FOR CONTRACT NO.: 04-1A9804

INFORMATION HANDOUT

MATERIALS INFORMATION

LIMITED SITE INVESTIGATION REPORT

ASBESTOS SURVEY

FOUNDATION REPORT

GEOTECHNICAL DESIGN REPORT

GEOTECHNICAL DATA REPORT

ROUTE: 04-SCl-101-31.8/34.3

LIMITED SITE INVESTIGATION REPORT

U.S. 101 OPERATIONAL IMPROVEMENTS PROJECT SAN JOSE, CALIFORNIA

PREPARED FOR:
HMH ENGINEERS
1570 OAKLAND ROAD
SAN JOSE, CALIFORNIA

PREPARED BY:
GEOCON CONSULTANTS, INC.
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LIVERMORE, CALIFORNIA

GEOCON

GEOCON PROJECT NO. E8432-06-01
CALTRANS EA 04-1A9801

DECEMBER 2008

GEOCON
CONSULTANTS, INC.
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS

Project No. E8432-06-01
December 22, 2008

Mr. William J. Wagner, P.E.
HMH Engineers
1570 Oakland Road
San Jose, California 95131

Subject: LIMITED SITE INVESTIGATION REPORT
U.S. 101 OPERATIONAL IMPROVEMENTS PROJECT
SAN JOSE, CALIFORNIA
CALTRANS EA 04-1A9801

Dear Mr. Wagner:

Geocon has performed environmental engineering services at the subject site in general accordance with the scope of work outlined in our workplan dated June 18, 2008. The subject site includes the southbound shoulder, center median, and the Tully Road interchange within the project limits of the U.S. 101 Operational Improvements Project in San Jose, Santa Clara County, California.

The accompanying report summarizes the services performed including limited soil sample collection from soil borings advanced using hand-auger and direct-push drilling equipment, and laboratory testing.

The contents of this report reflect the views of Geocon Consultants, Inc., who is responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the State of California or the Federal Highway Administration. This report does not constitute a standard, specification, or regulation.

If there are any questions concerning the contents of this report, or if Geocon may be of further service, please contact the undersigned at your convenience.

Sincerely,

GEOCON CONSULTANTS, INC.

Lauren Vigliotti
Senior Staff Geologist

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LIMITED SITE INVESTIGATION REPORT

1.0 INTRODUCTION

This *Limited Site Investigation Report* was prepared for the U.S. 101 Operational Improvements Project in the City of San Jose, California. The U.S. 101 Operational Improvements Project limits extend from the Story Road interchange (I/C) south to the Capitol Expressway I/C, and consist of an approximately 2.5-mile roadway segment.

This report documents a limited site investigation for metals, petroleum hydrocarbons, chlorinated pesticides, and naturally occurring asbestos (NOA), in shallow soil within the limits of the U.S. 101 Operational Improvements Project, as depicted on the Vicinity Map, Figure 1. Soil samples were collected along the center median, southbound shoulders, and the Tully Road I/C. The soil boring locations advanced during the site investigation within the project area are depicted on the Site Plan, Figure 2.

1.1 Purpose

The purpose of the proposed scope of services was to evaluate whether impacts due to metals, including aerially deposited lead (ADL), petroleum hydrocarbon compounds, or pesticides exist in the surface and near surface soil at the Site, associated with historical automobile emissions from the use of leaded gasoline or historical agricultural activities. NOA testing was also conducted as the Site is located in a potential area where ultramafic rock may be present. Groundwater is not expected to be encountered during proposed project construction activities; therefore no groundwater samples were collected during the investigation.

Soil borings were located on the center median, southbound shoulder, and the Tully Road I/C along an approximately 2.5-mile segment of U.S. 101. ADL soil samples were collected from three depths at each boring for the purpose of evaluating potential vertical impacts of lead in soil. Surface soil samples from these borings were also analyzed for pesticides due to past agricultural land use. We also advanced hand-auger soil borings in the vicinity of a proposed retaining wall (to a depth of five feet) and the bore and jack pit locations (to a depth of 10.5 feet) for the proposed 42-inch storm drain pipe. Groundwater was not encountered during advancement of the deeper borings; therefore grab-groundwater samples were not collected.

The information obtained from this investigation will be used by the Client to coordinate I/C project activities, evaluate soil reuse and soil/groundwater disposal options, and for health, safety, and waste management purposes.

1.2 Proposed Improvements

The U.S. 101 Operational Improvements Project will include the following:

- Construction of an additional lane on southbound U.S. 101 from a point just south of Story Road to Capitol Expressway, which will be constructed within the existing median.
- Construction of an auxiliary lane on southbound U.S.101 between Tully Road and Capitol Expressway, which consists of approximately 1.3 miles.
- Reconfiguration of the U.S. 101/Tully Road I/C, which includes realignment and widening of on- and off-ramps, removal of off-ramps, and replacement of the non-standard overcrossing with a new bridge that is approximately 4 feet (ft) higher than the existing structure.

The Site consists of an approximately 2.5-mile segment of U.S. 101 and includes the southbound shoulder, center median, and the Tully Road I/C. A Site Plan, presented as Figure 2, depicts proposed project improvement areas.

2.0 BACKGROUND

2.1 Previous Phase I Environmental Site Assessment

Parikh Consultants, Inc. (Parikh) performed a Phase I Environmental Site Assessment (ESA) of the project area in 2004, which identified the following:

- Historically, the surrounding area was used for agricultural purposes and therefore the potential exists for surface soil to be impacted with pesticides and/or herbicides.
- The U.S. 101 corridor and associated roadways have supported vehicular activity since the 1940's, and it is therefore highly likely that surface soils along these roadways have been impacted by the aerial deposition of lead.
- Pavement markings that consist of yellow paint and thermoplastic stripes may contain lead.
- The overcrossing structures, retaining walls and other structures located within the project limits were constructed prior to 1980 and therefore it is likely that these structures contain asbestos containing materials (ACM) and lead based paint (LBP).
- Properties located adjacent to the northbound Story Road on-ramp to U.S. 101 were identified as potential sources of soil and/or groundwater impact; stressed vegetation and staining was observed along the right-of-way in this area.

Based upon the above findings, Parikh recommended preparation of a workplan for collecting shallow soil samples the Site. The Phase I ESA also recommended soil and groundwater testing in the vicinity of the Story Road on-ramp; however, this area is not included in the proposed U.S.101 Operational Improvements Project, and was not included in the scope of this investigation. Additionally, Geocon has conducted an ACM/LCP survey at the Tully Road bridge, and the results were provided under separate cover.

2.2 Previous Investigation and Review of As-Built Plans

Geocon performed a previous ADL investigation along U.S. 101, north of the project site, and encountered former roadway structures, including concrete and asphalt, beneath the center median of U.S. 101 between I-880 and I-280/680.

Geocon reviewed As-Built Plans provided by the Client dated between 1960 and 1990 that include the project site. The plans indicate that former roadway structures are present beneath the center median of U.S. 101 between Capitol Expressway and the Tully Road I/C. Based upon the plans, former roadway structures do not appear to be present beneath the center median of U.S. 101 between Tully and Story Roads.

2.3 Aerially Deposited Lead

Ongoing testing by Caltrans throughout the State has indicated that ADL exists along major freeway routes due to emissions from vehicles powered by leaded gasoline. The ADL is generally limited to the upper two feet of soil material within the unpaved shoulder and median areas.

2.4 Naturally Occurring Asbestos

As defined in current California Air Resources Board (CARB) rules, serpentine material refers to any material that contains at least 10% serpentine, and asbestos-containing serpentine refers to serpentine materials with an asbestos content greater than 5% as determined by CARB Test Method 435 (CARB 435). The use of serpentine material for road surfacing is prohibited in California by Title 17 of the California Code of Regulations (CCR) Section 93106, Asbestos Airborne Toxic Control Measure (ATCM) for Surfacing Application (ATCM 93106), unless the material has been tested and determined to have an asbestos content of less than 0.25%. Materials found to contain asbestos of 0.25% or more are considered to be designated waste if transported offsite, requiring disposal at a landfill facility designated to accept asbestos waste. Alternatively, asbestos-containing materials may be reused onsite if buried beneath a minimum of six inches of soil.

The CARB specifies mitigation practices for construction, grading, quarrying, and surface mining operations that contain natural occurrences of asbestos outlined in Title 17, Section 93105 Asbestos ATCM for Construction, Grading, Quarrying, and Surface Mining Operations, (ATCM 93105). Based on Part (e) Subpart (2) of ATCM 93105 an asbestos dust mitigation plan is required and must be implemented for a project if NOA is disturbed after the start of construction. Additionally, ATCM 93105 specifies that the air pollution control district (APCD) must be notified, and an asbestos dust mitigation plan submitted to the APCD. The ATCM states that air monitoring may be required on the site. NOA potentially posses a health hazard when it becomes an airborne particulate.

The construction/maintenance activities mentioned above could disturb NOA laden debris and soil, thereby potentially creating an airborne hazard. Mitigation practices can reduce the risk of exposure to airborne NOA containing dust. Dust suppression practices include wetting the materials being disturbed and wearing approved respirators with HEPA filters during construction activities.

2.5 Hazardous Waste Determination Criteria

Regulatory criteria to classify a waste as California hazardous for handling and disposal purposes are contained in the CCR, Title 22, Division 4.5, Chapter 11, Article 3, §66261.24. Criteria to classify a waste as Resource, Conservation, and Recovery Act (RCRA) hazardous are contained in Chapter 40 of the Code of Federal Regulations (40 CFR), Section 261.

For waste containing metals, the waste is classified as California hazardous when: 1) the total metal content exceeds the respective Total Threshold Limit Concentration (TTLC); or 2) the soluble metal content exceeds the respective Soluble Threshold Limit Concentration (STLC) based on the standard Waste Extraction Test (WET). A waste has the potential of exceeding the STLC when the waste's total metal content is greater than or equal to ten times the respective STLC value since the WET uses a 1:10 dilution ratio. Hence, when a total metal is detected at a concentration greater than or equal to ten times the respective STLC, and assuming that 100 percent of the total metals are soluble, soluble metal analysis is required. A material is classified as RCRA hazardous, or Federal hazardous, when the soluble metal content exceeds the Federal regulatory level based on the Toxicity Characteristic Leaching Procedure (TCLP).

The above regulatory criteria are based on chemical concentrations. Wastes may also be classified as hazardous based on other criteria such as ignitability and corrosivity; however, for the purposes of this investigation, toxicity (i.e., lead concentrations) is the primary factor considered for waste classification since waste generated during the construction activities would not likely warrant testing for ignitability or other criteria. Waste that is classified as either California hazardous or RCRA hazardous requires management as a hazardous waste.

The Department of Toxic Substances Control (DTSC) regulates and interprets hazardous waste laws in California. The DTSC generally considers excavated or transported materials that exhibit "hazardous waste" characteristics to be a "waste" requiring proper management, treatment and disposal. Soil that contains lead above hazardous waste thresholds and is left in-place would not be necessarily classified by DTSC as a "waste." The DTSC has provided site-specific determinations that "movement of wastes within an area of contamination does not constitute "land disposal" and, thus, does not trigger hazardous waste disposal requirements. Therefore, lead-impacted soil that is

scarified in-place, moisture-conditioned, and re-compacted during landscaping improvement activities might not be considered a "waste;" DTSC should be consulted to confirm waste classification. It is noted that in addition to DTSC regulations, health and safety requirements and other local agency requirements may also apply to the handling and disposal of lead-impacted soil. Waste that is classified as either "California hazardous" or "RCRA hazardous," requires management as a hazardous waste and disposal at an appropriately permitted disposal facility.

2.6 DTSC Variance

The DTSC issued a variance on September 22, 2000 for Caltrans District 4 regarding the disposition of ADL-impacted soils within Caltrans projects. Review of the District 4 Variance, as modified by DTSC on September 12, 2003, and June 17, 2008, indicates the following conditions regarding reuse and management of ADL-impacted soil as fill material for construction and maintenance operations in Caltrans right-of-way.

Category 1 (Caltrans Type Y-1):

Soil exhibiting soluble lead concentrations less than or equal to 0.5 milligrams per liter (mg/l) [based on a modified waste extraction test using deionized water as the extractant (WET-DI)] and total lead concentrations of 1,411 mg/kg or less may be used as fill provided that the lead-impacted soil is placed a minimum of 5 feet above the maximum water table elevation and covered with at least 1 foot of clean soil.

Category 2 (Caltrans Type Y-2):

Soil exhibiting soluble lead concentrations greater than 0.5 mg/l and less than 50 mg/l (based on the WET-DI) and total lead concentrations greater than 1,411 mg/kg and less than 3,397 mg/kg may be used as fill provided that the lead-impacted soil is placed a minimum of 5 feet above the maximum water table elevation and protected from infiltration by a pavement structure maintained by Caltrans.

Category 3 (Caltrans Type Y-2):

Lead-impacted soil with a pH less than 5.0 shall only be used as fill material under the paved portion of the roadway.

2.7 Environmental Screening Levels

The San Francisco Bay Regional Water Quality Control Board (SFRWQCB) has prepared a technical report entitled *Screening For Environmental Concerns At Sites With Contaminated Soil and Groundwater, Interim Final* (November 2007), which presents Environmental Screening Levels (ESLs) for soil, groundwater, soil gas, and surface water, to assist in evaluating sites impacted by releases of hazardous chemicals. The ESLs are conservative values for more than 100 commonly detected contaminants, which may be used to compare with environmental data

collected at a site. ESLs are strictly risk assessment tools and "not regulatory clean up standards." The presence of a chemical at concentrations in excess of an ESL does not necessarily indicate that adverse impacts to human health or the environment are occurring; this simply indicates that a potential for adverse risk may exist and that additional evaluation is or may be warranted (SFRWQCB, 2007). The most restrictive ESL table was used for this characterization: Table A – Shallow Soil (≤3 meters below ground surface; bgs) – Groundwater is a Current or Potential Source of Drinking Water.

The most restrictive ESL table was used for this characterization: Table A – Shallow Soil (≤3 meters below ground surface; bgs) – Groundwater is a Current or Potential Source of Drinking Water. The respective ESLs are listed at the end of Tables 3 through 5 for comparative purposes.

3.0 SCOPE OF SERVICES

The following scope of services was performed by Geocon:

3.1 Pre-Field Activities

- Prepared the *Site Investigation Workplan, U.S. 101 Operational Improvements Project, San Jose, California,* dated June 18, 2008. The Workplan was electronically transmitted to the client and Caltrans, and was approved by Caltrans.
- Prepared a Health and Safety Plan (HSP) for the project that provided guidelines on the use of personal protective equipment and the health and safety procedures to be implemented during the investigation activities.
- Retained the services of a Gregg Drilling & Testing direct push drill rig to advance soil borings at the Site.
- Retained the services of Advanced Technology Laboratories (ATL) and EMSL Analytical (EMSL) to perform the analyses of the soil samples.
- Notified Underground Service Alert (USA) at least 48 hours prior to fieldwork involving drilling or direct push sampling activities.

3.2 Field Activities

The field activities consisted of advancing soil borings along the southbound shoulder, the Tully Road I/C, and the center median of U.S. 101 using hand-auger and direct-push methods. Groundwater was not encountered during the investigation activities. Soil samples were collected from the borings as follows:

- On January 30, 2008, we collected 108 soil samples from 36 soil borings (SB101-1 through SB101-36) at the following depth intervals: 0 foot to 0.5 foot, 1.0 foot to 1.5 feet (ft) and 2.0 ft to 2.5 ft.
- On August 6 and 7, 2008, we collected 153 soil samples from 51 borings (RW1-1 through RW1-4, SB101-37 through SB101-48 and TRI-1 through TRI-35). Soil samples from the shoulder borings (SB101-) were collected at the three depth intervals listed above. Retaining

wall soil samples (RW1-) were collected at depth intervals of 2.5 ft to 3.0 ft and 4.5 ft to 5.0 ft. Additionally, we collected soil samples at depths of 4.0 ft to 4.5 ft and 8.0 to 8.5 feet in two soil borings (TRI-11 and TRI-20), which were advanced to a depth of 10.5 feet, at the location of the bore and jack pit for the proposed storm drain line.

- On September 3, 2008, we collected 31 soil samples from 12 soil borings located in the center median of U.S. 101 (MB1 through MB12). Additionally, on November 4, 2008, we collected 40 samples from 14 soil borings located in the center median (MB13 through MB26). Soil samples were collected at depth intervals of 0.0 ft to 0.5 ft, 1.0 ft to 1.5 ft, and 2.0 ft to 2.5 ft.

Soil boring coordinates were obtained using global positioning system (GPS) equipment. The GPS coordinates are presented in Table 1. The boring locations are depicted on the Site Plans, Figures 2a through 2g.

4.0 INVESTIGATIVE METHODS

4.1 Sampling Procedures

The soil samples collected for metals, petroleum hydrocarbon compounds, and NOA analyses were retrieved using direct-push and hand-auger methods. Soil samples obtained from the direct-push borings were collected using 1.5-inch diameter acetate liners, which were secured with Teflon tape and plastic end caps. Soil samples collected using the hand auger were transferred from the auger bucket into individual polyethylene sample bags, with the exception of samples collected for pesticides analysis, which were collected in stainless steel tubes secured with Teflon tape and plastic end caps. Soil samples were labeled and placed in a chilled cooler for transport to the analytical laboratory. Completed soil borings were backfilled to surface grade with soil cuttings. Soil boring locations along the center median were initially core-drilled though the concrete/asphalt surface to access the underlying soil. Soil samples were collected from beneath the pavement using hand auger and direct-push drilling methods.

Sampling equipment was cleansed by washing the equipment with a Liquinox solution followed by two successive rinses with distilled water. The decontamination water was returned to the site surface away from storm drains and inlets in a manner not to create runoff.

The soil samples were transported to ATL and EMSL for analysis, under standard chain-of-custody documentation.

4.2 Laboratory Analyses

Laboratory analyses were performed under routine turn-around-times. Reproductions of the laboratory reports and chain-of-custody documentation are presented as Appendix A. The laboratory analyses performed are summarized below:

- A total of 324 soil samples were analyzed for total lead following Environmental Protection Agency (EPA) Test Method 6010.
- Twelve soil samples were analyzed for CAM17 metals using EPA Test Methods 6010B/7471A
- A total of 112 soil samples with total lead concentrations greater than 50 mg/kg (i.e. ten times the STLC of 5 mg/l) were further analyzed for soluble WET lead.
- A total of 51 soil samples with soluble (WET) lead concentrations greater than the STLC of 5 mg/l were further analyzed for soluble lead using deionized water as the extraction fluid (WET-DI).
- A total of 44 soil samples were further analyzed for soluble TCLP lead.
- Twelve soil samples were analyzed for total petroleum hydrocarbons (TPH) as diesel and as motor oil (TPHd/mo) using EPA Test Method 8015M
- Twelve soil samples were analyzed for TPH as gasoline (TPHg) and fuel oxygenate compounds (FOCs) using EPA Test Method 8021B.
- A total of 19 soil samples, which included 10 four-point composite soil samples, collected from the 0.0 ft to 0.5 ft depth interval, were analyzed for chlorinated pesticides using EPA Test Method 8082.
- A total of 37 soil samples were analyzed for NOA using CARB 435.
- A total of 22 soil samples were analyzed for soil pH following EPA Test Method 9045.

4.3 QA/QC Procedures

Quality assurance/quality control (QA/QC) procedures were performed for each method of analysis with specificity for each analyte listed in the test method's QA/QC. The laboratory QA/QC procedures included the following:

- One method blank for every ten samples, batch of samples or type of matrix, whichever was more frequent.
- One sample analyzed in duplicate for every ten samples, batch of samples or type of matrix, whichever was more frequent.
- One spiked sample for every ten samples, batch of samples or type of matrix, whichever was more frequent, with spike made at ten times the detection limit or at the analyte level.

Prior to submitting the soil samples to the laboratory, the chain-of-custody documentation was reviewed for accuracy and completeness.

5.0 INVESTIGATIVE RESULTS

Analytical results of the soil samples are summarized in Tables 2 through 6.

5.1 Shoulder and Tully Road I/C Soil Samples

- Total lead concentrations ranged from less than (<) the laboratory reporting limit of 5 mg/kg to 550 mg/kg, with 102 samples having concentrations equal to or exceeding 50 mg/kg (i.e. ten times the STLC of 5 mg/l).
- Soluble WET lead was reported in the soil samples at concentrations ranging from <0.25 mg/l to 41 mg/l.
- Soluble WET-DI lead was reported in the soil samples at concentrations ranging from <0.25 mg/l to 0.36 mg/l.
- Soluble TLCP lead was reported in the soil samples at concentrations ranging from <0.25 mg/l to 0.42 mg/l.
- Chromium was reported in the soil samples at concentrations ranging from 29 mg/kg to 55 mg/kg, with three samples exceeding ten times the STLC of 5.0 mg/kg. Soluble WET chromium was not detected above the laboratory reporting limit of 1.0 mg/l in the three samples.
- The following CAM17 metals were not detected above their respective laboratory reporting limits in the soil samples: antimony, beryllium, cadmium, molybdenum, silver, and thallium. Arsenic, barium, cobalt, copper, mercury, nickel, selenium, vanadium, and zinc were reported in the soil samples at concentrations below ten times their respective STLC values.
- Pesticides were detected in the soil samples. Specifically, 4,4'-DDD was detected in three of the samples at concentrations between 2.1 micrograms per kilogram (µg/kg) and 2.7 µg/kg; 4,4'-DDE was reported at concentrations ranging from <2.0 µg/kg to 6.4 µg/kg, 4,4'-DDT was reported at concentrations ranging from <2.0 µg/kg to 14 µg/kg, alpha-chlordane was reported in the soil samples at concentrations ranging from <1.0 µg/kg to 2.2 µg/kg, chlordane was reported at concentrations ranging from <8.5 µg/kg to 30 µg/kg, and gamma-chlordane was reported at concentrations ranging from <1.0 µg/kg to 2.3 µg/kg.
- NOA was reported in the soil samples at concentrations ranging from <0.25% to 3.00% dry weight content.
- Reported soil pH values in the soil samples ranged from 6.7 to 8.6.

5.2 Median Soil Samples

5.2.1 Subsurface Conditions

The median portion of the Site is paved with between approximately four inches and six inches of asphalt and concrete, which was cored in order to obtain soil samples. Soil samples collected from beneath the pavement generally consisted of gravelly sand road base material. Refusal was encountered in five of the borings (MB15 through MB19 and MB24) between approximately 12 and 20 inches beneath the base of the pavement. The table below provides a summary of the materials encountered in the median borings and the approximate station location.

Boring	Approximate Station (ft)	Core Results	Comments
MB1	1795+10	6" Asphalt 24" Road Base (Base)	Surface, 1 ft, and 2 ft samples collected
MB2	1789+70	6" Asphalt 18" Base	Surface, 1 ft, and 2 ft samples collected
MB3	1784+50	4" Asphalt 14" Concrete 12" Base	Collected 2 ft sample only.
MB4	1779+30	4" Asphalt 14" Concrete 8" Base 10" Base/Native	Collected 2 ft sample only.
MB5	1774+00	12" Asphalt	Collected 1 ft and 2 ft samples only.
MB6	1768+45	5" Asphalt	Surface, 1 ft, and 2 ft samples collected
MB7	1763+00	6" Asphalt	Surface, 1 ft, and 2 ft samples collected
MB8	1757+70	5" Asphalt	Surface, 1 ft, and 2 ft samples collected
MB9	1752+40	6" Asphalt	Surface, 1 ft, and 2 ft samples collected
MB10	1746+90	5" Asphalt	Surface, 1 ft, and 2 ft samples collected
MB11	1741+50	5" Asphalt	Surface, 1 ft, and 2 ft samples collected
MB12	1736+40	5" Asphalt	Surface, 1 ft, and 2 ft samples collected
MB13	1831+90	4" Concrete	Surface, 1 ft, and 2 ft samples collected
MB14	1826+80	4" Concrete	Surface, 1 ft, and 2 ft samples collected
MB15	1821+40	4" Concrete Base	Surface, 1 ft, and 20" samples collected. Refusal at 20", deep sample at 20"
MB16	1816+10	4" Concrete Base	Surface, 1 ft, and 20" samples collected. Refusal at 20", deep sample at 20"
MB17	1810+10	4" Concrete Base	Surface, 1 ft, and 20" samples collected. Refusal at 20", deep sample at 20"
MB18	1802+90	4.5" Concrete Base	Refusal at 12", only collected surface sample
MB19	1731+00	4.5" Concrete Base	Surface, 1 ft, and 19" samples collected. Refusal at 19", deep sample at 19"
MB20	1704+50	4" Concrete Base	Surface, 1 ft, and 2 ft samples collected
MB21	1720+20	4" Concrete Base	Surface, 1 ft, and 2 ft samples collected

Boring	Approximate Station (ft)	Core Results	Comments
MB22	1714+80	4" Concrete Base	Surface, 1 ft, and 2 ft samples collected
MB23	1709+75	4" Concrete Base	Surface, 1 ft, and 2 ft samples collected
MB24	1704+50	6" Concrete Base	Surface, 1 ft, and 20" samples collected. Refusal at 20", deep sample at 20"
MB25	1699+20	6" Concrete Base	Surface, 1 ft, and 2 ft samples collected
MB26	1694+00	6" Concrete Base	Surface, 1 ft, and 2 ft samples collected

5.2.2 Analytical Results

- Total lead concentrations ranged from <5 mg/kg to 1,700 mg/kg, with ten samples exceeding 50 mg/kg.
- Soluble WET lead was reported in the soil samples at concentrations ranging from 3.0 mg/l to 84 mg/l.
- Soluble WET-DI lead was reported in the soil samples analyzed at concentrations ranging from <0.25 mg/l to 13 mg/l.
- Soluble TLCP lead was reported in the soil samples at concentrations ranging from <0.25 mg/l to 17 mg/l.
- Pesticides were not detected above their respective laboratory reporting limits in the median soil samples.
- NOA was reported in the soil samples at concentrations ranging from 0.50% to 6.75% dry weight content.
- Reported soil pH values in the soil samples ranged from 7.4 to 9.1.

5.3 Laboratory Quality Assurance/Quality Control

We reviewed the laboratory QA/QC provided with the laboratory report. The data show acceptable surrogate recoveries and non-detect results for the method blanks.

The relative percent differences (RPDs) of the duplicate samples for several of the analyses were outside criteria. Matrix Spike (MS) and/or Matrix Spike Duplicate (MSD) were outside recovery criteria for a number of the analyses. The Case Narratives in the laboratory reports state that each analytical batch was validated by the Laboratory Control Sample (LCS). The data showed acceptable recoveries and RPDs for the remainder of the duplicates and matrix spikes. Several of the samples required dilution due to matrix effects.

Based on this limited data review, no additional qualifications of the soil data are necessary and the data are of sufficient quality for the purposes of this report.

5.4 Statistical Evaluation for Lead Detected in Soil Samples

Statistical methods were applied to the total lead data to evaluate: 1) the upper confidence limits (UCLs) of the arithmetic means of the total lead concentrations for each sampling depth; and 2) if an acceptable correlation between total and soluble lead concentrations exists that would allow the prediction of soluble lead concentrations based on calculated UCLs. The statistical methods used are discussed in a book entitled *Statistical Methods for Environmental Pollution Monitoring,* by Richard Gilbert; in an EPA *Technology Support Center Issue* document entitled, *The Lognormal Distribution in Environmental Applications,* by Ashok Singh et. al., dated December 1997; and in a book entitled *An Introduction to the Bootstrap,* by Bradley Efron and Robert J. Tibshirani.

The lead data for the Site were treated as seven sample populations for statistical evaluation, which consisted of the following:

A) Soil samples collected from shoulder borings SB101-1 through SB101-20 and SB101-37 (approximate station 1774.9 to 1838.0)

B) Soil samples collected from shoulder borings SB101-31 through SB101-36 and SB101-45 through SB101-48 (approximate station 1696.0 to 1724.4)

C) Soil samples collected from shoulder borings SB101-38 through SB101-42 and Tully Road I/C borings TRI-1 through TRI-8 (approximate station 1763.0 to 1770.5, northwestern portion of the I/C)

D) Soil samples collected from shoulder borings SB101-43, SB101-44, and Tully Road I/C borings TRI-9 through TRI-14 (approximate station 1756.0 to 1762.0; southwestern portion of the I/C)

E) Soil samples collected from Retaining Wall borings RW1-1 through RW1-4, and Tully Road I/C borings TRI-15 through TRI-26 (approximate station 1747.0 to 1762.0; southeastern portion of the I/C)

F) Soil samples collected from Tully Road I/C borings TRI-27 through TRI-35 (approximate station 1762.0 to 1777.0, northeastern portion of the I/C)

G) Soil samples collected from median borings MB1 through MB7 (approximate station 1763.0 to 1795.0)

H) Soil samples collected from median borings MB8 through MB12 (approximate station 1736.3 to 1757.7)

I) Soil samples collected from median borings MB13 through MB18 (approximate station 1802.9 to 1831.9)

J) Soil samples collected from median borings MB19 through MB26 (approximate station 1694.0 to 1731.0)

5.4.1 Calculating the UCLs for the Arithmetic Mean

The upper one-sided 90% and 95% UCLs of the arithmetic mean are defined as the values that, when calculated repeatedly for randomly drawn subsets of site data, equal or exceed the true mean 90% and 95% of the time, respectively. Statistical confidence limits are the classical tool for addressing uncertainties of a distribution mean. The UCLs of the arithmetic mean concentration are used as the mean concentrations because it is not possible to know the true mean due to the essentially infinite number of soil samples that could be collected from a site. The UCLs therefore account for uncertainties due to limited sampling data. As data become less limited at a site, uncertainties decrease, and the UCLs move closer to the true mean.

Non-parametric bootstrap techniques used to calculate the UCLs are discussed in the previously referenced EPA document and in *An Introduction to the Bootstrap.* For those samples in which total lead was not detected at concentrations exceeding the laboratory MRL, a value equal to one-half of the detection limit was used in the UCL calculation. The bootstrap test results are included in Appendix B, and the following tables present the calculated UCLs and statistics for the data set.

Shoulder Borings SB101-1 to SB101-20 and SB101-37
(Approximate Station 1774.9 to 1838.0)

SAMPLE INTERVAL (feet)	90% TOTAL LEAD UCL (mg/kg)	95% TOTAL LEAD UCL (mg/kg)	TOTAL LEAD MEAN (mg/kg)	MINIMUM VALUE (mg/kg)	MAXIMUM VALUE (mg/kg)
0 to 0.5	143.5	153.0	108.1	8.2	550
1.0 to 1.5	57.1	60.4	46.0	2.5	170
2.0 to 2.5	91.3	98.0	70.3	2.5	270

Shoulder Borings SB101-21 to SB101-36 and SB101-45 to SB101-48
(Approximate Station 1696.0 to 1724.4)

SAMPLE INTERVAL (feet)	90% TOTAL LEAD UCL (mg/kg)	95% TOTAL LEAD UCL (mg/kg)	TOTAL LEAD MEAN (mg/kg)	MINIMUM VALUE (mg/kg)	MAXIMUM VALUE (mg/kg)
0 to 0.5	55.0	59.1	42.3	2.5	210
1.0 to 1.5	34.7	36.4	29.1	2.5	69
2.0 to 2.5	35.3	37.2	29.0	5.6	93

Shoulder Borings SB101-38 to SB101-42 and Tully Road I/C Borings TRI-1 to TRI-8 (Approximate Station 1763.0. to 1770.5)

SAMPLE INTERVAL (feet)	90% TOTAL LEAD UCL (mg/kg)	95% TOTAL LEAD UCL (mg/kg)	TOTAL LEAD MEAN (mg/kg)	MINIMUM VALUE (mg/kg)	MAXIMUM VALUE (mg/kg)
0 to 0.5	83.7	88.4	67.1	13	210
1.0 to 1.5	49.9	53.0	36.5	9.0	160
2.0 to 2.5	41.8	46.4	29.6	7.9	140

Shoulder Borings SB101-43, SB101-44, and Tully Road I/C Borings TRI-9 to TRI-14 (Approximate Station 1756.0 to 1762.0)

SAMPLE INTERVAL (feet)	90% TOTAL LEAD UCL (mg/kg)	95% TOTAL LEAD UCL (mg/kg)	TOTAL LEAD MEAN (mg/kg)	MINIMUM VALUE (mg/kg)	MAXIMUM VALUE (mg/kg)
0 to 0.5	174.8	184.6	138.9	7.0	240
1.0 to 1.5	184.2	195.7	137.8	8.7	360
2.0 to 2.5	113.3	125.0	74.3	8.0	240

Retaining Wall Borings RW1-1 to RW1-4 and Tully Road I/C Borings TRI-15 to TRI-26 (Approximate Station 1747.0 to 1762.0)

SAMPLE INTERVAL (feet)	90% TOTAL LEAD UCL (mg/kg)	95% TOTAL LEAD UCL (mg/kg)	TOTAL LEAD MEAN (mg/kg)	MINIMUM VALUE (mg/kg)	MAXIMUM VALUE (mg/kg)
0 to 0.5	140.3	150.9	109.4	16	290
1.0 to 1.5	79.4	86.3	57.2	9.2	170
2.0 to 2.5	63.1	68.0	45.6	7.6	180
4.0 to 4.5	9.1	9.2	8.4	6.4	9.7

Tully Road I/C Borings TRI-27 to TRI-35 (Approximate Station 1762.0 to 1777.0)

SAMPLE INTERVAL (feet)	90% TOTAL LEAD UCL (mg/kg)	95% TOTAL LEAD UCL (mg/kg)	TOTAL LEAD MEAN (mg/kg)	MINIMUM VALUE (mg/kg)	MAXIMUM VALUE (mg/kg)
0 to 0.5	121.0	127.3	97.6	44	200
1.0 to 1.5	129.3	142.1	82.8	2.5	370
2.0 to 2.5	94.3	103.6	59.9	2.5	280

Median Borings MB-13 through MB-18
(Approximate Station 1802.9 to 1831.9)

SAMPLE INTERVAL (feet)	90% TOTAL LEAD UCL (mg/kg)	95% TOTAL LEAD UCL (mg/kg)	TOTAL LEAD MEAN (mg/kg)	MINIMUM VALUE (mg/kg)	MAXIMUM VALUE (mg/kg)
0 to 0.5	Not Calculated	Not Calculated	3.3	2.5	7.4
1.0 to 1.5	Not Calculated	Not Calculated	2.5	2.5	2.5
2.0 to 2.5	Not Calculated	Not Calculated	2.5	2.5	2.5

Median Borings MB1 through MB7
(Approximate Station 1763.0 to 1795.0)

SAMPLE INTERVAL (feet)	90% TOTAL LEAD UCL (mg/kg)	95% TOTAL LEAD UCL (mg/kg)	TOTAL LEAD MEAN (mg/kg)	MINIMUM VALUE (mg/kg)	MAXIMUM VALUE (mg/kg)
0 to 0.5	Not Calculated	Not Calculated	8.0	2.5	20
1.0 to 1.5	Not Calculated	Not Calculated	13.4	2.5	57
2.0 to 2.5	279.3	315.6	162.8	2.5	730

Median Borings MB8 through MB12
(Approximate Station 1736.3 to 1757.7)

SAMPLE INTERVAL (feet)	90% TOTAL LEAD UCL (mg/kg)	95% TOTAL LEAD UCL (mg/kg)	TOTAL LEAD MEAN (mg/kg)	MINIMUM VALUE (mg/kg)	MAXIMUM VALUE (mg/kg)
0 to 0.5	Not Calculated	Not Calculated	2.5	2.5	2.5
1.0 to 1.5	Not Calculated	Not Calculated	4.2	2.5	8.4
2.0 to 2.5	Not Calculated	Not Calculated	3.1	2.5	5.7

Median Borings MB-19 through MB-26
(Approximate Station 1694.0 to 1731.0)

SAMPLE INTERVAL (feet)	90% TOTAL LEAD UCL (mg/kg)	95% TOTAL LEAD UCL (mg/kg)	TOTAL LEAD MEAN (mg/kg)	MINIMUM VALUE (mg/kg)	MAXIMUM VALUE (mg/kg)
0 to 0.5	Not Calculated	Not Calculated	2.5	2.5	2.5
1.0 to 1.5	152.5	171.1	90.8	2.5	420
2.0 to 2.5	528.2	589.3	278.6	2.5	1,700

5.4.2 Correlation of Total and Soluble Lead

Total and corresponding soluble (WET) lead concentrations are bivariate data with a linear structure. This linear structure should allow for the prediction of soluble lead (WET) concentrations based on the UCLs calculated above in Section 5.4.1.

To estimate the degree of interrelation between total and corresponding soluble (WET) lead values (x and y, respectively), the *correlation coefficient [r]* is used. The correlation coefficient is a ratio that ranges from +1 to –1. A *correlation coefficient* of +1 indicates a perfect direct relationship between two variables; a *correlation coefficient* of –1 indicates that one variable changes inversely with relation to the other. Between the two extremes is a spectrum of less-than-perfect relationships, including zero, which indicates the lack of any sort of linear relationship at all. The *correlation coefficient* was calculated for the 112 (x, y) data points (i.e., soil samples analyzed for both total lead [x] and soluble [WET] lead [y]). The resulting *coefficient of determination* (r^2) equaled 0.726, which yields a corresponding *correlation coefficient* (r) of 0.852.

For the *correlation coefficient* that indicates a linear relationship between total and soluble (WET) lead concentrations, it is possible to compute the line of dependence or a best-fit line between the two variables. A least squares method was used to find the equation of a best-fit line (regression line) by forcing the y-intercept equal to zero since that is a known point. The equation of the regression line was determined to be $y = 0.0679(x)$, where x represents total lead concentrations and y represents predicted soluble lead (WET) concentrations.

This equation was used to estimate the expected WET soluble lead concentrations for the UCLs calculated in for samples collected from the Site (see Section 5.4.1). Regression analysis results and a scatter plot depicting the (x, y) data points along with the regression line are included in Appendix C. The predicted soluble (WET) lead concentrations for the soil samples collected at the Site are summarized in Tables 7a through 7j.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Waste classifications are evaluated based on the 90% UCL of the lead content for the relevant excavation depths; this has historically been considered sufficient to satisfy a good faith effort by the EPA as discussed in SW-846. Risk assessment characterization is based on the 95% UCL of the lead content in the waste for the relevant depths; this is in accordance with the Risk Assessment Guidance for Superfund (RAGS) Volume 1 Documentation for Exposure Assessment. Per Caltrans, the 90% UCLs are to be used to evaluate onsite reuse and the 95% UCLs are to be used to evaluate offsite disposal.

6.1 Predicted Soluble Lead

6.1.1 Borings SB101-1 to SB101-20 and SB101-37 (Approximate Station 1774.9 to 1838.0)

The following table summarizes the predicted soluble (WET) lead concentrations and the waste classification for excavated soil based on the calculated total lead UCLs and the relationship between total and soluble (WET) lead for data collected at the Site. The total and soluble (WET) lead calculations are summarized in Table 7a.

Excavation Depth	90% UCL Total Lead (mg/kg)	90% UCL Predicted WET Lead (mg/l)	95% UCL Total Lead (mg/kg)	95% UCL Predicted WET Lead (mg/l)	Waste Classification
0 to 1.0 ft	144	**9.7**	153	**10**	**Hazardous**
Underlying soil (1.0 to 2.5 ft)	*68*	*4.7*	*73*	*5.0*	*Non-Hazardous*
0 to 2.0 ft	100	**6.8**	107	**7.2**	**Hazardous**
Underlying Soil (2.0 to 2.5 ft)	*91*	***6.2***	*98*	***6.7***	***Hazardous***
0 to 2.5 ft	98	**6.7**	105	**7.1**	**Hazardous**

90% UCL applicable for waste classification and onsite reuse; 95% UCL applicable for risk assessment.

Based on the data presented in the above table, soil excavated from the surface to a depth of 1.0 foot would be classified as a California hazardous waste since the 90% UCL-predicted soluble (WET) lead concentration is greater than the lead STLC of 5.0 mg/l. Underlying soil (i.e., deeper than 1.0 foot) may be disposed as non-hazardous. Based on the data presented in the above table, if excavated separately, the top 1.0 foot of soil should be either (1) managed as a California hazardous waste or (2) stockpiled and resampled to confirm waste classification in accordance with specific disposal facility acceptance criteria, if applicable.

Based on the reported WET-DI results, soil excavated from the surface to a depth of 1.0 foot may be reused onsite in accordance with the DTSC Variance by placing the excavated soil under clean fill or pavement.

Based on the 90%-UCL-predicted soluble (TCLP) lead concentrations, soil will not be classified as a RCRA hazardous waste.

6.1.2 Borings SB101-21 to SB101-36 and SB101-45 to SB101-48 (Approximate Station 1696.0 to 1724.4)

The following table summarizes the predicted soluble (WET) lead concentrations and the waste classification for excavated soil based on the calculated total lead UCLs and the relationship between total and soluble (WET) lead for data collected at the Site. The total and soluble (WET) lead calculations are summarized in Table 7b.

Excavation Depth	90% UCL Total Lead (mg/kg)	90% UCL Predicted WET Lead (mg/l)	95% UCL Total Lead (mg/kg)	95% UCL Predicted WET Lead (mg/l)	Waste Classification
0 to 1.0 ft	55	3.7	59	4.0	Non-Hazardous
Underlying soil (1.0 to 2.5 ft)	*35*	*2.4*	*37*	*2.5*	*Non-Hazardous*
0 to 2.0 ft	45	3.0	48	3.2	Non-Hazardous
Underlying Soil (2.0 to 2.5 ft)	*35*	*2.4*	*37*	*2.5*	*Non-Hazardous*
0 to 2.5 ft	43	2.9	46	3.1	Non-Hazardous

90% UCL applicable for waste classification and onsite reuse; 95% UCL applicable for risk assessment.

Based on the data presented in the above table, soil excavated from this portion of the Site would not be classified as a California hazardous waste since the 90% UCL-predicted soluble (WET) lead concentrations are less than the lead STLC of 5.0 mg/l. Consequently, excavated soil may be reused onsite as non-hazardous with respect to lead content.

6.1.3 Borings SB101-38 to SB101-42 and TRI-1 to TRI-8 (Approximate Station 1763.0 to 1770.5)

The following table summarizes the predicted soluble (WET) lead concentrations and the waste classification for excavated soil based on the calculated total lead UCLs and the relationship between total and soluble (WET) lead for data collected at the Site. The total and soluble (WET) lead calculations are summarized in Table 7c.

Excavation Depth	90% UCL Total Lead (mg/kg)	90% UCL Predicted WET Lead (mg/l)	95% UCL Total Lead (mg/kg)	95% UCL Predicted WET Lead (mg/l)	Waste Classification
0 to 1.0 ft	84	**5.7**	88	**6.0**	**Hazardous**
Underlying soil (1.0 to 2.5 ft)	*47*	*3.2*	*51*	*3.4*	*Non-Hazardous*
0 to 2.0 ft	67	4.5	71	4.8	Non-Hazardous
Underlying Soil (2.0 to 2.5 ft)	*42*	*2.8*	*46*	*3.1*	*Non-Hazardous*
0 to 2.5 ft	62	4.2	66	4.5	Non-Hazardous

90% UCL applicable for waste classification and onsite reuse; 95% UCL applicable for risk assessment.

Based on the data presented in the above table, soil excavated from the surface to a depth of 1.0 foot would be classified as a California hazardous waste since the 90% UCL-predicted soluble (WET) lead concentration is greater than the lead STLC of 5.0 mg/l. Underlying soil (i.e., deeper than 1.0 foot) may be disposed as non-hazardous. Based on the data presented in the above table, if excavated separately, the top 1.0 foot of soil should be either (1) managed as a California hazardous waste or (2) stockpiled and resampled to confirm waste classification in accordance with specific disposal facility acceptance criteria, if applicable.

Based on the reported WET-DI results, soil excavated from the surface to a depth of 1.0 foot may be reused onsite in accordance with the DTSC Variance by placing the excavated soil under clean fill or pavement.

If excavations extend to a depth of 2.0 ft or greater and excavated soil is managed as a whole, excavated soil would not be classified as hazardous waste.

Based on the 90%-UCL-predicted soluble (TCLP) lead concentrations, soil will not be classified as a RCRA hazardous waste.

6.1.4 Borings SB101-43, SB101-44, and TRI-9 to TRI-14 (Approximate Station 1756.0 to 1762.0)

The following table summarizes the predicted soluble (WET) lead concentrations and the waste classification for excavated soil based on the calculated total lead UCLs and the relationship between total and soluble (WET) lead for data collected at the Site. The total and soluble (WET) lead calculations are summarized in Table 7d.

Excavation Depth	90% UCL Total Lead (mg/kg)	90% UCL Predicted WET Lead (mg/l)	95% UCL Total Lead (mg/kg)	95% UCL Predicted WET Lead (mg/l)	Waste Classification
0 to 1.0 ft	175	**12**	185	**13**	**Hazardous**
Underlying soil (1.0 to 2.5 ft)	*161*	*11*	*172*	*12*	***Hazardous***
0 to 2.0 ft	180	**12**	190	**13**	**Hazardous**
Underlying Soil (2.0 to 2.5 ft)	*113*	*7.7*	*125*	***8.5***	***Hazardous***
0 to 2.5 ft	166	**11**	177	**12**	**Hazardous**

90% UCL applicable for waste classification and onsite reuse; 95% UCL applicable for risk assessment.

Based on the data presented in the above table, soil excavated from the surface to a depth of at least 2.5 ft would be classified as a California hazardous waste since the 90% UCL-predicted soluble (WET) lead concentrations are greater than the lead STLC of 5.0 mg/l.

Based on the reported WET-DI results, soil excavated from the surface to a depth of 2.5 feet may be reused onsite in accordance with the DTSC Variance by placing the excavated soil under clean fill or pavement.

Based on the 90%-UCL-predicted soluble (TCLP) lead concentrations, soil will not be classified as a RCRA hazardous waste.

6.1.5 Borings RW1-1 to RW1-4 and TRI-15 to TRI-26 (Approximate Station 1747.0 to 1762.0)

The following table summarizes the predicted soluble (WET) lead concentrations and the waste classification for excavated soil based on the calculated total lead UCLs and the relationship between total and soluble (WET) lead for data collected at the Site. The total and soluble (WET) lead calculations are summarized in Table 7e.

Excavation Depth	90% UCL Total Lead (mg/kg)	90% UCL Predicted WET Lead (mg/l)	95% UCL Total Lead (mg/kg)	95% UCL Predicted WET Lead (mg/l)	Waste Classification
0 to 1.0 ft	140	**9.5**	151	**10**	**Hazardous**
Underlying soil (1.0 to 4.5 ft)	*60*	*4.1*	*65*	*4.4*	*Non-Hazardous*
0 to 2.0 ft	110	**7.5**	119	**8.1**	**Hazardous**
Underlying Soil (2.0 to 4.5 ft)	*52*	*3.5*	*56*	*3.8*	*Non-Hazardous*
0 to 4.0 ft	86	**5.9**	93	**6.3**	**Hazardous**
Underlying Soil (4.0 to 4.5 ft)	*9.1*	*0.6*	*9.2*	*0.6*	*Non-Hazardous*
0 to 4.5 ft	100	**6.8**	108	**7.3**	**Hazardous**

90% UCL applicable for waste classification and onsite reuse; 95% UCL applicable for risk assessment.

Based on the data presented in the above table, soil excavated from the surface to a depth of 1.0 foot would be classified as a California hazardous waste since the 90% UCL-predicted soluble (WET) lead concentration is greater than the lead STLC of 5.0 mg/l. Underlying soil (i.e., deeper than 1.0 foot) may be disposed as non-hazardous. Based on the data presented in the above table, if excavated separately, the top 1.0 foot of soil should be either (1) managed as a California hazardous waste or (2) stockpiled and resampled to confirm waste classification in accordance with specific disposal facility acceptance criteria, if applicable.
Based on the reported WET-DI results, soil excavated from the surface to a depth of 1.0 foot may be reused onsite in accordance with the DTSC Variance by placing the excavated soil under clean fill or pavement.

Based on the 90%-UCL-predicted soluble (TCLP) lead concentrations, soil will not be classified as a RCRA hazardous waste.

6.1.6 Borings TRI-27 to TRI-35 (Approximate Station 1762.0 to 1777.0)

The following table summarizes the predicted soluble (WET) lead concentrations and the waste classification for excavated soil based on the calculated total lead UCLs and the relationship between total and soluble (WET) lead for data collected at the Site. The total and soluble (WET) lead calculations are summarized in Table 7f.

Excavation Depth	90% UCL Total Lead (mg/kg)	90% UCL Predicted WET Lead (mg/l)	95% UCL Total Lead (mg/kg)	95% UCL Predicted WET Lead (mg/l)	Waste Classification
0 to 1.0 ft	121	**8.2**	127	**8.6**	**Hazardous**
Underlying soil (1.0 to 2.5 ft)	*118*	***8.0***	*129*	***8.8***	***Hazardous***
0 to 2.0 ft	125	**8.5**	135	**9.1**	**Hazardous**
Underlying Soil (2.0 to 2.5 ft)	*94*	***6.4***	*104*	***7.0***	***Hazardous***
0 to 2.5 ft	119	**8.1**	128	**8.7**	**Hazardous**

90% UCL applicable for waste classification and onsite reuse; 95% UCL applicable for risk assessment.

Based on the data presented in the above table, soil excavated from the surface to a depth of at least 2.5 ft would be classified as a California hazardous waste since the 90% UCL-predicted soluble (WET) lead concentrations are greater than the lead STLC of 5.0 mg/l.

Based on the reported WET-DI results, soil excavated from the surface to a depth of 2.5 feet may be reused onsite in accordance with the DTSC Variance by placing the excavated soil under clean fill or pavement.

Based on the 90%-UCL-predicted soluble (TCLP) lead concentrations, soil will not be classified as a RCRA hazardous waste.

6.1.7 Median Borings MB-13 to MB-18 (Approximate Station 1802.9 to 1831.9)

Based on the maximum total lead concentration of 7.4 mg/kg for samples collected in this portion of the median at the Site, and the corresponding predicted soluble (WET) lead concentrations excavated soil would not be classified as a California hazardous waste. Consequently, excavated soil may be reused onsite as non-hazardous with respect to lead content. The total and soluble (WET) lead calculations are summarized in Table 7g.

6.1.8 Median Borings MB-1 to MB-7 (Approximate Station 1763.0 to 1795.0)

The following table summarizes the predicted soluble (WET) lead concentrations and the waste classification for excavated soil based on the maximum reported total lead concentration for the soil collected between the surface and a depth of 1.5 feet, the calculated total lead UCLs for the 2.0 ft and 2.5 ft depth interval, and the relationship between total and soluble (WET) lead for data collected at the Site. The total and soluble (WET) lead calculations are summarized in Table 7h.

Excavation Depth	90% UCL Total Lead (mg/kg)	90% UCL Predicted WET Lead (mg/l)	95% UCL Total Lead (mg/kg)	95% UCL Predicted WET Lead (mg/l)	Waste Classification
0 to 1.0 ft	20	1.4	20	1.4	Non-Hazardous
Underlying soil (1.0 to 2.5 ft)	*131*	***8.9***	*143*	***9.7***	***Hazardous***
0 to 2.0 ft	39	2.6	39	2.6	Non-Hazardous
Underlying Soil (2.0 to 2.5 ft)	*279*	***19***	*316*	***21***	***Hazardous***
0 to 2.5 ft	87	**5.9**	94	**6.4**	***Hazardous***

90% UCL applicable for waste classification and onsite reuse; 95% UCL applicable for risk assessment.

Based on the data presented in the above table, soil excavated from the surface to a depth of 2.0 ft would not be classified as a California hazardous waste since the 90% UCL-predicted soluble (WET) lead concentrations are less than the lead STLC of 5.0 mg/l. Consequently, soil excavated from the surface to a depth of 2.0 ft may be reused onsite as non-hazardous with respect to lead content. However, if soil between the surface and a depth of 2.5 ft is excavated as a whole, it would be classified as a California hazardous waste since the 90% UCL-predicted soluble (WET) lead concentration exceeds the STLC; therefore, soil excavated at depths greater than 2.0 ft should be stockpiled and resampled to confirm waste classification in accordance with specific disposal facility acceptance criteria, if applicable.

Two soil samples collected from the center median (MB-1-2 and MB-2-2) had reported soluble WET-DI concentrations of 4.1 mg/l and 13 mg/l, respectively. Additionally, soil

sample MB-2-2 had a reported soluble TCLP lead concentration of 7.4 mg/l, exceeding the STLC of 5.0 mg/l. The results indicate that soil in the area of MB-1-2 may be reused onsite in accordance with the DTSC Variance by placing the excavated soil under a structure or pavement.

6.1.9 Median Borings MB-8 to MB-12 (Approximate Station 1736.3 to 1757.7)

Based on the maximum total lead concentration of 8.4 mg/kg for samples collected in this portion of the median at the Site, and the corresponding predicted soluble (WET) lead concentrations excavated soil would not be classified as a California hazardous waste. Consequently, excavated soil may be reused onsite as non-hazardous with respect to lead content. The total and soluble (WET) lead calculations are summarized in Table 7i.

6.1.10 Median Borings MB-19 to MB-26 (Approximate Station 1694.0 to 1731.0)

The following table summarizes the predicted soluble (WET) lead concentrations and the waste classification for excavated soil based on the maximum reported total lead concentration for the soil collected from the 0.0 ft to 0.5 ft depth interval, the calculated total lead UCLs for soil collected between 1.0 ft and 2.5 ft, and the relationship between total and soluble (WET) lead for data collected at the Site. The total and soluble (WET) lead calculations are summarized in Table 7j.

Excavation Depth	Maximum/ 90% UCL Total Lead (mg/kg)	Maximum/ 90% UCL Predicted WET Lead (mg/l)	Maximum/ 95% UCL Total Lead (mg/kg)	Maximum/ 95% UCL Predicted WET Lead (mg/l)	Waste Classification
0 to 1.0 ft	2.5	0.17	2.5	0.17	Non-Hazardous
Underlying soil (1.0 to 2.5 ft)	*278*	***19***	*311*	***21***	***Hazardous***
0 to 2.0 ft	78	**5.3**	87	**5.9**	***Hazardous***
Underlying Soil (2.0 to 2.5 ft)	*528*	***36***	*589*	***40***	***Hazardous***
0 to 2.5 ft	168	**11**	187	**13**	***Hazardous***

90% UCL applicable for waste classification and onsite reuse; 95% UCL applicable for risk assessment.

Based on the data presented in the above table, soil excavated from the surface to a depth of 1.0 ft would not be classified as a California hazardous waste since the 90% UCL-predicted soluble (WET) lead concentrations are less than the lead STLC of 5.0 mg/l. Consequently, soil excavated from the surface to a depth of 1.0 ft may be reused onsite as non-hazardous with respect to lead content. However, if soil between the surface and a depth of 2.5 ft is excavated as a whole, it would be classified as a California hazardous waste since the 90% UCL-predicted soluble (WET) lead concentration exceeds the STLC; therefore, soil excavated at depths greater than 1.0 ft should

be stockpiled and resampled to confirm waste classification in accordance with specific disposal facility acceptance criteria, if applicable.

Based on the reported WET-DI results, soil excavated from the surface to a depth of 2.5 feet may be reused onsite in accordance with the DTSC Variance by placing the excavated soil under clean fill or pavement.

Based on the 90%-UCL-predicted soluble (TCLP) lead concentrations, soil should not be classified as a RCRA hazardous waste.

6.2 CAM17 Metals

The total CAM17 metal results for soil samples collected at the Tully Road I/C and proposed retaining wall locations are summarized in Table 3. Based on the total CAM17 metals concentrations (with the exception of lead) and the reported levels of soluble (WET) chromium, soil excavated from the Site should not be considered a hazardous waste.

The CAM17 metals concentrations in soil were compared to ESLs (SFRWQCB, November 2007, Table A). Reported arsenic concentrations were between 5.5 mg/kg and 48 mg/kg in the soil samples, which exceed the residential and commercial/industrial land use ESLs of 0.38 mg/kg and 1.5 mg/kg, respectively. Reported vanadium concentrations were between 22 mg/kg and 38 mg/kg in the soil samples, exceeding the residential land use ESL of 15 mg/kg.

Upper one-sided 90% and 95% upper confidence limits (UCLs) were calculated for the reported arsenic and vanadium concentrations for the soil samples collected at the Site. The UCLs were compared with the residential and commercial/industrial land use ESLs and with published background levels typically present in California soils as presented in *Background Concentrations of Trace and Major Elements in California Soils* (Kearney Foundation of Soil Science, Division of Agriculture and Natural Resources, University of California, March 1996). The bootstrap results are included in Appendix B. The calculated standard bootstrap UCLs, ESLs and published background concentrations are summarized in the table below:

Metal	90% UCL	95% UCL	RESIDENTIAL ESL	COMMERCIAL/ INDUSTRIAL ESL	PUBLISHED BACKGROUND RANGE [1]
Arsenic	15.4	16.7	0.38	1.5	0.6 to 11.0
Vanadium	34.5	35	15	190	39 to 288

Concentrations reported in milligrams per kilogram (mg/kg)
[1] Kearney Foundation of Soil Science, March 1996

The 90% and 95% UCL values for arsenic in the soil samples collected at the Site are greater than the ESLs and the published background concentration range. The SFRWQCB *November 2007 Update to Environmental Screening Levels (ESLs) Technical Document* states that ambient background concentrations of arsenic typically exceed risk-based screening levels. In such instances, it may be more appropriate to compare site data to regionally-specific established background levels. However, an outlier test was performed for the arsenic data set, which indicated that the reported concentration of 48 mg/kg in sample RW1-4-2.5 is a statistical outlier. The calculated 90% and 95% UCLs for arsenic excluding the outlier were 8.7 mg/kg and 8.9 mg/kg, respectively, which are within the published background range (Kearney Foundation of Soil Science, 1996). Consequently, soil excavated in the vicinity of sample RW1-4 should be stockpiled and resampled to establish potential offsite disposal and/or reuse options.

The 90% and 95% UCL values for vanadium in the soil samples collected at the Site are greater than the residential land use ESL, and are less than both the commercial/industrial land use ESL and published background concentrations.

Based on the calculated UCLs for arsenic and vanadium, and comparisons to ESLs and the published background concentrations, offsite disposal of soil may be restricted based on metals content, depending on proposed use.

6.3 Petroleum Hydrocarbon Compounds

TPH or FOCs were not reported in the soil samples above their respective ESLs; therefore, offsite disposal of soil should not be restricted based on petroleum hydrocarbon content.

6.4 Pesticides

Pesticides were reported in the soil samples at concentrations that were below their respective ESLs for residential and commercial/industrial land use in shallow and deep soil (SFRWQCB, Tables A and C). Offsite disposal of excavated soil should not be restricted based on pesticides content.

6.5 Naturally Occurring Asbestos

The following conclusions and recommendations are based on the site investigation results and are applicable regardless of whether the excavated NOA-containing materials generated during construction activities are reused onsite or transported offsite for disposal.

Naturally occurring asbestos is a State of California regulated substance. Excavated materials with levels equal to or exceeding the CARB regulatory limit of 0.25% NOA content cannot be used as, or in such a way that it could fall under the definition of, surfacing material as defined by the ATCM 93106 Rules.

The asbestos content of soil samples collected at the Site ranged from 0.25% to 6.75%, exceeding the CARB limit of 0.25% for surfacing materials (see Table 6). The asbestos type reported is chrysotile, based on CARB 435 analysis. Therefore, there will likely be restrictions on reuse of these materials within the project boundaries or if disposed offsite.

NOA impacted soils may not be used as surfacing materials but may be used as fill materials provided they are buried beneath a minimum of six inches of clean material. Furthermore, construction/maintenance activities involving these asbestos-containing materials may fall under regulatory jurisdiction of the California Division of the Occupational Safety and Health Administration (Cal-OSHA) under Title 8 Section 5208 of the California Code of Regulations (CCR). Mitigation measures during construction/maintenance activities are required under ATCM 93105, to minimize releases of NOA to air (dust control) and surface waters (storm water discharge). Asbestos-containing soils reused on the Site should be placed in the deepest fills.

Under ATCM 93105, offsite disposal of the material requires asbestos content notification. Facility-specific landfill acceptance criteria should be determined for asbestos-containing soil materials. Asbestos at average concentrations less than 1.0% is generally eligible for disposal in a Class III Waste Management Unit (WMU). Asbestos at concentrations greater than 1.0% will require disposal in an appropriately permitted disposal facility, generally a Class II WMU.

6.6 Worker Protection

6.6.1 Lead

Per Caltrans requirements, the contractor(s) should prepare a project-specific lead compliance plan (CCR Title 8, Section 1532.1, the "Lead in Construction" standard) to minimize worker exposure to lead-impacted soil. The plan should include protocols for environmental and personnel monitoring, requirements for personal protective equipment, and other health and safety protocols and procedures for the handling of lead-impacted soil.

6.6.2 Naturally Occurring Asbestos

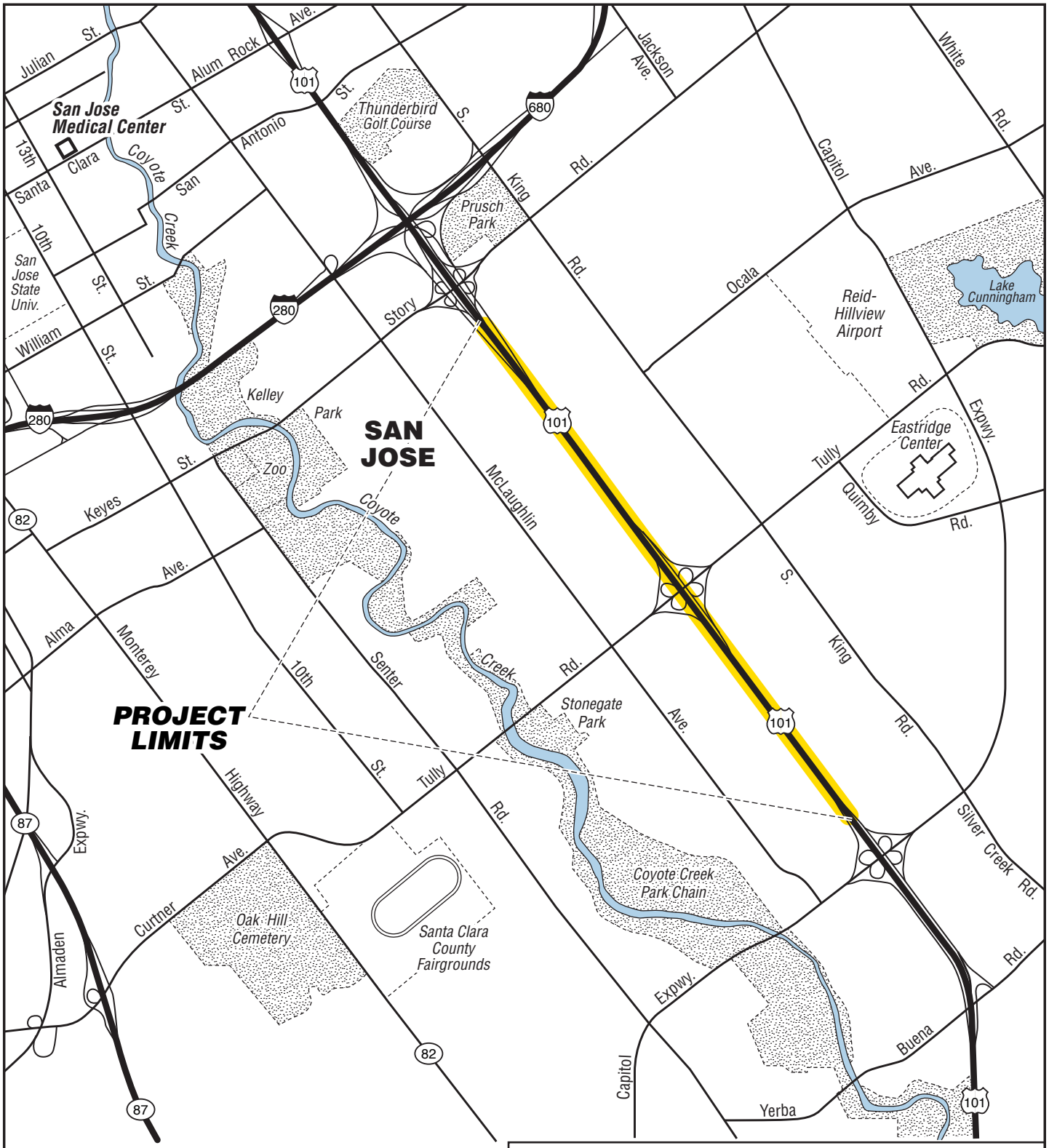
Currently, regulatory exposure limits and health hazard data are not available for NOA in soils. Federal regulations governing asbestos define it as the asbestiform variety of the amphibole minerals actinolite, amosite, anthophyllite, crocidolite, and tremolite, and the asbestiform variety of serpentine, chrysotile. Asbestos fibers occurring in industrial materials are considered by the National Institute for Occupational Safety and Health (NIOSH) as potential occupational carcinogens. Prudence is recommended, therefore, in dealing with soils containing NOA. Engineering controls such as wet suppression should be utilized to minimize aerial dispersion of NOA fibers in planned work areas during excavation and road construction activities. Under Title

8 Section 5208 of the CCR, disturbance of asbestos containing materials requires wet working methods and possible respiratory protection and air monitoring. The CARB has established protocols outlined in ATCM 93105 for the implementation of worker health, safety and monitoring plans for excavation, grading and transport of NOA-containing soils. The excavation contractor should consult ATCM 93105 and contact Cal-OSHA to establish the appropriate regulatory protocol and actions necessary for excavation and/or disturbance of asbestos-containing soils.

7.0 REPORT LIMITATIONS

This report has been prepared exclusively for HMH Engineers. The information contained herein is only valid as of the date of the field sampling, and will require an update to reflect additional information obtained.

This report is not a comprehensive site characterization and should not be construed as such. The findings as presented in this report are predicated on the results of the limited sampling and laboratory testing performed. In addition, the information obtained is not intended to address potential impacts related to sources other than those specified herein. Therefore, the report should be deemed conclusive with respect to only the information obtained. We make no warranty, express or implied, with respect to the content of this report or any subsequent reports, correspondence or consultation. Geocon strived to perform the services summarized herein in accordance with the local standard of care in the geographic region at the time the services were rendered.



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Scale in Miles

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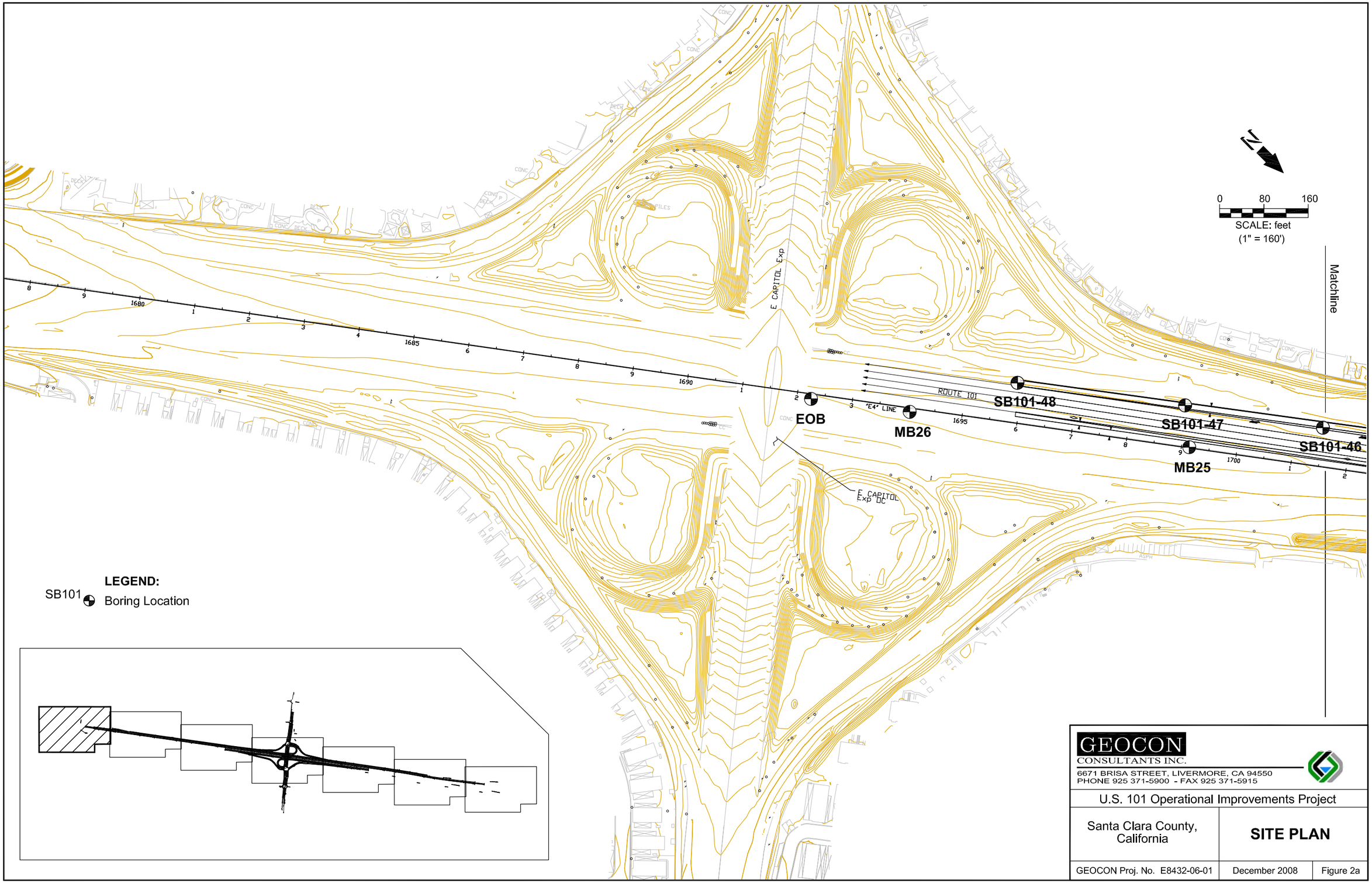
US 101 Operational Improvements

Santa Clara County, California

VICINITY MAP

E8432-06-01	December 2008	Figure 1



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U.S. 101 Operational Improvements Project

Santa Clara County, California

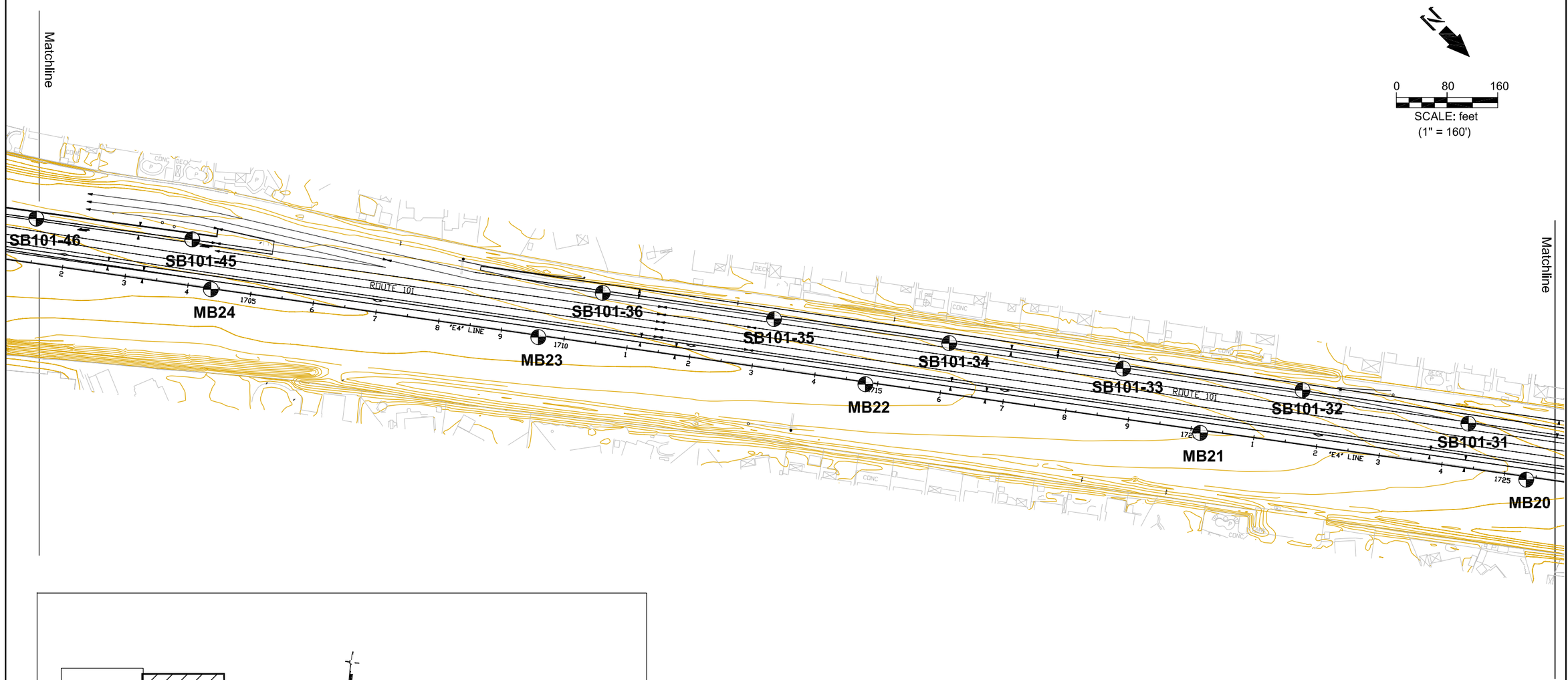
SITE PLAN

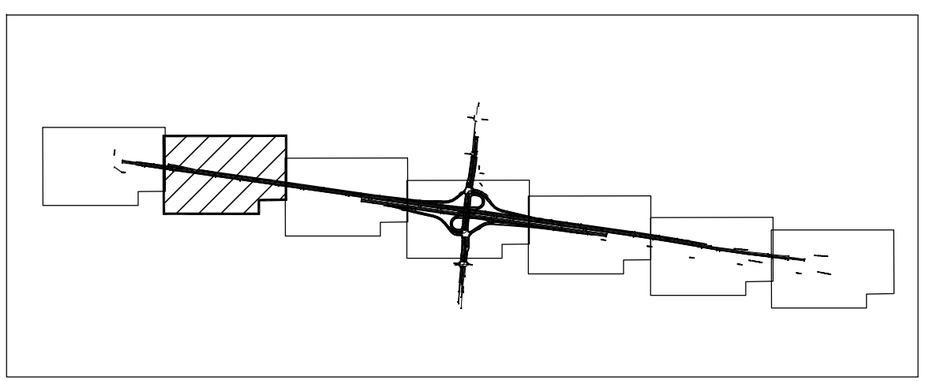
GEOCON Proj. No. E8432-06-01 | December 2008 | Figure 2a

SITE1108

LEGEND:

SB101 Boring Location





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Santa Clara County, California	SITE PLAN	
GEOCON Proj. No. E8432-06-01	December 2008	Figure 2b

SITE1108

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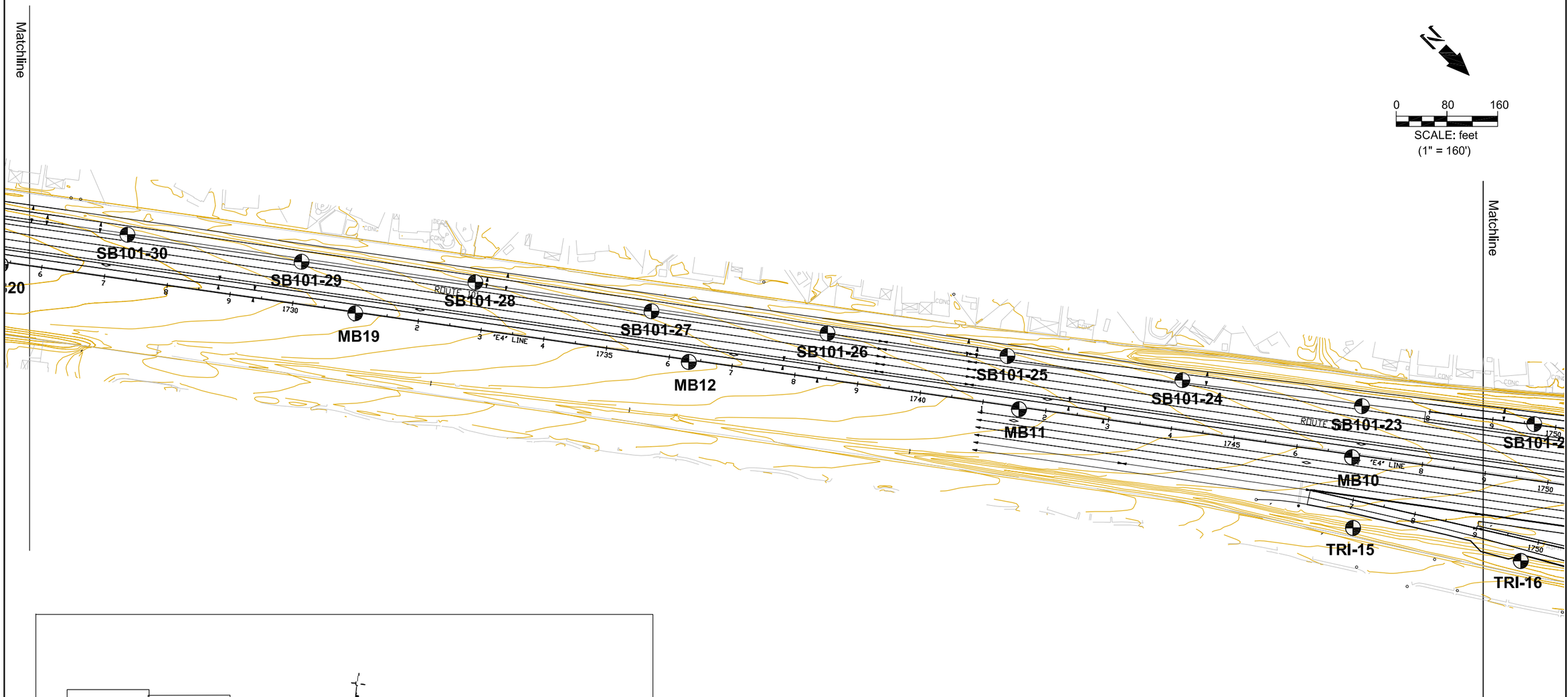

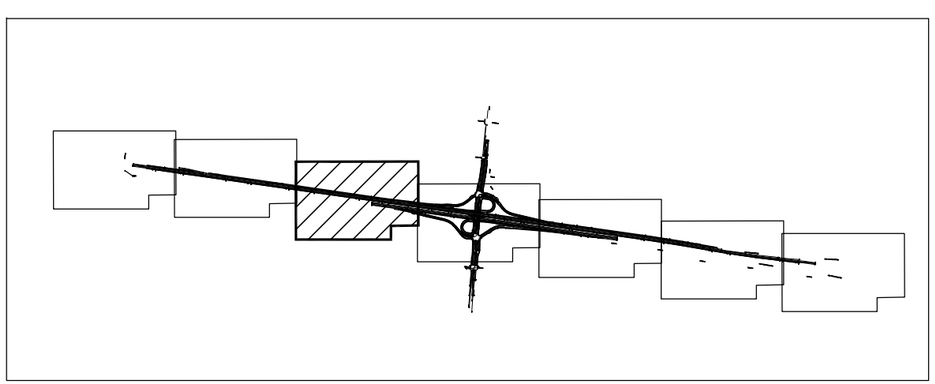

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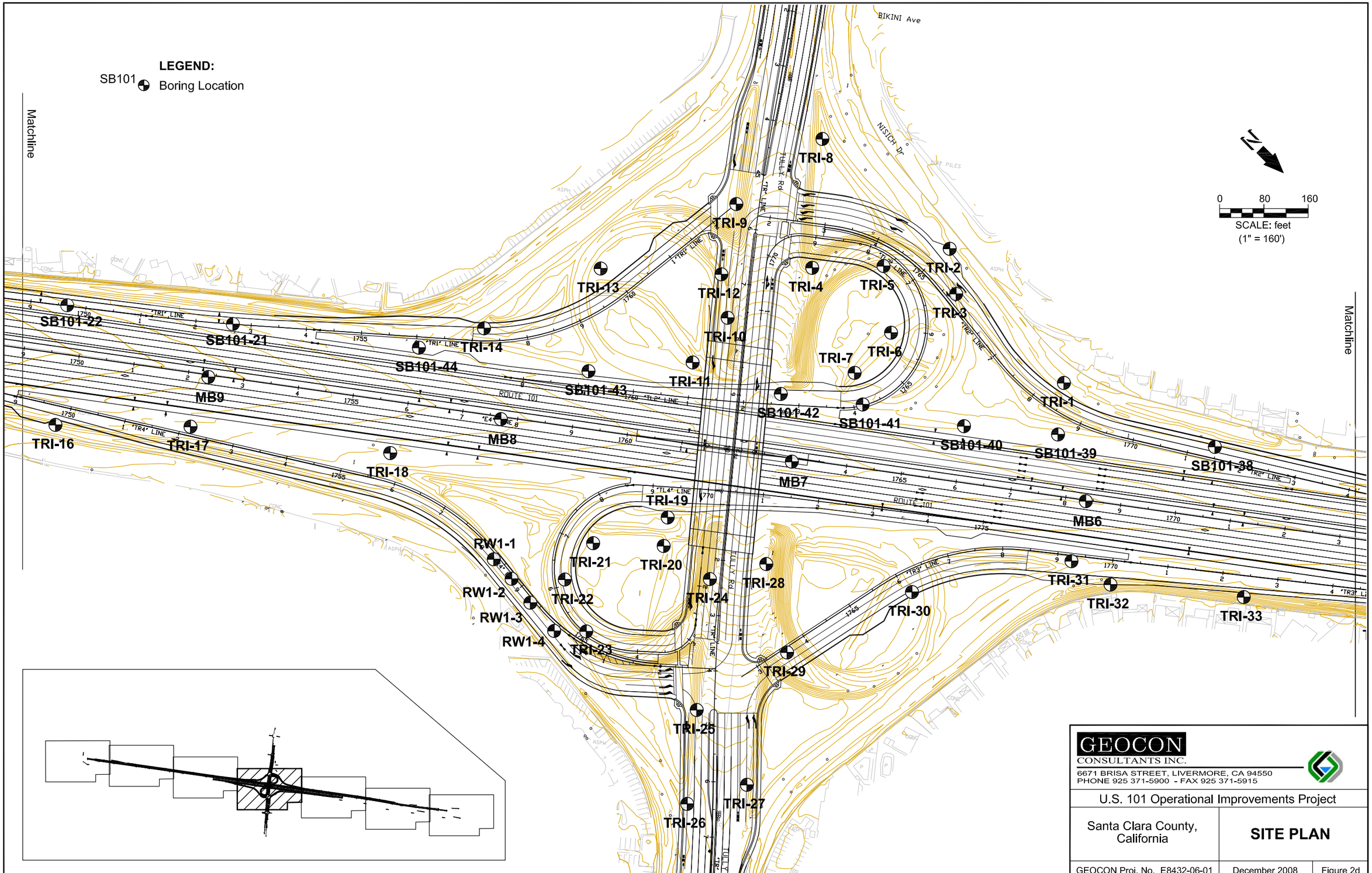
Santa Clara County, California	SITE PLAN	
GEOCON Proj. No. E8432-06-01	December 2008	Figure 2c

SITE1108



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U.S. 101 Operational Improvements Project

Santa Clara County, California	SITE PLAN	
GEOCON Proj. No. E8432-06-01	December 2008	Figure 2d

SITE1108

LEGEND:

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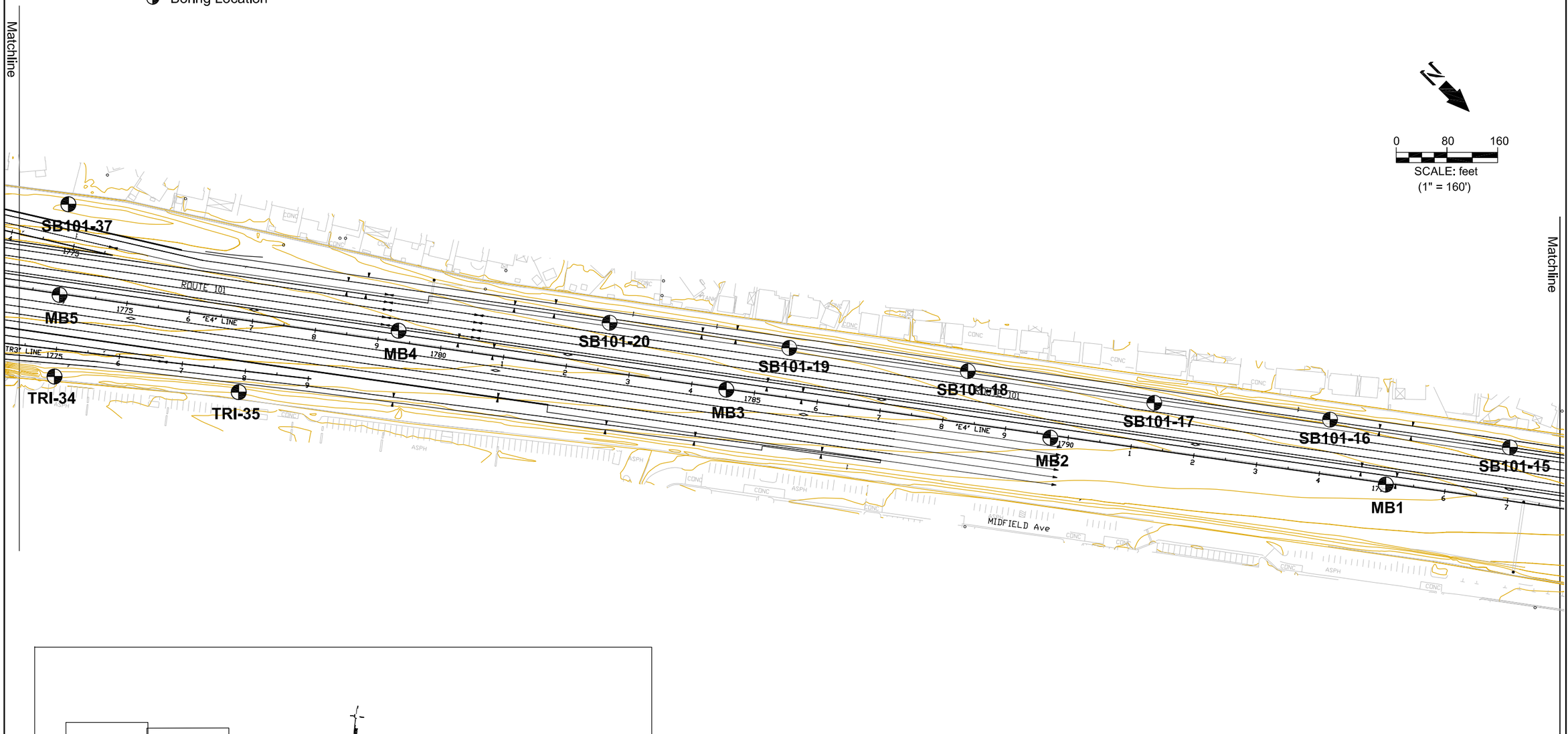

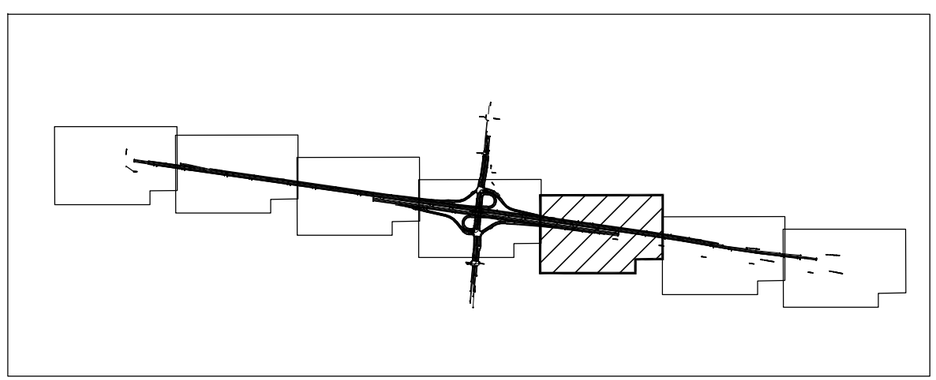

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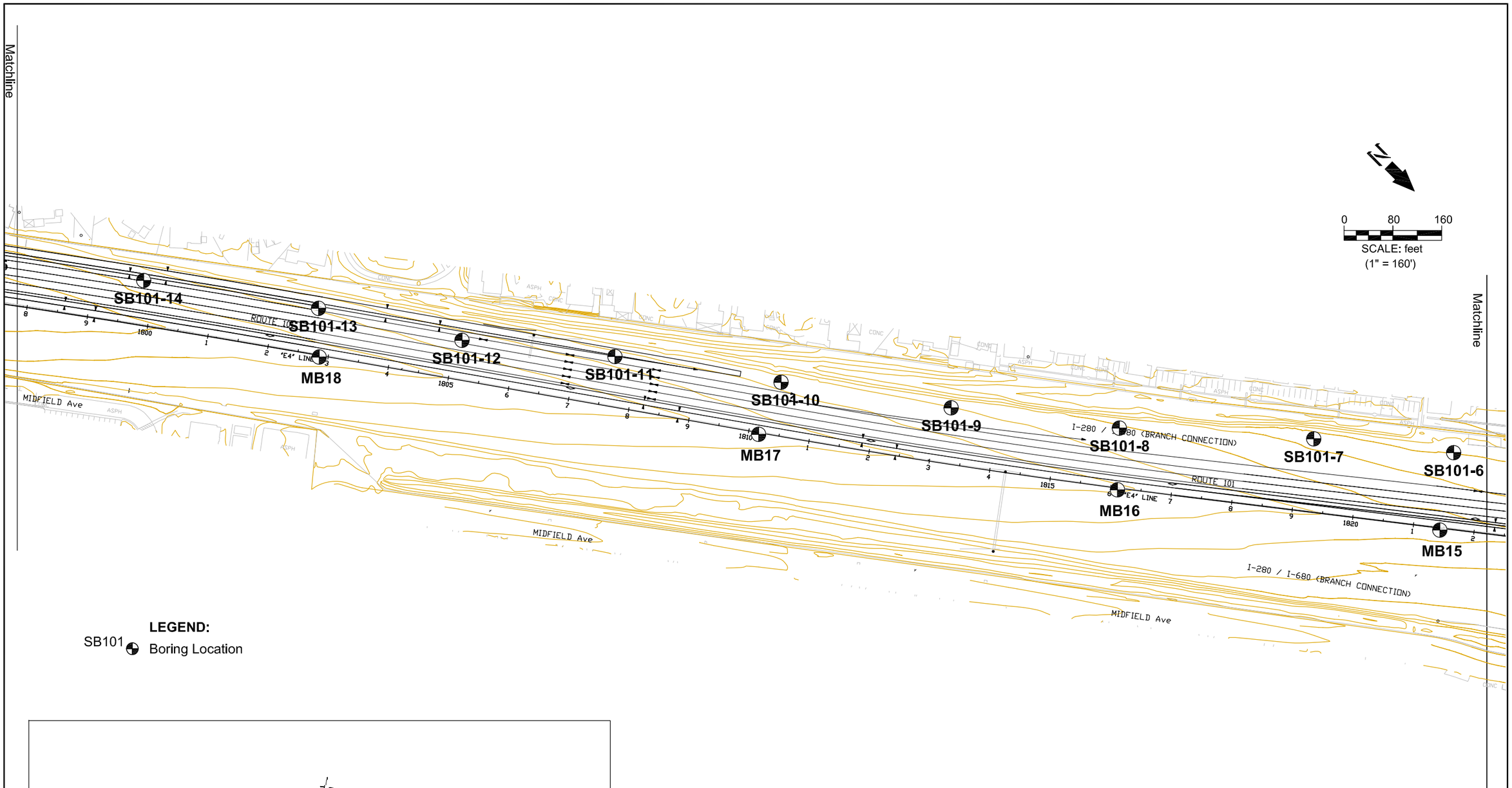
Santa Clara County, California	SITE PLAN	
GEOCON Proj. No. E8432-06-01	December 2008	Figure 2e

SITE1108



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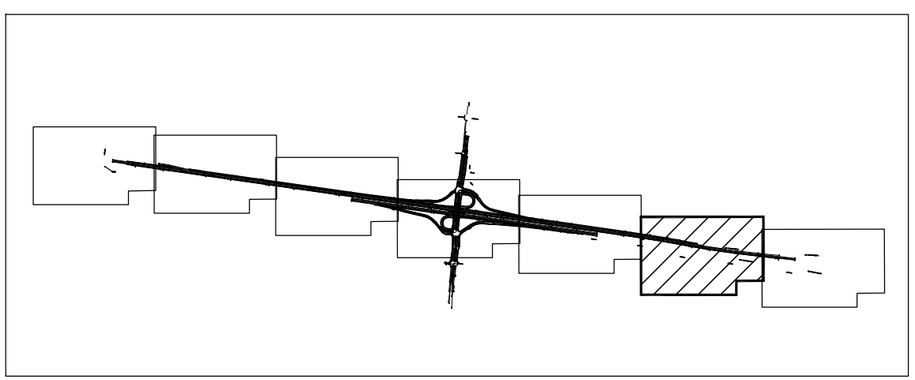

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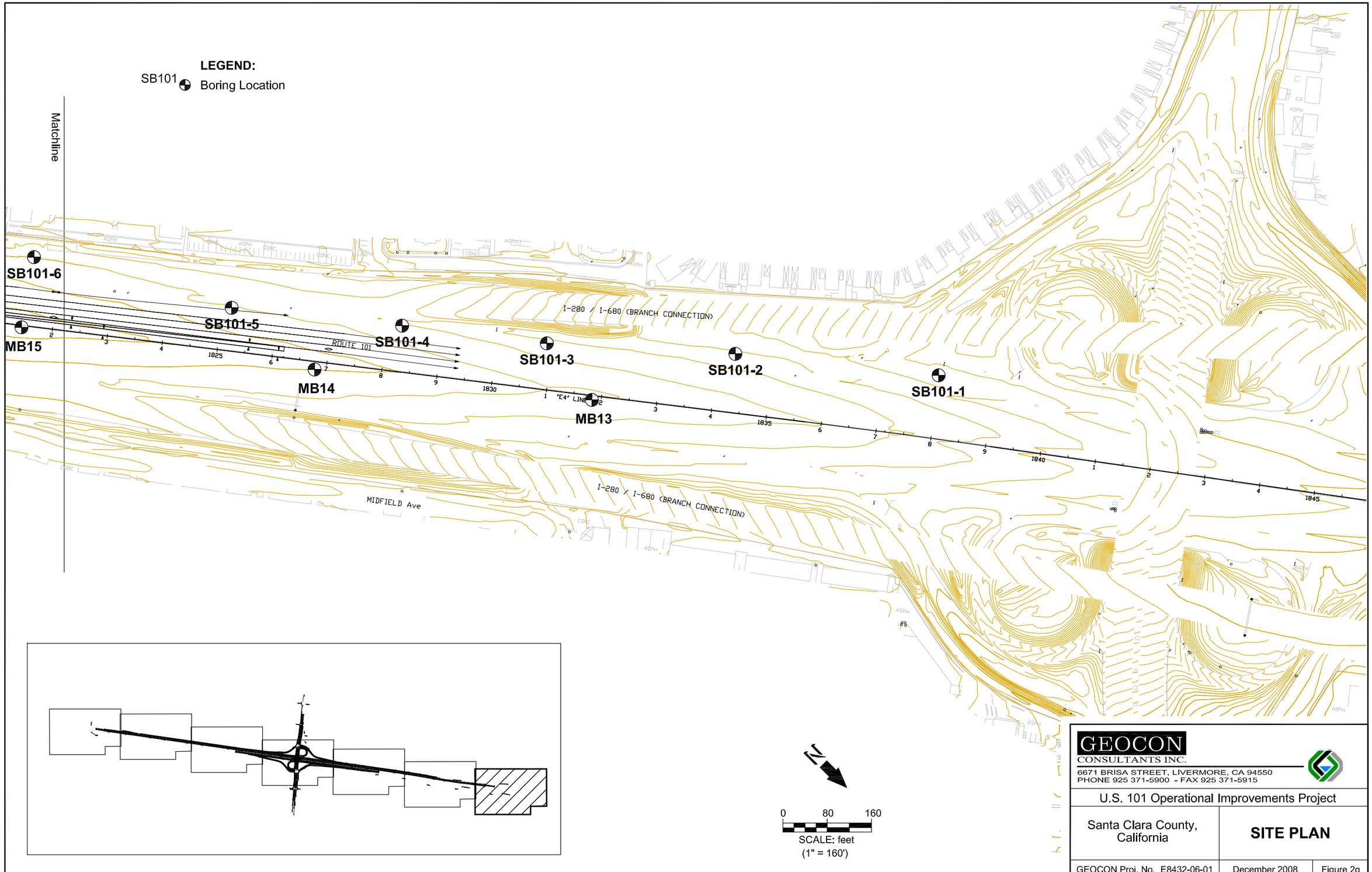
Santa Clara County, California

SITE PLAN

GEOCON Proj. No. E8432-06-01 | December 2008 | Figure 2f

SITE1108



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U.S. 101 Operational Improvements Project

Santa Clara County, California

SITE PLAN

GEOCON Proj. No. E8432-06-01 | December 2008 | Figure 2g

SITE1108

TABLE 1
Boring Coordinates
US 101 Operational Improvements Project
San Jose, California

Boring	Northing	Easting
MB1	1,943,821.562	6,172,496.247
MB2	1,943,395.259	6,172,818.255
MB3	1,942,980.072	6,173,126.076
MB4	1,942,548.809	6,173,425.978
MB5	1,942,130.676	6,173,764.154
MB6	1,941,685.774	6,174,097.874
MB7	1,941,259.915	6,174,422.815
MB8	1,940,834.232	6,174,740.013
MB9	1,940,406.768	6,175,059.921
MB10	1,939,968.802	6,175,388.865
MB11	1,939,543.822	6,175,706.857
MB12	1,939,122.733	6,176,022.343
MB13	1,946,772.238	6,170,303.306
MB14	1,946,378.978	6,170,618.892
MB15	1,945,950.485	6,170,939.658
MB16	1,945,530.404	6,171,266.572
MB17	1,945,050.218	6,171,618.113
MB18	1,944,451.474	6,172,037.821
MB19	1,938,696.308	6,176,339.994
MB20	1,938,246.608	6,176,681.531
MB21	1,937,830.350	6,176,993.442
MB22	1,937,402.280	6,177,312.761
MB23	1,936,984.629	6,177,625.389
MB24	1,936,565.646	6,177,937.527
MB25	1,936,145.976	6,178,249.137
MB26	1,935,743.817	6,178,560.985
RW1-1	1,935,105.772	6,177,088.654
RW1-2	1,941,051.730	6,174,930.053
RW1-3	1,941,106.108	6,174,936.781
RW1-4	1,941,172.525	6,174,942.309
SB101-1	1,947,184.053	6,169,828.795
SB101-2	1,946,896.778	6,170,061.128
SB101-3	1,946,642.379	6,170,288.673
SB101-4	1,946,434.893	6,170,451.022
SB101-5	1,946,194.146	6,170,646.147
SB101-6	1,945,876.873	6,170,833.983
SB101-7	1,945,698.723	6,170,980.108
SB101-8	1,945,461.026	6,171,192.886
SB101-9	1,945,242.601	6,171,364.310
SB101-10	1,945,015.903	6,171,531.813
SB101-11	1,944,793.500	6,171,694.462
SB101-12	1,944,597.613	6,171,852.926
SB101-13	1,944,394.309	6,171,982.118
SB101-14	1,944,159.459	6,172,152.493
SB101-15	1,943,918.609	6,172,316.509
SB101-16	1,943,686.960	6,172,486.042
SB101-17	1,943,472.279	6,172,663.394
SB101-18	1,943,228.896	6,172,836.090
SB101-19	1,943,003.862	6,173,009.320
SB101-20	1,942,775.338	6,173,181.634
SB101-21	1,940,370.497	6,174,960.951
SB101-22	1,940,135.043	6,175,148.518
SB101-23	1,939,922.838	6,175,320.778
SB101-24	1,939,693.564	6,175,492.096
SB101-25	1,939,471.539	6,175,660.385
SB101-26	1,939,245.337	6,175,835.547
SB101-27	1,939,024.418	6,176,007.340
SB101-28	1,938,795.577	6,176,171.526

TABLE 1
Boring Coordinates
US 101 Operational Improvements Project
San Jose, California

Boring	Northing	Easting
SB101-29	1,938,578.972	6,176,342.524
SB101-30	1,938,354.474	6,176,506.456
SB101-31	1,938,119.420	6,176,683.525
SB101-32	1,937,897.002	6,176,831.351
SB101-33	1,937,672.421	6,177,007.684
SB101-34	1,937,450.003	6,177,173.318
SB101-35	1,937,227.564	6,177,342.047
SB101-36	1,937,007.151	6,177,504.109
SB101-37	1,942,039.383	6,173,653.192
SB101-38	1,941,781.300	6,173,863.681
SB101-39	1,941,565.124	6,174,048.188
SB101-40	1,941,434.501	6,174,157.592
SB101-41	1,941,277.527	6,174,259.223
SB101-42	1,941,159.475	6,174,350.371
SB101-43	1,940,884.772	6,174,567.000
SB101-44	1,940,638.263	6,174,753.571
SB101-45	1,936,489.133	6,177,902.627
SB101-46	1,936,291.776	6,178,053.475
SB101-47	1,936,087.274	6,178,201.074
SB101-48	1,935,844.374	6,178,386.305
TRI-1	1,941,506.888	6,173,974.920
TRI-2	1,941,189.822	6,173,949.473
TRI-3	1,941,255.741	6,173,999.009
TRI-4	1,941,038.578	6,174,149.347
TRI-5	1,941,127.404	6,174,055.959
TRI-6	1,941,222.106	6,174,131.476
TRI-7	1,941,226.781	6,174,229.362
TRI-8	1,940,887.096	6,173,971.936
TRI-9	1,940,860.295	6,174,164.960
TRI-10	1,940,994.386	6,174,321.144
TRI-11	1,941,006.711	6,174,422.826
TRI-12	1,940,930.839	6,174,273.623
TRI-13	1,940,769.361	6,174,420.389
TRI-14	1,940,696.701	6,174,645.536
TRI-15	1,940,048.841	6,175,466.595
TRI-16	1,940,272.720	6,175,316.254
TRI-17	1,940,447.440	6,175,146.074
TRI-18	1,940,736.067	6,174,924.682
TRI-19	1,941,172.518	6,174,652.585
TRI-20	1,941,203.899	6,174,694.096
TRI-21	1,941,110.309	6,174,780.557
TRI-22	1,941,120.531	6,174,863.156
TRI-23	1,941,214.103	6,174,901.997
TRI-24	1,941,305.156	6,174,677.361
TRI-25	1,941,455.413	6,174,861.231
TRI-26	1,941,563.162	6,174,993.228
TRI-27	1,941,615.007	6,174,892.638
TRI-28	1,941,358.016	6,174,586.114
TRI-29	1,941,497.366	6,174,672.285
TRI-30	1,941,579.794	6,174,435.751
TRI-31	1,941,744.092	6,174,192.663
TRI-32	1,941,823.838	6,174,172.748
TRI-33	1,942,009.928	6,174,018.545
TRI-34	1,942,216.023	6,173,860.848
TRI-35	1,942,439.005	6,173,672.762

Boring Coordinates are in coordinate Zone 3, Datum NAD 83 (feet).

TABLE 2
Summary of Lead and pH Results
US 101 Operational Improvements Project
San Jose, California

Sample ID	Sample Depth (ft)	Total Lead (mg/kg)	WET Lead (mg/l)	WET-DI Lead (mg/l)	TCLP Lead (mg/l)	pH
MB1-0	0	<5.0	---	---	---	---
MB1-1	1	<5.0	---	---	---	9.1
MB1-2	2	150	24	4.1	1.2	---
MB2-0	0	6.9	---	---	---	---
MB2-1	1	<5.0	---	---	---	---
MB2-2	2	730	84	13	7.4	---
MB3-2	2	<5.0	---	---	---	---
MB4-2	2	12	---	---	---	---
MB5-1	1	<5.0	---	---	---	---
MB5-2	2	<5.0	---	---	---	---
MB6-0	0	20	---	---	---	---
MB6-1	1	<5.0	---	---	---	---
MB6-2	2	<5.0	---	---	---	---
MB7-0	0	<5.0	---	---	---	---
MB7-1	1	57	3.0	---	---	---
MB7-2	2	240	3.1	---	---	---
MB8-0	0	<5.0	---	---	---	---
MB8-1	1	5.3	---	---	---	---
MB8-2	2	<5.0	---	---	---	---
MB9-0	0	<5.0	---	---	---	8.6
MB9-1	1	<5.0	---	---	---	---
MB9-2	2	<5.0	---	---	---	---
MB10-0	0	<5.0	---	---	---	---
MB10-1	1	<5.0	---	---	---	---
MB10-2	2	5.7	---	---	---	8.4
MB11-0	0	<5.0	---	---	---	---
MB11-1	1	8.4	---	---	---	---
MB11-2	2	<5.0	---	---	---	---
MB12-0	0	<5.0	---	---	---	---
MB12-1	1	<5.0	---	---	---	---
MB12-2	2	<5.0	---	---	---	---
MB13-0	0	<5.0	---	---	---	---
MB13-1	1	<5.0	---	---	---	---
MB13-2	2	<5.0	---	---	---	---

TABLE 2
Summary of Lead and pH Results
US 101 Operational Improvements Project
San Jose, California

Sample ID	Sample Depth (ft)	Total Lead (mg/kg)	WET Lead (mg/l)	WET-DI Lead (mg/l)	TCLP Lead (mg/l)	pH
MB14-0	0	<5.0	---	---	---	---
MB14-1	1	<5.0	---	---	---	---
MB14-2	2	<5.0	---	---	---	---
MB15-0	0	<5.0	---	---	---	---
MB15-1	1	<5.0	---	---	---	8.2
MB15-2	2	<5.0	---	---	---	---
MB16-0	0	<5.0	---	---	---	---
MB16-1	1	<5.0	---	---	---	---
MB16-2	2	<5.0	---	---	---	---
MB17-0	0	<5.0	---	---	---	---
MB17-1	1	<5.0	---	---	---	---
MB17-2	2	<5.0	---	---	---	---
MB18-0	0	7.4	---	---	---	---
MB19-0	0	<5.0	---	---	---	---
MB19-1	1	<5.0	---	---	---	---
MB19-2	2	1,700	---	---	17	7.4
MB20-0	0	<5.0	---	---	---	---
MB20-1	1	140	17	<0.25	0.27	---
MB20-2	2	18	---	---	---	---
MB21-0	0	<5.0	---	---	---	---
MB21-1	1	<5.0	---	---	---	---
MB21-2	2	320	16	<0.25	0.46	---
MB22-0	0	<5.0	---	---	---	8.4
MB22-1	1	140	13	<0.25	0.34	---
MB22-2	2	16	---	---	---	---
MB23-0	0	<5.0	---	---	---	---
MB23-1	1	420	47	0.30	2.9	---
MB23-2	2	<5.0	---	---	---	---
MB24-0	0	<5.0	---	---	---	---
MB24-1	1	5.6	---	---	---	---
MB24-2	2	29	---	---	---	7.8
MB25-0	0	<5.0	---	---	---	---
MB25-1	1	6.8	---	---	---	---
MB25-2	2	140	8.6	<0.25	<0.25	---

TABLE 2
Summary of Lead and pH Results
US 101 Operational Improvements Project
San Jose, California

Sample ID	Sample Depth (ft)	Total Lead (mg/kg)	WET Lead (mg/l)	WET-DI Lead (mg/l)	TCLP Lead (mg/l)	pH
MB26-0	0	<5.0	---	---	---	---
MB26-1	1	8.9	---	---	---	---
MB26-2	2	<5.0	---	---	---	---
RW1-1-2.5	2.5	19	---	---	---	---
RW1-1-4.5	4.5	6.4	---	---	---	---
RW1-2-2.5	2.5	36	---	---	---	---
RW1-2-4.5	4.5	9.0	---	---	---	---
RW1-3-2.5	2.5	14	---	---	---	---
RW1-3-4.5	4.5	9.0	---	---	---	---
RW1-4-2.5	2.5	160	6.6	<0.25	<0.25	---
RW1-4-4.5	4.5	9.7	---	---	---	---
SB101-1-0	0	550	41	<0.25	<0.25	---
SB101-1-1	1	16	---	---	---	---
SB101-1-2	2	12	---	---	---	---
SB101-2-0	0	50	4.8	---	---	---
SB101-2-1	1	<5.0	---	---	---	8.3
SB101-2-2	2	<5.0	---	---	---	---
SB101-3-0	0	82	5.5	<0.25	---	---
SB101-3-1	1	51	3.3	---	---	---
SB101-3-2	2	100	12	<0.25	<0.25	---
SB101-4-0	0	29	---	---	---	---
SB101-4-1	1	<5.0	---	---	---	6.7
SB101-4-2	2	<5.0	---	---	---	---
SB101-5-0	0	120	15	<0.25	<0.25	---
SB101-5-1	1	14	---	---	---	---
SB101-5-2	2	160	12	<0.25	<0.25	---
SB101-6-0	0	350	27	<0.25	<0.25	---
SB101-6-1	1	<5.0	---	---	---	---
SB101-6-2	2	<5.0	---	---	---	---
SB101-7-0	0	280	14	<0.25	0.32	---
SB101-7-1	1	27	---	---	---	---
SB101-7-2	2	7.2	---	---	---	8.6

TABLE 2
Summary of Lead and pH Results
US 101 Operational Improvements Project
San Jose, California

Sample ID	Sample Depth (ft)	Total Lead (mg/kg)	WET Lead (mg/l)	WET-DI Lead (mg/l)	TCLP Lead (mg/l)	pH
SB101-8-0	0	90	2.1	---	---	---
SB101-8-1	1	6.9	---	---	---	---
SB101-8-2	2	<5.0	---	---	---	---
SB101-9-0	0	62	6.2	<0.25	---	8.0
SB101-9-1	1	50	6.7	0.36	---	---
SB101-9-2	2	250	21	<0.25	<0.25	---
SB101-10-0	0	150	7.6	<0.25	0.30	---
SB101-10-1	1	110	4.1	---	---	---
SB101-10-2	2	<5.0	---	---	---	---
SB101-11-0	0	50	3.2	---	---	---
SB101-11-1	1	45	---	---	---	---
SB101-11-2	2	<5.0	---	---	---	8.2
SB101-12-0	0	49	---	---	---	---
SB101-12-1	1	60	5.5	<0.25	---	---
SB101-12-2	2	52	1.2	---	---	---
SB101-13-0	0	74	4.8	---	---	---
SB101-13-1	1	32	---	---	---	---
SB101-13-2	2	270	21	<0.25	<0.25	---
SB101-14-0	0	22	---	---	---	8.1
SB101-14-1	1	39	---	---	---	---
SB101-14-2	2	82	5.4	<0.25	---	---
SB101-15-0	0	44	---	---	---	---
SB101-15-1	1	170	4.3	---	---	---
SB101-15-2	2	110	4.7	---	---	---
SB101-16-0	0	40	---	---	---	---
SB101-16-1	1	54	2.7	---	---	---
SB101-16-2	2	56	4.1	---	---	---
SB101-17-0	0	35	---	---	---	---
SB101-17-1	1	49	---	---	---	8.0
SB101-17-2	2	50	<0.25	---	---	---
SB101-18-0	0	57	3.5	---	---	---
SB101-18-1	1	45	---	---	---	---
SB101-18-2	2	24	---	---	---	---
SB101-19-0	0	41	---	---	---	---
SB101-19-1	1	44	---	---	---	---
SB101-19-2	2	110	7.0	<0.25	<0.25	---

TABLE 2
Summary of Lead and pH Results
US 101 Operational Improvements Project
San Jose, California

Sample ID	Sample Depth (ft)	Total Lead (mg/kg)	WET Lead (mg/l)	WET-DI Lead (mg/l)	TCLP Lead (mg/l)	pH
SB101-20-0	0	8.2	---	---	---	---
SB101-20-1	1	99	5.0	<0.25	---	---
SB101-20-2	2	68	6.4	<0.25	---	8.6
SB101-21-0	0	<5.0	---	---	---	---
SB101-21-1	1	7.7	---	---	---	---
SB101-21-2	2	8.5	---	---	---	---
SB101-22-0	0	6.9	---	---	---	---
SB101-22-1	1	11	---	---	---	7.5
SB101-22-2	2	15	---	---	---	---
SB101-23-0	0	210	8.0	<0.25	<0.25	---
SB101-23-1	1	25	---	---	---	---
SB101-23-2	2	7.1	---	---	---	---
SB101-24-0	0	<5.0	---	---	---	---
SB101-24-1	1	<5.0	---	---	---	---
SB101-24-2	2	25	---	---	---	---
SB101-25-0	0	45	---	---	---	---
SB101-25-1	1	39	---	---	---	8.2
SB101-25-2	2	22	---	---	---	---
SB101-26-0	0	14	---	---	---	---
SB101-26-1	1	13	---	---	---	---
SB101-26-2	2	30	---	---	---	---
SB101-27-0	0	11	---	---	---	---
SB101-27-1	1	21	---	---	---	---
SB101-27-2	2	52	2.8	---	---	---
SB101-28-0	0	22	---	---	---	---
SB101-28-1	1	47	---	---	---	---
SB101-28-2	2	42	---	---	---	8.2
SB101-29-0	0	12	---	---	---	---
SB101-29-1	1	36	---	---	---	---
SB101-29-2	2	15	---	---	---	---
SB101-30-0	0	46	---	---	---	---
SB101-30-1	1	20	---	---	---	---
SB101-30-2	2	11	---	---	---	---

TABLE 2
Summary of Lead and pH Results
US 101 Operational Improvements Project
San Jose, California

Sample ID	Sample Depth (ft)	Total Lead (mg/kg)	WET Lead (mg/l)	WET-DI Lead (mg/l)	TCLP Lead (mg/l)	pH
SB101-31-0	0	21	---	---	---	8.2
SB101-31-1	1	14	---	---	---	---
SB101-31-2	2	31	---	---	---	8.4
SB101-32-0	0	16	---	---	---	---
SB101-32-1	1	9.4	---	---	---	---
SB101-32-2	2	6.9	---	---	---	---
SB101-33-0	0	32	---	---	---	---
SB101-33-1	1	42	---	---	---	---
SB101-33-2	2	5.6	---	---	---	---
SB101-34-0	0	48	---	---	---	---
SB101-34-1	1	13	---	---	---	8.6
SB101-34-2	2	15	---	---	---	---
SB101-35-0	0	43	---	---	---	---
SB101-35-1	1	50	0.30	---	---	---
SB101-35-2	2	93	4.5	---	---	---
SB101-36-0	0	50	3.1	---	---	---
SB101-36-1	1	69	2.6	---	---	---
SB101-36-2	2	23	---	---	---	8.4
SB101-37-0	0	86	5.4	<0.25	---	---
SB101-37-1	1	47	---	---	---	---
SB101-37-2	2	110	3.4	---	---	---
SB101-38-0	0	80	4.1	---	---	---
SB101-38-1	1	16	---	---	---	---
SB101-38-2	2	12	---	---	---	---
SB101-39-0	0	40	---	---	---	---
SB101-39-1	1	25	---	---	---	---
SB101-39-2	2	28	---	---	---	---
SB101-40-0	0	44	---	---	---	---
SB101-40-1	1	37	---	---	---	---
SB101-40-2	2	14	---	---	---	---
SB101-41-0	0	54	1.2	---	---	---
SB101-41-1	1	15	---	---	---	---
SB101-41-2	2	11	---	---	---	---
SB101-42-0	0	40	---	---	---	---
SB101-42-1	1	56	2.2	---	---	---
SB101-42-2	2	140	4.7	---	---	---

TABLE 2
Summary of Lead and pH Results
US 101 Operational Improvements Project
San Jose, California

Sample ID	Sample Depth (ft)	Total Lead (mg/kg)	WET Lead (mg/l)	WET-DI Lead (mg/l)	TCLP Lead (mg/l)	pH
SB101-43-0	0	41	---	---	---	---
SB101-43-1	1	96	2.8	---	---	---
SB101-43-2	2	69	2.0	---	---	---
SB101-44-0	0	240	11	0.33	0.37	---
SB101-44-1	1	72	2.1	---	---	---
SB101-44-2	2	200	11	<0.25	0.33	---
SB101-45-0	0	100	6.0	<0.25	0.28	---
SB101-45-1	1	37	---	---	---	---
SB101-45-2	2	51	0.88	---	---	---
SB101-46-0	0	42	---	---	---	---
SB101-46-1	1	50	2.5	---	---	---
SB101-46-2	2	50	2.6	---	---	---
SB101-47-0	0	70	2.7	---	---	---
SB101-47-1	1	68	4.7	---	---	---
SB101-47-2	2	61	2.8	---	---	---
SB101-48-0	0	32	---	---	---	---
SB101-48-1	1	7.7	---	---	---	---
SB101-48-2	2	16	---	---	---	---
TRI-1-0	0	57	2.3	---	---	---
TRI-1-1	1	35	---	---	---	---
TRI-1-2	2	11	---	---	---	---
TRI-2-0	0	86	1.6	---	---	---
TRI-2-1	1	28	---	---	---	---
TRI-2-2	2	13	---	---	---	---
TRI-3-0	0	210	13	<0.25	0.28	---
TRI-3-1	1	160	9.3	<0.25	<0.25	---
TRI-3-2	2	43	---	---	---	---
TRI-4-0	0	86	2.9	---	---	---
TRI-4-1	1	35	---	---	---	---
TRI-4-2	2	57	2.6	---	---	---
TRI-5-0	0	37	---	---	---	---
TRI-5-1	1	35	---	---	---	---
TRI-5-2	2	17	---	---	---	---
TRI-6-0	0	13	---	---	---	---
TRI-6-1	1	9.7	---	---	---	---
TRI-6-2	2	7.9	---	---	---	---

TABLE 2
Summary of Lead and pH Results
US 101 Operational Improvements Project
San Jose, California

Sample ID	Sample Depth (ft)	Total Lead (mg/kg)	WET Lead (mg/l)	WET-DI Lead (mg/l)	TCLP Lead (mg/l)	pH
TRI-7-0	0	38	---	---	---	---
TRI-7-1	1	14	---	---	---	---
TRI-7-2	2	11	---	---	---	---
TRI-8-0	0	87	2.5	---	---	---
TRI-8-1	1	9.0	---	---	---	---
TRI-8-2	2	20	---	---	---	---
TRI-9-0	0	140	4.1	---	---	---
TRI-9-1	1	110	3.3	---	---	---
TRI-9-2	2	41	---	---	---	---
TRI-10-0	0	190	6.0	<0.25	<0.25	---
TRI-10-1	1	170	5.1	<0.25	<0.25	---
TRI-10-2	2	15	---	---	---	---
TRI-11-0	0	58	1.3	---	---	---
TRI-11-1	1	8.7	---	---	---	---
TRI-11-2	2	8.0	---	---	---	---
TRI-11-4	4	8.7	---	---	---	---
TRI-11-8	8	6.3	---	---	---	---
TRI-12-0	0	240	14	<0.25	0.26	---
TRI-12-1	1	360	14	<0.25	0.30	---
TRI-12-2	2	240	11	<0.25	0.26	---
TRI-13-0	0	32	---	---	---	---
TRI-13-1	1	86	1.7	---	---	---
TRI-13-2	2	13	---	---	---	---
TRI-14-0	0	170	7.0	<0.25	<0.25	---
TRI-14-1	1	200	6.1	<0.25	<0.25	---
TRI-14-2	2	8.3	---	---	---	---
TRI-15-0	0	37	---	---	---	---
TRI-15-1	1	39	---	---	---	---
TRI-15-2	2	83	2.9	---	---	---
TRI-16-0	0	16	---	---	---	---
TRI-16-1	1	11	---	---	---	---
TRI-16-2	2	9.5	---	---	---	---
TRI-17-0	0	43	---	---	---	---
TRI-17-1	1	19	---	---	---	---
TRI-17-2	2	9.3	---	---	---	---

TABLE 2
Summary of Lead and pH Results
US 101 Operational Improvements Project
San Jose, California

Sample ID	Sample Depth (ft)	Total Lead (mg/kg)	WET Lead (mg/l)	WET-DI Lead (mg/l)	TCLP Lead (mg/l)	pH
TRI-18-0	0	47	---	---	---	---
TRI-18-1	1	14	---	---	---	---
TRI-18-2	2	11	---	---	---	---
TRI-19-0	0	210	10	<0.25	<0.25	---
TRI-19-1	1	170	9.9	<0.25	<0.25	---
TRI-19-2	2	26	---	---	---	---
TRI-20-0	0	88	3.9	---	---	---
TRI-20-1	1	17	---	---	---	---
TRI-20-2	2	10	---	---	---	---
TRI-20-4	4	8.0	---	---	---	---
TRI-20-8	8	5.4	---	---	---	---
TRI-21-0	0	63	1.3	---	---	---
TRI-21-1	1	9.2	---	---	---	---
TRI-21-2	2	8.3	---	---	---	---
TRI-22-0	0	290	16	<0.25	<0.25	---
TRI-22-1	1	160	5.5	<0.25	<0.25	---
TRI-22-2	2	12	---	---	---	---
TRI-23-0	0	120	4.1	---	---	---
TRI-23-1	1	150	2.6	---	---	---
TRI-23-2	2	180	5.7	<0.25	<0.25	---
TRI-24-0	0	250	9.7	<0.25	0.25	---
TRI-24-1	1	69	3.3	---	---	---
TRI-24-2	2	110	2.9	---	---	---
TRI-25-0	0	75	3.7	---	---	---
TRI-25-1	1	9.7	---	---	---	---
TRI-25-2	2	7.6	---	---	---	---
TRI-26-0	0	74	4.0	---	---	---
TRI-26-1	1	18	---	---	---	---
TRI-26-2	2	34	---	---	---	---
TRI-27-0	0	200	11	<0.25	0.34	---
TRI-27-1	1	370	25	<0.25	0.42	---
TRI-27-2	2	280	16	<0.25	0.33	---
TRI-28-0	0	89	3.1	---	---	---
TRI-28-1	1	150	6.3	<0.25	0.29	---
TRI-28-2	2	78	2.8	---	---	---

TABLE 2
Summary of Lead and pH Results
US 101 Operational Improvements Project
San Jose, California

Sample ID	Sample Depth (ft)	Total Lead (mg/kg)	WET Lead (mg/l)	WET-DI Lead (mg/l)	TCLP Lead (mg/l)	pH
TRI-29-0	0	44	---	---	---	---
TRI-29-1	1	68	3.1	---	---	---
TRI-29-2	2	72	3.0	---	---	---
TRI-30-0	0	46	---	---	---	---
TRI-30-1	1	34	---	---	---	---
TRI-30-2	2	11	---	---	---	---
TRI-31-0	0	64	4.0	---	---	---
TRI-31-1	1	6.8	---	---	---	---
TRI-31-2	2	<5.0	---	---	---	---
TRI-32-0	0	67	1.9	---	---	---
TRI-32-1	1	16	---	---	---	---
TRI-32-2	2	9.3	---	---	---	---
TRI-33-0	0	130	8.1	<0.25	<0.25	---
TRI-33-1	1	33	---	---	---	---
TRI-33-2	2	16	---	---	---	---
TRI-34-0	0	68	2.3	---	---	---
TRI-34-1	1	65	2.3	---	---	---
TRI-34-2	2	52	1.2	---	---	---
TRI-35-0	0	170	8.5	<0.25	0.28	---
TRI-35-1	1	<5.0	---	---	---	---
TRI-35-2	2	18	---	---	---	---

Notes:
WET = Waste Extraction Test
WET DI = Waste Extraction Test using de-ionized water
TCLP = Toxicity Characteristic Leaching Procedure
mg/kg = milligrams per kilogram
mg/l = milligrams per liter
< = Not detected above the laboratory reporting limit
--- = Not analyzed

TABLE 3
Summary of CAM17 Metals Results
US 101 Operational Improvements Project
San Jose, California

Sample ID	Sample Depth (ft)	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Mercury
TRI-11-4	4.0	<2.0	7.7	140	<1.0	<1.0	46	12	29	8.7	<1.0	79	1.8	<1.0	<1.0	36	56	<0.10
TRI-11-8	8.0	<2.0	6.0	120	<1.0	<1.0	43	9.0	19	6.3	<1.0	71	1.4	<1.0	<1.0	29	46	<0.10
TRI-20-4	4.0	<2.0	6.2	150	<1.0	<1.0	38	9.8	23	8.0	<1.0	65	1.1	<1.0	<1.0	30	47	<0.10
TRI-20-8	8.0	<2.0	6.1	78	<1.0	<1.0	45	8.8	15	5.4	<1.0	62	1.1	<1.0	<1.0	28	39	<0.10
RW1-1-2.5	2.5	<2.0	8.6	99	<1.0	<1.0	29	6.9	15	19	<1.0	45	<1.0	<1.0	<1.0	22	33	<0.10
RW1-1-4.5	4.5	<2.0	5.5	110	<1.0	<1.0	37	9.0	18	6.4	<1.0	63	<1.0	<1.0	<1.0	27	43	<0.10
RW1-2-2.5	2.5	<2.0	13	160	<1.0	<1.0	45	11	27	36	<1.0	69	1.2	<1.0	<1.0	34	54	<0.10
RW1-2-4.5	4.5	<2.0	7.8	180	<1.0	<1.0	53	12	27	9.0	<1.0	82	1.4	<1.0	<1.0	38	56	<0.10
							<1.0											
RW1-3-2.5	2.5	<2.0	10	170	<1.0	<1.0	45	11	25	14	<1.0	73	1.2	<1.0	<1.0	35	51	<0.10
RW1-3-4.5	4.5	<2.0	7.7	170	<1.0	<1.0	51	12	28	9.0	<1.0	82	1.4	<1.0	<1.0	36	58	<0.10
							<1.0											
RW1-4-2.5	2.5	<2.0	48	170	<1.0	<1.0	47	12	58	160	<1.0	73	1.5	<1.0	<1.0	37	81	0.10
RW1-4-4.5	4.5	<2.0	8.2	170	<1.0	<1.0	55	13	30	9.7	<1.0	85	1.6	<1.0	<1.0	39	61	<0.10
							<1.0											
ESLs																		
Shallow Soils (≤3 m bgs)																		
Residential Land Use		6.1	0.38	750	4.0	1.7	750*	40	230	200	40	150	10	20	1.2	15	600	1.0
Comm/Ind Land Use		40	1.5	1,500	8.0	7.4	750*	80	230	750	40	150	10	40	15	190	600	100

Notes:

Results are shown in milligrams per kilogram (mg/kg)

Results in italics are soluble metal concentrations in milligrams per liter (mg/l) analyzed using the Waste Extraction Test (WET)

< = Analyte was not detected above the laboratory reporting limit

ESLs = Environmental Screening Levels, SFRWQCB, November 2007, Tables A and C.

* = Value is for Chromium III, no standard for total chromium

TABLE 4
Summary of Petroleum Hydrocarbon Results
US 101 Operational Improvements Project
San Jose, California

Sample ID	Sample Depth (ft)	TPHd (mg/kg)	TPHg (mg/kg)	TPHmo (mg/kg)	BTEX/FOCs (ug/kg)
TRI-11-4	4	<1.0	<1.0	<1.0	ND
TRI-11-8	8	1.4	<1.0	<1.0	ND
TRI-20-4	4	<1.0	<1.0	1.2	ND
TRI-20-8	8	<1.0	<1.0	<1.0	ND
RW1-1-2.5	2.5	1.3	---	2.8	---
RW1-1-4.5	4.5	<1.0	---	<1.0	---
RW1-2-2.5	2.5	1.6	---	3.6	---
RW1-2-4.5	4.5	<1.0	---	1.2	---
RW1-3-2.5	2.5	<1.0	---	1.7	---
RW1-3-4.5	4.5	<1.0	---	<1.0	---
RW1-4-2.5	2.5	4.5	---	8.2	---
RW1-4-4.5	4.5	<1.0	---	<1.0	---
ESLs					
Shallow Soils (≤3 m bgs)					
Residential Land Use		83	83	410	
Commercial/Industrial Land Use		83	83	2,500	

Notes:
TPHmo = Total Petroleum Hydrocarbons as motor oil
TPHd = Total Petroleum Hydrocarbons as diesel
TPHg = Total Petroleum Hydrocarbons as gasoline
FOCs = Fuel Oxygenate Compounds
mg/kg = milligrams per kilogram
ug/kg = micrograms per kilogram
ND = Not Detected above laboratory reporting limit
--- = Not Analyzed
< = Not detected above the stated laboratory reporting limit
ESLs = Environmental Screening Levels, SFRWQCB, November 2007, Table A.

TABLE 5
Summary of Pesticide and Herbicide Results
US 101 Operational Improvements Project
San Jose, California

Sample ID	Sample Depth (ft)	4,4'-DDD	4,4'-DDE	4,4'-DDT	alpha-Chlordane	Chlordane	gamma-Chlordane	Other Pesticides	Herbicides
MB1-0	0	<2.0	<2.0	<2.0	<1.0	<8.5	<1.0	ND	---
MB2-0	0	<2.0	<2.0	2.6	<1.0	<8.5	<1.0	ND	---
MB6-0	0	<2.0	<2.0	<2.0	<1.0	<8.5	<1.0	ND	---
MB7-0	0	<2.0	<2.0	<2.0	<1.0	<8.5	<1.0	ND	---
MB8-0	0	<2.0	<2.0	<2.0	<1.0	<8.5	<1.0	ND	---
MB9-0	0	<2.0	<2.0	<2.0	<1.0	<8.5	<1.0	ND	---
MB10-0	0	<2.0	<2.0	<2.0	<1.0	<8.5	<1.0	ND	---
MB11-0	0	<2.0	<2.0	<2.0	<1.0	<8.5	<1.0	ND	---
MB12-0	0	<2.0	<2.0	<2.0	<1.0	<8.5	<1.0	ND	---
SB101-5-0, 6-0, 7-0, 8-0 Composite	0	<2.0	3.9	6.1	1.5	20	2.3	ND	ND
Composite SB101-9-0, 10-0, 11-0, 12-0	0	<2.0	5.3	4.4	1.8	22	2.1	ND	ND
Composite SB101-13-0, 14-0, 15-0, 16-0	0	2.7	6.1	3.6	2.1	26	2.3	ND	ND
Composite SB101-17-0, 18-0, 19-0, 20-0	0	<2.0	2.8	3.3	<1.0	<8.5	<1.0	ND	ND

TABLE 5
Summary of Pesticide and Herbicide Results
US 101 Operational Improvements Project
San Jose, California

Sample ID	Sample Depth (ft)	4,4'-DDD	4,4'-DDE	4,4'-DDT	alpha-Chlordane	Chlordane	gamma-Chlordane	Other Pesticides	Herbicides
Composite SB101-21-0, 22-0, 23-0, 24-0	0	<20	<20	<20	<10	<85	<10	ND	ND
Composite SB101-25-0, 26-0, 27-0, 28-0	0	<2.0	3.0	<2.0	2.2	26	1.3	ND	ND
Composite SB101-29-0, 30-0, 31-0, 32-0	0	<2.0	3.8	4.5	1.6	30	1.7	ND	ND
Composite SB101-33-0, 34-0, 35-0, 36-0	0	2.1	4.7	2.2	1.4	20	1.6	ND	ND
Composite SB101-37-0, 38-0, 39-0, 40-0	0	<2.0	<2.0	2.0	<1.0	<8.5	<1.0	ND	ND
Composite SB101-45-0, 46-0, 47-0, 48-0	0	2.2	6.4	14	1.1	15	1.6	ND	ND
ESLs									
Shallow Soils (≤3 m bgs)									
Residential Land Use		2,300	1,600	1,600		440			
Commercial/Industrial Land Use		9,000	4,000	4,000		1,700			

Notes:
Data are shown in units of micrograms per kilogram (ug/mg).
ND = Not Detected above laboratory reporting limit
--- = Not Analyzed
< = Not detected above the stated laboratory reporting limit

TABLE 6
Summary of NOA Results
US 101 Operational Improvements Project
San Jose, California

Sample ID	Sample Depth (ft)	Asbestos Content (% dry weight)
SB101-1-1	1	0.25
SB101-6-2	2	2.25
SB101-8-2	2	3.00
SB101-10-1	1	<0.25
SB101-12-2	2	0.75
SB101-14-0	0	1.75
SB101-16-1	1	1.25
SB101-18-1	1	<0.25
SB101-20-1	1	1.50
SB101-22-1	1	ND
SB101-24-0	0	2.50
SB101-26-2	2	0.50
SB101-28-1	1	0.75
SB101-30-1	1	1.50
SB101-32-2	2	1.25
SB101-34-2	2	2.00
SB101-36-0	0	2.50
SB101-37-2	2	ND
SB101-43-2	2	ND
SB101-44-1	1	ND
SB101-46-2	2	ND
SB101-47-2	2	ND
MB1-1	1	1.25
MB2-1	1	1.50
MB5-1	1	0.25
MB6-1	1	1.00
MB7-1	1	0.50
MB8-1	1	0.75
MB9-1	1	3.00
MB10-1	1	0.75
MB11-1	1	6.75
MB12-1	1	1.00
TRI-2-2	2	ND
TRI-4-1	1	ND
TRI-8-1	1	ND
TRI-12-2	2	ND
TRI-13-2	2	ND
TRI-16-2	2	ND
TRI-18-1	1	<0.25
TRI-21-2	2	ND
TRI-23-1	1	ND
TRI-24-2	2	ND
TRI-27-1	1	ND
TRI-27-2	2	0.25
TRI-30-2	2	ND
TRI-33-1	1	<0.25
TRI-35-1	1	3.00

Note:

ND = Not detected at or above 0.25% target analytical sensitivity

TABLE 7a
Summary of Statistical Analysis
US 101 Operational Improvements Project
Santa Clara County, California

Shoulder Borings SB101-1 to SB101-20 and SB101-37 (Approximate Station 1774.9 to 1838.0)

TOTAL LEAD UCLs

	Total Lead (mg/kg)	
	90% UCL	95% UCL
0 to 0.5 ft	143.5	153.0
1 to 1.5 ft	57.1	60.4
2 to 2.5 ft	91.3	98.0

EXCAVATION SCENARIOS

	90% UCL		95% UCL	
Excavation Depth	Total Lead (mg/kg)	Soluble (WET) Lead* (mg/l)	Total Lead (mg/kg)	Soluble (WET) Lead* (mg/l)
0 to 1 ft	144	9.7	153	10
Underlying Soil (1 to 2.5 ft)	*68*	*4.7*	*73*	*5.0*
0 to 2 ft	100	6.8	107	7.2
Underlying Soil (2 to 2.5 ft)	*91*	*6.2*	*98*	*6.7*
0 to 2.5 ft	98	6.7	105	7.1

Notes:

UCL = Upper Confidence Level (90% UCL is applicable for onsite reuse; 95% UCL is applicable for offsite reuse/disposal)
mg/kg = milligrams per kilogram
mg/l = milligrams per liter
* = Soluble (WET) lead concentrations are predicted using slope of regression line, where y = predicted soluble (WET) lead and x = total lead.

Regression Line Slope: $y = 0.0679\ x$

TABLE 7b
Summary of Statistical Analysis
US 101 Operational Improvements Project
Santa Clara County, California

Shoulder Borings SB101-21 to SB101-36 and SB101-45 to SB101-48
(Approximate Station 1696.0 to 1724.4)

TOTAL LEAD UCLs

	Total Lead (mg/kg)	
	90% UCL	95% UCL
0 to 0.5 ft	55.0	59.1
1 to 1.5 ft	34.7	36.4
2 to 2.5 ft	35.3	37.2

EXCAVATION SCENARIOS

	90% UCL		95% UCL	
Excavation Depth	Total Lead (mg/kg)	Soluble (WET) Lead* (mg/l)	Total Lead (mg/kg)	Soluble (WET) Lead* (mg/l)
0 to 1 ft	55	3.7	59	4.0
Underlying Soil (1 to 2.5 ft)	*35*	*2.4*	*37*	*2.5*
0 to 2 ft	45	3.0	48	3.2
Underlying Soil (2 to 2.5 ft)	*35*	*2.4*	*37*	*2.5*
0 to 2.5 ft	43	2.9	46	3.1

Notes:

UCL = Upper Confidence Level (90% UCL is applicable for onsite reuse; 95% UCL is applicable for offsite reuse/disposal)
mg/kg = milligrams per kilogram
mg/l = milligrams per liter
* = Soluble (WET) lead concentrations are predicted using slope of regression line, where y = predicted soluble (WET) lead and x = total lead.

Regression Line Slope: $y = 0.0679\ x$

TABLE 7c
Summary of Statistical Analysis
US 101 Operational Improvements Project
Santa Clara County, California

Shoulder Borings SB101-38 to SB101-42 and Tully Road Interchange Borings TRI-1 to TRI-8
(Approximate Station 1763.0 to 1770.5)

TOTAL LEAD UCLs

	Total Lead (mg/kg)	
	90% UCL	95% UCL
0 to 0.5 ft	83.7	88.4
1 to 1.5 ft	49.9	53.0
2 to 2.5 ft	41.8	46.4

EXCAVATION SCENARIOS

	90% UCL		95% UCL	
Excavation Depth	Total Lead (mg/kg)	Soluble (WET) Lead* (mg/l)	Total Lead (mg/kg)	Soluble (WET) Lead* (mg/l)
0 to 1 ft	84	5.7	88	6.0
Underlying Soil (1 to 2.5 ft)	*47*	*3.2*	*51*	*3.4*
0 to 2 ft	67	4.5	71	4.8
Underlying Soil (2 to 2.5 ft)	*42*	*2.8*	*46*	*3.1*
0 to 2.5 ft	62	4.2	66	4.5

Notes:

UCL = Upper Confidence Level (90% UCL is applicable for onsite reuse; 95% UCL is applicable for offsite reuse/disposal)
mg/kg = milligrams per kilogram
mg/l = milligrams per liter
* = Soluble (WET) lead concentrations are predicted using slope of regression line, where y = predicted soluble (WET) lead and x = total lead.

Regression Line Slope: $y = 0.0679\ x$

TABLE 7d
Summary of Statistical Analysis
US 101 Operational Improvements Project
Santa Clara County, California

Shoulder Borings SB101-43 and SB101-44 and Tully Road Interchange Borings TRI-9 to TRI-14
(Approximate Station 1756.0 to 1762.0)

TOTAL LEAD UCLs

	Total Lead (mg/kg)	
	90% UCL	95% UCL
0 to 0.5 ft	174.8	184.6
1 to 1.5 ft	184.2	195.7
2 to 2.5 ft	113.3	125.0

EXCAVATION SCENARIOS

	90% UCL		95% UCL	
Excavation Depth	Total Lead (mg/kg)	Soluble (WET) Lead* (mg/l)	Total Lead (mg/kg)	Soluble (WET) Lead* (mg/l)
0 to 1 ft	175	12	185	13
Underlying Soil (1 to 2.5 ft)	*161*	*11*	*172*	*12*
0 to 2 ft	180	12	190	13
Underlying Soil (2 to 2.5 ft)	*113*	*7.7*	*125*	*8.5*
0 to 2.5 ft	166	11	177	12

Notes:

UCL = Upper Confidence Level (90% UCL is applicable for onsite reuse; 95% UCL is applicable for offsite reuse/disposal)
mg/kg = milligrams per kilogram
mg/l = milligrams per liter
* = Soluble (WET) lead concentrations are predicted using slope of regression line, where y = predicted soluble (WET) lead and x = total lead.

Regression Line Slope: $y = 0.0679\ x$

TABLE 7e
Summary of Statistical Analysis
US 101 Operational Improvements Project
Santa Clara County, California

Retaining Wall Borings RW1-1 to RW1-4 and Tully Road Interchange Borings TRI-15 to TRI-26
(Approximate Station 1747.0 to 1762.0)

TOTAL LEAD UCLs

	Total Lead (mg/kg)	
	90% UCL	95% UCL
0 to 0.5 ft	140.3	150.9
1 to 1.5 ft	79.4	86.3
2 to 2.5 ft	63.1	68.0
4 to 4.5 ft	9.1	9.2

EXCAVATION SCENARIOS

	90% UCL		95% UCL	
Excavation Depth	Total Lead (mg/kg)	Soluble (WET) Lead* (mg/l)	Total Lead (mg/kg)	Soluble (WET) Lead* (mg/l)
0 to 1 ft	140	9.5	151	10
Underlying Soil (1 to 4.5 ft)	*60*	*4.1*	*65*	*4.4*
0 to 2 ft	110	7.5	119	8.1
Underlying Soil (2 to 4.5 ft)	*52*	*3.5*	*56*	*3.8*
0 to 4 ft	86	5.9	93	6.3
Underlying Soil (4 to 4.5 ft)	*9.1*	*0.6*	*9.2*	*0.6*
0 to 4.5 ft	100	6.8	108	7.3

Notes:

UCL = Upper Confidence Level (90% UCL is applicable for onsite reuse; 95% UCL is applicable for offsite reuse/disposal)
mg/kg = milligrams per kilogram
mg/l = milligrams per liter
* = Soluble (WET) lead concentrations are predicted using slope of regression line, where y = predicted soluble (WET) lead and x = total lead.

Regression Line Slope: $y = 0.0679\ x$

TABLE 7f
Summary of Statistical Analysis
US 101 Operational Improvements Project
Santa Clara County, California

Tully Road Interchange Borings TRI-27 to TRI-35 (Approximate Station 1762.0 to 1777.0)

TOTAL LEAD UCLs

	Total Lead (mg/kg)	
	90% UCL	95% UCL
0 to 0.5 ft	121.0	127.3
1 to 1.5 ft	129.3	142.1
2 to 2.5 ft	94.3	103.6

EXCAVATION SCENARIOS

	90% UCL		95% UCL	
Excavation Depth	Total Lead (mg/kg)	Soluble (WET) Lead* (mg/l)	Total Lead (mg/kg)	Soluble (WET) Lead* (mg/l)
0 to 1 ft	121	8.2	127	8.6
Underlying Soil (1 to 2.5 ft)	*118*	*8.0*	*129*	*8.8*
0 to 2 ft	125	8.5	135	9.1
Underlying Soil (2 to 2.5 ft)	*94*	*6.4*	*104*	*7.0*
0 to 2.5 ft	119	8.1	128	8.7

Notes:

UCL = Upper Confidence Level (90% UCL is applicable for onsite reuse; 95% UCL is applicable for offsite reuse/disposal)
mg/kg = milligrams per kilogram
mg/l = milligrams per liter
* = Soluble (WET) lead concentrations are predicted using slope of regression line, where y = predicted soluble (WET) lead and x = total lead.

Regression Line Slope: $y = 0.0679\ x$

TABLE 7g
Summary of Statistical Analysis
US 101 Operational Improvements Project
Santa Clara County, California

Median Borings MB-13 to MB-18 (Approximate Station 1802.9 to 1831.9)

TOTAL LEAD Maximum and UCLs

	Total Lead (mg/kg) Maximum
0 to 0.5 ft	7.4
1 to 1.5 ft	2.5
2 to 2.5 ft	2.5

EXCAVATION SCENARIOS

Excavation Depth	Maximum Total Lead (mg/kg)	Soluble (WET) Lead* (mg/l)
0 to 1 ft	7.4	0.50
Underlying Soil (1 to 2.5 ft)	*2.5*	*0.17*
0 to 2 ft	5.0	0.34
Underlying Soil (2 to 2.5 ft)	*2.5*	*0.17*
0 to 2.5 ft	4.5	0.30

Notes:

UCL = Upper Confidence Level (90% UCL is applicable for onsite reuse; 95% UCL is applicable for offsite reuse/disposal)
mg/kg = milligrams per kilogram
mg/l = milligrams per liter
* = Soluble (WET) lead concentrations are predicted using slope of regression line, where y = predicted soluble (WET) lead and x = total lead.

Regression Line Slope: $y = 0.0679\ x$

TABLE 7h
Summary of Statistical Analysis
US 101 Operational Improvements Project
Santa Clara County, California

Median Borings MB-1 to MB-7 (Approximate Station 1763.0 to 1795.0)

TOTAL LEAD Maximum and UCLs

	Total Lead (mg/kg) Maximum	
0 to 0.5 ft	20.0	
1 to 1.5 ft	57.0	
	90% UCL	**95% UCL**
2 to 2.5 ft	279.3	315.6

EXCAVATION SCENARIOS

	Maximum/90% UCL		Maximum/95% UCL	
Excavation Depth	**Total Lead (mg/kg)**	**Soluble (WET) Lead* (mg/l)**	**Total Lead (mg/kg)**	**Soluble (WET) Lead* (mg/l)**
0 to 1 ft	20	1.4	20	1.4
Underlying Soil (1 to 2.5 ft)	*131*	*8.9*	*143*	*9.7*
0 to 2 ft	39	2.6	39	2.6
Underlying Soil (2 to 2.5 ft)	*279*	*19*	*316*	*21.4*
0 to 2.5 ft	87	5.9	94	6.4

Notes:

UCL = Upper Confidence Level (90% UCL is applicable for onsite reuse; 95% UCL is applicable for offsite reuse/disposal)
mg/kg = milligrams per kilogram
mg/l = milligrams per liter
* = Soluble (WET) lead concentrations are predicted using slope of regression line, where y = predicted soluble (WET) lead and x = total lead.

Regression Line Slope: $y = 0.0679\ x$

TABLE 7i
Summary of Statistical Analysis
US 101 Operational Improvements Project
Santa Clara County, California

Median Borings MB-8 to MB-12 (Approximate Station 1736.3 to 1757.7)

TOTAL LEAD Maximum and UCLs

	Total Lead (mg/kg) Maximum
0 to 0.5 ft	2.5
1 to 1.5 ft	8.4
2 to 2.5 ft	5.7

EXCAVATION SCENARIOS

Excavation Depth	Maximum Total Lead (mg/kg)	Soluble (WET) Lead* (mg/l)
0 to 1 ft	2.5	0.17
Underlying Soil (1 to 2.5 ft)	*7.5*	*0.51*
0 to 2 ft	5.5	0.37
Underlying Soil (2 to 2.5 ft)	*5.7*	*0.39*
0 to 2.5 ft	5.5	0.37

Notes:

UCL = Upper Confidence Level (90% UCL is applicable for onsite reuse; 95% UCL is applicable for offsite reuse/disposal)
mg/kg = milligrams per kilogram
mg/l = milligrams per liter
* = Soluble (WET) lead concentrations are predicted using slope of regression line, where y = predicted soluble (WET) lead and x = total lead.

Regression Line Slope: $y = 0.0679\ x$

TABLE 7j
Summary of Statistical Analysis
US 101 Operational Improvements Project
Santa Clara County, California

Median Borings MB-19 to MB-26 (Approximate Station 1694.0 to 1731.0)

TOTAL LEAD Maximum and UCLs

	Total Lead (mg/kg) Maximum	
0 to 0.5 ft	2.5	
	90% UCL	**95% UCL**
1 to 1.5 ft	152.5	171.1
2 to 2.5 ft	528.2	589.3

EXCAVATION SCENARIOS

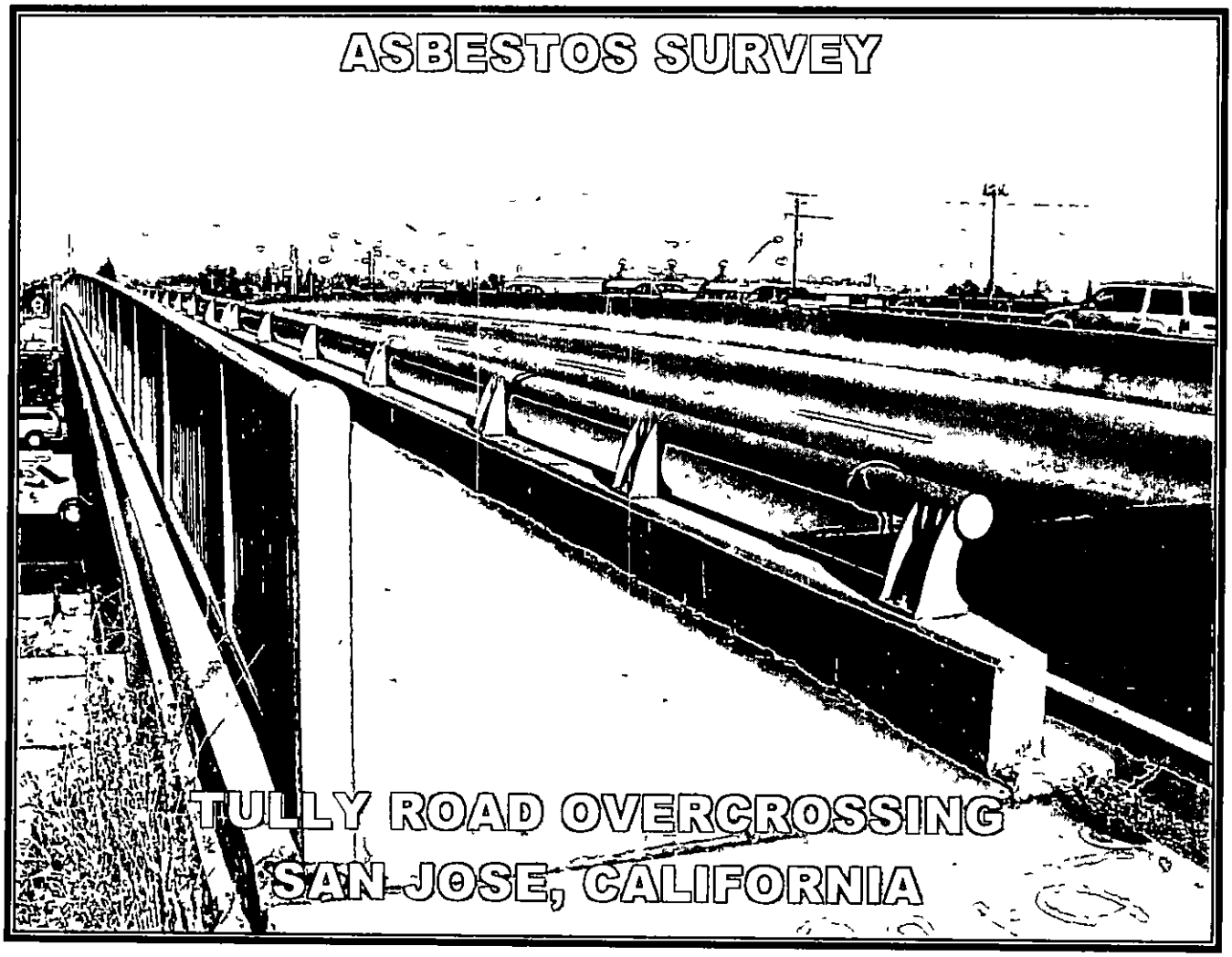
	Maximum/90% UCL		Maximum/95% UCL	
Excavation Depth	**Total Lead (mg/kg)**	**Soluble (WET) Lead* (mg/l)**	**Total Lead (mg/kg)**	**Soluble (WET) Lead* (mg/l)**
0 to 1 ft	2.5	0.17	2.5	0.17
Underlying Soil (1 to 2.5 ft)	*278*	*19*	*311*	*21*
0 to 2 ft	78	5.3	87	5.9
Underlying Soil (2 to 2.5 ft)	*528*	*36*	*589*	*40*
0 to 2.5 ft	168	11	187	13

Notes:

UCL = Upper Confidence Level (90% UCL is applicable for onsite reuse; 95% UCL is applicable for offsite reuse/disposal)
mg/kg = milligrams per kilogram
mg/l = milligrams per liter
* = Soluble (WET) lead concentrations are predicted using slope of regression line, where y = predicted soluble (WET) lead and x = total lead.

Regression Line Slope: $y = 0.0679\ x$

ASBESTOS SURVEY



TULLY ROAD OVERCROSSING
SAN JOSE, CALIFORNIA

PREPARED FOR
HMH ENGINEERS
1570 OAKLAND ROAD
SAN JOSE, CALIFORNIA

PREPARED BY
GEOCON CONSULTANTS, INC
6671 BRISA STREET
LIVERMORE, CALIFORNIA

GEOCON

GEOCON PROJECT NO E8432-06-01
CALTRANS EA NO 04-1A9801

DECEMBER 2008

GEOCON
CONSULTANTS, INC
GEOTECHNICAL ▫ ENVIRONMENTAL ▫ MATERIALS

Project No E8432-06-01
December 23, 2008

Mr William J Wagner, P E
HMH Engineers
1570 Oakland Road
San Jose, California 95131

Subject ASBESTOS SURVEY
TULLY ROAD OVERCROSSING (BRIDGE 37-0095)
SAN JOSE, CALIFORNIA

Dear Mr Wagner

We have performed an asbestos survey of the subject bridge in San Jose, California The scope of services provided by Geocon included surveying the bridge for suspect asbestos-containing materials, collecting bulk samples, and submitting the samples to a laboratory for analysis

The accompanying report summarizes the services performed and the results of laboratory testing

The contents of this report reflect the views of Geocon, who are responsible for the facts and accuracy of the data presented herein This report does not constitute a standard specification, or regulation

If there are any questions concerning the contents of this report, or if Geocon may be of further service, please contact me at your convenience

Sincerely,

GEOCON CONSULTANTS, INC.

David Watts, CAC
Senior Project Scientist

DAW ls

(10) Addressee
(1) Ray Boyer, Caltrans District 4

6671 Brisa Street ▫ Livermore, CA 94550 2505 ▫ Telephone (925) 371-5900 ▫ Fax (925) 371 5915

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ASBESTOS SURVEY REPORT

1.0 INTRODUCTION

1.1 Site Description

The project consists of the Tully Road Overcrossing (Bridge 37-0095) in San Jose California (the project location) The approximate project location is depicted on the Vicinity Map, Figure 1, and Site Plan, Figure 2

1 2 Objective

Our objective was to assess the potential presence and quantity of asbestos at the project location prior to planned demolition activities The information obtained from this investigation will be used by HMH Engineers for waste profiling, determining California Occupational Safety and Health Administration (Cal/OSHA) applicability, and coordinating asbestos disturbance activities

2 0 BACKGROUND

The *Code of Federal Regulations (CFR)*, 40 CFR 61, Subpart M, National Emissions Standards for Hazardous Air Pollutants (NESHAP) and Federal Occupational Safety and Health Administration (FED OSHA) classify asbestos-containing material (ACM) as any material or product that contains *more than* 1% asbestos Nonfriable ACM is classified by NESHAP as either Category I or Category II material defined as follows

- **Category I** – asbestos-containing packings gaskets, resilient floor coverings, and asphalt roofing products
- **Category II** – all remaining types of non-friable asbestos-containing material not included in Category I that when dry, cannot be crumbled pulverized, or reduced to powder by hand pressure

Regulated asbestos-containing material (RACM), a hazardous waste when friable, is classified as any manufactured material that contains *greater than* 1% asbestos by dry weight *and* is

- Friable, or
- Category I material that has become friable, or
- Category I material that has been subjected to sanding grinding, cutting or abrading, or
- Category II non-friable material that has a high probability of becoming crumbled, pulverized, or reduced to a powder during demolition or renovation activities

Activities that disturb materials containing *any* amount of asbestos are subject to certain requirements of the Cal/OSHA asbestos standard contained in Title 8, California Code of Regulations (CCR) Section 1529 Typically, removal or disturbance of more than 100 square feet of material containing more than 0 1% asbestos must be performed by a registered asbestos abatement contractor, but associated waste labeling is not required if the material contains 1% or less asbestos

When the asbestos content of a material exceeds 1%, virtually all requirements of the standard become effective

Materials containing more than 1% asbestos are also subject to NESHAP regulations (40 CFR Part 61, Subpart M) RACM (friable ACM and nonfriable ACM that will become friable during demolition or renovation operations) must be removed from buildings prior to demolition or renovation Certain nonfriable ACM and materials containing 1% or less asbestos may remain in buildings during demolition, however there are waste handling/disposal issues and Cal/OSHA work requirements that must be followed Contractors are responsible for segregating and characterizing waste streams prior to disposal

With respect to potential worker exposure, notification, and registration requirements, Cal/OSHA defines asbestos-containing construction material (ACCM) as construction material that contains more than 0 1% asbestos (Title 8, CCR 341 6)

3.0 SCOPE OF SERVICES

Mr David Watts, a California-Certified Asbestos Consultant (CAC), certification No 98-2404 (expiration September 16, 2009), completed an asbestos survey of the project location on October 15 2008

Suspect ACM were grouped into homogeneous areas with representative samples randomly collected from each In addition, each potential ACM was evaluated for quantity and friability A total of six bulk asbestos samples were collected from the project location

Our procedures for inspection and sampling are discussed below

- Collected bulk asbestos samples after first wetting friable material with a light mist of water The samples were then cut from the substrate and transferred to a labeled container Note that when multiple samples were collected, the sampling locations were distributed throughout the homogeneous area (spaces where the material was observed)
- Relinquished bulk asbestos samples to EMSL Analytical, Inc , a California-licensed laboratory, for asbestos analysis in accordance with EPA Test Method 600/R-93/116 using polarized light microscopy (PLM) under standard chain-of-custody procedures EMSL Analytical, Inc is a laboratory accredited by the National Institute of Standards and Technology National Voluntary Laboratory Accreditation Program (NIST-NVLAP) for bulk asbestos fiber analysis The laboratory analyses were requested on a 24-hour turn-around-time

Sample locations are presented on the Site Plan, Figure 2 Geocon sample group identification numbers, material descriptions, approximate quantities, friability assessments and photo references are summarized on the attached table Photos of suspect asbestos-containing materials are presented with the Site Photographs

4.0 INVESTIGATIVE RESULTS

Chrysotile asbestos at a concentration of 40% was detected in samples representing approximately 80 square feet of nonfriable sheet packing used as barrier rail shims

Chrysotile asbestos at a concentration of 15% was detected in samples representing approximately 5 square feet of nonfriable thread compound used on the barrier rail posts

No asbestos fibers were observed in samples of suspect joint fill material collected at the project location A summary of the analytical laboratory test results for asbestos is presented on the attached table

5.0 CONCLUSIONS AND RECOMMENDATIONS

NESHAP regulations do not require that asbestos-containing barrier rail shims and thread compound (Category I nonfriable/nonhazardous materials) identified during our survey be removed prior to demolition or treated as hazardous waste However, the disturbance of these materials is still covered by the Cal/OSHA asbestos standard We recommend that a licensed contractor registered with Cal/OSHA for asbestos-related work perform any activities that will disturb the barrier rail shims or thread compound Contractors are responsible for segregating and characterizing waste streams prior to disposal Contractors are responsible for informing the landfill of the contractor's intent to dispose of asbestos-containing waste

We also recommend the notification of contractors (that will be conducting demolition or related activities) of the presence of asbestos in their areas (i e , provide the contractor[s] with a copy of this report and a list of asbestos removed during subsequent activities) Contractors who are not trained for asbestos-related work should be instructed not to disturb asbestos

In accordance with Bay Area Air Quality Management District (BAAQMD) Regulation 11, Rule 2, written notification is required ten working days prior to commencement of *any* demolition activity (whether asbestos is present or not) In accordance with Title 8, CCR 341 9 written notification to the nearest Cal/OSHA district office is required at least 24 hours prior to certain asbestos-related work

6 0 REPORT LIMITATIONS

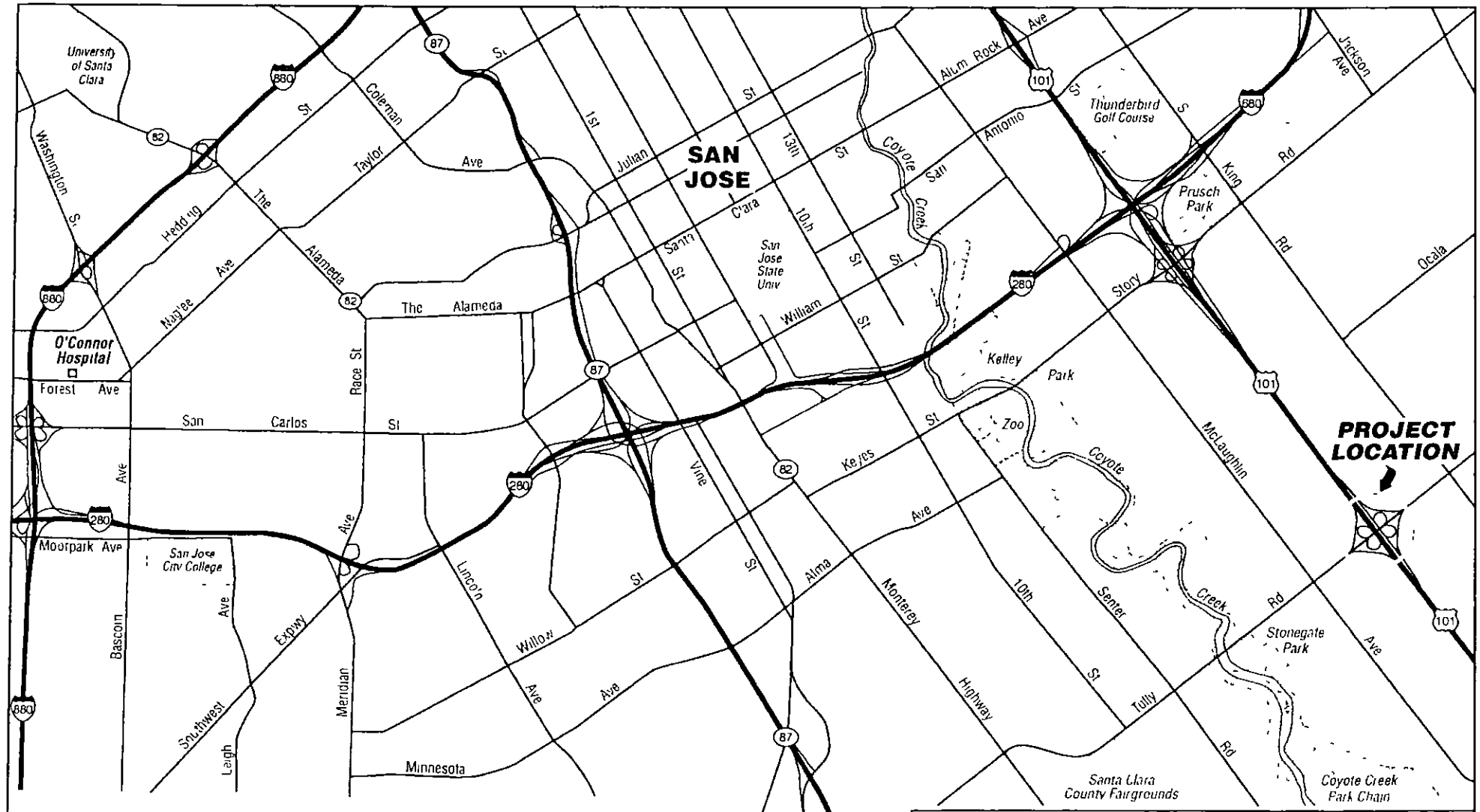
This report has been prepared exclusively for HMH Engineers The information contained herein is only valid as of the date of the report, and will require an update to reflect additional information obtained

The asbestos survey was conducted in conformance with generally accepted standards of practice for identifying and evaluating asbestos in structures The survey addressed only the structure identified in Section 1 1 Due to the nature of building surveys, asbestos use, and laboratory analytical limitations, some asbestos in the structure may not have been identified Spaces, such as wall cavities, crawlspaces, voids, and pipe chases, may have been concealed to our investigator Previous renovation work may have concealed or covered spaces or materials, or may have partially demolished materials and left debris in inaccessible areas Additionally, renovation activities may have partially replaced asbestos with indistinguishable non-asbestos Asbestos may exist in areas not accessible or sampled in conjunction with our scope of services

During demolition operations, suspect materials may be uncovered which are different from those accessible for sampling during this assessment Personnel in charge of renovation/demolition should be alerted to note materials uncovered during such activities that differ substantially from those included in this or previous assessment reports If additional suspect materials are found, they should be treated as ACM until/unless sampling and analysis indicate otherwise

This report is not a comprehensive site characterization and should not be construed as such The findings as presented in this report are predicated on the results of the limited sampling and laboratory testing performed In addition, the information obtained is not intended to address potential impacts related to sources other than those specified herein Therefore, the report should be deemed conclusive with respect to only the information obtained We make no warranty, express or implied with respect to the content of this report or any subsequent reports, correspondence, or consultation Geocon strived to perform the services summarized herein in accordance with the local standard of care in the geographic region at the time the services were rendered

The contents of this report reflect the views of the author who is responsible for the facts and accuracy of the data presented herein This report does not constitute a standard, specification, or regulation



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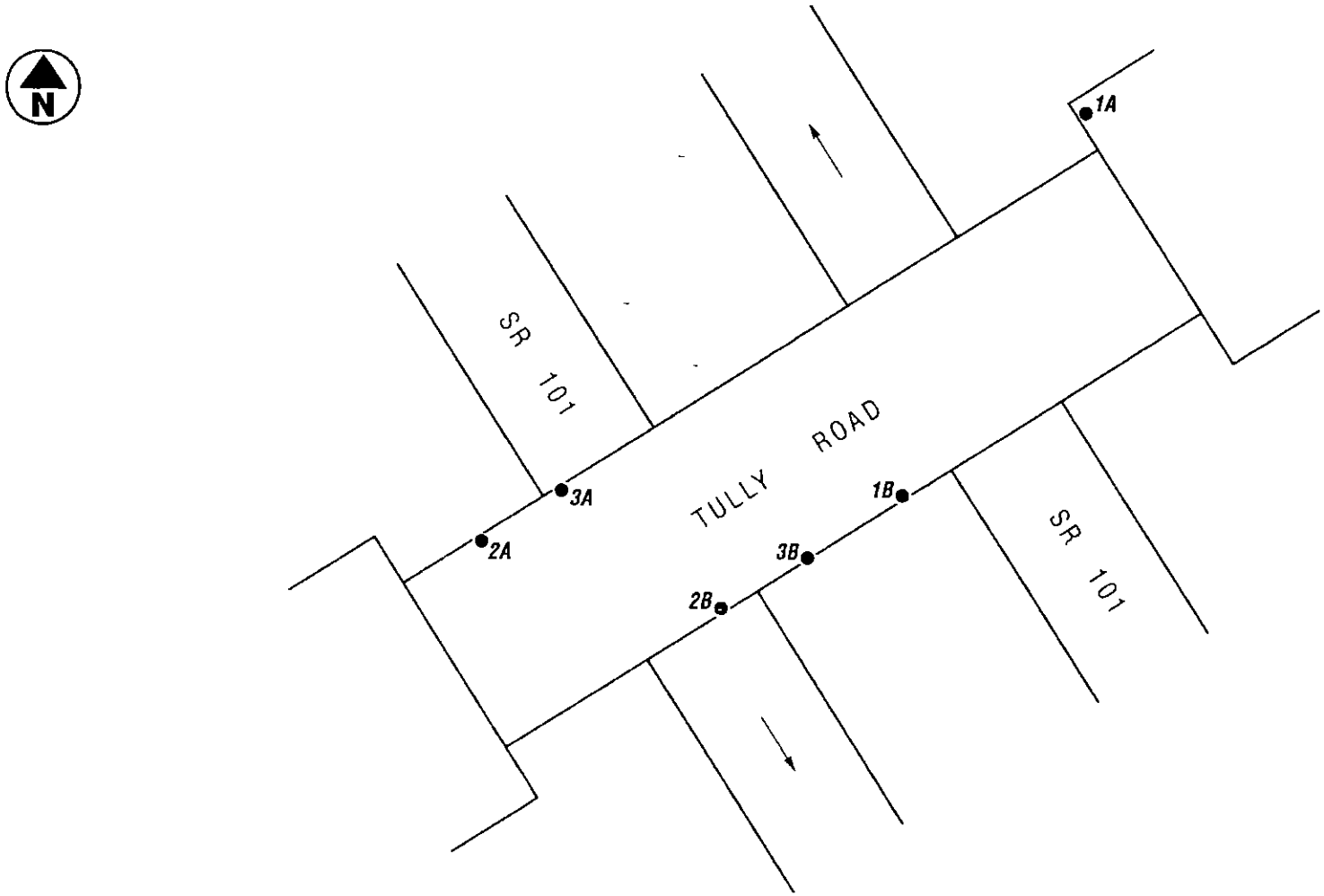
PHONE 925 371 5900 – FAX 925 371 5915

Tully Road at State Route 101

San Jose, California

VICINITY MAP

E8432-06-01	October 2008	Figure 1



TULLY ROAD OVERCROSSING
(BRIDGE 37-0095)

LEGEND

- Approximate Asbestos Sample Location

NO SCALE

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Tully Road at State Route 101

San Jose,
California

SITE PLAN

E8432-06-01	October 2008	Figure 2

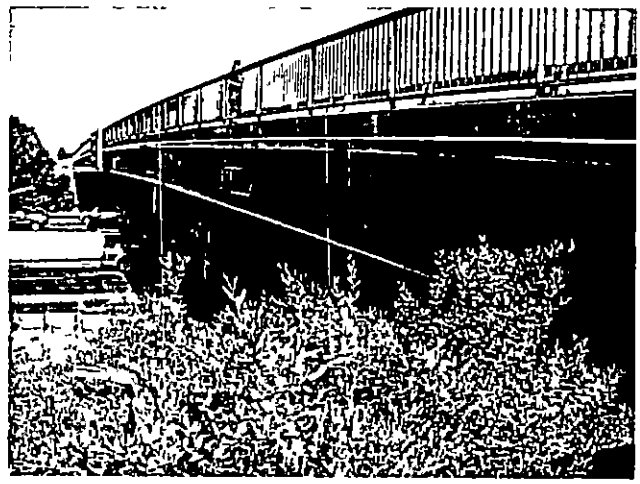

Photo 1 – Tully Road Overcrossing (Bridge 37-0095)

Photo 2 – East abutment

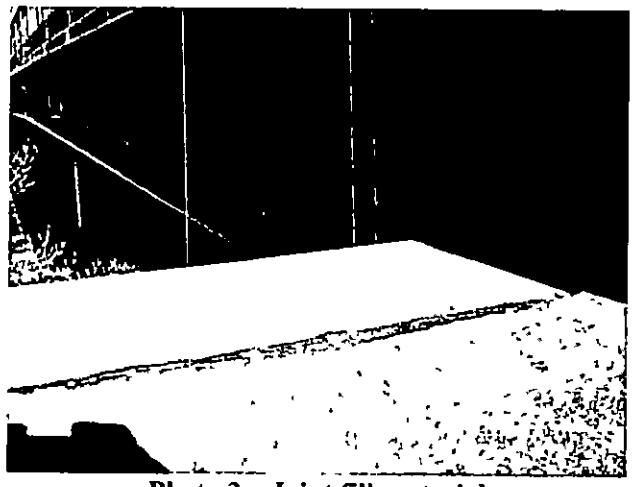

Photo 3 – Joint fill material

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PHOTOGRAPHS 1, 2, & 3		
Tully Road Overcrossing San Jose, California		
E8432-06-01		October 2008

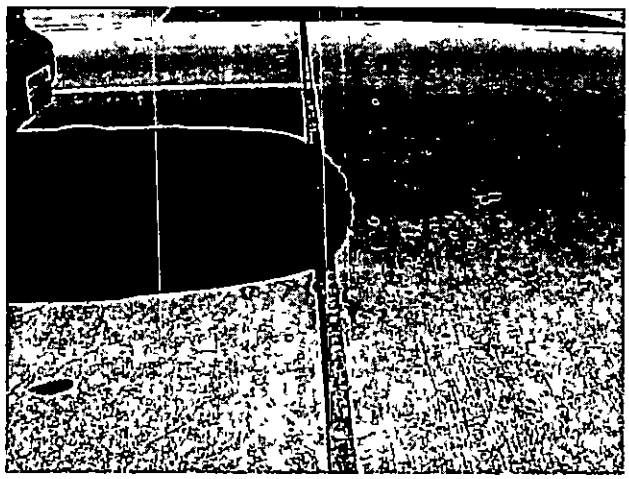

Photo 4 – Deck joint seal (non-suspect)

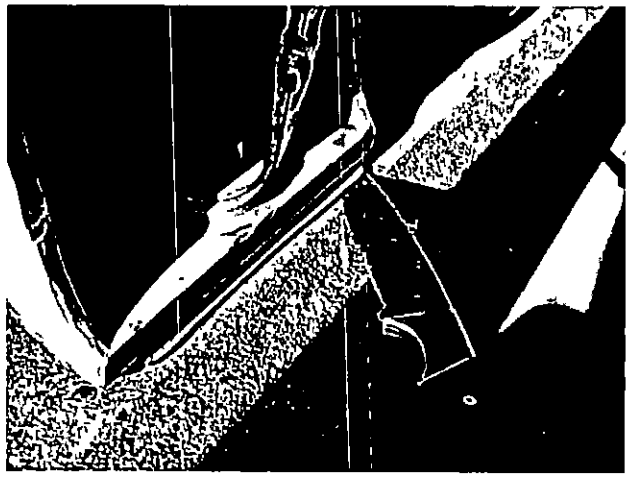

Photo 5 – Barrier rail post with shims and thread compound

Photo 6 – West abutment

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PHOTOGRAPHS 4, 5, & 6		
Tully Road Overcrossing San Jose, California		
E8432-06-01		October 2008

TABLE 1
SUMMARY OF ANALYTICAL LABORATORY TEST RESULTS - ASBESTOS
TULLY ROAD OVERCROSSING IN SAN JOSE, CALIFORNIA

Polarized Light Microscopy (PLM) - EPA Test Method 600/R-93/116

Sample Group ID	Description of Suspect Material	Approximate Quantity	Friable	Site Photo	Asbestos Content
1	Joint fill material (abutments and span)	ND	NA	2	ND
2	Shims (barrier rail)	80 square feet	No	5	40%
3	Thread compound (barrier rail)	5 square feet	No	5	15%

Notes

NA = Not applicable

ND = No asbestos fibers detected

APPENDIX A

EMSL Analytical, Inc
2235 Polvorosa Ave , Suite 230, San Leandro, CA 94577
Phone (510) 895-3675 Fax (510) 895-3630 Email nulprtaslab@emsl.com

Attn **David Watts**
Geocon Consultants
6671 Brisa Street
Livermore, CA 94550

Fax (925) 371-5915 Phone (925) 371-5900
Project **E8432-06-01**

Customer ID	GECN21
Customer PO	E8432-06-01
Received	10/15/08 4 55 PM
EMSL Order	090808290
EMSL Proj	
Analysis Date	10/16/2008
Report Date	10/17/2008

Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Location	Appearance	Non-Asbestos %	Fibrous	Non-Asbestos %	Non-Fibrous	Asbestos %	Type
1A, Joint fill material *090808290-0001*	Tully Road OC	Brown Fibrous Homogeneous	70%	Cellulose	30%	Non-fibrous (other)		**None Detected**
1B, Joint fill material *090808290-0002*	Tully Road OC	Brown Fibrous Homogeneous	70%	Cellulose	30%	Non-fibrous (other)		**None Detected**
2A, Shims *090808290-0003*	Tully Road OC	Gray White Fibrous Homogeneous			60%	Non-fibrous (other)	**40%**	**Chrysotile**
2B Shims *090808290-0004*	Tully Road OC	Gray White Fibrous Homogeneous			60%	Non-fibrous (other)	**40%**	**Chrysotile**
3A Thread compound *090808290-0005*	Tully Road OC	Gray, White Fibrous Homogeneous			85%	Non-fibrous (other)	**15%**	**Chrysotile**
3B, Thread compound *090808290-0006*	Tully Road OC	Gray White Fibrous Homogeneous			85%	Non-fibrous (other)	**15%**	**Chrysotile**

Analyst(s)

Alan Tahran (6)

Baojia Ke Laboratory Manager
or other approved signatory

Due to magnification limitations inherent in PLM asbestos fibers in dimensions below the resolution capability of PLM may not be detected Samples reported as <1% or none detected may require additional testing by TEM to confirm asbestos quantities The above test report relates only to the items tested and may not be reproduced in any form without the express written approval of EMSL Analytical Inc EMSL s liability is limited to the cost of analysis EMSL bears no responsibility for sample collection activities or analytical method limitations Interpretation and use of test results are the responsibility of the client Samples received in good condition unless otherwise noted
NVLAP Lab Code 101048 3

LM-1

THIS IS THE LAST PAGE OF THE REPORT

90808290

EMSL – San Leandro ◆ 2235 Polvorosa Ave, Suite 230, San Leandro, CA 94577

(888) 455-3675 ◆ Phone (510) 895-3675 ◆ Fax (510) 895-3680 ◆ sanleandrolab@emsl.com

EMSL Rep:	D. Kolter	*Third Party Billing*	**requires written authorization from third party*
Company:	Geocon	EMSL-Bill to:	
Contact:	D. Watts	Contact:	
Address:	6671 Brisa St	Address:	
City & State:	Livermore, CA Zip 94550	City & State:	Zip
Phone:	925-371-5900	Fax:	
☒ Email Results	D Watts	☐ Fax results	
Project Name or Number:	E8432-06-01	Purchase Order Number:	

TURNAROUND TIME

☐ 3 Hours	☐ 6 Hours	☒ 24 Hours	☐ 48 Hours	☐ 72 Hours	☐ 5 Days	☐ 10 Days

SAMPLE MATRIX

☐ Air	☒ Bulk	☐ Soil	☐ Wipe	☐ Micro-Vac	☐ Drinking Water	☐ Wastewater	☐ Chips	☐ Other

ASBESTOS ANALYSIS

PCM - Air
- ☐ NIOSH 7400 (A) Issue 2 August 1994
- ☐ OSHA w/ Time Weighted Average

TEM AIR
- ☐ AHERA 40 CFR, Part 763 Subpart E
- ☐ NIOSH 7402 Issue 2
- ☐ EPA Level II

PLM - Bulk
- ☒ EPA 600/R-93/116
- ☐ + Add Gravimetric Reduction (EPA NOB)

PLM CARB 435 Level ☐ A (0 25%) ☐ B (0 1%)
- ☐ NIOSH 9002
- ☐ EPA Point Count (400 Points)
- ☐ + Add Gravimetric Reduction (EPA NOB)
- ☐ EPA Point Count (1,000 Points)
- ☐ + Add Gravimetric Reduction (EPA NOB)
- ☐ Standard Addition Point Count

SOILS

PLM CARB 435 Level ☐ A (0 25%) ☐ B (0 1%)
TEM CARB 435 Level ☐ B (0 1%) ☐ C (0 01%) ☐ D (0 001%) ☐ E (0 0005%) ☐ F (0 0001%)
- ☐ EMSL MSD 9000 Method fibers/gram
- ☐ Superfund EPA 540-R097-028 (dust generation)

EPA Protocol ☐ Qualitative ☐ Quantitative

TEM BULK
- ☐ TEM EPA NOB, EPA 600/R-93/116 Section 2 5 5 1 (TEM % by VAE)
- ☐ Chatfield SOP-1988-02
- ☐ TEM EPA 600/R-93/116 Section 2 5 5 2 (TEM % by Mass)

TEM MICROVAC
- ☐ ASTM D 5755 (Quantitative)

TEM WIPE
- ☐ ASTM D-6480 (Quantitative)

TEM WATER
- ☐ EPA 100 2 (≥ 10 microns)
- ☐ Modified EPA 100 2 (≥ 0 5 microns)

OTHER

LEAD ANALYSIS

Flame Atomic Absorption
- ☐ Wipe, SW846-7420 ☐ ASTM ☐ non ASTM
- ☐ Soil, SW846-7420
- ☐ Air, NIOSH 7082
- ☐ Chips, SW846-7420 or AOAC 5 009 (974 02)
- ☐ Wastewater, SW 846-7420

☐ TCLP LEAD SW846-1311/7420

Graphite Furnace Atomic Absorption
- ☐ Air, NIOSH 7105
- ☐ Wastewater, SW846-7421
- ☐ Soil, SW846-7421
- ☐ Drinking Water, EPA 239 2

ICP – Inductively Coupled Plasma
- ☐ Wipe, SW846-6010 ☐ ASTM ☐ non ASTM
- ☐ Soil, SW846-6010
- ☐ Air, NIOSH 7300

MATERIALS ANALYSIS
- ☐ Particle Identification
- ☐ Full Particle Identification
- ☐ Dust Mites and Insect Fragments
- ☐ Particle Size & Distribution
- ☐ Product Comparison
- ☐ Paint Characterization
- ☐ Failure Analysis
- ☐ Corrosion Analysis
- ☐ Glove Box Containment Study
- ☐ Petrographic Examination of Concrete
- ☐ Portland Cement in Workplace Atmospheres (OSHA ID-143)
- ☐ Man Made Vitrous Fibers – MMVF s
- ☐ Synthetic Fiber Identification
- ☐ Other _____

MICROBIAL ANALYSIS

Air Samples
- ☐ Mold & Fungi by Air O Cell
- ☐ Mold & Fungi by Agar Plate count & id
- ☐ Bacterial Count and Gram Stain
- ☐ Bacterial Count and Identification

Water Samples
- ☐ Total Coliforms, Fecal Coliforms
- ☐ Escherichia Coli, Fecal Streptococcus
- ☐ Legionella
- ☐ Salmonella
- ☐ Giardia and Cryptosporidium

Wipe and Bulk Samples
- ☐ Mold & Fungi – Direct Examination
- ☐ Mold & Fungi – (Culture follow up to direct examination if necessary)
- ☐ Mold & Fungi – Culture (Count & ID)
- ☐ Mold & Fungi – Culture (Count only)
- ☐ Bacterial Count & Gram Stain
- ☐ Bacterial Count & Identification (3 most prominent types)
- ☐ Other _____

IAQ ANALYSIS
- ☐ Nuisance Dust (NIOSH 0500 & 0600)
- ☐ Airborne Dust (PM10, TSP)
- ☐ Silica Analysis by XRD ☐ NIOSH 7500
- ☐ HVAC Efficiency
- ☐ Carbon Black
- ☐ Airborne Oil Mist
- ☐ Other _____

Relinquished	[illegible]	Date	15 OCT 2008	Time	1657
Received	M Edwards	Date	15 OCT 2008	Time.	1657
Relinquished		Date		Time	
Received		Date		Time	

90808290

EMSL ANALYTICAL INC.

EMSL – San Leandro ◆ 2235 Polvorosa Ave, Suite 230, San Leandro, CA 94577

	SAMPLE NUMBER	SAMPLE DESCRIPTION	LOCATION	VOLUME Air (L) Area (Inches sq)
1	1A	JOINT FILL MAT'L	Tully RD OC	N/A
2	1B	" " "		
3	2A	SITIM S		
4	2B	"		
5	3A	THREAD COMPOUND		
6	3B	" "		
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				

Client Sample # (S) _____ TOTAL SAMPLE # 6

Relinquished		Date		Time	
Received	M. Edwards	Date	10/15/98	Time.	4:55
Relinquished		Date		Time	
Received		Date		Time	

FOUNDATION REPORT

TULLY ROAD OVERCROSSING/ROUTE 101
(BRIDGE NO. 37-0668)
SANTA CLARA COUNTY, CALIFORNIA
04-SCI-101 EA 1A9801

For

HMH ENGINEERS
1570 Oakland Road
San Jose, CA 95131

PARIKH CONSULTANTS, INC.

2360 Qume Drive, Suite A, San Jose, CA 95131
(408) 452-9000

May 1, 2009 Job No. 207150.TUL

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Appendix A

Log of Test Borings (Br. No. 37-0668)

As-Built Boring Data (Br. No. 37-95, Caltrans 1961)

CPT Site Investigation Report by Gregg In Situ, Inc. (December 18, 2007)

Appendix B

Laboratory Test Data

Appendix C

C-1: Liquefaction Potential per CPT Procedures
C-2: Evaluation of Liquefaction Down Drag Load, Generalized Soil & Strength Profile & Pile Capacity Evaluation
C-3: Geotechnical Parameters for LPILE (v.5) Analysis
C-4: Seismic Design Criteria
C-5: Embankment Settlement & Stability Evaluation

Appendix D

Caltrans Comment & Response Form (December 29, 2008)
Caltrans Comment & Response Form (March 10, 2009) – Interim
Caltrans Comment & Response Form (April 22, 2009)

Appendix E

Research on the Trace of Inferred Silver Creek Fault and Potential Fault Rupture for Tully Road Overcrossing/Route 101 (Br. No. 37-0668), Santa Clara County, CA (04-SCl-101 EA 1A9801), dated April 3, 2009, prepared by Parikh Consultants, Inc.

FOUNDATION REPORT
TULLY ROAD OVERCROSSING/ROUTE 101
(REPLACE, BRIDGE NO. 37-0668)
SANTA CLARA COUNTY, CALIFORNIA
04-SCl-101 EA 1A9801

INTRODUCTION

This report presents the results of our geotechnical engineering investigation for the proposed Tully Road Overcrossing (Replace) at Route 101, hereinafter referred to as "PROJECT", in Santa Clara County, California. The work was performed in general accordance with the scope of work outlined in our proposal to HMH Engineers, Inc. The general location of the project site and its vicinity are shown on the Project Location Map, Plate 1.

The geotechnical recommendations presented in this report are intended for design input and are not intended to be used as specifications. These recommendations should not be used for direct bidding purposes and cost estimate.

PROPOSED CONSTRUCTION

The project consists of bridge replacement along Tully Road, crossing over Route 101 (Br. No. 37-0668). The proposed bridge is a two-span, cast-in-place pre-stressed box girder structure of approximately 310 feet in length and 100 feet in width. The existing structure is a four-span I girder structure built circa 1962. The existing structure was retrofitted with 5-ft diameter CIDH piles at the abutments. For the proposed bridge replacement, staged construction is anticipated. The existing structure already has approach embankments in-place. The project requires additional embankment to about 25 feet high.

In addition to the bridge replacement, a MSE retaining wall (Br. No. 37E-0044) is proposed in the southeast quadrant along the NB off-ramp due to ramp reconfiguration of the interchange. The planned retaining wall is of approx. 305 feet long with maximum height up to approx. 16 feet per the information provided.

PURPOSE AND SCOPE

The purpose of this investigation was to evaluate the general subsurface conditions at the project site, to evaluate their engineering properties, and to provide geotechnical recommendations for the foundation design of the proposed project.

The scope of work performed for this investigation included a review of the readily available soils and geologic literature pertaining to the site including available as-built Log of Test Borings (LOTB) for the existing structure (Br. No. 37-95); site reconnaissance; obtaining representative soil samples encountered in two cone penetration tests (CPT) through push sampler; laboratory testing of the collected soil samples, performing engineering analyses based on the field and laboratory data, and preparation of this foundation report for the overcrossing structure (Br. No. 37-0668). The geotechnical recommendations for the MSE retaining wall (Br. No. 37E-0044) are presented in a separate report.

Due to limitations inherent in geotechnical investigations, it is neither uncommon to encounter unforeseen variations in the subsurface soil conditions during construction nor is it practical to determine all such variations during an acceptable program of drilling and sampling for a project of this scope. Such variations, when encountered, generally require additional engineering services to attain properly constructed project. We, therefore, recommend that a contingency fund be provided to accommodate any additional charges resulting from technical services that may be required during construction. Our recommendations in this report are based on the above information. Any major deviation should be reported to this office for consideration.

SITE CONDITIONS

The existing Tully Road/Route 101 interchange was completed circa 1962. The existing interchange is a full cloverleaf interchange with Tully Road Overcrossing carrying three lanes of traffic each way. The proposed improvements include modifying the interchange to a partial cloverleaf interchange and replacing the exiting overcrossing. The area within the project is generally level. The slopes in the vicinity of the abutments are standard 2H:1V slide slope and 1.5H:1V end slope. The slopes are generally covered with light vegetation. Based on the

topographic information provided, the existing grade along Route 101 is at approx. Elev. 127 to 129 feet, and the existing approach embankment is at approx. Elev. 145 to 147 feet.

FIELD EXPLORATION AND LABORATORY TESTING

Based on the preliminary plans, discussions with the designers, and readily available geotechnical data in the area, two cone penetration tests (CPT) were performed for the Tully Road Overcrossing near the abutment areas to maximum depth of 108 feet below the existing ground surface. The approximate CPT locations together with the as-built boring locations (Caltrans 1961) are shown on the LOTB sheet and Plate 1.

Gregg Drilling & In Situ, Inc. performed the CPTs (Borings 07-BR-01 and 07-BR-02) on 14 and 17 December 2007. The CPTs were conducted using a 20-Ton capacity cone with a tip area of 15 cm^2 and a friction sleeve area of 225 cm^2. The soil resistance exerted to the tip and side of the cone were recorded and correlated to soil type, classification and strength characteristics. Selected samples were also obtained from CPT push samplers at various depths. The samples were sealed and transported to our laboratory for further evaluation and testing. The results are presented on the LOTB in Appendix A. The as-built LOTB (Br. No. 37-95, Caltrans 1961) is also attached.

Laboratory tests were performed on selected soil samples collected during field exploration to evaluate the physical and index properties of the subsurface soils. The laboratory test methods and test results are presented on plates included in Appendix B. Laboratory test results for moisture content and Plasticity Indexes of the soil samples are presented on the LOTB in Appendix A. Detail results of laboratory tests are presented in Appendix B.

It should be noted that the descriptions of the soils encountered and relevant boring information presented on the LOTB depict subsurface conditions only at the locations indicated on the plan and on the particular date noted on the LOTB. Because of the variability from place to place within soil/rock in general, subsurface conditions at other locations may differ from conditions occurring at the boring locations explored. The abrupt stratum changes shown on the logs may be gradational and relatively minor changes in soil types within a stratum may not be noted on the logs due to field limitations. Also, the passage of time may result in a change in the soil conditions

at these locations due to environmental changes.

SUBSURFACE CONDITIONS

The subsurface conditions are based on the as-built LOTB sheet (Caltrans 1961) and CPT data performed in December 2007 (Parikh 2007). The approximate boring locations are shown on the attached LOTB sheet and Plate 1B (Site Plan). The CPTs were performed within the existing clove leaves of the interchange at about the same level of Route 101. The CPT interpretation was provided by Gregg In Situ, Inc. A complete report (12/18/07) prepared by Gregg is attached in Appendix A of the foundation report. Per Gregg's report, the interpretation follows the comprehensive review by Lunne, Robertson and Powell (1997). Note that the Gregg's CPT interpretation starts at 5 ft depth because the upper 5 ft is hand-augered as a safety practice. Parikh provided spread sheets for data correlation (attached in Appendix C) only to read Gregg's data and present/plot certain selected parameters along depth for convenience of reading the file.

At north abutment area, the layers and material descriptions of as-built Boring B-4 (Caltrans 1961) appear to correlate reasonably well with CPT BR-2. At south abutment, the as-built Boring B-1 indicate predominantly granular material in the upper 50 ft while CPT BR-1 encountered clay and silt layers in between granular layers. Below 50 ft depth, the material descriptions in B-1 appear to match reasonably well with the CPT data. The CPT data complement the subsoil information.

Based on the current CPT investigation, the substrata are summarized below:

BR-1 (Grade Elev. = 126 ft ±)

Depth (ft)	Material Descriptions	Remarks
0 to 6	Clay	
6 to 14	Silt & Sandy Silt, mixed with some clay	
14 to 21	Clay	LL = 30, PI = 10, Wc = 28%
21 to 27	Silt to Silty Sand	at 20 ft:- LL = 27, PI = 6, Wc = 24% at 25 ft: -#200 = 13%
27 to 42	Clay, low to moderate plasticity	LL = 39, PI = 19, Wc = 25%
42 to 49	Silty Sand to Sandy Silt, some clay interbedded	
49 to 73	Clay	Stiff to very stiff
73 to 78	Gravelly Sand & Sand	Dense (spike in cone tip resistance)
78 to 106	Clay to Silt, low plasticity	Very stiff to hard
106 to 108	Gravelly Sand to Sand	Dense (spike in cone tip resistance)

BR-2 (Grade Elev. = 127 ft ±)

Depth (ft)	Material Descriptions	Remarks
0 to 13	Sandy Silt, mixed with some clay	
13 to 16	Clay	Wc = 20%, medium stiff
16 to 22	Silty Clay	LL = 27, PI = 7, Wc = 19%
22 to 34	Silty Sand to Sandy Silt with clay layers interbedded	
34 to 44	Clay, low to moderate plasticity	LL = 31, PI = 12, Wc = 27%
44 to 48	Silty Sand to Sandy Silt	LL = 31, PI = 7, Wc = 29%
48 to 69	Clay	Very stiff
69 to 82	Gravelly Sand & Sand	Dense (spike in cone tip resistance)
82 to 99	Clay to Silt, low plasticity	Very stiff to hard

For the materials at shallow depth (within the upper 15 to 20 ft, we have referred to the CPTs and some other borings drilled in the interchange for roadway design. (These borings are presented in the project Geotechnical Design & Materials Report.) These upper materials generally consist of low plasticity clay and silt mixed with some sand. The near surface material is influenced by previous interchange construction.

The CPT data generally indicate two layers of sandy silt/silty fine sand of medium dense consistency. In BR-1, one layer is at 21- to 27-ft depth and one at about 42- to 49-ft depth. In BR-2, one layer is at 22- to 34-ft depth with some clay interbedded and one at about 44- to 48-ft depth. The distribution of layers appears to be generally consistent between BR-1 and BR-2. The layers also correlate with as-built B-4 (Caltrans 1961) with some variation of the particular layer thickness.

Below 50-ft depth, the subsoils consist of stiff to very stiff fine-grained material (clays and silts). At approximately 70- to 75-ft depth, a layer of dense sand and gravel was indicated in the current CPT and as-built LOTB. The thickness of the layer, however, appears to be variable. The thickness may vary from 5 feet (as-built B-4, Caltrans 1961) to 13 feet as encountered in current CPT (BR-2, Parikh 2007). Very dense sand and gravel were encountered in the CPTs at 108-ft depth (BR-1) and 100-ft depth (BR-2).

Groundwater Data. During CPT operation, pore pressure dissipation tests were performed in both BR-1 (12/14/07) and BR-2 (12/17/07). The dissipation test data is included in Gregg's CPT report of 12/18/07. Based on dissipation data, the groundwater depth is calculated at

approximately 15-ft depth. The as-built LOTB sheet (Caltrans 1961) shows groundwater at about 20 ft depth. Additional borings (presented in the project GDMR) drilled for roadway design at the interchange encountered groundwater at 15 to 17.5 ft depth in 12/2007. Groundwater level at the site appears to be relatively uniform.

We have considered groundwater level at 15-ft depth below existing Route 101 level for project design. The groundwater level is anticipated to vary with the passage of time due to seasonal groundwater fluctuation, surface and subsurface flows, ground surface run-off, and other factors that may not be present at the time of investigation.

GEOLOGY

General geologic features pertaining to the site were evaluated by reference to the Quaternary Geology of Santa Clara Valley, Santa Clara, Alameda, and San Mateo Counties, California, by E.J. Helley, R.W. Graymer, G.A. Phelps, P.K. Showalter, and C.M. Wentworth (USGS Open-File Report, 94-231, May 1994). Based on the publication, the on-site geologic conditions consist of Floodbasin Deposits (Qhb, Holocene) and Natural Levee Deposits (Qhl, Holocene). The project site is located in the Coast Ranges geomorphic province of California. A geologic map of the general project area is shown on Plate 2. The description of the main geologic unit is as follows:

Qhb (Holocene) – Very fine silty clay to clay deposits occupying flat-floored basins at the distal edge of alluvial fans

Qhl (Holocene) – Loose, moderately to well-sorted sandy or clayey silt grading to sandy or silty clay. These deposits are porous and permeable and provide conduits for transport of ground water. Levee deposits border stream channels, usually both banks, and slope away to flatter floodplains and basins. Abandoned levee systems have also been mapped.

EARTHQUAKE CONSIDERATIONS

Seismic Sources

The project site is located near an area of northern California known to be seismically active. Seismic activity may result in geological and seismic hazards including seismically induced fault

displacement and rupture, ground shaking, liquefaction, and structural hazards. Caltrans is currently revising/updating the 1996 Seismic Hazard Map. Based on communication with Caltrans, the new map (2008 in-progress) is near completion and may be released in the very near future. Caltrans provided us the new map (draft) with relevant data and indicated that we can start using the updated information since many of the fault data have been revised since 1996.

We reviewed the new Seismic Hazard Map (2008 in-progress) and noticed that in south Bay, the Silver Creek Fault has been added to the map, on the west of the Hayward Fault. The Silver Creek Fault has significant impact for the current Tully Road/Route 101 interchange project because it is in very close distance. A Fault Map based on the new Seismic Hazard Map (2008 in-progress) is attached. The Silver Creek Fault (Fault No. 152) is located to the west and subparallel to the Hayward Fault (Fault No. 355). The fault is inferred and buried under Quaternary sediments in the project vicinity at approximately 800 ft (0.24 km). Although the Silver Creek Fault is not included in the Alquist-Priolo Special Study Zones Map (San Jose East Quadrangle), the Silver Creek Fault has been studied by USGS and California Geological Survey. A study of the fault was also performed for VTA for the planned BART extension to San Jose project (by HMM/Bechtel-Geomatrix).

Based on discussion with Caltrans, the Silver Creek Fault is the governing fault for design. Based on the fault database provided by Caltrans, the Silver Creek Fault (FID = 152) is a reverse fault with maximum moment (Mmax) of 7.1. The soil profile is Type D, and the fault is at approximately 800 ft (0.24 km) from the site. A PBA of 0.7g is anticipated. Note that these data are for reference only. Due to close distance to fault, Caltrans indicated that the design should be based on the new map and revised criteria (NGA model) instead of the existing Caltrans standard ARS curves in Seismic Design Criteria (SDC v. 1.4). Therefore, the ARS design curve was developed through communication, collaboration and information provided by Caltrans as discussed in the “Seismic Design Criteria” section of the report.

Seismic Hazards/Liquefaction Impact

Potential seismic hazards may arise from three sources: surface fault rupture; ground shaking; and liquefaction. Due to close proximity of the site to the Silver Creek Fault and per Caltrans

comments (March 10, 2009), a research of readily available geologic data/literature on the trace of the inferred Silver Creek Fault and potential fault rupture was conducted to evaluate the impact on the structural design. The research results are presented in Appendix E of the report. Based on available geological and seismic data, the possibility of the site to experience strong ground shaking may be considered moderate to high.

Liquefaction Potential

Liquefaction is a phenomenon in which saturated cohesionless soils are subject to a temporary but essentially total loss of shear strength under the reversing, cyclic shear stresses associated with earthquake shaking. Submerged cohesionless sands and silts of low relative density are the type of soils, which usually are susceptible to liquefaction. Clays are generally not susceptible to liquefaction.

The evaluation of liquefaction susceptibility is based on CPT investigation in accordance with current geotechnical practice (Youd, et al, 2001). While carrying out the liquefaction analysis, we also reviewed the obtained soil samples and the specific laboratory testing. We also referenced the latest research of geotechnical engineering regarding Liquefaction Susceptibility of Fine-Grained Soils (Bray, et al 2004).

Recent advances in soil liquefaction engineering (Seed, et al. 2003 and Bray, et al. 2004) indicated that soils with sufficient fines content and fine-grained soils are also susceptible to liquefaction. A framework consisting of comparing Atterberg Limits (LL & PI) with natural water content (Wc) of the soils appears to be robust for evaluating liquefaction susceptibility of soils with sufficient fines and fine-grained soil. Bray, et al. (2004) suggested loose soils with PI<12 and Wc/LL >0.85 were susceptible to liquefaction, and loose soils with 12<PI<18 and Wc/LL>0.8 were systematically more resistant to liquefaction.

Per Bray's et al (2004) criteria, the silt material encountered in BR-1 (21- to 27-ft) with LL = 27, PI = 6 and Wc = 24% (Wc/LL = 0.89) is subject to liquefaction potential. The underlying Lean Clay with LL = 39 & PI = 19 is not liquefiable. In BR-2, Sample #8 at 48 ft (silt layer with LL = 31, PI = 7, Wc = 29% and Wc/LL = 0.94) also fits Bray's et al (2004) criteria of liquefaction

susceptibility.

In BR-1, liquefaction susceptibility was indicated at the silt-silty sand layer (approx. 21 to 27 ft) and silty sand-sand layer (approx. 42 to 49 ft). In BR-2, liquefaction susceptibility was indicated at approx. 22 to 34 ft (sand & silt mix with some clay interbedded) and at approx. 44 to 48 ft. The liquefaction susceptible layers indicated in BR-1 & BR-2 are reasonably consistent although the layer thickness has some variation. In addition, these layers also correlate with as-built B-4 (Caltrans 1961), which indicates slightly compact silty fine sand layer (approx. Elev. 107-97 ft) and slightly compact fine sand layer (approx. Elev. 85-75 ft). Therefore, from a practical design standpoint, it is recommended that the generalized soil profile for design consider liquefaction susceptible layers at 20-30 ft depth and 40-50 ft depth to account for some variations in the field. The CPT liquefaction analysis results are attached in Appendix C-1.

Although the low plasticity silt is still subject to liquefaction susceptibility, the settlement and deformation potential is lower than "sand". Per Bray, et al (2004), the low plasticity silt may dilate during shear once liquefaction is triggered and may undergo a transient loss of strength (cyclic mobility with limited flow deformation).

Post-Liquefaction Settlement. The potential for liquefaction may also induce ground settlement during a seismic event. We have reference both Tokimatsu and Seed (1987) and Ishihara and Yoshimine (1992) for estimation of post-liquefaction settlement. These references correlate post-liquefaction volumetric strain to cyclic stress ratio (CSR), SPT-N values, cone tip resistance, relative density, etc. These empirical references provide a general guide about the order of settlement magnitude. Based on the CPT data and as-built SPT-N values (12 to 14 typical), a volumetric strain of about 3 to 4% is estimated. Considering there are silt and some clay interbedded in the layers, we exercised judgment and adopted 3% volumetric strain for the total thickness of 20 ft for settlement estimation. It is estimated that the post-liquefaction settlement may be on the order of six to seven inches.

The post-liquefaction settlement may induce down drag load on the proposed pile foundations. The foundation design needs to consider the impact of liquefaction and additional down drag load due to liquefaction. The effect of post-liquefaction settlements and associated down drag load

have been considered in foundation design. Further details are discussed in the "Liquefaction Potential & Down Drag Load on Piles" section.

FINDINGS AND RECOMMENDATIONS

General

Based on the findings of the investigation, it is our opinion that the site is feasible for the planned project provided the recommendations presented in this report are incorporated into the final design and construction.

This report was prepared specifically for the proposed project according to the plans provided to us. Normal construction procedures were assumed throughout our analysis and represent one of the bases of recommendations presented herein. Our design criteria have been based upon the materials encountered at the site. Therefore, we should be notified in the event that these conditions are changed, so as to modify or amend our recommendations.

Liquefaction Potential & Down Drag Load on Piles

The liquefaction potential evaluation was performed in accordance with the methods proposed by Youd, et al. (2001) using the CPT procedures. The CPT liquefaction analysis data are attached in Appendix C-1. Based on the evaluation, it is recommended that the generalized soil profile for design consider liquefaction at the zones of 20- to 30-ft depth and at 40- to 50-ft depth. Due to the liquefaction potential, pile capacity contribution within the upper 50-ft depth (below existing Route 101 level) may be minimal.

In addition, the potential liquefaction-induce ground settlement tends to cause down drag load on the foundation piles from the upper 50 ft of overburden. The foundation design needs to consider the impact of liquefaction and additional down drag load due to liquefaction. The evaluation of down drag load due to liquefactions was performed in accordance with NAVFAC DM 7.2. For the proposed Bent 2, the piles are likely to be in a 5 x 5 pile group per column according to the designer. Per DM 7.2, the down drag load does not exceed the total weight of the soil enclosed in

the pile group. For the proposed pile groups of 19 ft x 19 ft in plan dimension with footing embedded at 6.5 to 7 feet below grade, the estimated down drag load is on the order of 25 Tons per pile at Bent 2.

For the proposed Abutments, the foundations may consist of two rows of pile. The configuration does not constitute a "group". Therefore, the down drag load was evaluated following procedures for a single pile per DM 7.2 using coefficient β and effective overburden stress. The overburden effect included the approach embankment. It is recommended that the standard predrill through embankment (Section 49-1.06 of Caltrans standard specs.) be extended to a minimum of 15 feet below original grade (OG) so that a portion of the down drag load may be reduced. Assume that the abutment footing level is at Elev. 137 feet (in the embankment) and OG (Route 101 level) is at Elev. 127 feet, the recommended predrill elevation is at 112 feet for abutment piles. The estimated down drag load is on the order of 32 Tons per pile at the abutments. The generalized soil profile, design soil strength, and evaluation of down drag load are attached in Appendix C-2.

Foundations

Based on the boring and CPT data, the subsoils contain two layers that are prone to liquefaction potential. The as-built foundations consist of 45-Ton driven pipe piles and steel H piles (10BP42). The existing structure was retrofitted with 5-ft diameter CIDH piles at the abutments.

Due to liquefaction potential, the foundation design needs to consider additional down drag load. The pile capacity contribution starts below the liquefiable layer, i.e., below 50-ft depth at the site. Since the sand and gravel layer at about 75-ft depth has variable thickness, it is not prudent to rely on end-bearing in this layer. Therefore, it is recommended that open end steel pipe piles (Caltrans Alt. "W") be used to penetrate this layer and develop frictional pile capacity from the very stiff soils underneath. Based on the analyses, Caltrans standard 16-inch diameter open end pipe pile (Class 200, Alt. "W") may be used, but the design pile capacity is limited to 140 Tons (nominal resistance) per pile.

Pertinent foundation design information provided by the structural designer, including Foundation Design Data and Foundation Loads, are presented in the following tables.

FOUNDATION DESIGN DATA (per Structural Designer)

Support No.	Design Method	Pile Type	Finish Grade Elev. (ft)	Pile Cut-off Elev. (ft)	Pile Cap Size (ft)		Permissible Settlement (in.)	No. of Piles per Support per Bridge
					B	L		
Abut 1	WSD	Class 200 Alt. "W"	144.3	138.0	8	120.6	1	Stage-I=23 piles Stage-II=20 piles
Bent 2	LRFD	Class 200 Alt. "W"	129.5	123.0	19	19	1	25 piles per column footing
Abut 3	WSD	Class 200 Alt. "W"	143.7	137.0	8	120.6	1	Stage-I=23 piles Stage-II=20 piles

FOUNDATION LOADS (per Structural Designer)

Support No.	Service-I Limit State (kips)			Strength Limit State (Controlling Group, kips)				Extreme Limit State (Controlling Group, kips)			
	Total Load		Perma-nent Loads	Compression		Tension		Compression		Tension	
	Per Support	Max. Per Pile	Per Support	Per Support	Max. Per Pile	Per Support	Max. Per Pile	Per Support	Max. Per Pile	Per Support	Max. Per Pile
Abut 1	-	136	-	-	N/A	N/A	N/A	-	N/A	N/A	N/A
Bent 2	-	135	-	-	185	-	-	-	275	-	45
Abut 3	-	136	-	-	N/A	N/A	N/A	-	N/A	N/A	N/A

Consistent with the current Caltrans requirements, Working Stress Design (WSD) is used for the abutment foundations and Load and Resistant Factor Design (LRFD) is used for the foundations for Bent 2 for the bridge. The abutment foundations are evaluated for the foundation design data and loading conditions using Caltrans November 2003 Bridge Design Specifications for foundations, using Working Stress Design (WSD) methods. The Bent 2 foundations are evaluated for the foundation design data and loading conditions using AASHTO LRFD Bridge Design Specifications–3rd Edition, with Interims Thru 2006 and current Caltrans Amendments (v3.06.01). The evaluation of Load Demands on the piles, based upon WSD and LRFD are presented in the table below:

EVALUATION OF LOAD DEMANDS

Support No.	Design Method	Service Loads (kips)	Required Factored Nominal Resistance (kips)				Nominal Resistance (kips)[1]		Nominal Driving Resistance Required (kips)[2]
		Comp.	Strength Limit		Extreme Limit		Comp.	Tens.	
			Comp. (ϕ=0.7)	Tens. (ϕ=0.7)	Comp. (ϕ=1.0)	Tens. (ϕ=1.0)			
Abut 1	WSD	136	N/A	N/A	N/A	N/A	280	0	408
Bent 2	LRFD	135	185	-	275	45	280	50	380
Abut 3	WSD	136	N/A	N/A	N/A	N/A	280	0	408

Notes:

(1) The Nominal Resistance is the maximum value of the following: Service Load x 2 (F.S.), Factored Resistance of Strength Limit (ϕ=0.7), and Factor Resistance of Extreme Limit (ϕ=1.0). The values were rounded up to the next 10 kips per MTD 3-1.

(2) The Nominal Driving Resistance Required is equal to the Nominal Resistance needed to support the factored load plus driving resistance from the unsuitable penetrated soil layers (liquefiable layers and potential down drag-generating layers) which do not contribute to the design resistance. Unsuitable soil layers extend to Elev. 77 ft due to concern of liquefaction and associated down drag load. The Nominal Driving Resistance Required = Nominal Resistance + 2 x F to account for the unsuitable soil layers, where F is the estimated down drag load. The estimated down drag loads (F) are 64 kips per pile at the Abuts and 50 kips at Bent 2. .

In preparation of the Pile Data Table, the following points are noted:

- The pile capacity contribution starts at Elev. 77 ft (approx. 50-ft depth below existing Route 101 grade). OG of Route 101 is at approx. 127 ft (Abuts) & 129 ft (Bent).
- The specified pile tip elev. were selected so that the Design Ultimate Pile Capacity $\geq$ Nominal Resistance + F (Down Drag Load)
- Nominal Driving Resistance Required = Nominal Resistance + 2xF (Down Drag Load) to account for driving resistance from the unsuitable soil layers during construction

The recommended minimum pile spacing is three times the pile diameter (3D). Based on the load demand and subsoil information, the recommended specified pile tip elevations are shown in the Pile Data Table below.

PILE DATA TABLE

Location	Pile Type	Nominal Resistance (kips)		Design Tip Elev. (ft)	Specified Tip Elev. (ft)	Nominal Driving Resistance (kips)
		Compression	Tension			
Abut 1	Class 200 Alt. "W"	280	0	32.0 (a); 50.0 (b)	32.0	408
Bent 2	Class 200 Alt. "W"	280	50	34.0 (a); 60.0 (b); 50.0 (c)	34.0	380
Abut 3	Class 200 Alt. "W"	280	0	32.0 (a); 50.0 (b)	32.0	408

Notes:
(1) Design tip elevations for Abutments are controlled by (a) Compression, (b) lateral load.
(2) Design tip elevations for Bent are controlled by (a) Compression, (b) Tension, (c) Lateral Load.
(3) The specified tip elev. shall not be raised above the design tip elev. for tension load, and lateral load.
(4) Unsuitable soil layers (liquefaction potential) that do not contribute to the design nominal resistance exist at the site extending to Elev. 77 ft. The estimated down drag loads are 64 kips per pile at the Abuts and 50 kips at Bent.
(5) The Nominal Driving Resistance Required is equal to the Nominal Resistance needed to support the factored load plus driving resistance from the unsuitable penetrated soil layers. The Nominal Driving Resistance Required = Nominal Resistance + 2 x F to account for driving resistance through the unsuitable soil layers, where F is the estimated down drag load.

Due to the hard clay and dense sand layers (at approx. Elev. 50 ft) present at the site, relatively hard driving conditions should be anticipated. We recommend that the piles be driven to the specified tip elevations. The estimation of the driven pile capacity in clay is based on the adhesion factor per FHWA manual (Tomlinson, 1980). The pile capacity will derive primarily from frictional resistance along the pile shaft. It is anticipated the pile capacity will develop after driving as a result of soil "freeze" and dissipation of excess pore water pressures. The gain of pile capacity after initial driving may be evaluated based on "redriving" after 24-hour (minimum) set-up. The Gates formula per Caltrans standard specifications may be used in the field for driving and capacity verification.

Per Caltrans Standard Specifications (Section 49-1.06), oversize predrill through the approach embankment is anticipated for abutment piles. It is recommended that the predrill for abutment piles extend to Elev. 112 feet to reduce the potential down drag load at liquefaction case. Pea gravel should be used to backfill the annular space after driving.

In the event that unanticipated pile driving conditions are encountered, it is recommended that a Pile Driving Analyzer (PDA) be used to evaluate the pile capacity. Typical application includes

capacity evaluation (for both during driving and re-striking) for piles that have experienced hard driving. The geotechnical engineer should be consulted for any unanticipated pile driving conditions.

Lateral Pile Capacity

It is our understanding that the structural designer will perform lateral load analyses for the piles using LPILE Program (v. 5). The recommended geotechnical parameters for LPILE analysis are provided in Appendix C-3. To account for group effect, p-multipliers of 0.6 and 0.8 are recommended for pile spacing of 3D & 4D, respectively.

Generally, abutment piles are designed for service loads only, and batter piles are used for resisting static lateral earth pressures. The bent piles are governed by seismic loading conditions. At service condition, there is minimal shear demand on the bent piles. In common engineering practice, a maximum pile head deflection of 1/4 inch is recommended for service condition for vertical piles. Under seismic loading condition, pending the overall structural design and considerations, a maximum pile head deflection up to about one to two inches is generally tolerable and accepted for design of bent piles.

Lateral Earth Pressures

Abutment retaining walls and wing walls should be designed to resist the following Applied Lateral Earth Pressures and live load. These values assume no hydrostatic pore pressure buildup behind the wall and are based on well-drained backfill behind the walls supported in native soil.

Applied Lateral Earth Pressure

Active Condition	36 pcf Equivalent Fluid Pressure (EFP) for engineered fill
At-Rest Condition	55 pcf Equivalent Fluid Pressure (EFP) for engineered fill
Passive Resistance	5 ksf (ultimate) for seismic design of the abutment backwall (5.5 feet high or greater); for activated height less than 5.5 feet modify proportionally, i.e. 5 x (H/5.5) ksf per SDC v. 1.4. A minimum lateral wall movement of 2% of wall height to mobilize the full ultimate passive pressure is required.

Cantilever walls which are free to rotate at least 0.004 radians may be assumed flexible for the active condition. Walls that are not capable of this movement should be assumed rigid and designed for the at-rest condition. The effect of any surcharge (dead, live, or traffic load) should be added to the preceding lateral earth pressures. A coefficient of 0.3 and 0.5 may be used to determine the additional earth pressure resulting from the surcharge for cantilever walls and rigid walls, respectively.

Seismic Design Criteria

Based on recent discussion with Caltrans, Caltrans is currently updating the seismic design criteria. The 1996 Seismic Hazard Map and fault database are being revised. The in-progress fault database incorporates primarily current CGS and USGS works of state-of-practice. The new database includes the Silver Creek Fault in the project vicinity (approx. 800 ft/0.24 km) which was not considered in the 1996 Map. Caltrans has indicated that the Silver Creek fault should be used in design of the Tully Road/Route 101 project.

In addition to updating the SHM and fault database, Caltrans also adopted new procedures for the development of response spectra for structure design. These procedures incorporate both deterministic and probabilistic criteria. The Next Generation Attenuation (NGA) models (2008) are used for deterministic assessment (with a revised late-Quaternary age fault database), and the USGS (2008) 5% in 50-year hazard maps are used for probabilistic assessment. Per our understanding, the minimum design requirement of the new tool is based on deterministic spectrum of a “M6.5 earthquake at 12 km” event. These spectra are enveloped and the largest values are used.

Based on communication, collaboration, and information provided by Caltrans, we have developed the ARS Design curve per Caltrans 2008 criteria. For the on-site alluvial soils, a shear wave velocity (Vs30m) of 270 m/sec (approx. 900 ft/sec) was adopted. Both directivity and basin effect were considered. The ARS curve, as shown on Plate 4, has been submitted and approved by Caltrans. The development of the curve including modification for directivity and basin effect together with emails/communications with Caltrans are attached in Appendix C-4 for information.

Embankment Settlement & Waiting Period

Embankments are required at the abutments for the proposed modification of Tully Road interchange. Based on discussion with the design team, a maximum embankment height of 25 feet is expected. The new approach embankments will abut existing embankments. The existing profile along Tully Road will be raised, and up to 14 feet of new fill anticipated on top of existing approach embankments.

The boring data indicates that the subsurface soil conditions generally consist of clay near the surface with interbedded layers of medium dense sand. Based on results from CPT 07-BR-1, the clay layers were considered in the settlement analysis. The evaluation of the consolidation settlements and data were presented in the Geotechnical Design & Materials Report of the roadway design submittal. Based on the results of the settlement analyses, the consolidation settlements are estimated to be on the order of 2 to 3 inches and are in the overconsolidated/elastic range (Appendix C-5). A 30-day settlement period is recommended for earthwork construction.

Embankment Stability

Stability analyses were performed for the proposed embankment slope (with maximum height of about 25 ft) at the Tully Road Interchange. Based on the results of the stability analyses, the stability of the proposed fill slopes appears reasonable with minimum factor of safety >1.3 under liquefaction condition. The results of the stability analyses and the strength parameters adopted in the stability are included in Appendix C-5.

Corrosion

Corrosion tests were performed on samples retrieved for the roadway design package. Chemical tests were performed on a soil sample retrieved within the interchange. A summary of the corrosion test results is presented below.

TABLE 5 - SUMMARY OF CORROSION TEST RESULTS

Boring No.	Station & Offset	Depth (ft)	Min. Resistivity (ohm-cm)	pH	Sulfate (ppm)	Chloride (ppm)
07-R-11	"E4" Sta. 1761+00, 410 Lt (Tully Rd I/C)	5	1130	8.18	141.4	86.6

Based on the data, the site subsoil is considered non-corrosive per Caltrans corrosion design guidelines, and standard Type II modified or Type I-P (MS) modified cement may be used for the concrete substructures. The minimum cement factor and cover thickness should be per Caltrans Bridge Design Specifications (Section 8.22).

Plan Review

We recommend that final plans for foundations be reviewed by this office prior to construction so that the intent of our recommendations is included in the project plans and specifications and to further see that no misunderstandings or misinterpretations have occurred.

Construction Observation

To a degree, the performance of any structure is dependent upon construction procedures and quality. Hence, observation of foundation excavations, and pile installations should be carried out by the regulating agencies. If the subsurface conditions different from those forming the basis of our recommendations is encountered this office should be informed in order to assess the need for design changes. Therefore, the recommendations presented in this report are contingent upon good quality control and these geotechnical observations during construction.

INVESTIGATION LIMITATIONS

Our services consist of professional opinions and recommendations made in accordance with generally accepted geotechnical engineering principles and practices and are based on our site reconnaissance and the assumption that the subsurface conditions do not deviate from observed conditions. All work done is in accordance with generally accepted geotechnical engineering principles and practices. No warranty, expressed or implied, of merchantability or fitness, is made or intended in connection with our work or by the furnishing of oral or written reports or findings. The scope of our services did not include any environmental assessment or investigation for the presence or absence of hazardous or toxic materials in structures, soil, surface water, groundwater or air, below or around this site. Unanticipated soil conditions are commonly encountered and cannot be fully determined by taking soil samples and excavating test borings; different soil conditions may require that additional expenditures be made during construction to attain a

properly constructed project. Some contingency fund is thus recommended to accommodate these possible extra costs.

This report has been prepared for the proposed project as described earlier, to assist the engineer in the design of this project. In the event any changes in the design or location of the facilities are planned, or if any variations or undesirable conditions are encountered during construction, our conclusions and recommendations shall not be considered valid unless the changes or variations are reviewed and our recommendations modified or approved by us in writing.

This report is issued with the understanding that it is the designer's responsibility to ensure that the information and recommendations contained herein are incorporated into the project and that necessary steps are also taken to see that the recommendations are carried out in the field.

The findings in this report are valid as of the present date. However, changes in the subsurface conditions can occur with the passage of time, whether they are due to natural processes or to the works of man, on this or adjacent properties. In addition, changes in applicable or appropriate standards occur, whether they result from legislation or from the broadening of knowledge. Accordingly, the findings in this report might be invalidated, wholly or partially, by changes outside of our control.

Respectfully submitted,
PARIKH CONSULTANTS, INC.

Y. David Wang, Ph.D., P.E. C52911
Senior Engineer

Gary Parikh, G.E. 666
Project Manager

REGISTERED PROFESSIONAL ENGINEER
GAURANG R. PARIKH
No. 666
EXP. 12-31-09
GEOTECHNICAL
STATE OF CALIFORNIA

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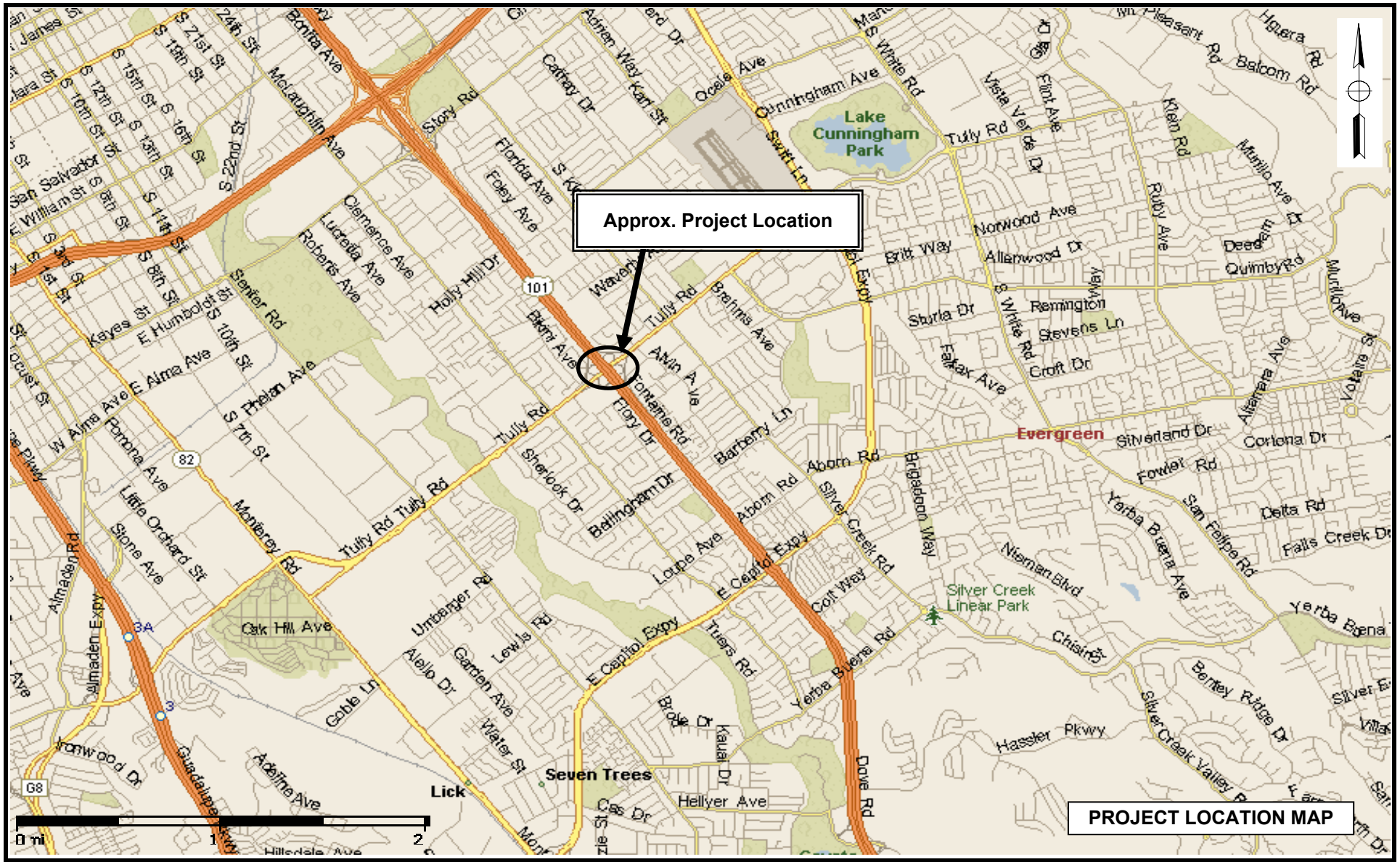

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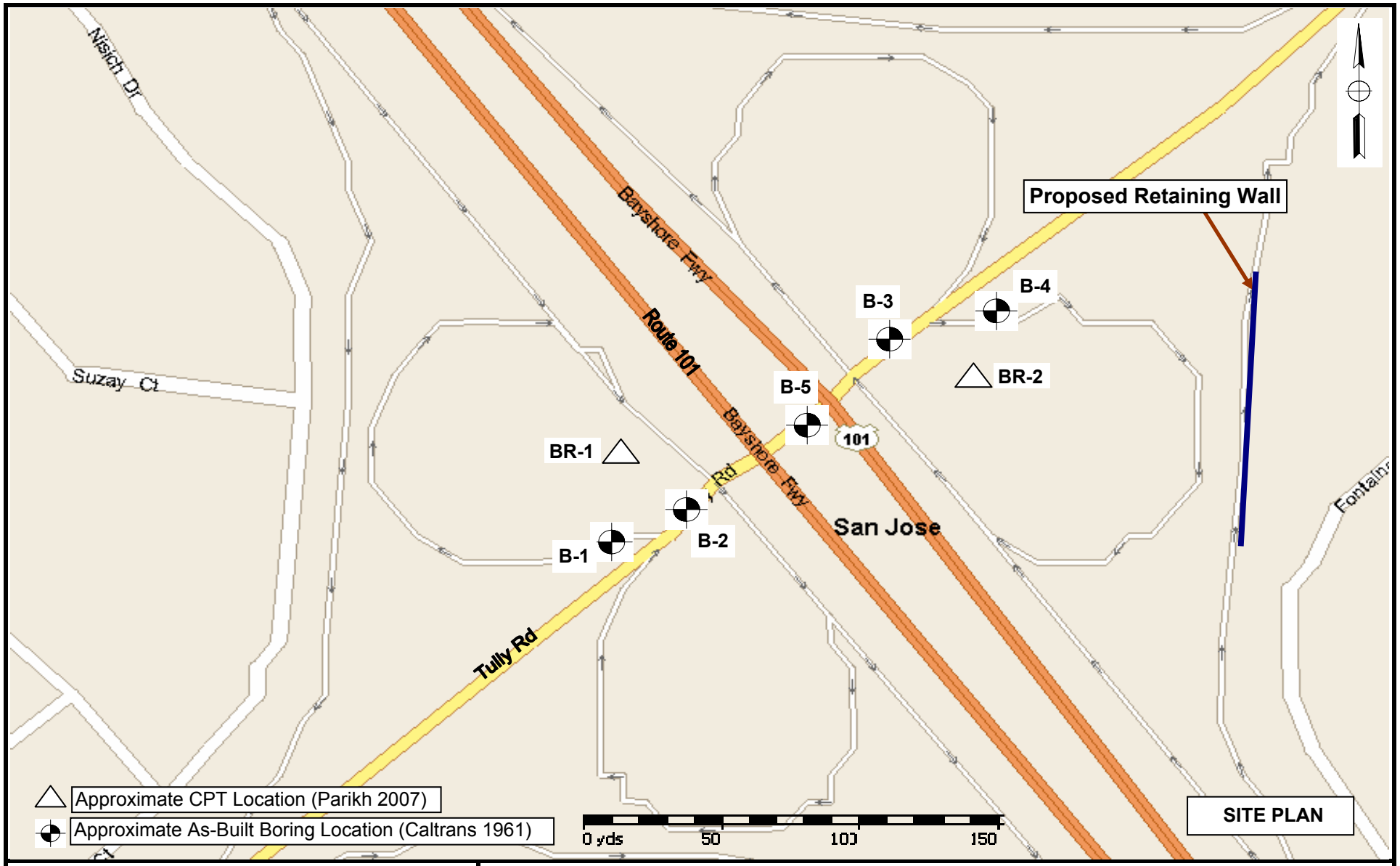
Practicing in the Geosciences

TULLY ROAD OVERCROSSING - ROUTE 101
SANTA CLARA COUNTY, CALIFORNIA

JOB NO.: 207150.TUL	PLATE NO.: 1A



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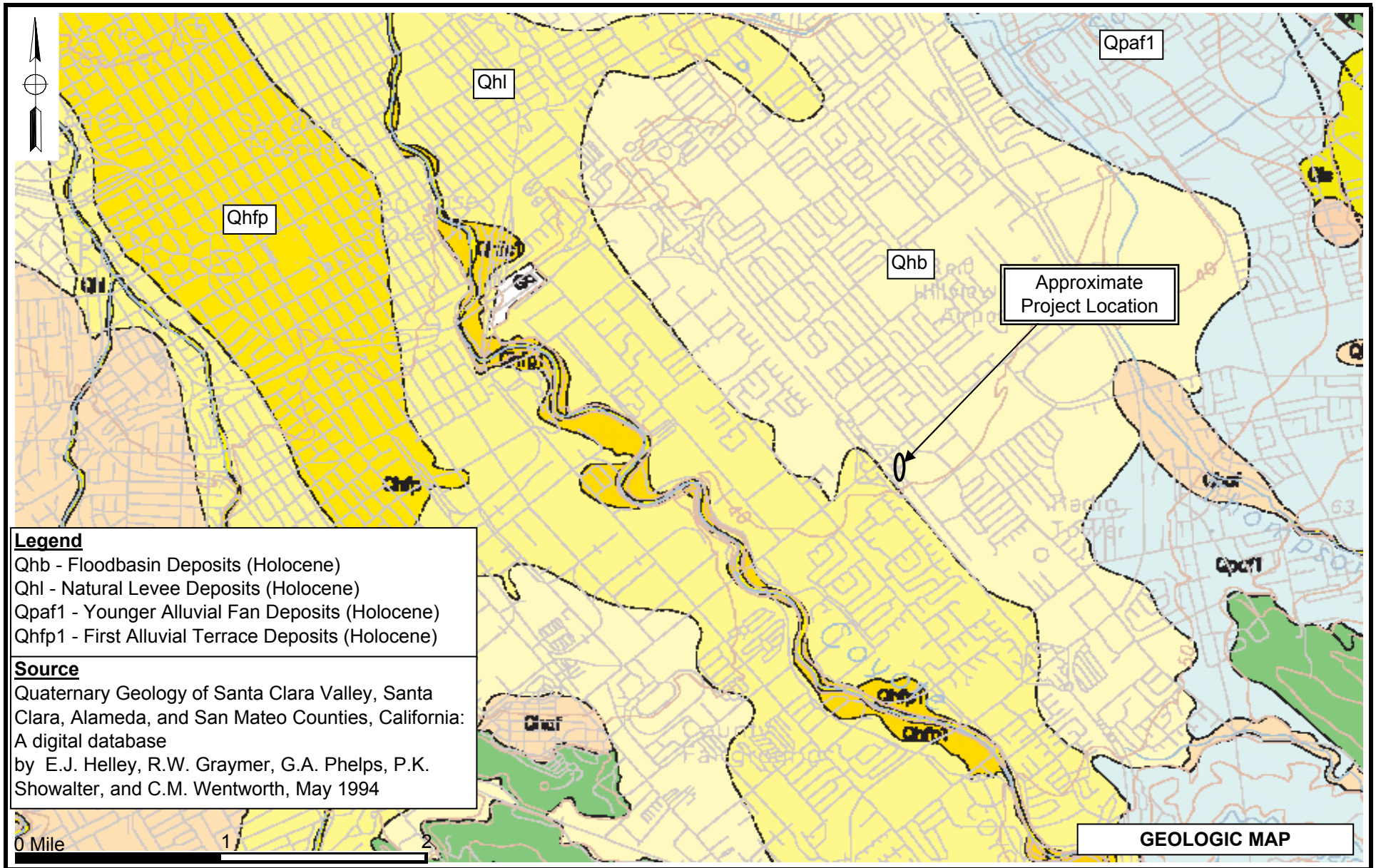
Practicing in the Geosciences

TULLY ROAD OVERCROSSING - ROUTE 101
SANTA CLARA COUNTY, CALIFORNIA

JOB NO.: 207150.TUL	PLATE NO.: 1B



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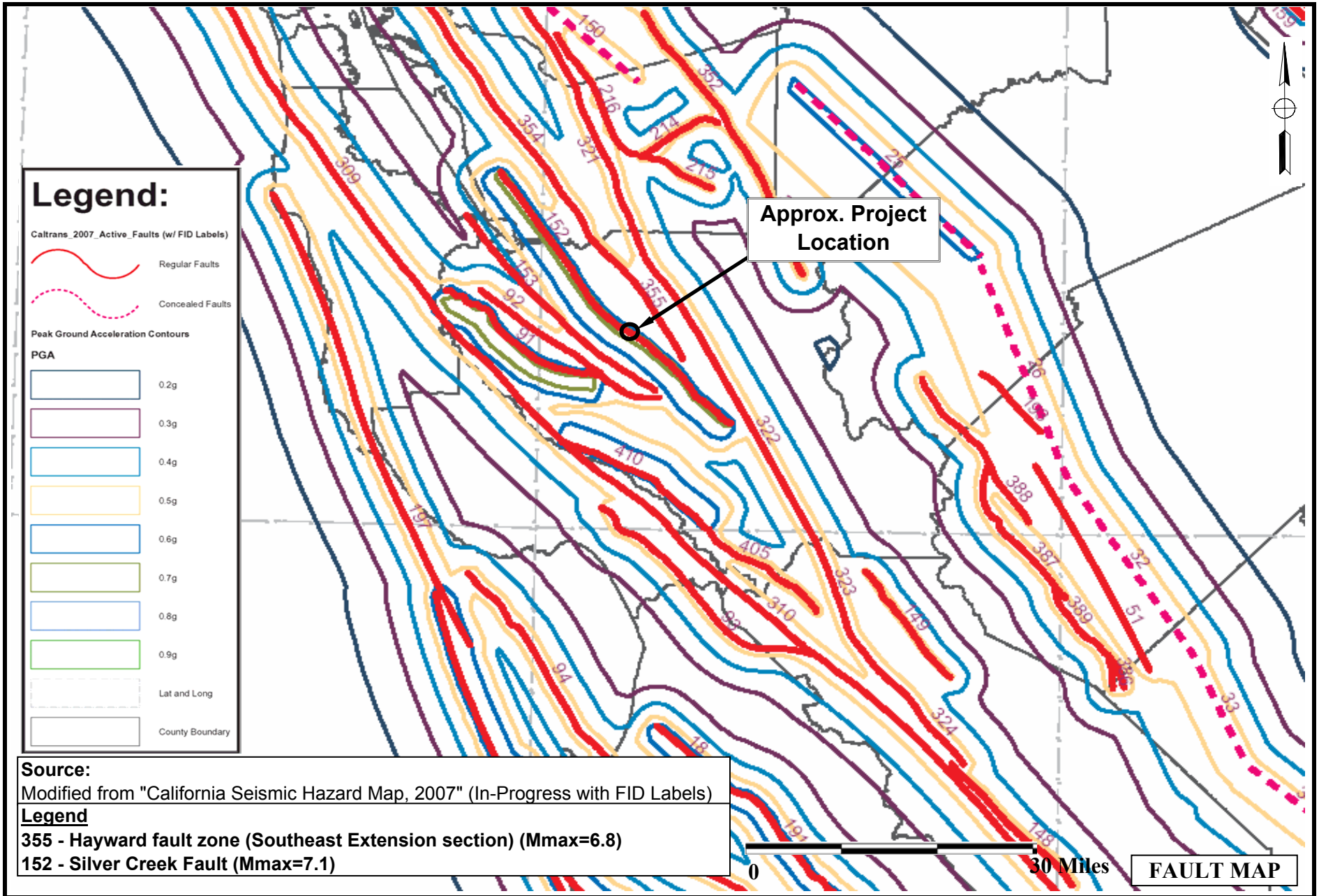
GEOTECHNICAL CONSULTANTS
MATERIALS TESTING

TULLY ROAD OVERCROSSING - ROUTE 101
SANTA CLARA COUNTY, CALIFORNIA

JOB NO.: 207150.TUL

PLATE NO.: 2



Source:
Modified from "California Seismic Hazard Map, 2007" (In-Progress with FID Labels)

Legend
355 - Hayward fault zone (Southeast Extension section) (Mmax=6.8)
152 - Silver Creek Fault (Mmax=7.1)

FAULT MAP

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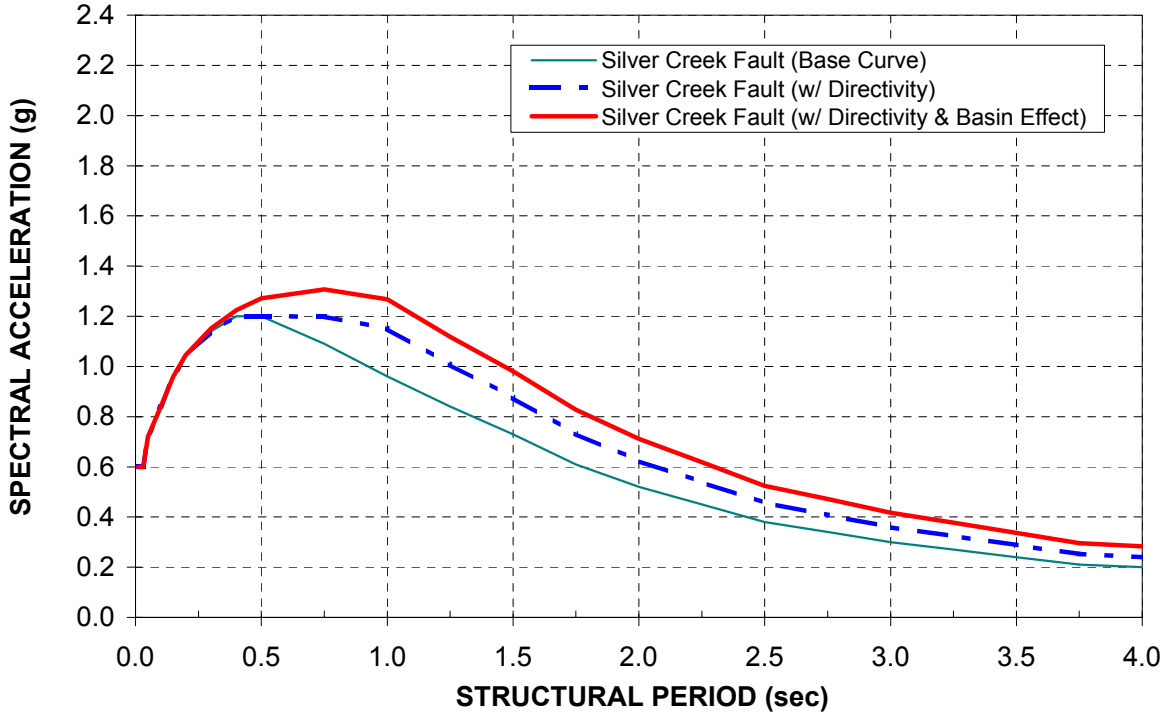
GEOTECHNICAL CONSULTANTS
MATERIALS TESTING

TULLY ROAD OVERCROSSING - ROUTE 101
SANTA CLARA COUNTY, CALIFORNIA

JOB NO.: 207150.TUL | PLATE NO.: 3

ARS DESIGN CURVE
TULLY RD OC - ROUTE 101 IMPROVEMENT
SANTA CLARA COUNTY, CALIFORNIA



Period	Silver Crk Fault - 152 (7.1) w/ mod.
(sec)	Spectral Accel. (g)
0.01	0.600
0.03	0.600
0.05	0.720
0.10	0.840
0.15	0.960
0.20	1.045
0.30	1.151
0.40	1.224
0.50	1.272
0.75	1.307
1.00	1.267
1.25	1.119
1.50	0.981
1.75	0.827
2.00	0.711
2.25	0.618
2.50	0.524
2.75	0.471
3.00	0.418
3.25	0.377
3.50	0.337
3.75	0.296
4.00	0.283

1. The base curve is per Caltrans 2008 Seismic Hazard Map (in-progress) considering both deterministic & probablistic models.
   Governing Fault: Fault ID #152 - Silver Creek Fault (reverse), Mmax = 7.1
   Location: Lat=37.318434 Long=-121.831377, Vs30 = 270 m/s
2. Modification for Directivity : 20% increase of Sa for T >1 sec., no change of Sa for T < 0.5 sec., and linear interpolation between 0.5 & 1 sec.
3. Modification for Basin Effect: Site Amplification is per Campbell and Bozorgnia (2007) considering Z2.5m/s depth.

APPENDIX A

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
04	SCI	101	31.8/34.2		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER GARY PARIKH No. G.E. 666 Exp. 12/31/09 GEOTECHNICAL STATE OF CALIFORNIA

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REFERENCE: CALTRANS SOIL & ROCK LOGGING, CLASSIFICATION, AND PRESENTATION MANUAL (JUNE 2007)

CEMENTATION

Description	Criteria
Weak	Crumbles or breaks with handling or little finger pressure.
Moderate	Crumbles or breaks with considerable finger pressure.
Strong	Will not crumble or break with finger pressure.

CONSISTENCY OF COHESIVE SOILS

Description	Unconfined Compressive Strength (tsf)	Pocket Penetrometer Measurement (tsf)	Torvane Measurement (tsf)	Field Approximation
Very Soft	< 0.25	< 0.25	< 0.12	Easily penetrated several inches by fist
Soft	0.25 to 0.50	0.25 to 0.50	0.12 to 0.25	Easily penetrated several inches by thumb
Medium Stiff	0.50 to 1.0	0.50 to 1.0	0.25 to 0.50	Penetrated several inches by thumb with moderate effort
Stiff	1 to 2	1 to 2	0.50 to 1.0	Readily indented by thumb but penetrated only with great effort
Very Stiff	2 to 4	2 to 4	1.0 to 2.0	Readily indented by thumbnail
Hard	> 4.0	> 4.0	> 2.0	Indented by thumbnail with difficulty

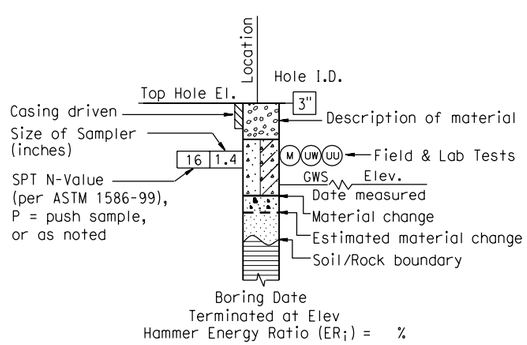
BOREHOLE IDENTIFICATION

Symbol	Hole Type	Description
Size	A	Auger Boring
Size	R P	Rotary drilled boring Rotary percussion boring (air)
Size	R	Rotary drilled diamond core
Size	HD HA	Hand driven (1-inch soil tube) Hand Auger
●	D	Dynamic Cone Penetration Boring
▲	CPT	Cone Penetration Test (ASTM D 5778-95)
[ ]	O	Other

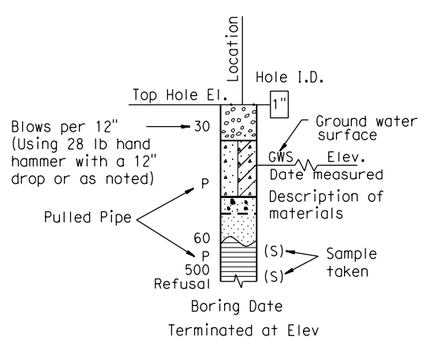
Note: Size in inches.

PLASTICITY OF FINE-GRAINED SOILS

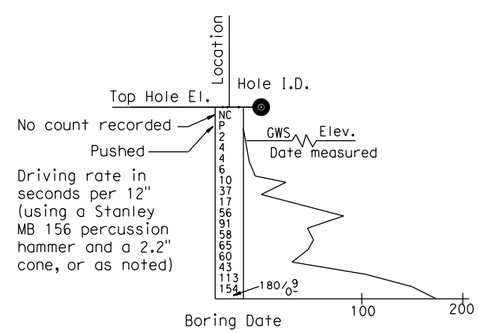
Description	Criteria
Nonplastic	A 1/8-inch thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.



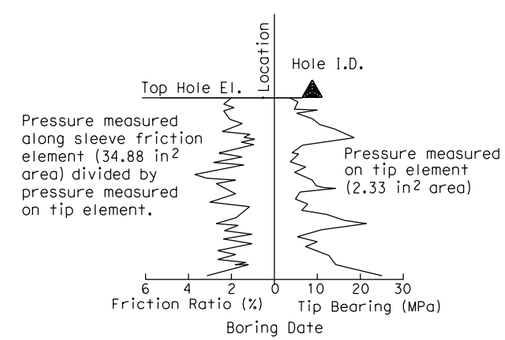
ROTARY BORING



HAND BORING



DYNAMIC CONE PENETRATION BORING



CONE PENETRATION TEST (CPT) SOUNDING

TULLY ROAD OVERCROSSING

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN DESIGN BRANCH	BRIDGE NO. 37-0668 POST MILE 33.0	SOIL LEGEND 1 OF 2 LOG OF TEST BORINGS
X DESIGN OVERSIGHT	X SIGN OFF DATE	PREPARED BY L. TRAN				
		CHECKED BY D. WANG				

GS LOTB SOIL LEGEND

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 04239
EA 1A9801

DISREGARD PRINTS BEARING EARLIER REVISION DATES 11/26/08 2/27/09 3/20/09

REVISION DATES

SHEET 23 OF 26

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REFERENCE: CALTRANS SOIL & ROCK LOGGING, CLASSIFICATION, AND PRESENTATION MANUAL (JUNE 2007)

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
04	SCI	101	31.8/34.2		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER GARY PARIKH No. G.E. 666 Exp. 12/31/09 GEOTECHNICAL STATE OF CALIFORNIA

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GROUP SYMBOLS AND NAMES

Graphic/Symbol	Group Names	Graphic/Symbol	Group Names
GW	Well-graded GRAVEL Well-graded GRAVEL with SAND	CL	Lean CLAY Lean CLAY with SAND Lean CLAY with GRAVEL SANDY lean CLAY SANDY lean CLAY with GRAVEL GRAVELLY lean CLAY GRAVELLY lean CLAY with SAND
GP	Poorly graded GRAVEL Poorly graded GRAVEL with SAND		
GW-GM	Well-graded GRAVEL with SILT Well-graded GRAVEL with SILT and SAND	CL-ML	SILTY CLAY SILTY CLAY with SAND SILTY CLAY with GRAVEL SANDY SILTY CLAY SANDY SILTY CLAY with GRAVEL GRAVELLY SILTY CLAY GRAVELLY SILTY CLAY with SAND
GW-GC	Well-graded GRAVEL with CLAY (or SILTY CLAY) Well-graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)		
GP-GM	Poorly graded GRAVEL with SILT Poorly graded GRAVEL with SILT and SAND	ML	SILT SILT with SAND SILT with GRAVEL SANDY SILT SANDY SILT with GRAVEL GRAVELLY SILT GRAVELLY SILT with SAND
GP-GC	Poorly graded GRAVEL with CLAY (or SILTY CLAY) Poorly graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)		
GM	SILTY GRAVEL SILTY GRAVEL with SAND	OL	ORGANIC lean CLAY ORGANIC lean CLAY with SAND ORGANIC lean CLAY with GRAVEL SANDY ORGANIC lean CLAY SANDY ORGANIC lean CLAY with GRAVEL GRAVELLY ORGANIC lean CLAY GRAVELLY ORGANIC lean CLAY with SAND
GC	CLAYEY GRAVEL CLAYEY GRAVEL with SAND		
GC-GM	SILTY, CLAYEY GRAVEL SILTY, CLAYEY GRAVEL with SAND	OL	ORGANIC SILT ORGANIC SILT with SAND ORGANIC SILT with GRAVEL SANDY ORGANIC SILT SANDY ORGANIC SILT with GRAVEL GRAVELLY ORGANIC SILT GRAVELLY ORGANIC SILT with SAND
SW	Well-graded SAND Well-graded SAND with GRAVEL		
SP	Poorly graded SAND Poorly graded SAND with GRAVEL	CH	Fat CLAY Fat CLAY with SAND Fat CLAY with GRAVEL SANDY fat CLAY SANDY fat CLAY with GRAVEL GRAVELLY fat CLAY GRAVELLY fat CLAY with SAND
SW-SM	Well-graded SAND with SILT Well-graded SAND with SILT and GRAVEL		
SW-SC	Well-graded SAND with CLAY (or SILTY CLAY) Well-graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)	MH	Elastic SILT Elastic SILT with SAND Elastic SILT with GRAVEL SANDY elastic SILT SANDY elastic SILT with GRAVEL GRAVELLY elastic SILT GRAVELLY elastic SILT with SAND
SP-SM	Poorly graded SAND with SILT Poorly graded SAND with SILT and GRAVEL		
SP-SC	Poorly graded SAND with CLAY (or SILTY CLAY) Poorly graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)	OH	ORGANIC fat CLAY ORGANIC fat CLAY with SAND ORGANIC fat CLAY with GRAVEL SANDY ORGANIC fat CLAY SANDY ORGANIC fat CLAY with GRAVEL GRAVELLY ORGANIC fat CLAY GRAVELLY ORGANIC fat CLAY with SAND
SM	SILTY SAND SILTY SAND with GRAVEL		
SC	CLAYEY SAND CLAYEY SAND with GRAVEL	OH	ORGANIC elastic SILT ORGANIC elastic SILT with SAND ORGANIC elastic SILT with GRAVEL SANDY ORGANIC elastic SILT SANDY ORGANIC elastic SILT with GRAVEL GRAVELLY ORGANIC elastic SILT GRAVELLY ORGANIC elastic SILT with SAND
SC-SM	SILTY, CLAYEY SAND SILTY, CLAYEY SAND with GRAVEL		
PT	PEAT	OL/OH	ORGANIC SOIL ORGANIC SOIL with SAND ORGANIC SOIL with GRAVEL SANDY ORGANIC SOIL SANDY ORGANIC SOIL with GRAVEL GRAVELLY ORGANIC SOIL GRAVELLY ORGANIC SOIL with SAND
	COBBLES COBBLES and BOULDERS BOULDERS		

FIELD AND LABORATORY TESTING

- (C) Consolidation (ASTM D 2435)
- (CL) Collapse Potential (ASTM D 5333)
- (CP) Compaction Curve (CTM 216)
- (CR) Corrosivity Testing (CTM 643, CTM 422, CTM 417)
- (CU) Consolidated Undrained Triaxial (ASTM D 4767)
- (DS) Direct Shear (ASTM D 3080)
- (EI) Expansion Index (ASTM D 4829)
- (M) Moisture Content (ASTM D 2216)
- (OC) Organic Content-% (ASTM D 2974)
- (P) Permeability (CTM 220)
- (PA) Particle Size Analysis (ASTM D 422)
- (PI) Plasticity Index (AASHTO T 90) Liquid Limit (AASHTO T 89)
- (PL) Point Load Index (ASTM D 5731)
- (PM) Pressure Meter
- (PP) Pocket Penetrometer
- (R) R-Value (CTM 301)
- (SE) Sand Equivalent (CTM 217)
- (SG) Specific Gravity (AASHTO T 100)
- (SL) Shrinkage Limit (ASTM D 427)
- (SW) Swell Potential (ASTM D 4546)
- (TV) Pocket Torvane
- (UC) Unconfined Compression-Soil (ASTM D 2166) Unconfined Compression-Rock (ASTM D 2938)
- (UU) Unconsolidated Undrained Triaxial (ASTM D 2850)
- (UW) Unit Weight (ASTM D 4767)
- (VS) Vane Shear (AASHTO T 223)

APPARENT DENSITY OF COHESIONLESS SOILS

Description	SPT N_{60} (Blows / 12 inches)
Very loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE

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

PERCENT OR PROPORTION OF SOILS

Description	Criteria
Trace	Particles are present but estimated to be less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

PARTICLE SIZE

Description		Size
Boulder		> 12"
Cobble		3" to 12"
Gravel	Coarse	3/4" to 3"
	Fine	No. 4 to 3/4"
Sand	Coarse	No. 10 to No. 4
	Medium	No. 40 to No. 10
	Fine	No. 200 to No. 40

TULLY ROAD OVERCROSSING

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN DESIGN BRANCH	BRIDGE NO. 37-0668 POST MILE 33.0	SOIL LEGEND 2 of 2 LOG OF TEST BORINGS
X DESIGN OVERSIGHT X SIGN OFF DATE	PREPARED BY L. TRAN CHECKED BY D. WANG				

GS LOTB SOIL LEGEND

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 04239 EA 1A9801

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REVISION DATES 11/06/08 2/4/09 3/20/09

SHEET 24 OF 26

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04	SCI	101	31.8/34.2		

CERTIFIED ENGINEERING GEOTECHNICAL

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER GARY PARIKH No. G.E. 666 Exp. 12/31/09 GEOTECHNICAL STATE OF CALIFORNIA

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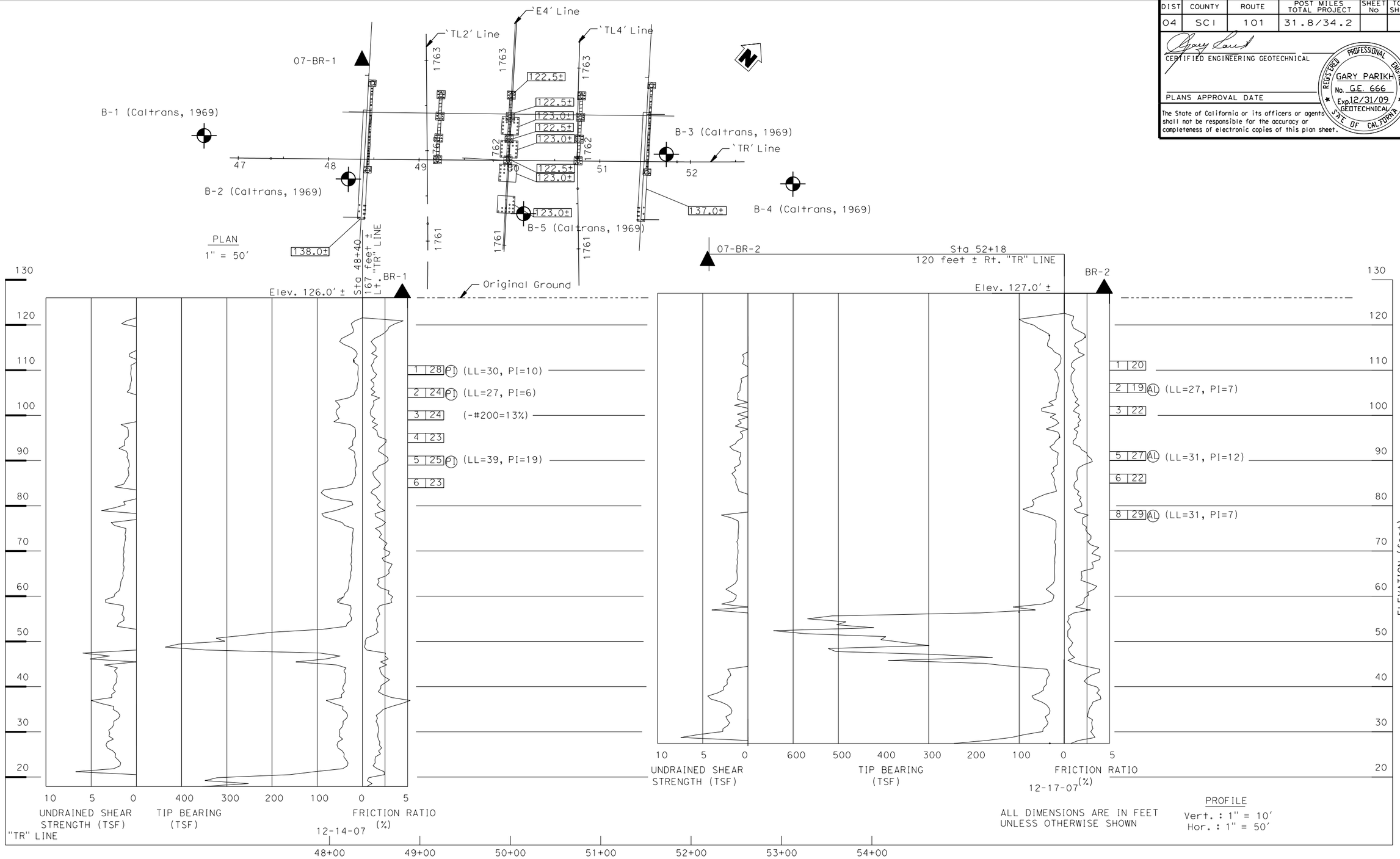

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X DESIGN OVERSIGHT	X SIGN OFF DATE	DRAWN BY: L. TRAN	FIELD INVESTIGATION BY:	DESIGN BRANCH	POST MILES 33.0	LOG OF TEST BORINGS 1 OF 2
		CHECKED BY: D. WANG	G. TRIPATHI			

OGS CIVIL LOG OF TEST BORINGS SHEET

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 04239
EA 1A9801

DISREGARD PRINTS BEARING EARLIER REVISION DATES 11/26/08 2/27/09 3/20/09

REVISION DATES

SHEET 25 OF 26

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7	CAL				

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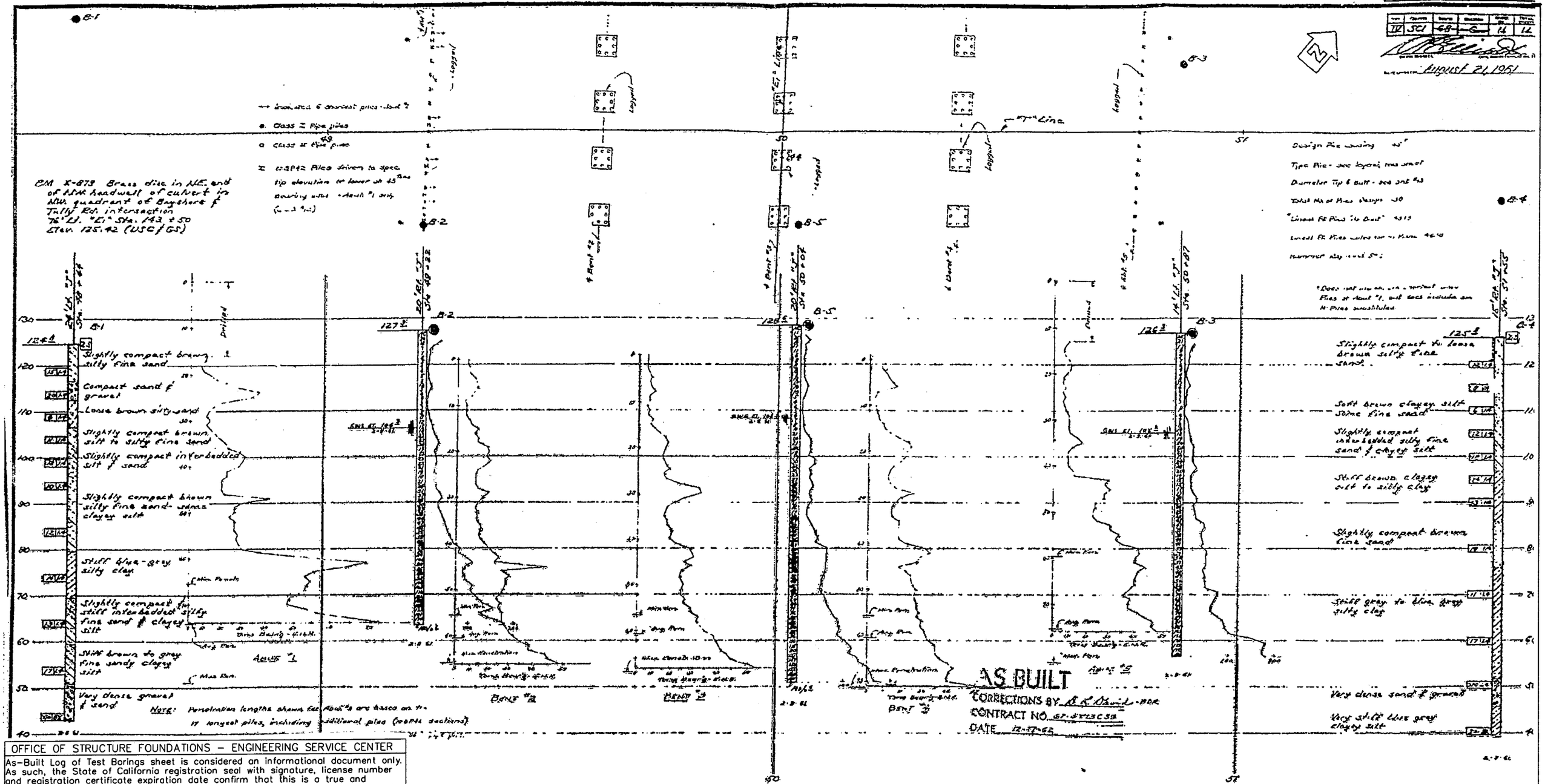
August 21, 1961



OFFICE OF STRUCTURE FOUNDATIONS – ENGINEERING SERVICE CENTER

As-Built Log of Test Borings sheet is considered an informational document only. As such, the State of California registration seal with signature, license number and registration certificate expiration date confirm that this is a true and accurate copy of the original document. This drawing is available and presented only for the convenience of any bidder, contractor or other interested party.

CERTIFIED ENGINEER DATE

REGISTERED PROFESSIONAL ENGINEER GARY PARIKH No. G.E. 666 Exp. 12/31/09 GEOTECHNICAL STATE OF CALIFORNIA

TULLY ROAD OVERCROSSING

LOG OF TEST BORINGS 2 OF 2

NOTE: A COPY OF THIS LOG OF TEST BORINGS IS AVAILABLE AT OFFICE OF STRUCTURE MAINTENANCE AND INVESTIGATIONS, SACRAMENTO, CALIFORNIA

CU: 04239
EA: 1A9801

BRIDGE No.	
37-0668	
Sheet	of
26	26

MATERIALS

- Plan of Air Boring
- Inclinometer
- ¼" Cone Penetrometer
- Auger Boring (Dry)
- Rotary Boring (Wet)
- Auger Boring (Dry)
- Jet Boring
- Core Boring
- Test Pit

Metamorphic Rock

LEGEND OF BORING OPERATIONS

1" Soil Tube — Rotary Boring — Penetration Boring

NOTE

Classification of earth materials as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

TULLY ROAD OVERCROSSING

LOG OF TEST BORINGS

SCALE 1" = 10' | BRIDGE 37-95 | FILE | DRAWING C-3795-14

December 18, 2007

Parkih Consultants
Attn: David Wang
365 S. Milpitas Blvd.
Milpitas, California 95035

Subject: CPT Site Investigation
Hwy 101 @Tully Rd. Bridge
San Jose, California
GREGG Project Number: 07-376MA

Dear Mr. Wang:

The following report presents the results of GREGG Drilling & Testing's Cone Penetration Test investigation for the above referenced site. The following testing services were performed:

1	Cone Penetration Tests	(CPTU)	☒
2	Pore Pressure Dissipation Tests	(PPD)	☒
3	Seismic Cone Penetration Tests	(SCPTU)	☐
4	Resistivity Cone Penetration Tests	(RCPTU)	☐
5	UVIF Cone Penetration Tests	(UVIFCPTU)	☐
6	Groundwater Sampling	(GWS)	☐
7	Soil Sampling	(SS)	☐
8	Vapor Sampling	(VS)	☐
9	Vane Shear Testing	(VST)	☐
10	SPT Energy Calibration	(SPTE)	☐

A list of reference papers providing additional background on the specific tests conducted is provided in the bibliography following the text of the report. If you would like a copy of any of these publications or should you have any questions or comments regarding the contents of this report, please do not hesitate to contact our office at (925) 313-5800.

Sincerely,
GREGG Drilling & Testing, Inc.

Mary Walden
Operations Manager

Cone Penetration Testing Procedure (CPT)

Gregg In Situ, Inc. carries out all Cone Penetration Tests (CPT) using an integrated electronic cone system, *Figure CPT*. The soundings were conducted using a 20 ton capacity cone with a tip area of 15 cm^2 and a friction sleeve area of 225 cm^2. The cone is designed with an equal end area friction sleeve and a tip end area ratio of 0.85.

The cone takes measurements of cone bearing (q_c), sleeve friction (f_s) and penetration pore water pressure (u_2) at 5-cm intervals during penetration to provide a nearly continuous hydrogeologic log. CPT data reduction and interpretation is performed in real time facilitating on-site decision making. The above mentioned parameters are stored on disk for further analysis and reference. All CPT soundings are performed in accordance with revised (2000) ASTM standards (D 5778-95).

The cone also contains a porous filter element located directly behind the cone tip (u_2), *Figure CPT.* It consists of porous plastic and is 5.0mm thick. The filter element is used to obtain penetration pore pressure as the cone is advanced as well as Pore Pressure Dissipation Tests (PPDT's) during appropriate pauses in penetration. It should be noted that prior to penetration, the element is fully saturated with silicon oil under vacuum pressure to ensure accurate and fast dissipation.

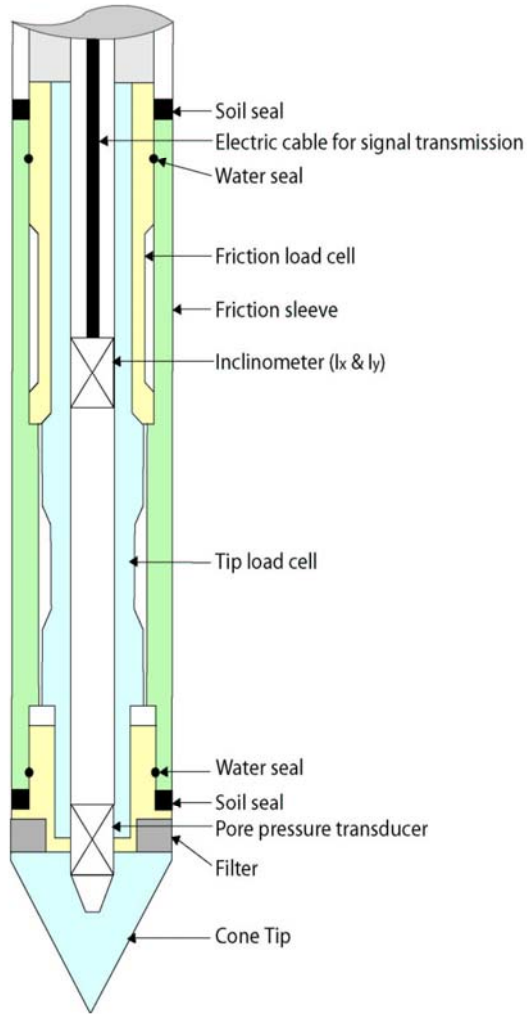


Figure CPT

When the soundings are complete, the test holes are grouted using a Gregg In Situ support rig. The grouting procedures generally consist of pushing a hollow CPT rod with a "knock out" plug to the termination depth of the test hole. Grout is then pumped under pressure as the tremie pipe is pulled from the hole. Disruption or further contamination to the site is therefore minimized.

Cone Penetration Test Sounding Summary

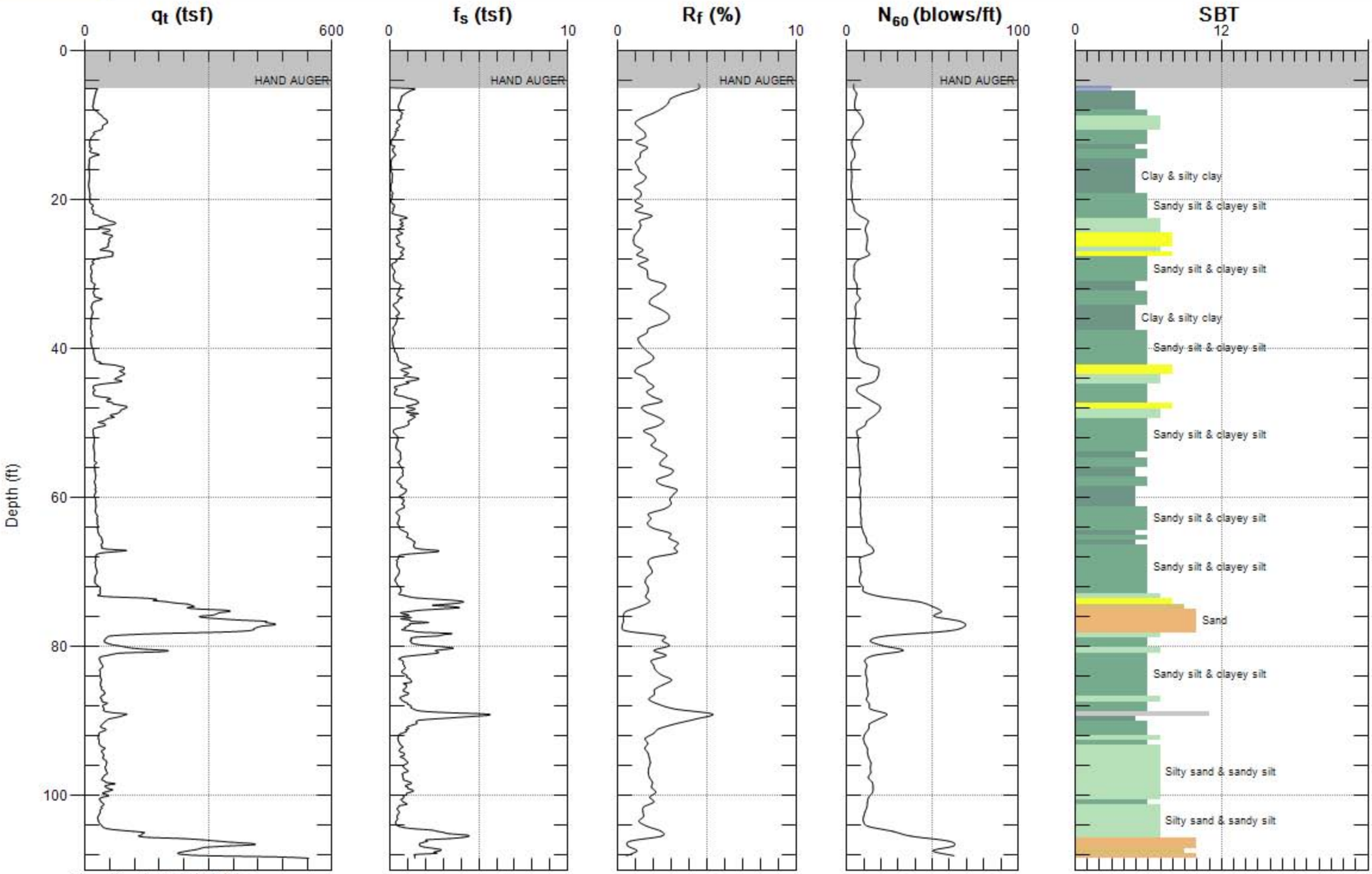
-Table 1-

CPT Sounding Identification	Date	Termination Depth (Feet)	Depth of Groundwater Samples (Feet)	Depth of Soil Samples (Feet)	Depth of Pore Pressure Dissipation Tests (Feet)
BR-1	12/14/07	108	-	-	42.8
BR-2	12/17/07	100	-	-	46.4

PARIKH CONSULTANTS

Site: HWY 101
Sounding: BR-1

Engineer: D.WANG
Date: 12/14/2007 09:25



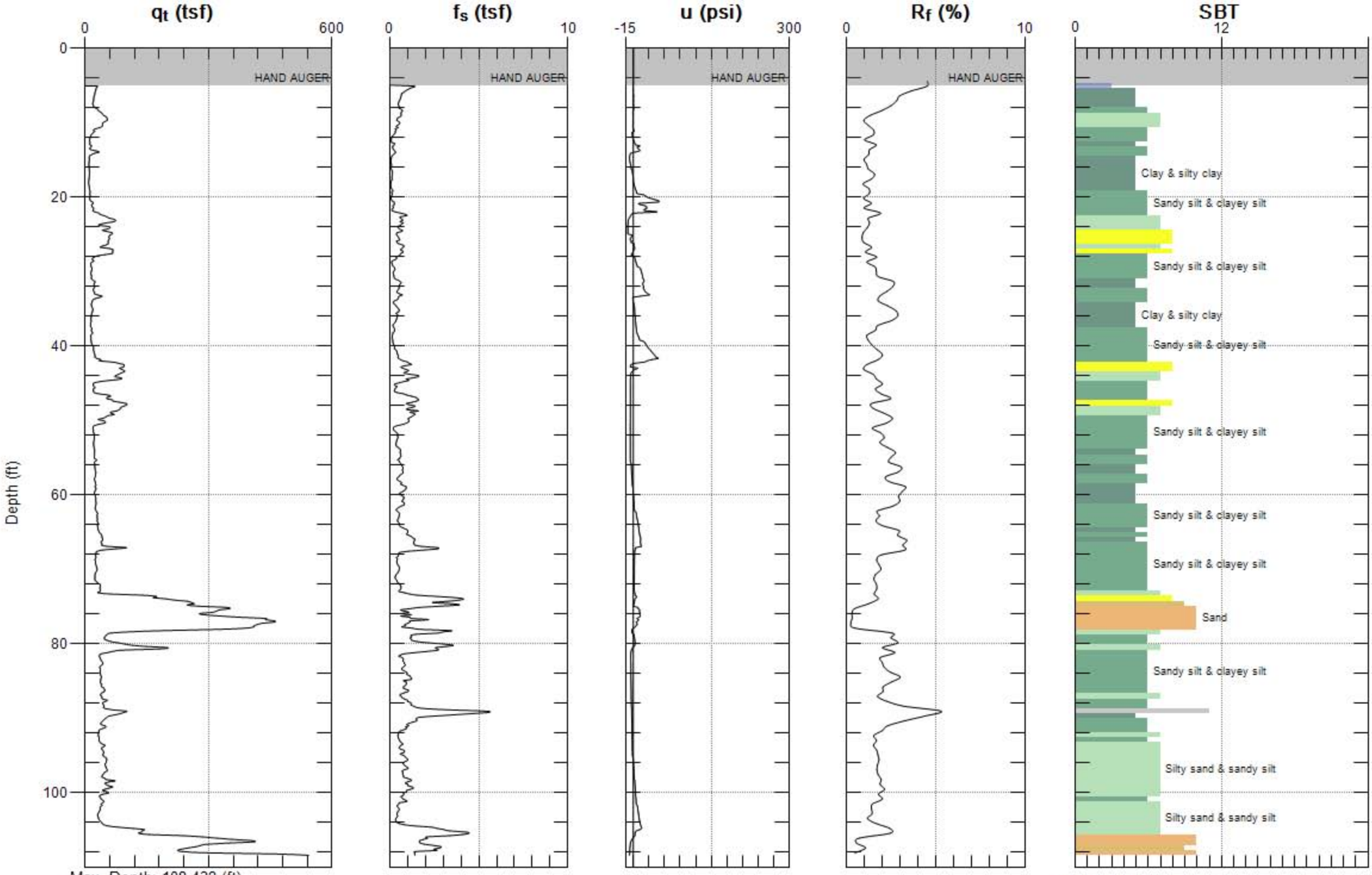
Max. Depth: 108.432 (ft)
Avg. Interval: 0.656 (ft)

SBT: Soil Behavior Type (Robertson 1990)

PARIKH CONSULTANTS

Site: HWY 101
Sounding: BR-1

Engineer: D.WANG
Date: 12/14/2007 09:25



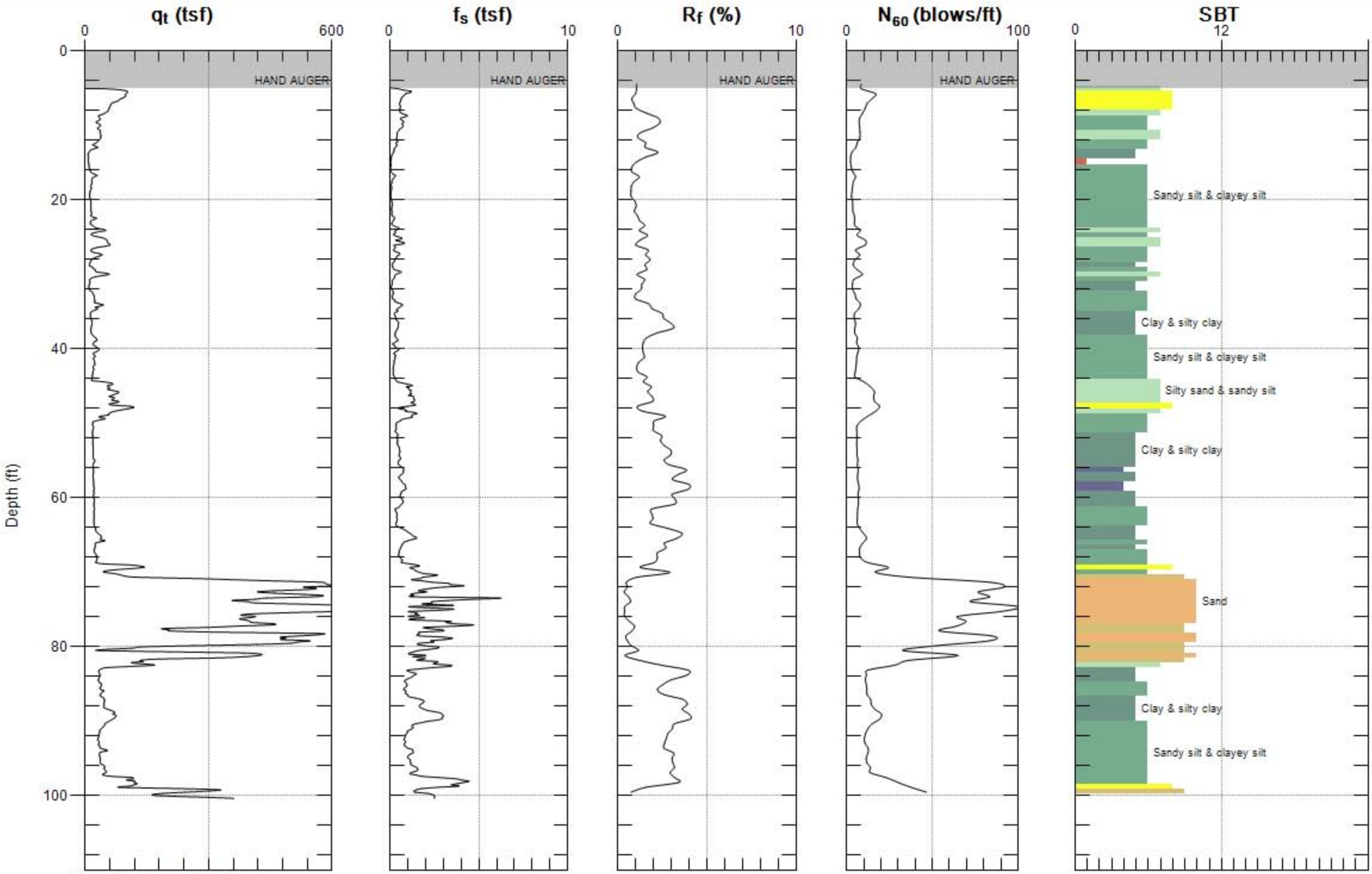
Max. Depth: 108.432 (ft)
Avg. Interval: 0.656 (ft)

SBT: Soil Behavior Type (Robertson 1990)

PARIKH CONSULTANTS

Site: HWY 101
Sounding: BR-2

Engineer: D.WANG
Date: 12/17/2007 09:01



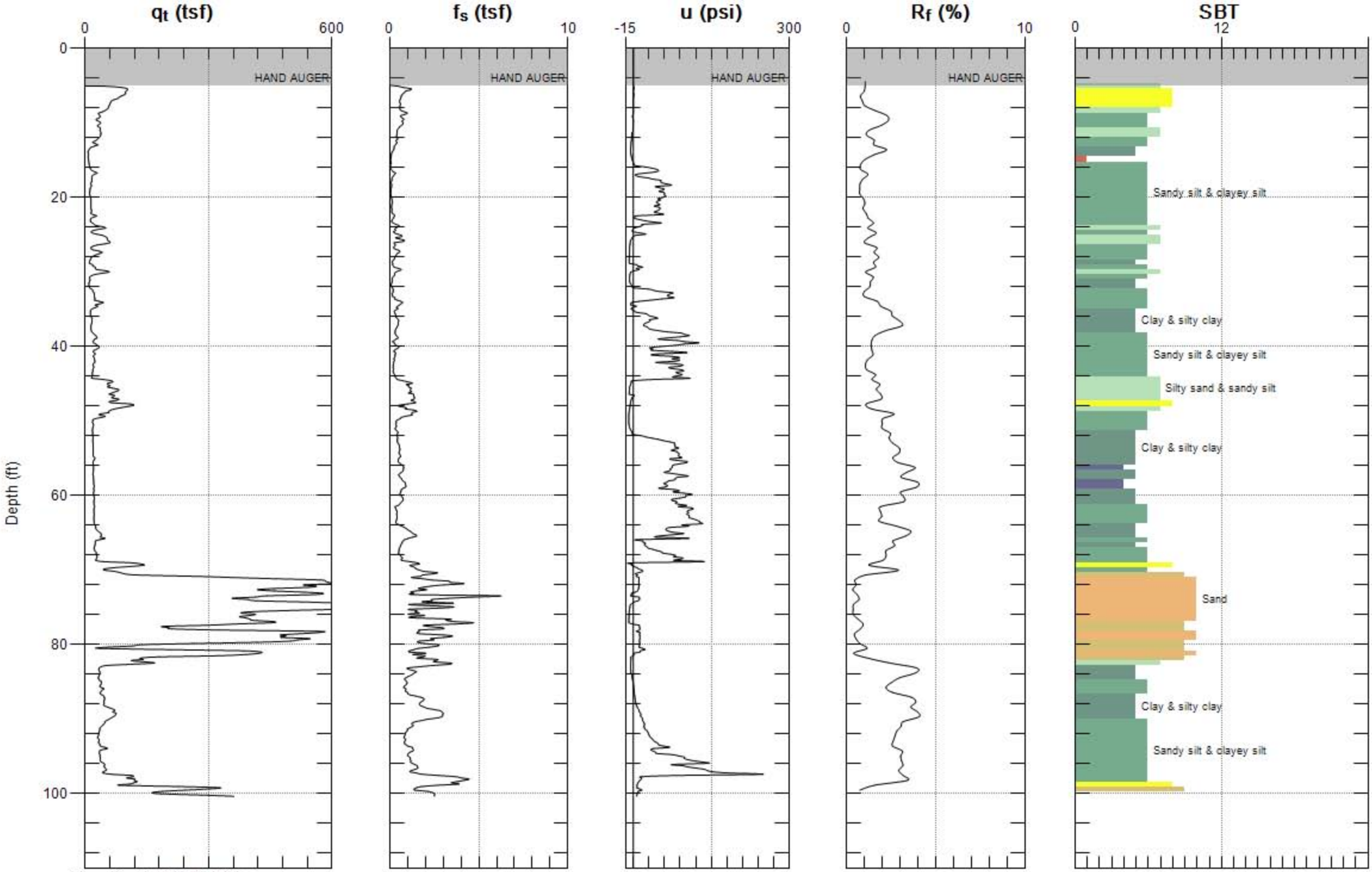
Max. Depth: 100.394 (ft)
Avg. Interval: 0.656 (ft)

SBT: Soil Behavior Type (Robertson 1990)

PARIKH CONSULTANTS

Site: HWY 101
Sounding: BR-2

Engineer: D.WANG
Date: 12/17/2007 09:01



Max. Depth: 100.394 (ft)
Avg. Interval: 0.656 (ft)

SBT: Soil Behavior Type (Robertson 1990)

Cone Penetration Test Data & Interpretation

Soil behavior type and stratigraphic interpretation is based on relationships between cone bearing (q_c), sleeve friction (f_s), and pore water pressure (u_2). The friction ratio (R_f) is a calculated parameter defined by $100 f_s/q_c$ and is used to infer soil behavior type. Generally:

Cohesive soils (clays)

- High friction ratio (R_f) due to small cone bearing (q_c)
- Generate large excess pore water pressures (u_2)

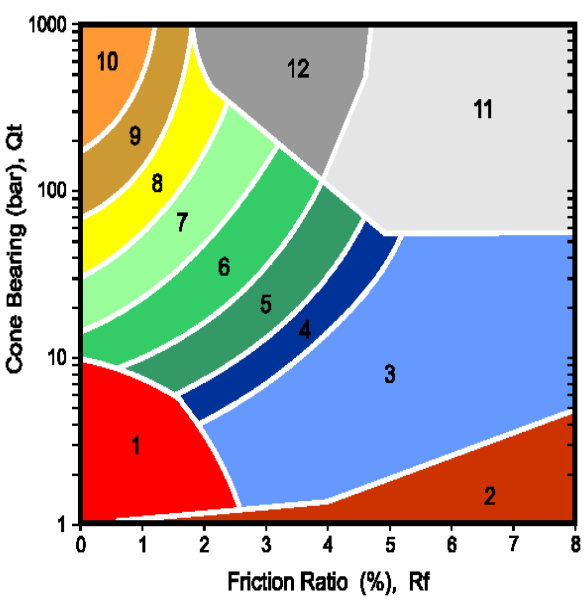
Cohesionless soils (sands)

- Low friction ratio (R_f) due to large cone bearing (q_c)
- Generate very little excess pore water pressures (u_2)

A complete set of baseline readings are taken prior to and at the completion of each sounding to determine temperature shifts and any zero load offsets. Corrections for temperature shifts and zero load offsets can be extremely important, especially when the recorded loads are relatively small. In sandy soils, however, these corrections are generally negligible.

The cone penetration test data collected from your site is presented in graphical form in Appendix CPT. The data includes CPT logs of measured soil parameters, computer calculations of interpreted soil behavior types (SBT), and additional geotechnical parameters. A summary of locations and depths is available in Table 1. Note that all penetration depths referenced in the data are with respect to the existing ground surface.

Soil interpretation for this project was conducted using recent correlations developed by Robertson, 1990, *Figure SBT*. Note that it is not always possible to clearly identify a soil type based solely on q_c, f_s, and u_2. In these situations, experience, judgment, and an assessment of the pore pressure dissipation data should be used to infer the soil behavior type.



ZONE	Qt/N	SBT
1	2	Sensitive, fine grained
2	1	Organic materials
3	1	Clay
4	1.5	Silty clay to clay
5	2	Clayey silt to silty clay
6	2.5	Sandy silt to clayey silt
7	3	Silty sand to sandy silt
8	4	Sand to silty sand
9	5	Sand
10	6	Gravely sand to sand
11	1	Very stiff fine grained*
12	2	Sand to clayey sand*

*over consolidated or cemented

Figure SBT

Cone Penetration Test (CPT) Interpretation

Gregg have recently updated their CPT interpretation and plotting software (2007). The software takes the CPT data and performs basic interpretation in terms of soil behavior type (SBT) and various geotechnical parameters using current published empirical correlations based on the comprehensive review by Lunne, Robertson and Powell (1997). The interpretation is presented in tabular format using MS Excel. The interpretations are presented only as a guide for geotechnical use and should be carefully reviewed. Gregg does not warranty the correctness or the applicability of any of the geotechnical parameters interpreted by the software and does not assume any liability for any use of the results in any design or review. The user should be fully aware of the techniques and limitations of any method used in the software.

The following provides a summary of the methods used for the interpretation. Many of the empirical correlations to estimate geotechnical parameters have constants that have a range of values depending on soil type, geologic origin and other factors. The software uses 'default' values that have been selected to provide, in general, conservatively low estimates of the various geotechnical parameters.

Input:

1. Units for display (Imperial or metric) (atm. pressure, pa = 0.96 tsf or 0.1 MPa)
2. Depth interval to average results,(ft or m). Data are collected at either 0.02 or 0.05m and can be averaged every 1, 3 or 5 intervals.
3. Elevation of ground surface (ft or m)
4. Depth to water table, z_w (ft or m) – input required
5. Net area ratio for cone, a (default to 0.85)
6. Relative Density constant, C_{Dr} (default to 350)
7. Young's modulus number for sands, α (default to 5)
8. Small strain shear modulus number
   a. for sands, S_G (default to 180 for SBT_n 5, 6, 7)
   b. for clays, C_G (default to 50 for SBT_n 1, 2, 3 & 4)
9. Undrained shear strength cone factor for clays, N_{kt} (default to 15)
10. Over Consolidation ratio number, k_{ocr} (default to 0.3)
11. Unit weight of water, (default to γ_w = 62.4 lb/ft^3 or 9.81 kN/m^3)

Column

1. Depth, z, (m) – CPT data is collected in meters
2. Depth (ft)
3. Cone resistance, q_c (tsf or MPa)
4. Sleeve friction, f_s (tsf or MPa)
5. Penetration pore pressure, u (psi or MPa), measured behind the cone (i.e. u_2)
6. Other – any additional data, if collected, e.g. electrical resistivity or UVIF
7. Total cone resistance, q_t (tsf or MPa) $q_t = q_c + u\,(1-a)$

8	Friction Ratio, R_f (%)	$R_f = (f_s/q_t) \times 100\%$
9	Soil Behavior Type (non-normalized), SBT	see note
10	Unit weight, γ (pcf or kN/m^3)	based on SBT, see note
11	Total overburden stress, σ_v (tsf)	$\sigma_{vo} = \gamma z$
12	Insitu pore pressure, u_o (tsf)	$u_o = \gamma_w (z - z_w)$
13	Effective overburden stress, σ'_{vo} (tsf)	$\sigma'_{vo} = \sigma_{vo} - u_o$
14	Normalized cone resistance, Q_{t1}	$Q_{t1} = (q_t - \sigma_{vo}) / \sigma'_{vo}$
15	Normalized friction ratio, F_r (%)	$F_r = f_s / (q_t - \sigma_{vo}) \times 100\%$
16	Normalized Pore Pressure ratio, B_q	$B_q = u - u_o / (q_t - \sigma_{vo})$
17	Soil Behavior Type (normalized), SBT_n	see note
18	SBT_n Index, I_c	see note
19	Normalized Cone resistance, Q_{tn} (n varies with Ic)	see note
20	Estimated permeability, k_{SBT} (cm/sec or ft/sec)	see note
21	Equivalent SPT N_{60}, blows/ft	see note
22	Equivalent SPT $(N_1)_{60}$ blows/ft	see note
23	Estimated Relative Density, D_r, (%)	see note
24	Estimated Friction Angle, ϕ', (degrees)	see note
25	Estimated Young's modulus, E_s (tsf)	see note
26	Estimated small strain Shear modulus, Go (tsf)	see note
27	Estimated Undrained shear strength, s_u (tsf)	see note
28	Estimated Undrained strength ratio	s_u/σ_v'
29	Estimated Over Consolidation ratio, OCR	see note

Notes:

1 Soil Behavior Type (non-normalized), SBT — Lunne et al. (1997)
listed below

2 Unit weight, γ either constant at 119 pcf or based on Non-normalized SBT
(Lunne et al., 1997 and table below)

3 Soil Behavior Type (Normalized), SBT_n — Lunne et al. (1997)

4 SBT_n Index, I_c — $I_c = ((3.47 - \log Q_{t1})^2 + (\log F_r + 1.22)^2)^{0.5}$

5 Normalized Cone resistance, Q_{tn} (n varies with Ic)

$Q_{tn} = ((q_t - \sigma_{vo})/pa)\ (pa/(\sigma'_{vo})^n$ and recalculate I_c, then iterate:

When $I_c < 1.64$, $n = 0.5$ (clean sand)
When $I_c > 3.30$, $n = 1.0$ (clays)
When $1.64 < I_c < 3.30$, $n = (I_c - 1.64)0.3 + 0.5$
Iterate until the change in n, $\Delta n < 0.01$

6 Estimated permeability, k_{SBT} (based on Normalized SBT_n)
(Lunne et al., 1997 and table below)

7 Equivalent SPT N_{60}, blows/ft Lunne et al. (1997)

$$\frac{(q_c/p_a)}{N_{60}} = 8.5\left(1 - \frac{I_c}{4.6}\right)$$

8 Equivalent SPT $(N_1)_{60}$ blows/ft $(N_1)_{60} = N_{60}\, C_N$,
where $C_N = (pa/\sigma'_{vo})^{0.5}$

9 Relative Density, D_r, (%) $D_r^2 = Q_{tn} / C_{Dr}$
Only SBT_n 5, 6, 7 & 8 *Show 'N/A' in zones 1, 2, 3, 4 & 9*

10 Friction Angle, ϕ', (degrees) $\tan\phi' = \frac{1}{2.68}\left[\log\left(\frac{q_c}{\sigma'_{vo}}\right) + 0.29\right]$
Only SBT_n 5, 6, 7 & 8 *Show'N/A' in zones 1, 2, 3, 4 & 9*

11 Young's modulus, E_s $E_s = \alpha\, q_t$
Only SBT_n 5, 6, 7 & 8 *Show 'N/A' in zones 1, 2, 3, 4 & 9*

12 Small strain shear modulus, Go
a. $G_o = S_G\,(q_t\ \sigma'_{vo}\ pa)^{1/3}$ *For SBT_n 5, 6, 7*
b. $G_o = C_G\, q_t$ *For SBT_n 1, 2, 3& 4*
Show 'N/A' in zones 8 & 9

13 Undrained shear strength, s_u $s_u = (q_t - \sigma_{vo}) / N_{kt}$
Only SBT_n 1, 2, 3, 4 & 9 *Show 'N/A' in zones 5, 6, 7 & 8*

14 Over Consolidation ratio, OCR $OCR = k_{ocr}\, Q_{t1}$
Only SBT_n 1, 2, 3, 4 & 9 *Show 'N/A' in zones 5, 6, 7 & 8*

SBT Zones		**SBT_n Zones**	
The following updated and simplified SBT descriptions have been used in the software:			
1	sensitive fine grained	1	sensitive fine grained
2	organic soils	2	organic soils
3	clays	3	clays
4	clays & silty clays	4	clays & silty clays
5	clays & silty clays		
6	silty sands & sandy silts	5	silty sands & sandy silts
7	silty sands & sandy silts		
8	sands & silty sands	6	sands & silty sands
9	sands & silty sands		
10	sands	7	sands
11	very dense/stiff soils*	8	very dense/stiff soils*
12	very dense/stiff soils*	9	very dense/stiff soils*

* heavily overconsolidated and/or cemented

Track when soils fall with zones of same description and print that description (i.e. if soils fall only within SBT zones 4 & 5, print 'clays & silty clays')

Estimated Permeability (see Lunne et al., 1997)

SBT_n	Permeability (ft/sec)	(m/sec)
1	$3x\ 10^{-8}$	$1x\ 10^{-8}$
2	$3x\ 10^{-7}$	$1x\ 10^{-7}$
3	$1x\ 10^{-9}$	$3x\ 10^{-10}$
4	$3x\ 10^{-8}$	$1x\ 10^{-8}$
5	$3x\ 10^{-6}$	$1x\ 10^{-6}$
6	$3x\ 10^{-4}$	$1x\ 10^{-4}$
7	$3x\ 10^{-2}$	$1x\ 10^{-2}$
8	$3x\ 10^{-6}$	$1x\ 10^{-6}$
9	$1x\ 10^{-8}$	$3x\ 10^{-9}$

Estimated Unit Weight (see Lunne et al., 1997)

SBT	Approximate Unit Weight (lb/ft^3)	(kN/m^3)
1	111.4	17.5
2	79.6	12.5
3	111.4	17.5
4	114.6	18.0
5	114.6	18.0
6	114.6	18.0
7	117.8	18.5
8	120.9	19.0
9	124.1	19.5
10	127.3	20.0
11	130.5	20.5
12	120.9	19.0

GREGG DRILLING & TESTING, INC.

CONE PENETRATION TEST DATA

Client:	PARIKH CONSULTANTS		
Site:	HWY 101		
Engineer:	D.WANG		
Sounding:	**BR-1**		
Date:	12/14/2007		
Time:	9:25 AM		

Units:	Imperial	
Data averaging interval:	0.200	meters
Assumed depth of water:	15.004	feet
Net area ratio of cone:	0.80	
Unit weight of water:	62.4	lb/ft^3
Relative density constant, C_{DR}:	350	
Young's modulus for sands, α:	4	
Small strain shear modulus number, S_G (sands	180	
Small strain shear modulus number, C_G (clays)	50	
N_{kt} for clays:	15	
OCR number, k_{OCr}:	0.3	

Interpretation based on Lunne, Robertson and Powell, 1997

Col 1i	Col 2i	Col 3i	Col 4i	Col 5i	Col 6i	Col 7i	Col 8i	Col 9i	Col 10i	Col 11i	Col 12i	Col 13i	Col 14i	Col 15i	Col 16i	Col 17i	Col 18i	Col 19i	Col 20i	Col 21i	Col 22i	Col 23i	Col 24i	Col 25i	Col 26i	Col 27i	Col 28i	Col 29i
Depth	Depth	q_c	f_s	u	Other	q_t	R_f	SBT	Unit Weight, γ	Total Overburden Stress, σ_v	Insitu pore pressure, u_o	Effective overburden stress, σ'_v	Normalized cone resistance, Q_t	Normalized Friction raio, F_r	Normalized pore pressure ratio, B_q	Soil Behavior Type (normalized) SBT_n	SBTn Index, I_c	Normalized Cone resistance, Q_{tn}	Estimated permeability, k_{SBT}	SPT N_{60}	SPT $(N_1)_{60}$	Relative Density, D_r	Friction Angle, φ'	Young's modulus, E_s	Small strain shear modulus, G_o	Undrained shear strength, s_u	Undrained strength ratio, s_u/σ'_v	Over consolidation ratio, OCR
(m)	(ft)	(tsf)	(tsf)	(psi)		(tsf)	(%)		(pcf)	(tsf)	(tsf)	(tsf)							(ft/sec)	(blows/ft)	(blows/ft)	(%)	(degrees)	(tsf)	(tsf)	(tsf)		
0.150	0.492	0.000	0.000	0.000							0.000																	
0.350	1.148	0.000	0.000	0.000							0.000																	
0.550	1.804	0.000	0.000	0.000							0.000																	
0.750	2.461	0.000	0.000	0.000							0.000																	
0.950	3.117	0.000	0.000	0.000							0.000																	
1.150	3.773	0.000	0.000	0.000							0.000																	
1.350	4.429	0.000	0.000	0.000							0.000																	
1.550	5.085	16.721	0.755	-0.442		16.71	4.51	3	111	0.283	0.000	0.283	58.01	4.59	0.00	4	2.54	42.85	3.00E-8	4.2	8.0				836	1.10	3.87	17.4
1.750	5.741	25.144	0.904	-0.348		25.14	3.60	5	115	0.321	0.000	0.321	77.35	3.64	0.00	4	2.38	55.55	3.00E-8	5.8	10.5				1257	1.65	5.16	23.2
1.950	6.398	22.174	0.657	0.018		22.17	2.96	5	115	0.358	0.000	0.358	60.86	3.01	0.00	5	2.39	45.24	3.00E-6	5.1	8.8	36	38	89	366			
2.150	7.054	19.910	0.557	-0.074		19.91	2.80	5	115	0.396	0.000	0.396	49.27	2.86	0.00	5	2.44	38.19	3.00E-6	4.7	7.7	33	37	80	365			
2.350	7.710	20.961	0.520	0.158		20.96	2.48	5	115	0.434	0.000	0.434	47.34	2.53	0.00	5	2.42	37.34	3.00E-6	4.9	7.7	33	36	84	383			
2.550	8.366	33.213	0.655	-0.291		33.21	1.97	6	115	0.471	0.000	0.471	69.47	2.00	0.00	5	2.23	53.47	3.00E-6	7.2	10.7	39	39	133	459			
2.750	9.022	46.296	0.607	-0.684		46.29	1.31	7	118	0.510	0.000	0.510	89.78	1.33	0.00	6	2.03	67.81	3.00E-4	9.2	13.2	44	40	185	526			
2.950	9.678	50.306	0.482	-0.681		50.30	0.96	7	118	0.549	0.000	0.549	90.70	0.97	0.00	6	1.93	69.21	3.00E-4	9.7	13.4	44	40	201	554			
3.150	10.335	40.843	0.492	-0.723		40.83	1.20	7	118	0.587	0.000	0.587	68.54	1.22	0.00	5	2.09	55.31	3.00E-6	8.3	11.2	40	39	163	529			
3.350	10.991	24.580	0.371	-0.147		24.58	1.51	6	115	0.625	0.000	0.625	38.34	1.55	0.00	5	2.36	32.99	3.00E-6	5.6	7.3	31	35	98	456			
3.550	11.647	15.575	0.232	-1.927		15.55	1.49	6	115	0.662	0.000	0.662	22.47	1.56	-0.01	5	2.55	20.20	3.00E-6	3.9	4.9	24	32	62	399			
3.750	12.303	11.517	0.116	0.270		11.52	1.01	6	115	0.700	0.000	0.700	15.46	1.07	0.00	4	2.60	14.16	3.00E-8	2.9	3.6				576	0.72	1.03	4.6
3.950	12.959	12.796	0.213	5.942		12.88	1.65	5	115	0.738	0.000	0.738	16.47	1.75	0.04	4	2.69	15.40	3.00E-8	3.4	4.1				644	0.81	1.10	4.9
4.150	13.615	19.605	0.252	8.648		19.73	1.28	6	115	0.775	0.000	0.775	24.45	1.33	0.03	5	2.48	22.63	3.00E-6	4.7	5.5	25	32	79	455			
4.350	14.272	18.784	0.231	-4.464		18.72	1.23	6	115	0.813	0.000	0.813	22.03	1.29	-0.02	5	2.51	20.68	3.00E-6	4.6	5.2	24	32	75	454			
4.550	14.928	10.036	0.097	-6.935		9.94	0.97	5	115	0.850	0.000	0.850	10.69	1.06	-0.05	4	2.74	10.30	3.00E-8	2.8	3.1				497	0.61	0.71	3.2
4.750	15.584	9.435	0.105	-5.482		9.36	1.12	5	115	0.888	0.018	0.870	9.74	1.24	-0.05	4	2.81	9.45	3.00E-8	2.7	3.0				468	0.56	0.65	2.9
4.950	16.240	10.103	0.122	-3.292		10.06	1.22	5	115	0.925	0.039	0.887	10.29	1.34	-0.03	4	2.80	10.02	3.00E-8	2.9	3.1				503	0.61	0.69	3.1
5.150	16.896	10.419	0.162	-1.200		10.40	1.56	5	115	0.963	0.059	0.904	10.44	1.72	-0.02	4	2.85	10.22	3.00E-8	3.0	3.3				520	0.63	0.70	3.1
5.350	17.552	9.464	0.132	-0.351		9.46	1.39	5	115	1.001	0.080	0.921	9.18	1.56	-0.01	4	2.88	9.02	3.00E-8	2.8	3.0				473	0.56	0.61	2.8
5.550	18.209	8.890	0.082	1.095		8.91	0.92	5	115	1.038	0.100	0.938	8.39	1.04	0.00	4	2.83	8.24	3.00E-8	2.6	2.7				445	0.52	0.56	2.5
5.750	18.865	10.428	0.131	3.843		10.48	1.25	5	115	1.076	0.120	0.955	9.85	1.39	0.02	4	2.83	9.70	3.00E-8	3.0	3.2				524	0.63	0.66	3.0
5.950	19.521	11.612	0.149	12.424		11.79	1.27	6	115	1.113	0.141	0.973	10.98	1.40	0.07	4	2.79	10.84	3.00E-8	3.3	3.4				590	0.71	0.73	3.3
6.150	20.177	11.431	0.113	35.074		11.94	0.95	6	115	1.151	0.161	0.990	10.90	1.05	0.22	4	2.73	10.77	3.00E-8	3.1	3.2				597	0.72	0.73	3.3
6.350	20.833	16.253	0.230	28.792		16.67	1.38	6	115	1.189	0.182	1.007	15.38	1.48	0.12	4	2.67	15.23	3.00E-8	4.3	4.4				833	1.03	1.03	4.6
6.550	21.490	18.268	0.183	23.637		18.61	0.98	6	115	1.226	0.202	1.024	16.98	1.05	0.09	5	2.56	16.85	3.00E-6	4.6	4.7	22	30	74	490			
6.750	22.146	31.207	0.598	12.768		31.39	1.90	6	115	1.264	0.223	1.041	28.94	1.98	0.02	5	2.52	28.83	3.00E-6	7.7	7.7	29	33	126	586			
6.950	22.802	60.027	0.732	-7.612		59.92	1.22	7	118	1.302	0.243	1.059	55.34	1.25	-0.01	5	2.17	55.36	3.00E-6	12.6	12.6	40	37	240	732			
7.150	23.458	53.343	0.680	-10.223		53.20	1.28	7	118	1.341	0.264	1.077	48.13	1.31	-0.02	5	2.23	48.41	3.00E-6	11.5	11.4	37	37	213	707			
7.350	24.114	49.685	0.568	-10.525		49.53	1.15	7	118	1.380	0.284	1.096	43.96	1.18	-0.02	5	2.24	44.45	3.00E-6	10.8	10.6	36	36	198	694			
7.550	24.770	57.086	0.532	-8.924		56.96	0.93	8	121	1.419	0.305	1.115	49.82	0.96	-0.02	5	2.14	50.74	3.00E-6	11.9	11.6	38	37	228	732			
7.750	25.427	58.576	0.503	-4.562		58.51	0.86	8	121	1.459	0.325	1.134	50.31	0.88	-0.01	5	2.12	51.57	3.00E-6	12.1	11.7	38	37	234	743			
7.950	26.083	55.491	0.526	-2.373		55.46	0.95	8	121	1.499	0.346	1.153	46.79	0.97	-0.01	5	2.17	48.19	3.00E-6	11.7	11.2	37	36	222	733			
8.150	26.739	51.748	0.722	1.629		51.77	1.39	7	118	1.537	0.366	1.171	42.89	1.44	0.00	5	2.30	44.23	3.00E-6	11.5	10.9	36	36	207	721			
8.350	27.395	63.093	0.671	-1.161		63.08	1.06	8	121	1.577	0.387	1.191	51.66	1.09	-0.01	5	2.16	53.79	3.00E-6	13.2	12.5	39	37	252	774			
8.550	28.051	27.044	0.455	0.983		27.06	1.68	6	115	1.615	0.407	1.208	21.07	1.79	-0.01	4	2.60	21.67	3.00E-8	6.9	6.5				1353	1.70	1.40	6.3
8.750	28.707	16.559	0.189	5.026		16.63	1.13	6	115	1.652	0.428	1.225	12.23	1.26	0.00	4	2.72	12.55	3.00E-8	4.5	4.2				832	1.00	0.82	3.7
8.950	29.364	14.955	0.240	9.918		15.10	1.59	6	115	1.690	0.448	1.242	10.80	1.79	0.02	4	2.85	11.04	3.00E-8	4.4	4.0				755	0.89	0.72	3.2
9.150	30.020	14.725	0.248	15.463		14.95	1.66	6	115	1.727	0.468	1.259	10.50	1.87	0.05	4	2.87	10.74	3.00E-8	4.3	4.0				747	0.88	0.70	3.2
9.350	30.676	14.859	0.266	17.902		15.12	1.76	6	115	1.765	0.489	1.276	10.46	1.99	0.06	4	2.88	10.71	3.00E-8	4.4	4.0				756	0.89	0.70	3.1
9.550	31.332	20.331	0.537	19.390		20.61	2.61	5	115	1.803	0.509	1.293	14.54	2.86	0.05	4	2.85	14.95	3.00E-8	5.9	5.4				1031	1.25	0.97	4.4
9.750	31.988	21.601	0.567	19.081		21.88	2.59	5	115	1.840	0.530	1.310	15.29	2.83	0.04	4	2.83	15.76	3.00E-8	6.2	5.6				1094	1.34	1.02	4.6
9.950	32.644	20.971	0.482	23.103		21.30	2.26	6	115	1.878	0.550	1.327	14.63	2.48	0.06	4	2.81	15.13	3.00E-8	6.0	5.4				1065	1.30	0.98	4.4
10.150	33.301	30.463	0.567	14.231		30.67	1.85	6	115	1.915	0.571	1.345	21.38	1.97	0.02	4	2.62	22.46	3.00E-8	7.9	7.0				1533	1.92	1.43	6.4
10.350	33.957	18.650	0.330	-0.323		18.65	1.77	6	115	1.953	0.591	1.362	12.26	1.98	-0.04	4	2.82	12.71	3.00E-8	5.4	4.7				932	1.11	0.82	3.7
10.550	34.613	16.167	0.373	1.657		16.19	2.30	5	115	1.991	0.612	1.379	10.30	2.63	-0.03	3	2.95	10.59	1.00E-9	5.0	4.4				810	0.95	0.69	3.1
10.750	35.269	17.724	0.490	2.464		17.76	2.76	5	115	2.028	0.632	1.396	11.27	3.12	-0.03	3	2.96	11.59	1.00E-9	5.5	4.8				888	1.05	0.75	3.4
10.950	35.925	14.964	0.429	3.289		15.01	2.86	5	115	2.066	0.653	1.413	9.16	3.31	-0.03	3	3.05	9.37	1.00E-9	4.9	4.3				751	0.86	0.61	2.7
11.150	36.581	14.238	0.361	4.096		14.30	2.52	5	115	2.103	0.673	1.430	8.53	2.96	-0.03	3	3.05	8.73	1.00E-9	4.7	4.0				715	0.81	0.57	2.6
11.350	37.238	13.713	0.240	4.980		13.78	1.74	5	115	2.141	0.694	1.447	8.04	2.06	-0.03	3	2.99	8.29	1.00E-9	4.4	3.7				689	0.78	0.54	2.4
11.550	37.894	16.148	0.261	6.121		16.24	1.61	6	115	2.179	0.714	1.464	9.60	1.86	-0.02	4	2.90	9.99	3.00E-8	4.9	4.1				812	0.94	0.64	2.9
11.750	38.550	15.060	0.173	8.767		15.19	1.14	6	115	2.216	0.735	1.482	8.75	1.33	-0.01	4	2.86	9.15	3.00E-8	4.4	3.7				759	0.86	0.58	2.6
11.950	39.206	14.429	0.175	15.095		14.65	1.20	6	115	2.254	0.755	1.499	8.27	1.41	0.03	4	2.90	8.63	3.00E-8	4.3	3.6				732	0.83	0.55	2.5
12.150	39.862	17.304	0.249	24.995		17.66	1.41	6	115	2.291	0.776	1.516	10.14	1.62	0.07	4	2.85	10.66	3.00E-8	5.1	4.2				883	1.02	0.68	3.0
12.350	40.518	20.054	0.354	32.151		20.52	1.72	6	115	2.329	0.796	1.533	11.86	1.94	0.08	4	2.83	12.51	3.00E-8	5.8	4.8				1026	1.21	0.79	3.6
12.550	41.175	22.518	0.462	40.107		23.10	2.00	6	115	2.367	0.817	1.550	13.37	2.23	0.10	4	2.82	14.14	3.00E-8	6.5	5.3				1155	1.38	0.89	4.0
12.750	41.831	38.083	0.679	35.025		38.59	1.76	6	115	2.404	0.837	1.567	23.09	1.88	0.05	4	2.58	25.15	3.00E-8	9.7	7.9				1929	2.41	1.54	6.9
12.950	42.487	85.772	0.979	1.962		85.80	1.14	8	121	2.444	0.857	1.586	52.54	1.17	-0.01	5	2.17	60.30	3.00E-6	18.1	14.8	42	37	343	944			
13.150	43.143	91.349	0.868	0.555		91.36	0.95	8	121	2.484	0.878	1.606	55.35	0.98	-0.01	5	2.11	64.30	3.00E-6	18.8	15.2	43	37	365	967			
13.350	43.799	82.449	1.223	-4.506		82.38	1.48	7	118	2.522	0.898	1.624	49.18	1.53	-0.02	5	2.27	56.22	3.00E-6	18.1	14.6	40	37	330	938			
13.550	44.455	68.832	1.151	-5.489		68.75	1.67	7	118	2.561	0.919	1.642	40.31	1.74	-0.02	5	2.37	45.62	3.00E-6	15.8	12.7	36	36	275	886			
13.750	45.112	23.835	0.476	-5.580		23.76	2.00	6	115	2.598	0.939	1.659	12.75	2.25	-0.06	4	2.84	13.58	3.00E-8	6.9	5.5				1188	1.41	0.85	3.8
13.950	45.768	21.247	0.340	-5.612		21.17	1.61	6	115	2.636	0.960	1.676	11.06	1.84	-0.07	4	2.84	11.78	3.00E-8	6.2	4.9				1058	1.24	0.74	3.3
14.150	46.424	38.627	0.741	-5.633		38.55	1.92	6	115	2.674	0.980	1.693	21.18	2.07	-0.04	4	2.64	23.28	3.00E-8	10.1	8.0				1927	2.39	1.41	6.4
14.350	47.080	60.696	1.489	-5.647		60.61	2.46	6	115	2.711	1.001	1.710	33.85	2.57	-0.02	4	2.53	37.84	3.00E-8	15.0	11.8				3031	3.86	2.26	10.2
14.550	47.736	90.165	1.255	-5.657		90.08	1.39	8	121	2.751	1.021	1.730	50.49	1.44	-0.02	5	2.24	59.09	3.00E-6	19.5	15.3	41	37	360	987			
14.750	48.392	85.591	1.276	-5.682		85.51	1.49	7	118	2.790	1.042	1.748	47.33	1.54	-0.02	5	2.28	55.23	3.00E-6	18.9	14.7	40	36	342	973			
14.950	49.049	65.480	1.381	-5.710		65.40	2.11	7	118	2.828	1.062	1.766	35.43	2.21	-0.02	5	2.48	40.25	3.00E-6	15.8	12.2	34	35	262	893			
15.150	49.705	44.977	1.151	-5.742		44.89	2.56	6	115	2.866	1.083	1.783	23.57	2.74	-0.04	4	2.67	26.03	3.00E-8	11.9	9.2				2245	2.80	1.57	7.1
15.350	50.361	39.353	0.871	-5.756		39.27	2.22	6	115	2.903	1.103	1.800	20.20	2.40	-0.04	4	2.69	22.28	3.00E-8	10.5	8.1				1964	2.42	1.35	6.1

Col 1i	Col 2i	Col 3i	Col 4i	Col 5i	Col 6i	Col 7i	Col 8i	Col 9i	Col 10i	Col 11i	Col 12i	Col 13i	Col 14i	Col 15i	Col 16i	Col 17i	Col 18i	Col 19i	Col 20i	Col 21i	Col 22i	Col 23i	Col 24i	Col 25i	Col 26i	Col 27i	Col 28i	Col 29i
Depth	Depth	q_c	f_s	u	Other	q_t	R_f	SBT	Unit Weight, γ	Total Overburden Stress, σ_v	Insitu pore pressure, u_o	Effective overburden stress, σ'_v	Normalized cone resistance, Q_{tn}	Normalized Friction raio, F_r	Normalized pore pressure ratio, B_q	Soil Behavior Type (normalized) SBT_n	SBTn Index, I_c	Normalized Cone resistance, Q_{tn}	Estimated permeability, k_{SBT}	SPT N_{60}	SPT $(N_1)_{60}$	Relative Density, D_r	Friction Angle, φ'	Young's modulus, E_s	Small strain shear modulus, G_o	Undrained shear strength, s_u	Undrained strength ratio, s_u/σ'_v	Over consolidation ratio, OCR
(m)	(ft)	(tsf)	(tsf)	(psi)		(tsf)	(%)		(pcf)	(tsf)	(tsf)	(tsf)							(ft/sec)	(blows/ft)	(blows/ft)	(%)	(degrees)	(tsf)	(tsf)	(tsf)		
15.550	51.017	20.226	0.290	-5.777		20.14	1.44	6	115	2.941	1.124	1.817	9.47	1.69	-0.09	4	2.88	10.14	3.00E-8	6.0	4.6				1007	1.15	0.63	2.8
15.750	51.673	20.951	0.397	-5.794		20.87	1.90	6	115	2.979	1.144	1.834	9.75	2.22	-0.09	3	2.93	10.37	1.00E-9	6.4	4.9				1043	1.19	0.65	2.9
15.950	52.329	22.059	0.461	-5.819		21.98	2.10	6	115	3.016	1.165	1.852	10.24	2.43	-0.08	3	2.94	10.89	1.00E-9	6.8	5.1				1099	1.26	0.68	3.1
16.150	52.986	20.971	0.388	-5.850		20.89	1.86	6	115	3.054	1.185	1.869	9.54	2.18	-0.09	3	2.94	10.16	1.00E-9	6.5	4.9				1044	1.19	0.64	2.9
16.350	53.642	21.811	0.497	-5.864		21.73	2.29	6	115	3.091	1.206	1.886	9.88	2.67	-0.09	3	2.97	10.47	1.00E-9	6.9	5.1				1086	1.24	0.66	3.0
16.550	54.298	22.785	0.621	-5.878		22.70	2.73	5	115	3.129	1.226	1.903	10.28	3.17	-0.08	3	3.00	10.85	1.00E-9	7.3	5.4				1135	1.30	0.69	3.1
16.750	54.954	23.597	0.582	-5.882		23.51	2.48	6	115	3.167	1.246	1.920	10.60	2.86	-0.08	3	2.96	11.26	1.00E-9	7.4	5.5				1176	1.36	0.71	3.2
16.950	55.610	24.571	0.579	-5.096		24.50	2.36	6	115	3.204	1.267	1.937	10.99	2.72	-0.08	3	2.94	11.75	1.00E-9	7.6	5.6				1225	1.42	0.73	3.3
17.150	56.266	23.797	0.726	-3.710		23.74	3.06	5	115	3.242	1.287	1.954	10.49	3.54	-0.08	3	3.02	11.06	1.00E-9	7.7	5.7				1187	1.37	0.70	3.1
17.350	56.923	25.296	0.729	-3.323		25.25	2.89	5	115	3.279	1.308	1.971	11.14	3.32	-0.07	3	2.98	11.84	1.00E-9	8.0	5.9				1262	1.46	0.74	3.3
17.550	57.579	24.169	0.526	-2.832		24.13	2.18	6	115	3.317	1.328	1.989	10.47	2.53	-0.07	3	2.94	11.22	1.00E-9	7.4	5.4				1206	1.39	0.70	3.1
17.750	58.235	24.084	0.573	-2.186		24.05	2.38	6	115	3.354	1.349	2.006	10.32	2.77	-0.07	3	2.97	11.02	1.00E-9	7.5	5.5				1203	1.38	0.69	3.1
17.950	58.891	25.545	0.838	-1.316		25.53	3.28	5	115	3.392	1.369	2.023	10.94	3.79	-0.07	3	3.02	11.56	1.00E-9	8.3	6.0				1276	1.48	0.73	3.3
18.150	59.547	23.892	0.743	-0.607		23.88	3.11	5	115	3.430	1.390	2.040	10.03	3.63	-0.07	3	3.04	10.56	1.00E-9	7.9	5.7				1194	1.36	0.67	3.0
18.350	60.203	24.609	0.713	0.126		24.61	2.90	5	115	3.467	1.410	2.057	10.28	3.37	-0.07	3	3.02	10.89	1.00E-9	7.9	5.7				1231	1.41	0.69	3.1
18.550	60.860	26.079	0.776	0.898		26.09	2.97	5	115	3.505	1.431	2.074	10.89	3.44	-0.06	3	3.00	11.58	1.00E-9	8.3	6.0				1305	1.51	0.73	3.3
18.750	61.516	25.296	0.655	1.516		25.32	2.59	6	115	3.542	1.451	2.091	10.41	3.01	-0.06	3	2.98	11.12	1.00E-9	8.0	5.7				1266	1.45	0.69	3.1
18.950	62.172	27.216	0.466	3.524		27.27	1.71	6	115	3.580	1.472	2.108	11.23	1.97	-0.05	4	2.85	12.34	3.00E-8	8.0	5.6				1363	1.58	0.75	3.4
19.150	62.828	29.374	0.542	6.359		29.47	1.84	6	115	3.618	1.492	2.126	12.16	2.10	-0.04	4	2.84	13.41	3.00E-8	8.5	6.0				1473	1.72	0.81	3.6
19.350	63.484	29.851	0.491	8.153		29.97	1.64	6	115	3.655	1.513	2.143	12.28	1.87	-0.04	4	2.81	13.65	3.00E-8	8.5	6.0				1498	1.75	0.82	3.7
19.550	64.140	30.720	0.615	9.743		30.86	1.99	6	115	3.693	1.533	2.160	12.58	2.26	-0.03	4	2.85	13.88	3.00E-8	9.0	6.3				1543	1.81	0.84	3.8
19.750	64.797	32.592	0.959	10.774		32.75	2.93	5	115	3.730	1.554	2.177	13.33	3.30	-0.03	3	2.92	14.49	1.00E-9	9.9	6.9				1637	1.93	0.89	4.0
19.950	65.453	39.200	1.123	12.627		39.38	2.85	6	115	3.768	1.574	2.194	16.23	3.15	-0.02	4	2.84	17.98	3.00E-8	11.4	7.9				1969	2.37	1.08	4.9
20.150	66.109	40.699	1.372	13.880		40.90	3.36	5	115	3.806	1.594	2.211	16.78	3.70	-0.02	3	2.87	18.47	1.00E-9	12.0	8.3				2045	2.47	1.12	5.0
20.350	66.765	54.795	1.727	12.561		54.98	3.14	6	115	3.843	1.615	2.228	22.95	3.38	-0.01	4	2.74	26.05	3.00E-8	15.1	10.4				2749	3.41	1.53	6.9
20.550	67.421	54.670	1.787	3.461		54.72	3.26	6	115	3.881	1.635	2.245	22.64	3.51	-0.03	4	2.76	25.64	3.00E-8	15.2	10.4				2736	3.39	1.51	6.8
20.750	68.077	25.927	0.500	2.450		25.96	1.93	6	115	3.918	1.656	2.262	9.74	2.27	-0.07	3	2.94	10.59	1.00E-9	8.0	5.5				1298	1.47	0.65	2.9
20.950	68.734	25.058	0.421	2.127		25.09	1.68	6	115	3.956	1.676	2.280	9.27	1.99	-0.07	3	2.93	10.11	1.00E-9	7.7	5.2				1254	1.41	0.62	2.8
21.150	69.390	26.318	0.476	1.944		26.35	1.81	6	115	3.994	1.697	2.297	9.73	2.13	-0.07	3	2.93	10.63	1.00E-9	8.0	5.5				1317	1.49	0.65	2.9
21.350	70.046	28.037	0.536	1.867		28.06	1.91	6	115	4.031	1.717	2.314	10.39	2.23	-0.07	3	2.91	11.39	1.00E-9	8.5	5.7				1403	1.60	0.69	3.1
21.550	70.702	24.532	0.398	1.786		24.56	1.62	6	115	4.069	1.738	2.331	8.79	1.94	-0.08	3	2.94	9.58	1.00E-9	7.6	5.1				1228	1.37	0.59	2.6
21.750	71.358	24.733	0.375	1.706		24.76	1.52	6	115	4.106	1.758	2.348	8.79	1.82	-0.08	4	2.93	9.63	3.00E-8	7.6	5.1				1238	1.38	0.59	2.6
21.950	72.014	33.614	0.560	1.604		33.64	1.67	6	115	4.144	1.779	2.365	12.47	1.90	-0.06	4	2.81	14.07	3.00E-8	9.6	6.4				1682	1.97	0.83	3.7
22.150	72.671	36.154	0.609	1.614		36.18	1.68	6	115	4.182	1.799	2.382	13.43	1.90	-0.05	4	2.78	15.26	3.00E-8	10.2	6.8				1809	2.13	0.90	4.0
22.350	73.327	88.494	1.362	3.548		88.55	1.54	7	118	4.220	1.820	2.401	35.13	1.62	-0.02	5	2.40	43.93	3.00E-6	20.5	13.6	35	35	354	1095			
22.550	73.983	200.308	3.528	3.966		200.36	1.76	8	121	4.260	1.840	2.420	81.04	1.80	-0.01	5	2.15	108.05	3.00E-6	41.8	27.6	56	39	801	1441			
22.750	74.639	259.533	3.171	1.278		259.55	1.22	9	124	4.301	1.861	2.440	104.61	1.24	-0.01	6	1.96	146.72	3.00E-4	50.2	33.1	65	41	1038	1575			
22.950	75.295	323.418	1.424	8.486		323.54	0.44	10	127	4.342	1.881	2.461	129.69	0.45	0.00	6	1.61	197.80	3.00E-4	55.4	36.3	75	42	1294	1700			
23.150	75.951	304.443	0.904	12.385		304.62	0.30	10	127	4.384	1.902	2.483	120.94	0.30	0.00	6	1.55	185.25	3.00E-4	51.1	33.4	73	42	1218	1671			
23.350	76.608	406.736	1.278	10.122		406.88	0.31	10	127	4.426	1.922	2.504	160.73	0.32	0.00	6	1.46	247.26	3.00E-4	66.2	43.0	84	43	1628	1846			
23.550	77.264	435.995	1.024	6.886		436.09	0.23	10	127	4.468	1.943	2.525	170.93	0.24	0.00	6	1.37	264.06	3.00E-4	69.1	44.7	87	43	1744	1894			
23.750	77.920	344.961	1.615	0.716		344.97	0.47	10	127	4.509	1.963	2.546	133.70	0.47	-0.01	6	1.62	207.41	3.00E-4	59.1	38.1	77	42	1380	1757			
23.950	78.576	93.326	2.375	-1.225		93.31	2.55	7	118	4.548	1.983	2.565	34.61	2.68	-0.02	4	2.54	42.45	3.00E-8	23.2	14.9				4665	5.92	2.31	10.4
24.150	79.232	49.189	1.219	2.120		49.22	2.48	6	115	4.586	2.004	2.582	17.29	2.73	-0.04	4	2.78	19.91	3.00E-8	13.8	8.8				2461	2.98	1.15	5.2
24.350	79.888	81.313	2.325	3.085		81.36	2.86	6	115	4.623	2.024	2.599	29.53	3.03	-0.02	4	2.63	35.48	3.00E-8	21.1	13.4				4068	5.12	1.97	8.9
24.550	80.545	147.118	2.950	-0.747		147.11	2.01	7	118	4.662	2.045	2.617	54.43	2.07	-0.01	5	2.32	71.23	3.00E-6	33.0	21.0	45	37	588	1334			
24.750	81.201	57.506	1.544	-4.481		57.44	2.69	6	115	4.699	2.065	2.634	20.02	2.93	-0.05	4	2.75	23.34	3.00E-8	15.9	10.1				2872	3.52	1.33	6.0
24.950	81.857	36.173	0.678	-4.987		36.10	1.88	6	115	4.737	2.086	2.651	11.83	2.16	-0.08	4	2.86	13.39	3.00E-8	10.6	6.7				1805	2.09	0.79	3.5
25.150	82.513	41.148	0.818	-4.899		41.08	1.99	6	115	4.775	2.106	2.668	13.60	2.25	-0.07	4	2.82	15.59	3.00E-8	11.8	7.4				2054	2.42	0.91	4.1
25.350	83.169	37.395	0.783	-4.755		37.33	2.10	6	115	4.812	2.127	2.686	12.11	2.41	-0.08	4	2.87	13.66	3.00E-8	11.1	7.0				1866	2.17	0.81	3.6
25.550	83.825	36.899	0.894	-4.682		36.83	2.43	6	115	4.850	2.147	2.703	11.83	2.80	-0.08	3	2.92	13.20	1.00E-9	11.2	7.0				1842	2.13	0.79	3.6
25.750	84.482	38.369	1.147	-4.615		38.30	3.00	6	115	4.887	2.168	2.720	12.29	3.43	-0.07	3	2.96	13.56	1.00E-9	12.0	7.5				1915	2.23	0.82	3.7
25.950	85.138	38.284	0.963	-4.492		38.22	2.52	6	115	4.925	2.188	2.737	12.16	2.89	-0.08	3	2.92	13.59	1.00E-9	11.6	7.2				1911	2.22	0.81	3.6
26.150	85.794	42.352	0.863	-4.296		42.29	2.04	6	115	4.963	2.209	2.754	13.55	2.31	-0.07	4	2.82	15.57	3.00E-8	12.2	7.6				2114	2.49	0.90	4.1
26.350	86.450	43.975	0.893	-4.120		43.92	2.03	6	115	5.000	2.229	2.771	14.04	2.29	-0.06	4	2.81	16.21	3.00E-8	12.6	7.8				2196	2.59	0.94	4.2
26.550	87.106	40.022	0.690	-3.969		39.96	1.73	7	118	5.039	2.250	2.789	12.52	1.97	-0.07	4	2.82	14.45	3.00E-8	11.5	7.1				1998	2.33	0.83	3.8
26.750	87.762	46.372	1.053	-3.797		46.32	2.27	6	115	5.076	2.270	2.806	14.70	2.55	-0.06	4	2.82	16.95	3.00E-8	13.3	8.2				2316	2.75	0.98	4.4
26.950	88.419	45.961	1.490	-3.527		45.91	3.24	6	115	5.114	2.291	2.824	14.45	3.65	-0.06	3	2.92	16.20	1.00E-9	14.0	8.6				2296	2.72	0.96	4.3
27.150	89.075	80.282	4.241	-3.274		80.23	5.29	11	131	5.157	2.311	2.846	26.38	5.65	-0.03	3	2.84	30.27	1.00E-9	23.4	14.3				4012	5.01	1.76	7.9
27.350	89.731	63.704	2.783	-3.078		63.66	4.37	5	115	5.194	2.331	2.863	20.42	4.76	-0.04	3	2.88	23.23	1.00E-9	18.9	11.5				3183	3.90	1.36	6.1
27.550	90.387	43.077	1.386	-2.829		43.04	3.22	6	115	5.232	2.352	2.880	13.13	3.67	-0.07	3	2.95	14.60	1.00E-9	13.4	8.1				2152	2.52	0.88	3.9
27.750	91.043	43.946	1.006	-2.720		43.91	2.29	6	115	5.270	2.372	2.897	13.34	2.60	-0.07	4	2.86	15.27	3.00E-8	12.9	7.8				2195	2.58	0.89	4.0
27.950	91.699	35.810	0.707	-2.527		35.77	1.98	6	115	5.307	2.393	2.914	10.45	2.32	-0.08	3	2.92	11.76	1.00E-9	10.9	6.6				1789	2.03	0.70	3.1
28.150	92.356	32.640	0.492	-2.351		32.61	1.51	7	118	5.346	2.413	2.933	9.30	1.80	-0.09	4	2.90	10.51	3.00E-8	9.8	5.9				1630	1.82	0.62	2.8
28.350	93.012	34.941	0.582	-2.246		34.91	1.67	6	115	5.383	2.434	2.950	10.01	1.97	-0.09	4	2.90	11.35	3.00E-8	10.5	6.3				1745	1.97	0.67	3.0
28.550	93.668	42.886	0.644	-2.102		42.86	1.50	7	118	5.422	2.454	2.968	12.61	1.72	-0.07	4	2.78	14.84	3.00E-8	12.1	7.2				2143	2.50	0.84	3.8
28.750	94.324	42.772	0.720	-1.891		42.74	1.68	7	118	5.461	2.475	2.986	12.49	1.93	-0.07	4	2.81	14.57	3.00E-8	12.2	7.3				2137	2.49	0.83	3.7
28.950	94.980	45.379	0.794	-1.403		45.36	1.75	7	118	5.499	2.495	3.004	13.27	1.99	-0.07	4	2.80	15.57	3.00E-8	12.9	7.6				2268	2.66	0.88	4.0
29.150	95.636	51.500	0.931	-0.122		51.50	1.81	7	118	5.538	2.516	3.022	15.21	2.03	-0.05	4	2.75	18.12	3.00E-8	14.2	8.4				2575	3.06	1.01	4.6
29.350	96.293	49.848	0.858	0.383		49.85	1.72	7	118	5.577	2.536	3.040	14.56	1.94	-0.06	4	2.76	17.34	3.00E-8	13.8	8.2				2493	2.95	0.97	4.4
29.550	96.949	51.395	0.871	0.825		51.41	1.69	7	118	5.615	2.557	3.059	14.97	1.90	-0.05	4	2.74	17.93	3.00E-8	14.1	8.3				2570	3.05	1.00	4.5
29.750	97.605	43.669	0.767	1.319		43.69	1.76	7	118	5.654	2.577	3.077	12.36	2.02	-0.07	4	2.82	14.42	3.00E-8	12.6	7.4				2184	2.54	0.82	3.7
29.950	98.261	54.116	1.044	2.186		54.15	1.93	7	118	5.693	2.598	3.095	15.66	2.15	-0.05	4	2.76	18.70	3.00E-8	15.0	8.8				2707	3.23	1.04	4.7
30.150	98.917	56.141	1.050	3.190		56.19	1.87	7	118	5.731	2.618	3.113	16.21	2.08	-0.05	4	2.73	19.51	3.00E-8	15.4	9.0				2809	3.36	1.08	4.9
30.350	99.573	53.801	1.141	3.780		53.86	2.12	7	118	5.770	2.639	3.131	15.36	2.37	-0.05	4	2.79	18.19	3.00E-8	15.2	8.8				2693	3.21	1.02	4.6
30.550	100.230	44.691	0.796	4.366		44.75	1.78	7	118	5.809	2.659	3.149	12.37	2.04	-0.06	4	2.83	14.46	3.00E-8	12.9	7.5				2238	2.60	0.82	3.7
30.750	100.886	40.098	0.804	5.019		40.17	2.00	6	115	5.846	2.680	3.167	10.84	2.34	-0.07	3	2.91	12.36	1.00E-9	12.1	7.0				2009	2.29	0.72	3.3
30.950	101.542	41.215	0.593	6.321		41.31	1.44	7	118	5.885	2.700	3.185	11.12	1.68	-0.06	4	2.82	13.06	3.00E-8	11.9	6.8				2065	2.36	0.74	3.3
31.150	102.198	36.106	0.504	8.641		36.23	1.39	7	118	5.923	2.720	3.203	9.46	1.66	-0.07	4	2.88	10.90	3.00E-8	10.7	6.2				1812	2.02	0.63	2.8
31.350	102.854	31.771	0.453	9.943		31.91	1.42	7	118	5.962	2.741	3.221	8.06	1.74	-0.08	3	2.95	9.07	1.00E-9	9.9	5.6				1596	1.73	0.54	2.4
31.550	103.511	33.022	0.388	11.308		33.18	1.17	7	118	6.001	2.761	3.239	8.39	1.43	-0.07	4	2.89	9.64	3.00E-8	9.9	5.7				1659	1.81	0.56	2.5
31.750	104.167	43.555	0.717	13.224		43.75	1.64	7	118	6.039	2.782	3.257	11.58	1.90	-0.05	4	2.84	13.57	3.00E-8	12.6	7.2				2187	2.51	0.77	3.5
31.950	104.823	106.476	2.565	12.877		106.66	2.41	7	118	6.078	2.802	3.276	30.71	2.55	-0.02	4	2.56	39.49	3.00E-8	26.8	15.2				5333	6.71	2.05	9.2
32.150	105.479	160.210	3.897	3.910		160.27	2.43	7	118	6.117	2.823	3.294	46.80	2.53	-0.02	5	2.42	63.23	3.00E-6	37.6	21.3	43	36	641	1482			
32.350	106.135	320.811	2.237	-0.677		320.80	0.70	10	127	6.158	2.843	3.315	94.91	0.71	-0.01	6	1.84	157.00	3.00E-4	59.4	33.6	67	40	1283	1872			
32.550	106.791	348.485	1.911	-5.134		348.41	0.55	10	127	6.200	2.864	3.336	102.57	0.56	-0.01	6	1.75	175.34	3.00E-4	62.5	35.2	71	41	1394	1929			
32.750	107.448	252.075	2.662	-6.433		251.98	1.06	9	124	6.241	2.884	3.357	73.21	1.08	-0.01	6	2.04	113.62	3.00E-4	50.3	28.2	57	39	1008	1735			
32.950	108.104	354.196	1.675	-7.036		354.09	0.47	10	127	6.283	2.905	3.378	102.97	0.48	-0.01	6	1.71	179.28	3.00E-4	62.8	35.1	72	41	1416	1947			

GREGG DRILLING & TESTING, INC.

CONE PENETRATION TEST DATA

Client:	PARIKH CONSULTANTS	Units:	Imperial
Site:	HWY 101	Data averaging interval:	0.200 meters
Engineer:	D.WANG	Assumed depth of water:	13.003 feet
Sounding:	**BR-2**	Net area ratio of cone:	0.80
Date:	12/17/2007	Unit weight of water:	62.4 lb/ft3
Time:	9:01 AM	Relative density constant, CDR:	350
		Young's modulus for sands, a:	4
		Small strain shear modulus number, SG (sands):	180
		Small strain shear modulus number, CG (clays):	50
		Nkt for clays:	15
		OCR number, kocr:	0.3

Interpretation based on Lunne, Robertson and Powell, 1997

Col 1i	Col 2i	Col 3i	Col 4i	Col 5i	Col 6i	Col 7i	Col 8i	Col 9i	Col 10i	Col 11i	Col 12i	Col 13i	Col 14i	Col 15i	Col 16i	Col 17i	Col 18i	Col 19i	Col 20i	Col 21i	Col 22i	Col 23i	Col 24i	Col 25i	Col 26i	Col 27i	Col 28i	Col 29i
Depth	Depth	qc	fs	u	Other	qt	Rf	SBT	Unit Weight, γ	Total Overburden Stress, σv	Insitu pore pressure, uo	Effective overburden stress, σ'v	Normalized cone resistance, Qtl	Normalized Friction raio, Fr	Normalized pore pressure ratio, Bq	Soil Behavior Type (normalized) SBTn	SBTn Index, Ic	Normalized Cone resistance, Qtn	Estimated permeability, kSBT	SPT N60	SPT (N1)60	Relative Density, Dr	Friction Angle, φ'	Young's modulus, Es	Small strain shear modulus, Go	Undrained shear strength, su	Undrained strength ratio, su/σ'v	Over consolidation ratio, OCR
(m)	(ft)	(tsf)	(tsf)	(psi)		(tsf)	(%)		(pcf)	(tsf)	(tsf)	(tsf)							(ft/sec)	(blows/ft)	(blows/ft)	(%)	(degrees)	(tsf)	(tsf)	(tsf)		
0.150	0.492	0.000	0.000	0.000							0.000																	
0.350	1.148	0.000	0.000	0.000							0.000																	
0.550	1.804	0.000	0.000	0.000							0.000																	
0.750	2.461	0.000	0.000	0.000							0.000																	
0.950	3.117	0.000	0.000	0.000							0.000																	
1.150	3.773	0.000	0.000	0.000							0.000																	
1.350	4.429	0.000	0.000	0.000							0.000																	
1.550	5.085	47.564	0.495	0.747		47.57	1.04	7	118	0.299	0.000	0.299	157.88	1.05	0.00	6	1.78	88.43	3.00E-4	8.6	16.2	50	43	190	445			
1.750	5.741	99.968	0.984	0.627		99.98	0.98	8	121	0.339	0.000	0.339	293.81	0.99	0.00	6	1.57	166.33	3.00E-4	16.9	29.9	69	46	400	594			
1.950	6.398	88.627	0.684	0.557		88.64	0.77	8	121	0.379	0.000	0.379	232.98	0.78	0.00	6	1.56	139.40	3.00E-4	14.9	25.0	63	45	355	592			
2.150	7.054	67.511	0.596	-0.049		67.51	0.88	8	121	0.418	0.000	0.418	160.32	0.89	0.00	6	1.72	103.16	3.00E-4	12.0	19.1	54	43	270	559			
2.350	7.710	58.248	0.596	-0.141		58.25	1.02	8	121	0.458	0.000	0.458	126.12	1.03	0.00	6	1.84	87.33	3.00E-4	10.8	16.4	50	42	233	548			
2.550	8.366	45.904	0.739	-0.204		45.90	1.61	7	118	0.497	0.000	0.497	91.39	1.63	0.00	5	2.08	69.19	3.00E-6	9.3	13.6	44	40	184	520			
2.750	9.022	34.246	0.775	-0.793		34.23	2.26	6	115	0.534	0.000	0.534	63.06	2.30	0.00	5	2.30	51.31	3.00E-6	7.6	10.7	38	38	137	483			
2.950	9.678	32.329	0.752	-0.353		32.32	2.33	6	115	0.572	0.000	0.572	55.51	2.37	0.00	5	2.35	46.52	3.00E-6	7.3	10.0	36	37	129	485			
3.150	10.335	34.201	0.665	-0.420		34.19	1.94	6	115	0.610	0.000	0.610	55.09	1.98	0.00	5	2.30	46.64	3.00E-6	7.6	10.0	37	37	137	505			
3.350	10.991	37.036	0.464	-1.139		37.02	1.25	7	118	0.648	0.000	0.648	56.11	1.28	0.00	5	2.17	47.49	3.00E-6	7.8	10.0	37	37	148	529			
3.550	11.647	37.070	0.411	-3.046		37.03	1.11	7	118	0.687	0.000	0.687	52.90	1.13	-0.01	5	2.16	45.61	3.00E-6	7.8	9.6	36	37	148	539			
3.750	12.303	26.854	0.413	-3.715		26.80	1.54	6	115	0.724	0.000	0.724	35.99	1.58	-0.01	5	2.38	32.41	3.00E-6	6.2	7.5	30	35	107	493			
3.950	12.959	22.392	0.341	-4.684		22.32	1.53	6	115	0.762	0.000	0.762	28.30	1.58	-0.02	5	2.47	26.05	3.00E-6	5.4	6.3	27	33	89	472			
4.150	13.615	9.943	0.220	-5.107		9.87	2.23	5	115	0.800	0.019	0.781	11.62	2.43	-0.04	4	2.89	11.19	3.00E-8	3.0	3.5				493	0.60	0.77	3.5
4.350	14.272	7.420	0.114	-4.396		7.36	1.54	5	115	0.837	0.040	0.798	8.17	1.74	-0.05	3	2.95	7.93	1.00E-9	2.3	2.6				368	0.43	0.54	2.5
4.550	14.928	8.032	0.082	-2.034		8.00	1.02	1	111	0.874	0.060	0.814	8.76	1.15	-0.03	4	2.83	8.44	3.00E-8	2.3	2.7				400	0.48	0.58	2.6
4.750	15.584	9.731	0.077	5.562		9.81	0.78	6	115	0.911	0.081	0.831	10.71	0.86	0.04	4	2.70	10.25	3.00E-8	2.6	3.0				491	0.59	0.71	3.2
4.950	16.240	14.761	0.119	39.097		15.32	0.78	6	115	0.949	0.101	0.848	16.95	0.83	0.19	5	2.51	16.08	3.00E-6	3.6	4.0	21	30	61	431			
5.150	16.896	21.467	0.258	18.015		21.73	1.19	6	115	0.987	0.121	0.865	23.97	1.24	0.06	5	2.47	22.79	3.00E-6	5.2	5.7	26	32	87	488			
5.350	17.552	15.730	0.146	36.400		16.25	0.90	6	115	1.024	0.142	0.882	17.26	0.96	0.16	5	2.54	16.55	3.00E-6	3.9	4.3	22	30	65	446			
5.550	18.209	13.853	0.109	57.669		14.68	0.74	6	115	1.062	0.162	0.899	15.15	0.80	0.29	5	2.55	14.60	3.00E-6	3.5	3.8	20	29	59	434			
5.750	18.865	11.831	0.094	51.772		12.58	0.74	6	115	1.099	0.183	0.916	12.52	0.82	0.31	4	2.63	12.16	3.00E-8	3.1	3.3				629	0.77	0.83	3.8
5.950	19.521	10.556	0.083	58.152		11.39	0.73	6	115	1.137	0.203	0.934	10.99	0.81	0.39	4	2.68	10.73	3.00E-8	2.8	3.0				570	0.68	0.73	3.3
6.150	20.177	12.728	0.126	53.016		13.49	0.94	6	115	1.175	0.224	0.951	12.96	1.03	0.29	4	2.66	12.69	3.00E-8	3.4	3.5				675	0.82	0.86	3.9
6.350	20.833	13.547	0.145	45.956		14.21	1.02	6	115	1.212	0.244	0.968	13.43	1.11	0.24	4	2.66	13.20	3.00E-8	3.6	3.7				710	0.87	0.90	4.0
6.550	21.490	13.809	0.132	47.331		14.49	0.91	6	115	1.250	0.265	0.985	13.44	1.00	0.24	4	2.64	13.25	3.00E-8	3.6	3.7				725	0.88	0.90	4.0
6.750	22.146	17.680	0.199	39.777		18.25	1.09	6	115	1.287	0.285	1.002	16.93	1.17	0.15	4	2.59	16.73	3.00E-8	4.5	4.6				913	1.13	1.13	5.1
6.950	22.802	17.736	0.216	8.914		17.86	1.21	6	115	1.325	0.306	1.019	16.23	1.30	0.02	4	2.62	16.10	3.00E-8	4.6	4.7				893	1.10	1.08	4.9
7.150	23.458	18.220	0.279	29.534		18.65	1.50	6	115	1.363	0.326	1.036	16.68	1.62	0.10	4	2.66	16.61	3.00E-8	4.8	4.9				932	1.15	1.11	5.0
7.350	24.114	34.474	0.410	5.389		34.55	1.19	7	118	1.401	0.347	1.054	31.44	1.24	0.00	5	2.37	31.41	3.00E-6	7.9	7.9	30	34	138	608			
7.550	24.770	23.968	0.398	7.459		24.08	1.65	6	115	1.439	0.367	1.072	21.12	1.76	0.01	4	2.60	21.18	3.00E-8	6.1	6.1				1204	1.51	1.41	6.3
7.750	25.427	50.578	0.617	-1.135		50.56	1.22	7	118	1.477	0.388	1.090	45.04	1.26	-0.01	5	2.24	45.47	3.00E-6	11.0	10.8	36	36	202	698			
7.950	26.083	49.914	0.500	-5.968		49.83	1.00	7	118	1.516	0.408	1.108	43.61	1.03	-0.02	5	2.21	44.27	3.00E-6	10.7	10.4	36	36	199	698			
8.150	26.739	19.262	0.322	-7.085		19.16	1.68	6	115	1.554	0.429	1.125	15.65	1.83	-0.05	4	2.72	15.82	3.00E-8	5.2	5.1				958	1.17	1.04	4.7
8.350	27.395	31.444	0.482	-7.381		31.34	1.54	6	115	1.591	0.449	1.142	26.04	1.62	-0.03	5	2.50	26.53	3.00E-6	7.7	7.4	28	33	125	604			
8.550	28.051	17.485	0.312	-7.839		17.37	1.80	6	115	1.629	0.469	1.159	13.58	1.98	-0.07	4	2.79	13.77	3.00E-8	4.9	4.7				869	1.05	0.91	4.1
8.750	28.707	12.589	0.188	-4.942		12.52	1.50	5	115	1.666	0.490	1.176	9.22	1.73	-0.08	4	2.90	9.34	3.00E-8	3.8	3.6				626	0.72	0.61	2.8
8.950	29.364	22.726	0.367	10.011		22.87	1.61	6	115	1.704	0.510	1.194	17.73	1.73	0.01	4	2.66	18.15	3.00E-8	6.0	5.6				1144	1.41	1.18	5.3
9.150	30.020	40.601	0.432	-0.888		40.59	1.06	7	118	1.743	0.531	1.212	32.06	1.11	-0.02	5	2.34	33.35	3.00E-6	9.2	8.6	31	34	162	672			
9.350	30.676	14.845	0.220	-7.018		14.74	1.49	6	115	1.780	0.551	1.229	10.55	1.69	-0.08	4	2.84	10.77	3.00E-8	4.3	4.0				737	0.86	0.70	3.2
9.550	31.332	10.538	0.139	-6.489		10.44	1.33	5	115	1.818	0.572	1.246	6.92	1.61	-0.12	3	2.99	7.03	1.00E-9	3.4	3.1				522	0.58	0.46	2.1
9.750	31.988	10.879	0.142	4.293		10.94	1.30	5	115	1.855	0.592	1.263	7.19	1.57	-0.03	3	2.97	7.32	1.00E-9	3.4	3.1				547	0.61	0.48	2.2
9.950	32.644	18.501	0.191	53.295		19.27	0.99	6	115	1.893	0.613	1.280	13.57	1.10	0.19	4	2.66	14.09	3.00E-8	4.9	4.4				963	1.16	0.90	4.1
10.150	33.301	21.785	0.222	67.605		22.76	0.98	6	115	1.931	0.633	1.297	16.05	1.07	0.20	4	2.59	16.78	3.00E-8	5.5	5.0				1138	1.39	1.07	4.8
10.350	33.957	31.817	0.549	18.851		32.09	1.71	6	115	1.968	0.654	1.314	22.91	1.82	0.02	4	2.58	24.03	3.00E-8	8.0	7.2				1604	2.01	1.53	6.9
10.550	34.613	26.821	0.508	-1.748		26.80	1.90	6	115	2.006	0.674	1.332	18.62	2.05	-0.03	4	2.68	19.44	3.00E-8	7.1	6.4				1340	1.65	1.24	5.6
10.750	35.269	13.871	0.344	5.086		13.94	2.47	5	115	2.043	0.695	1.349	8.82	2.89	-0.03	3	3.03	9.00	1.00E-9	4.5	4.0				697	0.79	0.59	2.6
10.950	35.925	13.731	0.364	34.455		14.23	2.56	5	115	2.081	0.715	1.366	8.89	3.00	0.15	3	3.04	9.08	1.00E-9	4.5	4.0				711	0.81	0.59	2.7
11.150	36.581	15.992	0.488	32.171		16.46	2.96	5	115	2.119	0.736	1.383	10.37	3.40	0.11	3	3.02	10.61	1.00E-9	5.2	4.5				823	0.96	0.69	3.1
11.350	37.238	14.249	0.452	23.729		14.59	3.10	5	115	2.156	0.756	1.400	8.88	3.64	0.08	3	3.09	9.05	1.00E-9	4.8	4.2				730	0.83	0.59	2.7
11.550	37.894	14.772	0.339	53.961		15.55	2.18	5	115	2.194	0.777	1.417	9.42	2.54	0.23	3	2.98	9.70	1.00E-9	4.7	4.0				777	0.89	0.63	2.8
11.750	38.550	23.428	0.394	90.837		24.74	1.59	6	115	2.231	0.797	1.434	15.69	1.75	0.26	4	2.70	16.58	3.00E-8	6.3	5.4				1237	1.50	1.05	4.7
11.950	39.206	21.284	0.316	84.651		22.50	1.41	6	115	2.269	0.818	1.451	13.94	1.56	0.26	4	2.72	14.74	3.00E-8	5.8	4.9				1125	1.35	0.93	4.2
12.150	39.862	27.623	0.395	77.542		28.74	1.37	6	115	2.307	0.838	1.469	18.00	1.49	0.18	4	2.62	19.26	3.00E-8	7.1	6.0				1437	1.76	1.20	5.4
12.350	40.518	24.334	0.354	56.759		25.15	1.41	6	115	2.344	0.858	1.486	15.35	1.55	0.14	4	2.68	16.35	3.00E-8	6.5	5.5				1258	1.52	1.02	4.6
12.550	41.175	20.913	0.322	69.396		21.91	1.47	6	115	2.382	0.879	1.503	13.00	1.65	0.21	4	2.76	13.77	3.00E-8	5.8	4.9				1096	1.30	0.87	3.9
12.750	41.831	21.746	0.263	75.251		22.83	1.15	6	115	2.419	0.899	1.520	13.43	1.29	0.22	4	2.69	14.35	3.00E-8	5.8	4.9				1141	1.36	0.90	4.0
12.950	42.487	19.735	0.219	74.983		20.81	1.05	6	115	2.457	0.920	1.537	11.94	1.19	0.24	4	2.72	12.75	3.00E-8	5.4	4.5				1041	1.22	0.80	3.6
13.150	43.143	17.942	0.215	83.033		19.14	1.12	6	115	2.495	0.940	1.554	10.71	1.29	0.30	4	2.78	11.38	3.00E-8	5.0	4.2				957	1.11	0.71	3.2
13.350	43.799	16.131	0.280	84.641		17.35	1.62	6	115	2.532	0.961	1.571	9.43	1.89	0.35	4	2.91	9.88	3.00E-8	4.9	4.0				868	0.99	0.63	2.8
13.550	44.455	41.348	0.595	43.538		41.97	1.42	7	118	2.571	0.981	1.589	24.79	1.51	0.05	5	2.50	27.35	3.00E-6	10.1	8.2	28	32	168	744			
13.750	45.112	58.493	1.085	-5.234		58.42	1.86	7	118	2.609	1.002	1.608	34.71	1.94	-0.02	5	2.45	38.66	3.00E-6	13.9	11.3	33	35	234	834			
13.950	45.768	71.009	1.174	-7.427		70.90	1.66	7	118	2.648	1.022	1.626	41.98	1.72	-0.02	5	2.35	47.48	3.00E-6	16.2	13.0	37	36	284	893			
14.150	46.424	67.394	1.279	-4.625		67.33	1.90	7	118	2.687	1.043	1.644	39.32	1.98	-0.02	5	2.41	44.26	3.00E-6	15.8	12.6	36	35	269	881			
14.350	47.080	69.995	1.352	-3.359		69.95	1.93	7	118	2.725	1.063	1.662	40.44	2.01	-0.02	5	2.41	45.69	3.00E-6	16.3	13.0	36	36	280	895			
14.550	47.736	91.585	0.995	-5.784		91.50	1.09	8	121	2.765	1.084	1.681	52.78	1.12	-0.02	5	2.16	61.89	3.00E-6	19.2	15.2	42	37	366	983			
14.750	48.392	76.824	1.057	-7.187		76.72	1.38	7	118	2.804	1.104	1.699	43.49	1.43	-0.02	5	2.29	50.25	3.00E-6	17.0	13.4	38	36	307	930			
14.950	49.049	47.436	1.251	-8.502		47.31	2.64	6	115	2.841	1.125	1.717	25.91	2.81	-0.04	4	2.65	28.50	3.00E-8	12.4	9.8				2366	2.96	1.73	7.8
15.150	49.705	29.945	0.603	-8.749		29.82	2.02	6	115	2.879	1.145	1.734	15.54	2.24	-0.07	4	2.77	16.83	3.00E-8	8.4	6.5				1491	1.80	1.04	4.7
15.350	50.361	19.161	0.380	-8.520		19.04	1.99	6	115	2.916	1.166	1.751	9.21	2.35	-0.11	3	2.97	9.69	1.00E-9	6.0	4.7				952	1.07	0.61	2.8
15.550	51.017	18.599	0.369	-6.242		18.51	1.99	6	115	2.954	1.186	1.768	8.80	2.37	-0.11	3	2.99	9.24	1.00E-9	5.9	4.6				925	1.04	0.59	2.6
15.750	51.673	18.231	0.447	1.311		18.25	2.45	5	115	2.992	1.207	1.785	8.55	2.93	-0.07	3	3.05	8.90	1.00E-9	6.0	4.6				913	1.02	0.57	2.6
15.950	52.329	18.432	0.449	36.623		18.96	2.37	5	115	3.029	1.227	1.802	8.84	2.82	0.09	3	3.03	9.24	1.00E-9	6.0	4.6				948	1.06	0.59	2.7
16.150	52.986	18.042	0.491	73.333		19.10	2.57	5	115	3.067	1.247	1.819	8.81	3.06	0.25	3	3.05	9.19	1.00E-9	5.9	4.5				955	1.07	0.59	2.6
16.350	53.642	18.231	0.572	80.280		19.39	2.95	5	115	3.104	1.268	1.836	8.87	3.51	0.28	3	3.08	9.21	1.00E-9	6.1	4.7				969	1.09	0.59	2.7

Col 1i	Col 2i	Col 3i	Col 4i	Col 5i	Col 6i	Col 7i	Col 8i	Col 9i	Col 10i	Col 11i	Col 12i	Col 13i	Col 14i	Col 15i	Col 16i	Col 17i	Col 18i	Col 19i	Col 20i	Col 21i	Col 22i	Col 23i	Col 24i	Col 25i	Col 26i	Col 27i	Col 28i	Col 29i
Depth	Depth	qc	fs	u	Other	qt	Rf	SBT	Unit Weight, γ	Total Overburden Stress, σv	Insitu pore pressure, uo	Effective overburden stress, σ'v	Normalized cone resistance, Qtl	Normalized Friction raio, Fr	Normalized pore pressure ratio, Bq	Soil Behavior Type (normalized) SBTn	SBTn Index, Ic	Normalized Cone resistance, Qtn	Estimated permeability, kSBT	SPT N60	SPT (N1)60	Relative Density, Dr	Friction Angle, φ'	Young's modulus, Es	Small strain shear modulus, Go	Undrained shear strength, su	Undrained strength ratio, su/σ'v	Over consolidation ratio, OCR
(m)	(ft)	(tsf)	(tsf)	(psi)		(tsf)	(%)		(pcf)	(tsf)	(tsf)	(tsf)							(ft/sec)	(blows/ft)	(blows/ft)	(%)	(degrees)	(tsf)	(tsf)	(tsf)		
16.550	54.298	18.081	0.567	83.558		19.28	2.94	5	115	3.142	1.288	1.854	8.71	3.51	0.29	3	3.09	9.04	1.00E-9	6.1	4.6				964	1.08	0.58	2.6
16.750	54.954	20.465	0.558	83.798		21.67	2.58	5	115	3.180	1.309	1.871	9.89	3.02	0.26	3	3.00	10.41	1.00E-9	6.6	4.9				1084	1.23	0.66	3.0
16.950	55.610	18.454	0.572	90.390		19.76	2.89	5	115	3.217	1.329	1.888	8.76	3.46	0.31	3	3.08	9.11	1.00E-9	6.2	4.6				988	1.10	0.58	2.6
17.150	56.266	19.072	0.770	73.816		20.14	3.83	4	115	3.255	1.350	1.905	8.86	4.56	0.23	3	3.15	9.12	1.00E-9	6.7	5.0				1007	1.13	0.59	2.7
17.350	56.923	18.560	0.657	73.604		19.62	3.35	5	115	3.292	1.370	1.922	8.49	4.03	0.24	3	3.13	8.77	1.00E-9	6.4	4.8				981	1.09	0.57	2.5
17.550	57.579	18.616	0.606	88.860		19.90	3.05	5	115	3.330	1.391	1.939	8.54	3.66	0.30	3	3.10	8.87	1.00E-9	6.4	4.7				995	1.10	0.57	2.6
17.750	58.235	19.796	0.824	66.763		20.76	3.97	4	115	3.368	1.411	1.956	8.89	4.74	0.20	3	3.15	9.14	1.00E-9	7.0	5.2				1038	1.16	0.59	2.7
17.950	58.891	20.437	0.834	62.984		21.34	3.91	4	115	3.405	1.432	1.973	9.09	4.65	0.17	3	3.14	9.38	1.00E-9	7.2	5.2				1067	1.20	0.61	2.7
18.150	59.547	19.485	0.630	90.706		20.79	3.03	5	115	3.443	1.452	1.991	8.72	3.63	0.29	3	3.09	9.07	1.00E-9	6.6	4.8				1040	1.16	0.58	2.6
18.350	60.203	20.276	0.691	95.694		21.65	3.19	5	115	3.480	1.473	2.008	9.05	3.80	0.30	3	3.09	9.43	1.00E-9	6.9	5.0				1083	1.21	0.60	2.7
18.550	60.860	20.331	0.684	80.171		21.49	3.18	5	115	3.518	1.493	2.025	8.87	3.80	0.24	3	3.10	9.24	1.00E-9	6.9	5.0				1074	1.20	0.59	2.7
18.750	61.516	20.526	0.417	100.485		21.97	1.90	6	115	3.555	1.514	2.042	9.02	2.26	0.31	3	2.97	9.64	1.00E-9	6.4	4.6				1099	1.23	0.60	2.7
18.950	62.172	19.952	0.408	106.861		21.49	1.90	6	115	3.593	1.534	2.059	8.69	2.28	0.34	3	2.98	9.27	1.00E-9	6.3	4.5				1075	1.19	0.58	2.6
19.150	62.828	19.824	0.420	107.812		21.38	1.96	6	115	3.631	1.555	2.076	8.55	2.37	0.35	3	3.00	9.10	1.00E-9	6.3	4.5				1069	1.18	0.57	2.6
19.350	63.484	19.724	0.392	124.707		21.52	1.82	6	115	3.668	1.575	2.093	8.53	2.20	0.41	3	2.98	9.12	1.00E-9	6.2	4.4				1076	1.19	0.57	2.6
19.550	64.140	23.294	0.687	93.407		24.64	2.79	5	115	3.706	1.595	2.110	9.92	3.28	0.25	3	3.02	10.52	1.00E-9	7.6	5.3				1232	1.40	0.66	3.0
19.750	64.797	30.675	1.135	73.354		31.73	3.58	5	115	3.743	1.616	2.128	13.16	4.05	0.13	3	2.98	14.09	1.00E-9	9.7	6.8				1587	1.87	0.88	3.9
19.950	65.453	39.337	1.333	74.820		40.41	3.30	5	115	3.781	1.636	2.145	17.08	3.64	0.10	3	2.86	18.78	1.00E-9	11.6	8.1				2021	2.44	1.14	5.1
20.150	66.109	31.165	0.822	34.747		31.67	2.60	6	115	3.819	1.657	2.162	12.88	2.95	0.03	3	2.90	14.05	1.00E-9	9.4	6.6				1583	1.86	0.86	3.9
20.350	66.765	22.904	0.624	24.663		23.26	2.68	5	115	3.856	1.677	2.179	8.91	3.22	0.01	3	3.06	9.40	1.00E-9	7.6	5.3				1163	1.29	0.59	2.7
20.550	67.421	23.412	0.530	44.796		24.06	2.20	6	115	3.894	1.698	2.196	9.18	2.63	0.08	3	3.00	9.83	1.00E-9	7.5	5.2				1203	1.34	0.61	2.8
20.750	68.077	26.932	0.620	76.861		28.04	2.21	6	115	3.931	1.718	2.213	10.89	2.57	0.16	3	2.93	11.84	1.00E-9	8.2	5.7				1402	1.61	0.73	3.3
20.950	68.734	46.461	0.961	79.840		47.61	2.02	6	115	3.969	1.739	2.230	19.57	2.20	0.09	4	2.68	22.51	3.00E-8	12.4	8.5				2381	2.91	1.30	5.9
21.150	69.390	113.437	1.422	0.356		113.44	1.25	8	121	4.009	1.759	2.249	48.65	1.30	-0.02	5	2.23	62.12	3.00E-6	24.4	16.8	42	37	454	1163			
21.350	70.046	63.751	1.852	12.625		63.93	2.90	6	115	4.046	1.780	2.267	26.42	3.09	-0.01	4	2.67	30.57	3.00E-8	16.9	11.5				3197	3.99	1.76	7.9
21.550	70.702	187.197	1.993	7.768		187.31	1.06	9	124	4.087	1.800	2.287	80.12	1.09	-0.01	6	2.01	108.18	3.00E-4	36.9	25.1	56	39	749	1383			
21.750	71.358	513.404	2.438	10.744		513.56	0.47	10	127	4.129	1.821	2.308	220.71	0.48	0.00	6	1.44	325.98	3.00E-4	83.1	56.3	97	45	2054	1941			
21.950	72.014	568.070	2.989	10.557		568.22	0.53	10	127	4.171	1.841	2.329	242.14	0.53	0.00	6	1.44	359.28	3.00E-4	91.9	61.9	101	45	2273	2014			
22.150	72.671	482.991	1.658	8.262		483.11	0.34	10	127	4.212	1.862	2.351	203.72	0.35	0.00	6	1.39	303.65	3.00E-4	76.9	51.6	93	44	1932	1914			
22.350	73.327	503.740	2.967	0.539		503.75	0.59	10	127	4.254	1.882	2.372	210.58	0.59	0.00	6	1.52	315.29	3.00E-4	83.6	55.8	95	44	2015	1946			
22.550	73.983	421.435	2.918	9.016		421.56	0.69	10	127	4.296	1.903	2.393	174.35	0.70	0.00	6	1.63	262.21	3.00E-4	72.5	48.2	87	43	1686	1840			
22.750	74.639	643.479	2.450	-3.454		643.43	0.38	10	127	4.338	1.923	2.415	264.68	0.38	0.00	7	1.32	399.83	3.00E-2	100.3	66.4	107	45	2574	2124			
22.950	75.295	572.588	2.100	-7.300		572.48	0.37	10	127	4.379	1.944	2.436	233.22	0.37	0.00	6	1.35	353.86	3.00E-4	90.2	59.5	101	45	2290	2049			
23.150	75.951	394.976	1.479	-8.206		394.86	0.37	10	127	4.421	1.964	2.457	158.89	0.38	-0.01	6	1.50	242.14	3.00E-4	65.1	42.8	83	43	1579	1816			
23.350	76.608	405.911	2.541	-8.470		405.79	0.63	10	127	4.463	1.984	2.479	161.92	0.63	-0.01	6	1.62	247.82	3.00E-4	69.7	45.6	84	43	1623	1838			
23.550	77.264	354.804	3.261	0.546		354.81	0.92	9	124	4.504	2.005	2.499	140.19	0.93	-0.01	6	1.78	207.86	3.00E-4	64.3	41.9	77	42	1419	1762			
23.750	77.920	298.740	2.293	10.828		298.90	0.77	9	124	4.544	2.025	2.519	116.85	0.78	0.00	6	1.79	173.42	3.00E-4	54.4	35.2	70	41	1196	1669			
23.950	78.576	522.300	2.297	11.061		522.46	0.44	10	127	4.586	2.046	2.540	203.86	0.44	0.00	6	1.45	315.88	3.00E-4	84.8	54.7	95	44	2090	2016			
24.150	79.232	505.238	2.617	12.361		505.42	0.52	10	127	4.628	2.066	2.562	195.50	0.52	0.00	6	1.51	304.18	3.00E-4	83.5	53.7	93	44	2022	1999			
24.350	79.888	287.216	2.128	12.055		287.39	0.74	9	124	4.669	2.087	2.582	109.50	0.75	0.00	6	1.80	163.77	3.00E-4	52.5	33.6	68	41	1150	1661			
24.550	80.545	158.678	1.813	15.347		158.90	1.14	9	124	4.709	2.107	2.602	59.26	1.18	-0.01	5	2.13	81.36	3.00E-6	32.9	21.0	48	38	636	1366			
24.750	81.201	389.473	1.523	5.382		389.55	0.39	10	127	4.751	2.128	2.623	146.68	0.40	0.00	6	1.54	230.96	3.00E-4	65.1	41.3	81	43	1558	1848			
24.950	81.857	177.516	2.126	-3.736		177.46	1.20	9	124	4.792	2.148	2.644	65.31	1.23	-0.01	5	2.11	90.71	3.00E-6	36.5	23.1	51	38	710	1425			
25.150	82.513	117.520	2.850	-4.974		117.45	2.43	7	118	4.831	2.169	2.662	42.31	2.53	-0.02	5	2.46	53.53	3.00E-6	28.0	17.7	39	36	470	1245			
25.350	83.169	38.423	1.501	-5.171		38.35	3.91	5	115	4.868	2.189	2.679	12.50	4.48	-0.08	3	3.02	13.53	1.00E-9	12.5	7.8				1917	2.23	0.83	3.7
25.550	83.825	34.942	1.352	-3.941		34.89	3.87	5	115	4.906	2.210	2.696	11.12	4.51	-0.08	3	3.06	11.90	1.00E-9	11.6	7.3				1744	2.00	0.74	3.3
25.750	84.482	33.237	0.986	-2.083		33.21	2.97	5	115	4.943	2.230	2.713	10.42	3.49	-0.08	3	3.02	11.30	1.00E-9	10.8	6.7				1660	1.88	0.69	3.1
25.950	85.138	37.983	0.948	-0.472		37.98	2.50	6	115	4.981	2.251	2.730	12.08	2.87	-0.07	3	2.92	13.49	1.00E-9	11.6	7.2				1899	2.20	0.81	3.6
26.150	85.794	39.754	0.877	0.698		39.76	2.20	6	115	5.019	2.271	2.747	12.65	2.52	-0.06	4	2.87	14.33	3.00E-8	11.8	7.3				1988	2.32	0.84	3.8
26.350	86.450	39.014	1.001	1.590		39.04	2.56	6	115	5.056	2.292	2.765	12.29	2.95	-0.06	3	2.92	13.74	1.00E-9	11.9	7.3				1952	2.27	0.82	3.7
26.550	87.106	45.447	1.645	2.897		45.49	3.62	5	115	5.094	2.312	2.782	14.52	4.07	-0.05	3	2.95	16.13	1.00E-9	14.0	8.7				2274	2.69	0.97	4.4
26.750	87.762	45.881	1.780	4.533		45.95	3.87	5	115	5.131	2.332	2.799	14.58	4.36	-0.05	3	2.96	16.12	1.00E-9	14.3	8.8				2297	2.72	0.97	4.4
26.950	88.419	55.629	2.000	7.733		55.74	3.59	5	115	5.169	2.353	2.816	17.96	3.95	-0.04	3	2.87	20.44	1.00E-9	16.4	10.1				2787	3.37	1.20	5.4
27.150	89.075	71.638	2.854	12.280		71.82	3.97	5	115	5.206	2.373	2.833	23.51	4.28	-0.02	3	2.80	27.32	1.00E-9	20.3	12.4				3591	4.44	1.57	7.1
27.350	89.731	67.009	2.726	15.541		67.23	4.05	5	115	5.244	2.394	2.850	21.75	4.40	-0.02	3	2.83	25.05	1.00E-9	19.4	11.8				3362	4.13	1.45	6.5
27.550	90.387	49.954	1.588	19.450		50.23	3.16	6	115	5.282	2.414	2.867	15.68	3.53	-0.02	3	2.88	17.81	1.00E-9	14.9	9.0				2512	3.00	1.05	4.7
27.750	91.043	39.203	1.201	21.304		39.51	3.04	6	115	5.319	2.435	2.884	11.85	3.51	-0.03	3	2.98	13.09	1.00E-9	12.4	7.5				1975	2.28	0.79	3.6
27.950	91.699	33.822	0.954	26.482		34.20	2.79	6	115	5.357	2.455	2.902	9.94	3.31	-0.02	3	3.02	10.83	1.00E-9	11.0	6.6				1710	1.92	0.66	3.0
28.150	92.356	31.298	0.856	32.153		31.76	2.70	6	115	5.394	2.476	2.919	9.03	3.25	-0.01	3	3.05	9.76	1.00E-9	10.3	6.2				1588	1.76	0.60	2.7
28.350	93.012	32.891	0.869	41.413		33.49	2.60	6	115	5.432	2.496	2.936	9.56	3.10	0.02	3	3.02	10.43	1.00E-9	10.7	6.4				1674	1.87	0.64	2.9
28.550	93.668	41.431	1.085	52.956		42.19	2.57	6	115	5.470	2.517	2.953	12.44	2.95	0.04	3	2.92	14.03	1.00E-9	12.6	7.5				2110	2.45	0.83	3.7
28.750	94.324	38.925	1.232	40.024		39.50	3.12	6	115	5.507	2.537	2.970	11.45	3.62	0.01	3	3.00	12.60	1.00E-9	12.4	7.4				1975	2.27	0.76	3.4
28.950	94.980	34.869	1.089	81.289		36.04	3.02	6	115	5.545	2.558	2.987	10.21	3.57	0.11	3	3.03	11.12	1.00E-9	11.4	6.8				1802	2.03	0.68	3.1
29.150	95.636	37.281	1.197	119.102		39.00	3.07	6	115	5.582	2.578	3.004	11.12	3.58	0.18	3	3.00	12.23	1.00E-9	11.9	7.1				1950	2.23	0.74	3.3
29.350	96.293	45.391	1.480	107.844		46.94	3.15	6	115	5.620	2.599	3.021	13.68	3.58	0.13	3	2.93	15.39	1.00E-9	13.9	8.2				2347	2.75	0.91	4.1
29.550	96.949	45.442	1.383	147.871		47.57	2.91	6	115	5.658	2.619	3.039	13.79	3.30	0.19	3	2.91	15.65	1.00E-9	13.7	8.1				2379	2.79	0.92	4.1
29.750	97.605	86.149	2.771	109.346		87.72	3.16	6	115	5.695	2.640	3.056	26.84	3.38	0.06	4	2.69	32.69	3.00E-8	23.0	13.6				4386	5.47	1.79	8.1
29.950	98.261	117.024	3.986	12.658		117.21	3.40	6	115	5.733	2.660	3.073	36.28	3.58	-0.02	4	2.61	45.38	3.00E-8	30.0	17.6				5860	7.43	2.42	10.9
30.150	98.917	172.414	2.685	7.624		172.52	1.56	8	121	5.772	2.681	3.092	53.93	1.61	-0.01	5	2.25	75.79	3.00E-6	37.5	21.9	47	37	690	1488			
30.350	99.573	244.275	1.782	10.740		244.43	0.73	9	124	5.813	2.701	3.112	76.67	0.75	-0.01	6	1.93	119.87	3.00E-4	46.7	27.2	59	39	978	1674			

Pore Pressure Dissipation Tests (PPDT)

Pore Pressure Dissipation Tests (PPDT's) conducted at various intervals measured hydrostatic water pressures and determined the approximate depth of the ground water table. A PPDT is conducted when the cone is halted at specific intervals determined by the field representative. The variation of the penetration pore pressure (u) with time is measured behind the tip of the cone and recorded by a computer system.

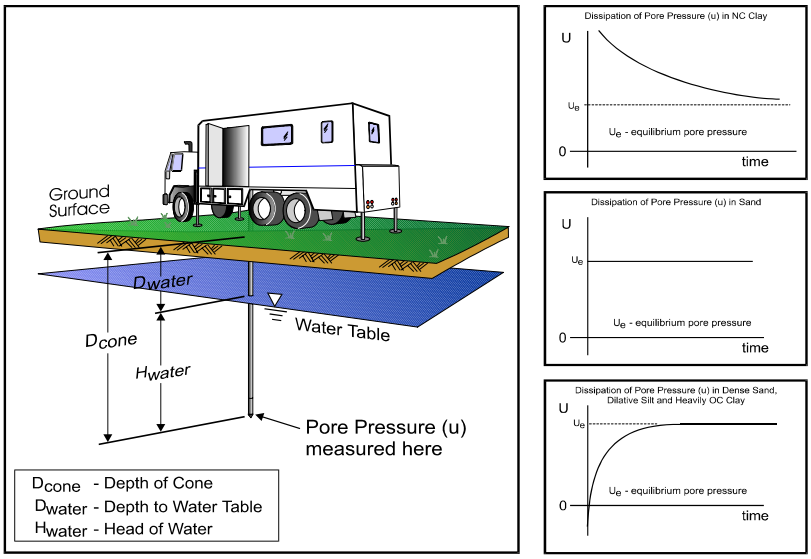
Pore pressure dissipation data can be interpreted to provide estimates of:

- Equilibrium piezometric pressure
- Phreatic Surface
- In situ horizontal coefficient of consolidation (c_h)
- In situ horizontal coefficient of permeability (k_h)

In order to correctly interpret the equilibrium piezometric pressure and/or the phreatic surface, the pore pressure must be monitored until such time as there is no variation in pore pressure with time, *Figure PPDT*. This time is commonly referred to as t_{100}, the point at which 100% of the excess pore pressure has dissipated.

A complete reference on pore pressure dissipation tests is presented by Robertson et al. 1992.

A summary of the pore pressure dissipation tests is summarized in Table 1. Pore pressure dissipation data is presented in graphical form in Appendix PPDT.



Water Table Calculation

$$D_{water} = D_{cone} - H_{water}$$

where $H_{water} = U_e$ (depth units)

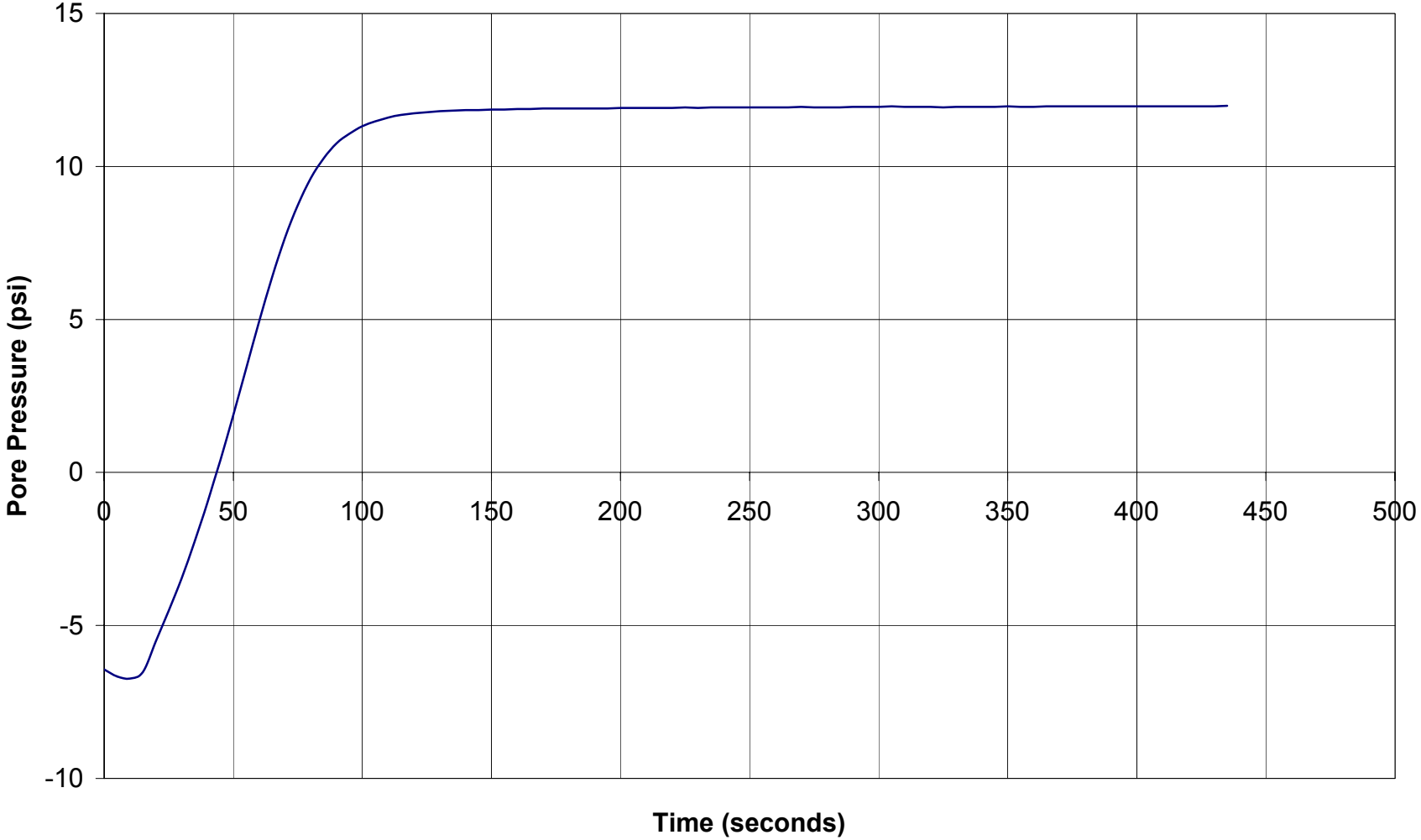
Useful Conversion Factors: 1psi = 0.704m = 2.31 feet (water)
1tsf = 0.958 bar = 13.9 psi
1m = 3.28 feet

Figure PPDT

GREGG DRILLING & TESTING

Pore Pressure Dissipation Test

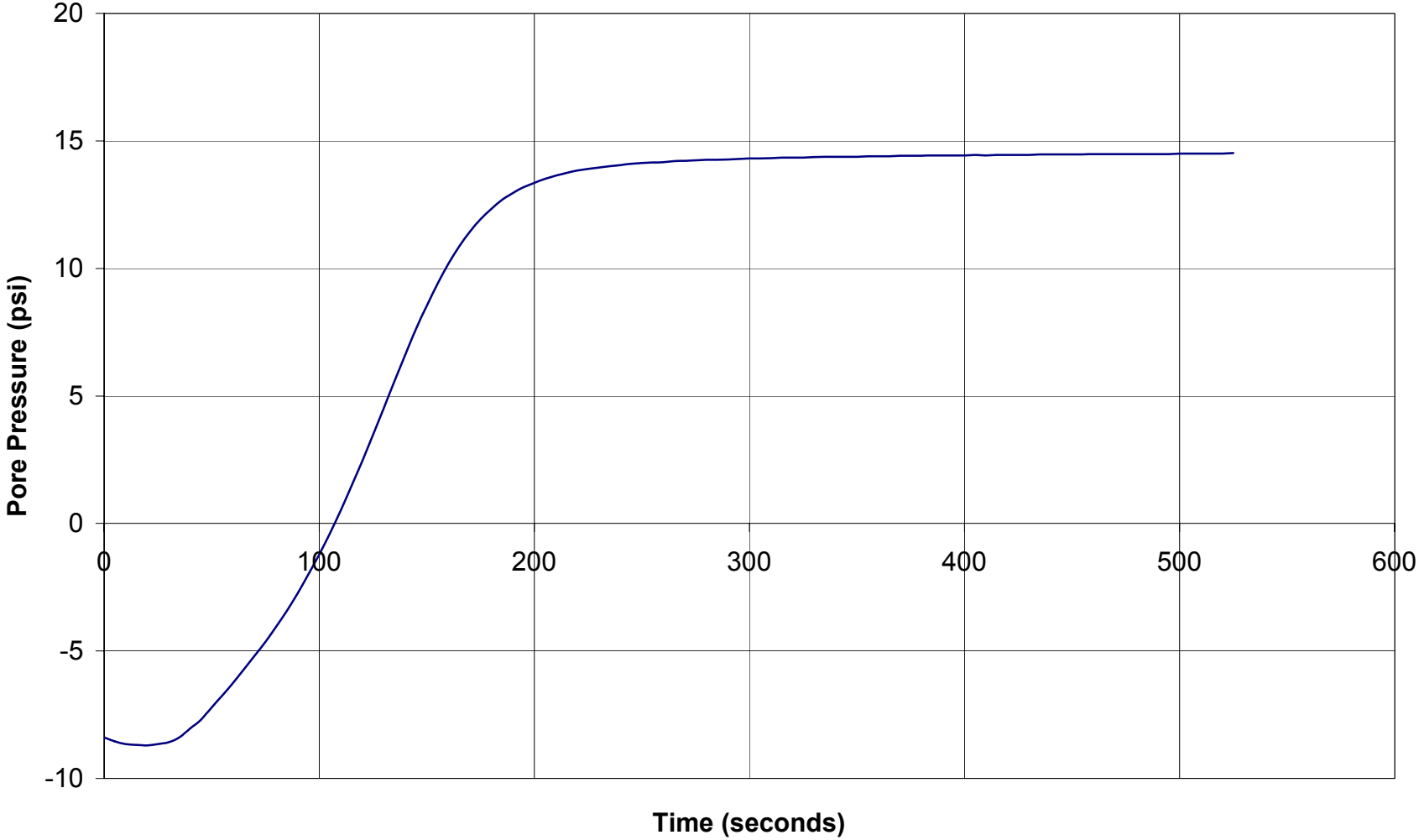
Sounding: BR-1
Depth: 42.815
Site: HWY 101
Engineer: D.WANG



GREGG DRILLING & TESTING

Pore Pressure Dissipation Test

Sounding: BR-2
Depth: 46.424
Site: HWY 101
Engineer: D.WANG



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Copies of ASTM Standards are available through www.astm.org

GREGG IN SITU
Digital File Formats

CPT Data Files

Unless otherwise requested by the client, Gregg CPT data files are named such that the first 3 characters contain Gregg In-Situ, Inc. job number, the next character is typically C for CPT (S if shear waves were collected, R if Resistivity was used, U for UVIF or M for 'Mini-Cone') followed by two or three characters indicating the sounding number. The last character position is reserved for the letters a, b, c, d etc to uniquely identify multiple soundings at the same location. The CPT sounding file has the extension COR and pore pressure dissipation files have the extension PPD. As an example, for job number 05-127 (Job Number 127 in the year 2005) the first sounding will have file names 127C01.COR and 127C01.PPC.

The CPT (COR) file consists of the following components:
1. Two lines of header information
2. Data records
3. End of data marker
4. Units information

Header Lines
Line 1: Columns 1-6 are blank (future use)
Columns 7-21 contain the sounding Date and Time
Columns 22-36 contain the sounding Operator
Line 2: Columns 1-16 contain the sounding ID
Columns 17-31 Field representative
Columns 32-47 contain the project name

Data Records
The data records contain 4 or more columns of data in floating point format. A comma (and spaces) separates each data item:
Column 1: Sounding Depth (m)
Column 2: Tip (q_c) data uncorrected for pore pressure effects. Recorded in units selected by the CPT operator.
Column 3: Sleeve (f_s) data. Recorded in units selected by the operator
Column 4: Dynamic pore pressure readings (u_2). Recorded in units selected by the operator
Column 5: Exists only if specialty modules (Resistivity and/or UVIF) have been used
End of Data Marker
After the last line of data a line containing ASCII 26 (CTL-Z) and a new line (carriage return/ line feed) character. This is used to mark the end of data.
Units Information
The last section of the file contains information about the units that were selected for the sounding. A separator bar makes up the first line. The second line contains the type of units used for depth, q_c, f_s and u_2. The third line contains the conversion values required for Gregg's software to convert the recorded data to an internal set of base units (bar for q_c, bar for f_s and meters for u_2).

CPT Dissipation Files

CPT Dissipation files have the same naming convention as the CPT sounding files and have the extension PPC. PPC files consist of the following components:

1. Two lines of header information
2. Data records

Header Lines (same as COR file):
Line 1: Columns 1-6 are blank (future use)
Columns 7-21 contain the sounding Date and Time
Columns 22-36 contain the sounding Operator
Line 2: Columns 1-16 Sounding or Location ID
Columns 17-31 Field Representative
Columns 32-47 Project Name

Data Records
The data records immediately follow the header lines. Each data record can occupy several lines in the file and is a complete record of a dissipation test at a particular depth. Each data record starts with a line containing two values separated by spaces; the first value being an index number and the second being the dissipation test depth in meters. Following this line are the dissipation pore pressure values stored at 5 second intervals with a maximum of 12 entries per line. The last line of the dissipation record may not contain a full 12 entries. The data record is terminated with an ASCII 30 character (appears as a triangle in some editors). This sequence is repeated for every dissipation test in the sounding. No marker is used to indicate end of file. Unit information is not stored in this file. Users would have to check the CPT file for the units that were used.

APPENDIX B

APPENDIX B

LABORATORY TESTS

Classification Tests

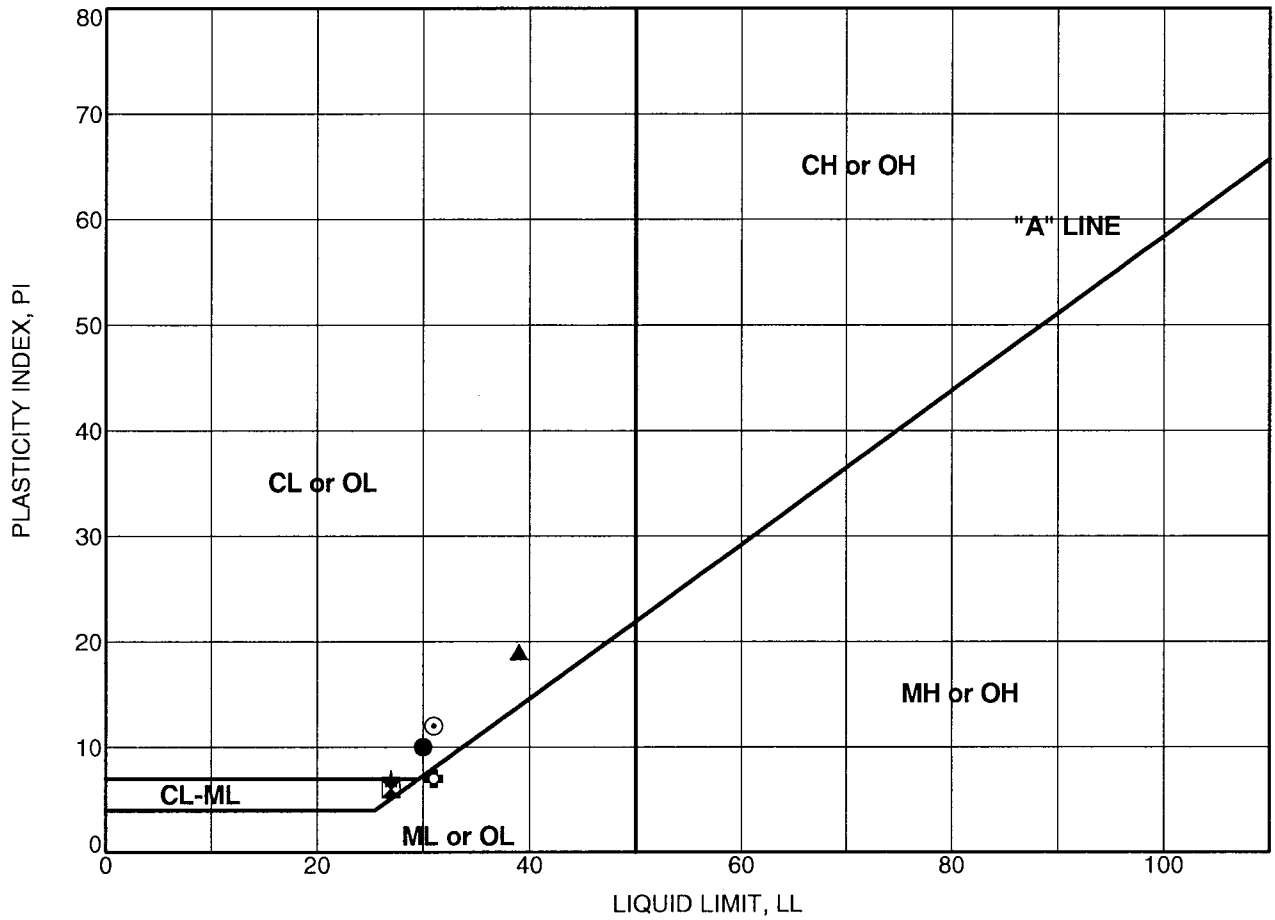
The field classification of the samples was visually verified in the laboratory according to the Unified Soil Classification System. The results are presented in "Log of Test Borings", Appendix A.

Moisture

The natural moisture contents were determined for selected undisturbed samples of the soils in general accordance with ASTM Test Method D 2216-92. This information was used to classify and correlate the soils. The results are presented at the appropriate depths on the "Log of Test Borings", Appendix A.

Atterberg Limits

The Atterberg Limits were determined for selected samples of the fine-grained materials. These results were used to classify the soils, as well as to obtain an indication of the effective strength characteristics and expansion potential with variations in moisture content. The Atterberg Limits were determined in general accordance with ASTM Test Method D 4318-93. The results of these tests are presented on Plate B-2, "Plasticity Chart".



PLASTICITY CHART

Boring Number	Sample Number	Depth (feet)	Test Symbol	Moisture Content (%)	LL	PL	PI	Description
BR-1	1	15.0	●	28	30	20	10	LEAN CLAY (CL)
BR-1	2	20.0	⊠	24	27	21	6	SILT (ML)
BR-1	5	35.0	▲	25	39	20	19	LEAN CLAY (CL)
BR-2	2	20.0	★	19	27	20	7	SILTY CLAY (CL-ML)
BR-2	5	35.0	⊙	27	31	19	12	LEAN CLAY (CL)
BR-2	8	48.0	✿	29	31	24	7	SILT (ML)

PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS ENGINEERING

TULLY ROAD OVERCROSSING - ROUTE 101
SAN JOSE, SANTA CLARA COUNTY, CALIFORNIA

JOB NO: 207150.TUL | PLATE NO: B-2

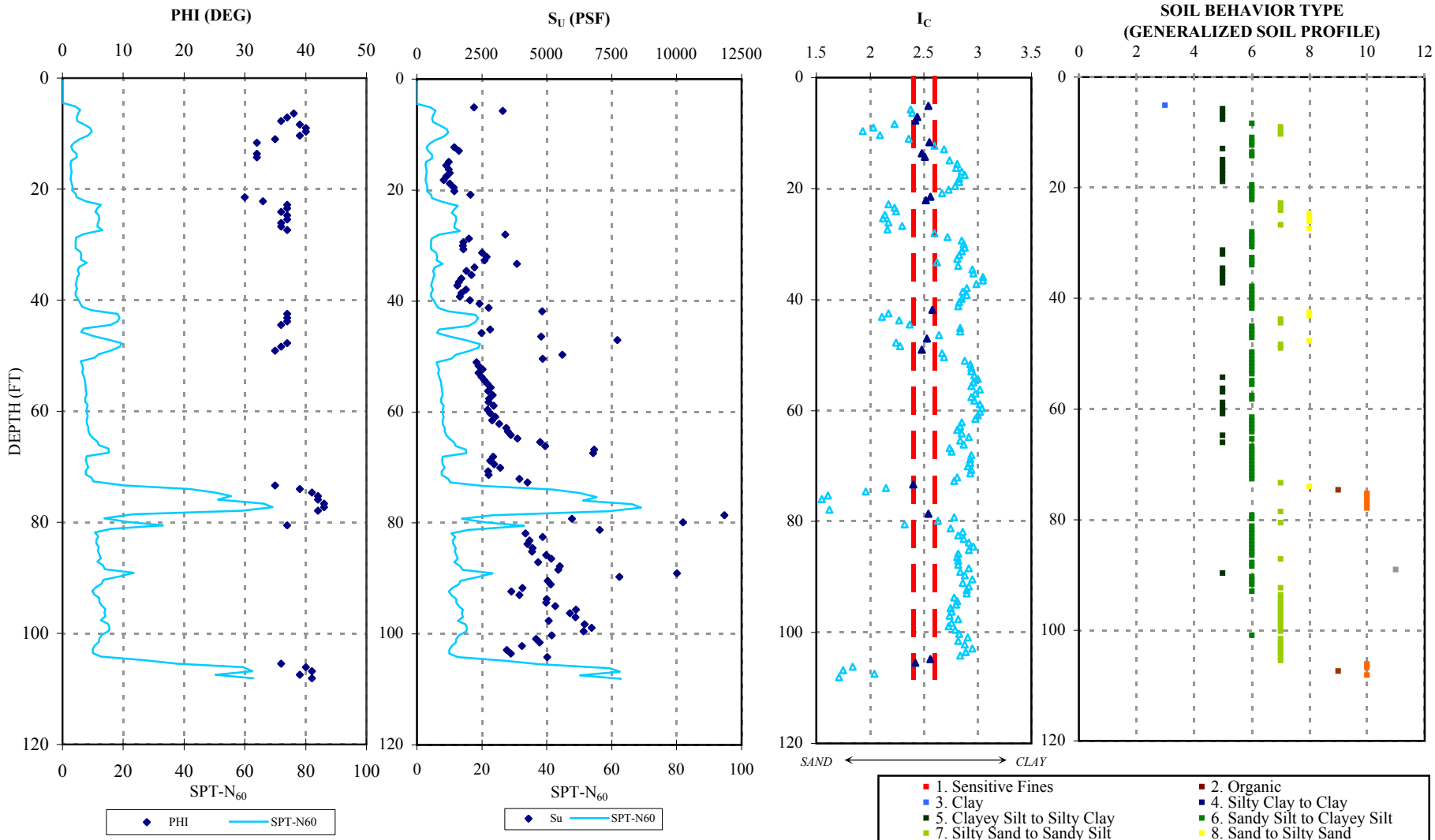
APPENDIX C

APPENDIX C-1

LIQUEFACTION POTENTIAL PER CPT PROCEDURES

CPT DATA CORRELATION

BR-1



Reference: CPT data and correlation provided by Gregg Drilling and Testing, Inc.

PARIKH

Practicing in the Geosciences

HWY 101/TULLY INTERCHANGE
SAN JOSE, CALIFORNIA

JOB NO.: 207150.10

PLATE NO.:

LIQUEFACTION POTENTIAL ANALYSIS (per Youd & Idriss, 2001)

PROJECT NAME ***HWY 101/TULLY***
PROJECT NO. ***207150.10***
CPT NO. ***BR-1***

FAULT INFO
COAST RANGE - SIERRAN BLOCK BOUNDARY ZONE (CSB)
a_{max} *(g)=* 0.6

FAULT M_w = 7.5
MSF = 1.00

			CPT RESULT INPUT							*CSR*		*CRR 7.5*						*F.S.=(CRR 7.5/CSR)*MSF*Kσ*Kα*		
Depth (ft)		Soil Behavior Type	qc (tsf)	fs (tsf)	σ_v (tsf)	u (tsf)	σ_v' (tsf)	Ic*	C_N*	γ_d	CSR	Ic	C_Q	q_{c1N}	K_C	$(q_{c1N})_{cs}$	$CRR_{7.5}$	Kσ	Kα	F.S.
0.492									1.7	1.00	#VALUE!							#VALUE!	1	
1.148									1.7	1.00	#VALUE!							#VALUE!	1	
1.804									1.7	1.00	#VALUE!							#VALUE!	1	
2.461									1.7	1.00	#VALUE!							#VALUE!	1	
3.117									1.7	0.99	#VALUE!							#VALUE!	1	
3.773									1.7	0.99	#VALUE!							#VALUE!	1	
4.429									1.7	0.99	#VALUE!							#VALUE!	1	
5.085	3	Clay	16.721	0.755	0.283		0.283	2.54	1.48348	0.99	0.386	2.540	1.48	24.81	2.979	73.894	0.12	1.00	1	
5.741	5	Clayey Silt to Silty Clay	25.144	0.904	0.321		0.321	2.38	1.44642	0.99	0.386	2.380	1.45	36.37	2.233	81.196	0.13	1.00	1	
6.398	5	Clayey Silt to Silty Clay	22.174	0.657	0.358		0.358	2.39	1.41207	0.99	0.385	2.390	1.41	31.31	2.272	71.140	0.11	1.00	1	
7.054	5	Clayey Silt to Silty Clay	19.91	0.557	0.396		0.396	2.44	1.37845	0.99	0.384	2.440	1.38	27.44	2.483	68.149	0.11	1.00	1	
7.71	5	Clayey Silt to Silty Clay	20.961	0.52	0.434		0.434	2.42	1.34639	0.98	0.384	2.420	1.35	28.22	2.396	67.615	0.11	1.00	1	
8.366	6	Sandy Silt to Clayey Silt	33.213	0.655	0.471		0.471	2.23	1.31658	0.98	0.383	2.230	1.32	43.73	1.743	76.237	0.12	1.00	1	
9.022	7	Silty Sand to Sandy Silt	46.296	0.607	0.51		0.51	2.03	1.28655	0.98	0.383	2.030	1.29	59.56	1.341	79.885	0.13	1.00	1	
9.678	7	Silty Sand to Sandy Silt	50.306	0.482	0.549		0.549	1.93	1.25786	0.98	0.382	1.930	1.26	63.28	1.218	77.102	0.12	1.00	1	
10.335	7	Silty Sand to Sandy Silt	40.843	0.492	0.587		0.587	2.09	1.23111	0.98	0.382	2.090	1.23	50.28	1.437	72.252	0.12	1.00	1	
10.991	6	Sandy Silt to Clayey Silt	24.58	0.371	0.625		0.625	2.36	1.20548	0.98	0.381	2.360	1.21	29.63	2.156	63.896	0.10	1.00	1	
11.647	6	Sandy Silt to Clayey Silt	15.575	0.232	0.662		0.662	2.55	1.18153	0.98	0.381	2.550	1.18	18.40	3.034	55.837	0.10	1.00	1	
12.303	6	Sandy Silt to Clayey Silt	11.517	0.116	0.7		0.7	2.6	1.15789	0.97	0.380							1.00	1	
12.959	5	Clayey Silt to Silty Clay	12.796	0.213	0.738		0.738	2.69	1.13519	0.97	0.379							1.00	1	
13.615	6	Sandy Silt to Clayey Silt	19.605	0.252	0.775		0.775	2.48	1.11392	0.97	0.379	2.480	1.11	21.84	2.669	58.294	0.10	1.00	1	
14.272	6	Sandy Silt to Clayey Silt	18.784	0.231	0.813		0.813	2.51	1.0929	0.97	0.378	2.510	1.09	20.53	2.820	57.882	0.10	1.00	1	
14.928	5	Clayey Silt to Silty Clay	10.036	0.097	0.85		0.85	2.74	1.07317	0.97	0.378							1.00	1	
15.584	5	Clayey Silt to Silty Clay	9.435	0.105	0.888	0.018	0.87	2.81	1.0628	0.97	0.385							1.00	1	
16.24	5	Clayey Silt to Silty Clay	10.103	0.122	0.925	0.039	0.887	2.8	1.05414	0.97	0.393							1.00	1	
16.896	5	Clayey Silt to Silty Clay	10.419	0.162	0.963	0.059	0.904	2.85	1.04563	0.96	0.401							1.00	1	
17.552	5	Clayey Silt to Silty Clay	9.464	0.132	1.001	0.08	0.921	2.88	1.03725	0.96	0.408							1.00	1	
18.209	5	Clayey Silt to Silty Clay	8.89	0.082	1.038	0.1	0.938	2.83	1.029	0.96	0.415							1.00	1	
18.865	5	Clayey Silt to Silty Clay	10.428	0.131	1.076	0.12	0.955	2.83	1.02088	0.96	0.422							1.00	1	
19.521	6	Sandy Silt to Clayey Silt	11.612	0.149	1.113	0.141	0.973	2.79	1.01243	0.96	0.427							1.00	1	
20.177	6	Sandy Silt to Clayey Silt	11.431	0.113	1.151	0.161	0.99	2.73	1.00457	0.96	0.434							1.00	1	
20.833	6	Sandy Silt to Clayey Silt	16.253	0.23	1.189	0.182	1.007	2.67	0.99683	0.95	0.440							1.00	1	
21.49	6	Sandy Silt to Clayey Silt	18.268	0.183	1.226	0.202	1.024	2.56	0.98921	0.95	0.445	2.560	0.99	18.07	3.091	55.849	0.10	1.00	1	0.22
22.146	6	Sandy Silt to Clayey Silt	31.207	0.598	1.264	0.223	1.041	2.52	0.9817	0.95	0.450	2.520	0.98	30.64	2.872	87.975	0.14	0.99	1	0.32
22.802	7	Silty Sand to Sandy Silt	60.027	0.732	1.302	0.243	1.059	2.17	0.97388	0.95	0.455	2.170	0.97	58.46	1.596	93.323	0.16	0.99	1	0.34
23.458	7	Silty Sand to Sandy Silt	53.343	0.68	1.341	0.264	1.077	2.23	0.96618	0.95	0.460	2.230	0.97	51.54	1.743	89.857	0.15	0.99	1	0.32
24.114	7	Silty Sand to Sandy Silt	49.685	0.568	1.38	0.284	1.096	2.24	0.95819	0.94	0.464	2.240	0.96	47.61	1.770	84.288	0.14	0.98	1	0.29
24.77	8	Sand to Silty Sand	57.086	0.532	1.419	0.305	1.115	2.14	0.95032	0.94	0.468	2.140	0.95	54.25	1.532	83.109	0.13	0.98	1	0.29
25.427	8	Sand to Silty Sand	58.576	0.503	1.459	0.325	1.134	2.12	0.94259	0.94	0.472	2.120	0.94	55.21	1.492	82.387	0.13	0.98	1	0.28
26.083	8	Sand to Silty Sand	55.491	0.526	1.499	0.346	1.153	2.17	0.93498	0.94	0.476	2.170	0.93	51.88	1.596	82.825	0.13	0.97	1	0.28
26.739	7	Silty Sand to Sandy Silt	51.748	0.722	1.537	0.366	1.171	2.3	0.92788	0.94	0.479	2.300	0.93	48.02	1.949	93.570	0.16	0.97	1	0.33
27.395	8	Sand to Silty Sand	63.093	0.671	1.577	0.387	1.191	2.16	0.92012	0.93	0.482	2.160	0.92	58.05	1.574	91.390	0.15	0.97	1	0.31
28.051	6	Sandy Silt to Clayey Silt	27.044	0.455	1.615	0.407	1.208	2.6	0.91362	0.93	0.485							0.96	1	
28.707	6	Sandy Silt to Clayey Silt	16.559	0.189	1.652	0.428	1.225	2.72	0.90722	0.93	0.487							0.96	1	
29.364	6	Sandy Silt to Clayey Silt	14.955	0.24	1.69	0.448	1.242	2.85	0.9009	0.92	0.490							0.96	1	
30.02	6	Sandy Silt to Clayey Silt	14.725	0.248	1.727	0.468	1.259	2.87	0.89467	0.92	0.492							0.95	1	
30.676	6	Sandy Silt to Clayey Silt	14.859	0.266	1.765	0.489	1.276	2.88	0.88853	0.92	0.495							0.95	1	
31.332	5	Clayey Silt to Silty Clay	20.331	0.537	1.803	0.509	1.293	2.85	0.88247	0.91	0.497							0.95	1	
31.988	5	Clayey Silt to Silty Clay	21.601	0.567	1.84	0.53	1.31	2.83	0.87649	0.91	0.498							0.95	1	
32.644	6	Sandy Silt to Clayey Silt	20.971	0.482	1.878	0.55	1.327	2.81	0.8706	0.91	0.500							0.94	1	
33.301	6	Sandy Silt to Clayey Silt	30.463	0.567	1.915	0.571	1.345	2.62	0.86444	0.90	0.501							0.94	1	
33.957	6	Sandy Silt to Clayey Silt	18.65	0.33	1.953	0.591	1.362	2.82	0.8587	0.90	0.502							0.94	1	
34.613	5	Clayey Silt to Silty Clay	16.167	0.373	1.991	0.612	1.379	2.95	0.85304	0.89	0.503							0.94	1	
35.269	5	Clayey Silt to Silty Clay	17.724	0.49	2.028	0.632	1.396	2.96	0.84746	0.89	0.504							0.94	1	
35.925	5	Clayey Silt to Silty Clay	14.964	0.429	2.066	0.653	1.413	3.05	0.84194	0.88	0.504							0.93	1	
36.581	5	Clayey Silt to Silty Clay	14.238	0.361	2.103	0.673	1.43	3.05	0.8365	0.88	0.504							0.93	1	
37.238	5	Clayey Silt to Silty Clay	13.713	0.24	2.141	0.694	1.447	2.99	0.83113	0.87	0.504							0.93	1	
37.894	6	Sandy Silt to Clayey Silt	16.148	0.261	2.179	0.714	1.464	2.9	0.82583	0.87	0.504							0.93	1	
38.55	6	Sandy Silt to Clayey Silt	15.06	0.173	2.216	0.735	1.482	2.86	0.82028	0.86	0.504							0.92	1	
39.206	6	Sandy Silt to Clayey Silt	14.429	0.175	2.254	0.755	1.499	2.9	0.81512	0.86	0.503							0.92	1	
39.862	6	Sandy Silt to Clayey Silt	17.304	0.249	2.291	0.776	1.516	2.85	0.81001	0.85	0.502							0.92	1	
40.518	6	Sandy Silt to Clayey Silt	20.054	0.354	2.329	0.796	1.533	2.83	0.80498	0.85	0.502							0.92	1	
41.175	6	Sandy Silt to Clayey Silt	22.518	0.462	2.367	0.817	1.55	2.82	0.8	0.84	0.501							0.92	1	
41.831	6	Sandy Silt to Clayey Silt	38.083	0.679	2.404	0.837	1.567	2.58	0.79508	0.83	0.499	2.580	0.80	30.28	3.206	97.089	0.17	0.91	1	0.33
42.487	8	Sand to Silty Sand	85.772	0.979	2.444	0.857	1.586	2.17	0.78966	0.83	0.498	2.170	0.79	67.73	1.596	108.124	0.20	0.91	1	0.40
43.143	8	Sand to Silty Sand	91.349	0.868	2.484	0.878	1.606	2.11	0.78403	0.82	0.496	2.110	0.78	71.62	1.473	105.509	0.19	0.90	1	0.38
43.799	7	Silty Sand to Sandy Silt	82.449	1.223	2.522	0.898	1.624	2.27	0.77904	0.82	0.494	2.270	0.78	64.23	1.856	119.218	0.24	0.91	1	0.48
44.455	7	Silty Sand to Sandy Silt	68.832	1.151	2.561	0.919	1.642	2.37	0.7741	0.81	0.492	2.370	0.77	53.28	2.194	116.905	0.23	0.91	1	0.46
45.112	6	Sandy Silt to Clayey Silt	23.835	0.476	2.598	0.939	1.659	2.84	0.7695	0.80	0.490							0.90	1	
45.768	6	Sandy Silt to Clayey Silt	21.247	0.34	2.636	0.96	1.676	2.84	0.76495	0.80	0.488							0.90	1	
46.424	6	Sandy Silt to Clayey Silt	38.627	0.741	2.674	0.98	1.693	2.64	0.76046	0.79	0.486							0.90	1	
47.08	6	Sandy Silt to Clayey Silt	60.696	1.489	2.711	1.001	1.71	2.53	0.75601	0.78	0.484	2.530	0.76	45.89	2.925	134.209	0.30	0.90	1	0.63
47.736	8	Sand to Silty Sand	90.165	1.255	2.751	1.021	1.73	2.24	0.75085	0.78	0.481	2.240	0.75	67.70	1.770	119.863	0.24	0.89	1	0.50
48.392	7	Silty Sand to Sandy Silt	85.591	1.276	2.79	1.042	1.748	2.28	0.74627	0.77	0.479	2.280	0.75	63.87	1.886	120.477	0.24	0.89	1	0.51
49.049	7	Silty Sand to Sandy Silt	65.48	1.381	2.828	1.062	1.766	2.48	0.74174	0.76	0.476	2.480	0.74	48.57	2.669	129.648	0.28	0.89	1	0.59
49.705	6	Sandy Silt to Clayey Silt	44.977	1.151	2.866	1.083	1.783	2.67	0.73751	0.76	0.474							0.89	1	
50.361	6	Sandy Silt to Clayey Silt	39.353	0.871	2.903	1.103	1.8	2.69	0.73333	0.75	0.471							0.89	1	
51.017	6	Sandy Silt to Clayey Silt	20.226	0.29	2.941	1.124	1.817	2.88	0.7292	0.74	0.469							0.89	1	
51.673	6	Sandy Silt to Clayey Silt	20.951	0.397	2.979	1.144	1.834	2.93	0.72512	0.74	0.466							0.89	1	
52.329	6	Sandy Silt to Clayey Silt	22.059	0.461	3.016	1.165	1.852	2.94	0.72084	0.73	0.463							0.88	1	
52.986	6	Sandy Silt to Clayey Silt	20.971	0.388	3.054	1.185	1.869	2.94	0.71685	0.72	0.461							0.88	1	
53.642	6	Sandy Silt to Clayey Silt	21.811	0.497	3.091	1.206	1.886	2.97	0.7129	0.72	0.458							0.88	1	
54.298	5	Clayey Silt to Silty Clay	22.785	0.621	3.129	1.226	1.903	3	0.70899	0.71	0.455							0.88	1	
54.954	6	Sandy Silt to Clayey Silt	23.597	0.582	3.167	1.246	1.92	2.96	0.70513	0.70	0.453							0.88	1	
55.61	6	Sandy Silt to Clayey Silt	24.571	0.579	3.204	1.267	1.937	2.94	0.70131	0.70	0.450							0.88	1	
56.266	5	Clayey Silt to Silty Clay	23.797	0.726	3.242	1.287	1.954	3.02	0.69753	0.69	0.447							0.87	1	
56.923	5	Clayey Silt to Silty Clay	25.296	0.729	3.279	1.308	1.971	2.98	0.69379	0.69	0.445							0.87	1	
57.579	6	Sandy Silt to Clayey Silt	24.169	0.526	3.317	1.328	1.989	2.94	0.68987	0.68	0.442							0.87	1	
58.235	6	Sandy Silt to Clayey Silt	24.084	0.573	3.354	1.349	2.006	2.97	0.68621	0.67	0.440							0.87	1	
58.891	5	Clayey Silt to Silty Clay	25.545	0.838	3.392	1.369	2.023	3.02	0.68259	0.67	0.437							0.87	1	
59.547	5	Clayey Silt to Silty Clay	23.892	0.743	3.43	1.39	2.04	3.04	0.67901	0.66	0.435							0.87	1	
60.203	5	Clayey Silt to Silty Clay	24.609	0.713	3.467	1.41	2.057	3.02	0.67547	0.66	0.432							0.87	1	
60.86	5	Clayey Silt to Silty Clay	26.079	0.776	3.505	1.431	2.074	3	0.67196	0.65	0.430							0.86	1	
61.516	6	Sandy Silt to Clayey Silt	25.296	0.655	3.542	1.451	2.091	2.98	0.66849	0.65	0.428							0.86	1	
62.172	6	Sandy Silt to Clayey Silt	27.216	0.466	3.58	1.472	2.108	2.85	0.66505	0.64	0.425							0.86	1	
62.828	6	Sandy Silt to Clayey Silt	29.374	0.542	3.618	1.492	2.126	2.84	0.66146	0.64	0.423							0.86	1	

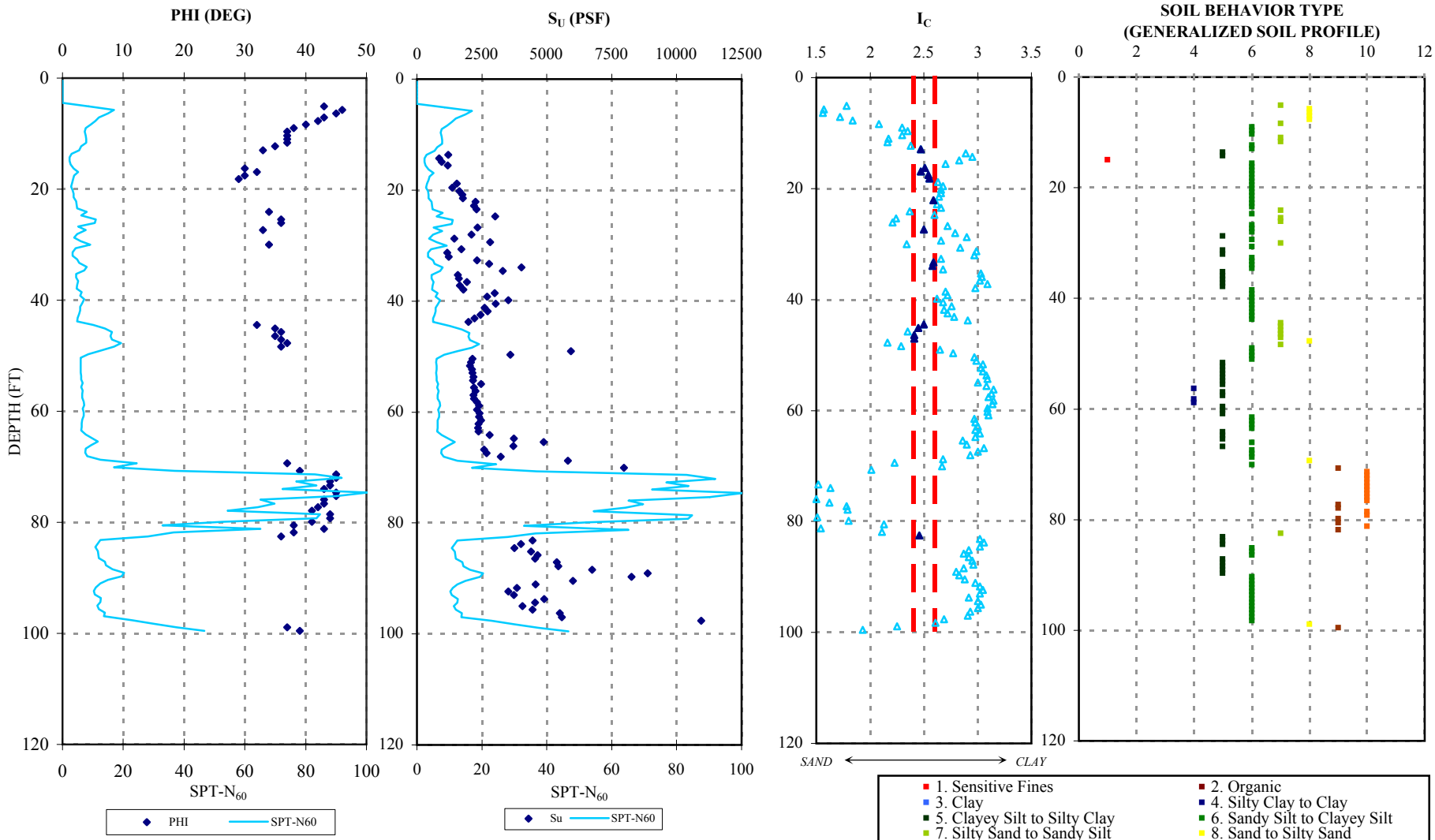
LIQUEFACTION POTENTIAL ANALYSIS (per Youd & Idriss, 2001)

PROJECT NAME	***HWY 101/TULLY***	*FAULT INFO*	
PROJECT NO.	***207150.10***	*COAST RANGE - SIERRAN BLOCK BOUNDARY ZONE (CSB)*	
CPT NO.	***BR-1***	*a_{max} (g)=* 0.6	*FAULT M_w =* 7.5
			MSF = 1.00

		CPT RESULT INPUT							*CSR*		*$CRR_{7.5}$*						*F.S.=($CRR_{7.5}$/CSR)*MSF*K_σ*K_α*		
Depth (ft)		Soil Behavior Type	qc (tsf)	fs (tsf)	σ_v (tsf)	u (tsf)	σ_v' (tsf)	Ic*	C_N*	γ_d	CSR	Ic	C_Q	q_{c1N}	K_C	$(q_{c1N})_{cs}$	$CRR_{7.5}$	$K\sigma$	$K\alpha$	F.S.
63.484	6	Sandy Silt to Clayey Silt	29.851	0.491	3.655	1.513	2.143	2.81	0.65809	0.63	0.421							0.86	1	
64.14	6	Sandy Silt to Clayey Silt	30.72	0.615	3.693	1.533	2.16	2.85	0.65476	0.63	0.419							0.86	1	
64.797	5	Clayey Silt to Silty Clay	32.592	0.959	3.73	1.554	2.177	2.92	0.65147	0.62	0.417							0.86	1	
65.453	6	Sandy Silt to Clayey Silt	39.2	1.123	3.768	1.574	2.194	2.84	0.6482	0.62	0.415							0.85	1	
66.109	5	Clayey Silt to Silty Clay	40.699	1.372	3.806	1.594	2.211	2.87	0.64497	0.61	0.413							0.85	1	
66.765	6	Sandy Silt to Clayey Silt	54.795	1.727	3.843	1.615	2.228	2.74	0.64177	0.61	0.411							0.85	1	
67.421	6	Sandy Silt to Clayey Silt	54.67	1.787	3.881	1.635	2.245	2.76	0.63861	0.61	0.409							0.85	1	
68.077	6	Sandy Silt to Clayey Silt	25.927	0.5	3.918	1.656	2.262	2.94	0.63547	0.60	0.407							0.85	1	
68.734	6	Sandy Silt to Clayey Silt	25.058	0.421	3.956	1.676	2.28	2.93	0.63218	0.60	0.405							0.85	1	
69.39	6	Sandy Silt to Clayey Silt	26.318	0.476	3.994	1.697	2.297	2.93	0.62911	0.60	0.404							0.85	1	
70.046	6	Sandy Silt to Clayey Silt	28.037	0.536	4.031	1.717	2.314	2.91	0.62607	0.59	0.402							0.85	1	
70.702	6	Sandy Silt to Clayey Silt	24.532	0.398	4.069	1.738	2.331	2.94	0.62305	0.59	0.400							0.84	1	
71.358	6	Sandy Silt to Clayey Silt	24.733	0.375	4.106	1.758	2.348	2.93	0.62007	0.58	0.399							0.84	1	
72.014	6	Sandy Silt to Clayey Silt	33.614	0.56	4.144	1.779	2.365	2.81	0.61711	0.58	0.397							0.84	1	
72.671	6	Sandy Silt to Clayey Silt	36.154	0.609	4.182	1.799	2.382	2.78	0.61418	0.58	0.396							0.84	1	
73.327	7	Silty Sand to Sandy Silt	88.494	1.362	4.22	1.82	2.401	2.4	0.61094	0.58	0.394	2.400	0.61	54.06	2.312	125.018	0.26	0.84	1	0.66
73.983	8	Sand to Silty Sand	200.308	3.528	4.26	1.84	2.42	2.15	0.60773	0.57	0.393	2.150	0.61	121.73	1.553	189.028		0.78	1	
74.639	9	Sand	259.533	3.171	4.301	1.861	2.44	1.96	0.6044	0.57	0.391	1.960	0.60	156.86	1.251	196.249		0.75	1	
75.295	10	Gravelly Sand to Sand	323.418	1.424	4.342	1.881	2.461	1.61	0.60093	0.57	0.390	1.610	0.60	194.35	1.000	194.351		0.71	1	
75.951	10	Gravelly Sand to Sand	304.443	0.904	4.384	1.902	2.483	1.55	0.59734	0.56	0.388	1.550	0.60	181.86	1.000	181.856		0.72	1	
76.608	10	Gravelly Sand to Sand	406.736	1.278	4.426	1.922	2.504	1.46	0.59395	0.56	0.387	1.460	0.59	241.58	1.000	241.582		0.69	1	
77.264	10	Gravelly Sand to Sand	435.995	1.024	4.468	1.943	2.525	1.37	0.5906	0.56	0.385	1.370	0.59	257.50	1.000	257.500		0.69	1	
77.92	10	Gravelly Sand to Sand	344.961	1.615	4.509	1.963	2.546	1.62	0.58729	0.56	0.384	1.620	0.59	202.59	1.000	202.593		0.70	1	
78.576	7	Silty Sand to Sandy Silt	93.326	2.375	4.548	1.983	2.565	2.54	0.58433	0.55	0.383	2.540	0.58	54.53	2.979	162.453		0.83	1	
79.232	6	Sandy Silt to Clayey Silt	49.189	1.219	4.586	2.004	2.582	2.78	0.5817	0.55	0.382							0.83	1	
79.888	6	Sandy Silt to Clayey Silt	81.313	2.325	4.623	2.024	2.599	2.63	0.5791	0.55	0.381							0.83	1	
80.545	7	Silty Sand to Sandy Silt	147.118	2.95	4.662	2.045	2.617	2.32	0.57637	0.55	0.380	2.320	0.58	84.79	2.015	170.824		0.81	1	
81.201	6	Sandy Silt to Clayey Silt	57.506	1.544	4.699	2.065	2.634	2.75	0.57381	0.54	0.379							0.82	1	
81.857	6	Sandy Silt to Clayey Silt	36.173	0.678	4.737	2.086	2.651	2.86	0.57128	0.54	0.378							0.82	1	
82.513	6	Sandy Silt to Clayey Silt	41.148	0.818	4.775	2.106	2.668	2.82	0.56877	0.54	0.377							0.82	1	
83.169	6	Sandy Silt to Clayey Silt	37.395	0.783	4.812	2.127	2.686	2.87	0.56613	0.54	0.376							0.82	1	
83.825	6	Sandy Silt to Clayey Silt	36.899	0.894	4.85	2.147	2.703	2.92	0.56367	0.54	0.375							0.82	1	
84.482	6	Sandy Silt to Clayey Silt	38.369	1.147	4.887	2.168	2.72	2.96	0.56122	0.53	0.374							0.82	1	
85.138	6	Sandy Silt to Clayey Silt	38.284	0.963	4.925	2.188	2.737	2.92	0.5588	0.53	0.373							0.82	1	
85.794	6	Sandy Silt to Clayey Silt	42.352	0.863	4.963	2.209	2.754	2.82	0.5564	0.53	0.373							0.82	1	
86.45	6	Sandy Silt to Clayey Silt	43.975	0.893	5	2.229	2.771	2.81	0.55402	0.53	0.372							0.82	1	
87.106	7	Silty Sand to Sandy Silt	40.022	0.69	5.039	2.25	2.789	2.82	0.55152	0.53	0.371							0.81	1	
87.762	6	Sandy Silt to Clayey Silt	46.372	1.053	5.076	2.27	2.806	2.82	0.54918	0.52	0.370							0.81	1	
88.419	6	Sandy Silt to Clayey Silt	45.961	1.49	5.114	2.291	2.824	2.92	0.54672	0.52	0.369							0.81	1	
89.075	11	Sitff Fine-Grained	80.282	4.241	5.157	2.311	2.846	2.84	0.54375	0.52	0.369							0.81	1	
89.731	5	Clayey Silt to Silty Clay	63.704	2.783	5.194	2.331	2.863	2.88	0.54147	0.52	0.368							0.81	1	
90.387	6	Sandy Silt to Clayey Silt	43.077	1.386	5.232	2.352	2.88	2.95	0.53922	0.52	0.367							0.81	1	
91.043	6	Sandy Silt to Clayey Silt	43.946	1.006	5.27	2.372	2.897	2.86	0.53698	0.52	0.367							0.81	1	
91.699	6	Sandy Silt to Clayey Silt	35.81	0.707	5.307	2.393	2.914	2.92	0.53476	0.52	0.366							0.81	1	
92.356	7	Silty Sand to Sandy Silt	32.64	0.492	5.346	2.413	2.933	2.9	0.5323	0.51	0.365							0.81	1	
93.012	6	Sandy Silt to Clayey Silt	34.941	0.582	5.383	2.434	2.95	2.9	0.53012	0.51	0.365							0.81	1	
93.668	7	Silty Sand to Sandy Silt	42.886	0.644	5.422	2.454	2.968	2.78	0.52783	0.51	0.364							0.80	1	
94.324	7	Silty Sand to Sandy Silt	42.772	0.72	5.461	2.475	2.986	2.81	0.52556	0.51	0.363							0.80	1	
94.98	7	Silty Sand to Sandy Silt	45.379	0.794	5.499	2.495	3.004	2.8	0.52331	0.51	0.363							0.80	1	
95.636	7	Silty Sand to Sandy Silt	51.5	0.931	5.538	2.516	3.022	2.75	0.52108	0.51	0.362							0.80	1	
96.293	7	Silty Sand to Sandy Silt	49.848	0.858	5.577	2.536	3.04	2.76	0.51887	0.51	0.362							0.80	1	
96.949	7	Silty Sand to Sandy Silt	51.395	0.871	5.615	2.557	3.059	2.74	0.51655	0.50	0.361							0.80	1	
97.605	7	Silty Sand to Sandy Silt	43.669	0.767	5.654	2.577	3.077	2.82	0.51438	0.50	0.360							0.80	1	
98.261	7	Silty Sand to Sandy Silt	54.116	1.044	5.693	2.598	3.095	2.76	0.51222	0.50	0.360							0.80	1	
98.917	7	Silty Sand to Sandy Silt	56.141	1.05	5.731	2.618	3.113	2.73	0.51009	0.50	0.359							0.80	1	
99.573	7	Silty Sand to Sandy Silt	53.801	1.141	5.77	2.639	3.131	2.79	0.50797	0.50	0.359							0.80	1	
100.23	7	Silty Sand to Sandy Silt	44.691	0.796	5.809	2.659	3.149	2.83	0.50586	0.50	0.358							0.79	1	
100.886	6	Sandy Silt to Clayey Silt	40.098	0.804	5.846	2.68	3.167	2.91	0.50378	0.50	0.358							0.79	1	
101.542	7	Silty Sand to Sandy Silt	41.215	0.593	5.885	2.7	3.185	2.82	0.50171	0.50	0.357							0.79	1	
102.198	7	Silty Sand to Sandy Silt	36.106	0.504	5.923	2.72	3.203	2.88	0.49966	0.49	0.357							0.79	1	
102.854	7	Silty Sand to Sandy Silt	31.771	0.453	5.962	2.741	3.221	2.95	0.49762	0.49	0.356							0.79	1	
103.511	7	Silty Sand to Sandy Silt	33.022	0.388	6.001	2.761	3.239	2.89	0.49561	0.49	0.356							0.79	1	
104.167	7	Silty Sand to Sandy Silt	43.555	0.717	6.039	2.782	3.257	2.84	0.49361	0.49	0.355							0.79	1	
104.823	7	Silty Sand to Sandy Silt	106.476	2.565	6.078	2.802	3.276	2.56	0.49151	0.49	0.355	2.560	0.49	52.33	3.091	161.741		0.79	1	
105.479	7	Silty Sand to Sandy Silt	160.21	3.897	6.117	2.823	3.294	2.42	0.48954	0.49	0.354	2.420	0.49	78.43	2.396	187.906		0.77	1	
106.135	10	Gravelly Sand to Sand	320.811	2.237	6.158	2.843	3.315	1.84	0.48726	0.49	0.354	1.840	0.49	156.32	1.137	177.741		0.67	1	
106.791	10	Gravelly Sand to Sand	348.485	1.911	6.2	2.864	3.336	1.75	0.48501	0.49	0.353	1.750	0.49	169.02	1.072	181.120		0.65	1	
107.448	9	Sand	252.075	2.662	6.241	2.884	3.357	2.04	0.48277	0.49	0.353	2.040	0.48	121.70	1.356	165.005		0.71	1	
108.104	10	Gravelly Sand to Sand	354.196	1.675	6.283	2.905	3.378	1.71	0.48056	0.49	0.352	1.710	0.48	170.21	1.045	177.803		0.65	1	

CPT DATA CORRELATION

BR-2



Reference: CPT data and correlation provided by Gregg Drilling and Testing, Inc.

PARIKH

Practicing in the Geosciences

HWY 101/TULLY INTERCHANGE
SAN JOSE, CALIFORNIA

JOB NO.: 207150.10

PLATE NO.:

LIQUEFACTION POTENTIAL ANALYSIS (per Youd & Idriss, 2001)

PROJECT NAME	***HWY 101/TULLY***	*FAULT INFO*	
PROJECT NO.	***207150.10***	*COAST RANGE - SIERRAN BLOCK BOUNDARY ZONE (CSB)*	
CPT NO.	***BR-2***	*a_{max} (g)=* 0.6	*FAULT M_w =* 7.5
			MSF = 1.00

		CPT RESULT INPUT							*CSR*		*$CRR_{7.5}$*						*F.S.=($CRR_{7.5}$/CSR)*MSF*K_σ*K_α*		
Depth (ft)		Soil Behavior Type	qc (tsf)	fs (tsf)	σ_v (tsf)	u (tsf)	σ_v' (tsf)	Ic*	C_N*	γ_d	CSR	Ic	C_Q	q_{c1N}	K_C	$(q_{c1N})_{cs}$	$CRR_{7.5}$	$K\sigma$	$K\alpha$	F.S.
0.492									1.7	1.00	#VALUE!							#VALUE!	1	
1.148									1.7	1.00	#VALUE!							#VALUE!	1	
1.804									1.7	1.00	#VALUE!							#VALUE!	1	
2.461									1.7	1.00	#VALUE!							#VALUE!	1	
3.117									1.7	0.99	#VALUE!							#VALUE!	1	
3.773									1.7	0.99	#VALUE!							#VALUE!	1	
4.429									1.7	0.99	#VALUE!							#VALUE!	1	
5.085	7	Silty Sand to Sandy Silt	47.564	0.495	0.299		0.299	1.78	1.46765	0.99	0.386	1.780	1.47	69.81	1.092	76.253	0.12	1.00	1	
5.741	8	Sand to Silty Sand	99.968	0.984	0.339		0.339	1.57	1.4295	0.99	0.386	1.570	1.43	142.90	1.000	142.904	0.35	1.00	1	
6.398	8	Sand to Silty Sand	88.627	0.684	0.379		0.379	1.56	1.39329	0.99	0.385	1.560	1.39	123.48	1.000	123.483	0.26	1.00	1	
7.054	8	Sand to Silty Sand	67.511	0.596	0.418		0.418	1.72	1.3597	0.99	0.384	1.720	1.36	91.79	1.051	96.507	0.16	1.00	1	
7.71	8	Sand to Silty Sand	58.248	0.596	0.458		0.458	1.84	1.3269	0.98	0.384	1.840	1.33	77.29	1.137	87.880	0.14	1.00	1	
8.366	7	Silty Sand to Sandy Silt	45.904	0.739	0.497		0.497	2.08	1.29641	0.98	0.383	2.080	1.30	59.51	1.420	84.484	0.14	1.00	1	
9.022	6	Sandy Silt to Clayey Silt	34.246	0.775	0.534		0.534	2.3	1.26874	0.98	0.383	2.300	1.27	43.45	1.949	84.671	0.14	1.00	1	
9.678	6	Sandy Silt to Clayey Silt	32.329	0.752	0.572		0.572	2.35	1.24153	0.98	0.382	2.350	1.24	40.14	2.120	85.078	0.14	1.00	1	
10.335	6	Sandy Silt to Clayey Silt	34.201	0.665	0.61		0.61	2.3	1.21547	0.98	0.382	2.300	1.22	41.57	1.949	81.009	0.13	1.00	1	
10.991	7	Silty Sand to Sandy Silt	37.036	0.464	0.648		0.648	2.17	1.19048	0.98	0.381	2.170	1.19	44.09	1.596	70.385	0.11	1.00	1	
11.647	7	Silty Sand to Sandy Silt	37.07	0.411	0.687		0.687	2.16	1.16587	0.98	0.381	2.160	1.17	43.22	1.574	68.038	0.11	1.00	1	
12.303	6	Sandy Silt to Clayey Silt	26.854	0.413	0.724		0.724	2.38	1.14345	0.97	0.380	2.380	1.14	30.71	2.233	68.554	0.11	1.00	1	
12.959	6	Sandy Silt to Clayey Silt	22.392	0.341	0.762		0.762	2.47	1.1213	0.97	0.379	2.470	1.12	25.11	2.621	65.817	0.11	1.00	1	
13.615	5	Clayey Silt to Silty Clay	9.943	0.22	0.8	0.019	0.781	2.89	1.11055	0.97	0.388							1.00	1	
14.272	5	Clayey Silt to Silty Clay	7.42	0.114	0.837	0.04	0.798	2.95	1.1011	0.97	0.397							1.00	1	
14.928	1	Sensitive Fines	8.032	0.082	0.874	0.06	0.814	2.83	1.09235	0.97	0.406							1.00	1	
15.584	6	Sandy Silt to Clayey Silt	9.731	0.077	0.911	0.081	0.831	2.7	1.08321	0.97	0.414							1.00	1	
16.24	6	Sandy Silt to Clayey Silt	14.761	0.119	0.949	0.101	0.848	2.51	1.07422	0.97	0.422	2.510	1.07	15.86	2.820	44.708	0.09	1.00	1	0.21
16.896	6	Sandy Silt to Clayey Silt	21.467	0.258	0.987	0.121	0.865	2.47	1.06538	0.96	0.429	2.470	1.07	22.87	2.621	59.950	0.10	1.00	1	0.23
17.552	6	Sandy Silt to Clayey Silt	15.73	0.146	1.024	0.142	0.882	2.54	1.05668	0.96	0.436	2.540	1.06	16.62	2.979	49.515	0.09	1.00	1	0.21
18.209	6	Sandy Silt to Clayey Silt	13.853	0.109	1.062	0.162	0.899	2.55	1.04812	0.96	0.443	2.550	1.05	14.52	3.034	44.056	0.09	1.00	1	0.20
18.865	6	Sandy Silt to Clayey Silt	11.831	0.094	1.099	0.183	0.916	2.63	1.0397	0.96	0.449							1.00	1	
19.521	6	Sandy Silt to Clayey Silt	10.556	0.083	1.137	0.203	0.934	2.68	1.03093	0.96	0.455							1.00	1	
20.177	6	Sandy Silt to Clayey Silt	12.728	0.126	1.175	0.224	0.951	2.66	1.02278	0.96	0.461							1.00	1	
20.833	6	Sandy Silt to Clayey Silt	13.547	0.145	1.212	0.244	0.968	2.66	1.01476	0.95	0.466							1.00	1	
21.49	6	Sandy Silt to Clayey Silt	13.809	0.132	1.25	0.265	0.985	2.64	1.00686	0.95	0.472							1.00	1	
22.146	6	Sandy Silt to Clayey Silt	17.68	0.199	1.287	0.285	1.002	2.59	0.99909	0.95	0.476	2.590	1.00	17.66	3.266	57.691	0.10	1.00	1	0.21
22.802	6	Sandy Silt to Clayey Silt	17.736	0.216	1.325	0.306	1.019	2.62	0.99144	0.95	0.481							1.00	1	
23.458	6	Sandy Silt to Clayey Silt	18.22	0.279	1.363	0.326	1.036	2.66	0.9839	0.95	0.486							0.99	1	
24.114	7	Silty Sand to Sandy Silt	34.474	0.41	1.401	0.347	1.054	2.37	0.97604	0.94	0.490	2.370	0.98	33.65	2.194	73.825	0.12	0.99	1	0.24
24.77	6	Sandy Silt to Clayey Silt	23.968	0.398	1.439	0.367	1.072	2.6	0.96831	0.94	0.493							0.99	1	
25.427	7	Silty Sand to Sandy Silt	50.578	0.617	1.477	0.388	1.09	2.24	0.9607	0.94	0.497	2.240	0.96	48.59	1.770	86.028	0.14	0.98	1	0.28
26.083	7	Silty Sand to Sandy Silt	49.914	0.5	1.516	0.408	1.108	2.21	0.95321	0.94	0.500	2.210	0.95	47.58	1.692	80.484	0.13	0.98	1	0.26
26.739	6	Sandy Silt to Clayey Silt	19.262	0.322	1.554	0.429	1.125	2.72	0.94624	0.94	0.504							0.98	1	
27.395	6	Sandy Silt to Clayey Silt	31.444	0.482	1.591	0.449	1.142	2.5	0.93937	0.93	0.507	2.500	0.94	29.54	2.768	81.773	0.13	0.97	1	0.26
28.051	6	Sandy Silt to Clayey Silt	17.485	0.312	1.629	0.469	1.159	2.79	0.9326	0.93	0.510							0.97	1	
28.707	5	Clayey Silt to Silty Clay	12.589	0.188	1.666	0.49	1.176	2.9	0.92593	0.93	0.512							0.97	1	
29.364	6	Sandy Silt to Clayey Silt	22.726	0.367	1.704	0.51	1.194	2.66	0.91896	0.92	0.514							0.97	1	
30.02	7	Silty Sand to Sandy Silt	40.601	0.432	1.743	0.531	1.212	2.34	0.91211	0.92	0.516	2.340	0.91	37.03	2.084	77.167	0.12	0.96	1	0.24
30.676	6	Sandy Silt to Clayey Silt	14.845	0.22	1.78	0.551	1.229	2.84	0.90572	0.92	0.518							0.96	1	
31.332	5	Clayey Silt to Silty Clay	10.538	0.139	1.818	0.572	1.246	2.99	0.89943	0.91	0.520							0.96	1	
31.988	5	Clayey Silt to Silty Clay	10.879	0.142	1.855	0.592	1.263	2.97	0.89322	0.91	0.521							0.95	1	
32.644	6	Sandy Silt to Clayey Silt	18.501	0.191	1.893	0.613	1.28	2.66	0.8871	0.91	0.523							0.95	1	
33.301	6	Sandy Silt to Clayey Silt	21.785	0.222	1.931	0.633	1.297	2.59	0.88106	0.90	0.524	2.590	0.88	19.19	3.266	62.688	0.10	0.95	1	0.20
33.957	6	Sandy Silt to Clayey Silt	31.817	0.549	1.968	0.654	1.314	2.58	0.8751	0.90	0.524	2.580	0.88	27.84	3.206	89.277	0.15	0.95	1	0.28
34.613	6	Sandy Silt to Clayey Silt	26.821	0.508	2.006	0.674	1.332	2.68	0.86888	0.89	0.525							0.94	1	
35.269	5	Clayey Silt to Silty Clay	13.871	0.344	2.043	0.695	1.349	3.03	0.86308	0.89	0.525							0.94	1	
35.925	5	Clayey Silt to Silty Clay	13.731	0.364	2.081	0.715	1.366	3.04	0.85737	0.88	0.525							0.94	1	
36.581	5	Clayey Silt to Silty Clay	15.992	0.488	2.119	0.736	1.383	3.02	0.85172	0.88	0.525							0.94	1	
37.238	5	Clayey Silt to Silty Clay	14.249	0.452	2.156	0.756	1.4	3.09	0.84615	0.87	0.525							0.93	1	
37.894	5	Clayey Silt to Silty Clay	14.772	0.339	2.194	0.777	1.417	2.98	0.84066	0.87	0.525							0.93	1	
38.55	6	Sandy Silt to Clayey Silt	23.428	0.394	2.231	0.797	1.434	2.7	0.83523	0.86	0.524							0.93	1	
39.206	6	Sandy Silt to Clayey Silt	21.284	0.316	2.269	0.818	1.451	2.72	0.82988	0.86	0.523							0.93	1	
39.862	6	Sandy Silt to Clayey Silt	27.623	0.395	2.307	0.838	1.469	2.62	0.82428	0.85	0.522							0.93	1	
40.518	6	Sandy Silt to Clayey Silt	24.334	0.354	2.344	0.858	1.486	2.68	0.81906	0.85	0.521							0.92	1	
41.175	6	Sandy Silt to Clayey Silt	20.913	0.322	2.382	0.879	1.503	2.76	0.81391	0.84	0.519							0.92	1	
41.831	6	Sandy Silt to Clayey Silt	21.746	0.263	2.419	0.899	1.52	2.69	0.80882	0.83	0.518							0.92	1	
42.487	6	Sandy Silt to Clayey Silt	19.735	0.219	2.457	0.92	1.537	2.72	0.8038	0.83	0.516							0.92	1	
43.143	6	Sandy Silt to Clayey Silt	17.942	0.215	2.495	0.94	1.554	2.78	0.79884	0.82	0.515							0.92	1	
43.799	6	Sandy Silt to Clayey Silt	16.131	0.28	2.532	0.961	1.571	2.91	0.79394	0.82	0.513							0.91	1	
44.455	7	Silty Sand to Sandy Silt	41.348	0.595	2.571	0.981	1.589	2.5	0.78881	0.81	0.511	2.500	0.79	32.62	2.768	90.295	0.15	0.91	1	0.29
45.112	7	Silty Sand to Sandy Silt	58.493	1.085	2.609	1.002	1.608	2.45	0.78348	0.80	0.508	2.450	0.78	45.83	2.528	115.863	0.22	0.91	1	0.44
45.768	7	Silty Sand to Sandy Silt	71.009	1.174	2.648	1.022	1.626	2.35	0.77849	0.80	0.506	2.350	0.78	55.28	2.120	117.173	0.23	0.91	1	0.45
46.424	7	Silty Sand to Sandy Silt	67.394	1.279	2.687	1.043	1.644	2.41	0.77356	0.79	0.503	2.410	0.77	52.13	2.354	122.703	0.25	0.91	1	0.50
47.08	7	Silty Sand to Sandy Silt	69.995	1.352	2.725	1.063	1.662	2.41	0.76869	0.78	0.500	2.410	0.77	53.80	2.354	126.637	0.27	0.90	1	0.54
47.736	8	Sand to Silty Sand	91.585	0.995	2.765	1.084	1.681	2.16	0.76362	0.78	0.498	2.160	0.76	69.94	1.574	110.098	0.20	0.90	1	0.41
48.392	7	Silty Sand to Sandy Silt	76.824	1.057	2.804	1.104	1.699	2.29	0.75888	0.77	0.495	2.290	0.76	58.30	1.917	111.765	0.21	0.90	1	0.42
49.049	6	Sandy Silt to Clayey Silt	47.436	1.251	2.841	1.125	1.717	2.65	0.7542	0.76	0.492							0.90	1	
49.705	6	Sandy Silt to Clayey Silt	29.945	0.603	2.879	1.145	1.734	2.77	0.74983	0.76	0.489							0.90	1	
50.361	6	Sandy Silt to Clayey Silt	19.161	0.38	2.916	1.166	1.751	2.97	0.74551	0.75	0.486							0.89	1	
51.017	6	Sandy Silt to Clayey Silt	18.599	0.369	2.954	1.186	1.768	2.99	0.74124	0.74	0.484							0.89	1	
51.673	5	Clayey Silt to Silty Clay	18.231	0.447	2.992	1.207	1.785	3.05	0.73702	0.74	0.481							0.89	1	
52.329	5	Clayey Silt to Silty Clay	18.432	0.449	3.029	1.227	1.802	3.03	0.73284	0.73	0.478							0.89	1	
52.986	5	Clayey Silt to Silty Clay	18.042	0.491	3.067	1.247	1.819	3.05	0.72872	0.72	0.475							0.89	1	
53.642	5	Clayey Silt to Silty Clay	18.231	0.572	3.104	1.268	1.836	3.08	0.72464	0.72	0.472							0.89	1	
54.298	5	Clayey Silt to Silty Clay	18.081	0.567	3.142	1.288	1.854	3.09	0.72037	0.71	0.469							0.88	1	
54.954	5	Clayey Silt to Silty Clay	20.465	0.558	3.18	1.309	1.871	3	0.71638	0.70	0.466							0.88	1	
55.61	5	Clayey Silt to Silty Clay	18.454	0.572	3.217	1.329	1.888	3.08	0.71244	0.70	0.464							0.88	1	
56.266	4	Silty Clay to Clay	19.072	0.77	3.255	1.35	1.905	3.15	0.70853	0.69	0.461							0.88	1	
56.923	5	Clayey Silt to Silty Clay	18.56	0.657	3.292	1.37	1.922	3.13	0.70468	0.69	0.458							0.88	1	
57.579	5	Clayey Silt to Silty Clay	18.616	0.606	3.33	1.391	1.939	3.1	0.70086	0.68	0.455							0.88	1	
58.235	4	Silty Clay to Clay	19.796	0.824	3.368	1.411	1.956	3.15	0.69708	0.67	0.453							0.87	1	
58.891	4	Silty Clay to Clay	20.437	0.834	3.405	1.432	1.973	3.14	0.69335	0.67	0.450							0.87	1	
59.547	5	Clayey Silt to Silty Clay	19.485	0.63	3.443	1.452	1.991	3.09	0.68944	0.66	0.447							0.87	1	
60.203	5	Clayey Silt to Silty Clay	20.276	0.691	3.48	1.473	2.008	3.09	0.68579	0.66	0.444							0.87	1	
60.86	5	Clayey Silt to Silty Clay	20.331	0.684	3.518	1.493	2.025	3.1	0.68217	0.65	0.442							0.87	1	
61.516	6	Sandy Silt to Clayey Silt	20.526	0.417	3.555	1.514	2.042	2.97	0.67859	0.65	0.439							0.87	1	
62.172	6	Sandy Silt to Clayey Silt	19.952	0.408	3.593	1.534	2.059	2.98	0.67505	0.64	0.437							0.87	1	
62.828	6	Sandy Silt to Clayey Silt	19.824	0.42	3.631	1.555	2.076	3	0.67155	0.64	0.435							0.86	1	

LIQUEFACTION POTENTIAL ANALYSIS (per Youd & Idriss, 2001)

PROJECT NAME ***HWY 101/TULLY***
PROJECT NO. ***207150.10***
CPT NO. ***BR-2***

FAULT INFO
COAST RANGE - SIERRAN BLOCK BOUNDARY ZONE (CSB)
a_{max} (g)= 0.6

FAULT M_w = 7.5
MSF = 1.00

		CPT RESULT INPUT							*CSR*		*$CRR_{7.5}$*						*F.S.=($CRR_{7.5}$/CSR)*MSF*K_σ*K_α*		
Depth (ft)		Soil Behavior Type	qc (tsf)	fs (tsf)	σ_v (tsf)	u (tsf)	σ_v' (tsf)	Ic*	C_N*	γ_d	CSR	Ic	C_Q	q_{c1N}	K_C	$(q_{c1N})_{cs}$	$CRR_{7.5}$	$K\sigma$	$K\alpha$	F.S.
63.484	6	Sandy Silt to Clayey Silt	19.724	0.392	3.668	1.575	2.093	2.98	0.66808	0.63	0.432							0.86	1	
64.14	5	Clayey Silt to Silty Clay	23.294	0.687	3.706	1.595	2.11	3.02	0.66465	0.63	0.430							0.86	1	
64.797	5	Clayey Silt to Silty Clay	30.675	1.135	3.743	1.616	2.128	2.98	0.66106	0.62	0.428							0.86	1	
65.453	5	Clayey Silt to Silty Clay	39.337	1.333	3.781	1.636	2.145	2.86	0.6577	0.62	0.426							0.86	1	
66.109	6	Sandy Silt to Clayey Silt	31.165	0.822	3.819	1.657	2.162	2.9	0.65437	0.61	0.424							0.86	1	
66.765	5	Clayey Silt to Silty Clay	22.904	0.624	3.856	1.677	2.179	3.06	0.65108	0.61	0.421							0.86	1	
67.421	6	Sandy Silt to Clayey Silt	23.412	0.53	3.894	1.698	2.196	3	0.64782	0.61	0.420							0.85	1	
68.077	6	Sandy Silt to Clayey Silt	26.932	0.62	3.931	1.718	2.213	2.93	0.64459	0.60	0.418							0.85	1	
68.734	6	Sandy Silt to Clayey Silt	46.461	0.961	3.969	1.739	2.23	2.68	0.6414	0.60	0.416							0.85	1	
69.39	8	Sand to Silty Sand	113.437	1.422	4.009	1.759	2.249	2.23	0.63787	0.60	0.414	2.230	0.64	72.36	1.743	126.153	0.27	0.84	1	0.64
70.046	6	Sandy Silt to Clayey Silt	63.751	1.852	4.046	1.78	2.267	2.67	0.63455	0.59	0.412							0.85	1	
70.702	9	Sand	187.197	1.993	4.087	1.8	2.287	2.01	0.63091	0.59	0.410	2.010	0.63	118.11	1.313	155.105	0.43	0.79	1	1.04
71.358	10	Gravelly Sand to Sand	513.404	2.438	4.129	1.821	2.308	1.44	0.62714	0.58	0.408	1.440	0.63	321.98	1.000	321.975		0.72	1	
72.014	10	Gravelly Sand to Sand	568.07	2.989	4.171	1.841	2.329	1.44	0.62341	0.58	0.406	1.440	0.62	354.14	1.000	354.138		0.71	1	
72.671	10	Gravelly Sand to Sand	482.991	1.658	4.212	1.862	2.351	1.39	0.61954	0.58	0.404	1.390	0.62	299.23	1.000	299.234		0.71	1	
73.327	10	Gravelly Sand to Sand	503.74	2.967	4.254	1.882	2.372	1.52	0.6159	0.58	0.402	1.520	0.62	310.25	1.000	310.254		0.71	1	
73.983	10	Gravelly Sand to Sand	421.435	2.918	4.296	1.903	2.393	1.63	0.6123	0.57	0.401	1.630	0.61	258.05	1.000	258.045		0.71	1	
74.639	10	Gravelly Sand to Sand	643.479	2.45	4.338	1.923	2.415	1.32	0.60858	0.57	0.399	1.320	0.61	391.61	1.000	391.605		0.70	1	
75.295	10	Gravelly Sand to Sand	572.588	2.1	4.379	1.944	2.436	1.35	0.60506	0.57	0.397	1.350	0.61	346.45	1.000	346.450		0.70	1	
75.951	10	Gravelly Sand to Sand	394.976	1.479	4.421	1.964	2.457	1.5	0.60159	0.56	0.396	1.500	0.60	237.61	1.000	237.612		0.70	1	
76.608	10	Gravelly Sand to Sand	405.911	2.541	4.463	1.984	2.479	1.62	0.59799	0.56	0.394	1.620	0.60	242.73	1.000	242.730		0.70	1	
77.264	9	Sand	354.804	3.261	4.504	2.005	2.499	1.78	0.59476	0.56	0.392	1.780	0.59	211.02	1.092	230.508		0.70	1	
77.92	9	Sand	298.74	2.293	4.544	2.025	2.519	1.79	0.59156	0.56	0.391	1.790	0.59	176.72	1.099	194.295		0.72	1	
78.576	10	Gravelly Sand to Sand	522.3	2.297	4.586	2.046	2.54	1.45	0.58824	0.55	0.390	1.450	0.59	307.24	1.000	307.235		0.69	1	
79.232	10	Gravelly Sand to Sand	505.238	2.617	4.628	2.066	2.562	1.51	0.5848	0.55	0.388	1.510	0.58	295.46	1.000	295.461		0.69	1	
79.888	9	Sand	287.216	2.128	4.669	2.087	2.582	1.8	0.5817	0.55	0.387	1.800	0.58	167.07	1.107	184.894		0.72	1	
80.545	9	Sand	158.678	1.813	4.709	2.107	2.602	2.13	0.57864	0.55	0.386	2.130	0.58	91.82	1.512	138.806	0.33	0.79	1	0.85
81.201	10	Gravelly Sand to Sand	389.473	1.523	4.751	2.128	2.623	1.54	0.57546	0.54	0.384	1.540	0.58	224.13	1.000	224.128		0.68	1	
81.857	9	Sand	177.516	2.126	4.792	2.148	2.644	2.11	0.57232	0.54	0.383	2.110	0.57	101.60	1.473	149.668	0.39	0.78	1	1.02
82.513	7	Silty Sand to Sandy Silt	117.52	2.85	4.831	2.169	2.662	2.46	0.56965	0.54	0.382	2.460	0.57	66.95	2.574	172.336		0.82	1	
83.169	5	Clayey Silt to Silty Clay	38.423	1.501	4.868	2.189	2.679	3.02	0.56716	0.54	0.381							0.82	1	
83.825	5	Clayey Silt to Silty Clay	34.942	1.352	4.906	2.21	2.696	3.06	0.56468	0.54	0.380							0.82	1	
84.482	5	Clayey Silt to Silty Clay	33.237	0.986	4.943	2.23	2.713	3.02	0.56223	0.53	0.379							0.82	1	
85.138	6	Sandy Silt to Clayey Silt	37.983	0.948	4.981	2.251	2.73	2.92	0.5598	0.53	0.379							0.82	1	
85.794	6	Sandy Silt to Clayey Silt	39.754	0.877	5.019	2.271	2.747	2.87	0.55739	0.53	0.378							0.82	1	
86.45	6	Sandy Silt to Clayey Silt	39.014	1.001	5.056	2.292	2.765	2.92	0.55485	0.53	0.377							0.82	1	
87.106	5	Clayey Silt to Silty Clay	45.447	1.645	5.094	2.312	2.782	2.95	0.55249	0.53	0.376							0.81	1	
87.762	5	Clayey Silt to Silty Clay	45.881	1.78	5.131	2.332	2.799	2.96	0.55014	0.52	0.375							0.81	1	
88.419	5	Clayey Silt to Silty Clay	55.629	2	5.169	2.353	2.816	2.87	0.54781	0.52	0.375							0.81	1	
89.075	5	Clayey Silt to Silty Clay	71.638	2.854	5.206	2.373	2.833	2.8	0.5455	0.52	0.374							0.81	1	
89.731	5	Clayey Silt to Silty Clay	67.009	2.726	5.244	2.394	2.85	2.83	0.54321	0.52	0.373							0.81	1	
90.387	6	Sandy Silt to Clayey Silt	49.954	1.588	5.282	2.414	2.867	2.88	0.54094	0.52	0.372							0.81	1	
91.043	6	Sandy Silt to Clayey Silt	39.203	1.201	5.319	2.435	2.884	2.98	0.53869	0.52	0.372							0.81	1	
91.699	6	Sandy Silt to Clayey Silt	33.822	0.954	5.357	2.455	2.902	3.02	0.53632	0.52	0.371							0.81	1	
92.356	6	Sandy Silt to Clayey Silt	31.298	0.856	5.394	2.476	2.919	3.05	0.53411	0.51	0.370							0.81	1	
93.012	6	Sandy Silt to Clayey Silt	32.891	0.869	5.432	2.496	2.936	3.02	0.53191	0.51	0.370							0.81	1	
93.668	6	Sandy Silt to Clayey Silt	41.431	1.085	5.47	2.517	2.953	2.92	0.52974	0.51	0.369							0.81	1	
94.324	6	Sandy Silt to Clayey Silt	38.925	1.232	5.507	2.537	2.97	3	0.52758	0.51	0.368							0.80	1	
94.98	6	Sandy Silt to Clayey Silt	34.869	1.089	5.545	2.558	2.987	3.03	0.52544	0.51	0.368							0.80	1	
95.636	6	Sandy Silt to Clayey Silt	37.281	1.197	5.582	2.578	3.004	3	0.52331	0.51	0.367							0.80	1	
96.293	6	Sandy Silt to Clayey Silt	45.391	1.48	5.62	2.599	3.021	2.93	0.5212	0.51	0.367							0.80	1	
96.949	6	Sandy Silt to Clayey Silt	45.442	1.383	5.658	2.619	3.039	2.91	0.51899	0.50	0.366							0.80	1	
97.605	6	Sandy Silt to Clayey Silt	86.149	2.771	5.695	2.64	3.056	2.69	0.51692	0.50	0.366							0.80	1	
98.261	6	Sandy Silt to Clayey Silt	117.024	3.986	5.733	2.66	3.073	2.61	0.51486	0.50	0.365							0.80	1	
98.917	8	Sand to Silty Sand	172.414	2.685	5.772	2.681	3.092	2.25	0.51258	0.50	0.364	2.250	0.51	88.38	1.798	158.923	0.45	0.77	1	1.24
99.573	9	Sand	244.275	1.782	5.813	2.701	3.112	1.93	0.5102	0.50	0.364	1.930	0.51	124.63	1.218	151.857	0.41	0.72	1	1.12

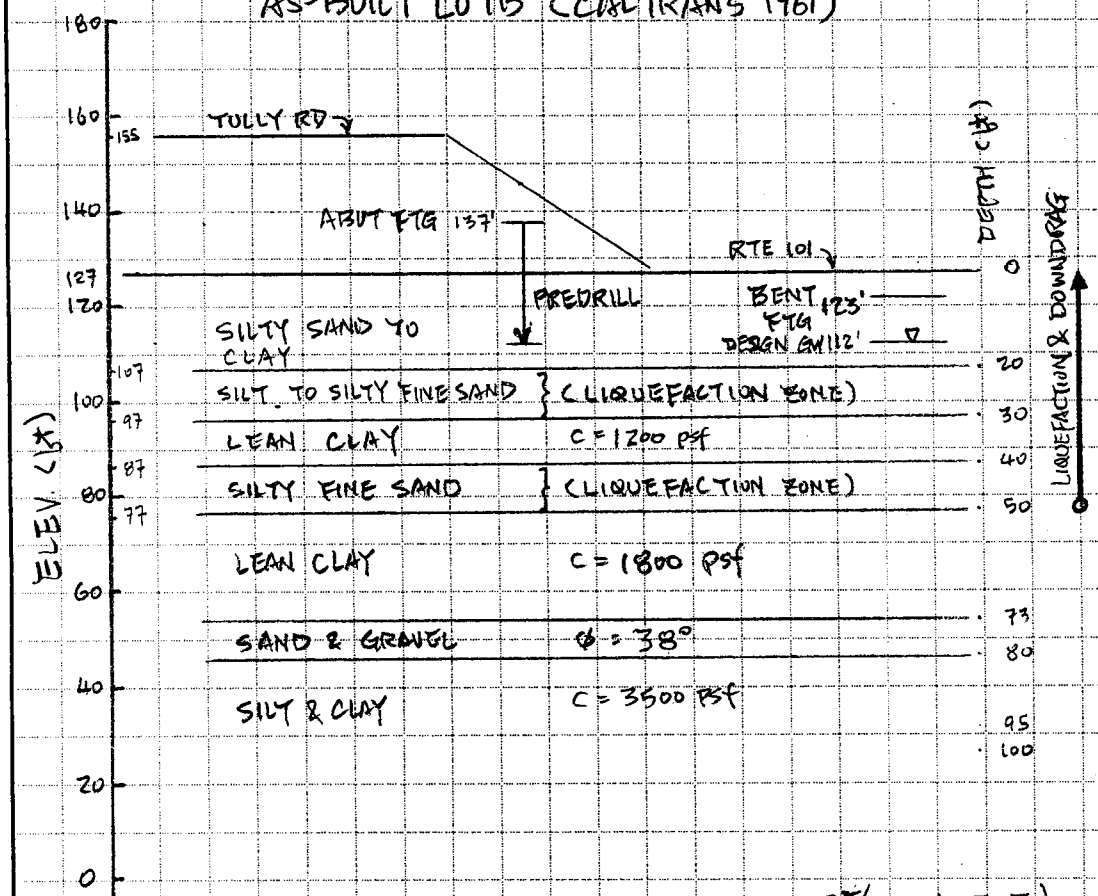
APPENDIX C-2

EVALUATION OF LIQUEFACTION DOWN DRAG LOAD, GENERALIZED SOIL/STRENGTH PROFILE & PILE CAPACITY EVALUATION

TULLY ROAD OVERCROSSING - ROUTE 101

- DESIGN SOIL STRENGTH PROFILE

REF: BR-1&2 CCPT DATA, PARIKH 2007)
AS-BUILT LOTB (CALTRANS 1961)



- LIQUEFACTION INDUCED DOWNDRAG LOAD = 25T/pile (BENT)
  32T/pile (ABUT)
- ASSUME PILE TIP IN CLAY → CONSERVATIVE; LOW END BEARING
- AVAILABLE ULTIMATE CAPACITY FOR DESIGN
  = ULTIMATE PILE CAPACITY − DOWNDRAG LOAD

- EVALUATION OF DOWN DRAG LOAD PER NAVFAC DM 7.2

*BENT – PILE GROUPS OF 5x5 w/ 4' SPACING ARE PLANNED. CHECK THE DOWNDRAG FOR PILE GROUPS. PER DM 7.2, THE LOAD DOES NOT EXCEED THE TOTAL SOIL WT. OF THE SOIL ENCLOSED IN THE GROUP.

TOTAL LOAD = (125x11+60x35)x19'x19'
= 627 TONS

FOR 5x5 GROUP. AVG DD LOAD = 627/25 = 25T/pile

*ABUT – THE ABUT FOUNDATION CONSISTS OF 2 ROWS OF PILES, NOT MUCH OF A GROUP. CHECK DOWNDRAG FOR SINGLE PILES PER DM 7.2 ($f = \beta \cdot \sigma_v'$). NEGLECT DD WITHIN THE LIQUEFACTION ZONES. SPECIFY PREDRILL FROM FTG (ELEV 137') TO ELEV 112' TO REDUCE DD LOAD. DD FROM ELEV. 112' TO 107' (BELOW PREDRILL) & ELEV 97'-87' (BETWN LIQUEFACTN ZONES). CONSIDER OVERBURDEN FROM ELEV 146' (ABOVE FTG) & β = 0.2 FOR CLAY PER DM 7.2.

DD(112-107) = 0.2(125x34'+60x2.5')x4.19 kf/ft³ x 5' = 9 T

DD(97-87) = 0.2(125x34'+60x20')x4.19 kf/ft³ x 10' = 23 T

TOTAL DD = 32T / pile @ ABUT

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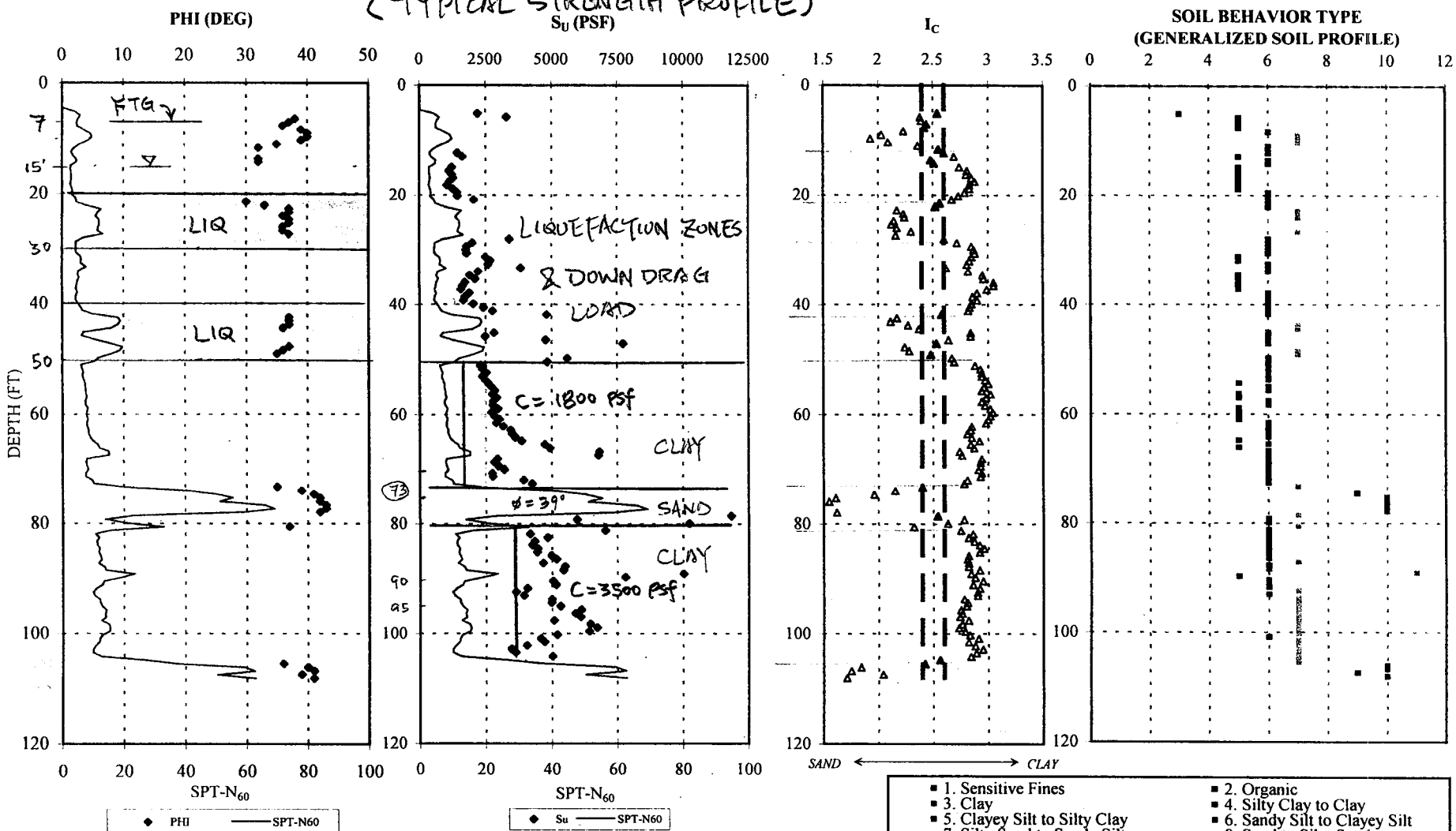
JOB
SHEET NO OF
CALCULATED BY Y. DAVID WANG DATE 11/24/08
CHECKED BY DATE
SCALE

CPT DATA CORRELATION

BR-1

(TYPICAL STRENGTH PROFILE)



- 1. Sensitive Fines
- 2. Organic
- 3. Clay
- 4. Silty Clay to Clay
- 5. Clayey Silt to Silty Clay
- 6. Sandy Silt to Clayey Silt
- 7. Silty Sand to Sandy Silt
- 8. Sand to Silty Sand
- 9. Sand
- 10. Gravelly Sand to Sand
- 11. Stiff Fine-Grained
- 12. Sand to Clayey Sand

Reference: CPT data and correlation provided by Gregg Drilling and Testing, Inc.

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HWY 101/TULLY INTERCHANGE
SAN JOSE, CALIFORNIA

JOB NO.: 207150.10

PLATE NO.:

(TEMPLATE)

DRIVEN PILE CAPACITY - ***Tully Road Overcrossing - Route 101*** ***ABUTS & BENT 2 (TYICAL)*** **ALLOWABLE FRICTIONAL PILE CAPACTY** 11/24/08

207150.10

Design per FHWA Manual

PILE DIA, B (ft) = 1.33

PILE SHAPE = 1

(1=CIRCLE, 2=SQ., 3=OCT.)

PILE MATERIAL = 2

(1=CONCRETE ,2=STEEL)

DRIVEN/DRILLED = 1

(1=DRIVEN ,2=DRILLED)

GROUPS INCREAMENTS

1- GRAVELS, SANDS (FT)= 5

AND NONPLASTIC SILTS

2- CLAYS AND PLASTIC SILTS

SOIL TYPES

GRAVEL, SAND, NSILT Ref: CPT 1 & 2 (Parikh 2007)

CLAY, PSILT

F.S. FOR COMPRESSION = 1

F.S. FOR UPLIFT = 1

PERIMETER OF THE PILE (ft) : 4.18 SQ. FT.

AREA OF THE PILE TIP 1.39 SQ. FT.

Class 200 Alt. "W" - 16" open end pipe pile

DEPTH FROM	TO		SOIL GROUP	EFFECTIVE UNIT WEIGHT(pcf)	WEIGHT OF LAYER (psf)	EFFECTIVE OVERBURDEN PRESSURE (psf)	SOIL TYPE	CONSISTENCY	SHEAR STRENGTH PARAMETERS c(psf)	ϕ (°)	FHWA Manual (Tomlinson, 1980) α	PER SECTION COMP. (Ton)	ULTIMATE COMPRESSION CAPACITY (Ton)	PER SECTION UPLIFT (Ton)	ULTIMATE UPLIFT CAPACITY (Ton)
0.0	7.0	BT2 FTG	2	125	875	438	CLAY		0	0	0.00				
7.0	10.0		2	125	375	1063	CLAY		0	0	0.00				
10.0	15.0		2	125	625	1563	CLAY		0	0	0.00		Downdrag ILoad (7' to 20') due to liquefaction settlement		
15.0	20.0		2	60	300	2025	CLAY		0	0	0.00				
20.0	25.0		2	60	300	2325	CLAY		0	0	0.00		(Liquefaction Potential @ 20'-30')		
25.0	30.0		2	60	300	2625	CLAY		0	0	0.00				
30.0	35.0		2	60	300	2925	CLAY		0	0	0.00		Downdrag ILoad (30' to 40') due to liquefaction settlement		
35.0	40.0		2	60	300	3225	CLAY		0	0	0.00				
40.0	45.0		2	60	300	3525	CLAY		0	0	0.00		(Liquefaction Potential @ 40'-50')		
45.0	50.0		2	60	300	3825	CLAY		0	0	0.00				
50.0	55.0		2	63	315	4133	CLAY	STIFF	1800	0	0.85	15.98	15.98	15.98	15.98
55.0	60.0		2	63	315	4448	CLAY	STIFF	1800	0	0.85	15.98	31.96	15.98	31.96
60.0	65.0		2	63	315	4763	CLAY	STIFF	1800	0	0.85	15.98	47.95	15.98	47.95
65.0	70.0		2	63	315	5078	CLAY	STIFF	1800	0	0.85	15.98	63.93	15.98	63.93
70.0	73.0		2	63	189	5330	CLAY	STIFF	1800	0	0.85	9.59	73.52	9.59	73.52
73.0	80.0		1	68	476	5662	SAND	DENSE	0	38	0.00	37.33	110.84	12.50	86.02
80.0	85.0		2	65	325	6063	CLAY	V.STIFF	3500	0	0.40	14.62	125.47	14.62	100.65
85.0	90.0		2	65	325	6388	CLAY	V.STIFF	3500	0	0.40	14.62	140.09	14.62	115.27
90.0	95.0		2	65	325	6713	CLAY	V.STIFF	3500	0	0.40	14.62	154.72	14.62	129.89
95.0	100.0		2	65	325	7038	CLAY	V.STIFF	3500	0	0.40	14.62	169.34	14.62	144.52

Downdrag Load in the upper 50 feet due to liquefaction is estimated in accordance with NAVFAC DM7.2 for downdrag load on pile groups.

At Abuts, the estimated down drag load is 32 Tons per pile. Predrill for abut piles should extend to Elev. 112'.

At Bent 2, for the planned 5 x 5 pile groups w/ 19'x19' ftg, total load = (125 pcf x 11' + 60 pcf x 35') x 19' x 19' = 627 Tons or Average 25 Tons of downdrag per pile per DM 7.2.

End Bearing Q = 9*Ac*Su = 9*1.36sq. ft. * 3.5 ksf = 43 kips or 21 Tons (Ultimate) -- On the conservative side, assume clay at tip.

Bent 2--> Adopt pile tip at 95' below grade (pile tip @ Elev. 34', OG-101 @ Elev. 129'), available Ult. Pile Capacity =155(Friction)+21(End Beaing)-25(Downdrag)=151T > Nominal Resistance (280k/140T), OK

Abuts --> Adopt pile tip at 95' below grade (pile tip @ Elev. 32', OG-101 @ Elev. 127'), available Ult. Pile Capacity =155(Friction)+21(End Beaing)-32(Downdrag)=144T > Nominal Resistance (280k/140T), OK

Pile Length @ Bent 2 = 123' (Ftg Elev.) - 34' (Tip) = 89 '

Pile Length @ Abuts = 138' (Ftg Elev.) - 32' (Tip) = 106 '

APPENDIX C-3

GEOTECHNICAL PARAMETERS FOR LPILE (V.5) ANALYSIS

Geotechnical Parameters for LPILE (V. 5) Analysis
Tully Road Overcrossing/Route 101, Santa Clara County, CA

Job No. 207150.BR
October 6, 2008

West Abutment (The existing Rte 101 is at approx. Elev. 127 ft):

Approx. Elevation (ft.)	Generalized Soil Profile	LPILE Soil Type	Soil Strength	K (pci)	E_{50} (in/in)	Effect Unit Wt. (pci)
Above 127	Embankment	3, CLAY	C = 1500 psf	--	0.007	0.072
127 to 117	Silty Sand	4, SAND	ϕ = 35 deg	25	--	0.069
117 to 112	Lean Clay	3, CLAY	C = 1200 psf	--	0.007	0.069
112 to 107	Lean Clay	3, CLAY	C = 1200 psf	--	0.007	0.036
107 to 97	Silty Find Sand to Silt (Potentially Liquefiable)	4, SAND (without liquefaction)	ϕ = 32 deg	20	--	0.036
		10, Liquefiable Sand (Rollings, 2003 as adopted in LPILE V. 5)				
97 to 87	Lean Clay, stiff	3, CLAY	C = 1200 psf	--	0.007	0.036
87 to 77	Silty Find Sand (Potentially Liquefiable)	4, SAND (without liquefaction)	ϕ = 32 deg	60	--	0.036
		10, Liquefiable Sand (Rollings, 2003 as adopted in LPILE V. 5)				
77 to 54	Lean Clay, stiff	3, CLAY	C = 1800 psf	--	0.007	0.036
54 to 47	Sand/Gravel, dense	4, SAND	ϕ = 38 deg	125	--	0.039
below 47	Clay & Silt, very stiff	3, CLAY	C = 3500 psf	--	0.005	0.039

East Abutment (The existing Rte 101 is at approx. Elev. 127 ft):

Approx. Elevation (ft.)	Generalized Soil Profile	LPILE Soil Type	Soil Strength	K (pci)	E_{50} (in/in)	Effect Unit Wt. (pci)
Above 127	Embankment	3, CLAY	C = 1500 psf	--	0.007	0.072
127 to 117	Silty Sand	4, SAND	ϕ = 35 deg	25	--	0.069
117 to 112	Lean Clay	3, CLAY	C = 1200 psf	--	0.007	0.069
112 to 107	Lean Clay	3, CLAY	C = 1200 psf	--	0.007	0.036
107 to 97	Silty Find Sand to Silt (Potentially Liquefiable)	4, SAND (without liquefaction)	ϕ = 32 deg	20	--	0.036
		10, Liquefiable Sand (Rollings, 2003 as adopted in LPILE V. 5)				
97 to 87	Lean Clay, stiff	3, CLAY	C = 1200 psf	--	0.007	0.036
87 to 77	Silty Find Sand (Potentially Liquefiable)	4, SAND (without liquefaction)	ϕ = 32 deg	60	--	0.036
		10, Liquefiable Sand (Rollings, 2003 as adopted in LPILE V. 5)				
77 to 57	Lean Clay, stiff	3, CLAY	C = 1800 psf	--	0.007	0.036
57 to 45	Sand/Gravel, dense	4, SAND	ϕ = 38 deg	125	--	0.039
below 45	Clay & Silt, very stiff	3, CLAY	C = 3500 psf	--	0.005	0.039

Bent 2 (The existing Rte 101 is at approx. Elev. 127 ft):

Approx. Elevation (ft.)	Generalized Soil Profile	LPILE Soil Type	Soil Strength	K (pci)	E_{50} (in/in)	Effect Unit Wt. (pci)
127 to 117	Silty Sand	4, SAND	ϕ = 35 deg	25	--	0.069
117 to 112	Lean Clay	3, CLAY	C = 1200 psf	--	0.007	0.069
112 to 107	Lean Clay	3, CLAY	C = 1200 psf	--	0.007	0.036
107 to 97	Silty Find Sand to Silt (Potentially Liquefiable)	4, SAND (without liquefaction)	ϕ = 32 deg	20	--	0.036
		10, Liquefiable Sand (Rollings, 2003 as adopted in LPILE V. 5)				
97 to 87	Lean Clay, stiff	3, CLAY	C = 1200 psf	--	0.007	0.036
87 to 77	Silty Find Sand (Potentially Liquefiable)	4, SAND (without liquefaction)	ϕ = 32 deg	60	--	0.036
		10, Liquefiable Sand (Rollings, 2003 as adopted in LPILE V. 5)				
77 to 54	Lean Clay, stiff	3, CLAY	C = 1800 psf	--	0.007	0.036
54 to 47	Sand/Gravel, dense	4, SAND	ϕ = 38 deg	125	--	0.039
below 47	Clay & Silt, very stiff	3, CLAY	C = 3500 psf	--	0.005	0.039

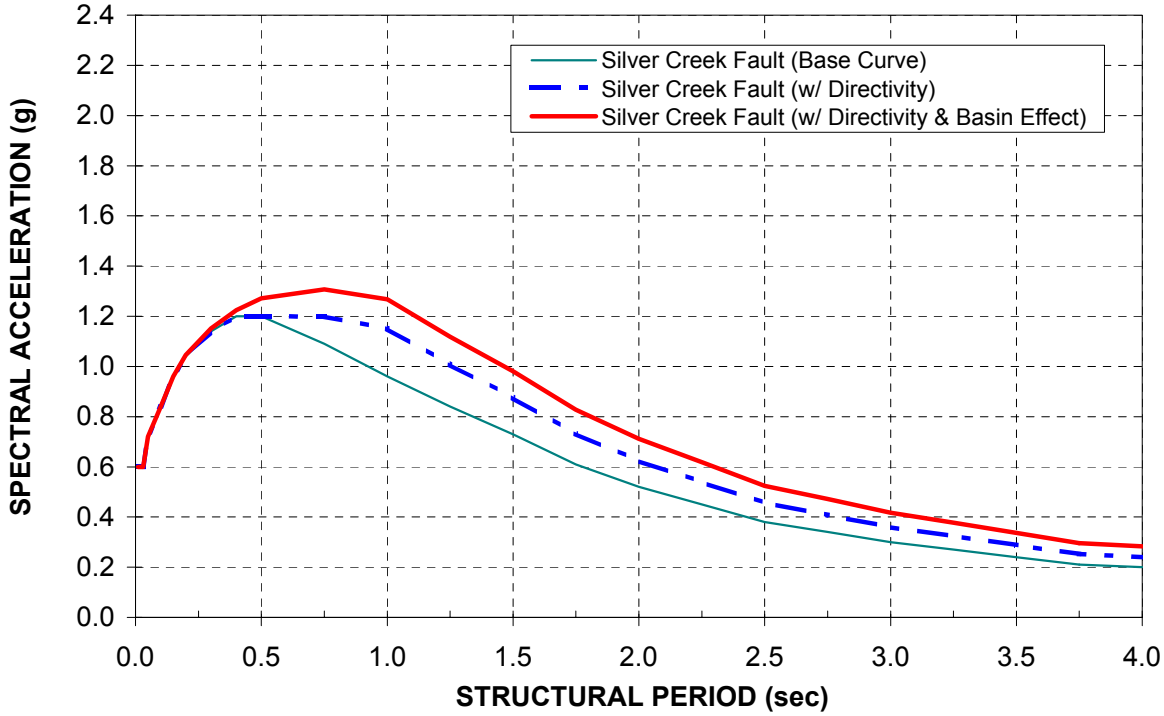
1. For group efficiency, use *p*-multiplier of 0.6 and *y*-multiplier of 1.0 for pile spacing of 3D when performing LPILE analysis. The *p*-multiplier = 0.8 for pile spacing of 4D, and 0.4 for 2D.

2. The K and E_{50} values in the tables above are for standard piles typically less then 2 ft in diameter. For pile size larger than 2 ft in diameter, the K values may be scaled up by multiplying a factor of $\sqrt{(D/2')}$, and the E_{50} values may be scaled down by dividing a factor of $\sqrt{(D/2')}$.

APPENDIX C-4

SEISMIC DESIGN CRITERIA

ARS DESIGN CURVE
TULLY RD OC - ROUTE 101 IMPROVEMENT
SANTA CLARA COUNTY, CALIFORNIA

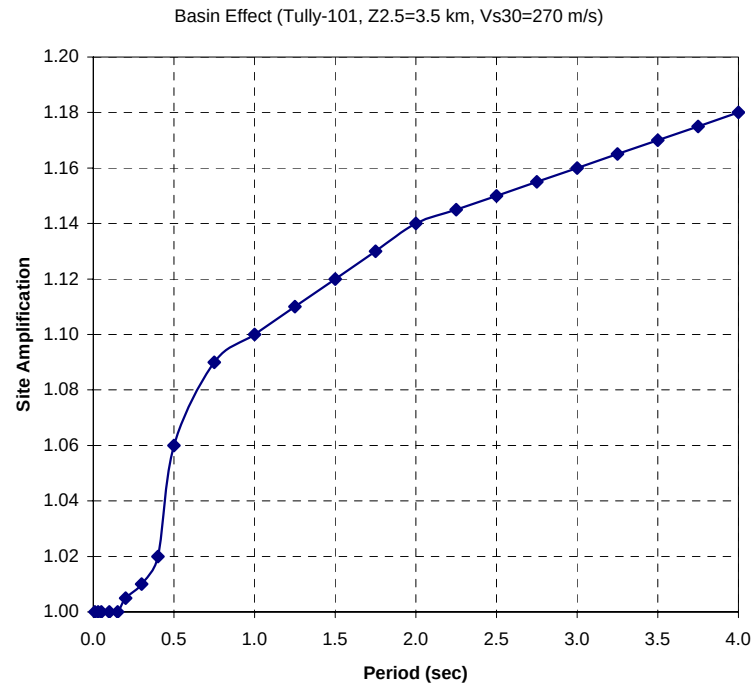


Period	Silver Crk Fault - 152 (7.1) w/ mod.
(sec)	Spectral Accel. (g)
0.01	0.600
0.03	0.600
0.05	0.720
0.10	0.840
0.15	0.960
0.20	1.045
0.30	1.151
0.40	1.224
0.50	1.272
0.75	1.307
1.00	1.267
1.25	1.119
1.50	0.981
1.75	0.827
2.00	0.711
2.25	0.618
2.50	0.524
2.75	0.471
3.00	0.418
3.25	0.377
3.50	0.337
3.75	0.296
4.00	0.283

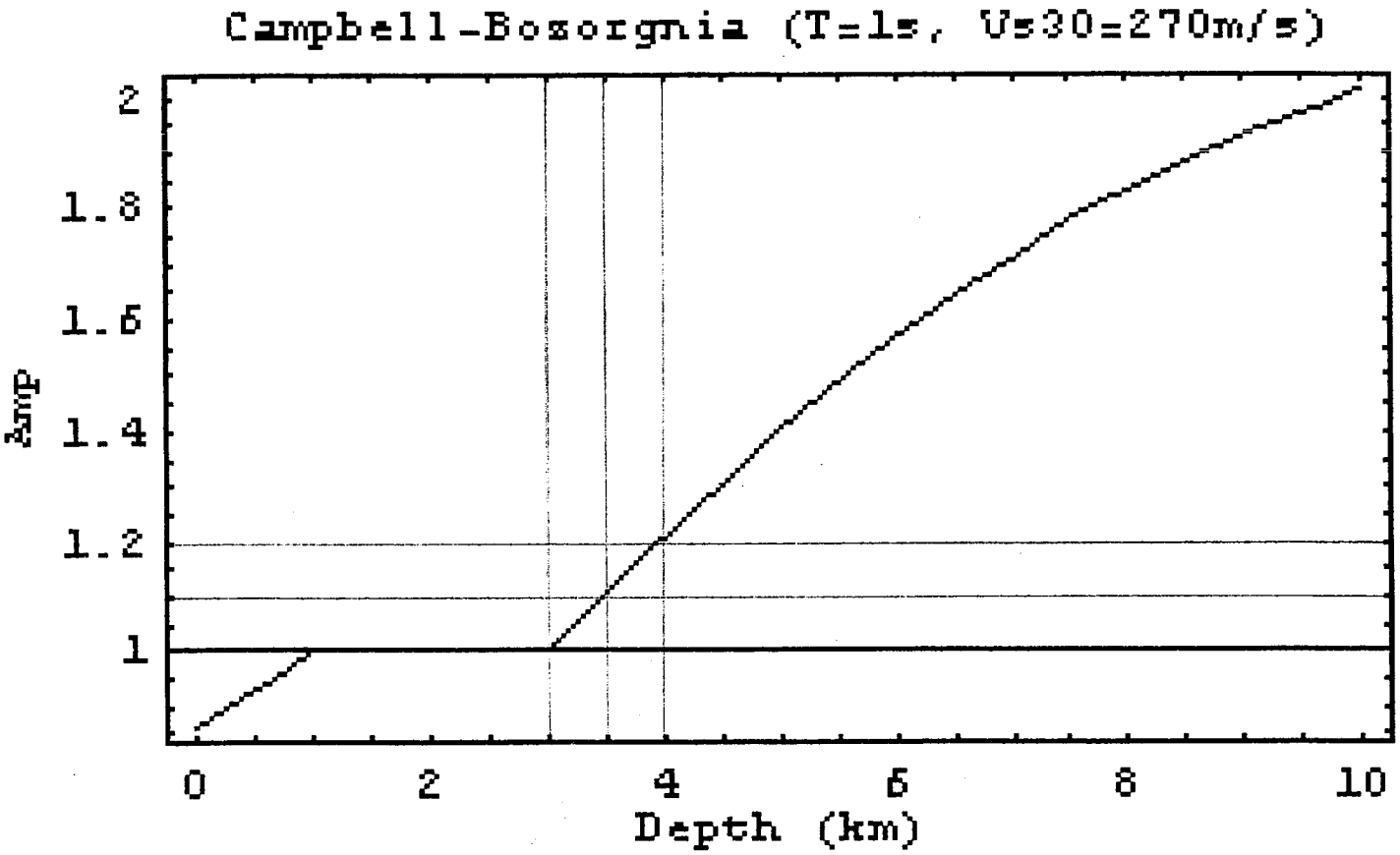
1. The base curve is per Caltrans 2008 Seismic Hazard Map (in-progress) considering both deterministic & probablistic models.
   Governing Fault: Fault ID #152 - Silver Creek Fault (reverse), Mmax = 7.1
   Location: Lat=37.318434 Long=-121.831377, Vs30 = 270 m/s
2. Modification for Directivity : 20% increase of Sa for T >1 sec., no change of Sa for T < 0.5 sec., and linear interpolation between 0.5 & 1 sec.
3. Modification for Basin Effect: Site Amplification is per Campbell and Bozorgnia (2007) considering Z2.5m/s depth.

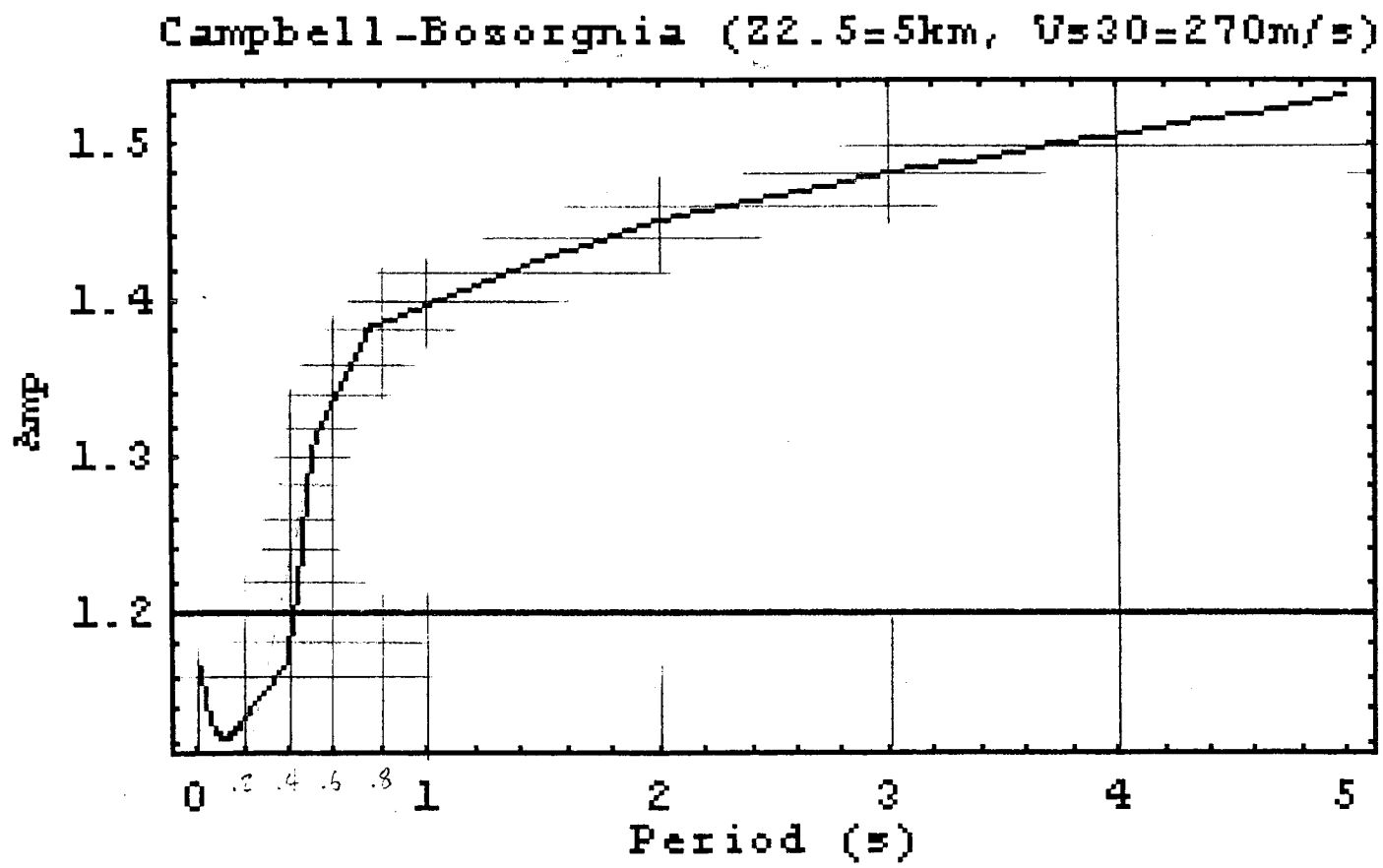
Silver Crk Fault - Caltrans 2008 Criteria

t	g	Mod g	Site Amp.	Directivity + Basin
0.010	0.600	0.600	1.000	0.600
0.030	0.600	0.600	1.000	0.600
0.050	0.720	0.720	1.000	0.720
0.100	0.840	0.840	1.000	0.840
0.150	0.960	0.960	1.000	0.960
0.200	1.040	1.040	1.005	1.045
0.300	1.140	1.140	1.010	1.151
0.400	1.200	1.200	1.020	1.224
0.500	1.200	1.200	1.060	1.272
0.750	1.090	1.199	1.090	1.307
1.000	0.960	1.152	1.100	1.267
1.250	0.840	1.008	1.110	1.119
1.500	0.730	0.876	1.120	0.981
1.750	0.610	0.732	1.130	0.827
2.000	0.520	0.624	1.140	0.711
2.250	0.450	0.540	1.145	0.618
2.500	0.380	0.456	1.150	0.524
2.750	0.340	0.408	1.155	0.471
3.000	0.300	0.360	1.160	0.418
3.250	0.270	0.324	1.165	0.377
3.500	0.240	0.288	1.170	0.337
3.750	0.210	0.252	1.175	0.296
4.000	0.200	0.240	1.180	0.283
	Base curve per Caltrans (2008) -NGA	Directivity	Basin Effect	Directivity + Basin Effect



Modification of Basin Effect is per Campbell and Bozorgnia NGA model (2007). Per geologic data, the depth to Z2.5 m/s velocity horizon is approx. 3.5 km at the site. Therefoe, a Site Amplification factor of 1.1 (at T = 1 sec.) was selected per the data provided. Since the basin effect is period-dependent, reference is made to the provided data for Z2.5 = 5 km & Vs30 = 270 m/s (Campbell-Borzorgnia model) for general trend of the factor. The final adopted Site Amplication is shown and plotted above. The selected factor is 1.1 at T = 1 sec., increasing gradually to 4 sec. and tapering to 1.0 at 0.2 sec.


Campbell-Boxorgnia (T=1s, Vs30=270m/s)
Amp
2
1.8
1.6
1.4
1.2
1
0
2
4
6
8
10
Depth (km)


Campbell-Boxorgnia (Z2.5=5km, Vs30=270m/s)
Amp
1.5
1.4
1.3
1.2
0
.2
.4
.6
.8
1
2
3
4
5
Period (s)

David Wang

From: John Alciati [jalciati@BiggsCardosa.com]
Sent: Monday, October 06, 2008 12:02 PM
To: 'Prasad, Ven'; John Kenyon; 'David Wang'
Cc: Michael Thomas; Ron Oen; Robert Yamane
Subject: FW: Tully Rd Design Spectrum

Attachments: Basin Effec - Site Amplication.pdf; Updated ARS Curve for Tully-Rte 101 (Caltrans 2008 - Silver Crk Fault) 9-26-08.xls

Basin Effec - Site Amplication... Updated ARS Curve for Tully-Rt...

All,

Caltrans has approved the attached ARS curve for Tully.

-----Original Message-----
From: Emil Vergara [mailto:emil_vergara@dot.ca.gov]
Sent: Monday, October 06, 2008 10:49 AM
To: Ron Oen; John Alciati
Subject: Fw: Tully Rd Design Spectrum

FYI.

Regards,

Emil A. Vergara Jr., P.E.
DES, OSFP Liaison Engineer
(916) 227-8360, FAX (916) 227-8683
http://www.dot.ca.gov/hq/esc/osfp/

****
****

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95816-8041
****
****
----- Forwarded by Emil Vergara/HQ/Caltrans/CAGov on 10/06/2008 10:46 AM

Martha Merriam/HQ/Caltrans/CAGov
10/06/2008 10:44 AM

To: Emil Vergara/HQ/Caltrans/CAGov@DOT
cc: Hossain Salimi/HQ/Caltrans/CAGov@DOT, Mike Keever/HQ/Caltrans/CAGov@DOT
Subject: Fw: Tully Rd Design Spectrum

Dear Emil,

We have reviewed the Tully Rd design spectrum submitted by Parikh Consultants. The spectrum was based on Caltrans 2008 criteria, per project specific revisions as described in MTD 20-11 and okayed by Mike Keever.
The spectrum is acceptable.

Martha Merriam, M.S., P.G., C.E.G.
Office of Geotechnical Support
916-227-7135
916-296-5351

Hossain Salimi
Senior Materials and Research Engineer
Office of Geotechnical Design-West
(916) 227-5865

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----- Forwarded by Martha Merriam/HQ/Caltrans/CAGov on 10/06/2008 10:35 AM

Martha Merriam/HQ/Caltrans/CAGov
09/30/2008 07:48 AM

To: Emil Vergara/HQ/Caltrans/CAGov
cc: "'Hossain Salimi'" <hossain_salimi@dot.ca.gov>, "'Mike Keever'" <mike_keever@dot.ca.gov>, "'Tom Shantz'" <tom_shantz@dot.ca.gov>, "David Wang" <dwang@parikhnet.com>, Gem-Yeu Ma/HQ/Caltrans/CAGov@DOT
Subject: RE: Tully Rd Design Spectrum(Document link: Martha Merriam)

Hi Emil,

As you can see, David has submitted a design spectrum for the Tully Rd replacement project for review. Hossain and I will be reviewing the submittal.

Martha

Martha Merriam, M.S., P.G., C.E.G.
Office of Geotechnical Support
916-227-7135

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"David Wang"
<dwang@parikh
net.com>

09/29/2008
10:40 AM

To
"'Martha Merriam'"
<martha_merriam@dot.ca.gov>

cc
"'Hossain Salimi'"
<hossain_salimi@dot.ca.gov>, "'Mike
Keever'" <mike_keever@dot.ca.gov>,
"'Tom Shantz'" <tom_shantz@dot.ca.gov>

Subject
RE: Tully Rd Design Spectrum

Martha,

(It seems that my email system has some problem. This is my third try...)

Please find the proposed ARS curve for Tully-Rte 101 project in San Jose.
The Excel file has two sheets which show the curve and data. The PDF file shows the back-up data you provided.

The base curve is per Caltrans 2008 criteria. Both directivity and basin effect are considered to modify the curve. Details are shown on the Excel file. Please review the data so that the structural engineer can proceed with the design.

Thank you so much for all the help. Please let me know if you have questions.

Regards,

Y. David Wang, Ph.D., P.E., Sen. Vice President Parikh Consultants, Inc.
356 S. Milpitas Blvd., Milpitas, CA 95035
(408) 945-1011 Tel (408) 945-1012 Fax

-----Original Message-----
From: Martha Merriam [mailto:martha_merriam@dot.ca.gov]
Sent: Thursday, September 18, 2008 5:34 PM
To: dwang@parikhnet.com
Cc: Hossain Salimi; Mike Keever; Tom Shantz
Subject: Tully Rd Design Spectrum

Dear David,

Here are some graphs provided by Tom Shantz which clarify the basin effect.
The depth along the x axis is depth to Z1.0 for the CY relationships, and depth to Z2.5 for the CB relationships (Tom, please correct me if I am wrong). We are ignoring for now the Z1.0 case for now. As you can see, the basin effects are period-dependent.

We discussed the northern California basin information earlier this week, and are tentatively not including the Evergreen Basin because of its minor effects (shallow and small in size with respect to our small scale project). CGS or the USGS will be doing a study defining California basins in more detail than we have been able to do, and when we incorporate that information down the road the Evergreen Basin may be included. But its effect will likely be small.

Please let me know if you have further questions. We look forward to reviewing your submittal. To clarify, we are using the larger of the deterministic ground motion (average values for ground motion of the Chiou-Youngs and Campbell-Bozorgnia 2008 relationships), and the probabilistic (USGS 5% in 50 yr ground motion), with near field and basin effects applied to both.

(Embedded image moved to file: pic26014.jpg)

(Embedded image moved to file: pic09483.jpg)

(Embedded image moved to file: pic07944.jpg)

(Embedded image moved to file: pic03131.jpg)

Martha Merriam, M.S., P.G., C.E.G.
Office of Geotechnical Support
916-227-7135
916-296-5351

"For individuals with sensory disabilities, this document will be made available, upon request, in Braille, large print, audiocassette, or computer disk. To obtain a copy in one of these alternate formats, please call Della Moore at (916) 227-8185 or TTY (916) 227-8454 or write to Della Moore, Division of Engineering Services, P.O. Box 168041, Sacramento, CA 95816-8041."

"David Wang"
<dwang@parikhnet.com>

09/17/2008 08:38 PM

To
"'Martha Merriam'"
<martha_merriam@dot.ca.gov>

cc
"'Mike Keever'"
<mike_keever@dot.ca.gov>, "'Hossain Salimi'"
<hossain_salimi@dot.ca.gov>

Subject
RE: Rte 101/Tully Rd in San Jose--New ARS Design Curve

Hi Martha,

Thanks for the geological info and papers on the P-wave & S-wave speed.
For
Rte 101/Tylly Rd site, your selection of basin depth (3.5 km) to 2.5 km/sec Velocity Horizon appears very reasonable. I agree with the work.

How are you doing with the ARS curve incorporating basin effect? Please let me know.
Thanks for your help.

Y. David Wang, Ph.D., P.E., Sen. Vice President Parikh Consultants, Inc.
356 S. Milpitas Blvd., Milpitas, CA 95035
(408) 945-1011 Tel (408) 945-1012 Fax

-----Original Message-----
From: Martha Merriam [mailto:martha_merriam@dot.ca.gov]
Sent: Monday, September 15, 2008 2:40 PM
To: David Wang
Cc: Mike Keever; Hossain Salimi
Subject: tully rd

The email describing what we discussed on Friday will be out tomorrow afternoon.

Martha

Martha Merriam, M.S., P.G., C.E.G.
Office of Geotechnical Support
916-227-7135
916-296-5351

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"David Wang" <dwang@parikhnet.com>		To
09/12/2008 07:25 PM	"'Martha Merriam'" <martha_merriam@dot.ca.gov>	
	"'Hossain Salimi'" <hossain_salimi@dot.ca.gov>	cc
	RE: Tully rd - attenuation relationship articles	Subject

Matha,

Thanks for all the info.

Y. David Wang, Ph.D., P.E., Sen. Vice President Parikh Consultants, Inc.
356 S. Milpitas Blvd., Milpitas, CA 95035
(408) 945-1011 Tel (408) 945-1012 Fax

-----Original Message-----
From: Martha Merriam [mailto:martha_merriam@dot.ca.gov]
Sent: Friday, September 12, 2008 6:04 PM
To: David Wang
Cc: Hossain Salimi
Subject: Tully rd - attenuation relationship articles

(See attached file: CB08 NGA Ground Motion Relations (Spectra, 2008)_Final.pdf)

(See attached file: Chiou and Youngs_NGA_Spectra-rev02.pdf)

Martha Merriam, M.S., P.G., C.E.G.
Office of Geotechnical Support
916-227-7135
916-296-5351

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(See attached file: Basin Effec - Site Amplication.pdf)(See attached file: Updated ARS Curve for Tully-Rte 101 (Caltrans 2008 - Silver Crk Fault) 9-26-08.xls)

APPENDIX C-5

EMBANKMENT SETTLEMENT & STABILITY EVALUATION

SETTLEMENT ANALYSIS *** TULLY ROAD OC-ROUTE 101, SANTA CLARA COUNTY *** **APPROACH EMBANKMENTS (TYPICAL)** 10/20/08

LOCATION: APPROACH EMBANKMENTS FOR THE BRIDGE

Height of fill = 25 ft
Width of fill = 60 ft
Fill Density = 130 pcf

Based on reference Borings BR-1 & 2 (CPTs), E-11, R-8 & E-39
The new embankment is about 60 ft wide abutting existing fill.

- The undrained shear strength (Su) is correlated with SPT-N values based on Terzaghi and Peck (1967), and NAVFAC DM-7.1 (1982).
- Approximate estimation of preconsolidation pressure is based on Su/P ratio per Skempton (1957).
- The modified compression index (Cc/1+e0) is correlated with natural moisture content based on Lambe and Whitman (1969).
- The recompression index is adopted as 12% of the virgin compression index, which is typically 5% to 10% of the compression index (Holtz and Kovacs, 1982).
- The applied pressure is estimated from 2V:1H distribution of the embankment load.

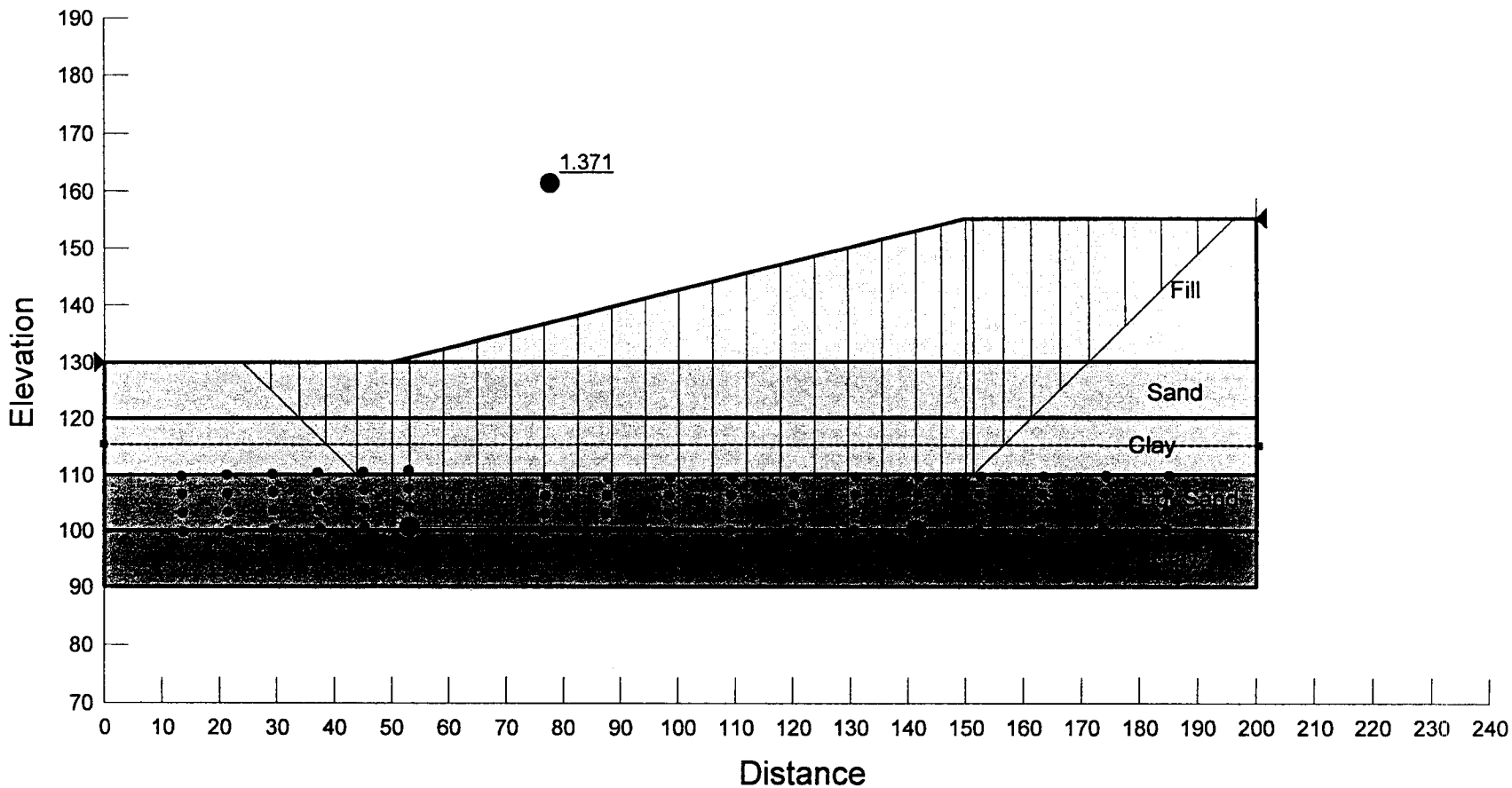
DEPTH FROM	TO	EFFECTIVE UNIT WEIGHT(pcf) (psf)	WEIGHT OF LAYER (psf)	MIDLAYER EFFECTIVE OVERBURDEN PRESSURE (psf)	APPLIED PRESSURE (psf)	GENERALIZED AVERAGE SPT-N VALUES	UNDRAINED SHEAR STRENGTH (psf)	PRECONSO-LIDATION PRESSURE (psf)	NATURAL WATER CONTENT (%)	MODIFIED VIRGIN COM-PRESSION INDEX	MODIFIED RECOM-PRESSION INDEX	CONSOLIDATION SETTLEMENTS (in.) OC	NC	SUM
			0											
0	5	125	625	312.5	3120	10				(sand layer)				
5	10	125	625	937.5	2889	10								
10	15	125	625	1562.5	2690	10	1200	4800	20	0.0847	0.0106	0.28	0.00	0.28
15	20	63	315	2032.5	2516	10	1200	4800	20	0.0847	0.0106	0.22	0.00	0.22
20	25	63	315	2347.5	2364	10				(sand layer)				
25	30	63	315	2662.5	2229	10								
30	35	63	315	2977.5	2108	10	1200	4800	25	0.1174	0.0147	0.18	0.18	0.36
35	40	63	315	3292.5	2000	10	1200	4800	25	0.1174	0.0147	0.14	0.30	0.44
40	45	63	315	3607.5	1902	20				(sand layer)				
45	50	63	315	3922.5	1814	20								
50	55	63	315	4237.5	1733	14	1800	7200	29	0.1443	0.0180	0.16	0.00	0.16
55	60	63	315	4552.5	1660	14	1800	7200	29	0.1443	0.0180	0.15	0.00	0.15
60	65	63	315	4867.5	1592	14	1800	7200	29	0.1443	0.0180	0.13	0.00	0.13
65	70	63	315	5182.5	1529	14	1800	7200	29	0.1443	0.0180	0.12	0.00	0.12
70	73	63	189	5434.5	1483	14	1800	7200	29	0.1443	0.0180	0.07	0.00	0.07
73	80	63	441	5749.5	1429	60				(SAND LAYER)				
80	90	63	630	6285	1345	30	3750	15000	29	0.1443	0.0180	0.18	0.00	0.18
										TOTAL SETTLEMENT (IN.) =		1.64	0.48	2.11

O.C. RANGE SETTLEMENT = 1.64 INCHES
N.C. RANGE SETTLEMENT = 0.48 INCHES

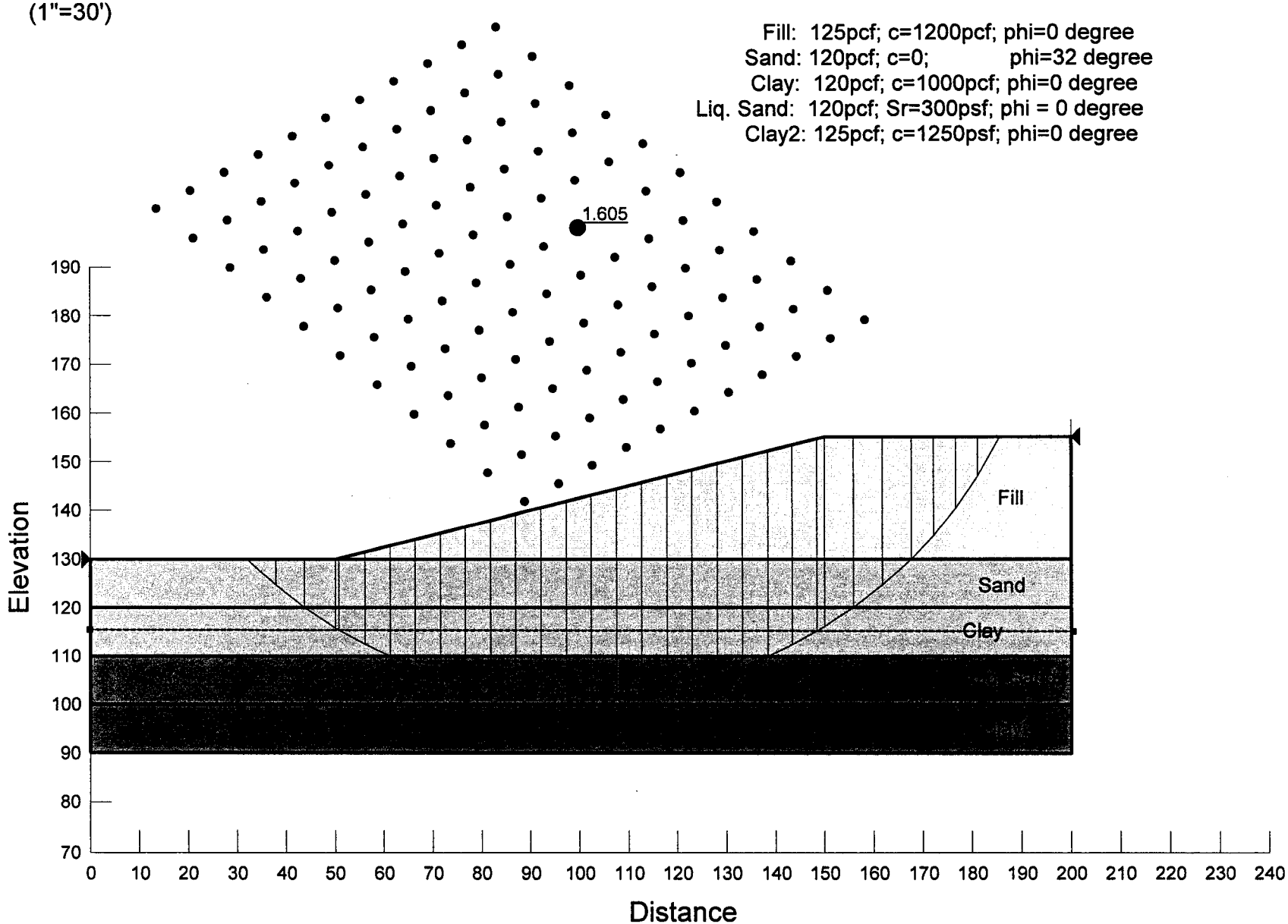
Majority of the settlement is in the overconsolidated/elastic range.

US 101 Improvements from I280/680 to Yerba Buena Road
Slope Stability Analysis for Embankment (gradient 4H:1V)
Tully Road OC/Rte 101
(1"=30')

Fill: 125pcf; c=1200pcf; phi=0 degree
Sand: 120pcf; c=0; phi=32 degree
Clay: 120pcf; c=1000pcf; phi=0 degree
Liq. Sand: 120pcf; Sr=300psf; phi = 0 degree
Clay2: 125pcf; c=1250psf; phi=0 degree



US 101 Improvements from I280/680 to Yerba Buena Road
Slope Stability Analysis for Embankment (gradient 4H:1V)
Tully Road OC/Rte 101
(1"=30')



APPENDIX D

Review Discipline: Geotechnical Design
Comments Due By: December 5, 2008
Date Review Completed: December 29, 2008

Compiled By: HMH
Date: December 29, 2008
JRT Meeting Date: January 9, 2008

COMMENT REVIEW AND RESPONSE

Project Title: **U.S. 101 Operational Improvement I-280/I-680 to Yerba Buena Road**

Submittal: **Geotechnical Foundation Report and Structure Plans**

Design Response by: **Parikh BCA**

CODE: A-Will Comply B-Consultant to Evaluate C-Will Not Incorporate D-VTA to Evaluate E-Caltrans to Evaluate/Clarify

AGCY	INIT	Item No.	Drawing or Page No.	Review Comments	Design Responses	Rev. Act.	JRT Disp.	Final Disp.
CT	Mohammad Zabolzadeh	1	Page 8	The recommended extension of the standard predrilling through the exist embankment should be specified in the SSP.	The bottom of predrilled hole elevation 112' as shown in the "Predrilled Holes" paragraph of the Piling SSP incorporates the recommended 15' minimum extension below OG noted on Page 8 of the Foundation Report dated 11-26-08. The recommended predrill elevation of 112' is also noted on page 8 of the Foundation Report.	C		

Review Discipline: Geotechnical Design
Comments Due By: December 5, 2008
Date Review Completed: December 29, 2008

Compiled By: HMH
Date: December 29, 2008
JRT Meeting Date: January 9, 2008

COMMENT REVIEW AND RESPONSE

Project Title: **U.S. 101 Operational Improvement I-280/I-680 to Yerba Buena Road**

Submittal: **Geotechnical Foundation Report and Structure Plans**

Design Response by: **Parikh BCA**

CODE: A-Will Comply B-Consultant to Evaluate C-Will Not Incorporate D-VTA to Evaluate E-Caltrans to Evaluate/Clarify

AGCY	INIT	Item No.	Drawing or Page No.	Review Comments	Design Responses	Rev. Act.	JRT Disp.	Final Disp.
CT	Mohammad Zabolzadeh	2	Tables Page 10 Page 11	The value of the Compression nominal Resistance for Bent 2 appears to be miscalculated. This value is shown to be as 2x Service Load (280 Kips). However, after applying factors of 0.7 and 1.0 to the values shown for Strength Limit and Extreme Limit, respectively, the nominal resistance value for Strength Limit case (380 kips) would be greater than nominal resistance for Service Loads (280 kips) and Extreme Limit cases (275). If agreed, Revise Nominal Driving Resistance Required and Specified Tip Elevation columns accordingly.	We double-checked with the designer about the nominal compression of Strength Limit State. Actually, the value (264 kips) shown on Page 10 for the strength Limit is already mistakenly factored by 0.7 (264= 185/0.7). The correct nominal resistance for Strength Limit State should be 185 kips, as shown on Page 9 of the report. For MTD 3-1, it should not be factored before entering into the table. We will revise the table on Page 10 to show 185 kips. The nominal resistance is governed by the Extreme Limit State (275 kips round up to 280 kips). The pile tip/capacity is not affected.			
CT	Mohammad Zabolzadeh	3	Plans Sheet 3	The heading labels for Design Tip Elevation and Specified Tip Elevation are not printed. Revise this sheet to show these labels.	Heading labels for the pile data table will be corrected.	A		

OSFP Review Comment & Response Form

General Project Information	Review Phase	Reviewer Information
Dist: 04 EA: 1A9801 Project Name: Tully Road 101/OC OSFP Liaison: Emil Vergara Phone: 227-8360 e-mail: Emil_Vergara@dot.ca.gov	☐ PSR/PDS (Review No. _) ☐ APS/PSR (Review No. _) ☐ APS/PR (Review No. _) ☐ Type Selection ☒ 65% PS&E Unchecked Details ☐ PS&E (Review No. _) ☐ Construction Support ☐ Other:	Reviewer Name: Mohammad Zabolzadeh Functional Unit: GS Phone Number: (510) 286-4831 e-mail: Mohammad_Zabolzadeh@dot.ca.gov Date of Review: 01/02/08
	Structure Information (Use when necessary to document comments by individual structure) Structure Name: Tully Rd OC Br No: 04-37-0668	

Consultant Information (to be filled in by Consultant)

Consultant Structure Lead (First and Last Name)	Structure Consultant Firm	Phone Number	e-mail	Response Date
Parikh				

#	Doc. (See Note 1)	Page, Section, or SSP	Review Comments	Consultant Responses	
1	FR	N/A	FR prepared by Parikh Consultants, Inc. dated 11/08.		
2	FR	Page 8	The recommended extension of the standard predrilling through the exist embankment should be specified in the SSP.		
3	FR	Tables on Pages 10&11	The value of the Compression nominal Resistance for Bent 2 appears to be miscalculated. This value is shown to be as 2x Service Load (280 Kips). However, after appling factors of 0.7 and 1.0 to the values shown for Strength Limit and Extreme Limit, respectively, the nominal resistance value for Strength Limit case (380 kips) would be greater than nominal resistance for Service Loads (280 kips) and Extreme Limit cases (275). If agreed, Revise Nominal Driving Resistance Required and Specified Tip Elevation columns accordingly.		
4	Plans		The heading labels for Design Tip Elevation and		

Note 1: Abbreviations for Typical Documents (if Abbr. is not below, type in the document type)					
P=Structure Plans	SP=Special Provisions	FR=Foundation Rpt	DC=Design Calcs	TS=Type Sel. Report	QCC=Quant. Check Calcs
RP=Road Plans	E=Estimate	H=Hydraulics Rpt	CC=Check Calcs	QC=Quant. Calcs	

✓= Comment Resolved (for Reviewer's use)

	Sheet 3		Specified Tip Elevation are not printed. Revise this sheet to show these labels.		
5	FR	N/A	C3-Not Approved, resubmit required	N/A	
6					
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✓= Comment Resolved
(for Reviewer's use)

OSFP Review Comment & Response Form

General Project Information	Review Phase		Reviewer Information
Dist: 04 EA: 1A9801 **Project Name: Tully Road 101/OC** **OSFP Liaison: Emil Vergara** **Phone: 227-8360** **e-mail: Emil_Vergara@dot.ca.gov**	☐ PSR/PDS (Review No. _) ☐ APS/PSR (Review No. _) ☐ APS/PR (Review No. _) ☐ Type Selection	☐ 65% PS&E Unchecked Details ☐ PS&E (Review No. _) ☐ Construction Support ☒ Other: Foundation Report	**Reviewer Name: R. Karpowicz/ M Zabolzadeh** **Functional Unit: GS** **Phone Number: (510) 286-4831** **e-mail:** **Mohammad_Zabolzadeh@dot.ca.gov** **Date of Review: 03/10/09**
	Structure Information (Use when necessary to document comments by individual structure) **Structure Name: Tully Rd OC** **Br No: 04-37-0668**		

Consultant Information (to be filled in by Consultant)

Consultant Structure Lead (First and Last Name)	Structure Consultant Firm	Phone Number	e-mail	Response Date
Parikh				

#	Doc. (See Note 1)	Page, Section, or SSP	Review Comments	Consultant Responses	
1	FR	N/A	FR prepared by Parikh Consultants, Inc. dated 01/30/09.		
2	FR	General	Numerous citations to scientific literature are provided in the text of the report; however, a complete reference to the citations is absent. Please include complete references cited in the text.	Will include a complete reference list.	
3	FR	Page 4	Please indicate which method of soil interpretation of the cone penetration data for this project was employed accordingly.	The CPT interpretation was provided by Gregg In Situ, Inc. A complete report (12/18/07) prepared by Gregg is attached in Appendix A of the foundation report. The interpretation follows the comprehensive review by Lunne, Robertson and Powell (1997), and Dr. Robertson joined Gregg In Situ several years ago. Gregg's CPT data is commonly adopted for design/investigation and has become a standard in geotechnical community. Parikh's spread sheet only reads Gregg's data and presents/plots certain selected parameters along depth for convenience of reading the file.	
4	FR	Page 4	The text indicates that information derived from	At north abutment area, the layers and material descriptions of	

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✓= Comment Resolved
(for Reviewer's use)

			borings and CPT data was used to investigate the subsurface in the area of the project. Please indicate your interpretation as to how well the CPT data correlates to the boring data.	as-built Boring B-4 (Caltrans 1961) appear to correlate reasonably well with CPT BR-2. At south abutment, the as-built Boring B-1 indicate predominantly granular material in the upper 50 ft while CPT BR-1 encountered clay and silt layers in between granular layers. Below 50 ft depth, the material descriptions in B-1 appear to match reasonably well with the CPT data. The CPT data complement the subsoil information.	
5	FR	Page 4	The Subsurface Conditions section inadequately describes the data derived from the CPT and laboratory testing. Specifically the subsurface material between a depth of 0 to 20 feet is not described. Layers of material are described at certain depths; however, their thicknesses are not described. Laboratory testing was performed on samples obtained from a soil probe; however there is no description of what the laboratory testing revealed about the physical properties of the subsurface materials. Please revise the Subsurface Conditions section to include a complete description of the subsurface material from the ground surface to the full depth explored, including a description of the physical properties of the materials based on laboratory testing.	Will revise the Subsurface Conditions to be more elaborate and indicate the layer thickness and laboratory data per the comment.	
6	FR	Page 4	The Subsurface Conditions section inaccurately describes the data derived from the CPT and laboratory testing. According to the text, "The CPT data generally indicate two layers of sandy silt/silty fine sand, one at about 20-foot depth…"; however, the LOTB BR-1 indicates that the material at approximately 20 feet below the ground surface consists of lean clay. Please revise the subsurface conditions section to accurately describe both LOTBs and the information derived from the previous subsurface investigation.	Similar to response to #5, will elaborate the Subsurface Conditions. Please note that in BR-1, the material encountered at approx. 21 to 27 ft depth consists of silt and silty sand based on laboratory PI and sieve/wash data. Lean clay (CL) was encountered below the silt. (CPT data interpretation starts from 5 ft depth because the upper 5 ft is hand augered – Gregg's safety practice.)	

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✓= Comment Resolved
(for Reviewer's use)

7	FR	Page 4	The text indicates that groundwater was encountered at about 15 feet. Please indicate what boring or borings this information is derived from and when the measurement was taken. In addition. Please comment on the groundwater level across the entire project limits.	During CPT operation, pore pressure dissipation tests were performed in both BR-1 (12/14/07) and BR-2 (12/17/07). The dissipation test data is included in Gregg's CPT report of 12/18/07. The as-built LOTB sheet (Caltrans 1961) shows groundwater at about 20 ft depth. Additional borings (presented in the project GDMR) drilled for roadway design at the interchange encountered groundwater at 15 to 17.5 ft depth in 12/2007. Groundwater level at the site appears to be relatively uniform.	
8	FR	Page5	Please revise the text to include the relative ages of the identified geologic units.	Will revise the text to include the relative ages.	
9	FR	Page 5	Please indicate the in which geomorphic province the subject site is located.	Will revise the text to show Coast Ranges geomorphic province.	
10	FR	Page 5	The text of the report refers to the Silver Creek Fault as a "new fault". This is an inappropriate adjective to describe the age or activity of a fault. Please use geologic nomenclature when describing geologic features and revise accordingly.	The intention was to show that the Silver Creek Fault was added in the 2008 Seismic Hazard Map. We will revise the language.	
11	FR	Page 5	The description of the Silver Creek Fault is incomplete. Please include a description of the Silver Creek Fault in accordance with the Caltrans "Guidelines for Structures Foundation Reports" Version 2, 2006. Specifically, the description should include the designation of the Silver Creek Fault, the style of faulting, the Magnitude of the Maximum Credible Earthquake (MCE), fault-to-site distance, and the Peak Bedrock Acceleration (PBA), and the soil profile type as defined in the Caltrans Seismic Design Criteria manual Appendix B.	Will revise the description for the Silver Creek Fault. Based on the fault database provided by Caltrans, the Silver Creek Fault (FID = 152) is a reverse fault with maximum moment (Mmax) of 7.1. The soil profile is Type D, and the fault is only 0.24 km from the site. A PBA of 0.7g is anticipated. Note that these data will be shown for reference only. Due to close distance to fault, Caltrans indicated that the design should be based on the new map and new criteria (NGA model) instead of the existing Caltrans standard ARS curves in SDC v. 1.4. The ARS design curve was developed through communication, collaboration and information provided by Caltrans as discussed in the report.	
12	FR	Page 5	The text indicates that HMM/Bechtel-Geomatrix performed a study of the Silver Creek Fault. Please summarize the scientific exploration	Will review the HMM/Bechtel-Geomatrix report and provide a summary.	

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✓= Comment Resolved
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			methods, findings and conclusions of the report with respect to the Silver Creek Fault.		
13	FR	Page 6	The text argues "Since no active faults pass through the project site and the thick alluvial deposits, the potential for fault rupture is relatively low"; however according to the California Seismic Hazards Map (Caltrans, 2008) and the Geologic map of California, San Jose sheet (CDMG, 2006) an inferred trace of the Silver Creek Fault passes directly through the site. In addition, the presence of thick alluvial deposits does not negate the possibility of active faulting. Please include a geologic map that delineates the locations of faults in the vicinity of the proposed project. In addition, please provide a justification as to why the Silver Creek Fault does not present a surface rupture hazard to the proposed project. If after closer review it is concluded that there is a potential for surface rupture at the site, a work plan will need to be submitted prior to performing any future field work addressing the fault rupture potential. A Fault Rupture Study should be performed in accordance with section 2.5.3 of Caltrans "Guidelines for Structures Foundation Reports" Version 2, 2006. Specifically, the study shall identify if the potential for Surface Fault Rupture Displacement Hazard exists and assess the location, magnitude, and orientation of static offset.	**We are currently communicating with USGS. The fault issue will be respond separately.**	

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RP=Road Plans	E=Estimate	H=Hydraulics Rpt	CC=Check Calcs	QC=Quant. Calcs	

✓= Comment Resolved
(for Reviewer's use)

			The liquefaction hazard potential evaluation is incomplete. Based on the text the evaluation was solely based on CPT data which was not correlated with obtained soil samples and was not confirmed with the laboratory testing results. The liquefaction hazard potential evaluation needs to be ratified by correlating the CPT data with obtained soil samples and laboratory testing.	We reviewed the obtained soil samples and the specific laboratory testing while carrying out the liquefaction investigation. We also referenced the latest research of geotechnical engineering regarding Liquefaction Susceptibility of Fine-Grained Soils (Bray, et al 2004). Please see response to #14. The CPT liquefaction analysis is in accordance with current geotechnical practice (Youd, et al, 2001).	
14	FR	Page 6	The text indicates the "Clays are generally not susceptible to liquefaction." This statement directly contradicts the results of the liquefaction potential analysis which are presented in the following paragraph. According to the text of the report and the Liquefaction Potential Analysis BR-1 there is a zone between approximately 20 and 30 feet below ground surface of potentially liquefiable material, consisting of lean clay according to the LOTB BR-1. Laboratory tests of this material confirm that this material correctly classified as clay with a liquid limit of 39% and a plasticity index of 19%. Please provide justification as to why the referenced clay layer at the site is susceptible to liquefaction and explain why there are contradictory statements in two consecutive paragraphs within the referenced report.	The reviewer may have overlooked a silt to silty sand layer at about 21 to 27 ft depth (Samples # 2 & 3 at 20 & 25 ft) above the clay layer in BR-1. The clay layer is at about 27 to 42 ft with LL = 39 & PI = 19. (Note that the CPT data starts from 5 ft depth because the upper 5 ft was hand-augered.) The Silt layer has LL= 27, PI = 6, and natural water content (Wc) of 24%. Recent advances in soil liquefaction engineering (Seed, et al. 2003 and Bray, et al. 2004) indicated that soils with sufficient fines content and fine-grained soils are also susceptible to liquefaction. A framework consisting of comparing Atterberg Limits (LL & PI) with natural water content (Wc) of the soils appears to be robust for evaluating liquefaction susceptibility of soils with sufficient fines and fine-grained soil. Bray, et al. (2004) suggested loose soils with PI<12 and wc/LL >0.85 were susceptible to liquefaction, and loose soils with 12<PI<18 and w_c/LL>0.8 were systematically more resistant to liquefaction. Per Bray's et al (2004) criteria, the on-site Silt layer in BR-1 with LL = 27, PI = 6 and Wc/LL = 0.89 is subject to liquefaction potential. The underlying Lean Clay with LL = 39 & PI = 19 is not liquefiable. In BR-2, Sample #8 at 48 ft (silt layer with LL = 31, PI = 7 with Wc of 29%) also fits Bray's et al (2004) criteria of liquefaction susceptibility. In BR-1, liquefaction susceptibility was indicated at the silt-	

Note 1: Abbreviations for Typical Documents (if Abbr. is not below, type in the document type)					
P=Structure Plans	SP=Special Provisions	FR=Foundation Rpt	DC=Design Calcs	TS=Type Sel. Report	QCC=Quant. Check Calcs
RP=Road Plans	E=Estimate	H=Hydraulics Rpt	CC=Check Calcs	QC=Quant. Calcs	

✓= Comment Resolved
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				silty sand layer (approx. 21 to 27 ft) and silty sand-sand layer (approx. 42 to 49 ft). In BR-2, liquefaction susceptibility was indicated at approx. 22 to 34 ft (sand & silt mix with some clay interbedded) and at approx. 44 to 48 ft. The liquefaction susceptible layers indicated in BR-1 & BR-2 are reasonably consistent although the layer thickness has some variation. In addition, these layers also correlate with as-built B-4 (Caltrans 1961), which indicates slightly compact silty fine sand layer (Elev. 107-97 ft) and slightly compact fine sand layer (Elev. 85-75 ft). Therefore, from a practical design standpoint, it is recommended that the generalized soil profile for design consider liquefaction susceptible layers at 20-30 ft depth and 40-50 ft depth to account for some variations. Although the low plasticity silt is still subject to liquefaction susceptibility, the settlement and deformation potential is lower than "sand". Per Bray, et al (2004), the low plasticity silt may dilate during shear once liquefaction is triggered and may undergo a transient loss of strength (cyclic mobility with limited flow deformation).	
15	FR	Page 6	According to the text "It is estimated that the post-liquefaction settlement may be on the order of six to seven inches." Please provide describe how this conclusion was determined.	We have reference both Tokimastsu and Seed (1987) and Ishihara and Yoshimine (1992) for estimation of post-liquefaction settlement. These references correlate post-liquefaction volumetric strain to cyclic stress ratio (CSR), SPT-N values, cone tip resistance, relative density, etc. These empirical references provide a general guide about the order of settlement magnitude. Based on the CPT data and as-built SPT-N values (12 to 14 typical), a volumetric strain of about 3 to 4% is estimated. Considering there are silt mix and some clay interbedded in the layers, we exercised judgment and adopted 3% volumetric strain for the total thickness of 20 ft for settlement estimation.	
16	FR	Page 7	In the Liquefaction Potential and Down Drag Load on Piles section the text indicates "Therefore, for the potential 20 feet of liquefiable sand…" According to the LOTB the potentially liquefiable material consists of clay. Please revise accordingly.	See response to #14.	

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17	FR	Page 8	The text indicates "Based on the Boring and CPT data, the subsoils consist of fine-grained sand and silt in the upper 50 feet that pose liquefaction potential." According to the LOTBs more than 50% on the subsurface material in the upper 50 feet consist of silty clay. Please revise this sentence accordingly. In addition, according to the Liquefaction Potential section only approximately 20 feet of material is potentially liquefiable, not the entire upper 50 feet of subsoil. Furthermore, the Liquefaction Hazard Analysis will have to be revised, and this section should be revised subsequent to the Liquefaction Hazard Analysis revision.	See response to #14. We will revise the language to better describe the liquefaction susceptibility of the two layers, instead of the entire 50 ft. The design considers the down drag load on the foundation piles from the upper 50 ft of overburden.	
18	FR	Page 11	The text indicates that "Due to the hard clay and dense sand layers present at the site, relatively hard driving conditions should be anticipated." Please provide justification for this statement.	Both current CPT and as-built LOTB sheet indicate stiff to hard clay and dense sand below Elev. 50 ft. Particularly, the dense sand layer may cause local hard driving condition. This is commonly observed in the field when piling encounters dense sand layers. For the planned Alt "W" pile (open end pipe pile), we believe driving is feasible.	
19	FR	Page 13	The text indicates "A minimum deterministic spectrum based on M6.5 at 12 km is included.", however; according to Plate No. 4, the design level earthquake is M7.1. Please revise the referenced statement accordingly.	The design earthquake is Mmax = 7.1 for the Silver Creek Fault. It is our understanding the "M6.5 at 12 km" event is the minimum design requirement considered in Caltrans new design tool based on NGA model. Will revise the language to avoid confusion.	
20	FR	Plate 1	The photograph used as the Project location map is inappropriate. The photograph does not provide the reader any reference to the project location relative to its location within Santa Clara County, let alone its location within the State. Please revise accordingly.	Will revise the plate.	
21	FR	Plate 1	Please include a scale on Plate No. 1.	Will revise the plate.	
22	FR	Plate 3	The California Seismic Hazards Map is enlarged	Will revise the plate.	

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			to an inappropriate scale. In addition the project location is incorrect. Please revise this plate accordingly.		
23	FR	LOTB – BR-1	The soil behavior type of the Liquefaction Potential Analysis BR-1 is inconsistent with the material description presented in the Log of Test Boring (LOTB) BR-1. Specifically the LOTB for BR-1 indicates that the upper 10 feet of the boring consists of silty sand; however, the soil behavior type of the Liquefaction Potential Analysis BR-1 for the same interval is indicated as clayey silt to silty clay. This pattern of inconsistency between LOTB BR-1 and Liquefaction Potential Analysis BR-1 persists for the majority of the logs. Please revise the Liquefaction Potential Analysis BR-1 to match the LOTB BR-1.	The following response is common to #23 & #24. The Gregg CPT investigation so far has been a standard in the geotechnical community. We recommend keeping the CPT data as it is. A complete set of Gregg's CPT report is attached with the foundation report so as to provide completeness of the subsurface data. The CPT classification is based on grain size distribution and intends to provide a guide to Soil Behavior Type (SBT). CPT classification is not expected to provide accurate prediction of soil type based on its physical properties (such as by Unified Soil Classification System - ASTM D 2487). In USCS, fine-grained material is classified based on Atterberg Limits (LL & PI), not on grain size distribution. The wordings of CPT classification and USCS adopted in Caltrans logging manual are different because the origin and intent of the two systems are different. The liquefaction analysis was conducted based on the CPT approach per Youd, et al (2001), which uses Soil Behavior Type index (Ic) as an indication of material behavior. Soil with Ic greater than 2.6 is considered too clayey to liquefy. To avoid confusion, we will revise the LOTB to show only the laboratory test results.	
24	FR	LOTB – BR-2	The soil behavior type of the Liquefaction Potential Analysis BR-2 is inconsistent with the material description presented in the Log of Test Boring (LOTB) BR-2. Specifically the LOTB for BR-2 indicates that the from approximately 8 feet to 16 feet below ground surface the boring consists of lean clay; however, the soil behavior type of the Liquefaction Potential Analysis BR-1 for the same interval is indicated as sandy silt to clayey silt. This pattern of inconsistency between LOTB BR-2 and Liquefaction Potential Analysis BR-2 persists for the majority of the logs. Please revise the Liquefaction Potential Analysis BR-2 to match the LOTB BR-2.		
25	FR	N/A	C3-Not Approved, resubmit required		
26					
27					

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✓= Comment Resolved
(for Reviewer's use)

OSFP Review Comment & Response Form

General Project Information	Review Phase	Reviewer Information
Dist: 04 EA: 1A9801 Project Name: Tully Road/101 IC OSFP Liaison: Emil Vergara Jr. Phone: (916) 227-8360 e-mail: Emil_Vergara@dot.ca.gov	☐ PSR/PDS (Review No. _) ☐ APS/PSR (Review No. _) ☐ APS/PR (Review No. _) ☐ Type Selection ☐ 65% PS&E Unchecked Details ☒ PS&E (Review No. 2) ☐ Construction Support ☐ Other: ____ **Structure Information** (Use when necessary to document comments by individual structure) Structure Name: Tully Road Overcrossing Br No: 37-0668	Reviewer Name: M Zabolzadeh/ R. Karpowicz Functional Unit: GS Phone Number: (510) 286-4831 e-mail: Mohammad_Zabolzadeh@dot.ca.gov Date of Review: 4/22/2009

Consultant Information (to be filled in by Consultant)

Consultant Structure Lead (First and Last Name)	Structure Consultant Firm	Phone Number	e-mail	Response Date
David Wang	Parikh	____	____	____

#	Doc. (See Note 1)	Page, Section, or SSP	Review Comments	Consultant Responses	
1	FR	N/A	FR prepared by Parikh Consultants, Inc. dated…..		
		General	All our previous comments have been addressed.		
		General	The fault study should be referenced in the foundation report.	Complied.	
	C2		Approved subject to OSFP verification		

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FOUNDATION REPORT

MSE RETAINING WALL
(BRIDGE NO. 37E-0044)
TULLY ROAD/ROUTE 101 INTERCHANGE
SANTA CLARA COUNTY, CALIFORNIA
04-SCI-101 EA 1A9801

For

HMH ENGINEERS
1570 Oakland Road
San Jose, CA 95131

PARIKH CONSULTANTS, INC.

2360 Qume Drive, Suite A, San Jose, CA 95131
(408) 452-9000

May 1, 2009 Job No. 207150.TUL

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Geotechnical ■
Environmental ■
Materials Testing ■
Construction Inspection ■

HMH Eningeers, Inc.
1570 Oakland Road, Suite 200
San Jose, CA 95131

May 1, 2009
Job No.: 207150.TUL

Attn.: Mr. Bill Wagner

Sub: Foundation Report for MSE Retaining Wall (Br. No. 37E-0044)
Tully Road/Route 101 Interchange Improvements
Santa Clara County, CA 04-SCl-101 EA 04-1A9801

Ref: Foundation Repot for Tully Road Overcrossing/Route 101 (Br. No. 37-0688)
Santa Clara County, CA 04-SCl-101 EA 04-1A9801 (Parikh, 1/30/2009)

Dear Mr. Wagner:

As requested, we are providing a foundation report for the proposed MSE retaining wall (Br. No. 37E-0044) at the Tully Road/Route 101 Interchange improvements project in Santa Clara County, CA. Per request by Caltrans, a separate foundation report is prepared for the Tully Road Overcrossing (Br. No. 37-0688).

Proposed Construction

The project consists of bridge replacement along Tully Road, crossing over Route 101 (Br. No. 37-0668). The proposed bridge is a two-span, cast-in-place pre-stressed box girder structure of approximately 310 feet in length and 100 feet in width.

In addition to the bridge replacement, a MSE retaining wall (Br. No. 37E-0044) is proposed in the southeast quadrant along the NB off-ramp due to ramp reconfiguration of the interchange. The planned retaining wall is of approx. 290 feet long with maximum height up to approx. 16 feet per the information provided.

Geology and Subsurface Conditions

The subsurface conditions are based on the as-built Log of Test Borings (LOTB) sheet (Caltrans 1961) and CPT data performed in December 2007 (Parikh 2007). The approximate boring locations are shown on the attached Site Plan. The CPTs were performed within the existing clove leaves of the interchange at about the same level of Route 101. The Project Location Map is shown on Plate 1A. The recent boring locations (Parikh 2007) and as-built boring locations (Caltrans 1961) are presented on Plate 1B (Site Plan).

Based on the boring data, the subsoils consist of layers of silty fine sand/sandy silt and clay in the upper 50 feet (below existing Route 101 level). The CPT data generally indicate two layers of sandy silt/silty fine sand, one at about 20-foot depth and one at about 40-foot depth. Below 50-foot depth, the subsoils consist of stiff to very stiff fine-grained material (clays and silts). At approximately 75-foot depth, a layer of dense sand and gravel was indicated in the current CPT and as-built LOTB. The thickness of the layer, however, appears to be variable. The thickness may vary from 5 feet (as-built B-4, Caltrans 1961) to over 8 feet as encountered in current CPT (BR-2, Parikh 2007). Very dense sand and gravel were encountered in the CPTs at 108-foot depth (BR-1) and 100-foot depth (BR-2). The current CPT data and as-built LOTB are attached with this memo.

Groundwater was encountered at about 15-foot depth in current investigation and at about 20-foot depth in the as-built LOTB (Caltrans 1961). We have considered groundwater level at 15-foot depth below existing Route 101 level for project design. The groundwater level is anticipated to vary with the passage of time due to seasonal groundwater fluctuation, surface and subsurface flows, ground surface run-off, and other factors that may not be present at the time of investigation.

General geologic features pertaining to the site were evaluated by reference to the Quaternary Geology of Santa Clara Valley, Santa Clara, Alameda, and San Mateo Counties, California, by E.J. Helley, R.W. Graymer, G.A. Phelps, P.K. Showalter, and C.M. Wentworth (USGS Open-File Report, 94-231, May 1994). Based on the publication, the on-site geologic conditions consist of Floodbasin Deposits (Qhb, Holocene) and Natural Levee Deposits (Qhl, Holocene). The Geologic Map is presented on Plate 2.

Seismic Sources

The project site is located near an area of northern California known to be seismically active. Seismic activity may result in geological and seismic hazards including seismically induced fault displacement and rupture, ground shaking, liquefaction, and structural hazards. Caltrans is currently revising/updating the 1996 Seismic Hazard Map. Based on communication with Caltrans, the new map (2008 in-progress) is near completion and may be released in the very near future. Caltrans provided us the new map (draft) with relevant data and indicated that we can start using the new information since many of the fault data have been updated since 1996. A Fault Map is shown on Plate 3.

We reviewed the new Seismic Hazard Map (2008 in-progress) and noticed that in south Bay, the Silver Creek Fault has been added to the west of the Hayward Fault. This fault has significant impact for the current Tully Road/Route 101 interchange project because it is in very close distance. A Fault Map based on the new Seismic Hazard Map (2008 in-progress) is attached. The Silver Creek Fault (Fault No. 152) is located to the west and subparallel to the Hayward Fault (Fault No. 355). The fault is inferred and buried under Quaternary sediments in the project vicinity (800 ft/0.24 km). Although the Silver Creek Fault is not included in the Alquist-Priolo

Special Study Zones Map (San Jose East Quadrangle), the Silver Creek Fault has been studied by USGS and California Geological Survey. A study of the fault was also performed for VTA for the planned BART extension to San Jose project (by HMM/Bechtel-Geomatrix).

Based on discussion with Caltrans, the Silver Creek Fault is the governing fault for design. The seismic design criteria for bridge structure design are presented in the separate foundation report for Tully Road Overcrossing (Br. No. 37-0688) and are not repeated in this report for MSE wall.

Liquefaction Potential

Liquefaction is a phenomenon in which saturated cohesionless soils are subject to a temporary but essentially total loss of shear strength under the reversing, cyclic shear stresses associated with earthquake shaking. Submerged cohesionless sands and silts of low relative density are the type of soils, which usually are susceptible to liquefaction. Clays are generally not susceptible to liquefaction.

At Tully Road Interchange area, it is our opinion that the upper submerged alluvial soils (sandy silt and silty fine sand) at two depths (20- to 30-ft depth and 40- to 50-ft depth) are prone to liquefaction. The liquefaction potential evaluation was performed in accordance with the methods proposed by Youd, et al. (2001) using the CPT procedures. The CPT liquefaction analysis data are attached in Appendix C-1. Based on the CPT data, it is recommended that the zones at 20- to 30-foot depth and at 40- to 50-foot depth be considered subject to liquefaction. The potential for liquefaction may also induce ground settlement during a seismic event. It is estimated that the post-liquefaction settlement may be on the order of six to seven inches.

The post-liquefaction settlement may induce down drag on the piles at the abutments and bent of the proposed Tully Road overcrossing replacement. The effect of post-liquefaction settlements and associated down drag load have been considered in foundation design and presented in the separate foundation report for the overcrossing structure.

MSE Retaining Wall

Due to right-of-way and other geometric constraints, a MSE retaining wall is proposed at NB off-ramp"TR4" Line (southeast quadrant) with wall height ranging from 5 to approx. 16 feet. Based on the boring data in the general project vicinity, the material anticipated at the wall subgrade may consist of medium dense sandy material overlying stiff clays. The design of MSE wall should follow Caltrans 'Bridge Design Aids' with the following guidelines:

Loading Condition	= 1	
Friction Angle	= 34°	(backfill)
Soil Unit Weight	= 125	pcf

The recommended minimum base width for the MSE wall vary with the height of the embankment and should be in accordance with the tables listed in Caltrans 'Bridge Design Aids'. It is recommended that the pressure exerted on the foundation soils be limited to 3000 psf in the sandy subgrade soil. The wall settlement under approx. 16-foot wall height is estimated on the order of 2 inches and in the over-consolidated/elastic range. We believe the settlement is tolerable and acceptable for MSE system. It is recommended that a 30-day settlement period be adopted for earthwork/wall construction.

The potential post-liquefaction settlement is approx. 6 to 7 inches. Typically differential settlement may on the order of 50% of the total settlement. This settlement magnitude is tolerable for Caltrans standard MSE walls. In Caltrans District 4, we have seen previous MSE wall settlement data (Route 87-between Hedding St and Route 880) on the order of 2 to 3 feet.

The stability of the MSE wall under long-term, pseudo-static, and liquefaction conditions were evaluated. A residual soil strength (Sr) of 300 psf was adopted for the sand layer between 20- and 30-foot depths under liquefaction condition. Based on the evaluation, the stability of the MSE wall is acceptable. The obtained minimum FS is about 1.95 for long term case, 1.15 for seismic/pseudo-static case, and 2.16 for post-liquefaction case, respectively. The evaluation results are attached in Appendix C.

Please be advised that we are performing a professional service and that our conclusions are professional opinions only. All work done and all recommendations made are in accordance with generally accepted geotechnical engineering principles and practices. No warranty, expressed or implied, of merchantability or fitness, is made or intended in connection with our work.

Respectfully submitted,
PARIKH CONSULTANTS, INC.

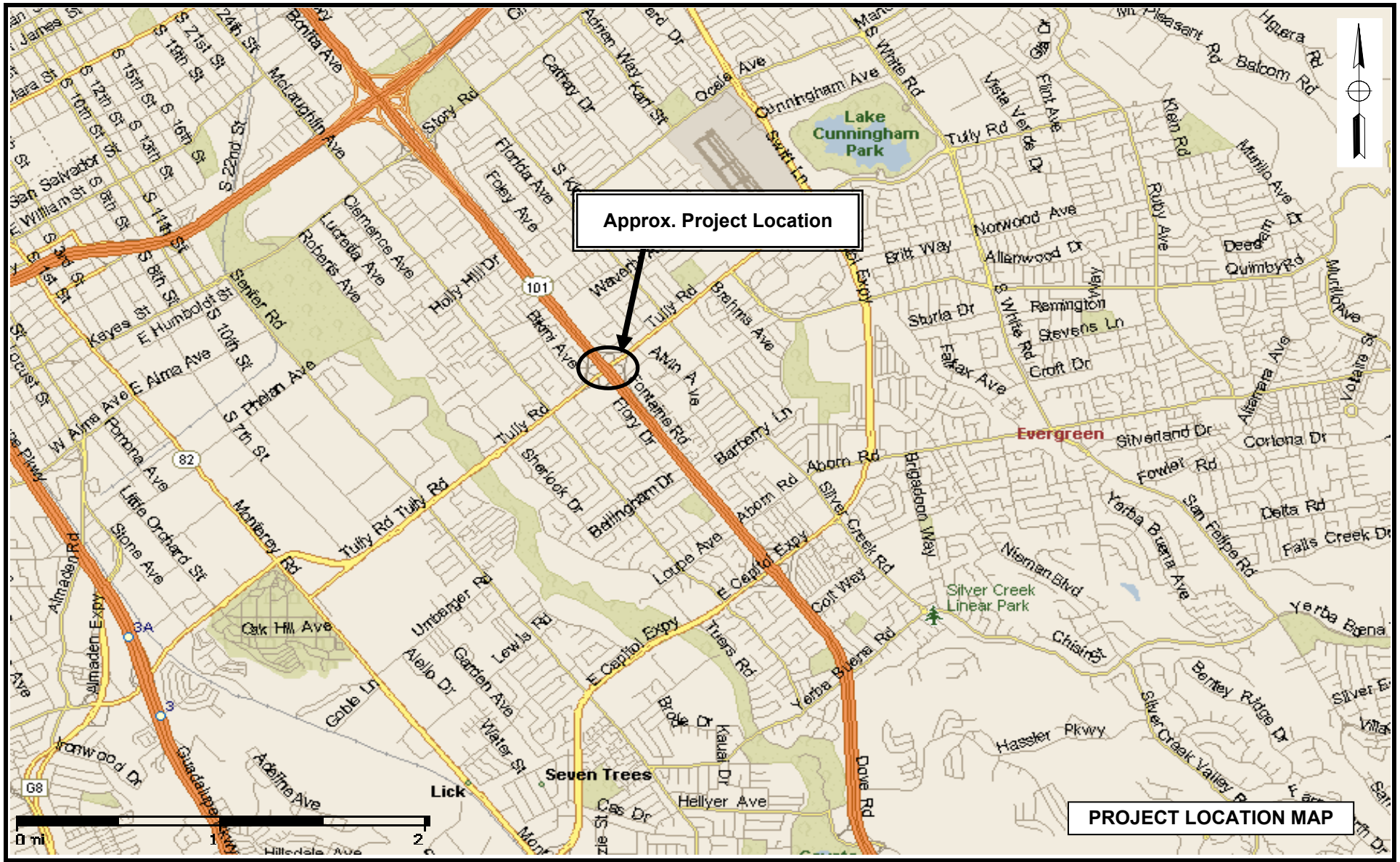
Y. David Wang, Ph.D., P.E. C52911
Senior Engineer

R. Gary Parikh, G.E. 666
Project Manager

REGISTERED PROFESSIONAL ENGINEER
GAURANG R. PARIKH
No. 666
EXP. 12-31-09
GEOTECHNICAL
STATE OF CALIFORNIA

Attachments: Plates 1A & 1B – Project Location Map & Site Plan
Plate 2 - Geologic Map
Plate 3 - Fault Map
Appendix A - Log of Test Borings (Parikh 2007 & Caltrans 1961)
CPT Site Investigation by Gregg In Situ (December 18,2007)
Appendix B - Laboratory Data
Appendix C - CPT Data & Liquefaction Analyses Results
MSE Wall Bearing Capacity, Settlement & Stability Evaluation
Appendix D – Caltrans Comment/Response Form (01/2009)
Caltrans Comment/Response Form (03/2009)
Caltrans Comment/Response Form (04/2009)

XC: Biggs Cardosa Associates (Mr. Ron Oen)
{S:\Ongoing Projects\207150\MSE WALL REPORT-Tully Rd-Route 101}



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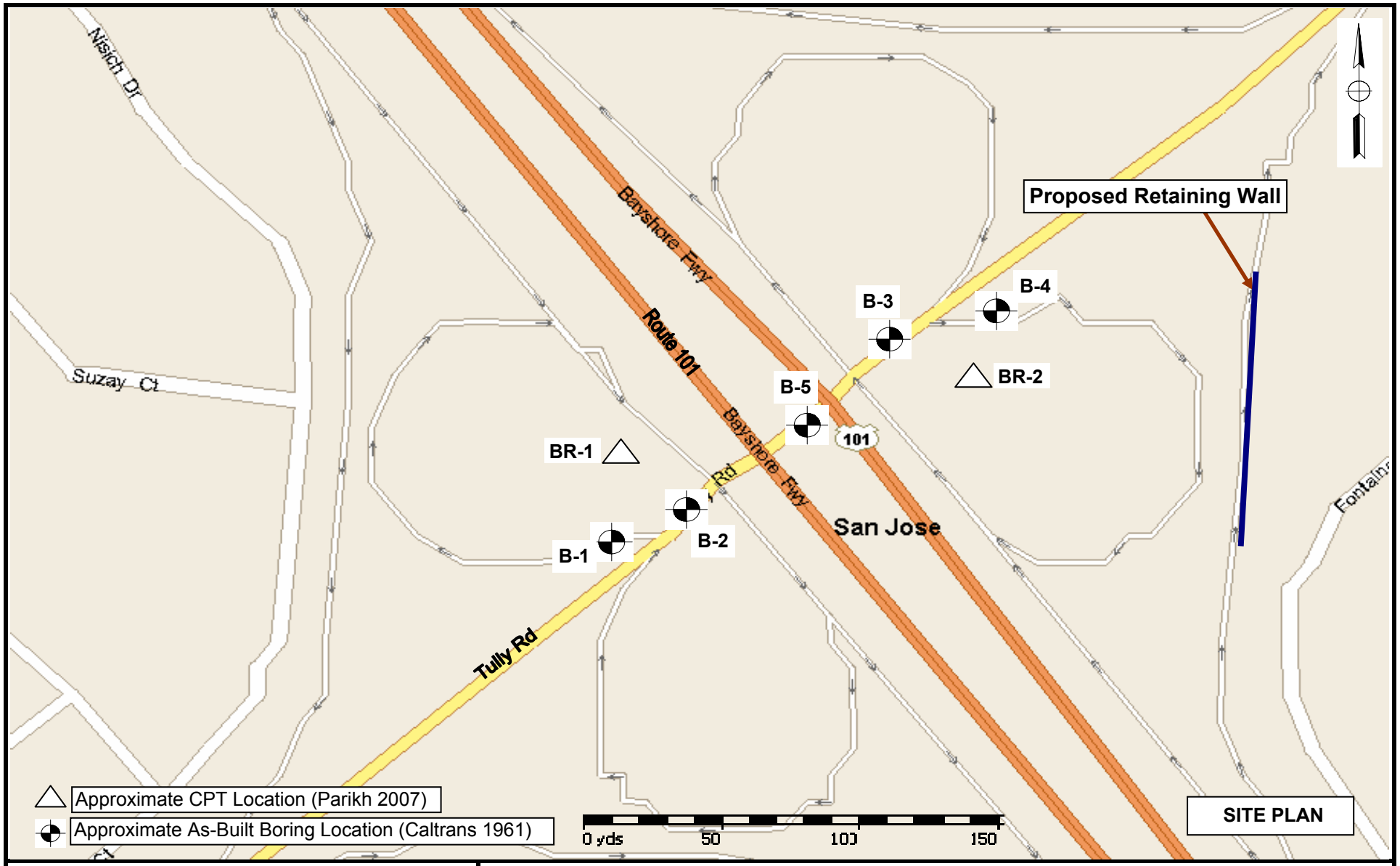
TULLY ROAD OVERCROSSING - ROUTE 101
SANTA CLARA COUNTY, CALIFORNIA

JOB NO.: 207150.TUL	PLATE NO.: 1A



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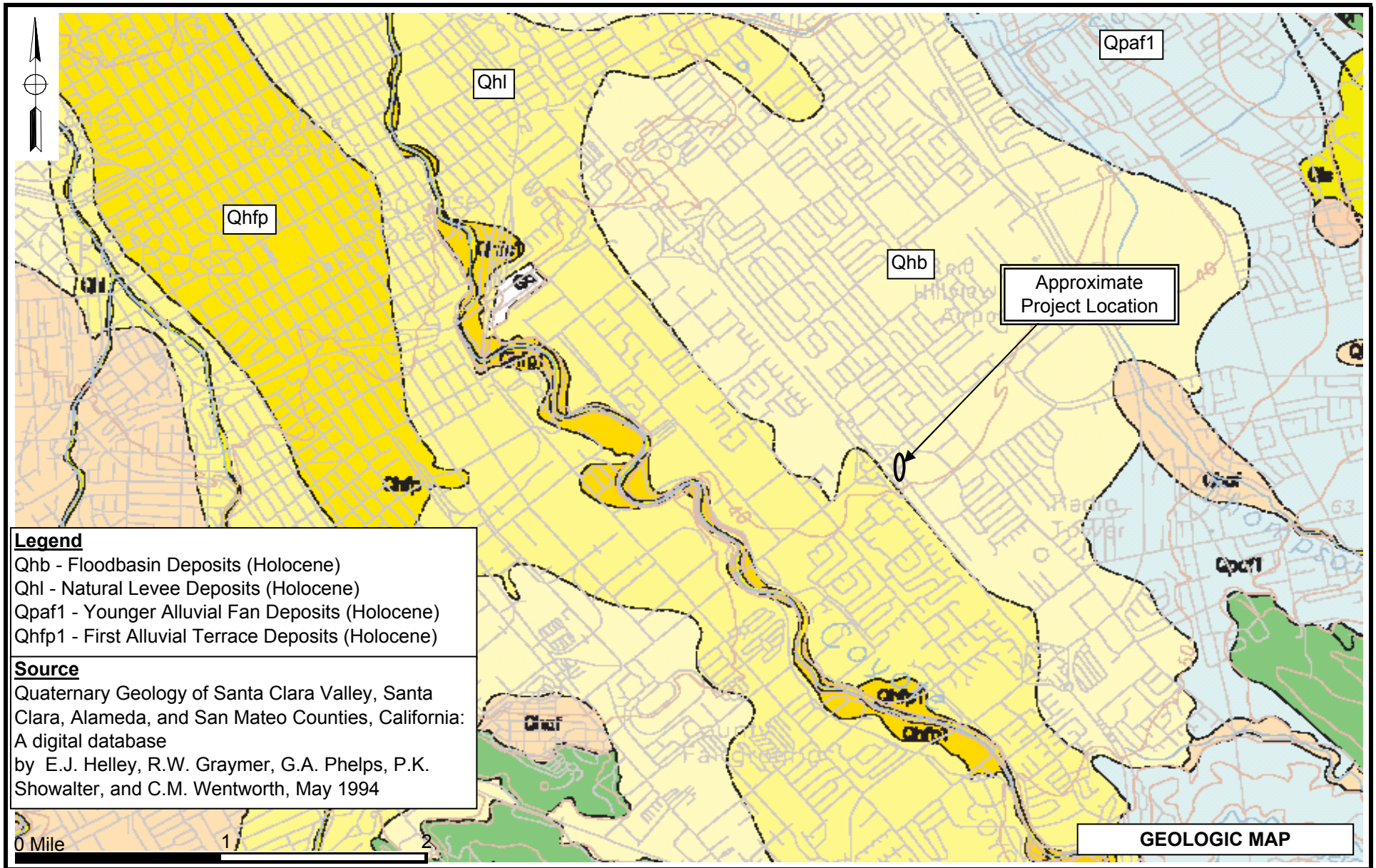
TULLY ROAD OVERCROSSING - ROUTE 101
SANTA CLARA COUNTY, CALIFORNIA

JOB NO.: 207150.TUL	PLATE NO.: 1B



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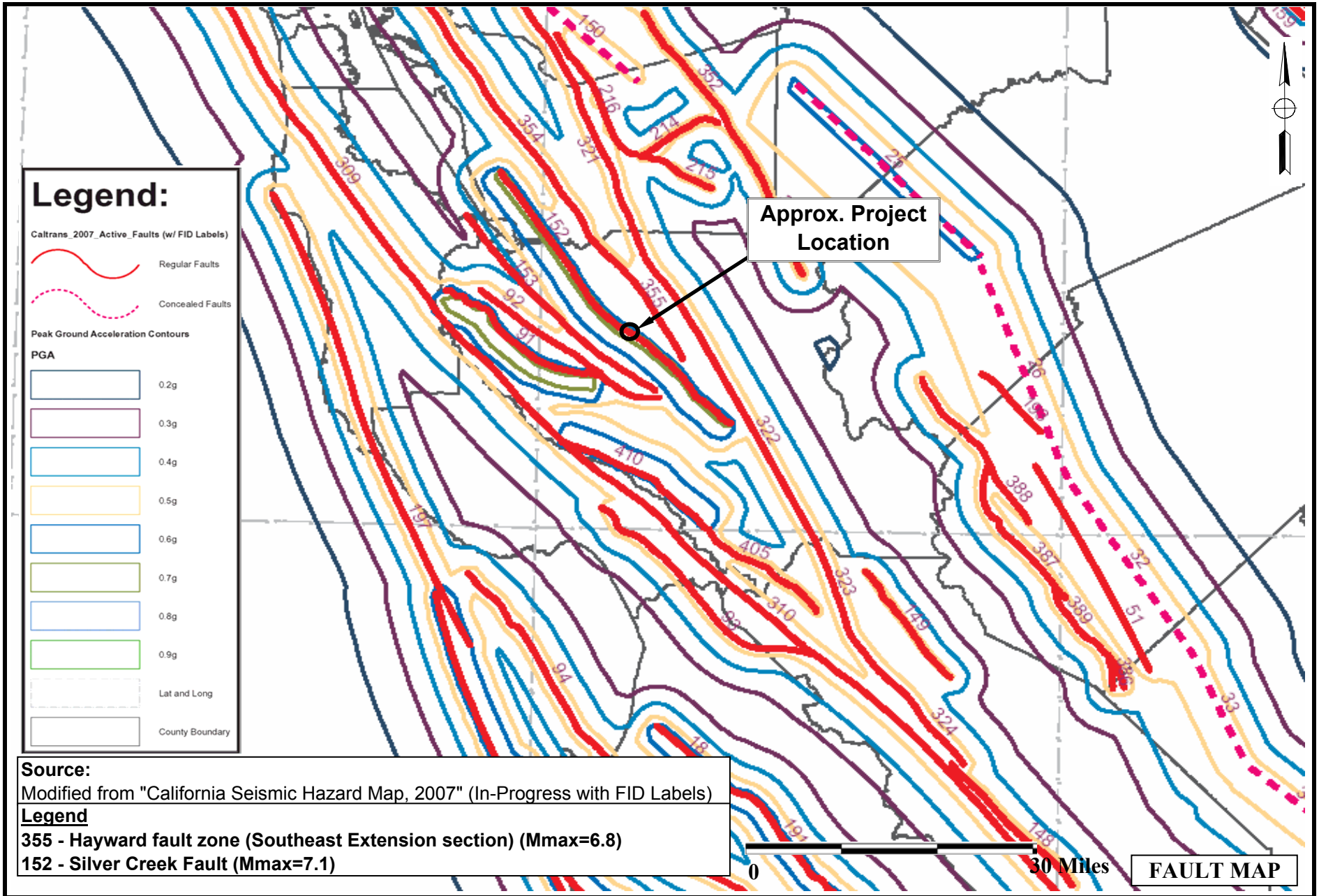
MATERIALS TESTING

TULLY ROAD OVERCROSSING - ROUTE 101
SANTA CLARA COUNTY, CALIFORNIA

JOB NO.: 207150.TUL

PLATE NO.: 2



Source:
Modified from "California Seismic Hazard Map, 2007" (In-Progress with FID Labels)

Legend
355 - Hayward fault zone (Southeast Extension section) (Mmax=6.8)
152 - Silver Creek Fault (Mmax=7.1)

FAULT MAP

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MATERIALS TESTING

TULLY ROAD OVERCROSSING - ROUTE 101
SANTA CLARA COUNTY, CALIFORNIA

JOB NO.: 207150.TUL | PLATE NO.: 3

APPENDIX A

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
04	SCI	101	31.8/34.2		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER GARY PARIKH No. G.E. 666 Exp. 12/31/09 GEOTECHNICAL STATE OF CALIFORNIA

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

REFERENCE: CALTRANS SOIL & ROCK LOGGING, CLASSIFICATION, AND PRESENTATION MANUAL (JUNE 2007)

CEMENTATION

Description	Criteria
Weak	Crumbles or breaks with handling or little finger pressure.
Moderate	Crumbles or breaks with considerable finger pressure.
Strong	Will not crumble or break with finger pressure.

CONSISTENCY OF COHESIVE SOILS

Description	Unconfined Compressive Strength (tsf)	Pocket Penetrometer Measurement (tsf)	Torvane Measurement (tsf)	Field Approximation
Very Soft	< 0.25	< 0.25	< 0.12	Easily penetrated several inches by fist
Soft	0.25 to 0.50	0.25 to 0.50	0.12 to 0.25	Easily penetrated several inches by thumb
Medium Stiff	0.50 to 1.0	0.50 to 1.0	0.25 to 0.50	Penetrated several inches by thumb with moderate effort
Stiff	1 to 2	1 to 2	0.50 to 1.0	Readily indented by thumb but penetrated only with great effort
Very Stiff	2 to 4	2 to 4	1.0 to 2.0	Readily indented by thumbnail
Hard	> 4.0	> 4.0	> 2.0	Indented by thumbnail with difficulty

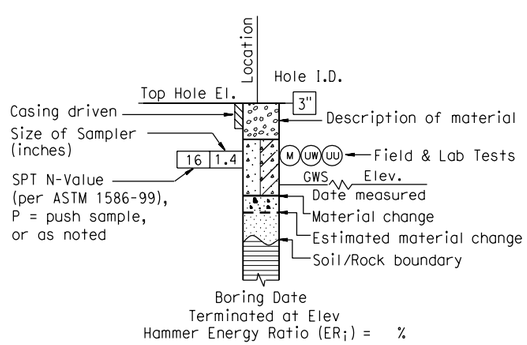
BOREHOLE IDENTIFICATION

Symbol	Hole Type	Description
Size	A	Auger Boring
Size	R P	Rotary drilled boring Rotary percussion boring (air)
Size	R	Rotary drilled diamond core
Size	HD HA	Hand driven (1-inch soil tube) Hand Auger
●	D	Dynamic Cone Penetration Boring
▲	CPT	Cone Penetration Test (ASTM D 5778-95)
[ ]	O	Other

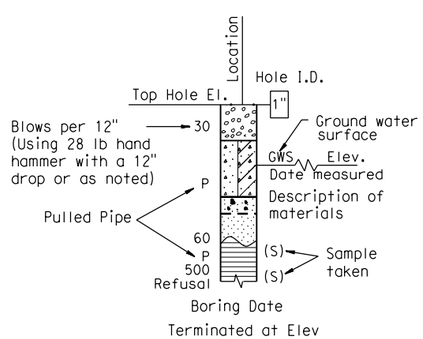
Note: Size in inches.

PLASTICITY OF FINE-GRAINED SOILS

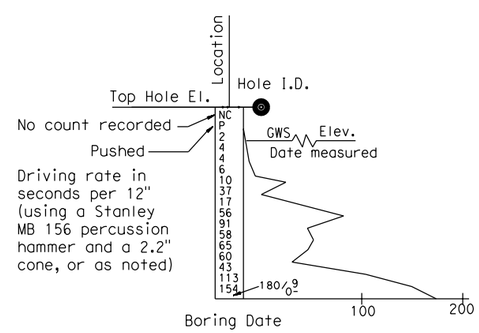
Description	Criteria
Nonplastic	A 1/8-inch thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.



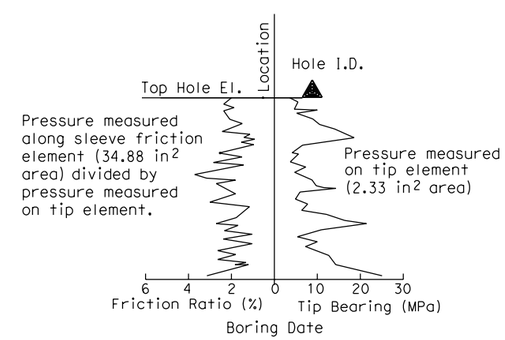
ROTARY BORING



HAND BORING



DYNAMIC CONE PENETRATION BORING



CONE PENETRATION TEST (CPT) SOUNDING

TULLY ROAD OVERCROSSING

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN DESIGN BRANCH	BRIDGE NO. 37-0668 POST MILE 33.0	SOIL LEGEND 1 OF 2 LOG OF TEST BORINGS
X DESIGN OVERSIGHT	X SIGN OFF DATE	PREPARED BY L. TRAN				
		CHECKED BY D. WANG				

GS LOTB SOIL LEGEND

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 04239
EA 1A9801

DISREGARD PRINTS BEARING EARLIER REVISION DATES 11/26/08 2/27/09 3/20/09

REVISION DATES

SHEET 23 OF 26

FILE => $REQUEST

USERNAME => $USER DATE PLOTTED => $DATE TIME PLOTTED => $TIME

REFERENCE: CALTRANS SOIL & ROCK LOGGING, CLASSIFICATION, AND PRESENTATION MANUAL (JUNE 2007)

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
04	SCI	101	31.8/34.2		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER GARY PARIKH No. G.E. 666 Exp. 12/31/09 GEOTECHNICAL STATE OF CALIFORNIA

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

GROUP SYMBOLS AND NAMES

Graphic/Symbol	Group Names	Graphic/Symbol	Group Names
GW	Well-graded GRAVEL Well-graded GRAVEL with SAND	CL	Lean CLAY Lean CLAY with SAND Lean CLAY with GRAVEL SANDY lean CLAY SANDY lean CLAY with GRAVEL GRAVELLY lean CLAY GRAVELLY lean CLAY with SAND
GP	Poorly graded GRAVEL Poorly graded GRAVEL with SAND		
GW-GM	Well-graded GRAVEL with SILT Well-graded GRAVEL with SILT and SAND	CL-ML	SILTY CLAY SILTY CLAY with SAND SILTY CLAY with GRAVEL SANDY SILTY CLAY SANDY SILTY CLAY with GRAVEL GRAVELLY SILTY CLAY GRAVELLY SILTY CLAY with SAND
GW-GC	Well-graded GRAVEL with CLAY (or SILTY CLAY) Well-graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)		
GP-GM	Poorly graded GRAVEL with SILT Poorly graded GRAVEL with SILT and SAND	ML	SILT SILT with SAND SILT with GRAVEL SANDY SILT SANDY SILT with GRAVEL GRAVELLY SILT GRAVELLY SILT with SAND
GP-GC	Poorly graded GRAVEL with CLAY (or SILTY CLAY) Poorly graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)		
GM	SILTY GRAVEL SILTY GRAVEL with SAND	OL	ORGANIC lean CLAY ORGANIC lean CLAY with SAND ORGANIC lean CLAY with GRAVEL SANDY ORGANIC lean CLAY SANDY ORGANIC lean CLAY with GRAVEL GRAVELLY ORGANIC lean CLAY GRAVELLY ORGANIC lean CLAY with SAND
GC	CLAYEY GRAVEL CLAYEY GRAVEL with SAND		
GC-GM	SILTY, CLAYEY GRAVEL SILTY, CLAYEY GRAVEL with SAND	OL	ORGANIC SILT ORGANIC SILT with SAND ORGANIC SILT with GRAVEL SANDY ORGANIC SILT SANDY ORGANIC SILT with GRAVEL GRAVELLY ORGANIC SILT GRAVELLY ORGANIC SILT with SAND
SW	Well-graded SAND Well-graded SAND with GRAVEL		
SP	Poorly graded SAND Poorly graded SAND with GRAVEL	CH	Fat CLAY Fat CLAY with SAND Fat CLAY with GRAVEL SANDY fat CLAY SANDY fat CLAY with GRAVEL GRAVELLY fat CLAY GRAVELLY fat CLAY with SAND
SW-SM	Well-graded SAND with SILT Well-graded SAND with SILT and GRAVEL		
SW-SC	Well-graded SAND with CLAY (or SILTY CLAY) Well-graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)	MH	Elastic SILT Elastic SILT with SAND Elastic SILT with GRAVEL SANDY elastic SILT SANDY elastic SILT with GRAVEL GRAVELLY elastic SILT GRAVELLY elastic SILT with SAND
SP-SM	Poorly graded SAND with SILT Poorly graded SAND with SILT and GRAVEL		
SP-SC	Poorly graded SAND with CLAY (or SILTY CLAY) Poorly graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)	OH	ORGANIC fat CLAY ORGANIC fat CLAY with SAND ORGANIC fat CLAY with GRAVEL SANDY ORGANIC fat CLAY SANDY ORGANIC fat CLAY with GRAVEL GRAVELLY ORGANIC fat CLAY GRAVELLY ORGANIC fat CLAY with SAND
SM	SILTY SAND SILTY SAND with GRAVEL		
SC	CLAYEY SAND CLAYEY SAND with GRAVEL	OH	ORGANIC elastic SILT ORGANIC elastic SILT with SAND ORGANIC elastic SILT with GRAVEL SANDY ORGANIC elastic SILT SANDY ORGANIC elastic SILT with GRAVEL GRAVELLY ORGANIC elastic SILT GRAVELLY ORGANIC elastic SILT with SAND
SC-SM	SILTY, CLAYEY SAND SILTY, CLAYEY SAND with GRAVEL		
PT	PEAT	OL/OH	ORGANIC SOIL ORGANIC SOIL with SAND ORGANIC SOIL with GRAVEL SANDY ORGANIC SOIL SANDY ORGANIC SOIL with GRAVEL GRAVELLY ORGANIC SOIL GRAVELLY ORGANIC SOIL with SAND
	COBBLES COBBLES and BOULDERS BOULDERS		

FIELD AND LABORATORY TESTING

- (C) Consolidation (ASTM D 2435)
- (CL) Collapse Potential (ASTM D 5333)
- (CP) Compaction Curve (CTM 216)
- (CR) Corrosivity Testing (CTM 643, CTM 422, CTM 417)
- (CU) Consolidated Undrained Triaxial (ASTM D 4767)
- (DS) Direct Shear (ASTM D 3080)
- (EI) Expansion Index (ASTM D 4829)
- (M) Moisture Content (ASTM D 2216)
- (OC) Organic Content-% (ASTM D 2974)
- (P) Permeability (CTM 220)
- (PA) Particle Size Analysis (ASTM D 422)
- (PI) Plasticity Index (AASHTO T 90) Liquid Limit (AASHTO T 89)
- (PL) Point Load Index (ASTM D 5731)
- (PM) Pressure Meter
- (PP) Pocket Penetrometer
- (R) R-Value (CTM 301)
- (SE) Sand Equivalent (CTM 217)
- (SG) Specific Gravity (AASHTO T 100)
- (SL) Shrinkage Limit (ASTM D 427)
- (SW) Swell Potential (ASTM D 4546)
- (TV) Pocket Torvane
- (UC) Unconfined Compression-Soil (ASTM D 2166) Unconfined Compression-Rock (ASTM D 2938)
- (UU) Unconsolidated Undrained Triaxial (ASTM D 2850)
- (UW) Unit Weight (ASTM D 4767)
- (VS) Vane Shear (AASHTO T 223)

APPARENT DENSITY OF COHESIONLESS SOILS

Description	SPT N_{60} (Blows / 12 inches)
Very loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE

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

PERCENT OR PROPORTION OF SOILS

Description	Criteria
Trace	Particles are present but estimated to be less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

PARTICLE SIZE

Description		Size
Boulder		> 12"
Cobble		3" to 12"
Gravel	Coarse	3/4" to 3"
	Fine	No. 4 to 3/4"
Sand	Coarse	No. 10 to No. 4
	Medium	No. 40 to No. 10
	Fine	No. 200 to No. 40

TULLY ROAD OVERCROSSING

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN DESIGN BRANCH	BRIDGE NO. 37-0668 POST MILE 33.0	SOIL LEGEND 2 of 2 LOG OF TEST BORINGS
X DESIGN OVERSIGHT X SIGN OFF DATE	PREPARED BY L. TRAN CHECKED BY D. WANG				

GS LOTB SOIL LEGEND

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 04239 EA 1A9801

FILE => $REQUEST

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES 11/06/08 2/4/09 3/20/09

SHEET 24 OF 26

USERNAME => $USER DATE PLOTTED => $DATE TIME PLOTTED => $TIME

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
04	SCI	101	31.8/34.2		

CERTIFIED ENGINEERING GEOTECHNICAL

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER GARY PARIKH No. G.E. 666 Exp. 12/31/09 GEOTECHNICAL STATE OF CALIFORNIA

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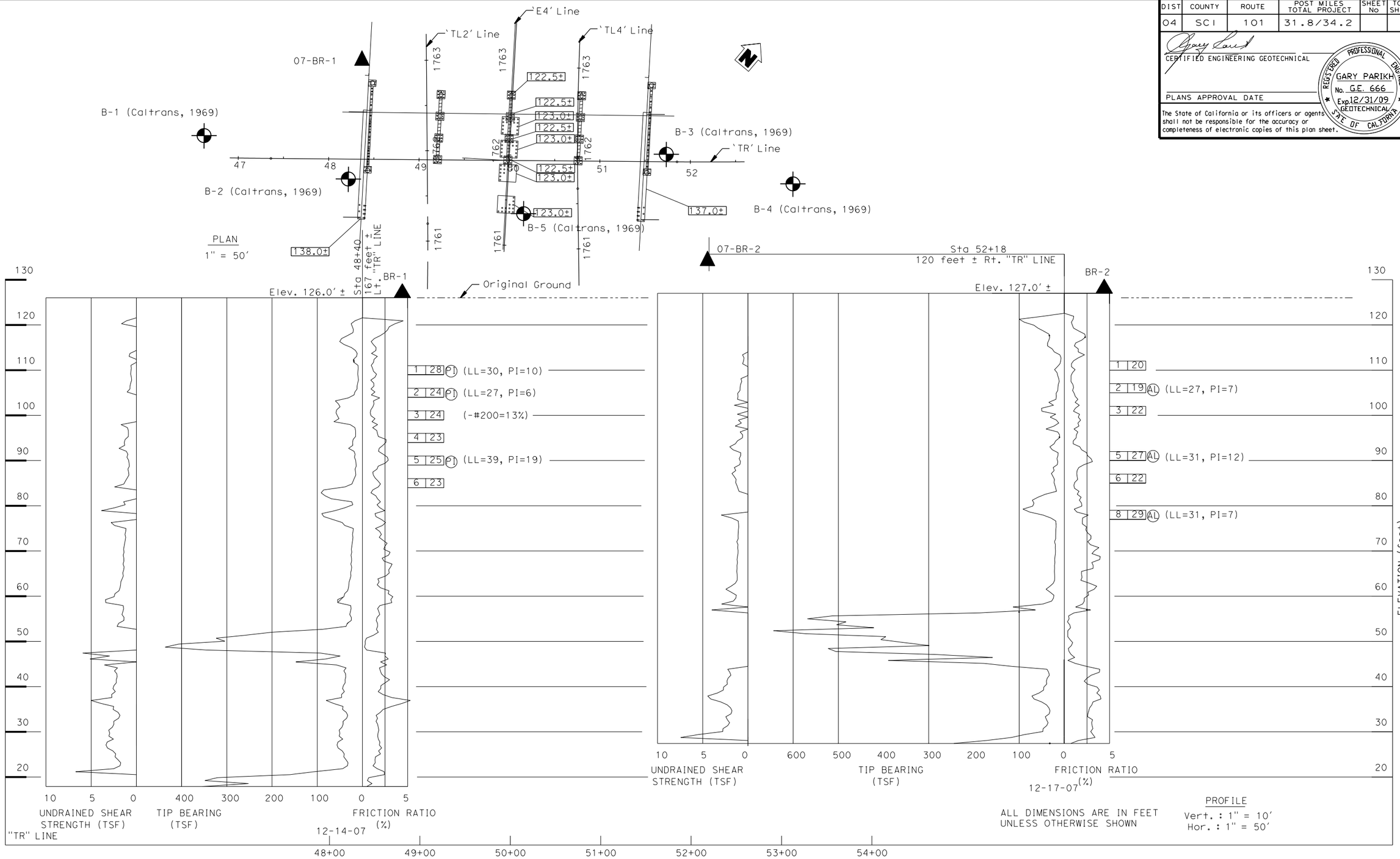

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 37-0668	TULLY ROAD OVERCROSSING
X DESIGN OVERSIGHT	X SIGN OFF DATE	DRAWN BY: L. TRAN	FIELD INVESTIGATION BY:	DESIGN BRANCH	POST MILES 33.0	LOG OF TEST BORINGS 1 OF 2
		CHECKED BY: D. WANG	G. TRIPATHI			

OGS CIVIL LOG OF TEST BORINGS SHEET

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 04239
EA 1A9801

DISREGARD PRINTS BEARING EARLIER REVISION DATES 11/26/08 2/27/09 3/20/09

REVISION DATES

SHEET 25 OF 26

FILE => $REQUEST

USERNAME => $USER DATE PLOTTED => $DATE TIME PLOTTED => $TIME

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DIST.	COUNTY	ROUTE	KILOMETER POST-TOTAL PROJECT	Sheet No.	Total Sheets
7	CAL				

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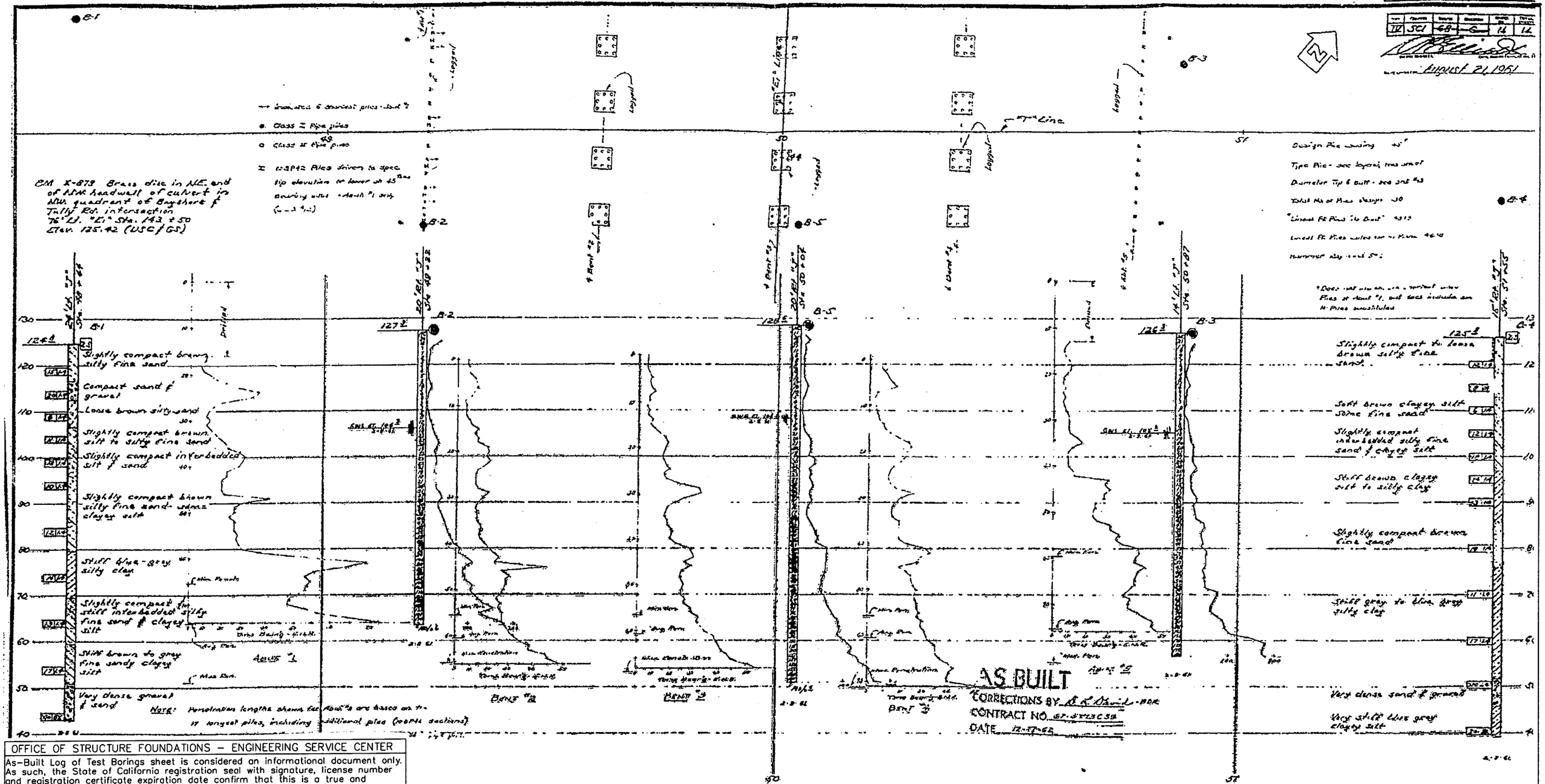
10	SCl	68	G	14	14

August 21, 1961



OFFICE OF STRUCTURE FOUNDATIONS – ENGINEERING SERVICE CENTER

As-Built Log of Test Borings sheet is considered an informational document only. As such, the State of California registration seal with signature, license number and registration certificate expiration date confirm that this is a true and accurate copy of the original document. This drawing is available and presented only for the convenience of any bidder, contractor or other interested party.

CERTIFIED ENGINEER DATE

REGISTERED PROFESSIONAL ENGINEER GARY PARIKH No. G.E. 666 Exp. 12/31/09 GEOTECHNICAL STATE OF CALIFORNIA

TULLY ROAD OVERCROSSING

LOG OF TEST BORINGS 2 OF 2

NOTE: A COPY OF THIS LOG OF TEST BORINGS IS AVAILABLE AT OFFICE OF STRUCTURE MAINTENANCE AND INVESTIGATIONS, SACRAMENTO, CALIFORNIA

CU: 04239
EA: 1A9801

BRIDGE No.	
37-0668	
Sheet	of
26	26

MATERIALS

- Plan of Air Boring
- Inclinometer
- ¼" Cone Penetrometer
- Auger Boring (Dry)
- Rotary Boring (Wet)
- Auger Boring (Dry)
- Jet Boring
- Core Boring
- Test Pit

Metamorphic Rock

LEGEND OF BORING OPERATIONS

1" Soil Tube — Rotary Boring — Penetration Boring

NOTE

Classification of earth materials as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

TULLY ROAD OVERCROSSING

LOG OF TEST BORINGS

SCALE 1" = 10' | BRIDGE 37-95 | FILE | DRAWING C-3795-14

December 18, 2007

Parkih Consultants
Attn: David Wang
365 S. Milpitas Blvd.
Milpitas, California 95035

Subject: CPT Site Investigation
Hwy 101 @Tully Rd. Bridge
San Jose, California
GREGG Project Number: 07-376MA

Dear Mr. Wang:

The following report presents the results of GREGG Drilling & Testing's Cone Penetration Test investigation for the above referenced site. The following testing services were performed:

1	Cone Penetration Tests	(CPTU)	☒
2	Pore Pressure Dissipation Tests	(PPD)	☒
3	Seismic Cone Penetration Tests	(SCPTU)	☐
4	Resistivity Cone Penetration Tests	(RCPTU)	☐
5	UVIF Cone Penetration Tests	(UVIFCPTU)	☐
6	Groundwater Sampling	(GWS)	☐
7	Soil Sampling	(SS)	☐
8	Vapor Sampling	(VS)	☐
9	Vane Shear Testing	(VST)	☐
10	SPT Energy Calibration	(SPTE)	☐

A list of reference papers providing additional background on the specific tests conducted is provided in the bibliography following the text of the report. If you would like a copy of any of these publications or should you have any questions or comments regarding the contents of this report, please do not hesitate to contact our office at (925) 313-5800.

Sincerely,
GREGG Drilling & Testing, Inc.

Mary Walden
Operations Manager

Cone Penetration Testing Procedure (CPT)

Gregg In Situ, Inc. carries out all Cone Penetration Tests (CPT) using an integrated electronic cone system, *Figure CPT*. The soundings were conducted using a 20 ton capacity cone with a tip area of 15 cm^2 and a friction sleeve area of 225 cm^2. The cone is designed with an equal end area friction sleeve and a tip end area ratio of 0.85.

The cone takes measurements of cone bearing (q_c), sleeve friction (f_s) and penetration pore water pressure (u_2) at 5-cm intervals during penetration to provide a nearly continuous hydrogeologic log. CPT data reduction and interpretation is performed in real time facilitating on-site decision making. The above mentioned parameters are stored on disk for further analysis and reference. All CPT soundings are performed in accordance with revised (2000) ASTM standards (D 5778-95).

The cone also contains a porous filter element located directly behind the cone tip (u_2), *Figure CPT.* It consists of porous plastic and is 5.0mm thick. The filter element is used to obtain penetration pore pressure as the cone is advanced as well as Pore Pressure Dissipation Tests (PPDT's) during appropriate pauses in penetration. It should be noted that prior to penetration, the element is fully saturated with silicon oil under vacuum pressure to ensure accurate and fast dissipation.

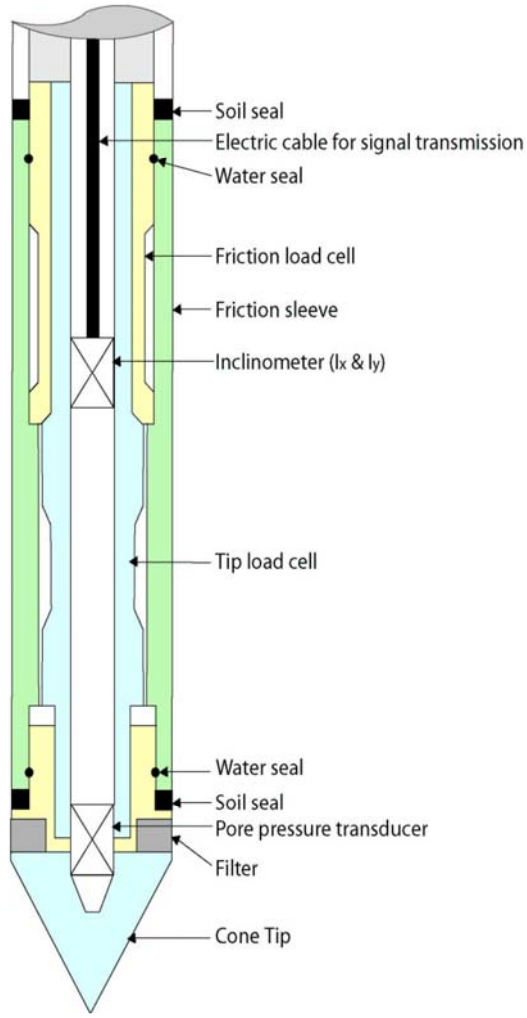


Figure CPT

When the soundings are complete, the test holes are grouted using a Gregg In Situ support rig. The grouting procedures generally consist of pushing a hollow CPT rod with a "knock out" plug to the termination depth of the test hole. Grout is then pumped under pressure as the tremie pipe is pulled from the hole. Disruption or further contamination to the site is therefore minimized.

Cone Penetration Test Sounding Summary

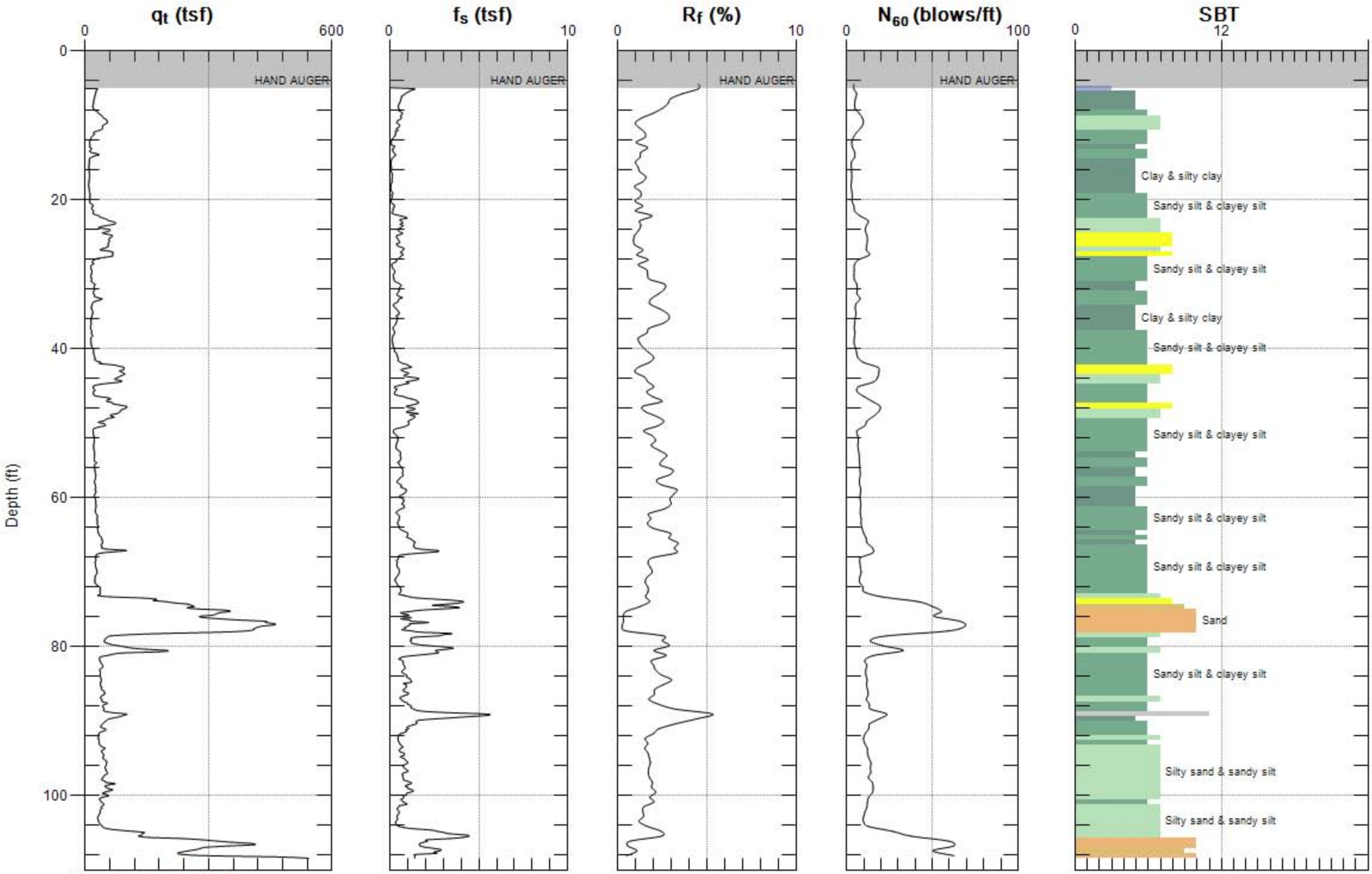
-Table 1-

CPT Sounding Identification	Date	Termination Depth (Feet)	Depth of Groundwater Samples (Feet)	Depth of Soil Samples (Feet)	Depth of Pore Pressure Dissipation Tests (Feet)
BR-1	12/14/07	108	-	-	42.8
BR-2	12/17/07	100	-	-	46.4

PARIKH CONSULTANTS

Site: HWY 101
Sounding: BR-1

Engineer: D.WANG
Date: 12/14/2007 09:25



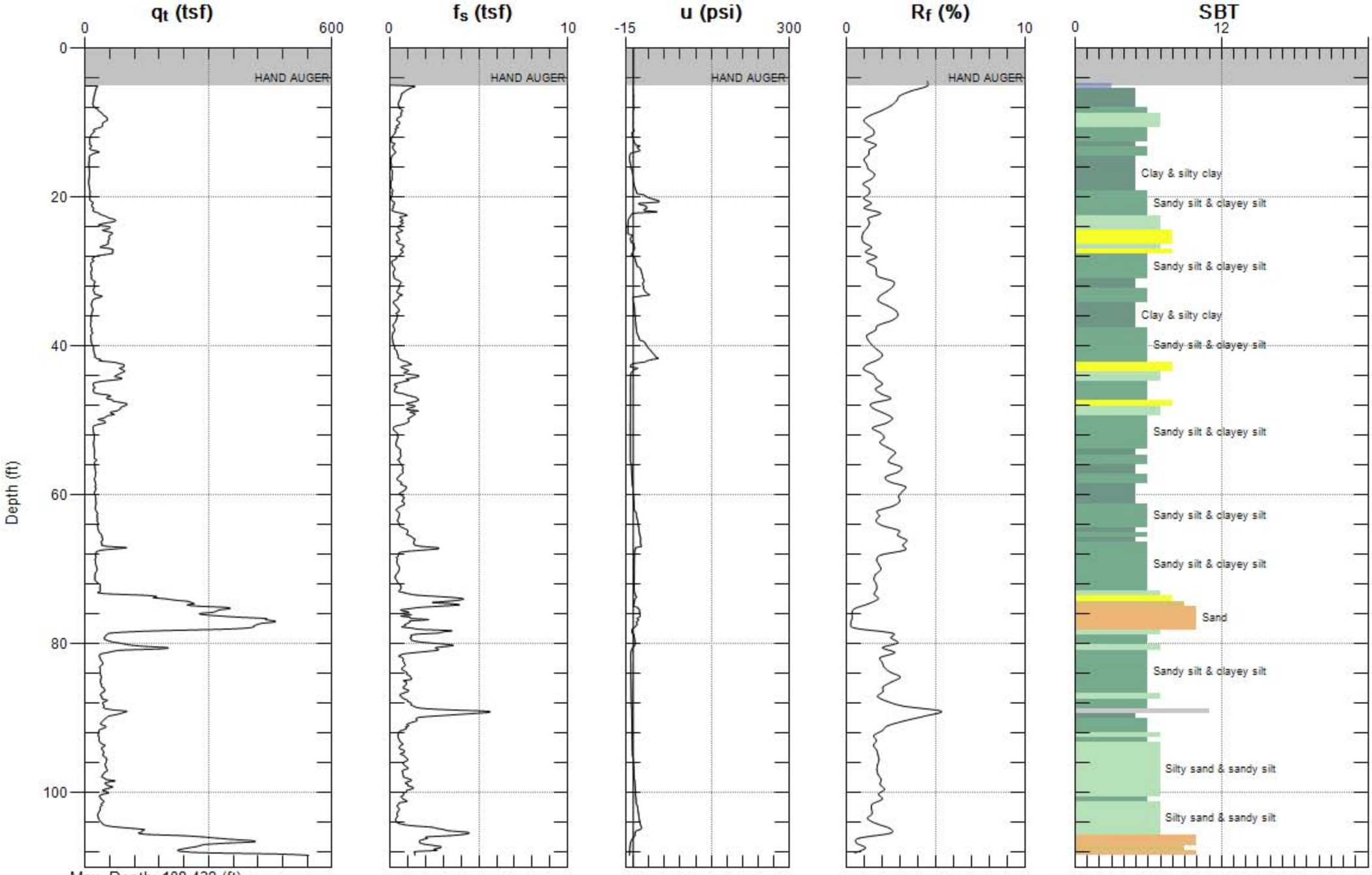
Max. Depth: 108.432 (ft)
Avg. Interval: 0.656 (ft)

SBT: Soil Behavior Type (Robertson 1990)

PARIKH CONSULTANTS

Site: HWY 101
Sounding: BR-1

Engineer: D.WANG
Date: 12/14/2007 09:25



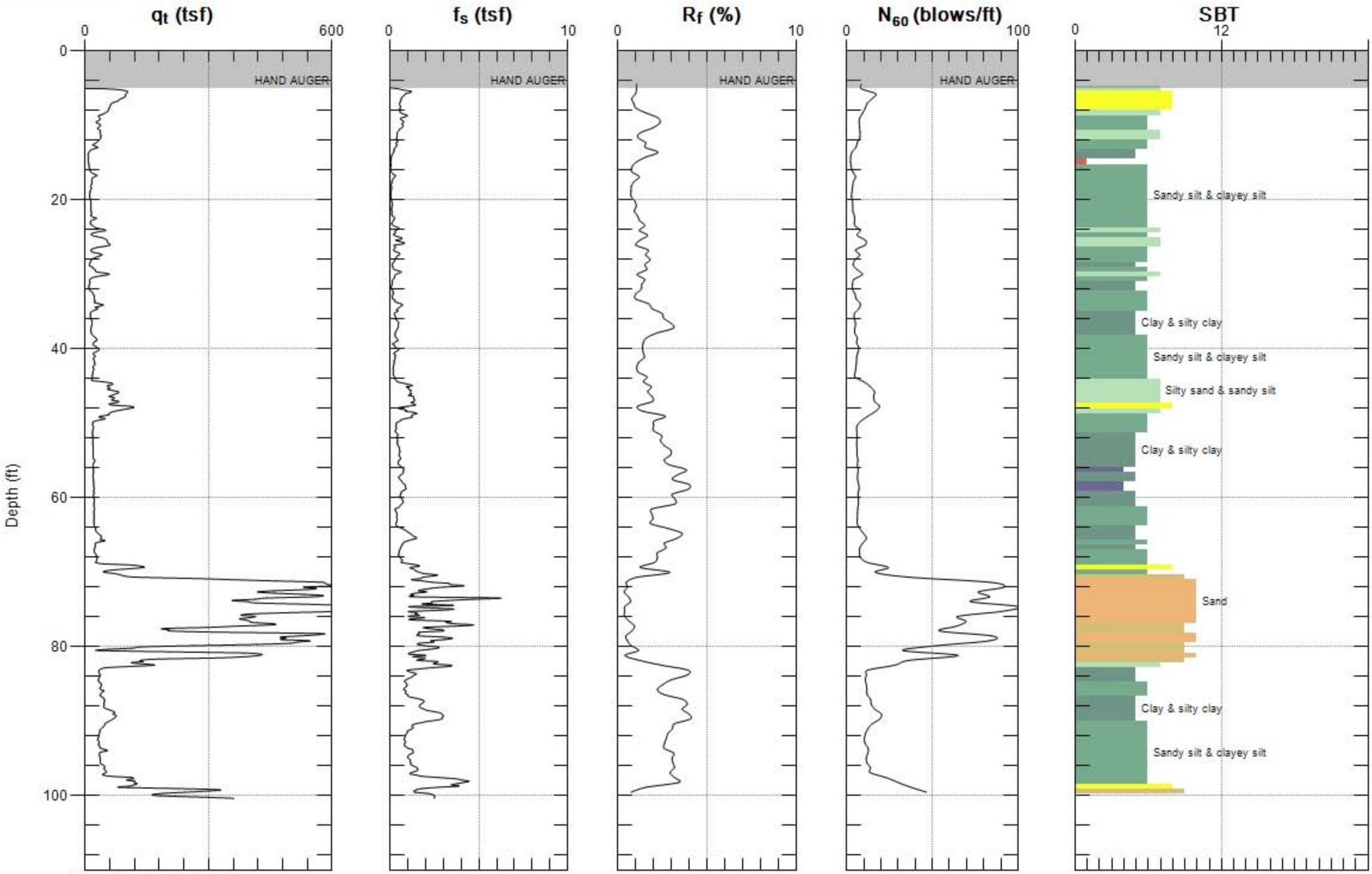
Max. Depth: 108.432 (ft)
Avg. Interval: 0.656 (ft)

SBT: Soil Behavior Type (Robertson 1990)

PARIKH CONSULTANTS

Site: HWY 101
Sounding: BR-2

Engineer: D.WANG
Date: 12/17/2007 09:01



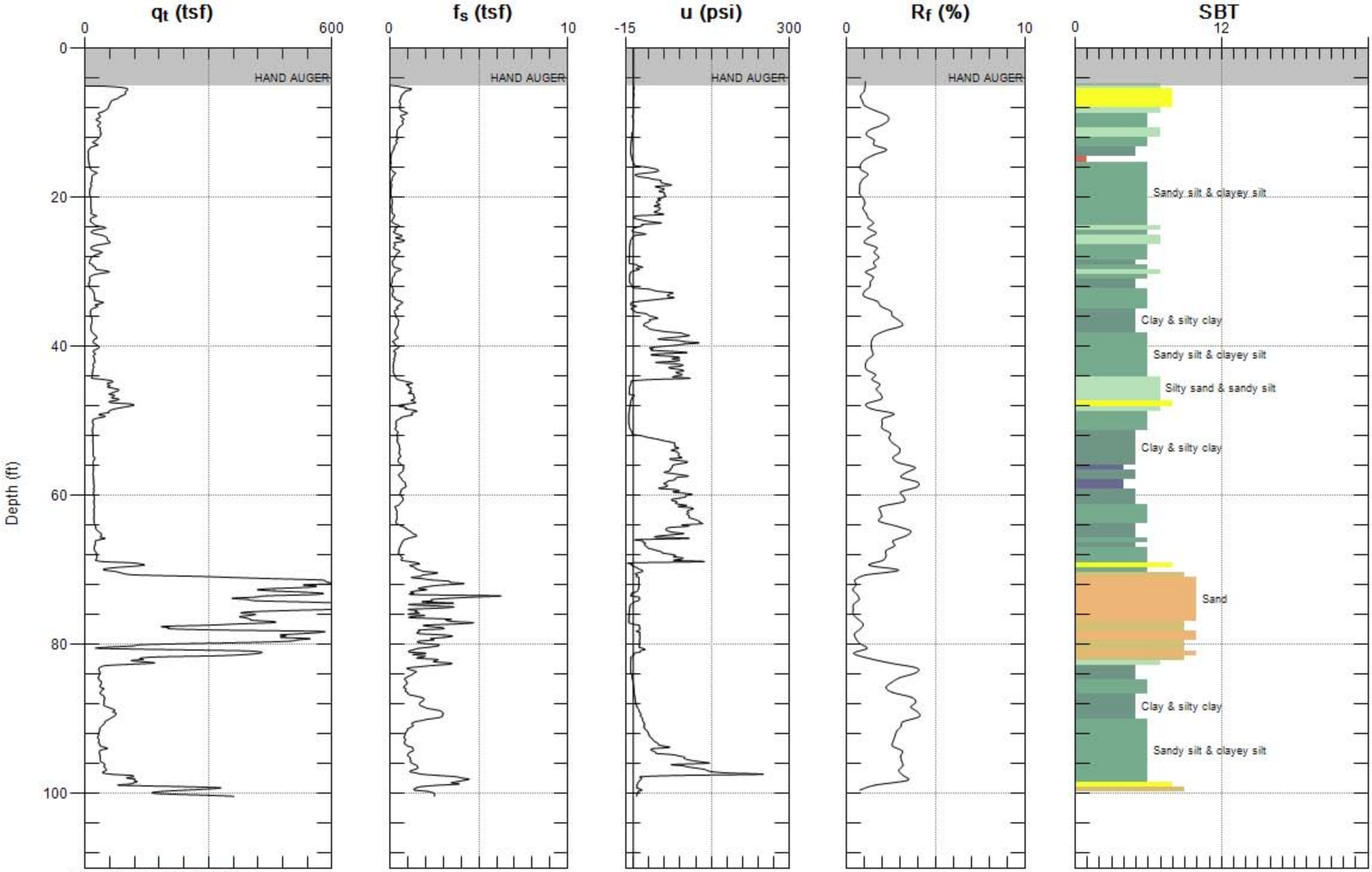
Max. Depth: 100.394 (ft)
Avg. Interval: 0.656 (ft)

SBT: Soil Behavior Type (Robertson 1990)

PARIKH CONSULTANTS

Site: HWY 101
Sounding: BR-2

Engineer: D.WANG
Date: 12/17/2007 09:01



Max. Depth: 100.394 (ft)
Avg. Interval: 0.656 (ft)

SBT: Soil Behavior Type (Robertson 1990)

Cone Penetration Test Data & Interpretation

Soil behavior type and stratigraphic interpretation is based on relationships between cone bearing (q_c), sleeve friction (f_s), and pore water pressure (u_2). The friction ratio (R_f) is a calculated parameter defined by $100 f_s/q_c$ and is used to infer soil behavior type. Generally:

Cohesive soils (clays)

- High friction ratio (R_f) due to small cone bearing (q_c)
- Generate large excess pore water pressures (u_2)

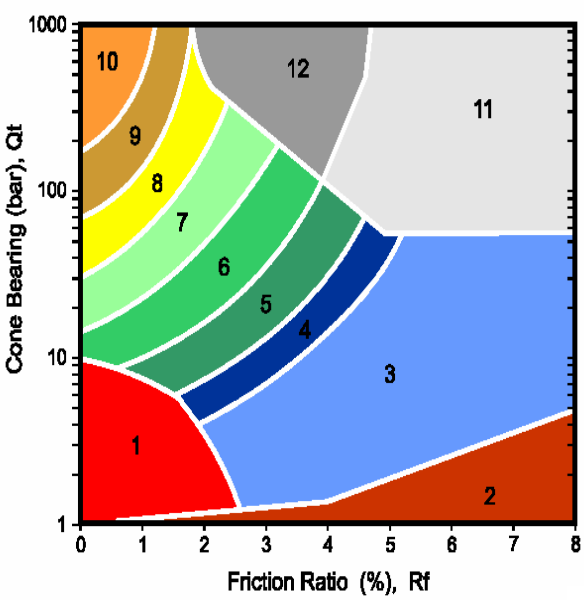
Cohesionless soils (sands)

- Low friction ratio (R_f) due to large cone bearing (q_c)
- Generate very little excess pore water pressures (u_2)

A complete set of baseline readings are taken prior to and at the completion of each sounding to determine temperature shifts and any zero load offsets. Corrections for temperature shifts and zero load offsets can be extremely important, especially when the recorded loads are relatively small. In sandy soils, however, these corrections are generally negligible.

The cone penetration test data collected from your site is presented in graphical form in Appendix CPT. The data includes CPT logs of measured soil parameters, computer calculations of interpreted soil behavior types (SBT), and additional geotechnical parameters. A summary of locations and depths is available in Table 1. Note that all penetration depths referenced in the data are with respect to the existing ground surface.

Soil interpretation for this project was conducted using recent correlations developed by Robertson, 1990, *Figure SBT*. Note that it is not always possible to clearly identify a soil type based solely on q_c, f_s, and u_2. In these situations, experience, judgment, and an assessment of the pore pressure dissipation data should be used to infer the soil behavior type.



ZONE	Qt/N	SBT
1	2	Sensitive, fine grained
2	1	Organic materials
3	1	Clay
4	1.5	Silty clay to clay
5	2	Clayey silt to silty clay
6	2.5	Sandy silt to clayey silt
7	3	Silty sand to sandy silt
8	4	Sand to silty sand
9	5	Sand
10	6	Gravely sand to sand
11	1	Very stiff fine grained*
12	2	Sand to clayey sand*

*over consolidated or cemented

Figure SBT

Cone Penetration Test (CPT) Interpretation

Gregg have recently updated their CPT interpretation and plotting software (2007). The software takes the CPT data and performs basic interpretation in terms of soil behavior type (SBT) and various geotechnical parameters using current published empirical correlations based on the comprehensive review by Lunne, Robertson and Powell (1997). The interpretation is presented in tabular format using MS Excel. The interpretations are presented only as a guide for geotechnical use and should be carefully reviewed. Gregg does not warranty the correctness or the applicability of any of the geotechnical parameters interpreted by the software and does not assume any liability for any use of the results in any design or review. The user should be fully aware of the techniques and limitations of any method used in the software.

The following provides a summary of the methods used for the interpretation. Many of the empirical correlations to estimate geotechnical parameters have constants that have a range of values depending on soil type, geologic origin and other factors. The software uses 'default' values that have been selected to provide, in general, conservatively low estimates of the various geotechnical parameters.

Input:

1. Units for display (Imperial or metric) (atm. pressure, pa = 0.96 tsf or 0.1 MPa)
2. Depth interval to average results,(ft or m). Data are collected at either 0.02 or 0.05m and can be averaged every 1, 3 or 5 intervals.
3. Elevation of ground surface (ft or m)
4. Depth to water table, z_w (ft or m) – input required
5. Net area ratio for cone, a (default to 0.85)
6. Relative Density constant, C_{Dr} (default to 350)
7. Young's modulus number for sands, α (default to 5)
8. Small strain shear modulus number
   a. for sands, S_G (default to 180 for SBT_n 5, 6, 7)
   b. for clays, C_G (default to 50 for SBT_n 1, 2, 3 & 4)
9. Undrained shear strength cone factor for clays, N_{kt} (default to 15)
10. Over Consolidation ratio number, k_{ocr} (default to 0.3)
11. Unit weight of water, (default to γ_w = 62.4 lb/ft^3 or 9.81 kN/m^3)

Column

1. Depth, z, (m) – CPT data is collected in meters
2. Depth (ft)
3. Cone resistance, q_c (tsf or MPa)
4. Sleeve friction, f_s (tsf or MPa)
5. Penetration pore pressure, u (psi or MPa), measured behind the cone (i.e. u_2)
6. Other – any additional data, if collected, e.g. electrical resistivity or UVIF
7. Total cone resistance, q_t (tsf or MPa) $q_t = q_c + u\,(1-a)$

8	Friction Ratio, R_f (%)	$R_f = (f_s/q_t) \times 100\%$
9	Soil Behavior Type (non-normalized), SBT	see note
10	Unit weight, γ (pcf or kN/m^3)	based on SBT, see note
11	Total overburden stress, σ_v (tsf)	$\sigma_{vo} = \gamma z$
12	Insitu pore pressure, u_o (tsf)	$u_o = \gamma_w (z - z_w)$
13	Effective overburden stress, σ'_{vo} (tsf)	$\sigma'_{vo} = \sigma_{vo} - u_o$
14	Normalized cone resistance, Q_{t1}	$Q_{t1} = (q_t - \sigma_{vo}) / \sigma'_{vo}$
15	Normalized friction ratio, F_r (%)	$F_r = f_s / (q_t - \sigma_{vo}) \times 100\%$
16	Normalized Pore Pressure ratio, B_q	$B_q = u - u_o / (q_t - \sigma_{vo})$
17	Soil Behavior Type (normalized), SBT_n	see note
18	SBT_n Index, I_c	see note
19	Normalized Cone resistance, Q_{tn} (n varies with Ic)	see note
20	Estimated permeability, k_{SBT} (cm/sec or ft/sec)	see note
21	Equivalent SPT N_{60}, blows/ft	see note
22	Equivalent SPT $(N_1)_{60}$ blows/ft	see note
23	Estimated Relative Density, D_r, (%)	see note
24	Estimated Friction Angle, ϕ', (degrees)	see note
25	Estimated Young's modulus, E_s (tsf)	see note
26	Estimated small strain Shear modulus, Go (tsf)	see note
27	Estimated Undrained shear strength, s_u (tsf)	see note
28	Estimated Undrained strength ratio	s_u/σ_v'
29	Estimated Over Consolidation ratio, OCR	see note

Notes:

1 Soil Behavior Type (non-normalized), SBT — Lunne et al. (1997)
listed below

2 Unit weight, γ either constant at 119 pcf or based on Non-normalized SBT
(Lunne et al., 1997 and table below)

3 Soil Behavior Type (Normalized), SBT_n — Lunne et al. (1997)

4 SBT_n Index, I_c — $I_c = ((3.47 - \log Q_{t1})^2 + (\log F_r + 1.22)^2)^{0.5}$

5 Normalized Cone resistance, Q_{tn} (n varies with Ic)

$Q_{tn} = ((q_t - \sigma_{vo})/pa)\ (pa/(\sigma'_{vo})^n$ and recalculate I_c, then iterate:

When $I_c < 1.64$, $n = 0.5$ (clean sand)
When $I_c > 3.30$, $n = 1.0$ (clays)
When $1.64 < I_c < 3.30$, $n = (I_c - 1.64)0.3 + 0.5$
Iterate until the change in n, $\Delta n < 0.01$

6 Estimated permeability, k_{SBT} (based on Normalized SBT_n)
(Lunne et al., 1997 and table below)

7 Equivalent SPT N_{60}, blows/ft Lunne et al. (1997)

$$\frac{(q_c/p_a)}{N_{60}} = 8.5\left(1 - \frac{I_c}{4.6}\right)$$

8 Equivalent SPT $(N_1)_{60}$ blows/ft $(N_1)_{60} = N_{60}\, C_N$,
where $C_N = (pa/\sigma'_{vo})^{0.5}$

9 Relative Density, D_r, (%) $D_r^2 = Q_{tn} / C_{Dr}$
Only SBT_n 5, 6, 7 & 8 *Show 'N/A' in zones 1, 2, 3, 4 & 9*

10 Friction Angle, ϕ', (degrees) $\tan\phi' = \frac{1}{2.68}\left[\log\left(\frac{q_c}{\sigma'_{vo}}\right) + 0.29\right]$
Only SBT_n 5, 6, 7 & 8 *Show'N/A' in zones 1, 2, 3, 4 & 9*

11 Young's modulus, E_s $E_s = \alpha\, q_t$
Only SBT_n 5, 6, 7 & 8 *Show 'N/A' in zones 1, 2, 3, 4 & 9*

12 Small strain shear modulus, Go
a. $G_o = S_G\,(q_t\ \sigma'_{vo}\ pa)^{1/3}$ *For SBT_n 5, 6, 7*
b. $G_o = C_G\, q_t$ *For SBT_n 1, 2, 3& 4*
Show 'N/A' in zones 8 & 9

13 Undrained shear strength, s_u $s_u = (q_t - \sigma_{vo}) / N_{kt}$
Only SBT_n 1, 2, 3, 4 & 9 *Show 'N/A' in zones 5, 6, 7 & 8*

14 Over Consolidation ratio, OCR $OCR = k_{ocr}\, Q_{t1}$
Only SBT_n 1, 2, 3, 4 & 9 *Show 'N/A' in zones 5, 6, 7 & 8*

SBT Zones		**SBT_n Zones**	
The following updated and simplified SBT descriptions have been used in the software:			
1	sensitive fine grained	1	sensitive fine grained
2	organic soils	2	organic soils
3	clays	3	clays
4	clays & silty clays	4	clays & silty clays
5	clays & silty clays		
6	silty sands & sandy silts	5	silty sands & sandy silts
7	silty sands & sandy silts		
8	sands & silty sands	6	sands & silty sands
9	sands & silty sands		
10	sands	7	sands
11	very dense/stiff soils*	8	very dense/stiff soils*
12	very dense/stiff soils*	9	very dense/stiff soils*

* heavily overconsolidated and/or cemented

Track when soils fall with zones of same description and print that description (i.e. if soils fall only within SBT zones 4 & 5, print 'clays & silty clays')

Estimated Permeability (see Lunne et al., 1997)

SBT_n	Permeability (ft/sec)	(m/sec)
1	$3x\ 10^{-8}$	$1x\ 10^{-8}$
2	$3x\ 10^{-7}$	$1x\ 10^{-7}$
3	$1x\ 10^{-9}$	$3x\ 10^{-10}$
4	$3x\ 10^{-8}$	$1x\ 10^{-8}$
5	$3x\ 10^{-6}$	$1x\ 10^{-6}$
6	$3x\ 10^{-4}$	$1x\ 10^{-4}$
7	$3x\ 10^{-2}$	$1x\ 10^{-2}$
8	$3x\ 10^{-6}$	$1x\ 10^{-6}$
9	$1x\ 10^{-8}$	$3x\ 10^{-9}$

Estimated Unit Weight (see Lunne et al., 1997)

SBT	Approximate Unit Weight (lb/ft^3)	(kN/m^3)
1	111.4	17.5
2	79.6	12.5
3	111.4	17.5
4	114.6	18.0
5	114.6	18.0
6	114.6	18.0
7	117.8	18.5
8	120.9	19.0
9	124.1	19.5
10	127.3	20.0
11	130.5	20.5
12	120.9	19.0

GREGG DRILLING & TESTING, INC.

CONE PENETRATION TEST DATA

Client:	PARIKH CONSULTANTS		
Site:	HWY 101		
Engineer:	D.WANG		
Sounding:	**BR-1**		
Date:	12/14/2007		
Time:	9:25 AM		

Units:	Imperial	
Data averaging interval:	0.200	meters
Assumed depth of water:	15.004	feet
Net area ratio of cone:	0.80	
Unit weight of water:	62.4	lb/ft^3
Relative density constant, C_{DR}:	350	
Young's modulus for sands, α:	4	
Small strain shear modulus number, S_G (sands	180	
Small strain shear modulus number, C_G (clays)	50	
N_{kt} for clays:	15	
OCR number, k_{OCr}:	0.3	

Interpretation based on Lunne, Robertson and Powell, 1997

Col 1i	Col 2i	Col 3i	Col 4i	Col 5i	Col 6i	Col 7i	Col 8i	Col 9i	Col 10i	Col 11i	Col 12i	Col 13i	Col 14i	Col 15i	Col 16i	Col 17i	Col 18i	Col 19i	Col 20i	Col 21i	Col 22i	Col 23i	Col 24i	Col 25i	Col 26i	Col 27i	Col 28i	Col 29i
Depth	Depth	q_c	f_s	u	Other	q_t	R_f	SBT	Unit Weight, γ	Total Overburden Stress, σ_v	Insitu pore pressure, u_o	Effective overburden stress, σ'_v	Normalized cone resistance, Q_t	Normalized Friction raio, F_r	Normalized pore pressure ratio, B_q	Soil Behavior Type (normalized) SBT_n	SBTn Index, I_c	Normalized Cone resistance, Q_{tn}	Estimated permeability, k_{SBT}	SPT N_{60}	SPT $(N_1)_{60}$	Relative Density, D_r	Friction Angle, φ'	Young's modulus, E_s	Small strain shear modulus, G_o	Undrained shear strength, s_u	Undrained strength ratio, s_u/σ'_v	Over consolidation ratio, OCR
(m)	(ft)	(tsf)	(tsf)	(psi)		(tsf)	(%)		(pcf)	(tsf)	(tsf)	(tsf)							(ft/sec)	(blows/ft)	(blows/ft)	(%)	(degrees)	(tsf)	(tsf)	(tsf)		
0.150	0.492	0.000	0.000	0.000							0.000																	
0.350	1.148	0.000	0.000	0.000							0.000																	
0.550	1.804	0.000	0.000	0.000							0.000																	
0.750	2.461	0.000	0.000	0.000							0.000																	
0.950	3.117	0.000	0.000	0.000							0.000																	
1.150	3.773	0.000	0.000	0.000							0.000																	
1.350	4.429	0.000	0.000	0.000							0.000																	
1.550	5.085	16.721	0.755	-0.442		16.71	4.51	3	111	0.283	0.000	0.283	58.01	4.59	0.00	4	2.54	42.85	3.00E-8	4.2	8.0				836	1.10	3.87	17.4
1.750	5.741	25.144	0.904	-0.348		25.14	3.60	5	115	0.321	0.000	0.321	77.35	3.64	0.00	4	2.38	55.55	3.00E-8	5.8	10.5				1257	1.65	5.16	23.2
1.950	6.398	22.174	0.657	0.018		22.17	2.96	5	115	0.358	0.000	0.358	60.86	3.01	0.00	5	2.39	45.24	3.00E-6	5.1	8.8	36	38	89	366			
2.150	7.054	19.910	0.557	-0.074		19.91	2.80	5	115	0.396	0.000	0.396	49.27	2.86	0.00	5	2.44	38.19	3.00E-6	4.7	7.7	33	37	80	365			
2.350	7.710	20.961	0.520	0.158		20.96	2.48	5	115	0.434	0.000	0.434	47.34	2.53	0.00	5	2.42	37.34	3.00E-6	4.9	7.7	33	36	84	383			
2.550	8.366	33.213	0.655	-0.291		33.21	1.97	6	115	0.471	0.000	0.471	69.47	2.00	0.00	5	2.23	53.47	3.00E-6	7.2	10.7	39	39	133	459			
2.750	9.022	46.296	0.607	-0.684		46.29	1.31	7	118	0.510	0.000	0.510	89.78	1.33	0.00	6	2.03	67.81	3.00E-4	9.2	13.2	44	40	185	526			
2.950	9.678	50.306	0.482	-0.681		50.30	0.96	7	118	0.549	0.000	0.549	90.70	0.97	0.00	6	1.93	69.21	3.00E-4	9.7	13.4	44	40	201	554			
3.150	10.335	40.843	0.492	-0.723		40.83	1.20	7	118	0.587	0.000	0.587	68.54	1.22	0.00	5	2.09	55.31	3.00E-6	8.3	11.2	40	39	163	529			
3.350	10.991	24.580	0.371	-0.147		24.58	1.51	6	115	0.625	0.000	0.625	38.34	1.55	0.00	5	2.36	32.99	3.00E-6	5.6	7.3	31	35	98	456			
3.550	11.647	15.575	0.232	-1.927		15.55	1.49	6	115	0.662	0.000	0.662	22.47	1.56	-0.01	5	2.55	20.20	3.00E-6	3.9	4.9	24	32	62	399			
3.750	12.303	11.517	0.116	0.270		11.52	1.01	6	115	0.700	0.000	0.700	15.46	1.07	0.00	4	2.60	14.16	3.00E-8	2.9	3.6				576	0.72	1.03	4.6
3.950	12.959	12.796	0.213	5.942		12.88	1.65	5	115	0.738	0.000	0.738	16.47	1.75	0.04	4	2.69	15.40	3.00E-8	3.4	4.1				644	0.81	1.10	4.9
4.150	13.615	19.605	0.252	8.648		19.73	1.28	6	115	0.775	0.000	0.775	24.45	1.33	0.03	5	2.48	22.63	3.00E-6	4.7	5.5	25	32	79	455			
4.350	14.272	18.784	0.231	-4.464		18.72	1.23	6	115	0.813	0.000	0.813	22.03	1.29	-0.02	5	2.51	20.68	3.00E-6	4.6	5.2	24	32	75	454			
4.550	14.928	10.036	0.097	-6.935		9.94	0.97	5	115	0.850	0.000	0.850	10.69	1.06	-0.05	4	2.74	10.30	3.00E-8	2.8	3.1				497	0.61	0.71	3.2
4.750	15.584	9.435	0.105	-5.482		9.36	1.12	5	115	0.888	0.018	0.870	9.74	1.24	-0.05	4	2.81	9.45	3.00E-8	2.7	3.0				468	0.56	0.65	2.9
4.950	16.240	10.103	0.122	-3.292		10.06	1.22	5	115	0.925	0.039	0.887	10.29	1.34	-0.03	4	2.80	10.02	3.00E-8	2.9	3.1				503	0.61	0.69	3.1
5.150	16.896	10.419	0.162	-1.200		10.40	1.56	5	115	0.963	0.059	0.904	10.44	1.72	-0.02	4	2.85	10.22	3.00E-8	3.0	3.3				520	0.63	0.70	3.1
5.350	17.552	9.464	0.132	-0.351		9.46	1.39	5	115	1.001	0.080	0.921	9.18	1.56	-0.01	4	2.88	9.02	3.00E-8	2.8	3.0				473	0.56	0.61	2.8
5.550	18.209	8.890	0.082	1.095		8.91	0.92	5	115	1.038	0.100	0.938	8.39	1.04	0.00	4	2.83	8.24	3.00E-8	2.6	2.7				445	0.52	0.56	2.5
5.750	18.865	10.428	0.131	3.843		10.48	1.25	5	115	1.076	0.120	0.955	9.85	1.39	0.02	4	2.83	9.70	3.00E-8	3.0	3.2				524	0.63	0.66	3.0
5.950	19.521	11.612	0.149	12.424		11.79	1.27	6	115	1.113	0.141	0.973	10.98	1.40	0.07	4	2.79	10.84	3.00E-8	3.3	3.4				590	0.71	0.73	3.3
6.150	20.177	11.431	0.113	35.074		11.94	0.95	6	115	1.151	0.161	0.990	10.90	1.05	0.22	4	2.73	10.77	3.00E-8	3.1	3.2				597	0.72	0.73	3.3
6.350	20.833	16.253	0.230	28.792		16.67	1.38	6	115	1.189	0.182	1.007	15.38	1.48	0.12	4	2.67	15.23	3.00E-8	4.3	4.4				833	1.03	1.03	4.6
6.550	21.490	18.268	0.183	23.637		18.61	0.98	6	115	1.226	0.202	1.024	16.98	1.05	0.09	5	2.56	16.85	3.00E-6	4.6	4.7	22	30	74	490			
6.750	22.146	31.207	0.598	12.768		31.39	1.90	6	115	1.264	0.223	1.041	28.94	1.98	0.02	5	2.52	28.83	3.00E-6	7.7	7.7	29	33	126	586			
6.950	22.802	60.027	0.732	-7.612		59.92	1.22	7	118	1.302	0.243	1.059	55.34	1.25	-0.01	5	2.17	55.36	3.00E-6	12.6	12.6	40	37	240	732			
7.150	23.458	53.343	0.680	-10.223		53.20	1.28	7	118	1.341	0.264	1.077	48.13	1.31	-0.02	5	2.23	48.41	3.00E-6	11.5	11.4	37	37	213	707			
7.350	24.114	49.685	0.568	-10.525		49.53	1.15	7	118	1.380	0.284	1.096	43.96	1.18	-0.02	5	2.24	44.45	3.00E-6	10.8	10.6	36	36	198	694			
7.550	24.770	57.086	0.532	-8.924		56.96	0.93	8	121	1.419	0.305	1.115	49.82	0.96	-0.02	5	2.14	50.74	3.00E-6	11.9	11.6	38	37	228	732			
7.750	25.427	58.576	0.503	-4.562		58.51	0.86	8	121	1.459	0.325	1.134	50.31	0.88	-0.01	5	2.12	51.57	3.00E-6	12.1	11.7	38	37	234	743			
7.950	26.083	55.491	0.526	-2.373		55.46	0.95	8	121	1.499	0.346	1.153	46.79	0.97	-0.01	5	2.17	48.19	3.00E-6	11.7	11.2	37	36	222	733			
8.150	26.739	51.748	0.722	1.629		51.77	1.39	7	118	1.537	0.366	1.171	42.89	1.44	0.00	5	2.30	44.23	3.00E-6	11.5	10.9	36	36	207	721			
8.350	27.395	63.093	0.671	-1.161		63.08	1.06	8	121	1.577	0.387	1.191	51.66	1.09	-0.01	5	2.16	53.79	3.00E-6	13.2	12.5	39	37	252	774			
8.550	28.051	27.044	0.455	0.983		27.06	1.68	6	115	1.615	0.407	1.208	21.07	1.79	-0.01	4	2.60	21.67	3.00E-8	6.9	6.5				1353	1.70	1.40	6.3
8.750	28.707	16.559	0.189	5.026		16.63	1.13	6	115	1.652	0.428	1.225	12.23	1.26	0.00	4	2.72	12.55	3.00E-8	4.5	4.2				832	1.00	0.82	3.7
8.950	29.364	14.955	0.240	9.918		15.10	1.59	6	115	1.690	0.448	1.242	10.80	1.79	0.02	4	2.85	11.04	3.00E-8	4.4	4.0				755	0.89	0.72	3.2
9.150	30.020	14.725	0.248	15.463		14.95	1.66	6	115	1.727	0.468	1.259	10.50	1.87	0.05	4	2.87	10.74	3.00E-8	4.3	4.0				747	0.88	0.70	3.2
9.350	30.676	14.859	0.266	17.902		15.12	1.76	6	115	1.765	0.489	1.276	10.46	1.99	0.06	4	2.88	10.71	3.00E-8	4.4	4.0				756	0.89	0.70	3.1
9.550	31.332	20.331	0.537	19.390		20.61	2.61	5	115	1.803	0.509	1.293	14.54	2.86	0.05	4	2.85	14.95	3.00E-8	5.9	5.4				1031	1.25	0.97	4.4
9.750	31.988	21.601	0.567	19.081		21.88	2.59	5	115	1.840	0.530	1.310	15.29	2.83	0.04	4	2.83	15.76	3.00E-8	6.2	5.6				1094	1.34	1.02	4.6
9.950	32.644	20.971	0.482	23.103		21.30	2.26	6	115	1.878	0.550	1.327	14.63	2.48	0.06	4	2.81	15.13	3.00E-8	6.0	5.4				1065	1.30	0.98	4.4
10.150	33.301	30.463	0.567	14.231		30.67	1.85	6	115	1.915	0.571	1.345	21.38	1.97	0.02	4	2.62	22.46	3.00E-8	7.9	7.0				1533	1.92	1.43	6.4
10.350	33.957	18.650	0.330	-0.323		18.65	1.77	6	115	1.953	0.591	1.362	12.26	1.98	-0.04	4	2.82	12.71	3.00E-8	5.4	4.7				932	1.11	0.82	3.7
10.550	34.613	16.167	0.373	1.657		16.19	2.30	5	115	1.991	0.612	1.379	10.30	2.63	-0.03	3	2.95	10.59	1.00E-9	5.0	4.4				810	0.95	0.69	3.1
10.750	35.269	17.724	0.490	2.464		17.76	2.76	5	115	2.028	0.632	1.396	11.27	3.12	-0.03	3	2.96	11.59	1.00E-9	5.5	4.8				888	1.05	0.75	3.4
10.950	35.925	14.964	0.429	3.289		15.01	2.86	5	115	2.066	0.653	1.413	9.16	3.31	-0.03	3	3.05	9.37	1.00E-9	4.9	4.3				751	0.86	0.61	2.7
11.150	36.581	14.238	0.361	4.096		14.30	2.52	5	115	2.103	0.673	1.430	8.53	2.96	-0.03	3	3.05	8.73	1.00E-9	4.7	4.0				715	0.81	0.57	2.6
11.350	37.238	13.713	0.240	4.980		13.78	1.74	5	115	2.141	0.694	1.447	8.04	2.06	-0.03	3	2.99	8.29	1.00E-9	4.4	3.7				689	0.78	0.54	2.4
11.550	37.894	16.148	0.261	6.121		16.24	1.61	6	115	2.179	0.714	1.464	9.60	1.86	-0.02	4	2.90	9.99	3.00E-8	4.9	4.1				812	0.94	0.64	2.9
11.750	38.550	15.060	0.173	8.767		15.19	1.14	6	115	2.216	0.735	1.482	8.75	1.33	-0.01	4	2.86	9.15	3.00E-8	4.4	3.7				759	0.86	0.58	2.6
11.950	39.206	14.429	0.175	15.095		14.65	1.20	6	115	2.254	0.755	1.499	8.27	1.41	0.03	4	2.90	8.63	3.00E-8	4.3	3.6				732	0.83	0.55	2.5
12.150	39.862	17.304	0.249	24.995		17.66	1.41	6	115	2.291	0.776	1.516	10.14	1.62	0.07	4	2.85	10.66	3.00E-8	5.1	4.2				883	1.02	0.68	3.0
12.350	40.518	20.054	0.354	32.151		20.52	1.72	6	115	2.329	0.796	1.533	11.86	1.94	0.08	4	2.83	12.51	3.00E-8	5.8	4.8				1026	1.21	0.79	3.6
12.550	41.175	22.518	0.462	40.107		23.10	2.00	6	115	2.367	0.817	1.550	13.37	2.23	0.10	4	2.82	14.14	3.00E-8	6.5	5.3				1155	1.38	0.89	4.0
12.750	41.831	38.083	0.679	35.025		38.59	1.76	6	115	2.404	0.837	1.567	23.09	1.88	0.05	4	2.58	25.15	3.00E-8	9.7	7.9				1929	2.41	1.54	6.9
12.950	42.487	85.772	0.979	1.962		85.80	1.14	8	121	2.444	0.857	1.586	52.54	1.17	-0.01	5	2.17	60.30	3.00E-6	18.1	14.8	42	37	343	944			
13.150	43.143	91.349	0.868	0.555		91.36	0.95	8	121	2.484	0.878	1.606	55.35	0.98	-0.01	5	2.11	64.30	3.00E-6	18.8	15.2	43	37	365	967			
13.350	43.799	82.449	1.223	-4.506		82.38	1.48	7	118	2.522	0.898	1.624	49.18	1.53	-0.02	5	2.27	56.22	3.00E-6	18.1	14.6	40	37	330	938			
13.550	44.455	68.832	1.151	-5.489		68.75	1.67	7	118	2.561	0.919	1.642	40.31	1.74	-0.02	5	2.37	45.62	3.00E-6	15.8	12.7	36	36	275	886			
13.750	45.112	23.835	0.476	-5.580		23.76	2.00	6	115	2.598	0.939	1.659	12.75	2.25	-0.06	4	2.84	13.58	3.00E-8	6.9	5.5				1188	1.41	0.85	3.8
13.950	45.768	21.247	0.340	-5.612		21.17	1.61	6	115	2.636	0.960	1.676	11.06	1.84	-0.07	4	2.84	11.78	3.00E-8	6.2	4.9				1058	1.24	0.74	3.3
14.150	46.424	38.627	0.741	-5.633		38.55	1.92	6	115	2.674	0.980	1.693	21.18	2.07	-0.04	4	2.64	23.28	3.00E-8	10.1	8.0				1927	2.39	1.41	6.4
14.350	47.080	60.696	1.489	-5.647		60.61	2.46	6	115	2.711	1.001	1.710	33.85	2.57	-0.02	4	2.53	37.84	3.00E-8	15.0	11.8				3031	3.86	2.26	10.2
14.550	47.736	90.165	1.255	-5.657		90.08	1.39	8	121	2.751	1.021	1.730	50.49	1.44	-0.02	5	2.24	59.09	3.00E-6	19.5	15.3	41	37	360	987			
14.750	48.392	85.591	1.276	-5.682		85.51	1.49	7	118	2.790	1.042	1.748	47.33	1.54	-0.02	5	2.28	55.23	3.00E-6	18.9	14.7	40	36	342	973			
14.950	49.049	65.480	1.381	-5.710		65.40	2.11	7	118	2.828	1.062	1.766	35.43	2.21	-0.02	5	2.48	40.25	3.00E-6	15.8	12.2	34	35	262	893			
15.150	49.705	44.977	1.151	-5.742		44.89	2.56	6	115	2.866	1.083	1.783	23.57	2.74	-0.04	4	2.67	26.03	3.00E-8	11.9	9.2				2245	2.80	1.57	7.1
15.350	50.361	39.353	0.871	-5.756		39.27	2.22	6	115	2.903	1.103	1.800	20.20	2.40	-0.04	4	2.69	22.28	3.00E-8	10.5	8.1				1964	2.42	1.35	6.1

Col 1i	Col 2i	Col 3i	Col 4i	Col 5i	Col 6i	Col 7i	Col 8i	Col 9i	Col 10i	Col 11i	Col 12i	Col 13i	Col 14i	Col 15i	Col 16i	Col 17i	Col 18i	Col 19i	Col 20i	Col 21i	Col 22i	Col 23i	Col 24i	Col 25i	Col 26i	Col 27i	Col 28i	Col 29i
Depth	Depth	q_c	f_s	u	Other	q_t	R_f	SBT	Unit Weight, γ	Total Overburden Stress, σ_v	Insitu pore pressure, u_o	Effective overburden stress, σ'_v	Normalized cone resistance, Q_{tn}	Normalized Friction raio, F_r	Normalized pore pressure ratio, B_q	Soil Behavior Type (normalized) SBT_n	SBTn Index, I_c	Normalized Cone resistance, Q_{tn}	Estimated permeability, k_{SBT}	SPT N_{60}	SPT $(N_1)_{60}$	Relative Density, D_r	Friction Angle, φ'	Young's modulus, E_s	Small strain shear modulus, G_o	Undrained shear strength, s_u	Undrained strength ratio, s_u/σ'_v	Over consolidation ratio, OCR
(m)	(ft)	(tsf)	(tsf)	(psi)		(tsf)	(%)		(pcf)	(tsf)	(tsf)	(tsf)							(ft/sec)	(blows/ft)	(blows/ft)	(%)	(degrees)	(tsf)	(tsf)	(tsf)		
15.550	51.017	20.226	0.290	-5.777		20.14	1.44	6	115	2.941	1.124	1.817	9.47	1.69	-0.09	4	2.88	10.14	3.00E-8	6.0	4.6				1007	1.15	0.63	2.8
15.750	51.673	20.951	0.397	-5.794		20.87	1.90	6	115	2.979	1.144	1.834	9.75	2.22	-0.09	3	2.93	10.37	1.00E-9	6.4	4.9				1043	1.19	0.65	2.9
15.950	52.329	22.059	0.461	-5.819		21.98	2.10	6	115	3.016	1.165	1.852	10.24	2.43	-0.08	3	2.94	10.89	1.00E-9	6.8	5.1				1099	1.26	0.68	3.1
16.150	52.986	20.971	0.388	-5.850		20.89	1.86	6	115	3.054	1.185	1.869	9.54	2.18	-0.09	3	2.94	10.16	1.00E-9	6.5	4.9				1044	1.19	0.64	2.9
16.350	53.642	21.811	0.497	-5.864		21.73	2.29	6	115	3.091	1.206	1.886	9.88	2.67	-0.09	3	2.97	10.47	1.00E-9	6.9	5.1				1086	1.24	0.66	3.0
16.550	54.298	22.785	0.621	-5.878		22.70	2.73	5	115	3.129	1.226	1.903	10.28	3.17	-0.08	3	3.00	10.85	1.00E-9	7.3	5.4				1135	1.30	0.69	3.1
16.750	54.954	23.597	0.582	-5.882		23.51	2.48	6	115	3.167	1.246	1.920	10.60	2.86	-0.08	3	2.96	11.26	1.00E-9	7.4	5.5				1176	1.36	0.71	3.2
16.950	55.610	24.571	0.579	-5.096		24.50	2.36	6	115	3.204	1.267	1.937	10.99	2.72	-0.08	3	2.94	11.75	1.00E-9	7.6	5.6				1225	1.42	0.73	3.3
17.150	56.266	23.797	0.726	-3.710		23.74	3.06	5	115	3.242	1.287	1.954	10.49	3.54	-0.08	3	3.02	11.06	1.00E-9	7.7	5.7				1187	1.37	0.70	3.1
17.350	56.923	25.296	0.729	-3.323		25.25	2.89	5	115	3.279	1.308	1.971	11.14	3.32	-0.07	3	2.98	11.84	1.00E-9	8.0	5.9				1262	1.46	0.74	3.3
17.550	57.579	24.169	0.526	-2.832		24.13	2.18	6	115	3.317	1.328	1.989	10.47	2.53	-0.07	3	2.94	11.22	1.00E-9	7.4	5.4				1206	1.39	0.70	3.1
17.750	58.235	24.084	0.573	-2.186		24.05	2.38	6	115	3.354	1.349	2.006	10.32	2.77	-0.07	3	2.97	11.02	1.00E-9	7.5	5.5				1203	1.38	0.69	3.1
17.950	58.891	25.545	0.838	-1.316		25.53	3.28	5	115	3.392	1.369	2.023	10.94	3.79	-0.07	3	3.02	11.56	1.00E-9	8.3	6.0				1276	1.48	0.73	3.3
18.150	59.547	23.892	0.743	-0.607		23.88	3.11	5	115	3.430	1.390	2.040	10.03	3.63	-0.07	3	3.04	10.56	1.00E-9	7.9	5.7				1194	1.36	0.67	3.0
18.350	60.203	24.609	0.713	0.126		24.61	2.90	5	115	3.467	1.410	2.057	10.28	3.37	-0.07	3	3.02	10.89	1.00E-9	7.9	5.7				1231	1.41	0.69	3.1
18.550	60.860	26.079	0.776	0.898		26.09	2.97	5	115	3.505	1.431	2.074	10.89	3.44	-0.06	3	3.00	11.58	1.00E-9	8.3	6.0				1305	1.51	0.73	3.3
18.750	61.516	25.296	0.655	1.516		25.32	2.59	6	115	3.542	1.451	2.091	10.41	3.01	-0.06	3	2.98	11.12	1.00E-9	8.0	5.7				1266	1.45	0.69	3.1
18.950	62.172	27.216	0.466	3.524		27.27	1.71	6	115	3.580	1.472	2.108	11.23	1.97	-0.05	4	2.85	12.34	3.00E-8	8.0	5.6				1363	1.58	0.75	3.4
19.150	62.828	29.374	0.542	6.359		29.47	1.84	6	115	3.618	1.492	2.126	12.16	2.10	-0.04	4	2.84	13.41	3.00E-8	8.5	6.0				1473	1.72	0.81	3.6
19.350	63.484	29.851	0.491	8.153		29.97	1.64	6	115	3.655	1.513	2.143	12.28	1.87	-0.04	4	2.81	13.65	3.00E-8	8.5	6.0				1498	1.75	0.82	3.7
19.550	64.140	30.720	0.615	9.743		30.86	1.99	6	115	3.693	1.533	2.160	12.58	2.26	-0.03	4	2.85	13.88	3.00E-8	9.0	6.3				1543	1.81	0.84	3.8
19.750	64.797	32.592	0.959	10.774		32.75	2.93	5	115	3.730	1.554	2.177	13.33	3.30	-0.03	3	2.92	14.49	1.00E-9	9.9	6.9				1637	1.93	0.89	4.0
19.950	65.453	39.200	1.123	12.627		39.38	2.85	6	115	3.768	1.574	2.194	16.23	3.15	-0.02	4	2.84	17.98	3.00E-8	11.4	7.9				1969	2.37	1.08	4.9
20.150	66.109	40.699	1.372	13.880		40.90	3.36	5	115	3.806	1.594	2.211	16.78	3.70	-0.02	3	2.87	18.47	1.00E-9	12.0	8.3				2045	2.47	1.12	5.0
20.350	66.765	54.795	1.727	12.561		54.98	3.14	6	115	3.843	1.615	2.228	22.95	3.38	-0.01	4	2.74	26.05	3.00E-8	15.1	10.4				2749	3.41	1.53	6.9
20.550	67.421	54.670	1.787	3.461		54.72	3.26	6	115	3.881	1.635	2.245	22.64	3.51	-0.03	4	2.76	25.64	3.00E-8	15.2	10.4				2736	3.39	1.51	6.8
20.750	68.077	25.927	0.500	2.450		25.96	1.93	6	115	3.918	1.656	2.262	9.74	2.27	-0.07	3	2.94	10.59	1.00E-9	8.0	5.5				1298	1.47	0.65	2.9
20.950	68.734	25.058	0.421	2.127		25.09	1.68	6	115	3.956	1.676	2.280	9.27	1.99	-0.07	3	2.93	10.11	1.00E-9	7.7	5.2				1254	1.41	0.62	2.8
21.150	69.390	26.318	0.476	1.944		26.35	1.81	6	115	3.994	1.697	2.297	9.73	2.13	-0.07	3	2.93	10.63	1.00E-9	8.0	5.5				1317	1.49	0.65	2.9
21.350	70.046	28.037	0.536	1.867		28.06	1.91	6	115	4.031	1.717	2.314	10.39	2.23	-0.07	3	2.91	11.39	1.00E-9	8.5	5.7				1403	1.60	0.69	3.1
21.550	70.702	24.532	0.398	1.786		24.56	1.62	6	115	4.069	1.738	2.331	8.79	1.94	-0.08	3	2.94	9.58	1.00E-9	7.6	5.1				1228	1.37	0.59	2.6
21.750	71.358	24.733	0.375	1.706		24.76	1.52	6	115	4.106	1.758	2.348	8.79	1.82	-0.08	4	2.93	9.63	3.00E-8	7.6	5.1				1238	1.38	0.59	2.6
21.950	72.014	33.614	0.560	1.604		33.64	1.67	6	115	4.144	1.779	2.365	12.47	1.90	-0.06	4	2.81	14.07	3.00E-8	9.6	6.4				1682	1.97	0.83	3.7
22.150	72.671	36.154	0.609	1.614		36.18	1.68	6	115	4.182	1.799	2.382	13.43	1.90	-0.05	4	2.78	15.26	3.00E-8	10.2	6.8				1809	2.13	0.90	4.0
22.350	73.327	88.494	1.362	3.548		88.55	1.54	7	118	4.220	1.820	2.401	35.13	1.62	-0.02	5	2.40	43.93	3.00E-6	20.5	13.6	35	35	354	1095			
22.550	73.983	200.308	3.528	3.966		200.36	1.76	8	121	4.260	1.840	2.420	81.04	1.80	-0.01	5	2.15	108.05	3.00E-6	41.8	27.6	56	39	801	1441			
22.750	74.639	259.533	3.171	1.278		259.55	1.22	9	124	4.301	1.861	2.440	104.61	1.24	-0.01	6	1.96	146.72	3.00E-4	50.2	33.1	65	41	1038	1575			
22.950	75.295	323.418	1.424	8.486		323.54	0.44	10	127	4.342	1.881	2.461	129.69	0.45	0.00	6	1.61	197.80	3.00E-4	55.4	36.3	75	42	1294	1700			
23.150	75.951	304.443	0.904	12.385		304.62	0.30	10	127	4.384	1.902	2.483	120.94	0.30	0.00	6	1.55	185.25	3.00E-4	51.1	33.4	73	42	1218	1671			
23.350	76.608	406.736	1.278	10.122		406.88	0.31	10	127	4.426	1.922	2.504	160.73	0.32	0.00	6	1.46	247.26	3.00E-4	66.2	43.0	84	43	1628	1846			
23.550	77.264	435.995	1.024	6.886		436.09	0.23	10	127	4.468	1.943	2.525	170.93	0.24	0.00	6	1.37	264.06	3.00E-4	69.1	44.7	87	43	1744	1894			
23.750	77.920	344.961	1.615	0.716		344.97	0.47	10	127	4.509	1.963	2.546	133.70	0.47	-0.01	6	1.62	207.41	3.00E-4	59.1	38.1	77	42	1380	1757			
23.950	78.576	93.326	2.375	-1.225		93.31	2.55	7	118	4.548	1.983	2.565	34.61	2.68	-0.02	4	2.54	42.45	3.00E-8	23.2	14.9				4665	5.92	2.31	10.4
24.150	79.232	49.189	1.219	2.120		49.22	2.48	6	115	4.586	2.004	2.582	17.29	2.73	-0.04	4	2.78	19.91	3.00E-8	13.8	8.8				2461	2.98	1.15	5.2
24.350	79.888	81.313	2.325	3.085		81.36	2.86	6	115	4.623	2.024	2.599	29.53	3.03	-0.02	4	2.63	35.48	3.00E-8	21.1	13.4				4068	5.12	1.97	8.9
24.550	80.545	147.118	2.950	-0.747		147.11	2.01	7	118	4.662	2.045	2.617	54.43	2.07	-0.01	5	2.32	71.23	3.00E-6	33.0	21.0	45	37	588	1334			
24.750	81.201	57.506	1.544	-4.481		57.44	2.69	6	115	4.699	2.065	2.634	20.02	2.93	-0.05	4	2.75	23.34	3.00E-8	15.9	10.1				2872	3.52	1.33	6.0
24.950	81.857	36.173	0.678	-4.987		36.10	1.88	6	115	4.737	2.086	2.651	11.83	2.16	-0.08	4	2.86	13.39	3.00E-8	10.6	6.7				1805	2.09	0.79	3.5
25.150	82.513	41.148	0.818	-4.899		41.08	1.99	6	115	4.775	2.106	2.668	13.60	2.25	-0.07	4	2.82	15.59	3.00E-8	11.8	7.4				2054	2.42	0.91	4.1
25.350	83.169	37.395	0.783	-4.755		37.33	2.10	6	115	4.812	2.127	2.686	12.11	2.41	-0.08	4	2.87	13.66	3.00E-8	11.1	7.0				1866	2.17	0.81	3.6
25.550	83.825	36.899	0.894	-4.682		36.83	2.43	6	115	4.850	2.147	2.703	11.83	2.80	-0.08	3	2.92	13.20	1.00E-9	11.2	7.0				1842	2.13	0.79	3.6
25.750	84.482	38.369	1.147	-4.615		38.30	3.00	6	115	4.887	2.168	2.720	12.29	3.43	-0.07	3	2.96	13.56	1.00E-9	12.0	7.5				1915	2.23	0.82	3.7
25.950	85.138	38.284	0.963	-4.492		38.22	2.52	6	115	4.925	2.188	2.737	12.16	2.89	-0.08	3	2.92	13.59	1.00E-9	11.6	7.2				1911	2.22	0.81	3.6
26.150	85.794	42.352	0.863	-4.296		42.29	2.04	6	115	4.963	2.209	2.754	13.55	2.31	-0.07	4	2.82	15.57	3.00E-8	12.2	7.6				2114	2.49	0.90	4.1
26.350	86.450	43.975	0.893	-4.120		43.92	2.03	6	115	5.000	2.229	2.771	14.04	2.29	-0.06	4	2.81	16.21	3.00E-8	12.6	7.8				2196	2.59	0.94	4.2
26.550	87.106	40.022	0.690	-3.969		39.96	1.73	7	118	5.039	2.250	2.789	12.52	1.97	-0.07	4	2.82	14.45	3.00E-8	11.5	7.1				1998	2.33	0.83	3.8
26.750	87.762	46.372	1.053	-3.797		46.32	2.27	6	115	5.076	2.270	2.806	14.70	2.55	-0.06	4	2.82	16.95	3.00E-8	13.3	8.2				2316	2.75	0.98	4.4
26.950	88.419	45.961	1.490	-3.527		45.91	3.24	6	115	5.114	2.291	2.824	14.45	3.65	-0.06	3	2.92	16.20	1.00E-9	14.0	8.6				2296	2.72	0.96	4.3
27.150	89.075	80.282	4.241	-3.274		80.23	5.29	11	131	5.157	2.311	2.846	26.38	5.65	-0.03	3	2.84	30.27	1.00E-9	23.4	14.3				4012	5.01	1.76	7.9
27.350	89.731	63.704	2.783	-3.078		63.66	4.37	5	115	5.194	2.331	2.863	20.42	4.76	-0.04	3	2.88	23.23	1.00E-9	18.9	11.5				3183	3.90	1.36	6.1
27.550	90.387	43.077	1.386	-2.829		43.04	3.22	6	115	5.232	2.352	2.880	13.13	3.67	-0.07	3	2.95	14.60	1.00E-9	13.4	8.1				2152	2.52	0.88	3.9
27.750	91.043	43.946	1.006	-2.720		43.91	2.29	6	115	5.270	2.372	2.897	13.34	2.60	-0.07	4	2.86	15.27	3.00E-8	12.9	7.8				2195	2.58	0.89	4.0
27.950	91.699	35.810	0.707	-2.527		35.77	1.98	6	115	5.307	2.393	2.914	10.45	2.32	-0.08	3	2.92	11.76	1.00E-9	10.9	6.6				1789	2.03	0.70	3.1
28.150	92.356	32.640	0.492	-2.351		32.61	1.51	7	118	5.346	2.413	2.933	9.30	1.80	-0.09	4	2.90	10.51	3.00E-8	9.8	5.9				1630	1.82	0.62	2.8
28.350	93.012	34.941	0.582	-2.246		34.91	1.67	6	115	5.383	2.434	2.950	10.01	1.97	-0.09	4	2.90	11.35	3.00E-8	10.5	6.3				1745	1.97	0.67	3.0
28.550	93.668	42.886	0.644	-2.102		42.86	1.50	7	118	5.422	2.454	2.968	12.61	1.72	-0.07	4	2.78	14.84	3.00E-8	12.1	7.2				2143	2.50	0.84	3.8
28.750	94.324	42.772	0.720	-1.891		42.74	1.68	7	118	5.461	2.475	2.986	12.49	1.93	-0.07	4	2.81	14.57	3.00E-8	12.2	7.3				2137	2.49	0.83	3.7
28.950	94.980	45.379	0.794	-1.403		45.36	1.75	7	118	5.499	2.495	3.004	13.27	1.99	-0.07	4	2.80	15.57	3.00E-8	12.9	7.6				2268	2.66	0.88	4.0
29.150	95.636	51.500	0.931	-0.122		51.50	1.81	7	118	5.538	2.516	3.022	15.21	2.03	-0.05	4	2.75	18.12	3.00E-8	14.2	8.4				2575	3.06	1.01	4.6
29.350	96.293	49.848	0.858	0.383		49.85	1.72	7	118	5.577	2.536	3.040	14.56	1.94	-0.06	4	2.76	17.34	3.00E-8	13.8	8.2				2493	2.95	0.97	4.4
29.550	96.949	51.395	0.871	0.825		51.41	1.69	7	118	5.615	2.557	3.059	14.97	1.90	-0.05	4	2.74	17.93	3.00E-8	14.1	8.3				2570	3.05	1.00	4.5
29.750	97.605	43.669	0.767	1.319		43.69	1.76	7	118	5.654	2.577	3.077	12.36	2.02	-0.07	4	2.82	14.42	3.00E-8	12.6	7.4				2184	2.54	0.82	3.7
29.950	98.261	54.116	1.044	2.186		54.15	1.93	7	118	5.693	2.598	3.095	15.66	2.15	-0.05	4	2.76	18.70	3.00E-8	15.0	8.8				2707	3.23	1.04	4.7
30.150	98.917	56.141	1.050	3.190		56.19	1.87	7	118	5.731	2.618	3.113	16.21	2.08	-0.05	4	2.73	19.51	3.00E-8	15.4	9.0				2809	3.36	1.08	4.9
30.350	99.573	53.801	1.141	3.780		53.86	2.12	7	118	5.770	2.639	3.131	15.36	2.37	-0.05	4	2.79	18.19	3.00E-8	15.2	8.8				2693	3.21	1.02	4.6
30.550	100.230	44.691	0.796	4.366		44.75	1.78	7	118	5.809	2.659	3.149	12.37	2.04	-0.06	4	2.83	14.46	3.00E-8	12.9	7.5				2238	2.60	0.82	3.7
30.750	100.886	40.098	0.804	5.019		40.17	2.00	6	115	5.846	2.680	3.167	10.84	2.34	-0.07	3	2.91	12.36	1.00E-9	12.1	7.0				2009	2.29	0.72	3.3
30.950	101.542	41.215	0.593	6.321		41.31	1.44	7	118	5.885	2.700	3.185	11.12	1.68	-0.06	4	2.82	13.06	3.00E-8	11.9	6.8				2065	2.36	0.74	3.3
31.150	102.198	36.106	0.504	8.641		36.23	1.39	7	118	5.923	2.720	3.203	9.46	1.66	-0.07	4	2.88	10.90	3.00E-8	10.7	6.2				1812	2.02	0.63	2.8
31.350	102.854	31.771	0.453	9.943		31.91	1.42	7	118	5.962	2.741	3.221	8.06	1.74	-0.08	3	2.95	9.07	1.00E-9	9.9	5.6				1596	1.73	0.54	2.4
31.550	103.511	33.022	0.388	11.308		33.18	1.17	7	118	6.001	2.761	3.239	8.39	1.43	-0.07	4	2.89	9.64	3.00E-8	9.9	5.7				1659	1.81	0.56	2.5
31.750	104.167	43.555	0.717	13.224		43.75	1.64	7	118	6.039	2.782	3.257	11.58	1.90	-0.05	4	2.84	13.57	3.00E-8	12.6	7.2				2187	2.51	0.77	3.5
31.950	104.823	106.476	2.565	12.877		106.66	2.41	7	118	6.078	2.802	3.276	30.71	2.55	-0.02	4	2.56	39.49	3.00E-8	26.8	15.2				5333	6.71	2.05	9.2
32.150	105.479	160.210	3.897	3.910		160.27	2.43	7	118	6.117	2.823	3.294	46.80	2.53	-0.02	5	2.42	63.23	3.00E-6	37.6	21.3	43	36	641	1482			
32.350	106.135	320.811	2.237	-0.677		320.80	0.70	10	127	6.158	2.843	3.315	94.91	0.71	-0.01	6	1.84	157.00	3.00E-4	59.4	33.6	67	40	1283	1872			
32.550	106.791	348.485	1.911	-5.134		348.41	0.55	10	127	6.200	2.864	3.336	102.57	0.56	-0.01	6	1.75	175.34	3.00E-4	62.5	35.2	71	41	1394	1929			
32.750	107.448	252.075	2.662	-6.433		251.98	1.06	9	124	6.241	2.884	3.357	73.21	1.08	-0.01	6	2.04	113.62	3.00E-4	50.3	28.2	57	39	1008	1735			
32.950	108.104	354.196	1.675	-7.036		354.09	0.47	10	127	6.283	2.905	3.378	102.97	0.48	-0.01	6	1.71	179.28	3.00E-4	62.8	35.1	72	41	1416	1947			

GREGG DRILLING & TESTING, INC.

CONE PENETRATION TEST DATA

Client:	PARIKH CONSULTANTS	Units:	Imperial
Site:	HWY 101	Data averaging interval:	0.200 meters
Engineer:	D.WANG	Assumed depth of water:	13.003 feet
Sounding:	**BR-2**	Net area ratio of cone:	0.80
Date:	12/17/2007	Unit weight of water:	62.4 lb/ft3
Time:	9:01 AM	Relative density constant, CDR:	350
		Young's modulus for sands, a:	4
		Small strain shear modulus number, SG (sands):	180
		Small strain shear modulus number, CG (clays):	50
		Nkt for clays:	15
		OCR number, kocr:	0.3

Interpretation based on Lunne, Robertson and Powell, 1997

Col 1i	Col 2i	Col 3i	Col 4i	Col 5i	Col 6i	Col 7i	Col 8i	Col 9i	Col 10i	Col 11i	Col 12i	Col 13i	Col 14i	Col 15i	Col 16i	Col 17i	Col 18i	Col 19i	Col 20i	Col 21i	Col 22i	Col 23i	Col 24i	Col 25i	Col 26i	Col 27i	Col 28i	Col 29i
Depth	Depth	qc	fs	u	Other	qt	Rf	SBT	Unit Weight, γ	Total Overburden Stress, σv	Insitu pore pressure, uo	Effective overburden stress, σ'v	Normalized cone resistance, Qtl	Normalized Friction raio, Fr	Normalized pore pressure ratio, Bq	Soil Behavior Type (normalized) SBTn	SBTn Index, Ic	Normalized Cone resistance, Qtn	Estimated permeability, kSBT	SPT N60	SPT (N1)60	Relative Density, Dr	Friction Angle, φ'	Young's modulus, Es	Small strain shear modulus, Go	Undrained shear strength, su	Undrained strength ratio, su/σ'v	Over consolidation ratio, OCR
(m)	(ft)	(tsf)	(tsf)	(psi)		(tsf)	(%)		(pcf)	(tsf)	(tsf)	(tsf)							(ft/sec)	(blows/ft)	(blows/ft)	(%)	(degrees)	(tsf)	(tsf)	(tsf)		
0.150	0.492	0.000	0.000	0.000							0.000																	
0.350	1.148	0.000	0.000	0.000							0.000																	
0.550	1.804	0.000	0.000	0.000							0.000																	
0.750	2.461	0.000	0.000	0.000							0.000																	
0.950	3.117	0.000	0.000	0.000							0.000																	
1.150	3.773	0.000	0.000	0.000							0.000																	
1.350	4.429	0.000	0.000	0.000							0.000																	
1.550	5.085	47.564	0.495	0.747		47.57	1.04	7	118	0.299	0.000	0.299	157.88	1.05	0.00	6	1.78	88.43	3.00E-4	8.6	16.2	50	43	190	445			
1.750	5.741	99.968	0.984	0.627		99.98	0.98	8	121	0.339	0.000	0.339	293.81	0.99	0.00	6	1.57	166.33	3.00E-4	16.9	29.9	69	46	400	594			
1.950	6.398	88.627	0.684	0.557		88.64	0.77	8	121	0.379	0.000	0.379	232.98	0.78	0.00	6	1.56	139.40	3.00E-4	14.9	25.0	63	45	355	592			
2.150	7.054	67.511	0.596	-0.049		67.51	0.88	8	121	0.418	0.000	0.418	160.32	0.89	0.00	6	1.72	103.16	3.00E-4	12.0	19.1	54	43	270	559			
2.350	7.710	58.248	0.596	-0.141		58.25	1.02	8	121	0.458	0.000	0.458	126.12	1.03	0.00	6	1.84	87.33	3.00E-4	10.8	16.4	50	42	233	548			
2.550	8.366	45.904	0.739	-0.204		45.90	1.61	7	118	0.497	0.000	0.497	91.39	1.63	0.00	5	2.08	69.19	3.00E-6	9.3	13.6	44	40	184	520			
2.750	9.022	34.246	0.775	-0.793		34.23	2.26	6	115	0.534	0.000	0.534	63.06	2.30	0.00	5	2.30	51.31	3.00E-6	7.6	10.7	38	38	137	483			
2.950	9.678	32.329	0.752	-0.353		32.32	2.33	6	115	0.572	0.000	0.572	55.51	2.37	0.00	5	2.35	46.52	3.00E-6	7.3	10.0	36	37	129	485			
3.150	10.335	34.201	0.665	-0.420		34.19	1.94	6	115	0.610	0.000	0.610	55.09	1.98	0.00	5	2.30	46.64	3.00E-6	7.6	10.0	37	37	137	505			
3.350	10.991	37.036	0.464	-1.139		37.02	1.25	7	118	0.648	0.000	0.648	56.11	1.28	0.00	5	2.17	47.49	3.00E-6	7.8	10.0	37	37	148	529			
3.550	11.647	37.070	0.411	-3.046		37.03	1.11	7	118	0.687	0.000	0.687	52.90	1.13	-0.01	5	2.16	45.61	3.00E-6	7.8	9.6	36	37	148	539			
3.750	12.303	26.854	0.413	-3.715		26.80	1.54	6	115	0.724	0.000	0.724	35.99	1.58	-0.01	5	2.38	32.41	3.00E-6	6.2	7.5	30	35	107	493			
3.950	12.959	22.392	0.341	-4.684		22.32	1.53	6	115	0.762	0.000	0.762	28.30	1.58	-0.02	5	2.47	26.05	3.00E-6	5.4	6.3	27	33	89	472			
4.150	13.615	9.943	0.220	-5.107		9.87	2.23	5	115	0.800	0.019	0.781	11.62	2.43	-0.04	4	2.89	11.19	3.00E-8	3.0	3.5				493	0.60	0.77	3.5
4.350	14.272	7.420	0.114	-4.396		7.36	1.54	5	115	0.837	0.040	0.798	8.17	1.74	-0.05	3	2.95	7.93	1.00E-9	2.3	2.6				368	0.43	0.54	2.5
4.550	14.928	8.032	0.082	-2.034		8.00	1.02	1	111	0.874	0.060	0.814	8.76	1.15	-0.03	4	2.83	8.44	3.00E-8	2.3	2.7				400	0.48	0.58	2.6
4.750	15.584	9.731	0.077	5.562		9.81	0.78	6	115	0.911	0.081	0.831	10.71	0.86	0.04	4	2.70	10.25	3.00E-8	2.6	3.0				491	0.59	0.71	3.2
4.950	16.240	14.761	0.119	39.097		15.32	0.78	6	115	0.949	0.101	0.848	16.95	0.83	0.19	5	2.51	16.08	3.00E-6	3.6	4.0	21	30	61	431			
5.150	16.896	21.467	0.258	18.015		21.73	1.19	6	115	0.987	0.121	0.865	23.97	1.24	0.06	5	2.47	22.79	3.00E-6	5.2	5.7	26	32	87	488			
5.350	17.552	15.730	0.146	36.400		16.25	0.90	6	115	1.024	0.142	0.882	17.26	0.96	0.16	5	2.54	16.55	3.00E-6	3.9	4.3	22	30	65	446			
5.550	18.209	13.853	0.109	57.669		14.68	0.74	6	115	1.062	0.162	0.899	15.15	0.80	0.29	5	2.55	14.60	3.00E-6	3.5	3.8	20	29	59	434			
5.750	18.865	11.831	0.094	51.772		12.58	0.74	6	115	1.099	0.183	0.916	12.52	0.82	0.31	4	2.63	12.16	3.00E-8	3.1	3.3				629	0.77	0.83	3.8
5.950	19.521	10.556	0.083	58.152		11.39	0.73	6	115	1.137	0.203	0.934	10.99	0.81	0.39	4	2.68	10.73	3.00E-8	2.8	3.0				570	0.68	0.73	3.3
6.150	20.177	12.728	0.126	53.016		13.49	0.94	6	115	1.175	0.224	0.951	12.96	1.03	0.29	4	2.66	12.69	3.00E-8	3.4	3.5				675	0.82	0.86	3.9
6.350	20.833	13.547	0.145	45.956		14.21	1.02	6	115	1.212	0.244	0.968	13.43	1.11	0.24	4	2.66	13.20	3.00E-8	3.6	3.7				710	0.87	0.90	4.0
6.550	21.490	13.809	0.132	47.331		14.49	0.91	6	115	1.250	0.265	0.985	13.44	1.00	0.24	4	2.64	13.25	3.00E-8	3.6	3.7				725	0.88	0.90	4.0
6.750	22.146	17.680	0.199	39.777		18.25	1.09	6	115	1.287	0.285	1.002	16.93	1.17	0.15	4	2.59	16.73	3.00E-8	4.5	4.6				913	1.13	1.13	5.1
6.950	22.802	17.736	0.216	8.914		17.86	1.21	6	115	1.325	0.306	1.019	16.23	1.30	0.02	4	2.62	16.10	3.00E-8	4.6	4.7				893	1.10	1.08	4.9
7.150	23.458	18.220	0.279	29.534		18.65	1.50	6	115	1.363	0.326	1.036	16.68	1.62	0.10	4	2.66	16.61	3.00E-8	4.8	4.9				932	1.15	1.11	5.0
7.350	24.114	34.474	0.410	5.389		34.55	1.19	7	118	1.401	0.347	1.054	31.44	1.24	0.00	5	2.37	31.41	3.00E-6	7.9	7.9	30	34	138	608			
7.550	24.770	23.968	0.398	7.459		24.08	1.65	6	115	1.439	0.367	1.072	21.12	1.76	0.01	4	2.60	21.18	3.00E-8	6.1	6.1				1204	1.51	1.41	6.3
7.750	25.427	50.578	0.617	-1.135		50.56	1.22	7	118	1.477	0.388	1.090	45.04	1.26	-0.01	5	2.24	45.47	3.00E-6	11.0	10.8	36	36	202	698			
7.950	26.083	49.914	0.500	-5.968		49.83	1.00	7	118	1.516	0.408	1.108	43.61	1.03	-0.02	5	2.21	44.27	3.00E-6	10.7	10.4	36	36	199	698			
8.150	26.739	19.262	0.322	-7.085		19.16	1.68	6	115	1.554	0.429	1.125	15.65	1.83	-0.05	4	2.72	15.82	3.00E-8	5.2	5.1				958	1.17	1.04	4.7
8.350	27.395	31.444	0.482	-7.381		31.34	1.54	6	115	1.591	0.449	1.142	26.04	1.62	-0.03	5	2.50	26.53	3.00E-6	7.7	7.4	28	33	125	604			
8.550	28.051	17.485	0.312	-7.839		17.37	1.80	6	115	1.629	0.469	1.159	13.58	1.98	-0.07	4	2.79	13.77	3.00E-8	4.9	4.7				869	1.05	0.91	4.1
8.750	28.707	12.589	0.188	-4.942		12.52	1.50	5	115	1.666	0.490	1.176	9.22	1.73	-0.08	4	2.90	9.34	3.00E-8	3.8	3.6				626	0.72	0.61	2.8
8.950	29.364	22.726	0.367	10.011		22.87	1.61	6	115	1.704	0.510	1.194	17.73	1.73	0.01	4	2.66	18.15	3.00E-8	6.0	5.6				1144	1.41	1.18	5.3
9.150	30.020	40.601	0.432	-0.888		40.59	1.06	7	118	1.743	0.531	1.212	32.06	1.11	-0.02	5	2.34	33.35	3.00E-6	9.2	8.6	31	34	162	672			
9.350	30.676	14.845	0.220	-7.018		14.74	1.49	6	115	1.780	0.551	1.229	10.55	1.69	-0.08	4	2.84	10.77	3.00E-8	4.3	4.0				737	0.86	0.70	3.2
9.550	31.332	10.538	0.139	-6.489		10.44	1.33	5	115	1.818	0.572	1.246	6.92	1.61	-0.12	3	2.99	7.03	1.00E-9	3.4	3.1				522	0.58	0.46	2.1
9.750	31.988	10.879	0.142	4.293		10.94	1.30	5	115	1.855	0.592	1.263	7.19	1.57	-0.03	3	2.97	7.32	1.00E-9	3.4	3.1				547	0.61	0.48	2.2
9.950	32.644	18.501	0.191	53.295		19.27	0.99	6	115	1.893	0.613	1.280	13.57	1.10	0.19	4	2.66	14.09	3.00E-8	4.9	4.4				963	1.16	0.90	4.1
10.150	33.301	21.785	0.222	67.605		22.76	0.98	6	115	1.931	0.633	1.297	16.05	1.07	0.20	4	2.59	16.78	3.00E-8	5.5	5.0				1138	1.39	1.07	4.8
10.350	33.957	31.817	0.549	18.851		32.09	1.71	6	115	1.968	0.654	1.314	22.91	1.82	0.02	4	2.58	24.03	3.00E-8	8.0	7.2				1604	2.01	1.53	6.9
10.550	34.613	26.821	0.508	-1.748		26.80	1.90	6	115	2.006	0.674	1.332	18.62	2.05	-0.03	4	2.68	19.44	3.00E-8	7.1	6.4				1340	1.65	1.24	5.6
10.750	35.269	13.871	0.344	5.086		13.94	2.47	5	115	2.043	0.695	1.349	8.82	2.89	-0.03	3	3.03	9.00	1.00E-9	4.5	4.0				697	0.79	0.59	2.6
10.950	35.925	13.731	0.364	34.455		14.23	2.56	5	115	2.081	0.715	1.366	8.89	3.00	0.15	3	3.04	9.08	1.00E-9	4.5	4.0				711	0.81	0.59	2.7
11.150	36.581	15.992	0.488	32.171		16.46	2.96	5	115	2.119	0.736	1.383	10.37	3.40	0.11	3	3.02	10.61	1.00E-9	5.2	4.5				823	0.96	0.69	3.1
11.350	37.238	14.249	0.452	23.729		14.59	3.10	5	115	2.156	0.756	1.400	8.88	3.64	0.08	3	3.09	9.05	1.00E-9	4.8	4.2				730	0.83	0.59	2.7
11.550	37.894	14.772	0.339	53.961		15.55	2.18	5	115	2.194	0.777	1.417	9.42	2.54	0.23	3	2.98	9.70	1.00E-9	4.7	4.0				777	0.89	0.63	2.8
11.750	38.550	23.428	0.394	90.837		24.74	1.59	6	115	2.231	0.797	1.434	15.69	1.75	0.26	4	2.70	16.58	3.00E-8	6.3	5.4				1237	1.50	1.05	4.7
11.950	39.206	21.284	0.316	84.651		22.50	1.41	6	115	2.269	0.818	1.451	13.94	1.56	0.26	4	2.72	14.74	3.00E-8	5.8	4.9				1125	1.35	0.93	4.2
12.150	39.862	27.623	0.395	77.542		28.74	1.37	6	115	2.307	0.838	1.469	18.00	1.49	0.18	4	2.62	19.26	3.00E-8	7.1	6.0				1437	1.76	1.20	5.4
12.350	40.518	24.334	0.354	56.759		25.15	1.41	6	115	2.344	0.858	1.486	15.35	1.55	0.14	4	2.68	16.35	3.00E-8	6.5	5.5				1258	1.52	1.02	4.6
12.550	41.175	20.913	0.322	69.396		21.91	1.47	6	115	2.382	0.879	1.503	13.00	1.65	0.21	4	2.76	13.77	3.00E-8	5.8	4.9				1096	1.30	0.87	3.9
12.750	41.831	21.746	0.263	75.251		22.83	1.15	6	115	2.419	0.899	1.520	13.43	1.29	0.22	4	2.69	14.35	3.00E-8	5.8	4.9				1141	1.36	0.90	4.0
12.950	42.487	19.735	0.219	74.983		20.81	1.05	6	115	2.457	0.920	1.537	11.94	1.19	0.24	4	2.72	12.75	3.00E-8	5.4	4.5				1041	1.22	0.80	3.6
13.150	43.143	17.942	0.215	83.033		19.14	1.12	6	115	2.495	0.940	1.554	10.71	1.29	0.30	4	2.78	11.38	3.00E-8	5.0	4.2				957	1.11	0.71	3.2
13.350	43.799	16.131	0.280	84.641		17.35	1.62	6	115	2.532	0.961	1.571	9.43	1.89	0.35	4	2.91	9.88	3.00E-8	4.9	4.0				868	0.99	0.63	2.8
13.550	44.455	41.348	0.595	43.538		41.97	1.42	7	118	2.571	0.981	1.589	24.79	1.51	0.05	5	2.50	27.35	3.00E-6	10.1	8.2	28	32	168	744			
13.750	45.112	58.493	1.085	-5.234		58.42	1.86	7	118	2.609	1.002	1.608	34.71	1.94	-0.02	5	2.45	38.66	3.00E-6	13.9	11.3	33	35	234	834			
13.950	45.768	71.009	1.174	-7.427		70.90	1.66	7	118	2.648	1.022	1.626	41.98	1.72	-0.02	5	2.35	47.48	3.00E-6	16.2	13.0	37	36	284	893			
14.150	46.424	67.394	1.279	-4.625		67.33	1.90	7	118	2.687	1.043	1.644	39.32	1.98	-0.02	5	2.41	44.26	3.00E-6	15.8	12.6	36	35	269	881			
14.350	47.080	69.995	1.352	-3.359		69.95	1.93	7	118	2.725	1.063	1.662	40.44	2.01	-0.02	5	2.41	45.69	3.00E-6	16.3	13.0	36	36	280	895			
14.550	47.736	91.585	0.995	-5.784		91.50	1.09	8	121	2.765	1.084	1.681	52.78	1.12	-0.02	5	2.16	61.89	3.00E-6	19.2	15.2	42	37	366	983			
14.750	48.392	76.824	1.057	-7.187		76.72	1.38	7	118	2.804	1.104	1.699	43.49	1.43	-0.02	5	2.29	50.25	3.00E-6	17.0	13.4	38	36	307	930			
14.950	49.049	47.436	1.251	-8.502		47.31	2.64	6	115	2.841	1.125	1.717	25.91	2.81	-0.04	4	2.65	28.50	3.00E-8	12.4	9.8				2366	2.96	1.73	7.8
15.150	49.705	29.945	0.603	-8.749		29.82	2.02	6	115	2.879	1.145	1.734	15.54	2.24	-0.07	4	2.77	16.83	3.00E-8	8.4	6.5				1491	1.80	1.04	4.7
15.350	50.361	19.161	0.380	-8.520		19.04	1.99	6	115	2.916	1.166	1.751	9.21	2.35	-0.11	3	2.97	9.69	1.00E-9	6.0	4.7				952	1.07	0.61	2.8
15.550	51.017	18.599	0.369	-6.242		18.51	1.99	6	115	2.954	1.186	1.768	8.80	2.37	-0.11	3	2.99	9.24	1.00E-9	5.9	4.6				925	1.04	0.59	2.6
15.750	51.673	18.231	0.447	1.311		18.25	2.45	5	115	2.992	1.207	1.785	8.55	2.93	-0.07	3	3.05	8.90	1.00E-9	6.0	4.6				913	1.02	0.57	2.6
15.950	52.329	18.432	0.449	36.623		18.96	2.37	5	115	3.029	1.227	1.802	8.84	2.82	0.09	3	3.03	9.24	1.00E-9	6.0	4.6				948	1.06	0.59	2.7
16.150	52.986	18.042	0.491	73.333		19.10	2.57	5	115	3.067	1.247	1.819	8.81	3.06	0.25	3	3.05	9.19	1.00E-9	5.9	4.5				955	1.07	0.59	2.6
16.350	53.642	18.231	0.572	80.280		19.39	2.95	5	115	3.104	1.268	1.836	8.87	3.51	0.28	3	3.08	9.21	1.00E-9	6.1	4.7				969	1.09	0.59	2.7

Col 1i	Col 2i	Col 3i	Col 4i	Col 5i	Col 6i	Col 7i	Col 8i	Col 9i	Col 10i	Col 11i	Col 12i	Col 13i	Col 14i	Col 15i	Col 16i	Col 17i	Col 18i	Col 19i	Col 20i	Col 21i	Col 22i	Col 23i	Col 24i	Col 25i	Col 26i	Col 27i	Col 28i	Col 29i
Depth	Depth	qc	fs	u	Other	qt	Rf	SBT	Unit Weight, γ	Total Overburden Stress, σv	Insitu pore pressure, uo	Effective overburden stress, σ'v	Normalized cone resistance, Qtl	Normalized Friction raio, Fr	Normalized pore pressure ratio, Bq	Soil Behavior Type (normalized) SBTn	SBTn Index, Ic	Normalized Cone resistance, Qtn	Estimated permeability, kSBT	SPT N60	SPT (N1)60	Relative Density, Dr	Friction Angle, φ'	Young's modulus, Es	Small strain shear modulus, Go	Undrained shear strength, su	Undrained strength ratio, su/σ'v	Over consolidation ratio, OCR
(m)	(ft)	(tsf)	(tsf)	(psi)		(tsf)	(%)		(pcf)	(tsf)	(tsf)	(tsf)							(ft/sec)	(blows/ft)	(blows/ft)	(%)	(degrees)	(tsf)	(tsf)	(tsf)		
16.550	54.298	18.081	0.567	83.558		19.28	2.94	5	115	3.142	1.288	1.854	8.71	3.51	0.29	3	3.09	9.04	1.00E-9	6.1	4.6				964	1.08	0.58	2.6
16.750	54.954	20.465	0.558	83.798		21.67	2.58	5	115	3.180	1.309	1.871	9.89	3.02	0.26	3	3.00	10.41	1.00E-9	6.6	4.9				1084	1.23	0.66	3.0
16.950	55.610	18.454	0.572	90.390		19.76	2.89	5	115	3.217	1.329	1.888	8.76	3.46	0.31	3	3.08	9.11	1.00E-9	6.2	4.6				988	1.10	0.58	2.6
17.150	56.266	19.072	0.770	73.816		20.14	3.83	4	115	3.255	1.350	1.905	8.86	4.56	0.23	3	3.15	9.12	1.00E-9	6.7	5.0				1007	1.13	0.59	2.7
17.350	56.923	18.560	0.657	73.604		19.62	3.35	5	115	3.292	1.370	1.922	8.49	4.03	0.24	3	3.13	8.77	1.00E-9	6.4	4.8				981	1.09	0.57	2.5
17.550	57.579	18.616	0.606	88.860		19.90	3.05	5	115	3.330	1.391	1.939	8.54	3.66	0.30	3	3.10	8.87	1.00E-9	6.4	4.7				995	1.10	0.57	2.6
17.750	58.235	19.796	0.824	66.763		20.76	3.97	4	115	3.368	1.411	1.956	8.89	4.74	0.20	3	3.15	9.14	1.00E-9	7.0	5.2				1038	1.16	0.59	2.7
17.950	58.891	20.437	0.834	62.984		21.34	3.91	4	115	3.405	1.432	1.973	9.09	4.65	0.17	3	3.14	9.38	1.00E-9	7.2	5.2				1067	1.20	0.61	2.7
18.150	59.547	19.485	0.630	90.706		20.79	3.03	5	115	3.443	1.452	1.991	8.72	3.63	0.29	3	3.09	9.07	1.00E-9	6.6	4.8				1040	1.16	0.58	2.6
18.350	60.203	20.276	0.691	95.694		21.65	3.19	5	115	3.480	1.473	2.008	9.05	3.80	0.30	3	3.09	9.43	1.00E-9	6.9	5.0				1083	1.21	0.60	2.7
18.550	60.860	20.331	0.684	80.171		21.49	3.18	5	115	3.518	1.493	2.025	8.87	3.80	0.24	3	3.10	9.24	1.00E-9	6.9	5.0				1074	1.20	0.59	2.7
18.750	61.516	20.526	0.417	100.485		21.97	1.90	6	115	3.555	1.514	2.042	9.02	2.26	0.31	3	2.97	9.64	1.00E-9	6.4	4.6				1099	1.23	0.60	2.7
18.950	62.172	19.952	0.408	106.861		21.49	1.90	6	115	3.593	1.534	2.059	8.69	2.28	0.34	3	2.98	9.27	1.00E-9	6.3	4.5				1075	1.19	0.58	2.6
19.150	62.828	19.824	0.420	107.812		21.38	1.96	6	115	3.631	1.555	2.076	8.55	2.37	0.35	3	3.00	9.10	1.00E-9	6.3	4.5				1069	1.18	0.57	2.6
19.350	63.484	19.724	0.392	124.707		21.52	1.82	6	115	3.668	1.575	2.093	8.53	2.20	0.41	3	2.98	9.12	1.00E-9	6.2	4.4				1076	1.19	0.57	2.6
19.550	64.140	23.294	0.687	93.407		24.64	2.79	5	115	3.706	1.595	2.110	9.92	3.28	0.25	3	3.02	10.52	1.00E-9	7.6	5.3				1232	1.40	0.66	3.0
19.750	64.797	30.675	1.135	73.354		31.73	3.58	5	115	3.743	1.616	2.128	13.16	4.05	0.13	3	2.98	14.09	1.00E-9	9.7	6.8				1587	1.87	0.88	3.9
19.950	65.453	39.337	1.333	74.820		40.41	3.30	5	115	3.781	1.636	2.145	17.08	3.64	0.10	3	2.86	18.78	1.00E-9	11.6	8.1				2021	2.44	1.14	5.1
20.150	66.109	31.165	0.822	34.747		31.67	2.60	6	115	3.819	1.657	2.162	12.88	2.95	0.03	3	2.90	14.05	1.00E-9	9.4	6.6				1583	1.86	0.86	3.9
20.350	66.765	22.904	0.624	24.663		23.26	2.68	5	115	3.856	1.677	2.179	8.91	3.22	0.01	3	3.06	9.40	1.00E-9	7.6	5.3				1163	1.29	0.59	2.7
20.550	67.421	23.412	0.530	44.796		24.06	2.20	6	115	3.894	1.698	2.196	9.18	2.63	0.08	3	3.00	9.83	1.00E-9	7.5	5.2				1203	1.34	0.61	2.8
20.750	68.077	26.932	0.620	76.861		28.04	2.21	6	115	3.931	1.718	2.213	10.89	2.57	0.16	3	2.93	11.84	1.00E-9	8.2	5.7				1402	1.61	0.73	3.3
20.950	68.734	46.461	0.961	79.840		47.61	2.02	6	115	3.969	1.739	2.230	19.57	2.20	0.09	4	2.68	22.51	3.00E-8	12.4	8.5				2381	2.91	1.30	5.9
21.150	69.390	113.437	1.422	0.356		113.44	1.25	8	121	4.009	1.759	2.249	48.65	1.30	-0.02	5	2.23	62.12	3.00E-6	24.4	16.8	42	37	454	1163			
21.350	70.046	63.751	1.852	12.625		63.93	2.90	6	115	4.046	1.780	2.267	26.42	3.09	-0.01	4	2.67	30.57	3.00E-8	16.9	11.5				3197	3.99	1.76	7.9
21.550	70.702	187.197	1.993	7.768		187.31	1.06	9	124	4.087	1.800	2.287	80.12	1.09	-0.01	6	2.01	108.18	3.00E-4	36.9	25.1	56	39	749	1383			
21.750	71.358	513.404	2.438	10.744		513.56	0.47	10	127	4.129	1.821	2.308	220.71	0.48	0.00	6	1.44	325.98	3.00E-4	83.1	56.3	97	45	2054	1941			
21.950	72.014	568.070	2.989	10.557		568.22	0.53	10	127	4.171	1.841	2.329	242.14	0.53	0.00	6	1.44	359.28	3.00E-4	91.9	61.9	101	45	2273	2014			
22.150	72.671	482.991	1.658	8.262		483.11	0.34	10	127	4.212	1.862	2.351	203.72	0.35	0.00	6	1.39	303.65	3.00E-4	76.9	51.6	93	44	1932	1914			
22.350	73.327	503.740	2.967	0.539		503.75	0.59	10	127	4.254	1.882	2.372	210.58	0.59	0.00	6	1.52	315.29	3.00E-4	83.6	55.8	95	44	2015	1946			
22.550	73.983	421.435	2.918	9.016		421.56	0.69	10	127	4.296	1.903	2.393	174.35	0.70	0.00	6	1.63	262.21	3.00E-4	72.5	48.2	87	43	1686	1840			
22.750	74.639	643.479	2.450	-3.454		643.43	0.38	10	127	4.338	1.923	2.415	264.68	0.38	0.00	7	1.32	399.83	3.00E-2	100.3	66.4	107	45	2574	2124			
22.950	75.295	572.588	2.100	-7.300		572.48	0.37	10	127	4.379	1.944	2.436	233.22	0.37	0.00	6	1.35	353.86	3.00E-4	90.2	59.5	101	45	2290	2049			
23.150	75.951	394.976	1.479	-8.206		394.86	0.37	10	127	4.421	1.964	2.457	158.89	0.38	-0.01	6	1.50	242.14	3.00E-4	65.1	42.8	83	43	1579	1816			
23.350	76.608	405.911	2.541	-8.470		405.79	0.63	10	127	4.463	1.984	2.479	161.92	0.63	-0.01	6	1.62	247.82	3.00E-4	69.7	45.6	84	43	1623	1838			
23.550	77.264	354.804	3.261	0.546		354.81	0.92	9	124	4.504	2.005	2.499	140.19	0.93	-0.01	6	1.78	207.86	3.00E-4	64.3	41.9	77	42	1419	1762			
23.750	77.920	298.740	2.293	10.828		298.90	0.77	9	124	4.544	2.025	2.519	116.85	0.78	0.00	6	1.79	173.42	3.00E-4	54.4	35.2	70	41	1196	1669			
23.950	78.576	522.300	2.297	11.061		522.46	0.44	10	127	4.586	2.046	2.540	203.86	0.44	0.00	6	1.45	315.88	3.00E-4	84.8	54.7	95	44	2090	2016			
24.150	79.232	505.238	2.617	12.361		505.42	0.52	10	127	4.628	2.066	2.562	195.50	0.52	0.00	6	1.51	304.18	3.00E-4	83.5	53.7	93	44	2022	1999			
24.350	79.888	287.216	2.128	12.055		287.39	0.74	9	124	4.669	2.087	2.582	109.50	0.75	0.00	6	1.80	163.77	3.00E-4	52.5	33.6	68	41	1150	1661			
24.550	80.545	158.678	1.813	15.347		158.90	1.14	9	124	4.709	2.107	2.602	59.26	1.18	-0.01	5	2.13	81.36	3.00E-6	32.9	21.0	48	38	636	1366			
24.750	81.201	389.473	1.523	5.382		389.55	0.39	10	127	4.751	2.128	2.623	146.68	0.40	0.00	6	1.54	230.96	3.00E-4	65.1	41.3	81	43	1558	1848			
24.950	81.857	177.516	2.126	-3.736		177.46	1.20	9	124	4.792	2.148	2.644	65.31	1.23	-0.01	5	2.11	90.71	3.00E-6	36.5	23.1	51	38	710	1425			
25.150	82.513	117.520	2.850	-4.974		117.45	2.43	7	118	4.831	2.169	2.662	42.31	2.53	-0.02	5	2.46	53.53	3.00E-6	28.0	17.7	39	36	470	1245			
25.350	83.169	38.423	1.501	-5.171		38.35	3.91	5	115	4.868	2.189	2.679	12.50	4.48	-0.08	3	3.02	13.53	1.00E-9	12.5	7.8				1917	2.23	0.83	3.7
25.550	83.825	34.942	1.352	-3.941		34.89	3.87	5	115	4.906	2.210	2.696	11.12	4.51	-0.08	3	3.06	11.90	1.00E-9	11.6	7.3				1744	2.00	0.74	3.3
25.750	84.482	33.237	0.986	-2.083		33.21	2.97	5	115	4.943	2.230	2.713	10.42	3.49	-0.08	3	3.02	11.30	1.00E-9	10.8	6.7				1660	1.88	0.69	3.1
25.950	85.138	37.983	0.948	-0.472		37.98	2.50	6	115	4.981	2.251	2.730	12.08	2.87	-0.07	3	2.92	13.49	1.00E-9	11.6	7.2				1899	2.20	0.81	3.6
26.150	85.794	39.754	0.877	0.698		39.76	2.20	6	115	5.019	2.271	2.747	12.65	2.52	-0.06	4	2.87	14.33	3.00E-8	11.8	7.3				1988	2.32	0.84	3.8
26.350	86.450	39.014	1.001	1.590		39.04	2.56	6	115	5.056	2.292	2.765	12.29	2.95	-0.06	3	2.92	13.74	1.00E-9	11.9	7.3				1952	2.27	0.82	3.7
26.550	87.106	45.447	1.645	2.897		45.49	3.62	5	115	5.094	2.312	2.782	14.52	4.07	-0.05	3	2.95	16.13	1.00E-9	14.0	8.7				2274	2.69	0.97	4.4
26.750	87.762	45.881	1.780	4.533		45.95	3.87	5	115	5.131	2.332	2.799	14.58	4.36	-0.05	3	2.96	16.12	1.00E-9	14.3	8.8				2297	2.72	0.97	4.4
26.950	88.419	55.629	2.000	7.733		55.74	3.59	5	115	5.169	2.353	2.816	17.96	3.95	-0.04	3	2.87	20.44	1.00E-9	16.4	10.1				2787	3.37	1.20	5.4
27.150	89.075	71.638	2.854	12.280		71.82	3.97	5	115	5.206	2.373	2.833	23.51	4.28	-0.02	3	2.80	27.32	1.00E-9	20.3	12.4				3591	4.44	1.57	7.1
27.350	89.731	67.009	2.726	15.541		67.23	4.05	5	115	5.244	2.394	2.850	21.75	4.40	-0.02	3	2.83	25.05	1.00E-9	19.4	11.8				3362	4.13	1.45	6.5
27.550	90.387	49.954	1.588	19.450		50.23	3.16	6	115	5.282	2.414	2.867	15.68	3.53	-0.02	3	2.88	17.81	1.00E-9	14.9	9.0				2512	3.00	1.05	4.7
27.750	91.043	39.203	1.201	21.304		39.51	3.04	6	115	5.319	2.435	2.884	11.85	3.51	-0.03	3	2.98	13.09	1.00E-9	12.4	7.5				1975	2.28	0.79	3.6
27.950	91.699	33.822	0.954	26.482		34.20	2.79	6	115	5.357	2.455	2.902	9.94	3.31	-0.02	3	3.02	10.83	1.00E-9	11.0	6.6				1710	1.92	0.66	3.0
28.150	92.356	31.298	0.856	32.153		31.76	2.70	6	115	5.394	2.476	2.919	9.03	3.25	-0.01	3	3.05	9.76	1.00E-9	10.3	6.2				1588	1.76	0.60	2.7
28.350	93.012	32.891	0.869	41.413		33.49	2.60	6	115	5.432	2.496	2.936	9.56	3.10	0.02	3	3.02	10.43	1.00E-9	10.7	6.4				1674	1.87	0.64	2.9
28.550	93.668	41.431	1.085	52.956		42.19	2.57	6	115	5.470	2.517	2.953	12.44	2.95	0.04	3	2.92	14.03	1.00E-9	12.6	7.5				2110	2.45	0.83	3.7
28.750	94.324	38.925	1.232	40.024		39.50	3.12	6	115	5.507	2.537	2.970	11.45	3.62	0.01	3	3.00	12.60	1.00E-9	12.4	7.4				1975	2.27	0.76	3.4
28.950	94.980	34.869	1.089	81.289		36.04	3.02	6	115	5.545	2.558	2.987	10.21	3.57	0.11	3	3.03	11.12	1.00E-9	11.4	6.8				1802	2.03	0.68	3.1
29.150	95.636	37.281	1.197	119.102		39.00	3.07	6	115	5.582	2.578	3.004	11.12	3.58	0.18	3	3.00	12.23	1.00E-9	11.9	7.1				1950	2.23	0.74	3.3
29.350	96.293	45.391	1.480	107.844		46.94	3.15	6	115	5.620	2.599	3.021	13.68	3.58	0.13	3	2.93	15.39	1.00E-9	13.9	8.2				2347	2.75	0.91	4.1
29.550	96.949	45.442	1.383	147.871		47.57	2.91	6	115	5.658	2.619	3.039	13.79	3.30	0.19	3	2.91	15.65	1.00E-9	13.7	8.1				2379	2.79	0.92	4.1
29.750	97.605	86.149	2.771	109.346		87.72	3.16	6	115	5.695	2.640	3.056	26.84	3.38	0.06	4	2.69	32.69	3.00E-8	23.0	13.6				4386	5.47	1.79	8.1
29.950	98.261	117.024	3.986	12.658		117.21	3.40	6	115	5.733	2.660	3.073	36.28	3.58	-0.02	4	2.61	45.38	3.00E-8	30.0	17.6				5860	7.43	2.42	10.9
30.150	98.917	172.414	2.685	7.624		172.52	1.56	8	121	5.772	2.681	3.092	53.93	1.61	-0.01	5	2.25	75.79	3.00E-6	37.5	21.9	47	37	690	1488			
30.350	99.573	244.275	1.782	10.740		244.43	0.73	9	124	5.813	2.701	3.112	76.67	0.75	-0.01	6	1.93	119.87	3.00E-4	46.7	27.2	59	39	978	1674			

Pore Pressure Dissipation Tests (PPDT)

Pore Pressure Dissipation Tests (PPDT's) conducted at various intervals measured hydrostatic water pressures and determined the approximate depth of the ground water table. A PPDT is conducted when the cone is halted at specific intervals determined by the field representative. The variation of the penetration pore pressure (u) with time is measured behind the tip of the cone and recorded by a computer system.

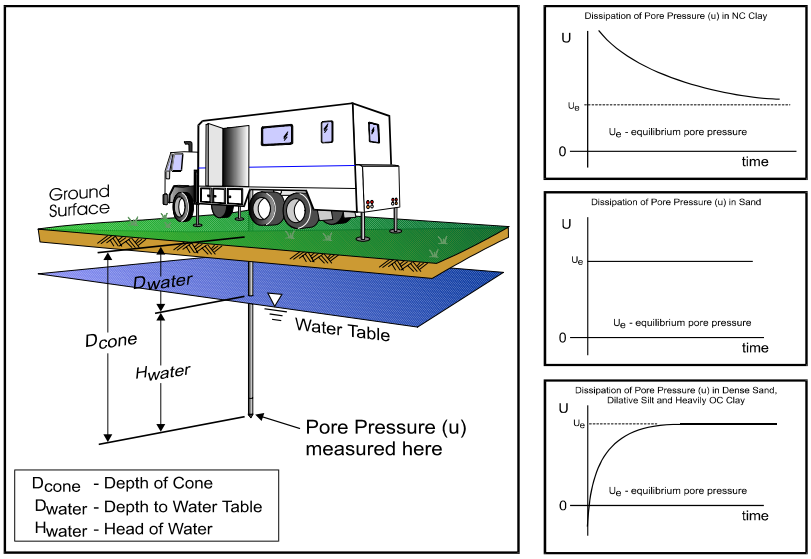
Pore pressure dissipation data can be interpreted to provide estimates of:

- Equilibrium piezometric pressure
- Phreatic Surface
- In situ horizontal coefficient of consolidation (c_h)
- In situ horizontal coefficient of permeability (k_h)

In order to correctly interpret the equilibrium piezometric pressure and/or the phreatic surface, the pore pressure must be monitored until such time as there is no variation in pore pressure with time, *Figure PPDT*. This time is commonly referred to as t_{100}, the point at which 100% of the excess pore pressure has dissipated.

A complete reference on pore pressure dissipation tests is presented by Robertson et al. 1992.

A summary of the pore pressure dissipation tests is summarized in Table 1. Pore pressure dissipation data is presented in graphical form in Appendix PPDT.



Water Table Calculation

$$D_{water} = D_{cone} - H_{water}$$

where $H_{water} = U_e$ (depth units)

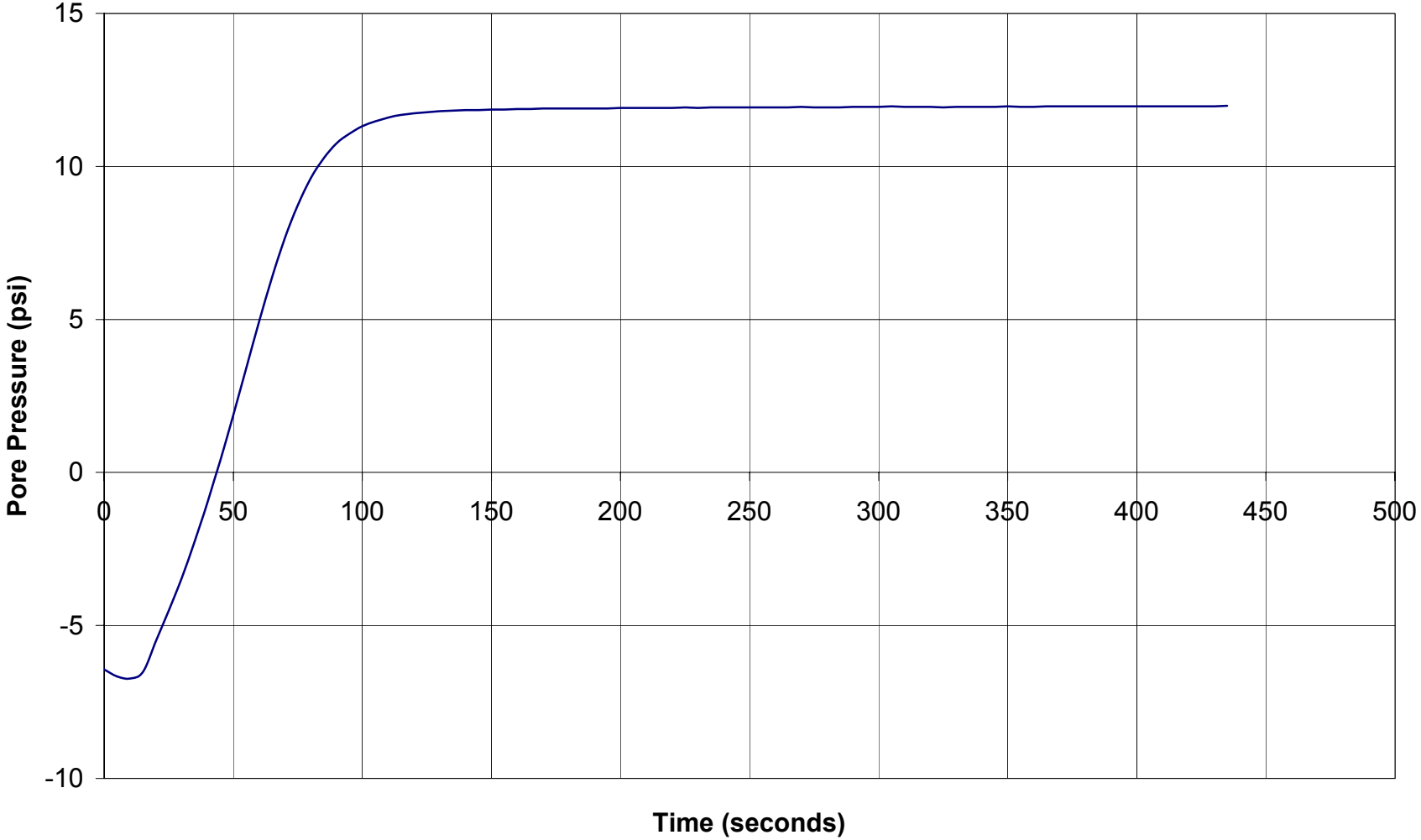
Useful Conversion Factors: 1psi = 0.704m = 2.31 feet (water)
1tsf = 0.958 bar = 13.9 psi
1m = 3.28 feet

Figure PPDT

GREGG DRILLING & TESTING

Pore Pressure Dissipation Test

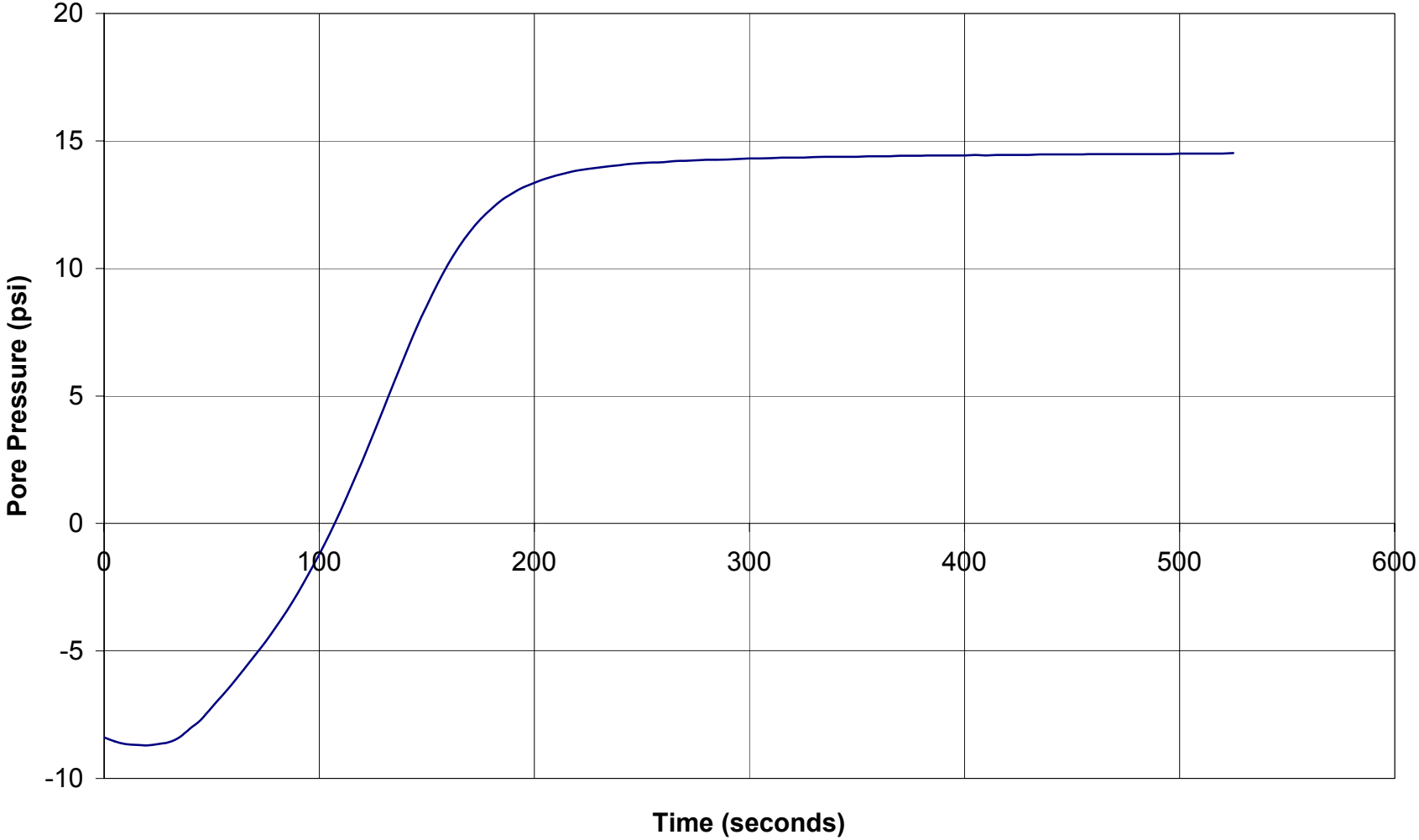
Sounding: BR-1
Depth: 42.815
Site: HWY 101
Engineer: D.WANG



GREGG DRILLING & TESTING

Pore Pressure Dissipation Test

Sounding: BR-2
Depth: 46.424
Site: HWY 101
Engineer: D.WANG



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Copies of ASTM Standards are available through www.astm.org

GREGG IN SITU
Digital File Formats

CPT Data Files

Unless otherwise requested by the client, Gregg CPT data files are named such that the first 3 characters contain Gregg In-Situ, Inc. job number, the next character is typically C for CPT (S if shear waves were collected, R if Resistivity was used, U for UVIF or M for 'Mini-Cone') followed by two or three characters indicating the sounding number. The last character position is reserved for the letters a, b, c, d etc to uniquely identify multiple soundings at the same location. The CPT sounding file has the extension COR and pore pressure dissipation files have the extension PPD. As an example, for job number 05-127 (Job Number 127 in the year 2005) the first sounding will have file names 127C01.COR and 127C01.PPC.

The CPT (COR) file consists of the following components:
1. Two lines of header information
2. Data records
3. End of data marker
4. Units information

Header Lines
Line 1: Columns 1-6 are blank (future use)
Columns 7-21 contain the sounding Date and Time
Columns 22-36 contain the sounding Operator
Line 2: Columns 1-16 contain the sounding ID
Columns 17-31 Field representative
Columns 32-47 contain the project name

Data Records
The data records contain 4 or more columns of data in floating point format. A comma (and spaces) separates each data item:
Column 1: Sounding Depth (m)
Column 2: Tip (q_c) data uncorrected for pore pressure effects. Recorded in units selected by the CPT operator.
Column 3: Sleeve (f_s) data. Recorded in units selected by the operator
Column 4: Dynamic pore pressure readings (u_2). Recorded in units selected by the operator
Column 5: Exists only if specialty modules (Resistivity and/or UVIF) have been used
End of Data Marker
After the last line of data a line containing ASCII 26 (CTL-Z) and a new line (carriage return/ line feed) character. This is used to mark the end of data.
Units Information
The last section of the file contains information about the units that were selected for the sounding. A separator bar makes up the first line. The second line contains the type of units used for depth, q_c, f_s and u_2. The third line contains the conversion values required for Gregg's software to convert the recorded data to an internal set of base units (bar for q_c, bar for f_s and meters for u_2).

CPT Dissipation Files

CPT Dissipation files have the same naming convention as the CPT sounding files and have the extension PPC. PPC files consist of the following components:

1. Two lines of header information
2. Data records

Header Lines (same as COR file):
Line 1: Columns 1-6 are blank (future use)
Columns 7-21 contain the sounding Date and Time
Columns 22-36 contain the sounding Operator
Line 2: Columns 1-16 Sounding or Location ID
Columns 17-31 Field Representative
Columns 32-47 Project Name

Data Records
The data records immediately follow the header lines. Each data record can occupy several lines in the file and is a complete record of a dissipation test at a particular depth. Each data record starts with a line containing two values separated by spaces; the first value being an index number and the second being the dissipation test depth in meters. Following this line are the dissipation pore pressure values stored at 5 second intervals with a maximum of 12 entries per line. The last line of the dissipation record may not contain a full 12 entries. The data record is terminated with an ASCII 30 character (appears as a triangle in some editors). This sequence is repeated for every dissipation test in the sounding. No marker is used to indicate end of file. Unit information is not stored in this file. Users would have to check the CPT file for the units that were used.

APPENDIX B

APPENDIX B

LABORATORY TESTS

Classification Tests

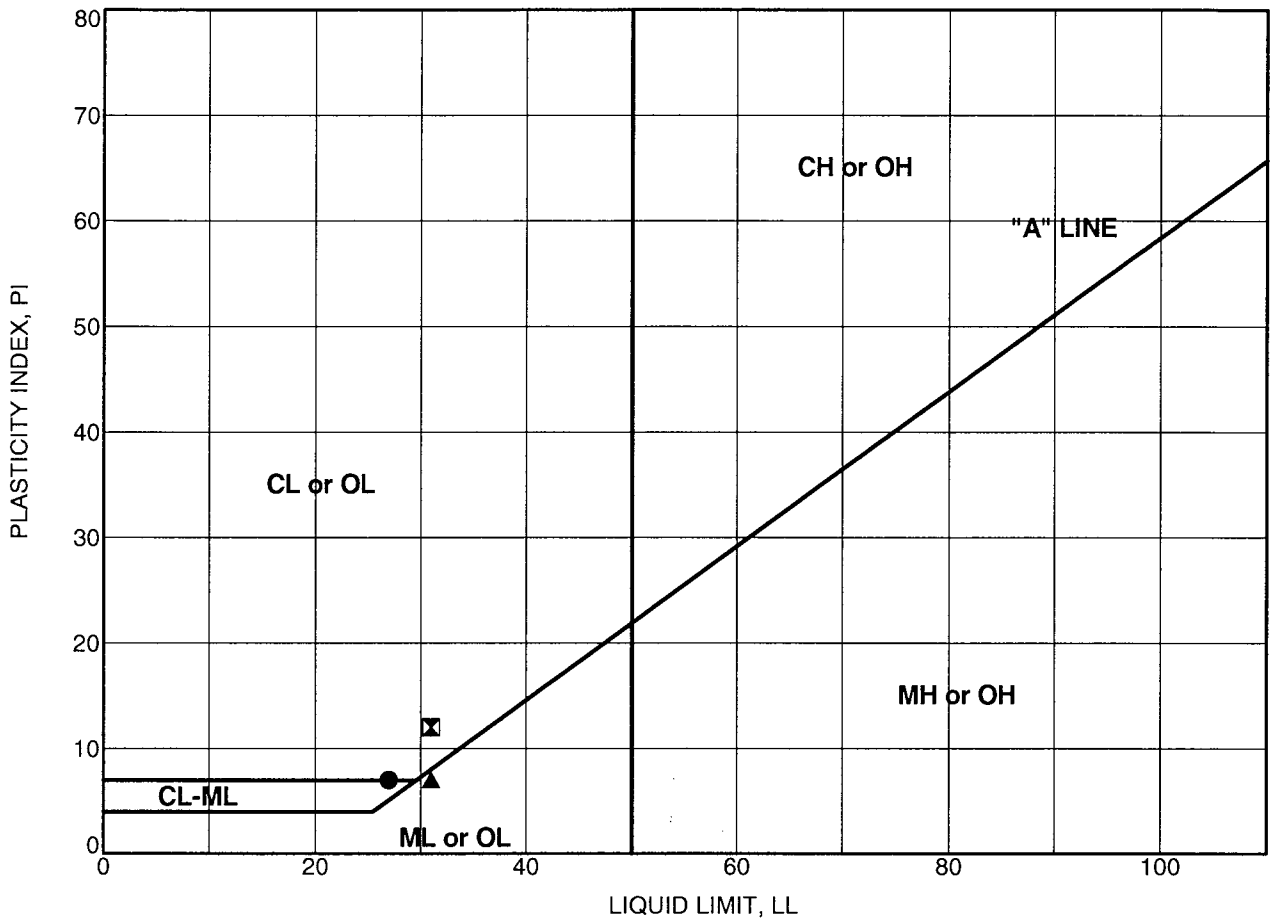
The field classification of the samples was visually verified in the laboratory according to the Unified Soil Classification System. The results are presented in "Log of Test Borings", Appendix A.

Moisture

The natural moisture contents were determined for selected undisturbed samples of the soils in general accordance with ASTM Test Method D 2216-92. This information was used to classify and correlate the soils. The results are presented at the appropriate depths on the "Log of Test Borings", Appendix A.

Atterberg Limits

The Atterberg Limits were determined for selected samples of the fine-grained materials. These results were used to classify the soils, as well as to obtain an indication of the effective strength characteristics and expansion potential with variations in moisture content. The Atterberg Limits were determined in general accordance with ASTM Test Method D 4318-93. The results of these tests are presented on Plate B-2, "Plasticity Chart".



PLASTICITY CHART

Boring Number	Sample Number	Depth (feet)	Test Symbol	Moisture Content (%)	LL	PL	PI	Description
BR-2	2	20.0	●	19	27	20	7	SILTY CLAY (CL-ML)
BR-2	5	35.0	⊠	27	31	19	12	LEAN CLAY (CL)
BR-2	8	48.0	▲	29	31	24	7	SILT (ML)

PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS ENGINEERING

TULLY ROAD OVERCROSSING-RTE 101 / RETAINING WALL NO. 1 (MSE)
SAN JOSE, SANTA CLARA COUNTY, CALIFORNIA

JOB NO: 207150.TUL

PLATE NO: B-2

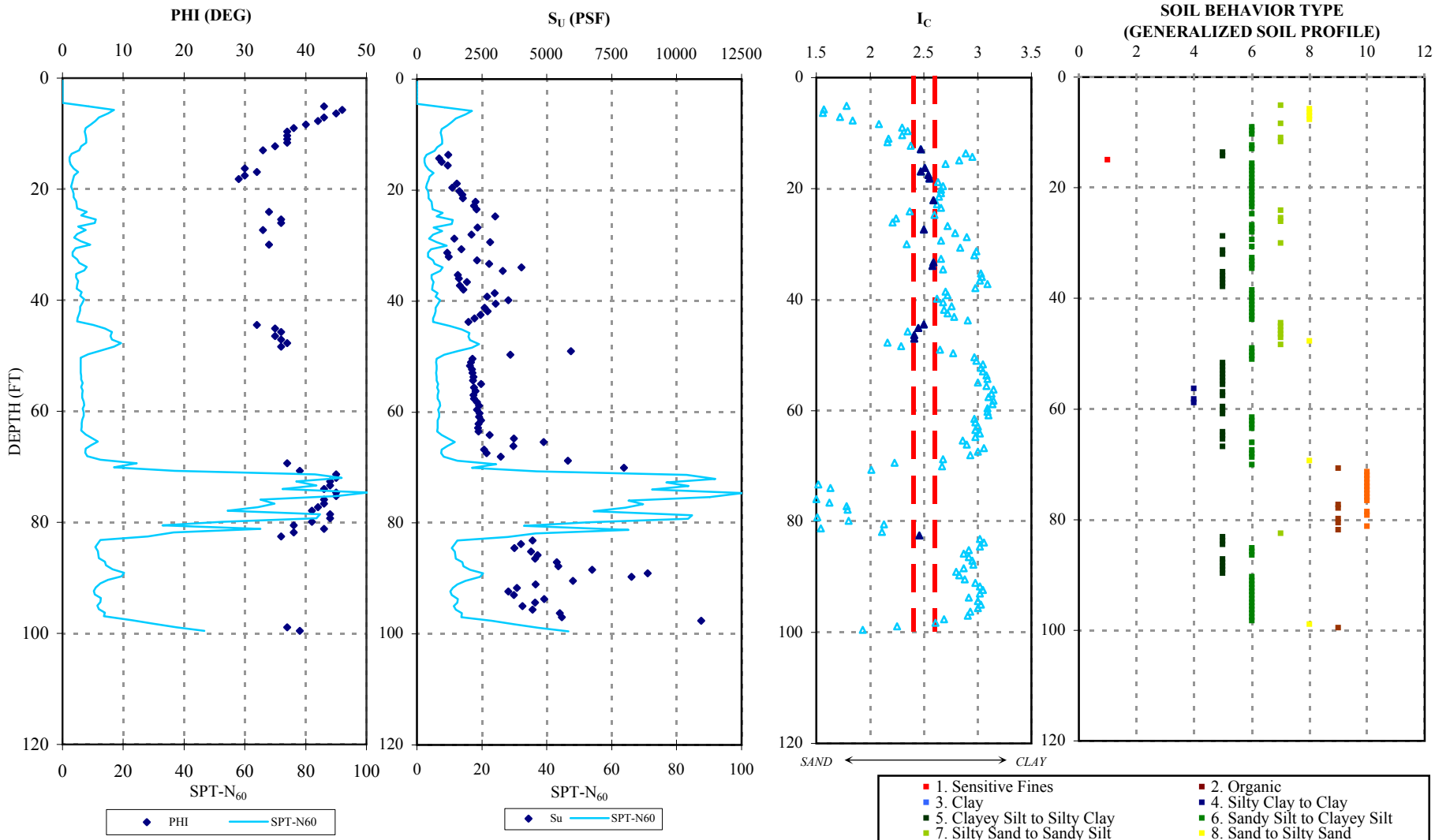
APPENDIX C

APPENDIX C-1

LIQUEFACTION POTENTIAL PER CPT PROCEDURES

CPT DATA CORRELATION

BR-2



Reference: CPT data and correlation provided by Gregg Drilling and Testing, Inc.

PARIKH

Practicing in the Geosciences

HWY 101/TULLY INTERCHANGE
SAN JOSE, CALIFORNIA

JOB NO.: 207150.10

PLATE NO.:

LIQUEFACTION POTENTIAL ANALYSIS (per Youd & Idriss, 2001)

PROJECT NAME	***HWY 101/TULLY***	*FAULT INFO*	
PROJECT NO.	***207150.10***	*COAST RANGE - SIERRAN BLOCK BOUNDARY ZONE (CSB)*	
CPT NO.	***BR-2***	*a_{max} (g)=* 0.6	*FAULT M_w =* 7.5
			MSF = 1.00

		CPT RESULT INPUT							*CSR*		*$CRR_{7.5}$*						*F.S.=($CRR_{7.5}$/CSR)*MSF*K_σ*K_α*		
Depth (ft)		Soil Behavior Type	qc (tsf)	fs (tsf)	σ_v (tsf)	u (tsf)	σ_v' (tsf)	Ic*	C_N*	γ_d	CSR	Ic	C_Q	q_{c1N}	K_C	$(q_{c1N})_{cs}$	$CRR_{7.5}$	$K\sigma$	$K\alpha$	F.S.
0.492									1.7	1.00	#VALUE!							#VALUE!	1	
1.148									1.7	1.00	#VALUE!							#VALUE!	1	
1.804									1.7	1.00	#VALUE!							#VALUE!	1	
2.461									1.7	1.00	#VALUE!							#VALUE!	1	
3.117									1.7	0.99	#VALUE!							#VALUE!	1	
3.773									1.7	0.99	#VALUE!							#VALUE!	1	
4.429									1.7	0.99	#VALUE!							#VALUE!	1	
5.085	7	Silty Sand to Sandy Silt	47.564	0.495	0.299		0.299	1.78	1.46765	0.99	0.386	1.780	1.47	69.81	1.092	76.253	0.12	1.00	1	
5.741	8	Sand to Silty Sand	99.968	0.984	0.339		0.339	1.57	1.4295	0.99	0.386	1.570	1.43	142.90	1.000	142.904	0.35	1.00	1	
6.398	8	Sand to Silty Sand	88.627	0.684	0.379		0.379	1.56	1.39329	0.99	0.385	1.560	1.39	123.48	1.000	123.483	0.26	1.00	1	
7.054	8	Sand to Silty Sand	67.511	0.596	0.418		0.418	1.72	1.3597	0.99	0.384	1.720	1.36	91.79	1.051	96.507	0.16	1.00	1	
7.71	8	Sand to Silty Sand	58.248	0.596	0.458		0.458	1.84	1.3269	0.98	0.384	1.840	1.33	77.29	1.137	87.880	0.14	1.00	1	
8.366	7	Silty Sand to Sandy Silt	45.904	0.739	0.497		0.497	2.08	1.29641	0.98	0.383	2.080	1.30	59.51	1.420	84.484	0.14	1.00	1	
9.022	6	Sandy Silt to Clayey Silt	34.246	0.775	0.534		0.534	2.3	1.26874	0.98	0.383	2.300	1.27	43.45	1.949	84.671	0.14	1.00	1	
9.678	6	Sandy Silt to Clayey Silt	32.329	0.752	0.572		0.572	2.35	1.24153	0.98	0.382	2.350	1.24	40.14	2.120	85.078	0.14	1.00	1	
10.335	6	Sandy Silt to Clayey Silt	34.201	0.665	0.61		0.61	2.3	1.21547	0.98	0.382	2.300	1.22	41.57	1.949	81.009	0.13	1.00	1	
10.991	7	Silty Sand to Sandy Silt	37.036	0.464	0.648		0.648	2.17	1.19048	0.98	0.381	2.170	1.19	44.09	1.596	70.385	0.11	1.00	1	
11.647	7	Silty Sand to Sandy Silt	37.07	0.411	0.687		0.687	2.16	1.16587	0.98	0.381	2.160	1.17	43.22	1.574	68.038	0.11	1.00	1	
12.303	6	Sandy Silt to Clayey Silt	26.854	0.413	0.724		0.724	2.38	1.14345	0.97	0.380	2.380	1.14	30.71	2.233	68.554	0.11	1.00	1	
12.959	6	Sandy Silt to Clayey Silt	22.392	0.341	0.762		0.762	2.47	1.1213	0.97	0.379	2.470	1.12	25.11	2.621	65.817	0.11	1.00	1	
13.615	5	Clayey Silt to Silty Clay	9.943	0.22	0.8	0.019	0.781	2.89	1.11055	0.97	0.388							1.00	1	
14.272	5	Clayey Silt to Silty Clay	7.42	0.114	0.837	0.04	0.798	2.95	1.1011	0.97	0.397							1.00	1	
14.928	1	Sensitive Fines	8.032	0.082	0.874	0.06	0.814	2.83	1.09235	0.97	0.406							1.00	1	
15.584	6	Sandy Silt to Clayey Silt	9.731	0.077	0.911	0.081	0.831	2.7	1.08321	0.97	0.414							1.00	1	
16.24	6	Sandy Silt to Clayey Silt	14.761	0.119	0.949	0.101	0.848	2.51	1.07422	0.97	0.422	2.510	1.07	15.86	2.820	44.708	0.09	1.00	1	0.21
16.896	6	Sandy Silt to Clayey Silt	21.467	0.258	0.987	0.121	0.865	2.47	1.06538	0.96	0.429	2.470	1.07	22.87	2.621	59.950	0.10	1.00	1	0.23
17.552	6	Sandy Silt to Clayey Silt	15.73	0.146	1.024	0.142	0.882	2.54	1.05668	0.96	0.436	2.540	1.06	16.62	2.979	49.515	0.09	1.00	1	0.21
18.209	6	Sandy Silt to Clayey Silt	13.853	0.109	1.062	0.162	0.899	2.55	1.04812	0.96	0.443	2.550	1.05	14.52	3.034	44.056	0.09	1.00	1	0.20
18.865	6	Sandy Silt to Clayey Silt	11.831	0.094	1.099	0.183	0.916	2.63	1.0397	0.96	0.449							1.00	1	
19.521	6	Sandy Silt to Clayey Silt	10.556	0.083	1.137	0.203	0.934	2.68	1.03093	0.96	0.455							1.00	1	
20.177	6	Sandy Silt to Clayey Silt	12.728	0.126	1.175	0.224	0.951	2.66	1.02278	0.96	0.461							1.00	1	
20.833	6	Sandy Silt to Clayey Silt	13.547	0.145	1.212	0.244	0.968	2.66	1.01476	0.95	0.466							1.00	1	
21.49	6	Sandy Silt to Clayey Silt	13.809	0.132	1.25	0.265	0.985	2.64	1.00686	0.95	0.472							1.00	1	
22.146	6	Sandy Silt to Clayey Silt	17.68	0.199	1.287	0.285	1.002	2.59	0.99909	0.95	0.476	2.590	1.00	17.66	3.266	57.691	0.10	1.00	1	0.21
22.802	6	Sandy Silt to Clayey Silt	17.736	0.216	1.325	0.306	1.019	2.62	0.99144	0.95	0.481							1.00	1	
23.458	6	Sandy Silt to Clayey Silt	18.22	0.279	1.363	0.326	1.036	2.66	0.9839	0.95	0.486							0.99	1	
24.114	7	Silty Sand to Sandy Silt	34.474	0.41	1.401	0.347	1.054	2.37	0.97604	0.94	0.490	2.370	0.98	33.65	2.194	73.825	0.12	0.99	1	0.24
24.77	6	Sandy Silt to Clayey Silt	23.968	0.398	1.439	0.367	1.072	2.6	0.96831	0.94	0.493							0.99	1	
25.427	7	Silty Sand to Sandy Silt	50.578	0.617	1.477	0.388	1.09	2.24	0.9607	0.94	0.497	2.240	0.96	48.59	1.770	86.028	0.14	0.98	1	0.28
26.083	7	Silty Sand to Sandy Silt	49.914	0.5	1.516	0.408	1.108	2.21	0.95321	0.94	0.500	2.210	0.95	47.58	1.692	80.484	0.13	0.98	1	0.26
26.739	6	Sandy Silt to Clayey Silt	19.262	0.322	1.554	0.429	1.125	2.72	0.94624	0.94	0.504							0.98	1	
27.395	6	Sandy Silt to Clayey Silt	31.444	0.482	1.591	0.449	1.142	2.5	0.93937	0.93	0.507	2.500	0.94	29.54	2.768	81.773	0.13	0.97	1	0.26
28.051	6	Sandy Silt to Clayey Silt	17.485	0.312	1.629	0.469	1.159	2.79	0.9326	0.93	0.510							0.97	1	
28.707	5	Clayey Silt to Silty Clay	12.589	0.188	1.666	0.49	1.176	2.9	0.92593	0.93	0.512							0.97	1	
29.364	6	Sandy Silt to Clayey Silt	22.726	0.367	1.704	0.51	1.194	2.66	0.91896	0.92	0.514							0.97	1	
30.02	7	Silty Sand to Sandy Silt	40.601	0.432	1.743	0.531	1.212	2.34	0.91211	0.92	0.516	2.340	0.91	37.03	2.084	77.167	0.12	0.96	1	0.24
30.676	6	Sandy Silt to Clayey Silt	14.845	0.22	1.78	0.551	1.229	2.84	0.90572	0.92	0.518							0.96	1	
31.332	5	Clayey Silt to Silty Clay	10.538	0.139	1.818	0.572	1.246	2.99	0.89943	0.91	0.520							0.96	1	
31.988	5	Clayey Silt to Silty Clay	10.879	0.142	1.855	0.592	1.263	2.97	0.89322	0.91	0.521							0.95	1	
32.644	6	Sandy Silt to Clayey Silt	18.501	0.191	1.893	0.613	1.28	2.66	0.8871	0.91	0.523							0.95	1	
33.301	6	Sandy Silt to Clayey Silt	21.785	0.222	1.931	0.633	1.297	2.59	0.88106	0.90	0.524	2.590	0.88	19.19	3.266	62.688	0.10	0.95	1	0.20
33.957	6	Sandy Silt to Clayey Silt	31.817	0.549	1.968	0.654	1.314	2.58	0.8751	0.90	0.524	2.580	0.88	27.84	3.206	89.277	0.15	0.95	1	0.28
34.613	6	Sandy Silt to Clayey Silt	26.821	0.508	2.006	0.674	1.332	2.68	0.86888	0.89	0.525							0.94	1	
35.269	5	Clayey Silt to Silty Clay	13.871	0.344	2.043	0.695	1.349	3.03	0.86308	0.89	0.525							0.94	1	
35.925	5	Clayey Silt to Silty Clay	13.731	0.364	2.081	0.715	1.366	3.04	0.85737	0.88	0.525							0.94	1	
36.581	5	Clayey Silt to Silty Clay	15.992	0.488	2.119	0.736	1.383	3.02	0.85172	0.88	0.525							0.94	1	
37.238	5	Clayey Silt to Silty Clay	14.249	0.452	2.156	0.756	1.4	3.09	0.84615	0.87	0.525							0.93	1	
37.894	5	Clayey Silt to Silty Clay	14.772	0.339	2.194	0.777	1.417	2.98	0.84066	0.87	0.525							0.93	1	
38.55	6	Sandy Silt to Clayey Silt	23.428	0.394	2.231	0.797	1.434	2.7	0.83523	0.86	0.524							0.93	1	
39.206	6	Sandy Silt to Clayey Silt	21.284	0.316	2.269	0.818	1.451	2.72	0.82988	0.86	0.523							0.93	1	
39.862	6	Sandy Silt to Clayey Silt	27.623	0.395	2.307	0.838	1.469	2.62	0.82428	0.85	0.522							0.93	1	
40.518	6	Sandy Silt to Clayey Silt	24.334	0.354	2.344	0.858	1.486	2.68	0.81906	0.85	0.521							0.92	1	
41.175	6	Sandy Silt to Clayey Silt	20.913	0.322	2.382	0.879	1.503	2.76	0.81391	0.84	0.519							0.92	1	
41.831	6	Sandy Silt to Clayey Silt	21.746	0.263	2.419	0.899	1.52	2.69	0.80882	0.83	0.518							0.92	1	
42.487	6	Sandy Silt to Clayey Silt	19.735	0.219	2.457	0.92	1.537	2.72	0.8038	0.83	0.516							0.92	1	
43.143	6	Sandy Silt to Clayey Silt	17.942	0.215	2.495	0.94	1.554	2.78	0.79884	0.82	0.515							0.92	1	
43.799	6	Sandy Silt to Clayey Silt	16.131	0.28	2.532	0.961	1.571	2.91	0.79394	0.82	0.513							0.91	1	
44.455	7	Silty Sand to Sandy Silt	41.348	0.595	2.571	0.981	1.589	2.5	0.78881	0.81	0.511	2.500	0.79	32.62	2.768	90.295	0.15	0.91	1	0.29
45.112	7	Silty Sand to Sandy Silt	58.493	1.085	2.609	1.002	1.608	2.45	0.78348	0.80	0.508	2.450	0.78	45.83	2.528	115.863	0.22	0.91	1	0.44
45.768	7	Silty Sand to Sandy Silt	71.009	1.174	2.648	1.022	1.626	2.35	0.77849	0.80	0.506	2.350	0.78	55.28	2.120	117.173	0.23	0.91	1	0.45
46.424	7	Silty Sand to Sandy Silt	67.394	1.279	2.687	1.043	1.644	2.41	0.77356	0.79	0.503	2.410	0.77	52.13	2.354	122.703	0.25	0.91	1	0.50
47.08	7	Silty Sand to Sandy Silt	69.995	1.352	2.725	1.063	1.662	2.41	0.76869	0.78	0.500	2.410	0.77	53.80	2.354	126.637	0.27	0.90	1	0.54
47.736	8	Sand to Silty Sand	91.585	0.995	2.765	1.084	1.681	2.16	0.76362	0.78	0.498	2.160	0.76	69.94	1.574	110.098	0.20	0.90	1	0.41
48.392	7	Silty Sand to Sandy Silt	76.824	1.057	2.804	1.104	1.699	2.29	0.75888	0.77	0.495	2.290	0.76	58.30	1.917	111.765	0.21	0.90	1	0.42
49.049	6	Sandy Silt to Clayey Silt	47.436	1.251	2.841	1.125	1.717	2.65	0.7542	0.76	0.492							0.90	1	
49.705	6	Sandy Silt to Clayey Silt	29.945	0.603	2.879	1.145	1.734	2.77	0.74983	0.76	0.489							0.90	1	
50.361	6	Sandy Silt to Clayey Silt	19.161	0.38	2.916	1.166	1.751	2.97	0.74551	0.75	0.486							0.89	1	
51.017	6	Sandy Silt to Clayey Silt	18.599	0.369	2.954	1.186	1.768	2.99	0.74124	0.74	0.484							0.89	1	
51.673	5	Clayey Silt to Silty Clay	18.231	0.447	2.992	1.207	1.785	3.05	0.73702	0.74	0.481							0.89	1	
52.329	5	Clayey Silt to Silty Clay	18.432	0.449	3.029	1.227	1.802	3.03	0.73284	0.73	0.478							0.89	1	
52.986	5	Clayey Silt to Silty Clay	18.042	0.491	3.067	1.247	1.819	3.05	0.72872	0.72	0.475							0.89	1	
53.642	5	Clayey Silt to Silty Clay	18.231	0.572	3.104	1.268	1.836	3.08	0.72464	0.72	0.472							0.89	1	
54.298	5	Clayey Silt to Silty Clay	18.081	0.567	3.142	1.288	1.854	3.09	0.72037	0.71	0.469							0.88	1	
54.954	5	Clayey Silt to Silty Clay	20.465	0.558	3.18	1.309	1.871	3	0.71638	0.70	0.466							0.88	1	
55.61	5	Clayey Silt to Silty Clay	18.454	0.572	3.217	1.329	1.888	3.08	0.71244	0.70	0.464							0.88	1	
56.266	4	Silty Clay to Clay	19.072	0.77	3.255	1.35	1.905	3.15	0.70853	0.69	0.461							0.88	1	
56.923	5	Clayey Silt to Silty Clay	18.56	0.657	3.292	1.37	1.922	3.13	0.70468	0.69	0.458							0.88	1	
57.579	5	Clayey Silt to Silty Clay	18.616	0.606	3.33	1.391	1.939	3.1	0.70086	0.68	0.455							0.88	1	
58.235	4	Silty Clay to Clay	19.796	0.824	3.368	1.411	1.956	3.15	0.69708	0.67	0.453							0.87	1	
58.891	4	Silty Clay to Clay	20.437	0.834	3.405	1.432	1.973	3.14	0.69335	0.67	0.450							0.87	1	
59.547	5	Clayey Silt to Silty Clay	19.485	0.63	3.443	1.452	1.991	3.09	0.68944	0.66	0.447							0.87	1	
60.203	5	Clayey Silt to Silty Clay	20.276	0.691	3.48	1.473	2.008	3.09	0.68579	0.66	0.444							0.87	1	
60.86	5	Clayey Silt to Silty Clay	20.331	0.684	3.518	1.493	2.025	3.1	0.68217	0.65	0.442							0.87	1	
61.516	6	Sandy Silt to Clayey Silt	20.526	0.417	3.555	1.514	2.042	2.97	0.67859	0.65	0.439							0.87	1	
62.172	6	Sandy Silt to Clayey Silt	19.952	0.408	3.593	1.534	2.059	2.98	0.67505	0.64	0.437							0.87	1	
62.828	6	Sandy Silt to Clayey Silt	19.824	0.42	3.631	1.555	2.076	3	0.67155	0.64	0.435							0.86	1	

LIQUEFACTION POTENTIAL ANALYSIS (per Youd & Idriss, 2001)

PROJECT NAME ***HWY 101/TULLY***
PROJECT NO. ***207150.10***
CPT NO. ***BR-2***

FAULT INFO
COAST RANGE - SIERRAN BLOCK BOUNDARY ZONE (CSB)
a_{max} (g)= 0.6

FAULT M_w = 7.5
MSF = 1.00

		CPT RESULT INPUT							*CSR*		*$CRR_{7.5}$*						*F.S.=($CRR_{7.5}$/CSR)*MSF*K_σ*K_α*		
Depth (ft)		Soil Behavior Type	qc (tsf)	fs (tsf)	σ_v (tsf)	u (tsf)	σ_v' (tsf)	Ic*	C_N*	γ_d	CSR	Ic	C_Q	q_{c1N}	K_C	$(q_{c1N})_{cs}$	$CRR_{7.5}$	$K\sigma$	$K\alpha$	F.S.
63.484	6	Sandy Silt to Clayey Silt	19.724	0.392	3.668	1.575	2.093	2.98	0.66808	0.63	0.432							0.86	1	
64.14	5	Clayey Silt to Silty Clay	23.294	0.687	3.706	1.595	2.11	3.02	0.66465	0.63	0.430							0.86	1	
64.797	5	Clayey Silt to Silty Clay	30.675	1.135	3.743	1.616	2.128	2.98	0.66106	0.62	0.428							0.86	1	
65.453	5	Clayey Silt to Silty Clay	39.337	1.333	3.781	1.636	2.145	2.86	0.6577	0.62	0.426							0.86	1	
66.109	6	Sandy Silt to Clayey Silt	31.165	0.822	3.819	1.657	2.162	2.9	0.65437	0.61	0.424							0.86	1	
66.765	5	Clayey Silt to Silty Clay	22.904	0.624	3.856	1.677	2.179	3.06	0.65108	0.61	0.421							0.86	1	
67.421	6	Sandy Silt to Clayey Silt	23.412	0.53	3.894	1.698	2.196	3	0.64782	0.61	0.420							0.85	1	
68.077	6	Sandy Silt to Clayey Silt	26.932	0.62	3.931	1.718	2.213	2.93	0.64459	0.60	0.418							0.85	1	
68.734	6	Sandy Silt to Clayey Silt	46.461	0.961	3.969	1.739	2.23	2.68	0.6414	0.60	0.416							0.85	1	
69.39	8	Sand to Silty Sand	113.437	1.422	4.009	1.759	2.249	2.23	0.63787	0.60	0.414	2.230	0.64	72.36	1.743	126.153	0.27	0.84	1	0.64
70.046	6	Sandy Silt to Clayey Silt	63.751	1.852	4.046	1.78	2.267	2.67	0.63455	0.59	0.412							0.85	1	
70.702	9	Sand	187.197	1.993	4.087	1.8	2.287	2.01	0.63091	0.59	0.410	2.010	0.63	118.11	1.313	155.105	0.43	0.79	1	1.04
71.358	10	Gravelly Sand to Sand	513.404	2.438	4.129	1.821	2.308	1.44	0.62714	0.58	0.408	1.440	0.63	321.98	1.000	321.975		0.72	1	
72.014	10	Gravelly Sand to Sand	568.07	2.989	4.171	1.841	2.329	1.44	0.62341	0.58	0.406	1.440	0.62	354.14	1.000	354.138		0.71	1	
72.671	10	Gravelly Sand to Sand	482.991	1.658	4.212	1.862	2.351	1.39	0.61954	0.58	0.404	1.390	0.62	299.23	1.000	299.234		0.71	1	
73.327	10	Gravelly Sand to Sand	503.74	2.967	4.254	1.882	2.372	1.52	0.6159	0.58	0.402	1.520	0.62	310.25	1.000	310.254		0.71	1	
73.983	10	Gravelly Sand to Sand	421.435	2.918	4.296	1.903	2.393	1.63	0.6123	0.57	0.401	1.630	0.61	258.05	1.000	258.045		0.71	1	
74.639	10	Gravelly Sand to Sand	643.479	2.45	4.338	1.923	2.415	1.32	0.60858	0.57	0.399	1.320	0.61	391.61	1.000	391.605		0.70	1	
75.295	10	Gravelly Sand to Sand	572.588	2.1	4.379	1.944	2.436	1.35	0.60506	0.57	0.397	1.350	0.61	346.45	1.000	346.450		0.70	1	
75.951	10	Gravelly Sand to Sand	394.976	1.479	4.421	1.964	2.457	1.5	0.60159	0.56	0.396	1.500	0.60	237.61	1.000	237.612		0.70	1	
76.608	10	Gravelly Sand to Sand	405.911	2.541	4.463	1.984	2.479	1.62	0.59799	0.56	0.394	1.620	0.60	242.73	1.000	242.730		0.70	1	
77.264	9	Sand	354.804	3.261	4.504	2.005	2.499	1.78	0.59476	0.56	0.392	1.780	0.59	211.02	1.092	230.508		0.70	1	
77.92	9	Sand	298.74	2.293	4.544	2.025	2.519	1.79	0.59156	0.56	0.391	1.790	0.59	176.72	1.099	194.295		0.72	1	
78.576	10	Gravelly Sand to Sand	522.3	2.297	4.586	2.046	2.54	1.45	0.58824	0.55	0.390	1.450	0.59	307.24	1.000	307.235		0.69	1	
79.232	10	Gravelly Sand to Sand	505.238	2.617	4.628	2.066	2.562	1.51	0.5848	0.55	0.388	1.510	0.58	295.46	1.000	295.461		0.69	1	
79.888	9	Sand	287.216	2.128	4.669	2.087	2.582	1.8	0.5817	0.55	0.387	1.800	0.58	167.07	1.107	184.894		0.72	1	
80.545	9	Sand	158.678	1.813	4.709	2.107	2.602	2.13	0.57864	0.55	0.386	2.130	0.58	91.82	1.512	138.806	0.33	0.79	1	0.85
81.201	10	Gravelly Sand to Sand	389.473	1.523	4.751	2.128	2.623	1.54	0.57546	0.54	0.384	1.540	0.58	224.13	1.000	224.128		0.68	1	
81.857	9	Sand	177.516	2.126	4.792	2.148	2.644	2.11	0.57232	0.54	0.383	2.110	0.57	101.60	1.473	149.668	0.39	0.78	1	1.02
82.513	7	Silty Sand to Sandy Silt	117.52	2.85	4.831	2.169	2.662	2.46	0.56965	0.54	0.382	2.460	0.57	66.95	2.574	172.336		0.82	1	
83.169	5	Clayey Silt to Silty Clay	38.423	1.501	4.868	2.189	2.679	3.02	0.56716	0.54	0.381							0.82	1	
83.825	5	Clayey Silt to Silty Clay	34.942	1.352	4.906	2.21	2.696	3.06	0.56468	0.54	0.380							0.82	1	
84.482	5	Clayey Silt to Silty Clay	33.237	0.986	4.943	2.23	2.713	3.02	0.56223	0.53	0.379							0.82	1	
85.138	6	Sandy Silt to Clayey Silt	37.983	0.948	4.981	2.251	2.73	2.92	0.5598	0.53	0.379							0.82	1	
85.794	6	Sandy Silt to Clayey Silt	39.754	0.877	5.019	2.271	2.747	2.87	0.55739	0.53	0.378							0.82	1	
86.45	6	Sandy Silt to Clayey Silt	39.014	1.001	5.056	2.292	2.765	2.92	0.55485	0.53	0.377							0.82	1	
87.106	5	Clayey Silt to Silty Clay	45.447	1.645	5.094	2.312	2.782	2.95	0.55249	0.53	0.376							0.81	1	
87.762	5	Clayey Silt to Silty Clay	45.881	1.78	5.131	2.332	2.799	2.96	0.55014	0.52	0.375							0.81	1	
88.419	5	Clayey Silt to Silty Clay	55.629	2	5.169	2.353	2.816	2.87	0.54781	0.52	0.375							0.81	1	
89.075	5	Clayey Silt to Silty Clay	71.638	2.854	5.206	2.373	2.833	2.8	0.5455	0.52	0.374							0.81	1	
89.731	5	Clayey Silt to Silty Clay	67.009	2.726	5.244	2.394	2.85	2.83	0.54321	0.52	0.373							0.81	1	
90.387	6	Sandy Silt to Clayey Silt	49.954	1.588	5.282	2.414	2.867	2.88	0.54094	0.52	0.372							0.81	1	
91.043	6	Sandy Silt to Clayey Silt	39.203	1.201	5.319	2.435	2.884	2.98	0.53869	0.52	0.372							0.81	1	
91.699	6	Sandy Silt to Clayey Silt	33.822	0.954	5.357	2.455	2.902	3.02	0.53632	0.52	0.371							0.81	1	
92.356	6	Sandy Silt to Clayey Silt	31.298	0.856	5.394	2.476	2.919	3.05	0.53411	0.51	0.370							0.81	1	
93.012	6	Sandy Silt to Clayey Silt	32.891	0.869	5.432	2.496	2.936	3.02	0.53191	0.51	0.370							0.81	1	
93.668	6	Sandy Silt to Clayey Silt	41.431	1.085	5.47	2.517	2.953	2.92	0.52974	0.51	0.369							0.81	1	
94.324	6	Sandy Silt to Clayey Silt	38.925	1.232	5.507	2.537	2.97	3	0.52758	0.51	0.368							0.80	1	
94.98	6	Sandy Silt to Clayey Silt	34.869	1.089	5.545	2.558	2.987	3.03	0.52544	0.51	0.368							0.80	1	
95.636	6	Sandy Silt to Clayey Silt	37.281	1.197	5.582	2.578	3.004	3	0.52331	0.51	0.367							0.80	1	
96.293	6	Sandy Silt to Clayey Silt	45.391	1.48	5.62	2.599	3.021	2.93	0.5212	0.51	0.367							0.80	1	
96.949	6	Sandy Silt to Clayey Silt	45.442	1.383	5.658	2.619	3.039	2.91	0.51899	0.50	0.366							0.80	1	
97.605	6	Sandy Silt to Clayey Silt	86.149	2.771	5.695	2.64	3.056	2.69	0.51692	0.50	0.366							0.80	1	
98.261	6	Sandy Silt to Clayey Silt	117.024	3.986	5.733	2.66	3.073	2.61	0.51486	0.50	0.365							0.80	1	
98.917	8	Sand to Silty Sand	172.414	2.685	5.772	2.681	3.092	2.25	0.51258	0.50	0.364	2.250	0.51	88.38	1.798	158.923	0.45	0.77	1	1.24
99.573	9	Sand	244.275	1.782	5.813	2.701	3.112	1.93	0.5102	0.50	0.364	1.930	0.51	124.63	1.218	151.857	0.41	0.72	1	1.12

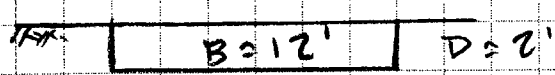
APPENDIX C-2

MSE WALL BEARING CAPCITY, SETTLEMENT & STABILITY EVALUATION

MSE RETAINING WALL AT TULLY RD / RTE 101 INTERCHANGE

EVALUATION OF BEARING CAPACITY

- MAX WALL HEIGHT ~ 16'
- ASSUME WIDTH OF REINFORCEMENT ~ 12' (~ 0.8H) FOR CALC.
- THE WALL BOTTOM IS IN SANDY MATERIAL PER CPT BR-2.
- ASSUME EMBEDMENT ~ 2'
- FOUNDATION SOIL = SAND. $\phi = 30° - 32° \pm$, $C = 0$.



$$q_{ult} = \cancel{C N_c}^{\,0} + \gamma D N_q + \gamma \frac{B}{2} \cdot N_\gamma \qquad \left(\phi = 30° - 32° \pm,\ N_q = 20,\ N_\gamma = 18\right)$$

$$= (62)(2')(20) + (62)(12)/2 \cdot (18)$$

USE $\gamma = 62$ pcf FOR SATURATED CONDITION (CONSERVATIVE)

$$= 2480 + 6696$$

$$= 9176 \text{ psf (ULTIMATE)}$$

IT IS REASONABLE TO USE ALLOWABLE BEARING CAPACITY OF 3000 psf FOR MSE WALL DESIGN.

SETTLEMENT ANALYSIS *** TULLY ROAD OC-ROUTE 101, SANTA CLARA COUNTY *** **MSE RETAINING WALL (TYPICAL)** 01/20/09

LOCATION: APPROACH EMBANKMENTS FOR THE BRIDGE

Height of fill = 20 ft
Width of fill = 40 ft
Fill Density = 150 pcf

Based on reference Borings BR-1 & 2 (CPTs), E-11, R-8 & E-39
The max wall height is 16 ft and the recommended bearing capacity/contact pressure is 3000 psf. Therefore, assume 20 ft wall ht and unit wt of 150 pcf for modeling to similuate the contact pressure of 3000 psf. Also, conservatively consider the fill width for evaluation.

- The undrained shear strength (Su) is correlated with SPT-N values based on Terzaghi and Peck (1967), and NAVFAC DM-7.1 (1982).
- Approximate estimation of preconsolidation pressure is based on Su/P ratio per Skempton (1957).
- The modified compression index (Cc/1+e0) is correlated with natural moisture content based on Lambe and Whitman (1969).
- The recompression index is adopted as 12% of the virgin compression index, which is typically 5% to 10% of the compression index (Holtz and Kovacs, 1982).
- The applied pressure is estimated from 2V:1H distribution of the embankment load.

DEPTH FROM	TO	EFFECTIVE UNIT WEIGHT(pcf) (psf)	WEIGHT OF LAYER (psf)	MIDLAYER EFFECTIVE OVERBURDEN PRESSURE (psf)	APPLIED PRESSURE (psf)	GENERALIZED AVERAGE SPT-N VALUES	UNDRAINED SHEAR STRENGTH (psf)	PRECONSO-LIDATION PRESSURE (psf)	NATURAL WATER CONTENT (%)	MODIFIED VIRGIN COM-PRESSION INDEX	MODIFIED RECOM-PRESSION INDEX	CONSOLIDATION SETTLEMENTS (in.) OC	NC	SUM
			0											
0	5	125	625	312.5	2824	10				(sand layer)				
5	10	125	625	937.5	2526	10								
10	15	125	625	1562.5	2286	10	1200	4800	20	0.0847	0.0106	0.25	0.00	0.25
15	20	63	315	2032.5	2087	10	1200	4800	20	0.0847	0.0106	0.19	0.00	0.19
20	25	63	315	2347.5	1920	10				(sand layer)				
25	30	63	315	2662.5	1778	10								
30	35	63	315	2977.5	1655	10	1200	4800	25	0.1174	0.0147	0.17	0.00	0.17
35	40	63	315	3292.5	1548	10	1200	4800	25	0.1174	0.0147	0.14	0.03	0.17
40	45	63	315	3607.5	1455	20				(sand layer)				
45	50	63	315	3922.5	1371	20								
50	55	63	315	4237.5	1297	14	1800	7200	29	0.1443	0.0180	0.13	0.00	0.13
55	60	63	315	4552.5	1231	14	1800	7200	29	0.1443	0.0180	0.11	0.00	0.11
60	65	63	315	4867.5	1171	14	1800	7200	29	0.1443	0.0180	0.10	0.00	0.10
65	70	63	315	5182.5	1116	14	1800	7200	29	0.1443	0.0180	0.09	0.00	0.09
70	73	63	189	5434.5	1076	14	1800	7200	29	0.1443	0.0180	0.05	0.00	0.05
73	80	63	441	5749.5	1030	60				(SAND LAYER)				
80	90	63	630	6285	960	30	3750	15000	29	0.1443	0.0180	0.13	0.00	0.13
										TOTAL SETTLEMENT (IN.) =		1.37	0.03	1.40

O.C. RANGE SETTLEMENT = 1.37 INCHES
N.C. RANGE SETTLEMENT = 0.03 INCHES

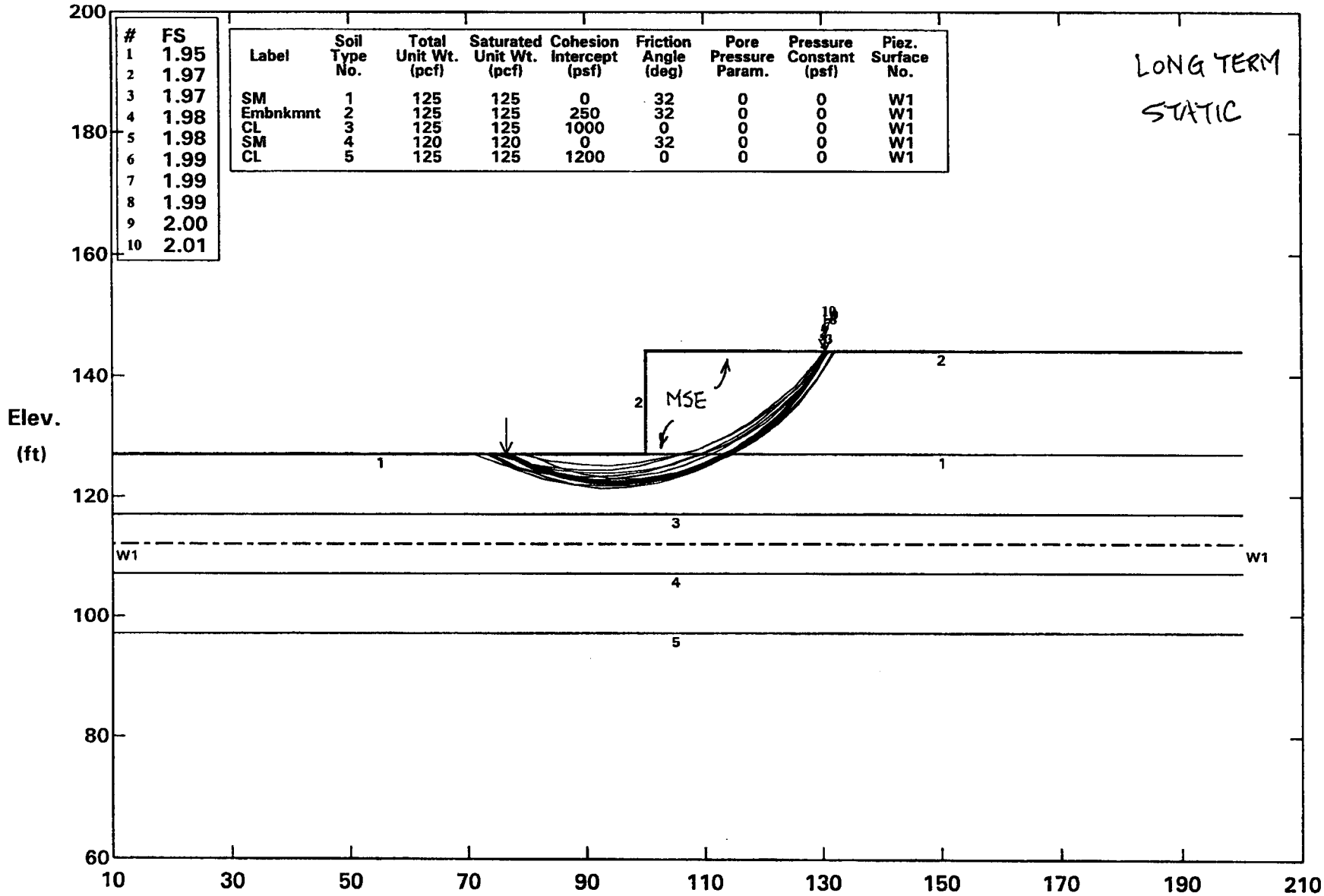
Majority of the settlement is in the overconsolidated/elastic range.

MSE Retaining Wall at NB Off-Ramp Tully Road/Route 101 I/C. 207150

Ten Most Critical. C:207150W1.PLT By: dw 10-27-08 6:34pm

#	FS
1	1.95
2	1.97
3	1.97
4	1.98
5	1.98
6	1.99
7	1.99
8	1.99
9	2.00
10	2.01

Label	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
SM	1	125	125	0	32	0	0	W1
Embnkmnt	2	125	125	250	32	0	0	W1
CL	3	125	125	1000	0	0	0	W1
SM	4	120	120	0	32	0	0	W1
CL	5	125	125	1200	0	0	0	W1



PCSTABL5M FSmin = 1.95 X-Axis (ft)

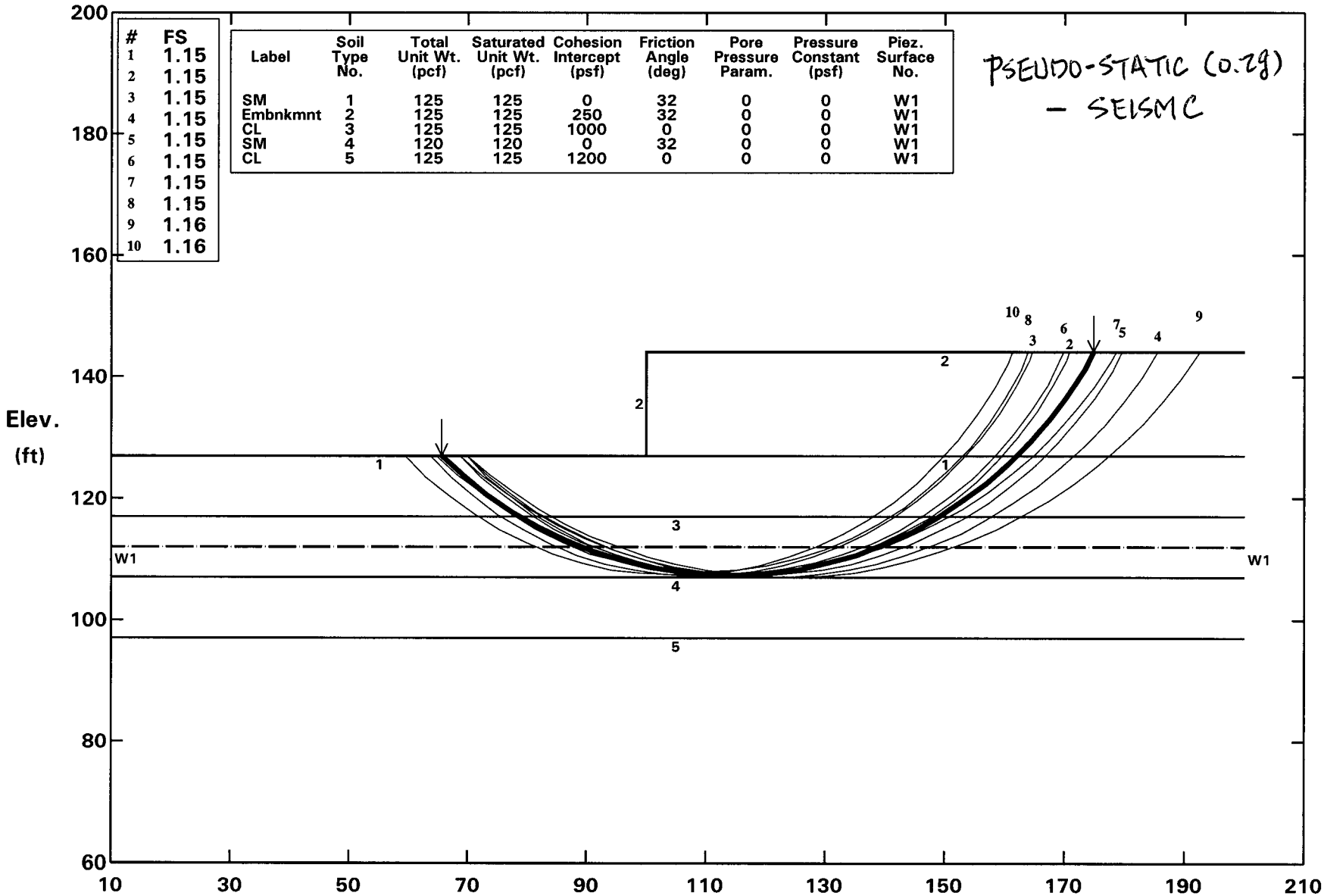
MSE Retaining Wall at NB Off-Ramp Tully Road/Route 101 I/C. 207150

Ten Most Critical. C:207150W1.PLT By: dw 03-27-09 1:09am

#	FS
1	1.15
2	1.15
3	1.15
4	1.15
5	1.15
6	1.15
7	1.15
8	1.15
9	1.16
10	1.16

Label	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
SM	1	125	125	0	32	0	0	W1
Embnkmnt	2	125	125	250	32	0	0	W1
CL	3	125	125	1000	0	0	0	W1
SM	4	120	120	0	32	0	0	W1
CL	5	125	125	1200	0	0	0	W1

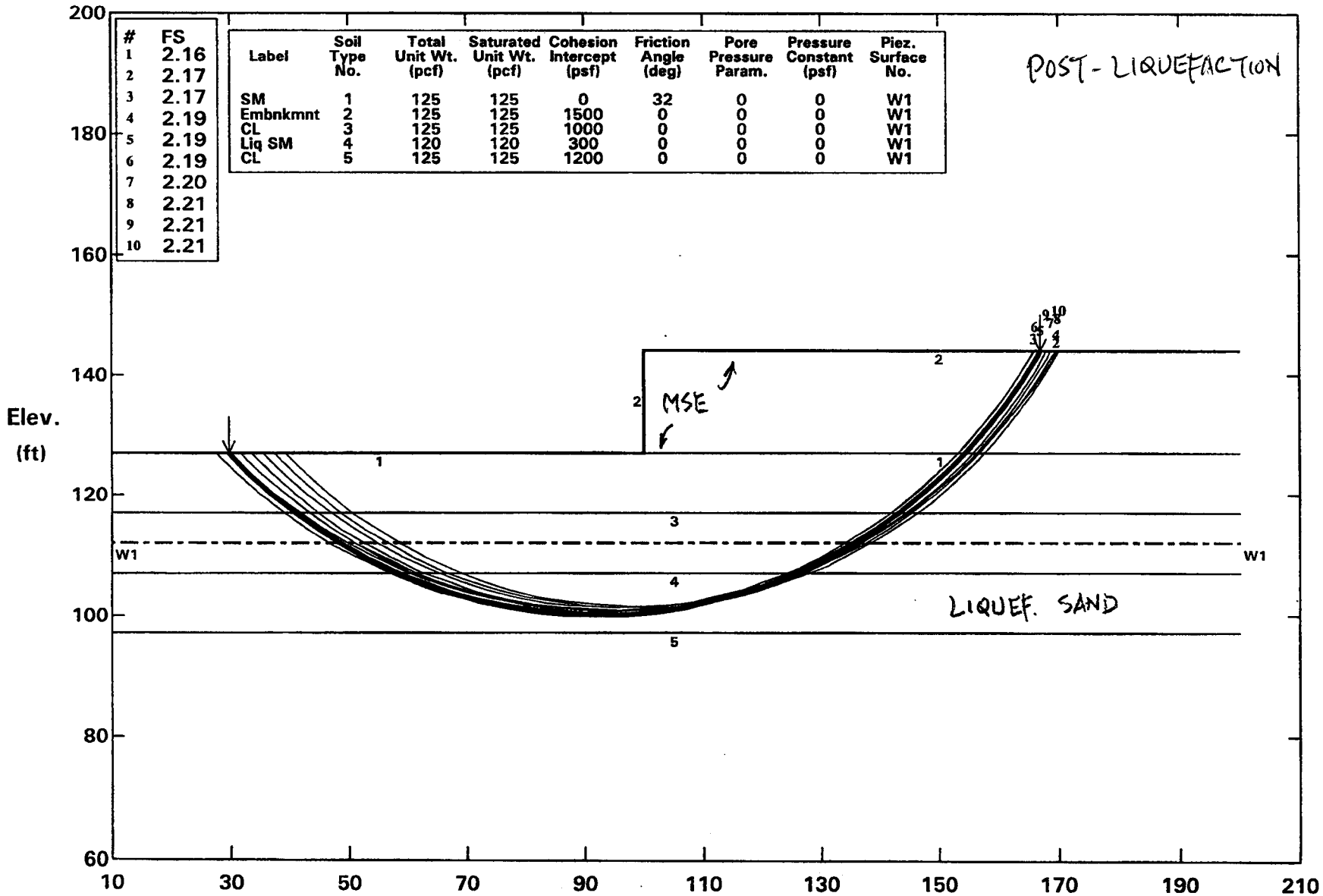
PSEUDO-STATIC (0.29)
– SEISMIC



PCSTABL5M FSmin = 1.15 X-Axis (ft)

MSE Retaining Wall at NB Off-Ramp Tully Road/Route 101 I/C. 207150

Ten Most Critical. C:207150W1.PLT By: dw 10-27-08 6:37pm



#	FS
1	2.16
2	2.17
3	2.17
4	2.19
5	2.19
6	2.19
7	2.20
8	2.21
9	2.21
10	2.21

Label	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
SM	1	125	125	0	32	0	0	W1
Embnkmnt	2	125	125	1500	0	0	0	W1
CL	3	125	125	1000	0	0	0	W1
Liq SM	4	120	120	300	0	0	0	W1
CL	5	125	125	1200	0	0	0	W1

PCSTABL5M FSmin = 2.16 X-Axis (ft)

APPENDIX D

OSFP Review Comment & Response Form

General Project Information	Review Phase	Reviewer Information
Dist: 04 EA: 1A9801 Project Name: Tully Road 101/OC OSFP Liaison: Emil Vergara Phone: 227-8360 e-mail: Emil_Vergara@dot.ca.gov	☐ PSR/PDS (Review No. _) ☐ APS/PSR (Review No. _) ☐ APS/PR (Review No. _) ☐ Type Selection ☒ 65% PS&E Unchecked Details ☐ PS&E (Review No. _) ☐ Construction Support ☐ Other:	Reviewer Name: Mohammad Zabolzadeh Functional Unit: GS Phone Number: (510) 286-4831 e-mail: Mohammad_Zabolzadeh@dot.ca.gov Date of Review: 01/06/08 09
	Structure Information (Use when necessary to document comments by individual structure) Structure Name: MSE Wall Br No: 37E-0044	

Consultant Information (to be filled in by Consultant)

Consultant Structure Lead (First and Last Name)	Structure Consultant Firm	Phone Number	e-mail	Response Date
Parikh				

#	Doc. (See Note 1)	Page, Section, or SSP	Review Comments	Consultant Responses	
1	FR	N/A	FR prepared by Parikh Consultants, Inc. dated 11/08.		
2	FR	Page 17	The proposed Earth Retaining Systems (MSE Retaining Wall) should be included in a separate report.	Complied.	
3	FR	N/A	C3-Not Approved, resubmit required		
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					

Note 1: Abbreviations for Typical Documents (if Abbr. is not below, type in the document type)					
P=Structure Plans	SP=Special Provisions	FR=Foundation Rpt	DC=Design Calcs	TS=Type Sel. Report	QCC=Quant. Check Calcs
RP=Road Plans	E=Estimate	H=Hydraulics Rpt	CC=Check Calcs	QC=Quant. Calcs	

✓ = Comment Resolved (for Reviewer's use)

OSFP Review Comment & Response Form

General Project Information	Review Phase		Reviewer Information
Dist: 04 EA: 1A9801 **Project Name: Tully Road 101/OC** **OSFP Liaison: Emil Vergara** **Phone: 227-8360** **e-mail: Emil_Vergara@dot.ca.gov**	☐ PSR/PDS (Review No. _) ☐ APS/PSR (Review No. _) ☐ APS/PR (Review No. _) ☐ Type Selection	☐ 65% PS&E Unchecked Details ☐ PS&E (Review No. _) ☐ Construction Support ☒ Other: MSE Wall Foundation Report	**Reviewer Name: M Zabolzadeh** **Functional Unit: GS** **Phone Number: (510) 286-4831** **e-mail:** **Mohammad_Zabolzadeh@dot.ca.gov** **Date of Review: 03/30/09**
	Structure Information (Use when necessary to document comments by individual structure) **Structure Name: Tully Rd OC MSE Wall** **Br No: 04-37E-0044**		

Consultant Information (to be filled in by Consultant)

Consultant Structure Lead (First and Last Name)	Structure Consultant Firm	Phone Number	e-mail	Response Date
Parikh				

#	Doc. (See Note 1)	Page, Section, or SSP	Review Comments	Consultant Responses	
1	FR	N/A	FR prepared by Parikh Consultants, Inc. dated 01/30/09.		
2	FR		Differential settlements due to the liquefaction potential including it's magnitude as well as its effect on the proposed MSE wall should be discussed in the report.	The potential ground settlement due to liquefaction is approx. six to seven inches. Typically differential settlement may be on the order of 50% of the total settlement. This settlement magnitude is tolerable for Caltrans standard MSE walls. In Caltrans District 4, we have seen previous MSE wall settlement data (Route 87– between Hedding Street and Route 880) on the order of 2 to 3 feet.	
3	FR		The computer printout of the stability analysis of the proposed MSE wall under seismic loading should be included.	A pseudo-static embankment stability analysis of the MSE wall is performed in accordance with Caltrans Guidelines for Structures Foundation Reports (v. 2.0, May 2006). The min. FS is greater than 1.1, and the system is considered to have adequate stability.	
4	FR	N/A	C3-Not Approved, resubmit requested.		

Note 1: Abbreviations for Typical Documents (if Abbr. is not below, type in the document type)					
P=Structure Plans	SP=Special Provisions	FR=Foundation Rpt	DC=Design Calcs	TS=Type Sel. Report	QCC=Quant. Check Calcs
RP=Road Plans	E=Estimate	H=Hydraulics Rpt	CC=Check Calcs	QC=Quant. Calcs	

✓= Comment Resolved
(for Reviewer's use)

OSFP Review Comment & Response Form

General Project Information	Review Phase		Reviewer Information
Dist: 04 EA: 1A9801 **Project Name: Tully Road/101 IC** **OSFP Liaison: Emil Vergara Jr.** **Phone: (916) 227-8360** **e-mail: Emil_Vergara@dot.ca.gov**	☐ PSR/PDS (Review No.) ☐ APS/PSR (Review No.) ☐ APS/PR (Review No.) ☐ Type Selection	☐ 65% PS&E Unchecked Details ☒ PS&E (Review No. 2) ☐ Construction Support ☐ Other:	**Reviewer Name: M Zabolzadeh** **Functional Unit: GS** **Phone Number: (510) 286-4831** **e-mail:** **Mohammad_Zabolzadeh@dot.ca.gov** **Date of Review: 4/20/2009**
	Structure Information (Use when necessary to document comments by individual structure) **Structure Name: Retaining Wall No. 1 (MSE)** **Br No: 37E0044**		

Consultant Information (to be filled in by Consultant)

Consultant Structure Lead (First and Last Name)	Structure Consultant Firm	Phone Number	e-mail	Response Date
David Wang	Parikh			

#	Doc. (See Note 1)	Page, Section, or SSP	Review Comments	Consultant Responses	
1	FR	N/A	FR prepared by Parikh Consultants, Inc. dated 03/30/2009.		
		General	Our previous comments dated 03/30/2009 are incorporated into the report.		
	C1		Approved as submitted		

Note 1: Abbreviations for Typical Documents (if Abbr. is not below, type in the document type)					
P=Structure Plans	SP=Special Provisions	FR=Foundation Rpt	DC=Design Calcs	TS=Type Sel. Report	QCC=Quant. Check Calcs
RP=Road Plans	E=Estimate	H=Hydraulics Rpt	CC=Check Calcs	QC=Quant. Calcs	

✓= Comment Resolved
(for Reviewer's use)

GEOTECHNICAL DESIGN & MATERIALS REPORT

US 101 IMPROVEMENTS
FROM I-280/680 TO YERBA BUENA ROAD
SANTA CLARA COUNTY, CALIFORNIA
04-SCI-101 31.8/34.3 EA 1A9801

For

HMH ENGINEERS
1570 Oakland Road
San Jose, CA 95131

PARIKH CONSULTANTS, INC.

356 S. Milpitas Blvd., Milpitas, CA 95035
(408) 945-1011

April 14, 2009 Job No. 207150.GDR

PARIKH
Practicing in the Geosciences

Geotechnical ■
Environmental ■
Materials Testing ■
Construction Inspection ■

HMH Engineers
1570 Oakland Road
San Jose, CA 95131

Job No.: 207150.GDR
April 14, 2009

Attn: Mr. Bill Wanger

Sub: GEOTECHNICAL DESIGN & MATERIALS REPORT
US 101 IMPROVEMENTS FROM I-280/680 TO YERBA BUENA ROAD
SANTA CLARA COUNTY, CA

Dear Mr. Wagner:

Transmitted herewith is the Geotechnical Materials Report for the subject project. The report was prepared in accordance with the scope of work outlined in our proposal.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning our findings or conclusions, please feel free to contact this office at (408) 452-9000.

Very truly yours,
PARIKH Consultants, Inc.

Y. David Wang for
Gary Parikh, P.E., G.E.
President

Attachment: Geotechnical Design & Materials Reports

"Approved as to impact on State facilities and conformance with applicable State standards and practices, and the technical oversight were performed as described in the California Department of Transportation A&E Consultant Services Manual."

Caltrans_____

Title_____

Date_____

Caltrans_____

Title_____

Date_____

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As-Built Log of Test Borings
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GEOTECHNICAL DESIGN & MATERIALS REPORT
U.S. 101 IMPROVEMENTS
FROM I-280/680 TO YERBA BUENA ROAD
SANTA CLARA COUNTY, CALIFORNIA
04-SCl-101 31.8/34.3 EA 1A9801

1. INTRODUCTION

This report presents the results of our geotechnical investigation for the proposed operational improvements on U.S. Route 101 between the junction of I-280/680 and Yerba Buena Road in the City of San Jose, California. The overall length of the project is approximately 3.9 miles. The general location of the project site and its limits are shown in Plate 1, Project Location Map.

The improvements will be constructed in two phases. Phase I improvements include widening southbound Route 101 and the Tully Road interchange. Phase II will include the improvements at the Capitol Expressway interchange and the Yerba Buena Road interchange ramps.

This report addresses the design of embankment, structural pavement sections, and corrosion investigation recommendations. The investigation included review of readily available soils and geologic literature pertaining to the site including as-built information and "Log of Test Borings" (LOTB) and pavement as-built data, site reconnaissance, obtaining representative samples and logging soil materials encountered in exploratory borings, laboratory testing of the representative samples, performing engineering analyses, and preparation of this report.

The purpose of this report is to document subsurface geotechnical conditions, provide analyses of anticipated site conditions as they pertain to the project described herein, and to recommend design and construction criteria for the project. This report also establishes a geotechnical baseline to be used in assessing the existence and scope of changed site conditions, if any.

The report is intended for use by the project roadway design engineer, construction personnel, bidders, and contractors for information and reference purposes only and should not be construed directly as project specifications.

Due to limitations inherent in geotechnical investigations, it is neither uncommon to encounter unforeseen variations in the soil conditions during construction nor is it practical to determine all such variations during an acceptable program of drilling and sampling for a project of this scope.

Such variations, when encountered, generally require additional engineering services to attain a properly constructed project. We, therefore recommend that a contingency fund be provided to accommodate any additional charges resulting from technical services that may be required during construction.

2. EXISTING FACILITIES AND PROPOSED IMPROVEMENTS

U.S. 101 is an 8-lane freeway with three mixed-flow lanes and one high-occupancy vehicle (HOV) lane in each direction within the study limits. The travel lanes measure approximately 12 feet wide with approximately 10 feet left and right shoulder widths. A concrete barrier divides the existing median, and the width from the center of the concrete barrier to the edge of traveled way is approximately 18 feet.

The project proposes to construct numerous operational and safety improvements on U.S. 101, in the City of San Jose, Santa Clara County, California. The project limits extend from the I-280/680 interchange on the north to the Yerba Buena Road interchange on the south. All of the proposed improvements would be constructed within the existing Caltrans right-of-way. The proposed overall improvements for two phases consist of the followings:

- Construct one additional lane in the southbound direction from south of Story Road interchange to the Yerba Buena Road interchange.
- Modify the U.S. 101/Tully Road interchange to a partial cloverleaf interchange and replace the existing Tully Road overcrossing.
- Modify the U.S. 101/Capitol Expressway interchange to a partial cloverleaf interchange.
- Extend the existing southbound auxiliary lane of U.S. 101 between the Tully Road and Capitol Expressway interchanges.
- Modify the collector-distributor (C-D) system on northbound U.S. 101 between Yerba Buena Road and Capitol Expressway and construct a new on-ramp from the C-D road to northbound U.S. 101 south of Capitol Expressway Overcrossing.
- Modify the southbound off-ramp from U.S 101 to Yerba Buena Road to remove the C-D road between Capitol Expressway and Yerba Buena Road, add an auxiliary lane between Capitol Expressway and Yerba Buena Road, and widen the Yerba Buena Road off-ramp to two lanes.

The current project phase is for improvements from 0.1 mile north of Capital Expwy OC to 0.3 mile south of Story Road OC. The Site Plans (Plates 2A through 2O) are included in this report to show the existing facilities, proposed improvements and boring locations.

3. PERTINENT REPORTS AND INVESTIGATION

In addition to the as-built information obtained from HMH Engineers, the following investigation reports were also reviewed to supplement the subsurface information obtained for the project during this study.

- PARIKH Consultants, Inc., August 2008 (Revised), "Foundation Type Selection Report, Tully Road Overcrossing (Bridge No. 37-0668)", prepared for HMH Engineers.

4. PHYSICAL SETTING

4.1 Climate

The climate in this area can be described as semi-arid (subtropical) which is generally characterized with moderate climatic conditions. The average temperatures range from 58 to 84 °F (14 - 29 °C) in summer and 42 to 59 °F (6 - 15 °C) during winter. Temperatures between night and day can vary by 30 to 40 °F (17 to 22 °C). The average annual rainfall is approximately 14.4 inches (366mm).

4.2 Topography and drainage

The topography within the project site along US Route 101 is mainly flat with slight grade increase from approximate Elevation of 105 ft at the north (Story Road) to approximate Elevation of 168 ft at the south (Yerba Buena Road). Some grade differences are noted due to roadway crossing and bridge embankment along the alignment. The existing approach embankments are approx. 20 to 25 feet high at Tully Road and Capital Expwy interchanges. The vicinity around the project area is mainly occupied by urban residential/commercial development. The site drainage is generally by sheet flow, or collected by local drainage systems.

4.3 Man-Made and Natural Features of Engineering and Construction Significance

The subject was considered and was determined to be not significant for the project.

4.4 Regional Geology and Seismicity

The project is located in the southern portion of the San Francisco Bay Area. The regional structure of the area is similar to the Northern California Coast Ranges, consisting of a complex series of northwest-trending synclines and anticlines with a number of northwest trending faults. In general, the Coast Range in this region is double chains of mountain running north-northwest. Between the two chains of mountain lies the basin of San Francisco Bay, including the valleys at the end of the Bay, Petaluma on the north and Santa Clara on the south. Three prominent geologic blocks dominate the San Francisco Area: the Santa Cruz Mountains (western block), San Francisco Bay (central block), and the East Bay Hills/Diablo range (eastern block).

The project site is located within a seismically active region. A Fault Map, showing the site location relative to the major active faults in the vicinity per Caltrans latest Seismic Hazard Map (2008 in-progress), is presented on Plate 4. Significant earthquakes, which have occurred in this area, are generally associated with crustal movements along well-defined active fault zones. Faults in the vicinity of the site with a moderate to high potential for surface rupture include the Hayward Fault zone (southeast extension), the Calaveras Fault zone, the Monte Vista-Shannon Fault zone, the Cascade Fault, and the Silver Creek Fault.

5. EXPLORATION

5.1 Drilling, Coring, and Sampling

Based on the preliminary plans, discussions with the design team, and readily available geotechnical data in the area, 48 borings were drilled at selected locations to depths ranging from 3 ft to 30 ft below the existing ground surface. A total of 41 pavement corings were also carried out within the project limits to determine the existing pavement thickness. Two Cone Penetration Tests (CPTs) were also performed to obtain continuous soil data at the Tully Road overcrossing.

- Borings 07-R-1 through 07-R-42 (with the exception of eight borings 07-R-8, 07-E/R-11, 07-R-21, 07-R-23, 07-R-29, 07-R-31, 07-E/R-32, and 07-E-39) were

drilled at shallow depth (approximately 3ft to 5ft) to collect bulk samples for pavement design;

- Three borings, namely 07-R-8, 07-E/R-11, and 07-E-39 were drilled in the vicinity of Tully Road Interchange for the design of new ramps, roadway, retaining walls, and an overcrossing structure replacement. These borings were drilled to approximate depth of 30 ft;

- Two CPT Tests, namely 07-BR-1 and 07-BR-2, were conducted in the vicinity of Tully Road Interchange for the design of an overcrossing structure replacement. The CPTs were advanced to approximate depth of 100ft and 108ft, respectively;

- Five borings, namely 07-R-21, 07-R-23, 07-R-29, 07-R-31, and 07-E/R-32 were drilled in the vicinity of Capitol Road Interchange for the design of new ramps and roadway. These borings were drilled to approximate depth of 30 ft;

- A total of 36 pavement corings were conducted along the southbound shoulder of Route 101 in the project vicinity; while five (5) corings/borings, namely 07-R-3, 07-R-5, 07-R-13, 07-R-16, and 07-R-27 were cored along the southbound median shoulder. These five median corings were drilled in combination with the borings to determine the existing thickness of the pavements.

Borings 07-R-1 through 07-R-42 (including the eight borings at the interchanges) were drilled by Exploration Geoservice Inc. of San Jose between 26 November and 17 December 2007 under the supervision of our field engineer. The borings were advanced using a truck-mounted rig using 8" hollow stem auger.

Selected samples were obtained from 2.5-inch I.D. (Modified California, MC) and 1.4-inch I.D. (Standard Penetration Test, SPT) samplers at various depths. The samplers were driven into subsurface soils under the impact of a 140-pound hammer having a free fall of 30 inches. The blow counts are presented on the Log of Test Boring (LOTB) in Appendix A. When correlating standard penetration data, the blow counts for the Modified California Sampler may be converted to equivalent SPT blow counts by multiplying a conversion factor of 0.65. The samples were sealed and transported to our laboratory for further evaluation and testing. The field investigation was conducted under the supervision of our field engineer who logged the test borings and prepared the samples for subsequent laboratory testing and evaluation. Table 1 below summarizes the locations and test results of the borings and median corings.

Gregg Drilling & In Situ, Inc. of Martinez, CA, performed the CPTs (Borings 07-BR-01 and 07-BR-02) on 14 and 17 December 2007. The CPTs were conducted using a 20-Ton capacity cone with a tip area of 15 cm^2 and a friction sleeve area of 225 cm^2. The soil resistance exerted to the tip and side of the cone were recorded and correlated to soil type, classification and strength characteristics. Selected samples were also obtained from CPT push samplers at various depths. The samples were sealed and transported to our laboratory for further evaluation and testing. Results of the six borings and 2 CPTs performed for the two interchanges are presented in the LOTB in Appendix A.

Pavement corings were drilled by Penhall Company Inc. between 26 and 28 of December 2007 under the supervision of our field engineer. The corings were advanced using an 8" diamond core. Aggregate base and subbase below the pavement were drilled by DL Drilling using a jeep-mounted auger drilling method. Table 1 summarizes the borings/corings location and near-surface soil data (R-value tests & Atterberg Limits). Tables 2 and 3 present a summary of the pavement coring locations and data. Photos of the pavement cores are attached in Appendix D.

The approximate locations of these explorations are shown on the attached Site Plans, Plates 2A through 2O.

5.2 Geologic Mapping

The subject was considered and was determined to be not significant for the project.

5.3 Geophysical Studies

The subject was considered and was determined to be not applicable to the project.

5.4 Instrumentation

The subject was considered and was determined to be not applicable to the project.

TABLE 1 - SUMMARY OF BORING/CORING LOCATIONS & SOIL DATA

Boring No.	Station (ft.)	Offset (ft.) - "E4" line	Date Drilled	Description	Remarks
07-R-1	1832+20	Lt. 80	11/26/2007	Dark brown gray Clayey Sand	PI=19, R=8

07-R-2	1819+00	Lt. 110	11/27/2007	Brown Lean Clay, trace Gravel	--
07-R-3	1805+50	Lt. 20	12/5/2007	Dk. Brown Lean Clay w/ Sand & Gravel	--
07-R-4	1796+00	Lt. 100	11/26/2007	Brown gray Clayey Sand w/ Gravel	PI=21, R=16
07-R-5	1786+10	Lt. 20	12/5/2007	Brown Lean Clay	--
07-R-6	1775+75	Lt. 90	11/26/2007	Dark Brown Lean Clay	PI=23, R=15
07-R-7	1769+30	Lt. 90	11/26/2007	Light Brown Lean Clay	PI=17, R =7
07-R-8	1763+00	Lt. 400	11/26/2007	Dark Brown Lean Clay	PI=17, R = 15
07-E-9	1764+00	Lt. 540	11/26/2007	Brown Lean Clay	--
07-R-10	1761+25	Lt. 960	11/27/2007	Dark Brown gray Lean Clay	PI=13, R=11
07-R/E-11	1761+00	Lt. 410	11/26/2007	Brown Lean Clay	PI=18, R=8
07-R-12	1757+25	Lt. 135	11/27/2007	Brown gray Sandy Silt	PI=16, R=9
07-R-13	1761+30	Lt. 5	12/5/2007	Brown Lean Clay	PI=19, R = 13
07-R-14	1747+00	Lt. 100	11/26/2007	Brown Lean Clay w/ Gravel	--
07-R-15	1736+50	Lt. 95	11/26/2007	Brown gray Clayey Sand w/ Gravel	PI=14, R=16
07-R-16	1727+50	Lt. 20	12/5/2007	Brown Lean Clay	--
07-R-17	1716+50	Lt. 100	11/26/2007	Dk. Brown gray Lean Clay w/ Sand & Gravel	--
07-R-18	1705+00	Lt. 75	11/26/2007	Dark Brown gray Clayey Sand	PI=16, R=9
07-R-19	1698+40	Lt. 190	11/26/2007	Light Brown Silty Clay	--
07-R-20	1693+20	Lt. 100	11/26/2007	Brown Lean Clay	PI=12, R =10
07-E-21	1692+25	Lt. 470	11/26/2007	Brown Lean Clay	--
07-R-22	1690+50	Lt. 900	11/26/2007	Brown gray Clayey Sand	PI=19, R=26
07-E-23	1690+25	Lt. 400	11/26/2007	Brown Lean Clay	--
07-R-24	1688+50	Lt. 120	11/26/2007	Dk. Brown gray Lean Clay w/ Sand & Gravel	PI=13, R=29
07-R-24A	1685+90	Lt. 120	12/17/2007	Brown Lean Clay	PI=12, R = 20
07-R-25	1675+25	Lt. 120	11/26/2007	Brown Lean Clay	--
07-R-26	1678+25	Rt. 130	11/26/2007	Dk. Brown gray Lean Clay w/ Sand & Gravel	PI=15, R<5
07-R-27	1684+85	Lt. 5	12/5/2007	Brown Lean Clay w/ Sand	PI=34, R = 12
07-R-28	1688+75	Rt. 120	11/26/2007	Dk. Brown Lean Clay w/ Sand & Gravel	--
07-E-29	1690+80	Rt.420	12/3/2007	Dark Brown Lean Clay	
07-R-30	1691+00	Rt. 920	11/27/2007	Dk. Brown Lean Clay w/ Sand & Gravel	--
07-R-31	1692+50	Rt. 120	11/27/2007	Dk. Brown Lean Clay w/ Sand & Gravel	PI=11, R=16
07-E-32	1693+20	Rt. 510	12/4/2007	Dk. Brown Lean Clay	PI = 15
07-R-33	1699+10	Rt. 80	11/27/2007	Brown Clayey Gravel w/ Fines	--
07-R-34	1712+80	Rt. 90	11/27/2007	Dk. Brown gray Clayey Sand w/ Gravel	PI=14, R=13
07-R-35	1746+75	Rt. 100	11/27/2007	Brown Lean Clay	--
07-R-36	1756+50	Rt. 120	11/27/2007	Dk. Brown gray Lean Clay	PI=16, R=8
07-R-37	1759+20	Rt. 430	11/27/2007	Dk. Brown Lean Clay	--
07-R-38	1761+50	Rt. 920	12/04/2007	Dk. Brown Lean Clay w/ Gravel	--
07-E-39	1763+40	Rt. 440	12/4/2007	Dk. Brown Lean Clay	
07-R-40	1765+00	Rt. 100	11/27/2007	Dk. Brown Lean Clay w/ Gravel	PI=20, R=12
07-R-41	1770+75	Rt. 90	11/27/2007	Dk. Brown Lean Clay w/ Gravel	--
07-R-42	1787+25	Rt. 75	11/27/2007	Dk. Brown Lean Clay	PI=14, R=13

TABLE 2 - SUMMARY OF SHOULDER CORINGS

Boring No.	Approx.	Approx. Offset	Date Cored	Approx. Existing Pavement Thickness (inches)**

	Station (ft)	From "E4" line (ft)		Asphalt Concrete (AC)	Aggregate Base (AB)	Aggregate Subbase (AS)
07-C-2	1825+00	Lt. 80	12/26/2007	6.25	10	11
07-C-3	1820+60	Lt. 80	12/26/2007	6.25	12	11
07-C-4	1815+00	Lt. 100	12/26/2007	5	20	--
07-C-6	1805+00	Lt. 90	12/26/2007	4.5	12	9
07-C-9	1790+00	Lt. 90	12/26/2007	4.5	12	11
07-C-11*	1778+50	Lt.80	12/26/2007	3"+1.5"	(11.5" PCC)	
07-C-12	1775+00	Lt. 70	12/27/2007	4.75	12	13.5
07-C-13A	1769+75	Lt. 80	12/27/2007	5	12	13.5
07-C-13B	1770+00	Lt. 120	12/26/2007	7	23	--
07-C-13C*	1771+00	Lt. 145	12/26/2007	2.25"+4.5"	10	13
07-C-14A	1763+50	Lt. 80	12/27/2007	5.5	12.5	13.5
07-C-14B*	1763+50	Lt. 110	12/28/2007	4.75"+9"	12	--
07-C-15A	1760+00	Lt. 80	12/27/2007	9	13	14.5
07-C-15B*	1760+00	Lt. 120	12/27/2007	4.75"+8"	9	10
07-C-16	1756+50	Lt. 80	12/28/2007	5.5	11.5	13.5
07-C-17A	1751+25	Lt. 80	12/28/2007	6.25	13	14.5
07-C-17B	1751+25	Lt. 110	12/26/2007	5.5	12	13
07-C-18	1745+00	Lt. 80	12/26/2007	5.5	13	12
07-C-19	1738+00	Lt. 90	12/27/2007	5	11	13
07-C-21	1730+00	Lt. 90	12/27/2007	5.25	12	13
07-C-23	1723+25	Lt. 80	12/27/2007	5	11	13
07-C-24	1715+00	Lt. 90	12/27/2007	5.5	10	12.5
07-C-25	1710+00	Lt. 80	12/27/2007	5.5	10	13
07-C-26	1705+00	Lt. 65	12/28/2007	6.5	15	--
07-C-26A	1702+00	Lt. 70	12/28/2007	6.25	10	13
07-C-26B*	1702+00	Lt. 120	12/27/2007	2"+7.5"	10	11
07-C-27	1700+00	Lt. 70	12/28/2007	6.5	10	16
07-C-28	1695+10	Lt. 80	12/28/2007	6.25	12	13.5
07-C-30	1685+00	Lt. 80	12/28/2007	7.5	11	13
07-C-32A	1676+00	Lt. 75	12/28/2007	7.75	12	13
07-C-32B	1673+60	Lt. 110	12/28/2007	11.25	12	10
07-C-33A	1759+40	Rt. 80	12/28/2007	5.5	12	13
07-C-33B*	1759+40	Rt. 110	12/27/2007	3.25"+3.5"	14	16
07-C-34A	1765+50	Rt. 80	12/28/2007	5.5	11	13
07-C-34B	1766+60	Rt. 100	12/27/2007	7.75	14	14
07-C-35	1687+55	Rt. 90	12/27/2007	4.5	12	13

* multiple layers of AC were recovered during coring
** transition between AB & AS is approximate due to field limitations

TABLE 3 - SUMMARY OF MEDIAN CORINGS

Boring No.	Approx. Station (ft)	Approx. Offset From "E4" line (ft)	Date Cored	Approx. Existing Pavement Thickness (inches)**			
				Asphalt Concrete (AC)	Portland Cement Concrete (PCC)	Aggregate Base (AB)	Aggregate Subbase (AS)
07-R-3	1805+50	Lt. 20	12/5/2007	9	8	-	5
07-R-5*	1786+10	Lt. 20	12/5/2007	2.5" + 4"	10.5	-	2
07-R-13	1761+30	Lt. 5	12/5/2007	6.5	-	10	7
07-R-16	1727+50	Lt. 20	12/5/2007	6	-	5	-
07-R-27	1684+85	Lt. 5	12/5/2007	5	-	10	7

* multiple layers of AC were recovered during coring
** transition between AB & ASB is approximate due to field limitations

5.5 Exploration Notes

The exploratory borings mainly encountered undivided surficial deposits. Drilling conditions using hollow stem augers were considered normal for this site.

6. GEOTECHNICAL TESTING

6.1 In-Situ Testing

In-situ testing consists of recording blow counts during sampling (using both Modified California sampler and Standard Penetration Test sampler) and performing CPTs in the field. Based on our previous experience, when correlating standard penetration data in similar soils, the blow counts for the Modified California Sampler may be converted equivalent SPT blow counts by multiplying a conversion factor of 0.65. Based on the average values of the SPT-N values for the soil materials encountered in the field exploration, the subsurface soils are classified generally as stiff cohesive soils with lenses of medium dense cohesionless soils. The in-situ test results are presented on the LOTB attached in Appendix A.

6.2 Laboratory Testing

Laboratory tests performed for the study include the following: Laboratory determination of Moisture-Density (California Test Method 226), Atterberg Limits (California Test Method 204), Grain Size Analysis (California Test Method 202), Unconfined Compression Test (California Test Method 221), R-value Test (California Test Method 301), Consolidation Test (California Test Method T219), and Corrosion Test (California Test Method 643). The laboratory test results are attached in Appendix B. Moisture-Density test and Unit Weight test results are summarized on the

LOTBs attached in Appendix A.

7. GEOTECHNICAL CONDITIONS

7.1 Site Geology

General geologic features pertaining to the site were evaluated by reference to the Map of Quaternary Geology of Santa Clara Valley, Santa Clara, Alameda, and San Mateo counties, California. (E.J. Helley, R. W. Graymer, G.A. Phelps, P.K. Showalter, and C.M. Wentworth, May 1994). Based on the map, the subsurface soils of the site consist mainly of Holocene Floodbasin Deposits (Qhb), Holocene Natural Levee Deposits (Qhl), and Pleistocene Younger Alluvial Fan Deposits (Qpaf1). A geologic map of the project vicinity is shown on Plate 3A. In addition to Plate 3A, excerpts of the Seismic Hazard Map prepared by California Geologic Survey (January 2001) are presented on Plate 3B which delineates the liquefaction potential area. Descriptions of the geologic units are as follows:

Qhl - Natural Levee Deposits (Holocene) - Loose, moderately to well-sorted sandy or clayey silt grading to sandy or silty clay. These deposits are porous and permeable and provide conduits for transport of ground water. Levee deposits border stream channels, usually both banks, and slope away to flatter floodplains and basins.

Qhb - Floodplain deposits (Holocene) - Medium to dark gray, dense, sandy to silty clay. Lenses of coarser material (silt, sand, and pebbles) may be locally present.

Qpaf1 – Younger Alluvial Terrace Deposits (Pleistocene) - Qpaf1 is the first Pleistocene alluvial terrace. Deposits consist of crudely bedded, clast-supported, gravels, cobbles, and boulders with a sandy matrix. Clasts as much as 35 cm in diameter are present. Coarse sand lenses may be locally present. Pleistocene terrace deposits are cut into Qpaf alluvial fan deposits a few meters and lie up to several meters above Holocene deposits. These terrace deposits are so similar in lithology and texture as to be almost identical. They are distinguished for mapping purposes on topographic position (the highest is the oldest), degree of dissection, and soil profile development. The highest terrace displays the thickest argillic B-horizon and the dark A-horizon (Mollic epipedon). Each terrace represents the cutting and filling of previous deposits.

7.1.1 Lithology

The site consists of native alluvial and roadway fill. The subject was considered and was determined to be not applicable for the project. Detailed description of subsoil conditions are presented in Section 7.2.

7.1.2 *Structure*

The site consists of roadway fill, native alluvial and fluvial soils, and embankments. The subject was considered and was determined to be not applicable for the project.

7.1.3 Existing Slope Stability

The slopes at the project site consist of man-made embankment slope at the existing bridge abutments of the interchanges. No other major slopes are present within the project limit. These existing slopes typically have gradient of 2H:1V or flatter, covered with vegetations, and generally appear to be in good condition.

7.2 Subsurface Soil Conditions

Based on the boring data and the as-built LOTB, the subsurface soil conditions of the site generally consist of varying thickness of firm to stiff clay and interbedded medium dense sand lenses to the maximum depth explored (30 feet below existing grade). The CPT data obtained at Tully Road OC also indicate layers of silty fine sand/sandy silt and clay in the upper 50 feet (below Route 101 grade). Based on the typical SPT-N values for the soil materials encountered in the field exploration, the subsurface soils generally consists of firm to stiff and hard cohesive soils and medium dense silty sand. The SPT-N values were typically on the order of 7 to 34. The in-situ test results are presented on the LOTB in Appendix A.

Detailed descriptions of the materials encountered in the exploratory borings are presented in the LOTB in Appendix A “Log of Test Borings”. It should be noted that these descriptions and related information depict subsurface conditions only at the locations indicated and on the particular date noted on the LOTB. Because of the variability from place to place within soil/rock in general, subsurface soil conditions at other locations may differ from conditions occurring at the locations

explored. The abrupt stratum changes shown on the logs may be gradational and relatively minor changes in soil types within a stratum may not be noted due to field limitations. Also, the passage of time may result in a change in the soil conditions at the locations due to environmental changes.

7.3 Water

7.3.1 *Surface Water*

The terrain along Route 101 slightly slopes downward from southeast to northwest. The surface water/drainage generally follows the ground topography and is collected in local storm drainage system.

7.3.1.1 *Scour*

The subject was considered and was determined to be not applicable for the roadway project.

7.3.1.2 *Erosion*

The existing slopes have established landscaping to help control erosion. The subject was considered and was determined to be not applicable for the project.

7.3.2 *Groundwater*

Groundwater was encountered in borings 07-E/R-11 and 07-R-8 during drilling at approximate elevations of 112.5 to 114 ft, respectively. Groundwater was also estimated during CPT tests at 07-BR-1 and 07-BR-02 with approximate elevations of 112 and 114 ft, respectively. Groundwater was encountered at elevations of 105 ft to 108 ft from Caltrans as built plan for Tully Road O/C (1961). For design, it is recommended that the groundwater level be assumed at Elev. 115 ft (at 15-ft depth below existing Route 101 level) at Tully Road Interchange area. At the Capitol Expwy vicinity, no groundwater was encountered to the maximum depth explored (i.e. 30 ft) in the borings. It is anticipated that groundwater level will vary with the passage of time due to seasonal runoff, groundwater fluctuations, surface and subsurface flow, ground surface run-off, and other factors that were not existent at the time of investigation.

7.4 Project Site Seismicity

7.4.1 *Ground Motions*

The project is located in a seismically active part of northern California. Many faults exist in the San Francisco Bay Area are capable of producing earthquakes that may cause strong ground shaking at the site. The attached Fault Map (Plate 4) presents the locations of the fault systems relative to the project site.

The maximum earthquake magnitudes (Mmax) for some of the major faults in the area determined by Caltrans latest Seismic Hazard Map (2008 in-progress) are summarized below. These maximum credible earthquake magnitudes represent the largest earthquakes that could occur on the given fault based on the current understanding of the regional tectonic structure.

TABLE 4 - EARTHQUAKE DATA

Fault	Estimated Closest Distance to the Project Area (km)	Maximum Earthquake Magnitude
Hayward (strike-slip)	6.1	6.8
Calaveras (strike-slip)	10.2	7.4
Monte Vista–Shannon (reverse)	7.2	6.7
Cascade (reverse)	7.2	6.9
Silver Creek (reverse)	< 1	7.1

7.4.2 *Ground Rupture*

The Silver Creek fault is in close proximity, but the fault is buried with thick alluvial soil. A separate study is performed regarding the Silver Creek Fault trace and potential rupture for structure design.

8. GEOTECHNICAL ANALYSIS AND DESIGN

8.1 Dynamic Analysis

8.1.1 *Parameter Selection*

Based on recent discussion with Caltrans, Caltrans is currently updating the seismic design criteria. The 1996 Seismic Hazard Map and fault database are being revised. The in-progress fault database incorporates primarily current CGS and USGS works of state-of-practice. The new database includes a new fault, the Silver Creek Fault, in the project vicinity (within 1 km) which was not

considered in the 1996 Map. Caltrans has indicated that the Silver Creek fault should be used in design of the Tully Road/Route 101 project.

In addition to updating the SHM and fault database, Caltrans also adopted new procedures for the development of response spectra for structure design. These procedures incorporate both deterministic and probabilistic criteria. The Next Generation Attenuation (NGA) models (2008) are used for deterministic assessment (with a revised late-Quaternary age fault database), and the USGS (2008) 5% in 50-year hazard maps are used for probabilistic assessment. Per our understanding, the minimum design requirement of the new tool is based on deterministic spectrum of a "M6.5 earthquake at 12 km" event. These spectra are enveloped and the largest values are used.

Based on communication, collaboration, and information provided by Caltrans, we have developed the ARS Design curve per Caltrans 2008 criteria. For the on-site alluvial soils, a shear wave velocity (Vs30m) of 270 m/sec (approx. 900 ft/sec) was adopted. Both directivity and basin effect were considered. The ARS curve, as shown on Plate 5, has been submitted and approved by Caltrans.

8.1.2 *Analysis*

Stability analysis of the embankment slope was performed using Program Slope/W. The results of slope stability analyses are included in Appendix E. Stability of the embankment slopes were judged to be adequate.

8.1.3 *Liquefaction Potential*

Liquefaction is a phenomenon in which saturated cohesionless soils are subject to a temporary but essentially total loss of shear strength under the reversing, cyclic shear stresses associated with earthquake shaking. Submerged cohesionless sands and silts of low relative density are the type of soils, which usually are susceptible to liquefaction. Clays are generally not susceptible to liquefaction.

The evaluation of liquefaction susceptibility is based on CPT investigation in accordance with current geotechnical practice (Youd, et al, 2001). While carrying out the liquefaction analysis, we

also reviewed the obtained soil samples and the specific laboratory testing. We also referenced the latest research of geotechnical engineering regarding Liquefaction Susceptibility of Fine-Grained Soils (Bray, et al 2004).

Recent advances in soil liquefaction engineering (Seed, et al. 2003 and Bray, et al. 2004) indicated that soils with sufficient fines content and fine-grained soils are also susceptible to liquefaction. A framework consisting of comparing Atterberg Limits (LL & PI) with natural water content (Wc) of the soils appears to be robust for evaluating liquefaction susceptibility of soils with sufficient fines and fine-grained soil. Bray, et al. (2004) suggested loose soils with PI<12 and Wc/LL >0.85 were susceptible to liquefaction, and loose soils with 12<PI<18 and Wc/LL>0.8 were systematically more resistant to liquefaction.

Per Bray's et al (2004) criteria, the silt material encountered in BR-1 (21- to 27-ft) with LL = 27, PI = 6 and Wc = 24% (Wc/LL = 0.89) is subject to liquefaction potential. The underlying Lean Clay with LL = 39 & PI = 19 is not liquefiable. In BR-2, Sample #8 at 48 ft (silt layer with LL = 31, PI = 7, Wc = 29% and Wc/LL = 0.94) also fits Bray's et al (2004) criteria of liquefaction susceptibility. In BR-1, liquefaction susceptibility was indicated at the silt-silty sand layer (approx. 21 to 27 ft) and silty sand-sand layer (approx. 42 to 49 ft). In BR-2, liquefaction susceptibility was indicated at approx. 22 to 34 ft (sand & silt mix with some clay interbedded) and at approx. 44 to 48 ft. The liquefaction susceptible layers indicated in BR-1 & BR-2 are reasonably consistent although the layer thickness has some variation. In addition, these layers also correlate with as-built B-4 (Caltrans 1961), which indicates slightly compact silty fine sand layer (approx. Elev. 107-97 ft) and slightly compact fine sand layer (approx. Elev. 85-75 ft). Therefore, from a practical design standpoint, it is recommended that the generalized soil profile for design consider liquefaction susceptible layers at 20-30 ft depth and 40-50 ft depth to account for some variations in the field. The CPT liquefaction analysis results are attached in Appendix E.

Although the low plasticity silt is still subject to liquefaction susceptibility, the settlement and deformation potential is lower than "sand". Per Bray, et al (2004), the low plasticity silt may dilate during shear once liquefaction is triggered and may undergo a transient loss of strength (cyclic mobility with limited flow deformation).

8.1.4 *Post-Liquefaction Settlement*

The potential for liquefaction may also induce ground settlement during a seismic event. We have reference both Tokimatsu and Seed (1987) and Ishihara and Yoshimine (1992) for estimation of post-liquefaction settlement. These references correlate post-liquefaction volumetric strain to cyclic stress ratio (CSR), SPT-N values, cone tip resistance, relative density, etc. These empirical references provide a general guide about the order of settlement magnitude. Based on the CPT data and as-built SPT-N values (12 to 14 typical), a volumetric strain of about 3 to 4% is estimated. Considering there are silt and some clay interbedded in the layers, we exercised judgment and adopted 3% volumetric strain for the total thickness of 20 ft for settlement estimation. It is estimated that the post-liquefaction settlement may be on the order of six to seven inches.

In our opinion, the liquefaction potential along the project is generally moderate to high. The impact of the post-liquefaction settlement on the roadway, however, should be relatively small because:

- The potentially liquefiable soil layers are generally covered by predominantly cohesive soils, which tend to serve as a "soil mat" and should reduce the potential impact of liquefaction. The anticipated magnitudes of ground settlements are tolerable for the roadway and planned MSE wall.

- The post-liquefaction settlement probably would be random and localized and could spread out over some distance/area.

The post-liquefaction settlement may induce down drag on the piles at the abutments and bents of the proposed Tully Road overcrossing replacement. The foundation design needs to consider the impact of liquefaction and additional down drag loads due to liquefaction. The effect of post-liquefaction settlements and associated down drag load have been considered in foundation design of the Tully Road overcrossing (Br. No. 37-0668). A foundation report is prepared separately.

8.2 Cuts and Excavations

Based on the plans and profiles provided to us, no major cuts and excavations are planned for the project.

8.2.1 Stability

The subject was considered and was determined to be not applicable for the project.

8.2.2 *Rippability*

Based on the investigation, rippability does not appear to be a concern for construction.

8.2.3 Grading Factor

The on-site native soil meeting the project specifications may be used as engineered fill. For preliminary estimate, a grading factor of 0.9 may be assumed for the import materials based on our previous experience.

8.3 Embankments

8.3.1 Embankment Settlements & Settlement Monitoring

Embankments are required at the abutments for the proposed modification of Tully Road interchange. Based on discussion with the design team, a maximum embankment height of 25 feet is expected. The new approach embankments will abut existing embankments. The existing profile along Tully Road will be raised, and up to 14 feet of new fill anticipated on top of existing approach embankments.

The boring data indicates that the subsurface soil conditions generally consist of clay near the surface with interbedded layers of medium dense sand. Based on results from CPT 07-BR-1, the clay layers were considered in the settlement analysis. The evaluation of the consolidation settlements under the new fill was based on the consolidation test results, understanding of the consolidation behavior of the clay and empirical correlations in the literatures. Based on the results of the settlement analyses, the consolidation settlements are estimated to be on the order of 2 to 3 inches and are in the overconsolidated/elastic range. A 30-day settlement period is recommended for ground adjustment under the 25-foot embankment.

Although 25 ft of embankment is planned, the new embankment is going to abut the existing approach fill and on top of exiting side slopes. Also, the site subsoils consist of an upper clayey/silty layer with Su = 1 to 1.2 ksf per CPT data at the two abutment areas. Since fill placement and compacting still take time, we feel that a normal earthwork sequence, say, limit to approx. 2 feet of new fill placement per day may suffice. We do not see a need to further break the embankment construction into two stages.

It is recommended that settlement platforms be installed and settlement be monitored per California Test 112. As a common practice, this is typically handled by the project Resident Engineer. It is recommended that a minimum of 3 to 4 settlement platforms be installed per abutment since earthwork and construction equipment tend to destroy some platforms during fill placement.

8.3.2 Evaluation of Embankment Stability

For fill slopes, based on the slope height, slope gradient, ground and subsoil conditions, stability analyses were performed on the embankment slope (with maximum height of about 25 ft) at the proposed Tully Road Interchange. Based on the results of the stability analyses, the stability of the proposed fill slopes appears reasonable with minimum factor of safety >1.3 under liquefaction condition. The results of the stability analyses and the strength parameters adopted in the stability are included in Appendix E.

8.3.3 Existing utilities under the proposed Embankment

Based on the plans and site reconnaissance, there are existing utilities underneath the existing embankments. These utility lines shall be protected and preserved during construction and/or relocated.

8.4 Earth Retaining Systems

8.4.1 MSE Retaining Wall

It is our understanding that due to right-of-way and other geometric constraints, a MSE retaining wall is proposed at NB off-ramp"TR4" Line (southeast quadrant) with wall height ranging from 5 to 17 feet. Based on the boring data in the general project vicinity, the material anticipated at the wall

subgrade may consist of medium dense sandy material overlying stiff clays. The design of MSE wall should follow Caltrans 'Bridge Design Aids' with the following guidelines:

Loading Condition	= 1	(assuming level ground on top of slope)
Friction Angle	= 34°	(backfill)
Soil Unit Weight	= 125	pcf

The recommended minimum base width for the MSE wall vary with the height of the embankment and should be in accordance with the tables listed in Caltrans 'Bridge Design Aids'. It is recommended that the pressure exerted on the foundation soils be limited to 3000 psf.

Per Caltrans comments and past experience with the MSE walls, for the areas where the shoulder is PCC and a concrete barrier will be mounted on the MSE wall, Caltrans recommends (regardless of the height of the wall) the length of the reinforcement of the top panel be about 20% to 30% longer than the rest of the reinforcements. This is because the top reinforcement may not have sufficient overburden to withstand the weight of the concrete barrier and the top panel tends to start leaning afterwards.

The wall settlement under approx. 16-foot wall height is estimated on the order of 2 inches and in the over-consolidated/elastic range. We believe the settlement is tolerable and acceptable for MSE system. It is recommended that a 30-day settlement period be adopted for earthwork/wall construction. The potential post-liquefaction settlement is approx. 6 to 7 inches. Typically differential settlement may on the order of 50% of the total settlement. This settlement magnitude is tolerable for Caltrans standard MSE walls. In Caltrans District 4, we have seen previous MSE wall settlement data (Route 87-between Hedding St and Route 880) on the order of 2 to 3 feet.

The stability of the MSE wall under long-term, pseudo-static, and liquefaction conditions were evaluated. A residual soil strength (Sr) of 300 psf was adopted for the sand layer between 20- and 30-foot depths under liquefaction condition. Based on the evaluation, the stability of the MSE wall is acceptable. The obtained minimum FS is about 1.95 for long term case, 1.15 for seismic/pseudo-static case, and 2.16 for post-liquefaction case, respectively. A foundation report for the MSE wall was prepared separately.

8.4.2 Temporary Retaining Wall

It is anticipated that temporary retaining walls are required at Tully Road for stage construction. These walls are to support the embankment during construction while maintaining existing traffic on Tully Road. The anticipated maximum wall height is approx. 14 feet. The selection of wall type, design, and construction should be the contractor's responsibility. Temporary retaining wall is a design-build system by the contractor. We understand that Caltrans has many pre-approved wall systems. Based on our experience, temporary retaining walls of MSE type, such as welded wire wall, have been commonly used in District 4.

8.5 Culverts

8.5.1 *Corrosion Investigation*

The corrosion investigation for this project was performed in general accordance with the provisions of California Test Method 643. Chemical tests were performed on two soil samples, namely from Borings 07-R-11 and 07-R/E-29, to evaluate the corrosion potential of the subsurface soil. A summary of the corrosion test results is presented in Table 5.

TABLE 5 - SUMMARY OF CORROSION TEST RESULTS

Boring No.	Station & Offset	Depth (ft)	Min. Resistivity (ohm-cm)	pH	Sulfate (ppm)	Chloride (ppm)
07-R-11	"E4" Sta. 1761+00, 410 Lt (Tully Rd I/C)	5	1130	8.18	141.4	86.6
07-R/E-29	"E4" Sta. 1690+80, 420 Rt. (Capital Expwy I/C)	4.5	480	8.90	160.3	506.8

For selection of pipe material for culvert and storm drain applications, it is our understanding that AltPipe computer program is used by Caltrans to assist designers. AltPipe program is a web-based tool (http://dap1.dot.ca.gov//design/altpipe/) and updates and supersedes the previous CULVERT 4 program. The computations performed by AltPipe are based on the procedures and California Test Methods described in Chapter 850 of the Caltrans Highway Design Manual (HDM). AltPipe incorporates current requirements from the HDM supplemented by Caltrans Design Information Bulletin No. 83 (D.I.B. No. 83, June 30, 2003) for abrasion potential for material selection.

The AltPipe program is intended for final design by the civil or hydraulic designer. In addition to soil corrosivity data, the input requires data such as Abrasion Level, 2-5 year Flow Velocity, and height of cover that should be determined while finalizing the drainage design.

8.6 Bore-and-Jack Operation

Per information provided by the designer, the drainage system includes a jacked 42-inch diameter RCP at approx. Sta. 1758+60 ("E4" Line; Tully Road interchange) below existing Route 101. The location is about 250 ft just south of Tully Road OC. The existing grade is at approx. Elev. 130 ft, the planned invert is at Elev. 122.0 to 122.7 ft, and the recommended Design Groundwater level is at Elev. 115 ft (approx. 15-ft depth below Route 101 grade). The drainage system also includes a jacked 48-inch diameter RCP under Tully Road at approx. TR 52+40. The existing grade is approx. Elev. 144, the proposed grade is approx. Elev. 151, and the planned invert is 121.5 ft. Per boring data, the jacking operation probably will encounter the upper sand/silt mixed with clay. Based on the boring data, the site appears to fit "Nongassy" category of OSHA's classification. The bore-and-jack operation requires construction of jacking and receiving pits that should be shored.

Groundwater Control. If groundwater is encountered after excavating the jacking and receiving pits, temporary, controlled dewatering should be implemented to maintain reasonably dry working conditions. Groundwater levels may change with time. Therefore, the contractor should satisfy himself with the prevailing conditions and obtain additional information if needed to design the required dewatering method. Developing and implementing an effective dewatering program should be the contractor's responsibility. The dewatering system should prevent pumping soil fines with the discharge water. If soil fines are pumped, failure of shoring, partial instability of excavation bottom resulting in intolerable settlement and unsafe working conditions may occur.

The work should conform to applicable provisions of Section 65-1.05 of Caltrans Standard Specifications. It is the contractor's responsibility to protect the existing Route 101 for the bore-and-jack operation. We recommend the following:

- Bentonite slurry may be used as a lubricant during the jacking operation. The lubricant slurry should not be allowed to advance ahead of the pipe.
- The annular space around the outside of the pipe shall be cement grouted upon completion of the jacking operation.
- Settlement hubs should be placed across the jacking lines prior to commencement of the operation. The hubs should be placed and monitored prior to and during the entire operation.

Lateral Design. It is anticipated that the shoring system may consist of sheet piles for the jacking and receiving pits. Lateral earth pressures for internally braced shoring system are presented on Apparent Lateral Earth Pressures for Shoring, Plate 6. Additional lateral load due to relevant traffic and construction operations should be included for design. The lateral load may be assumed at 40% of the total vertical surcharge load. For passive design, an equivalent fluid pressure of 350 pcf may be used with a maximum passive resistance of 2400 psf below the base of excavation. A minimum FS of 1.5 is recommended. The contractor should provide his design-build system for the shoring work. It is the contractor's responsibility to select the type of shoring system, the design, and the performance of the system.

The pressure exerted by the reaction block on the surrounding soils should not exceed a horizontal bearing capacity of 2000 psf. The reaction block should be properly designed to uniformly distribute the jacking thrust to the jacking pit shoring system.

8.7 Overhead Sign Foundations

There are four overhead signs planned for the project. The design uses Caltrans standard plans for Post Type VIII sign foundations. This standard plan includes 5-ft dia. CIDH concrete piles of 25 ft long. The boring data generally indicate stiff clays and silts mixed with some sand in the upper 20 ft. We believe the standard sign foundations are feasible. However, due to concern of liquefaction at 20- to 30-ft depth per CPT data and analyses, it is recommended that the sign CIDH foundations be extended to at least 35 ft deep to pass the liquefaction zone.

Construction Considerations. Caltrans standard specifications and standard special provisions (SSP) for "Cast-in-Place Concrete Piling" should be used for the construction of CIDH piles. It is expected that groundwater will be encountered during construction, and "dry" condition as per the standard specifications Section 49-4 could not be maintained.

Vertical inspection pipes for acceptance testing should be provided in all CIDH piles that are 24 inches in diameter or larger, except when the holes are dry or when the holes are dewatered without the use of temporary casing to control groundwater. The acceptance test should include Gamma-Gamma Logging and may also include crosshole sonic logging. Gamma-Gamma Logging should be

performed in accordance with California Test 233 Standard (CT233) to check the homogeneity of CIDH piles. CT233 defines pile rejection criteria based on the statistical principles of mean and three standard deviations to analyze the homogeneity of a pile. Anomalies detected should be evaluated by the designer for their significance and potential impact on design and to see if mitigation plans are required. Details of the acceptance testing and Gamma-Gamma Logging are contained in Caltrans SSP and CT233.

Due to the presence of granular material and groundwater, raveling or caving is expected which may require additional drilling and cleaning effort and may increase the concrete volume for the piles. It is prudent to make the contractor aware of these conditions so that he takes appropriate steps to comply with the standards and maintain the integrity of the CIDH piles. The use of temporary steel casing should be anticipated at all times to maintain the integrity of the piles. Prior to construction, the qualifications and previous work experience of the potential sub-contractors should be reviewed. The intent is to help select qualified contractors to reduce construction issues.

All piles excavations should be observed by the geotechnical engineer or regulatory agency prior to the placement of reinforcement and concrete so that if conditions differ from those anticipated, appropriate recommendations can be made.

9. STRUCTURAL PAVEMENT

R-value tests were conducted on representative samples collected at proposed subgrade level. The test results are summarized in Table 6.

TABLE 6 - SUMMARY OF R-VALUE TEST RESULTS

Boring No.	Station (ft.)	Offset (ft.) From "E4" line	Date Drilled	Description	R-value
07-R-1	1832+20	Lt. 80	11/26/2007	Dark brown gray Clayey Sand	8
07-R-4	1796+00	Lt. 100	11/26/2007	Brown gray Clayey Sand w/ Gravel	16
07-R-6	1775+75	Lt. 90	11/26/2007	Dark Brown Lean Clay	15
07-R-7	1769+30	Lt. 90	11/26/2007	Light Brown Silty Clay	7
07-R-8	1763+00	Lt. 400	11/26/2007	Dark Brown Lean Clay	15
07-R-10	1761+25	Lt. 960	11/27/2007	Dark Brown gray Lean Clay	11
07-R/E-11	1761+00	Lt. 410	11/26/2007	Brown Lean Clay	8

Boring No.	Station (ft.)	Offset (ft.) From "E4" line	Date Drilled	Description	R-value
07-R-12	1757+25	Lt. 135	11/27/2007	Brown gray Sandy Silt	9
07-R-13	1761+30	Lt. 5	12/5/2007	Brown Lean Clay	13
07-R-15	1736+50	Lt. 95	11/26/2007	Brown gray Clayey Sand w/ Gravel	16
07-R-18	1705+00	Lt. 75	11/26/2007	Dark Brownish gray Clayey Sand	9
07-R-20	1693+20	Lt. 100	11/26/2007	Brown Lean Clay	10
07-R-22	1690+50	Lt. 900	11/26/2007	Brown gray Clayey Sand	26
07-R-24	1688+50	Lt. 120	11/26/2007	Dk. Brown gray Lean Clay w/ Sand & Gravel	29
07-R-24A	1685+90	Lt. 120	12/17/2007	Brown Lean Clay	20
07-R-26	1678+25	Rt. 130	11/26/2007	Dk. Brown gray Lean Clay w/ Sand & Gravel	<5
07-R-27	1684+85	Lt. 5	12/5/2007	Brown Lean Clay w/ Sand	12
07-R-31	1692+50	Rt. 120	11/27/2007	Dk. Brown Lean Clay w/ Sand & Gravel	16
07-R-34	1712+80	Rt. 90	11/27/2007	Dk. Brown gray Clayey Sand w/ Gravel	13
07-R-36	1756+50	Rt. 120	11/27/2007	Dk. Brown gray Lean Clay	8
07-R-40	1765+00	Rt. 100	11/27/2007	Dk. Brown Lean Clay w/ Gravel	12
07-R-42	1787+25	Rt. 75	11/27/2007	Dk. Brown Lean Clay	13

Based on the test results, the R-values of the subgrade soils along the southbound shoulder (i.e. 07-R-1 to 07-R-24A) ranged between 7 and 29. An R-value of 7 is selected for the pavement design at the southbound section between Story Road and Capitol Expwy Interchange. The recommended minimum R-value for Class 3 Aggregate Base (AB) is 78 and Class 4 Aggregate Subbase (AS) is 50. Fill material to be placed within 4 feet of the finished pavement subgrade should have a minimum R-value of 15.

According to the results from pavement coring (Table 2), the existing pavement sections along the southbound shoulder of Route 101 within the project limit generally consist of Asphalt Concrete (AC) over Aggregate Base (AB) over Aggregate Subbase (AS); and AC over AB. The coring results indicated that the pavement section along the southbound median of Route 101 generally consist of AC over AB over AS; or AC over Portland Cement Concrete (PCC) over AS; or AC over ASB. Details of the coring results are listed in Tables 2 & 3 (Section 5.1) and photos of the cores retrieved are attached in Appendix D. The thicknesses of the AB and AS are only approximate as transition between AB & AS cannot be well defined due to field limitations.

Based on the Traffic Index (T.I.) provided by the designer, lane 1 of US 101 was assigned with a TI

of 12, while an index of 14 was assigned to lane 4. A TI of 10 was assigned for the on-off ramps. The design TI on the city street (Tully Road) was assumed a range (8, 9, and 10) for analysis.

Discussion on Expansiveness & Subgrade Treatment. Per Atterberg Limits tests data of the near surface materials, the on-site soils generally have low to moderate plasticity (PIs are generally between 10 and 20). The relatively low R-value is mainly because of the fine material (silt and lean clay). Actually some R-values are in the range of 10 to 15 as shown in Table 6, and we selected the minimum value for design to be on the conservative side. In our experience, the concern of expansiveness is not significant at the site. For rigid pavement option, since the design R-value is less than 10 (Type 3 subgrade), it has been recommended to over-excavate and replace with one foot of Aggregate Subbase below pavement subgrade for treatment to improve to Type II subgrade.

Based on the provided TI's and utilizing Caltrans HDM procedures (Section 600, July 1, 2008), the structural pavement sections are presented in Tables 7A to 7C. The designer also indicates that the NB off-ramp nose area will receive overlay of 0.25' HMA. The pavement sections at the NB off-ramp (existing sections of 0.45' AC, 0.67'CTB & 1.08 AS) will be changed to 0.55' HMA, 0.75' AB & 1.20' AS. The Gravel Equivalent values were verified by the designer (as shown in Appendix E-4). The analysis of as-builts indicates that the existing GE is close to the design GE.

10. MATERIAL SOURCES

There are several commercial sources of asphalt, concrete, and aggregate products in the area. Table 8 lists available commercial suppliers in the area.

TABLE 8 - SOURCES OF ASPHALT AND AGGREGATE MATERIAL

Source	Location	Approx. Haul Dist. (one way, miles)
All American Paving	San Jose, CA 95113	4.6
Bay Area Asphalt & Cement Works	545 Nipper Avenue, San Jose, CA 95133	4.8
Reed & Graham, Inc.	690 Sunol St, San Jose, CA 95126	5.2
Bond Pavement Solutions Inc.	1063 Camino Ricardo, San Jose, CA 95125.	6.0
Granite rock - San Jose Road Materials and Asphalt Plants	11711 Berryessa Road, San Jose, CA 95133	6.1
Asphalt Maintenance Systems Inc.	1607 Terminal Avenue, San Jose, CA 95112	6.7
Heriberto Lopez Concrete	San Jose, CA 95123.	6.8

TABLE 7A - STRUCTURAL PAVEMENT SECTIONS (HIGHWAY LANES)

Location	R - Value	TI	Structural Pavement Section								
			Option 1				Option 2	Option 3 **			
			HMA (ft)	ATPB* (ft)	LCB (ft)	AS (ft)	Full Depth (ft)	JPCP (ft)	LCB/ HMA-A (ft)	AS (ft)	Subgrade Treatment
Story Road to Tully Road Interchange	7	12 (Lane #1)	0.65	--	0.60	1.45	1.60	0.85	0.40	0.60	1.00 ft AS
		14 (Lane #4)	0.70	--	0.70	1.70	1.90	0.95	0.50	0.70	1.00 ft AS
		14 (Lane # 4)*	0.70	0.25	0.50	1.70	1.90	0.95	0.50	0.70	1.00 ft AS
Tully Road to Capitol Expwy Interchange	7	12 (Lane #1)	0.65	--	0.60	1.45	1.60	0.85	0.40	0.60	1.00 ft AS
		14 (Lane #4)	0.70	--	0.70	1.70	1.90	0.95	0.50	0.70	1.00 ft AS
		14 (Lane #4)*	0.70	0.25	0.50	1.70	1.90	0.95	0.50	0.70	1.00 ft AS

Notes:

* The as-built plans of Contract 04-437414 indicate that the existing pavement sections of portions of the outside lane along Rte 101 between Story Road IC and Capitol Expwy IC include ATPB layer (0.60' AC, 0.25' ATPB, 0.70' CTB & 1.00' AS).

For new construction using ATPB layer to match as-built conditions, the new ATPB layer may be "sandwiched" in-between HMA layers in order to match the as-built ATPB layer for drainage purpose.

** For PCC design, Type II Soil: $10 \leq R \leq 40$; Type III Soil: $R < 10$. Per HDM, subgrade treatment is recommended for Type III soil to improve to Type II soil for design. The recommended subgrade treatment consists of over-excavating and replacing 1 ft below pavement subgrade with AS.

JPCB = Jointed plain concrete pavement
HMA = Mot Mix Asphalt
AB = Class3 Aggregate Base (R-value = 78)
AS = Class 4 Aggregate Subbase (R-value = 50)
LCB = Lean Concrete Base

TABLE 7B - STRUCTURAL PAVEMENT SECTIONS (HIGHWAY ON-OFF RAMP)

Location	R - Value	TI	Structural Pavement Section			
			Option 1			Option 2
			HMA (ft)	AB (ft)	AS (ft)	Full Depth (ft)
Interchange on-off ramp	7	10	0.55	0.75	1.20	1.30

TABLE 8C - STRUCTURAL PAVEMENT SECTIONS (TULLY ROAD)

Location	R - Value	TI	Structural Pavement Section		
			Option 1		Option 2
			HMA (ft)	AB (ft)	Full Depth (ft)
Tully Road - City Street	7	8	0.40	1.45	1.00
		9	0.45	1.65	1.15
		10	0.55	1.80	1.30

Design values are based on the Highway Design Manual Tables (empirical method).

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	SCI	101	31.8/34.3		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER CHESTER C. BALLESTEROS No. 70706 Exp. 6-30-09 CIVIL STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

HMH
1570 OAKLAND ROAD
SAN JOSE, CA 95131

SANTA CLARA VALLEY
TRANSPORTATION AUTHORITY
3331 N. FIRST STREET
SAN JOSE, CA 95134

NOTES:

1. DIMENSIONS OF THE PAVEMENT STRUCTURES (STRUCTURAL SECTIONS) ARE SUBJECT TO TOLERANCES SPECIFIED IN THE STANDARD SPECIFICATIONS.
2. SUPERELEVATION AS SHOWN OR AS DIRECTED BY THE ENGINEER.
3. ALL EXISTING STRUCTURAL SECTIONS SHOWN ARE BASED ON PREVIOUS AS-BUILTS AND ARE CONSIDERED APPROXIMATE.
4. EXACT LOCATIONS AND TYPES OF DIKES, CURBS, MBGR AND BARRIERS ARE SHOWN ON THE LAYOUT AND SHEETS C-1 THRU C-6.
5. EXACT LOCATIONS AND TYPES OF DRAINAGE DITCHES ARE SHOWN ON THE DRAINAGE PLAN.
6. EXACT LOCATIONS OF EDGE DRAINS ARE SHOWN ON THE SUBSURFACE DRAINAGE PLAN.
7. FOR SLOPE ROUNDING, SEE CONSTRUCTION DETAILS.
8. WHENEVER A FILL SLOPE IS STEEPER THAN 4:1, THE SUBBASE IS TO BE EXTENDED TO THE FILL SLOPE.
9. EXISTING UTLITIES HAVE NOT BEEN PLOTTED ON THESE TYPICAL CROSS SECTIONS.

TYPICAL STRUCTURAL SECTIONS

[1] 0.10′ HMA (OG)
0.70′ HMA (TYPE A)
0.70′ LCB
1.70′ AS (CLASS 4)

[2] 0.55′ HMA (TYPE A)
0.75′ AB (CLASS 3)
1.20′ AS (CLASS 4)

[3] 0.55′ HMA (TYPE A)
1.80′ AB (CLASS 3)

[4] 0.30′ PCC
0.25′ AB (CLASS 3)

[5] 0.10′ HMA (OG)
0.50′ HMA (TYPE A)
0.25′ ATPB
0.20′ HMA (TYPE A)
0.50′ LCB
1.70′ AS (CLASS 4)

[6] 0.10′ HMA (OG)
0.65′ HMA (TYPE A)
0.60′ LCB
1.45′ AS (CLASS 4)

[7] 1.30′ FDHMA (TYPE A)

[8] 0.10′ HMA (OG)

[9] 0.33′ PCC
0.50′ AB (CLASS 3)

[10] 0.30′ HMA (TYPE A)
1.00′ AB (CLASS 3)
(SEE "DE" SHEETS)

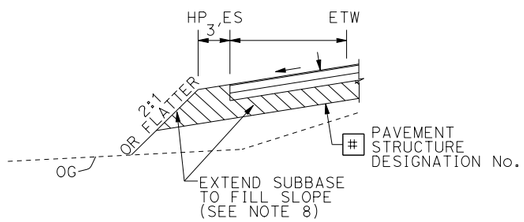
[11] 0.25′ HMA (TYPE A)
TO
2.00′ HMA (TYPE A)

ABBREVIATIONS

FDHMA	FULL DEPTH HOT MIX ASPHALT
HMA (OG)	HOT MIX ASPHALT (OPEN GRADED)
RHMA (G)	RUBBERIZED HOT MIX ASPHALT (GAP GRADED)

DESIGN DESIGNATION (ROUTE 101)

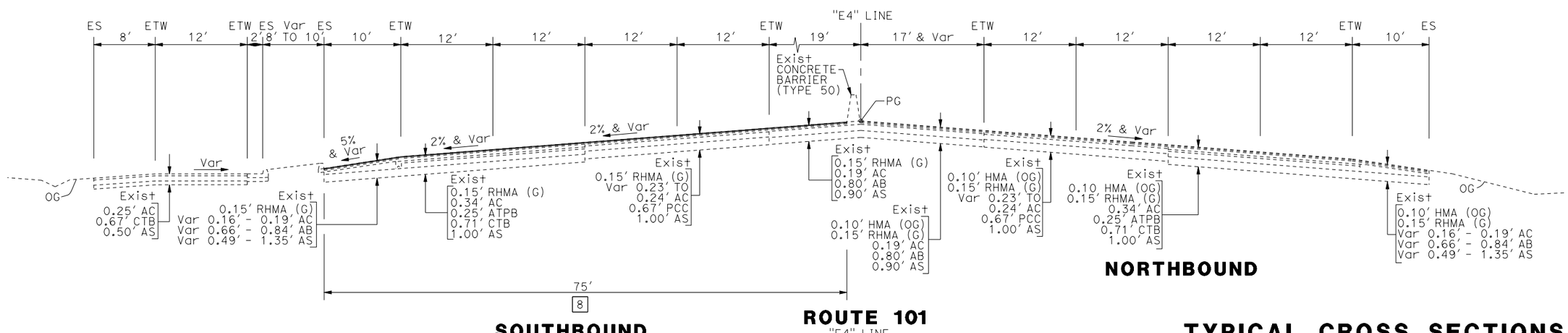
ADT (2030)= D=
DHV= T=7.9%
V=



SUBBASE EXTENSION DETAIL

SUBBASE EXTENSION LOCATIONS
(SEE NOTE 8)

"TR2" 1762+40 TO "TR2" 1764+50
"TL2" 1766+00 TO "TL2" 1767+10
"TR3" 1763+40 TO "TR3" 1765+50



TYPICAL CROSS SECTIONS

NO SCALE

X-1

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans

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Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	SCI	101	31.8/34.3		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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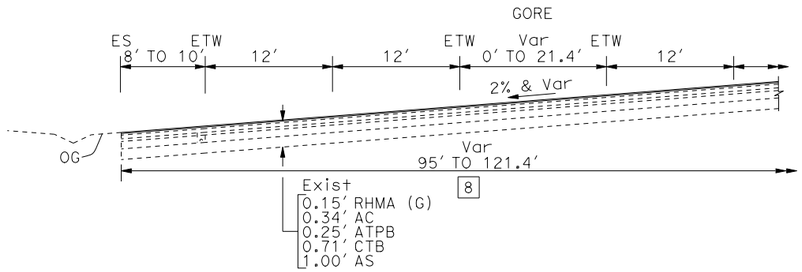
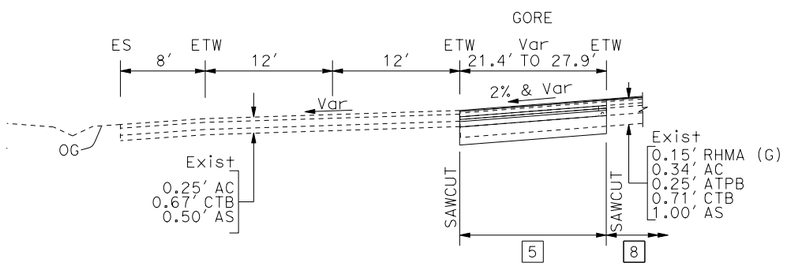
SAN JOSE, CA 95134

NOTES:

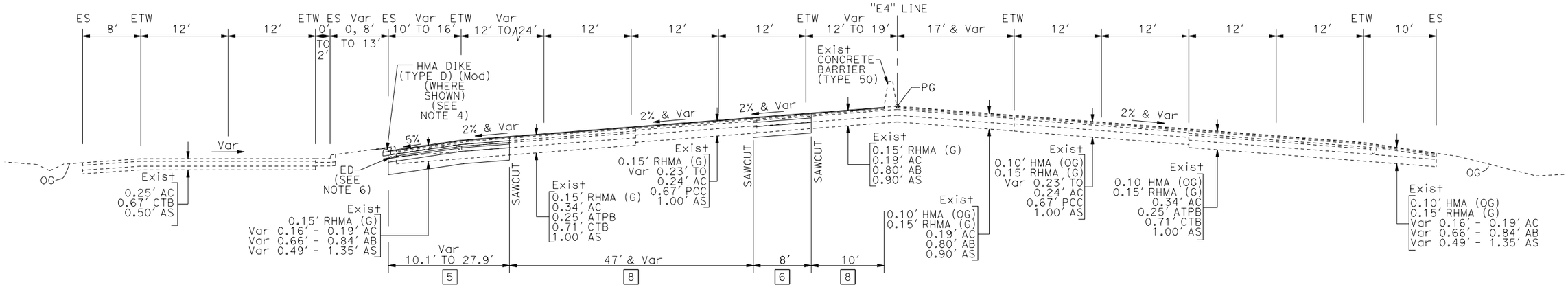
1. FOR NOTES, LEGEND AND ABBREVIATIONS, SEE SHEET X-1



SOUTHBOUND
"E4" 1705+25 TO 1708+54



SOUTHBOUND
"E4" 1704+35 TO 1705+25



SOUTHBOUND
"E4" LINE
"E4" 1695+95 TO 1708+54

ROUTE 101

NORTHBOUND
"E4" LINE
"E4" 1695+95 TO 1740+94

TYPICAL CROSS SECTIONS

NO SCALE

X-2

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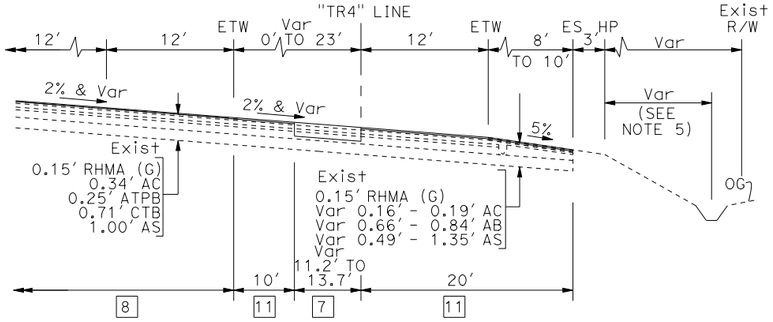
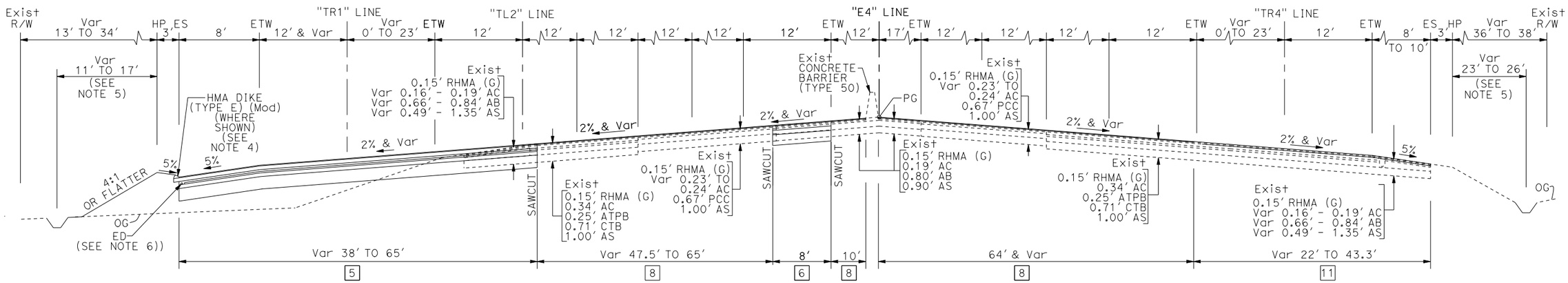


NORTHBOUND

"E4" 1748+98 TO 1749+28



SOUTHBOUND

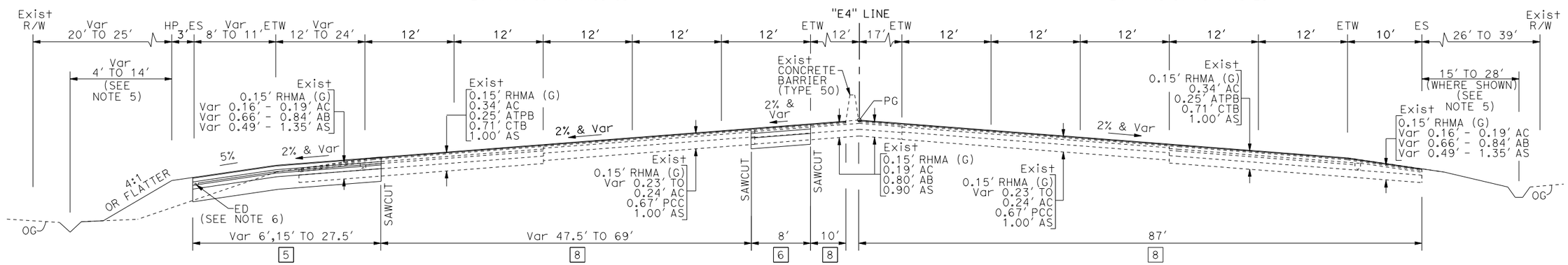
"E4" 1744+95 TO 1755+05

ROUTE 101

"E4" LINE

NORTHBOUND

"E4" 1746+31 TO 1749+28



SOUTHBOUND

"E4" 1708+54 TO 1744+95

ROUTE 101

"E4" LINE

NORTHBOUND

"E4" 1740+94 TO 1746+31

TYPICAL CROSS SECTIONS

NO SCALE

X-3

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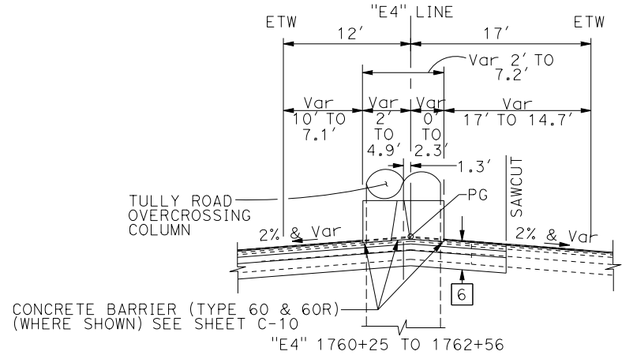

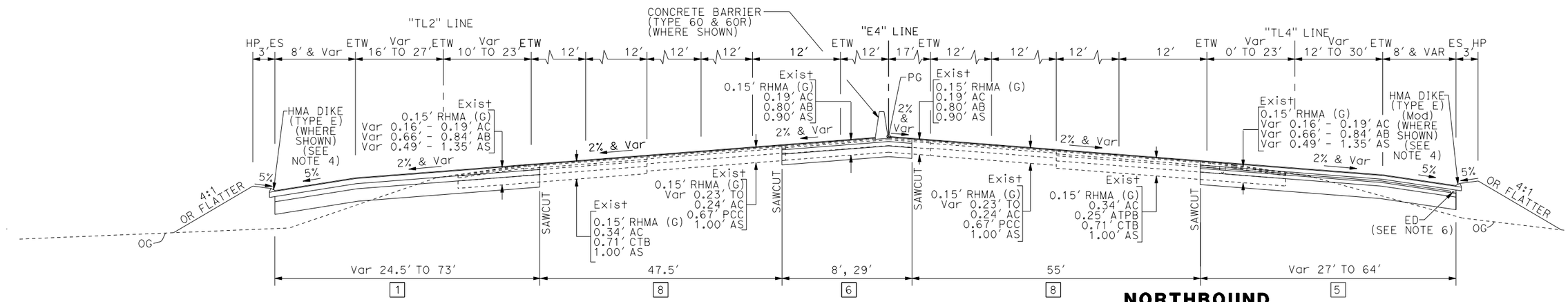

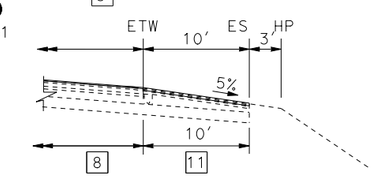

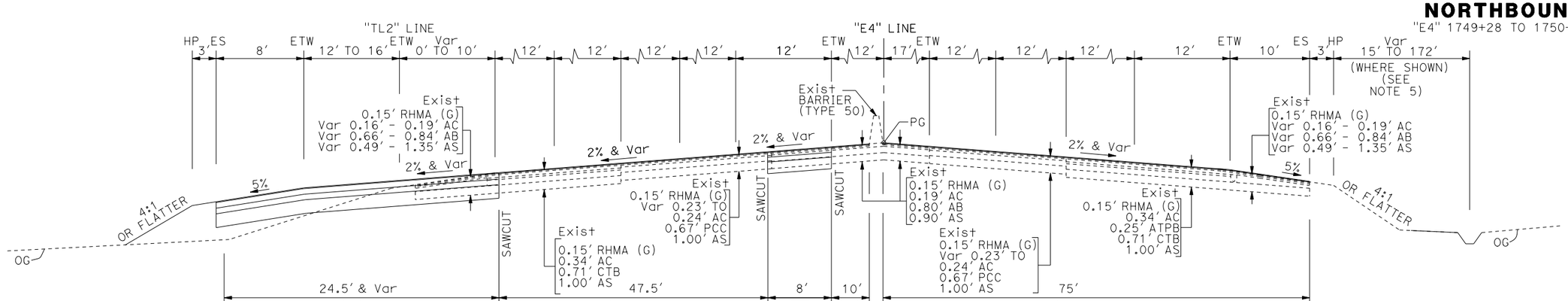

TYPICAL CROSS SECTIONS

NO SCALE

X-4

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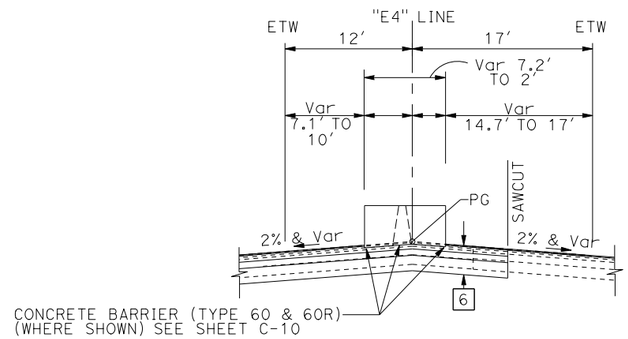
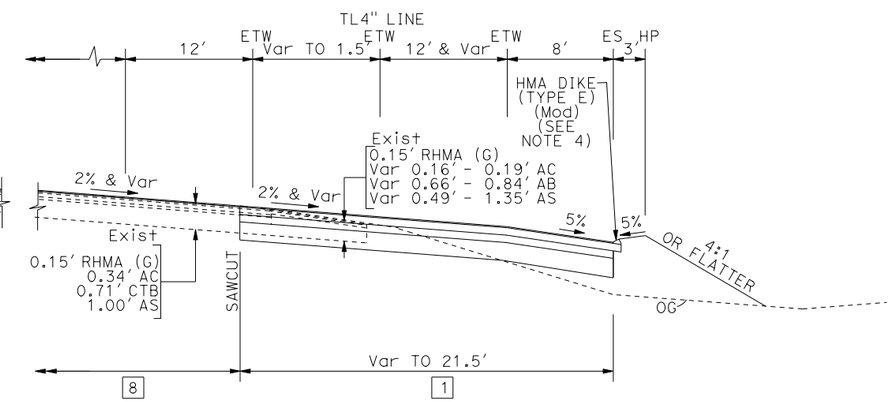
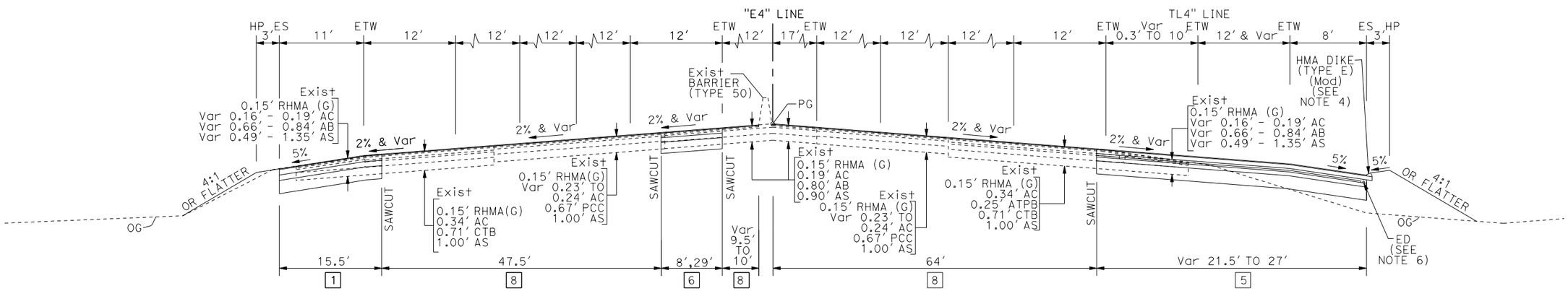


"E4" 1762+56 TO 1763+51



NORTHBOUND
"E4" 1766+86 TO 1768+12



SOUTHBOUND
"E4" 1762+63 TO 1771+96

ROUTE 101
"E4" LINE

NORTHBOUND
"E4" 1763+51 TO 1768+12

TYPICAL CROSS SECTIONS

NO SCALE

X-5

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NOTES:
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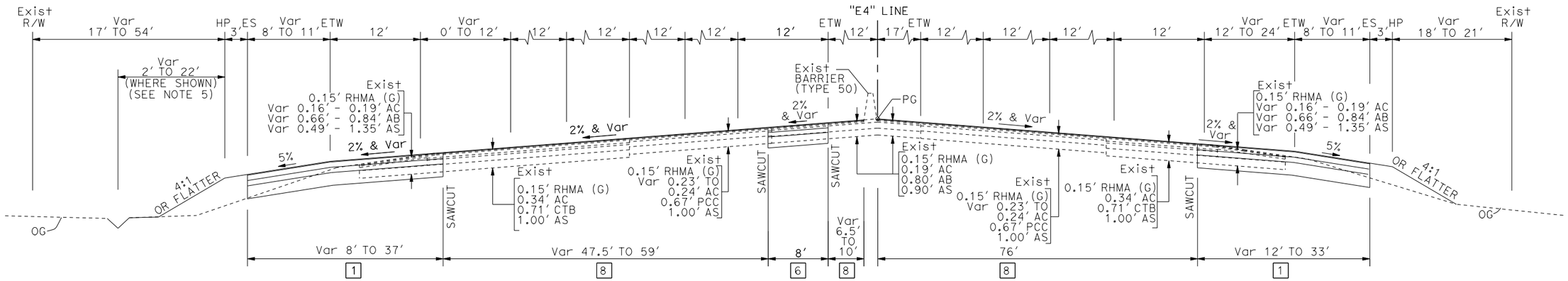

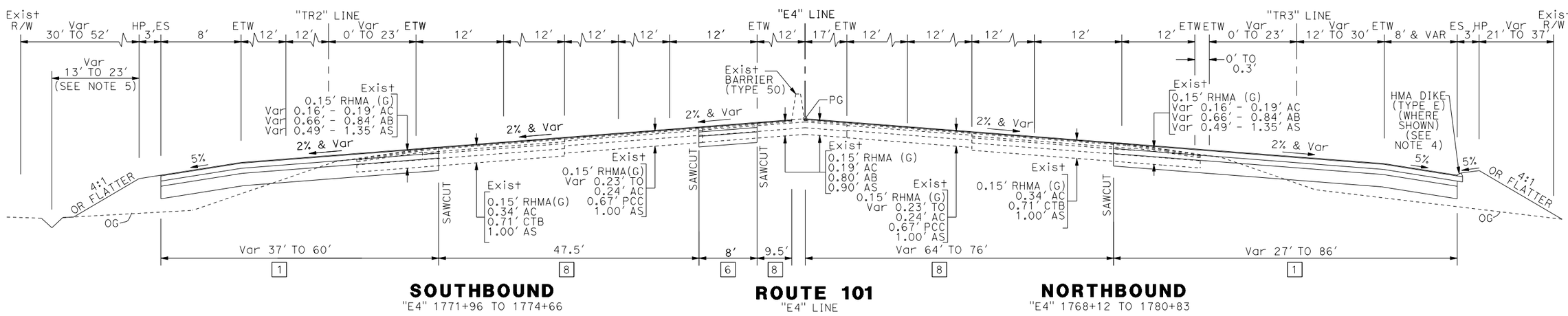

TYPICAL CROSS SECTIONS

NO SCALE

X-6

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NOTES:

1. FOR NOTES, LEGEND AND ABBREVIATIONS, SEE SHEET X-1

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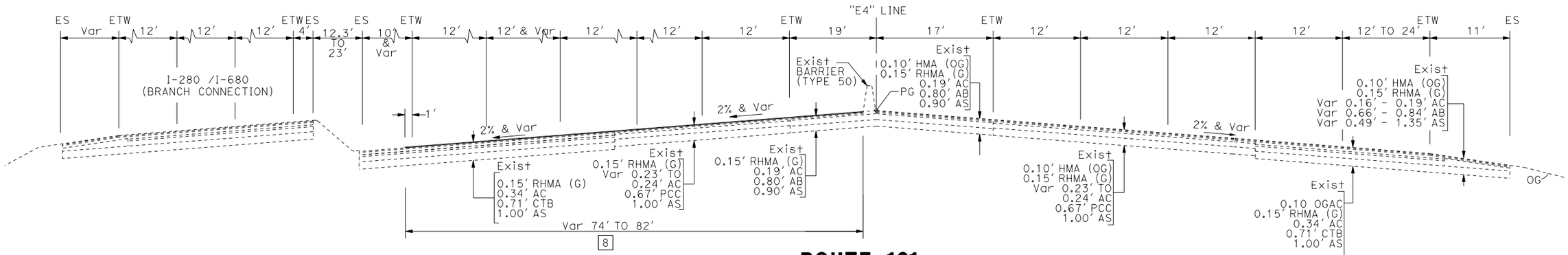
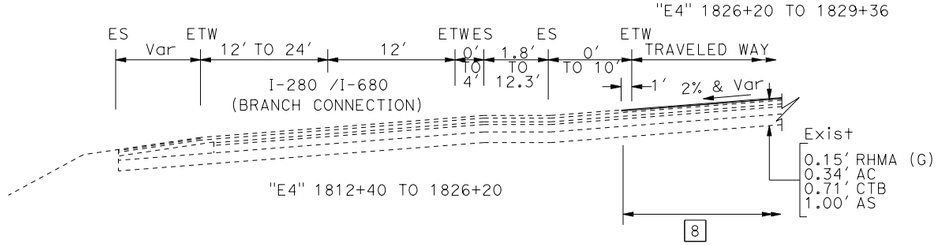
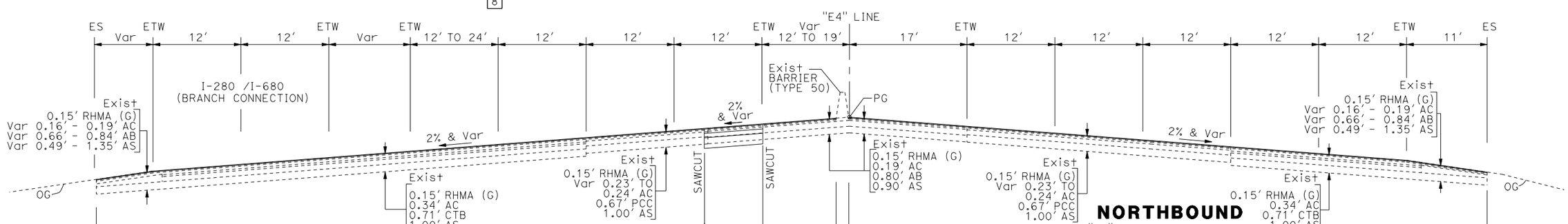


ROUTE 101
"E4" LINE

SOUTHBOUND
"E4" 1826+20 TO 1829+36

NORTHBOUND
"E4" 1789+91 TO 1797+00





NORTHBOUND
"E4" 1786+83 TO 1789+91

ROUTE 101
"E4" LINE

SOUTHBOUND
"E4" 1809+70 TO 1826+20

TYPICAL CROSS SECTIONS
NO SCALE

X-7

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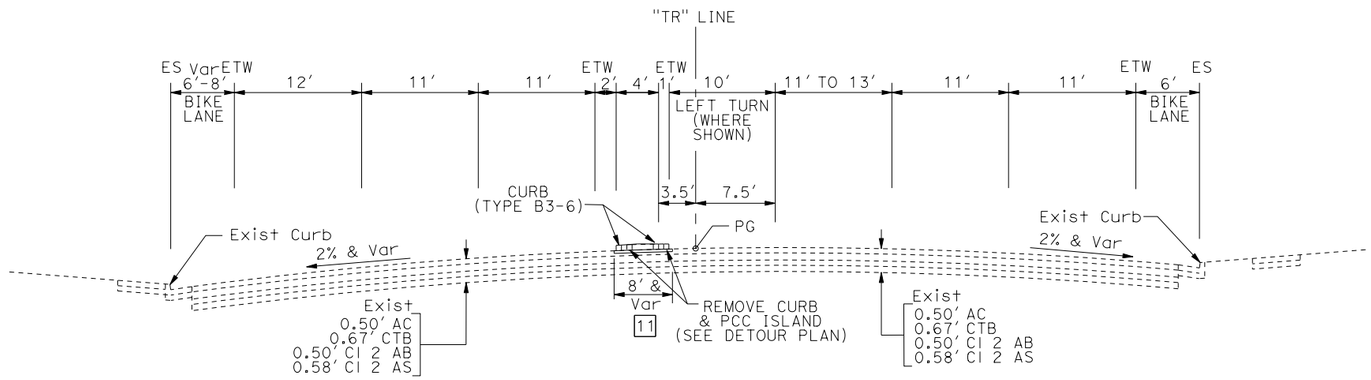
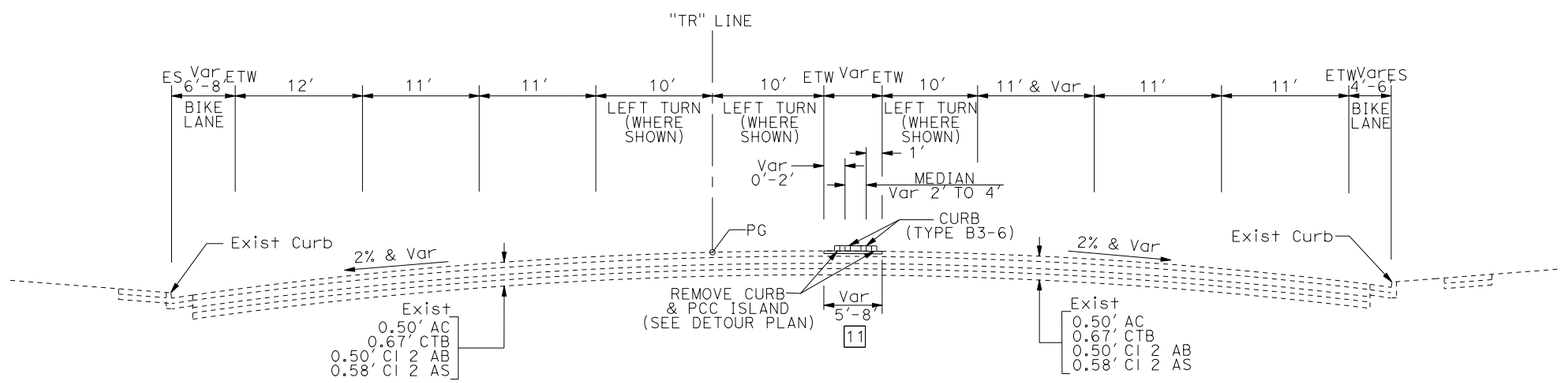
NOTES:

1. FOR NOTES, LEGEND AND ABBREVIATIONS, SEE SHEET X-1



WESTBOUND **TULLY ROAD** **EASTBOUND**

"TR" LINE
"TR" 36+70 TO 38+37



WESTBOUND **TULLY ROAD** **EASTBOUND**

"TR" LINE
"TR" 35+00 TO 36+70

TYPICAL CROSS SECTIONS

NO SCALE

X-8

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NOTES:

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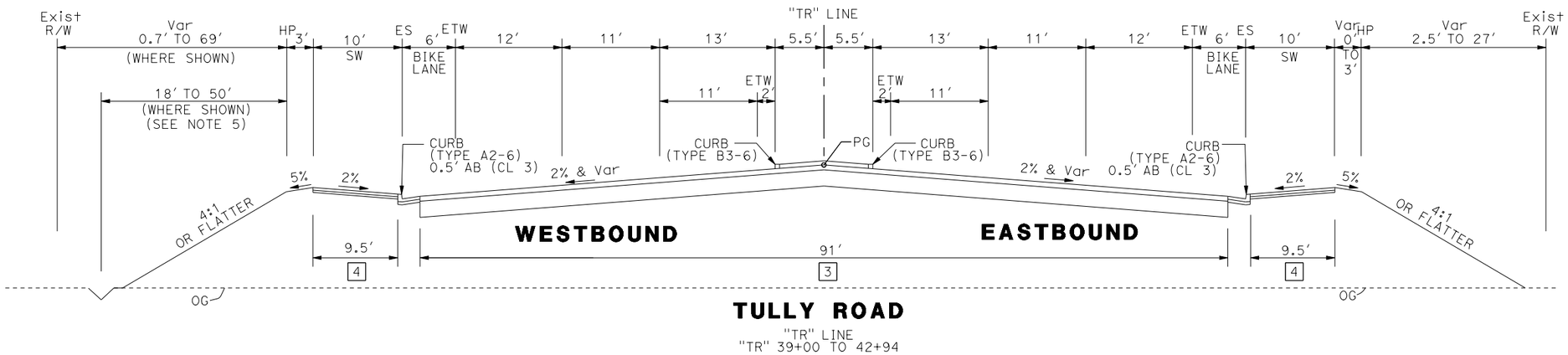
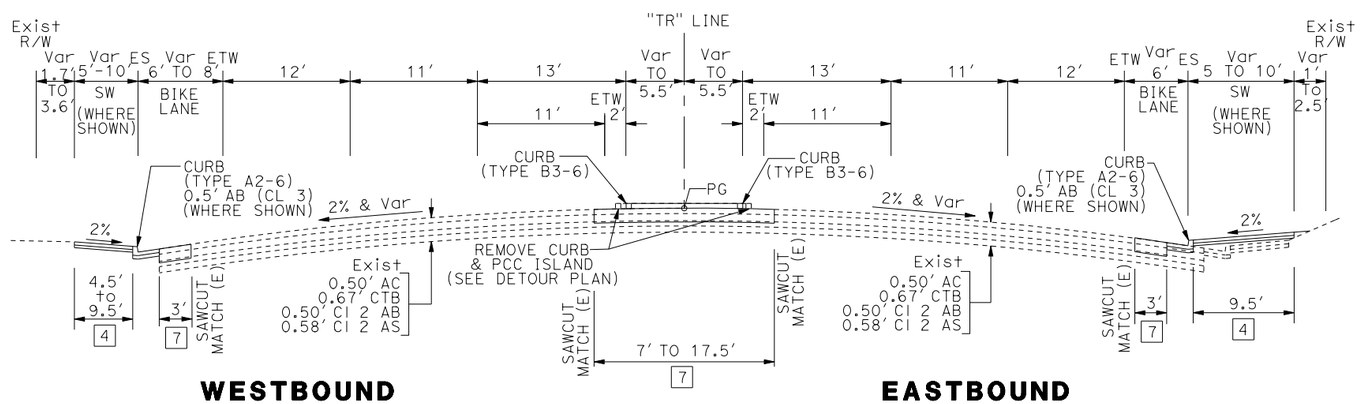


TULLY ROAD

"TR" LINE
"TR" 39+00 TO 42+94



WESTBOUND **EASTBOUND**

TULLY ROAD

"TR" LINE
"TR" 38+37 TO 39+00

TYPICAL CROSS SECTIONS

NO SCALE

X-9

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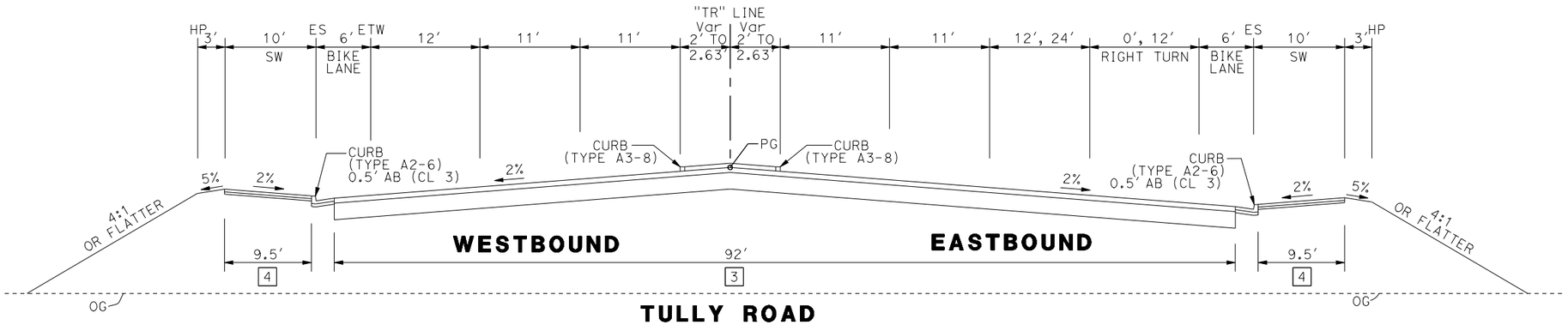
NOTES:

1. FOR NOTES, LEGEND AND ABBREVIATIONS, SEE SHEET X-1

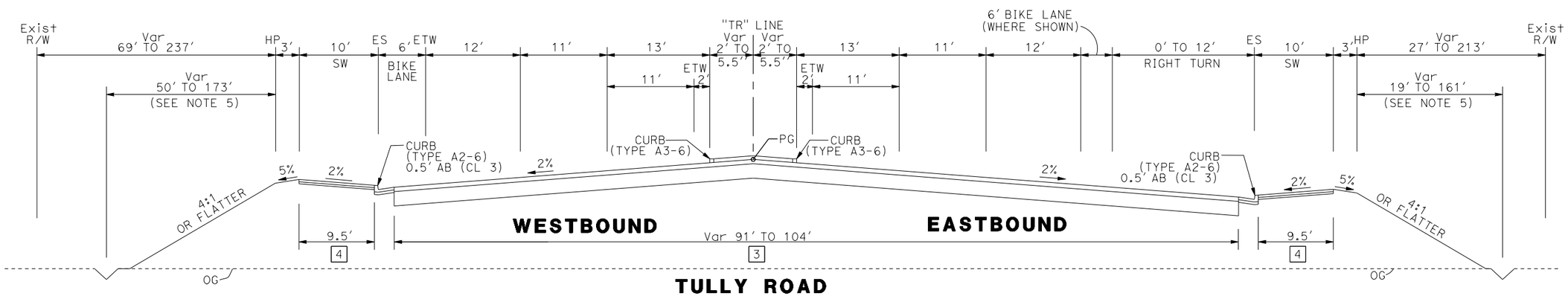
TULLY ROAD OVERCROSSING

Br No. 37-0668
(SEE STRUCTURE PLAN)
"TR" LINE
"TR" 48+08.17 TO 51+80.17



TULLY ROAD

"TR" LINE
"TR" 46+45 TO 48+08.17



TULLY ROAD

"TR" LINE
"TR" 42+94 TO 46+45

TYPICAL CROSS SECTIONS

NO SCALE

X-10

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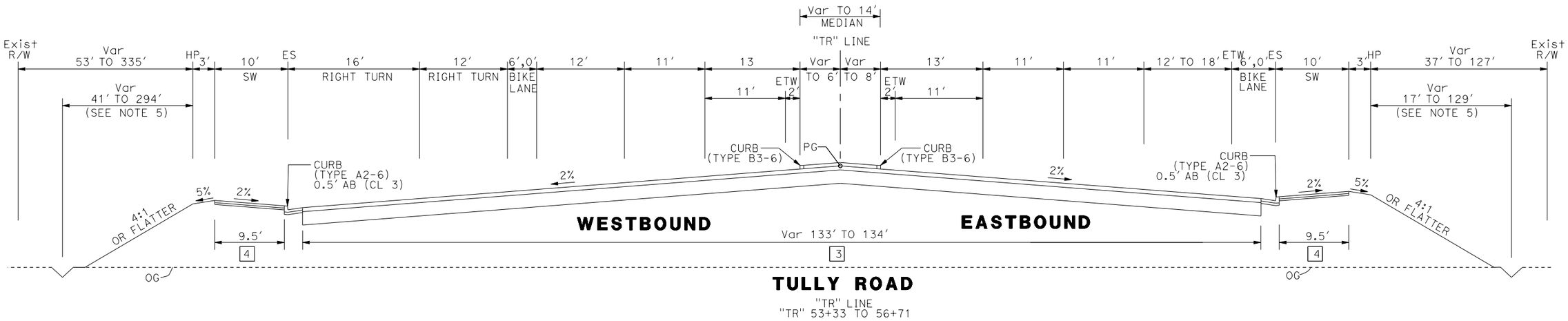

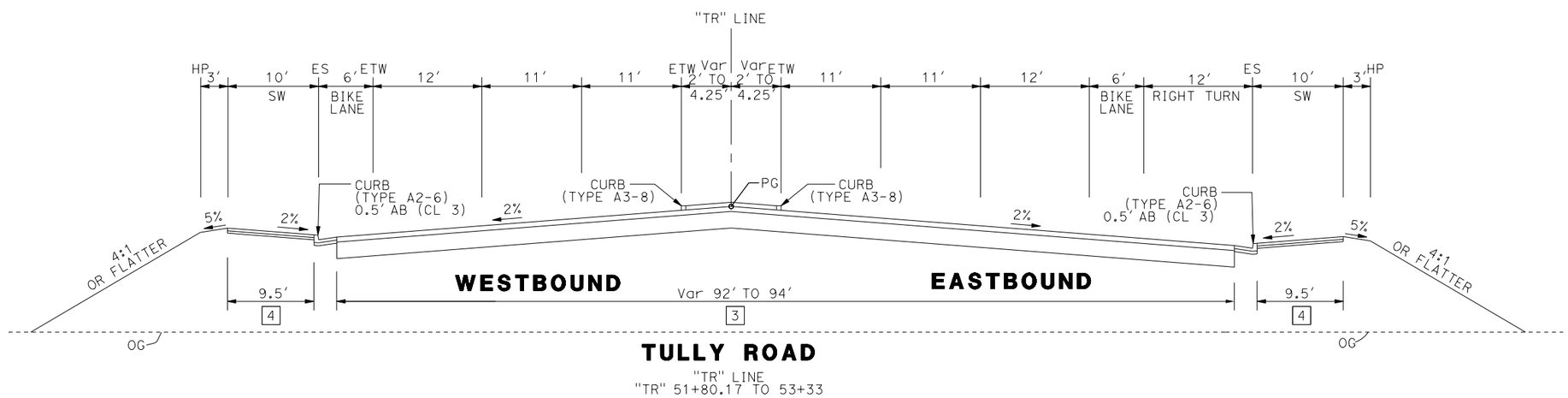

TYPICAL CROSS SECTIONS

NO SCALE

X-11

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CONSULTANT FUNCTIONAL SUPERVISOR

WILLIAM J. WAGNER

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

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BORDER LAST REVISED 4/11/2008 | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | USERNAME => cballesteros | DGN FILE => 323110ca11.dgn | CU 04239 | EA 04-1A9801

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	SCI	101	31.8/34.3		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER CHESTER C. BALLESTEROS No. 70706 Exp. 6-30-09 CIVIL STATE OF CALIFORNIA

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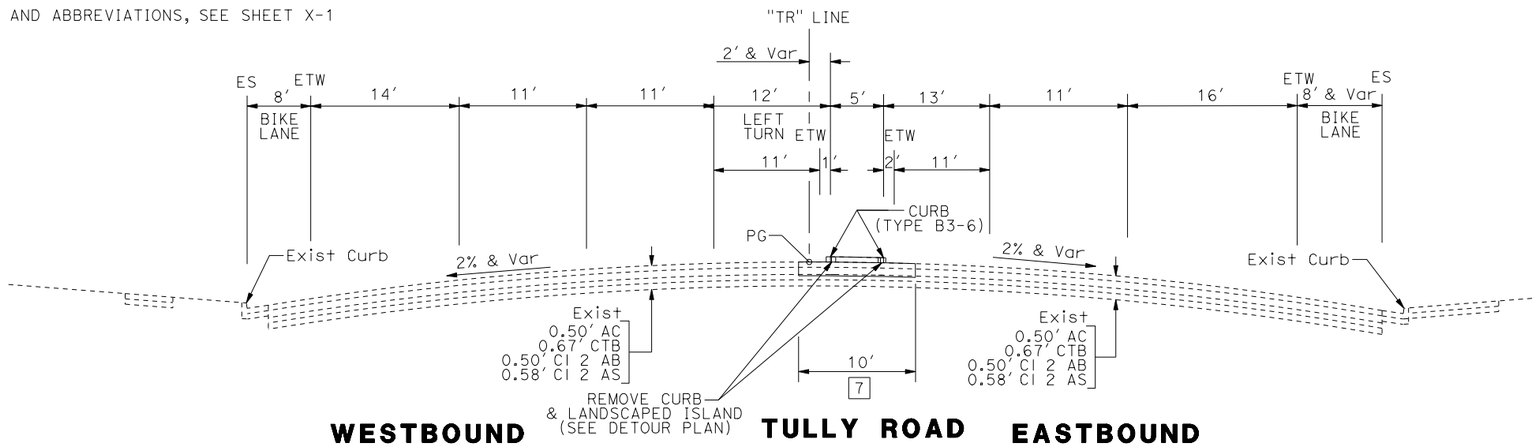
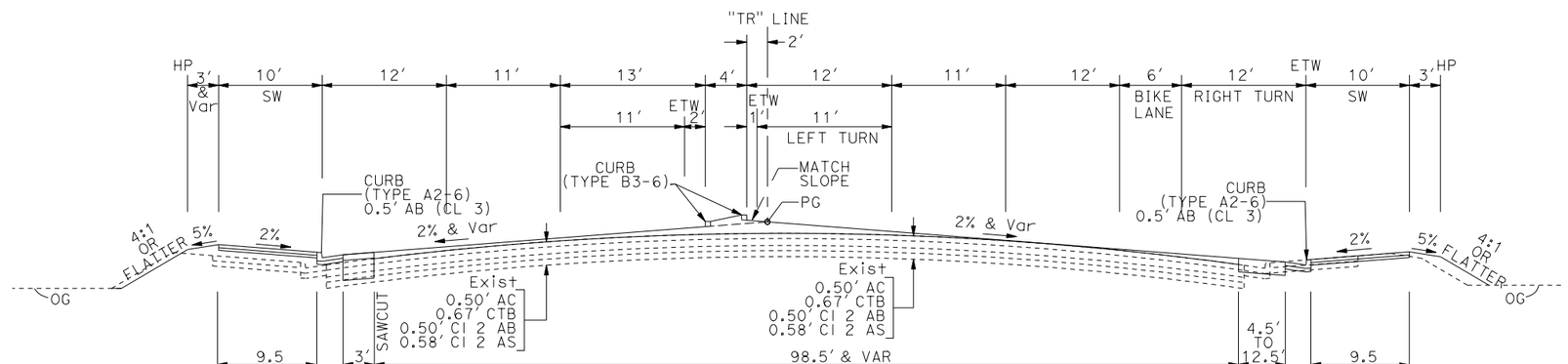
TRANSPORTATION AUTHORITY
3331 N. FIRST STREET
SAN JOSE, CA 95134

NOTES:

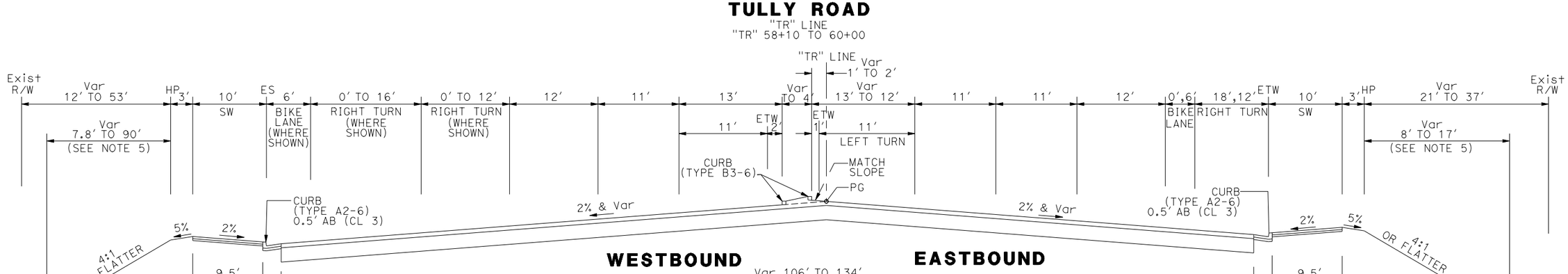
1. FOR NOTES, LEGEND AND ABBREVIATIONS, SEE SHEET X-1



"TR" LINE
"TR" 60+00 TO 62+55



"TR" LINE
"TR" 58+10 TO 60+00



"TR" LINE
"TR" 56+71 TO 58+10

TYPICAL CROSS SECTIONS

NO SCALE

X-12

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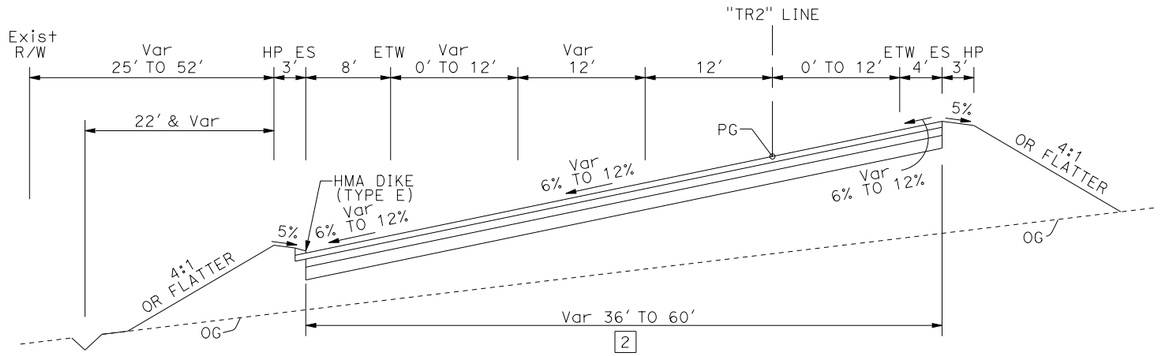

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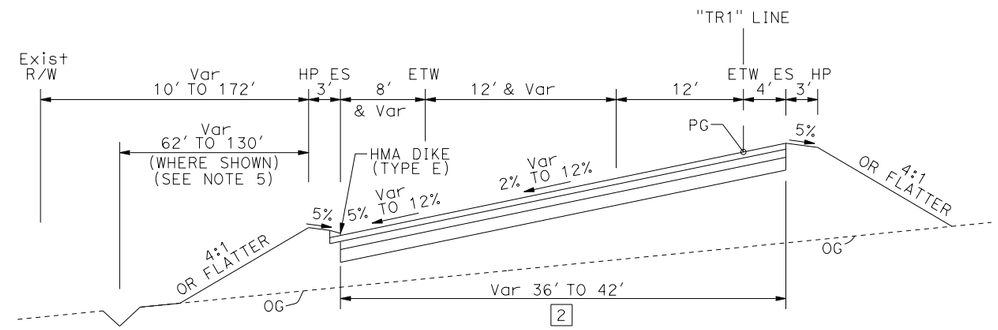
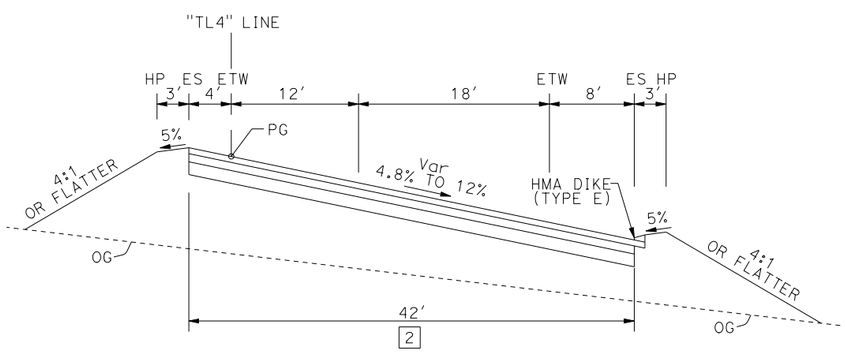
"TR2" LINE
"TR2" 1761+36 TO 1771+96



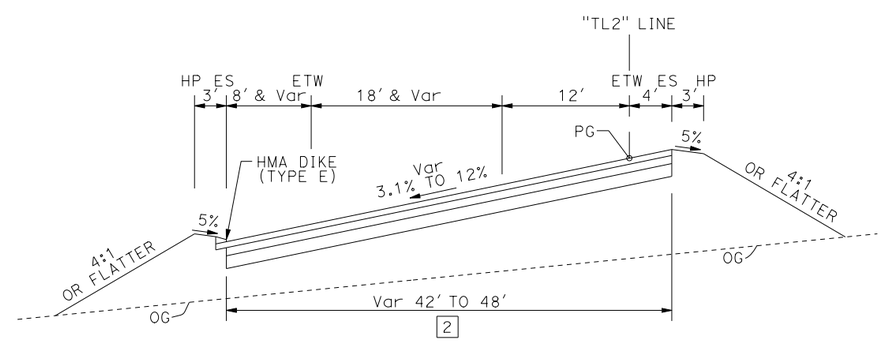
ROUTE 101 SB ONRAMP FROM EB TULLY ROAD

"TR1" LINE
"TR1" 1755+05 TO 1762+01



ROUTE 101 NB ONRAMP FROM EB TULLY ROAD

"TL4" LINE
"TL4" 1754+94 TO 1760+26



ROUTE 101 SB ONRAMP FROM WB TULLY ROAD

"TL2" LINE
"TL2" 1762+68 TO 1769+45

TYPICAL CROSS SECTIONS

NO SCALE

X-13

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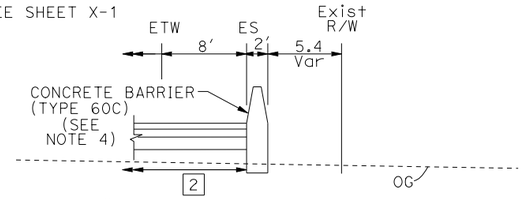
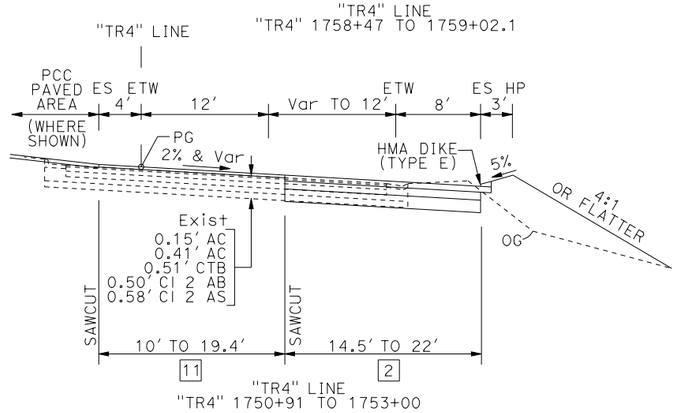
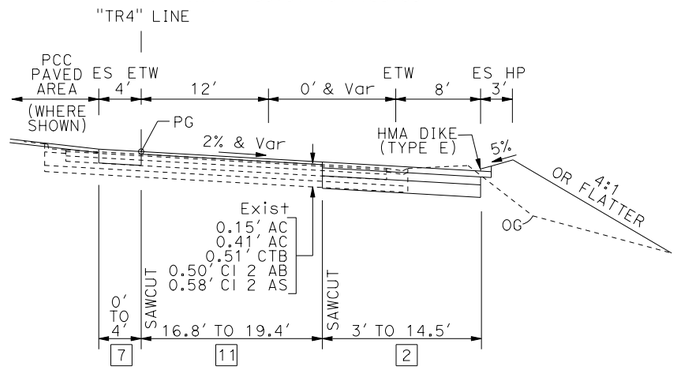
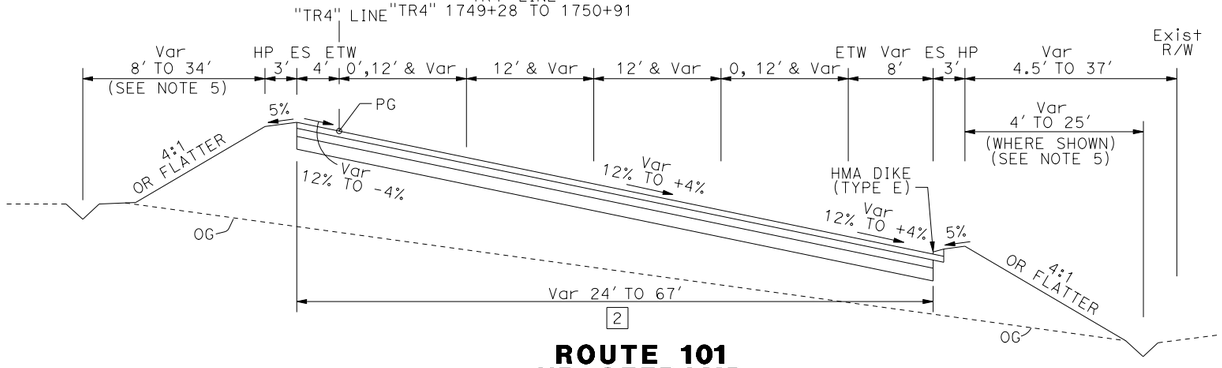


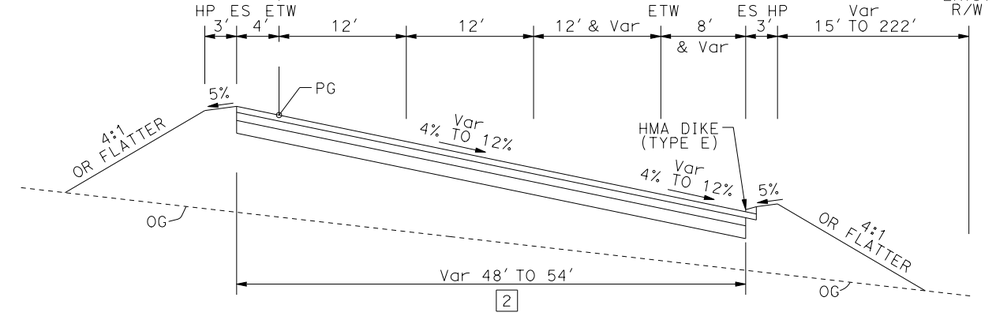






ROUTE 101
NB OFFRAMP
TO TULLY ROAD

"TR4" LINE
"TR4" 1760+73.8 TO 1762+24
"TR4" 1749+28 TO 1759+02.1



ROUTE 101
NB ONRAMP
FROM WB TULLY ROAD

"TR3" LINE
"TR3" 1762+05 TO 1768+13

TYPICAL CROSS SECTIONS

NO SCALE

X-14

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

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Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	SCI	101	31.8/34.3		

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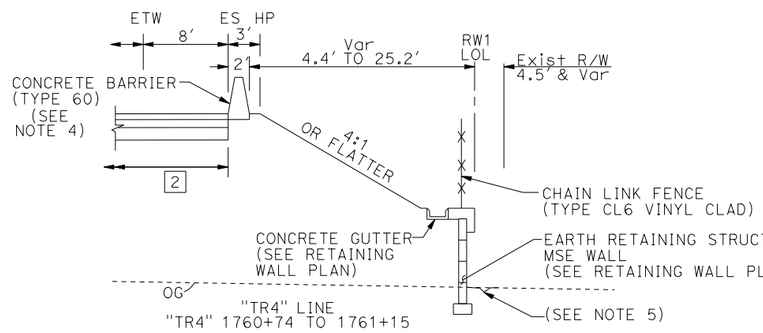

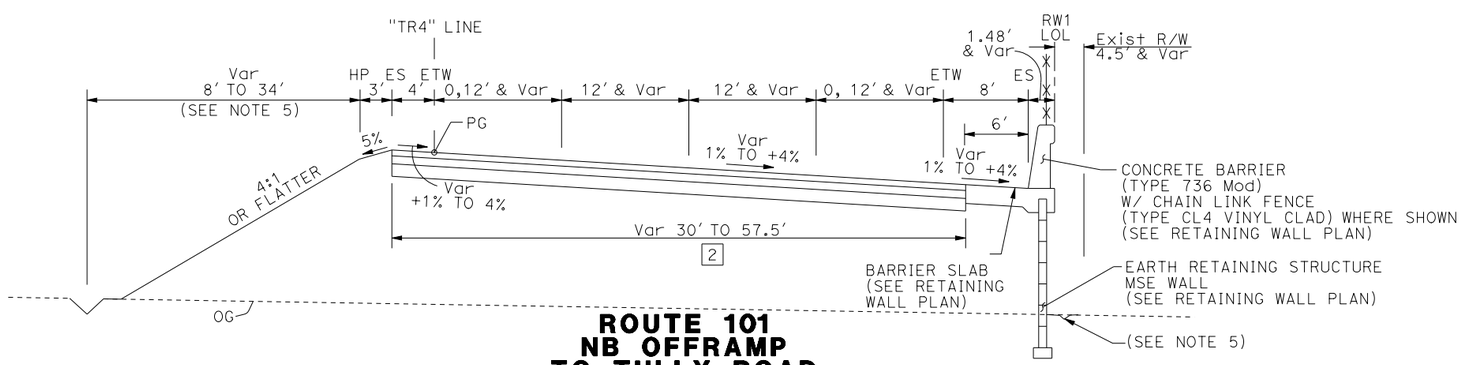

ROUTE 101
NB OFFRAMP
TO TULLY ROAD

"TR4" LINE
"TR4" 1759+02.1 TO 1760+74

TYPICAL CROSS SECTIONS

NO SCALE

X-15

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11. MATERIAL DISPOSAL

Majority of the project will require fill for the proposed widening. Based on our understanding, the project will require minimal disposal of the excess materials.

12. CONSTRUCTION CONSIDERATIONS

12.1 Construction Advisories

These sections are written primarily for the engineer responsible for the preparation of plans and specifications. Since these sections identify potential construction issues related to the project, it may also be of use to the Agency's representatives involved in monitoring of construction activity. The field investigation performed by us primarily addresses design issues and was not planned specifically to identify construction issues.

The project site is located along the existing US Route 101 and city streets of Tully Road and Capitol Expressway Interchanges. Therefore, traffic control is required to maintain traffic flow along Route 101 and the respective city streets. Several underground utilities exist at the site. The contractor should verify the utility lines, be aware of the existing conditions and plan the construction activities accordingly.

In our opinion, conventional equipment may be used to excavate the on-site soil materials. The materials to be excavated may consist of firm to very stiff clay with varying amounts of silt and gravel with occasional medium dense sand. Localized subgrade pumping may be encountered during earthwork construction depending on the weather, moisture condition of the subsurface soils, and surface drainage conditions. Equipment mobility may also be difficult if the subgrade is wet. In which case, the subgrade soils may require reworking, aeration, or over-excavation and replacing with dry granular fill to facilitate earthwork construction. It is possible that unknown old buried utilities or abandoned structures, concrete rubble etc. are located along the alignment. It might require special equipment and additional efforts to remove these buried objects.

Prospective contractors for the project must evaluate construction-related issues on the basis of their own knowledge and experience in the local area, on the basis of similar projects in other localities, or on the basis of field investigation on the site performed by them, taking into account their proposed construction methods and procedures. In addition, construction activities related to excavation and lateral earth support must conform to safety requirements of OSHA and other applicable municipal and Stage regulatory agencies.

12.2 Construction Consideration that Influence Specifications

The contractor should verify the conditions of the existing utility lines. These locations should not be used for stockpiling of borrow materials. Any conflicts with proposed construction should also be reviewed prior to construction.

12.3 Hazardous Waste Considerations

The project environmental study report should be referred to for further details about any potential hazardous materials within the project site.

12.4 Differing Site Conditions

The soil conditions described in this report are based on available boring data. It should be noted that these borings depict subsurface conditions only at the locations drilled. Because of the variability from place to place within soils in general, and the nature of geologic depositions, subsurface conditions could change between the explored locations.

Early communication should be made between the Resident Engineer, the Contractor, and the Geotechnical Engineer as soon as conditions that differ from those established in this report are recognized by any of the parties. Additional recommendations could be provided if such conditions arise.

13. RECOMMENDATIONS AND SPECIFICATIONS

13.1 Summary of Recommendations

If the designer has questions or concerns with any of these recommendations, or, if conditions are found to be different during construction, the Geotechnical Engineer who prepared this report should

be contacted. Additional fieldwork, analysis or changes in recommendations may be required. These services may be provided under a separate authorization, as necessary. A concise summary of the geotechnical recommendations is presented below:

- The subsoils generally consist of firm to hard clay with varying amounts of silt and gravel and lenses of medium dense sand.
- Seismic design criteria should follow the latest Caltrans 2008 criteria (updated fault database and procedures for developing design response spectra). (Ref.: Section 7.4)
- Based on investigation, groundwater was encountered at approximately 15 ft below the existing ground surface, whereas as-built LOTB (Caltrans 1961) indicated groundwater level at approximately 20 feet depth at the general vicinity of Tully Road Interchange. No groundwater was encountered (to 30 ft depth) at the vicinity of Capitol Expressway Interchange. The impact of liquefaction is considered moderate to high at the Tully Road Interchange. (Ref: Section 8)
- The proposed modifications for the interchanges will require new approach embankments for the abutments. The estimated settlement is anticipated to be in the overconsolidated/elastic range and on the order of 2 to 3 inches under the additional fill (up to 25 feet).
- Pavement Sections (Ref: Section 9). Refer to Tables 7A to 7C for the design structural pavement sections.

13.2 Recommended Materials Specifications

13.2.1 *Standard Specifications*

Unless otherwise stated in the special provisions, all materials specifications should conform to Caltrans Standard Specifications, May 2006 edition and Amendments dated April 2009, including but not limited to the following: Earthwork, Structure Backfill, Pervious Backfill Material, Reinforcing Geosynthetics, Thermoplastic Pipes, Hot Mix Asphalt, Aggregate Base, Aggregate Subbase, Lean Concrete Base, etc.

13.2.2 *Special Provisions*

<u>Imported Borrow:</u>

Imported material should be in accordance with the specifications set forth in Caltrans Section 19. In particular, for new embankment/roadway construction, the material placed within 4 ft of the finish pavement subgrade should meet the following requirements:

1. Free of organic or other deleterious materials.
2. An R-value of no less than 15.

Aggregate Base: Class 3 aggregate base shall conform to the provisions in Section 26 of the Standard Specifications and to these Special Provisions. It shall also be clean and free from organic matter and other deleterious substances. The percentage composition by weight of Class 3 aggregate base shall conform to the following grading as determined by California Test Method No. 202.

Gradation Requirement (Percent Passing)

Sieve Sizes	1-1/2 inch Maximum		¾ inch Maximum	
	Operating Range	Contract Compliance	Operating Range	Contract Compliance
2”	100	100		
1-1/2”	90 – 100	87 - 100		
1”	--	--	100	100
¾”	50 – 85	45 – 90	90 – 100	87 – 100
No. 4	24 - 45	20 – 50	35 – 60	30 – 65
No. 30	10 – 25	6 – 29	10 – 30	5 – 35
No. 200	2 -11	0 -14	2 -11	0 - 14

Quality requirements

California Test Method	Operating Range	Contract Compliance
Sand Equivalent (217)	25 Min.	22 Min.
Resistance (R-value) (301)	-	78 Min.
Durability Index	-	35 Min.

Aggregate Subbase: Aggregate Subbase shall be Class 4 and shall conform to the provisions in Section 25 of the Standard Specifications and to these Special Provisions. Class 4 aggregate subbase shall be clean and free from organic matter and other deleterious substances. The percentage composition by weight of Class 4 aggregate subbase shall conform to the following grading as determined by California Test Method No. 202.

Gradation Requirement (Percent Passing)

Sieve Sizes	Operating Range	Contract Compliance
2-1/2”	100	100
No. 4	30 – 65	25 – 70
No. 200	0 – 15	0 – 18

Class 4 aggregate subbase shall also conform to the quality requirements given on the following table:

Quality requirements

California Test Method	Operating Range	Contract Compliance
Sand Equivalent (217)	21 Min.	18 Min.
Resistance (R-value) (301)	50	50 Min.

14. INVESTIGATION LIMITATIONS

Our services consist of professional opinions and recommendations made in accordance with generally accepted geotechnical engineering principles and practices and are based on our field exploration and the assumption that the soil conditions do not deviate from observed conditions.

No warranty, expressed or implied, of merchantability or fitness, is made or intended in connection with our work or by the furnishing of oral or written reports or findings. The scope of our services did not include any environmental assessment or investigation for the presence or absence of hazardous or toxic materials in structures, soil, surface water, groundwater or air, below or around this site. Unanticipated soil conditions are commonly encountered and cannot be fully determined by taking soil samples and excavating test borings; different soil conditions may require that additional expenditures be made during construction to attain a properly constructed project. Some contingency fund is thus recommended to accommodate these possible extra costs.

This report has been prepared for the proposed project as described earlier, to assist the engineer in the design of this project. In the event any changes in the design or location of the facilities are planned, or if any variations or undesirable conditions are encountered during construction, our findings and recommendations shall not be considered valid unless the changes or variations are reviewed and our recommendations modified or approved by us in writing.

This report is issued with the understanding that it is the designer's responsibility to ensure that the information and recommendations contained herein are incorporated into the project and that necessary steps are also taken to see that the recommendations are carried out in the field.

The findings in this report are valid as of the present date. However, changes in the soil conditions can occur with the passage of time, whether they are due to natural processes or to the works of man, on this or adjacent properties. In addition, changes in applicable or appropriate standards occur, whether they result from legislation or from the broadening of knowledge. Accordingly, the findings in this report might be invalidated, wholly or partially, by changes outside of our control.

Respectfully submitted,
PARIKH CONSULTANTS, INC.

Y. David Wang, Ph.D., P.E. C52911
Senior Engineer

R. Gary Parikh, G.E. 666
Project Manager

REGISTERED PROFESSIONAL ENGINEER
GAURANG R. PARIKH
No. 666
EXP. 12-31-09
GEOTECHNICAL
STATE OF CALIFORNIA

S:/ONGOING PROJECTS/2007/207150.GDR/GDMR-TULLY RD-RTE 101 4-09

REFERENCES

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Caltrans as-built roadway plans (Contract No. 04-437414), In Santa Clara County in and near San Jose from 0.4 mile north of Hellyer Avenue overcrossing to 0.1 mile north of Route 280

Caltrans California Seismic Hazard Map (2008 In-progress)

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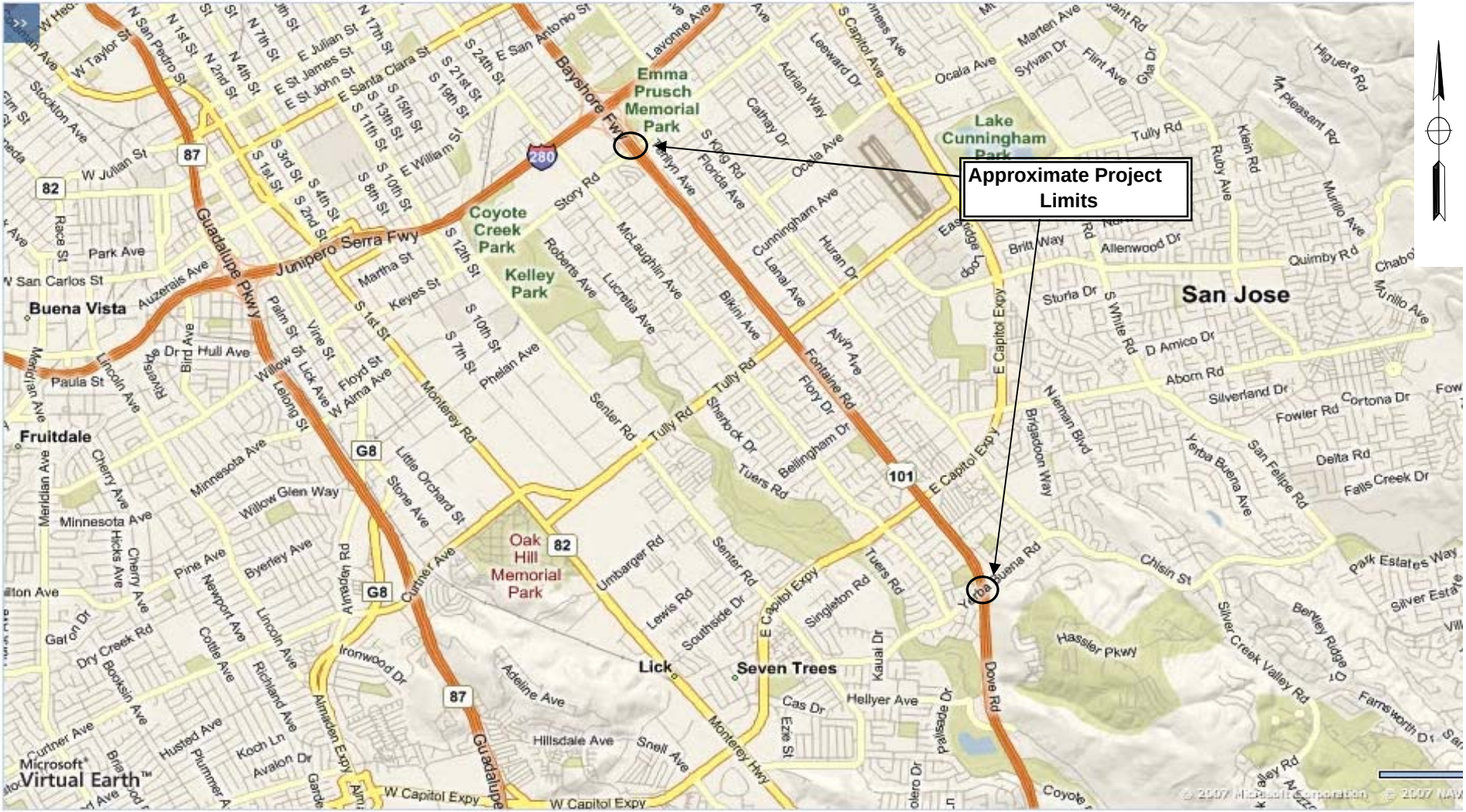


SCALE: 0 1 mile

SOURCE:
2007 MICROSOFT VIRTUAL EARTH

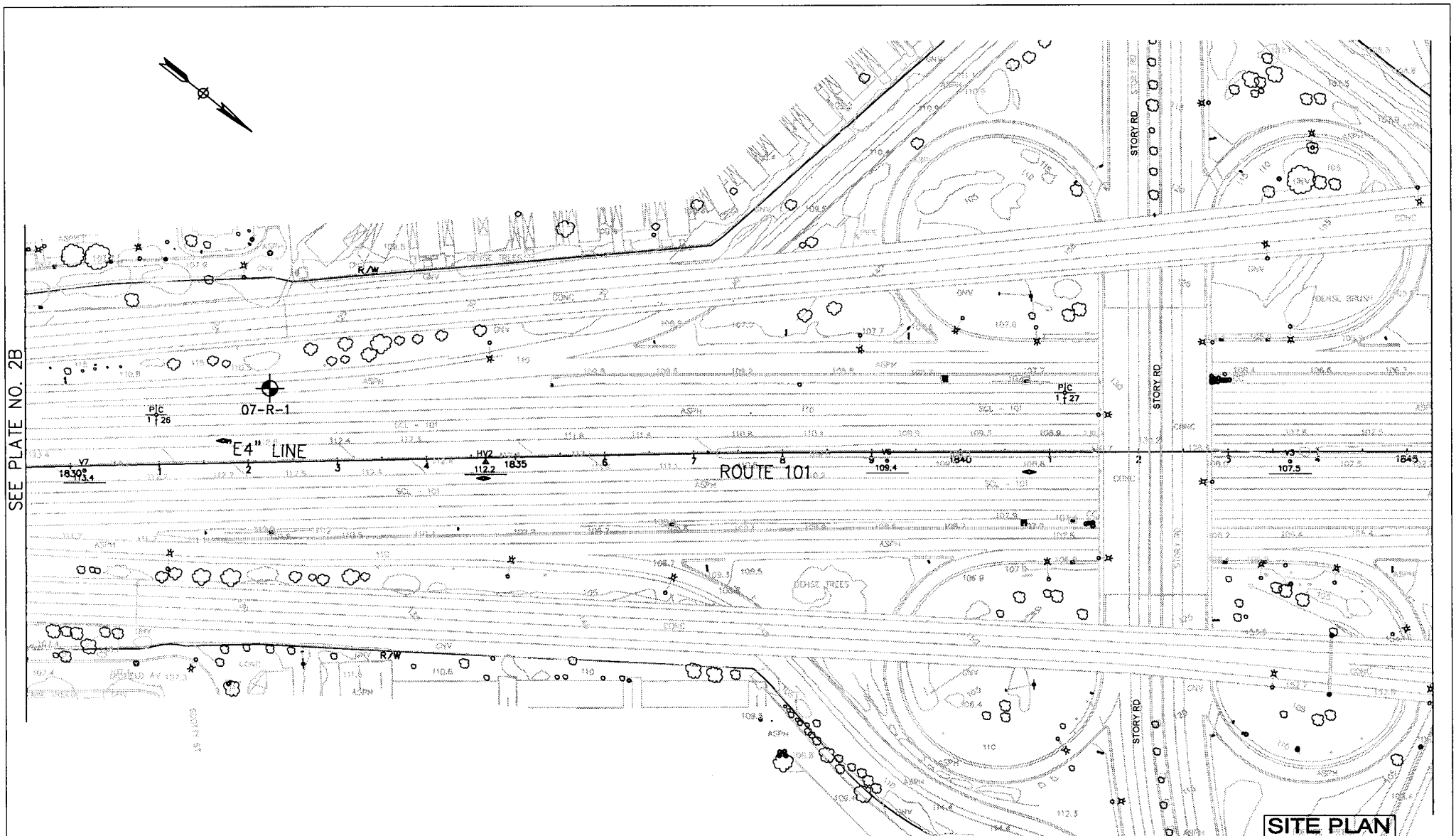
LOCATION MAP

PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS TESTING

US 101 IMPROVEMENTS FROM I-280/680 TO YERBA BUENA ROAD
SANTA CLARA COUNTY, CALIFORNIA

JOB NO.: 207150.GDR

PLATE NO.: 1



LEGEND

07-R-1 — Approx. Boring Location (PARIKH)

07-C-1 — Approx. Coring Location (PARIKH)

100' 0' 100' 200'

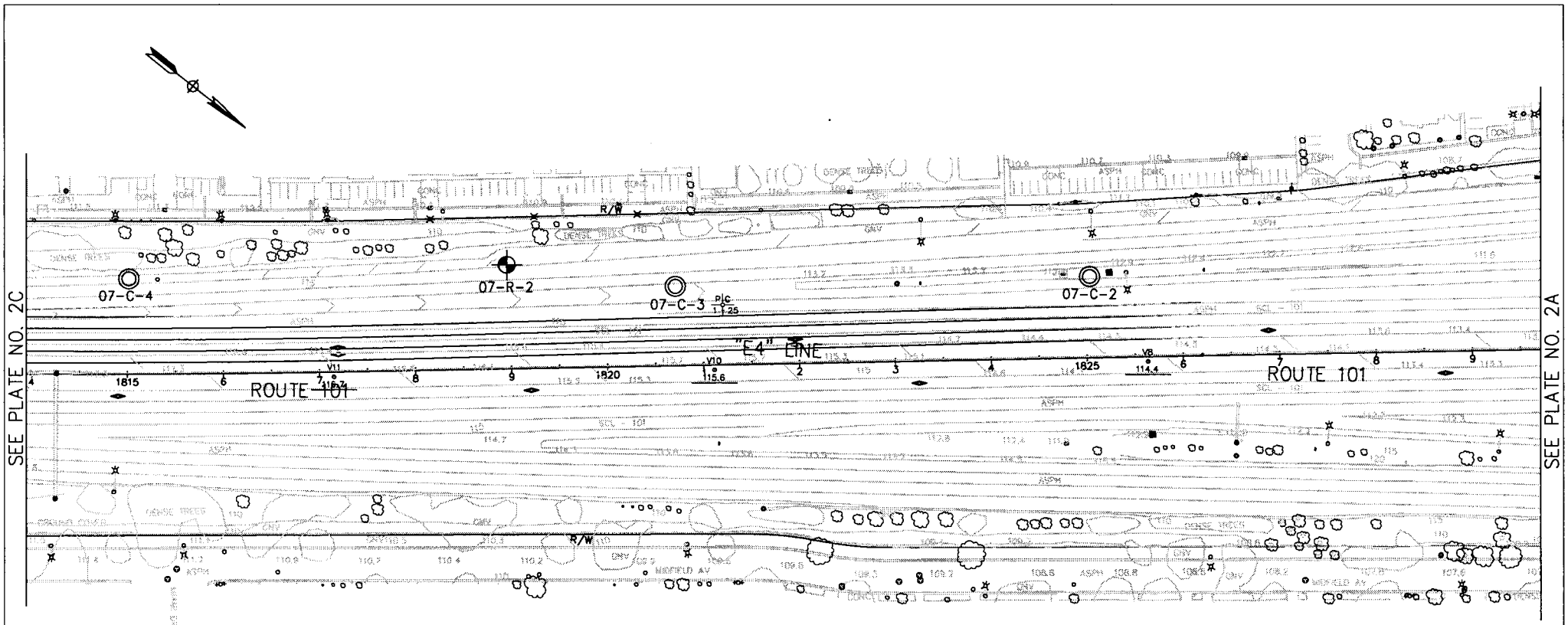
GRAPHIC SCALE

Note: All units are in feet unless otherwise specified
Reference Map was provided by HMH Engineers

PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS ENGINEERING

US 101 IMPROVEMENTS
FROM I-280/680 TO YERBA BUENA ROAD
SANTA CLARA COUNTY, CALIFORNIA

JOB NO.:207150.GDR | PLATE NO: 2A



SITE PLAN

LEGEND

07-R-1 Approx. Boring Location (PARIKH)

07-C-1 Approx. Coring Location (PARIKH)

100' 0' 100' 200'

GRAPHIC SCALE

Note: All units are in feet unless otherwise specified
Reference Map was provided by HMH Engineers

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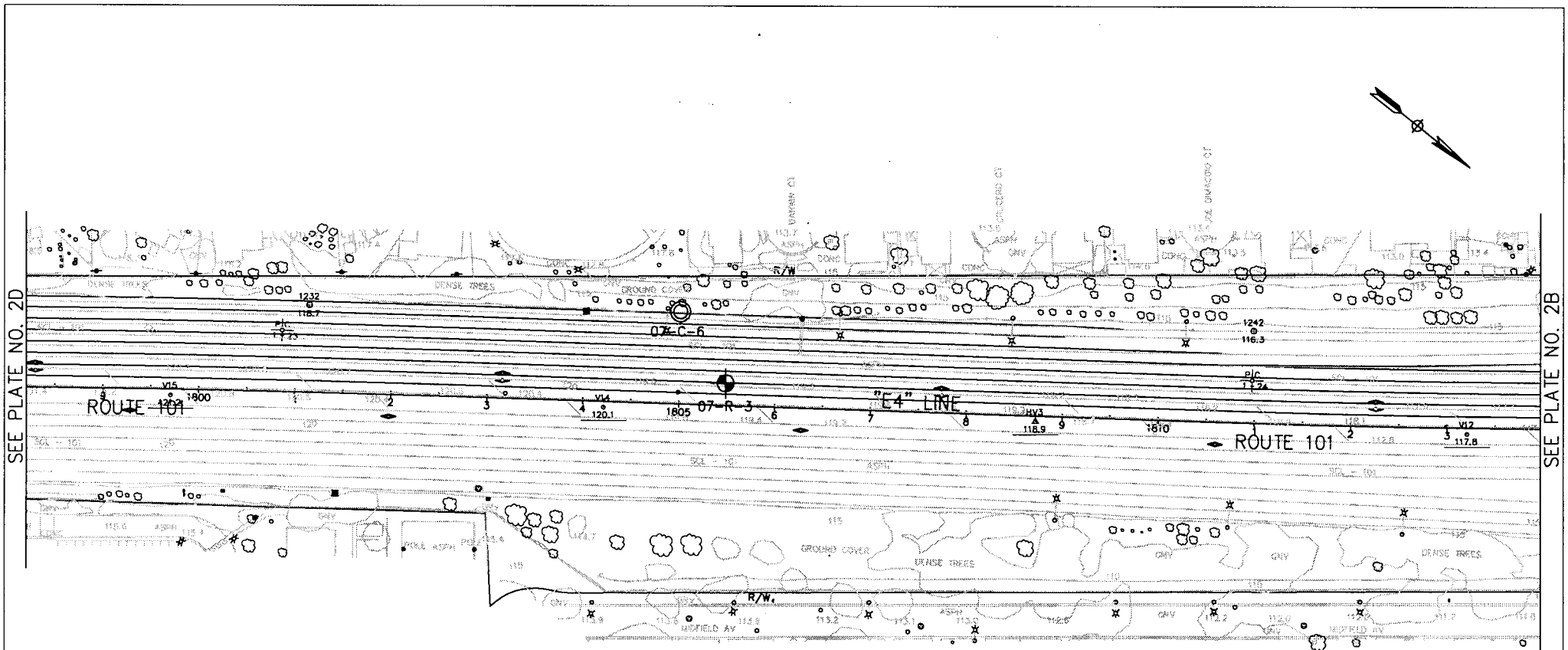
GEOTECHNICAL CONSULTANTS
MATERIALS ENGINEERING

US 101 IMPROVEMENTS
FROM I-280/680 TO YERBA BUENA ROAD
SANTA CLARA COUNTY, CALIFORNIA

JOB NO.:207150.GDR | PLATE NO: 2B



SITE PLAN

LEGEND

07-R-1 — Approx. Boring Location (PARIKH)

07-C-1 — Approx. Coring Location (PARIKH)

100' 0' 100' 200'

GRAPHIC SCALE

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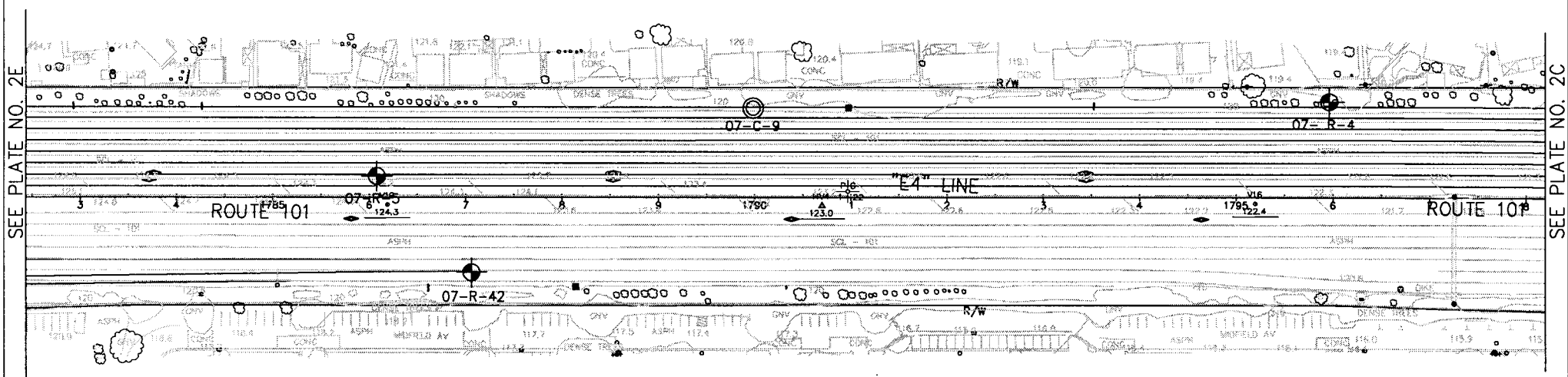
Reference Map was provided by HMH Engineers

PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS ENGINEERING

US 101 IMPROVEMENTS
FROM I-280/680 TO YERBA BUENA ROAD
SANTA CLARA COUNTY, CALIFORNIA

JOB NO.:207150.GDR

PLATE NO: 2C



SITE PLAN

LEGEND

07-R-1 Approx. Boring Location (PARIKH)

07-C-1 Approx. Coring Location (PARIKH)

100' 0' 100' 200'

GRAPHIC SCALE

Note: All units are in feet unless otherwise specified
Reference Map was provided by HMH Engineers

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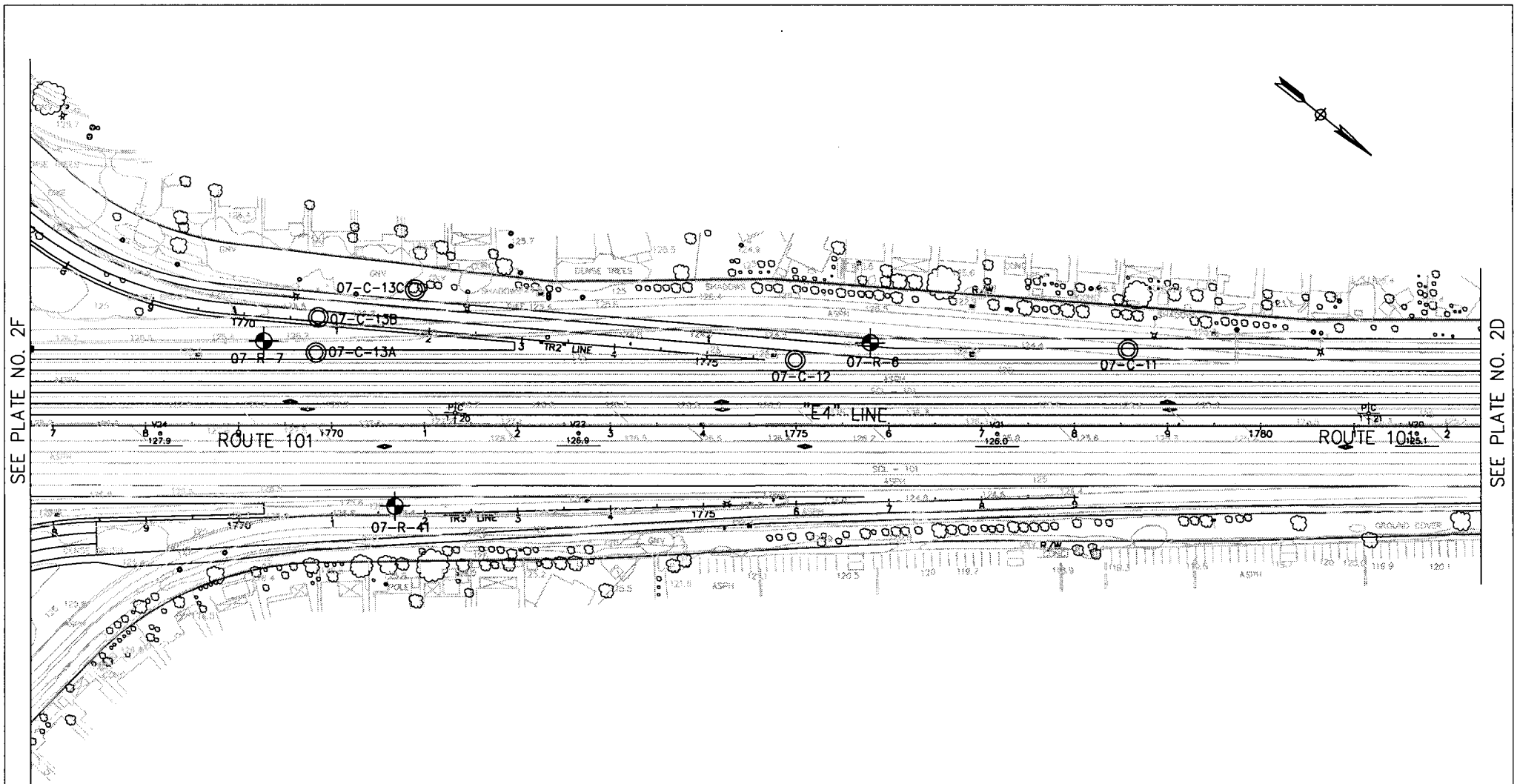
GEOTECHNICAL CONSULTANTS
MATERIALS ENGINEERING

US 101 IMPROVEMENTS
FROM I-280/680 TO YERBA BUENA ROAD
SANTA CLARA COUNTY, CALIFORNIA

JOB NO.:207150.GDR | PLATE NO: 2D



SITE PLAN

LEGEND

07-R-1 Approx. Boring Location (PARIKH)

07-C-1 Approx. Coring Location (PARIKH)

100' 0' 100' 200'

GRAPHIC SCALE

Note: All units are in feet unless otherwise specified

Reference Map was provided by HMH Engineers

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GEOTECHNICAL CONSULTANTS

MATERIALS ENGINEERING

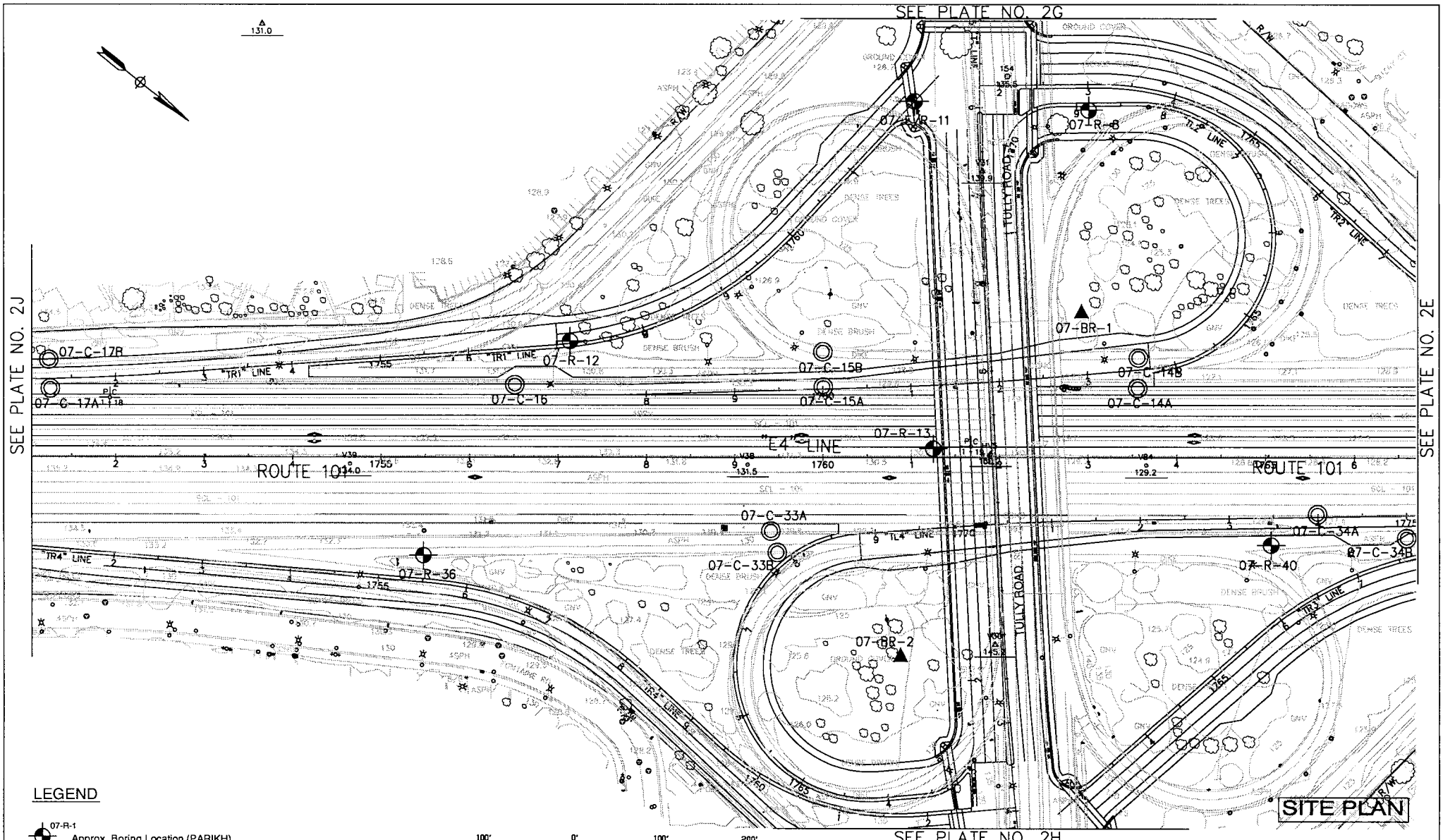
US 101 IMPROVEMENTS

FROM I-280/680 TO YERBA BUENA ROAD

SANTA CLARA COUNTY, CALIFORNIA

JOB NO.:207150.GDR

PLATE NO: 2E



LEGEND

- 07-R-1 Approx. Boring Location (PARIKH)
- 07-C-1 Approx. Coring Location (PARIKH)
- 07-BR-1 Approx. Cone Penetration Location (PARIKH)

100' 0' 100' 200'

GRAPHIC SCALE

Note: All units are in feet unless otherwise specified
Reference Map was provided by HMH Engineers

PARIKH CONSULTANTS, INC.
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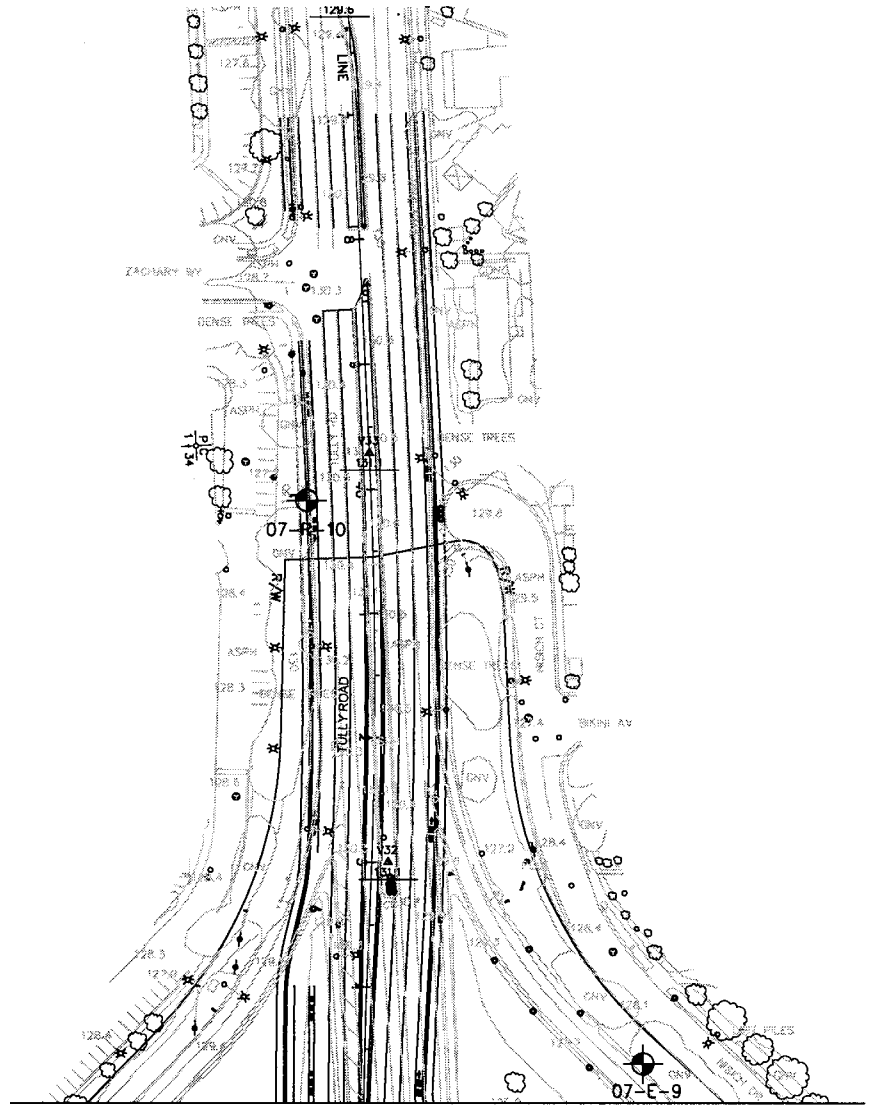
US 101 IMPROVEMENTS
FROM I-280/680 TO YERBA BUENA ROAD
SANTA CLARA COUNTY, CALIFORNIA

JOB NO.:207150.GDR | PLATE NO: 2F



SEE PLATE NO. 2F

SITE PLAN

LEGEND

07-R-1
Approx. Boring Location (PARIKH)

100' 0' 100' 200'
GRAPHIC SCALE

Note: All units are in feet unless otherwise specified
Reference Map was provided by HMH Engineers

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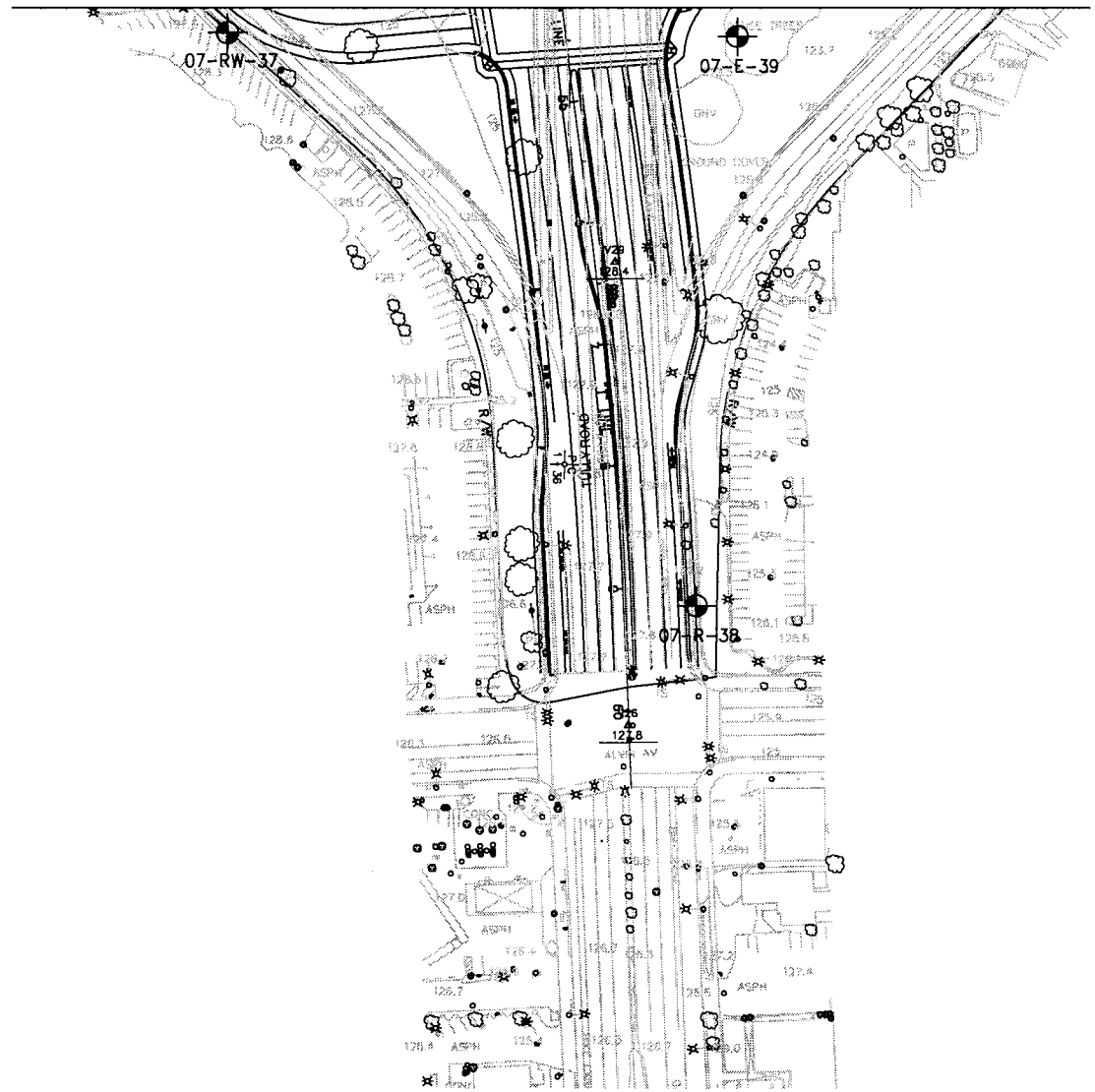
MATERIALS ENGINEERING

US 101 IMPROVEMENTS
FROM I-280/680 TO YERBA BUENA ROAD
SANTA CLARA COUNTY, CALIFORNIA

JOB NO.:207150.GDR | PLATE NO: 2G

SEE PLATE NO. 2F



SITE PLAN

LEGEND

07-R-1 Approx. Boring Location (PARIKH)

100' 0' 100' 200'

GRAPHIC SCALE

Note: All units are in feet unless otherwise specified

Reference Map was provided by HMH Engineers

PARIKH CONSULTANTS, INC.

GEOTECHNICAL CONSULTANTS

MATERIALS ENGINEERING

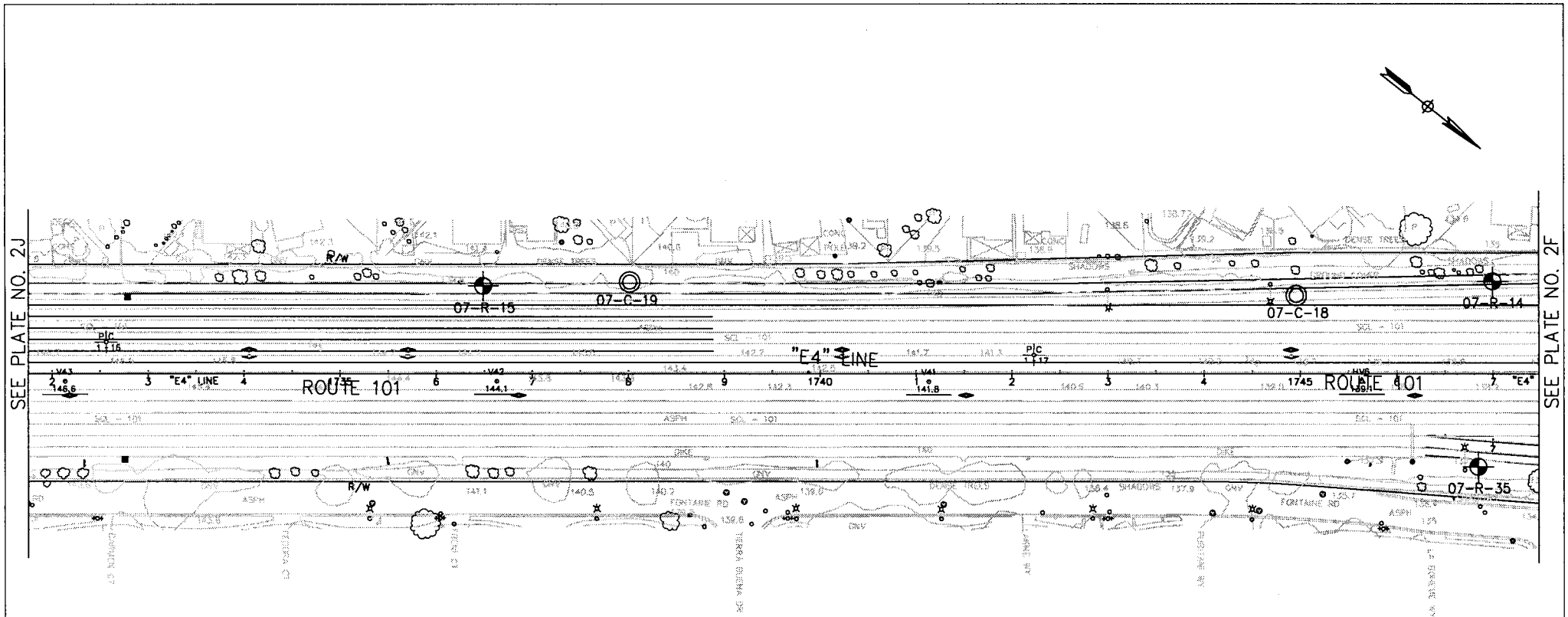
US 101 IMPROVEMENTS

FROM I-280/680 TO YERBA BUENA ROAD

SANTA CLARA COUNTY, CALIFORNIA

JOB NO.:207150.GDR

PLATE NO: 2H



SITE PLAN

LEGEND

07-R-1 — Approx. Boring Location (PARIKH)

07-C-1 — Approx. Coring Location (PARIKH)

100' 0' 100' 200'

GRAPHIC SCALE

Note: All units are in feet unless otherwise specified
Reference Map was provided by HMH Engineers

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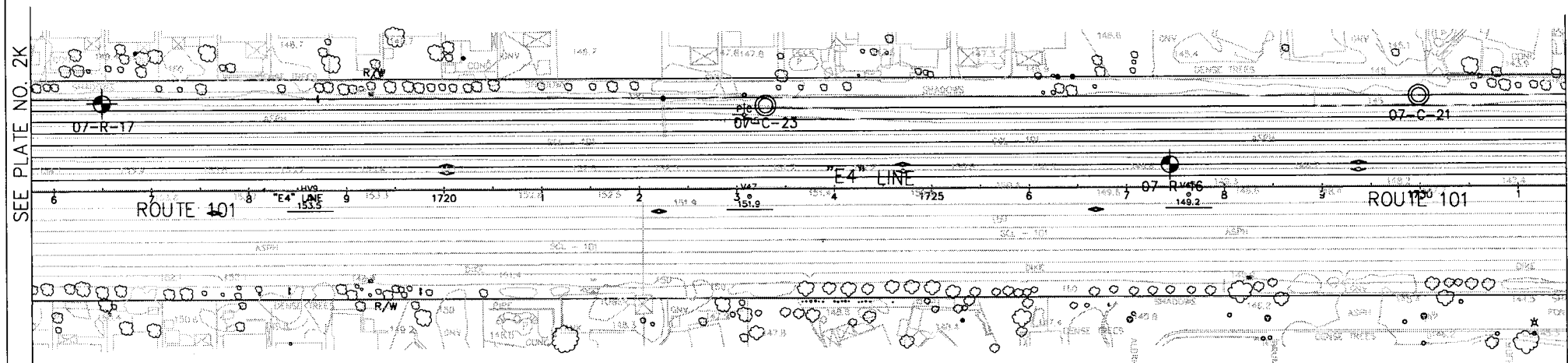
GEOTECHNICAL CONSULTANTS
MATERIALS ENGINEERING

US 101 IMPROVEMENTS
FROM I-280/680 TO YERBA BUENA ROAD
SANTA CLARA COUNTY, CALIFORNIA

JOB NO.:207150.GDR | PLATE NO: 2I



SITE PLAN

LEGEND

07-R-1 — Approx. Boring Location (PARIKH)

07-C-1 — Approx. Coring Location (PARIKH)

100' 0' 100' 200'

GRAPHIC SCALE

Note: All units are in feet unless otherwise specified
Reference Map was provided by HMH Engineers

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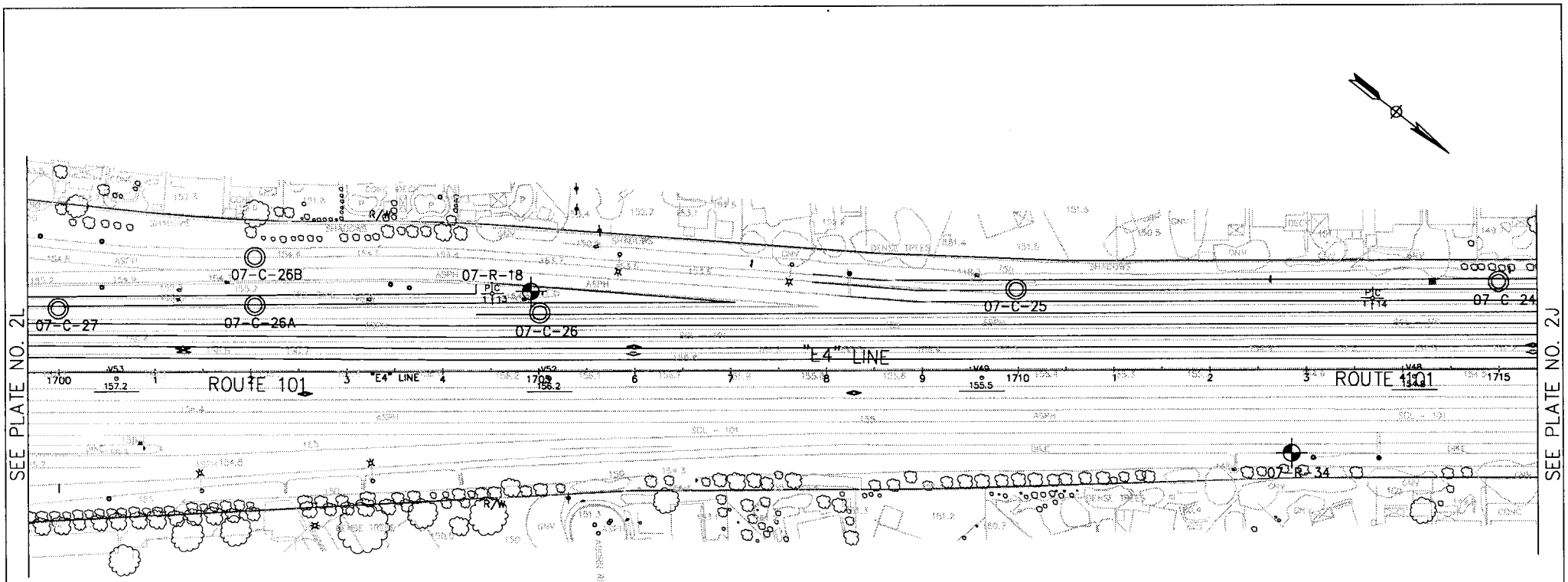
GEOTECHNICAL CONSULTANTS
MATERIALS ENGINEERING

US 101 IMPROVEMENTS
FROM I-280/680 TO YERBA BUENA ROAD
SANTA CLARA COUNTY, CALIFORNIA

JOB NO.:207150.GDR | PLATE NO: 2J



SITE PLAN

LEGEND

07-R-1 — Approx. Boring Location (PARIKH)

07-C-1 — Approx. Coring Location (PARIKH)

100' 0' 100' 200'

GRAPHIC SCALE

Note: All units are in feet unless otherwise specified
Reference Map was provided by HMH Engineers

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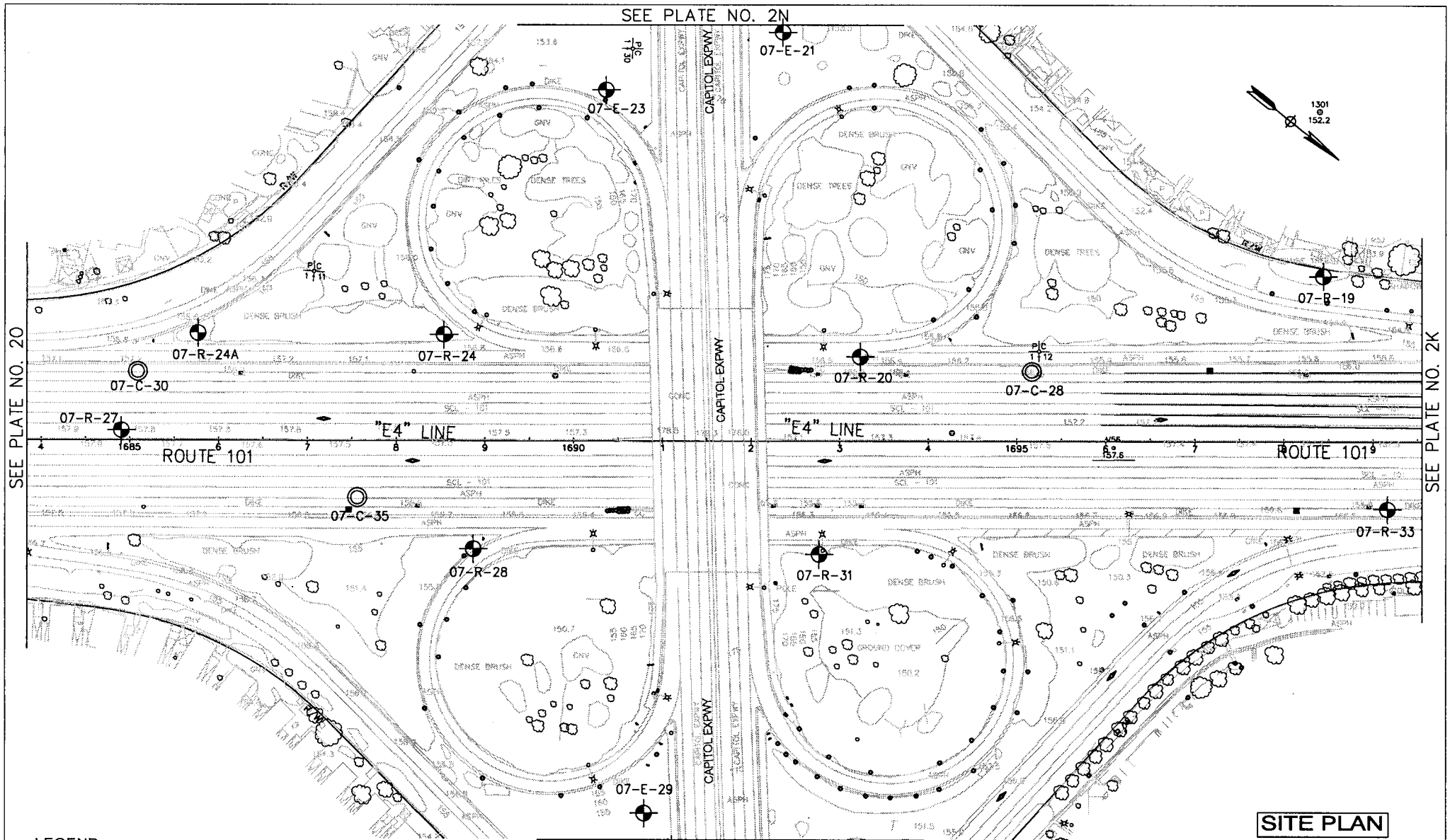
GEOTECHNICAL CONSULTANTS
MATERIALS ENGINEERING

US 101 IMPROVEMENTS
FROM I-280/680 TO YERBA BUENA ROAD
SANTA CLARA COUNTY, CALIFORNIA

JOB NO.:207150.GDR | PLATE NO: 2K



SITE PLAN

LEGEND

07-R-1 — Approx. Boring Location (PARIKH)

07-C-1 — Approx. Coring Location (PARIKH)

100' 0' 100' 200'

GRAPHIC SCALE

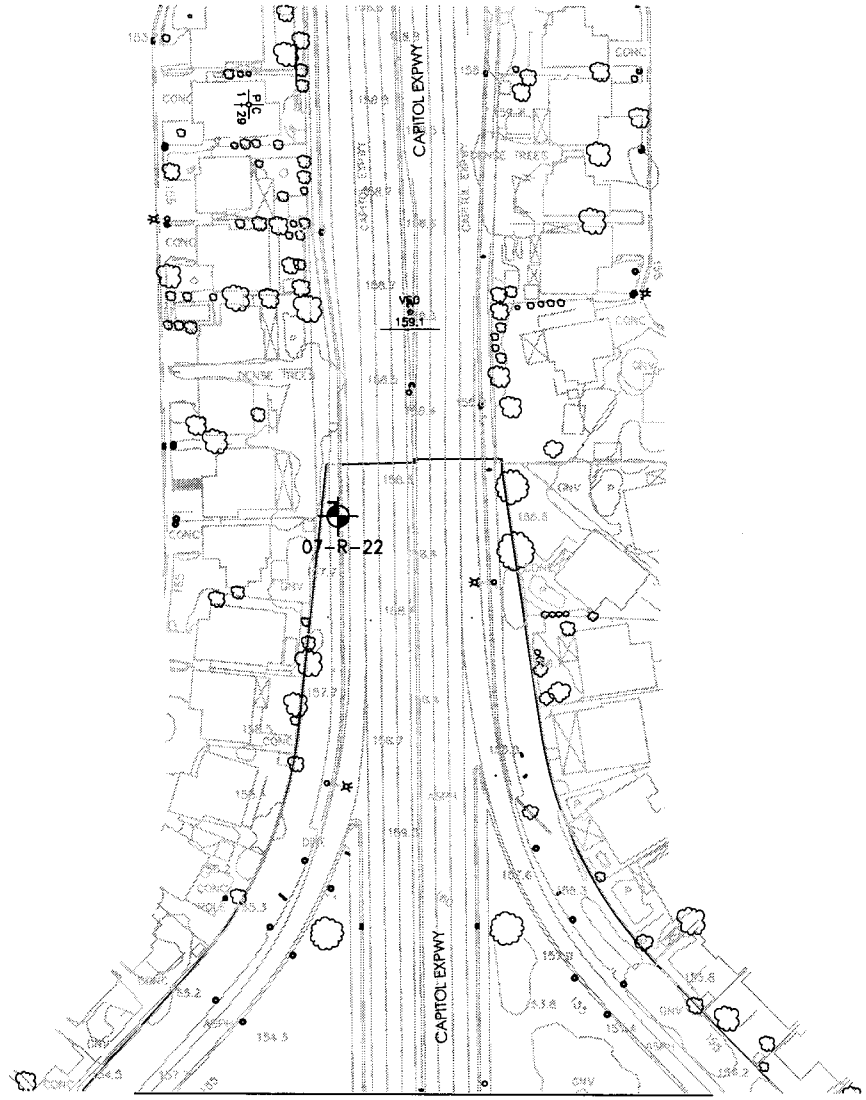
Note: All units are in feet unless otherwise specified
Reference Map was provided by HMH Engineers

PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS ENGINEERING

US 101 IMPROVEMENTS
FROM I-280/680 TO YERBA BUENA ROAD
SANTA CLARA COUNTY, CALIFORNIA

JOB NO.:207150.GDR

PLATE NO: 2L



SITE PLAN

LEGEND

07-R-1 Approx. Boring Location (PARIKH)

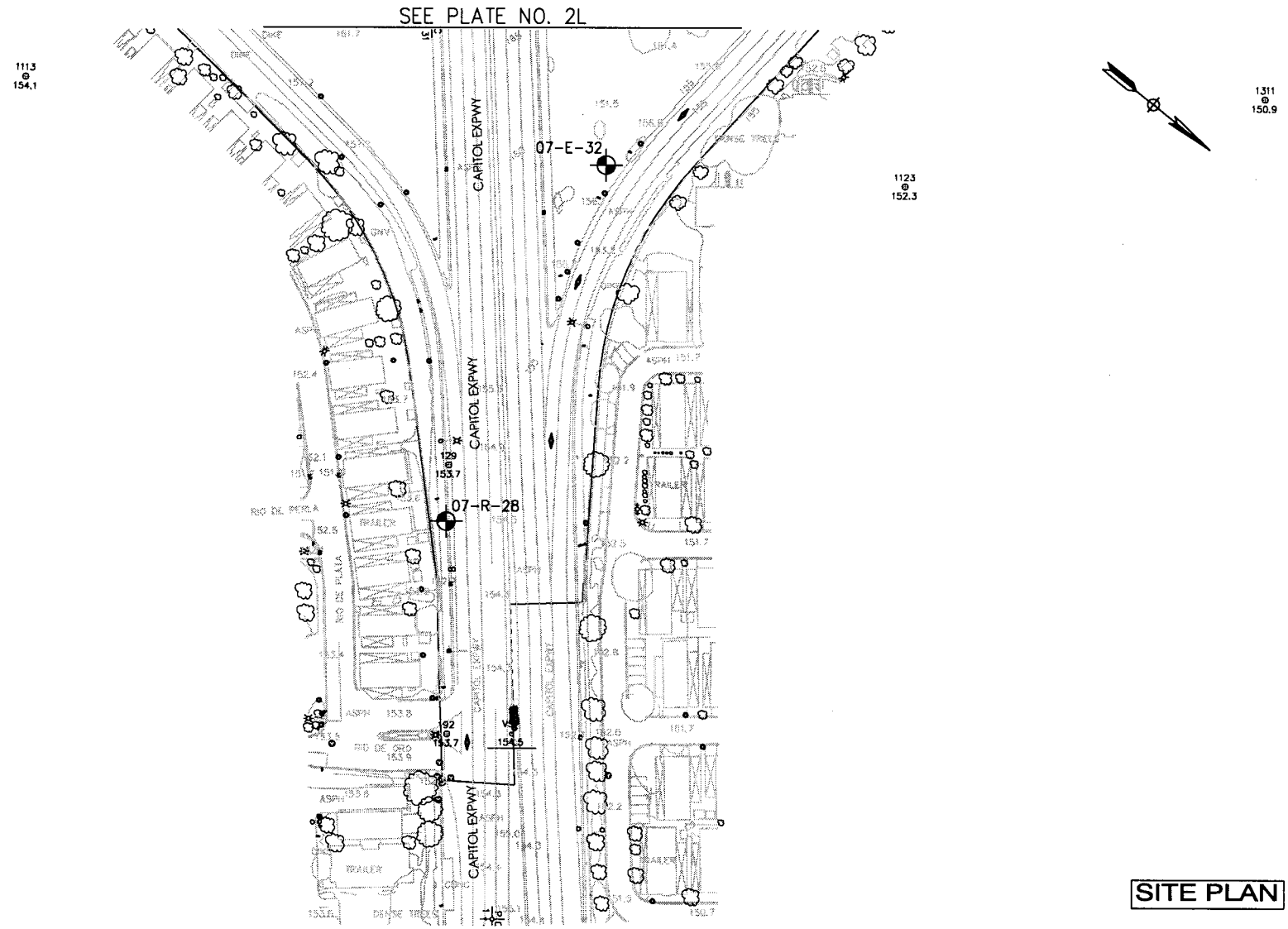
100' 0' 100' 200'
GRAPHIC SCALE

Note: All units are in feet unless otherwise specified
Reference Map was provided by HMH Engineers

PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS ENGINEERING

US 101 IMPROVEMENTS
FROM I-280/680 TO YERBA BUENA ROAD
SANTA CLARA COUNTY, CALIFORNIA

JOB NO.:207150.GDR | PLATE NO: 2M



SITE PLAN

LEGEND

07-R-1 Approx. Boring Location (PARIKH)

100' 0' 100' 200'

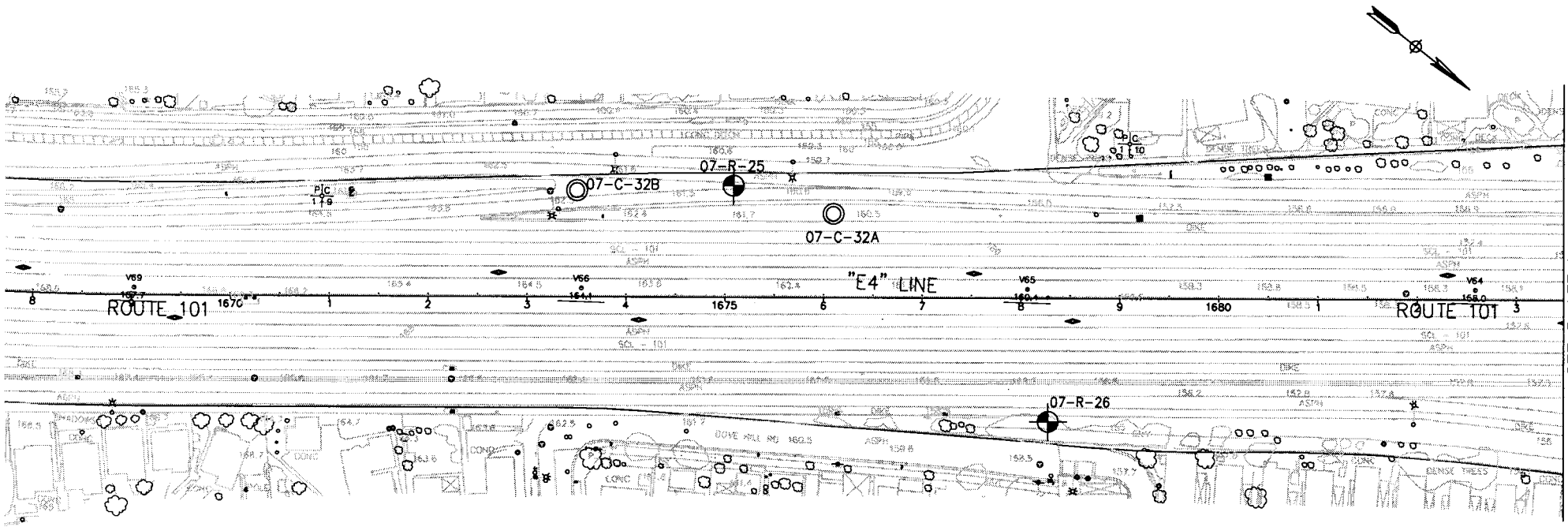
GRAPHIC SCALE

Note: All units are in feet unless otherwise specified
Reference Map was provided by HMH Engineers

PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS ENGINEERING

US 101 IMPROVEMENTS
FROM I-280/680 TO YERBA BUENA ROAD
SANTA CLARA COUNTY, CALIFORNIA

JOB NO.:207150.GDR | PLATE NO: 2N



LEGEND

07-R-1 Approx. Boring Location (PARIKH)

07-C-1 Approx. Coring Location (PARIKH)

100' 0' 100' 200'

GRAPHIC SCALE

Note: All units are in feet unless otherwise specified
Reference Map was provided by HMH Engineers

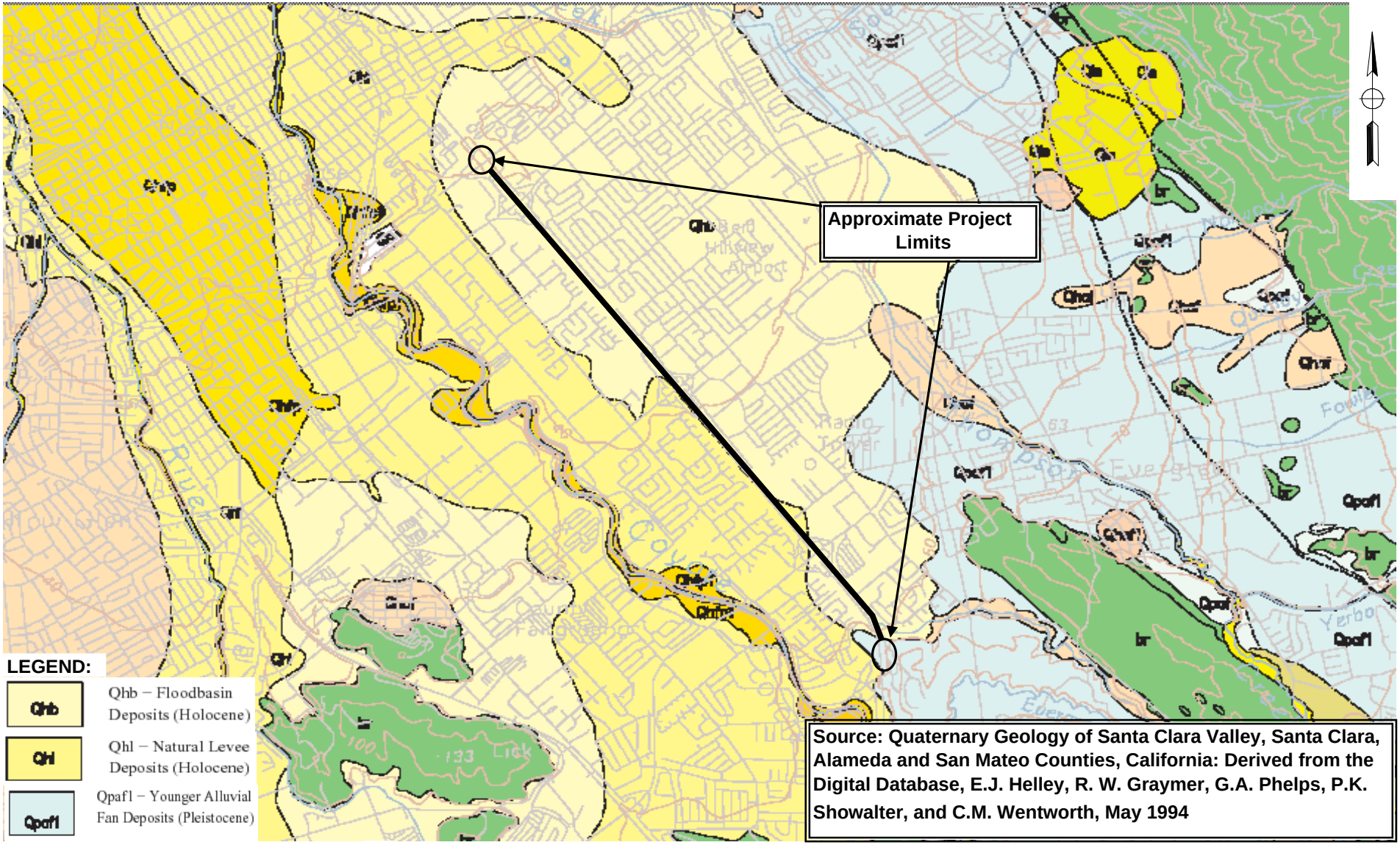
SITE PLAN

PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS ENGINEERING

US 101 IMPROVEMENTS
FROM I-280/680 TO YERBA BUENA ROAD
SANTA CLARA COUNTY, CALIFORNIA

JOB NO.:207150.GDR

PLATE NO: 2O



LEGEND:

- Qhb – Floodbasin Deposits (Holocene)
- Qhl – Natural Levee Deposits (Holocene)
- Qpaf1 – Younger Alluvial Fan Deposits (Pleistocene)

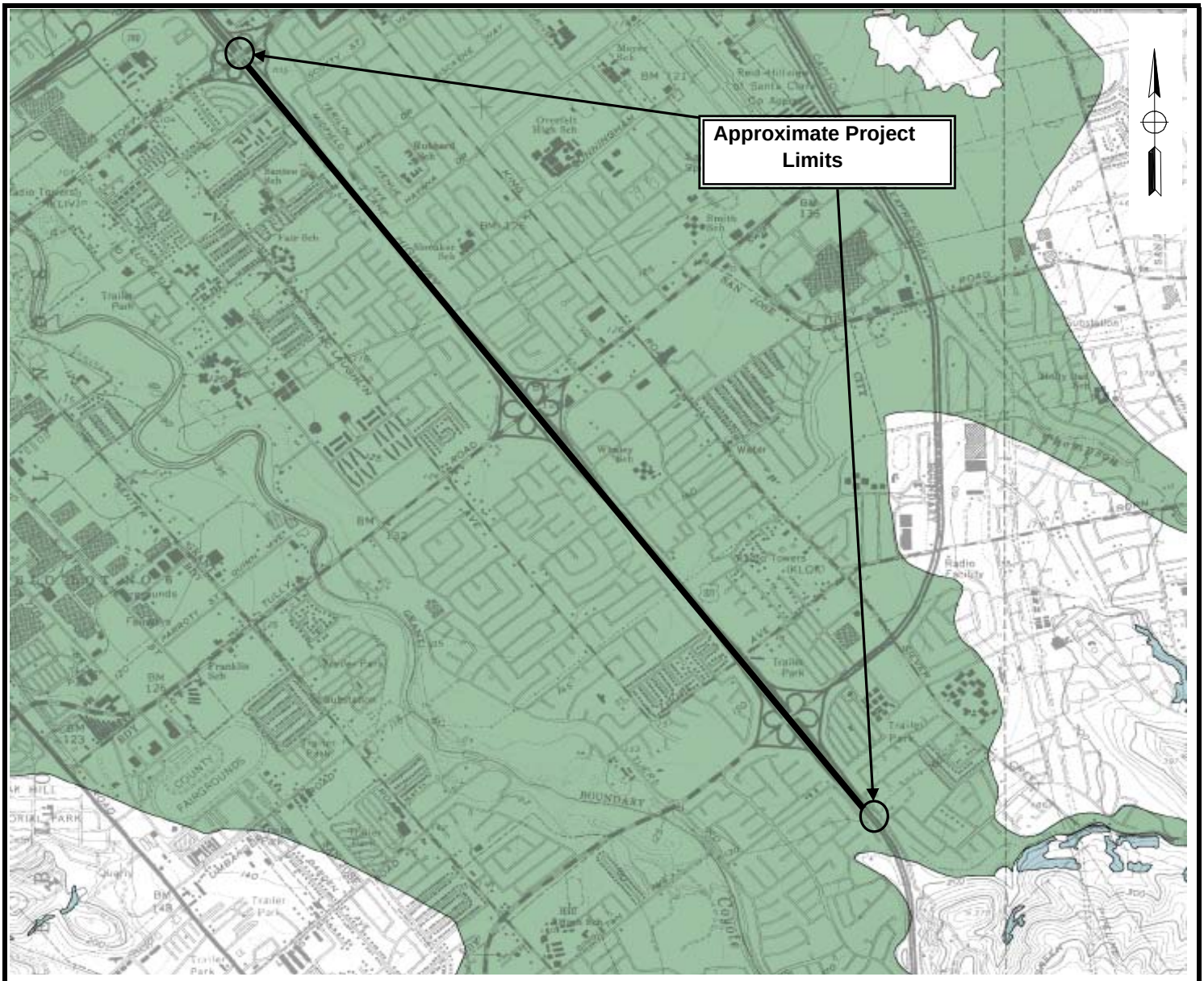
SCALE: 1 0 1 Mile

GEOLOGIC MAP

PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS TESTING

US 101 IMPROVEMENTS FROM I-280/680 TO YERBA BUENA ROAD
SANTA CLARA COUNTY, CALIFORNIA

JOB NO.: 207150.GDR | PLATE NO.: 3A



SCALE 1:24,000

1 .5 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

STATE OF CALIFORNIA
SEISMIC HAZARD ZONES

Delineated in compliance with
Chapter 7.8, Division 2 of the California Public Resources Code
(Seismic Hazards Mapping Act)

SAN JOSE EAST QUADRANGLE

OFFICIAL MAP

Released: January 17, 2001

MAP EXPLANATION

Zones of Required Investigation:

Liquefaction

Areas where historic occurrence of liquefaction, or local geological, geotechnical and groundwater conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

Earthquake-Induced Landslides

Areas where previous occurrence of landslide movement, or local topographic, geological, geotechnical and subsurface water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

DATA AND METHODOLOGY USED TO DEVELOP THIS MAP ARE PRESENTED IN THE FOLLOWING:

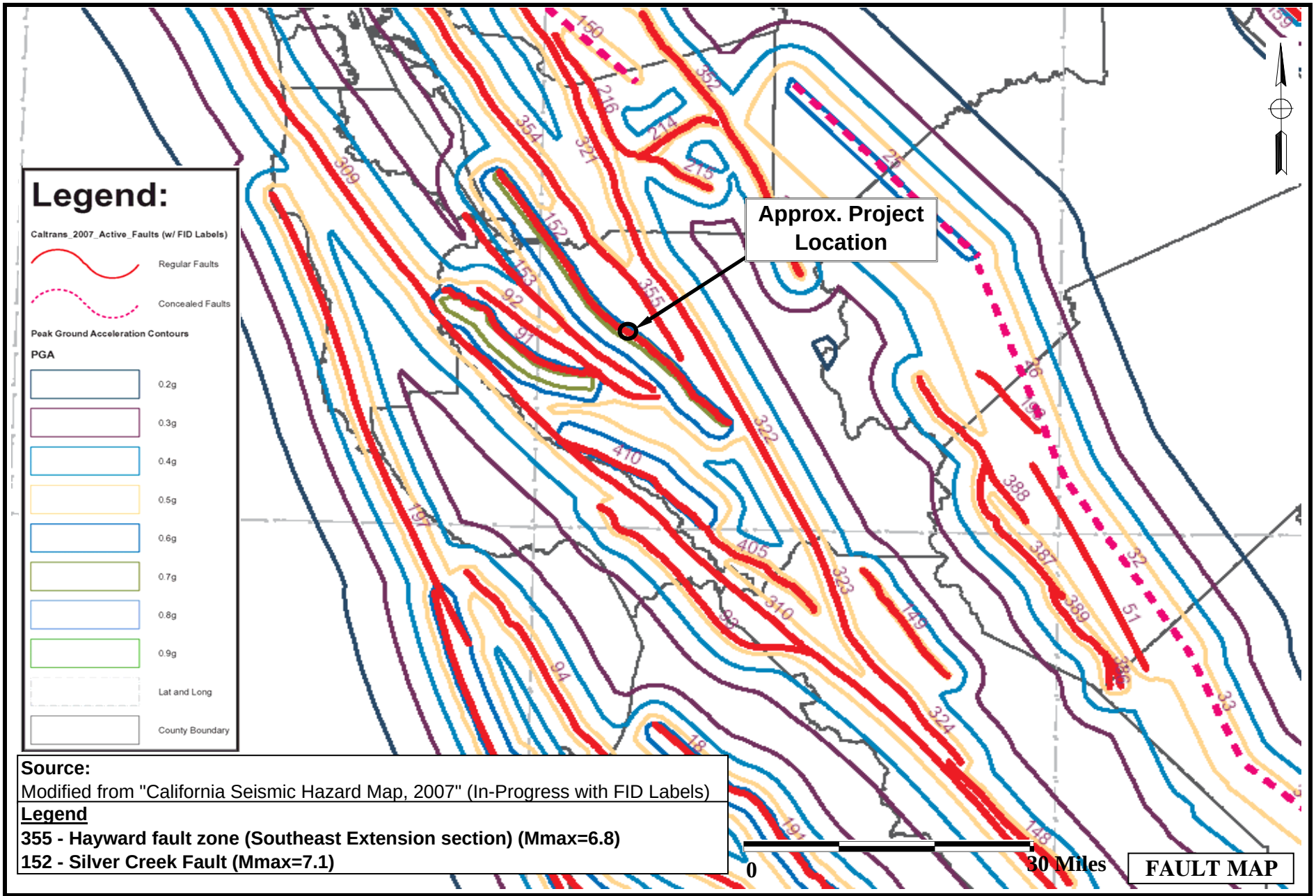
Seismic Hazard Evaluation of the San Jose East 7.5 minute quadrangle, Santa Clara County, California: California Division of Mines and Geology, Open-File Report 2000-010.

SEISMIC HAZARD MAP

PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS TESTING

US 101 IMPROVEMENTS FROM I-280/680 TO YERBA BUENA ROAD
SANTA CLARA COUNTY, CALIFORNIA

JOB NO.: 207150.GDR | **PLATE NO.: 3B**



Source:
Modified from "California Seismic Hazard Map, 2007" (In-Progress with FID Labels)

Legend
355 - Hayward fault zone (Southeast Extension section) (Mmax=6.8)
152 - Silver Creek Fault (Mmax=7.1)

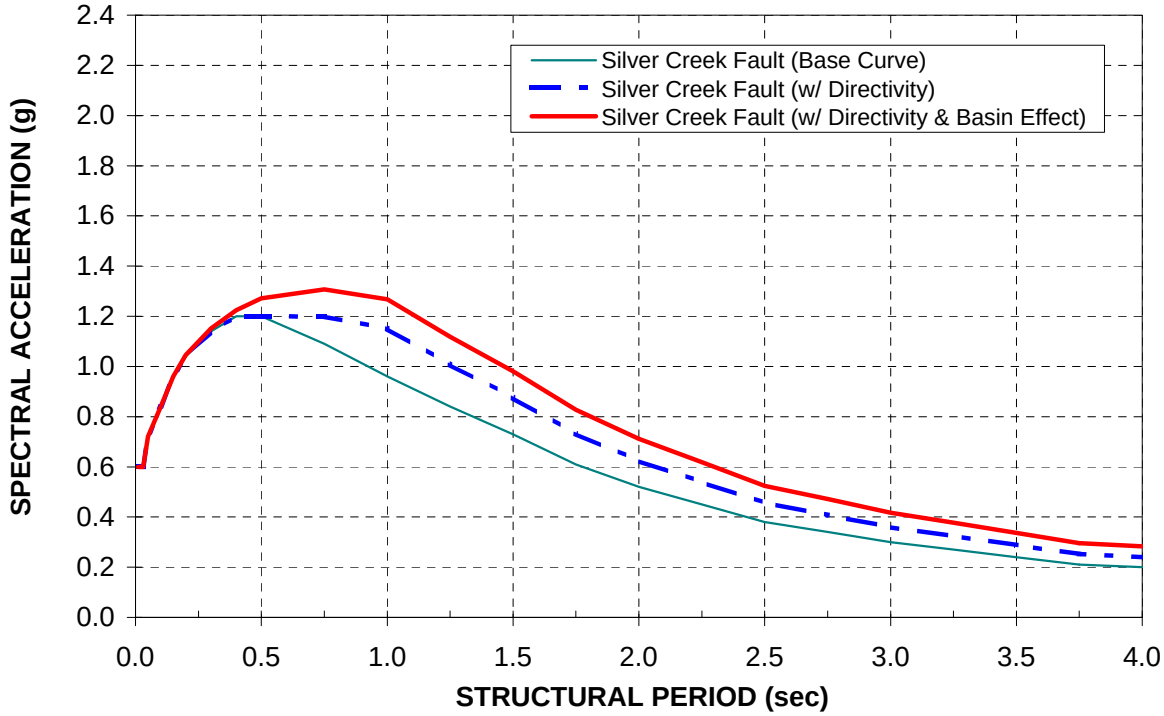
FAULT MAP

PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS TESTING

ROUTE 101 TULLY ROAD OPERATIONAL IMPROVEMENTS PROJECT
SANTA CLARA COUNTY, CALIFORNIA

JOB NO.: 207150.GDR | **PLATE NO.: 4**

ARS DESIGN CURVE
TULLY RD OC - ROUTE 101 IMPROVEMENT
SANTA CLARA COUNTY, CALIFORNIA



Period	Silver Crk Fault - 152 (7.1) w/ mod.
(sec)	Spectral Accel. (g)
0.01	0.600
0.03	0.600
0.05	0.720
0.10	0.840
0.15	0.960
0.20	1.045
0.30	1.151
0.40	1.224
0.50	1.272
0.75	1.307
1.00	1.267
1.25	1.119
1.50	0.981
1.75	0.827
2.00	0.711
2.25	0.618
2.50	0.524
2.75	0.471
3.00	0.418
3.25	0.377
3.50	0.337
3.75	0.296
4.00	0.283

1. The base curve is per Caltrans 2008 Seismic Hazard Map (in-progress) considering both deterministic & probablistic models.
   Governing Fault: Fault ID #152 - Silver Creek Fault (reverse), Mmax = 7.1
   Location: Lat=37.318434 Long=-121.831377, Vs30 = 270 m/s
2. Modification for Directivity : 20% increase of Sa for T >1 sec., no change of Sa for T < 0.5 sec., and linear interpolation between 0.5 & 1 sec.
3. Modification for Basin Effect: Site Amplification is per Campbell and Bozorgnia (2007) considering Z2.5m/s depth.

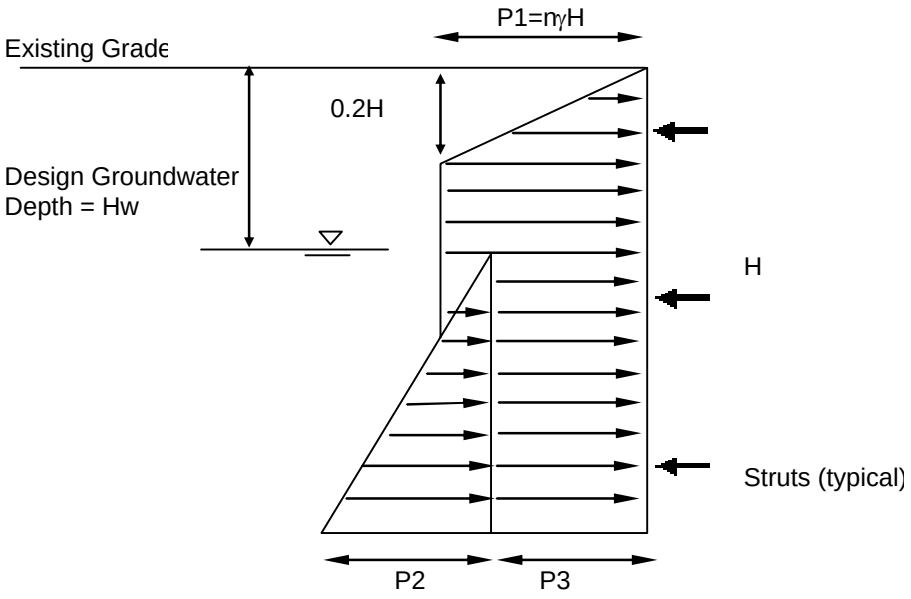
PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS TESTING

TULLY ROAD OVERCROSSING - ROUTE 101
SANTA CLARA COUNTY, CALIFORNIA

JOB NO.: 207150.TUL

PLATE NO.: 5

APPARENT LATERAL EARTH PRESSURE DIAGRAM



H = Excavation Depth in feet
P1 = nγH = 0.3(125)H = 37.5H psf
P2 = 62.4 (H-Hw) psf
P3 = n(γHw + γ'(H - Hw)) psf

γ = 125 pcf (Total Unit Weight)
γ' = 65 pcf (Buoyant Unit Weight)

1. The pressure diagram is based on average soil and groundwater conditions.
2. Lateral earth pressure should be checked where conditions are different
3. All relevant surcharge loads including construction operation should be added for designing the shoring system.

APPARENT LATERAL EARTH PRESSURE DIAGRAM

PARIKH
Practicing In the Geosciences

ROUTE 101 IMPROVEMENTS
FROM I-280/680 TO YEARBA BUENA ROAD
SANTA CLARA COUNTY, CALIFORNIA

JOB NO.: 207150.GDR | **PLATE NO. 6**

APPENDIX A

REFERENCE: CALTRANS SOIL & ROCK LOGGING, CLASSIFICATION, AND PRESENTATION MANUAL (JUNE 2007)

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
04	SCI	101	31.8/34.2	____	____

REGISTERED GEOTECHNICAL ENGINEER — DATE

PLANS APPROVAL DATE

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

REGISTERED PROFESSIONAL ENGINEER — GARY PARIKH — No. G.E. 666 — Exp. 12/31/09 — GEOTECHNICAL — STATE OF CALIFORNIA

GROUP SYMBOLS AND NAMES

Graphic/Symbol	Group Names
GW	Well-graded GRAVEL Well-graded GRAVEL with SAND
GP	Poorly graded GRAVEL Poorly graded GRAVEL with SAND
GW-GM	Well-graded GRAVEL with SILT Well-graded GRAVEL with SILT and SAND
GW-GC	Well-graded GRAVEL with CLAY (or SILTY CLAY) Well-graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)
GP-GM	Poorly graded GRAVEL with SILT Poorly graded GRAVEL with SILT and SAND
GP-GC	Poorly graded GRAVEL with CLAY (or SILTY CLAY) Poorly graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)
GM	SILTY GRAVEL SILTY GRAVEL with SAND
GC	CLAYEY GRAVEL CLAYEY GRAVEL with SAND
GC-GM	SILTY, CLAYEY GRAVEL SILTY, CLAYEY GRAVEL with SAND
SW	Well-graded SAND Well-graded SAND with GRAVEL
SP	Poorly graded SAND Poorly graded SAND with GRAVEL
SW-SM	Well-graded SAND with SILT Well-graded SAND with SILT and GRAVEL
SW-SC	Well-graded SAND with CLAY (or SILTY CLAY) Well-graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)
SP-SM	Poorly graded SAND with SILT Poorly graded SAND with SILT and GRAVEL
SP-SC	Poorly graded SAND with CLAY (or SILTY CLAY) Poorly graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)
SM	SILTY SAND SILTY SAND with GRAVEL
SC	CLAYEY SAND CLAYEY SAND with GRAVEL
SC-SM	SILTY, CLAYEY SAND SILTY, CLAYEY SAND with GRAVEL
PT	PEAT
	COBBLES COBBLES and BOULDERS BOULDERS

Graphic/Symbol	Group Names
CL	Lean CLAY Lean CLAY with SAND Lean CLAY with GRAVEL SANDY lean CLAY SANDY lean CLAY with GRAVEL GRAVELLY lean CLAY GRAVELLY lean CLAY with SAND
CL-ML	SILTY CLAY SILTY CLAY with SAND SILTY CLAY with GRAVEL SANDY SILTY CLAY SANDY SILTY CLAY with GRAVEL GRAVELLY SILTY CLAY GRAVELLY SILTY CLAY with SAND
ML	SILT SILT with SAND SILT with GRAVEL SANDY SILT SANDY SILT with GRAVEL GRAVELLY SILT GRAVELLY SILT with SAND
OL	ORGANIC lean CLAY ORGANIC lean CLAY with SAND ORGANIC lean CLAY with GRAVEL SANDY ORGANIC lean CLAY SANDY ORGANIC lean CLAY with GRAVEL GRAVELLY ORGANIC lean CLAY GRAVELLY ORGANIC lean CLAY with SAND
OL	ORGANIC SILT ORGANIC SILT with SAND ORGANIC SILT with GRAVEL SANDY ORGANIC SILT SANDY ORGANIC SILT with GRAVEL GRAVELLY ORGANIC SILT GRAVELLY ORGANIC SILT with SAND
CH	Fat CLAY Fat CLAY with SAND Fat CLAY with GRAVEL SANDY fat CLAY SANDY fat CLAY with GRAVEL GRAVELLY fat CLAY GRAVELLY fat CLAY with SAND
MH	Elastic SILT Elastic SILT with SAND Elastic SILT with GRAVEL SANDY elastic SILT SANDY elastic SILT with GRAVEL GRAVELLY elastic SILT GRAVELLY elastic SILT with SAND
OH	ORGANIC fat CLAY ORGANIC fat CLAY with SAND ORGANIC fat CLAY with GRAVEL SANDY ORGANIC fat CLAY SANDY ORGANIC fat CLAY with GRAVEL GRAVELLY ORGANIC fat CLAY GRAVELLY ORGANIC fat CLAY with SAND
OH	ORGANIC elastic SILT ORGANIC elastic SILT with SAND ORGANIC elastic SILT with GRAVEL SANDY ORGANIC elastic SILT SANDY ORGANIC elastic SILT with GRAVEL GRAVELLY ORGANIC elastic SILT GRAVELLY ORGANIC elastic SILT with SAND
OL/OH	ORGANIC SOIL ORGANIC SOIL with SAND ORGANIC SOIL with GRAVEL SANDY ORGANIC SOIL SANDY ORGANIC SOIL with GRAVEL GRAVELLY ORGANIC SOIL GRAVELLY ORGANIC SOIL with SAND

FIELD AND LABORATORY TESTING

- (C) Consolidation (ASTM D 2435)
- (CL) Collapse Potential (ASTM D 5333)
- (CP) Compaction Curve (CTM 216)
- (CR) Corrosivity Testing (CTM 643, CTM 422, CTM 417)
- (CU) Consolidated Undrained Triaxial (ASTM D 4767)
- (DS) Direct Shear (ASTM D 3080)
- (EI) Expansion Index (ASTM D 4829)
- (M) Moisture Content (ASTM D 2216)
- (OC) Organic Content-% (ASTM D 2974)
- (P) Permeability (CTM 220)
- (PA) Particle Size Analysis (ASTM D 422)
- (PI) Plasticity Index (AASHTO T 90) Liquid Limit (AASHTO T 89)
- (PL) Point Load Index (ASTM D 5731)
- (PM) Pressure Meter
- (PP) Pocket Penetrometer
- (R) R-Value (CTM 301)
- (SE) Sand Equivalent (CTM 217)
- (SG) Specific Gravity (AASHTO T 100)
- (SL) Shrinkage Limit (ASTM D 427)
- (SW) Swell Potential (ASTM D 4546)
- (TV) Pocket Torvane
- (UC) Unconfined Compression-Soil (ASTM D 2166) Unconfined Compression-Rock (ASTM D 2938)
- (UU) Unconsolidated Undrained Triaxial (ASTM D 2850)
- (UW) Unit Weight (ASTM D 4767)
- (VS) Vane Shear (AASHTO T 223)

APPARENT DENSITY OF COHESIONLESS SOILS

Description	SPT N_{60} (Blows / 12 inches)
Very loose	0 – 4
Loose	5 – 10
Medium Dense	11 – 30
Dense	31 – 50
Very Dense	> 50

MOISTURE

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

PERCENT OR PROPORTION OF SOILS

Description	Criteria
Trace	Particles are present but estimated to be less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

PARTICLE SIZE

Description		Size
Boulder		> 12"
Cobble		3" to 12"
Gravel	Coarse	3/4" to 3"
	Fine	No. 4 to 3/4"
Sand	Coarse	No. 10 to No. 4
	Medium	No. 40 to No. 10
	Fine	No. 200 to No. 40

ENGINEERING SERVICES	GEOTECHNICAL SERVICES
PREPARED BY	L. TRAN
CHECKED BY	D. WANG

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DIVISION OF ENGINEERING SERVICES
STRUCTURE DESIGN
DESIGN BRANCH

BRIDGE NO. –
POST MILE –

SOIL LEGEND
LOG OF TEST BORINGS

GS LOTB SOIL LEGEND

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU
EA 04-1A9801

FILE => $REQUEST

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES: 04/03/09

SHEET ___ OF ___

USERNAME => $USER DATE PLOTTED => $DATE TIME PLOTTED => $TIME

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
04	SCI	101	31.8/34.2	____	____

REGISTERED GEOTECHNICAL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER GARY PARIKH No. G.E. 666 Exp. 12/31/09 GEOTECHNICAL STATE OF CALIFORNIA

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

REFERENCE: CALTRANS SOIL & ROCK LOGGING, CLASSIFICATION, AND PRESENTATION MANUAL (JUNE 2007)

CEMENTATION

Description	Criteria
Weak	Crumbles or breaks with handling or little finger pressure.
Moderate	Crumbles or breaks with considerable finger pressure.
Strong	Will not crumble or break with finger pressure.

CONSISTENCY OF COHESIVE SOILS

Description	Unconfined Compressive Strength (tsf)	Pocket Penetrometer Measurement (tsf)	Torvane Measurement (tsf)	Field Approximation
Very Soft	< 0.25	< 0.25	< 0.12	Easily penetrated several inches by fist
Soft	0.25 to 0.50	0.25 to 0.50	0.12 to 0.25	Easily penetrated several inches by thumb
Medium Stiff	0.50 to 1.0	0.50 to 1.0	0.25 to 0.50	Penetrated several inches by thumb with moderate effort
Stiff	1 to 2	1 to 2	0.50 to 1.0	Readily indented by thumb but penetrated only with great effort
Very Stiff	2 to 4	2 to 4	1.0 to 2.0	Readily indented by thumbnail
Hard	> 4.0	> 4.0	> 2.0	Indented by thumbnail with difficulty

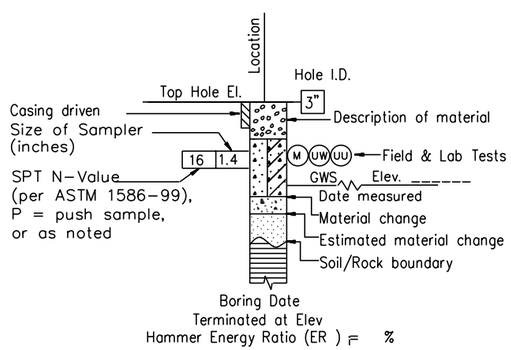
BOREHOLE IDENTIFICATION

Symbol	Hole Type	Description
Size	A	Auger Boring
Size	R P	Rotary drilled boring Rotary percussion boring (air)
Size	R	Rotary drilled diamond core
Size	HD HA	Hand driven (1-inch soil tube) Hand Auger
●	D	Dynamic Cone Penetration Boring
▲	CPT	Cone Penetration Test (ASTM D 5778-95)
□	O	Other

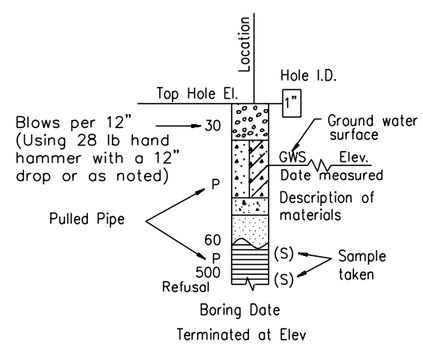
Note: Size in inches.

PLASTICITY OF FINE-GRAINED SOILS

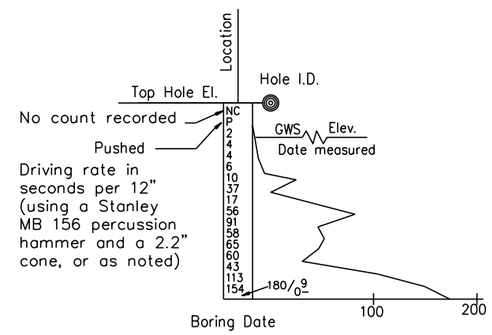
Description	Criteria
Nonplastic	A 1/8-inch thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.



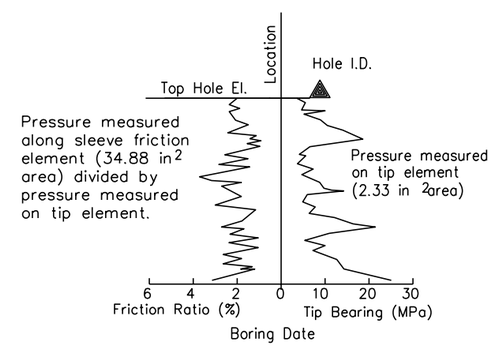
ROTARY BORING



HAND BORING



DYNAMIC CONE PENETRATION BORING



CONE PENETRATION TEST (CPT) SOUNDING

ENGINEERING SERVICES	GEOTECHNICAL SERVICES
PREPARED BY	L. TRAN
CHECKED BY	D. WANG

STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN

DESIGN BRANCH

BRIDGE NO. –

POST MILE –

SOIL LEGEND

LOG OF TEST BORINGS

GS LOTB SOIL LEGEND

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU
EA 04-1A9801

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES 04/03/09 SHEET ___ OF ___

FILE => $REQUEST

USERNAME => $USER DATE PLOTTED => $DATE TIME PLOTTED => $TIME

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
04	SCI	101	31.8/34.2	____	____

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

PROFESSIONAL ENGINEER — GARY PARIKH — No. G.E. 666 — Exp. 12/31/09 — GEOTECHNICAL — STATE OF CALIFORNIA

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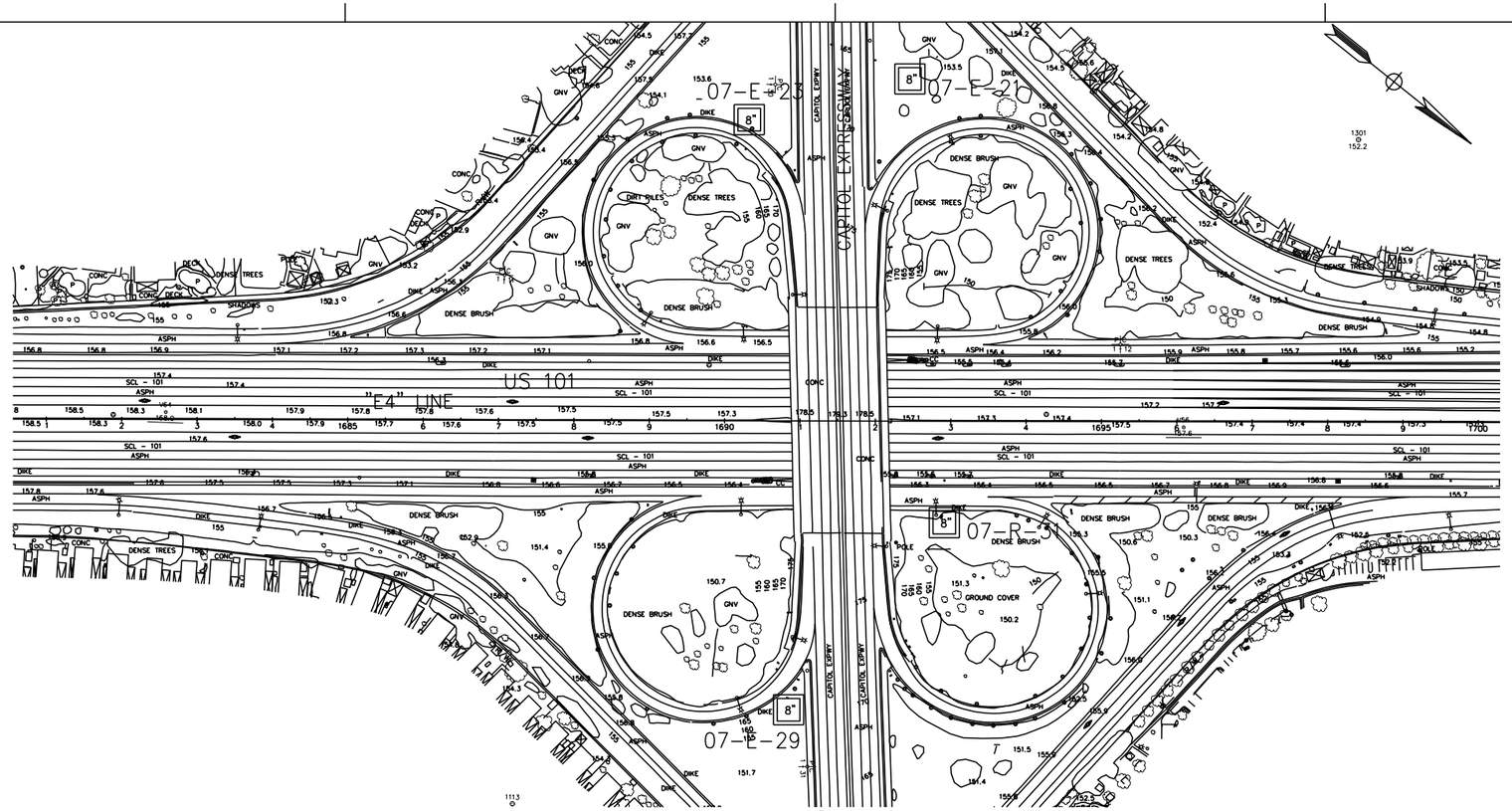
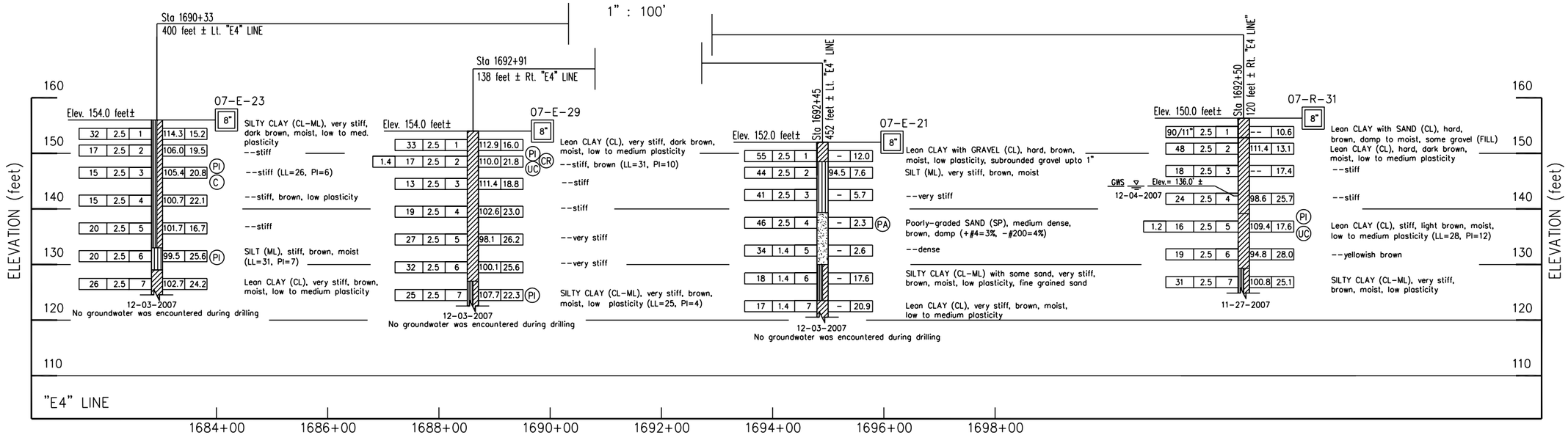


PLAN
1" : 100'

Note:
Standard Penetration Test Sampler: I.D. = 1.4"; O.D. = 2"
Modified California Sampler: I.D. = 2.5"; O.D. = 3"
Hammer Assembly: A 140 lb hammer with a 30" drop
(Automatic Hammer)



PROFILE
Vert. : 1" = 10'
Hor. : 1" = 100'

ALL DIMENSIONS ARE IN FEET UNLESS OTHERWISE SHOWN

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	US 101 IMPROVEMENTS FROM I-280/680 TO YERBA BUENA ROAD SANTA CLARA COUNTY, CALIFORNIA
FUNCTIONAL SUPERVISOR	DRAWN BY: L. TRAN	FIELD INVESTIGATION BY:	DESIGN BRANCH	POST MILES	LOG OF TEST BORINGS
NAME: _____	CHECKED BY: P. CHAN	G. TRIPATHI			

OGS CIVIL LOG OF TEST BORINGS SHEET

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU _____
EA 04-1A9801

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES: 10/24/08 04/03/09

SHEET ___ OF ___

FILE => $REQUEST

USERNAME => $USER

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
04	SCI	101	31.8/34.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — GARY PARIKH — No. G.E. 666 — Exp. 12/31/09 — GEOTECHNICAL — STATE OF CALIFORNIA

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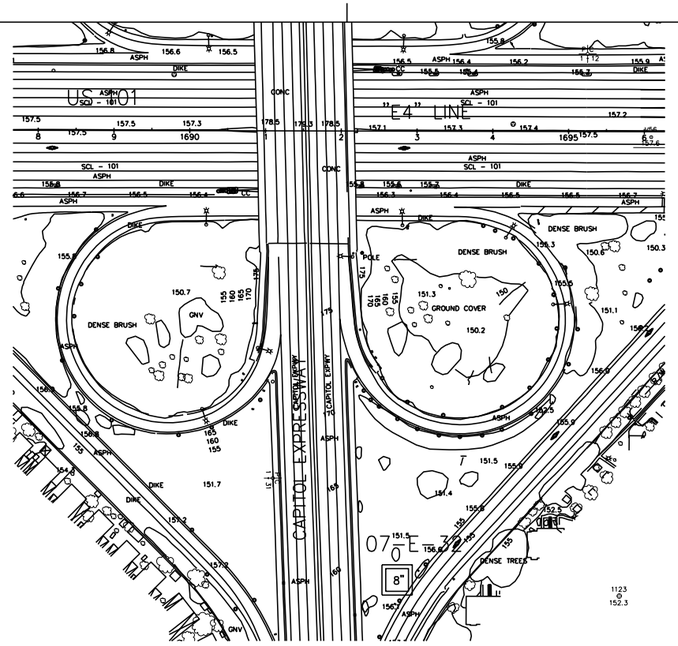
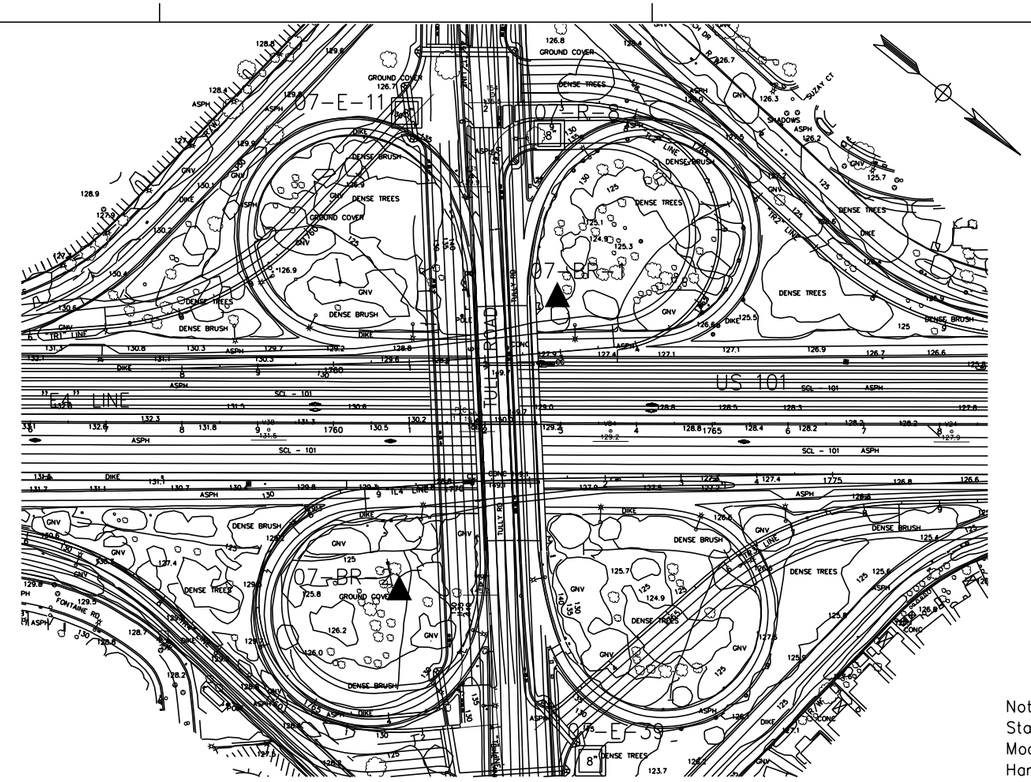
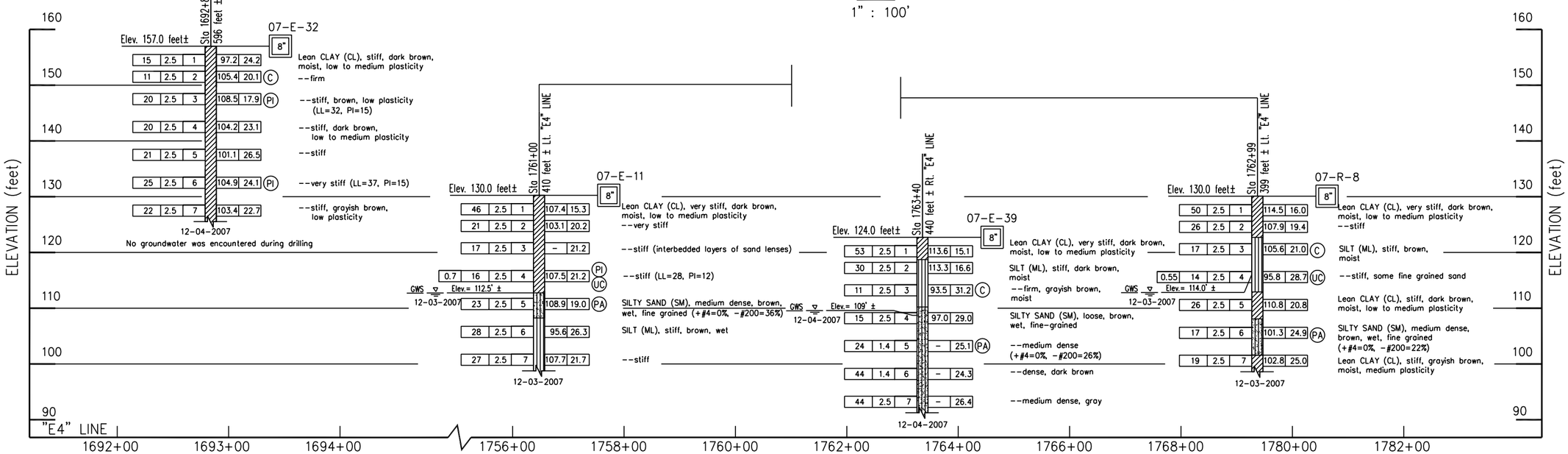


PLAN
1" : 100'



PLAN
1" : 100'

Note:
Standard Penetration Test Sampler: I.D.=1.4"; O.D.=2"
Modified California Sampler: I.D.=2.5"; O.D.=3"
Hammer Assembly: A 140 lb hammer with a 30" drop (Automatic Hammer)



ALL DIMENSIONS ARE IN FEET UNLESS OTHERWISE SHOWN

PROFILE
Vert. : 1" = 10'
Hor. : 1" = 100'

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	US 101 IMPROVEMENTS FROM I-280/680 TO YERBA BUENA ROAD SANTA CLARA COUNTY, CALIFORNIA
FUNCTIONAL SUPERVISOR	DRAWN BY: L. TRAN		DESIGN BRANCH	POST MILES	LOG OF TEST BORINGS
NAME:	CHECKED BY: P. CHAN	FIELD INVESTIGATION BY: G. TRIPATHI			

OGS CIVIL LOG OF TEST BORINGS SHEET

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU
EA 04-1A9801

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES 10/24/08 — SHEET — OF

FILE => $REQUEST

USERNAME => $USER DATE PLOTTED => $DATE TIME PLOTTED => $TIME

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
04	SCI	101	31.8/34.2		

REGISTERED GEOTECHNICAL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER GARY PARIKH No. G.E. 666 Exp. 12/31/09 GEOTECHNICAL STATE OF CALIFORNIA

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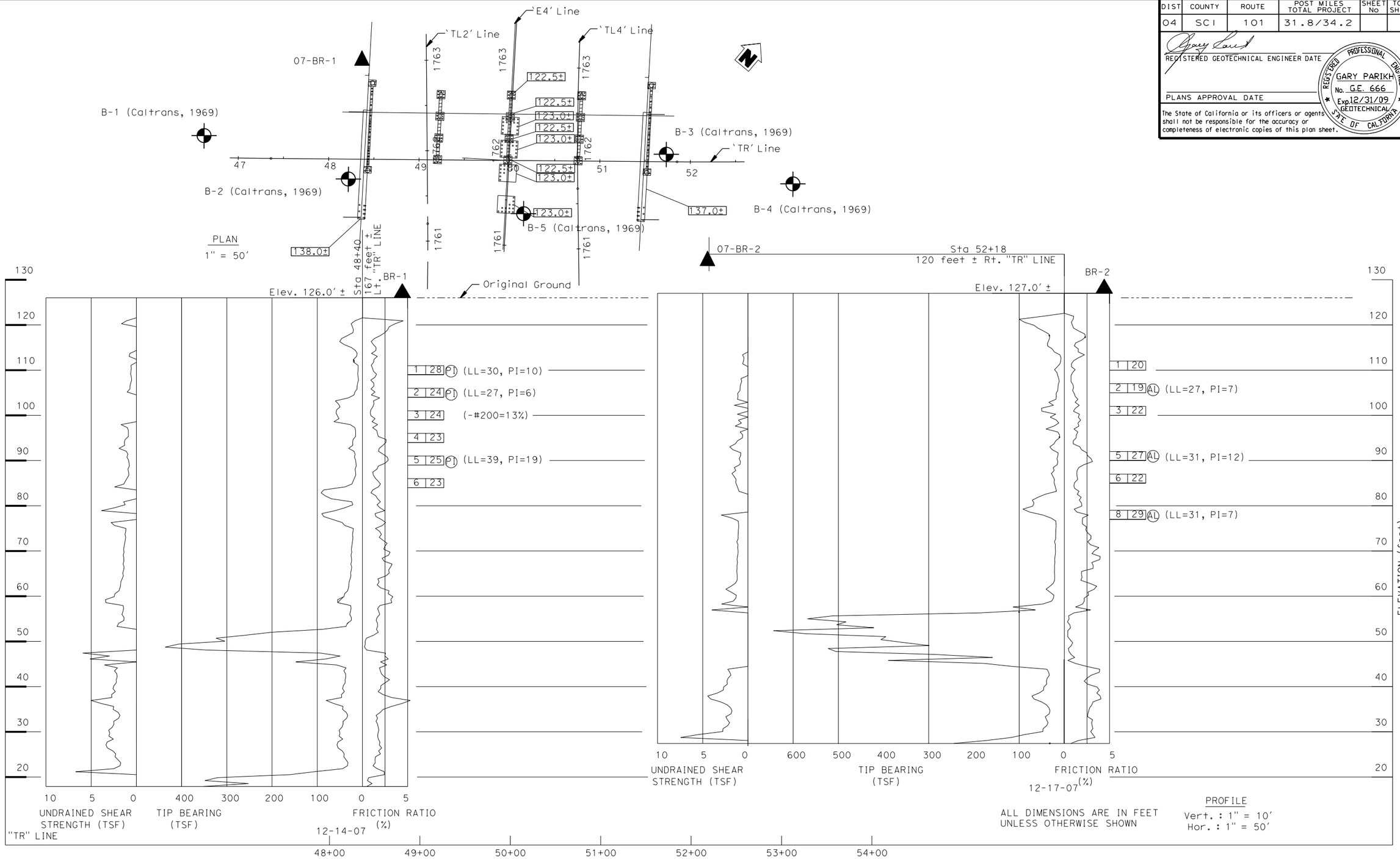

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN DESIGN BRANCH	BRIDGE NO. 37-0668 POST MILES 33.0	TULLY ROAD OVERCROSSING LOG OF TEST BORINGS 1 OF 2
X DESIGN OVERSIGHT X SIGN OFF DATE	DRAWN BY: L. TRAN CHECKED BY: D. WANG	FIELD INVESTIGATION BY: G. TRIPATHI			

OGS CIVIL LOG OF TEST BORINGS SHEET

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 04239
EA 1A9801

DISREGARD PRINTS BEARING EARLIER REVISION DATES 11/26/08 2/27/09 3/20/09

REVISION DATES

SHEET 25 OF 26

FILE => $REQUEST

USERNAME => $USER DATE PLOTTED => $DATE TIME PLOTTED => $TIME

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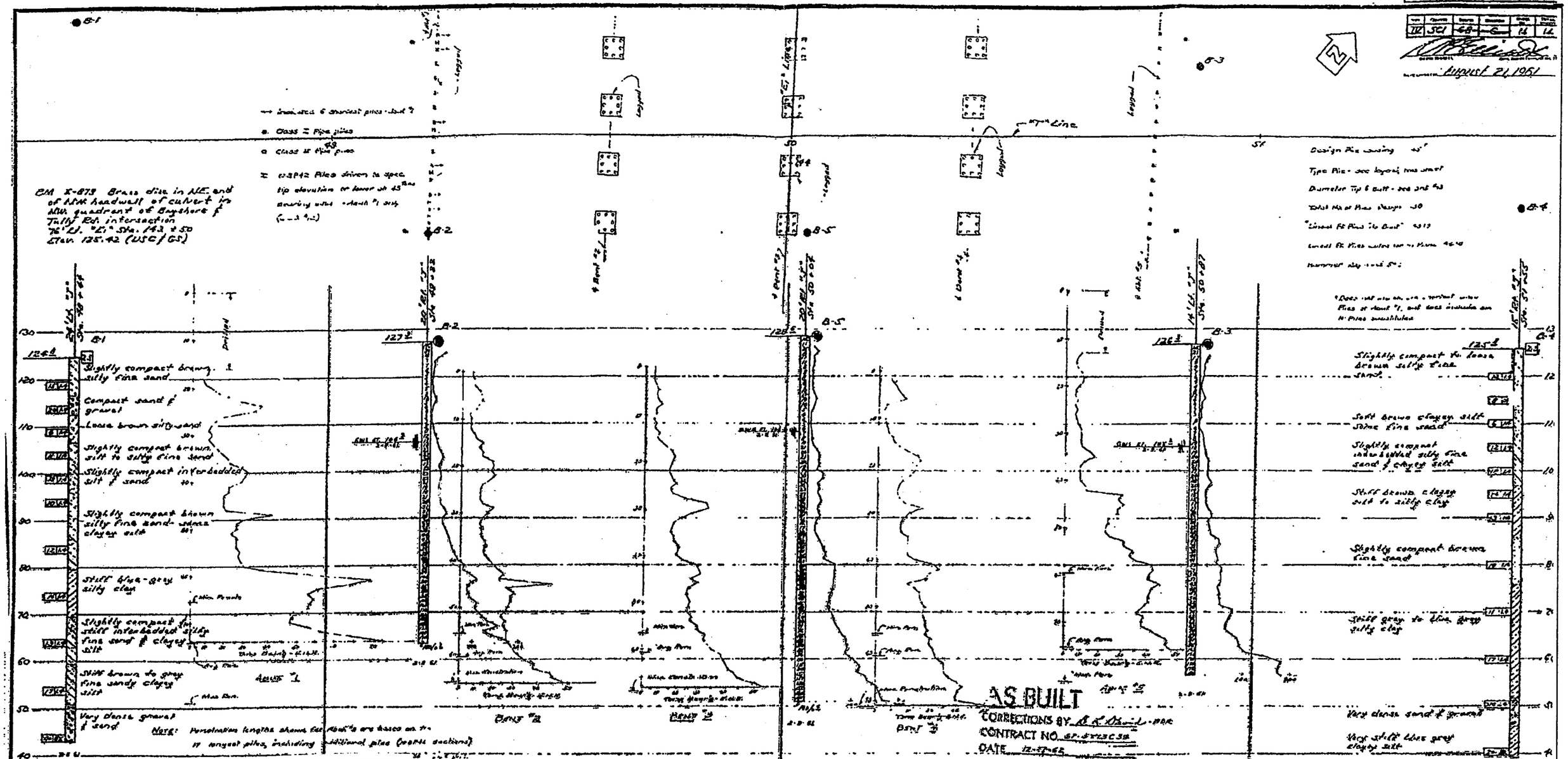
110	SCl	68	C	16	16

August 21, 1961



OFFICE OF STRUCTURE FOUNDATIONS – ENGINEERING SERVICE CENTER

As-Built Log of Test Borings sheet is considered an informational document only. As such, the State of California registration seal with signature, license number and registration certificate expiration date confirm that this is a true and accurate copy of the original document. This drawing is available and presented only for the convenience of any bidder, contractor or other interested party.

DIST.	COUNTY	ROUTE	KILOMETER POST–TOTAL PROJECT	Sheet No.	Total Sheets
04	Scl	101	31.8/34.2		

CERTIFIED ENGINEER DATE

REGISTERED PROFESSIONAL ENGINEER GARY PARIKH No. G.E. 666 Exp. 12/31/09 GEOTECHNICAL STATE OF CALIFORNIA

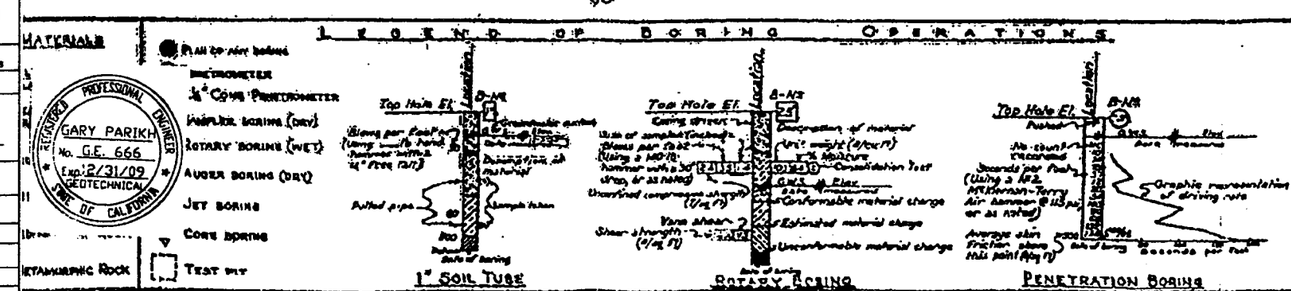
TULLY ROAD OVERCROSSING

LOG OF TEST BORINGS 2 OF 2

NOTE: A COPY OF THIS LOG OF TEST BORINGS IS AVAILABLE AT OFFICE OF STRUCTURE MAINTENANCE AND INVESTIGATIONS, SACRAMENTO, CALIFORNIA

CU: 04239
EA: 1A9801

BRIDGE No.	
37-0668	
Sheet	of
26	26



NOTE

Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

TULLY ROAD OVERCROSSING

LOG OF TEST BORINGS

SCALE	1" = 10'	BRIDGE	37-95	FILE	DRAWING	C-3795-14

December 18, 2007

Parkih Consultants
Attn: David Wang
365 S. Milpitas Blvd.
Milpitas, California 95035

Subject: CPT Site Investigation
Hwy 101 @Tully Rd. Bridge
San Jose, California
GREGG Project Number: 07-376MA

Dear Mr. Wang:

The following report presents the results of GREGG Drilling & Testing's Cone Penetration Test investigation for the above referenced site. The following testing services were performed:

1	Cone Penetration Tests	(CPTU)	☒
2	Pore Pressure Dissipation Tests	(PPD)	☒
3	Seismic Cone Penetration Tests	(SCPTU)	☐
4	Resistivity Cone Penetration Tests	(RCPTU)	☐
5	UVIF Cone Penetration Tests	(UVIFCPTU)	☐
6	Groundwater Sampling	(GWS)	☐
7	Soil Sampling	(SS)	☐
8	Vapor Sampling	(VS)	☐
9	Vane Shear Testing	(VST)	☐
10	SPT Energy Calibration	(SPTE)	☐

A list of reference papers providing additional background on the specific tests conducted is provided in the bibliography following the text of the report. If you would like a copy of any of these publications or should you have any questions or comments regarding the contents of this report, please do not hesitate to contact our office at (925) 313-5800.

Sincerely,
GREGG Drilling & Testing, Inc.

Mary Walden
Operations Manager

Cone Penetration Testing Procedure (CPT)

Gregg In Situ, Inc. carries out all Cone Penetration Tests (CPT) using an integrated electronic cone system, *Figure CPT*. The soundings were conducted using a 20 ton capacity cone with a tip area of 15 cm^2 and a friction sleeve area of 225 cm^2. The cone is designed with an equal end area friction sleeve and a tip end area ratio of 0.85.

The cone takes measurements of cone bearing (q_c), sleeve friction (f_s) and penetration pore water pressure (u_2) at 5-cm intervals during penetration to provide a nearly continuous hydrogeologic log. CPT data reduction and interpretation is performed in real time facilitating on-site decision making. The above mentioned parameters are stored on disk for further analysis and reference. All CPT soundings are performed in accordance with revised (2000) ASTM standards (D 5778-95).

The cone also contains a porous filter element located directly behind the cone tip (u_2), *Figure CPT.* It consists of porous plastic and is 5.0mm thick. The filter element is used to obtain penetration pore pressure as the cone is advanced as well as Pore Pressure Dissipation Tests (PPDT's) during appropriate pauses in penetration. It should be noted that prior to penetration, the element is fully saturated with silicon oil under vacuum pressure to ensure accurate and fast dissipation.

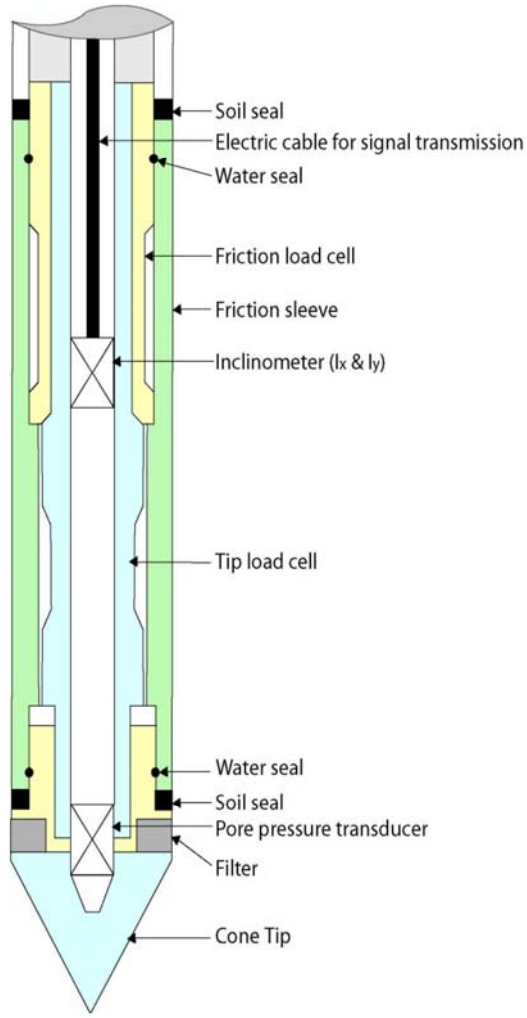


Figure CPT

When the soundings are complete, the test holes are grouted using a Gregg In Situ support rig. The grouting procedures generally consist of pushing a hollow CPT rod with a "knock out" plug to the termination depth of the test hole. Grout is then pumped under pressure as the tremie pipe is pulled from the hole. Disruption or further contamination to the site is therefore minimized.

Cone Penetration Test Sounding Summary

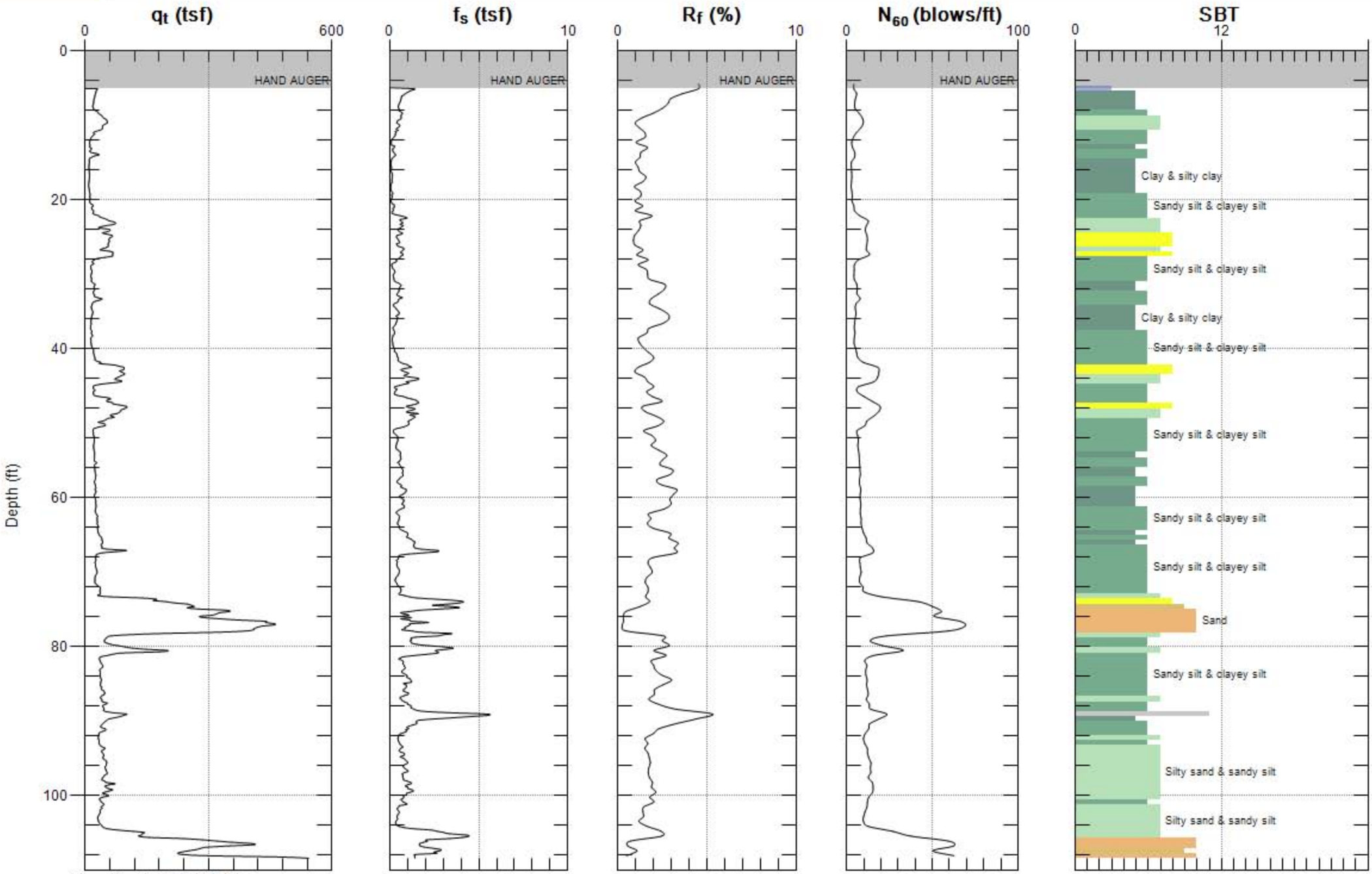
-Table 1-

CPT Sounding Identification	Date	Termination Depth (Feet)	Depth of Groundwater Samples (Feet)	Depth of Soil Samples (Feet)	Depth of Pore Pressure Dissipation Tests (Feet)
BR-1	12/14/07	108	-	-	42.8
BR-2	12/17/07	100	-	-	46.4

PARIKH CONSULTANTS

Site: HWY 101
Sounding: BR-1

Engineer: D.WANG
Date: 12/14/2007 09:25



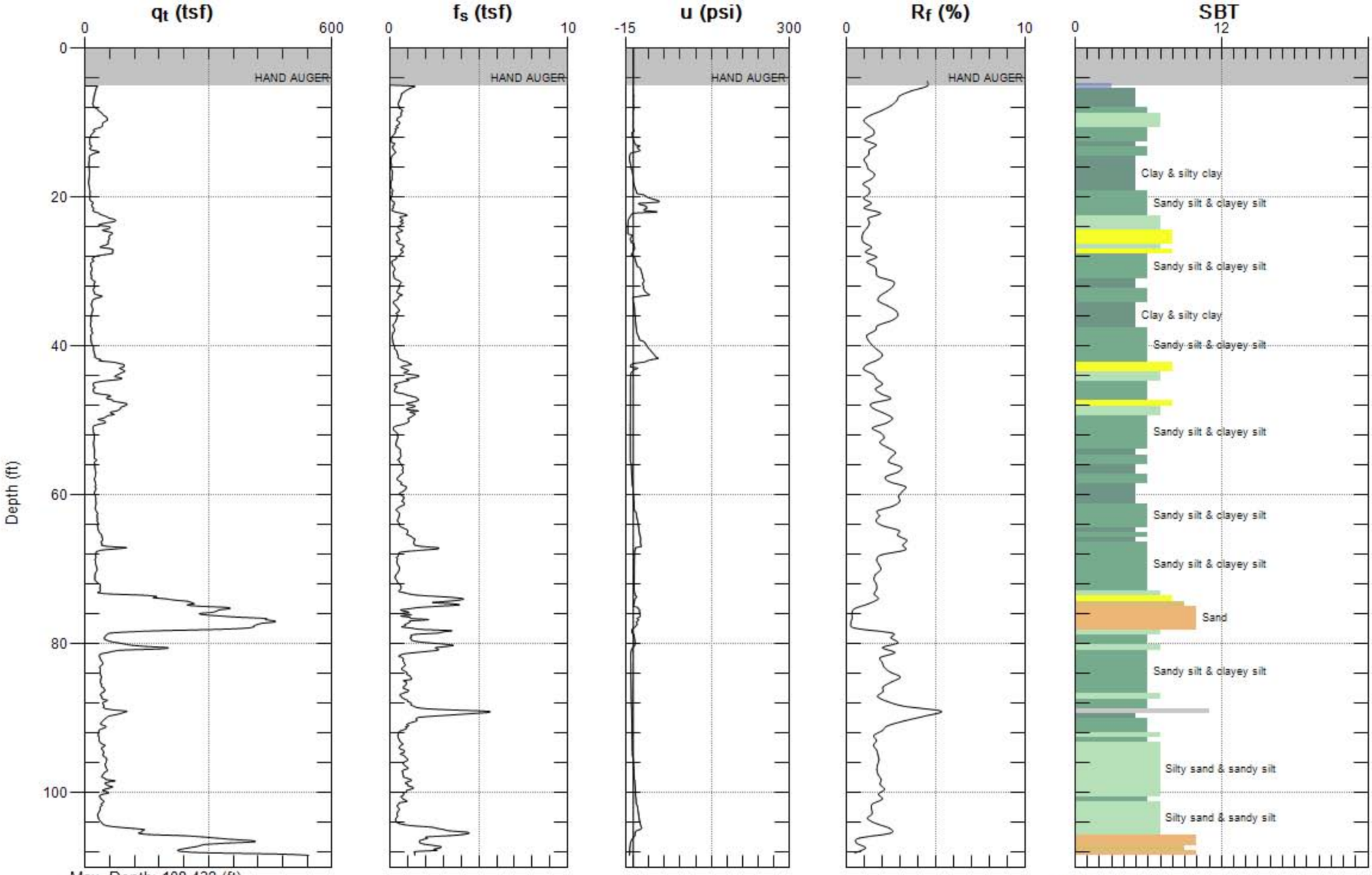
Max. Depth: 108.432 (ft)
Avg. Interval: 0.656 (ft)

SBT: Soil Behavior Type (Robertson 1990)

PARIKH CONSULTANTS

Site: HWY 101
Sounding: BR-1

Engineer: D.WANG
Date: 12/14/2007 09:25



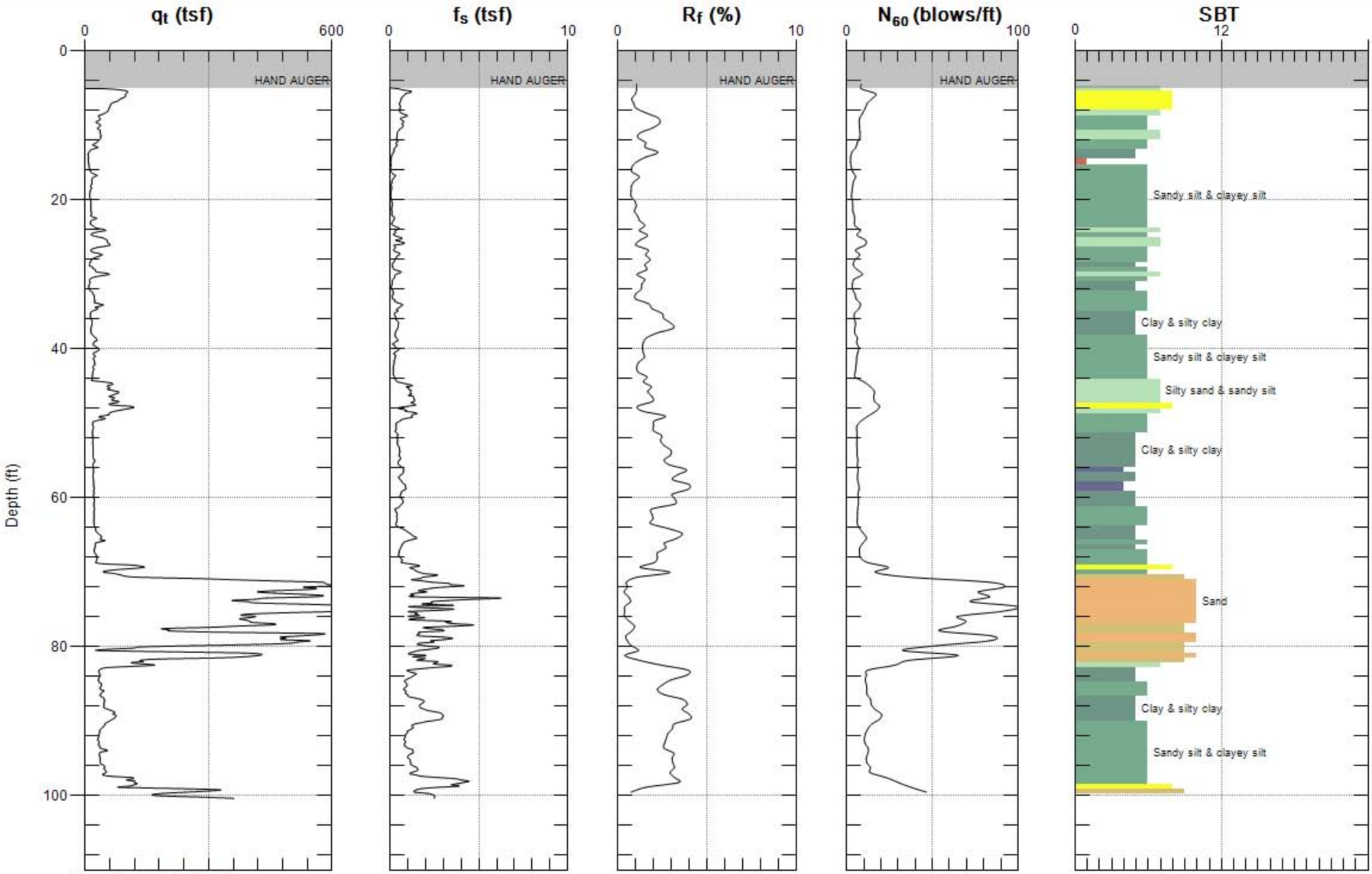
Max. Depth: 108.432 (ft)
Avg. Interval: 0.656 (ft)

SBT: Soil Behavior Type (Robertson 1990)

PARIKH CONSULTANTS

Site: HWY 101
Sounding: BR-2

Engineer: D.WANG
Date: 12/17/2007 09:01



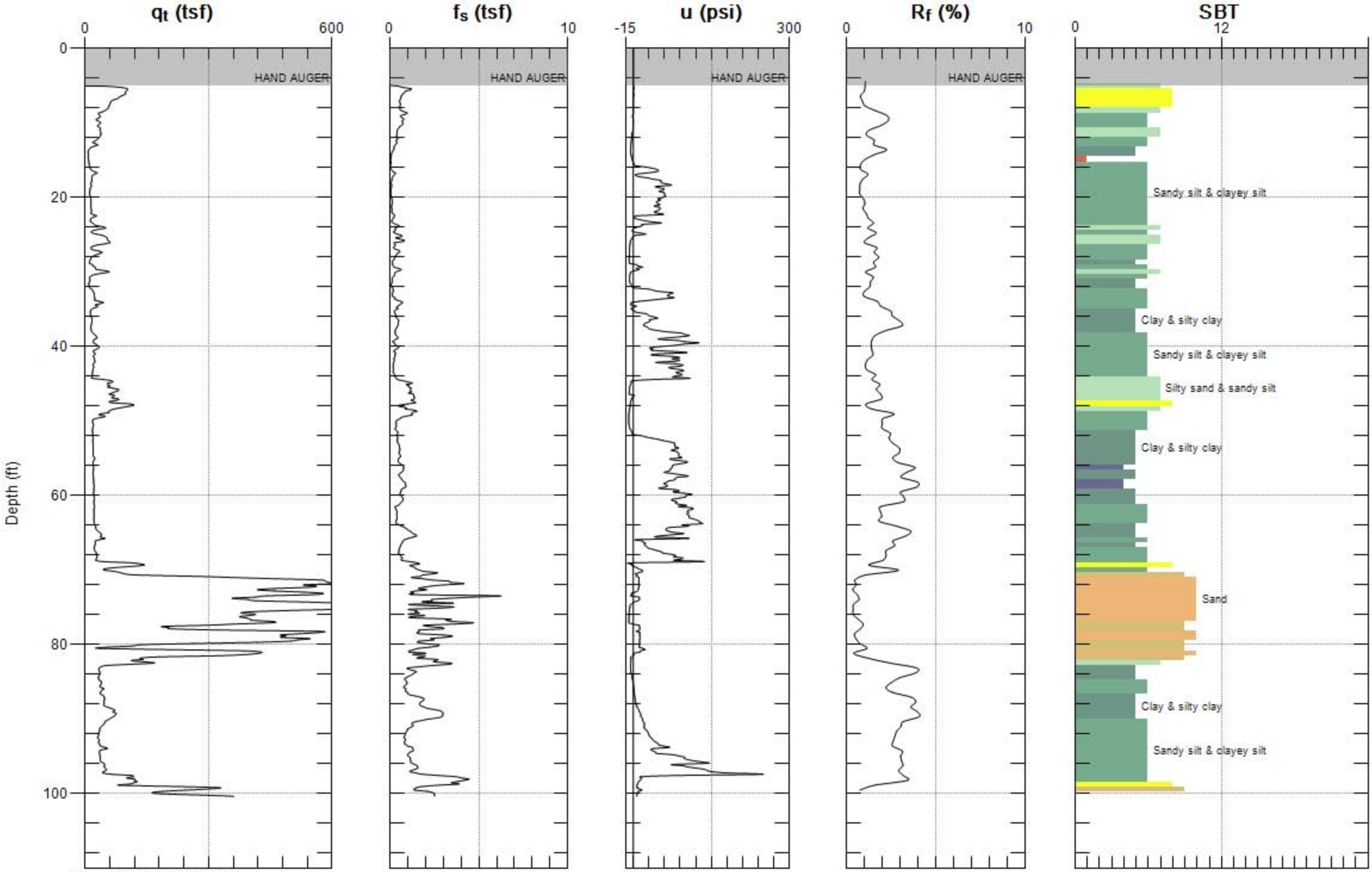
Max. Depth: 100.394 (ft)
Avg. Interval: 0.656 (ft)

SBT: Soil Behavior Type (Robertson 1990)

PARIKH CONSULTANTS

Site: HWY 101
Sounding: BR-2

Engineer: D.WANG
Date: 12/17/2007 09:01



Max. Depth: 100.394 (ft)
Avg. Interval: 0.656 (ft)

SBT: Soil Behavior Type (Robertson 1990)

Cone Penetration Test Data & Interpretation

Soil behavior type and stratigraphic interpretation is based on relationships between cone bearing (q_c), sleeve friction (f_s), and pore water pressure (u_2). The friction ratio (R_f) is a calculated parameter defined by $100 f_s/q_c$ and is used to infer soil behavior type. Generally:

Cohesive soils (clays)

- High friction ratio (R_f) due to small cone bearing (q_c)
- Generate large excess pore water pressures (u_2)

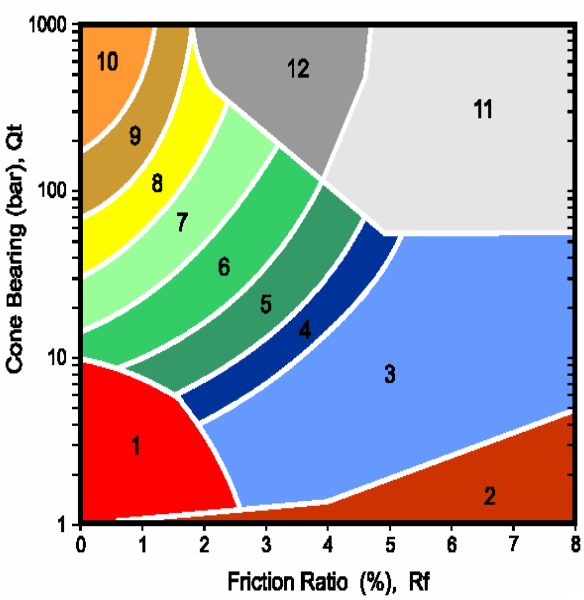
Cohesionless soils (sands)

- Low friction ratio (R_f) due to large cone bearing (q_c)
- Generate very little excess pore water pressures (u_2)

A complete set of baseline readings are taken prior to and at the completion of each sounding to determine temperature shifts and any zero load offsets. Corrections for temperature shifts and zero load offsets can be extremely important, especially when the recorded loads are relatively small. In sandy soils, however, these corrections are generally negligible.

The cone penetration test data collected from your site is presented in graphical form in Appendix CPT. The data includes CPT logs of measured soil parameters, computer calculations of interpreted soil behavior types (SBT), and additional geotechnical parameters. A summary of locations and depths is available in Table 1. Note that all penetration depths referenced in the data are with respect to the existing ground surface.

Soil interpretation for this project was conducted using recent correlations developed by Robertson, 1990, *Figure SBT*. Note that it is not always possible to clearly identify a soil type based solely on q_c, f_s, and u_2. In these situations, experience, judgment, and an assessment of the pore pressure dissipation data should be used to infer the soil behavior type.



ZONE	Qt/N	SBT
1	2	Sensitive, fine grained
2	1	Organic materials
3	1	Clay
4	1.5	Silty clay to clay
5	2	Clayey silt to silty clay
6	2.5	Sandy silt to clayey silt
7	3	Silty sand to sandy silt
8	4	Sand to silty sand
9	5	Sand
10	6	Gravely sand to sand
11	1	Very stiff fine grained*
12	2	Sand to clayey sand*

*over consolidated or cemented

Figure SBT

Cone Penetration Test (CPT) Interpretation

Gregg have recently updated their CPT interpretation and plotting software (2007). The software takes the CPT data and performs basic interpretation in terms of soil behavior type (SBT) and various geotechnical parameters using current published empirical correlations based on the comprehensive review by Lunne, Robertson and Powell (1997). The interpretation is presented in tabular format using MS Excel. The interpretations are presented only as a guide for geotechnical use and should be carefully reviewed. Gregg does not warranty the correctness or the applicability of any of the geotechnical parameters interpreted by the software and does not assume any liability for any use of the results in any design or review. The user should be fully aware of the techniques and limitations of any method used in the software.

The following provides a summary of the methods used for the interpretation. Many of the empirical correlations to estimate geotechnical parameters have constants that have a range of values depending on soil type, geologic origin and other factors. The software uses 'default' values that have been selected to provide, in general, conservatively low estimates of the various geotechnical parameters.

Input:

1. Units for display (Imperial or metric) (atm. pressure, pa = 0.96 tsf or 0.1 MPa)
2. Depth interval to average results,(ft or m). Data are collected at either 0.02 or 0.05m and can be averaged every 1, 3 or 5 intervals.
3. Elevation of ground surface (ft or m)
4. Depth to water table, z_w (ft or m) – input required
5. Net area ratio for cone, a (default to 0.85)
6. Relative Density constant, C_{Dr} (default to 350)
7. Young's modulus number for sands, α (default to 5)
8. Small strain shear modulus number
   a. for sands, S_G (default to 180 for SBT_n 5, 6, 7)
   b. for clays, C_G (default to 50 for SBT_n 1, 2, 3 & 4)
9. Undrained shear strength cone factor for clays, N_{kt} (default to 15)
10. Over Consolidation ratio number, k_{ocr} (default to 0.3)
11. Unit weight of water, (default to γ_w = 62.4 lb/ft^3 or 9.81 kN/m^3)

Column

1. Depth, z, (m) – CPT data is collected in meters
2. Depth (ft)
3. Cone resistance, q_c (tsf or MPa)
4. Sleeve friction, f_s (tsf or MPa)
5. Penetration pore pressure, u (psi or MPa), measured behind the cone (i.e. u_2)
6. Other – any additional data, if collected, e.g. electrical resistivity or UVIF
7. Total cone resistance, q_t (tsf or MPa) $q_t = q_c + u\,(1-a)$

8	Friction Ratio, R_f (%)	$R_f = (f_s/q_t) \times 100\%$
9	Soil Behavior Type (non-normalized), SBT	see note
10	Unit weight, γ (pcf or kN/m^3)	based on SBT, see note
11	Total overburden stress, σ_v (tsf)	$\sigma_{vo} = \gamma z$
12	Insitu pore pressure, u_o (tsf)	$u_o = \gamma_w (z - z_w)$
13	Effective overburden stress, σ'_{vo} (tsf)	$\sigma'_{vo} = \sigma_{vo} - u_o$
14	Normalized cone resistance, Q_{t1}	$Q_{t1} = (q_t - \sigma_{vo}) / \sigma'_{vo}$
15	Normalized friction ratio, F_r (%)	$F_r = f_s / (q_t - \sigma_{vo}) \times 100\%$
16	Normalized Pore Pressure ratio, B_q	$B_q = u - u_o / (q_t - \sigma_{vo})$
17	Soil Behavior Type (normalized), SBT_n	see note
18	SBT_n Index, I_c	see note
19	Normalized Cone resistance, Q_{tn} (n varies with Ic)	see note
20	Estimated permeability, k_{SBT} (cm/sec or ft/sec)	see note
21	Equivalent SPT N_{60}, blows/ft	see note
22	Equivalent SPT $(N_1)_{60}$ blows/ft	see note
23	Estimated Relative Density, D_r, (%)	see note
24	Estimated Friction Angle, ϕ', (degrees)	see note
25	Estimated Young's modulus, E_s (tsf)	see note
26	Estimated small strain Shear modulus, Go (tsf)	see note
27	Estimated Undrained shear strength, s_u (tsf)	see note
28	Estimated Undrained strength ratio	s_u/σ_v'
29	Estimated Over Consolidation ratio, OCR	see note

Notes:

1 Soil Behavior Type (non-normalized), SBT — Lunne et al. (1997)
listed below

2 Unit weight, γ either constant at 119 pcf or based on Non-normalized SBT
(Lunne et al., 1997 and table below)

3 Soil Behavior Type (Normalized), SBT_n — Lunne et al. (1997)

4 SBT_n Index, I_c — $I_c = ((3.47 - \log Q_{t1})^2 + (\log F_r + 1.22)^2)^{0.5}$

5 Normalized Cone resistance, Q_{tn} (n varies with Ic)

$Q_{tn} = ((q_t - \sigma_{vo})/pa)\ (pa/(\sigma'_{vo})^n$ and recalculate I_c, then iterate:

When $I_c < 1.64$, $n = 0.5$ (clean sand)
When $I_c > 3.30$, $n = 1.0$ (clays)
When $1.64 < I_c < 3.30$, $n = (I_c - 1.64)0.3 + 0.5$
Iterate until the change in n, $\Delta n < 0.01$

6 Estimated permeability, k_{SBT} (based on Normalized SBT_n)
(Lunne et al., 1997 and table below)

7 Equivalent SPT N_{60}, blows/ft Lunne et al. (1997)

$$\frac{(q_c/p_a)}{N_{60}} = 8.5\left(1 - \frac{I_c}{4.6}\right)$$

8 Equivalent SPT $(N_1)_{60}$ blows/ft $(N_1)_{60} = N_{60}\, C_N$,
where $C_N = (pa/\sigma'_{vo})^{0.5}$

9 Relative Density, D_r, (%) $D_r^2 = Q_{tn} / C_{Dr}$
Only SBT_n 5, 6, 7 & 8 *Show 'N/A' in zones 1, 2, 3, 4 & 9*

10 Friction Angle, ϕ', (degrees) $\tan\phi' = \frac{1}{2.68}\left[\log\left(\frac{q_c}{\sigma'_{vo}}\right) + 0.29\right]$
Only SBT_n 5, 6, 7 & 8 *Show'N/A' in zones 1, 2, 3, 4 & 9*

11 Young's modulus, E_s $E_s = \alpha\, q_t$
Only SBT_n 5, 6, 7 & 8 *Show 'N/A' in zones 1, 2, 3, 4 & 9*

12 Small strain shear modulus, Go
a. $G_o = S_G\,(q_t\ \sigma'_{vo}\ pa)^{1/3}$ *For SBT_n 5, 6, 7*
b. $G_o = C_G\, q_t$ *For SBT_n 1, 2, 3& 4*
Show 'N/A' in zones 8 & 9

13 Undrained shear strength, s_u $s_u = (q_t - \sigma_{vo}) / N_{kt}$
Only SBT_n 1, 2, 3, 4 & 9 *Show 'N/A' in zones 5, 6, 7 & 8*

14 Over Consolidation ratio, OCR $OCR = k_{ocr}\, Q_{t1}$
Only SBT_n 1, 2, 3, 4 & 9 *Show 'N/A' in zones 5, 6, 7 & 8*

SBT Zones		**SBT_n Zones**	
The following updated and simplified SBT descriptions have been used in the software:			
1	sensitive fine grained	1	sensitive fine grained
2	organic soils	2	organic soils
3	clays	3	clays
4	clays & silty clays	4	clays & silty clays
5	clays & silty clays		
6	silty sands & sandy silts	5	silty sands & sandy silts
7	silty sands & sandy silts		
8	sands & silty sands	6	sands & silty sands
9	sands & silty sands		
10	sands	7	sands
11	very dense/stiff soils*	8	very dense/stiff soils*
12	very dense/stiff soils*	9	very dense/stiff soils*

* heavily overconsolidated and/or cemented

Track when soils fall with zones of same description and print that description (i.e. if soils fall only within SBT zones 4 & 5, print 'clays & silty clays')

Estimated Permeability (see Lunne et al., 1997)

SBT_n	Permeability (ft/sec)	(m/sec)
1	$3x\ 10^{-8}$	$1x\ 10^{-8}$
2	$3x\ 10^{-7}$	$1x\ 10^{-7}$
3	$1x\ 10^{-9}$	$3x\ 10^{-10}$
4	$3x\ 10^{-8}$	$1x\ 10^{-8}$
5	$3x\ 10^{-6}$	$1x\ 10^{-6}$
6	$3x\ 10^{-4}$	$1x\ 10^{-4}$
7	$3x\ 10^{-2}$	$1x\ 10^{-2}$
8	$3x\ 10^{-6}$	$1x\ 10^{-6}$
9	$1x\ 10^{-8}$	$3x\ 10^{-9}$

Estimated Unit Weight (see Lunne et al., 1997)

SBT	Approximate Unit Weight (lb/ft^3)	(kN/m^3)
1	111.4	17.5
2	79.6	12.5
3	111.4	17.5
4	114.6	18.0
5	114.6	18.0
6	114.6	18.0
7	117.8	18.5
8	120.9	19.0
9	124.1	19.5
10	127.3	20.0
11	130.5	20.5
12	120.9	19.0

GREGG DRILLING & TESTING, INC.

CONE PENETRATION TEST DATA

Client:	PARIKH CONSULTANTS		
Site:	HWY 101		
Engineer:	D.WANG		
Sounding:	**BR-1**		
Date:	12/14/2007		
Time:	9:25 AM		

Units:	Imperial	
Data averaging interval:	0.200	meters
Assumed depth of water:	15.004	feet
Net area ratio of cone:	0.80	
Unit weight of water:	62.4	lb/ft^3
Relative density constant, C_{DR}:	350	
Young's modulus for sands, α:	4	
Small strain shear modulus number, S_G (sands	180	
Small strain shear modulus number, C_G (clays)	50	
N_{kt} for clays:	15	
OCR number, k_{OCr}:	0.3	

Interpretation based on Lunne, Robertson and Powell, 1997

Col 1i	Col 2i	Col 3i	Col 4i	Col 5i	Col 6i	Col 7i	Col 8i	Col 9i	Col 10i	Col 11i	Col 12i	Col 13i	Col 14i	Col 15i	Col 16i	Col 17i	Col 18i	Col 19i	Col 20i	Col 21i	Col 22i	Col 23i	Col 24i	Col 25i	Col 26i	Col 27i	Col 28i	Col 29i
Depth	Depth	q_c	f_s	u	Other	q_t	R_f	SBT	Unit Weight, γ	Total Overburden Stress, σ_v	Insitu pore pressure, u_o	Effective overburden stress, σ'_v	Normalized cone resistance, Q_t	Normalized Friction raio, F_r	Normalized pore pressure ratio, B_q	Soil Behavior Type (normalized) SBT_n	SBTn Index, I_c	Normalized Cone resistance, Q_{tn}	Estimated permeability, k_{SBT}	SPT N_{60}	SPT $(N_1)_{60}$	Relative Density, D_r	Friction Angle, φ'	Young's modulus, E_s	Small strain shear modulus, G_o	Undrained shear strength, s_u	Undrained strength ratio, s_u/σ'_v	Over consolidation ratio, OCR
(m)	(ft)	(tsf)	(tsf)	(psi)		(tsf)	(%)		(pcf)	(tsf)	(tsf)	(tsf)							(ft/sec)	(blows/ft)	(blows/ft)	(%)	(degrees)	(tsf)	(tsf)	(tsf)		
0.150	0.492	0.000	0.000	0.000							0.000																	
0.350	1.148	0.000	0.000	0.000							0.000																	
0.550	1.804	0.000	0.000	0.000							0.000																	
0.750	2.461	0.000	0.000	0.000							0.000																	
0.950	3.117	0.000	0.000	0.000							0.000																	
1.150	3.773	0.000	0.000	0.000							0.000																	
1.350	4.429	0.000	0.000	0.000							0.000																	
1.550	5.085	16.721	0.755	-0.442		16.71	4.51	3	111	0.283	0.000	0.283	58.01	4.59	0.00	4	2.54	42.85	3.00E-8	4.2	8.0				836	1.10	3.87	17.4
1.750	5.741	25.144	0.904	-0.348		25.14	3.60	5	115	0.321	0.000	0.321	77.35	3.64	0.00	4	2.38	55.55	3.00E-8	5.8	10.5				1257	1.65	5.16	23.2
1.950	6.398	22.174	0.657	0.018		22.17	2.96	5	115	0.358	0.000	0.358	60.86	3.01	0.00	5	2.39	45.24	3.00E-6	5.1	8.8	36	38	89	366			
2.150	7.054	19.910	0.557	-0.074		19.91	2.80	5	115	0.396	0.000	0.396	49.27	2.86	0.00	5	2.44	38.19	3.00E-6	4.7	7.7	33	37	80	365			
2.350	7.710	20.961	0.520	0.158		20.96	2.48	5	115	0.434	0.000	0.434	47.34	2.53	0.00	5	2.42	37.34	3.00E-6	4.9	7.7	33	36	84	383			
2.550	8.366	33.213	0.655	-0.291		33.21	1.97	6	115	0.471	0.000	0.471	69.47	2.00	0.00	5	2.23	53.47	3.00E-6	7.2	10.7	39	39	133	459			
2.750	9.022	46.296	0.607	-0.684		46.29	1.31	7	118	0.510	0.000	0.510	89.78	1.33	0.00	6	2.03	67.81	3.00E-4	9.2	13.2	44	40	185	526			
2.950	9.678	50.306	0.482	-0.681		50.30	0.96	7	118	0.549	0.000	0.549	90.70	0.97	0.00	6	1.93	69.21	3.00E-4	9.7	13.4	44	40	201	554			
3.150	10.335	40.843	0.492	-0.723		40.83	1.20	7	118	0.587	0.000	0.587	68.54	1.22	0.00	5	2.09	55.31	3.00E-6	8.3	11.2	40	39	163	529			
3.350	10.991	24.580	0.371	-0.147		24.58	1.51	6	115	0.625	0.000	0.625	38.34	1.55	0.00	5	2.36	32.99	3.00E-6	5.6	7.3	31	35	98	456			
3.550	11.647	15.575	0.232	-1.927		15.55	1.49	6	115	0.662	0.000	0.662	22.47	1.56	-0.01	5	2.55	20.20	3.00E-6	3.9	4.9	24	32	62	399			
3.750	12.303	11.517	0.116	0.270		11.52	1.01	6	115	0.700	0.000	0.700	15.46	1.07	0.00	4	2.60	14.16	3.00E-8	2.9	3.6				576	0.72	1.03	4.6
3.950	12.959	12.796	0.213	5.942		12.88	1.65	5	115	0.738	0.000	0.738	16.47	1.75	0.04	4	2.69	15.40	3.00E-8	3.4	4.1				644	0.81	1.10	4.9
4.150	13.615	19.605	0.252	8.648		19.73	1.28	6	115	0.775	0.000	0.775	24.45	1.33	0.03	5	2.48	22.63	3.00E-6	4.7	5.5	25	32	79	455			
4.350	14.272	18.784	0.231	-4.464		18.72	1.23	6	115	0.813	0.000	0.813	22.03	1.29	-0.02	5	2.51	20.68	3.00E-6	4.6	5.2	24	32	75	454			
4.550	14.928	10.036	0.097	-6.935		9.94	0.97	5	115	0.850	0.000	0.850	10.69	1.06	-0.05	4	2.74	10.30	3.00E-8	2.8	3.1				497	0.61	0.71	3.2
4.750	15.584	9.435	0.105	-5.482		9.36	1.12	5	115	0.888	0.018	0.870	9.74	1.24	-0.05	4	2.81	9.45	3.00E-8	2.7	3.0				468	0.56	0.65	2.9
4.950	16.240	10.103	0.122	-3.292		10.06	1.22	5	115	0.925	0.039	0.887	10.29	1.34	-0.03	4	2.80	10.02	3.00E-8	2.9	3.1				503	0.61	0.69	3.1
5.150	16.896	10.419	0.162	-1.200		10.40	1.56	5	115	0.963	0.059	0.904	10.44	1.72	-0.02	4	2.85	10.22	3.00E-8	3.0	3.3				520	0.63	0.70	3.1
5.350	17.552	9.464	0.132	-0.351		9.46	1.39	5	115	1.001	0.080	0.921	9.18	1.56	-0.01	4	2.88	9.02	3.00E-8	2.8	3.0				473	0.56	0.61	2.8
5.550	18.209	8.890	0.082	1.095		8.91	0.92	5	115	1.038	0.100	0.938	8.39	1.04	0.00	4	2.83	8.24	3.00E-8	2.6	2.7				445	0.52	0.56	2.5
5.750	18.865	10.428	0.131	3.843		10.48	1.25	5	115	1.076	0.120	0.955	9.85	1.39	0.02	4	2.83	9.70	3.00E-8	3.0	3.2				524	0.63	0.66	3.0
5.950	19.521	11.612	0.149	12.424		11.79	1.27	6	115	1.113	0.141	0.973	10.98	1.40	0.07	4	2.79	10.84	3.00E-8	3.3	3.4				590	0.71	0.73	3.3
6.150	20.177	11.431	0.113	35.074		11.94	0.95	6	115	1.151	0.161	0.990	10.90	1.05	0.22	4	2.73	10.77	3.00E-8	3.1	3.2				597	0.72	0.73	3.3
6.350	20.833	16.253	0.230	28.792		16.67	1.38	6	115	1.189	0.182	1.007	15.38	1.48	0.12	4	2.67	15.23	3.00E-8	4.3	4.4				833	1.03	1.03	4.6
6.550	21.490	18.268	0.183	23.637		18.61	0.98	6	115	1.226	0.202	1.024	16.98	1.05	0.09	5	2.56	16.85	3.00E-6	4.6	4.7	22	30	74	490			
6.750	22.146	31.207	0.598	12.768		31.39	1.90	6	115	1.264	0.223	1.041	28.94	1.98	0.02	5	2.52	28.83	3.00E-6	7.7	7.7	29	33	126	586			
6.950	22.802	60.027	0.732	-7.612		59.92	1.22	7	118	1.302	0.243	1.059	55.34	1.25	-0.01	5	2.17	55.36	3.00E-6	12.6	12.6	40	37	240	732			
7.150	23.458	53.343	0.680	-10.223		53.20	1.28	7	118	1.341	0.264	1.077	48.13	1.31	-0.02	5	2.23	48.41	3.00E-6	11.5	11.4	37	37	213	707			
7.350	24.114	49.685	0.568	-10.525		49.53	1.15	7	118	1.380	0.284	1.096	43.96	1.18	-0.02	5	2.24	44.45	3.00E-6	10.8	10.6	36	36	198	694			
7.550	24.770	57.086	0.532	-8.924		56.96	0.93	8	121	1.419	0.305	1.115	49.82	0.96	-0.02	5	2.14	50.74	3.00E-6	11.9	11.6	38	37	228	732			
7.750	25.427	58.576	0.503	-4.562		58.51	0.86	8	121	1.459	0.325	1.134	50.31	0.88	-0.01	5	2.12	51.57	3.00E-6	12.1	11.7	38	37	234	743			
7.950	26.083	55.491	0.526	-2.373		55.46	0.95	8	121	1.499	0.346	1.153	46.79	0.97	-0.01	5	2.17	48.19	3.00E-6	11.7	11.2	37	36	222	733			
8.150	26.739	51.748	0.722	1.629		51.77	1.39	7	118	1.537	0.366	1.171	42.89	1.44	0.00	5	2.30	44.23	3.00E-6	11.5	10.9	36	36	207	721			
8.350	27.395	63.093	0.671	-1.161		63.08	1.06	8	121	1.577	0.387	1.191	51.66	1.09	-0.01	5	2.16	53.79	3.00E-6	13.2	12.5	39	37	252	774			
8.550	28.051	27.044	0.455	0.983		27.06	1.68	6	115	1.615	0.407	1.208	21.07	1.79	-0.01	4	2.60	21.67	3.00E-8	6.9	6.5				1353	1.70	1.40	6.3
8.750	28.707	16.559	0.189	5.026		16.63	1.13	6	115	1.652	0.428	1.225	12.23	1.26	0.00	4	2.72	12.55	3.00E-8	4.5	4.2				832	1.00	0.82	3.7
8.950	29.364	14.955	0.240	9.918		15.10	1.59	6	115	1.690	0.448	1.242	10.80	1.79	0.02	4	2.85	11.04	3.00E-8	4.4	4.0				755	0.89	0.72	3.2
9.150	30.020	14.725	0.248	15.463		14.95	1.66	6	115	1.727	0.468	1.259	10.50	1.87	0.05	4	2.87	10.74	3.00E-8	4.3	4.0				747	0.88	0.70	3.2
9.350	30.676	14.859	0.266	17.902		15.12	1.76	6	115	1.765	0.489	1.276	10.46	1.99	0.06	4	2.88	10.71	3.00E-8	4.4	4.0				756	0.89	0.70	3.1
9.550	31.332	20.331	0.537	19.390		20.61	2.61	5	115	1.803	0.509	1.293	14.54	2.86	0.05	4	2.85	14.95	3.00E-8	5.9	5.4				1031	1.25	0.97	4.4
9.750	31.988	21.601	0.567	19.081		21.88	2.59	5	115	1.840	0.530	1.310	15.29	2.83	0.04	4	2.83	15.76	3.00E-8	6.2	5.6				1094	1.34	1.02	4.6
9.950	32.644	20.971	0.482	23.103		21.30	2.26	6	115	1.878	0.550	1.327	14.63	2.48	0.06	4	2.81	15.13	3.00E-8	6.0	5.4				1065	1.30	0.98	4.4
10.150	33.301	30.463	0.567	14.231		30.67	1.85	6	115	1.915	0.571	1.345	21.38	1.97	0.02	4	2.62	22.46	3.00E-8	7.9	7.0				1533	1.92	1.43	6.4
10.350	33.957	18.650	0.330	-0.323		18.65	1.77	6	115	1.953	0.591	1.362	12.26	1.98	-0.04	4	2.82	12.71	3.00E-8	5.4	4.7				932	1.11	0.82	3.7
10.550	34.613	16.167	0.373	1.657		16.19	2.30	5	115	1.991	0.612	1.379	10.30	2.63	-0.03	3	2.95	10.59	1.00E-9	5.0	4.4				810	0.95	0.69	3.1
10.750	35.269	17.724	0.490	2.464		17.76	2.76	5	115	2.028	0.632	1.396	11.27	3.12	-0.03	3	2.96	11.59	1.00E-9	5.5	4.8				888	1.05	0.75	3.4
10.950	35.925	14.964	0.429	3.289		15.01	2.86	5	115	2.066	0.653	1.413	9.16	3.31	-0.03	3	3.05	9.37	1.00E-9	4.9	4.3				751	0.86	0.61	2.7
11.150	36.581	14.238	0.361	4.096		14.30	2.52	5	115	2.103	0.673	1.430	8.53	2.96	-0.03	3	3.05	8.73	1.00E-9	4.7	4.0				715	0.81	0.57	2.6
11.350	37.238	13.713	0.240	4.980		13.78	1.74	5	115	2.141	0.694	1.447	8.04	2.06	-0.03	3	2.99	8.29	1.00E-9	4.4	3.7				689	0.78	0.54	2.4
11.550	37.894	16.148	0.261	6.121		16.24	1.61	6	115	2.179	0.714	1.464	9.60	1.86	-0.02	4	2.90	9.99	3.00E-8	4.9	4.1				812	0.94	0.64	2.9
11.750	38.550	15.060	0.173	8.767		15.19	1.14	6	115	2.216	0.735	1.482	8.75	1.33	-0.01	4	2.86	9.15	3.00E-8	4.4	3.7				759	0.86	0.58	2.6
11.950	39.206	14.429	0.175	15.095		14.65	1.20	6	115	2.254	0.755	1.499	8.27	1.41	0.03	4	2.90	8.63	3.00E-8	4.3	3.6				732	0.83	0.55	2.5
12.150	39.862	17.304	0.249	24.995		17.66	1.41	6	115	2.291	0.776	1.516	10.14	1.62	0.07	4	2.85	10.66	3.00E-8	5.1	4.2				883	1.02	0.68	3.0
12.350	40.518	20.054	0.354	32.151		20.52	1.72	6	115	2.329	0.796	1.533	11.86	1.94	0.08	4	2.83	12.51	3.00E-8	5.8	4.8				1026	1.21	0.79	3.6
12.550	41.175	22.518	0.462	40.107		23.10	2.00	6	115	2.367	0.817	1.550	13.37	2.23	0.10	4	2.82	14.14	3.00E-8	6.5	5.3				1155	1.38	0.89	4.0
12.750	41.831	38.083	0.679	35.025		38.59	1.76	6	115	2.404	0.837	1.567	23.09	1.88	0.05	4	2.58	25.15	3.00E-8	9.7	7.9				1929	2.41	1.54	6.9
12.950	42.487	85.772	0.979	1.962		85.80	1.14	8	121	2.444	0.857	1.586	52.54	1.17	-0.01	5	2.17	60.30	3.00E-6	18.1	14.8	42	37	343	944			
13.150	43.143	91.349	0.868	0.555		91.36	0.95	8	121	2.484	0.878	1.606	55.35	0.98	-0.01	5	2.11	64.30	3.00E-6	18.8	15.2	43	37	365	967			
13.350	43.799	82.449	1.223	-4.506		82.38	1.48	7	118	2.522	0.898	1.624	49.18	1.53	-0.02	5	2.27	56.22	3.00E-6	18.1	14.6	40	37	330	938			
13.550	44.455	68.832	1.151	-5.489		68.75	1.67	7	118	2.561	0.919	1.642	40.31	1.74	-0.02	5	2.37	45.62	3.00E-6	15.8	12.7	36	36	275	886			
13.750	45.112	23.835	0.476	-5.580		23.76	2.00	6	115	2.598	0.939	1.659	12.75	2.25	-0.06	4	2.84	13.58	3.00E-8	6.9	5.5				1188	1.41	0.85	3.8
13.950	45.768	21.247	0.340	-5.612		21.17	1.61	6	115	2.636	0.960	1.676	11.06	1.84	-0.07	4	2.84	11.78	3.00E-8	6.2	4.9				1058	1.24	0.74	3.3
14.150	46.424	38.627	0.741	-5.633		38.55	1.92	6	115	2.674	0.980	1.693	21.18	2.07	-0.04	4	2.64	23.28	3.00E-8	10.1	8.0				1927	2.39	1.41	6.4
14.350	47.080	60.696	1.489	-5.647		60.61	2.46	6	115	2.711	1.001	1.710	33.85	2.57	-0.02	4	2.53	37.84	3.00E-8	15.0	11.8				3031	3.86	2.26	10.2
14.550	47.736	90.165	1.255	-5.657		90.08	1.39	8	121	2.751	1.021	1.730	50.49	1.44	-0.02	5	2.24	59.09	3.00E-6	19.5	15.3	41	37	360	987			
14.750	48.392	85.591	1.276	-5.682		85.51	1.49	7	118	2.790	1.042	1.748	47.33	1.54	-0.02	5	2.28	55.23	3.00E-6	18.9	14.7	40	36	342	973			
14.950	49.049	65.480	1.381	-5.710		65.40	2.11	7	118	2.828	1.062	1.766	35.43	2.21	-0.02	5	2.48	40.25	3.00E-6	15.8	12.2	34	35	262	893			
15.150	49.705	44.977	1.151	-5.742		44.89	2.56	6	115	2.866	1.083	1.783	23.57	2.74	-0.04	4	2.67	26.03	3.00E-8	11.9	9.2				2245	2.80	1.57	7.1
15.350	50.361	39.353	0.871	-5.756		39.27	2.22	6	115	2.903	1.103	1.800	20.20	2.40	-0.04	4	2.69	22.28	3.00E-8	10.5	8.1				1964	2.42	1.35	6.1

Col 1i	Col 2i	Col 3i	Col 4i	Col 5i	Col 6i	Col 7i	Col 8i	Col 9i	Col 10i	Col 11i	Col 12i	Col 13i	Col 14i	Col 15i	Col 16i	Col 17i	Col 18i	Col 19i	Col 20i	Col 21i	Col 22i	Col 23i	Col 24i	Col 25i	Col 26i	Col 27i	Col 28i	Col 29i
Depth	Depth	q_c	f_s	u	Other	q_t	R_f	SBT	Unit Weight, γ	Total Overburden Stress, σ_v	Insitu pore pressure, u_o	Effective overburden stress, σ'_v	Normalized cone resistance, Q_{tn}	Normalized Friction raio, F_r	Normalized pore pressure ratio, B_q	Soil Behavior Type (normalized) SBT_n	SBTn Index, I_c	Normalized Cone resistance, Q_{tn}	Estimated permeability, k_{SBT}	SPT N_{60}	SPT $(N_1)_{60}$	Relative Density, D_r	Friction Angle, φ'	Young's modulus, E_s	Small strain shear modulus, G_o	Undrained shear strength, s_u	Undrained strength ratio, s_u/σ'_v	Over consolidation ratio, OCR
(m)	(ft)	(tsf)	(tsf)	(psi)		(tsf)	(%)		(pcf)	(tsf)	(tsf)	(tsf)							(ft/sec)	(blows/ft)	(blows/ft)	(%)	(degrees)	(tsf)	(tsf)	(tsf)		
15.550	51.017	20.226	0.290	-5.777		20.14	1.44	6	115	2.941	1.124	1.817	9.47	1.69	-0.09	4	2.88	10.14	3.00E-8	6.0	4.6				1007	1.15	0.63	2.8
15.750	51.673	20.951	0.397	-5.794		20.87	1.90	6	115	2.979	1.144	1.834	9.75	2.22	-0.09	3	2.93	10.37	1.00E-9	6.4	4.9				1043	1.19	0.65	2.9
15.950	52.329	22.059	0.461	-5.819		21.98	2.10	6	115	3.016	1.165	1.852	10.24	2.43	-0.08	3	2.94	10.89	1.00E-9	6.8	5.1				1099	1.26	0.68	3.1
16.150	52.986	20.971	0.388	-5.850		20.89	1.86	6	115	3.054	1.185	1.869	9.54	2.18	-0.09	3	2.94	10.16	1.00E-9	6.5	4.9				1044	1.19	0.64	2.9
16.350	53.642	21.811	0.497	-5.864		21.73	2.29	6	115	3.091	1.206	1.886	9.88	2.67	-0.09	3	2.97	10.47	1.00E-9	6.9	5.1				1086	1.24	0.66	3.0
16.550	54.298	22.785	0.621	-5.878		22.70	2.73	5	115	3.129	1.226	1.903	10.28	3.17	-0.08	3	3.00	10.85	1.00E-9	7.3	5.4				1135	1.30	0.69	3.1
16.750	54.954	23.597	0.582	-5.882		23.51	2.48	6	115	3.167	1.246	1.920	10.60	2.86	-0.08	3	2.96	11.26	1.00E-9	7.4	5.5				1176	1.36	0.71	3.2
16.950	55.610	24.571	0.579	-5.096		24.50	2.36	6	115	3.204	1.267	1.937	10.99	2.72	-0.08	3	2.94	11.75	1.00E-9	7.6	5.6				1225	1.42	0.73	3.3
17.150	56.266	23.797	0.726	-3.710		23.74	3.06	5	115	3.242	1.287	1.954	10.49	3.54	-0.08	3	3.02	11.06	1.00E-9	7.7	5.7				1187	1.37	0.70	3.1
17.350	56.923	25.296	0.729	-3.323		25.25	2.89	5	115	3.279	1.308	1.971	11.14	3.32	-0.07	3	2.98	11.84	1.00E-9	8.0	5.9				1262	1.46	0.74	3.3
17.550	57.579	24.169	0.526	-2.832		24.13	2.18	6	115	3.317	1.328	1.989	10.47	2.53	-0.07	3	2.94	11.22	1.00E-9	7.4	5.4				1206	1.39	0.70	3.1
17.750	58.235	24.084	0.573	-2.186		24.05	2.38	6	115	3.354	1.349	2.006	10.32	2.77	-0.07	3	2.97	11.02	1.00E-9	7.5	5.5				1203	1.38	0.69	3.1
17.950	58.891	25.545	0.838	-1.316		25.53	3.28	5	115	3.392	1.369	2.023	10.94	3.79	-0.07	3	3.02	11.56	1.00E-9	8.3	6.0				1276	1.48	0.73	3.3
18.150	59.547	23.892	0.743	-0.607		23.88	3.11	5	115	3.430	1.390	2.040	10.03	3.63	-0.07	3	3.04	10.56	1.00E-9	7.9	5.7				1194	1.36	0.67	3.0
18.350	60.203	24.609	0.713	0.126		24.61	2.90	5	115	3.467	1.410	2.057	10.28	3.37	-0.07	3	3.02	10.89	1.00E-9	7.9	5.7				1231	1.41	0.69	3.1
18.550	60.860	26.079	0.776	0.898		26.09	2.97	5	115	3.505	1.431	2.074	10.89	3.44	-0.06	3	3.00	11.58	1.00E-9	8.3	6.0				1305	1.51	0.73	3.3
18.750	61.516	25.296	0.655	1.516		25.32	2.59	6	115	3.542	1.451	2.091	10.41	3.01	-0.06	3	2.98	11.12	1.00E-9	8.0	5.7				1266	1.45	0.69	3.1
18.950	62.172	27.216	0.466	3.524		27.27	1.71	6	115	3.580	1.472	2.108	11.23	1.97	-0.05	4	2.85	12.34	3.00E-8	8.0	5.6				1363	1.58	0.75	3.4
19.150	62.828	29.374	0.542	6.359		29.47	1.84	6	115	3.618	1.492	2.126	12.16	2.10	-0.04	4	2.84	13.41	3.00E-8	8.5	6.0				1473	1.72	0.81	3.6
19.350	63.484	29.851	0.491	8.153		29.97	1.64	6	115	3.655	1.513	2.143	12.28	1.87	-0.04	4	2.81	13.65	3.00E-8	8.5	6.0				1498	1.75	0.82	3.7
19.550	64.140	30.720	0.615	9.743		30.86	1.99	6	115	3.693	1.533	2.160	12.58	2.26	-0.03	4	2.85	13.88	3.00E-8	9.0	6.3				1543	1.81	0.84	3.8
19.750	64.797	32.592	0.959	10.774		32.75	2.93	5	115	3.730	1.554	2.177	13.33	3.30	-0.03	3	2.92	14.49	1.00E-9	9.9	6.9				1637	1.93	0.89	4.0
19.950	65.453	39.200	1.123	12.627		39.38	2.85	6	115	3.768	1.574	2.194	16.23	3.15	-0.02	4	2.84	17.98	3.00E-8	11.4	7.9				1969	2.37	1.08	4.9
20.150	66.109	40.699	1.372	13.880		40.90	3.36	5	115	3.806	1.594	2.211	16.78	3.70	-0.02	3	2.87	18.47	1.00E-9	12.0	8.3				2045	2.47	1.12	5.0
20.350	66.765	54.795	1.727	12.561		54.98	3.14	6	115	3.843	1.615	2.228	22.95	3.38	-0.01	4	2.74	26.05	3.00E-8	15.1	10.4				2749	3.41	1.53	6.9
20.550	67.421	54.670	1.787	3.461		54.72	3.26	6	115	3.881	1.635	2.245	22.64	3.51	-0.03	4	2.76	25.64	3.00E-8	15.2	10.4				2736	3.39	1.51	6.8
20.750	68.077	25.927	0.500	2.450		25.96	1.93	6	115	3.918	1.656	2.262	9.74	2.27	-0.07	3	2.94	10.59	1.00E-9	8.0	5.5				1298	1.47	0.65	2.9
20.950	68.734	25.058	0.421	2.127		25.09	1.68	6	115	3.956	1.676	2.280	9.27	1.99	-0.07	3	2.93	10.11	1.00E-9	7.7	5.2				1254	1.41	0.62	2.8
21.150	69.390	26.318	0.476	1.944		26.35	1.81	6	115	3.994	1.697	2.297	9.73	2.13	-0.07	3	2.93	10.63	1.00E-9	8.0	5.5				1317	1.49	0.65	2.9
21.350	70.046	28.037	0.536	1.867		28.06	1.91	6	115	4.031	1.717	2.314	10.39	2.23	-0.07	3	2.91	11.39	1.00E-9	8.5	5.7				1403	1.60	0.69	3.1
21.550	70.702	24.532	0.398	1.786		24.56	1.62	6	115	4.069	1.738	2.331	8.79	1.94	-0.08	3	2.94	9.58	1.00E-9	7.6	5.1				1228	1.37	0.59	2.6
21.750	71.358	24.733	0.375	1.706		24.76	1.52	6	115	4.106	1.758	2.348	8.79	1.82	-0.08	4	2.93	9.63	3.00E-8	7.6	5.1				1238	1.38	0.59	2.6
21.950	72.014	33.614	0.560	1.604		33.64	1.67	6	115	4.144	1.779	2.365	12.47	1.90	-0.06	4	2.81	14.07	3.00E-8	9.6	6.4				1682	1.97	0.83	3.7
22.150	72.671	36.154	0.609	1.614		36.18	1.68	6	115	4.182	1.799	2.382	13.43	1.90	-0.05	4	2.78	15.26	3.00E-8	10.2	6.8				1809	2.13	0.90	4.0
22.350	73.327	88.494	1.362	3.548		88.55	1.54	7	118	4.220	1.820	2.401	35.13	1.62	-0.02	5	2.40	43.93	3.00E-6	20.5	13.6	35	35	354	1095			
22.550	73.983	200.308	3.528	3.966		200.36	1.76	8	121	4.260	1.840	2.420	81.04	1.80	-0.01	5	2.15	108.05	3.00E-6	41.8	27.6	56	39	801	1441			
22.750	74.639	259.533	3.171	1.278		259.55	1.22	9	124	4.301	1.861	2.440	104.61	1.24	-0.01	6	1.96	146.72	3.00E-4	50.2	33.1	65	41	1038	1575			
22.950	75.295	323.418	1.424	8.486		323.54	0.44	10	127	4.342	1.881	2.461	129.69	0.45	0.00	6	1.61	197.80	3.00E-4	55.4	36.3	75	42	1294	1700			
23.150	75.951	304.443	0.904	12.385		304.62	0.30	10	127	4.384	1.902	2.483	120.94	0.30	0.00	6	1.55	185.25	3.00E-4	51.1	33.4	73	42	1218	1671			
23.350	76.608	406.736	1.278	10.122		406.88	0.31	10	127	4.426	1.922	2.504	160.73	0.32	0.00	6	1.46	247.26	3.00E-4	66.2	43.0	84	43	1628	1846			
23.550	77.264	435.995	1.024	6.886		436.09	0.23	10	127	4.468	1.943	2.525	170.93	0.24	0.00	6	1.37	264.06	3.00E-4	69.1	44.7	87	43	1744	1894			
23.750	77.920	344.961	1.615	0.716		344.97	0.47	10	127	4.509	1.963	2.546	133.70	0.47	-0.01	6	1.62	207.41	3.00E-4	59.1	38.1	77	42	1380	1757			
23.950	78.576	93.326	2.375	-1.225		93.31	2.55	7	118	4.548	1.983	2.565	34.61	2.68	-0.02	4	2.54	42.45	3.00E-8	23.2	14.9				4665	5.92	2.31	10.4
24.150	79.232	49.189	1.219	2.120		49.22	2.48	6	115	4.586	2.004	2.582	17.29	2.73	-0.04	4	2.78	19.91	3.00E-8	13.8	8.8				2461	2.98	1.15	5.2
24.350	79.888	81.313	2.325	3.085		81.36	2.86	6	115	4.623	2.024	2.599	29.53	3.03	-0.02	4	2.63	35.48	3.00E-8	21.1	13.4				4068	5.12	1.97	8.9
24.550	80.545	147.118	2.950	-0.747		147.11	2.01	7	118	4.662	2.045	2.617	54.43	2.07	-0.01	5	2.32	71.23	3.00E-6	33.0	21.0	45	37	588	1334			
24.750	81.201	57.506	1.544	-4.481		57.44	2.69	6	115	4.699	2.065	2.634	20.02	2.93	-0.05	4	2.75	23.34	3.00E-8	15.9	10.1				2872	3.52	1.33	6.0
24.950	81.857	36.173	0.678	-4.987		36.10	1.88	6	115	4.737	2.086	2.651	11.83	2.16	-0.08	4	2.86	13.39	3.00E-8	10.6	6.7				1805	2.09	0.79	3.5
25.150	82.513	41.148	0.818	-4.899		41.08	1.99	6	115	4.775	2.106	2.668	13.60	2.25	-0.07	4	2.82	15.59	3.00E-8	11.8	7.4				2054	2.42	0.91	4.1
25.350	83.169	37.395	0.783	-4.755		37.33	2.10	6	115	4.812	2.127	2.686	12.11	2.41	-0.08	4	2.87	13.66	3.00E-8	11.1	7.0				1866	2.17	0.81	3.6
25.550	83.825	36.899	0.894	-4.682		36.83	2.43	6	115	4.850	2.147	2.703	11.83	2.80	-0.08	3	2.92	13.20	1.00E-9	11.2	7.0				1842	2.13	0.79	3.6
25.750	84.482	38.369	1.147	-4.615		38.30	3.00	6	115	4.887	2.168	2.720	12.29	3.43	-0.07	3	2.96	13.56	1.00E-9	12.0	7.5				1915	2.23	0.82	3.7
25.950	85.138	38.284	0.963	-4.492		38.22	2.52	6	115	4.925	2.188	2.737	12.16	2.89	-0.08	3	2.92	13.59	1.00E-9	11.6	7.2				1911	2.22	0.81	3.6
26.150	85.794	42.352	0.863	-4.296		42.29	2.04	6	115	4.963	2.209	2.754	13.55	2.31	-0.07	4	2.82	15.57	3.00E-8	12.2	7.6				2114	2.49	0.90	4.1
26.350	86.450	43.975	0.893	-4.120		43.92	2.03	6	115	5.000	2.229	2.771	14.04	2.29	-0.06	4	2.81	16.21	3.00E-8	12.6	7.8				2196	2.59	0.94	4.2
26.550	87.106	40.022	0.690	-3.969		39.96	1.73	7	118	5.039	2.250	2.789	12.52	1.97	-0.07	4	2.82	14.45	3.00E-8	11.5	7.1				1998	2.33	0.83	3.8
26.750	87.762	46.372	1.053	-3.797		46.32	2.27	6	115	5.076	2.270	2.806	14.70	2.55	-0.06	4	2.82	16.95	3.00E-8	13.3	8.2				2316	2.75	0.98	4.4
26.950	88.419	45.961	1.490	-3.527		45.91	3.24	6	115	5.114	2.291	2.824	14.45	3.65	-0.06	3	2.92	16.20	1.00E-9	14.0	8.6				2296	2.72	0.96	4.3
27.150	89.075	80.282	4.241	-3.274		80.23	5.29	11	131	5.157	2.311	2.846	26.38	5.65	-0.03	3	2.84	30.27	1.00E-9	23.4	14.3				4012	5.01	1.76	7.9
27.350	89.731	63.704	2.783	-3.078		63.66	4.37	5	115	5.194	2.331	2.863	20.42	4.76	-0.04	3	2.88	23.23	1.00E-9	18.9	11.5				3183	3.90	1.36	6.1
27.550	90.387	43.077	1.386	-2.829		43.04	3.22	6	115	5.232	2.352	2.880	13.13	3.67	-0.07	3	2.95	14.60	1.00E-9	13.4	8.1				2152	2.52	0.88	3.9
27.750	91.043	43.946	1.006	-2.720		43.91	2.29	6	115	5.270	2.372	2.897	13.34	2.60	-0.07	4	2.86	15.27	3.00E-8	12.9	7.8				2195	2.58	0.89	4.0
27.950	91.699	35.810	0.707	-2.527		35.77	1.98	6	115	5.307	2.393	2.914	10.45	2.32	-0.08	3	2.92	11.76	1.00E-9	10.9	6.6				1789	2.03	0.70	3.1
28.150	92.356	32.640	0.492	-2.351		32.61	1.51	7	118	5.346	2.413	2.933	9.30	1.80	-0.09	4	2.90	10.51	3.00E-8	9.8	5.9				1630	1.82	0.62	2.8
28.350	93.012	34.941	0.582	-2.246		34.91	1.67	6	115	5.383	2.434	2.950	10.01	1.97	-0.09	4	2.90	11.35	3.00E-8	10.5	6.3				1745	1.97	0.67	3.0
28.550	93.668	42.886	0.644	-2.102		42.86	1.50	7	118	5.422	2.454	2.968	12.61	1.72	-0.07	4	2.78	14.84	3.00E-8	12.1	7.2				2143	2.50	0.84	3.8
28.750	94.324	42.772	0.720	-1.891		42.74	1.68	7	118	5.461	2.475	2.986	12.49	1.93	-0.07	4	2.81	14.57	3.00E-8	12.2	7.3				2137	2.49	0.83	3.7
28.950	94.980	45.379	0.794	-1.403		45.36	1.75	7	118	5.499	2.495	3.004	13.27	1.99	-0.07	4	2.80	15.57	3.00E-8	12.9	7.6				2268	2.66	0.88	4.0
29.150	95.636	51.500	0.931	-0.122		51.50	1.81	7	118	5.538	2.516	3.022	15.21	2.03	-0.05	4	2.75	18.12	3.00E-8	14.2	8.4				2575	3.06	1.01	4.6
29.350	96.293	49.848	0.858	0.383		49.85	1.72	7	118	5.577	2.536	3.040	14.56	1.94	-0.06	4	2.76	17.34	3.00E-8	13.8	8.2				2493	2.95	0.97	4.4
29.550	96.949	51.395	0.871	0.825		51.41	1.69	7	118	5.615	2.557	3.059	14.97	1.90	-0.05	4	2.74	17.93	3.00E-8	14.1	8.3				2570	3.05	1.00	4.5
29.750	97.605	43.669	0.767	1.319		43.69	1.76	7	118	5.654	2.577	3.077	12.36	2.02	-0.07	4	2.82	14.42	3.00E-8	12.6	7.4				2184	2.54	0.82	3.7
29.950	98.261	54.116	1.044	2.186		54.15	1.93	7	118	5.693	2.598	3.095	15.66	2.15	-0.05	4	2.76	18.70	3.00E-8	15.0	8.8				2707	3.23	1.04	4.7
30.150	98.917	56.141	1.050	3.190		56.19	1.87	7	118	5.731	2.618	3.113	16.21	2.08	-0.05	4	2.73	19.51	3.00E-8	15.4	9.0				2809	3.36	1.08	4.9
30.350	99.573	53.801	1.141	3.780		53.86	2.12	7	118	5.770	2.639	3.131	15.36	2.37	-0.05	4	2.79	18.19	3.00E-8	15.2	8.8				2693	3.21	1.02	4.6
30.550	100.230	44.691	0.796	4.366		44.75	1.78	7	118	5.809	2.659	3.149	12.37	2.04	-0.06	4	2.83	14.46	3.00E-8	12.9	7.5				2238	2.60	0.82	3.7
30.750	100.886	40.098	0.804	5.019		40.17	2.00	6	115	5.846	2.680	3.167	10.84	2.34	-0.07	3	2.91	12.36	1.00E-9	12.1	7.0				2009	2.29	0.72	3.3
30.950	101.542	41.215	0.593	6.321		41.31	1.44	7	118	5.885	2.700	3.185	11.12	1.68	-0.06	4	2.82	13.06	3.00E-8	11.9	6.8				2065	2.36	0.74	3.3
31.150	102.198	36.106	0.504	8.641		36.23	1.39	7	118	5.923	2.720	3.203	9.46	1.66	-0.07	4	2.88	10.90	3.00E-8	10.7	6.2				1812	2.02	0.63	2.8
31.350	102.854	31.771	0.453	9.943		31.91	1.42	7	118	5.962	2.741	3.221	8.06	1.74	-0.08	3	2.95	9.07	1.00E-9	9.9	5.6				1596	1.73	0.54	2.4
31.550	103.511	33.022	0.388	11.308		33.18	1.17	7	118	6.001	2.761	3.239	8.39	1.43	-0.07	4	2.89	9.64	3.00E-8	9.9	5.7				1659	1.81	0.56	2.5
31.750	104.167	43.555	0.717	13.224		43.75	1.64	7	118	6.039	2.782	3.257	11.58	1.90	-0.05	4	2.84	13.57	3.00E-8	12.6	7.2				2187	2.51	0.77	3.5
31.950	104.823	106.476	2.565	12.877		106.66	2.41	7	118	6.078	2.802	3.276	30.71	2.55	-0.02	4	2.56	39.49	3.00E-8	26.8	15.2				5333	6.71	2.05	9.2
32.150	105.479	160.210	3.897	3.910		160.27	2.43	7	118	6.117	2.823	3.294	46.80	2.53	-0.02	5	2.42	63.23	3.00E-6	37.6	21.3	43	36	641	1482			
32.350	106.135	320.811	2.237	-0.677		320.80	0.70	10	127	6.158	2.843	3.315	94.91	0.71	-0.01	6	1.84	157.00	3.00E-4	59.4	33.6	67	40	1283	1872			
32.550	106.791	348.485	1.911	-5.134		348.41	0.55	10	127	6.200	2.864	3.336	102.57	0.56	-0.01	6	1.75	175.34	3.00E-4	62.5	35.2	71	41	1394	1929			
32.750	107.448	252.075	2.662	-6.433		251.98	1.06	9	124	6.241	2.884	3.357	73.21	1.08	-0.01	6	2.04	113.62	3.00E-4	50.3	28.2	57	39	1008	1735			
32.950	108.104	354.196	1.675	-7.036		354.09	0.47	10	127	6.283	2.905	3.378	102.97	0.48	-0.01	6	1.71	179.28	3.00E-4	62.8	35.1	72	41	1416	1947			

GREGG DRILLING & TESTING, INC.

CONE PENETRATION TEST DATA

Client:	PARIKH CONSULTANTS	Units:	Imperial
Site:	HWY 101	Data averaging interval:	0.200 meters
Engineer:	D.WANG	Assumed depth of water:	13.003 feet
Sounding:	**BR-2**	Net area ratio of cone:	0.80
Date:	12/17/2007	Unit weight of water:	62.4 lb/ft3
Time:	9:01 AM	Relative density constant, CDR:	350
		Young's modulus for sands, a:	4
		Small strain shear modulus number, SG (sands):	180
		Small strain shear modulus number, CG (clays):	50
		Nkt for clays:	15
		OCR number, kocr:	0.3

Interpretation based on Lunne, Robertson and Powell, 1997

Col 1i	Col 2i	Col 3i	Col 4i	Col 5i	Col 6i	Col 7i	Col 8i	Col 9i	Col 10i	Col 11i	Col 12i	Col 13i	Col 14i	Col 15i	Col 16i	Col 17i	Col 18i	Col 19i	Col 20i	Col 21i	Col 22i	Col 23i	Col 24i	Col 25i	Col 26i	Col 27i	Col 28i	Col 29i
Depth	Depth	qc	fs	u	Other	qt	Rf	SBT	Unit Weight, γ	Total Overburden Stress, σv	Insitu pore pressure, uo	Effective overburden stress, σ'v	Normalized cone resistance, Qtl	Normalized Friction raio, Fr	Normalized pore pressure ratio, Bq	Soil Behavior Type (normalized) SBTn	SBTn Index, Ic	Normalized Cone resistance, Qtn	Estimated permeability, kSBT	SPT N60	SPT (N1)60	Relative Density, Dr	Friction Angle, φ'	Young's modulus, Es	Small strain shear modulus, Go	Undrained shear strength, su	Undrained strength ratio, su/σ'v	Over consolidation ratio, OCR
(m)	(ft)	(tsf)	(tsf)	(psi)		(tsf)	(%)		(pcf)	(tsf)	(tsf)	(tsf)							(ft/sec)	(blows/ft)	(blows/ft)	(%)	(degrees)	(tsf)	(tsf)	(tsf)		
0.150	0.492	0.000	0.000	0.000							0.000																	
0.350	1.148	0.000	0.000	0.000							0.000																	
0.550	1.804	0.000	0.000	0.000							0.000																	
0.750	2.461	0.000	0.000	0.000							0.000																	
0.950	3.117	0.000	0.000	0.000							0.000																	
1.150	3.773	0.000	0.000	0.000							0.000																	
1.350	4.429	0.000	0.000	0.000							0.000																	
1.550	5.085	47.564	0.495	0.747		47.57	1.04	7	118	0.299	0.000	0.299	157.88	1.05	0.00	6	1.78	88.43	3.00E-4	8.6	16.2	50	43	190	445			
1.750	5.741	99.968	0.984	0.627		99.98	0.98	8	121	0.339	0.000	0.339	293.81	0.99	0.00	6	1.57	166.33	3.00E-4	16.9	29.9	69	46	400	594			
1.950	6.398	88.627	0.684	0.557		88.64	0.77	8	121	0.379	0.000	0.379	232.98	0.78	0.00	6	1.56	139.40	3.00E-4	14.9	25.0	63	45	355	592			
2.150	7.054	67.511	0.596	-0.049		67.51	0.88	8	121	0.418	0.000	0.418	160.32	0.89	0.00	6	1.72	103.16	3.00E-4	12.0	19.1	54	43	270	559			
2.350	7.710	58.248	0.596	-0.141		58.25	1.02	8	121	0.458	0.000	0.458	126.12	1.03	0.00	6	1.84	87.33	3.00E-4	10.8	16.4	50	42	233	548			
2.550	8.366	45.904	0.739	-0.204		45.90	1.61	7	118	0.497	0.000	0.497	91.39	1.63	0.00	5	2.08	69.19	3.00E-6	9.3	13.6	44	40	184	520			
2.750	9.022	34.246	0.775	-0.793		34.23	2.26	6	115	0.534	0.000	0.534	63.06	2.30	0.00	5	2.30	51.31	3.00E-6	7.6	10.7	38	38	137	483			
2.950	9.678	32.329	0.752	-0.353		32.32	2.33	6	115	0.572	0.000	0.572	55.51	2.37	0.00	5	2.35	46.52	3.00E-6	7.3	10.0	36	37	129	485			
3.150	10.335	34.201	0.665	-0.420		34.19	1.94	6	115	0.610	0.000	0.610	55.09	1.98	0.00	5	2.30	46.64	3.00E-6	7.6	10.0	37	37	137	505			
3.350	10.991	37.036	0.464	-1.139		37.02	1.25	7	118	0.648	0.000	0.648	56.11	1.28	0.00	5	2.17	47.49	3.00E-6	7.8	10.0	37	37	148	529			
3.550	11.647	37.070	0.411	-3.046		37.03	1.11	7	118	0.687	0.000	0.687	52.90	1.13	-0.01	5	2.16	45.61	3.00E-6	7.8	9.6	36	37	148	539			
3.750	12.303	26.854	0.413	-3.715		26.80	1.54	6	115	0.724	0.000	0.724	35.99	1.58	-0.01	5	2.38	32.41	3.00E-6	6.2	7.5	30	35	107	493			
3.950	12.959	22.392	0.341	-4.684		22.32	1.53	6	115	0.762	0.000	0.762	28.30	1.58	-0.02	5	2.47	26.05	3.00E-6	5.4	6.3	27	33	89	472			
4.150	13.615	9.943	0.220	-5.107		9.87	2.23	5	115	0.800	0.019	0.781	11.62	2.43	-0.04	4	2.89	11.19	3.00E-8	3.0	3.5				493	0.60	0.77	3.5
4.350	14.272	7.420	0.114	-4.396		7.36	1.54	5	115	0.837	0.040	0.798	8.17	1.74	-0.05	3	2.95	7.93	1.00E-9	2.3	2.6				368	0.43	0.54	2.5
4.550	14.928	8.032	0.082	-2.034		8.00	1.02	1	111	0.874	0.060	0.814	8.76	1.15	-0.03	4	2.83	8.44	3.00E-8	2.3	2.7				400	0.48	0.58	2.6
4.750	15.584	9.731	0.077	5.562		9.81	0.78	6	115	0.911	0.081	0.831	10.71	0.86	0.04	4	2.70	10.25	3.00E-8	2.6	3.0				491	0.59	0.71	3.2
4.950	16.240	14.761	0.119	39.097		15.32	0.78	6	115	0.949	0.101	0.848	16.95	0.83	0.19	5	2.51	16.08	3.00E-6	3.6	4.0	21	30	61	431			
5.150	16.896	21.467	0.258	18.015		21.73	1.19	6	115	0.987	0.121	0.865	23.97	1.24	0.06	5	2.47	22.79	3.00E-6	5.2	5.7	26	32	87	488			
5.350	17.552	15.730	0.146	36.400		16.25	0.90	6	115	1.024	0.142	0.882	17.26	0.96	0.16	5	2.54	16.55	3.00E-6	3.9	4.3	22	30	65	446			
5.550	18.209	13.853	0.109	57.669		14.68	0.74	6	115	1.062	0.162	0.899	15.15	0.80	0.29	5	2.55	14.60	3.00E-6	3.5	3.8	20	29	59	434			
5.750	18.865	11.831	0.094	51.772		12.58	0.74	6	115	1.099	0.183	0.916	12.52	0.82	0.31	4	2.63	12.16	3.00E-8	3.1	3.3				629	0.77	0.83	3.8
5.950	19.521	10.556	0.083	58.152		11.39	0.73	6	115	1.137	0.203	0.934	10.99	0.81	0.39	4	2.68	10.73	3.00E-8	2.8	3.0				570	0.68	0.73	3.3
6.150	20.177	12.728	0.126	53.016		13.49	0.94	6	115	1.175	0.224	0.951	12.96	1.03	0.29	4	2.66	12.69	3.00E-8	3.4	3.5				675	0.82	0.86	3.9
6.350	20.833	13.547	0.145	45.956		14.21	1.02	6	115	1.212	0.244	0.968	13.43	1.11	0.24	4	2.66	13.20	3.00E-8	3.6	3.7				710	0.87	0.90	4.0
6.550	21.490	13.809	0.132	47.331		14.49	0.91	6	115	1.250	0.265	0.985	13.44	1.00	0.24	4	2.64	13.25	3.00E-8	3.6	3.7				725	0.88	0.90	4.0
6.750	22.146	17.680	0.199	39.777		18.25	1.09	6	115	1.287	0.285	1.002	16.93	1.17	0.15	4	2.59	16.73	3.00E-8	4.5	4.6				913	1.13	1.13	5.1
6.950	22.802	17.736	0.216	8.914		17.86	1.21	6	115	1.325	0.306	1.019	16.23	1.30	0.02	4	2.62	16.10	3.00E-8	4.6	4.7				893	1.10	1.08	4.9
7.150	23.458	18.220	0.279	29.534		18.65	1.50	6	115	1.363	0.326	1.036	16.68	1.62	0.10	4	2.66	16.61	3.00E-8	4.8	4.9				932	1.15	1.11	5.0
7.350	24.114	34.474	0.410	5.389		34.55	1.19	7	118	1.401	0.347	1.054	31.44	1.24	0.00	5	2.37	31.41	3.00E-6	7.9	7.9	30	34	138	608			
7.550	24.770	23.968	0.398	7.459		24.08	1.65	6	115	1.439	0.367	1.072	21.12	1.76	0.01	4	2.60	21.18	3.00E-8	6.1	6.1				1204	1.51	1.41	6.3
7.750	25.427	50.578	0.617	-1.135		50.56	1.22	7	118	1.477	0.388	1.090	45.04	1.26	-0.01	5	2.24	45.47	3.00E-6	11.0	10.8	36	36	202	698			
7.950	26.083	49.914	0.500	-5.968		49.83	1.00	7	118	1.516	0.408	1.108	43.61	1.03	-0.02	5	2.21	44.27	3.00E-6	10.7	10.4	36	36	199	698			
8.150	26.739	19.262	0.322	-7.085		19.16	1.68	6	115	1.554	0.429	1.125	15.65	1.83	-0.05	4	2.72	15.82	3.00E-8	5.2	5.1				958	1.17	1.04	4.7
8.350	27.395	31.444	0.482	-7.381		31.34	1.54	6	115	1.591	0.449	1.142	26.04	1.62	-0.03	5	2.50	26.53	3.00E-6	7.7	7.4	28	33	125	604			
8.550	28.051	17.485	0.312	-7.839		17.37	1.80	6	115	1.629	0.469	1.159	13.58	1.98	-0.07	4	2.79	13.77	3.00E-8	4.9	4.7				869	1.05	0.91	4.1
8.750	28.707	12.589	0.188	-4.942		12.52	1.50	5	115	1.666	0.490	1.176	9.22	1.73	-0.08	4	2.90	9.34	3.00E-8	3.8	3.6				626	0.72	0.61	2.8
8.950	29.364	22.726	0.367	10.011		22.87	1.61	6	115	1.704	0.510	1.194	17.73	1.73	0.01	4	2.66	18.15	3.00E-8	6.0	5.6				1144	1.41	1.18	5.3
9.150	30.020	40.601	0.432	-0.888		40.59	1.06	7	118	1.743	0.531	1.212	32.06	1.11	-0.02	5	2.34	33.35	3.00E-6	9.2	8.6	31	34	162	672			
9.350	30.676	14.845	0.220	-7.018		14.74	1.49	6	115	1.780	0.551	1.229	10.55	1.69	-0.08	4	2.84	10.77	3.00E-8	4.3	4.0				737	0.86	0.70	3.2
9.550	31.332	10.538	0.139	-6.489		10.44	1.33	5	115	1.818	0.572	1.246	6.92	1.61	-0.12	3	2.99	7.03	1.00E-9	3.4	3.1				522	0.58	0.46	2.1
9.750	31.988	10.879	0.142	4.293		10.94	1.30	5	115	1.855	0.592	1.263	7.19	1.57	-0.03	3	2.97	7.32	1.00E-9	3.4	3.1				547	0.61	0.48	2.2
9.950	32.644	18.501	0.191	53.295		19.27	0.99	6	115	1.893	0.613	1.280	13.57	1.10	0.19	4	2.66	14.09	3.00E-8	4.9	4.4				963	1.16	0.90	4.1
10.150	33.301	21.785	0.222	67.605		22.76	0.98	6	115	1.931	0.633	1.297	16.05	1.07	0.20	4	2.59	16.78	3.00E-8	5.5	5.0				1138	1.39	1.07	4.8
10.350	33.957	31.817	0.549	18.851		32.09	1.71	6	115	1.968	0.654	1.314	22.91	1.82	0.02	4	2.58	24.03	3.00E-8	8.0	7.2				1604	2.01	1.53	6.9
10.550	34.613	26.821	0.508	-1.748		26.80	1.90	6	115	2.006	0.674	1.332	18.62	2.05	-0.03	4	2.68	19.44	3.00E-8	7.1	6.4				1340	1.65	1.24	5.6
10.750	35.269	13.871	0.344	5.086		13.94	2.47	5	115	2.043	0.695	1.349	8.82	2.89	-0.03	3	3.03	9.00	1.00E-9	4.5	4.0				697	0.79	0.59	2.6
10.950	35.925	13.731	0.364	34.455		14.23	2.56	5	115	2.081	0.715	1.366	8.89	3.00	0.15	3	3.04	9.08	1.00E-9	4.5	4.0				711	0.81	0.59	2.7
11.150	36.581	15.992	0.488	32.171		16.46	2.96	5	115	2.119	0.736	1.383	10.37	3.40	0.11	3	3.02	10.61	1.00E-9	5.2	4.5				823	0.96	0.69	3.1
11.350	37.238	14.249	0.452	23.729		14.59	3.10	5	115	2.156	0.756	1.400	8.88	3.64	0.08	3	3.09	9.05	1.00E-9	4.8	4.2				730	0.83	0.59	2.7
11.550	37.894	14.772	0.339	53.961		15.55	2.18	5	115	2.194	0.777	1.417	9.42	2.54	0.23	3	2.98	9.70	1.00E-9	4.7	4.0				777	0.89	0.63	2.8
11.750	38.550	23.428	0.394	90.837		24.74	1.59	6	115	2.231	0.797	1.434	15.69	1.75	0.26	4	2.70	16.58	3.00E-8	6.3	5.4				1237	1.50	1.05	4.7
11.950	39.206	21.284	0.316	84.651		22.50	1.41	6	115	2.269	0.818	1.451	13.94	1.56	0.26	4	2.72	14.74	3.00E-8	5.8	4.9				1125	1.35	0.93	4.2
12.150	39.862	27.623	0.395	77.542		28.74	1.37	6	115	2.307	0.838	1.469	18.00	1.49	0.18	4	2.62	19.26	3.00E-8	7.1	6.0				1437	1.76	1.20	5.4
12.350	40.518	24.334	0.354	56.759		25.15	1.41	6	115	2.344	0.858	1.486	15.35	1.55	0.14	4	2.68	16.35	3.00E-8	6.5	5.5				1258	1.52	1.02	4.6
12.550	41.175	20.913	0.322	69.396		21.91	1.47	6	115	2.382	0.879	1.503	13.00	1.65	0.21	4	2.76	13.77	3.00E-8	5.8	4.9				1096	1.30	0.87	3.9
12.750	41.831	21.746	0.263	75.251		22.83	1.15	6	115	2.419	0.899	1.520	13.43	1.29	0.22	4	2.69	14.35	3.00E-8	5.8	4.9				1141	1.36	0.90	4.0
12.950	42.487	19.735	0.219	74.983		20.81	1.05	6	115	2.457	0.920	1.537	11.94	1.19	0.24	4	2.72	12.75	3.00E-8	5.4	4.5				1041	1.22	0.80	3.6
13.150	43.143	17.942	0.215	83.033		19.14	1.12	6	115	2.495	0.940	1.554	10.71	1.29	0.30	4	2.78	11.38	3.00E-8	5.0	4.2				957	1.11	0.71	3.2
13.350	43.799	16.131	0.280	84.641		17.35	1.62	6	115	2.532	0.961	1.571	9.43	1.89	0.35	4	2.91	9.88	3.00E-8	4.9	4.0				868	0.99	0.63	2.8
13.550	44.455	41.348	0.595	43.538		41.97	1.42	7	118	2.571	0.981	1.589	24.79	1.51	0.05	5	2.50	27.35	3.00E-6	10.1	8.2	28	32	168	744			
13.750	45.112	58.493	1.085	-5.234		58.42	1.86	7	118	2.609	1.002	1.608	34.71	1.94	-0.02	5	2.45	38.66	3.00E-6	13.9	11.3	33	35	234	834			
13.950	45.768	71.009	1.174	-7.427		70.90	1.66	7	118	2.648	1.022	1.626	41.98	1.72	-0.02	5	2.35	47.48	3.00E-6	16.2	13.0	37	36	284	893			
14.150	46.424	67.394	1.279	-4.625		67.33	1.90	7	118	2.687	1.043	1.644	39.32	1.98	-0.02	5	2.41	44.26	3.00E-6	15.8	12.6	36	35	269	881			
14.350	47.080	69.995	1.352	-3.359		69.95	1.93	7	118	2.725	1.063	1.662	40.44	2.01	-0.02	5	2.41	45.69	3.00E-6	16.3	13.0	36	36	280	895			
14.550	47.736	91.585	0.995	-5.784		91.50	1.09	8	121	2.765	1.084	1.681	52.78	1.12	-0.02	5	2.16	61.89	3.00E-6	19.2	15.2	42	37	366	983			
14.750	48.392	76.824	1.057	-7.187		76.72	1.38	7	118	2.804	1.104	1.699	43.49	1.43	-0.02	5	2.29	50.25	3.00E-6	17.0	13.4	38	36	307	930			
14.950	49.049	47.436	1.251	-8.502		47.31	2.64	6	115	2.841	1.125	1.717	25.91	2.81	-0.04	4	2.65	28.50	3.00E-8	12.4	9.8				2366	2.96	1.73	7.8
15.150	49.705	29.945	0.603	-8.749		29.82	2.02	6	115	2.879	1.145	1.734	15.54	2.24	-0.07	4	2.77	16.83	3.00E-8	8.4	6.5				1491	1.80	1.04	4.7
15.350	50.361	19.161	0.380	-8.520		19.04	1.99	6	115	2.916	1.166	1.751	9.21	2.35	-0.11	3	2.97	9.69	1.00E-9	6.0	4.7				952	1.07	0.61	2.8
15.550	51.017	18.599	0.369	-6.242		18.51	1.99	6	115	2.954	1.186	1.768	8.80	2.37	-0.11	3	2.99	9.24	1.00E-9	5.9	4.6				925	1.04	0.59	2.6
15.750	51.673	18.231	0.447	1.311		18.25	2.45	5	115	2.992	1.207	1.785	8.55	2.93	-0.07	3	3.05	8.90	1.00E-9	6.0	4.6				913	1.02	0.57	2.6
15.950	52.329	18.432	0.449	36.623		18.96	2.37	5	115	3.029	1.227	1.802	8.84	2.82	0.09	3	3.03	9.24	1.00E-9	6.0	4.6				948	1.06	0.59	2.7
16.150	52.986	18.042	0.491	73.333		19.10	2.57	5	115	3.067	1.247	1.819	8.81	3.06	0.25	3	3.05	9.19	1.00E-9	5.9	4.5				955	1.07	0.59	2.6
16.350	53.642	18.231	0.572	80.280		19.39	2.95	5	115	3.104	1.268	1.836	8.87	3.51	0.28	3	3.08	9.21	1.00E-9	6.1	4.7				969	1.09	0.59	2.7

Col 1i	Col 2i	Col 3i	Col 4i	Col 5i	Col 6i	Col 7i	Col 8i	Col 9i	Col 10i	Col 11i	Col 12i	Col 13i	Col 14i	Col 15i	Col 16i	Col 17i	Col 18i	Col 19i	Col 20i	Col 21i	Col 22i	Col 23i	Col 24i	Col 25i	Col 26i	Col 27i	Col 28i	Col 29i
Depth	Depth	qc	fs	u	Other	qt	Rf	SBT	Unit Weight, γ	Total Overburden Stress, σv	Insitu pore pressure, uo	Effective overburden stress, σ'v	Normalized cone resistance, Qtl	Normalized Friction raio, Fr	Normalized pore pressure ratio, Bq	Soil Behavior Type (normalized) SBTn	SBTn Index, Ic	Normalized Cone resistance, Qtn	Estimated permeability, kSBT	SPT N60	SPT (N1)60	Relative Density, Dr	Friction Angle, φ'	Young's modulus, Es	Small strain shear modulus, Go	Undrained shear strength, su	Undrained strength ratio, su/σ'v	Over consolidation ratio, OCR
(m)	(ft)	(tsf)	(tsf)	(psi)		(tsf)	(%)		(pcf)	(tsf)	(tsf)	(tsf)							(ft/sec)	(blows/ft)	(blows/ft)	(%)	(degrees)	(tsf)	(tsf)	(tsf)		
16.550	54.298	18.081	0.567	83.558		19.28	2.94	5	115	3.142	1.288	1.854	8.71	3.51	0.29	3	3.09	9.04	1.00E-9	6.1	4.6				964	1.08	0.58	2.6
16.750	54.954	20.465	0.558	83.798		21.67	2.58	5	115	3.180	1.309	1.871	9.89	3.02	0.26	3	3.00	10.41	1.00E-9	6.6	4.9				1084	1.23	0.66	3.0
16.950	55.610	18.454	0.572	90.390		19.76	2.89	5	115	3.217	1.329	1.888	8.76	3.46	0.31	3	3.08	9.11	1.00E-9	6.2	4.6				988	1.10	0.58	2.6
17.150	56.266	19.072	0.770	73.816		20.14	3.83	4	115	3.255	1.350	1.905	8.86	4.56	0.23	3	3.15	9.12	1.00E-9	6.7	5.0				1007	1.13	0.59	2.7
17.350	56.923	18.560	0.657	73.604		19.62	3.35	5	115	3.292	1.370	1.922	8.49	4.03	0.24	3	3.13	8.77	1.00E-9	6.4	4.8				981	1.09	0.57	2.5
17.550	57.579	18.616	0.606	88.860		19.90	3.05	5	115	3.330	1.391	1.939	8.54	3.66	0.30	3	3.10	8.87	1.00E-9	6.4	4.7				995	1.10	0.57	2.6
17.750	58.235	19.796	0.824	66.763		20.76	3.97	4	115	3.368	1.411	1.956	8.89	4.74	0.20	3	3.15	9.14	1.00E-9	7.0	5.2				1038	1.16	0.59	2.7
17.950	58.891	20.437	0.834	62.984		21.34	3.91	4	115	3.405	1.432	1.973	9.09	4.65	0.17	3	3.14	9.38	1.00E-9	7.2	5.2				1067	1.20	0.61	2.7
18.150	59.547	19.485	0.630	90.706		20.79	3.03	5	115	3.443	1.452	1.991	8.72	3.63	0.29	3	3.09	9.07	1.00E-9	6.6	4.8				1040	1.16	0.58	2.6
18.350	60.203	20.276	0.691	95.694		21.65	3.19	5	115	3.480	1.473	2.008	9.05	3.80	0.30	3	3.09	9.43	1.00E-9	6.9	5.0				1083	1.21	0.60	2.7
18.550	60.860	20.331	0.684	80.171		21.49	3.18	5	115	3.518	1.493	2.025	8.87	3.80	0.24	3	3.10	9.24	1.00E-9	6.9	5.0				1074	1.20	0.59	2.7
18.750	61.516	20.526	0.417	100.485		21.97	1.90	6	115	3.555	1.514	2.042	9.02	2.26	0.31	3	2.97	9.64	1.00E-9	6.4	4.6				1099	1.23	0.60	2.7
18.950	62.172	19.952	0.408	106.861		21.49	1.90	6	115	3.593	1.534	2.059	8.69	2.28	0.34	3	2.98	9.27	1.00E-9	6.3	4.5				1075	1.19	0.58	2.6
19.150	62.828	19.824	0.420	107.812		21.38	1.96	6	115	3.631	1.555	2.076	8.55	2.37	0.35	3	3.00	9.10	1.00E-9	6.3	4.5				1069	1.18	0.57	2.6
19.350	63.484	19.724	0.392	124.707		21.52	1.82	6	115	3.668	1.575	2.093	8.53	2.20	0.41	3	2.98	9.12	1.00E-9	6.2	4.4				1076	1.19	0.57	2.6
19.550	64.140	23.294	0.687	93.407		24.64	2.79	5	115	3.706	1.595	2.110	9.92	3.28	0.25	3	3.02	10.52	1.00E-9	7.6	5.3				1232	1.40	0.66	3.0
19.750	64.797	30.675	1.135	73.354		31.73	3.58	5	115	3.743	1.616	2.128	13.16	4.05	0.13	3	2.98	14.09	1.00E-9	9.7	6.8				1587	1.87	0.88	3.9
19.950	65.453	39.337	1.333	74.820		40.41	3.30	5	115	3.781	1.636	2.145	17.08	3.64	0.10	3	2.86	18.78	1.00E-9	11.6	8.1				2021	2.44	1.14	5.1
20.150	66.109	31.165	0.822	34.747		31.67	2.60	6	115	3.819	1.657	2.162	12.88	2.95	0.03	3	2.90	14.05	1.00E-9	9.4	6.6				1583	1.86	0.86	3.9
20.350	66.765	22.904	0.624	24.663		23.26	2.68	5	115	3.856	1.677	2.179	8.91	3.22	0.01	3	3.06	9.40	1.00E-9	7.6	5.3				1163	1.29	0.59	2.7
20.550	67.421	23.412	0.530	44.796		24.06	2.20	6	115	3.894	1.698	2.196	9.18	2.63	0.08	3	3.00	9.83	1.00E-9	7.5	5.2				1203	1.34	0.61	2.8
20.750	68.077	26.932	0.620	76.861		28.04	2.21	6	115	3.931	1.718	2.213	10.89	2.57	0.16	3	2.93	11.84	1.00E-9	8.2	5.7				1402	1.61	0.73	3.3
20.950	68.734	46.461	0.961	79.840		47.61	2.02	6	115	3.969	1.739	2.230	19.57	2.20	0.09	4	2.68	22.51	3.00E-8	12.4	8.5				2381	2.91	1.30	5.9
21.150	69.390	113.437	1.422	0.356		113.44	1.25	8	121	4.009	1.759	2.249	48.65	1.30	-0.02	5	2.23	62.12	3.00E-6	24.4	16.8	42	37	454	1163			
21.350	70.046	63.751	1.852	12.625		63.93	2.90	6	115	4.046	1.780	2.267	26.42	3.09	-0.01	4	2.67	30.57	3.00E-8	16.9	11.5				3197	3.99	1.76	7.9
21.550	70.702	187.197	1.993	7.768		187.31	1.06	9	124	4.087	1.800	2.287	80.12	1.09	-0.01	6	2.01	108.18	3.00E-4	36.9	25.1	56	39	749	1383			
21.750	71.358	513.404	2.438	10.744		513.56	0.47	10	127	4.129	1.821	2.308	220.71	0.48	0.00	6	1.44	325.98	3.00E-4	83.1	56.3	97	45	2054	1941			
21.950	72.014	568.070	2.989	10.557		568.22	0.53	10	127	4.171	1.841	2.329	242.14	0.53	0.00	6	1.44	359.28	3.00E-4	91.9	61.9	101	45	2273	2014			
22.150	72.671	482.991	1.658	8.262		483.11	0.34	10	127	4.212	1.862	2.351	203.72	0.35	0.00	6	1.39	303.65	3.00E-4	76.9	51.6	93	44	1932	1914			
22.350	73.327	503.740	2.967	0.539		503.75	0.59	10	127	4.254	1.882	2.372	210.58	0.59	0.00	6	1.52	315.29	3.00E-4	83.6	55.8	95	44	2015	1946			
22.550	73.983	421.435	2.918	9.016		421.56	0.69	10	127	4.296	1.903	2.393	174.35	0.70	0.00	6	1.63	262.21	3.00E-4	72.5	48.2	87	43	1686	1840			
22.750	74.639	643.479	2.450	-3.454		643.43	0.38	10	127	4.338	1.923	2.415	264.68	0.38	0.00	7	1.32	399.83	3.00E-2	100.3	66.4	107	45	2574	2124			
22.950	75.295	572.588	2.100	-7.300		572.48	0.37	10	127	4.379	1.944	2.436	233.22	0.37	0.00	6	1.35	353.86	3.00E-4	90.2	59.5	101	45	2290	2049			
23.150	75.951	394.976	1.479	-8.206		394.86	0.37	10	127	4.421	1.964	2.457	158.89	0.38	-0.01	6	1.50	242.14	3.00E-4	65.1	42.8	83	43	1579	1816			
23.350	76.608	405.911	2.541	-8.470		405.79	0.63	10	127	4.463	1.984	2.479	161.92	0.63	-0.01	6	1.62	247.82	3.00E-4	69.7	45.6	84	43	1623	1838			
23.550	77.264	354.804	3.261	0.546		354.81	0.92	9	124	4.504	2.005	2.499	140.19	0.93	-0.01	6	1.78	207.86	3.00E-4	64.3	41.9	77	42	1419	1762			
23.750	77.920	298.740	2.293	10.828		298.90	0.77	9	124	4.544	2.025	2.519	116.85	0.78	0.00	6	1.79	173.42	3.00E-4	54.4	35.2	70	41	1196	1669			
23.950	78.576	522.300	2.297	11.061		522.46	0.44	10	127	4.586	2.046	2.540	203.86	0.44	0.00	6	1.45	315.88	3.00E-4	84.8	54.7	95	44	2090	2016			
24.150	79.232	505.238	2.617	12.361		505.42	0.52	10	127	4.628	2.066	2.562	195.50	0.52	0.00	6	1.51	304.18	3.00E-4	83.5	53.7	93	44	2022	1999			
24.350	79.888	287.216	2.128	12.055		287.39	0.74	9	124	4.669	2.087	2.582	109.50	0.75	0.00	6	1.80	163.77	3.00E-4	52.5	33.6	68	41	1150	1661			
24.550	80.545	158.678	1.813	15.347		158.90	1.14	9	124	4.709	2.107	2.602	59.26	1.18	-0.01	5	2.13	81.36	3.00E-6	32.9	21.0	48	38	636	1366			
24.750	81.201	389.473	1.523	5.382		389.55	0.39	10	127	4.751	2.128	2.623	146.68	0.40	0.00	6	1.54	230.96	3.00E-4	65.1	41.3	81	43	1558	1848			
24.950	81.857	177.516	2.126	-3.736		177.46	1.20	9	124	4.792	2.148	2.644	65.31	1.23	-0.01	5	2.11	90.71	3.00E-6	36.5	23.1	51	38	710	1425			
25.150	82.513	117.520	2.850	-4.974		117.45	2.43	7	118	4.831	2.169	2.662	42.31	2.53	-0.02	5	2.46	53.53	3.00E-6	28.0	17.7	39	36	470	1245			
25.350	83.169	38.423	1.501	-5.171		38.35	3.91	5	115	4.868	2.189	2.679	12.50	4.48	-0.08	3	3.02	13.53	1.00E-9	12.5	7.8				1917	2.23	0.83	3.7
25.550	83.825	34.942	1.352	-3.941		34.89	3.87	5	115	4.906	2.210	2.696	11.12	4.51	-0.08	3	3.06	11.90	1.00E-9	11.6	7.3				1744	2.00	0.74	3.3
25.750	84.482	33.237	0.986	-2.083		33.21	2.97	5	115	4.943	2.230	2.713	10.42	3.49	-0.08	3	3.02	11.30	1.00E-9	10.8	6.7				1660	1.88	0.69	3.1
25.950	85.138	37.983	0.948	-0.472		37.98	2.50	6	115	4.981	2.251	2.730	12.08	2.87	-0.07	3	2.92	13.49	1.00E-9	11.6	7.2				1899	2.20	0.81	3.6
26.150	85.794	39.754	0.877	0.698		39.76	2.20	6	115	5.019	2.271	2.747	12.65	2.52	-0.06	4	2.87	14.33	3.00E-8	11.8	7.3				1988	2.32	0.84	3.8
26.350	86.450	39.014	1.001	1.590		39.04	2.56	6	115	5.056	2.292	2.765	12.29	2.95	-0.06	3	2.92	13.74	1.00E-9	11.9	7.3				1952	2.27	0.82	3.7
26.550	87.106	45.447	1.645	2.897		45.49	3.62	5	115	5.094	2.312	2.782	14.52	4.07	-0.05	3	2.95	16.13	1.00E-9	14.0	8.7				2274	2.69	0.97	4.4
26.750	87.762	45.881	1.780	4.533		45.95	3.87	5	115	5.131	2.332	2.799	14.58	4.36	-0.05	3	2.96	16.12	1.00E-9	14.3	8.8				2297	2.72	0.97	4.4
26.950	88.419	55.629	2.000	7.733		55.74	3.59	5	115	5.169	2.353	2.816	17.96	3.95	-0.04	3	2.87	20.44	1.00E-9	16.4	10.1				2787	3.37	1.20	5.4
27.150	89.075	71.638	2.854	12.280		71.82	3.97	5	115	5.206	2.373	2.833	23.51	4.28	-0.02	3	2.80	27.32	1.00E-9	20.3	12.4				3591	4.44	1.57	7.1
27.350	89.731	67.009	2.726	15.541		67.23	4.05	5	115	5.244	2.394	2.850	21.75	4.40	-0.02	3	2.83	25.05	1.00E-9	19.4	11.8				3362	4.13	1.45	6.5
27.550	90.387	49.954	1.588	19.450		50.23	3.16	6	115	5.282	2.414	2.867	15.68	3.53	-0.02	3	2.88	17.81	1.00E-9	14.9	9.0				2512	3.00	1.05	4.7
27.750	91.043	39.203	1.201	21.304		39.51	3.04	6	115	5.319	2.435	2.884	11.85	3.51	-0.03	3	2.98	13.09	1.00E-9	12.4	7.5				1975	2.28	0.79	3.6
27.950	91.699	33.822	0.954	26.482		34.20	2.79	6	115	5.357	2.455	2.902	9.94	3.31	-0.02	3	3.02	10.83	1.00E-9	11.0	6.6				1710	1.92	0.66	3.0
28.150	92.356	31.298	0.856	32.153		31.76	2.70	6	115	5.394	2.476	2.919	9.03	3.25	-0.01	3	3.05	9.76	1.00E-9	10.3	6.2				1588	1.76	0.60	2.7
28.350	93.012	32.891	0.869	41.413		33.49	2.60	6	115	5.432	2.496	2.936	9.56	3.10	0.02	3	3.02	10.43	1.00E-9	10.7	6.4				1674	1.87	0.64	2.9
28.550	93.668	41.431	1.085	52.956		42.19	2.57	6	115	5.470	2.517	2.953	12.44	2.95	0.04	3	2.92	14.03	1.00E-9	12.6	7.5				2110	2.45	0.83	3.7
28.750	94.324	38.925	1.232	40.024		39.50	3.12	6	115	5.507	2.537	2.970	11.45	3.62	0.01	3	3.00	12.60	1.00E-9	12.4	7.4				1975	2.27	0.76	3.4
28.950	94.980	34.869	1.089	81.289		36.04	3.02	6	115	5.545	2.558	2.987	10.21	3.57	0.11	3	3.03	11.12	1.00E-9	11.4	6.8				1802	2.03	0.68	3.1
29.150	95.636	37.281	1.197	119.102		39.00	3.07	6	115	5.582	2.578	3.004	11.12	3.58	0.18	3	3.00	12.23	1.00E-9	11.9	7.1				1950	2.23	0.74	3.3
29.350	96.293	45.391	1.480	107.844		46.94	3.15	6	115	5.620	2.599	3.021	13.68	3.58	0.13	3	2.93	15.39	1.00E-9	13.9	8.2				2347	2.75	0.91	4.1
29.550	96.949	45.442	1.383	147.871		47.57	2.91	6	115	5.658	2.619	3.039	13.79	3.30	0.19	3	2.91	15.65	1.00E-9	13.7	8.1				2379	2.79	0.92	4.1
29.750	97.605	86.149	2.771	109.346		87.72	3.16	6	115	5.695	2.640	3.056	26.84	3.38	0.06	4	2.69	32.69	3.00E-8	23.0	13.6				4386	5.47	1.79	8.1
29.950	98.261	117.024	3.986	12.658		117.21	3.40	6	115	5.733	2.660	3.073	36.28	3.58	-0.02	4	2.61	45.38	3.00E-8	30.0	17.6				5860	7.43	2.42	10.9
30.150	98.917	172.414	2.685	7.624		172.52	1.56	8	121	5.772	2.681	3.092	53.93	1.61	-0.01	5	2.25	75.79	3.00E-6	37.5	21.9	47	37	690	1488			
30.350	99.573	244.275	1.782	10.740		244.43	0.73	9	124	5.813	2.701	3.112	76.67	0.75	-0.01	6	1.93	119.87	3.00E-4	46.7	27.2	59	39	978	1674			

Pore Pressure Dissipation Tests (PPDT)

Pore Pressure Dissipation Tests (PPDT's) conducted at various intervals measured hydrostatic water pressures and determined the approximate depth of the ground water table. A PPDT is conducted when the cone is halted at specific intervals determined by the field representative. The variation of the penetration pore pressure (u) with time is measured behind the tip of the cone and recorded by a computer system.

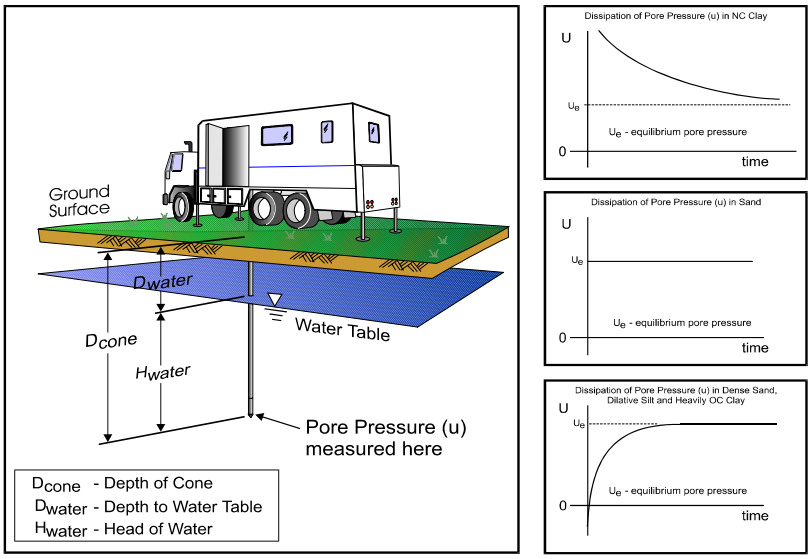
Pore pressure dissipation data can be interpreted to provide estimates of:

- Equilibrium piezometric pressure
- Phreatic Surface
- In situ horizontal coefficient of consolidation (c_h)
- In situ horizontal coefficient of permeability (k_h)

In order to correctly interpret the equilibrium piezometric pressure and/or the phreatic surface, the pore pressure must be monitored until such time as there is no variation in pore pressure with time, *Figure PPDT*. This time is commonly referred to as t_{100}, the point at which 100% of the excess pore pressure has dissipated.

A complete reference on pore pressure dissipation tests is presented by Robertson et al. 1992.

A summary of the pore pressure dissipation tests is summarized in Table 1. Pore pressure dissipation data is presented in graphical form in Appendix PPDT.



Water Table Calculation

$$D_{water} = D_{cone} - H_{water}$$

where $H_{water} = U_e$ (depth units)

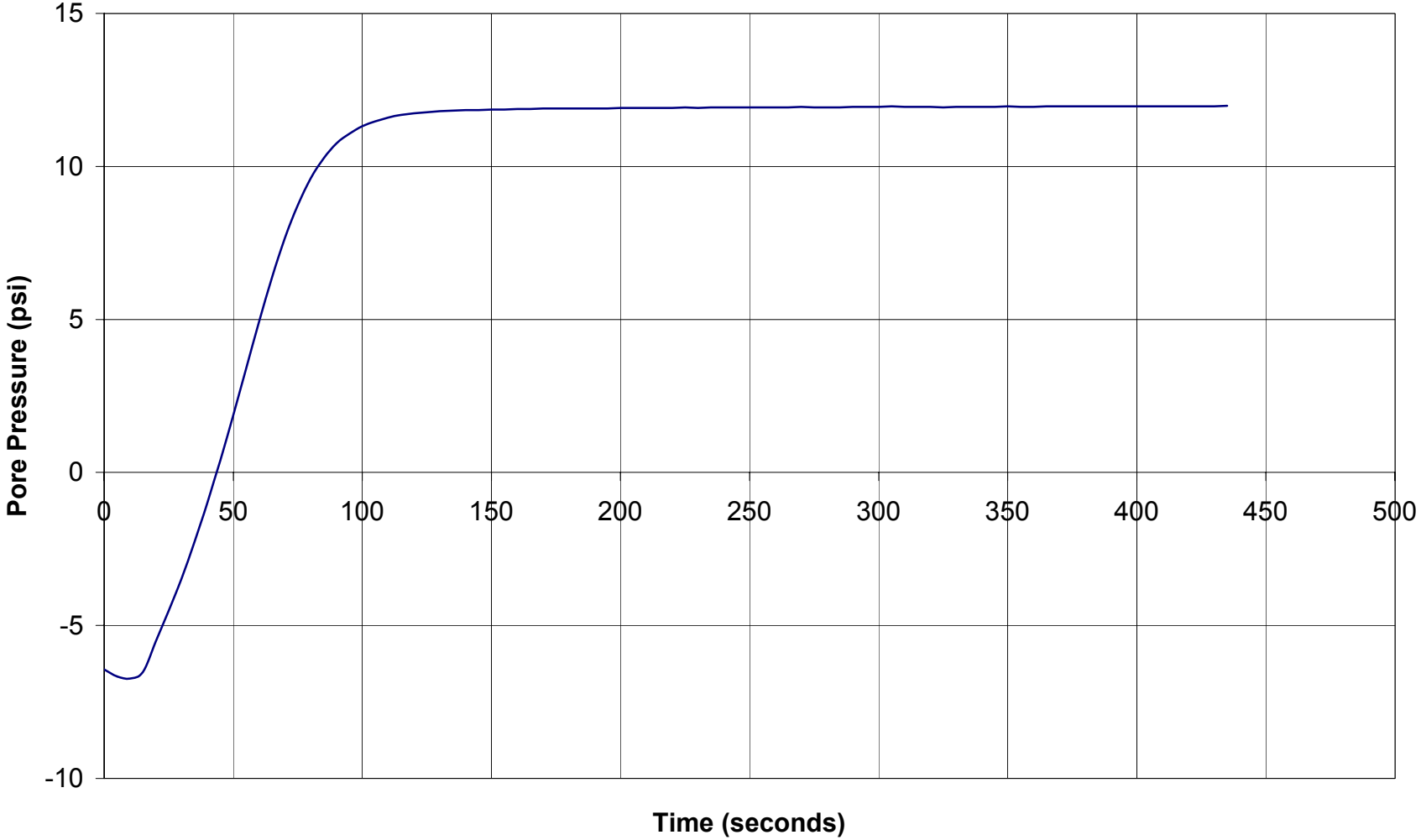
Useful Conversion Factors: 1psi = 0.704m = 2.31 feet (water)
1tsf = 0.958 bar = 13.9 psi
1m = 3.28 feet

Figure PPDT

GREGG DRILLING & TESTING

Pore Pressure Dissipation Test

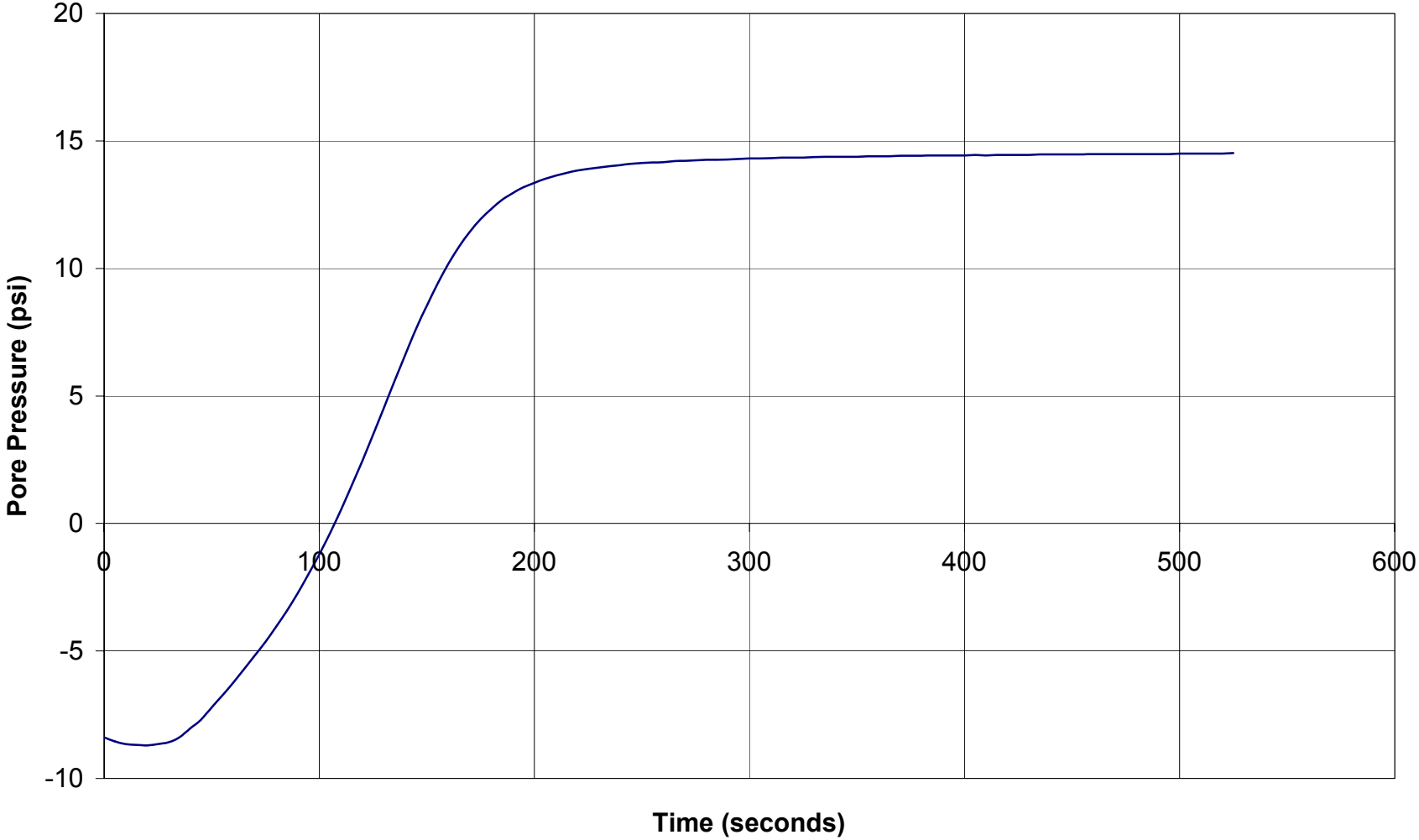
Sounding: BR-1
Depth: 42.815
Site: HWY 101
Engineer: D.WANG



GREGG DRILLING & TESTING

Pore Pressure Dissipation Test

Sounding: BR-2
Depth: 46.424
Site: HWY 101
Engineer: D.WANG



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Copies of ASTM Standards are available through www.astm.org

GREGG IN SITU
Digital File Formats

CPT Data Files

Unless otherwise requested by the client, Gregg CPT data files are named such that the first 3 characters contain Gregg In-Situ, Inc. job number, the next character is typically C for CPT (S if shear waves were collected, R if Resistivity was used, U for UVIF or M for 'Mini-Cone') followed by two or three characters indicating the sounding number. The last character position is reserved for the letters a, b, c, d etc to uniquely identify multiple soundings at the same location. The CPT sounding file has the extension COR and pore pressure dissipation files have the extension PPD. As an example, for job number 05-127 (Job Number 127 in the year 2005) the first sounding will have file names 127C01.COR and 127C01.PPC.

The CPT (COR) file consists of the following components:
1. Two lines of header information
2. Data records
3. End of data marker
4. Units information

Header Lines
Line 1: Columns 1-6 are blank (future use)
Columns 7-21 contain the sounding Date and Time
Columns 22-36 contain the sounding Operator
Line 2: Columns 1-16 contain the sounding ID
Columns 17-31 Field representative
Columns 32-47 contain the project name

Data Records
The data records contain 4 or more columns of data in floating point format. A comma (and spaces) separates each data item:
Column 1: Sounding Depth (m)
Column 2: Tip (q_c) data uncorrected for pore pressure effects. Recorded in units selected by the CPT operator.
Column 3: Sleeve (f_s) data. Recorded in units selected by the operator
Column 4: Dynamic pore pressure readings (u_2). Recorded in units selected by the operator
Column 5: Exists only if specialty modules (Resistivity and/or UVIF) have been used
End of Data Marker
After the last line of data a line containing ASCII 26 (CTL-Z) and a new line (carriage return/ line feed) character. This is used to mark the end of data.
Units Information
The last section of the file contains information about the units that were selected for the sounding. A separator bar makes up the first line. The second line contains the type of units used for depth, q_c, f_s and u_2. The third line contains the conversion values required for Gregg's software to convert the recorded data to an internal set of base units (bar for q_c, bar for f_s and meters for u_2).

CPT Dissipation Files

CPT Dissipation files have the same naming convention as the CPT sounding files and have the extension PPC. PPC files consist of the following components:

1. Two lines of header information
2. Data records

Header Lines (same as COR file):
Line 1: Columns 1-6 are blank (future use)
Columns 7-21 contain the sounding Date and Time
Columns 22-36 contain the sounding Operator
Line 2: Columns 1-16 Sounding or Location ID
Columns 17-31 Field Representative
Columns 32-47 Project Name

Data Records
The data records immediately follow the header lines. Each data record can occupy several lines in the file and is a complete record of a dissipation test at a particular depth. Each data record starts with a line containing two values separated by spaces; the first value being an index number and the second being the dissipation test depth in meters. Following this line are the dissipation pore pressure values stored at 5 second intervals with a maximum of 12 entries per line. The last line of the dissipation record may not contain a full 12 entries. The data record is terminated with an ASCII 30 character (appears as a triangle in some editors). This sequence is repeated for every dissipation test in the sounding. No marker is used to indicate end of file. Unit information is not stored in this file. Users would have to check the CPT file for the units that were used.

APPENDIX B

APPENDIX B

LABORATORY TESTS

Classification Tests

The field classification of the samples was visually verified in the laboratory according to the Unified Soil Classification System. The results are presented in "Log of Test Borings", Appendix A.

Moisture-Density

The natural moisture contents and dry unit weights were determined for selected undisturbed samples of the soils in general accordance with ASTM Test Method D 2216-92. This information was used to classify and correlate the soils. The results are presented at the appropriate depths on the "Log of Test Borings", Appendix A.

Atterberg Limits

The Atterberg Limits were determined for selected samples of the fine-grained materials. These results were used to classify the soils, as well as to obtain an indication of the effective strength characteristics and expansion potential with variations in moisture content. The Atterberg Limits were determined in general accordance with ASTM Test Method D 4318-93. The results of these tests are presented on Plates B-2a to B-2c, "Plasticity Chart".

Grain Size Classification

Grain size classification tests (ASTM Test Method D422-63) were performed on selected samples of granular soil to aid in the classification. The results are presented on Plate B-3, "Grain Size Distribution Curves".

Unconfined Compression Tests

Strength tests were performed on selected undisturbed samples using unconfined compression machine. Unconfined compression tests were performed in general accordance with ASTM Test Method D 2166-91. The results are presented on "Log of Test Borings", Appendix A.

Consolidation Tests

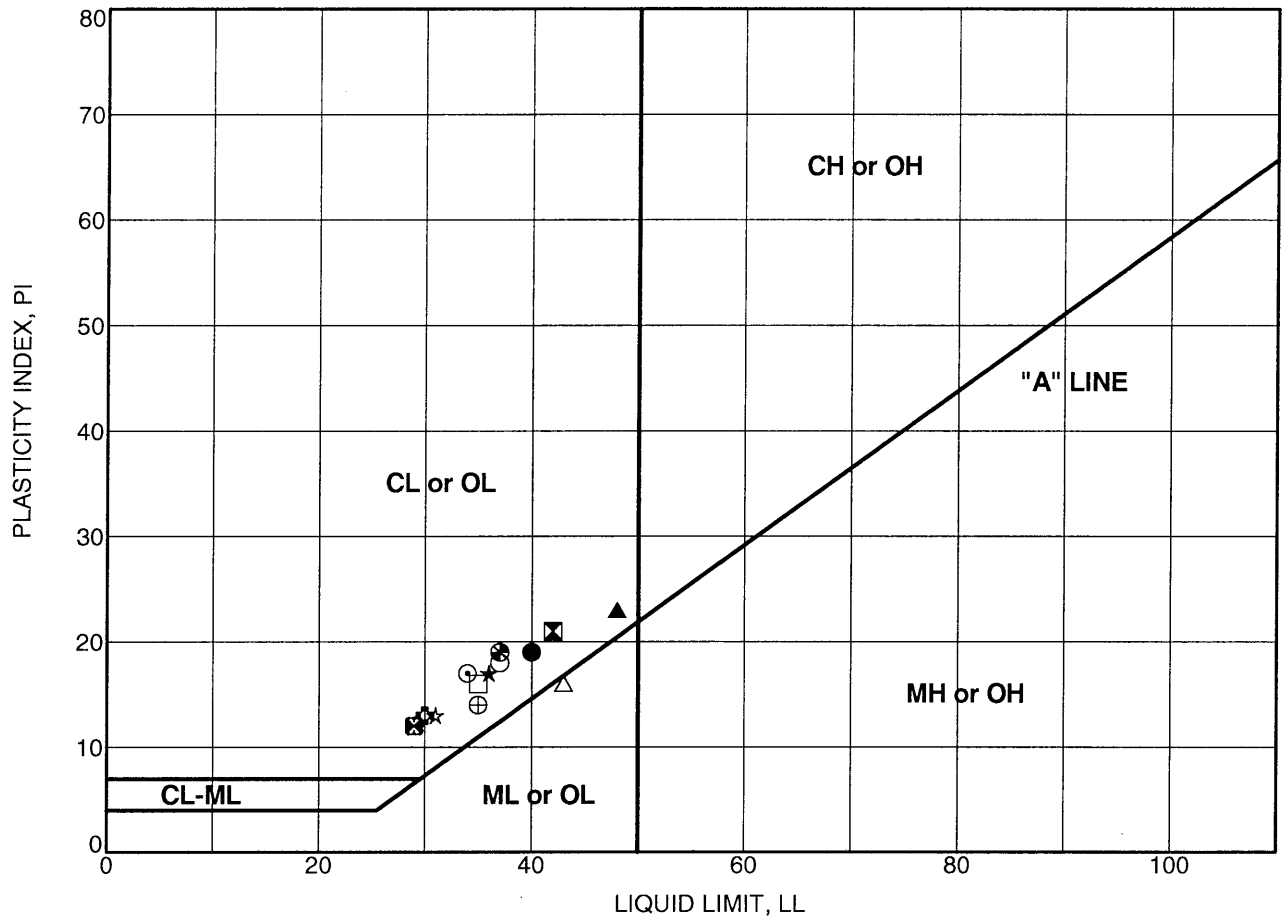
Consolidation tests (California Test Method T219) were performed on two selected undisturbed samples. The test results are presented on Plates B-4A to B-4D.

R-value Tests

R-value tests were performed on representative bulk samples for pavement design. The tests were performed according to California Test Method 301. The test results are presented on Plates B-5A and B-5V.

Corrosion Tests

Corrosion tests were performed on a selected sample to determine the corrosion potential of the soils. The pH and minimum resistively tests were performed according to California Test Method 643. The tests were performed by Sunland Analytical. The test results are presented on Plate B-6A to B-6B.



PLASTICITY CHART

Boring Number	Sample Number	Depth (feet)	Test Symbol	Moisture Content (%)	LL	PL	PI	Description
R01	BULK	5.0	●		40	21	19	LEAN CLAY (CL)
R04	BULK	5.0	⊠		42	21	21	LEAN CLAY (CL)
R06	BULK	5.0	▲		48	25	23	LEAN CLAY (CL)
R07	BULK	5.0	★		36	19	17	LEAN CLAY (CL)
R08	BULK	5.0	⊙		34	17	17	LEAN CLAY (CL)
R10	BULK	5.0	✿		30	17	13	LEAN CLAY (CL)
R11	BULK	5.0	○		37	19	18	LEAN CLAY (CL)
R12	BULK	5.0	△		43	27	16	SILT (ML)
R13	BULK	5.0	⊗		37	18	19	LEAN CLAY (CL)
R15	BULK	5.0	⊕		35	21	14	LEAN CLAY (CL)
R18	BULK	5.0	□		35	19	16	LEAN CLAY (CL)
R20	BULK	5.0	⊗		29	17	12	LEAN CLAY (CL)
R22	BULK	5.0	◕		37	18	19	LEAN CLAY (CL)
R24	BULK	5.0	☆		31	18	13	LEAN CLAY (CL)
R24A	BULK	5.0	✿		29	17	12	LEAN CLAY (CL)

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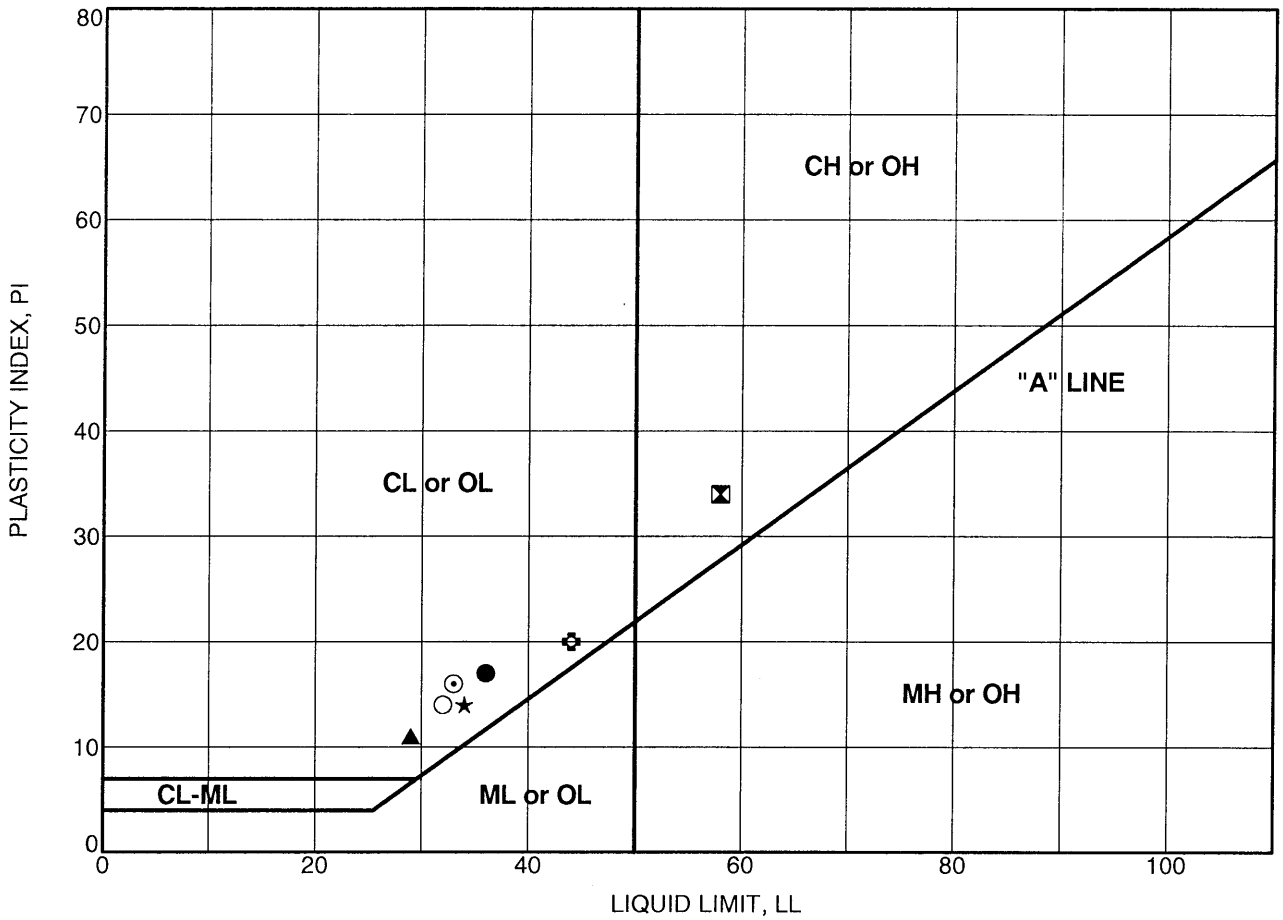
JOB NO: 207150.GDR | PLATE NO: B-2a



PLASTICITY CHART

Boring Number	Sample Number	Depth (feet)	Test Symbol	Moisture Content (%)	LL	PL	PI	Description
R26	BULK	5.0	●		36	19	17	LEAN CLAY (CL)
R27	BULK	5.0	⧗		58	24	34	FAT CLAY (CH)
R31	BULK	5.0	▲		29	18	11	LEAN CLAY (CL)
R34	BULK	5.0	★		34	20	14	LEAN CLAY (CL)
R36	BULK	5.0	⊙		33	17	16	LEAN CLAY (CL)
R40	BULK	5.0	✿		44	24	20	LEAN CLAY (CL)
R42	BULK	5.0	○		32	18	14	LEAN CLAY (CL)

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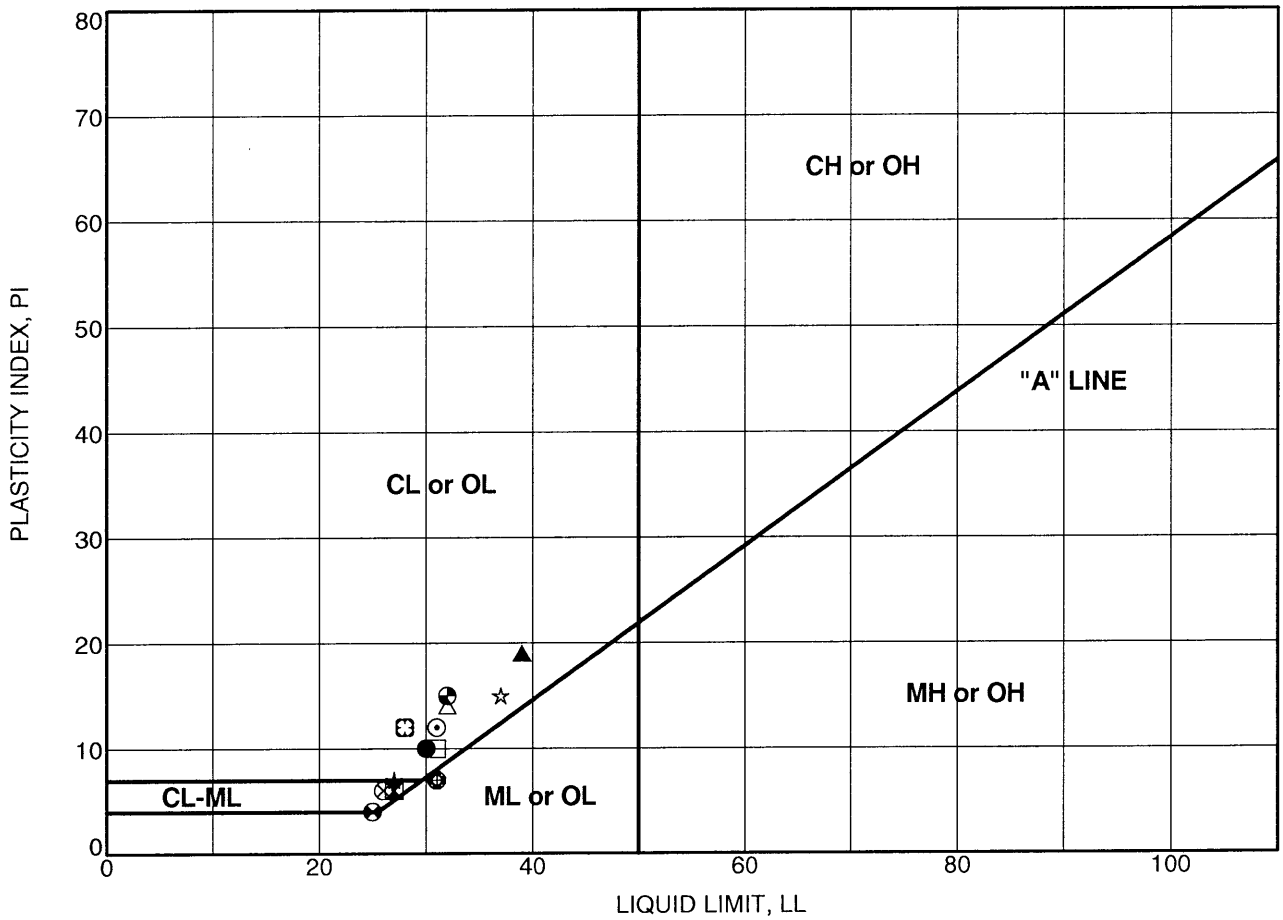
JOB NO: 207150.GDR | PLATE NO: B-2b



PLASTICITY CHART

Boring Number	Sample Number	Depth (feet)	Test Symbol	Moisture Content (%)	LL	PL	PI	Description
BR-1	1	15.0	●	28	30	20	10	LEAN CLAY (CL)
BR-1	2	20.0	⊠	24	27	21	6	SILT (ML)
BR-1	5	35.0	▲	25	39	20	19	LEAN CLAY (CL)
BR-2	2	20.0	★	19	27	20	7	SILTY CLAY (CL-ML)
BR-2	5	35.0	⊙	27	31	19	12	LEAN CLAY (CL)
BR-2	8	50.0	✪	33	31	24	7	SILT (ML)
E-11	MC-4	13.5	○	21	28	16	12	LEAN CLAY (CL)
E-21	MC-2	4.5	△	8	32	18	14	LEAN CLAY WITH SAND (CL)
E-23	MC-3	8.5	⊗		26	20	6	SILTY CLAY (CL-ML)
E-23	MC-6	23.5	⊕	26	31	24	7	SILT (ML)
E-29	MC-2	4.5	□	22	31	21	10	LEAN CLAY (CL)
E-29	MC-7	28.5	⊗	22	25	21	4	SILTY CLAY(CL-ML)
E-32	MC-3	8.5	◕	18	32	17	15	LEAN CLAY (CL)
E-32	MC-6	23.5	☆	24	37	22	15	LEAN CLAY (CL)
R-31	BULK	18.5	⊠	18	28	16	12	LEAN CLAY (CL)

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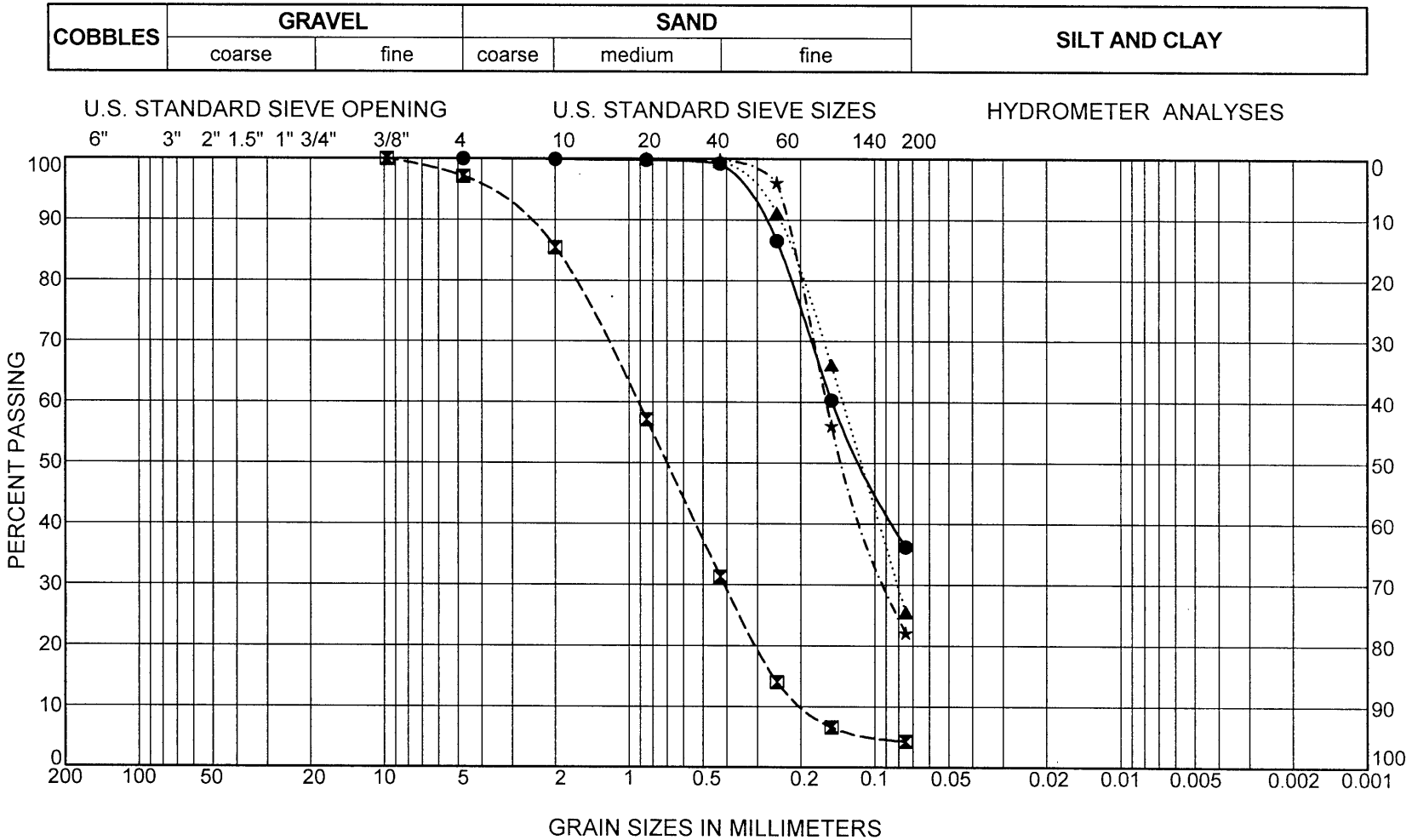
JOB NO: 207150.GDR | PLATE NO: B-2c

GRAIN SIZE DISTRIBUTION CURVES



Boring Number	Sample Number	Depth (feet)	Symbol	LL	PI	Description
E-11	MC-5	18.5	●			SILTY SAND (SM)
E-21	MC-4	13.5	⊠			POORLY-GRADED SAND (SP)
E-39	MC-5	18.5	▲			SILTY SAND (SM)
R-08	MC-6	23.5	★			SILTY SAND (SM)

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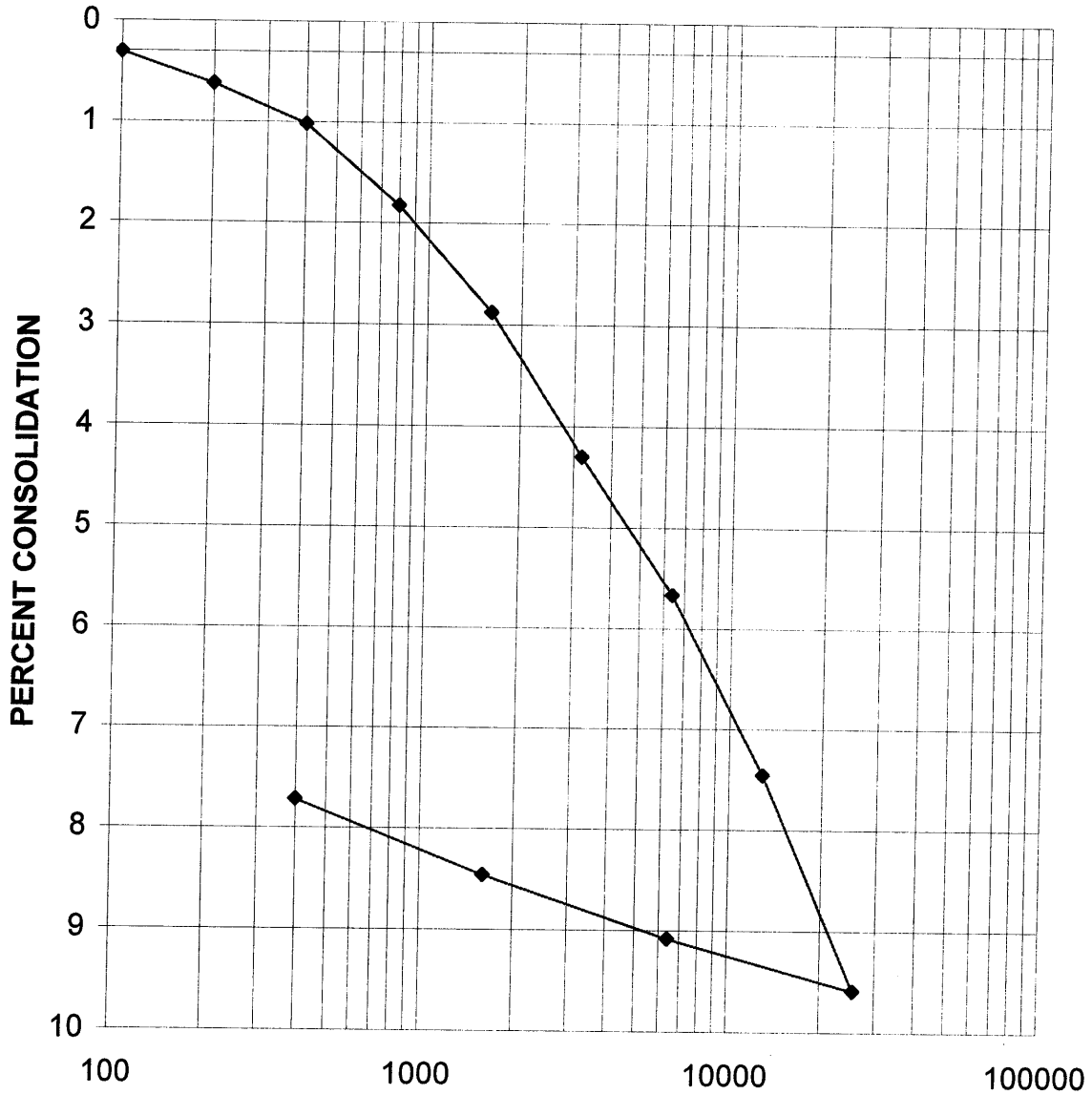
JOB NO: 207150.GDR

PLATE NO: B-3

CONSOLIDATION TEST RESULTS



	MOISTURE CONTENT %	DRY DENSITY PCF	HEIGHT (INCHES)	DIAMETER (INCHES)
INITIAL	21.0	105.6	1.0000	2.416
FINAL	18.4	114.5	0.9228	2.416

BORING NO.	R-8	SAMPLE NO.	3	ELEV. OR DEPTH	8.5'
DESCRIPTION	Silt, yellowish brown				

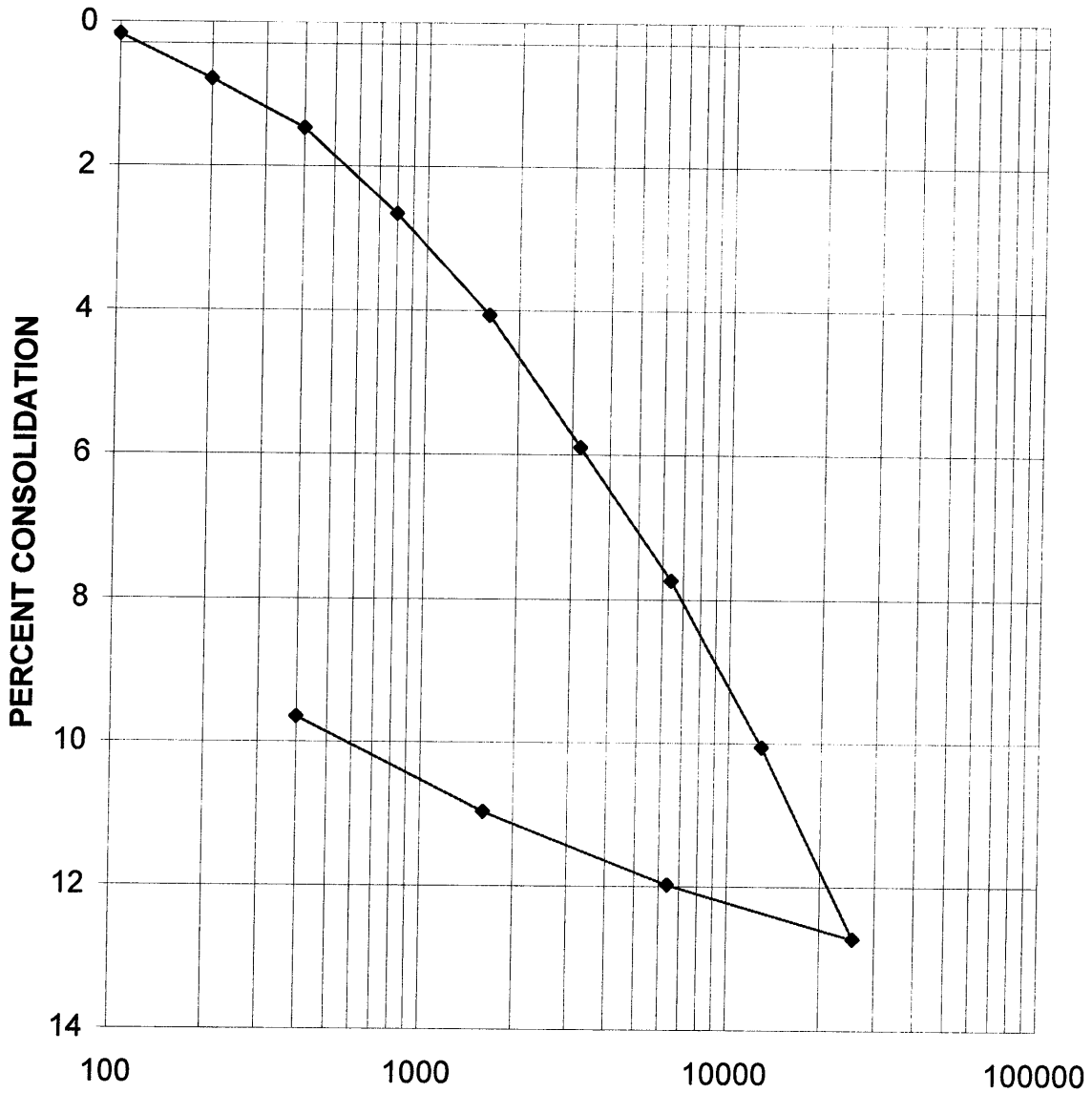
PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS ENGINEERING

US 101 Improvement I-280/680 to Yerba Buena RD
SANTA CLARA COUNTY

DATE	JOB NO:
1/28/2008	207150.GDR

Reported by: Prav Dayah **PLATE NO: B-4A**

CONSOLIDATION TEST RESULTS



	MOISTURE CONTENT %	DRY DENSITY PCF	HEIGHT (INCHES)	DIAMETER (INCHES)
INITIAL	20.8	105.4	1.0000	2.416
FINAL	17.5	116.6	0.9035	2.416

BORING NO.	E-23	SAMPLE NO.	3	ELEV. OR DEPTH	8.5'
DESCRIPTION	Silty clay, brown				

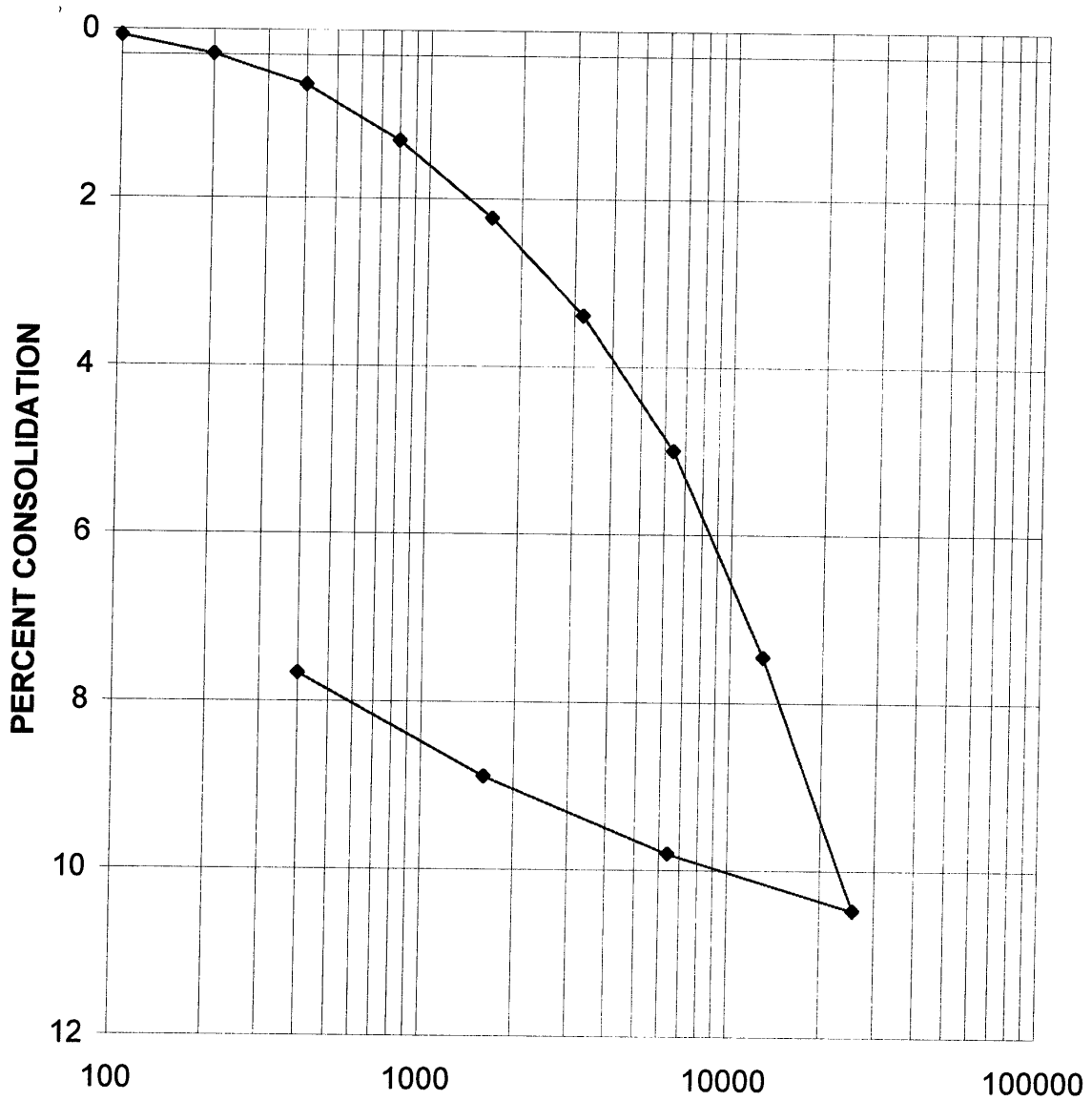
PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS ENGINEERING

US 101 Improvement I-280/680 to Yerba Buena RD
SANTA CLARA COUNTY, CA

DATE	JOB NO:
2/28/2008	207150.GDR

Reported by: Prav Dayah **PLATE NO: B-4B**

CONSOLIDATION TEST RESULTS



	MOISTURE CONTENT %	DRY DENSITY PCF	HEIGHT (INCHES)	DIAMETER (INCHES)
INITIAL	20.1	105.4	1.0000	2.416
FINAL	17.7	114.2	0.9233	2.416

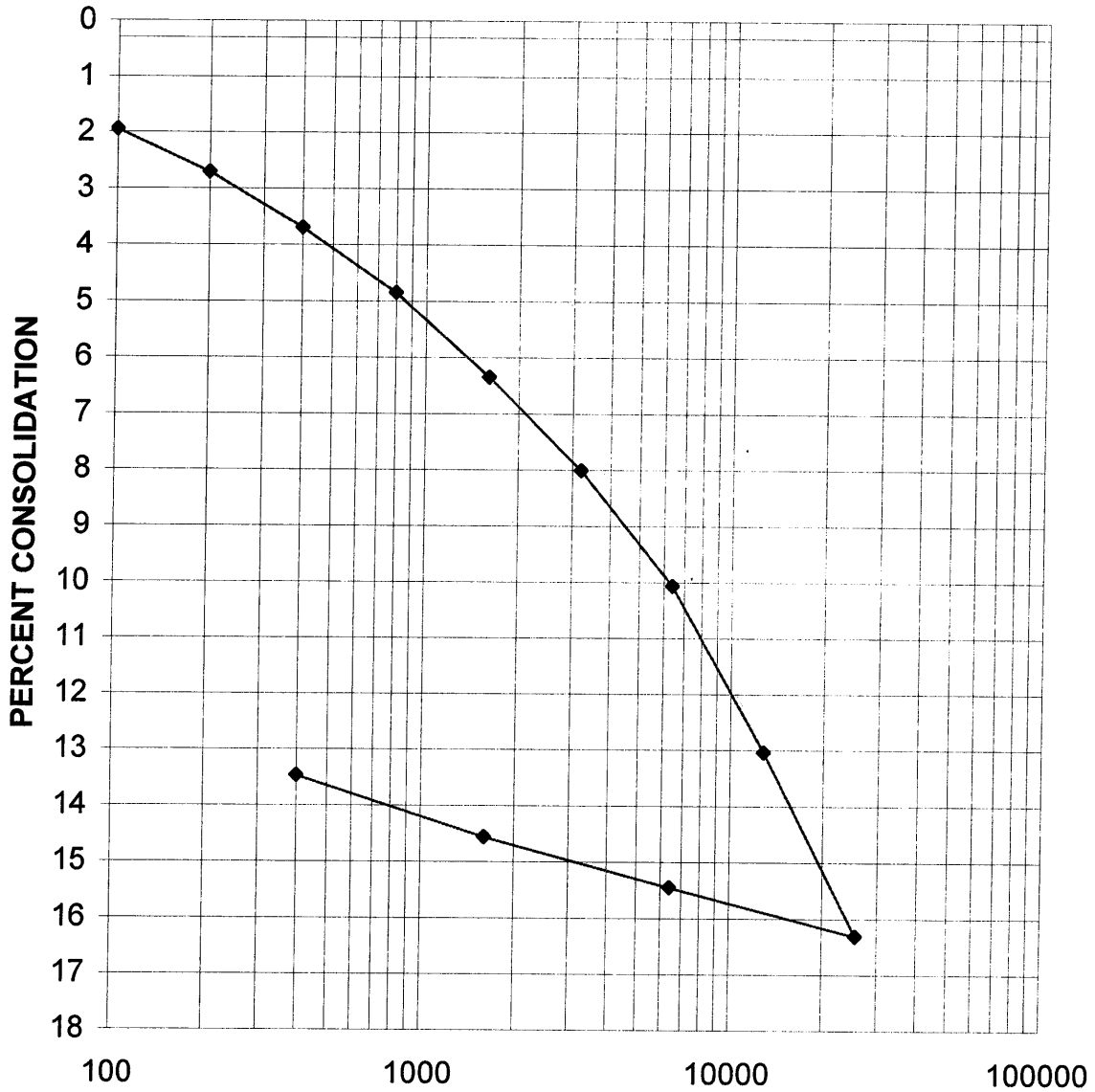
BORING NO.	E-32	SAMPLE NO.	2	ELEV. OR DEPTH	4.5'
DESCRIPTION	Lean Clay, yellowish brown				

PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS ENGINEERING

US 101 Improvement I-280/680 to Yerba Buena RD
SANTA CLARA COUNTY, CA

DATE 1/28/2008	JOB NO: 207150.GDR
Reported by: Prav Dayah	**PLATE NO: B-4C**

CONSOLIDATION TEST RESULTS



LOAD - POUNDS PER SQUARE FOOT

	MOISTURE CONTENT %	DRY DENSITY PCF	HEIGHT (INCHES)	DIAMETER (INCHES)
INITIAL	31.2	93.5	1.0000	2.416
FINAL	23.0	108.1	0.8653	2.416

BORING NO.	E-39	SAMPLE NO.	3	ELEV. OR DEPTH	8.5'
DESCRIPTION	Silty clay, brown				

PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS ENGINEERING

US 101 Improvement I-280/680 to Yerba Buena RD
SANTA CLARA COUNTY, CA

DATE	JOB NO:
1/28/2008	207150.GDR

Reported by: Prav Dayah **PLATE NO: B-4D**

COOPER TESTING LABORATORY

R-value Test Report (Caltrans 301)

Job No.:	157-251	Date:	12/05/07	Initial Moisture,	14.8%
Client:	Parikh Consultants, Inc.	Tested	MD	R-value by Stabilometer	8
Project:	Hwy 101-Tully Rd - 207150.GDR	Reduced	RU		
Sample	R-1 @ 0-5'	Checked	DC	Expansion Pressure	0 psf
Soil Type:	Grayish Brown Sandy CLAY				

Specimen Number	A	B	C	D	Remarks:
Exudation Pressure, psi	350	535	252		
Prepared Weight, grams	1200	1200	1200		
Final Water Added, grams/cc	40	20	65		
Weight of Soil & Mold, grams	3168	3206	3130		
Weight of Mold, grams	2080	2108	2089		
Height After Compaction, in.	2.59	2.52	2.5		
Moisture Content, %	18.6	16.7	21.0		
Dry Density, pcf	107.2	113.0	104.2		
Expansion Pressure, psf	0.0	0.0	0.0		
Stabilometer @ 1000					
Stabilometer @ 2000	140	126	144		
Turns Displacement	3.42	2.71	3.8		
R-value	10	20	7		

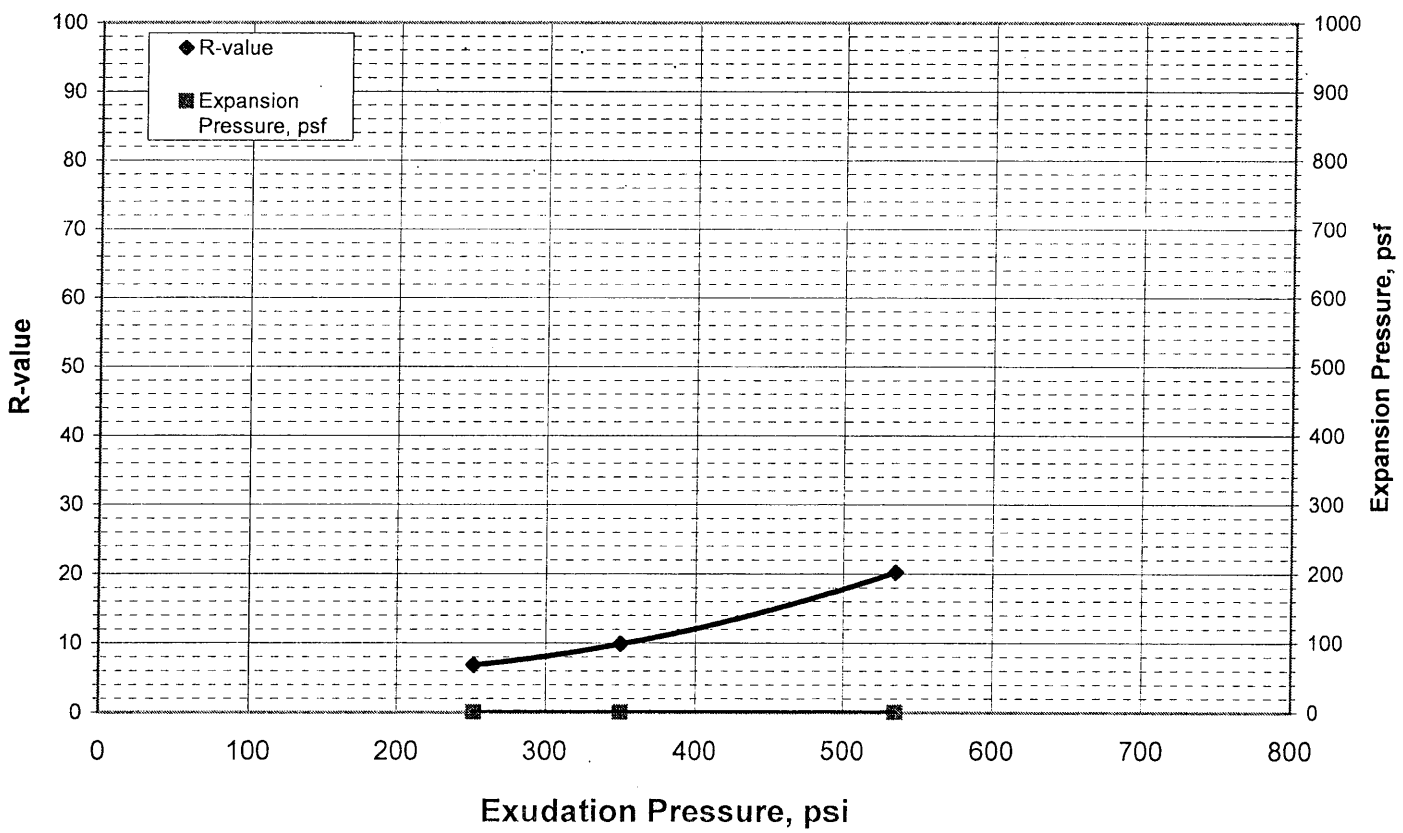


PLATE NO.: B-5A

R-value Test Report (Caltrans 301)

Job No.:	157-251	Date:	12/07/07	Initial Moisture,	6.7%
Client:	Parikh Consultants, Inc.	Tested	MD	R-value by Stabilometer	16
Project:	Hwy 101-Tully Rd - 207150.GDR	Reduced	RU		
Sample	R-4 @ 0-5'	Checked	DC	Expansion Pressure	0 psf
Soil Type:	Grayish Brown Sandy CLAY				

Specimen Number	A	B	C	D
Exudation Pressure, psi	800	255	695	
Prepared Weight, grams	1300	1300	1300	
Final Water Added, grams/cc	70	125	90	
Weight of Soil & Mold, grams	3144	3303	3239	
Weight of Mold, grams	2096	2104	2108	
Height After Compaction, in.	2.32	2.7	2.5	
Moisture Content, %	12.4	17.0	14.1	
Dry Density, pcf	121.6	115.0	120.1	
Expansion Pressure, psf	0.0	0.0	0.0	
Stabilometer @ 1000				
Stabilometer @ 2000	72	128	94	
Turns Displacement	3.23	3.92	3.09	
R-value	44	15	36	

Remarks:

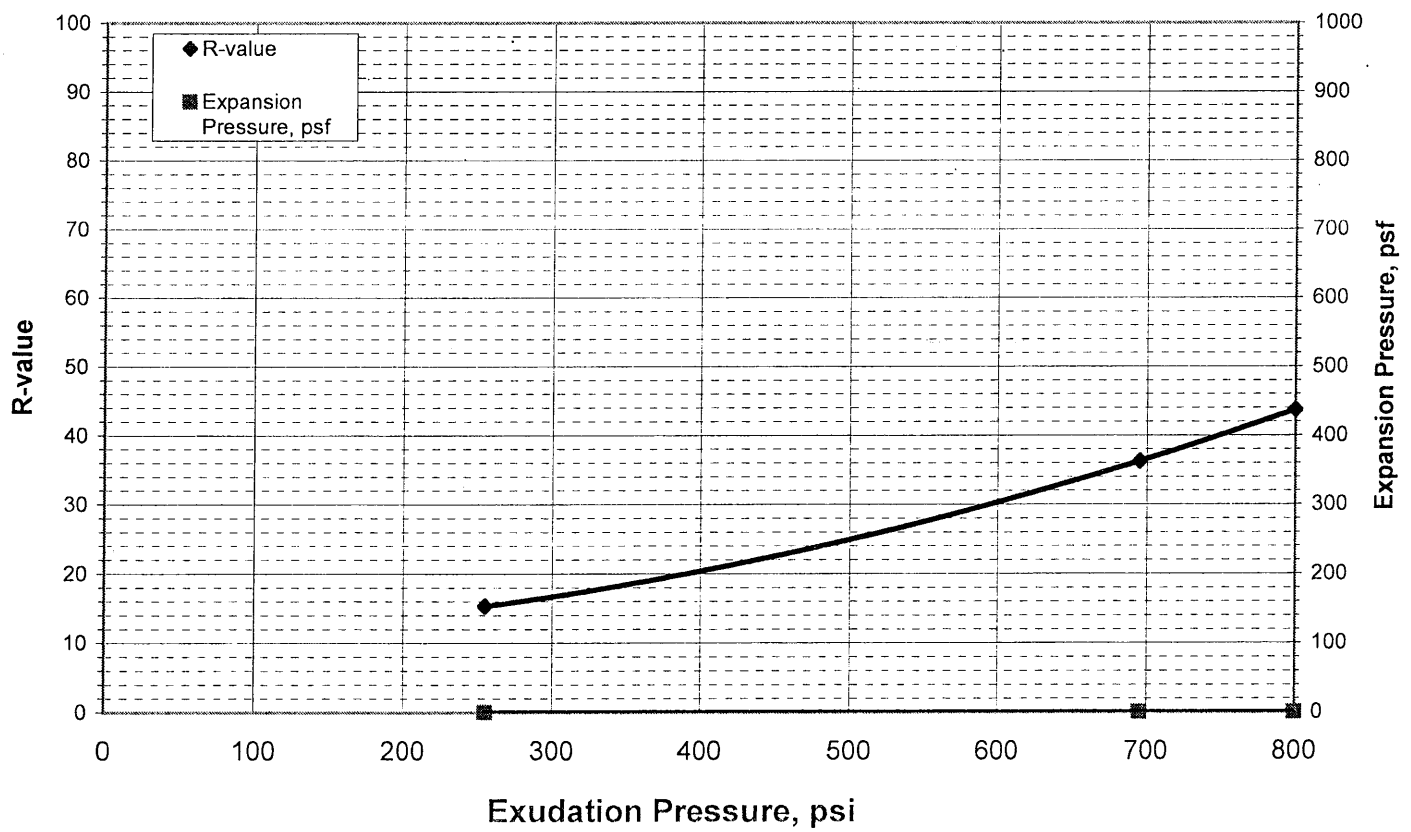


PLATE NO.: B-5B

COOPER TESTING LABORATORY

R-value Test Report (Caltrans 301)

Job No.:	157-251	Date:	12/07/07	Initial Moisture,	7.2%
Client:	Parikh Consultants, Inc.	Tested	MD	R-value by Stabilometer	15
Project:	Hwy 101-Tully Rd - 207150.GDR	Reduced	RU		
Sample	R-6 @ 0-5'	Checked	DC	Expansion Pressure	40 psf
Soil Type:	Grayish Brown Clayey SAND near Sandy CLAY				

Specimen Number	A	B	C	D
Exudation Pressure, psi	465	247	800	
Prepared Weight, grams	1300	1300	1300	
Final Water Added, grams/cc	125	160	100	
Weight of Soil & Mold, grams	3205	3269	3212	
Weight of Mold, grams	2109	2092	2089	
Height After Compaction, in.	2.56	2.75	2.53	
Moisture Content, %	17.5	20.3	15.4	
Dry Density, pcf	110.4	107.7	116.5	
Expansion Pressure, psf	103.2	0.0	133.3	
Stabilometer @ 1000				
Stabilometer @ 2000	110	138	78	
Turns Displacement	3.12	3.72	2.77	
R-value	28	11	49	

Remarks:

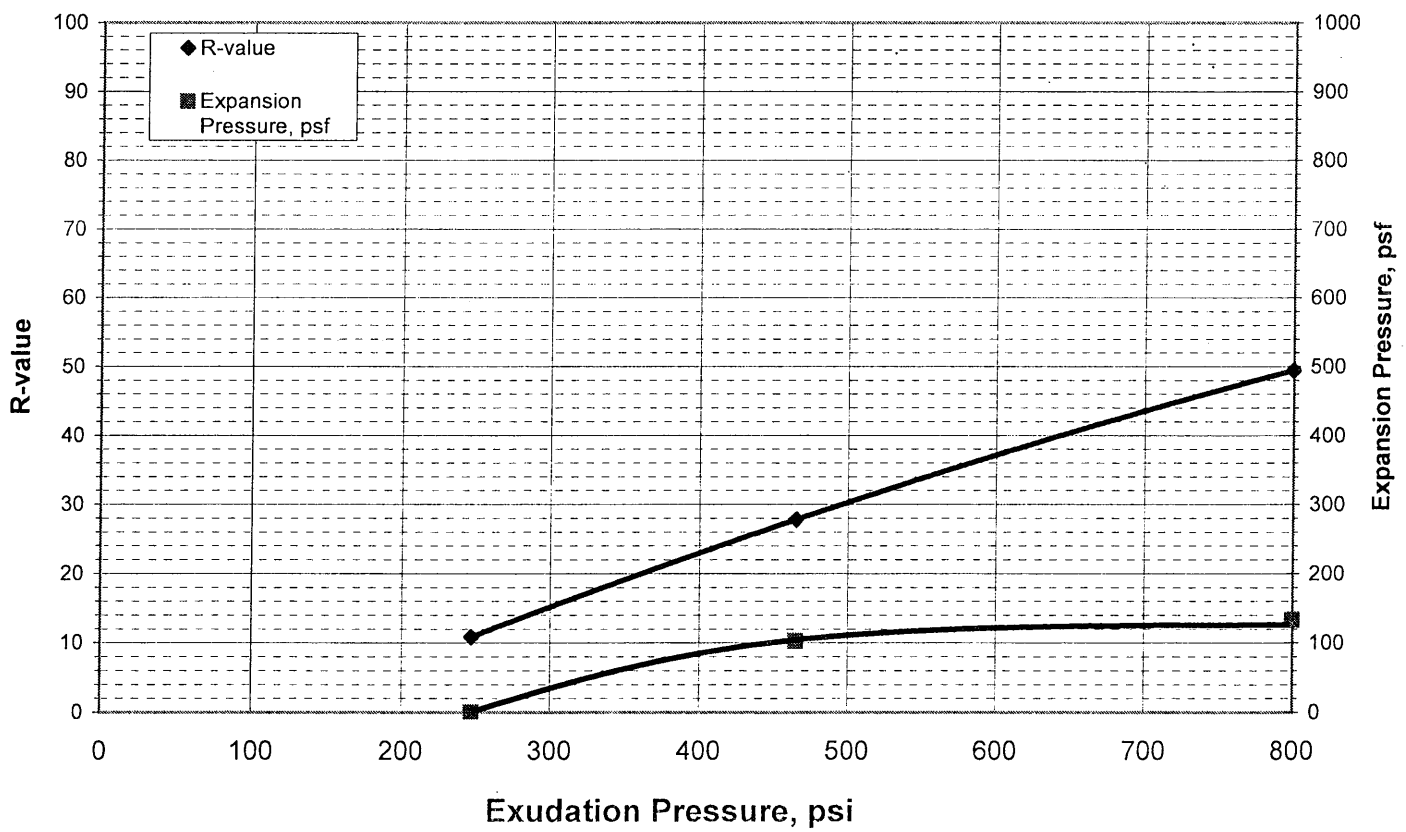


PLATE NO.: B-5C

R-value Test Report (Caltrans 301)

Job No.:	157-253	Date:	01/02/08	Initial Moisture,	8.6%
Client:	Parikh Consultants, Inc.	Tested	MD	R-value by Stabilometer	7
Project:	Rte. 101 Tully Road - 207150.GDR	Reduced	RU		
Sample	R-7 @ 0-5'	Checked	DC	Expansion Pressure	0 psf
Soil Type:	Light Brown Sandy CLAY				

Specimen Number	A	B	C	D
Exudation Pressure, psi	800	315	240	
Prepared Weight, grams	1200	1200	1200	
Final Water Added, grams/cc	60	120	140	
Weight of Soil & Mold, grams	3156	3248	3174	
Weight of Mold, grams	2111	2190	2101	
Height After Compaction, in.	2.39	2.74	2.68	
Moisture Content, %	14.0	19.4	21.2	
Dry Density, pcf	116.1	97.9	100.0	
Expansion Pressure, psf	0.0	0.0	0.0	
Stabilometer @ 1000				
Stabilometer @ 2000	128	144	150	
Turns Displacement	2.72	3.51	4.21	
R-value	18	8	4	

Remarks:

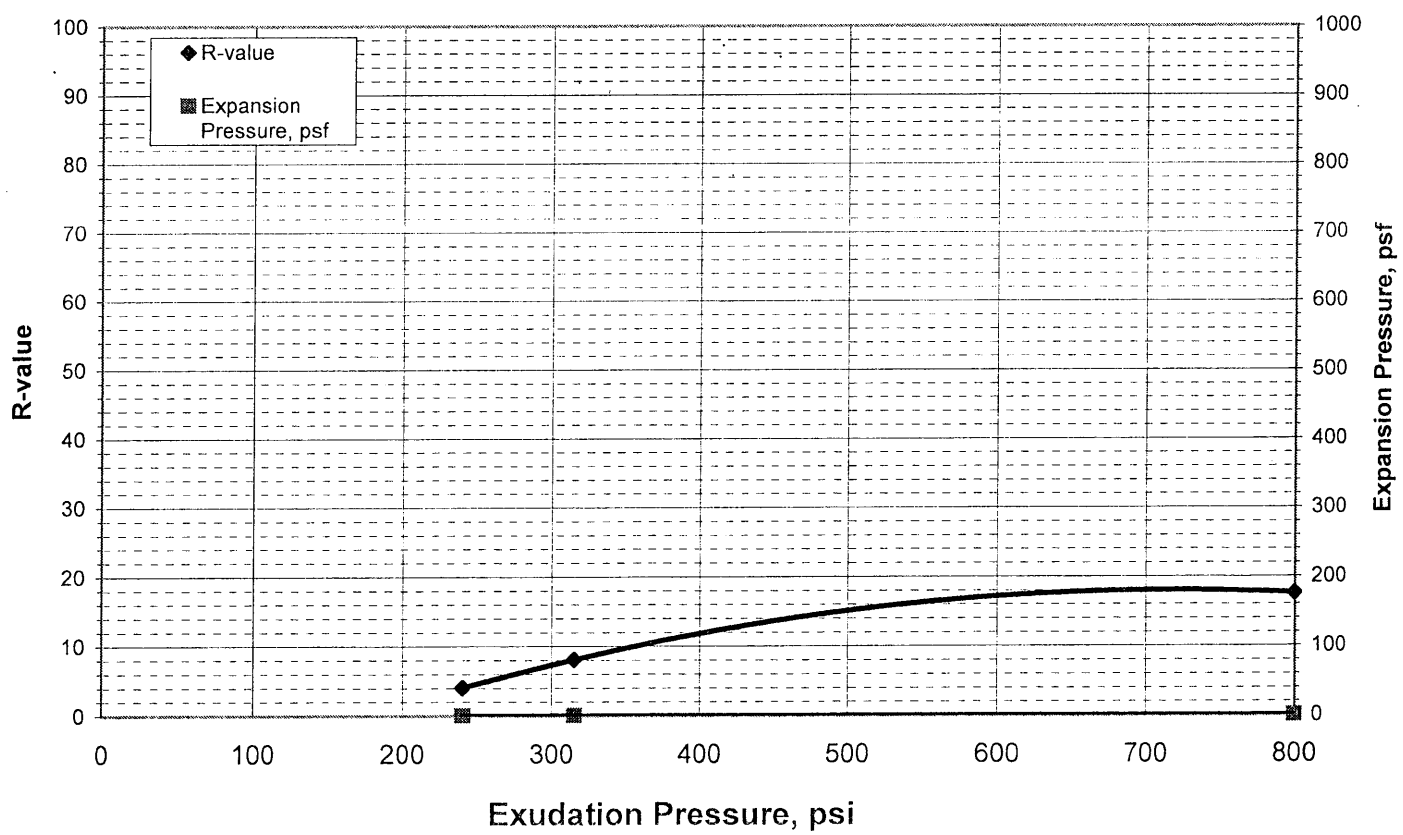
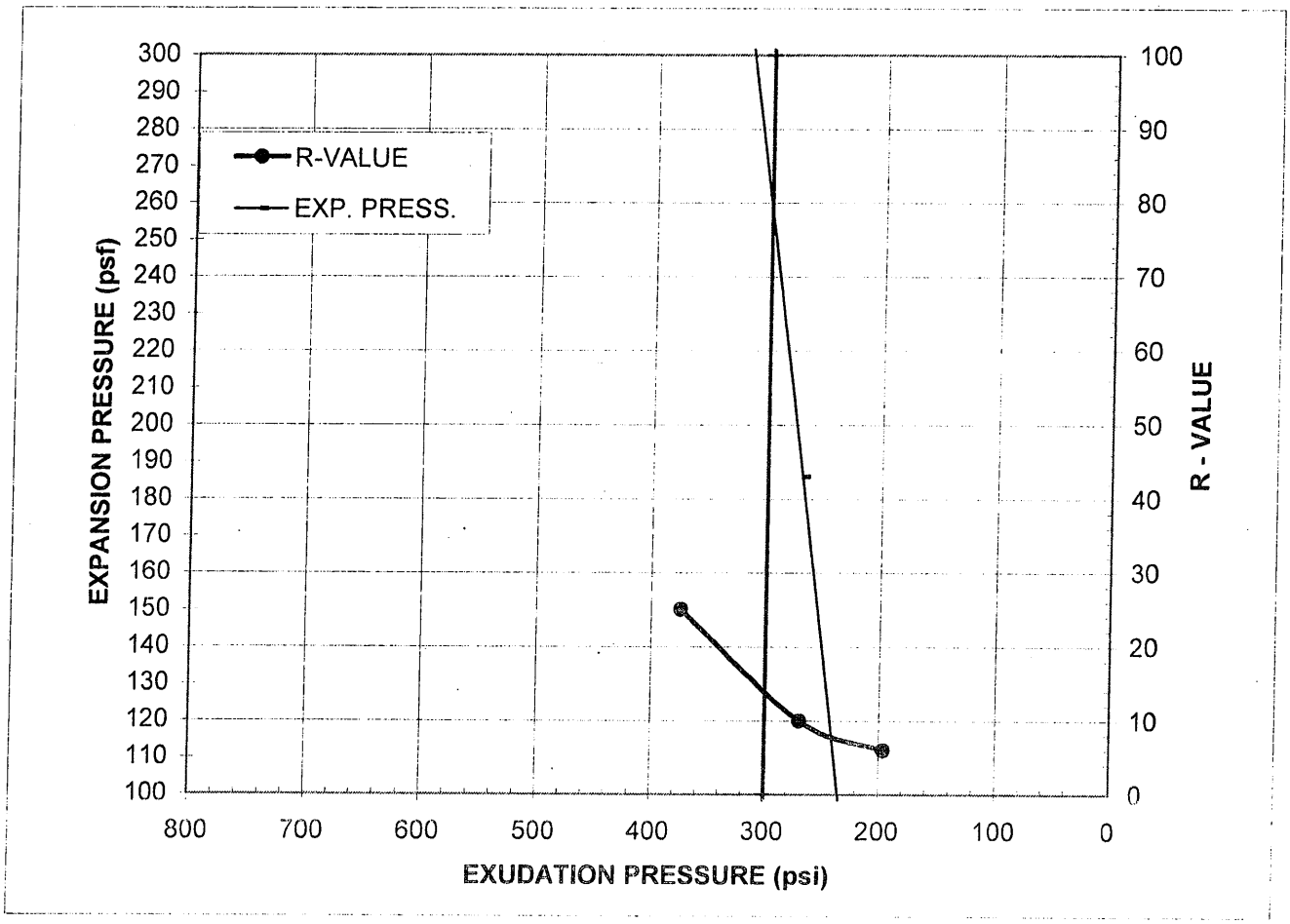


PLATE NO.: B-5D

R-VALUE REPORT

Parikh Consultants, Inc. **ASTM D2844 or CTM 301** (408) 945-1011

Project Name: Rte. 101 Tully Rd. Operational Improvement Project		Date:	01/15/08
Client: HMH		Project #:	207150.GDR
Sample #: R-8	Depth: 0' - 5'	Lab #:	M685
Location / Source:	Onsite / Native	Sample Date:	
Material : Sandy clay, brown		Sampled By:	



Specimen No.	A	B	C
Exudation Pressure, psi	196	269	374
Expansion Pressure, psf	0	186	433
R-Value	6	10	25
Moisture Content at Test, %	19.3	17.4	15.5
Dry Density at Test, pcf	107.3	111.7	116.4

R-Value @ 300 psi Exudation Pressure = 15

Expansion Pressure @300 psi Exudation, psf = **260**

Minimum R-Value Requirement:

Comments:

Report By: Prav Dayah

RVALUE with calcs pdp

R-value Test Report (Caltrans 301)

Job No.:	157-251	Date:	12/05/07	Initial Moisture,	9.6%
Client:	Parikh Consultants, Inc.	Tested	MD	R-value by Stabilometer	11
Project:	Hwy 101-Tully Rd - 207150.GDR	Reduced	RU		
Sample	R-10 @ 0-5'	Checked	DC	Expansion Pressure	60 psf
Soil Type:	Grayish Brown CLAY				

Specimen Number	A	B	C	D
Exudation Pressure, psi	639	367	280	
Prepared Weight, grams	1200	1200	1200	
Final Water Added, grams/cc	40	55	75	
Weight of Soil & Mold, grams	3184	3197	3145	
Weight of Mold, grams	2089	2089	2080	
Height After Compaction, in.	2.49	2.55	2.5	
Moisture Content, %	13.2	14.6	16.4	
Dry Density, pcf	117.6	114.8	110.8	
Expansion Pressure, psf	116.1	90.3	55.9	
Stabilometer @ 1000				
Stabilometer @ 2000	116	125	140	
Turns Displacement	2.97	3.75	3.65	
R-value	24	16	9	

Remarks:

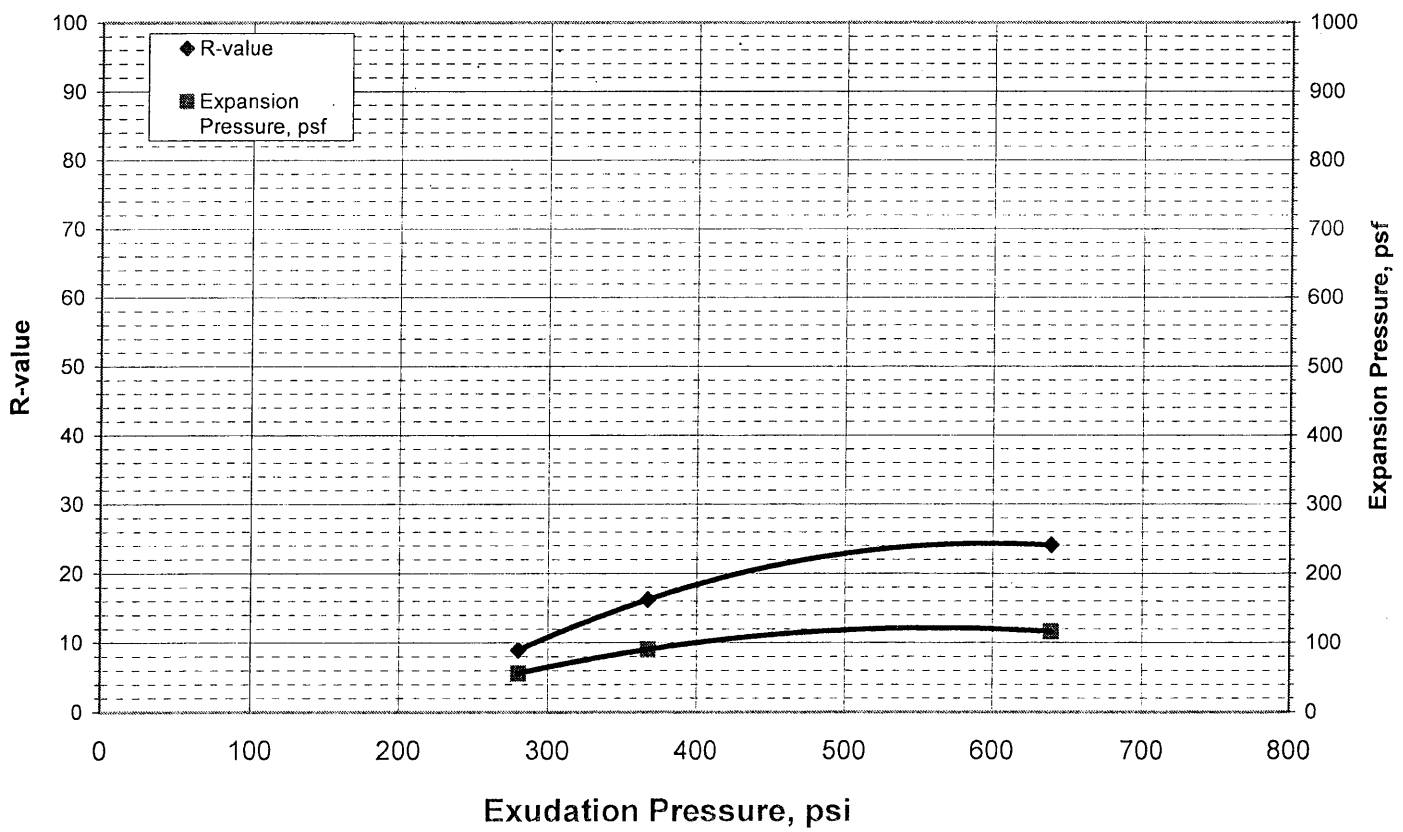


PLATE NO.: B-5F

COOPER TESTING LABORATORY

R-value Test Report (Caltrans 301)

Job No.:	157-253	Date:	01/02/08	Initial Moisture,	11.3%
Client:	Parikh Consultants, Inc.	Tested	MD	R-value by Stabilometer	8
Project:	Rte. 101 Tully Road - 207150.GDR	Reduced	RU		
Sample	R-11 @ 0-5'	Checked	DC	Expansion Pressure	0 psf
Soil Type:	Brown Sandy CLAY				

Specimen Number	A	B	C	D
Exudation Pressure, psi	490	350	290	
Prepared Weight, grams	1200	1200	1200	
Final Water Added, grams/cc	80	100	120	
Weight of Soil & Mold, grams	3117	3172	3114	
Weight of Mold, grams	2099	2108	2108	
Height After Compaction, in.	2.36	2.51	2.53	
Moisture Content, %	18.7	20.5	22.4	
Dry Density, pcf	110.1	106.5	98.4	
Expansion Pressure, psf	0.0	0.0	0.0	
Stabilometer @ 1000				
Stabilometer @ 2000	138	143	142	
Turns Displacement	3.14	3.25	3.44	
R-value	11	8	8	

Remarks:

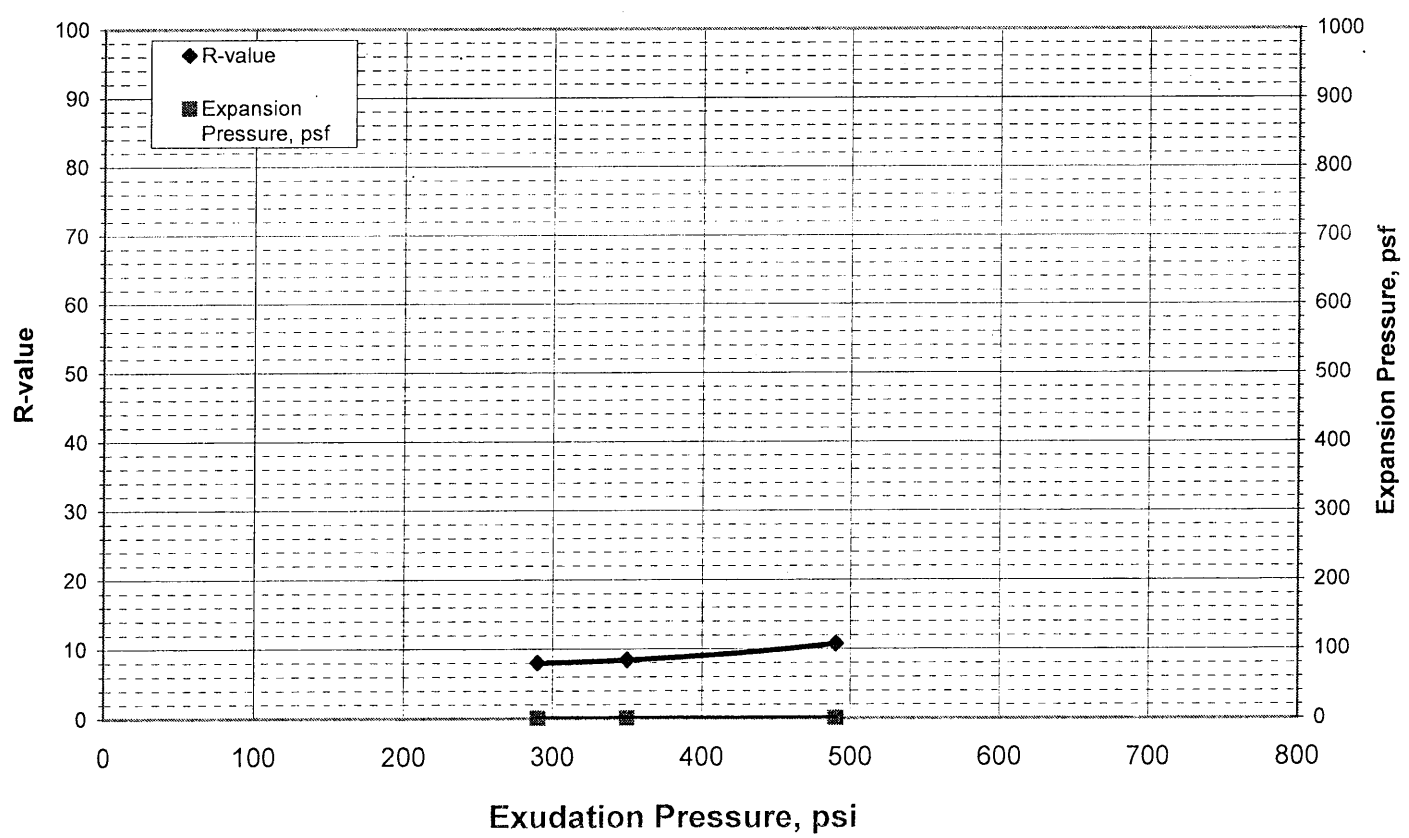


PLATE NO.: B-5G

R-value Test Report (Caltrans 301)

Job No.:	157-251	Date:	12/05/07	Initial Moisture,	10.2%
Client:	Parikh Consultants, Inc.	Tested	MD	R-value by Stabilometer	9
Project:	Hwy 101-Tully Rd - 207150.GDR	Reduced	RU		
Sample	R-12 @ 0-5'	Checked	DC	Expansion Pressure	20 psf
Soil Type:	Grayish Brown CLAY				

Specimen Number	A	B	C	D	Remarks:
Exudation Pressure, psi	220	561	709		
Prepared Weight, grams	1200	1200	1200		
Final Water Added, grams/cc	80	40	30		
Weight of Soil & Mold, grams	3140	3173	3191		
Weight of Mold, grams	2104	2190	2096		
Height After Compaction, in.	2.41	2.48	2.45		
Moisture Content, %	17.5	13.8	12.9		
Dry Density, pcf	110.8	105.4	119.8		
Expansion Pressure, psf	0.0	64.5	90.3		
Stabilometer @ 1000					
Stabilometer @ 2000	140	126	108		
Turns Displacement	3.83	2.86	2.9		
R-value	8	19	29		

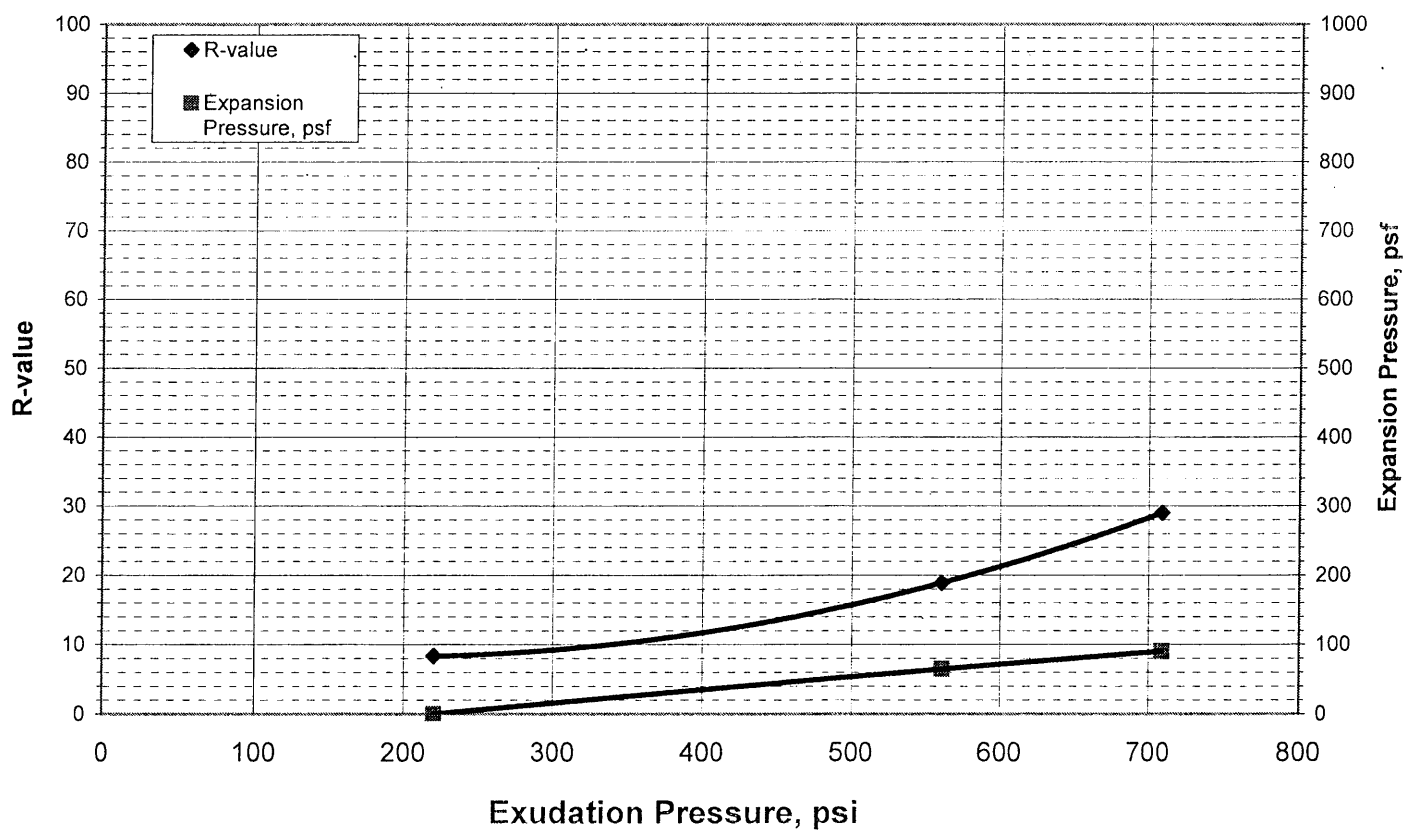


PLATE NO.: B-5H

R-value Test Report (Caltrans 301)

Job No.:	157-253	Date:	01/02/08	Initial Moisture,	8.2%
Client:	Parikh Consultants, Inc.	Tested	MD	R-value by Stabilometer	13
Project:	Rte. 101 Tully Road - 207150.GDR	Reduced	RU		
Sample	R-13 @ 0-5'	Checked	DC	Expansion Pressure	0 psf
Soil Type:	Grayish Brown Sandy CLAY				

Specimen Number	A	B	C	D
Exudation Pressure, psi	250	310	540	
Prepared Weight, grams	1200	1200	1200	
Final Water Added, grams/cc	80	60	40	
Weight of Soil & Mold, grams	3191	3251	3245	
Weight of Mold, grams	2087	2101	2111	
Height After Compaction, in.	2.51	2.58	2.51	
Moisture Content, %	15.4	13.6	11.8	
Dry Density, pcf	115.4	118.8	122.3	
Expansion Pressure, psf	0.0	0.0	0.0	
Stabilometer @ 1000				
Stabilometer @ 2000	143	135	127	
Turns Displacement	4.04	3.15	2.84	
R-value	7	13	19	

Remarks:

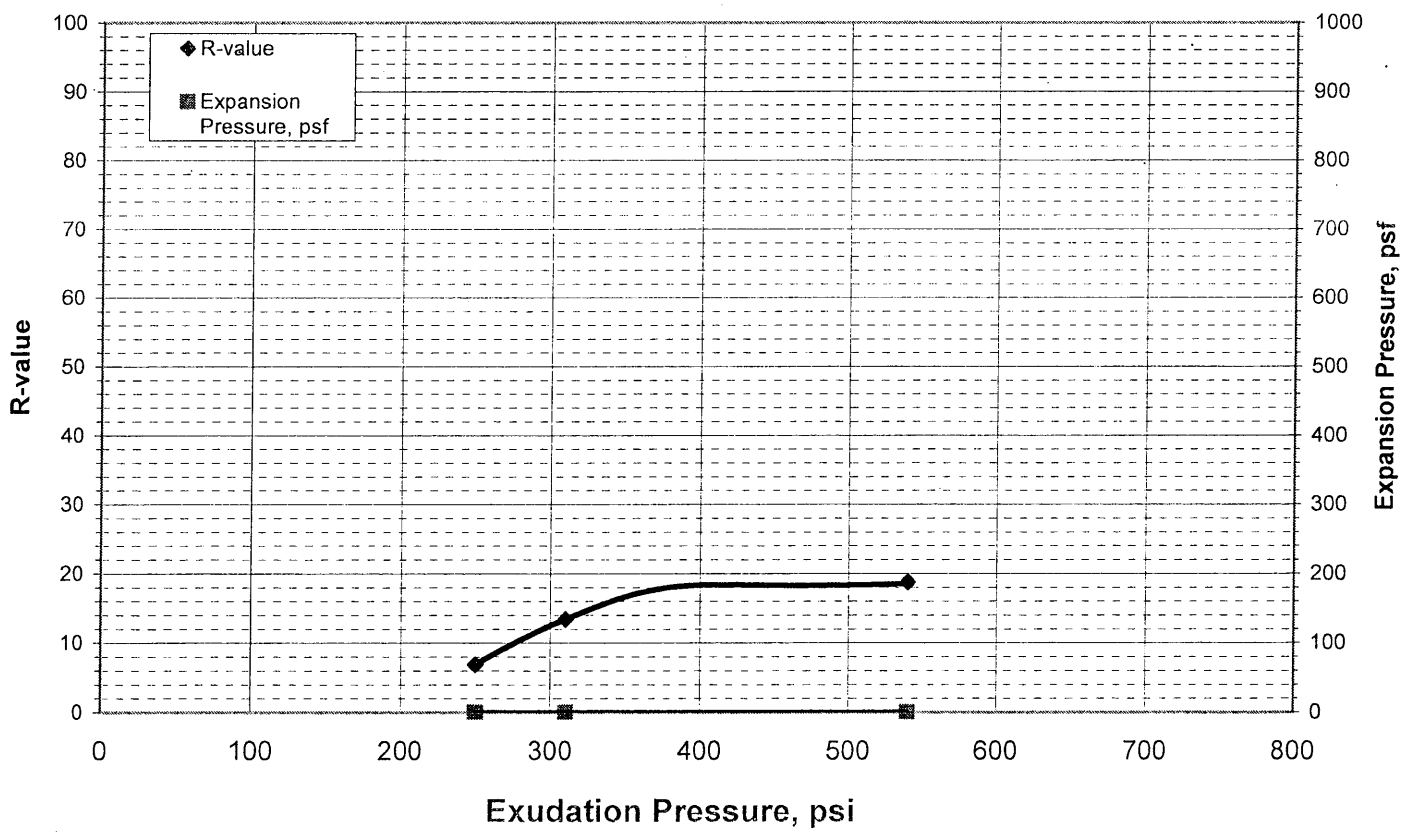


PLATE NO.: B-5I

R-value Test Report (Caltrans 301)

COOPER TESTING LABORATORY

Job No.:	157-251	Date:	12/06/07	Initial Moisture,	5.5%
Client:	Parikh Consultants, Inc.	Tested	MD	R-value by Stabilometer	16
Project:	Hwy 101-Tully Rd - 207150.GDR	Reduced	RU		
Sample	R-15 @ 0-5'	Checked	DC	Expansion Pressure	0 psf
Soil Type:	Grayish Brown Clayey SAND near Sandy CLAY				

Specimen Number	A	B	C	D
Exudation Pressure, psi	502	800	201	
Prepared Weight, grams	1300	1300	1300	
Final Water Added, grams/cc	82	70	110	
Weight of Soil & Mold, grams	3195	3172	3281	
Weight of Mold, grams	2122	2109	2143	
Height After Compaction, in.	2.54	2.45	2.69	
Moisture Content, %	12.2	11.2	14.4	
Dry Density, pcf	114.0	118.1	111.9	
Expansion Pressure, psf	0.0	0.0	0.0	
Stabilometer @ 1000				
Stabilometer @ 2000	118	84	128	
Turns Displacement	3.18	3.06	3.64	
R-value	22	43	16	

Remarks:

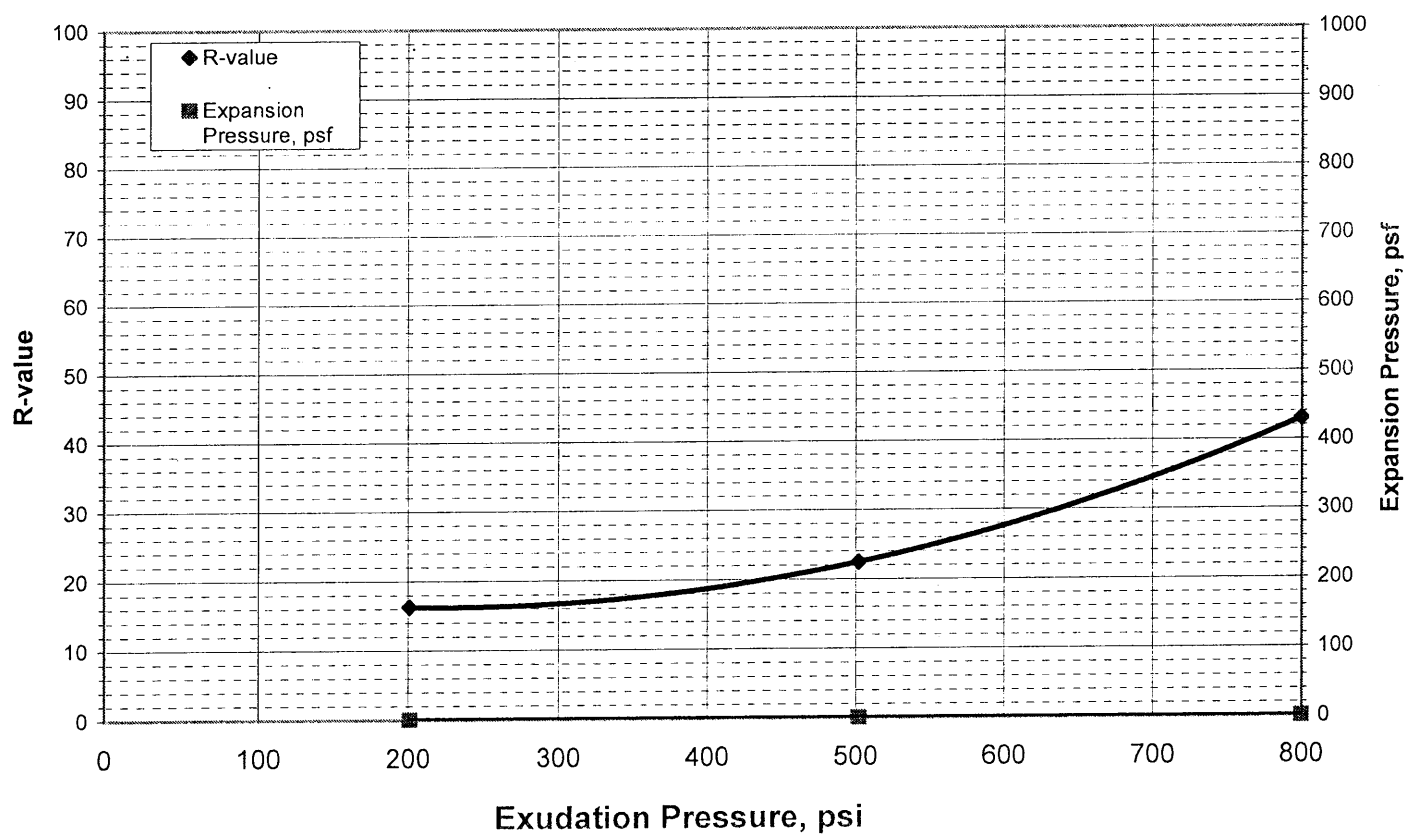


PLATE NO.: B-5J

COOPER TESTING LABORATORY

R-value Test Report (Caltrans 301)

Job No.:	157-251	Date:	12/06/07	Initial Moisture,	11.0%
Client:	Parikh Consultants, Inc.	Tested	MD	R-value by Stabilometer	9
Project:	Hwy 101-Tully Rd - 207150.GDR	Reduced	RU		
Sample	R-18 @ 0-5'	Checked	DC	Expansion Pressure	0 psf
Soil Type:	Grayish Brown Sandy CLAY				

Specimen Number	A	B	C	D
Exudation Pressure, psi	365	225	800	
Prepared Weight, grams	1200	1200	1200	
Final Water Added, grams/cc	50	65	15	
Weight of Soil & Mold, grams	3191	3197	3215	
Weight of Mold, grams	2096	2104	2096	
Height After Compaction, in.	2.47	2.53	2.41	
Moisture Content, %	15.6	17.0	12.4	
Dry Density, pcf	116.1	111.8	125.1	
Expansion Pressure, psf	0.0	0.0	146.2	
Stabilometer @ 1000				
Stabilometer @ 2000	134	146	70	
Turns Displacement	3.56	3.57	2.45	
R-value	12	6	57	

Remarks:

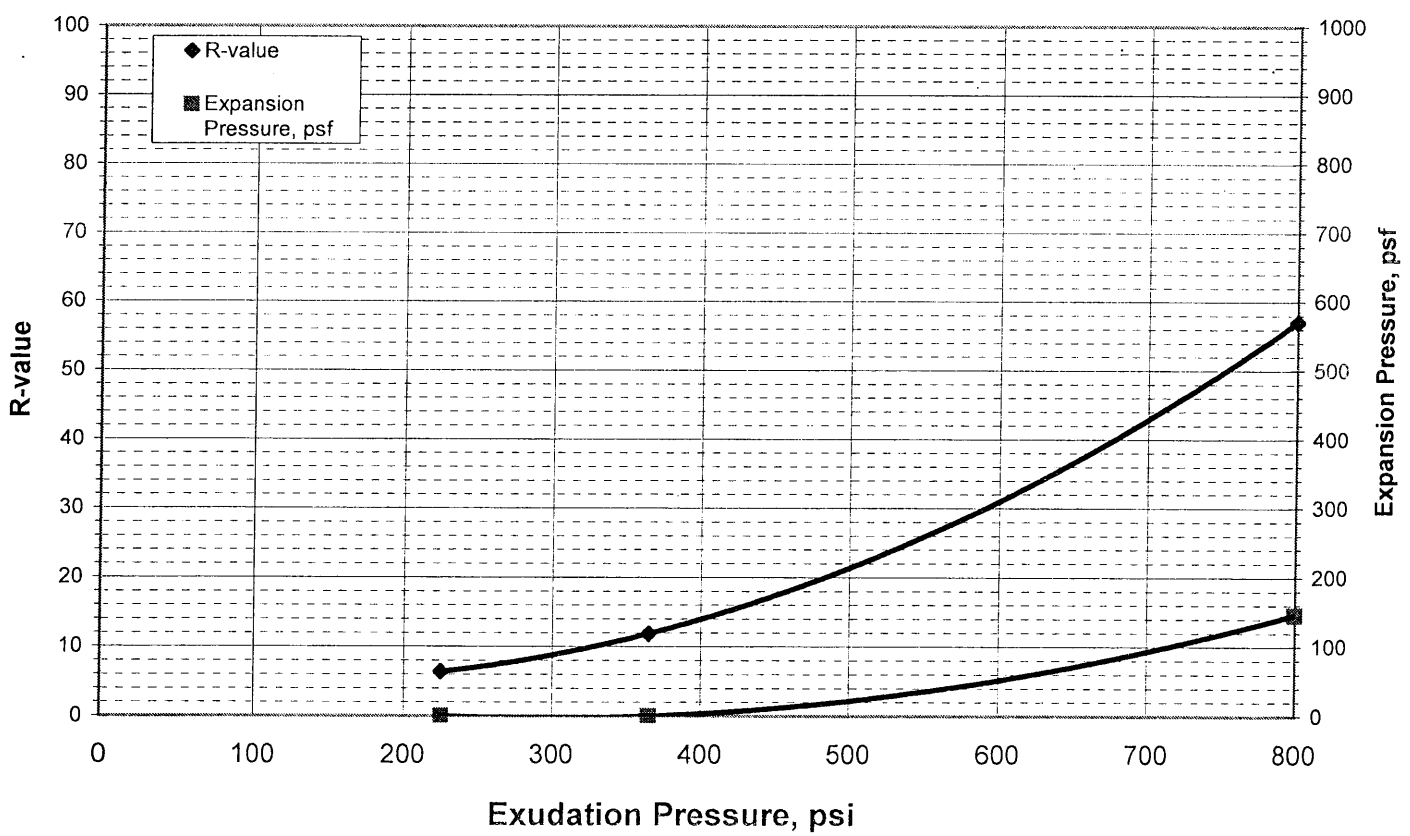


PLATE NO.: B-5K

R-value Test Report (Caltrans 301)

Job No.:	157-253	Date:	01/03/08	Initial Moisture,	9.9%
Client:	Parikh Consultants, Inc.	Tested	MD	R-value by Stabilometer	10
Project:	Rte. 101 Tully Road - 207150.GDR	Reduced	RU		
Sample	R-20 @ 0-5'	Checked	DC	Expansion Pressure	20 psf
Soil Type:	Brown Sandy CLAY				

Specimen Number	A	B	C	D
Exudation Pressure, psi	340	215	640	
Prepared Weight, grams	1200	1200	1200	
Final Water Added, grams/cc	60	80	40	
Weight of Soil & Mold, grams	3196	3223	3148	
Weight of Mold, grams	2108	2080	2099	
Height After Compaction, in.	2.49	2.74	2.35	
Moisture Content, %	15.4	17.2	13.5	
Dry Density, pcf	114.7	107.8	119.1	
Expansion Pressure, psf	21.5	0.0	167.7	
Stabilometer @ 1000				
Stabilometer @ 2000	136	146	104	
Turns Displacement	3.26	3.74	2.78	
R-value	12	7	29	

Remarks:

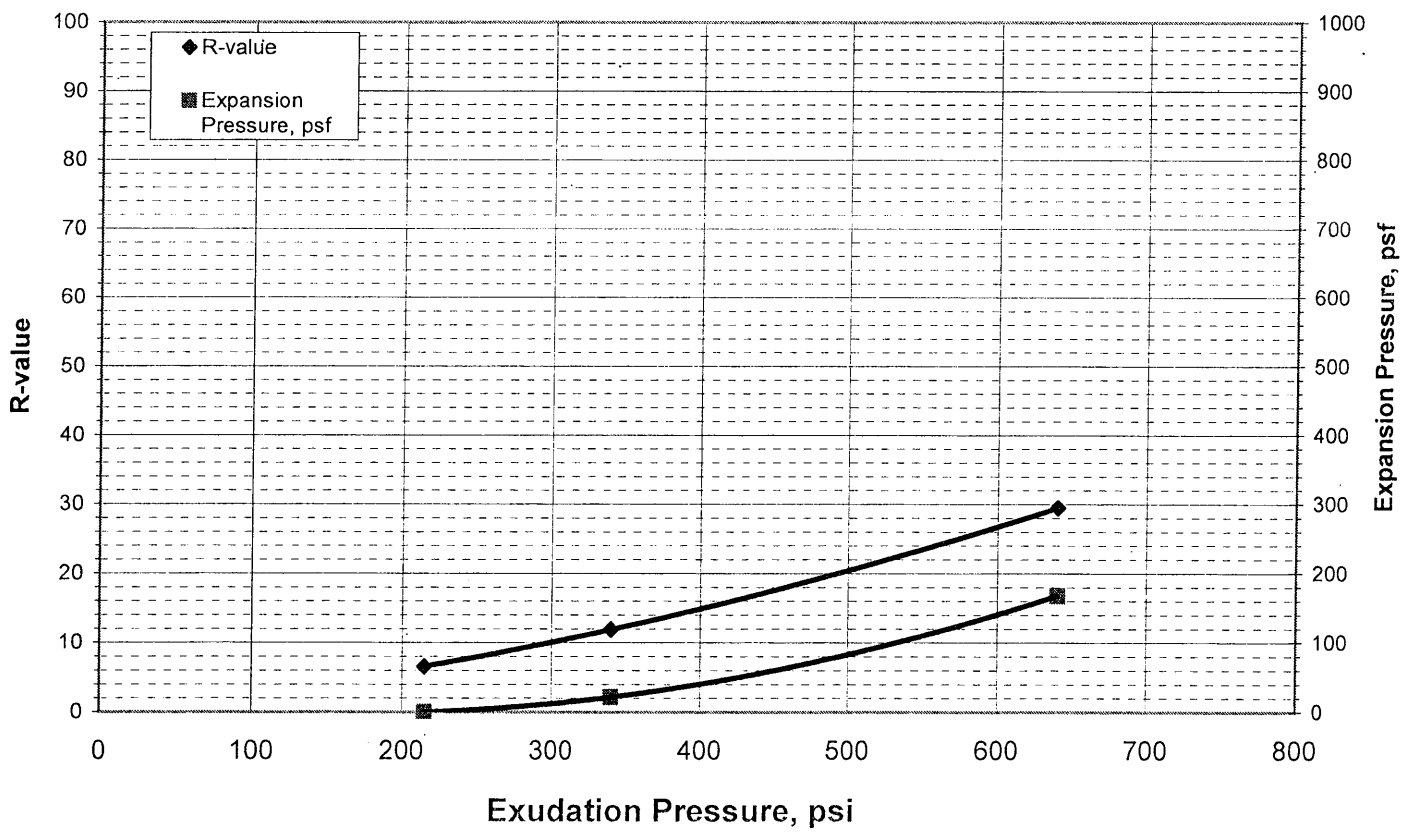


PLATE NO.: B-5L

COOPER TESTING LABORATORY

R-value Test Report (Caltrans 301)

Job No.:	157-251	Date:	12/05/07	Initial Moisture,	16.5%
Client:	Parikh Consultants, Inc.	Tested	MD	R-value by Stabilometer	26
Project:	Hwy 101-Tully Rd - 207150.GDR	Reduced	RU		
Sample	R-22 @ 0-5'	Checked	DC	Expansion Pressure	0 psf
Soil Type:	Dark Gray Clayey SAND near Sandy CLAY				

Specimen Number	A	B	C	D
Exudation Pressure, psi	257	704	376	
Prepared Weight, grams	1200	1200	1200	
Final Water Added, grams/cc	40	13	33	
Weight of Soil & Mold, grams	3202	3146	3097	
Weight of Mold, grams	2089	2096	2089	
Height After Compaction, in.	2.67	2.47	2.44	
Moisture Content, %	20.3	17.7	19.7	
Dry Density, pcf	104.9	109.3	104.5	
Expansion Pressure, psf	0.0	0.0	0.0	
Stabilometer @ 1000				
Stabilometer @ 2000	118	56	104	
Turns Displacement	3.12	3.2	3.17	
R-value	25	59	29	

Remarks:

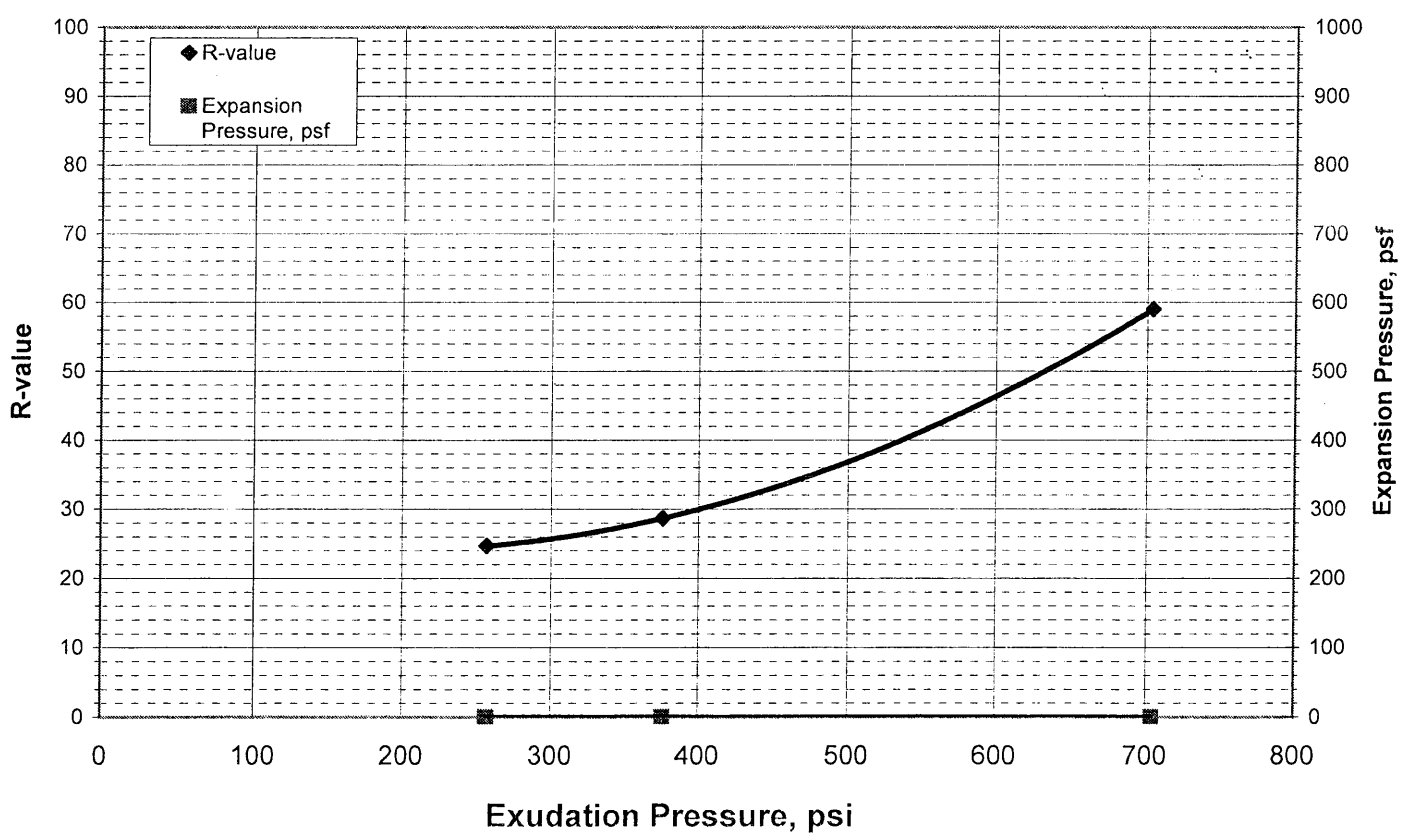
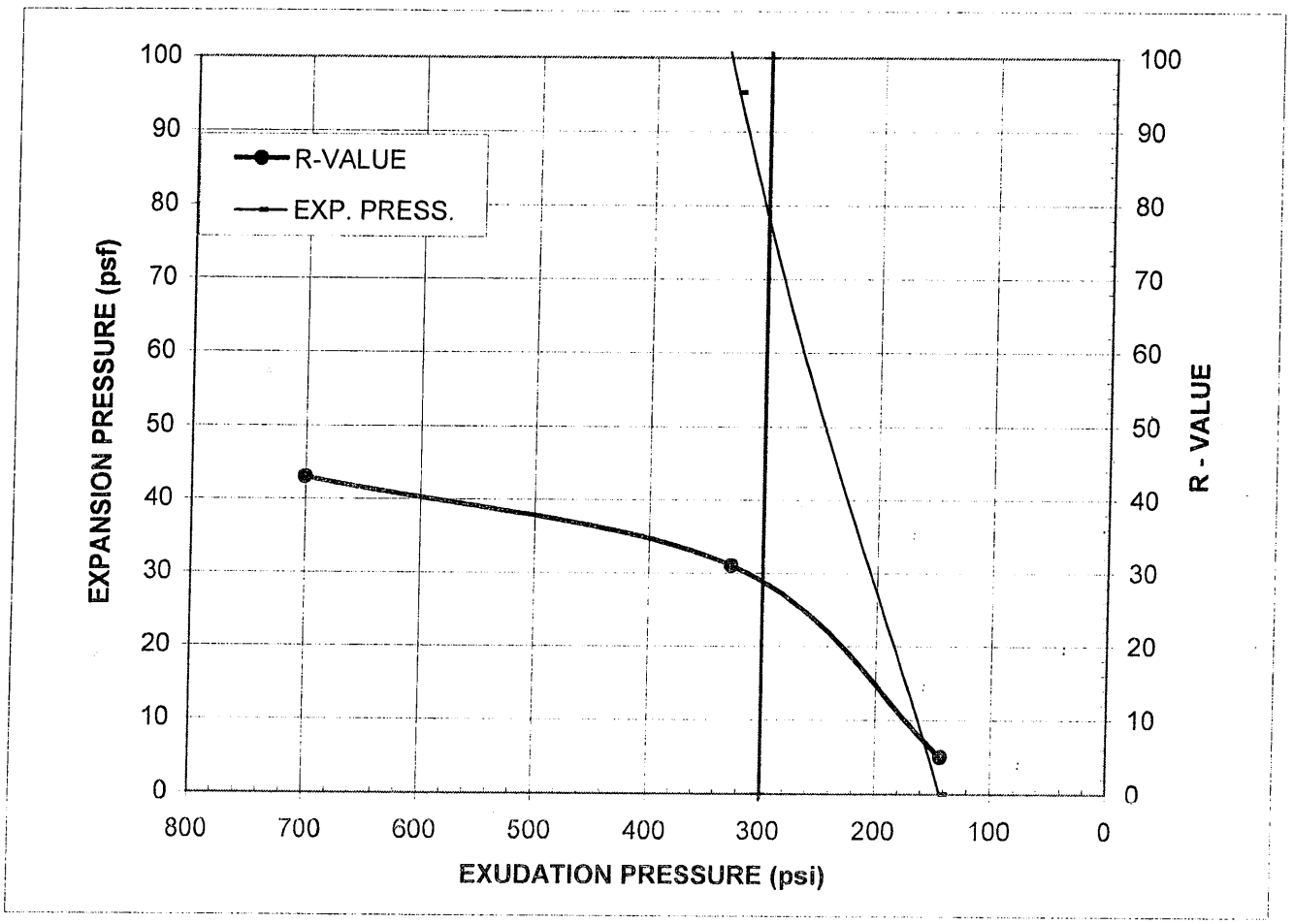


PLATE NO.: B-5M

R-VALUE REPORT

Parikh Consultants, Inc. **ASTM D2844 or CTM 301** (408) 945-1011

Project Name: Rte. 101 Tully Rd. Operational Improvement Project		Date:	01/15/08
Client:	HMH	Project #:	207150.GDR
Sample #: R-24	Depth: 0' - 5'	Lab #:	M685
Location / Source:	Onsite / Native	Sample Date:	
Material :	Sandy clay with some gravel, brown	Sampled By:	



Specimen No.	A	B	C
Exudation Pressure, psi	143	327	701
Expansion Pressure, psf	0	95.3	359
R-Value	5	31	43
Moisture Content at Test, %	19.3	15.7	14.8
Dry Density at Test, pcf	105.2	113.8	114.5

R-Value @ 300 psi Exudation Pressure = 29

Expansion Pressure @300 psi Exudation, psf = **78**

Minimum R-Value Requirement:

Comments:

Report By: Prav Dayah

RVALUE with graphs pdp

PLATE NO.: B-5N

COOPER TESTING LABORATORY

R-value Test Report (Caltrans 301)

Job No.:	157-253	Date:	01/04/08	Initial Moisture,	10.9%
Client:	Parikh Consultants, Inc.	Tested	MD	R-value by Stabilometer	20
Project:	Rte. 101 Tully Road - 207150.GDR	Reduced	RU		
Sample	R-24A @ 0-2'	Checked	DC	Expansion Pressure	0 psf
Soil Type:	Brown Sandy CLAY				

Specimen Number	A	B	C	D
Exudation Pressure, psi	163	410	800	
Prepared Weight, grams	1200	1200	1200	
Final Water Added, grams/cc	85	40	15	
Weight of Soil & Mold, grams	3167	3200	3205	
Weight of Mold, grams	2190	2106	2096	
Height After Compaction, in.	2.57	2.5	2.58	
Moisture Content, %	18.7	14.5	12.2	
Dry Density, pcf	97.0	115.7	116.0	
Expansion Pressure, psf	0.0	0.0	0.0	
Stabilometer @ 1000				
Stabilometer @ 2000	144	106	58	
Turns Displacement	3.75	3.15	3.3	
R-value	7	29	59	

Remarks:

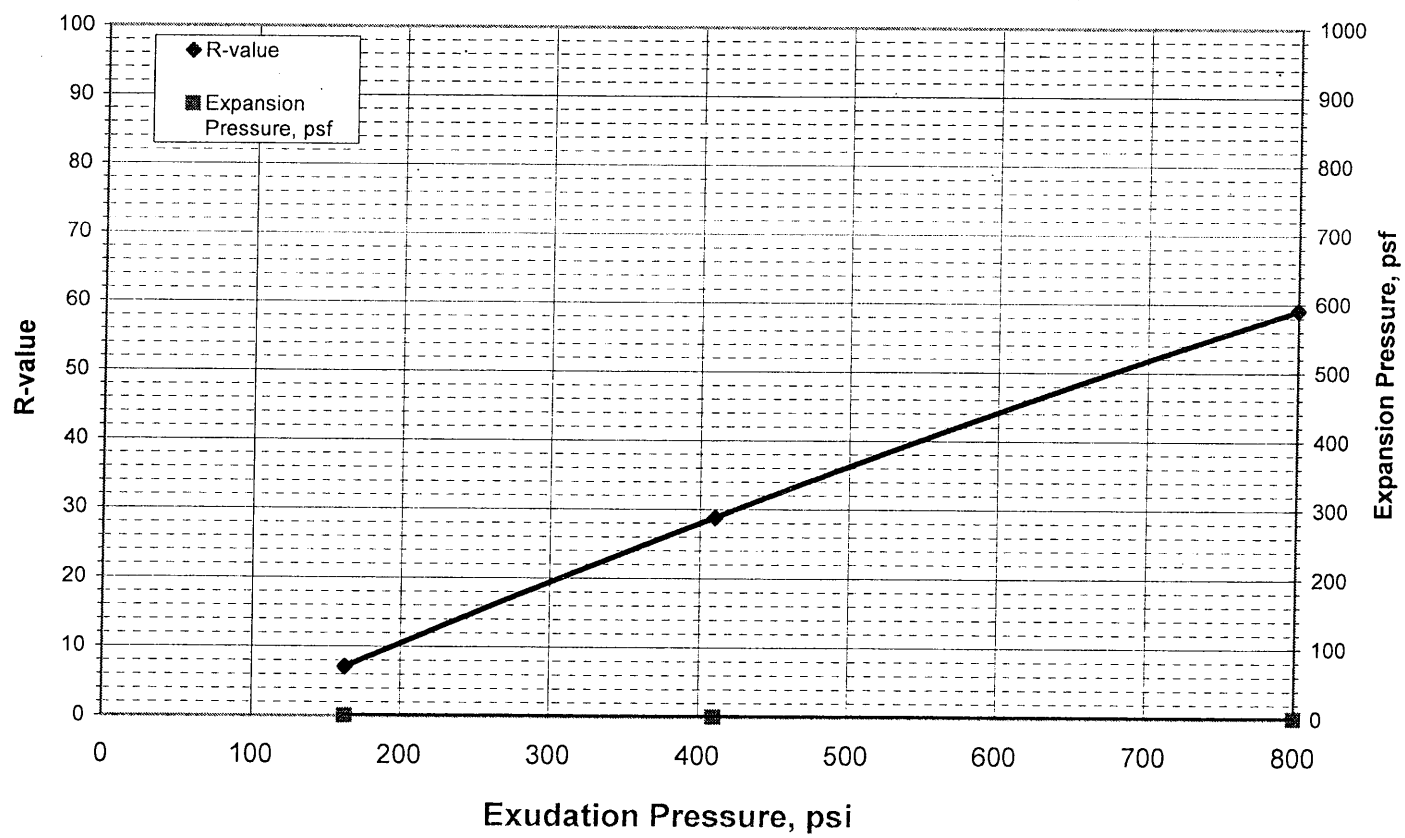


PLATE NO.: B-5O

R-value Test Report (Caltrans 301)

Job No.:	157-251	Date:	12/11/07	Initial Moisture,	11.5%
Client:	Parikh Consultants, Inc.	Tested	MD	R-value by Stabilometer	<5
Project:	Hwy 101-Tully Rd - 207150.GDR	Reduced	RU		
Sample	R-26 @ 0-5'	Checked	DC	Expansion Pressure	psf
Soil Type:	Brown Sandy CLAY				

Specimen Number	A	B	C	D
Exudation Pressure, psi	497			
Prepared Weight, grams	1200			
Final Water Added, grams/cc	46			
Weight of Soil & Mold, grams	3160			
Weight of Mold, grams	2108			
Height After Compaction, in.	2.52			
Moisture Content, %	15.8			
Dry Density, pcf	109.2			
Expansion Pressure, psf	305.3			
Stabilometer @ 1000				
Stabilometer @ 2000	116			
Turns Displacement	3			
R-value	24			

Remarks:

Soil extruded from the mold giving a false exudation pressure. Per Caltrans, the R-Value test was terminated and an R-Value of less than 5 was reported.

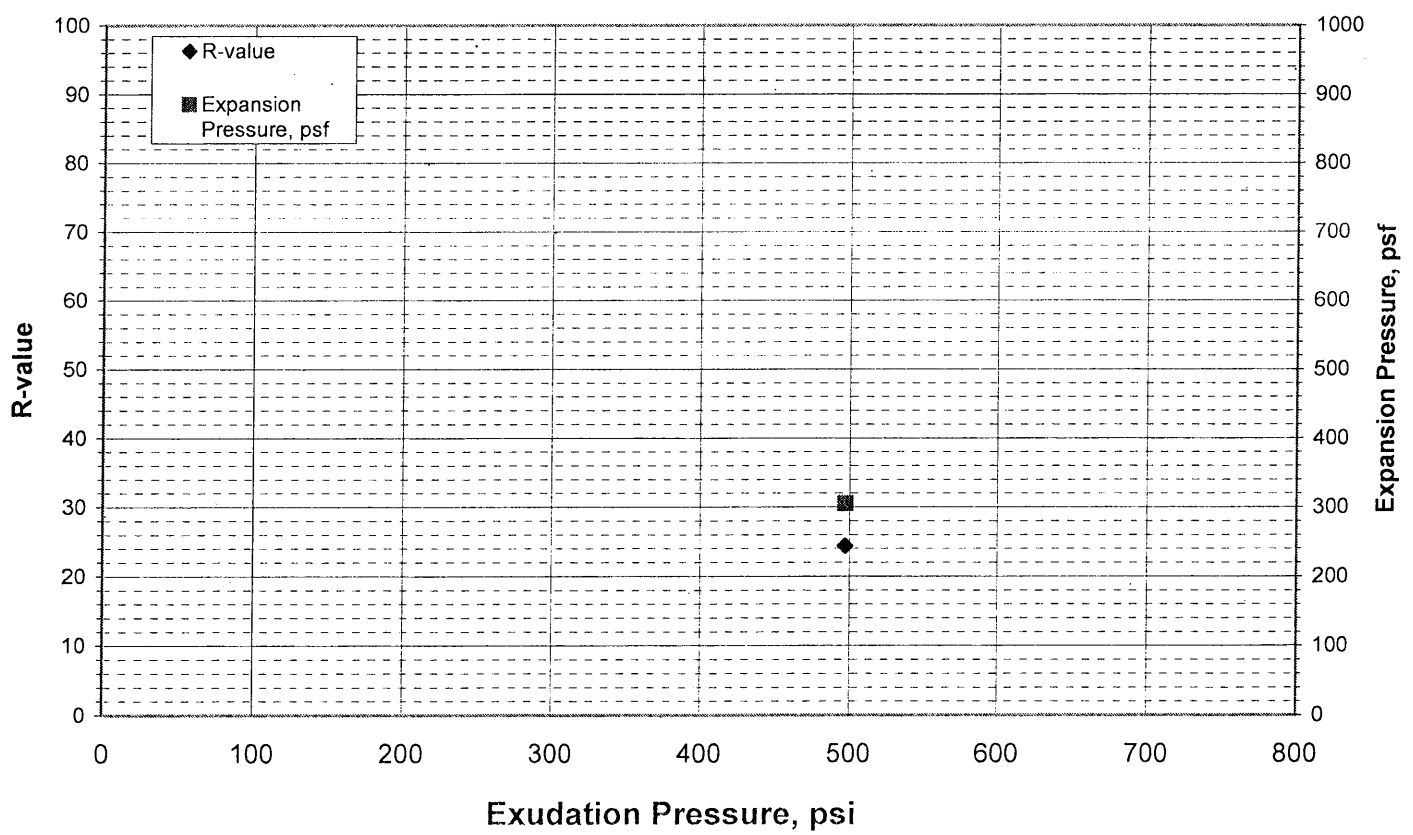


PLATE NO.: B-5P

R-value Test Report (Caltrans 301)

Job No.:	157-253	Date:	01/03/08	Initial Moisture,	12.3%
Client:	Parikh Consultants, Inc.	Tested	MD	R-value by Stabilometer	12
Project:	Rte. 101 Tully Road - 207150.GDR	Reduced	RU		
Sample	R-27 @ 0-5'	Checked	DC	Expansion Pressure	110 psf
Soil Type:	Brown & Dark Brown Sandy CLAY				

Specimen Number	A	B	C	D	Remarks:
Exudation Pressure, psi	290	490	170		
Prepared Weight, grams	1200	1200	1200		
Final Water Added, grams/cc	60	40	70		
Weight of Soil & Mold, grams	3210	3177	3149		
Weight of Mold, grams	2111	2101	2087		
Height After Compaction, in.	2.55	2.45	2.52		
Moisture Content, %	17.9	16.1	18.9		
Dry Density, pcf	110.7	114.6	107.3		
Expansion Pressure, psf	124.7	137.6	30.1		
Stabilometer @ 1000					
Stabilometer @ 2000	136	120	142		
Turns Displacement	3.29	2.92	3.3		
R-value	12	22	9		

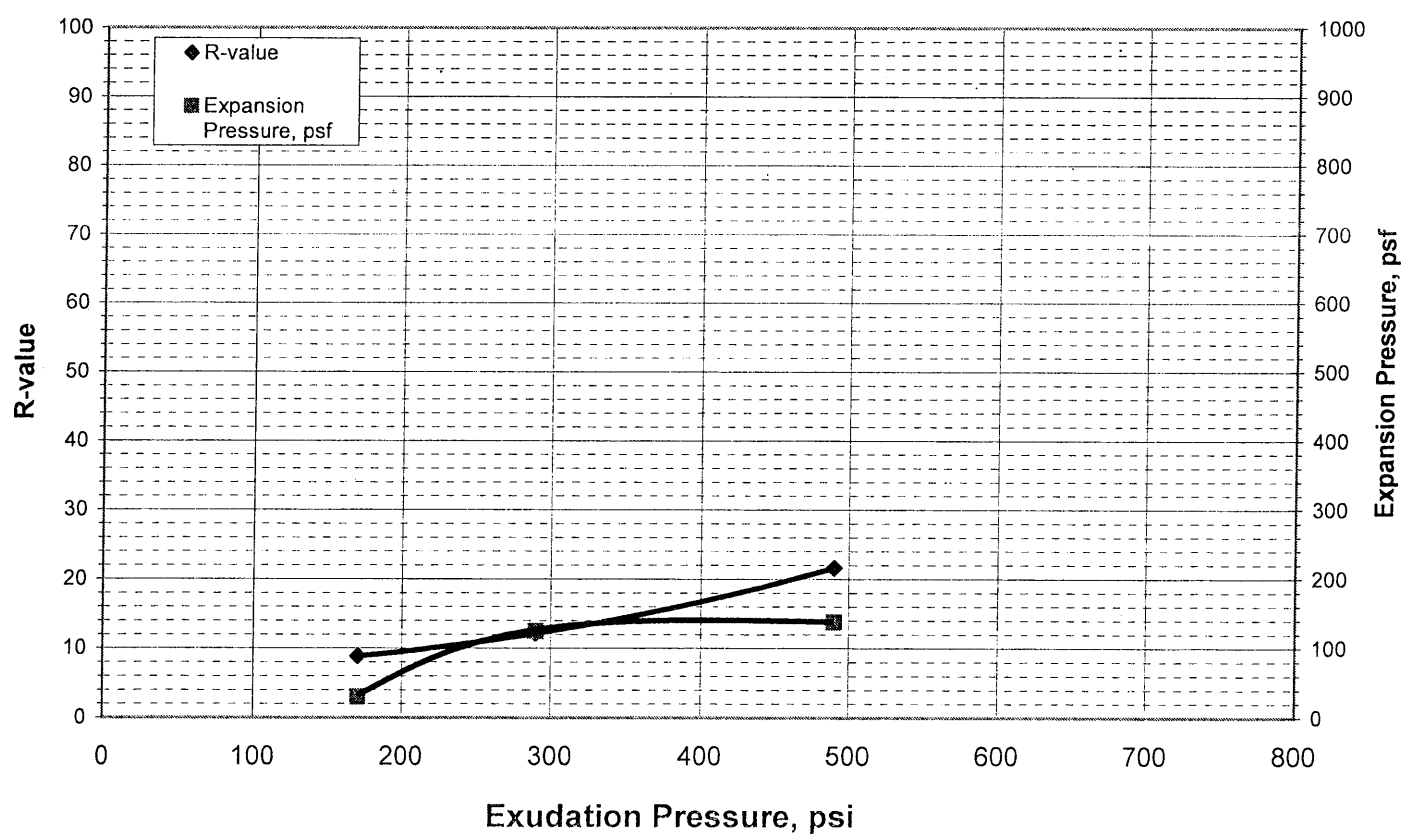


PLATE NO.: B-5Q

R-value Test Report (Caltrans 301)

Job No.:	157-251	Date:	12/11/07	Initial Moisture,	10.3%
Client:	Parikh Consultants, Inc.	Tested	MD	R-value by Stabilometer	16
Project:	Hwy 101-Tully Rd - 207150.GDR	Reduced	RU		
Sample	R-31 @ 0-5'	Checked	DC	Expansion Pressure	240 psf
Soil Type:	Brown Clayey SAND, trace Gravel				

Specimen Number	A	B	C	D
Exudation Pressure, psi	440	197	770	
Prepared Weight, grams	1200	1200	1200	
Final Water Added, grams/cc	41	65	20	
Weight of Soil & Mold, grams	3231	3297	3158	
Weight of Mold, grams	2089	2120	2067	
Height After Compaction, in.	2.5	2.68	2.35	
Moisture Content, %	14.1	16.3	12.1	
Dry Density, pcf	121.3	114.4	125.4	
Expansion Pressure, psf	309.6	176.3	447.2	
Stabilometer @ 1000				
Stabilometer @ 2000	116	144	92	
Turns Displacement	3	3.95	3.22	
R-value	24	7	33	

Remarks:

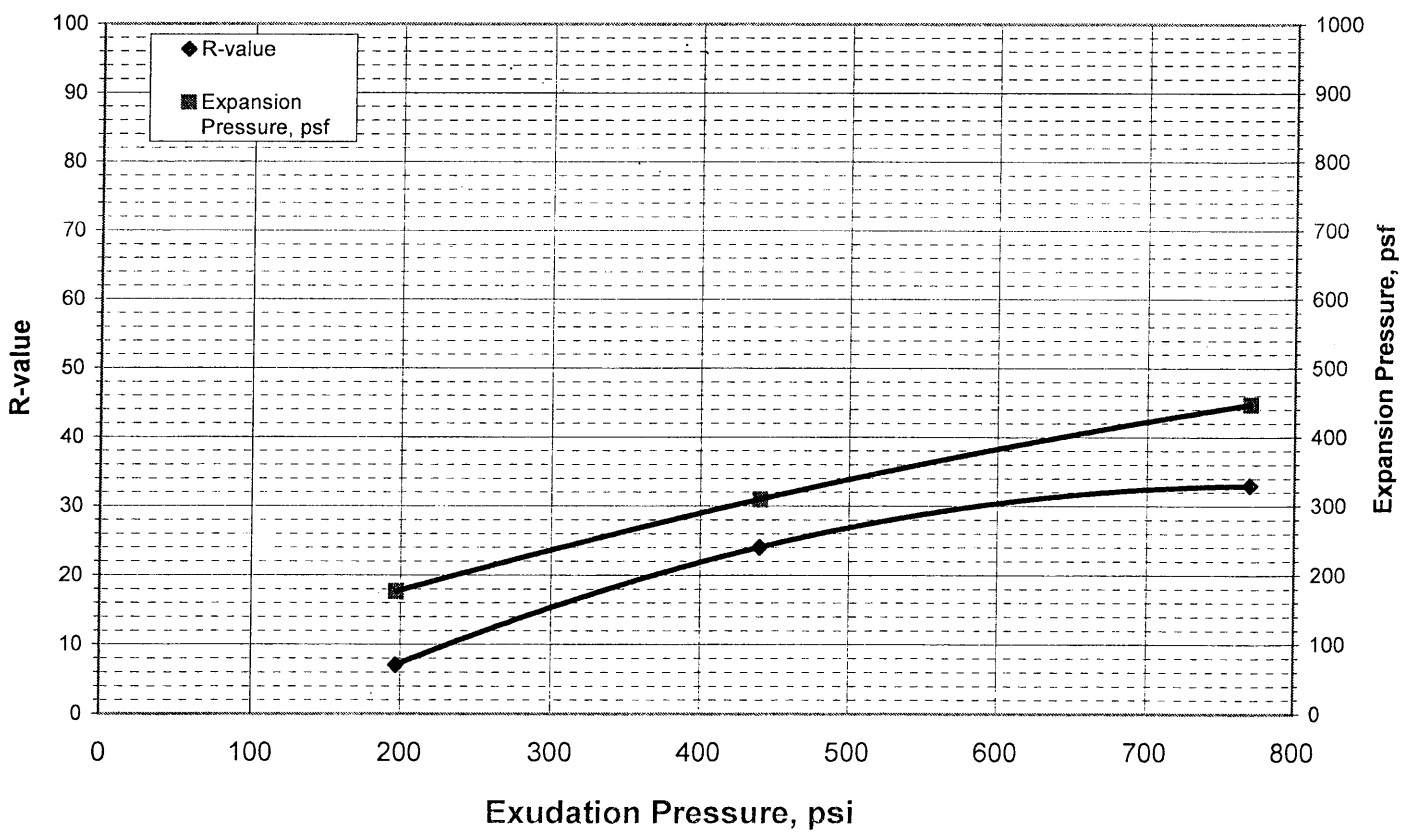


PLATE NO.: B-5R

COOPER TESTING LABORATORY

R-value Test Report (Caltrans 301)

Job No.:	157-251	Date:	12/12/07	Initial Moisture,	8.2%
Client:	Parikh Consultants, Inc.	Tested	MD	R-value by Stabilometer	13
Project:	Hwy 101-Tully Rd - 207150.GDR	Reduced	RU		
Sample	R-34 @ 0-5'	Checked	DC	Expansion Pressure	0 psf
Soil Type:	Brown Clayey SAND				

Specimen Number	A	B	C	D
Exudation Pressure, psi	470	150	800	
Prepared Weight, grams	1200	1200	1200	
Final Water Added, grams/cc	29	70	0	
Weight of Soil & Mold, grams	3171	3235	3182	
Weight of Mold, grams	2075	2111	2109	
Height After Compaction, in.	2.35	2.56	2.39	
Moisture Content, %	10.8	14.5	8.2	
Dry Density, pcf	127.4	116.1	125.6	
Expansion Pressure, psf	0.0	0.0	0.0	
Stabilometer @ 1000				
Stabilometer @ 2000	100	144	34	
Turns Displacement	3.45	5.04	3.91	
R-value	27	5	68	

Remarks:

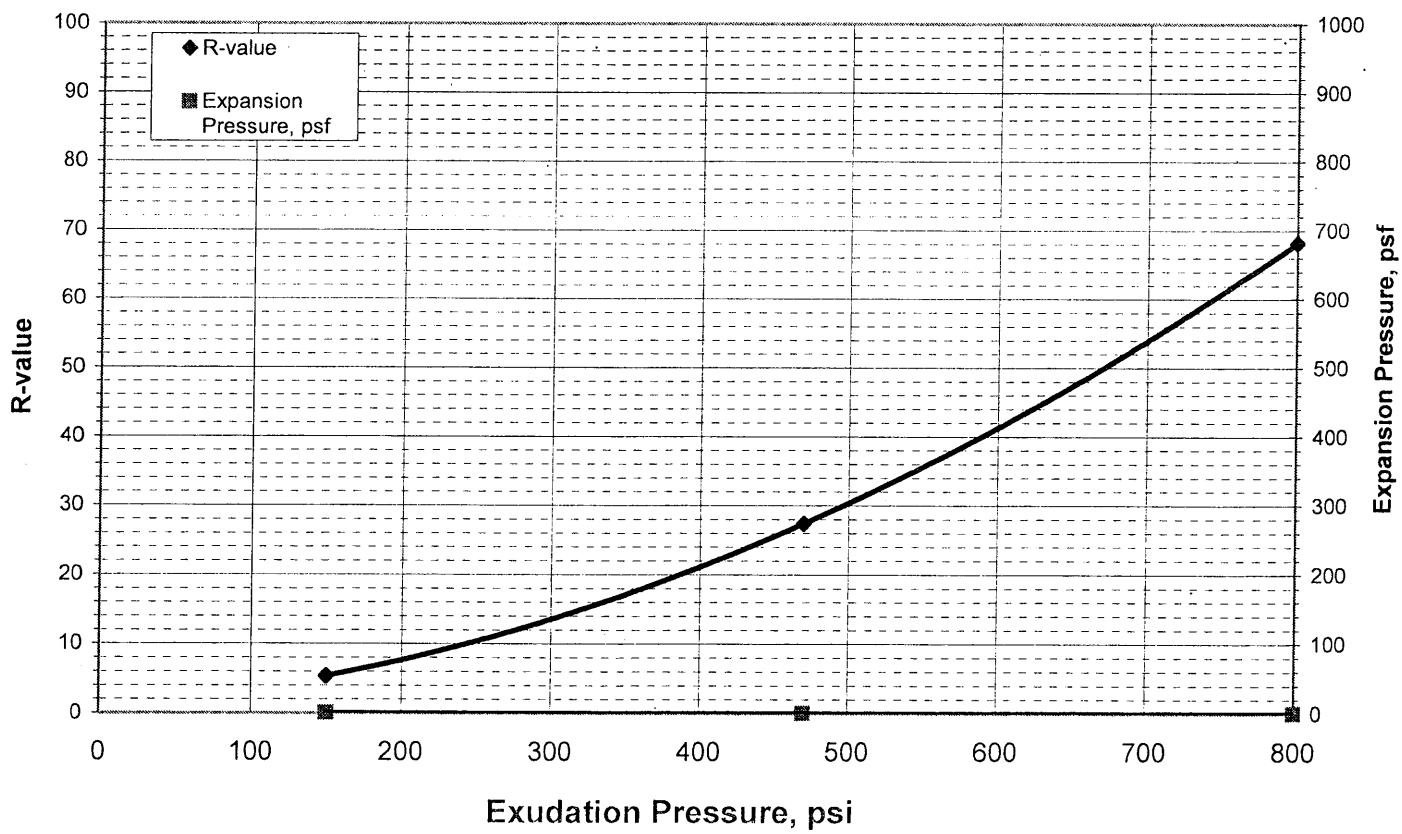


PLATE NO.: B-5S

COOPER TESTING LABORATORY

R-value Test Report (Caltrans 301)

Job No.:	157-251	Date:	12/12/07	Initial Moisture,	11.6%
Client:	Parikh Consultants, Inc.	Tested	MD	R-value by Stabilometer	8
Project:	Hwy 101-Tully Rd - 207150.GDR	Reduced	RU		
Sample	R-36 @ 0-5'	Checked	DC	Expansion Pressure	0 psf
Soil Type:	Brown Sandy CLAY				

Specimen Number	A	B	C	D
Exudation Pressure, psi	377	267	800	
Prepared Weight, grams	1200	1200	1200	
Final Water Added, grams/cc	54	98	30	
Weight of Soil & Mold, grams	3144	3175	3143	
Weight of Mold, grams	2102	2108	2089	
Height After Compaction, in.	2.42	2.31	2.65	
Moisture Content, %	16.7	20.8	14.4	
Dry Density, pcf	111.8	115.8	105.3	
Expansion Pressure, psf	0.0	0.0	0.0	
Stabilometer @ 1000				
Stabilometer @ 2000	122	148	114	
Turns Displacement	3.93	4.65	3.09	
R-value	16	4	27	

Remarks:

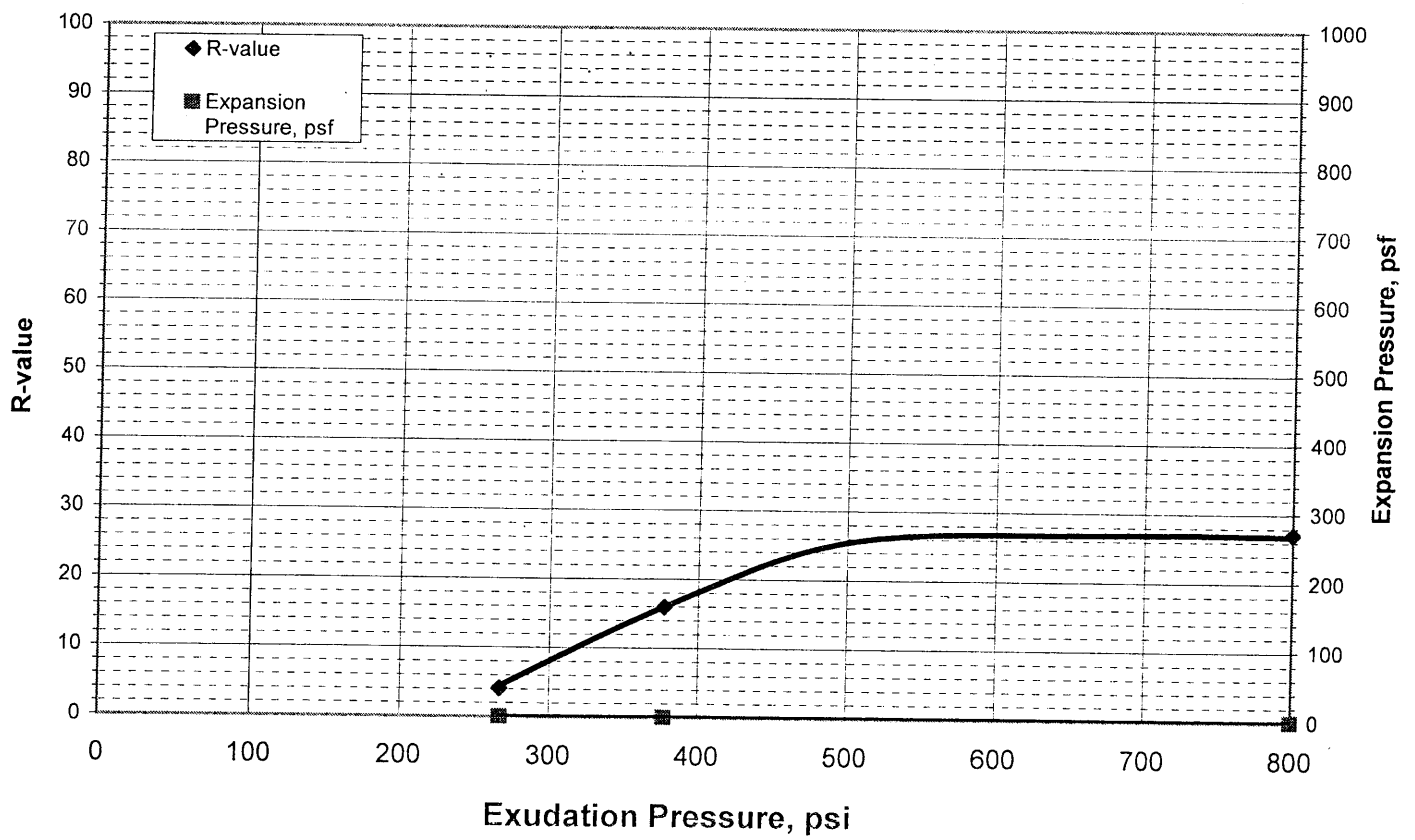


PLATE NO.: B-5T

COOPER TESTING LABORATORY

R-value Test Report (Caltrans 301)

Job No.:	157-251	Date:	12/11/07	Initial Moisture,	15.8%
Client:	Parikh Consultants, Inc.	Tested	MD	R-value by Stabilometer	12
Project:	Hwy 101-Tully Rd - 207150.GDR	Reduced	RU		
Sample	R-40 @ 0-5'	Checked	DC	Expansion Pressure	0 psf
Soil Type:	Brown Clayey SAND				

Specimen Number	A	B	C	D
Exudation Pressure, psi	295	375	156	
Prepared Weight, grams	1200	1200	1200	
Final Water Added, grams/cc	73	43	108	
Weight of Soil & Mold, grams	3090	3150	3155	
Weight of Mold, grams	2096	2104	2081	
Height After Compaction, in.	2.55	2.45	2.7	
Moisture Content, %	22.8	19.9	26.2	
Dry Density, pcf	96.1	107.8	95.4	
Expansion Pressure, psf	0.0	0.0	0.0	
Stabilometer @ 1000				
Stabilometer @ 2000	136	136	146	
Turns Displacement	3.56	2.92	4.18	
R-value	11	13	6	

Remarks:

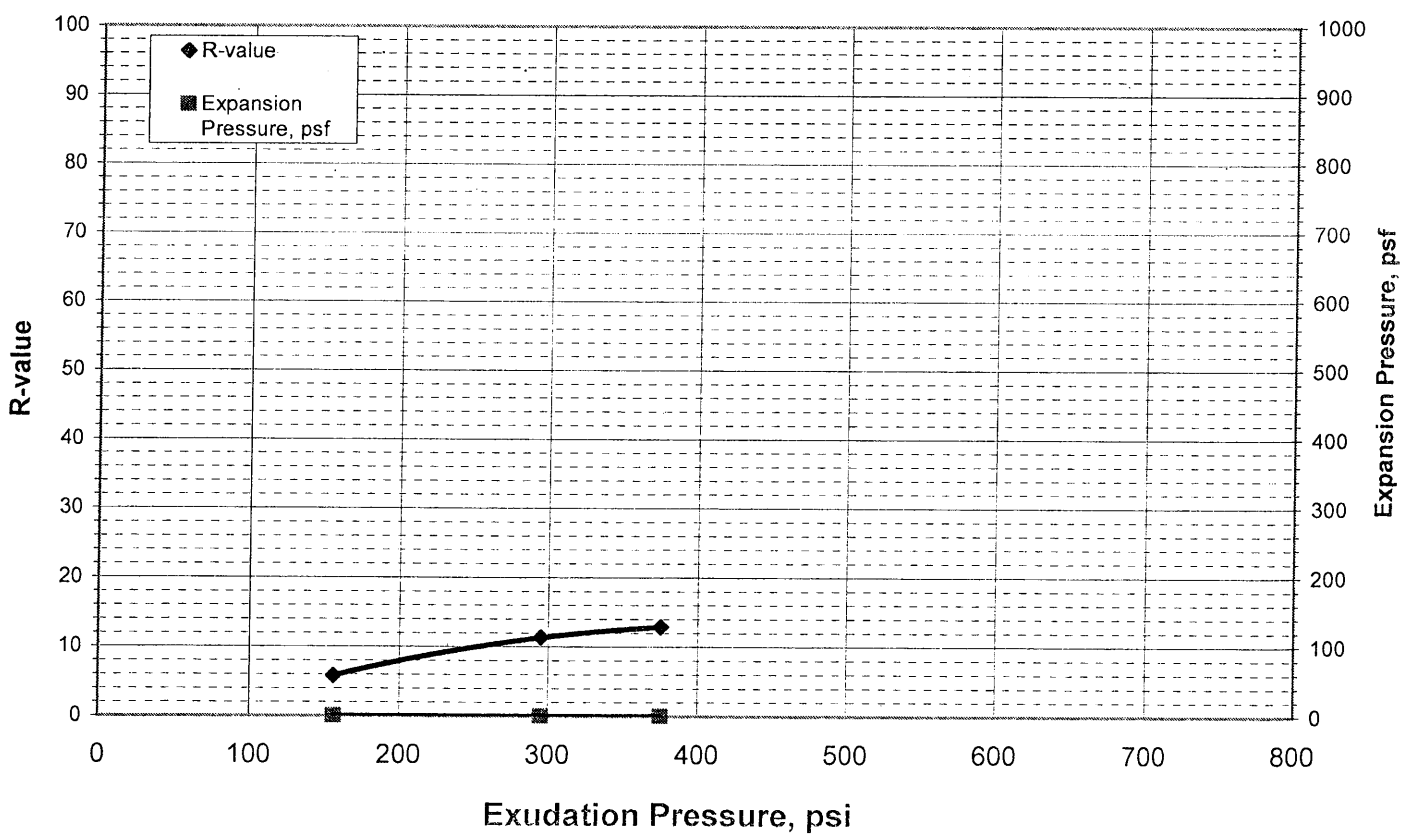


PLATE NO.: B-5U

R-value Test Report (Caltrans 301)

Job No.:	157-251	Date:	12/11/07	Initial Moisture,	12.8%
Client:	Parikh Consultants, Inc.	Tested	MD	R-value by Stabilometer	13
Project:	Hwy 101-Tully Rd - 207150.GDR	Reduced	RU		
Sample	R-42 @ 0-5'	Checked	DC	Expansion Pressure	0 psf
Soil Type:	Brown Clayey SAND				

Specimen Number	A	B	C	D
Exudation Pressure, psi	511	254	200	
Prepared Weight, grams	1200	1200	1200	
Final Water Added, grams/cc	30	58	87	
Weight of Soil & Mold, grams	3209	3199	3203	
Weight of Mold, grams	2104	2109	2101	
Height After Compaction, in.	2.53	2.56	2.64	
Moisture Content, %	15.6	18.3	21.0	
Dry Density, pcf	114.4	109.0	104.5	
Expansion Pressure, psf	0.0	0.0	0.0	
Stabilometer @ 1000				
Stabilometer @ 2000	110	138	146	
Turns Displacement	3	3.74	3.97	
R-value	27	10	6	

Remarks:

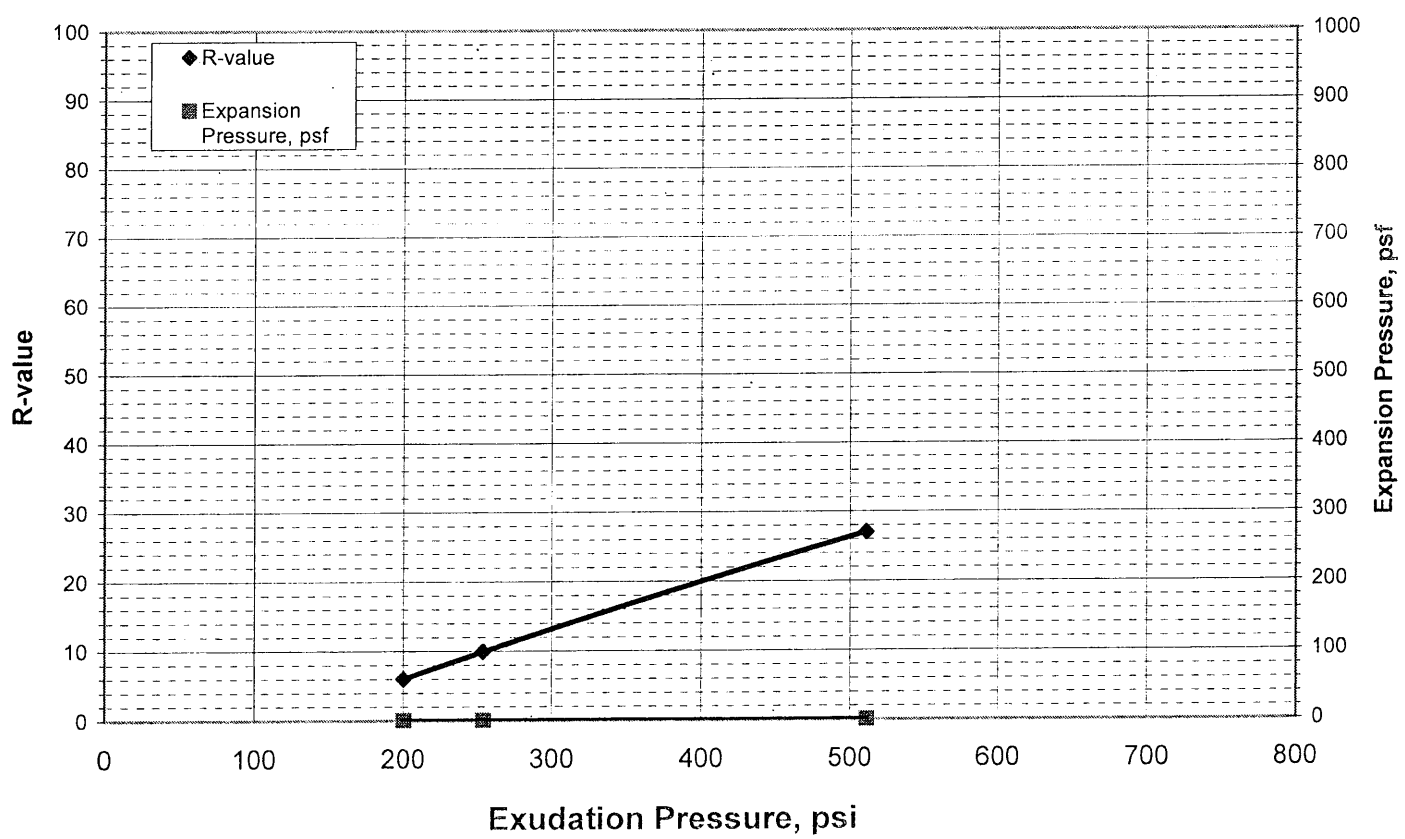


PLATE NO.: B-5V

Sunland Analytical
11353 Pyrites Way, Suite 4
Rancho Cordova, CA 95670
(916) 852-8557

Date Reported 01/30/2008
Date Submitted 01/23/2008

To: Prav Dayah
Parikh Consultants, Inc.
356 S. Milpitas Blvd.
Milpitas, CA 95035

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 207150.GDR/RTE.101 Site ID : R11 @0-5'.
Thank you for your business.

* For future reference to this analysis please use SUN # 52471-104934.

EVALUATION FOR SOIL CORROSION

Soil pH	8.18		
Minimum Resistivity	1.13 ohm-cm (x1000)		
Chloride	86.6 ppm	00.00866	%
Sulfate	141.4 ppm	00.01414	%

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

PLATE NO.: B-6A

Sunland Analytical

11353 Pyrites Way, Suite 4
Rancho Cordova, CA 95670
(916) 852-8557

Date Reported 01/30/2008
Date Submitted 01/23/2008

To: Prav Dayah
Parikh Consultants, Inc.
356 S. Milpitas Blvd.
Milpitas, CA 95035

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 207150.GDR/RTE.101 Site ID : E-29 #2@4.5'.
Thank you for your business.

* For future reference to this analysis please use SUN # 52471-104933.

EVALUATION FOR SOIL CORROSION

Soil pH	8.90		
Minimum Resistivity	0.48 ohm-cm (x1000)		
Chloride	506.8 ppm	00.05068	%
Sulfate	160.3 ppm	00.01603	%

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

PLATE NO.: B-6B

APPENDIX C

HMH: USE FOR 2064-02

DIST	COUNTY	ROUTE	POST MILE TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
04	SCl	101	30.5/35.0	1	239

INDEX OF SHEETS

Sheet No	1	Title and Location Map
" "	2-7	Typical Cross Sections
" "	8	Standard Plans List
" "	9-10	Construction Staking Survey Control Data
" "	11	Key Map and Line Index
" "	12-26	Layout, Utilities
" "	27-34	Profiles
" "	35-36	Construction Details
" "	37-51	Drainage Plans
" "	52-64	Drainage Profiles
" "	65-77	Drainage Details, Quantities
" "	78-83	Stage Construction Plans
" "	84	Detour Layouts
" "	85-88	Construction Area Signs
" "	89-108	Pavement Delineation (Temporary Delineation Plan)
" "	109-125	Pavement Delineation Plan, Quantities
" "	126-128	Summary of Quantities
" "	129-137	Sign Plan
" "	138-180	Sound Wall Plan
" "	181-199	Lighting, Ramp Metering, Sign Illumination
" "	200-239	Planting and Irrigation Plans

STATE OF CALIFORNIA

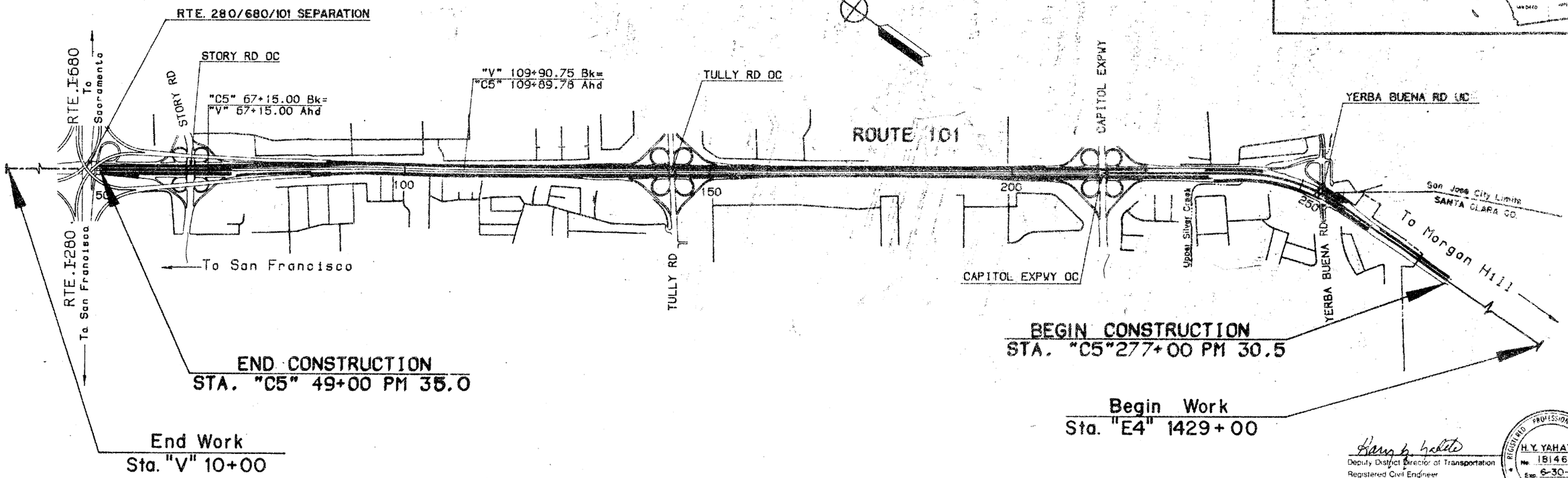
DEPARTMENT OF TRANSPORTATION

PROJECT PLANS FOR CONSTRUCTION ON STATE HIGHWAY

IN SANTA CLARA COUNTY IN AND NEAR SAN JOSE FROM 0.4 MILE NORTH OF HELLYER AVENUE OVERCROSSING TO 0.1 MILE NORTH OF ROUTE 280

To be supplemented by Standard Plans dated January, 1988

REDUCED PLAN
USE SCALE BELOW
0 1 2 3
3 INCHES ON ORIGINAL PLAN



NO SCALE

Deputy District Director of Transportation
Registered Civil Engineer

August 1, 1988
Plans Approval Date

REGISTERED PROFESSIONAL ENGINEER
H. Y. YAHATA
No. 18146
Exp. 6-30-89
CIVIL
STATE OF CALIFORNIA

PROJECT ENGINEER	DATE	DESIGN ENGINEER	DATE	APPROVAL RECOMMENDED BY	DATE
[illegible]	5/5/88	[illegible]	5/5/88	M. E. Walsh	7/11/88

The Contractor shall possess the Class (or Classes) of license as specified in the "Notice to Contractors".

Contract No. 04-437414

FORM DC-OE 93-PF (REV. 8/86)

FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 1 2 3

CU 04283

EA 437411

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO	TOTAL SHEETS
04	SCI	101	30.5/35.0	8	239

To accompany plans dated 8-1-88

GENERAL ROAD WORK

- ■ A-10A Abbreviations
- ■ A-10B Symbols
- ■ A20-A Pavement Markers and Traffic Lines, Typical Details
- ■ A20-B Pavement Markers and Traffic Lines, Typical Details
- ■ A20-C Pavement Markers and Traffic Lines, Typical Details
- □ A-24A Pavement Markings — Arrows
- ■ A-24B Pavement Markings — Arrows and Symbols
- □ A-24C Pavement Markings — Words
- □ A-24D Pavement Markings — Words and Crosswalks
- □ A30-A P.C.C. Paving Details
- ■ A62-A Excavation and Backfill Miscellaneous — Limits of Payment
- □ A62-B Excavation and Backfill Bridge Surcharge and Wall — Limits of Payment
- □ A62-C Excavation and Backfill Bridge — Limits of Payment
- ■ A62-D Excavation and Backfill Details Concrete and Pipe Culverts
- □ A62-E Excavation and Backfill Details Reinforced Concrete Box and Arch Culverts
- ■ A62-F Excavation and Backfill Details Metal Culverts
- □ A73 Type III Barricade and Object Markers
- □ A74-A Markers and Delineators
- □ A74-B Survey Monuments
- ■ A75-A Concrete Barrier Type 50
- ■ A75-B Concrete Barrier Type 50
- □ A75-C Headlight Glare Screen
- ■ A77C-1 Metal Beam Guard Railing — Standard Hardware
- ■ A77C-2 Metal Beam Guard Railing
- □ A77-D Barrier and Guard Rail Anchors
- ■ A77-E Cable Anchor Assembly (Breakaway)
- □ A77-F Thrie Beam Barrier
- □ A77-G Thrie Beam Barrier
- ■ A79-A Guard Rail Flares
- ■ A79-B Miscellaneous Guard Rail Details
- ■ A79-C Guard Rail Connections to Bridge Rails, Retaining Walls and Abutments
- □ A79-D Guard Rail Connections to Bridge Sidewalks and Curbs
- □ A79-E Thrie Beam Connection to Type 50 Barrier
- □ A80 Emergency Passageways
- □ A83 Portable Scale Pad and Approach Slab Details
- □ C7-A1 Reinforced Concrete Crib Wall Battered Walls — Type A, B, & C
- □ C7-A2 Reinforced Concrete Crib Wall Battered Walls — Type D, E, & F
- □ C7-A3 Reinforced Concrete Crib Wall Vertical Walls — Type A, B, & C
- □ C7-A4 Reinforced Concrete Crib Wall Vertical Walls — Type D, E, & F
- □ C7-A5 Reinforced Concrete Crib Wall Type A, B, C, D, E, & F Header and Stretcher Details
- □ C7-B1 Reinforced Concrete Crib Wall Foundation Pressure —Battered Wall
- □ C7-B2 Reinforced Concrete Crib Wall Foundation Pressure — Vertical Wall
- □ C8-A Steel Crib Wall — Construction Details
- □ C8-B Steel Crib Wall — Design Data
- □ C8-C Steel Crib Wall — Design Data
- □ C9-A Timber Crib Wall Types A, B, C and D — Construction Details
- □ C9-B Timber Crib Wall Types A, B, C and D — Design Data
- □ D72 Drainage Inlets — OS, OL, GOL
- ■ D73 Drainage Inlets — G1, G2, G3, G4, G5, G6
- ■ D74 Drainage Inlets — GT1, GT2, GT3, GT4, GO, GDO
- □ D75 Pipe Inlets
- ■ D77-A Grate Details
- □ D77-B Bicycle Proof Grate Details
- ■ D78 Gutter Depressions
- □ D80 Single Box Culvert
- □ D81 Double Box Culvert
- ■ D83 Box Culvert Miscellaneous Details
- □ D84 Box Culvert Wingwalls, Types A, B & C
- □ D85 Box Culvert Wingwalls, Types D & E
- □ D86-A Box Culvert Warped Wingwalls
- □ D86-B Pipe Culvert Headwalls, Endwalls and Warped Wingwalls
- □ D86-C Arch Culvert Headwalls, Endwalls and Warped Wingwalls
- □ D87-A Overside Drains
- □ D87-B Overside Drains
- □ D87-C Underdrains
- ■ D88 Construction Loads on Culverts
- ■ D89 Pipe Headwalls and Strut Details
- □ D90 Pipe Culvert Headwalls, Endwalls & Wingwalls Types A, B & C
- □ D93 Drainage Inlet Riser Connections
- ■ D94 Flared End Sections
- □ D95 Concrete Arch Culverts
- □ D96 Pipe Riser with Debris Rack Cage
- □ D97A CMP Coupling Band Details No. 1, Flanged End CSP Channel Coupling Band Details — Downdrains, Standard and Positive Joints
- ■ D97B-1 CMP Coupling Band Details No. 2, Annular, Reformed End, and Helical Coupling Bands — Downdrains, Standard and Positive Joints
- ■ D97B-2 CMP Coupling Band Details No. 3, Flanged End CSP Channel Coupling Band Details — Downdrains, Standard and Positive Joints
- ■ D97C-1 CMP Coupling Band Details No. 4, Universal Coupling Bands Standard and Positive Joints
- ■ D97C-2 CMP Coupling Band Details No. 5, Universal Coupling Bands Standard and Positive Joints
- ■ D97D CMP Coupling Details No. 6 — Standard Joint
- □ D97E-1 CMP Coupling Details No. 7 — Positive Joint
- □ D97E-2 CMP Coupling Details No. 8 — Positive Joints and Downdrains
- ■ D97-F Reinforced Concrete Pipe or Non-Reinforced Concrete Pipe Standard and Positive Joints
- □ D98-A Standard Inlet Structure Shoulder Installation Details and Details of Slotted Drain Connections
- □ D98-B 12" Thru 24" Slotted C.S.P. Drain Details
- □ D98-C Alternative Hinged Cover for Type OL & OS Inlets and Trash Rack for Type OGP Inlet
- ■ D98D-1 Structural Section Drainage System Details
- ■ D98D-2 Edge Drain Outlet and Vent Details
- ■ D98D-3 Edge Drain Cleanout
- ■ D98D-4 Cross Drain Interceptor Details
- □ F-10 Chain Link Fence
- □ F-20 Barbed Wire and Wire Mesh Fence
- ■ N8-A Curbs, Dikes and Driveways
- □ N8-B Wheelchair Ramp Detail No. 1
- □ N8-C Wheelchair Ramp Detail No. 2
- ■ T-10 Traffic Control System for Lane Closure on Freeways and Expressways, Miscellaneous Details
- □ T-11 Traffic Control System for Lane Closure on Multilane Conventional Highways, Miscellaneous Details
- □ T-12 Traffic Control System for Lane Closure On Multilane Conventional Highways, Miscellaneous Details
- □ T-13 Traffic Control System for Lane Closure on Two Lane Conventional Highways
- ■ T-14 Details for Ramp Closures, Miscellaneous Details

BRIDGE

- ■ B0-1 Bridge Details
- ■ B0-3 Bridge Details
- □ B0-5 Bridge Details
- □ B0-13 Bridge Details
- □ B2-3 16" Cast-in-Drilled-Hole Concrete Pipe
- □ B2-5 Pile Details — Class 45 and Class 70
- □ B2-8 Pile Details — Class 45C and Class 70C
- □ B2-9 Load Test Anchor Pile Details
- □ B3-1 Retaining Wall — Type 1 H=4'-30'
- □ B3-2 Retaining Wall — Type 1 H=32'-36'
- □ B3-3 Retaining Wall — Type 1A
- □ B3-4 Retaining Wall — Type 2
- □ B3-5 Counterfort Retaining Wall — Type 3
- □ B3-6 Counterfort Retaining Wall — Type 4
- □ B3-7 Retaining Wall — Type 5
- □ B3-8 Retaining Wall Details No. 1
- □ B3-9 Retaining Wall Details No. 2
- □ B3-11 Retaining Wall Type 6 — 6' Max.
- □ B6-1 T-Beam Details
- □ B6-10 Utility Openings — T-Beam
- □ B6-21 Joint Seals
- □ B7-1 Box Girder Details
- □ B7-5 Deck Drains
- □ B7-6 Deck Drains — Types D-1 and D-2
- □ B7-10 Utility Opening — Box Girder
- □ B7-11 Utilities Details
- □ B8-5 Cast-in-Place Prestressed Girder Details
- □ B11-7 Chain Link Railing
- ■ B11-30 Temporary Railing (Type K)
- □ B11-47 Cable Railing
- □ B11-51 Tubular Hand Railing
- □ B11-52 Chain Link Railing Type 7
- □ B11-53 Concrete Barrier Type 25
- □ B11-54 Concrete Barrier Type 26
- □ B13-1 Slope Protection Detail No. 1
- □ B13-2 Slope Protection Detail No. 2
- □ B14-1 Structural Steel Plate Vehicular Undercrossing
- □ B14-2 Structural Steel Plate Arches
- □ B14-3 Supply Line and Communication and Sprinkler Control Conduit
- □ B14-4 Supply line

SIGNS, SIGNALS & LIGHTING

OVERHEAD SIGNS — TRUSS

- ■ S1-12 Overhead Signs, Truss, Instructions and Examples
- ■ S2-11 Overhead Signs, Truss, Single Post Type, Post Type II thru VII
- ■ S3-11 Overhead Signs, Truss, Two Post Type, Post Type I-S thru VII-S
- ■ S4-6 Overhead Signs, Truss, Single Post Type, Structural Frame Members
- ■ S5-6 Overhead Signs, Truss, Two Post Type, Structural Fram Members
- ■ S6-6 Overhead Signs, Truss, Structural Frame Details
- ■ S7-8 Overhead Signs, Truss, Frame Juncture Details
- ■ S8B Overhead Signs, Steel Frame Removable Sign Panel Frames
- ■ S8-BA Overhead Formed Panel Details for Mounting on Removable Sign Panel Frames
- □ S8C Overhead Signs, Truss, Sign Panel Mounting Details Laminated Panel, Type A
- ■ S8D Overhead Signs, Truss, Removal Sign Panel Frames 110" and 120" Sign Panels
- ■ S9-12 Overhead Signs, Walkway Details No. 1
- ■ S10-9 Overhead Signs, Walkway Details No. 2
- ■ S11-10 Overhead Signs, Walkway Safety Railing Details
- ■ S13-10 Overhead Signs, Truss, Pile Foundation

OVERHEAD SIGNS — LIGHTWEIGHT

- □ S14 A-5 Overhead Signs, Lightweight, Balanced-Single Steel Post Connection and Mounting Details
- □ S14B-4 Overhead Signs, Lightweight, Balanced-Single Steel Post Details
- □ S15-8 Overhead Signs, Lightweight, Type A, Connection Details
- □ S16-7 Overhead Signs, Lightweight, Type B, Connection Details
- □ S17-8 Overhead Signs, Lightweight, Type C, Connection Details
- □ S18A-8 Overhead Signs, Lightweight, Sign Panel Mounting Details, Laminated Panel, Type A
- □ S18B-7 Overhead Signs, Lightweight, Light Fixture Mounting Details
- □ S20A-7 Overhead Signs, Lightweight, Post Details
- □ S20B-9 Overhead Signs, Lightweight, Foundation

OVERHEAD SIGNS — BOX BEAM CLOSED TRUSS ALTERNATIVE

- □ S39-6 Overhead Signs, Box Beam, Closed Truss Alternative Foundation
- □ S40A-1 Overhead Signs, Box Beam, Closed Truss Alternative Two Post Type Frame Members
- □ S40B-1 Overhead Signs, Box Beam, Closed Truss Alternative, Single and Two Post Type General Frame Details
- □ S40C-1 Overhead Signs, Box Beam, Closed Truss Alternative, Ribbed Sheet Metal Details
- □ S40D-1 Overhead Signs, Box Beam, Closed Truss Alternative, Two Post Type Frame Details
- □ S40E-1 Overhead Signs, Box Beam, Closed Truss Alternative, Two Post Type Frame Juncture Details
- □ S40F-1 Overhead Signs, Box Beam, Closed Truss Alternative, Two Post Type Post Details
- □ S40G-1 Overhead Signs, Box Beam, Closed Truss Alternative, Single Post Type Frame Members
- □ S40H-1 Overhead Signs, Box Beam, Closed Truss Alternative, Single Post Cantilever Frame Details
- □ S40I-1 Overhead Signs, Box Beam, Closed Truss Alternative, Single Post Cantilever Frame Juncture Details
- □ S40J-1 Overhead Signs, Box Beam, Closed Truss Alternative, Single Post Cantilever Post Details
- □ S40K-1 Overhead Signs, Box Beam, Closed Truss Alternative, Single Post Butterfly Frame Details
- □ S40L-3 Overhead Signs, Box Beam, Closed Truss Alternative, Single Post Butterfly Frame Juncture Details
- □ S40M-1 Overhead Signs, Box Beam, Closed Truss Alternative, Single Post Butterfly Post Details

OVERHEAD SIGNS — TUBULAR

- □ S40N Overhead Signs, Tubular, Instructions and Examples
- □ S40P Overhead Signs, Tubular, Single Post Type Layout and Pipe Selection
- □ S40Q Overhead Signs, Tubular, Two Post Type Layout and Pipe Selection
- □ S40R Overhead Signs, Tubular, Structural Frame Details No. 1
- □ S40S Overhead Signs, Tubular, Structural Frame Details No. 2
- □ S40T Overhead Signs, Tubular, Foundation Details

ROADSIDE SIGNS

- ■ S41-3 Roadside Signs, Typical Installation Details No. 1
- ■ S42-15 Roadside Signs, Wood Posts, Typical Installation Details No. 2
- □ S43-A Roadside Signs, Laminated Wood Box Posts, Typical Installation Details No. 3
- □ S43-B Roadside Signs, Steel Post, Typical Installation Details
- □ S44-7 Roadside Signs, Typical Installation Details No. 4

SIGNAL AND LIGHTING DETAILS

- ■ ES-1A Signal and Lighting Details, Symbols and Abbreviations
- ■ ES-1B Signal and Lighting Details, Symbols and Abbreviations
- ■ ES-2A Signal and Lighting Details, Service Equipment
- □ ES-2B Signal and Lighting Details, Service Equipment
- ■ ES-2C Signal and Lighting Details, Service Equipment
- □ ES-2D Signal and Lighting Details, Service Equipment
- ■ ES-2E Signal and Lighting Details, Service Equipment and Typical Wiring Diagram
- □ ES-3A Signal and Lighting Details, Signal Heads and Mountings
- □ ES-3B Signal and Lighting Details, Signal Heads and Mountings
- □ ES-3C Signal and Lighting Details, Signal Heads and Mounting
- □ ES-3D Signal and Lighting Details, Signal Heads and Mountings
- □ ES-3E Signal and Lighting Details, Signal Heads and Mountings
- ■ ES-4A Signal and Lighting Details, Controller Cabinet Details
- ■ ES-4B Signal and Lighting Details, Controller Cabinet Details
- □ ES-4C Signal and Lighting Details, Controller Cabinet Details
- ■ ES-5A Signal and Lighting Details, Detectors
- ■ ES-5B Signal and Lighting Details, Detectors
- □ ES-5C Signal and Lighting Details, Detectors
- □ ES-5D Signal and Lighting Details, Detectors
- □ ES-5E Signal and Lighting Details, Detectors
- □ ES-5F Signal and Lighting Details, Pedestrian Barricades
- ■ ES-6A Signal and Lighting Standards, Type 1 Standards and Pushbutton Posts
- □ ES-6B Lighting Standards, Types 15 and 21
- ■ ES-6D Lighting Standards, Types 30 and 31
- □ ES-6DA Lighting Standards, Type 32
- ■ ES-6E Lighting Standards, Types 30 and 31, Base Plate Details
- □ ES-6F 10 Degree Lighting Standards
- □ ES-6H 10 Degree Lighting Standards Details
- □ ES-6J Signal and Lighting Standards Case 1 Arm Loading, Wind Velocity = 70 MPH Arm Lengths 15' to 30'
- □ ES-6K Signal and Lighting Standards Case 2 Arm Loading, Wind Velocity = 70 MPH Arm Lengths 20' to 30'
- □ RD-6L Signal and Lighting Standards Case 3 Arm Loading, Wind Velocity = 70 MPH Arm Lengths 20' to 45'
- □ ES-6M Signal and Lighting Standards Case 4 Arm Loading, Wind Velocity = 70 MPH Arm Lengths 25' to 45'
- □ ES-6MA Signal and Lighting Standards Case 5 Arm Loading, Wind Velocity = 70 MPH Arm Lengths 50' to 55'
- □ ES-6N Signal and Lighting Standards Type 40-0-80
- □ ES-6O Signal and Lighting Standards Case 1 Arm Loading, Wind Velocity = 80 MPH Arm Lengths 25' to 30'
- □ ES-6P Signal and Lighting Standards Case 2 Arm Loading, Wind Velocity = 80 MPH Arm Lengths 20' to 30'
- □ ES-6Q Signal and Lighting Standards Case 3 Arm Loading, Wind Velocity = 80 MPH Arm Lengths 20' to 45'
- □ ES-6R Signal and Lighting Standards Case 4 Arm Loading, Wind Velocity = 80 MPH Arm Lengths 25' to 45'
- □ ES-6RA Signal and Lighting Standards Case 5 Arm Loading, Wind Velocity = 80 MPH Arm Lengths 50' to 55'
- □ ES-6S Signal and Lighting Standards Details No. 1
- □ ES-6T Signal and Lighting Standards Details No. 2
- □ ES-6U Slip Base Insert for Type 10 and 15 Lighting Standards
- □ ES-6V Left Turn Signal and Sign Standard Type 30
- □ ES-7A Signal and Lighting Details, Electrical Details Structure Installations
- □ ES-7B Signal and Lighting Details, Electrical Details Structure Installations
- □ ES-7C Signal and Lighting Details, Electrical Details Structure Installations
- □ ES-7D Signal and Lighting Details, Electrical Details Structure Installations
- □ ES-7E Signal and Lighting Details, Electrical Details Structure Installations
- □ ES-7F Signal and Lighting Details, Electrical Details Structure Installations
- ■ ES-8 Signal and Lighting Details, Pull Box Details
- □ ES-9A Cantilever Flashing Beacon Details, Types 9, 9A, 9B
- □ ES-9B Cantilever Flashing Beacon Details, Types 9, 9A, 9B
- ■ ES-10 Signal and Lighting Details, Isolux Diagrams
- ■ ES-11 Signal and Lighting Details, Foundation Installations
- □ ES-12 Pedestrian Undercrossing Fluorescent Lighting Fixture
- ■ ES-13 Signal and Lighting Details, Splicing Details
- □ ES-14 Signal and Lighting Details, Wiring Details and Fuse Ratings
- □ ES-15 Pedestrian Overcrossing Fluorescent Lighting Fixture

EXTINGUISHABLE MESSAGE SIGN

- □ ES-27A Extinguishable Message Sign, 10" Letters
- □ ES-27B Extinguishable Message Sign, 10" Letters
- □ ES-28 Extinguishable Message Sign and Flashing Beacons

SIGN LIGHTING DETAILS

- ■ ES-29 Mercury Sign Lighting Equipment
- □ ES-30 36" Fluorescent Sign Lighting Equipment
- ■ ES-32A Sign Lighting Equipment
- ■ ES-32B Signal and Lighting Details, Sign Lighting Control
- □ ES-33 Internally Illuminated Street Name Sign

REDUCED PLAN
USE SCALE BELOW
0 1 2 3
3 INCHES ON ORIGINAL PLAN

STANDARD PLANS LIST

(January, 1988 Edition)

The Standard Plan sheets indicated by a marked box are applicable to this CONTRACT NO. 04-437414

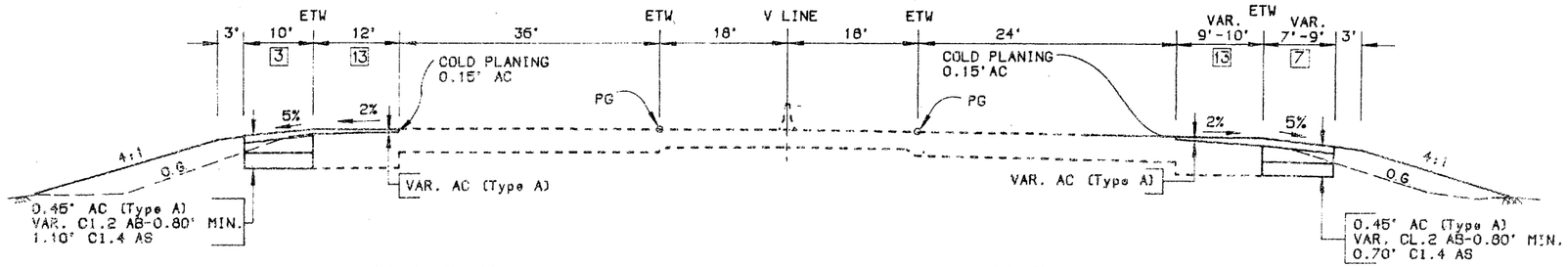
DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
04	SCI	101	30.5/35.0	2	239

REGISTERED CIVIL ENGINEER

8-1-88
PLANS APPROVAL DATE

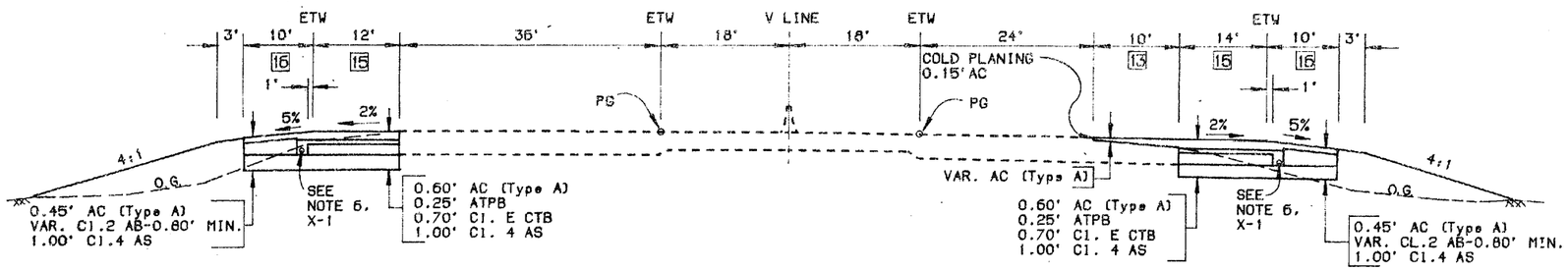
REGISTERED PROFESSIONAL ENGINEER R. K. TANAKA No. 23233 Exp. 12-31-89 CIVIL STATE OF CALIFORNIA

MARK THOMAS & CO., INC.
90 ARCHER STREET
SAN JOSE, CA 95112



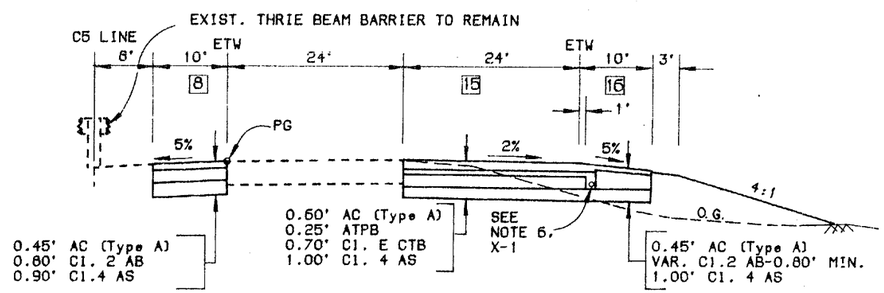
NORTHBOUND
STA. "V" 71+00 TO 74+78

SOUTHBOUND
STA. "V" 96+99 TO 97+26

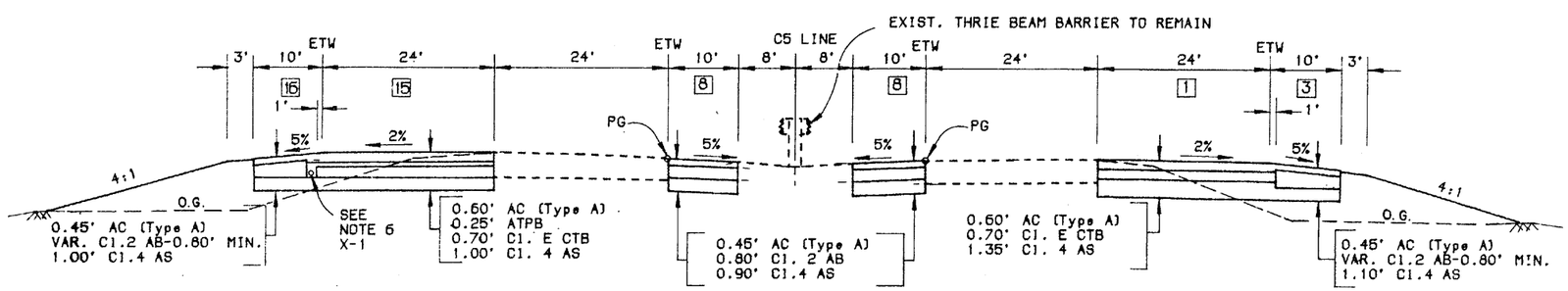


NORTHBOUND
STA. "V" 69+00 TO 71+00

SOUTHBOUND
STA. "V" 69+00 TO 70+83



SOUTHBOUND
STA. "C5" 55+00 TO 69+00



NORTHBOUND
STA. "C5" 49+00 TO 69+00

SOUTHBOUND
STA. "C5" 49+10 TO 55+00

NOTES:

1. DIMENSIONS OF THE STRUCTURAL SECTIONS ARE SUBJECT TO THE TOLERANCES SPECIFIED IN THE STANDARD SPECIFICATIONS.
2. SUPERELEVATION AS SHOWN OR AS DIRECTED BY THE ENGINEER.
3. FOR LOCATIONS OF OUTSIDE WIDENING C5 215+35 TO 277+00, REFER TO LAYOUT SHEETS
4. SEE DETAIL ON SHEET X-6 FOR DIKE LOCATION AND GRADING THROUGH TULLY ROAD AND CAPITOL EXPRESSWAY INTERCHANGE AREAS.
5. FOR LOCATIONS AND TYPES OF CURBS AND DIKES, REFER TO LAYOUT SHEETS
6. FOR LOCATIONS OF EDGE DRAINS, SEE DRAINAGE PLANS. FOR EDGE DRAIN DETAIL, SEE SHEET X-6.

ABBREVIATIONS/LEGEND

No STRUCTURAL SECTION

REDUCED PLAN
USE SCALE BELOW
0 1 2 3
3 INCHES ON ORIGINAL PLAN

TYPICAL CROSS SECTIONS

NO SCALE

X-1

PROJECT DEVELOPMENT
DENNIS BOSLER
CHECKED BY
DATE REVISED

DC-OE-82-PF (REV. 1/86)

FOR REDUCED PLANS
ORIGINAL SCALE IS IN INCHES 0 1 2 3

CU 04283

EA 437411

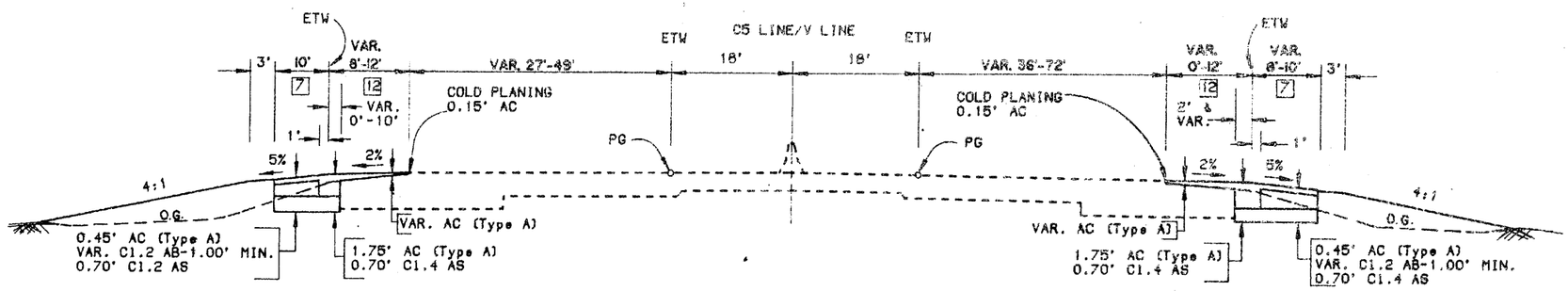
DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
04	SCI	101	30.5/35.0	3	239

REGISTERED CIVIL ENGINEER

9-1-88
PLANS APPROVAL DATE

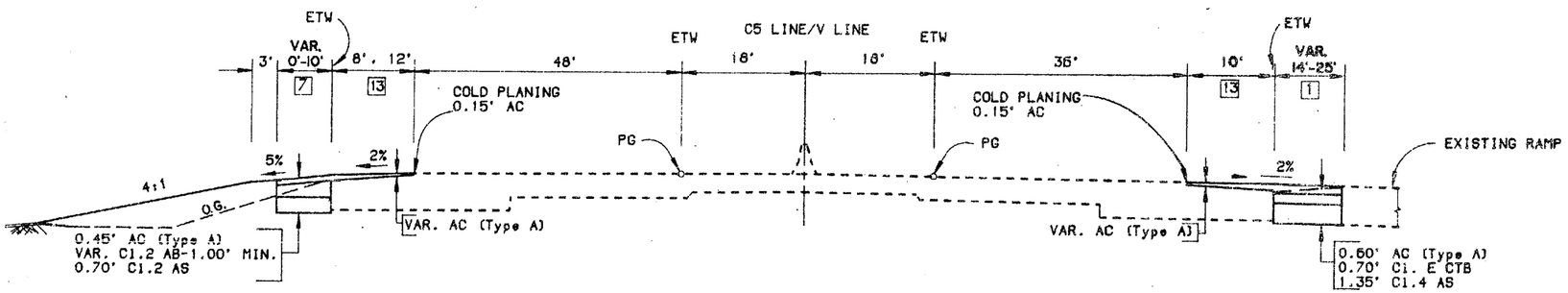
REGISTERED PROFESSIONAL ENGINEER R. K. TANAKA No. 23233 Exp. 12-31-89 CIVIL STATE OF CALIFORNIA

MARK THOMAS & CO., INC.
90 ARCHER STREET
SAN JOSE, CA 95112



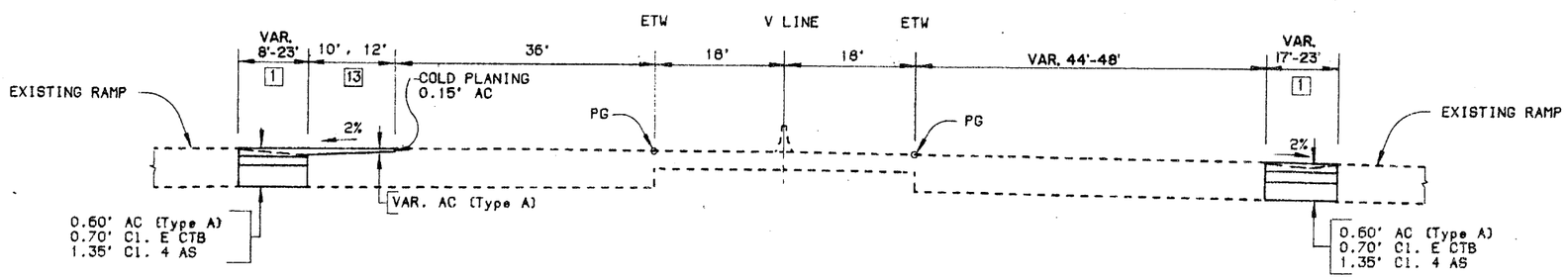
NORTHBOUND
STA. "V" 81+75 TO 86+96

SOUTHBOUND
STA. "V" 97+26 TO "C5" 126+56
STA. "C5" 129+28 TO 149+90



NORTHBOUND
STA. "V" 78+75 TO 81+75
STA. "C5" 112+36 TO 124+32

SOUTHBOUND
STA. "C5" 128+00 TO 129+28



NORTHBOUND
STA. "V" 74+78 TO 77+19
STA. "V" 86+96 TO 90+53

SOUTHBOUND
STA. "V" 84+28 TO 87+50

REDUCED PLAN
USE SCALE BELOW
0 1 2 3
3 INCHES ON ORIGINAL PLAN

TYPICAL CROSS SECTIONS

NO SCALE

X-2

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans PROJECT DEVELOPMENT

PROJECT ENGINEER: DENNIS BOSLER

DATE	REVISED BY	DATE REVISED

CALCULATED/DESIGNED BY
CHECKED BY

FORM DC-OE-92-PF (REV. 1/88)

FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 1 2 3

CU 04283 | EA 437411

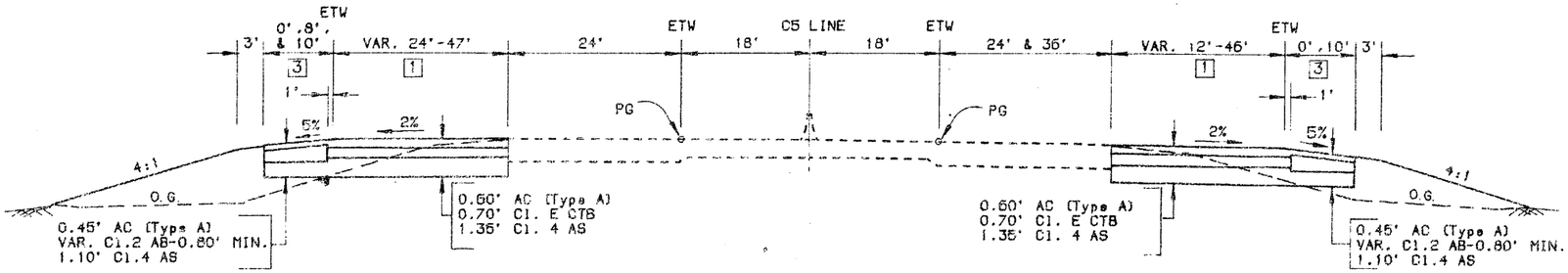
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO	TOTAL SHEETS
04	SCI	101	30.5/35.0	4	239

REGISTERED CIVIL ENGINEER

8-1-88
PLANS APPROVAL DATE

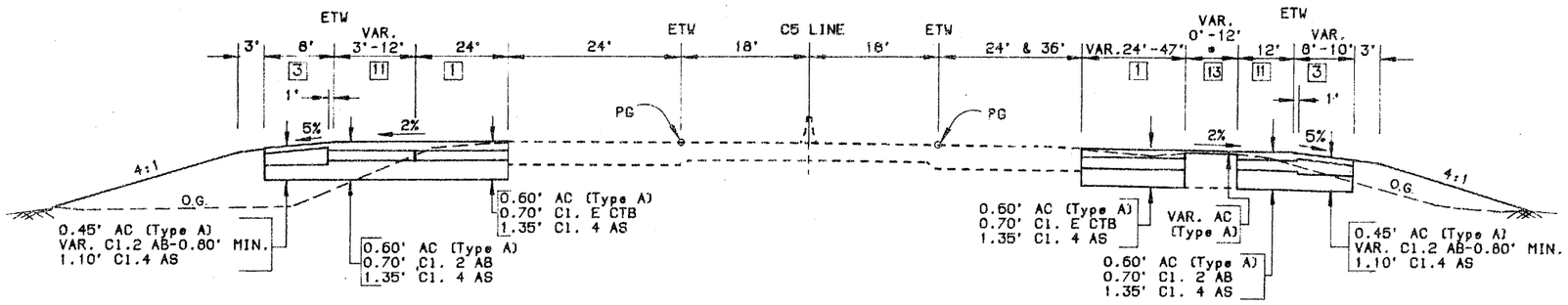
REGISTERED PROFESSIONAL ENGINEER R. K. TANAKA No. 23233 Exp. 12-31-89 CIVIL STATE OF CALIFORNIA

MARK THOMAS & CO., INC.
90 ARCHER STREET
SAN JOSE, CA 95112



NORTHBOUND
STA. "C5" 134+50 TO 141+20
STA. "C5" 157+12 TO 160+11
STA. "C5" 198+22 TO 215+35

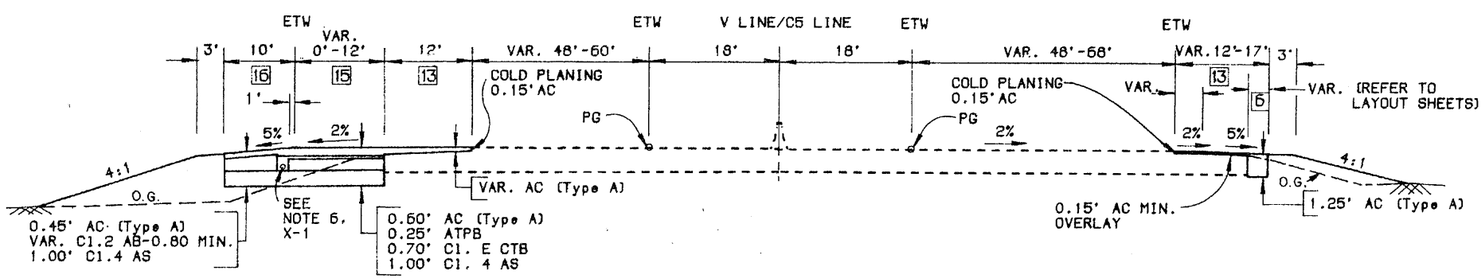
SOUTHBOUND
STA. "C5" 149+90 TO 160+34



NORTHBOUND
STA. "C5" 129+67 TO 134+50

SOUTHBOUND
STA. "C5" 196+63 TO 201+40

• SECTIONS 13 FROM "C5" 196+63 TO 198+20 ONLY.



NORTHBOUND
STA. "V" 94+08 TO "C5" 112+36

SOUTHBOUND
STA. "V" 92+90 TO 96+99

REDUCED PLAN
USE SCALE BELOW
0 1 2 3
3 INCHES ON ORIGINAL PLAN

TYPICAL CROSS SECTIONS

NO SCALE

X-3

PROJECT DEVELOPMENT

DATE REVISED

CHECKED BY

DESIGNED BY

2-OE-92-PF (REV. 1/86)

FOR REDUCED PLANS
ORIGINAL SCALE IS IN INCHES 0 1 2 3

CU 04283

EA 437411

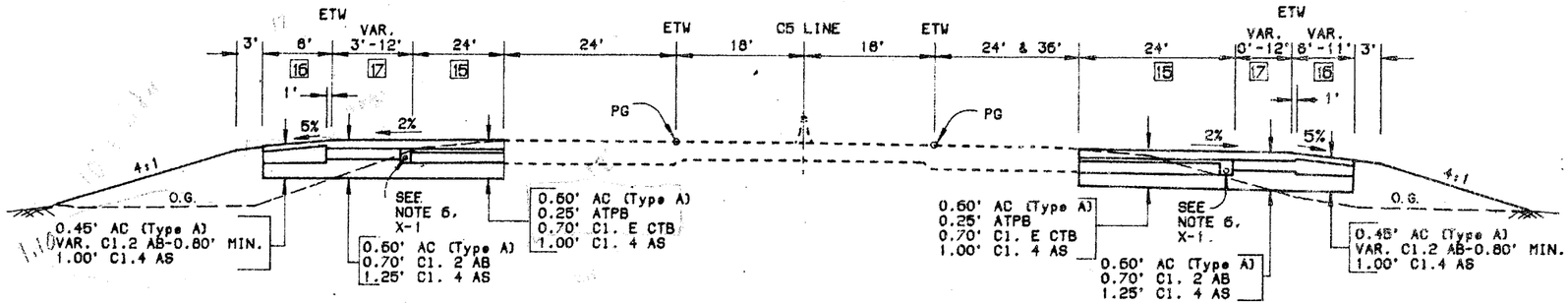
DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
04	SCI	101	30.5/35.0	5	239

REGISTERED CIVIL ENGINEER

8-1-88
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER R. K. TANAKA No. 23233 Exp. 12-31-89 CIVIL STATE OF CALIFORNIA

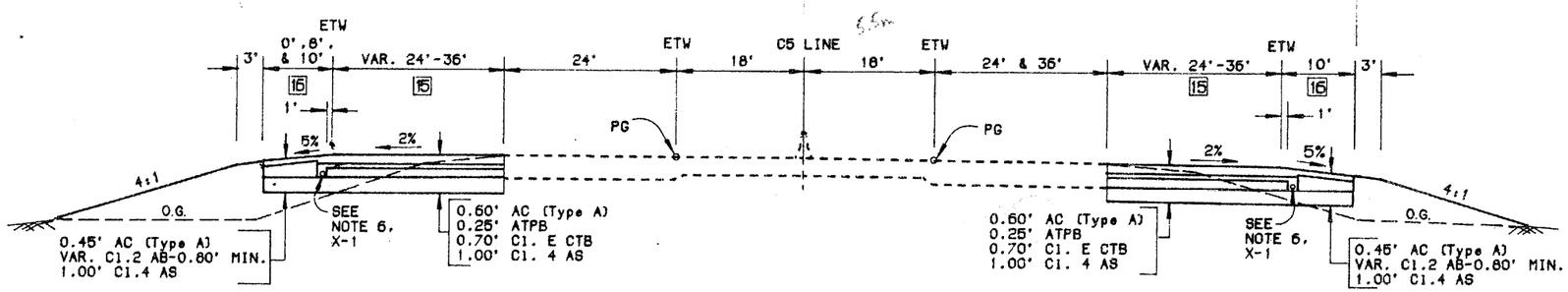
MARK THOMAS & CO., INC.
90 ARCHER STREET
SAN JOSE, CA 95112



NORTHBOUND
STA. "C5" 193+74 TO 198+22

SOUTHBOUND
STA. "C5" 160+34 TO 164+85

REDUCED PLAN
USE SCALE BELOW
0 1 2 3
3 INCHES ON ORIGINAL PLAN



NORTHBOUND
STA. "C5" 141+20 TO 157+12
STA. "C5" 160+11 TO 193+74

SOUTHBOUND
STA. "C5" 164+85 TO 196+53
STA. "C5" 201+40 TO 215+35

TYPICAL CROSS SECTIONS

NO SCALE

X-4

DATE	REVISED BY	DATE REVISED

CALCULATED/DESIGNED BY
CHECKED BY

PROJECT ENGINEER
DENNIS BOSLER

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans
PROJECT DEVELOPMENT

FORM DC-OE-92-PF (REV. 1/86)

FOR REDUCED PLANS
ORIGINAL SCALE IS IN INCHES 0 1 2 3

CU 04283

EA 437411

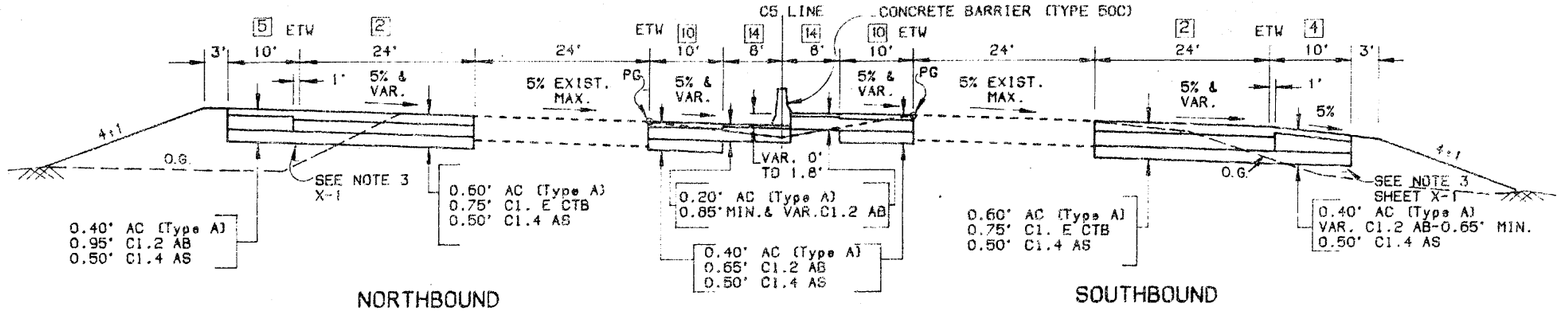
DIST	COUNTY	ROUTE	TOTAL PROJECT	NO	SHEETS
04	SCI	101	30.5/35.0	6	239

REGISTERED CIVIL ENGINEER

8-1-88
PLANS APPROVAL DATE

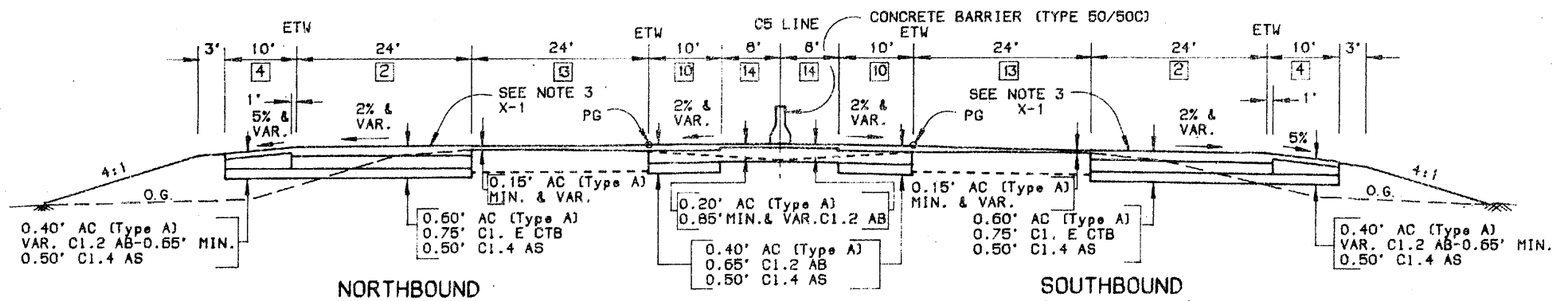
R. K. TANAKA
No. 23233
Exp. 12-31-89
CIVIL
REGISTERED PROFESSIONAL ENGINEER
STATE OF CALIFORNIA

MARK THOMAS & CO., INC.
90 ARCHER STREET
SAN JOSE, CA 95112



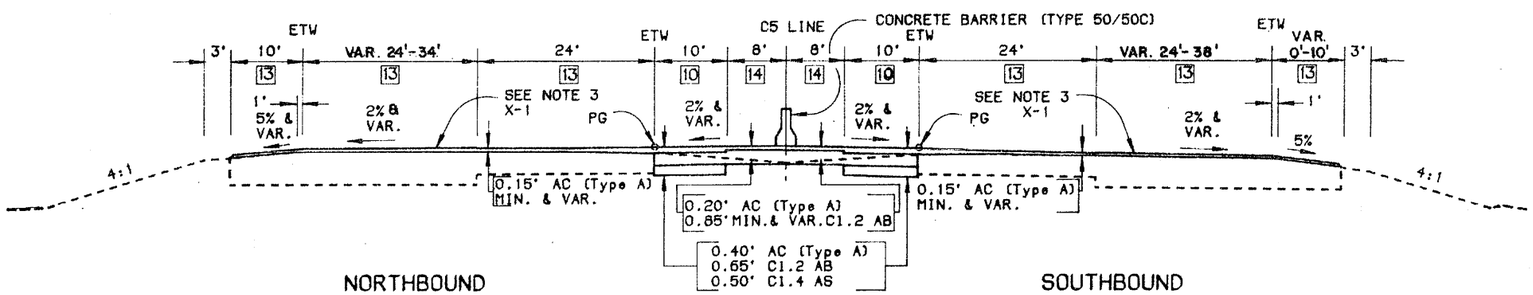
NORTHBOUND
STA. "C5" 236+50 TO 256+00

SOUTHBOUND
STA. "C5" 236+50 TO 256+00



NORTHBOUND
STA. "C5" 233+00 TO 236+50
STA. "C5" 266+10 TO 277+00

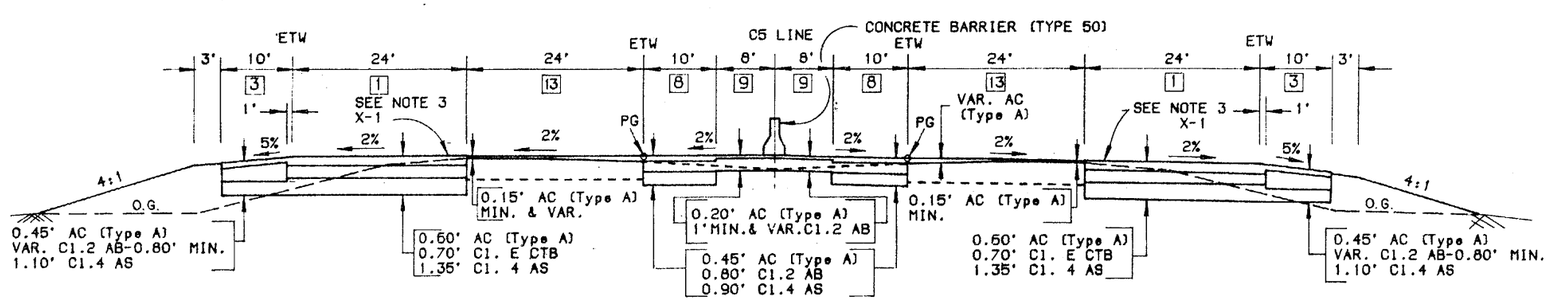
SOUTHBOUND
STA. "C5" 256+00 TO 260+00



NORTHBOUND
STA. "C5" 222+00 TO 233+00
STA. "C5" 256+00 TO 266+10

(SEE NOTE 2 THIS SHEET.)

SOUTHBOUND
STA. "C5" 232+00 TO 236+50
STA. "C5" 260+00 TO 277+00



NORTHBOUND
STA. "C5" 215+35 TO 222+00

(SEE NOTE 1 THIS SHEET.)

SOUTHBOUND
STA. "C5" 215+35 TO 232+00

REDUCED PLAN
USE SCALE BELOW
0 1 2 3
3 INCHES ON original PLAN

1. MEDIAN SECTION APPLIES C5 215+35 TO 232+00.
2. MEDIAN SECTION APPLIES C5 232+00 TO 277+00.

TYPICAL CROSS SECTIONS

NO SCALE

X-5

DATE REVISED
CHECKED BY
DENNIS BOSLER
PROJECT DEVELOPMENT
STATE OF CALIFORNIA

FOR REDUCED PLANS
ORIGINAL SCALE IS IN INCHES 0 1 2 3

CU 04283
EA 437411

DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
04	SCI	101	30.5/35.0	7	239

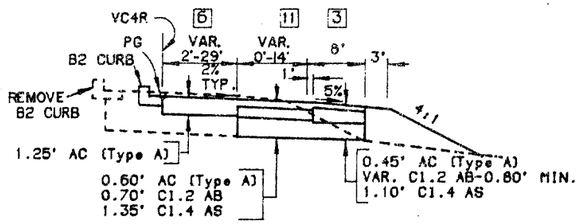
REGISTERED CIVIL ENGINEER

8-1-88
PLANS APPROVAL DATE

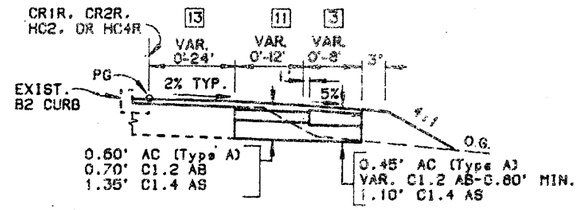
R.K. TANAKA No. 23233 Exp. 12-31-89 CIVIL — REGISTERED PROFESSIONAL ENGINEER — STATE OF CALIFORNIA

MARK THOMAS & CO., INC.
90 ARCHER STREET
SAN JOSE, CA 95112

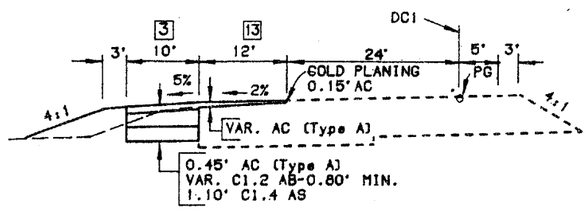
REDUCED PLAN
USE SCALE BELOW
0 1 2 3
3 INCHES ON ORIGINAL PLAN



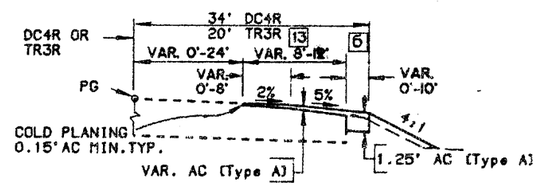
VC4R



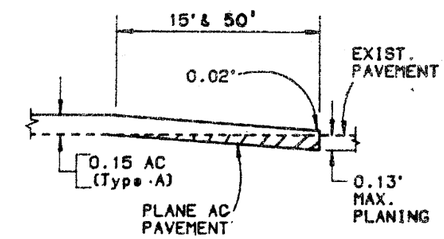
CR1, CR1R, CR2R, HC2, HC4R, & HC4



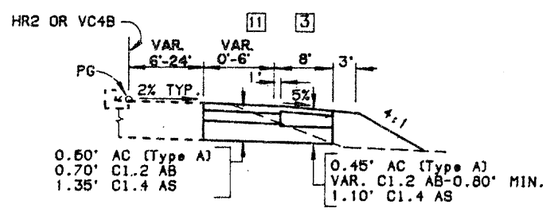
DC1



DC4R & TR3R

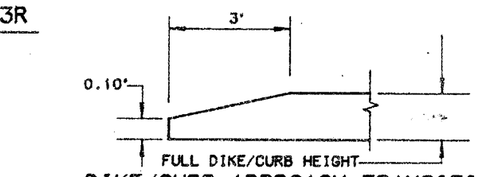


PAVEMENT TRANSITION - CONFORM

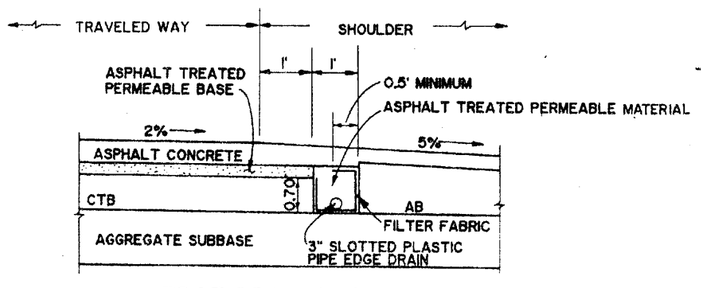


HR2 & VC4B

RAMPS



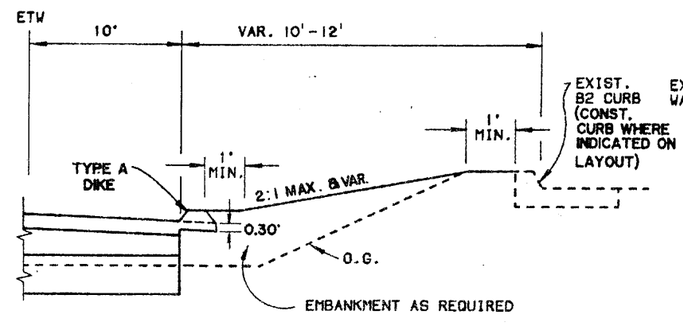
DIKE/CURB APPROACH TRANSITION



EDGE DRAIN DETAIL

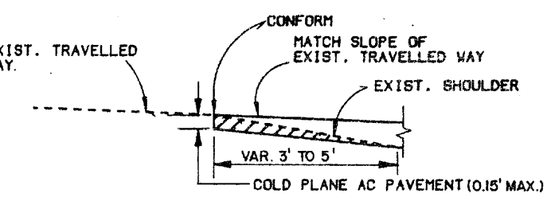
(NO SCALE)

For details not shown, refer to Std. Detail D98 D-1, Type 5



TYPE A DIKE AT TULLY ROAD & CAPITOL EXPRESSWAY INTERCHANGE AREAS

(NO SCALE)



PAVEMENT PLANING

TYPICAL CROSS SECTIONS

NO. SCALE

X-6

STATE OF CALIFORNIA . DEPARTMENT OF TRANSPORTATION
Caltrans
PROJECT DEVELOPMENT

PROJECT ENGINEER DENNIS BOSLER

CALCULATED/DESIGNED BY | CHECKED BY | DATE | REVISED BY | DATE REVISED

APPENDIX D

PARIKH CONSULTANTS, INC. GEOTECHNICAL CONSULTANTS MATERIALS TESTING	US 101 IMPROVEMENTS FROM I-280/680 TO YERBA BUENA ROAD SANTA CLARA COUNTY, SAN JOSE, CA	
	JOB NO.: 207150.GDR	PLATE NO.: D1

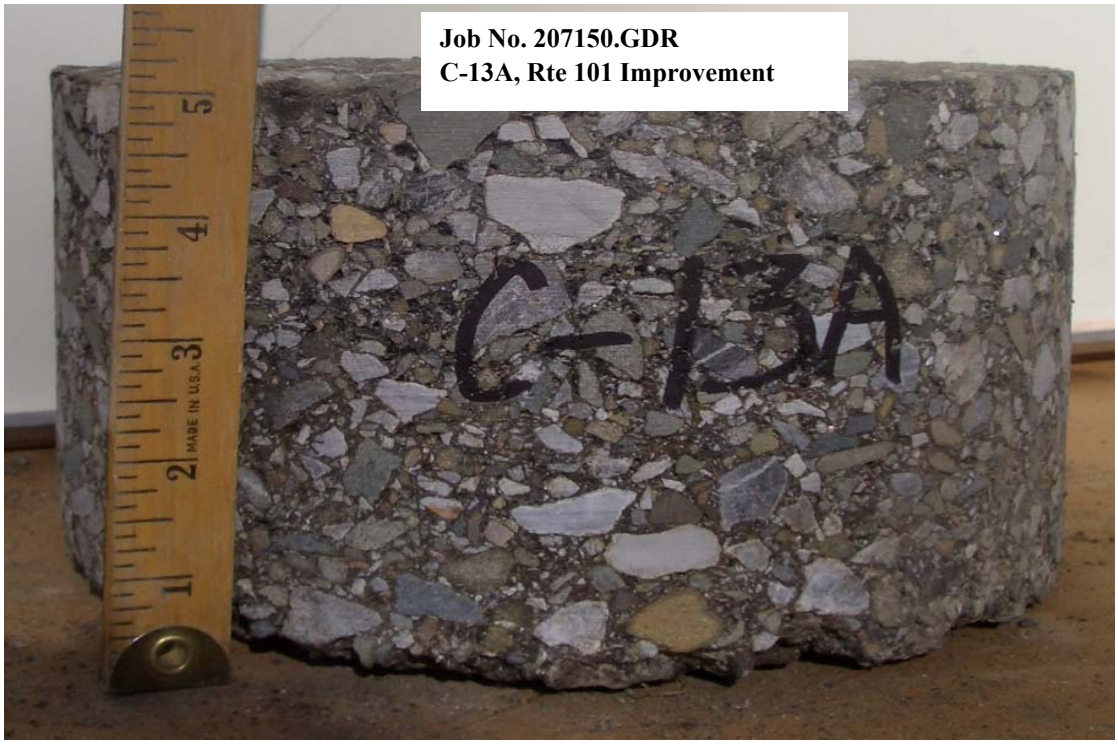
PARIKH CONSULTANTS, INC. GEOTECHNICAL CONSULTANTS MATERIALS TESTING	US 101 IMPROVEMENTS FROM I-280/680 TO YERBA BUENA ROAD SANTA CLARA COUNTY, SAN JOSE, CA	
	JOB NO.: 207150.GDR	PLATE NO.: D2

PARIKH CONSULTANTS, INC. GEOTECHNICAL CONSULTANTS MATERIALS TESTING	US 101 IMPROVEMENTS FROM I-280/680 TO YERBA BUENA ROAD SANTA CLARA COUNTY, SAN JOSE, CA	
	JOB NO.: 207150.GDR	PLATE NO.: D3

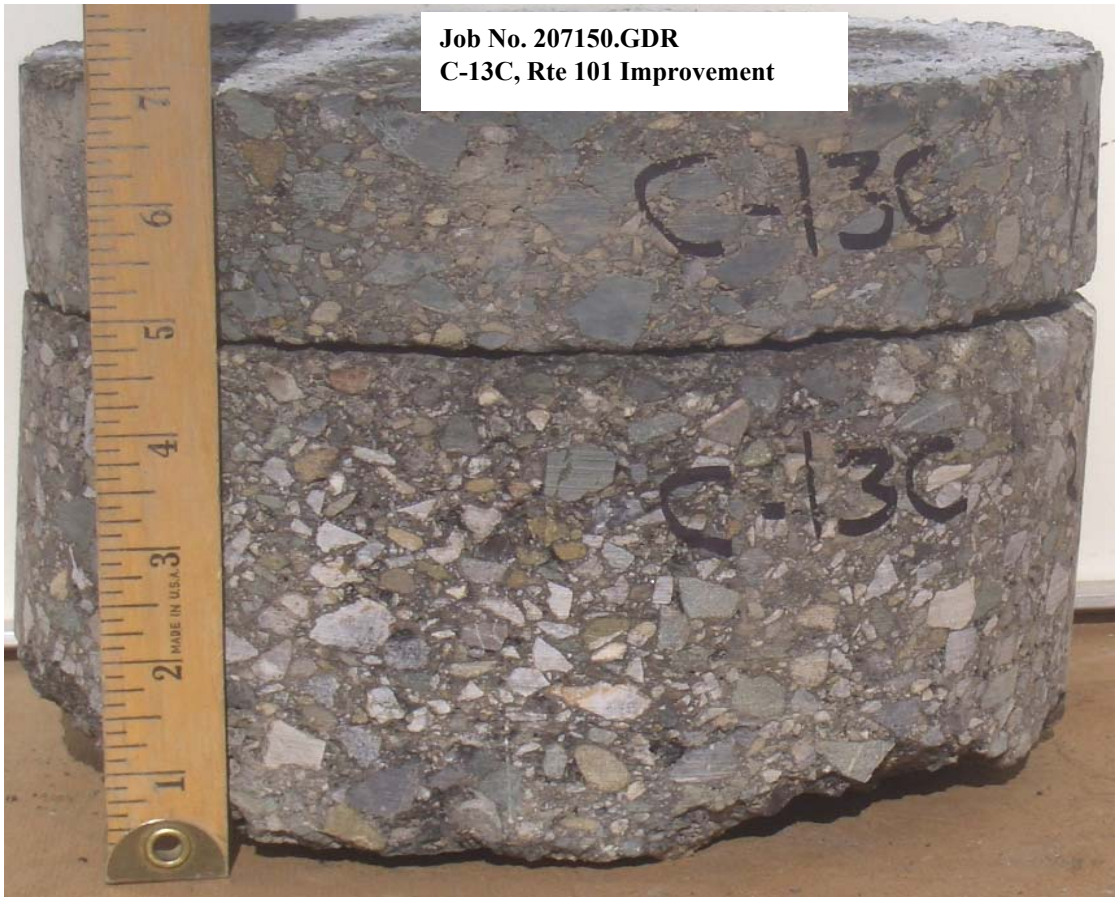
PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS TESTING

US 101 IMPROVEMENTS
FROM I-280/680 TO YERBA BUENA ROAD
SANTA CLARA COUNTY, SAN JOSE, CA

JOB NO.: 207150.GDR | PLATE NO.: D4



PARIKH CONSULTANTS, INC. GEOTECHNICAL CONSULTANTS MATERIALS TESTING	US 101 IMPROVEMENTS FROM I-280/680 TO YERBA BUENA ROAD SANTA CLARA COUNTY, SAN JOSE, CA	
	JOB NO.: 207150.GDR	PLATE NO.: D5



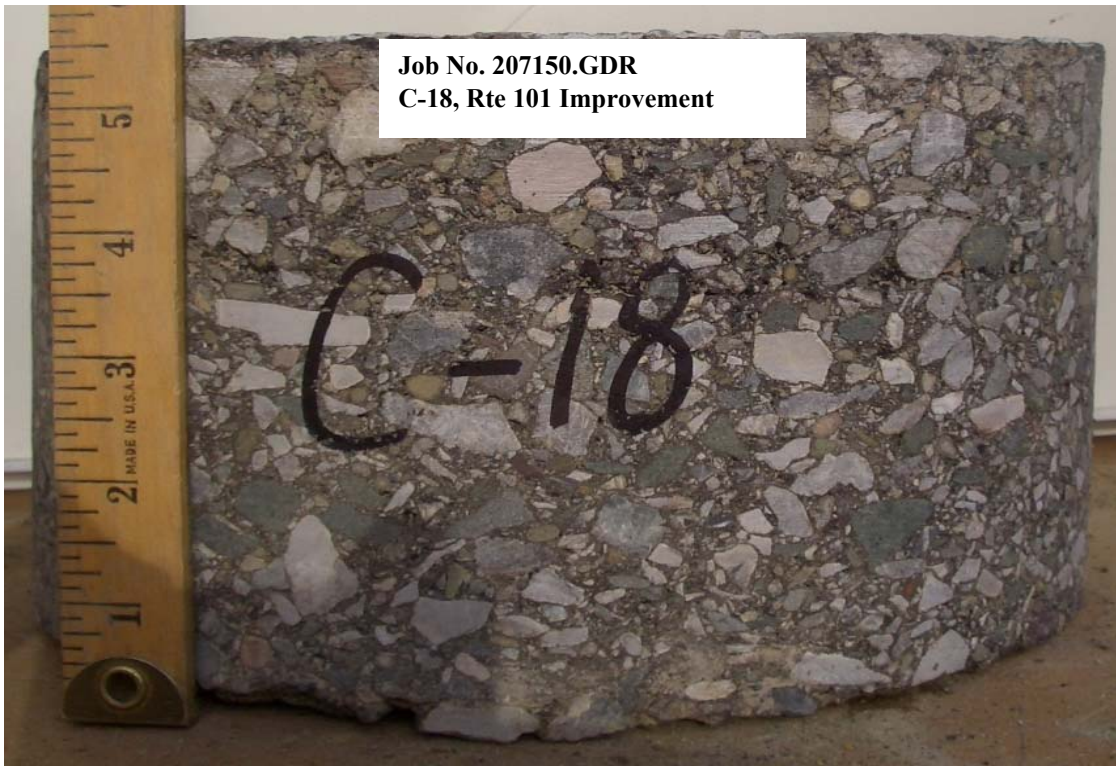
PARIKH CONSULTANTS, INC. GEOTECHNICAL CONSULTANTS MATERIALS TESTING	US 101 IMPROVEMENTS FROM I-280/680 TO YERBA BUENA ROAD SANTA CLARA COUNTY, SAN JOSE, CA	
	JOB NO.: 207150.GDR	PLATE NO.: D6

PARIKH CONSULTANTS, INC. GEOTECHNICAL CONSULTANTS MATERIALS TESTING	US 101 IMPROVEMENTS FROM I-280/680 TO YERBA BUENA ROAD SANTA CLARA COUNTY, SAN JOSE, CA	
	JOB NO.: 207150.GDR	PLATE NO.: D7

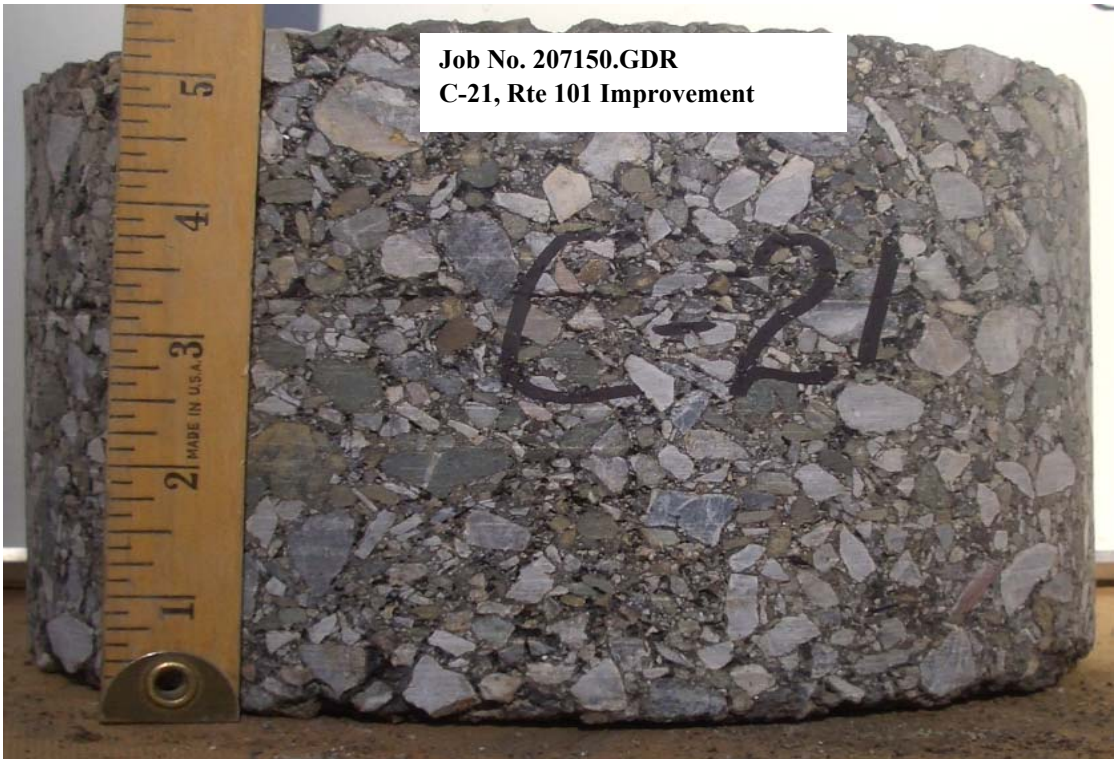
PARIKH CONSULTANTS, INC. GEOTECHNICAL CONSULTANTS MATERIALS TESTING	US 101 IMPROVEMENTS FROM I-280/680 TO YERBA BUENA ROAD SANTA CLARA COUNTY, SAN JOSE, CA	
	JOB NO.: 207150.GDR	PLATE NO.: D8

PARIKH CONSULTANTS, INC. GEOTECHNICAL CONSULTANTS MATERIALS TESTING	US 101 IMPROVEMENTS FROM I-280/680 TO YERBA BUENA ROAD SANTA CLARA COUNTY, SAN JOSE, CA	
	JOB NO.: 207150.GDR	PLATE NO.: D9

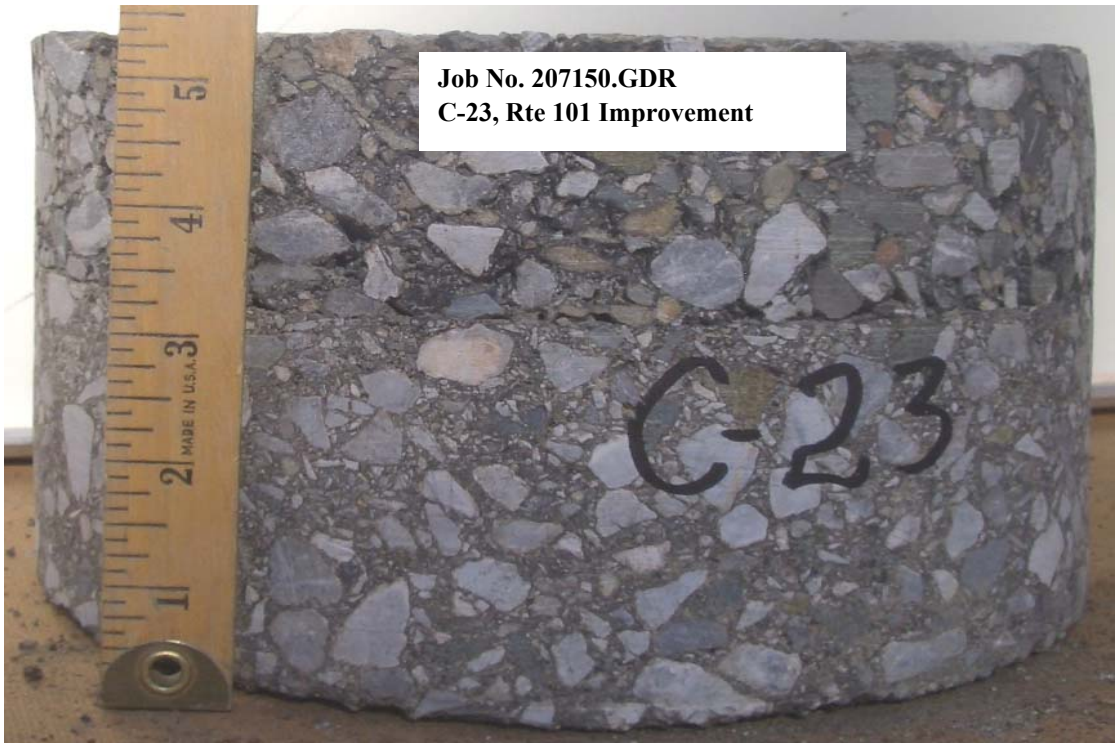
PARIKH CONSULTANTS, INC. GEOTECHNICAL CONSULTANTS MATERIALS TESTING	US 101 IMPROVEMENTS FROM I-280/680 TO YERBA BUENA ROAD SANTA CLARA COUNTY, SAN JOSE, CA	
	JOB NO.: 207150.GDR	PLATE NO.: D10

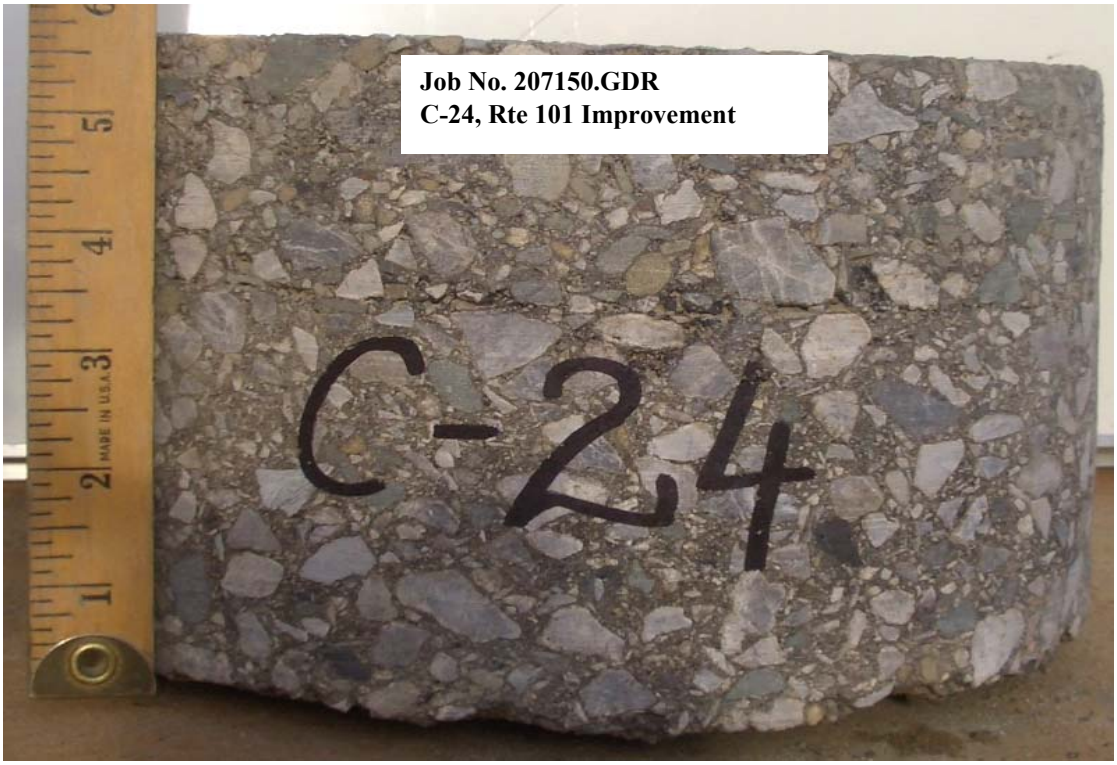


PARIKH CONSULTANTS, INC. GEOTECHNICAL CONSULTANTS MATERIALS TESTING	US 101 IMPROVEMENTS FROM I-280/680 TO YERBA BUENA ROAD SANTA CLARA COUNTY, SAN JOSE, CA	
	JOB NO.: 207150.GDR	PLATE NO.: D11

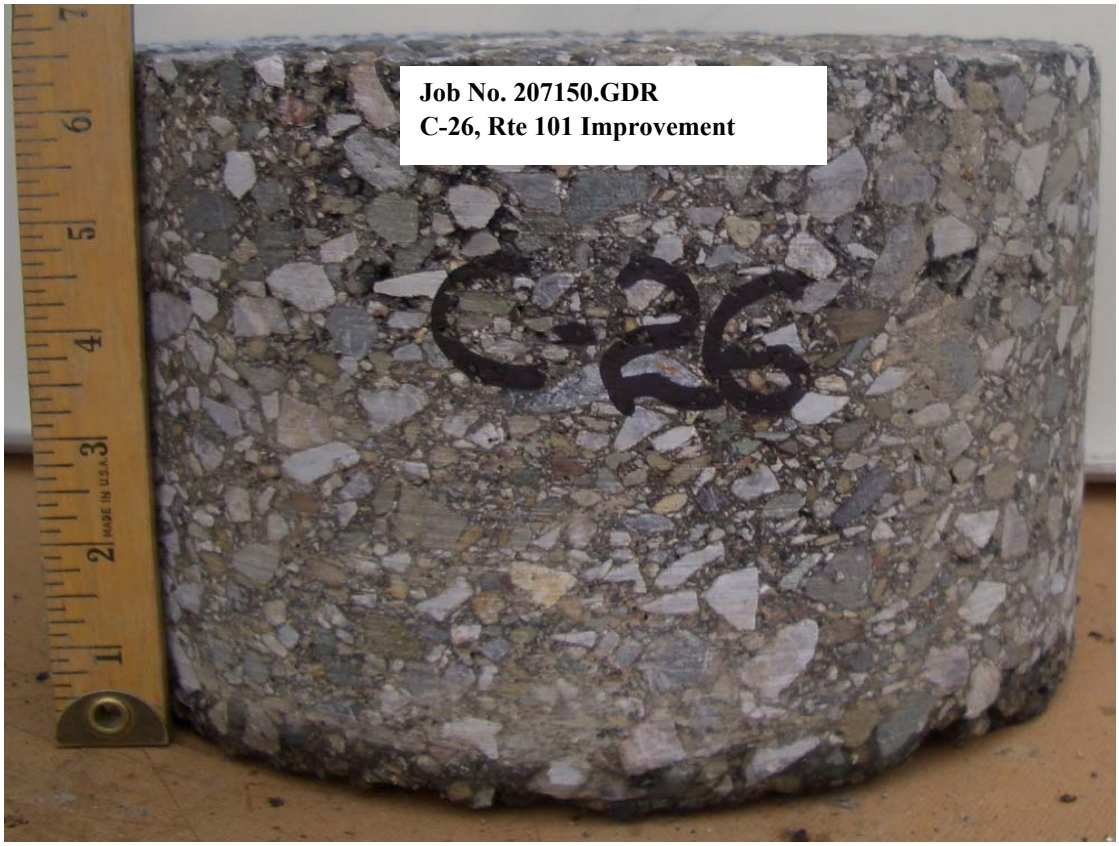


PARIKH CONSULTANTS, INC. GEOTECHNICAL CONSULTANTS MATERIALS TESTING	US 101 IMPROVEMENTS FROM I-280/680 TO YERBA BUENA ROAD SANTA CLARA COUNTY, SAN JOSE, CA	
	JOB NO.: 207150.GDR	PLATE NO.: D12

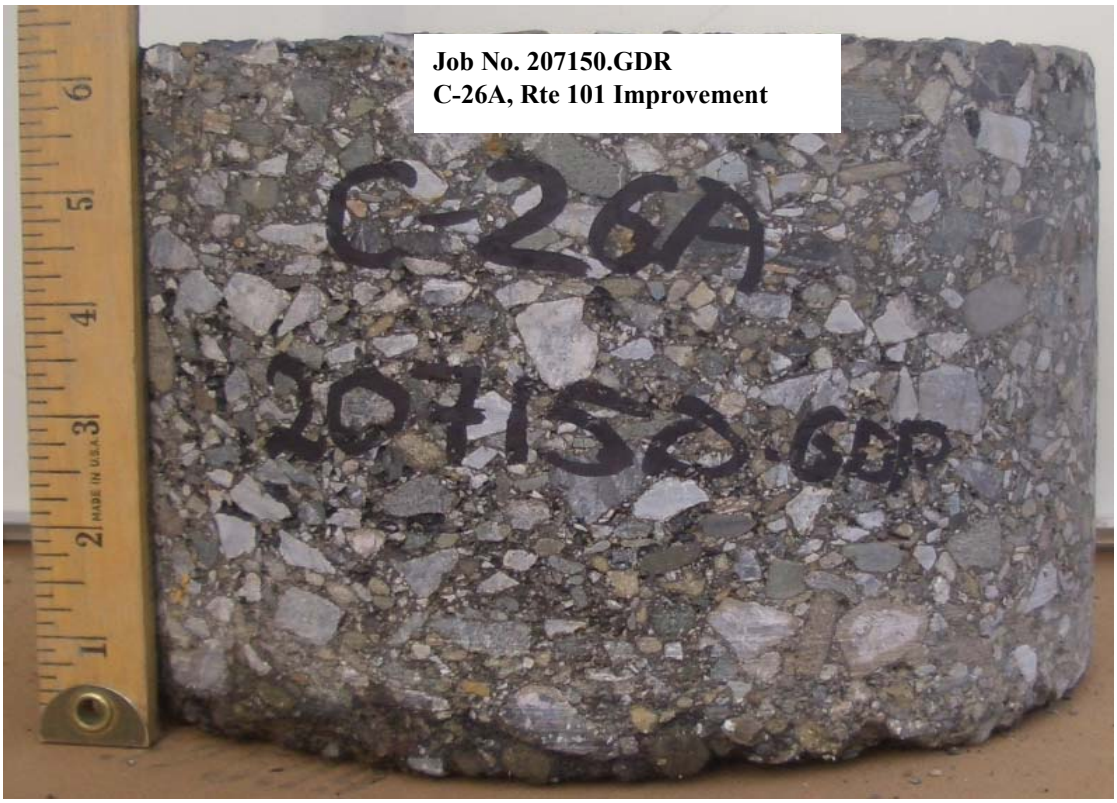




PARIKH CONSULTANTS, INC. GEOTECHNICAL CONSULTANTS MATERIALS TESTING	US 101 IMPROVEMENTS FROM I-280/680 TO YERBA BUENA ROAD SANTA CLARA COUNTY, SAN JOSE, CA	
	JOB NO.: 207150.GDR	PLATE NO.: D13



PARIKH CONSULTANTS, INC. GEOTECHNICAL CONSULTANTS MATERIALS TESTING	US 101 IMPROVEMENTS FROM I-280/680 TO YERBA BUENA ROAD SANTA CLARA COUNTY, SAN JOSE, CA	
	JOB NO.: 207150.GDR	PLATE NO.: D14



PARIKH CONSULTANTS, INC. GEOTECHNICAL CONSULTANTS MATERIALS TESTING	US 101 IMPROVEMENTS FROM I-280/680 TO YERBA BUENA ROAD SANTA CLARA COUNTY, SAN JOSE, CA	
	JOB NO.: 207150.GDR	PLATE NO.: D15

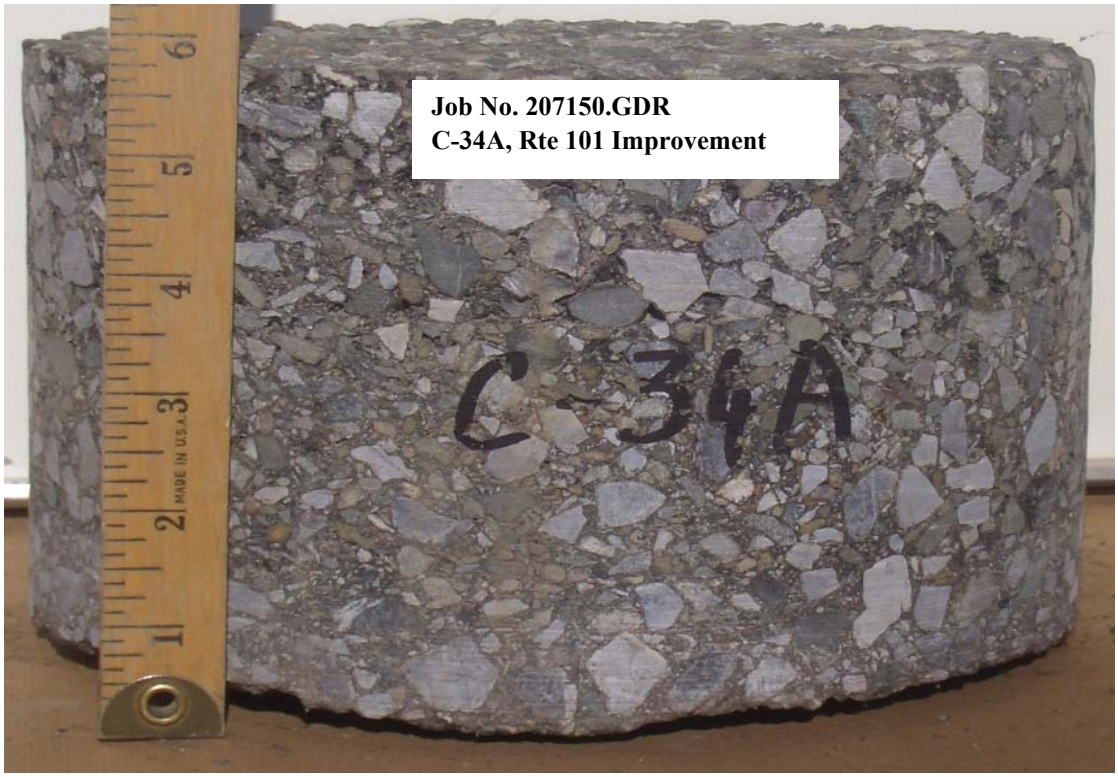
PARIKH CONSULTANTS, INC. GEOTECHNICAL CONSULTANTS MATERIALS TESTING	US 101 IMPROVEMENTS FROM I-280/680 TO YERBA BUENA ROAD SANTA CLARA COUNTY, SAN JOSE, CA	
	JOB NO.: 207150.GDR	PLATE NO.: D16

PARIKH CONSULTANTS, INC. GEOTECHNICAL CONSULTANTS MATERIALS TESTING	US 101 IMPROVEMENTS FROM I-280/680 TO YERBA BUENA ROAD SANTA CLARA COUNTY, SAN JOSE, CA	
	JOB NO.: 207150.GDR	PLATE NO.: D17

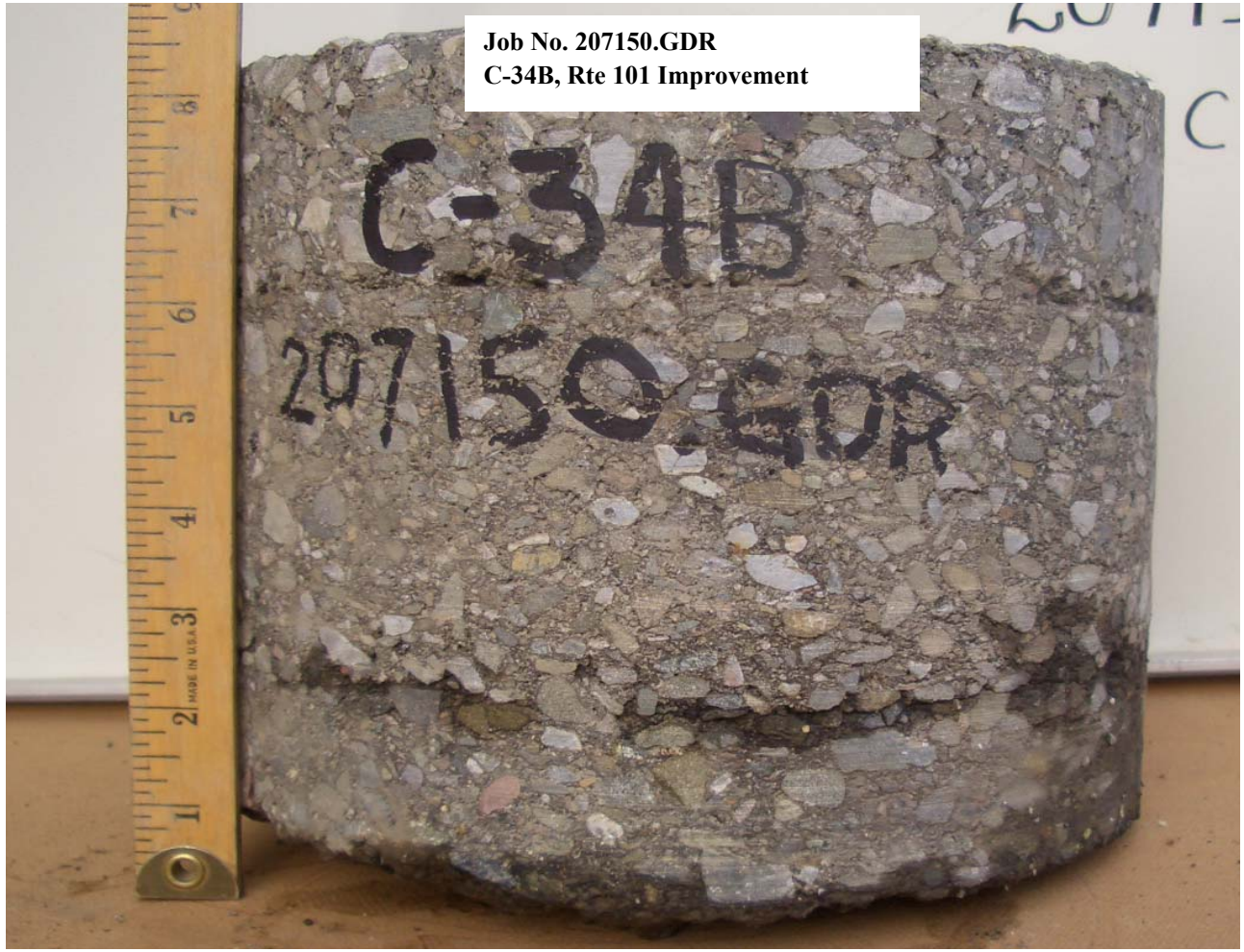
PARIKH CONSULTANTS, INC. GEOTECHNICAL CONSULTANTS MATERIALS TESTING	US 101 IMPROVEMENTS FROM I-280/680 TO YERBA BUENA ROAD SANTA CLARA COUNTY, SAN JOSE, CA	
	JOB NO.: 207150.GDR	PLATE NO.: D18

PARIKH CONSULTANTS, INC. GEOTECHNICAL CONSULTANTS MATERIALS TESTING	US 101 IMPROVEMENTS FROM I-280/680 TO YERBA BUENA ROAD SANTA CLARA COUNTY, SAN JOSE, CA	
	JOB NO.: 207150.GDR	PLATE NO.: D19

PARIKH CONSULTANTS, INC. GEOTECHNICAL CONSULTANTS MATERIALS TESTING	US 101 IMPROVEMENTS FROM I-280/680 TO YERBA BUENA ROAD SANTA CLARA COUNTY, SAN JOSE, CA	
	JOB NO.: 207150.GDR	PLATE NO.: D20



PARIKH CONSULTANTS, INC. GEOTECHNICAL CONSULTANTS MATERIALS TESTING	US 101 IMPROVEMENTS FROM I-280/680 TO YERBA BUENA ROAD SANTA CLARA COUNTY, SAN JOSE, CA	
	JOB NO.: 207150.GDR	PLATE NO.: D21



PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS TESTING

US 101 IMPROVEMENTS FROM I-280/680 TO YERBA BUENA ROAD
SANTA CLARA COUNTY, SAN JOSE, CA

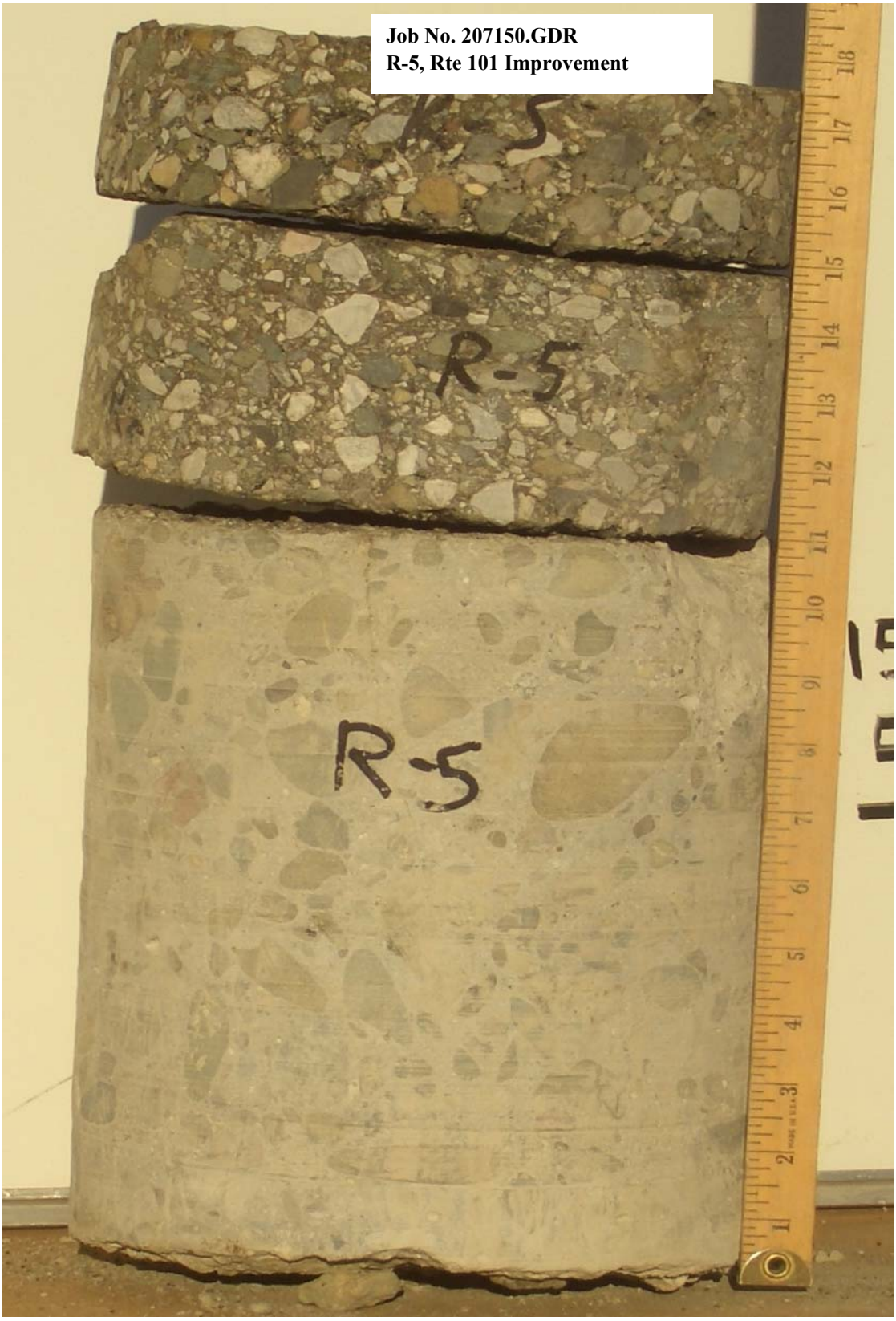
JOB NO.: 207150.GDR	PLATE No.: D22

PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS TESTING

US 101 IMPROVEMENTS FROM I-280/680 TO YERBA BUENA ROAD
SANTA CLARA COUNTY, SAN JOSE, CA

JOB NO.: 207150.GDR

PLATE NO.: D23



PARIKH CONSULTANTS, INC. GEOTECHNICAL CONSULTANTS MATERIALS TESTING	US 101 IMPROVEMENTS FROM I-280/680 TO YERBA BUENA ROAD SANTA CLARA COUNTY, SAN JOSE, CA	
	JOB NO.: 207150.GDR	PLATE NO.: D24

PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS TESTING

US 101 IMPROVEMENTS FROM I-280/680 TO YERBA BUENA ROAD
SANTA CLARA COUNTY, SAN JOSE, CA

JOB NO.: 207150.GDR | PLATE NO.: D25

APPENDIX E

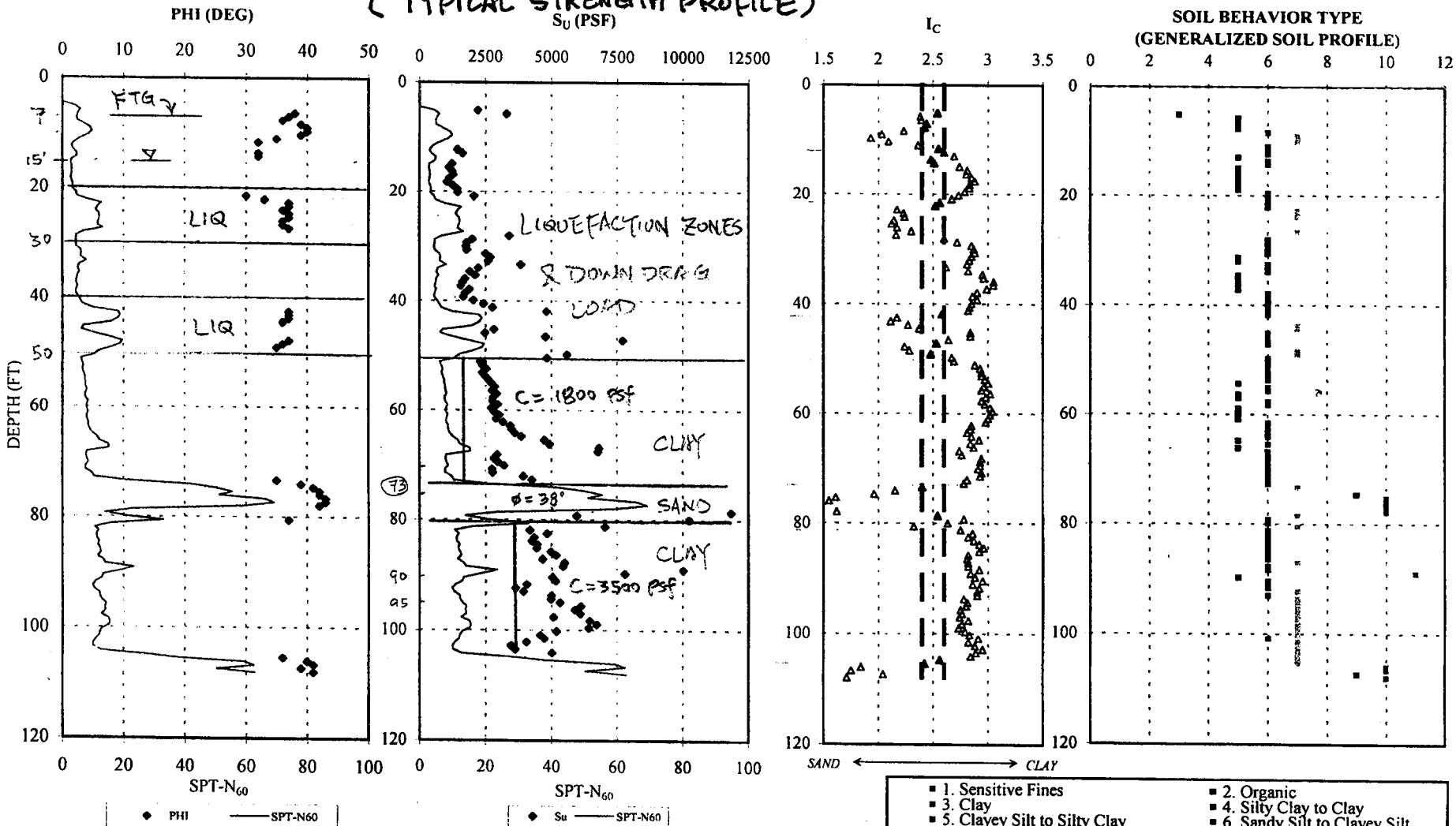
APPENDIX E-1

Liquefaction Potential Analyses based on CPT

CPT DATA CORRELATION

BR-1

(TYPICAL STRENGTH PROFILE)



- 1. Sensitive Fines
- 2. Organic
- 3. Clay
- 4. Silty Clay to Clay
- 5. Clayey Silt to Silty Clay
- 6. Sandy Silt to Clayey Silt
- 7. Silty Sand to Sandy Silt
- 8. Sand to Silty Sand
- 9. Sand
- 10. Gravelly Sand to Sand
- 11. Stiff Fine-Grained
- 12. Sand to Clayey Sand

Reference: CPT data and correlation provided by Gregg Drilling and Testing, Inc.

PARIKH

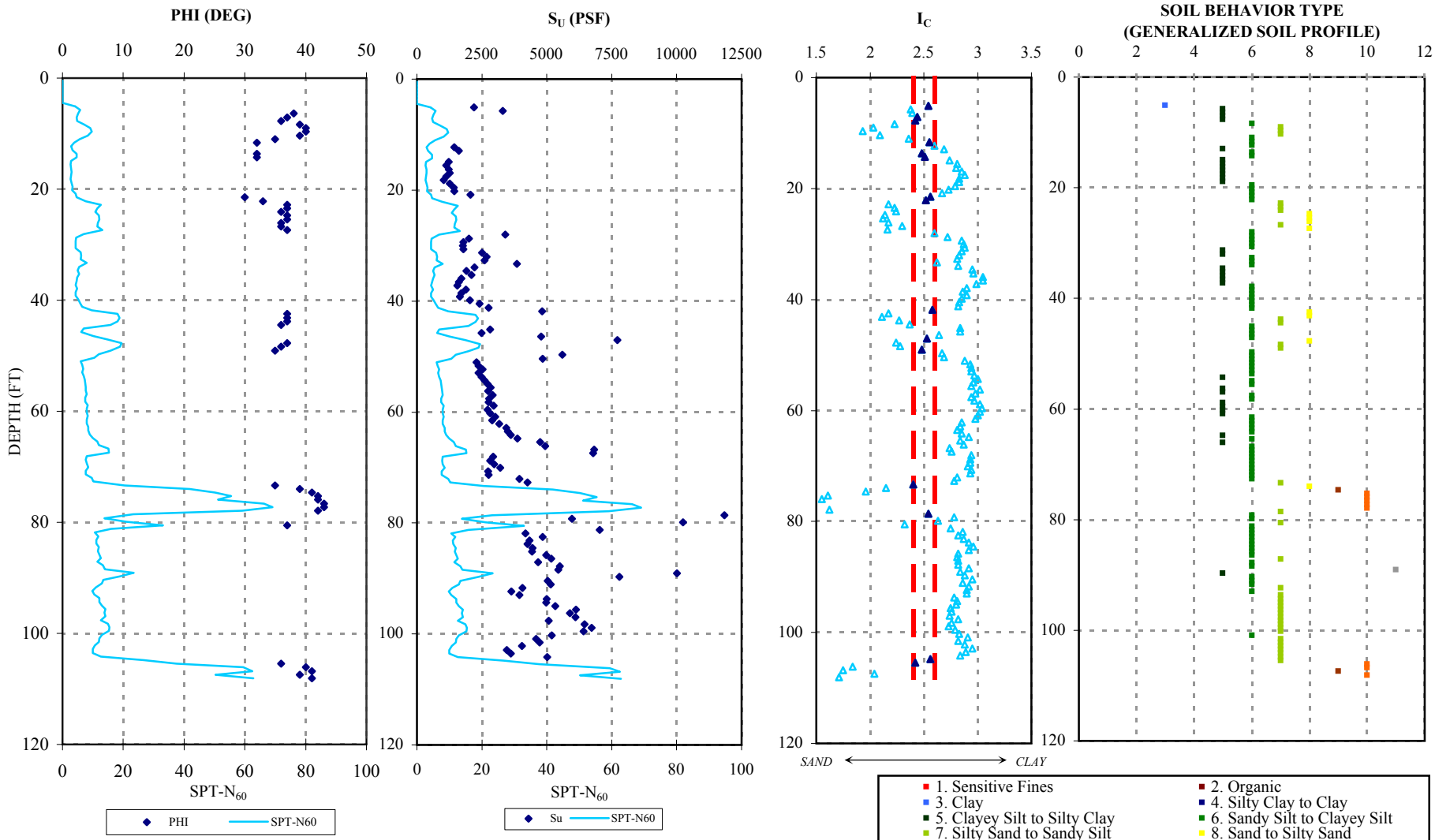
Practicing in the Geosciences

HWY 101/TULLY INTERCHANGE
SAN JOSE, CALIFORNIA

JOB NO.: 207150.10	PLATE NO.:

CPT DATA CORRELATION

BR-1



Reference: CPT data and correlation provided by Gregg Drilling and Testing, Inc.

PARIKH

Practicing in the Geosciences

HWY 101/TULLY INTERCHANGE
SAN JOSE, CALIFORNIA

JOB NO.: 207150.10

PLATE NO.:

LIQUEFACTION POTENTIAL ANALYSIS (per Youd & Idriss, 2001)

PROJECT NAME ***HWY 101/TULLY***
PROJECT NO. ***207150.10***
CPT NO. ***BR-1***

FAULT INFO
COAST RANGE - SIERRAN BLOCK BOUNDARY ZONE (CSB)
a_{max} *(g)=* 0.6

FAULT M_w = 7.5
MSF = 1.00

			CPT RESULT INPUT							*CSR*		*CRR 7.5*						*F.S.=(CRR 7.5/CSR)*MSF*Kσ*Kα*		
Depth (ft)		Soil Behavior Type	qc (tsf)	fs (tsf)	σ_v (tsf)	u (tsf)	σ_v' (tsf)	Ic*	C_N*	γ_d	CSR	Ic	C_Q	q_{c1N}	K_C	$(q_{c1N})_{cs}$	$CRR_{7.5}$	Kσ	Kα	F.S.
0.492									1.7	1.00	#VALUE!							#VALUE!	1	
1.148									1.7	1.00	#VALUE!							#VALUE!	1	
1.804									1.7	1.00	#VALUE!							#VALUE!	1	
2.461									1.7	1.00	#VALUE!							#VALUE!	1	
3.117									1.7	0.99	#VALUE!							#VALUE!	1	
3.773									1.7	0.99	#VALUE!							#VALUE!	1	
4.429									1.7	0.99	#VALUE!							#VALUE!	1	
5.085	3	Clay	16.721	0.755	0.283		0.283	2.54	1.48348	0.99	0.386	2.540	1.48	24.81	2.979	73.894	0.12	1.00	1	
5.741	5	Clayey Silt to Silty Clay	25.144	0.904	0.321		0.321	2.38	1.44642	0.99	0.386	2.380	1.45	36.37	2.233	81.196	0.13	1.00	1	
6.398	5	Clayey Silt to Silty Clay	22.174	0.657	0.358		0.358	2.39	1.41207	0.99	0.385	2.390	1.41	31.31	2.272	71.140	0.11	1.00	1	
7.054	5	Clayey Silt to Silty Clay	19.91	0.557	0.396		0.396	2.44	1.37845	0.99	0.384	2.440	1.38	27.44	2.483	68.149	0.11	1.00	1	
7.71	5	Clayey Silt to Silty Clay	20.961	0.52	0.434		0.434	2.42	1.34639	0.98	0.384	2.420	1.35	28.22	2.396	67.615	0.11	1.00	1	
8.366	6	Sandy Silt to Clayey Silt	33.213	0.655	0.471		0.471	2.23	1.31658	0.98	0.383	2.230	1.32	43.73	1.743	76.237	0.12	1.00	1	
9.022	7	Silty Sand to Sandy Silt	46.296	0.607	0.51		0.51	2.03	1.28655	0.98	0.383	2.030	1.29	59.56	1.341	79.885	0.13	1.00	1	
9.678	7	Silty Sand to Sandy Silt	50.306	0.482	0.549		0.549	1.93	1.25786	0.98	0.382	1.930	1.26	63.28	1.218	77.102	0.12	1.00	1	
10.335	7	Silty Sand to Sandy Silt	40.843	0.492	0.587		0.587	2.09	1.23111	0.98	0.382	2.090	1.23	50.28	1.437	72.252	0.12	1.00	1	
10.991	6	Sandy Silt to Clayey Silt	24.58	0.371	0.625		0.625	2.36	1.20548	0.98	0.381	2.360	1.21	29.63	2.156	63.896	0.10	1.00	1	
11.647	6	Sandy Silt to Clayey Silt	15.575	0.232	0.662		0.662	2.55	1.18153	0.98	0.381	2.550	1.18	18.40	3.034	55.837	0.10	1.00	1	
12.303	6	Sandy Silt to Clayey Silt	11.517	0.116	0.7		0.7	2.6	1.15789	0.97	0.380							1.00	1	
12.959	5	Clayey Silt to Silty Clay	12.796	0.213	0.738		0.738	2.69	1.13519	0.97	0.379							1.00	1	
13.615	6	Sandy Silt to Clayey Silt	19.605	0.252	0.775		0.775	2.48	1.11392	0.97	0.379	2.480	1.11	21.84	2.669	58.294	0.10	1.00	1	
14.272	6	Sandy Silt to Clayey Silt	18.784	0.231	0.813		0.813	2.51	1.0929	0.97	0.378	2.510	1.09	20.53	2.820	57.882	0.10	1.00	1	
14.928	5	Clayey Silt to Silty Clay	10.036	0.097	0.85		0.85	2.74	1.07317	0.97	0.378							1.00	1	
15.584	5	Clayey Silt to Silty Clay	9.435	0.105	0.888	0.018	0.87	2.81	1.0628	0.97	0.385							1.00	1	
16.24	5	Clayey Silt to Silty Clay	10.103	0.122	0.925	0.039	0.887	2.8	1.05414	0.97	0.393							1.00	1	
16.896	5	Clayey Silt to Silty Clay	10.419	0.162	0.963	0.059	0.904	2.85	1.04563	0.96	0.401							1.00	1	
17.552	5	Clayey Silt to Silty Clay	9.464	0.132	1.001	0.08	0.921	2.88	1.03725	0.96	0.408							1.00	1	
18.209	5	Clayey Silt to Silty Clay	8.89	0.082	1.038	0.1	0.938	2.83	1.029	0.96	0.415							1.00	1	
18.865	5	Clayey Silt to Silty Clay	10.428	0.131	1.076	0.12	0.955	2.83	1.02088	0.96	0.422							1.00	1	
19.521	6	Sandy Silt to Clayey Silt	11.612	0.149	1.113	0.141	0.973	2.79	1.01243	0.96	0.427							1.00	1	
20.177	6	Sandy Silt to Clayey Silt	11.431	0.113	1.151	0.161	0.99	2.73	1.00457	0.96	0.434							1.00	1	
20.833	6	Sandy Silt to Clayey Silt	16.253	0.23	1.189	0.182	1.007	2.67	0.99683	0.95	0.440							1.00	1	
21.49	6	Sandy Silt to Clayey Silt	18.268	0.183	1.226	0.202	1.024	2.56	0.98921	0.95	0.445	2.560	0.99	18.07	3.091	55.849	0.10	1.00	1	0.22
22.146	6	Sandy Silt to Clayey Silt	31.207	0.598	1.264	0.223	1.041	2.52	0.9817	0.95	0.450	2.520	0.98	30.64	2.872	87.975	0.14	0.99	1	0.32
22.802	7	Silty Sand to Sandy Silt	60.027	0.732	1.302	0.243	1.059	2.17	0.97388	0.95	0.455	2.170	0.97	58.46	1.596	93.323	0.16	0.99	1	0.34
23.458	7	Silty Sand to Sandy Silt	53.343	0.68	1.341	0.264	1.077	2.23	0.96618	0.95	0.460	2.230	0.97	51.54	1.743	89.857	0.15	0.99	1	0.32
24.114	7	Silty Sand to Sandy Silt	49.685	0.568	1.38	0.284	1.096	2.24	0.95819	0.94	0.464	2.240	0.96	47.61	1.770	84.288	0.14	0.98	1	0.29
24.77	8	Sand to Silty Sand	57.086	0.532	1.419	0.305	1.115	2.14	0.95032	0.94	0.468	2.140	0.95	54.25	1.532	83.109	0.13	0.98	1	0.29
25.427	8	Sand to Silty Sand	58.576	0.503	1.459	0.325	1.134	2.12	0.94259	0.94	0.472	2.120	0.94	55.21	1.492	82.387	0.13	0.98	1	0.28
26.083	8	Sand to Silty Sand	55.491	0.526	1.499	0.346	1.153	2.17	0.93498	0.94	0.476	2.170	0.93	51.88	1.596	82.825	0.13	0.97	1	0.28
26.739	7	Silty Sand to Sandy Silt	51.748	0.722	1.537	0.366	1.171	2.3	0.92788	0.94	0.479	2.300	0.93	48.02	1.949	93.570	0.16	0.97	1	0.33
27.395	8	Sand to Silty Sand	63.093	0.671	1.577	0.387	1.191	2.16	0.92012	0.93	0.482	2.160	0.92	58.05	1.574	91.390	0.15	0.97	1	0.31
28.051	6	Sandy Silt to Clayey Silt	27.044	0.455	1.615	0.407	1.208	2.6	0.91362	0.93	0.485							0.96	1	
28.707	6	Sandy Silt to Clayey Silt	16.559	0.189	1.652	0.428	1.225	2.72	0.90722	0.93	0.487							0.96	1	
29.364	6	Sandy Silt to Clayey Silt	14.955	0.24	1.69	0.448	1.242	2.85	0.9009	0.92	0.490							0.96	1	
30.02	6	Sandy Silt to Clayey Silt	14.725	0.248	1.727	0.468	1.259	2.87	0.89467	0.92	0.492							0.95	1	
30.676	6	Sandy Silt to Clayey Silt	14.859	0.266	1.765	0.489	1.276	2.88	0.88853	0.92	0.495							0.95	1	
31.332	5	Clayey Silt to Silty Clay	20.331	0.537	1.803	0.509	1.293	2.85	0.88247	0.91	0.497							0.95	1	
31.988	5	Clayey Silt to Silty Clay	21.601	0.567	1.84	0.53	1.31	2.83	0.87649	0.91	0.498							0.95	1	
32.644	6	Sandy Silt to Clayey Silt	20.971	0.482	1.878	0.55	1.327	2.81	0.8706	0.91	0.500							0.94	1	
33.301	6	Sandy Silt to Clayey Silt	30.463	0.567	1.915	0.571	1.345	2.62	0.86444	0.90	0.501							0.94	1	
33.957	6	Sandy Silt to Clayey Silt	18.65	0.33	1.953	0.591	1.362	2.82	0.8587	0.90	0.502							0.94	1	
34.613	5	Clayey Silt to Silty Clay	16.167	0.373	1.991	0.612	1.379	2.95	0.85304	0.89	0.503							0.94	1	
35.269	5	Clayey Silt to Silty Clay	17.724	0.49	2.028	0.632	1.396	2.96	0.84746	0.89	0.504							0.94	1	
35.925	5	Clayey Silt to Silty Clay	14.964	0.429	2.066	0.653	1.413	3.05	0.84194	0.88	0.504							0.93	1	
36.581	5	Clayey Silt to Silty Clay	14.238	0.361	2.103	0.673	1.43	3.05	0.8365	0.88	0.504							0.93	1	
37.238	5	Clayey Silt to Silty Clay	13.713	0.24	2.141	0.694	1.447	2.99	0.83113	0.87	0.504							0.93	1	
37.894	6	Sandy Silt to Clayey Silt	16.148	0.261	2.179	0.714	1.464	2.9	0.82583	0.87	0.504							0.93	1	
38.55	6	Sandy Silt to Clayey Silt	15.06	0.173	2.216	0.735	1.482	2.86	0.82028	0.86	0.504							0.92	1	
39.206	6	Sandy Silt to Clayey Silt	14.429	0.175	2.254	0.755	1.499	2.9	0.81512	0.86	0.503							0.92	1	
39.862	6	Sandy Silt to Clayey Silt	17.304	0.249	2.291	0.776	1.516	2.85	0.81001	0.85	0.502							0.92	1	
40.518	6	Sandy Silt to Clayey Silt	20.054	0.354	2.329	0.796	1.533	2.83	0.80498	0.85	0.502							0.92	1	
41.175	6	Sandy Silt to Clayey Silt	22.518	0.462	2.367	0.817	1.55	2.82	0.8	0.84	0.501							0.92	1	
41.831	6	Sandy Silt to Clayey Silt	38.083	0.679	2.404	0.837	1.567	2.58	0.79508	0.83	0.499	2.580	0.80	30.28	3.206	97.089	0.17	0.91	1	0.33
42.487	8	Sand to Silty Sand	85.772	0.979	2.444	0.857	1.586	2.17	0.78966	0.83	0.498	2.170	0.79	67.73	1.596	108.124	0.20	0.91	1	0.40
43.143	8	Sand to Silty Sand	91.349	0.868	2.484	0.878	1.606	2.11	0.78403	0.82	0.496	2.110	0.78	71.62	1.473	105.509	0.19	0.90	1	0.38
43.799	7	Silty Sand to Sandy Silt	82.449	1.223	2.522	0.898	1.624	2.27	0.77904	0.82	0.494	2.270	0.78	64.23	1.856	119.218	0.24	0.91	1	0.48
44.455	7	Silty Sand to Sandy Silt	68.832	1.151	2.561	0.919	1.642	2.37	0.7741	0.81	0.492	2.370	0.77	53.28	2.194	116.905	0.23	0.91	1	0.46
45.112	6	Sandy Silt to Clayey Silt	23.835	0.476	2.598	0.939	1.659	2.84	0.7695	0.80	0.490							0.90	1	
45.768	6	Sandy Silt to Clayey Silt	21.247	0.34	2.636	0.96	1.676	2.84	0.76495	0.80	0.488							0.90	1	
46.424	6	Sandy Silt to Clayey Silt	38.627	0.741	2.674	0.98	1.693	2.64	0.76046	0.79	0.486							0.90	1	
47.08	6	Sandy Silt to Clayey Silt	60.696	1.489	2.711	1.001	1.71	2.53	0.75601	0.78	0.484	2.530	0.76	45.89	2.925	134.209	0.30	0.90	1	0.63
47.736	8	Sand to Silty Sand	90.165	1.255	2.751	1.021	1.73	2.24	0.75085	0.78	0.481	2.240	0.75	67.70	1.770	119.863	0.24	0.89	1	0.50
48.392	7	Silty Sand to Sandy Silt	85.591	1.276	2.79	1.042	1.748	2.28	0.74627	0.77	0.479	2.280	0.75	63.87	1.886	120.477	0.24	0.89	1	0.51
49.049	7	Silty Sand to Sandy Silt	65.48	1.381	2.828	1.062	1.766	2.48	0.74174	0.76	0.476	2.480	0.74	48.57	2.669	129.648	0.28	0.89	1	0.59
49.705	6	Sandy Silt to Clayey Silt	44.977	1.151	2.866	1.083	1.783	2.67	0.73751	0.76	0.474							0.89	1	
50.361	6	Sandy Silt to Clayey Silt	39.353	0.871	2.903	1.103	1.8	2.69	0.73333	0.75	0.471							0.89	1	
51.017	6	Sandy Silt to Clayey Silt	20.226	0.29	2.941	1.124	1.817	2.88	0.7292	0.74	0.469							0.89	1	
51.673	6	Sandy Silt to Clayey Silt	20.951	0.397	2.979	1.144	1.834	2.93	0.72512	0.74	0.466							0.89	1	
52.329	6	Sandy Silt to Clayey Silt	22.059	0.461	3.016	1.165	1.852	2.94	0.72084	0.73	0.463							0.88	1	
52.986	6	Sandy Silt to Clayey Silt	20.971	0.388	3.054	1.185	1.869	2.94	0.71685	0.72	0.461							0.88	1	
53.642	6	Sandy Silt to Clayey Silt	21.811	0.497	3.091	1.206	1.886	2.97	0.7129	0.72	0.458							0.88	1	
54.298	5	Clayey Silt to Silty Clay	22.785	0.621	3.129	1.226	1.903	3	0.70899	0.71	0.455							0.88	1	
54.954	6	Sandy Silt to Clayey Silt	23.597	0.582	3.167	1.246	1.92	2.96	0.70513	0.70	0.453							0.88	1	
55.61	6	Sandy Silt to Clayey Silt	24.571	0.579	3.204	1.267	1.937	2.94	0.70131	0.70	0.450							0.88	1	
56.266	5	Clayey Silt to Silty Clay	23.797	0.726	3.242	1.287	1.954	3.02	0.69753	0.69	0.447							0.87	1	
56.923	5	Clayey Silt to Silty Clay	25.296	0.729	3.279	1.308	1.971	2.98	0.69379	0.69	0.445							0.87	1	
57.579	6	Sandy Silt to Clayey Silt	24.169	0.526	3.317	1.328	1.989	2.94	0.68987	0.68	0.442							0.87	1	
58.235	6	Sandy Silt to Clayey Silt	24.084	0.573	3.354	1.349	2.006	2.97	0.68621	0.67	0.440							0.87	1	
58.891	5	Clayey Silt to Silty Clay	25.545	0.838	3.392	1.369	2.023	3.02	0.68259	0.67	0.437							0.87	1	
59.547	5	Clayey Silt to Silty Clay	23.892	0.743	3.43	1.39	2.04	3.04	0.67901	0.66	0.435							0.87	1	
60.203	5	Clayey Silt to Silty Clay	24.609	0.713	3.467	1.41	2.057	3.02	0.67547	0.66	0.432							0.87	1	
60.86	5	Clayey Silt to Silty Clay	26.079	0.776	3.505	1.431	2.074	3	0.67196	0.65	0.430							0.86	1	
61.516	6	Sandy Silt to Clayey Silt	25.296	0.655	3.542	1.451	2.091	2.98	0.66849	0.65	0.428							0.86	1	
62.172	6	Sandy Silt to Clayey Silt	27.216	0.466	3.58	1.472	2.108	2.85	0.66505	0.64	0.425							0.86	1	
62.828	6	Sandy Silt to Clayey Silt	29.374	0.542	3.618	1.492	2.126	2.84	0.66146	0.64	0.423							0.86	1	

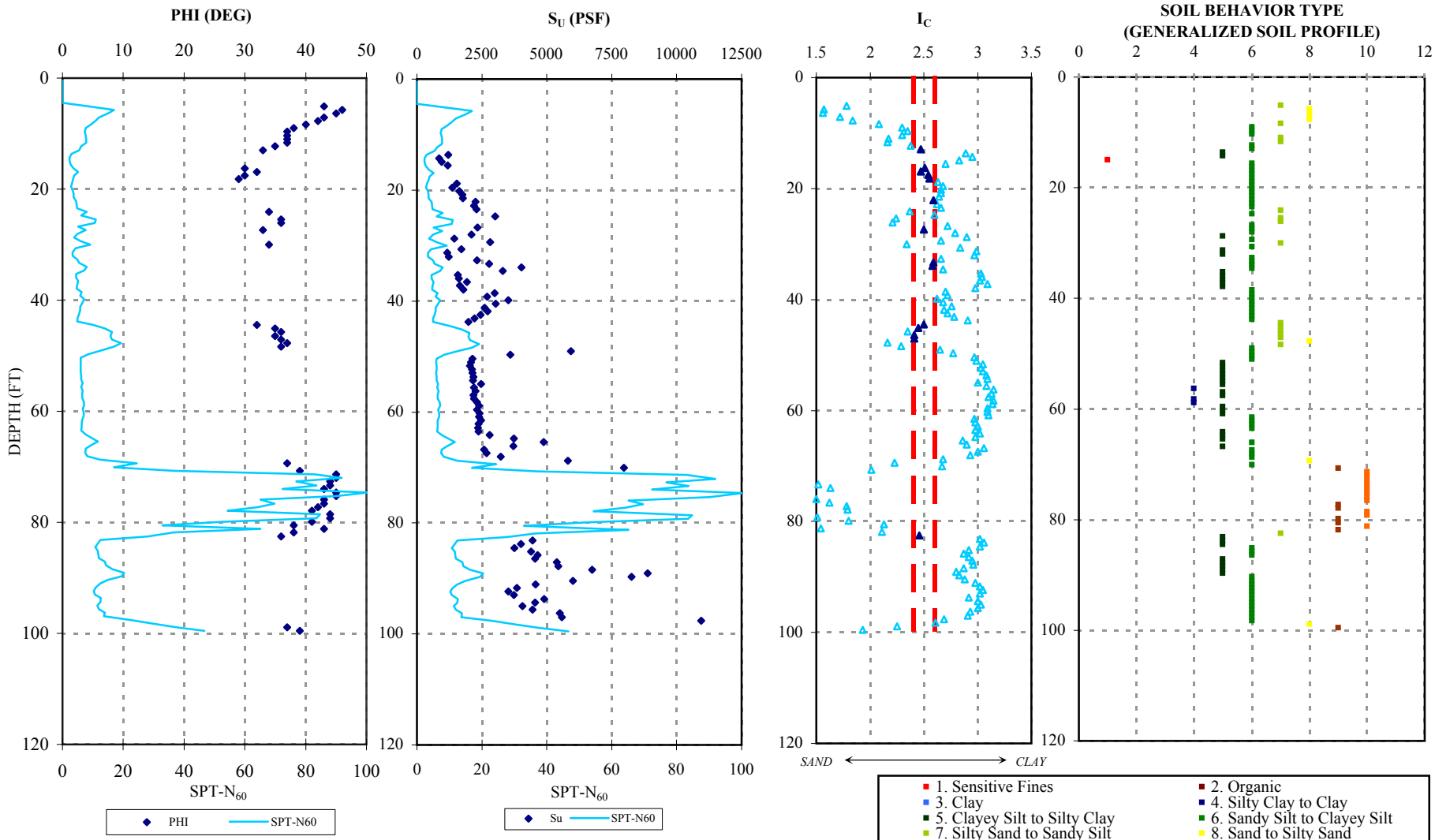
LIQUEFACTION POTENTIAL ANALYSIS (per Youd & Idriss, 2001)

PROJECT NAME	***HWY 101/TULLY***	*FAULT INFO*	
PROJECT NO.	***207150.10***	*COAST RANGE - SIERRAN BLOCK BOUNDARY ZONE (CSB)*	
CPT NO.	***BR-1***	*a_{max} (g)=* 0.6	*FAULT M_w =* 7.5
			MSF = 1.00

		CPT RESULT INPUT							*CSR*		*$CRR_{7.5}$*						*F.S.=($CRR_{7.5}$/CSR)*MSF*K_σ*K_α*		
Depth (ft)		Soil Behavior Type	qc (tsf)	fs (tsf)	σ_v (tsf)	u (tsf)	σ_v' (tsf)	Ic*	C_N*	γ_d	CSR	Ic	C_Q	q_{c1N}	K_C	$(q_{c1N})_{cs}$	$CRR_{7.5}$	$K\sigma$	$K\alpha$	F.S.
63.484	6	Sandy Silt to Clayey Silt	29.851	0.491	3.655	1.513	2.143	2.81	0.65809	0.63	0.421							0.86	1	
64.14	6	Sandy Silt to Clayey Silt	30.72	0.615	3.693	1.533	2.16	2.85	0.65476	0.63	0.419							0.86	1	
64.797	5	Clayey Silt to Silty Clay	32.592	0.959	3.73	1.554	2.177	2.92	0.65147	0.62	0.417							0.86	1	
65.453	6	Sandy Silt to Clayey Silt	39.2	1.123	3.768	1.574	2.194	2.84	0.6482	0.62	0.415							0.85	1	
66.109	5	Clayey Silt to Silty Clay	40.699	1.372	3.806	1.594	2.211	2.87	0.64497	0.61	0.413							0.85	1	
66.765	6	Sandy Silt to Clayey Silt	54.795	1.727	3.843	1.615	2.228	2.74	0.64177	0.61	0.411							0.85	1	
67.421	6	Sandy Silt to Clayey Silt	54.67	1.787	3.881	1.635	2.245	2.76	0.63861	0.61	0.409							0.85	1	
68.077	6	Sandy Silt to Clayey Silt	25.927	0.5	3.918	1.656	2.262	2.94	0.63547	0.60	0.407							0.85	1	
68.734	6	Sandy Silt to Clayey Silt	25.058	0.421	3.956	1.676	2.28	2.93	0.63218	0.60	0.405							0.85	1	
69.39	6	Sandy Silt to Clayey Silt	26.318	0.476	3.994	1.697	2.297	2.93	0.62911	0.60	0.404							0.85	1	
70.046	6	Sandy Silt to Clayey Silt	28.037	0.536	4.031	1.717	2.314	2.91	0.62607	0.59	0.402							0.85	1	
70.702	6	Sandy Silt to Clayey Silt	24.532	0.398	4.069	1.738	2.331	2.94	0.62305	0.59	0.400							0.84	1	
71.358	6	Sandy Silt to Clayey Silt	24.733	0.375	4.106	1.758	2.348	2.93	0.62007	0.58	0.399							0.84	1	
72.014	6	Sandy Silt to Clayey Silt	33.614	0.56	4.144	1.779	2.365	2.81	0.61711	0.58	0.397							0.84	1	
72.671	6	Sandy Silt to Clayey Silt	36.154	0.609	4.182	1.799	2.382	2.78	0.61418	0.58	0.396							0.84	1	
73.327	7	Silty Sand to Sandy Silt	88.494	1.362	4.22	1.82	2.401	2.4	0.61094	0.58	0.394	2.400	0.61	54.06	2.312	125.018	0.26	0.84	1	0.66
73.983	8	Sand to Silty Sand	200.308	3.528	4.26	1.84	2.42	2.15	0.60773	0.57	0.393	2.150	0.61	121.73	1.553	189.028		0.78	1	
74.639	9	Sand	259.533	3.171	4.301	1.861	2.44	1.96	0.6044	0.57	0.391	1.960	0.60	156.86	1.251	196.249		0.75	1	
75.295	10	Gravelly Sand to Sand	323.418	1.424	4.342	1.881	2.461	1.61	0.60093	0.57	0.390	1.610	0.60	194.35	1.000	194.351		0.71	1	
75.951	10	Gravelly Sand to Sand	304.443	0.904	4.384	1.902	2.483	1.55	0.59734	0.56	0.388	1.550	0.60	181.86	1.000	181.856		0.72	1	
76.608	10	Gravelly Sand to Sand	406.736	1.278	4.426	1.922	2.504	1.46	0.59395	0.56	0.387	1.460	0.59	241.58	1.000	241.582		0.69	1	
77.264	10	Gravelly Sand to Sand	435.995	1.024	4.468	1.943	2.525	1.37	0.5906	0.56	0.385	1.370	0.59	257.50	1.000	257.500		0.69	1	
77.92	10	Gravelly Sand to Sand	344.961	1.615	4.509	1.963	2.546	1.62	0.58729	0.56	0.384	1.620	0.59	202.59	1.000	202.593		0.70	1	
78.576	7	Silty Sand to Sandy Silt	93.326	2.375	4.548	1.983	2.565	2.54	0.58433	0.55	0.383	2.540	0.58	54.53	2.979	162.453		0.83	1	
79.232	6	Sandy Silt to Clayey Silt	49.189	1.219	4.586	2.004	2.582	2.78	0.5817	0.55	0.382							0.83	1	
79.888	6	Sandy Silt to Clayey Silt	81.313	2.325	4.623	2.024	2.599	2.63	0.5791	0.55	0.381							0.83	1	
80.545	7	Silty Sand to Sandy Silt	147.118	2.95	4.662	2.045	2.617	2.32	0.57637	0.55	0.380	2.320	0.58	84.79	2.015	170.824		0.81	1	
81.201	6	Sandy Silt to Clayey Silt	57.506	1.544	4.699	2.065	2.634	2.75	0.57381	0.54	0.379							0.82	1	
81.857	6	Sandy Silt to Clayey Silt	36.173	0.678	4.737	2.086	2.651	2.86	0.57128	0.54	0.378							0.82	1	
82.513	6	Sandy Silt to Clayey Silt	41.148	0.818	4.775	2.106	2.668	2.82	0.56877	0.54	0.377							0.82	1	
83.169	6	Sandy Silt to Clayey Silt	37.395	0.783	4.812	2.127	2.686	2.87	0.56613	0.54	0.376							0.82	1	
83.825	6	Sandy Silt to Clayey Silt	36.899	0.894	4.85	2.147	2.703	2.92	0.56367	0.54	0.375							0.82	1	
84.482	6	Sandy Silt to Clayey Silt	38.369	1.147	4.887	2.168	2.72	2.96	0.56122	0.53	0.374							0.82	1	
85.138	6	Sandy Silt to Clayey Silt	38.284	0.963	4.925	2.188	2.737	2.92	0.5588	0.53	0.373							0.82	1	
85.794	6	Sandy Silt to Clayey Silt	42.352	0.863	4.963	2.209	2.754	2.82	0.5564	0.53	0.373							0.82	1	
86.45	6	Sandy Silt to Clayey Silt	43.975	0.893	5	2.229	2.771	2.81	0.55402	0.53	0.372							0.82	1	
87.106	7	Silty Sand to Sandy Silt	40.022	0.69	5.039	2.25	2.789	2.82	0.55152	0.53	0.371							0.81	1	
87.762	6	Sandy Silt to Clayey Silt	46.372	1.053	5.076	2.27	2.806	2.82	0.54918	0.52	0.370							0.81	1	
88.419	6	Sandy Silt to Clayey Silt	45.961	1.49	5.114	2.291	2.824	2.92	0.54672	0.52	0.369							0.81	1	
89.075	11	Sitff Fine-Grained	80.282	4.241	5.157	2.311	2.846	2.84	0.54375	0.52	0.369							0.81	1	
89.731	5	Clayey Silt to Silty Clay	63.704	2.783	5.194	2.331	2.863	2.88	0.54147	0.52	0.368							0.81	1	
90.387	6	Sandy Silt to Clayey Silt	43.077	1.386	5.232	2.352	2.88	2.95	0.53922	0.52	0.367							0.81	1	
91.043	6	Sandy Silt to Clayey Silt	43.946	1.006	5.27	2.372	2.897	2.86	0.53698	0.52	0.367							0.81	1	
91.699	6	Sandy Silt to Clayey Silt	35.81	0.707	5.307	2.393	2.914	2.92	0.53476	0.52	0.366							0.81	1	
92.356	7	Silty Sand to Sandy Silt	32.64	0.492	5.346	2.413	2.933	2.9	0.5323	0.51	0.365							0.81	1	
93.012	6	Sandy Silt to Clayey Silt	34.941	0.582	5.383	2.434	2.95	2.9	0.53012	0.51	0.365							0.81	1	
93.668	7	Silty Sand to Sandy Silt	42.886	0.644	5.422	2.454	2.968	2.78	0.52783	0.51	0.364							0.80	1	
94.324	7	Silty Sand to Sandy Silt	42.772	0.72	5.461	2.475	2.986	2.81	0.52556	0.51	0.363							0.80	1	
94.98	7	Silty Sand to Sandy Silt	45.379	0.794	5.499	2.495	3.004	2.8	0.52331	0.51	0.363							0.80	1	
95.636	7	Silty Sand to Sandy Silt	51.5	0.931	5.538	2.516	3.022	2.75	0.52108	0.51	0.362							0.80	1	
96.293	7	Silty Sand to Sandy Silt	49.848	0.858	5.577	2.536	3.04	2.76	0.51887	0.51	0.362							0.80	1	
96.949	7	Silty Sand to Sandy Silt	51.395	0.871	5.615	2.557	3.059	2.74	0.51655	0.50	0.361							0.80	1	
97.605	7	Silty Sand to Sandy Silt	43.669	0.767	5.654	2.577	3.077	2.82	0.51438	0.50	0.360							0.80	1	
98.261	7	Silty Sand to Sandy Silt	54.116	1.044	5.693	2.598	3.095	2.76	0.51222	0.50	0.360							0.80	1	
98.917	7	Silty Sand to Sandy Silt	56.141	1.05	5.731	2.618	3.113	2.73	0.51009	0.50	0.359							0.80	1	
99.573	7	Silty Sand to Sandy Silt	53.801	1.141	5.77	2.639	3.131	2.79	0.50797	0.50	0.359							0.80	1	
100.23	7	Silty Sand to Sandy Silt	44.691	0.796	5.809	2.659	3.149	2.83	0.50586	0.50	0.358							0.79	1	
100.886	6	Sandy Silt to Clayey Silt	40.098	0.804	5.846	2.68	3.167	2.91	0.50378	0.50	0.358							0.79	1	
101.542	7	Silty Sand to Sandy Silt	41.215	0.593	5.885	2.7	3.185	2.82	0.50171	0.50	0.357							0.79	1	
102.198	7	Silty Sand to Sandy Silt	36.106	0.504	5.923	2.72	3.203	2.88	0.49966	0.49	0.357							0.79	1	
102.854	7	Silty Sand to Sandy Silt	31.771	0.453	5.962	2.741	3.221	2.95	0.49762	0.49	0.356							0.79	1	
103.511	7	Silty Sand to Sandy Silt	33.022	0.388	6.001	2.761	3.239	2.89	0.49561	0.49	0.356							0.79	1	
104.167	7	Silty Sand to Sandy Silt	43.555	0.717	6.039	2.782	3.257	2.84	0.49361	0.49	0.355							0.79	1	
104.823	7	Silty Sand to Sandy Silt	106.476	2.565	6.078	2.802	3.276	2.56	0.49151	0.49	0.355	2.560	0.49	52.33	3.091	161.741		0.79	1	
105.479	7	Silty Sand to Sandy Silt	160.21	3.897	6.117	2.823	3.294	2.42	0.48954	0.49	0.354	2.420	0.49	78.43	2.396	187.906		0.77	1	
106.135	10	Gravelly Sand to Sand	320.811	2.237	6.158	2.843	3.315	1.84	0.48726	0.49	0.354	1.840	0.49	156.32	1.137	177.741		0.67	1	
106.791	10	Gravelly Sand to Sand	348.485	1.911	6.2	2.864	3.336	1.75	0.48501	0.49	0.353	1.750	0.49	169.02	1.072	181.120		0.65	1	
107.448	9	Sand	252.075	2.662	6.241	2.884	3.357	2.04	0.48277	0.49	0.353	2.040	0.48	121.70	1.356	165.005		0.71	1	
108.104	10	Gravelly Sand to Sand	354.196	1.675	6.283	2.905	3.378	1.71	0.48056	0.49	0.352	1.710	0.48	170.21	1.045	177.803		0.65	1	

CPT DATA CORRELATION

BR-2



Reference: CPT data and correlation provided by Gregg Drilling and Testing, Inc.

PARIKH

Practicing in the Geosciences

HWY 101/TULLY INTERCHANGE
SAN JOSE, CALIFORNIA

JOB NO.: 207150.10

PLATE NO.:

LIQUEFACTION POTENTIAL ANALYSIS (per Youd & Idriss, 2001)

PROJECT NAME	***HWY 101/TULLY***	*FAULT INFO*	
PROJECT NO.	***207150.10***	*COAST RANGE - SIERRAN BLOCK BOUNDARY ZONE (CSB)*	
CPT NO.	***BR-2***	*a_{max} (g)=* 0.6	*FAULT M_w =* 7.5
			MSF = 1.00

		CPT RESULT INPUT							*CSR*		*$CRR_{7.5}$*						*F.S.=($CRR_{7.5}$/CSR)*MSF*K_σ*K_α*		
Depth (ft)		Soil Behavior Type	qc (tsf)	fs (tsf)	σ_v (tsf)	u (tsf)	σ_v' (tsf)	Ic*	C_N*	γ_d	CSR	Ic	C_Q	q_{c1N}	K_C	$(q_{c1N})_{cs}$	$CRR_{7.5}$	$K\sigma$	$K\alpha$	F.S.
0.492									1.7	1.00	#VALUE!							#VALUE!	1	
1.148									1.7	1.00	#VALUE!							#VALUE!	1	
1.804									1.7	1.00	#VALUE!							#VALUE!	1	
2.461									1.7	1.00	#VALUE!							#VALUE!	1	
3.117									1.7	0.99	#VALUE!							#VALUE!	1	
3.773									1.7	0.99	#VALUE!							#VALUE!	1	
4.429									1.7	0.99	#VALUE!							#VALUE!	1	
5.085	7	Silty Sand to Sandy Silt	47.564	0.495	0.299		0.299	1.78	1.46765	0.99	0.386	1.780	1.47	69.81	1.092	76.253	0.12	1.00	1	
5.741	8	Sand to Silty Sand	99.968	0.984	0.339		0.339	1.57	1.4295	0.99	0.386	1.570	1.43	142.90	1.000	142.904	0.35	1.00	1	
6.398	8	Sand to Silty Sand	88.627	0.684	0.379		0.379	1.56	1.39329	0.99	0.385	1.560	1.39	123.48	1.000	123.483	0.26	1.00	1	
7.054	8	Sand to Silty Sand	67.511	0.596	0.418		0.418	1.72	1.3597	0.99	0.384	1.720	1.36	91.79	1.051	96.507	0.16	1.00	1	
7.71	8	Sand to Silty Sand	58.248	0.596	0.458		0.458	1.84	1.3269	0.98	0.384	1.840	1.33	77.29	1.137	87.880	0.14	1.00	1	
8.366	7	Silty Sand to Sandy Silt	45.904	0.739	0.497		0.497	2.08	1.29641	0.98	0.383	2.080	1.30	59.51	1.420	84.484	0.14	1.00	1	
9.022	6	Sandy Silt to Clayey Silt	34.246	0.775	0.534		0.534	2.3	1.26874	0.98	0.383	2.300	1.27	43.45	1.949	84.671	0.14	1.00	1	
9.678	6	Sandy Silt to Clayey Silt	32.329	0.752	0.572		0.572	2.35	1.24153	0.98	0.382	2.350	1.24	40.14	2.120	85.078	0.14	1.00	1	
10.335	6	Sandy Silt to Clayey Silt	34.201	0.665	0.61		0.61	2.3	1.21547	0.98	0.382	2.300	1.22	41.57	1.949	81.009	0.13	1.00	1	
10.991	7	Silty Sand to Sandy Silt	37.036	0.464	0.648		0.648	2.17	1.19048	0.98	0.381	2.170	1.19	44.09	1.596	70.385	0.11	1.00	1	
11.647	7	Silty Sand to Sandy Silt	37.07	0.411	0.687		0.687	2.16	1.16587	0.98	0.381	2.160	1.17	43.22	1.574	68.038	0.11	1.00	1	
12.303	6	Sandy Silt to Clayey Silt	26.854	0.413	0.724		0.724	2.38	1.14345	0.97	0.380	2.380	1.14	30.71	2.233	68.554	0.11	1.00	1	
12.959	6	Sandy Silt to Clayey Silt	22.392	0.341	0.762		0.762	2.47	1.1213	0.97	0.379	2.470	1.12	25.11	2.621	65.817	0.11	1.00	1	
13.615	5	Clayey Silt to Silty Clay	9.943	0.22	0.8	0.019	0.781	2.89	1.11055	0.97	0.388							1.00	1	
14.272	5	Clayey Silt to Silty Clay	7.42	0.114	0.837	0.04	0.798	2.95	1.1011	0.97	0.397							1.00	1	
14.928	1	Sensitive Fines	8.032	0.082	0.874	0.06	0.814	2.83	1.09235	0.97	0.406							1.00	1	
15.584	6	Sandy Silt to Clayey Silt	9.731	0.077	0.911	0.081	0.831	2.7	1.08321	0.97	0.414							1.00	1	
16.24	6	Sandy Silt to Clayey Silt	14.761	0.119	0.949	0.101	0.848	2.51	1.07422	0.97	0.422	2.510	1.07	15.86	2.820	44.708	0.09	1.00	1	0.21
16.896	6	Sandy Silt to Clayey Silt	21.467	0.258	0.987	0.121	0.865	2.47	1.06538	0.96	0.429	2.470	1.07	22.87	2.621	59.950	0.10	1.00	1	0.23
17.552	6	Sandy Silt to Clayey Silt	15.73	0.146	1.024	0.142	0.882	2.54	1.05668	0.96	0.436	2.540	1.06	16.62	2.979	49.515	0.09	1.00	1	0.21
18.209	6	Sandy Silt to Clayey Silt	13.853	0.109	1.062	0.162	0.899	2.55	1.04812	0.96	0.443	2.550	1.05	14.52	3.034	44.056	0.09	1.00	1	0.20
18.865	6	Sandy Silt to Clayey Silt	11.831	0.094	1.099	0.183	0.916	2.63	1.0397	0.96	0.449							1.00	1	
19.521	6	Sandy Silt to Clayey Silt	10.556	0.083	1.137	0.203	0.934	2.68	1.03093	0.96	0.455							1.00	1	
20.177	6	Sandy Silt to Clayey Silt	12.728	0.126	1.175	0.224	0.951	2.66	1.02278	0.96	0.461							1.00	1	
20.833	6	Sandy Silt to Clayey Silt	13.547	0.145	1.212	0.244	0.968	2.66	1.01476	0.95	0.466							1.00	1	
21.49	6	Sandy Silt to Clayey Silt	13.809	0.132	1.25	0.265	0.985	2.64	1.00686	0.95	0.472							1.00	1	
22.146	6	Sandy Silt to Clayey Silt	17.68	0.199	1.287	0.285	1.002	2.59	0.99909	0.95	0.476	2.590	1.00	17.66	3.266	57.691	0.10	1.00	1	0.21
22.802	6	Sandy Silt to Clayey Silt	17.736	0.216	1.325	0.306	1.019	2.62	0.99144	0.95	0.481							1.00	1	
23.458	6	Sandy Silt to Clayey Silt	18.22	0.279	1.363	0.326	1.036	2.66	0.9839	0.95	0.486							0.99	1	
24.114	7	Silty Sand to Sandy Silt	34.474	0.41	1.401	0.347	1.054	2.37	0.97604	0.94	0.490	2.370	0.98	33.65	2.194	73.825	0.12	0.99	1	0.24
24.77	6	Sandy Silt to Clayey Silt	23.968	0.398	1.439	0.367	1.072	2.6	0.96831	0.94	0.493							0.99	1	
25.427	7	Silty Sand to Sandy Silt	50.578	0.617	1.477	0.388	1.09	2.24	0.9607	0.94	0.497	2.240	0.96	48.59	1.770	86.028	0.14	0.98	1	0.28
26.083	7	Silty Sand to Sandy Silt	49.914	0.5	1.516	0.408	1.108	2.21	0.95321	0.94	0.500	2.210	0.95	47.58	1.692	80.484	0.13	0.98	1	0.26
26.739	6	Sandy Silt to Clayey Silt	19.262	0.322	1.554	0.429	1.125	2.72	0.94624	0.94	0.504							0.98	1	
27.395	6	Sandy Silt to Clayey Silt	31.444	0.482	1.591	0.449	1.142	2.5	0.93937	0.93	0.507	2.500	0.94	29.54	2.768	81.773	0.13	0.97	1	0.26
28.051	6	Sandy Silt to Clayey Silt	17.485	0.312	1.629	0.469	1.159	2.79	0.9326	0.93	0.510							0.97	1	
28.707	5	Clayey Silt to Silty Clay	12.589	0.188	1.666	0.49	1.176	2.9	0.92593	0.93	0.512							0.97	1	
29.364	6	Sandy Silt to Clayey Silt	22.726	0.367	1.704	0.51	1.194	2.66	0.91896	0.92	0.514							0.97	1	
30.02	7	Silty Sand to Sandy Silt	40.601	0.432	1.743	0.531	1.212	2.34	0.91211	0.92	0.516	2.340	0.91	37.03	2.084	77.167	0.12	0.96	1	0.24
30.676	6	Sandy Silt to Clayey Silt	14.845	0.22	1.78	0.551	1.229	2.84	0.90572	0.92	0.518							0.96	1	
31.332	5	Clayey Silt to Silty Clay	10.538	0.139	1.818	0.572	1.246	2.99	0.89943	0.91	0.520							0.96	1	
31.988	5	Clayey Silt to Silty Clay	10.879	0.142	1.855	0.592	1.263	2.97	0.89322	0.91	0.521							0.95	1	
32.644	6	Sandy Silt to Clayey Silt	18.501	0.191	1.893	0.613	1.28	2.66	0.8871	0.91	0.523							0.95	1	
33.301	6	Sandy Silt to Clayey Silt	21.785	0.222	1.931	0.633	1.297	2.59	0.88106	0.90	0.524	2.590	0.88	19.19	3.266	62.688	0.10	0.95	1	0.20
33.957	6	Sandy Silt to Clayey Silt	31.817	0.549	1.968	0.654	1.314	2.58	0.8751	0.90	0.524	2.580	0.88	27.84	3.206	89.277	0.15	0.95	1	0.28
34.613	6	Sandy Silt to Clayey Silt	26.821	0.508	2.006	0.674	1.332	2.68	0.86888	0.89	0.525							0.94	1	
35.269	5	Clayey Silt to Silty Clay	13.871	0.344	2.043	0.695	1.349	3.03	0.86308	0.89	0.525							0.94	1	
35.925	5	Clayey Silt to Silty Clay	13.731	0.364	2.081	0.715	1.366	3.04	0.85737	0.88	0.525							0.94	1	
36.581	5	Clayey Silt to Silty Clay	15.992	0.488	2.119	0.736	1.383	3.02	0.85172	0.88	0.525							0.94	1	
37.238	5	Clayey Silt to Silty Clay	14.249	0.452	2.156	0.756	1.4	3.09	0.84615	0.87	0.525							0.93	1	
37.894	5	Clayey Silt to Silty Clay	14.772	0.339	2.194	0.777	1.417	2.98	0.84066	0.87	0.525							0.93	1	
38.55	6	Sandy Silt to Clayey Silt	23.428	0.394	2.231	0.797	1.434	2.7	0.83523	0.86	0.524							0.93	1	
39.206	6	Sandy Silt to Clayey Silt	21.284	0.316	2.269	0.818	1.451	2.72	0.82988	0.86	0.523							0.93	1	
39.862	6	Sandy Silt to Clayey Silt	27.623	0.395	2.307	0.838	1.469	2.62	0.82428	0.85	0.522							0.93	1	
40.518	6	Sandy Silt to Clayey Silt	24.334	0.354	2.344	0.858	1.486	2.68	0.81906	0.85	0.521							0.92	1	
41.175	6	Sandy Silt to Clayey Silt	20.913	0.322	2.382	0.879	1.503	2.76	0.81391	0.84	0.519							0.92	1	
41.831	6	Sandy Silt to Clayey Silt	21.746	0.263	2.419	0.899	1.52	2.69	0.80882	0.83	0.518							0.92	1	
42.487	6	Sandy Silt to Clayey Silt	19.735	0.219	2.457	0.92	1.537	2.72	0.8038	0.83	0.516							0.92	1	
43.143	6	Sandy Silt to Clayey Silt	17.942	0.215	2.495	0.94	1.554	2.78	0.79884	0.82	0.515							0.92	1	
43.799	6	Sandy Silt to Clayey Silt	16.131	0.28	2.532	0.961	1.571	2.91	0.79394	0.82	0.513							0.91	1	
44.455	7	Silty Sand to Sandy Silt	41.348	0.595	2.571	0.981	1.589	2.5	0.78881	0.81	0.511	2.500	0.79	32.62	2.768	90.295	0.15	0.91	1	0.29
45.112	7	Silty Sand to Sandy Silt	58.493	1.085	2.609	1.002	1.608	2.45	0.78348	0.80	0.508	2.450	0.78	45.83	2.528	115.863	0.22	0.91	1	0.44
45.768	7	Silty Sand to Sandy Silt	71.009	1.174	2.648	1.022	1.626	2.35	0.77849	0.80	0.506	2.350	0.78	55.28	2.120	117.173	0.23	0.91	1	0.45
46.424	7	Silty Sand to Sandy Silt	67.394	1.279	2.687	1.043	1.644	2.41	0.77356	0.79	0.503	2.410	0.77	52.13	2.354	122.703	0.25	0.91	1	0.50
47.08	7	Silty Sand to Sandy Silt	69.995	1.352	2.725	1.063	1.662	2.41	0.76869	0.78	0.500	2.410	0.77	53.80	2.354	126.637	0.27	0.90	1	0.54
47.736	8	Sand to Silty Sand	91.585	0.995	2.765	1.084	1.681	2.16	0.76362	0.78	0.498	2.160	0.76	69.94	1.574	110.098	0.20	0.90	1	0.41
48.392	7	Silty Sand to Sandy Silt	76.824	1.057	2.804	1.104	1.699	2.29	0.75888	0.77	0.495	2.290	0.76	58.30	1.917	111.765	0.21	0.90	1	0.42
49.049	6	Sandy Silt to Clayey Silt	47.436	1.251	2.841	1.125	1.717	2.65	0.7542	0.76	0.492							0.90	1	
49.705	6	Sandy Silt to Clayey Silt	29.945	0.603	2.879	1.145	1.734	2.77	0.74983	0.76	0.489							0.90	1	
50.361	6	Sandy Silt to Clayey Silt	19.161	0.38	2.916	1.166	1.751	2.97	0.74551	0.75	0.486							0.89	1	
51.017	6	Sandy Silt to Clayey Silt	18.599	0.369	2.954	1.186	1.768	2.99	0.74124	0.74	0.484							0.89	1	
51.673	5	Clayey Silt to Silty Clay	18.231	0.447	2.992	1.207	1.785	3.05	0.73702	0.74	0.481							0.89	1	
52.329	5	Clayey Silt to Silty Clay	18.432	0.449	3.029	1.227	1.802	3.03	0.73284	0.73	0.478							0.89	1	
52.986	5	Clayey Silt to Silty Clay	18.042	0.491	3.067	1.247	1.819	3.05	0.72872	0.72	0.475							0.89	1	
53.642	5	Clayey Silt to Silty Clay	18.231	0.572	3.104	1.268	1.836	3.08	0.72464	0.72	0.472							0.89	1	
54.298	5	Clayey Silt to Silty Clay	18.081	0.567	3.142	1.288	1.854	3.09	0.72037	0.71	0.469							0.88	1	
54.954	5	Clayey Silt to Silty Clay	20.465	0.558	3.18	1.309	1.871	3	0.71638	0.70	0.466							0.88	1	
55.61	5	Clayey Silt to Silty Clay	18.454	0.572	3.217	1.329	1.888	3.08	0.71244	0.70	0.464							0.88	1	
56.266	4	Silty Clay to Clay	19.072	0.77	3.255	1.35	1.905	3.15	0.70853	0.69	0.461							0.88	1	
56.923	5	Clayey Silt to Silty Clay	18.56	0.657	3.292	1.37	1.922	3.13	0.70468	0.69	0.458							0.88	1	
57.579	5	Clayey Silt to Silty Clay	18.616	0.606	3.33	1.391	1.939	3.1	0.70086	0.68	0.455							0.88	1	
58.235	4	Silty Clay to Clay	19.796	0.824	3.368	1.411	1.956	3.15	0.69708	0.67	0.453							0.87	1	
58.891	4	Silty Clay to Clay	20.437	0.834	3.405	1.432	1.973	3.14	0.69335	0.67	0.450							0.87	1	
59.547	5	Clayey Silt to Silty Clay	19.485	0.63	3.443	1.452	1.991	3.09	0.68944	0.66	0.447							0.87	1	
60.203	5	Clayey Silt to Silty Clay	20.276	0.691	3.48	1.473	2.008	3.09	0.68579	0.66	0.444							0.87	1	
60.86	5	Clayey Silt to Silty Clay	20.331	0.684	3.518	1.493	2.025	3.1	0.68217	0.65	0.442							0.87	1	
61.516	6	Sandy Silt to Clayey Silt	20.526	0.417	3.555	1.514	2.042	2.97	0.67859	0.65	0.439							0.87	1	
62.172	6	Sandy Silt to Clayey Silt	19.952	0.408	3.593	1.534	2.059	2.98	0.67505	0.64	0.437							0.87	1	
62.828	6	Sandy Silt to Clayey Silt	19.824	0.42	3.631	1.555	2.076	3	0.67155	0.64	0.435							0.86	1	

LIQUEFACTION POTENTIAL ANALYSIS (per Youd & Idriss, 2001)

PROJECT NAME ***HWY 101/TULLY***
PROJECT NO. ***207150.10***
CPT NO. ***BR-2***

FAULT INFO
COAST RANGE - SIERRAN BLOCK BOUNDARY ZONE (CSB)
a_{max} (g)= 0.6

FAULT M_w = 7.5
MSF = 1.00

		CPT RESULT INPUT							*CSR*		*$CRR_{7.5}$*						*F.S.=($CRR_{7.5}$/CSR)*MSF*K_σ*K_α*		
Depth (ft)		Soil Behavior Type	qc (tsf)	fs (tsf)	σ_v (tsf)	u (tsf)	σ_v' (tsf)	Ic*	C_N*	γ_d	CSR	Ic	C_Q	q_{c1N}	K_C	$(q_{c1N})_{cs}$	$CRR_{7.5}$	$K\sigma$	$K\alpha$	F.S.
63.484	6	Sandy Silt to Clayey Silt	19.724	0.392	3.668	1.575	2.093	2.98	0.66808	0.63	0.432							0.86	1	
64.14	5	Clayey Silt to Silty Clay	23.294	0.687	3.706	1.595	2.11	3.02	0.66465	0.63	0.430							0.86	1	
64.797	5	Clayey Silt to Silty Clay	30.675	1.135	3.743	1.616	2.128	2.98	0.66106	0.62	0.428							0.86	1	
65.453	5	Clayey Silt to Silty Clay	39.337	1.333	3.781	1.636	2.145	2.86	0.6577	0.62	0.426							0.86	1	
66.109	6	Sandy Silt to Clayey Silt	31.165	0.822	3.819	1.657	2.162	2.9	0.65437	0.61	0.424							0.86	1	
66.765	5	Clayey Silt to Silty Clay	22.904	0.624	3.856	1.677	2.179	3.06	0.65108	0.61	0.421							0.86	1	
67.421	6	Sandy Silt to Clayey Silt	23.412	0.53	3.894	1.698	2.196	3	0.64782	0.61	0.420							0.85	1	
68.077	6	Sandy Silt to Clayey Silt	26.932	0.62	3.931	1.718	2.213	2.93	0.64459	0.60	0.418							0.85	1	
68.734	6	Sandy Silt to Clayey Silt	46.461	0.961	3.969	1.739	2.23	2.68	0.6414	0.60	0.416							0.85	1	
69.39	8	Sand to Silty Sand	113.437	1.422	4.009	1.759	2.249	2.23	0.63787	0.60	0.414	2.230	0.64	72.36	1.743	126.153	0.27	0.84	1	0.64
70.046	6	Sandy Silt to Clayey Silt	63.751	1.852	4.046	1.78	2.267	2.67	0.63455	0.59	0.412							0.85	1	
70.702	9	Sand	187.197	1.993	4.087	1.8	2.287	2.01	0.63091	0.59	0.410	2.010	0.63	118.11	1.313	155.105	0.43	0.79	1	1.04
71.358	10	Gravelly Sand to Sand	513.404	2.438	4.129	1.821	2.308	1.44	0.62714	0.58	0.408	1.440	0.63	321.98	1.000	321.975		0.72	1	
72.014	10	Gravelly Sand to Sand	568.07	2.989	4.171	1.841	2.329	1.44	0.62341	0.58	0.406	1.440	0.62	354.14	1.000	354.138		0.71	1	
72.671	10	Gravelly Sand to Sand	482.991	1.658	4.212	1.862	2.351	1.39	0.61954	0.58	0.404	1.390	0.62	299.23	1.000	299.234		0.71	1	
73.327	10	Gravelly Sand to Sand	503.74	2.967	4.254	1.882	2.372	1.52	0.6159	0.58	0.402	1.520	0.62	310.25	1.000	310.254		0.71	1	
73.983	10	Gravelly Sand to Sand	421.435	2.918	4.296	1.903	2.393	1.63	0.6123	0.57	0.401	1.630	0.61	258.05	1.000	258.045		0.71	1	
74.639	10	Gravelly Sand to Sand	643.479	2.45	4.338	1.923	2.415	1.32	0.60858	0.57	0.399	1.320	0.61	391.61	1.000	391.605		0.70	1	
75.295	10	Gravelly Sand to Sand	572.588	2.1	4.379	1.944	2.436	1.35	0.60506	0.57	0.397	1.350	0.61	346.45	1.000	346.450		0.70	1	
75.951	10	Gravelly Sand to Sand	394.976	1.479	4.421	1.964	2.457	1.5	0.60159	0.56	0.396	1.500	0.60	237.61	1.000	237.612		0.70	1	
76.608	10	Gravelly Sand to Sand	405.911	2.541	4.463	1.984	2.479	1.62	0.59799	0.56	0.394	1.620	0.60	242.73	1.000	242.730		0.70	1	
77.264	9	Sand	354.804	3.261	4.504	2.005	2.499	1.78	0.59476	0.56	0.392	1.780	0.59	211.02	1.092	230.508		0.70	1	
77.92	9	Sand	298.74	2.293	4.544	2.025	2.519	1.79	0.59156	0.56	0.391	1.790	0.59	176.72	1.099	194.295		0.72	1	
78.576	10	Gravelly Sand to Sand	522.3	2.297	4.586	2.046	2.54	1.45	0.58824	0.55	0.390	1.450	0.59	307.24	1.000	307.235		0.69	1	
79.232	10	Gravelly Sand to Sand	505.238	2.617	4.628	2.066	2.562	1.51	0.5848	0.55	0.388	1.510	0.58	295.46	1.000	295.461		0.69	1	
79.888	9	Sand	287.216	2.128	4.669	2.087	2.582	1.8	0.5817	0.55	0.387	1.800	0.58	167.07	1.107	184.894		0.72	1	
80.545	9	Sand	158.678	1.813	4.709	2.107	2.602	2.13	0.57864	0.55	0.386	2.130	0.58	91.82	1.512	138.806	0.33	0.79	1	0.85
81.201	10	Gravelly Sand to Sand	389.473	1.523	4.751	2.128	2.623	1.54	0.57546	0.54	0.384	1.540	0.58	224.13	1.000	224.128		0.68	1	
81.857	9	Sand	177.516	2.126	4.792	2.148	2.644	2.11	0.57232	0.54	0.383	2.110	0.57	101.60	1.473	149.668	0.39	0.78	1	1.02
82.513	7	Silty Sand to Sandy Silt	117.52	2.85	4.831	2.169	2.662	2.46	0.56965	0.54	0.382	2.460	0.57	66.95	2.574	172.336		0.82	1	
83.169	5	Clayey Silt to Silty Clay	38.423	1.501	4.868	2.189	2.679	3.02	0.56716	0.54	0.381							0.82	1	
83.825	5	Clayey Silt to Silty Clay	34.942	1.352	4.906	2.21	2.696	3.06	0.56468	0.54	0.380							0.82	1	
84.482	5	Clayey Silt to Silty Clay	33.237	0.986	4.943	2.23	2.713	3.02	0.56223	0.53	0.379							0.82	1	
85.138	6	Sandy Silt to Clayey Silt	37.983	0.948	4.981	2.251	2.73	2.92	0.5598	0.53	0.379							0.82	1	
85.794	6	Sandy Silt to Clayey Silt	39.754	0.877	5.019	2.271	2.747	2.87	0.55739	0.53	0.378							0.82	1	
86.45	6	Sandy Silt to Clayey Silt	39.014	1.001	5.056	2.292	2.765	2.92	0.55485	0.53	0.377							0.82	1	
87.106	5	Clayey Silt to Silty Clay	45.447	1.645	5.094	2.312	2.782	2.95	0.55249	0.53	0.376							0.81	1	
87.762	5	Clayey Silt to Silty Clay	45.881	1.78	5.131	2.332	2.799	2.96	0.55014	0.52	0.375							0.81	1	
88.419	5	Clayey Silt to Silty Clay	55.629	2	5.169	2.353	2.816	2.87	0.54781	0.52	0.375							0.81	1	
89.075	5	Clayey Silt to Silty Clay	71.638	2.854	5.206	2.373	2.833	2.8	0.5455	0.52	0.374							0.81	1	
89.731	5	Clayey Silt to Silty Clay	67.009	2.726	5.244	2.394	2.85	2.83	0.54321	0.52	0.373							0.81	1	
90.387	6	Sandy Silt to Clayey Silt	49.954	1.588	5.282	2.414	2.867	2.88	0.54094	0.52	0.372							0.81	1	
91.043	6	Sandy Silt to Clayey Silt	39.203	1.201	5.319	2.435	2.884	2.98	0.53869	0.52	0.372							0.81	1	
91.699	6	Sandy Silt to Clayey Silt	33.822	0.954	5.357	2.455	2.902	3.02	0.53632	0.52	0.371							0.81	1	
92.356	6	Sandy Silt to Clayey Silt	31.298	0.856	5.394	2.476	2.919	3.05	0.53411	0.51	0.370							0.81	1	
93.012	6	Sandy Silt to Clayey Silt	32.891	0.869	5.432	2.496	2.936	3.02	0.53191	0.51	0.370							0.81	1	
93.668	6	Sandy Silt to Clayey Silt	41.431	1.085	5.47	2.517	2.953	2.92	0.52974	0.51	0.369							0.81	1	
94.324	6	Sandy Silt to Clayey Silt	38.925	1.232	5.507	2.537	2.97	3	0.52758	0.51	0.368							0.80	1	
94.98	6	Sandy Silt to Clayey Silt	34.869	1.089	5.545	2.558	2.987	3.03	0.52544	0.51	0.368							0.80	1	
95.636	6	Sandy Silt to Clayey Silt	37.281	1.197	5.582	2.578	3.004	3	0.52331	0.51	0.367							0.80	1	
96.293	6	Sandy Silt to Clayey Silt	45.391	1.48	5.62	2.599	3.021	2.93	0.5212	0.51	0.367							0.80	1	
96.949	6	Sandy Silt to Clayey Silt	45.442	1.383	5.658	2.619	3.039	2.91	0.51899	0.50	0.366							0.80	1	
97.605	6	Sandy Silt to Clayey Silt	86.149	2.771	5.695	2.64	3.056	2.69	0.51692	0.50	0.366							0.80	1	
98.261	6	Sandy Silt to Clayey Silt	117.024	3.986	5.733	2.66	3.073	2.61	0.51486	0.50	0.365							0.80	1	
98.917	8	Sand to Silty Sand	172.414	2.685	5.772	2.681	3.092	2.25	0.51258	0.50	0.364	2.250	0.51	88.38	1.798	158.923	0.45	0.77	1	1.24
99.573	9	Sand	244.275	1.782	5.813	2.701	3.112	1.93	0.5102	0.50	0.364	1.930	0.51	124.63	1.218	151.857	0.41	0.72	1	1.12

APPENDIX E-2

Structural Pavement Design

ROUTE 101 IMPROVEMENTS – RTE 280/680 TO CAPITOL EXPWY

OUTSIDE LANE $TI = 14$, $R_{base} = 7$, $R_{AS} = 50$ (0.4 AS)

- HIGH TI → USE LEAN CONCRETE BASE (LCB)
- AS-BUILT HAS ATPB → NEED ATPB TO CARRY WATER

$$GE_{TOTAL} = 0.0032\,TI\,(100 - R_{base})$$
$$= 0.0032(14)(100-7)$$
$$= 4.166$$

(I) USE HMA / ATPB / LCB / AS COMBINATION

$$GE_{HMA+ATPB+LCB} = 0.0032\,TI\,(100 - R_{AS})$$
$$= 0.0032\,(14)(100-50)$$
$$= 2.24$$

- $GE_{HMA} = (GE_{HMA+ATPB+LCB}) \times 0.4 + 0.2$
  $= (2.24)(0.4) + 0.2 = 1.10$

$t > 0.5'$ $\quad G_{f\,HMA} = (7.0)\dfrac{(t)^{1/3}}{(TI)^{1/2}} = (7.0)\dfrac{t^{1/3}}{\sqrt{14}} = 1.87\,t^{1/3}$

HMA THICKNESS $t = GE_{HMA}/G_f = \dfrac{1.10}{1.87\,t^{1/3}}$

$t \cdot t^{1/3} = \dfrac{1.10}{1.87}$, $\quad t^{4/3} = 0.59$, $\quad t = (0.59)^{3/4} = 0.67'$

$G_f = 1.87\,t^{1/3} = 1.64$

$t = 0.67' \longrightarrow$ USE HMA $t = 0.70'$
$GE_{HMA} = 1.16$

- ATPB LAYER → USE 0.25' ATPB

$G_{f\,ATPB} = 1.40$, $\quad \therefore \quad GE_{ATPB} = 0.25 \times 1.40 = 0.35$

- LCB LAYER → $GE_{LCB} = GE_{HMA+ATPB+LCB} - GE_{HMA} - 0.35 + 0.2$
  $= 2.24 - 1.16 - 0.35 + 0.2 = 0.93$

USE 0.5' LCB (GE = 0.95 > 0.93)

$GE_{AS} = GE_{TOTAL} - GE_{HMA} - GE_{ATPB} - GE_{LCB}$

$= 4.17 - 1.16 - 0.35 - 0.95 = 1.71$ USE AS 1.70'

PAVEMENT SECTIONS

0.70'	HMA
0.25'	ATPB
0.50'	LCB
1.70'	AS

ATPB MAY BE SANDWICHED IN-BETWEEN HMA TO MATCH AS-BUILT ATPB FOR DRAINAGE PURPOSE.

(II) FULL DEPTH OPTION

$GE_{TOTAL} = 0.0032\,TI(100 - R_{base})$
$= 0.0032(14)(100-7)$
$= 4.166$

FULL DEPTH $GE_{HMA} = 4.166 + 0.1\,(ES) = 4.27$

$G_f = (7.0)\frac{t^{1/3}}{\sqrt{TI}} = (7.0)\frac{t^{1/3}}{\sqrt{14}} = 1.87\,t^{1/3}$

$t = GE_{HMA} / G_f = \frac{4.27}{1.87\,t^{1/3}}$

$t \cdot t^{1/3} = \frac{4.27}{1.87}$, $t^{4/3} = 2.28$, $t = (2.28)^{3/4} = 1.86'$

∴ USE FULL DEPTH HMA 1.90'

Table 623.1E
Rigid Pavement Catalog
(South Coast/Central Coast, Type II Subgrade Soil) (1), (2), (3), (4)

	Rigid Pavement Structural Depth							
TI	With Lateral Support (ft)				Without Lateral Support (ft)			
< 9	0.70 JPCP 0.35 LCB 0.50 AS	0.70 JPCP 0.35 HMA-A 0.50 AS	0.70 JPCP 1.00 AB	0.70 JPCP 0.35 ATPB 0.80 AB	0.70 JPCP 0.35 LCB 0.50 AS	0.70 JPCP 0.35 HMA-A 0.50 AS	0.75 JPCP 1.00 AB	0.75 JPCP 0.35 ATPB 0.80 AB
9.5 to 10	0.70 JPCP 0.35 LCB 0.50 AS	0.70 JPCP 0.35 HMA-A 0.50 AS	0.75 JPCP 1.00 AB	0.75 JPCP 0.35 ATPB 0.80 AB	0.75 JPCP 0.35 LCB 0.50 AS	0.75 JPCP 0.35 HMA-A 0.50 AS	0.80 JPCP 1.00 AB	0.80 JPCP 0.35 ATPB 0.80 AB
10.5 to 11	0.75 JPCP 0.40 LCB 0.60 AS	0.75 JPCP 0.40 HMA-A 0.60 AS	0.80 JPCP 1.30 AB		0.80 JPCP 0.40 LCB 0.60 AS	0.80 JPCP 0.40 HMA-A 0.60 AS	0.85 JPCP 1.30 AB	
11.5 to 12	0.80 JPCP 0.40 LCB 0.60 AS	0.80 JPCP 0.40 HMA-A 0.60 AS	0.80 CRCP 0.40 HMA-A 0.60 AS		0.85 JPCP 0.40 LCB 0.60 AS	0.85 JPCP 0.40 HMA-A 0.60 AS	0.80 CRCP 0.40 HMA-A 0.60 AS	
12.5 to 13	0.85 JPCP 0.50 LCB 0.70 AS	0.85 JPCP 0.50 HMA-A 0.70 AS	0.80 CRCP 0.50 HMA-A 0.70 AS		0.90 JPCP 0.50 LCB 0.70 AS	0.90 JPCP 0.50 HMA-A 0.70 AS	0.85 CRCP 0.50 HMA-A 0.70 AS	
13.5 to 14	0.85 JPCP 0.50 LCB 0.70 AS	0.85 JPCP 0.50 HMA-A 0.70 AS	0.80 CRCP 0.50 HMA-A 0.70 AS		0.95 JPCP 0.50 LCB 0.70 AS	0.95 JPCP 0.50 HMA-A 0.70 AS	0.90 CRCP 0.50 HMA-A 0.70 AS	
14.5 to 15	0.90 JPCP 0.50 LCB 0.70 AS	0.90 JPCP 0.50 HMA-A 0.70 AS	0.85 CRCP 0.50 HMA-A 0.70 AS		1.00 JPCP 0.50 LCB 0.70 AS	1.00 JPCP 0.50 HMA-A 0.70 AS	0.95 CRCP 0.50 HMA-A 0.70 AS	
15.5 to 16	0.95 JPCP 0.50 LCB 0.70 AS	0.90 JPCP 0.50 HMA-A 0.70 AS	0.85 CRCP 0.50 HMA-A 0.70 AS		1.05 JPCP 0.50 LCB 0.70 AS	1.05 JPCP 0.50 HMA-A 0.70 AS	0.95 CRCP 0.50 HMA-A 0.70 AS	
16.5 to 17	1.00 JPCP 0.50 LCB 0.70 AS	0.95 JPCP 0.50 HMA-A 0.70 AS	0.90 CRCP 0.50 HMA-A 0.70 AS		1.10 JPCP 0.50 LCB 0.70 AS	1.10 JPCP 0.50 HMA-A 0.70 AS	1.00 CRCP 0.50 HMA-A 0.70 AS	
> 17	1.05 JPCP 0.50 LCB 0.70 AS	1.05 JPCP 0.50 HMA-A 0.70 AS	0.95 CRCP 0.50 HMA-A 0.70 AS		1.15 JPCP 0.50 LCB 0.70 AS	1.15 JPCP 0.50 HMA-A 0.70 AS	1.00 CRCP 0.50 HMA-A 0.70 AS	

Notes:

(1) Thicknesses shown for JPCP are for doweled pavement only. The thickness shown in these tables are not valid for nondowelec JPCP.

(2) Includes 0.03 ft sacrificial wearing course for future grinding of JPCP/CRCP.

(3) Portland cement concrete may be substituted for LCB when justified for constructibility or traffic handling. If Portland cement concrete is used in lieu of LCB, it must be placed in a separate lift than JPCP and must not be bonded to the JPCP.

(4) If ATPB is needed for TIs > 10.0 to perpetuate an existing treated permeable layer, place the ATPB between the surface layer (JPCP or CRCP) and the base layer. No deduction is made to the thickness of the base and subbase layers on account of the ATPB.

Legend:

JPCP = Jointed Plain Concrete Pavement
CRCP = Continuously Reinforced Concrete Pavement
LCB = Lean Concrete Base
HMA-A = Hot Mix Asphalt (Type A)
ATPB = Asphalt Treated Permeable Base
AB = Class 2 Aggregate Base
AS = Class 2 Aggregate Subbase
TI = Traffic Index

DESIGN DESIGNATION

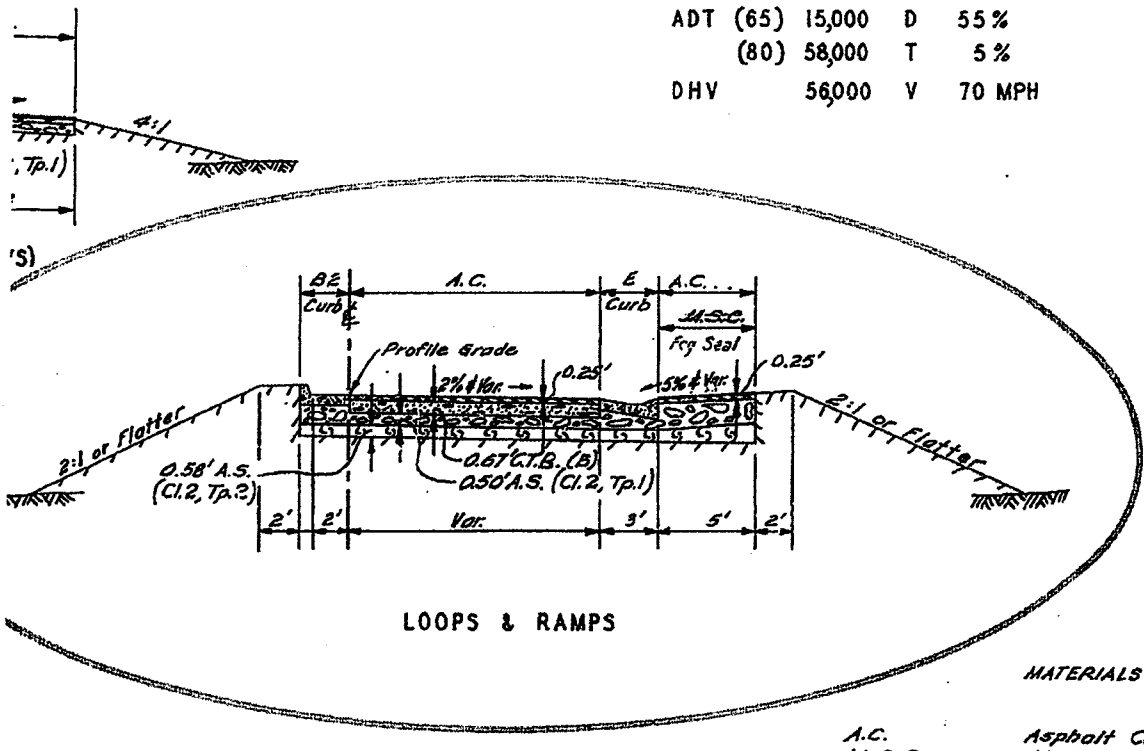
ADT	(65) 15,000	D	55 %
	(80) 58,000	T	5 %
DHV	56,000	V	70 MPH

DIST.	COUNTY	ROUTE	SECTION	SHEET NO.	TOTAL SHEETS
IV	S.C.	68	S.J.S.C.	2	57

August 21, 1961

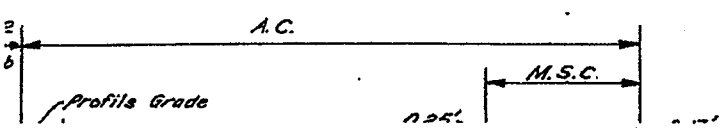
STATE HIGHWAY ENGINEER

Civil Engineer Licensed in Cal. No. 5945



MATERIALS ABBREVIATIONS

A.C.	Asphalt Concrete
M.S.C.	Medium Seal Coat
P.C.C. S.W.	Portland Cement Concrete Sidewalk
A.B. (2)	Aggregate Base (Class 2)
C.T.B. (B)	Cement Treated Base (Class B)
A.S. (Cl.2, Tp.1)	Aggregate Subbase (Class 2, Type 1)
A.S. (Cl.2, Tp.2)	" " (" 2, Type 2)



EXIST GRAVEL EQUIV.

1.08 ASB × 1.0 = 1.08

0.67 CTB(B) × 1.2 = 0.80

0.25 AC for TI=10 → 0.45' (orig const)

0.20 AC for TI=10 → 0.36 (2001 pvmt rehab.)

TOTAL GE 2.69'

ROUTE 101 NB
OFF-RAMP TO TULLY RD.

1962 ORIG. CONST.

PROPOSED G.E. (R=7)

1.20 ASB × 1.0 = 1.20

0.75 AB × 1.1 = 0.82

0.55 AC for TI=10 → 1.00

3.02

0.25' AC overlay adds 0.43' GE

APPENDIX E-3

Consolidation Settlement Analysis

SETTLEMENT ANALYSIS *** TULLY ROAD OC-ROUTE 101, SANTA CLARA COUNTY *** **APPROACH EMBANKMENTS (TYPICAL)** 10/20/08

LOCATION: APPROACH EMBANKMENTS FOR THE BRIDGE

Height of fill = 25 ft
Width of fill = 60 ft
Fill Density = 130 pcf

Based on reference Borings BR-1 & 2 (CPTs), E-11, R-8 & E-39
The new embankment is about 60 ft wide abutting existing fill.

- The undrained shear strength (Su) is correlated with SPT-N values based on Terzaghi and Peck (1967), and NAVFAC DM-7.1 (1982).
- Approximate estimation of preconsolidation pressure is based on Su/P ratio per Skempton (1957).
- The modified compression index (Cc/1+e0) is correlated with natural moisture content based on Lambe and Whitman (1969).
- The recompression index is adopted as 12% of the virgin compression index, which is typically 5% to 10% of the compression index (Holtz and Kovacs, 1982).
- The applied pressure is estimated from 2V:1H distribution of the embankment load.

DEPTH FROM	TO	EFFECTIVE UNIT WEIGHT(pcf) (psf)	WEIGHT OF LAYER (psf)	MIDLAYER EFFECTIVE OVERBURDEN PRESSURE (psf)	APPLIED PRESSURE (psf)	GENERALIZED AVERAGE SPT-N VALUES	UNDRAINED SHEAR STRENGTH (psf)	PRECONSO-LIDATION PRESSURE (psf)	NATURAL WATER CONTENT (%)	MODIFIED VIRGIN COM-PRESSION INDEX	MODIFIED RECOM-PRESSION INDEX	CONSOLIDATION SETTLEMENTS (in.) OC	NC	SUM
			0											
0	5	125	625	312.5	3120	10				(sand layer)				
5	10	125	625	937.5	2889	10								
10	15	125	625	1562.5	2690	10	1200	4800	20	0.0847	0.0106	0.28	0.00	0.28
15	20	63	315	2032.5	2516	10	1200	4800	20	0.0847	0.0106	0.22	0.00	0.22
20	25	63	315	2347.5	2364	10				(sand layer)				
25	30	63	315	2662.5	2229	10								
30	35	63	315	2977.5	2108	10	1200	4800	25	0.1174	0.0147	0.18	0.18	0.36
35	40	63	315	3292.5	2000	10	1200	4800	25	0.1174	0.0147	0.14	0.30	0.44
40	45	63	315	3607.5	1902	20				(sand layer)				
45	50	63	315	3922.5	1814	20								
50	55	63	315	4237.5	1733	14	1800	7200	29	0.1443	0.0180	0.16	0.00	0.16
55	60	63	315	4552.5	1660	14	1800	7200	29	0.1443	0.0180	0.15	0.00	0.15
60	65	63	315	4867.5	1592	14	1800	7200	29	0.1443	0.0180	0.13	0.00	0.13
65	70	63	315	5182.5	1529	14	1800	7200	29	0.1443	0.0180	0.12	0.00	0.12
70	73	63	189	5434.5	1483	14	1800	7200	29	0.1443	0.0180	0.07	0.00	0.07
73	80	63	441	5749.5	1429	60				(SAND LAYER)				
80	90	63	630	6285	1345	30	3750	15000	29	0.1443	0.0180	0.18	0.00	0.18
										TOTAL SETTLEMENT (IN.) =		1.64	0.48	2.11

O.C. RANGE SETTLEMENT = 1.64 INCHES
N.C. RANGE SETTLEMENT = 0.48 INCHES

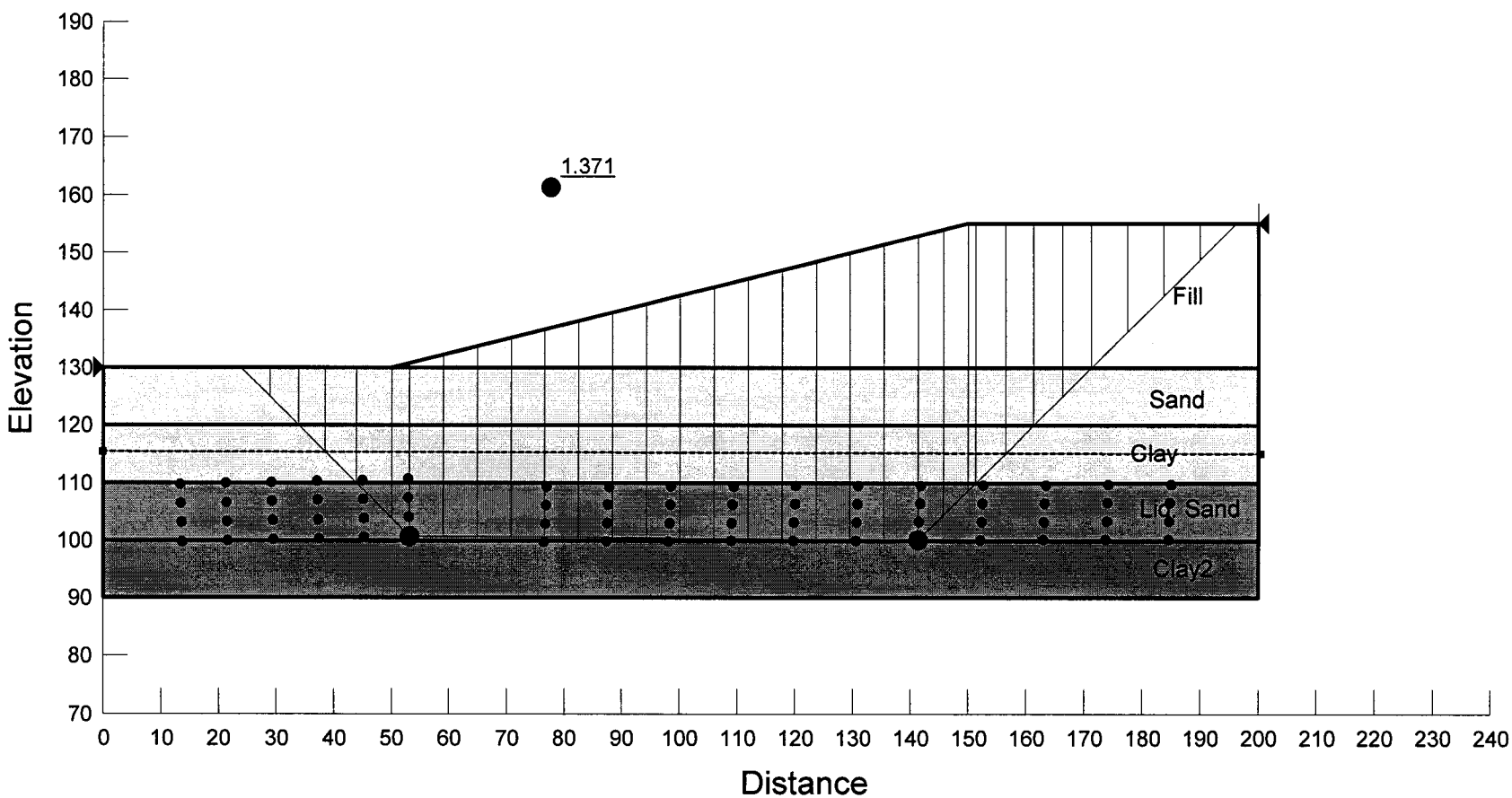
Majority of the settlement is in the overconsolidated/elastic range.

APPENDIX E-4

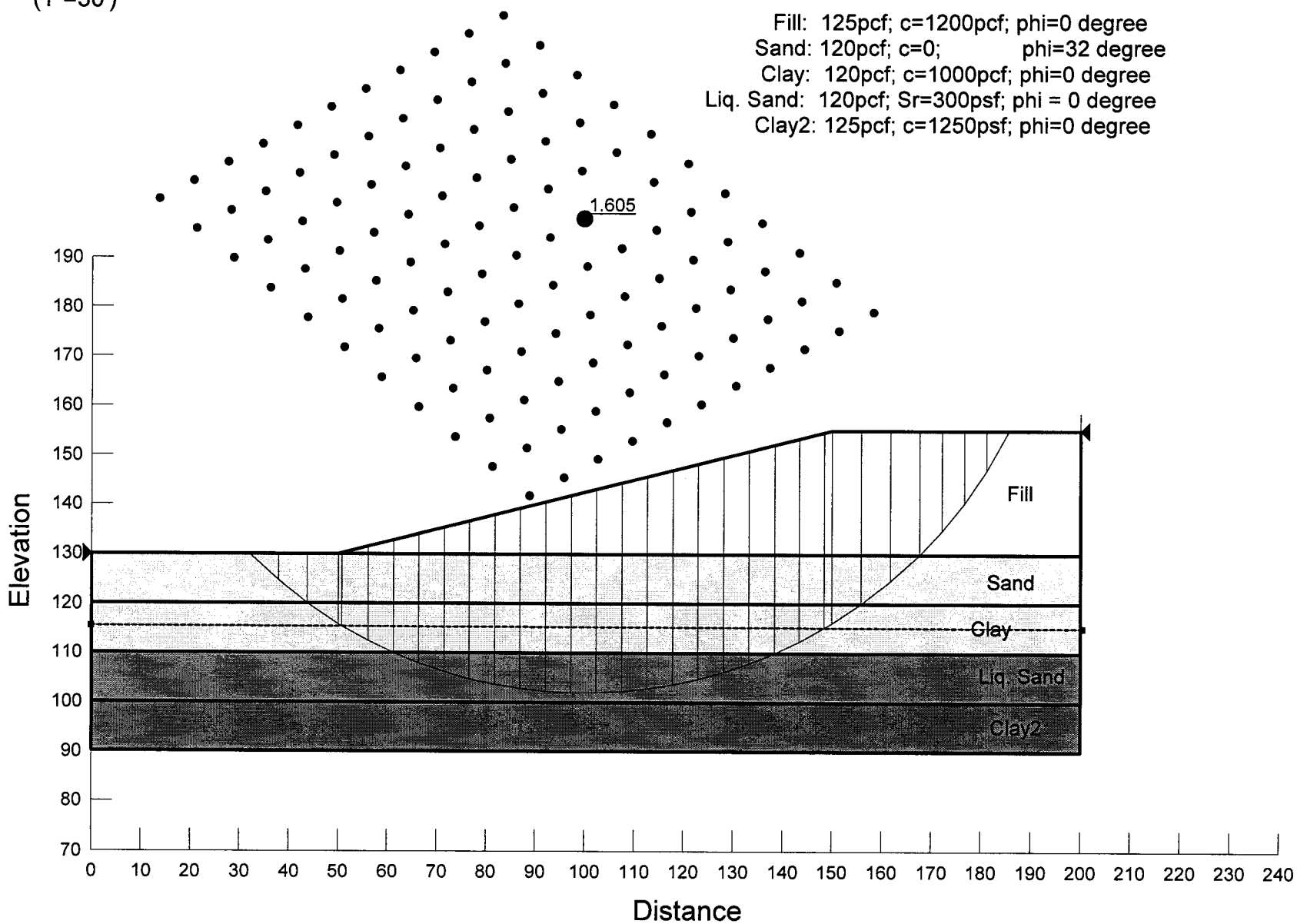
Embankment Slope Stability Analysis

US 101 Improvements from I280/680 to Yerba Buena Road
Slope Stability Analysis for Embankment (gradient 4H:1V)
Tully Road OC/Rte 101
(1"=30')

Fill: 125pcf; c=1200pcf; phi=0 degree
Sand: 120pcf; c=0; phi=32 degree
Clay: 120pcf; c=1000pcf; phi=0 degree
Liq. Sand: 120pcf; Sr=300psf; phi = 0 degree
Clay2: 125pcf; c=1250psf; phi=0 degree



US 101 Improvements from I280/680 to Yerba Buena Road
Slope Stability Analysis for Embankment (gradient 4H:1V)
Tully Road OC/Rte 101
(1"=30')

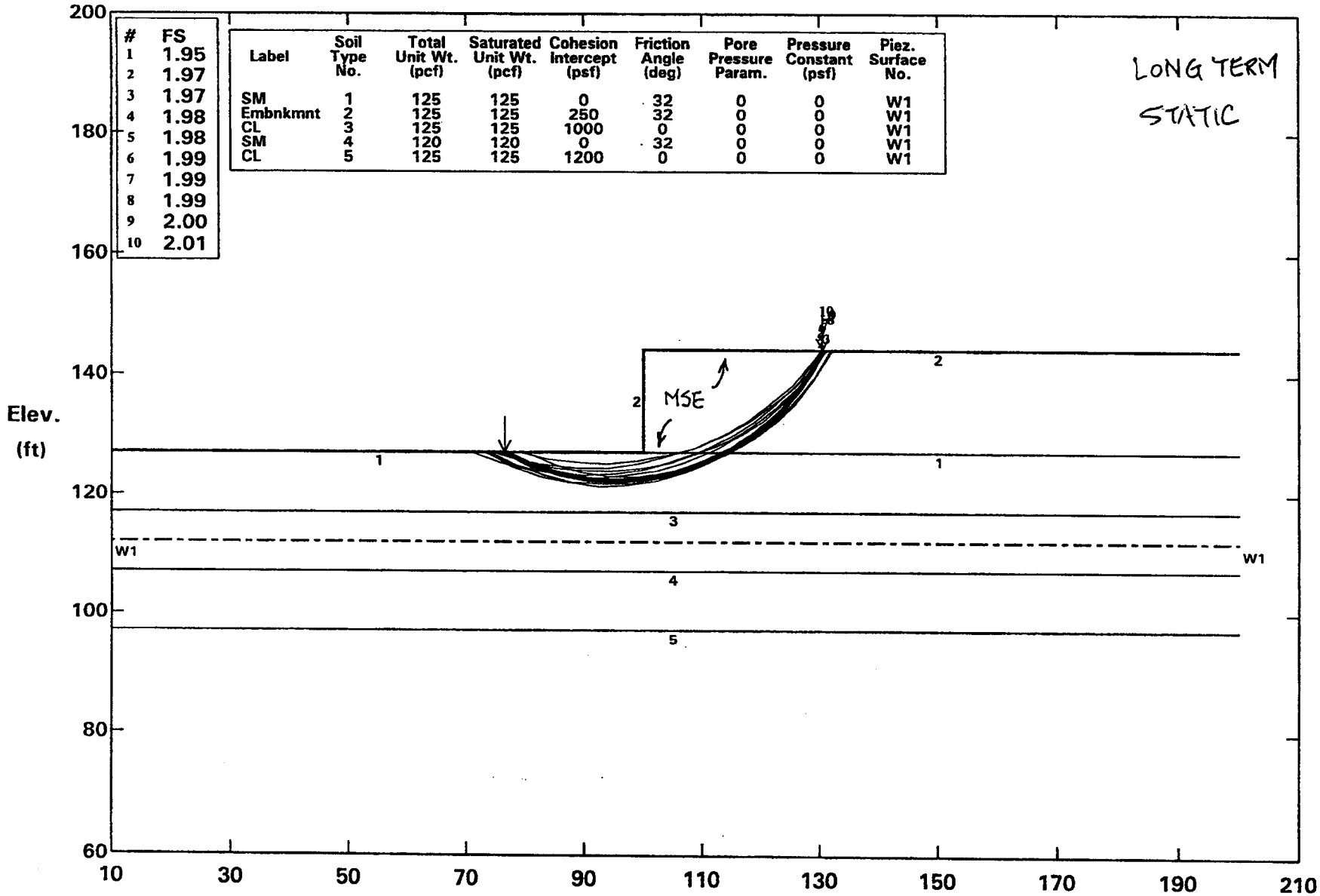


MSE Retaining Wall at NB Off-Ramp Tully Road/Route 101 I/C. 207150

Ten Most Critical. C:207150W1.PLT By: dw 10-27-08 6:34pm

#	FS
1	1.95
2	1.97
3	1.97
4	1.98
5	1.98
6	1.99
7	1.99
8	1.99
9	2.00
10	2.01

Label	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
SM	1	125	125	0	32	0	0	W1
Embnkmnt	2	125	125	250	32	0	0	W1
CL	3	125	125	1000	0	0	0	W1
SM	4	120	120	0	32	0	0	W1
CL	5	125	125	1200	0	0	0	W1



PCSTABL5M FSmin = 1.95 X-Axis (ft)

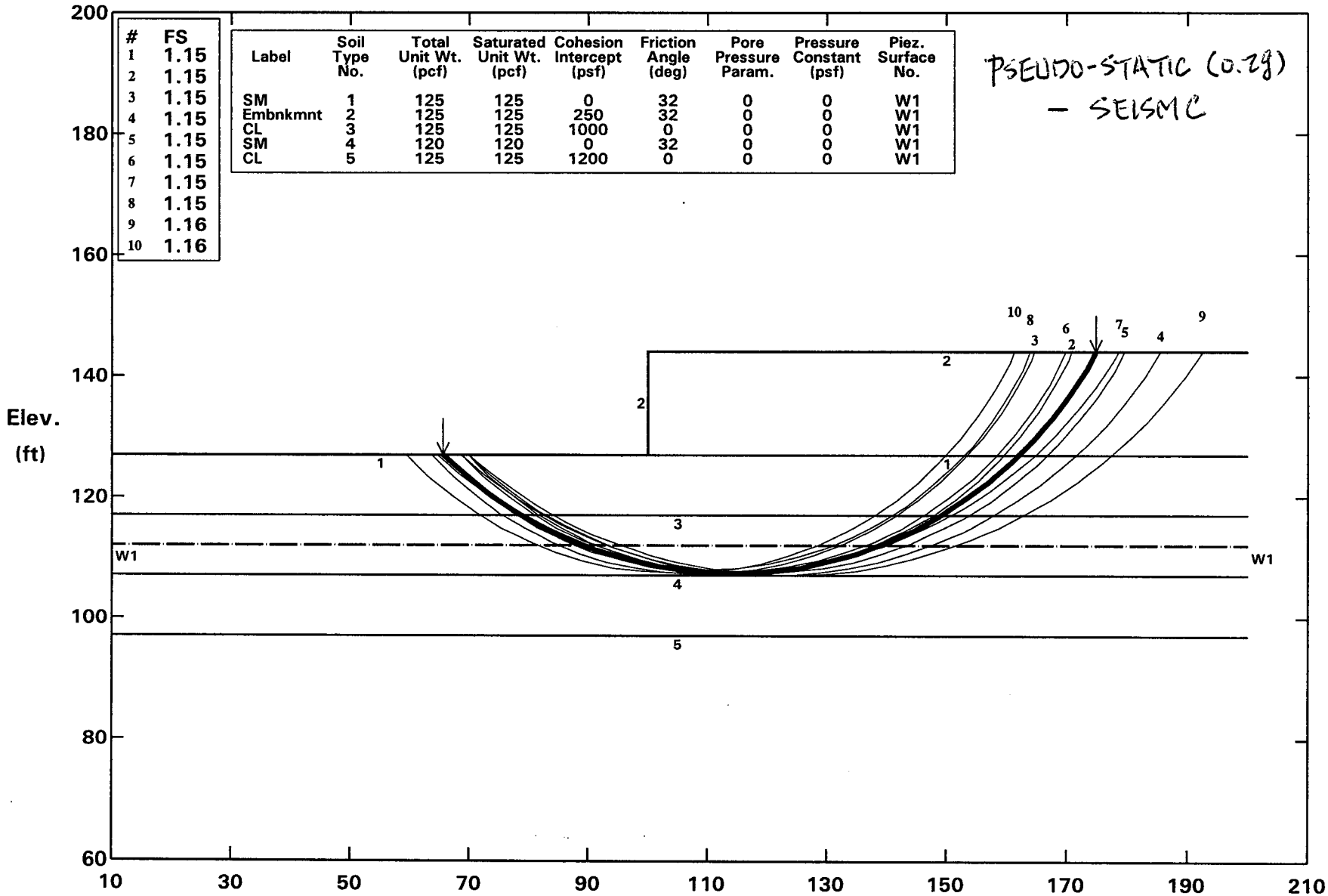
MSE Retaining Wall at NB Off-Ramp Tully Road/Route 101 I/C. 207150

Ten Most Critical. C:207150W1.PLT By: dw 03-27-09 1:09am

#	FS
1	1.15
2	1.15
3	1.15
4	1.15
5	1.15
6	1.15
7	1.15
8	1.15
9	1.16
10	1.16

Label	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
SM	1	125	125	0	32	0	0	W1
Embnkmnt	2	125	125	250	32	0	0	W1
CL	3	125	125	1000	0	0	0	W1
SM	4	120	120	0	32	0	0	W1
CL	5	125	125	1200	0	0	0	W1

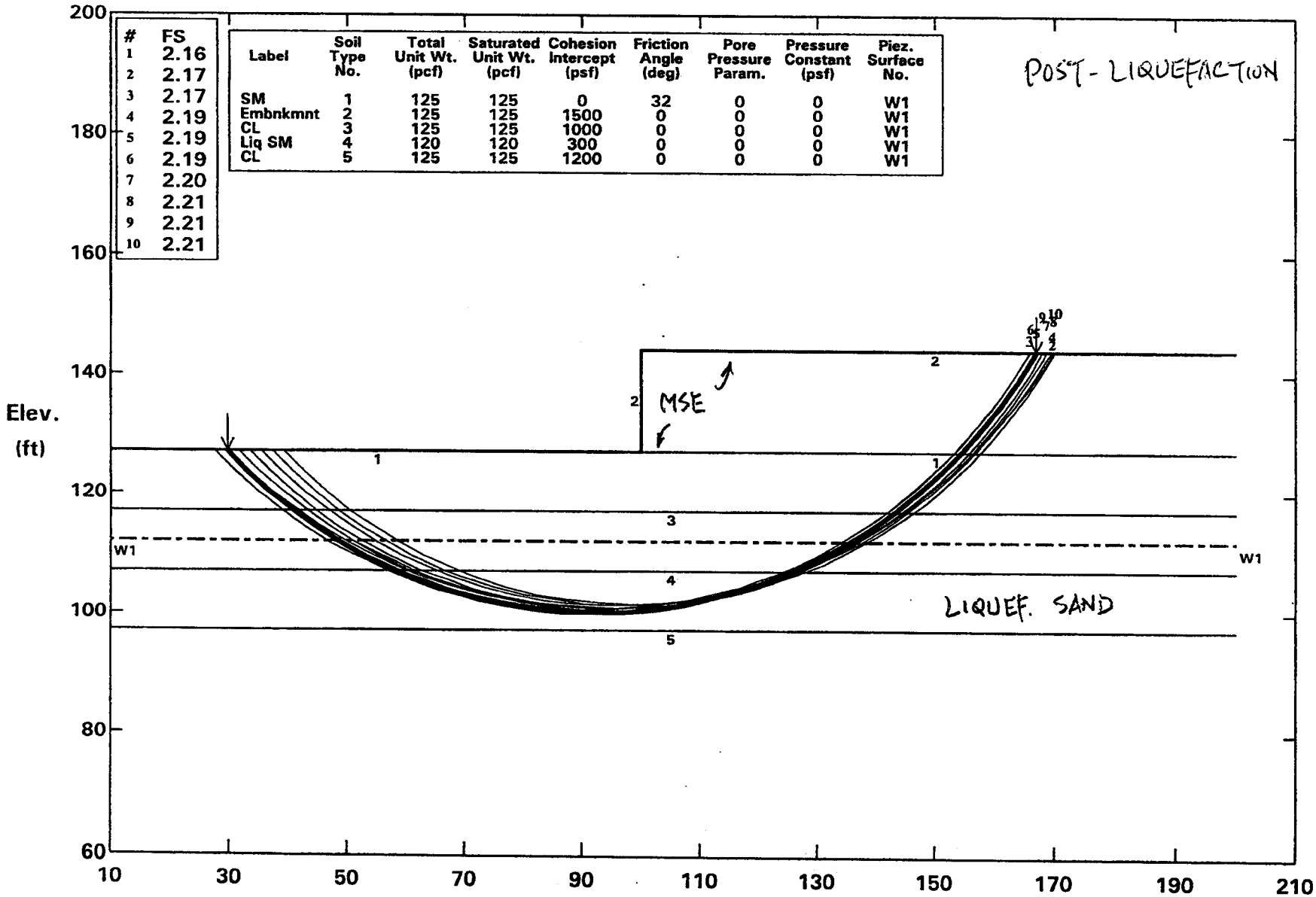
PSEUDO-STATIC (0.2g)
– SEISMIC



PCSTABL5M FSmin = 1.15 X-Axis (ft)

MSE Retaining Wall at NB Off-Ramp Tully Road/Route 101 I/C. 207150

Ten Most Critical. C:207150W1.PLT By: dw 10-27-08 6:37pm



#	FS
1	2.16
2	2.17
3	2.17
4	2.19
5	2.19
6	2.19
7	2.20
8	2.21
9	2.21
10	2.21

Label	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
SM	1	125	125	0	32	0	0	W1
Embnkmnt	2	125	125	1500	0	0	0	W1
CL	3	125	125	1000	0	0	0	W1
Liq SM	4	120	120	300	0	0	0	W1
CL	5	125	125	1200	0	0	0	W1

PCSTABL5M FSmin = 2.16 X-Axis (ft)

APPENDIX F

Review Discipline: Geotechnical Design

Comments Due By: December 5, 2008

Date Review Completed: December 5, 2008

Compiled By: HMH

Date: April 10, 2009

JRT Meeting Date: December 18, 2008

COMMENT REVIEW AND RESPONSE

Project Title: **U.S. 101 Operational Improvement I-280/I-680 to Yerba Buena Road**

Submittal: **65% PS&E and Various Project Reports**

Design Response by: **Parikh HMH**

CODE: A-Will Comply B-Consultant to Evaluate C-Will Not Incorporate D-VTA to Evaluate E-Caltrans to Evaluate/Clarify

AGCY	INIT	Item No.	Drawing or Page No.	Review Comments	Design Responses	Rev. Act.	JRT Disp.	Final Disp.
CT	Mohammad Zabolzadeh	1	GDMR Section 8	According to the contract plan sheets SD-1 through SD-3, there are four proposed overhead signs (A, B, C, and D). The foundation investigations and recommendations for these overhead signs should be included in this section of the report.	The current design uses Caltrans standard plans for sign foundations which consist of 5-ft dia. CIDH piles of 25 ft long for Post Type VIII. The boring data generally indicate stiff clays and silts mixed with some sand in the upper 20 ft. We believe the standard sign foundations are feasible. However, due to concern of liquefaction at 20- to 30-ft depth per CPT data and analyses, it is recommended that the sign CIDH foundations be extended to at least 35 ft deep to pass the liquefaction zone. Groundwater is expected during construction, and Caltrans standard specifications and special provisions for CIDH construction should apply. The use of temporary casing is anticipated. Vertical inspection pipes for acceptance testing should be provided in all CIDH piles. The acceptance test should include Gamma- Gamma Logging and may also include crosshole sonic logging. Gamma-Gamma Logging should be performed in accordance with California Test 233 Standard (CT233) to check the homogeneity of CIDH piles.	A		A

Review Discipline: Geotechnical Design

Comments Due By: December 5, 2008

Date Review Completed: December 5, 2008

Compiled By: HMH

Date: April 10, 2009

JRT Meeting Date: December 18, 2008

COMMENT REVIEW AND RESPONSE

Project Title: **U.S. 101 Operational Improvement I-280/I-680 to Yerba Buena Road**

Submittal: **65% PS&E and Various Project Reports**

Design Response by: **Parikh HMH**

CODE: A-Will Comply B-Consultant to Evaluate C-Will Not Incorporate D-VTA to Evaluate E-Caltrans to Evaluate/Clarify

AGCY	INIT	Item No.	Drawing or Page No.	Review Comments	Design Responses	Rev. Act.	JRT Disp.	Final Disp.
CT	Mohammad Zabolzadeh	2	GDMR Section 8.3.1 & 8.3.2	This section refers to the proposed 25 ft high (maximum) embankment and its long-term stability. Because of the considerable amount of the proposed fill, control rate of fill placement, may be necessary to control the short-term stability of the fill. This should be discussed in the report.	Although 25 ft of embankment is planned, the new embankment is going to abut the existing approach fill and on top of exiting side slopes. Also, the site subsoils consist of an upper clayey/silty layer with Su = 1 to 1.2 ksf per CPT data at the two abutment areas. Since fill placement and compacting still take time, we feel that a normal earthwork sequence, say, limit to approx. 2 feet of new fill placement per day may suffice. We do not see a need to further break the embankment construction into two stages.	A		A
CT	Mohammad Zabolzadeh	3	GDMR Section 8.3.1 & 8.3.2	Are settlement platforms required to verify the estimated amount of the settlements? Either way, please include the discussion in this section.	Concur. We will recommend that settlement platforms be installed and settlement be monitored per California Test 112. As a common practice, this is typically handled by the project Resident Engineer. It is recommended that a minimum of 3 to 4 settlement platforms be installed per abutment since earthwork and construction equipment tend to destroy some platforms during fill placement.	A		A

Review Discipline: Geotechnical Design

Comments Due By: December 5, 2008

Date Review Completed: December 5, 2008

Compiled By: HMH

Date: April 10, 2009

JRT Meeting Date: December 18, 2008

COMMENT REVIEW AND RESPONSE

Project Title: **U.S. 101 Operational Improvement I-280/I-680 to Yerba Buena Road**

Submittal: **65% PS&E and Various Project Reports**

Design Response by: **Parikh HMH**

CODE: A-Will Comply B-Consultant to Evaluate C-Will Not Incorporate D-VTA to Evaluate E-Caltrans to Evaluate/Clarify

AGCY	INIT	Item No.	Drawing or Page No.	Review Comments	Design Responses	Rev. Act.	JRT Disp.	Final Disp.
CT	Mohammad Zabolzadeh	4	GDMR Section 8.4.1	This section refers to Caltrans "Bridge Design Aids" for the recommended base width (the same as the length of the reinforcements) of the proposed MSE wall. This table shows the length of the reinforcements that is all the same from top to bottom of the wall. However, based on our past experience with the MSE walls, for the areas where the shoulder is PCC and a concrete barrier will be mounted on the MSE wall, we recommend (regardless of the height of the wall) the length of the reinforcement of the top panel be about 20% to 30% longer than the rest of the reinforcements. This is because the top reinforcement may not have sufficient overburden to withstand the weight of the concrete barrier and the top panel will start leaning afterwards. If agreeable, coordinate with Structures Design to implement changes in contract plans.	Concur. We will coordinate with the structural designer to implement the change.	A		A

Review Discipline: Geotechnical Design

Comments Due By: December 5, 2008

Date Review Completed: December 5, 2008

Compiled By: HMH

Date: April 10, 2009

JRT Meeting Date: December 18, 2008

COMMENT REVIEW AND RESPONSE

Project Title: **U.S. 101 Operational Improvement I-280/I-680 to Yerba Buena Road**

Submittal: **65% PS&E and Various Project Reports**

Design Response by: **Parikh HMH**

CODE: A-Will Comply B-Consultant to Evaluate C-Will Not Incorporate D-VTA to Evaluate E-Caltrans to Evaluate/Clarify

AGCY	INIT	Item No.	Drawing or Page No.	Review Comments	Design Responses	Rev. Act.	JRT Disp.	Final Disp.
CT	Mohammad Zabolzadeh	5	Structures MSE Sheet 6	Site Plan - The proposed MSE wall and its limits should be shown on the site plan. Either replace the site plan sheets with the current layout plan sheets, or include the proposed MSE wall.	Limits of the MSE wall are shown in the Highway Plans on both the Layout sheets and Retaining Wall (MSE) sheets. Site Plan in GDMR will be updated.	A		A
CT	Mohammad Zabolzadeh	6	SD-1	The length of the pile for the proposed overhead sign A on Sheet SD-1 is shown to be 22ft. However, the pile length of all the other proposed signs with the same post type VIII, are shown to be 25 ft. Revise accordingly, or explain the reasoning.	All four foundations will be increased to 35' deep per response to comment 1.	A		A

Review Discipline: Materials
Comments Due By: December 5, 2008
Date Review Completed: December 5, 2008

Compiled By: HMH
Date: April 10, 2009
JRT Meeting Date: December 18, 2008

COMMENT REVIEW AND RESPONSE

Project Title: **U.S. 101 Operational Improvement I-280/I-680 to Yerba Buena Road**

Submittal: **65% PS&E and Various Project Reports**

Design Response by: **Parikh HMH**

CODE: A-Will Comply B-Consultant to Evaluate C-Will Not Incorporate D-VTA to Evaluate E-Caltrans to Evaluate/Clarify

AGCY	INIT	Item No.	Drawing or Page No.	Review Comments	Design Responses	Rev. Act.	JRT Disp.	Final Disp.
CT	Rick D'Onofrio Materials	1	GDMR Page 21	First paragraph – The limit from Yerba Buena Road UC I/C to East Capital Expressway OC I/C seems no longer to be part of the project limit. Therefore, the sentence "and an R-value of 10 for the section of southbound Route 101 between Capitol Expressway Interchange and Yerba Buena Road." should be deleted. Has the proposed project limits changed?	The current project limit does not include Capital Expressway. We will revise the language in the report.	A		A
CT	Rick D'Onofrio Materials	2	GDMR Table 8A	Please delete the structural section for row #4, "Capitol Expwy to Yerba Buena". This location is no longer part of the project limits.	Concur.	A		A
CT	Rick D'Onofrio Materials	3	GDMR Table 8A	Is it necessary to use two different R-value with very close R-values (7 vs. 1O)? The overall difference in the pavement section thickness is only about 0.15' (1.8"). We recommend using only one R-value of seven for ease of construction with only one grading plane. Please ignore this statement if the limit of this project that we have mentioned above has changed.	See response to Item 1.	A		A

Review Discipline: Materials
Comments Due By: December 5, 2008
Date Review Completed: December 5, 2008

Compiled By: HMH
Date: April 10, 2009
JRT Meeting Date: December 18, 2008

COMMENT REVIEW AND RESPONSE

Project Title: **U.S. 101 Operational Improvement I-280/I-680 to Yerba Buena Road**

Submittal: **65% PS&E and Various Project Reports**

Design Response by: **Parikh HMH**

CODE: A-Will Comply B-Consultant to Evaluate C-Will Not Incorporate D-VTA to Evaluate E-Caltrans to Evaluate/Clarify

AGCY	INIT	Item No.	Drawing or Page No.	Review Comments	Design Responses	Rev. Act.	JRT Disp.	Final Disp.
CT	Rick D'Onofrio Materials	4	GDMR	Because of low R-value(s) of the native basement soils do we have any expansive soil problems? Do we need to lime treat the native soil?	All PI data are presented in Appendix B (Plates B-2a thru B-2c) of the GDMR. The on-site soils generally have low to moderate plasticity (PIs are generally between 10 and 20). The relatively low R-value is mainly because of the fine material (silt and lean clay). Actually some R-values are in the range of 10 to 15 (Page 20 of the GDMR), and we selected the minimum value for design to be on the conservative side. In our experience, the concern of expansiveness is not significant at the site. For rigid pavement option, since the design R-value is less than 10 (Type 3 subgrade), it has been recommended to over-excavate and replace with one foot of AS below pavement subgrade for treatment to improve to Type II subgrade.	C		C
CT	Rick D'Onofrio Materials	5	GDMR	Is this a 20 or 40 yr pavement design? Need to run a LCCA to determine either a 20 or 40-yr pavement design with the lowest cost.	The design TI is based on 20-yr design life. There is limited value in 40-yr. life for the narrow widening areas in this project.	A		A

Review Discipline: Materials
Comments Due By: December 5, 2008
Date Review Completed: December 5, 2008

Compiled By: HMH
Date: April 10, 2009
JRT Meeting Date: December 18, 2008

COMMENT REVIEW AND RESPONSE

Project Title: **U.S. 101 Operational Improvement I-280/I-680 to Yerba Buena Road**

Submittal: **65% PS&E and Various Project Reports**

Design Response by: **Parikh HMH**

CODE: A-Will Comply B-Consultant to Evaluate C-Will Not Incorporate D-VTA to Evaluate E-Caltrans to Evaluate/Clarify

AGCY	INIT	Item No.	Drawing or Page No.	Review Comments	Design Responses	Rev. Act.	JRT Disp.	Final Disp.
CT	Rick D'Onofrio	6	Plans Typical X-Sec	It seems that the existing ATPB layer and the ATPB layer of new pavement section #5 are not at the same elevation/level. Please provide construction details showing how they are connected together.	Typical sections have been revised to "sandwich' the ATPB between 0.50' HMA (Type A) and 0.20' HMA (Type A). This would allow enough overlap to connect proposed and existing ATPB.	A		A
CT	Rick D'Onofrio	7	Plans	Prior to overlaying HMA (OGFC) layer, the preparatory work consists of removing and replacing the locally failure AC surface as digouts and sealing the cracks that are ¼" or larger. The quantities and the costs of these repaired works should be included in the Quantities sheets.	Caltrans SHOPP project 04-0C9004 will do digouts and crack-seals with grinding and RHMA overlay that precedes this contract. This contract is only doing HMA (OGFC) to avoid re-striping damage to new pavement.	C		C
CT	Rick D'Onofrio	8	Plans	As a District practice, we no longer allow the new edgedrain system to be placed next to the ETW line. We recommend placing the new edgedrain system at the end of the shoulder.		A		A
CT	Rick D'Onofrio	9	Plans C-11	The cross slope of the MVP should be sloped toward the traveled way. Otherwise, the surface water during rainy seasons cannot drain due to the HMA dike.	Per HDM 107.2 It is preferred to provide flow line around MVP. Per HDM 301.2 (2c) max difference between TW and shoulder is not to exceed 8%.	C		C
CT	Rick D'Onofrio	10	Plans	The HMA (OGFC) layer should not be placed under the HMA dike and should be terminated at the face of the HMA dike. A minimum of 0.20' thickness of HMA (A) is required under the HMA dike.		A		A

Review Discipline: Materials
Comments Due By: December 5, 2008
Date Review Completed: December 5, 2008

Compiled By: HMH
Date: April 10, 2009
JRT Meeting Date: December 18, 2008

COMMENT REVIEW AND RESPONSE

Project Title: **U.S. 101 Operational Improvement I-280/I-680 to Yerba Buena Road**

Submittal: **65% PS&E and Various Project Reports**

Design Response by: **Parikh HMH**

CODE: A-Will Comply B-Consultant to Evaluate C-Will Not Incorporate D-VTA to Evaluate E-Caltrans to Evaluate/Clarify

AGCY	INIT	Item No.	Drawing or Page No.	Review Comments	Design Responses	Rev. Act.	JRT Disp.	Final Disp.
CT	Rick D'Onofrio	11	Plans	Shoulder backing should be placed adjacent to the new HMA (OGFC) layer if the outside shoulder has no HMA dike.	Per conversation between Linda Grevera of HMH and Rick D'Onofrio, backing is not required	C		C
CT	Rick D'Onofrio	12	Specs	SSP 25-020 (Aggregate Subbase - Class 4) – Please fill the following Aggregate Grading and Quality requirements for Class 4 Aggregate Subbase in the two blank tables:		A		A
CT	Rick D'Onofrio	13	Specs	SSP 26-030 (Aggregate Base- Class 3) – Please fill the following Aggregate Grading and Quality Requirements for Class 3 Aggregate Base to the two blank tables in Paragraph #3: 1) At the option of the contractor, the grading for either the ¾" maximum or 1 ½" maximum should be used, 2) Also keep Paragraph # 4	Comment about Paragraph #3 should be for Paragraph #5? Comment about Paragraph #4 should be for Paragraph #3?	E E		A A
CT	Rick D'Onofrio	14	Specs	SSP 29-010 (Treated Permeable Bases) – Please replace the asphalt binder grade PG 64-10 with PG 70-10.		A		A
CT	Rick D'Onofrio	15	Specs	SSP 39-050 (RMA) – Keep Paragraph #18, and delete Paragraphs #23 and #24.		A		A
CT	Rick D'Onofrio	16	Specs	SSP 39-100 (RMA-OGFe) – In Paragraph #6 replace asphalt binder grade PG 6410 with PG 58-34PM; keep Paragraph 9, and delete Paragraphs #6 and #10.		A		A

Review Discipline: Materials
Comments Due By: December 5, 2008
Date Review Completed: December 5, 2008

Compiled By: HMH
Date: April 10, 2009
JRT Meeting Date: December 18, 2008

COMMENT REVIEW AND RESPONSE

Project Title: **U.S. 101 Operational Improvement I-280/I-680 to Yerba Buena Road**

Submittal: **65% PS&E and Various Project Reports**

Design Response by: **Parikh HMH**

CODE: A-Will Comply B-Consultant to Evaluate C-Will Not Incorporate D-VTA to Evaluate E-Caltrans to Evaluate/Clarify

AGCY	INIT	Item No.	Drawing or Page No.	Review Comments	Design Responses	Rev. Act.	JRT Disp.	Final Disp.
CT	Rick D'Onofrio	17	Specs	SSP 39-400 (RMA Lime Treatment-Slurry Method) – Please delete "and OGFC".		A		A
CT	Rick D'Onofrio	18	Specs	SSP 39-450 (RMA Lime Treatment-Dry Lime Method) – Please delete "and OGFC".		A		A

Review Discipline: ALL Caltrans Functional Units
Comments Due By: 4/11/08
Date Review Completed: May 12, 2008

Compiled By: HMH Engineers
Date: October 23, 2008
JRT Meeting Date: May 16, 2008

COMMENT REVIEW AND RESPONSE

Project Title: **U.S. 101 Operational Improvement I-280/I-680 to Yerba Buena Road**

Submittal: **35% PS&E and Various Project Reports**

Design Response by: **HMH Engineers**

CODE: A-Will Comply; B-Consultant to Evaluate; C-Will Not Incorporate; D-VTA to Evaluate; E-Caltrans to Evaluate/Clarify

AGCY	INIT	Item No.	Drawing or Page No.	Review Comments	Design Responses	Rev. Act.	JRT Disp.	Final Disp.
CT	Mohammad Zabolzadeh, Geotechnical Design	1	Geotech Design & Materials Report	According to Section 8.4, the limits and the location of the proposed retaining walls are not available at this time. Also, it appears that Caltrans Standard Type 1 walls on spread footing are proposed for these walls. Based on the proposed 25' high embankment fills, some of these walls may be retaining considerable amount of embankment fill. We recommend discussing the differential settlements along the foundation of these walls due to the proposed fills including the wall tolerances with regards to the differential settlements.	Per latest discussion with the designer, there is a MSE retaining wall planned at NB off-ramp ("TR4" Line in the southeast quadrant). The anticipated wall height varies form 5 to 17 ft. Differential settlement is of less concern since the MSE is tolerable for ground adjust (potential of liquefaction settlement) compared to standard cantilever concrete walls. Recommendations for the MSE wall are presented in the report. Along Tully Road, temporary retaining walls up to 14 ft high, most likely the welded wire type, are required for stage construction. The temporary walls are contractor's design-build items.	A		
CT	Mohammad Zabolzadeh, Geotechnical Design	2	Geotech Design & Materials Report	All the proposed retaining walls are missing from the plans. We will review the plans on the next PS&E circulation.	See Response 1.			

Review Discipline: ALL Caltrans Functional Units
Comments Due By: 4/11/08
Date Review Completed: May 12, 2008

Compiled By: HMH Engineers
Date: October 23, 2008
JRT Meeting Date: May 16, 2008

COMMENT REVIEW AND RESPONSE

Project Title: **U.S. 101 Operational Improvement I-280/I-680 to Yerba Buena Road**

Submittal: **35% PS&E and Various Project Reports**

Design Response by: **HMH Engineers**

CODE: A-Will Comply; B-Consultant to Evaluate; C-Will Not Incorporate; D-VTA to Evaluate; E-Caltrans to Evaluate/Clarify

AGCY	INIT	Item No.	Drawing or Page No.	Review Comments	Design Responses	Rev. Act.	JRT Disp.	Final Disp.
CT	Lester Lee, Traffic Systems	3a		The comment matrix for a previous review requested the PS&E package for EA 4A5324 (WVDS project). A copy of the package was delivered at the 4/3/08 project meeting.				
CT	Lester Lee, Traffic Systems	3b		The pavement delineation sheets suggest a realignment of the lanes. Mainline detector loops and future WVDS sensors will have to be replaced in the lanes where the realignment is more than 1 foot, as the existing detectors would be off-center with respect to the realigned lanes.				
CT	Lester Lee, Traffic Systems	3c		Only two electrical sheets relevant to 'Modify and Signal Lighting' (E-2 and E-4) were included in the set that was submitted for Traffic Systems' review, which limited the review. Please include Electrical Sheets (including Notes, Abbreviations, etc.) in the next submittal that addresses TOS elements within the project limits.				
CT	Lester Lee, Traffic Systems	3d		All existing and operational TOS elements and ramp metering equipment must be kept operational throughout the construction phase in accordance with Special Provision 86-031. Any TOS or ramp meter elements that may be affected by this project must be relocated, modified, or fully replaced as necessary.				
CT	Richard D'Onofrio, Richard Chan, Materials	1a	Geotech Design & Materials Report, 19	We recommend using Class 4 Aggregate Sub-base (ASB) with R-value of 50 instead of Class 3 ASB with R-value of 40.	The pavement design has been revised using Class 4 Aggregate Subbase (AS) with R-value of 50.	A		

Review Discipline: ALL Caltrans Functional Units
Comments Due By: 4/11/08
Date Review Completed: May 12, 2008

Compiled By: HMH Engineers
Date: October 23, 2008
JRT Meeting Date: May 16, 2008

COMMENT REVIEW AND RESPONSE

Project Title: **U.S. 101 Operational Improvement I-280/I-680 to Yerba Buena Road**

Submittal: **35% PS&E and Various Project Reports**

Design Response by: **HMH Engineers**

CODE: A-Will Comply; B-Consultant to Evaluate; C-Will Not Incorporate; D-VTA to Evaluate; E-Caltrans to Evaluate/Clarify

AGCY	INIT	Item No.	Drawing or Page No.	Review Comments	Design Responses	Rev. Act.	JRT Disp.	Final Disp.
CT	Richard D'Onofrio, Richard Chan, Materials	1b	Geotech Design & Materials Report, 20	We believed that the higher TI of 14 should be assigned to the outer lane#4 instead of Lane#1 and the lower TI of 12 should be assigned to the inside Lane#1 instead of Lane #4. Please revise.	The design has been revised accordingly.	A		
CT	Richard D'Onofrio, Richard Chan, Materials	1c	Geotech Design & Materials Report, 20	Is it necessary to use three different R-value with very close R-values? We recommend using only one R-value of seven for ease of construction with only one grading plane.	The design has been revised accordingly assuming R-value of 7 for majority of the alignment. For south of Capitol Expwy, an R-value of 10 was used for design.	B		
CT	Richard D'Onofrio, Richard Chan, Materials	1d	Geotech Design & Materials Report, 20	The layer thickness of the pavement sections should be in feet with an increment of 0.05'. In Table 7A some layer thickness are in inch and some are in feet, and for consistency all layer thicknesses should be in feet. Please revise.	The design has been revised accordingly.	A		
CT	Richard D'Onofrio, Richard Chan, Materials	1e	Geotech Design & Materials Report, 20	Because of the high TIs (12 and 14) based on the District Practice we recommend using a stronger base such as LCB to improve the strength of the granular base materials under the AC Pavement. Therefore, we recommend using the structural pavement section of Option #1 for the mainline instead of Option#2.	The design has been revised accordingly.	A		

Review Discipline: ALL Caltrans Functional Units
Comments Due By: 4/11/08
Date Review Completed: May 12, 2008

Compiled By: HMH Engineers
Date: October 23, 2008
JRT Meeting Date: May 16, 2008

COMMENT REVIEW AND RESPONSE

Project Title: **U.S. 101 Operational Improvement I-280/I-680 to Yerba Buena Road**

Submittal: **35% PS&E and Various Project Reports**

Design Response by: **HMH Engineers**

CODE: A-Will Comply; B-Consultant to Evaluate; C-Will Not Incorporate; D-VTA to Evaluate; E-Caltrans to Evaluate/Clarify

AGCY	INIT	Item No.	Drawing or Page No.	Review Comments	Design Responses	Rev. Act.	JRT Disp.	Final Disp.
CT	Richard D'Onofrio, Richard Chan, Materials	2a	"X" Sheets	The locations of the ATPB layer in the provided existing AS-Built (Contract# 04-437411) do not match your proposed ATPB placement (Pavement Section#5) in your plans. From the previous contract we found three areas with ATPB layer in NB direction and two areas in SB direction.	The designer will address the issue.	A		
CT	Richard D'Onofrio, Richard Chan, Materials	2b	"X" Sheets	The existing pavement sections should be shown in the Typical Section Sheets.	The designer will address the issue.	A		
CT	Richard D'Onofrio, Richard Chan, Materials	2c	"X" Sheets	Please revise the structural pavement Sections #1, #5 and #6 with Option#1 as shown in the Materials Report.	The designer will address the issue.	A		
CT	Kamran Nakhjiri, Water Quality	1	SWDR, Front Signature Sheet	Please type the follow names as signatory authorities in the signature block: ▪ Ramin Bolourchian for project Manager ▪ Robert Braga for Maintenance rep ▪ David Yam for Landscape rep ▪ Kamran Nakhjiri for SW coordination				
CT	Kamran Nakhjiri, Water Quality	2	SWDR, Front Signature Sheet	Project Engineer must sign & stamp the front sheet prior to approval for PS&E stage.				

Review Discipline: Geotechnical Design

Comments Due By: December 5, 2008

Date Review Completed: December 5, 2008

Compiled By: HMH

Date: December 8, 2008

JRT Meeting Date: December 18, 2008

COMMENT REVIEW AND RESPONSE

Project Title: **U.S. 101 Operational Improvement I-280/I-680 to Yerba Buena Road**

Submittal: **65% PS&E and Various Project Reports**

Design Response by: **Parikh HMH**

CODE: A-Will Comply B-Consultant to Evaluate C-Will Not Incorporate D-VTA to Evaluate E-Caltrans to Evaluate/Clarify

AGCY	INIT	Item No.	Drawing or Page No.	Review Comments	Design Responses	Rev. Act.	JRT Disp.	Final Disp.
CT	Mohammad Zabolzadeh	1	GDMR Section 8	According to the contract plan sheets SD-1 through SD-3, there are four proposed overhead signs (A, B, C, and D). The foundation investigations and recommendations for these overhead signs should be included in this section of the report.	The current design uses Caltrans standard plans for sign foundations which consist of 5-ft dia. CIDH piles of 25 ft long for Post Type VIII. The boring data generally indicate stiff clays and silts mixed with some sand in the upper 20 ft. We believe the standard sign foundations are feasible. However, due to concern of liquefaction at 20- to 30-ft depth per CPT data and analyses, it is recommended that the sign CIDH foundations be extended to at least 35 ft deep to pass the liquefaction zone. Groundwater is expected during construction, and Caltrans standard specifications and special provisions for CIDH construction should apply. The use of temporary casing is anticipated. Vertical inspection pipes for acceptance testing should be provided in all CIDH piles. The acceptance test should include Gamma- Gamma Logging and may also include crosshole sonic logging. Gamma-Gamma Logging should be performed in accordance with California Test 233 Standard (CT233) to check the homogeneity of CIDH piles.			

Review Discipline: Geotechnical Design

Comments Due By: December 5, 2008

Date Review Completed: December 5, 2008

Compiled By: HMH

Date: December 8, 2008

JRT Meeting Date: December 18, 2008

COMMENT REVIEW AND RESPONSE

Project Title: **U.S. 101 Operational Improvement I-280/I-680 to Yerba Buena Road**

Submittal: **65% PS&E and Various Project Reports**

Design Response by: **Parikh HMH**

CODE: A-Will Comply B-Consultant to Evaluate C-Will Not Incorporate D-VTA to Evaluate E-Caltrans to Evaluate/Clarify

AGCY	INIT	Item No.	Drawing or Page No.	Review Comments	Design Responses	Rev. Act.	JRT Disp.	Final Disp.
CT	Mohammad Zabolzadeh	2	GDMR Section 8.3.1 & 8.3.2	This section refers to the proposed 25 ft high (maximum) embankment and its long-term stability. Because of the considerable amount of the proposed fill, control rate of fill placement, may be necessary to control the short-term stability of the fill. This should be discussed in the report.	Although 25 ft of embankment is planned, the new embankment is going to abut the existing approach fill and on top of exiting side slopes. Also, the site subsoils consist of an upper clayey/silty layer with Su = 1 to 1.2 ksf per CPT data at the two abutment areas. Since fill placement and compacting still take time, we feel that a normal earthwork sequence, say, limit to approx. 2 feet of new fill placement per day may suffice. We do not see a need to further break the embankment construction into two stages.			
CT	Mohammad Zabolzadeh	3	GDMR Section 8.3.1 & 8.3.2	Are settlement platforms required to verify the estimated amount of the settlements? Either way, please include the discussion in this section.	Concur. We will recommend that settlement platforms be installed and settlement be monitored per California Test 112. As a common practice, this is typically handled by the project Resident Engineer. It is recommended that a minimum of 3 to 4 settlement platforms be installed per abutment since earthwork and construction equipment tend to destroy some platforms during fill placement.			

Review Discipline: Geotechnical Design

Comments Due By: December 5, 2008

Date Review Completed: December 5, 2008

Compiled By: HMH

Date: December 8, 2008

JRT Meeting Date: December 18, 2008

COMMENT REVIEW AND RESPONSE

Project Title: **U.S. 101 Operational Improvement I-280/I-680 to Yerba Buena Road**

Submittal: **65% PS&E and Various Project Reports**

Design Response by: **Parikh HMH**

CODE: A-Will Comply B-Consultant to Evaluate C-Will Not Incorporate D-VTA to Evaluate E-Caltrans to Evaluate/Clarify

AGCY	INIT	Item No.	Drawing or Page No.	Review Comments	Design Responses	Rev. Act.	JRT Disp.	Final Disp.
CT	Mohammad Zabolzadeh	4	GDMR Section 8.4.1	This section refers to Caltrans "Bridge Design Aids" for the recommended base width (the same as the length of the reinforcements) of the proposed MSE wall. This table shows the length of the reinforcements that is all the same from top to bottom of the wall. However, based on our past experience with the MSE walls, for the areas where the shoulder is PCC and a concrete barrier will be mounted on the MSE wall, we recommend (regardless of the height of the wall) the length of the reinforcement of the top panel be about 20% to 30% longer than the rest of the reinforcements. This is because the top reinforcement may not have sufficient overburden to withstand the weight of the concrete barrier and the top panel will start leaning afterwards. If agreeable, coordinate with Structures Design to implement changes in contract plans.	Concur. We will coordinate with the structural designer to implement the change.			

Review Discipline: Materials
Comments Due By: December 5, 2008
Date Review Completed: December 5, 2008

Compiled By: HMH
Date: December 8, 2008
JRT Meeting Date: December 18, 2008

COMMENT REVIEW AND RESPONSE

Project Title: **U.S. 101 Operational Improvement I-280/I-680 to Yerba Buena Road**

Submittal: **65% PS&E and Various Project Reports**

Design Response by: **Parikh HMH**

CODE: A-Will Comply B-Consultant to Evaluate C-Will Not Incorporate D-VTA to Evaluate E-Caltrans to Evaluate/Clarify

AGCY	INIT	Item No.	Drawing or Page No.	Review Comments	Design Responses	Rev. Act.	JRT Disp.	Final Disp.
CT	Rick D'Onofrio Materials	1	GDMR Page 21	First paragraph – The limit from Yerba Buena Road UC I/C to East Capital Expressway OC I/C seems no longer to be part of the project limit. Therefore, the sentence "and an R-value of 10 for the section of southbound Route 101 between Capitol Expressway Interchange and Yerba Buena Road." should be deleted. Has the proposed project limits changed?	The current project limit does not include Capital Expwy part per latest information. We will revise the language in the report.			
CT	Rick D'Onofrio Materials	2	GDMR Table 8A	Please delete the structural section for row #4, "Capitol Expwy to Yerba Buena". This location is no longer part of the project limits.	Concur.			
CT	Rick D'Onofrio Materials	3	GDMR Table 8A	Is it necessary to use two different R-value with very close R-values (7 vs. 1O)? The overall difference in the pavement section thickness is only about 0.15' (1.8"). We recommend using only one R-value of seven for ease of construction with only one grading plane. Please ignore this statement if the limit of this project that we have mentioned above has changed.	See response to Item 1.			

Review Discipline: Materials
Comments Due By: December 5, 2008
Date Review Completed: December 5, 2008

Compiled By: HMH
Date: December 8, 2008
JRT Meeting Date: December 18, 2008

COMMENT REVIEW AND RESPONSE

Project Title: **U.S. 101 Operational Improvement I-280/I-680 to Yerba Buena Road**

Submittal: **65% PS&E and Various Project Reports**

Design Response by: **Parikh HMH**

CODE: A-Will Comply B-Consultant to Evaluate C-Will Not Incorporate D-VTA to Evaluate E-Caltrans to Evaluate/Clarify

AGCY	INIT	Item No.	Drawing or Page No.	Review Comments	Design Responses	Rev. Act.	JRT Disp.	Final Disp.
CT	Rick D'Onofrio Materials	4	GDMR	Because of low R-value(s) of the native basement soils do we have any expansive soil problems? Do we need to lime treat the native soil?	All PI data are presented in Appendix B (Plates B-2a thru B-2c) of the GDMR. The on-site soils generally have low to moderate plasticity (PIs are generally between 10 and 20). The relatively low R-value is mainly because of the fine material (silt and lean clay). Actually some R-values are in the range of 10 to 15 (Page 20 of the GDMR), and we selected the minimum value for design to be on the conservative side. In our experience, the concern of expansiveness is not significant at the site. For rigid pavement option, since the design R-value is less than 10 (Type 3 subgrade), it has been recommended to over-excavate and replace with one foot of AS below pavement subgrade for treatment to improve to Type II subgrade.			
CT	Rick D'Onofrio Materials	5	GDMR	Is this a 20 or 40 yr pavement design? Need to run a LCCA to determine either a 20 or 40-yr pavement design with the lowest cost.	Per our understanding, the design TI is based on 40-yr design life.			
CT	Rick D'Onofrio	6	Plans Typical X-Sec	It seems that the existing ATPB layer and the ATPB layer of new pavement section #5 are not at the same elevation/level. Please provide construction details showing how they are connected together.				

GEOTECHNICAL DATA REPORT

SANTA TERESA STOCKPILE
SAN JOSE, CALIFORNIA

For

DMJM HARRIS
2335 American River Drive, Suite 100
Sacramento, CA 95825

PARIKH CONSULTANTS, INC.

356 S. Milpitas Blvd., Milpitas, CA 95035
(408) 945-1011

January 2008

Job No. 207154.10

PARIKH
Practicing in the Geosciences

Geotechnical ■
Environmental ■
Materials Testing ■
Construction Inspection ■

DMJM Harris
2335 American River Drive, Suite 100
Sacramento, CA 95825

January 16, 2008
Job No.: 207154.10

Attn.: Mr. Alan Boone

Sub: Geotechnical Data Report for Santa Teresa Stockpile, Santa Clara County, CA

Dear Mr. Boone:

As requested, we are providing this geotechnical data report for the stockpile material located near the existing parking lot of Santa Teresa Light Rail Transit Station in south San Jose, Santa Clara County, CA.

Introduction

This report presents the results of our geotechnical exploration and laboratory testing for the Santa Teresa stockpile in the City of San Jose, California. Our work was performed generally in accordance with the scope of work as per our agreement. The general location of the site and its vicinity are shown on the Project Location Map, Plate 1.

Purpose and Scope

The purpose of this investigation was to evaluate the general soil conditions at the project site and to evaluate their engineering properties, such as gradation distribution, plasticity index, R-values, for other potential use of the stockpile material.

The scope of work performed for this investigation included obtaining representative soil samples and logging materials encountered in seven drilled borings, laboratory testing of the collected samples, and preparation of this data report. The basis for this investigation is a topographic survey plan for stockpile volume calculations, dated 03-16-2006, provided by Santa Clara Valley Transportation Authority. We have presented the descriptive log of the boreholes in Appendix A.

Site Condition

The project is located in San Jose and generally bounded by Via del Oro on the north, San Ignacio Avenue on the south, Santa Teresa Blvd. on the west, and Santa Teresa Park & Ride on the west. The existing stockpile extends to about 10 feet above the surrounding area.

Field Exploration and Laboratory Testing

Based on the plans and discussions with VTA, seven exploratory borings were drilled to a maximum depth of 10 feet below the existing ground surface. The boring locations are shown on the Site Plan, Plate 2.

The test borings were advanced with a truck-mounted drill rig using 8-inch diameter hollow stem auger method. Selected samples were obtained from Modified California samplers (2.5 in. I.D.) and Standard Penetration Test samplers (1.4 in. I.D.) at various depths. The MC and SPT samplers were driven under the impact of a 140 lb. hammer having a free fall of 30 in. The blow counts are presented on the "Log of Borings". (When correlating standard penetration data in similar soils, the blow counts for the Modified California Sampler can be taken as roughly twice that for the Standard Penetration Test in similar soils). The samples were sealed and transported to our laboratory for further evaluation and testing. The field investigation was conducted under the supervision of our field engineer who logged the test borings and prepared the samples for subsequent laboratory testing and evaluation.

Laboratory tests were performed on selected samples obtained during field exploration to determine the physical and engineering properties of the subsoils. Laboratory data of moisture contents and dry density are presented on the Log of Borings in Appendix A. Additional laboratory data is summarized in Appendix B.

The bore logs presented in Appendix A were prepared from the field logs which were edited after visual re-examination of the samples in the laboratory and results of classification tests on selected soil samples as indicated on the logs. The abrupt stratum changes shown on these logs may be gradual and relatively minor changes in soil types within a stratum may not be noted on the logs due to field limitations.

Subsurface Conditions

Based on exploratory borings and laboratory data, the existing stockpile material appears to have been generated from excavation/cut at another source containing Serpentine material. During drilling, rock fragments of Serpentine were observed in the cuttings and on site. In general, the material may be classified as Lean Clay with Sand (CL), containing gravel- and cobble-size rock fragments. Occasional layers of medium dense clayey sand were also encountered. Based on the field operation, gravel and rock fragments ranging from ½ inch to 4 inches were observed. Relatively hard drilling condition (grinding/rig chattering) was encountered, indicating relatively large size rock fragments generated from the cut.

The consistency of the existing stockpile is generally stiff. Majority of the retrieved samples are clayey in nature. Based on the Plasticity Index tests, the clay is of medium to high plasticity with PI's in the range of 12 to 22. Limited grain size distribution tests were performed on the clayey sand samples obtained. Based on the data, the fines content (passing #200 sieve) may be on the

order of 40%+. Three bulk samples were obtained from drill cuttings at boring locations B-1, B-2 and B-6 for R-value testing. The obtained R-values are 13, 14 and 45.

It should be noted that the descriptions and related information depict subsurface conditions only at the locations indicated on the logs and on the particular date noted on the logs. Because of the variability from place to place within soil strata in general, subsurface conditions at other locations may differ from conditions occurring at the locations explored. The passage of time may result in a change in the soil conditions at the locations due to environmental changes. Detailed descriptions of the materials encountered in the borings are presented in Appendix A.

Groundwater level was not encountered within the explored boring depth. The groundwater level may vary with the passage of time due to seasonal groundwater fluctuation, surface and subsurface flows, ground surface run-off, and other factors that may not be present at the time of investigation.

Please be advised that we are performing a professional service and that our conclusions and recommendations are professional opinions only. All work done and all recommendations made are in accordance with generally accepted Geotechnical engineering principles and practices. No warranty, expressed or implied, of merchantability or fitness, is made or intended in connection with our work.

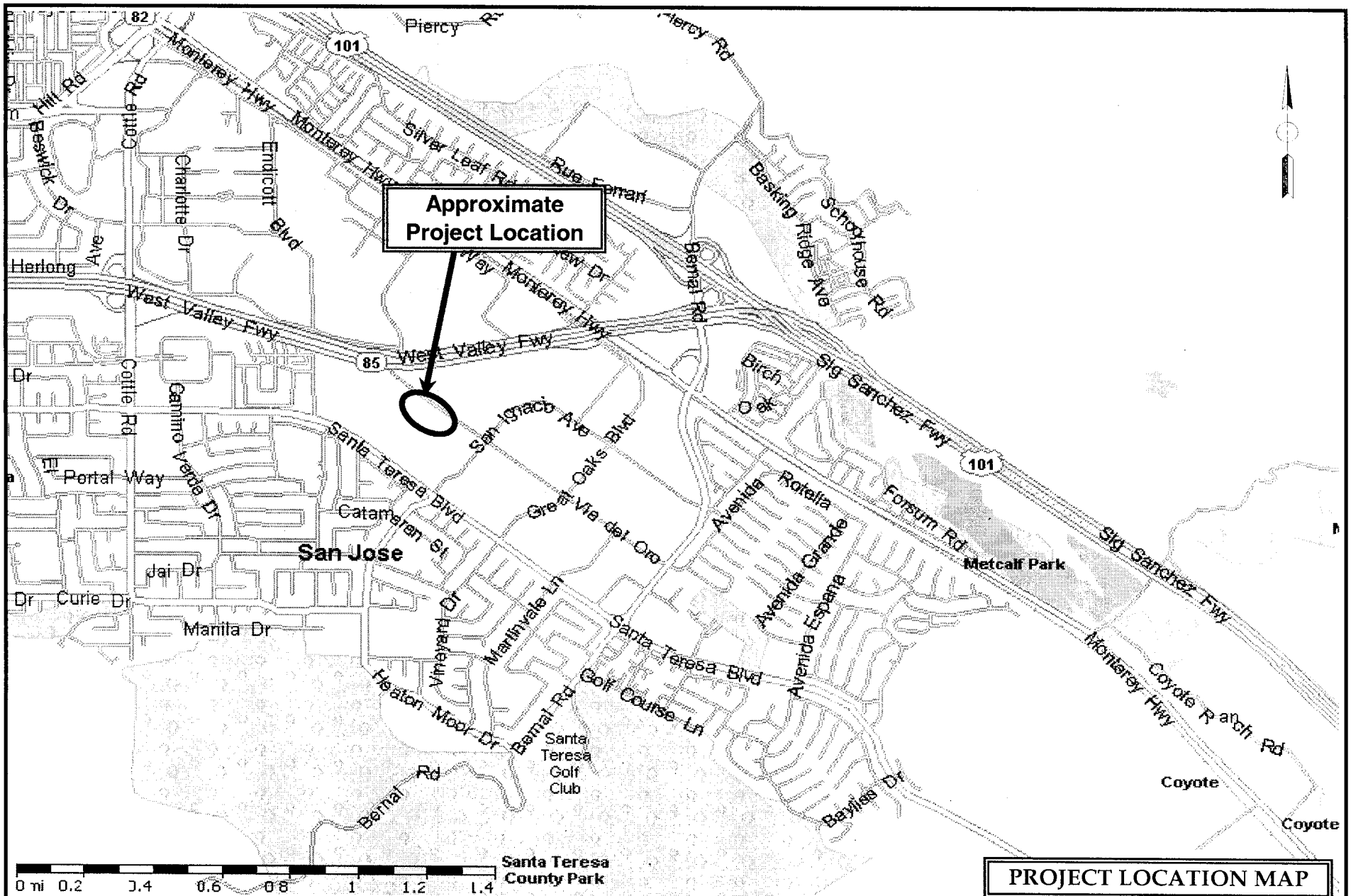
Very truly yours,
PARIKH CONSULTANTS, INC.

Lam Tran
Staff Engineer

REGISTERED PROFESSIONAL ENGINEER
GAURANG R. PARIKH
No. 666
EXP. 12-31-09
GEOTECHNICAL
STATE OF CALIFORNIA

Gary Parikh, P.E., G.E., 666
Project Manager

Attachments: Project Location Map
Site Plan
Appendix A - Log of Borings
Appendix B – Laboratory Test Data



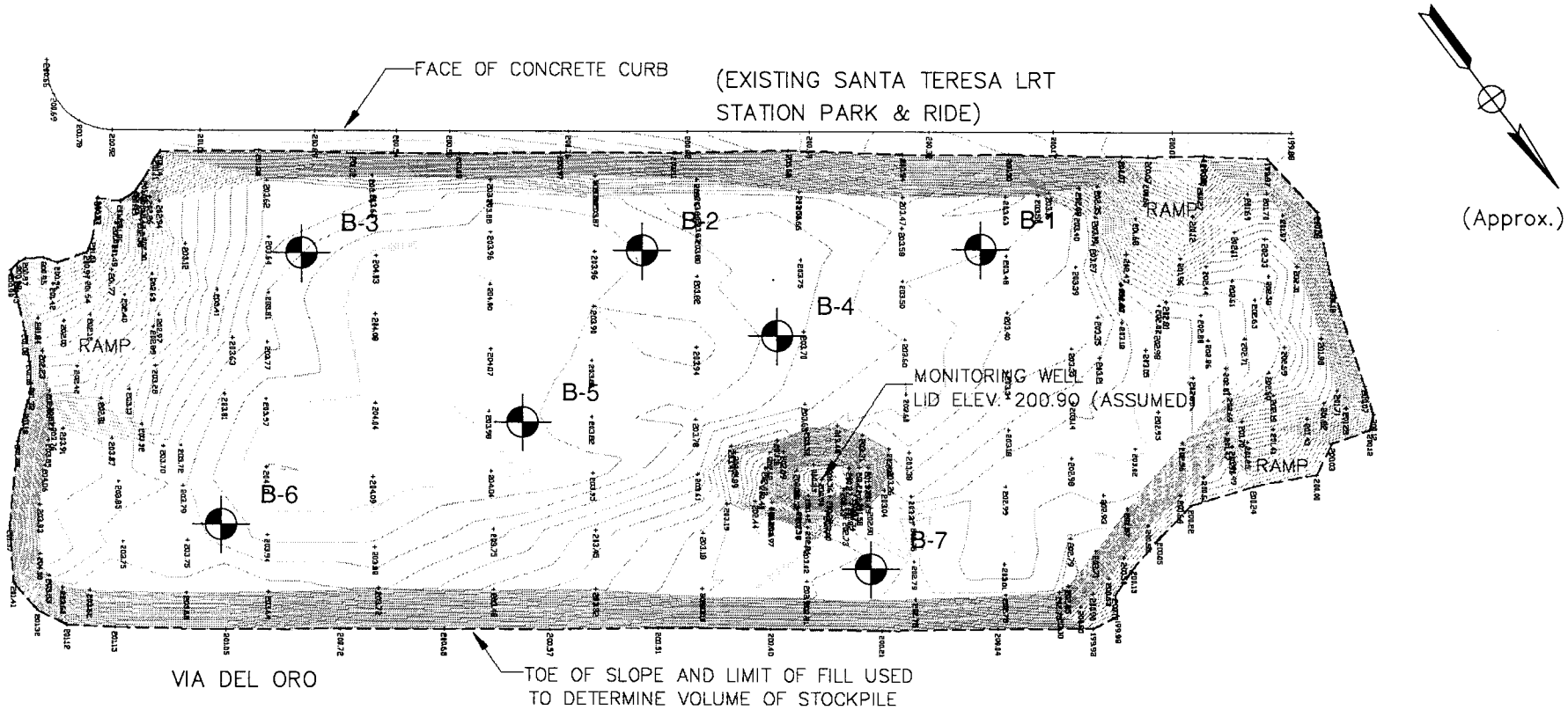
PROJECT LOCATION MAP

PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS TESTING

SANTA TERESA STOCKPILE
SAN JOSE, CALIFORNIA

JOB NO.: 207154.10

PLATE NO.: 1



Note: All units are in metric unless otherwise specified
Reference Map: Santa Teresa Park & Ride, Topographic survey for stockpile volume calculations, dated 03-16-2006, provided by Santa Clara Valley Transportation Authority.

LEGEND

Approx. Soil Boring Location

SITE PLAN

PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS ENGINEERING

SANTA TERESA STOCKPILE
SAN JOSE, CALIFORNIA

JOB NO.:207154.10

PLATE NO.: 2

APPENDIX A

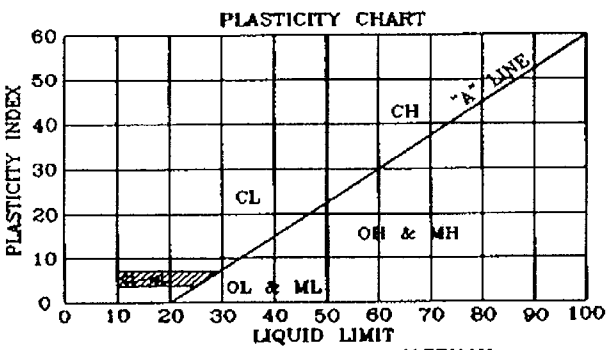
UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOLS	ILLUSTRATIVE GROUP NAMES
COARSE-GRAINED SOILS More than 50% retained on No. 200 sieve	GRAVELS More than 50% of coarse fraction retained on No. 4 sieve	CLEAN GRAVELS Less than 5% fines	GW	Well graded gravel, Well graded gravel with sand
			GP	Poorly graded gravel, Poorly graded gravel with sand
		GRAVELS WITH FINES More than 12% fines	GM	Silty gravel, Silty gravel with sand
			GC	Clayey gravel, Clayey gravel with sand
	SANDS 50% or more of coarse fraction passing No. 4 sieve	CLEAN SANDS Less than 5% fines	SW	Well graded sand, Well graded sand with gravel
			SP	Poorly graded sand, Poorly graded sand with gravel
		SANDS WITH FINES More than 12% fines	SM	Silty sand, Silty sand with gravel
			SC	Clayey sand, Clayey sand with gravel
FINE-GRAINED SOILS 50% or more passing No. 200 sieve	SILTS AND CLAYS Liquid Limit less than 50%		ML	Silt, Sandy silt with gravel
			CL	Lean clay, Sandy lean clay with gravel
			OL	Organic clay, Sandy organic clay with gravel
	SILTS AND CLAYS Liquid Limit more than 50%		MH	Elastic silt, Sandy elastic silt with gravel
			CH	Fat clay, Sandy fat clay with gravel
			OH	Organic clay, Sandy organic clay with gravel
HIGHLY ORGANIC			PT	Peat, Highly organic silts

NOTE: 1. Coarse-grained soils receive dual symbols if: (a) their fines are CL-ML (e.g. SC-SM or GC-GM) or (b) they contain 5-12% fines (e.g. SW-SM, GP-GC, etc.). Fine-grained soils receive dual symbols if their limits plot in the hatched zone of the Plasticity Chart (CL-ML).

2. The table lists 30 out of a possible 110 Group Names, all of which are assigned to unique proportions of the constituent soils. Flow charts in ASTM D 2487-93 aid assignment of the Group Names.

PLASTICITY CHART



GRAIN SIZE CLASSIFICATION

CLASSIFICATION	US STANDARD SIEVE SIZE
BOULDERS	Above 12"
COBBLES	12" to 3"
GRAVEL Coarse Fine	 3" to 3/4" 3/4" to No. 4
SAND Coarse Medium Fine	 No. 4 to No. 10 No. 10 to No. 40 No. 40 to No.200
SILT & CLAY	Below No. 200

COHESIVE SOIL CONSISTENCY

CLASSIFICATION	UNCONFINED COMP. STRENGTH (psf)
Very Soft	< 500
Soft	500 - 1000
Medium(Firm)	1000 - 2000
Stiff	2000 - 4000
Very Stiff	4000 - 8000
Hard	> 8000

COHESIONLESS SOIL RELATIVE DENSITY

CLASSIFICATION	SPT BLOW COUNTS (Blows/ft)
Very Loose	< 4
Loose	5 to 10
Medium Dense	11 to 30
Dense	31 to 50
Very Dense	> 50

PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS TESTING

SANTA TERESA STOCKPILE
SAN JOSE, CALIFORNIA

JOB NO.: 207154.10 | PLATE NO.: A-1A

Boring Location, Elevation & Date Drilled:	Drilling Method:	BORING NUMBER **LEGEND**
	Sampling Method:	Sheet 1 of 1

Sample Type & No.	Dry Density (pcf)	Water Content (%)	Blows Per Foot	Compress. Strength (tsf)	Depth (ft) Soil Graph & U.S.C.S.		
					0	Compressive strength as measured by Pocket Penetrometer, in tsf.	pp=1.0tsf
C-1			22			2 inch I.D. California Sampler (C).	
MC-2	110	12	23	1.2	5	2-1/2 inch I.D. Modified California Sampler (MC).	
SH-3	98	28	100 psi	0.8		3.5-inch I.D. Pitcher Tube Sampler (Cored).	
					10		
SPT-4	-	10	35	-		1-3/8 inch I.D. Standard Splitspoon Sampler (SPT).	
					15		
HS-5	95	20		0.7		1.9 inch I.D. Hand Sampler driven with a slide hammer.	
						Groundwater level first encountered during drilling	
					20	Groundwater level at completion of boring	
BULK-6	-	12				Bulk sample stored in plastic bag.	
						Liquid Limit (LL), in percent Plasticity Index (PI), in percent	LL=30 PI=10
NX-3	-	-		12.0	25		
						NX Core.	
						Consolidation Test	CN
						Percent gravel and coarser in sample,(+#4) Percent fines (silt/clay) in sample, (-#200)	+#4=20% -#200=50%
					30	Triaxial Test	TX

LEGEND FOR LOG OF BORING

PARIKH CONSULTANTS, INC.
Geotechnical & Materials Engineering

SANTA TERESA STOCKPILE
SAN JOSE, CALIFORNIA

Date: 12/2007 | Job No.: 207154.10

This log is part of the report prepared by Parikh Consultants, Inc. for the named project and should be read together with that report for complete interpretation. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.

Plate: A-1B

LEGEND LEGEND.GPJ 1-3-08

Boring Location, Elevation & Date Drilled:	Drilling Method:	BORING NUMBER
SEE SITE PLAN; Elev. approx. ft.; drilled on 12-18-07	8-inch dia. HOLLOW STEM AUGER	B-1
	Sampling Method: 2 1/2" I.D. Mod. Cal. (MC), 1 3/8" I.D. Std. Pen., 140 lbs hammer, 30 inch drop.	Sheet 1 of 1

Sample Type & No.	Dry Density (pcf)	Water Content (%)	Blows Per Foot	Compress. Strength (tsf)	Depth (ft) Soil Graph & U.S.C.S.		
					0	CL	LEAN CLAY WITH SAND (CL), very stiff, grayish brown, moist, gravel up to 1/2 inch
MC-1		14.3	32				--grades with cobble-size rock fragments (hard augering/rig chattering) (LL=39, PI=19)
					5		
MC-2		4.4	36				--very stiff, rock fragments up to 4 inches
MC-3		11.5	40		10		--very stiff, yellowish brown, gravel up to 1/2 inch (LL=31, PI=14)
							Bottom of drill hole at 10 feet. No groundwater was encountered during drilling. Bulk Sample (LEAN CLAY WITH SAND (CL), grayish brown, moist, gravel up to 1/2 inch to 1 1/2 inches) taken from 0 to 5 feet
							Noticed serpentine fragments in cutting
					15		
					20		
					25		
					30		

LOG OF BORING

PARIKH CONSULTANTS, INC.
Geotechnical & Materials Engineering

SANTA TERESA STOCKPILE
SAN JOSE, CALIFORNIA

Date: 12/2007 | Job No.: 207154.10

This log is part of the report prepared by Parikh Consultants, Inc. for the named project and should be read together with that report for complete interpretation. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.

Plate: A-2

LB 207154.10.GPJ 1-16-08

Boring Location, Elevation & Date Drilled:	Drilling Method:	BORING NUMBER
SEE SITE PLAN; Elev. approx. ft.; drilled on 12-18-07	8-inch dia. HOLLOW STEM AUGER	B-2
	Sampling Method: 2 1/2" I.D. Mod. Cal. (MC), 1 3/8" I.D. Std. Pen., 140 lbs hammer, 30 inch drop.	Sheet 1 of 1

Sample Type & No.	Dry Density (pcf)	Water Content (%)	Blows Per Foot	Compress. Strength (tsf)	Depth (ft)	Soil Graph & U.S.C.S.			
					0		CL	LEAN CLAY WITH SAND (CL), very stiff, grayish brown, moist, gravel up to 1/2 inch TO 1 inch	
MC-1		9.3	39					--grades with cobble-size rock fragments (hard augering/rig chattering)	(LL=32, PI=12)
					5				
SPT-2		7.5	29					--very stiff, gray, encountered aggregate base	(LL=39, PI=20)
								--grades with more gravel and rock fragments	
MC-3		11.1	18		10			--stiff, dark gray, gravel up to 1/2 inch to 2 inches	(LL=34, PI=17)
								Bottom of drill hole at 10 feet. No groundwater was encountered during drilling. Bulk Sample (LEAN CLAY (CL), yellowish brown, moist, gravel up to 1/2 inch to 1 inch) taken from 0 to 5 feet	
								Noticed serpentine fragments in cutting	
					15				
					20				
					25				
					30				

LOG OF BORING

PARIKH CONSULTANTS, INC.
Geotechnical & Materials Engineering

SANTA TERESA STOCKPILE
SAN JOSE, CALIFORNIA

Date: 12/2007 | Job No.: 207154.10

This log is part of the report prepared by Parikh Consultants, Inc. for the named project and should be read together with that report for complete interpretation. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.

Plate: A-3

LB 207154.10.GPJ 1-16-08

Boring Location, Elevation & Date Drilled:	Drilling Method:	BORING NUMBER
SEE SITE PLAN; Elev. approx. ft.; drilled on 12-18-07	8-inch dia. HOLLOW STEM AUGER	B-3
	Sampling Method: 2 1/2" I.D. Mod. Cal. (MC), 1 3/8" I.D. Std. Pen., 140 lbs hammer, 30 inch drop.	Sheet 1 of 1

Sample Type & No.	Dry Density (pcf)	Water Content (%)	Blows Per Foot	Compress. Strength (tsf)	Depth (ft)	Soil Graph & U.S.C.S.			
					0		CL	LEAN CLAY WITH SAND (CL), very stiff, light grayish brown, moist, gravel up to 2 1/2 inches	
MC-1		13.4	38					--grades with cobble-size rock fragments (hard augering/rig chattering)	(LL=43, PI=22)
					5		SC	CLAYEY SAND (SC), medium dense, light brown, moist, some gravel	
SPT-2		10.9	26						(+#4=7%, -#200=45%)
MC-3		9.8	36		10		CL	LEAN CLAY (CL), very stiff, yellowish brown on top of sample and gray on bottom of sample, moist	(LL=33, PI=16)
								Bottom of drill hole at 10 feet. No groundwater was encountered during drilling.	
					15				
					20				
					25				
					30				

LOG OF BORING

PARIKH CONSULTANTS, INC.
Geotechnical & Materials Engineering

SANTA TERESA STOCKPILE
SAN JOSE, CALIFORNIA

Date: 12/2007 | Job No.: 207154.10

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Plate: A-4

LB 207154.10.GPJ 1-16-08

Boring Location, Elevation & Date Drilled: SEE SITE PLAN; Elev. approx. ft.; drilled on 12-18-07	Drilling Method: 8-inch dia. HOLLOW STEM AUGER	BORING NUMBER **B-4**
	Sampling Method: 2 1/2" I.D. Mod. Cal. (MC), 1 3/8" I.D. Std. Pen., 140 lbs hammer, 30 inch drop.	Sheet 1 of 1

Sample Type & No.	Dry Density (pcf)	Water Content (%)	Blows Per Foot	Compress. Strength (tsf)	Depth (ft) Soil Graph & U.S.C.S.		Description	
					0	SC	CLAYEY SAND (SC), yellowish brown, moist, some gravel	
MC-1		12.6	43			CH	FAT CLAY (CH), very stiff, gray, moist, some gravel	
					5	CL	LEAN CLAY (CL), light brown, moist	
MC-2		-	43				--no recovery	
							--grades with cobble-size rock fragments (hard augering/rig chattering)	
SPT-3		-	17				--no recovery	
SPT-4		9.2	27		10		--very stiff, gravel up to 1 inch	(LL=34, PI=16)
							Bottom of drill hole at 10 feet. No groundwater was encountered during drilling.	
							Noticed serpentine fragments in cutting	
					15			
					20			
					25			
					30			

LOG OF BORING

PARIKH CONSULTANTS, INC.
Geotechnical & Materials Engineering

SANTA TERESA STOCKPILE
SAN JOSE, CALIFORNIA

Date: 12/2007 | Job No.: 207154.10

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Plate: A-5

LB 207154.10.GPJ 1-16-08

Boring Location, Elevation & Date Drilled: SEE SITE PLAN; Elev. approx. ft.; drilled on 12-18-07	Drilling Method: 8-inch dia. HOLLOW STEM AUGER	BORING NUMBER **B-5**
	Sampling Method: 2 1/2" I.D. Mod. Cal. (MC), 1 3/8" I.D. Std. Pen., 140 lbs hammer, 30 inch drop.	Sheet 1 of 1

Sample Type & No.	Dry Density (pcf)	Water Content (%)	Blows Per Foot	Compress. Strength (tsf)	Depth (ft)	Soil Graph & U.S.C.S.		
					0	CL	LEAN CLAY WITH SAND (CL), very stiff, brown, moist, gravel up to 1/2 inch, encountered asphalt pieces	
MC-1		11.3	39					(LL=46, PI=25)
					5	SC	CLAYEY SAND WITH GRAVEL (SC), medium dense, yellowish brown, moist, gravel up to 1 inch	
SPT-2	116.1	10.0	18					(+#4=24%, -#200=35%)
MC-3		18.5	34		10	CL	LEAN CLAY WITH SAND (CL), very stiff, grayish brown, moist, gravel up to 1/2 inch	(LL=40, PI=20)
							Bottom of drill hole at 10 feet. No groundwater was encountered during drilling.	
					15			
					20			
					25			
					30			

LOG OF BORING

PARIKH CONSULTANTS, INC.
Geotechnical & Materials Engineering

SANTA TERESA STOCKPILE
SAN JOSE, CALIFORNIA

Date: 12/2007 | Job No.: 207154.10

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Plate: A-6

LB 207154.10.GPJ 1-16-08

Boring Location, Elevation & Date Drilled:	Drilling Method:	BORING NUMBER
SEE SITE PLAN; Elev. approx. ft.; drilled on 12-18-07	8-inch dia. HOLLOW STEM AUGER	B-6
	Sampling Method: 2 1/2" I.D. Mod. Cal. (MC), 1 3/8" I.D. Std. Pen., 140 lbs hammer, 30 inch drop.	Sheet 1 of 1

Sample Type & No.	Dry Density (pcf)	Water Content (%)	Blows Per Foot	Compress. Strength (tsf)	Depth (ft)	Soil Graph & U.S.C.S.			
					0		SC	CLAYEY SAND WITH GRAVEL (SC), medium dense, grayish brown, moist, gravel and rock fragments up to 1/4 inch to 2 inches	
MC-1		6.2	51						(+#4=29%, -#200=36%)
					5		CL	LEAN CLAY WITH SAND (CL), very stiff, grayish brown, moist, gravel up to 1/2 inch	
SPT-2		13.9	26						(LL=39, PI=19)
								--color change to reddish brown at 8.5 feet	
MC-3		10.8	27		10			--very stiff, grayish brown, less gravel	
								Bottom of drill hole at 10 feet. No groundwater was encountered during drilling. Bulk Sample (CLAYEY SAND WITH GRAVEL (SC), grayish brown, moist, gravel up to 1/4 inch to 3 inches) taken from 0 to 5 feet	
					15				
					20				
					25				
					30				

LOG OF BORING

PARIKH CONSULTANTS, INC.
Geotechnical & Materials Engineering

SANTA TERESA STOCKPILE
SAN JOSE, CALIFORNIA

Date: 12/2007 | Job No.: 207154.10

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Plate: A-7

LB 207154.10.GPJ 1-16-08

Boring Location, Elevation & Date Drilled:	Drilling Method:	BORING NUMBER
SEE SITE PLAN; Elev. approx. ft.; drilled on 12-18-07	8-inch dia. HOLLOW STEM AUGER	B-7
	Sampling Method: 2 1/2" I.D. Mod. Cal. (MC), 1 3/8" I.D. Std. Pen., 140 lbs hammer, 30 inch drop.	Sheet 1 of 1

Sample Type & No.	Dry Density (pcf)	Water Content (%)	Blows Per Foot	Compress. Strength (tsf)	Depth (ft)	Soil Graph & U.S.C.S.			
					0		SC	CLAYEY SAND WITH GRAVEL (SC), medium dense, yellowish brown, moist, encountered asphalt pieces up to 2.5 inches	
MC-1		14.3	19					--(hard augering/rig chattering)	(+#4=23%, -#200=39%)
					5		CL	LEAN CLAY WITH SAND (CL), stiff, grayish brown, moist, gravel and rock fragments up to 2 inches	
SPT-2		14.9	22						(LL=34, PI=16)
MC-3		17.1	21		10			--stiff, brown, gravel up to 1/2 inch	(LL=46, PI=22)
								Bottom of drill hole at 10 feet. No groundwater was encountered during drilling.	
								Noticed serpentine fragments in cutting	
					15				
					20				
					25				
					30				

LOG OF BORING

PARIKH CONSULTANTS, INC.
Geotechnical & Materials Engineering

SANTA TERESA STOCKPILE
SAN JOSE, CALIFORNIA

Date: 12/2007 | Job No.: 207154.10

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Plate: A-8

LB 207154.10.GPJ 1-16-08

APPENDIX B

APPENDIX B

LABORATORY TESTS

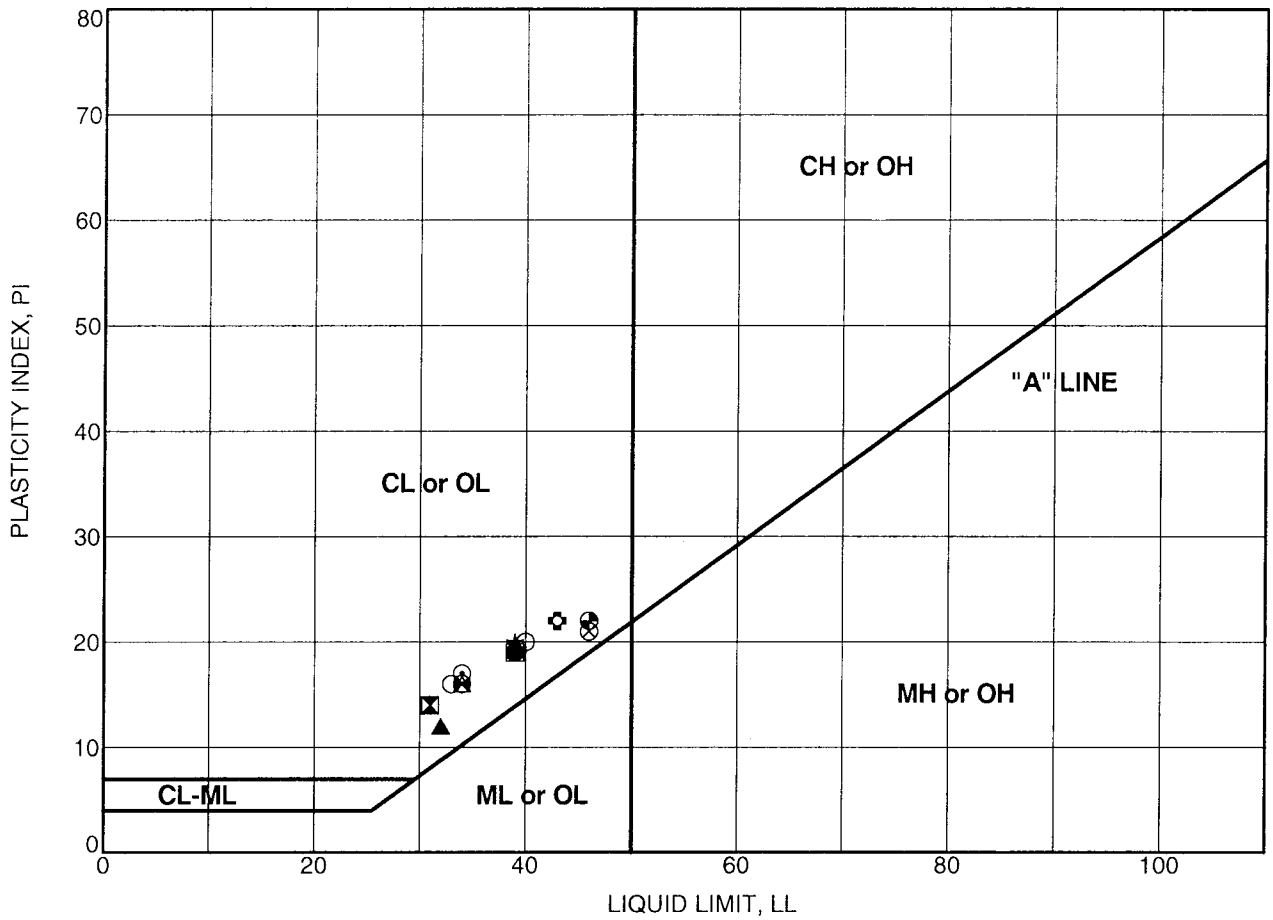
Classification Tests
The field classification of the samples was visually verified in the laboratory according to the Unified Soil Classification System. The results are presented in Appendix A.

Moisture-Density
The natural moisture contents and dry unit weights were determined for selected undisturbed samples of the soils in general accordance with ASTM Test Method D 2216-92. This information was used to classify and correlate the soils. The results are presented at the appropriate depths in Appendix A.

Atterberg Limits
The Atterberg Limits were determined for selected samples of the fine-grained materials. These results were used to classify the soils, as well as to obtain an indication of the effective strength characteristics and expansion potential with variations in moisture content. The Atterberg Limits were determined in general accordance with ASTM Test Method D 4318-93. The results of these tests are presented on Plate B-2, "Plasticity Chart".

Grain Size Classification
Grain size classification tests (ASTM Test Method D422-63) were performed on selected samples of granular soil to aid in the classification. The results are presented on Plate B-3, "Grain Size Distribution Curves".

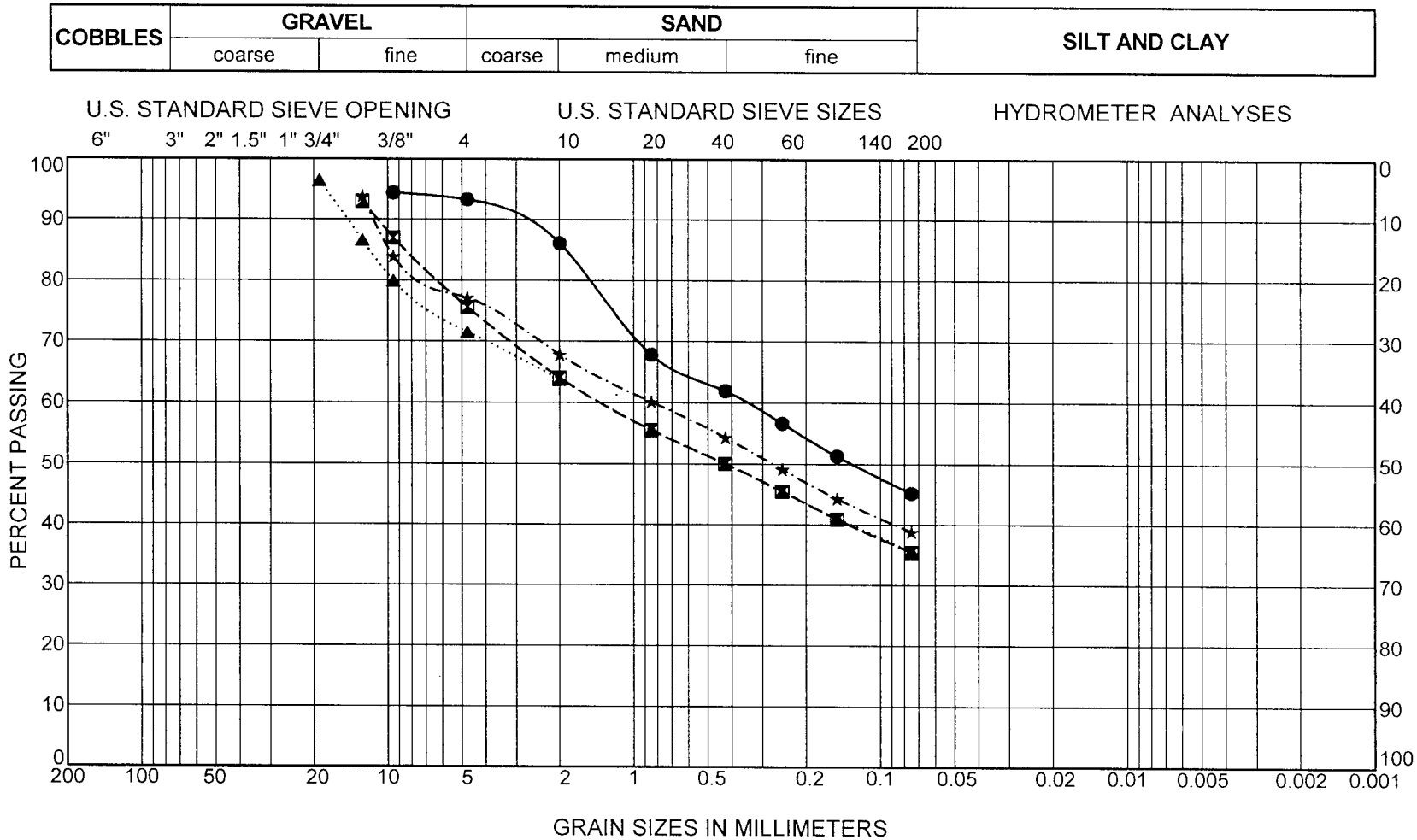
R-value Tests
R-value tests were performed on representative bulk samples for pavement design. The tests were performed according to California Test Method 301. The test results are presented on Plates B-4A thru B-4C.



PLASTICITY CHART

Boring Number	Sample Number	Depth (feet)	Test Symbol	Moisture Content (%)	LL	PL	PI	Description
B-1	MC-1	3.0	●	14	39	20	19	LEAN CLAY WITH SAND (CL)
B-1	MC-3	9.5	⊠	12	31	17	14	LEAN CLAY WITH SAND (CL)
B-2	MC-1	3.0	▲	9	32	20	12	LEAN CLAY WITH SAND (CL)
B-2	SPT-2	6.0	★	8	39	19	20	LEAN CLAY WITH SAND (CL)
B-2	MC-3	9.5	⊙	11	34	17	17	LEAN CLAY WITH SAND (CL)
B-3	MC-1	3.0	✿	13	43	21	22	LEAN CLAY WITH SAND (CL)
B-3	MC-3	9.5	○	10	33	17	16	LEAN CLAY (CL)
B-4	SPT-4	9.5	△	9	34	18	16	LEAN CLAY (CL)
B-5	MC-1	3.0	⊗	11	46	25	21	LEAN CLAY WITH SAND (CL)
B-5	MC-3	9.5	⊕	19	40	20	20	LEAN CLAY WITH SAND (CL)
B-6	SPT-2	6.0	□	14	39	20	19	LEAN CLAY WITH SAND (CL)
B-7	SPT-2	6.0	⊞	15	34	18	16	LEAN CLAY WITH SAND (CL)
B-7	MC-3	9.5	◕	17	46	24	22	LEAN CLAY WITH SAND (CL)

GRAIN SIZE DISTRIBUTION CURVES



Boring Number	Sample Number	Depth (feet)	Symbol	LL	PI	Description
B-3	SPT-2	6.0	●			CLAYEY SAND (SC)
B-5	SPT-2	6.0	⊠			CLAYEY SAND WITH GRAVEL (SC)
B-6	MC-1	3.0	▲			CLAYEY SAND WITH GRAVEL (SC)
B-7	MC-1	3.0	★			CLAYEY SAND WITH GRAVEL (SC)

PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS ENGINEERING

JOB NO: 207154.10

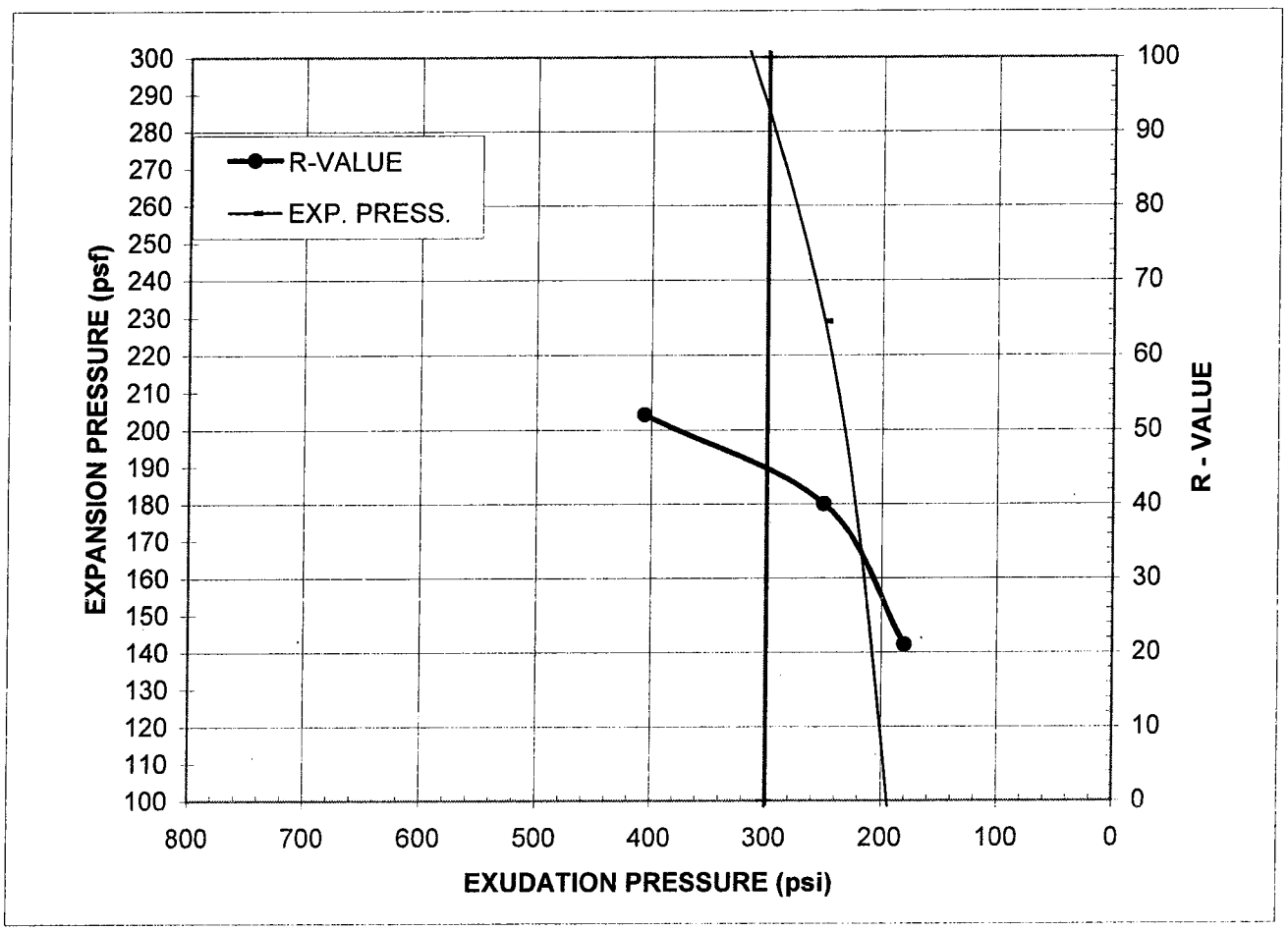
SANTA TERESA STOCKPILE
SAN JOSE, CALIFORNIA

PLATE NO: B-3

R-VALUE REPORT

Parikh Consultants, Inc. ASTM D2844 or CTM 301 (408) 945-1011

Project Name:	Santa Teresa Stockpile	Date:	1/4/08
Client:	VTA / DMJM	Project #:	207154.10
Sample #:	1 Depth: 0' - 5'	Lab #:	M684
Location / Source:	Onsite / Native	Sample Date:	
Material :	Clay with gravel, brown	Sampled By:	



Specimen No.	A	B	C
Exudation Pressure, psi	180	250	406
Expansion Pressure, psf	61	229	385
R-Value	21	40	52
Moisture Content at Test, %	19.8	17.9	16.8
Dry Density at Test, pcf	107.2	111.3	113.7

R-Value @ 300 psi Exudation Pressure = 45

Expansion Pressure @300 psi Exudation, psf = **285**

Minimum R-Value Requirement:

Comments:

Report By: Prav Dayah

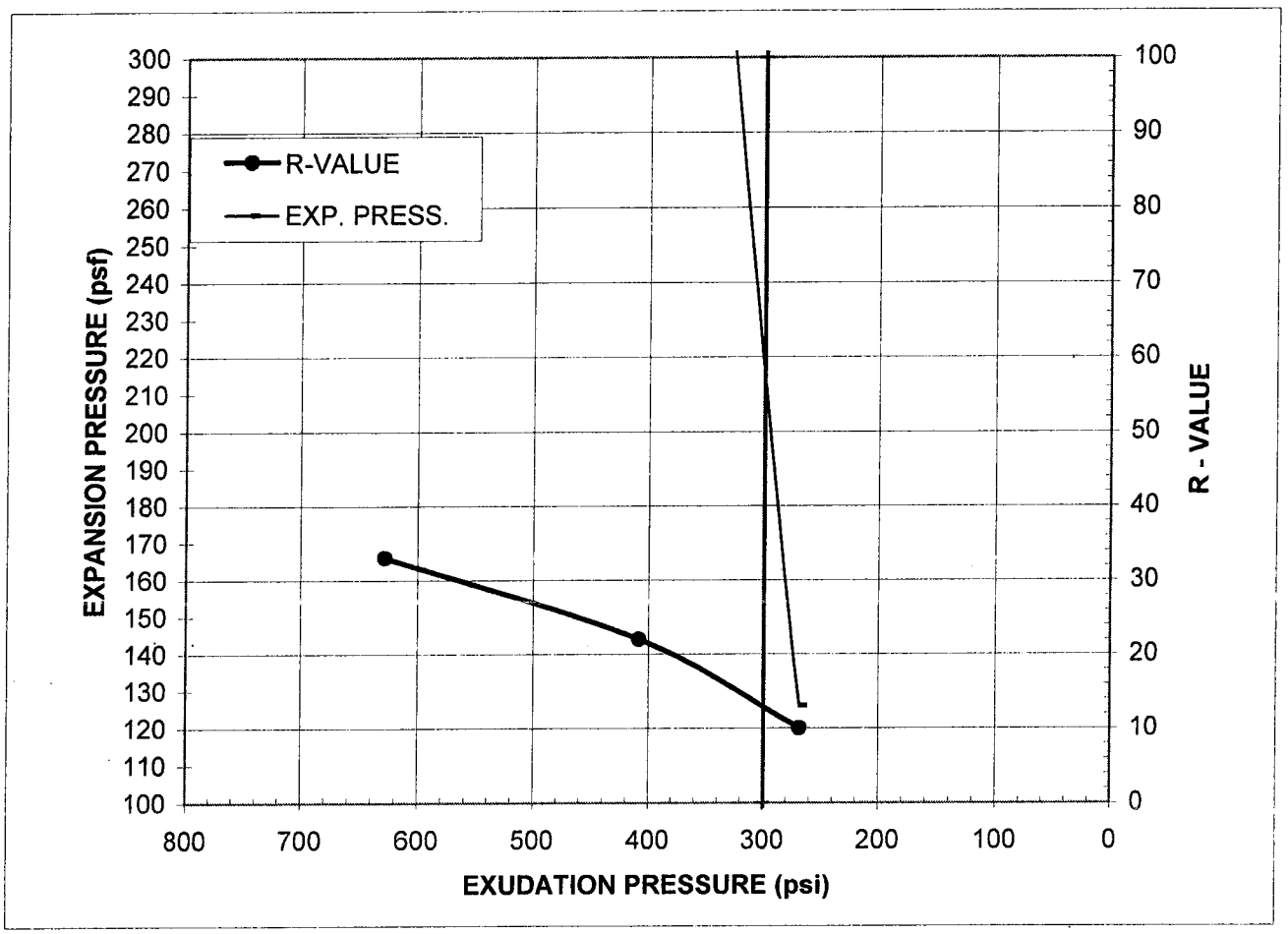
RVALUE with calcs pdp

PLATE NO.: B-4A

R-VALUE REPORT

Parikh Consultants, Inc. **ASTM D2844 or CTM 301** (408) 945-1011

Project Name: Santa Teresa Stockpile		Date:	1/4/08
Client: VTA / DMJM		Project #:	207154.10
Sample #: 2	Depth: 0' - 5'	Lab #:	M684
Location / Source:	Onsite / Native	Sample Date:	
Material : Clay., brown		Sampled By:	



Specimen No.	A	B	C
Exudation Pressure, psi	268	408	628
Expansion Pressure, psf	126	476	498
R-Value	10	22	33
Moisture Content at Test, %	18.0	15.7	14.4
Dry Density at Test, pcf	110.5	116.3	119.3

R-Value @ 300 psi Exudation Pressure = 14

Expansion Pressure @300 psi Exudation, psf = **215**

Minimum R-Value Requirement:

Comments:

Report By: Prav Dayah

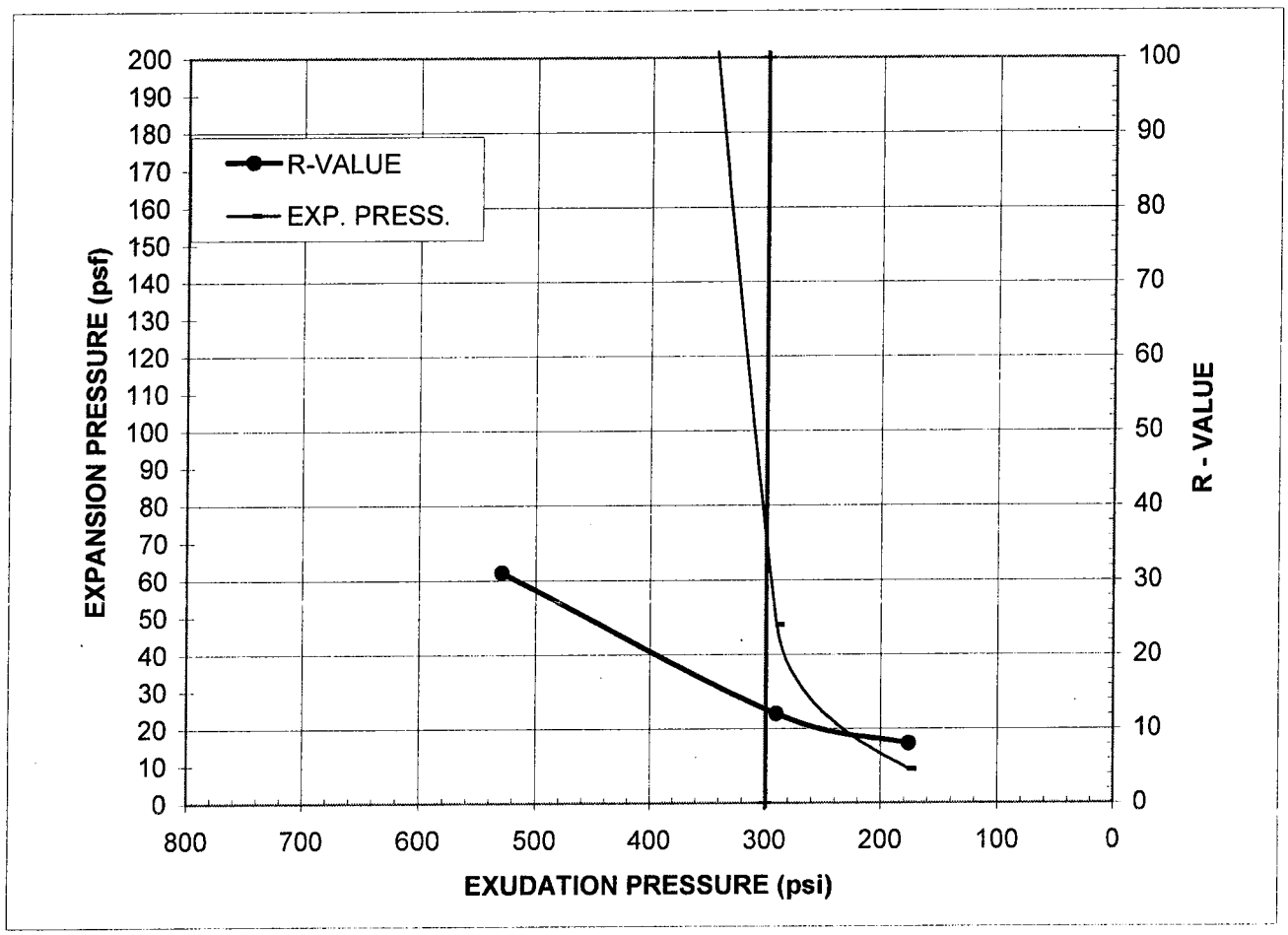
RVALUE with calcs pdp

PLATE NO.: B-4B

R-VALUE REPORT

Parikh Consultants, Inc. **ASTM D2844 or CTM 301** (408) 945-1011

Project Name: Santa Teresa Stockpile		Date:	1/4/08
Client: VTA / DMJM		Project #:	207154.10
Sample #: 6	Depth: 0' - 5'	Lab #:	M684
Location / Source:	Onsite / Native	Sample Date:	
Material : Clayl, brown		Sampled By:	



Specimen No.	A	B	C
Exudation Pressure, psi	176	290	529
Expansion Pressure, psf	9	48	844
R-Value	8	12	31
Moisture Content at Test, %	16.6	14.8	13.0
Dry Density at Test, pcf	110.8	117.8	123.1

R-Value @ 300 psi Exudation Pressure = 13

Expansion Pressure @300 psi Exudation, psf = **70**

Minimum R-Value Requirement:

Comments:

Report By: Prav Dayah

RVALUE with calcs pdp

PLATE NO.: B-4C

January 14, 2008

ELAP No.: 1838
NELAP No.: 02107CA
NEVADA.: CA-401
Arizona: AZ0689
CSDLAC No.: 10196
Workorder No.: 096287

Rick Day\Chris Merritt
Geocon Consultants, Inc.
6671 Brisa Street
Livermore, CA 94550
TEL: (925) 371-5900
FAX: (925) 371-5915

RE: SANTA TERESA STOCKPILE, E8440-06-01

Attention: Rick Day\Chris Merritt

Enclosed are the results for sample(s) received on January 07, 2008 by Advanced Technology Laboratories . The sample(s) are tested for the parameters as indicated in the enclosed chain of custody in accordance with the applicable laboratory certifications.

Thank you for the opportunity to service the needs of your company.

Please feel free to call me at (562)989-4045 if I can be of further assistance to your company.

Sincerely,

for Eddie F. Rodriguez
Laboratory Director

The cover letter and the case narrative are an integral part of this analytical report and cannot be reproduced in part or in its entirety without written permission from the client and Advanced Technology Laboratories.

Advanced Technology Laboratories
3275 Walnut Avenue Signal Hill, CA 90755 Tel: 562 989-4045 Fax: 562 989-4040

CLIENT: Geocon Consultants, Inc.
Project: SANTA TERESA STOCKPILE, E8440-06-01
Lab Order: 096287

CASE NARRATIVE

Analytical Comments for Method 6010

Matrix Spike (MS) and /or Matrix Spike Duplicate (MSD) are/is outside recovery criteria for samples 096324-010AMS and 096324-010AMSD; however, the analytical batch was validated by the Laboratory Control Sample (LCS).

Analytical Comments for Method 8015 (DRO/ORO)

Dilution was necessary for sample 096287-005A, due to sample matrix.

Matrix Spike (MS) and /or Matrix Spike Duplicate (MSD) are/is outside recovery criteria for sample 096287-005AMSD; however, the analytical batch was validated by the Laboratory Control Sample (LCS).

RPD for Matrix Spike (MS)/Matrix Spike Duplicate (MSD) is outside criteria for sample 096287-005AMSD; however, the analytical batch was validated by the Laboratory Control Sample (LCS).

Analytical Comments for Method 8270

Dilution was necessary for sample 096287-005A, due to sample matrix.

Matrix Spike (MS) and /or Matrix Spike Duplicate (MSD) are/is outside recovery criteria for samples 096272-015AMS and 096272-015AMSD; however, the analytical batch was validated by the Laboratory Control Sample (LCS).

Advanced Technology Laboratories

ANALYTICAL RESULTS

Print Date: *14-Jan-08*

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	COMPOSITE STS - 1 to 4
Lab Order:	096287	**Collection Date:**	1/3/2008
Project:	SANTA TERESA STOCKPILE, E8440-06-0	**Matrix:**	SOIL
Lab ID:	096287-005A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP6_080110B	QC Batch: 42664			PrepDate:	1/9/2008	Analyst: **CL**
Antimony	ND	2.0		mg/Kg	1	1/10/2008 05:10 PM
Arsenic	3.4	1.0		mg/Kg	1	1/10/2008 05:10 PM
Barium	250	1.0		mg/Kg	1	1/10/2008 05:10 PM
Beryllium	ND	1.0		mg/Kg	1	1/10/2008 05:10 PM
Cadmium	ND	1.0		mg/Kg	1	1/10/2008 05:10 PM
Chromium	180	1.0		mg/Kg	1	1/10/2008 05:10 PM
Cobalt	31	1.0		mg/Kg	1	1/10/2008 05:10 PM
Copper	48	2.0		mg/Kg	1	1/10/2008 05:10 PM
Lead	11	1.0		mg/Kg	1	1/10/2008 05:10 PM
Molybdenum	ND	1.0		mg/Kg	1	1/10/2008 05:10 PM
Nickel	370	1.0		mg/Kg	1	1/10/2008 05:10 PM
Selenium	ND	1.0		mg/Kg	1	1/10/2008 05:10 PM
Silver	ND	1.0		mg/Kg	1	1/10/2008 05:10 PM
Thallium	ND	1.0		mg/Kg	1	1/10/2008 05:10 PM
Vanadium	54	1.0		mg/Kg	1	1/10/2008 05:10 PM
Zinc	65	1.0		mg/Kg	1	1/10/2008 05:10 PM
MERCURY BY COLD VAPOR TECHNIQUE						
	EPA 7471			**EPA 7471A**		
RunID: AA5_080107B	QC Batch: 42621			PrepDate:	1/7/2008	Analyst: **LKN**
Mercury	0.66	0.10		mg/Kg	1	1/7/2008

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

Advanced Technology Laboratories

ANALYTICAL RESULTS

Print Date: *14-Jan-08*

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	COMPOSITE STS - 1 to 4
Lab Order:	096287	**Collection Date:**	1/3/2008
Project:	SANTA TERESA STOCKPILE, E8440-06-0	**Matrix:**	SOIL
Lab ID:	096287-005A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
DIESEL & MOTOR OIL RANGE ORGANICS BY GC/FID						
EPA 3550B				**EPA 8015B(M)**		
RunID: GC3_080109A	QC Batch: 42685			PrepDate:	1/9/2008	Analyst: **JNV**
DRO	19	2.0		mg/Kg	2	1/9/2008 10:48 PM
ORO	110	2.0		mg/Kg	2	1/9/2008 10:48 PM
Surr: p-Terphenyl	65.0	26-127		%REC	2	1/9/2008 10:48 PM
GASOLINE RANGE ORGANICS BY GC/FID						
				EPA 8015B(M)		
RunID: GC2_080109A	QC Batch: E08VS007			PrepDate:		Analyst: **AAH**
GRO	ND	1.0		mg/Kg	1	1/9/2008 01:35 PM
Surr: Bromofluorobenzene (FID)	99.5	42-142		%REC	1	1/9/2008 01:35 PM
PCBS BY GC/ECD						
EPA 3550B				**EPA 8082**		
RunID: GC4_080108B	QC Batch: 42649			PrepDate:	1/8/2008	Analyst: **HL**
Aroclor 1016	ND	16		µg/Kg	1	1/9/2008 09:59 AM
Aroclor 1221	ND	33		µg/Kg	1	1/9/2008 09:59 AM
Aroclor 1232	ND	16		µg/Kg	1	1/9/2008 09:59 AM
Aroclor 1242	ND	16		µg/Kg	1	1/9/2008 09:59 AM
Aroclor 1248	ND	16		µg/Kg	1	1/9/2008 09:59 AM
Aroclor 1254	ND	16		µg/Kg	1	1/9/2008 09:59 AM
Aroclor 1260	ND	16		µg/Kg	1	1/9/2008 09:59 AM
Aroclor 1262	ND	16		µg/Kg	1	1/9/2008 09:59 AM
Aroclor 1268	ND	16		µg/Kg	1	1/9/2008 09:59 AM
Surr: Decachlorobiphenyl	66.9	41-127		%REC	1	1/9/2008 09:59 AM
Surr: Tetrachloro-m-xylene	71.3	54-127		%REC	1	1/9/2008 09:59 AM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

Advanced Technology Laboratories

ANALYTICAL RESULTS

Print Date: *14-Jan-08*

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	COMPOSITE STS - 1 to 4
Lab Order:	096287	**Collection Date:**	1/3/2008
Project:	SANTA TERESA STOCKPILE, E8440-06-0	**Matrix:**	SOIL
Lab ID:	096287-005A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ORGANOCHLORINE PESTICIDES BY GC/ECD						
EPA 3550B				**EPA 8081A**		
RunID: GC9_080109A	QC Batch: 42649				PrepDate: 1/8/2008	Analyst: **VLT**
4,4´-DDD	ND	2.0		µg/Kg	1	1/9/2008 04:11 PM
4,4´-DDE	ND	2.0		µg/Kg	1	1/9/2008 04:11 PM
4,4´-DDT	ND	2.0		µg/Kg	1	1/9/2008 04:11 PM
Aldrin	ND	1.0		µg/Kg	1	1/9/2008 04:11 PM
alpha-BHC	ND	1.0		µg/Kg	1	1/9/2008 04:11 PM
alpha-Chlordane	ND	1.0		µg/Kg	1	1/9/2008 04:11 PM
beta-BHC	ND	1.0		µg/Kg	1	1/9/2008 04:11 PM
Chlordane	ND	8.5		µg/Kg	1	1/9/2008 04:11 PM
delta-BHC	ND	1.0		µg/Kg	1	1/9/2008 04:11 PM
Dieldrin	ND	2.0		µg/Kg	1	1/9/2008 04:11 PM
Endosulfan I	ND	1.0		µg/Kg	1	1/9/2008 04:11 PM
Endosulfan II	ND	2.0		µg/Kg	1	1/9/2008 04:11 PM
Endosulfan sulfate	ND	2.0		µg/Kg	1	1/9/2008 04:11 PM
Endrin	ND	2.0		µg/Kg	1	1/9/2008 04:11 PM
Endrin aldehyde	ND	2.0		µg/Kg	1	1/9/2008 04:11 PM
Endrin ketone	ND	2.0		µg/Kg	1	1/9/2008 04:11 PM
gamma-BHC	ND	1.0		µg/Kg	1	1/9/2008 04:11 PM
gamma-Chlordane	ND	1.0		µg/Kg	1	1/9/2008 04:11 PM
Heptachlor	ND	1.0		µg/Kg	1	1/9/2008 04:11 PM
Heptachlor epoxide	ND	1.0		µg/Kg	1	1/9/2008 04:11 PM
Methoxychlor	ND	8.5		µg/Kg	1	1/9/2008 04:11 PM
Toxaphene	ND	85		µg/Kg	1	1/9/2008 04:11 PM
Surr: Decachlorobiphenyl	46.3	31-132		%REC	1	1/9/2008 04:11 PM
Surr: Tetrachloro-m-xylene	45.8	34-106		%REC	1	1/9/2008 04:11 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

Advanced Technology Laboratories

ANALYTICAL RESULTS

Print Date: *14-Jan-08*

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	COMPOSITE STS - 1 to 4
Lab Order:	096287	**Collection Date:**	1/3/2008
Project:	SANTA TERESA STOCKPILE, E8440-06-0	**Matrix:**	SOIL
Lab ID:	096287-005A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
VOLATILE ORGANIC COMPOUNDS BY GC/MS						
			EPA 8260B			
RunID: MS4_080110B	QC Batch: K08VS010			PrepDate:		Analyst: **AAH**
1,1,1,2-Tetrachloroethane	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
1,1,1-Trichloroethane	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
1,1,2,2-Tetrachloroethane	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
1,1,2-Trichloroethane	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
1,1-Dichloroethane	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
1,1-Dichloroethene	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
1,1-Dichloropropene	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
1,2,3-Trichlorobenzene	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
1,2,3-Trichloropropane	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
1,2,4-Trichlorobenzene	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
1,2,4-Trimethylbenzene	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
1,2-Dibromo-3-chloropropane	ND	10		µg/Kg	1	1/10/2008 09:22 PM
1,2-Dibromoethane	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
1,2-Dichlorobenzene	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
1,2-Dichloroethane	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
1,2-Dichloropropane	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
1,3,5-Trimethylbenzene	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
1,3-Dichlorobenzene	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
1,3-Dichloropropane	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
1,4-Dichlorobenzene	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
2,2-Dichloropropane	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
2-Chlorotoluene	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
4-Chlorotoluene	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
4-Isopropyltoluene	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
Benzene	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
Bromobenzene	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
Bromodichloromethane	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
Bromoform	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
Bromomethane	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
Carbon tetrachloride	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
Chlorobenzene	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
Chloroethane	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
Chloroform	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
Chloromethane	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
cis-1,2-Dichloroethene	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

Advanced Technology Laboratories

ANALYTICAL RESULTS

Print Date: *14-Jan-08*

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	COMPOSITE STS - 1 to 4
Lab Order:	096287	**Collection Date:**	1/3/2008
Project:	SANTA TERESA STOCKPILE, E8440-06-0	**Matrix:**	SOIL
Lab ID:	096287-005A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
VOLATILE ORGANIC COMPOUNDS BY GC/MS						
			EPA 8260B			
RunID: MS4_080110B	QC Batch: K08VS010			PrepDate:		Analyst: **AAH**
cis-1,3-Dichloropropene	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
Dibromochloromethane	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
Dibromomethane	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
Dichlorodifluoromethane	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
Ethylbenzene	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
Hexachlorobutadiene	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
Isopropylbenzene	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
m,p-Xylene	ND	10		µg/Kg	1	1/10/2008 09:22 PM
Methylene chloride	49	5.0		µg/Kg	1	1/10/2008 09:22 PM
n-Butylbenzene	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
n-Propylbenzene	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
Naphthalene	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
o-Xylene	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
sec-Butylbenzene	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
Styrene	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
tert-Butylbenzene	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
Tetrachloroethene	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
Toluene	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
trans-1,2-Dichloroethene	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
Trichloroethene	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
Trichlorofluoromethane	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
Vinyl chloride	ND	5.0		µg/Kg	1	1/10/2008 09:22 PM
Surr: 1,2-Dichloroethane-d4	89.9	70-130		%REC	1	1/10/2008 09:22 PM
Surr: 4-Bromofluorobenzene	89.1	70-130		%REC	1	1/10/2008 09:22 PM
Surr: Dibromofluoromethane	94.9	70-130		%REC	1	1/10/2008 09:22 PM
Surr: Toluene-d8	99.5	70-130		%REC	1	1/10/2008 09:22 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

Advanced Technology Laboratories

ANALYTICAL RESULTS

Print Date: *14-Jan-08*

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	COMPOSITE STS - 1 to 4
Lab Order:	096287	**Collection Date:**	1/3/2008
Project:	SANTA TERESA STOCKPILE, E8440-06-0	**Matrix:**	SOIL
Lab ID:	096287-005A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
SEMIVOLATILE ORGANIC COMPOUNDS BY GC/MS						
EPA 3550B				**EPA 8270C**		
RunID: MS6_080108A	QC Batch: 42652				PrepDate: 1/8/2008	Analyst: **MFR**
1,2,4-Trichlorobenzene	ND	3300		µg/Kg	10	1/9/2008 04:22 AM
1,2-Dichlorobenzene	ND	3300		µg/Kg	10	1/9/2008 04:22 AM
1,3-Dichlorobenzene	ND	3300		µg/Kg	10	1/9/2008 04:22 AM
1,4-Dichlorobenzene	ND	3300		µg/Kg	10	1/9/2008 04:22 AM
2,4,5-Trichlorophenol	ND	3300		µg/Kg	10	1/9/2008 04:22 AM
2,4,6-Trichlorophenol	ND	3300		µg/Kg	10	1/9/2008 04:22 AM
2,4-Dichlorophenol	ND	16000		µg/Kg	10	1/9/2008 04:22 AM
2,4-Dimethylphenol	ND	3300		µg/Kg	10	1/9/2008 04:22 AM
2,4-Dinitrophenol	ND	16000		µg/Kg	10	1/9/2008 04:22 AM
2,4-Dinitrotoluene	ND	3300		µg/Kg	10	1/9/2008 04:22 AM
2,6-Dinitrotoluene	ND	3300		µg/Kg	10	1/9/2008 04:22 AM
2-Chloronaphthalene	ND	3300		µg/Kg	10	1/9/2008 04:22 AM
2-Chlorophenol	ND	3300		µg/Kg	10	1/9/2008 04:22 AM
2-Methylnaphthalene	ND	3300		µg/Kg	10	1/9/2008 04:22 AM
2-Methylphenol	ND	3300		µg/Kg	10	1/9/2008 04:22 AM
2-Nitroaniline	ND	16000		µg/Kg	10	1/9/2008 04:22 AM
2-Nitrophenol	ND	3300		µg/Kg	10	1/9/2008 04:22 AM
3,3´-Dichlorobenzidine	ND	6600		µg/Kg	10	1/9/2008 04:22 AM
3-Nitroaniline	ND	16000		µg/Kg	10	1/9/2008 04:22 AM
4,6-Dinitro-2-methylphenol	ND	16000		µg/Kg	10	1/9/2008 04:22 AM
4-Bromophenyl-phenylether	ND	3300		µg/Kg	10	1/9/2008 04:22 AM
4-Chloro-3-methylphenol	ND	6600		µg/Kg	10	1/9/2008 04:22 AM
4-Chloroaniline	ND	6600		µg/Kg	10	1/9/2008 04:22 AM
4-Chlorophenyl-phenylether	ND	3300		µg/Kg	10	1/9/2008 04:22 AM
4-Methylphenol	ND	3300		µg/Kg	10	1/9/2008 04:22 AM
4-Nitroaniline	ND	16000		µg/Kg	10	1/9/2008 04:22 AM
4-Nitrophenol	ND	16000		µg/Kg	10	1/9/2008 04:22 AM
Acenaphthene	ND	3300		µg/Kg	10	1/9/2008 04:22 AM
Acenaphthylene	ND	3300		µg/Kg	10	1/9/2008 04:22 AM
Anthracene	ND	3300		µg/Kg	10	1/9/2008 04:22 AM
Benzidine (M)	ND	16000		µg/Kg	10	1/9/2008 04:22 AM
Benzo(a)anthracene	ND	3300		µg/Kg	10	1/9/2008 04:22 AM
Benzo(a)pyrene	ND	3300		µg/Kg	10	1/9/2008 04:22 AM
Benzo(b)fluoranthene	ND	3300		µg/Kg	10	1/9/2008 04:22 AM
Benzo(g,h,i)perylene	ND	3300		µg/Kg	10	1/9/2008 04:22 AM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

Advanced Technology Laboratories

ANALYTICAL RESULTS
Print Date: *14-Jan-08*

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	COMPOSITE STS - 1 to 4
Lab Order:	096287	**Collection Date:**	1/3/2008
Project:	SANTA TERESA STOCKPILE, E8440-06-0	**Matrix:**	SOIL
Lab ID:	096287-005A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
SEMIVOLATILE ORGANIC COMPOUNDS BY GC/MS						
EPA 3550B				**EPA 8270C**		
RunID: MS6_080108A	QC Batch: 42652				PrepDate: 1/8/2008	Analyst: **MFR**
Benzo(k)fluoranthene	ND	3300		µg/Kg	10	1/9/2008 04:22 AM
Benzoic acid	ND	16000		µg/Kg	10	1/9/2008 04:22 AM
Benzyl alcohol	ND	6600		µg/Kg	10	1/9/2008 04:22 AM
Bis(2-chloroethoxy)methane	ND	3300		µg/Kg	10	1/9/2008 04:22 AM
Bis(2-chloroethyl)ether	ND	3300		µg/Kg	10	1/9/2008 04:22 AM
Bis(2-chloroisopropyl)ether	ND	3300		µg/Kg	10	1/9/2008 04:22 AM
Bis(2-ethylhexyl)phthalate	ND	3300		µg/Kg	10	1/9/2008 04:22 AM
Butylbenzylphthalate	ND	3300		µg/Kg	10	1/9/2008 04:22 AM
Chrysene	ND	3300		µg/Kg	10	1/9/2008 04:22 AM
Di-n-butylphthalate	ND	3300		µg/Kg	10	1/9/2008 04:22 AM
Di-n-octylphthalate	ND	3300		µg/Kg	10	1/9/2008 04:22 AM
Dibenz(a,h)anthracene	ND	3300		µg/Kg	10	1/9/2008 04:22 AM
Dibenzofuran	ND	3300		µg/Kg	10	1/9/2008 04:22 AM
Diethylphthalate	ND	3300		µg/Kg	10	1/9/2008 04:22 AM
Dimethylphthalate	ND	3300		µg/Kg	10	1/9/2008 04:22 AM
Fluoranthene	ND	3300		µg/Kg	10	1/9/2008 04:22 AM
Fluorene	ND	3300		µg/Kg	10	1/9/2008 04:22 AM
Hexachlorobenzene	ND	3300		µg/Kg	10	1/9/2008 04:22 AM
Hexachlorobutadiene	ND	6600		µg/Kg	10	1/9/2008 04:22 AM
Hexachlorocyclopentadiene	ND	6600		µg/Kg	10	1/9/2008 04:22 AM
Hexachloroethane	ND	3300		µg/Kg	10	1/9/2008 04:22 AM
Indeno(1,2,3-cd)pyrene	ND	3300		µg/Kg	10	1/9/2008 04:22 AM
Isophorone	ND	3300		µg/Kg	10	1/9/2008 04:22 AM
N-Nitrosodi-n-propylamine	ND	3300		µg/Kg	10	1/9/2008 04:22 AM
N-Nitrosodiphenylamine	ND	3300		µg/Kg	10	1/9/2008 04:22 AM
Naphthalene	ND	3300		µg/Kg	10	1/9/2008 04:22 AM
Nitrobenzene	ND	3300		µg/Kg	10	1/9/2008 04:22 AM
Pentachlorophenol	ND	16000		µg/Kg	10	1/9/2008 04:22 AM
Phenanthrene	ND	3300		µg/Kg	10	1/9/2008 04:22 AM
Phenol	ND	3300		µg/Kg	10	1/9/2008 04:22 AM
Pyrene	ND	3300		µg/Kg	10	1/9/2008 04:22 AM
Surr: 1,2-Dichlorobenzene-d4	81.7	40-97		%REC	10	1/9/2008 04:22 AM
Surr: 2,4,6-Tribromophenol	75.8	31-148		%REC	10	1/9/2008 04:22 AM
Surr: 2-Chlorophenol-d4	82.4	49-103		%REC	10	1/9/2008 04:22 AM
Surr: 2-Fluorobiphenyl	93.7	55-102		%REC	10	1/9/2008 04:22 AM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

Advanced Technology Laboratories

ANALYTICAL RESULTS

Print Date: *14-Jan-08*

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	COMPOSITE STS - 1 to 4
Lab Order:	096287	**Collection Date:**	1/3/2008
Project:	SANTA TERESA STOCKPILE, E8440-06-0	**Matrix:**	SOIL
Lab ID:	096287-005A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
SEMIVOLATILE ORGANIC COMPOUNDS BY GC/MS						
EPA 3550B				**EPA 8270C**		
RunID: MS6_080108A	QC Batch: 42652			PrepDate:	1/8/2008	Analyst: **MFR**
Surr: 2-Fluorophenol	78.0	45-105		%REC	10	1/9/2008 04:22 AM
Surr: 4-Terphenyl-d14	95.4	52-124		%REC	10	1/9/2008 04:22 AM
Surr: Nitrobenzene-d5	76.6	48-109		%REC	10	1/9/2008 04:22 AM
Surr: Phenol-d5	79.6	47-108		%REC	10	1/9/2008 04:22 AM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT: Geocon Consultants, Inc.
Work Order: 096287
Project: SANTA TERESA STOCKPILE, E8440-06-01

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_S

Sample ID: **MB-42664** SampType: **MBLK** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **1/9/2008** RunNo: **89735**
Client ID: **PBS** Batch ID: **42664** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **1/10/2008** SeqNo: **1371073**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	ND	2.0									
Arsenic	0.198	1.0									
Barium	ND	1.0									
Beryllium	ND	1.0									
Cadmium	ND	1.0									
Chromium	ND	1.0									
Cobalt	ND	1.0									
Copper	ND	2.0									
Lead	ND	1.0									
Molybdenum	ND	1.0									
Nickel	ND	1.0									
Selenium	ND	1.0									
Silver	ND	1.0									
Thallium	ND	1.0									
Vanadium	ND	1.0									
Zinc	ND	1.0									

Sample ID: **LCS-42664** SampType: **LCS** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **1/9/2008** RunNo: **89735**
Client ID: **LCSS** Batch ID: **42664** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **1/10/2008** SeqNo: **1371074**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	45.598	2.0	50.00	0	91.2	80	120				
Arsenic	44.920	1.0	50.00	0.1976	89.4	80	120				
Barium	45.064	1.0	50.00	0	90.1	80	120				
Beryllium	48.017	1.0	50.00	0	96.0	80	120				
Cadmium	46.027	1.0	50.00	0	92.1	80	120				
Chromium	47.160	1.0	50.00	0	94.3	80	120				
Cobalt	46.932	1.0	50.00	0	93.9	80	120				

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 096287
Project: SANTA TERESA STOCKPILE, E8440-06-01

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_S

Sample ID: **LCS-42664** SampType: **LCS** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **1/9/2008** RunNo: **89735**
Client ID: **LCSS** Batch ID: **42664** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **1/10/2008** SeqNo: **1371074**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Copper	48.061	2.0	50.00	0	96.1	80	120				
Lead	46.398	1.0	50.00	0	92.8	80	120				
Molybdenum	47.649	1.0	50.00	0	95.3	80	120				
Nickel	45.864	1.0	50.00	0	91.7	80	120				
Selenium	43.125	1.0	50.00	0	86.2	80	120				
Silver	45.036	1.0	50.00	0	90.1	80	120				
Thallium	47.297	1.0	50.00	0	94.6	80	120				
Vanadium	45.381	1.0	50.00	0	90.8	80	120				
Zinc	44.318	1.0	50.00	0	88.6	80	120				

Sample ID: **096324-010AMS** SampType: **MS** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **1/9/2008** RunNo: **89735**
Client ID: **ZZZZZZ** Batch ID: **42664** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **1/10/2008** SeqNo: **1371093**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	92.388	2.0	125.0	0.8310	73.2	24	110				
Arsenic	421.113	1.0	125.0	220.8	160	61	104				S
Barium	183.571	1.0	125.0	57.27	101	35	135				
Beryllium	104.452	1.0	125.0	0.2505	83.4	64	104				
Cadmium	119.251	1.0	125.0	3.877	92.3	65	106				
Chromium	131.092	1.0	125.0	14.27	93.5	47	122				
Cobalt	105.564	1.0	125.0	8.763	77.4	55	111				
Copper	174.669	2.0	125.0	45.77	103	52	132				
Lead	128.241	1.0	125.0	26.86	81.1	37	128				
Molybdenum	102.376	1.0	125.0	0	81.9	58	108				
Nickel	129.234	1.0	125.0	23.52	84.6	48	120				
Selenium	94.650	1.0	125.0	0	75.7	57	105				
Silver	115.608	1.0	125.0	0	92.5	44	116				
Thallium	106.371	1.0	125.0	0	85.1	55	103				
Vanadium	125.892	1.0	125.0	15.04	88.7	57	116				
Zinc	161.420	1.0	125.0	58.37	82.4	41	120				

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 096287
Project: SANTA TERESA STOCKPILE, E8440-06-01

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_S

Sample ID: **096324-010AMSD** SampType: **MSD** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **1/9/2008** RunNo: **89735**
Client ID: **ZZZZZZ** Batch ID: **42664** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **1/10/2008** SeqNo: **1371094**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	91.140	2.0	125.0	0.8310	72.2	24	110	92.39	1.36	20	
Arsenic	375.766	1.0	125.0	220.8	124	61	104	421.1	11.4	20	S
Barium	164.806	1.0	125.0	57.27	86.0	35	135	183.6	10.8	20	
Beryllium	101.749	1.0	125.0	0.2505	81.2	64	104	104.5	2.62	20	
Cadmium	116.585	1.0	125.0	3.877	90.2	65	106	119.3	2.26	20	
Chromium	127.368	1.0	125.0	14.27	90.5	47	122	131.1	2.88	20	
Cobalt	103.927	1.0	125.0	8.763	76.1	55	111	105.6	1.56	20	
Copper	171.498	2.0	125.0	45.77	101	52	132	174.7	1.83	20	
Lead	122.356	1.0	125.0	26.86	76.4	37	128	128.2	4.70	20	
Molybdenum	100.684	1.0	125.0	0	80.5	58	108	102.4	1.67	20	
Nickel	125.195	1.0	125.0	23.52	81.3	48	120	129.2	3.17	20	
Selenium	93.116	1.0	125.0	0	74.5	57	105	94.65	1.63	20	
Silver	113.180	1.0	125.0	0	90.5	44	116	115.6	2.12	20	
Thallium	105.244	1.0	125.0	0	84.2	55	103	106.4	1.06	20	
Vanadium	123.279	1.0	125.0	15.04	86.6	57	116	125.9	2.10	20	
Zinc	154.546	1.0	125.0	58.37	76.9	41	120	161.4	4.35	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 096287
Project: SANTA TERESA STOCKPILE, E8440-06-01

ANALYTICAL QC SUMMARY REPORT

TestCode: 7471_S

Sample ID: **096290-001A-MS** SampType: **MS** TestCode: **7471_S** Units: **mg/Kg** Prep Date: **1/7/2008** RunNo: **89561**
Client ID: **ZZZZZZ** Batch ID: **42621** TestNo: **EPA 7471A** **EPA 7471** Analysis Date: **1/7/2008** SeqNo: **1368336**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	0.834	0.10	0.8300	0	100	58	168				

Sample ID: **096290-001A-MSD** SampType: **MSD** TestCode: **7471_S** Units: **mg/Kg** Prep Date: **1/7/2008** RunNo: **89561**
Client ID: **ZZZZZZ** Batch ID: **42621** TestNo: **EPA 7471A** **EPA 7471** Analysis Date: **1/7/2008** SeqNo: **1368337**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	0.861	0.10	0.8300	0	104	58	168	0.8336	3.21	20	

Sample ID: **LCS-42621** SampType: **LCS** TestCode: **7471_S** Units: **mg/Kg** Prep Date: **1/7/2008** RunNo: **89561**
Client ID: **LCSS** Batch ID: **42621** TestNo: **EPA 7471A** **EPA 7471** Analysis Date: **1/7/2008** SeqNo: **1368338**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	0.797	0.10	0.8300	0	96.1	80	120				

Sample ID: **MB-42621** SampType: **MBLK** TestCode: **7471_S** Units: **mg/Kg** Prep Date: **1/7/2008** RunNo: **89561**
Client ID: **PBS** Batch ID: **42621** TestNo: **EPA 7471A** **EPA 7471** Analysis Date: **1/7/2008** SeqNo: **1368339**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	ND	0.10									

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 096287
Project: SANTA TERESA STOCKPILE, E8440-06-01

ANALYTICAL QC SUMMARY REPORT

TestCode: 8015_S_DM LL

Sample ID: **MB-42685** SampType: **MBLK** TestCode: **8015_S_DM L** Units: **mg/Kg** Prep Date: **1/9/2008** RunNo: **89691**
Client ID: **PBS** Batch ID: **42685** TestNo: **EPA 8015B(M EPA 3550B** Analysis Date: **1/9/2008** SeqNo: **1370031**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
DRO	ND	1.0									
ORO	ND	1.0									
Surr: p-Terphenyl	2.354		2.670		88.2	26	127				

Sample ID: **LCS-42685** SampType: **LCS** TestCode: **8015_S_DM L** Units: **mg/Kg** Prep Date: **1/9/2008** RunNo: **89691**
Client ID: **LCSS** Batch ID: **42685** TestNo: **EPA 8015B(M EPA 3550B** Analysis Date: **1/9/2008** SeqNo: **1370032**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
DRO	23.957	1.0	33.00	0	72.6	27	105				
Surr: p-Terphenyl	2.764		2.670		104	26	127				

Sample ID: **096287-005AMS** SampType: **MS** TestCode: **8015_S_DM L** Units: **mg/Kg** Prep Date: **1/9/2008** RunNo: **89691**
Client ID: **COMPOSITE STS - 1** Batch ID: **42685** TestNo: **EPA 8015B(M EPA 3550B** Analysis Date: **1/9/2008** SeqNo: **1370033**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
DRO	30.101	2.0	33.00	19.20	33.0	14	102				
Surr: p-Terphenyl	1.910		2.670		71.6	26	127				

Sample ID: **096287-005AMSD** SampType: **MSD** TestCode: **8015_S_DM L** Units: **mg/Kg** Prep Date: **1/9/2008** RunNo: **89691**
Client ID: **COMPOSITE STS - 1** Batch ID: **42685** TestNo: **EPA 8015B(M EPA 3550B** Analysis Date: **1/9/2008** SeqNo: **1370034**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
DRO	63.995	10	33.00	19.20	136	14	102	30.10	72.0	20	SR
Surr: p-Terphenyl	2.220		2.670		83.1	26	127		0	0	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 096287
Project: SANTA TERESA STOCKPILE, E8440-06-01

ANALYTICAL QC SUMMARY REPORT

TestCode: 8015_S_GAS

Sample ID: **096273-001AMS** SampType: **MS** TestCode: **8015_S_GAS** Units: **mg/Kg** Prep Date: RunNo: **89620**
Client ID: **ZZZZZZ** Batch ID: **E08VS007** TestNo: **EPA 8015B(M** Analysis Date: **1/9/2008** SeqNo: **1370227**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
GRO	4.693	1.0	5.000	0	93.9	33	120				
Surr: Bromofluorobenzene (FID)	93.704		100.0		93.7	42	142				

Sample ID: **096273-001AMSD** SampType: **MSD** TestCode: **8015_S_GAS** Units: **mg/Kg** Prep Date: RunNo: **89620**
Client ID: **ZZZZZZ** Batch ID: **E08VS007** TestNo: **EPA 8015B(M** Analysis Date: **1/9/2008** SeqNo: **1370228**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
GRO	4.581	1.0	5.000	0	91.6	33	120	4.693	2.42	20	
Surr: Bromofluorobenzene (FID)	97.019		100.0		97.0	42	142		0	20	

Sample ID: **E080109LCS1** SampType: **LCS** TestCode: **8015_S_GAS** Units: **mg/Kg** Prep Date: RunNo: **89620**
Client ID: **LCSS** Batch ID: **E08VS007** TestNo: **EPA 8015B(M** Analysis Date: **1/9/2008** SeqNo: **1370231**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
GRO	5.499	1.0	5.000	0	110	74	118				
Surr: Bromofluorobenzene (FID)	97.708		100.0		97.7	42	142				

Sample ID: **E080109MB1** SampType: **MBLK** TestCode: **8015_S_GAS** Units: **mg/Kg** Prep Date: RunNo: **89620**
Client ID: **PBS** Batch ID: **E08VS007** TestNo: **EPA 8015B(M** Analysis Date: **1/9/2008** SeqNo: **1370244**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
GRO	ND	1.0									
Surr: Bromofluorobenzene (FID)	96.398		100.0		96.4	42	142				

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 096287
Project: SANTA TERESA STOCKPILE, E8440-06-01

ANALYTICAL QC SUMMARY REPORT

TestCode: 8081_S

Sample ID: **MB-42649** SampType: **MBLK** TestCode: **8081_S** Units: **µg/Kg** Prep Date: **1/8/2008** RunNo: **89647**
Client ID: **PBS** Batch ID: **42649** TestNo: **EPA 8081A** **EPA 3550B** Analysis Date: **1/9/2008** SeqNo: **1369342**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
4,4´-DDD	ND	2.0									
4,4´-DDE	ND	2.0									
4,4´-DDT	ND	2.0									
Aldrin	ND	1.0									
alpha-BHC	ND	1.0									
alpha-Chlordane	ND	1.0									
beta-BHC	ND	1.0									
Chlordane	ND	8.5									
delta-BHC	ND	1.0									
Dieldrin	ND	2.0									
Endosulfan I	ND	1.0									
Endosulfan II	ND	2.0									
Endosulfan sulfate	ND	2.0									
Endrin	ND	2.0									
Endrin aldehyde	ND	2.0									
Endrin ketone	ND	2.0									
gamma-BHC	ND	1.0									
gamma-Chlordane	ND	1.0									
Heptachlor	ND	1.0									
Heptachlor epoxide	ND	1.0									
Methoxychlor	ND	8.5									
Toxaphene	ND	85									
Surr: Tetrachloro-m-xylene	11.528		16.67		69.2	34	106				
Surr: Decachlorobiphenyl	12.579		16.67		75.5	31	132				

Sample ID: **LCS-42649** SampType: **LCS** TestCode: **8081_S** Units: **µg/Kg** Prep Date: **1/8/2008** RunNo: **89647**
Client ID: **LCSS** Batch ID: **42649** TestNo: **EPA 8081A** **EPA 3550B** Analysis Date: **1/9/2008** SeqNo: **1369343**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aldrin	12.822	1.0	16.67	0	76.9	59	111				

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 096287
Project: SANTA TERESA STOCKPILE, E8440-06-01

ANALYTICAL QC SUMMARY REPORT

TestCode: 8081_S

Sample ID: **LCS-42649** SampType: **LCS** TestCode: **8081_S** Units: **µg/Kg** Prep Date: **1/8/2008** RunNo: **89647**
Client ID: **LCSS** Batch ID: **42649** TestNo: **EPA 8081A** **EPA 3550B** Analysis Date: **1/9/2008** SeqNo: **1369343**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Dieldrin	13.831	2.0	16.67	0	83.0	57	105				
Endrin	14.838	2.0	16.67	0	89.0	52	139				
gamma-BHC	13.277	1.0	16.67	0	79.6	58	111				
Heptachlor	13.999	1.0	16.67	0	84.0	59	114				
Surr: Tetrachloro-m-xylene	12.827		16.67		76.9	34	106				
Surr: Decachlorobiphenyl	13.330		16.67		80.0	31	132				

Sample ID: **MB-42649MS** SampType: **MS** TestCode: **8081_S** Units: **µg/Kg** Prep Date: **1/8/2008** RunNo: **89647**
Client ID: **ZZZZZZ** Batch ID: **42649** TestNo: **EPA 8081A** **EPA 3550B** Analysis Date: **1/9/2008** SeqNo: **1369344**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
4,4´-DDT	13.487	2.0	16.67	0	80.9	33	122				
Aldrin	12.826	1.0	16.67	0	76.9	36	118				
Dieldrin	13.880	2.0	16.67	0	83.3	35	116				
Endrin	15.092	2.0	16.67	0	90.5	39	140				
gamma-BHC	13.190	1.0	16.67	0	79.1	34	117				
Heptachlor	13.998	1.0	16.67	0	84.0	37	121				
Surr: Tetrachloro-m-xylene	12.643		16.67		75.8	34	106				
Surr: Decachlorobiphenyl	13.430		16.67		80.6	31	132				

Sample ID: **MB-42649MSD** SampType: **MSD** TestCode: **8081_S** Units: **µg/Kg** Prep Date: **1/8/2008** RunNo: **89647**
Client ID: **ZZZZZZ** Batch ID: **42649** TestNo: **EPA 8081A** **EPA 3550B** Analysis Date: **1/9/2008** SeqNo: **1369345**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
4,4´-DDT	13.650	2.0	16.67	0	81.9	33	122	13.49	1.20	20	
Aldrin	12.981	1.0	16.67	0	77.9	36	118	12.83	1.20	20	
Dieldrin	13.983	2.0	16.67	0	83.9	35	116	13.88	0.735	20	
Endrin	15.073	2.0	16.67	0	90.4	39	140	15.09	0.124	20	
gamma-BHC	13.324	1.0	16.67	0	79.9	34	117	13.19	1.01	20	
Heptachlor	14.201	1.0	16.67	0	85.2	37	121	14.00	1.44	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 096287
Project: SANTA TERESA STOCKPILE, E8440-06-01

ANALYTICAL QC SUMMARY REPORT

TestCode: 8081_S

Sample ID: **MB-42649MSD** SampType: **MSD** TestCode: **8081_S** Units: **µg/Kg** Prep Date: **1/8/2008** RunNo: **89647**
Client ID: **ZZZZZZ** Batch ID: **42649** TestNo: **EPA 8081A** **EPA 3550B** Analysis Date: **1/9/2008** SeqNo: **1369345**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Surr: Tetrachloro-m-xylene	12.722		16.67		76.3	34	106		0	20	
Surr: Decachlorobiphenyl	13.436		16.67		80.6	31	132		0	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 096287
Project: SANTA TERESA STOCKPILE, E8440-06-01

ANALYTICAL QC SUMMARY REPORT

TestCode: 8082_S

Sample ID: **MB-42649** SampType: **MBLK** TestCode: **8082_S** Units: **µg/Kg** Prep Date: **1/8/2008** RunNo: **89630**
Client ID: **PBS** Batch ID: **42649** TestNo: **EPA 8082** **EPA 3550B** Analysis Date: **1/9/2008** SeqNo: **1369112**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aroclor 1016	ND	16									
Aroclor 1221	ND	33									
Aroclor 1232	ND	16									
Aroclor 1242	ND	16									
Aroclor 1248	ND	16									
Aroclor 1254	ND	16									
Aroclor 1260	ND	16									
Aroclor 1262	ND	16									
Aroclor 1268	ND	16									
Surr: Decachlorobiphenyl	14.582		16.67		87.5	41	127				
Surr: Tetrachloro-m-xylene	14.895		16.67		89.4	54	127				

Sample ID: **LCSA-42649** SampType: **LCS** TestCode: **8082_S** Units: **µg/Kg** Prep Date: **1/8/2008** RunNo: **89630**
Client ID: **LCSS** Batch ID: **42649** TestNo: **EPA 8082** **EPA 3550B** Analysis Date: **1/9/2008** SeqNo: **1369113**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aroclor 1016	141.845	16	166.7	0	85.1	53	111				
Aroclor 1260	151.533	16	166.7	0	90.9	53	114				
Surr: Decachlorobiphenyl	15.873		16.67		95.2	41	127				
Surr: Tetrachloro-m-xylene	15.697		16.67		94.2	54	127				

Sample ID: **MB-42649MSA** SampType: **MS** TestCode: **8082_S** Units: **µg/Kg** Prep Date: **1/8/2008** RunNo: **89630**
Client ID: **ZZZZZZ** Batch ID: **42649** TestNo: **EPA 8082** **EPA 3550B** Analysis Date: **1/9/2008** SeqNo: **1369114**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aroclor 1016	134.890	16	166.7	0	80.9	43	116				
Aroclor 1260	142.512	16	166.7	0	85.5	40	126				
Surr: Decachlorobiphenyl	15.773		16.67		94.6	41	127				
Surr: Tetrachloro-m-xylene	16.148		16.67		96.9	54	127				

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 096287
Project: SANTA TERESA STOCKPILE, E8440-06-01

ANALYTICAL QC SUMMARY REPORT

TestCode: 8082_S

Sample ID:	**MB-42649MSDA**	SampType:	**MSD**	TestCode:	**8082_S**	Units:	**µg/Kg**	Prep Date:	**1/8/2008**	RunNo:	**89630**						
Client ID:	**ZZZZZZ**	Batch ID:	**42649**	TestNo:	**EPA 8082**		**EPA 3550B**	Analysis Date:	**1/9/2008**	SeqNo:	**1369115**						
Analyte			Result	PQL	SPK value	SPK Ref Val		%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual			
Aroclor 1016			134.052	16	166.7	0		80.4	43	116	134.9	0.623	20				
Aroclor 1260			141.863	16	166.7	0		85.1	40	126	142.5	0.456	20				
Surr: Decachlorobiphenyl			15.665		16.67			94.0	41	127		0	0				
Surr: Tetrachloro-m-xylene			16.008		16.67			96.0	54	127		0	0				

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 096287
Project: SANTA TERESA STOCKPILE, E8440-06-01

ANALYTICAL QC SUMMARY REPORT

TestCode: 8260_S

Sample ID: **K080110LCS2** SampType: **LCS** TestCode: **8260_S** Units: **µg/Kg** Prep Date: RunNo: **89716**
Client ID: **LCSS** Batch ID: **K08VS010** TestNo: **EPA 8260B** Analysis Date: **1/10/2008** SeqNo: **1370370**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
1,1-Dichloroethene	46.760	5.0	50.00	0	93.5	70	130				
Benzene	51.400	5.0	50.00	0	103	70	130				
Chlorobenzene	48.180	5.0	50.00	0	96.4	70	130				
MTBE	43.070	5.0	50.00	0	86.1	70	130				
Toluene	49.670	5.0	50.00	0	99.3	70	130				
Trichloroethene	49.340	5.0	50.00	0	98.7	70	130				
Surr: 1,2-Dichloroethane-d4	39.460		50.00		78.9	70	130				
Surr: 4-Bromofluorobenzene	44.560		50.00		89.1	70	130				
Surr: Dibromofluoromethane	42.670		50.00		85.3	70	130				
Surr: Toluene-d8	48.440		50.00		96.9	70	130				

Sample ID: **K080110MB4** SampType: **MBLK** TestCode: **8260_S** Units: **µg/Kg** Prep Date: RunNo: **89716**
Client ID: **PBS** Batch ID: **K08VS010** TestNo: **EPA 8260B** Analysis Date: **1/10/2008** SeqNo: **1370372**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
1,1,1,2-Tetrachloroethane	ND	5.0									
1,1,1-Trichloroethane	ND	5.0									
1,1,2,2-Tetrachloroethane	ND	5.0									
1,1,2-Trichloroethane	ND	5.0									
1,1-Dichloroethane	ND	5.0									
1,1-Dichloroethene	ND	5.0									
1,1-Dichloropropene	ND	5.0									
1,2,3-Trichlorobenzene	ND	5.0									
1,2,3-Trichloropropane	ND	5.0									
1,2,4-Trichlorobenzene	ND	5.0									
1,2,4-Trimethylbenzene	ND	5.0									
1,2-Dibromo-3-chloropropane	ND	10									
1,2-Dibromoethane	ND	5.0									
1,2-Dichlorobenzene	ND	5.0									
1,2-Dichloroethane	ND	5.0									

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 096287
Project: SANTA TERESA STOCKPILE, E8440-06-01

ANALYTICAL QC SUMMARY REPORT

TestCode: 8260_S

Sample ID: **K080110MB4** SampType: **MBLK** TestCode: **8260_S** Units: **µg/Kg** Prep Date: RunNo: **89716**
Client ID: **PBS** Batch ID: **K08VS010** TestNo: **EPA 8260B** Analysis Date: **1/10/2008** SeqNo: **1370372**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
1,2-Dichloropropane	ND	5.0									
1,3,5-Trimethylbenzene	ND	5.0									
1,3-Dichlorobenzene	ND	5.0									
1,3-Dichloropropane	ND	5.0									
1,4-Dichlorobenzene	ND	5.0									
2,2-Dichloropropane	ND	5.0									
2-Chlorotoluene	ND	5.0									
4-Chlorotoluene	ND	5.0									
4-Isopropyltoluene	ND	5.0									
Benzene	ND	5.0									
Bromobenzene	ND	5.0									
Bromodichloromethane	ND	5.0									
Bromoform	ND	5.0									
Bromomethane	ND	5.0									
Carbon tetrachloride	ND	5.0									
Chlorobenzene	ND	5.0									
Chloroethane	ND	5.0									
Chloroform	ND	5.0									
Chloromethane	ND	5.0									
cis-1,2-Dichloroethene	ND	5.0									
cis-1,3-Dichloropropene	ND	5.0									
Dibromochloromethane	ND	5.0									
Dibromomethane	ND	5.0									
Dichlorodifluoromethane	ND	5.0									
Ethylbenzene	ND	5.0									
Hexachlorobutadiene	ND	5.0									
Isopropylbenzene	ND	5.0									
m,p-Xylene	ND	10									
Methylene chloride	ND	5.0									
n-Butylbenzene	ND	5.0									

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 096287
Project: SANTA TERESA STOCKPILE, E8440-06-01

ANALYTICAL QC SUMMARY REPORT

TestCode: 8260_S

Sample ID: **K080110MB4** SampType: **MBLK** TestCode: **8260_S** Units: **µg/Kg** Prep Date: RunNo: **89716**
Client ID: **PBS** Batch ID: **K08VS010** TestNo: **EPA 8260B** Analysis Date: **1/10/2008** SeqNo: **1370372**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
n-Propylbenzene	ND	5.0									
Naphthalene	ND	5.0									
o-Xylene	ND	5.0									
sec-Butylbenzene	ND	5.0									
Styrene	ND	5.0									
tert-Butylbenzene	ND	5.0									
Tetrachloroethene	ND	5.0									
Toluene	ND	5.0									
trans-1,2-Dichloroethene	ND	5.0									
Trichloroethene	ND	5.0									
Trichlorofluoromethane	ND	5.0									
Vinyl chloride	ND	5.0									
Surr: 1,2-Dichloroethane-d4	42.770		50.00		85.5	70	130				
Surr: 4-Bromofluorobenzene	44.750		50.00		89.5	70	130				
Surr: Dibromofluoromethane	45.710		50.00		91.4	70	130				
Surr: Toluene-d8	48.640		50.00		97.3	70	130				

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 096287
Project: SANTA TERESA STOCKPILE, E8440-06-01

ANALYTICAL QC SUMMARY REPORT

TestCode: 8270_S_FULL

Sample ID: **LCS-42652** SampType: **LCS** TestCode: **8270_S_FUL** Units: **µg/Kg** Prep Date: **1/8/2008** RunNo: **89746**
Client ID: **LCSS** Batch ID: **42652** TestNo: **EPA 8270C** **EPA 3550B** Analysis Date: **1/8/2008** SeqNo: **1371236**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
1,2,4-Trichlorobenzene	2695.333	330	3330	0	80.9	60	98				
1,4-Dichlorobenzene	2408.667	330	3330	0	72.3	58	91				
2,4-Dinitrotoluene	3310.333	330	3330	0	99.4	69	123				
2-Chlorophenol	2766.667	330	3330	0	83.1	58	97				
4-Chloro-3-methylphenol	3309.333	660	3330	0	99.4	69	123				
4-Nitrophenol	3576.000	1600	3330	0	107	61	128				
Acenaphthene	2742.333	330	3330	0	82.4	66	104				
N-Nitrosodi-n-propylamine	2971.333	330	3330	0	89.2	56	120				
Pentachlorophenol	3758.333	1600	3330	0	113	77	127				
Phenol	2971.000	330	3330	0	89.2	61	108				
Pyrene	2539.667	330	3330	0	76.3	57	119				
Surr: 1,2-Dichlorobenzene-d4	2506.333		3330		75.3	40	97				
Surr: 2,4,6-Tribromophenol	3664.667		3330		110	31	148				
Surr: 2-Chlorophenol-d4	2726.333		3330		81.9	49	103				
Surr: 2-Fluorobiphenyl	2751.667		3330		82.6	55	102				
Surr: 2-Fluorophenol	2716.667		3330		81.6	45	105				
Surr: 4-Terphenyl-d14	3067.667		3330		92.1	52	124				
Surr: Nitrobenzene-d5	2888.333		3330		86.7	48	109				
Surr: Phenol-d5	2758.333		3330		82.8	47	108				

Sample ID: **MB-42652** SampType: **MBLK** TestCode: **8270_S_FUL** Units: **µg/Kg** Prep Date: **1/8/2008** RunNo: **89746**
Client ID: **PBS** Batch ID: **42652** TestNo: **EPA 8270C** **EPA 3550B** Analysis Date: **1/8/2008** SeqNo: **1371237**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
1,2,4-Trichlorobenzene	ND	330									
1,2-Dichlorobenzene	ND	330									
1,3-Dichlorobenzene	ND	330									
1,4-Dichlorobenzene	ND	330									
2,4,5-Trichlorophenol	ND	330									
2,4,6-Trichlorophenol	ND	330									

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 096287
Project: SANTA TERESA STOCKPILE, E8440-06-01

ANALYTICAL QC SUMMARY REPORT

TestCode: 8270_S_FULL

Sample ID:	**MB-42652**	SampType:	**MBLK**	TestCode:	**8270_S_FUL**	Units:	**µg/Kg**	Prep Date:	**1/8/2008**	RunNo:	**89746**		
Client ID:	**PBS**	Batch ID:	**42652**	TestNo:	**EPA 8270C**		**EPA 3550B**	Analysis Date:	**1/8/2008**	SeqNo:	**1371237**		

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
2,4-Dichlorophenol	ND	1600									
2,4-Dimethylphenol	ND	330									
2,4-Dinitrophenol	ND	1600									
2,4-Dinitrotoluene	ND	330									
2,6-Dinitrotoluene	ND	330									
2-Chloronaphthalene	ND	330									
2-Chlorophenol	ND	330									
2-Methylnaphthalene	ND	330									
2-Methylphenol	ND	330									
2-Nitroaniline	ND	1600									
2-Nitrophenol	ND	330									
3,3´-Dichlorobenzidine	ND	660									
3-Nitroaniline	ND	1600									
4,6-Dinitro-2-methylphenol	ND	1600									
4-Bromophenyl-phenylether	ND	330									
4-Chloro-3-methylphenol	ND	660									
4-Chloroaniline	ND	660									
4-Chlorophenyl-phenylether	ND	330									
4-Methylphenol	ND	330									
4-Nitroaniline	ND	1600									
4-Nitrophenol	ND	1600									
Acenaphthene	ND	330									
Acenaphthylene	ND	330									
Anthracene	ND	330									
Benzidine (M)	ND	1600									
Benzo(a)anthracene	ND	330									
Benzo(a)pyrene	ND	330									
Benzo(b)fluoranthene	ND	330									
Benzo(g,h,i)perylene	ND	330									
Benzo(k)fluoranthene	ND	330									

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 096287
Project: SANTA TERESA STOCKPILE, E8440-06-01

ANALYTICAL QC SUMMARY REPORT

TestCode: 8270_S_FULL

Sample ID:	**MB-42652**	SampType:	**MBLK**	TestCode:	**8270_S_FUL**	Units:	**µg/Kg**	Prep Date:	**1/8/2008**	RunNo:	**89746**		
Client ID:	**PBS**	Batch ID:	**42652**	TestNo:	**EPA 8270C**		**EPA 3550B**	Analysis Date:	**1/8/2008**	SeqNo:	**1371237**		

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Benzoic acid	ND	1600									
Benzyl alcohol	ND	660									
Bis(2-chloroethoxy)methane	ND	330									
Bis(2-chloroethyl)ether	ND	330									
Bis(2-chloroisopropyl)ether	ND	330									
Bis(2-ethylhexyl)phthalate	ND	330									
Butylbenzylphthalate	ND	330									
Chrysene	ND	330									
Di-n-butylphthalate	ND	330									
Di-n-octylphthalate	ND	330									
Dibenz(a,h)anthracene	ND	330									
Dibenzofuran	ND	330									
Diethylphthalate	ND	330									
Dimethylphthalate	ND	330									
Fluoranthene	ND	330									
Fluorene	ND	330									
Hexachlorobenzene	ND	330									
Hexachlorobutadiene	ND	660									
Hexachlorocyclopentadiene	ND	660									
Hexachloroethane	ND	330									
Indeno(1,2,3-cd)pyrene	ND	330									
Isophorone	ND	330									
N-Nitrosodi-n-propylamine	ND	330									
N-Nitrosodiphenylamine	ND	330									
Naphthalene	ND	330									
Nitrobenzene	ND	330									
Pentachlorophenol	ND	1600									
Phenanthrene	ND	330									
Phenol	ND	330									
Pyrene	ND	330									

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 096287
Project: SANTA TERESA STOCKPILE, E8440-06-01

ANALYTICAL QC SUMMARY REPORT

TestCode: 8270_S_FULL

Sample ID: **MB-42652** SampType: **MBLK** TestCode: **8270_S_FUL** Units: **µg/Kg** Prep Date: **1/8/2008** RunNo: **89746**
Client ID: **PBS** Batch ID: **42652** TestNo: **EPA 8270C** **EPA 3550B** Analysis Date: **1/8/2008** SeqNo: **1371237**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Surr: 1,2-Dichlorobenzene-d4	2483.333		3330		74.6	40	97				
Surr: 2,4,6-Tribromophenol	3170.333		3330		95.2	31	148				
Surr: 2-Chlorophenol-d4	2706.667		3330		81.3	49	103				
Surr: 2-Fluorobiphenyl	2608.333		3330		78.3	55	102				
Surr: 2-Fluorophenol	2695.667		3330		81.0	45	105				
Surr: 4-Terphenyl-d14	2857.333		3330		85.8	52	124				
Surr: Nitrobenzene-d5	2785.333		3330		83.6	48	109				
Surr: Phenol-d5	2762.333		3330		83.0	47	108				

Sample ID: **096272-015AMS** SampType: **MS** TestCode: **8270_S_FUL** Units: **µg/Kg** Prep Date: **1/8/2008** RunNo: **89746**
Client ID: **ZZZZZZ** Batch ID: **42652** TestNo: **EPA 8270C** **EPA 3550B** Analysis Date: **1/8/2008** SeqNo: **1371239**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
1,2,4-Trichlorobenzene	2813.333	3300	3330	0	84.5	50	102				
1,4-Dichlorobenzene	2363.333	3300	3330	0	71.0	46	94				
2,4-Dinitrotoluene	2176.667	3300	3330	0	65.4	63	125				
2-Chlorophenol	2643.333	3300	3330	0	79.4	49	101				
4-Chloro-3-methylphenol	2993.333	6600	3330	0	89.9	60	128				
4-Nitrophenol	1736.667	16000	3330	0	52.2	48	135				
Acenaphthene	3026.667	3300	3330	0	90.9	57	109				
N-Nitrosodi-n-propylamine	2596.667	3300	3330	0	78.0	48	123				
Pentachlorophenol	1950.000	16000	3330	0	58.6	62	135				S
Phenol	2796.667	3300	3330	0	84.0	50	113				
Pyrene	3333.333	3300	3330	0	100	52	126				
Surr: 1,2-Dichlorobenzene-d4	2403.333		3330		72.2	40	97				
Surr: 2,4,6-Tribromophenol	2916.667		3330		87.6	31	148				
Surr: 2-Chlorophenol-d4	2550.000		3330		76.6	49	103				
Surr: 2-Fluorobiphenyl	2936.667		3330		88.2	55	102				
Surr: 2-Fluorophenol	2470.000		3330		74.2	45	105				
Surr: 4-Terphenyl-d14	3366.667		3330		101	52	124				

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 096287
Project: SANTA TERESA STOCKPILE, E8440-06-01

ANALYTICAL QC SUMMARY REPORT

TestCode: 8270_S_FULL

Sample ID: **096272-015AMS** SampType: **MS** TestCode: **8270_S_FUL** Units: **µg/Kg** Prep Date: **1/8/2008** RunNo: **89746**
Client ID: **ZZZZZZ** Batch ID: **42652** TestNo: **EPA 8270C** **EPA 3550B** Analysis Date: **1/8/2008** SeqNo: **1371239**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Surr: Nitrobenzene-d5	2246.667		3330		67.5	48	109				
Surr: Phenol-d5	2566.667		3330		77.1	47	108				

Sample ID: **096272-015AMSD** SampType: **MSD** TestCode: **8270_S_FUL** Units: **µg/Kg** Prep Date: **1/8/2008** RunNo: **89746**
Client ID: **ZZZZZZ** Batch ID: **42652** TestNo: **EPA 8270C** **EPA 3550B** Analysis Date: **1/8/2008** SeqNo: **1371240**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
1,2,4-Trichlorobenzene	2876.667	3300	3330	0	86.4	50	102	2813	0	20	
1,4-Dichlorobenzene	2513.333	3300	3330	0	75.5	46	94	2363	0	20	
2,4-Dinitrotoluene	2400.000	3300	3330	0	72.1	63	125	2177	0	20	
2-Chlorophenol	2810.000	3300	3330	0	84.4	49	101	2643	0	20	
4-Chloro-3-methylphenol	3010.000	6600	3330	0	90.4	60	128	2993	0	20	
4-Nitrophenol	1833.333	16000	3330	0	55.1	48	135	1737	0	20	
Acenaphthene	3110.000	3300	3330	0	93.4	57	109	3027	0	20	
N-Nitrosodi-n-propylamine	2766.667	3300	3330	0	83.1	48	123	2597	0	20	
Pentachlorophenol	1993.333	16000	3330	0	59.9	62	135	1950	0	20	S
Phenol	2883.333	3300	3330	0	86.6	50	113	2797	0	20	
Pyrene	3456.667	3300	3330	0	104	52	126	3333	3.63	20	
Surr: 1,2-Dichlorobenzene-d4	2560.000		3330		76.9	40	97		0	20	
Surr: 2,4,6-Tribromophenol	3076.667		3330		92.4	31	148		0	20	
Surr: 2-Chlorophenol-d4	2716.667		3330		81.6	49	103		0	20	
Surr: 2-Fluorobiphenyl	3053.333		3330		91.7	55	102		0	20	
Surr: 2-Fluorophenol	2553.333		3330		76.7	45	105		0	20	
Surr: 4-Terphenyl-d14	3376.667		3330		101	52	124		0	20	
Surr: Nitrobenzene-d5	2400.000		3330		72.1	48	109		0	20	
Surr: Phenol-d5	2736.667		3330		82.2	47	108		0	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CHAIN OF CUSTODY RECORD

Advanced Technology Laboratories
3275 Walnut Avenue
Signal Hill, CA 90755
(562) 989-4045 • Fax (562) 989-4040

FOR LABORATORY USE ONLY:

P.O.#:

Logged By: Date: 1/7/08

Method of Transport: Client ☐ ATL ☐ CA OverN ☑ FEDEX ☐ Other: GSO

Sample Condition Upon Receipt:
1. CHILLED 13-8 Y☐ N☐ 4. SEALED Y☐ N☐
2. HEADSPACE (VOA) Y☐ N☐ 5. # OF SPLS MATCH COC Y☐ N☐
3. CONTAINER INTACT Y☐ N☐ 6. PRESERVED Y☐ N☐

Client: GEOCON
Attn: RICK DAY / CHRIS MERRITT
Address: 6671 BRISA ST
City: LIVERMORE State: CA Zip Code: 94550
TEL: (925) 371-5900
FAX: ( ) 5915

Project Name: SANTA TERESA STOCKPILE Project #: ES4140-06-01 Sampler: (Printed Name) CHRIS MERRITT (Signature)

Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
CHRIS MERRITT	1-3-08	1630	[illegible]	1/7/08	745

I hereby authorize ATL to perform the work indicated below:
Project Mgr /Submitter: CM 1-3-08
Print Name Date
CM
Signature

Send Report To: Attn: N/A Co: Address City State Zip

Bill To: Attn: N/A Co: Address City State Zip

Special Instructions/Comments:

Sample/Records - Archival & Disposal
Unless otherwise requested by client, all samples will be disposed 45 days after receipt and records will be disposed 1 year after submittal of final report.

Storage Fees (applies when storage is requested):
- Sample : $2.00 / sample / mo (after 45 days)
- Records : $1.00 / ATL workorder / mo (after 1 year)

Circle or Add Analysis(es) Requested

ITEM	LAB USE ONLY: Batch #: / Lab No.	Sample Description: Sample I.D. / Location	Date	Time	8081A (Pesticides)	8082 (PCB)	8260B (Volatiles)	8270C (BNA)	6010B (Total Metal)	8015B (GRO) / 8020 (BTEX)	8015B (DRO)	8021 (BTEX)	TITLE 22 / CAM 17 (6010 / 7000)	SOIL	WATER	GROUND WATER	WASTEWATER	TAT	Container(s) #	Container(s) Type	PRESERVATION	REMARKS
	696287-001	STS-1	1-3-08		X	X	X	X	X	X	X	X	X	X				E				
	2	STS-2																				
	3	STS-3	STS-1TO4 (COMPOSITE)																			
	4	STS-4																				

Q A / Q C: RTNE ☑ CT ☐ SWRCB ☐ Logcode ____ OTHER ____

• TAT starts 8 a.m. following day if samples received after 3 p.m.

TAT: A= Overnight ≤ 24 hr B= Emergency Next workday C= Critical 2 Workdays D= Urgent 3 Workdays E= Routine 7 Workdays

Container Types: T=Tube V=VOA L=Liter P=Pint J=Jar B=Tedlar G=Glass P=Plastic M=Metal

Preservatives: H=HCl N=HNO_3 S=H_2SO_4 C=4°C Z=$Zn(AC)_2$ O=NaOH T=$Na_2S_2O_3$

DISTRIBUTION: **White** with report, **Yellow** to folder, **Pink** to submitter.

March 10, 2008

ELAP No.: 1838
NELAP No.: 02107CA
NEVADA.: CA-401
Arizona: AZ0689
CSDLAC No.: 10196
Workorder No.: 096287

Rick Day\Chris Merritt
Geocon Consultants, Inc.
6671 Brisa Street
Livermore, CA 94550
TEL: (925) 371-5900
FAX: (925) 371-5915

RE: SANTA TERESA STOCKPILE, E8440-06-01

Attention: Rick Day\Chris Merritt

Enclosed are the results for sample(s) received on January 07, 2008 by Advanced Technology Laboratories . The sample(s) are tested for the parameters as indicated in the enclosed chain of custody in accordance with the applicable laboratory certifications.

This is an addendum report. Please incorporate with documentation previously submitted.

Thank you for the opportunity to service the needs of your company.

Please feel free to call me at (562)989-4045 if I can be of further assistance to your company.

Sincerely,

Eddie F. Rodriguez
Laboratory Director

The cover letter is an integral part of this analytical report. This Laboratory Report cannot be reproduced in part or in its entirety without written permission from the client and Advanced Technology Laboratories.

Advanced Technology Laboratories
3275 Walnut Avenue Signal Hill, CA 90755 Tel: 562 989-4045 Fax: 562 989-4040

CLIENT: Geocon Consultants, Inc.
Project: SANTA TERESA STOCKPILE, E8440-06-01
Lab Order: 096287

CASE NARRATIVE

Results were J-Flag. "J" is used to flag those results that are between the PQL (Practical Quantitation Limit) and the calculated MDL (Method Detection Limit). Results that are "J" Flagged are estimated values since it becomes difficult to accurately quantitate the analyte near the MDL.

Analytical Comments for Method 6010

Dilution was necessary for sample 096287-005A, due to sample matrix

Advanced Technology Laboratories

ANALYTICAL RESULTS

Print Date: *10-Mar-08*

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	COMPOSITE STS - 1 to 4
Lab Order:	096287	**Collection Date:**	1/3/2008
Project:	SANTA TERESA STOCKPILE, E8440-06-01	**Matrix:**	SOIL
Lab ID:	096287-005A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
ICP METALS BY STLC							
			WET/ EPA 6010B				
RunID: **ICP8_080308A**	QC Batch: **R92125**				PrepDate:		Analyst: **CL**
Chromium	0.42	0.018	1.0	J	mg/L	20	3/10/2008 09:19 AM
Nickel	3.2	0.014	1.0		mg/L	20	3/10/2008 09:19 AM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
	ND	Not Detected at the Reporting Limit	S	Spike/Surrogate outside of limits due to matrix interference
		Results are wet unless otherwise specified	DO	Surrogate Diluted Out

Advanced Technology Laboratories

Date: *10-Mar-08*

CLIENT: Geocon Consultants, Inc.
Work Order: 096287
Project: SANTA TERESA STOCKPILE, E8440-06-01

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_ST

Sample ID: **MB-44142** SampType: **MBLK** TestCode: **6010_ST** Units: **mg/L** Prep Date: RunNo: **92125**
Client ID: **PBS** Batch ID: **R92125** TestNo: **WET/ EPA 60** Analysis Date: **3/10/2008** SeqNo: **1414019**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium	ND	0.050									
Nickel	ND	0.050									

Sample ID: **LCS-44142** SampType: **LCS** TestCode: **6010_ST** Units: **mg/L** Prep Date: RunNo: **92125**
Client ID: **LCSS** Batch ID: **R92125** TestNo: **WET/ EPA 60** Analysis Date: **3/10/2008** SeqNo: **1414020**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium	0.946	0.050	1.000	0	94.6	85	115				
Nickel	0.934	0.050	1.000	0	93.4	85	115				

Sample ID: **097398-001AMS** SampType: **MS** TestCode: **6010_ST** Units: **mg/L** Prep Date: RunNo: **92125**
Client ID: **ZZZZZZ** Batch ID: **R92125** TestNo: **WET/ EPA 60** Analysis Date: **3/10/2008** SeqNo: **1414024**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium	2.435	1.0	2.500	0.1172	92.7	83	115				
Nickel	2.473	1.0	2.500	0.1454	93.1	86	113				

Sample ID: **097398-001AMSD** SampType: **MSD** TestCode: **6010_ST** Units: **mg/L** Prep Date: RunNo: **92125**
Client ID: **ZZZZZZ** Batch ID: **R92125** TestNo: **WET/ EPA 60** Analysis Date: **3/10/2008** SeqNo: **1414025**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium	2.476	1.0	2.500	0.1172	94.4	83	115	2.435	1.69	20	
Nickel	2.517	1.0	2.500	0.1454	94.9	86	113	2.473	1.74	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits
S	Spike/Surrogate outside of limits due to matrix interference	DO	Surrogate Diluted Out		Calculations are based on raw values

Diane Galvan

From: Rick Day [day@geoconinc.com]
Sent: Friday, March 07, 2008 1:06 PM
To: Diane Galvan
Subject: 96287 WET request

Diane –

096287-005
Composite STS 1 to 4
WET Chromium and WET Nickel

Results on Monday, March 10, if possible.

Thanks,
Rick.

Richard Day, PG, CEG, CHG
Vice President
Geocon Consultants, Inc.
6671 Brisa Street
Livermore, CA 94550
925.371.5900, ext. 201 Tel
925.371.5915 Fax
925.872.5860 Cell

GEOTECHNICAL ENVIRONMENTAL MATERIALS

San Diego Murrieta Burbank San Bernardino Bakersfield Sacramento Livermore Carson City Las Vegas Portla

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EMSL Analytical, Inc
2235 Polvorosa Ave , Suite 230, San Leandro, CA 94577
Phone: (510) 895-3675 Fax: 5108953680 Email: milpitaslab@emsl.com

Attn: **Chris Merritt & Rick Day**
Geocon Consultants
2356 Research Drive
Livermore, CA 94550

Fax: (925) 371-5915 Phone: (925) 371-5900
Project: **E8215-06-15 / RT 87 South NOA, Santa Teresa, Stockpile**

Customer ID: GECN21
Customer PO: E8215-06-15
Received: 08/30/06 1:40 PM
EMSL Order: 090604449

EMSL Proj:
Analysis Date: 9/7/2006
Report Date: 9/7/2006

PLM Analysis of Bulk Samples for Asbestos via EPA 600/R-93/116 Method with CARB 435 Prep (Milling) Level A for 0.25% Target Analytical Sensitivity

			Non-Asbestos		Asbestos
Sample	**Location**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
1-43 *090604449-0001*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
1-44 *090604449-0002*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
1-45 *090604449-0003*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
3-12 *090604449-0004*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**None Detected**
3-13 *090604449-0005*		Brown Non-Fibrous Homogeneous		98.75% Non-fibrous (other)	**1.25% Chrysotile**
3-18 *090604449-0006*		Brown Non-Fibrous Homogeneous		99.50% Non-fibrous (other)	**0.50% Chrysotile**
3-27 *090604449-0007*		Brown Non-Fibrous Homogeneous		99.75% Non-fibrous (other)	**0.25% Chrysotile**
3-29 *090604449-0008*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
3-32 *090604449-0009*		Brown Non-Fibrous Homogeneous		99.75% Non-fibrous (other)	**0.25% Chrysotile**

Analyst(s)

Jeremy Malson (70)
Jason McGriff (75)

or other approved signatory

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Geocon Consultants
2356 Research Drive
Livermore, CA 94550

Fax: (925) 371-5915 Phone: (925) 371-5900
Project: **E8215-06-15 / RT 87 South NOA, Santa Teresa, Stockpile**

Customer ID: GECN21
Customer PO: E8215-06-15
Received: 08/30/06 1:40 PM
EMSL Order: 090604449

EMSL Proj:
Analysis Date: 9/7/2006
Report Date: 9/7/2006

PLM Analysis of Bulk Samples for Asbestos via EPA 600/R-93/116 Method with CARB 435 Prep (Milling) Level A for 0.25% Target Analytical Sensitivity

			Non-Asbestos		Asbestos
Sample	**Location**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
3-33 *090604449-0009A*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
3-36 *090604449-0010*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
3-39 *090604449-0011*		Brown Non-Fibrous Homogeneous		99.25% Non-fibrous (other)	**0.75% Chrysotile**
4-15 *090604449-0012*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
4-20 *090604449-0013*		Brown Non-Fibrous Homogeneous		99.75% Non-fibrous (other)	**0.25% Chrysotile**
4-45 *090604449-0014*		Brown Non-Fibrous Homogeneous		99.50% Non-fibrous (other)	**0.50% Chrysotile**
4-26 *090604449-0015*		Brown Non-Fibrous Homogeneous		99.00% Non-fibrous (other)	**1.00% Chrysotile**
1-25 *090604449-0016*		Brown Non-Fibrous Homogeneous		98.25% Non-fibrous (other)	**1.75% Chrysotile**
1-17 *090604449-0017*		Brown Non-Fibrous Homogeneous		99.25% Non-fibrous (other)	**0.75% Chrysotile**

Analyst(s)

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Project: **E8215-06-15 / RT 87 South NOA, Santa Teresa, Stockpile**

Customer ID: GECN21
Customer PO: E8215-06-15
Received: 08/30/06 1:40 PM
EMSL Order: 090604449

EMSL Proj:
Analysis Date: 9/7/2006
Report Date: 9/7/2006

PLM Analysis of Bulk Samples for Asbestos via EPA 600/R-93/116 Method with CARB 435 Prep (Milling) Level A for 0.25% Target Analytical Sensitivity

			Non-Asbestos		Asbestos
Sample	**Location**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
1-3 *090604449-0018*		Brown Non-Fibrous Homogeneous		99.50% Non-fibrous (other)	**0.50% Chrysotile**
1-7 *090604449-0019*		Brown Non-Fibrous Homogeneous		99.50% Non-fibrous (other)	**0.50% Chrysotile**
1-27 *090604449-0020*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
2-28 *090604449-0021*		Brown Non-Fibrous Homogeneous		99.50% Non-fibrous (other)	**0.50% Chrysotile**
1-23 *090604449-0022*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**None Detected**
4-12 *090604449-0023*		Brown Non-Fibrous Homogeneous		99.75% Non-fibrous (other)	**0.25% Chrysotile**
4-35 *090604449-0024*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
4-5 *090604449-0025*		Brown Non-Fibrous Homogeneous		99.25% Non-fibrous (other)	**0.75% Chrysotile**
4-14 *090604449-0026*		Brown Non-Fibrous Homogeneous		99.00% Non-fibrous (other)	**1.00% Chrysotile**

Analyst(s)

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Jason McGriff (75)

or other approved signatory

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Project: **E8215-06-15 / RT 87 South NOA, Santa Teresa, Stockpile**

Customer ID: GECN21
Customer PO: E8215-06-15
Received: 08/30/06 1:40 PM
EMSL Order: 090604449

EMSL Proj:
Analysis Date: 9/7/2006
Report Date: 9/7/2006

PLM Analysis of Bulk Samples for Asbestos via EPA 600/R-93/116 Method with CARB 435 Prep (Milling) Level A for 0.25% Target Analytical Sensitivity

			Non-Asbestos		Asbestos
Sample	**Location**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
4-32 *090604449-0027*		Brown Non-Fibrous Homogeneous		98.50% Non-fibrous (other)	**1.50% Chrysotile**
4-37 *090604449-0028*		Brown Non-Fibrous Homogeneous		99.00% Non-fibrous (other)	**1.00% Chrysotile**
4-44 *090604449-0029*		Brown Non-Fibrous Homogeneous		98.25% Non-fibrous (other)	**1.75% Chrysotile**
3-8 *090604449-0030*		Brown Non-Fibrous Homogeneous		99.25% Non-fibrous (other)	**0.75% Chrysotile**
4-16 *090604449-0031*		Brown Non-Fibrous Homogeneous		99.75% Non-fibrous (other)	**0.25% Chrysotile**
4-41 *090604449-0032*		Brown Non-Fibrous Homogeneous		99.75% Non-fibrous (other)	**0.25% Chrysotile**
4-21 *090604449-0033*		Brown Non-Fibrous Homogeneous		99.50% Non-fibrous (other)	**0.50% Chrysotile**
4-39 *090604449-0034*		Brown Non-Fibrous Homogeneous		99.50% Non-fibrous (other)	**0.50% Chrysotile**
2-16 *090604449-0035*		Brown Non-Fibrous Homogeneous		99.25% Non-fibrous (other)	**0.75% Chrysotile**

Analyst(s)

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Project: **E8215-06-15 / RT 87 South NOA, Santa Teresa, Stockpile**

Customer ID: GECN21
Customer PO: E8215-06-15
Received: 08/30/06 1:40 PM
EMSL Order: 090604449

EMSL Proj:
Analysis Date: 9/7/2006
Report Date: 9/7/2006

PLM Analysis of Bulk Samples for Asbestos via EPA 600/R-93/116 Method with CARB 435 Prep (Milling) Level A for 0.25% Target Analytical Sensitivity

			Non-Asbestos		Asbestos
Sample	**Location**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
2-15 *090604449-0036*		Brown Non-Fibrous Homogeneous		99.75% Non-fibrous (other)	**0.25% Chrysotile**
2-20 *090604449-0037*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
2-35 *090604449-0038*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
2-1 *090604449-0039*		Brown Non-Fibrous Homogeneous		99.00% Non-fibrous (other)	**1.00% Chrysotile**
4-18 *090604449-0040*		Brown Non-Fibrous Homogeneous		99.50% Non-fibrous (other)	**0.50% Chrysotile**
4-13 *090604449-0041*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
4-10 *090604449-0042*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
2-6 *090604449-0043*		Brown Non-Fibrous Homogeneous		99.50% Non-fibrous (other)	**0.50% Chrysotile**
1-9 *090604449-0044*		Brown Non-Fibrous Homogeneous		99.50% Non-fibrous (other)	**0.50% Chrysotile**

Analyst(s)

Jeremy Malson (70)
Jason McGriff (75)

or other approved signatory

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Attn: **Chris Merritt & Rick Day**
Geocon Consultants
2356 Research Drive
Livermore, CA 94550

Fax: (925) 371-5915 Phone: (925) 371-5900
Project: **E8215-06-15 / RT 87 South NOA, Santa Teresa, Stockpile**

Customer ID: GECN21
Customer PO: E8215-06-15
Received: 08/30/06 1:40 PM
EMSL Order: 090604449

EMSL Proj:
Analysis Date: 9/7/2006
Report Date: 9/7/2006

PLM Analysis of Bulk Samples for Asbestos via EPA 600/R-93/116 Method with CARB 435 Prep (Milling) Level A for 0.25% Target Analytical Sensitivity

			Non-Asbestos		Asbestos
Sample	**Location**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
1-33 *090604449-0045*		Brown Non-Fibrous Homogeneous		97.00% Non-fibrous (other)	**3.00% Chrysotile**
1-37 *090604449-0046*		Brown Non-Fibrous Homogeneous		99.75% Non-fibrous (other)	**0.25% Chrysotile**
1-8 *090604449-0047*		Brown Non-Fibrous Homogeneous		99.25% Non-fibrous (other)	**0.75% Chrysotile**
4-31 *090604449-0048*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
4-43 *090604449-0049*		Brown Non-Fibrous Homogeneous		99.75% Non-fibrous (other)	**0.25% Chrysotile**
4-48 *090604449-0050*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
3-9 *090604449-0051*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
3-14 *090604449-0052*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
3-16 *090604449-0053*		Brown Non-Fibrous Homogeneous		99.75% Non-fibrous (other)	**0.25% Chrysotile**

Analyst(s)
Jeremy Malson (70)
Jason McGriff (75)

or other approved signatory

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Project: **E8215-06-15 / RT 87 South NOA, Santa Teresa, Stockpile**

Customer ID: GECN21
Customer PO: E8215-06-15
Received: 08/30/06 1:40 PM
EMSL Order: 090604449

EMSL Proj:
Analysis Date: 9/7/2006
Report Date: 9/7/2006

PLM Analysis of Bulk Samples for Asbestos via EPA 600/R-93/116 Method with CARB 435 Prep (Milling) Level A for 0.25% Target Analytical Sensitivity

			Non-Asbestos		Asbestos
Sample	**Location**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
2-21 *090604449-0054*		Brown Non-Fibrous Homogeneous		99.75% Non-fibrous (other)	**0.25% Chrysotile**
2-4 *090604449-0055*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
2-17 *090604449-0056*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
2-31 *090604449-0057*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
2-24 *090604449-0058*		Brown Non-Fibrous Homogeneous		99.50% Non-fibrous (other)	**0.50% Chrysotile**
2-12 *090604449-0059*		Brown Non-Fibrous Homogeneous		99.75% Non-fibrous (other)	**0.25% Chrysotile**
2-3 *090604449-0060*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
2-39 *090604449-0061*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
1-28 *090604449-0062*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**None Detected**

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PLM Analysis of Bulk Samples for Asbestos via EPA 600/R-93/116 Method with CARB 435 Prep (Milling) Level A for 0.25% Target Analytical Sensitivity

			Non-Asbestos		Asbestos
Sample	**Location**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
2-22 *090604449-0063*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
2-11 *090604449-0064*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
1-22 *090604449-0065*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
2-19 *090604449-0066*		Brown Non-Fibrous Homogeneous		99.50% Non-fibrous (other)	**0.50% Chrysotile**
2-25 *090604449-0067*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
2-14 *090604449-0068*		Brown Non-Fibrous Homogeneous		99.00% Non-fibrous (other)	**1.00% Chrysotile**
2-9 *090604449-0069*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
2-10 *090604449-0070*		Brown Non-Fibrous Homogeneous		99.25% Non-fibrous (other)	**0.75% Chrysotile**
4-25 *090604449-0071*		Brown Non-Fibrous Homogeneous		99.50% Non-fibrous (other)	**0.50% Chrysotile**

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PLM Analysis of Bulk Samples for Asbestos via EPA 600/R-93/116 Method with CARB 435 Prep (Milling) Level A for 0.25% Target Analytical Sensitivity

			Non-Asbestos		Asbestos
Sample	**Location**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
4-24 *090604449-0072*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
2-5 *090604449-0073*		Brown Non-Fibrous Homogeneous		99.25% Non-fibrous (other)	**0.75% Chrysotile**
3-7 *090604449-0074*		Brown Non-Fibrous Homogeneous		99.25% Non-fibrous (other)	**0.75% Chrysotile**
4-9 *090604449-0075*		Brown Non-Fibrous Homogeneous		99.25% Non-fibrous (other)	**0.75% Chrysotile**
3-37 *090604449-0076*		Brown Non-Fibrous Homogeneous		99.50% Non-fibrous (other)	**0.50% Chrysotile**
4-8 *090604449-0077*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
3-11 *090604449-0078*		Brown Non-Fibrous Homogeneous		99.25% Non-fibrous (other)	**0.75% Chrysotile**
1-34 *090604449-0079*		Brown Non-Fibrous Homogeneous		99.75% Non-fibrous (other)	**0.25% Chrysotile**
4-6 *090604449-0080*		Brown Non-Fibrous Homogeneous		99.25% Non-fibrous (other)	**0.75% Chrysotile**

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PLM Analysis of Bulk Samples for Asbestos via EPA 600/R-93/116 Method with CARB 435 Prep (Milling) Level A for 0.25% Target Analytical Sensitivity

			Non-Asbestos		Asbestos
Sample	**Location**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
4-7 *090604449-0081*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
4-1 *090604449-0082*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
3-4 *090604449-0083*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
4-28 *090604449-0084*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
4-33 *090604449-0085*		Brown Non-Fibrous Homogeneous		99.25% Non-fibrous (other)	**0.75% Chrysotile**
4-34 *090604449-0086*		Brown Non-Fibrous Homogeneous		99.25% Non-fibrous (other)	**0.75% Chrysotile**
3-5 *090604449-0087*		Brown Non-Fibrous Homogeneous		98.50% Non-fibrous (other)	**1.50% Chrysotile**
3-2 *090604449-0088*		Brown Non-Fibrous Homogeneous		98.50% Non-fibrous (other)	**1.50% Chrysotile**
3-1 *090604449-0089*		Brown Non-Fibrous Homogeneous		99.00% Non-fibrous (other)	**1.00% Chrysotile**

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PLM Analysis of Bulk Samples for Asbestos via EPA 600/R-93/116 Method with CARB 435 Prep (Milling) Level A for 0.25% Target Analytical Sensitivity

			Non-Asbestos		Asbestos
Sample	**Location**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
4-36 *090604449-0090*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
3-19 *090604449-0091*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
3-20 *090604449-0092*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
3-21 *090604449-0093*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
3-30 *090604449-0094*		Brown Non-Fibrous Homogeneous		98.50% Non-fibrous (other)	**1.50% Chrysotile**
3-31 *090604449-0095*		Brown Non-Fibrous Homogeneous		98.75% Non-fibrous (other)	**1.25% Chrysotile**
2-33 *090604449-0096*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
2-32 *090604449-0097*		Brown Non-Fibrous Homogeneous		98.25% Non-fibrous (other)	**1.75% Chrysotile**
2-36 *090604449-0098*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**

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PLM Analysis of Bulk Samples for Asbestos via EPA 600/R-93/116 Method with CARB 435 Prep (Milling) Level A for 0.25% Target Analytical Sensitivity

			Non-Asbestos		Asbestos
Sample	**Location**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
2-29 *090604449-0099*		Brown Non-Fibrous Homogeneous		99.50% Non-fibrous (other)	**0.50% Chrysotile**
3-10 *090604449-0100*		Brown Non-Fibrous Homogeneous		99.50% Non-fibrous (other)	**0.50% Chrysotile**
3-35 *090604449-0101*		Brown Non-Fibrous Homogeneous		99.50% Non-fibrous (other)	**0.50% Chrysotile**
3-34 *090604449-0102*		Brown Non-Fibrous Homogeneous		98.75% Non-fibrous (other)	**1.25% Chrysotile**
3-15 *090604449-0103*		Brown Non-Fibrous Homogeneous		98.75% Non-fibrous (other)	**1.25% Chrysotile**
3-22 *090604449-0104*		Brown Non-Fibrous Homogeneous		99.75% Non-fibrous (other)	**0.25% Chrysotile**
3-28 *090604449-0105*		Brown Non-Fibrous Homogeneous		99.50% Non-fibrous (other)	**0.50% Chrysotile**
3-6 *090604449-0106*		Brown Non-Fibrous Homogeneous		98.50% Non-fibrous (other)	**1.50% Chrysotile**
3-3 *090604449-0107*		Brown Non-Fibrous Homogeneous		98.00% Non-fibrous (other)	**2.00% Chrysotile**

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PLM Analysis of Bulk Samples for Asbestos via EPA 600/R-93/116 Method with CARB 435 Prep (Milling) Level A for 0.25% Target Analytical Sensitivity

			Non-Asbestos		Asbestos
Sample	**Location**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
3-25 *090604449-0108*		Brown Non-Fibrous Homogeneous		99.25% Non-fibrous (other)	**0.75% Chrysotile**
3-26 *090604449-0109*		Brown Non-Fibrous Homogeneous		99.75% Non-fibrous (other)	**0.25% Chrysotile**
4-17 *090604449-0110*		Brown Non-Fibrous Homogeneous		99.25% Non-fibrous (other)	**0.75% Chrysotile**
4-22 *090604449-0111*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
2-8 *090604449-0112*		Brown Non-Fibrous Homogeneous		99.50% Non-fibrous (other)	**0.50% Chrysotile**
2-26 *090604449-0113*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
2-30 *090604449-0114*		Brown Non-Fibrous Heterogeneous		99.00% Non-fibrous (other)	**1.00% Chrysotile**
2-23 *090604449-0115*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
2-18 *090604449-0116*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**

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PLM Analysis of Bulk Samples for Asbestos via EPA 600/R-93/116 Method with CARB 435 Prep (Milling) Level A for 0.25% Target Analytical Sensitivity

			Non-Asbestos		Asbestos
Sample	**Location**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
2-27 *090604449-0117*		Brown Non-Fibrous Homogeneous		99.00% Non-fibrous (other)	**1.00% Chrysotile**
2-7 *090604449-0118*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
2-13 *090604449-0119*		Brown Non-Fibrous Homogeneous		99.25% Non-fibrous (other)	**0.75% Chrysotile**
2-2 *090604449-0120*		Brown Non-Fibrous Homogeneous		99.75% Non-fibrous (other)	**0.25% Chrysotile**
2-24 *090604449-0121*		Brown Non-Fibrous Homogeneous		99.25% Non-fibrous (other)	**0.75% Chrysotile**
1-24 *090604449-0122*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**None Detected**
1-31 *090604449-0123*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
1-30 *090604449-0124*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
1-2 *090604449-0125*		Brown Non-Fibrous Homogeneous		97.75% Non-fibrous (other)	**2.25% Chrysotile**

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PLM Analysis of Bulk Samples for Asbestos via EPA 600/R-93/116 Method with CARB 435 Prep (Milling) Level A for 0.25% Target Analytical Sensitivity

			Non-Asbestos		Asbestos
Sample	**Location**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
1-21 *090604449-0126*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
1-6 *090604449-0127*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
1-10 *090604449-0128*		Brown Non-Fibrous Homogeneous		98.50% Non-fibrous (other)	**1.50% Chrysotile**
1-35 *090604449-0129*		Brown Non-Fibrous Homogeneous		98.75% Non-fibrous (other)	**1.25% Chrysotile**
1-29 *090604449-0130*		Brown Non-Fibrous Homogeneous		99.50% Non-fibrous (other)	**0.50% Chrysotile**
1-1 *090604449-0131*		Brown Non-Fibrous Homogeneous		99.50% Non-fibrous (other)	**0.50% Chrysotile**
1-4 *090604449-0132*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
1-5 *090604449-0133*		Brown Non-Fibrous Homogeneous		99.25% Non-fibrous (other)	**0.75% Chrysotile**
1-11 *090604449-0134*		Brown Non-Fibrous Homogeneous		99.25% Non-fibrous (other)	**0.75% Chrysotile**

Analyst(s)

Jeremy Malson (70)
Jason McGriff (75)

or other approved signatory

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EMSL Analytical, Inc
2235 Polvorosa Ave , Suite 230, San Leandro, CA 94577
Phone: (510) 895-3675 Fax: 5108953680 Email: milpitaslab@emsl.com

Attn: **Chris Merritt & Rick Day**
Geocon Consultants
2356 Research Drive
Livermore, CA 94550

Fax: (925) 371-5915 Phone: (925) 371-5900
Project: **E8215-06-15 / RT 87 South NOA, Santa Teresa, Stockpile**

Customer ID: GECN21
Customer PO: E8215-06-15
Received: 08/30/06 1:40 PM
EMSL Order: 090604449

EMSL Proj:
Analysis Date: 9/7/2006
Report Date: 9/7/2006

PLM Analysis of Bulk Samples for Asbestos via EPA 600/R-93/116 Method with CARB 435 Prep (Milling) Level A for 0.25% Target Analytical Sensitivity

			Non-Asbestos		Asbestos
Sample	**Location**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
1-12 *090604449-0135*		Brown Non-Fibrous Homogeneous		99.00% Non-fibrous (other)	**1.00% Chrysotile**
1-36 *090604449-0136*		Brown Non-Fibrous Homogeneous		98.50% Non-fibrous (other)	**1.50% Chrysotile**
1-26 *090604449-0137*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
1-15 *090604449-0138*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
1-13 *090604449-0139*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
1-16 *090604449-0140*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
1-18 *090604449-0141*		Brown Non-Fibrous Homogeneous		99.25% Non-fibrous (other)	**0.75% Chrysotile**
3-24, 1050 *090604449-0142*		Brown Non-Fibrous Homogeneous		99.50% Non-fibrous (other)	**0.50% Chrysotile**
4-23 *090604449-0143*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**

Analyst(s)

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Report Date:	9/7/2006

PLM Analysis of Bulk Samples for Asbestos via EPA 600/R-93/116 Method with CARB 435 Prep (Milling) Level A for 0.25% Target Analytical Sensitivity

			Non-Asbestos		Asbestos
Sample	**Location**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
4-44		Brown		99.50% Non-fibrous (other)	**0.50% Chrysotile**
090604449-0144		Non-Fibrous Homogeneous			

Analyst(s)

Jeremy Malson (70)
Jason McGriff (75)

or other approved signatory

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Summary of NOA Results
Santa Teresa Stockpile

WMU1		WMU2		WMU3		WMU4	
Sample ID	**Asbestos Content**	**Sample ID**	**Asbestos Content**	**Sample ID**	**Asbestos Content**	**Sample ID**	**Asbestos Content**
1-1	0.50% Chrysotile	2-1	1.00% Chrysotile	3-1	1.00% Chrysotile	4-1	<0.25% Chrysotile
1-2	2.25% Chrysotile	2-2	0.25% Chrysotile	3-2	1.50% Chrysotile	4-5	0.75% Chrysotile
1-3	0.50% Chrysotile	2-3	<0.25% Chrysotile	3-3	2.00% Chrysotile	4-6	0.75% Chrysotile
1-4	<0.25% Chrysotile	2-4	<0.25% Chrysotile	3-4	<0.25% Chrysotile	4-7	<0.25% Chrysotile
1-5	0.75% Chrysotile	2-5	0.75% Chrysotile	3-5	1.50% Chrysotile	4-8	<0.25% Chrysotile
1-6	<0.25% Chrysotile	2-6	0.50% Chrysotile	3-6	1.50% Chrysotile	4-9	0.75% Chrysotile
1-7	0.50% Chrysotile	2-7	<0.25% Chrysotile	3-7	0.75% Chrysotile	4-10	<0.25% Chrysotile
1-8	0.75% Chrysotile	2-8	0.50% Chrysotile	3-8	0.75% Chrysotile	4-12	0.25% Chrysotile
1-9	0.50% Chrysotile	2-9	<0.25% Chrysotile	3-9	<0.25% Chrysotile	4-13	<0.25% Chrysotile
1-10	1.50% Chrysotile	2-10	0.75% Chrysotile	3-10	0.50% Chrysotile	4-14	1.00% Chrysotile
1-11	0.75% Chrysotile	2-11	<0.25% Chrysotile	3-11	0.75% Chrysotile	4-15	<0.25% Chrysotile
1-12	1.00% Chrysotile	2-12	0.25% Chrysotile	3-12	None Detected	4-16	0.25% Chrysotile
1-13	<0.25% Chrysotile	2-13	0.75% Chrysotile	3-13	1.25% Chrysotile	4-17	0.75% Chrysotile
1-15	<0.25% Chrysotile	2-14	1.00% Chrysotile	3-14	<0.25% Chrysotile	4-18	0.50% Chrysotile
1-16	<0.25% Chrysotile	2-15	0.25% Chrysotile	3-15	1.25% Chrysotile	4-20	0.25% Chrysotile
1-17	0.75% Chrysotile	2-16	0.75% Chrysotile	3-16	0.25% Chrysotile	4-21	0.50% Chrysotile
1-18	0.75% Chrysotile	2-17	<0.25% Chrysotile	3-18	0.50% Chrysotile	4-22	<0.25% Chrysotile
1-21	<0.25% Chrysotile	2-18	<0.25% Chrysotile	3-19	<0.25% Chrysotile	4-23	<0.25% Chrysotile
1-22	<0.25% Chrysotile	2-19	0.50% Chrysotile	3-20	<0.25% Chrysotile	4-24	<0.25% Chrysotile
1-23	None Detected	2-20	<0.25% Chrysotile	3-21	<0.25% Chrysotile	4-25	0.50% Chrysotile
1-24	None Detected	2-21	0.25% Chrysotile	3-22	0.25% Chrysotile	4-26	1.00% Chrysotile
1-25	1.75% Chrysotile	2-22	<0.25% Chrysotile	3-24	0.50% Chrysotile	4-28	<0.25% Chrysotile
1-26	<0.25% Chrysotile	2-23	<0.25% Chrysotile	3-25	0.75% Chrysotile	4-31	<0.25% Chrysotile
1-27	<0.25% Chrysotile	2-24	0.50% Chrysotile	3-26	0.25% Chrysotile	4-32	1.50% Chrysotile
1-28	None Detected	2-24	0.75% Chrysotile	3-27	0.25% Chrysotile	4-33	0.75% Chrysotile
1-29	0.50% Chrysotile	2-25	<0.25% Chrysotile	3-28	0.50% Chrysotile	4-34	0.75% Chrysotile
1-30	<0.25% Chrysotile	2-26	<0.25% Chrysotile	3-29	<0.25% Chrysotile	4-35	<0.25% Chrysotile
1-31	<0.25% Chrysotile	2-27	1.00% Chrysotile	3-30	1.50% Chrysotile	4-36	<0.25% Chrysotile
1-33	3.00% Chrysotile	2-28	0.50% Chrysotile	3-31	1.25% Chrysotile	4-37	1.00% Chrysotile
1-34	0.25% Chrysotile	2-29	0.50% Chrysotile	3-32	0.25% Chrysotile	4-39	0.50% Chrysotile
1-35	1.25% Chrysotile	2-30	1.00% Chrysotile	3-33	<0.25% Chrysotile	4-41	0.25% Chrysotile
1-36	1.50% Chrysotile	2-31	<0.25% Chrysotile	3-34	1.25% Chrysotile	4-43	0.25% Chrysotile
1-37	0.25% Chrysotile	2-32	1.75% Chrysotile	3-35	0.50% Chrysotile	4-44	1.75% Chrysotile
1-43	<0.25% Chrysotile	2-33	<0.25% Chrysotile	3-36	<0.25% Chrysotile	4-44	0.50% Chrysotile
1-44	<0.25% Chrysotile	2-35	<0.25% Chrysotile	3-37	0.50% Chrysotile	4-45	0.50% Chrysotile
1-45	<0.25% Chrysotile	2-36	<0.25% Chrysotile	3-39	0.75% Chrysotile	4-48	<0.25% Chrysotile
		2-39	<0.25% Chrysotile				

AVERAGE ASBESTOS CONTENT **ENTIRE STOCKPILE: 0.48%**

WMU1: 0.53% **WMU2: 0.36%** **WMU3: 0.61%** **WMU4: 0.42%**

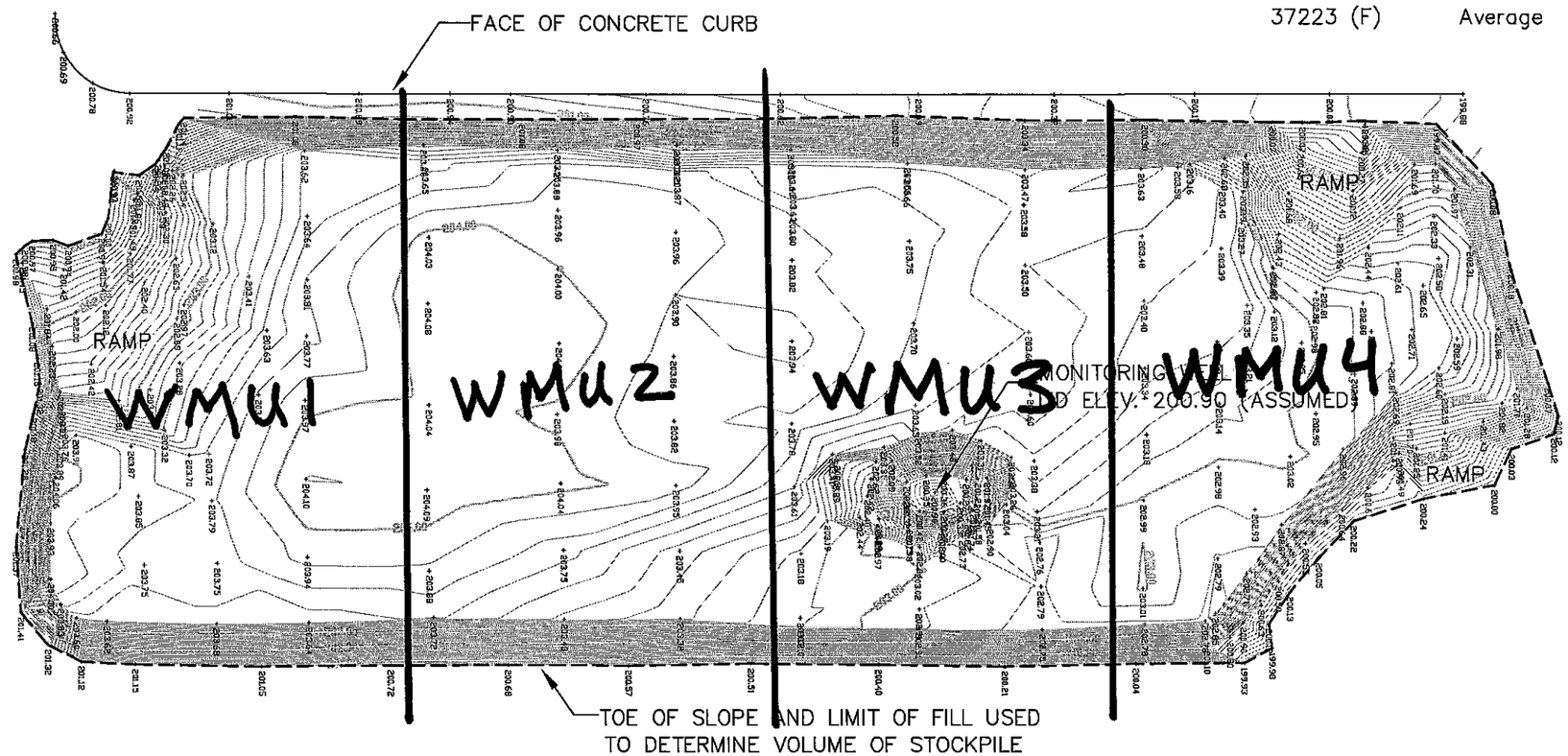
(ASSUMED)

SITE VOLUME TABLE: UNADJUSTED

Site	Stratum	Surf1	Surf2	Cut cu.m.	Fill cu.m.	Net cu.m.	Method
santa-teresa-park&ride	santa stratum	boundary	all site	0	37212	37212 (F)	Grid
				0	37229	37229 (F)	Composite
				0	37229	37229 (F)	End area
				0	37221	37221 (F)	Prismoidal
						37223 (F)	Average

Comments:

1. Volumes were computed using the Terrain Module of the AutoDesk Land Desktop 2004 software. The two surfaces defining the stratum were developed from field data collected on March 14, 2006. The base surface was constructed utilizing "Toe of Slope" shots along the perimeter of the site and near the monitoring well found within the fill area. The second surface defining the stratum was developed from the same "Toe of Slope" shots along with other features collected to accurately define the fill area during the field survey.
2. Elevations and Coordinates were assumed and are in metric.
3. Contour interval is 10 centimeters.
4. This survey meets National Map Accuracy Standards.
5. Volumes shown are in cubic meters
6. The field surveyors indicated that the fill felt soft and may not have been compacted.
7. Since compaction was questionable we used a cut & fill factor of one for our volume calculations.



0 20 40

(IN METERS)
GRAPHIC SCALE

DATE		DRAWING		SUBMITTED		
				DESIGNED M. SHOUP	CHECKED M. SHOUP	
				DRAWN G.Z	CADD FILE NAME SANTA-TERESA PARK	

LICENSED LAND SURVEYOR MICHAEL A. SHOUP 7616 EXPIRES 12-31-06 STATE OF CALIFORNIA

SANTA CLARA Valley Transportation Authority

APPROVED

CADD FILE DATE 03-16-06 | SCALE 1:400
PLOT DATE 03-16-06 | BOARD APPROVAL DATE

SANTA TERESA PARK & RIDE
TOPOGRAPHIC SURVEY FOR
STOCKPILE VOLUME CALCULATIONS

PCA NO. | CONTRACT NO. | FILE LOCATION

SHEET OF
DRAWING NO. G-1
REVISION A