**STRUCTURAL SYSTEMS**

**RESEARCH PROJECT**

Report No.
SSRP–05/02

# FIELD INVESTIGATION REPORT FOR ABUTMENT BACKFILL CHARACTERIZATION

**by**

**EARTH MECHANICS, INC.**

Final Report Submitted to the California Department of Transportation (Caltrans), under Contract No. 59A0288

July 2005

Department of Structural Engineering
University of California, San Diego
La Jolla, California 92093-0085

University of California, San Diego

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Structural Systems Research Project

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16. Abstract

This report presents the results of a review of over 100 bridge abutments across the state of California. It includes characterizations of typical backfill materials used behind abutments. It was part of an overall effort to improve on current methods of analyzing the seismic response for abutments systems.

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# EXECUTIVE SUMMARY

This project is a result of Request for Proposal (#0213DCT) dated 8/6/02 for geotechnical consulting firms to perform a field drilling program to assist a larger research program being conducted by Caltrans and University of California at San Diego (UCSD). Earth Mechanics, Inc. (EMI) was selected to undertake the scope work described in the RFP under Task 3 (Abutment Backfill Characterization) of RTA Contract No. 59A0337 (Response Assessment of Bridge Systems - Seismic, Live, and Long Term Loads). The California Department of Transportation (Caltrans) is the ultimate client and end-user of this project.

The Abutment Backfill Characterization task of this project is divided into two phases:

- Phase I was to consist of a review of approximately 90 bridges state-wide and selection of approximately 20 bridge sites as potential candidates for further geotechnical field investigation of abutment backfills. It was the mutual understanding that Caltrans would provide bridge plans and logs of test borings for approximately 90 bridges.

- Phase II was to consist of the actual investigation of 10 of the potential candidate bridges. The investigation consists of soil borings with sampling, laboratory testing, CPT soundings with shear wave velocity measurement, and data analysis. The analysis was to be supplemented with some pressuremeter testing (PMT) to further characterize the properties of the abutment backfill. A report was to be provided at completion of Phase II.

At the end of Phase I, our database had grown to a total of 115 bridges. Caltrans provided plans for 105 sites and selected 26 bridge sites for investigation. We conducted site reconnaissance at a total of 35 of the bridge sites to verify that they met selection criteria, feasibility for site investigation, and to establish logistics requirements (traffic control). A Draft Report has been submitted earlier summarizing the progress of Phase I work.

At the end of Phase II, we had tested a total of 15 bridge sites. Site investigation was performed at 11 bridge sites with a total of 26 soil borings, 22 CPT's and 14 PMT's. Caltrans provided bulk samples from 4 additional sites which we tested in the laboratory as well. The field and laboratory data was then evaluated and 4 soil type categories developed with representative geotechnical properties. The present report provides a final presentation of both Phase I and II work performed by EMI and serves as a project deliverable for both phases.

# 1.0 INTRODUCTION

The California Department of Transportation (CALTRANS) provides a contract through the University of California, San Diego (UCSD) for conducting soil investigation of abutment backfill on ten selected bridges. This investigation is part of a larger research program being sponsored by CALTRANS. The purpose of this investigation program is to provide data to establish the types of abutment soil backfill that have been used in California highway bridges to allow a characterization of backfill behavior.

# 2.0 PHASE I – REVIEW AND SELECTION OF BRIDGES

## 2.1 Background

The objective of this project is to investigate and characterize the structure backfill behavior when the bridge structure is subjected to seismic loading. The current design practice for ordinary bridges assumes that the abutment backwall shears off in the beginning of seismic loading and does not contribute to the abutment's ability to resist external loads. The only load-resisting source is the soil backfills behind the wall, providing passive pressure against the wall movement when the superstructure is pushed into the soil. The amount of passive resistance mobilized depends on the load-deformation characteristics of the soil backfills.

Caltrans design practice makes use of the load-deformation curve established from the full-scale testing of a 5.5 ft high abutment conducted at the University of California, Davis (Caltrans 2001). The abutment was backfilled with silty clay loam. Current design criteria given in Caltrans Seismic Design Criteria (2001) are based on an interpretation of the test results and disregard actual soil backfill conditions. It would be highly desirable to develop site- and/or soil-specific abutment load-deformation relationships for bridge design. It is our understanding that Caltrans is moving towards this direction.

From experience and our review of typical bridge plans (Caltrans, 1999b) and the requirements presented in the Caltrans Standard Specifications (Caltrans, 1999a), it is obvious that there is tremendous variation in soil types used for structural abutment backfills and therefore load-deformation behavior in true field conditions. It will be a key effort to quantify typical abutment backfills and the potential range of variation in the field for improving current abutment design procedures and hence our ability to predict the overall bridge behavior for ordinary bridges.

## 2.2 Typical Abutment Backfills

Prior to 1995-96, the construction of abutment backfill did not require a particular soil type. Sections 19.306 and 19-3.065 of the current Caltrans Standard Specifications (Caltrans, 1999a) only contain gradation requirements and a compaction requirement of 95% relative compaction. Given these specifications, soils with high clay content (meeting the grain size requirements) could be used as abutment backfills as long as the required degree of compaction was achieved. This led to poor performance of some abutments, such as heaving and cracking of pavement overlying the backfill. Recognizing the shortcomings of these Standard Specifications, Caltrans encouraged the designers to include additional requirements in the project special provisions. The additional requirements are:

- The materials behind the abutment wall should be low-expansive soil with an Expansion Index (EI) of less than 50 as determined per ASTM D-4829.

- The backfill materials should have a Sand Equivalent of more than 20 determined per Caltrans Test Method 217.

These two additional requirements necessitate that the backfill behind abutments and retaining walls be predominantly sandy soil. A typical area of soil backfills that is to meet the soil type and compaction requirements is schematically shown in Figure 1. These two additional requirements do not yet appear in the current Standard Specifications. It is thought that these new requirements have probably been implemented in the final contract documents for most new bridge design after 1996, but may not have been enforced for all bridges. It is possible that some new bridge construction include clayey soil in structural backfill.

### 2.3 Review and Selection of Bridges

Caltrans provided us with As-Built plans or Log-Of-Test-Boring (LOTB) sheets for a total of 105 bridges state-wide in December 2003. The As-Built Plans consisted of General Plans showing bridge structure  of test borings. We have located these bridge sites on the maps as shown in Figures 3 to 6. We then created a bridge database presented in Table 1 using Microsoft Access software. This database included:

- bridge number,
- bridge name,
- site location,
- site longitude and latitude coordinates,
- number of lanes,
- bridge width,
- year of original construction and modification,
- indicators for site reconnaissance conducted,
- indicator for potential bridge candidates to be investigated further,
- as-performed filed investigation: boring, CPT and PMT depth and locations.

From these bridge plans, we selected bridges to be targeted for investigation of the soil backfill. It is important to understand what kinds of soil types have been used in California highway bridges. Our goal was to collect sufficient abutment backfill properties to develop “typical” soil parameters statewide that can be used to develop site- and soil-specific load-deformation characteristics of the backfill. As a result, our review and selection process considered a number of issues, including:

- Abutment type,
- geographic distribution,
- backfill soil type,
- accessibility and safety for site drilling (requirement of traffic control),
- fill height that could be sampled and tested, and

- ease of securing encroachment permits considering the time constraints.

We conducted site reconnaissance at a total of 35 of the bridge sites to verify that they met selection criteria, that site investigation was feasible, and to establish logistics requirements such as traffic control.

The potential candidates sites included highway over- and undercrossings, river crossings, and railroad, pedestrian or utility underpasses. A few bridges selected are relatively new structures conforming to the latest structure detailing and soil type requirements. Other bridges are older bridges which constitute the bulk of the present day bridge improvement projects undertaken by various state, city and local agencies. New construction sites have the advantage of safe environment, virgin undisturbed soil condition, and easy encroachment permissions obtained from Caltrans.

A total of up to 26 potential candidate bridges were found to be suitable for further investigation as identified in Table 1. Bridge plans and photographs for the selected bridges are provided in Appendix A. Bridge plans and photographs of the remaining bridges can be provided upon request.

## 3.0 PHASE II - FIELD INVESTIGATIONS

### 3.1 General

The original scope for the field program called for drilling of two soil borings and two Cone Penetration Tests (CPT) with shear wave velocity measurements for each of 10 bridge sites. During Phase II, site investigation was actually performed at a total of 11 bridges, and Caltrans collected bulk samples from 4 additional sites. Table 2 lists the resulting 25 locations at 15 bridges. The site locations are shown on the state map of Figure 2, and on selected area street maps in Figures 3 to 6. The state map of Figure 2 also shows the number of bridges in each county.

At some sites, bridges were currently under construction and we took the opportunity of investigating the new fills before the roadways were completed. For those sites, Mr. Shamsabadi of Caltrans arranged for permission with the construction site resident engineers.

### 3.2 Testing

Each site included up to 1 to 3 borings, CPT's and Pressuremeter tests. A total number of 26 soil borings, 22 CPT's and 14 PMT's were performed. The borings, CPT's and PMT's were performed a small distance behind the abutment walls as listed in Table 1. The distance and depths are given in Table 1.

#### 3.2.1 Soil Borings

Subsurface soils and conditions were logged and samples of soils were collected for laboratory testing. The borings were drilled using a truck-mounted drill rig equipped with 8" diameter hollow-stem augers. Large bulk samples of near-surface soils were collected at many sites for laboratory testing. Standard Penetration Test (SPT) samples and relatively undisturbed ring samples were logged in the field and collected for laboratory testing. The SPT sampler and

Modified California Drive sampler were used at approximately 5-ft intervals. The SPT sampler (1.4" ID, 2" OD) was driven a total depth of 18" or until refusal, using a 140-lb hammer falling 30". SPT blowcounts for the last 12" of penetration were recorded on the boring logs and were used to correlate in-situ soil strengths.

The relatively undisturbed ring samples were collected at 10 ft intervals (alternating with the SPT sampler) by driving the Drive sampler a total of depth of 18" or until refusal, using the same hammer and drop height. The Drive sampler is a split-barrel sampler (2.5" ID) with a tapered cutting tip and lined with a series of 1" tall brass rings.

### 3.2.2 Seismic Cone Penetrometer

Conventional CPT's were by Holguin Fahin Associates and Gregg Drilling using 10 $cm^2$ cones and 25-ton trucks with on-board data acquisition. The soundings were performed a small distance behind the abutment walls. The CPT report with measured data of cone tip resistance and sleeve friction is provided in Appendix A. The reports also include correlated data such as soil behavior types, undrained shear strengths and friction angles. The data is provided in graphical and tabular form over depth.

Shear wave and compression wave velocities were also measured with the seismic cone at discrete depths, typically every 5 feet. Excitation was generated by impacting a timber log at the surface, which was weighed down by the truck's dead weight, using a sledge hammer. The impact triggers the electronic recording of the arrival time which was measured by the seismic cone at the tip.

### 3.2.3 Pressuremeter

Testing was performed in the dry augered boreholes at selected depths using our mechanical Texam Pressuremeter device manufactured by RocTest using NX drill bit. The tests were performed a small distance behind the abutment walls as shown in Table 3.

The device, probe and tubes were carefully saturated and calibrated for pressure, volume measurement and creep. The probe used consists of a single 70-mm diameter inflatable rubber membrane enclosed in a flexible metal shield. The device operates by means of water injected through high-pressure tubing into a rubber balloon which exerts lateral pressure to the soil of the borehole walls. The incremental amounts of water injected to achieve a predefined increment of pressure is measured. The increments of amounts of water are then correlated to lateral in-situ strain (and displacement) yield of the soil. We performed cycles of unloading and reloading. The test data results are provided in Appendix A in terms of lateral soil stress versus radial strain. Appendix C contains information on the device used.

It can be noted that some of these resulting curves exhibit an initial upward trend at the departure of the curves that is not typical for loading behavior of soil. The upward departure is attributed to initial side effects of the test balloon when it is being filled with water and borehole disturbance when the hole is drilled. At that stage, the balloon elongates vertically and develops uniform contact with the borehole walls.

## 3.3 Results

Appendix A provides the following information for each bridge (as available):

- Bridge number and site location of the bridge,

- Brief discussion of the field program with boring/test location relative to the abutment (if applicable)
- Photographs from site reconnaissance and testing,
- Bridge plans as provided by Caltrans,
- Boring logs,
- CPT logs,
- Seismic wave velocities, and
- Pressuremeter test results.

The boring logs represent records of field observations; soil types shown on the boring logs may be revised depending on visual re-classification and testing in the laboratory. Refer to Table 1 and Appendix B for final soil classification.

## 4.0 LABORATORY TESTING

Caltrans planned to test about 20 structural backfill soil samples from state-wide construction sites and 10 drilled samples using Modified California Sampler from the existing bridges as part of Caltrans' abutment drilling program. Caltrans had some of the samples delivered to our office.

Laboratory testing was performed by EMI on selected soil samples from the bridge sites to provide backfill characterization. A summary of the test procedures and results is provided below. All test results are summarized in Table 3 in order of borehole and depth. The actual test results are provided in Appendix B.

### 4.1 Moisture/Density

Soil samples collected in brass ring containers were taped in the field to prevent moisture change during transport and storage. Field moist density was determined in the laboratory. Dry density and field moisture were determined in the laboratory by oven drying. The standards used were ASTM D-2937 for dry density and D-2216 for moisture. The densities and moisture contents are given in the summary Table 3.

### 4.2 Gradation

For the sand samples were run through a standard sieve test per Caltrans Test Methods 202/203 to analyze grain size distributions. The grain size curves show the presence of fines and coarse fractions and are provided in Appendix A.

### 4.3 Plasticity

Atterberg limits were performed on the cohesive samples to determine their plasticity index (PI) from the liquid limit (LL) and plastic limits (PL) using Caltrans Test Method 204. The PI determines whether a soil is a silt or clay (See Table 3).

### 4.4 Expansion Index

This test was performed using ASTM D-4829-95/UBC 29-2 on samples from soils to be UU-

tested. This test provides a measure of the expansion potential of any type of soil samples. Typically, expansion potential increase with presence of montmorillionite, which tends to be present more in fine-grained (cohesive) soils. Granular (sandy) soil typically have low EI (less than 20). Caltrans standard specifications for Abutment backfill require that the EI be less than 50.

### 4.5 Sand Equivalent

This test was performed using CT Test Method 217 on samples from sandy soils to be UU-tested. This test provides a measure of the amount of fines and coarse fractions in predominantly granular samples. Caltrans standard specifications for Abutment backfill require that the SE be 20 or more.

### 4.6 Maximum Density

The maximum density and optimum moisture content was determined per ASTM D-1557 for each bulk sample representing a soil to be UU-tested. This method uses the Modified Proctor Test in a 4" diameter mold and requires four points to develop the dry density versus moisture curve. The Caltrans standard Test CT 216 requires only three points and was not used in our study. As a result, The ASTM method requires more effort. Nevertheless, we elected to use the ASTM method because our experience has shown that the CT 216 method can underpredict the maximum density.

### 4.7 Direct Shear Tests

Direct shear tests were conducted using ASTM-D3080 on a few ring samples of sandy soils as an alternate method to determine shear strength parameters of sandy soils. The test is run at three vertical pressures. Plots of the load-displacement curves and the three associated Mohr circles for the peak and the residual states are provided in Appendix B. The interpreted shear strength parameters are summarized in Table 3.

### 4.8 UU Tests

Samples were selected from the bridge sites following the criteria we defined above. We selected samples that were considered representative of the various soil types, the range in field density and that were from different locations in the State.

The samples were prepared following ASTM D-2850. Preparation included oven drying and passing the sample through a #4 sieve if it contained gravel. Cohesive samples were extruded directly from five of our brass rings (2.42" ID, 2.5" OD, 1" high) and trimmed at the top and bottom ends for testing in the triaxial cell. Those samples are labeled "in-situ" in this report. Certain cohesive samples that could not be extruded were remolded in a 2.42" ID brass cylinder 5" high by compacting to 95% relative compaction (95% of the field dry density) in accordance with Caltrans Standard Specifications. A rubber membrane was then applied to the surface of the samples. Granular samples were carefully compacted to the same criteria in a 2.8" ID aluminum split mold (5.75" high) lined with a rubber membrane under vacuum. All specimens were then capped by a filter stone and loading plate at each end, inside the rubber membrane. The membrane was then secured with outside O-rings outside the membrane to prevent water infiltration.

Specimens were then consolidated and tested in a Geomatic triaxial apparatus to failure under unconsolidated undrained (UU) conditions at three different confining pressures in order to obtain the total-stress friction angle and cohesion value at failure. The depth of interest in this study was in the upper few feet of the abutment walls where the wall engages (pushes into) the backfill soils and the passive wedge is expected to mobilize. If the sample was from this shallow depth zone, the first confining pressure was typically set equivalent to its original in-situ overburden pressure, otherwise an equivalent test pressure was calculated from the desired depth and the sample's field density. The second and third confining pressure levels were set at arbitrary multiples of the first pressure to cover an equivalent soil depth range of up to about 20 ft.

The results in terms of deviatoric stress versus axial strain curves are plotted in Appendix B typically showing three unloading and reloading cycles. The plots include the three associated Mohr circles for the three failure states and the interpreted shear strength parameters (Mohr-Coulomb failure criteria).

## 5.0 CONCLUSIONS

Soil Types. For each bridge site shown in Table 3, representative soil types were defined from the soil samples in the upper 15 ft of the boreholes. The resulting 23 bridge-specific soil types were then sorted by USCS soil type. Because there are many soil types in the USCS system, the data was then grouped into four key soil categories: clean sands, "dirty" sands containing fines, clayey sands, and cohesive soils. Table 4 defines these four categories and provides the number of sites and soil samples and depth range that these categories are based on. Overall, we found that the majority of fills are silty sands with gravels. The blowcounts and shear wave velocities vary significantly, even within the same backfill, and it is difficult to find trends. Blowcounts frequently have more variation and are lower in older fills compared to more recent constructions. Newer fills tend to have higher strength and in-situ density due to a better quality compaction effort.

Geotechnical Properties. For each of the selected soil type category, Table 4 shows the ranges of geotechnical properties measured in the field and laboratory:

- SPT blowcount. Uncorrected SPT blowcount. Non-standard blowcounts were converted to SPT-equivalent blowcounts.
- Field density. Dry density determined from ring samples, and moisture.
- Grain size distribution. Percentage of gravel, sand and fines fractions, and qualitative assessment (fine, medium, coarse).
- Plasticity. Plasticity Index (PI) and qualitative assessment (none, low, medium, high) for cohesive portion of the sample.
- Sand Equivalent (SE)
- Expansion Index (EI)
- Compaction. Maximum dry density and optimum moisture per ASTM-1557.
- Compacted fill parameters. Dry density of the soil compacted to 95% R.C., and shear strength parameters (friction angle, cohesion) from the UU triaxial tests at failure and

residual values from direct shear tests (peak values were high and were ignored).

Values shown in the table in parentheses are typical values based on straight average and some judgment. In addition to soil descriptions and shear strength properties indicated in Table 4, shear wave velocities and pressuremeter test results were evaluated.

Shear Wave Velocities. Shear wave velocities were measured using a seismic cone which as a built-in seismometer to measure seismic velocities. Shear waves are generated by striking a beam coupled to the ground surface by a hydraulic cylinder under the CPT rig. The sledgehammer strikes the beam and triggers seismic wave sending the impulse signal down the ground surface. Geophones embedded in the piezocone pickup the arriving signal to determine arrival times. A presumptive shear wave velocity of 800 feet per second for compacted backfills as indicated in Caltrans BDS is a reasonable average value to be used for the cohesionless soils such as Soil Type Categories I, II, and III in Table 4. The typical shear wave velocities range from 700 to 1000 feet per second for those soil categories. The clayey soil such as Soil Type Category IV tends to show a lower shear wave velocity than the cohesionless soils. Representative shear wave velocities for the Soil Type Category IV are 550 to 800 feet per second. These values are also shown in Table 4.

Soil Moduli. Pressuremeter tests were performed for initial monotonic loading, followed by cycles of unloading and reloading. The Young's modulus is determined as a ratio of pressure increment to the increment of radial strains. The modulus determined for unloading/reloading is larger than the modulus determined from initial loading. Since a borehole must be made prior to inserting a pressuremeter probe, the initial branch of stress versus strain relation is often influenced by the borehole disturbance. While there are no quantitative measures of borehole disturbance, some considerations were given to account for this effect. The following secant modulus is judged to be appropriate based on the limited pressuremeter test results:

| | |
|---|---|
| Soil Type Categories I, II, III: | Initial Modulus 2,000 to 4,000 kPa |
| | Unloading/Reloading Modulus 10,000 to 15,000 kPa |
| Soil Type Category IV: | Initial Modulus 1,500 to 3,000 kPa |
| | Unloading/Reloading Modulus 6,000 to 10,000 kPa |

These moduli ranges are also shown in Table 4.

In conclusion, we find that the number of bridges and soil samples tested so far in this project are relatively few comparing to the variability of site conditions, structures, and geographic locations. To establish firm trends for abutment backfill properties statewide, more field work would be needed at bridge sites throughout the state, particularly in the northern and in-land areas.

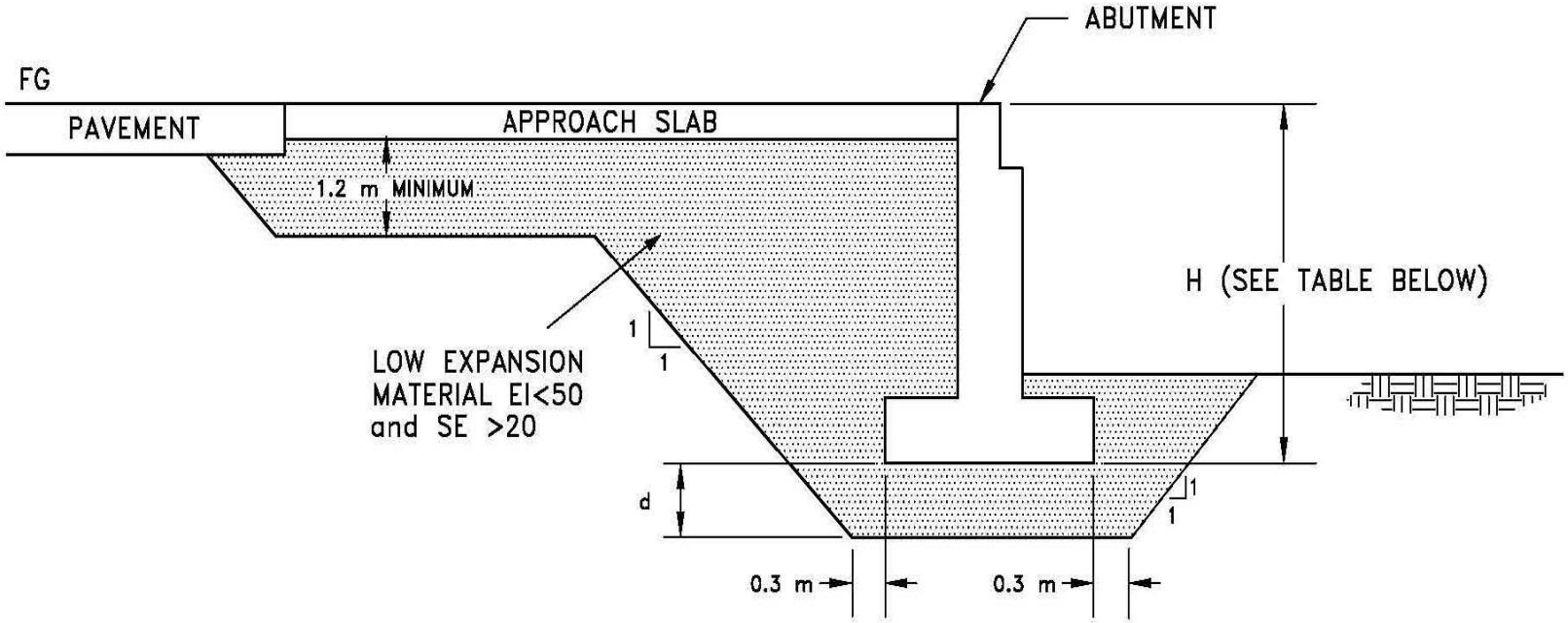
## 6.0 REFERENCES

Caltrans (2002), Guideline for Foundation Investigations and Reports, Division of Engineering Services.

Caltrans (2001), Seismic Design Criteria, December.

Caltrans (1999a), Standard Specifications, July.

Caltrans (1999b), Standard Plans, July.




| H | d |
|---|---|
| <4.9 m | 1.2 m |
| >4.9 m | 0 m |

NO SCALE

EXPANSION INDEX TO BE DETERMINED BY ASTM D4829
SAND EQUIVALENT TO BE DETERMINED
BY CALIFORNIA TEST METHOD 217

FIGURE 1. CURRENT CALTRANS BACKFILL REQUIREMENTS

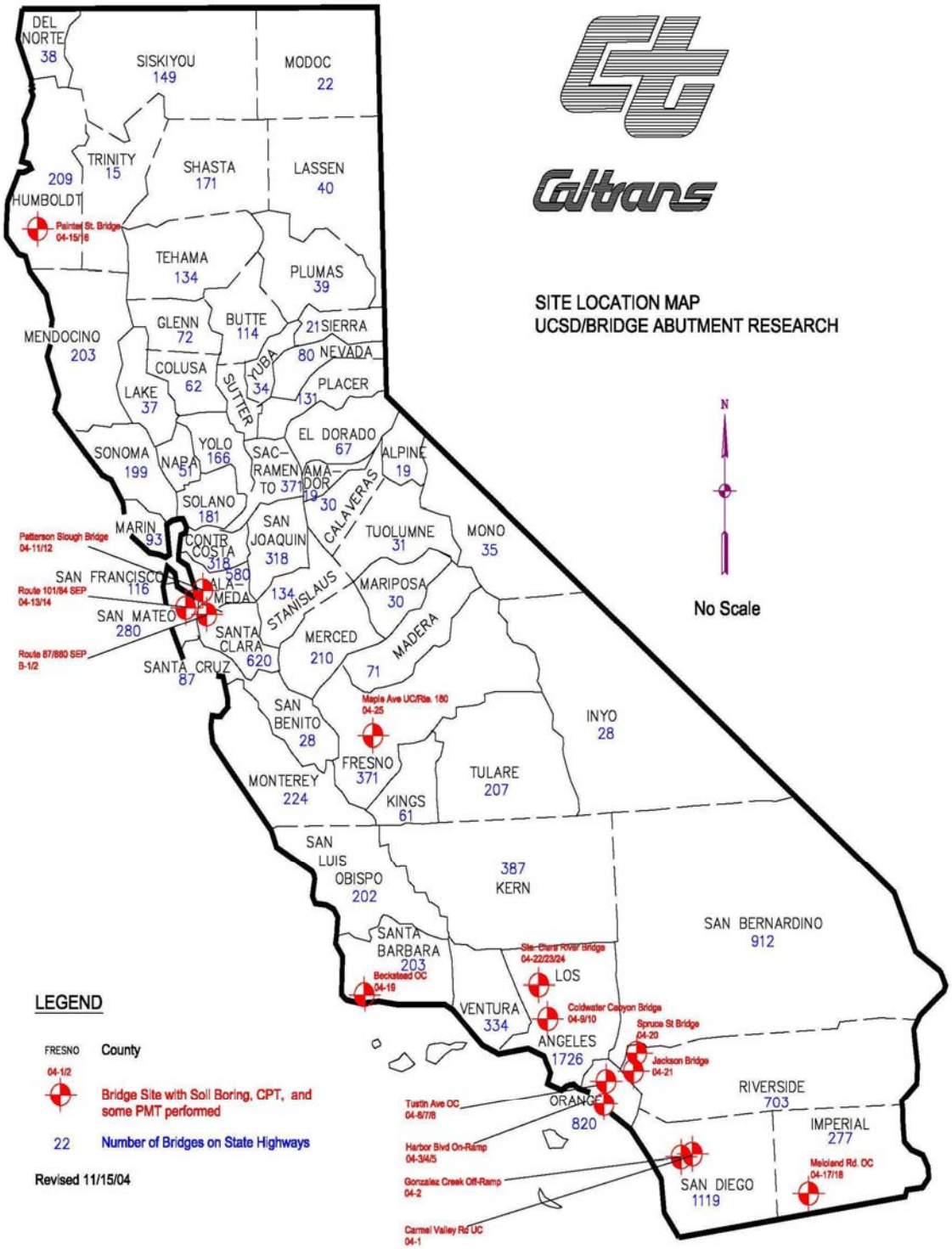



Figure 2. Map of Site Locations and Bridge Counts by County

Figure 3. Map of Bridge Sites in San Francisco Bay Area

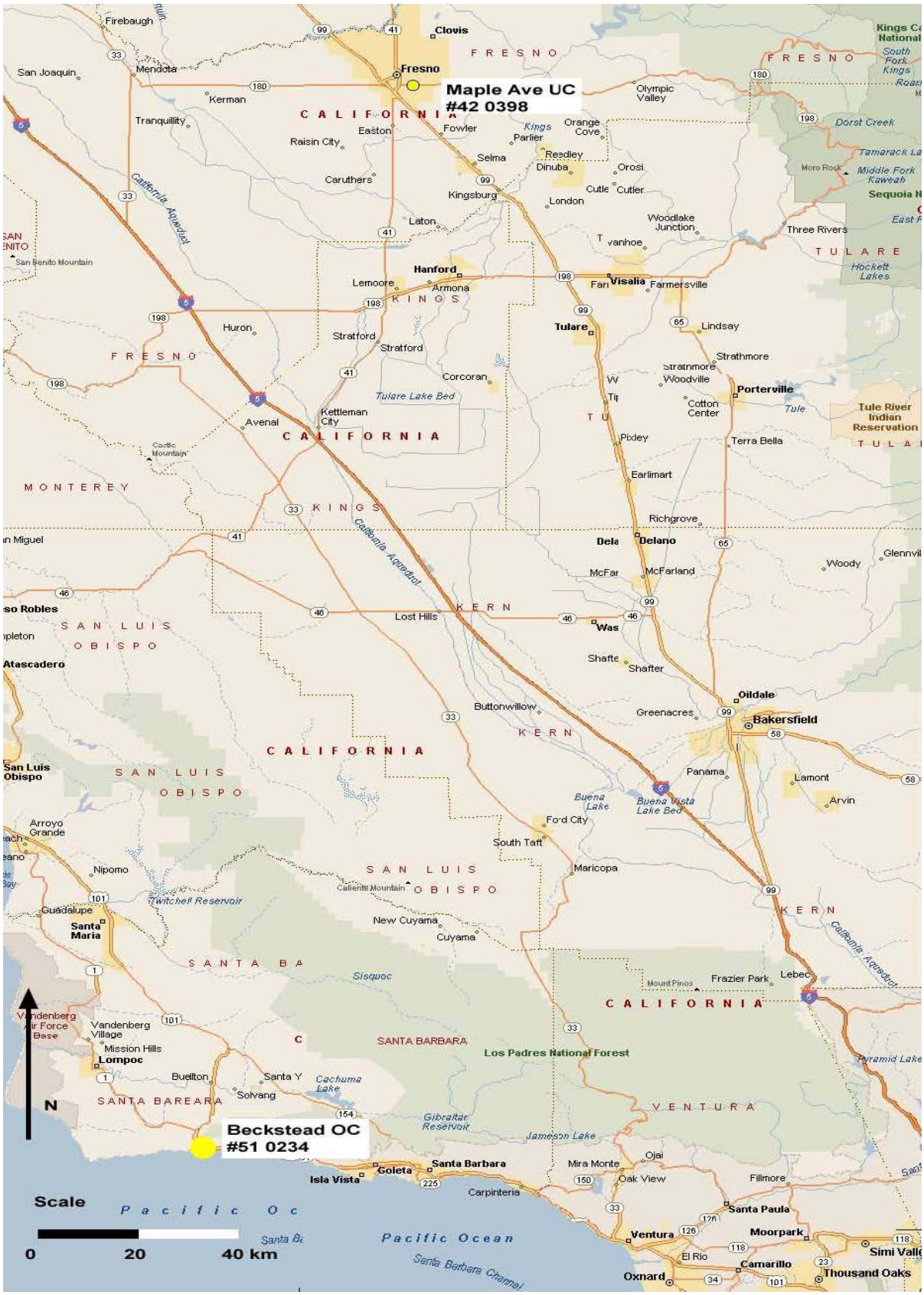



Figure 4. Map of Bridge Sites in Central California

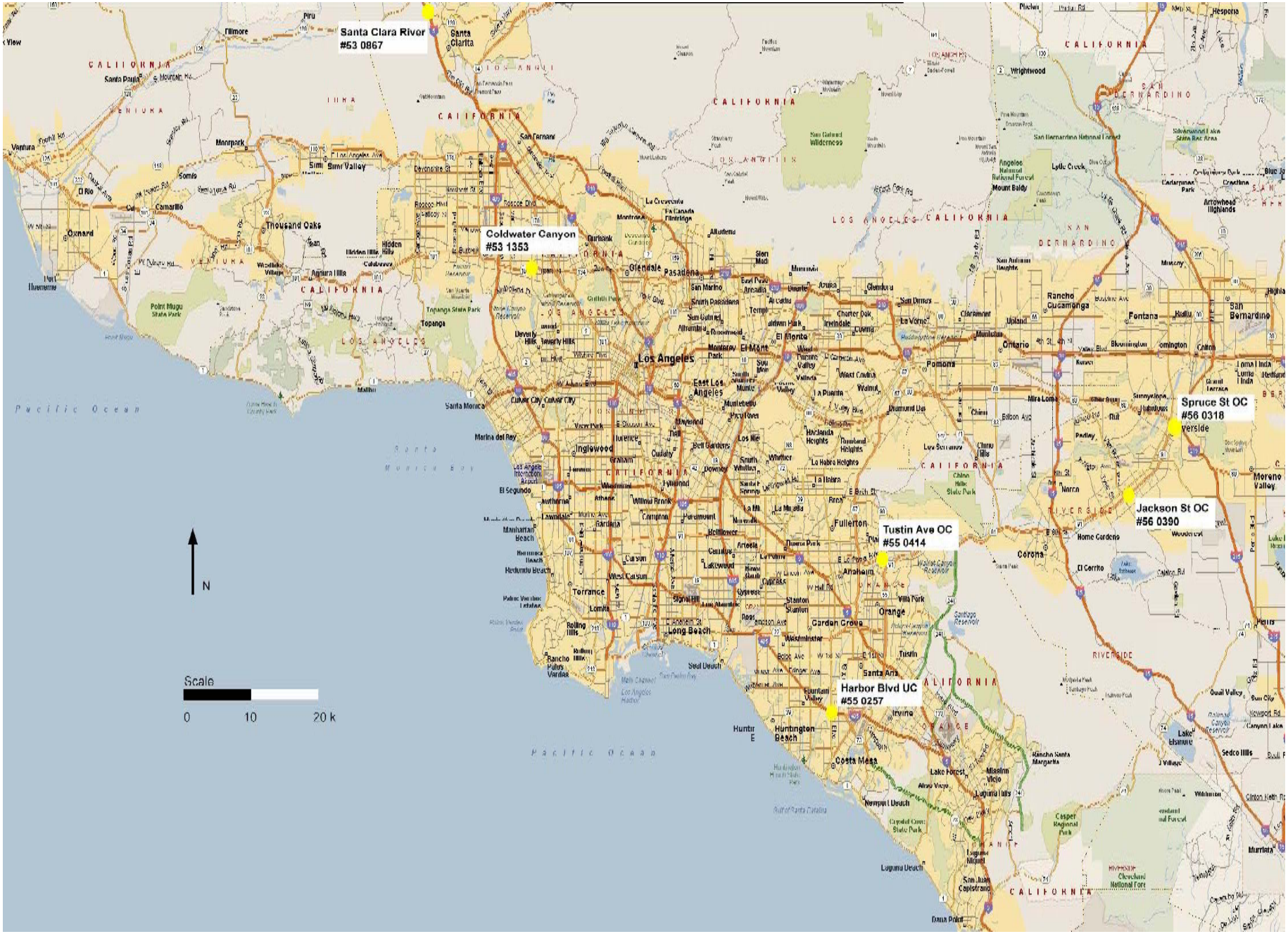



Figure 5. Map of Bridge Sites in Los Angeles/Orange County/San Bernardino Areas

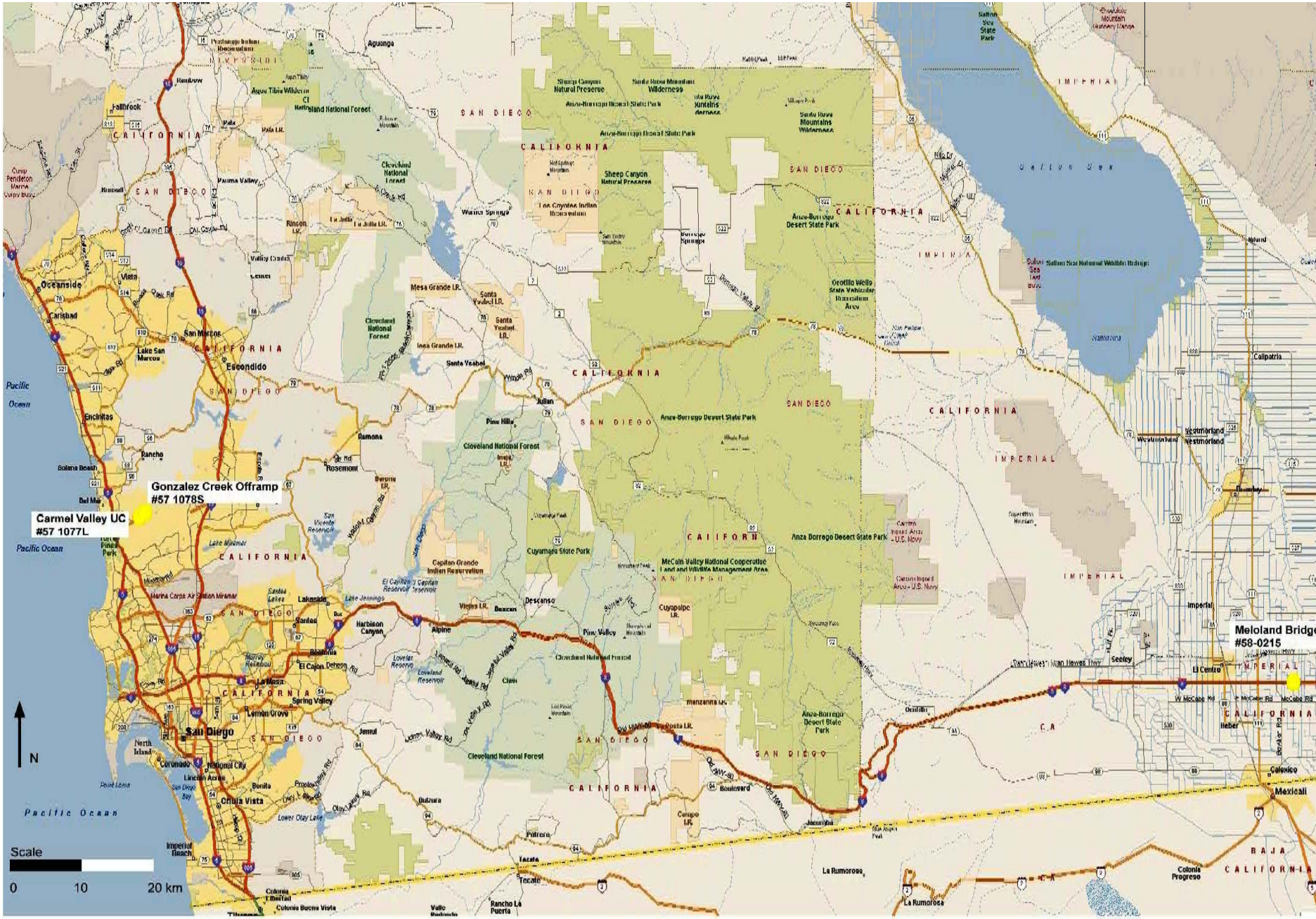



Figure 6. Map of Bridge Sites in San Diego Area

# Table 1. Bridge Database

Date: 5/31/2005 10:33:56 MK/EMI

| ID# | Bridge No. | Bridge Name | County | Route | Date Built | Have Plans? | Visited | Candidate for Drilling? | Comments | # of Lanes | Rdwy Width | Latitude | Longitude | Location Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 86 | 57-0791 S | "E" Street On-Ramp | San Diego | I-5 | 1992 | Y | N | N? | drill thru conc. appr. Slabs | 2 | 11, 13.7 | 32.6396 | -117.0998 | Chula Vista, I-5/route 54 intersection |
| 17 | 23-0213 | Allison Drive OC | Solano | I-80 | 1997 | Y | N | | | 4 | 28 | 38.3615 | -121.9693 | Vacaville, just south of Nut Tree Factory |
| 87 | 57-0935 | Ammo Rd OC | San Diego | I-15 | 1982 | Y | N | N | | 2 | 8.5 | 32.8751 | -117.1070 | Miramar Marine Corps Airstation--Difficult to pinpoint |
| 29 | 39-0154 | Arburua Rd OC | Merced | I-5 | 1971 | Y | N | | | 2 | 24.1 | 36.9643 | -120.8824 | ~7 mi SW of Los Banos |
| 72 | 54-1107 | Archibald Ave Offramp SEP | San Bernardino | I-10 | 1996 | Y | Y | N | | 2 | 11.2 | 34.0676 | -117.5933 | North of Ontario Airport |
| 51 | 53-1204 | Atlantic Ave OC | Los Angeles | I-405 | 1963 | Y | Y | Y* | | 4 | 28 | 33.8153 | -118.1851 | Long Beach |
| 54 | 53-1986 | Balboa Boulevard OC | Los Angeles | I-5 | 1971 | Y | N | N | no struct. Plans, T/C diff. @ north abut | 2 | 12.2 | 34.3209 | -118.4964 | LA, near I-5/I-210 |
| 33 | 44-0124 | Bardin Rd OC | Monterey | US-101 | 1955 | Y | N | | | 2 | 8.5 | 36.6610 | -121.6230 | Near Salinas Municipal Airport--CAN'T FIND SPECIFIC ON MAP |
| 21 | 28-0083 S | Barrett Ave UC | Contra Costa | I-80 | 1997 | Y | Y | Y | busy, may require TC | 1 | 7.3 | 37.9355 | -122.3268 | Richmond over Barrett Ave |
| 53 | 53-1605 | Barrington Ave | Los Angeles | I-10 | 1963 | Y | Y | N | | 10 | 42.7 | 34.0296 | -118.4441 | LA, just west of I-10, I-405 intersection |
| 23 | 34-0047 S | Bay Shore Ave UC | San Francisco | US-101 | 1950 | Y | Y | N | No LOTB avail, busy loc, TC req'd, permit | 2 | 7.9 | 37.71592 | -122.3985 | San Francisco, US-101 south of 280 |
| 114 | 51-0234 | Beckstead OC | Santa Barbara | | | N | Y | Y | Collected bulk sample | | | 34.4738 | -120.2090 | Santa Barbara |
| 43 | 52-0247 | Borchard Rd OC | Ventura | US-101 | 1962, 1992 | Y | N | N | T/C not feas. | 2 | 11.3 | 34.1844 | -118.9256 | 7.1 mi west of LA County line in Ventura County |
| 34 | 44-0131 L | Boronda Rd OC | Monterey | US-101 | 1965 | Y | N | N | has MSE walls | 2 | 12.3 | 36.7220 | -121.6599 | Salinas |
| 65 | 54-0415 | Bridge Across Colorado River at | San Bernardino | I-40 | 1966 | Y | N | Y? | req. T/C | 4 | 18.3 | 34.71696 | -114.48657 | Colorado River Crossing on I-40 at CA/AZ border |
| 50 | 53-1203 | California Ave OC | Los Angeles | I-405 | 1964 | Y | Y | Y | | 2 | 17.1 | 33.8143 | -118.1806 | Signal Hill |
| 92 | 57-1083 R/L | Camino Ruiz UC | San Diego | SR-56 | 2002 | Y | Y | Y | | | | 32.9580 | -117.1553 | San Diego, on SR-56 between I-5 and I-15 |
| 100 | 57-1077 L | Carmel Valley Rd UC | San Diego | SR-56 | 2004 | N | Y | Y | Drilled 2/7/04. Collected bulk sample | | | 32.9487 | -117.2031 | San Diego, on new SR-56 between I-5 and I-15 |
| 89 | 57-0991 S | Carmel Valley UC | San Diego | I-5 | 1996 | Y | Y | Y | | 2 | 11.9 | 32.9326 | -117.2410 | Del Mar, north of 1-5/I-805 merge |
| 48 | 53-1200 | Cherry Ave OC | Los Angeles | I-405 | 1964 | Y | Y | Y* | | 4 | 25.6 | 33.8135 | -118.1676 | Long Beach |
| 108 | 53-1353 | Coldwater Canyon | Los Angeles | SR-101 | 1971 | Y | Y | Y | Drilled 4/19/04 | | | 34.1569 | -118.4137 | 101 over Coldwater Canyon |
| 56 | 53-2264 | Colorado Boulevard SEP | Los Angeles | SR-134 | 1975 | Y | N | N | | 5 | 26.5 | 34.1457 | -118.1549 | Pasadena |

| ID# | Bridge No. | Bridge Name | County | Route | Date Built | Have Plans? | Visited | Candidate for Drilling? | Comments | # of Lanes | Rdwy Width | Latitude | Longitude | Location Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 97 | 28-0185 | Concord Ave OH | Contra Costa | I-680 | 1963 (2000 | N | Y | | | | 38.9 | 37.9762 | -122.0634 | Pacheco/Concord |
| 15 | 22-0144 | County Rd 102 OC | Yolo | I-5 | 1969 | Y | N | | | 2 | 9.8 | 38.6738 | -121.7286 | 2 miles east of Woodland |
| 10 | 11-0083 | County Rd 68 OC | Glenn | I-5 | 1970 | Y | N | | | 2 | 9.8 | 39.4072 | -122.1954 | North of Norman, intersection of county road 68 and I-5 |
| 63 | 53-2831 | Del Amo Boulevard OC | Los Angeles | I-405 | 2002 | Y | N | N | | | | 33.8464 | -118.2696 | Carson |
| 22 | 29-0259 | Durham Ferry OC | San Joaquin | I-5 | 1971 | Y | N | | | 2 | 9.8 | 37.6673 | -121.3432 | ~20 mi west of Modesto |
| 40 | 51-0224 | El Rincon OC | Santa Barbara | US-101 | 1963 | Y | N | | | 2 | 8.5 | 34.3837 | -119.4847 | Carpenteria, 1.6 mi west of Ventura/Santa Barbara County line |
| 69 | 54-0964 L | Etiwanda Creek Bridge | San Bernardino | I-15 | 1976 | Y | N | (Y) | T/C not feas. on S/B | 6 | 32.6 | 34.1268 | -117.5075 | Etiwanda, north of California Speedway |
| 39 | 51-0117 (51-0328?) | Fairview Ave OC (AKA Linden Ave | Santa Barbara | US-101 | 2001 | Y | N | | | | 10.2 | 34.44 | -119.832 | Goleta |
| 78 | 55-1025 S | Fairview Rd On-Ramp OC | Orange | I-405 | 2004 | Y | Y | Y | | | | 33.6877 | -117.9076 | Costa Mesa |
| 8 | 10-0269 | Forsythe Creek Bridge | Mendocino | US-101 | 1990 | Y | N | | | 4 | 24.1 | 39.2547 | -123.2127 | ~9 mi North of Ukiah in Redwood Valley |
| 7 | 08-0123 L | Gay Creek Bridge | Tehama | I-5 | 1966 | Y | N | | | 2 | 11.9 | 39.8002 | -122.1999 | ~8 miles south of Corning, just north of Glenn/Tehama County line |
| 101 | 57-1078 S | Gonzalez Creek Off-Ramp | San Diego | SR-56 | 2004 | N | Y | Y | Drilled 2/7/04 | | | 32.9510 | -117.1979 | San Diego, on new SR-56 between I-5 and I-15 |
| 106 | 55-0257 | Harbor Blvd UC (Widen) | Orange | I-405 | 2003 | Y | Y | Y | Drilled 2/28/04 | 1 | 7.3+ | 33.6890 | -117.9194 | I-405 S/B On-Ramp over Harbor Blvd, Costa Mesa |
| 96 | 28-0143 | Hercules OH | Contra Costa | I-80 | 1998 | N | Y | N | | | 46.3 | 38.0121 | -122.2708 | Pinole/Hercules |
| 76 | 55-0822 E | HOV Ramp OC | Orange | I-5 | 1996 | Y | N | | busy HOV br. | 2 | 15.3 | 33.6447 | -117.7353 | Irvine, I-405 and I-5 split |
| 20 | 27-0083 | Ignacio Blvd OC | Marin | US-101 | 1964 | Y | Y | N | T/C req'd | 5 | 23.2 | 38.0662 | -122.5373 | ~3.5 miles south of Novato on Hwy 101 |
| 81 | 56-0390 | Jackson St OC (Replace) | Riverside | SR-91 | 2001 | Y | Y | Y | Bulk sample collected | 2 | 15.6 | 33.9185 | -117.4346 | Riverside, intersection of Jackson St and SR-91 |
| 30 | 42-0238 | Jeffery Ave OC | Fresno | I-5 | 1968 | Y | N | | | 2 | 805 | 36.3701 | -120.3357 | Coalinga |
| 70 | 54-0971 | Jurupa St OC | San Bernardino | I-15 | 1977, 1995 | Y | Y | N | | 6 | 34.1 | 34.0481 | -117.5500 | Ontario, south of I-15, I-10 intersection |
| 2 | 01-0032 | Klamath River Overflow Bridge | Del Norte | US-101 | 1965 | Y | N | | | 2 | 8.5 | 41.5182 | -124.0309 | 1000 ft south of Klamath River over Klamath Beach blvd and Waukett Creek |
| 44 | 53-0061 | La Canada Arch Bridge Widening | Los Angeles | SR-2 | 1930, 1966 | Y | Y | N | | 4 | 20.7 | 34.207 | -118.200 | La Canada Flintridge |
| 60 | 53-2791 S | La Cienga-Venice Outer SEP | Los Angeles | I-10 | 1994 | Y | Y | N | | 1 | 6.1 | 34.0363 | -118.3773 | LA, East of I-10, I-405 intersection |
| 19 | 24-0287 R | Lambert Rd UC | Sacramento | I-5 | 1975 | Y | N | | | 2 | 12.2 | 38.3206 | -121.4652 | South of Sacramento near Elk Grove |

| ID# | Bridge No. | Bridge Name | County | Route | Date Built | Have Plans? | Visited | Candidate for Drilling? | Comments | # of Lanes | Rdwy Width | Latitude | Longitude | Location Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | 06-0180 | Lamoine Rd OC | Shasta | I-5 | 1991 | Y | N | | | 2 | 12.2 | 40.9775 | -122.4333 | Lamoine, ~20 miles north of Redding |
| 38 | 50-0270 | Lebec OC | Kern | I-5 | 1964 | Y | N | N | T/C not feas. | 2 | 9.8 | 34.8356 | -118.8634 | Northside of Lebec, just south of Grapevine |
| 32 | 43-0019 | Lomerias OC | San Benito | US-101 | 1969 | Y | N | | | 2 | 10.4 | 36.8952 | -121.5564 | ~7 mi south of Gilroy |
| 52 | 53-1205 | Long Beach Boulevard OC | Los Angeles | I-405 | 1963 | Y | Y | N | | 12 | 47.5 | 33.8174 | -118.1893 | Long Beach |
| 116 | 42-0398 | Maple Ave UC | Fresno | SR-168 | 200X | Y | Y | N | Collected bulk sample | | | 36.7361 | -119.7456 | Olive Ave |
| 95 | 28-0087 | McBryde Ave OC | Contra Costa | I-80 | 1997 | N | Y | | | 4 | 23.1 | 37.9482 | -122.3255 | Richmond |
| 111 | 58-0215 | Meloland Rd OC | Imperial | I-8 | 1969 | Y | Y | Y | Drilled 8/20/04 | 2 | 44 | 32.7738 | -115.4478 | El Centro |
| 12 | 19-0056 S | Miners Ravine Bridge | Placer | I-80 | 1989 | Y | N | | | 1 | 7.3 | 38.7537 | -121.2644 | Roseville, just south of Atlantic St, I-80 intersection |
| 80 | 56-0315 | Mission Inn Ave UC (Widen) | Riverside | SR-91 | 1957, 2002 | LOTB only | N | N | AKA 7th St., T/C not feas. | | | 33.9807 | -117.3690 | Riverside, intersection of Mission Inn Ave and SR-91 |
| 58 | 53-2602 | Montana Ave Pedestrian OC | Los Angeles | US-1 | 1979 | Y | Y | N | | | | 34.0216 | -118.5083 | Santa Monica |
| 71 | 54-0986 L | MWD Pipeline UC | San Bernardino | I-15 | 1975 | Y | Y | N | | 4 | 20.4 | 34.110 | -117.528 | North of Ontario Mills CAN'T PINPOINT ON MAP |
| 11 | 15-0062 L | North Arbuckle UC | Colusa | I-5 | 1967 | Y | N | | | 2 | 11.9 | 39.0246 | -122.0628 | 0.5 mi North of Arbuckle over Salt Creek Dr |
| 68 | 54-0910 F | Northeast Connector OC | San Bernardino | I-10 and I-15 | 1975 | Y | Y | N | | 2 | 11 | 34.0672 | -117.5447 | 9.9 miles east of LA county line, intersection of I-10 and I-15 |
| 104 | 55-0447G | Northwest Connector OC | Orange | SR-91/SR-57 | 1969 | Y | N | N | busy connector | | 12.5 | 33.8521 | -117.8768 | Santa Ana |
| 16 | 23-0145 | Nut Tree Rd OC | Solano | I-80 | 1963 | Y | N | | | 2 | 9.8 | 38.3696 | -121.9578 | ~2 miles east of Vacaville |
| 49 | 53-1202 | Orange Ave OC | Los Angeles | I-405 | 1964 | Y | Y | Y | | 3 | 17.1 | 33.8143 | -118.1763 | Signal Hill |
| 55 | 53-2195 | Orange Grove Boulevard OC | Los Angeles | I-210 | 1973 | Y | Y | Y* | busy | 4 | 19.5 | 34.1469 | -118.1610 | Pasadena |
| 75 | 55-0459 | Orangethorpe Ave UC | Orange | SR-57 | 1969 | Y | Y | N | have CT Max. | 13 | 59.4 | 33.8705 | -117.8799 | Placentia |
| 112 | 04-0236 | Painter St | Humboldt | | 1973 | Y | Y | Y | Drilled 7/1/04 | 2-4 | 52 | 40.5032 | -124.1024 | in city of Rio Dell |
| 82 | 56-0563 | Palm Drive OC | Riverside | I-10 | 1968 | Y | N | Y? | | 13 | 59.4 | 33.8796 | -116.5038 | Palm Springs |
| 109 | 33-0250 | Patterson Slough | Fremont | Patterson Channel | 1955 | Y | Y | Y | Drilled 6/17/04 | 6-8 | 94 | 37.5837 | -122.0502 | Patterson |
| 24 | 34-0056 | Paul Ave UC | San Francisco | US-101 | 1954 | Y | Y | N | Busy location, TC req'd, permit concerns | 10 | 43.7 | 37.7236 | -122.4011 | San Francisco, US-101 south of 280 |
| 90 | 57-1080 | Rancho Santa Fe Farms OC | San Diego | SR-56 | 2002 | Y | Y | Y | | | | 32.9647 | -117.1777 | San Diego, on SR-56 between I-5 and I-15 |

| ID# | Bridge No. | Bridge Name | County | Route | Date Built | Have Plans? | Visited | Candidate for Drilling? | Comments | # of Lanes | Rdwy Width | Latitude | Longitude | Location Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 77 | 55-0959 | Redhill Ave (replace) | Orange | I-405 | 2002 | Y | Y | N | site not found | 2 | 22.2 | 33.6868 | -117.8670 | Costa Mesa, near I-405/SR-55 intersection |
| 4 | 04-0028 | Redwood Creek Bridge | Humboldt | US-101 | 1988 | Y | N | | | 2 | 12.2 | 41.2884 | -124.0581 | Northside of Orick |
| 98 | 28-0308 | Richmond Parkway OC | Contra Costa | I-80 | 1997 | N | Y | | | 7 | 34.8 | 37.9867 | -122.3145 | San Pablo/Pinole |
| 14 | 20-0235 | Rohnert Park Expressway OC | Sonoma | US-101 | 1973 | Y | Y | N | T/C req'd | 8 | 16.2 | 38.3483 | -122.7131 | Rohnert Park |
| 13 | 19-0177 | Roseville Parkway OC | Placer | I-80 | 2001 | Y | N | | | | | 38.7638 | -121.2578 | Roseville, NE of Sacramento |
| 1 | 01-0026 | Route 101/169 SEP | Del Norte | US-101 | 1965 | Y | N | | | 2 | 12.4 | 41.5231 | -124.0339 | 0.25 mi south of Klamath over SR 169 and Hoppaw Creek |
| 110 | 35-0083 | Route 101/84 SEP | San Mateo | SR-101/84 | 19XX | Y | Y | Y | Drilled 6/13/04 | 2 | 202 | 37.4892 | -122.2128 | 101/84 Interchange |
| 57 | 53-2317 | Route 134/7 SEP | Los Angeles | I-210/SR-134/I-710 | 1975 | Y | N | N | | 6 | 47.9 | 34.1497 | -118.1554 | Pasadena |
| 62 | 53-2795 G | Route 14/5 SEP & OH | Los Angeles | I-5 | 1994 | Y | Y | Y | | 3 | 15.5 | 34.3350 | -118.5084 | South of Santa Clarita |
| 61 | 53-2795 F | Route 14/5 SEP and OH | Los Angeles | I-5 | 1994 | Y | Y | Y | | 3 | 15.5 | 34.3357 | -118.5079 | South of Santa Clarita |
| 42 | 51-0329 | Route 154/US-101 SEP | Santa Barbara | US-101 | 2000 | Y | N | N | T/C not feas. | 2 | 12.1 | 34.6813 | -120.1570 | North of Beullton |
| 85 | 57-0551 G | Route 209/5 SEP | San Diego | I-5 | 1969 | Y | N | N | | 2 | 11 | 32.7548 | -117.2016 | San Diego, south of I-5/I-8 I/C-- Route 209 is AKA Rosecrans |
| 67 | 54-0764 | Route 259/30 SEP | San Bernadino | SR-30/SR-259 | 1968 | Y | N | N | T/C not feas. | | 15.5 | 34.1456 | -117.2981 | San Bernadino |
| 46 | 53-1196 | Route 405/19 SEP | Los Angeles | I-405 | 1964 | Y | Y | N | | 11 | 50.6 | 33.8056 | -118.1425 | Long Beach |
| 18 | 24-0207 L | Route 5/880 SEP | Sacramento | I-80 | 1968 | Y | N | | | 5 | 20.1 | 38.6249 | -121.5172 | Sacramento, I-80 (No longer called 880!) I-5 intersection |
| 74 | 55-0446 | Route 57/91 SEP | Orange | SR-57/SR-91 | 1969 | Y | Y | N | | 9 | 45.1 | 33.8498 | -117.858 | 0.41 of Anaheim City Park |
| 83 | 56-0656 | Route 79/15 SEP | Riverside | I-15 | 1979 | LOTB only | N | N | tiebacks @ north abut | 4 | 18.6 | 33.5224 | -117.1629 | Temecula, Winchester Road and I-15 |
| 25 | 35-0066 | Route 84/101 SEP | San Mateo | US-101 | 1998 | Y | N | | | 5 | 23.2 | 37.4889 | -122.2128 | Menlo Park, intersection of Marsh Rd and US-101 |
| 73 | 55-0217 | Route 91/250 SEP | Orange | SR-91 | 1967 | Y | Y | N | have CT Max., replace br. 55-852 | | | 33.8541 | -117.8892 | 0.25 mi west of intersection of Placentia Ave and Riverside Freeway |
| 27 | 37-0609 | Rte 87/880 SEP | Santa Clara | I-880 | 2004 | Y | Y | Y | Drilled 1/30/04 | 10 | 17 | 37.3543 | -121.91112 | San Jose, near airport |
| 31 | 42-0250 | Russell Ave OC | Fresno | I-5 | 1966 | Y | N | | | 2 | 8.5 | 36.6855 | -120.6578 | 20 miles SW of Mendota, intersection with I-5 |
| 9 | 10-0273 | Russsian River Bridge & OH | Mendocino | US-101 | 1989 | Y | N | | | 4 | 22.6 | 38.8563 | -123.0364 | just north of Sonoma-Mendocino county line on US-101 |
| 3 | 02-0002 | Sacramento River Bridge and OH | Siskiyou | I-5 | 1955 | Y | N | | | 5 | 25.3 | 41.2206 | -122.2751 | Dunsmuir, north of Redding |

| ID# | Bridge No. | Bridge Name | County | Route | Date Built | Have Plans? | Visited | Candidate for Drilling? | Comments | # of Lanes | Rdwy Width | Latitude | Longitude | Location Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 93 | 58-0325 | Sand Hills OC | Imperial | I-8 | 1989 | Y | N | Y? | site not found | 2 | 9.8 | 32.75 | -114.75 | I-8 P.M. 80.5 |
| 113 | 53-0687 | Santa Clara River (Replace) | Los Angeles | I-5 | 2004 | Y | Y | Y | Collected bulk sample. Drilled 6/5-6/04 | 6 | 23 | 34.4257 | -118.5841 | I-5 over Santa Clara River, Santa Clarita (by Magic Mountain Park) |
| 36 | 49-0153 R | Santa Margarita Creek | San Luis Obispo | US-101 | 1996 | Y | N | | | 3 | 18.1 | 35.3842 | -120.6288 | Santa Margarita, Route 58/US-101 intersection |
| 26 | 37-0006 L | Sargent Bridge and OH | Santa Clara | US-101 | 1970 | Y | N | | | 2 | 11.9 | 36.9297 | -121.5482 | 1.8 miles south of Gilroy city limits |
| 45 | 53-1102 L | Sepulveda Boulevard UC (widen) | Los Angeles | US-101 | 1959, 2000 | Y | Y | N | busy connector | 5 | 23.0 | 34.1595 | -118.4662 | Los Angeles, intersection of I-405 and UW-101 |
| 28 | 38-0104 L | Shells (Shiells) Rd UC | Stanislaus | I-5 | 1967 | Y | N | | | 2 | 11 | 37.2966 | -121.1011 | ~4 miles north of Merced/Stanislaus County line, west of Newman |
| 94 | 28-0085 | Solano Ave OC | Contra Costa | I-80 | 1997 | N | Y | | | | 15.8 | 37.9373 | -122.3259 | Richmond |
| 99 | 28-0306 | South Main Lilac RW | Contra Costa | I-680 | 1990 | N | Y | N | | | | 37.8901 | -122.0593 | Walnut Creek |
| 5 | 04-0285 | South Prairie Creek Park UC | Humboldt | US-101 | 1990 | Y | N | | | 4 | 21.3 | 41.3089 | -124.0453 | ~5 miles north of Orick |
| 84 | 56-0318 | Spruce Street OC (Replace) | Riverside | SR-91 | 2002 | Y | Y | Y | Collected bulk sample | 6 | 27.1 | 33.9910 | -117.3588 | Riverside, intersection of Spruce St and SR-91 |
| 103 | 55-0852 | State College UC | Orange | SR-91 | 1999 | Y | Y | Y | | 9 | 46.7 | 33.8552 | -117.8890 | Santa Ana |
| 105 | 51-0322 | Storke OH | Santa Barbara | SPT. R/R | 1995 | Y | N | N | has MSE walls | 5+ | | | | over SPT Co. Track |
| 41 | 51-0307 | Storke Rd OC | Santa Barbara | US-101 | 1997 | Y | N | N | | 6 | 28.6 | 34.4345 | -119.8707 | Goleta |
| 37 | 49-0240 | Tefft Street OC | San Luis Obispo | US-101 | 1996 | Y | N | | T/C req'd | 6 | 25 | 35.0368 | -120.4846 | Nipomo, South of San Luis Obispo |
| 47 | 53-1198 | Temple Ave OC | Los Angeles | I-405 | 1964 | Y | Y | Y* | T/C on city st. | 4 | 22.6 | 33.8102 | -118.1589 | Long Beach |
| 102 | 33-0264 | Thorton Ave SEP | Oakland | I-880 | 1997 | N | Y | | | | 32.5 | 37.5473 | -122.0223 | Newark |
| 107 | 55-0414 | Tustin Ave OC (Widen) | Orange | SR-91 | 2004 | Y | Y | Y | Drilled 3/6/04 | 2 | 20.8 | 33.8512 | -117.8380 | Tustin Ave over Riverside Fwy, Olive |
| 35 | 45-0067 | Utica Ave OC | Kings | I-5 | 1971 | Y | N | | | 2 | 9.8 | 35.9347 | -119.9125 | 5 miles south of Kettleman City |
| 59 | 53-2775 | Valley Circle Blvd OC | Los Angeles | US-101 | 1996 | Y | N | Y? | | 6 | 24.7 | 34.1595 | -118.6373 | Calabasas, just east of Thousand Oaks, intersection of Mulholland and US 101 |
| 91 | 57-1081 R/L | Vehicular UC | San Diego | SR-56 | 2002 | Y | N | N | | | | 32.9654 | -117.1723 | San Diego, on SR-56 between I-5 and I-15 |
| 66 | 54-0439 | Vineyard Ave OC | San Bernardino | I-10 | 1971 | Y | Y | N | | 5 | 43.2 | 34.0706 | -117.6111 | North of Ontario Airport |
| 88 | 57-0986 F | West Connector OC | San Diego | I-8 | 1991 | Y | N | | busy connector | 2 | 11 | 32.7627 | -117.1630 | University Heights, I-8/Route 163 intersection |
| 79 | 56-0004 R/L | Whitewater River Bridge (Widen) | Riverside | I-10 | 1952, 1967 | Y | N | Y*? | high fill | 4 | 20.3 | 33.9226 | -116.6356 | West of Palm Springs |

| ID# | Bridge No. | Bridge Name | County | Route | Date Built | Have Plans? | Visited | Candidate for Drilling? | Comments | # of Lanes | Rdwy Width | Latitude | Longitude | Location Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 64 | 53-86 | Woodwardia Canyon Bridge | Los Angeles | SR-2 | 1931 | Y | N | N | | 2 | 10.4 | 34.226 | -118.188 | La Canada Flintridge |

Bridge count 116 Candidate Count: 26

Notes:

*) Site proposed for Phase-2 drilling
T/C=Traffic Control
OC=Overcrossing
UC=Undercrossing
SEP=Separation
I/C=Interchange
HOV=High Occupancy Vehicle
CT=Caltrans
S/B=southbound
N/B=northbound
W/B=westbound
E/B=eastbound

# Table 2. Bridge Sites Investigated

Date: 5/31/2005 10:34:34 AM MK/EMI

| ID# | Bridge No. | Bridge Name, County | Drilled | Abut Wall Height | Borings/SPT No. | Borings/SPT Depth (ft) | Borings/SPT Setback (ft) | CPT No. | CPT Depth (ft) | CPT Setback (ft) | PMT No. | PMT Depth (ft) | PMT Setback (ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 27 | 37-0609 | Rte 87/880 SEP | Drilled 1/30/04 | 13.6 | **B-1** | 31.5 | 42.5 | **CPT-1** | 30.0 | 44.5 | | | |
| | | Santa Clara | | 12.2 | **B-2** | 31.5 | 45.0 | **CPT-2** | 30.0 | 47.0 | | | |
| 101 | 57-1078 S | Gonzalez Creek Off-Ramp | Drilled 2/7/04 | 8.0 | **04-1** | 25.5 | 2.0 | **04-1C** | 17.4 | 7.0 | | | |
| | | San Diego | | | | | | | | | | | |
| 100 | 57-1077 L | Carmel Valley Rd UC | Drilled 2/7/04. Collected bulk sample | 8.0 | **04-2** | 22.8 | 8.0 | **04-2C** | 25.0 | 8.0 | | | |
| | | San Diego | | | | | | | | | | | |
| 106 | 55-0257 | Harbor Blvd UC (Widen) | Drilled 2/28/04 | 27.3 | **04-3** | 21.5 | 13.0 | **04-3C** | 15.0 | 13.0 | | | |
| | | Orange | | 10.0 | **04-4** | 21.5 | 2.0 | **04-4C** | 20.0 | 3.7 | | | |
| | | | | 27.3 | | | | **04-5C** | 20.0 | 5.0 | | | |
| 107 | 55-0414 | Tustin Ave OC (Widen) | Drilled 3/6/04 | 20.3 | **04-6** | 21.5 | 5.5 | **04-6C** | 20.0 | 16.0 | | | |
| | | Orange | | 25.4 | **04-7** | 21.5 | 6.5 | **04-7C** | 20.0 | 16.0 | | | |
| | | | | 25.4 | **04-8** | 11.5 | 18.0 | | | | | | |
| 108 | 53-1353 | Coldwater Canyon | Drilled 4/19/04 | | **04-9** | 16.5 | 5.0 | **04-9C** | 14.3 | 5.0 | **04-9P** | 7.5 | 5.0 |
| | | Los Angeles | | | | | | | | | **04-9P** | 12.5 | 5.0 |
| | | | | | **04-10** | 16.5 | 5.0 | **04-10C** | 14.9 | 5.0 | **04-10P** | 10.0 | 5.0 |
| 109 | 33-0250 | Patterson Slough | Drilled 6/17/04 | 5.5 | **04-11A** | 21.5 | 3.0 | **04-11C** | 20.0 | 3.0 | **04-11P** | 5.0 | 3.0 |
| | | Fremont | | 5.5 | **04-12A** | 21.5 | 3.0 | **04-11C** | 20.0 | 3.0 | **04-12P** | 5.0 | 3.0 |
| 110 | 35-0083 | Route 101/84 SEP | Drilled 6/13/04 | | **04-14A** | 21.5 | 6.0 | **04-14C** | 28.0 | | **04-14P** | 7.5 | 6.0 |
| | | San Mateo | | | **04-13A** | 21.5 | 9.0 | **04-13C** | 20.0 | | **04-13P** | 7.5 | 9.0 |

| ID# | Bridge No. | Bridge Name, County | Drilled | Abut Wall Height | Borings/SPT No. | Borings/SPT Depth (ft) | Borings/SPT Setback (ft) | CPT No. | CPT Depth (ft) | CPT Setback (ft) | PMT No. | PMT Depth (ft) | PMT Setback (ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 112 | 04-0236 | Painter St | Drilled 7/1/04 | 12.3 | **04-15A** | 15.5 | 5.0 | **04-15C** | 14.0 | 4.0 | **04-15P** | 8.0 | 5.0 |
| | | Humboldt | | 11.5 | **04-16A** | 14.0 | 4.0 | **04-15D** | 9.5 | 5.0 | **04-16P** | 12.5 | 2.0 |
| | | | | 12.3 | | | | **04-16C** | 12.5 | 5.0 | | | |
| 111 | 58-0215 | Meloland Rd OC | Drilled 8/20/04 | 13.0 | **04-17A** | 21.5 | 3.0 | **04-17C** | 30.0 | 3.0 | **04-17P** | 11.0 | 3.0 |
| | | Imperial | | 13.0 | **04-18A** | 21.5 | 2.5 | **04-18C** | 4.0 | 3.0 | **04-18P** | 7.5 | 2.5 |
| | | | | | | | | | | | **04-18P** | 11.5 | 2.5 |
| 114 | 51-0234 | Beckstead OC | Collected bulk sample | | **04-19** | 3.0 | | | | | | | |
| | | Santa Barbara | | | | | | | | | | | |
| 84 | 56-0318 | Spruce Street OC (Replace) | Collected bulk sample | | **04-20** | 3.0 | | | | | | | |
| | | Riverside | | | | | | | | | | | |
| 81 | 56-0390 | Jackson St OC (Replace) | Bulk sample collected | | **04-21** | 3.0 | | | | | | | |
| | | Riverside | | | | | | | | | | | |
| 113 | 53-0687 | Santa Clara River (Replace) | Collected bulk sample. Drilled 6/5-6/04 | | **04-22** | 3.0 | | | | | | | |
| | | Los Angeles | | | **04-23** | 25.0 | 3.0 | **04-23C** | 25.0 | 5.0 | **04-23P** | 5.5 | 4.0 |
| | | | | | **04-24** | 25.0 | 5.0 | **04-24C** | 25.0 | 7.0 | **04-24P** | 7.5 | 4.0 |
| 116 | 42-0398 | Maple Ave UC | Collected bulk sample | | **04-25** | 10.0 | | | | | | | |
| | | Fresno | | | | | | | | | | | |

**Total Count of Bridges Selected: 15** **Total Counts:** **26 Boreholes** **22 CPT's** **14 PMT's**

*) Depth is in ft below existig grade. Setback is distance in ft behind back face of abutment wall

**Table 3 SUMMARY OF SOIL LABORATORY TEST RESULTS**
**CT-UCSD/ABUTMENT RESEARCH PROGRAM**

| Bridge | County | Boring No. | Sample No. | Depth | Soil Type | SPT Blow-count | Moist. Content | Dry Density | Void Ratio | Poro-sity | Grain Size Distribution | | | | Atterberg Limits | | | | Sand Equi-valent | Expan-sion Index | Com-paction | | Unconsolidated Undrained Triaxial | | | | Direct Shear | | | | PMT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | $N_{SPT}$ | w | $\rho_d$ | e | n | Gravel | Sand | Fines | sand size | LL | PL | PI | plast. | SE | EI | $\rho_{d,max}$ | $w_{opt}$ | $\rho_d$ | $\sigma_c$ | $\phi$ | c | $\phi_{peak}$ | $c_{peak}$ | $\phi_{res}$ | $c_{res}$ | Depth |
| | | | | (ft) | (USCS) | (bpf) | (%) | (pcf) | (-) | (%) | (%) | (%) | (%) | (-) | (%) | (%) | (%) | (-) | (-) | (-) | (pcf) | (%) | (pcf) | (ksf) | (deg) | (ksf) | (deg) | (ksf) | (deg) | (ksf) | (ft) |
| Route 87/880 SEP | Santa Clara | B-1 | B-0 | 0-5 | SM | | | | | | | | | | | | | | | 1 | | | | | | | | | | | |
| | | | D-1 | 2.50 | SM | 88 | 6.0 | 123.9 | 0.36 | 26.46 | 25 | 55 | 20 | coarse | | | | low | | | | | | | | | | | | | |
| | | | S-2 | 5.00 | SM | 47 | 5.8 | | | | 30 | 50 | 20 | coarse | | | | n-l | | | | | | | | | | | | | |
| | | | D-3 | 7.50 | SM w/ Gr | 65 | 4.4 | 109.7 | 0.54 | 34.89 | 25 | 55 | 20 | coarse | | | | none | | | | | | | | | 48.8 | 0.17 | 45.8 | 0.06 | |
| | | | S-4 | 10.00 | Cl-ML | 28 | 17.7 | | | | 0 | 30 | 70 | medium | | | | l-m | | | | | | | | | | | | | |
| | | | D-5 | 20.00 | CH | 32 | 29.7 | | | | 0 | 10 | 90 | fine | 62 | 24 | 38 | high | | | | | | | | | | | | | |
| | | | S-6A | 25.00 | CL | | 30.4 | 88.3 | 0.91 | 47.59 | 0 | 10 | 90 | fine | | | | med. | | | | | | | | | | | | | |
| | | | S-6B | 25.50 | ML | 17 | 21.4 | | | | 0 | 30 | 70 | medium | | | | low | | | | | | | | | | | | | |
| | | | D-7 | 30.00 | CL | 27 | 28.2 | 92.3 | 0.83 | 45.22 | 0 | 20 | 80 | fine | | | | med. | | | | | | | | | | | | | |
| | | B-2 | B-0 | 0-5 | ML w/ Gr | | 11.6 | | | | | | | coarse | | | | | | | | | | | | | | | | | |
| | | | S-1A | 1.00 | Sa. CL | 91 | 16.1 | | | | | | | coarse | | | | | | | | | | | | | | | | | |
| | | | S-1 | 2.50 | Sa. CL | 47 | 11.6 | | | | | | | coarse | | | | low | | | | | | | | | | | | | |
| | | | D-2 | 5.00 | Sa. CL | 35 | 16.1 | 104.1 | 0.62 | 38.21 | | | | medium | | | | m-h | | | | | 115.1 | 0.57 | 0.0 | 2.80 | | | | | |
| | | | S-3 | 7.50 | CL-CH | 21 | 24.6 | | | | 50 | 22 | 28 | medium | 50 | 22 | 28 | m-h | | 77 | | | | | | | | | | | |
| | | | D-4 | 10.00 | Sa. CL w/ Gr | 34 | 14.4 | 111.8 | 0.51 | 33.64 | | | | coarse | | | | m-h | | | | | 111.6 | 1.28 | 0.0 | 3.40 | | | | | |
| | | | S-5 | 20.00 | Sa. CH | 31 | 31.9 | | | | 65 | 29 | 36 | fine | 65 | 29 | 36 | high | | | | | | | | | | | | | |
| | | | D-6 | 25.00 | Sa. CL | 50 | 29.2 | 92.5 | 0.82 | 45.10 | | | | fine | | | | med. | | | | | | | | | | | | | |
| | | | S-7 | 30.00 | Sa. CL | 22 | 19.4 | | | | | | | fine | | | | med. | | | | | | | | | | | | | |
| Gonzalez Creek Br | San Diego | 04-1 | B-0 | 0-5 | SM/ML w/ Gr | | | | | | 28 | 57 | 15 | | | | | | 37 | 0 | 127.0 | 8.0 | 120.7 | 0.72/1.03/1.54 | 34.7 | 0.25 | | | | | |
| | | | D-1A | 2.50 | SM/ML | | 15.9 | 105.2 | 0.60 | 37.56 | 0 | 50 | 50 | fine | | | | | 6 | | | | | | | | | | | | |
| | | | D-1B | 3.00 | SM/ML | 65 | 15.2 | 114.3 | 0.47 | 32.16 | 0 | 50 | 50 | medium | | | | low | | | | | | | | | | | | | |
| | | | D-2A | 5.00 | SM/ML | | 14.7 | 101.3 | 0.66 | 39.87 | 0 | 50 | 50 | medium | | | | low | | | | | | | | | | | | | |
| | | | D-2B | 6.00 | SM/ML | 70 | 14.2 | 115.2 | 0.46 | 31.62 | 0 | 50 | 50 | medium | | | | low | | | | | | | | | | | | | |
| | | | S-3 | 6.50 | SM/ML | 33 | 12.3 | | | | 0 | 50 | 50 | medium | | | | low | | | | | | | | | | | | | |
| | | | D-4A | 8.50 | SM/ML | | 12.3 | 114.3 | 0.47 | 32.16 | 0 | 50 | 50 | medium | | | | low | | | | | 115.7 | 1.14/2.3/4.6 | 24.1 | 3.50 | | | | | |
| | | | D-4B | 9.00 | SC/CL | 44 | 14.4 | 112.9 | 0.49 | 32.99 | 0 | 50 | 50 | medium | | | | l-m | | | | | 115.7 | 1.14/2.3/4.6 | 22.5 | 6.00 | | | | | |
| | | | D-5A | 10.00 | SC/CL | | 17.4 | 108.2 | 0.56 | 35.78 | 0 | 56 | 44 | medium | | | | low | | | | | | | | | | | | | |
| | | | D-5B | 10.50 | SC/CL | 68 | 15.0 | 113.9 | 0.48 | 32.40 | 0 | 50 | 50 | medium | | | | low | | | | | | | | | | | | | |
| | | | S-6 | 11.50 | SM/ML | 29 | 12.6 | | | | 0 | 50 | 50 | medium | | | | low | | | | | | | | | | | | | |
| | | | D-7A | 15.00 | SM/ML/CL | | 11.2 | 111.9 | 0.51 | 33.58 | 0 | 65 | 35 | medium | | | | low | | 16 | | | | | | | | | | | |
| | | | D-7B | 16.00 | SM/ML/CL | 48 | 11.7 | 117.0 | 0.44 | 30.56 | 0 | 65 | 35 | medium | | | | low | | | | | | | | | | | | | |
| | | | D-8 | 17.50 | SM | 50/3" | | | | | | | | medium | | | | | | | | | | | | | | | | | |
| | | | S-9 | 19.00 | SM | 44 | | | | | | | | medium | | | | | | | | | | | | | | | | | |
| | | | D-10 | 22.00 | SC/CL | 42 | 9.2 | 115.0 | 0.47 | 31.74 | 0 | 50 | 50 | medium | | | | med. | | | | | | | | | | | | | |
| | | | S-11 | 25.00 | SM | 58 | 10.8 | | | | 0 | 65 | 35 | medium | | | | low | | | | | | | | | | | | | |
| Carmel Valley Rd UC | | 04-2 | B-0 | 0-5 | SM w/ Gr | | | | | | 22 | 56 | 22 | | | | | | 17 | 4 | | | | | | | | | | | |
| | | | D-1A | 3.00 | SM w/ Gr | | 7.6 | 124.8 | 0.35 | 25.93 | 5 | 70 | 25 | coarse | | | | none | | | | | | | | | | | | | |
| | | | D-1B | 3.50 | SM w/ Gr | 61 | 7.1 | 124.8 | 0.35 | 25.93 | 5 | 70 | 25 | coarse | | | | none | | | | | | | | | | | | | |
| | | | D-2A | 5.50 | SM w/ Gr | | 8.0 | 125.4 | 0.34 | 25.57 | 10 | 65 | 25 | coarse | | | | none | | | | | | | | | | | | | |
| | | | D-2B | 6.00 | SM w/ Gr | 63 | 8.6 | 120.5 | 0.40 | 28.48 | 10 | 65 | 25 | coarse | | | | none | | | | | | | | | | | | | |
| | | | S-3 | 7.00 | SM w/ Gr | 30 | 9.1 | 129.2 | 0.30 | 23.31 | 0 | 65 | 35 | coarse | | | | low | | | | | | | | | | | | | |
| | | | D-4 | 9.50 | SM w/ Gr | 47 | 5.6 | | | | 10 | 65 | 25 | coarse | | | | none | | | | | | | | | 39.4 | 0.46 | 34.6 | 0.33 | |
| | | | D-5A | 13.00 | SM w/ Gr | | 7.1 | 109.0 | 0.55 | 35.30 | 10 | 65 | 25 | coarse | | | | none | | | | | | | | | | | | | |
| | | | D-5B | 13.50 | SM w/ Gr | 14 | 6.2 | 110.0 | 0.53 | 34.71 | 10 | 65 | 25 | coarse | | | | none | | | | | | | | | | | | | |
| | | | S-6 | 14.00 | SM w/ Gr | 6 | 10.8 | 92.1 | 0.83 | 45.33 | 10 | 65 | 25 | coarse | | | | none | | | | | | | | | | | | | |
| | | | D-7A | 18.00 | SM w/ Gr | 27 | 9.2 | 125.2 | 0.35 | 25.69 | 10 | 65 | 25 | coarse | | | | none | | | | | | | | | | | | | |
| | | | D-7B | 18.50 | SC-SM | 50/3" | 9.0 | 124.2 | 0.36 | 26.28 | 10 | 60 | 40 | coarse | | | | none | | | | | | | | | | | | | |
| | | | S-8 | 20.00 | SM | 67 | 5.9 | | | | 0 | 65 | 35 | medium | | | | low | | | | | | | | | | | | | |
| | | | D-9 | 21.50 | SM/CL | 50/3" | 5.7 | 109.9 | 0.53 | 34.77 | 0 | 30 | 70 | medium | | | | l-m | | | | | | | | | | | | | |



Table 3 (Cont'd)

| Bridge | County | Boring No. | Sample No. | Depth | Soil Type | SPT Blow-count | Moist. Content | Dry Density | Void Ratio | Poro-sity | Grain Size Distribution | | | | Atterberg Limits | | | | Sand Equi-valent | Expan-sion Index | Com-paction | | Unconsolidated Undrained Triaxial | | | | Direct Shear | | | | PMT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | $N_{SPT}$ | w | $\rho_d$ | e | n | Gravel | Sand | Fines | sand size | LL | PL | PI | plast. | SE | EI | $\rho_{d,max}$ | $w_{opt}$ | $\rho_d$ | $\sigma_c$ | $\phi$ | c | $\phi_{peak}$ | $c_{peak}$ | $\phi_{res}$ | $c_{res}$ | Depth |
| | | | | (ft) | (USCS) | (bpf) | (%) | (pcf) | (-) | (%) | (%) | (%) | (%) | (-) | (%) | (%) | (%) | (-) | (-) | (-) | (pcf) | (%) | (pcf) | (ksf) | (deg) | (ksf) | (deg) | (ksf) | (deg) | (ksf) | (ft) |
| Harbor Blvd On-Ramp | Orange | 04-3 | B-0 | 0-1.5 | SM w/ Gr | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | D-1A | 2.50 | SM w/ Gr | | 8.4 | 118.1 | 0.43 | 29.90 | 15 | 60 | 25 | coarse | | | | none | | | | | | | | | | | | | |
| | | | D-1B | 3.00 | SC | 25 | 5.0 | 114.9 | 0.47 | 31.80 | 10 | 60 | 30 | coarse | | | | none | | | | | | | | | | | | | |
| | | | D-2A | 5.00 | SM w/ Gr | 14 | 14.4 | 106.5 | 0.58 | 36.79 | 5 | 60 | 35 | coarse | | | | low | | | | | 115.7 | 0.42/0.86/1.72 | 28.1 | 1.44 | | | | | |
| | | | D-2B | 5.50 | SM w/ Gr & CL | | 14.0 | 108.7 | 0.55 | 35.48 | 8 | 72 | 20 | fine-co. | 22 | 18 | 4 | n-l | 8 | 60 | | | | | | | 32.3 | 0.85 | 44.4 | 0.03 | |
| | | | D-3A | 7.00 | SM w/ Gr & CL | | 8.5 | 97.0 | 0.74 | 42.43 | 5 | 70 | 25 | coarse | | | | | | | | | | | | | | | | | |
| | | | D-3B | 7.50 | SM w/ Gr | 9 | 7.8 | 104.7 | 0.61 | 37.86 | 5 | 70 | 25 | coarse | | | | none | | | | | 115.0 | 1.08/2.14/4.31 | 33.2 | 0.67 | | | | | |
| | | | D-4A | 10.00 | SM w/ Gr | | 8.0 | 108.4 | 0.55 | 35.66 | 0 | 70 | 30 | medium | | | | none | | | | | | | | | | | | | |
| | | | D-4B | 10.50 | SM | 20 | 6.4 | 101.3 | 0.66 | 39.87 | 10 | 65 | 25 | coarse | | | | none | | | | | | | | | | | | | |
| | | | D-5A | 12.50 | SM w/ Gr | | 9.1 | 98.9 | 0.70 | 41.30 | 5 | 70 | 25 | fine | | | | none | | | | | | | | | | | | | |
| | | | D-5B | 13.00 | SM w/ Gr | 35 | 8.3 | 106.5 | 0.58 | 36.79 | 0 | 70 | 30 | fine | | | | none | | | | | | | | | | | | | |
| | | | D-6 | 20.00 | SM | 16 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 04-4 | D-1A | 2.50 | SP w/ ML & Gr | | 6.2 | 110.2 | 0.53 | 34.59 | 5 | 80 | 15 | | | | | | | | | | | | | | | | | | |
| | | | D-1B | 3.00 | SP w/ ML & Gr | 20 | 10.1 | 113.9 | 0.48 | 32.40 | 5 | 80 | 15 | coarse | | | | none | | | | | | | | | | | | | |
| | | | D-2A | 5.00 | SP w/ ML & Gr | | 6.4 | 120.1 | 0.40 | 28.72 | 5 | 80 | 15 | coarse | | | | none | | | | | | | | | | | | | |
| | | | D-2B | 5.50 | SP w/ ML & Gr | 54 | 6.0 | 119.7 | 0.41 | 28.95 | 10 | 75 | 15 | coarse | | | | none | 37 | 7 | | | | | | | 45.4 | 0.30 | 34.8 | 0.26 | |
| | | | D-3A | 7.50 | SP w/ ML & Gr | | 7.7 | 119.5 | 0.41 | 29.07 | 6 | 82 | 12 | coarse | | | | none | | | | | | | | | | | | | |
| | | | D-3B | 8.00 | SP w/ ML & Gr | 29 | 7.7 | 116.4 | 0.45 | 30.91 | 5 | 80 | 15 | fine-co. | | | | n-l | | | | | | | | | | | | | |
| | | | D-4A | 10.00 | SM | | 17.1 | 101.5 | 0.66 | 39.76 | 0 | 70 | 30 | coarse | | | | none | | | | | | | | | | | | | |
| | | | D-4B | 10.50 | SP w/ ML & Gr | 27 | 17.5 | 104.6 | 0.61 | 37.92 | 0 | 70 | 30 | medium | | | | none | | | | | | | | | | | | | |
| | | | D-5A | 12.50 | SP w/ ML & Gr | | 16.1 | 103.1 | 0.63 | 38.81 | 0 | 70 | 30 | medium | | | | none | | | | | | | | | | | | | |
| | | | D-5B | 13.00 | SP w/ ML & Gr | 35 | 15.4 | 106.1 | 0.59 | 37.03 | 0 | 70 | 30 | medium | | | | none | | | | | | | | | | | | | |
| | | | D-6 | 20.00 | SP w/ ML & Gr | 20 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Tustin Ave Br | Orange | 04-6 | B-0 | 0-2.5 | SM w/ Gr | | | | | | 26 | 61 | 13 | coarse | | | | | | | | | | | | | | | | | |
| | | | D-1 | 2.50 | SM w/ Gr | 29 | 9.8 | 117.8 | 0.43 | 30.08 | 10 | 70 | 20 | coarse | | | | none | | | | | | | | | | | | | |
| | | | D-2 | 5.00 | SC | 20 | | | | | 8 | 54 | 38 | coarse | | | | | 11 | | | | 118.8 | 0.71/1.43/2.87 | 24.5 | 1.30 | | | | | |
| | | | D-3 | 7.50 | SM w/ Gr | 20 | 11.5 | 117.1 | 0.44 | 30.50 | 10 | 60 | 30 | coarse | | | | low | | | | | | | | | | | | | |
| | | | D-4 | 10.00 | SM w/ Gr | 32 | 8.3 | 121.6 | 0.39 | 27.83 | 10 | 60 | 30 | coarse | | | | low | | | | | | | | | | | | | |
| | | | D-5 | 12.50 | CL | 16 | 16.3 | 111.5 | 0.51 | 33.82 | 0 | 25 | 75 | coarse | | | | med. | | | | | | | | | | | | | |
| | | | D-6 | 15.00 | CL w/ SP & Gr | 19 | 9.8 | 108.3 | 0.56 | 35.72 | 5 | 75 | 20 | coarse | | | | med. | | | | | | | | | | | | | |
| | | | D-7 | 20.00 | SM w/ Gr | 22 | 7.3 | 125.2 | 0.35 | 25.69 | 5 | 60 | 35 | coarse | | | | low | | | | | | | | | | | | | |
| | | 04-7 | B-0 | 0.00 | SM/SC w/ Gr | | 7.6 | | | | 10 | 60 | 30 | coarse | | | | n-l | | | 133.0 | 8.0 | 126.4 | | | | | | | | |
| | | | D-1 | 2.50 | SC w/ Gr | 16 | 8.5 | 128.9 | 0.31 | 23.49 | 10 | 60 | 30 | coarse | | | | low | | | | | | | | | | | | | |
| | | | D-2 | 5.00 | SC w/ Gr | 10 | 8.9 | 121.7 | 0.38 | 27.77 | 10 | 60 | 30 | coarse | | | | low | | | | | | | | | | | | | |
| | | | D-3 | 7.50 | SM w/ Gr | 16 | 7.3 | 115.8 | 0.45 | 31.27 | 10 | 60 | 30 | coarse | | | | none | | | | | | | | | | | | | |
| | | | D-4 | 10.00 | SM w/ Gr | 29 | 6.9 | 122.3 | 0.38 | 27.41 | 10 | 60 | 30 | coarse | | | | none | | | | | | | | | | | | | |
| | | | D-5 | 12.50 | SM w/ Gr | 9 | 9.7 | 105.2 | 0.60 | 37.56 | 10 | 60 | 30 | coarse | | | | none | | | | | | | | | | | | | |
| | | | D-6 | 15.00 | SM w/ Gr | 13 | 8.1 | 99.4 | 0.69 | 41.00 | 10 | 60 | 30 | coarse | | | | none | | | | | | | | | | | | | |
| | | | D-7 | 20.00 | SM w/ Gr | 20 | 4.5 | 108.1 | 0.56 | 35.84 | 10 | 60 | 30 | coarse | | | | none | | | | | | | | | | | | | |
| | | 04-8 | D-1 | 5.00 | SM w/ Gr | 25 | 10.2 | 123.7 | 0.36 | 26.58 | 10 | 60 | 30 | coarse | | | | low | | | | | | | | | | | | | |
| | | | D-2 | 10.00 | SM w/ Gr | 63 | 9.0 | 123.2 | 0.37 | 26.88 | 10 | 60 | 30 | coarse | | | | low | | | | | | | | | | | | | |
| Coldwater Canyon | Los Angeles | 04-9 | B-0 | 0-5 | SM w/ Gr | | 8.5 | | | | 17 | 70 | 13 | coarse | | | | none | 26 | 1 | 123.0 | 10.0 | 116.9 | | | | | | | | |
| | | | D-1 | 5.00 | SP-SM w/ Gr | 31 | 4.7 | 118.8 | 0.42 | 29.49 | 15 | 70 | 15 | coarse | | | | none | | | | | | | | | | | | | 7.5 |
| | | | D-2 | 10.00 | SP w/ Gr | 19 | 3.5 | 118.8 | 0.42 | 29.49 | 15 | 80 | 5 | coarse | | | | none | | | | | | | | | | | | | 12.5 |
| | | | D-3 | 15.00 | SP w/ Gr | 10 | 4.1 | 110.2 | 0.53 | 34.59 | 10 | 85 | 5 | coarse | | | | none | | | | | | | | | | | | | |
| | | 04-10 | B-0 | 0.00 | SP-SM w/ Gr | | 6.2 | | | | 10 | 75 | 15 | coarse | | | | none | | | | | | | | | | | | | |
| | | | D-1 | 5.00 | SP-SM w/ Gr | 23 | 10.9 | 108.3 | 0.56 | 35.72 | 10 | 75 | 15 | coarse | | | | none | | | | | | | | | | | | | |
| | | | D-2 | 7.50 | SP-SM w/ Gr | 18 | 5.4 | 116.7 | 0.44 | 30.73 | 15 | 70 | 15 | coarse | | | | none | | | | | | | | | | | | | |
| | | | D-3 | 12.50 | SP w/ Gr | 18 | 9.0 | 107.6 | 0.57 | 36.13 | 15 | 80 | 5 | coarse | | | | none | | | | | | | | | | | | | 7.5 |
| | | | D-4-1 | 15.00 | CL | | 22.3 | 93.9 | 0.79 | 44.27 | | | | fine | 43 | 24 | 19 | med. | | | | | 105.9 | 1.88/3.74/7.48 | 17.3 | 2.13 | | | | | |
| | | | D-4-2 | 16.00 | CL | 24 | | | | | | | | fine | | | | med. | | | | | | | | | | | | | |

Table 3 (Cont'd)

| Bridge | County | Boring No. | Sample No. | Depth | Soil Type | SPT Blow-count | Moist. Content | Dry Density | Void Ratio | Poro-sity | Grain Size Distribution | | | | Atterberg Limits | | | | Sand Equi-valent | Expan-sion Index | Com-paction | | Unconsolidated Undrained Triaxial | | | | Direct Shear | | | | PMT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | $N_{SPT}$ | w | $\rho_d$ | e | n | Gravel | Sand | Fines | sand size | LL | PL | PI | plast. | SE | EI | $\rho_{d,max}$ | $w_{opt}$ | $\rho_d$ | $\sigma_c$ | $\phi$ | c | $\phi_{peak}$ | $c_{peak}$ | $\phi_{res}$ | $c_{res}$ | Depth |
| | | | | (ft) | (USCS) | (bpf) | (%) | (pcf) | (-) | (%) | (%) | (%) | (%) | (-) | (%) | (%) | (%) | (-) | (-) | (-) | (pcf) | (%) | (pcf) | (ksf) | (deg) | (ksf) | (deg) | (ksf) | (deg) | (ksf) | (ft) |
| Patterson Slough | Alameda | 04-11A | B-0 | 0-5 | ML/CL | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | D-1 | 8.00 | ML/CL | 18 | | | | | | | | | | | | | | | | | 120.7 | 1.08/2.15/4.32 | 6.9 | 0.92 | | | | | |
| | | | S-2 | 10.00 | Sa. CL | 12 | 15.5 | | | | 0 | 30 | 70 | fine | 28 | 16 | 12 | med. | | | | | | | | | | | | | |
| | | | D-3 | 12.50 | ML/CL | 23 | | | | | | | | fine | | | | | | | | | 121.8 | 1.73/3.46/6.91 | 15.2 | 4.34 | | | | | |
| | | | S-4 | 15.00 | Sa. CL | 32 | 15.7 | | | | 0 | 15 | 85 | fine | 37 | 17 | 20 | med. | | | | | | | | | | | | | |
| | | | D-5 | 20.00 | Sa. CL | 19 | 18.7 | 107.7 | 0.56 | 36.08 | 0 | 35 | 65 | fine | | | | l-m | | | | | | | | | | | | | |
| | | 04-12A | B-0 | 0-5 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | D-1 | 2.50 | SM w/ Gr | 26 | 5.1 | 125.9 | 0.34 | 25.27 | 20 | 50 | 25 | coarse | | | | none | | | | | | | | | | | | | |
| | | | D-2 | 5.00 | Sa. CL w/ Gr | 30 | 10.7 | 120.8 | 0.39 | 28.30 | 10 | 30 | 60 | coarse | | | | low | | | | | | | | | | | | | 5.0 |
| | | | S-3 | 7.50 | Sa. CL | 15 | 15.4 | | | | 0 | 25 | 75 | fine | | | | med. | | | | | | | | | | | | | |
| | | | D-4 | 10.00 | Sa. CL | 32 | 19.2 | 115.8 | 0.45 | 31.27 | 0 | 30 | 70 | fine | | | | l-m | | | | | | | | | | | | | 11.0 |
| | | | S-5 | 12.50 | SM w/ SP | 32 | 18.3 | | | | 0 | 25 | 75 | fine | 38 | 26 | 12 | med. | | | | | | | | | | | | | |
| | | | D-6 | 15.00 | Sa. CL | 45 | 15.7 | 107.6 | 0.57 | 36.13 | 0 | 30 | 70 | fine | | | | med. | | | | | | | | | | | | | |
| | | | S-7 | 20.00 | Sa. CL | 19 | 21.0 | | | | 0 | 30 | 70 | fine | | | | med. | | | | | | | | | | | | | |
| Route 10/84 SEP | San Mateo | 04-13A | B-0 | 0- | Sa. CL w/ Gr | | 11.8 | | | | | | | coarse | | | | med. | 9 | | | | | | | | | | | | |
| | | | D-1 | 2.50 | SP | 19 | 21.0 | 95.7 | 0.76 | 43.20 | 0 | 95 | 5 | medium | | | | none | | | | | | | | | | | | | |
| | | | S-2 | 5.00 | SM w/ Gr | | | | | | 10 | 70 | 20 | coarse | | | | none | | | | | | | | | | | | | |
| | | | D-3 | 7.50 | SP | 10 | 5.8 | 89.8 | 0.88 | 46.70 | 0 | 95 | 5 | medium | | | | none | | | | | | | | | | | | | 7.5 |
| | | | S-4 | 10.00 | SP | 2 | 7.3 | | | | 0 | 95 | 5 | medium | | | | none | | | | | | | | | | | | | |
| | | | D-5 | 12.50 | SP-SM | 10 | 7.2 | 95.2 | 0.77 | 43.49 | 0 | 90 | 10 | medium | | | | none | | | | | | | | | | | | | |
| | | | D-6 | 15.00 | SP-SM | 11 | 7.9 | | | | 0 | 90 | 10 | medium | | | | none | | | | | | | | | | | | | |
| | | | S-7 | 18.50 | CL | | 8.1 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | D-8 | 20.00 | Sa. CL w/ Gr | 27 | 7.6 | 125.9 | 0.34 | 25.27 | 10 | 25 | 65 | coarse | | | | med. | | | | | | | | | | | | | |
| | | | S-9 | 25.00 | SC w/ Gr | 37 | 11.0 | | | | | | | coarse | | | | l-m | | | | | | | | | | | | | |
| | | | D-10 | 30.00 | CL-CH | 39 | 28.2 | 94.6 | 0.78 | 43.85 | | | | fine | | | | m-h | | | | | | | | | | | | | |
| | | 04-14A | D-1 | 2.50 | SC w/ Gr | 45 | 6.7 | 124.1 | 0.36 | 26.34 | 20 | 55 | 25 | coarse | | | | low | | | | | | | | | | | | | |
| | | | D-2 | 7.50 | SC-SM | 22 | 10.0 | 114.4 | 0.47 | 32.10 | 10 | 60 | 30 | coarse | | | | low | | | | | | | | | | | | | 7.5 |
| | | | D-3 | 10.00 | SC w/ Gr | | 7.3 | | | | 5 | 60 | 35 | coarse | 29 | 15 | 14 | low | | | | | 125.1 | 1.37/2.73/5.47 | 22.8 | 1.28 | | | | | |
| | | | S-4 | 12.50 | Sa. CL | 26 | 8.6 | | | | 0 | 35 | 65 | coarse | | | | l-m | | | | | | | | | | | | | |
| | | | D-5 | 15.00 | Sa. CL/SC w/ Gr | 36 | 10.0 | 115.0 | 0.47 | 31.74 | 20 | 40 | 40 | coarse | | | | low | | | | | | | | | | | | | |
| | | | S-6 | 20.00 | SM w/ Gr | 24 | 16.4 | | | | 0 | 65 | 35 | fine | | | | low | | | | | | | | | | | | | |
| Painter St | Humboldt | 04-15A | B-0 | 0.00 | GW-GM | | 2.2 | | | | 59 | 35 | 6 | coarse | | | | none | 43 | | | | | | | | | | | | |
| | | | S-1 | 2.50 | SP w/ Gr | 59 | 3.1 | | | | 25 | 70 | 5 | coarse | | | | none | | | | | | | | | | | | | |
| | | | S-2B | 5.00 | SP w/ Gr | 47 | 3.9 | | | | 25 | 70 | 5 | coarse | | | | none | | | | | 129.5 | 0.87/1.01/1.3 | 43.3 | 0.13 | | | | | |
| | | | B-3A | 7.00 | SP w/ CL | | 4.5 | | | | | | | coarse | | | | none | | | | | | | | | | | | | |
| | | | Comp. | 2.5-7 | SP | | | | | | | | | | | | | | | | | | 129.5 | 1.00 | NA | NA | | | | | |
| | | | D-3B | 7.50 | Sa. CL | 32 | 19.9 | | | | 3 | 35 | 62 | coarse | 34 | 19 | 15 | low | | | | | 115.7 | 1.0/2.01/4.02 | 11.5 | 3.90 | | | | | 8.0 |
| | | | S-4 | 10.00 | CL w/ Sa. | 16 | 16.4 | | | | | | | medium | | | | med. | | | | | | | | | | | | | |
| | | | D-5 | 12.50 | CL w/ Sa. | 18 | 21.0 | 116.2 | 0.45 | 31.03 | | | | coarse | | | | med. | | | | | 116.2 | 1.07 | 0.0 | 7.75 | | | | | |
| | | | S-6 | 14.00 | ML | 20 | | | | | | | | medium | | | | med. | | | | | | | | | | | | | |
| | | 04-16A | B-0 | 0.00 | SP | | 2.2 | | | | 35 | 60 | 5 | coarse | | | | none | | | | | | | | | | | | | |
| | | | S-1 | 2..5 | SP | 63 | 4.2 | | | | 25 | 70 | 5 | coarse | | | | none | | | | | | | | | | | | | |
| | | | D-2 | 5.00 | SP | 90 | 4.1 | 124.5 | 0.35 | 26.10 | 20 | 75 | 5 | coarse | | | | none | | | | | | | | | | | | | |
| | | | S-3A | 7.50 | CL | | 19.6 | | | | 0 | 20 | 80 | fine | | | | med. | | | | | | | | | | | | | |
| | | | S-3B | 7.50 | SP | 11 | 5.8 | | | | 10 | 85 | 5 | coarse | | | | none | | | | | | | | | | | | | |
| | | | D-4 | 10.00 | CL w/ ML | 19 | 28.9 | 90.2 | 0.87 | 46.46 | 0 | 25 | 75 | fine | 42 | 27 | 15 | med. | | | | | 115.2 | 1.3/2.59/5.46 | 7.1 | 3.30 | | | | | |
| | | | S-5 | 12.50 | CL | 19 | 21.2 | | | | 0 | 25 | 75 | fine | | | | med. | | | | | | | | | | | | | 12.5 |

Table 3 (Cont'd)

| Bridge | County | Boring No. | Sample No. | Depth | Soil Type | SPT Blow-count | Moist. Content | Dry Density | Void Ratio | Poro-sity | Grain Size Distribution | | | | Atterberg Limits | | | | Sand Equi-valent | Expan-sion Index | Com-paction | | Unconsolidated Undrained Triaxial | | | | Direct Shear | | | | PMT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | $N_{SPT}$ | w | $\rho_d$ | e | n | Gravel | Sand | Fines | sand size | LL | PL | PI | plast. | SE | EI | $\rho_{d,max}$ | $w_{opt}$ | $\rho_d$ | $\sigma_c$ | $\phi$ | c | $\phi_{peak}$ | $c_{peak}$ | $\phi_{res}$ | $c_{res}$ | Depth |
| | | | | (ft) | (USCS) | (bpf) | (%) | (pcf) | (-) | (%) | (%) | (%) | (%) | (-) | (%) | (%) | (%) | (-) | (-) | (-) | (pcf) | (%) | (pcf) | (ksf) | (deg) | (ksf) | (deg) | (ksf) | (deg) | (ksf) | (ft) |
| Meloland Rd | Imperial | 04-17A | B-0 | 0-2.5 | SM w/ Gr | | 6.2 | | | | 18 | 64 | 18 | coarse | | | | n-l | 21 | | | | 127.0 | 0.77/1.0/1.28 | 32.4 | 0.83 | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | 127.0 | 1.00 | | | | | | | |
| | | | S-1 | 2.50 | SM w/ Gr | 15 | 6.1 | | | | 2 | 70 | 28 | coarse | | | | none | | | 133.0 | 7.0 | | | | | | | | | |
| | | | D-2 | 5.00 | SP w/ Gr | 27 | 2.5 | 123.7 | 0.36 | 26.58 | 15 | 80 | 5 | coarse | | | | none | | | | | | | | | | | | | |
| | | | S-3 | 7.50 | SP w/ Gr | 15 | 4.2 | | | | 15 | 80 | 5 | coarse | | | | none | | | | | | | | | | | | | 11.0 |
| | | | D-4 | 10.00 | CL w/ Sa. | 9 | 31.6 | | | | 15 | 80 | 5 | fine | | | | high | | | | | | | | | | | | | |
| | | | S-5 | 12.50 | CL | 5 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | D-6 | 15.00 | CL w/ SP | 18 | | | | | | | | | 64 | 24 | 41 | | | | 122.4 | 17.0 | 105.0 | 1.87/3.73/7.49 | 3.1 | 2.55 | | | | | |
| | | | S-7 | 20.00 | CL | 12 | | | | | | | | fine | | | | m-h | | | | | | | | | | | | | |
| | | 04-18A | B-0 | 0-2.5 | SP w/ Gr | | 3.6 | | | | 20 | 75 | 5 | coarse | | | | none | | | | | | | | | | | | | |
| | | | S-1 | 2.50 | SP w/ Gr | 22 | 3.8 | | | | | | | medium | | | | none | | | | | | | | | | | | | |
| | | | D-2 | 5.00 | SM w/ Gr | 48 | 4.1 | 118.6 | 0.42 | 29.61 | | | | medium | | | | none | | | | | | | | | | | | | |
| | | | S-3 | 7.50 | SM w/ Gr | 19 | 8.3 | | | | | | | medium | | | | none | | | | | | | | | | | | | 7.5 |
| | | | D-4 | 10.00 | CH | 3 | | | | | | | | | 62 | 24 | 38 | | | | 114.3 | 22.0 | 93.7 | 1.15/2.3/4.6 | 3.6 | 0.57 | | | | | 11.5 |
| | | | S-5 | 12.50 | CL w/ Sa. | 2 | 28.4 | | | | | | | fine | | | | m-h | | | | | | | | | | | | | |
| | | | D-6 | 15.00 | CL w/ Sa. | 12 | 27.5 | 94.6 | 0.78 | 43.85 | | | | fine | | | | m-h | | | | | | | | | | | | | |
| | | | S-7 | 20.00 | CL w/ Sa. | 10 | 24.5 | | | | 0 | 20 | 80 | fine | | | | m-h | | | | | | | | | | | | | |
| Br. 51-0234 | Santa Barbara | 04-19 | B-0 | 0-5 | SP-SM | | 0.6 | | | | 1 | 87 | 12 | fine-med. | | | | | 29 | 0 | 108.5 | 12.5 | 103.0 | 0.6/0.87/1.31 | 34.3 | 0.31 | | | | | |
| Br. 56-0800 | Riverside | 04-20 | B-0 | 0-5 | SM | | 3.6 | | | | 14 | 72 | 14 | medium | | | | | 27 | 0 | 135.5 | 6.5 | | | | | | | | | |
| Jackson | Riverside | 04-21 | B-0 | 0-5 | SM | | 0.7 | | | | 5 | 75 | 20 | medium | | | | | 31 | 2 | 127.0 | 8.0 | 120.7 | 0.72/1.03/1.55 | 32.6 | 0.43 | | | | | |
| Sta. Clara River Bridge | Santa Clarita | 04-22 | B-0 | 0-5 | SW-SM | | 4.8 | | | | | | | coarse | | | | | 52 | 2 | 131.0 | 8.5 | 124.5 | 0.75/1.0/1.25 | 23.7 | 1.42 | | | | | |
| | | 04-23 | B-0 | 0-4.0 | SM w/ Gr | | 7.1 | 134.6 | 0.25 | 20.11 | | | | | | | | | | | | | | | | | | | | | |
| | | | S-1 | 2.00 | SM w/ Gr | 47 | 6.7 | | | | 10 | 60 | 30 | coarse | | | | none | | | | | | | | | | | | | |
| | | | S-2 | 5.00 | SM | | 6.7 | | | | 13 | 66 | 21 | coarse | | | | none | 32 | | | | | | | | | | | | 5.5 |
| | | | D-3 | 7.50 | SM | 78 | 6.6 | 126.2 | 0.34 | 25.09 | 10 | 60 | 30 | coarse | | | | none | | | | | | | | | | | | | |
| | | | S-4 | 10.00 | SM | 13 | 5.8 | | | | 10 | 60 | 30 | coarse | | | | none | | | | | | | | | | | | | |
| | | | S-5 | 15.00 | ML/SM | 8 | 7.5 | | | | 10 | 60 | 30 | coarse | | | | none | | | | | | | | | | | | | |
| | | | S-6 | 20.00 | SM | 30 | 21.2 | | | | 0 | 30 | 70 | fine | | | | low | | | | | | | | | | | | | |
| | | | S-7 | 25.00 | SM | 27 | 7.9 | | | | 5 | 65 | 30 | coarse | | | | none | | | | | | | | | | | | | |
| | | 04-24 | B-0 | 0.00 | SM | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | S-1 | 2.00 | SM | 19 | | | | | | | | coarse | | | | none | | | | | | | | | | | | | |
| | | | S-2 | 5.00 | SM | 22 | | | | | | | | coarse | | | | none | | | | | | | | | | | | | |
| | | | S-3 | 7.50 | SM | 26 | | 141.9 | 0.19 | 15.78 | | | | coarse | | | | none | | | | | | | | | | | | | 7.5 |
| | | | D-4 | 10.00 | SM | 50 | | | | | | | | coarse | | | | none | | | | | | | | | | | | | |
| | | | S-5 | 15.00 | SM | 11 | | | | | | | | coarse | | | | none | | | | | | | | | | | | | |
| | | | S-6A | 20.00 | SM | | | | | | | | | coarse | | | | low | | | | | | | | | | | | | |
| | | | S-6B | 20.50 | SM w/ Gr | 21 | | | | | | | | fine-co. | | | | none | | | | | | | | | | | | | |
| | | | S7- | 25.00 | SM w/ Gr | 17 | | | | | | | | coarse | | | | none | | | | | | | | | | | | | |
| Maple Ave UC | Fresno | 04-25 | B-0 | 10.00 | SM w/ Gr | | | | | | | | | | | | | | | | | | 120.7 | 0.77/1.03/1.29 | 33.6 | 0.46 | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | 120.7 | 1.00 | NA | NA | | | | | |
| TOTALS: | | 25 | 184 samples | | | 134 | 153 | 93 | 93 | 93 | 136 | | | | 13 | | | | 15 | 11 | 10 | | 26 | | | | 4 | | 4 | | 14 |

Notes: *Plasticity (qualitative): l=low, n=none

**Table 4** **SOIL TYPE CATEGORIES**
**CT-UCSD/ABUTMENT RESEARCH PROGRAM**

| Soil Type Categories | | Number of bridges | Number of samples tested | Depth (ft) | Sand grain size | Plasticity | SPT Blow-count | Field Moisture Content | Field Dry Density | Grain Size Distribution | | | Plas-ticity | Sand Equi-valent | Expan-sion Index | Compaction | | Shear strengths of compacted soil (95% R.C.) | | | Shear wave velocity | Secant Modulus | Secant Modulus |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | $N_{SPT}$ | w | $\rho_d$ | Gravel | Sand | Fines | PI | SE | EI | $\gamma_{d,max}$ | $w_{opt}$ | $\rho_d$ | $\phi$ | c | $v_S$ | initial $E_S$ | reload $E_R$ |
| | | | | | | | (bpf) | (%) | (pcf) | (%) | (%) | (%) | (%) | (-) | (-) | (pcf) | (%) | (pcf) | (deg) | (ksf) | (fps) | (MPa) | (MPa) |
| I | DENSE TO VERY DENSE SANDS WITH GRAVEL | 2 | 2 | 2.5-7.5 | coarse | none-low | 52-59 | 3-6 | 120 | 8-25 | 70-79 | 5-13 | <5 (0) | 37-43 (40) | 0-7 | NM | NM | 125-130 (125) | 35-43 (38) | 0.13-0.3 (0) | 700-1,000 (800) | 2-4 | 10-15 |
| II | MEDIUM DENSE SILTY SANDS, SOME WITH GRAVEL | 9 | 10 | 0-9.5 (0-5) | fine-coarse | none-low | 9-15 | 5-14 | 105-120 | 1-28 | 60-87 | 12-35 | 5-10 (8) | 21-52 (34) | 0-2 | 109-127 | 8-12 | 116-127 (120) | 24-35 (33) | 0.25-1.5 (0.5) | | | |
| III | MEDIUM DENSE CLAYEY SANDS, SOME WITH GRAVEL | 4 | 4 | 5-10 | medium coarse | low | 20-44 | 7-15 | 113-114 | 0-8 | 50-60 | 35-50 | 6-14 (10) | 11 | 0 | NM | NM | 116-125 (120) | 22.5-24 (23) | 1.3-6 (2) | | | |
| IV | STIFF-HARD CLAYS WITH FINE TO COARSE-GRAINED SANDS, SOME WITH SILTS | 5 | 10 | 5-12.5 | fine-coarse | medium-high | 18-35 | 14-29 | 90-116 | 0-3 | 25-35 | 62-75 | 12-41 (22) | 0-3 (0) | 20-77 | 114-122 | 17-22 | 106-122 (110) | 0-17 (6) | 1-8 (3.5) | 550-800 | 1.5-3 | 6-10 |

Typical parameters are in ()
NM=Not measured

# APPENDIX A

# Field Investigations and Logs

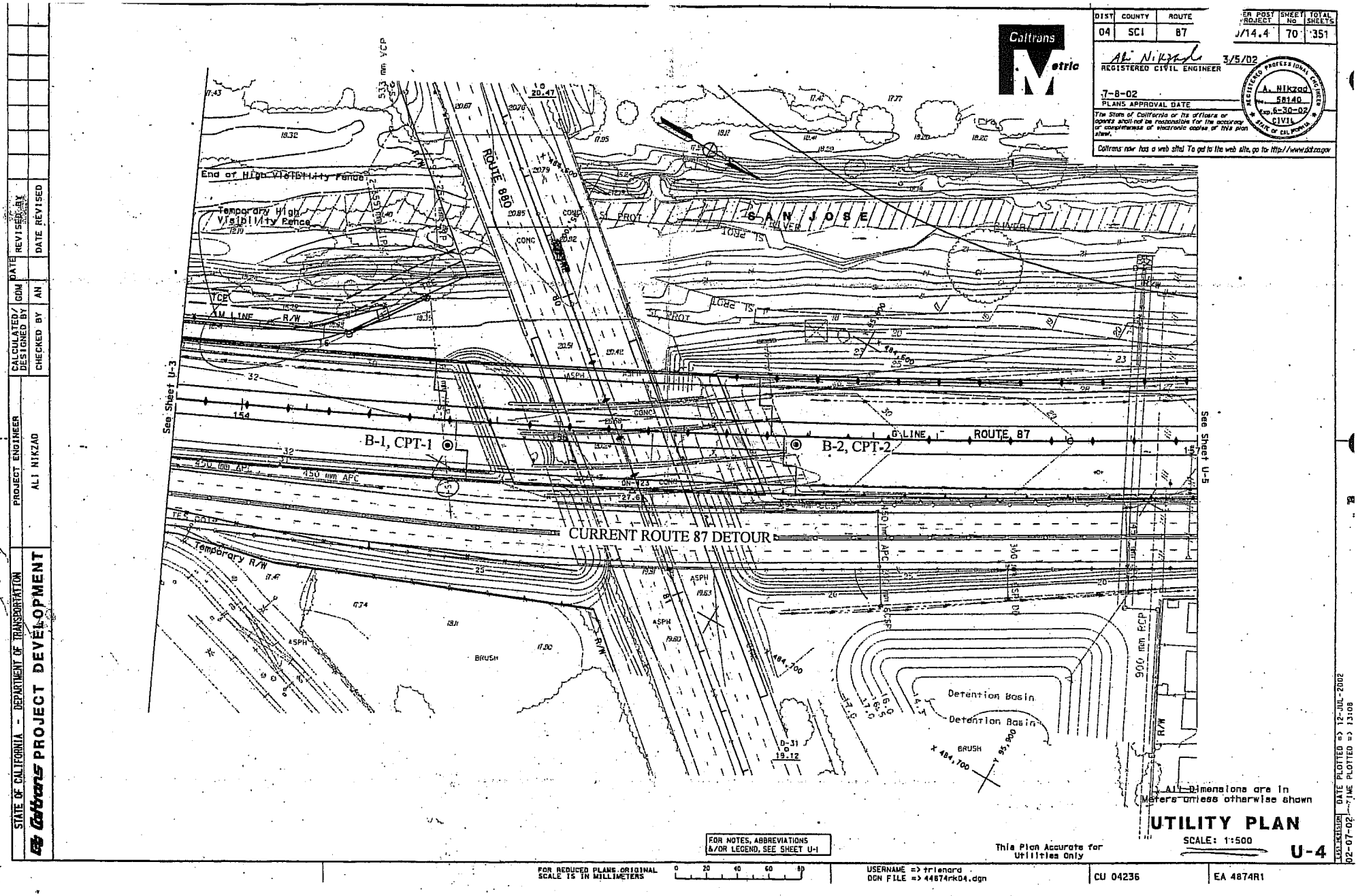
# Caltrans Bridge 37-0609
# Route 87/880 Separation, Santa Clara

## Caltrans Bridge 37-0609, Route 87/880 Separation, Santa Clara

The field investigation for the Route 87/880 bridge was conducted on 1/30/04, consisting of (2) 30-ft deep soil borings and (2) 30-ft deep CPT's. Drilling was performed by Gregg Drilling of Martinez, CA. Boring 04-1 and CPT 04C-1 were located on the south bridge abutment in the north-bound lane, near the approach slab. Boring 04-2 and CPT 04C-2 were located on the north bridge abutment in the north-bound lane, also near the approach slab. Geotechnical soil sampling consisted of ring samples collected using a Modified California sampler and small bulk samples collected with a SPT sampler. Samples were taken at 2.5-ft intervals for the first 10 feet and at 5-ft intervals below. No groundwater was encountered during the investigation.

**North Abutment**

**South Abutment**




Route 87/I-880 Boring Locations

4a

INDEX OF SHEETS


| Sheet No. | Description |
|---|---|
| 1 | Title and Location Map |
| 2-5 | Typical Cross Sections |
| 6 | Key Map and Line Index |
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| 17-25 | Profiles |
| 26-32 | Construction Details |
| 33-35 | Contour Grading |
| 36-66 | Drainage Plans, Edge Drain Plan, Drainage Profiles, Details and Quantities |
| 67-73 | Utility Plans |
| 74-97 | Stage Construction Plans |
| 98-100 | Construction Area Signs |
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| 117-122 | Summary of Quantities |
| 123-141 | Sign Plans |
| 142-144 | Temporary Water Pollution Control Details |
| 145-153 | Erosion Control Plans and Details |
| 154-161 | Sound Wall Plans |
| 162-199 | Electrical Plans |
| 200-217 | Revised Standard Plans |

STRUCTURE PLANS

| | |
|---|---|
| 218-257 | Taylor Street Urban Interchange |
| 258-272 | MSE Retaining Wall |
| 273-294 | Hedding Street Undercrossing |
| 295-317 | RTE 87/880 Separation |
| 318-338 | Taylor Street Frontage Road Pumping Plant |
| 339-348 | Electrical for Taylor Street Pump Plant |
| 349-351 | Juvenile Hall Sign & Army Corps Stairs |

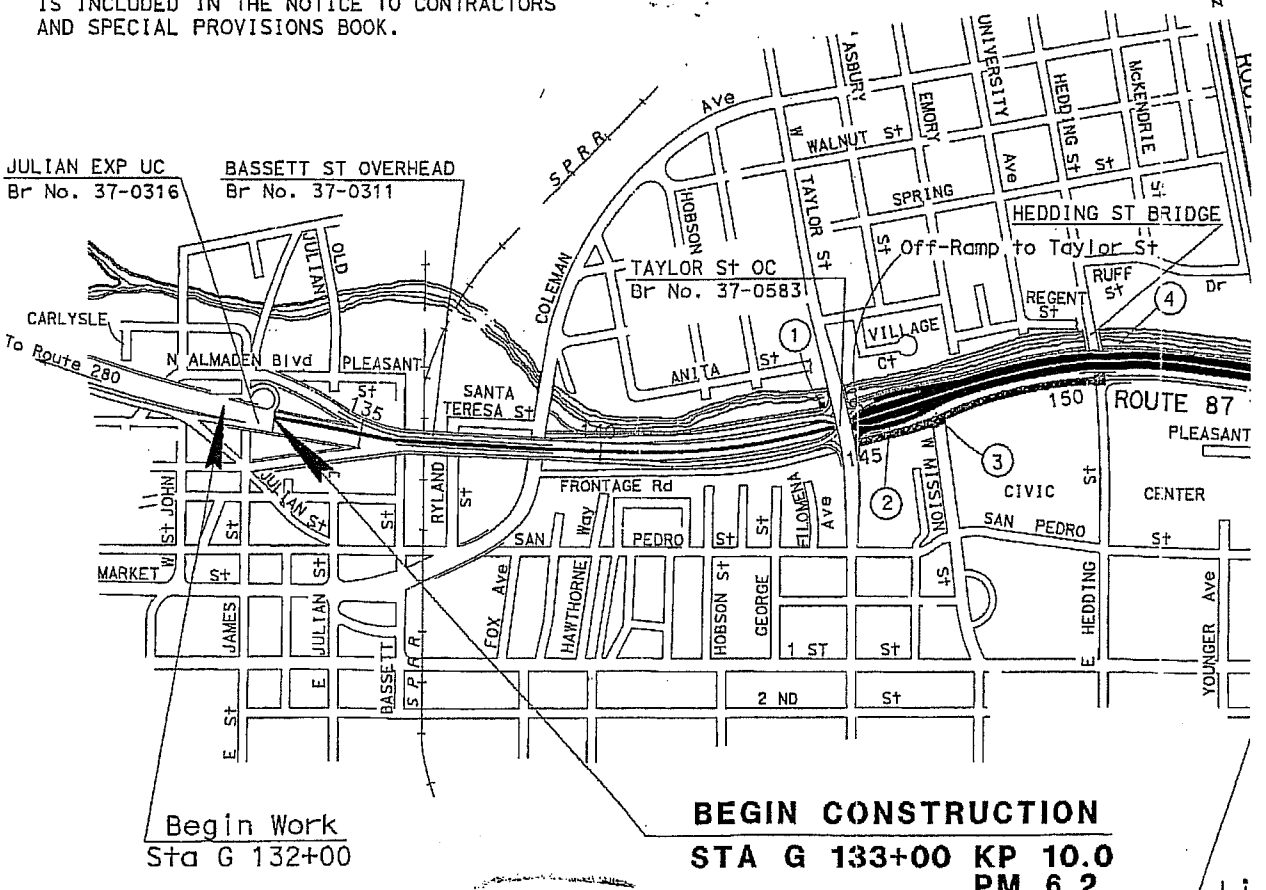

THE STANDARD PLANS LIST APPLICABLE TO THIS CONTRACT IS INCLUDED IN THE NOTICE TO CONTRACTORS AND SPECIAL PROVISIONS BOOK.

STATE
# DEPARTMENT

# PROJECT PLANS
# STATE

## IN SANTA
## IN
## FROM JULIAN EXP
## TO ROUTE 8

To be supplemented by




The Contractor shall possess the Class (or classes) of license as specified in the ''Notice to Contractors''.

| PROJECT ENGINEER | DATE | PROJECT MANAGER | DATE |
|---|---|---|---|
| SAN D. DO | | GENE GONZALO | |

NPS

| DIST | COUNTY | ROUTE | KILOMETER POST TOTAL PROJECT | SHEET No | TOTAL SHEETS |
|---|---|---|---|---|---|
| 04 | SCI | 87 | 10.0/14.4 | 1 | 351 |

CALIFORNIA
TRANSPORTATION

ACNH-S087(023)E

46

# OR CONSTRUCTION ON
# HIGHWAY

## .ARA COUNTY
## N JOSE
## SSWAY UNDERCROSSING
## 101 SEPARATION

lard Plans dated July, 1999

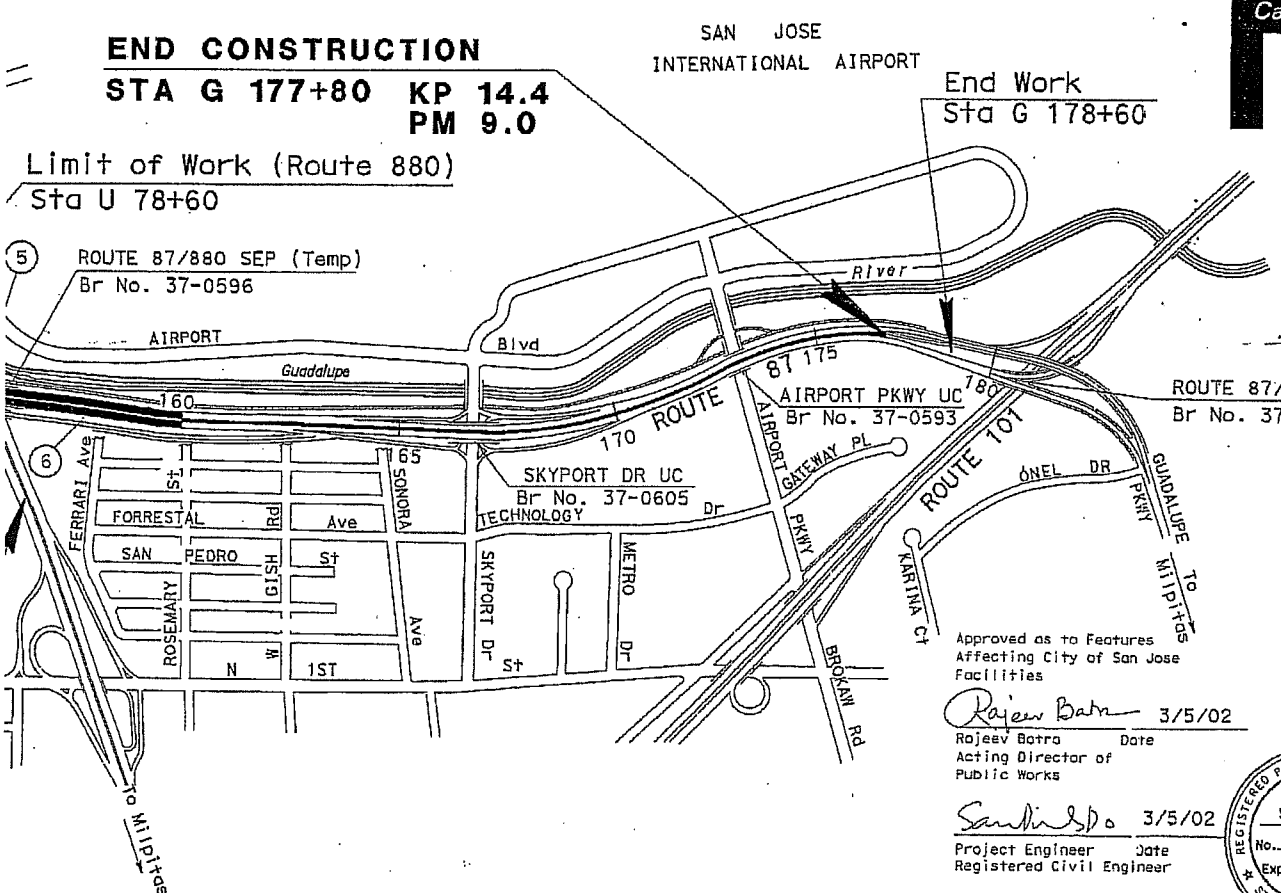
The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

Caltrans now has a web site! To get to the web site, go to: http://www.dot.ca.gov

### STRUCTURE LIST

1. Frontage Road Pumping Plant (No.37-0583W)
2. Route 87 On Ramp from Taylor St (No. 37-0583)
3. Retaining Wall No.1 (No. 37-0583)
4. Hedding Street Undercrossing (No. 37-0608)
5. Route 87/880 Separation (No. 37-0609)
6. Soundwall No.1

Caltrans Metric




Approved as to Features Affecting City of San Jose Facilities

Rajeev Batra 3/5/02
Rajeev Batra Date
Acting Director of Public Works

S.D. Do 3/5/02
Project Engineer Date
Registered Civil Engineer

REGISTERED PROFESSIONAL ENGINEER S.D. Do No. 56515 Exp. 6-30-05 CIVIL STATE OF CALIFORNIA

July 8, 2002
Plans Approval Date

SCALE

Contract No. 04-4874R4

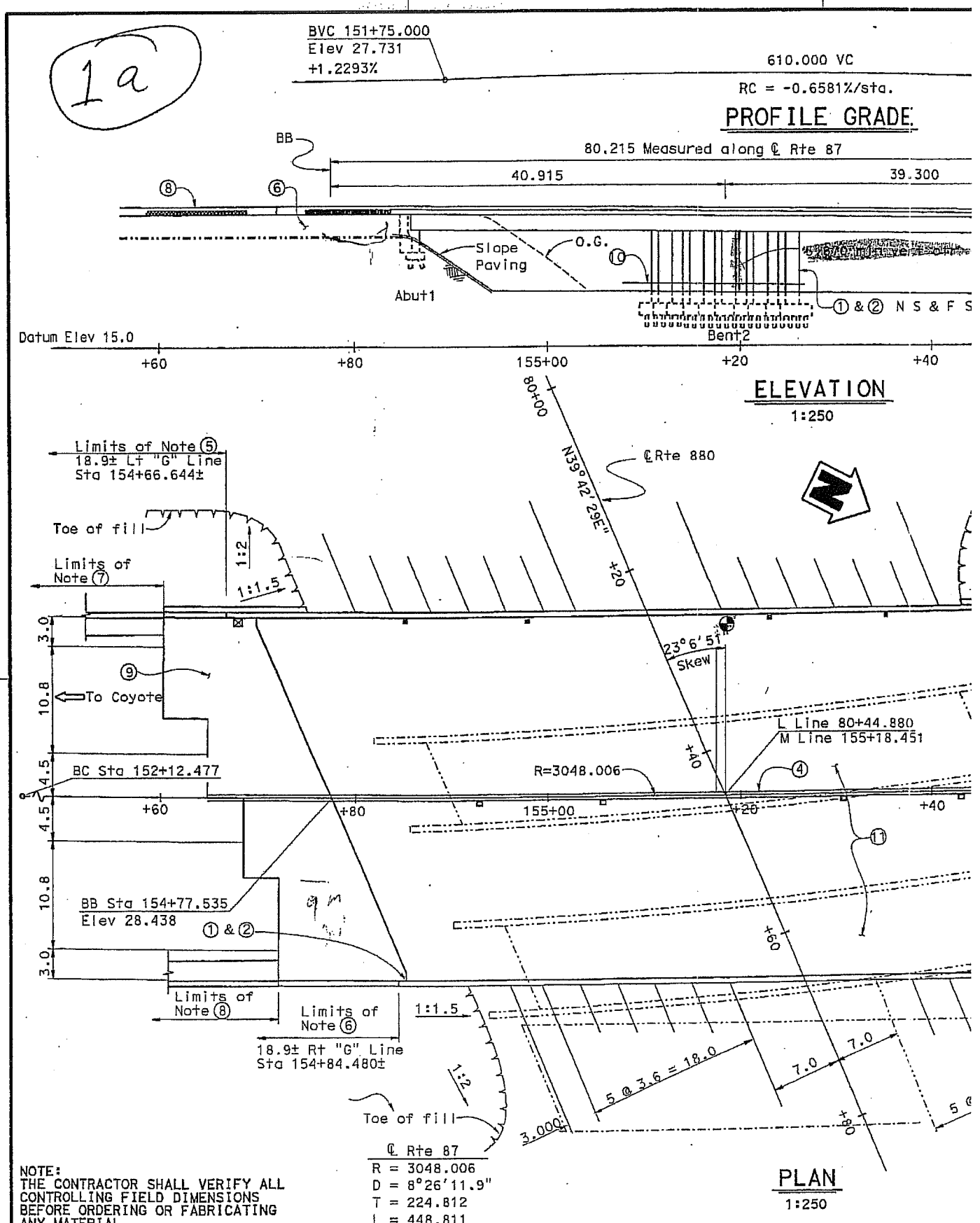
LAST REVISION 05-31-02
DATE PLOTTED => 18-JUL-2002
TIME PLOTTED => 14:03

USERNAME => trienard
DGN FILE => 44874rp01.dgn



CU 04236 EA 4874R1

1a




NOTE:
THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.

| | | | | | | |
|---|---|---|---|---|---|---|
| DESIGN ENGINEER | DESIGN | BY Reza Erfanian | CHECKED Julie Wolf | LOAD FACTOR DESIGN | LIVE LOADING: HS20-44 AND ALTERNATIVE AND PERMIT DESIGN LOAD | |
| | DETAILS | BY Bill Costa | CHECKED Julie Wolf | LAYOUT | BY Reza Erfanian | CHECKED Julie Wolf |
| | QUANTITIES | BY Abhijit Naik | CHECKED Ling Wang | SPECIFICATIONS | BY Lugi Yang | PLANS AND SPECS COMPARED Lugi Yang |

STRUCTURES DESIGN GENERAL PLAN SHEET (METRIC) (REV.3/1/99)

ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS

| DIST | COUNTY | ROUTE | KILOMETER POST TOTAL PROJECT | SHEET No | TOTAL SHEETS |
|---|---|---|---|---|---|
| 04 | SCI | 87 | 10.0/14.4 | 295 | 351 |

Reza Erfanian 3-13-02
REGISTERED CIVIL ENGINEER

7-8-02
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER Reza Erfanian No. 48240 Exp. 6-30-04 CIVIL STATE OF CALIFORNIA

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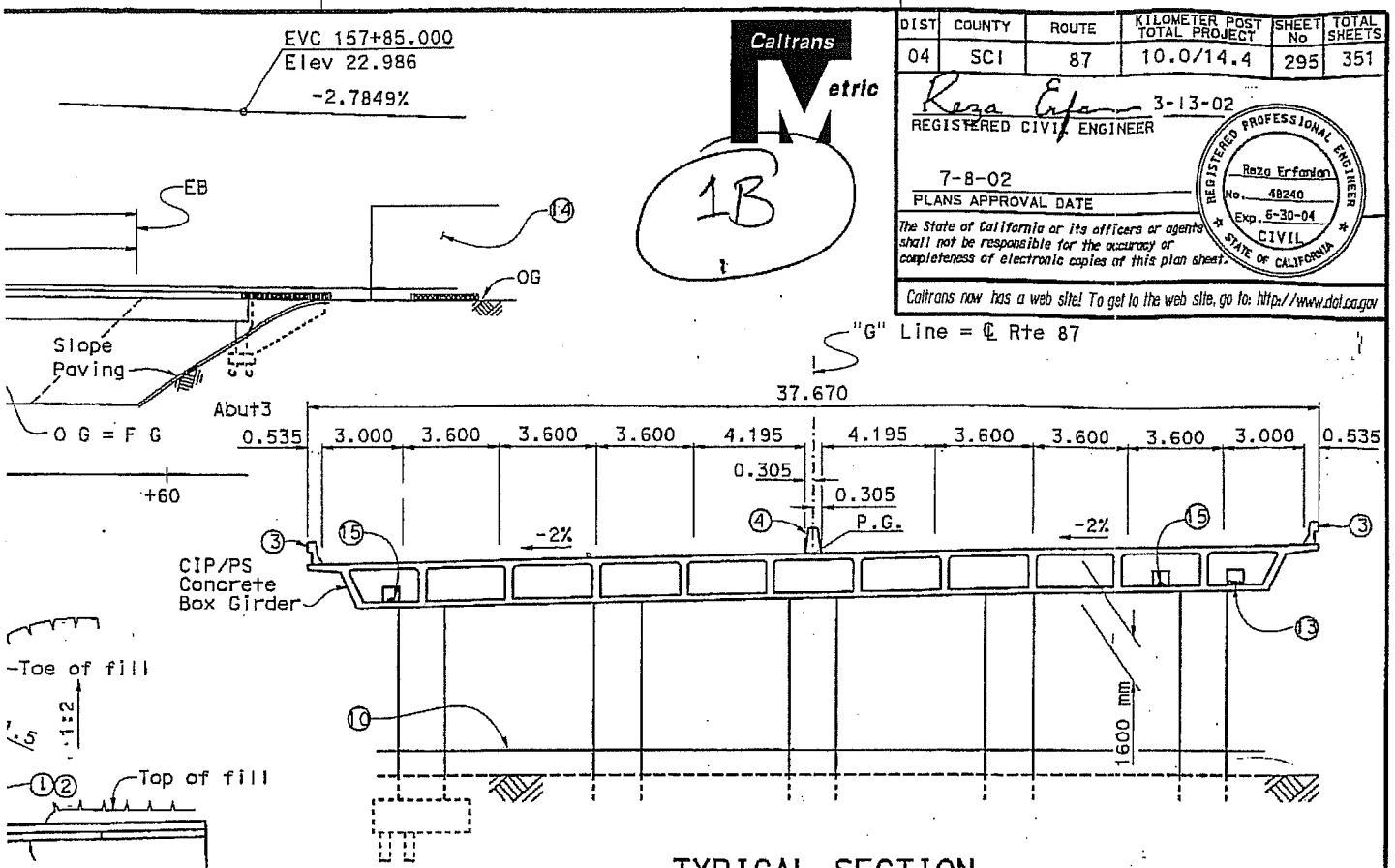
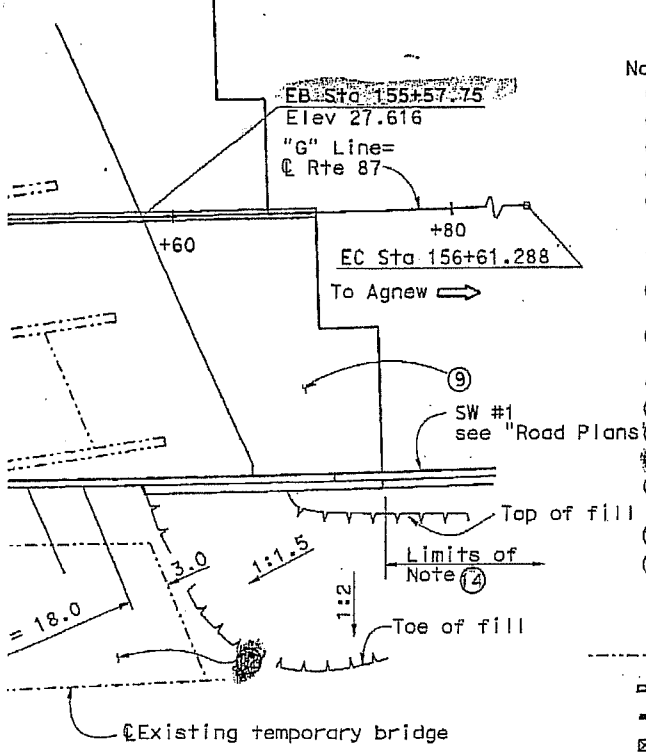
Caltrans Metric

1B




## TYPICAL SECTION

1:125




Notes:

1. Paint "Br. No. 37-0609".
2. Paint " Rte 87/880 Separation".
3. Concrete Barrier Type 25(Mod).
4. Concrete Barrier Type 60A.
5. Existing MSE Wall No.3 Br.No. 37-590M, see "MSE Wall (Mod)" elsewhere in these plans.
6. Existing MSE Wall No.4 Br.No. 37-591M, see "MSE Wall (Mod)" elsewhere in these plans.
7. Barrier Slab on existing MSE Wall No.3, see "MSE Wall (Mod)" elsewhere in this Contract.
8. Barrier Slab on existing MSE Wall No.4, see "MSE Wall (Mod)" elsewhere in this Contract.
9. Structural Approach Slab Type N(9S).
10. Concrete Barrier Type 60E, see Road Plans.
11. Existing Bridge No. 37-181 & 37-182 to be removed.
12. Existing Temporary Bridge No. 37-0598 to be removed.
13. TOS & Fiber optic conduit, see "Road Plans". (3-89mm & 1-102mm)
14. Sound Wall No. 1, see "Road Plans"
15. Utility Opening for 75 mm ø irrigation line.

Indicates Point of Minimum Vertical Clearance.
Indicates existing structure.
- indicates Deck Drain Type D-2
- indicates Deck Drain Type D-3
- indicates Terminal Drainage Inlet

For Pile Data, Index to Plans, Std Plans list, General Notes, and Quantities, see "Index to Plans" sheet.

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

| STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION | DIVISION OF STRUCTURES STRUCTURE DESIGN 7 | BRIDGE No. 37-0609 / KILOMETER POST 12.5 | RTE 87/880 SEPARATION GENERAL PLAN |
|---|---|---|---|
| 30 40 50 60 70 80 90 100 | CU 04 EA 4874R1 | DISREGARD PRINTS BEARING EARLIER REVISION DATES | REVISION DATES (PRELIMINARY STAGE ONLY) 5-23-01 9-20-01 10-18-01 11-14-01 3-4-02 11-2-00 11-15-00 1-22-01 2-21-01 SHEET 1 OF 23 |

FILE => 37-0609-a-gp.dgn

USERNAME => trding DATE PLOTTED => 15-JUL-2002 TIME PLOTTED => 13:18

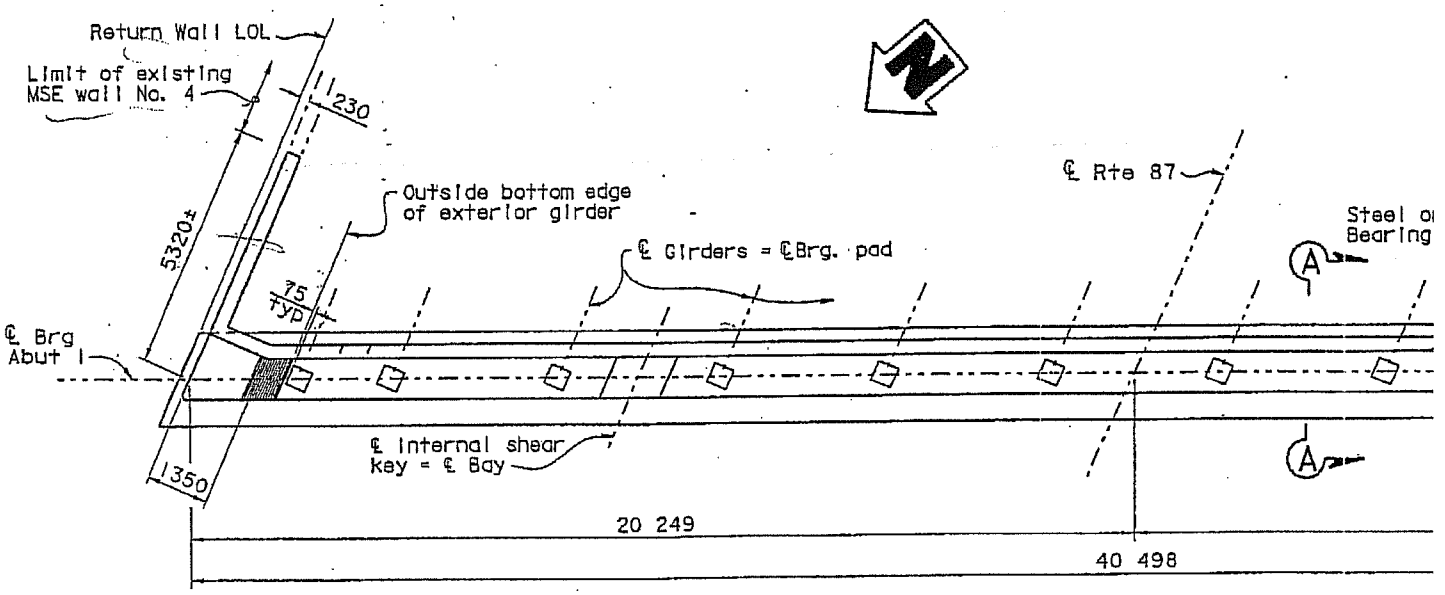
3a

| MARK | DATE | DESCRIPTIONS | BY | CH'D |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| 1 | 2-24-03 | Modify wall | RE | |

REVISIONS

PROFESSIONAL ENGINEER — REGISTERED — Reza Erfanian — No. 48240 — Exp. 6-30-04 — CIVIL — STATE OF CALIFORNIA — 2-24-03

CONTRACT CHANGE ORDER NO. _____
SHEET ____ OF ____




PLAN
1:80

Notes:

1. For new barrier slab on existing MSE W "MSE Modifications" elsewhere in this
2. For Abutment Elevation and Footing Pl see "Abutment 3 Layout" sheet.
3. For location of Section A-A, see "Abut

NOTE:
THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.

| | | |
|---|---|---|
| DESIGN | BY Reza Erfanian | CHECKED Julie Wolf |
| DETAILS | BY Sandra McNealy | CHECKED Julie Wolf |
| QUANTITIES | BY Abhijit Naik | CHECKED Ling Wang |

36

| DIST | COUNTY | ROUTE | KILOMETER POST TOTAL PROJECT | SHEET No | TOTAL SHEETS |
|---|---|---|---|---|---|
| 04 | SCI | 87 | 10.0/14.4 | 299R1 | 351 |

Caltrans Metric

Reza Erfanian 3-13-02
REGISTERED CIVIL ENGINEER

7-8-02
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER Reza Erfanian No. 48240 Exp. 6-30-04 CIVIL STATE OF CALIFORNIA

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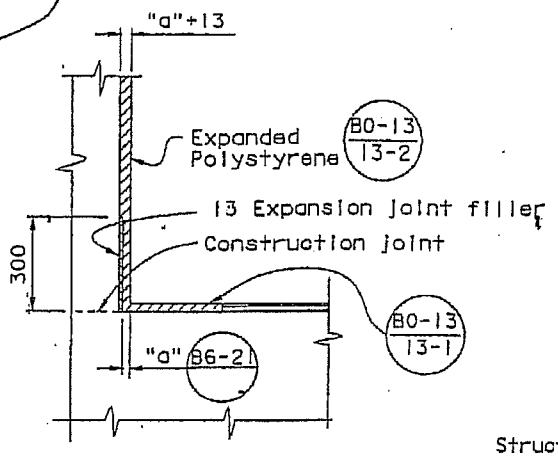
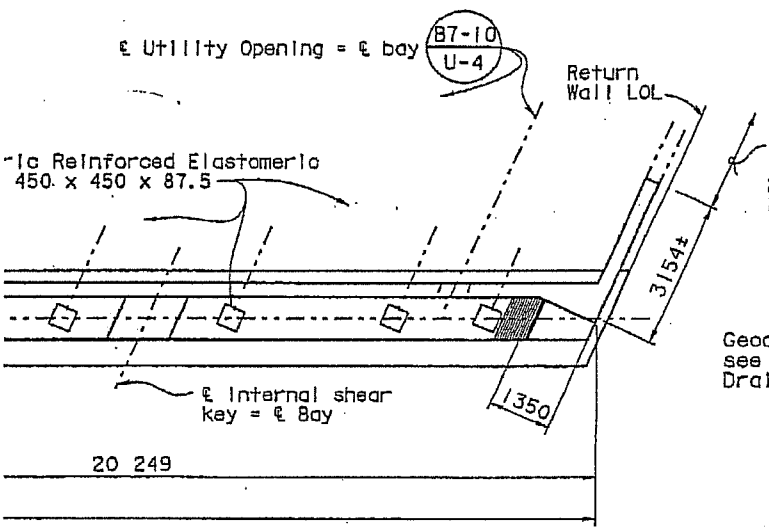
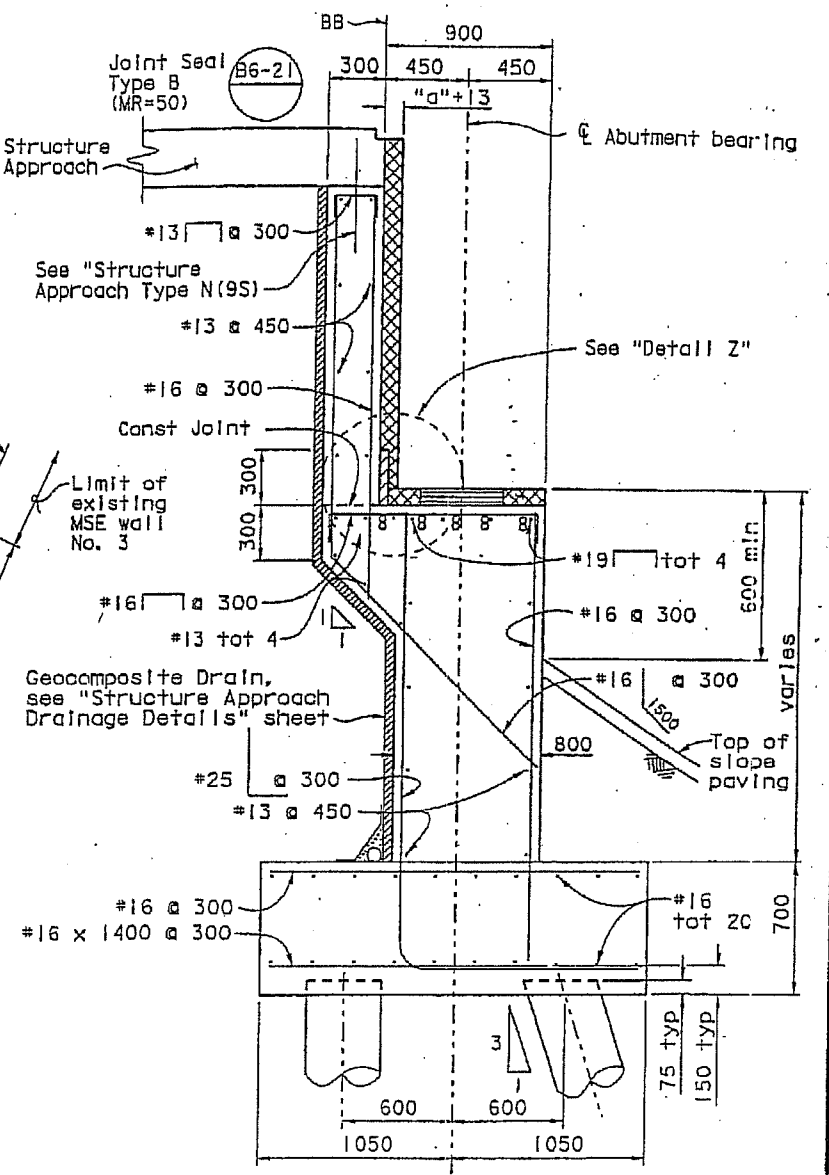



DETAIL Z
No scale




SECTION A-A
1:20

see
dot.

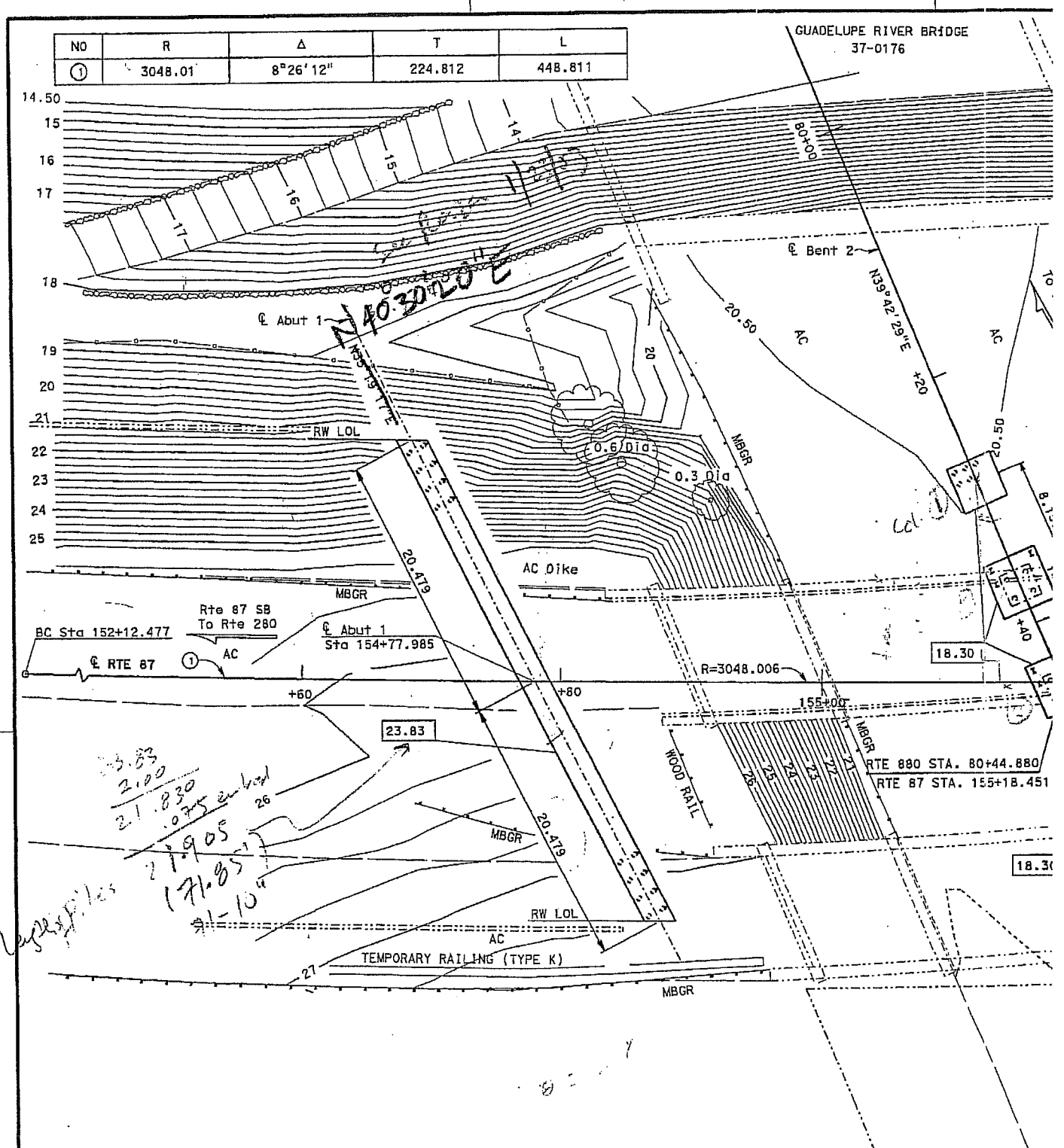
3 Layout" sheet.

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

| STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION | DIVISION OF STRUCTURES STRUCTURE DESIGN 7 | BRIDGE NO. 37-0609 / KILOMETER POST 12.5 | RTE 87/880 SEPARATION ABUTMENT 1 LAYOUT |
|---|---|---|---|

5a

| NO | R | Δ | T | L |
|---|---|---|---|---|
| 1 | 3048.01 | 8°26'12" | 224.812 | 448.811 |




SURVEY CONTROL

PT-60

Fnd L & T in bridge 37-0181 NB Rte 87 @ Rte 880 OC. 0.1 back fr top face PCC Curb. 30 N of BB. 19.816 RT. L RTE 87 STA. 155+25.945
N= 95759.940 E= 484677.127 Elev. = 27.971

DN 430

Fnd PK nail in AC shldr of SB Rte 87 Approx. 90 S'ly of call box SC-87-75, 12 N'ly of Electrolier 10K148. 7.859 LT. L RTE 87 STA. 151+53.854
N= 95407.934 E= 484802.745 Elev. = 18.619

NOTE:
THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.

Note: Indicates bottom of footing elevation.

| PRELIMINARY INVESTIGATION SECTION | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| SCALE | VERT.DATUM NAD27 | PHOTOGRAMMETRY AS OF: | | | | | DESIGN | BY Reza Erfanian | CHECKED Julie Wolf |
| 1:200 | HORZ.DATUM NGVD29 | SURVEYED | BY B.W. LETCHER 6-1997 | DRAFTED | BY B.W. LETCHER 3-2000 | | DETAILS | BY Sandra McNealy | CHECKED Julie Wolf |
| ALIGNMENT TIES | DISTRICT TRAV. SHEETS | FIELD CHECKED | BY T.C. GILLETT 3-2000 | CHECKED | BY J. RING 6/2000 | | QUANTITIES | BY Abhijit Naik | CHECKED Ling Wang |

STRUCTURES FOUNDATION PLAN SHEET (METRIC) (REV. 3/1/99)

ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS

56

| DIST | COUNTY | ROUTE | KILOMETER POST TOTAL PROJECT | SHEET No | TOTAL |
|---|---|---|---|---|---|
| 04 | SCI | 87 | 10.0/14.4 | 298 | 351 |

Caltrans Metric

Reza Erfanian 3-13-02
REGISTERED CIVIL ENGINEER

7-8-02
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER Reza Erfanian No. 48240 Exp. 6-30-04 CIVIL STATE OF CALIFORNIA

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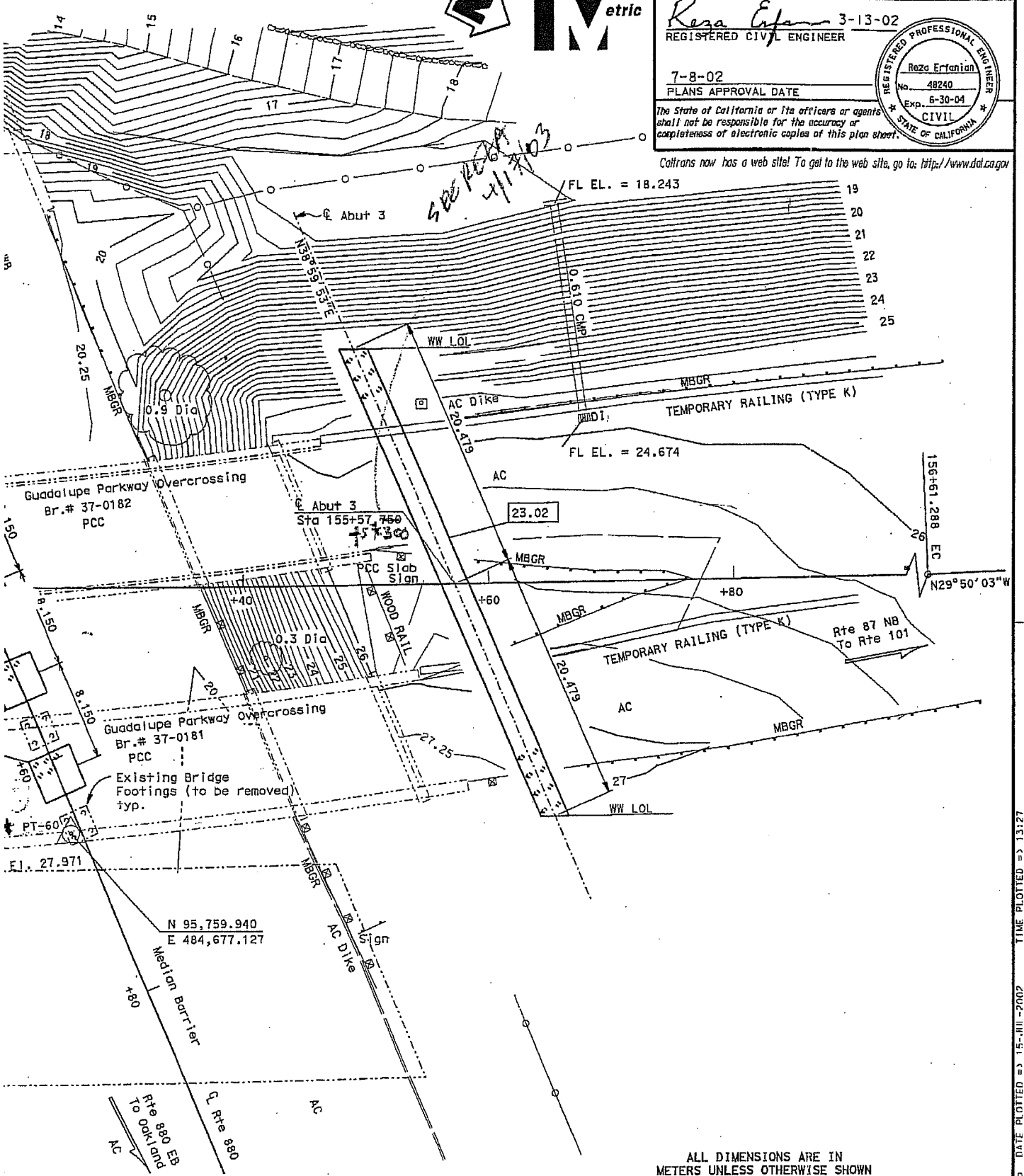


ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

| STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION | DIVISION OF STRUCTURES STRUCTURE DESIGN 7 | BRIDGE NO. 37-0609 | RTE 87/880 SEPARATION |
|---|---|---|---|
| | | KILOMETER POST 12.5 | FOUNDATION PLAN |
| | CU 04237 EA 4874R1 | DISREGARD PRINTS BEARING EARLIER REVISION DATES | REVISION DATES (PRELIMINARY STAGE ONLY) 2-31-2000 12-15-00 2-21-01 3-15-01 4-2-01 5-7-01 9-20-01 3-4-02 3-12-02 SHEET 4 OF 23 |

FILE => 37-0609-e-fp.dgn

USERNAME => trannda DATE PLOTTED => 15-JUL-2002 TIME PLOTTED => 13:27

6a

# INDEX TO PLANS


| Sheet No. | Title |
|---|---|
| 1 | GENERAL PLAN |
| 2 | INDEX TO PLANS |
| 3 | DECK CONTOURS |
| 4 | FOUNDATION PLAN |
| 5 | ABUTMENT 1 LAYOUT |
| 6 | ABUTMENT 3 LAYOUT |
| 7 | ABUTMENT DETAILS NO. 1 |
| 8 | ABUTMENT DETAILS NO. 2 |
| 9 | BENT LAYOUT |
| 10 | BENT DETAILS NO. 1 |
| 11 | BENT DETAILS NO. 2 |
| 12 | TYPICAL SECTION |
| 13 | GIRDER LAYOUT |
| 14 | ADDITIONAL REINFORCEMENT |
| 15 | MISCELLANEOUS DETAILS |
| 16 | CONCRETE BARRIER TYPE 25 (MOD) |
| 17 | TERMINAL DRAINAGE INLET DETAILS |
| 18 | STRUCTURE APPROACH TYPE N(9S) |
| 19 | ABUTMENT 1 APPROACH SLAB DETAILS |
| 20 | STRUCTURE APPROACH DRAINAGE DETAILS |
| 21 | SLOPE PAVING - FULL SLOPE |
| 22 | LOG OF TEST BORINGS 1 OF 2 |
| 23 | LOG OF TEST BORINGS 2 OF 2 |


BRIDGE REMOVAL, LOCATION
BRIDGE REMOVAL, LOCATION
BRIDGE REMOVAL, LOCATION
STRUCTURE EXCAVATION (BR
STRUCTURE BACKFILL (BRID
NPS 3 SUPPLY LINE (BRIDG
FURNISH STEEL PILING (HP
DRIVE STEEL PILE (HP 250
FURNISH PILING (CLASS 62
DRIVE PILE (CLASS 625)
PRESTRESSING CAST-IN-PLA
STRUCTURAL CONCRETE, BRI
STRUCTURAL CONCRETE, BRI
STRUCTURAL CONCRETE, APP
(TYPE N)
ARCHITECTURAL TREATMENT
JOINT SEAL (MR 50 MM)
BAR REINFORCING STEEL (B
SLOPE PAVING (MASONRY BL
MISCELLANEOUS METAL (BRI
CONCRETE BARRIER (TYPE 2
CONCRETE BARRIER (TYPE 6

## STANDARD PLANS DATED JULY 1999

| | |
|---|---|
| A10A | ABBREVIATIONS |
| A62C | LIMITS OF PAYMENT FOR EXCAVATION AND BACKFILL - BRIDGE |
| A76A | CONCRETE BARRIER TYPE 60 |
| B0-1 | BRIDGE DETAILS |
| B0-5 | BRIDGE DETAILS |
| B2-5 | PILE DETAILS-CLASS 400 AND CLASS 625 |
| B6-21 | JOINT SEALS (MAXIMUM MOVEMENT RATING=50 mm) |
| B7-10 | UTILITY OPENING-BOX GIRDER |
| B8-5 | CAST-IN-PLACE PRESTRESSED GIRDER DETAILS |
| B11-53 | CONCRETE BARRIER TYPE 25 |
| B14-5 | WATER SUPPLY LINE (DETAILS)(PIPE SIZES LESS THAN NPS 4) |

STANDARD PLAN SHEET NO.

DETAIL NO.

PILE D

| Location | Pile Type | Design Loading | Nominc Compres |
|---|---|---|---|
| Abut 1 | Class 625 Alt "V" or "X" | 625 kN | 1250 |
| Bent 2 columns 1,4,&5 | Class 625 Alt "V" or "X" | 625 kN | 1250 |
| Bent 2 columns 2&3 | Steel HP 250X85 | 625 kN | 1250 |
| Abut 3 | Class 625 Alt "V" or "X" | 625 kN | 1250 |

Design tip elvations control
[1] Compression, [2] Tension

NOTE:
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| | | |
|---|---|---|
| DESIGN | BY Reza Erfanian | CHECKED Julie Wolf |
| DETAILS | BY Sandra McNealy | CHECKED Julie Wolf |
| QUANTITIES | BY Abhijit Naik | CHECKED Ling Wong |

STRUCTURES DESIGN DETAIL SHEET (METRIC) REV. 4/20/00)

ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS

65

Caltrans Metric

| DIST | COUNTY | ROUTE | KILOMETER POST TOTAL PROJECT | SHEET No | TOTAL SHEETS |
|---|---|---|---|---|---|
| 04 | SCI | 87 | 10.0/14.4 | 296 | 351 |

Reza Erfanian 3-13-02
REGISTERED CIVIL ENGINEER

7-8-02
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER Reza Erfanian No. 48240 Exp. 6-30-04 CIVIL STATE OF CALIFORNIA

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| | | |
|---|---|---|
| ITIES | | |
| ECL Gr. Br. | LUMP | SUM |
| Gr. B | LUMP | SUM |
| Temp. 2 Span Wellat Br. | LUMP | SUM |
| | 810 | m³ |
| | 546 | m³ |
| | 208 | m |
| X 85) | 655 | m |
| ) | 32 | EA |
| | 2 765 | m |
| | 156 | EA |
| NCRETE | LUMP | SUM |
| OOTING | 210 | m³ |
| | 2 088 | m³ |
| SLAB | 248 | m³ |
| | 42 | m² |
| | 81 | m |
| ) | 294 500 | kg |
| | 970 | m² |
| | 920 | kg |
| IFIED) | 205 | m |
| | 103 | m |

## GENERAL NOTES
## LOAD FACTOR DESIGN

DESIGN: BRIDGE DESIGN SPECIFICATIONS (1996 AASHTO with Interims and Revisions by CALTRANS)

SEISMIC DESIGN: Caltrans Seismic Design Criteria (SDC), Version 1.1 July 1999

DEAD LOAD: Includes 1675 Pa for future wearing surface.

LIVE LOADING: HS20-44 and alternative and permit design load.

SEISMIC LOADING: SDC ARS Curve For Soil Profile D (M=7.25 ± .25) (Peak Rock Acceleration = 0.6 g)

REINFORCED CONCRETE:
$f_y$ = 416 MPa
$f'_c$ = 28 MPa
n = 8

TRANSVERSE DECK SLAB : (WORKING STRESS DESIGN)
$f_s$ = 140 MPa
$f'_c$ = 8 MPa
n = 10

PRESTRESSED CONCRETE: See "Prestressing Notes" on "Girder Layout" sheet.

TABLE B2-5

| sistance Tension | Bottom of Footing Elev. | Design Tip Elev. | Specified Tip Elev. |
|---|---|---|---|
| N/A | 23.826 m | +~~2.0~~(1) +5.1 | ~~+2.0~~ +5.1 |
| 350 kN | 18.3 m | +3.96(1) +7.9(2) Δ=3.94 m = 12.92' | +3.96 |
| 350 kN | 18.3 m | -2.1(1) +2.44(2) | -2.1 |
| N/A | 23.016 m | +7.6(1) | +7.6 |

y the following demands:

John Erfanian 3/13/03

Pier 3
14.415 m X 3.28 = 47.28'
20.4 m X 3.28 = 66.91'

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

| STATE OF ALIFORNIA DEPARTMENT OF TRANSPORTATION | DIVISION OF STRUCTURES STRUCTURE DESIGN 7 | BRIDGE NO. 37-0609 | RTE 87/880 SEPARATION |
|---|---|---|---|
| | | KILOMETER POST 12.5 | INDEX TO PLANS |
| CU 04 EA 4874R1 | DISREGARD PRINTS BEARING EARLIER REVISION DATES | REVISION DATES (PRELIMINARY STAGE ONLY) 2-21-01 5-7-01 5-25-01 9-20-01 2-4-02 | SHEET 2 OF 23 |

FILE => 37-0609-a-itp.dgn

USERNAME => trding DATE PLOTTED => 15-JUL-2002 TIME PLOTTED => 13:18

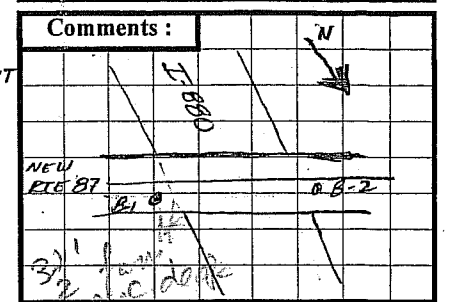
1-5

# LOG OF BORING NO. ( B-1 )

Earth Mechanics
Geotechnical and Earthquake

| | | | |
|---|---|---|---|
| Project Name | : UCSD BRIDGE ABUTMENT STUDY, 87/880 | | |
| Project Location | : SAN JOSE, CA — RTE 87 / I-880 BRIDGE-SOUTH ABUTMENT | | |
| E.M.I. Project No. | : 02-165 | Site Condition : | DAVE D |
| Weather | : CLOUDY, LT RAIN | Elevation : | 32 m |
| Traffic Control | : N/A | Operator : | — |
| Drilling Company | : GREGG DRILLING | Operator : | JASON |
| Type of Rig | : MOBILE B61-HDX | Drop (in) : | 30" |
| Borehole Diameter (inch) | : 6" - HOLLOW STEM AUGER | Drive Wt. (lbs) : | 140 lbs |
| Logged By | : J.C. | Date Drilled : | 1-30-04 |

Comments :




Backfilled with : CUTTINGS

| | Time | | | | | | | | | | Back to | Proposed Depth |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Depature | Arrival | Start | Break | Resume | Lunch | Resume | Break | Finish | Off | Office | 30 ft |
| Driller | | | | | | | | | | | | Water Table |
| Traffic Control | | | | | | | | | | | | N/A ft |
| Logger | | | | | | | | | | | | Caving |
| Total | | | | | | | | | | | | N/A ft |

| Depth (ft) | Sampler Type (Bulk, Drive, SPT, Tube) | Sample Number | Sample Type (B/D/S.B./T) | Blows/6" | Recovery (inch) | U.S.C.S. | Color | Description (ASTM D-2488-93) | Moisture State (Dry, Moist, Wet) | Max. Size | Grain Size (%) Gravel : Sand : Fines | Sand Size | Plasticity | Consistency | Cementation | $O^2$/LEL/PID |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | B | D | | | | | DRK BRN | ASPHALT 6" BASE | | | : : | | | | | |
| 2.5 | D | 1 | | 40 | 18" | ML | YELLOW-BRN | GRAVELLY SILT W/ SAND, SL. MOIST, SL. ANG. GRAVEL UP TO 1", FINE-V. FINE GRAINED SAND LOW PLASTICITY, HARD | M | | | | | | | |
| | | | | 38 | | | | | | | | | | | | |
| | | | | 50 | | | | | | | | | | | | |
| 5 | S | 2 | | 13 | 18" | ML | BRN | GRAVELLY SILT W/ SAND, SL MOIST, ANGULAR GRAVELS ½"-1" DIAM., V. FINE GRAINED SAND, LOW PLASTICITY, HARD | | | : : | | | | | |
| | | | | 20 | | | | | | | | | | | | |
| | | | | 27 | | | | | | | | | | | | |
| ~~10~~ | | | | | | | | | | | : : | | | | | |
| 7.5 | D | 3 | | 26 | 18" | ML | | SAME, ANGULAR GRAVELS ~½" DIAM | | | | | | | | |
| | | | | 31 | | | | | | | | | | | | |
| | | | | 34 | | | | | | | | | | | | |
| ~~15~~ | | | | | | | SILT — | SILTY CLAY W/ TRACE GRAVEL | | | : : | | | | | |
| 10 | S | 4 | | 11 | 18" | CL/ML | BRN/GRAY | ORGANICS (WOOD, ROOTS) MOD PLASTICITY | | | | | | | | |
| | | | | 12 | | | | V. STIFF, MOTTLED GRAY/BROWN/BLACK | | | | | | | | |
| | | | | 16 | | | | LAMINATED - LIKELY NATIVE MATERIAL | | | | | | | | |
| 20 | | | | | | | DARK BRN/GRAY | | | | : : | | | | | |
| | D | 5 | | 11 | 18" | CL | | CLAY W/ SILT, TRACE ORGANICS, | | | | | | | | |
| | | | | 16 | | | | MOIST, MOD PLASTICITY, V. STIFF, | | | | | | | | |
| | | | | 16 | | | | SOME LAMINATION | | | | | | | | |
| 25 | | | | | | | | | | | : : | | | | | |
| | S | 6A | | 8 | 18" | CL/ML | BROWN | CLAY W/ SILT, MOIST, MOD PLASTICITY GRADING TO → | | | | | | | | |
| | | | | 8 | | | | SILT W/ CLAY @ 20.75', LOW-NONPLASTIC, V. STIFF | | | | | | | | |
| | | 6B | | 9 | | | | | | | | | | | | |

# LOG OF BORING NO. ( B-1 SOUTH ABUTMENT )

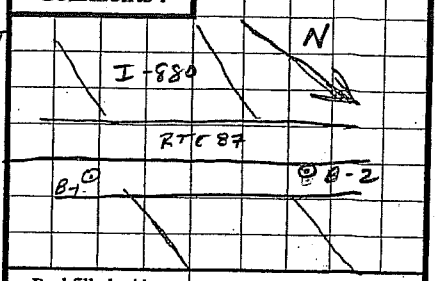
Project No. : 02-165 Project Name : BRIDGE ABUTMENT STUDY, 87/880

| Depth (ft) | Sampler Type (Bulk, Drive, SPT, Tube) | Sample Number | Sample Type (B/D/S.B./T) | Blows/6" | Recovery (inch) | U.S.C.S. | Description (ASTM D-2488-93) Color | | Moisture State (Dry, Moist, Wet) | Max. Size | Grain Size (%) Gravel : Sand : Fines | Sand Size | Plasticity | Consistency | Cementation | $O^2$/LEL/PID |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30 | D | 7 | | 12 13 | 16" | CL | OLIVE/ BROWN/ | CLAY W/ SILT, MOIST, MOD-SL PLASTICITY, V. STIFF, TRACE ORGANICS, MOTTLED | | | : : | | | | | |
| | | | | 14 | | | ORANGE | ORANGE BROWN OXIDATION, LAMINATED TRACE GRAVELS | | | : : | | | | | |
| 35 | | | | | | | | | | | : : | | | | | |
| | | | | | | | | | | | : : | | | | | |
| 40 | | | | | | | | | | | : : | | | | | |
| | | | | | | | | | | | : : | | | | | |
| 45 | | | | | | | | | | | : : | | | | | |
| | | | | | | | | | | | : : | | | | | |
| 50 | | | | | | | | | | | : : | | | | | |
| | | | | | | | | | | | : : | | | | | |
| 55 | | | | | | | | | | | : : | | | | | |
| | | | | | | | | | | | : : | | | | | |
| 60 | | | | | | | | | | | : : | | | | | |
| | | | | | | | | | | | : : | | | | | |
| 65 | | | | | | | | | | | : : | | | | | |
| 70 | | | | | | | | | | | : : | | | | | |

# LOG OF BORING NO. ( B-2 )

| | | | |
|---|---|---|---|
| Project Name | : UCSD BRIDGE ABUTMENT STUDY | | |
| Project Location | : SAN JOSE, CA - RTE 87/I-880 BRIDGE - NORTH ABUTMENT | | |
| E.M.I. Project No. | : 02-165 | Site Condition : | PAVED |
| Weather | : CLOUDY, LT RAIN | Elevation : | |
| Traffic Control | : N/A | Operator : | — |
| Drilling Company | : GREGG DRILLING | Operator : | JASON |
| Type of Rig | : MOBILE B-61 HDX | Drop (in) : | 30" |
| Borehole Diameter (inch) | : 6" - HOLLOW STEM AUGER | Drive Wt. (lbs) : | 140 lbs |
| Logged By | : J.C. | Date Drilled : | 1-30-04 |

Comments :




Backfilled with : CUTTINGS

| | Time | | | | | | | | | | Back to Office | Proposed Depth |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Depature | Arrival | Start | Break | Resume | Lunch | Resume | Break | Finish | Off | | 30 ft |
| Driller | | | | | | | | | | | | Water Table |
| Traffic Control | | | | | | | | 3' | | | | N/A ft |
| Logger | | | | | | | | | | | | Caving |
| Total | | | | | | | | | | | | N/A ft |

| Depth (ft) | Sampler Type (Bulk, Drive, SPT, Tube) | Sample Number | Sample Type (B/D/S.B./T) | Blows/6" | Recovery (inch) | U.S.C.S. | Color | Description (ASTM D-2488-93) | Moisture State (Dry, Moist, Wet) | Max. Size | Grain Size (%) Gravel : Sand : Fines | Sand Size | Plasticity | Consistency | Cementation | $O^2$/LEL/PID |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | B | 0 | | | | | | | | | : : | | | | | |
| ~~2.5~~ | S | — | | 30<br>41<br>50 | Ø | — | | INITIAL ATTEMPT = NO RECOVERY, TIP PLUGGED W/ GRAVEL<br>REPEAT SAMPLE @ 2.5 !!? | | | | | | | | |
| 2.5 | S | 1 | | 8<br>21<br>26 | 18" | ML | DRK BROWN | SILT W/ CLAY & TRACE GRAVEL, NON-LOW PLASTIC, HARD, MOIST | | | : : | | | | | |
| ~~10~~<br>5 | D | 2 | | 12<br>15<br>20 | 18" | CL | DRK BROWN/ GRAY | SILTY CLAY, MOIST, LOW PLASTICITY, HARD, TRACE ORGANICS, LAMINATED SOME ORANGE-BRN OXIDATION | | | : : | | | | | |
| ~~15~~<br>7.5 | S | 3 | | 7<br>10<br>11 | 18" | CL | BROWN/ GRAY/ | SILTY CLAY, MOIST, LOW-MOD PLASTICITY V. STIFF, | | | : : | | | | | |
| ~~20~~<br>10 | D | 4 | | 12<br>14<br>20 | 18" | CL | BROWN/ GRAY/ ORANGE | SILTY CLAY, MOIST, MOD PLASTICITY, HARD, TRACE SUBANGULAR PEA GRAVEL, TRACE ORGANICS, ORANGE-BRN OXIDATION | | | : : | | | | | |
| 15<br>20 | S | 5 | | 8<br>13<br>18 | 18" | CL | GRAY | SILTY CLAY, MOIST, MOD PLASTICITY, HARD, TRACE ORGANICS - WOOD/PLANT, LAMINATED, ORANGE-BRN OXIDATION | | | : : | | | | | |

2-5

# LOG OF BORING NO. ( B-2 NORTH ABUTMENT )

Earth Mechanics, Inc.

**Project No. :** 02-165 **Project Name :** BRIDGE ABUTMENT STUDY, 87/880

| Depth (ft) | Sampler Type (Bulk, Drive, SPT, Tube) | Sample Number | Sample Type (B/D/S.B./T) | Blows/6" | Recovery (inch) | U.S.C.S. | Color | Description (ASTM D-2488-93) | Moisture State (Dry, Moist, Wet) | Max. Size | Grain Size (%) Gravel : Sand : Fines | Sand Size | Plasticity | Consistency | Cementation | $O^2$/LEL/PID |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ~~30~~ | | ~~5~~ | | 14 | 18" | CL | GRAY/ | SAME | SL M | | : : | | | | | |
| 25 | D | 6 | | 22 | | | ORANGE | | | | | | | | | |
| | | | | 28 | | | | | | | : : | | | | | |
| ~~28~~ | | | | 8 | 18' | CL | BLACK → | SILTY CLAY, → CLAYEY SILT MOIST, TRACE SUB-ANGULAR | | | : : | | | | | |
| 30 | S | 7 | | 10 | | /ML | DRK GRAY | ~~GRAVEL~~ & ORGANICS, LOW PLASTICITY | | | | | | | | |
| | | | | 12 | | | | ~~VL~~ STIFF | | | : : | | | | | |
| 40 | | | | | | | | | | | : : | | | | | |
| | | | | | | | | | | | : : | | | | | |
| 45 | | | | | | | | | | | : : | | | | | |
| | | | | | | | | | | | : : | | | | | |
| 50 | | | | | | | | | | | : : | | | | | |
| | | | | | | | | | | | : : | | | | | |
| 55 | | | | | | | | | | | : : | | | | | |
| | | | | | | | | | | | : : | | | | | |
| 60 | | | | | | | | | | | : : | | | | | |
| | | | | | | | | | | | : : | | | | | |
| 65 | | | | | | | | | | | : : | | | | | |
| 70 | | | | | | | | | | | : : | | | | | |

GREGG DRILLING AND TESTING, INC.
GREGG IN SITU, INC.
ENVIRONMENTAL AND GEOTECHNICAL INVESTIGATION SERVICES

March 5, 2004

Earth Mechanics
Attn: Jody Castle
7700 Edgewater Drive
Oakland, California 94621

Subject: CPT Site Investigation
87 & I-880
San Jose, California
GREGG Project Number: 04-022ma

Dear Jody:

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

| | | | |
|---|---|---|---|
| 1 | Cone Penetration Tests | (CPTU) | X |
| 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 (562) 427-6899.

Sincerely,
GREGG IN SITU, Inc.

Mary Walden
Operations Manager

950 Howe Road • Martinez, California 90755 • (925) 313-5800 • FAX (925) 313-0302
OTHER OFFICES: SUMMERVILLE • LOS ANGELES • SALT LAKE CITY • HOUSTON • VANCOUVER • WEST BERLIN (NJ) • AUGUSTA
www.greggdrilling.com

# Bibliography

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Greig, J.w., R.G. Campanella and P.K. Robertson, "Comparison of Field Vane Results With Other In-Situ Test Results", International Symposium, on Laboratory and Field Vane Shear Strength Testing, ASTM, Tampa, FL, Proceedings, 1987.

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Mayne, P.W., "NHI (2002) Manual on Subsurface Investigations: Geotechnical Site Characterization", available through www.ce.gatech.edu/~geosys/Faculty/Mayne/papers/index.html, Section 5.3, pp. 107-112.

Robertson, P.K., R.G. Campanella, D. Gillespie and A. Rice, "Seismic CPT to Measure In-Situ Shear Wave Velocity", Journal of Geotechnical Engineering ASCE, Vol. 112, No. 8, 1986
pp. 791-803.

Robertson, P.K., T. Lunne and J.J.M. Powell, "Geo-Environmental Application of Penetration Testing", Geotechnical Site Characterization, Robertson & Mayne (editors), 1998 Balkema, Rotterdam, ISBN 90 5410 939 4 pp 35-47.

Roberston, P.K., "Soil Classification using the Cone Penetration Test", Canadian Geotechnical Journal, Vol. 27, 1990 pp. 151-158.

Woeller, D.J., P.K. Robertson, T.J. Boyd and Dave Thomas, "Detection of Polyaromatic Hydrocarbon Contaminants Using the UVIF-CPT", 53rd Canadian Geotechnical Conference Montreal, QC October pp. 733-739, 2000.

Zemo, D.A., T.A. Delfino, J.D. Gallinatti, V.A. Baker and L.R. Hilpert, "Field Comparison of Analytical Results from Discrete-Depth Groundwater Samplers" BAT EnviroProbe and QED HydroPunch, Sixth national Outdoor Action Conference, Las Vegas, Nevada Proceedings, 1992, pp 299-312.

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

# 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 dynamic 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 (2002) 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 dynamic 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.

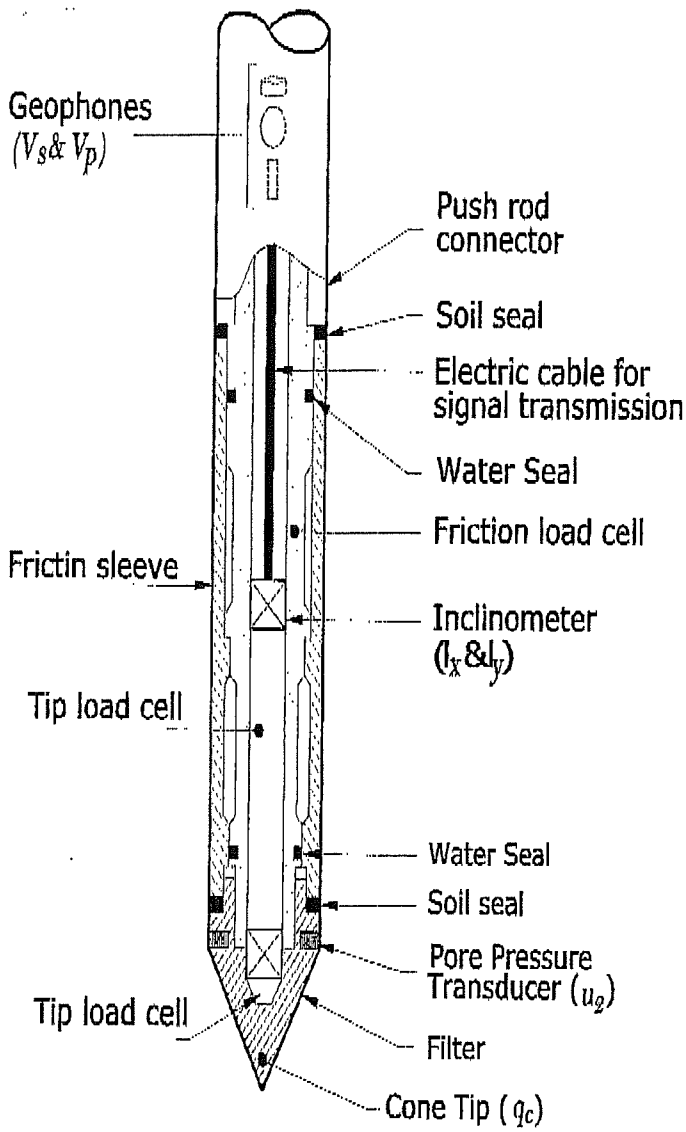


*Figure CPT*

When the soundings are complete, the test holes are grouted using a Gregg In Situ support rig. The grouting procedure consists 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.

# Gregg In Situ

Environmental and Geotechnical Site Investigation Contractors

**Gregg In Situ CPT Interpretations as of January 7, 1999 (Release 1.00.19)**

Gregg In Situ's interpretation routine should be considered a calculator of current published CPT correlations and is subject to change to reflect the current state of practice. The interpreted values are not considered valid for all soil types. The interpretations are presented only as a guide for geotechnical use and should be carefully scrutinized for consideration in any geotechnical design. Reference to current literature is strongly recommended.

The CPT interpretations are based on values of tip, sleeve friction and pore pressure averaged over a user specified interval (typically 0.25m). Note that Qt is the recorded tip value, Qc, corrected for pore pressure effects. Since all Gregg In Situ cones have equal end area friction sleeves, pore pressure corrections to sleeve friction, Fs, are not required.

The tip correction is: $Qt = Qc + (1-a) \bullet Ud$

where: *Qt* is the corrected tip load
*Qc* is the recorded tip load
*Ud* is the recorded dynamic pore pressure
*a* is the Net Area Ratio for the cone (typically 0.85 for Gregg In Situ cones)

Effective vertical overburden stresses are calculated based on a hydrostatic distribution of equilibrium pore pressures below the water table or from a user defined equilibrium pore pressure profile (this can be obtained from CPT dissipation tests). The stress calculations use unit weights assigned to the Soil Behavior Type zones or from a user defined unit weight profile.

Details regarding the interpretation methods for all of the interpreted parameters is given in table 1. The appropriate references referred to in table 1 are listed in table 2.

The estimated Soil Behavior Type is based on the charts developed by Robertson and Campanella shown in figure 1.

**Table 1 CPT Interpretation Methods**

| Interpreted Parameter | Description | Equation | Ref |
|---|---|---|---|
| Depth | mid layer depth | | |
| AvgQt | Averaged corrected tip (Qt) | $AvgQt = \frac{1}{n}\sum_{i=1}^{n} Qt_i$ | |
| AvgFs | Averaged sleeve friction (Fs) | $AvgFs = \frac{1}{n}\sum_{i=1}^{n} Fs_i$ | |
| AvgRf | Averaged friction ratio (Rf) | $AvgRf = 100\% \bullet \frac{AvgFs}{AvgQt}$ | |
| AvgUd | Averaged dynamic pore pressure (Ud) | $AvgUd = \frac{1}{n}\sum_{i=1}^{n} Ud_i$ | |
| SBT | Soil Behavior Type as defined by Robertson and Campanella | | 1 |

# CPT Interpretations

| | | | |
|---|---|---|---|
| U.Wt. | Unit Weight of soil determined from:<br>1) uniform value or<br>2) value assigned to each SBT zone<br>3) user supplied unit weight profile | | |
| TStress | Total vertical overburden stress at mid layer depth | $TStress = \sum_{i=1}^{n} \gamma_i h_i$<br>where $\gamma_i$ is layer unit weight<br>$h_i$ is layer thickness | |
| EStress | Effective vertical overburden stress at mid layer depth | $EStress = TStress - Ueq$ | |
| Ueq | Equilibrium pore pressure determined from:<br>1) hydrostatic from water table depth<br>2) user supplied profile | | |
| Cn | SPT $N_{60}$ overburden correction factor | $Cn = (\sigma_v')^{-0.5}$<br>where $\sigma_v'$ is in tsf<br>$0.5 < C_n < 2.0$ | |
| $N_{60}$ | SPT N value at 60% energy calculated from Qt/N ratios assigned to each SBT zone | | 3 |
| $(N1)_{60}$ | SPT $N_{60}$ value corrected for overburden pressure | $N1_{60} = Cn * N_{60}$ | 3 |
| $\Delta(N1)_{60}$ | Equivalent Clean Sand Correction to $(N1)_{60}$ | $\Delta(N1)_{60} = \frac{K_{SPT}}{1 - K_{SPT}} * (N1)_{60}$<br>Where: $K_{SPT}$ is defined as:<br>0.0 for FC < 5%<br>0.0167 * (FC - 5) for 5% < FC < 35%<br>0.5 for FC > 35%<br>FC - Fines Content in % | 7 |
| $(N1)_{60cs}$ | Equivalent Clean Sand $(N1)_{60}$ | $(N1)_{60cs} = (N1)_{60} + \Delta(N1)_{60}$ | 7 |
| Su | Undrained shear strength - Nkt is use selectable | $Su = \frac{Qt - \sigma_v}{N_{kt}}$ | 2 |
| k | Coefficient of permeability (assigned to each SBT zone) | | 6 |
| Bq | Pore pressure parameter | $Bq = \frac{\Delta u}{Qt - \sigma_v}$ | 2 |
| Qtn | Normalized Qt for Soil Behavior Type classification as defined by Robertson, 1990 | $Qtn = \frac{Qt - \sigma_v}{\sigma_v'}$ | 4 |
| Rfn | Normalized Rf for Soil Behavior Type classification as defined by Robertson, 1990 | $Rfn = 100\% * \frac{f_s}{Qt - \sigma_v}$ | 4 |
| SBTn | Normalized Soil Behavior Type (slightly modified from that published by Robertson, 1990. This version includes all the soil zones of the original non-normalized SBT chart - see figure 1) | | 4 |
| Qc1 | Normalized Qt for seismic analysis | $qc1 = qc * (Pa/\sigma_v')^{0.5}$<br>where: Pa = atm. pressure | 5 |
| Qc1N | Dimensionless Normalized Qt1 | qc1N = qc1 / Pa<br>where: Pa = atm. pressure | |

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# CPT Interpretations

| | | | |
|---|---|---|---|
| ΔQc1N1 | Equivalent clean sand correction | $\Delta qc1N = \frac{K_{CPT}}{1 - K_{CPT}} * qc1N$<br><br>Where: $K_{CPT}$ is defined as:<br><br>0.0 for FC < 5%<br>0.0267 * (FC - 5) for 5% < FC < 35%<br>0.5 for FC > 35%<br><br>FC - Fines Content in % | 5 |
| Qc1Ncs | Clean Sand equivalent Qc1N | $qc1Ncs = qc1N + \Delta qc1N$ | 5 |
| Ic | Soil Index for estimating grain characteristics | $Ic = [(3.47 - \log Q)^2 + (\log F + 1.22)^2]^{0.5}$ | 5 |
| FC | Fines content (%) | $FC=1.75(Ic^{3.25}) - 3.7$<br>$FC=100$ for $Ic > 3.5$<br>$FC=0$ for $Ic < 1.26$<br>$FC = 5\%$ if $1.64 < Ic < 2.6$ AND $Rfn<0.5$ | 8 |
| PHI | Friction Angle | Campanella and Robertson<br>Durunoglu and Mitchel<br>Janbu | 1 |
| Dr | Relative Density | Ticino Sand<br>Hokksund Sand<br>Schmertmann 1976<br>Jamiolkowski - All Sands | 1 |
| OCR | Over Consolidation Ratio | | 1 |
| State Parameter | | | 9 |
| CRR | Cyclic Resistance Ratio | | 7 |

GREGG

CPT Interpretations

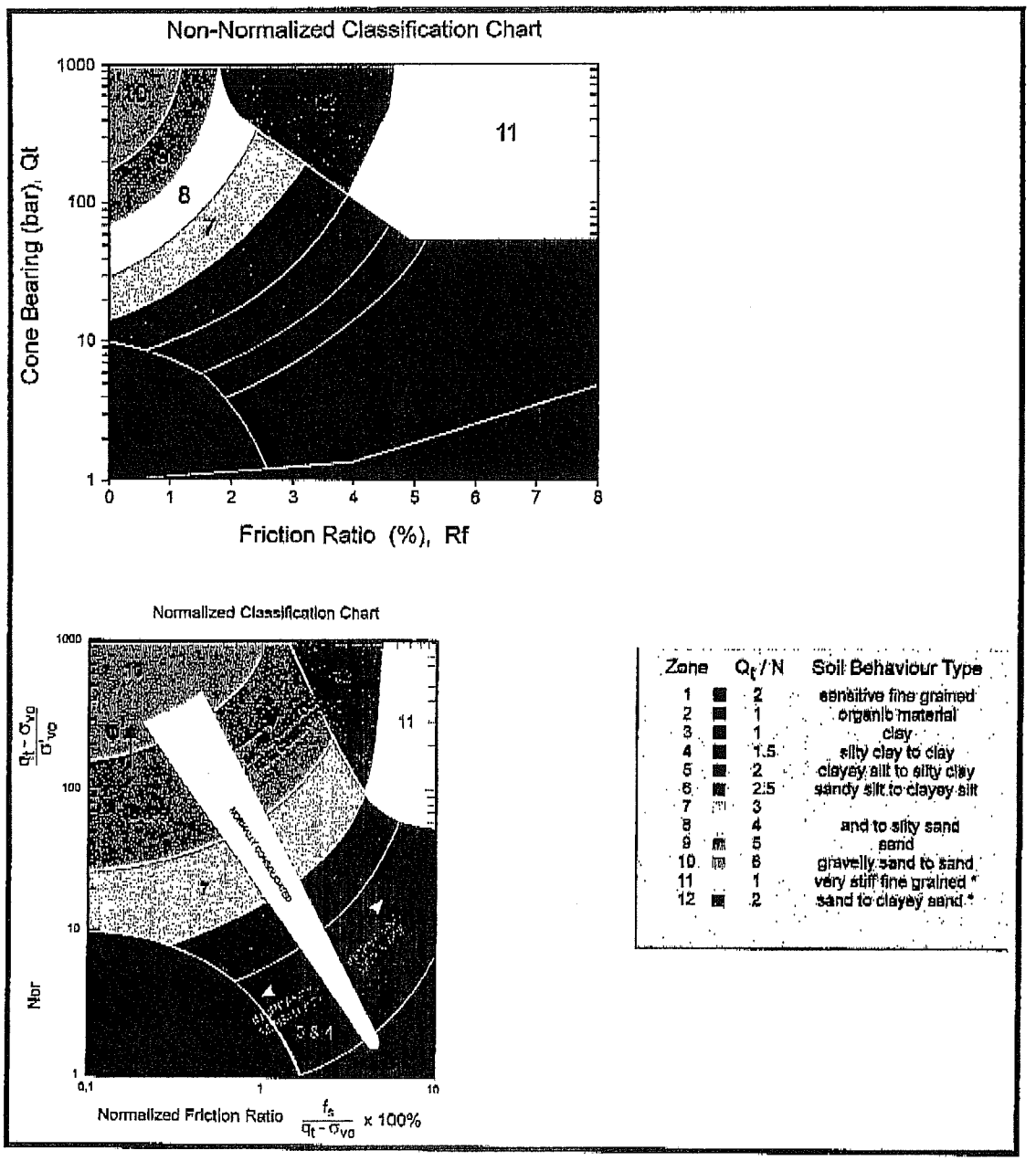


Figure 1 Non-Normalized and Normalized Soil Behavior Type Classification Charts

**Table 2 References**

| No. | Reference |
|---|---|
| 1 | Robertson, P.K. and Campanella, R.G., 1986, "Guidelines for Use, Interpretation and Application of the CPT and CPTU", UBC, Soil Mechanics Series No. 105, Civil Eng. Dept., Vancouver, B.C., Canada |
| 2 | Robertson, P.K., Campanella, R.G., Gillespie, D. and Greig, J., 1986, "Use of Piezometer Cone Data", Proceedings of InSitu 86, ASCE Specialty Conference, Blacksburg, Virginia. |
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| 5 | Robertson, P.K. and Fear, C.E., 1995, "Liquefaction of Sands and its Evaluation", Keynote Lecture, First International Conference on Earthquake Geotechnical Engineering, Tokyo, Japan. |
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| 8 | Wride, C.E. and Robertson, P.K., 1997, "Phase II Data Review Report (Massey and Kidd Sites, Fraser River Delta)", Volume 1 - Data Report (June 1997), University of Alberta. |
| 9 | Plewes, H.D., Davies, M.P. and Jefferies, M.G., 1992, "CPT Based Screening Procedure for Evaluating Liquefaction Susceptibility", 45th Canadian Geotechnical Conference, Toronto, Ontario, October 1992. |

# 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 ($u_2$)

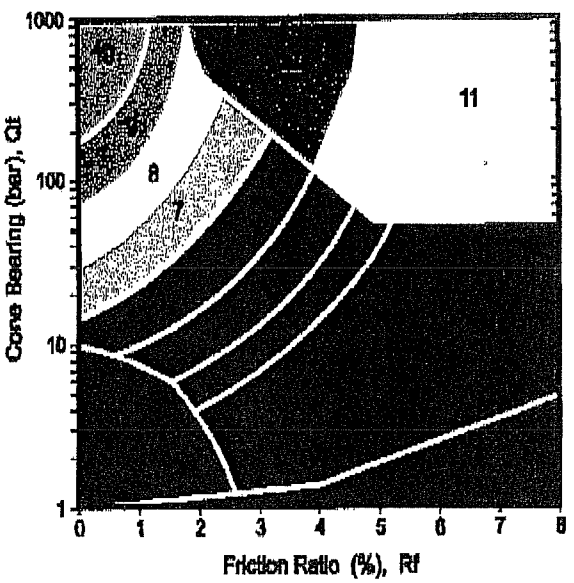
Cohesionless soils (sands)

- 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.

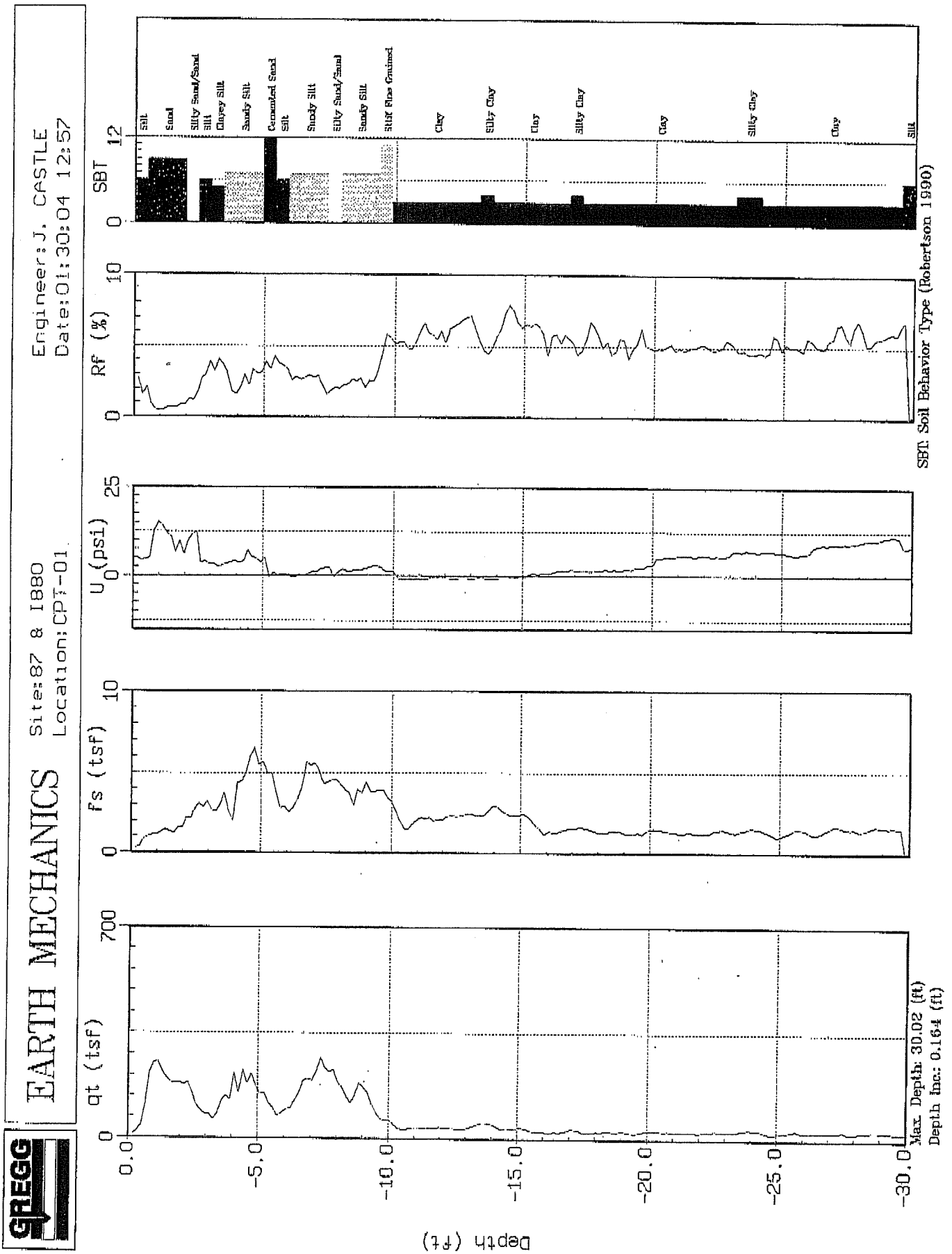
Soil interpretation for this project was conducted using recent correlations developed by Robertson et al, 1990, *Figure SBT*. Note that it is not always possible to clearly identify a soil type based solely on $q_c$, $f_s$, and $u_2$. In these situations, experience, judgment, and an assessment of the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

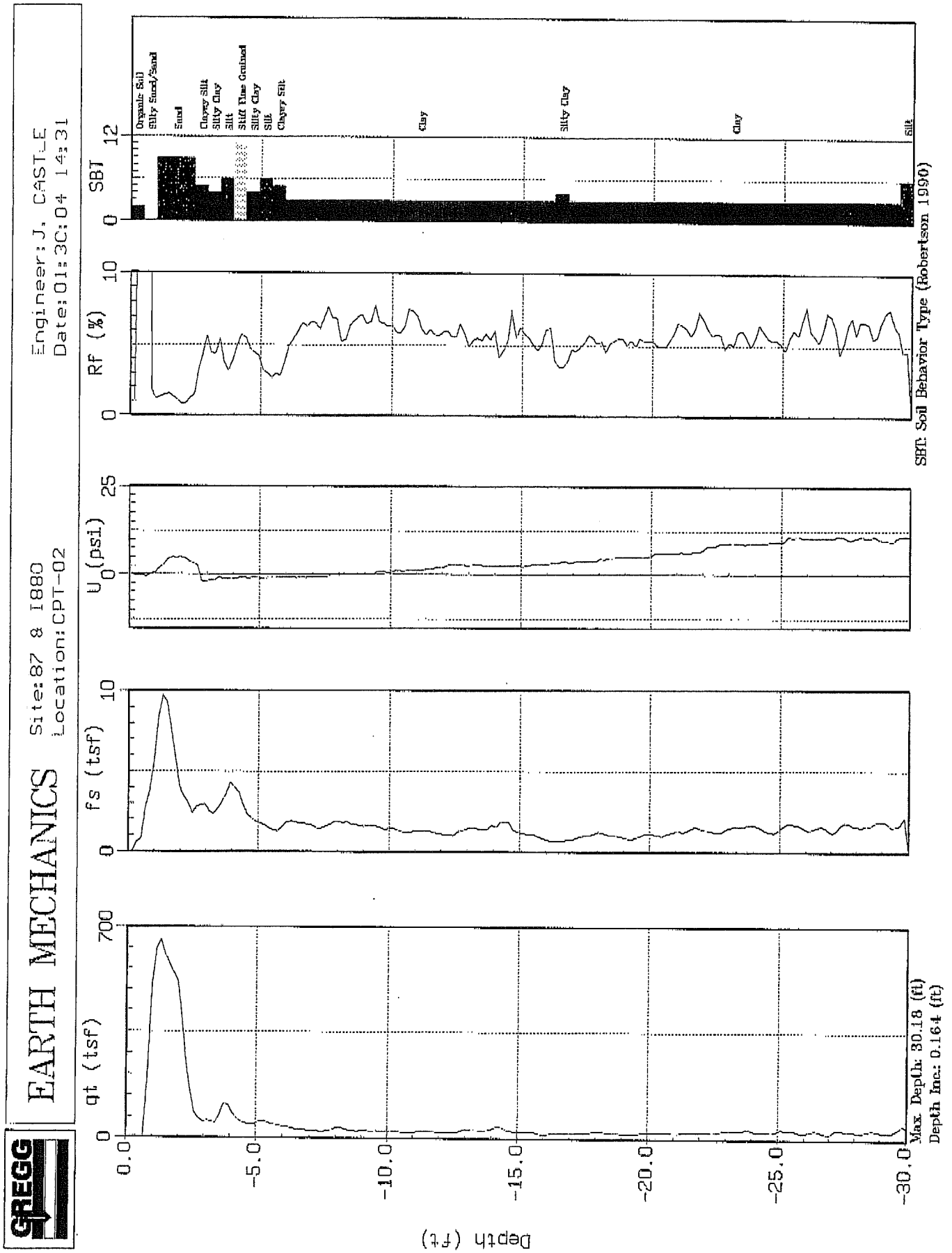


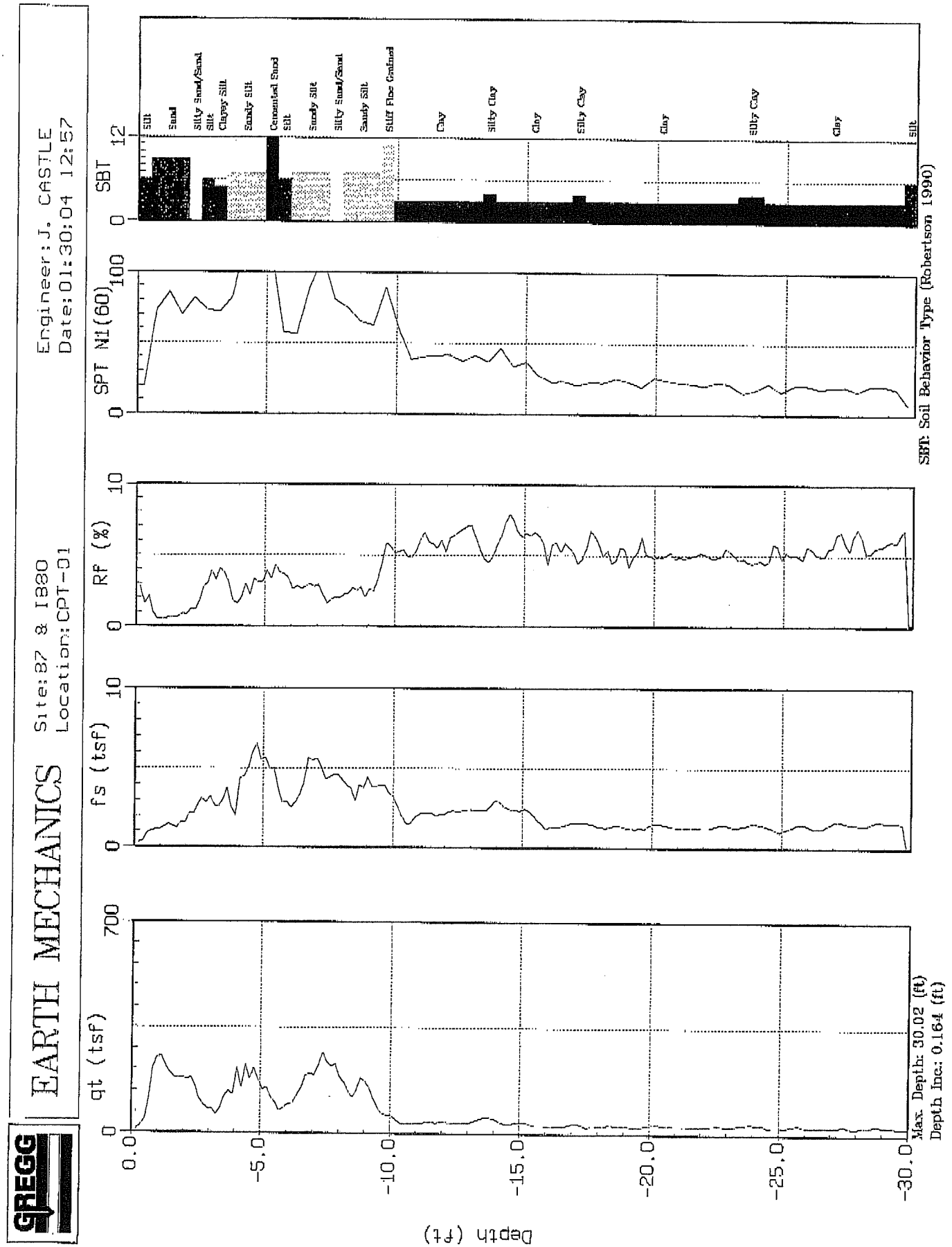

| ZONE | Qt/N | SBT |
|---|---|---|
| 1 | 2 | Sensitive, fine grained |
| 2 | 1 | Organic materials |
| 3 | 1 | Clay |
| 4 | 1.5 | Silty clay to clay |
| 5 | 2 | Clayey silt to silty clay |
| 6 | 2.5 | Sandy silt to clayey silt |
| 7 | 3 | Silty sand to sandy silt |
| 8 | 4 | Sand to silty sand |
| 9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


GREGG
EARTH MECHANICS
Site:87 & 1880
Location:CPT-01
Engineer:J. CASTLE
Date:01:30:04 12:57
qt (tsf)
Fs (tsf)
$U_0$(psi)
Rf (%)
SBT
Silt
Sand
Silty Sand/Sand Silt
Clayey Silt
Sandy Silt
Cemented Sand Silt
Sandy Silt
Silty Sand/Sand
Sandy Silt
Stiff Fine Grained
Clay
Silty Clay
Clay
Silty Clay
Clay
Silty Clay
Clay
Silt
SBT: Soil Behavior Type (Robertson 1990)
Max Depth: 30.02 (ft)
Depth Inc.: 0.164 (ft)
Depth (ft)


GREGG
EARTH MECHANICS
Site:87 & 1880
Location:CPT-02
Engineer:J. CASTLE
Date:01:3C:04 14:31
qt (tsf)
0
700
fs (tsf)
0
10
$U_0$(psi)
0
25
RF (%)
0
10
SBT
0
12
Organic Soil
Silty Sand/Sand
Sand
Clayey Silt
Silty Clay
Silt
Stiff Fine Grained
Silty Clay
Silt
Clayey Silt
Clay
Silty Clay
Clay
Silt
SBT: Soil Behavior Type (Robertson 1990)
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
Depth (ft)
Max Depth: 30.18 (ft)
Depth Inc.: 0.164 (ft)

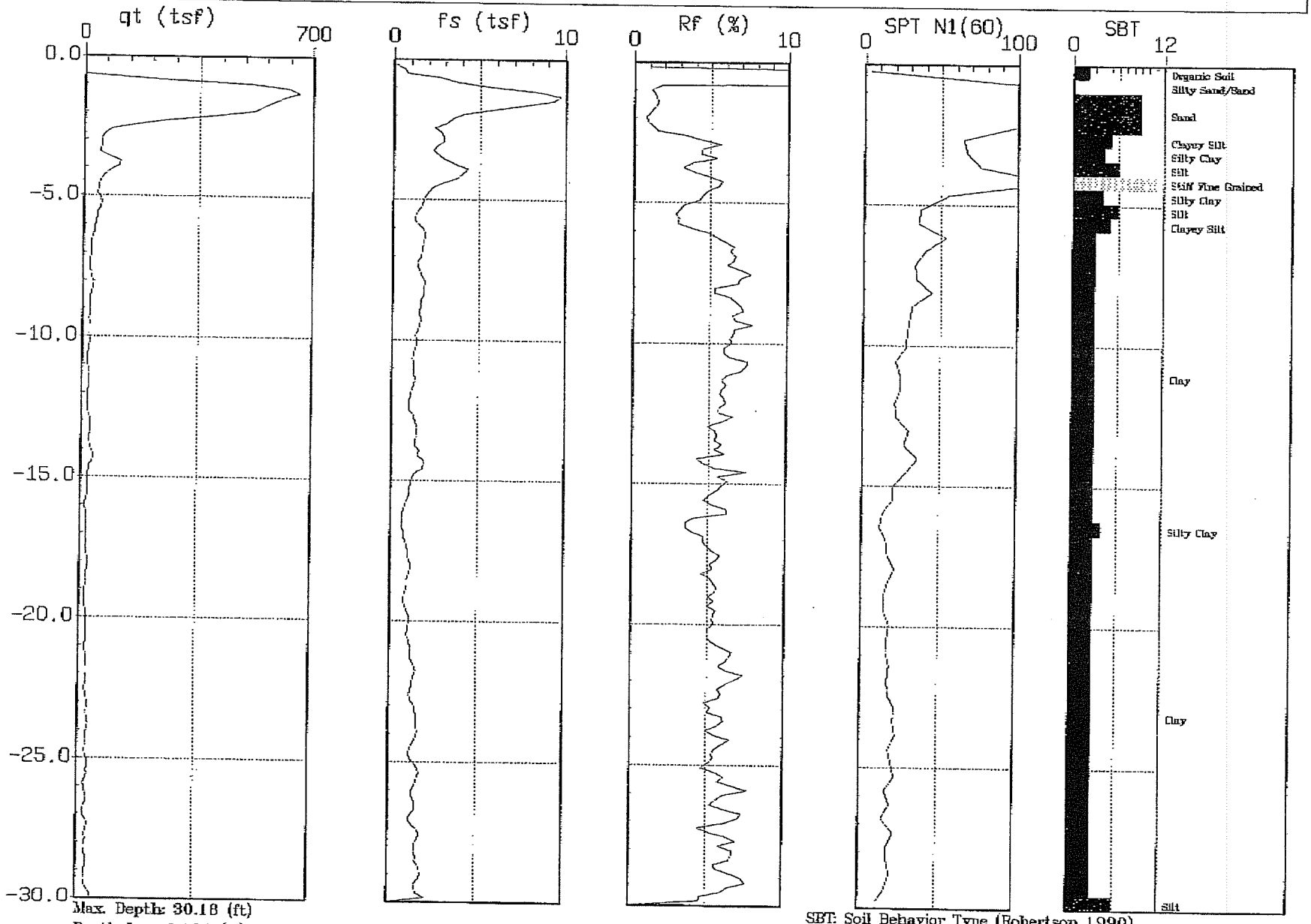

GREGG
EARTH MECHANICS
Site:87 & I880
Location:CPT-01
Engineer:J. CASTLE
Date:01:30:04 12:57
qt (tsf)
0
700
fs (tsf)
0
10
RF (%)
0
10
SPT N1(60)
0
100
SBT
0
12
Silt
Sand
Silty Sand/Sand
Silt
Clayey Silt
Sandy Silt
Cemented Sand
Silt
Sandy Silt
Silty Sand/Sand
Sandy Silt
Stiff Fine Grained
Clay
Silty Clay
Clay
Silty Clay
Clay
Silty Clay
Clay
Silt
SBT: Soil Behavior Type (Robertson 1990)
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
Depth (ft)
Max. Depth: 30.02 (ft)
Depth Inc: 0.164 (ft)

GREGG

# EARTH MECHANICS

Site: 87 & I880
Location: CPT-02

Engineer: J. CASTLE
Date: 01:30:04 14:31




Max. Depth: 30.18 (ft)
Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

Gregg In Situ, Inc.
Interpretation Output - Release 1.00.19e
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Run No: 04-0305-0954-0126
Job No: 04-022MA
Client: EARTH MECHANICS
Project: CPT SITE INVESTIGATION
Site: 87 & I880
Location: CPT-01
Engineer: J. CASTLE
CPT Date: 04/30/01
CPT Time: 12:57
CPT File: 022C01.COR
Northing (m): 0.000
Easting (m): 0.000
Elevation (m): 0.000

Water Table (m): 12.19 (ft): 40.0
Su Nkt used: 12.50
Averaging Increment (m): 0.15
Phi Method : Robertson and Campanella, 1983
Dr Method : Jamiolkowski - All Sands
State Parameter M: 1.20
Used Unit Weights Assigned to Soil Zones
Values of 1.0E9 or UnDef are printed for parameters that are not valid for the material type (SBT)

| Depth (ft) | AvgQt (tsf) | AvgFs (tsf) | AvgRf (%) | AvgUd (ft) | SBT | U.Wt. pcf | TStress (tsf) | EStress (tsf) | Ueq (tsf) | Cn | N60 (blows/ft) | (N1)60 (blows/ft) | Su (tsf) | CRR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.25 | 24.9 | 0.51 | 2.04 | 10.6 | 6 | 114.6 | 0.01 | 0.01 | 0.00 | 2.00 | 9.5 | 19.1 | 1.99 | 0.00 |
| 0.74 | 191.1 | 1.07 | 0.56 | 25.3 | 9 | 124.1 | 0.04 | 0.04 | 0.00 | 2.00 | 36.6 | 73.2 | UnDef | 0.00 |
| 1.23 | 223.7 | 1.33 | 0.59 | 28.3 | 9 | 124.1 | 0.07 | 0.07 | 0.00 | 2.00 | 42.8 | 85.7 | UnDef | 0.00 |
| 1.72 | 182.5 | 1.41 | 0.77 | 17.3 | 9 | 124.1 | 0.10 | 0.10 | 0.00 | 2.00 | 34.9 | 69.9 | UnDef | 0.00 |
| 2.21 | 171.0 | 2.34 | 1.37 | 25.9 | 8 | 120.9 | 0.13 | 0.13 | 0.00 | 2.00 | 40.9 | 81.9 | UnDef | 0.00 |
| 2.71 | 95.9 | 3.02 | 3.15 | 8.2 | 6 | 114.6 | 0.16 | 0.16 | 0.00 | 2.00 | 36.7 | 73.4 | 7.66 | 0.00 |
| 3.20 | 74.8 | 2.73 | 3.64 | 6.7 | 5 | 114.6 | 0.19 | 0.19 | 0.00 | 2.00 | 35.8 | 71.7 | 5.97 | 0.00 |
| 3.61 | 129.4 | 3.13 | 2.42 | 8.0 | 7 | 117.8 | 0.22 | 0.22 | 0.00 | 2.00 | 41.3 | 82.6 | UnDef | 0.00 |
| 4.02 | 163.4 | 3.59 | 2.20 | 8.8 | 7 | 117.8 | 0.24 | 0.24 | 0.00 | 2.00 | 52.2 | 104.3 | UnDef | 0.00 |
| 4.51 | 207.0 | 5.88 | 2.84 | 13.4 | 7 | 117.8 | 0.27 | 0.27 | 0.00 | 1.93 | 66.1 | 127.5 | UnDef | 0.00 |
| 5.00 | 156.9 | 5.39 | 3.43 | 6.3 | 6 | 114.6 | 0.30 | 0.30 | 0.00 | 1.83 | 60.1 | 110.2 | 12.52 | 0.00 |
| 5.50 | 97.7 | 3.87 | 3.96 | 0.9 | 5 | 114.6 | 0.33 | 0.33 | 0.00 | 1.75 | 46.8 | 82.0 | 7.79 | 0.00 |
| 5.99 | 93.4 | 2.74 | 2.93 | -0.5 | 6 | 114.6 | 0.35 | 0.35 | 0.00 | 1.68 | 35.8 | 60.2 | 7.45 | 0.00 |
| 6.56 | 164.6 | 4.64 | 2.82 | 1.0 | 7 | 117.8 | 0.39 | 0.39 | 0.00 | 1.61 | 52.5 | 84.4 | UnDef | 0.00 |

Gregg In Situ, Inc.
Run No: 04-0305-C954-0126
CPT File: 022C01.CCR

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| Depth (ft) | AvgQt (tsf) | AvgFs (tsf) | AvgRf (%) | AvgUd (ft) | SBT | U.Wt. pcf | TStress (tsf) | EStress (tsf) | Ueq (tsf) | Cn | N60 (blows/ft) | (N1)60 | Su (tsf) | CRR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7.14 | 227.8 | 4.98 | 2.19 | 3.9 | 7 | 117.8 | 0.42 | 0.42 | 0.00 | 1.54 | 72.7 | 112.1 | UnDef | 0.00 |
| 7.63 | 228.0 | 4.50 | 1.98 | 2.3 | 8 | 120.9 | 0.45 | 0.45 | 0.00 | 1.49 | 54.6 | 81.4 | UnDef | 0.00 |
| 8.12 | 164.0 | 3.96 | 2.42 | 3.5 | 7 | 117.8 | 0.48 | 0.48 | 0.00 | 1.44 | 52.3 | 75.6 | UnDef | 0.00 |
| 8.61 | 147.3 | 3.54 | 2.40 | 3.7 | 7 | 117.8 | 0.51 | 0.51 | 0.00 | 1.40 | 47.0 | 65.9 | UnDef | 0.00 |
| 9.10 | 145.1 | 4.03 | 2.77 | 5.8 | 7 | 117.8 | 0.54 | 0.54 | 0.00 | 1.36 | 46.3 | 63.2 | UnDef | 0.00 |
| 9.60 | 70.9 | 3.75 | 5.29 | 3.8 | 11 | 130.5 | 0.57 | 0.57 | 0.00 | 1.33 | 67.9 | 90.1 | UnDef | 0.00 |
| 10.09 | 48.9 | 2.57 | 5.25 | -0.6 | 3 | 111.4 | 0.60 | 0.60 | 0.00 | 1.29 | 46.8 | 60.6 | 3.86 | 0.00 |
| 10.58 | 31.8 | 1.59 | 5.01 | -2.4 | 3 | 111.4 | 0.63 | 0.63 | 0.00 | 1.26 | 30.5 | 38.5 | 2.49 | 0.00 |
| 11.07 | 34.4 | 2.14 | 6.22 | -2.1 | 3 | 111.4 | 0.65 | 0.65 | 0.00 | 1.24 | 33.0 | 40.8 | 2.70 | 0.00 |
| 11.56 | 36.1 | 2.09 | 5.78 | -1.2 | 3 | 111.4 | 0.68 | 0.68 | 0.00 | 1.21 | 34.6 | 41.9 | 2.83 | 0.00 |
| 12.06 | 37.0 | 2.20 | 5.94 | -1.8 | 3 | 111.4 | 0.71 | 0.71 | 0.00 | 1.19 | 35.5 | 42.2 | 2.91 | 0.00 |
| 12.55 | 33.8 | 2.31 | 6.83 | -1.5 | 3 | 111.4 | 0.73 | 0.73 | 0.00 | 1.17 | 32.4 | 37.8 | 2.65 | 0.00 |
| 13.04 | 38.4 | 2.38 | 6.21 | -1.7 | 3 | 111.4 | 0.76 | 0.76 | 0.00 | 1.15 | 36.8 | 42.1 | 3.01 | 0.00 |
| 13.53 | 52.3 | 2.47 | 4.71 | -1.8 | 4 | 114.6 | 0.79 | 0.79 | 0.00 | 1.13 | 33.4 | 37.6 | 4.12 | 0.00 |
| 14.03 | 44.3 | 2.81 | 6.34 | -1.6 | 3 | 111.4 | 0.82 | 0.82 | 0.00 | 1.11 | 42.5 | 47.0 | 3.48 | 0.00 |
| 14.52 | 32.6 | 2.39 | 7.32 | -1.2 | 3 | 111.4 | 0.85 | 0.85 | 0.00 | 1.09 | 31.2 | 33.9 | 2.54 | 0.00 |
| 15.01 | 36.5 | 2.35 | 6.42 | -0.5 | 3 | 111.4 | 0.87 | 0.87 | 0.00 | 1.07 | 35.0 | 37.5 | 2.85 | 0.00 |
| 15.50 | 27.5 | 1.74 | 6.32 | 1.3 | 3 | 111.4 | 0.90 | 0.90 | 0.00 | 1.05 | 26.4 | 27.8 | 2.13 | 0.00 |
| 15.99 | 23.7 | 1.25 | 5.28 | 1.9 | 3 | 111.4 | 0.93 | 0.93 | 0.00 | 1.04 | 22.7 | 23.5 | 1.82 | 0.00 |
| 16.49 | 24.4 | 1.35 | 5.56 | 3.4 | 3 | 111.4 | 0.96 | 0.96 | 0.00 | 1.02 | 23.3 | 23.9 | 1.87 | 0.00 |
| 16.98 | 32.4 | 1.55 | 4.77 | 3.5 | 3 | 111.4 | 0.98 | 0.98 | 0.00 | 1.01 | 31.0 | 31.3 | 2.51 | 0.00 |
| 17.47 | 24.6 | 1.51 | 6.16 | 3.0 | 3 | 111.4 | 1.01 | 1.01 | 0.00 | 1.00 | 23.5 | 23.4 | 1.88 | 0.00 |
| 17.96 | 24.2 | 1.29 | 5.35 | 3.7 | 3 | 111.4 | 1.04 | 1.04 | 0.00 | 0.98 | 23.2 | 22.7 | 1.85 | 0.00 |
| 18.45 | 27.8 | 1.36 | 4.88 | 3.8 | 3 | 111.4 | 1.06 | 1.06 | 0.00 | 0.97 | 26.6 | 25.8 | 2.14 | 0.00 |
| 18.95 | 26.0 | 1.25 | 4.80 | 4.0 | 3 | 111.4 | 1.09 | 1.09 | 0.00 | 0.96 | 24.9 | 23.8 | 1.99 | 0.00 |
| 19.44 | 21.6 | 1.20 | 5.53 | 5.4 | 3 | 111.4 | 1.12 | 1.12 | 0.00 | 0.95 | 20.7 | 19.6 | 1.64 | 0.00 |
| 19.93 | 29.5 | 1.44 | 4.89 | 8.6 | 3 | 111.4 | 1.15 | 1.15 | 0.00 | 0.93 | 28.2 | 26.4 | 2.27 | 0.00 |
| 20.42 | 28.0 | 1.41 | 5.04 | 12.0 | 3 | 111.4 | 1.17 | 1.17 | 0.00 | 0.92 | 26.8 | 24.7 | 2.15 | 0.00 |
| 20.92 | 26.4 | 1.27 | 4.82 | 13.0 | 3 | 111.4 | 1.20 | 1.20 | 0.00 | 0.91 | 25.3 | 23.1 | 2.02 | 0.00 |
| 21.41 | 25.8 | 1.27 | 4.94 | 12.9 | 3 | 111.4 | 1.23 | 1.23 | 0.00 | 0.90 | 24.7 | 22.3 | 1.96 | 0.00 |
| 21.90 | 24.3 | 1.23 | 5.06 | 13.5 | 3 | 111.4 | 1.26 | 1.26 | 0.00 | 0.89 | 23.2 | 20.7 | 1.84 | 0.00 |
| 22.39 | 27.7 | 1.35 | 4.87 | 12.8 | 3 | 111.4 | 1.28 | 1.28 | 0.00 | 0.88 | 26.5 | 23.4 | 2.11 | 0.00 |
| 22.88 | 26.4 | 1.39 | 5.27 | 14.1 | 3 | 111.4 | 1.31 | 1.31 | 0.00 | 0.87 | 25.2 | 22.0 | 2.00 | 0.00 |
| 23.38 | 28.6 | 1.33 | 4.67 | 16.4 | 3 | 111.4 | 1.34 | 1.34 | 0.00 | 0.86 | 27.4 | 23.6 | 2.18 | 0.00 |
| 23.87 | 33.0 | 1.50 | 4.55 | 15.9 | 3 | 111.4 | 1.37 | 1.37 | 0.00 | 0.86 | 31.6 | 27.1 | 2.53 | 0.00 |
| 24.36 | 27.8 | 1.35 | 4.87 | 16.3 | 3 | 111.4 | 1.39 | 1.39 | 0.00 | 0.85 | 26.6 | 22.6 | 2.11 | 0.00 |

Gregg In Situ, Inc.
Run No: 04-0305-0954-0126
CPT File: D22C01.COR

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| Depth (ft) | AvgQt (tsf) | AvgFs (tsf) | AvgRf (%) | AvgUd (ft) | SBT | U.Wt. pcf | TStress (tsf) | EStress (tsf) | Ueq (tsf) | Cn | N60 (blows/ft) | (N1)60 (blows/ft) | Su (tsf) | CRR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24.85 | 20.4 | 1.06 | 5.20 | 15.5 | 3 | 111.4 | 1.42 | 1.42 | 0.00 | 0.84 | 19.6 | 16.4 | 1.52 | 0.00 |
| 25.34 | 27.0 | 1.35 | 4.98 | 14.2 | 3 | 111.4 | 1.45 | 1.45 | 0.00 | 0.83 | 25.9 | 21.5 | 2.05 | 0.00 |
| 25.84 | 27.2 | 1.43 | 5.24 | 15.0 | 3 | 111.4 | 1.48 | 1.48 | 0.00 | 0.82 | 26.1 | 21.5 | 2.06 | 0.00 |
| 26.33 | 24.2 | 1.21 | 4.98 | 19.9 | 3 | 111.4 | 1.50 | 1.50 | 0.00 | 0.82 | 23.2 | 18.9 | 1.82 | 0.00 |
| 26.82 | 25.6 | 1.50 | 5.85 | 20.5 | 3 | 111.4 | 1.53 | 1.53 | 0.00 | 0.81 | 24.5 | 19.8 | 1.93 | 0.00 |
| 27.31 | 26.8 | 1.59 | 5.92 | 21.0 | 3 | 111.4 | 1.56 | 1.56 | 0.00 | 0.80 | 25.7 | 20.6 | 2.02 | 0.00 |
| 27.80 | 22.4 | 1.45 | 6.49 | 21.8 | 3 | 111.4 | 1.59 | 1.59 | 0.00 | 0.79 | 21.4 | 17.0 | 1.66 | 0.00 |
| 28.30 | 27.8 | 1.47 | 5.28 | 23.3 | 3 | 111.4 | 1.61 | 1.61 | 0.00 | 0.79 | 26.6 | 21.0 | 2.09 | 0.00 |
| 28.79 | 28.4 | 1.63 | 5.74 | 24.4 | 3 | 111.4 | 1.64 | 1.64 | 0.00 | 0.78 | 27.2 | 21.3 | 2.14 | 0.00 |
| 29.28 | 25.7 | 1.57 | 6.11 | 25.7 | 3 | 111.4 | 1.67 | 1.67 | 0.00 | 0.77 | 24.6 | 19.0 | 1.92 | 0.00 |

Gregg In Situ, Inc.
Interpretation Output - Release 1.00.19e

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Run No: 04-0305-0954-0126
Job No: 04-022MA
Client: EARTH MECHANICS
Project: CPT SITE INVESTIGATION
Site: 87 & I880
Location: CPT-01
Engineer: J. CASTLE
CPT Date: 04/30/01
CPT Time: 12:57
CPT File: 022C01.COR
Northing (m): 0.000
Easting (m): 0.000
Elevation (m): 0.000

---

Water Table (m): 12.19 (ft): 40.0
Su Mkt used: 12.50
Averaging Increment (m): 0.15
Phi Method : Robertson and Campanella, 1983
Dr Method : Jamiolkowski - All Sands
State Parameter M: 1.20
Used Unit Weights Assigned to Soil Zones
Values of 1.0E9 or UnDef are printed for parameters that are not valid for the material type (SBT)

---

| Depth (ft) | k (cm/s) | Bq | Qtn | Rfn | QclN | DeltaQclN | QclNcs | Fc (%) | Phi (Deg) | Dr (%) | OCR | State Param | Del(n1)60 | (N1)60cs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.25 | 5.0E-05 | 0.01 | 1000.0 | 2.04 | 47.7 | UnDef | UnDef | 0.0 | 50 | 87.9 | 10.0 | -0.52 | UnDef | UnDef |
| 0.74 | 5.0E-02 | 0.00 | 1000.0 | 0.56 | 365.9 | 0.0 | 365.9 | 0.0 | 50 | 95.0 | 1.0 | -0.34 | 0.0 | 73.2 |
| 1.23 | 5.0E-02 | 0.00 | 1000.0 | 0.59 | 428.4 | 0.0 | 428.4 | 0.0 | 50 | 95.0 | 1.0 | -0.35 | 0.0 | 85.7 |
| 1.72 | 5.0E-02 | 0.00 | 1000.0 | 0.78 | 349.5 | 0.0 | 349.5 | 0.0 | 50 | 95.0 | 1.0 | -0.38 | 0.0 | 69.9 |
| 2.21 | 5.0E-03 | 0.00 | 1000.0 | 1.37 | 327.5 | UnDef | UnDef | 0.0 | 50 | 95.0 | 1.0 | -0.45 | UnDef | UnDef |
| 2.71 | 5.0E-05 | 0.00 | 584.7 | 3.16 | 183.6 | UnDef | UnDef | 0.0 | 50 | 91.4 | 10.0 | -0.58 | UnDef | UnDef |
| 3.20 | 5.0E-06 | 0.00 | 389.0 | 3.65 | 143.3 | UnDef | UnDef | 0.0 | UnDef | UnDef | 10.0 | UnDef | UnDef | UnDef |
| 3.61 | 5.0E-04 | 0.00 | 599.0 | 2.43 | 247.8 | UnDef | UnDef | 0.0 | 50 | 95.0 | 1.0 | -0.50 | UnDef | UnDef |
| 4.02 | 5.0E-04 | 0.00 | 680.6 | 2.20 | 313.0 | UnDef | UnDef | 0.0 | 50 | 95.0 | 1.0 | -0.49 | UnDef | UnDef |
| 4.51 | 5.0E-04 | 0.00 | 769.1 | 2.85 | 390.7 | UnDef | UnDef | 0.0 | 50 | 95.0 | 1.0 | -0.58 | UnDef | UnDef |
| 5.00 | 5.0E-05 | 0.00 | 526.6 | 3.44 | 281.5 | UnDef | UnDef | 0.0 | 48 | 95.0 | 10.0 | -0.60 | UnDef | UnDef |
| 5.50 | 5.0E-06 | 0.00 | 299.1 | 3.97 | 167.5 | UnDef | UnDef | 0.0 | UnDef | UnDef | 10.0 | UnDef | UnDef | UnDef |
| 5.99 | 5.0E-05 | 0.00 | 263.1 | 2.94 | 153.7 | UnDef | UnDef | 0.0 | 46 | 79.6 | 10.0 | -0.45 | UnDef | UnDef |
| 6.56 | 5.0E-04 | 0.00 | 424.1 | 2.83 | 258.8 | UnDef | UnDef | 0.0 | 48 | 94.5 | 1.0 | -0.50 | UnDef | UnDef |

Gregg In Situ, Inc.
Run No: 04-0305-0954-0125
CPT File: 022C01.CCR

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| Depth (ft) | k (cm/s) | Bq | Qtn | Rfn | QcIN | DeltaQcIN | QcINcs | Fc (%) | Fnt (Deg) | Dr (%) | OCR | State Param | Del(n1)60 | (N1)60cs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7.14 | 5.0E-04 | 0.00 | 540.3 | 2.19 | 343.7 | UnDef | UnDef | 0.0 | 50 | 95.0 | 1.0 | -0.47 | UnDef | UnDef |
| 7.63 | 5.0E-03 | 0.00 | 505.4 | 1.98 | 332.5 | UnDef | UnDef | 0.0 | 48 | 95.0 | 1.0 | -0.44 | UnDef | UnDef |
| 8.12 | 5.0E-04 | 0.00 | 340.8 | 2.42 | 231.7 | UnDef | UnDef | 0.0 | 48 | 91.4 | 1.0 | -0.43 | UnDef | UnDef |
| 8.61 | 5.0E-04 | 0.00 | 288.5 | 2.41 | 202.2 | UnDef | UnDef | 0.0 | 46 | 87.5 | 1.0 | -0.41 | UnDef | UnDef |
| 9.10 | 5.0E-04 | 0.00 | 269.0 | 2.78 | 193.7 | UnDef | UnDef | 0.0 | 46 | 86.2 | 1.0 | -0.44 | UnDef | UnDef |
| 9.60 | 1.0E-15 | 0.00 | 123.8 | 5.33 | 92.1 | UnDef | UnDef | 0.0 | 42 | 64.9 | 1.0 | -0.65 | UnDef | UnDef |
| 10.09 | 5.0E-08 | 0.00 | 80.8 | 5.31 | 61.9 | UnDef | UnDef | 0.0 | UnDef | UnDef | 10.0 | UnDef | UnDef | UnDef |
| 10.58 | 5.0E-08 | 0.00 | 49.9 | 5.11 | 39.4 | 157.4 | 196.8 | 36.3 | UnDef | UnDef | 6.0 | UnDef | 38.5 | 77.0 |
| 11.07 | 5.0E-08 | 0.00 | 51.7 | 6.34 | 41.7 | UnDef | UnDef | 100.0 | UnDef | UnDef | 10.0 | UnDef | UnDef | UnDef |
| 11.56 | 5.0E-08 | 0.00 | 52.1 | 5.89 | 42.8 | UnDef | UnDef | 100.0 | UnDef | UnDef | 10.0 | UnDef | UnDef | UnDef |
| 12.06 | 5.0E-08 | 0.00 | 51.3 | 6.05 | 43.1 | UnDef | UnDef | 100.0 | UnDef | UnDef | 10.0 | UnDef | UnDef | UnDef |
| 12.55 | 5.0E-08 | 0.00 | 45.0 | 6.98 | 38.6 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 13.04 | 5.0E-08 | 0.00 | 49.3 | 6.33 | 43.0 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 13.53 | 5.0E-07 | 0.00 | 65.2 | 4.79 | 57.6 | 141.1 | 198.7 | 31.6 | UnDef | UnDef | 10.0 | UnDef | 30.0 | 67.6 |
| 14.03 | 5.0E-08 | 0.00 | 53.2 | 6.46 | 48.0 | UnDef | UnDef | 100.0 | UnDef | UnDef | 10.0 | UnDef | UnDef | UnDef |
| 14.52 | 5.0E-08 | 0.00 | 37.5 | 7.52 | 34.7 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 15.01 | 5.0E-08 | 0.00 | 40.9 | 6.59 | 38.3 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 15.50 | 5.0E-08 | 0.00 | 29.6 | 6.54 | 28.4 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 15.99 | 5.0E-08 | 0.00 | 24.5 | 5.50 | 24.0 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 16.49 | 5.0E-08 | 0.00 | 24.5 | 5.78 | 24.4 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 16.98 | 5.0E-08 | 0.00 | 32.0 | 4.92 | 32.0 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 17.47 | 5.0E-08 | 0.00 | 23.3 | 6.43 | 23.9 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 17.96 | 5.0E-08 | 0.00 | 22.3 | 5.59 | 23.2 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 18.45 | 5.0E-08 | 0.00 | 25.1 | 5.07 | 26.4 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 18.95 | 5.0E-08 | 0.01 | 22.8 | 5.01 | 24.3 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 19.44 | 5.0E-08 | 0.01 | 18.3 | 5.83 | 20.0 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 19.93 | 5.0E-08 | 0.01 | 24.7 | 5.09 | 26.9 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 20.42 | 5.0E-08 | 0.01 | 22.8 | 5.26 | 25.3 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 20.92 | 5.0E-08 | 0.02 | 21.0 | 5.05 | 23.6 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 21.41 | 5.0E-08 | 0.02 | 20.0 | 5.18 | 22.8 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 21.90 | 5.0E-08 | 0.02 | 18.3 | 5.33 | 21.2 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 22.39 | 5.0E-08 | 0.02 | 20.6 | 5.11 | 23.9 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 22.88 | 5.0E-08 | 0.02 | 19.1 | 5.55 | 22.5 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 23.38 | 5.0E-08 | 0.02 | 20.3 | 4.90 | 24.2 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 23.87 | 5.0E-08 | 0.02 | 23.2 | 4.75 | 27.7 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 24.36 | 5.0E-08 | 0.02 | 18.9 | 5.12 | 23.0 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |

Gregg In Situ, Inc.
Run No: 04-0305-0954-0126
CPT File: 022C01.COR

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| Depth (ft) | k (cm/s) | Bq | Qtn | Rfn | QclN | DeltaQclN | QclNcs | Fc (%) | Phi (Deg) | Dr (%) | OCR | State Param | Del(n1)60 | (N1)60cs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24.85 | 5.0E-08 | 0.03 | 13.4 | 5.59 | 16.8 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 25.34 | 5.0E-08 | 0.02 | 17.7 | 5.26 | 22.0 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 25.84 | 5.0E-08 | 0.02 | 17.4 | 5.54 | 21.9 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 26.33 | 5.0E-08 | 0.03 | 15.1 | 5.30 | 19.3 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 26.82 | 5.0E-08 | 0.03 | 15.7 | 6.23 | 20.3 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 27.31 | 5.0E-08 | 0.03 | 16.2 | 6.29 | 21.0 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 27.80 | 5.0E-08 | 0.03 | 13.1 | 6.98 | 17.4 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 28.30 | 5.0E-08 | 0.03 | 16.2 | 5.60 | 21.4 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 28.79 | 5.0E-08 | 0.03 | 16.3 | 6.09 | 21.7 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 29.28 | 5.0E-08 | 0.03 | 14.4 | 6.53 | 19.4 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |

Gregg In Situ, Inc. Page: 1a
Interpretation Output - Release 1.00.19e
Run No: 04-0305-0954-0186
Job No: 04-022MA
Client: EARTH MECHANICS
Project: CPT SITE INVESTIGATION
Site: B7 & I880
Location: CPT-02
Engineer: J. CASTLE
CPT Date: 04/30/01
CPT Time: 14:31
CPT File: 022C02.CCR
Northing (m): 0.000
Easting (m): 0.000
Elevation (m): 0.000

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Water Table (m): 12.19 (ft): 40.0
Su Nkt used: 12.50
Averaging Increment (m): 0.15
Phi Method : Robertson and Campanella, 1983
Dr Method : Jamiolkowski - All Sands
State Parameter M: 1.20
Used Unit Weights Assigned to Soil Zones
Values of 1.0E9 or UnDef are printed for parameters that are not valid for the material type (SBT)

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| Depth (ft) | AvgQt (tsf) | AvgFs (tsf) | AvgRf (%) | AvgUd (ft) | SBT | U.Wt. pcf | TStress (tsf) | EStress (tsf) | Ueq (tsf) | Cn | N60 (blows/ft) | (N1)60 | Su (tsf) | CRR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.25 | 2.0 | 0.45 | 22.53 | -0.6 | 2 | 111.4 | 0.01 | 0.01 | 0.00 | 2.00 | 1.9 | 3.8 | 0.16 | 0.00 |
| 0.74 | 238.6 | 4.03 | 1.69 | 0.0 | 8 | 120.9 | 0.04 | 0.04 | 0.00 | 2.00 | 57.1 | 114.2 | UnDef | 0.00 |
| 1.23 | 630.9 | 9.15 | 1.45 | 7.1 | 9 | 124.1 | 0.07 | 0.07 | 0.00 | 2.00 | 120.8 | 241.7 | UnDef | 0.00 |
| 1.72 | 549.2 | 5.88 | 1.07 | 11.4 | 9 | 124.1 | 0.10 | 0.10 | 0.00 | 2.00 | 105.2 | 210.4 | UnDef | 0.00 |
| 2.21 | 265.4 | 2.93 | 1.10 | 8.8 | 9 | 124.1 | 0.13 | 0.13 | 0.00 | 2.00 | 50.8 | 101.7 | UnDef | 0.00 |
| 2.71 | 67.2 | 2.86 | 4.25 | -1.2 | 5 | 114.6 | 0.16 | 0.16 | 0.00 | 2.00 | 32.2 | 64.4 | 5.36 | 0.00 |
| 3.20 | 52.6 | 2.48 | 4.71 | -3.3 | 4 | 114.6 | 0.19 | 0.19 | 0.00 | 2.00 | 33.6 | 67.2 | 4.19 | 0.00 |
| 3.61 | 94.4 | 3.28 | 3.48 | -2.9 | 6 | 114.6 | 0.21 | 0.21 | 0.00 | 2.00 | 36.2 | 72.3 | 7.54 | 0.00 |
| 4.02 | 84.8 | 3.98 | 4.70 | -2.8 | 11 | 130.5 | 0.24 | 0.24 | 0.00 | 2.00 | 81.2 | 162.4 | UnDef | 0.00 |
| 4.51 | 48.3 | 2.39 | 4.95 | -2.2 | 3 | 111.4 | 0.27 | 0.27 | 0.00 | 1.93 | 46.3 | 89.1 | 3.84 | 0.00 |
| 5.00 | 50.3 | 1.74 | 3.46 | -2.4 | 5 | 114.6 | 0.30 | 0.30 | 0.00 | 1.83 | 24.1 | 44.1 | 4.00 | 0.00 |
| 5.50 | 46.8 | 1.33 | 2.84 | -2.2 | 6 | 114.6 | 0.33 | 0.33 | 0.00 | 1.75 | 17.9 | 31.4 | 3.71 | 0.23 |
| 5.99 | 36.8 | 1.73 | 4.70 | -1.9 | 3 | 111.4 | 0.35 | 0.35 | 0.00 | 1.68 | 35.2 | 59.2 | 2.91 | 0.00 |
| 6.56 | 27.2 | 1.73 | 6.35 | -1.8 | 3 | 111.4 | 0.39 | 0.39 | 0.00 | 1.61 | 26.1 | 42.0 | 2.15 | 0.00 |

Gregg In Situ, Inc.
Run No: 04-0305-0954-0186
CPT File: 022C02.CCR

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| Depth (ft) | AvgQt (tsf) | AvgFs (tsf) | AvgRf (%) | AvgUd (ft) | SBT | U.Wt. pcf | TStress (tsf) | EStress (tsf) | Ueq (tsf) | Cn | N60 (blows/ft) | (N1)60 (blows/ft) | Su (tsf) | CRR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7.14 | 22.7 | 1.48 | 6.54 | -1.8 | 3 | 111.4 | 0.42 | 0.42 | 0.00 | 1.55 | 21.7 | 33.6 | 1.78 | 0.00 |
| 7.63 | 23.8 | 1.69 | 7.10 | -0.6 | 3 | 111.4 | 0.44 | 0.44 | 0.00 | 1.50 | 22.8 | 34.2 | 1.87 | 0.00 |
| 8.12 | 32.2 | 1.81 | 5.63 | -0.1 | 3 | 111.4 | 0.47 | 0.47 | 0.00 | 1.46 | 30.9 | 44.9 | 2.54 | 0.00 |
| 8.61 | 23.6 | 1.64 | 6.93 | 0.1 | 3 | 111.4 | 0.50 | 0.50 | 0.00 | 1.41 | 22.6 | 32.0 | 1.85 | 0.00 |
| 9.10 | 23.0 | 1.59 | 6.92 | 0.3 | 3 | 111.4 | 0.53 | 0.53 | 0.00 | 1.38 | 22.0 | 30.3 | 1.80 | 0.00 |
| 9.60 | 22.3 | 1.45 | 6.50 | 1.7 | 3 | 111.4 | 0.55 | 0.55 | 0.00 | 1.34 | 21.4 | 28.7 | 1.74 | 0.00 |
| 10.09 | 22.5 | 1.37 | 6.07 | 2.1 | 3 | 111.4 | 0.58 | 0.58 | 0.00 | 1.31 | 21.6 | 28.3 | 1.75 | 0.00 |
| 10.58 | 17.4 | 1.22 | 7.00 | 2.6 | 3 | 111.4 | 0.61 | 0.61 | 0.00 | 1.28 | 16.7 | 21.4 | 1.34 | 0.00 |
| 11.07 | 20.3 | 1.27 | 6.26 | 3.0 | 3 | 111.4 | 0.64 | 0.64 | 0.00 | 1.25 | 19.4 | 24.3 | 1.57 | 0.00 |
| 11.56 | 21.0 | 1.23 | 5.86 | 4.2 | 3 | 111.4 | 0.66 | 0.66 | 0.00 | 1.23 | 20.1 | 24.6 | 1.62 | 0.00 |
| 12.06 | 18.4 | 1.08 | 5.86 | 5.6 | 3 | 111.4 | 0.69 | 0.69 | 0.00 | 1.20 | 17.6 | 21.1 | 1.41 | 0.00 |
| 12.55 | 19.3 | 1.16 | 6.00 | 6.3 | 3 | 111.4 | 0.72 | 0.72 | 0.00 | 1.18 | 18.5 | 21.8 | 1.49 | 0.00 |
| 13.04 | 27.5 | 1.44 | 5.26 | 6.3 | 3 | 111.4 | 0.75 | 0.75 | 0.00 | 1.16 | 26.3 | 30.4 | 2.14 | 0.00 |
| 13.53 | 25.1 | 1.39 | 5.53 | 5.9 | 3 | 111.4 | 0.77 | 0.77 | 0.00 | 1.14 | 24.1 | 27.4 | 1.95 | 0.00 |
| 14.03 | 34.2 | 1.65 | 4.84 | 6.0 | 3 | 111.4 | 0.80 | 0.80 | 0.00 | 1.12 | 32.7 | 36.6 | 2.67 | 0.00 |
| 14.52 | 27.5 | 1.65 | 6.02 | 6.2 | 3 | 111.4 | 0.83 | 0.83 | 0.00 | 1.10 | 26.3 | 28.9 | 2.13 | 0.00 |
| 15.01 | 19.7 | 1.16 | 5.88 | 5.7 | 3 | 111.4 | 0.86 | 0.86 | 0.00 | 1.08 | 18.8 | 20.4 | 1.50 | 0.00 |
| 15.50 | 20.1 | 0.99 | 4.93 | 6.7 | 3 | 111.4 | 0.88 | 0.88 | 0.00 | 1.06 | 19.3 | 20.5 | 1.54 | 0.00 |
| 15.99 | 13.6 | 0.72 | 5.30 | 7.2 | 3 | 111.4 | 0.91 | 0.91 | 0.00 | 1.05 | 13.0 | 13.7 | 1.02 | 0.00 |
| 16.49 | 18.2 | 0.66 | 3.65 | 8.2 | 4 | 114.6 | 0.94 | 0.94 | 0.00 | 1.03 | 11.6 | 12.0 | 1.38 | 0.15 |
| 16.98 | 16.8 | 0.80 | 4.76 | 8.3 | 3 | 111.4 | 0.97 | 0.97 | 0.00 | 1.02 | 16.1 | 16.3 | 1.27 | 0.00 |
| 17.47 | 18.0 | 1.00 | 5.52 | 8.7 | 3 | 111.4 | 0.99 | 0.99 | 0.00 | 1.00 | 17.3 | 17.3 | 1.36 | 0.00 |
| 17.96 | 23.2 | 1.16 | 4.99 | 9.7 | 3 | 111.4 | 1.02 | 1.02 | 0.00 | 0.99 | 22.2 | 22.0 | 1.77 | 0.00 |
| 18.45 | 18.8 | 1.01 | 5.36 | 11.0 | 3 | 111.4 | 1.05 | 1.05 | 0.00 | 0.98 | 18.0 | 17.6 | 1.42 | 0.00 |
| 18.95 | 16.1 | 0.86 | 5.32 | 11.4 | 3 | 111.4 | 1.08 | 1.08 | 0.00 | 0.96 | 15.4 | 14.8 | 1.20 | 0.00 |
| 19.44 | 16.7 | 0.89 | 5.31 | 11.4 | 3 | 111.4 | 1.10 | 1.10 | 0.00 | 0.95 | 16.0 | 15.3 | 1.25 | 0.00 |
| 19.93 | 21.1 | 1.11 | 5.26 | 12.7 | 3 | 111.4 | 1.13 | 1.13 | 0.00 | 0.94 | 20.2 | 19.0 | 1.60 | 0.00 |
| 20.42 | 20.0 | 1.02 | 5.10 | 14.4 | 3 | 111.4 | 1.16 | 1.16 | 0.00 | 0.93 | 19.1 | 17.8 | 1.51 | 0.00 |
| 20.92 | 19.3 | 1.22 | 6.32 | 14.5 | 3 | 111.4 | 1.19 | 1.19 | 0.00 | 0.92 | 18.5 | 17.0 | 1.45 | 0.00 |
| 21.41 | 22.2 | 1.34 | 6.04 | 14.7 | 3 | 111.4 | 1.21 | 1.21 | 0.00 | 0.91 | 21.3 | 19.3 | 1.68 | 0.00 |
| 21.90 | 21.0 | 1.43 | 6.80 | 16.4 | 3 | 111.4 | 1.24 | 1.24 | 0.00 | 0.90 | 20.1 | 18.0 | 1.58 | 0.00 |
| 22.39 | 21.4 | 1.24 | 5.81 | 19.4 | 3 | 111.4 | 1.27 | 1.27 | 0.00 | 0.89 | 20.5 | 18.2 | 1.61 | 0.00 |
| 22.88 | 27.1 | 1.37 | 5.05 | 20.7 | 3 | 111.4 | 1.30 | 1.30 | 0.00 | 0.88 | 25.9 | 22.8 | 2.06 | 0.00 |
| 23.38 | 26.5 | 1.56 | 5.90 | 20.3 | 3 | 111.4 | 1.32 | 1.32 | 0.00 | 0.87 | 25.4 | 22.1 | 2.02 | 0.00 |
| 23.87 | 28.7 | 1.60 | 5.58 | 20.9 | 3 | 111.4 | 1.35 | 1.35 | 0.00 | 0.86 | 27.5 | 23.6 | 2.19 | 0.00 |
| 24.36 | 23.6 | 1.33 | 5.65 | 21.1 | 3 | 111.4 | 1.38 | 1.38 | 0.00 | 0.85 | 22.6 | 19.2 | 1.78 | 0.00 |

Gregg In Situ, Inc.
Run No: 04-0305-0954-0186
CPT File: 022C02.COR



| Depth (ft) | AvgQt (tsf) | AvgFs (tsf) | AvgRf (%) | AvgUd (ft) | SBT | U.Wt. pcf | TStress (tsf) | EStress (tsf) | Ueq (tsf) | Cn | N60 (blows/ft) | (N1)60 (blows/ft) | Su (tsf) | CRR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24.85 | 26.2 | 1.32 | 5.05 | 21.6 | 3 | 111.4 | 1.41 | 1.41 | 0.00 | 0.84 | 25.1 | 21.2 | 1.98 | 0.00 |
| 25.34 | 29.2 | 1.70 | 5.83 | 24.8 | 3 | 111.4 | 1.43 | 1.43 | 0.00 | 0.84 | 27.9 | 23.4 | 2.22 | 0.00 |
| 25.84 | 21.7 | 1.47 | 6.79 | 24.4 | 3 | 111.4 | 1.46 | 1.46 | 0.00 | 0.83 | 20.8 | 17.2 | 1.62 | 0.00 |
| 26.33 | 26.1 | 1.48 | 5.68 | 24.6 | 3 | 111.4 | 1.49 | 1.49 | 0.00 | 0.82 | 25.0 | 20.5 | 1.97 | 0.00 |
| 26.82 | 19.1 | 1.32 | 6.93 | 24.5 | 3 | 111.4 | 1.51 | 1.51 | 0.00 | 0.81 | 18.3 | 14.9 | 1.41 | 0.00 |
| 27.31 | 29.9 | 1.60 | 5.36 | 25.0 | 3 | 111.4 | 1.54 | 1.54 | 0.00 | 0.81 | 28.6 | 23.1 | 2.27 | 0.00 |
| 27.80 | 25.0 | 1.62 | 6.49 | 24.0 | 3 | 111.4 | 1.57 | 1.57 | 0.00 | 0.80 | 23.9 | 19.1 | 1.87 | 0.00 |
| 28.30 | 25.2 | 1.57 | 6.23 | 24.8 | 3 | 111.4 | 1.60 | 1.60 | 0.00 | 0.79 | 24.1 | 19.1 | 1.89 | 0.00 |
| 28.79 | 28.0 | 1.83 | 6.54 | 23.8 | 3 | 111.4 | 1.62 | 1.62 | 0.00 | 0.78 | 26.8 | 21.0 | 2.11 | 0.00 |
| 29.28 | 24.2 | 1.61 | 6.66 | 23.0 | 3 | 111.4 | 1.65 | 1.65 | 0.00 | 0.78 | 23.2 | 18.1 | 1.81 | 0.00 |
| 29.77 | 41.5 | 1.27 | 3.06 | 25.7 | 5 | 114.6 | 1.68 | 1.68 | 0.00 | 0.77 | 19.8 | 15.3 | 3.18 | 0.44 |

Gregg In Situ, Inc.
Interpretation Output - Release 1.00.19e

Page: 1b

Run No: 04-0305-0954-0186
Job No: 04-022MA
Client: EARTH MECHANICS
Project: CPT SITE INVESTIGATION
Site: 87 & I880
Location: CPT-02
Engineer: J. CASTLE
CPT Date: 04/30/01
CPT Time: 14:31
CPT File: 022C02.COR
Northing (m): 0.000
Easting (m): 0.000
Elevation (m): 0.000

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Water Table (m): 12.19 (ft): 40.0
Su Nkt used: 12.50
Averaging Increment (m): 0.15
Phi Method : Robertson and Campanella, 1983
Dr Method : Jamiolkowski - All Sands
State Parameter M: 1.20
Used Unit Weights Assigned to Soil Zones
Values of 1.0E9 or UnDef are printed for parameters that are not valid for the material type (SBT)

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| Depth (ft) | k (cm/s) | Bq | Qtn | Rfn | Qc1N | DeltaQc1N | Qc1Ncs | Fc (%) | Phi (Deg) | Dr (%) | OCR | State Param | Del(n1)60 | (N1)60cs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.25 | 1.0E-15 | -0.01 | 145.1 | 10.00 | 3.8 | UnDef | UnDef | 0.0 | UnDef | UnDef | 10.0 | UnDef | UnDef | UnDef |
| 0.74 | 5.0E-03 | 0.00 | 1000.0 | 1.69 | 457.0 | UnDef | UnDef | 0.0 | 50 | 95.0 | 1.0 | -0.48 | UnDef | UnDef |
| 1.23 | 5.0E-02 | 0.00 | 1000.0 | 1.45 | 1208.4 | UnDef | UnDef | 0.0 | 50 | 95.0 | 1.0 | -0.46 | UnDef | UnDef |
| 1.72 | 5.0E-02 | 0.00 | 1000.0 | 1.07 | 1051.8 | 0.0 | 1051.8 | 0.8 | 50 | 95.0 | 1.0 | -0.41 | 0.0 | 210.4 |
| 2.21 | 5.0E-02 | 0.00 | 1000.0 | 1.10 | 508.4 | 0.0 | 508.4 | 0.9 | 50 | 95.0 | 1.0 | -0.42 | 0.0 | 101.7 |
| 2.71 | 5.0E-06 | 0.00 | 411.6 | 4.26 | 128.7 | UnDef | UnDef | 0.0 | UnDef | UnDef | 10.0 | UnDef | UnDef | UnDef |
| 3.20 | 5.0E-07 | 0.00 | 274.3 | 4.72 | 100.8 | UnDef | UnDef | 0.0 | UnDef | UnDef | 10.0 | UnDef | UnDef | UnDef |
| 3.61 | 5.0E-05 | 0.00 | 438.9 | 3.49 | 180.8 | UnDef | UnDef | 0.0 | 48 | 87.1 | 10.0 | -0.58 | UnDef | UnDef |
| 4.02 | 1.0E-15 | 0.00 | 352.2 | 4.71 | 162.4 | UnDef | UnDef | 0.0 | 48 | 82.4 | 1.0 | -0.73 | UnDef | UnDef |
| 4.51 | 5.0E-08 | 0.00 | 176.0 | 4.97 | 91.0 | UnDef | UnDef | 0.0 | UnDef | UnDef | 10.0 | UnDef | UnDef | UnDef |
| 5.00 | 5.0E-06 | 0.00 | 168.0 | 3.48 | 90.2 | UnDef | UnDef | 0.0 | UnDef | UnDef | 10.0 | UnDef | UnDef | UnDef |
| 5.50 | 5.0E-05 | 0.00 | 142.5 | 2.86 | 80.2 | 36.7 | 116.9 | 15.8 | 44 | 60.9 | 10.0 | -0.37 | 7.7 | 39.1 |
| 5.99 | 5.0E-08 | 0.00 | 103.0 | 4.74 | 60.5 | UnDef | UnDef | 0.0 | UnDef | UnDef | 10.0 | UnDef | UnDef | UnDef |
| 6.56 | 5.0E-08 | 0.00 | 69.6 | 6.44 | 42.9 | UnDef | UnDef | 0.0 | UnDef | UnDef | 10.0 | UnDef | UnDef | UnDef |

Gregg In Situ, Inc.
Run No: 04-0305-0954-0186
CPT File: 022C02.COR

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| Depth (ft) | k (cm/s) | Bq | Qtn | Rfn | QclN | DeltaQclN | QclNcs | Fc (%) | Phi (Deg) | Dr (%) | OCR | State Param | Del(n1)60 | (N1)60cs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7.14 | 5.0E-08 | 0.00 | 53.3 | 6.66 | 34.4 | UnDef | UnDef | 100.0 | UnDef | UnDef | 10.0 | UnDef | UnDef | UnDef |
| 7.63 | 5.0E-08 | 0.00 | 52.5 | 7.23 | 35.0 | UnDef | UnDef | 100.0 | UnDef | UnDef | 10.0 | UnDef | UnDef | UnDef |
| 8.12 | 5.0E-08 | 0.00 | 67.2 | 5.71 | 45.9 | UnDef | UnDef | 0.0 | UnDef | UnDef | 10.0 | UnDef | UnDef | UnDef |
| 8.61 | 5.0E-08 | 0.00 | 46.3 | 7.08 | 32.7 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 9.10 | 5.0E-08 | 0.00 | 42.6 | 7.08 | 31.0 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 9.60 | 5.0E-08 | 0.00 | 39.2 | 6.66 | 29.3 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 10.09 | 5.0E-08 | 0.00 | 37.7 | 6.23 | 28.9 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 10.58 | 5.0E-08 | 0.00 | 27.6 | 7.26 | 21.8 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 11.07 | 5.0E-08 | 0.00 | 30.9 | 6.46 | 24.9 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 11.56 | 5.0E-08 | 0.01 | 30.6 | 6.05 | 25.2 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 12.06 | 5.0E-08 | 0.01 | 25.5 | 6.09 | 21.6 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 12.55 | 5.0E-08 | 0.01 | 25.9 | 6.23 | 22.3 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 13.04 | 5.0E-08 | 0.01 | 35.8 | 5.40 | 31.1 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 13.53 | 5.0E-08 | 0.01 | 31.5 | 5.71 | 28.0 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 14.03 | 5.0E-08 | 0.01 | 41.7 | 4.96 | 37.4 | 149.5 | 186.8 | 38.5 | UnDef | UnDef | 6.0 | UnDef | 36.6 | 73.1 |
| 14.52 | 5.0E-08 | 0.01 | 32.2 | 6.21 | 29.5 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 15.01 | 5.0E-08 | 0.01 | 22.0 | 6.15 | 20.8 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 15.50 | 5.0E-08 | 0.01 | 21.8 | 5.16 | 20.9 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 15.99 | 5.0E-08 | 0.02 | 13.9 | 5.68 | 14.0 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 16.49 | 5.0E-07 | 0.01 | 18.4 | 3.84 | 18.4 | 73.7 | 92.1 | 48.9 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 16.98 | 5.0E-08 | 0.02 | 16.4 | 5.05 | 16.7 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | 12.0 | 24.0 |
| 17.47 | 5.0E-08 | 0.02 | 17.1 | 5.84 | 17.7 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 17.96 | 5.0E-08 | 0.01 | 21.7 | 5.22 | 22.4 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 18.45 | 5.0E-08 | 0.02 | 17.0 | 5.67 | 18.0 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 18.95 | 5.0E-08 | 0.02 | 13.9 | 5.71 | 15.2 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 19.44 | 5.0E-08 | 0.02 | 14.2 | 5.69 | 15.6 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 19.93 | 5.0E-08 | 0.02 | 17.7 | 5.56 | 19.4 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 20.42 | 5.0E-08 | 0.02 | 16.2 | 5.42 | 18.2 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 20.92 | 5.0E-08 | 0.03 | 15.3 | 6.73 | 17.3 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 21.41 | 5.0E-08 | 0.02 | 17.3 | 6.39 | 19.7 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 21.90 | 5.0E-08 | 0.03 | 15.9 | 7.23 | 18.4 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 22.39 | 5.0E-08 | 0.03 | 15.9 | 6.17 | 18.6 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 22.88 | 5.0E-08 | 0.03 | 19.9 | 5.30 | 23.3 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 23.38 | 5.0E-08 | 0.03 | 19.0 | 6.21 | 22.6 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 23.87 | 5.0E-08 | 0.02 | 20.2 | 5.86 | 24.1 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 24.36 | 5.0E-08 | 0.03 | 16.1 | 6.00 | 19.7 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |

Gregg In Situ, Inc.
Run No: 04-0305-0954-0186
CPT File: 022C02.COR

Page: 3b

| Depth (ft) | k (cm/s) | Bq | Qtn | Rfn | QclN | DeltaQclN | QclNcs | Fc (%) | Phi (Deg) | Dr (%) | CCR | State Param | Del(n1)60 | (N1)60cs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24.85 | 5.0E-08 | 0.03 | 17.6 | 5.34 | 21.6 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 25.34 | 5.0E-08 | 0.03 | 19.4 | 6.13 | 23.9 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 25.84 | 5.0E-08 | 0.04 | 13.9 | 7.28 | 17.6 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 26.33 | 5.0E-08 | 0.03 | 16.5 | 6.02 | 20.9 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 26.82 | 5.0E-08 | 0.04 | 11.6 | 7.53 | 15.2 | UnDef | UnDef | 100.0 | UnDef | UnDef | 3.0 | UnDef | UnDef | UnDef |
| 27.31 | 5.0E-08 | 0.03 | 18.4 | 5.65 | 23.6 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 27.80 | 5.0E-08 | 0.03 | 14.9 | 6.93 | 19.5 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 28.30 | 5.0E-08 | 0.03 | 14.8 | 6.65 | 19.5 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 28.79 | 5.0E-08 | 0.03 | 16.2 | 6.95 | 21.5 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 29.28 | 5.0E-08 | 0.03 | 13.7 | 7.15 | 18.5 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 29.77 | 5.0E-06 | 0.02 | 23.7 | 3.19 | 31.3 | 125.2 | 156.5 | 41.2 | UnDef | UnDef | 6.0 | UnDef | 15.3 | 30.6 |

# Caltrans Bridge 57-1078D
# Gonzalez Creek Rd UC, San Diego

# And

# Caltrans Bridge 57-1077L
# Carmel Valley Rd UC, San Diego

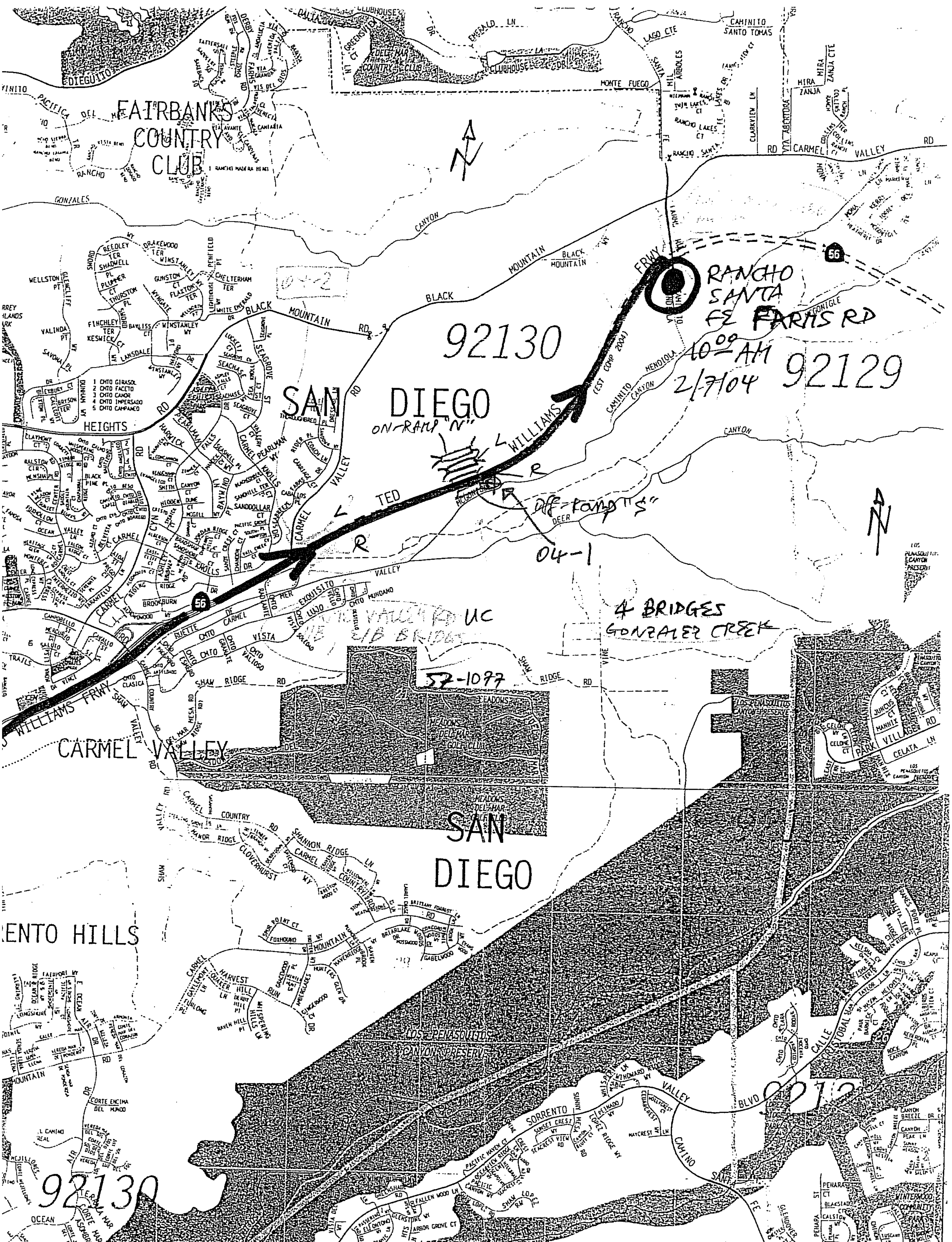
**Caltrans Bridge 57-1078D, Gonzalez Creek Rd UC, San Diego**

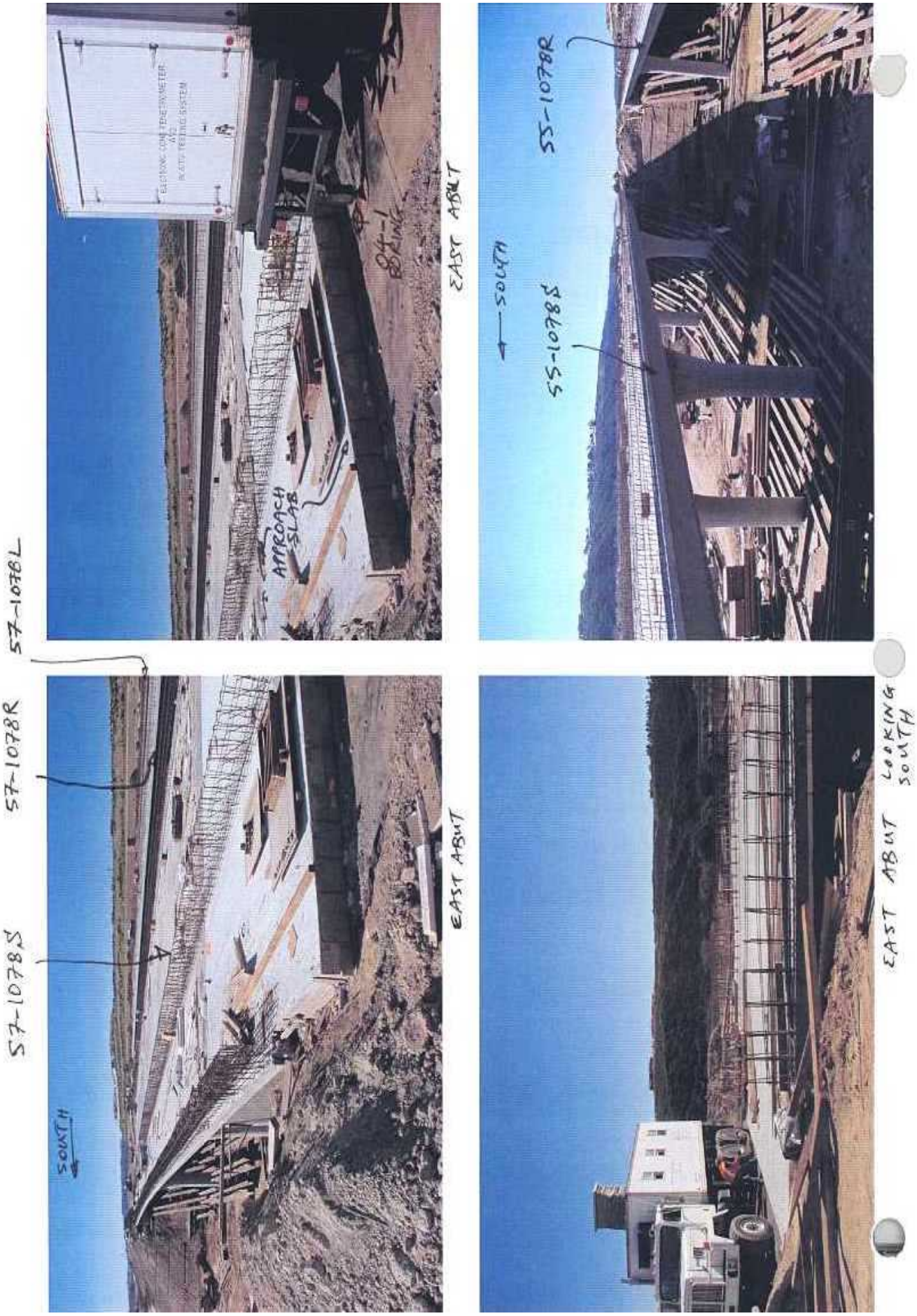
This Route 56 bridge is located in the Carmel Valley area of San Diego where SR56 is being built. This bridge is one of four parallel bridges in construction. The site is located 1-2 miles southwesterly from Rancho Santa Fe Springs Rd bridge over SR57. The field investigation was conducted on 2/7/04 and consisted of (1) 25.5-ft deep soil boring performed by 2R Drilling, and (1) 17.4-ft deep seismic CPT sounding performed by HFA. Boring 04-1 and CPT 04-1C were located at the north bridge abutment, adjacent to the newly cast concrete approach slab. Geotechnical soil sampling consisted of 11 ring and bag samples collected at dense (2.5-ft) intervals using a Modified California and SPT samplers, and one bulk sample was collected. Seven seismic wave measurements were taken at <3-ft intervals. Groundwater was not encountered.

ELECTRONIC CONE PENETROMETER
AND
IN SITU TESTING SYSTEM

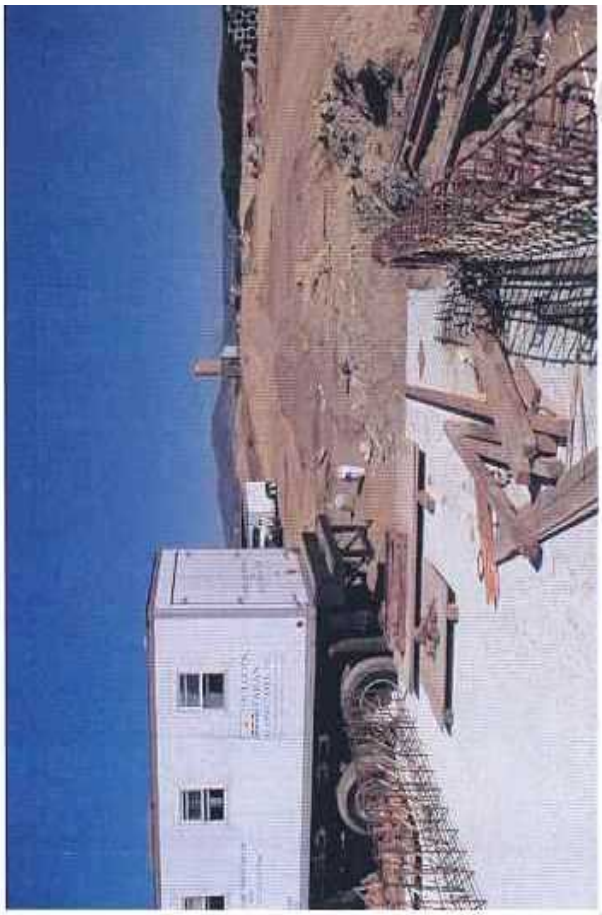
## Caltrans Bridge 57-1077L, Carmel Valley Rd UC, San Diego

This bridge is located in the same Carmel Valley area of San Diego where the SR56 is being built. The bridge is one of two parallel bridges in construction. This site is located about 2,500 ft westerly of Gonzalez Creek bridge. The field investigation for this bridge was conducted on 2/7/04, consisting of (1) 22.8-ft deep soil boring and (1) 25-ft conventional and seismic CPT sounding. Drilling was performed by 2R Drilling and CPT was performed by HFA. Boring 04-2 and CPT 04-2C were located at the south bridge abutment, between the two newly cast wingwalls. Geotechnical soil sampling consisted of 9 ring and bag samples collected at 2.5-ft intervals using a Modified California and SPT samplers, and one bulk sample was collected. 10 seismic wave measurements were taken at 2.5-ft intervals. Groundwater was not encountered during the investigation.

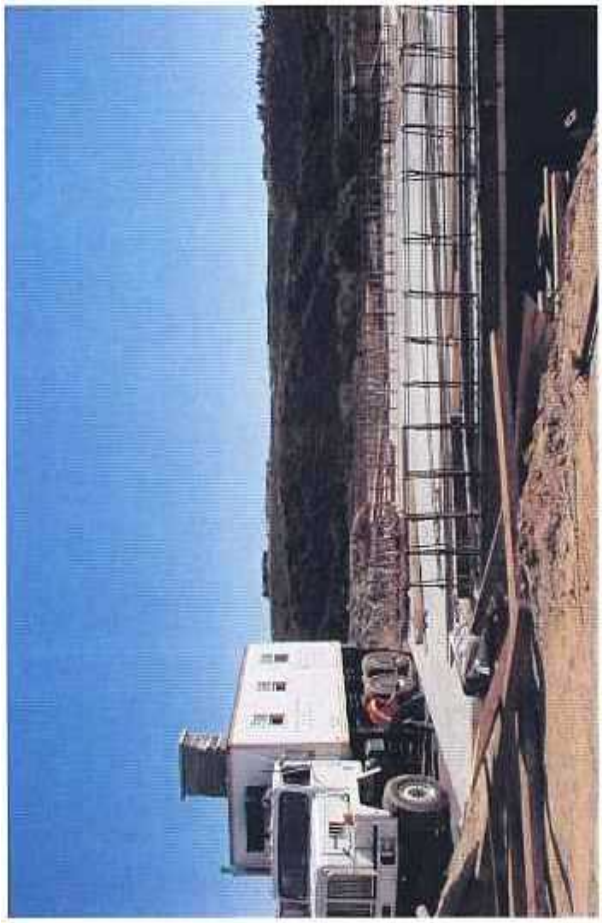

FAIRBANKS COUNTRY CLUB
SAN DIEGO
92130
92129
RANCHO SANTA FE FARMS RD
10:09 AM
2/7/04
ON-RAMP "N"
OFF-RAMP "S"
04-1
4 BRIDGES
GONZALEZ CREEK
57-1097
CARMEL VALLEY
SAN DIEGO
RENTO HILLS
92130
BLACK MOUNTAIN RD
CARMEL VALLEY RD
TED WILLIAMS FRWY
LOS PENASQUITOS CANYON PRESERVE
MEADOWS DEL MAR GOLF CLUB
SORRENTO VALLEY BLVD
CAMINO SANTA FE




**57-1078S Gonzalez Creek Rd** 04-1



ALL EAST ABUT



**57-1078S Gonzalez Creek Rd** 04-1

TO: L. ANDOSH 714 751 3928
FROM: M. LIMON (Mike)

| DIST | COUNTY | ROUTE | KILOMETER POST TOTAL PROJECT | SHEET No. | TOTAL SHEETS |
|---|---|---|---|---|---|
| 11 | SD | 56 | 2.9/10.6 | 664 | 856 |

REGISTERED CIVIL ENGINEER 11-9-01

4-1-02
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER Mark DeSalvatore No. 39499 Exp. 12-31-01 CIVIL STATE OF CALIFORNIA

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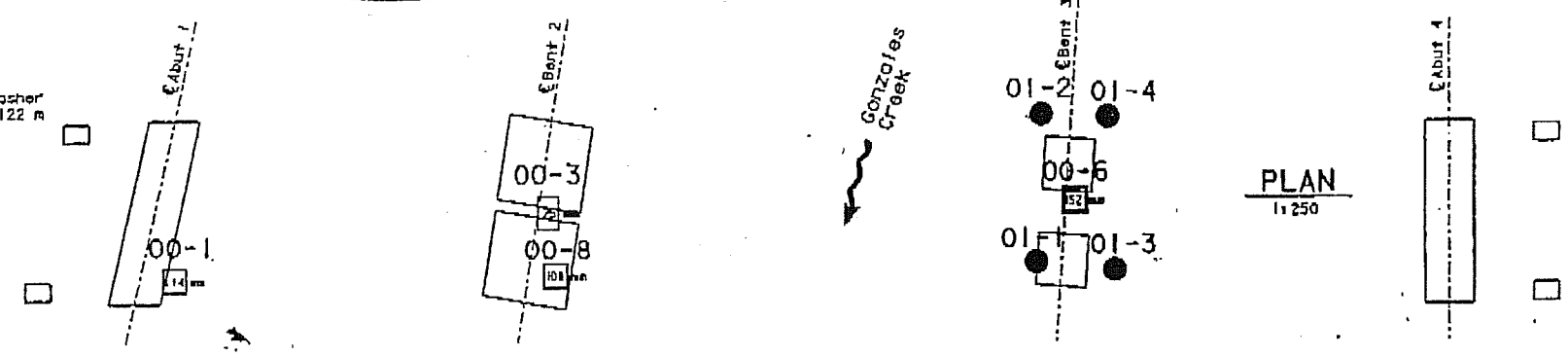
"A" Line

57+00 +20 N 57° 18' 15" E +40 +60 +80 58+00

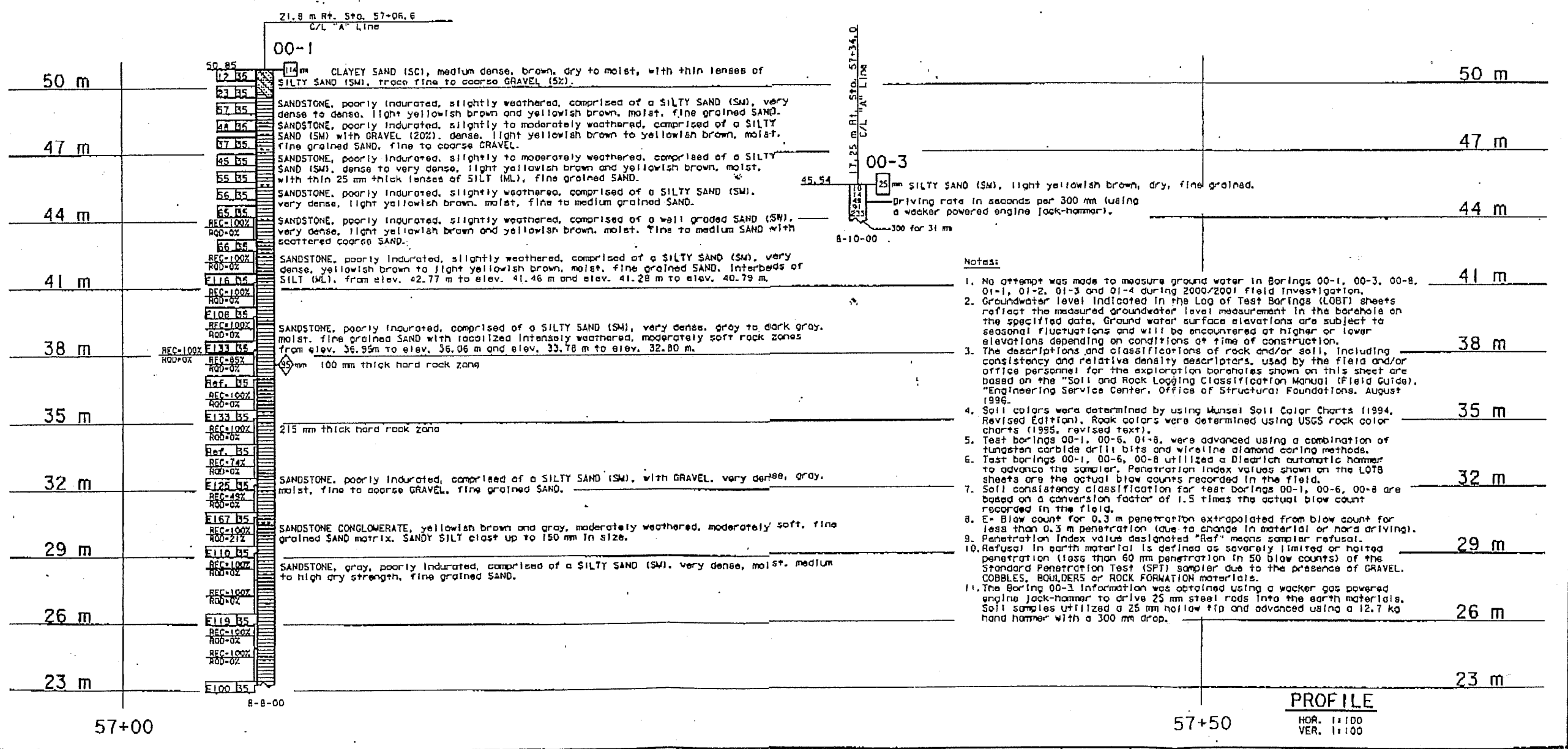
## BENCH MARK

BM WP 59 L Elev. 69.485 m

1 in. Iron Pipe With Nail & Washer
N 587,563.961 m, E 1,911,638.122 m
Vertical Datum: NAVD 1988
Horizontal Datum: NAD 83




PLAN
1:250




Notes:

1. No attempt was made to measure ground water in Borings 00-1, 00-3, 00-8, 01-1, 01-2, 01-3 and 01-4 during 2000/2001 field investigation.
2. Groundwater level indicated in the Log of Test Borings (LOBT) sheets reflect the measured groundwater level measurement in the borehole on the specified date. Ground water surface elevations are subject to seasonal fluctuations and will be encountered at higher or lower elevations depending on conditions at time of construction.
3. The descriptions and classifications of rock and/or soil, including consistency and relative density descriptors, used by the field and/or office personnel for the exploration boreholes shown on this sheet are based on the "Soil and Rock Logging Classification Manual (Field Guide), "Engineering Service Center, Office of Structural Foundations, August 1996.
4. Soil colors were determined by using Munsel Soil Color Charts (1994, Revised Edition). Rock colors were determined using USGS rock color charts (1995, revised text).
5. Test borings 00-1, 00-6, 01-8, were advanced using a combination of tungsten carbide drill bits and wireline diamond coring methods.
6. Test borings 00-1, 00-6, 00-8 utilized a Diedrich automatic hammer to advance the sampler. Penetration index values shown on the LOTB sheets are the actual blow counts recorded in the field.
7. Soil consistency classification for test borings 00-1, 00-6, 00-8 are based on a conversion factor of 1.5 times the actual blow count recorded in the field.
8. E- Blow count for 0.3 m penetration extrapolated from blow count for less than 0.3 m penetration (due to change in material or hard driving).
9. Penetration index value designated "Ref" means sampler refusal.
10. Refusal in earth material is defined as severely limited or halted penetration (less than 60 mm penetration in 50 blow counts) of the Standard Penetration Test (SPT) sampler due to the presence of GRAVEL, COBBLES, BOULDERS or ROCK FORMATION materials.
11. The Boring 00-3 information was obtained using a wacker gas powered engine jack-hammer to drive 25 mm steel rods into the earth materials. Soil samples utilized a 25 mm hollow tip and advanced using a 12.7 kg hand hammer with a 300 mm drop.

## PROFILE

HOR. 1:100
VER. 1:100

| ENGINEERING SERVICES | GEOTECHNICAL SERVICES |
|---|---|
| PLANS BY F. Nguyen 8/01 | |
| CHECKED BY E. Neupert 10/4/01 | |

FIELD INVESTIGATION BY: H. Valencia

STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES STRUCTURE DESIGN 12

BRIDGE NO. 57-1078R
KILOMETER POST 4.76

CU 11
EA 172821

# GONZALES CREEK BRIDGE
# LOG OF TEST BORINGS 1 OF 5

SHEET 25 OF 29

FILE => 57-1078r1-1-1tb05.dgn

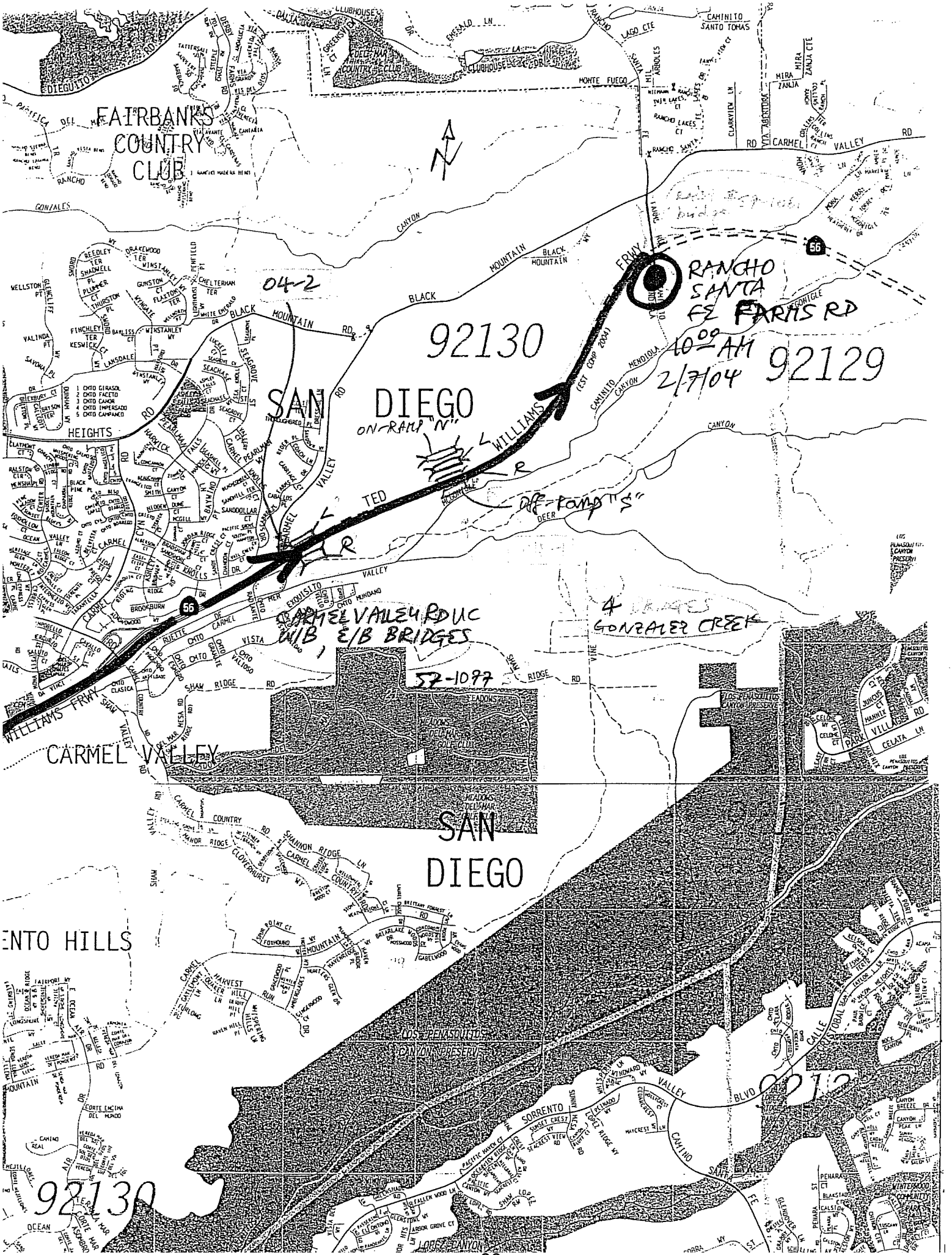
ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS 0 10 20 30 40 50 60 70 80 90 100

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY)

USERNAME => RDD4425 DATE PLOTTED => 30-APR-2002 TIME PLOTTED => 11:01

79


FAIRBANKS COUNTRY CLUB
DIEGUITO
CAMINITO SANTO TOMAS
MONTE FUEGO
CARMEL VALLEY RD
GONZALES
CANYON
BLACK MOUNTAIN RD
BLACK MOUNTAIN
04-2
92130
SAN DIEGO
RANCHO SANTA FE FARMS RD
10:00 AM 2/7/04
92129
HEIGHTS
WILLIAMS
ON-RAMP "N"
OFF-RAMP "S"
CARMEL VALLEY RD UC W/B E/B BRIDGES
GONZALEZ CREEK
57-1097
SHAW RIDGE RD
CARMEL VALLEY
SAN DIEGO
ENTO HILLS
LOS PENASQUITOS CANYON PRESERV
92130

| DIST | COUNTY | ROUTE | KILOMETER POST TOTAL PROJECT | SHEET No | TOTAL SHEETS |
|---|---|---|---|---|---|
| 11 | SD | 56 | 2.9/10.6 | 637 | 856 |

Caltrans Metric

REGISTERED CIVIL ENGINEER 11-7-01

4-1-02
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER Mark DeSalvatore No. 39499 Exp. 12-31-01 CIVIL STATE OF CALIFORNIA

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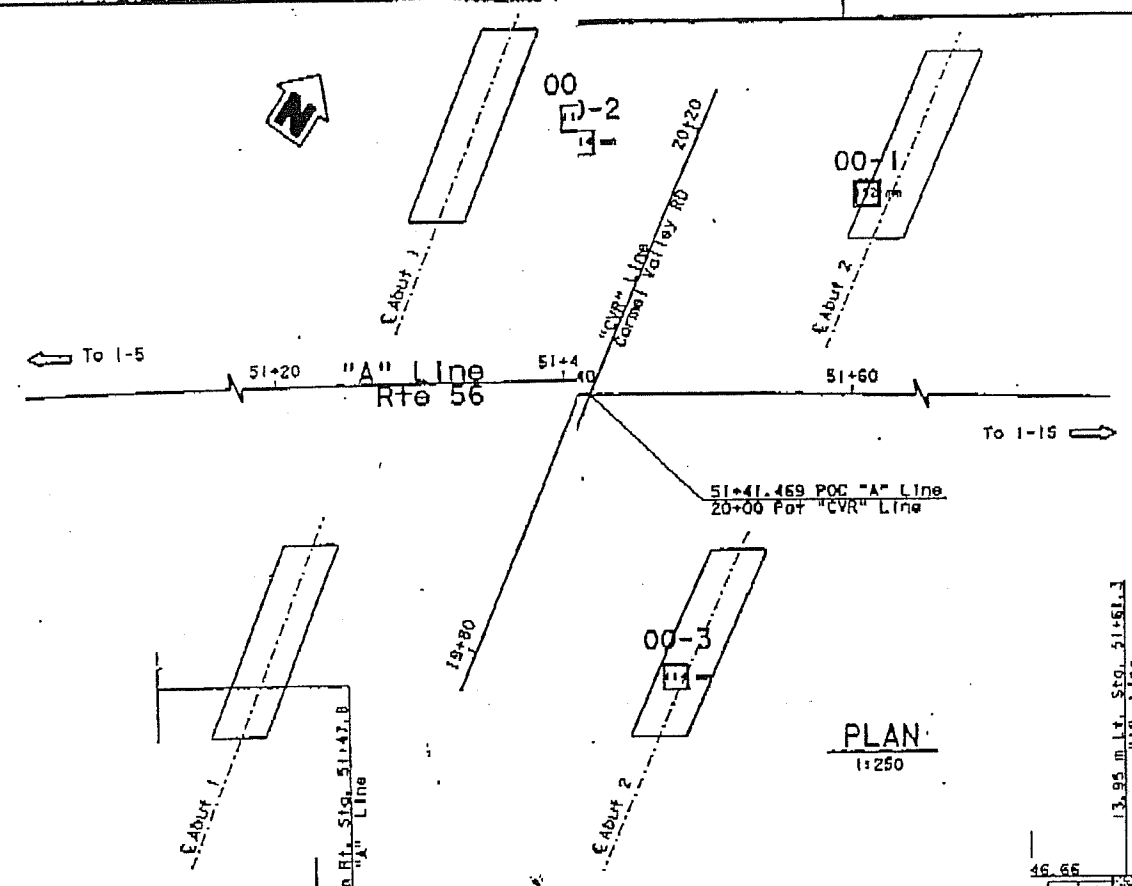
## BENCH MARK

BM WP52L Elev. 63.54 m

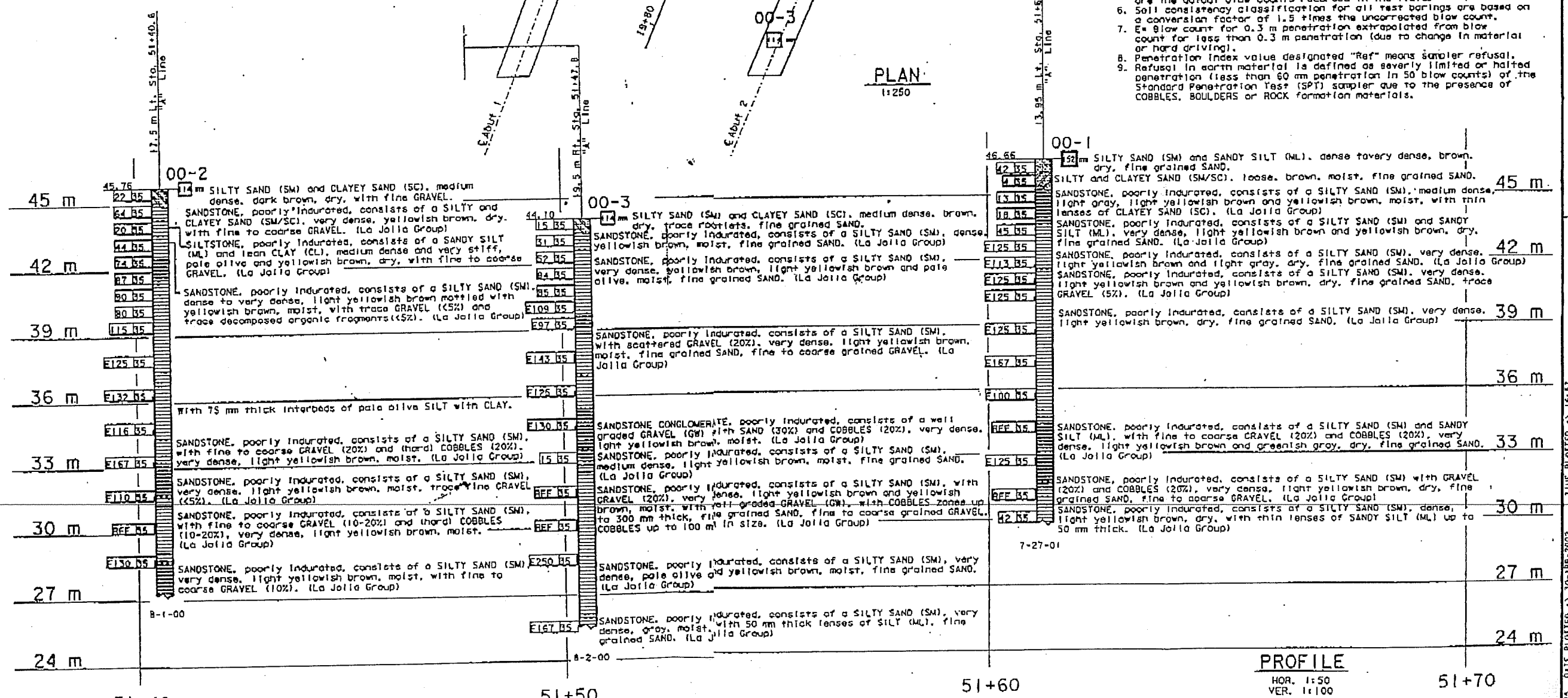
1 in. Iron Pipe w/ Nail & Washer
N587270.976 m, E1910973.547 m
Vertical Datum: NAVD 1988
Horizontal Datum: NAD 83




PLAN
1:250

Notes:

1. No attempt was made to measure ground water in Borings 00-2 and 00-3 during the field investigation.
2. Ground water was not encountered in Boring 00-1 during the field investigation.
3. The descriptions and classifications of rock and/or soil, including consistency and relative density descriptors, used by the field and/or office personnel for the exploration boreholes shown on this sheet are based on the "Soil and Rock Logging Classification Manual (Field Guide)," Engineering Service Center, Office of Structural Foundations, August 1996.
4. Soil colors were determined by using Munsell Soil Color Charts (1994, Revised Edition). Rock colors were determined using USGS rock color charts (1995, revised text).
5. All test borings utilized a Diedrich automatic hammer to advance the sampler. Penetration index values shown on the LOTB sheets are the actual blow counts recorded in the field.
6. Soil consistency classification for all test borings are based on a conversion factor of 1.5 times the uncorrected blow count.
7. E= Blow count for 0.3 m penetration extrapolated from blow count for less than 0.3 m penetration (due to change in material or hard driving).
8. Penetration index value designated "Ref" means sampler refusal.
9. Refusal in earth material is defined as severly limited or halted penetration (less than 60 mm penetration in 50 blow counts) of the Standard Penetration Test (SPT) sampler due to the presence of COBBLES, BOULDERS or ROCK formation materials.




PROFILE
HOR. 1:50
VER. 1:100

| ENGINEERING SERVICES | GEOTECHNICAL SERVICES |
|---|---|
| DRAWN BY W. Tang 8/01 | |
| CHECKED BY N. Sandoval 10/01 | |

FIELD INVESTIGATION BY: H. Valencia

STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES STRUCTURE DESIGN 12

BRIDGE NO. 57-1077 R/L
KILOMETER POST 4.1

CARMEL VALLEY ROAD UNDERCROSSING

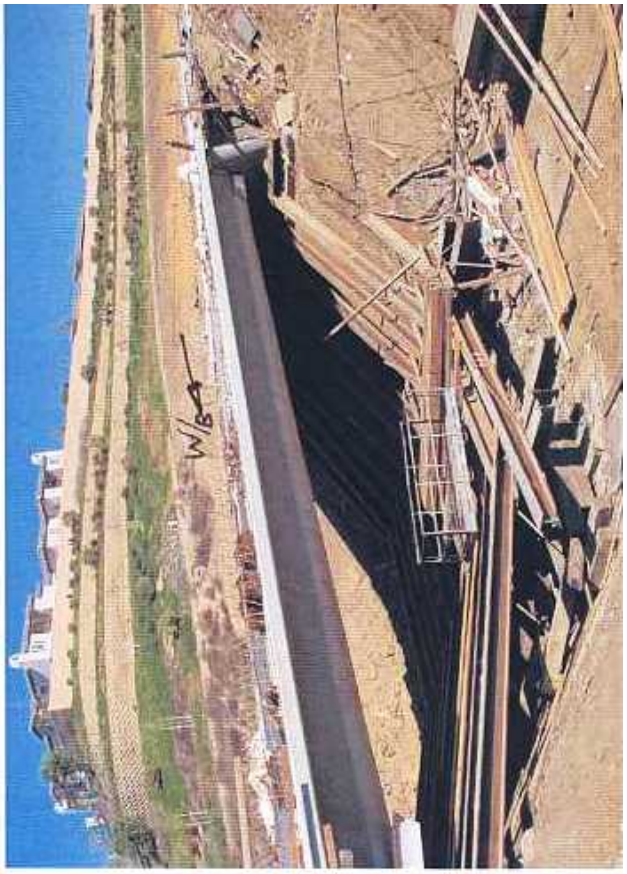
LOG OF TEST BORINGS 1 OF 3

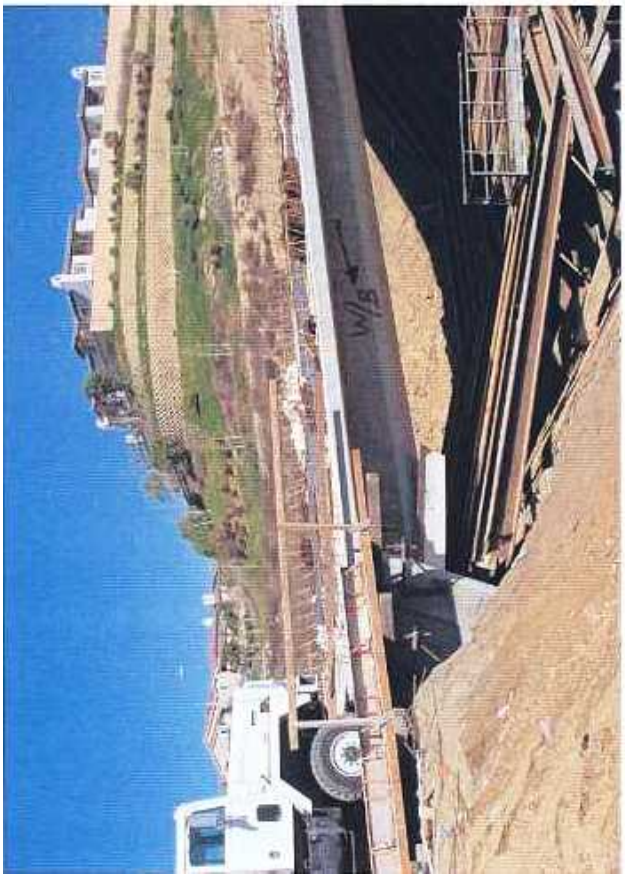
CU 11
EA 172821

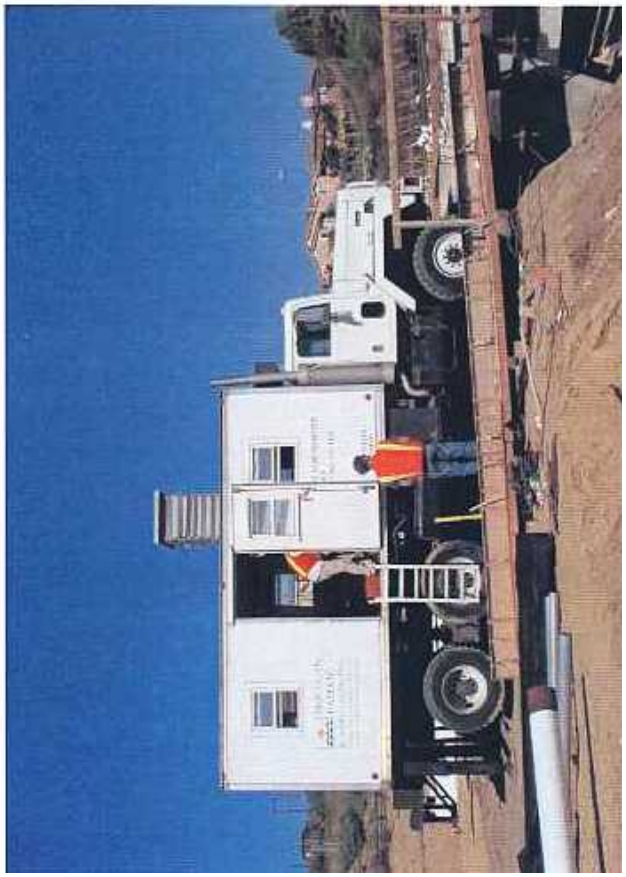
SHEET 19 OF 21

FILE -> 57-1077r1-1-lt001.dgn

ETRIC) REV. 3/12/01

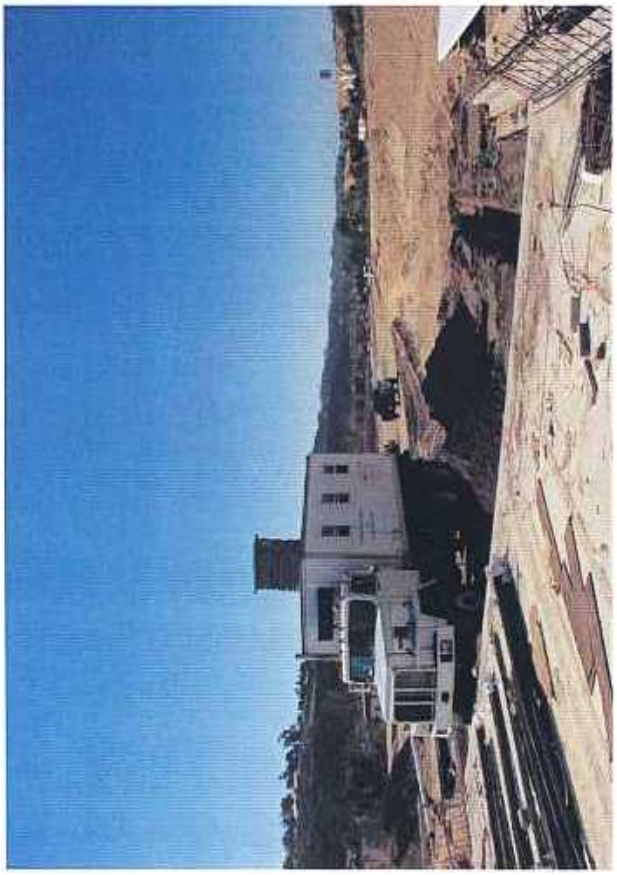


**57-1077L Carmen Valley Rd UC** 04-2

**57-1077L Carmen Valley Rd UC** 04-2



**57-1077L Carmen Valley Rd UC** 04-2

WEST ABUT

EAST ABUT

EAST ABUT

EASTERN HOLE

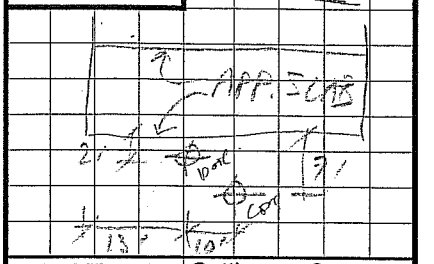
# LOG OF BORING NO. ( 04-1 )

N. SR 56

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

| | | | |
|---|---|---|---|
| Project Name | : CT / UCSD - Abutment Research @ Rancho Santa Fe Farm | | |
| Project Location | : San Diego, CA | | |
| E.M.I. Project No. | : 02-165 | Site Condition : | New Road Fill |
| Weather | : WARM, SUNNY | Elevation : | |
| Traffic Control | : None | Operator : | NICK |
| Drilling Company | : 2R DRILLING | Operator : | |
| Type of Rig | : CME 55 AUTO HAMMER | Drop (in) : | 30.0 |
| Borehole Diameter (inch) | : 8" | Drive Wt. (lbs) : | 140.0 |
| Logged By | : Bruce Schell | Date Drilled : | 2- 7 -04 |

Comments :




Backfilled With : Cuttings + Cement

| | Time | | | | | | | | | | Back to Office | Proposed Depth |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Depature | Arrival | Start | Break | Rework | Lunch | Rework | Break | Finish | Off | | 35.0 |
| Driller | | | | | | | | | | | | Water Table |
| Traffic Control | | | | | | | | | | | | ft |
| Logger | | | | | | | | | | | | Caving |
| Total | | | | | | | | | | | | ft |

| Depth (ft) | Sampler Type (Bulk, Drive, SPT, Tube) | Sample Number | Sample Type (B/D/S.B./T) | Blows/6" | Recovery (inch) | U.S.C.S. | Description ( ASTM D-2488-93 ) Color | Moisture State (Dry, Moist, Wet) | Max. Size | Grain Size ( % ) Gravel : Sand : Fines | Sand Size | Plasticity | Consistency | Cementation | $O^2$/LEL/PID |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | B | 0 | | | | | | | | : : | | | | | |
| 2½ | D | 1 | | 18/25/40 | 12 | Typical clay/sand/gravel fill | SILTY SAND: Yell Brn with white & Red Brn Streaks, moist, dense (FILL), trace of fractured hard rocks (Friable) | | | | | | | | |
| 5 | D | 2 | | 20/20/50 | 12 or 5" | | Same w/ SILTSTONE fragments; multicolored Brns, yell-Brn, Red Brn, Blk, moist, dense to hard but friable | | | | | | | | |
| | S | 3 | | 10/16/17 | 18 | | SANDY SILT: Multicolored, moist, v. dense, all is friable | | | | | | | | |
| 9½ | D | 4 | | 8/16/22 | 12 | | SILTY CLAY & SANDY SILT with frags of Siltstone, multicolored, moist, dense/Stiff (FILL) | | | | | | | | |
| 10 | D | 5 | | 13/38/40 | 12 | | SILT w/ Sand/Gravel; multicolored, moist, v. dense/Stiff; looks like decomposed siltstone frags in Silt/Sandy Silt Matrix (FILL) | | | | | | | | |
| 13 | S | 6 | | 10/12/17 | 18 | More Uniform FILL | Same in upper 3" Then SILTSTONE; Gray with yell Brn Spots, moist, v. Stiff friable; looks like Bedrock within fill (Probably a large block of bedrock (soft) in fill | | | | | | | | |
| 15 | D | 7 | | 12/18/30 | 12 | | SILTY SAND/SANDY SILT, Multicolored, moist, v. dense, friable, Nearly Horiz layering but crude with scattered decomposed rock frags. (FILL) | | | | | | | | |
| 17½ | D | 8 | | 50 for 3" | NSR | | | | | | | | | | |
| | S | 9 | | 12/22/22 | 18 | 7" Rec | SANDY SILT w/ Hard Gray Rocks; Multicolored Brns & Grays, moist, v. dense, (Fill) | | | | | | | | |
| 20 | | | | | | | Approx. Contact | | | | | | | | |
| | | | | | | | NATIVE SOIL DEVELOPED ON SILTY/SANDY BEDROCK | | | | | | | | |
| | D | 10 | | 18/19/23 | 12 | Soil | SILTY SAND & SILTY CLAY; DK Brn with yell Brn & Reddish-Brn Spots & Streaks, Sl. Moist to dry, hard/V. Stiff plant & root matter and Tiny (<1mm) vesicles (root holes) this is an argillic soil horizon. | | | | | | | | |
| 25 | S | 11 | | 8/25/33 | 18 | ROCK | Same in upper 4" - sharp contact with well-developed Ang. blocky soil structure SANDY SILTSTONE & SILTSTONE: v. pale Brn to h. Gray with few yell-Brn / Red-Brn Spots & Streaks; Sl. Moist to dry, hard soil (Soft Rock), friable. Sand is fine grained | | | | | | | | |

# LOG OF BORING NO. ( 04-2 )

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

Carmel Valley Rd W/B

| | | | |
|---|---|---|---|
| Project Name | : CT / UCSD - Abutment Research @ Rancho Santa Fe Farm | | |
| Project Location | : San Diego, CA | | |
| E.M.I. Project No. | : 02-165 | Site Condition : | New Road Fill |
| Weather | : Warm Sunny | Elevation : | |
| Traffic Control | : None | Operator : | NICK |
| Drilling Company | : 2R DRILLING | Operator : | |
| Type of Rig | : CME 55 AUTO HAMMER | Drop (in) : | 30.0 |
| Borehole Diameter (inch) | : 8" | Drive Wt. (lbs) : | 140.0 |
| Logged By | : Bruce Schell | Date Drilled : | 2-7-04 |

**Comments :** PP = Pocket Penetrom
8 ft - W of Concrete Deck
9 ft N of Southern edge
Deck - W. Bound Lanes

**Backfilled With :** Cuttings + Cement

| | Time | | | | | | | | | | Back to Office | Proposed Depth |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Depature | Arrival | Start | Break | Rework | Lunch | Rework | Break | Finish | Off | | 35.0 |
| Driller | | | | | | | | | | | | Water Table |
| Traffic Control | | | | | | | | | | | | None ft |
| Logger | | | | | | | | | | | | Caving |
| Total | | | | | | | | | | | | ft |

| Depth (ft) | Sampler Type (Bulk, Drive, SPT, Tube) | Sample Number | Sample Type (B/D/S.B./T) | Blows/6" | Recovery (inch) | U.S.C.S. | Color | Moisture State (Dry, Moist, Wet) | Max. Size | Grain Size (%) | Gravel : Sand : Fines | Sand Size | Plasticity | Consistency | Cementation | $O^2$/LEL/PID |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Description ( ASTM D-2488-93 ) | | | | | | | | | |
| | | | | | | | CPT 15½ ft from approach deck | | | | | | | | | |
| 0 | B | B | | | | | CLAYEY SAND w/GRAVEL (FILL): DK. Grayish Brown, dry to moist, v. dense | | | | | | | | | |
| | D | 1 | | 21/34/27 | 12 | | CLAYEY SAND w/ GRAVEL (FILL): DK Gry-Brn, Moist, V dense/V stiff (PP > 4.5 TSF) with black angular frags and round hard asph. pcs. to 1½" size; plant frags, earthy smell. | | | | | | | | | |
| 5 | D | 2 | | 15/23/40 | 12 | | Same but lighter DK. brown color (TSF > 4.5) still with black pcs. of asph. miraceous | | | | | | | | | |
| | S | 3 | | 12/14/16 | 18 | | Same, some of rocks are well-rounded & polished (Quartzite) & some angular. Some color variations from Brn to V. dk Brn | | | | | | | | | |
| | D | 4 | | 13/19/28 | 12 | | Same CLAYEY SAND w/ GRAVEL, DK Brn, Moist, v dense/v. stiff. 20-30% small asph. pcs.; many are black | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | |
| 12½ | D | 5 | | 6/7/7 | 12 | | Same but less cohesive; otherwise same color & mixture at rock frags. Pea size to 1½" (FILL) | | | | | | | | | |
| | S | 6 | | 3/3/3 | 7" | | Same - tip blocked by 2" Rock frag (FILL) | | | | | | | | | |
| 15 | | | | | | | | | | | | | | | | |
| | | | | | | | GRAVELLY CLAY: DK Brn, V. moist, soft in cuttings & waste barrel | | | | | | | | | |
| | D | 7 | | 18/27/50 for 3" | 12 | | GRAVELLY CLAY: DK Brn, Sl. moist, heavy/stiff, with plant material (Soil) | | | | | | | | | |
| | | | | | | | Bottom Ring & tip is SILTY SANDSTONE; H. yell Brn, Sl. moist, v. dense, friable with near-horizontal banding (Bedding) (Bedrock) | | | | | | | | | |
| 20 | S | 8 | | 17/27/40 | 18 | | Same H. yell Brn - H. gray SILTY SANDSTONE; Sl. Moist, v. dense, - hard (Soft - friable rock). Trace coarse grains | | | | | | | | | |
| | D | 9 | | 50 for 3" | | | Same SILTY SANDSTONE H. gray with yell brown spots, streaks, & near horiz. laminations | | | | | | | | | |
| 25 | | | | | | | | | | | | | | | | |
| | | | | | | | Terminated drilling @ 22'9" | | | | | | | | | |

HOLGUIN, FAHAN & ASSOCIATES, INC.
ENVIRONMENTAL MANAGEMENT CONSULTANTS
948 North Lemon Street, Orange, CA 92867 (714)-210-5971 FAX (714) 210-5975

February 18, 2004



Mr. Mike Kapuskar
Earth Mechanics, Inc.
17660 Newhope St, Suite E
Fountain Valley, CA 92708

**PROJECT NAME:** CPT Testing at UCSD Abut Research;
**PROJECT NO.:** TBD

Dear Mr. Kapuskar:

Enclosed please find copies of the cone penetrometer testing (CPT) data for the above referenced project along with a copy of the corresponding invoice.

The cone penetrometer testing conducted for this project consisted of pushing an instrumented cone-tipped probe into the ground while simultaneously recording the resistance to penetration at the cone tip and along the friction sleeve.

The cone penetrometer testing described in this report was conducted in general accordance with the current ASTM specifications (ASTM D5778-95 and D3441-94) using an electronic cone penetrometer.

The CPT equipment operated by Holguin, Fahan & Associates, Inc. (HFA) consists of a cone assembly mounted at the end of a series of hollow sounding rods. A set of hydraulic rams is used to continuously push the cone and rods into the soil at a rate of 20-mm per second (approximately four feet per minute) while the cone tip resistance and sleeve friction resistance are recorded every 50-mm (approximately two inches) and stored in digital form. A specially designed all wheel drive 23-ton truck provides the required reaction weight for pushing the cone assembly and is also used to transport and house the test equipment.

The cone penetrometer assembly used for this project consists of a conical tip and a cylindrical friction sleeve. The conical tip has a 60° apex angle and a diameter of 35.6-mm (1.40-inch) resulting in a projected cross-sectional area of 10 $cm^2$ (1.5 square inches). The cylindrical friction sleeve is 133-mm (5.25-inch) in length and has an outside diameter of 35.8-mm (1.41-inch), resulting in a surface area of 150 $cm^2$ (23 square inches).

The interior of the cone penetrometer is instrumented with strain gauges that allow simultaneous measurement of cone tip and friction sleeve resistance during penetration. Continuous electric signals from the strain gauges are transmitted by a shielded cable in the sounding rods to the PC-based data acquisition hardware in the CPT truck. The sounding log is also displayed on a monitor.

The CPT data processing is performed using the truck mounted computer based data acquisition and presentation system. The computer generated graphical logs include cone resistance, friction resistance, friction ratio, and pore pressure ratio versus depth at a user selectable scale.

Soil behavior type interpretations are based on the following reference: Robertson, P.K. and Campanella, R.C., 1989, "Guidelines for Geotechnical Design using the Cone Penetrometer Test and CPT with Pore Pressure Measurement." Soil Mechanics series No. 120, Civil Engineering Department, University of British Columbia, Vancouver, B.C., V6T 1Z4, September 1989.

Interpretations and plotting has been done using HFA's proprietary data interpretation and presentation software. It is important to note that the data is not averaged. All interpretations are point interpretations at the corresponding depth listed.

It is also important to note that the soil behavior type correlations are based on a combination of theory, field research, research performed under laboratory conditions, and literature review. The information presented in the tabulated and/or graphical logs should, therefore, be viewed as a guideline rather than as precise measurements.

Some care is recommended when using the soil behavior type interpretations. If a tabulation depth happens to fall on a soil layer interface, or a seam of soil differing from the rest of the layer, the tabulated data can be misleading. The solution to this problem is the proper use of the graphical CPT logs. The tip and sleeve penetration resistance logs are the primary source of profile description; the soil behavior type logs are supplemental. The graphical logs of tip and sleeve resistance should be examined and layer boundaries delineated in accordance with the project requirements. The soil behavior type interpretations are only representative of the response of the soil to the large shear deformations imposed during cone penetration. This is not necessarily a prediction of grain size distribution. However, it has been found that the interpreted soil behavior types generally agree well with the soil types defined in accordance with the grain size distribution methods such as used in the Unified Soil Classification System.

Limitations

Holguin, Fahan & Associates, Inc. (HFA) presents the attached data in accordance with ASTM Standards D5778-95 and D3441-94 and generally accepted cone penetrometer testing practices and standards. The attached data further relates only to the specific project and location discussed in the data. Judgement may be required to verify the CPT soil behavior interpretations.

The "Client" may distribute this data or excerpts therefrom provided the following statement is prominently displayed and included with the distribution:

"Neither CLIENT nor HFA make any guarantee or warranty, express or implied, regarding this data. THE USE OF THIS INFORMATION SHALL BE AT THE USER'S SOLE RISK REGARDLESS OF ANY FAULT OR NEGLIGENCE OF THE CLIENT OR HFA."

Please feel free to call if you have any questions.

Respectfully submitted,

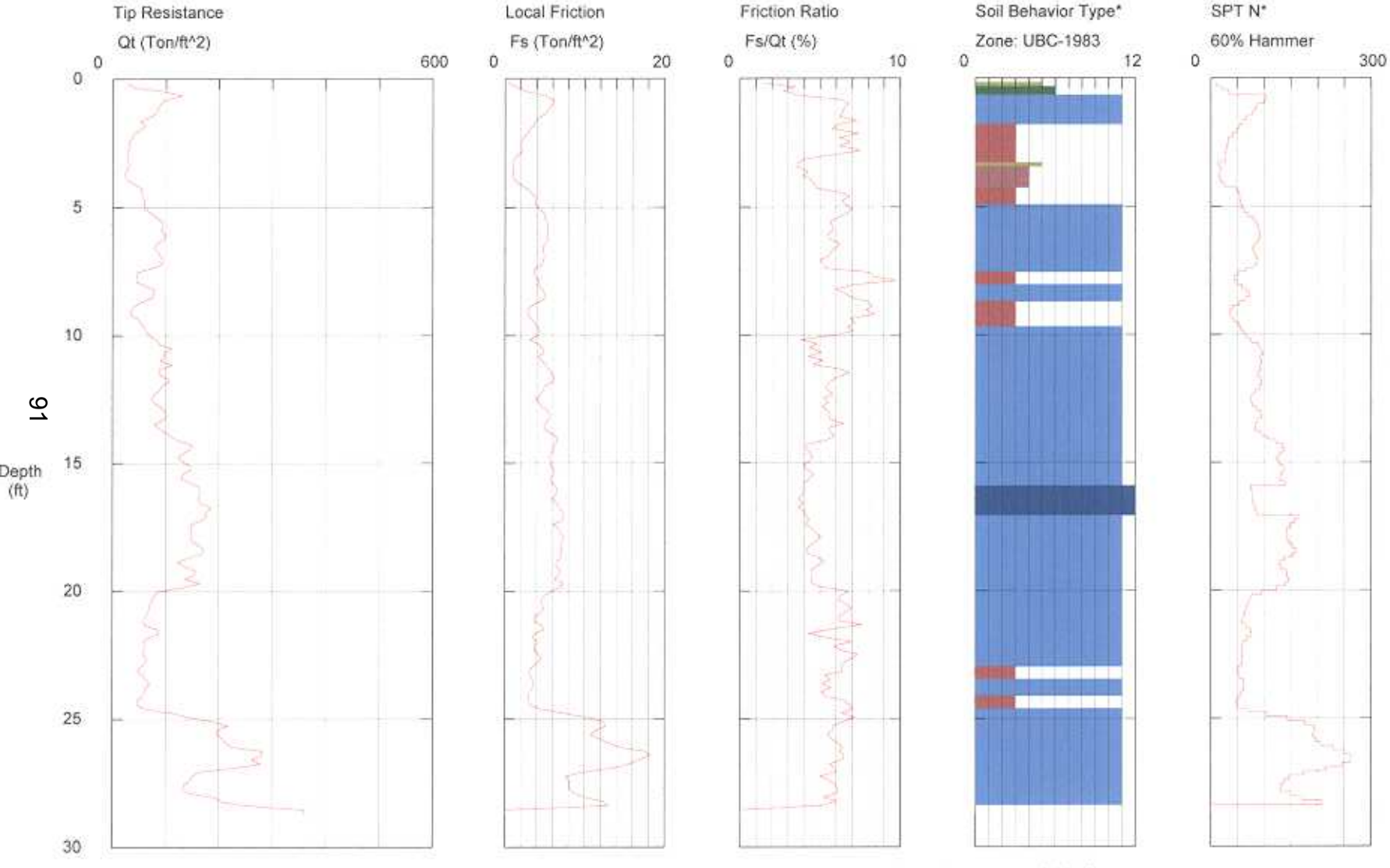
Amanda Hancock
CPT Operations Manager
Holguin, Fahan & Associates, Inc.

:AH\Enclosures

# Earth Mechanics

Operator: Vic-Ian
Sounding: 04-1
Cone Used: DSG0409

CPT Date/Time: 2/7/2004 12:55
Location: UCSD Abut Research
Job Number: 02-165 Carmel Valley B-2



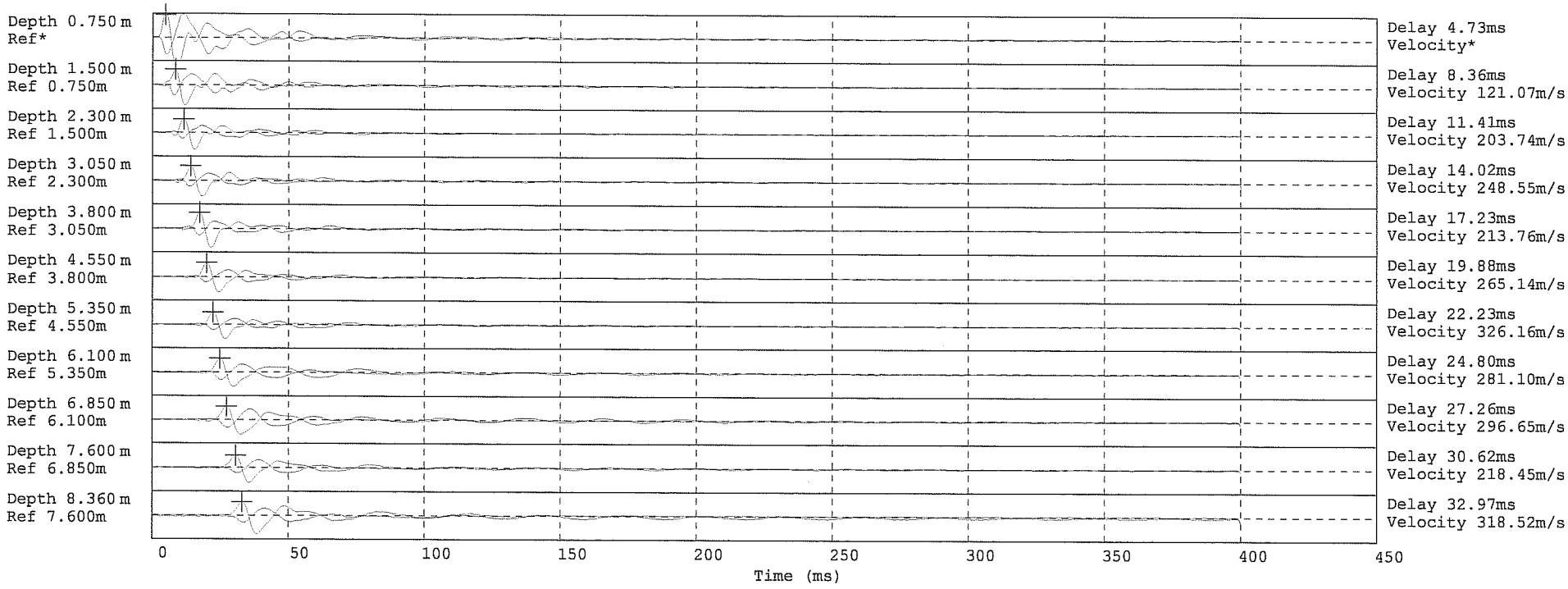

Maximum Depth = 28.71 feet

Depth Increment = 0.164 feet

1 sensitive fine grained
2 organic material
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 very stiff fine grained (*)
12 sand to clayey sand (*)

ehavior type and SPT based on data from UBC-1983

# Earth Mechanics
## 04-1




Hammer to Rod String Distance 1.524 (m)
* = Not Determined

# CPT INTERPRETATIONS

SOUNDING : 04-1 PROJECT No.: 02-165 Carme
PROJECT : UCSD Abut Resear CONE/RIG : DSG0409
DATE/TIME: 2/7/2004 12:55



| DEPTH (m) | DEPTH (ft) | TIP RESISTANCE (tsf) | FRICTION RATIO (%) | SOIL BEHAVIOR TYPE | N(60) | N1(60) | Dr (%) | Su (tsf) | PHI (Degrees) |
|---|---|---|---|---|---|---|---|---|---|
| .150 | .49 | 97.43 | 2.69 | SANDY SILT to CLAYEY SILT | 39 | 62 | | 5.7 | |
| .300 | .98 | 88.60 | 6.80 | *VERY STIFF FINE GRAINED | 89 | 100 | | | |
| .450 | 1.48 | 71.96 | 6.21 | *VERY STIFF FINE GRAINED | 72 | 100 | | | |
| .600 | 1.97 | 52.87 | 5.73 | CLAY | 53 | 85 | | 3.1 | |
| .750 | 2.46 | 29.86 | 6.88 | CLAY | 30 | 48 | | 1.7 | |
| .900 | 2.95 | 27.82 | 6.15 | CLAY | 28 | 44 | | 1.6 | |
| 1.050 | 3.44 | 30.12 | 3.55 | CLAYEY SILT to SILTY CLAY | 15 | 24 | | 2.0 | |
| 1.200 | 3.94 | 26.23 | 4.42 | CLAY to SILTY CLAY | 17 | 28 | | 1.5 | |
| 1.350 | 4.43 | 53.69 | 6.13 | CLAY | 54 | 86 | | 3.1 | |
| 1.500 | 4.92 | 58.74 | 6.61 | CLAY | 59 | 94 | | 3.4 | |
| 1.650 | 5.41 | 82.72 | 6.14 | *VERY STIFF FINE GRAINED | 83 | 100 | | | |
| 1.800 | 5.91 | 91.22 | 5.85 | *VERY STIFF FINE GRAINED | 91 | 100 | | | |
| 1.950 | 6.40 | 83.08 | 6.19 | *VERY STIFF FINE GRAINED | 83 | 100 | | | |
| 2.100 | 6.89 | 89.70 | 5.55 | *VERY STIFF FINE GRAINED | 90 | 100 | | | |
| 2.250 | 7.38 | 70.70 | 5.34 | *VERY STIFF FINE GRAINED | 71 | 100 | | | |
| 2.400 | 7.87 | 44.65 | 9.74 | CLAY | 45 | 63 | | 2.6 | |
| 2.550 | 8.37 | 76.96 | 6.52 | *VERY STIFF FINE GRAINED | 77 | 100 | | | |
| 2.700 | 8.86 | 39.76 | 8.23 | CLAY | 40 | 53 | | 2.3 | |
| 2.850 | 9.35 | 47.25 | 6.87 | CLAY | 47 | 61 | | 2.7 | |
| 3.000 | 9.84 | 61.71 | 7.04 | CLAY | 62 | 78 | | 3.6 | |
| 3.150 | 10.33 | 88.06 | 4.80 | *VERY STIFF FINE GRAINED | 88 | 100 | | | |
| 3.300 | 10.83 | 98.35 | 4.26 | CLAYEY SILT to SILTY CLAY | 49 | 59 | | 5.7 | |
| 3.450 | 11.32 | 88.28 | 6.25 | *VERY STIFF FINE GRAINED | 88 | 100 | | | |
| 3.600 | 11.81 | 106.64 | 5.60 | *VERY STIFF FINE GRAINED | 100 | 100 | | | |
| 3.750 | 12.30 | 77.94 | 5.79 | *VERY STIFF FINE GRAINED | 78 | 88 | | | |
| 3.900 | 12.80 | 91.08 | 5.13 | *VERY STIFF FINE GRAINED | 91 | 100 | | | |
| 4.050 | 13.29 | 96.52 | 5.63 | *VERY STIFF FINE GRAINED | 97 | 100 | | | |
| 4.200 | 13.78 | 97.67 | 5.63 | *VERY STIFF FINE GRAINED | 98 | 100 | | | |
| 4.350 | 14.27 | 148.13 | 4.15 | *VERY STIFF FINE GRAINED | 100 | 100 | | | |
| 4.500 | 14.76 | 123.09 | 4.56 | *VERY STIFF FINE GRAINED | 100 | 100 | | | |
| 4.650 | 15.26 | 147.79 | 4.17 | *VERY STIFF FINE GRAINED | 100 | 100 | | | |
| 4.800 | 15.75 | 145.27 | 4.04 | *VERY STIFF FINE GRAINED | 100 | 100 | | | |
| 4.950 | 16.24 | 163.08 | 3.92 | *SAND to CLAYEY SAND | 82 | 80 | | | |
| 5.100 | 16.73 | 186.63 | 3.64 | *SAND to CLAYEY SAND | 93 | 91 | | | |
| 5.250 | 17.22 | 167.76 | 4.33 | *VERY STIFF FINE GRAINED | 100 | 100 | | | |
| 5.400 | 17.72 | 147.19 | 4.71 | *VERY STIFF FINE GRAINED | 100 | 100 | | | |
| 5.550 | 18.21 | 161.80 | 4.42 | *VERY STIFF FINE GRAINED | 100 | 100 | | | |
| 5.700 | 18.70 | 142.81 | 4.91 | *VERY STIFF FINE GRAINED | 100 | 100 | | | |
| 5.850 | 19.19 | 156.45 | 4.49 | *VERY STIFF FINE GRAINED | 100 | 100 | | | |
| 6.000 | 19.69 | 165.25 | 4.45 | *VERY STIFF FINE GRAINED | 100 | 100 | | | |
| 6.150 | 20.18 | 78.64 | 6.28 | *VERY STIFF FINE GRAINED | 79 | 70 | | | |

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 126 pcf
ASSUMED DEPTH OF WATER TABLE = 50.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

*HOLGUIN, FAHAN & ASSOCIATES, INC.*
*Interpretations based on ROBERTSON and CAMPANELLA, 1989*

SOUNDING : 04-1

| DEPTH (m) | DEPTH (ft) | TIP RESISTANCE (tsf) | FRICTION RATIO (%) | SOIL BEHAVIOR TYPE | N(60) | N1(60) | Dr (%) | Su (tsf) | PHI (Degrees) |
|---|---|---|---|---|---|---|---|---|---|
| 6.300 | 20.67 | 70.32 | 7.00 | *VERY STIFF FINE GRAINED | 70 | 61 | | | |
| 6.450 | 21.16 | 58.87 | 6.20 | CLAY | 59 | 51 | | 3.4 | |
| 6.600 | 21.65 | 87.76 | 4.28 | CLAYEY SILT to SILTY CLAY | 44 | 37 | | 5.1 | |
| 6.750 | 22.15 | 63.19 | 5.86 | CLAY | 63 | 53 | | 3.6 | |
| 6.900 | 22.64 | 64.90 | 6.98 | *VERY STIFF FINE GRAINED | 65 | 54 | | | |
| 7.050 | 23.13 | 47.28 | 6.46 | CLAY | 47 | 39 | | 2.7 | |
| 7.200 | 23.62 | 71.28 | 5.13 | *VERY STIFF FINE GRAINED | 71 | 58 | | | |
| 7.350 | 24.11 | 56.71 | 5.36 | CLAY | 57 | 46 | | 3.2 | |
| 7.500 | 24.61 | 63.01 | 7.09 | CLAY | 63 | 50 | | 3.6 | |
| 7.650 | 25.10 | 190.31 | 6.52 | *VERY STIFF FINE GRAINED | 100 | 100 | | | |
| 7.800 | 25.59 | 195.90 | 5.49 | *VERY STIFF FINE GRAINED | 100 | 100 | | | |
| 7.950 | 26.08 | 224.59 | 6.42 | *VERY STIFF FINE GRAINED | 100 | 100 | | | |
| 8.100 | 26.57 | 262.07 | 6.45 | *VERY STIFF FINE GRAINED | 100 | 100 | | | |
| 8.250 | 27.07 | 163.46 | 6.02 | *VERY STIFF FINE GRAINED | 100 | 100 | | | |
| 8.400 | 27.56 | 134.72 | 6.01 | *VERY STIFF FINE GRAINED | 100 | 100 | | | |
| 8.550 | 28.05 | 192.85 | 5.23 | *VERY STIFF FINE GRAINED | 100 | 100 | | | |
| 8.700 | 28.54 | 362.13 | ***** | | 0 | 0 | | | .0 |

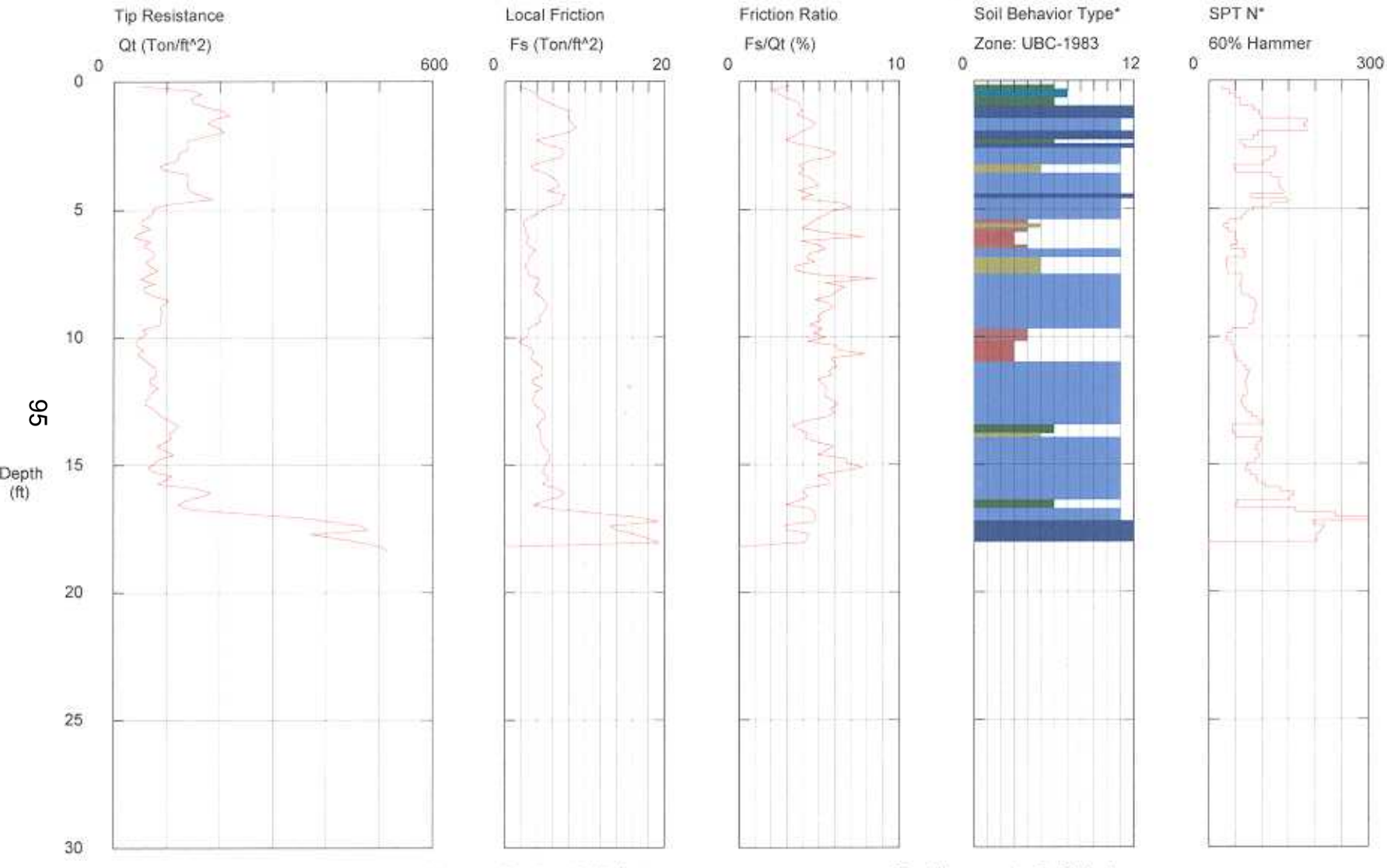
*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 126 pcf
ASSUMED DEPTH OF WATER TABLE = 50.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

*HOLGUIN, FAHAN & ASSOCIATES, INC.*
*Interpretations based on ROBERTSON and CAMPANELLA, 1989*

# Earth Mechanics

Operator: Vic-Ian
Sounding: 04-2B
Cone Used: DSG0409

CPT Date/Time: 2/7/2004 2:51
Location: UCSD Abut Research
Job Number: 02-165 Carmel Valley B-2



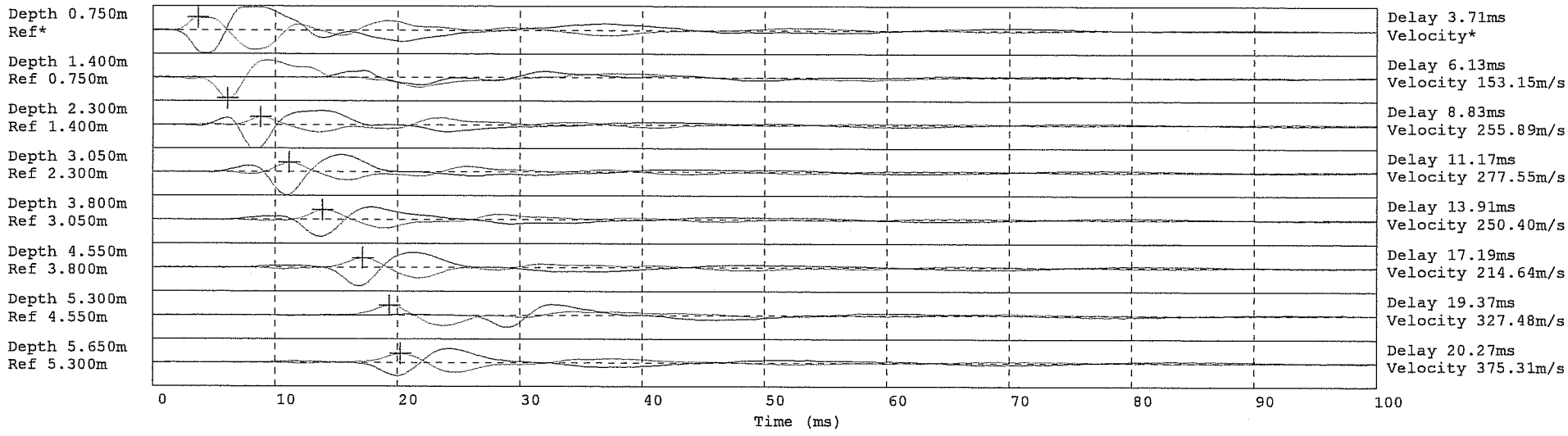

Maximum Depth = 18.37 feet

Depth Increment = 0.164 feet

1 sensitive fine grained
2 organic material
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 very stiff fine grained (*)
12 sand to clayey sand (*)

ehavior type and SPT based on data from UBC-1983

# Earth Mechanics
## 04-2B




Hammer to Rod String Distance 1.524 (m)
* = Not Determined

# CPT INTERPRETATIONS

SOUNDING : 04-2B
PROJECT : UCSD Abut Resear
DATE/TIME: 2/7/2004 2:51

PROJECT No.: 02-165
CONE/RIG : DSG0409

| DEPTH (m) | DEPTH (ft) | TIP RESISTANCE (tsf) | FRICTION RATIO (%) | SOIL BEHAVIOR TYPE | N(60) | N1(60) | Dr (%) | Su (tsf) | PHI (Degrees) |
|---|---|---|---|---|---|---|---|---|---|
| 2.100 | 6.89 | 72.30 | 4.22 | CLAYEY SILT to SILTY CLAY | 36 | 54 | | 4.2 | |
| 2.250 | 7.38 | 83.39 | 3.53 | SANDY SILT to CLAYEY SILT | 33 | 49 | | 4.9 | |
| 2.400 | 7.87 | 77.85 | 5.39 | *VERY STIFF FINE GRAINED | 78 | 100 | | | |
| 2.550 | 8.37 | 76.40 | 5.76 | *VERY STIFF FINE GRAINED | 76 | 100 | | | |
| 2.700 | 8.86 | 87.00 | 5.85 | *VERY STIFF FINE GRAINED | 87 | 100 | | | |
| 2.850 | 9.35 | 90.11 | 5.06 | *VERY STIFF FINE GRAINED | 90 | 100 | | | |
| 3.000 | 9.84 | 62.59 | 4.64 | CLAY to SILTY CLAY | 42 | 53 | | 3.6 | |
| 3.150 | 10.33 | 45.56 | 6.13 | CLAY | 46 | 56 | | 2.6 | |
| 3.300 | 10.83 | 56.18 | 5.74 | CLAY | 56 | 67 | | 3.3 | |
| 3.450 | 11.32 | 80.89 | 5.59 | *VERY STIFF FINE GRAINED | 81 | 95 | | | |
| 3.600 | 11.81 | 69.36 | 5.16 | *VERY STIFF FINE GRAINED | 69 | 80 | | | |
| 3.750 | 12.30 | 68.05 | 5.35 | *VERY STIFF FINE GRAINED | 68 | 77 | | | |
| 3.900 | 12.80 | 77.94 | 5.72 | *VERY STIFF FINE GRAINED | 78 | 86 | | | |
| 4.050 | 13.29 | 107.73 | 4.18 | CLAYEY SILT to SILTY CLAY | 54 | 58 | | 6.3 | |
| 4.200 | 13.78 | 104.40 | 4.30 | *VERY STIFF FINE GRAINED | 100 | 100 | | | |
| 4.350 | 14.27 | 81.15 | 5.91 | *VERY STIFF FINE GRAINED | 81 | 85 | | | |
| 4.500 | 14.76 | 85.14 | 6.69 | *VERY STIFF FINE GRAINED | 85 | 88 | | | |
| 4.650 | 15.26 | 72.40 | 6.40 | *VERY STIFF FINE GRAINED | 72 | 73 | | | |
| 4.800 | 15.75 | 82.78 | 5.71 | *VERY STIFF FINE GRAINED | 83 | 82 | | | |
| 4.950 | 16.24 | 163.03 | 4.29 | *VERY STIFF FINE GRAINED | 100 | 100 | | | |
| 5.100 | 16.73 | 143.30 | 4.47 | *VERY STIFF FINE GRAINED | 100 | 100 | | | |
| 5.250 | 17.22 | 409.33 | 4.71 | *VERY STIFF FINE GRAINED | 100 | 100 | | | |
| 5.400 | 17.72 | 369.90 | 4.38 | *VERY STIFF FINE GRAINED | 100 | 100 | | | |

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 128 pcf
ASSUMED DEPTH OF WATER TABLE = 50.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

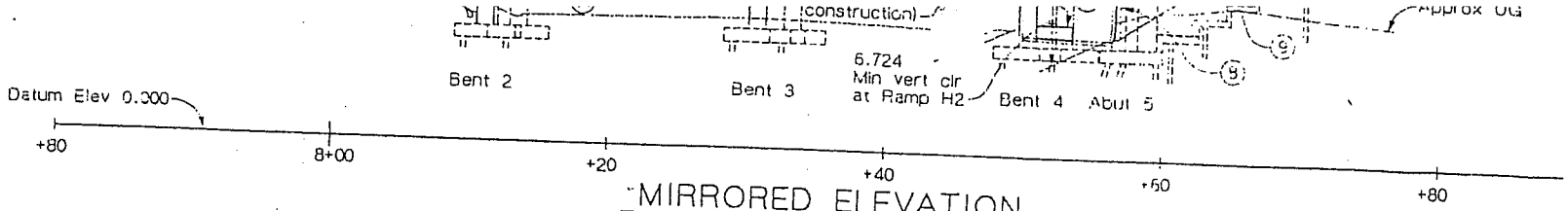
*HOLGUIN, FAHAN & ASSOCIATES, INC.*
*Interpretations based on ROBERTSON and CAMPANELLA, 1989*

# Caltrans Bridge 55-0257
# Harbor Blvd UC (Widen), Orange Co.

**Caltrans Bridge 55-0257, Harbor Blvd., Costa Mesa, Orange Co.**

This bridge undercrossing is located in Santa Ana in Orange County. The I-405 runs on high raised embankments in this area. The subject bridge is skewed and consists of older bridges that were subsequently widened in the median and the outer sides. A subject bridge is part of the SB loop ramp recently added in 2004. The east Abutment No. 1 is a small monolithic abutment 10 ft tall and on one row of piles. The west Abutment 5 is a tall, heavy seat-type abutment on three rows of piles.

The field investigation for this bridge was conducted on 2/28/04, consisting of (2) 21.5-ft deep soil borings and (3) 15 to 20-ft deep conventional and seismic CPT's. Drilling was performed by 2R Drilling and CPT was performed by HFA. Borehole 04-3 and CPT 04-3C were performed at Abutment 1 behind the approach slab (at about 13 feet away from the abutment wall). Borehole 04-4 and CPT's 04-4C and 04-5C were performed at Abutment 5 through the approach slab (about 4 to 5 ft from the abutment wall), which was precored using an electric coring machine. Geotechnical soil sampling consisted of ring samples collected at 2.5-ft depth intervals using a Modified California and SPT samplers. Seismic wave measurements were taken at 2.5-ft intervals. Groundwater was not encountered.



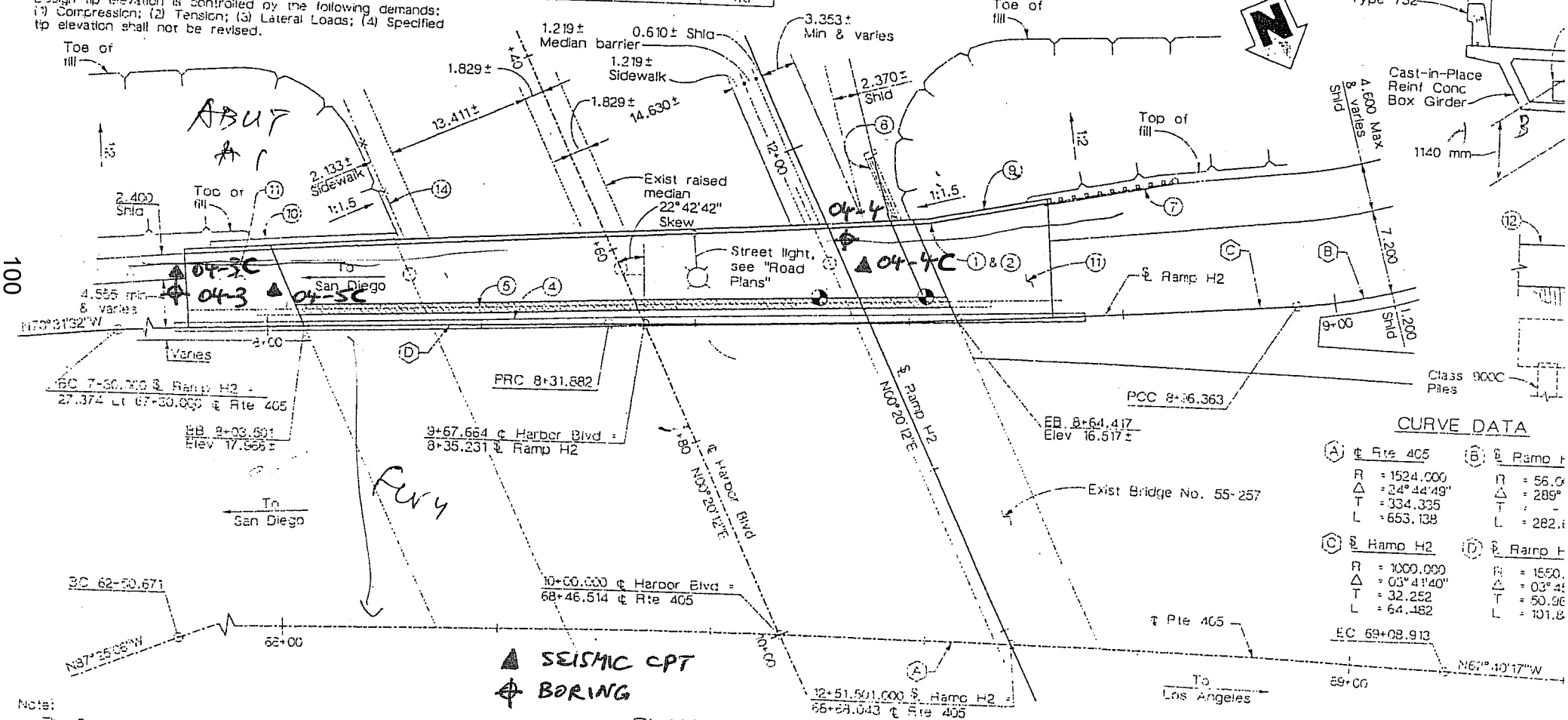

## MIRRORED ELEVATION

1:250

## PILE DATA - CLASS 400C AND CLASS 900C PILES

| Location | Pile Type | Design Loading (Service) | Nominal Resistance | | Design Tip Elevation | Specified Tip Elevation |
|---|---|---|---|---|---|---|
| | | | Compression | Tension | | |
| Abutment 1 | Class 900C | 400 kN | 800 kN | 0 kN | + 2.5 (1) & 6.5 (3) | + 2.5 |
| Bent 2 | Class 900C | 675 kN | 1350 kN | 900 kN | -6.0 (1), -7.00 (2) & -2.0 (3) | -7.0(4) |
| Bent 3 | Class 900C | 750 kN | 1500 kN | 800 kN | -6.0 (1), -6.00 (2) & -2.0 (3) | -6.0(4) |
| Bent 4 | Class 900C | 725 kN | 1450 kN | 850 kN | -6.0 (1), -6.00 (2) & -2.0 (3) | -6.0(4) |
| Abutment 5 | Class 900C | 625 kN | 1250 kN | 0 kN | -5.0 (1) & -0.5 (3) | -5.0 |
| Retaining Wall | Class 400C | 375 kN | 750 kN | 0 kN | +1.5 (1 & 3 | +1.5 |

Design tip elevation is controlled by the following demands: (1) Compression; (2) Tension; (3) Lateral Loads; (4) Specified tip elevation shall not be revised.




## CURVE DATA

(A) ℄ Rte 405
R = 1524.000
Δ = 24°44'49"
T = 334.335
L = 653.138

(B) ℄ Ramp H
R = 56.0
Δ = 289°
T = -
L = 282.6

(C) ℄ Ramp H2
R = 1000.000
Δ = 03°41'40"
T = 32.252
L = 64.482

(D) ℄ Ramp H
R = 1550.
Δ = 03°4
T = 50.96
L = 101.8

## PLAN

1:250

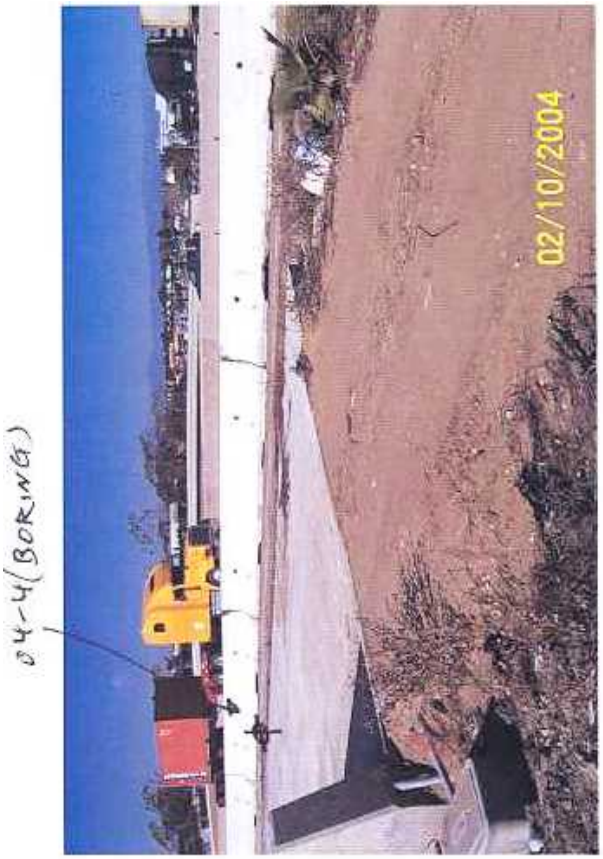
Note:
The Contractor shall verify all controlling field dimensions before ordering or fabricating any material

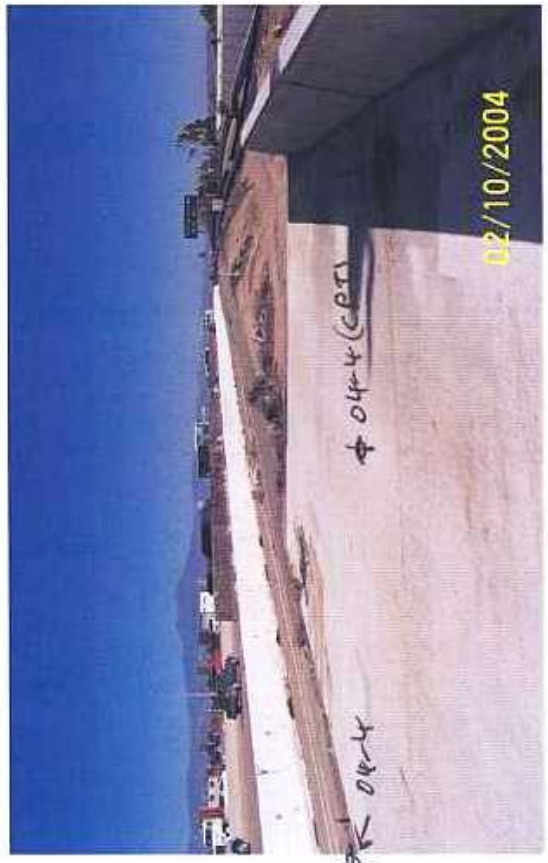
Note: For "Index to Plans", "Standard Plans Dated July 1992" and "General Notes Load Factor Design", see "Index to Plans" sh

| | | | | |
|---|---|---|---|---|
| 3/3/00 | DESIGN A. Solana | CHECKED A. Moubayed/O. Jaradat | LOAD FACTOR DESIGN | FILE CONTROL NO. 55-4 AND ALTERNATIVE AND PERMIT DESIGN LOADING |
| | DETAILS G. Sueiow | CHECKED A. Wang | LAYOUT G. Sueiow | CHECKED A. Moubayed |
| | QUANTITIES | CHECKED | SPECIFICATIONS | PLANS AND SPECS |

PREPARED FOR THE STATE OF CALIFORNIA

Linh Trinh
PROJECT ENGINEER

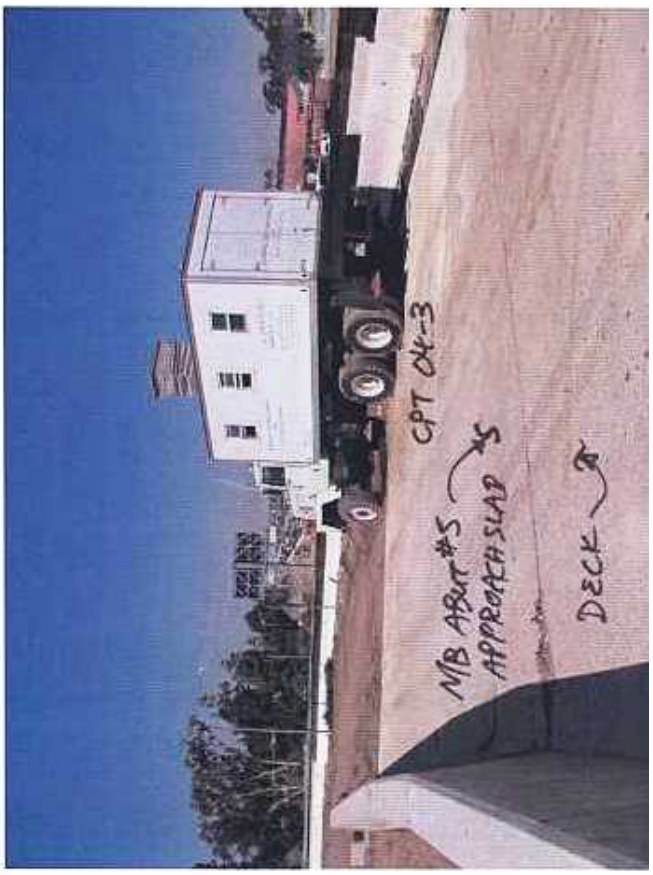


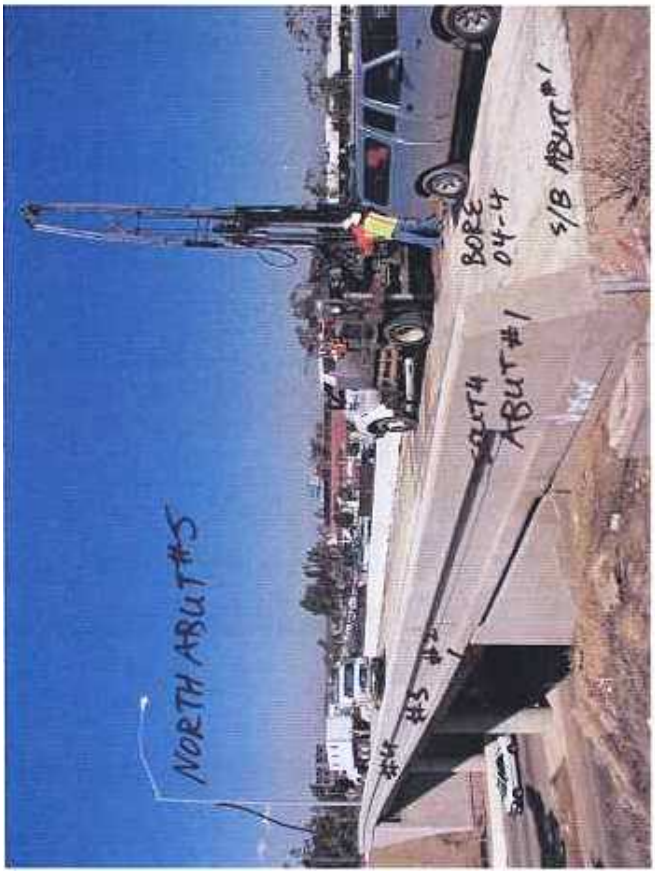



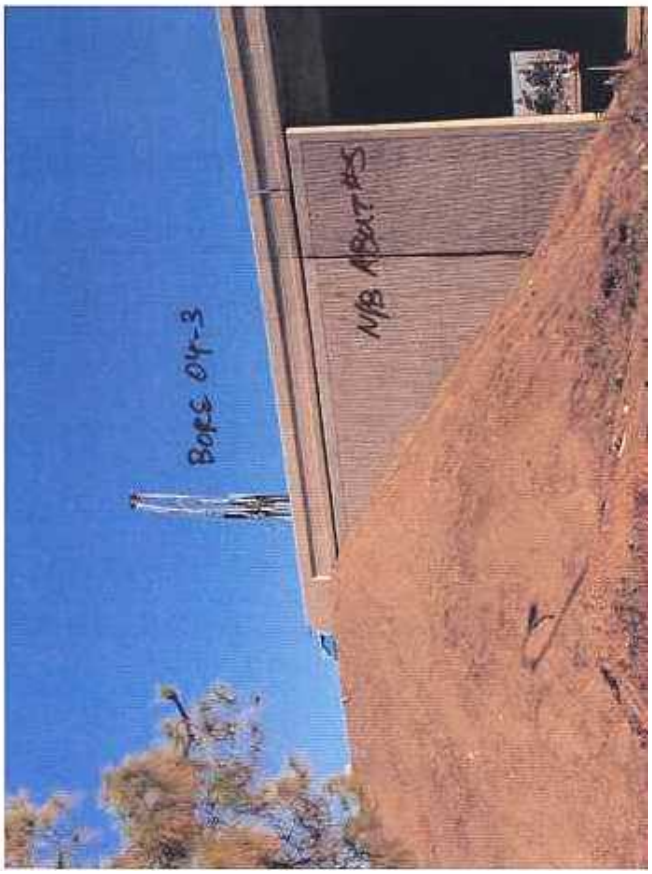

SOUTH ABUT #1

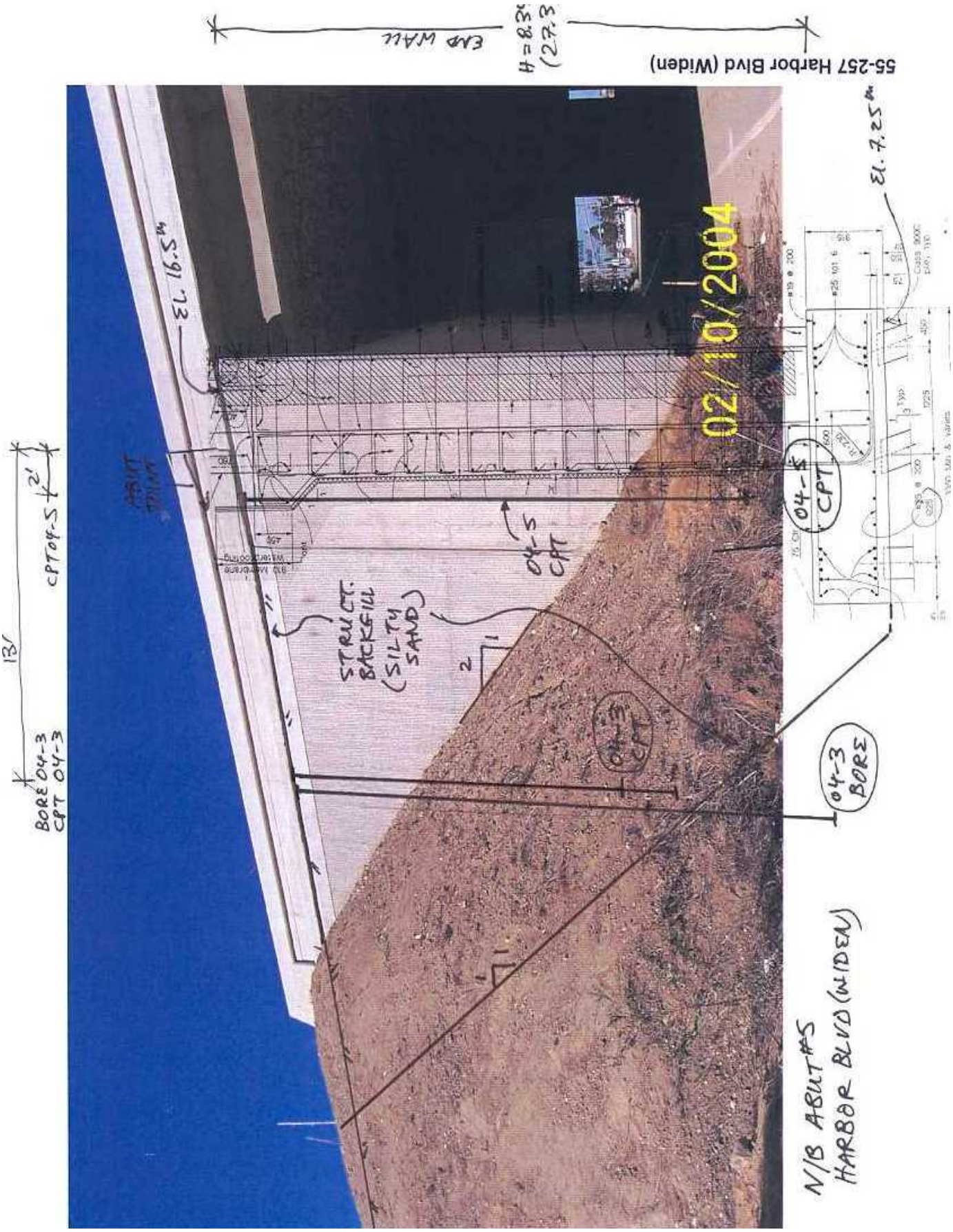
**55-257 Harbor Blvd UC (Widen)**

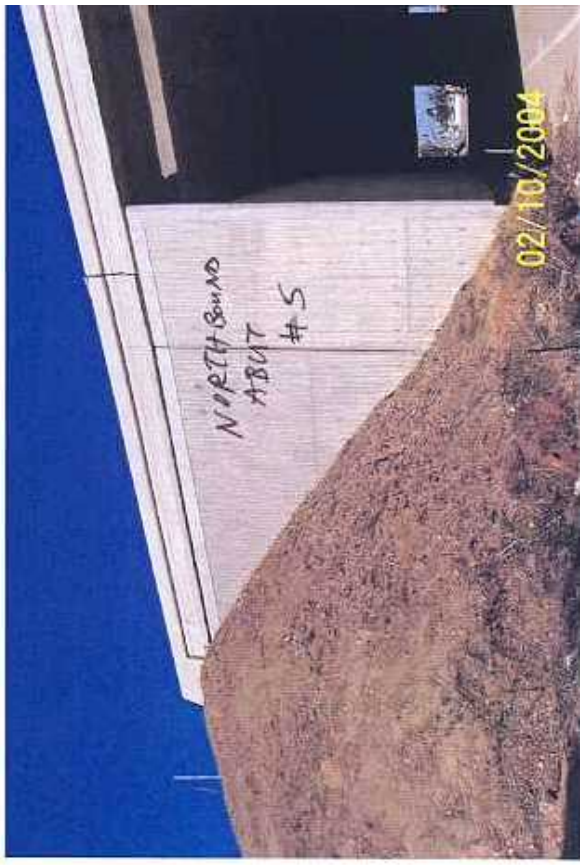
CPT-04-5
N/B ABUT #
SLAB

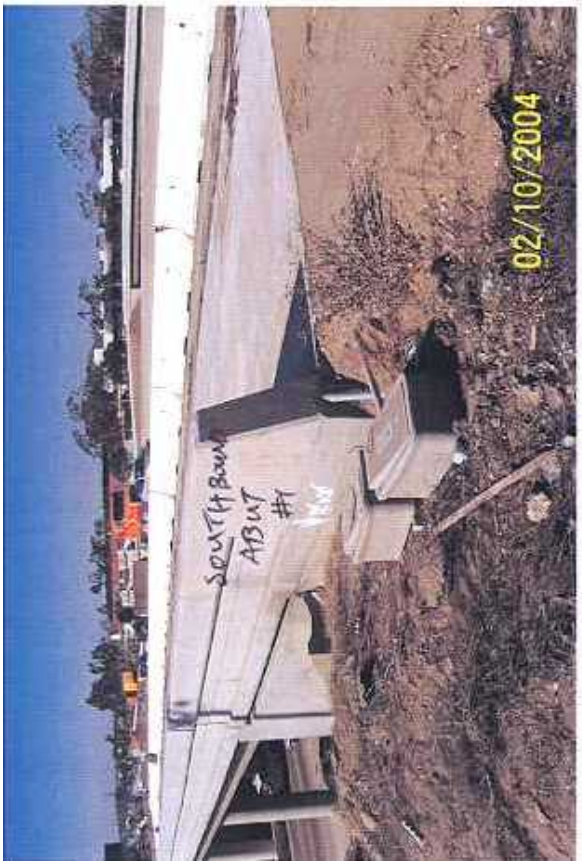

CPT 04-3
N/B ABUT #5
APPROACH SLAB
DECK


NORTH ABUT #5
BORE
04-4
S/B ABUT #1
ABUT #1

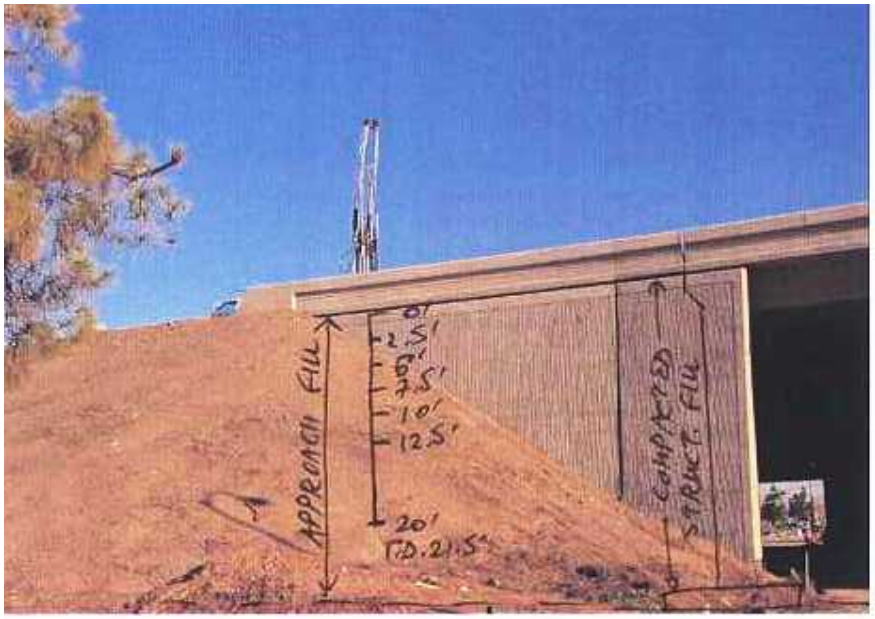

BORE 04-3
N/B ABUT #5


55-257 Harbor Blvd (Widen)
END WALL
H=8.3
(27.3
EL. 16.5m
EL. 7.25m
02/10/2004
ABUT JOINT
04-5 CPT
STRUCT. BACKFILL (SILTY SAND)
04-3 CPT
04-3 BORE
BORE 04-3
CPT 04-3
CPT 04-5
13'
2'
N/B ABUT #5
HARBOR BLVD (WIDEN)

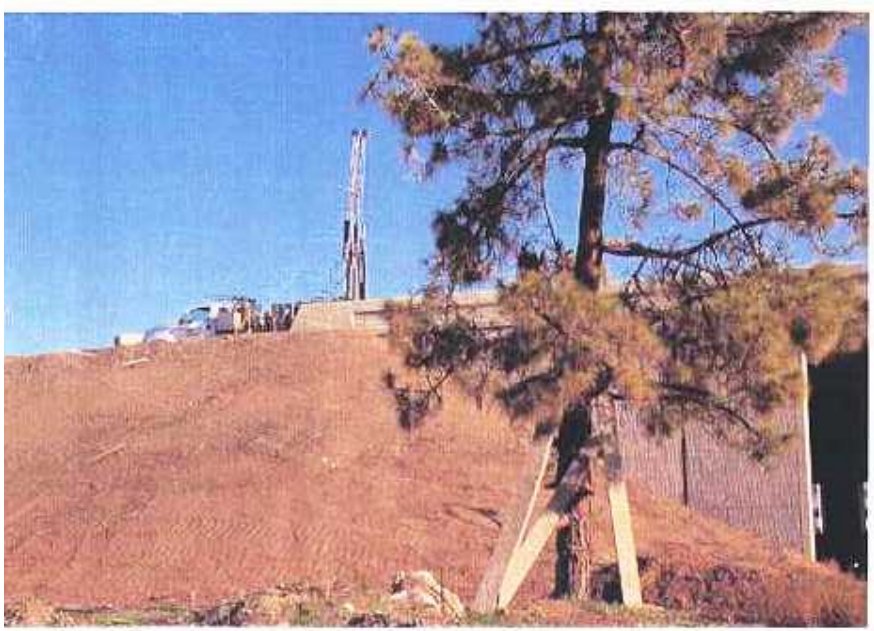


**55-257 Harbor Blvd (Widen)**


APPROACH FILL
0'
2.5'
5'
7.5'
10'
12.5'
20'
T.D. 21.5'
COMPACTED STRUCT. FILL

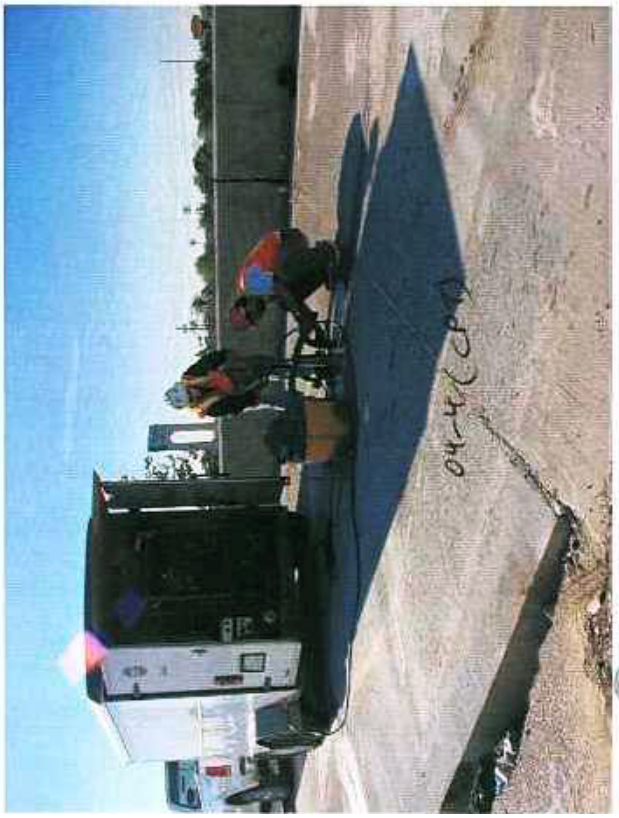
(CPT)
04-3 (BORING)
04-5 (CPT)
02/10/2004



04-5 (CPT)
04-3 (CPT)
04-3 (BORING)
02/10/2004

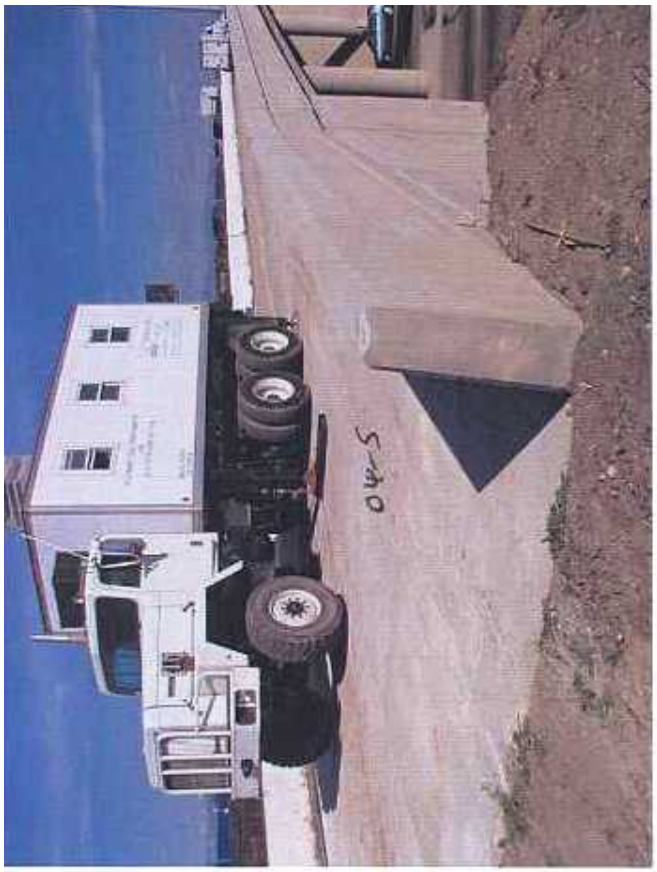
NORTH ABUT #5

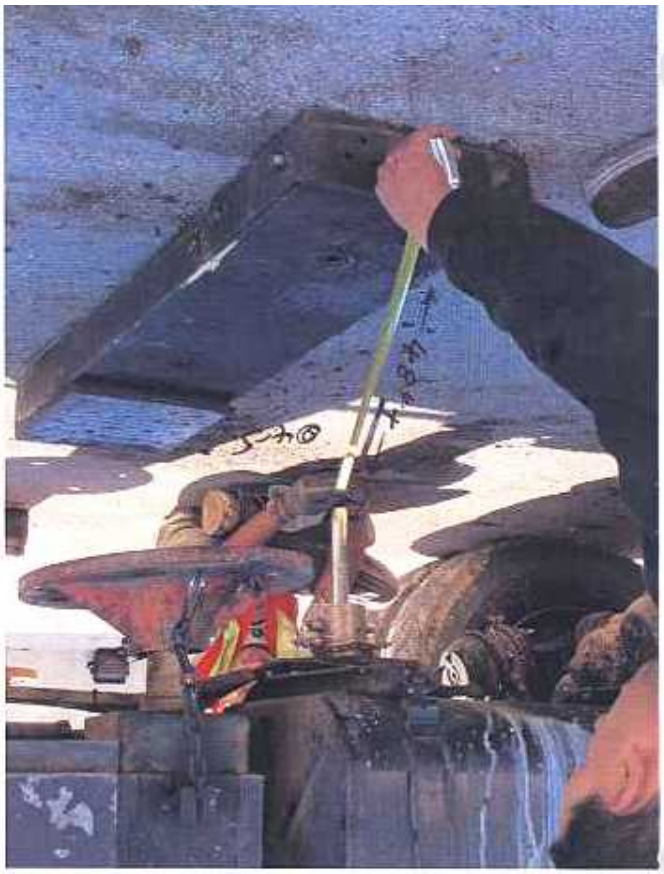
**55-527 Harbor Blvd UC (Widen)**



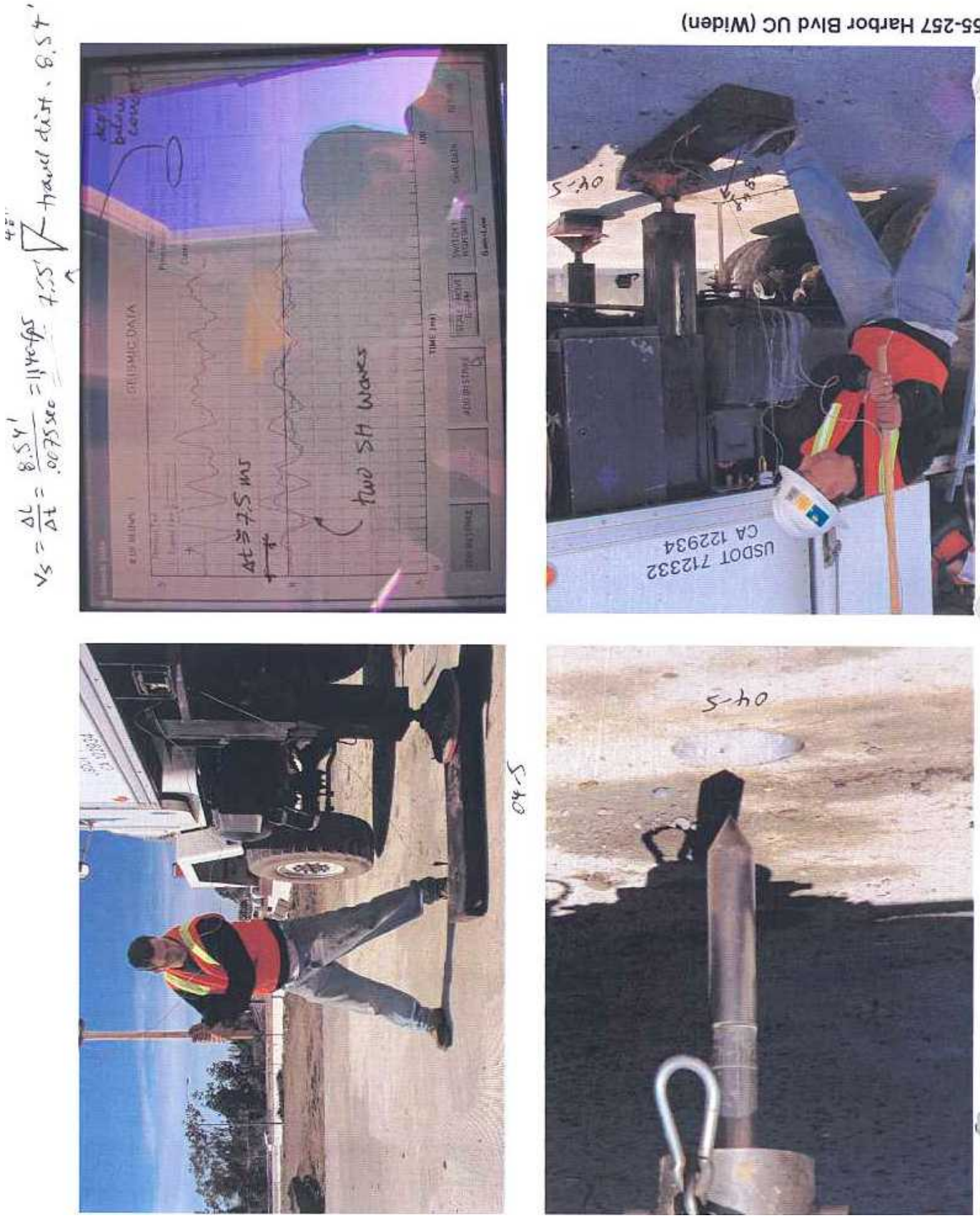
SOUTH ABUT #1

**55-257 Harbor Blvd UC (Widen)**



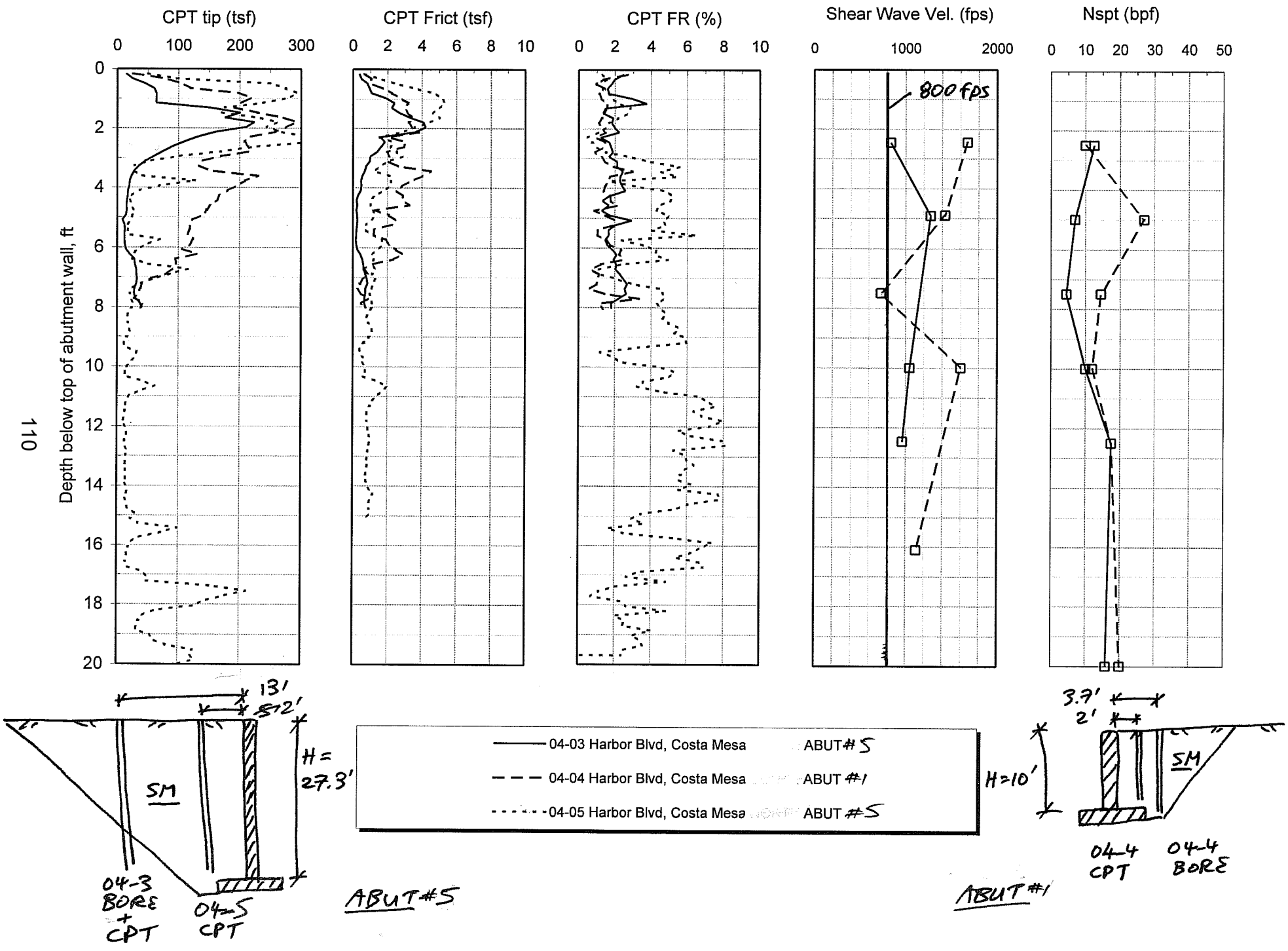



**55-257 Harbor Blvd UC (Widen)**




**55-257 Harbor Blvd UC (Widen)**

## BOREHOLE & CPT DATA FOR HARBOR DR. ABUTMENTS

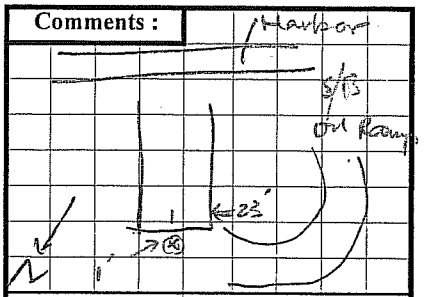


# LOG OF BORING NO. ( 04-3 )

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

| | | | |
|---|---|---|---|
| Project Name | : CT / UCSD - Abutment Research | | |
| Project Location | : Costa Mesa, CA (Harbor Blvd. & I-405) | | |
| E.M.I. Project No. | : 02-165 | Site Condition : | dirt road |
| Weather | : Sunny, mild | Elevation : | |
| Traffic Control | : N/A | Operator : | |
| Drilling Company | : 2R DRILLING | Operator : | Jeff / Steve |
| Type of Rig | : CME 55 AUTO HAMMER | Drop (in) : | 30.0 |
| Borehole Diameter (inch) | : 8" | Drive Wt. (lbs) : | 140.0 |
| Logged By | : R.J. | Date Drilled : | 2-28-04 |

**Comments :**




Backfilled With : Cuttings + Cement

| | Time | | | | | | | | | | Back to Office | Proposed Depth |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Depature | Arrival | Start | Break | Rework | Lunch | Rework | Break | Finish | Off | | 25.0 |
| Driller | | 0740 | 0830 | | | | | | | | | Water Table |
| Traffic Control | | | | | | | | | | | | — ft |
| Logger | | 0730 | | | | | | | | | | Caving |
| Total | | | | | | | | | | | | 14.0 ft |

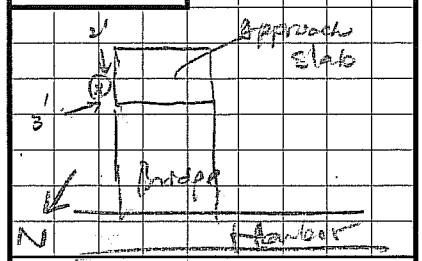
| Depth (ft) | Sampler Type (Bulk, Drive, SPT, Tube) | Sample Number | Sample Type (B/D/S.B./T) | Blows/6" | Recovery (inch) | U.S.C.S. | Color | Description (ASTM D-2488-93) | Moisture State (Dry, Moist, Wet) | Max. Size | Grain Size (%) Gravel : Sand : Fines | Sand Size | Plasticity | Consistency | Cementation | $O^2$/LEL/PID |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | Bu | Bu | | | | | | | | | : : | | | | | |
| 2.5 | D | 1 | | 20 11 14 | 12/18 | SM | Brn | SILTY SAND w/gvl F-m. poorly c.pa gvl to 3/4" | m | 3/4 | 15:72:12 | F-C | N.P | M.D | N | |
| 5 | D | 2 | | 6 6 8 | 11/18 | Sm | Brn | SILTY SAND w/gvl F-m. pa tr. c. pa. gvl to 1/2" | m | 1/2 | 10:75:15 | F-C | N.P | L | N | |
| 7.5 | D | 3 | | 8 5 4 | 12/18 | Sm | DK Yel Brn | SILTY SAND. F. pa. tr. m. pa tr. pea gvl | m | #4 | 5:75:20 | F-m | N.P. | L | N | |
| 10 | D | 4 | B-O | 7 8 12 | 12/18 | Sm | DK Yel. brn & Brn | SILTY SAND F. pa unif. tr. mica | m | #40 | 0:75:25 | F | N.P. | L | N | |
| 12.5 | D | 5 | | 8 15 20 | 12/18 | Sm | Brn | SAME | | | | | | | | |
| 15 | | | | | | | | | | | : : | | | | | |
| 20 | S | 6 | | 7 7 9 | 14/18 | Sm | Brn | SILTY SAND. Unif. F. pa | m | #40 | 0:70:30 | F | N.P | M.D | N | |
| | | | | | | | | T.D 21.5' No G/W encountered | | | | | | | | |
| 25 | | | | | | | | | | | : : | | | | | |

# LOG OF BORING NO. ( 04-4 )

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

| | | | |
|---|---|---|---|
| Project Name | : CT / UCSD - Abutment Research | | |
| Project Location | : Costa Mesa, CA (Harbor Blvd. & I-405) | | |
| E.M.I. Project No. | : 02-165 | Site Condition : | Asphalt |
| Weather | : Sunny, mild | Elevation : | |
| Traffic Control | : N/A | Operator : | |
| Drilling Company | : 2R DRILLING | Operator : | Jeff / Steve |
| Type of Rig | : CME 55 AUTO HAMMER | Drop (in) : | 30.0 |
| Borehole Diameter (inch) | : 8" | Drive Wt. (lbs) : | 140.0 |
| Logged By | : R.J. | Date Drilled : | 2-28-04 |

**Comments :**




Backfilled With : Cuttings + Cement

| | Time | | | | | | | | | | Back to Office | Proposed Depth |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Depature | Arrival | Start | Break | Rework | Lunch | Rework | Break | Finish | Off | | 25.0 |
| Driller | | | 0930 | | | | | | | 1030 | | Water Table |
| Traffic Control | | | | | | | | | | | | — ft |
| Logger | | | | | | | | | | | | Caving |
| Total | | | | | | | | | | | | 12.5 ft |

| Depth (ft) | Sampler Type (Bulk, Drive, SPT, Tube) | Sample Number | Sample Type (B/D/S.B./T) | Blows/6" | Recovery (inch) | U.S.C.S. | Color | Description (ASTM D-2488-93) | Moisture State (Dry, Moist, Wet) | Max. Size | Grain Size (%) Gravel : Sand : Fines | Sand Size | Plasticity | Consistency | Cementation | $O^2$/LEL/PID |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | VB | 0 | | | | | | | | | : : | | | | | |
| 2.5 | D | 1 | | 5 15 | 12/18 | SPSM | Yel. brn | SAND w/ silt. F-C. pea tr. gvl to 1" | m | 1" | 10:83:7 | F-C | N.P | L | N | |
| | | | | | | | | (1B sl. disturbed, broke at 3") | | | | | | | | |
| 5 | D | 2 | | 21 23 | 12/18 | SPSM | Yel. brn | SAME | | | 15:78:7 | | | MD | | |
| 7.5 | D | 3 | | 16 14 | 12/18 | | | SAME | | | | | | MD | | |
| 10 | D | 4 | | 9 11 16 | 12/18 | SM | Brn to Red brn | SILTY SAND Unif. F. pea tr. mica | m | #40 | 0:70:30 | F | N.P | MD | N | |
| 12.5 | D | 5 | | 8 15 20 | 12/18 | ML | Brn | SANDY SILT unif F. pea, tr. mica | m | #40 | 0:45:55 | F | N.P. | V.St | N | |
| 15 | | | | | | | | | | | : : | | | | | |
| 20 | S | 6 | | 9 8 12 | 10/18 | | | SAME AS D-5 | | | : : | | | | | |
| | | | | | | | | T.D. 21.5' No G/W encountered | | | | | | | | |
| 25 | | | | | | | | | | | : : | | | | | |

HOLGUIN, FAHAN & ASSOCIATES, INC.
ENVIRONMENTAL MANAGEMENT CONSULTANTS
948 North Lemon Street, Orange, CA 92867 (714)-210-5971 FAX (714) 210-5975

March 8, 2004



Mr. Mike Kapuskar
Earth Mechanics, Inc.
17660 Newhope St, Suite E
Fountain Valley, CA 92708

**PROJECT NAME:** CPT Testing for UCSD Abut Research: ~~Tustin Ave over 91~~ Harbor Blvd;
**PROJECT NO.:** ~~TBD~~

Dear Mr. Kapuskar:

Enclosed please find copies of the cone penetrometer testing (CPT) data for the above referenced project along with a copy of the corresponding invoice.

The cone penetrometer testing conducted for this project consisted of pushing an instrumented cone-tipped probe into the ground while simultaneously recording the resistance to penetration at the cone tip and along the friction sleeve.

The cone penetrometer testing described in this report was conducted in general accordance with the current ASTM specifications (ASTM D5778-95 and D3441-94) using an electronic cone penetrometer.

The CPT equipment operated by Holguin, Fahan & Associates, Inc. (HFA) consists of a cone assembly mounted at the end of a series of hollow sounding rods. A set of hydraulic rams is used to continuously push the cone and rods into the soil at a rate of 20-mm per second (approximately four feet per minute) while the cone tip resistance and sleeve friction resistance are recorded every 50-mm (approximately two inches) and stored in digital form. A specially designed all wheel drive 23-ton truck provides the required reaction weight for pushing the cone assembly and is also used to transport and house the test equipment.

The cone penetrometer assembly used for this project consists of a conical tip and a cylindrical friction sleeve. The conical tip has a 60° apex angle and a diameter of 35.6-mm (1.40-inch) resulting in a projected cross-sectional area of 10 $cm^2$ (1.5 square inches). The cylindrical friction sleeve is 133-mm (5.25-inch) in length and has an outside diameter of 35.8-mm (1.41-inch), resulting in a surface area of 150 $cm^2$ (23 square inches).

The interior of the cone penetrometer is instrumented with strain gauges that allow simultaneous measurement of cone tip and friction sleeve resistance during penetration. Continuous electric signals from the strain gauges are transmitted by a shielded cable in the sounding rods to the PC-based data acquisition hardware in the CPT truck. The sounding log is also displayed on a monitor.

The CPT data processing is performed using the truck mounted computer based data acquisition and presentation system. The computer generated graphical logs include cone resistance, friction resistance, friction ratio, and pore pressure ratio versus depth at a user selectable scale.

Soil behavior type interpretations are based on the following reference: Robertson, P.K. and Campanella, R.C., 1989, "Guidelines for Geotechnical Design using the Cone Penetrometer Test and CPT with Pore Pressure Measurement." Soil Mechanics series No. 120, Civil Engineering Department, University of British Columbia, Vancouver, B.C., V6T 1Z4, September 1989.

Interpretations and plotting has been done using HFA's proprietary data interpretation and presentation software. It is important to note that the data is not averaged. All interpretations are point interpretations at the corresponding depth listed.

It is also important to note that the soil behavior type correlations are based on a combination of theory, field research, research performed under laboratory conditions, and literature review. The information presented in the tabulated and/or graphical logs should, therefore, be viewed as a guideline rather than as precise measurements.

Some care is recommended when using the soil behavior type interpretations. If a tabulation depth happens to fall on a soil layer interface, or a seam of soil differing from the rest of the layer, the tabulated data can be misleading. The solution to this problem is the proper use of the graphical CPT logs. The tip and sleeve penetration resistance logs are the primary source of profile description; the soil behavior type logs are supplemental. The graphical logs of tip and sleeve resistance should be examined and layer boundaries delineated in accordance with the project requirements. The soil behavior type interpretations are only representative of the response of the soil to the large shear deformations imposed during cone penetration. This is not necessarily a prediction of grain size distribution. However, it has been found that the interpreted soil behavior types generally agree well with the soil types defined in accordance with the grain size distribution methods such as used in the Unified Soil Classification System.

Limitations

Holguin, Fahan & Associates, Inc. (HFA) presents the attached data in accordance with ASTM Standards D5778-95 and D3441-94 and generally accepted cone penetrometer testing practices and standards. The attached data further relates only to the specific project and location discussed in the data. Judgement may be required to verify the CPT soil behavior interpretations.

The "Client" may distribute this data or excerpts therefrom provided the following statement is prominently displayed and included with the distribution:

"Neither CLIENT nor HFA make any guarantee or warranty, express or implied, regarding this data. THE USE OF THIS INFORMATION SHALL BE AT THE USER'S SOLE RISK REGARDLESS OF ANY FAULT OR NEGLIGENCE OF THE CLIENT OR HFA."

Please feel free to call if you have any questions.

Respectfully submitted,

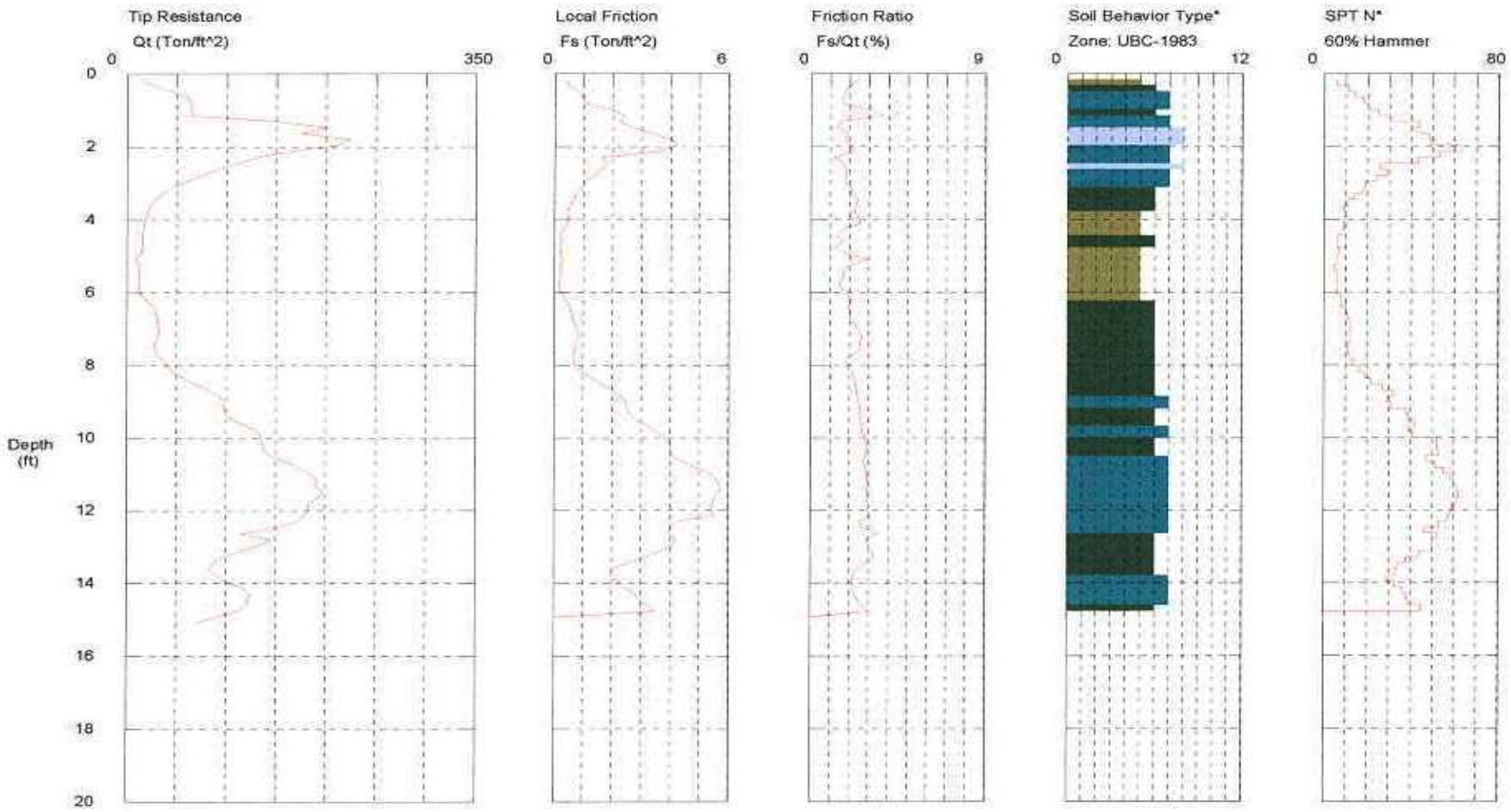
Amanda Hancock
CPT Operations Manager
Holguin, Fahan & Associates, Inc.

:AH\Enclosures

# Earth Mechanics

Operator: BOBBY-VICTOR
Sounding: CPT-04-3C
Cone Used: DSG0409

CPT Date/Time: 2/28/2004 10:49
Location: UCSD Abut Research
Job Number: 02-165 Harbor Dr




Maximum Depth = 15.09 feet

Depth Increment = 0.164 feet

1 sensitive fine grained
2 organic material
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 very stiff fine grained (*)
12 sand to clayey sand (*)

ehavior type and SPT based on data from UBC-1983

# CPT INTERPRETATIONS

SOUNDING : CPT-4-3 (04-3C)
PROJECT : UCSD Abut Resear
DATE/TIME: 2/28/2004 10:49

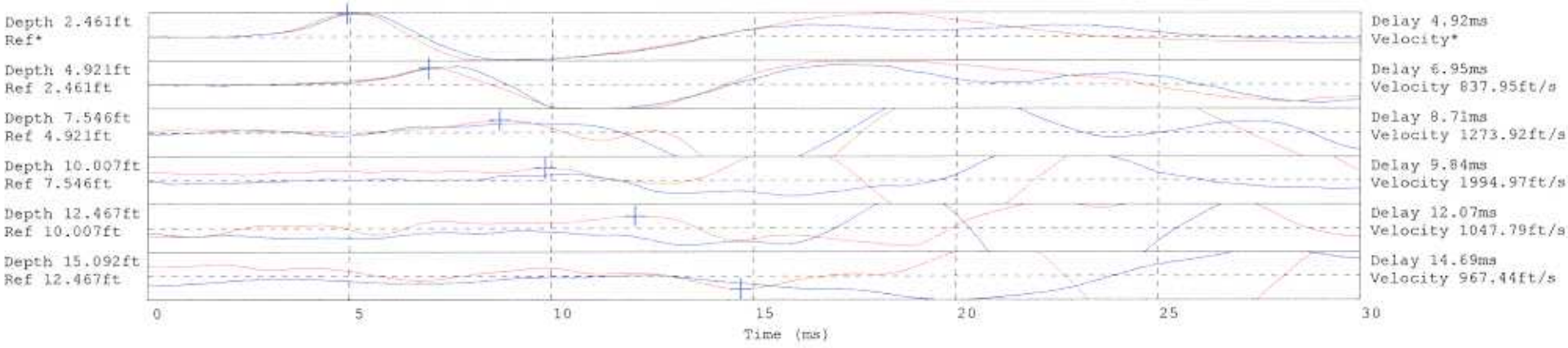
PROJECT No.: 02-165 Harbo
CONE/RIG : DSG0409

| DEPTH (m) | DEPTH (ft) | TIP RESISTANCE (tsf) | FRICTION RATIO (%) | SOIL BEHAVIOR TYPE | N(60) | N1(60) | Dr (%) | Su (tsf) | PHI (Degrees) |
|---|---|---|---|---|---|---|---|---|---|
| .150 | .49 | 45.11 | 1.82 | SANDY SILT to CLAYEY SILT | 18 | 29 | | 3.0 | |
| .300 | .98 | 64.15 | 2.94 | SANDY SILT to CLAYEY SILT | 26 | 41 | | 4.3 | |
| .450 | 1.48 | 200.99 | 1.34 | SAND to SILTY SAND | 50 | 80 | 96 | | |
| .600 | 1.97 | 210.57 | 2.00 | SAND to SILTY SAND | 53 | 84 | 98 | | |
| .750 | 2.46 | 109.27 | 1.68 | SILTY SAND to SANDY SILT | 36 | 58 | 79 | | 49.0 |
| .900 | 2.95 | 60.28 | 1.67 | SILTY SAND to SANDY SILT | 20 | 32 | 62 | | 46.0 |
| 1.050 | 3.44 | 28.11 | 2.44 | SANDY SILT to CLAYEY SILT | 11 | 18 | | 1.9 | |
| 1.200 | 3.94 | 20.14 | 2.42 | CLAYEY SILT to SILTY CLAY | 10 | 16 | | 1.3 | |
| 1.350 | 4.43 | 15.82 | 1.31 | SANDY SILT to CLAYEY SILT | 6 | 10 | | 1.2 | |
| 1.500 | 4.92 | 14.36 | 1.71 | CLAYEY SILT to SILTY CLAY | 7 | 11 | | 1.1 | |
| 1.650 | 5.41 | 12.52 | 1.65 | CLAYEY SILT to SILTY CLAY | 6 | 10 | | 1.0 | |
| 1.800 | 5.91 | 12.55 | 1.59 | CLAYEY SILT to SILTY CLAY | 6 | 10 | | 1.0 | |
| 1.950 | 6.40 | 28.33 | 1.93 | SANDY SILT to CLAYEY SILT | 11 | 18 | | 2.2 | |
| 2.100 | 6.89 | 31.57 | 2.29 | SANDY SILT to CLAYEY SILT | 13 | 20 | | 2.1 | |
| 2.250 | 7.38 | 28.34 | 2.54 | CLAYEY SILT to SILTY CLAY | 14 | 21 | | 1.9 | |
| 2.400 | 7.87 | 36.85 | 1.79 | SANDY SILT to CLAYEY SILT | 15 | 21 | | 2.9 | |
| 2.550 | 8.37 | 57.32 | 2.28 | SANDY SILT to CLAYEY SILT | 23 | 32 | | 3.8 | |
| 2.700 | 8.86 | 93.91 | 2.43 | SILTY SAND to SANDY SILT | 31 | 43 | 74 | | 43.0 |
| 2.850 | 9.35 | 99.76 | 2.61 | SANDY SILT to CLAYEY SILT | 40 | 53 | | 5.8 | |
| 3.000 | 9.84 | 132.94 | 2.65 | SILTY SAND to SANDY SILT | 44 | 58 | 83 | | 44.0 |
| 3.150 | 10.33 | 137.97 | 2.92 | SANDY SILT to CLAYEY SILT | 55 | 70 | | 8.1 | |
| 3.300 | 10.83 | 172.03 | 2.86 | SILTY SAND to SANDY SILT | 57 | 71 | 89 | | 45.0 |
| 3.450 | 11.32 | 190.42 | 2.99 | SILTY SAND to SANDY SILT | 63 | 77 | 91 | | 45.0 |
| 3.600 | 11.81 | 183.07 | 2.98 | SILTY SAND to SANDY SILT | 61 | 72 | 89 | | 44.5 |
| 3.750 | 12.30 | 170.62 | 2.52 | SILTY SAND to SANDY SILT | 57 | 66 | 87 | | 44.5 |
| 3.900 | 12.80 | 145.77 | 2.88 | SILTY SAND to SANDY SILT | 49 | 55 | 82 | | 43.5 |
| 4.050 | 13.29 | 95.85 | 3.32 | SANDY SILT to CLAYEY SILT | 38 | 43 | | 5.6 | |
| 4.200 | 13.78 | 90.07 | 2.14 | SILTY SAND to SANDY SILT | 30 | 33 | 67 | | 40.5 |
| 4.350 | 14.27 | 123.47 | 2.26 | SILTY SAND to SANDY SILT | 41 | 44 | 75 | | 42.0 |
| 4.500 | 14.76 | 112.25 | 3.07 | SANDY SILT to CLAYEY SILT | 45 | 48 | | 6.6 | |

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 50.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

*HOLGUIN, FAHAN & ASSOCIATES, INC.*
*Interpretations based on ROBERTSON and CAMPANELLA, 1989*

# Earth Mechanic
## CPT-04-3C

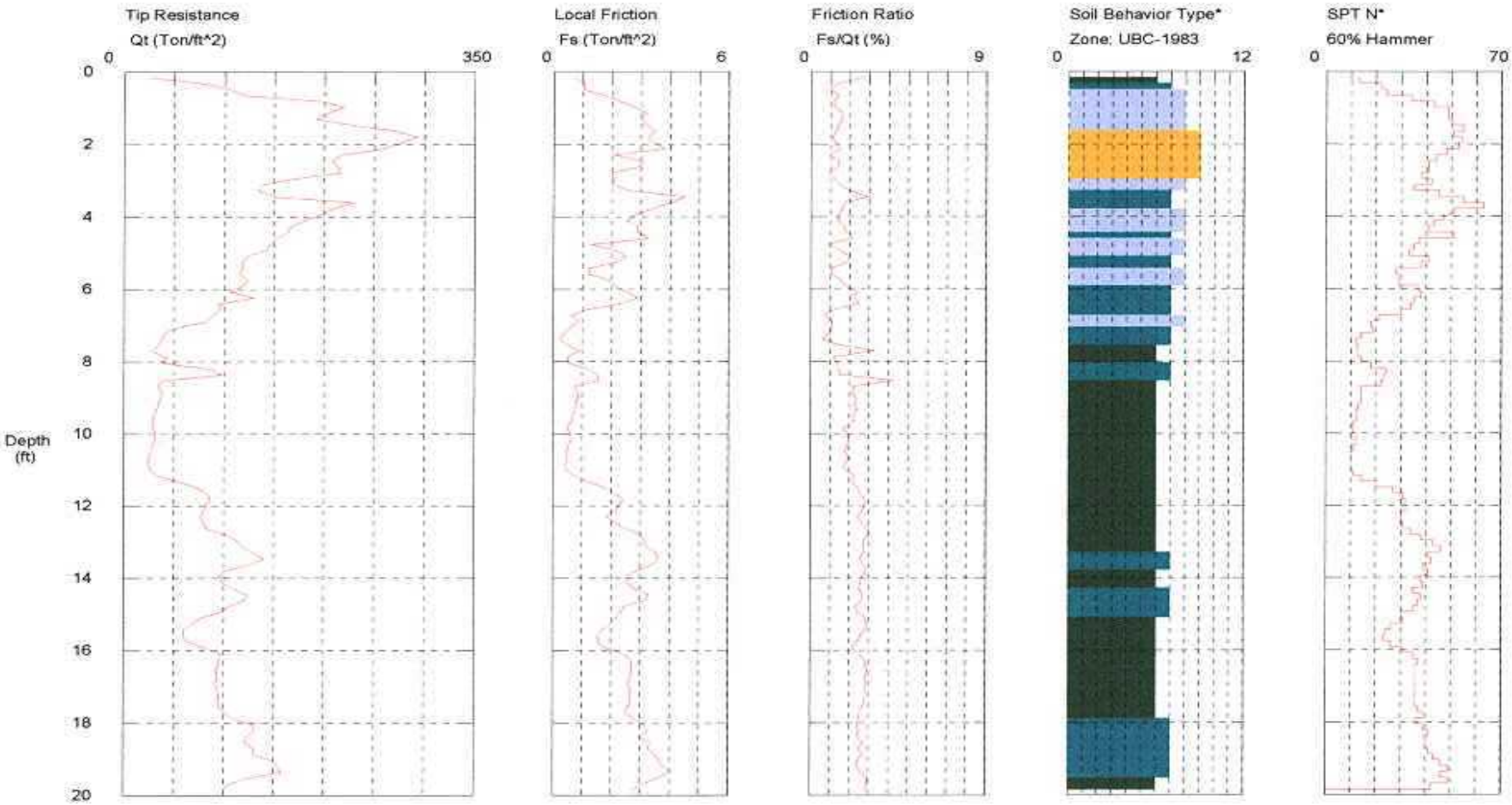



Hammer to Rod String Distance 1.143 (m)
* = Not Determined

# Earth Mechanics

Operator: BOBBY-VICTOR
Sounding: CPT-04-4C
Cone Used: DSG0409

CPT Date/Time: 2/28/2004 11:36
Location: UCSD Abut Research
Job Number: 02-165 Harbor Dr




Maximum Depth = 20.18 feet

Depth Increment = 0.164 feet

1 sensitive fine grained
2 organic material
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 very stiff fine grained (*)
12 sand to clayey sand (*)

ehavior type and SPT based on data from UBC-1983

# CPT INTERPRETATIONS

SOUNDING : CPT-4-4 (04-4C)
PROJECT : UCSD Abut Resear
DATE/TIME: 2/28/2004 11:36

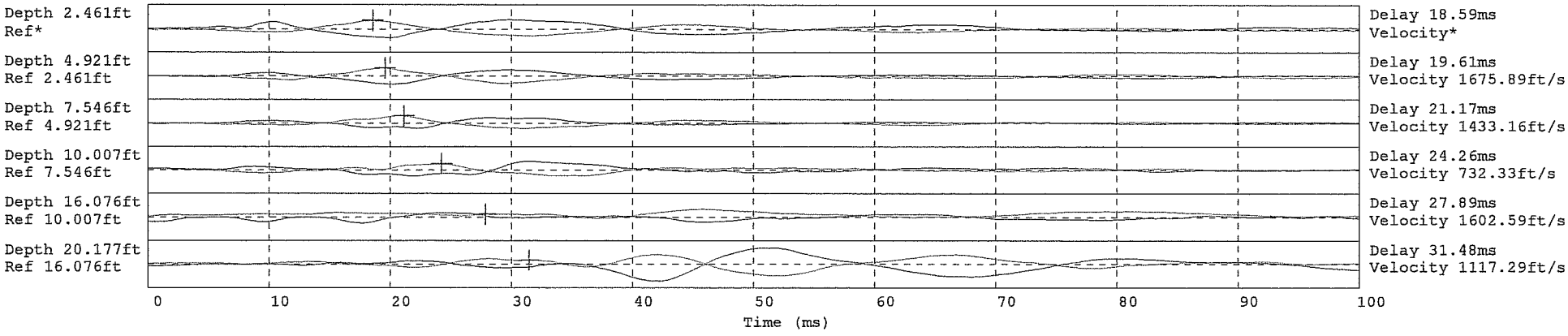
PROJECT No.: 02-165 Harbo
CONE/RIG : DSG0409

| DEPTH (m) | DEPTH (ft) | TIP RESISTANCE (tsf) | FRICTION RATIO (%) | SOIL BEHAVIOR TYPE | N(60) | N1(60) | Dr (%) | Su (tsf) | PHI (Degrees) |
|---|---|---|---|---|---|---|---|---|---|
| .150 | .49 | 105.27 | .96 | SAND to SILTY SAND | 26 | 42 | 78 | | |
| .300 | .98 | 219.40 | 1.25 | SAND to SILTY SAND | 55 | 88 | 99 | | |
| .450 | 1.48 | 229.05 | 1.39 | SAND to SILTY SAND | 57 | 92 | 100 | | |
| .600 | 1.97 | 275.95 | 1.24 | SAND | 55 | 88 | 100 | | |
| .750 | 2.46 | 207.79 | 1.46 | SAND to SILTY SAND | 52 | 83 | 97 | | |
| .900 | 2.95 | 169.33 | 1.24 | SAND to SILTY SAND | 42 | 68 | 91 | | |
| 1.050 | 3.44 | 152.06 | 2.97 | SANDY SILT to CLAYEY SILT | 61 | 97 | | 8.9 | |
| 1.200 | 3.94 | 195.77 | 1.45 | SAND to SILTY SAND | 49 | 78 | 96 | | 49.5 |
| 1.350 | 4.43 | 163.12 | 1.78 | SAND to SILTY SAND | 41 | 65 | 90 | | 48.0 |
| 1.500 | 4.92 | 141.77 | 1.47 | SAND to SILTY SAND | 35 | 57 | 86 | | 47.0 |
| 1.650 | 5.41 | 118.85 | 1.04 | SAND to SILTY SAND | 30 | 48 | 81 | | 46.0 |
| 1.800 | 5.91 | 118.83 | 1.78 | SILTY SAND to SANDY SILT | 40 | 63 | 81 | | 46.0 |
| 1.950 | 6.40 | 95.64 | 2.45 | SILTY SAND to SANDY SILT | 32 | 51 | 75 | | 44.5 |
| 2.100 | 6.89 | 81.66 | 1.12 | SAND to SILTY SAND | 20 | 32 | 71 | | 43.5 |
| 2.250 | 7.38 | 38.51 | .59 | SILTY SAND to SANDY SILT | 13 | 19 | 49 | | 39.0 |
| 2.400 | 7.87 | 42.69 | 1.16 | SILTY SAND to SANDY SILT | 14 | 21 | 52 | | 39.5 |
| 2.550 | 8.37 | 98.04 | 1.53 | SILTY SAND to SANDY SILT | 33 | 46 | 76 | | 43.5 |
| 2.700 | 8.86 | 38.68 | 2.15 | SANDY SILT to CLAYEY SILT | 15 | 21 | | 2.5 | |
| 2.850 | 9.35 | 32.49 | 2.37 | SANDY SILT to CLAYEY SILT | 13 | 17 | | 2.1 | |
| 3.000 | 9.84 | 29.44 | 1.69 | SANDY SILT to CLAYEY SILT | 12 | 15 | | 2.3 | |
| 3.150 | 10.33 | 28.81 | 1.87 | SANDY SILT to CLAYEY SILT | 12 | 15 | | 2.3 | |
| 3.300 | 10.83 | 24.43 | 1.78 | SANDY SILT to CLAYEY SILT | 10 | 12 | | 1.9 | |
| 3.450 | 11.32 | 54.30 | 2.12 | SANDY SILT to CLAYEY SILT | 22 | 26 | | 3.6 | |
| 3.600 | 11.81 | 86.89 | 2.77 | SANDY SILT to CLAYEY SILT | 35 | 41 | | 5.1 | |
| 3.750 | 12.30 | 75.94 | 2.43 | SANDY SILT to CLAYEY SILT | 30 | 35 | | 5.0 | |
| 3.900 | 12.80 | 102.84 | 2.96 | SANDY SILT to CLAYEY SILT | 41 | 47 | | 6.0 | |
| 4.050 | 13.29 | 128.86 | 2.73 | SILTY SAND to SANDY SILT | 43 | 48 | 77 | | 42.5 |
| 4.200 | 13.78 | 101.65 | 2.88 | SANDY SILT to CLAYEY SILT | 41 | 45 | | 5.9 | |
| 4.350 | 14.27 | 108.50 | 2.52 | SILTY SAND to SANDY SILT | 36 | 39 | 72 | | 42.0 |
| 4.500 | 14.76 | 105.30 | 2.33 | SILTY SAND to SANDY SILT | 35 | 37 | 70 | | 41.0 |
| 4.650 | 15.26 | 67.80 | 2.92 | SANDY SILT to CLAYEY SILT | 27 | 28 | | 4.5 | |
| 4.800 | 15.75 | 63.45 | 2.44 | SANDY SILT to CLAYEY SILT | 25 | 26 | | 4.2 | |
| 4.950 | 16.24 | 95.57 | 2.80 | SANDY SILT to CLAYEY SILT | 38 | 39 | | 5.6 | |
| 5.100 | 16.73 | 92.96 | 2.85 | SANDY SILT to CLAYEY SILT | 37 | 37 | | 5.4 | |
| 5.250 | 17.22 | 95.28 | 2.79 | SANDY SILT to CLAYEY SILT | 38 | 37 | | 5.5 | |
| 5.400 | 17.72 | 100.59 | 2.46 | SILTY SAND to SANDY SILT | 34 | 33 | 66 | | 39.5 |
| 5.550 | 18.21 | 130.77 | 2.50 | SILTY SAND to SANDY SILT | 44 | 42 | 73 | | 41.5 |
| 5.700 | 18.70 | 130.16 | 2.52 | SILTY SAND to SANDY SILT | 43 | 41 | 73 | | 41.0 |
| 5.850 | 19.19 | 154.67 | 2.45 | SILTY SAND to SANDY SILT | 52 | 48 | 77 | | 42.0 |
| 6.000 | 19.69 | 105.16 | 2.94 | SANDY SILT to CLAYEY SILT | 42 | 39 | | 6.1 | |

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 50.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

*HOLGUIN, FAHAN & ASSOCIATES, INC.*
*Interpretations based on ROBERTSON and CAMPANELLA, 1989*

# Earth Mechanic
# CPT-04-4C

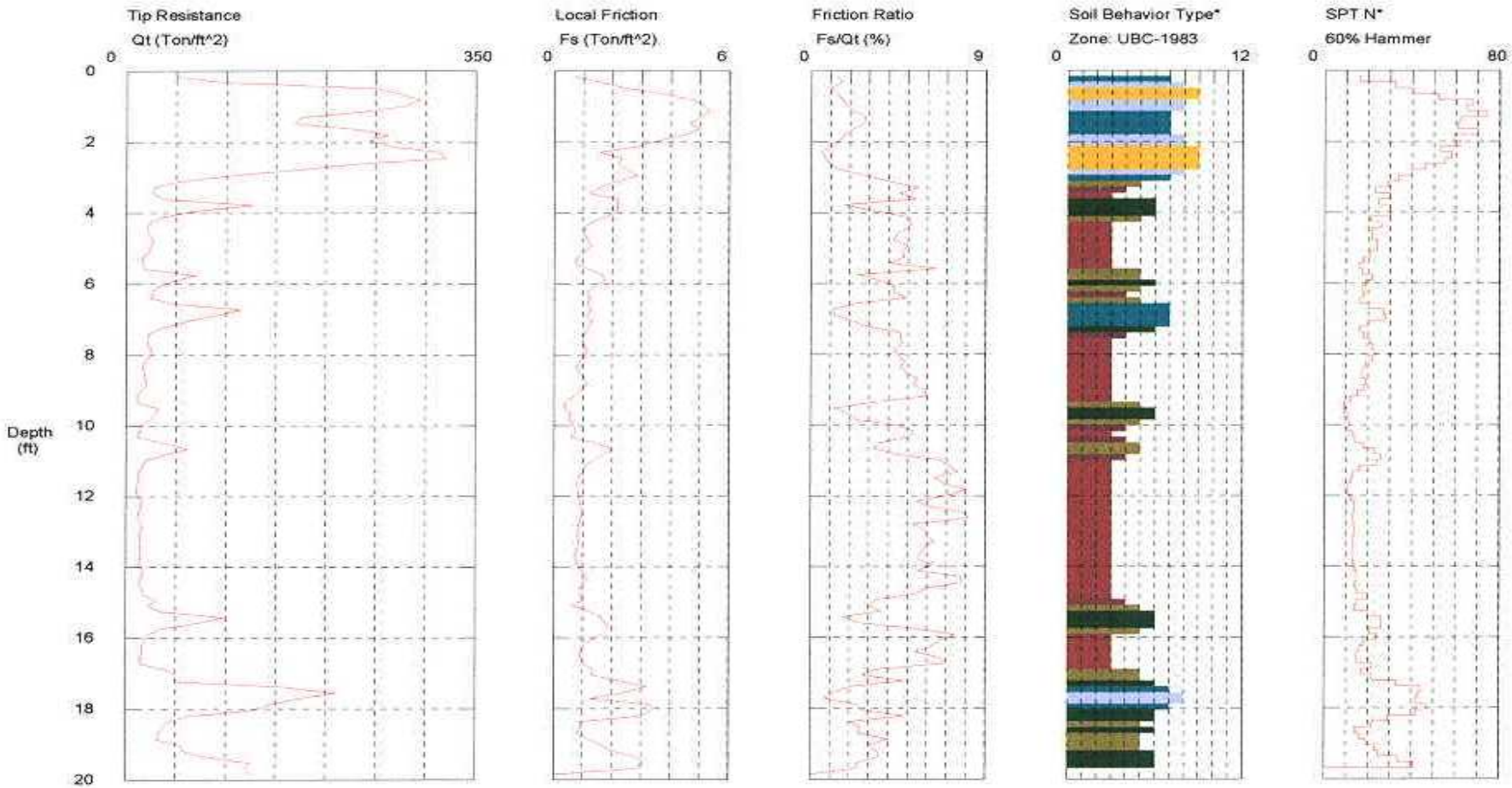



Hammer to Rod String Distance 1.143 (m)
* = Not Determined

# Earth Mechanics

Operator: BOBBY-VICTOR
Sounding: CPT-04-5C
Cone Used: DSG0409

CPT Date/Time: 2/28/2004 2:22:
Location: UCSD Abut Research
Job Number: 02-165 Harbor Dr




Maximum Depth = 20.01 feet

Depth Increment = 0.164 feet

1 sensitive fine grained
2 organic material
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 very stiff fine grained (*)
12 sand to clayey sand (*)

ehavior type and SPT based on data from UBC-1983

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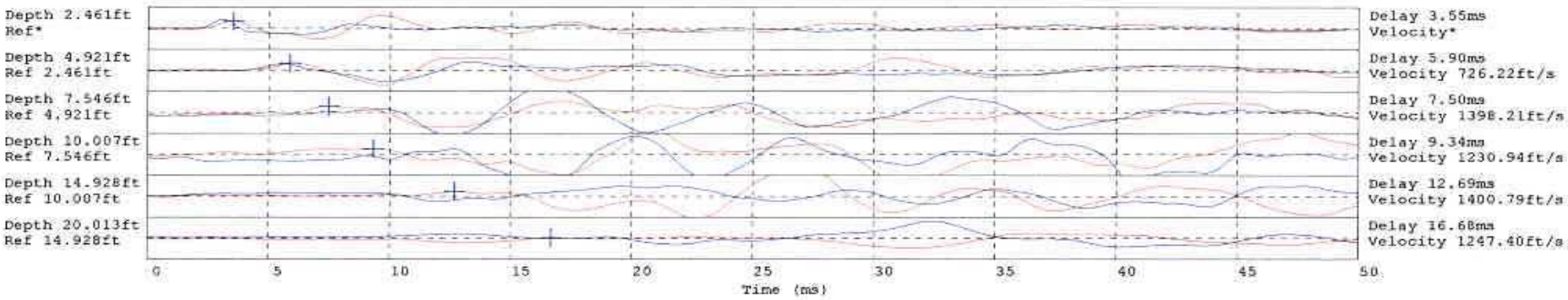
*****************************************************************
*                                                               *
*                    CPT INTERPRETATIONS                        *
*                                                               *
*  SOUNDING : CPT-4-5  (04-5C)          PROJECT No.: 02-165 Harbo  *
*  PROJECT  : UCSD Abut Resear          CONE/RIG : DSG0409         *
*  DATE/TIME: 2/28/2004  2:22                                      *
*                                                               *
*****************************************************************
```

| DEPTH (m) | DEPTH (ft) | TIP RESISTANCE (tsf) | FRICTION RATIO (%) | SOIL BEHAVIOR TYPE | N(60) | N1(60) | Dr (%) | Su (tsf) | PHI (Degrees) |
|---|---|---|---|---|---|---|---|---|---|
| .150 | .49 | 249.99 | .97 | SAND | 50 | 80 | 100 | | |
| .300 | .98 | 280.58 | 1.84 | SAND to SILTY SAND | 70 | 100 | 100 | | |
| .450 | 1.48 | 170.28 | 2.73 | SILTY SAND to SANDY SILT | 57 | 91 | 92 | | |
| .600 | 1.97 | 243.64 | 1.47 | SAND to SILTY SAND | 61 | 97 | 100 | | |
| .750 | 2.46 | 319.63 | .72 | SAND | 64 | 100 | 100 | | |
| .900 | 2.95 | 101.95 | 2.82 | SANDY SILT to CLAYEY SILT | 41 | 65 | | 6.0 | |
| 1.050 | 3.44 | 26.74 | 4.56 | CLAY | 27 | 43 | | 1.6 | |
| 1.200 | 3.94 | 69.63 | 3.14 | SANDY SILT to CLAYEY SILT | 28 | 45 | | 4.1 | |
| 1.350 | 4.43 | 20.30 | 5.04 | CLAY | 20 | 32 | | 1.3 | |
| 1.500 | 4.92 | 25.46 | 5.01 | CLAY | 25 | 41 | | 1.5 | |
| 1.650 | 5.41 | 17.34 | 4.06 | CLAY to SILTY CLAY | 12 | 18 | | 1.1 | |
| 1.800 | 5.91 | 49.04 | 3.56 | CLAYEY SILT to SILTY CLAY | 25 | 39 | | 2.9 | |
| 1.950 | 6.40 | 24.78 | 4.92 | CLAY | 25 | 40 | | 1.4 | |
| 2.100 | 6.89 | 89.03 | 1.24 | SAND to SILTY SAND | 22 | 35 | 73 | | 44.0 |
| 2.250 | 7.38 | 23.49 | 4.58 | CLAY | 23 | 35 | | 1.5 | |
| 2.400 | 7.87 | 25.67 | 4.30 | CLAY to SILTY CLAY | 17 | 25 | | 1.7 | |
| 2.550 | 8.37 | 16.54 | 4.64 | CLAY | 17 | 23 | | 1.1 | |
| 2.700 | 8.86 | 21.18 | 5.28 | CLAY | 21 | 29 | | 1.2 | |
| 2.850 | 9.35 | 11.90 | 3.30 | CLAY to SILTY CLAY | 8 | 11 | | .8 | |
| 3.000 | 9.84 | 22.14 | 2.31 | CLAYEY SILT to SILTY CLAY | 11 | 14 | | 1.4 | |
| 3.150 | 10.33 | 11.94 | 5.03 | CLAY | 12 | 15 | | .8 | |
| 3.300 | 10.83 | 38.22 | 4.49 | CLAY to SILTY CLAY | 25 | 32 | | 2.2 | |
| 3.450 | 11.32 | 13.06 | 7.58 | CLAY | 13 | 16 | | .8 | |
| 3.600 | 11.81 | 10.19 | 7.99 | CLAY | 10 | 12 | | .6 | |
| 3.750 | 12.30 | 15.39 | 6.10 | CLAY | 15 | 18 | | 1.0 | |
| 3.900 | 12.80 | 16.40 | 5.27 | CLAY | 16 | 19 | | 1.0 | |
| 4.050 | 13.29 | 13.29 | 6.38 | CLAY | 13 | 15 | | .8 | |
| 4.200 | 13.78 | 13.69 | 5.52 | CLAY | 14 | 15 | | .9 | |
| 4.350 | 14.27 | 15.26 | 7.71 | CLAY | 15 | 16 | | 1.0 | |
| 4.500 | 14.76 | 17.36 | 5.41 | CLAY | 17 | 18 | | 1.1 | |
| 4.650 | 15.26 | 35.06 | 3.63 | CLAYEY SILT to SILTY CLAY | 18 | 18 | | 2.3 | |
| 4.800 | 15.75 | 34.66 | 5.36 | CLAY | 35 | 36 | | 2.0 | |
| 4.950 | 16.24 | 15.98 | 6.23 | CLAY | 16 | 16 | | 1.0 | |
| 5.100 | 16.73 | 15.11 | 6.90 | CLAY | 15 | 15 | | .9 | |
| 5.250 | 17.22 | 49.21 | 4.84 | CLAY to SILTY CLAY | 33 | 32 | | 2.8 | |
| 5.400 | 17.72 | 173.42 | .72 | SAND | 35 | 34 | 82 | | 43.0 |
| 5.550 | 18.21 | 61.52 | 4.84 | CLAY to SILTY CLAY | 41 | 39 | | 3.6 | |
| 5.700 | 18.70 | 32.90 | 2.46 | SANDY SILT to CLAYEY SILT | 13 | 12 | | 2.1 | |
| 5.850 | 19.19 | 58.38 | 3.43 | CLAYEY SILT to SILTY CLAY | 29 | 27 | | 3.4 | |
| 6.000 | 19.69 | 119.26 | 2.38 | SILTY SAND to SANDY SILT | 40 | 37 | 70 | | 40.0 |

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 50.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

*HOLGUIN, FAHAN & ASSOCIATES, INC.*
*Interpretations based on ROBERTSON and CAMPANELLA, 1989*

**Earth Mechanic**
**CPT-04-5C**



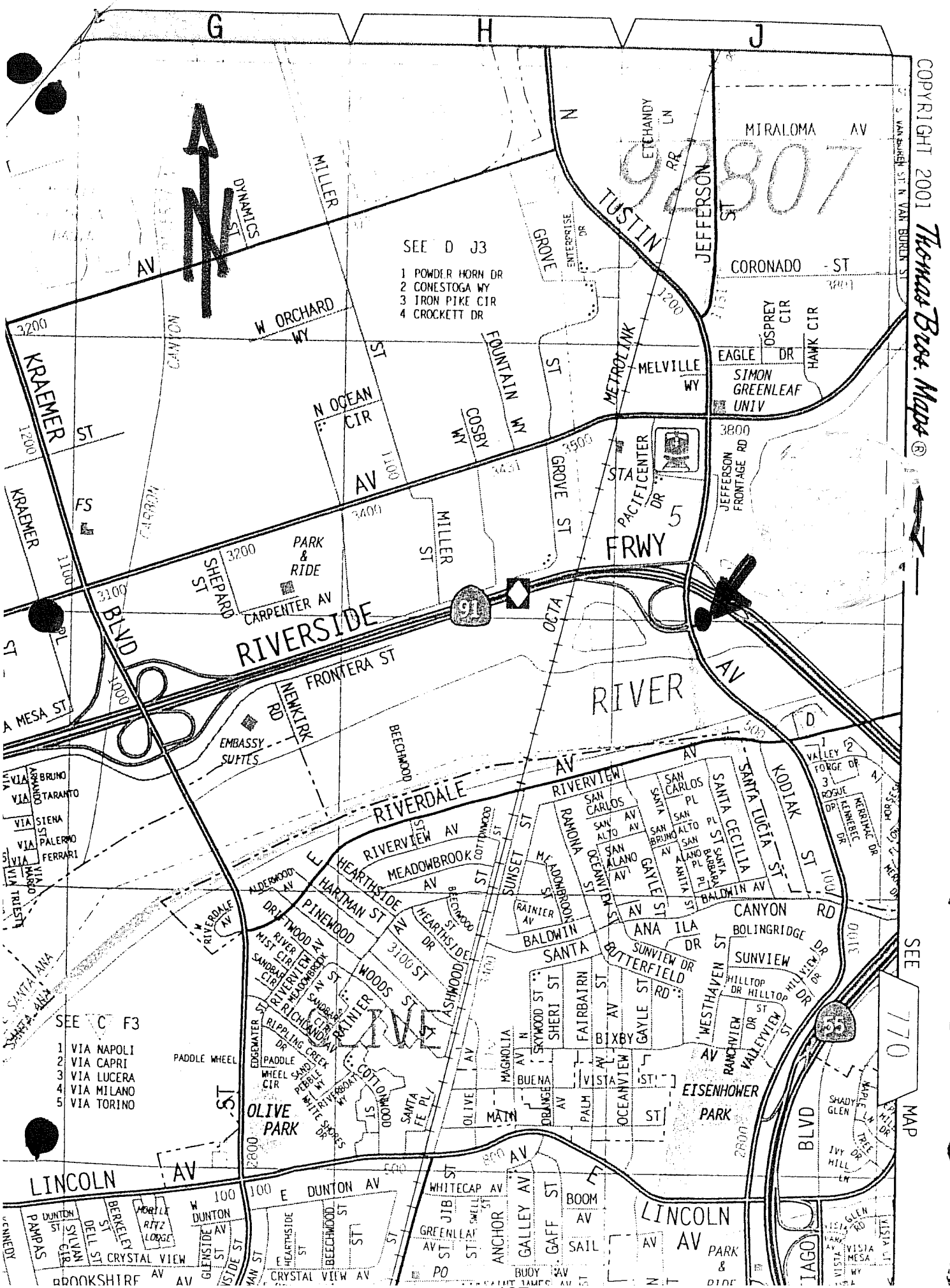

Hammer to Rod String Distance 1.143 (m)
* = Not Determined

# Caltrans Bridge 55-0414
# Tustin Ave OC (Widen), Orange Co.

**Caltrans Bridge 55-0414, Tustin Ave OC (Widen), Orange Co.**

This bridge is located in Riverside in Orange County and is in construction next to an existing Tustin Ave bridge over SR90. The new abutments are seat-type with rigid walls about 20 to 25 ft tall on piles and boxed in by existing and new wingwalls.

The field investigation for this bridge was conducted on 3/6/04, consisting of (3) up to 21.5-ft deep soil borings and (2) 20-ft conventional and seismic CPT's. Drilling was performed by 2R Drilling and CPT by HFA. Borehole 04-6 and CPT 04-6C were performed at the south abutment. Borehole 04-7 and CPT 04-7C were performed at the north abutment. Another borehole 04-8 was added at CPT 04-7C to define the extent of the structural backfill. Geotechnical soil sampling consisted of ring samples collected at 2.5-ft depth intervals using a Modified California and SPT samplers. Seismic wave measurements were taken at 2.5-ft intervals. Groundwater was not encountered.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G
H
J
SEE D J3
1 POWDER HORN DR
2 CONESTOGA WY
3 IRON PIKE CIR
4 CROCKETT DR
SEE C F3
1 VIA NAPOLI
2 VIA CAPRI
3 VIA LUCERA
4 VIA MILANO
5 VIA TORINO
MIRALOMA AV
CORONADO ST
JEFFERSON ST
TUSTIN
MILLER
DYNAMICS ST
W ORCHARD WY
KRAEMER ST
N OCEAN CIR
FOUNTAIN WY
COSBY WY
GROVE ST
METROLINK
MELVILLE WY
EAGLE DR
OSPREY CIR
HAWK CIR
SIMON GREENLEAF UNIV
JEFFERSON FRONTAGE RD
PACIFICENTER DR
STA 5
FRWY
PARK & RIDE
SHEPARD ST
CARPENTER AV
RIVERSIDE BLVD
OCTA
FRONTERA ST
NEWKIRK RD
EMBASSY SUITES
RIVER
RIVERDALE AV
RIVERVIEW AV
MEADOWBROOK AV
HEARTHSIDE
HARTMAN ST
PINEWOOD
WOODS ST
RAINIER AV
SUNSET
RAMONA
SAN CARLOS
SAN ALTO
SAN ALANO
SAN BRUNO
SANTA CECILIA
SANTA LUCIA ST
KODIAK ST
GAYLE ST
BALDWIN AV
CANYON RD
ANA ILA DR
BOLINGRIDGE DR
SUNVIEW DR
BUTTERFIELD RD
SUNVIEW
HILLTOP DR
WESTHAVEN ST
RANCHVIEW DR
VALLEYVIEW ST
SHERI ST
FAIRBAIRN ST
BIXBY
SKYWOOD ST
MAGNOLIA AV
BUENA VISTA ST
OCEANVIEW ST
EISENHOWER PARK
OLIVE PARK
MAIN
PALM
ORANGE AV
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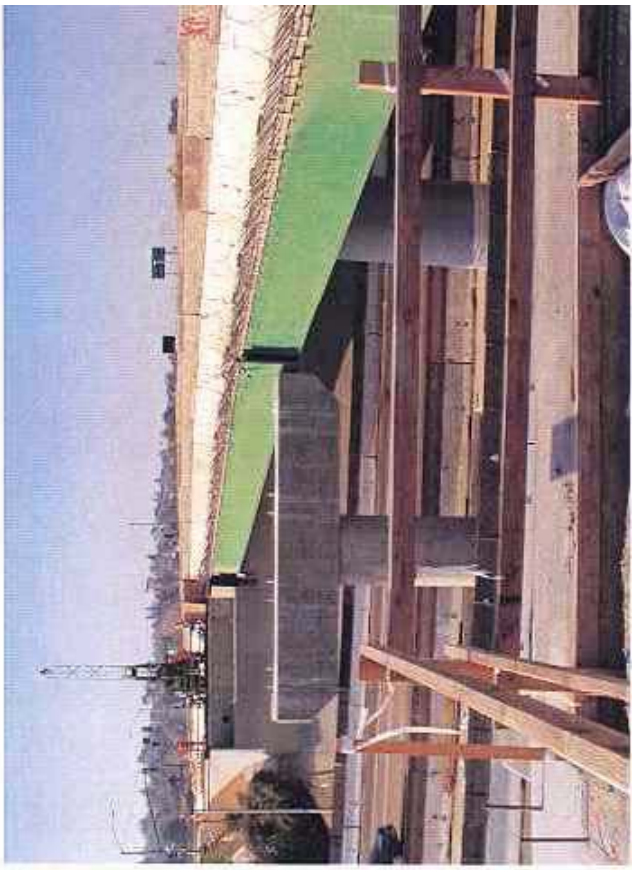
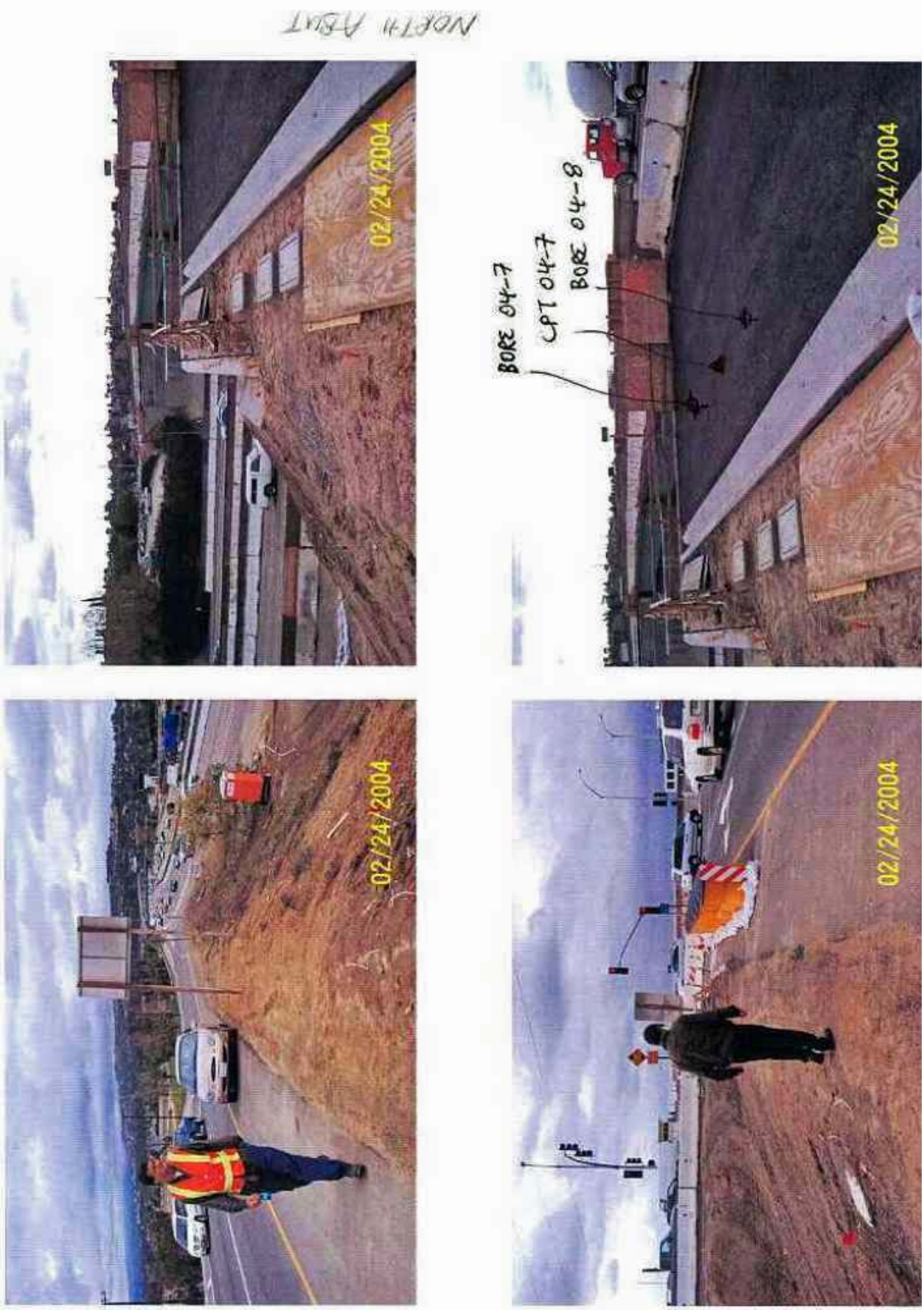
SANTA FE PL
PADDLE WHEEL
RIPPLING CREEK
RIVERBOAT WY
WHITE SHORES DR
LINCOLN AV
E DUNTON AV
W DUNTON AV
WHITECAP AV
GALLEY AV
GAFF ST
BOOM AV
SAIL AV
ANCHOR
GREENLEAF AV
BUOY AV
PO
PARK & RIDE
CRYSTAL VIEW
CRYSTAL VIEW AV
BROOKSHIRE AV
PAMPAS
BERKELEY ST
DELL ST
SYLVAN CIR
GLENSIDE ST
BEECHWOOD ST
MOBILE RITZ LODGE
SHADY GLEN
IVY HILL LN
VIA BRUNO
VIA TARANTO
VIA SIENA
VIA PALERMO
VIA FERRARI
VIA MARGO
VIA TRIESTE
SANTA ANA
SEE MAP
770
55
91
5
FS

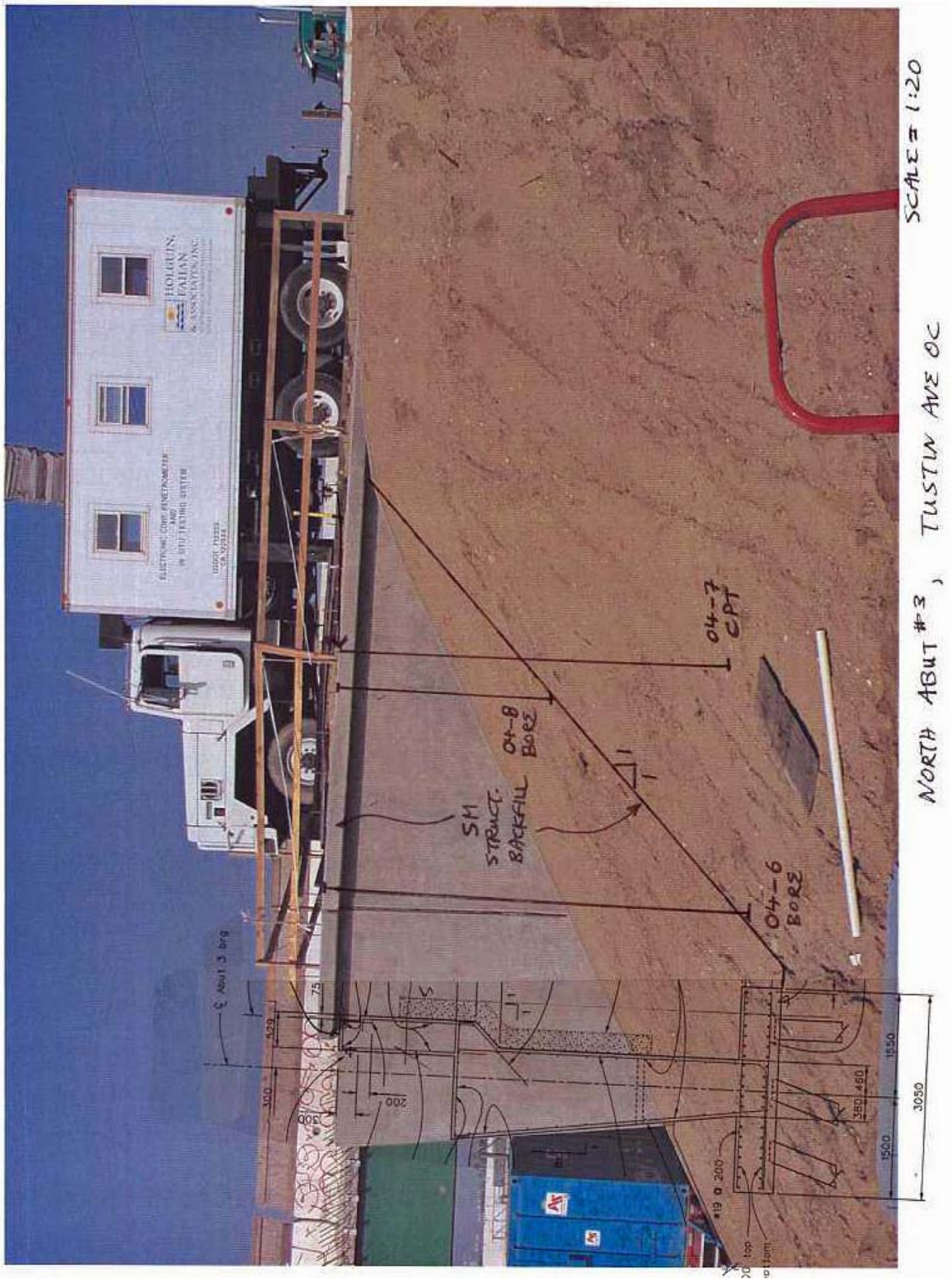


**55-414 Tustin Ave OC (Widen)**



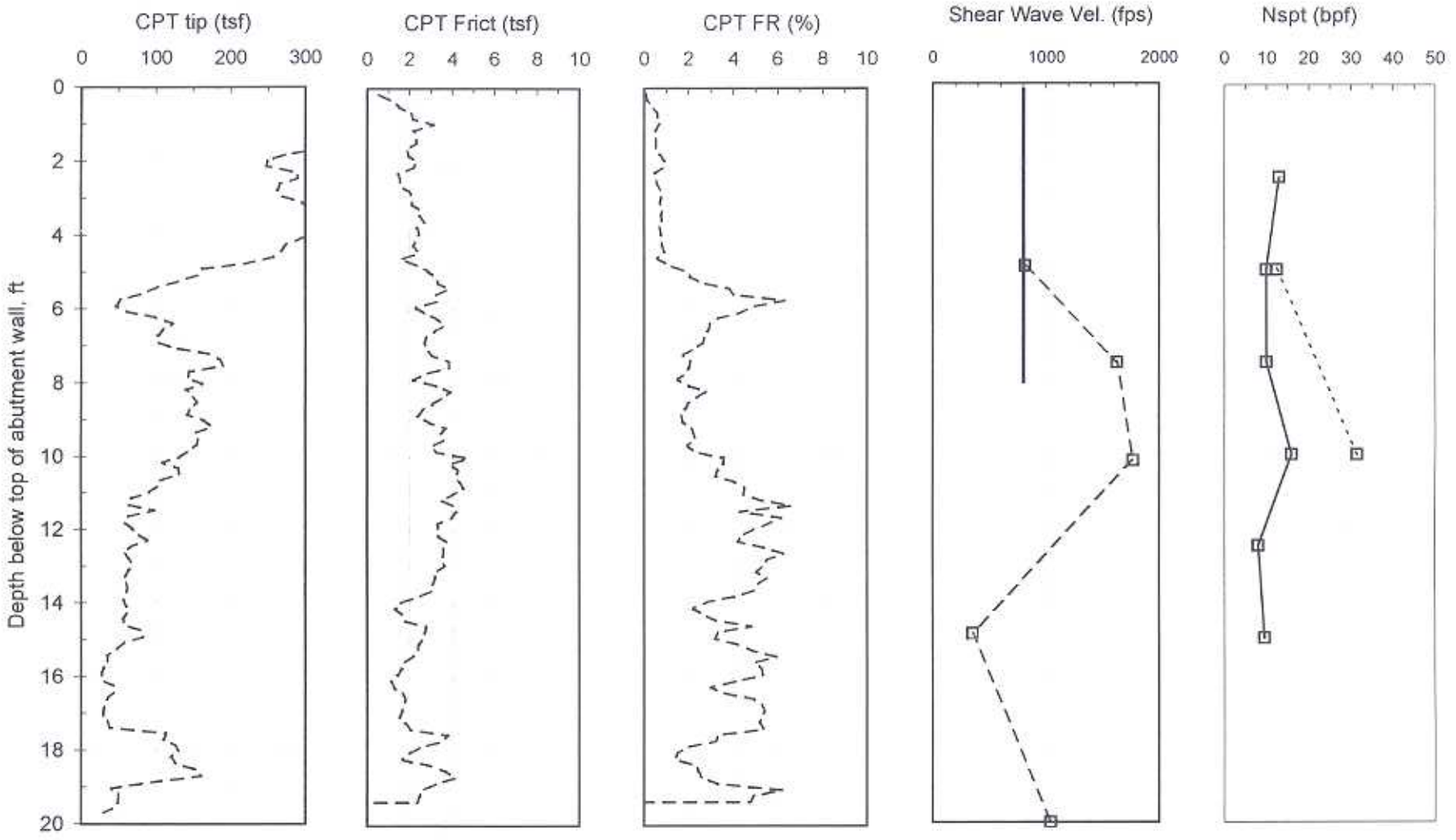

**55-414 Tustin Ave OC (Widen)**

**55-414 Tustin Ave OC (Widen)**

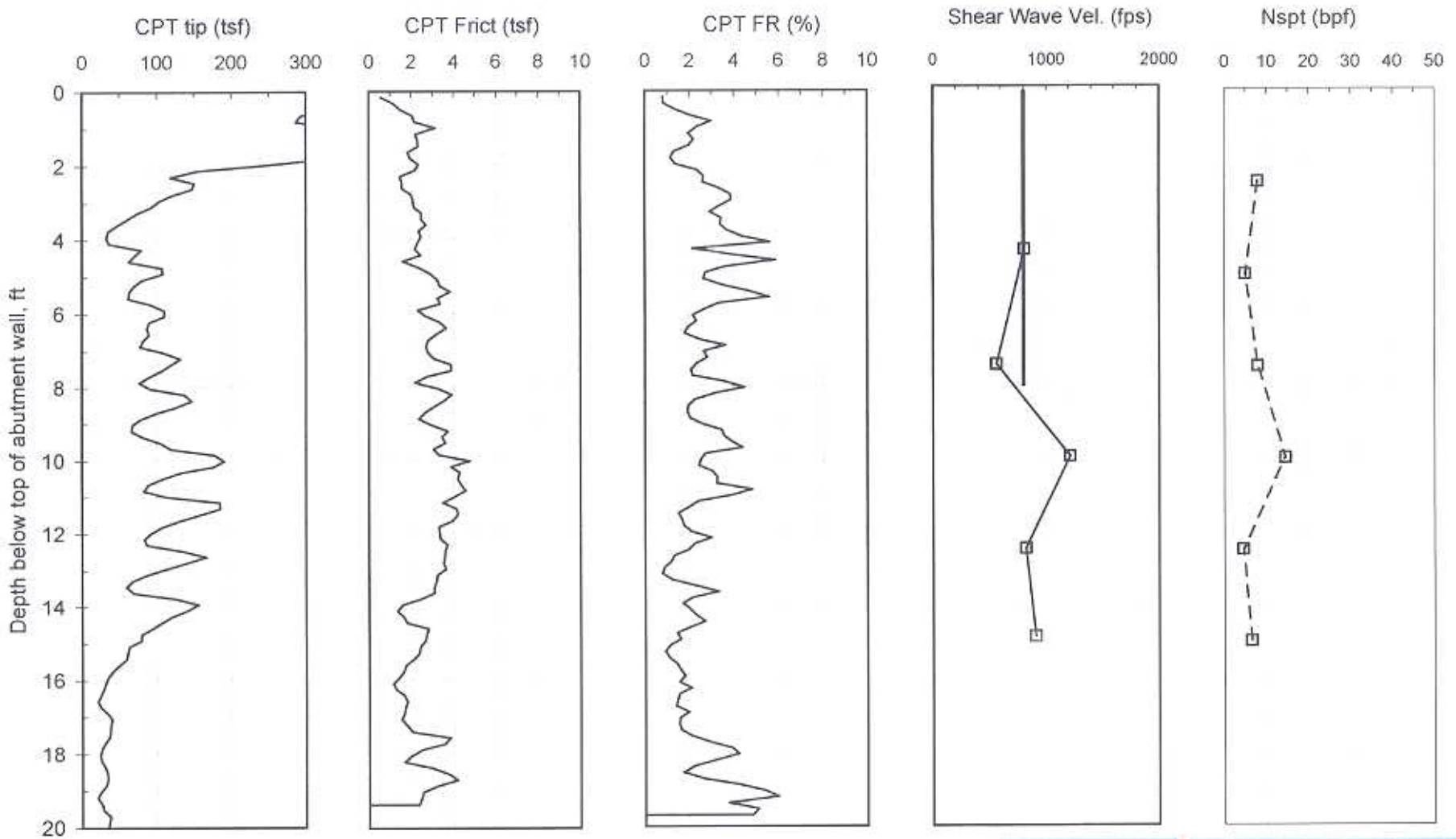



**55-414 Tustin Ave OC (Widen)**

## BOREHOLE & CPT DATA FOR TUSTIN AVE OC NORTH ABUTMENT



BOREHOLE & CPT DATA FOR TUSTIN AVE OC ABUTMENTS



| DIST. | COUNTY | ROUTE | POST km TOTAL PROJECT | SHEET No. | TOTAL SHEETS |
|---|---|---|---|---|---|
| 12 | ORA | 91 | 13.5 | 65 | 104 |

Caltrans Metric

Perry C Schacht
REGISTERED CIVIL ENGINEER

PLANS APPROVAL DATE

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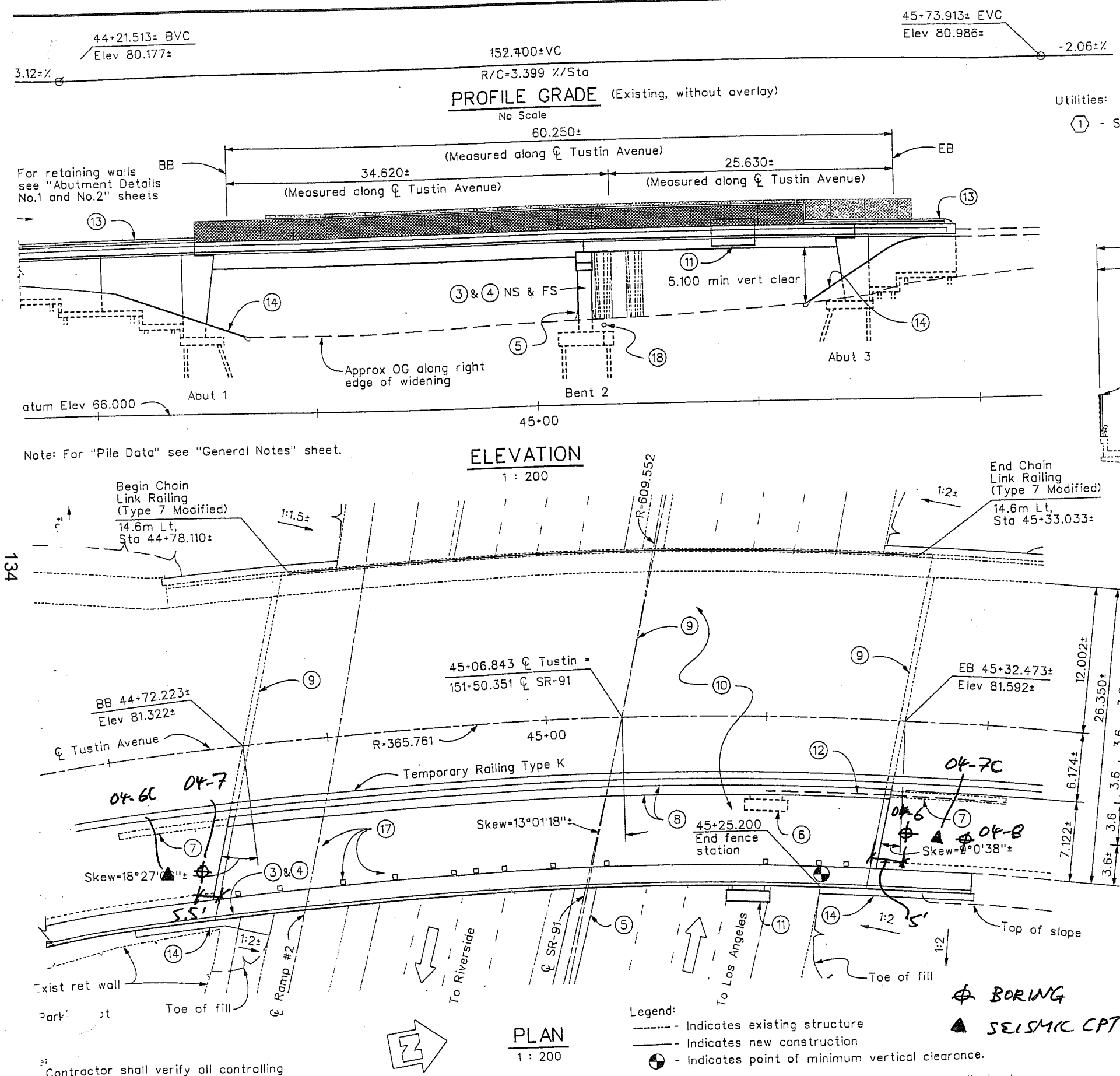
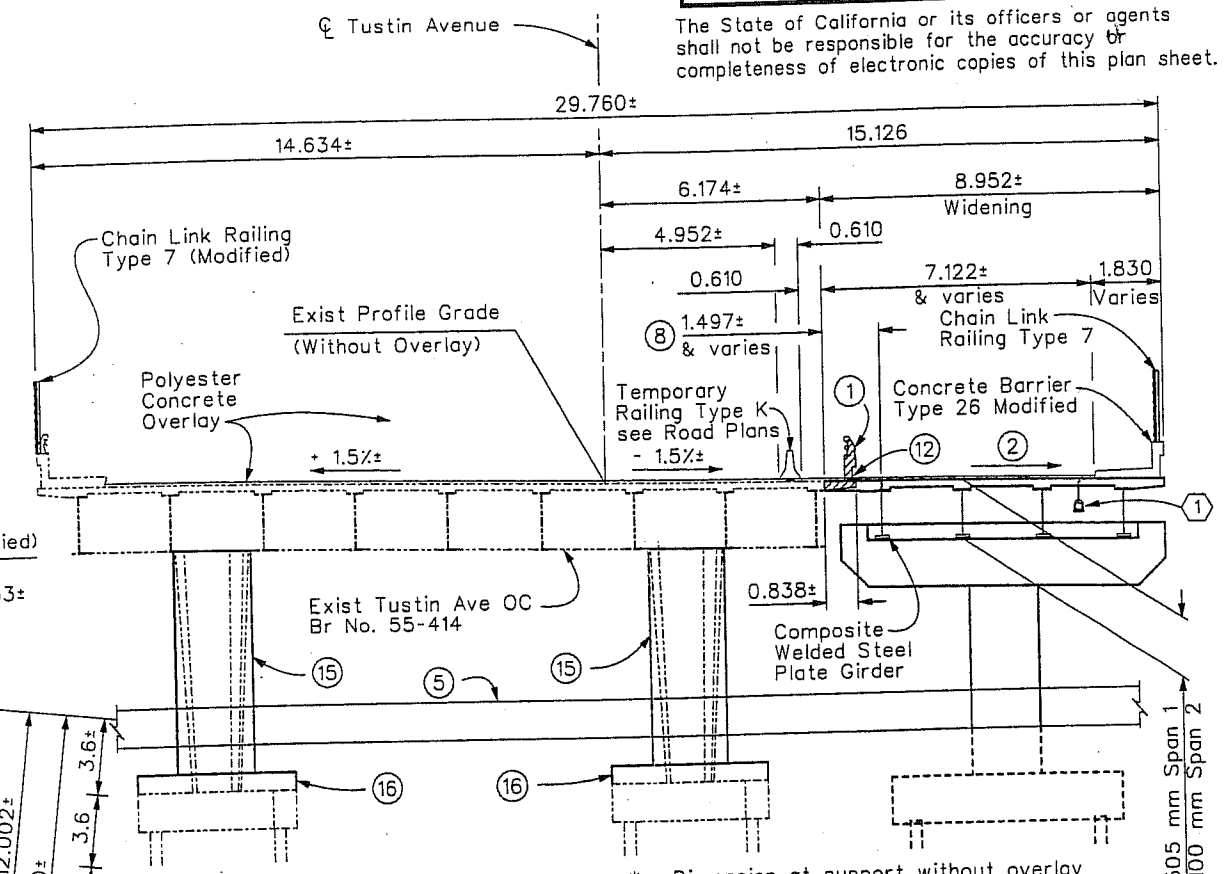



Utilities:
(1) - Steel Drainage Pipe




* - Dimension at support without overlay

TYPICAL SECTION
1 : 100

Notes:

1. Bridge removal (Portion), Remove existing concrete barrier, hand railing and overhang.
2. Match existing grades and cross slope.
3. Paint "Tustin Ave Overcrossing"
4. Paint "Bridge No. 54-414"
5. Concrete Barrier Type 60, see "Road Plans"
6. Existing Structure Mounted Sign to be relocated
7. Remove top 1.0 m of existing retaining wall and exist concrete barrier. See "Miscellaneous Details" sheet
8. Closure Pour
9. Replace existing joint seal
10. Polyester Concrete Overlay
11. Relocate existing structure mounted sign
12. Remove and relocate existing electrical conduit for structure mounted sign, see "Electrical Plans"
13. Tubular Hand Railing
14. Slope Paving
15. Steel Column Casing
16. Footing Retrofit
17. Deck Drains Type D-1, tot 12.
18. Remove and Reconstruct Existing 380mm dia. SCSP: See "Road Plans".

All dimensions are in meters unless otherwise shown

Contractor shall verify all controlling dimensions before ordering or fabricating any material.

For General Notes, Index to Bridge Plans, Quantities, and Standard Plans list see "General Notes" sheet

| DESIGN | BY Perry Schacht | CHECKED Rick Chan | LOAD FACTOR DESIGN | LIVE LOADING: HS20-44 AND ALTERNATIVE AND PERMIT DESIGN LOAD | PREPARED FOR THE STATE OF CALIFORNIA | Perry Schacht | BRIDGE No. 55-414 | TUSTIN AVENUE OVERCROSSING-WIDEN |
|---|---|---|---|---|---|---|---|---|

| DIST. | COUNTY | ROUTE | POST km TOTAL PROJECT | SHEET No. | TOTAL SHEETS |
|---|---|---|---|---|---|
| 12 | ORA | 91 | 13.5 | 66 | 104 |

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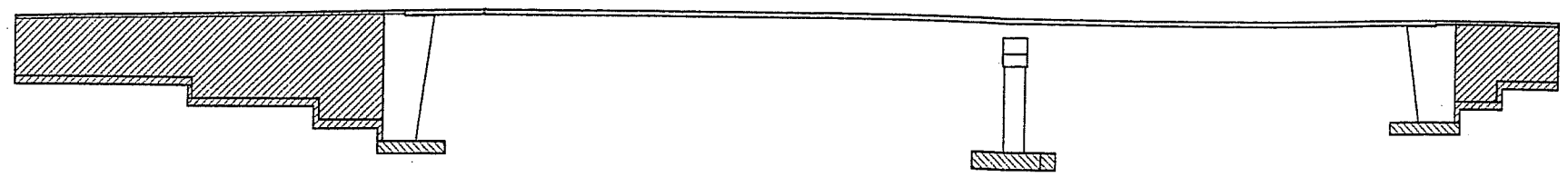


## CONCRETE STRENGTH AND TYPE LIMITS

No Scale

- Structural Concrete, Bridge (28 MPa @ 28 days).
- Structural Concrete, Bridge Footing (28 MPa @ 28 days).
- Structural Concrete, Retaining Wall

## GENERAL NOTES
## LOAD FACTOR DESIGN

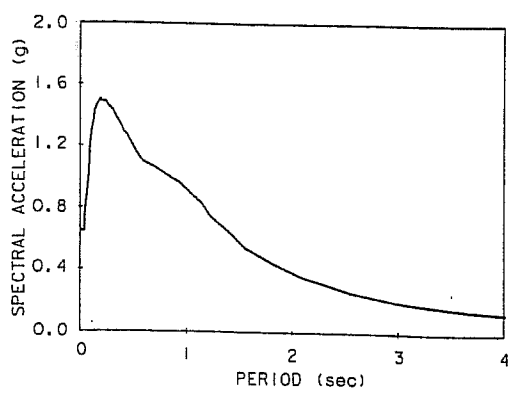
DESIGN: Caltrans Bridge Design Specifications - April 2000 (LFD) 1996 AASHTO with Interims and Revisions by Caltrans

SEISMIC DESIGN: Caltrans Seismic Design Criteria (SDC), Version 1.1 July 1999

DEAD LOAD: Includes 1675 $N/m^2$ for future wearing surface

LIVE LOADING: HS20-44 and alternative and permit design load

SEISMIC LOADING: SDC ARS Curve For Soil Profile D (M=6.5 ±0.25) and (M=7.25 ±0.25), (Peak Rock Acceleration = 0.5g) with Modifications, see curve below




REINFORCED CONCRETE:
fy = 420 MPa
fc = 28 MPa
n = 8

Transverse Deck Slabs (Working Stress Design)
fs = 138 MPa
fc = 8.3 MPa
n = 10

STRUCTURAL STEEL:
fy = 345 MPa

HS BOLTS: ASTM A325, Type 1

ANCHOR RODS: ASTM A449

Note:
The Contractor shall verify all controlling field dimensions before ordering or fabricating any material.

PILE DATA - CLASS 400C PILE

| Location | Design Loading (Service Load) | Nominal Resistance | | Design Tip Elevation | Specified Tip Elevation |
|---|---|---|---|---|---|
| | | Compression | Tension | | |
| Abut 1 | 400 kN | 800 kN | - | 61 (1) & 64 (2) | 61 |
| Bent 2 | 400 kN | 800 kN | 400 kN | 61 (1) & 64 (2) (3) | 61 |
| Abut 3 | 400 kN | 800 kN | - | 61 (1) & 64 (2) | 61 |
| Ret Walls | 400 kN | 800 kN | - | 64 (2) | 64 |

(1) Compression
(2) Lateral Loading
(3) Uplift

## STANDARD PLANS DATED JULY, 1999 *

| | | |
|---|---|---|
| | A10A | ABBREVIATIONS |
| | A10B | SYMBOLS |
| | A62C | LIMITS OF PAYMENT FOR EXCAVATION AND BACKFILL BRIDGE |
| | B0-1 | BRIDGE DETAILS |
| RSP | B0-3 | BRIDGE DETAILS |
| | B0-5 | BRIDGE DETAILS |
| | B0-13 | BRIDGE DETAILS |
| | B2-6 | PILE DETAILS CLASS 400C AND CLASS 625C |
| RSP | B3-1 | RETAINING WALL TYPE 1 H=1200 THROUGH 9100 mm |
| RSP | B3-8 | RETAINING WALL DETAILS NO. 1 |
| | B6-21 | JOINT SEALS (MOVEMENT RATING = 50 mm) |
| | B7-1 | BOX GIRDER DETAILS |
| | B7-6 | DECK DRAINS TYPES D-1 AND D-2 |
| | B8-5 | CAST-IN-PLACE PRESTRESSED GIRDER DETAILS |
| | B11-51 | TUBULAR HAND RAILING |
| | B11-52 | CHAIN LINK RAILING TYPE 7 |
| | B11-54 | CONCRETE BARRIER TYPE 26 |

* - RSP Indicates Revised Standard Plan per Standard Plans Dated July, 1999, Erratum No. 99-1

## INDEX TO BRIDGE PLANS


| SHEET NO. | TITLE |
|---|---|
| 1 | GENERAL PLAN |
| 2 | GENERAL NOTES |
| 3 | FOUNDATION PLAN |
| 4 | ABUTMENT 1 LAYOUT |
| 5 | ABUTMENT 3 LAYOUT |
| 6 | ABUTMENT DETAILS NO. 1 |
| 7 | ABUTMENT DETAILS NO. 2 |
| 8 | ABUTMENT DETAILS NO. 3 |
| 9 | ABUTMENT DETAILS NO. 4 |
| 10 | BENT DETAILS |
| 11 | BENT RETROFIT DETAILS |
| 12 | TYPICAL SECTION |
| 13 | GIRDER LAYOUT |
| 14 | GIRDER DETAILS NO. 1 |
| 15 | GIRDER DETAILS NO. 2 |
| 16 | FRAMING DETAILS |
| 17. | MISCELLANEOUS DETAILS |
| 18 | STEEL GIRDER DETAILS |
| 19 | STEEL COLUMN CASINGS |
| 20 | CHAIN LINK RAILING TYPE 7 (MODIFIED) DETAILS NO. 1 |
| 21 | CHAIN LINK RAILING TYPE 7 (MODIFIED) DETAILS NO. 2 |
| 22 | DECK DRAIN LAYOUT |
| 23 | DECK DRAIN DETAILS |
| 24 | SLOPE PAVING - FULL SLOPE |
| 25 | LOG OF TEST BORINGS |
| 26 | AS-BUILT LOG OF TEST BORINGS |

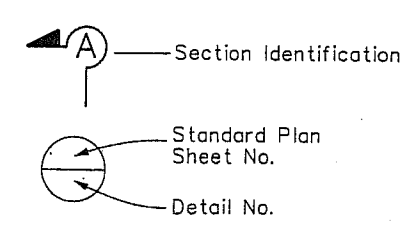

## APPROXIMATE PAY QUANTITIES

| | | |
|---|---|---|
| CLEAN BRIDGE DECK | 1,548. | M2 |
| BRIDGE REMOVAL (PORTION) | | LS |
| FURNISH PILE (CLASS 400C) | 1,195. | M |
| DRIVE PILE (CLASS 400C) | 98. | M |
| DRILL AND BOND DOWEL | 163. | M |
| FURNISH POLYESTER CONCRETE OVERLAY | 36. | M3 |
| CLEAN AND PAINT STRUCTURAL STEEL | | LS |
| TREAT BRIDGE DECK | 1,548 | M2 |
| FURNISH BRIDGE DECK TREATMENT MATERIAL (Low Odor) | | LS |
| RECONSTRUCT SIGN STRUCTURE | 1. | EA |
| MOBILIZATION | | LS |

## FINAL PAY QUANTITIES

| | | |
|---|---|---|
| STRUCTURE EXCAVATION (BRIDGE) | 264. | M3 |
| STRUCTURE EXCAVATION (RETAINING WALL) | 247. | M3 |
| STRUCTURE BACKFILL (BRIDGE) | 251. | M3 |
| STRUCTURE BACKFILL (RETAINING WALL) | 331. | M3 |
| STRUCTURAL CONCRETE, BRIDGE FOOTING | 68. | M3 |
| STRUCTURAL CONCRETE, BRIDGE | 277. | M3 |
| STRUCTURAL CONCRETE, RETAINING WALL | 94. | M3 |
| PLACE POLYESTER CONCRETE OVERLAY | 1548. | M2 |
| JOINT SEAL (MR 30 mm) | 93. | M |
| BAR REINFORCING STEEL (BRIDGE) | 36,245. | Kg |
| BAR REINFORCING STEEL (RETAINING WALL) | 7,082. | Kg |
| COLUMN CASING | 5,346. | Kg |
| FURNISH STRUCTURAL STEEL (BRIDGE) | 100,646. | Kg |
| ERECT STRUCTURAL STEEL (BRIDGE) | 100,646. | Kg |
| SLOPE PAVING (CONCRETE) | 37. | M3 |
| CHAIN LINK RAILING (TYPE 7) | 51. | M |
| CHAIN LINK RAILING (TYPE 7 MODIFIED) | 56. | M |
| MISCELLANEOUS METAL (BRIDGE) | 2,442. | Kg |
| TUBULAR HAND RAILING | 41. | M |
| CONCRETE BARRIER (TYPE 26) MODIFIED | 92. | M |

## PLAN SYMBOLS




All dimensions are in meters unless otherwise shown

DESIGN BY Perry Schacht | CHECKED Rick Chan | PREPARED FOR THE | BRIDGE No. —

| DIST. | COUNTY | ROUTE | POST km TOTAL PROJECT | SHEET No. | TOTAL SHEETS |
|---|---|---|---|---|---|
| 12 | ORA | 91 | 13.5 | 67 | 104 |

Perry C Schacht
REGISTERED CIVIL ENGINEER

PLANS APPROVAL DATE

Perry C. Schacht
No. C41095
Exp. 3-31-03
CIVIL
STATE OF CALIFORNIA

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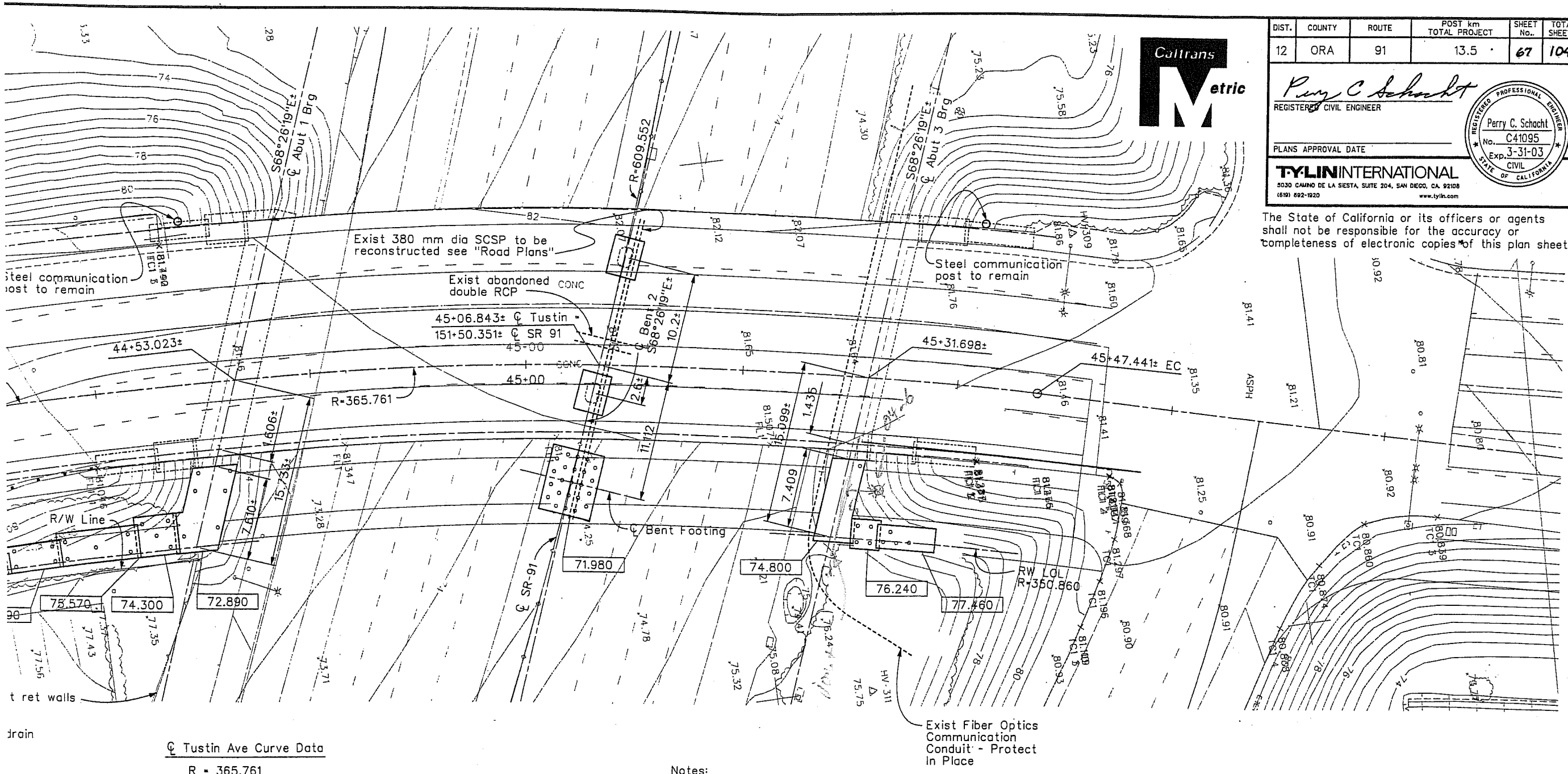


℄ Tustin Ave Curve Data

R = 365.761

Δ = 66° 40' 56"

L = 425.681

T = 240.636

PLAN
1 : 200

Notes:

1. ☐ - Indicates bottom of footing elevation.
2. For limits of excavation & backfill, see A62C
3. Not all piles shown.

:H MARKS

Elev 234.70
C headwall East
Grove St Ora-175-B

Elev 239.32
CC headwall 18.0 m right
-B

controlling
g or

All dimensions are in meters unless otherwise shown

| DIST. | COUNTY | ROUTE | POST km TOTAL PROJECT | SHEET No. | TOTAL SHEETS |
|---|---|---|---|---|---|
| 12 | ORA | 91 | 13.5 | 68 | 104 |

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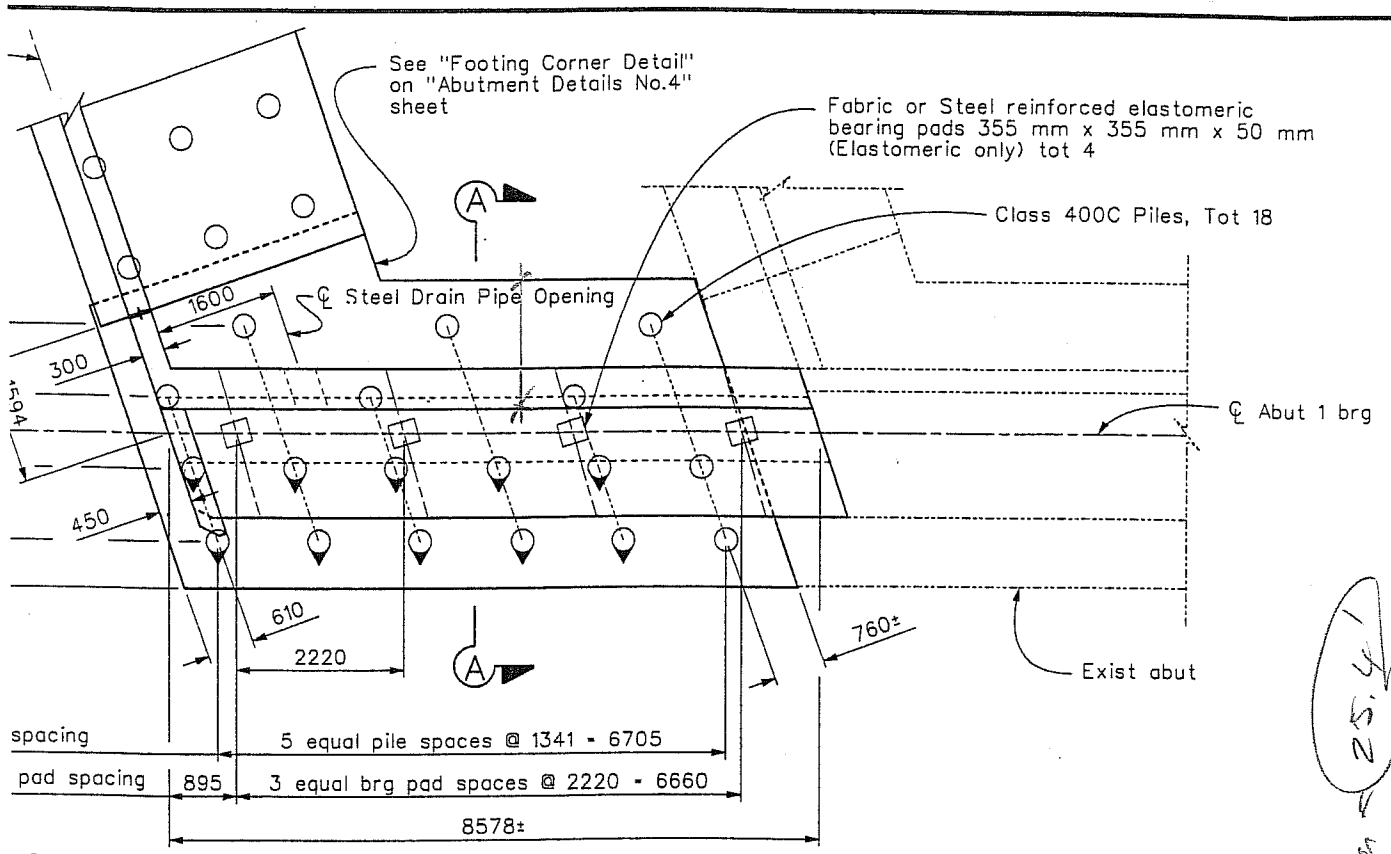
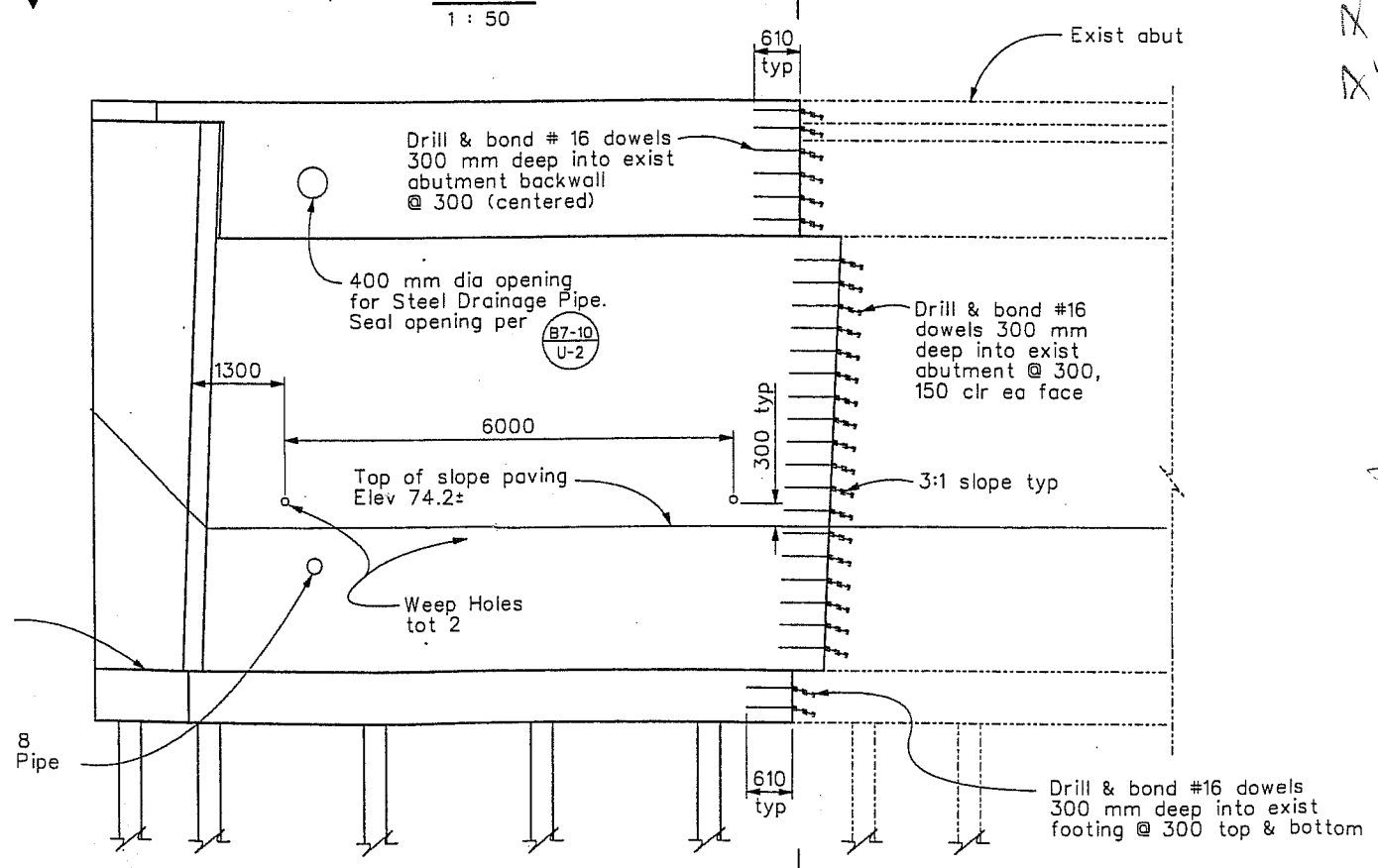
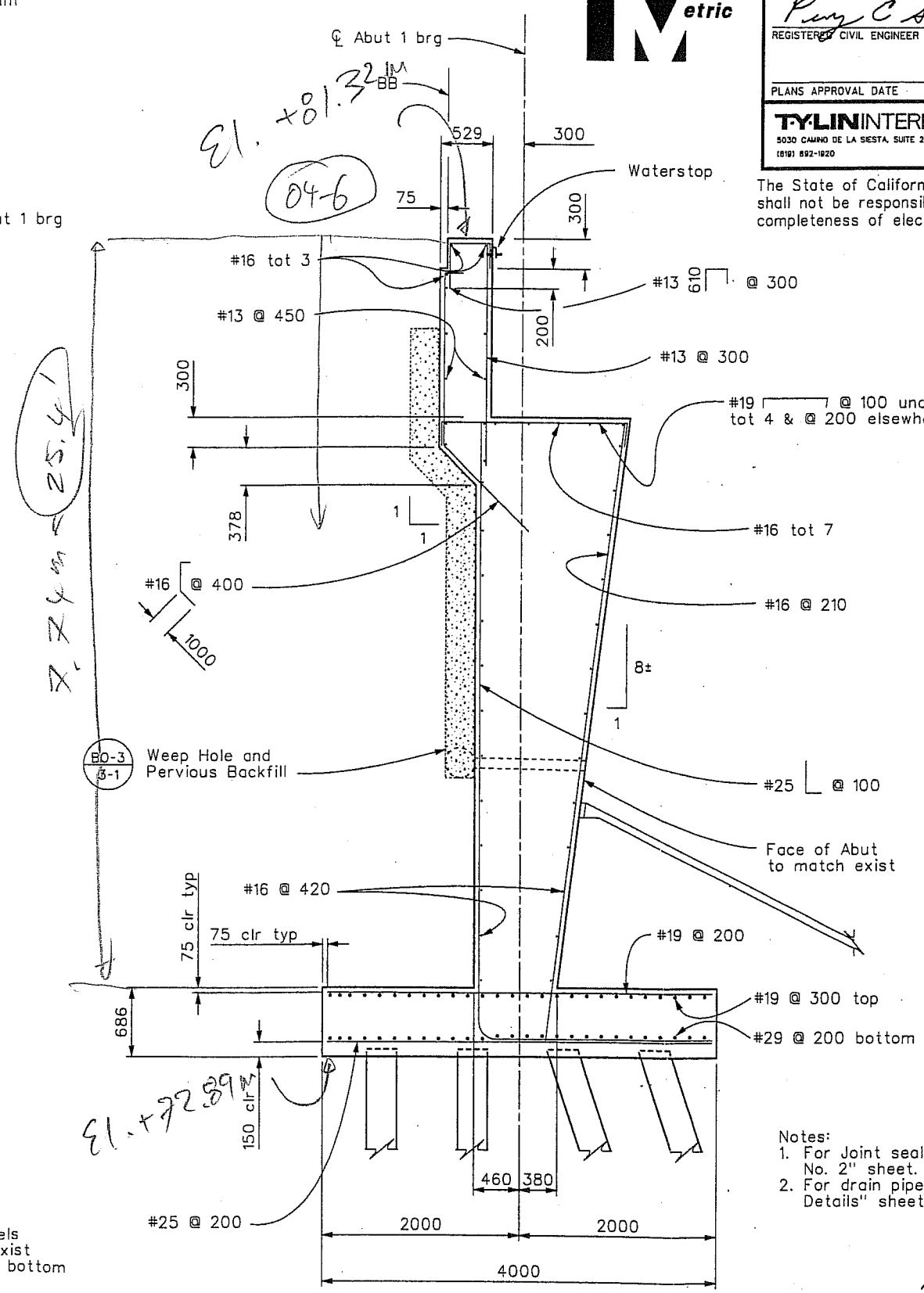



PLAN
1 : 50




ELEVATION
1 : 50

Note: For "Section C-C" see "Abutment Details No.3" sheet.




SECTION A-A
1 : 30

Notes:
1. For Joint seal details, see "Girder Details No. 2" sheet.
2. For drain pipe details, see "Deck Drain Details" sheet.

South Abut #1 layout

All dimensions are shown in millimeters unless otherwise shown

/ all controlling
dering or

| DIST. | COUNTY | ROUTE | POST km TOTAL PROJECT | SHEET No. | TOTAL SHEETS |
|---|---|---|---|---|---|
| 12 | ORA | 91 | 13.5 | 69 | 104 |

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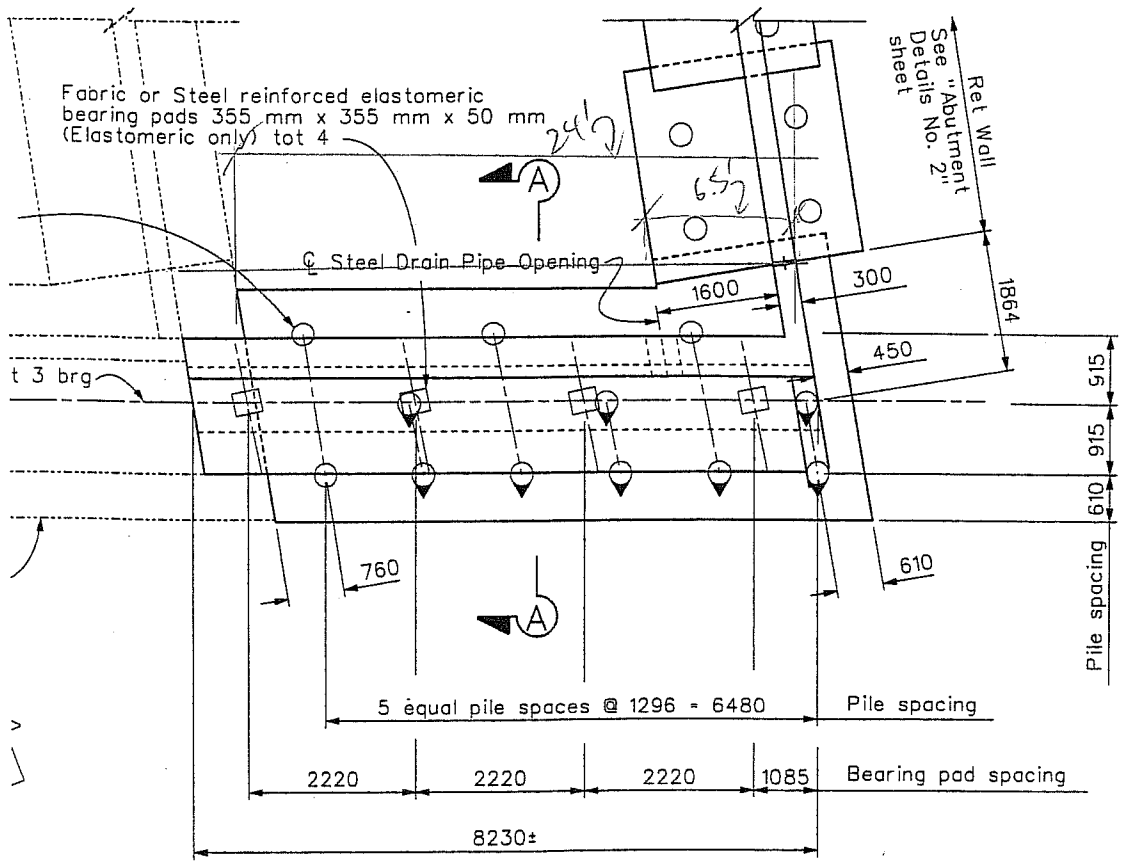
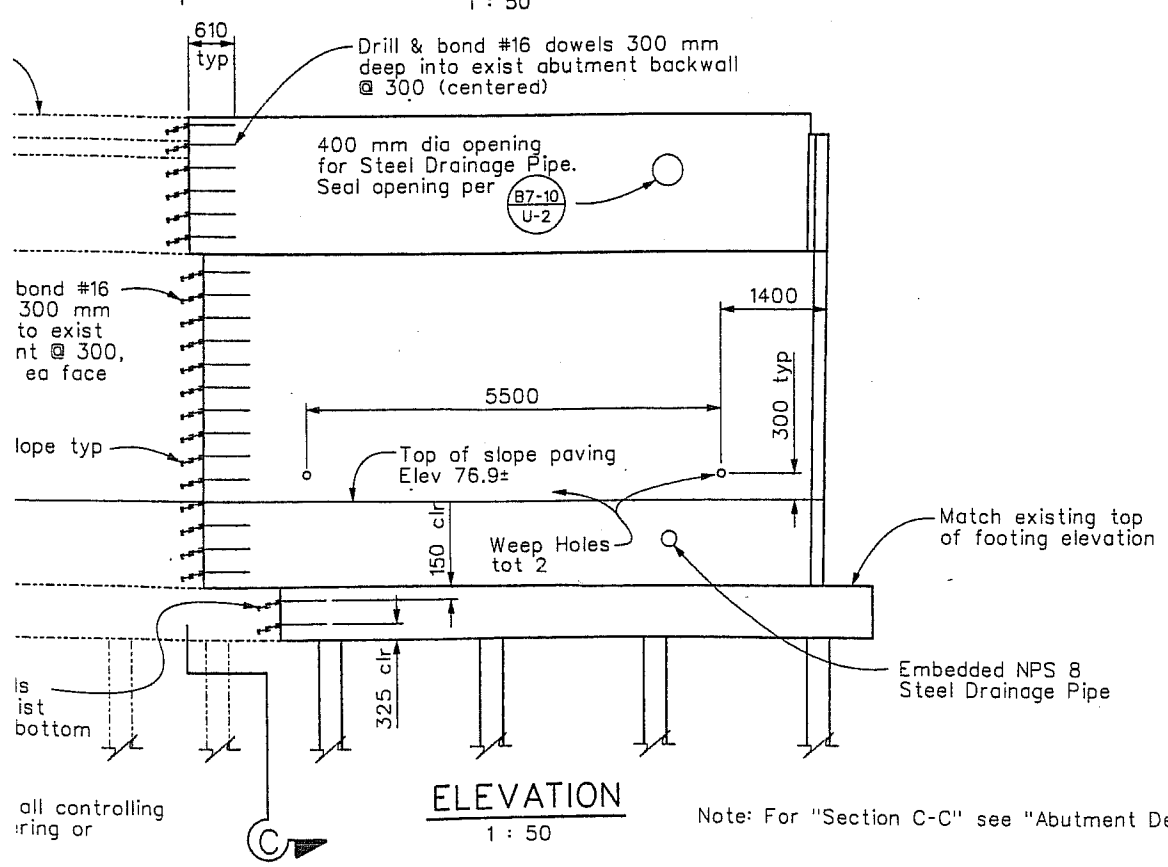


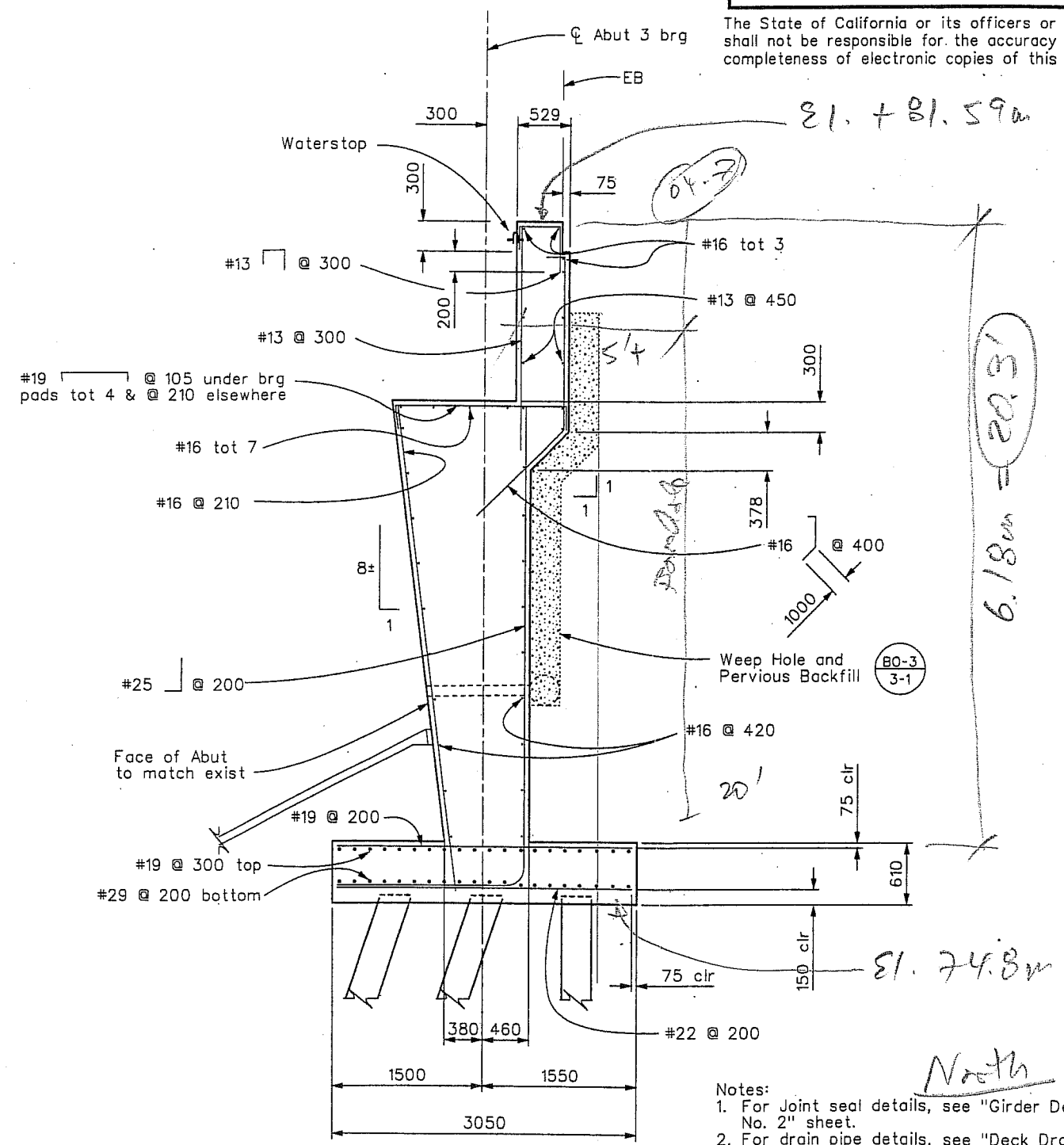

○ - Indicates vertical piles
Ⓟ - Indicates 1:3 battered piles

## PLAN
1 : 50




## ELEVATION
1 : 50

Note: For "Section C-C" see "Abutment Details No.3" sheet.




## SECTION A-A
1 : 30

Notes:
1. For Joint seal details, see "Girder Details No. 2" sheet.
2. For drain pipe details, see "Deck Drain Details" sheet.

All dimensions are shown in millimeters unless otherwise shown

| DIST. | COUNTY | ROUTE | POST km TOTAL PROJECT | SHEET No. | TOTAL SHEETS |
|---|---|---|---|---|---|
| 12 | ORA | 91 | 13.5 | 71 | 104 |

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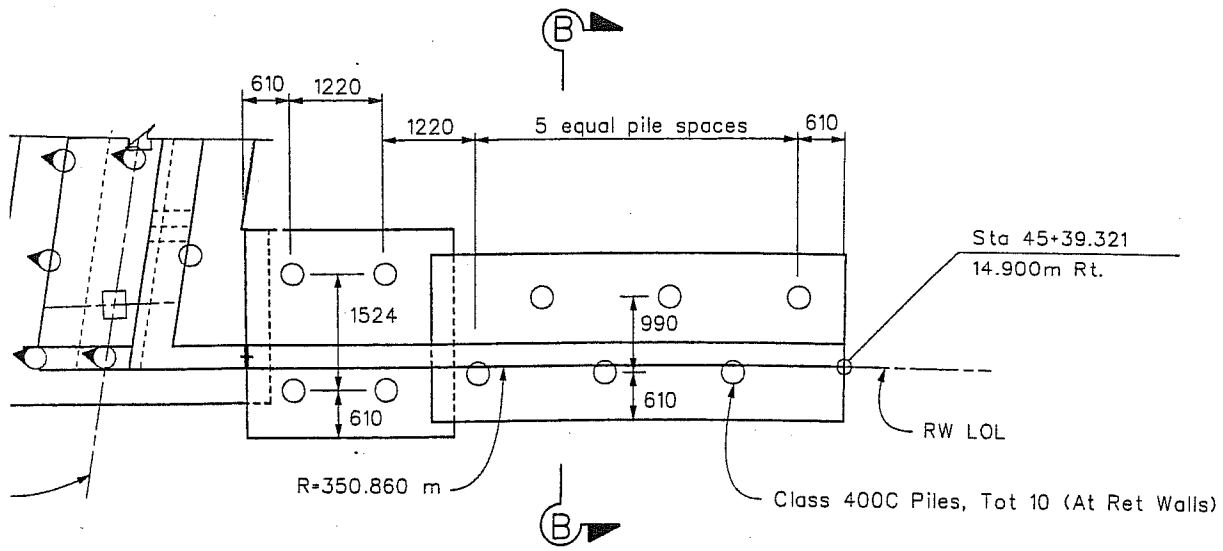
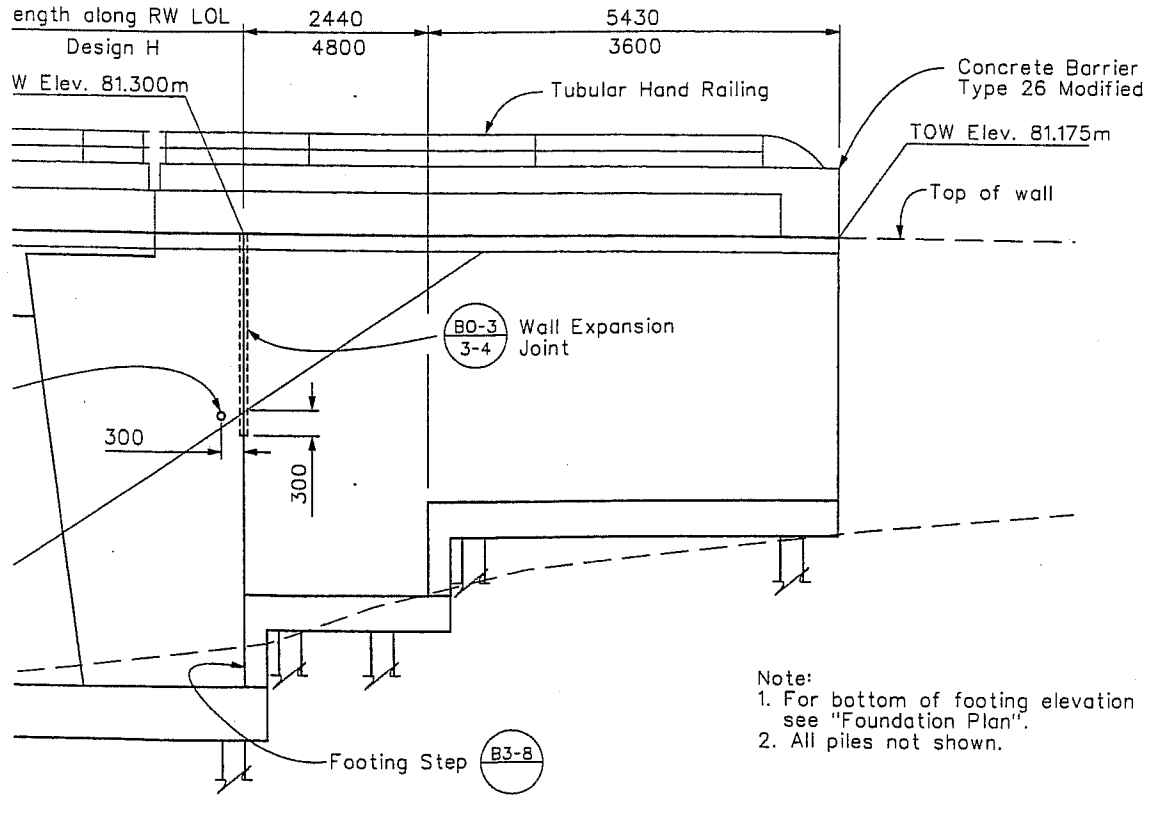



PLAN
1 : 200

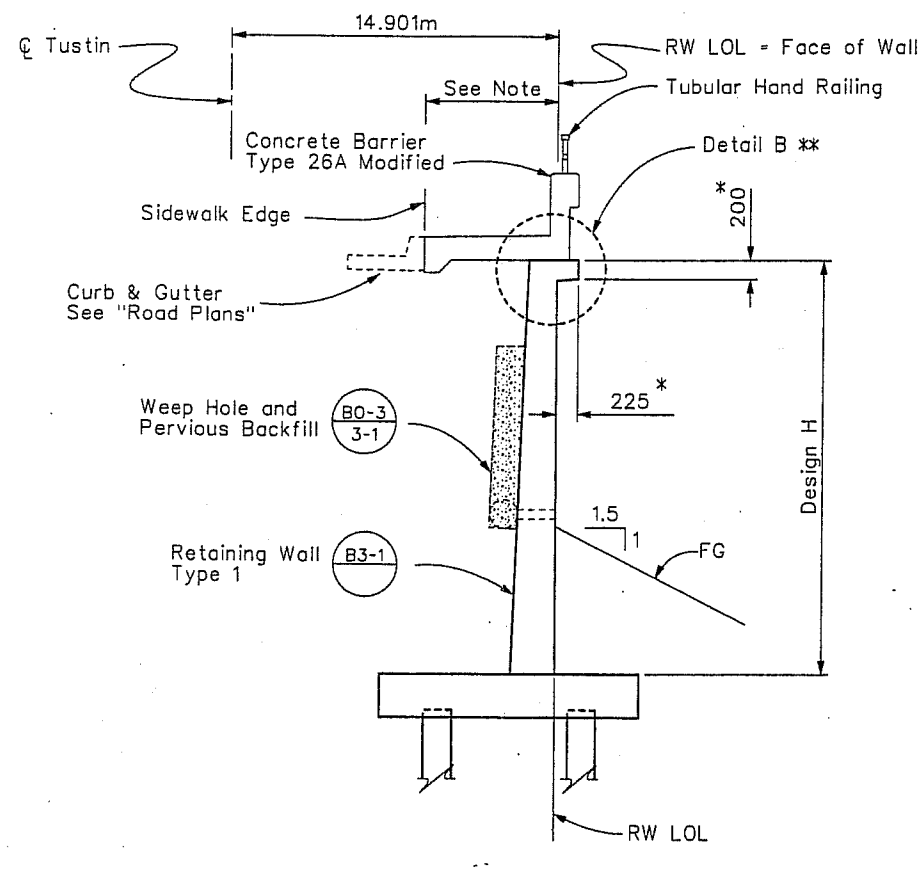
Note: Pile spacing measured along RW LOL.




Note:
1. For bottom of footing elevation see "Foundation Plan".
2. All piles not shown.

ELEVATION
1 : 200

ABUTMENT 3 RETAINING WALL
1 : 50




SECTION B-B
1 : 40

* - Match deck overhang.

** - For "Detail B" see "Abutment Details No.1" sheet

Note: For Location of Sidewalk Edge, See "Sidewalk Plan" on "Miscellaneous Details" Sheet.

Abut #3

ontrolling
or

All dimensions are shown in millimeters unless otherwise shown

| DIST. | COUNTY | ROUTE | POST km TOTAL PROJECT | SHEET No. | TOTAL SHEETS |
|---|---|---|---|---|---|
| 12 | ORA | 91 | 13.5 | 72 | 104 |

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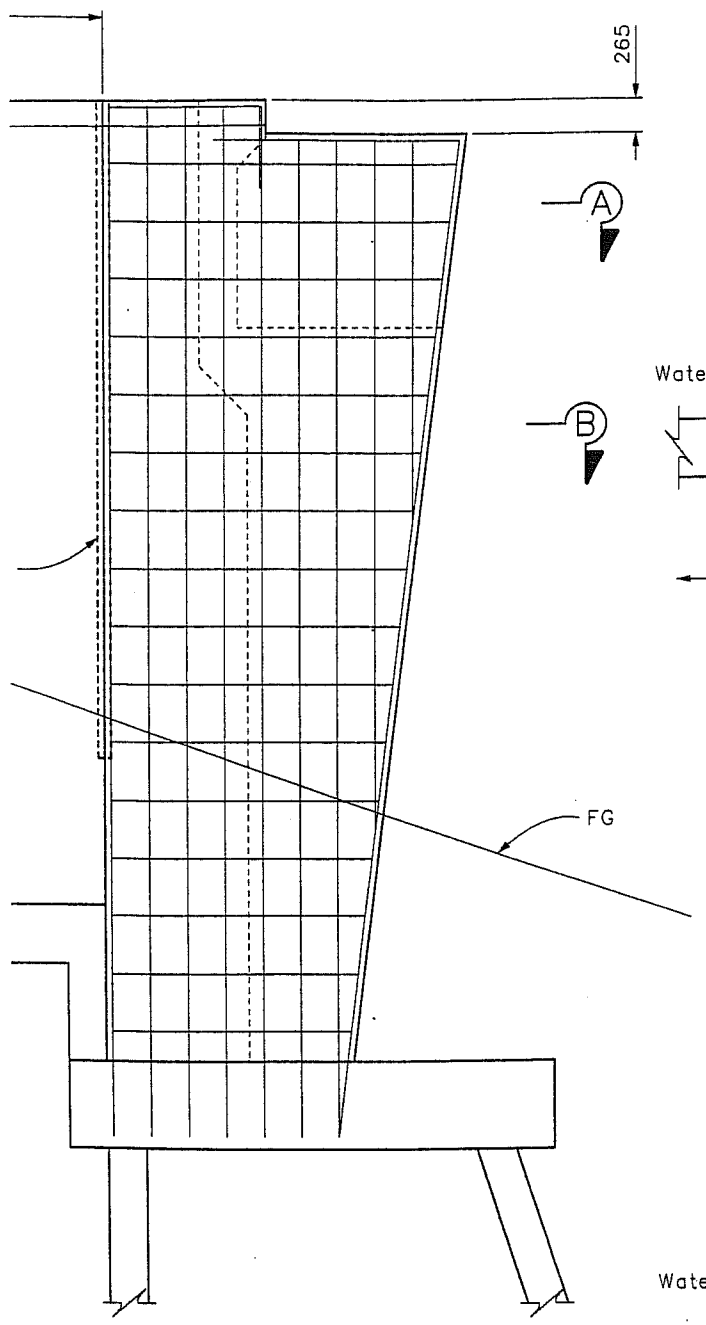
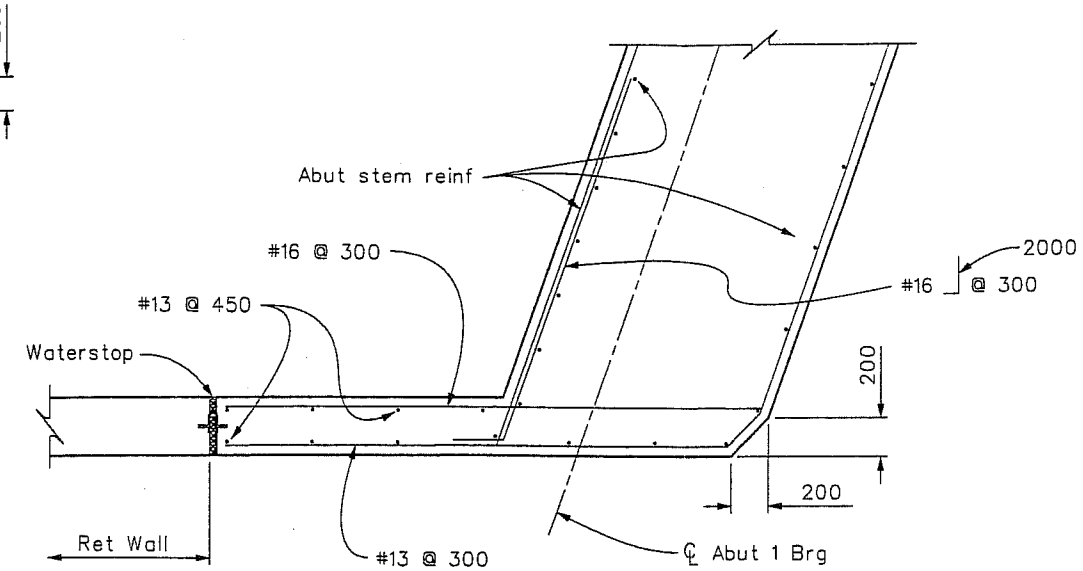
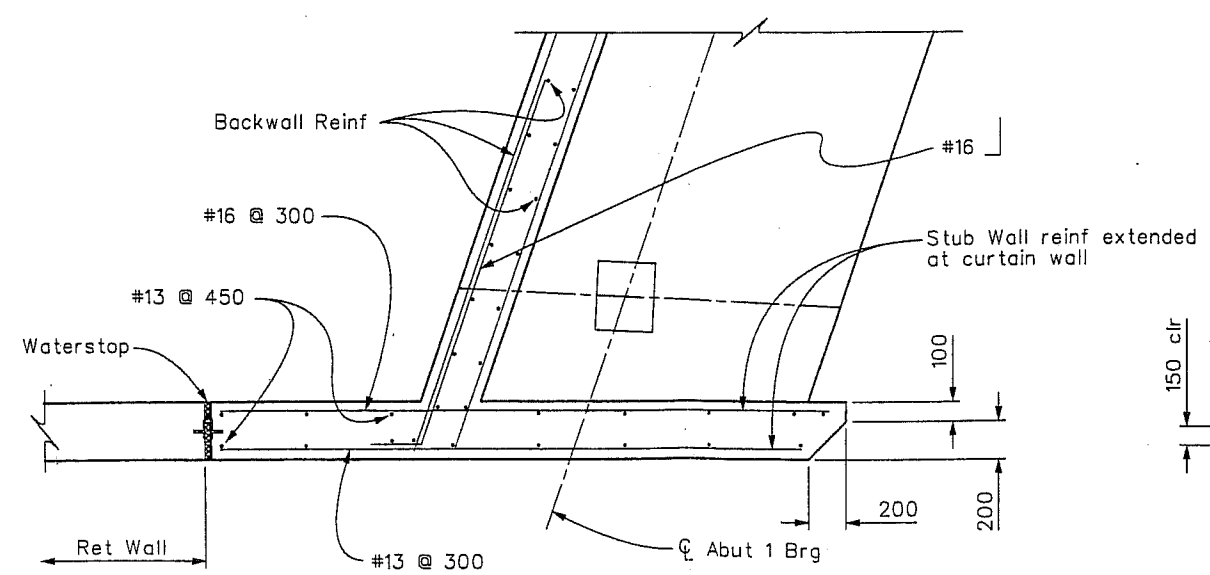



Note:
Details similar for Abut 3 stub wall unless otherwise noted.

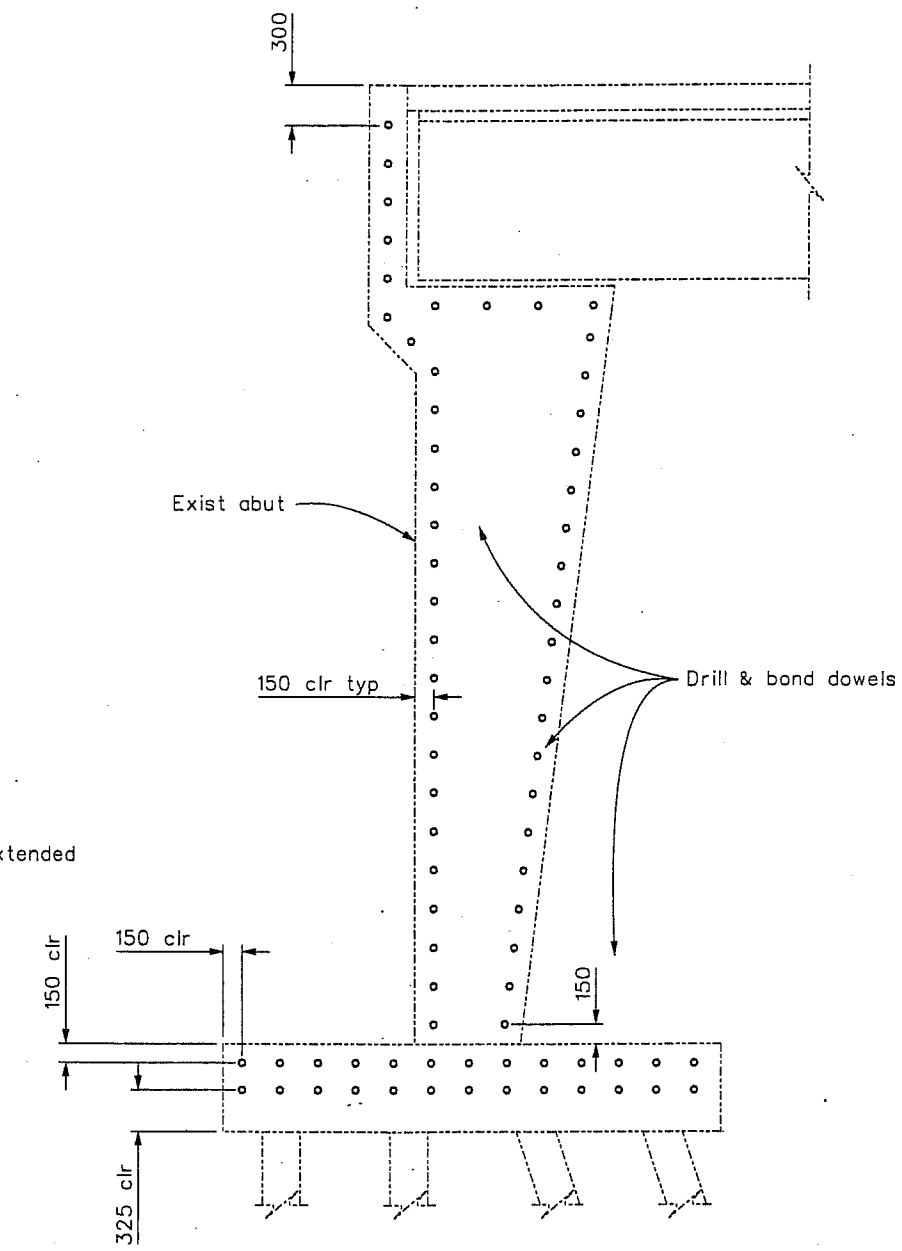
TMENT 1 STUB WALL ELEVATION
1 : 30




SECTION B-B
1 : 20




SECTION A-A
1 : 20




SECTION C-C
No Scale

Abut #1

controlling
g or

All dimensions are shown in millimeters unless otherwise shown

DESIGN BY Perry Schacht CHECKED Rick Chan PREPARED FOR THE BRIDGE No. TUSTIN AVENUE OVERCROSSING WIDEN

| DIST | COUNTY | ROUTE | KILOMETER POST TOTAL PROJECT | SHEET No | TOTAL SHEETS |
|---|---|---|---|---|---|
| 12 | Ora | 091 | 13.5 (8.4) | 25/ 121 | 26/ 184 |

REGISTERED CIVIL ENGINEER — DATE 6/21/02

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — ROBERT G. TRUJILLO — No. 60912 — Exp. Dec. 31, 2004 — CIVIL — STATE OF CALIFORNIA

CITY OF ANAHEIM
200 S. ANAHEIM BLVD.
ANAHEIM, CALIFORNIA 92805

Goffman, McCormick & Urban, Inc.
23241 Arroyo Vista, Rancho Santa Margarita, CA 92688
Telephone: (949) 888-6513

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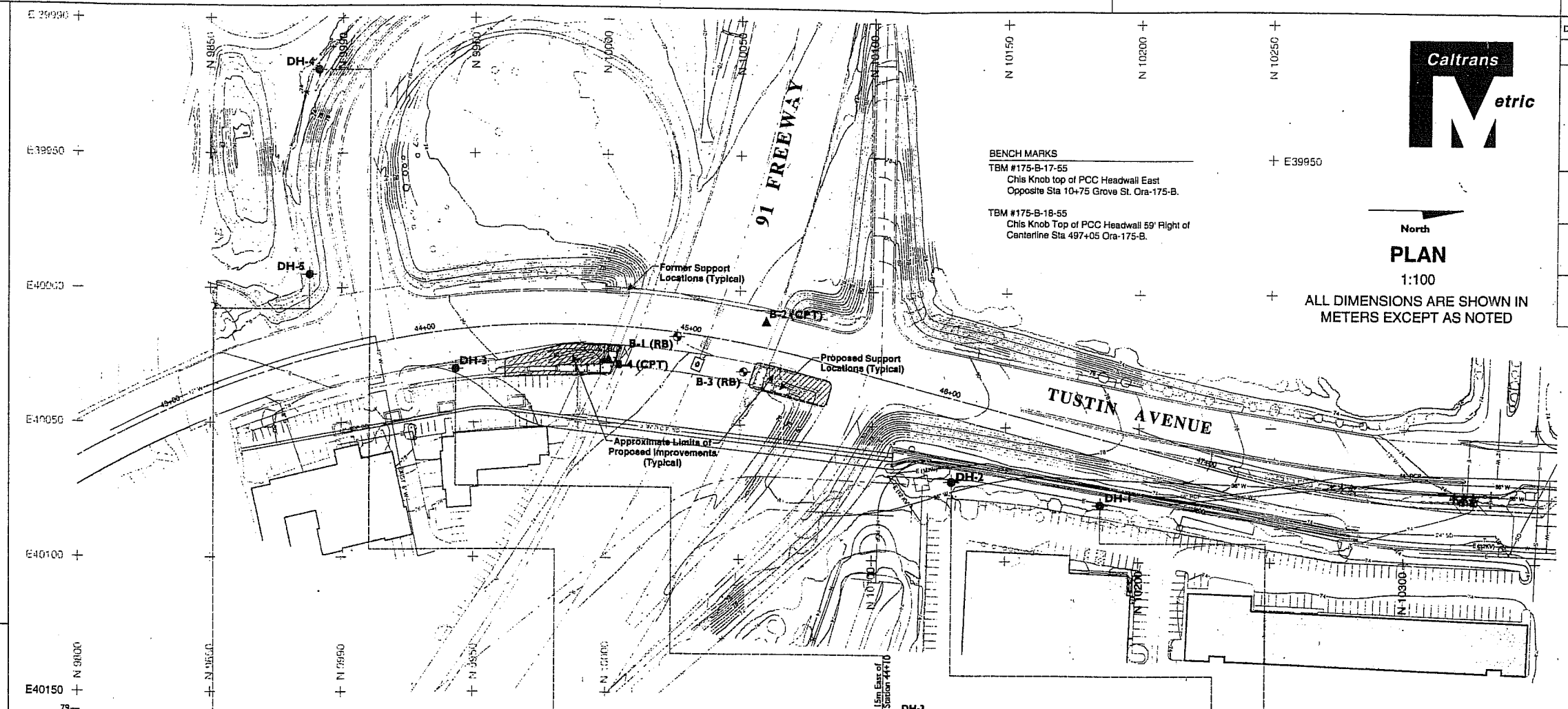



Notes:

1) Two types of samplers were utilized during subsurface exploration in order to:
   a) obtain standard penetration test readings and
   b) obtain undisturbed soil samples for laboratory testing

2) The two types of samplers are as follows:

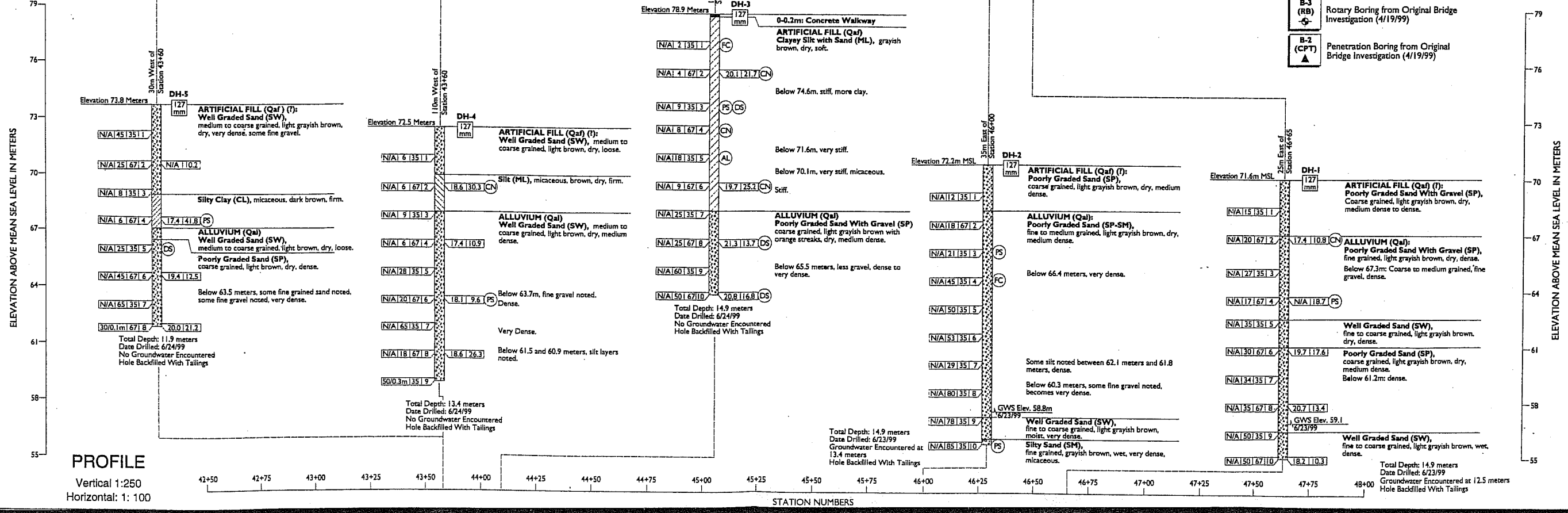
| Sampler Type | Inside Diameter | Outside Diameter | Hammer Used | Hammer Weight | Lift & Drop Method | Drop Height |
|---|---|---|---|---|---|---|
| SPT | 35mm | 51mm | Donut Hammer | 63.4kg | Free Line Lift and Drop | 762mm |
| Drive (Non-SPT) | 57mm | 86mm | Donut Hammer | 181.2kg | Free Line Lift and Drop | 457mm |

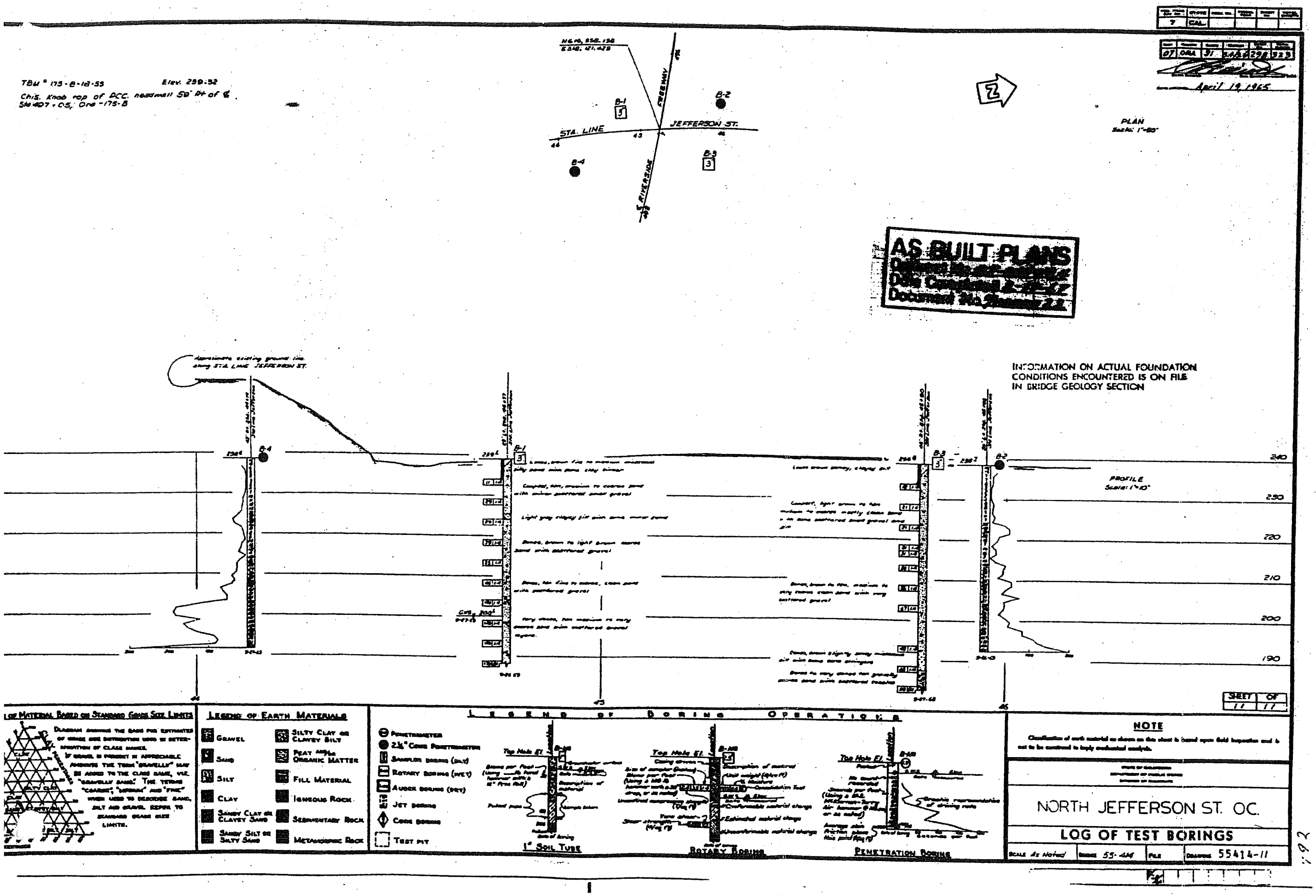
3) In order to distinguish between the two types of samplers used, we indicated the inside diameters for each sample taken in the individual boring logs.

4) The blow counts obtained from the nonstandard penetration tests may be converted to standard blow counts by multiplying the blow counts by 0.6 based on formulas by Lacroix and Horn (1973). Please note that this factor is approximate. Determinations of soil consistency should be based on blow counts obtained using the SPT sampler.

## EXPLANATION

- DH-5 — Borings from Current Field Investigation
- B-3 (RB) — Rotary Boring from Original Bridge Investigation (4/19/99)
- B-2 (CPT) — Penetration Boring from Original Bridge Investigation (4/19/99)





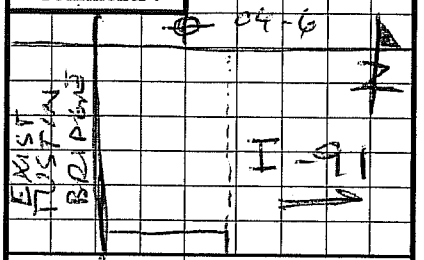
TBM # 175-B-18-55
Elev. 239.52
Chis. Knob top of PCC. headwall 59' Rt of ℄
Sta 407+05, Ore -175-B
STA. LINE
JEFFERSON ST.
FREEWAY
RIVERSIDE
B-1
B-2
B-3
B-4
PLAN
Scale: 1"=80'
April 19, 1965
AS BUILT PLANS
INFORMATION ON ACTUAL FOUNDATION CONDITIONS ENCOUNTERED IS ON FILE IN BRIDGE GEOLOGY SECTION
PROFILE
Scale: 1"=10'
240
230
220
210
200
190
SHEET 11 OF 11
LEGEND OF EARTH MATERIALS
GRAVEL
SAND
SILT
CLAY
SANDY CLAY OR CLAYEY SAND
SANDY SILT OR SILTY SAND
SILTY CLAY OR CLAYEY SILT
PEAT AND/OR ORGANIC MATTER
FILL MATERIAL
IGNEOUS ROCK
SEDIMENTARY ROCK
METAMORPHIC ROCK
LEGEND OF BORING OPERATIONS
PENETROMETER
2½" CONE PENETROMETER
SAMPLER BORING (DRY)
ROTARY BORING (WET)
AUGER BORING (DRY)
JET BORING
CORE BORING
TEST PIT
1" SOIL TUBE
ROTARY BORING
PENETRATION BORING
NOTE
NORTH JEFFERSON ST. OC.
LOG OF TEST BORINGS
SCALE As Noted
BRIDGE 55-414
FILE
DRAWING 55414-11

# LOG OF BORING NO. ( 04-6 )

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

| | | | |
|---|---|---|---|
| Project Name | : Abutment Research | | |
| Project Location | : JUSTIN AVE over I-91 | | |
| M.I. Project No. | : 02-165 | Site Condition : | |
| Weather | : Sunny | Elevation : | |
| Traffic Control | : N/A | Operator : | Duane |
| Drilling Company | : ZR | Operator : | Steve |
| Type of Rig | : #5 Trip h. | Drop (in) : | 30.0 |
| Borehole Diameter (inch) | : 8.0" | Drive Wt. (lbs) : | 140.0 |
| Logged By | : SS | Date Drilled : | 3/6/04 |

Comments :




Back Filled By :

| | Time | | | | | | | | | | Back to Office | Proposed Depth |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Depature | Arrival | Start | Break | Rework | Lunch | Rework | Break | Finish | Off | | ft |
| Driller | | | | | | | | | | | | Water Table |
| Traffic Control | | | | | | | | | | | | ft |
| Logger | | | | | | | | | | | | Caving |
| Total | | | | | | | | | | | | ft |

| Depth (ft) | Sampler Type (Bulk, Drive, SPT, Tube) | Sample Number | Sample Type (B/D/S.B./T) | ~~Blows~~ | ~~Recovery (inch)~~ Blows/6" | U.S.C.S. | Description (ASTM D-2488-93) Color | Moisture State (Dry, Moist, Wet) | Max. Size | Grain Size (%) Gravel : Sand : Fines | Sand Size | Plasticity | Consistency | Cementation | $O^2$/LEL/PID |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | N. ABUT per MK loc'n. map 6" A/C over 11" base | | | | | | | | |
| 2.5 | D | 1 | | | 12 | SP-SM | FINE SAND W/ SILT lt. brown, moist, fine-gr., med dense | | | | | | | | |
| | | | | | 13 | | tr. mica | | | | | | | | |
| | | | | | 16 | | | | | | | | | | |
| 5 | D | 2 | | | 9 | SM | SILTY SAND W/ GRAVEL | | | | | | | | |
| | | | | | 8 | | | | | | | | | | |
| | | | | | 12 | | dk brown, moist, fine-gr. w/ gravel up to 1/2" | | | | | | | | |
| | | | | | | | med dense, w/ wood fragments | | | | | | | | |
| 7.5 | D | 3 | | | 5 | SM | SILTY SAND w/ some gravel | | | | | | | | |
| | | | | | 8 | | dk brown, moist, fine gr., some grav. to 1/2", | | | | | | | | |
| | | | | | 12 | | loose, tr. mica | | | | | | | | |
| 10 | D | 4 | | | 10 | SM | same as above | | | | | | | | |
| | | | | | 16 | | but med dense & gravel up to 1" | | | | | | | | |
| | | | | | 16 | | | | | | | | | | |
| 12.5 | D | 5 | | | 3 | ML | SILT W/ FINE SAND & GRAVEL | | | | | | | | |
| | | | | | 6 | | brown, moist, stiff, gravel to 1/2" | | | | | | | | |
| | | | | | 10 | | (only 8" recovered) | | | | | | | | |
| 15 | D | 6 | | | 7 | ML | TOP MNG = ML same as above | | | | | | | | |
| | | | | | 9 | | BOT. MNG = SP-SM w/ gravel to 1/2", reddish brown | | | | | | | | |
| | | | | | 10 | | loose | | | | | | | | |

# LOG OF BORING NO. ( 04-6 )

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

**Project No. :** 02-165 **Project Name :** Abutment Research

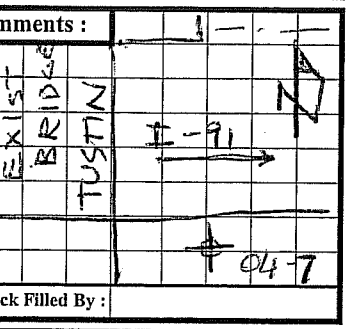
| Depth (ft) | Sampler Type (Bulk, Drive, SPT, Tube) | Sample Number | Sample Type (B/D/S.B./T) | Blows/6" | Recovery (inch) | U.S.C.S. | Description (ASTM D-2488-93) Color | Moisture State (Dry, Moist, Wet) | Max. Size | Grain Size (%) Gravel : Sand : Fines | Sand Size | Plasticity | Consistency | Cementation | $O^2$/LEL/PID |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | D | 7 | | 8<br>9<br>13 | | SM | SAND W/ SILT & GRAVEL<br>lt. reddish brown, moist, gravel to 2"<br>med dense, tr. mica | | | : : | | | | | |
| | | | | | | | TD = 21.5' | | | : : | | | | | |
| | 3RD | | BOREHOLE | | | | 04-8<br>N. ABUT - 11.5' N of 04-5 | | | : : | | | | | |
| 5 | D | 1 | | 9<br>8<br>17 | | SM | SILTY SAND W/ GRAVEL<br>lt. brown to brown, moist, fine to w/ gravel to 1/2"<br>med dense | | | : : | | | | | |
| 10 | D | 2 | | 17<br>32<br>31 | | SM | same as above but lt. yell. brown, dense | | | | | | | | |
| | | | | | | | TD = 11.5' | | | : : | | | | | |
| | | | | | | | | | | : : | | | | | |

# LOG OF BORING NO. ( 04-7 )

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

| | | | |
|---|---|---|---|
| Project Name | : Abutment Research | | |
| Project Location | : TUSTIN AVE over I-91 | | |
| E.M.I. Project No. | : 02-165 | Site Condition : | A/C |
| Weather | : Sunny | Elevation : | |
| Traffic Control | : N/A | Operator : | Steve |
| Drilling Company | : ZR | Operator : | Duane |
| Type of Rig | : HS Trip h. | Drop (in) : | 30.0 |
| Borehole Diameter (inch) | : 8.0" | Drive Wt. (lbs) : | 140.0 |
| Logged By | : SS | Date Drilled : | 3/6/04 |

Comments :




Back Filled By :

| | Time | | | | | | | | | | Back to Office | Proposed Depth |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Depature | Arrival | Start | Break | Rework | Lunch | Rework | Break | Finish | Off | | ft |
| Driller | | | | | | | | | | | | Water Table |
| Traffic Control | | | | | | | | | | | | ft |
| Logger | | | | | | | | | | | | Caving |
| Total | | | | | | | | | | | | ft |

| Depth (ft) | Sampler Type (Bulk, Drive, SPT, Tube) | Sample Number | Sample Type (B/D/S.B./T) | Blows/6" | Recovery (inch) | U.S.C.S. | Description (ASTM D-2488-93) Color | Moisture State (Dry, Moist, Wet) | Max. Size | Grain Size (%) Gravel : Sand : Fines | Sand Size | Plasticity | Consistency | Cementation | $O^2$/LEL/PID |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | S. ABUT 6.5" A/C over 6" base (MK measured boring loc'n.) | | | | | | | | |
| 0 | B | 0 | | | | ML | SILT w/ SAND & GRAVEL lt. brown, moist, gravel to 1/2" | | | : : | | | | | |
| 2.5 | D | 1 | | 8 8 8 | | SM | SILTY SAND w/ GRAVEL lt. brown, moist, fine-gr. w/ gravel: to 1/2" loose, locally ~~to~~ w/ silt pockets | | | | | | | | |
| 5 | D | 2 | | 7 5 5 | | SM | SILTY SAND W/ GRAVEL lt. brown, moist, fine to med w/ gravel up to 1", loose, w/ silt pockets | | | | | | | | |
| 7.5 | D | 3 | | 6 7 9 | | SM | same as above but brown | | | : : | | | | | |
| 10 | D | 4 | | 9 11 18 | | SM | same as above, w/ silt lumps & pockets (sample disturbed due to gravel) | | | : : | | | | | |
| 12.5 | D | 5 | | 2 4 5 | | SM | SILTY SAND W/ GRAVEL brown, moist, fine-gr. w/ gravel to: 1", loose w/ silt pockets | | | | | | | | |
| 15 | D | 6 | | 6 6 7 | | SM | same as above, w/ rock ø > 2.5" @ tip of sampler | | | | | | | | |

# LOG OF BORING NO. ( 04-7 )

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

**Project No. :** 02-165 **Project Name :** Abutment Research

| Depth (ft) | Sampler Type (Bulk, Drive, SPT, Tube) | Sample Number | Sample Type (B/D/S.B./T) | Blows/6" | Recovery (inch) | U.S.C.S. | Description (ASTM D-2488-93) Color | Moisture State (Dry, Moist, Wet) | Max. Size | Grain Size (%) Gravel : Sand : Fines | Sand Size | Plasticity | Consistency | Cementation | $O^2$/LEL/PID |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | : : | | | | | |
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| 20 | | 7 | | 10 | | SM | SILTY SAND w/ GRAVEL | | | | | | | | |
| | | | | 11 | | | lt. yell brown, moist, fine-gr. | | | w/ : gravel to 1/2" | | | | | |
| | | | | 9 | | | loose, tr. mica | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | TD = 21.5' | | | | | | | | |
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HOLGUIN, FAHAN & ASSOCIATES, INC.
ENVIRONMENTAL MANAGEMENT CONSULTANTS
948 North Lemon Street, Orange, CA 92867 (714)-210-5971 FAX (714) 210-5975

March 20, 2004



Mr. Mike Kapuskar
Earth Mechanics, Inc.
17660 Newhope St, Suite E
Fountain Valley, CA 92708

**PROJECT NAME:** CPT Testing for UCSD Abut Research: Tustin Ave over 91;
**PROJECT NO.:** 021-65-Tusin Ave & 91

Dear Mr. Kapuskar:

Enclosed please find copies of the cone penetrometer testing (CPT) data for the above referenced project along with a copy of the corresponding invoice.

The cone penetrometer testing conducted for this project consisted of pushing an instrumented cone-tipped probe into the ground while simultaneously recording the resistance to penetration at the cone tip and along the friction sleeve.

The cone penetrometer testing described in this report was conducted in general accordance with the current ASTM specifications (ASTM D5778-95 and D3441-94) using an electronic cone penetrometer.

The CPT equipment operated by Holguin, Fahan & Associates, Inc. (HFA) consists of a cone assembly mounted at the end of a series of hollow sounding rods. A set of hydraulic rams is used to continuously push the cone and rods into the soil at a rate of 20-mm per second (approximately four feet per minute) while the cone tip resistance and sleeve friction resistance are recorded every 50-mm (approximately two inches) and stored in digital form. A specially designed all wheel drive 23-ton truck provides the required reaction weight for pushing the cone assembly and is also used to transport and house the test equipment.

The cone penetrometer assembly used for this project consists of a conical tip and a cylindrical friction sleeve. The conical tip has a 60° apex angle and a diameter of 35.6-mm (1.40-inch) resulting in a projected cross-sectional area of 10 $cm^2$ (1.5 square inches). The cylindrical friction sleeve is 133-mm (5.25-inch) in length and has an outside diameter of 35.8-mm (1.41-inch), resulting in a surface area of 150 $cm^2$ (23 square inches).

The interior of the cone penetrometer is instrumented with strain gauges that allow simultaneous measurement of cone tip and friction sleeve resistance during penetration. Continuous electric signals from the strain gauges are transmitted by a shielded cable in the sounding rods to the PC-based data acquisition hardware in the CPT truck. The sounding log is also displayed on a monitor.

The CPT data processing is performed using the truck mounted computer based data acquisition and presentation system. The computer generated graphical logs include cone resistance, friction resistance, friction ratio, and pore pressure ratio versus depth at a user selectable scale.

Soil behavior type interpretations are based on the following reference: Robertson, P.K. and Campanella, R.C., 1989, "Guidelines for Geotechnical Design using the Cone Penetrometer Test and CPT with Pore Pressure Measurement." Soil Mechanics series No. 120, Civil Engineering Department, University of British Columbia, Vancouver, B.C., V6T 1Z4, September 1989.

Interpretations and plotting has been done using HFA's proprietary data interpretation and presentation software. It is important to note that the data is not averaged. All interpretations are point interpretations at the corresponding depth listed.

It is also important to note that the soil behavior type correlations are based on a combination of theory, field research, research performed under laboratory conditions, and literature review. The information presented in the tabulated and/or graphical logs should, therefore, be viewed as a guideline rather than as precise measurements.

Some care is recommended when using the soil behavior type interpretations. If a tabulation depth happens to fall on a soil layer interface, or a seam of soil differing from the rest of the layer, the tabulated data can be misleading. The solution to this problem is the proper use of the graphical CPT logs. The tip and sleeve penetration resistance logs are the primary source of profile description; the soil behavior type logs are supplemental. The graphical logs of tip and sleeve resistance should be examined and layer boundaries delineated in accordance with the project requirements. The soil behavior type interpretations are only representative of the response of the soil to the large shear deformations imposed during cone penetration. This is not necessarily a prediction of grain size distribution. However, it has been found that the interpreted soil behavior types generally agree well with the soil types defined in accordance with the grain size distribution methods such as used in the Unified Soil Classification System.

Limitations

Holguin, Fahan & Associates, Inc. (HFA) presents the attached data in accordance with ASTM Standards D5778-95 and D3441-94 and generally accepted cone penetrometer testing practices and standards. The attached data further relates only to the specific project and location discussed in the data. Judgement may be required to verify the CPT soil behavior interpretations.

The "Client" may distribute this data or excerpts therefrom provided the following statement is prominently displayed and included with the distribution:

"Neither CLIENT nor HFA make any guarantee or warranty, express or implied, regarding this data. THE USE OF THIS INFORMATION SHALL BE AT THE USER'S SOLE RISK REGARDLESS OF ANY FAULT OR NEGLIGENCE OF THE CLIENT OR HFA."

Please feel free to call if you have any questions.

Respectfully submitted,

Amanda Hancock
CPT Operations Manager
Holguin, Fahan & Associates, Inc.

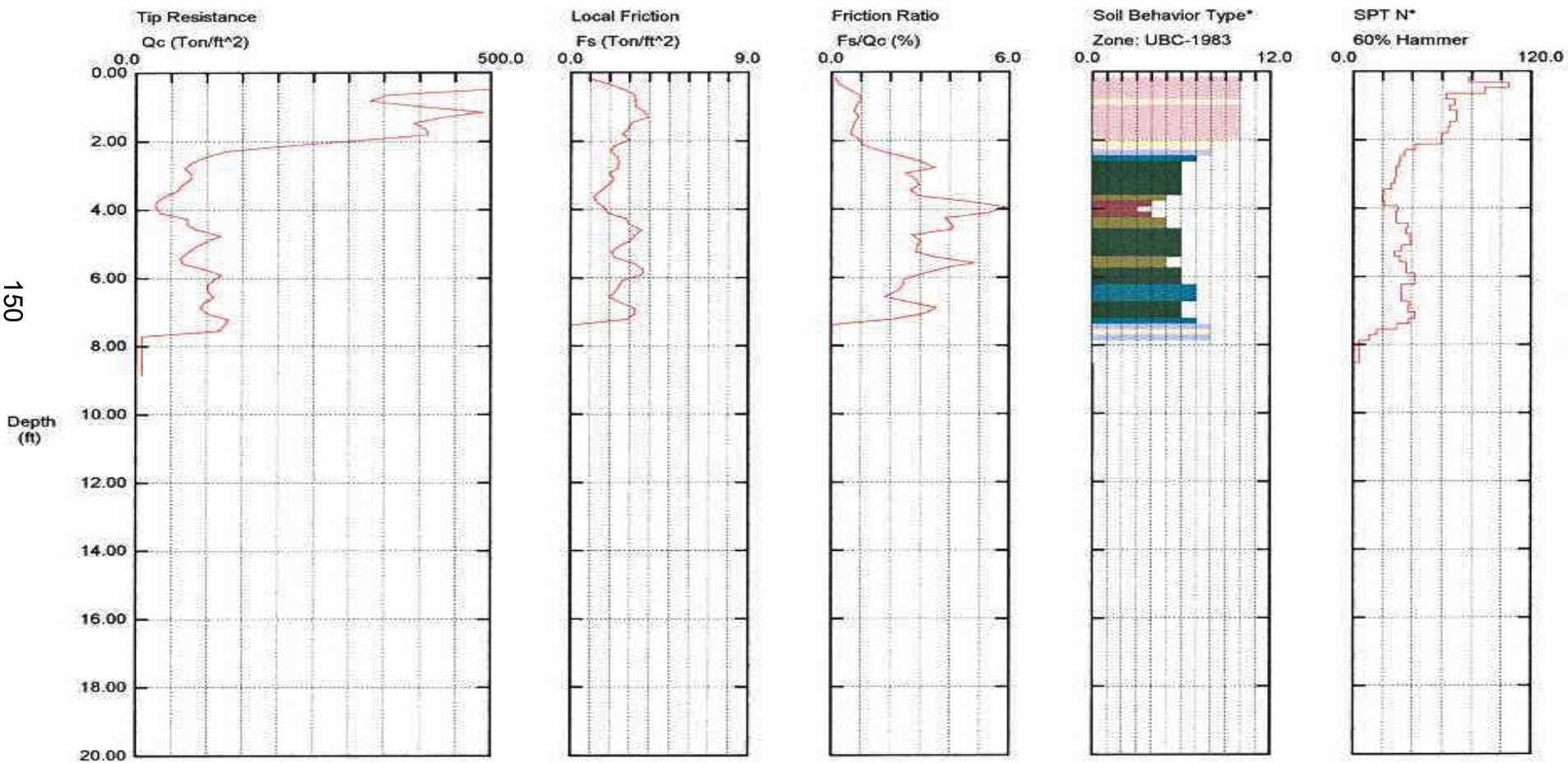
:AH\Enclosures

behavior type and SPT based on data from UBC-1983

# Earth Mechanics

Operator: Bob-Victor
Sounding: CPT-04-6C
Cone Used: DSG0409

CPT Date/Time: 3/6/2004 10:18
Location: UCSD Abut Research
Job Number: 02165




Maximum Depth = 8.86 feet

Depth Increment = 0.16 feet

1 sensitive fine grained
2 organic material
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 very stiff fine grained (*)
12 sand to clayey sand (*)

# CPT INTERPRETATIONS

SOUNDING : CPT-04-6C
PROJECT : UCSD Abut Resear
DATE/TIME: 3/6/2004 10:18

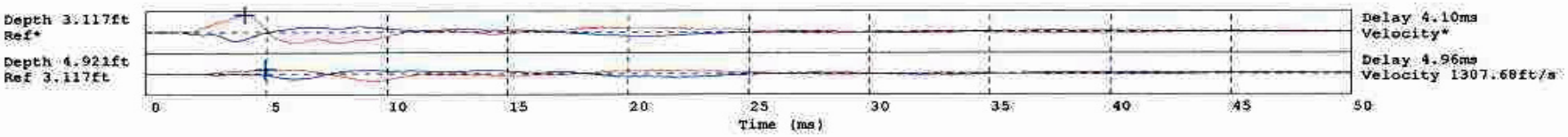
PROJECT No.: 02165
CONE/RIG : DSG0409

| DEPTH (m) | DEPTH (ft) | TIP RESISTANCE (tsf) | FRICTION RATIO (%) | SOIL BEHAVIOR TYPE | N(60) | N1(60) | Dr (%) | Su (tsf) | PHI (Degrees) |
|---|---|---|---|---|---|---|---|---|---|
| .150 | .49 | 510.06 | .52 | GRAVELLY SAND to SAND | 85 | 100 | 100 | | |
| .300 | .98 | 400.41 | .81 | SAND | 80 | 100 | 100 | | |
| .450 | 1.48 | 391.75 | .78 | SAND | 78 | 100 | 100 | | |
| .600 | 1.97 | 313.65 | .96 | SAND | 63 | 100 | 100 | | |
| .750 | 2.46 | 98.08 | 2.42 | SILTY SAND to SANDY SILT | 33 | 52 | 76 | | 48.5 |
| .900 | 2.95 | 78.23 | 2.49 | SANDY SILT to CLAYEY SILT | 31 | 50 | | 5.2 | |
| 1.050 | 3.44 | 58.04 | 2.67 | SANDY SILT to CLAYEY SILT | 23 | 37 | | 3.9 | |
| 1.200 | 3.94 | 29.17 | 5.89 | CLAY | 29 | 47 | | 1.7 | |
| 1.350 | 4.43 | 73.43 | 4.06 | CLAYEY SILT to SILTY CLAY | 37 | 59 | | 4.3 | |
| 1.500 | 4.92 | 100.64 | 3.00 | SANDY SILT to CLAYEY SILT | 40 | 64 | | 5.9 | |
| 1.650 | 5.41 | 63.43 | 3.55 | CLAYEY SILT to SILTY CLAY | 32 | 51 | | 3.7 | |
| 1.800 | 5.91 | 121.35 | 3.01 | SANDY SILT to CLAYEY SILT | 49 | 78 | | 7.1 | |
| 1.950 | 6.40 | 102.76 | 2.25 | SILTY SAND to SANDY SILT | 34 | 55 | 77 | | 45.0 |
| 2.100 | 6.89 | 91.69 | 3.55 | SANDY SILT to CLAYEY SILT | 37 | 58 | | 5.4 | |
| 2.250 | 7.38 | 125.30 | .00 | | 0 | 0 | | | .0 |
| 2.400 | 7.87 | 9.17 | .03 | SENSITIVE FINE GRAINED | 5 | 7 | | .9 | |
| 2.550 | 8.37 | 9.19 | .01 | SENSITIVE FINE GRAINED | 5 | 7 | | .9 | |
| 2.700 | 8.86 | 9.09 | ***** | | 0 | 0 | | | .0 |

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 118 pcf
ASSUMED DEPTH OF WATER TABLE = 30.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

*HOLGUIN, FAHAN & ASSOCIATES, INC.*
*Interpretations based on ROBERTSON and CAMPANELLA, 1989*

**Earth Mechanics**
**CPT-04-6C**



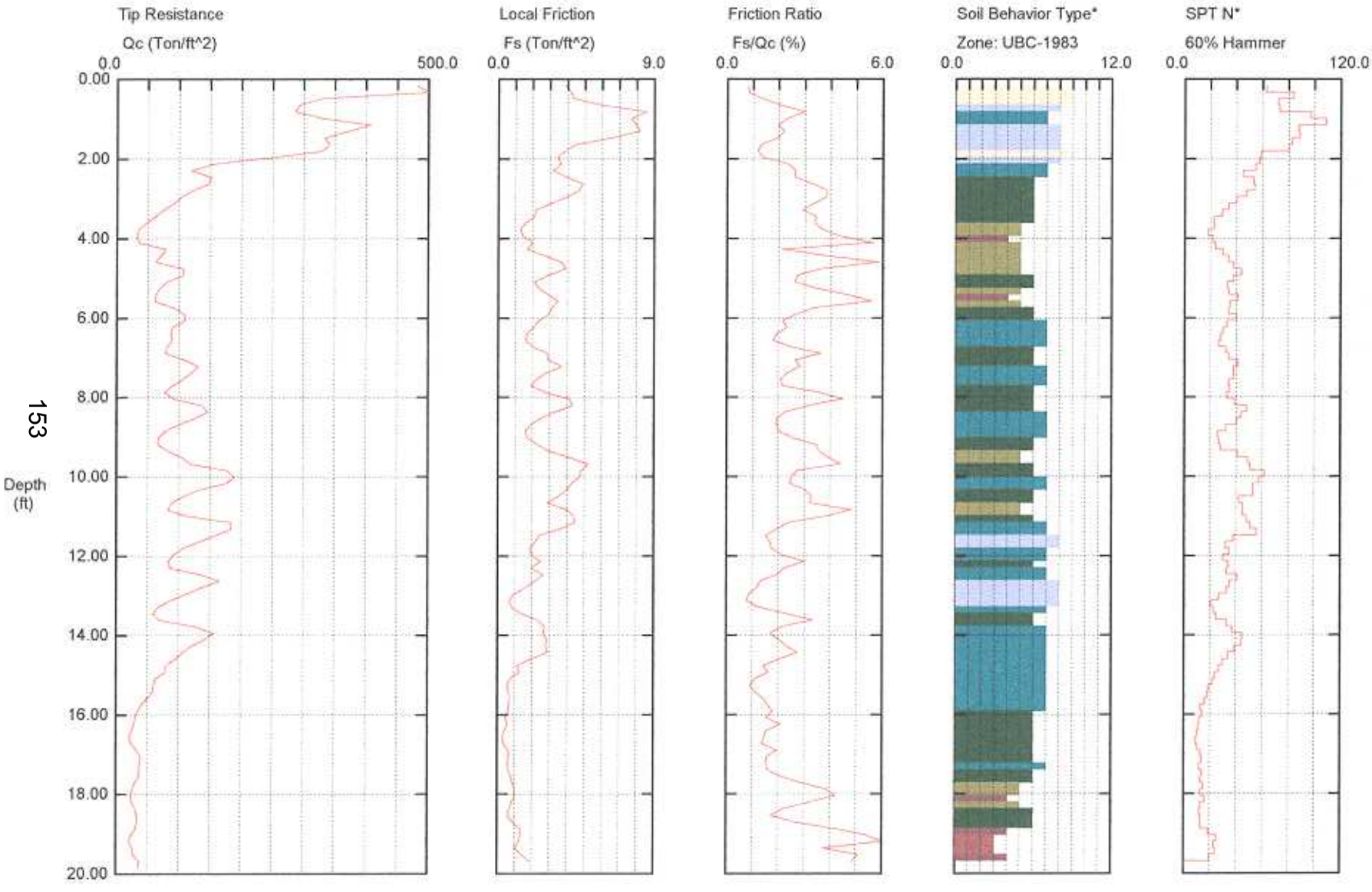

Hammer to Rod String Distance 1.524 (m)
* = Not Determined

behavior type and SPT based on data from UBC-1983

# Earth Mechanics

Operator: Bob-Victor
Sounding: CPT-04-6C
Cone Used: DSG0409

CPT Date/Time: 3/6/2004 10:39
Location: UCSD Abut Research
Job Number: 02165




Maximum Depth = 20.01 feet

Depth Increment = 0.16 feet

1 sensitive fine grained
2 organic material
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 very stiff fine grained (*)
12 sand to clayey sand (*)

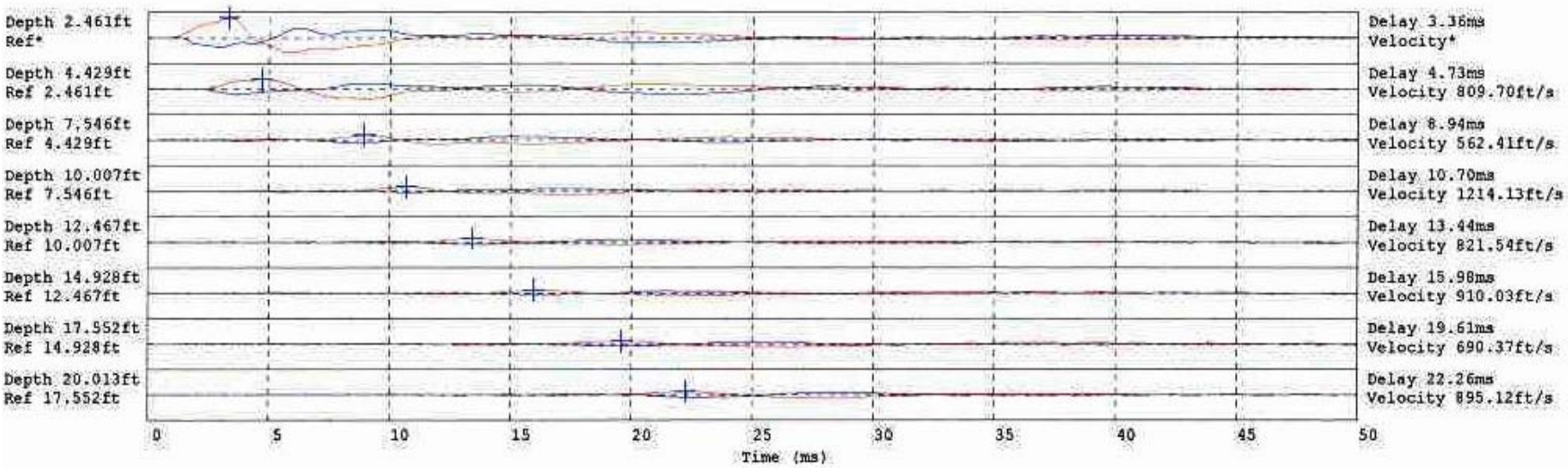
```
*****************************************************************
*                                                               *
*                    CPT  INTERPRETATIONS                       *
*                                                               *
*  SOUNDING : CPT-04-6C                  PROJECT No.: 02165     *
*  PROJECT  : UCSD Abut Resear           CONE/RIG : DSG0409     *
*  DATE/TIME: 3/6/2004  10:39                                   *
*                                                               *
*****************************************************************
```

| DEPTH (m) | DEPTH (ft) | TIP RESISTANCE (tsf) | FRICTION RATIO (%) | SOIL BEHAVIOR TYPE | N(60) | N1(60) | Dr (%) | Su (tsf) | PHI (Degrees) |
|---|---|---|---|---|---|---|---|---|---|
| .150 | .49 | 330.90 | 1.32 | SAND | 66 | 100 | 100 | | |
| .300 | .98 | 331.05 | 2.33 | SILTY SAND to SANDY SILT | 100 | 100 | 100 | | |
| .450 | 1.48 | 334.20 | 1.96 | SAND to SILTY SAND | 84 | 100 | 100 | | |
| .600 | 1.97 | 246.62 | 1.39 | SAND to SILTY SAND | 62 | 99 | 100 | | |
| .750 | 2.46 | 150.81 | 2.61 | SILTY SAND to SANDY SILT | 50 | 80 | 88 | | |
| .900 | 2.95 | 103.79 | 3.86 | CLAYEY SILT to SILTY CLAY | 52 | 83 | | 6.1 | |
| 1.050 | 3.44 | 61.08 | 3.44 | CLAYEY SILT to SILTY CLAY | 31 | 49 | | 3.6 | |
| 1.200 | 3.94 | 32.74 | 4.36 | CLAY to SILTY CLAY | 22 | 35 | | 1.9 | |
| 1.350 | 4.43 | 70.54 | 3.83 | CLAYEY SILT to SILTY CLAY | 35 | 56 | | 4.1 | |
| 1.500 | 4.92 | 107.70 | 2.71 | SANDY SILT to CLAYEY SILT | 43 | 69 | | 6.3 | |
| 1.650 | 5.41 | 63.09 | 4.63 | CLAY to SILTY CLAY | 42 | 67 | | 3.7 | |
| 1.800 | 5.91 | 110.21 | 2.66 | SILTY SAND to SANDY SILT | 37 | 59 | 79 | | 45.5 |
| 1.950 | 6.40 | 86.93 | 1.92 | SILTY SAND to SANDY SILT | 29 | 46 | 72 | | 44.5 |
| 2.100 | 6.89 | 78.27 | 3.63 | CLAYEY SILT to SILTY CLAY | 39 | 61 | | 4.6 | |
| 2.250 | 7.38 | 119.11 | 2.32 | SILTY SAND to SANDY SILT | 40 | 60 | 81 | | 45.0 |
| 2.400 | 7.87 | 76.91 | 3.55 | CLAYEY SILT to SILTY CLAY | 38 | 56 | | 4.5 | |
| 2.550 | 8.37 | 146.95 | 2.24 | SILTY SAND to SANDY SILT | 49 | 70 | 87 | | 45.5 |
| 2.700 | 8.86 | 77.96 | 2.03 | SILTY SAND to SANDY SILT | 26 | 36 | 69 | | 42.5 |
| 2.850 | 9.35 | 82.07 | 3.56 | CLAYEY SILT to SILTY CLAY | 41 | 55 | | 4.8 | |
| 3.000 | 9.84 | 177.83 | 2.72 | SILTY SAND to SANDY SILT | 59 | 78 | 91 | | 45.5 |
| 3.150 | 10.33 | 131.68 | 3.03 | SANDY SILT to CLAYEY SILT | 53 | 67 | | 7.7 | |
| 3.300 | 10.83 | 82.78 | 4.82 | *VERY STIFF FINE GRAINED | 83 | 100 | | | |
| 3.450 | 11.32 | 184.80 | 1.97 | SILTY SAND to SANDY SILT | 62 | 75 | 90 | | 45.0 |
| 3.600 | 11.81 | 107.36 | 1.75 | SILTY SAND to SANDY SILT | 36 | 43 | 74 | | 42.5 |
| 3.750 | 12.30 | 86.92 | 2.24 | SILTY SAND to SANDY SILT | 29 | 34 | 68 | | 41.5 |
| 3.900 | 12.80 | 138.43 | 1.19 | SAND to SILTY SAND | 35 | 40 | 80 | | 43.5 |
| 4.050 | 13.29 | 67.37 | 1.23 | SILTY SAND to SANDY SILT | 22 | 25 | 59 | | 39.0 |
| 4.200 | 13.78 | 126.24 | 2.15 | SILTY SAND to SANDY SILT | 42 | 47 | 77 | | 42.5 |
| 4.350 | 14.27 | 120.58 | 2.32 | SILTY SAND to SANDY SILT | 40 | 44 | 75 | | 42.0 |
| 4.500 | 14.76 | 79.48 | 1.44 | SILTY SAND to SANDY SILT | 26 | 28 | 62 | | 39.5 |
| 4.650 | 15.26 | 60.85 | .92 | SILTY SAND to SANDY SILT | 20 | 21 | 54 | | 38.5 |
| 4.800 | 15.75 | 41.05 | 1.60 | SILTY SAND to SANDY SILT | 14 | 14 | 42 | | 37.0 |
| 4.950 | 16.24 | 28.74 | 2.08 | SANDY SILT to CLAYEY SILT | 11 | 12 | | 1.9 | |
| 5.100 | 16.73 | 25.10 | 1.39 | SANDY SILT to CLAYEY SILT | 10 | 10 | | 1.9 | |
| 5.250 | 17.22 | 38.15 | 1.53 | SILTY SAND to SANDY SILT | 13 | 13 | 39 | | 36.0 |
| 5.400 | 17.72 | 30.23 | 2.93 | CLAYEY SILT to SILTY CLAY | 15 | 15 | | 1.9 | |
| 5.550 | 18.21 | 25.75 | 3.20 | CLAYEY SILT to SILTY CLAY | 13 | 12 | | 1.6 | |
| 5.700 | 18.70 | 34.20 | 2.64 | SANDY SILT to CLAYEY SILT | 14 | 13 | | 2.2 | |
| 5.850 | 19.19 | 20.89 | 6.00 | CLAY | 21 | 20 | | 1.2 | |
| 6.000 | 19.69 | 38.09 | 4.85 | CLAY | 38 | 35 | | 2.2 | |

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 118 pcf
ASSUMED DEPTH OF WATER TABLE = 30.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

*HOLGUIN, FAHAN & ASSOCIATES, INC.*
*Interpretations based on ROBERTSON and CAMPANELLA, 1989*

## Earth Mechanics
## CPT-04-6 C



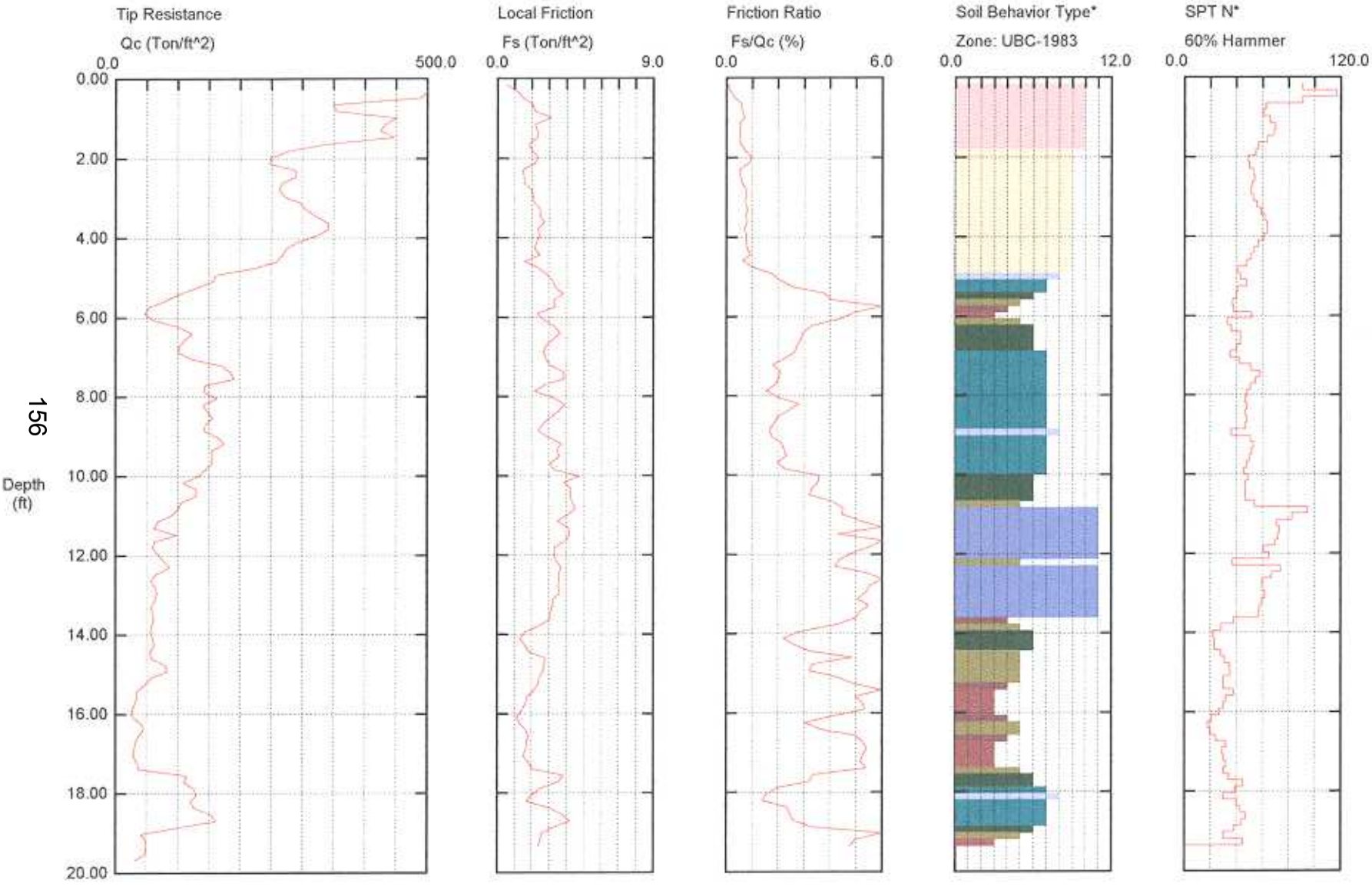

Hammer to Rod String Distance 1.524 (m)
* = Not Determined

behavior type and SPT based on data from UBC-1983

# Earth Mechanics

Operator: Bob-Victor
Sounding: CPT-04-7C
Cone Used: DSG0409

CPT Date/Time: 3/6/2004 9:03
Location: UCSD Abut ResearCH
Job Number: 02165




Maximum Depth = 19.69 feet

Depth Increment = 0.16 feet

1 sensitive fine grained
2 organic material
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 very stiff fine grained (*)
12 sand to clayey sand (*)

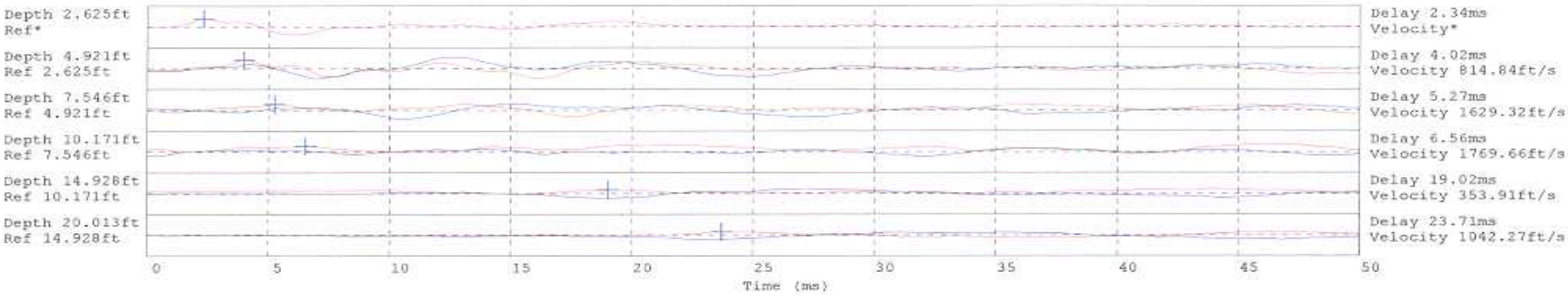
```
*****************************************************************
*                                                               *
*                    CPT  INTERPRETATIONS                       *
*                                                               *
*  SOUNDING : CPT-04-7C                  PROJECT No.: 02165     *
*  PROJECT  : UCSD Abut Resear           CONE/RIG : DSG0409     *
*  DATE/TIME: 3/6/2004   9:03                                   *
*                                                               *
*****************************************************************
```

| DEPTH (m) | DEPTH (ft) | TIP RESISTANCE (tsf) | FRICTION RATIO (%) | SOIL BEHAVIOR TYPE | N(60) | N1(60) | Dr (%) | Su (tsf) | PHI (Degrees) |
|---|---|---|---|---|---|---|---|---|---|
| .150 | .49 | 489.96 | .30 | GRAVELLY SAND to SAND | 82 | 100 | 100 | | |
| .300 | .98 | 450.88 | .70 | GRAVELLY SAND to SAND | 75 | 100 | 100 | | |
| .450 | 1.48 | 446.60 | .52 | GRAVELLY SAND to SAND | 74 | 100 | 100 | | |
| .600 | 1.97 | 249.40 | .94 | SAND | 50 | 80 | 100 | | |
| .750 | 2.46 | 290.12 | .53 | SAND | 58 | 93 | 100 | | |
| .900 | 2.95 | 269.97 | .78 | SAND | 54 | 86 | 100 | | |
| 1.050 | 3.44 | 321.80 | .77 | SAND | 64 | 100 | 100 | | |
| 1.200 | 3.94 | 323.42 | .76 | SAND | 65 | 100 | 100 | | |
| 1.350 | 4.43 | 267.63 | .92 | SAND | 54 | 86 | 100 | | |
| 1.500 | 4.92 | 162.54 | 1.77 | SAND to SILTY SAND | 41 | 65 | 90 | | 48.0 |
| 1.650 | 5.41 | 101.35 | 3.78 | CLAYEY SILT to SILTY CLAY | 51 | 81 | | 5.9 | |
| 1.800 | 5.91 | 47.30 | 4.88 | CLAY to SILTY CLAY | 32 | 50 | | 2.8 | |
| 1.950 | 6.40 | 122.88 | 2.96 | SANDY SILT to CLAYEY SILT | 49 | 79 | | 7.2 | |
| 2.100 | 6.89 | 101.76 | 2.64 | SANDY SILT to CLAYEY SILT | 41 | 64 | | 6.0 | |
| 2.250 | 7.38 | 185.39 | 2.08 | SILTY SAND to SANDY SILT | 62 | 94 | 94 | | 46.5 |
| 2.400 | 7.87 | 142.02 | 1.53 | SAND to SILTY SAND | 36 | 52 | 86 | | 45.5 |
| 2.550 | 8.37 | 148.24 | 2.38 | SILTY SAND to SANDY SILT | 49 | 70 | 88 | | 45.5 |
| 2.700 | 8.86 | 142.09 | 1.67 | SAND to SILTY SAND | 36 | 49 | 86 | | 45.0 |
| 2.850 | 9.35 | 154.69 | 2.22 | SILTY SAND to SANDY SILT | 52 | 69 | 88 | | 45.0 |
| 3.000 | 9.84 | 144.11 | 2.27 | SILTY SAND to SANDY SILT | 48 | 63 | 85 | | 44.5 |
| 3.150 | 10.33 | 129.60 | 3.31 | SANDY SILT to CLAYEY SILT | 52 | 66 | | 7.6 | |
| 3.300 | 10.83 | 100.97 | 4.51 | *VERY STIFF FINE GRAINED | 100 | 100 | | | |
| 3.450 | 11.32 | 62.66 | 6.60 | CLAY | 63 | 77 | | 3.6 | |
| 3.600 | 11.81 | 59.15 | 5.59 | CLAY | 59 | 71 | | 3.4 | |
| 3.750 | 12.30 | 87.92 | 4.21 | CLAYEY SILT to SILTY CLAY | 44 | 52 | | 5.1 | |
| 3.900 | 12.80 | 63.41 | 5.54 | CLAY | 63 | 73 | | 3.7 | |
| 4.050 | 13.29 | 58.13 | 5.49 | CLAY | 58 | 66 | | 3.4 | |
| 4.200 | 13.78 | 58.78 | 4.19 | CLAYEY SILT to SILTY CLAY | 29 | 33 | | 3.4 | |
| 4.350 | 14.27 | 62.34 | 2.60 | SANDY SILT to CLAYEY SILT | 25 | 27 | | 4.1 | |
| 4.500 | 14.76 | 81.10 | 3.34 | SANDY SILT to CLAYEY SILT | 32 | 35 | | 4.7 | |
| 4.650 | 15.26 | 48.40 | 4.88 | CLAY to SILTY CLAY | 32 | 34 | | 2.8 | |
| 4.800 | 15.75 | 30.90 | 5.27 | CLAY | 31 | 32 | | 1.8 | |
| 4.950 | 16.24 | 42.45 | 3.00 | CLAYEY SILT to SILTY CLAY | 21 | 22 | | 2.8 | |
| 5.100 | 16.73 | 32.30 | 5.26 | CLAY | 32 | 33 | | 1.8 | |
| 5.250 | 17.22 | 34.71 | 5.17 | CLAY | 35 | 34 | | 2.0 | |
| 5.400 | 17.72 | 110.42 | 3.22 | SANDY SILT to CLAYEY SILT | 44 | 43 | | 6.4 | |
| 5.550 | 18.21 | 120.39 | 1.39 | SAND to SILTY SAND | 30 | 29 | 71 | | 41.0 |
| 5.700 | 18.70 | 161.34 | 2.59 | SILTY SAND to SANDY SILT | 54 | 51 | 79 | | 42.5 |
| 5.850 | 19.19 | 49.96 | 4.96 | CLAY to SILTY CLAY | 33 | 31 | | 2.9 | |
| 6.000 | 19.69 | 30.79 | ***** | | 0 | 0 | | | .0 |

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 118 pcf
ASSUMED DEPTH OF WATER TABLE = 30.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

*HOLGUIN, FAHAN & ASSOCIATES, INC.*
*Interpretations based on ROBERTSON and CAMPANELLA, 1989*

## Earth Mechanics
## CPT-04-7C



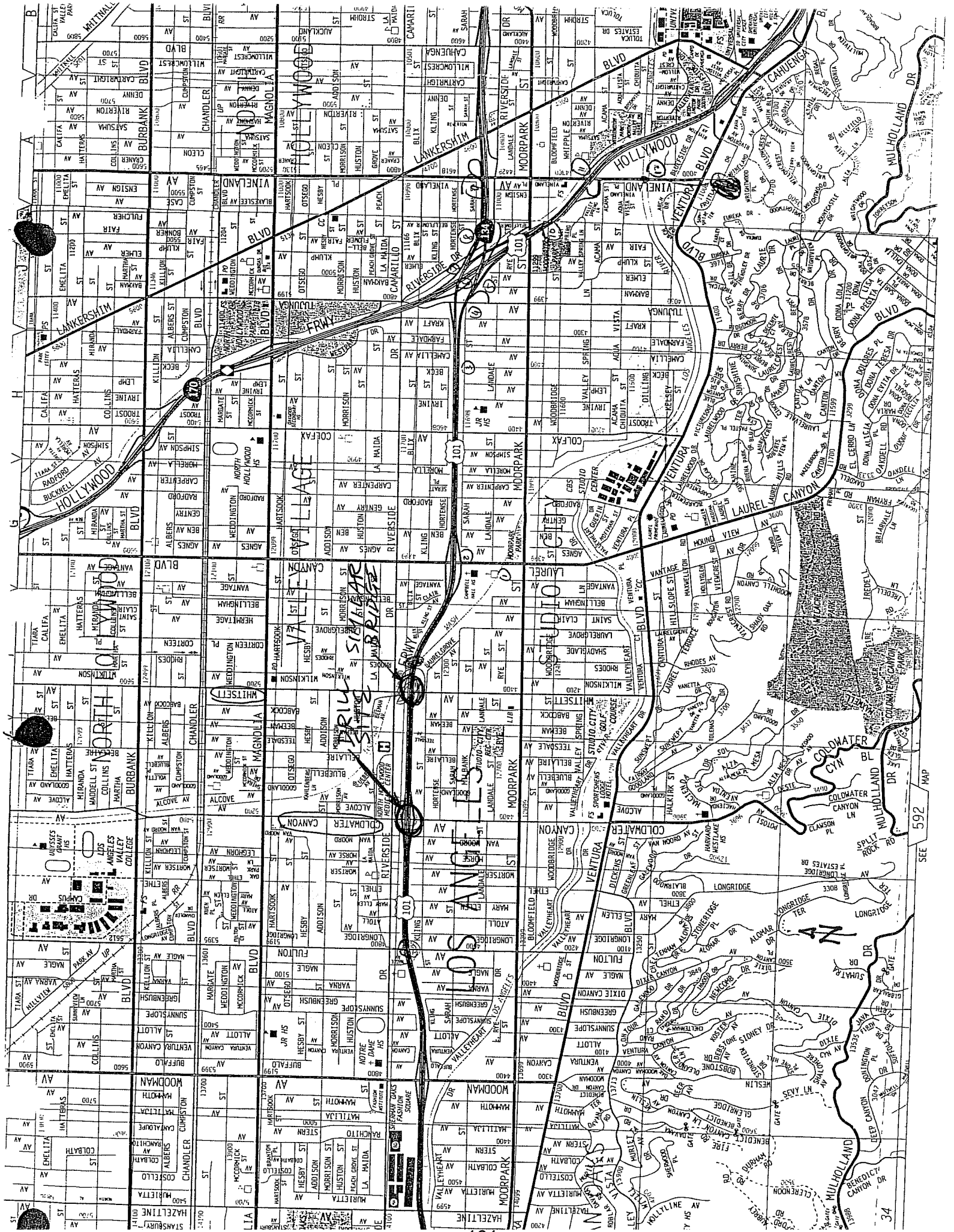

Hammer to Rod String Distance 1.524 (m)
* = Not Determined

# Caltrans Bridge 55-0131
# Coldwater Canyon, Los Angeles

## Caltrans Bridge 55-0131, Coldwater Canyon, Los Angeles

This freeway undercrossing is located in Studio City in the Los Angeles area. The 101 freeway runs on a high raised embankment in this area. The abutments are tall monolithic abutments on piles, but one has a horizontal joint with a transverse shear key (hinge) at the deck soffit level (see Abutment detail plan), which is an unusual location for Caltrans bridges. Caltrans provided plans for the adjacent Whitsett Ave UC bridge which is about 2500 ft east of the Coldwater Canyon bridge.

The field investigation for this bridge was conducted on 3/6/04 at nighttime on the EB slow-lane.and required traffic control. The investigation consisted of (2) 16.5-ft deep soil borings and (2) about 14.5-ft deep conventional and seismic CPT soundings. Drilling was performed by 2R Drilling and CPT by HFA. All locations were precored by Penhall and were about set back about 5 ft from the abutment walls. Borehole 04-9 and CPT 04-9C were performed at the west abutment, and Borehole 04-10 and CPT 04-10C were performed at the east abutment. Geotechnical soil sampling consisted of ring samples collected at 5-ft or 2.5-ft depth intervals using a Modified California sampler. Groundwater was not encountered. Seismic wave measurements were taken at 2.5-ft intervals. Three pressuremeter tests were performed in the two boreholes at 7.5, 10 and 12.5 depths.

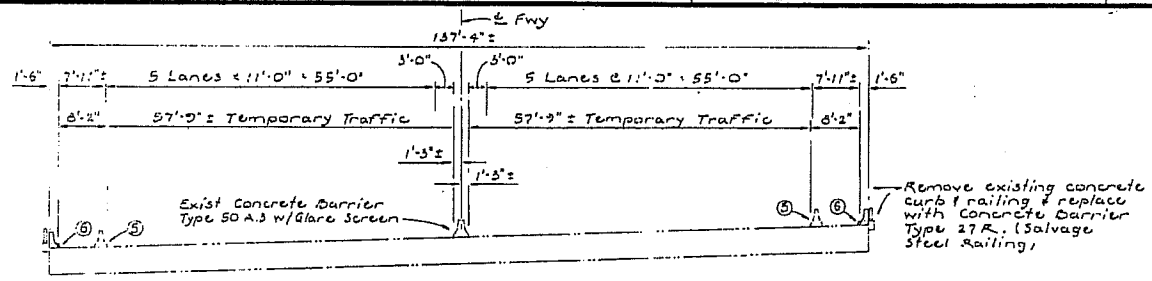

HOLLYWOOD
LANKERSHIM
VINELAND
VENTURA
CAHUENGA
MULHOLLAND
LAUREL CANYON
COLDWATER CYN
VALLEY VILLAGE
STUDIO CITY
NORTH HOLLYWOOD
LOS ANGELES
FRIULI SIMILAR BRIDGE
SHERMAN OAKS FASHION SQUARE
LOS ANGELES VALLEY COLLEGE
MAGNOLIA
BURBANK
CHANDLER
RIVERSIDE
MOORPARK
WOODMAN
HAZELTINE
VALLEYHEART
LONGRIDGE
FULTON
ALCOVE
WHITSETT
COLFAX
TUJUNGA
CAMARILLO
SARAH
LANDALE
HORTENSE
BELLAIRE
ADDISON
HESBY
HARTSOOK
MORRISON
HUSTON
GREENBUSH
SUNNYSLOPE
ALLOTT
VENTURA CANYON
BUFFALO
MARGATE
WEDDINGTON
MCCORMICK
KILLION
ALBERS
CUMPSTON
COLBATH
MURIETTA
HAZELTINE
SEE MAP 592

| DIST. | COUNTY | ROUTE | POST MILES TOTAL PROJECT | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| 07 | LA | 101 | 10.4/25.4 | 445 | 575 |

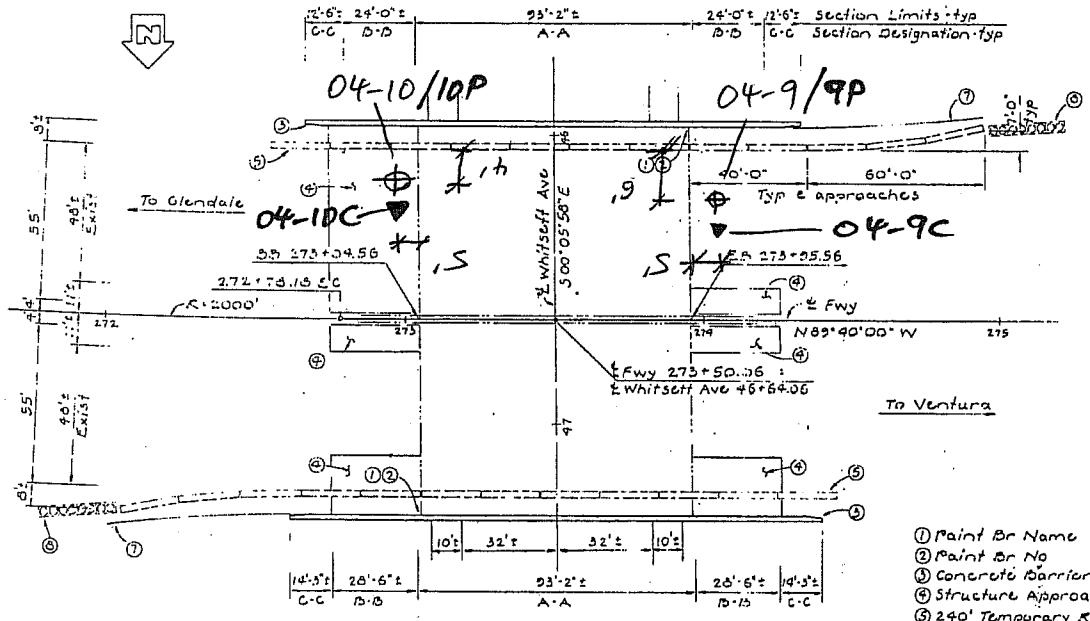
CHIEF, OFFICE OF STRUCTURE DESIGN
REGISTERED CIVIL ENGINEER

5-30-89
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER S. D. NEWELL No. 13798 Exp. 03/31/93 CIVIL STATE OF CALIFORNIA




TYPICAL SECTION
1" = 10'




PLAN
1" = 20'

BORING/PRESSUREMETER

SEISMIC CPT

APPROXIMATE QUANTITIES

| | | |
|---|---|---|
| TEMPORARY RAILING (TYPE K) | 480 | LF |
| TEMPORARY CRASH CUSHION MODULE | 14 | EA |
| SALVAGE METAL BRIDGE RAILING | 345 | LF |
| BRIDGE REMOVAL (PORTION), LOCATION 24 | LUMP | SUM |
| AGGREGATE BASE (APPROACH SLAB) | 15 | CY |
| PAVING NOTCH EXTENSION | 99 | CF |
| REFINISH BRIDGE DECK | 32 | SQFT |
| JOINT SEAL (MR 1/2") | 132 | LF |

FINAL PAY QUANTITIES

| | | |
|---|---|---|
| STRUCTURAL CONCRETE, APPROACH SLAB (TYPE R) | 147 | CY |
| CONCRETE BARRIER (TYPE 27R) | 345 | LF |

INDEX TO PLANS

| SHEET NO. | TITLE |
|---|---|
| 1 | GENERAL PLAN |
| 2 | CONCRETE BARRIER TYPE 27R |
| 3 | STRUCTURE APPROACH TYPE R(30D) |

STANDARD PLANS DATED JANUARY 1988

| | |
|---|---|
| A35-A | P.C.C. PAVING DETAILS |
| B6-21 | JOINT SEALS |
| B11-58 | TEMPORARY RAILING (TYPE K) |

AS BUILT
CORRECTIONS BY G. KIESZNER
CONTRACT NO. 07-104164
DATE 2-16-93 AS MET 10/4/93

1. Paint Br Name
2. Paint Br No
3. Concrete Barrier Type 27R
4. Structure Approach Type R(30D)-construct along exist lane lines.
5. 240' Temporary Railing (Type K)-Layout shown for railing replacement only.
6. Refinish deck
7. MBGR, see "Road Plans"
8. Temporary Crash Cushion

Standard Plan Sheet No.
Detail No.

NOTE:
THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.

RAILING REPLACEMENT & PAVEMENT REHAB

| | | | | |
|---|---|---|---|---|
| Submitted by: C17514 | DESIGN | Hasan & Okoshian | Checked: Jeffrey B. Woody | LOAD FACTOR DESIGN |
| Approval Recommended by: C-8198 | DETAILS | R. Kurata | Checked: Jeffrey B. Woody | LAYOUT |
| | QUANTITIES | Hamon R. Moch | Checked: | SPECIFICATIONS |

LIVE LOADING: HS20-44 AND ALTERNATIVE AVO PERMIT DESIGN LOAD

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES
STRUCTURE DESIGN 11
Project Engineer — Registered Civil Engineer No.

BRIDGE NO. 53-1540
POST MILE 13.39

WHITSETT AVENUE UNDERCROSSING
GENERAL PLAN

SHEET 1 OF 3

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 07
EA ~~0659B1~~ 104161

Disregard prints bearing earlier revision dates

REVISION DATES (PRELIMINARY STAGE ONLY)

(SIMILAR BRIDGE)

U-0143(4) I-083-2(4)

| FED. ROAD DIST. NO. | STATE | FISCAL YEAR | ROUTE NO. | TOTAL SHEETS |
|---|---|---|---|---|
| 7 | CALIF. | | 295 | 439 |

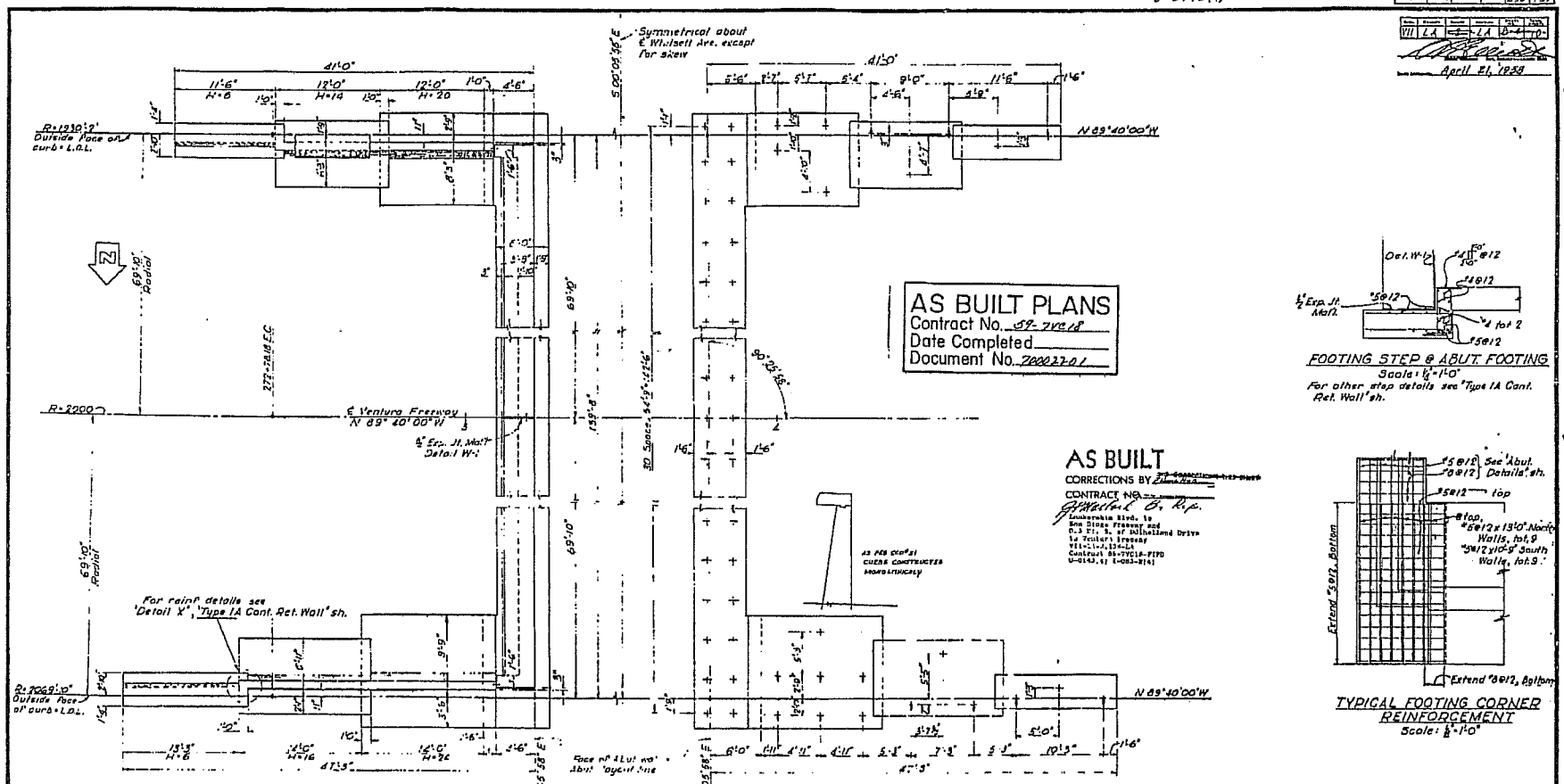
| Date | Revision | Approved | Approved | Approved | Approved |
|---|---|---|---|---|---|
| 7/11 | LA | LA | | | |

April 21, 1988

AS BUILT PLANS
Contract No. 59-7V018
Date Completed
Document No. 7000227-01

AS BUILT
CORRECTIONS BY
CONTRACT NO.
Gerstenkorn & Kip.
Snakeroka Blvd. to
San Diego Freway and
0.3 Mi. N. of Mulholland Drive
In Ventura County
Contract 59-7V018-FIFD
U-0143(4) I-083-2(4)

AS PER CONTRACT CURB CONTINUES HORIZONTALLY




PLAN

FOOTING LAYOUT
Abut. 1 shown, Abut. 2 similar except for skew.
Wall dimens. shown are meas. along L.O.L.

PILE LAYOUT
Abut. 1 shown, Abut. 2 similar except for skew.

"Notes"
+ Indicates Vertical Pile
+ " Batter Pile (1:3)
Batter every other pile in each row
Abut. Fig except as shown.
For wall details not shown see Type 1A Cont. Ret. Wall sh.




FOOTING STEP @ ABUT. FOOTING
Scale: ½"=1'-0"
For other step details see Type 1A Cont. Ret. Wall sh.



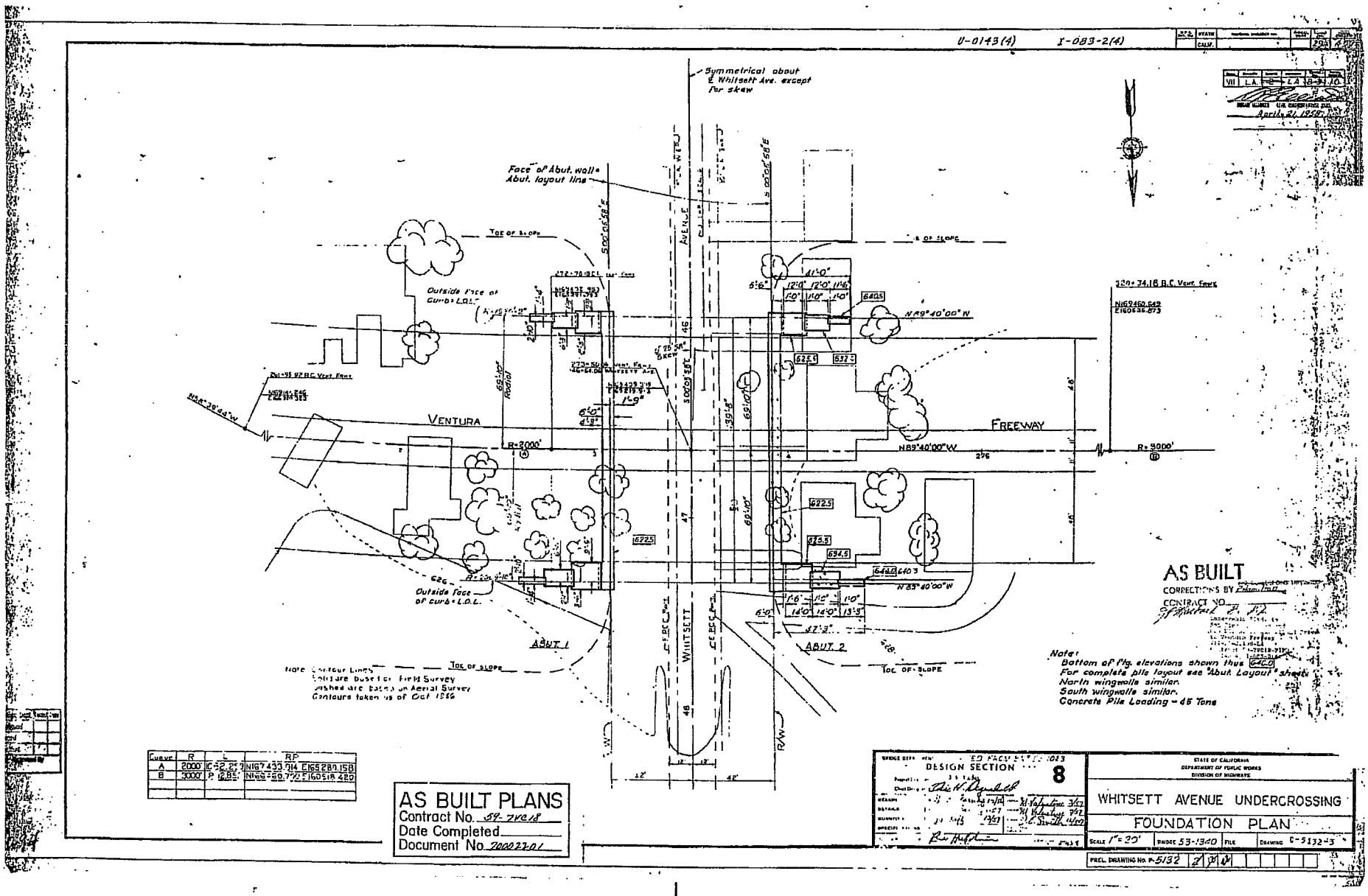

TYPICAL FOOTING CORNER REINFORCEMENT
Scale: ½"=1'-0"

| Bridge Designation 4: 4P-EC FROM 8P 53-1068 | STATE OF CALIFORNIA DEPARTMENT OF PUBLIC WORKS DIVISION OF HIGHWAYS |
|---|---|
| DESIGN SECTION 8 | WHITSETT AVENUE UNDERCROSSING |
| | ABUTMENT LAYOUT |
| | Except as shown SCALE 3/32"=1'-0" BRIDGE 53-1340 FILE DRAWING 6-5132-A |
| | PRCL. DRAWING NO. 5132 |

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF PUBLIC WORKS.
DATE 7/24/91 SIGNATURE TITLE



295




| Curve | R | L | RP |
|---|---|---|---|
| A | 2000' | C-52.25' | N167 433.014 E165 280.158 |
| B | 3000' | P 12.85' | N166 460.792 E160 518.420 |

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF PUBLIC WORKS.

DATE 9/24/71 SIGNATURE [illegible] TITLE [illegible]



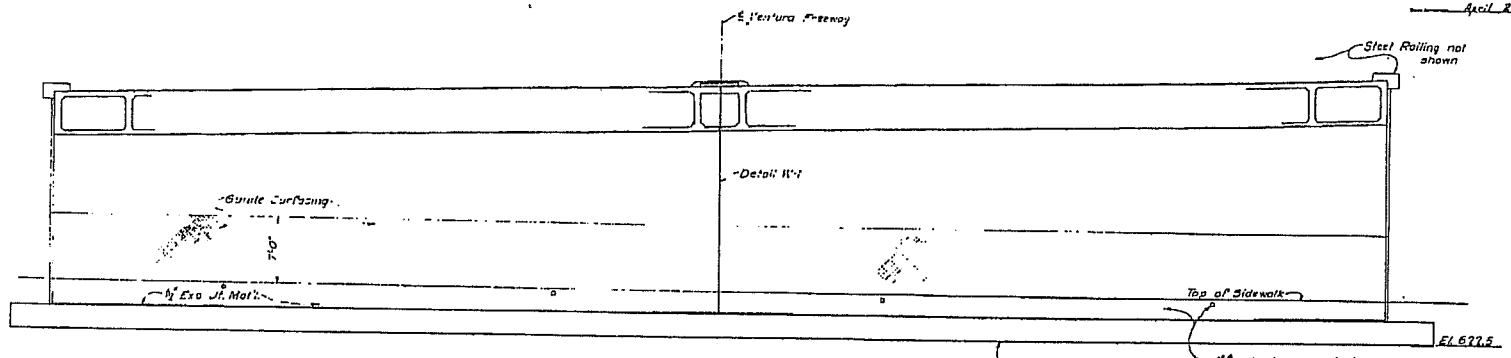
CMPDF - www.ls-tm.com

U-0143(4) I-083-2(4)

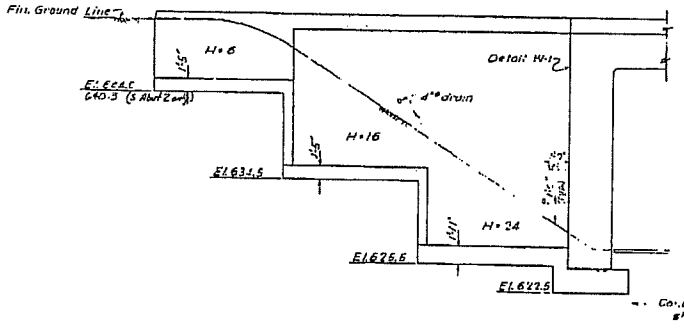
| FED. ROAD DIST. NO. | STATE | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|
| 7 | CALIF. | | 297 | 439 |

| DIST. | SUBMITTED | | | | | |
|---|---|---|---|---|---|---|
| VII | LA | | LA | B-6 | 10 | |

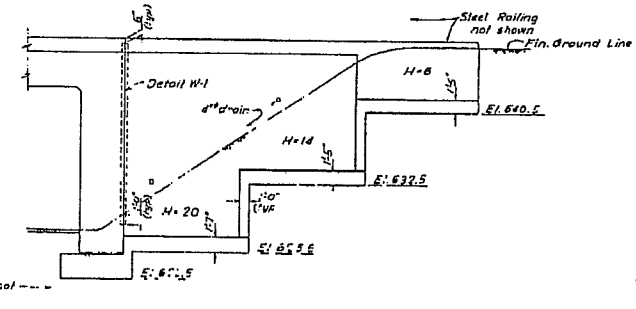
April 21, 1958




ELEVATION-ABUTMENT 2
(Abut. 1 similar)




NORTH WINGWALL ABUTMENT 1
(North wall Abut 2 similar)




SOUTH WINGWALL ABUTMENT 1
(South wall Abut. 2 similar)

AS BUILT
CORRECTIONS BY E. Hamilton
CONTRACT NO.
Lankershim Blvd. to San Diego Freeway and 0.3 Mi. S. of Mulholland Drive to Ventura Freeway
VII-LA-2,158-LA
Contract 59-7V018-FIFO
U-0143(4) I-083-2(4)

AS BUILT PLANS
Contract No. 59-7V018
Date Completed
Document No. 700022-01

Note: For wall details not shown see "Type 1A Cont. Ret. Wall" & "Abut. Layout" sheets. Wall "H" values are for determining wall & flg. reinf. only. For curb details & tap of wall see "Mis. Data" sheet.

BRIDGE DEPARTMENT ADAPTED FROM BR. # 53-1063
DESIGN SECTION 8

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

WHITSETT AVENUE UNDERCROSSING

ABUTMENT & WINGWALL ELEVATIONS

Except as noted SCALE 3/16" = 1'-0" | Bridge 53-1340 | File | Drawing C-5132-6

PREL. DRAWING No. P-5132

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF PUBLIC WORKS.

DATE 9/24/71 SIGNATURE [signature] TITLE HAC II



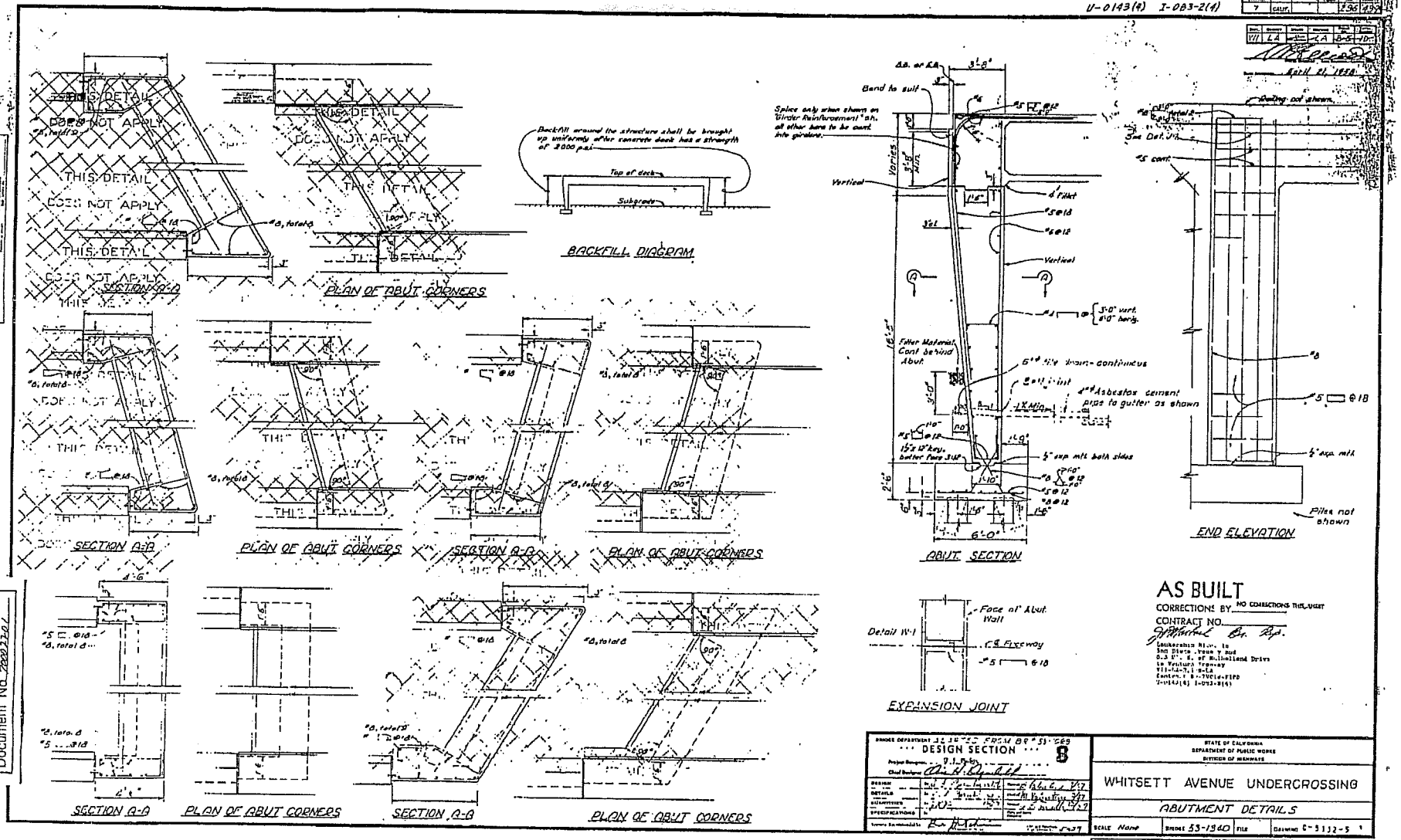
297

U-0143(4) I-083-2(4)

| District | State | Route | Sheet | Total Sheets |
|---|---|---|---|---|
| 7 | CALIF. | | 2.96 | 4.96 |

| Rev. | Revision | Date | Initials |
|---|---|---|---|
| W1 | LA | 4-21-70 | CA 8-5-70 |

April 21, 1970




AS BUILT
CORRECTIONS BY NO CORRECTIONS THIS SHEET
CONTRACT NO.

AS BUILT PLANS
Contract No. 53-71260
Date Completed
Document No. 2002202

BRIDGE DEPARTMENT 53-19-55 FROM 88-53-569
DESIGN SECTION 8
Project Engineer
Chief Bridge

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

WHITSETT AVENUE UNDERCROSSING

ABUTMENT DETAILS

SCALE None | BRIDGE 53-1960 | FILE | Drawing C-53132-5

PREL. DRAWING No. P. 6132-U-5

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF PUBLIC WORKS.

DATE 9/24/01 SIGNATURE TITLE HAC II



296

#47

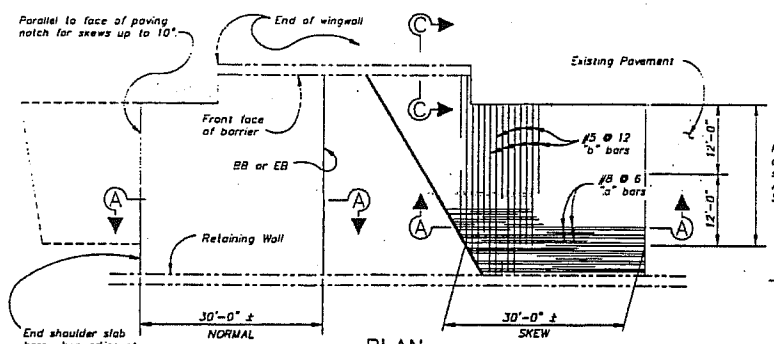
| DIST. | COUNTY | ROUTE | POST MILES TOTAL PROJECT | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| 07 | LA | 101 | 10.4/25.4 | 447 | 575 |

REGISTERED ENGINEER - CIVIL

5-30-89

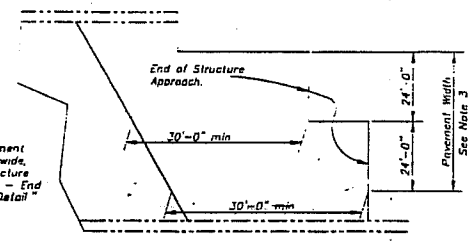
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER F.M. SEMANS C 17514 6-30-89 CIVIL STATE OF CALIFORNIA



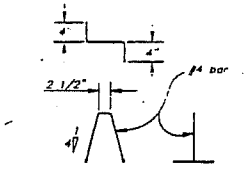

PLAN

1" = 10'



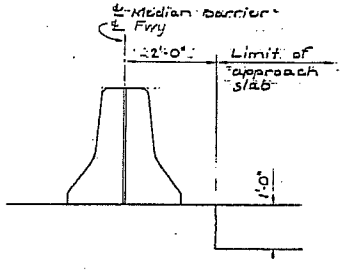

STRUCTURE APPROACH – END STAGGER DETAIL

No Scale

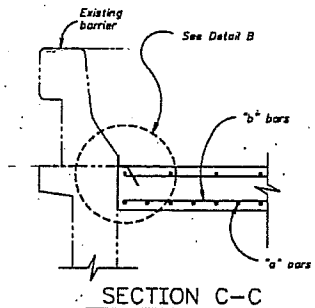



BAR CHAIR DETAIL

1" = 1'-0"

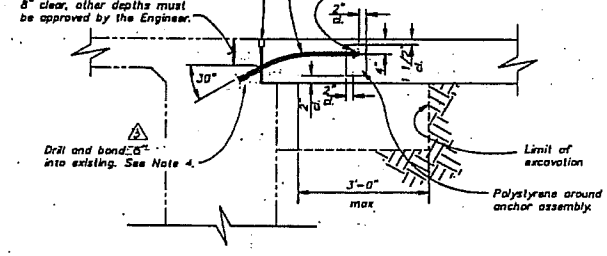



SECTION AT MEDIAN BARRIER



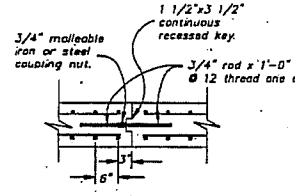

SECTION C–C

3/4" = 1'-0"




TIE DETAIL

3/4" = 1'-0"

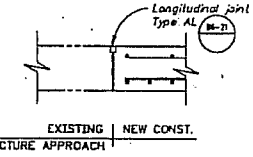



AS BUILT

CORRECTIONS BY G. KIRZHNER

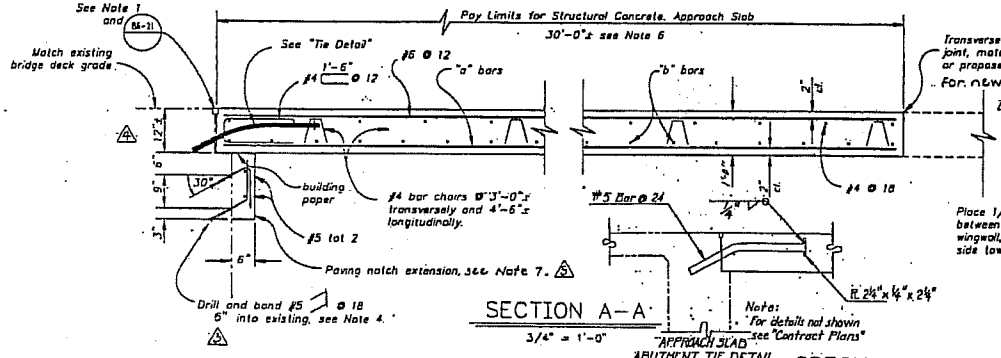
CONTRACT NO. 07-104164

DATE 2-16-93 04 MET 10/4/93




LONGITUDINAL CONSTRUCTION JOINT ALTERNATIVES

3/4" = 1'-0"



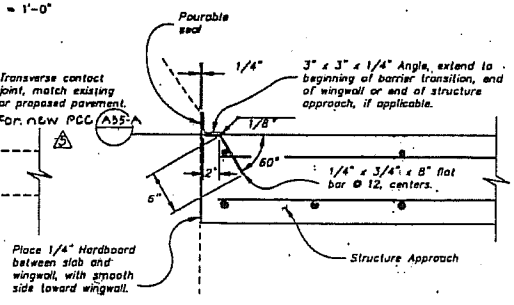

SECTION A–A

3/4" = 1'-0"

Note: For details not shown see "Contract Plans"

APPROACH SLAB ABUTMENT TIE DETAIL

SPECIAL DETAIL




DETAIL B

1-1/2" = 1'-0"

NOTE:
THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.

## NOTES

1. ~~Sealed joint for MR5 (Movement Rating) ± 1/2" (Type A Seal) reinforcement to clear a sawcut for sealed joint when required.~~
2. #5 bar may be substituted for 3/4" rod. Place rod or bar parallel to ℄ roadway.
3. Structure Approach to skewed structures shall be staggered at lane lines. Staggered lines may be 24' or 36' apart for skews of 45° or less and at any lane line for skews greater than 45°.
4. Space to avoid existing prestress anchorages and main reinforcement.
5. Longitudinal construction joints shall be permitted as approved by the Engineer.
6. Transverse contact joint shall be a minimum of 5' from an existing or constructed weakened plane joint.
7. Paving notch extension is required when the existing paving notch is less than 6" wide.

| STANDARD DRAWING | | | |
|---|---|---|---|
| FILE No. XS 22-19 | DESIGN | BY | Checked |
| DRAWING | DETAILS | BY | Checked |
| DATE REVISED | SUBMITTED BY | | Approved Recommended By |

1 Delete detail
2 New detail
3 Revise dim
4 Delete note
5 Revise note
6 New note

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES
STRUCTURE DESIGN 11

BRIDGE No. 53-1340

POST MILE 13.30

WHITSETT AVENUE UNDERCROSSING

STRUCTURE APPROACH TYPE R(30D)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS

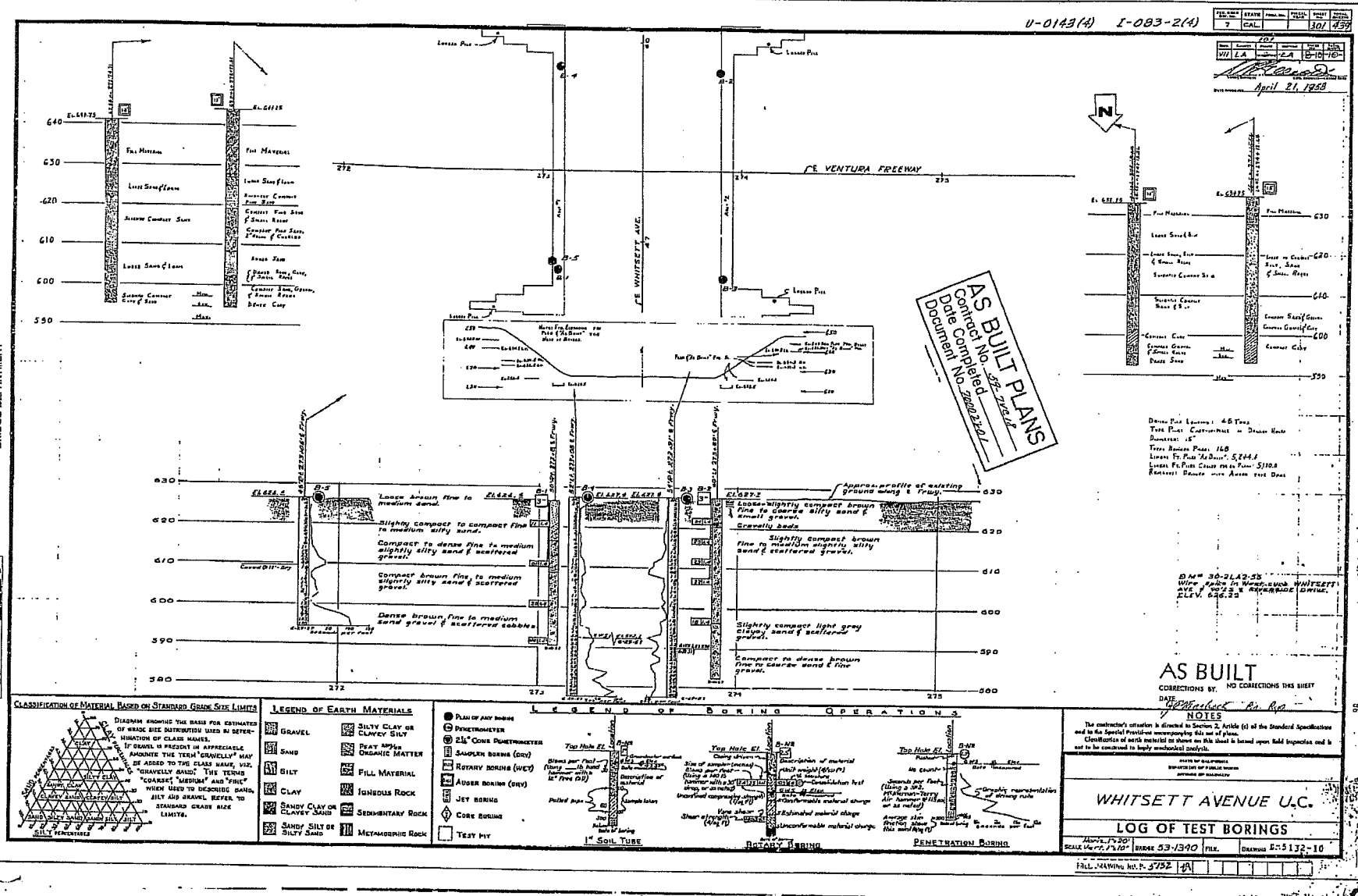
CU 07
EA ~~065981~~ 104161

Disregard prints bearing earlier revision dates

REVISION DATES (PRELIMINARY STAGE ONLY)

SHEET 3 OF 3

167




I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF PUBLIC WORKS.

DATE 7/24/71 SIGNATURE [signature] TITLE HAC II



CAPDIF - www.bastin.com

# LOG OF BORING NO. ( 04-9 )

E/B West Abut.

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

| | | | | | |
|---|---|---|---|---|---|
| Project Name | : | CT / UCSD - Abutment Research | | | |
| Project Location | : | North Hollywood, CA (101 FWY @ Coldwater Canyon Rd.) | | | |
| E.M.I. Project No. | : | 02-165 | Site Condition : | FWY Bridge Abut | |
| Weather | : | Night | Elevation : | | |
| Traffic Control | : | N/A (provided by other) | Operator : | | |
| Drilling Company | : | 2R DRILLING | Operator : | Brian / Ron | |
| Type of Rig | : | CME 55 AUTO HAMMER | Drop (in) : | 30.0 | |
| Borehole Diameter (inch) | : | 8" | Drive Wt. (lbs) : | 140.0 | |
| Logged By | : | R.J. | Date Drilled : | 4-19-04 | |

Comments : 5' West of joint; 4' off lane

Backfilled With : Cuttings + Cement

| | Time | | | | | | | | | | Back to Office | Proposed Depth |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Depature | Arrival | Start | Break | Rework | Lunch | Rework | Break | Finish | Off | | 15.0 |
| Driller | | 1050 | 1200 | | | | | | | | | Water Table |
| Traffic Control | | | | | | | | | | | | — ft |
| Logger | | | | | | | | | | | | Caving |
| Total | | | | | | | | | | | | — ft |

| Depth (ft) | Sampler Type (Bulk, Drive, SPT, Tube) | Sample Number | Sample Type (B/D/S.B./T) | Blows/6" | Recovery (inch) | U.S.C.S. | Color | Description (ASTM D-2488-93): 3 1/4" O.D. pavement; 1" A/c, 12" Concrete, 11" base | Moisture State (Dry, Moist, Wet) | Max. Size | Grain Size (%) Gravel : Sand : Fines | Sand Size | Plasticity | Consistency | Cementation | O²/LEL/PID |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | B | 0 | | | | SPSM | Yel. brw w/ brn | SAND w/ silt and gvl to 1 1/2 F.C. pa | M | 1 1/2 | 25:7 | F-C | N.P. | | | |
| 2.5 | | | | | | | | | | | | | | | | |
| 5 | D | 1 | | 8 12 19 | 12/18 | SPSM | Brw to ol. brw | SAND w/ silt F-C pa gvl to 1/2" | M | 1/2 | 5:95:5 | F-C | N.P. | M.D | N | |
| 7.5 | | | | | | | | | | | | | | | | |
| 10 | D | 2 | | 6 10 9 | 12/18 | SP | Brw to ol. brn | SAND F-C pa gvl to 3/4 | M | 3/4 | 7:90:3 | F-C | N.P. | L | N | |
| 15 | D | 3 | | 5 5 5 | 14/18 | SP | | SAND | | | : : | | | | | |
| | | | | | | | | T.D 16.5' no G/W encountered | | | | | | | | |
| 20 | | | | | | | | | | | : : | | | | | |
| 25 | | | | | | | | | | | : : | | | | | |

+33" MT 1

1.5 ft + 29" of 5 ft

# LOG OF BORING NO. ( 04-10 )

E/B East Abut.

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

| | | | |
|---|---|---|---|
| Project Name | : CT / UCSD - Abutment Research | | |
| Project Location | : North Hollywood, CA (101 FWY @ Coldwater Canyon Rd.) | | |
| E.M.I. Project No. | : 02-165 | Site Condition : | FWY Bridge Abut. |
| Weather | : | Elevation : | |
| Traffic Control | : N/A (provided by other) | Operator : | |
| Drilling Company | : 2R DRILLING | Operator : | Brian / Ray |
| Type of Rig | : CME 55 AUTO HAMMER | Drop (in) : | 30.0 |
| Borehole Diameter (inch) | : 8" | Drive Wt. (lbs) : | 140.0 |
| Logged By | : R.J. | Date Drilled : | 4-19-04 |

**Comments :**

5 East of Joint

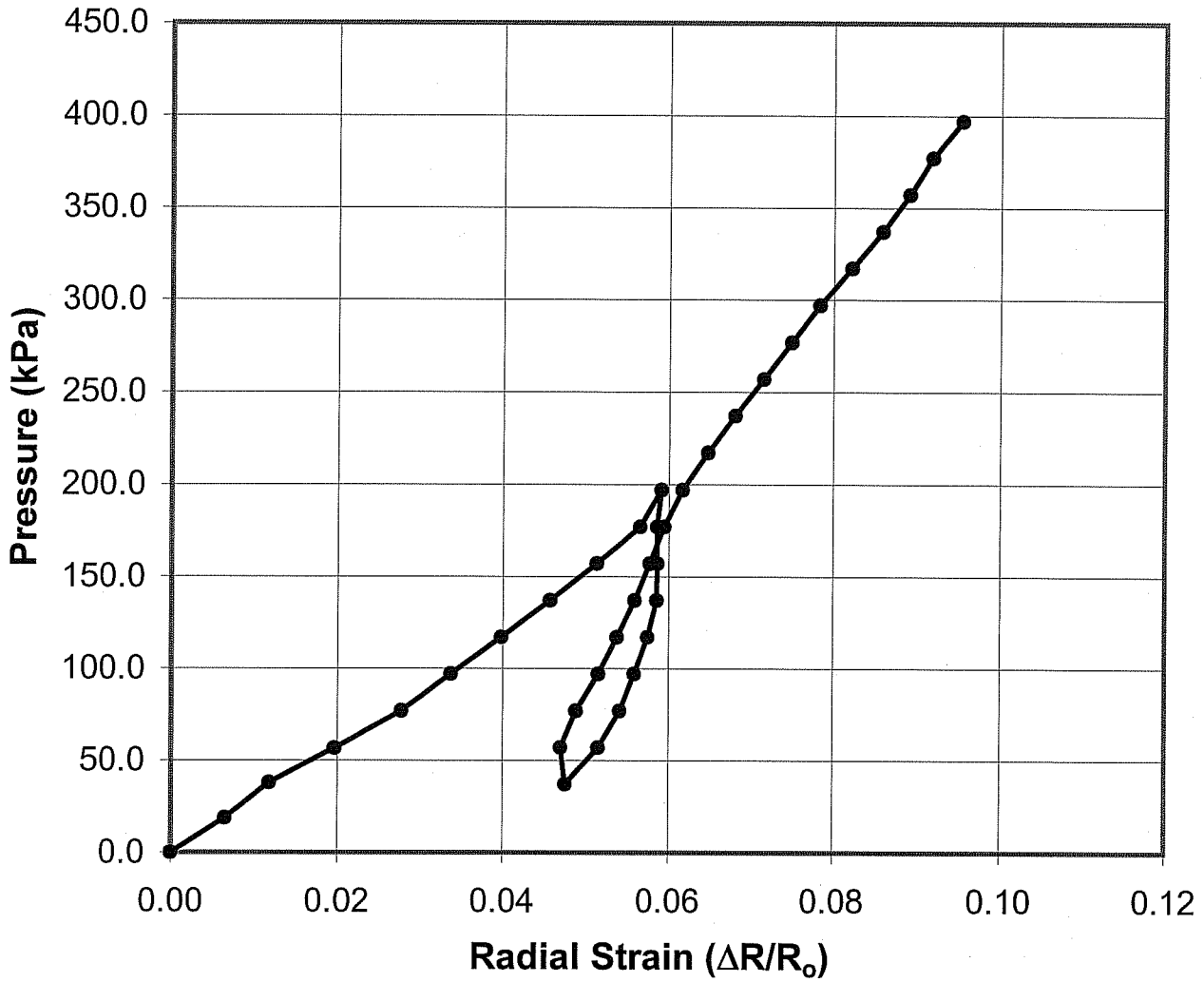
4 off lane

Backfilled With : Cuttings + Cement

| | Time | | | | | | | | | | Back to Office | Proposed Depth |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Depature | Arrival | Start | Break | Rework | Lunch | Rework | Break | Finish | Off | | 15.0 |
| Driller | | 0216 | 0233 | | | | | | | 0355 | | Water Table |
| Traffic Control | | | | | | | | | | | | — ft |
| Logger | | | | | | | | | | | | Caving |
| Total | | | | | | | | | | | | — ft |

| Depth (ft) | Sampler Type (Bulk, Drive, SPT, Tube) | Sample Number | Sample Type (B/D/S.B./T) | Blows/6" | Recovery (inch) | U.S.C.S. | Color | Description (ASTM D-2488-93) | Moisture State (Dry, Moist, Wet) | Max. Size | Grain Size (%) Gravel : Sand : Fines | Sand Size | Plasticity | Consistency | Cementation | $O^2$/LEL/PID |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 1" a/c 12" Concrete 13" base 3 1/4" O.D. Sampler | | | | | | | | |
| 0 | B | 0 | | | | SP-SM | Yel. brn to brn | Sand w/ silt and grl. to 1/2 F.C. pa | M | 1 1/2 | 6:89:5 | F.C. | N.P. | | | |
| 2.5 | | | | | | | | | | | | | | | | |
| 5 | D | 1 | | 13 9 10 | 12/18 | SP-SM | Brn | SAND w/ silt and grl. to 3/4 F.C. pa | M | 3/4 | 7:88:5 | F.C. | N.P. | M.D. | N | |
| 7.5 | D | 2 | | 16 10 8 | 12/18 | SP-SM CL | Red. brn | SAND/CLAY w/ tr. grl. to 3/4 L P.I. | M | 3/4 | 3:32:65 | F.M. | L | MD Stiff | | |
| 10 | | | | | | | | | | | : : | | | | | |
| 12.5 | D | 3 | | 4 6 12 | 12/18 | SP | Brn. | SAND w/ grl to 1" F.C. pa | M | 1" | 7:90:3 | F.C. | N.P. | M.D. | N | |
| 15 | D | 4 | | 5 8 16 | 12/18 | SP CL | Brn to Yel. brn | 1" SAND LEAN CLAY w/ silt & F. pa. tr. grl. to 3/4. sl. oxidation L P.I. | M | 3/4 | 4:36:60 | F. | L | ST. | N | |
| 20 | | | | | | | | T.D. 16.5' No G/W encountered | | | | | | | | |
| 25 | | | | | | | | | | | : : | | | | | |

# Pressuremeter Test Result



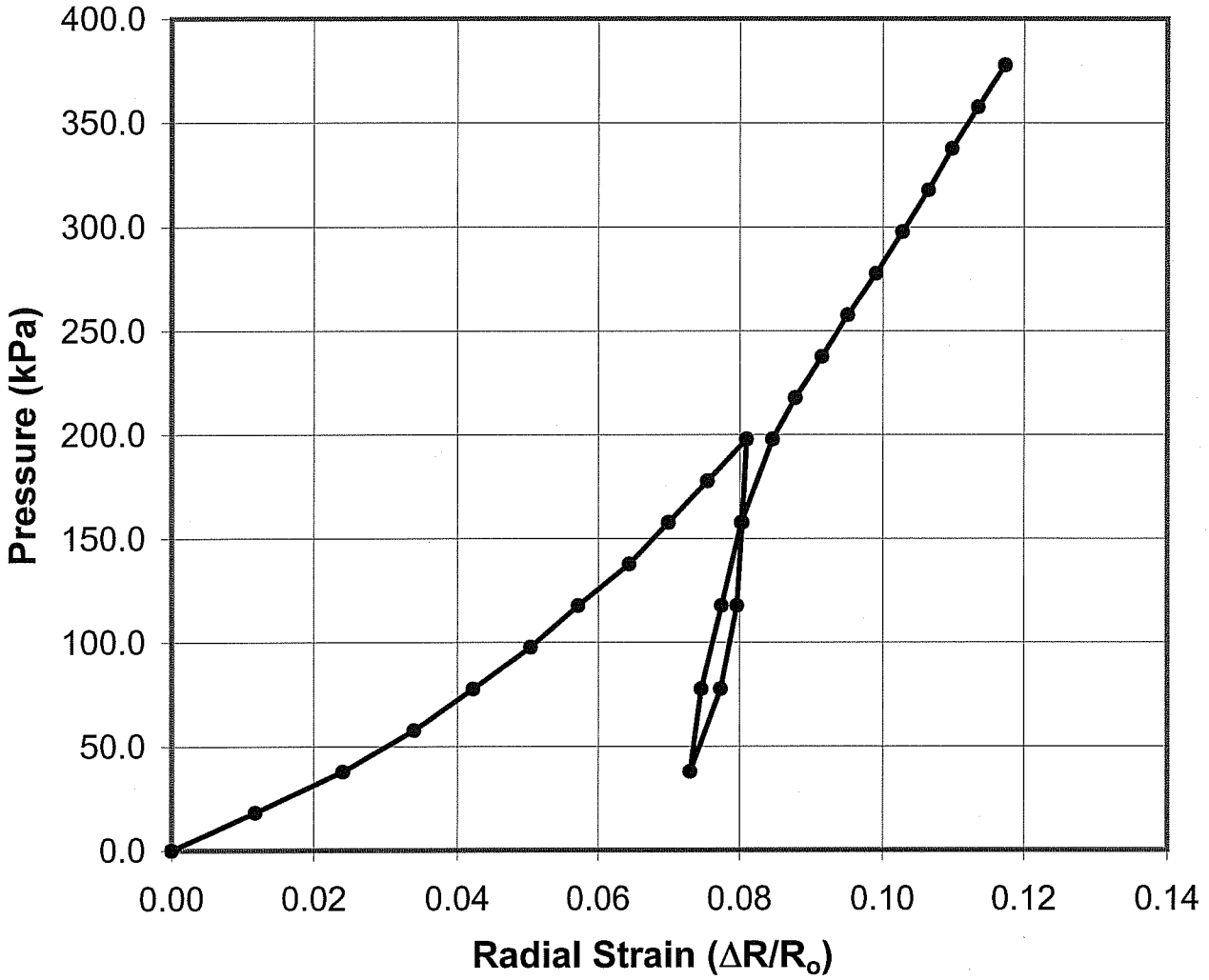

| | |
|---|---|
| Boring No.: | **04-9P** |
| Location: | **Coldwater Canyon** |
| | **Los Angeles County** |
| Test Date: | **4/19/04** |
| Test Depth: | **7.5 ft** |
| Soil Type: | **Poorly Graded Sand with Silt and Gravel** |

**Earth Mechanics, Inc.**
Geotechnical and Earthquake Engineering

**CALTRANS-UCSD / Abutment Research**

Project No : 02-165 | Date : 12/22/2004

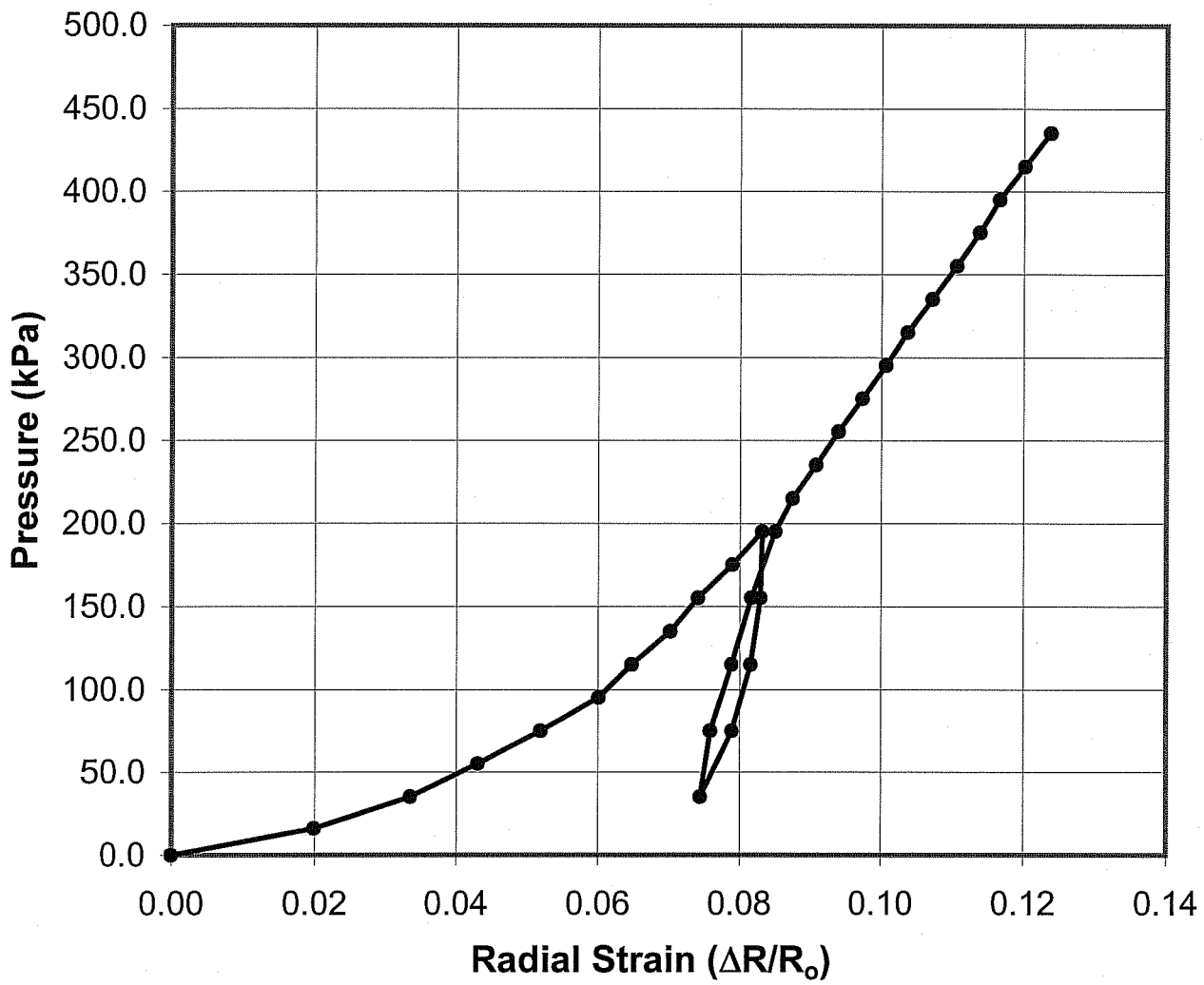
# Pressuremeter Test Result




| | |
|---|---|
| Boring No.: | **04-9P** |
| Location: | **Coldwater Canyon** |
| | **Los Angles County** |
| Test Date: | **4/19/04** |
| Test Depth: | **12.5 ft** |
| Soil Type: | **Poorly Graded Sand with Gravel** |

| | | |
|---|---|---|
| Earth Mechanics, Inc.<br>Geotechnical and Earthquake Engineering | **CALTRANS-UCSD / Abutment Research** | |
| | Project No : 02-165 | Date : 12/22/2004 |

# Pressuremeter Test Result




| | |
|---|---|
| Boring No.: | **04-10P** |
| Location: | **Coldwater Canyon** |
| | **Los Angeles County** |
| Test Date: | **4/19/04** |
| Test Depth: | **7.5 ft** |
| Soil Type: | **Poorly Graded Sand with Silt and Gravel** |

| | | |
|---|---|---|
| Earth Mechanics, Inc.<br>Geotechnical and Earthquake Engineering | **CALTRANS-UCSD / Abutment Research** | |
| | Project No : 02-165 | Date : 12/22/2004 |

HOLGUIN, FAHAN & ASSOCIATES, INC.
ENVIRONMENTAL MANAGEMENT CONSULTANTS
948 North Lemon Street, Orange, CA 92867 (714)-210-5971 FAX (714) 210-5975

April 16, 2004



Mr. (Raj) S. Varatharaj
Earth Mechanics, Inc.
17660 Newhope St, Suite E
Fountain Valley, CA 92708

**PROJECT NAME:** CPT Testing at UCSD Abut Research-Coldwater Canyon;
**PROJECT NO.:** 02-165

Dear Mr. Varatharaj: M. K.

Enclosed please find copies of the cone penetrometer testing (CPT) data for the above referenced project along with a copy of the corresponding invoice.

The cone penetrometer testing conducted for this project consisted of pushing an instrumented cone-tipped probe into the ground while simultaneously recording the resistance to penetration at the cone tip and along the friction sleeve.

The cone penetrometer testing described in this report was conducted in general accordance with the current ASTM specifications (ASTM D5778-95 and D3441-94) using an electronic cone penetrometer.

The CPT equipment operated by Holguin, Fahan & Associates, Inc. (HFA) consists of a cone assembly mounted at the end of a series of hollow sounding rods. A set of hydraulic rams is used to continuously push the cone and rods into the soil at a rate of 20-mm per second (approximately four feet per minute) while the cone tip resistance and sleeve friction resistance are recorded every 50-mm (approximately two inches) and stored in digital form. A specially designed all wheel drive 23-ton truck provides the required reaction weight for pushing the cone assembly and is also used to transport and house the test equipment.

The cone penetrometer assembly used for this project consists of a conical tip and a cylindrical friction sleeve. The conical tip has a 60° apex angle and a diameter of 35.6-mm (1.40-inch) resulting in a projected cross-sectional area of 10 $cm^2$ (1.5 square inches). The cylindrical friction sleeve is 133-mm (5.25-inch) in length and has an outside diameter of 35.8-mm (1.41-inch), resulting in a surface area of 150 $cm^2$ (23 square inches).

The interior of the cone penetrometer is instrumented with strain gauges that allow simultaneous measurement of cone tip and friction sleeve resistance during penetration. Continuous electric signals from the strain gauges are transmitted by a shielded cable in the sounding rods to the PC-based data acquisition hardware in the CPT truck. The sounding log is also displayed on a monitor.

The CPT data processing is performed using the truck mounted computer based data acquisition and presentation system. The computer generated graphical logs include cone resistance, friction resistance, friction ratio, and pore pressure ratio versus depth at a user selectable scale.

Soil behavior type interpretations are based on the following reference: Robertson, P.K. and Campanella, R.C., 1989, "Guidelines for Geotechnical Design using the Cone Penetrometer Test and CPT with Pore Pressure Measurement." Soil Mechanics series No. 120, Civil Engineering Department, University of British Columbia, Vancouver, B.C., V6T 1Z4, September 1989.

Interpretations and plotting has been done using HFA's proprietary data interpretation and presentation software. It is important to note that the data is not averaged. All interpretations are point interpretations at the corresponding depth listed.

It is also important to note that the soil behavior type correlations are based on a combination of theory, field research, research performed under laboratory conditions, and literature review. The information presented in the tabulated and/or graphical logs should, therefore, be viewed as a guideline rather than as precise measurements.

Some care is recommended when using the soil behavior type interpretations. If a tabulation depth happens to fall on a soil layer interface, or a seam of soil differing from the rest of the layer, the tabulated data can be misleading. The solution to this problem is the proper use of the graphical CPT logs. The tip and sleeve penetration resistance logs are the primary source of profile description; the soil behavior type logs are supplemental. The graphical logs of tip and sleeve resistance should be examined and layer boundaries delineated in accordance with the project requirements. The soil behavior type interpretations are only representative of the response of the soil to the large shear deformations imposed during cone penetration. This is not necessarily a prediction of grain size distribution. However, it has been found that the interpreted soil behavior types generally agree well with the soil types defined in accordance with the grain size distribution methods such as used in the Unified Soil Classification System.

Limitations

Holguin, Fahan & Associates, Inc. (HFA) presents the attached data in accordance with ASTM Standards D5778-95 and D3441-94 and generally accepted cone penetrometer testing practices and standards. The attached data further relates only to the specific project and location discussed in the data. Judgement may be required to verify the CPT soil behavior interpretations.

The "Client" may distribute this data or excerpts therefrom provided the following statement is prominently displayed and included with the distribution:

"Neither CLIENT nor HFA make any guarantee or warranty, express or implied, regarding this data. THE USE OF THIS INFORMATION SHALL BE AT THE USER'S SOLE RISK REGARDLESS OF ANY FAULT OR NEGLIGENCE OF THE CLIENT OR HFA."

Please feel free to call if you have any questions.

Respectfully submitted,

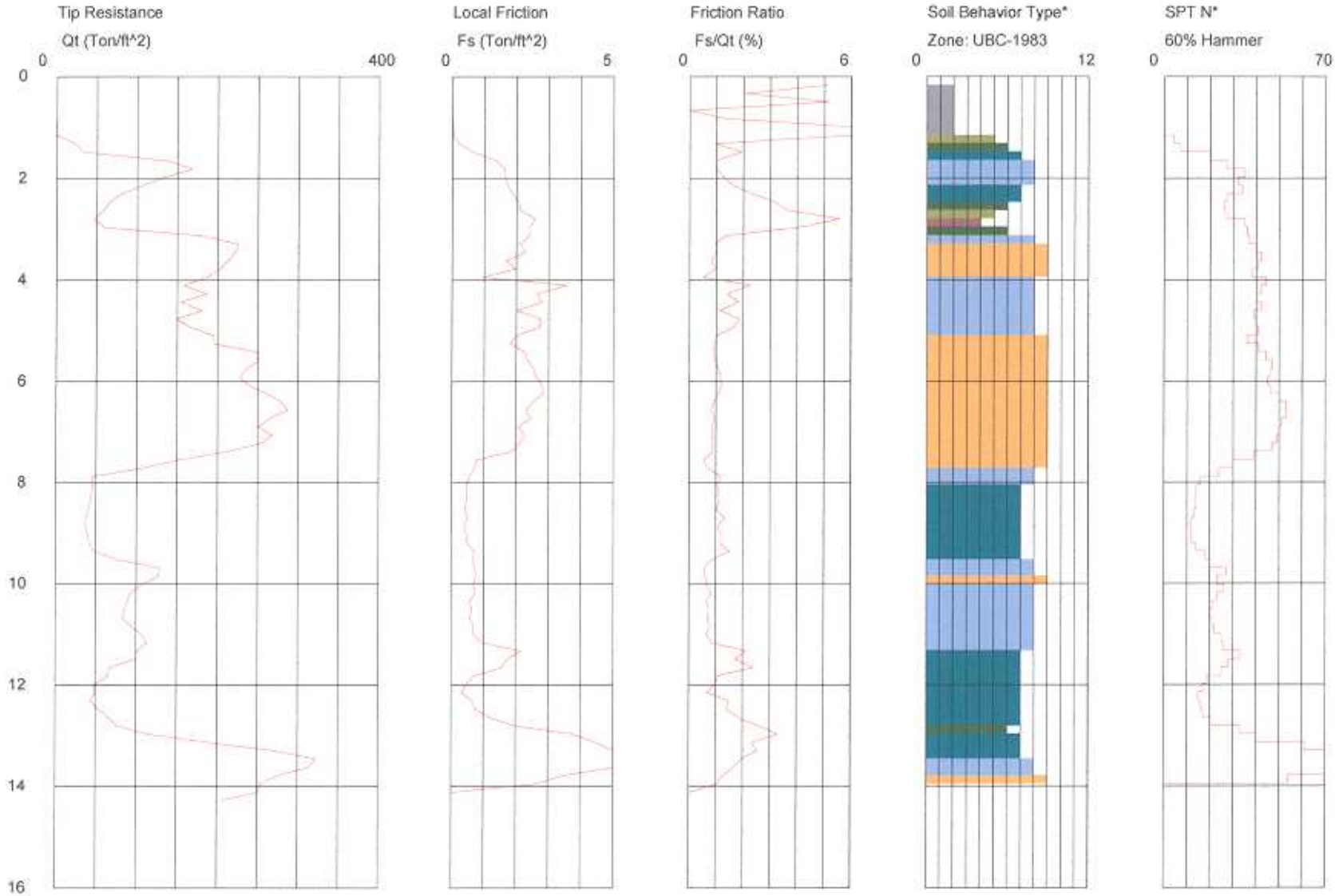
Amanda Hancock
CPT Operations Manager
Holguin, Fahan & Associates, Inc.

:AH\Enclosures

# Earth Mechanics

Operator: Bobby-Mike
Sounding: 04-09 C
Cone Used: DSG0409

CPT Date/Time: 4/20/2004 2:37
Location: Coldwater Canyon
Job Number: 02-165




Maximum Depth = 14.27 feet

Depth Increment = 0.164 feet

1 sensitive fine grained
2 organic material
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 very stiff fine grained (*)
12 sand to clayey sand (*)

behavior type and SPT based on data from UBC-1983

# CPT INTERPRETATIONS

SOUNDING : 04-09C
PROJECT : Coldwater Canyon
DATE/TIME: 4/20/2004 2:37

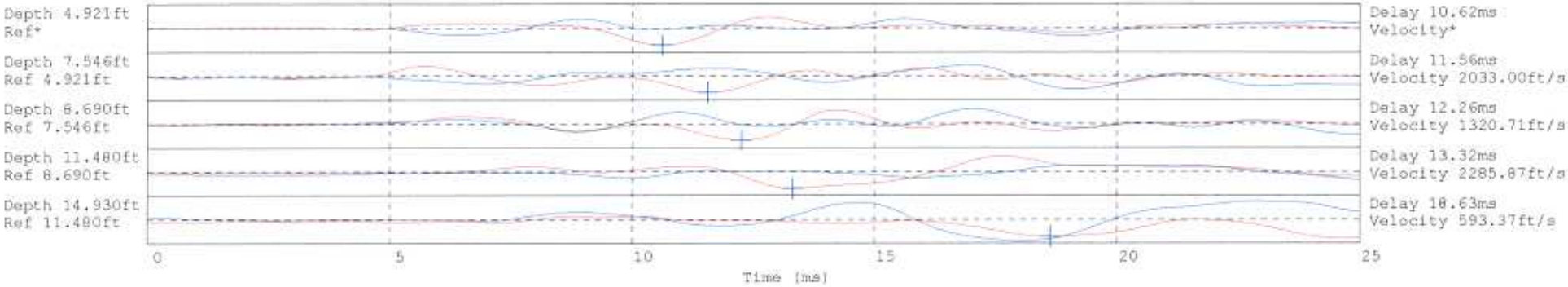
PROJECT No.: 02-165
CONE/RIG : DSG0409

| DEPTH (m) | DEPTH (ft) | TIP RESISTANCE (tsf) | FRICTION RATIO (%) | SOIL BEHAVIOR TYPE | N(60) | N1(60) | Dr (%) | Su (tsf) | PHI (Degrees) |
|---|---|---|---|---|---|---|---|---|---|
| .150 | .49 | .04 | 5.00 | ORGANIC MATERIAL | 0 | 0 | | .0 | |
| .300 | .98 | .15 | 14.67 | ORGANIC MATERIAL | 0 | 0 | | .0 | |
| .450 | 1.48 | 32.86 | 1.93 | SANDY SILT to CLAYEY SILT | 13 | 21 | | 2.6 | |
| .600 | 1.97 | 132.29 | 1.24 | SAND to SILTY SAND | 33 | 53 | 84 | | |
| .750 | 2.46 | 65.28 | 3.16 | SANDY SILT to CLAYEY SILT | 26 | 42 | | 3.8 | |
| .900 | 2.95 | 58.62 | 4.10 | CLAYEY SILT to SILTY CLAY | 29 | 47 | | 3.4 | |
| 1.050 | 3.44 | 220.88 | 1.03 | SAND | 44 | 71 | 99 | | |
| 1.200 | 3.94 | 186.52 | .50 | SAND | 37 | 60 | 94 | | 49.0 |
| 1.350 | 4.43 | 153.63 | 1.82 | SILTY SAND to SANDY SILT | 51 | 82 | 89 | | 48.0 |
| 1.500 | 4.92 | 166.06 | 1.65 | SAND to SILTY SAND | 42 | 66 | 91 | | 48.0 |
| 1.650 | 5.41 | 248.83 | .91 | SAND | 50 | 80 | 100 | | 49.0 |
| 1.800 | 5.91 | 227.25 | 1.15 | SAND | 45 | 73 | 100 | | 48.5 |
| 1.950 | 6.40 | 279.15 | .90 | SAND | 56 | 89 | 100 | | 49.0 |
| 2.100 | 6.89 | 250.45 | .82 | SAND | 50 | 78 | 100 | | 48.0 |
| 2.250 | 7.38 | 210.42 | .88 | SAND | 42 | 63 | 98 | | 47.0 |
| 2.400 | 7.87 | 45.83 | 1.18 | SILTY SAND to SANDY SILT | 15 | 22 | 54 | | 39.5 |
| 2.550 | 8.37 | 42.64 | 1.10 | SILTY SAND to SANDY SILT | 14 | 20 | 52 | | 39.0 |
| 2.700 | 8.86 | 36.61 | 1.04 | SILTY SAND to SANDY SILT | 12 | 17 | 47 | | 38.5 |
| 2.850 | 9.35 | 47.41 | 1.50 | SILTY SAND to SANDY SILT | 16 | 21 | 54 | | 39.0 |
| 3.000 | 9.84 | 126.79 | .60 | SAND | 25 | 33 | 81 | | 44.0 |
| 3.150 | 10.33 | 88.65 | .64 | SAND to SILTY SAND | 22 | 28 | 70 | | 42.0 |
| 3.300 | 10.83 | 93.37 | .74 | SAND to SILTY SAND | 23 | 29 | 71 | | 42.0 |
| 3.450 | 11.32 | 100.99 | 2.12 | SILTY SAND to SANDY SILT | 34 | 41 | 73 | | 42.5 |
| 3.600 | 11.81 | 65.58 | 1.06 | SILTY SAND to SANDY SILT | 22 | 26 | 60 | | 39.5 |
| 3.750 | 12.30 | 43.74 | 1.49 | SILTY SAND to SANDY SILT | 15 | 17 | 48 | | 38.0 |
| 3.900 | 12.80 | 76.12 | 2.57 | SANDY SILT to CLAYEY SILT | 30 | 35 | | 5.0 | |
| 4.050 | 13.29 | 270.19 | 2.54 | SILTY SAND to SANDY SILT | 90 | 100 | 99 | | 46.0 |
| 4.200 | 13.78 | 275.76 | 1.26 | SAND | 55 | 61 | 99 | | 46.0 |

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 20.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

*HOLGUIN, FAHAN & ASSOCIATES, INC.*
*Interpretations based on ROBERTSON and CAMPANELLA, 1989*

# Earth Mechanics
## 04-09C

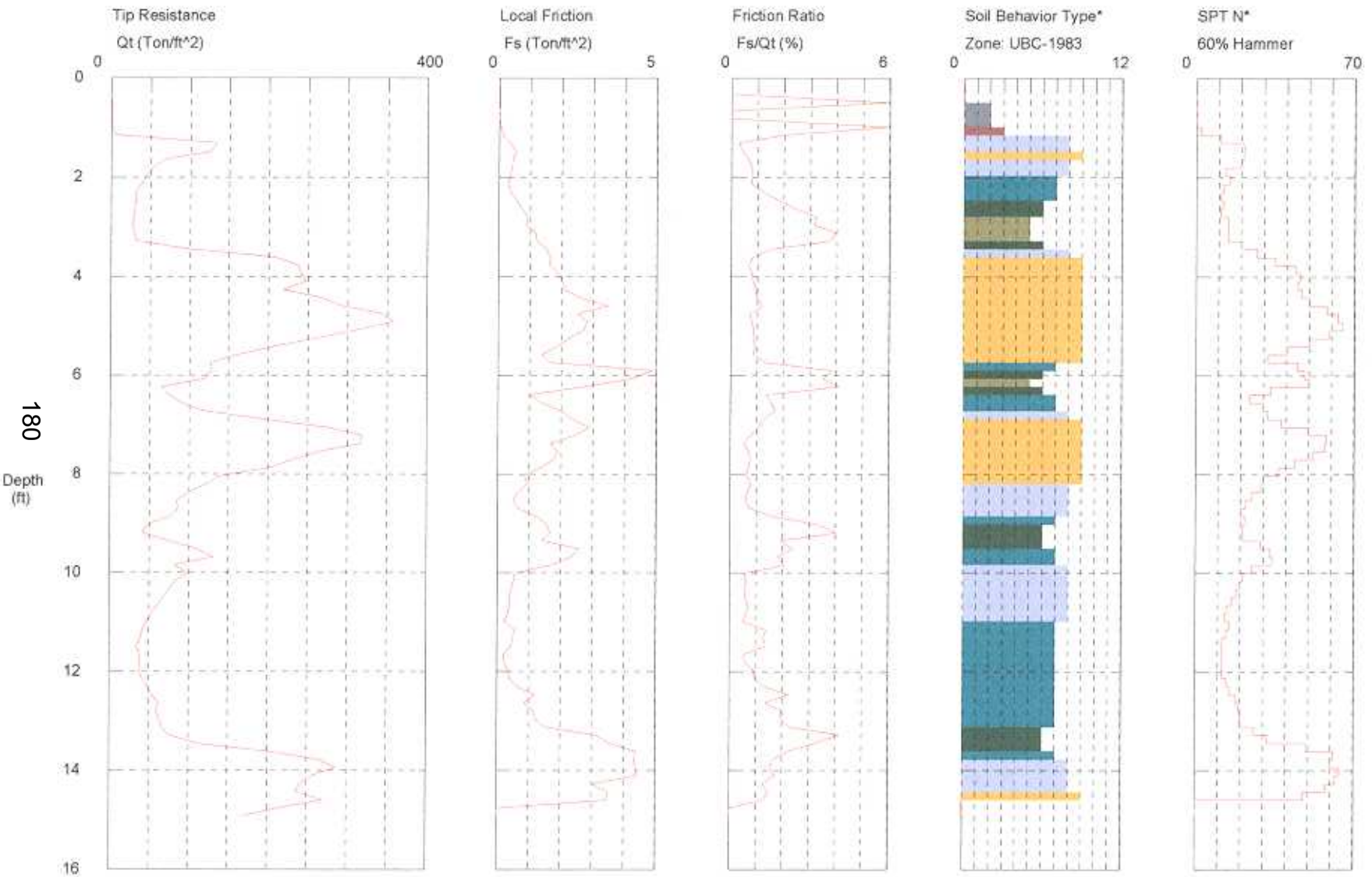



Hammer to Rod String Distance 1.778 (m)
* = Not Determined

# Earth Mechanics

Operator: Bobby-Mike
Sounding: 04-10C
Cone Used: DSG0409

CPT Date/Time: 4/20/2004 1:11
Location: Coldwater Canyon
Job Number: 02-165




Maximum Depth = 14.93 feet

Depth Increment = 0.164 feet

1 sensitive fine grained
2 organic material
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 very stiff fine grained (*)
12 sand to clayey sand (*)

ehavior type and SPT based on data from UBC-1983

# CPT INTERPRETATIONS

SOUNDING : 04-10C
PROJECT : Coldwater Canyon
DATE/TIME: 4/20/2004 1:11

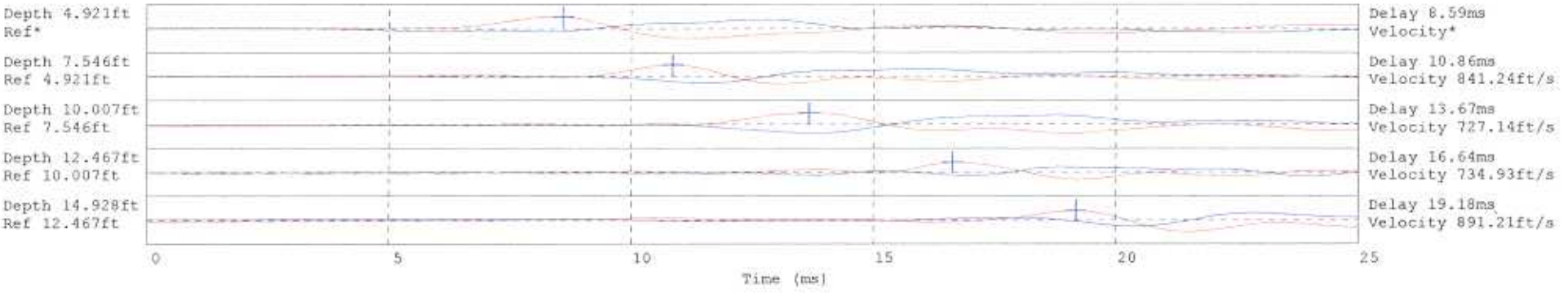
PROJECT No.: 02-165
CONE/RIG : DSG0409

| DEPTH (m) | DEPTH (ft) | TIP RESISTANCE (tsf) | FRICTION RATIO (%) | SOIL BEHAVIOR TYPE | N(60) | N1(60) | Dr (%) | Su (tsf) | PHI (Degrees) |
|---|---|---|---|---|---|---|---|---|---|
| .150 | .49 | .35 | 6.86 | ORGANIC MATERIAL | 0 | 1 | | .0 | |
| .300 | .98 | .39 | 15.38 | ORGANIC MATERIAL | 0 | 1 | | .0 | |
| .450 | 1.48 | 125.87 | .44 | SAND | 25 | 40 | 83 | | |
| .600 | 1.97 | 44.38 | .80 | SILTY SAND to SANDY SILT | 15 | 24 | 53 | | 46.0 |
| .750 | 2.46 | 31.02 | 1.79 | SANDY SILT to CLAYEY SILT | 12 | 20 | | 2.5 | |
| .900 | 2.95 | 27.77 | 3.13 | CLAYEY SILT to SILTY CLAY | 14 | 22 | | 1.8 | |
| 1.050 | 3.44 | 97.71 | 1.55 | SILTY SAND to SANDY SILT | 33 | 52 | 76 | | 47.0 |
| 1.200 | 3.94 | 240.27 | .79 | SAND | 48 | 77 | 100 | | |
| 1.350 | 4.43 | 264.73 | .97 | SAND | 53 | 85 | 100 | | |
| 1.500 | 4.92 | 356.83 | .79 | SAND | 71 | 100 | 100 | | |
| 1.650 | 5.41 | 207.61 | .91 | SAND | 42 | 66 | 97 | | 48.5 |
| 1.800 | 5.91 | 128.22 | 3.82 | SANDY SILT to CLAYEY SILT | 51 | 82 | | 7.5 | |
| 1.950 | 6.40 | 74.12 | 1.35 | SILTY SAND to SANDY SILT | 25 | 40 | 68 | | 43.5 |
| 2.100 | 6.89 | 196.01 | 1.21 | SAND to SILTY SAND | 49 | 76 | 96 | | 47.0 |
| 2.250 | 7.38 | 316.42 | .53 | GRAVELLY SAND to SAND | 53 | 79 | 100 | | 48.5 |
| 2.400 | 7.87 | 199.86 | .67 | SAND | 40 | 58 | 96 | | 46.5 |
| 2.550 | 8.37 | 100.96 | .65 | SAND to SILTY SAND | 25 | 36 | 77 | | 44.0 |
| 2.700 | 8.86 | 76.89 | 1.62 | SILTY SAND to SANDY SILT | 26 | 35 | 68 | | 42.5 |
| 2.850 | 9.35 | 72.91 | 1.92 | SILTY SAND to SANDY SILT | 24 | 32 | 66 | | 42.0 |
| 3.000 | 9.84 | 82.19 | 2.09 | SILTY SAND to SANDY SILT | 27 | 36 | 69 | | 42.0 |
| 3.150 | 10.33 | 75.16 | .57 | SAND to SILTY SAND | 19 | 24 | 66 | | 41.5 |
| 3.300 | 10.83 | 53.41 | .63 | SAND to SILTY SAND | 13 | 17 | 55 | | 39.0 |
| 3.450 | 11.32 | 39.19 | 1.27 | SILTY SAND to SANDY SILT | 13 | 16 | 46 | | 38.0 |
| 3.600 | 11.81 | 37.98 | .59 | SILTY SAND to SANDY SILT | 13 | 15 | 44 | | 37.5 |
| 3.750 | 12.30 | 48.08 | 1.30 | SILTY SAND to SANDY SILT | 16 | 19 | 50 | | 38.5 |
| 3.900 | 12.80 | 58.66 | 1.98 | SILTY SAND to SANDY SILT | 20 | 22 | 55 | | 39.0 |
| 4.050 | 13.29 | 75.04 | 4.17 | CLAYEY SILT to SILTY CLAY | 38 | 42 | | 4.4 | |
| 4.200 | 13.78 | 265.23 | 1.64 | SAND to SILTY SAND | 66 | 73 | 98 | | 46.0 |
| 4.350 | 14.27 | 240.60 | 1.25 | SAND | 48 | 52 | 94 | | 45.0 |
| 4.500 | 14.76 | 214.13 | ***** | | 0 | 0 | | | .0 |

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 20.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

*HOLGUIN, FAHAN & ASSOCIATES, INC.*
*Interpretations based on ROBERTSON and CAMPANELLA, 1989*

# Earth Mechanics
## 04-10C




Hammer to Rod String Distance 1.778 (m)
* = Not Determined

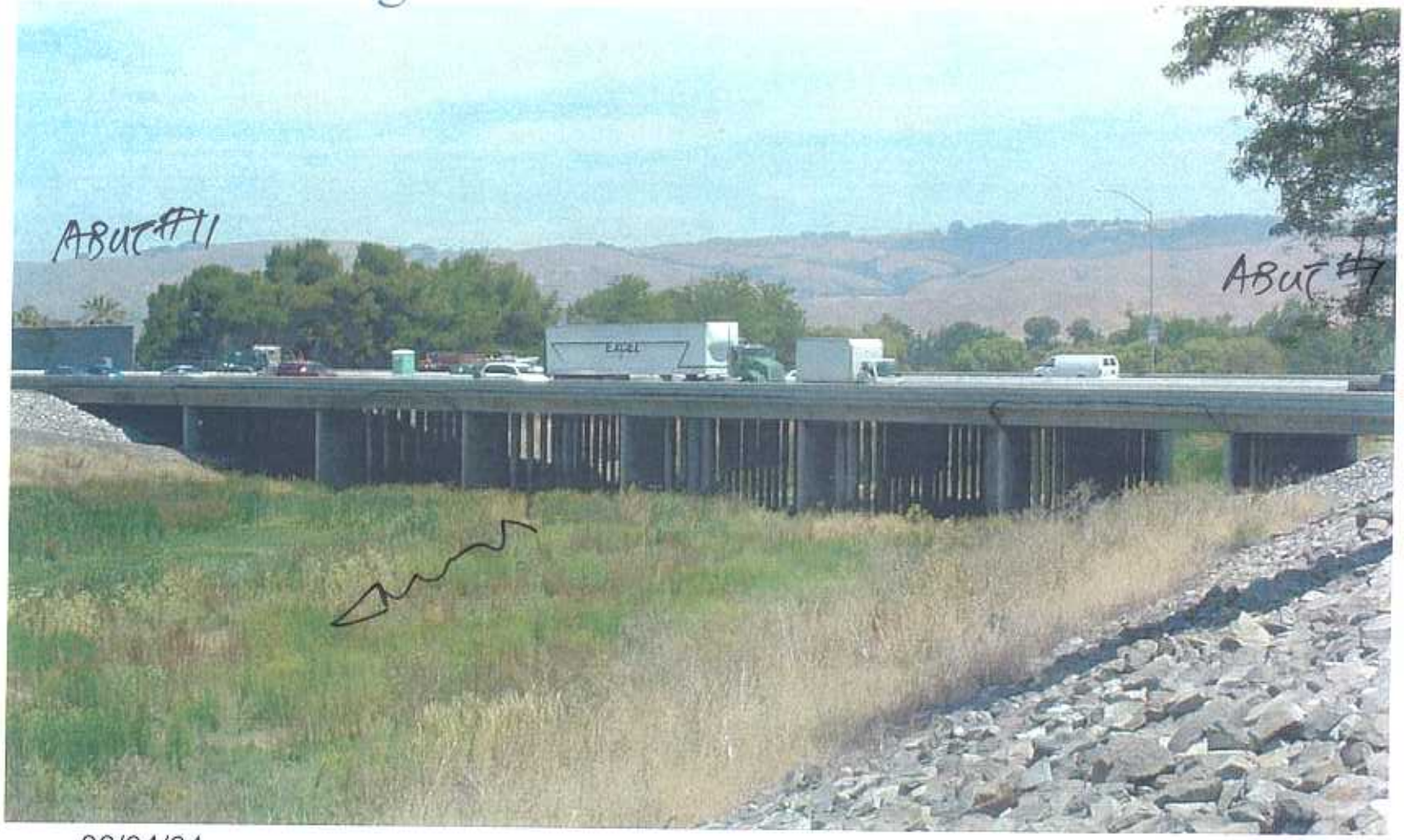
# Caltrans Bridge 33-0250
# Patterson Slough Bridge, Fremont

## Caltrans Bridge 33-0250, Patterson Slough Bridge, Fremont

The field investigation for the Patterson Slough Bridge, conducted on 6/11/04 and 6/12/04, consisted of 2 soil borings (04-11A and 04-12A), 2 PMT borings (04-11P and 04-12P), and 2 CPT's (04-11C and 04-12C). Soil and PMT borings were drilled by Pitcher Drilling of Palo Alto. CPT's were performed by Gregg Drilling of Martinez. Locations 04-11x were located on the north bridge abutment in the south-bound carpool lane. Locations 04-12x were located on the south bridge abutment in the south-bound carpool lane.

Geotechnical soil sampling consisted of ring samples collected using a Modified California sampler and small bulk samples collected with a SPT sampler. Samples were taken at 2.5-ft intervals to 15 ft depth and at 20 ft depth. No groundwater was encountered during the investigation. One pressuremeter tests was performed at each abutment at 5 ft depth.

# View to the northeast from walking trail along Patterson Slough



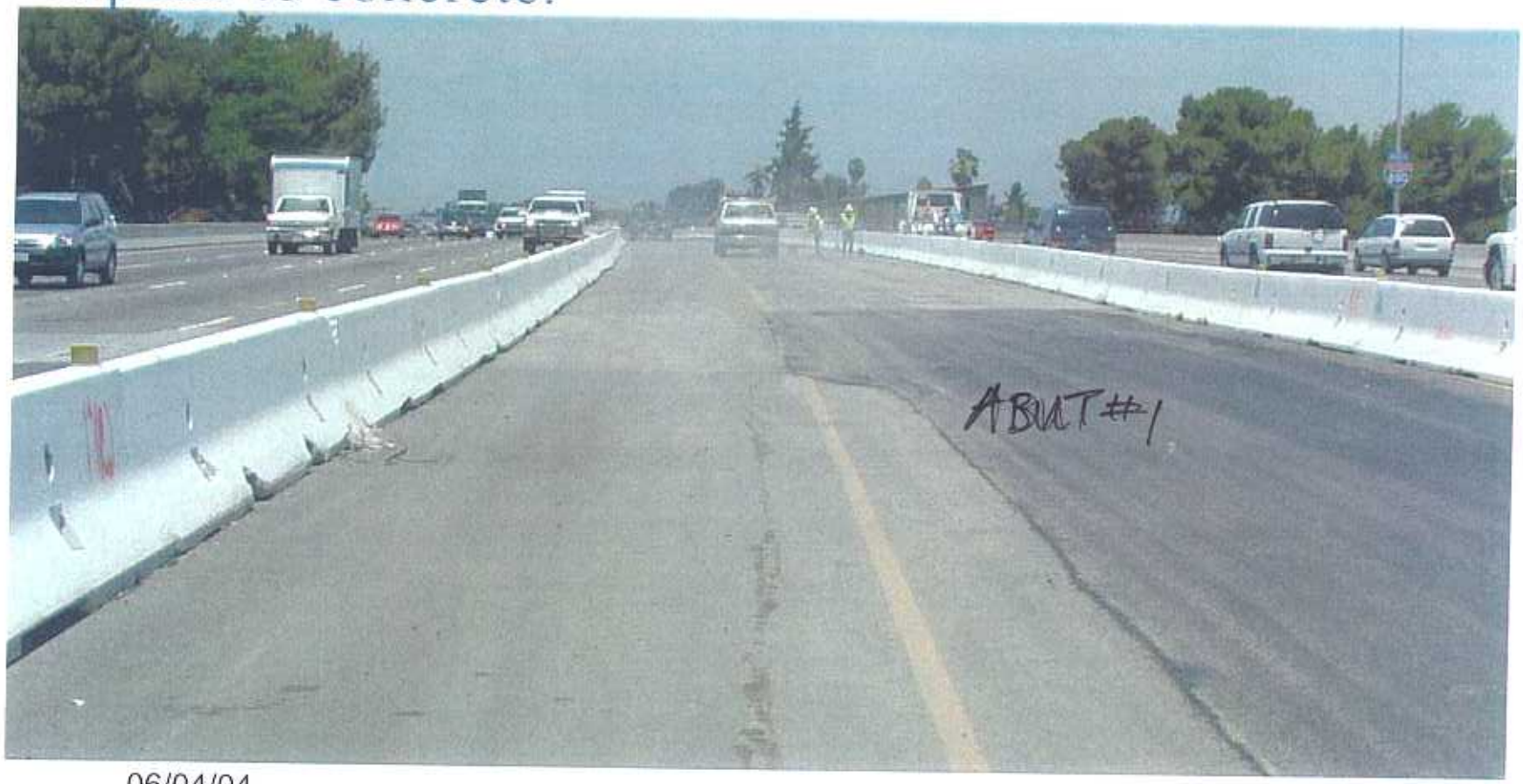

06/04/04

06/04/04

Drilling will be from the center of I-880. Separated from traffic by K-rail barriers on both sides. **Note, No Overhead Power Lines, utilities along side of bridge**.

06/04/04

View to the north from south bridge abutment at approximately Sta. 163+80. Note transition from asphalt to concrete.




06/04/04

# South abutment, boring B-1 planned location

06/04/04

ABUT#1

# View to the south from north bridge abutment at approximately Sta. 169+00.

06/04/04

ABUT #11

# North abutment, boring B-2 planned location

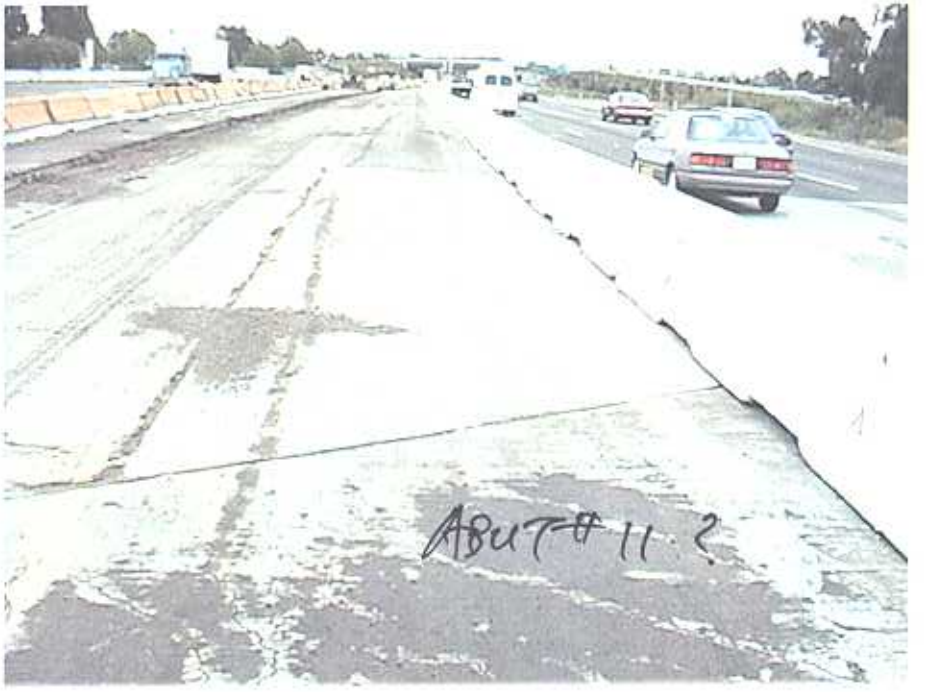
06/04/04

ABUT #1

ABUT #11

ABUT #1

ABUT #1 ?


ABUT #11 ?

| DIST. | COUNTY | ROUTE | POST MILES—TOTAL PROJECT | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| 04 | Ala | 17 | 10.0/12.5 | 28 | 33 |

REGISTERED CIVIL ENGINEER NUMBER 5209

ASSISTANT STATE HIGHWAY ENGINEER

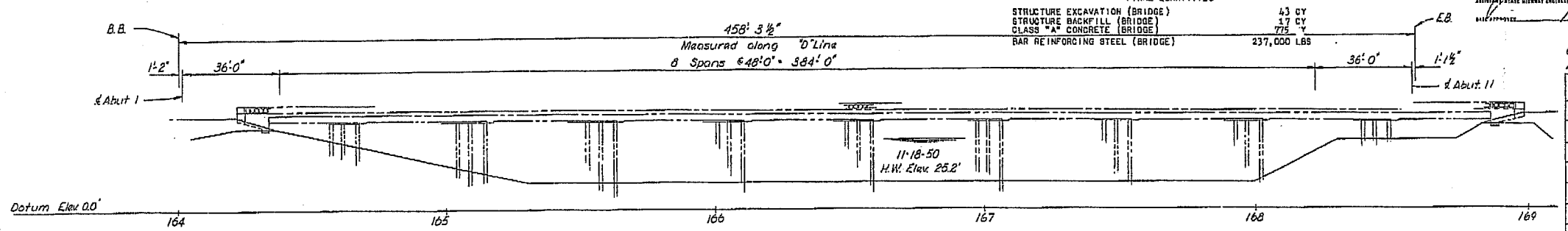
DATE: May 13 1968

**APPROXIMATE QUANTITIES**

| | |
|---|---|
| TEMPORARY RAILING (TYPE "J") | 1,016 LF |
| REMOVE PORTIONS OF BRIDGE | LUMP SUM |
| FURNISHING CONCRETE PILING (CLASS I) | 5,305 LF |
| DRIVING CONCRETE PILES | 80 EA |
| WATERSTOPS | 98 LF |
| MISCELLANEOUS METAL (BRIDGE) | 2,700 LBS |

**FINAL QUANTITIES**

| | |
|---|---|
| STRUCTURE EXCAVATION (BRIDGE) | 43 CY |
| STRUCTURE BACKFILL (BRIDGE) | 17 CY |
| CLASS "A" CONCRETE (BRIDGE) | 775 CY |
| BAR REINFORCING STEEL (BRIDGE) | 237,000 LBS |




ELEVATION
1" = 20'-0"

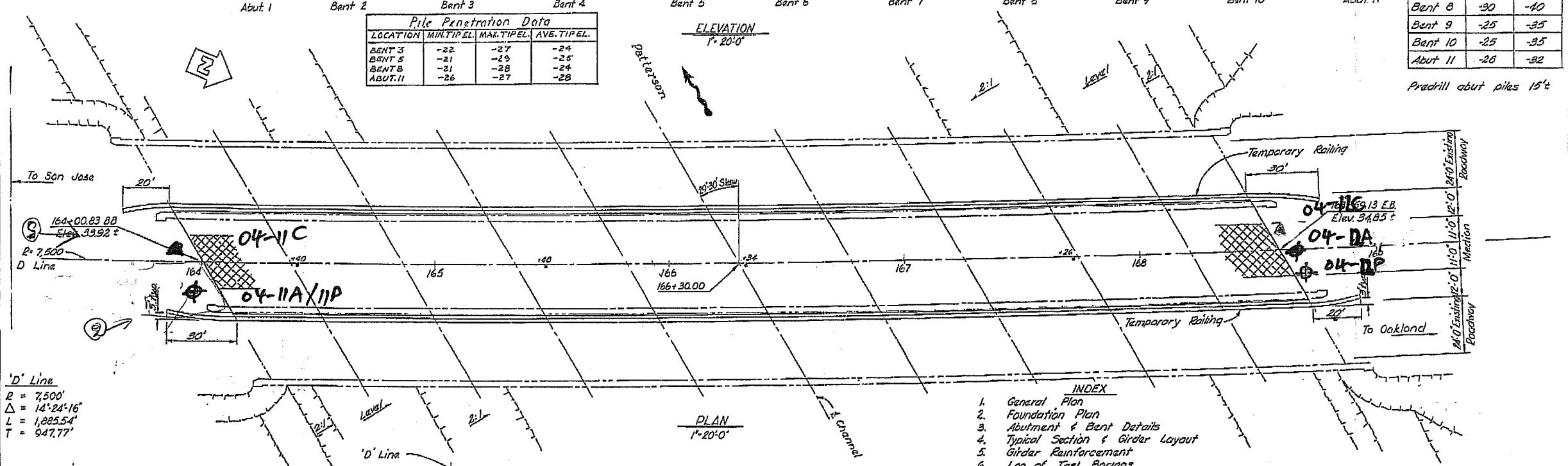
CLASS I DRIVEN CONCRETE PILE (45 TON BRG.)

| | Specified Tip Elev. | Estimated Tip Elev. |
|---|---|---|
| Abut 1 | -20 | -32 |
| Bent 2 | -28 | -35 |
| Bent 3 | -30 | -35 |
| Bent 4 | -28 | -34 |
| Bent 5 | -30 | -35 |
| Bent 6 | -30 | -35 |
| Bent 7 | -28 | -32 |
| Bent 8 | -30 | -40 |
| Bent 9 | -25 | -35 |
| Bent 10 | -25 | -35 |
| Abut 11 | -26 | -32 |

Predrill abut piles 15'±

Pile Penetration Data

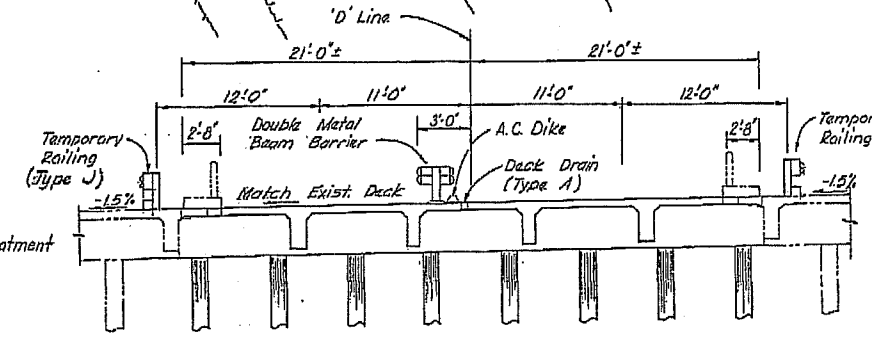
| LOCATION | MIN. TIP EL. | MAX. TIP EL. | AVE. TIP EL. |
|---|---|---|---|
| BENT 3 | -22 | -27 | -24 |
| BENT 5 | -21 | -29 | -25 |
| BENT 8 | -21 | -28 | -24 |
| ABUT. 11 | -26 | -27 | -28 |




PLAN
1" = 20'-0"

'D' Line
P = 7,500'
Δ = 14°24'16"
L = 1,885.54'
T = 947.77'

NOTE
---- Indicates existing structure
▫ Indicates deck drain (Type A)
Denotes contrast treatment




TYPICAL SECTION
3/16" = 1'-0"

Notes:
The contractor shall verify all dependent dimensions in the field before ordering or fabricating any material.
Remove interfering portions of existing structure.

INDEX

1. General Plan
2. Foundation Plan
3. Abutment & Bent Details
4. Typical Section & Girder Layout
5. Girder Reinforcement
6. Log of Test Borings

Standard Plans dated February 1968
B2-1 Concrete Pile Details
B6-1 T-Beam Details No. 1
B6-20 T-Beam Hinge Details - Steel
B9-2 Drain Details
B11-30 Temporary Railings

NO AS BUILT
CORRECTIONS BY L.G. FRANCIS 3-20-70
CONTRACT NO. 04-358204
DATE 3-12-69

FOR GENERAL NOTES SEE Foundation Plan

LIVE LOADING HS20-44 AND ALTERNATIVE

BRIDGE DEPARTMENT
DESIGN SECTION 1
Section Supervisor: Gerald A. Hoed Jr.
Project Designer:

| | | | |
|---|---|---|---|
| DESIGN | W. STANCIK 1/68 | Checked J. Jung 1/68 | |
| DETAILS | B. Keefe 8-67 | Checked J. Jung 1/68 | |
| LAYOUT | W. STANCIK 1/68 | Checked J. Jung 1/68 | |
| QUANTITIES | R. Seyer 1/68 | Checked R. Yeung 1/68 | |
| SPECIFICATIONS | J.P. Hunter 1/68 | Checked Project Engineer Concurred | |

Approval Recommended by: R. H. Alexander, Bridge Engineer — Registered Civil Eng. License No. 5209

STATE OF CALIFORNIA
HIGHWAY TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

# PATTERSON SLOUGH BRIDGE (WIDENING)

LOCATED ABOUT 5 MILES N. OF FREMONT BOULEVARD IN ALAMEDA COUNTY

## GENERAL PLAN

| BRIDGE NO. | POST MILE | DRAWING NO. | SHEET | OF |
|---|---|---|---|---|
| 33-250 | | 33250-1 | 1 | 6 |

REVISION DATES (PRELIMINARY STAGE ONLY)

WO 358201 CU 04219

Disregard prints bearing earlier revision dates

AS BUILT PLANS
Contract No. 04-358204
Date Completed
Document No. 4000-1739

193

28

F-341 (14)

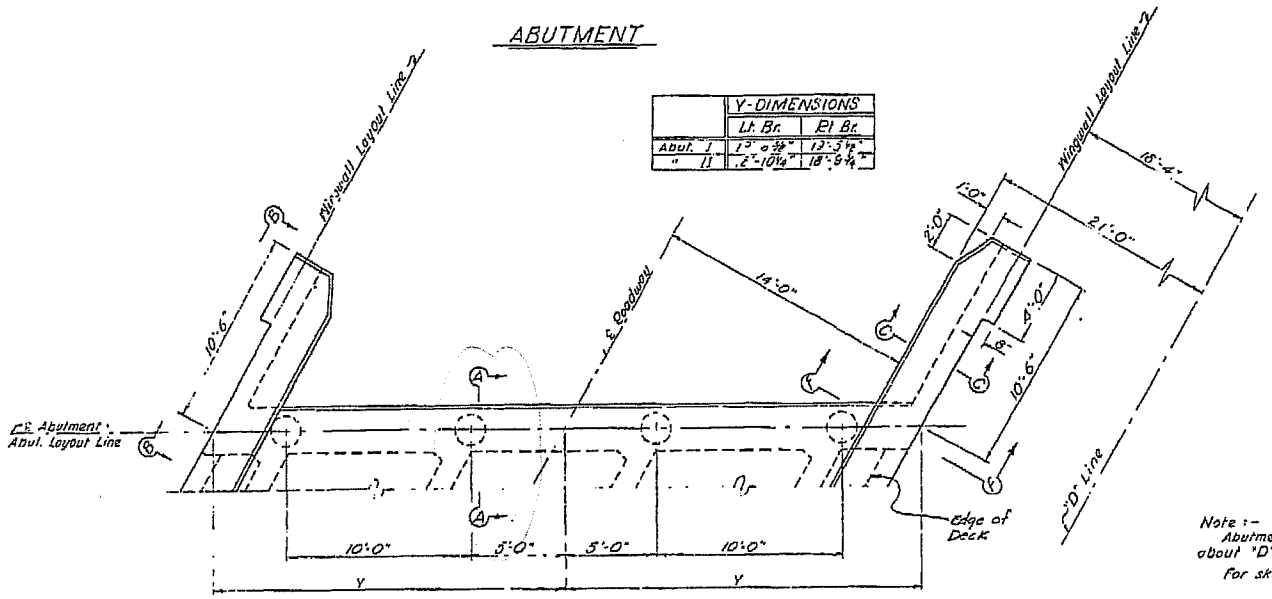
| FED. ROAD DIST. NO. | STATE | PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| 7 | CALIF. | | | 164 | 248 |

| DIST. | COUNTY | ROUTE | SECTION | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| IV | Ala. | 69 | D | 2 | 11 |

DATE APPROVED November 14, 1955

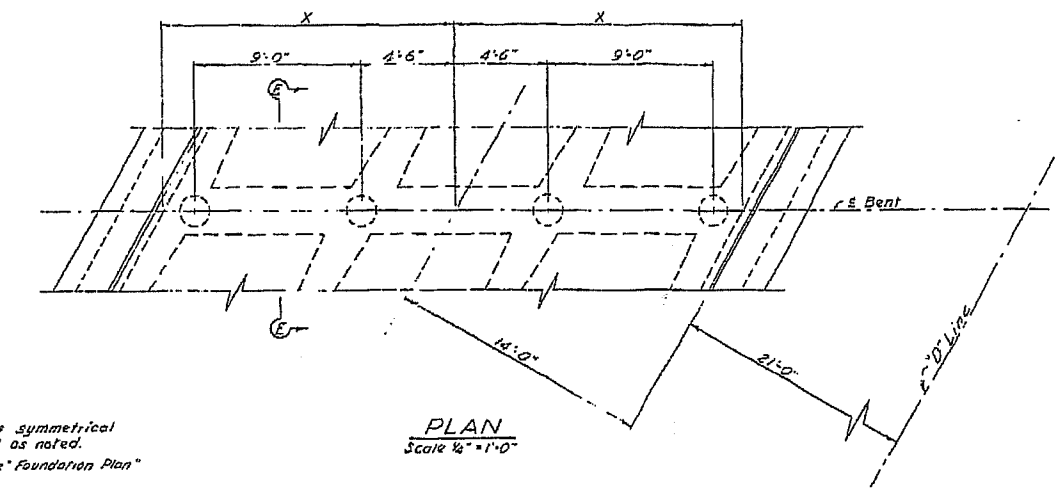
## ABUTMENT

| | Y-DIMENSIONS | |
|---|---|---|
| | Lt. Br. | Rt. Br. |
| Abut. 1 | 13'-9 11/16" | 12'-3 11/16" |
| " 11 | 2'-10 1/16" | 18'-9 1/16" |




PLAN
Scale 1/4" = 1'-0"

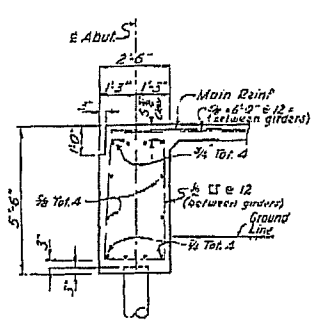
## BENT



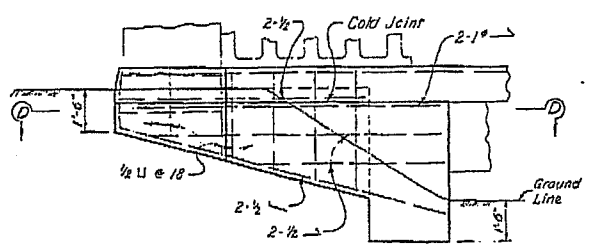

PLAN
Scale 1/4" = 1'-0"

Note:-
Abutments & Bents symmetrical about "D" Line except as noted.
For skew angles see "Foundation Plan"

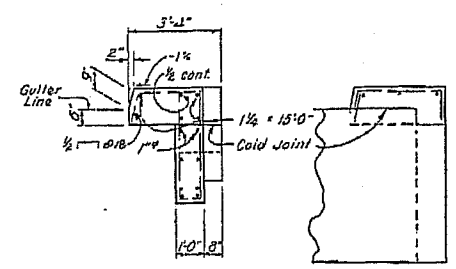
| | X-DIMENSIONS | |
|---|---|---|
| | Lt. Br. | Rt. Br. |
| Bent 2 | 15'-10 1/16" | 15'-9 11/16" |
| " 3 | 15'-9 1/16" | 15'-9" |
| " 4 | 15'-9" | 15'-8 15/16" |
| " 5 | 15'-8 1/2" | 15'-7 15/16" |
| " 6 | 15'-7 1/2" | 15'-7" |
| " 7 | 15'-6 1/2" | 15'-6 1/16" |
| " 8 | 15'-5 1/2" | 15'-5 1/16" |
| " 9 | 15'-5 1/2" | 15'-4 1/2" |
| " 10 | 15'-4 1/2" | 15'-4 1/16" |




SECTION A-A
Scale 1/8" = 1'-0"



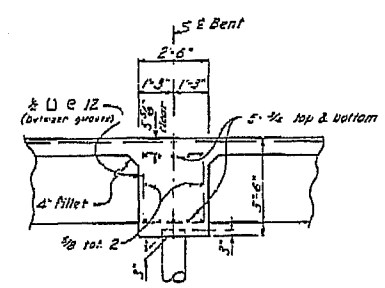

VIEW B-B
Scale 1/8" = 1'-0"



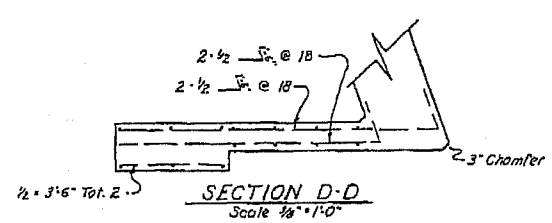

SECTION C-C
Scale 1/8" = 1'-0"



SECTION F-F
Scale: 1/8" = 1'-0"




SECTION E-E
Scale: 1/8" = 1'-0"




SECTION D-D
Scale 1/8" = 1'-0"

AS BUILT PLANS
Contract No. 56-4TC57
Date Completed
Document No. 40002296

NO CORRECTIONS
CONTRACT No. 56-4TC57-F
DATE ACCEPTED Dec 6 1957
AS BUILT
RESIDENT ENGINEER
REVISIONS BY DATE 7-18-57

BRIDGE DEPARTMENT
... DESIGN SECTION ... 7

| | | | |
|---|---|---|---|
| Project Designer | | | |
| Chief Designer | | | |
| DESIGN | | Checked | 8-55 |
| DETAILS | By Bill Oliver 4-55 | Checked | 8-55 |
| QUANTITIES | By 8-55 | Checked | 8-55 |
| SPECIFICATIONS | By | Checked | |
| Approval Recommended by | | Plan and Specs. Approved For Letting On | 5-6-57 |

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

PATTERSON SLOUGH BRIDGE

ABUTMENT & BENT DETAILS

| SCALE | BRIDGE | FILE | DRAWING |
|---|---|---|---|
| As Noted | 33-250 1/2 | | B-4135-3 |

PREL. DRAWING No. F-4135 32

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF PUBLIC WORKS.

DATE June 21, 1971 SIGNATURE TITLE Engineer, Photographic Office

| DIST. | COUNTY | ROUTE | POST MILES—TOTAL PROJECT | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| 04 | Alc. | 17 | 10.0/12.5 | 33 | 53 |

DESIGNED BY ... REGISTERED CIVIL ENGINEER NO. 22225

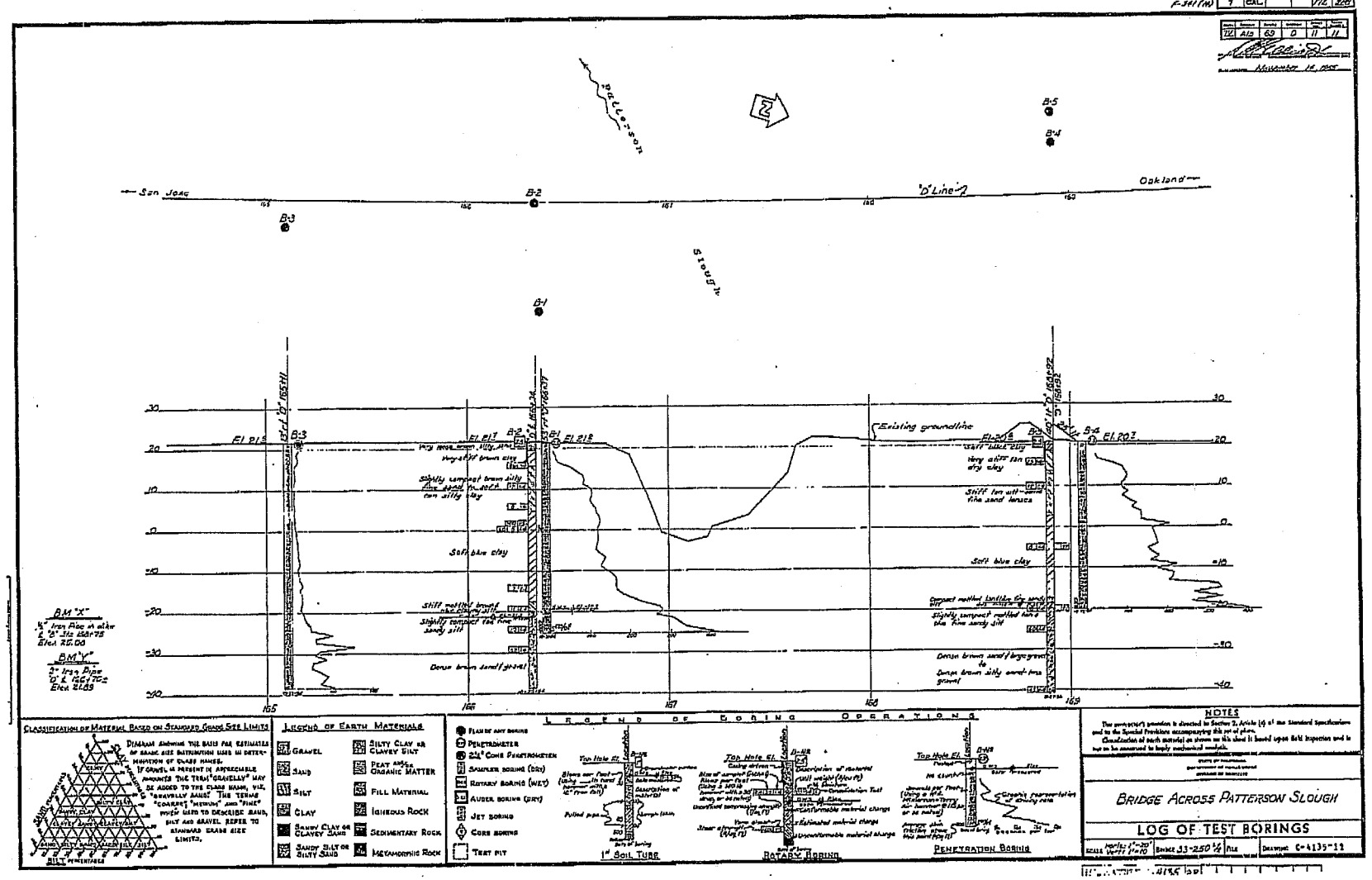
DATE APPROVED May 13 1968

| FED. REG. NO. | STATE | Public Inc. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| 7 | CAL. | | 1971 | 1209 | |

F-341(14)

| DIST. | COUNTY | ROUTE | POST MILES | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| 04 | Alc | 65 | 0 | 11 | 11 |

November 18 1971




Legend of Boring Operations

Penetrometer
Sampler Boring (Dry)
Rotary Boring (Wet)
Auger Boring (Dry)
Jet Boring
Core Boring
Test Pit
2½" Core Penetrometer
1" Soil Tube
Rotary Boring
Penetration Boring

Legend of Earth Materials

Gravel
Sand
Silt
Clay
Sandy Clay or Clayey Sand
Sandy Silt or Silty Sand
Silty Clay or Clayey Silt
Peat and Organic Matter
Fill Material
Igneous Rock
Sedimentary Rock
Metamorphic Rock

Classification of Material Based on Standard Grain Size Limits

Diagram showing the basis for estimates of grain size distribution used in determination of class names.

If gravel is present in appreciable amounts the term "gravelly" may be added to the class name, viz. "gravelly sand". The terms "coarse", "medium" and "fine" may be used to describe sand, silt and gravel. Refer to standard grain size limits.

Silt percentage

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.

Field Study
Designed
Checked
Approved

BRIDGE DEPARTMENT
ENGINEERING GEOLOGY SECTION

33

AS BUILT PLANS
Contract No. 04-358204
Date Completed
Document No. 40001739

INFORMATION ON ACTUAL FOUNDATION CONDITIONS ENCOUNTERED IS ON FILE IN BRIDGE GEOLOGY SECTION

AS BUILT
CORRECTIONS BY J. G. FRANCIS 3/20/70
CONTRACT NO. 04-358204
DATE 3-12-69

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

PATTERSON SLOUGH WIDEN

LOG OF TEST BORINGS

| BRIDGE NO. | POST MILE | DRAWING NO. | SHEET | OF |
|---|---|---|---|---|
| 33-250½ | | | 6 | 6 |

REVISION DATES (PRELIMINARY STAGE ONLY)

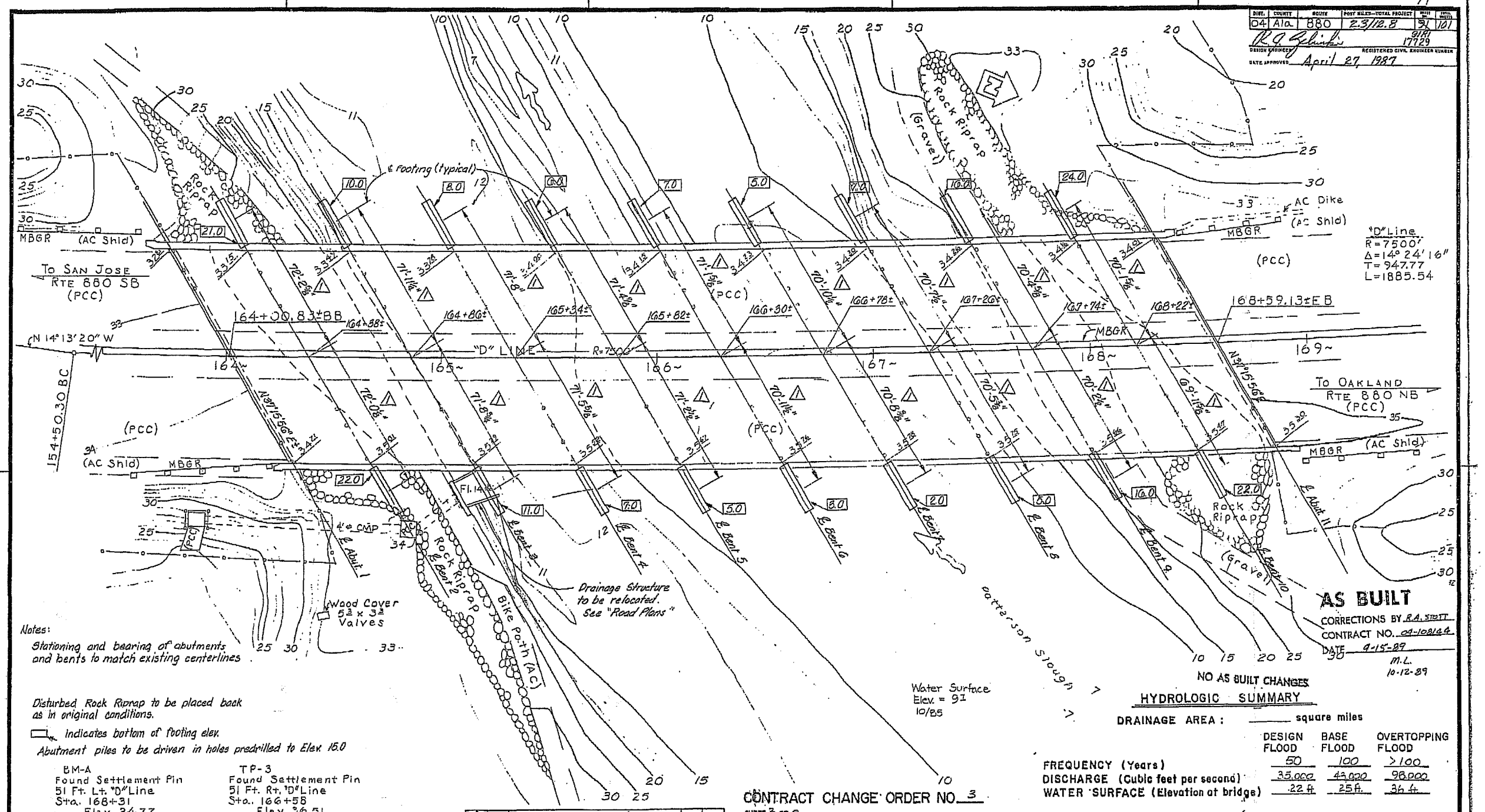
WO 358201
CU 04219

Disregard prints bearing earlier revision dates

| DIST. | COUNTY | ROUTE | POST MILES—TOTAL PROJECT | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| 04 | Ala | 880 | 2.3/12.8 | 91 | 101 |

DESIGN ENGINEER: R. A. Gelinski — REGISTERED CIVIL ENGINEER NUMBER: 91R1 17729

DATE APPROVED: April 27, 1987




Notes:

Stationing and bearing of abutments and bents to match existing centerlines.

Disturbed Rock Riprap to be placed back as in original conditions.

Indicates bottom of footing elev.

Abutment piles to be driven in holes predrilled to Elev. 15.0

BM-A
Found Settlement Pin
51 Ft. Lt. "D" Line
Sta. 168+31
Elev. 34.77

TP-3
Found Settlement Pin
51 Ft. Rt. "D" Line
Sta. 166+58
Elev. 36.51

**AS BUILT**
CORRECTIONS BY R.A. STOTT
CONTRACT NO. 04-108144
DATE 9-15-89
M.L. 10-12-89

NO AS BUILT CHANGES

CONTRACT CHANGE ORDER NO. 3
SHEET 3 OF 9

| MARK | DATE | DESCRIPTION | BY | CHD |
|---|---|---|---|---|
| 1 | 6/87 | Dimension Change | TAH | JGS |

REVISIONS

NOTE:
THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.

## HYDROLOGIC SUMMARY

DRAINAGE AREA: _____ square miles

| | DESIGN FLOOD | BASE FLOOD | OVERTOPPING FLOOD |
|---|---|---|---|
| FREQUENCY (Years) | 50 | 100 | >100 |
| DISCHARGE (Cubic feet per second) | 35,000 | 43,000 | 98,000 |
| WATER SURFACE (Elevation at bridge) | 22 ft | 25 ft. | 36 ft. |

Flood plain data are based upon information available when the plans were prepared and are shown to meet Federal requirements. The accuracy of said information is not warranted by the State and interested or affected parties should make their own investigation.

PR-33250-1

91

PRELIMINARY INVESTIGATION SECTION

| | | | | | |
|---|---|---|---|---|---|
| SCALE 1" = 20' | DATUM 1957 As Built | PHOTOGRAMMETRY AS OF: | | DRAWN | By RKB 11/85 |
| | | SURVEYED | By TCF 11/85 | TRACED | By D.A.W. 11/85 |
| ALIGNMENT TIES 1969 "As Built" Plans | | FIELD CHKD | By | CHECKED | By TCF 12/85 |

| | | | |
|---|---|---|---|
| DESIGN | By J. Strootman 1/86 | Checked | 1/86 |
| DETAILS | By J. Thorne 1/86 | Checked | 1/86 |
| QUANTITIES | By T.A. Hanson 1/86 | Checked | J. Thorne 1/86 |

State of CALIFORNIA
DEPARTMENT OF TRANSPORTATION

STRUCTURES - DESIGN 4
PROJECT ENGINEER: J. Strootman 35509 — REGISTERED CIVIL ENGINEER NO.

BRIDGE NO. 33-250
POST MILE 11.8

PATTERSON SLOUGH BRIDGE (WIDEN)
FOUNDATION PLAN

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 04334
WO 108141

Discard prints bearing earlier revision dates →

REVISION DATES (PRELIMINARY STAGE ONLY)

SHEET 3 OF 13

AS BUILT PLANS
Contract No. 04-108144
Date Completed 9-15-89
Document No.

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF TRANSPORTATION.

DATE 12/11/89 — SIGNATURE Donald Blackford — TITLE SUPERVISOR OF MICROFILM SERVICES

1-5

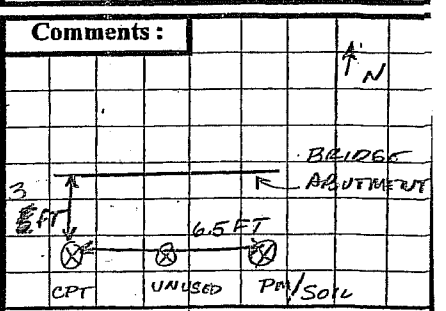
# LOG OF BORING NO. ( ~~SBT~~ 04-11A SOUTH ABUTMENT )

34"

Earth Mechanics, Inc.
Geotechnical and Computational Engineering

| | | | |
|---|---|---|---|
| **Project Name** | : UCSD BRIDGE ABUTMENT STUDY | | |
| **Project Location** | : PATTERSON SLOUGH BRIDGE, I-880, FREMONT, CA | | |
| **E.M.I. Project No.** | : 02-165 | **Site Condition** : | PAVED, CONCRETE |
| **Weather** | : SUNNY, WARM | **Elevation** : | 33.92 FT |
| **Traffic Control** | : CALTRANS | **Operator** : | |
| **Drilling Company** | : PITCHER | **Operator** : | RON PITCHER |
| **Type of Rig** | : FAILING 150 | **Drop (in)** : | |
| **Borehole Diameter** (inch) | : 6" | **Drive Wt. (lbs)** : | |
| **Logged By** | : J.C. | **Date Drilled** : | 6-12-04 |

**Comments :**




Backfilled with : GROUT/CUTTINGS

| | Time | | | | | | | | | | Back to Office | Proposed Depth |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Depature | Arrival | Start | Break | Resume | Lunch | Resume | Break | Finish | Off | | 20 ft |
| Driller | | | | | | | | | | | | Water Table |
| Traffic Control | | | | | | | | | | | | N/A ft |
| Logger | | | | | | | | | | | | Caving |
| Total | | | | | | | | | | | | 2-4 ft |

| Depth (ft) | Sampler Type (Bulk, Drive, SPT, Tube) | Sample Number | Sample Type (B/D/S.B./T) | Blows/6" | Recovery (inch) | U.S.C.S. | Description (ASTM D-2488-93) Color | Moisture State (Dry, Moist, Wet) | Max. Size | Grain Size (%) Gravel : Sand : Fines | Sand Size | Plasticity | Consistency | Cementation | $O^2$/LEL/PID |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | 0-22" CONCRETE, 22"-4FT PEA GRAVEL, NO MATRIX. | | | | | | | | |
| | | | | | | | HOLE CAVING IN. NO SAMPLE POSSIBLE @ 2.5'. ADDED | | | | | | | | |
| 2.5 | | | | | | | BENTONITE TO HOLE. DUE TO DIFFICULTY KEEPING HOLE OPEN. | | | | | | | | |
| | | | | | | | DECIDED TO KEEP SAME HOLE FOR PMT AND SAMPLING. | | | | | | | | |
| ~~5~~ | 8 | 1 | D | 3 | | ML/CL | CLAYEY SILT - SILTY CLAY, GRAY/BRN-ORANGE MOTTLED, MOIST | | | | | | | | |
| | | | | 4 | | | SL. PLASTICITY, STIFF | | | | | | | | |
| | | | | 14 | 10" | | | | | | | | | | |
| 10 | | 2 | S | 4 | | ML/CL | CLAYEY SILT, GRAY - OLIVE BROWN MOTTLED, NO PLASTICITY, | | | | | | | | |
| | | | | 5 | 15" | | SL. MOIST, STIFF | | | | | | | | |
| | | | | 7 | | | | | | | | | | | |
| ~~15~~ | | 3 | D | 7 | | ML/CL | SILTY CLAY/CLAYEY SILT, BLACK, DRY, LOW PLASTICITY, STIFF | | | | | | | | |
| 12.5 | | | | 15 | 11" | | SL. SULFIDE ODOR? (ROTTEN EGG) | | | | | | | | |
| | | | | 18 | | | | | | | | | | | |
| ~~20~~ | | 4 | S | 6 | | CL | SILTY CLAY - DK GRAY W/ BRN-ORANGE MOTTLED, SL. MOIST | | | | | | | | |
| 15 | | | | 13 | 18" | | HARD, PLASTIC, ORGANICS, LAMINATED | | | | | | | | |
| | | | | 19 | | | | | | | | | | | |
| ~~25~~ | | 5 | D | 5 | 10" | CL | [X-LOST TIP SAMPLE - FELL OUT INTO HOLE RING: SAMPLE | | | | | | | | |
| 20 | | | | 9 | | | IS BOTTOM 4"-10" RINGS] SANDY CLAY, BRN, SL MOIST, PLASTIC, GRADING TO | | | | | | | | |
| | | | | 10 | | SM | SILTY SAND, YELLOW BRN, SL MOIST, M. DENSE, NO PLASTICITY | | | | | | | | |

1-5

# LOG OF BORING NO. ( ~~B-4~~ 04-12A )

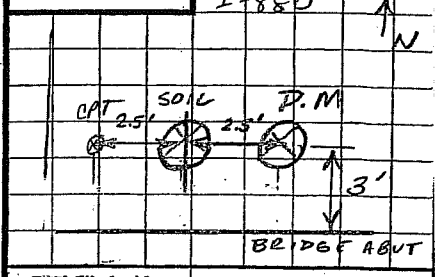
NORTH ABUTMENT

Earth Mechanics, Inc.
Geotechnical and Transportation Engineering

36/5

| | | | |
|---|---|---|---|
| **Project Name** | : VCSD BRIDGE ABUTMENT STUDY | | |
| **Project Location** | : PATTERSON SLOUGH BRIDGE, I-880, FREMONT, CA | | |
| **E.M.I. Project No.** | : 02-165 | **Site Condition :** | PAVED, CONCRETE |
| **Weather** | : SUNNY, WARM | **Elevation :** | 34.85 FT |
| **Traffic Control** | : CALTRANS | **Operator :** | |
| **Drilling Company** | : PITCHER | **Operator :** | RON PITCHER |
| **Type of Rig** | : FAILING 150 | **Drop (in) :** | |
| **Borehole Diameter** (inch) | : 6" | **Drive Wt. (lbs) :** | |
| **Logged By** | : J.C. | **Date Drilled :** | 6-12-04 |

**Comments :** I-880




**Backfilled with :**

| | Time | | | | | | | | | | Back to Office | Proposed Depth |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Depature | Arrival | Start | Break | Resume | Lunch | Resume | Break | Finish | Off | | 20 ft |
| **Driller** | | | | | | | | | | | | **Water Table** |
| **Traffic Control** | | | | | | | | | | | | NA ft |
| **Logger** | | | | | | | | | | | | **Caving** |
| **Total** | | | | | | | | | | | | ft |

| Depth (ft) | Sampler Type (Bulk, Drive, SPT, Tube) | Sample Number | Sample Type (B/D/S.B./T) | Blows/6" | Recovery (inch) | U.S.C.S. | Description (ASTM D-2488-93) Color | Moisture State (Dry, Moist, Wet) | Max. Size | Grain Size (%) Gravel : Sand : Fines | Sand Size | Plasticity | Consistency | Cementation | $O^2$/LEL/PID |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | 0-17" - CONCRETE, 17"-24" DEA GRAVEL | | | : : | | | | | |
| 2.5 | D | 1 | | 5/11/12 | 14" | SM | SILTY SAND W/GRAVEL - YELLOW BROWN - GRAY, MOIST, M DENSE, ROUNDED GRAVELS TO 2.5" DIAM - MOISTURE MAY BE FROM CONCRETE CORING | | | | | | | | |
| 5 | D | 2 | | 10/14/16 | 15" | ML / SM | SANDY SILT W/GRAVEL - GRAY/BLK MOTTLED, MOIST, MOD. DENSE, GRAVELS TO ~1.5" DIAM, FINE GRAINED SAND | | | : : | | | | | |
| ~~10~~ 7.5 | S | 3 | | 8/7/8 | 12" | ML | SILT W/ SAND, OLIVE BRN, SL. MOIST STIFF, NO PLASTICITY, TRACE GRAVELS, <0.5" DIAM | | | | | | | | |
| 10 ~~15~~ | D | 4 | | 7/14/18 | 15" | CL | SILTY CLAY W/GRAVEL, BRN, MOIST TO WET, PLASTIC, SUBROUNDED TO SUBANG GRAVELS TO 3/4" DIAM HARD | | | | | | | | |
| 12.5 ~~20~~ | S | 5 | | 7/14/18 | 18 | CL | CLAY W/SILT - BLUE/GRAY MOTTLED W/ YELLOW BROWN, MOIST, HARD, PLASTIC | | | | | | | | |
| 15 ~~25~~ | D | 6 | | 16/22/23 | 16" | MH / ML | ELASTIC SILT W/ SAND - BLK/GRAY MOTTLED, SL. MOIST, HARD SL. PLASTICITY, HARD | | | | | | | | |

2-5

# LOG OF BORING NO. ( ~~B-4~~ 04-12A )

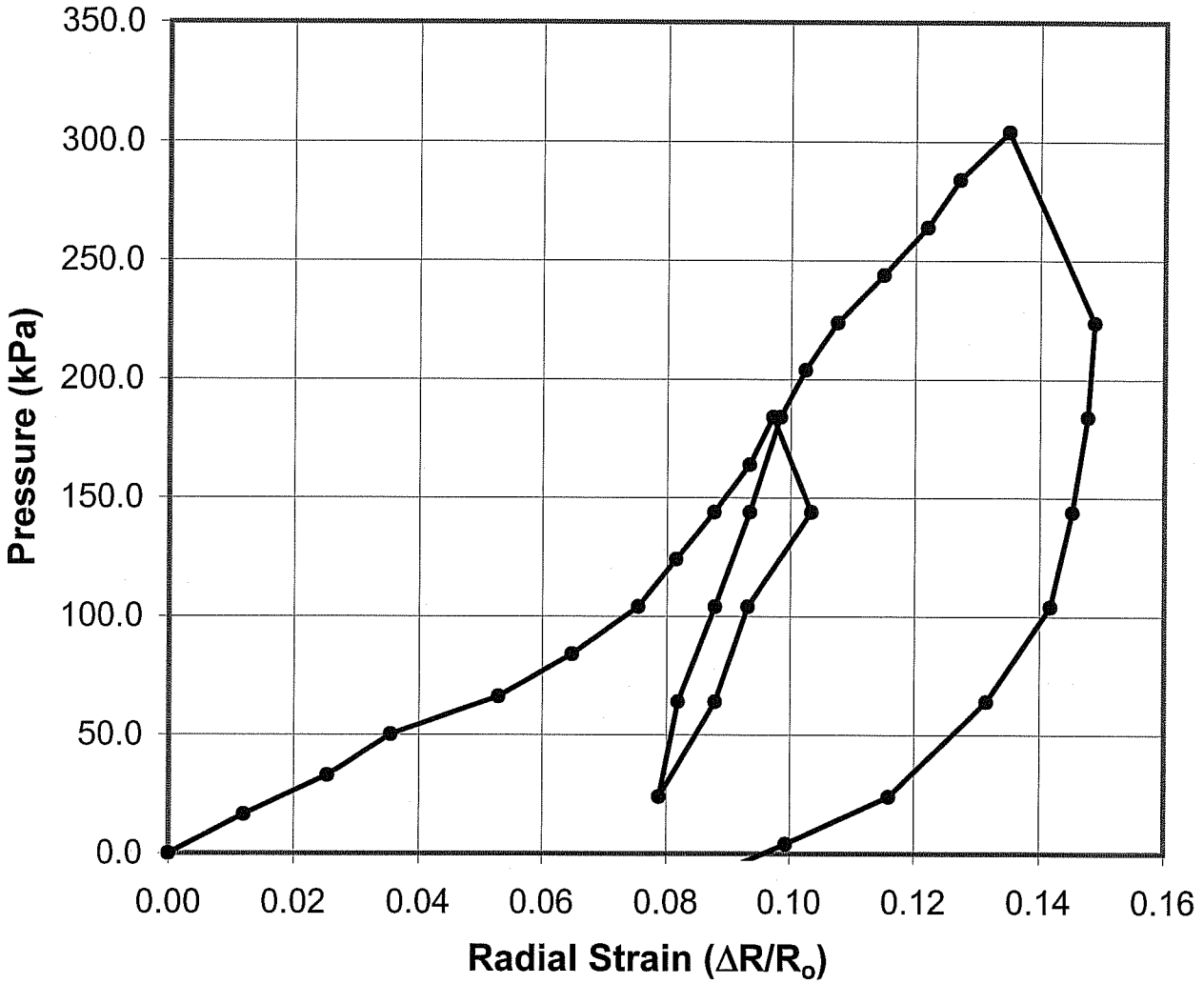
NORTH ABUTMENT

Earth Mechanics, Inc.

**Project No. :** 02-165 **Project Name :** UCSD - PATTERSON SLOUGH

| Depth (ft) | Sampler Type (Bulk, Drive, SPT, Tube) | Sample Number | Sample Type (B/D/S.B./T) | Blows/6" | Recovery (inch) | U.S.C.S. | Description (ASTM D-2488-93) Color | Moisture State (Dry, Moist, Wet) | Max. Size | Grain Size (%) Gravel : Sand : Fines | Sand Size | Plasticity | Consistency | Cementation | $O^2$/LEL/PID |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 ~~30~~ | S | 7 | | 4 | 18" | CL | SILTY CLAY W/SAND YELLOW BRN MOTTLED W/GRAY, TRACE | | | : : | | | | | |
| | | | | 8 | | | ORGANICS, MOIST, PLASTIC, V. STIFF, V. FINE GRAINED | | | | | | | | |
| | | | | 11 | | | SAND | | | : : | | | | | |
| 35 | | | | | | | * AT 19' - CHANGE IN COLOR FROM GRAY BLACK TO YELLOW BROWN | | | | | | | | |
| | | | | | | | HIGHER CLAY CONTENT. | | | | | | | | |
| | | | | | | | | | | : : | | | | | |
| 40 | | | | | | | | | | : : | | | | | |
| | | | | | | | | | | : : | | | | | |
| 45 | | | | | | | | | | : : | | | | | |
| | | | | | | | | | | : : | | | | | |
| 50 | | | | | | | | | | : : | | | | | |
| | | | | | | | | | | : : | | | | | |
| 55 | | | | | | | | | | : : | | | | | |
| | | | | | | | | | | : : | | | | | |
| 60 | | | | | | | | | | : : | | | | | |
| | | | | | | | | | | : : | | | | | |
| 65 | | | | | | | | | | : : | | | | | |
| 70 | | | | | | | | | | : : | | | | | |

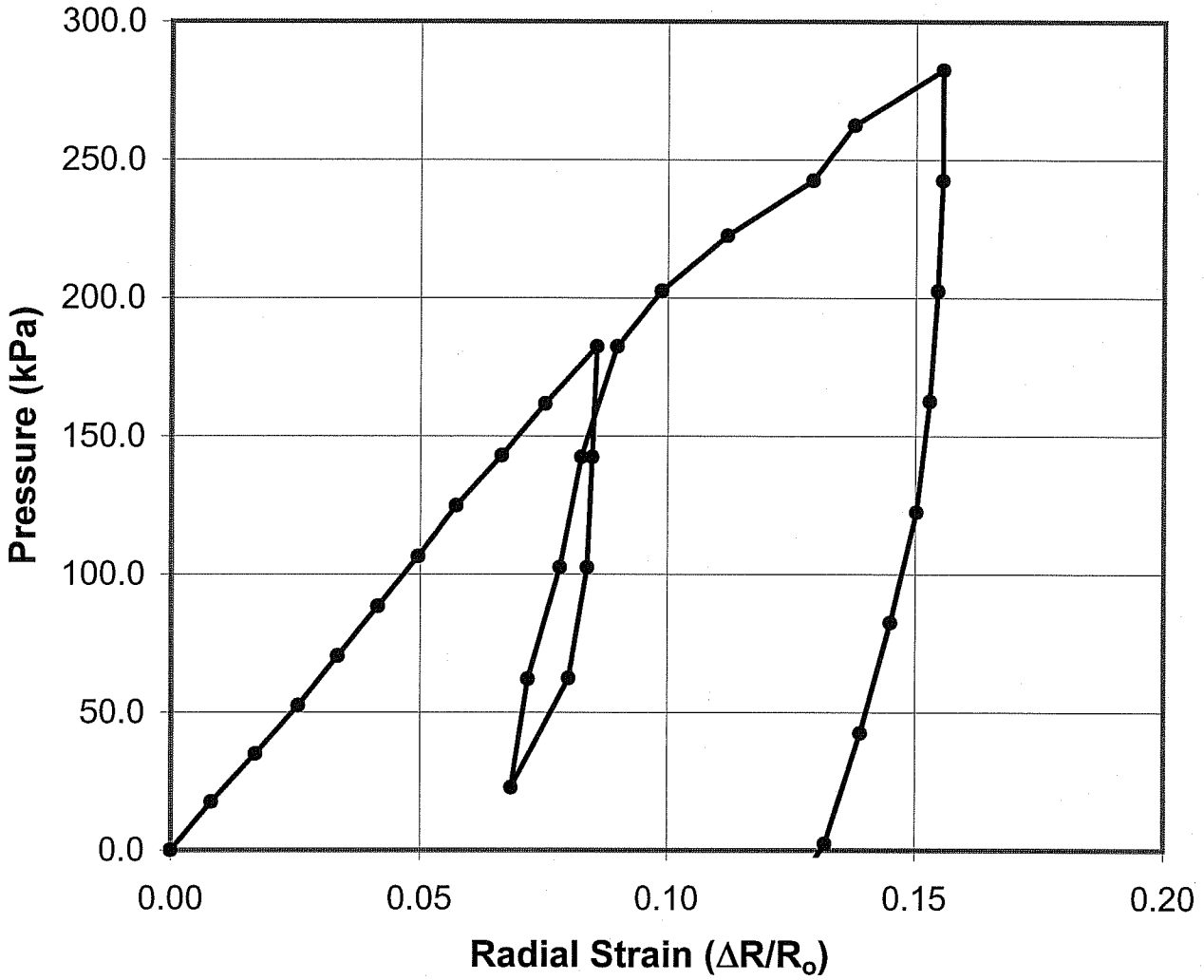
# Pressuremeter Test Result




| | |
|---|---|
| Boring No.: | **04-11P** |
| Location: | **Patterson Slough, Abut #1** |
| | **Frement County** |
| Test Date: | **6/17/2004** |
| Test Depth: | **5 ft** |
| Soil Type: | **Silt and Clay** |

| | | |
|---|---|---|
| Earth Mechanics, Inc.<br>Geotechnical and Earthquake Engineering | **CALTRANS-UCSD / Abutment Research** | |
| | Project No : 02-165 | Date : 12/22/2004 |

# Pressuremeter Test Result




| | |
|---|---|
| Boring No.: | **04-12P** |
| Location: | **Patterson Slough, Abut #3** |
| | **Frement County** |
| Test Date: | **6/17/2004** |
| Test Depth: | **5 ft** |
| Soil Type: | **Sandy Clay with Gravel** |

**Earth Mechanics, Inc.**
Geotechnical and Earthquake Engineering

**CALTRANS-UCSD / Abutment Research**

Project No : 02-165 | Date : 12/22/2004

GREGG DRILLING AND TESTING, INC.
GREGG IN SITU, INC.
ENVIRONMENTAL AND GEOTECHNICAL INVESTIGATION SERVICES

June 17, 2004

Earth Mechanics
Attn: Jody Castle
7700 Edgewater Drive Suite 846
Oakland, California 94621

Subject: CPT Site Investigation
Peterson Slough Bridge
Fremont, California
GREGG Project Number: 04-201ma

Dear Jody:

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

| | | | |
|---|---|---|---|
| 1 | Cone Penetration Tests | (CPTU) | X |
| 2 | Pore Pressure Dissipation Tests | (PPD) | ☐ |
| 3 | Seismic Cone Penetration Tests | (SCPTU) | X |
| 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 (562) 427-6899.

Sincerely,
GREGG IN SITU, Inc.

Mary Walden
Operations Manager

950 Howe Road • Martinez, California 94553 • (925) 313-5800 • FAX (925) 313-0302
OTHER OFFICES: SUMMERVILLE • LOS ANGELES • SALT LAKE CITY • HOUSTON • VANCOUVER • WEST BERLIN (NJ) •AUGUSTA
www.greggdrilling.com

# Bibliography

Campanella, R.G. and I. Weemees, "Development and Use of An Electrical Resistivity Cone for Groundwater Contamination Studies", Canadian Geotechnical Journal, Vol. 27 No. 5, 1990 pp. 557-567.

Daniel, C.R., J.A. Howie and A. Sy, "A Method for Correlating Large Penetration Test (LPT) to Standard Penetration Test (SPT) Blow Counts", 55th Canadian Geotechnical Conference, Niagara Falls, Ontario, Proceedings ,2002.

DeGroot, D.J. and A.J. Lutenegger, "Reliability of Soil Gas Sampling and Characterization Techniques", International Site Characterization Conference - Atlanta, 1998.

Greig, J.w., R.G. Campanella and P.K. Robertson, "Comparison of Field Vane Results With Other In-Situ Test Results", International Symposium, on Laboratory and Field Vane Shear Strength Testing, ASTM, Tampa, FL, Proceedings, 1987.

Kurfurst, P.J. and D.J. Woeller, "Electric cone Penetrometer – Development and Field Results From the Canadian Arctic", Penetration Testing 1988 ISOPT, Orlando, Volume 2 pp 823-830.

Mayne, P.W., "NHI (2002) Manual on Subsurface Investigations: Geotechnical Site Characterization", available through www.ce.gatech.edu/~geosys/Faculty/Mayne/papers/index.html, Section 5.3, pp. 107-112.

Robertson, P.K., R.G. Campanella, D. Gillespie and A. Rice, "Seismic CPT to Measure In-Situ Shear Wave Velocity", Journal of Geotechnical Engineering ASCE, Vol. 112, No. 8, 1986
pp. 791-803.

Robertson, P.K., T. Lunne and J.J.M. Powell, "Geo-Environmental Application of Penetration Testing", Geotechnical Site Characterization, Robertson & Mayne (editors), 1998 Balkema, Rotterdam, ISBN 90 5410 939 4 pp 35-47.

Roberston, P.K., "Soil Classification using the Cone Penetration Test", Canadian Geotechnical Journal, Vol. 27, 1990 pp. 151-158.

Woeller, D.J., P.K. Robertson, T.J. Boyd and Dave Thomas, "Detection of Polyaromatic Hydrocarbon Contaminants Using the UVIF-CPT", 53rd Canadian Geotechnical Conference Montreal, QC October pp. 733-739, 2000.

Zemo, D.A., T.A. Delfino, J.D. Gallinatti, V.A. Baker and L.R. Hilpert, "Field Comparison of Analytical Results from Discrete-Depth Groundwater Samplers" BAT EnviroProbe and QED HydroPunch, Sixth national Outdoor Action Conference, Las Vegas, Nevada Proceedings, 1992, pp 299-312.

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

**Gregg In Situ CPT Interpretations as of January 7, 1999 (Release 1.00.19)**

Gregg In Situ's interpretation routine should be considered a calculator of current published CPT correlations and is subject to change to reflect the current state of practice. The interpreted values are not considered valid for all soil types. The interpretations are presented only as a guide for geotechnical use and should be carefully scrutinized for consideration in any geotechnical design. Reference to current literature is strongly recommended.

The CPT interpretations are based on values of tip, sleeve friction and pore pressure averaged over a user specified interval (typically 0.25m). Note that Qt is the recorded tip value, Qc, corrected for pore pressure effects. Since all Gregg In Situ cones have equal end area friction sleeves, pore pressure corrections to sleeve friction, Fs, are not required.

The tip correction is: $Qt = Qc + (1-a) \bullet Ud$

where: *Qt* is the corrected tip load
*Qc* is the recorded tip load
*Ud* is the recorded dynamic pore pressure
*a* is the Net Area Ratio for the cone (typically 0.85 for Gregg In Situ cones)

Effective vertical overburden stresses are calculated based on a hydrostatic distribution of equilibrium pore pressures below the water table or from a user defined equilibrium pore pressure profile (this can be obtained from CPT dissipation tests). The stress calculations use unit weights assigned to the Soil Behavior Type zones or from a user defined unit weight profile.

Details regarding the interpretation methods for all of the interpreted parameters is given in table 1. The appropriate references referred to in table 1 are listed in table 2.

The estimated Soil Behavior Type is based on the charts developed by Robertson and Campanella shown in figure 1.

**Table 1 CPT Interpretation Methods**

| Interpreted Parameter | Description | Equation | Ref |
|---|---|---|---|
| Depth | mid layer depth | | |
| AvgQt | Averaged corrected tip (Qt) | $AvgQt = \frac{1}{n}\sum_{i=1}^{n} Qt_i$ | |
| AvgFs | Averaged sleeve friction (Fs) | $AvgFs = \frac{1}{n}\sum_{i=1}^{n} Fs_i$ | |
| AvgRf | Averaged friction ratio (Rf) | $AvgRf = 100\% \bullet \frac{AvgFs}{AvgQt}$ | |
| AvgUd | Averaged dynamic pore pressure (Ud) | $AvgUd = \frac{1}{n}\sum_{i=1}^{n} Ud_i$ | |
| SBT | Soil Behavior Type as defined by Robertson and Campanella | | 1 |

| | | | |
|---|---|---|---|
| U.Wt. | Unit Weight of soil determined from:<br>1) uniform value or<br>2) value assigned to each SBT zone<br>3) user supplied unit weight profile | | |
| TStress | Total vertical overburden stress at mid layer depth | $TStress = \sum_{i=1}^{n} \gamma_i h_i$<br>where $\gamma_i$ is layer unit weight<br>$h_i$ is layer thickness | |
| EStress | Effective vertical overburden stress at mid layer depth | $EStress = TStress - Ueq$ | |
| Ueq | Equilibrium pore pressure determined from:<br>1) hydrostatic from water table depth<br>2) user supplied profile | | |
| Cn | SPT $N_{60}$ overburden correction factor | $Cn=(\sigma_v')^{-0.5}$<br>where $\sigma_v'$ *is in tsf*<br>$0.5 < C_n < 2.0$ | |
| $N_{60}$ | SPT N value at 60% energy calculated from Qt/N ratios assigned to each SBT zone | | 3 |
| $(N1)_{60}$ | SPT $N_{60}$ value corrected for overburden pressure | $N1_{60} = Cn \bullet N_{60}$ | 3 |
| $\Delta(N1)_{60}$ | Equivalent Clean Sand Correction to $(N1)_{60}$ | $\Delta(N1)_{60} = \frac{K_{SPT}}{1-K_{SPT}} \bullet (N1)_{60}$<br>Where: $K_{SPT}$ is defined as:<br>0.0 for FC < 5%<br>0.0167 • (FC - 5) for 5% < FC < 35%<br>0.5 for FC > 35%<br>FC - Fines Content in % | 7 |
| $(N1)_{60cs}$ | Equivalent Clean Sand $(N1)_{60}$ | $(N1)_{60cs} = (N1)_{60} + \Delta(N1)_{60}$ | 7 |
| Su | Undrained shear strength - Nkt is use selectable | $Su = \frac{Qt - \sigma_v}{N_{kt}}$ | 2 |
| k | Coefficient of permeability (assigned to each SBT zone) | | 6 |
| Bq | Pore pressure parameter | $Bq = \frac{\Delta u}{Qt - \sigma_v}$ | 2 |
| Qtn | Normalized Qt for Soil Behavior Type classification as defined by Robertson, 1990 | $Qtn = \frac{Qt - \sigma_v}{\sigma_v'}$ | 4 |
| Rfn | Normalized Rf for Soil Behavior Type classification as defined by Robertson, 1990 | $Rfn = 100\% \bullet \frac{f_s}{Qt - \sigma_v}$ | 4 |
| SBTn | Normalized Soil Behavior Type (slightly modified from that published by Robertson, 1990. This version includes all the soil zones of the original non-normalized SBT chart - see figure 1) | | 4 |
| Qc1 | Normalized Qt for seismic analysis | $qc1 = qc \bullet (Pa/\sigma_v')^{0.5}$<br>where: Pa = atm. pressure | 5 |
| Qc1N | Dimensionless Normalized Qt1 | qc1N = qc1 / Pa<br>where: Pa = atm. pressure | |

| | | | |
|---|---|---|---|
| ΔQc1N1 | Equivalent clean sand correction | $\Delta qc1N = \frac{K_{CPT}}{1-K_{CPT}} \bullet qc1N$<br><br>Where: $K_{CPT}$ is defined as:<br><br>0.0 for FC < 5%<br>0.0267 • (FC - 5) for 5% < FC < 35%<br>0.5 for FC > 35%<br><br>FC - Fines Content in % | 5 |
| Qc1Ncs | Clean Sand equivalent Qc1N | $qc1Ncs = qc1N + \Delta qc1N$ | 5 |
| Ic | Soil index for estimating grain characteristics | $Ic = [(3.47 - logQ)^2 + (log\ F + 1.22)^2]^{0.5}$ | 5 |
| FC | Fines content (%) | $FC=1.75(Ic^{3.25}) - 3.7$<br>$FC=100$ for $Ic > 3.5$<br>$FC=0$ for $Ic < 1.26$<br>$FC = 5\%$ if $1.64 < Ic < 2.6$ AND $Rfn<0.5$ | 8 |
| PHI | Friction Angle | Campanella and Robertson<br>Durunoglu and Mitchel<br>Janbu | 1 |
| Dr | Relative Density | Ticino Sand<br>Hokksund Sand<br>Schmertmann 1976<br>Jamiolkowski - All Sands | 1 |
| OCR | Over Consolidation Ratio | | 1 |
| State Parameter | | | 9 |
| CRR | Cyclic Resistance Ratio | | 7 |
| | | | |

# APPENDIX CPT

# 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 dynamic 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 (2002) 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 dynamic 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.

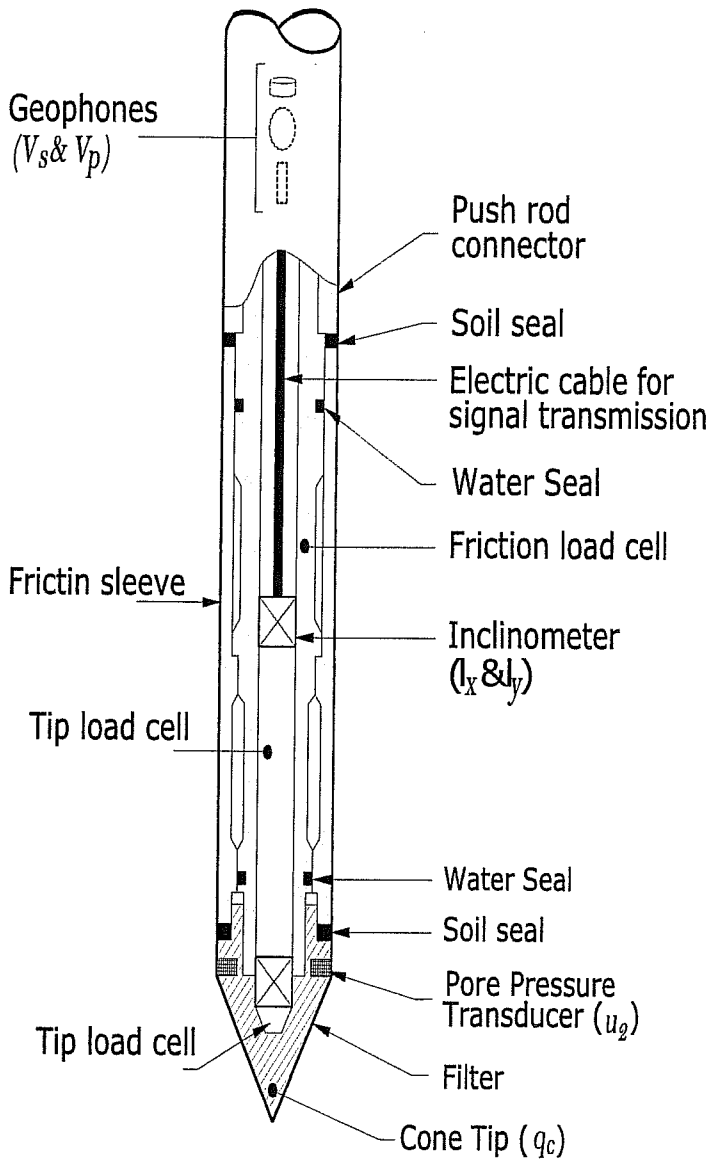



*Figure CPT*

When the soundings are complete, the test holes are grouted using a Gregg In Situ support rig. The grouting procedure consists 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 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 ($u_2$)

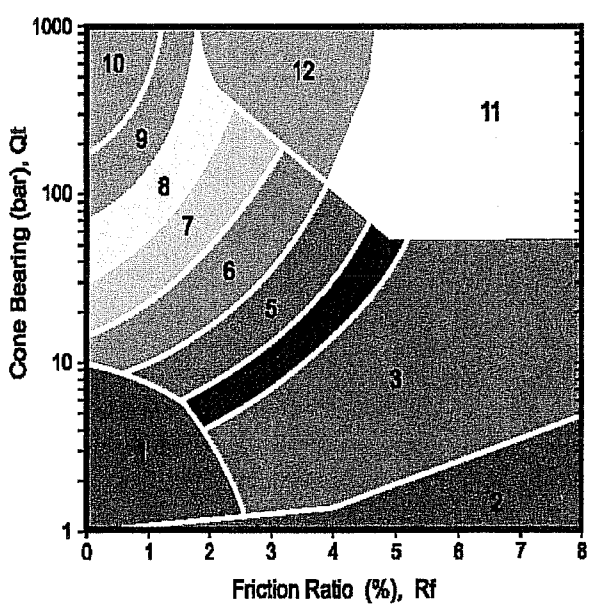
Cohesionless soils (sands)

- 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 et al, 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 greained |
| 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

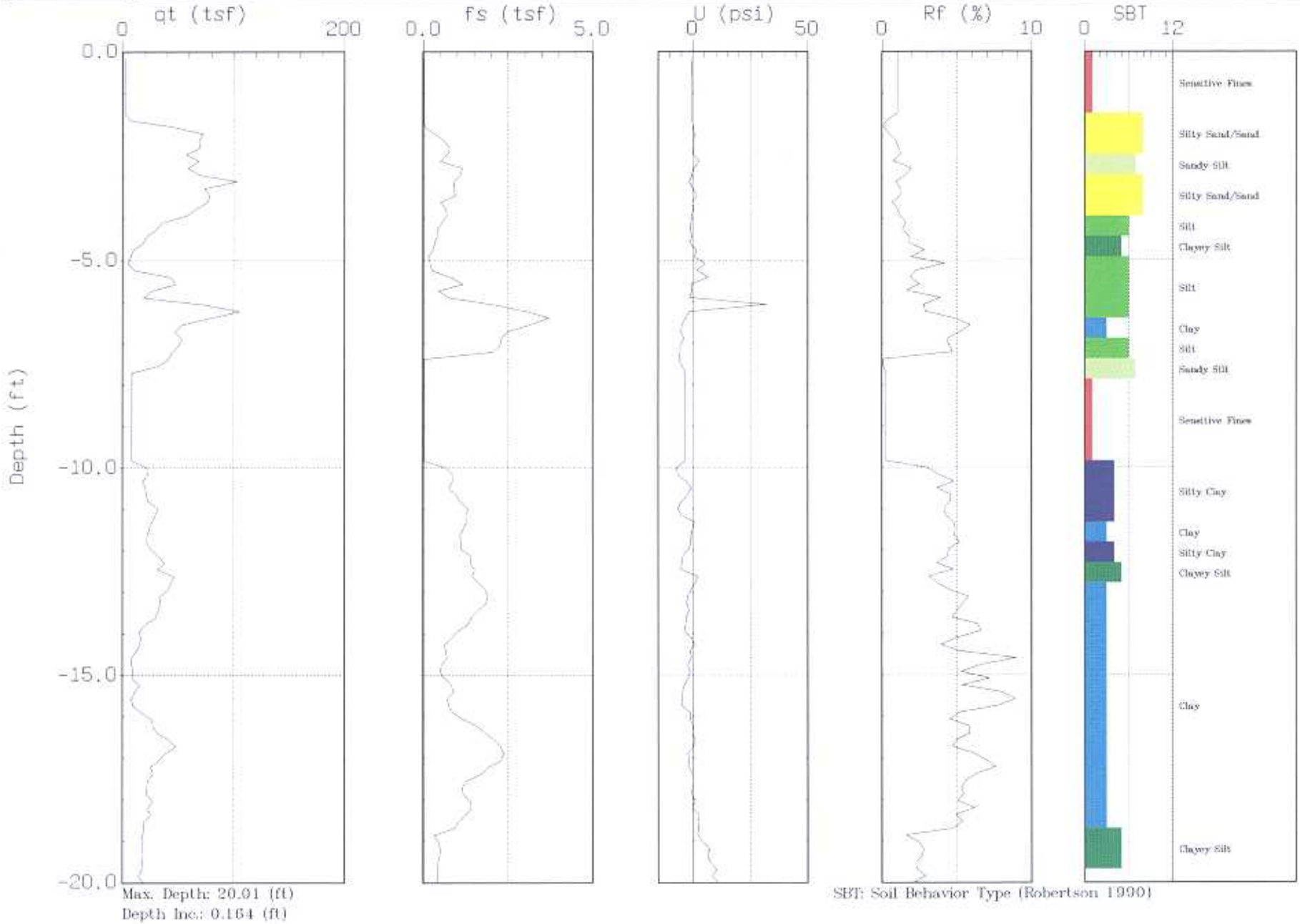
*Figure SBT*

GREGG

# EARTH MECHANICS

Site: PATTERSON SLOUGH
Location: CPT-ABUT-1 04-11

Engineer: J. CASTLE
Date: 06:11:04 11:15

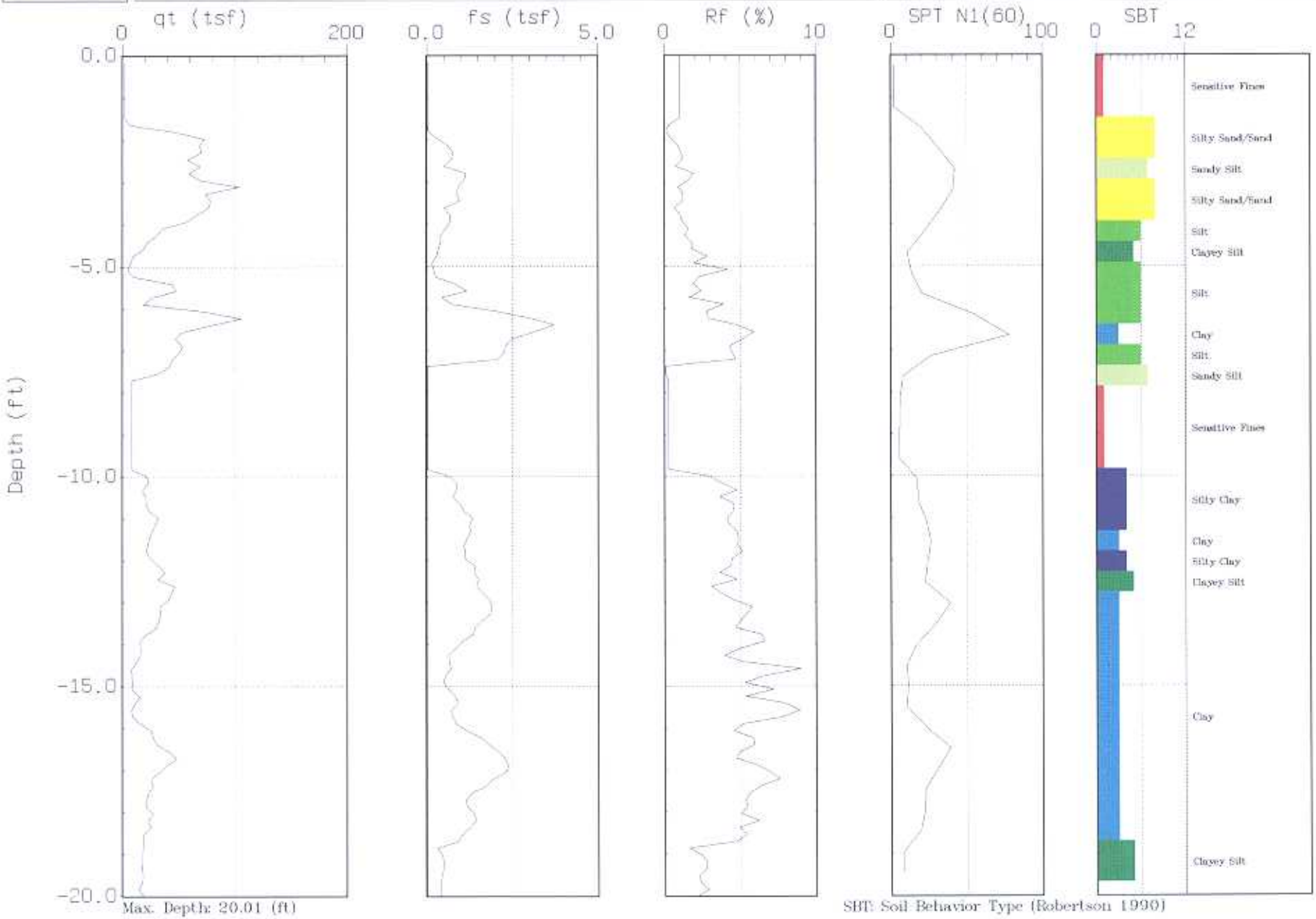


GREGG

# EARTH MECHANICS

Site: PATTERSON SLOUGH
Location: CPT-ABUT-1 04-11

Engineer: J. CASTLE
Date: 06:11:04 11:15




Max. Depth: 20.01 (ft)
Depth Inc.: 0.164 (ft)

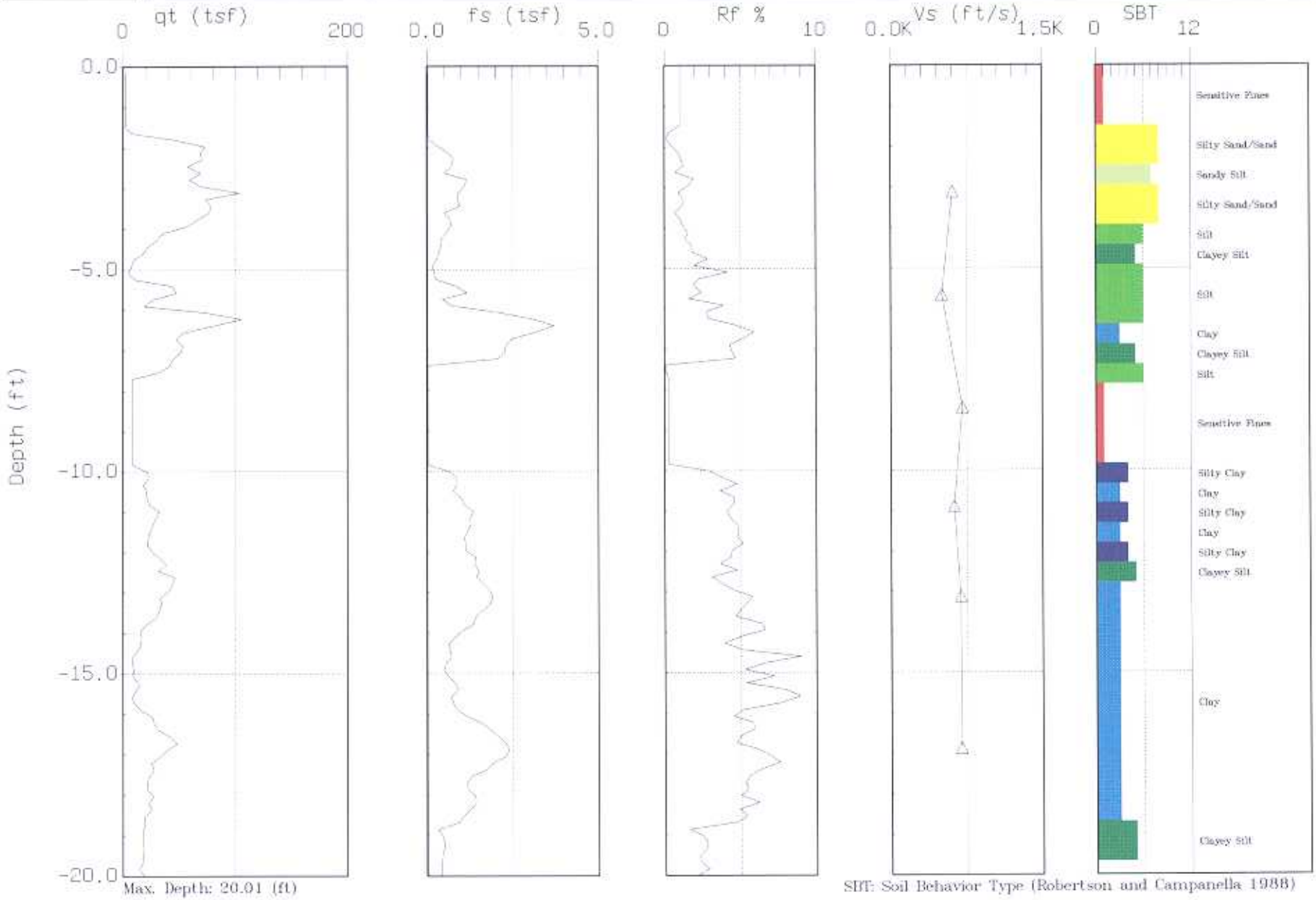
SBT: Soil Behavior Type (Robertson 1990)

GREGG

EARTH MECHANICS

Site: PATTERSON SLOUGH
Location: CPT-ABUT-1 04-11

Engineer: J. CASTLE
Date: 06:11:04 11:15




Max. Depth: 20.01 (ft)

Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson and Campanella 1988)

Gregg In Situ, Inc.
Interpretation Output - Release 1.00.19e
Run No: 04-0617-1644-0326
Job No: 04-201MA
Client: EARTH MECHANICS
Project: CPT SITE INVESTIGATION
Site: PATTERSON SLOUGH
Location: CPT-ABUT-1 04-11C
Engineer: J. CASTLE
CPT Date: 04/11/06
CPT Time: 11:15
CPT File: 201S01.COR
Northing (m): 0.000
Easting (m): 0.000
Elevation (m): 0.000

---

Water Table (m): 9.14 (ft): 30.0
Su Nkt used: 12.50
Averaging Increment (m): 0.15
Phi Method : Robertson and Campanella, 1983
Dr Method : Jamiolkowski - All Sands
State Parameter M: 1.20
Used Unit Weights Assigned to Soil Zones
Values of 1.0E9 or UnDef are printed for parameters that are not valid for the material type (SBT)

| Depth (ft) | AvgQt (tsf) | AvgFs (tsf) | AvgRf (%) | AvgUd (ft) | SBT | U.Wt. pcf | TStress (tsf) | EStress (tsf) | Ueq (tsf) | Cn | N60 (blows/ft) | (N1)60 | Su (tsf) | CRR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.25 | 2.0 | 0.02 | 1.00 | -0.8 | 1 | 79.6 | 0.01 | 0.01 | 0.00 | 2.00 | 1.0 | 1.9 | 0.16 | 0.00 |
| 0.74 | 2.0 | 0.02 | 1.00 | -0.6 | 1 | 79.6 | 0.03 | 0.03 | 0.00 | 2.00 | 1.0 | 1.9 | 0.16 | 0.00 |
| 1.23 | 2.0 | 0.02 | 1.00 | -0.6 | 1 | 79.6 | 0.05 | 0.05 | 0.00 | 2.00 | 1.0 | 1.9 | 0.16 | 0.00 |
| 1.72 | 41.6 | 0.12 | 0.30 | 0.5 | 8 | 120.9 | 0.07 | 0.07 | 0.00 | 2.00 | 10.0 | 19.9 | UnDef | 0.13 |
| 2.21 | 65.4 | 0.69 | 1.06 | 0.9 | 8 | 120.9 | 0.10 | 0.10 | 0.00 | 2.00 | 15.7 | 31.3 | UnDef | 0.26 |
| 2.71 | 65.9 | 0.91 | 1.37 | 2.1 | 7 | 117.8 | 0.13 | 0.13 | 0.00 | 2.00 | 21.1 | 42.1 | UnDef | 0.27 |
| 3.20 | 85.3 | 0.91 | 1.07 | 0.2 | 8 | 120.9 | 0.16 | 0.16 | 0.00 | 2.00 | 20.4 | 40.8 | UnDef | 0.00 |
| 3.61 | 71.3 | 0.58 | 0.81 | 0.3 | 8 | 120.9 | 0.19 | 0.19 | 0.00 | 2.00 | 17.1 | 34.2 | UnDef | 0.32 |
| 4.02 | 41.0 | 0.54 | 1.31 | -2.2 | 7 | 117.8 | 0.21 | 0.21 | 0.00 | 2.00 | 13.1 | 26.2 | UnDef | 0.14 |
| 4.51 | 16.5 | 0.33 | 2.02 | -0.1 | 5 | 114.6 | 0.24 | 0.24 | 0.00 | 2.00 | 7.9 | 15.8 | 1.30 | 0.09 |
| 5.00 | 7.3 | 0.19 | 2.55 | 5.9 | 4 | 114.6 | 0.27 | 0.27 | 0.00 | 1.93 | 4.6 | 9.0 | 0.56 | 0.11 |
| 5.50 | 39.3 | 0.80 | 2.04 | 4.2 | 6 | 114.6 | 0.30 | 0.30 | 0.00 | 1.84 | 15.1 | 27.7 | 3.12 | 0.16 |
| 5.99 | 66.0 | 1.94 | 2.94 | 22.8 | 6 | 114.6 | 0.32 | 0.32 | 0.00 | 1.76 | 25.3 | 44.4 | 5.26 | 0.00 |
| 6.56 | 58.4 | 2.91 | 4.98 | -9.9 | 11 | 130.5 | 0.36 | 0.36 | 0.00 | 1.67 | 55.9 | 93.2 | UnDef | 0.00 |

Gregg In Situ, Inc.
Run No: 04-0617-1644-0326
CPT File: 201S01.COR

04-11C



| Depth (ft) | AvgQt (tsf) | AvgFs (tsf) | AvgRf (%) | AvgUd (ft) | SBT | U.Wt. pcf | TStress (tsf) | EStress (tsf) | Ueq (tsf) | Cn | N60 (blows/ft) | (N1)60 | Su (tsf) | CRR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7.14 | 45.5 | 1.45 | 3.18 | -13.4 | 5 | 114.6 | 0.40 | 0.40 | 0.00 | 1.59 | 21.8 | 34.7 | 3.61 | 0.23 |
| 7.63 | 16.1 | 0.02 | 0.12 | -8.6 | 6 | 114.6 | 0.42 | 0.42 | 0.00 | 1.54 | 6.2 | 9.5 | 1.25 | 0.00 |
| 8.12 | 8.3 | 0.02 | 0.24 | -7.3 | 1 | 79.6 | 0.45 | 0.45 | 0.00 | 1.49 | 4.0 | 5.9 | 0.63 | 0.00 |
| 8.61 | 8.3 | 0.02 | 0.24 | -7.3 | 1 | 79.6 | 0.47 | 0.47 | 0.00 | 1.46 | 4.0 | 5.8 | 0.62 | 0.00 |
| 9.10 | 8.3 | 0.02 | 0.24 | -7.3 | 1 | 79.6 | 0.49 | 0.49 | 0.00 | 1.43 | 4.0 | 5.7 | 0.62 | 0.00 |
| 9.60 | 8.3 | 0.02 | 0.24 | -7.3 | 1 | 79.6 | 0.51 | 0.51 | 0.00 | 1.41 | 4.0 | 5.6 | 0.62 | 0.00 |
| 10.09 | 20.9 | 0.79 | 3.78 | -12.9 | 4 | 114.6 | 0.53 | 0.53 | 0.00 | 1.37 | 13.3 | 18.3 | 1.63 | 0.34 |
| 10.58 | 21.8 | 0.93 | 4.25 | -6.1 | 3 | 111.4 | 0.56 | 0.56 | 0.00 | 1.34 | 20.9 | 27.9 | 1.70 | 0.35 |
| 11.07 | 29.3 | 1.28 | 4.35 | -8.3 | 4 | 114.6 | 0.59 | 0.59 | 0.00 | 1.31 | 18.7 | 24.5 | 2.30 | 0.00 |
| 11.56 | 22.6 | 1.12 | 4.95 | -1.6 | 3 | 111.4 | 0.61 | 0.61 | 0.00 | 1.28 | 21.7 | 27.7 | 1.76 | 0.00 |
| 12.06 | 31.8 | 1.29 | 4.07 | -8.3 | 4 | 114.6 | 0.64 | 0.64 | 0.00 | 1.25 | 20.3 | 25.4 | 2.49 | 0.00 |
| 12.55 | 40.6 | 1.52 | 3.75 | -1.6 | 5 | 114.6 | 0.67 | 0.67 | 0.00 | 1.22 | 19.4 | 23.8 | 3.19 | 0.34 |
| 13.04 | 35.8 | 1.86 | 5.19 | -4.6 | 3 | 111.4 | 0.70 | 0.70 | 0.00 | 1.20 | 34.3 | 41.1 | 2.81 | 0.00 |
| 13.53 | 27.6 | 1.45 | 5.23 | -6.0 | 3 | 111.4 | 0.72 | 0.72 | 0.00 | 1.17 | 26.5 | 31.1 | 2.15 | 0.00 |
| 14.03 | 15.8 | 0.81 | 5.14 | -2.9 | 3 | 111.4 | 0.75 | 0.75 | 0.00 | 1.15 | 15.1 | 17.5 | 1.20 | 0.00 |
| 14.52 | 9.5 | 0.63 | 6.57 | -3.1 | 3 | 111.4 | 0.78 | 0.78 | 0.00 | 1.13 | 9.1 | 10.3 | 0.70 | 0.00 |
| 15.01 | 11.0 | 0.64 | 5.79 | -5.4 | 3 | 111.4 | 0.81 | 0.81 | 0.00 | 1.11 | 10.6 | 11.8 | 0.82 | 0.00 |
| 15.50 | 9.6 | 0.78 | 8.13 | -11.0 | 3 | 111.4 | 0.83 | 0.83 | 0.00 | 1.09 | 9.2 | 10.0 | 0.70 | 0.00 |
| 15.99 | 23.3 | 1.21 | 5.18 | -1.8 | 3 | 111.4 | 0.86 | 0.86 | 0.00 | 1.08 | 22.3 | 24.0 | 1.79 | 0.00 |
| 16.49 | 40.3 | 2.06 | 5.11 | 0.9 | 3 | 111.4 | 0.89 | 0.89 | 0.00 | 1.06 | 38.6 | 40.9 | 3.15 | 0.00 |
| 16.98 | 32.3 | 2.19 | 6.79 | -4.4 | 3 | 111.4 | 0.92 | 0.92 | 0.00 | 1.04 | 30.9 | 32.3 | 2.51 | 0.00 |
| 17.47 | 23.9 | 1.38 | 5.77 | -0.4 | 3 | 111.4 | 0.94 | 0.94 | 0.00 | 1.03 | 22.9 | 23.5 | 1.84 | 0.00 |
| 17.96 | 23.8 | 1.32 | 5.54 | 0.1 | 3 | 111.4 | 0.97 | 0.97 | 0.00 | 1.01 | 22.8 | 23.1 | 1.83 | 0.00 |
| 18.45 | 21.1 | 1.06 | 5.02 | 5.6 | 3 | 111.4 | 1.00 | 1.00 | 0.00 | 1.00 | 20.2 | 20.3 | 1.61 | 0.00 |
| 18.95 | 18.0 | 0.41 | 2.26 | 10.3 | 5 | 114.6 | 1.03 | 1.03 | 0.00 | 0.99 | 8.6 | 8.5 | 1.36 | 0.14 |
| 19.44 | 17.7 | 0.43 | 2.43 | 18.6 | 5 | 114.6 | 1.05 | 1.05 | 0.00 | 0.97 | 8.5 | 8.3 | 1.33 | 0.14 |

Gregg In Situ, Inc.
Interpretation Output - Release 1.00.19e
Run No: 04-0617-1644-0326
Job No: 04-201MA
Client: EARTH MECHANICS
Project: CPT SITE INVESTIGATION
Site: PATTERSON SLOUGH
Location: CPT-ABUT-1 04-11C
Engineer: J. CASTLE
CPT Date: 04/11/06
CPT Time: 11:15
CPT File: 201S01.COR
Northing (m): 0.000
Easting (m): 0.000
Elevation (m): 0.000

---

Water Table (m): 9.14 (ft): 30.0
Su Nkt used: 12.50
Averaging Increment (m): 0.15
Phi Method : Robertson and Campanella, 1983
Dr Method : Jamiolkowski - All Sands
State Parameter M: 1.20
Used Unit Weights Assigned to Soil Zones
Values of 1.0E9 or UnDef are printed for parameters that are not valid for the material type (SBT)

---

| Depth (ft) | k (cm/s) | Bq | Qtn | Rfn | Qc1N | DeltaQc1N | Qc1Ncs | Fc (%) | Phi (Deg) | Dr (%) | OCR | State Param | Del(n1)60 | (N1)60cs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.25 | 1.0E-07 | -0.01 | 203.0 | 1.01 | 3.8 | 0.1 | 3.9 | 5.9 | UnDef | UnDef | 10.0 | UnDef | 0.0 | 1.9 |
| 0.74 | 1.0E-07 | -0.01 | 67.0 | 1.02 | 3.8 | 1.3 | 5.1 | 14.4 | UnDef | UnDef | 10.0 | UnDef | 0.4 | 2.3 |
| 1.23 | 1.0E-07 | -0.01 | 39.8 | 1.03 | 3.8 | 2.7 | 6.5 | 20.3 | UnDef | UnDef | 6.0 | UnDef | 0.7 | 2.6 |
| 1.72 | 5.0E-03 | 0.00 | 564.7 | 0.30 | 79.8 | 0.0 | 79.8 | 0.0 | 50 | 78.9 | 1.0 | -0.24 | 0.0 | 19.9 |
| 2.21 | 5.0E-03 | 0.00 | 632.1 | 1.06 | 125.3 | 0.0 | 125.3 | 1.7 | 50 | 87.0 | 1.0 | -0.37 | 0.0 | 31.3 |
| 2.71 | 5.0E-04 | 0.00 | 495.8 | 1.38 | 126.3 | 0.0 | 126.3 | 3.8 | 48 | 83.7 | 1.0 | -0.38 | 0.0 | 42.1 |
| 3.20 | 5.0E-03 | 0.00 | 525.2 | 1.07 | 163.4 | 0.0 | 163.4 | 2.3 | 48 | 88.2 | 1.0 | -0.35 | 0.0 | 40.8 |
| 3.61 | 5.0E-03 | 0.00 | 380.6 | 0.81 | 136.6 | 0.0 | 136.6 | 2.0 | 48 | 81.0 | 1.0 | -0.29 | 0.0 | 34.2 |
| 4.02 | 5.0E-04 | 0.00 | 192.8 | 1.32 | 78.5 | 6.6 | 85.0 | 7.9 | 44 | 63.4 | 1.0 | -0.28 | 1.3 | 27.5 |
| 4.51 | 5.0E-06 | 0.00 | 67.8 | 2.05 | 31.6 | 22.2 | 53.8 | 20.4 | UnDef | UnDef | 10.0 | UnDef | 5.5 | 21.3 |
| 5.00 | 5.0E-07 | 0.03 | 26.1 | 2.65 | 13.8 | 55.0 | 68.8 | 36.8 | UnDef | UnDef | 6.0 | UnDef | 9.0 | 17.9 |
| 5.50 | 5.0E-05 | 0.00 | 131.8 | 2.06 | 70.7 | 22.8 | 93.6 | 14.1 | 44 | 57.4 | 10.0 | -0.30 | 5.0 | 32.7 |
| 5.99 | 5.0E-05 | 0.01 | 202.5 | 2.95 | 113.4 | UnDef | UnDef | 0.0 | 46 | 70.9 | 10.0 | -0.42 | UnDef | UnDef |
| 6.56 | 1.0E-15 | -0.01 | 161.1 | 5.01 | 95.2 | UnDef | UnDef | 0.0 | 44 | 65.9 | 1.0 | -0.64 | UnDef | UnDef |

Gregg In Situ, Inc.
Run No: 04-0617-1644-0326
CPT File: 201S01.COR

04-11C



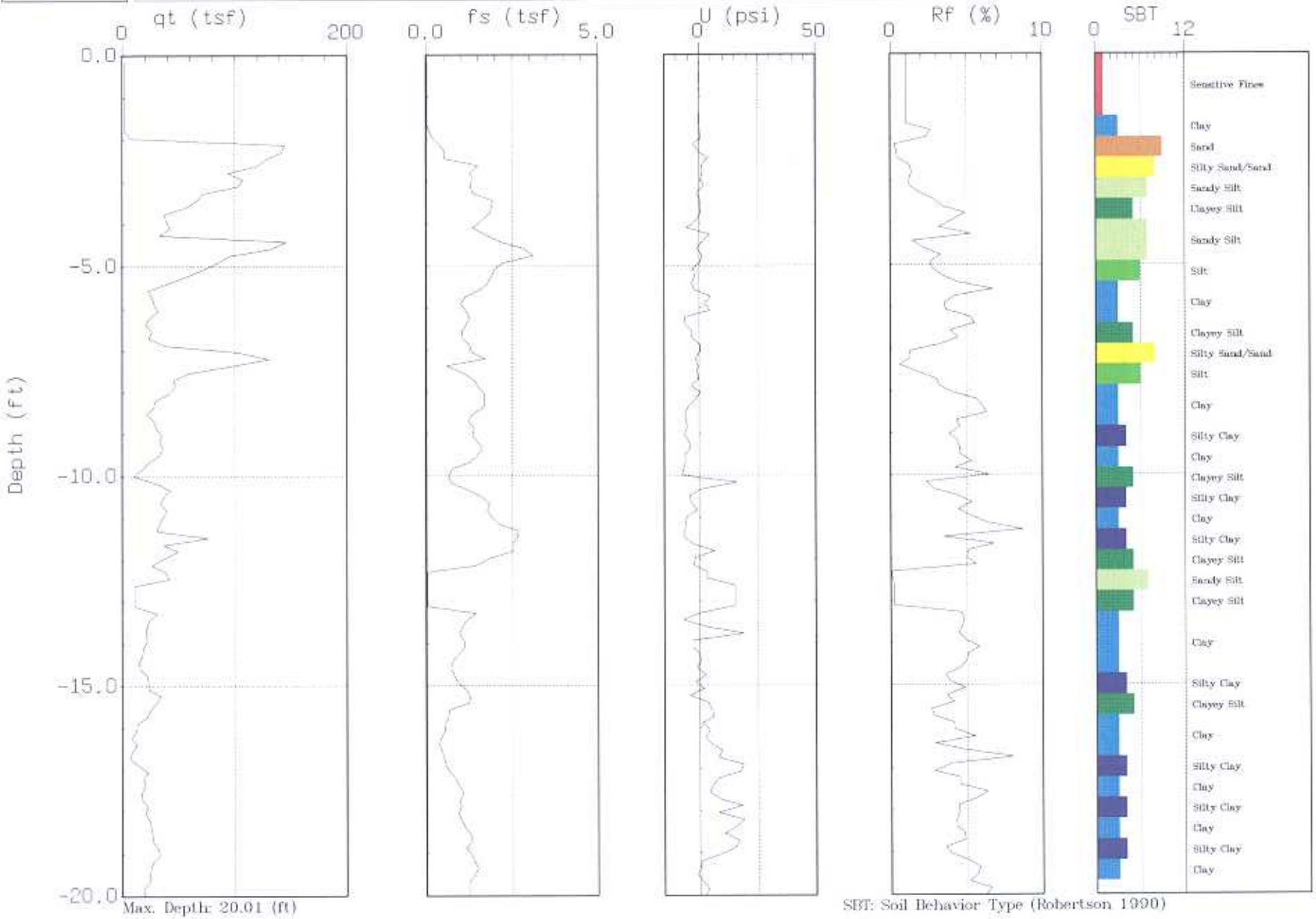
| Depth (ft) | k (cm/s) | Bq | Qtn | Rfn | Qc1N | DeltaQc1N | Qc1Ncs | Fc (%) | Phi (Deg) | Dr (%) | OCR | State Param | Del(n1)60 | (N1)60cs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7.14 | 5.0E-06 | -0.01 | 114.1 | 3.21 | 70.8 | 47.5 | 118.3 | 20.0 | UnDef | UnDef | 10.0 | UnDef | 11.6 | 46.3 |
| 7.63 | 5.0E-05 | -0.02 | 36.9 | 0.13 | 24.2 | 0.0 | 24.2 | 5.0 | 38 | 30.0 | 6.0 | 0.07 | 0.0 | 9.5 |
| 8.12 | 1.0E-07 | -0.03 | 17.5 | 0.26 | 12.1 | 0.0 | 12.1 | 5.0 | UnDef | UnDef | 6.0 | UnDef | 0.0 | 5.9 |
| 8.61 | 1.0E-07 | -0.03 | 16.7 | 0.26 | 11.9 | 0.0 | 11.9 | 5.0 | UnDef | UnDef | 6.0 | UnDef | 0.0 | 5.8 |
| 9.10 | 1.0E-07 | -0.03 | 16.0 | 0.26 | 11.6 | 0.0 | 11.6 | 5.0 | UnDef | UnDef | 6.0 | UnDef | 0.0 | 5.7 |
| 9.60 | 1.0E-07 | -0.03 | 15.4 | 0.26 | 11.4 | 0.0 | 11.4 | 5.0 | UnDef | UnDef | 6.0 | UnDef | 0.0 | 5.6 |
| 10.09 | 5.0E-07 | -0.02 | 38.4 | 3.88 | 28.1 | 112.4 | 140.5 | 36.0 | UnDef | UnDef | 6.0 | UnDef | 18.3 | 36.7 |
| 10.58 | 5.0E-08 | -0.01 | 38.0 | 4.36 | 28.5 | 114.1 | 142.6 | 37.9 | UnDef | UnDef | 6.0 | UnDef | 27.9 | 55.8 |
| 11.07 | 5.0E-07 | -0.01 | 49.1 | 4.44 | 37.5 | 135.8 | 173.4 | 34.3 | UnDef | UnDef | 6.0 | UnDef | 23.5 | 48.0 |
| 11.56 | 5.0E-08 | 0.00 | 35.9 | 5.09 | 28.3 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 12.06 | 5.0E-07 | -0.01 | 48.6 | 4.15 | 38.9 | 123.8 | 162.6 | 33.5 | UnDef | UnDef | 6.0 | UnDef | 23.0 | 48.4 |
| 12.55 | 5.0E-06 | 0.00 | 59.6 | 3.81 | 48.6 | 91.8 | 140.3 | 29.5 | UnDef | UnDef | 10.0 | UnDef | 16.4 | 40.2 |
| 13.04 | 5.0E-08 | 0.00 | 50.3 | 5.30 | 42.0 | 167.9 | 209.8 | 36.7 | UnDef | UnDef | 10.0 | UnDef | 41.1 | 82.1 |
| 13.53 | 5.0E-08 | -0.01 | 37.1 | 5.37 | 31.8 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 14.03 | 5.0E-08 | -0.01 | 20.0 | 5.40 | 17.8 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 14.52 | 5.0E-08 | -0.01 | 11.2 | 7.16 | 10.6 | UnDef | UnDef | 100.0 | UnDef | UnDef | 3.0 | UnDef | UnDef | UnDef |
| 15.01 | 5.0E-08 | -0.02 | 12.7 | 6.25 | 12.0 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 15.50 | 5.0E-08 | -0.04 | 10.5 | 8.90 | 10.3 | UnDef | UnDef | 100.0 | UnDef | UnDef | 3.0 | UnDef | UnDef | UnDef |
| 15.99 | 5.0E-08 | 0.00 | 26.0 | 5.38 | 24.5 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 16.49 | 5.0E-08 | 0.00 | 44.3 | 5.22 | 41.8 | 167.2 | 209.0 | 38.4 | UnDef | UnDef | 6.0 | UnDef | 40.9 | 81.8 |
| 16.98 | 5.0E-08 | 0.00 | 34.2 | 6.99 | 33.0 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 17.47 | 5.0E-08 | 0.00 | 24.3 | 6.01 | 24.1 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 17.96 | 5.0E-08 | 0.00 | 23.5 | 5.77 | 23.6 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 18.45 | 5.0E-08 | 0.01 | 20.2 | 5.27 | 20.7 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 18.95 | 5.0E-06 | 0.02 | 16.5 | 2.40 | 17.4 | 69.5 | 86.8 | 43.9 | UnDef | UnDef | 6.0 | UnDef | 8.5 | 17.0 |
| 19.44 | 5.0E-06 | 0.03 | 15.8 | 2.59 | 16.9 | 67.5 | 84.4 | 45.8 | UnDef | UnDef | 6.0 | UnDef | 8.3 | 16.5 |

GREGG

# EARTH MECHANICS

Site: PATTERSON SLOUGH
Location: CPT-ABUT-11 04-12

Engineer: J. CASTLE
Date: 06:11:04 12:18




Max. Depth: 20.01 (ft)
Depth Inc.: 0.164 (ft)

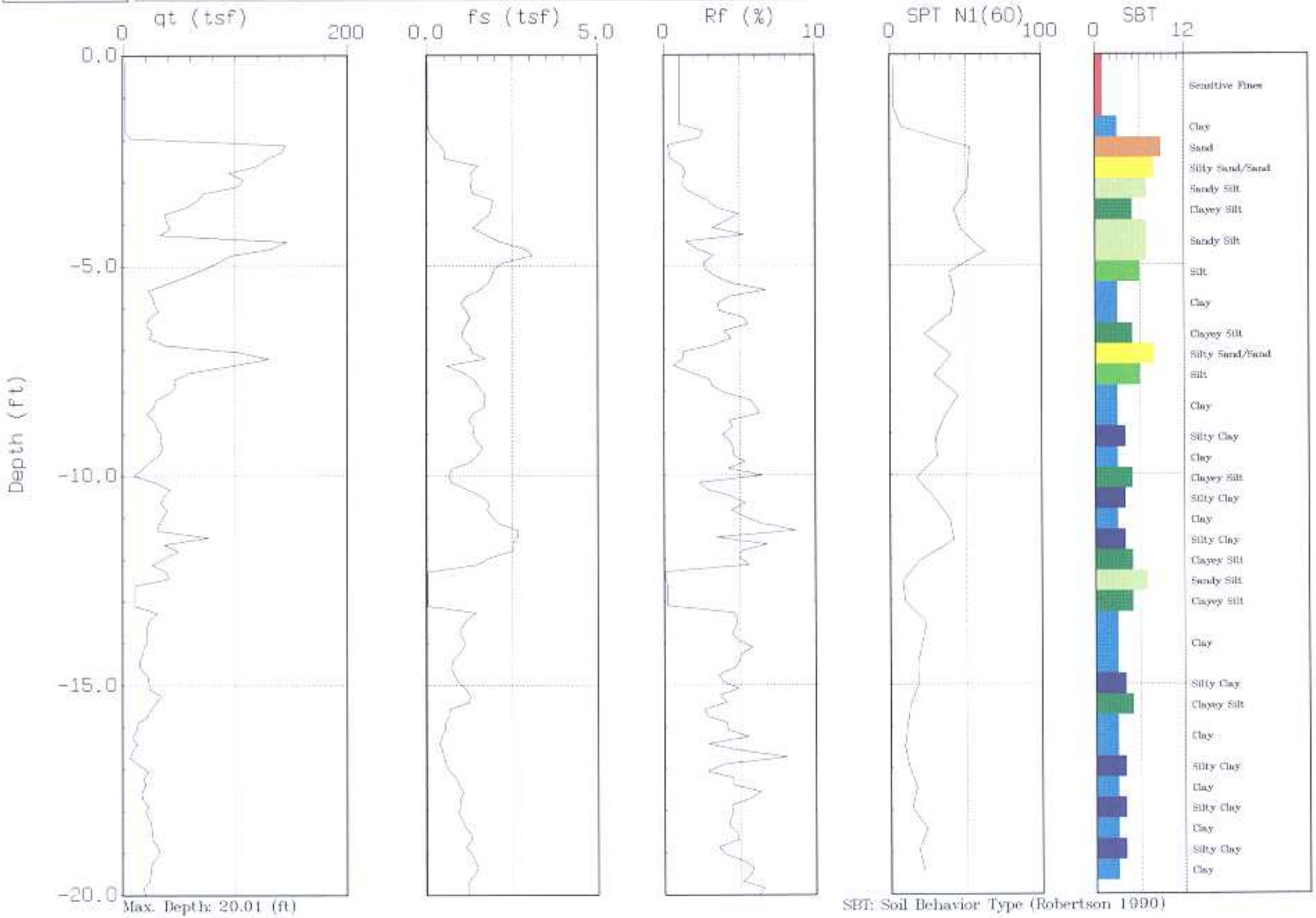
SBT: Soil Behavior Type (Robertson 1990)

GREGG

# EARTH MECHANICS

Site: PATTERSON SLOUGH
Location: CPT-ABUT-11 04-12

Engineer: J. CASTLE
Date: 06:11:04 12:18




Max. Depth: 20.01 (ft)
Depth Inc.: 0.164 (ft)

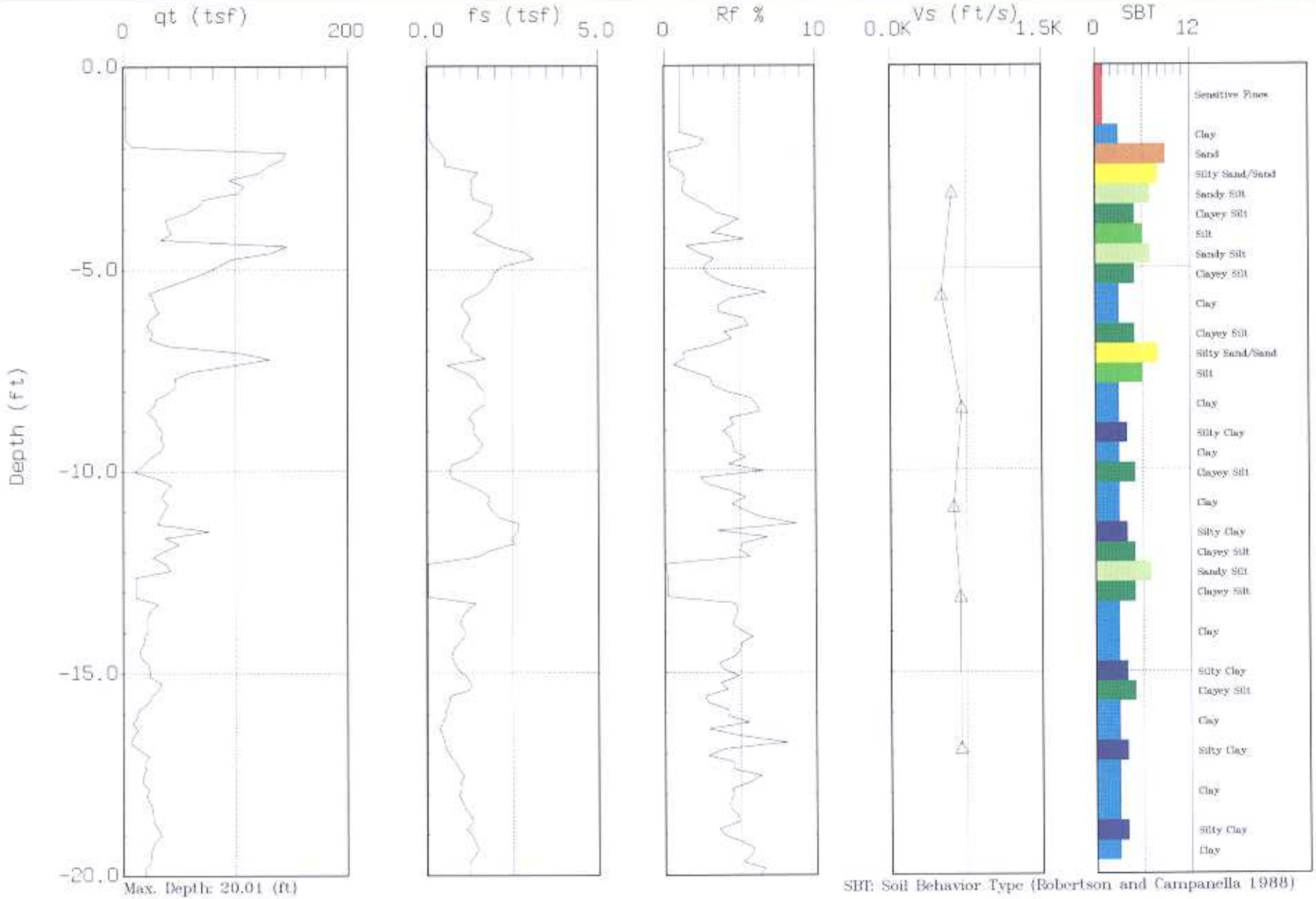
SBT: Soil Behavior Type (Robertson 1990)

GREGG

# EARTH MECHANICS

Site: PATTERSON SLOUGH
Location: CPT-ABUT-11 04-12

Engineer: J. CASTLE
Date: 06:11:04 12:18




Max. Depth: 20.01 (ft)
Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson and Campanella 1988)

Gregg In Situ, Inc.
Interpretation Output - Release 1.00.19e
Run No: 04-0617-1644-0403
Job No: 04-201MA
Client: EARTH MECHANICS
Project: CPT SITE INVESTIGATION
Site: PATTERSON SLOUGH
Location: CPT-ABUT-11 04-12C
Engineer: J. CASTLE
CPT Date: 04/11/06
CPT Time: 12:18
CPT File: 201S11.COR
Northing (m): 0.000
Easting (m): 0.000
Elevation (m): 0.000

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Water Table (m): 9.14 (ft): 30.0
Su Nkt used: 12.50
Averaging Increment (m): 0.15
Phi Method : Robertson and Campanella, 1983
Dr Method : Jamiolkowski - All Sands
State Parameter M: 1.20
Used Unit Weights Assigned to Soil Zones
Values of 1.0E9 or UnDef are printed for parameters that are not valid for the material type (SBT)

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| Depth (ft) | AvgQt (tsf) | AvgFs (tsf) | AvgRf (%) | AvgUd (ft) | SBT | U.Wt. pcf | TStress (tsf) | EStress (tsf) | Ueq (tsf) | Cn | N60 (blows/ft) | (N1)60 | Su (tsf) | CRR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.25 | 2.0 | 0.02 | 1.00 | -0.4 | 1 | 79.6 | 0.01 | 0.01 | 0.00 | 2.00 | 1.0 | 1.9 | 0.16 | 0.00 |
| 0.74 | 2.0 | 0.02 | 1.00 | -0.1 | 1 | 79.6 | 0.03 | 0.03 | 0.00 | 2.00 | 1.0 | 1.9 | 0.16 | 0.00 |
| 1.23 | 2.0 | 0.02 | 1.00 | -0.2 | 1 | 79.6 | 0.05 | 0.05 | 0.00 | 2.00 | 1.0 | 1.9 | 0.16 | 0.00 |
| 1.72 | 3.8 | 0.08 | 2.14 | 0.6 | 3 | 111.4 | 0.07 | 0.07 | 0.00 | 2.00 | 3.6 | 7.2 | 0.30 | 0.00 |
| 2.21 | 138.5 | 0.47 | 0.34 | 0.5 | 9 | 124.1 | 0.10 | 0.10 | 0.00 | 2.00 | 26.5 | 53.0 | UnDef | 0.00 |
| 2.71 | 107.5 | 1.37 | 1.27 | 2.2 | 8 | 120.9 | 0.13 | 0.13 | 0.00 | 2.00 | 25.7 | 51.5 | UnDef | 0.00 |
| 3.20 | 80.3 | 1.51 | 1.88 | 1.0 | 7 | 117.8 | 0.16 | 0.16 | 0.00 | 2.00 | 25.6 | 51.3 | UnDef | 0.00 |
| 3.61 | 46.5 | 1.86 | 4.01 | 1.0 | 5 | 114.6 | 0.18 | 0.18 | 0.00 | 2.00 | 22.3 | 44.6 | 3.71 | 0.00 |
| 4.02 | 38.1 | 1.56 | 4.10 | -1.5 | 5 | 114.6 | 0.21 | 0.21 | 0.00 | 2.00 | 18.3 | 36.5 | 3.03 | 0.00 |
| 4.51 | 124.5 | 2.69 | 2.16 | 1.2 | 7 | 117.8 | 0.24 | 0.24 | 0.00 | 2.00 | 39.8 | 79.5 | UnDef | 0.00 |
| 5.00 | 70.9 | 2.03 | 2.87 | -3.3 | 6 | 114.6 | 0.27 | 0.27 | 0.00 | 1.94 | 27.2 | 52.7 | 5.65 | 0.00 |
| 5.50 | 29.8 | 1.48 | 4.97 | -0.8 | 3 | 111.4 | 0.29 | 0.29 | 0.00 | 1.85 | 28.5 | 52.7 | 2.36 | 0.00 |
| 5.99 | 27.8 | 1.13 | 4.06 | 0.1 | 4 | 114.6 | 0.32 | 0.32 | 0.00 | 1.76 | 17.8 | 31.3 | 2.20 | 0.20 |
| 6.56 | 27.2 | 1.12 | 4.11 | -7.1 | 4 | 114.6 | 0.35 | 0.35 | 0.00 | 1.68 | 17.4 | 29.2 | 2.15 | 0.22 |

Gregg In Situ, Inc.
Run No: 04-0617-1644-0403
CPT File: 201S11.COR



04-12C

| Depth (ft) | AvgQt (tsf) | AvgFs (tsf) | AvgRf (%) | AvgUd (ft) | SBT | U.Wt. pcf | TStress (tsf) | EStress (tsf) | Ueq (tsf) | Cn | N60 (blows/ft) | (N1)60 | Su (tsf) | CRR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7.14 | 109.6 | 1.19 | 1.08 | -1.4 | 8 | 120.9 | 0.39 | 0.39 | 0.00 | 1.61 | 26.2 | 42.1 | UnDef | 0.00 |
| 7.63 | 50.7 | 1.31 | 2.58 | -3.5 | 6 | 114.6 | 0.42 | 0.42 | 0.00 | 1.55 | 19.4 | 30.1 | 4.02 | 0.22 |
| 8.12 | 32.6 | 1.67 | 5.11 | -4.8 | 3 | 111.4 | 0.44 | 0.44 | 0.00 | 1.50 | 31.2 | 46.8 | 2.57 | 0.00 |
| 8.61 | 26.6 | 1.31 | 4.92 | -13.2 | 3 | 111.4 | 0.47 | 0.47 | 0.00 | 1.46 | 25.5 | 37.1 | 2.09 | 0.00 |
| 9.10 | 34.8 | 1.48 | 4.24 | -11.5 | 4 | 114.6 | 0.50 | 0.50 | 0.00 | 1.41 | 22.2 | 31.4 | 2.74 | 0.33 |
| 9.60 | 24.4 | 1.15 | 4.73 | -14.7 | 3 | 111.4 | 0.53 | 0.53 | 0.00 | 1.38 | 23.4 | 32.2 | 1.91 | 0.00 |
| 10.09 | 27.4 | 0.84 | 3.09 | 7.2 | 5 | 114.6 | 0.56 | 0.56 | 0.00 | 1.34 | 13.1 | 17.6 | 2.15 | 0.19 |
| 10.58 | 36.9 | 1.72 | 4.67 | -6.8 | 3 | 111.4 | 0.58 | 0.58 | 0.00 | 1.31 | 35.3 | 46.2 | 2.90 | 0.00 |
| 11.07 | 33.1 | 2.22 | 6.70 | -13.6 | 3 | 111.4 | 0.61 | 0.61 | 0.00 | 1.28 | 31.7 | 40.6 | 2.60 | 0.00 |
| 11.56 | 54.5 | 2.55 | 4.69 | -1.9 | 4 | 114.6 | 0.64 | 0.64 | 0.00 | 1.25 | 34.8 | 43.5 | 4.31 | 0.00 |
| 12.06 | 34.0 | 1.10 | 3.25 | -0.9 | 5 | 114.6 | 0.67 | 0.67 | 0.00 | 1.23 | 16.3 | 19.9 | 2.66 | 0.25 |
| 12.55 | 20.9 | 0.02 | 0.10 | 25.8 | 7 | 117.8 | 0.70 | 0.70 | 0.00 | 1.20 | 6.7 | 8.0 | UnDef | 0.00 |
| 13.04 | 17.4 | 0.49 | 2.80 | 23.8 | 5 | 114.6 | 0.72 | 0.72 | 0.00 | 1.18 | 8.3 | 9.8 | 1.33 | 0.17 |
| 13.53 | 22.2 | 1.04 | 4.66 | 11.4 | 3 | 111.4 | 0.75 | 0.75 | 0.00 | 1.15 | 21.3 | 24.6 | 1.72 | 0.00 |
| 14.03 | 19.6 | 1.03 | 5.24 | -4.2 | 3 | 111.4 | 0.78 | 0.78 | 0.00 | 1.13 | 18.8 | 21.3 | 1.51 | 0.00 |
| 14.52 | 17.4 | 0.74 | 4.27 | 1.3 | 3 | 111.4 | 0.81 | 0.81 | 0.00 | 1.11 | 16.6 | 18.5 | 1.32 | 0.00 |
| 15.01 | 26.8 | 1.09 | 4.07 | -3.3 | 4 | 114.6 | 0.83 | 0.83 | 0.00 | 1.10 | 17.1 | 18.7 | 2.08 | 0.35 |
| 15.50 | 25.6 | 0.84 | 3.27 | 11.2 | 5 | 114.6 | 0.86 | 0.86 | 0.00 | 1.08 | 12.3 | 13.2 | 1.98 | 0.31 |
| 15.99 | 11.1 | 0.49 | 4.46 | 5.9 | 3 | 111.4 | 0.89 | 0.89 | 0.00 | 1.06 | 10.6 | 11.2 | 0.81 | 0.00 |
| 16.49 | 9.2 | 0.43 | 4.64 | 17.1 | 3 | 111.4 | 0.92 | 0.92 | 0.00 | 1.04 | 8.8 | 9.2 | 0.66 | 0.00 |
| 16.98 | 18.4 | 0.67 | 3.65 | 33.8 | 4 | 114.6 | 0.95 | 0.95 | 0.00 | 1.03 | 11.7 | 12.1 | 1.40 | 0.15 |
| 17.47 | 18.2 | 0.98 | 5.41 | 14.0 | 3 | 111.4 | 0.97 | 0.97 | 0.00 | 1.01 | 17.4 | 17.6 | 1.37 | 0.00 |
| 17.96 | 22.3 | 0.97 | 4.37 | 34.8 | 3 | 111.4 | 1.00 | 1.00 | 0.00 | 1.00 | 21.4 | 21.4 | 1.70 | 0.00 |
| 18.45 | 26.3 | 1.22 | 4.65 | 32.9 | 3 | 111.4 | 1.03 | 1.03 | 0.00 | 0.99 | 25.1 | 24.8 | 2.02 | 0.00 |
| 18.95 | 30.7 | 1.27 | 4.14 | 19.1 | 4 | 114.6 | 1.06 | 1.06 | 0.00 | 0.97 | 19.6 | 19.1 | 2.37 | 0.37 |
| 19.44 | 24.4 | 1.36 | 5.56 | 0.5 | 3 | 111.4 | 1.08 | 1.08 | 0.00 | 0.96 | 23.4 | 22.5 | 1.87 | 0.00 |

Gregg In Situ, Inc. Page: 1b
Interpretation Output - Release 1.00.19e
Run No: 04-0617-1644-0403
Job No: 04-201MA
Client: EARTH MECHANICS
Project: CPT SITE INVESTIGATION
Site: PATTERSON SLOUGH
Location: CPT-ABUT-11 04-12C
Engineer: J. CASTLE
CPT Date: 04/11/06
CPT Time: 12:18
CPT File: 201S11.COR
Northing (m): 0.000
Easting (m): 0.000
Elevation (m): 0.000

---

Water Table (m): 9.14 (ft): 30.0
Su Nkt used: 12.50
Averaging Increment (m): 0.15
Phi Method : Robertson and Campanella, 1983
Dr Method : Jamiolkowski - All Sands
State Parameter M: 1.20
Used Unit Weights Assigned to Soil Zones
Values of 1.0E9 or UnDef are printed for parameters that are not valid for the material type (SBT)

---

| Depth (ft) | k (cm/s) | Bq | Qtn | Rfn | Qc1N | DeltaQc1N | Qc1Ncs | Fc (%) | Phi (Deg) | Dr (%) | OCR | State Param | Del(n1)60 | (N1)60cs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.25 | 1.0E-07 | -0.01 | 203.2 | 1.01 | 3.8 | 0.1 | 3.9 | 5.9 | UnDef | UnDef | 10.0 | UnDef | 0.0 | 1.9 |
| 0.74 | 1.0E-07 | 0.00 | 67.1 | 1.02 | 3.8 | 1.3 | 5.1 | 14.4 | UnDef | UnDef | 10.0 | UnDef | 0.4 | 2.3 |
| 1.23 | 1.0E-07 | 0.00 | 39.9 | 1.03 | 3.8 | 2.6 | 6.5 | 20.3 | UnDef | UnDef | 6.0 | UnDef | 0.7 | 2.6 |
| 1.72 | 5.0E-08 | 0.00 | 51.2 | 2.19 | 7.2 | 7.9 | 15.1 | 24.5 | UnDef | UnDef | 10.0 | UnDef | 3.5 | 10.7 |
| 2.21 | 5.0E-02 | 0.00 | 1000.0 | 0.34 | 265.2 | 0.0 | 265.2 | 0.0 | 50 | 95.0 | 1.0 | -0.30 | 0.0 | 53.0 |
| 2.71 | 5.0E-03 | 0.00 | 815.8 | 1.28 | 205.8 | 0.0 | 205.8 | 2.0 | 50 | 95.0 | 1.0 | -0.42 | 0.0 | 51.5 |
| 3.20 | 5.0E-04 | 0.00 | 498.1 | 1.89 | 153.8 | UnDef | UnDef | 0.0 | 48 | 86.6 | 1.0 | -0.43 | UnDef | UnDef |
| 3.61 | 5.0E-06 | 0.00 | 250.8 | 4.02 | 89.1 | UnDef | UnDef | 0.0 | UnDef | UnDef | 10.0 | UnDef | UnDef | UnDef |
| 4.02 | 5.0E-06 | 0.00 | 182.0 | 4.12 | 73.0 | UnDef | UnDef | 0.0 | UnDef | UnDef | 10.0 | UnDef | UnDef | UnDef |
| 4.51 | 5.0E-04 | 0.00 | 524.7 | 2.17 | 238.5 | UnDef | UnDef | 0.0 | 48 | 93.6 | 1.0 | -0.46 | UnDef | UnDef |
| 5.00 | 5.0E-05 | 0.00 | 266.1 | 2.88 | 134.7 | UnDef | UnDef | 0.0 | 46 | 75.8 | 10.0 | -0.45 | UnDef | UnDef |
| 5.50 | 5.0E-08 | 0.00 | 100.6 | 5.02 | 53.8 | UnDef | UnDef | 0.0 | UnDef | UnDef | 10.0 | UnDef | UnDef | UnDef |
| 5.99 | 5.0E-07 | 0.00 | 85.6 | 4.10 | 48.0 | 62.0 | 110.0 | 26.1 | UnDef | UnDef | 10.0 | UnDef | 17.1 | 48.4 |
| 6.56 | 5.0E-07 | -0.01 | 75.9 | 4.17 | 44.8 | 69.0 | 113.8 | 27.7 | UnDef | UnDef | 10.0 | UnDef | 17.9 | 47.1 |

Gregg In Situ, Inc.
Run No: 04-0617-1644-0403
CPT File: 201S11.COR

04-12C

| Depth (ft) | k (cm/s) | Bq | Qtn | Rfn | Qc1N | DeltaQc1N | Qc1Ncs | Fc (%) | Phi (Deg) | Dr (%) | OCR | State Param | Del(n1)60 | (N1)60cs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7.14 | 5.0E-03 | 0.00 | 281.6 | 1.09 | 172.2 | 0.0 | 172.2 | 4.7 | 46 | 82.9 | 1.0 | -0.29 | 0.0 | 42.1 |
| 7.63 | 5.0E-05 | 0.00 | 120.6 | 2.60 | 76.8 | 37.2 | 114.0 | 17.2 | 42 | 59.7 | 10.0 | -0.33 | 7.7 | 37.8 |
| 8.12 | 5.0E-08 | 0.00 | 72.3 | 5.19 | 47.8 | UnDef | UnDef | 0.0 | UnDef | UnDef | 10.0 | UnDef | UnDef | UnDef |
| 8.61 | 5.0E-08 | -0.02 | 55.5 | 5.01 | 38.0 | 140.0 | 178.0 | 34.5 | UnDef | UnDef | 10.0 | UnDef | 36.0 | 73.1 |
| 9.10 | 5.0E-07 | -0.01 | 68.6 | 4.30 | 48.2 | 90.0 | 138.2 | 29.4 | UnDef | UnDef | 10.0 | UnDef | 21.6 | 53.0 |
| 9.60 | 5.0E-08 | -0.02 | 45.3 | 4.83 | 32.9 | 131.5 | 164.4 | 36.8 | UnDef | UnDef | 6.0 | UnDef | 32.2 | 64.4 |
| 10.09 | 5.0E-06 | 0.01 | 48.3 | 3.15 | 35.9 | 69.9 | 105.8 | 29.7 | UnDef | UnDef | 6.0 | UnDef | 12.4 | 30.0 |
| 10.58 | 5.0E-08 | -0.01 | 62.2 | 4.74 | 47.2 | 123.1 | 170.3 | 32.1 | UnDef | UnDef | 10.0 | UnDef | 38.1 | 84.4 |
| 11.07 | 5.0E-08 | -0.01 | 53.3 | 6.82 | 41.5 | UnDef | UnDef | 100.0 | UnDef | UnDef | 10.0 | UnDef | UnDef | UnDef |
| 11.56 | 5.0E-07 | 0.00 | 84.4 | 4.74 | 66.7 | UnDef | UnDef | 0.0 | UnDef | UnDef | 10.0 | UnDef | UnDef | UnDef |
| 12.06 | 5.0E-06 | 0.00 | 50.0 | 3.31 | 40.7 | 81.1 | 121.8 | 29.9 | UnDef | UnDef | 6.0 | UnDef | 14.2 | 34.1 |
| 12.55 | 5.0E-04 | 0.04 | 29.0 | 0.10 | 24.5 | 0.0 | 24.5 | 5.0 | 36 | 30.0 | 1.0 | 0.11 | 0.0 | 8.0 |
| 13.04 | 5.0E-06 | 0.04 | 23.0 | 2.93 | 20.0 | 80.0 | 100.0 | 40.4 | UnDef | UnDef | 6.0 | UnDef | 9.8 | 19.6 |
| 13.53 | 5.0E-08 | 0.02 | 28.6 | 4.82 | 25.1 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 14.03 | 5.0E-08 | -0.01 | 24.2 | 5.46 | 21.7 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 14.52 | 5.0E-08 | 0.00 | 20.5 | 4.48 | 18.9 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 15.01 | 5.0E-07 | 0.00 | 31.1 | 4.20 | 28.7 | 114.8 | 143.5 | 40.6 | UnDef | UnDef | 6.0 | UnDef | 18.7 | 37.5 |
| 15.50 | 5.0E-06 | 0.01 | 28.7 | 3.38 | 27.0 | 107.9 | 134.8 | 38.7 | UnDef | UnDef | 6.0 | UnDef | 13.2 | 26.4 |
| 15.99 | 5.0E-08 | 0.02 | 11.4 | 4.85 | 11.5 | UnDef | UnDef | 100.0 | UnDef | UnDef | 3.0 | UnDef | UnDef | UnDef |
| 16.49 | 5.0E-08 | 0.06 | 9.0 | 5.15 | 9.4 | UnDef | UnDef | 100.0 | UnDef | UnDef | 3.0 | UnDef | UnDef | UnDef |
| 16.98 | 5.0E-07 | 0.06 | 18.5 | 3.85 | 18.5 | 74.1 | 92.6 | 48.9 | UnDef | UnDef | 6.0 | UnDef | 12.1 | 24.2 |
| 17.47 | 5.0E-08 | 0.03 | 17.7 | 5.72 | 18.0 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 17.96 | 5.0E-08 | 0.05 | 21.3 | 4.57 | 21.8 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 18.45 | 5.0E-08 | 0.04 | 24.5 | 4.84 | 25.3 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 18.95 | 5.0E-07 | 0.02 | 28.1 | 4.29 | 29.2 | 116.9 | 146.1 | 42.7 | UnDef | UnDef | 6.0 | UnDef | 19.1 | 38.1 |
| 19.44 | 5.0E-08 | 0.00 | 21.6 | 5.82 | 23.0 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |

# APPENDIX SEISMIC

# Seismic Cone Penetrometer Testing
## (SCPTu)

Gregg In Situ, Inc. uses a modified CPT cone that contains a built in seismometer to measure compression and shear wave velocities in addition to the standard piezocone parameters ($q_c$, $f_s$, and $u_2$). Therefore, four independent readings are compiled with depth in a single sounding. The standard CPT parameters are recorded continuously while the seismic test is usually performed at 5-foot intervals.

Shear waves are generated by striking a seismic beam coupled to the ground surface by a hydraulic cylinder under the CPT rig, *Figure SCPTu*. Compression waves are generated by striking an auger in the ground. The sledgehammer that strikes the beam/auger acts as a trigger, initiating the recording of the seismic wave trace. Before measurements are taken, the rods are decoupled from the CPT rig to prevent energy transmission down the rods.

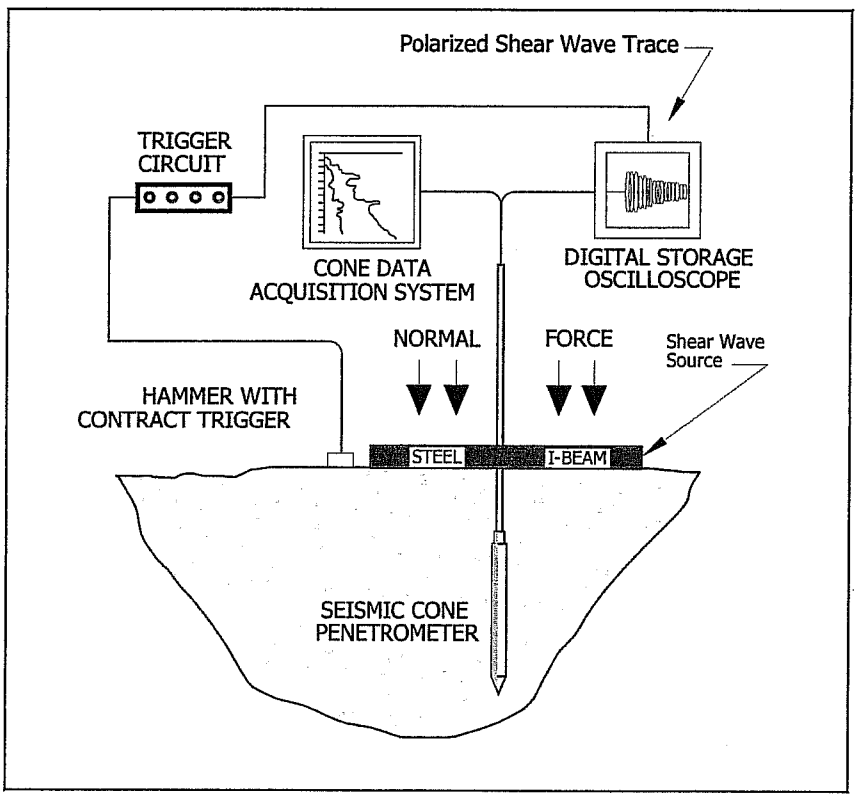



*Figure SCPTu*

Geophones in the body of the piezocone recognize the arriving waves generated at the ground surface, *Figure Seismic*. Any waves received by the geophones on the cone penetrometer are sent back up to the truck to be displayed on an oscilloscope. On site software then plots the wave amplitude versus time to calculate wave velocities.

At least two waves are recorded for each test depth so the operator can check consistency of the waveforms. Shear wave data is sampled at a frequency of 20kHz (20,000 samples per second) and compression wave data is sampled at 50kHz (50,000 samples per second). To maintain a desired signal resolution, the input sensitivity (gain) is increased with depth.

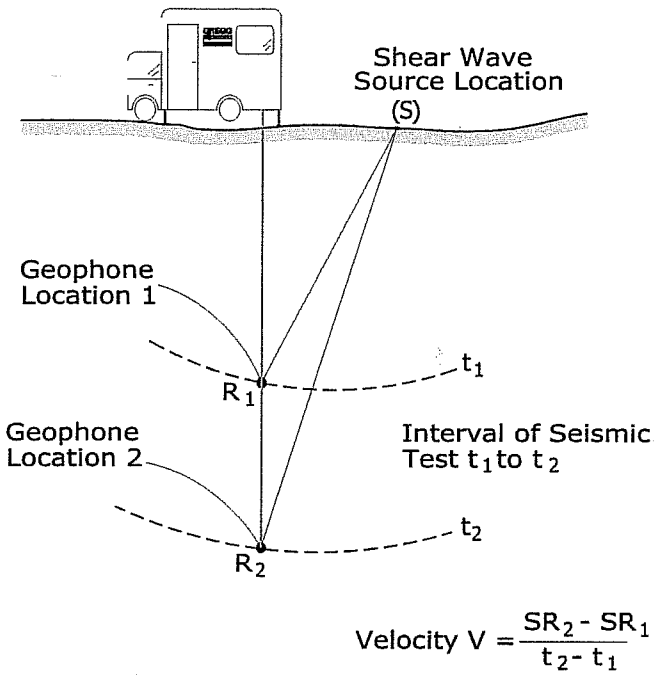



*Figure Seismic*

Offset distances of the beam from the cone and the location of the geophone are all taken into account in calculations.

The shear wave velocity ($V_s$) provides information about small-strain stiffness while the penetration data provides information about large-strain failures. From interval shear wave velocity ($V_s$) and the mass density ($\rho$) of a soil layer, the dynamic shear modulus ($G_o$) of the soil can be calculated in a specific depth interval. The dynamic shear modulus ($G_0$) is a key parameter for the analysis of soil behavior in response to dynamic loading from earthquakes, ice, vibrating machine foundations, waves and wind.

A summary of the data collected including the depth and location identification is displayed in Table 1 and graphical formats and can be found with the corresponding CPT plot.

For a detailed reference on seismic CPT, refer to Robertson et. al., 1986.

GREGG

GIS Project No: 04-201MA
Client: Earth Mechanics
Site: Patterson Slough Bridge
Location ABUT-1
Sounding Date: June 11, 2004

**Shear Wave Velocity Calculations**

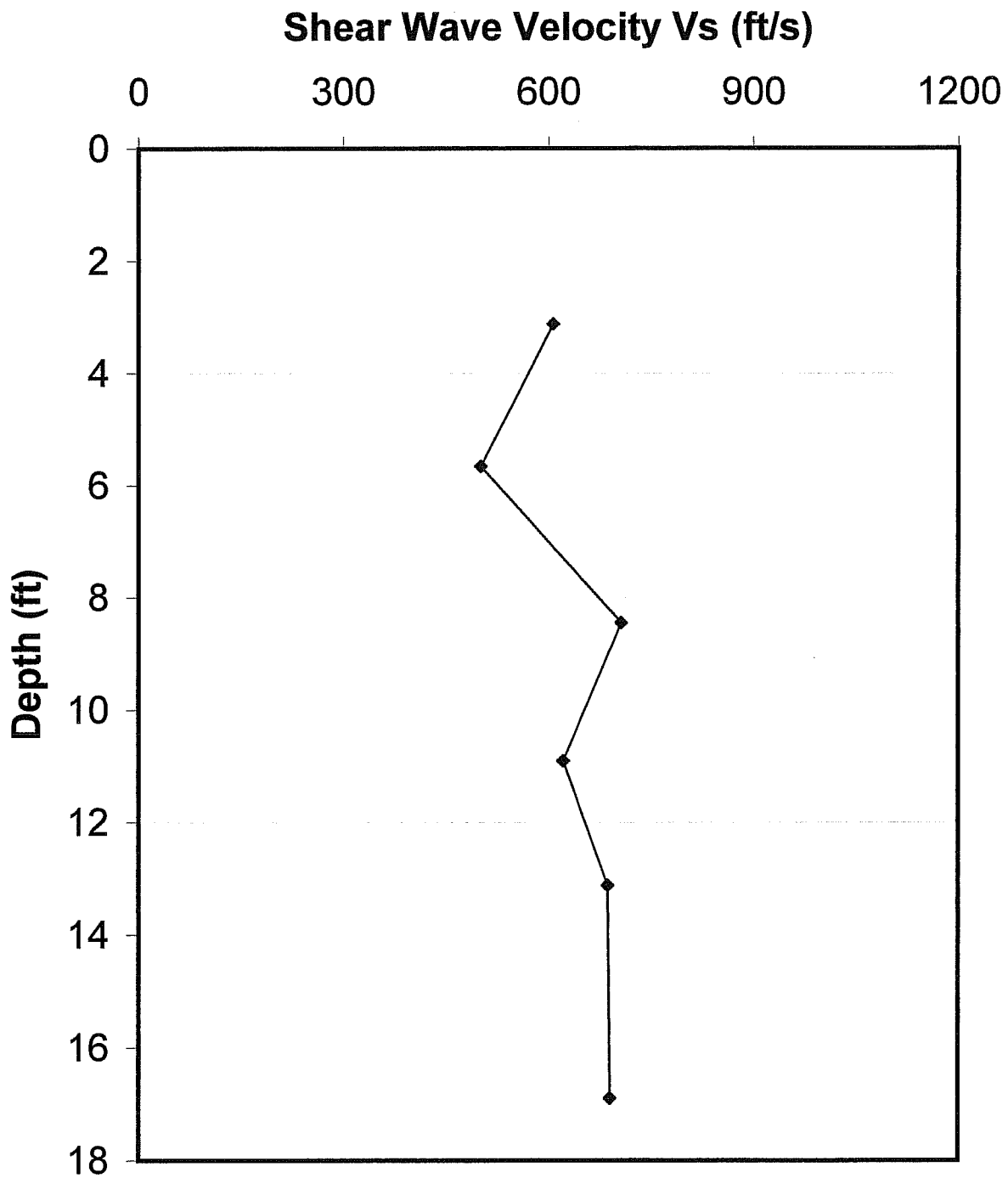
| | | |
|---|---|---|
| Geophone Offset | (feet) | 0.66 |
| Source Offset | (feet) | 2.50 |

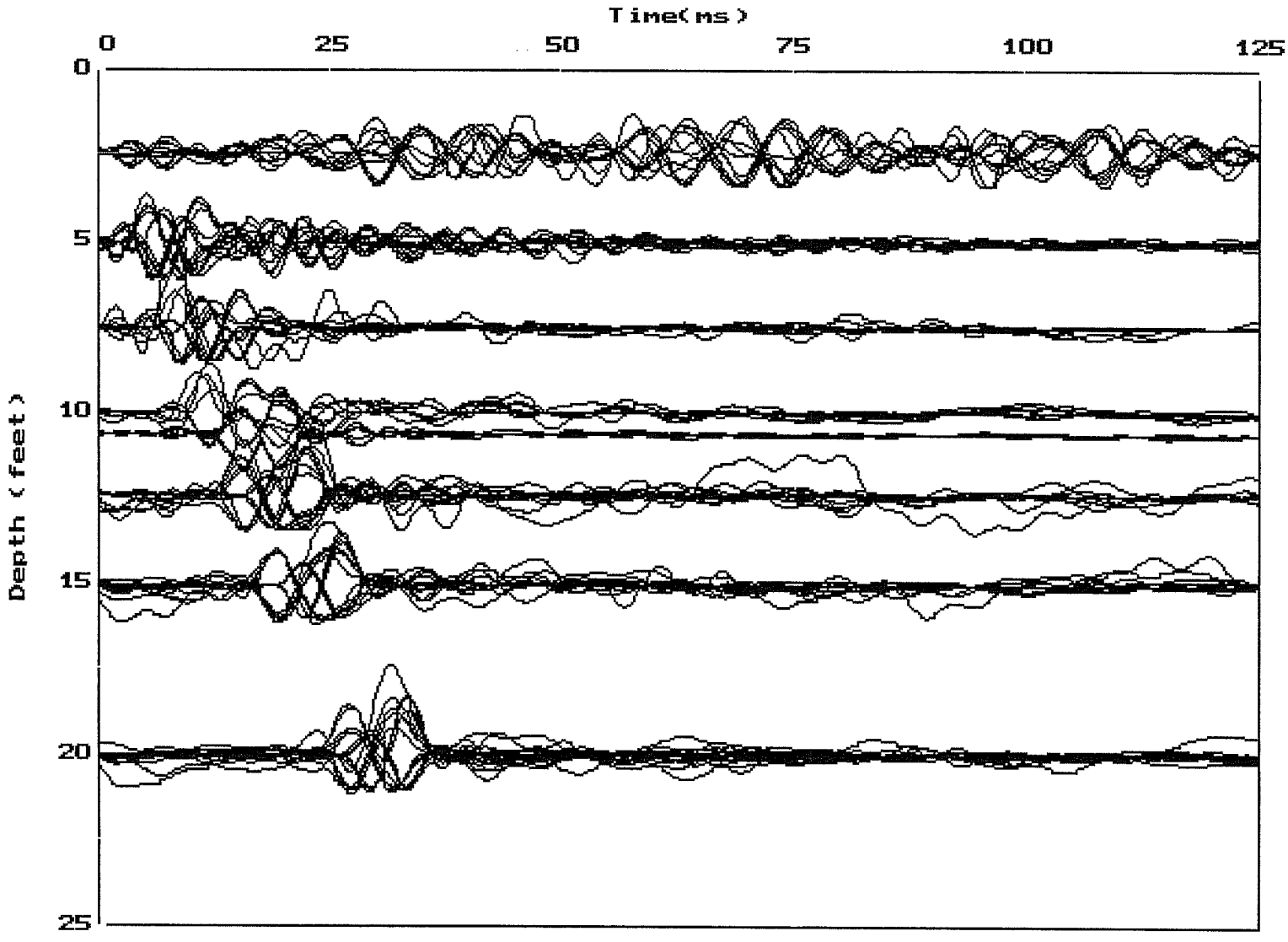
| Test Depth (feet) | Geophone Depth (feet) | Ray Path (feet) | Incremental Distance (feet) | Time Interval (ms) | Interval Velocity (ft/s) | Interval Depth (feet) | Interval Depth (feet) | Vs (ft/s) | Vs (m/s) | Interval Depth (m) |
|---|---|---|---|---|---|---|---|---|---|---|
| 2.46 | 1.80 | 3.08 | | | | | | | | |
| 5.08 | 4.42 | 5.08 | 2.00 | 3.29 | 607 | 3.11 | 3.11 | 607 | 185 | 0.95 |
| 7.54 | 6.88 | 7.32 | 2.24 | 4.47 | 502 | 5.65 | 5.65 | 502 | 153 | 1.72 |
| 10.66 | 10.00 | 10.31 | 2.99 | 4.23 | 706 | 8.44 | 8.44 | 706 | 215 | 2.57 |
| 12.46 | 11.80 | 12.07 | 1.75 | 2.82 | 622 | 10.90 | 10.90 | 622 | 190 | 3.32 |
| 15.09 | 14.43 | 14.65 | 2.58 | 3.76 | 687 | 13.12 | 13.12 | 687 | 209 | 4.00 |
| 20.01 | 19.35 | 19.51 | 4.87 | 7.05 | 690 | 16.89 | 16.89 | 690 | 210 | 5.15 |

# Shear Wave Velocity Profile

GREGG

Client: 04-201ma - Earth Mechanics
Site: Patterson Slough Bridge
Location: ABUT-1 04-11C
Sounding Date: June 11, 2004






EARTH MECHANICS PATTERSON 06:11:04 SCPT-01 04-11C

# Caltrans Bridge 35-0083
# Route 101/84 Separation, San Mateo

**Caltrans Bridge 35-0083, Route 101/84 Separation, San Mateo**

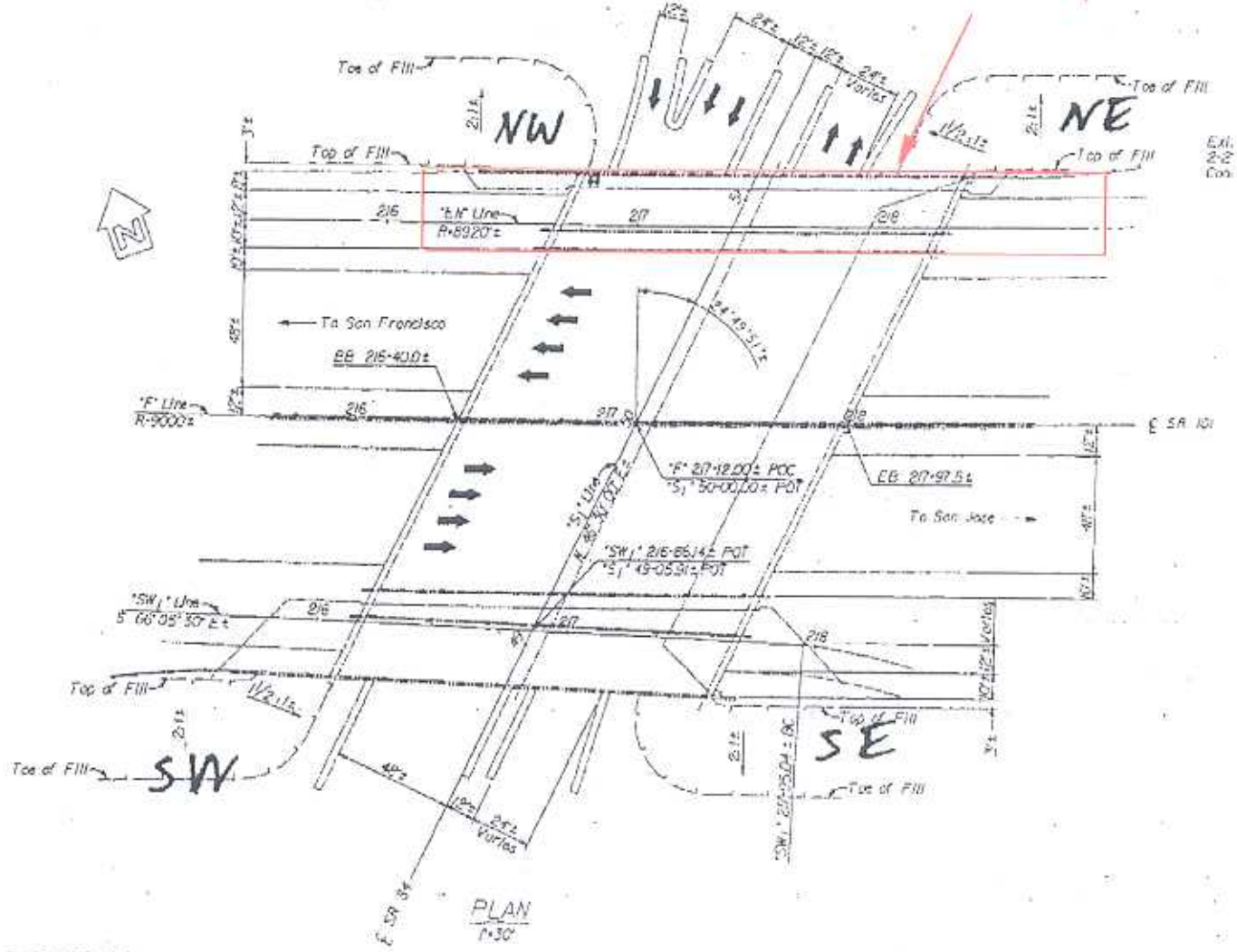
The field investigation for the Route 101/84 Separation Bridge, conducted on 6/11/04 and 6/12/04, consisted of 2 soil borings (04-13A and 04-14A), PMT in the soil borings, and 2 CPT (04-13 and 04-14). Soil/PMT borings were drilled by Pitcher Drilling of Palo Alto. CPT's were performed by Gregg Drilling of Martinez. Locations 04-13x were located on the northeast bridge abutment in the north-bound lane. Locations 04-14x were located on the northwest bridge abutment in the north-bound lane.

Geotechnical soil sampling consisted of ring samples collected using a Modified California sampler and small bulk samples collected with a SPT sampler. Samples were taken at 2.5-ft intervals to 15 ft depth and at 20 ft depth for 04-14A. Samples were taken at 2.5-ft intervals to 15 ft depth and at 20, 25, and 28 ft depth for 04-13A. No groundwater was encountered during the investigation. One pressuremeter test was performed at 7.5 ft depth in each boring.

06/13/2004

ELEVATION
1"=30'

Only the area outlined in red is shown in construction photos



# View to the east from northwest corner of bridge abutment.

06/04/04

NW abut #1

# View to the east, no pavement on western abutment.

06/04/04

NW abut #1

View to the east

Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

06/04/04

NW abut #1

# View to the west from northeast corner of bridge abutment, installing new guardrail. Note wall shape.

06/04/04

NE abut #3

# View to the west, asphalt on eastern abutment.

06/04/04

NE abut #3

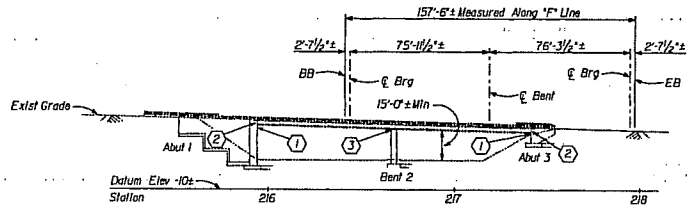
| DIST | COUNTY | ROUTE | POST MILES TOTAL PROJECT | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| 04 | SM | 84,101 | 24.7/24.9, 1.9/5.9 | 27 | 52 |

William R. Earl
REGISTERED CIVIL ENGINEER

7-11-94
PLANS APPROVAL DATE

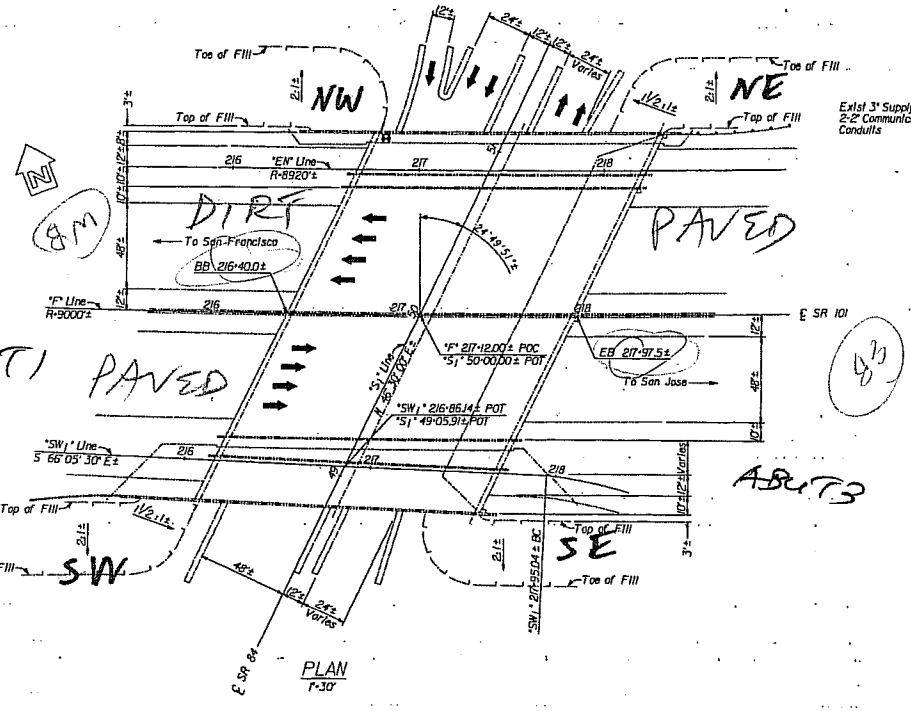
REGISTERED PROFESSIONAL ENGINEER — William R. Earl — No. 45652 — Exp. 12-31-94 — CIVIL — STATE OF CALIFORNIA

INCA ENGINEERS, INC.
510 BERCUT DRIVE, SUITE V
SACRAMENTO, CA 95814

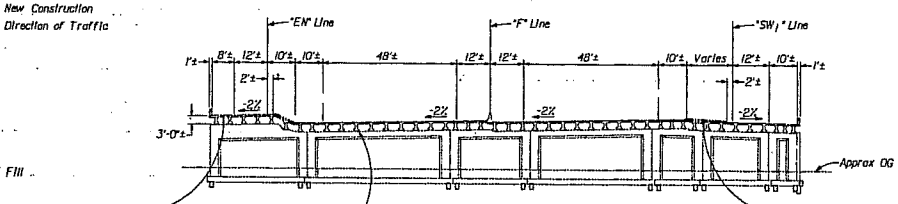



ELEVATION
1"=30'

Legend:
1. Supplemental Support
2. Treated Timber Restraint Block
3. Drill & Bond Dowels
- Indicates Point Of Min Vert Clr
- Indicates Exist Structure
- Indicates New Construction
- Indicates Direction of Traffic




PLAN
1"=30'




TYPICAL SECTION
1"=20'

Note:
See Roadway Plans For Traffic Control Requirements

## GENERAL NOTES
LOAD FACTOR DESIGN

**DESIGN**
Bridge Design Specifications: 1983 AASHTO with Interims and Revisions by Caltrans

**DESIGN SEISMIC LOAD**
Peak Rock Acceleration ·0.57g
Depth of Alluvium >150 ft

**CORED AND DRILLED HOLES**
Location of Cored and Drilled Holes Shown in the Plans are Approximate. Prior to Placing Holes in Concrete the Contractor Shall Locate all Reinf Steel and Adjust the Location of the Holes to Clear all Reinf Bars (Except as Noted). Final Hole Locations are Subject to Approval of the Engineer.

**REINFORCED CONCRETE**
(Assumed For Retrofit Evaluation)
f'c = 5,000 psi
fy = 40,000 psi

**REINFORCED CONCRETE (NEW)**
f'c = 3250 psi
fy = 60,000 psi

**DATUM**
Datum and Elevations Shown are Based on As-Built Drawings.

**QUANTITIES**

| | | |
|---|---|---|
| BRIDGE REMOVAL (PORTION) | LUMP SUM | |
| STRUCTURE EXCAVATION (BRIDGE) | 20 | CY |
| STRUCTURE BACKFILL (BRIDGE) | 11 | CY |
| STRUCTURAL CONCRETE, BRIDGE | 30 | CY |
| DRILL AND BOND DOWEL | 446 | LF |
| CORE CONCRETE (1 1/2") | 520 | LF |
| JOINT SEAL (MR 1/2") | 200 | LF |
| BAR REINFORCING STEEL (BRIDGE) | 7,100 | LB |
| TREATED DOUGLAS FIR TIMBER | 1.8 | MFBM |

## INDEX TO PLANS


| Sheet No. | Sheet Title |
|---|---|
| 1 | General Plan |
| 2 | Abutment 1 Layout 1 |
| 3 | Abutment 1 Layout 2 |
| 4 | Abutment 3 Layout 1 |
| 5 | Abutment 3 Layout 2 |
| 6 | Abutment Details |
| 7 | Bent 2 Layout 1 |
| 8 | Bent 2 Layout 2 |
| 9 | As-Built Log Of Test Borings |


**INDEX TO STANDARD PLANS (DATED JULY 1992)**

| | |
|---|---|
| A-10A | Abbreviations |
| A-10B | Symbols |
| B6-21 | Joint Seals (Max Movement Rating <2") |

NO CHANGES R.A. 7-24-95
AS BUILT
CORRECTIONS BY Jim Ehrlich
CONTRACT NO. 04-141304
DATE 4-22-95

The Contractor Shall Verify all Controlling Field Dimensions Before Ordering or Fabricating Materials.

| | | | | | |
|---|---|---|---|---|---|
| Thomas Post / Randy Anderson — DESIGN OVERSIGHT — 5/02/94 — DESIGN SITE | DESIGN | BY C.Shenoy | CHECKED T.Keng | | |
| | DETAILS | BY L.Davis | CHECKED W.Earl | LAYOUT BY L.Davis | CHECKED W.Earl |
| | QUANTITIES | BY C.Shenoy | CHECKED G.Rowe | SPECIFICATIONS BY W.Earl | PLANS AND SPECS CHECKED G.Rowe |

PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

W.Earl — PROJECT ENGINEER

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 04
EA 141301
590046-2

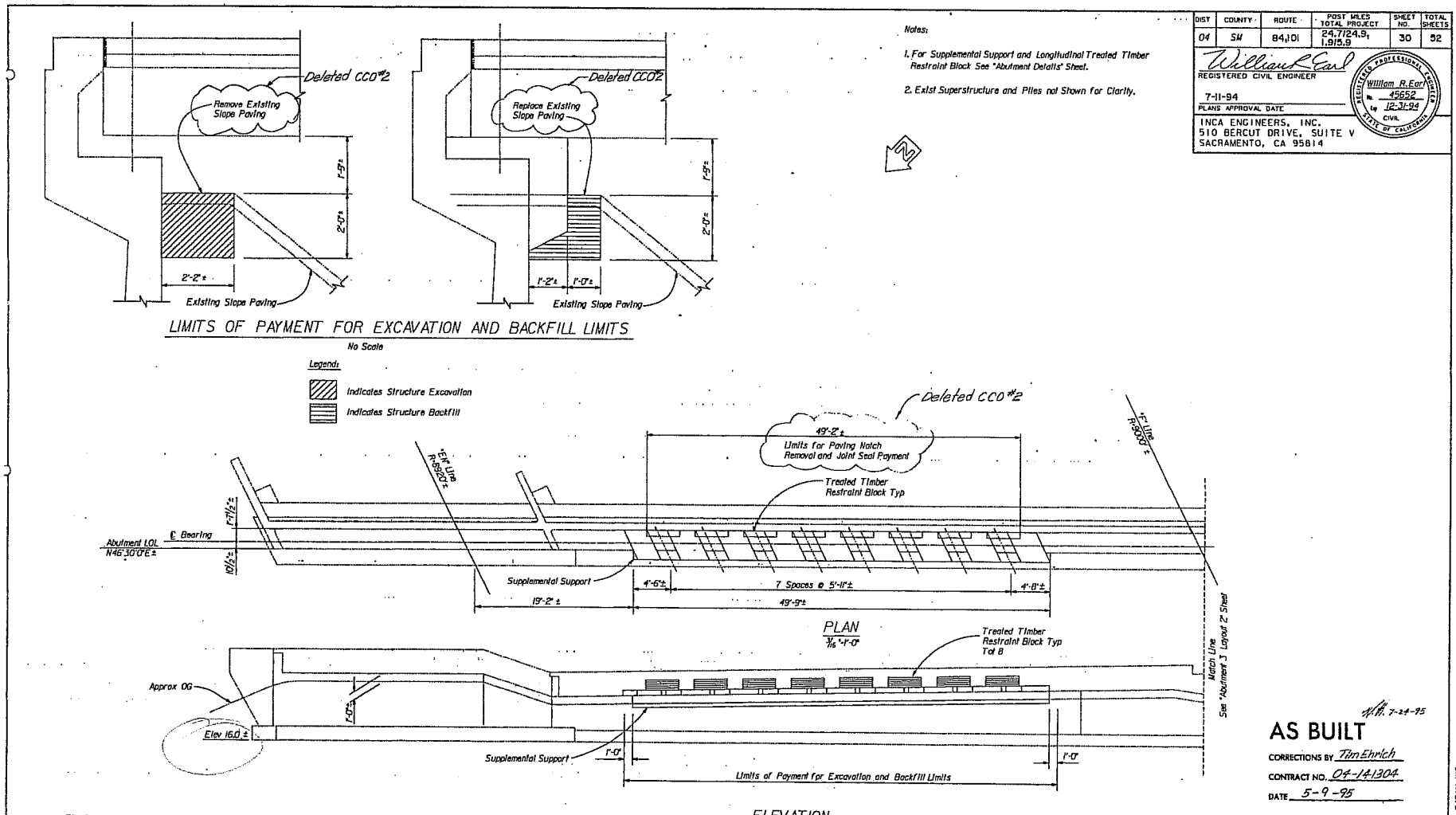
BRIDGE NO. 35-83 R/L & OL
POST MILE 5.39

DISREGARD PRINTS BEARING EARLIER REVISION DATES — REVISION DATES (PRELIMINARY STAGE ONLY) 6-8-93 7-30-93 9-30-93 10-26-93 4-27-94

SHEET 1 OF 9

# EARTHQUAKE RETROFIT PROJECT NO 414
# ROUTE 101/84 SEPARATION
## GENERAL PLAN

SR-GPLDN 12-30-93 9:44AM WS




Notes:

1. For Supplemental Support and Longitudinal Treated Timber Restraint Block See "Abutment Details" Sheet.
2. Exist Superstructure and Piles not Shown for Clarity.

| DIST | COUNTY | ROUTE | POST MILES TOTAL PROJECT | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| 04 | SM | 84,101 | 24.7/24.9, 1.9/15.9 | 30 | 52 |

William R. Earl
REGISTERED CIVIL ENGINEER
7-11-94
PLANS APPROVAL DATE
INCA ENGINEERS, INC.
510 BERCUT DRIVE, SUITE V
SACRAMENTO, CA 95814

REGISTERED PROFESSIONAL ENGINEER William R. Earl No. 45652 Exp. 12-31-94 CIVIL STATE OF CALIFORNIA

AS BUILT
CORRECTIONS BY Tim Ehrich
CONTRACT NO. 04-141304
DATE 5-9-95
7-24-95

The Contractor Shall Verify All Controlling Field Dimensions Before Ordering Or Fabricating any Material

Thomas Post / Randy Anderson
DESIGN OVERSIGHT
5/02/94
SIGN OFF DATE

| | | | |
|---|---|---|---|
| DESIGN | BY C. Shenoy | CHECKED | T. Keng |
| DETAILS | BY W. Simonsma | CHECKED | W. Earl |
| QUANTITIES | BY C. Shenoy | CHECKED | G. Rowe |

PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

W. Earl
PROJECT ENGINEER

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 04
EA 141301

BRIDGE NO. 35-83 R/L & OL
POST MILE 5.39

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY)

EARTHQUAKE RETROFIT PROJECT NO 414
ROUTE 101/84 SEPARATION
ABUTMENT 3 LAYOUT 1

SHEET 4 OF 9

SR-A3LOGN 12-21-93 9:12AM WS

| DIST | COUNTY | ROUTE | POST MILES TOTAL PROJECT | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| 04 | SM | 84,101 | 24.7/24.9, 1.9/5.9 | 31 | 52 |

William R. Earl
REGISTERED CIVIL ENGINEER

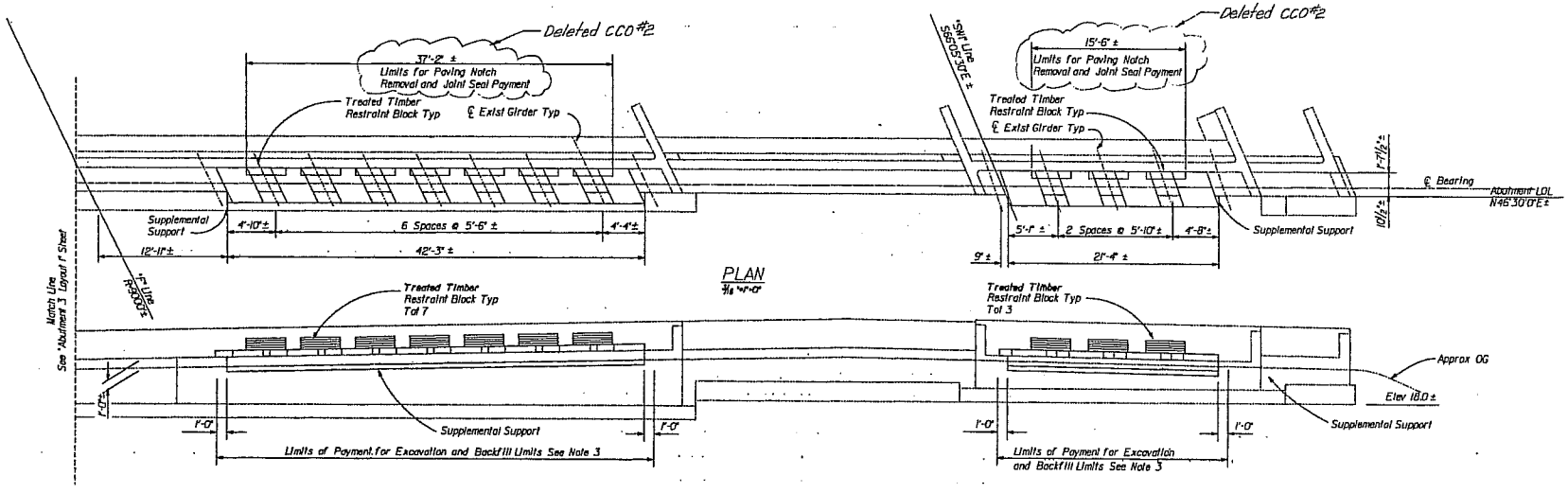
7-11-94
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
William R. Earl
No. 45652
Exp. 12-31-94
CIVIL
STATE OF CALIFORNIA

INCA ENGINEERS, INC.
510 BERCUT DRIVE, SUITE V
SACRAMENTO, CA 95814

Notes:

1. For Supplemental Support and Longitudinal Treated Timber Restraint Block See 'Abutment Details' Sheet
2. Exist Superstructure and Piles Not Shown For Clarity
3. See 'Abutment 3 Layout 1' Sheet for Limits of Payment for Excavation and Backfill Limits.



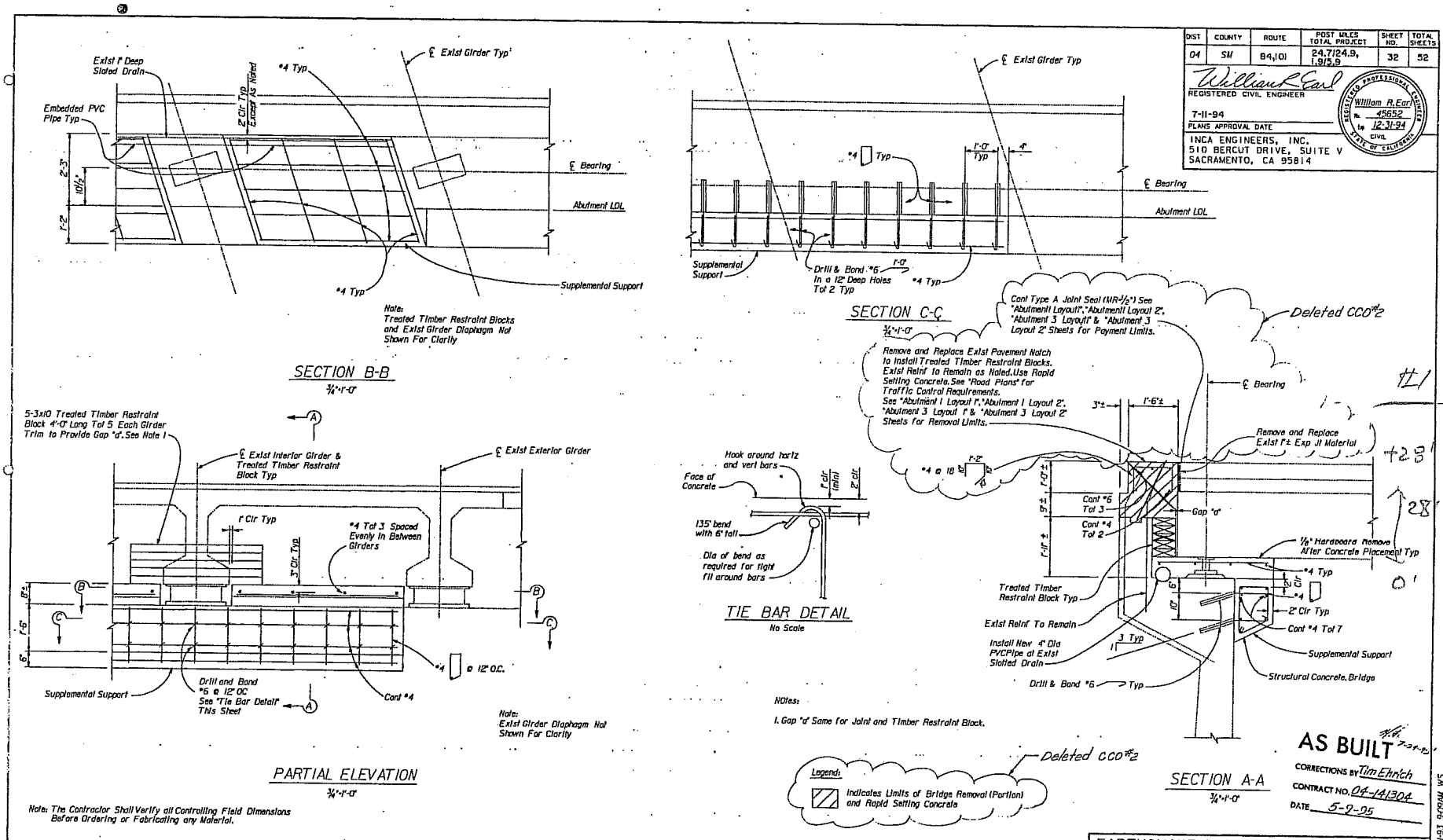

ELEVATION
3/16"=1'-0"

AS BUILT 7-26-95
CORRECTIONS BY Tim Ehrlich
CONTRACT NO. 04-141304
DATE 5-9-95

The Contractor Shall Verify All Controlling Field Dimensions Before Ordering Or Fabricating any Material.

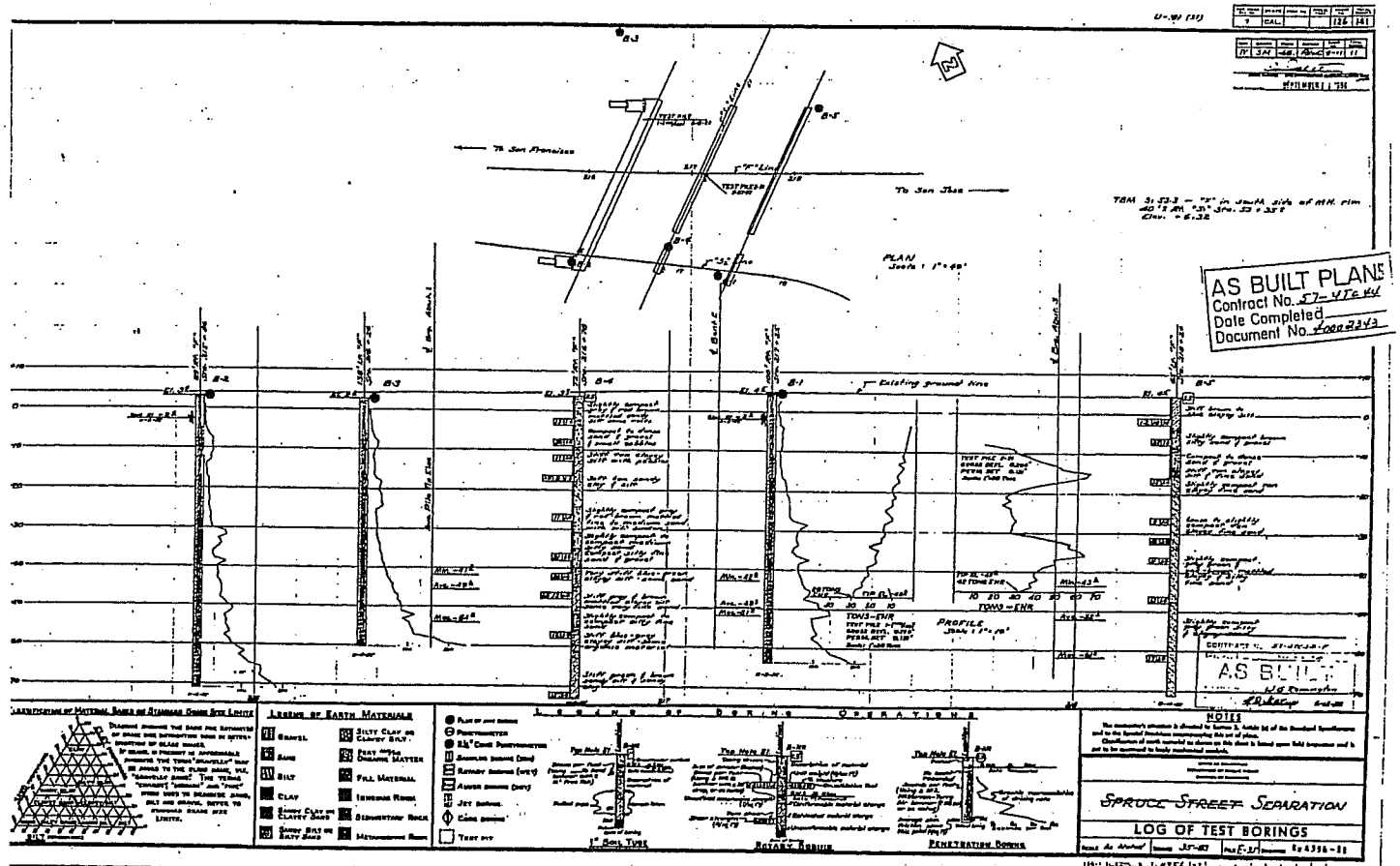
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Thomas Post / Randy Anderson (RA) DESIGN OVERSIGHT 5/02/94 SIGN OFF DATE | DESIGN | BY C.Shenoy | CHECKED T.Keng | PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION | W.Earl PROJECT ENGINEER | BRIDGE NO. 35-83 R/L & OL | EARTHQUAKE RETROFIT PROJECT NO 414 |
| | DETAILS | BY W.Simonsma | CHECKED W.Earl | | | POST MILE 5.39 | ROUTE 101/84 SEPARATION |
| | QUANTITIES | BY C.Shenoy | CHECKED G.Rowe | | | | ABUTMENT 3 LAYOUT 2 |
| | ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3 | | | | CU 04 EA 141301 | DISREGARD PRINTS BEARING EARLIER REVISION DATES | REVISION DATES (PRELIMINARY STAGE ONLY) SHEET 5 OF 9 |

SR-A3LDGN 12-31-93 9:12AM WS



DIST 04 | COUNTY SM | ROUTE 84,101 | POST MILES TOTAL PROJECT 24.7/24.9, 1.9/5.9 | SHEET NO. 32 | TOTAL SHEETS 52
William R. Earl
REGISTERED CIVIL ENGINEER
7-11-94
PLANS APPROVAL DATE
INCA ENGINEERS, INC.
510 BERCUT DRIVE, SUITE V
SACRAMENTO, CA 95814
William R. Earl
No. 45652
Exp. 12-31-94
CIVIL
STATE OF CALIFORNIA
REGISTERED PROFESSIONAL ENGINEER
Exist 1" Deep Slotted Drain
Embedded PVC Pipe Typ
2" Clr Typ Except As Noted
#4 Typ
℄ Exist Girder Typ
℄ Bearing
Abutment LOL
Supplemental Support
Note: Treated Timber Restraint Blocks and Exist Girder Diaphagm Not Shown For Clarity
SECTION B-B
3/4"=1'-0"
Drill & Bond #6 In a 12" Deep Holes Tot 2 Typ
SECTION C-C
3/4"=1'-0"
Cont Type A Joint Seal (MR-1/2") See "Abutment1 Layout1", "Abutment1 Layout 2", "Abutment 3 Layout1" & "Abutment 3 Layout 2" Sheets for Payment Limits.
Deleted CCO#2
Remove and Replace Exist Pavement Notch to Install Treated Timber Restraint Blocks. Exist Reinf to Remain as Noted. Use Rapid Setting Concrete. See "Road Plans" for Traffic Control Requirements. See "Abutment 1 Layout 1", "Abutment 1 Layout 2", "Abutment 3 Layout 1" & "Abutment 3 Layout 2" Sheets for Removal Limits.
Remove and Replace Exist 1"± Exp Jt Material
5-3x10 Treated Timber Restraint Block 4'-0" Long Tot 5 Each Girder Trim to Provide Gap "d". See Note 1
℄ Exist Interior Girder & Treated Timber Restraint Block Typ
℄ Exist Exterior Girder
1" Clr Typ
#4 Tot 3 Spaced Evenly In Between Girders
3" Clr Typ
Supplemental Support
Drill and Bond #6 @ 12" OC See "Tie Bar Detail" This Sheet
Cont #4
#4 @ 12" O.C.
Note: Exist Girder Diaphagm Not Shown For Clarity
PARTIAL ELEVATION
3/4"=1'-0"
Hook around horiz and vert bars
Face of Concrete
135° bend with 6" tail
Dia of bend as required for tight fit around bars
TIE BAR DETAIL
No Scale
Cont #6 Tot 3
Cont #4 Tot 2
Gap "d"
1/8" Hardboard Remove After Concrete Placement Typ
Treated Timber Restraint Block Typ
Exist Reinf To Remain
Install New 4" Dia PVCPipe at Exist Slotted Drain
Drill & Bond #6 Typ
2" Clr Typ
Cont #4 Tot 7
Supplemental Support
Structural Concrete, Bridge
Notes:
1. Gap "d" Same for Joint and Timber Restraint Block.
Deleted CCO#2
Legend:
Indicates Limits of Bridge Removal (Portion) and Rapid Setting Concrete
SECTION A-A
3/4"=1'-0"
AS BUILT
CORRECTIONS BY Tim Ehrich
CONTRACT NO. 04-141304
DATE 5-9-95
Note: The Contractor Shall Verify all Controlling Field Dimensions Before Ordering or Fabricating any Material.
Thomas Post / Randy Anderson
DESIGN OVERSIGHT 5/22/94
DESIGN C. Shenoy
DETAILS W. Simonsma
QUANTITIES C. Shenoy
CHECKED T. Kehg
CHECKED W. Earl
CHECKED G. Rowe
PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION
W. Earl
PROJECT ENGINEER
BRIDGE NO. 35-83 R/L & OL
POST MILE 5.39
EARTHQUAKE RETROFIT PROJECT NO 414
ROUTE 101/84 SEPARATION
ABUTMENT DETAILS
ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3
CU 04
EA 141301
DISREGARD PRINTS BEARING EARLIER REVISION DATES
REVISION DATES (PRELIMINARY STAGE ONLY)
SHEET 6 OF 9
SR-A11.DGN 12-31-93 9:09AM WS

| 7-11-94 TO ACCOMPANY PLANS DATED | DIST | COUNTY | ROUTE | POST MILES TOTAL PROJECT | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|---|
| | 04 | SM | 84,101 | 24.7/24.9, 1.9/5.9 | 35 | 52 |




AS BUILT PLANS
Contract No. 57-4Tc44
Date Completed
Document No. 4000 2343

The As-Built Log of Test Boring Sheet Was Used to Prepare the Geotechnical Report

NO CHANGES 7-25-95

AS BUILT

CORRECTIONS BY Tim Ehrich

CONTRACT NO. 04-141304

DATE 4-27-95

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Post/Randy Anderson | NOTE: ADDITIONAL AS-BUILT FOUNDATION DATA MAY BE AVAILABLE AT THE DIVISION OF NEW TECHNOLOGY, MATERIALS AND RESEARCH 5900 FOLSOM BOULEVARD, SACRAMENTO, CALIFORNIA 95819 | DESIGN | C.Shenay / W.Earl | CHECKED T.Keng / G.Rowe | PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION | W.Earl | BRIDGE NO. 35-83 R/L & OL |
| 5/12/94 | | DETAILS | W.Simonsma | CHECKED G.Rowe / W.Earl | | | POST MILE 5.39 |
| | | QUANTITIES | C.Shenay | CHECKED G.Rowe | | | |

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 04
EA 141301

EARTHQUAKE RETROFIT PROJECT NO 414
ROUTE 101/84 SEPARATION
AS-BUILT LOG OF TEST BORINGS

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY)

SHEET 9 OF 9

1-5

# LOG OF BORING NO. ( ~~B-T~~ 04-13A)

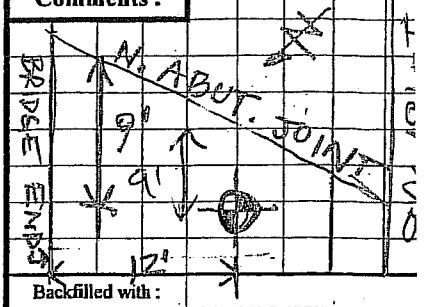
04-13A

NW ABUTMENT

Steve Gona (650) 223-7209

| | | | |
|---|---|---|---|
| Project Name | : UCSD - RTE 101/84 SEPARATION | | |
| Project Location | : REDWOOD CITY, CA | | |
| E.M.I. Project No. | : 02-165 | Site Condition : | DIRT |
| Weather | : SUNNY, WARM | Elevation : | 4FT |
| Traffic Control | : N/A | Operator : | |
| Drilling Company | : PITCHER | Operator : | RON PITCHER |
| Type of Rig | : FAILING 1500 | Drop (in) : | |
| Borehole Diameter (inch) | : 6" | Drive Wt. (lbs) : | |
| Logged By | : J.C. | Date Drilled : | 6-13-04 |

Comments :




Backfilled with :

| | Time | | | | | | | | | | Back to | Proposed Depth |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Depature | Arrival | Start | Break | Resume | Lunch | Resume | Break | Finish | Off | Office | ft |
| Driller | | | | | | | | | | | | Water Table |
| Traffic Control | | | | | | | | | | | | ft |
| Logger | | | | | | | | | | | | Caving |
| Total | | | | | | | | | | | | ft |

| Depth (ft) | Sampler Type (Bulk, Drive, SPT, Tube) | Sample Number | Sample Type (B/D/S.B./T) | Blows/6" | Recovery (inch) | U.S.C.S. | Description (ASTM D-2488-93) Color | Moisture State (Dry, Moist, Wet) | Max. Size | Grain Size (%) Gravel : Sand : Fines | Sand Size | Plasticity | Consistency | Cementation | O²/LEL/PID |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | : : | | | | | |
| 2.5 | D | 1 | | 6 8 11 | 16" | SP | SAND, BROWN/BLACK, DRY, FINE-MED GRAINED, LOOSE, WELL SORTED, MICACEOUS, ARTIFICIAL FILL | | | | | | | | |
| 5 | | | | | | SP | SAME | | | : : | | | | | |
| | | 2 | | | | | BULK SAMPLE - PM TEST - NO BLOW COUNTS | | | | | | | | |
| ~~10~~ 7.5 | D | 3 | | 4 5 5 | 17" | SP | SAME | | | : : | | | | | |
| ~~15~~ | S | 4 | | 1 1 1 | 17.5" | SP | SAME | | | : : | | | | | |
| ~~20~~ | D | 5 | | 3 5 5 | 18" | SP | SAME | | | : : | | | | | |
| ~~25~~ | | 6 | | 2 5 6 | 18 | | SAME | | | : : | | | | | |

NW ABUTMENT

**Project No. :** 02-165 **Project Name :** UCSD- RTE 101/84 SEPARATION

| Depth (ft) | Sampler Type (Bulk, Drive, SPT, Tube) | Sample Number | Sample Type (B/D/S.B./T) | Blows/6" | Recovery (inch) | U.S.C.S. | Description (ASTM D-2488-93) Color | Moisture State (Dry, Moist, Wet) | Max. Size | Grain Size (%) Gravel : Sand : Fines | Sand Size | Plasticity | Consistency | Cementation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30 | | | | | | | | | | : : | | | | |
| 18.5 | B | 7 | | | | CL | * At 18.5' - change in lithology - native mat'l clay w/ serpentinite alluvium. Took bulk sample from 18.5'-20' | | | | | | | |
| ~~35~~ 20 | | 8 | D | 6 10 17 | 15" | CL | CLAY W/ GRAVEL - BROWN - ORANGE MOTTLED, H. WEATHERED DRY - SL. MOIST, PLASTIC, V. STIFF, AND GRAVELS TO 2" DIAM, COMPRISED OF FRANCISCAN - SERPENTINITE/SANDSTONE | | | | | | | |
| 5 ~~40~~ | | 9 | S | 30 22 15 | 12" | CL | SAME | | | : : | | | | |
| | | | | | | | | | | : : | | | | |
| ~~45~~ | | 10 | D | 8 17 22 | 17 | OH | * DRILLER RPTS MORE MORE MOISTURE IN CUTTINGS @ 26' DEPTH - LIKELY PERCHED $H_2O$ CLAY - BLK, ORGANIC, HIGHLY PLASTIC, SL. MOIST BAY MD | | | | | | | |
| 50 | | | | | | | | | | : : | | | | |
| | | | | | | | | | | : : | | | | |
| 55 | | | | | | | | | | : : | | | | |
| | | | | | | | | | | : : | | | | |
| 60 | | | | | | | | | | : : | | | | |
| | | | | | | | | | | : : | | | | |
| 65 | | | | | | | | | | : : | | | | |
| | | | | | | | | | | : : | | | | |

1-5

# LOG OF BORING NO. ( B-3 04-14A )

NE Abutment

Earth Mechanics, Inc.

| | | | |
|---|---|---|---|
| Project Name | : VCSD - 101/84 SEPARATION | | |
| Project Location | : REDWOOD CITY | | |
| E.M.I. Project No. | : 02-165 | Site Condition : | ASPHALT |
| Weather | : SUNNY WARM | Elevation : | 4.5 FT |
| Traffic Control | : N/A | Operator : | |
| Drilling Company | : PITCHER | Operator : | RON PITCHER |
| Type of Rig | : FAILING 1500 | Drop (in) : | |
| Borehole Diameter (inch) | : 6" | Drive Wt. (lbs) : | |
| Logged By | : J.C. | Date Drilled : | 6-13-04 |

Comments : 6' from Abutment

Backfilled with :

| | Time | | | | | | | | | | Back to Office | Proposed Depth |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Depature | Arrival | Start | Break | Resume | Lunch | Resume | Break | Finish | Off | | ft |
| Driller | | | | | | | | | | | | Water Table |
| Traffic Control | | | | | | | | | | | | ft |
| Logger | | | | | | | | | | | | Caving |
| Total | | | | | | | | | | | | ft |

| Depth (ft) | Sampler Type (Bulk, Drive, SPT, Tube) | Sample Number | Sample Type (SD/S.B./T) | Blows/6" | Recovery (inch) | U.S.C.S. | Description (ASTM D-2488-93) Color | Moisture State (Dry, Moist, Wet) | Max. Size | Grain Size (%) Gravel : Sand : Fines | Sand Size | Plasticity | Consistency | Cementation | O²/LEL/PID |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | | | | | | |
| 2.5 | D | 1 | | 12 24 21 | 15" | SP-SC | CLAYEY SAND W/ GRAVEL, BRN ORANGE, SL. PLASTIC, DRY - SL. MOIST, V. STIFF GRAVELS COMPRISED OF SERPENTINITE + FRANCISCAN | | | | | | | | |
| 5 | | | | | | | - SHELBY TUBE - 5 TO 7.5' CAPPED & SHIPPED (1.5' REC. IN SHELBY) (HYDR. PRESSURE 100 - 115 psi APPLIED) | | | | | | | | |
| ~~10~~ 7.5 | D | 2 | | 10 11 11 | 14" | CL | SANDY CLAY W GRAVEL, GRAY, SL. PLASTIC, SL. MOIST, STIFF ANG. GRAVELS TO ½" DIAM OF MUDSTONE | | | | | | | | |
| | | | | | | ML | SANDY SILT, BRN-ORANGE, NO PLASTICITY, M. DENSE, SL. MOIST | | | | | | | | |
| 10 ~~15~~ | D | 3 | | | | | [NO BLOW COUNTS - JUST PUSHED SAMPLER FOR PM TEST INTERVAL] | | | | | | | | |
| | | | | | | CL | SILTY CLAY, BRN-ORANGE, SL MOIST, M. PLASTICITY, | | | | | | | | |
| 12.5 ~~20~~ | S | 4 | | 8 11 13 | 4" | CL | SAME - LOW PLASTICITY, ANG. GRAVELS TO 1½" DIAM, V. STIFF V. POOR RECOVERY | | | | | | | | |
| ~~25~~ | D | 5 | | 6 23 13 | 4" | CL | SILTY CLAY W/ GRAVEL - GRAY/BRN, SL MOIST, LOW PLASTICITY, HARD. | | | | | | | | |

2-5

# LOG OF BORING NO. ( ~~B-3~~ 04-14A )

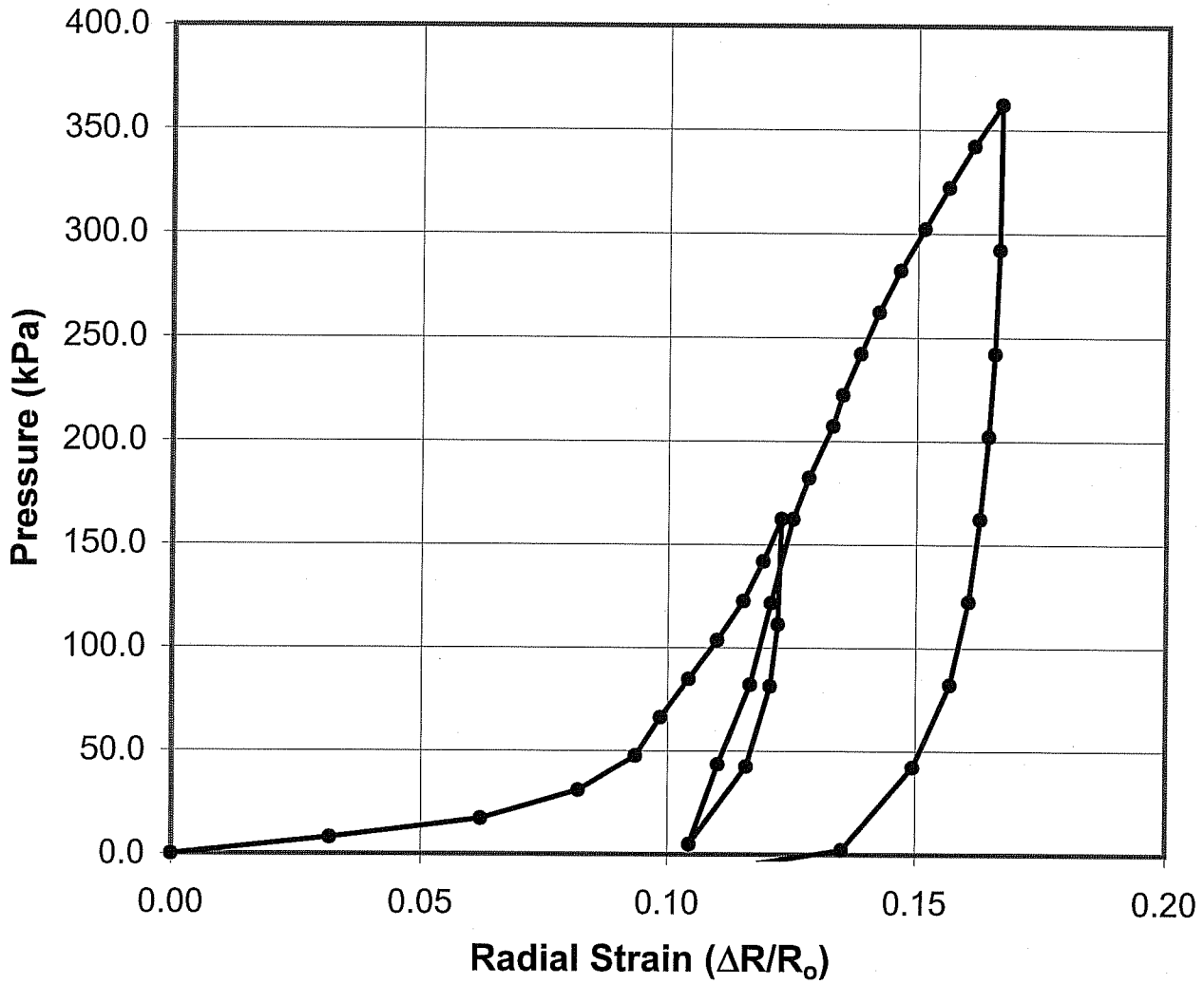
NE ABUTMENT

Earth Mechanics, Inc.

**Project No.:** 02-165 **Project Name:** UCSD - RTE 101/84 SEPARATION

| Depth (ft) | Sampler Type (Bulk, Drive, SPT, Tube) | Sample Number | Sample Type (B/D/S.B./T) | Blows/6" | Recovery (inch) | U.S.C.S. | Description (ASTM D-2488-93) Color | Moisture State (Dry, Moist, Wet) | Max. Size | Grain Size (%) Gravel : Sand : Fines | Sand Size | Plasticity | Consistency | Cementation | O²/LEL/PID |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ~~30~~ | S | 6 | | 9 | 11 | SC | CLAYEY SAND W/ GRAVEL - BRN ORANGE, COARSE - FINE | | | : : | | | | | |
| 20 | | | | 13 | 10 | | GRAINED, SL MOIST, SL. PLASTICITY, ANG GRAVELS ½-1" DIAM | | | | | | | | |
| | | | | 11 | | | M. DENSE. | | | : : | | | | | |
| 35 | | | | | | | | | | : : | | | | | |
| | | | | | | | | | | : : | | | | | |
| 40 | | | | | | | | | | : : | | | | | |
| | | | | | | | | | | : : | | | | | |
| 45 | | | | | | | | | | : : | | | | | |
| | | | | | | | | | | : : | | | | | |
| 50 | | | | | | | | | | : : | | | | | |
| | | | | | | | | | | : : | | | | | |
| 55 | | | | | | | | | | : : | | | | | |
| | | | | | | | | | | : : | | | | | |
| 60 | | | | | | | | | | : : | | | | | |
| | | | | | | | | | | : : | | | | | |
| 65 | | | | | | | | | | : : | | | | | |
| 70 | | | | | | | | | | : : | | | | | |

# Pressuremeter Test Result



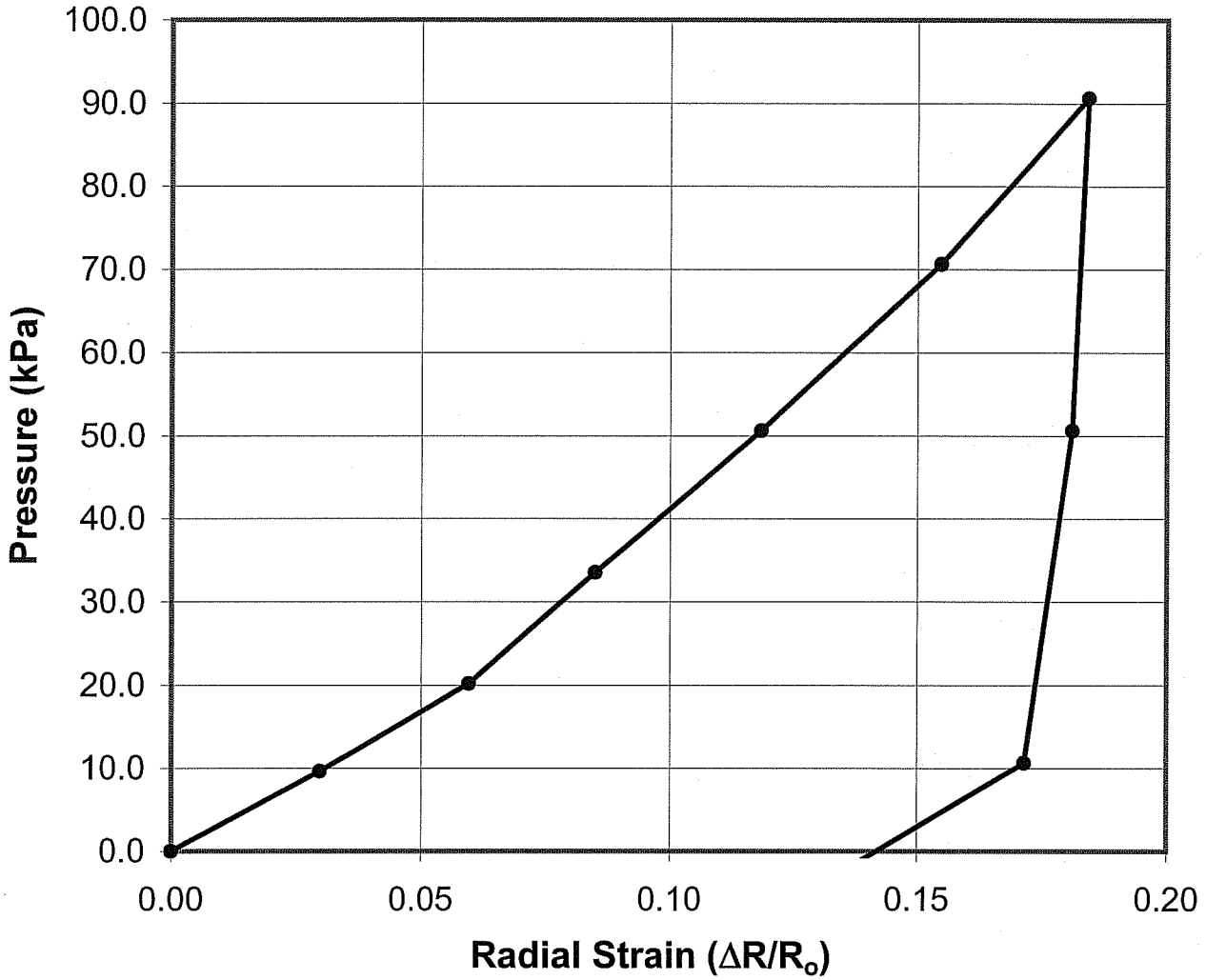

| | |
|---|---|
| Boring No.: | **04-13P** |
| Location: | **Route 101/84 SEP** |
| | **San Mateo County** |
| Test Date: | **6/13/2004** |
| Test Depth: | **7.5 ft** |
| Soil Type: | **Sand to Silty Sand with Gravel** |

**Earth Mechanics, Inc.**
Geotechnical and Earthquake Engineering

**CALTRANS-UCSD / Abutment Research**

Project No : 02-165 | Date : 12/22/2004

# Pressuremeter Test Result




| | |
|---|---|
| Boring No.: | **04-14P** |
| Location: | **Route 101/84 SEP** |
| | **San Mateo County** |
| Test Date: | **6/13/2004** |
| Test Depth: | **7.5 ft** |
| Soil Type: | **Silty to Clayey Sand with Gravel** |

| | | |
|---|---|---|
| Earth Mechanics, Inc.<br>Geotechnical and Earthquake Engineering | **CALTRANS-UCSD / Abutment Research** | |
| | Project No : 02-165 | Date : 12/22/2004 |

GREGG DRILLING AND TESTING, INC.
GREGG IN SITU, INC.
ENVIRONMENTAL AND GEOTECHNICAL INVESTIGATION SERVICES

June 18, 2004

Earth Mechanics
Attn: Jody Castle
7700 Edgewater Drive, Suite 846
Oakland, California 94621

Subject: CPT Site Investigation
Highway 101 & Route 84
Redwood City, California
GREGG Project Number: 04-202ma

Dear Jody:

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

| | | | |
|---|---|---|---|
| 1 | Cone Penetration Tests | (CPTU) | X |
| 2 | Pore Pressure Dissipation Tests | (PPD) | ☐ |
| 3 | Seismic Cone Penetration Tests | (SCPTU) | X |
| 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 (562) 427-6899.

Sincerely,
GREGG IN SITU, Inc.

Mary Walden
Operations Manager

950 Howe Road • Martinez, California 94553 • (925) 313-5800 • FAX (925) 313-0302
OTHER OFFICES: SUMMERVILLE • LOS ANGELES • SALT LAKE CITY • HOUSTON • VANCOUVER • WEST BERLIN (NJ) •AUGUSTA
www.greggdrilling.com

# Bibliography

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Zemo, D.A., T.A. Delfino, J.D. Gallinatti, V.A. Baker and L.R. Hilpert, "Field Comparison of Analytical Results from Discrete-Depth Groundwater Samplers" BAT EnviroProbe and QED HydroPunch, Sixth national Outdoor Action Conference, Las Vegas, Nevada Proceedings, 1992, pp 299-312.

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

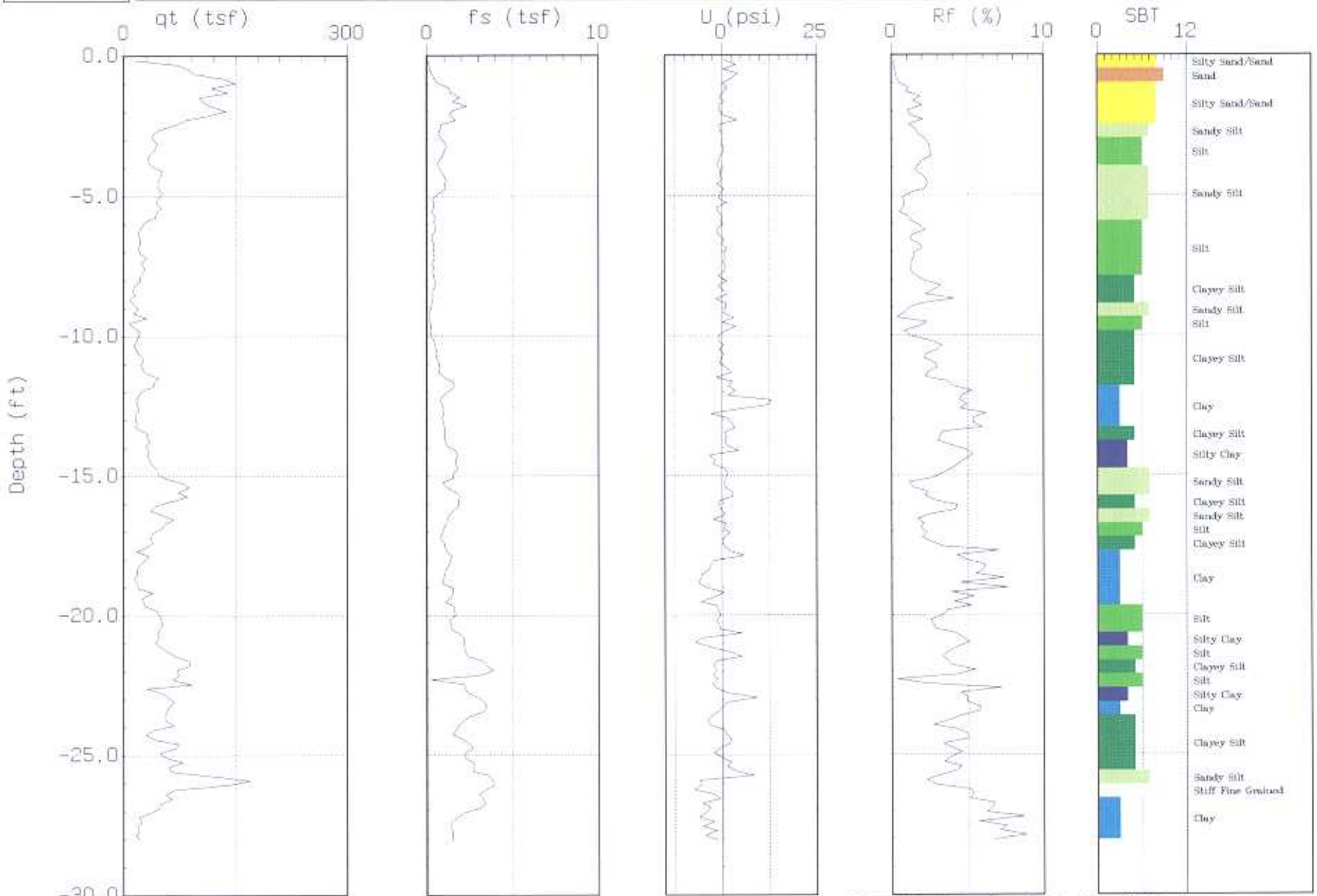
~~SOUTH~~ NW ABUT

GREGG

# EARTH MECHANICS

Site: HWY 101/ROUTE 84
Location: ~~B-2~~ B-1 04-13

Engineer: J. CASTLE
Date: 06:11:04 15:32




Max. Depth: 28.05 (ft)
Depth Inc.: 0.164 (ft)

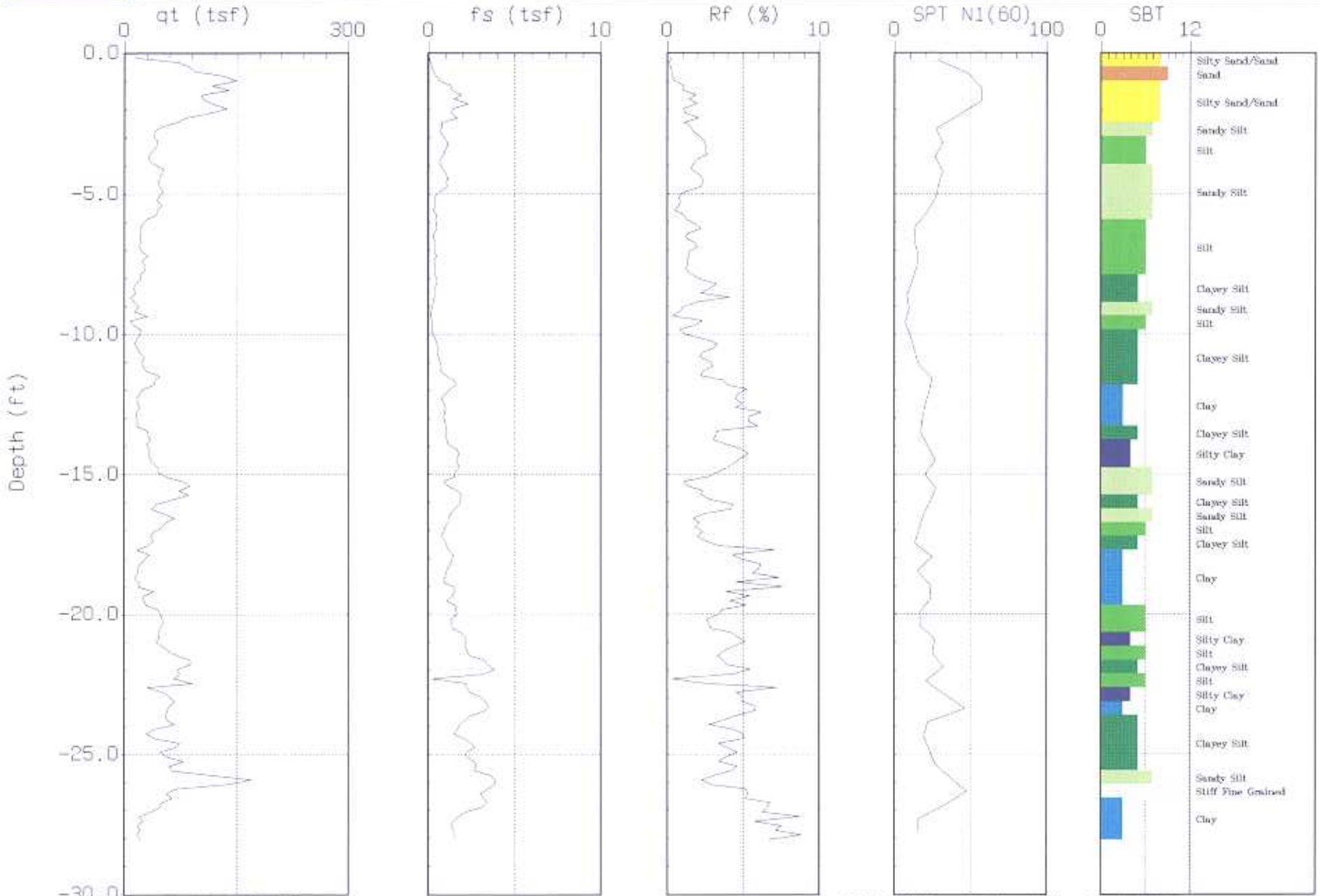
SBT: Soil Behavior Type (Robertson 1990)

GREGG

# EARTH MECHANICS

Site: HWY 101/ROUTE 84
Location: ~~B-2~~ B-1 04-13

Engineer: J. CASTLE
Date: 06:11:04 15:32




Max. Depth: 28.05 (ft)
Depth Inc.: 0.164 (ft)

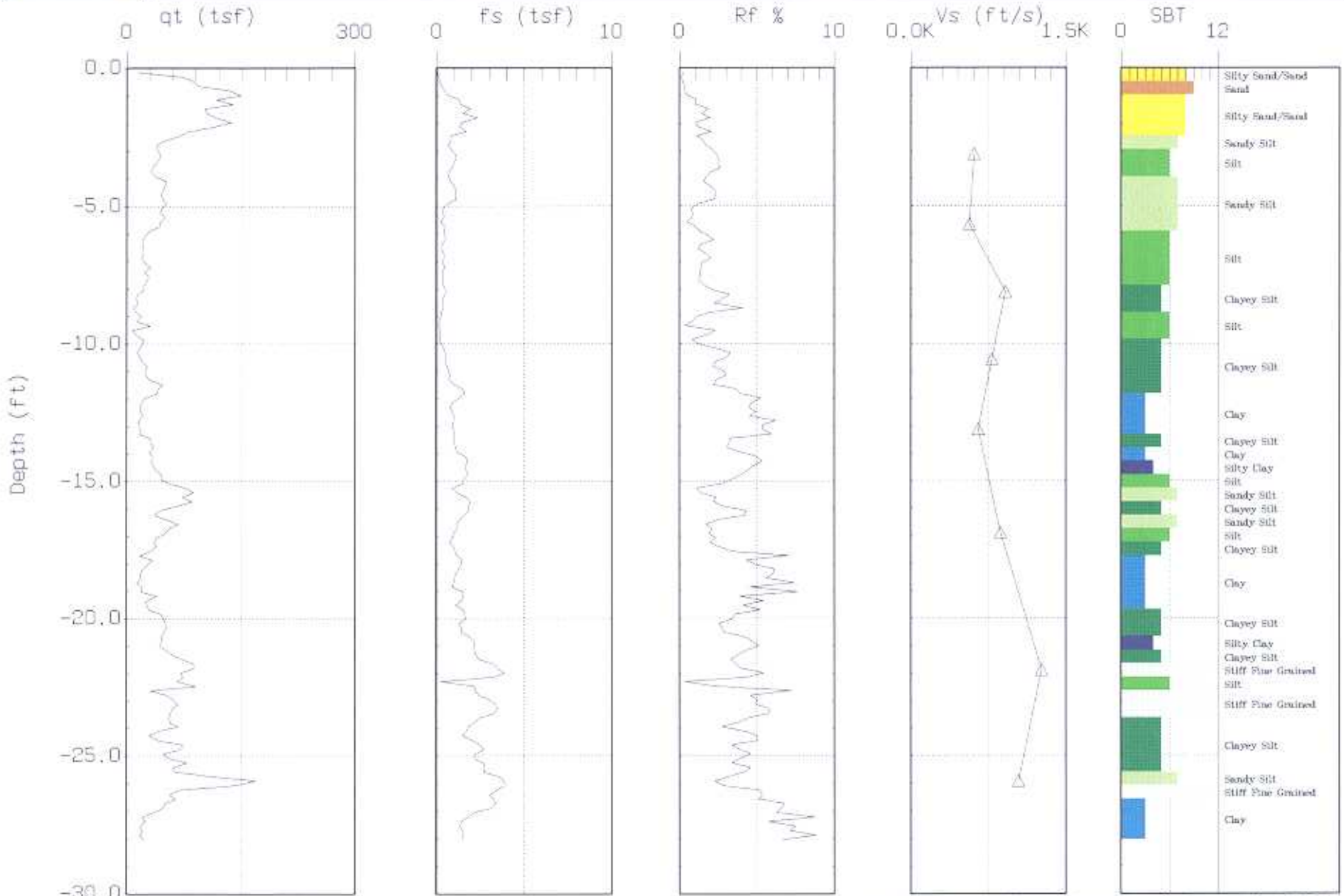
SBT: Soil Behavior Type (Robertson 1990)

GREGG

# EARTH MECHANICS

Site: HWY 101/ROUTE 84
Location: ~~B-2~~ B-1 04-13

Engineer: J. CASTLE
Date: 06:11:04 15:32




Max. Depth: 28.05 (ft)

Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson and Campanella 1988)

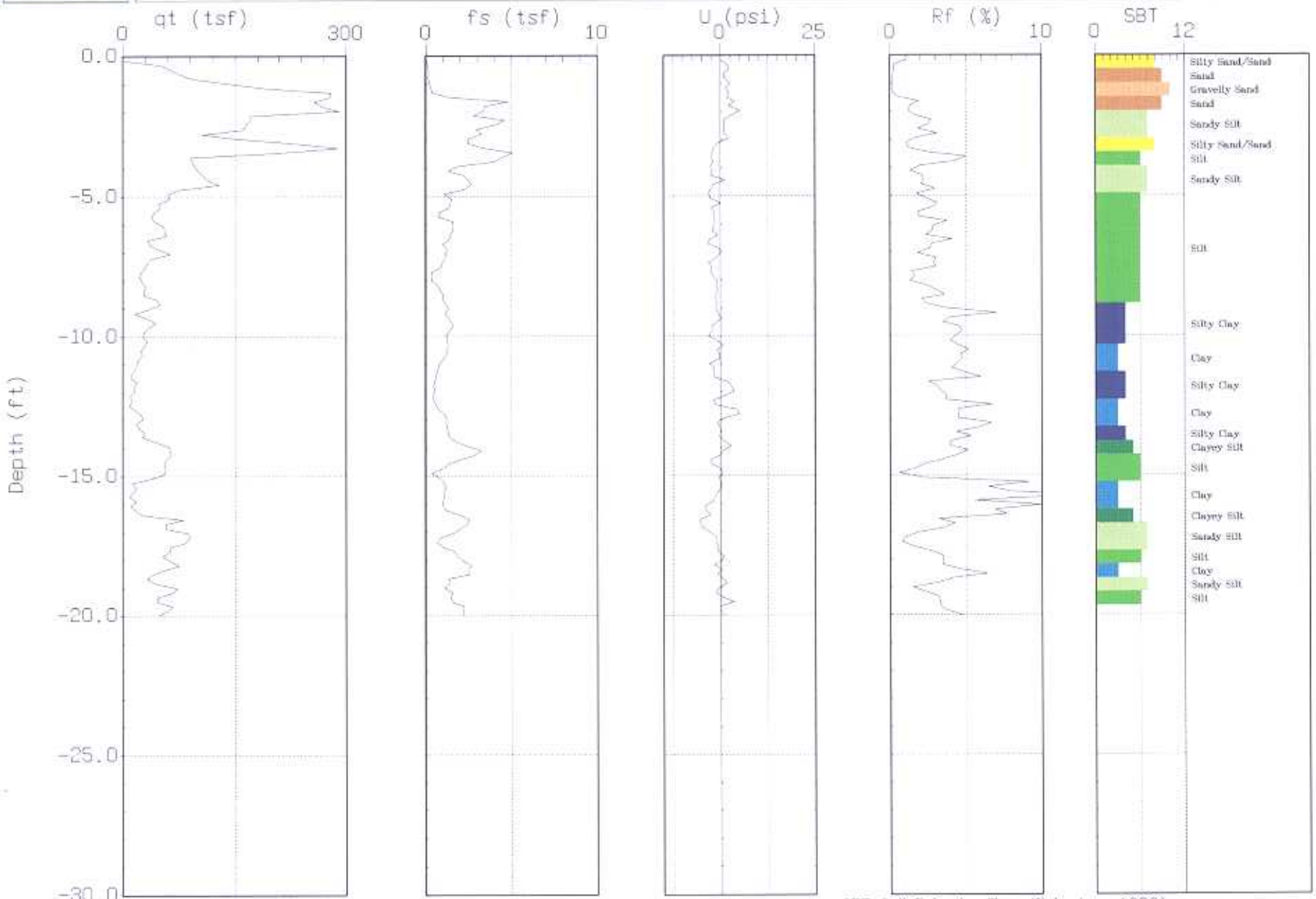
NE ABUT

GREGG

# EARTH MECHANICS

Site: HWY 101/ROUTE 84
Location: (B-1) B-3 04-14

Engineer: J. CASTLE
Date: 06:11:04 14:36




Max. Depth: 20.01 (ft)
Depth Inc.: 0.164 (ft)

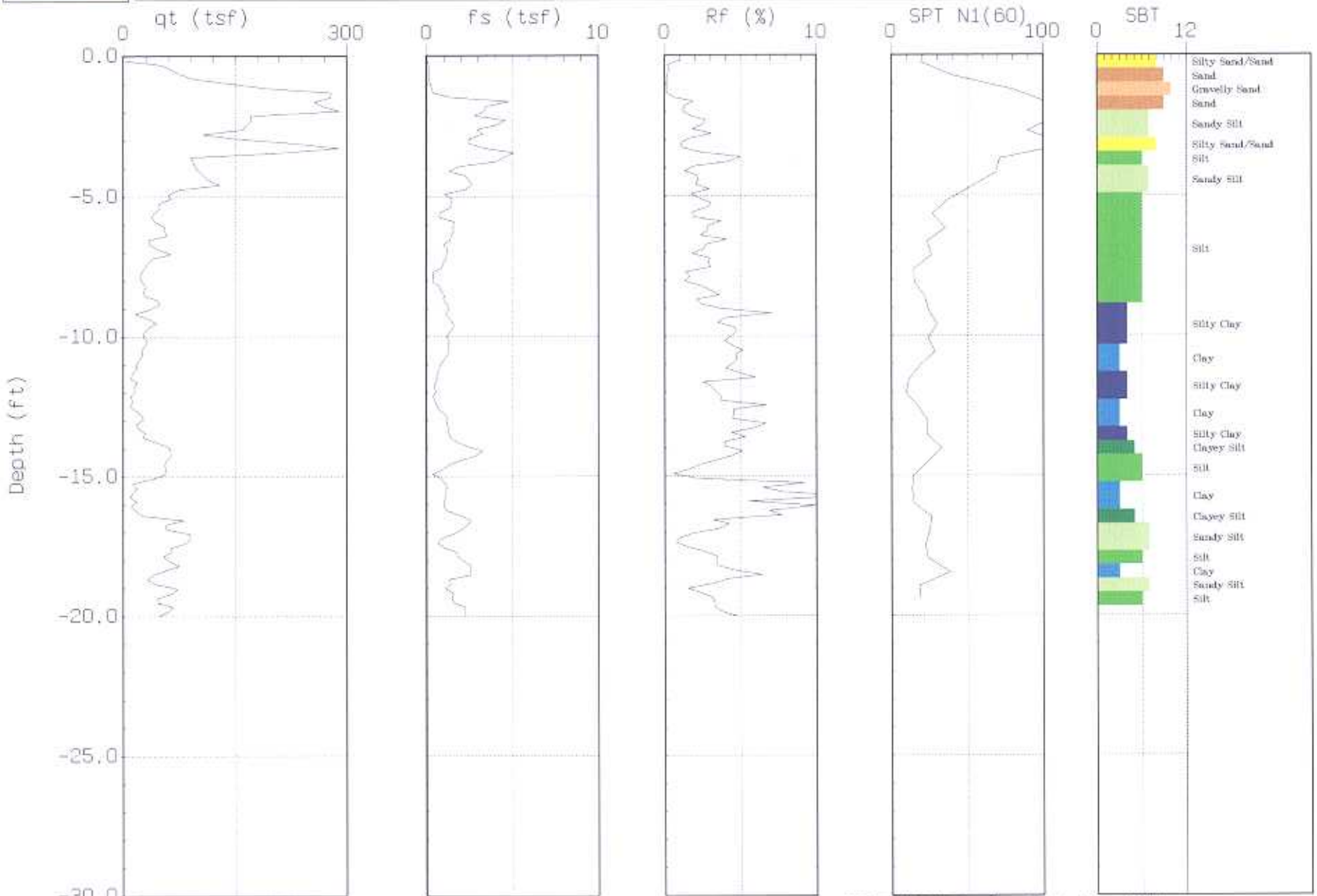
SBT: Soil Behavior Type (Robertson 1990)

GREGG

# EARTH MECHANICS

Site: HWY 101/ROUTE 84
Location: ~~B-1~~ B-3 04-14

Engineer: J. CASTLE
Date: 06:11:04 14:36




Max. Depth: 20.01 (ft)
Depth Inc.: 0.164 (ft)

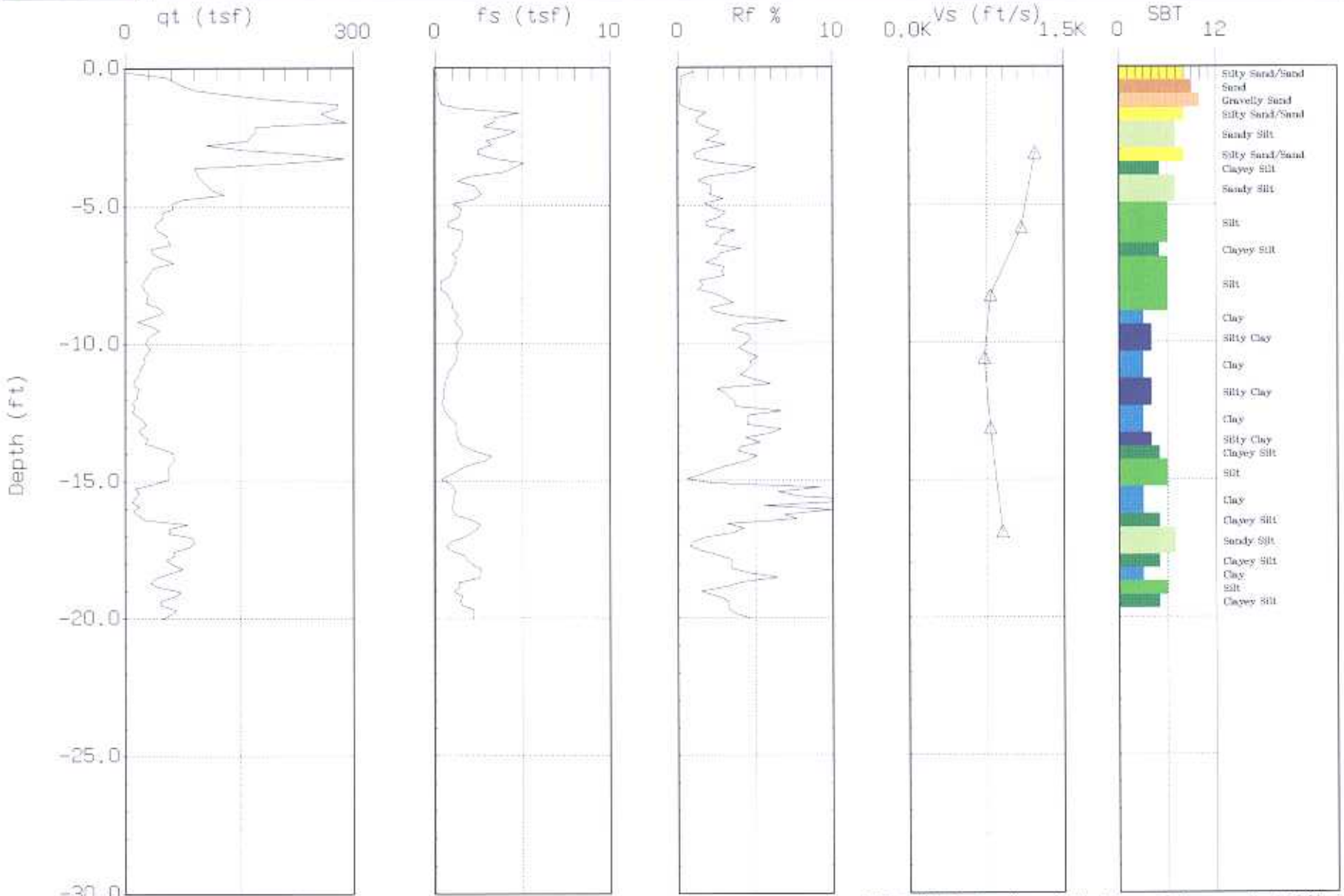
SBT: Soil Behavior Type (Robertson 1990)

GREGG

# EARTH MECHANICS

Site: HWY 101/ROUTE 84
Location: B/1 B-3 04-14

Engineer: J. CASTLE
Date: 06:11:04 14:36




Max. Depth: 20.01 (ft)

Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson and Campanella 1988)

# APPENDIX CPT

# 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 dynamic 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 (2002) 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 dynamic 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.

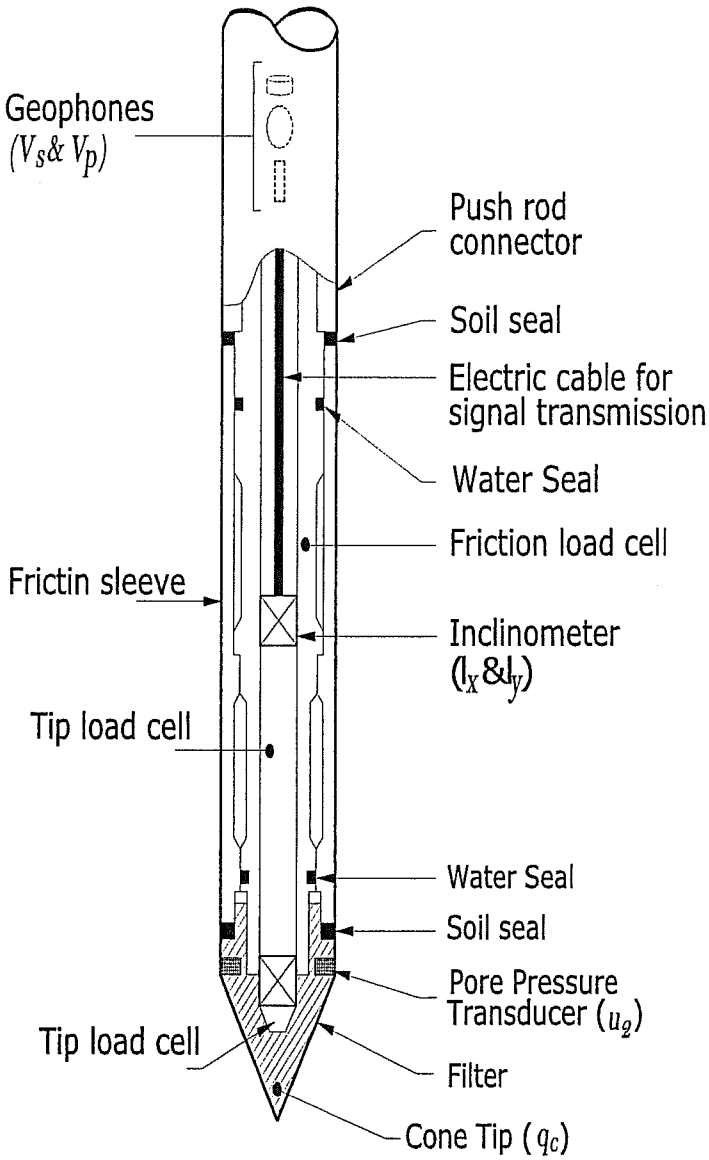



*Figure CPT*

When the soundings are complete, the test holes are grouted using a Gregg In Situ support rig. The grouting procedure consists 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 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 $100f_s/q_c$ 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 ($u_2$)

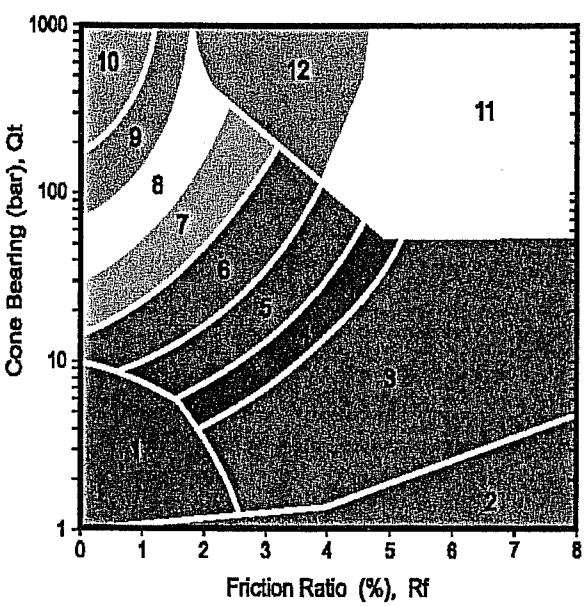
Cohesionless soils (sands)

- 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 et al, 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 greained |
| 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 Sounding Summary

-Table 1-

| | CPT Sounding Identification | Date | Termination Depth (Feet) | Number of Groundwater Samples | Number of Soil Samples | Depth of Pore Pressure Dissipation Tests |
|---|---|---|---|---|---|---|
| 04-14 | B-1 | 6/11/04 | 20 | - | - | - |
| 04-13 | B-2 | 6/11/04 | 28 | - | - | - |



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# APPENDIX SEISMIC

# Seismic Cone Penetrometer Testing
## (SCPTu)

Gregg In Situ, Inc. uses a modified CPT cone that contains a built in seismometer to measure compression and shear wave velocities in addition to the standard piezocone parameters ($q_c$, $f_s$, and $u_2$). Therefore, four independent readings are compiled with depth in a single sounding. The standard CPT parameters are recorded continuously while the seismic test is usually performed at 5-foot intervals.

Shear waves are generated by striking a seismic beam coupled to the ground surface by a hydraulic cylinder under the CPT rig, *Figure SCPTu*. Compression waves are generated by striking an auger in the ground. The sledgehammer that strikes the beam/auger acts as a trigger, initiating the recording of the seismic wave trace. Before measurements are taken, the rods are decoupled from the CPT rig to prevent energy transmission down the rods.

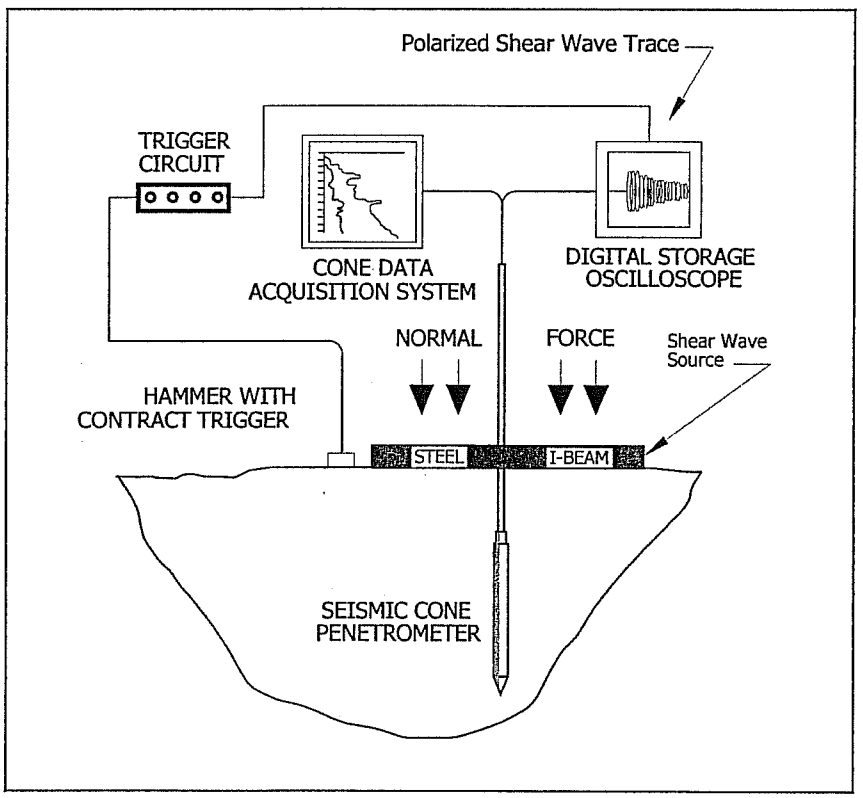



*Figure SCPTu*

Geophones in the body of the piezocone recognize the arriving waves generated at the ground surface, *Figure Seismic*. Any waves received by the geophones on the cone penetrometer are sent back up to the truck to be displayed on an oscilloscope. On site software then plots the wave amplitude versus time to calculate wave velocities.

At least two waves are recorded for each test depth so the operator can check consistency of the waveforms. Shear wave data is sampled at a frequency of 20kHz (20,000 samples per second) and compression wave data is sampled at 50kHz (50,000 samples per second). To maintain a desired signal resolution, the input sensitivity (gain) is increased with depth.

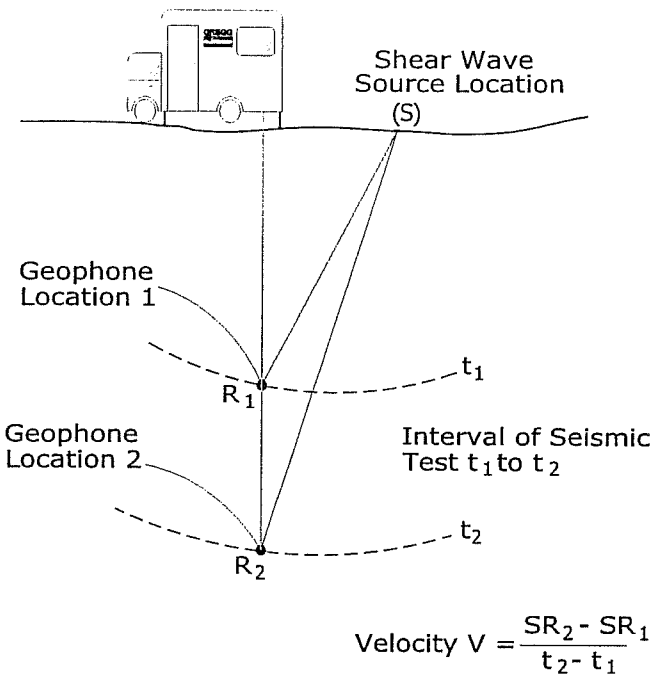



*Figure Seismic*

Offset distances of the beam from the cone and the location of the geophone are all taken into account in calculations.

The shear wave velocity ($V_s$) provides information about small-strain stiffness while the penetration data provides information about large-strain failures. From interval shear wave velocity ($V_s$) and the mass density ($\rho$) of a soil layer, the dynamic shear modulus ($G_o$) of the soil can be calculated in a specific depth interval. The dynamic shear modulus ($G_0$) is a key parameter for the analysis of soil behavior in response to dynamic loading from earthquakes, ice, vibrating machine foundations, waves and wind.

A summary of the data collected including the depth and location identification is displayed in Table 1 and graphical formats and can be found with the corresponding CPT plot.

For a detailed reference on seismic CPT, refer to Robertson et. al., 1986.

GREGG

GIS Project No: 04-202MA
Client: Earth Mechanics
Site: Highway 101 & Route 84
Location B-2
Sounding Date: June 11, 2004

04-13

**Shear Wave Velocity Calculations**

| | | |
|---|---|---|
| Geophone Offset | (feet) | 0.66 |
| Source Offset | (feet) | 2.50 |

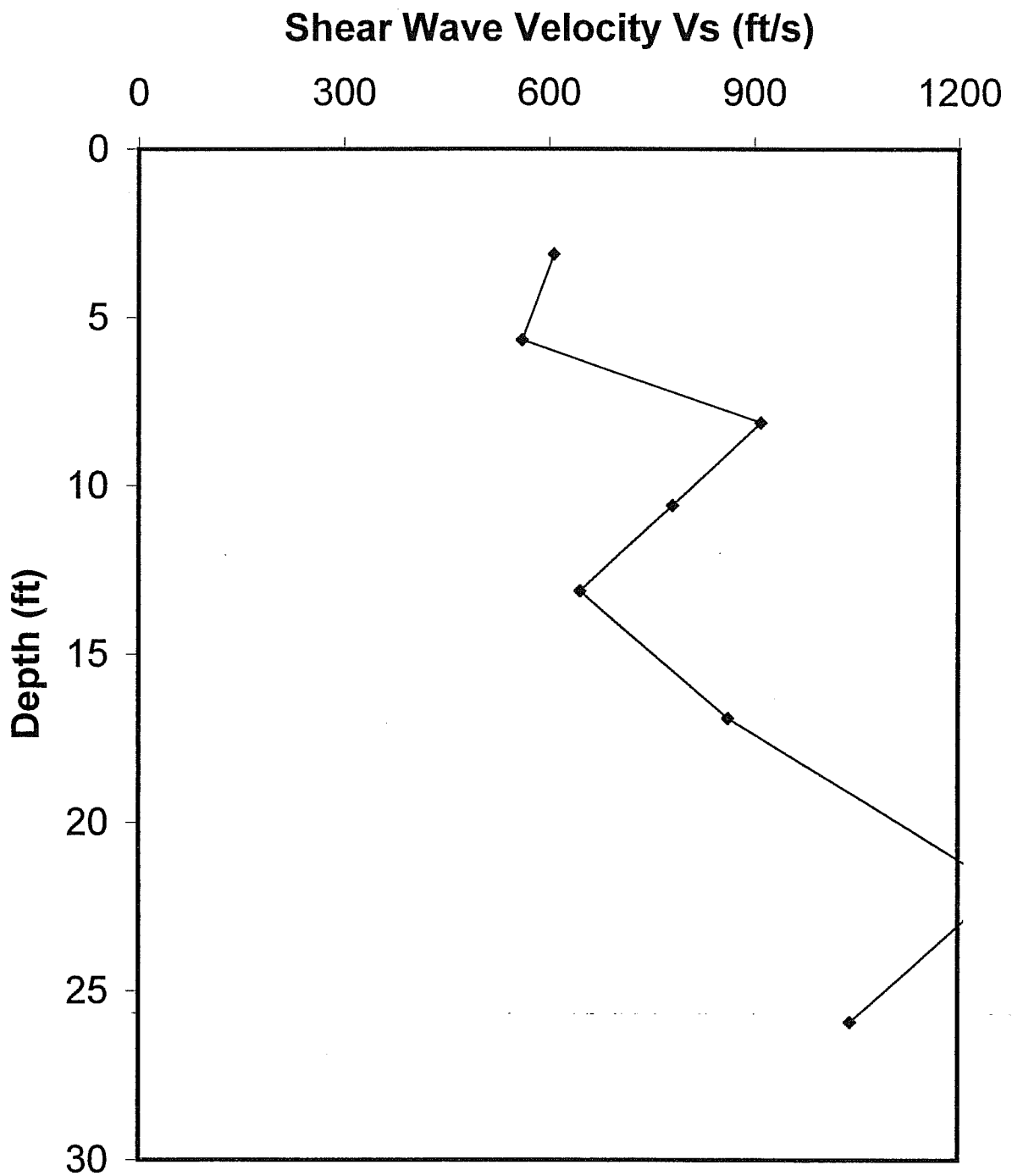
| Test Depth (feet) | Geophone Depth (feet) | Ray Path (feet) | Incremental Distance (feet) | Time Interval (ms) | Interval Velocity (ft/s) | Interval Depth (feet) | Interval Depth (feet) | Vs (ft/s) | Vs (m/s) | Interval Depth (m) |
|---|---|---|---|---|---|---|---|---|---|---|
| 2.46 | 1.80 | 3.08 | | | | | | | | |
| 5.08 | 4.42 | 5.08 | 2.00 | 3.29 | 607 | 3.11 | 3.11 | 607 | 185 | 0.95 |
| 7.54 | 6.88 | 7.32 | 2.24 | 4.00 | 561 | 5.65 | 5.65 | 561 | 171 | 1.72 |
| 10.00 | 9.34 | 9.67 | 2.35 | 2.58 | 910 | 8.11 | 8.11 | 910 | 277 | 2.47 |
| 12.46 | 11.80 | 12.07 | 2.39 | 3.06 | 782 | 10.57 | 10.57 | 782 | 238 | 3.22 |
| 15.09 | 14.43 | 14.65 | 2.58 | 3.99 | 647 | 13.12 | 13.12 | 647 | 197 | 4.00 |
| 20.01 | 19.35 | 19.51 | 4.87 | 5.64 | 863 | 16.89 | 16.89 | 863 | 263 | 5.15 |
| 25.09 | 24.43 | 24.56 | 5.05 | 3.99 | 1265 | 21.89 | 21.89 | 1265 | 386 | 6.67 |
| 28.04 | 27.38 | 27.50 | 2.94 | 2.82 | 1041 | 25.91 | 25.91 | 1041 | 317 | 7.90 |

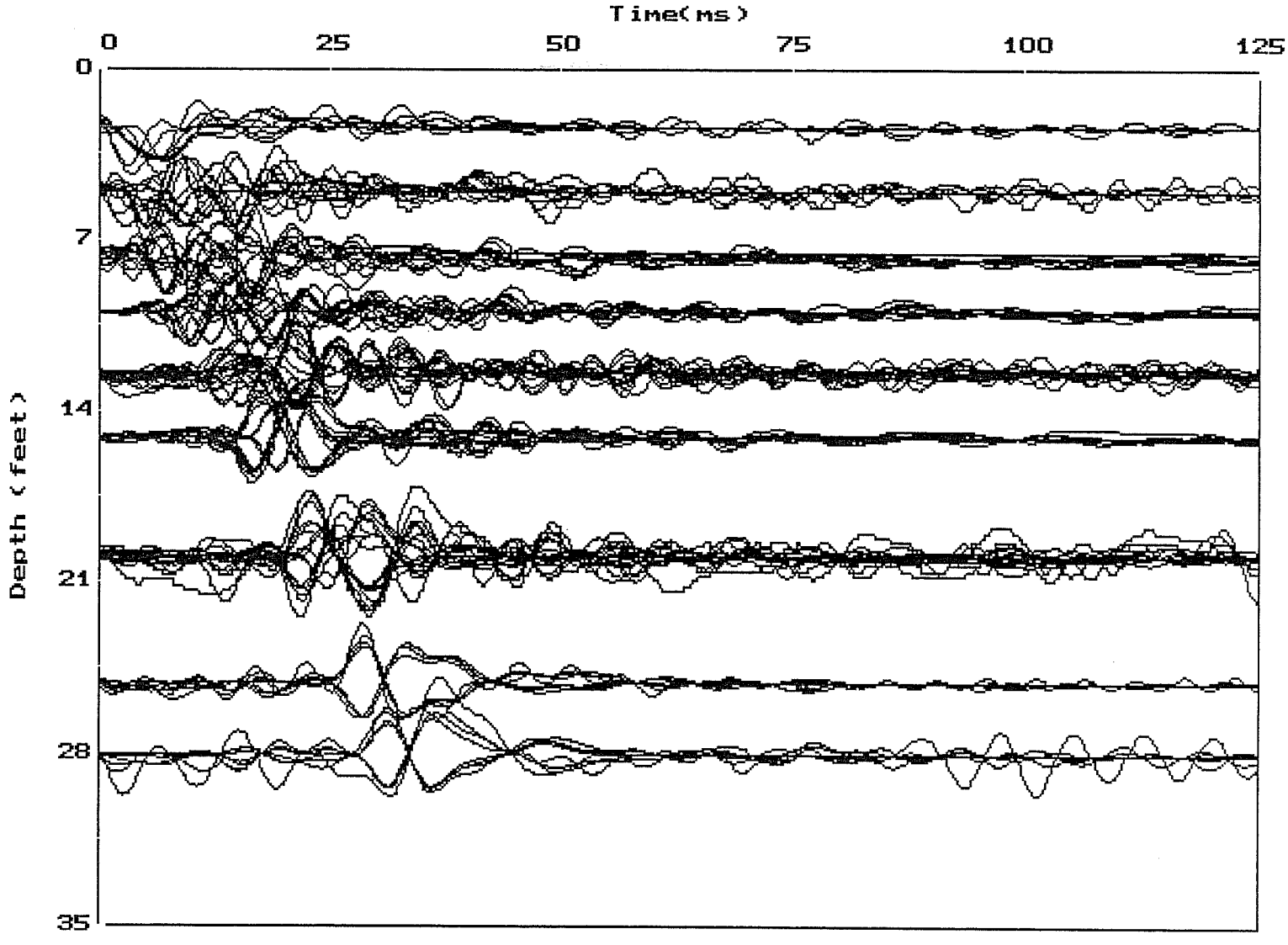
# Shear Wave Velocity Profile

GREGG

Client: 04-202ma - Earth Mechanics
Site: Highway 101 & Route 84
Location: B-2
Sounding Date: June 11, 2004

04-13C






EARTH MECHANICS HWY 101 06:11:04 B-1

04-13

GREGG

GIS Project No: 04-202MA
Client: Earth Mechanics
Site: Highway 101 & Route 84
Location B-1
Sounding Date: June 11, 2004

04-14C

**Shear Wave Velocity Calculations**

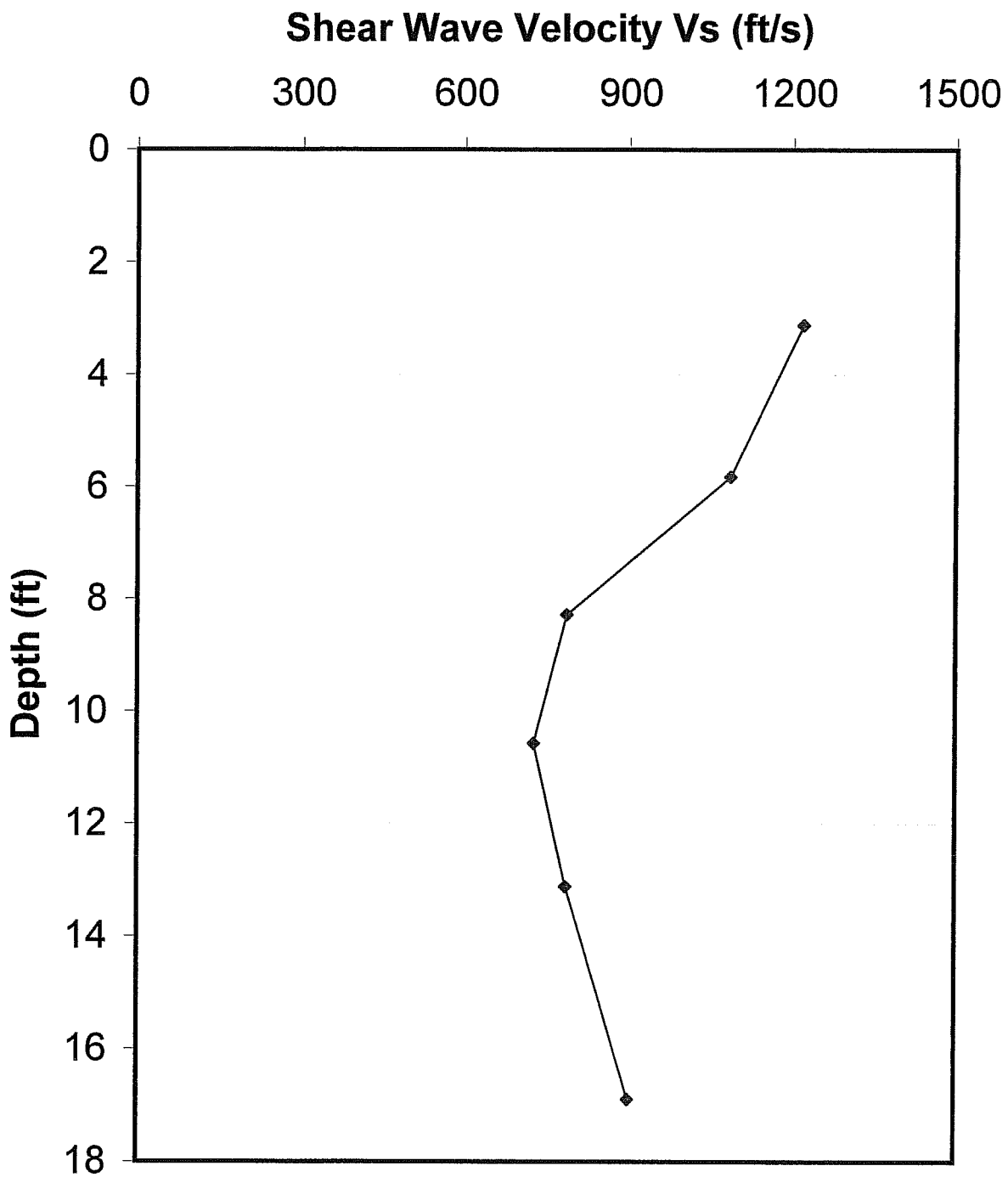
| | | |
|---|---|---|
| Geophone Offset | (feet) | 0.66 |
| Source Offset | (feet) | 2.50 |

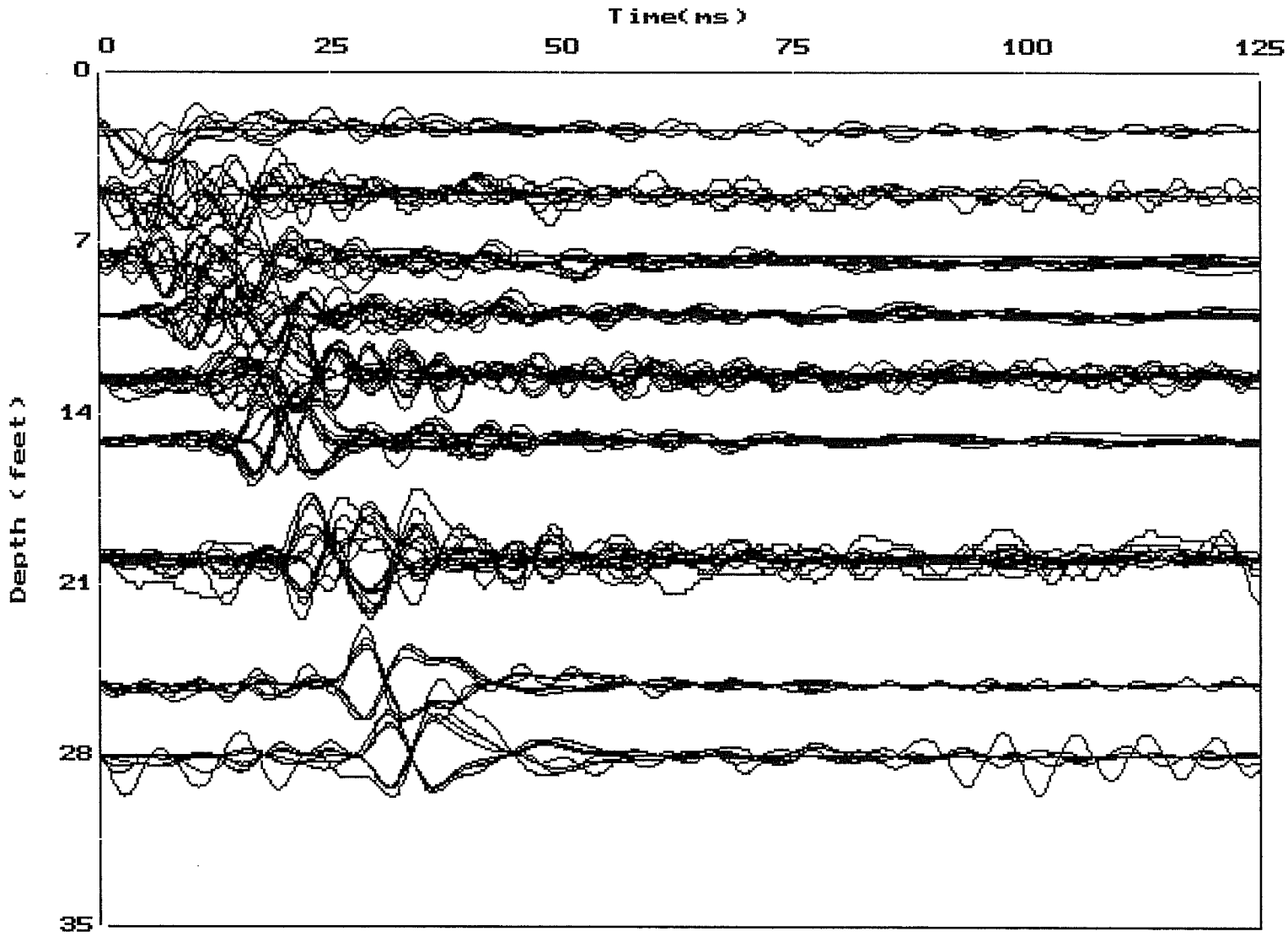
| Test Depth (feet) | Geophone Depth (feet) | Ray Path (feet) | Incremental Distance (feet) | Time Interval (ms) | Interval Velocity (ft/s) | Interval Depth (feet) | Interval Depth (feet) | Vs (ft/s) | Vs (m/s) | Interval Depth (m) |
|---|---|---|---|---|---|---|---|---|---|---|
| 2.46 | 1.80 | 3.08 | | | | | | | | |
| 5.08 | 4.42 | 5.08 | 2.00 | 1.64 | 1219 | 3.11 | 3.11 | 1219 | 371 | 0.95 |
| 7.87 | 7.21 | 7.63 | 2.55 | 2.35 | 1087 | 5.82 | 5.82 | 1087 | 331 | 1.77 |
| 10.00 | 9.34 | 9.67 | 2.04 | 2.59 | 787 | 8.28 | 8.28 | 787 | 240 | 2.52 |
| 12.46 | 11.80 | 12.07 | 2.39 | 3.29 | 727 | 10.57 | 10.57 | 727 | 222 | 3.22 |
| 15.09 | 14.43 | 14.65 | 2.58 | 3.29 | 785 | 13.12 | 13.12 | 785 | 239 | 4.00 |
| 20.01 | 19.35 | 19.51 | 4.87 | 5.40 | 901 | 16.89 | 16.89 | 901 | 275 | 5.15 |

# Shear Wave Velocity Profile

GREGG

Client: 04-202ma - Earth Mechanics
Site: Highway 101 & Route 84
Location: B-1
Sounding Date: June 11, 2004 04-14C






EARTH MECHANICS HWY 101 06:11:04 B-1

04-14

# Caltrans Bridge 04-0236
# Painter St. Bridge, Humboldt Co.

**Caltrans Bridge 04-0236, Painter St Bridge, Humboldt Co.**

Painter St. is one of the Caltrans bridges that are seismically instrumented and focus of numerous research studies. The field investigation for the Painter Street Bridge, conducted on 6/30/04 and 7/01/04, consisted of 2 soil borings (04-15A and 04-16A), 2 PMT borings (04-15P and 04-16P), and 2 CPT (04-15C/D and 04-16C). Soil and PMT borings were drilled by PC Exploration of Rocklin. CPT's were performed by Gregg Drilling of Martinez. Locations 04-15x were located on the west bridge abutment in the east-bound lane, near the approach slab and locations 04-16x were located on the west bridge abutment, in the east-bound lane, also near the approach slab.

Geotechnical soil sampling consisted of ring samples collected using a Modified California sampler and small bulk samples collected with a SPT sampler. Samples were taken at 2.5-ft intervals. No groundwater was encountered during the investigation. One pressuremeter test was performed in each boring.

6-30-04, Painter St Bridge, view to NE

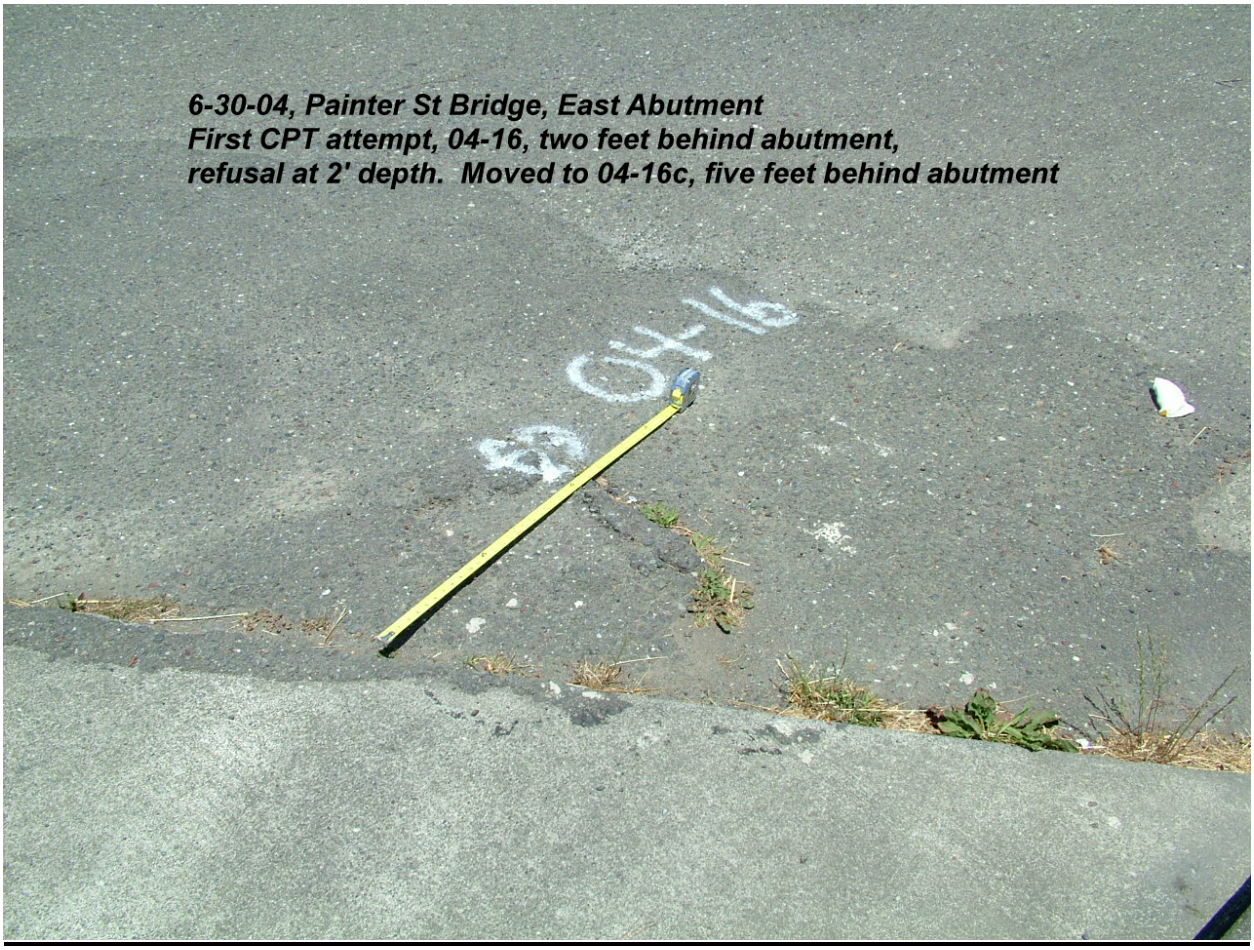
6-30-04, Painter St Bridge, view to W. Gregg CPT truck

6-30-04, Painter St Bridge, West Abutment.
First CPT attempt, 04-15, refusal at 9.5' depth.

6-30-04, Painter St Bridge, West Abutment.
Second CPT attempt, 04-15C, completed to 14.5'

6-30-04, Painter St Bridge,
Gregg Drilling CPT truck

6-30-04, Painter St Bridge, West Abutment.
First CPT attempt, 04-15, refusal at 9.5' depth.


6-30-04, Painter St Bridge, East Abutment
First CPT attempt, 04-16, two feet behind abutment,
refusal at 2' depth. Moved to 04-16c, five feet behind abutment
04-16

*6-30-04, Painter St Bridge, East Abutment*
*First CPT attempt, 04-15, two feet behind abutment,*
*refusal at 9.5' depth. Moved to 04-15C, four feet behind abutment*

*7-1-04, Painter St Bridge, West Abutment*
*PC Exploration drilling 04-15A soil sampling*

7-1-04, Painter St, West Abutment
PC Exploration Drilling 04-15A

7-1-04, Painter St, West Abutment
PC Exploration Drilling 04-15A

*7-1-04, Painter St, West Abutment*
*Saverio Siciliano preparing pressuremeter*

*7-1-04, Painter St, West Abutment*
*PMT boring 04-15D*

| DIST. | COUNTY | ROUTE | POST MILES—TOTAL PROJECT | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| 01 | Hum | 101 | R51.5/R53.9 | 129 | [illegible] |

DISTRICT ENGINEER [illegible] PROFESSIONAL CIVIL ENGINEER NUMBER [illegible]

DISTRICT BRIDGE ENGINEER [illegible] REGISTERED CIVIL ENGINEER NUMBER [illegible]

DATE APPROVED November 19, 1973

Sta. 16+50.00 BVC
E 128.00

+4.00%

700 V.C.
Rate of Change: +11% / Sta. on

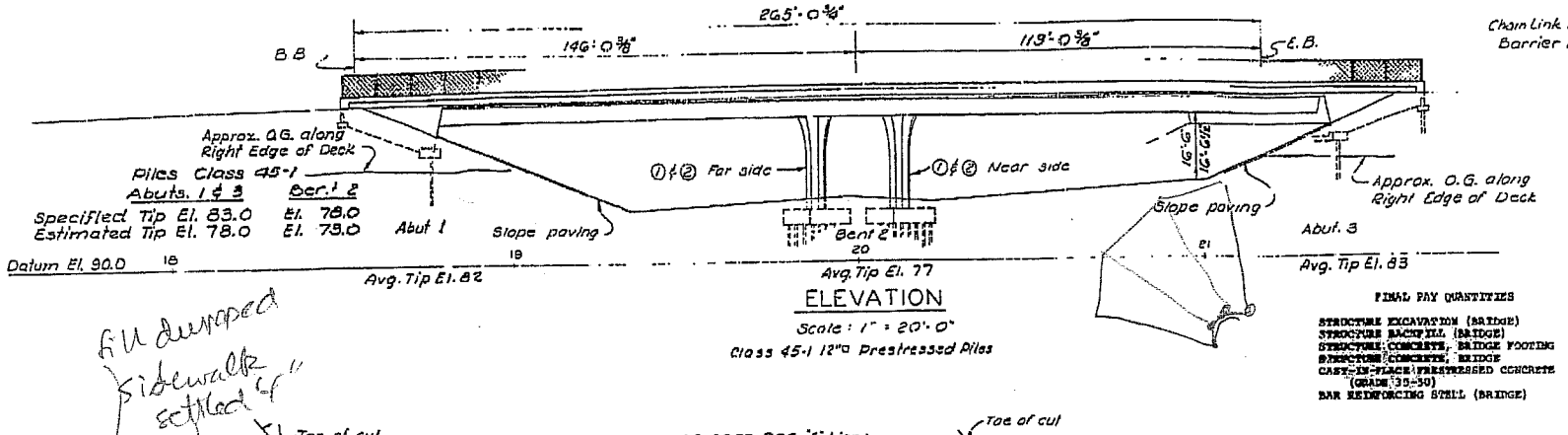
Sta. 23+50.00 E.V.C.
El. 128.70

-3.80%

## PROFILE GRADE

No Scale

Distances measured along ℄ Painter Street



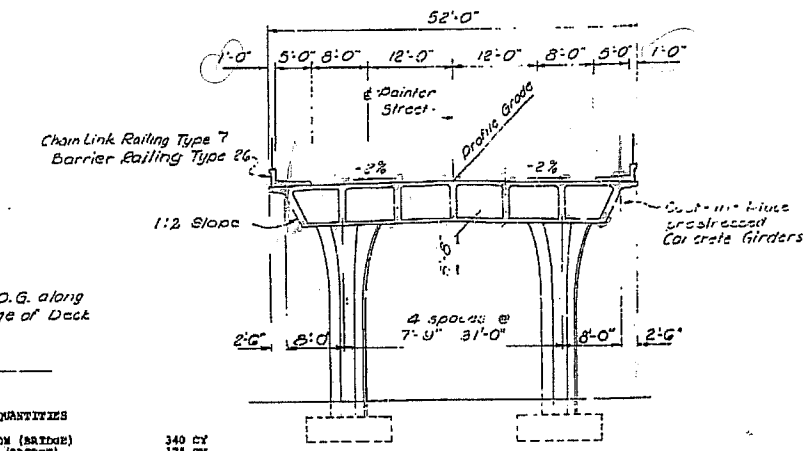

## ELEVATION

Scale: 1" = 20'-0"

Class 45-1 12"ø Prestressed Piles

FINAL PAY QUANTITIES

| | |
|---|---|
| STRUCTURE EXCAVATION (BRIDGE) | 340 CY |
| STRUCTURE BACKFILL (BRIDGE) | 175 CY |
| STRUCTURE CONCRETE, BRIDGE FOOTING | 88 CY |
| STRUCTURE CONCRETE, BRIDGE | 230 CY |
| CAST-IN-PLACE PRESTRESSED CONCRETE (GRADE 35-50) | 1,025 CY |
| BAR REINFORCING STEEL (BRIDGE) | 225,000 LB |




## TYPICAL SECTION

Scale: 1" = 10'-0"

⊕ BORING/PMT
▲ CPT

## INDEX TO PLANS


| Sheet No | Title |
|---|---|
| 1 | General Plan |
| 2 | Deck Contours |
| 3 | Foundation Plan |
| 4 | Abutment Details |
| 5 | Bent 2 Details |
| 6 | Typical Section |
| 7 | Girder Layout |
| 8 | Simple Beam Wingwall Details |
| 9 | Slope Paving Details - Full Slope |
| 10 | Log of Test Borings |


STANDARD PLANS DATED JANUARY, 1973

| | |
|---|---|
| A62-B8 | EXCAVATION AND BACKFILL BRIDGE DEATS OF PAYMENT |
| B0-1 | BRIDGE DETAILS (GENERAL & ABUTMENT) |
| B0-3 | BRIDGE DETAILS (RAILS) |
| B0-5 | BRIDGE DETAILS (DECKS) |
| B2-1 | PILE DETAILS - CLASS 45-1 & CLASS 45-2 |
| B7-1 | BOX GIRDER DETAILS |
| B8-5 | CAST-IN-PLACE PRESTRESSED GIRDER DETAILS |
| B11-52 | CHAIN LINK RAILING TYPE 7 |
| B11-54 | BARRIER RAILING TYPE 26 |

Fill dumped sidewalk settled 4"

Top of cut
Toe of fill
Top of fill
Toe of cut
Top of cut
Toe of cut
Top of cut
Toe of fill
Top of fill
Toe of fill
Top of fill
Toe of fill
Top of fill
Toe of cut
Top of cut
Toe of cut
Top of cut
Toe of cut

172+89.77 POC "℄ Line"
20+00.00 POT Painter St.

Skew L
38°-55'-25" Lt

℄ Painter St.
S 88° 28'03" E
Sta. 16+53.97 B.B.
El. 133.84

04-15P
04-15A
04-15C
04-16C
04-16P
04-16A

Sta. 21+19.08 E.B.
El. 134.51

Min. el. = 16.91 ft.

6 lamps

℄ Line
R 1850.3

to Scotia
to Fortuna

Sidewalk
5'-0"
5'-0"
8'-0"
12'-0"
12'-0"
8'-0"
5'-0"
5'-0"
Sidewalk
5'-0"

1" offset @ wingwall

AS BUILT
CORRECTIONS BY I.A. Schroeder
CONTRACT NO. 01-061224
DATE 7-23-76 R.T. 4-1-77

## PLAN

Scale: 1" = 20'-0"

APPROXIMATE QUANTITIES

| | |
|---|---|
| FURNISH PILING (CLASS 45-1) | 2,460 LF |
| DRIVE PILE (CLASS 45) | 70 EA |
| PRESTRESSING CAST-IN-PLACE CONCRETE | LUMP SUM |
| WATERSTOP | 35 LF |
| STRIP WATERSTOP | 60 LF |
| 8" PERFORATED STEEL PIPE UNDERDRAIN (.064" THICK) | 116 LF |
| CLASS 1 PERMEABLE MATERIAL (BRIDGE) | 30 CY |
| 8" CORRUGATED STEEL PIPE DOWNDRAIN (.064" THICK) | 92 LF |
| SLOPE PAVING (CONCRETE) | 69 CY |
| CHAIN LINK RAILING (TYPE 7) | 635 LF |

⊗ Point of minimum vertical clearance.
① Point "Bridge No. 4-236 ℄ year constructed."
② Point "Painter Street Overcrossing".

FOR GENERAL NOTES SEE "Deck Contours" sheet

LIVE LOADING HS20-44 AND ALTERNATIVE

BRIDGE DEPARTMENT
DESIGN SECTION 6
Section Engineer [illegible] 10-73
Project Designer P.N. Olson

| | | | |
|---|---|---|---|
| DESIGN | [illegible] 3/70 | Checked | P.N. Olson |
| DETAILS | [illegible] Chg. 2-69 | Checked | P.N. Olson |
| LAYOUT | [illegible] 3/70 | Checked | P.N. Olson |
| QUANTITIES | [illegible] 9/71 | Checked | R. Green |
| SPECIFICATIONS | [illegible] 11/73 | Checked | R.B.R. 11/73 |

Approved Bridge Engineer [illegible] Date [illegible] Bridge Engineer [illegible] 7880

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

PAINTER STREET OVERCROSSING

LOCATED IN THE CITY OF RIO DELL, IN HUMBOLDT COUNTY

GENERAL PLAN

BRIDGE NO. 04-236 | POST MILE 53.2 | DRAWING NO. 04236-1 | SHEET 1 OF 10

WO 051221
CU 01201

Disregard prints bearing earlier revision dates

AS BUILT PLANS
Contract No. 01-061224
Date Completed
Document No. 1000 2617

129

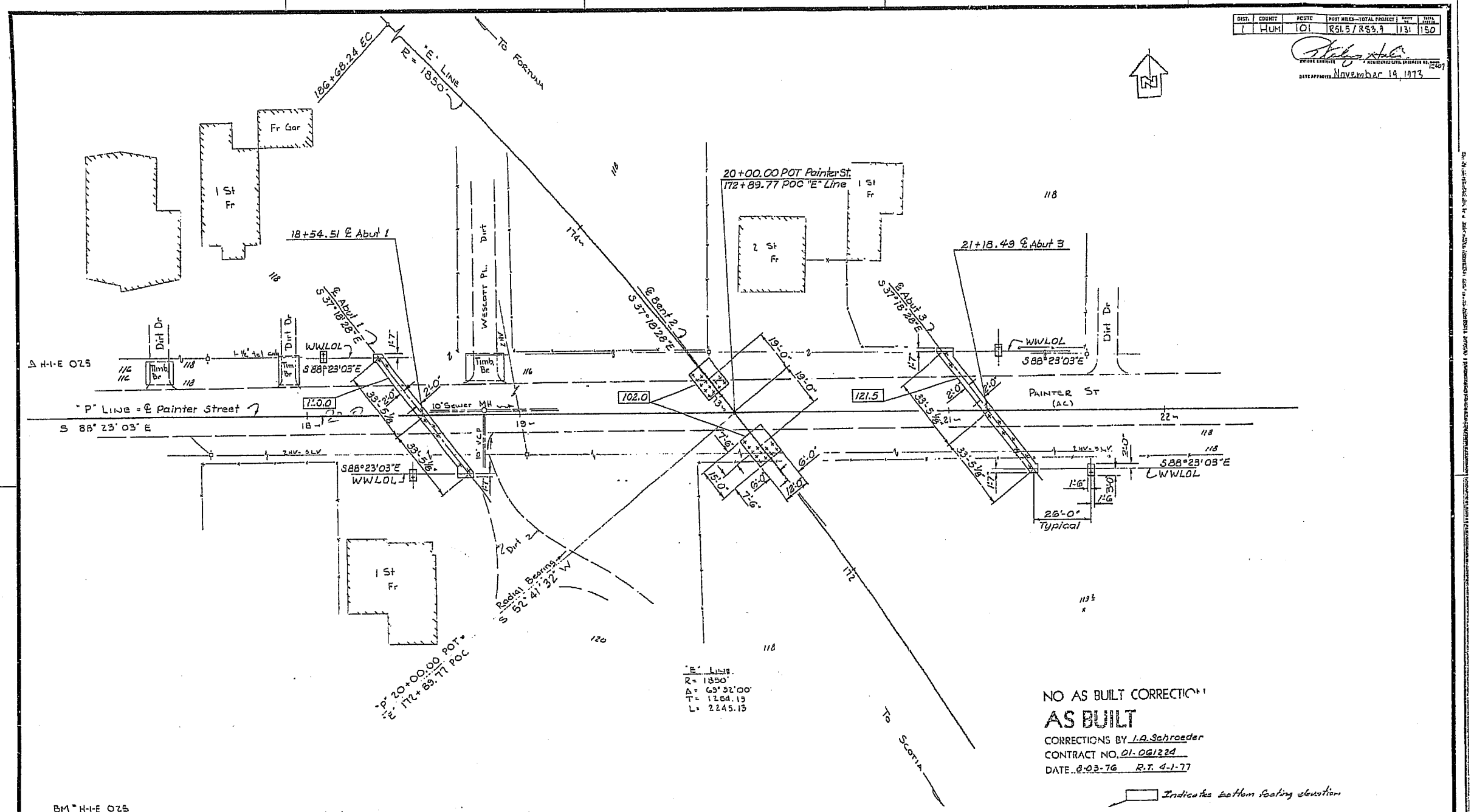
MICROFILMED
OCT 1 0 1978

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF TRANSPORTATION.

DATE 10-6-78 SIGNATURE Joseph M. Roth TITLE Supervisor of Microfilm

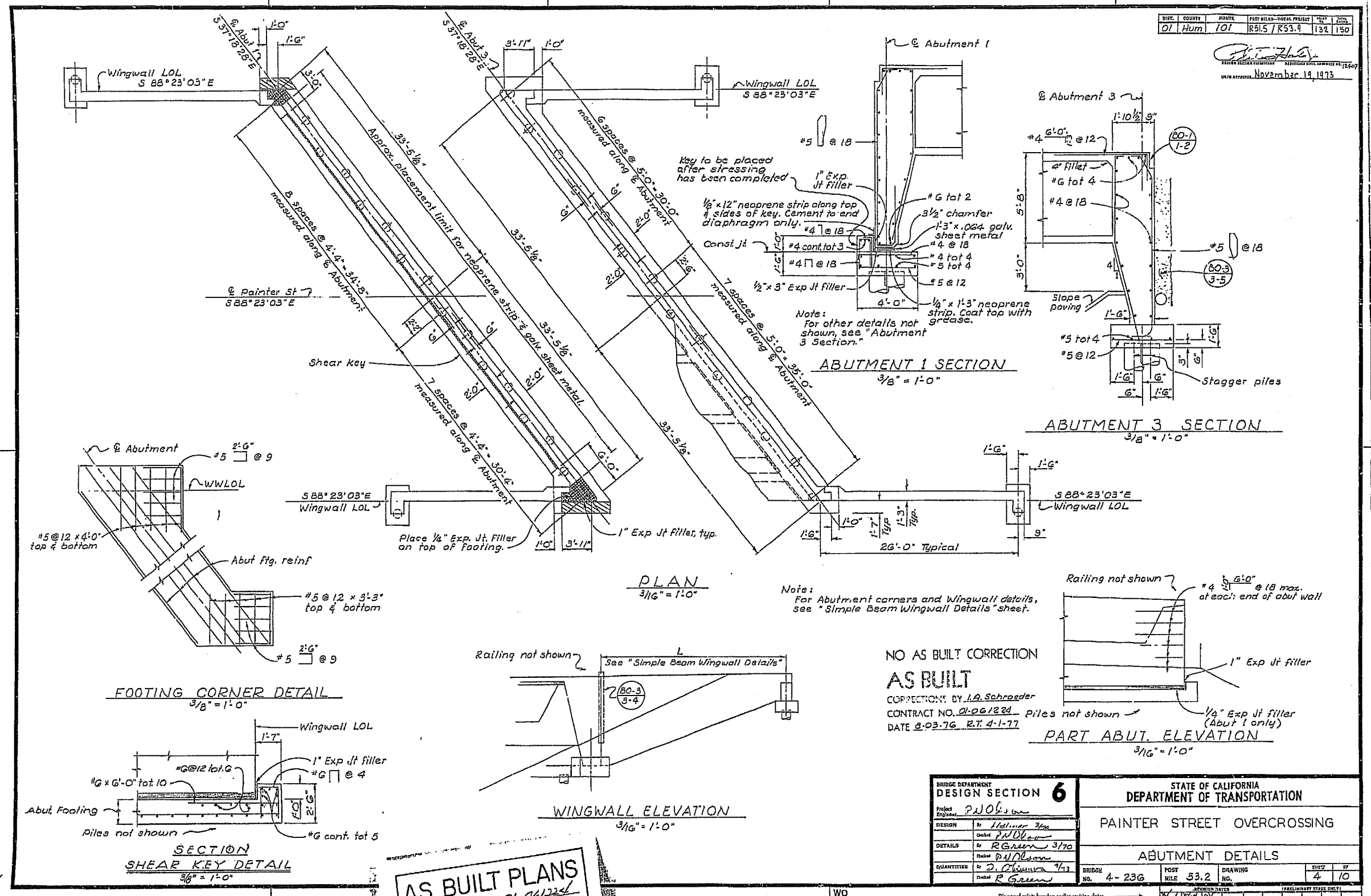
| DIST. | COUNTY | ROUTE | POST MILES—TOTAL PROJECT | ROUTE NO. | TOTAL PROJECT |
|---|---|---|---|---|---|
| 1 | HUM | 101 | R51.5 / R53.9 | 131 | 150 |

DATE APPROVED November 19, 1973




I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF TRANSPORTATION.

DATE 4/14/77 SIGNATURE Joseph M. Cooke TITLE Supervisor




NO AS BUILT CORRECTION

AS BUILT

CORRECTIONS BY I.A. Schroeder

CONTRACT NO. 01-061224

DATE 8-03-76 R.T. 4-1-77

132

AS BUILT PLANS
Contract No. 01-061224
Date Completed —
Document No. 1000-2617

BRIDGE DEPARTMENT
DESIGN SECTION 6
Project Engineer P.N. Olson
DESIGN — By Helmer 3/70 — Checked P.N. Olson
DETAILS — By R. Green 3/70 — Checked P.N. Olson
QUANTITIES — By D. Olivera 9/73 — Checked R. Green

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

PAINTER STREET OVERCROSSING

ABUTMENT DETAILS

BRIDGE NO. 4-236 | POST MILE 53.2 | DRAWING NO. | SHEET 4 OF 10

WO
CU

Disregard prints bearing earlier revision dates

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF TRANSPORTATION.

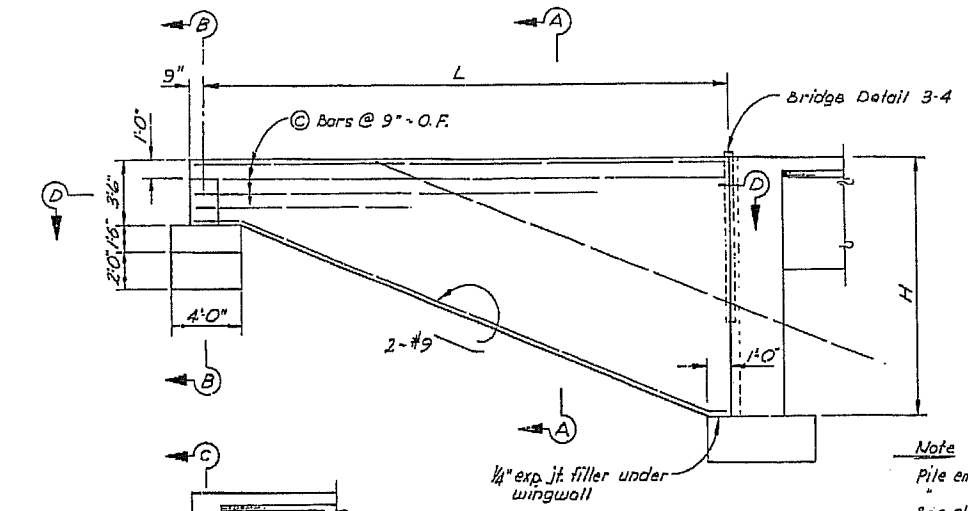
DATE 4/14/77 — Joseph M. Costa — TITLE Supervisor

| DIST. | COUNTY | ROUTE | POST MILES—TOTAL PROJECT | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| 01 | Hum | 101 | R51.5/R53.4 | 134 | 150 |

DIRECTOR OF TRANSPORTATION — STATE BRIDGE ENGINEER

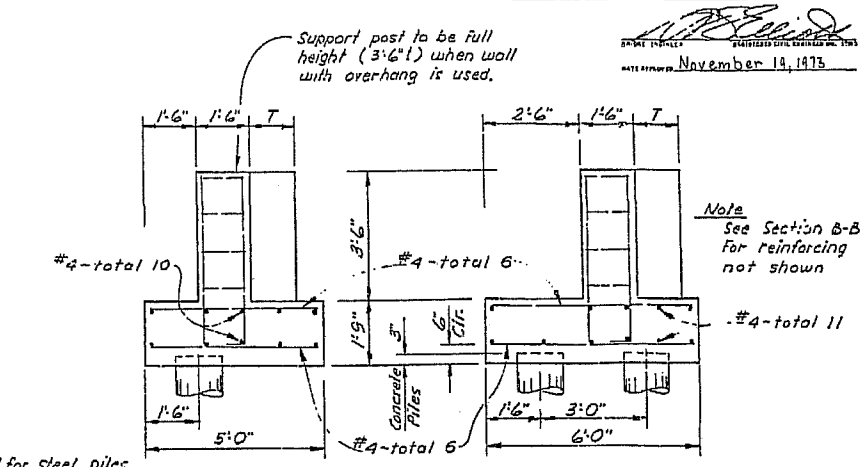
DATE APPROVED November 18, 1975

| WINGWALL DATA | | | | |
|---|---|---|---|---|
| L (ft) | H (ft) | T | Ⓒ & Ⓢ bars | No. piles |
| 20 | 10 | 1'-0" | 7 | 1 |
| | 11 | 1'-0" | 7 | 1 |
| | 12 | 1'-0" | 7 | 1 |
| | 13 | 1'-0" | 7 | 1 |
| | 14 | 1'-0" | 8 | 1 |
| 22 | 10 | 1'-0" | 8 | 1 |
| | 11 | 1'-0" | 8 | 1 |
| | 12 | 1'-0" | 8 | 1 |
| | 13 | 1'-0" | 8 | 1 |
| | 14 | 1'-0" | 8 | 1 |
| 24 | 10 | 1'-0" | 8 | 1 |
| | 11 | 1'-0" | 8 | 1 |
| | 12 | 1'-3" | 8 | 1 |
| | 13 | 1'-3" | 8 | 1 |
| | 14 | 1'-3" | 8 | 2 |
| 26 | 10 | 1'-3" | 8 | 1 |
| | 11 | 1'-3" | 8 | 1 |
| | 12 | 1'-3" | 8 | 1 |
| | 13 | 1'-3" | 8 | 2 |
| | 14 | 1'-3" | 8 | 2 |
| 28 | 10 | 1'-3" | 8 | 1 |
| | 11 | 1'-3" | 8 | 1 |
| | 12 | 1'-3" | 9 | 2 |
| | 13 | 1'-3" | 9 | 2 |
| | 14 | 1'-3" | 9 | 2 |
| 30 | 10 | 1'-3" | 9 | 1 |
| | 11 | 1'-3" | 9 | 1 |
| | 12 | 1'-3" | 9 | 2 |
| | 13 | 1'-3" | 9 | 2 |
| | 14 | 1'-6" | 9 | 2 |
| 32 | 10 | 1'-3" | 9 | 1 |
| | 11 | 1'-6" | 9 | 2 |
| | 12 | 1'-6" | 9 | 2 |
| | 13 | 1'-6" | 9 | 2 |
| | 14 | 1'-6" | 9 | 2 |
| 34 | 10 | 1'-6" | 9 | 1 |
| | 11 | 1'-6" | 9 | 2 |
| | 12 | 1'-6" | 9 | 2 |
| | 13 | 1'-6" | 10 | 2 |
| | 14 | 1'-6" | 10 | 2 |
| 36 | 10 | 1'-6" | 10 | 2 |
| | 11 | 1'-6" | 10 | 2 |
| | 12 | 1'-6" | 10 | 2 |
| | 13 | 1'-6" | 10 | 2 |
| | 14 | 1'-6" | 10 | 2 |
| 38 | 10 | 1'-6" | 10 | 2 |
| | 11 | 1'-6" | 10 | 2 |
| | 12 | 1'-6" | 10 | 2 |
| | 13 | 1'-6" | 10 | 2 |
| | 14 | 1'-9" | 10 | 2 |
| 40 | 10 | 1'-6" | 10 | 2 |
| | 11 | 1'-6" | 10 | 2 |
| | 12 | 1'-9" | 10 | 2 |
| | 13 | 1'-9" | 10 | 2 |
| | 14 | 1'-9" | 10 | 2 |



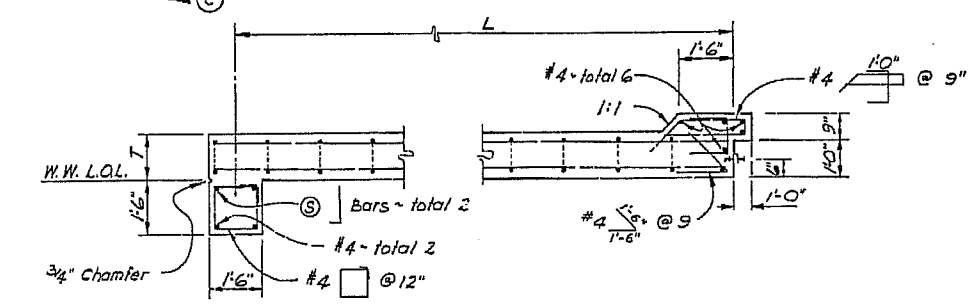

ELEVATION

Note
Pile embedment : 5" for steel piles
" " : 6" for Timber piles
Bar clearance : 6" for Steel Piles
" " : 9" for Timber Piles
Increase footing depth to 2'-0" if Timber Piles are used.

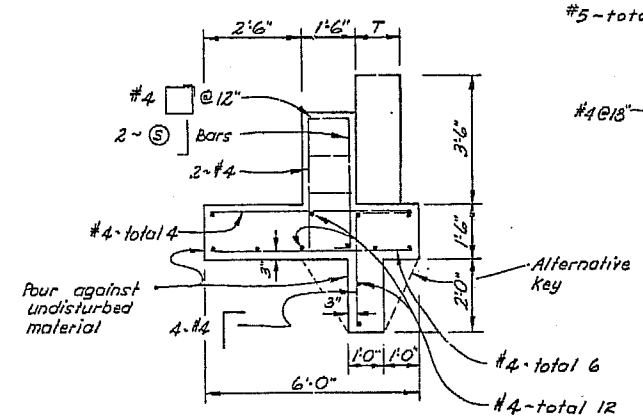



Note
See Section B-B for reinforcing not shown

SECTION C-C

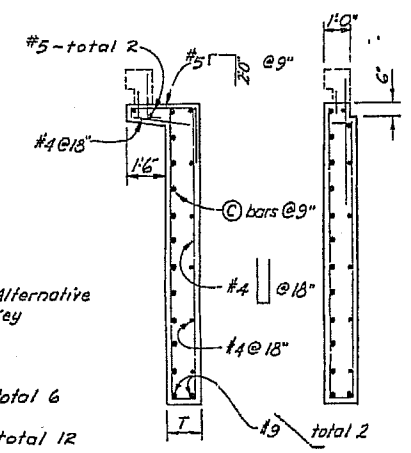



SECTION D-D

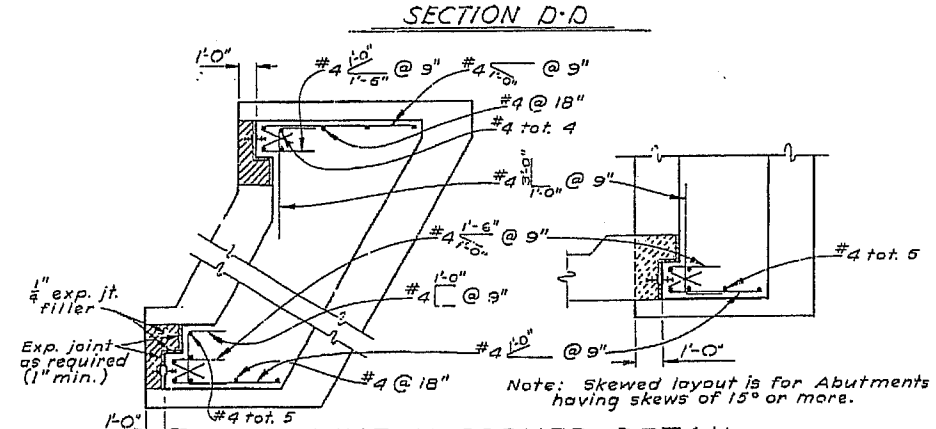



SECTION B-B

Note: When superstructure is prestressed, the wingwall must be placed after stressing is completed. Backfill material inside of walls must be placed prior to placing backfill outside of walls.




SECTION A-A




Note: Skewed layout is for Abutments having skews of 15° or more.

ABUTMENT CORNER DETAIL

NO AS BUILT CORRECTION

AS BUILT
CORRECTIONS BY I.A. Schroeder
CONTRACT NO. 01-06:224
DATE 8-03-76 R.T. 4-1-77

6/71 STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION XS-4-25

PAINTER STREET OVERCROSSING

SIMPLE BEAM WINGWALL DETAILS

| BRIDGE NO. | POST MILE | DRAWING NO. | SHEET | OF |
|---|---|---|---|---|
| 4-236 | 53.2 | | 8 | 10 |

REVISION DATES (PRELIMINARY STAGE ONLY)

Disregard prints bearing earlier revision dates → 7/8/80

WO
CU

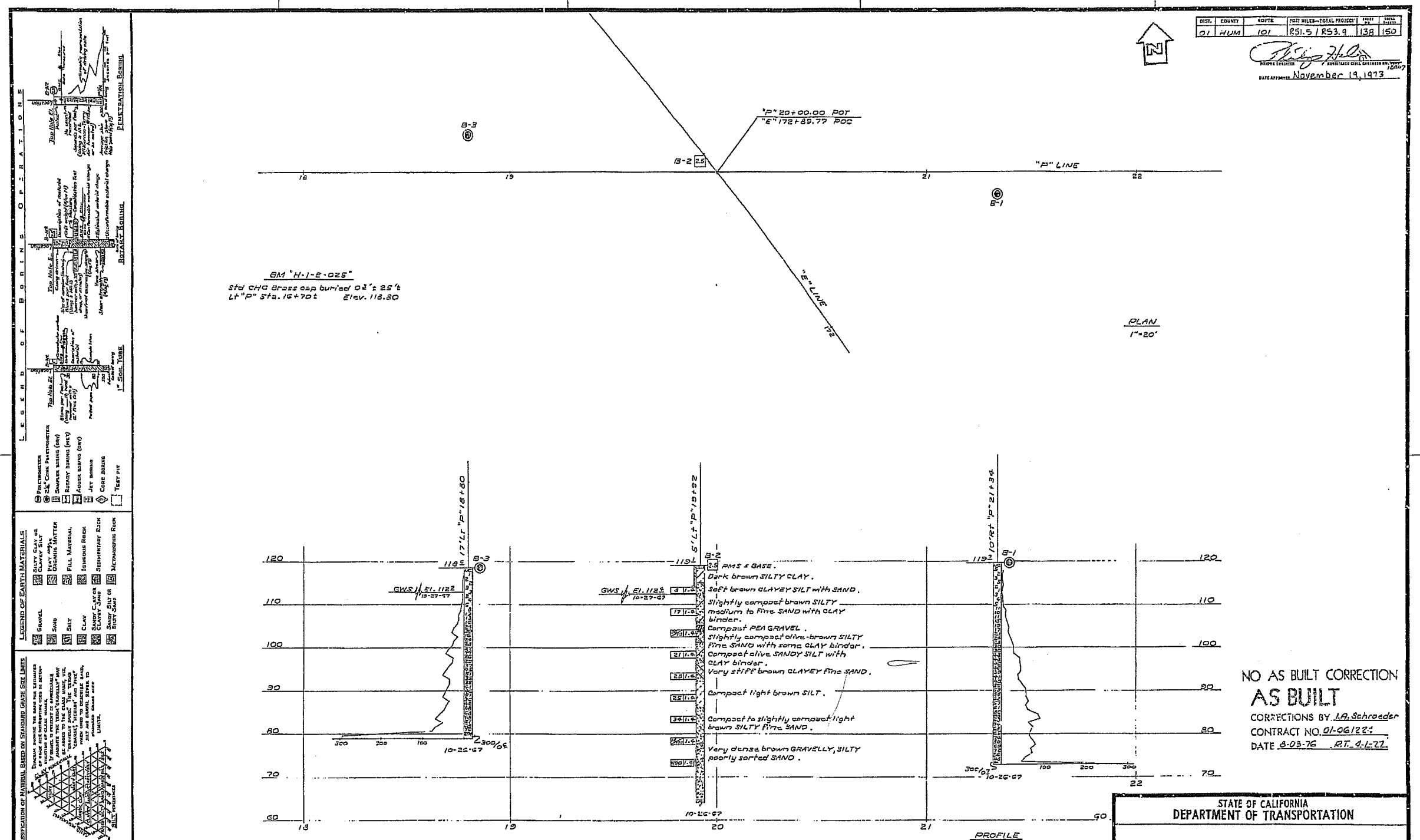
STANDARD DRAWING

AS BUILT PLANS
Contract No. 01-06:224
Date Completed —
Document No. Lean Dolt

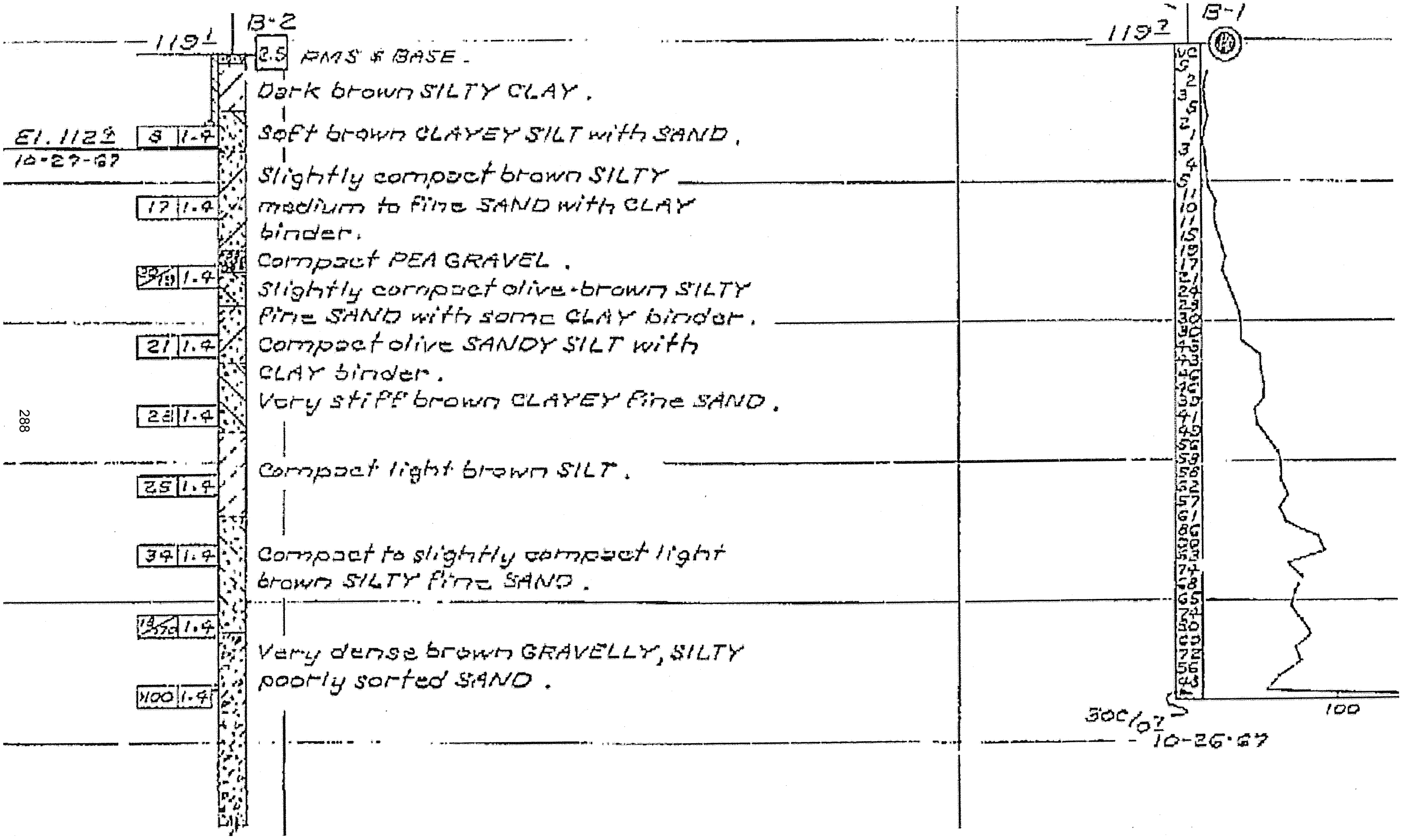
136

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF TRANSPORTATION.

DATE 11/14/77 SIGNATURE Joseph M. Cole TITLE Cameraman



DIST. 01 | COUNTY HUM | ROUTE 101 | POST MILES—TOTAL PROJECT R51.5 / R53.9 | SHEET 138 | TOTAL SHEETS 150
DATE APPROVED November 19, 1973
"P" 20+00.00 POT
"E" 172+89.77 POC
B-3
B-2
B-1
"P" LINE
"E" LINE
BM "H-1-E-025"
Std CHG Brass cap buried 0.3' ± 25'±
Lt "P" Sta. 16+70± Elev. 118.80
PLAN
1"=20'
17' Lt "P" 18+80
5' Lt "P" 19+92
10' Rt "P" 21+34
PMS & BASE.
Dark brown SILTY CLAY.
Soft brown CLAYEY SILT with SAND.
Slightly compact brown SILTY medium to fine SAND with CLAY binder.
Compact PEA GRAVEL.
Slightly compact olive-brown SILTY fine SAND with some CLAY binder.
Compact olive SANDY SILT with CLAY binder.
Very stiff brown CLAYEY fine SAND.
Compact light brown SILT.
Compact to slightly compact light brown SILTY fine SAND.
Very dense brown GRAVELLY, SILTY poorly sorted SAND.
GWS El. 112.2 10-27-67
10-26-67
PROFILE
Vert. 1"=10'
Horiz. 1"=20'
NO AS BUILT CORRECTION
AS BUILT
CORRECTIONS BY I.A. Schroeder
CONTRACT NO. 01-061224
DATE 8-03-76 R.T. 4-1-77
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
PAINTER STREET OVERCROSSING
LOG OF TEST BORINGS
BRIDGE NO. 4-236
POST MILE 53.2
DRAWING No.
SHEET 10 OF 10
WO 061221
CU 01201
PR-4236-2
Disregard prints bearing earlier revision dates
REVISION DATES (PRELIMINARY STAGE ONLY)
11/13/67
AS BUILT PLANS
Contract No. 01-061224
Date Completed —
Document No. 1000 2617
I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF TRANSPORTATION.
DATE 4/14/77
SIGNATURE Joseph M. Coate
TITLE Supervisor
LEGEND OF BORING OPERATIONS
LEGEND OF EARTH MATERIALS
CLASSIFICATION OF MATERIAL BASED ON STANDARD GRADE SIZE LIMITS
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.
BRIDGE DEPARTMENT
ENGINEERING GEOLOGY SECTION
FIELD STUDY H.E. Beeston 10-67
DRAWN K. Endow 11-13-67
CHECKED H.E. Beeston 11-19-67
138


B-2
119±
2.5 PMS & BASE.
Dark brown SILTY CLAY.
El. 112±
10-27-67
8 1.4
Soft brown CLAYEY SILT with SAND.
Slightly compact brown SILTY
17 1.4
medium to fine SAND with CLAY
binder.
Compact PEA GRAVEL.
1.4
Slightly compact olive-brown SILTY
fine SAND with some CLAY binder.
21 1.4
Compact olive SANDY SILT with
CLAY binder.
Very stiff brown CLAYEY fine SAND.
28 1.4
Compact light brown SILT.
25 1.4
34 1.4
Compact to slightly compact light
brown SILTY fine SAND.
1.4
Very dense brown GRAVELLY, SILTY
poorly sorted SAND.
>100 1.4
119±
B-1
100
10-26-67

1-5

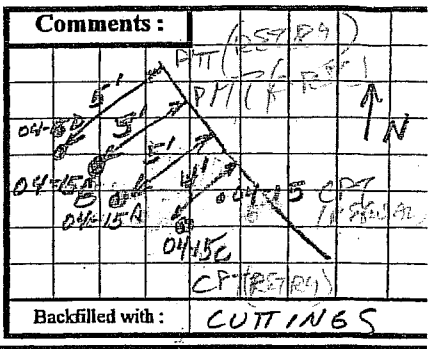
# LOG OF BORING NO. ( 04-15A )

4' behind abutment

Earth Mechanics, Inc.
Geotechnical and Geophysical Engineering

| | | | |
|---|---|---|---|
| Project Name | : UCSD BRIDGE STUDY - PAINTER ST WEST ABUTMENT #1 | | |
| Project Location | : RIO DELL, HUMBOLDT COUNTY | | |
| E.M.I. Project No. | : 02-165 | Site Condition : | PAVED |
| Weather | : FOGGY, COOL | Elevation : | 133.8 FT |
| Traffic Control | : CALTRANS | Operator : | |
| Drilling Company | : PC EXPLORATION | Operator : | FRANK |
| Type of Rig | : MOBILE B61 | Drop (in) : | |
| Borehole Diameter (inch) | : 7¼" - HSA | Drive Wt. (lbs) : | |
| Logged By | : J.C. | Date Drilled : | 7-1-04 |

Comments :




Backfilled with : CUTTINGS

| | Time | | | | | | | | | | Back to Office | Proposed Depth |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Depature | Arrival | Start | Break | Resume | Lunch | Resume | Break | Finish | Off | | ft |
| Driller | | | | | | | | | | | | Water Table |
| Traffic Control | | | | | | | | | | | | ft |
| Logger | | | | | | | | | | | | Caving |
| Total | | | | | | | | | | | | ft |

| Depth (ft) | Sampler Type (Bulk, Drive, SPT, Tube) | Sample Number | Sample Type (B/D/S/B/T) | Blows/6" | Recovery (inch) | U.S.C.S. | Description (ASTM D-2488-93) Color | Moisture State (Dry, Moist, Wet) | Max. Size | Grain Size (%) Gravel : Sand : Fines | Sand Size | Plasticity | Consistency | Cementation | O²/LEL/PID |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | B | | | | | SP | SILTY SAND W/GRAVEL, BROWN, DRY, COARSE-FINE GRAINED W/GRAVEL TO 1" DIAM. | | | | | | | | |
| 2.5 | S | 1 | | 24 27 32 | 14" | SP | SAND, DK GRAY-BLK, MOIST, V. DENSE, COARSE-FINE GRAINED SAND W/GRAVEL TO 1" DIAM | | | | | | | | |
| 5 | D | 2A | | 50/3" | Ø | — | NO RECOVERY - TRY SPT SAMPLER | | | : : | | | | | |
| | S | 2B | | 16 22 25 | 14" | SP | SAME. DENSE | | | | | | | | |
| 7.0 | B | 3A | | — | | SP | SAME. COARSE GRAINED. GRAVEL > 1" DIAM, DRY | | | | | | | | |
| 7.5 | D | 3B | | 50 16 16 | 18" | ML | (NOTE - AFTER 50 BLOWS, RIGHT AT 6", DECIDED TO CONTINUE) CLAYEY SILT, BLACK W ORANGE MOTTLING, MOIST, V. STIFF, SL. PLASTIC, ORGANICS, ROUNDED GRAVELS TO ½", TR. F. GRAND SAND | | | : : | | | | | |
| 10 | S | 4 | | 7 8 8 | 18" | ML | CLAYEY SILT, GRAY-BROWN, MOIST, V. STIFF, NO PLASTIC, TR. ORGANICS & GRAVELS TO ~⅛" DIAM | | | : : | | | | | |
| 12.5 | D | 5 | | 7 10 8 | 18" | ML | CLAYEY SILT, DK GRAY, MOIST, STIFF, SL-NO PLASTIC, ROUNDED GRAVELS TO ¼" DIAM, ORGANICS | | | : : | | | | | |
| 14 | S | 6 | | 5 7 13 | 16" | ML | SILT W/SAND, BLACK-GRAY, MOIST, V. STIFF, NO PLASTIC FINE-MED SAND, TRACE GRAVELS + ORGANICS | | | | | | | | |

BOH = 14'

1-5

# LOG OF BORING NO. ( 04-15D )

SUCCESSFUL PMT BORING

Earth Mechanics, Inc.

| | | | |
|---|---|---|---|
| Project Name | : PAINTER ST / UCSD STUDY | | |
| Project Location | : RIO DELL | | |
| E.M.I. Project No. | : 02-165 | Site Condition : | PAVED |
| Weather | : FOGGY | Elevation : | 139.81 |
| Traffic Control | : CALTRANS | Operator : | |
| Drilling Company | : PC EX PLORATION | Operator : | FRANK |
| Type of Rig | : MOBILE B61 | Drop (in) : | |
| Borehole Diameter (inch) | : 7¾" HSA | Drive Wt. (lbs) : | |
| Logged By | : J.C. | Date Drilled : | 7-1-04 |

Comments :

Backfilled with : CUTTINGS

| | Time | | | | | | | | | | Back to Office | Proposed Depth |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Depature | Arrival | Start | Break | Resume | Lunch | Resume | Break | Finish | Off | | ft |
| Driller | | | | | | | | | | | | Water Table |
| Traffic Control | | | | | | | | | | | | ft |
| Logger | | | | | | | | | | | | Caving |
| Total | | | | | | | | | | | | ft |

| Depth (ft) | Sampler Type (Bulk, Drive, SPT, Tube) | Sample Number | Sample Type (B/D/S.R./T) | Blows/6" | Recovery (inch) | U.S.C.S. | Description (ASTM D-2488-93) Color | Moisture State (Dry, Moist, Wet) | Max. Size | Grain Size (%) Gravel : Sand : Fines | Sand Size | Plasticity | Consistency | Cementation | $O^2$/LEL/PID |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | : : | | | | | |
| 2.5 | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | : : | | | | | |
| 8 | | | | | | | | | | : : | | | | | |
| 8-9.5 | | | | | | ML | CLAYEY SILT, BLACK-DK GRAY W/ BROWN-ORANGE MOTTLING, SL MOIST, STIFF-FIRM, TR. GRAVELS TO ½" FINE-MED SAND | | | | | | | | |
| 15 | | | | | | | | | | : : | | | | | |
| 20 | | | | | | | | | | : : | | | | | |
| 25 | | | | | | | | | | : : | | | | | |

1-5

# LOG OF BORING NO. ( 04-16A )

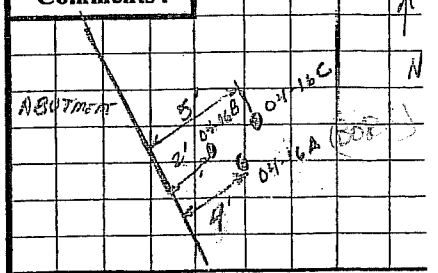
4' behind abutment

Earth Mechanics, Inc.

UCSD BRIDGE STUDY

| | | | |
|---|---|---|---|
| Project Name | : PAINTER ST - EAST ABUTMENT #3 | | |
| Project Location | : RIO DELL, HUMBOLDT COUNTY | | |
| E.M.I. Project No. | : 02-165 | Site Condition : | PAVED ASPHALT |
| Weather | : CLOUDY, COOL | Elevation : | 134.5FT |
| Traffic Control | : CALTRANS | Operator : | |
| Drilling Company | : PC EXPLORATION | Operator : | FRANK |
| Type of Rig | : MOBILE B61 - HSA | Drop (in) : | |
| Borehole Diameter (inch) | : 7 1/4 " | Drive Wt. (lbs) : | |
| Logged By | : J.C. | Date Drilled : | 7-1-04 |

**Comments :**



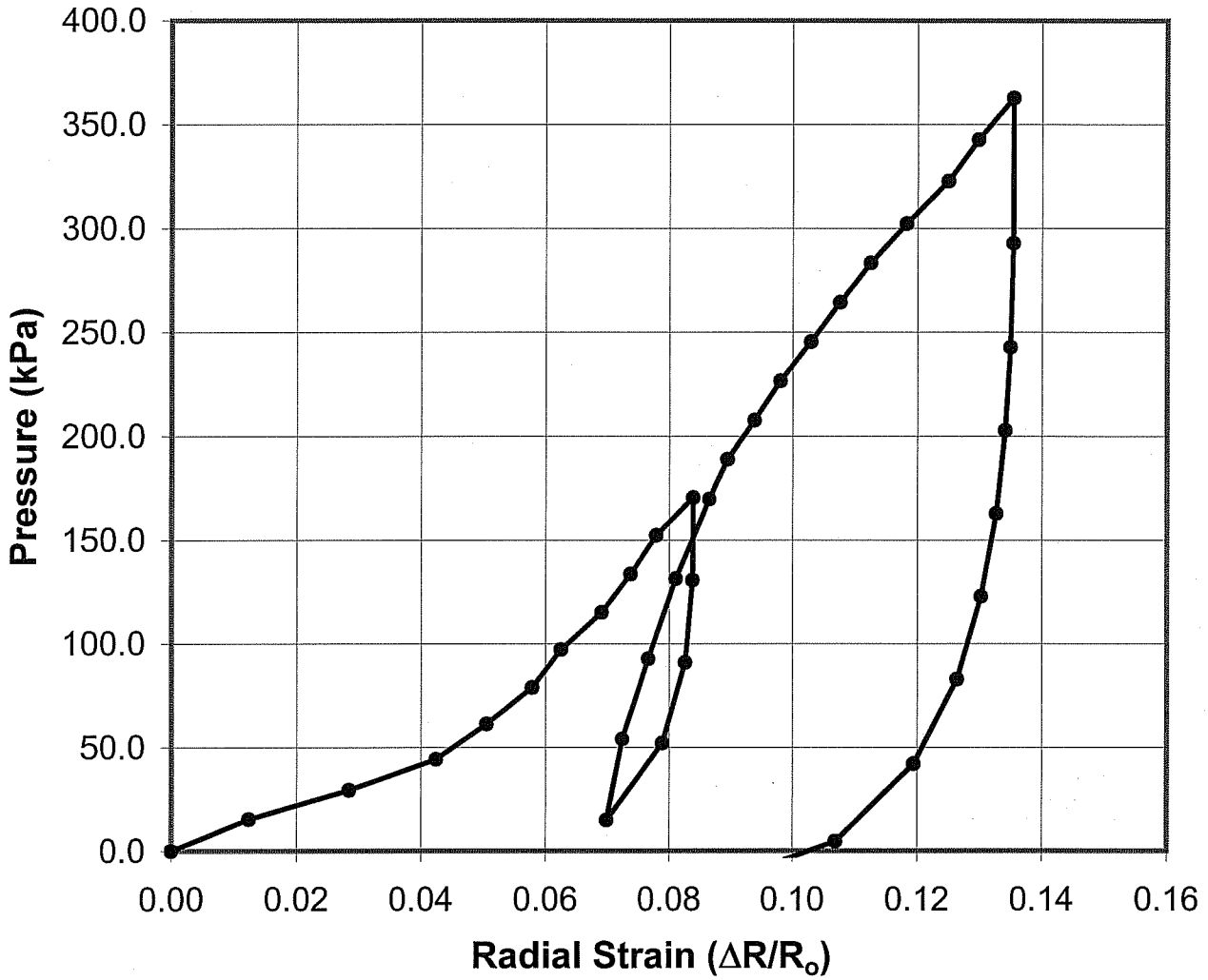

Backfilled with : CUTTINGS

| | Time | | | | | | | | | | Back to Office | Proposed Depth |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Depature | Arrival | Start | Break | Resume | Lunch | Resume | Break | Finish | Off | | 12.5 ft |
| Driller | | | | | | | | | | | | Water Table |
| Traffic Control | | | | | | | | | | | | N/A ft |
| Logger | | | | | | | | | | | | Caving |
| Total | | | | | | | | | | | | N/A ft |

| Depth (ft) | Sampler Type (Bulk, Drive, SPT, Tube) | Sample Number | Sample Type (B/D/S.B./T) | Blows/6" | Recovery (inch) | U.S.C.S. | Description (ASTM D-2488-93) Color | Moisture State (Dry, Moist, Wet) | Max. Size | Grain Size (%) Gravel : Sand : Fines | Sand Size | Plasticity | Consistency | Cementation | $O^2$/LEL/PID |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | B | Ø | | | | SP | BULK - SAND W/GRAVEL, BROWN, DRY, NO PLASTIC GRAVELS > 1/2" DIAM | | | | | | | | |
| 2.5 | S | 1 | | 19 30 33 | 16" | SP | SAND W/ GRAVEL, GRAY-BROWN, DENSE, DRY, NO PLASTIC, GRAVELS 1/2"-1/4" DIAM | | | | | | | | |
| 5 | D | 2 | | 19 40 50 | 18" | SP | SAME | | | : : | | | | | |
| 7.5 ~~10~~ | S | 3A 3B | | 3 4 7 | 17" | CL 13" | SILTY CLAY, OLIVE-GRAY, FIRM, SL. MOIST, SL. PLASTICITY COARSE SAND & GRAVELS TO 1/8" DIAM | | | | | | | | |
| | | | | | | 4" SP | SAND W/GRAVEL, GRAY-BROWN, SL MOIST, GRAVELS TO 1/8" DIAM LOOSE | | | | | | | | |
| 10 ~~15~~ | D | 4 | | 5 7 12 | 18" | CL | CLAY W/SILT-BLACK/OLIVE/GRAY MOTTLING, V. STIFF, MOIST, PLASTIC, ORGANICS (ROOTS) PRESENT, | | | : : | | | | | |
| 12.5 ~~20~~ | S | 5 | | 5 7 12 | 17 | CL | SILTY CLAY, OLIVE-BROWN, MOIST, V. STIFF, SL. PLASTIC, TR. FINE-GRAINED SAND, MOTTLED W/ BROWN-ORANGE & GRAY. | | | : : | | | | | |
| 25 | | | | | | | | | | : : | | | | | |

BOH = 12.5'

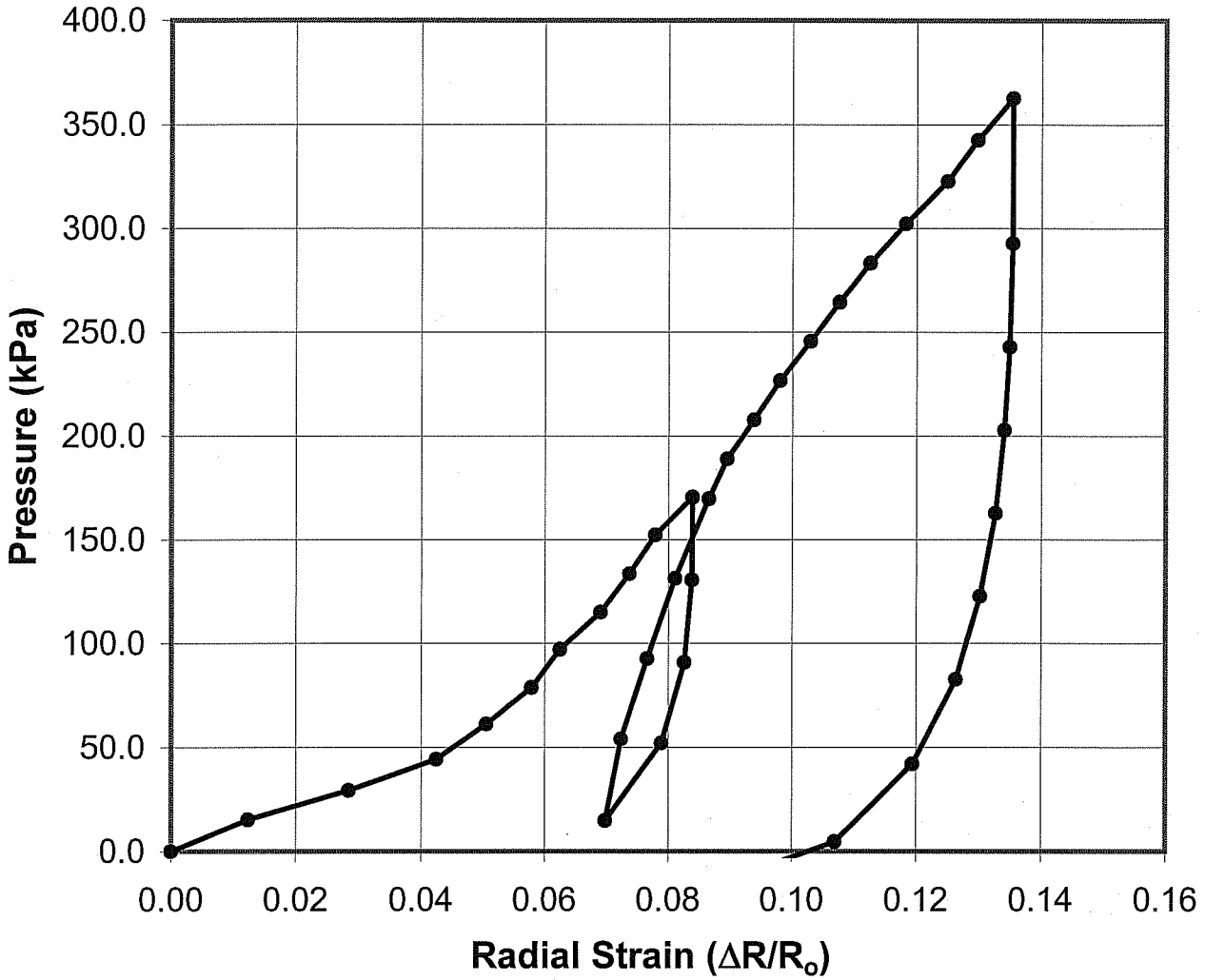
# Pressuremeter Test Result




| | |
|---|---|
| Boring No.: | **04-15P** |
| Location: | **Painter St. Abut#1** |
| | **Humboldt County** |
| Test Date: | **7/1/04** |
| Test Depth: | **8 ft** |
| Soil Type: | **Poorly Graded Sand with Clay** |

| | | |
|---|---|---|
| Earth Mechanics, Inc.<br>Geotechnical and Earthquake Engineering | **CALTRANS-UCSD / Abutment Research** | |
| | Project No : 02-165 | Date : 12/22/2004 |

# Pressuremeter Test Result




| | |
|---|---|
| Boring No.: | **04-16P** |
| Location: | **Painter St. Abut#3** |
| | **Humboldt County** |
| Test Date: | **7/1/04** |
| Test Depth: | **12.5 ft** |
| Soil Type: | **Sandy Clay** |

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

**CALTRANS-UCSD / Abutment Research**

Project No : 02-165 | Date : 12/22/2004

GREGG DRILLING AND TESTING, INC.
GREGG IN SITU, INC.
ENVIRONMENTAL AND GEOTECHNICAL INVESTIGATION SERVICES

July 14, 2004

Earth Mechanics
Attn: Jody Castle
7700 Edgewater Drive #846
Oakland, California 94621

Subject: CPT Site Investigation
Painter Street Bridge
Rio Dell, California
GREGG Project Number: 04-226ma

Dear Jody:

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

| | | | |
|---|---|---|---|
| 1 | Cone Penetration Tests | (CPTU) | x |
| 2 | Pore Pressure Dissipation Tests | (PPD) | ☐ |
| 3 | Seismic Cone Penetration Tests | (SCPTU) | x |
| 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 (562) 427-6899.

Sincerely,
GREGG IN SITU, Inc.

Mary Walden
Operations Manager

950 Howe Road • Martinez, California 94553 • (925) 313-5800 • FAX (925) 313-0302
OTHER OFFICES: SUMMERVILLE • LOS ANGELES • SALT LAKE CITY • HOUSTON • VANCOUVER • WEST BERLIN (NJ) • AUGUSTA
www.greggdrilling.com

# Bibliography

Campanella, R.G. and I. Weemees, "Development and Use of An Electrical Resistivity Cone for Groundwater Contamination Studies", Canadian Geotechnical Journal, Vol. 27 No. 5, 1990 pp. 557-567.

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Robertson, P.K., R.G. Campanella, D. Gillespie and A. Rice, "Seismic CPT to Measure In-Situ Shear Wave Velocity", Journal of Geotechnical Engineering ASCE, Vol. 112, No. 8, 1986
pp. 791-803.

Robertson, P.K., T. Lunne and J.J.M. Powell, "Geo-Environmental Application of Penetration Testing", Geotechnical Site Characterization, Robertson & Mayne (editors), 1998 Balkema, Rotterdam, ISBN 90 5410 939 4 pp 35-47.

Roberston, P.K., "Soil Classification using the Cone Penetration Test", Canadian Geotechnical Journal, Vol. 27, 1990 pp. 151-158.

Woeller, D.J., P.K. Robertson, T.J. Boyd and Dave Thomas, "Detection of Polyaromatic Hydrocarbon Contaminants Using the UVIF-CPT", 53rd Canadian Geotechnical Conference Montreal, QC October pp. 733-739, 2000.

Zemo, D.A., T.A. Delfino, J.D. Gallinatti, V.A. Baker and L.R. Hilpert, "Field Comparison of Analytical Results from Discrete-Depth Groundwater Samplers" BAT EnviroProbe and QED HydroPunch, Sixth national Outdoor Action Conference, Las Vegas, Nevada Proceedings, 1992, pp 299-312.

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

# APPENDIX CPT

# 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 dynamic 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 (2002) 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 dynamic 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.

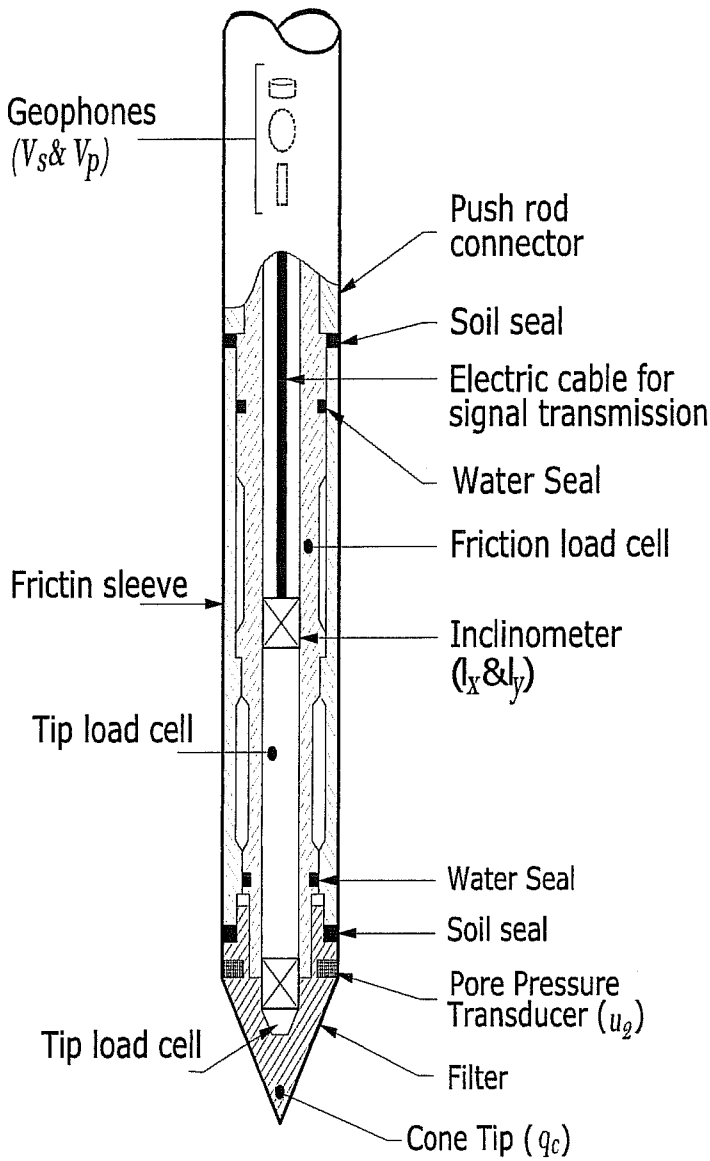



*Figure CPT*

When the soundings are complete, the test holes are grouted using a Gregg In Situ support rig. The grouting procedure consists 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 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 $100f_s/q_c$ 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 ($u_2$)

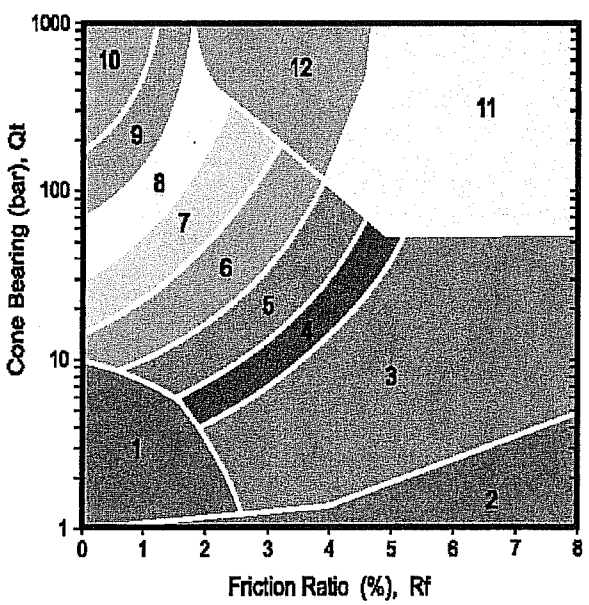
Cohesionless soils (sands)

- 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 et al, 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 greained |
| 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*

**Gregg In Situ CPT Interpretations as of January 7, 1999 (Release 1.00.19)**

Gregg In Situ's interpretation routine should be considered a calculator of current published CPT correlations and is subject to change to reflect the current state of practice. The interpreted values are not considered valid for all soil types. The interpretations are presented only as a guide for geotechnical use and should be carefully scrutinized for consideration in any geotechnical design. Reference to current literature is strongly recommended.

The CPT interpretations are based on values of tip, sleeve friction and pore pressure averaged over a user specified interval (typically 0.25m). Note that Qt is the recorded tip value, Qc, corrected for pore pressure effects. Since all Gregg In Situ cones have equal end area friction sleeves, pore pressure corrections to sleeve friction, Fs, are not required.

The tip correction is: $Qt = Qc + (1-a) \bullet Ud$

where: *Qt* is the corrected tip load
*Qc* is the recorded tip load
*Ud* is the recorded dynamic pore pressure
*a* is the Net Area Ratio for the cone (typically 0.85 for Gregg In Situ cones)

Effective vertical overburden stresses are calculated based on a hydrostatic distribution of equilibrium pore pressures below the water table or from a user defined equilibrium pore pressure profile (this can be obtained from CPT dissipation tests). The stress calculations use unit weights assigned to the Soil Behavior Type zones or from a user defined unit weight profile.

Details regarding the interpretation methods for all of the interpreted parameters is given in table 1. The appropriate references referred to in table 1 are listed in table 2.

The estimated Soil Behavior Type is based on the charts developed by Robertson and Campanella shown in figure 1.

**Table 1 CPT Interpretation Methods**

| Interpreted Parameter | Description | Equation | Ref |
|---|---|---|---|
| Depth | mid layer depth | | |
| AvgQt | Averaged corrected tip (Qt) | $AvgQt = \frac{1}{n}\sum_{i=1}^{n} Qt_i$ | |
| AvgFs | Averaged sleeve friction (Fs) | $AvgFs = \frac{1}{n}\sum_{i=1}^{n} Fs_i$ | |
| AvgRf | Averaged friction ratio (Rf) | $AvgRf = 100\% \bullet \frac{AvgFs}{AvgQt}$ | |
| AvgUd | Averaged dynamic pore pressure (Ud) | $AvgUd = \frac{1}{n}\sum_{i=1}^{n} Ud_i$ | |
| SBT | Soil Behavior Type as defined by Robertson and Campanella | | 1 |

| | | | |
|---|---|---|---|
| U.Wt. | Unit Weight of soil determined from:<br>1) uniform value or<br>2) value assigned to each SBT zone<br>3) user supplied unit weight profile | | |
| TStress | Total vertical overburden stress at mid layer depth | $TStress = \sum_{i=1}^{n} \gamma_i h_i$<br>where $\gamma_i$ is layer unit weight<br>$h_i$ is layer thickness | |
| EStress | Effective vertical overburden stress at mid layer depth | $EStress = TStress - Ueq$ | |
| Ueq | Equilibrium pore pressure determined from:<br>1) hydrostatic from water table depth<br>2) user supplied profile | | |
| Cn | SPT $N_{60}$ overburden correction factor | $Cn=(\sigma_v')^{-0.5}$<br>where $\sigma_v'$ *is in tsf*<br>$0.5 < C_n < 2.0$ | |
| $N_{60}$ | SPT N value at 60% energy calculated from Qt/N ratios assigned to each SBT zone | | 3 |
| $(N1)_{60}$ | SPT $N_{60}$ value corrected for overburden pressure | $N1_{60} = Cn \bullet N_{60}$ | 3 |
| $\Delta(N1)_{60}$ | Equivalent Clean Sand Correction to $(N1)_{60}$ | $\Delta(N1)_{60} = \frac{K_{SPT}}{1 - K_{SPT}} \bullet (N1)_{60}$<br>Where: $K_{SPT}$ is defined as:<br>0.0 for FC < 5%<br>0.0167 • (FC - 5) for 5% < FC < 35%<br>0.5 for FC > 35%<br>FC - Fines Content in % | 7 |
| $(N1)_{60cs}$ | Equivalent Clean Sand $(N1)_{60}$ | $(N1)_{60cs} = (N1)_{60} + \Delta(N1)_{60}$ | 7 |
| Su | Undrained shear strength - Nkt is use selectable | $Su = \frac{Qt - \sigma_v}{N_{kt}}$ | 2 |
| k | Coefficient of permeability (assigned to each SBT zone) | | 6 |
| Bq | Pore pressure parameter | $Bq = \frac{\Delta u}{Qt - \sigma_v}$ | 2 |
| Qtn | Normalized Qt for Soil Behavior Type classification as defined by Robertson, 1990 | $Qtn = \frac{Qt - \sigma_v}{\sigma'_v}$ | 4 |
| Rfn | Normalized Rf for Soil Behavior Type classification as defined by Robertson, 1990 | $Rfn = 100\% \bullet \frac{f_s}{Qt - \sigma_v}$ | 4 |
| SBTn | Normalized Soil Behavior Type (slightly modified from that published by Robertson, 1990. This version includes all the soil zones of the original non-normalized SBT chart - see figure 1) | | 4 |
| Qc1 | Normalized Qt for seismic analysis | $qc1 = qc \bullet (Pa/\sigma_v')^{0.5}$<br>where: Pa = atm. pressure | 5 |
| Qc1N | Dimensionless Normalized Qt1 | qc1N = qc1 / Pa<br>where: Pa = atm. pressure | |

| | | | |
|---|---|---|---|
| ΔQc1N1 | Equivalent clean sand correction | $\Delta qc1N = \frac{K_{CPT}}{1 - K_{CPT}} \bullet qc1N$<br><br>Where: $K_{CPT}$ is defined as:<br><br>0.0 for FC < 5%<br>0.0267 • (FC - 5) for 5% < FC < 35%<br>0.5 for FC > 35%<br><br>FC - Fines Content in % | 5 |
| Qc1Ncs | Clean Sand equivalent Qc1N | $qc1Ncs = qc1N + \Delta qc1N$ | 5 |
| Ic | Soil index for estimating grain characteristics | $Ic = [(3.47 - \log Q)^2 + (\log F + 1.22)^2]^{0.5}$ | 5 |
| FC | Fines content (%) | $FC=1.75(Ic^{3.25}) - 3.7$<br>$FC=100$ for $Ic > 3.5$<br>$FC=0$ for $Ic < 1.26$<br>$FC = 5\%$ if $1.64 < Ic < 2.6$ AND $Rfn<0.5$ | 8 |
| PHI | Friction Angle | Campanella and Robertson<br>Durunoglu and Mitchel<br>Janbu | 1 |
| Dr | Relative Density | Ticino Sand<br>Hokksund Sand<br>Schmertmann 1976<br>Jamiolkowski - All Sands | 1 |
| OCR | Over Consolidation Ratio | | 1 |
| State Parameter | | | 9 |
| CRR | Cyclic Resistance Ratio | | 7 |

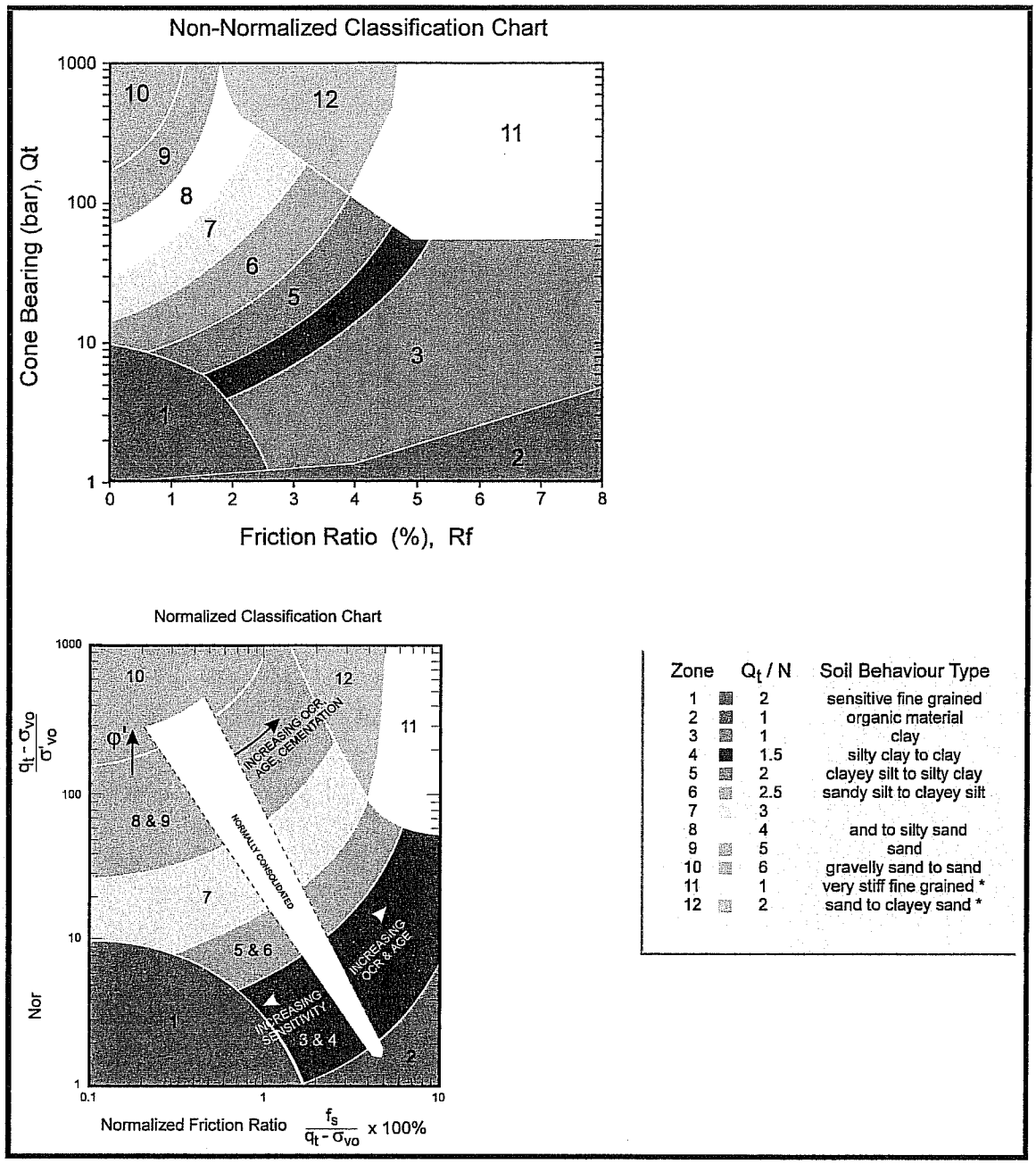



Figure 1 Non-Normalized and Normalized Soil Behavior Type Classification Charts

**Table 2 References**

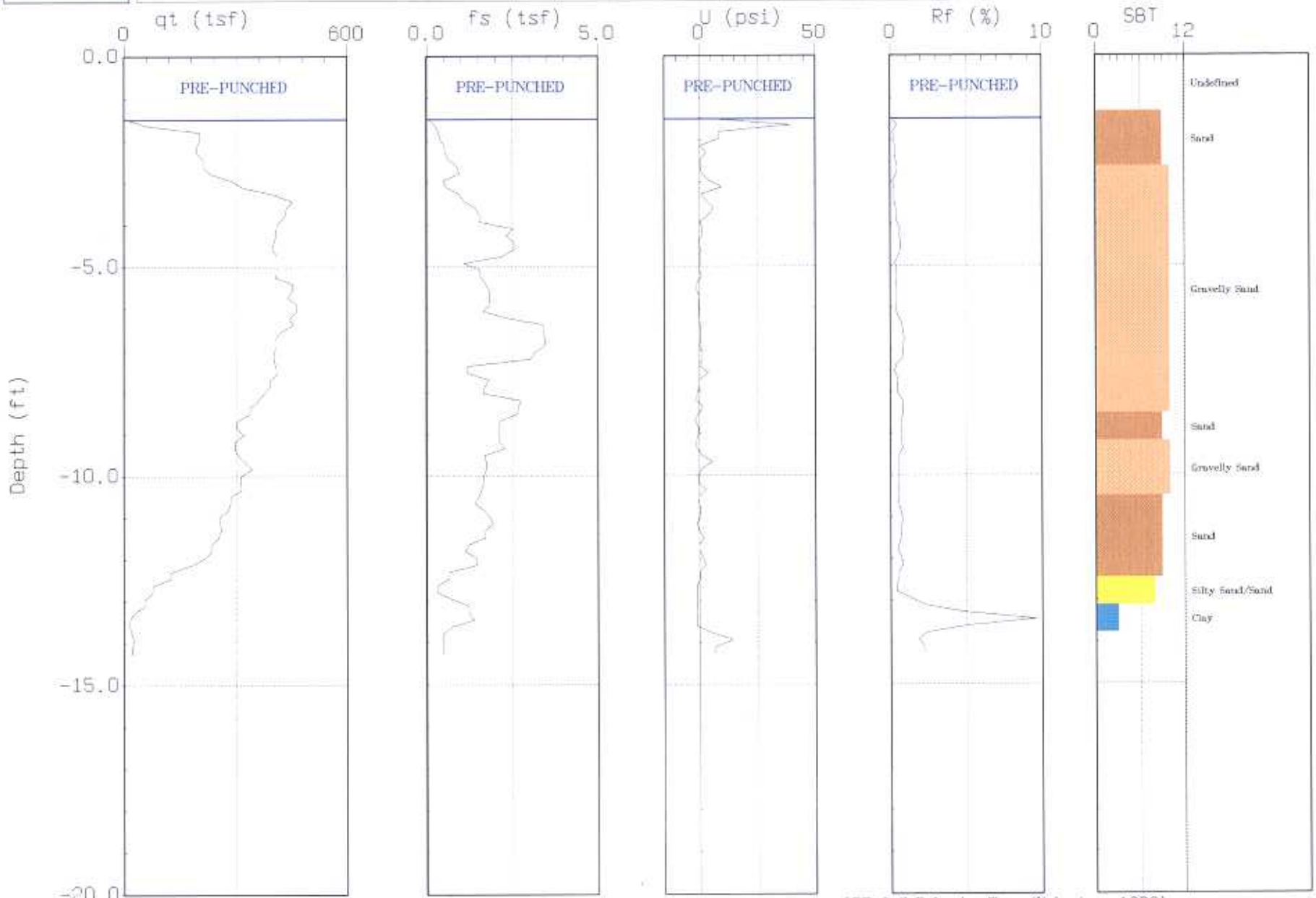

| No. | Reference |
|---|---|
| 1 | Robertson, P.K. and Campanella, R.G., 1986, "Guidelines for Use, Interpretation and Application of the CPT and CPTU", UBC, Soil Mechanics Series No. 105, Civil Eng. Dept., Vancouver, B.C., Canada |
| 2 | Robertson, P.K., Campanella, R.G., Gillespie, D. and Greig, J., 1986, "Use of Piezometer Cone Data", Proceedings of InSitu 86, ASCE Specialty Conference, Blacksburg, Virginia. |
| 3 | Robertson, P.K. and Campanella, R.G., 1989, "Guidelines for Geotechnical Design Using CPT and CPTU", UBC, Soil Mechanics Series No. 120, Civil Eng. Dept., Vancouver, B.C., Canada |
| 4 | Robertson, P.K., 1990, "Soil Classification Using the Cone Penetration Test", Canadian Geotechnical Journal, Volume 27. |
| 5 | Robertson, P.K. and Fear, C.E., 1995, "Liquefaction of Sands and its Evaluation", Keynote Lecture, First International Conference on Earthquake Geotechnical Engineering, Tokyo, Japan. |
| 6 | Gregg In Situ Internal Report |
| 7 | Robertson, P.K. and Wride, C.E., 1997, "Cyclic Liquefaction and its Evaluation Based on SPT and CPT", NCEER Workshop Paper, January 22, 1997 |
| 8 | Wride, C.E. and Robertson, P.K., 1997, "Phase II Data Review Report (Massey and Kidd Sites, Fraser River Delta)", Volume 1 - Data Report (June 1997), University of Alberta. |
| 9 | Plewes, H.D., Davies, M.P. and Jefferies, M.G., 1992, "CPT Based Screening Procedure for Evaluating Liquefaction Susceptibility", 45th Canadian Geotechnical Conference, Toronto, Ontario, October 1992. |

GREGG

# EARTH MECHANICS

Site: PAINTER ST. BR.
Location: CPT-04-15C

Engineer: J. CASTLE
Date: 06:30:04 14:34




Max. Depth: 14.27 (ft)
Depth Inc.: 0.164 (ft)

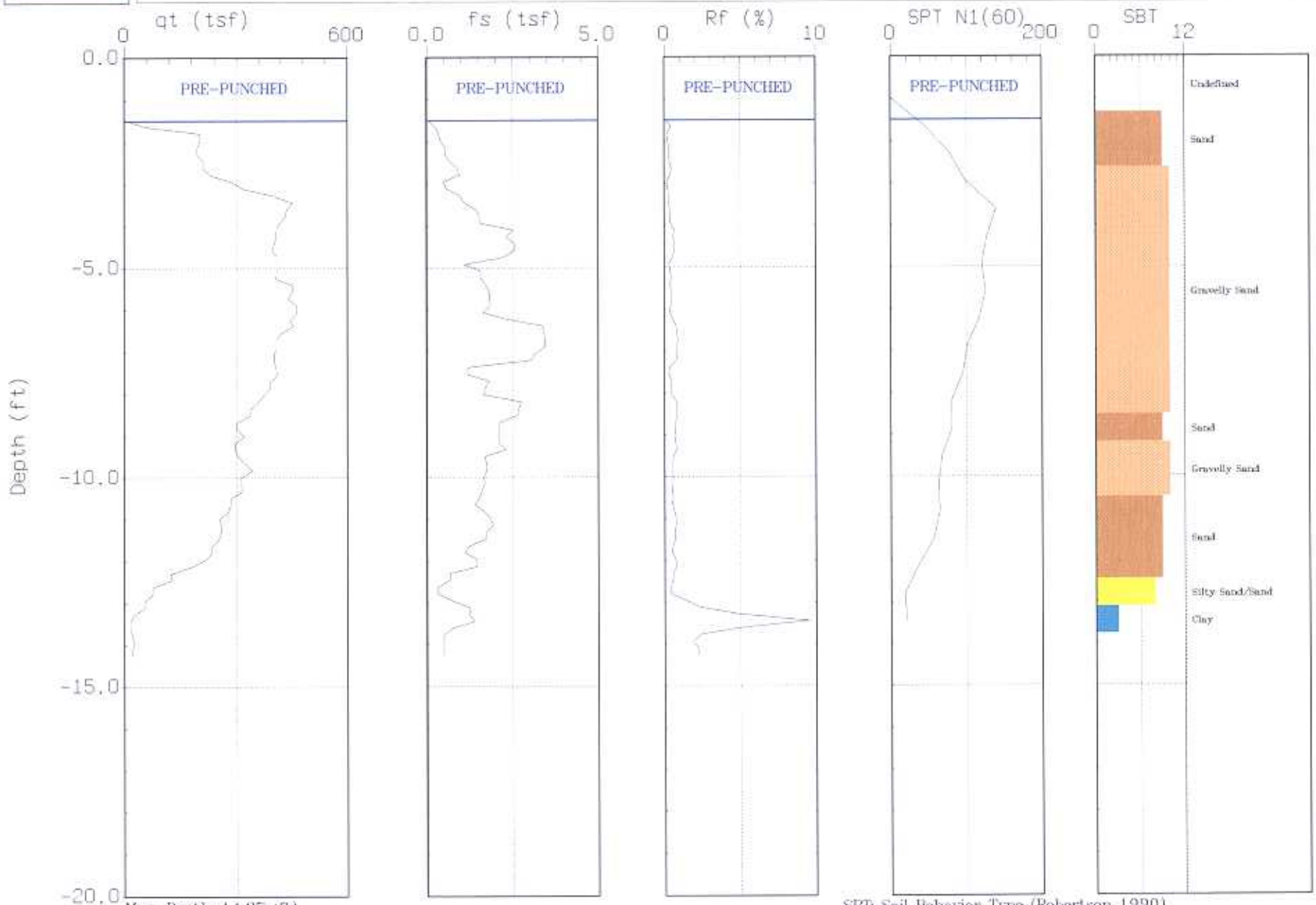
SBT: Soil Behavior Type (Robertson 1990)

GREGG

# EARTH MECHANICS

Site: PAINTER ST. BR.
Location: CPT-04-15C

Engineer: J. CASTLE
Date: 06:30:04 14:34




Max. Depth: 14.27 (ft)
Depth Inc.: 0.164 (ft)

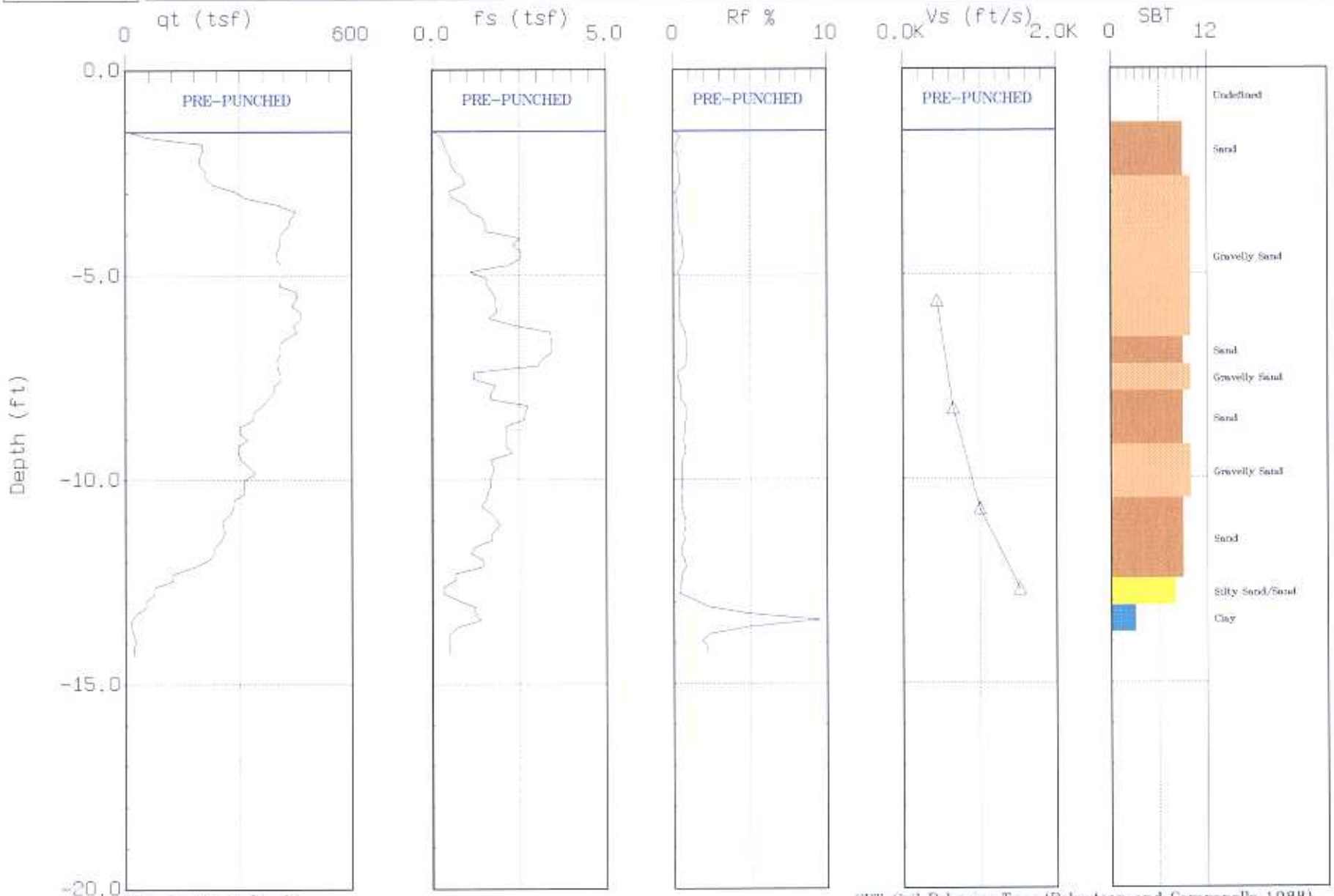
SBT: Soil Behavior Type (Robertson 1990)

GREGG

# EARTH MECHANICS

Site: PAINTER ST. BR.
Location: CPT-04-15C

Engineer: J. CASTLE
Date: 06:30:04 14:34




Max. Depth: 14.27 (ft)

Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson and Campanella 1988)

Gregg In Situ, Inc.
Interpretation Output - Release 1.00.19e
Run No: 04-0714-0947-2272
Job No: 04-226MA
Client: EARTH MECHANICS
Project: CPT SITE INVESTIGATION
Site: PAINTER ST. BR.
Location: CPT-04-15C
Engineer: J. CASTLE
CPT Date: 04/30/06
CPT Time: 14:34
CPT File: 226SC15C.COR
Northing (m): 0.000
Easting (m): 0.000
Elevation (m): 0.000

Water Table (m): 7.62 (ft): 25.0
Su Nkt used: 12.50
Averaging Increment (m): 0.15
Phi Method : Robertson and Campanella, 1983
Dr Method : Jamiolkowski - All Sands
State Parameter M: 1.20
Used Unit Weights Assigned to Soil Zones
Values of 1.0E9 or UnDef are printed for parameters that are not valid for the material type (SBT)

| Depth (ft) | AvgQt (tsf) | AvgFs (tsf) | AvgRf (%) | AvgUd (ft) | SBT | U.Wt. pcf | TStress (tsf) | EStress (tsf) | Ueq (tsf) | Cn | N60 (blows/ft) | (N1)60 | Su (tsf) | CRR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.25 | 0.0 | 0.00 | 0.00 | 0.0 | UnDef | 124.1 | 0.02 | 0.02 | 0.00 | 2.00 | UnDef | UnDef | UnDef | 0.00 |
| 0.74 | 0.0 | 0.00 | 0.00 | 0.0 | UnDef | 124.1 | 0.05 | 0.05 | 0.00 | 2.00 | UnDef | UnDef | UnDef | 0.00 |
| 1.23 | 0.0 | 0.00 | 0.00 | 0.0 | UnDef | 124.1 | 0.08 | 0.08 | 0.00 | 2.00 | UnDef | UnDef | UnDef | 0.00 |
| 1.72 | 154.7 | 0.32 | 0.21 | 43.0 | 9 | 124.1 | 0.11 | 0.11 | 0.00 | 2.00 | 29.6 | 59.2 | UnDef | 0.00 |
| 2.21 | 200.2 | 0.55 | 0.28 | 3.2 | 9 | 124.1 | 0.14 | 0.14 | 0.00 | 2.00 | 38.3 | 76.7 | UnDef | 0.00 |
| 2.71 | 243.3 | 0.76 | 0.31 | 4.5 | 10 | 127.3 | 0.17 | 0.17 | 0.00 | 2.00 | 38.8 | 77.7 | UnDef | 0.00 |
| 3.20 | 391.0 | 0.86 | 0.22 | 10.5 | 10 | 127.3 | 0.20 | 0.20 | 0.00 | 2.00 | 62.4 | 124.8 | UnDef | 0.00 |
| 3.61 | 436.5 | 1.47 | 0.34 | 11.8 | 10 | 127.3 | 0.23 | 0.23 | 0.00 | 2.00 | 69.7 | 139.3 | UnDef | 0.00 |
| 4.02 | 410.6 | 2.11 | 0.51 | 2.2 | 10 | 127.3 | 0.25 | 0.25 | 0.00 | 1.99 | 65.5 | 130.6 | UnDef | 0.00 |
| 4.51 | 402.9 | 2.44 | 0.60 | 0.4 | 10 | 127.3 | 0.28 | 0.28 | 0.00 | 1.88 | 64.3 | 120.8 | UnDef | 0.00 |
| 5.00 | 409.5 | 1.40 | 0.34 | 0.9 | 10 | 127.3 | 0.31 | 0.31 | 0.00 | 1.78 | 65.4 | 116.6 | UnDef | 0.00 |
| 5.50 | 450.0 | 1.78 | 0.39 | -1.5 | 10 | 127.3 | 0.35 | 0.35 | 0.00 | 1.70 | 71.8 | 122.1 | UnDef | 0.00 |
| 5.99 | 458.4 | 1.94 | 0.42 | -0.7 | 10 | 127.3 | 0.38 | 0.38 | 0.00 | 1.63 | 73.2 | 119.1 | UnDef | 0.00 |
| 6.56 | 424.0 | 3.42 | 0.81 | 0.9 | 9 | 124.1 | 0.41 | 0.41 | 0.00 | 1.56 | 81.2 | 126.3 | UnDef | 0.00 |

Gregg In Situ, Inc.
Run No: 04-0714-0947-2272
CPT File: 226SC15C.COR

04-15c



| Depth (ft) | AvgQt (tsf) | AvgFs (tsf) | AvgRf (%) | AvgUd (ft) | SBT | U.Wt. pcf | TStress (tsf) | EStress (tsf) | Ueq (tsf) | Cn | N60 (blows/ft) | (N1)60 | Su (tsf) | CRR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7.14 | 402.4 | 2.46 | 0.61 | 1.9 | 10 | 127.3 | 0.45 | 0.45 | 0.00 | 1.49 | 64.2 | 95.8 | UnDef | 0.00 |
| 7.63 | 398.0 | 1.56 | 0.39 | 3.0 | 10 | 127.3 | 0.48 | 0.48 | 0.00 | 1.44 | 63.5 | 91.6 | UnDef | 0.00 |
| 8.12 | 356.5 | 2.36 | 0.66 | -0.6 | 10 | 127.3 | 0.51 | 0.51 | 0.00 | 1.40 | 56.9 | 79.5 | UnDef | 0.00 |
| 8.61 | 313.1 | 2.29 | 0.73 | -2.1 | 9 | 124.1 | 0.54 | 0.54 | 0.00 | 1.36 | 60.0 | 81.4 | UnDef | 0.00 |
| 9.10 | 304.2 | 2.17 | 0.71 | -2.6 | 9 | 124.1 | 0.57 | 0.57 | 0.00 | 1.32 | 58.3 | 76.9 | UnDef | 0.00 |
| 9.60 | 324.1 | 1.72 | 0.53 | 5.7 | 10 | 127.3 | 0.60 | 0.60 | 0.00 | 1.29 | 51.7 | 66.6 | UnDef | 0.00 |
| 10.09 | 313.0 | 1.63 | 0.52 | 1.1 | 10 | 127.3 | 0.64 | 0.64 | 0.00 | 1.25 | 50.0 | 62.7 | UnDef | 0.00 |
| 10.58 | 282.4 | 1.53 | 0.54 | 0.3 | 10 | 127.3 | 0.67 | 0.67 | 0.00 | 1.22 | 45.1 | 55.2 | UnDef | 0.00 |
| 11.07 | 256.9 | 1.82 | 0.71 | -1.1 | 9 | 124.1 | 0.70 | 0.70 | 0.00 | 1.20 | 49.2 | 58.9 | UnDef | 0.00 |
| 11.56 | 238.9 | 1.34 | 0.56 | 1.5 | 9 | 124.1 | 0.73 | 0.73 | 0.00 | 1.17 | 45.8 | 53.6 | UnDef | 0.00 |
| 12.06 | 173.1 | 1.18 | 0.68 | 3.4 | 9 | 124.1 | 0.76 | 0.76 | 0.00 | 1.15 | 33.2 | 38.1 | UnDef | 0.00 |
| 12.55 | 92.0 | 0.41 | 0.45 | -1.3 | 8 | 120.9 | 0.79 | 0.79 | 0.00 | 1.13 | 22.0 | 24.8 | UnDef | 0.18 |
| 13.04 | 44.0 | 1.05 | 2.40 | -2.5 | 6 | 114.6 | 0.82 | 0.82 | 0.00 | 1.11 | 16.8 | 18.6 | 3.45 | 0.19 |
| 13.53 | 16.3 | 0.86 | 5.28 | 2.3 | 3 | 111.4 | 0.85 | 0.85 | 0.00 | 1.09 | 15.6 | 16.9 | 1.23 | 0.00 |

Gregg In Situ, Inc.
Interpretation Output - Release 1.00.19e
Run No: 04-0714-0947-2272
Job No: 04-226MA
Client: EARTH MECHANICS
Project: CPT SITE INVESTIGATION
Site: PAINTER ST. BR.
Location: CPT-04-15C
Engineer: J. CASTLE
CPT Date: 04/30/06
CPT Time: 14:34
CPT File: 226SC15C.COR
Northing (m): 0.000
Easting (m): 0.000
Elevation (m): 0.000

Water Table (m): 7.62 (ft): 25.0
Su Nkt used: 12.50
Averaging Increment (m): 0.15
Phi Method : Robertson and Campanella, 1983
Dr Method : Jamiolkowski - All Sands
State Parameter M: 1.20
Used Unit Weights Assigned to Soil Zones
Values of 1.0E9 or UnDef are printed for parameters that are not valid for the material type (SBT)

| Depth (ft) | k (cm/s) | Bq | Qtn | Rfn | Qc1N | DeltaQc1N | Qc1Ncs | Fc (%) | Phi (Deg) | Dr (%) | OCR | State Param | Del(n1)60 | (N1)60cs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.25 | 1.0E-15 | 0.00 | 5.8 | 0.10 | 0.2 | UnDef | UnDef | 100.0 | UnDef | UnDef | 1.0 | UnDef | UnDef | UnDef |
| 0.74 | 1.0E-15 | 0.00 | 1.3 | 0.10 | 0.2 | UnDef | UnDef | 100.0 | UnDef | UnDef | 1.0 | UnDef | UnDef | UnDef |
| 1.23 | 1.0E-15 | 0.00 | 0.4 | 0.10 | 0.2 | UnDef | UnDef | 100.0 | UnDef | UnDef | 1.0 | UnDef | UnDef | UnDef |
| 1.72 | 5.0E-02 | 0.01 | 1000.0 | 0.21 | 296.2 | 0.0 | 296.2 | 0.0 | 50 | 95.0 | 1.0 | -0.25 | 0.0 | 59.2 |
| 2.21 | 5.0E-02 | 0.00 | 1000.0 | 0.28 | 383.4 | 0.0 | 383.4 | 0.0 | 50 | 95.0 | 1.0 | -0.28 | 0.0 | 76.7 |
| 2.71 | 5.0E+00 | 0.00 | 1000.0 | 0.31 | 466.1 | 0.0 | 466.1 | 0.0 | 50 | 95.0 | 1.0 | -0.29 | 0.0 | 77.7 |
| 3.20 | 5.0E+00 | 0.00 | 1000.0 | 0.22 | 748.9 | 0.0 | 748.9 | 0.0 | 50 | 95.0 | 1.0 | -0.26 | 0.0 | 124.8 |
| 3.61 | 5.0E+00 | 0.00 | 1000.0 | 0.34 | 836.0 | 0.0 | 836.0 | 0.0 | 50 | 95.0 | 1.0 | -0.30 | 0.0 | 139.3 |
| 4.02 | 5.0E+00 | 0.00 | 1000.0 | 0.52 | 786.3 | 0.0 | 786.3 | 0.0 | 50 | 95.0 | 1.0 | -0.33 | 0.0 | 130.6 |
| 4.51 | 5.0E+00 | 0.00 | 1000.0 | 0.61 | 740.8 | 0.0 | 740.8 | 0.0 | 50 | 95.0 | 1.0 | -0.35 | 0.0 | 120.8 |
| 5.00 | 5.0E+00 | 0.00 | 1000.0 | 0.34 | 714.5 | 0.0 | 714.5 | 0.0 | 50 | 95.0 | 1.0 | -0.30 | 0.0 | 116.6 |
| 5.50 | 5.0E+00 | 0.00 | 1000.0 | 0.40 | 748.7 | 0.0 | 748.7 | 0.0 | 50 | 95.0 | 1.0 | -0.31 | 0.0 | 122.1 |
| 5.99 | 5.0E+00 | 0.00 | 1000.0 | 0.42 | 730.4 | 0.0 | 730.4 | 0.0 | 50 | 95.0 | 1.0 | -0.32 | 0.0 | 119.1 |
| 6.56 | 5.0E-02 | 0.00 | 1000.0 | 0.81 | 645.5 | 0.0 | 645.5 | 0.0 | 50 | 95.0 | 1.0 | -0.38 | 0.0 | 126.3 |

Gregg In Situ, Inc.
Run No: 04-0714-0947-2272
CPT File: 226SC15C.COR

04-15c



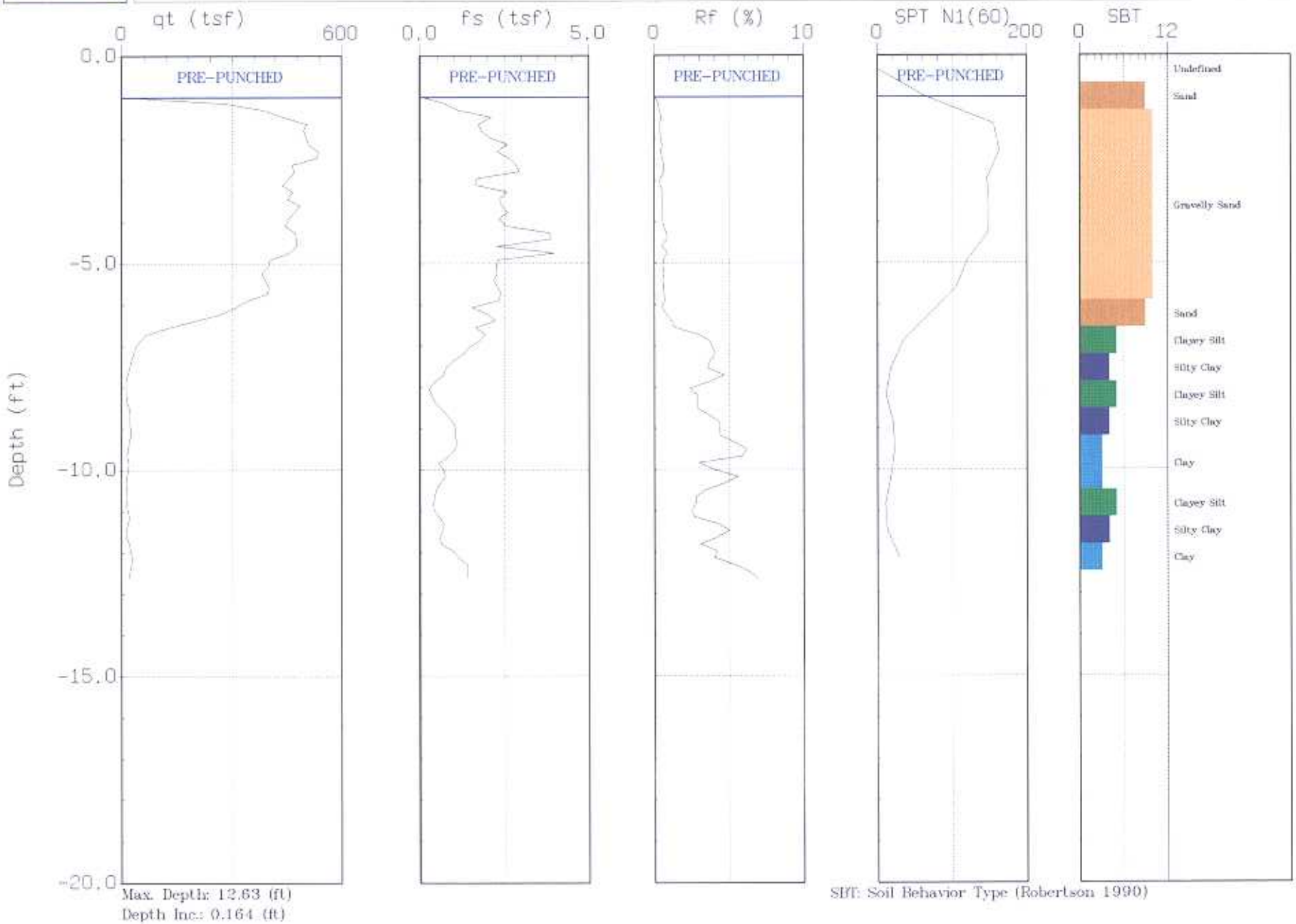
| Depth (ft) | k (cm/s) | Bq | Qtn | Rfn | Qc1N | DeltaQc1N | Qc1Ncs | Fc (%) | Phi (Deg) | Dr (%) | OCR | State Param | Del(n1)60 | (N1)60cs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7.14 | 5.0E+00 | 0.00 | 894.7 | 0.61 | 587.5 | 0.0 | 587.5 | 0.0 | 50 | 95.0 | 1.0 | -0.34 | 0.0 | 95.8 |
| 7.63 | 5.0E+00 | 0.00 | 827.2 | 0.39 | 561.9 | 0.0 | 561.9 | 0.0 | 50 | 95.0 | 1.0 | -0.29 | 0.0 | 91.6 |
| 8.12 | 5.0E+00 | 0.00 | 695.4 | 0.66 | 487.6 | 0.0 | 487.6 | 0.0 | 50 | 95.0 | 1.0 | -0.33 | 0.0 | 79.5 |
| 8.61 | 5.0E-02 | 0.00 | 575.8 | 0.73 | 415.9 | 0.0 | 415.9 | 0.4 | 50 | 95.0 | 1.0 | -0.32 | 0.0 | 81.4 |
| 9.10 | 5.0E-02 | 0.00 | 529.5 | 0.71 | 393.1 | 0.0 | 393.1 | 0.5 | 48 | 95.0 | 1.0 | -0.31 | 0.0 | 76.9 |
| 9.60 | 5.0E+00 | 0.00 | 535.4 | 0.53 | 408.0 | 0.0 | 408.0 | 0.0 | 50 | 95.0 | 1.0 | -0.28 | 0.0 | 66.6 |
| 10.09 | 5.0E+00 | 0.00 | 491.4 | 0.52 | 384.2 | 0.0 | 384.2 | 0.0 | 48 | 95.0 | 1.0 | -0.27 | 0.0 | 62.7 |
| 10.58 | 5.0E+00 | 0.00 | 422.4 | 0.54 | 338.4 | 0.0 | 338.4 | 0.2 | 48 | 95.0 | 1.0 | -0.26 | 0.0 | 55.2 |
| 11.07 | 5.0E-02 | 0.00 | 367.1 | 0.71 | 300.9 | 0.0 | 300.9 | 1.6 | 48 | 95.0 | 1.0 | -0.28 | 0.0 | 58.9 |
| 11.56 | 5.0E-02 | 0.00 | 327.0 | 0.56 | 274.0 | 0.0 | 274.0 | 1.1 | 48 | 95.0 | 1.0 | -0.24 | 0.0 | 53.6 |
| 12.06 | 5.0E-02 | 0.00 | 227.1 | 0.69 | 194.5 | 0.0 | 194.5 | 3.3 | 46 | 86.3 | 1.0 | -0.23 | 0.0 | 38.1 |
| 12.55 | 5.0E-03 | 0.00 | 115.6 | 0.45 | 101.4 | 0.0 | 101.4 | 5.0 | 42 | 67.7 | 1.0 | -0.13 | 0.0 | 24.8 |
| 13.04 | 5.0E-05 | 0.00 | 52.7 | 2.44 | 47.6 | 57.0 | 104.5 | 25.4 | 38 | 46.0 | 10.0 | -0.22 | 9.6 | 28.2 |
| 13.53 | 5.0E-08 | 0.00 | 18.2 | 5.57 | 17.3 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |

GREGG

# EARTH MECHANICS

Site: PAINTER ST. BR.
Location: CPT-04-16C

Engineer: J. CASTLE
Date: 06:30:04 15:25




Max. Depth: 12.63 (ft)
Depth Inc.: 0.164 (ft)

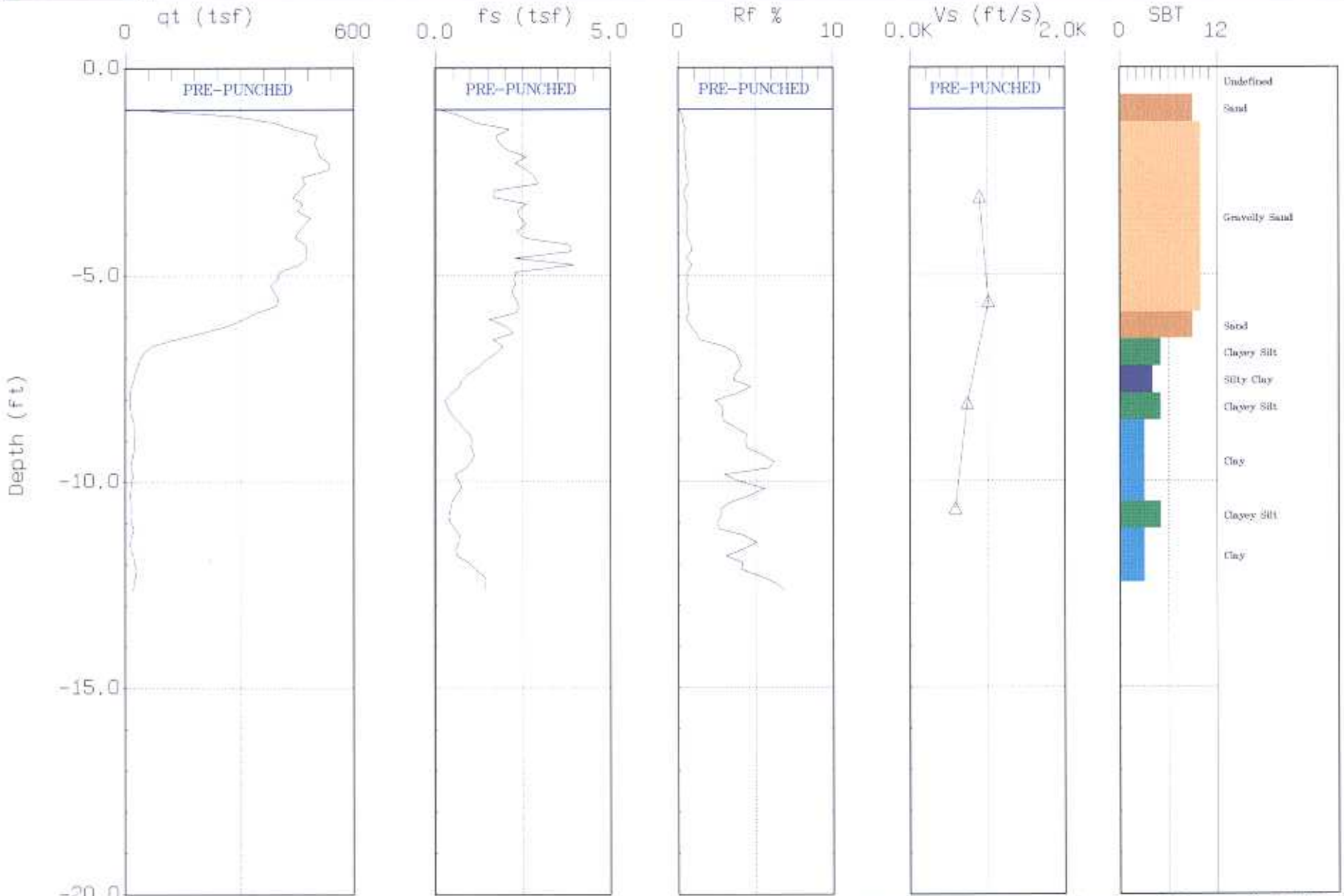
SBT: Soil Behavior Type (Robertson 1990)

GREGG

# EARTH MECHANICS

Site: PAINTER ST. BR.
Location: CPT-04-16C

Engineer: J. CASTLE
Date: 06:30:04 15:25




Max. Depth: 12.63 (ft)
Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson and Campanella 1988)

Gregg In Situ, Inc.
Interpretation Output - Release 1.00.19e
Run No: 04-0714-0947-2327
Job No: 04-226MA
Client: EARTH MECHANICS
Project: CPT SITE INVESTIGATION
Site: PAINTER ST. BR.
Location: CPT-04-16C
Engineer: J. CASTLE
CPT Date: 04/30/06
CPT Time: 15:25
CPT File: 226SC16C.COR
Northing (m): 0.000
Easting (m): 0.000
Elevation (m): 0.000

Water Table (m): 7.62 (ft): 25.0
Su Nkt used: 12.50
Averaging Increment (m): 0.15
Phi Method : Robertson and Campanella, 1983
Dr Method : Jamiolkowski - All Sands
State Parameter M: 1.20
Used Unit Weights Assigned to Soil Zones
Values of 1.0E9 or UnDef are printed for parameters that are not valid for the material type (SBT)

| Depth (ft) | AvgQt (tsf) | AvgFs (tsf) | AvgRf (%) | AvgUd (ft) | SBT | U.Wt. pcf | TStress (tsf) | EStress (tsf) | Ueq (tsf) | Cn | N60 (blows/ft) | (N1)60 (blows/ft) | Su (tsf) | CRR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.25 | 0.0 | 0.00 | 0.00 | 0.0 | UnDef | 124.1 | 0.02 | 0.02 | 0.00 | 2.00 | UnDef | UnDef | UnDef | 0.00 |
| 0.74 | 0.0 | 0.00 | 0.00 | 0.0 | UnDef | 124.1 | 0.05 | 0.05 | 0.00 | 2.00 | UnDef | UnDef | UnDef | 0.00 |
| 1.23 | 371.0 | 1.32 | 0.35 | 3.8 | 10 | 127.3 | 0.08 | 0.08 | 0.00 | 2.00 | 59.2 | 118.4 | UnDef | 0.00 |
| 1.72 | 502.8 | 1.86 | 0.37 | 3.6 | 10 | 127.3 | 0.11 | 0.11 | 0.00 | 2.00 | 80.3 | 160.5 | UnDef | 0.00 |
| 2.21 | 527.5 | 2.49 | 0.47 | 10.3 | 10 | 127.3 | 0.14 | 0.14 | 0.00 | 2.00 | 84.2 | 168.4 | UnDef | 0.00 |
| 2.71 | 465.2 | 2.47 | 0.53 | -0.5 | 10 | 127.3 | 0.17 | 0.17 | 0.00 | 2.00 | 74.3 | 148.5 | UnDef | 0.00 |
| 3.20 | 453.5 | 2.19 | 0.48 | 1.5 | 10 | 127.3 | 0.20 | 0.20 | 0.00 | 2.00 | 72.4 | 144.8 | UnDef | 0.00 |
| 3.61 | 479.3 | 2.49 | 0.52 | 5.1 | 10 | 127.3 | 0.23 | 0.23 | 0.00 | 2.00 | 76.5 | 153.0 | UnDef | 0.00 |
| 4.02 | 459.2 | 2.90 | 0.63 | 2.0 | 10 | 127.3 | 0.25 | 0.25 | 0.00 | 1.98 | 73.3 | 145.4 | UnDef | 0.00 |
| 4.51 | 470.4 | 3.37 | 0.72 | 1.1 | 10 | 127.3 | 0.29 | 0.29 | 0.00 | 1.87 | 75.1 | 140.5 | UnDef | 0.00 |
| 5.00 | 393.2 | 2.28 | 0.58 | 0.4 | 10 | 127.3 | 0.32 | 0.32 | 0.00 | 1.78 | 62.8 | 111.5 | UnDef | 0.00 |
| 5.50 | 394.6 | 2.29 | 0.58 | -0.2 | 10 | 127.3 | 0.35 | 0.35 | 0.00 | 1.69 | 63.0 | 106.7 | UnDef | 0.00 |
| 5.99 | 305.1 | 1.95 | 0.64 | -1.3 | 9 | 124.1 | 0.38 | 0.38 | 0.00 | 1.62 | 58.4 | 94.9 | UnDef | 0.00 |
| 6.56 | 109.0 | 1.88 | 1.73 | -1.1 | 7 | 117.8 | 0.41 | 0.41 | 0.00 | 1.55 | 34.8 | 54.1 | UnDef | 0.00 |

Gregg In Situ, Inc.
Run No: 04-0714-0947-2327
CPT File: 226SC16C.COR

04-16C



| Depth (ft) | AvgQt (tsf) | AvgFs (tsf) | AvgRf (%) | AvgUd (ft) | SBT | U.Wt. pcf | TStress (tsf) | EStress (tsf) | Ueq (tsf) | Cn | N60 (blows/ft) | (N1)60 (blows/ft) | Su (tsf) | CRR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7.14 | 30.8 | 1.20 | 3.89 | 1.4 | 5 | 114.6 | 0.45 | 0.45 | 0.00 | 1.50 | 14.8 | 22.1 | 2.43 | 0.24 |
| 7.63 | 15.6 | 0.61 | 3.92 | -7.6 | 3 | 111.4 | 0.47 | 0.47 | 0.00 | 1.45 | 15.0 | 21.7 | 1.21 | 0.21 |
| 8.12 | 12.8 | 0.35 | 2.72 | -8.4 | 5 | 114.6 | 0.50 | 0.50 | 0.00 | 1.41 | 6.1 | 8.6 | 0.98 | 0.14 |
| 8.61 | 21.9 | 0.80 | 3.65 | -6.8 | 4 | 114.6 | 0.53 | 0.53 | 0.00 | 1.37 | 14.0 | 19.2 | 1.71 | 0.35 |
| 9.10 | 22.5 | 1.05 | 4.67 | -7.2 | 3 | 111.4 | 0.56 | 0.56 | 0.00 | 1.34 | 21.6 | 28.9 | 1.76 | 0.38 |
| 9.60 | 16.4 | 0.80 | 4.88 | -8.9 | 3 | 111.4 | 0.59 | 0.59 | 0.00 | 1.31 | 15.7 | 20.5 | 1.27 | 0.00 |
| 10.09 | 14.3 | 0.67 | 4.66 | -4.3 | 3 | 111.4 | 0.61 | 0.61 | 0.00 | 1.28 | 13.7 | 17.5 | 1.10 | 0.00 |
| 10.58 | 14.3 | 0.42 | 2.98 | -1.5 | 5 | 114.6 | 0.64 | 0.64 | 0.00 | 1.25 | 6.8 | 8.5 | 1.09 | 0.14 |
| 11.07 | 17.8 | 0.55 | 3.08 | -0.7 | 5 | 114.6 | 0.67 | 0.67 | 0.00 | 1.22 | 8.5 | 10.4 | 1.37 | 0.19 |
| 11.56 | 15.8 | 0.62 | 3.91 | -2.3 | 3 | 111.4 | 0.70 | 0.70 | 0.00 | 1.20 | 15.1 | 18.1 | 1.21 | 0.15 |
| 12.06 | 25.8 | 1.16 | 4.49 | -0.2 | 3 | 111.4 | 0.72 | 0.72 | 0.00 | 1.17 | 24.7 | 29.0 | 2.00 | 0.38 |

Gregg In Situ, Inc.
Interpretation Output - Release 1.00.19e
Run No: 04-0714-0947-2327
Job No: 04-226MA
Client: EARTH MECHANICS
Project: CPT SITE INVESTIGATION
Site: PAINTER ST. BR.
Location: CPT-04-16C
Engineer: J. CASTLE
CPT Date: 04/30/06
CPT Time: 15:25
CPT File: 226SC16C.COR
Northing (m): 0.000
Easting (m): 0.000
Elevation (m): 0.000

---

Water Table (m): 7.62 (ft): 25.0
Su Nkt used: 12.50
Averaging Increment (m): 0.15
Phi Method : Robertson and Campanella, 1983
Dr Method : Jamiolkowski - All Sands
State Parameter M: 1.20
Used Unit Weights Assigned to Soil Zones
Values of 1.0E9 or UnDef are printed for parameters that are not valid for the material type (SBT)

---

| Depth (ft) | k (cm/s) | Bq | Qtn | Rfn | Qc1N | DeltaQc1N | Qc1Ncs | Fc (%) | Phi (Deg) | Dr (%) | OCR | State Param | Del(n1)60 | (N1)60cs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.25 | 1.0E-15 | 0.00 | 5.8 | 0.10 | 0.2 | UnDef | UnDef | 100.0 | UnDef | UnDef | 1.0 | UnDef | UnDef | UnDef |
| 0.74 | 1.0E-15 | 0.00 | 1.3 | 0.10 | 0.2 | UnDef | UnDef | 100.0 | UnDef | UnDef | 1.0 | UnDef | UnDef | UnDef |
| 1.23 | 5.0E+00 | 0.00 | 1000.0 | 0.35 | 710.7 | 0.0 | 710.7 | 0.0 | 50 | 95.0 | 1.0 | -0.30 | 0.0 | 118.4 |
| 1.72 | 5.0E+00 | 0.00 | 1000.0 | 0.37 | 963.0 | 0.0 | 963.0 | 0.0 | 50 | 95.0 | 1.0 | -0.30 | 0.0 | 160.5 |
| 2.21 | 5.0E+00 | 0.00 | 1000.0 | 0.47 | 1010.3 | 0.0 | 1010.3 | 0.0 | 50 | 95.0 | 1.0 | -0.33 | 0.0 | 168.4 |
| 2.71 | 5.0E+00 | 0.00 | 1000.0 | 0.53 | 891.1 | 0.0 | 891.1 | 0.0 | 50 | 95.0 | 1.0 | -0.34 | 0.0 | 148.5 |
| 3.20 | 5.0E+00 | 0.00 | 1000.0 | 0.48 | 868.5 | 0.0 | 868.5 | 0.0 | 50 | 95.0 | 1.0 | -0.33 | 0.0 | 144.8 |
| 3.61 | 5.0E+00 | 0.00 | 1000.0 | 0.52 | 917.9 | 0.0 | 917.9 | 0.0 | 50 | 95.0 | 1.0 | -0.34 | 0.0 | 153.0 |
| 4.02 | 5.0E+00 | 0.00 | 1000.0 | 0.63 | 879.6 | 0.0 | 879.6 | 0.0 | 50 | 95.0 | 1.0 | -0.36 | 0.0 | 145.4 |
| 4.51 | 5.0E+00 | 0.00 | 1000.0 | 0.72 | 861.4 | 0.0 | 861.4 | 0.0 | 50 | 95.0 | 1.0 | -0.37 | 0.0 | 140.5 |
| 5.00 | 5.0E+00 | 0.00 | 1000.0 | 0.58 | 683.5 | 0.0 | 683.5 | 0.0 | 50 | 95.0 | 1.0 | -0.35 | 0.0 | 111.5 |
| 5.50 | 5.0E+00 | 0.00 | 1000.0 | 0.58 | 654.4 | 0.0 | 654.4 | 0.0 | 50 | 95.0 | 1.0 | -0.35 | 0.0 | 106.7 |
| 5.99 | 5.0E-02 | 0.00 | 803.6 | 0.64 | 484.8 | 0.0 | 484.8 | 0.0 | 50 | 95.0 | 1.0 | -0.34 | 0.0 | 94.9 |
| 6.56 | 5.0E-04 | 0.00 | 262.4 | 1.73 | 165.8 | 14.8 | 180.6 | 8.1 | 46 | 81.8 | 1.0 | -0.35 | 2.9 | 57.0 |

Gregg In Situ, Inc.
Run No: 04-0714-0947-2327
CPT File: 226SC16C.COR

04-16c



| Depth (ft) | k (cm/s) | Bq | Qtn | Rfn | Qc1N | DeltaQc1N | Qc1Ncs | Fc (%) | Phi (Deg) | Dr (%) | OCR | State Param | Del(n1)60 | (N1)60cs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7.14 | 5.0E-06 | 0.00 | 68.0 | 3.95 | 45.1 | 74.5 | 119.6 | 28.3 | UnDef | UnDef | 10.0 | UnDef | 14.1 | 36.2 |
| 7.63 | 5.0E-08 | -0.02 | 31.9 | 4.04 | 22.2 | 88.8 | 111.0 | 39.6 | UnDef | UnDef | 6.0 | UnDef | 21.7 | 43.4 |
| 8.12 | 5.0E-06 | -0.02 | 24.4 | 2.83 | 17.7 | 70.6 | 88.3 | 38.9 | UnDef | UnDef | 6.0 | UnDef | 8.6 | 17.3 |
| 8.61 | 5.0E-07 | -0.01 | 40.2 | 3.74 | 29.4 | 113.7 | 143.1 | 34.8 | UnDef | UnDef | 6.0 | UnDef | 18.9 | 38.1 |
| 9.10 | 5.0E-08 | -0.01 | 39.3 | 4.79 | 29.5 | 118.0 | 147.5 | 38.9 | UnDef | UnDef | 6.0 | UnDef | 28.9 | 57.8 |
| 9.60 | 5.0E-08 | -0.02 | 27.0 | 5.06 | 21.0 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 10.09 | 5.0E-08 | -0.01 | 22.3 | 4.87 | 17.9 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 10.58 | 5.0E-06 | 0.00 | 21.2 | 3.12 | 17.4 | 69.7 | 87.1 | 42.8 | UnDef | UnDef | 6.0 | UnDef | 8.5 | 17.1 |
| 11.07 | 5.0E-06 | 0.00 | 25.6 | 3.20 | 21.3 | 85.3 | 106.7 | 39.8 | UnDef | UnDef | 6.0 | UnDef | 10.4 | 20.9 |
| 11.56 | 5.0E-08 | 0.00 | 21.6 | 4.09 | 18.5 | 74.0 | 92.5 | 46.8 | UnDef | UnDef | 6.0 | UnDef | 18.1 | 36.2 |
| 12.06 | 5.0E-08 | 0.00 | 34.6 | 4.62 | 29.6 | 118.5 | 148.1 | 40.4 | UnDef | UnDef | 6.0 | UnDef | 29.0 | 58.0 |

# APPENDIX SEISMIC

# Seismic Cone Penetrometer Testing
## (SCPTu)

Gregg In Situ, Inc. uses a modified CPT cone that contains a built in seismometer to measure compression and shear wave velocities in addition to the standard piezocone parameters ($q_c$, $f_s$, and $u_2$). Therefore, four independent readings are compiled with depth in a single sounding. The standard CPT parameters are recorded continuously while the seismic test is usually performed at 5-foot intervals.

Shear waves are generated by striking a seismic beam coupled to the ground surface by a hydraulic cylinder under the CPT rig, *Figure SCPTu*. Compression waves are generated by striking an auger in the ground. The sledgehammer that strikes the beam/auger acts as a trigger, initiating the recording of the seismic wave trace. Before measurements are taken, the rods are decoupled from the CPT rig to prevent energy transmission down the rods.

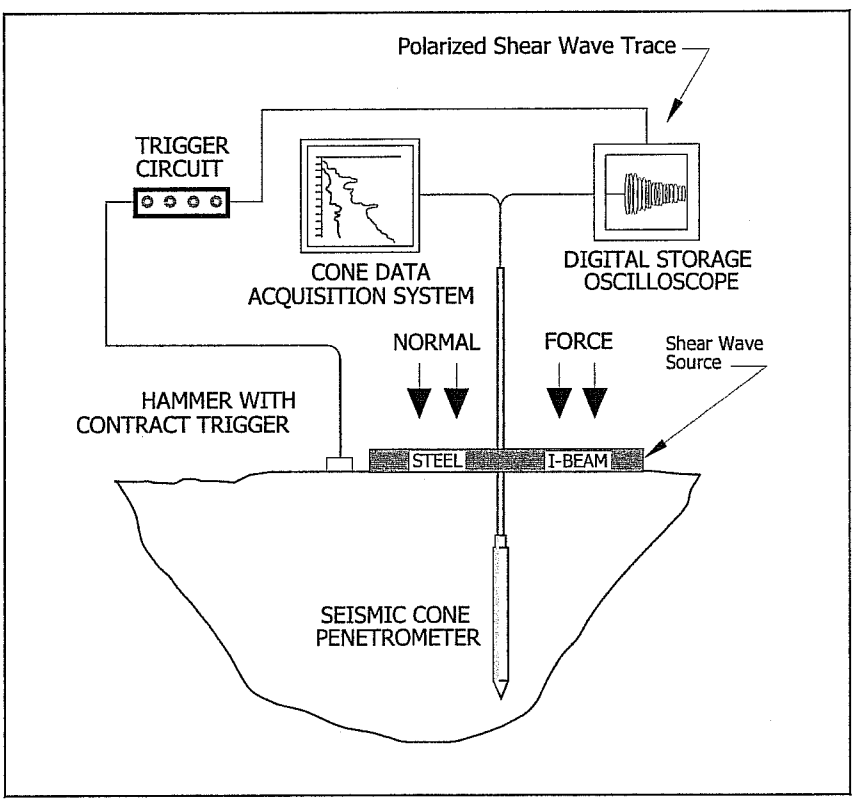



*Figure SCPTu*

Geophones in the body of the piezocone recognize the arriving waves generated at the ground surface, *Figure Seismic*. Any waves received by the geophones on the cone penetrometer are sent back up to the truck to be displayed on an oscilloscope. On site software then plots the wave amplitude versus time to calculate wave velocities.

At least two waves are recorded for each test depth so the operator can check consistency of the waveforms. Shear wave data is sampled at a frequency of 20kHz (20,000 samples per second) and compression wave data is sampled at 50kHz (50,000 samples per second). To maintain a desired signal resolution, the input sensitivity (gain) is increased with depth.

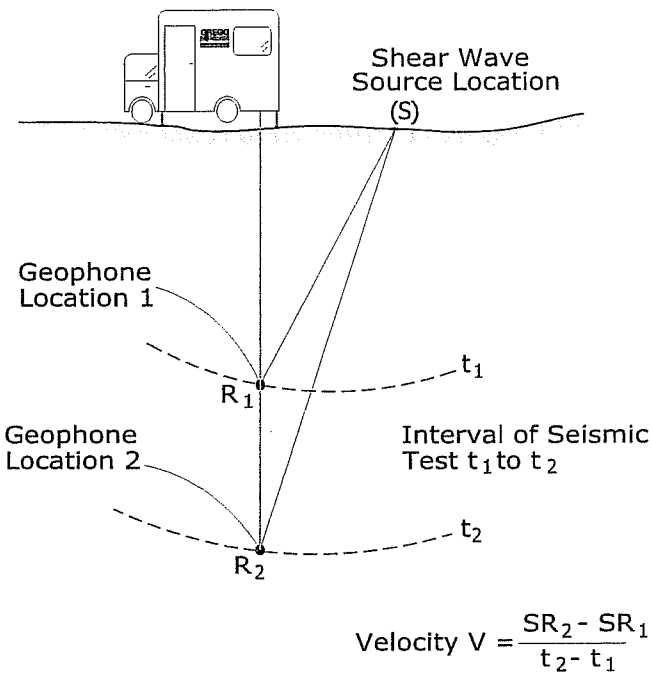



*Figure Seismic*

Offset distances of the beam from the cone and the location of the geophone are all taken into account in calculations.

The shear wave velocity ($V_s$) provides information about small-strain stiffness while the penetration data provides information about large-strain failures. From interval shear wave velocity ($V_s$) and the mass density ($\rho$) of a soil layer, the dynamic shear modulus ($G_o$) of the soil can be calculated in a specific depth interval. The dynamic shear modulus ($G_0$) is a key parameter for the analysis of soil behavior in response to dynamic loading from earthquakes, ice, vibrating machine foundations, waves and wind.

A summary of the data collected including the depth and location identification is displayed in Table 1 and graphical formats and can be found with the corresponding CPT plot.

For a detailed reference on seismic CPT, refer to Robertson et. al., 1986.

GREGG

GIS Project No: 04-226MA
Client: Earth Mechanics
Site: Painter Street Bridge
Location SCPT-04-15C
Sounding Date: June 30, 2004

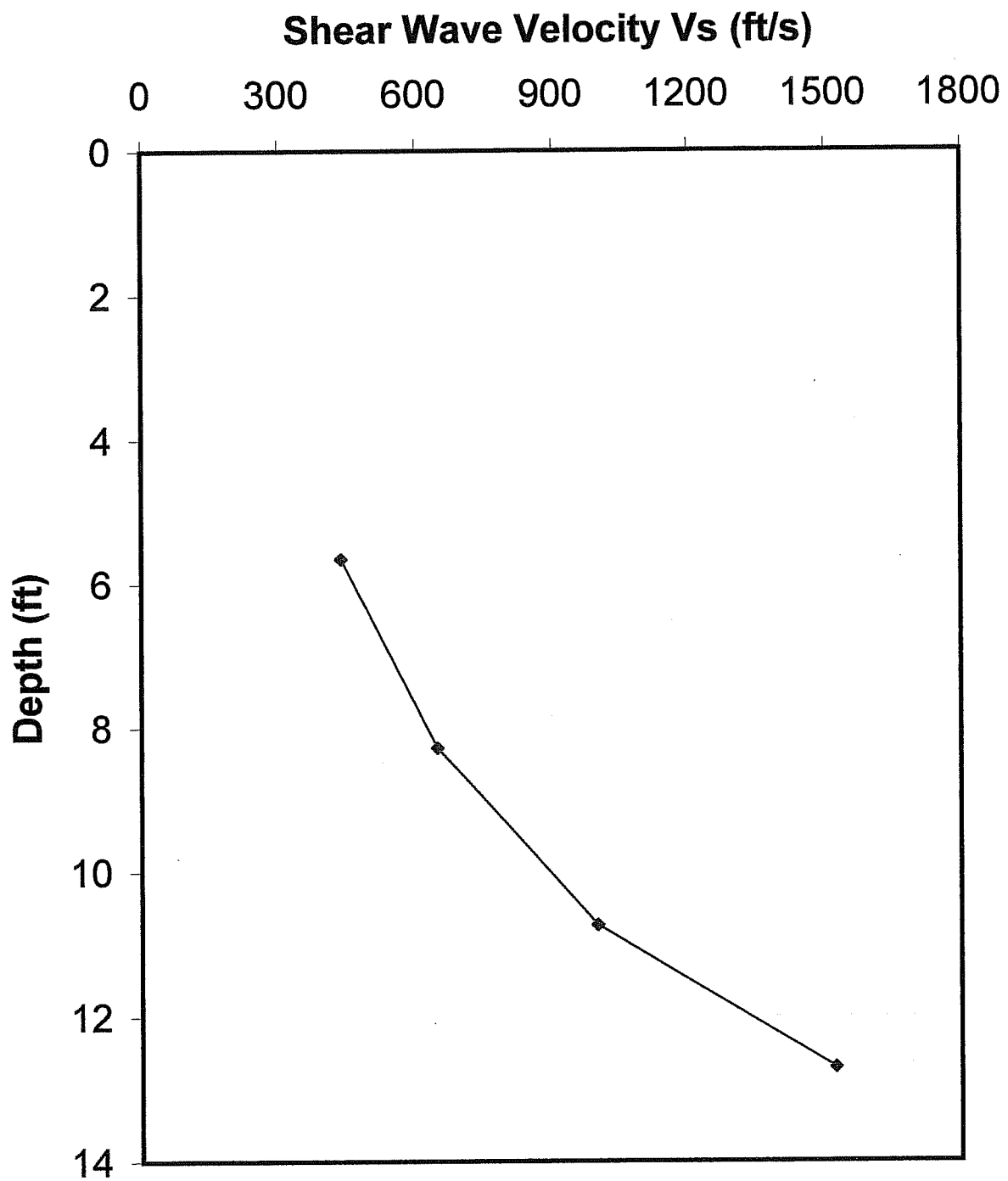
**Shear Wave Velocity Calculations**

| | | |
|---|---|---|
| Geophone Offset | (feet) | 0.66 |
| Source Offset | (feet) | 1.50 |

| Test Depth (feet) | Geophone Depth (feet) | Ray Path (feet) | Incremental Distance (feet) | Time Interval (ms) | Interval Velocity (ft/s) | Interval Depth (feet) | Interval Depth (feet) | Vs (ft/s) | Vs (m/s) | Interval Depth (m) |
|---|---|---|---|---|---|---|---|---|---|---|
| 5.08 | 4.42 | 4.67 | | | | | | | | |
| 7.54 | 6.88 | 7.05 | 2.37 | 5.41 | 439 | 5.65 | 5.65 | 439 | 134 | 1.72 |
| 10.33 | 9.67 | 9.79 | 2.74 | 4.23 | 649 | 8.28 | 8.28 | 649 | 198 | 2.52 |
| 12.46 | 11.80 | 11.90 | 2.11 | 2.11 | 1000 | 10.74 | 10.74 | 1000 | 305 | 3.27 |
| 14.27 | 13.61 | 13.70 | 1.80 | 1.18 | 1523 | 12.71 | 12.71 | 1523 | 464 | 3.87 |

# Shear Wave Velocity Profile

Client: 04-226ma Earth Mechanics
Site: Painter Street Bridge
Location: SCPT-4-15C
Sounding Date: June 30, 2004



GREGG

GIS Project No: 04-226MA
Client: Earth Mechanics
Site: Painter Street Bridge
Location SCPT-04-16C
Sounding Date: June 30, 2004

**Shear Wave Velocity Calculations**

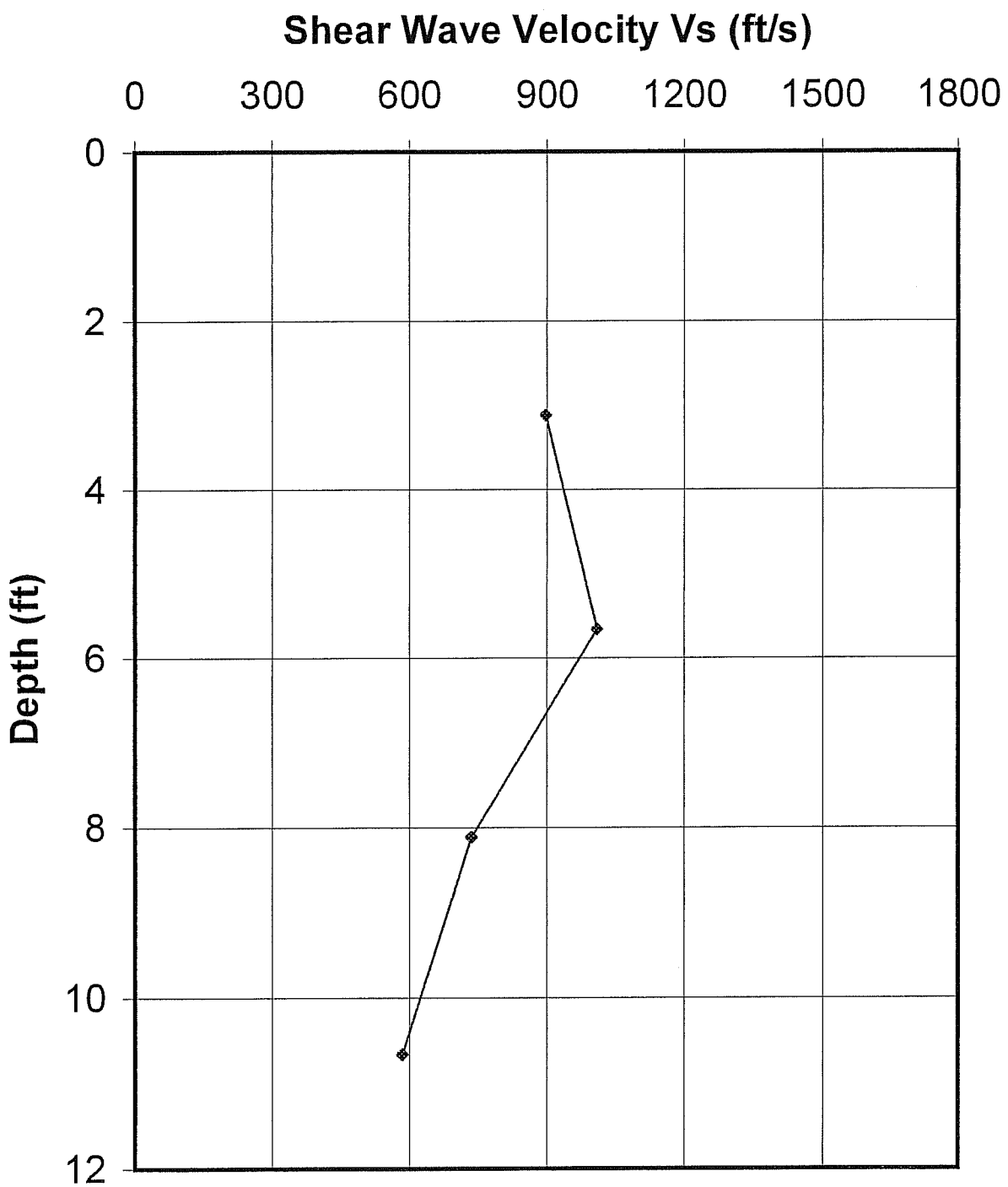
| | | |
|---|---|---|
| Geophone Offset | (feet) | 0.66 |
| Source Offset | (feet) | 1.50 |

| Test Depth (feet) | Geophone Depth (feet) | Ray Path (feet) | Incremental Distance (feet) | Time Interval (ms) | Interval Velocity (ft/s) | Interval Depth (feet) |
|---|---|---|---|---|---|---|
| 2.46 | 1.80 | 2.35 | | | | |
| 5.08 | 4.42 | 4.67 | 2.33 | 2.59 | 898 | 3.11 |
| 7.54 | 6.88 | 7.05 | 2.37 | 2.35 | 1010 | 5.65 |
| 10.00 | 9.34 | 9.46 | 2.42 | 3.29 | 735 | 8.11 |
| 12.63 | 11.97 | 12.07 | 2.60 | 4.46 | 584 | 10.66 |

# Shear Wave Velocity Profile

GREGG

Client: 04-226ma Earth Mechanics
Site: Painter Street Bridge
Location: SCPT-4-16C
Sounding Date: June 30, 2004



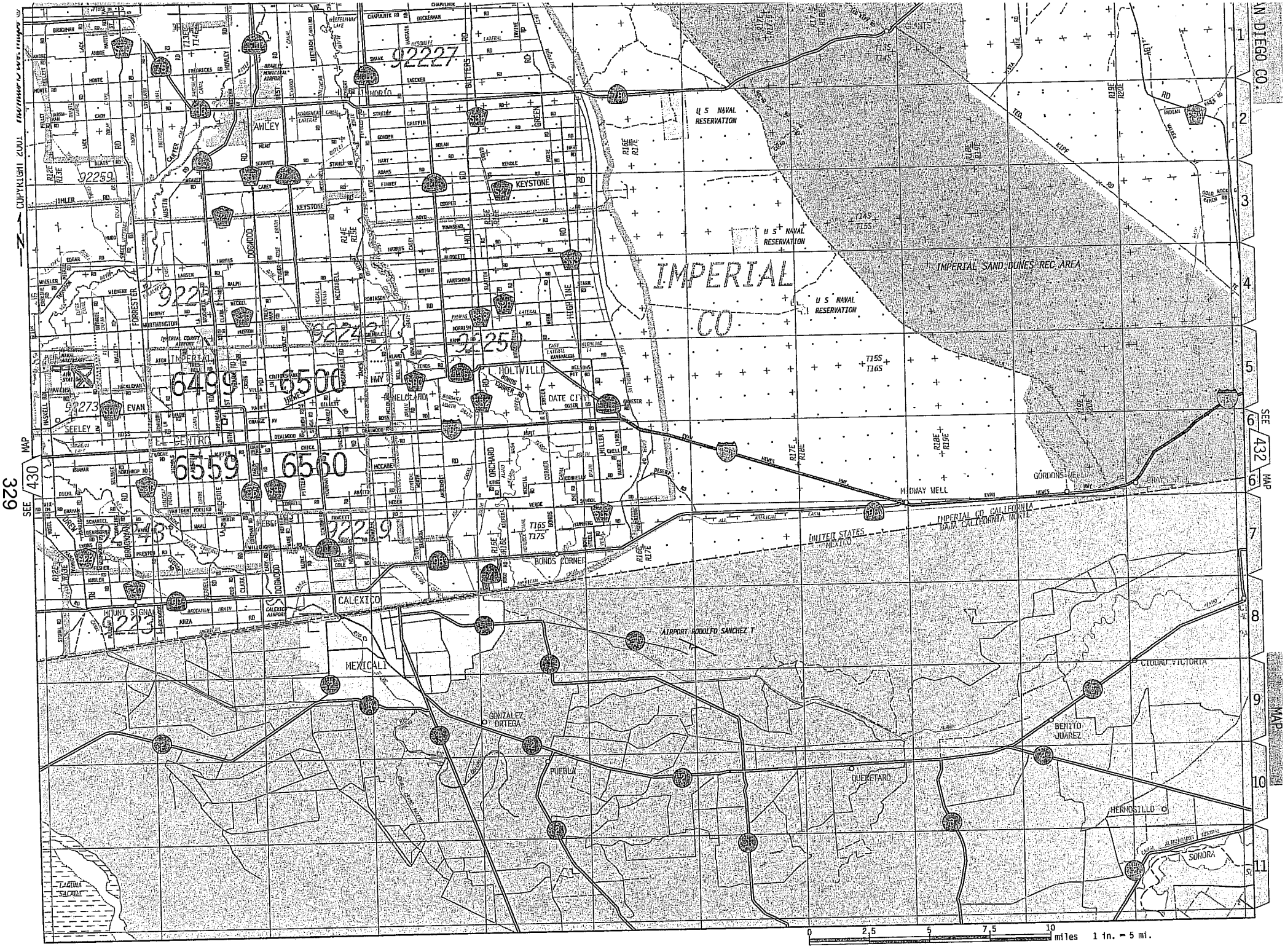
# Caltrans Bridge 58-0215
# Meloland Rd. OC, Imperial Co.

**Caltrans Bridge 58-0215, Meloland Rd. OC, Imperial Co.**

Meloland Rd bridge is one of the Caltrans bridges that are seismically instrumented. The field investigation for this bridge, conducted on 8/20/04, consisted of 2 soil borings (04-17A and 04-18A), 2 PMT borings (04-17P and 04-18P), and 1 CPT sounding (04-18C). Soil and PMT borings were drilled by 2R Drilling of Chino. CPT were performed by Holguin, Fahan, and Associates (HFA) of Orange. Locations 04-17 and 04-17P were located on the south bridge abutment in the north-bound lane, near the approach slab and locations 04-18, 04-18P, and 04-18C were located on the north bridge abutment, in the north-bound lane, also near the approach slab.

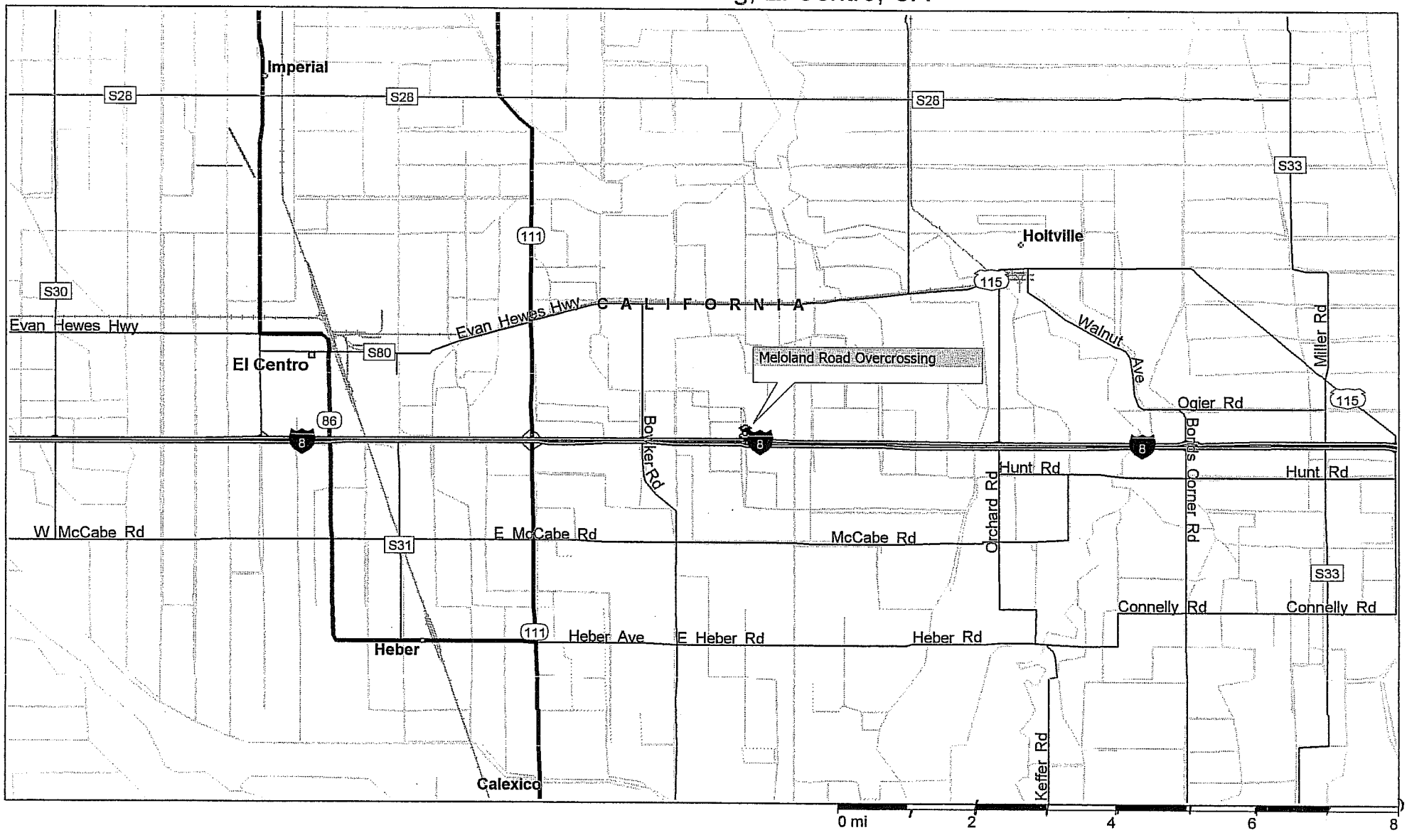
Geotechnical soil sampling consisted of ring samples collected using a Modified California sampler and small bulk samples collected with a SPT sampler. Samples were taken at 2.5-ft intervals to 15 ft depth and at 20 ft depth. No groundwater was encountered during the investigation. One pressuremeter test was performed at the south end and two tests at the north end. No CPT boring was conducted at the south abutment due to equipment malfunction. HFA returned to the site at a later date to conduct the north abutment CPT investigation.

ker Road
/4 MILES




COPYRIGHT 2001 THOMAS BROS. MAPS

# Meloland Overcrossing, El Centro, CA



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I-008-2(23)117

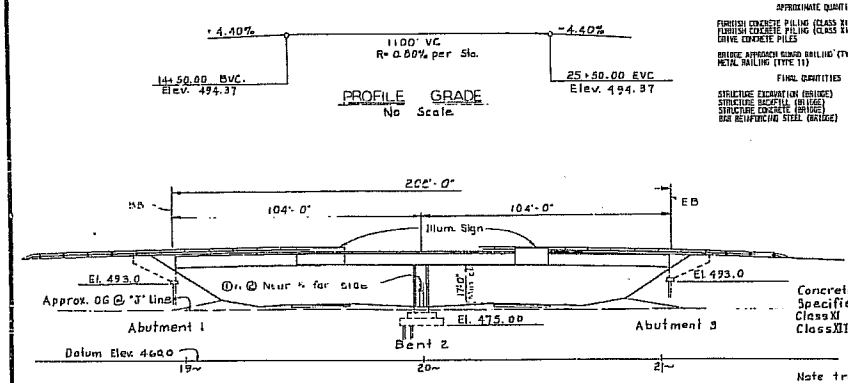
| DIST. | COUNTY | ROUTE | POST MILES-TOTAL PROJECT | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| 11 | Imp | 8 | 0.40/R36.3 | 208 | 338 |

APPROXIMATE QUANTITIES

| | | |
|---|---|---|
| FURNISH CONCRETE PILING (CLASS XI) | 990 | LF |
| FURNISH CONCRETE PILING (CLASS XII) | 1,135 | LF |
| DRIVE CONCRETE PILES | 39 | EA |
| BRIDGE APPROACH GUARD RAILING (TYPE B) | 234 | LF |
| METAL RAILING (TYPE 11) | 494 | LF |

FINAL QUANTITIES

| | | |
|---|---|---|
| STRUCTURE EXCAVATION (BRIDGE) | 180 | CY |
| STRUCTURE BACKFILL (BRIDGE) | 130 | CY |
| STRUCTURE CONCRETE (BRIDGE) | 555 | CY |
| BAR REINFORCING STEEL (BRIDGE) | 160,000 | LB |



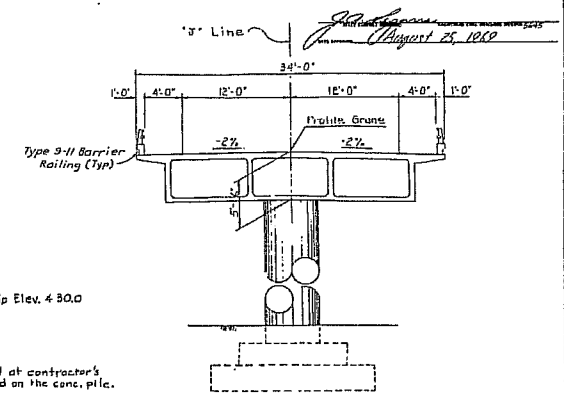

PROFILE GRADE
No Scale




ELEVATION
Scale 1"=20'

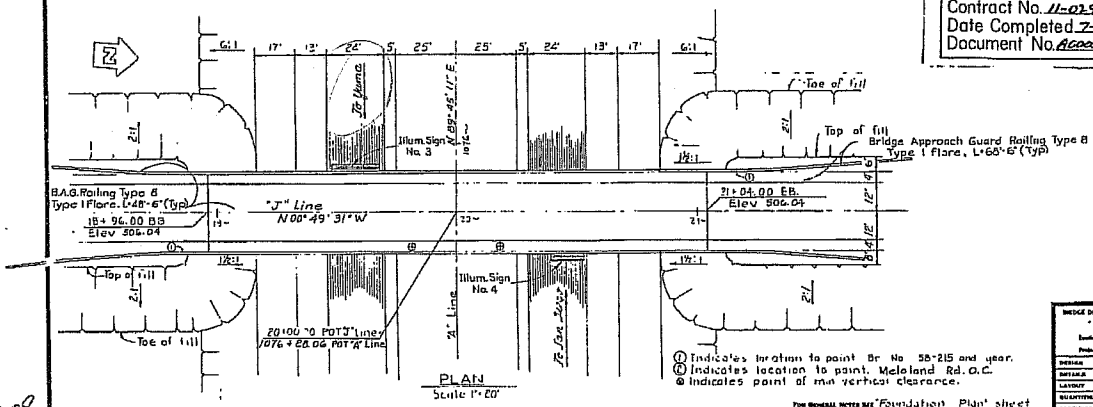
Concrete piles (45 ton bearing)
Specified tip elev. 493.0 Estimated tip Elev. 430.0
Class XI @ Abutments
Class XII @ Bents

Note treated timber piles may be used at contractor's option. The engineers estimated is based on the conc. pile.




TYPICAL SECTION
Scale 3/16"=1'-0"

AS BUILT PLANS
Contract No. 11-029821-4
Date Completed 7-1-71
Document No. 8000059




PLAN
Scale 1"=20'

① Indicates location to point Br. No. 58-215 and year.
Ⓑ Indicates location to point. Meloland Rd. O.C.
Ⓐ Indicates point of min vertical clearance.

For General Notes see "Foundation Plan" sheet

Log Location 1820-44 and Alternative

INDEX TO PLANS

| SHEET NO | TITLE |
|---|---|
| 1 | General Plan |
| 2 | Grid Grades |
| 3 | Foundation Plan |
| 4 | Abutment Details |
| 5 | Bent Details |
| 6 | Typical Section & Girder Layout |
| 7 | Girder Reinforcement |
| 8 | Corrosion Resistant Concrete Pile Details -45 Ton |
| 9 | Log of Test Borings |
| | Std. Plans Dated July 1969 |
| A62-B-2 | Exc. & Backfill Br. & Walls-Limits of Payment |
| B0-1 | Bridge Details |
| B0-5 | " |
| B7-1 | Box Grd. Details |
| B11-36 | B.A.G.R. Type B (Layout) |
| B11-37 | " " " (Details) |
| B11-43 | Metal Railing Det.-Types 9, 10 & 11 |
| B11-45 | Barrier Railing Type 9-11 |

NO AS BUILT
CORRECTIONS BY R.J. Drzill
CONTRACT NO. 029 823

BRIDGE DEPARTMENT
··· DESIGN SECTION ···
14

STATE OF CALIFORNIA
HIGHWAY TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

MELOLAND ROAD OVERCROSSING
LOCATED APPROX. 3.1 MILES E. OF EXISTING STATE ROUTE 111 AND APPROX. 2.1 MILES N. OF EXISTING U.S. HIGH ROUTE 80 IN IMPERIAL COUNTY

GENERAL PLAN

| BRIDGE NO. | POST MILE | TRANSITION NO. | SHEET | OF |
|---|---|---|---|---|
| 58-215 | 43.6 | 58215-1 | 1 | 9 |

WO 029821
CU 11205

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF PUBLIC WORKS.

DATE 10/2/71 SIGNATURE [illegible] TITLE DAGII

331

208

1968 D
1969 Contract Bundle

| DIST. | COUNTY | ROUTE | SECTION | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| 11 | Imp. | 8 | R20.6/R26.3 | 210 | 304 |

A.P. Ouzounian
DIVISION OF HIGHWAY BRIDGE ENGINEERS
DATE APPROVED August 25, 1969

## UTILITIES

PP" 401348 H
① 4 wires & Tel Cable @ El 502± NES

PP" 401347 H
② 4 wires & Tel Cable @ El 502± NES

PP" 562.5 D
③ 3 wires @ El 510± NES
4 Wires @ El 515± NES

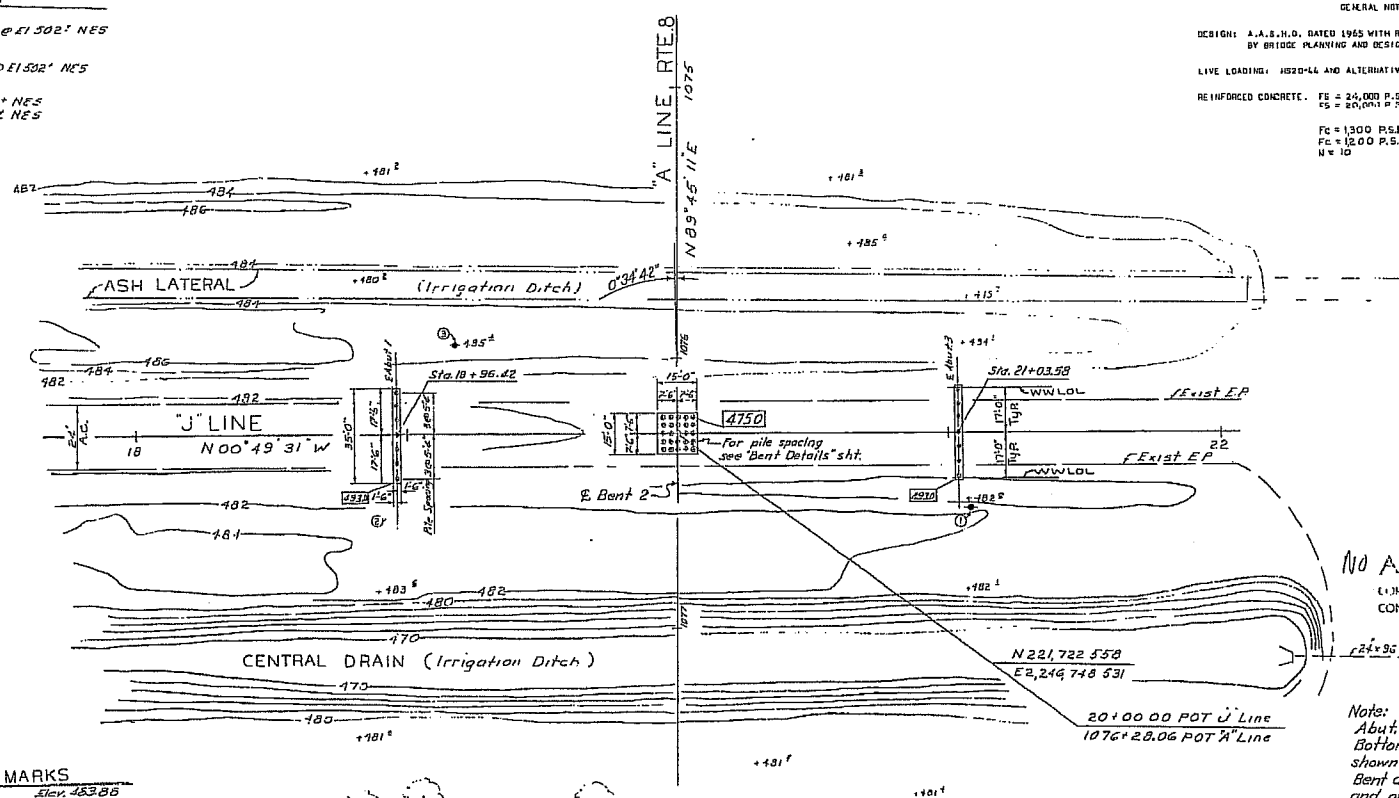
## GENERAL NOTES

DESIGN: A.A.S.H.O. DATED 1965 WITH REVISIONS AND AS SUPPLEMENTED BY BRIDGE PLANNING AND DESIGN MANUAL.

LIVE LOADING: HS20-44 AND ALTERNATIVE

REINFORCED CONCRETE. fs = 24,000 P.S.I. EXCEPT
fs = 20,000 P.S.I. IN TRANSVERSE DECK SLABS AND STIRRUPS.

fc = 1,300 P.S.I. EXCEPT
fc = 1,200 P.S.I. IN TRANSVERSE DECK SLABS
N = 10




No AS BUILT
CORRECTIONS BY
CONTRACT NO.

## BENCH MARKS

BM "80" Elev. 483.88
Chsld "D" on hdwl 275' Lt. 1075+70 "A"

BM "A5 Mon 27C-21.5 A Elev. 481.18
RR spike in J Rd 156.31' Lt. 1076+25.41 A
N 221,878.859 E 2,246,745.203.

BRIDGE DEPARTMENT
DESIGN SECTION 14
Prepared by C. Pendley
DESIGN by D.H.C. Lindsey
Checked by J.E. Shepard
DETAILS by J.E. Shepard
Checked by J.E. Shepard
QUANTITIES by
Checked by Ken Johnson

STATE OF CALIFORNIA
HIGHWAY TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

MELOLAND ROAD OVERCROSSING

FOUNDATION PLAN

| BRIDGE NO. | DRAWING NO. | SCALE | SHEET | OF |
|---|---|---|---|---|
| 58-215 | 58-215-3 | 1=20' | 3 | 9 |

REVISION DATES (PRELIMINARY STAGE ONLY)

AS BUILT PLANS
Contract No. 11-0T181
Date Completed 7-1-75
Document No. 1000-R13

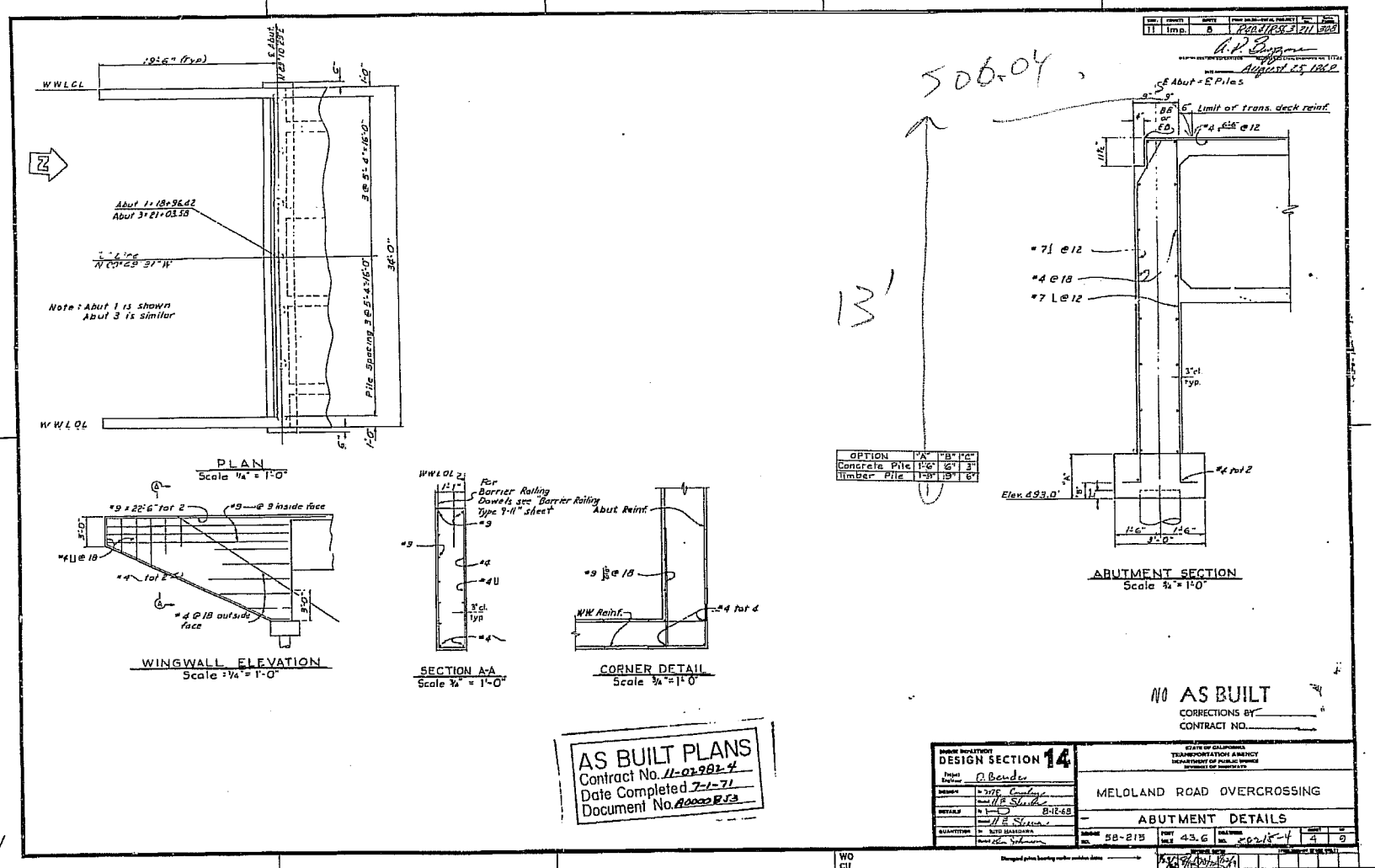
WO

Shaded and plates bearing earlier revision dates

E-5P

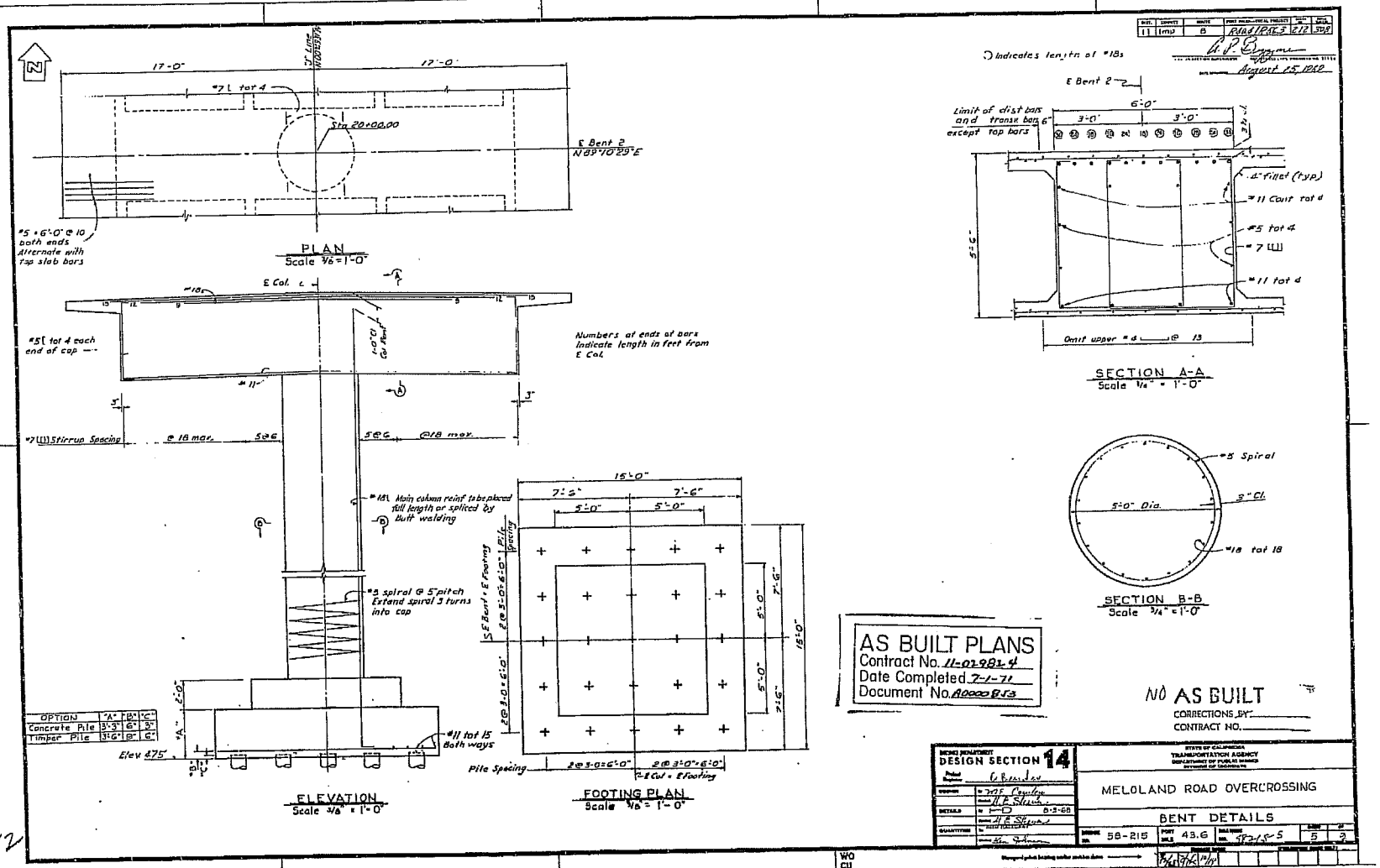
332

210




I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF PUBLIC WORKS.

DATE 11/5/70 SIGNATURE [illegible] TITLE [illegible]

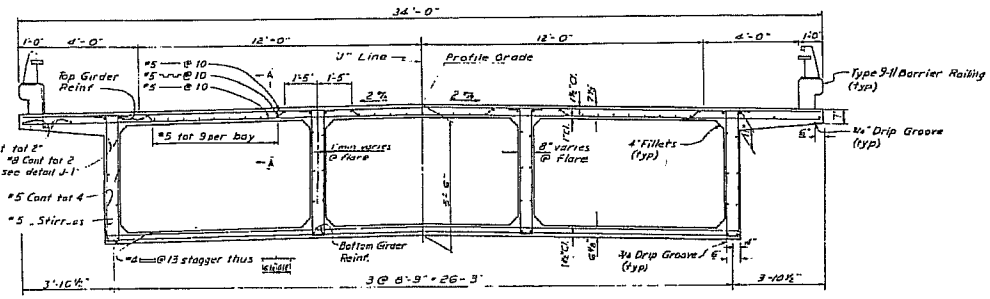



| OPTION | "A" | "B" | "C" |
|---|---|---|---|
| Concrete Pile | 3'-3" | 6" | 3" |
| Timber Pile | 3'-6" | 8" | 6" |

212

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF PUBLIC WORKS.

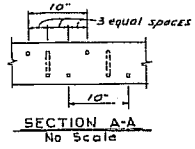
DATE 11/23/70 SIGNATURE [signature] TITLE [illegible]



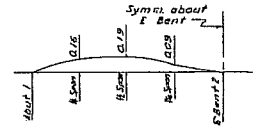

Note: For girder reinf not shown see "Girder Reinforcement" sht
For Details D-1, V-1 & J-1 see "Box Girder Details No. 1" sheet.
For Barrier Railing Reinf see "Barrier Railing Type 9-11" sheet

TYPICAL SECTION
Scale ½" = 1'-0"

Note: At contractor's option the soffit may be cast on a straight line between outside edges of box girder. Slab thickness to remain as shown. Stem and stirrup heights to vary to meet finished grades and provide clearances shown.

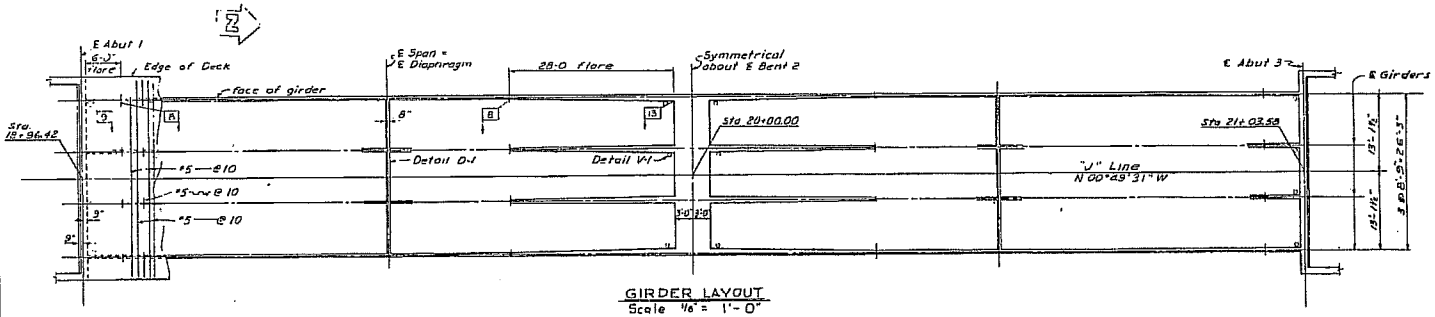



SECTION A-A
No Scale

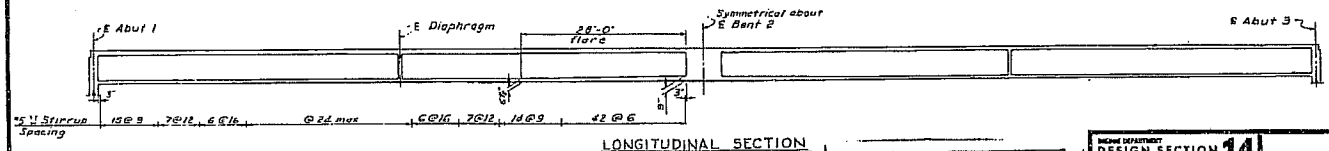



CAMBER DIAGRAM
No Scale

Total girder deflection due to dead loads. The amount of camber for construction will be determined by the Engineer.




GIRDER LAYOUT
Scale 1/16" = 1'-0"




LONGITUDINAL SECTION
Scale : 1/16" = 1'-0

NO AS BUILT
CORRECTIONS BY
CONTRACT NO.

AS BUILT PLANS
Contract No. 11-02982-4
Date Completed 7-1-71
Document No. A0002853

| | | | | | | |
|---|---|---|---|---|---|---|
| 11 | Imp | 8 | PAA 1255 | 213 | 348 | |

August 25, 1982

DESIGN DEPARTMENT
DESIGN SECTION 14
Project Engineer O. Bender
Drawn
Checked
Details 8-12-68
Checked
Quantities
Checked

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

MELCLAND ROAD OVERCROSSING

TYPICAL SECTION & GIRDER LAYOUT

| BRIDGE NO. | POST MILE | DRAWING NO. | SHEET | OF |
|---|---|---|---|---|
| 58-215 | 43.6 | 58-215-C-6 | 6 | 9 |

WO
CH

213

335

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF PUBLIC WORKS.

DATE 11/4/82 SIGNATURE [illegible] TITLE [illegible]

Route 08

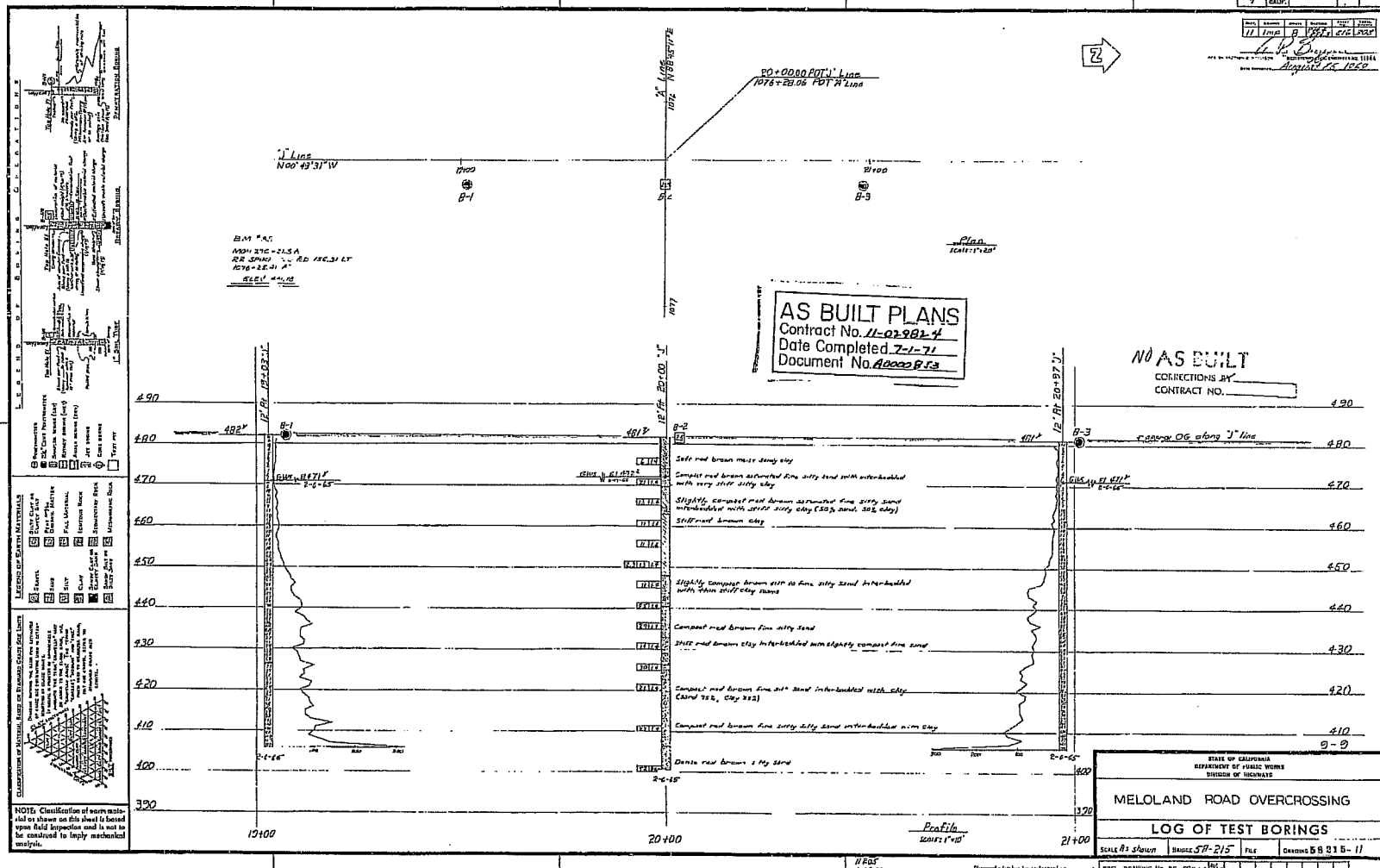
336

Rte 111 To 2.5 mi W of Rte 115

| FED. ROAD DIST. NO. | STATE | F.A. PROJECT NO. | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|
| 7 | CALIF. | | | |

| DIST. | DRAWING | SHEET | BRIDGE NO. | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| 11 | Imp | 8 | 58-215 | 215 | 2058 |

Bridge Engineer
August 15, 1958




LEGEND OF BORING CLASSIFICATIONS

LEGEND OF EARTH MATERIALS

CLASSIFICATION OF MATERIAL BASED ON BLOWING COUNT PER FOOT

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.

BRIDGE DEPARTMENT
ENGINEERING GEOLOGY SECTION

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

MELOLAND ROAD OVERCROSSING

LOG OF TEST BORINGS

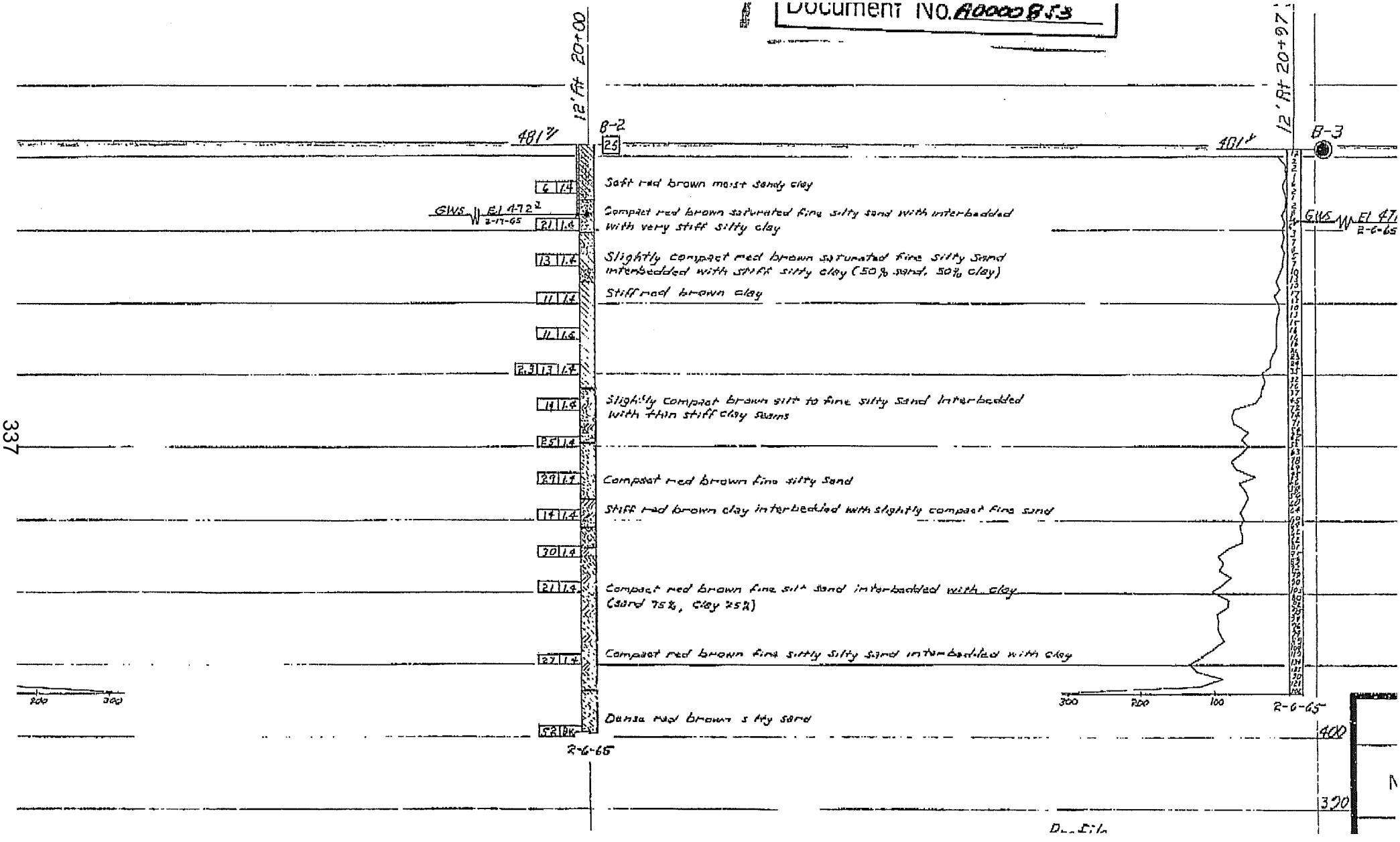
SCALE As Shown | BRIDGE 58-215 | FILE | DRAWING 58 215-11

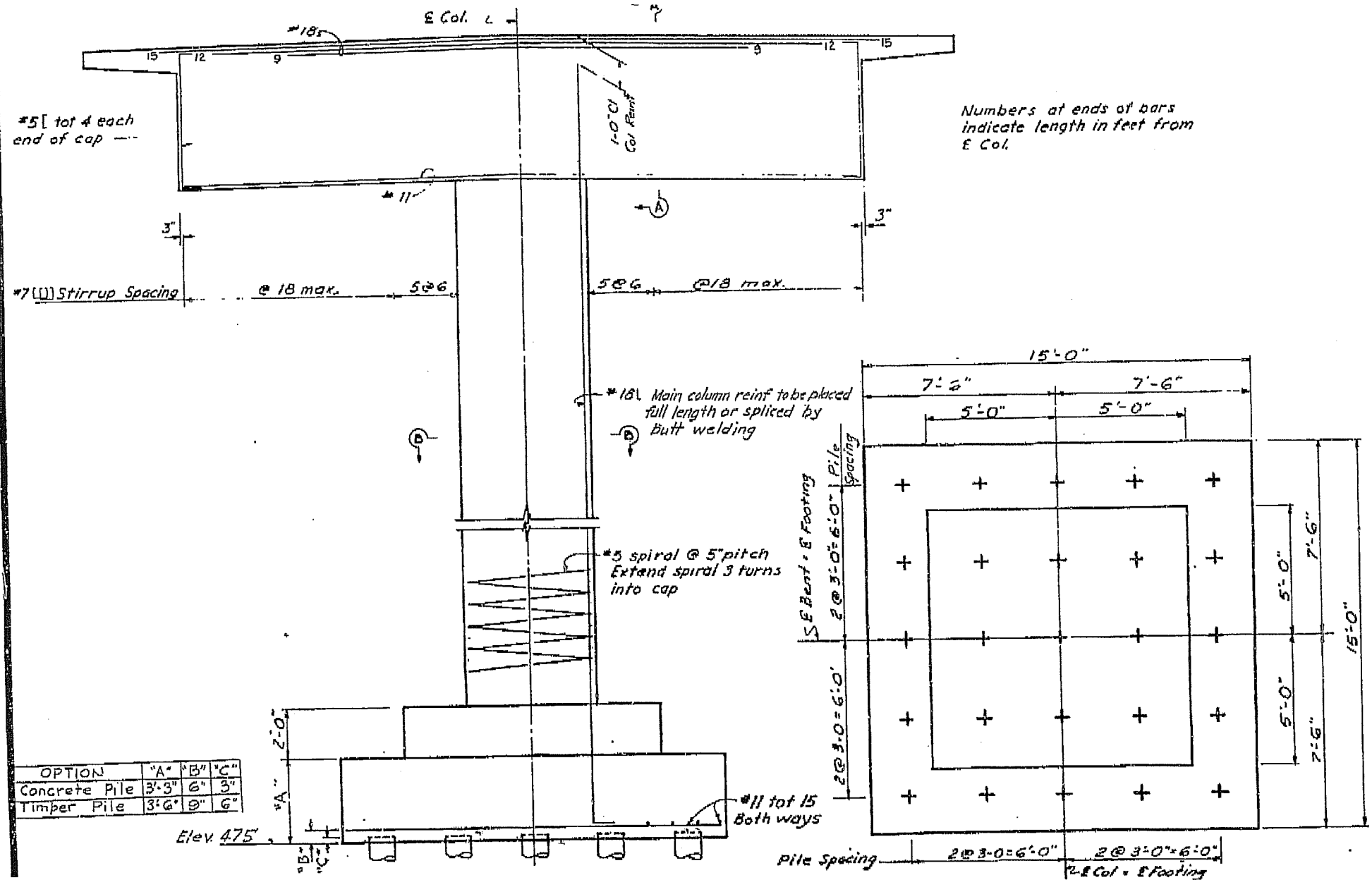
FIELD DRAWING No. PR-58 Sht 2

216

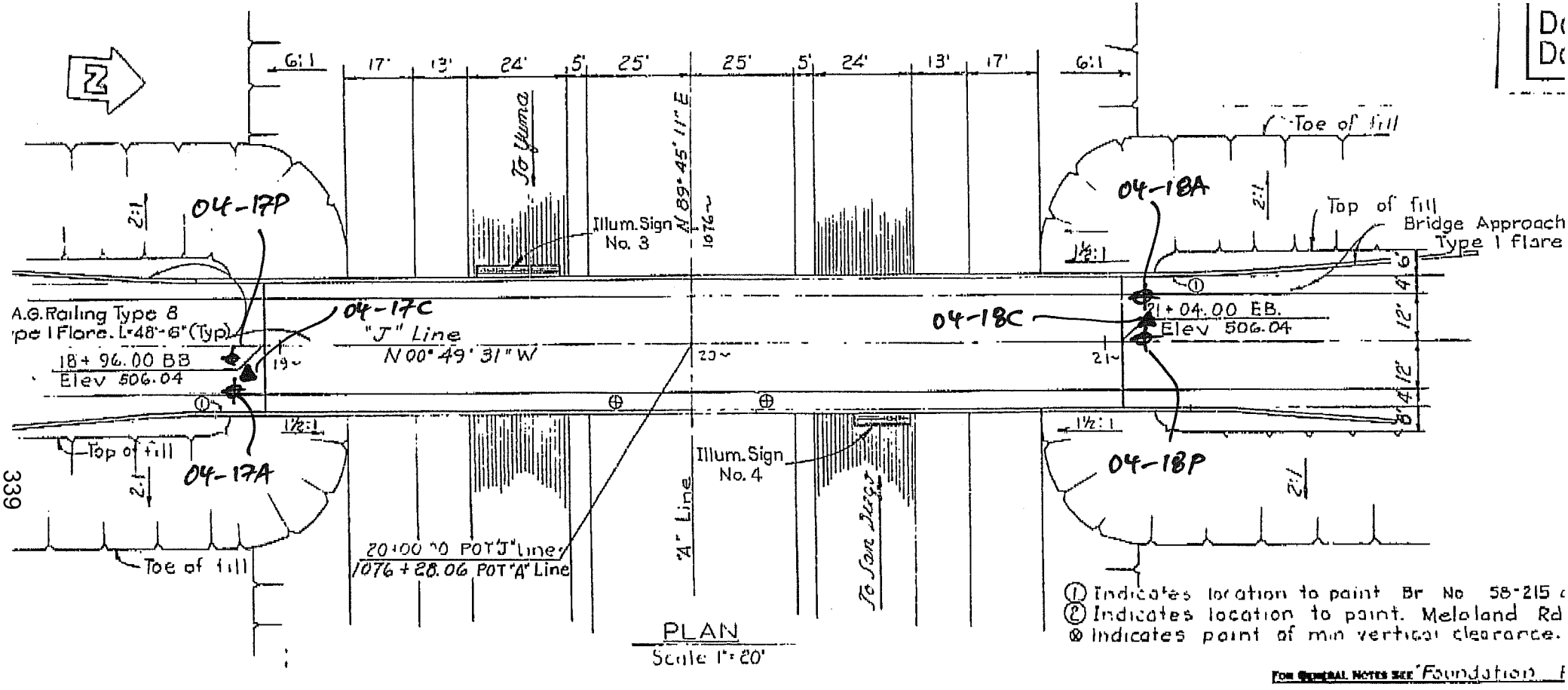
I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF PUBLIC WORKS.

Document No. A0000853






| OPTION | "A" | "B" | "C" |
|---|---|---|---|
| Concrete Pile | 3'-3" | 6" | 3" |
| Timber Pile | 3'-6" | 9" | 6" |




BOREHOLE / PMT

CPT

I HEREB
UNDER M
AUTHORI

DATE

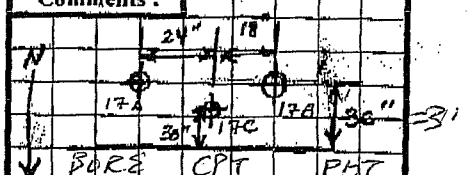
# LOG OF BORING NO. ( 04-17A )

04-17A

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

| | | | |
|---|---|---|---|
| Project Name | : UCSD Bridge Abutment Study/Meloland Bridge | | |
| Project Location | : 6 Miles east of El Centro | | |
| E.M.I. Project No. | : 02-165 | Site Condition : | Paved, concrete |
| Weather | : Sunny | Elevation : | |
| Traffic Control | : Caltrans | Operator : | |
| Drilling Company | : 2R Drilling, Inc. | Operator : | JERRY/JORGE |
| Type of Rig | : CME 55 | Drop (in) : | 30.0 |
| Borehole Diameter (inch) | : 8.0" | Drive Wt. (lbs) : | 140.0 |
| Logged By | : M.T. | Date Drilled : | 08-20-04 |

Comments :




Back Filled By : CUTTINGS

| | Time | | | | | | | | | | Back to Office | Proposed Depth |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Depature | Arrival | Start | Break | Rework | Lunch | Rework | Break | Finish | Off | | 20.0 ft |
| Driller | | | | | | | | | | | | Water Table |
| Traffic Control | | | | | | | | | | | | NA ft |
| Logger | | | | | | | | | | | | Caving |
| Total | | | | | | | | | | | | ft |

Description ( ASTM D-2488-93 )

| Depth (ft) | Sampler Type (Bulk, Drive, SPT, Tube) | Sample Number | Sample Type (BUNSLR/T) | Blows/6" | Recovery (inch) | U.S.C.S. | Color | 7" ASPHALT | Moisture State (Dry, Moist, Wet) | Max. Size | Grain Size (%) | Gravel : Sand : Fines | Sand Size | Plasticity | Consistency | Cementation | O²/LEL/PID |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | B | 0 | | | | | | Medium Dense | | | | | | | | | |
| | | | | 11 | | | | Yellowish Brown | | | | | | | | | |
| 2.5 | S | 1 | | 70 | 5 | | | Silty Sand, fine grain | | | | | | | | | |
| | | | | | 6 | | | with peat gravel, 8" gravel | | | | | | | | | |
| | | | | | 9 | | | | | | | | | | | | |
| 5 | D | 2 | | 5 | | | Yellowish brown | | | | | | | | | | |
| | | | | 11 | | | | Silty Sand with many | | | | | | | | | |
| | | | | 18 | | | | gravel - gravel - up to 1" | | | | | | | | | |
| 7.5 | S | 3 | | 10 | 15" | | Yellowish Brown, Medium dense | | | | | | | | | | |
| | | | | 8 | | | | Silty Sand with many | | | | | | | | | |
| | | | | 7 | | | | gravel 1.5" | | | | | | | | | |
| 10 | D | 4 | Bag Sample | 7 | | | Dark Brown | Silty Clay, Firm | | | | | | | | | |
| | | | | 4 | | | | | | | | | | | | | |
| | | | | 5 | | | | | | | | | | | | | |
| | | | | | | | | sample was disturbed by cutting | | | | | | | | | |
| 12.5 | S | 5 | 0.1" | 1 | | | | | | | | | | | | | |
| | | | | 2 | | | Dark Brown | ~~Soft~~ Silty Clay | | | | | | | | | |
| | | | | 3 | | | | sample could be found | | | | | | | | | |
| | | | | | | | | only at the tip of shoes | | | | | | | | | |
| 15 | D | 6 | | 5 | | | Dark B | stiff Silty Clay | | | | | | | | | |
| | | | | 8 | | | | | | | | | | | | | |
| | | | | 10 | | | | | | | | | | | | | |
| 20 | S | 7 | 15" | 3 | | | Dark B | stiff Silty clay, moisture | | | | | | | | | |
| | | | | 5 | | | | | | | | | | | | | |
| | | | | 7 | | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | | | | | | |

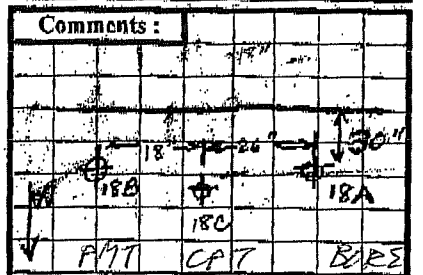
# LOG OF BORING NO. ( 04 - 18A )

04-18A

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

| | | | |
|---|---|---|---|
| Project Name | : UCSD Bridge Abutment Study/Meloland Bridge | | |
| Project Location | : 6 Miles east of El Centro | | |
| E.M.I. Project No. | : 02-165 | Site Condition : | Paved, concrete |
| Weather | : Sunny | Elevation : | |
| Traffic Control | : Caltrans | Operator : | GENE |
| Drilling Company | : 2R Drilling, Inc. | Operator : | JERRY/JORGE |
| Type of Rig | : CME 55 | Drop (in) : | 30.0 |
| Borehole Diameter (inch) | : 8.0" | Drive Wt. (lbs) : | 140.0 |
| Logged By | : | Date Drilled : | 08-20-04 |

Comments :



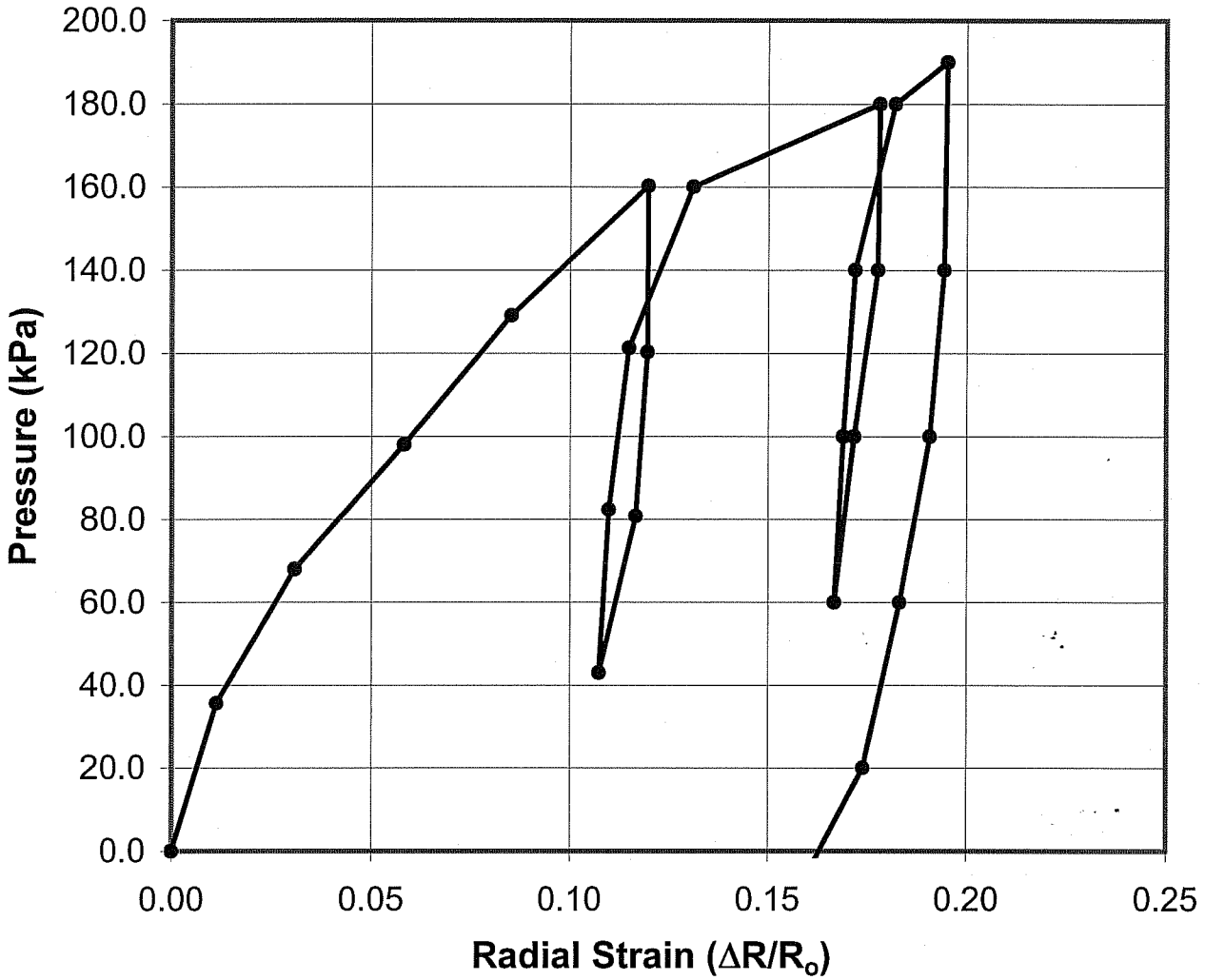

Back Filled By : CUTTINGS

| | Time | | | | | | | | | | Back to Office | Proposed Depth |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Depature | Arrival | Start | Break | Rework | Lunch | Rework | Break | Finish | Off | | 20.0 ft |
| Driller | | | | | | | | | | | | Water Table |
| Traffic Control | | | | | | | | | | | | N/A ft |
| Logger | | | | | | | | | | | | Caving |
| Total | | | | | | | | | | | | ft |

Description ( ASTM D-2488-93 )

| Depth (ft) | Sampler Type (Bulk, Drive, SPT, Tube) | Sample Number | Sample Type (B/D/S/B/T) | Blows/6" | Recovery (inch) | U.S.C.S. | Color | 5½" ASPHALT - | Moisture State (Dry, Moist, Wet) | Max. Size | Grain Size ( % ) Gravel : Sand : Fines | Sand Size | Plasticity | Consistency | Cementation | $O^2$/LEL/PID |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | B | 0 | | | | SP | | SAND, BRN-YELLOW, DRY, F-MED GRAINED TR PEA GRAVEL | | | : : | | | | | |
| 2.5 | S | 1 | | 8 11 11 | 18" | SP | | SAND, BROWN-PINK, DRY, MED DENSE, TR PEA GRAVEL, FINE TO MEDGRAINED, | | | 5:90:5 | | | | | |
| 5 | D | 2 | 13 19 29 | 13 19 29 | 12" | SP/SM | | SAME, SLIGHT INCREASE IN SILT | | | 5:85:10 | | | | | |
| 7.5 | S | 3 | | 6 10 9 | 14.5" | SP | | SAME, MOIST, SLIGHT INCREASE IN GRAVELS | | | | | | | | |
| 10 | D | 4 | | 2 1 2 | 12" | CL | | CLAY, DK BROWN, V. SOFT, WET, PLASTIC, * LIKELY ONLY PERCHED $H_2O$ @ CLAY/SAND INTERFACE | | | : : | | | | | |
| 12.5 | S | 5 | | 1 1 1 | 18" | CL | | SAME | | | | | | | | |
| 15 | D | 6 | | 4 5 7 | 12" | CL | | SAME, FIRM, MOIST, LOW PLASTICITY | | | : : | | | | | |
| 20 | S | 7 | | 3 4 6 | 17.5" | CL | | SAME, STIFF, MOIST, LOW PLASTICITY | | | : : | | | | | |
| | | | | | | BOH = 20' | | | | | | | | | | |
| 25 | | | | | | GW = N/A | | | | | : : | | | | | |

# Pressuremeter Test Result



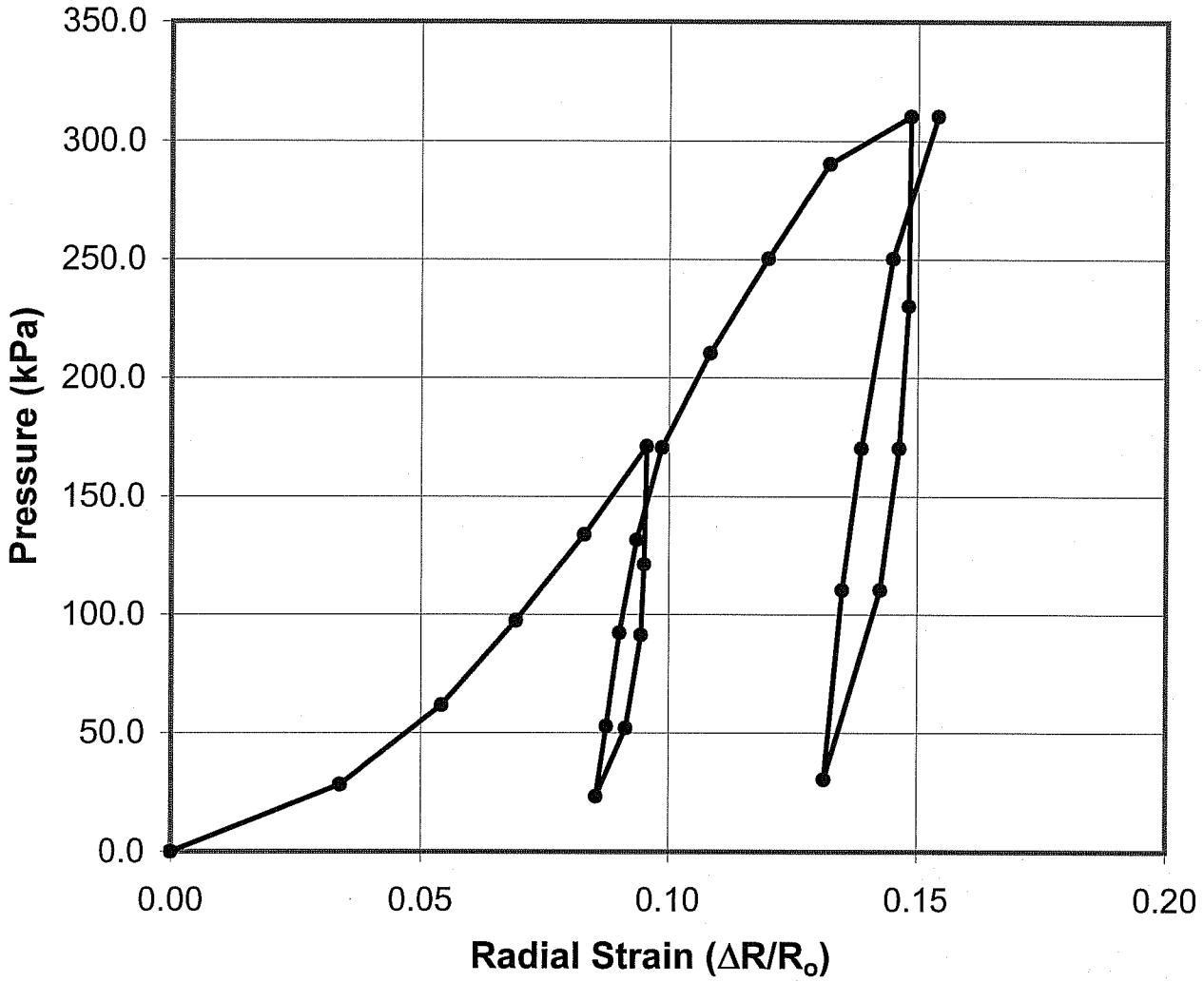

| | |
|---|---|
| Boring No.: | **04-17P** |
| Location: | **Meloland Overcrossing, Abut#1** |
| | **Imperial County** |
| Test Date: | **8/20/04** |
| Test Depth: | **11 ft** |
| Soil Type: | **Clay with Sand** |

**Earth Mechanics, Inc.**
Geotechnical and Earthquake Engineering

**CALTRANS-UCSD / Abutment Research**

Project No : 02-165 | Date : 12/22/2004

# Pressuremeter Test Result



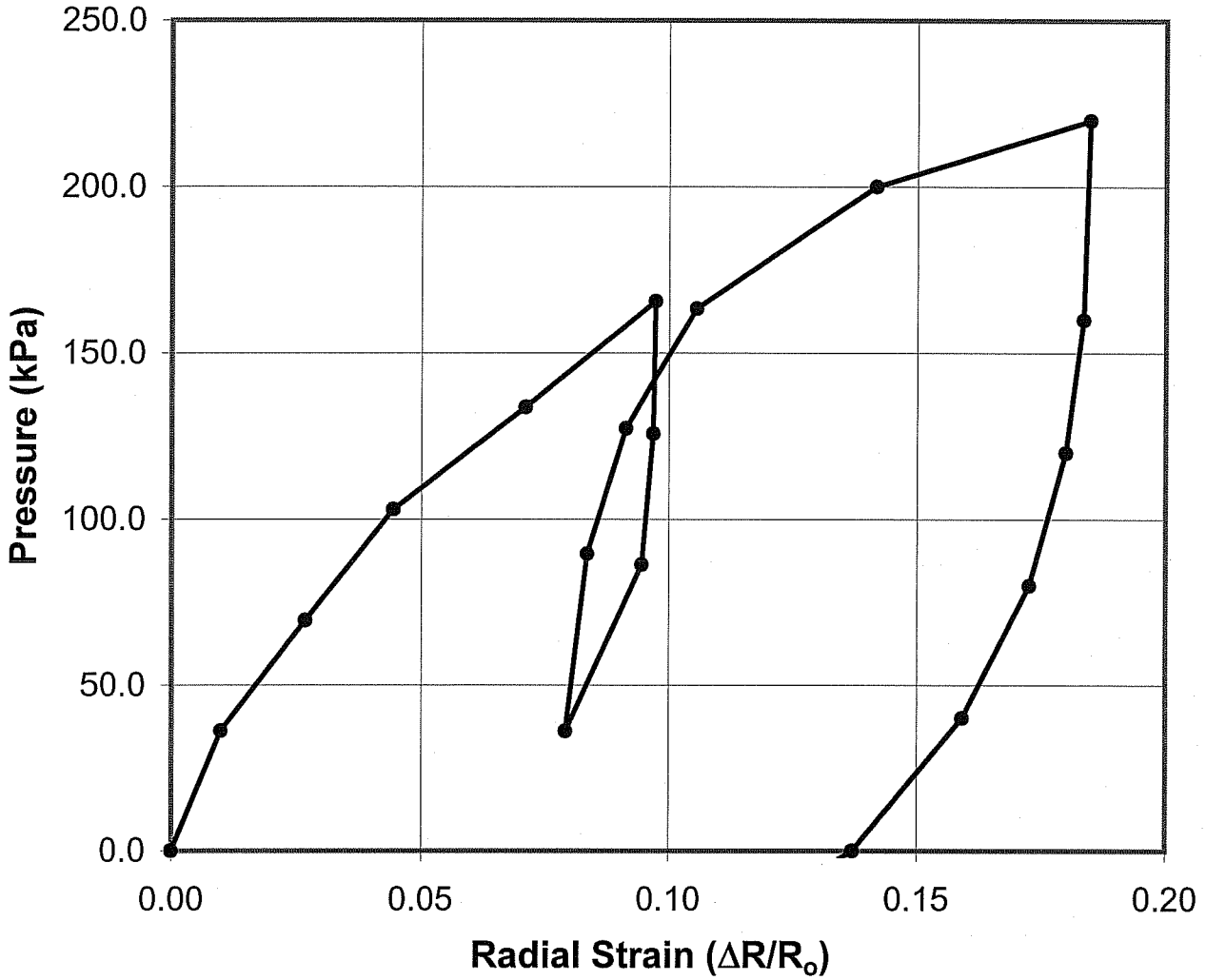

| | |
|---|---|
| Boring No.: | **04-18P** |
| Location: | **Meloland Overcrossing, Abut#3** |
| | **Imperial County** |
| Test Date: | **8/20/04** |
| Test Depth: | **7.5 ft** |
| Soil Type: | **Silty Sand with Gravel** |

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

**CALTRANS-UCSD / Abutment Research**

Project No : 02-165 | Date : 12/22/2004

# Pressuremeter Test Result




| | |
|---|---|
| Boring No.: | **04-18P** |
| Location: | **Meloland Overcrossing, Abut#3** |
| | **Imperial County** |
| Test Date: | **8/20/04** |
| Test Depth: | **11.5 ft** |
| Soil Type: | **Clay with Sand** |

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

**CALTRANS-UCSD / Abutment Research**

Project No : 02-165 | Date : 12/22/2004

HOLGUIN, FAHAN & ASSOCIATES, INC.
ENVIRONMENTAL MANAGEMENT CONSULTANTS
948 North Lemon Street, Orange, CA 92867 (714)-210-5971 FAX (714) 210-5975

August 31, 2004



Mr. Mike Kapuskar
Earth Mechanics, Inc.
17660 Newhope St, Suite E
Fountain Valley, CA 92708

**PROJECT NAME:** CPT Testing at UCSD Bridge Study in El Centro, CA;
**PROJECT NO.:** 02165

Dear Mr. Kapuskar:

Enclosed please find copies of the cone penetrometer testing (CPT) data for the above referenced project along with a copy of the corresponding invoice.

The cone penetrometer testing conducted for this project consisted of pushing an instrumented cone-tipped probe into the ground while simultaneously recording the resistance to penetration at the cone tip and along the friction sleeve.

The cone penetrometer testing described in this report was conducted in general accordance with the current ASTM specifications (ASTM D5778-95 and D3441-94) using an electronic cone penetrometer.

The CPT equipment operated by Holguin, Fahan & Associates, Inc. (HFA) consists of a cone assembly mounted at the end of a series of hollow sounding rods. A set of hydraulic rams is used to continuously push the cone and rods into the soil at a rate of 20-mm per second (approximately four feet per minute) while the cone tip resistance and sleeve friction resistance are recorded every 50-mm (approximately two inches) and stored in digital form. A specially designed all wheel drive 23-ton truck provides the required reaction weight for pushing the cone assembly and is also used to transport and house the test equipment.

The cone penetrometer assembly used for this project consists of a conical tip and a cylindrical friction sleeve. The conical tip has a 60° apex angle and a diameter of 35.6-mm (1.40-inch) resulting in a projected cross-sectional area of 10 $cm^2$ (1.5 square inches). The cylindrical friction sleeve is 133-mm (5.25-inch) in length and has an outside diameter of 35.8-mm (1.41-inch), resulting in a surface area of 150 $cm^2$ (23 square inches).

The interior of the cone penetrometer is instrumented with strain gauges that allow simultaneous measurement of cone tip and friction sleeve resistance during penetration. Continuous electric signals from the strain gauges are transmitted by a shielded cable in the sounding rods to the PC-based data acquisition hardware in the CPT truck. The sounding log is also displayed on a monitor.

The CPT data processing is performed using the truck mounted computer based data acquisition and presentation system. The computer generated graphical logs include cone resistance, friction resistance, friction ratio, and pore pressure ratio versus depth at a user selectable scale.

Soil behavior type interpretations are based on the following reference: Robertson, P.K. and Campanella, R.C., 1989, "Guidelines for Geotechnical Design using the Cone Penetrometer Test and CPT with Pore Pressure Measurement." Soil Mechanics series No. 120, Civil Engineering Department, University of British Columbia, Vancouver, B.C., V6T 1Z4, September 1989.

Interpretations and plotting has been done using HFA's proprietary data interpretation and presentation software. It is important to note that the data is not averaged. All interpretations are point interpretations at the corresponding depth listed.

It is also important to note that the soil behavior type correlations are based on a combination of theory, field research, research performed under laboratory conditions, and literature review. The information presented in the tabulated and/or graphical logs should, therefore, be viewed as a guideline rather than as precise measurements.

Some care is recommended when using the soil behavior type interpretations. If a tabulation depth happens to fall on a soil layer interface, or a seam of soil differing from the rest of the layer, the tabulated data can be misleading. The solution to this problem is the proper use of the graphical CPT logs. The tip and sleeve penetration resistance logs are the primary source of profile description; the soil behavior type logs are supplemental. The graphical logs of tip and sleeve resistance should be examined and layer boundaries delineated in accordance with the project requirements. The soil behavior type interpretations are only representative of the response of the soil to the large shear deformations imposed during cone penetration. This is not necessarily a prediction of grain size distribution. However, it has been found that the interpreted soil behavior types generally agree well with the soil types defined in accordance with the grain size distribution methods such as used in the Unified Soil Classification System.

Limitations

Holguin, Fahan & Associates, Inc. (HFA) presents the attached data in accordance with ASTM Standards D5778-95 and D3441-94 and generally accepted cone penetrometer testing practices and standards. The attached data further relates only to the specific project and location discussed in the data. Judgement may be required to verify the CPT soil behavior interpretations.

The "Client" may distribute this data or excerpts therefrom provided the following statement is prominently displayed and included with the distribution:

"Neither CLIENT nor HFA make any guarantee or warranty, express or implied, regarding this data. THE USE OF THIS INFORMATION SHALL BE AT THE USER'S SOLE RISK REGARDLESS OF ANY FAULT OR NEGLIGENCE OF THE CLIENT OR HFA."

Please feel free to call if you have any questions.

Respectfully submitted,

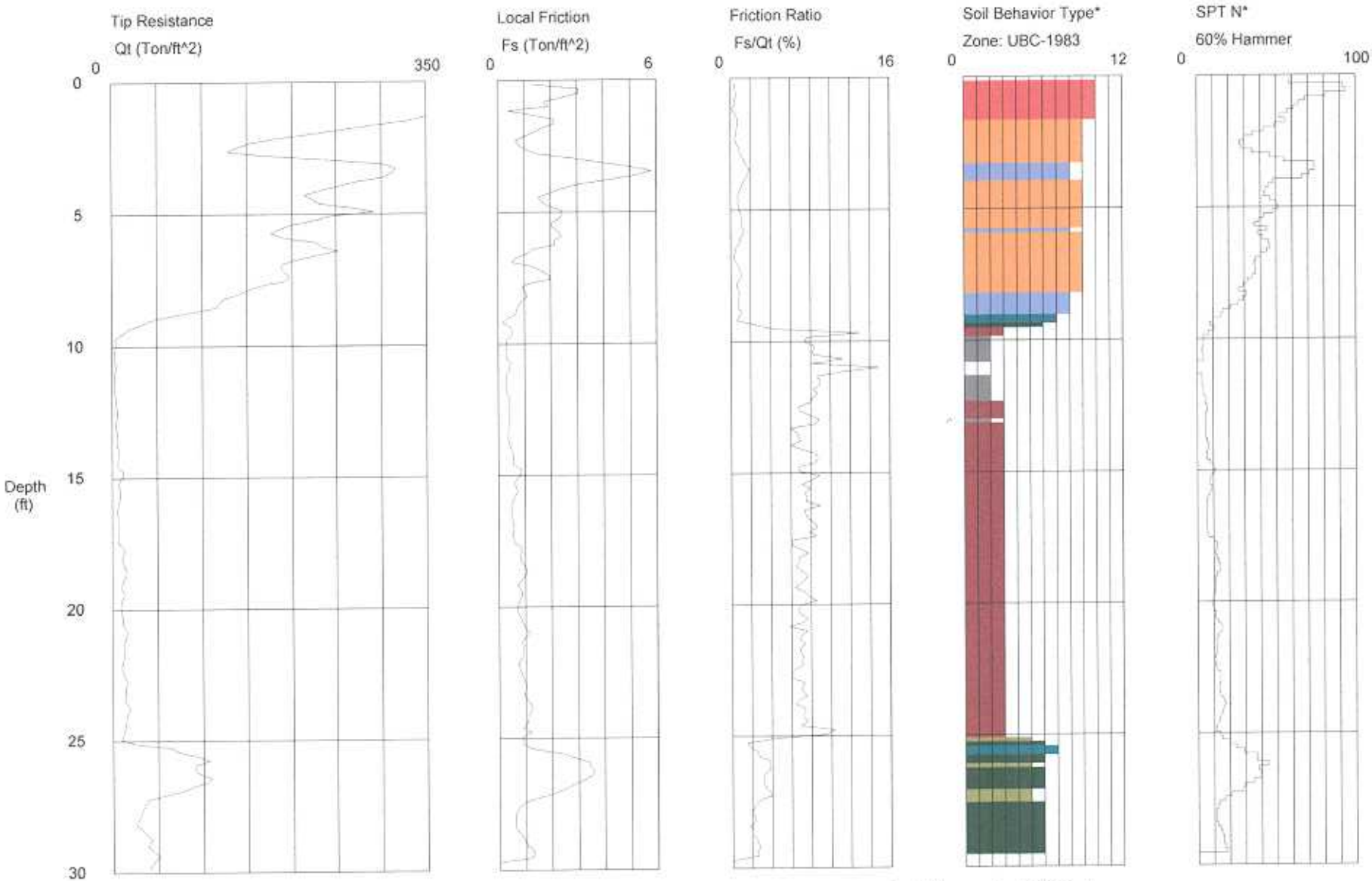
Amanda Hancock
CPT Operations Manager
Holguin, Fahan & Associates, Inc.

:AH\Enclosures

# Earth Mechanics

Operator: ML-VO
Sounding: 04-18C
Cone Used: DSG786

CPT Date/Time: 8/20/2004 12:47
Location: UCSD Bridge Study
Job Number: 02165




Maximum Depth = 29.86 feet

Depth Increment = 0.164 feet

1 sensitive fine grained
2 organic material
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 very stiff fine grained (*)
12 sand to clayey sand (*)

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

# CPT INTERPRETATIONS

SOUNDING : 04-18C
PROJECT : UCSD Bridge Stud
DATE/TIME: 8/20/2004 12:47

PROJECT No.: 2165
CONE/RIG : DSG786



| DEPTH (m) | DEPTH (ft) | TIP RESISTANCE (tsf) | FRICTION RATIO (%) | SOIL BEHAVIOR TYPE | N(60) | N1(60) | Dr (%) | Su (tsf) | PHI (Degrees) |
|---|---|---|---|---|---|---|---|---|---|
| .150 | .49 | 641.26 | .47 | GRAVELLY SAND to SAND | 100 | 100 | 100 | | |
| .300 | .98 | 400.56 | .48 | GRAVELLY SAND to SAND | 67 | 100 | 100 | | |
| .450 | 1.48 | 330.72 | .64 | SAND | 66 | 100 | 100 | | |
| .600 | 1.97 | 220.07 | .62 | SAND | 44 | 70 | 99 | | |
| .750 | 2.46 | 139.38 | .57 | SAND | 28 | 45 | 86 | | |
| .900 | 2.95 | 244.64 | 1.14 | SAND | 49 | 78 | 100 | | |
| 1.050 | 3.44 | 312.19 | 1.86 | SAND to SILTY SAND | 78 | 100 | 100 | | |
| 1.200 | 3.94 | 252.59 | 1.22 | SAND | 51 | 81 | 100 | | |
| 1.350 | 4.43 | 222.84 | .68 | SAND | 45 | 71 | 99 | | 49.5 |
| 1.500 | 4.92 | 292.07 | .82 | SAND | 58 | 93 | 100 | | |
| 1.650 | 5.41 | 198.00 | 1.01 | SAND | 40 | 63 | 96 | | 48.0 |
| 1.800 | 5.91 | 191.28 | 1.26 | SAND to SILTY SAND | 48 | 76 | 95 | | 47.5 |
| 1.950 | 6.40 | 251.72 | .53 | SAND | 50 | 81 | 100 | | 48.5 |
| 2.100 | 6.89 | 189.12 | .28 | SAND | 38 | 59 | 95 | | 47.0 |
| 2.250 | 7.38 | 197.07 | .98 | SAND | 39 | 59 | 96 | | 47.0 |
| 2.400 | 7.87 | 150.12 | .59 | SAND | 30 | 44 | 88 | | 45.5 |
| 2.550 | 8.37 | 120.41 | .73 | SAND to SILTY SAND | 30 | 42 | 82 | | 44.5 |
| 2.700 | 8.86 | 63.22 | 1.05 | SILTY SAND to SANDY SILT | 21 | 29 | 63 | | 41.0 |
| 2.850 | 9.35 | 18.70 | 2.49 | CLAYEY SILT to SILTY CLAY | 9 | 12 | | 1.2 | |
| 3.000 | 9.84 | 4.25 | 7.60 | ORGANIC MATERIAL | 4 | 6 | | .4 | |
| 3.150 | 10.33 | 3.46 | 8.27 | ORGANIC MATERIAL | 3 | 4 | | .3 | |
| 3.300 | 10.83 | 5.31 | 8.15 | CLAY | 5 | 7 | | .3 | |
| 3.450 | 11.32 | 3.42 | 8.63 | ORGANIC MATERIAL | 3 | 4 | | .3 | |
| 3.600 | 11.81 | 3.65 | 8.27 | ORGANIC MATERIAL | 4 | 4 | | .3 | |
| 3.750 | 12.30 | 5.38 | 7.97 | CLAY | 5 | 6 | | .3 | |
| 3.900 | 12.80 | 5.31 | 7.87 | CLAY | 5 | 6 | | .3 | |
| 4.050 | 13.29 | 6.31 | 5.93 | CLAY | 6 | 7 | | .4 | |
| 4.200 | 13.78 | 6.11 | 6.96 | CLAY | 6 | 7 | | .4 | |
| 4.350 | 14.27 | 6.82 | 8.52 | CLAY | 7 | 7 | | .4 | |
| 4.500 | 14.76 | 12.91 | 6.71 | CLAY | 13 | 14 | | .8 | |
| 4.650 | 15.26 | 7.18 | 8.13 | CLAY | 7 | 8 | | .4 | |
| 4.800 | 15.75 | 8.66 | 7.37 | CLAY | 9 | 9 | | .5 | |
| 4.950 | 16.24 | 5.63 | 8.93 | CLAY | 6 | 6 | | .3 | |
| 5.100 | 16.73 | 6.95 | 7.74 | CLAY | 7 | 7 | | .4 | |
| 5.250 | 17.22 | 6.81 | 7.81 | CLAY | 7 | 7 | | .4 | |
| 5.400 | 17.72 | 13.74 | 6.01 | CLAY | 14 | 13 | | .8 | |
| 5.550 | 18.21 | 12.21 | 6.78 | CLAY | 12 | 12 | | .7 | |
| 5.700 | 18.70 | 15.48 | 6.92 | CLAY | 15 | 15 | | 1.0 | |
| 5.850 | 19.19 | 10.18 | 6.91 | CLAY | 10 | 9 | | .6 | |
| 6.000 | 19.69 | 10.54 | 7.75 | CLAY | 11 | 10 | | .6 | |
| 6.150 | 20.18 | 10.36 | 6.77 | CLAY | 10 | 9 | | .6 | |

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 40.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

*HOLGUIN, FAHAN & ASSOCIATES, INC.*

*Interpretations based on: Robertson and Campanella, 1989.*

SOUNDING : 04-18C

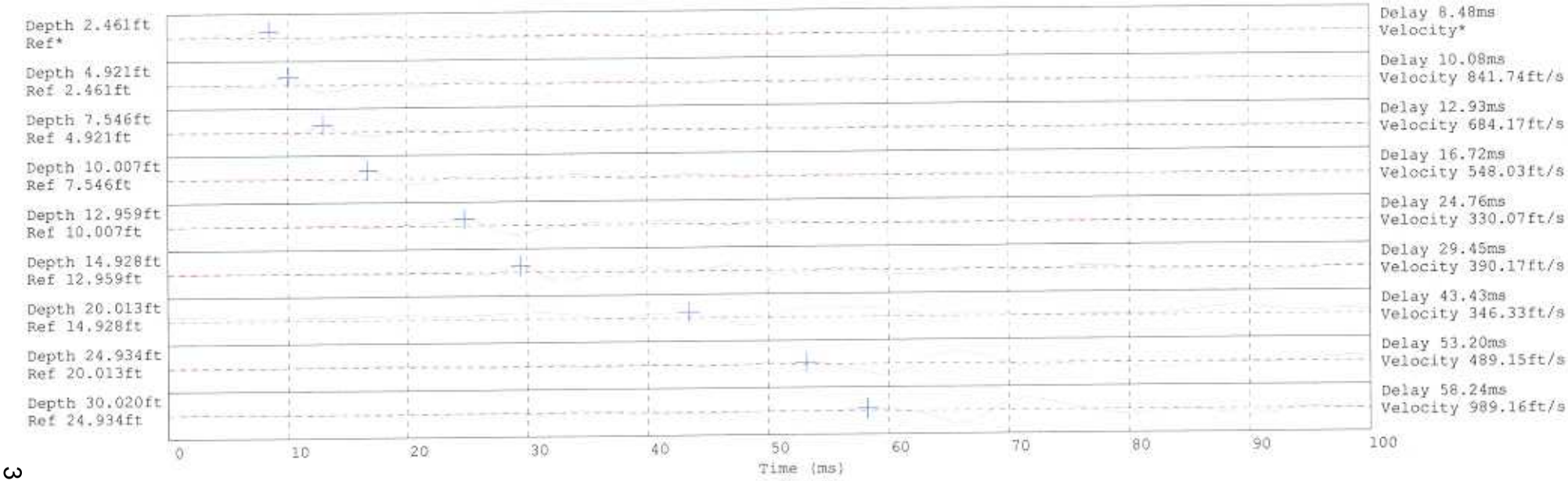
| DEPTH (m) | DEPTH (ft) | TIP RESISTANCE (tsf) | FRICTION RATIO (%) | SOIL BEHAVIOR TYPE | N(60) | N1(60) | Dr (%) | Su (tsf) | PHI (Degrees) |
|---|---|---|---|---|---|---|---|---|---|
| 6.300 | 20.67 | 13.00 | 7.19 | CLAY | 13 | 12 | | .8 | |
| 6.450 | 21.16 | 14.02 | 7.07 | CLAY | 14 | 12 | | .9 | |
| 6.600 | 21.65 | 13.25 | 6.86 | CLAY | 13 | 12 | | .8 | |
| 6.750 | 22.15 | 10.49 | 7.00 | CLAY | 10 | 9 | | .6 | |
| 6.900 | 22.64 | 14.82 | 6.04 | CLAY | 15 | 13 | | .9 | |
| 7.050 | 23.13 | 14.47 | 7.00 | CLAY | 14 | 12 | | .9 | |
| 7.200 | 23.62 | 16.71 | 6.75 | CLAY | 17 | 14 | | 1.0 | |
| 7.350 | 24.11 | 15.13 | 7.20 | CLAY | 15 | 13 | | .9 | |
| 7.500 | 24.61 | 12.85 | 6.87 | CLAY | 13 | 11 | | .8 | |
| 7.650 | 25.10 | 22.68 | 3.97 | CLAY to SILTY CLAY | 15 | 12 | | 1.4 | |
| 7.800 | 25.59 | 92.56 | 2.59 | SANDY SILT to CLAYEY SILT | 37 | 30 | | 6.1 | |
| 7.950 | 26.08 | 91.07 | 3.76 | CLAYEY SILT to SILTY CLAY | 46 | 36 | | 5.3 | |
| 8.100 | 26.57 | 104.89 | 3.08 | SANDY SILT to CLAYEY SILT | 42 | 33 | | 6.1 | |
| 8.250 | 27.07 | 58.37 | 3.67 | CLAYEY SILT to SILTY CLAY | 29 | 23 | | 3.3 | |
| 8.400 | 27.56 | 33.36 | 2.40 | SANDY SILT to CLAYEY SILT | 13 | 10 | | 2.1 | |
| 8.550 | 28.05 | 27.00 | 2.22 | SANDY SILT to CLAYEY SILT | 11 | 8 | | 1.7 | |
| 8.700 | 28.54 | 37.15 | 1.97 | SANDY SILT to CLAYEY SILT | 15 | 11 | | 2.4 | |
| 8.850 | 29.04 | 38.73 | 2.58 | SANDY SILT to CLAYEY SILT | 15 | 12 | | 2.5 | |
| 9.000 | 29.53 | 46.60 | 2.62 | SANDY SILT to CLAYEY SILT | 19 | 14 | | 3.0 | |

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 40.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

*HOLGUIN, FAHAN & ASSOCIATES, INC.*

*Interpretations based on: Robertson and Campanella, 1989.*

# Earth Mechanics
## 04-18C

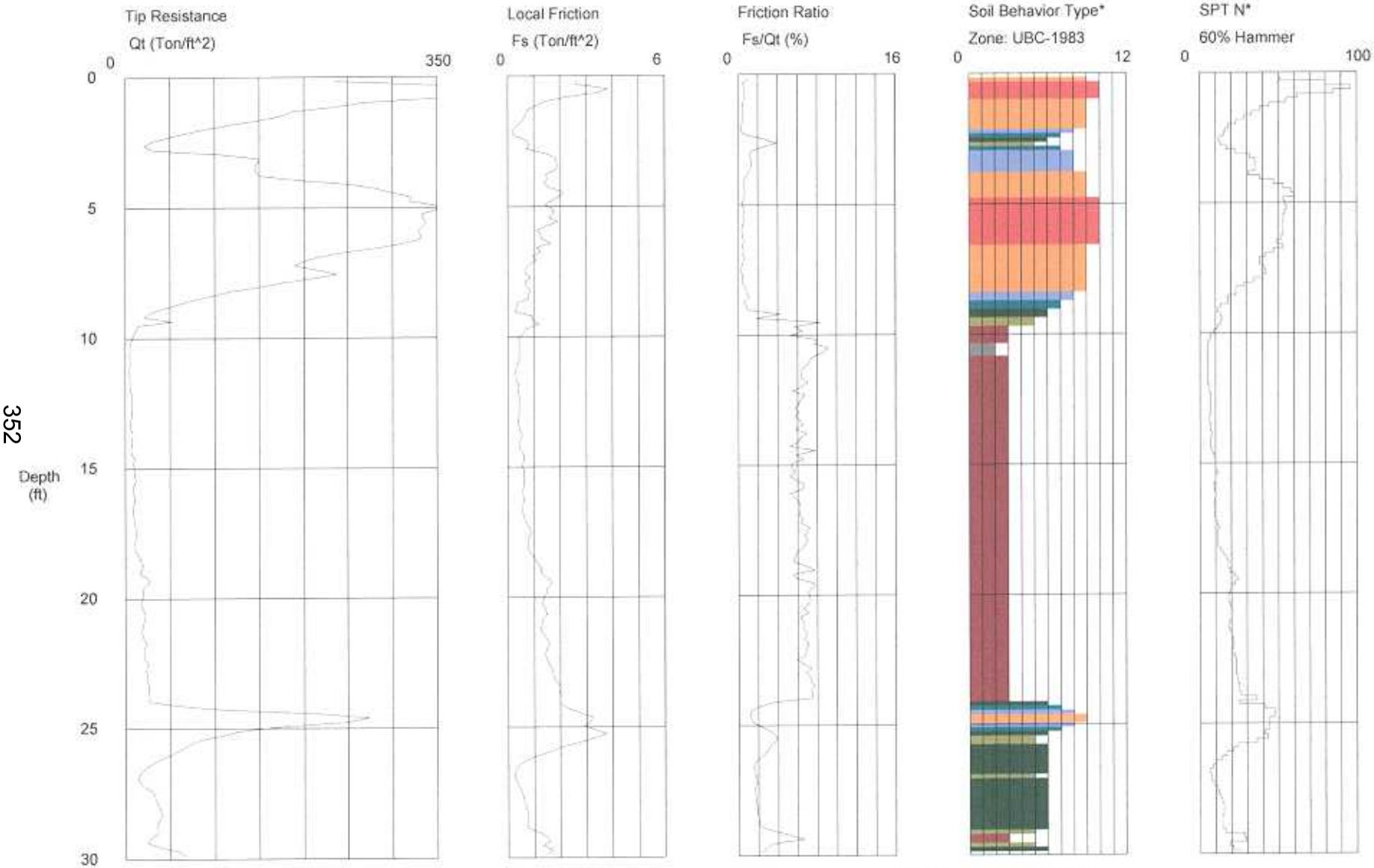



Hammer to Rod String Distance 1.6891 (m)
* = Not Determined

# Earth Mechanics

Operator: ML-VO
Sounding: 04-17C
Cone Used: DSG786

CPT Date/Time: 8/24/2004 10:27
Location: UCSD Bridge Study
Job Number: 02165




Maximum Depth = 30.35 feet

Depth Increment = 0.164 feet

1 sensitive fine grained
2 organic material
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 very stiff fine grained (*)
12 sand to clayey sand (*)

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

# CPT INTERPRETATIONS

SOUNDING : 04-17C
PROJECT : UCSD Bridge Stud
DATE/TIME: 8/24/2004 10:27

PROJECT No.: 2165
CONE/RIG : DSG786



| DEPTH (m) | DEPTH (ft) | TIP RESISTANCE (tsf) | FRICTION RATIO (%) | SOIL BEHAVIOR TYPE | N(60) | N1(60) | Dr (%) | Su (tsf) | PHI (Degrees) |
|---|---|---|---|---|---|---|---|---|---|
| .150 | .49 | 709.44 | .54 | GRAVELLY SAND to SAND | 100 | 100 | 100 | | |
| .300 | .98 | 268.46 | .51 | SAND | 54 | 86 | 100 | | |
| .450 | 1.48 | 175.93 | .41 | SAND | 35 | 56 | 93 | | |
| .600 | 1.97 | 91.13 | .32 | SAND to SILTY SAND | 23 | 36 | 74 | | 49.0 |
| .750 | 2.46 | 29.28 | 2.50 | SANDY SILT to CLAYEY SILT | 12 | 19 | | 1.9 | |
| .900 | 2.95 | 109.40 | 1.25 | SAND to SILTY SAND | 27 | 44 | 79 | | 48.0 |
| 1.050 | 3.44 | 144.92 | 1.31 | SAND to SILTY SAND | 36 | 58 | 87 | | 48.5 |
| 1.200 | 3.94 | 194.39 | .78 | SAND | 39 | 62 | 95 | | 49.5 |
| 1.350 | 4.43 | 301.28 | .70 | SAND | 60 | 96 | 100 | | |
| 1.500 | 4.92 | 352.37 | .41 | GRAVELLY SAND to SAND | 59 | 94 | 100 | | |
| 1.650 | 5.41 | 334.16 | .48 | GRAVELLY SAND to SAND | 56 | 89 | 100 | | |
| 1.800 | 5.91 | 328.92 | .34 | GRAVELLY SAND to SAND | 55 | 88 | 100 | | |
| 1.950 | 6.40 | 307.21 | .54 | SAND | 61 | 98 | 100 | | 49.0 |
| 2.100 | 6.89 | 215.26 | .44 | SAND | 43 | 67 | 98 | | 47.5 |
| 2.250 | 7.38 | 213.63 | .31 | SAND | 43 | 64 | 98 | | 47.0 |
| 2.400 | 7.87 | 173.81 | .38 | SAND | 35 | 51 | 92 | | 46.0 |
| 2.550 | 8.37 | 96.71 | .81 | SAND to SILTY SAND | 24 | 34 | 75 | | 43.5 |
| 2.700 | 8.86 | 40.38 | .87 | SILTY SAND to SANDY SILT | 13 | 18 | 50 | | 38.5 |
| 2.850 | 9.35 | 52.57 | 1.78 | SILTY SAND to SANDY SILT | 18 | 23 | 57 | | 39.5 |
| 3.000 | 9.84 | 9.19 | 6.54 | CLAY | 9 | 12 | | .6 | |
| 3.150 | 10.33 | 5.33 | 7.75 | CLAY | 5 | 7 | | .3 | |
| 3.300 | 10.83 | 5.78 | 7.56 | CLAY | 6 | 7 | | .3 | |
| 3.450 | 11.32 | 4.65 | 6.34 | CLAY | 5 | 6 | | .3 | |
| 3.600 | 11.81 | 5.61 | 7.06 | CLAY | 6 | 7 | | .3 | |
| 3.750 | 12.30 | 6.92 | 6.76 | CLAY | 7 | 8 | | .4 | |
| 3.900 | 12.80 | 7.62 | 5.68 | CLAY | 8 | 9 | | .5 | |
| 4.050 | 13.29 | 6.11 | 6.27 | CLAY | 6 | 7 | | .4 | |
| 4.200 | 13.78 | 8.01 | 6.93 | CLAY | 8 | 9 | | .5 | |
| 4.350 | 14.27 | 8.12 | 5.21 | CLAY | 8 | 9 | | .5 | |
| 4.500 | 14.76 | 9.18 | 6.63 | CLAY | 9 | 10 | | .6 | |
| 4.650 | 15.26 | 10.50 | 5.80 | CLAY | 11 | 11 | | .6 | |
| 4.800 | 15.75 | 8.78 | 6.75 | CLAY | 9 | 9 | | .5 | |
| 4.950 | 16.24 | 10.58 | 5.71 | CLAY | 11 | 11 | | .6 | |
| 5.100 | 16.73 | 9.20 | 6.23 | CLAY | 9 | 9 | | .5 | |
| 5.250 | 17.22 | 12.04 | 6.34 | CLAY | 12 | 12 | | .7 | |
| 5.400 | 17.72 | 11.67 | 6.76 | CLAY | 12 | 11 | | .7 | |
| 5.550 | 18.21 | 12.43 | 6.43 | CLAY | 12 | 12 | | .8 | |
| 5.700 | 18.70 | 20.22 | 5.54 | CLAY | 20 | 19 | | 1.1 | |
| 5.850 | 19.19 | 24.76 | 5.52 | CLAY | 25 | 23 | | 1.4 | |
| 6.000 | 19.69 | 19.21 | 7.60 | CLAY | 19 | 18 | | 1.2 | |
| 6.150 | 20.18 | 17.44 | 7.34 | CLAY | 17 | 16 | | 1.1 | |

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 40.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

*HOLGUIN, FAHAN & ASSOCIATES, INC.*

*Interpretations based on: Robertson and Campanella, 1989.*

SOUNDING : 04-17C

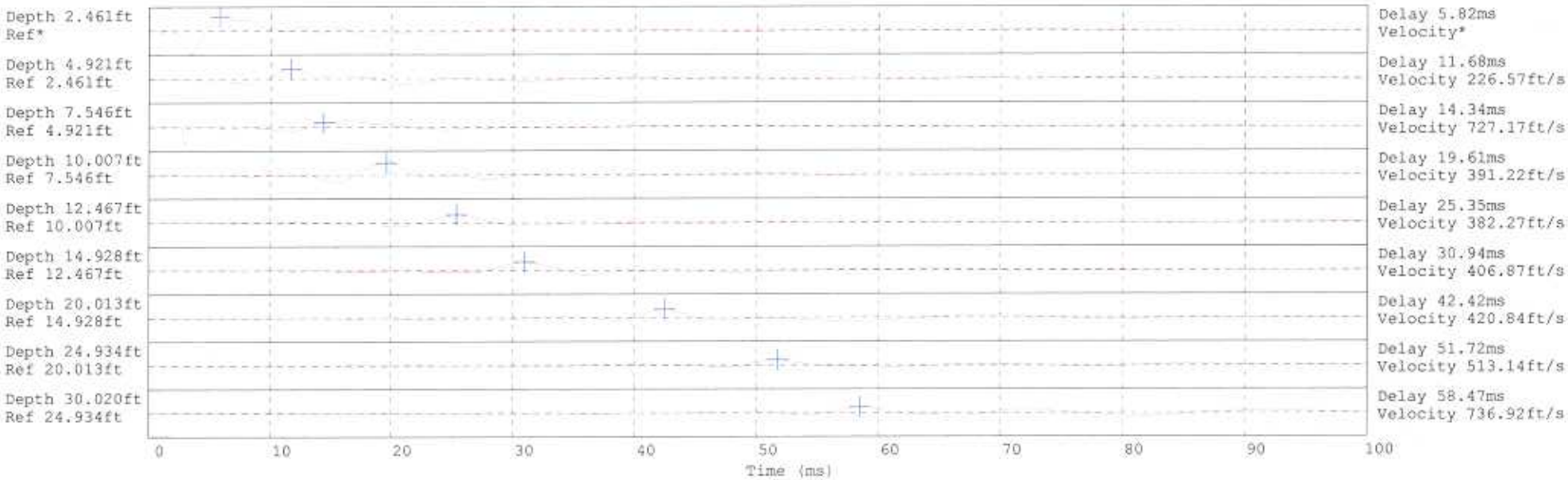
| DEPTH (m) | DEPTH (ft) | TIP RESISTANCE (tsf) | FRICTION RATIO (%) | SOIL BEHAVIOR TYPE | N(60) | N1(60) | Dr (%) | Su (tsf) | PHI (Degrees) |
|---|---|---|---|---|---|---|---|---|---|
| 6.300 | 20.67 | 20.88 | 7.12 | CLAY | 21 | 19 | | 1.3 | |
| 6.450 | 21.16 | 19.00 | 6.66 | CLAY | 19 | 17 | | 1.2 | |
| 6.600 | 21.65 | 22.66 | 6.61 | CLAY | 23 | 20 | | 1.3 | |
| 6.750 | 22.15 | 20.93 | 6.80 | CLAY | 21 | 18 | | 1.2 | |
| 6.900 | 22.64 | 24.06 | 6.58 | CLAY | 24 | 21 | | 1.3 | |
| 7.050 | 23.13 | 24.07 | 7.31 | CLAY | 24 | 20 | | 1.3 | |
| 7.200 | 23.62 | 26.47 | 7.38 | CLAY | 26 | 22 | | 1.5 | |
| 7.350 | 24.11 | 58.04 | 3.45 | CLAYEY SILT to SILTY CLAY | 29 | 24 | | 3.3 | |
| 7.500 | 24.61 | 274.20 | 1.17 | SAND | 55 | 45 | 90 | | 43.5 |
| 7.650 | 25.10 | 127.15 | 2.59 | SILTY SAND to SANDY SILT | 42 | 35 | 68 | | 39.0 |
| 7.800 | 25.59 | 72.20 | 3.76 | CLAYEY SILT to SILTY CLAY | 36 | 29 | | 4.2 | |
| 7.950 | 26.08 | 44.38 | 2.61 | SANDY SILT to CLAYEY SILT | 18 | 14 | | 2.9 | |
| 8.100 | 26.57 | 20.33 | 1.44 | SANDY SILT to CLAYEY SILT | 8 | 6 | | 1.5 | |
| 8.250 | 27.07 | 16.46 | 1.76 | CLAYEY SILT to SILTY CLAY | 8 | 6 | | 1.2 | |
| 8.400 | 27.56 | 32.46 | 1.66 | SANDY SILT to CLAYEY SILT | 13 | 10 | | 2.5 | |
| 8.550 | 28.05 | 38.32 | 1.79 | SANDY SILT to CLAYEY SILT | 15 | 12 | | 2.9 | |
| 8.700 | 28.54 | 37.76 | 1.99 | SANDY SILT to CLAYEY SILT | 15 | 12 | | 2.4 | |
| 8.850 | 29.04 | 35.53 | 3.36 | CLAYEY SILT to SILTY CLAY | 18 | 13 | | 2.3 | |
| 9.000 | 29.53 | 38.14 | 3.45 | CLAYEY SILT to SILTY CLAY | 19 | 14 | | 2.4 | |
| 9.150 | 30.02 | 76.41 | 2.06 | SILTY SAND to SANDY SILT | 25 | 19 | 51 | | 36.5 |

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 40.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

*HOLGUIN, FAHAN & ASSOCIATES, INC.*

*Interpretations based on: Robertson and Campanella, 1989.*

# Earth Mechanics
## 04-17C



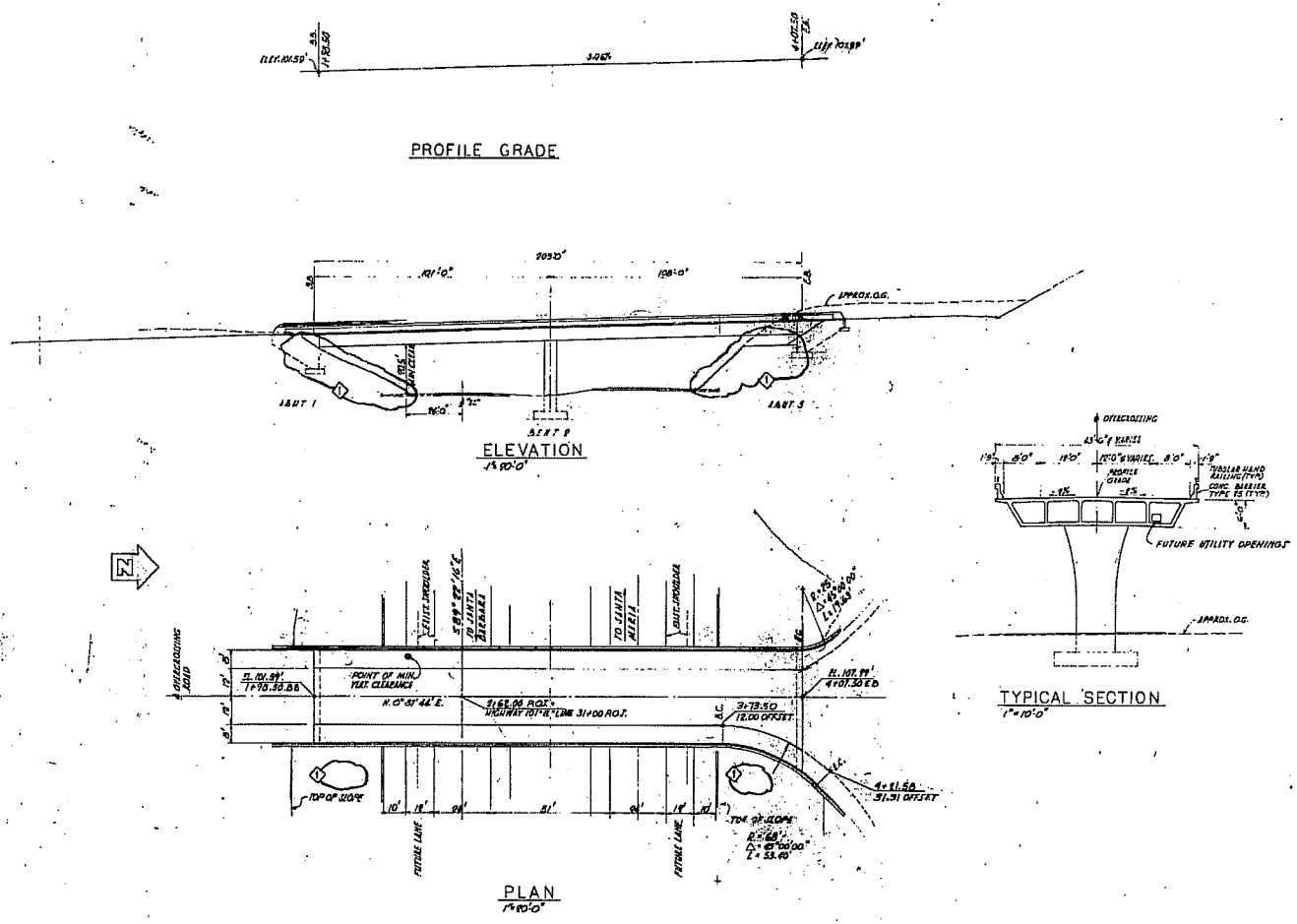

Hammer to Rod String Distance 1.7272 (m)
* = Not Determined

# Caltrans Bridge 51-0234
# Becksead OC, Santa Barbara Co.

**Caltrans Bridge 51-0234, Becksead OC, Santa Barbara Co.**

This bridge is located northwest of the city of Santa Barbara in Santa Barbara County. The bridge is an overcrossing over Rte 101.

Caltrans provided a bulk sample taken from this bridge site. We have performed UU testing on this sample. Test results are in Appendix C.




## INDEX TO PLANS

| DRAWING No | TITLE |
|---|---|
| F-11042 | GENERAL PLAN |
| F-11043 | LOG OF TEST PITS |
| F-11044 | ABUTMENT PLANS & DETAILS |
| F-11045 | ABUTMENT DETAILS |
| F-11046 | SECTIONS AND GIRDER LAYOUT |
| STANDARD PLANS, DATED JANUARY, 1981 | |
| BD-1, 3, 5 & 13 | BRIDGE DETAILS |
| BT-1 | BOX GIRDER DETAILS |
| BT-6 | DECK DRAINS - TYPES D-1 & D-2 |
| BT-10 | UTILITY OPENING - BOX GIRDER |
| BH-31 | TUBULAR HANDRAILING |
| BH-33 | CONCRETE BARRIER - TYPE 25 |
| BH-30 | TEMPORARY RAILING (TYPE K) |

NOTE:
MINIMUM OPENING WITCH FOR FALSEWORK IS 44'.
MINIMUM TEMPORARY VERTICAL CLEARANCE IS 14'-6".

### GENERAL NOTES
### LOAD FACTOR DESIGN

DESIGN: BRIDGE DESIGN SPECIFICATIONS (1977) AASHTO with Interims and California Supplements.

DEAD LOAD: Includes 20 psf for future wearing surface.

LIVE LOADING: HS20-44 and alternative and permit design load.

REINFORCED CONCRETE: $f_y$ = 60,000 psi; $f'_c$ = 3,250 psi; n = 9

Transverse deck slabs (working Stress Design): $f_s$ = 20,000 psi; $f_c$ = 1,500 psi; n = 9

FOOTING PRESSURE (TONS PER SQ.)

| SERVICE LEVEL | ALLOWABLE | DESIGN |
|---|---|---|
| ABUT. 1 | 4.0 | 3.0 |
| BENT 2 | 5.0 | 2.5 |
| ABUT. 3 | 4.0 | 3.0 |

AS BUILT
CORRECTIONS BY
CONTRACT NO. 05-301900
DATE 2-8-85

AS BUILT PLANS
Contract No. 05-301900
Date Completed 2-8-85
Document No.

0' 10' 20' 40' 60'
GRAPHIC SCALE

Davy McKee
DMC ENGINEERS & CONSTRUCTORS
SAN FRANCISCO, CALIFORNIA

REFERENCE DRAWINGS

REVISIONS
1. AS-BUILT 4-22-85
2. ISSUED FOR APPROVAL 2-8-85
3. ADDED INDEX PLAN, GENERAL NOTES & REVISED TITLE BLOCK
4. ISSUED FOR CONSTRUCTION 5-1-85

SCALE Noted
DATE 1/25/84
DR. APPR.
CHIEF, DEPT.
APPROVED
DWG. DEPT.
2-8-85

Chevron U.S.A. Inc.
Offshore Projects Department,
Western Region

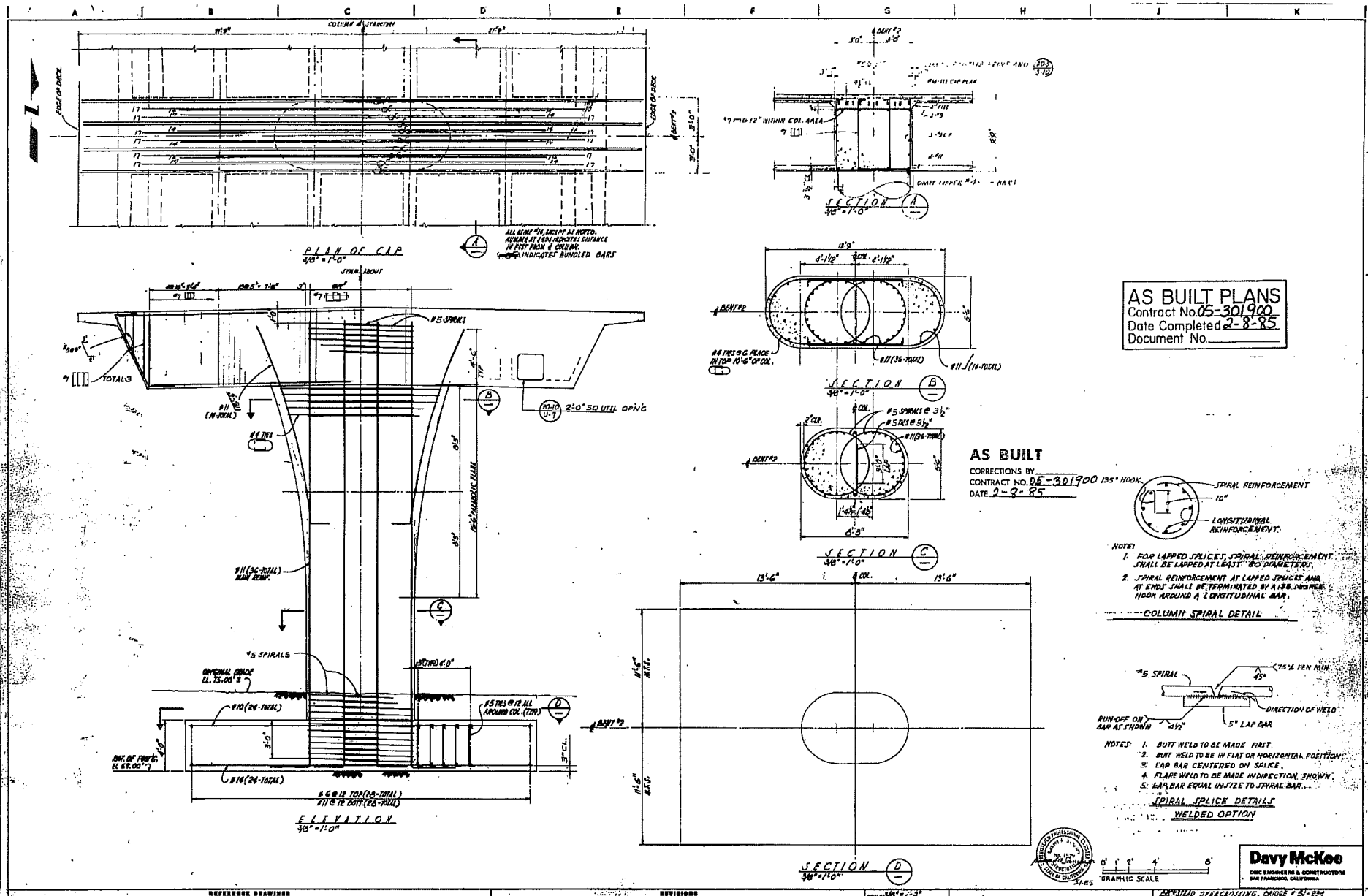
BACKSTEAD OVERCROSSING, BRIDGE # 51-234
GENERAL PLAN
BECKSTEAD INTERCHANGE, 5-SB-101-44.7
POINT ARGUELLO OIL & GAS SYSTEM (PAGS)

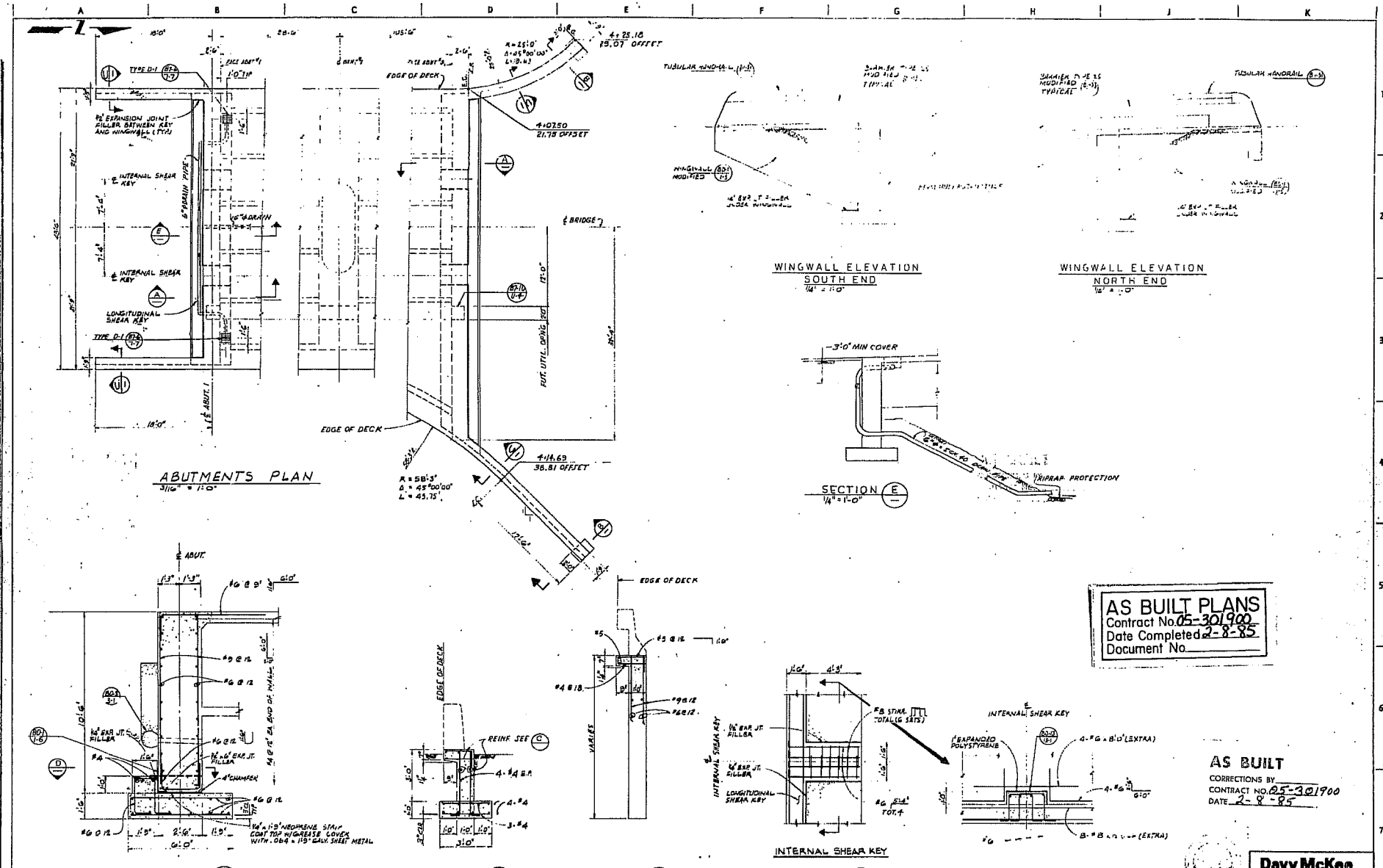
S W.O. B.O. F-11042-1

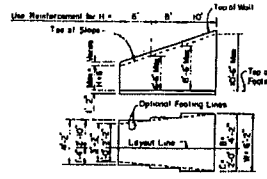
SCALE 1"=50' MICROFILM - STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION - MICROFILM
SCALE 1"=20' MICROFILM - STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION - MICROFILM
SCALE 1"=10' or 1"=100' MICROFILM - STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION - MICROFILM
SCALE 1"=40' MICROFILM - STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION - MICROFILM

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF TRANSPORTATION.

DATE 9/11/90 Donald Blackford SUPERVISOR OF SURVEYS

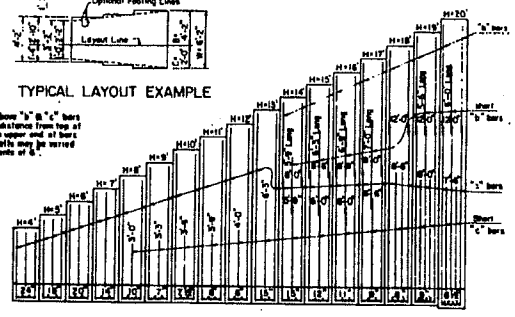

PLAN OF CAP
SECTION A
SECTION B
SECTION C
SECTION D
ELEVATION
AS BUILT PLANS
Contract No. 05-301900
Date Completed 2-8-85
Document No.
AS BUILT
CORRECTIONS BY
CONTRACT NO. 05-301900
DATE 2-8-85
COLUMN SPIRAL DETAIL
SPIRAL SPLICE DETAILS
WELDED OPTION
Davy McKee
Chevron U.S.A. Inc.
Offshore Projects Department, Western Region
F-110450

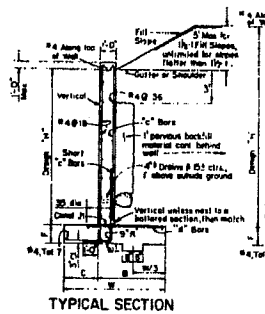

ABUTMENTS PLAN
3/16" = 1'-0"
WINGWALL ELEVATION
SOUTH END
1/4" = 1'-0"
WINGWALL ELEVATION
NORTH END
1/4" = 1'-0"
SECTION E
1/4" = 1'-0"
SECTION A
1/2" = 1'-0"
SECTION B
1/2" = 1'-0"
SECTION C
1/2" = 1'-0"
SECTION D
3/8" = 1'-0"
INTERNAL SHEAR KEY
EDGE OF DECK
LONGITUDINAL SHEAR KEY
INTERNAL SHEAR KEY
3'-0" MIN COVER
RIPRAP PROTECTION
AS BUILT PLANS
Contract No. 05-301900
Date Completed 2-8-85
Document No.
AS BUILT
CORRECTIONS BY
CONTRACT NO. 05-301900
DATE 2-8-85
Davy McKee
DMC ENGINEERS & CONSTRUCTORS
SAN FRANCISCO, CALIFORNIA
REFERENCE DRAWINGS
REVISIONS
ISSUED FOR REVIEW & COMMENTS 1-25-85
ISSUED FOR APPROVAL 2-8-85
REVISED TITLE BLOCK
ISSUED FOR CONSTRUCTION 5-1-85
SCALE AS SHOWN
Chevron
Chevron U.S.A. Inc.
Western Region
BACKSTEAD OVERCROSSING, BRIDGE # 51-234
ABUTMENTS PLANS & DETAILS
BACKSTEAD INTERCHANGE, 5-SB-101-44.7
POINT ARGUELLO OIL & GAS SYSTEM (PAGS) (PAGS)
S
F-11044-0
MICROFILM - STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION - MICROFILM
I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF TRANSPORTATION.
9/11/90
SUPERVISOR OF MICROFILMING



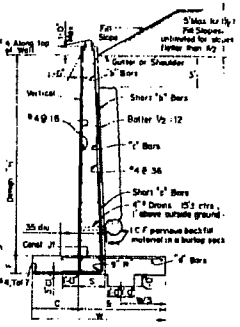

TYPICAL LAYOUT EXAMPLE

Design Notes.
Unit Stresses $f_s$ = 24,000 psi, $f_c$ = 1,300 psi, n = 10
Maximum Toe Pressure = 1 ½ Tons/sq ft
Elevations, length and angle of flare of wings may be varied by the Engineer to suit conditions encountered in the field
Walls designed for 2' live load surcharge, 1½ : 1 sloping surcharge not to exceed 5' in elevation plus 2' live load surcharge, or unlimited 2 : 1 surcharge if 1½ : 1 slope exceeds 5', use Type 2 Retaining Wall
Wall height may be exceeded by 6" before going to the next greater "H"

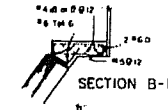


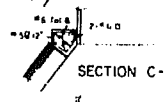

TYPICAL SECTION
H=4' THRU 12'



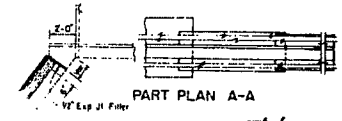

TYPICAL SECTION
H=13' THRU 20'



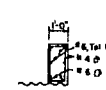
SECTION B-B



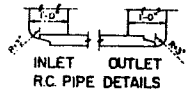
SECTION C-C




PART PLAN A-A



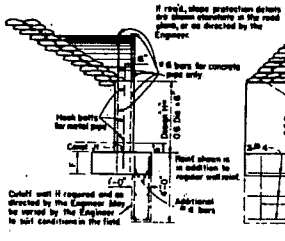
SECTION D-D



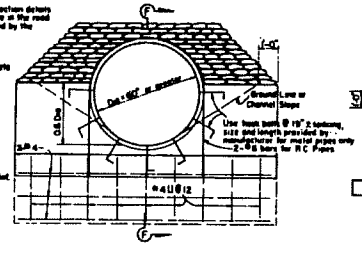
INLET OUTLET
R.C. PIPE DETAILS

## REINFORCED CONCRETE WINGWALLS

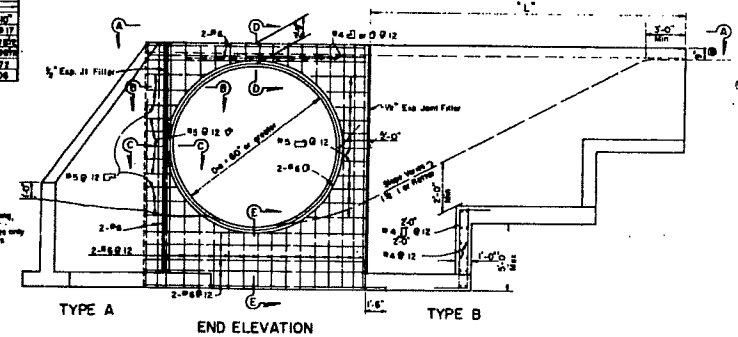
| Design H | 4' | 5' | 6' | 7' | 8' | 9' | 10' | 11' | 12' | 13' | 14' | 15' | 16' | 17' | 18' | 19' | 20' |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| W | 3'-2" | 3'-8" | 4'-2" | 4'-6" | 5'-2" | 5'-8" | 6'-2" | 6'-8" | 7'-2" | 7'-8" | 8'-0" | 8'-8" | 9'-4" | 10'-0" | 10'-8" | 11'-4" | 12'-0" |
| C | 1'-0" | 1'-2" | 1'-4" | 1'-6" | 1'-8" | 1'-10" | 2'-0" | 2'-2" | 2'-4" | 2'-6" | 2'-8" | 3'-0" | 3'-4" | 3'-8" | 4'-0" | 4'-4" | 4'-8" |
| B | 2'-2" | 2'-6" | 2'-10" | 3'-2" | 3'-6" | 3'-10" | 4'-2" | 4'-6" | 4'-10" | 5'-2" | 5'-6" | 6'-0" | 6'-6" | 6'-8" | 7'-0" | 7'-4" | 7'-8" |
| F | 1'-2" | | | | | | | | | | | | | | | | 1'-4" |
| Batter | None | | | | | | | | | | 1/2:12 | | | | | | |
| S | 1'-0" | | | | | | | | | 1'-0" | 1'-2" | 1'-2" | 1'-3" | 1'-3" | 1'-3" | 1'-4" | 1'-4" |
| "a" bars | None | | | | | | | | | | | | | | | | |
| "b" bars | #4@24 | #4@18 | #5@20 | #5@14 | #5@10 | #5@7 | #6@7" | #6 | #6@6 | #6@5 | #6@5 | #6@4 | #6@4 | #6@3 | #6@3 | #6@3 | #6@3 |
| "c" bars | #4@24 | #4@18 | #5@20 | #5@14 | #5@10 | #5@14 | #6@15 | #6@16 | #6@12 | #6@15 | #6@15 | #6@12 | #6@11 | #6@9 | #6@9 | #6@9 | #6@8 |
| Conc. Cu. Yd. | 0.32 | 0.38 | 0.44 | 0.49 | 0.55 | 0.61 | 0.67 | 0.75 | 0.79 | 1.02 | 1.10 | 1.18 | 1.26 | 1.34 | 1.43 | 1.53 | 1.72 |
| Reinf. Lbs. | 13 | 16 | 19 | 25 | 30 | 37 | 49 | 62 | 78 | 73 | 90 | 104 | 123 | 141 | 170 | 188 | 206 |




SECTION F-F

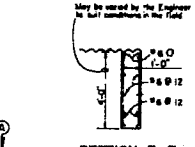



TYPE C WALL




TYPE A END ELEVATION TYPE B

STRAIGHT WINGWALLS




SECTION E-E

Unless otherwise designated

AS BUILT
CORRECTIONS BY
CONTRACT NO. 05-301900
DATE 2-8-85

AS BUILT PLANS
Contract No. 05-301900
Date Completed 2-8-85
Document No.

Davy McKee
DMC ENGINEERS & CONSTRUCTORS
SAN FRANCISCO, CALIFORNIA

REFERENCE DRAWINGS

| | | |
|---|---|---|
| ROUGH GRADING | SHT 2 | F-11007 |
| ROUGH GRADING | SHT 4 | F-11009 |

REVISIONS

| | | |
|---|---|---|
| 4 | AS-BUILT | 0-30-84 |
| 3 | ISSUED FOR 30% PLANT REVIEW | 2-1-82 |
| 2 | ISSUED FOR CONSTRUCTION | 6-8-85 |
| 1 | REISSUED FOR THIRD PARTY REVIEW | 8-7-86 |

SCALE None

Chevron U.S.A. Inc.
Offshore Projects Department, Western Region

ROAD CULVERT WINGWALLS

POINT IZQUIERDO OIL & GAS SYSTEM (PIOS) (PIGS)

S F-11091-2

SP-66-01

MICROFILM - STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION - MICROFILM

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF TRANSPORTATION.

DATE 7/11/90 SUPERVISOR OF MICROFILMING

361

# Caltrans Bridge 56-0318
# Spruce St. OC, Riverside Co.

**Spruce St. OC, Bridge 56-0318, Riverside Co.**

This overcrossing over SR 91 is located south of the Rte 215/91 interchange in Riverside County.

Caltrans provided a bulk sample taken from this bridge site. However, UU testing was not performed on this sample because of the limited testing program. As a replacement, soil from the Jackson St. bridge, which is also in this county, was tested instead. Caltrans provided maximum density test results using a nuclear gauge. The data showed the in-situ fills had a relative compaction of 90 to 95%..

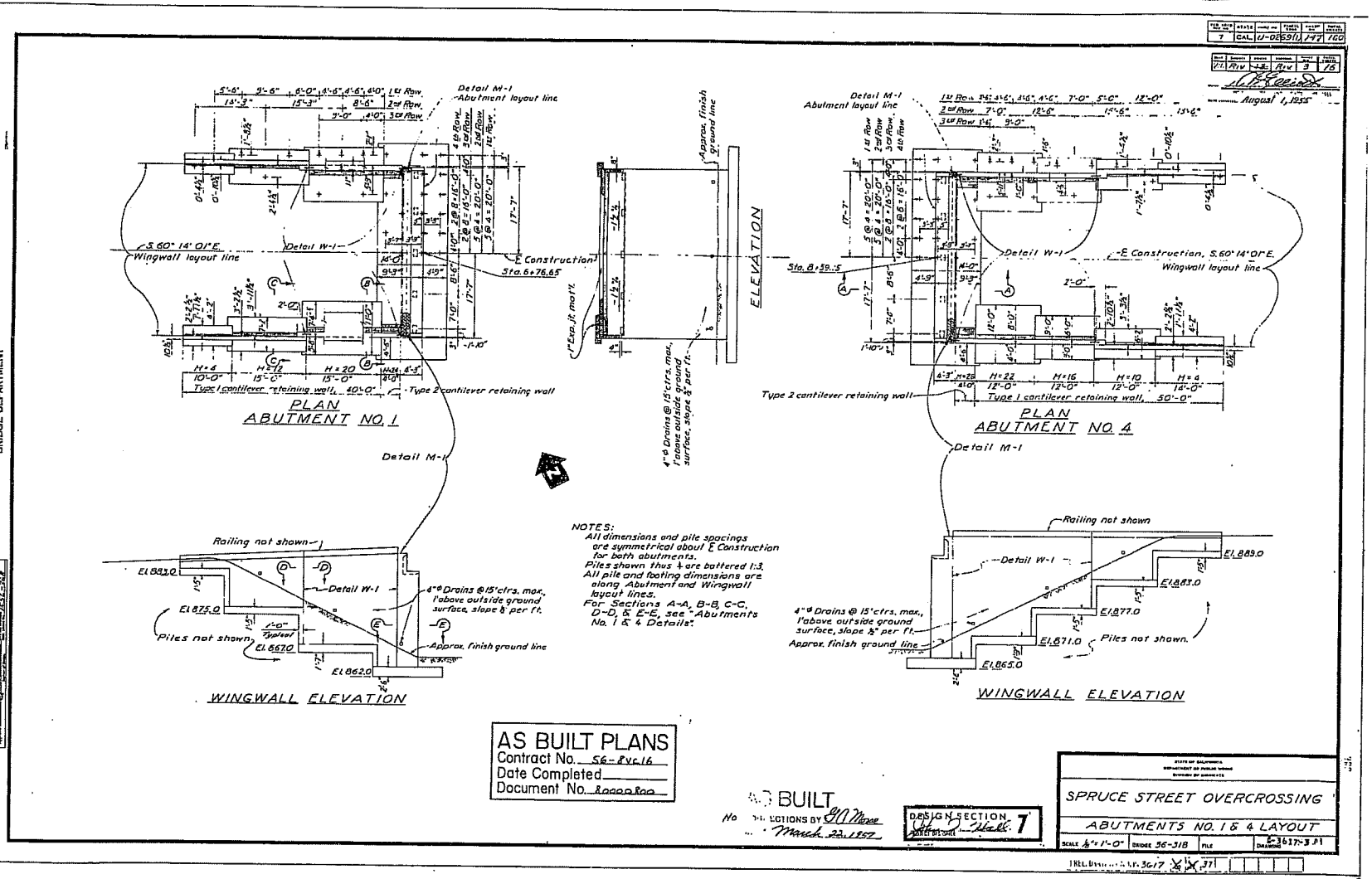
02/05/2004

02/05/2004

02/05/2004

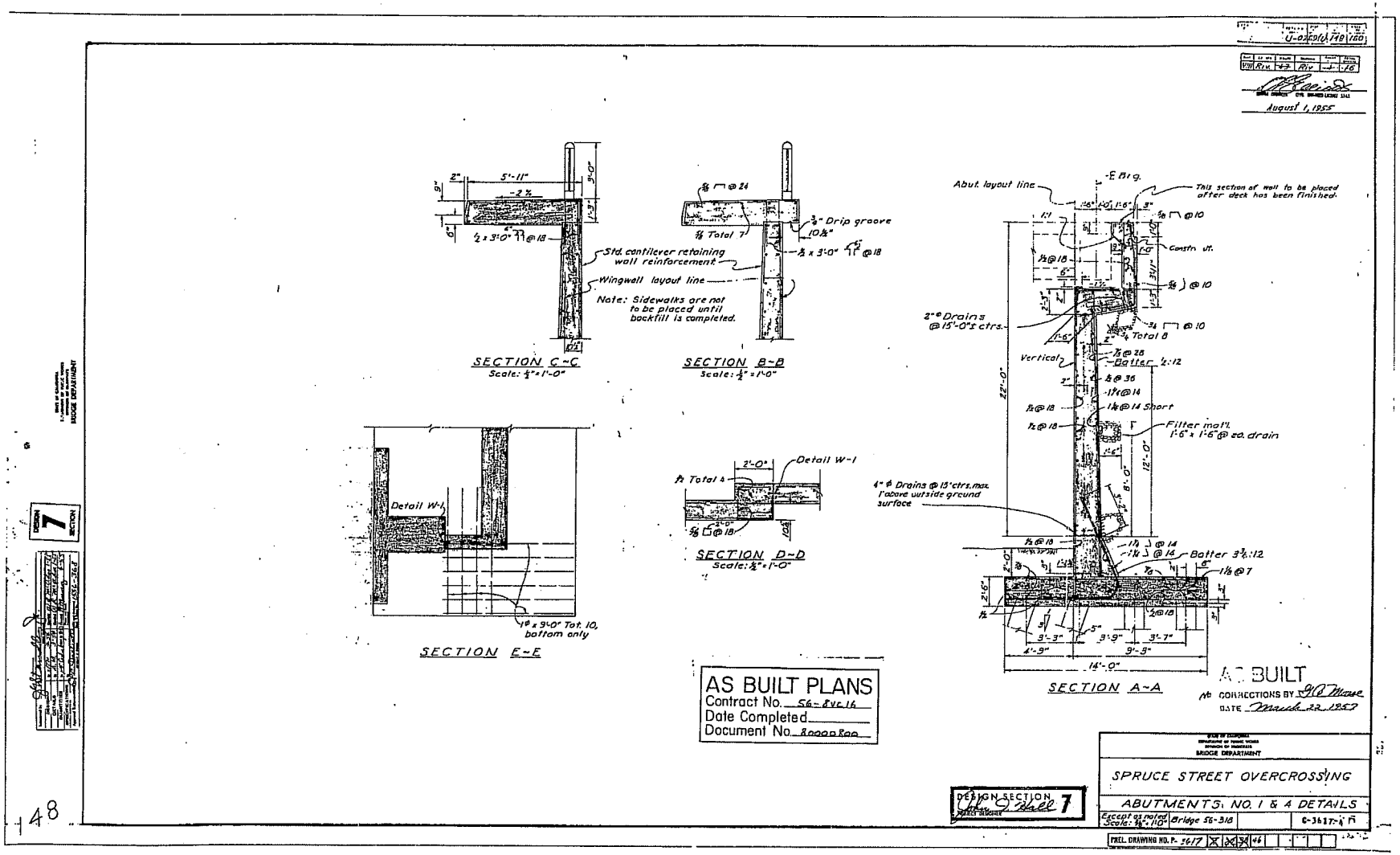
02/05/2004

Best Sales
02/05/2004




I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF PUBLIC WORKS.

DATE 9-31-11 SIGNATURE [illegible] TITLE [illegible]



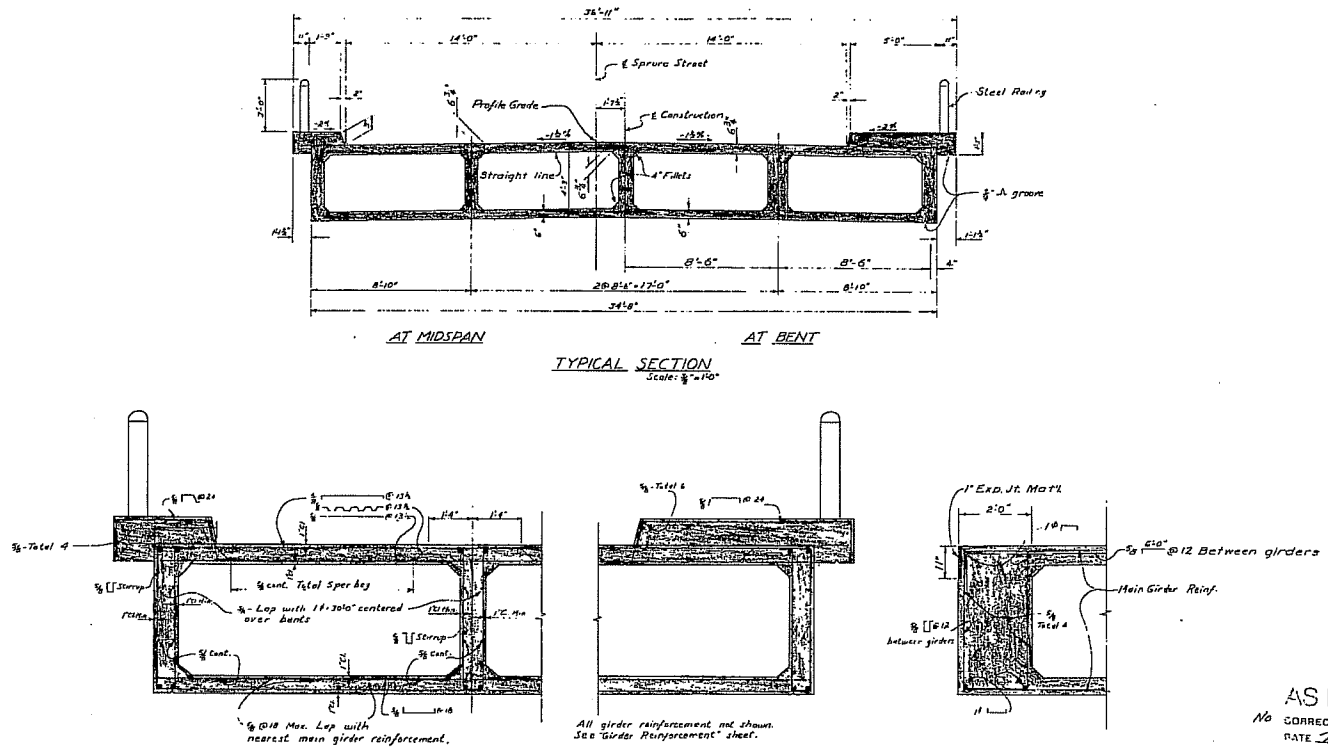

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF PUBLIC WORKS.

DATE _____ SIGNATURE _____ TITLE _____

BRIDGE DEPARTMENT

| | | | | | |
|---|---|---|---|---|---|
| 7 | CAL. | U-0269(1) | 150 | 160 | |

August 1, 1955




AS BUILT
No CORRECTIONS BY G.C. Moore
DATE March 22, 1957

AS BUILT PLANS
Contract No. 56-8VC16
Date Completed
Document No. 80000800

DESIGN SECTION 7

SPRUCE STREET OVERCROSSING

TYPICAL SECTION

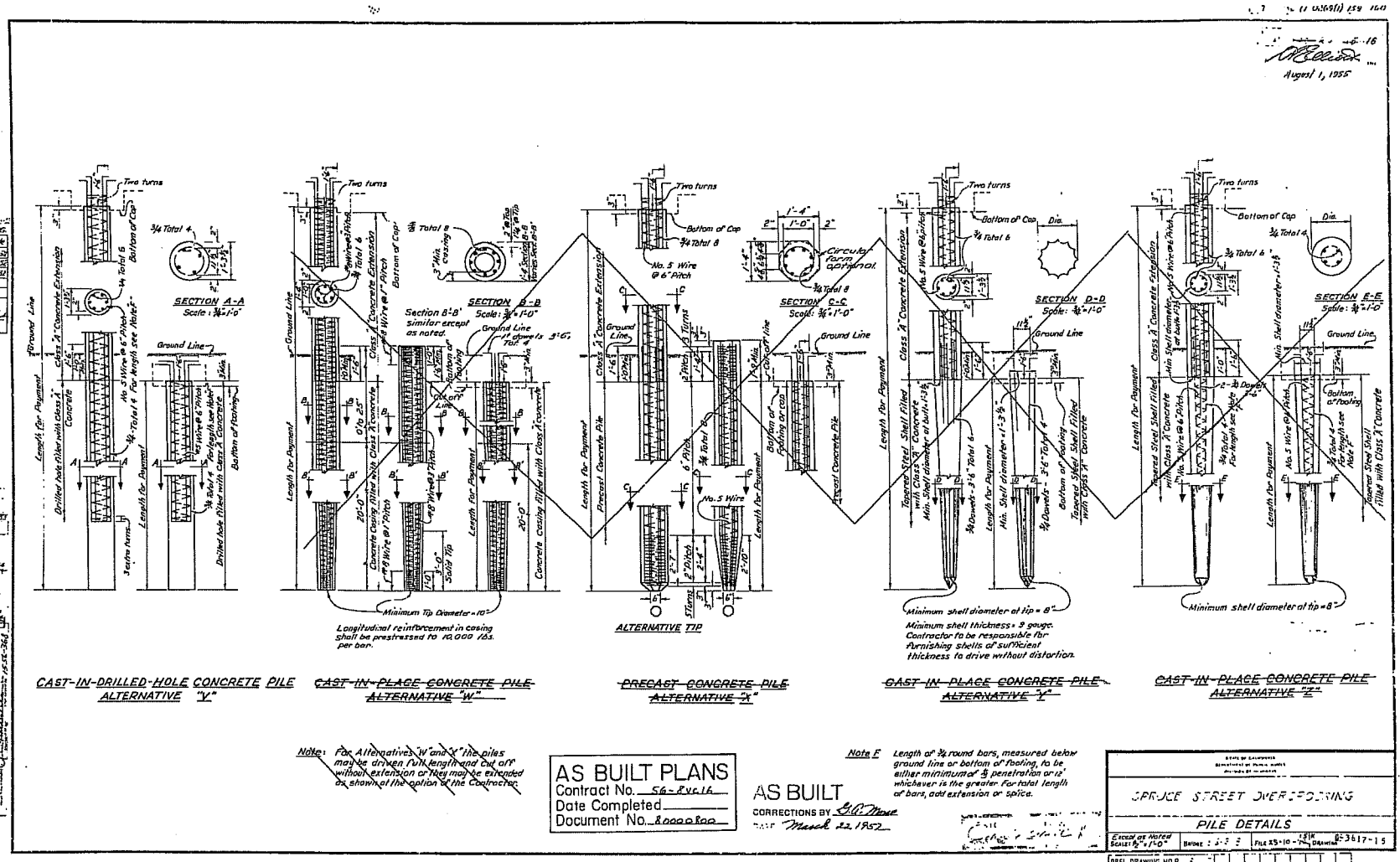
SCALE As Noted | BRIDGE 56-318 | FILE | DRAWING C-3617-6

150

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF PUBLIC WORKS.

DATE 9/13/71 SIGNATURE [illegible] TITLE [illegible]

MICROFILM - STATE OF CALIFORNIA - DEPARTMENT OF PUBLIC WORKS - MICROFILM

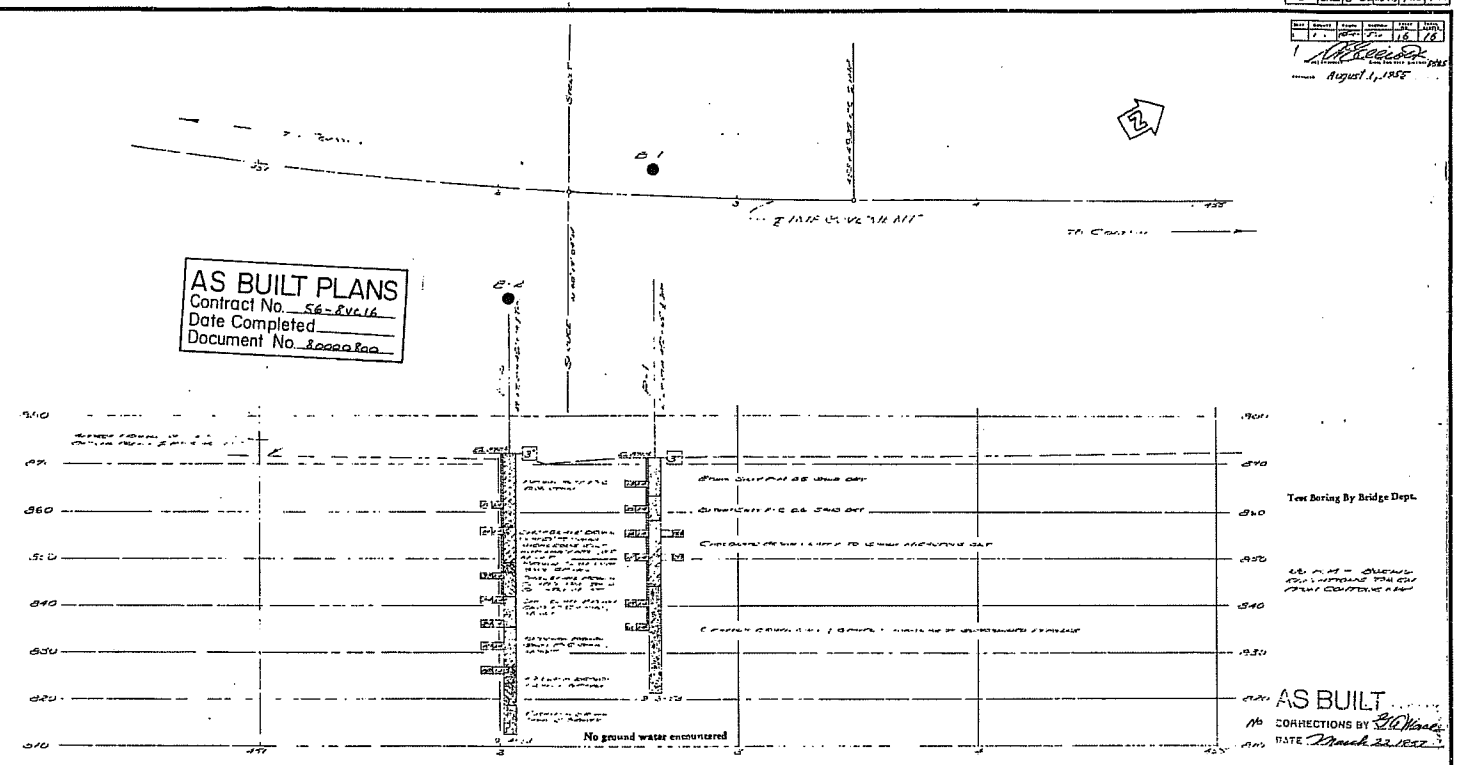

August 1, 1955
SECTION A-A
Scale: 3/4"=1'-0"
SECTION B-B
Scale: 3/4"=1'-0"
SECTION C-C
Scale: 3/4"=1'-0"
SECTION D-D
Scale: 3/4"=1'-0"
SECTION E-E
Scale: 3/4"=1'-0"
Two turns
Ground Line
Length for Payment
Minimum Tip Diameter = 10"
Longitudinal reinforcement in casing shall be prestressed to 10,000 lbs. per bar.
ALTERNATIVE TIP
Minimum shell diameter at tip = 8"
Minimum shell thickness = 9 gauge. Contractor to be responsible for furnishing shells of sufficient thickness to drive without distortion.
CAST-IN-DRILLED-HOLE CONCRETE PILE ALTERNATIVE "V"
CAST-IN-PLACE CONCRETE PILE ALTERNATIVE "W"
PRECAST CONCRETE PILE ALTERNATIVE "X"
CAST-IN-PLACE CONCRETE PILE ALTERNATIVE "Y"
CAST-IN-PLACE CONCRETE PILE ALTERNATIVE "Z"
Note: For Alternatives "W" and "X" the piles may be driven full length and cut off without extension or they may be extended as shown at the option of the Contractor.
Note F Length of 3/4 round bars, measured below ground line or bottom of footing, to be either minimum of 5/8 penetration or 12" whichever is the greater. For total length of bars, add extension or splice.
AS BUILT PLANS
Contract No. 56-8vc16
Date Completed
Document No. 80000800
AS BUILT
CORRECTIONS BY G.A. Moss
DATE March 22, 1952
SPRUCE STREET OVERCROSSING
PILE DETAILS
Except as Noted
PREL DRAWING NO.P.
I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF PUBLIC WORKS.
DATE
SIGNATURE
TITLE
MICROFILM - STATE OF CALIFORNIA - DEPARTMENT OF PUBLIC WORKS - MICROFILM

| FED. ROAD DIST. | STATE | FEDERAL AID PROJ. NO. | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|
| 2 | CAL. | U-026910 | 160 | 160 |

| DATE | REVISED | DRAWN | CHECKED | SHEET | SHEETS |
|---|---|---|---|---|---|
| 1 | 1-1 | RPC | RC | 16 | 16 |

August 1, 1955

AS BUILT PLANS
Contract No. 56-8V616
Date Completed
Document No. 80000800




AS BUILT
No CORRECTIONS BY
DATE March 22, 1957

BRIDGE DEPARTMENT

| FIELD STUDY | |
|---|---|
| DRAWN | |
| CHECKED | |
| Special Thanks to | |

## Classification of Material Based on Standard Grade Size Limits

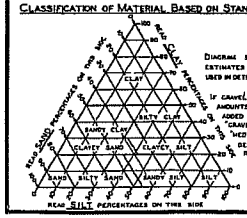



Diagram showing the basis for estimates of grade size distribution used in determination of class names.

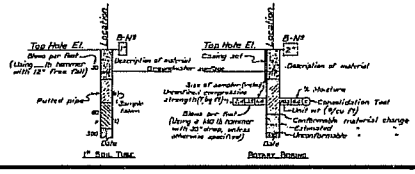
If gravel is present in appreciable amounts the term "gravelly" may be added to the class name, viz. "gravelly sand." The terms "coarse," "medium" and "fine" when used to describe gravel, sand and silt refer to standard grade size limits.

## Legend of Earth Materials

- Gravel
- Sand
- Silt
- Clay
- Sandy Clay or Clayey Sand
- Sandy Silt or Silty Sand
- Silty Clay or Clayey Silt
- Peat and/or Organic Clay
- Filled Material
- Igneous Rock
- Sedimentary Rock
- Metamorphic Rock

## Legend of Boring Operations

- Plan of any boring
- Penetrometer
- 2½" Cone penetrometer
- Sampler boring (DRY)
- Rotary boring (WET)
- Auger boring (DRY)
- Jet boring
- Core boring
- Test pit




## Notes

The contractor's attention is directed to Section 2, Article 23 of the Standard Specifications and to the Special Provisions accompanying this set of plans.

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

Penetrometer borings having a rate of penetration measured in seconds per foot are driven with a No 2 Smidman-Terry air hammer at 115 PSI.

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

# SPRUCE STREET O.C.

## LOG OF TEST BORINGS

| SCALE | BRIDGE | FILE | DRAWING |
|---|---|---|---|
| | | | U-3617-16 |

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF PUBLIC WORKS.

DATE 5-31-61 SIGNATURE TITLE

MICROFILM - STATE OF CALIFORNIA - DEPARTMENT OF PUBLIC WORKS - MICROFILM

160

# Caltrans Bridge 56-0390
# Jackson St. OC (Replace), Riverside Co.

**Caltrans Bridge 56-0390, Jackson St. OC (Replace), Riverside Co.**

This bridge is located at Jackson St. over SR 91, halfway between Corona and Riverside cities in Riverside County.

Caltrans provided a bulk sample taken from this bridge site for determination of fill properties. We have performed UU testing on this sample. Caltrans provided maximum density test results using a nuclear gauge. Test results from our UU testing are in Appendix C. The data showed the in-situ fills had a relative compaction of 92 to 97%.

02/05/2004

02/05/2004

02/05/2004

| DIST | COUNTY | ROUTE | KILOMETER POST TOTAL PROJECT | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| 08 | Riv | 91 | 18.0/28.5 | 367 | 377 |

REGISTERED ENGINEER - CIVIL
1-22-01
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER DAVID A. ANDERSON No. 36066 EXP. 6-30-04 CIVIL STATE OF CALIFORNIA

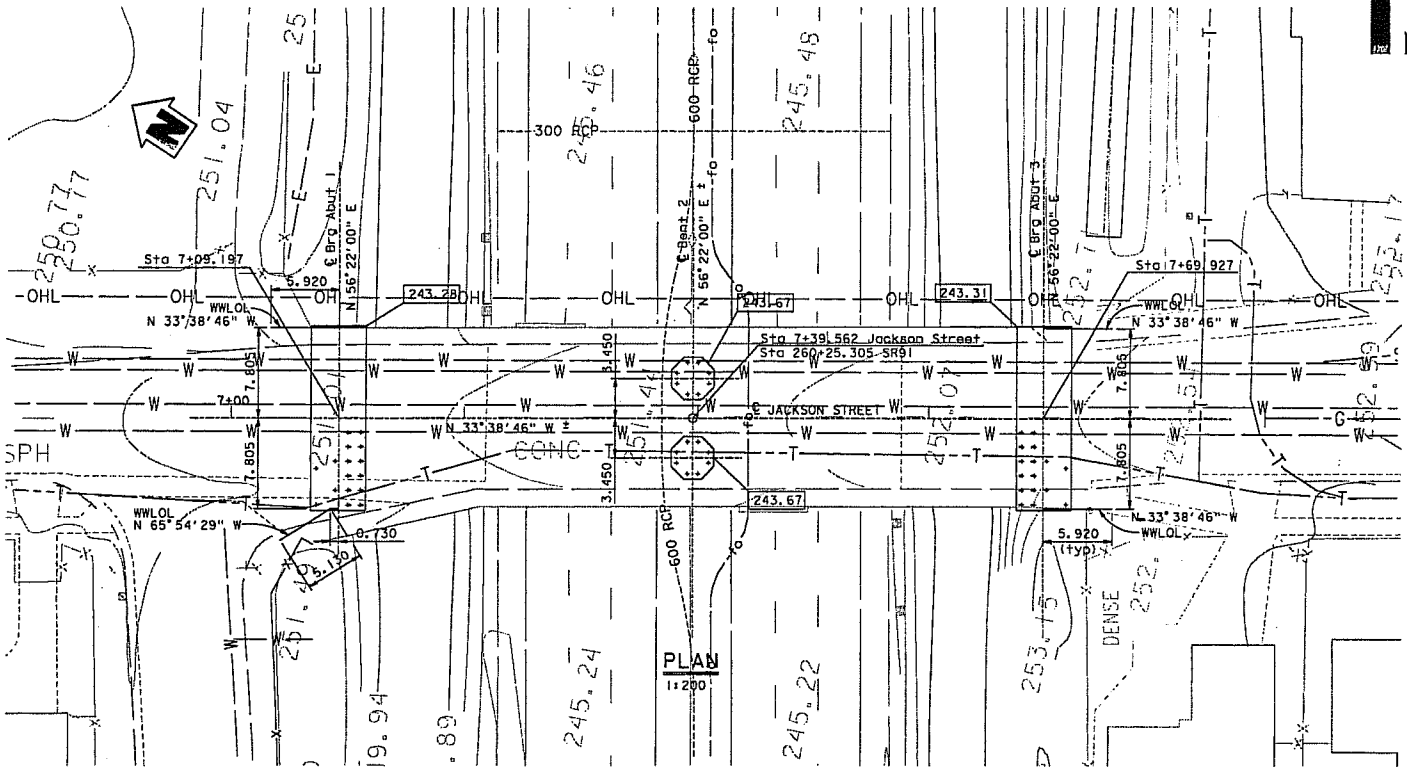
*The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.*

URS GREINER WOODWARD CLYDE
2020 East First Street
Suite 400
Santa Ana CA, 92705-4032

RIVERSIDE COUNTY
TRANSPORTATION COMMISSION
3560 University Avenue, Suite 100
Riverside, California 92501

*Caltrans now has a web site! To get to the web site, go to: http://www.dot.ca.gov*

NO AS BUILT CHANGES
**AS BUILT**
CORRECTIONS BY Alex Angle
CONTRACT NO. 08-4353U4
DATE 12/16/03




BENCH MARKS

BM: RCTC Pt No. 3226, Elev 811.17' (247.245 m) (NGVD DATUM, 1929) 2" brass disk in 2" IP with 10" concrete collar stamped "California Dept of Transportation RIV 91-14.85 LS 5679 1990" per RCTC horizontal and vertical control book, page 167.

BM: RCTC Pt No. 3224, Elev 797.98' (243.225 m) (NGVD DATUM, 1929) 2" brass disk in 2" IP with 10" concrete collar stamped "California Dept of Transportation RIV 91-14.33 LS 5679 1990" per RCTC horizontal and vertical control book, page 165.

PILE DATA TABLE

| Location | Pile Type Alternative "Y" | Design Loading | Nominal Resistance Compression | Nominal Resistance Tension | Design Tip Elevations | Specified Tip Elevations |
|---|---|---|---|---|---|---|
| Abutment 1 | Class 625 | 600 kN | 1200 kN | 0 | +233.5(1) m | +233.5 m |
| Bent 2 | Class 625 | 550 kN | 1100 kN | 0 | +232.5(1) m | +232.5 m |
| Abutment 3 | Class 625 | 600 kN | 1200 kN | 0 | +233.5(1) m | +233.5 m |

Design tip elevation is controlled by the following demands:
(1) Compression, (2) Tension

LEGEND:
▭ = Indicates bot of ftg elev
+ = Vertical piles
+ = Battered piles, 1:3 typ

NOTES:
1. For Bent 2 pile layout see 'Bent Details No.2' Sheet.
2. For Abut 1 & Abut 3 pile layout see 'Abutment details No.1' Sheet.
3. For limits of payment for structure excavation and backfill see A62-C
4. For pile details, see B2-5, Alternative "Y" for all piles.

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

Ross Khiabani 07/19/00
GEOTECHNICAL PROFESSIONAL APPROVAL DATE

DESIGN OVERSIGHT
OCT. 6, 2000
SIGN OFF DATE

| SCALE: | VERT. DATUM | HORZ. DATUM |
|---|---|---|
| PHOTOGRAMMETRY AS OF: N/A | ALIGNMENT TIES N/A | |
| SURVEYED BY T. Thacker | DRAFTED BY D. Bouldin | |
| FIELD CHECKED BY T. Thacker | CHECKED BY D. Williams | |

| | | |
|---|---|---|
| DESIGN | BY N. Patel | CHECKED A. Athalye |
| DETAILS | BY P. Zucchi | CHECKED A. Athalye |
| QUANTITIES | BY N. Patel | CHECKED S. Collon |

PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

J. Chapman
PROJECT ENGINEER

CU 08110
EA 4353U1

BRIDGE NO. 56-0390
KILOMETER POST 23.6(14.6)

# JACKSON STREET OC (REPLACE)
## FOUNDATION PLAN

SHEET 4 OF 14

DISREGARD PRINTS BEARING EARLIER REVISION DATES
REVISION DATES (PRELIMINARY STAGE ONLY)

FOUNDATION PLAN SHEET (METRIC) (REV. 9/2/98)

ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS 0 10 20 30 40 50 60 70 80 90 100

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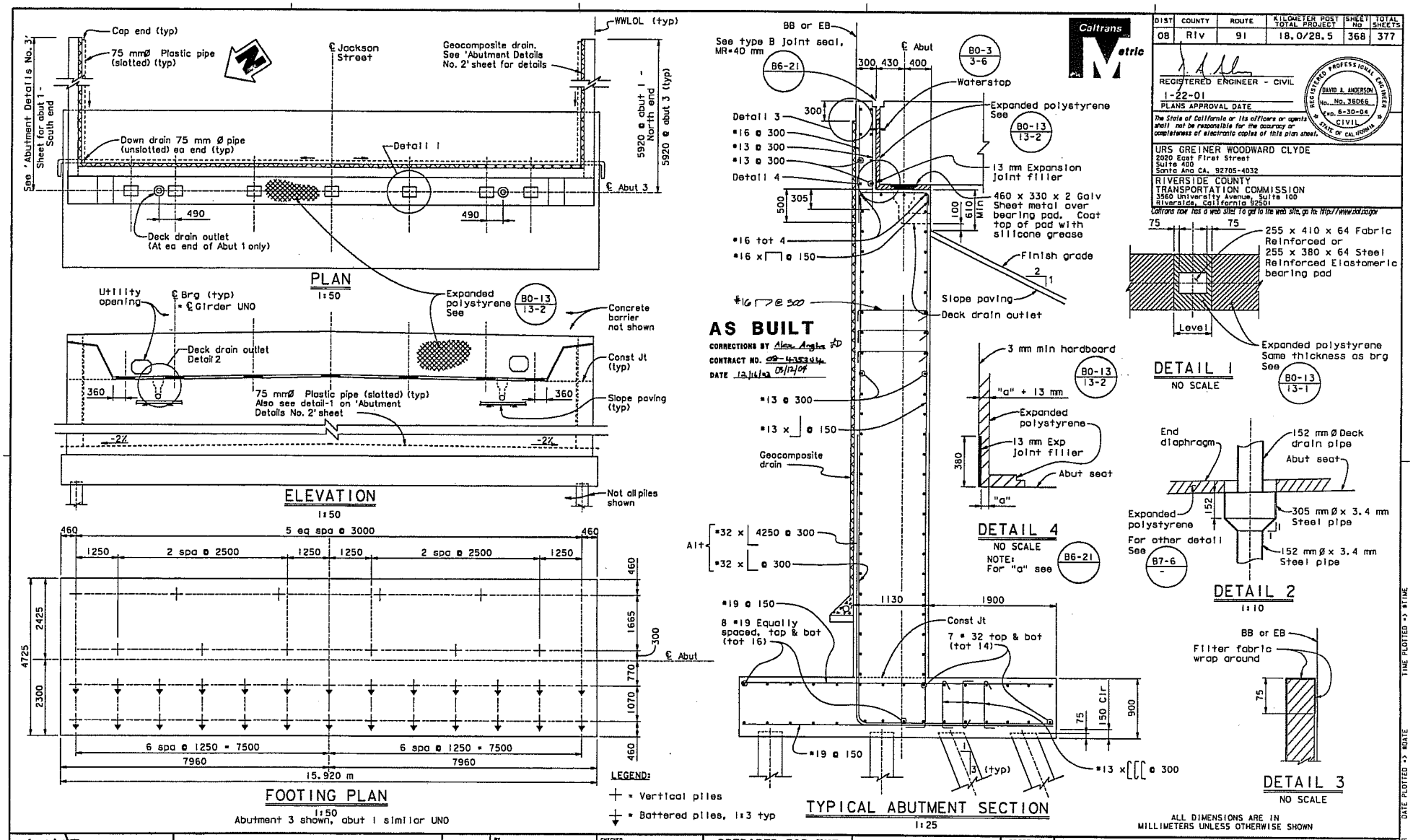
DATE PLOTTED => $DATE
USERNAME => $USER

$FILE$
$DATE$
$TIME$




| DIST | COUNTY | ROUTE | KILOMETER POST TOTAL PROJECT | SHEET No | TOTAL SHEETS |
|---|---|---|---|---|---|
| 08 | Riv | 91 | 18.0/28.5 | 368 | 377 |

REGISTERED ENGINEER - CIVIL
1-22-01
PLANS APPROVAL DATE

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REGISTERED PROFESSIONAL ENGINEER DAVID A. ANDERSON No. 36066 Exp. 6-30-04 CIVIL STATE OF CALIFORNIA

URS GREINER WOODWARD CLYDE
2020 East First Street
Suite 400
Santa Ana CA. 92705-4032

RIVERSIDE COUNTY TRANSPORTATION COMMISSION
3560 University Avenue, Suite 100
Riverside, California 92501

Caltrans now has a web site! To get to the web site, go to: http://www.dot.ca.gov

DESIGN OVERSIGHT
Oct. 6, 2000
SIGN OFF DATE

DESIGN DETAIL SHEET (METRIC) (REV. 9/2/98)

| | BY | CHECKED |
|---|---|---|
| DESIGN | N. Patel | A. Athalye |
| DETAILS | P. Zucchi | A. Athalye |
| QUANTITIES | N. Patel | S. Callan |

PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

J. Chapman
PROJECT ENGINEER

BRIDGE NO. 56-0390
KILOMETER POST 23.6(14.6)

JACKSON STREET OC (REPLACE)
ABUTMENT DETAILS NO. 1

ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS 0 10 20 30 40 50 60 70 80 90 100

CU 08110
EA 4353U1

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY)

SHEET 5 OF 14

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

| DIST | COUNTY | ROUTE | KILOMETER POST TOTAL PROJECT | SHEET No | TOTAL SHEETS |
|---|---|---|---|---|---|
| 08 | Riv | 91 | 18.0/28.5 | 369 | 377 |

Caltrans Metric

REGISTERED ENGINEER - CIVIL
1-22-01
PLANS APPROVAL DATE

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REGISTERED PROFESSIONAL ENGINEER DAVID A. ANDERSON No. 36066 Exp. 6-30-04 CIVIL STATE OF CALIFORNIA

URS GREINER WOODWARD CLYDE
2020 East First Street
Suite 400
Santa Ana CA. 92705-4032

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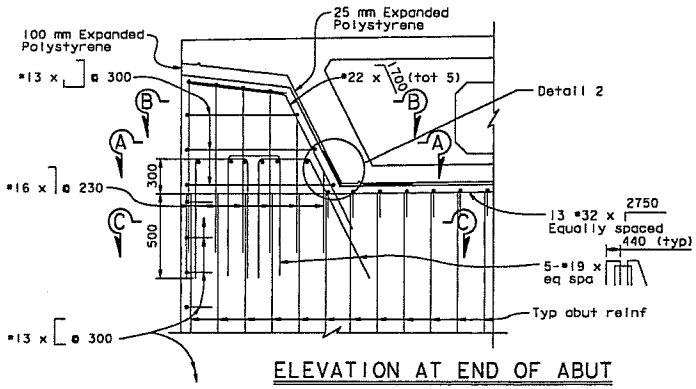
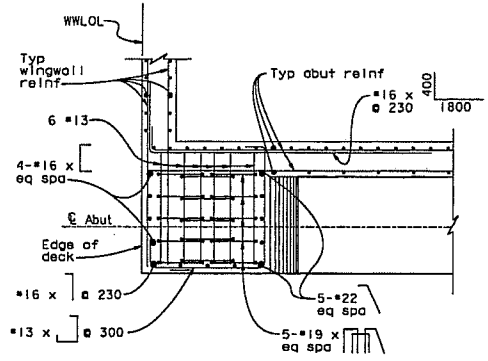
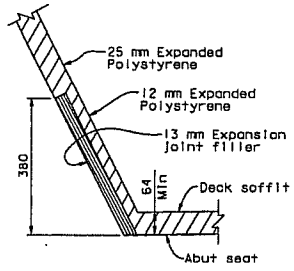
NO AS BUILT CHANGES
**AS BUILT**
CORRECTIONS BY Alex Angle
CONTRACT NO. [illegible]
DATE 12/18/03



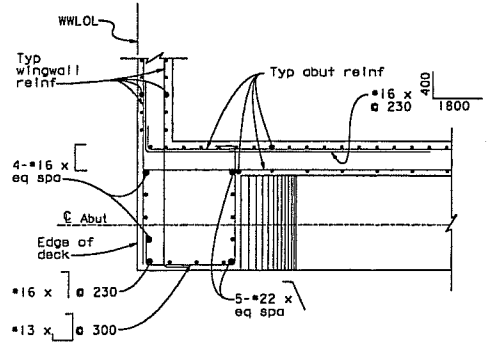

ELEVATION AT END OF ABUT
1:20
North End of Abut 3 Shown, other locations similar except Layout of South End Wingwall at Abut 1




SECTION A-A
1:20




DETAIL 2
NO SCALE




SECTION B-B
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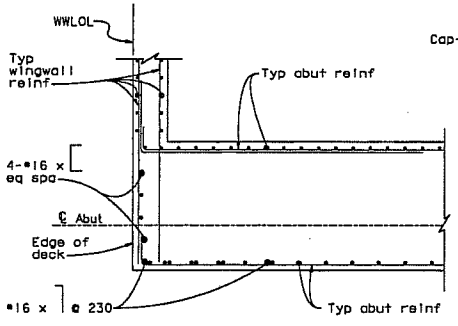
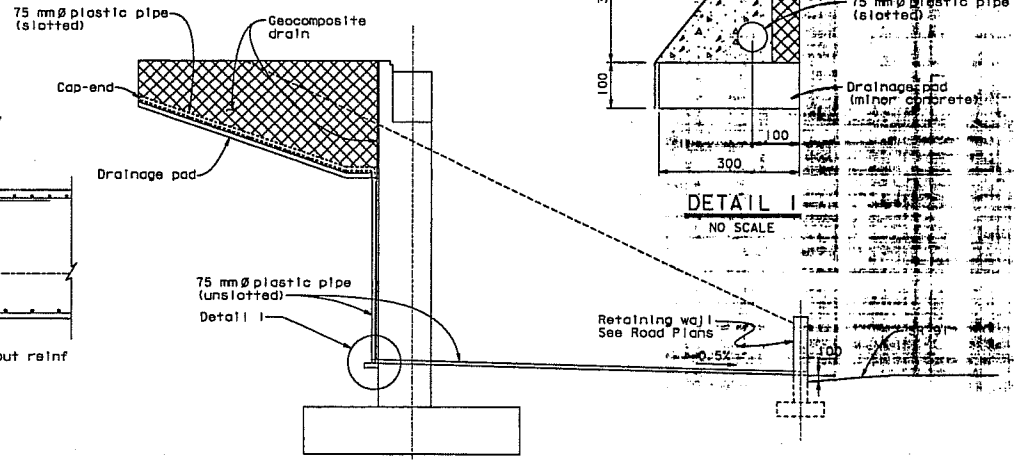



SECTION C-C
1:20




DETAIL 1
NO SCALE

ABUT DRAINAGE DETAILS
NO SCALE

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

DESIGN OVERSIGHT
Oct. 6, 2000
SIGN OFF DATE

DESIGN DETAIL SHEET (METRIC) (REV. 9/2/98)

| | BY | CHECKED |
|---|---|---|
| DESIGN | N. Patel | A. Athalye |
| DETAILS | P. Zucchi | A. Athalye |
| QUANTITIES | N. Patel | S. Callan |

ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS 0 10 20 30 40 50 60 70 80 90 100

PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

J. Chapman
PROJECT ENGINEER

CU 08110
EA 4353U1
FILE -> #REQUEST

BRIDGE NO. 56-0390
KILOMETER POST 23.6(14.6)

JACKSON STREET OC (REPLACE)
ABUTMENT DETAILS NO. 2

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY)

SHEET 6 OF 14

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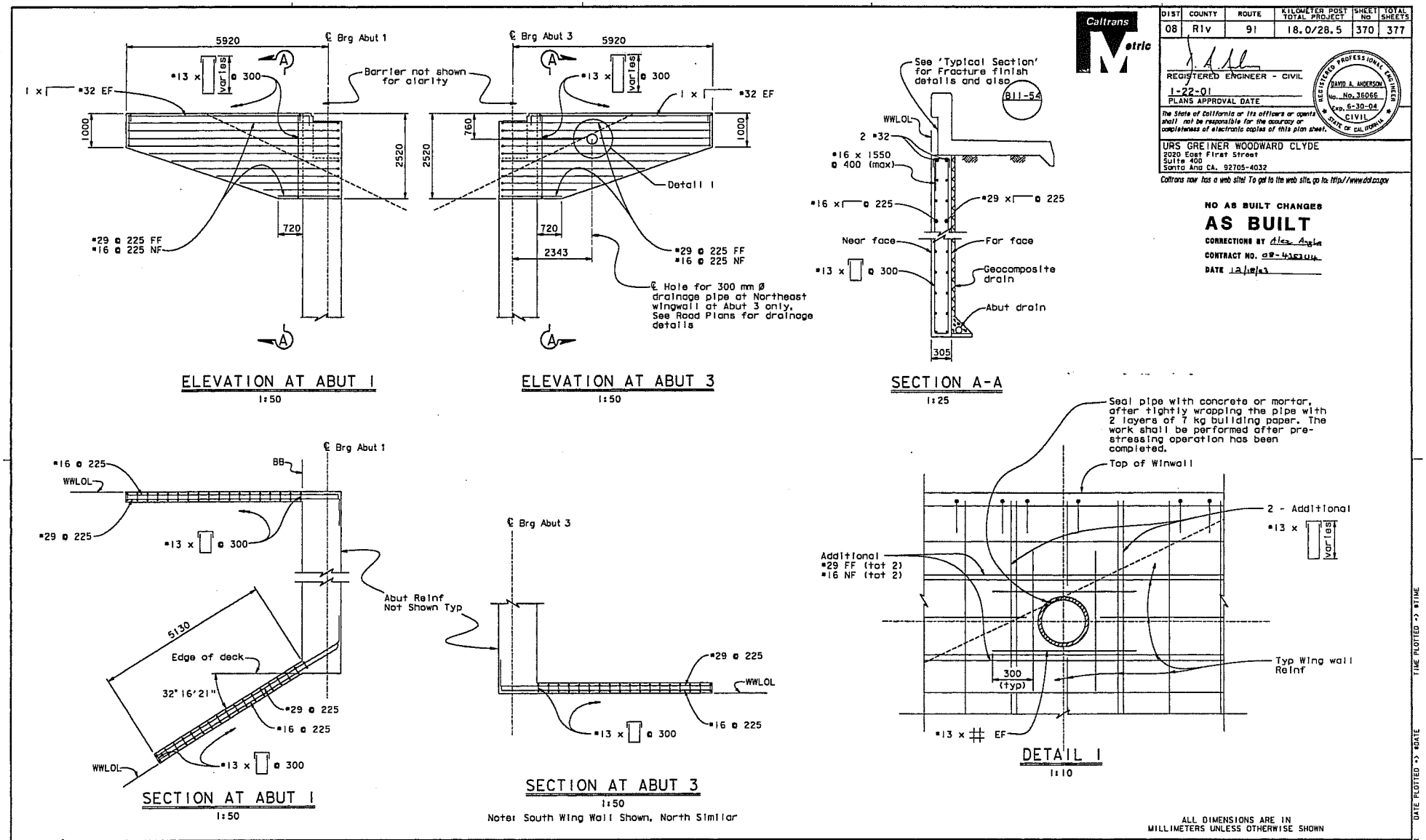


| DIST | COUNTY | ROUTE | KILOMETER POST TOTAL PROJECT | SHEET No | TOTAL SHEETS |
|---|---|---|---|---|---|
| 08 | Riv | 91 | 18.0/28.5 | 370 | 377 |

Caltrans Metric

REGISTERED ENGINEER - CIVIL

1-22-01
PLANS APPROVAL DATE

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REGISTERED PROFESSIONAL ENGINEER DAVID A. ANDERSON No. No. 36066 Exp. 6-30-04 CIVIL STATE OF CALIFORNIA

URS GREINER WOODWARD CLYDE
2020 East First Street
Suite 400
Santa Ana CA. 92705-4032

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NO AS BUILT CHANGES
**AS BUILT**
CORRECTIONS BY Alex Angle
CONTRACT NO. 08-4353U4
DATE 12/18/03

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

DESIGN OVERSIGHT
Oct. 6 2000
SIGN OFF DATE

DESIGN DETAIL SHEET (METRIC) (REV. 9/2/98)

| | BY | CHECKED |
|---|---|---|
| DESIGN | N. Patel | A. Athalye |
| DETAILS | P. Zucchi | A. Athalye |
| QUANTITIES | N. Patel | S. Callan |

PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

J. Chapman
PROJECT ENGINEER

BRIDGE NO. 56-0390
KILOMETER POST 23.6(14.6)

JACKSON STREET OC (REPLACE)
ABUTMENT DETAILS NO. 3

ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS 0 10 20 30 40 50 60 70 80 90 100

CU 08110
EA 4353U1

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY) 3/13/00 4/21/00 10/5/00

SHEET 7 OF 14

FILE => $REQUEST

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

| DIST | COUNTY | ROUTE | KILOMETER POST TOTAL PROJECT | SHEET NO | TOTAL SHEETS |
|---|---|---|---|---|---|
| 08 | Riv | 91 | 18.0/28.5 | 364 | 377 |

REGISTERED ENGINEER - CIVIL

1-22-01
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER DAVID A. ANDERSON No. 36066 Exp. 6-30-04 CIVIL STATE OF CALIFORNIA

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URS GREINER WOODWARD CLYDE
2020 East First Street
Suite 400
Santa Ana CA. 92705-4032

RIVERSIDE COUNTY
TRANSPORTATION COMMISSION
3560 University Avenue, Suite 100
Riverside, California 92501

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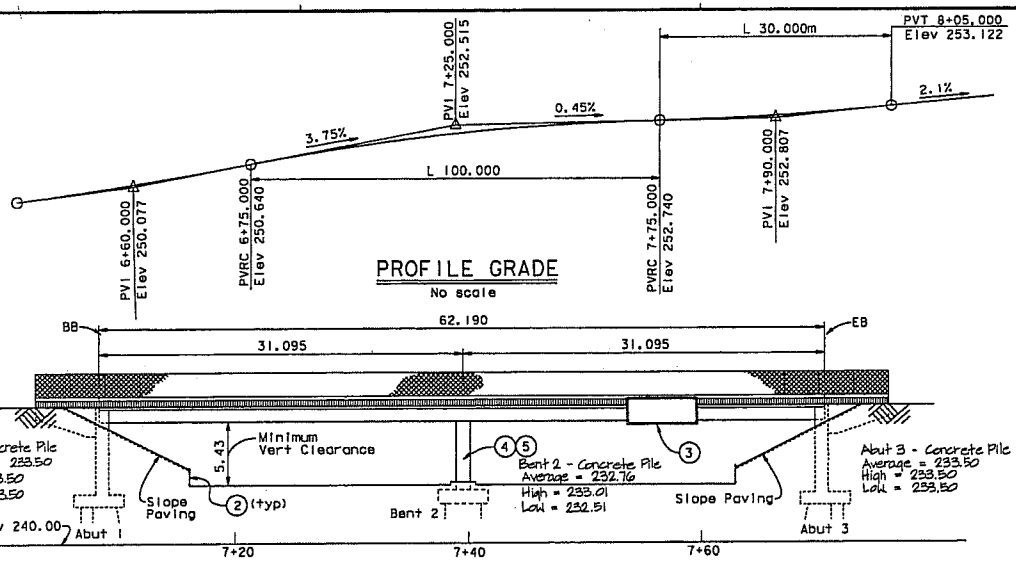
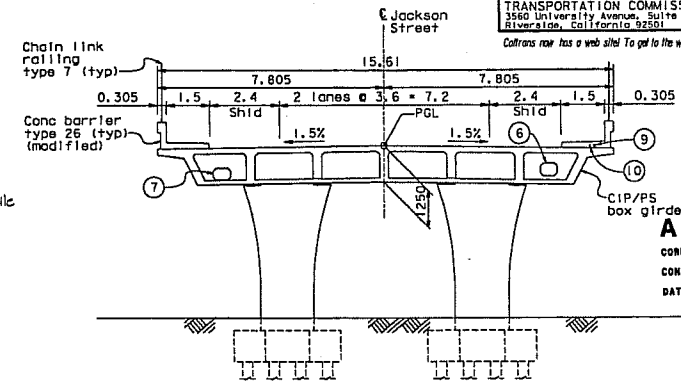
Caltrans Metric

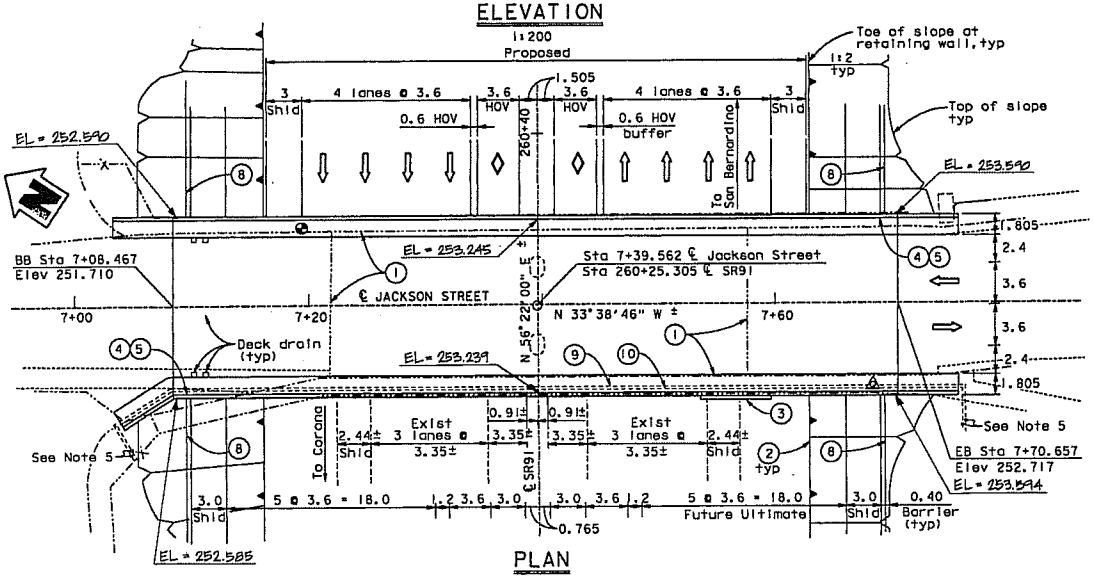



QUANTITIES

| | | |
|---|---|---|
| BRIDGE REMOVAL | LUMP | SUM |
| STRUCTURE EXCAVATION (BRIDGE) | 1,625 | $m^3$ |
| STRUCTURE BACKFILL (BRIDGE) | 965 | $m^3$ |
| FURNISH PILING (CLASS 625) | 1,048 | m |
| DRIVE PILE (CLASS 625) | 100 | EA |
| PRESTRESSING CAST-IN-PLACE CONCRETE | LUMP | SUM |
| STRUCTURAL CONCRETE, BRIDGE FOOTING | 161 | $m^3$ |
| STRUCTURAL CONCRETE, BRIDGE | 775 | $m^3$ |
| JOINT SEAL (TYPE B - MR 40 MM) | 32 | m |
| BAR REINFORCING STEEL (BRIDGE) | 105,000 | kg |
| GEOCOMPOSITE DRAIN | 270 | $m^2$ |
| SLOPE PAVING (CONCRETE) | 29 | $m^3$ |
| MISCELLANEOUS METAL (BRIDGE) | 1,175 | kg |
| CHAIN LINK RAILING (TYPE 7) | 145 | m |
| CONCRETE BARRIER (TYPE 26 MODIFIED) | 145 | m |




**AS BUILT**
CORRECTIONS BY Alex Angles
CONTRACT NO. 08-4353U4
DATE 12/19/03 03/12/04




LEGEND:

1. Remove existing structure
2. Retaining wall (see Road Plans)
3. See 'Bridge Mounted Sign' sheet and Road Plans for details
4. Paint "Jackson Street Overcrossing"
5. Paint "Br No. 56-0390"
6. Opening for 622 mm wide x 400 mm deep casing for Pacbell Utilities
7. Opening for 585 mm wide x 400 mm deep casing for Riverside Electric Utilities
8. Future retaining wall (see Road Plans)
9. 75mm GSP Irrigation Supply Line
10. 53mm Irrigation Control Conduit with pullwire

Denotes Existing structure

Point of minimum vertical clearance

NOTES:

1. For "Standard Plans", See 'Index to Plans' sheet
2. For "Pile Data Table", See 'Foundation Plan' sheet
3. For "General Notes", see 'Index to Plans' sheet
4. The contractor shall verify all controlling field dimensions before ordering or fabricating any material.
5. For continuation of Irrigation Supply Line and Control Conduit, see "Road Plans"

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

| | | | | | |
|---|---|---|---|---|---|
| DESIGN OVERSIGHT | DESIGN | BY N. Patel | CHECKED A. Athalye | LOAD FACTOR DESIGN | LIVE LOADING: HS20-44 AND ALTERNATIVE AND PERMIT DESIGN LOAD |
| OCT. 6, 2000 | DETAILS | BY P. Zucchi | CHECKED A. Athalye | LAYOUT | BY P. Zucchi / CHECKED N. Patel |
| SIGN OFF DATE | QUANTITIES | BY N. Patel | CHECKED S. Collan | SPECIFICATIONS | BY D. Harnagel / PLANS AND SPECS COMPARED D. Harnagel |

DESIGN GENERAL PLAN SHEET (METRIC) (REV. 9/2/99)

**PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION**

J. Chapman
PROJECT ENGINEER

CU 08110
EA 4353U1

BRIDGE NO. 56-0390
KILOMETER POST 23.6(14.6)

# JACKSON STREET OC (REPLACE)
## GENERAL PLAN

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY) 3/27/98 9/29/98 10/5/98

SHEET 1 OF 14

ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS 0 10 20 30 40 50 60 70 80 90 100

Caltrans now has a web site! To get to the web site, go to: http://www.dot.ca.gov

Caltrans Metric

| DIST | COUNTY | ROUTE | KILOMETER POST TOTAL PROJECT | SHEET No | TOTAL SHEETS |
|---|---|---|---|---|---|
| 08 | Riv | 91 | 18.0/28.5 | 377 | 377 |

REGISTERED CIVIL ENGINEER

1-22-01
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — ROSS KHABANI — No. 2202 — Exp. 6/30/04 — STATE OF CALIFORNIA

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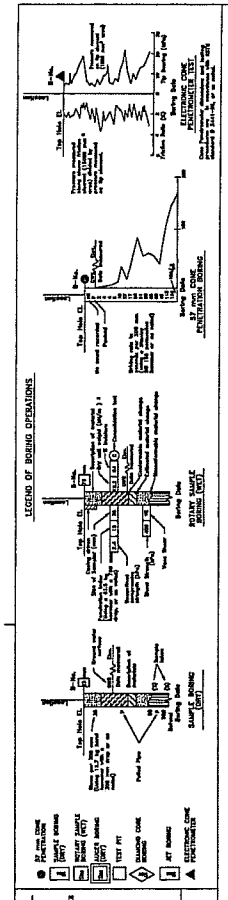
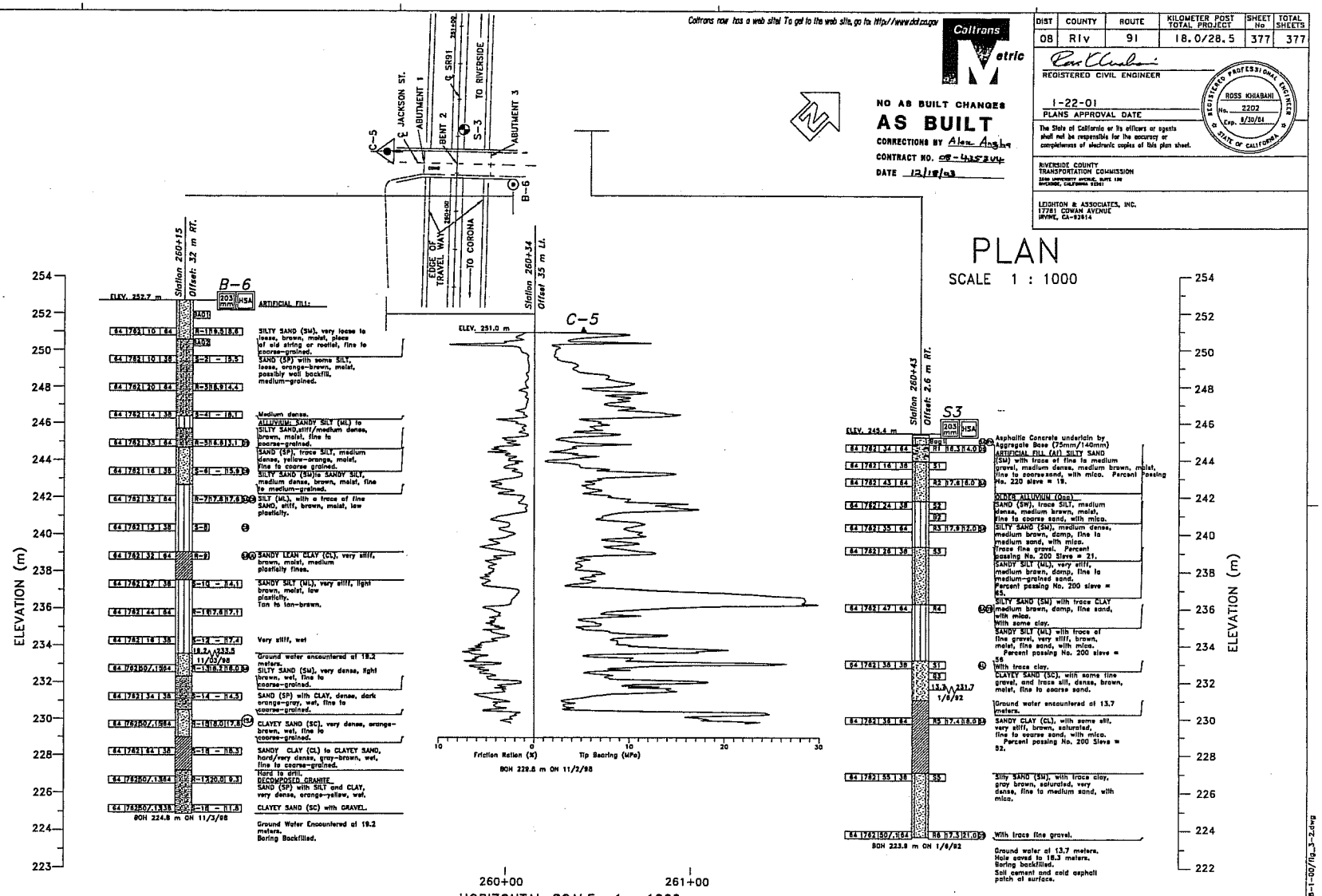
RIVERSIDE COUNTY TRANSPORTATION COMMISSION
3560 UNIVERSITY AVENUE, SUITE 100
RIVERSIDE, CALIFORNIA 92501

LEIGHTON & ASSOCIATES, INC.
17781 COWAN AVENUE
IRVINE, CA-92614

NO AS BUILT CHANGES
**AS BUILT**
CORRECTIONS BY Alex Angles
CONTRACT NO. 08-435204
DATE 12/18/03




ATTACHMENT B-5

| DESIGN OVERSIGHT | DRAWN BY | Karen Perez | JGH/ENG FIELD INVESTIGATOR |
|---|---|---|---|
| SIGN OFF DATE | CHECKED BY | Ross Khabani | DATE 1/92 and 11/98 |

PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

Jeffrey G. Chapman
PROJECT ENGINEER

| BRIDGE NO. | 56-390 |
|---|---|
| POST MILE | 23.6 |

CU 08110
EA 4353U1

# JACKSON STREET OC
# LOG OF TEST BORINGS

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY) | SHEET 14 | OF 14

OSF CIVIL LOG OF TEST BORING SHEET (METRIC) (REV. 4/20/00) Modified for an geotechnical consultants

pwdrafting/980236/001/of_8-1-00/fig_3-2.dwg

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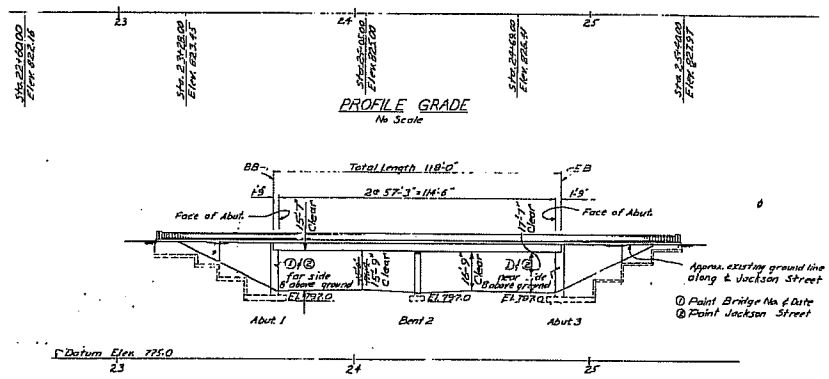
| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO. | TOTAL SHEETS | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| 7 | CALIF. | FSP-4204 | 88 | 187 | |

| REVISION | |
|---|---|
| 12 Shift Pier and Footing | |
| 11 Change Pier Footing | |
| 10 Change Pier Footing | |
| 9 Change Pier Footing | |
| 8 Change Pier Footing | |
| 7 Change Pier Footing | |
| 6 Change Pier Footing | |
| 5 Change Pier Footing | |
| 4 Change Pier Footing | |
| 3 Change Pier Footing | |
| 2 Change Pier Footing | |
| 1 Change Pier Footing | |

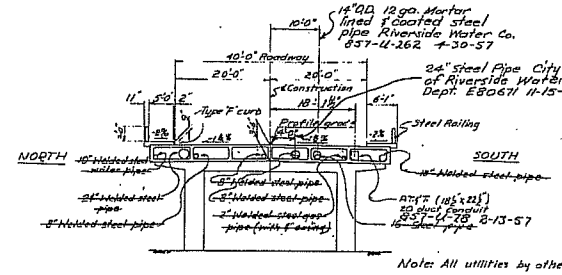
| REVISION | |
|---|---|
| 12 Change Pier Footing | |
| 11 Change Pier Footing | |
| 10 Change Pier Footing | |
| 9 Change Pier Footing | |
| 8 Change Pier Footing | |
| 7 Change Pier Footing | |
| 6 Change Pier Footing | |
| 5 Change Pier Footing | |
| 4 Change Pier Footing | |
| 3 Change Pier Footing | |
| 2 Change Pier Footing | |
| 1 Change Pier Footing | |



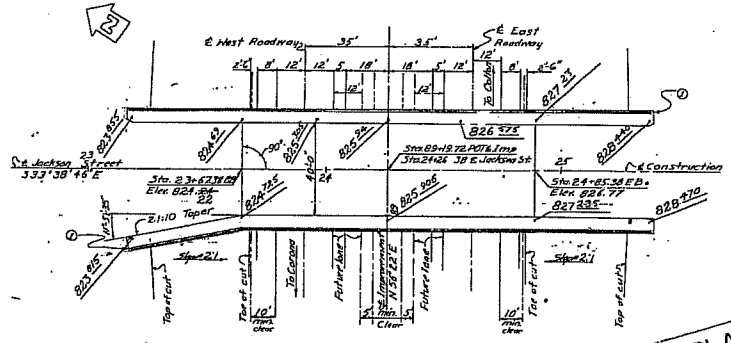

APPROXIMATE QUANTITIES

| | |
|---|---|
| STRUCTURE EXCAVATION | 960 C.Y. |
| STRUCTURE BACKFILL | 1,060 C.Y. |
| CLASS A CONCRETE (BRIDGE)(950 C.Y.) | LUMP SUM |
| RUBBER WATERSTOPS | 120 L.F. |
| BAR REINFORCING STEEL (BRIDGE)(168,000 LBS.) | LUMP SUM |
| STEEL RAILING | 437 L.F. |

Date Approved May 14, 1957




TYPICAL SECTION
Scale: 1" = 10'




PLAN
Scale: 1" = 20'

B.M. 9-D-57 El. 821.62
Sphd. nail in lead in P.C.C. curb 192' Lt. Sta. 89+02 E. Improv.

B.M. 9-E-57 El. 822.52
Sphd. nail in lead in P.C.C. curb 169' Rt. E. Improv. Sta. 89+02

INDEX TO PLANS


| Sheet No. | Title |
|---|---|
| 1 | General Plan |
| 2 | Foundation Plan |
| 3 | Abutment Layout |
| 4 | Abutment Details |
| 5 | Type 1A Cantilever Retaining Wall |
| 6 | Type 2 Cantilever Retaining Wall |
| 7 | Bent 2 |
| 8 | Typical Section |
| 9 | Girder Layout and Reinforcement |
| 10 | Standard Details No. 1 |
| 11 | Standard Details No. 2 |
| 12 | Standard Utility Details No. 1 |
| 13 | Steel Railing |
| 14 | Log of Test Borings |


THIS SET OF PLANS HAS BEEN CORRECTED TO CORRESPOND TO THE "AS BUILT" PRINTS DATED _____ AS SUBMITTED BY RESIDENT ENGINEER CONTRACTOR CORRECTED BY [illegible] DATE [illegible]

58-8VC8

For General Notes see "Standard Details No. 2" sheet

AS BUILT PLANS
Contract No. 58-8VC8
Date Completed
Document No. 80000703

Live Loading: H20-S16-44

BRIDGE DEPARTMENT
DESIGN SECTION 7
Project Designer [illegible]
Chief Designer [illegible]

| | | | |
|---|---|---|---|
| DESIGN | W. D. Freeman 11-55 | [illegible] 4-56 | [illegible] 4-56 |
| DETAILS | W. D. Freeman 11-55 | [illegible] 4-56 | [illegible] 5-2-56 |
| QUANTITIES | W. Dave Moore 1-56 | [illegible] 1-56 | [illegible] 2-1-56 |
| SPECIFICATIONS | W. [illegible] 8-56 | [illegible] | |
| Approved recommended | [illegible] | | [illegible] 5-14-57 |

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

JACKSON STREET OVERCROSSING
LOCATED IN THE CITY OF RIVERSIDE, ABOUT 1.8 MILES NORTHEAST OF THE SOUTHEASTERLY CITY LIMIT

GENERAL PLAN

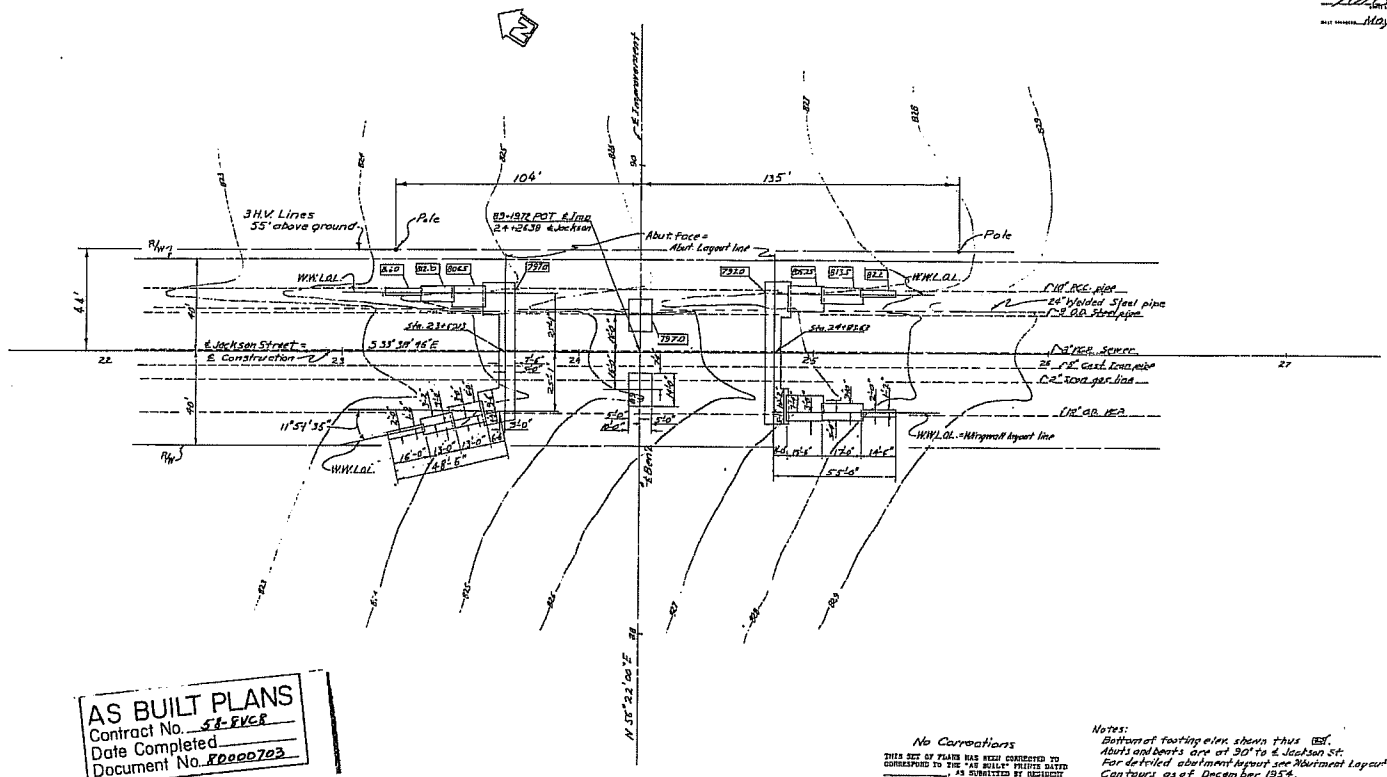
| SCALE AS NOTED | BRIDGE 58-390 | FILE | DRAWING C-4342-1 |
|---|---|---|---|

PREL. DRAWING No. P-4342 | Z | X | Y | P | 1 |

| FED. ROAD DIST. NO. | STATE | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|
| 7 | CALIF. | 1954-55 | 83 | 187 |

| DATE | DRAWN | TRACED | CHECKED | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| 7/28 | RW | [illegible] | [illegible] | 2 | 12 |

May 13, 1957




AS BUILT PLANS
Contract No. 58-EVCR
Date Completed
Document No. RD000703

No Corrections

THIS SET OF PLANS HAS BEEN CORRECTED TO CORRESPOND TO THE "AS BUILT" PRINTS DATED ____, AS SUBMITTED BY RESIDENT

ENGINEER
TRACINGS CORRECTED BY [illegible] DATE 7-15-57

Notes:
Bottom of footing elev. shown thus [illegible].
Abuts and bents are at 90° to ℄ Jackson St.
For detailed abutment layout see "Abutment Layout" sheet.
Contours as of December 1954.

B.M. (Indiana - Donald) '54
Sph'd Nail in 2"x2" Rwd. hub buried 18"
315' Rt. 83+19 R.O.T. ℄ Imp
El. 828.38

B.M. (Indiana - Jackson) '54
Sph'd nail in 2"x2" Rwd. hub buried 18"
127' Rt. 83+42 R.O.T. ℄ Imp
El. 827.47

BRIDGE DEPARTMENT
... DESIGN SECTION ... 7
Project Designer [illegible]
Chief Designer [illegible]

| | | | |
|---|---|---|---|
| DESIGN | [illegible] | [illegible] | [illegible] |
| DETAILS | [illegible] | [illegible] | [illegible] |
| QUANTITIES | [illegible] | [illegible] | [illegible] |
| SPECIFICATIONS | | | |

Approved for transmittal by [illegible] Chief Bridge Engineer

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

JACKSON ST. OVERCROSSING

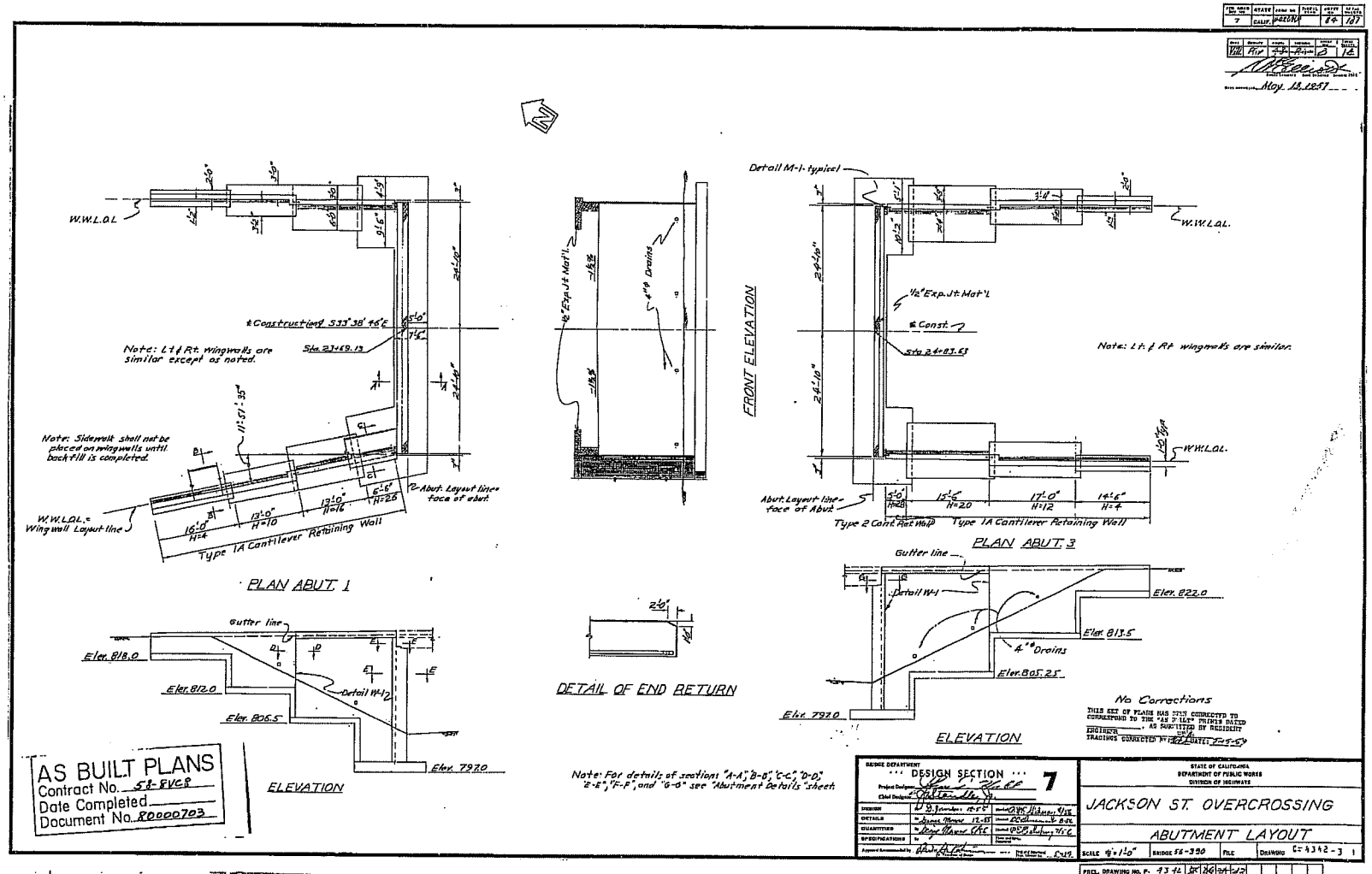
FOUNDATION PLAN

SCALE 1" = 20' | DWING. 56-390 | FILE | DRAWING C-43 42-2

PREL. DRAWING No. P-43 42

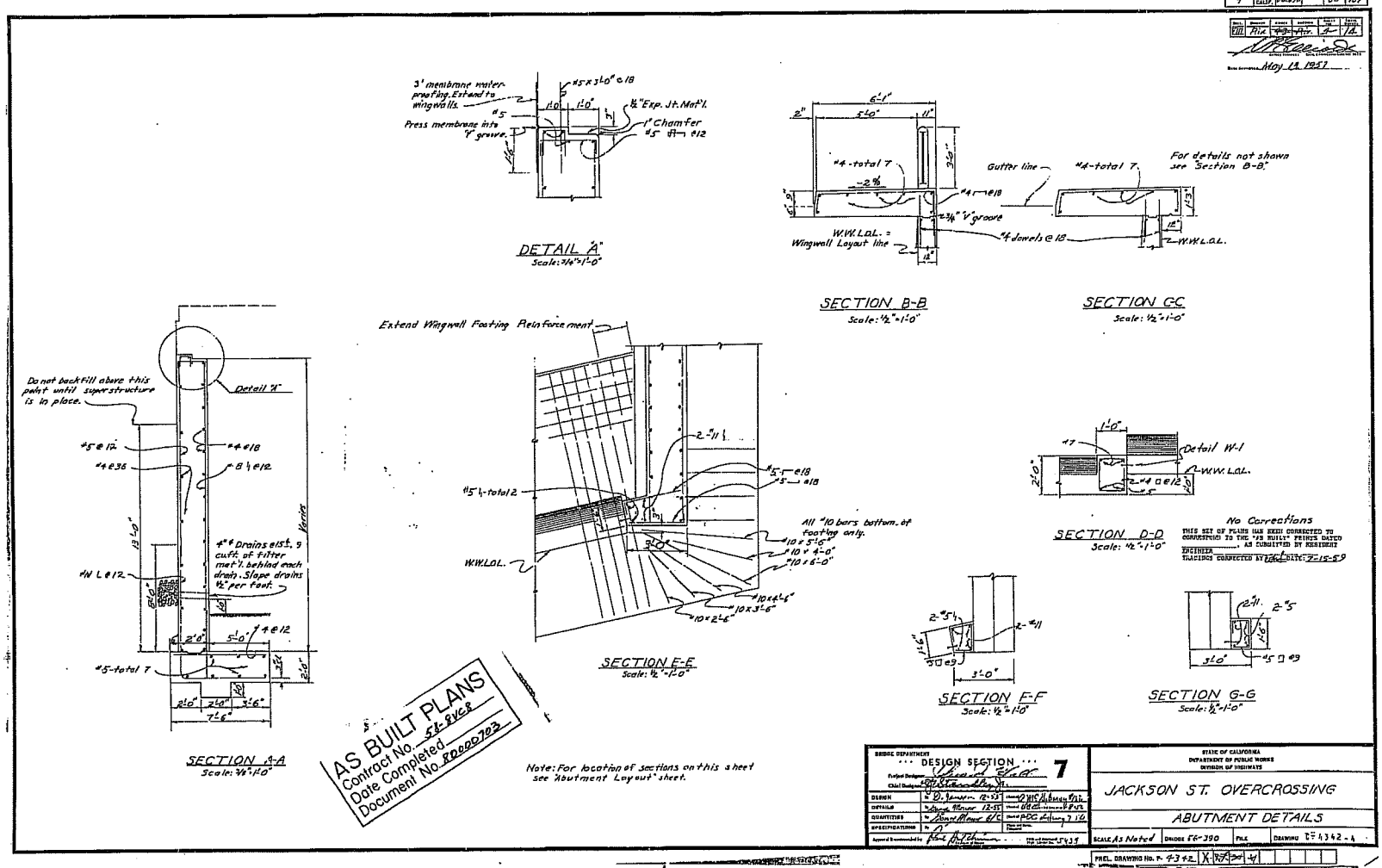
83

383



W.W.L.O.L.
℄ Construction 533°38'46"E
Sta. 23+69.13
Note: Lt. & Rt. wingwalls are similar except as noted.
Note: Sidewalk shall not be placed on wingwalls until backfill is completed.
W.W.L.O.L. = Wing wall Layout line
Abut. Layout line = face of abut.
Type 1A Cantilever Retaining Wall
PLAN ABUT. 1
Gutter line
Elev. 818.0
Elev. 812.0
Elev. 806.5
Detail W-1
Elev. 797.0
ELEVATION
℄ Exp. Jt. Mat'l.
4" ϕ Drains
FRONT ELEVATION
DETAIL OF END RETURN
Detail M-1 typical
1/2" Exp. Jt. Mat'l.
℄ Const.
Sta. 24+83.63
Note: Lt. & Rt. wingwalls are similar.
Abut. Layout line = face of Abut.
Type 2 Cant. Ret. Wall
Type 1A Cantilever Retaining Wall
PLAN ABUT. 3
Elev. 822.0
Elev. 813.5
Elev. 805.25
Elev. 797.0
ELEVATION
No Corrections
Note: For details of sections "A-A", "B-B", "C-C", "D-D", "E-E", "F-F", and "G-G" see "Abutment Details" sheet.
AS BUILT PLANS
Contract No. 58-8VC8
Date Completed
Document No. 80000703
DESIGN SECTION 7
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS
JACKSON ST. OVERCROSSING
ABUTMENT LAYOUT
SCALE 1/4" = 1'-0"
BRIDGE 56-390
FILE
DRAWING C-4342-3
PREL. DRAWING NO. P-4342


84



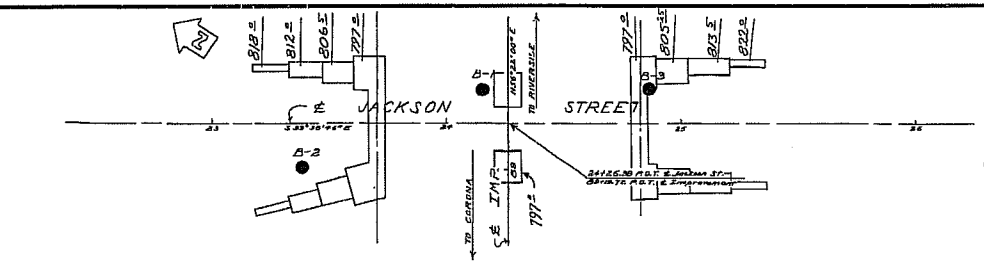
DETAIL "A"
Scale: 3/4"=1'-0"
3' membrane water-proofing. Extend to wingwalls.
Press membrane into "V" groove.
#5 x 3'-0" @ 18
1/2" Exp. Jt. Mat'l.
1" Chamfer
SECTION B-B
Scale: 1/2"=1'-0"
#4-total 7
W.W.L.O.L. = Wingwall Layout line
3/4" "V" groove
#4 dowels @ 18
SECTION C-C
Scale: 1/2"=1'-0"
Gutter line
For details not shown see "Section B-B."
W.W.L.O.L.
SECTION D-D
Scale: 1/2"=1'-0"
Detail W-1
W.W.L.O.L.
SECTION E-E
Scale: 1/2"=1'-0"
Extend Wingwall Footing Reinforcement
#5 1/2-total 2
All #10 bars bottom of footing only.
#10 x 5'-6"
#10 x 4'-0"
#10 x 6'-0"
#10 x 4'-6"
#10 x 3'-6"
#10 x 2'-6"
W.W.L.O.L.
SECTION F-F
Scale: 1/2"=1'-0"
SECTION G-G
Scale: 1/2"=1'-0"
SECTION A-A
Scale: 3/4"=1'-0"
Do not backfill above this point until superstructure is in place.
Detail "A"
#5 @ 12
#4 @ 36
#4 @ 18
#8 1/2 @ 12
4" ϕ Drains elst. 9 cu.ft. of filter mat'l. behind each drain. Slope drains 1/2" per foot.
#N L @ 12
#5-total 7
Varies
No Corrections
THIS SET OF PLANS HAS BEEN CORRECTED TO CORRESPOND TO THE "AS BUILT" PRINTS DATED ..... AS SUBMITTED BY RESIDENT ENGINEER
TRACINGS CORRECTED BY ..... DATE: 7-15-59
AS BUILT PLANS
Contract No. 58-8VC8
Date Completed
Document No. 80000703
Note: For location of sections on this sheet see "Abutment Layout" sheet.
BRIDGE DEPARTMENT
DESIGN SECTION 7
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS
JACKSON ST. OVERCROSSING
ABUTMENT DETAILS
SCALE As Noted
DRAWING
PREL. DRAWING No. F-4342


385

| FED. HWY. ADM. REGION | STATE | FEDERAL AID PROJECT NO. | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|
| 7 | CAL. | [illegible] | 95 | 187 |

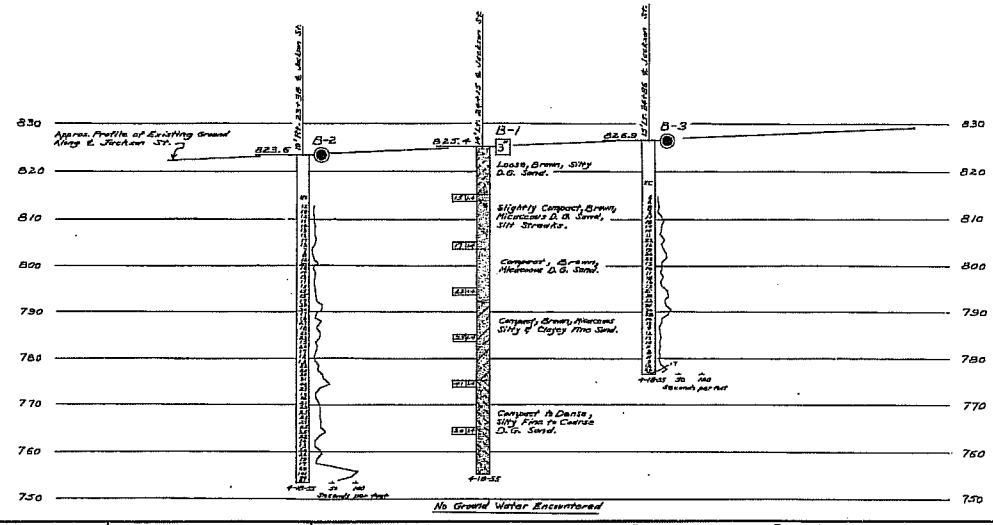
| DIST. | SUBMIT | RECOM. | RECOM. | APPROVED |
|---|---|---|---|---|
| VIII | PRT | [illegible] | [illegible] | [illegible] |

Date approved May 12, 1951




Construction Notes:

1. Elev. shown at ftgs. are 'As Built' ftg subgrade, & are same as shown on plans. Elev. Sym. about ℄ Jackson.
2. No ground water encountered
3. Material uncovered at subgrade similar to that on Borings.
4. Fdtns. on spread ftgs. - no piling




B.M. Ind-Donald-54
Spike Nail in 2"X2" Rwd. Hub buried 18" S15°W.82+18 P.G.T. ℄ Imp.
El. 828.38'

B.M. Ind-Jackson 1-8
Spike Nail in 2"X2" Rwd. Hub buried 18" 13°W.Rt.88+42 P.G.T. ℄ Imp.
El. 827.47'

Test Boring by Bridge Dept.

THIS SET OF PLANS HAS BEEN CORRECTED TO CORRESPOND TO THE "AS BUILT" PLANS DATED ____, AS SUBMITTED BY RESIDENT ENGINEER ____ DATE 7-57

AS BUILT PLANS
Contract No. 54-Riv-8
Date Completed
Document No. 1000723

BRIDGE DEPARTMENT

| FIELD STUDY | |
|---|---|
| DRAWN | [illegible] |
| CHECKED | [illegible] |

Approved Bridge Engineer [illegible]

### Classification of Material Based on Standard Grade Size Limits

Diagram showing the basis for estimates of grade size distribution used in determination of class names.

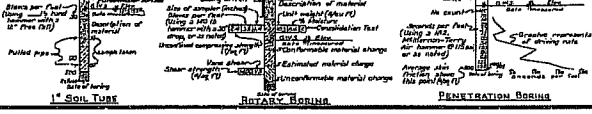
If gravel is present in appreciable amounts the term "gravelly" may be added to the class name, viz. "gravelly sand." The terms "coarse", "medium" and "fine" when used to describe sand, silt and gravel, refer to standard grade size limits.

### Legend of Earth Materials

- Gravel
- Sand
- Silt
- Clay
- Sandy Clay or Clayey Sand
- Sandy Silt or Silty Sand
- Silty Clay or Clayey Silt
- Peat and Organic Matter
- Fill Material
- Igneous Rock
- Sedimentary Rock
- Metamorphic Rock

### Legend of Boring Operations

- Plan of any boring
- Penetrometer
- 2½" Cone Penetrometer
- Sampler boring (dry)
- Rotary boring (wet)
- Auger boring (dry)
- Jet boring
- Core boring
- Test pit




### Notes

The contractor's attention is directed to Section 2, Article (c) of the Standard Specifications and to the Special Provisions accompanying this set of plans.

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

# JACKSON ST. O. C.

## LOG OF TEST BORINGS

Month, Year 1950
Scale Horz. 1"=10' Vert. 1"=10'
Bridge 56-280
File E-56
Drawing E-4342-14

PREL. DRAWING No. P-4342 [illegible] 57

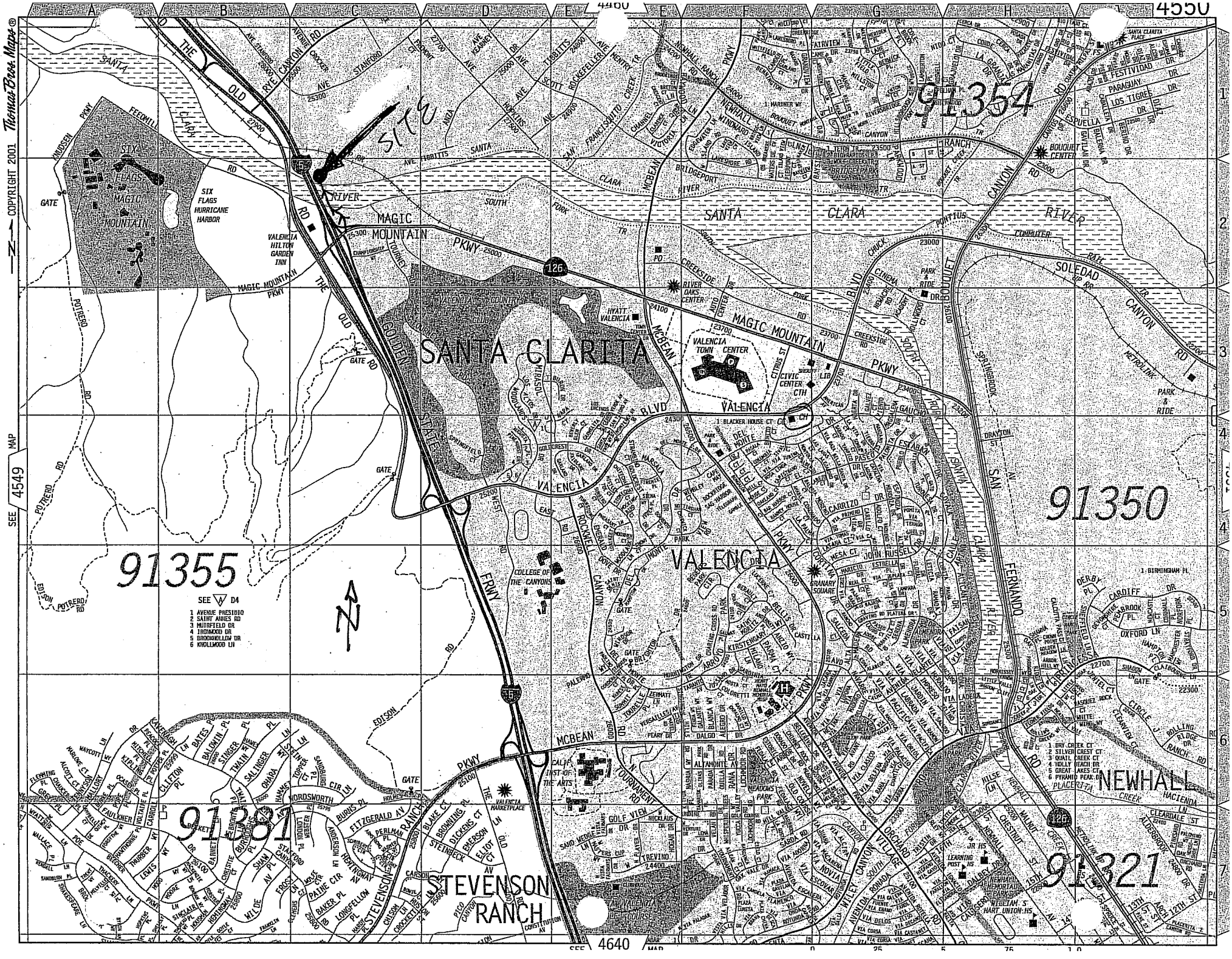
95

# Caltrans Bridge 53-2928
# Santa Clara River Bridge,
# Los Angeles Co./Santa Clarita

**Caltrans Bridge 53-2928, Santa Clara River Bridge,**
**Los Angeles Co./Santa Clarita**

This freeway undercrossing is located in Santa Clarita in Santa Clara County, near Magic Mountain Parkway. Two new bridge are being built on the outside of the two existing bridges. The four bridges span over a deep gorge. The abutments of the two new bridges are monolithic abutments on piles.

The field investigation for the new bridges was conducted on 3/6/04 on the freshly compacted fill. The investigation consisted of (2) 25-ft deep soil borings and (2) 25-ft deep conventional and seismic CPT soundings. Drilling was performed by 2R Drilling and CPT by HFA. All locations were set back 3 to 5 ft behind the abutment walls. Borehole 04-23 and CPT 04-23C were performed at the north abutment of the east bridge, and Borehole 04-24 and CPT 04-24C were performed at the north abutment of the west. Drilling at the south abutments of either bridge was not feasible. Geotechnical soil sampling consisted of ring samples collected at 2.5-ft depth intervals using a Modified California and SPT sampler. Groundwater was not encountered. Seismic wave measurements were taken at 2.5-ft intervals. Two pressuremeter tests were performed in the two boreholes at 5.5 and 7.5-ft depth.


COPYRIGHT 2001 Thomas Bros. Maps®
SANTA CLARITA
VALENCIA
STEVENSON RANCH
NEWHALL
91355
91354
91350
91321
91381
SIX FLAGS MAGIC MOUNTAIN
SIX FLAGS HURRICANE HARBOR
VALENCIA HILTON GARDEN INN
MAGIC MOUNTAIN PKWY
SANTA CLARA RIVER
VALENCIA TOWN CENTER
CIVIC CENTER CTH
HYATT VALENCIA
RIVER OAKS CENTER
COLLEGE OF THE CANYONS
VALENCIA MARKETPLACE
GRANARY SQUARE
BOUQUET CENTER
PARK & RIDE
SEE 4549 MAP
SEE 4640 MAP
4460
4550

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

ACNHI-005-3(026)170N

| DIST | COUNTY | ROUTE | KILOMETER POST TOTAL PROJECT | SHEET No | TOTAL SHEETS |
|---|---|---|---|---|---|
| 07 | LA | 5, 126 | R85 3/R87.6, R9.3/R9.6 | 1 | 350 |

# PROJECT PLANS FOR CONSTRUCTION ON
# STATE HIGHWAY

## IN LOS ANGELES COUNTY IN SANTA CLARITA ON ROUTE 5 FROM 0.8 km NORTH OF VALENCIA BOULEVARD OVERCROSSING TO 0.6 km NORTH OF RYE CANYON BOULEVARD UNDERCROSSING AND ON ROUTE 126 FROM 0.1 km WEST OF ROUTE 5/126 SEPARATION TO 0.2 km EAST OF ROUTE 5/126 SEPARATION

To be supplemented by Standard Plans dated July, 1999

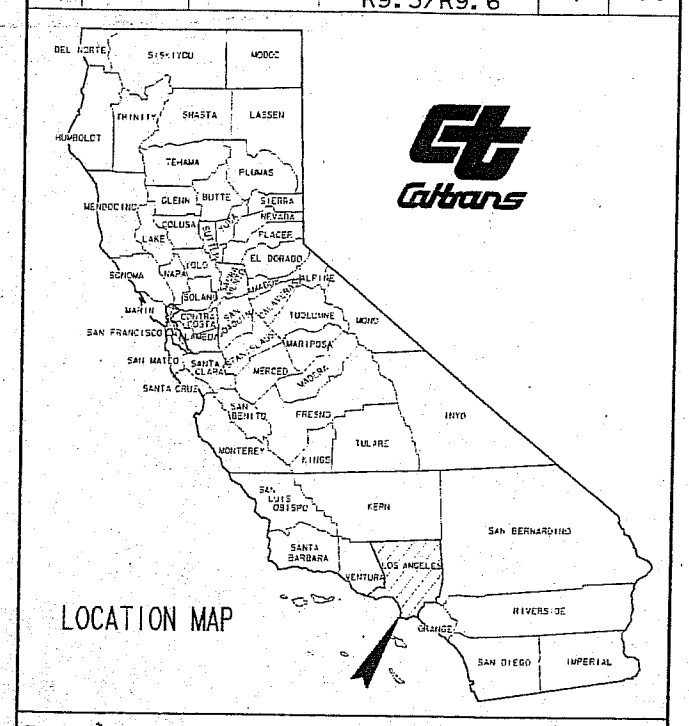
INDEX OF SHEETS


| Sheet No. | Description |
|---|---|
| 1 | Title and Location Map |
| 2-4 | Typical Cross Sections |
| 5-12 | Layouts |
| 13-16 | Profiles |
| 17-33 | Construction Details |
| 34-38 | Contour Grading |
| 39-79 | Drainage Plans, Profiles and Details |
| 80-85 | Utility Plans |
| 86-89 | Transportation Management Plans |
| 90-163 | Stage Construction and Traffic Handling Plans |
| 164 | Detour Plan |
| 165-167 | Construction Area Signs |
| 168-183 | Pavement Delineation Plans and Quantities |
| 184-187 | Summary of Quantities |
| 188-194 | Sign Plan, Details and Quantities |
| 195-196 | Retaining Wall Plans, Details, and Quantities |
| 197-203 | Highway Planting Plans |
| 204-220 | Electrical Plans |
| 221-230 | Revised Standard Plans |

STRUCTURE PLANS

| | |
|---|---|
| 231-244 | Bridge No. 53-1625, Route 5/126 Separation (Temp. Bridge) |
| 245-272 | Bridge No. 53-2928, Route 5/126 Separation (Replace) |
| 273-291 | Bridge No. 53-0687R/L, Santa Clara River Bridge (Temp. Widening) |
| 292-301 | Bridge No. 53-0688, Santa Clara Overhead (Widen) |
| 302-312 | Bridge No. 53-1688, Rye Canyon Road UC (Widen) |
| 313-350 | Bridge No. 53-2925, Santa Clara River Bridge (Replace) |


THE STANDARD PLANS LIST APPLICABLE TO THIS CONTRACT IS INCLUDED IN THE NOTICE TO CONTRACTORS AND SPECIAL PROVISIONS BOOK.





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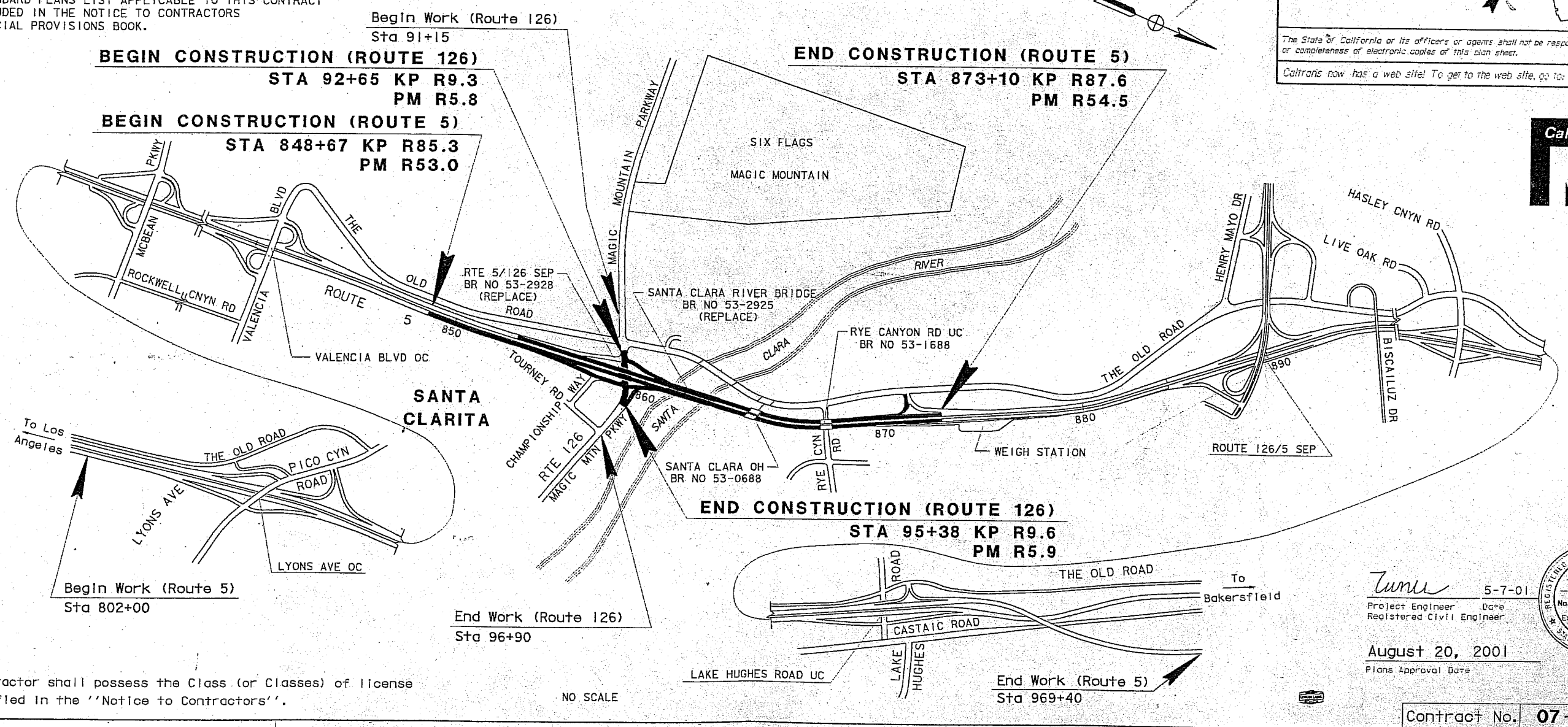


The Contractor shall possess the Class (or Classes) of license as specified in the ''Notice to Contractors''.

NO SCALE

Project Engineer — Date
Registered Civil Engineer

5-7-01

August 20, 2001
Plans Approval Date

REGISTERED PROFESSIONAL ENGINEER — TUNG TO — No. 37314 — Exp. 6-30-04 — CIVIL — STATE OF CALIFORNIA

Contract No. 07-1760U4

| PROJECT ENGINEER | DATE | PROJECT MANAGER | DATE | DESIGN OVERSIGHT |
|---|---|---|---|---|
| C. LOERA | | | | GREGORY DAMICO |

LAST REVISION 00-00-00 — DATE PLOTTED => 30-AUG-2001 14:31

FORM DC-OE-93-FF (REV. 3/98)

FOR REDUCED PLANS ORIGINAL SCALE IS IN MILLIMETERS — 0 20 40 60 80

USERNAME => trdamon
DGN FILE => 71760u001.dgn

CU 07247 — EA 1760U1

390

## HYDROLOGIC SUMMARY

DRAINAGE AREA: 1090 SQUARE KILOMETERS

| | DESIGN FLOOD | BASE FLOOD | OVERTOPPING FLOOD |
|---|---|---|---|
| FREQUENCY (YEARS) | 50 | 100 | >500 |
| DISCHARGE (CMS) | 869 | 1334 | N/A |
| WATER SURFACE ELEVATION (M) | 321.3 | 322.2 | 335.5 |

FLOOD PLAIN DATA ARE BASED UPON INFORMATION AVAILABLE WHEN THE PLANS WERE PREPARED AND ARE SHOWN TO MEET FEDERAL REQUIREMENTS. THE ACCURACY OF SAID INFORMATION IS NOT WARRANTED BY THE STATE AND INTERESTED OR AFFECTED PARTIES SHOULD MAKE THEIR OWN INVESTIGATION.

Caltrans Metric

| DIST | COUNTY | ROUTE | KILOMETER POST TOTAL PROJECT | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| 07 | LA | 5, 126 | R85.3/R87.6 R9.3/R9.6 | 316 | 350 |

Mario A. Bernardone 5-30-01
REGISTERED ENGINEER-CIVIL

8-20-01
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER M. Bernardone No. C 050736 Exp. 9-30-01 CIVIL STATE OF CALIFORNIA

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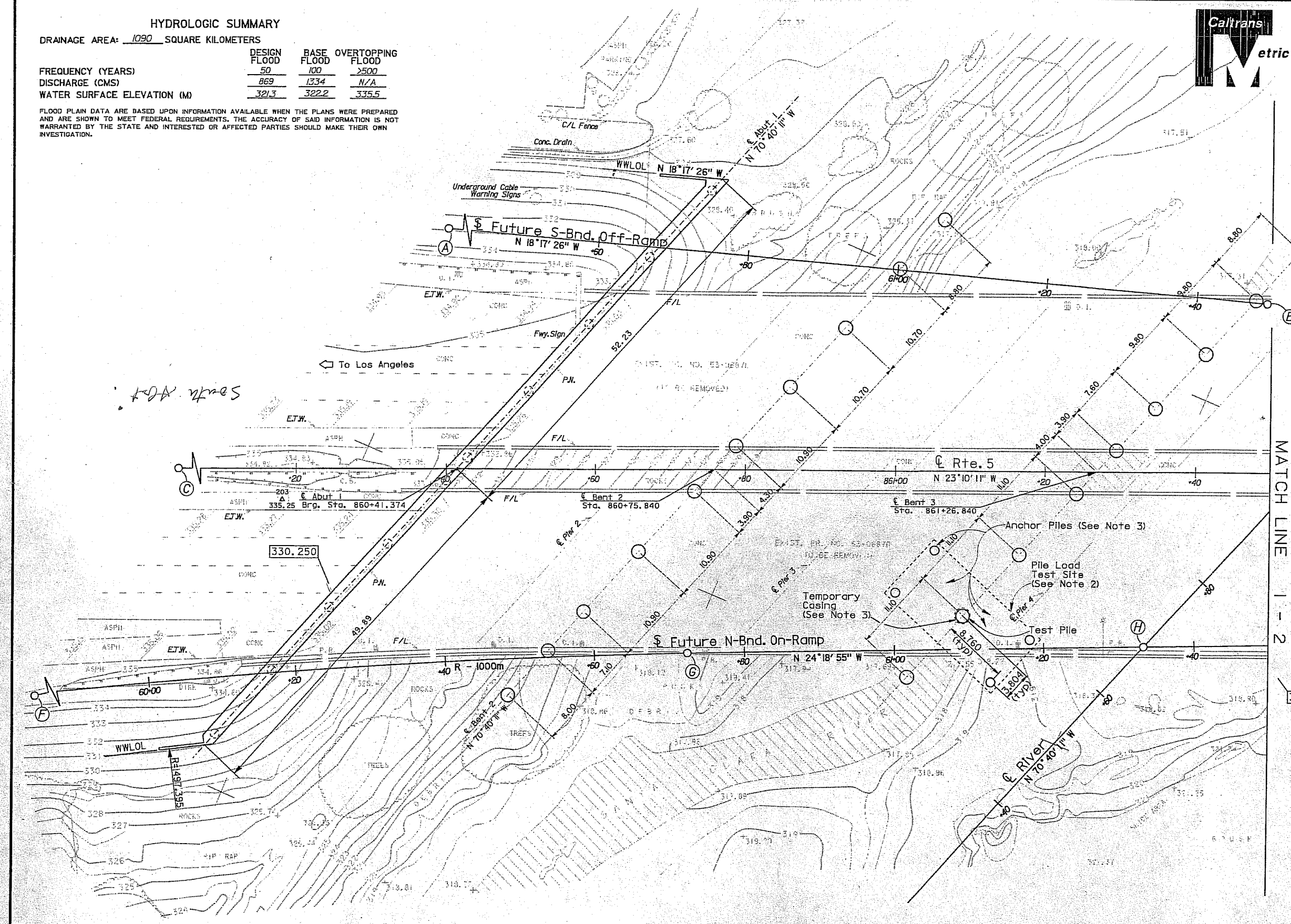


### CURVE DATA

℄ Prop. N-Bnd. On-Ramp
R - 1000m
Δ - 06° 02' 37"
L - 105.481
T - 52.789
N 603211.845
E 1947219.736

### BENCH MARKS

Refer to Sht. 2 of 2.

### LEGEND

+ denotes spot elevation.
denotes electrolier.
330.250 denotes bottom of Abutment elevation

### NOTES

1. For call-outs, refer to sheet 2 of 2.
2. Test Pile to be Pile Load Tested @ EL. 285 then @ EL. 282 (If necessary). See "Column Details" sheet.
3. Anchor Piles and Temporary Casing to be removed after Pile Load Test is complete.

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

PRELIMINARY INVESTIGATION SECTION

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| SCALE 1:250 | DATUM NAVD 1988 | PHOTOGRAMMETRY AS OF: | | DRAWN | BY M. HENNING 3/99 | DESIGN | BY Mario Bernardone / CHECKED Glenn Matthews |
| | | SURVEYED | BY | TRACED | BY | DETAILS | BY A. Onodera / CHECKED Mario Bernardone |
| ALIGNMENT TIES | | FIELD CHECKED | BY A. LEE 3/10/99 | CHECKED | BY L. MANABO 3/31/99 | QUANTITIES | BY Genaro M. Doria / CHECKED Joel Magana |

DS OSMI MDET (CADD 5-95)
DS OSD 2145 (4/89)

ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS 0 10 20 30 40 50 60 70 80 90 100

STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES STRUCTURE DESIGN 13

CU 07
EA 1760U1

BRIDGE NO. 53-2925
KILOMETER POST R86.4

# SANTA CLARA RIVER BRIDGE (REPLACE)
# FOUNDATION PLAN 1

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY) 10-23-98 2-11-00 2-21-00 3-22-00 4-3-00 6-1-00 8-10-00 10-31-00 12-15-00 4-25-01

SHEET 4 OF 38

dcfna01.dgn

391

| DIST | COUNTY | ROUTE | KILOMETER POST TOTAL PROJECT | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| 07 | LA | 5, 126 | R85.3/R87.6, R9.3/R9.6 | 317 | 350 |

Mario A. Bernardone 5-30-01
REGISTERED ENGINEER-CIVIL

8-20-01
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — M. Bernardone No. C 050736 Exp. 9-30-01 CIVIL — STATE OF CALIFORNIA

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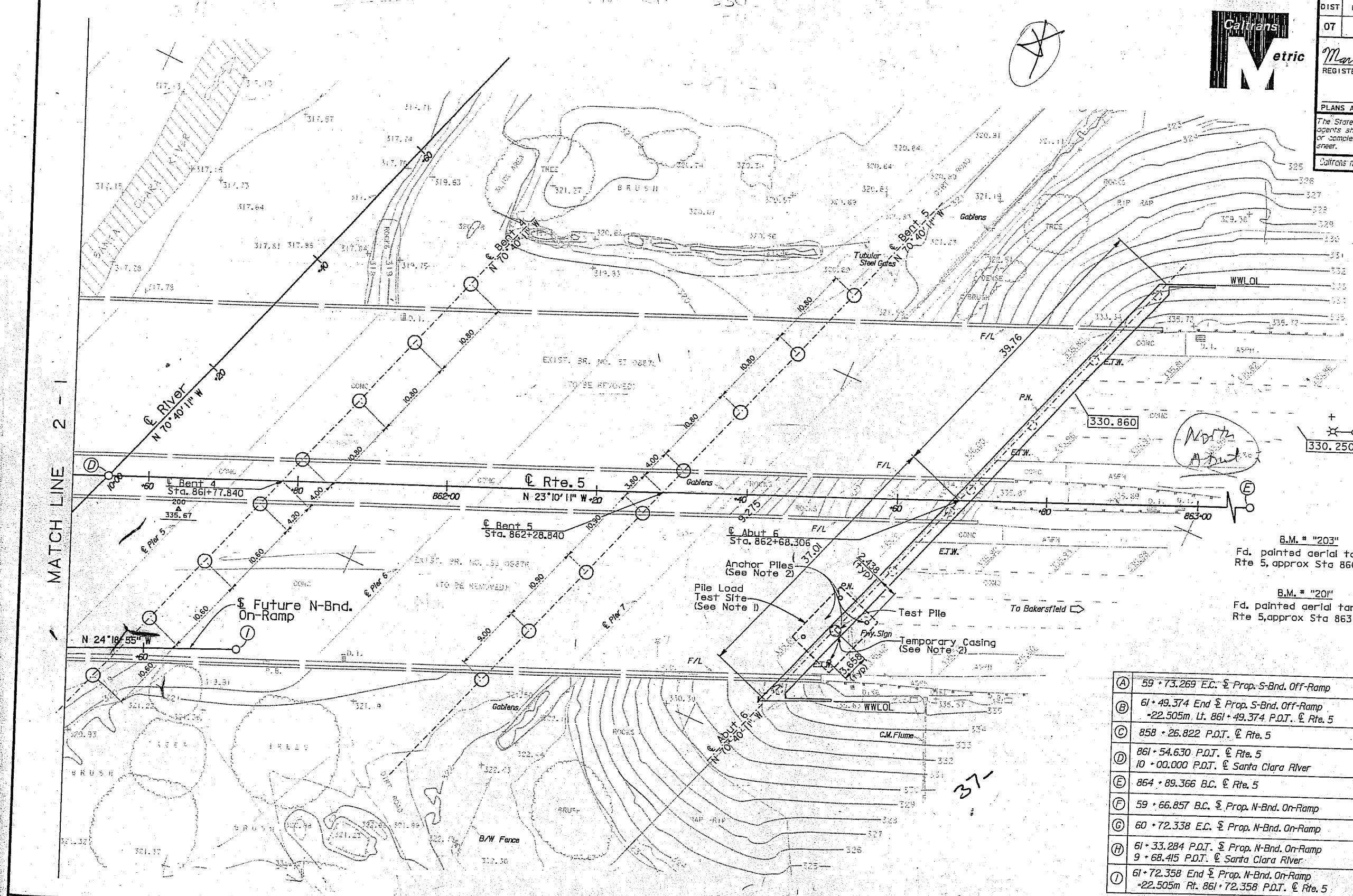


## NOTE

1. Test Pile to be Pile Load Tested @ El. 294. See "Column Details" sheet.
2. Anchor Piles and Temporary Casing to be removed after Pile Load Test is complete.

## LEGEND

+ denotes spot elevation.
denotes electrolier.
330.250 denotes bottom of Abutment elevation

## BENCH MARKS

B.M. # "203" — Elev. 335.247m
Fd. painted aerial target on w'ly asph shldr of N-Bnd Rte 5, approx Sta 860 + 18. N602742.211, E1946311.053

B.M. # "201" — Elev. 335.976m
Fd. painted aerial target on w'ly asph shldr of N-Bnd Rte 5, approx Sta 863 + 07. N603007.691, E1946197.517

| | | NORTH | EAST |
|---|---|---|---|
| A | 59 + 73.269 E.C. ℄ Prop. S-Bnd. Off-Ramp | 602685.187 | 1946290.190 |
| B | 61 + 49.374 End ℄ Prop. S-Bnd. Off-Ramp =22.505m Lt. 861 + 49.374 P.O.T. ℄ Rte. 5 | 602852.395 | 1946234.922 |
| C | 858 + 26.822 P.O.T. ℄ Rte. 5 | 602564.714 | 1946382.522 |
| D | 861 + 54.630 P.O.T. ℄ Rte. 5<br>10 + 00.000 P.O.T. ℄ Santa Clara River | 602866.082 | 1946253.544 |
| E | 864 + 89.366 B.C. ℄ Rte. 5 | 603173.819 | 1946121.840 |
| F | 59 + 66.857 B.C. ℄ Prop. N-Bnd. On-Ramp | 602706.430 | 1946356.860 |
| G | 60 + 72.338 E.C. ℄ Prop. N-Bnd. On-Ramp | 602800.087 | 1946308.443 |
| H | 61 + 33.284 P.O.T. ℄ Prop. N-Bnd. On-Ramp<br>9 + 68.415 P.O.T. ℄ Santa Clara River | 602855.627 | 1946283.348 |
| I | 61 + 72.358 End ℄ Prop. N-Bnd. On-Ramp =22.505m Rt. 861 + 72.358 P.O.T. ℄ Rte. 5 | 602891.235 | 1946267.259 |

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

PRELIMINARY INVESTIGATION SECTION

| SCALE 1:250 | DATUM NAVD 1988 | PHOTOGRAMMETRY AS OF: | DRAWN BY M. HENNING 3/99 | DESIGN BY Mario Bernardone | CHECKED Glenn Matthews |
|---|---|---|---|---|---|
| ALIGNMENT TIES | | SURVEYED BY | TRACED BY | DETAILS BY A. Gnodera | CHECKED Mario Bernardone |
| | | FIELD CHECKED BY A. LEE 3/10/99 | CHECKED BY L. MANABO 3/31/99 | QUANTITIES BY Genaro M. Dorla | CHECKED Joel Magana |

DS 95M1 MDET (CADD 5-95)
DS OSD 2145 (4/89)

ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS 0 10 20 30 40 50 60 70 80 90 100

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES
STRUCTURE DESIGN 13

CU 07
EA 176011

BRIDGE NO. 53-2925
KILOMETER POST R86.4

# SANTA CLARA RIVER BRIDGE (REPLACE)
## FOUNDATION PLAN 2

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY): 12-23-99 2-14-00 3-23-00 3-28-00 6-2-00 8-10-00 4-25-01

SHEET 5 OF 38

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NOTES:
1. For Section A-A, see "Abutment Details 1" sheet.
2. For Section B-B and C-C, see "Abutment Details 2" sheet.
3. Existing piles that conflict with new pile placement shall be removed.
4. Temporary Shoring Required for Stage Construction.

——— Indicates existing structure.
I Indicates existing steel pile.

Caltrans Metric

| DIST | COUNTY | ROUTE | KILOMETER POST TOTAL PROJECT | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| 07 | LA | 5, 126 | R85.3/R87.6, R9.3/R9.6 | 318 | 350 |

Mario A. Bernardone 5-30-01
REGISTERED CIVIL ENGINEER

8-20-01
PLANS APPROVAL DATE

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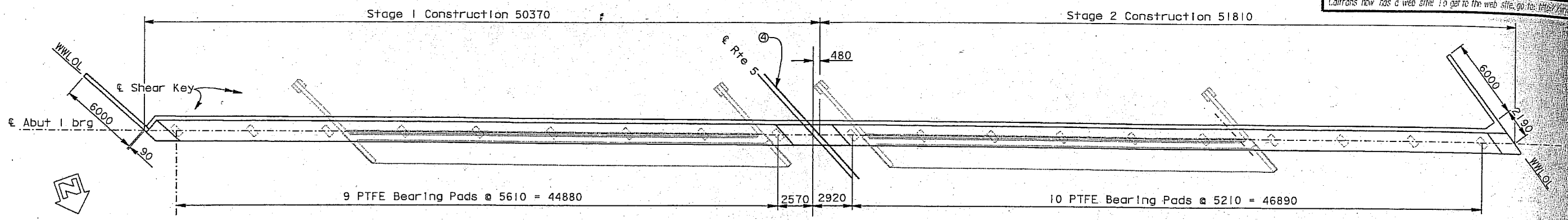
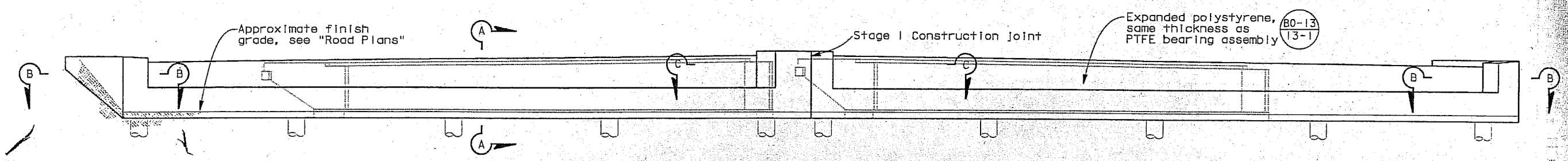
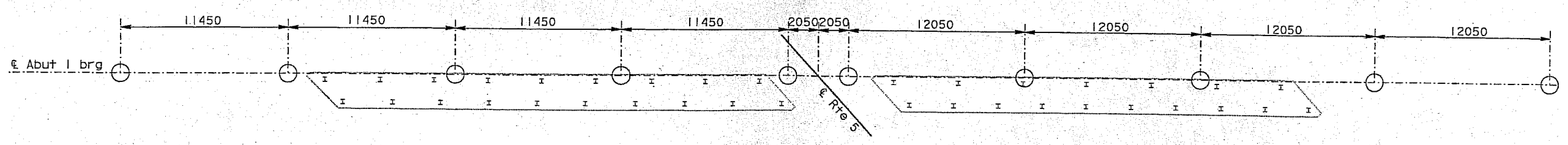



**PLAN**
1:150




**ELEVATION**
1:150




**PILE LAYOUT**
1:150

NOTE:
THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

| | BY | CHECKED |
|---|---|---|
| DESIGN | David Seifert | Genaro M. Doria |
| DETAILS | A. Onodera | David Seifert |
| QUANTITIES | Genaro M. Doria | Joel Magana |

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES
STRUCTURE DESIGN 13

BRIDGE NO. 53-2925
KILOMETER POST R86.4

SANTA CLARA RIVER BRIDGE (REPLACE)
ABUTMENT 1 LAYOUT

STRUCTURES DESIGN DETAIL SHEET (METRIC) (REV. 3/1/99)

ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS 0 10 20 30 40 50 60 70 80 90 100

CU 07
EA 1760U1

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY) STAGE ONLY: 2-10-00 2-14-00 2-15-00 3-6-00 3-23-00 3-28-00 3-30-00 4-25-01 5-22-01

SHEET 6 OF 38

FILE => ddabt1lay1.dgn

ddabt1lay1.dgn

USERNAME => trtonyv DATE PLOTTED => 24-AUG-2001 TIME PLOTTED => 14:49

| DIST | COUNTY | ROUTE | KILOMETER POST TOTAL PROJECT | SHEET No | TOTAL SHEETS |
|---|---|---|---|---|---|
| 07 | LA | 5,126 | R85.3/R87.6, R9.3/R9.6 | 319 | 350 |

Caltrans Metric

Mario A. Bernardone 5-30-01
REGISTERED CIVIL ENGINEER

8-20-01
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER M. Bernardone No. C 050736 Exp. 9-30-01 CIVIL STATE OF CALIFORNIA

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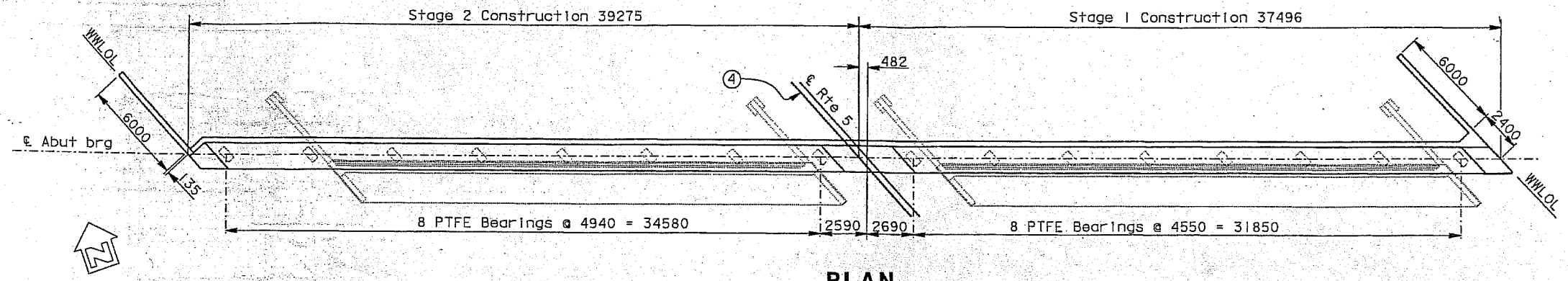
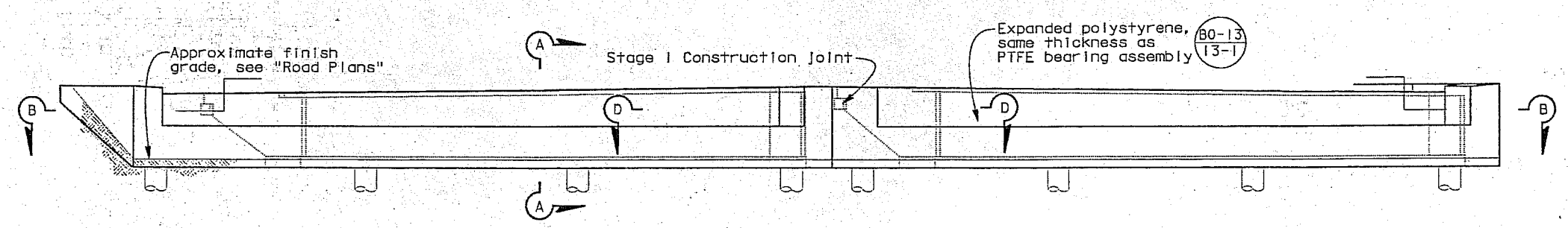
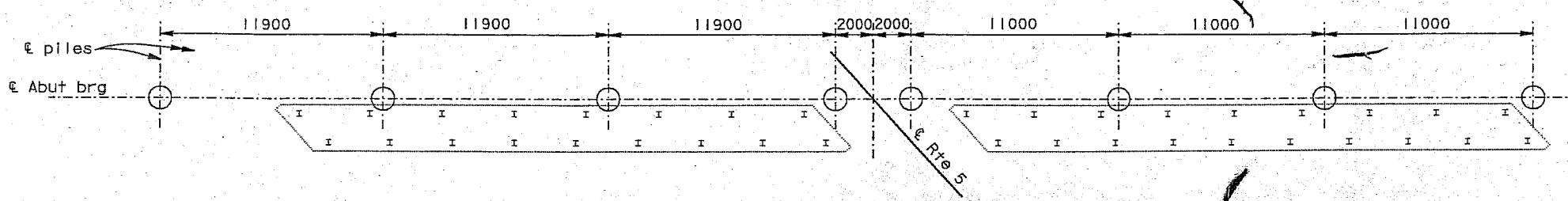



**PLAN**
1:150




**ELEVATION**
1:150




**PILE LAYOUT**
1:150

NOTES:
1. For Section A-A, see "Abutment Details 1" sheet.
2. For Section B-B, C-C, and D-D, see "Abutment Details 2" sheet.
3. Existing piles that conflict with new pile placement shall be removed.
4. Temporary Shoring Required for Stage Construction.

——— Indicates existing structure.
I Indicates existing steel pile.

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

NOTE:
THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.

| | BY | CHECKED |
|---|---|---|
| DESIGN | David Seifert | Genaro M. Doria |
| DETAILS | A. Onodera | David Seifert |
| QUANTITIES | Gerano M. Doria | Joel Magana |

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES
STRUCTURE DESIGN 13

BRIDGE NO. 53-2925
KILOMETER POST R86.4

# SANTA CLARA RIVER BRIDGE (REPLACE)
## ABUTMENT 6 LAYOUT

STRUCTURES DESIGN DETAIL SHEET (METRIC) (REV. 3/1/99)

ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS 0 10 20 30 40 50 60 70 80 90 100

CU 07
EA 1760U1

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY) 2-15-00 3-24-00 3-28-00 3-30-00 5-5-00 6-1-00 4-25-01 5-22-01

SHEET 7 OF 38

FILE => ddabt21ay6.dgn

ddabt21ay6.dgn

USERNAME => trtonyv DATE PLOTTED => 24-AUG-2001 TIME PLOTTED => 13:38

394

| DIST | COUNTY | ROUTE | KILOMETER POST TOTAL PROJECT | SHEET No. | TOTAL SHEETS |
|---|---|---|---|---|---|
| 07 | LA | 5, 126 | R85.3/R87.6 R9.3/R9.6 | 320 | 350 |

Caltrans Metric

Mario A. Bernardone 5-30-01
REGISTERED CIVIL ENGINEER

8-20-01
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER M. Bernardone No. C 050736 Exp. 9-30-01 CIVIL STATE OF CALIFORNIA

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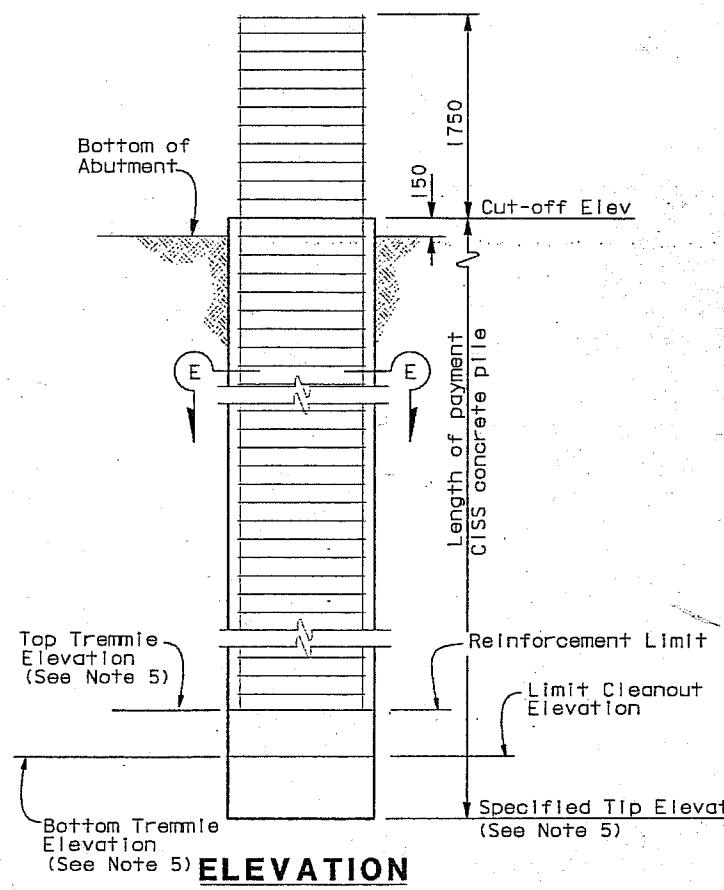
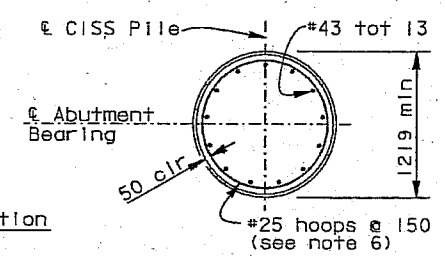


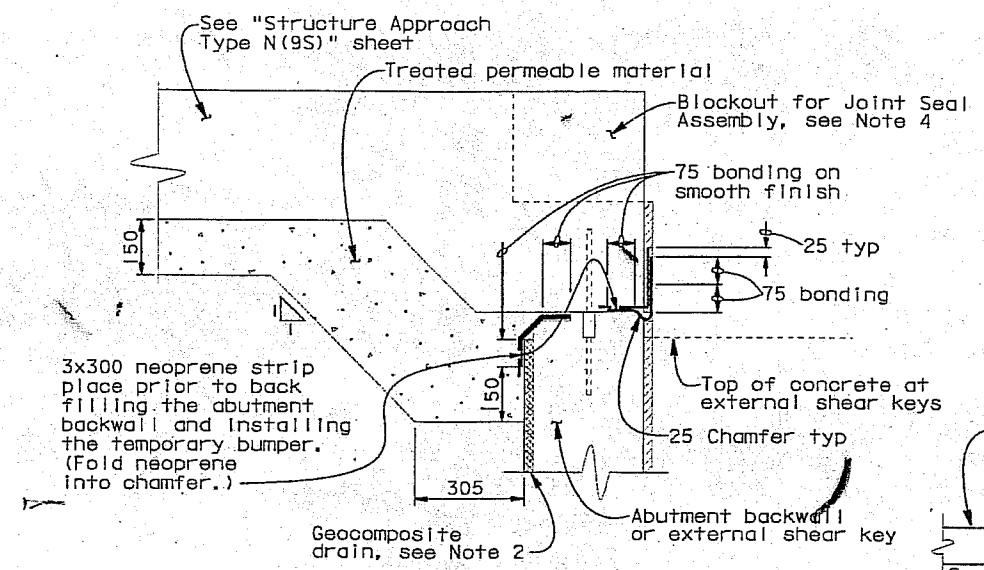

## ELEVATION




## SECTION E-E

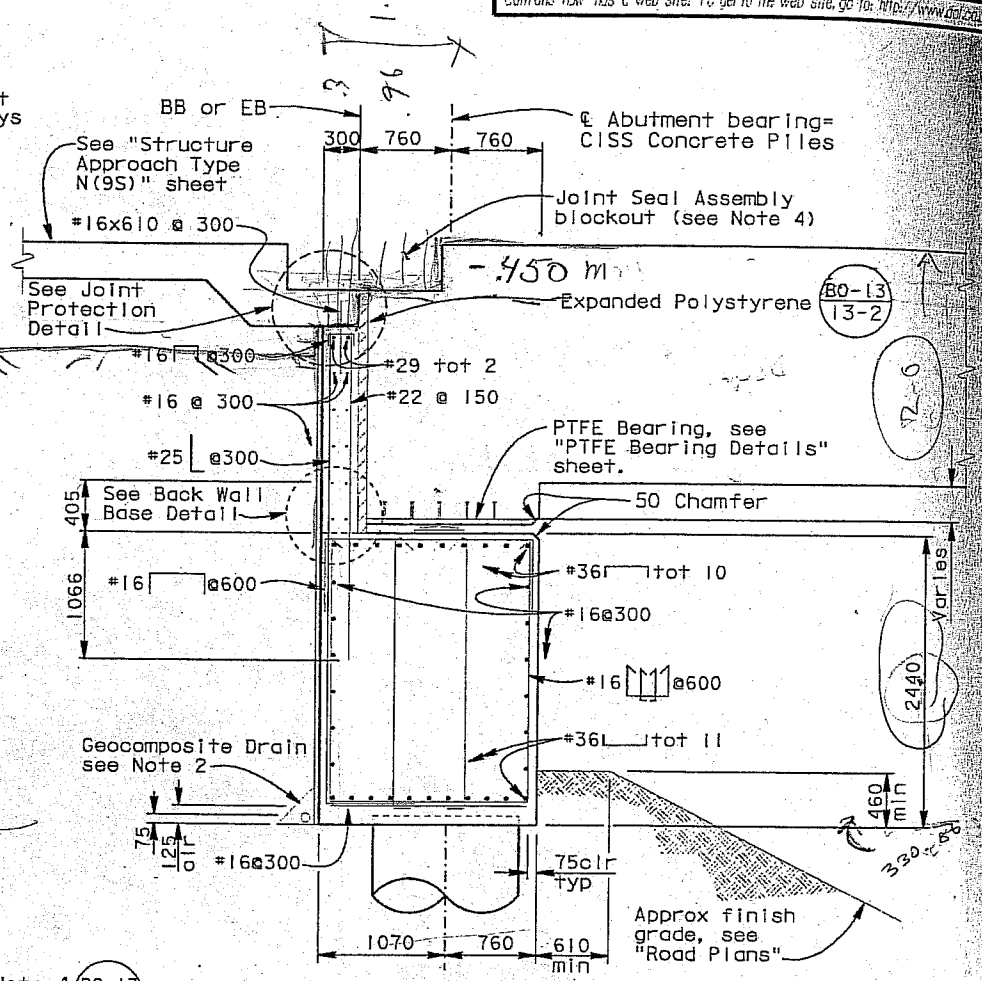
# 1219 CISS CONCRETE PILE DETAILS

1:30



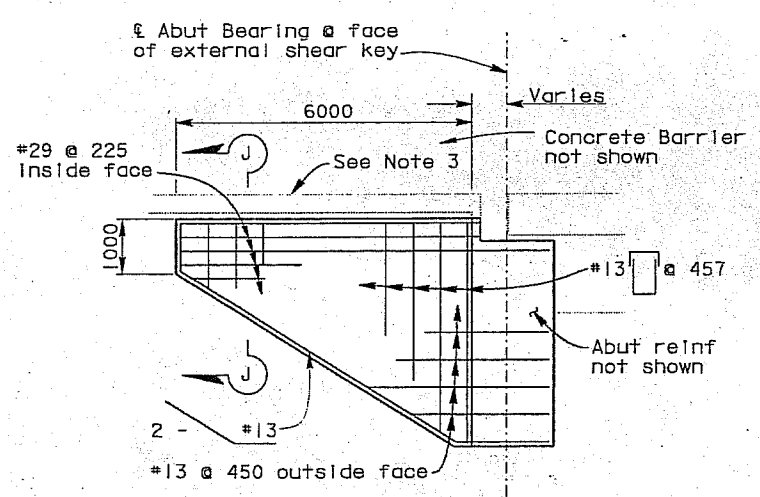

## JOINT PROTECTION DETAIL

No scale



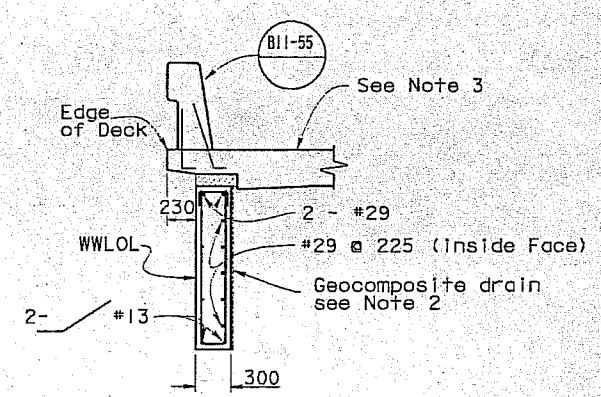

## SECTION A-A

1:30



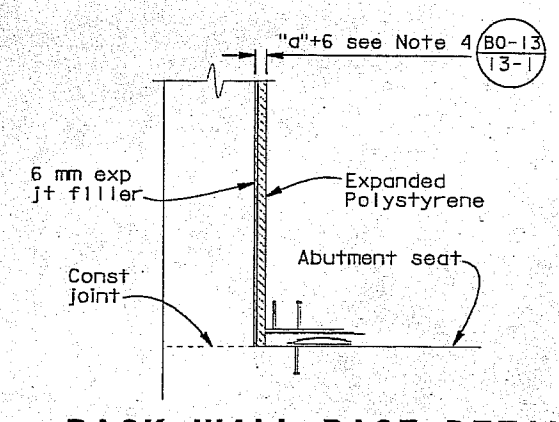

## WINGWALL ELEVATION

No scale




## SECTION J-J

1:30




## BACK WALL BASE DETAIL

No Scale

NOTES:

1. For location of Section A-A, see "Abutment 1 Layout" and "Abutment 6 Layout" sheets.
2. See "Structure Approach Drainage Details" sheet.
3. Structure Approach, see "Structure Approach Type N(9S)" sheet.
4. For MR "a" dimension and Joint Seal details, see "Abutment Joint Seal Details" sheet.
5. See "Column Details" sheet.
6. All hoops are "ultimate" butt splices continuous.

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

| | BY | CHECKED |
|---|---|---|
| DESIGN | David Seifert | Genaro M. Doria |
| DETAILS | A. Onodera | David Seifert |
| QUANTITIES | Genaro M. Doria | Joel Magana |

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES
STRUCTURE DESIGN 13

BRIDGE NO. 53-2925
KILOMETER POST R86.4

SANTA CLARA RIVER BRIDGE (REPLACE)
ABUTMENT DETAILS 1

CU 07
EA 1760U1

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY) 2-1-00 2-16-00 3-27-00 3-28-00 5-3-00 1-18-01 4-25-01 5-22-01

SHEET 8 OF 38

STRUCTURES DESIGN DETAIL SHEET (METRIC) (REV. 3/1/99)

ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS 0 10 20 30 40 50 60 70 80 90 100

FILE => ddabt3det1.dgn

ddabt3det1.dgn

USERNAME => trtonyv DATE PLOTTED => 24-AUG-2001 TIME PLOTTED => 14:38

395

| DIST | COUNTY | ROUTE | KILOMETER POST TOTAL PROJECT | SHEET No | TOTAL SHEETS |
|---|---|---|---|---|---|
| 07 | LA | 5,126 | R85.3/R87.6. R9.3/R9.6 | 321 | 350 |

Caltrans Metric

Mario A. Bernardone 5-30-01
REGISTERED CIVIL ENGINEER

8-20-01
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER M. Bernardone No. C 050736 Exp. 9-30-01 CIVIL STATE OF CALIFORNIA

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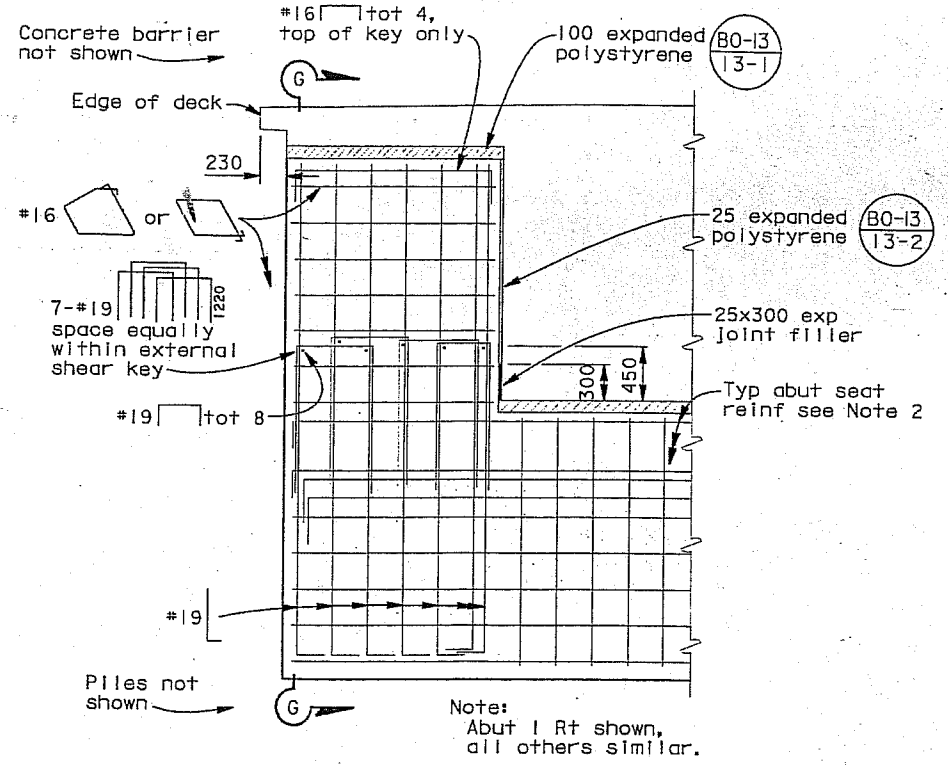
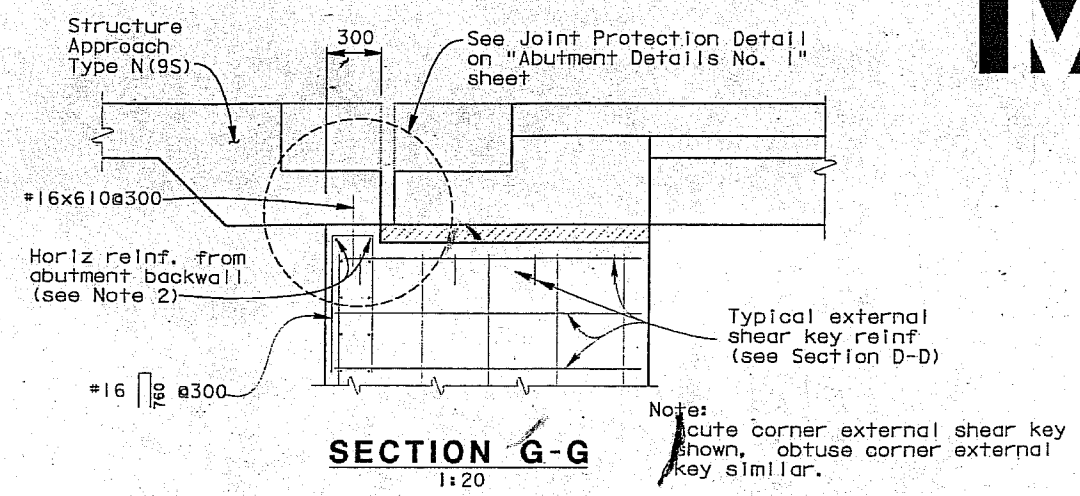



Note: Abut 1 Rt shown, all others similar.

## PART ELEVATION
1:30

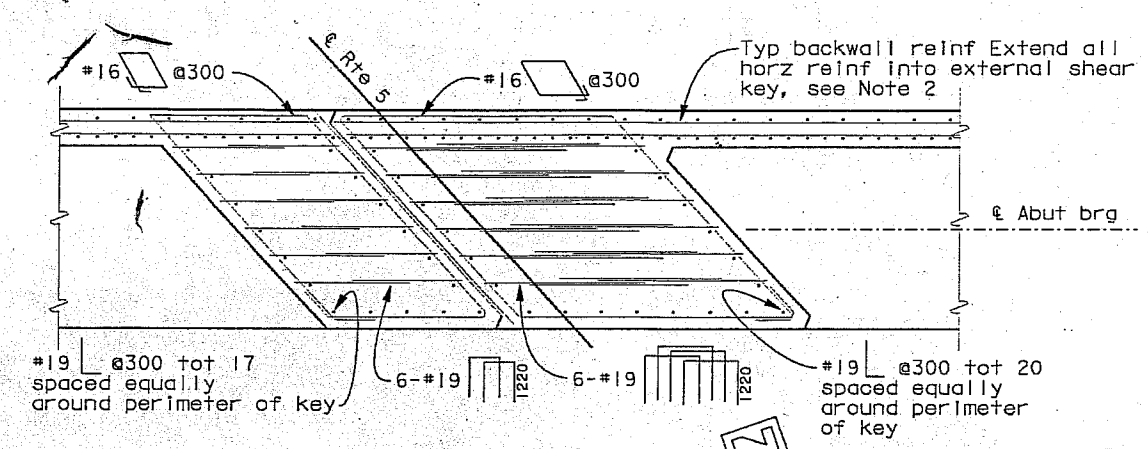



Note: Acute corner external shear key shown, obtuse corner external key similar.

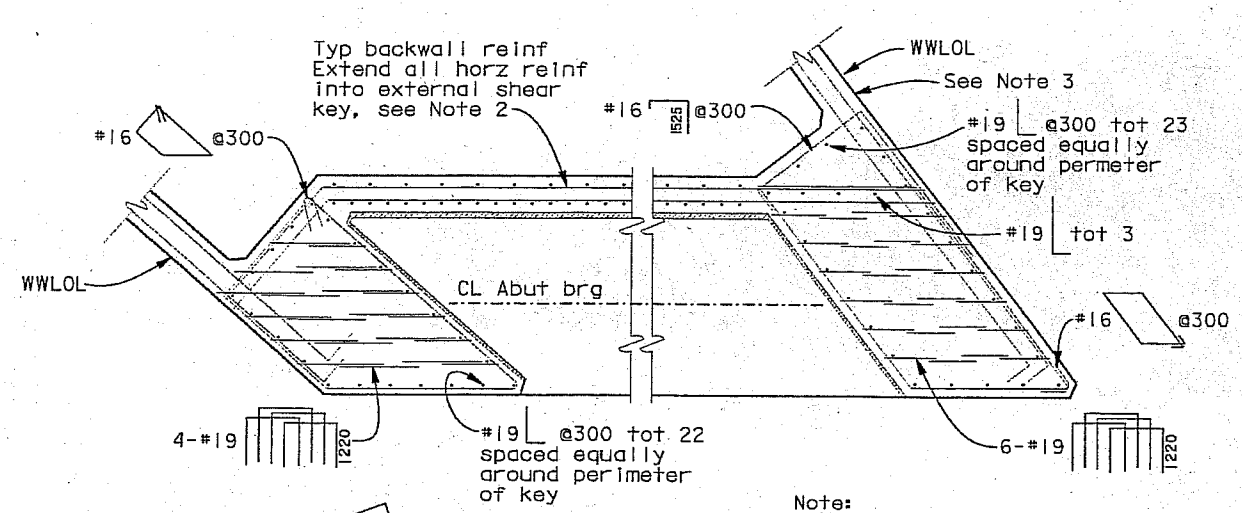
## SECTION G-G
1:20

NOTES:

1. See Section A-A on "Abutment Details No. 1" sheet for details not shown.
2. See Wingwall Elevation on "Abutment Details 1" sheet.

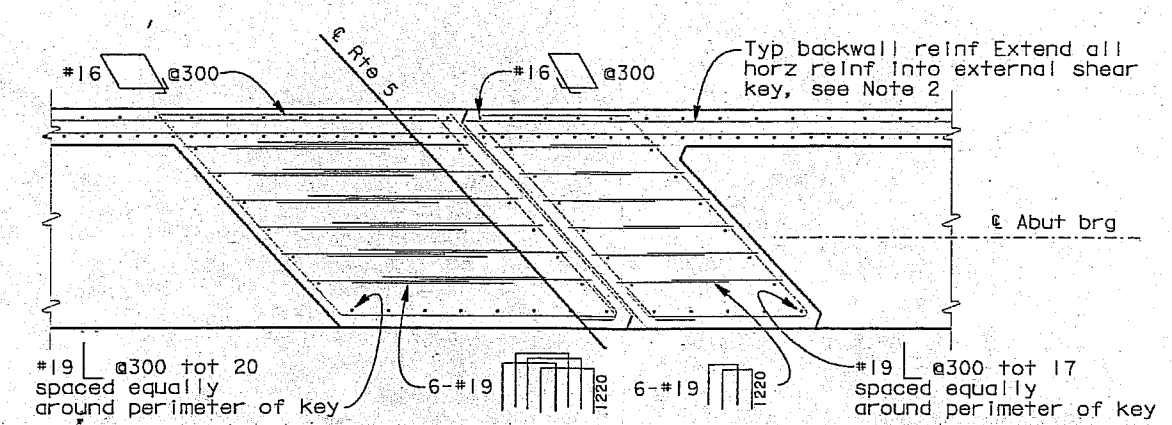



## SECTION C-C
1:30




Note: Abut 1 shown Abut 6 similar.

## SECTION B-B
1:30




## SECTION D-D
1:30

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

| | | | |
|---|---|---|---|
| DESIGN | BY David Seifert | CHECKED Genaro M. Doria | |
| DETAILS | BY A. Onodera | CHECKED David Seifert | |
| QUANTITIES | BY Genaro M. Doria | CHECKED Joel Magana | |

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES
STRUCTURE DESIGN 13

BRIDGE NO. 53-2925
KILOMETER POST R86.4

SANTA CLARA RIVER BRIDGE (REPLACE)
ABUTMENT DETAILS 2

STRUCTURES DESIGN DETAIL SHEET (METRIC) (REV. 3/1/99)

ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS 0 10 20 30 40 50 60 70 80 90 100

CU 07
EA 1760U1

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY) 1-26-00 2-2-00 2-17-00 3-27-00 5-5-00 1-25-01

SHEET 9 OF 38

FILE => ddabt4det2.dgn

ddabt4det2.dgn

USERNAME => trtonyv DATE PLOTTED => 24-AUG-2001 TIME PLOTTED => 13:38

| DIST | COUNTY | ROUTE | KILOMETER POST TOTAL PROJECT | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| 07 | LA | 5,126 | R85.3/R87.6, R9.3/R9.6 | 322 | 350 |

Caltrans Metric

Mario A. Bernardone 5-30-01
REGISTERED CIVIL ENGINEER

8-20-01
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER M. Bernardone No. C 050736 Exp. 9-30-01 CIVIL STATE OF CALIFORNIA

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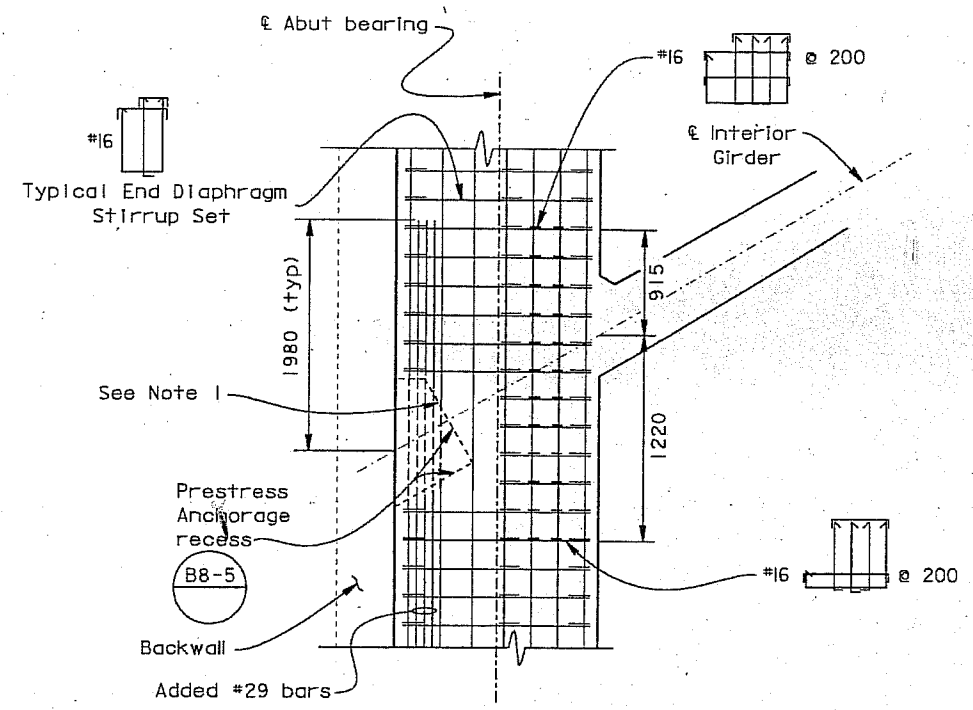
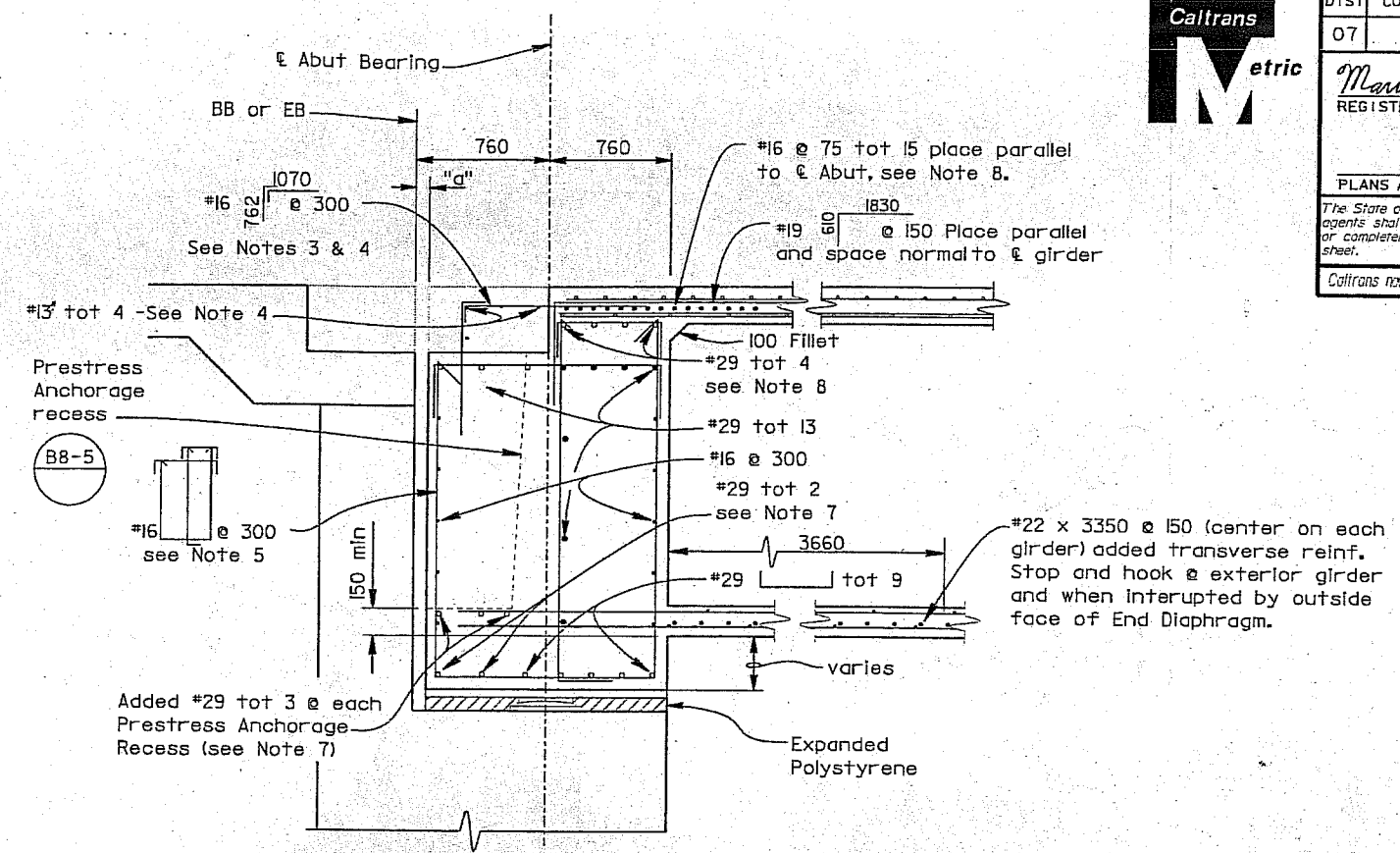


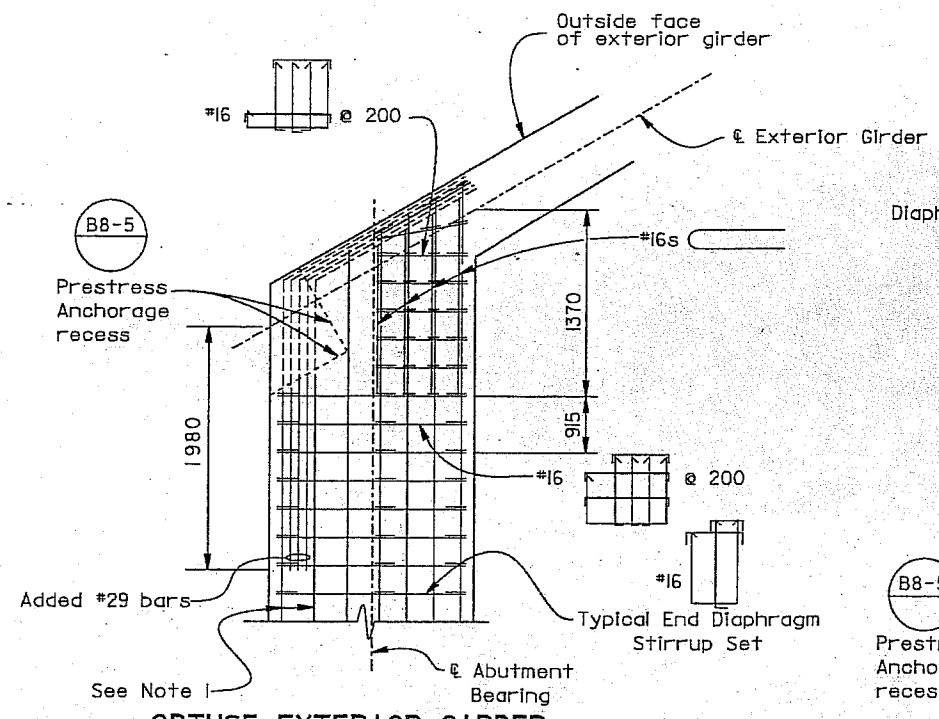

## TYPICAL INTERIOR GIRDER

(See Note 2)



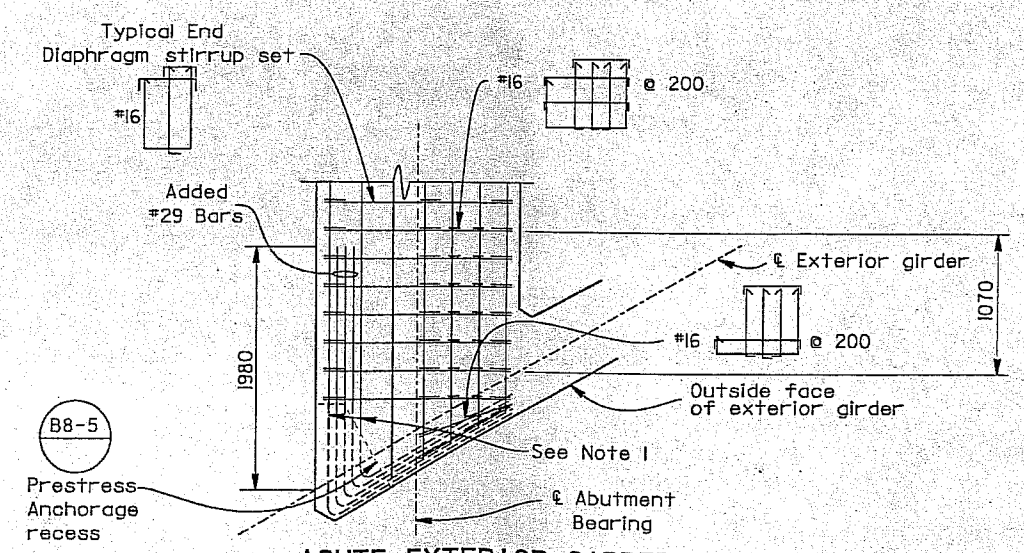

## END DIAPHRAGM SECTION

No scale (See Notes 6 & 9)




## OBTUSE EXTERIOR GIRDER

(See Note 2)




## ACUTE EXTERIOR GIRDER

(See Note 2)

## END DIAPHRAGM PLANS

No scale

NOTES:

1. Stop End Diaphragm Longitudinal Reinf. when in conflict with Prestress Anchorage Recess (max 3 bars).
2. End Diaphragm Longitudinal & stirrup Reinf. shown only.
3. Place normal to & space along ℄ brg.
4. Reinf. may be adjusted as necessary to accomodate installation of joint seal assembly upon approval by the engineer.
5. See End Diaphragm Plans for additional End Diaphragm Stirrup Set requirements @ Girders.
6. Abutment & Structural approach slab reinf. not shown.
7. Bars to be hooked @ outside girders as shown on "End Diaphragm Plans" details.
8. Extend to edge of deck. Stop and hook at joint seal blockout where occurs.
9. Additional bars w/in End Diaphragm are required at deck overhang, see "Abutment Joint Seal Details" sheet.

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

| | BY | CHECKED |
|---|---|---|
| DESIGN | David Seifert | Genaro M. Doria |
| DETAILS | A. Onodera | David Seifert |
| QUANTITIES | Genaro M. Doria | Joel Magana |

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES
STRUCTURE DESIGN 13

BRIDGE NO. 53-2925
KILOMETER POST R86.4

# SANTA CLARA RIVER BRIDGE (REPLACE)
## ABUTMENT DETAILS 3

STRUCTURES DESIGN DETAIL SHEET (METRIC) (REV. 3/1/99)

ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS 0 10 20 30 40 50 60 70 80 90 100

CU 07
EA 1760U1

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY) 2-2-00 2-15-00 3-23-00 5-5-00 4-25-01

SHEET 10 OF 38

FILE => ddabt5det3.dgn

USERNAME => tfrtonyv DATE PLOTTED => 24-AUG-2001 TIME PLOTTED => 23:13:38

STATION NO - 862 +55

Elevation Foundation 330.86
Column 24.40
Cap 2.00
357.26

| DIST | COUNTY | ROUTE | KILOMETER POST TOTAL PROJECT | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| 07 | LA | 5, 126 | R85.3/R87.6. R9.3/R9.6 | 317 | 350 |

Mario A. Bernardone 5-30-01
REGISTERED ENGINEER-CIVIL

8-20-01
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — M. Bernardone No. C 050736 Exp. 9-30-01 CIVIL — STATE OF CALIFORNIA

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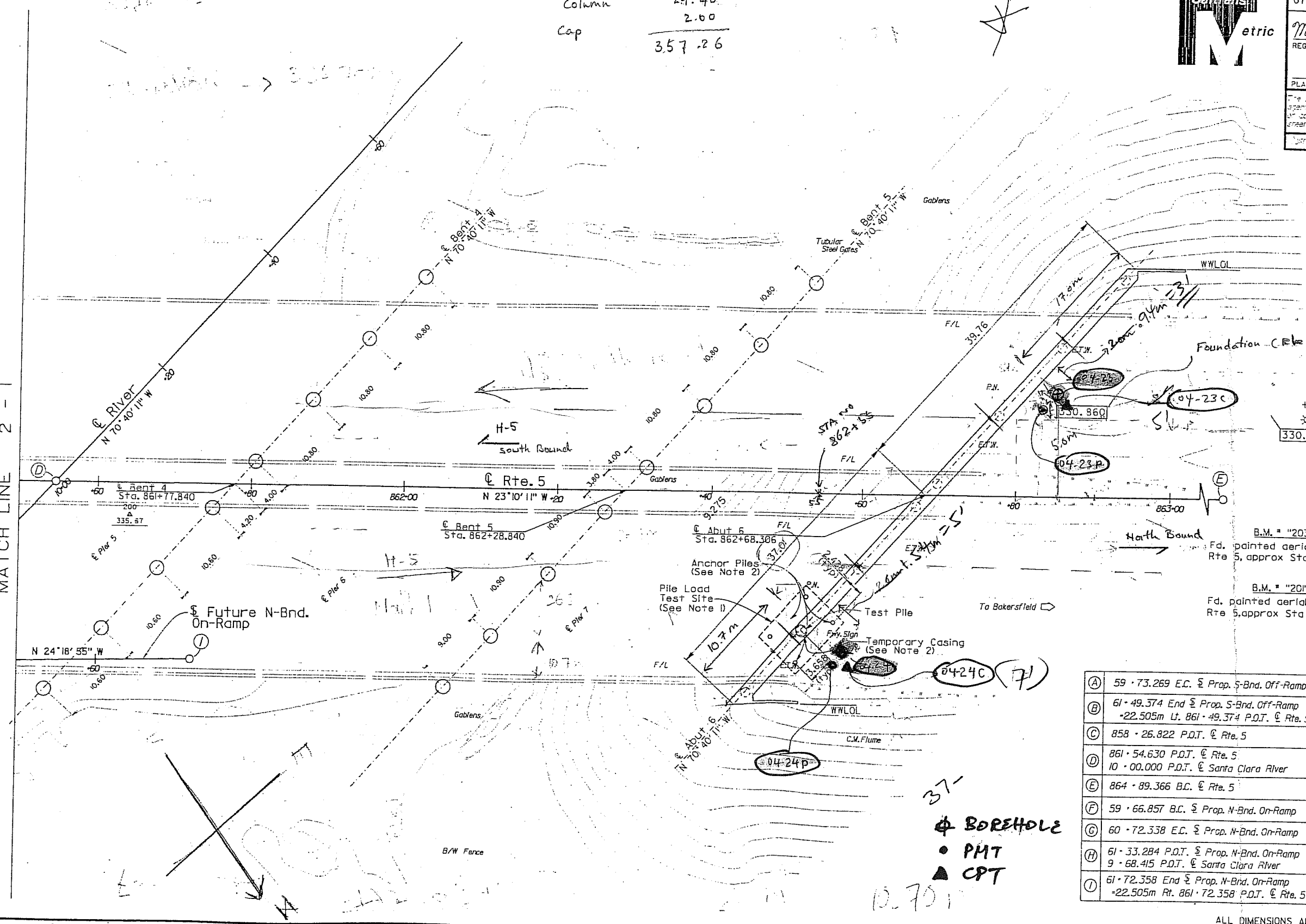



## NOTE

1. Test Pile to be Pile Load Tested @ El. 294. See "Column Details" sheet.
2. Anchor Piles and Temporary Casing to be removed after Pile Load Test is complete.

## LEGEND

+ denotes spot elevation.
denotes electrolier.
330.250 denotes bottom of Abutment elevation

## BENCH MARKS

B.M. # "203" Elev. 335.247m
Fd. painted aerial target on w'ly asph shldr of N-Bnd Rte 5, approx Sta 860 + 18. N602742.211, E1946311.053

B.M. # "201" Elev. 335.976m
Fd. painted aerial target on w'ly asph shldr of N-Bnd Rte 5, approx Sta 863 + 07. N603007.691, E1946197.517

| | | NORTH | EAST |
|---|---|---|---|
| (A) | 59 - 73.269 E.C. ℄ Prop. S-Bnd. Off-Ramp | 602685.187 | 1946290.190 |
| (B) | 61 - 49.374 End ℄ Prop. S-Bnd. Off-Ramp =22.505m Lt. 861 - 49.374 P.O.T. ℄ Rte. 5 | 602852.395 | 1946234.922 |
| (C) | 858 - 26.822 P.O.T. ℄ Rte. 5 | 602564.714 | 1946382.522 |
| (D) | 861 - 54.630 P.O.T. ℄ Rte. 5 10 - 00.000 P.O.T. ℄ Santa Clara River | 602866.082 | 1946253.544 |
| (E) | 864 - 89.366 B.C. ℄ Rte. 5 | 603173.819 | 1946121.840 |
| (F) | 59 - 66.857 B.C. ℄ Prop. N-Bnd. On-Ramp | 602706.430 | 1946356.860 |
| (G) | 60 - 72.338 E.C. ℄ Prop. N-Bnd. On-Ramp | 602800.087 | 1946308.443 |
| (H) | 61 - 33.284 P.O.T. ℄ Prop. N-Bnd. On-Ramp 9 - 68.415 P.O.T. ℄ Santa Clara River | 602855.627 | 1946283.348 |
| (I) | 61 - 72.358 End ℄ Prop. N-Bnd. On-Ramp =22.505m Rt. 861 - 72.358 P.O.T. ℄ Rte. 5 | 602891.235 | 1946267.259 |

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

PRELIMINARY INVESTIGATION SECTION

| SCALE | DATUM | PHOTOGRAMMETRY AS OF: | DRAWN BY M. HENNING 3/99 | DESIGN BY Mario Bernardone | CHECKED Glenn Matthews |
|---|---|---|---|---|---|
| 1:250 | NAVD 1988 | SURVEYED BY | TRACED BY | DETAILS BY A. Onodera | CHECKED Mario Bernardone |
| ALIGNMENT TIES | | FIELD CHECKED BY A. LEE 3/10/99 | CHECKED BY L. MANABO 3/31/99 | QUANTITIES BY Genaro M. Darla | CHECKED Joel Magana |

DS OSD 2145 (4/89)

ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS 0 10 20 30 40 50 60 70 80 90 100

STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES STRUCTURE DESIGN 13

CU 07
EA 176CU1

BRIDGE NO. 53-2925
KILOMETER POST R86.4

# SANTA CLARA RIVER BRIDGE (REPLACE)
## FOUNDATION PLAN 2

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY)

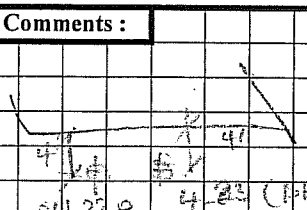
SHEET 5 OF 38

# LOG OF BORING NO. ( 04-23 )

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

| | | | |
|---|---|---|---|
| Project Name | : UCSD / Abutment Research-Santa Clara River Bridge | | |
| Project Location | : City of Santa Clarita, CA | | |
| E.M.I. Project No. | : 02-165 | Site Condition : | Finished subgrade |
| Weather | : SUNNY | Elevation : | |
| Traffic Control | : N/A | Operator : | 2R / NICK |
| Drilling Company | : 2R DRILLING | Operator : | |
| Type of Rig | : CME 55 AUTO HAMMER | Drop (in) : | 30 |
| Borehole Diameter (inch) | : 8" | Drive Wt. (lbs) : | 140 |
| Logged By | : Mike K. | Date Drilled : | 10-5-04 |

Comments :




Backfilled with Cuttings + Cement

| | Time | | | | | | | | | | Back to Office | Proposed Depth |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Depature | Arrival | Start | Break | Rework | Lunch | Rework | Break | Finish | Off | | 25.0 ft |
| Driller | | | | | | | | | | | | Water Table |
| Traffic Control | | | | | | | | | | | | ft |
| Logger | | | | | | | | | | | | Caving |
| Total | | | | | | | | | | | | ft |

| Depth (ft) | Sampler Type (Bulk, Drive, SPT, Tube) | Sample Number | Sample Type (B/D/S.B./T) | Blows/6" 04-23 BORE | Recovery (inch) 04-23 P | U.S.C.S. | Color | Description (ASTM D-2488-93) | Moisture State (Dry, Moist, Wet) | Max. Size | Grain Size (%) Gravel : Sand : Fines | Sand Size | Plasticity | Consistency | Cementation | O²/LEL/PID |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | B | 0 | | | | | | | | | : : | | | | | |
| 2 | S | 1 | 7 9 12 | 18/18 | 19 19 28 | SM | DK BRN TO BRN | Si. SA., F-CO, W/ SOME GR. | | | | | | | | |
| 5 | D | 2 | 8 13 20 | 18/18 | 30 36 42 | SM | D Brown | Si SA, F-C, w/gr up to 3/4" | M | 3/4 | 1 : 89 : 10 | F.C | N | MOD-N | | |
| 7.5 | D | 3 | 20 38 42 | 18/18 | | SM | " | " " " gr 2" | M | 2" | 1 | FC | N | | | |
| 10 | D | 4 | 5 5 8 | 18/18 | | SM | . | Si SA, F.C w/gr 3/4 | M | 3/4 | : : | FC | N | MD | | |
| 15 | S | 5 | 2 4 4 | 18/18 | | ML | | Sandy Silt, fine Sa. w/mica | M | #200 | 0 : 10 : 90 | F | N | loose | | |
| | | 16 | | | | SM | | SM at 16', Silty Sa, F-C w/gr 3/4" | | | | | | | | |
| 20 | S | 6 | 10 13 17 | 18/18 | | SM | D. Brown | Silty SA, F-C w/gr 1/2" | M | | 2 : 87 : 11 | F-C | N | M-D | | |
| 25 | S | 7 | 14 14 13 | 18/18 | | SM | D. Brown | Silty SA, F-C, w/gr 3/4" | M | | 3 : 85 : 12 | FC | N | M-D | | |
| | | | | | | | Terminated 26.5', Backfill w/ on-site soil + water | | | | | | | | | |

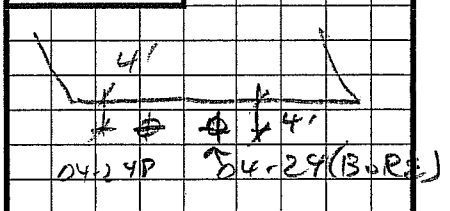
shifted location 1' away. when rig hit hard layer at 7.5'

# LOG OF BORING NO. ( 04-24 )

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

| | | | |
|---|---|---|---|
| Project Name | : UCSD / Abutment Research-Santa Clara River Bridge | | |
| Project Location | : City of Santa Clarita, CA | | |
| E.M.I. Project No. | : 02-165 | Site Condition : | Finished subgrade |
| Weather | : SUNNY | Elevation : | |
| Traffic Control | : N/A | Operator : | 2R/NICK |
| Drilling Company | : 2R DRILLING | Operator : | |
| Type of Rig | : CME 55 AUTO HAMMER | Drop (in) : | 30 |
| Borehole Diameter (inch) | : 8" | Drive Wt. (lbs) : | 140 |
| Logged By | : Mike K. | Date Drilled : | 10-5-04 |

Comments :

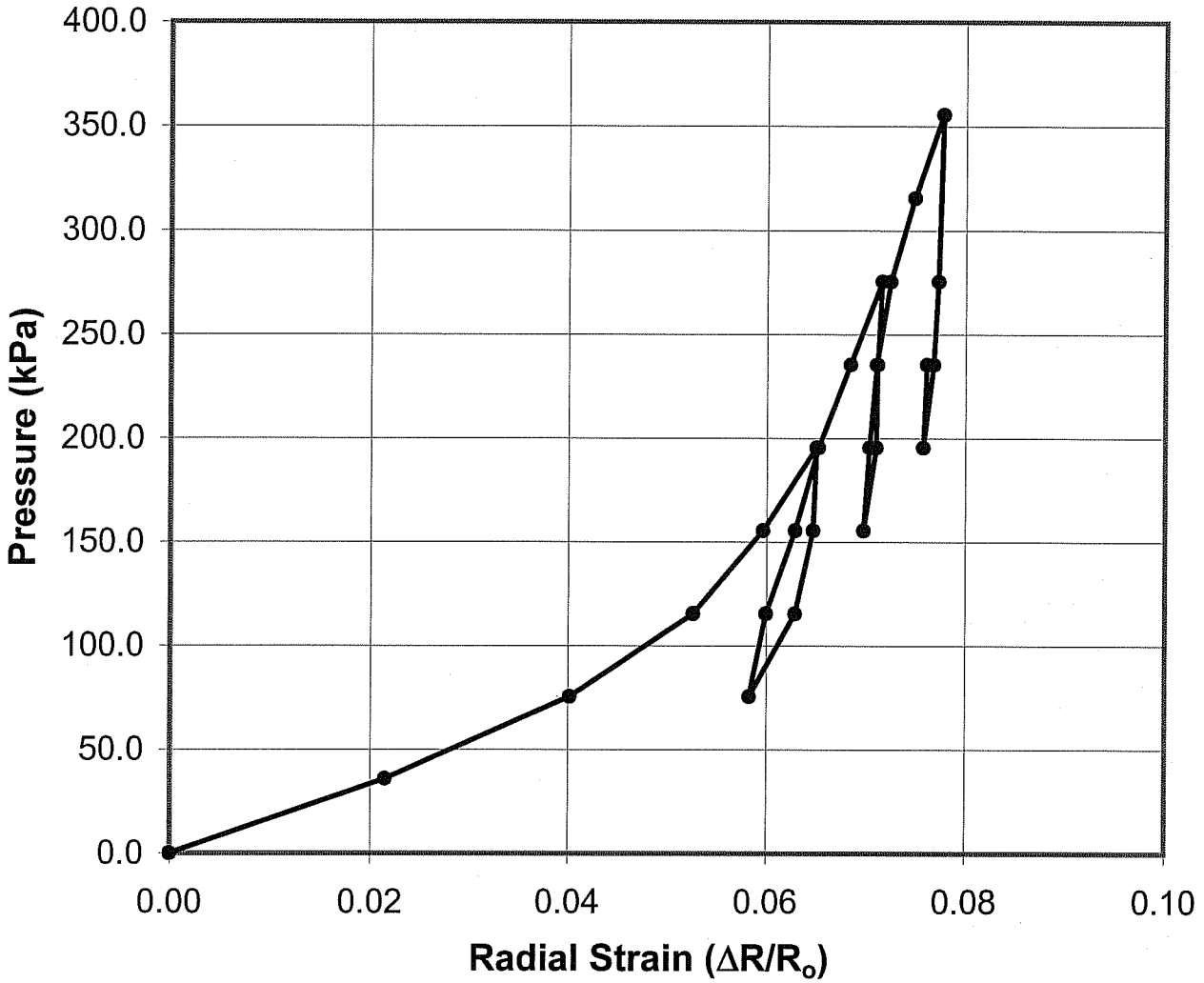



Backfilled with Cuttings + Cement

| | Time | | | | | | | | | | Back to Office | Proposed Depth |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Depature | Arrival | Start | Break | Rework | Lunch | Rework | Break | Finish | Off | | 25.0 ft |
| Driller | | | | | | | | | | | | Water Table |
| Traffic Control | | | | | | | | | | | | ft |
| Logger | | | | | | | | | | | | Caving |
| Total | | | | | | | | | | | | ft |

| Depth (ft) | Sampler Type (Bulk, Drive, SPT, Tube) | Sample Number | Sample Type (B/D/S.B./T) | Blows/6" | Recovery (inch) | U.S.C.S. | Color | Description (ASTM D-2488-93) | Moisture State (Dry, Moist, Wet) | Max. Size | Grain Size (%) Gravel : Sand : Fines | Sand Size | Plasticity | Consistency | Cementation | O²/LEL/PID |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | B | 0 | | 8 9 | | | | | | | : : | | | | | |
| 2 | D S | 1 | | 8 9 10 | | SM | DK BRN GRAY, WHITE | SI. SA., FI-MED, SOME GR' | | | | | | | | |
| 5 | S | 2 | | 9 10 12 | | SM | " | SI. SA., FI-CO., MULTI-COLORED FRAG'S | GRAVEL | | : : | | | | | |
| 7.5 | S | 3 | | 10 11 15 | | SM | " | SAME | | | | | | | | |
| 10 | D | 4 A → 4B → | | 13 26 24 | | SM | " | SAME | | | : : | | | | | |
| 15 | S | 5 | | 5 5 6 | ! | SM | " | SI. SA., FI-CO. | | | : : | | | | | |
| | | | | | | SM | BR | | | | | | | | | |
| 20 | S | 6 A → 6B → | | 4 5 16 | | SM | BR | SI. SA, FI-MED | | | : : | | | | | |
| | | | | | | SM | DK BRN | SI. SA, FI-CO, SOME GR. (LIKE 'B ID') | | | | | | | | |
| 25 | S | 7 | | 5 8 9 | | " | " | " | | | : : | | | | | |
| | | | | | | TERMINATED | | @ 26.5' . BACKFILLED W/ ON-SITE SOIL + WATER | | | | | | | | |

# Pressuremeter Test Result



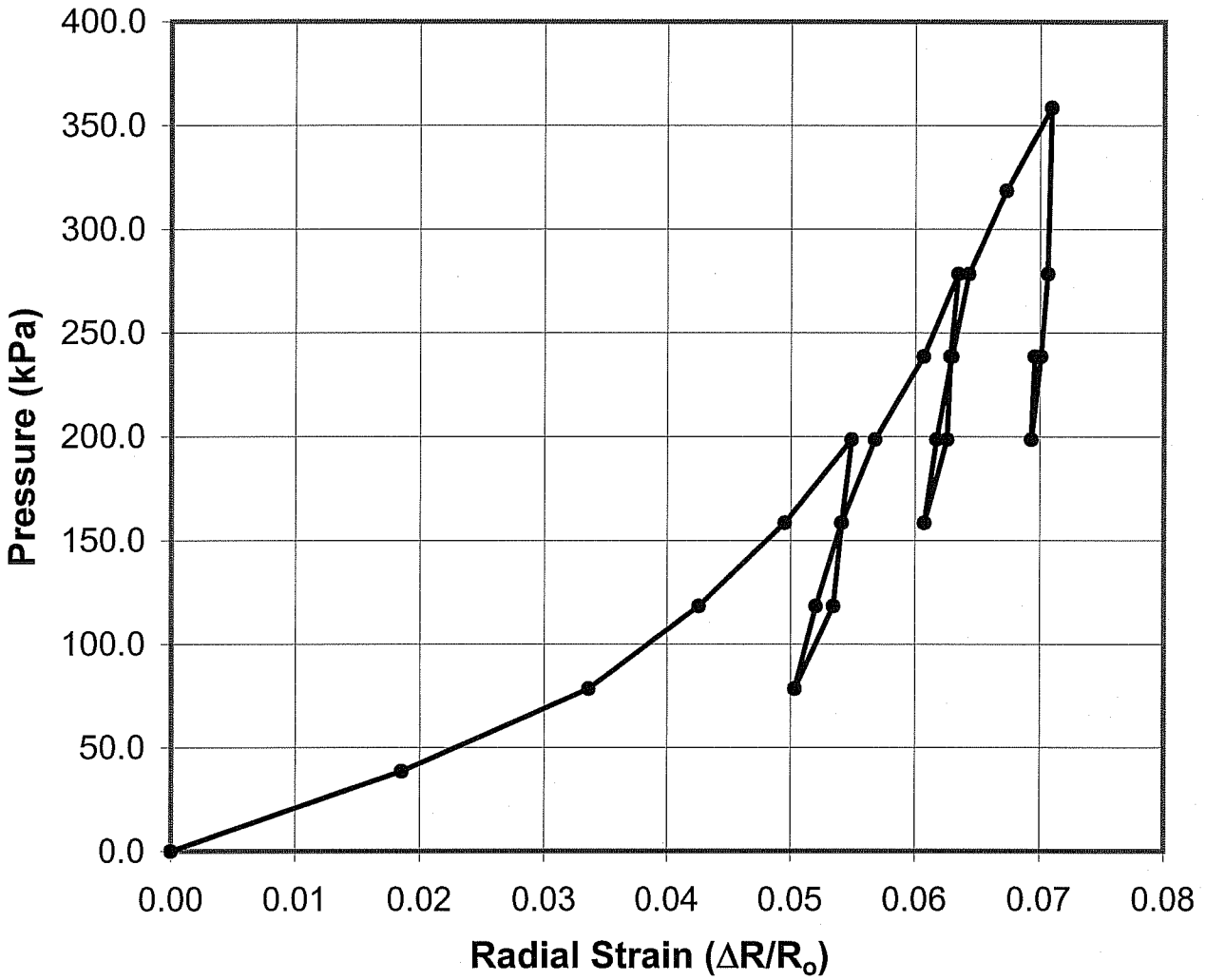

| | |
|---|---|
| Boring No.: | **04-23P** |
| Location: | **Santa Clara River (Replace)** |
| | **Los Angeles County** |
| Test Date: | **6/5/04-6/6/04** |
| Test Depth: | **5.5 ft** |
| Soil Type: | **Silty Sand** |

**Earth Mechanics, Inc.**
Geotechnical and Earthquake Engineering

**CALTRANS-UCSD / Abutment Research**

Project No : 02-165 | Date : 12/22/2004

# Pressuremeter Test Result




| | |
|---|---|
| Boring No.: | **04-24P** |
| Location: | **Santa Clara River (Replace)** |
| | **Los Angeles County** |
| Test Date: | **6/5/04-6/6/04** |
| Test Depth: | **7.5 ft** |
| Soil Type: | **Silty Sand** |

**Earth Mechanics, Inc.**
Geotechnical and Earthquake Engineering

**CALTRANS-UCSD / Abutment Research**

Project No : 02-165 | Date : 12/22/2004

HOLGUIN, FAHAN & ASSOCIATES, INC.
ENVIRONMENTAL MANAGEMENT CONSULTANTS
948 North Lemon Street, Orange, CA 92867 (714)-210-5971 FAX (714) 210-5975

October 14, 2004



Mr. Mike Kapuskar
Earth Mechanics, Inc.
17660 Newhope St, Suite E
Fountain Valley, CA 92708

**PROJECT NAME:** CPT Testing at UCSD Santa Clarita River Bridge in Santa Clarita, CA;
**PROJECT NO.:** 02-165

Dear Mr. Kapuskar:

Enclosed please find copies of the cone penetrometer testing (CPT) data for the above referenced project along with a copy of the corresponding invoice.

The cone penetrometer testing conducted for this project consisted of pushing an instrumented cone-tipped probe into the ground while simultaneously recording the resistance to penetration at the cone tip and along the friction sleeve.

The cone penetrometer testing described in this report was conducted in general accordance with the current ASTM specifications (ASTM D5778-95 and D3441-94) using an electronic cone penetrometer.

The CPT equipment operated by Holguin, Fahan & Associates, Inc. (HFA) consists of a cone assembly mounted at the end of a series of hollow sounding rods. A set of hydraulic rams is used to continuously push the cone and rods into the soil at a rate of 20-mm per second (approximately four feet per minute) while the cone tip resistance and sleeve friction resistance are recorded every 50-mm (approximately two inches) and stored in digital form. A specially designed all wheel drive 23-ton truck provides the required reaction weight for pushing the cone assembly and is also used to transport and house the test equipment.

The cone penetrometer assembly used for this project consists of a conical tip and a cylindrical friction sleeve. The conical tip has a 60° apex angle and a diameter of 35.6-mm (1.40-inch) resulting in a projected cross-sectional area of 10 $cm^2$ (1.5 square inches). The cylindrical friction sleeve is 133-mm (5.25-inch) in length and has an outside diameter of 35.8-mm (1.41-inch), resulting in a surface area of 150 $cm^2$ (23 square inches).

The interior of the cone penetrometer is instrumented with strain gauges that allow simultaneous measurement of cone tip and friction sleeve resistance during penetration. Continuous electric signals from the strain gauges are transmitted by a shielded cable in the sounding rods to the PC-based data acquisition hardware in the CPT truck. The sounding log is also displayed on a monitor.

The CPT data processing is performed using the truck mounted computer based data acquisition and presentation system. The computer generated graphical logs include cone resistance, friction resistance, friction ratio, and pore pressure ratio versus depth at a user selectable scale.

Soil behavior type interpretations are based on the following reference: Robertson, P.K. and Campanella, R.C., 1989, "Guidelines for Geotechnical Design using the Cone Penetrometer Test and CPT with Pore Pressure Measurement." Soil Mechanics series No. 120, Civil Engineering Department, University of British Columbia, Vancouver, B.C., V6T 1Z4, September 1989.

Interpretations and plotting has been done using HFA's proprietary data interpretation and presentation software. It is important to note that the data is not averaged. All interpretations are point interpretations at the corresponding depth listed.

It is also important to note that the soil behavior type correlations are based on a combination of theory, field research, research performed under laboratory conditions, and literature review. The information presented in the tabulated and/or graphical logs should, therefore, be viewed as a guideline rather than as precise measurements.

Some care is recommended when using the soil behavior type interpretations. If a tabulation depth happens to fall on a soil layer interface, or a seam of soil differing from the rest of the layer, the tabulated data can be misleading. The solution to this problem is the proper use of the graphical CPT logs. The tip and sleeve penetration resistance logs are the primary source of profile description; the soil behavior type logs are supplemental. The graphical logs of tip and sleeve resistance should be examined and layer boundaries delineated in accordance with the project requirements. The soil behavior type interpretations are only representative of the response of the soil to the large shear deformations imposed during cone penetration. This is not necessarily a prediction of grain size distribution. However, it has been found that the interpreted soil behavior types generally agree well with the soil types defined in accordance with the grain size distribution methods such as used in the Unified Soil Classification System.

Limitations

Holguin, Fahan & Associates, Inc. (HFA) presents the attached data in accordance with ASTM Standards D5778-95 and D3441-94 and generally accepted cone penetrometer testing practices and standards. The attached data further relates only to the specific project and location discussed in the data. Judgement may be required to verify the CPT soil behavior interpretations.

The "Client" may distribute this data or excerpts therefrom provided the following statement is prominently displayed and included with the distribution:

"Neither CLIENT nor HFA make any guarantee or warranty, express or implied, regarding this data. THE USE OF THIS INFORMATION SHALL BE AT THE USER'S SOLE RISK REGARDLESS OF ANY FAULT OR NEGLIGENCE OF THE CLIENT OR HFA."

Please feel free to call if you have any questions.

Respectfully submitted,

Rachel Carter for AH

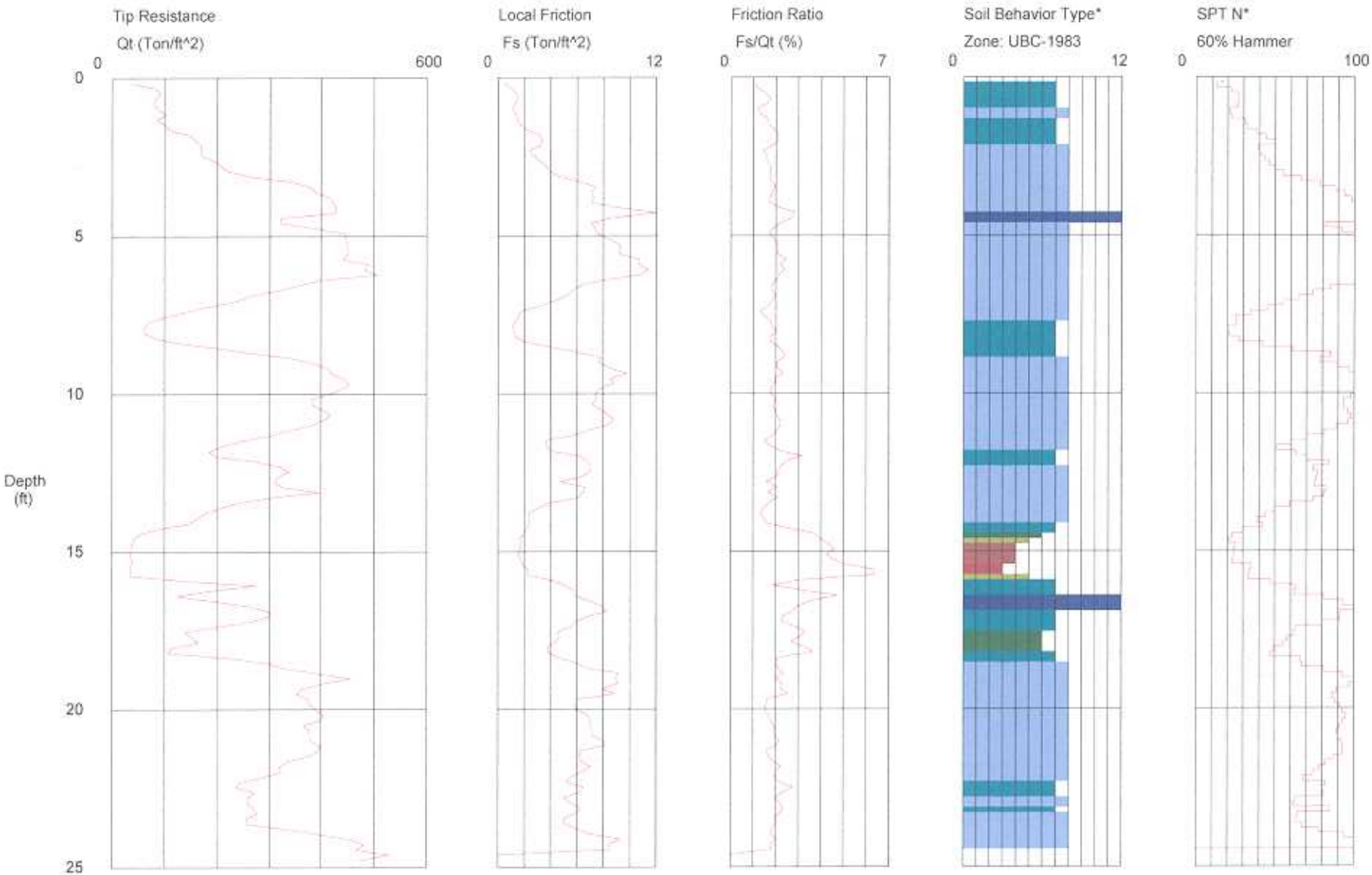
Amanda Hancock
CPT Operations Manager
Holguin, Fahan & Associates, Inc.

:AH\Enclosures

# Earth Mechanics

Operator: BH-JH
Sounding: 04-23C
Cone Used: DSG0705

CPT Date/Time: 10/6/2004 12:02
Location: UCSD Santa Clarita Bridge
Job Number: 02-165




Maximum Depth = 24.77 feet

Depth Increment = 0.164 feet

1 sensitive fine grained
2 organic material
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 very stiff fine grained (*)
12 sand to clayey sand (*)

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

UCSD Santa Clarita River Bridge

Project ID: Earth Mechanics
ata File: SDF(362).cpt
T Date: 10/6/2004 12:02:41 PM

Sounding ID: 04-23C A
Project No: 02-165

| Depth ft | qc PS tsf | Slv Stss tsf | Frct Rato % | * Material Behavior Description | Qc to N | * SPT N1 60% | SPT N 60% | * Rel Den % | * Ftn Ang deg | * Und Shr tsf | * % Fin Ic |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.33 | 81.6 | 0.9 | 1.1 | clean SAND to silty SAND | 5.0 | 26 | 16 | 76 | 48 | - | 9 |
| 0.49 | 92.1 | 1.4 | 1.5 | clean SAND to silty SAND | 5.0 | 30 | 18 | 80 | 48 | - | 11 |
| 0.66 | 83.6 | 1.5 | 1.7 | clean SAND to silty SAND | 5.0 | 27 | 17 | 77 | 48 | - | 13 |
| 0.82 | 78.2 | 1.2 | 1.6 | clean SAND to silty SAND | 5.0 | 25 | 16 | 74 | 48 | - | 12 |
| 0.98 | 87.2 | 1.0 | 1.2 | clean SAND to silty SAND | 5.0 | 28 | 17 | 78 | 48 | - | 9 |
| 1.15 | 102.8 | 1.3 | 1.3 | clean SAND to silty SAND | 5.0 | 33 | 21 | 84 | 48 | - | 9 |
| 1.31 | 86.2 | 1.4 | 1.7 | clean SAND to silty SAND | 5.0 | 28 | 17 | 78 | 48 | - | 12 |
| 1.48 | 99.6 | 1.6 | 1.7 | clean SAND to silty SAND | 5.0 | 32 | 20 | 82 | 48 | - | 11 |
| 1.64 | 110.3 | 2.1 | 1.9 | clean SAND to silty SAND | 5.0 | 35 | 22 | 86 | 48 | - | 11 |
| 1.80 | 148.2 | 3.1 | 2.1 | clean SAND to silty SAND | 5.0 | 48 | 30 | 95 | 48 | - | 10 |
| 1.97 | 157.7 | 3.3 | 2.1 | clean SAND to silty SAND | 5.0 | 51 | 32 | 95 | 48 | - | 10 |
| 2.13 | 168.2 | 3.2 | 1.9 | clean SAND to silty SAND | 5.0 | 54 | 34 | 95 | 48 | - | 9 |
| 2.30 | 167.8 | 2.4 | 1.4 | clean SAND to silty SAND | 5.0 | 54 | 34 | 95 | 48 | - | 7 |
| 2.46 | 170.3 | 2.7 | 1.6 | clean SAND to silty SAND | 5.0 | 55 | 34 | 95 | 48 | - | 7 |
| 2.62 | 194.8 | 3.1 | 1.6 | clean SAND to silty SAND | 5.0 | 62 | 39 | 95 | 48 | - | 7 |
| 2.79 | 207.9 | 3.6 | 1.7 | clean SAND to silty SAND | 5.0 | 67 | 42 | 95 | 48 | - | 7 |
| 2.95 | 221.2 | 3.9 | 1.8 | clean SAND to silty SAND | 5.0 | 71 | 44 | 95 | 48 | - | 7 |
| 3.12 | 264.1 | 4.6 | 1.7 | clean SAND to silty SAND | 5.0 | 85 | 53 | 95 | 48 | - | 6 |
| 3.28 | 341.0 | 6.1 | 1.8 | clean SAND to silty SAND | 5.0 | 100 | 68 | 95 | 48 | - | 5 |
| 3.44 | 376.6 | 7.4 | 2.0 | stiff SAND to clayy SAND | 1.0 | 100 | 100 | 95 | - | 37.7 | 5 |
| 3.61 | 386.6 | 7.1 | 1.8 | stiff SAND to clayy SAND | 1.0 | 100 | 100 | 95 | - | 38.7 | 5 |
| 3.77 | 416.0 | 7.3 | 1.7 | stiff SAND to clayy SAND | 1.0 | 100 | 100 | 95 | - | 41.7 | 5 |
| 3.94 | 421.6 | 7.1 | 1.7 | stiff SAND to clayy SAND | 1.0 | 100 | 100 | 95 | - | 42.2 | 5 |
| 4.10 | 427.8 | 9.0 | 2.1 | stiff SAND to clayy SAND | 1.0 | 100 | 100 | 95 | - | 42.9 | 6 |
| 4.26 | 426.3 | 12.0 | 2.8 | stiff SAND to clayy SAND | 1.0 | 100 | 100 | 95 | - | 42.7 | 8 |
| 4.43 | 321.6 | 8.7 | 2.7 | stiff SAND to clayy SAND | 1.0 | 100 | 100 | 95 | - | 32.2 | 9 |
| 4.59 | 320.3 | 7.0 | 2.2 | stiff SAND to clayy SAND | 1.0 | 100 | 100 | 95 | - | 32.1 | 7 |
| 4.76 | 386.7 | 0.3 | 0.1 | grvly SAND to dense SAND | 6.0 | 100 | 64 | 95 | 48 | - | 5 |
| 4.92 | 443.5 | 0.3 | 0.1 | grvly SAND to dense SAND | 6.0 | 100 | 74 | 95 | 48 | - | 5 |
| 5.08 | 63.7 | 0.3 | 0.5 | clean SAND to silty SAND | 5.0 | 20 | 13 | 68 | 44 | - | 6 |
| 5.25 | 63.7 | 9.2 | 9.9 | very stiff fine SOIL | 2.0 | 51 | 32 | - | 44 | - | 38 |
| 5.41 | 63.7 | 9.3 | 9.9 | very stiff fine SOIL | 2.0 | 51 | 32 | - | 44 | - | 38 |
| 5.58 | 451.0 | 9.2 | 2.1 | stiff SAND to clayy SAND | 1.0 | 100 | 100 | 95 | - | 45.2 | 5 |
| 5.74 | 439.4 | 10.7 | 2.4 | stiff SAND to clayy SAND | 1.0 | 100 | 100 | 95 | - | 44.0 | 7 |
| 5.90 | 488.9 | 10.6 | 2.2 | stiff SAND to clayy SAND | 1.0 | 100 | 100 | 95 | - | 49.0 | 5 |
| 6.07 | 481.0 | 11.4 | 2.4 | stiff SAND to clayy SAND | 1.0 | 100 | 100 | 95 | - | 48.0 | 6 |
| 6.23 | 506.4 | 10.8 | 2.1 | stiff SAND to clayy SAND | 1.0 | 100 | 100 | 95 | - | 49.9 | 5 |
| 6.40 | 392.5 | 7.9 | 2.0 | stiff SAND to clayy SAND | 1.0 | 100 | 100 | 95 | - | 38.2 | 6 |
| 6.56 | 353.5 | 6.3 | 1.8 | clean SAND to silty SAND | 5.0 | 100 | 71 | 95 | 48 | - | 5 |
| 6.72 | 313.3 | 5.7 | 1.8 | clean SAND to silty SAND | 5.0 | 95 | 63 | 95 | 48 | - | 6 |
| 6.89 | 262.3 | 5.2 | 2.0 | clean SAND to silty SAND | 5.0 | 79 | 52 | 95 | 48 | - | 7 |
| 7.05 | 236.6 | 4.3 | 1.8 | clean SAND to silty SAND | 5.0 | 70 | 47 | 95 | 48 | - | 7 |

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

**Holguin, Fahan & Associates, Inc.**

UCSD Santa Clarita River Bridge

Project ID: Earth Mechanics
Data File: SDF(362).cpt
T Date: 10/6/2004 12:02:41 PM

Sounding ID: 04-23C
Project No: 02-165

| Depth ft | qc PS tsf | Slv Stss tsf | Frct Rato % | * Material Behavior Description | Qc to N | * SPT N1 60% | SPT N 60% | * Rel Den % | * Ftn Ang deg | * Und Shr tsf | * % Fin Ic |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 7.22 | 187.1 | 3.2 | 1.7 | clean SAND to silty SAND | 5.0 | 55 | 37 | 95 | 47 | - | 8 |
| 7.38 | 139.8 | 1.8 | 1.3 | clean SAND to silty SAND | 5.0 | 41 | 28 | 90 | 46 | - | 7 |
| 7.54 | 103.5 | 1.5 | 1.5 | clean SAND to silty SAND | 5.0 | 30 | 21 | 80 | 45 | - | 10 |
| 7.71 | 69.6 | 1.2 | 1.8 | silty SAND to sandy SILT | 4.0 | 25 | 17 | 67 | 43 | - | 15 |
| 7.87 | 61.3 | 1.1 | 1.8 | silty SAND to sandy SILT | 4.0 | 22 | 15 | 62 | 42 | - | 17 |
| 8.04 | 60.5 | 1.2 | 2.0 | silty SAND to sandy SILT | 4.0 | 21 | 15 | 61 | 42 | - | 18 |
| 8.20 | 78.4 | 1.4 | 1.7 | silty SAND to sandy SILT | 4.0 | 27 | 20 | 69 | 43 | - | 14 |
| 8.36 | 118.6 | 2.1 | 1.8 | clean SAND to silty SAND | 5.0 | 32 | 24 | 83 | 45 | - | 11 |
| 8.53 | 196.4 | 4.2 | 2.1 | clean SAND to silty SAND | 5.0 | 53 | 39 | 95 | 47 | - | 10 |
| 8.69 | 261.4 | 6.1 | 2.3 | stiff SAND to clayy SAND | 1.0 | 100 | 100 | 95 | - | 21.8 | 9 |
| 8.86 | 337.7 | 7.9 | 2.3 | stiff SAND to clayy SAND | 1.0 | 100 | 100 | 95 | - | 27.9 | 8 |
| 9.02 | 383.8 | 7.6 | 2.0 | stiff SAND to clayy SAND | 1.0 | 100 | 100 | 95 | - | 31.4 | 6 |
| 9.18 | 411.7 | 8.5 | 2.1 | stiff SAND to clayy SAND | 1.0 | 100 | 100 | 95 | - | 33.4 | 6 |
| 9.35 | 420.1 | 9.7 | 2.3 | stiff SAND to clayy SAND | 1.0 | 100 | 100 | 95 | - | 33.8 | 7 |
| 9.51 | 440.0 | 8.5 | 1.9 | stiff SAND to clayy SAND | 1.0 | 100 | 100 | 95 | - | 35.1 | 6 |
| 9.68 | 452.5 | 8.8 | 1.9 | stiff SAND to clayy SAND | 1.0 | 100 | 100 | 95 | - | 35.9 | 6 |
| 9.84 | 442.1 | 7.7 | 1.7 | clean SAND to silty SAND | 5.0 | 100 | 88 | 95 | 48 | - | 5 |
| 10.00 | 411.1 | 7.4 | 1.8 | clean SAND to silty SAND | 5.0 | 100 | 82 | 95 | 48 | - | 5 |
| 10.17 | 379.3 | 7.5 | 2.0 | clean SAND to silty SAND | 5.0 | 94 | 76 | 95 | 48 | - | 6 |
| 10.33 | 380.2 | 7.1 | 1.9 | clean SAND to silty SAND | 5.0 | 93 | 76 | 95 | 48 | - | 6 |
| 10.50 | 402.1 | 7.7 | 1.9 | clean SAND to silty SAND | 5.0 | 98 | 80 | 95 | 48 | - | 6 |
| 10.66 | 417.1 | 8.3 | 2.0 | stiff SAND to clayy SAND | 1.0 | 100 | 100 | 95 | - | 31.4 | 6 |
| 10.82 | 405.5 | 8.8 | 2.2 | stiff SAND to clayy SAND | 1.0 | 100 | 100 | 95 | - | 30.4 | 7 |
| 10.99 | 378.5 | 8.3 | 2.2 | stiff SAND to clayy SAND | 1.0 | 100 | 100 | 95 | - | 28.1 | 7 |
| 11.15 | 335.2 | 6.9 | 2.1 | clean SAND to silty SAND | 5.0 | 79 | 67 | 95 | 48 | - | 7 |
| 11.32 | 300.0 | 5.6 | 1.9 | clean SAND to silty SAND | 5.0 | 70 | 60 | 95 | 48 | - | 7 |
| 11.48 | 247.2 | 3.6 | 1.5 | clean SAND to silty SAND | 5.0 | 58 | 49 | 95 | 47 | - | 6 |
| 11.64 | 210.4 | 3.7 | 1.8 | clean SAND to silty SAND | 5.0 | 49 | 42 | 95 | 46 | - | 9 |
| 11.81 | 184.1 | 4.0 | 2.2 | clean SAND to silty SAND | 5.0 | 42 | 37 | 92 | 45 | - | 11 |
| 11.97 | 197.4 | 6.2 | 3.2 | stiff SAND to clayy SAND | 1.0 | 100 | 100 | 94 | - | 14.0 | 14 |
| 12.14 | 273.7 | 6.8 | 2.5 | stiff SAND to clayy SAND | 1.0 | 100 | 100 | 95 | - | 19.3 | 10 |
| 12.30 | 317.8 | 7.0 | 2.2 | clean SAND to silty SAND | 5.0 | 72 | 64 | 95 | 47 | - | 8 |
| 12.46 | 335.5 | 7.0 | 2.1 | clean SAND to silty SAND | 5.0 | 75 | 67 | 95 | 48 | - | 8 |
| 12.63 | 313.8 | 6.3 | 2.0 | clean SAND to silty SAND | 5.0 | 70 | 63 | 95 | 47 | - | 8 |
| 12.79 | 307.9 | 4.8 | 1.6 | clean SAND to silty SAND | 5.0 | 68 | 62 | 95 | 47 | - | 6 |
| 12.96 | 324.2 | 6.6 | 2.0 | clean SAND to silty SAND | 5.0 | 71 | 65 | 95 | 47 | - | 8 |
| 13.12 | 395.7 | 6.5 | 1.6 | clean SAND to silty SAND | 5.0 | 86 | 79 | 95 | 48 | - | 5 |
| 13.28 | 296.7 | 6.1 | 2.1 | clean SAND to silty SAND | 5.0 | 64 | 59 | 95 | 47 | - | 8 |
| 13.45 | 238.7 | 4.0 | 1.7 | clean SAND to silty SAND | 5.0 | 51 | 48 | 95 | 46 | - | 8 |
| 13.61 | 206.5 | 3.0 | 1.5 | clean SAND to silty SAND | 5.0 | 44 | 41 | 93 | 45 | - | 8 |
| 13.78 | 176.7 | 2.3 | 1.3 | clean SAND to silty SAND | 5.0 | 38 | 35 | 88 | 44 | - | 8 |
| 13.94 | 162.1 | 2.3 | 1.4 | clean SAND to silty SAND | 5.0 | 34 | 32 | 85 | 44 | - | 9 |
| 14.10 | 144.4 | 2.4 | 1.7 | clean SAND to silty SAND | 5.0 | 30 | 29 | 81 | 43 | - | 11 |

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

**Holguin, Fahan & Associates, Inc.**

UCSD Santa Clarita River Bridge

Project ID: Earth Mechanics
ta File: SDF(362).cpt
T Date: 10/6/2004 12:02:41 PM

Sounding ID: 04-23C
Project No: 02-165

| Depth ft | qc PS tsf | Slv Stss tsf | Frct Rato % | * Material Behavior Description | Qc to N | * SPT N1 60% | SPT N 60% | * Rel Den % | * Ftn Ang deg | * Und Shr tsf | * % Fin Ic |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 14.27 | 87.7 | 2.2 | 2.5 | silty SAND to sandy SILT | 4.0 | 23 | 22 | 64 | 41 | - | 19 |
| 14.43 | 53.6 | 2.0 | 3.8 | clayy SILT to silty CLAY | 2.0 | 28 | 27 | 48 | - | 3.6 | 31 |
| 14.60 | 42.1 | 1.7 | 4.0 | clayy SILT to silty CLAY | 2.0 | 22 | 21 | 39 | - | 2.8 | 35 |
| 14.76 | 38.0 | 0.2 | 0.6 | silty SAND to sandy SILT | 4.0 | 10 | 10 | 36 | 36 | - | 17 |
| 14.92 | 37.0 | 1.6 | 4.6 | clayy SILT to silty CLAY | 2.0 | 20 | 18 | - | - | 2.7 | 38 |
| 15.09 | 9.4 | 1.7 | 9.9 | silty CLAY to CLAY | 1.5 | 7 | 6 | - | - | 0.6 | 85 |
| 15.25 | 35.6 | 1.5 | 4.3 | clayy SILT to silty CLAY | 2.0 | 19 | 18 | - | - | 2.5 | 38 |
| 15.42 | 38.0 | 1.7 | 4.6 | clayy SILT to silty CLAY | 2.0 | 20 | 19 | - | - | 2.6 | 38 |
| 15.58 | 36.6 | 1.9 | 5.3 | silty CLAY to CLAY | 1.5 | 26 | 24 | - | - | 2.5 | 41 |
| 15.74 | 36.2 | 2.3 | 6.5 | silty CLAY to CLAY | 1.5 | 25 | 24 | - | - | 2.5 | 45 |
| 15.91 | 33.7 | 2.2 | 6.6 | silty CLAY to CLAY | 1.5 | 23 | 22 | - | - | 2.3 | 47 |
| 16.07 | 134.0 | 4.1 | 3.1 | silty SAND to sandy SILT | 4.0 | 33 | 34 | 76 | 42 | - | 18 |
| 16.24 | 272.0 | 5.0 | 1.8 | clean SAND to silty SAND | 5.0 | 53 | 54 | 95 | 46 | - | 8 |
| 16.40 | 187.0 | 5.8 | 3.1 | stiff SAND to clayy SAND | 1.0 | 100 | 100 | 87 | - | 11.3 | 16 |
| 16.56 | 122.9 | 5.8 | 4.8 | very stiff fine SOIL | 2.0 | 60 | 61 | 73 | 42 | - | 25 |
| 16.73 | 194.9 | 7.0 | 3.6 | stiff SAND to clayy SAND | 1.0 | 100 | 100 | 88 | - | 11.7 | 17 |
| 16.89 | 263.4 | 7.8 | 3.0 | stiff SAND to clayy SAND | 1.0 | 100 | 100 | 95 | - | 15.8 | 13 |
| 17.06 | 298.1 | 8.2 | 2.8 | stiff SAND to clayy SAND | 1.0 | 100 | 100 | 95 | - | 17.8 | 12 |
| 17.22 | 296.8 | 6.8 | 2.3 | clean SAND to silty SAND | 5.0 | 57 | 59 | 95 | 46 | - | 10 |
| 17.38 | 261.5 | 5.9 | 2.3 | clean SAND to silty SAND | 5.0 | 50 | 52 | 95 | 45 | - | 11 |
| 17.55 | 196.1 | 5.5 | 2.8 | silty SAND to sandy SILT | 4.0 | 46 | 49 | 87 | 44 | - | 15 |
| 17.71 | 137.4 | 4.5 | 3.3 | silty SAND to sandy SILT | 4.0 | 32 | 34 | 75 | 42 | - | 19 |
| 17.88 | 151.8 | 4.7 | 3.1 | silty SAND to sandy SILT | 4.0 | 35 | 38 | 79 | 42 | - | 18 |
| 18.04 | 163.2 | 4.4 | 2.7 | silty SAND to sandy SILT | 4.0 | 38 | 41 | 81 | 43 | - | 16 |
| 18.20 | 114.0 | 3.8 | 3.3 | silty SAND to sandy SILT | 4.0 | 26 | 28 | 69 | 41 | - | 21 |
| 18.37 | 104.8 | 3.8 | 3.7 | silty SAND to sandy SILT | 4.0 | 24 | 26 | 66 | 40 | - | 24 |
| 18.53 | 219.1 | 4.6 | 2.1 | clean SAND to silty SAND | 5.0 | 40 | 44 | 90 | 44 | - | 11 |
| 18.70 | 295.2 | 5.9 | 2.0 | clean SAND to silty SAND | 5.0 | 54 | 59 | 95 | 45 | - | 9 |
| 18.86 | 323.6 | 6.7 | 2.1 | clean SAND to silty SAND | 5.0 | 59 | 65 | 95 | 46 | - | 9 |
| 19.02 | 392.1 | 9.2 | 2.3 | stiff SAND to clayy SAND | 1.0 | 100 | 100 | 95 | - | 22.1 | 9 |
| 19.19 | 455.9 | 8.9 | 2.0 | clean SAND to silty SAND | 5.0 | 82 | 91 | 95 | 47 | - | 7 |
| 19.35 | 402.3 | 9.1 | 2.3 | stiff SAND to clayy SAND | 1.0 | 100 | 100 | 95 | - | 22.5 | 9 |
| 19.52 | 359.1 | 7.9 | 2.2 | clean SAND to silty SAND | 5.0 | 64 | 72 | 95 | 46 | - | 9 |
| 19.68 | 351.0 | 8.9 | 2.5 | stiff SAND to clayy SAND | 1.0 | 100 | 100 | 95 | - | 19.5 | 10 |
| 19.84 | 373.0 | 6.0 | 1.6 | clean SAND to silty SAND | 5.0 | 66 | 75 | 95 | 46 | - | 6 |
| 20.01 | 375.4 | 5.9 | 1.6 | clean SAND to silty SAND | 5.0 | 66 | 75 | 95 | 46 | - | 6 |
| 20.17 | 387.7 | 5.9 | 1.5 | clean SAND to silty SAND | 5.0 | 68 | 78 | 95 | 46 | - | 6 |
| 20.34 | 404.8 | 6.8 | 1.7 | clean SAND to silty SAND | 5.0 | 71 | 81 | 95 | 46 | - | 6 |
| 20.50 | 398.1 | 7.0 | 1.8 | clean SAND to silty SAND | 5.0 | 69 | 80 | 95 | 46 | - | 7 |
| 20.66 | 363.9 | 7.0 | 1.9 | clean SAND to silty SAND | 5.0 | 63 | 73 | 95 | 46 | - | 8 |
| 20.83 | 375.0 | 7.1 | 1.9 | clean SAND to silty SAND | 5.0 | 65 | 75 | 95 | 46 | - | 8 |
| 20.99 | 374.8 | 7.1 | 1.9 | clean SAND to silty SAND | 5.0 | 65 | 75 | 95 | 46 | - | 8 |
| 21.16 | 374.9 | 8.1 | 2.2 | clean SAND to silty SAND | 5.0 | 64 | 75 | 95 | 46 | - | 9 |

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

**Holguin, Fahan & Associates, Inc.**

UCSD Santa Clarita River Bridge

Project ID: Earth Mechanics
ta File: SDF(362).cpt
T Date: 10/6/2004 12:02:41 PM

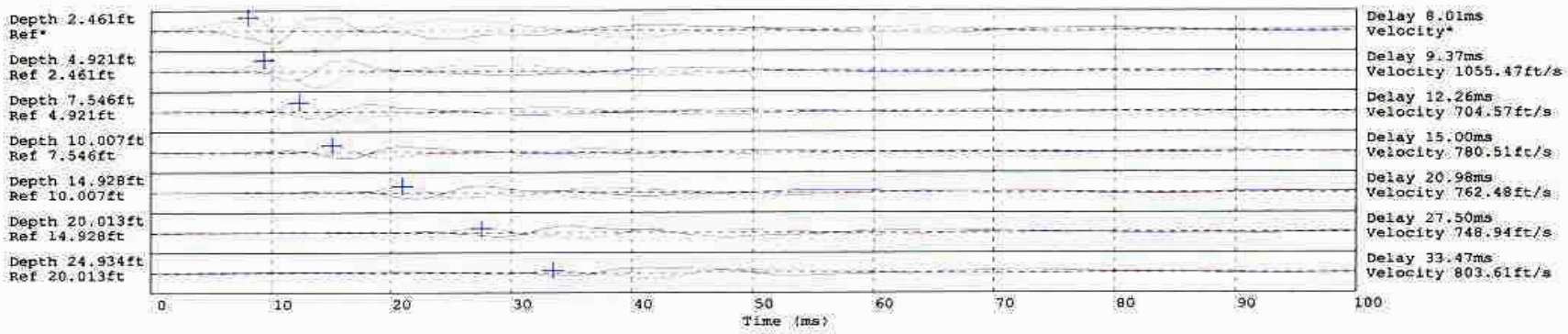
Sounding ID: 04-23C
Project No: 02-165

| Depth ft | qc PS tsf | Slv Stss tsf | Frct Rato % | * Material Behavior Description | Qc to N | * SPT N1 60% | SPT N 60% | * Rel Den % | * Ftn Ang deg | * Und Shr tsf | * % Fin Ic |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 21.32 | 400.2 | 8.1 | 2.0 | clean SAND to silty SAND | 5.0 | 68 | 80 | 95 | 46 | - | 8 |
| 21.48 | 391.9 | 6.2 | 1.6 | clean SAND to silty SAND | 5.0 | 67 | 78 | 95 | 46 | - | 6 |
| 21.65 | 373.0 | 6.2 | 1.7 | clean SAND to silty SAND | 5.0 | 63 | 75 | 95 | 46 | - | 7 |
| 21.81 | 331.7 | 6.3 | 1.9 | clean SAND to silty SAND | 5.0 | 56 | 66 | 95 | 45 | - | 8 |
| 21.98 | 318.5 | 7.0 | 2.2 | clean SAND to silty SAND | 5.0 | 54 | 64 | 95 | 45 | - | 10 |
| 22.14 | 321.3 | 6.4 | 2.0 | clean SAND to silty SAND | 5.0 | 54 | 64 | 95 | 45 | - | 9 |
| 22.30 | 286.5 | 5.5 | 1.9 | clean SAND to silty SAND | 5.0 | 48 | 57 | 95 | 44 | - | 10 |
| 22.47 | 246.2 | 5.2 | 2.1 | clean SAND to silty SAND | 5.0 | 41 | 49 | 91 | 44 | - | 11 |
| 22.63 | 234.8 | 6.5 | 2.8 | silty SAND to sandy SILT | 4.0 | 49 | 59 | 89 | 43 | - | 14 |
| 22.80 | 271.7 | 6.3 | 2.3 | clean SAND to silty SAND | 5.0 | 45 | 54 | 94 | 44 | - | 11 |
| 22.96 | 256.8 | 5.0 | 2.0 | clean SAND to silty SAND | 5.0 | 42 | 51 | 92 | 44 | - | 10 |
| 23.12 | 257.7 | 5.5 | 2.1 | clean SAND to silty SAND | 5.0 | 42 | 52 | 92 | 44 | - | 11 |
| 23.29 | 268.5 | 6.2 | 2.3 | clean SAND to silty SAND | 5.0 | 44 | 54 | 93 | 44 | - | 12 |
| 23.45 | 275.4 | 6.0 | 2.2 | clean SAND to silty SAND | 5.0 | 45 | 55 | 94 | 44 | - | 11 |
| 23.62 | 255.5 | 5.0 | 2.0 | clean SAND to silty SAND | 5.0 | 41 | 51 | 91 | 43 | - | 10 |
| 23.78 | 255.9 | 5.0 | 2.0 | clean SAND to silty SAND | 5.0 | 41 | 51 | 91 | 43 | - | 11 |
| 23.94 | 326.9 | 6.0 | 1.8 | clean SAND to silty SAND | 5.0 | 53 | 65 | 95 | 45 | - | 9 |
| 24.11 | 392.8 | 6.9 | 1.8 | clean SAND to silty SAND | 5.0 | 63 | 79 | 95 | 45 | - | 7 |
| 24.27 | 455.6 | 9.3 | 2.0 | clean SAND to silty SAND | 5.0 | 73 | 91 | 95 | 46 | - | 8 |
| 24.44 | 481.0 | 8.4 | 1.8 | clean SAND to silty SAND | 5.0 | 77 | 96 | 95 | 46 | - | 6 |
| 24.60 | 466.8 | 8.5 | 1.8 | clean SAND to silty SAND | 5.0 | 74 | 93 | 95 | 46 | - | 7 |

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

**Holguin, Fahan & Associates, Inc.**

**Earth Mechanics**
**04-23C**

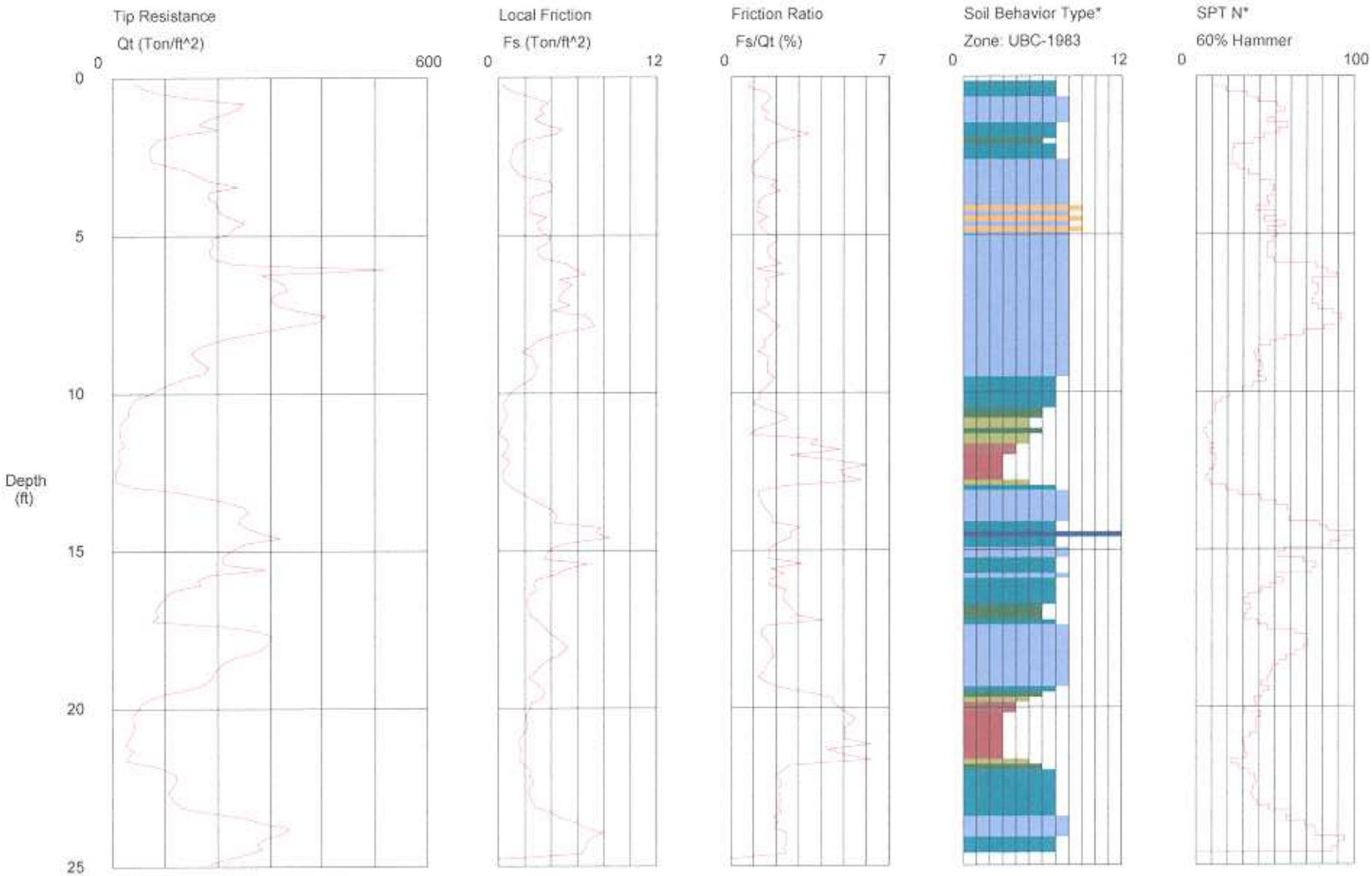



Hammer to Rod String Distance 1.524 (m)
* = Not Determined

# Earth Mechanics

Operator: BH-JH
Sounding: 04-24C
Cone Used: DSG0705

CPT Date/Time: 10/6/2004 8:53
Location: UCSD Santa Clarita Bridge
Job Number: 02-165




Maximum Depth = 24.93 feet

Depth Increment = 0.164 feet

1 sensitive fine grained
2 organic material
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 very stiff fine grained (*)
12 sand to clayey sand (*)

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

UCSD Santa Clarita River Bridge

Project ID: Earth Mechanics
ta File: SDF(359).cpt
T Date: 10/6/2004 8:53:21 AM

Sounding ID: 04-24C
Project No: 02-165

| Depth ft | qc PS tsf | Slv Stss tsf | Frct Rato % | * Material Behavior Description | Qc to N | * SPT N1 60% | SPT N 60% | * Rel Den % | * Ftn Ang deg | * Und Shr tsf | * % Fin Ic |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.33 | 56.6 | 0.4 | 0.8 | clean SAND to silty SAND | 5.0 | 18 | 11 | 64 | 48 | - | 10 |
| 0.49 | 86.1 | 1.3 | 1.5 | clean SAND to silty SAND | 5.0 | 28 | 17 | 78 | 48 | - | 11 |
| 0.66 | 153.7 | 2.7 | 1.8 | clean SAND to silty SAND | 5.0 | 49 | 31 | 95 | 48 | - | 9 |
| 0.82 | 248.4 | 3.8 | 1.5 | clean SAND to silty SAND | 5.0 | 80 | 50 | 95 | 48 | - | 5 |
| 0.98 | 235.1 | 3.1 | 1.3 | clean SAND to silty SAND | 5.0 | 75 | 47 | 95 | 48 | - | 5 |
| 1.15 | 213.0 | 3.4 | 1.6 | clean SAND to silty SAND | 5.0 | 68 | 43 | 95 | 48 | - | 6 |
| 1.31 | 180.9 | 2.7 | 1.5 | clean SAND to silty SAND | 5.0 | 58 | 36 | 95 | 48 | - | 6 |
| 1.48 | 163.9 | 3.3 | 2.0 | clean SAND to silty SAND | 5.0 | 53 | 33 | 95 | 48 | - | 9 |
| 1.64 | 198.6 | 4.8 | 2.4 | stiff SAND to clayy SAND | 1.0 | 100 | 100 | 95 | - | 19.9 | 10 |
| 1.80 | 123.1 | 4.2 | 3.4 | stiff SAND to clayy SAND | 1.0 | 100 | 100 | 89 | - | 12.3 | 16 |
| 1.97 | 84.1 | 2.1 | 2.5 | silty SAND to sandy SILT | 4.0 | 34 | 21 | 77 | 48 | - | 16 |
| 2.13 | 75.2 | 1.3 | 1.7 | clean SAND to silty SAND | 5.0 | 24 | 15 | 73 | 48 | - | 13 |
| 2.30 | 68.5 | 1.1 | 1.5 | clean SAND to silty SAND | 5.0 | 22 | 14 | 70 | 48 | - | 13 |
| 2.46 | 71.6 | 1.0 | 1.4 | clean SAND to silty SAND | 5.0 | 23 | 14 | 72 | 48 | - | 12 |
| 2.62 | 72.8 | 0.8 | 1.1 | clean SAND to silty SAND | 5.0 | 23 | 15 | 72 | 48 | - | 10 |
| 2.79 | 108.0 | 1.0 | 0.9 | clean SAND to silty SAND | 5.0 | 35 | 22 | 85 | 48 | - | 6 |
| 2.95 | 145.2 | 1.3 | 0.9 | clean SAND to silty SAND | 5.0 | 47 | 29 | 95 | 48 | - | 5 |
| 3.12 | 163.1 | 1.7 | 1.0 | clean SAND to silty SAND | 5.0 | 52 | 33 | 95 | 48 | - | 5 |
| 3.28 | 188.3 | 3.9 | 2.1 | clean SAND to silty SAND | 5.0 | 60 | 38 | 95 | 48 | - | 9 |
| 3.44 | 237.9 | 4.2 | 1.8 | clean SAND to silty SAND | 5.0 | 76 | 48 | 95 | 48 | - | 6 |
| 3.61 | 183.9 | 4.0 | 2.2 | clean SAND to silty SAND | 5.0 | 59 | 37 | 95 | 48 | - | 9 |
| 3.77 | 180.6 | 2.5 | 1.4 | clean SAND to silty SAND | 5.0 | 58 | 36 | 95 | 48 | - | 6 |
| 3.94 | 195.4 | 2.4 | 1.2 | clean SAND to silty SAND | 5.0 | 63 | 39 | 95 | 48 | - | 5 |
| 4.10 | 198.4 | 2.5 | 1.3 | clean SAND to silty SAND | 5.0 | 64 | 40 | 95 | 48 | - | 5 |
| 4.26 | 203.8 | 2.3 | 1.1 | clean SAND to silty SAND | 5.0 | 65 | 41 | 95 | 48 | - | 5 |
| 4.43 | 224.9 | 3.6 | 1.6 | clean SAND to silty SAND | 5.0 | 72 | 45 | 95 | 48 | - | 6 |
| 4.59 | 249.8 | 2.9 | 1.2 | clean SAND to silty SAND | 5.0 | 80 | 50 | 95 | 48 | - | 5 |
| 4.76 | 229.5 | 3.0 | 1.3 | clean SAND to silty SAND | 5.0 | 74 | 46 | 95 | 48 | - | 5 |
| 4.92 | 222.6 | 3.4 | 1.5 | clean SAND to silty SAND | 5.0 | 71 | 45 | 95 | 48 | - | 6 |
| 5.08 | 187.3 | 4.0 | 2.1 | clean SAND to silty SAND | 5.0 | 60 | 37 | 95 | 48 | - | 9 |
| 5.25 | 191.8 | 3.6 | 1.9 | clean SAND to silty SAND | 5.0 | 62 | 38 | 95 | 48 | - | 8 |
| 5.41 | 185.2 | 2.9 | 1.6 | clean SAND to silty SAND | 5.0 | 59 | 37 | 95 | 48 | - | 7 |
| 5.58 | 183.1 | 3.0 | 1.6 | clean SAND to silty SAND | 5.0 | 59 | 37 | 95 | 48 | - | 7 |
| 5.74 | 194.7 | 3.4 | 1.8 | clean SAND to silty SAND | 5.0 | 62 | 39 | 95 | 48 | - | 7 |
| 5.90 | 234.4 | 5.2 | 2.2 | stiff SAND to clayy SAND | 1.0 | 100 | 100 | 95 | - | 23.5 | 8 |
| 6.07 | 521.0 | 5.8 | 1.1 | clean SAND to silty SAND | 5.0 | 100 | 100 | 95 | 48 | - | 5 |
| 6.23 | 281.7 | 6.6 | 2.4 | stiff SAND to clayy SAND | 1.0 | 100 | 100 | 95 | - | 27.5 | 8 |
| 6.40 | 307.9 | 4.7 | 1.5 | clean SAND to silty SAND | 5.0 | 95 | 62 | 95 | 48 | - | 5 |
| 6.56 | 328.1 | 5.6 | 1.7 | clean SAND to silty SAND | 5.0 | 100 | 66 | 95 | 48 | - | 5 |
| 6.72 | 331.7 | 5.1 | 1.5 | clean SAND to silty SAND | 5.0 | 100 | 66 | 95 | 48 | - | 5 |
| 6.89 | 305.2 | 4.7 | 1.5 | clean SAND to silty SAND | 5.0 | 91 | 61 | 95 | 48 | - | 5 |
| 7.05 | 300.6 | 4.6 | 1.5 | clean SAND to silty SAND | 5.0 | 88 | 60 | 95 | 48 | - | 5 |

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

**Holguin, Fahan & Associates, Inc.**

UCSD Santa Clarita River Bridge

Project ID: Earth Mechanics
ta File: SDF(359).cpt
T Date: 10/6/2004 8:53:21 AM

Sounding ID: 04-24C
Project No: 02-165

| Depth ft | qc PS tsf | Slv Stss tsf | Frct Rato % | * Material Behavior Description | Qc to N | * SPT N1 60% | SPT N 60% | * Rel Den % | * Ftn Ang deg | * Und Shr tsf | * % Fin Ic |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 7.22 | 313.4 | 5.4 | 1.7 | clean SAND to silty SAND | 5.0 | 91 | 63 | 95 | 48 | - | 6 |
| 7.38 | 354.8 | 4.1 | 1.2 | clean SAND to silty SAND | 5.0 | 100 | 71 | 95 | 48 | - | 5 |
| 7.54 | 406.2 | 6.6 | 1.6 | clean SAND to silty SAND | 5.0 | 100 | 81 | 95 | 48 | - | 5 |
| 7.71 | 394.1 | 7.0 | 1.8 | clean SAND to silty SAND | 5.0 | 100 | 79 | 95 | 48 | - | 5 |
| 7.87 | 338.2 | 7.3 | 2.2 | stiff SAND to clayy SAND | 1.0 | 100 | 100 | 95 | - | 29.4 | 7 |
| 8.04 | 282.8 | 5.3 | 1.9 | clean SAND to silty SAND | 5.0 | 78 | 57 | 95 | 48 | - | 7 |
| 8.20 | 228.5 | 3.9 | 1.7 | clean SAND to silty SAND | 5.0 | 62 | 46 | 95 | 48 | - | 7 |
| 8.36 | 193.0 | 2.8 | 1.5 | clean SAND to silty SAND | 5.0 | 52 | 39 | 95 | 47 | - | 7 |
| 8.53 | 164.2 | 2.4 | 1.5 | clean SAND to silty SAND | 5.0 | 44 | 33 | 93 | 46 | - | 8 |
| 8.69 | 148.8 | 1.7 | 1.2 | clean SAND to silty SAND | 5.0 | 39 | 30 | 89 | 46 | - | 7 |
| 8.86 | 156.6 | 2.6 | 1.7 | clean SAND to silty SAND | 5.0 | 41 | 31 | 91 | 46 | - | 9 |
| 9.02 | 169.3 | 2.7 | 1.6 | clean SAND to silty SAND | 5.0 | 44 | 34 | 93 | 46 | - | 8 |
| 9.18 | 183.4 | 3.0 | 1.6 | clean SAND to silty SAND | 5.0 | 47 | 37 | 95 | 46 | - | 8 |
| 9.35 | 171.0 | 2.7 | 1.6 | clean SAND to silty SAND | 5.0 | 44 | 34 | 93 | 46 | - | 9 |
| 9.51 | 135.4 | 2.6 | 1.9 | clean SAND to silty SAND | 5.0 | 34 | 27 | 85 | 45 | - | 12 |
| 9.68 | 110.8 | 1.9 | 1.8 | clean SAND to silty SAND | 5.0 | 28 | 22 | 78 | 44 | - | 12 |
| 9.84 | 88.2 | 1.3 | 1.5 | clean SAND to silty SAND | 5.0 | 22 | 18 | 70 | 42 | - | 13 |
| 10.00 | 70.1 | 0.9 | 1.3 | clean SAND to silty SAND | 5.0 | 17 | 14 | 62 | 41 | - | 14 |
| 10.17 | 43.3 | 0.6 | 1.3 | silty SAND to sandy SILT | 4.0 | 13 | 11 | 46 | 38 | - | 19 |
| 10.33 | 36.1 | 0.3 | 1.0 | silty SAND to sandy SILT | 4.0 | 11 | 9 | 40 | 37 | - | 19 |
| 10.50 | 30.3 | 0.4 | 1.5 | silty SAND to sandy SILT | 4.0 | 9 | 8 | 34 | 36 | - | 25 |
| 10.66 | 30.7 | 0.7 | 2.3 | silty SAND to sandy SILT | 4.0 | 9 | 8 | 34 | 36 | - | 30 |
| 10.82 | 20.2 | 0.5 | 2.6 | clayy SILT to silty CLAY | 2.0 | 13 | 10 | - | - | 1.7 | 37 |
| 10.99 | 13.1 | 0.3 | 2.0 | clayy SILT to silty CLAY | 2.0 | 10 | 7 | - | - | 1.2 | 39 |
| 11.15 | 12.9 | 0.1 | 1.2 | clayy SILT to silty CLAY | 2.0 | 8 | 6 | - | - | 1.1 | 36 |
| 11.32 | 14.3 | 0.1 | 0.9 | silty SAND to sandy SILT | 4.0 | 4 | 4 | 8 | 31 | - | 33 |
| 11.48 | 16.1 | 0.6 | 4.0 | silty CLAY to CLAY | 1.5 | 15 | 11 | - | - | 1.5 | 46 |
| 11.64 | 22.9 | 0.8 | 3.6 | clayy SILT to silty CLAY | 2.0 | 16 | 11 | - | - | 2.1 | 38 |
| 11.81 | 11.7 | 0.6 | 5.2 | silty CLAY to CLAY | 1.5 | 11 | 8 | - | - | 1.0 | 58 |
| 11.97 | 8.8 | 0.2 | 2.9 | silty CLAY to CLAY | 1.5 | 8 | 6 | - | - | 0.7 | 55 |
| 12.14 | 17.3 | 0.8 | 4.6 | silty CLAY to CLAY | 1.5 | 15 | 12 | - | - | 1.5 | 48 |
| 12.30 | 11.3 | 0.7 | 6.4 | silty CLAY to CLAY | 1.5 | 10 | 8 | - | - | 0.9 | 64 |
| 12.46 | 6.2 | 0.3 | 5.5 | silty CLAY to CLAY | 1.5 | 5 | 4 | - | - | 0.5 | 79 |
| 12.63 | 6.5 | 0.3 | 5.6 | silty CLAY to CLAY | 1.5 | 6 | 4 | - | - | 0.5 | 78 |
| 12.79 | 7.7 | 0.4 | 6.4 | silty CLAY to CLAY | 1.5 | 7 | 5 | - | - | 0.6 | 76 |
| 12.96 | 41.0 | 0.9 | 2.3 | silty SAND to sandy SILT | 4.0 | 11 | 10 | 40 | 37 | - | 27 |
| 13.12 | 125.9 | 1.5 | 1.2 | clean SAND to silty SAND | 5.0 | 27 | 25 | 77 | 43 | - | 10 |
| 13.28 | 174.7 | 2.2 | 1.3 | clean SAND to silty SAND | 5.0 | 38 | 35 | 88 | 44 | - | 8 |
| 13.45 | 217.2 | 2.9 | 1.3 | clean SAND to silty SAND | 5.0 | 47 | 43 | 95 | 45 | - | 7 |
| 13.61 | 250.0 | 3.7 | 1.5 | clean SAND to silty SAND | 5.0 | 53 | 50 | 95 | 46 | - | 7 |
| 13.78 | 258.7 | 4.2 | 1.6 | clean SAND to silty SAND | 5.0 | 55 | 52 | 95 | 46 | - | 7 |
| 13.94 | 241.9 | 4.4 | 1.8 | clean SAND to silty SAND | 5.0 | 51 | 48 | 95 | 46 | - | 9 |
| 14.10 | 238.8 | 4.2 | 1.8 | clean SAND to silty SAND | 5.0 | 50 | 48 | 95 | 46 | - | 9 |

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

**Holguin, Fahan & Associates, Inc.**

UCSD Santa Clarita River Bridge

Project ID: Earth Mechanics
ta File: SDF(359).cpt
T Date: 10/6/2004 8:53:21 AM

Sounding ID: 04-24C
Project No: 02-165

| Depth ft | qc PS tsf | Slv Stss tsf | Frct Rato % | * Material Behavior Description | Qc to N | * SPT N1 60% | SPT N 60% | * Rel Den % | * Ftn Ang deg | * Und Shr tsf | * % Fin Ic |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 14.27 | 255.4 | 7.8 | 3.1 | stiff SAND to clayy SAND | 1.0 | 100 | 100 | 95 | - | 16.5 | 13 |
| 14.43 | 284.1 | 7.4 | 2.6 | stiff SAND to clayy SAND | 1.0 | 100 | 100 | 95 | - | 18.3 | 11 |
| 14.60 | 318.0 | 8.4 | 2.7 | stiff SAND to clayy SAND | 1.0 | 100 | 100 | 95 | - | 20.4 | 10 |
| 14.76 | 250.5 | 5.2 | 2.1 | clean SAND to silty SAND | 5.0 | 51 | 50 | 95 | 46 | - | 10 |
| 14.92 | 233.8 | 4.0 | 1.7 | clean SAND to silty SAND | 5.0 | 48 | 47 | 95 | 45 | - | 9 |
| 15.09 | 215.8 | 3.7 | 1.7 | clean SAND to silty SAND | 5.0 | 44 | 43 | 93 | 45 | - | 9 |
| 15.25 | 207.2 | 3.5 | 1.7 | clean SAND to silty SAND | 5.0 | 42 | 41 | 91 | 45 | - | 9 |
| 15.42 | 212.8 | 6.8 | 3.2 | stiff SAND to clayy SAND | 1.0 | 100 | 100 | 92 | - | 13.2 | 15 |
| 15.58 | 292.0 | 5.1 | 1.8 | clean SAND to silty SAND | 5.0 | 58 | 58 | 95 | 46 | - | 8 |
| 15.74 | 185.1 | 4.4 | 2.4 | silty SAND to sandy SILT | 4.0 | 46 | 46 | 87 | 44 | - | 13 |
| 15.91 | 162.3 | 2.8 | 1.8 | clean SAND to silty SAND | 5.0 | 32 | 32 | 82 | 43 | - | 11 |
| 16.07 | 166.0 | 2.7 | 1.6 | clean SAND to silty SAND | 5.0 | 33 | 33 | 83 | 43 | - | 11 |
| 16.24 | 115.7 | 2.8 | 2.5 | silty SAND to sandy SILT | 4.0 | 28 | 29 | 71 | 41 | - | 17 |
| 16.40 | 102.7 | 2.4 | 2.3 | silty SAND to sandy SILT | 4.0 | 25 | 26 | 67 | 41 | - | 18 |
| 16.56 | 94.8 | 2.2 | 2.3 | silty SAND to sandy SILT | 4.0 | 23 | 24 | 64 | 40 | - | 19 |
| 16.73 | 85.5 | 2.2 | 2.6 | silty SAND to sandy SILT | 4.0 | 21 | 21 | 60 | 40 | - | 21 |
| 16.89 | 82.5 | 2.3 | 2.8 | silty SAND to sandy SILT | 4.0 | 20 | 21 | 59 | 39 | - | 22 |
| 17.06 | 86.3 | 2.5 | 2.9 | silty SAND to sandy SILT | 4.0 | 21 | 22 | 60 | 39 | - | 22 |
| 17.22 | 74.9 | 3.0 | 4.1 | clayy SILT to silty CLAY | 2.0 | 35 | 37 | 56 | - | 4.7 | 29 |
| 17.38 | 210.1 | 3.3 | 1.6 | clean SAND to silty SAND | 5.0 | 40 | 42 | 90 | 44 | - | 9 |
| 17.55 | 279.8 | 3.8 | 1.4 | clean SAND to silty SAND | 5.0 | 52 | 56 | 95 | 45 | - | 6 |
| 17.71 | 302.9 | 4.2 | 1.4 | clean SAND to silty SAND | 5.0 | 57 | 61 | 95 | 46 | - | 6 |
| 17.88 | 296.5 | 4.7 | 1.6 | clean SAND to silty SAND | 5.0 | 55 | 59 | 95 | 45 | - | 7 |
| 18.04 | 288.8 | 5.2 | 1.8 | clean SAND to silty SAND | 5.0 | 53 | 58 | 95 | 45 | - | 8 |
| 18.20 | 272.1 | 4.9 | 1.8 | clean SAND to silty SAND | 5.0 | 50 | 54 | 95 | 45 | - | 9 |
| 18.37 | 233.4 | 4.4 | 1.9 | clean SAND to silty SAND | 5.0 | 43 | 47 | 92 | 44 | - | 10 |
| 18.53 | 211.5 | 3.6 | 1.7 | clean SAND to silty SAND | 5.0 | 39 | 42 | 89 | 44 | - | 10 |
| 18.70 | 202.3 | 3.1 | 1.5 | clean SAND to silty SAND | 5.0 | 37 | 40 | 87 | 43 | - | 9 |
| 18.86 | 191.6 | 2.7 | 1.4 | clean SAND to silty SAND | 5.0 | 35 | 38 | 85 | 43 | - | 9 |
| 19.02 | 189.2 | 2.2 | 1.2 | clean SAND to silty SAND | 5.0 | 34 | 38 | 85 | 43 | - | 8 |
| 19.19 | 177.2 | 2.8 | 1.6 | clean SAND to silty SAND | 5.0 | 32 | 35 | 82 | 43 | - | 10 |
| 19.35 | 152.3 | 3.3 | 2.2 | silty SAND to sandy SILT | 4.0 | 34 | 38 | 77 | 42 | - | 15 |
| 19.52 | 101.6 | 3.5 | 3.5 | silty SAND to sandy SILT | 4.0 | 23 | 25 | 64 | 40 | - | 24 |
| 19.68 | 73.0 | 3.3 | 4.6 | clayy SILT to silty CLAY | 2.0 | 32 | 37 | 53 | - | 4.2 | 31 |
| 19.84 | 54.7 | 2.5 | 4.6 | clayy SILT to silty CLAY | 2.0 | 23 | 27 | - | - | 2.9 | 37 |
| 20.01 | 49.5 | 2.4 | 5.0 | silty CLAY to CLAY | 1.5 | 27 | 33 | - | - | 2.6 | 39 |
| 20.17 | 41.5 | 2.1 | 5.3 | silty CLAY to CLAY | 1.5 | 22 | 28 | - | - | 2.2 | 44 |
| 20.34 | 36.8 | 2.0 | 5.7 | silty CLAY to CLAY | 1.5 | 20 | 25 | - | - | 1.9 | 47 |
| 20.50 | 41.8 | 2.2 | 5.5 | silty CLAY to CLAY | 1.5 | 22 | 28 | - | - | 2.1 | 44 |
| 20.66 | 40.8 | 2.0 | 5.1 | silty CLAY to CLAY | 1.5 | 22 | 27 | - | - | 2.1 | 44 |
| 20.83 | 35.6 | 1.8 | 5.3 | silty CLAY to CLAY | 1.5 | 19 | 24 | - | - | 1.8 | 47 |
| 20.99 | 31.0 | 1.6 | 5.2 | silty CLAY to CLAY | 1.5 | 16 | 21 | - | - | 1.5 | 50 |
| 21.16 | 25.1 | 1.6 | 6.5 | silty CLAY to CLAY | 1.5 | 13 | 17 | - | - | 1.2 | 59 |

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

**Holguin, Fahan & Associates, Inc.**

UCSD Santa Clarita River Bridge

Project ID: Earth Mechanics
ata File: SDF(359).cpt
T Date: 10/6/2004 8:53:21 AM

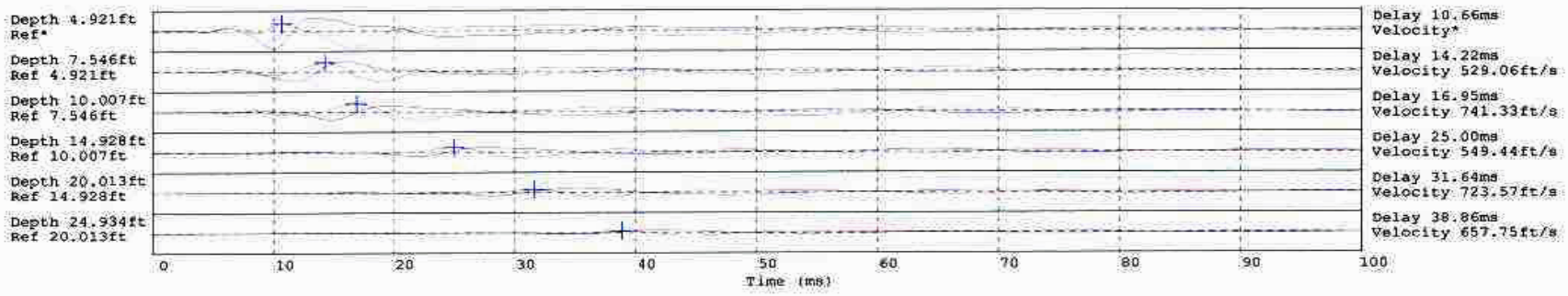
Sounding ID: 04-24C
Project No: 02-165

| Depth ft | qc PS tsf | Slv Stss tsf | Frct Rato % | * Material Behavior Description | Qc to N | * SPT N1 60% | SPT N 60% | * Rel Den % | * Ftn Ang deg | * Und Shr tsf | * % Fin Ic |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 21.32 | 40.9 | 1.7 | 4.4 | silty CLAY to CLAY | 1.5 | 21 | 27 | - | - | 2.0 | 42 |
| 21.48 | 32.2 | 1.6 | 5.3 | silty CLAY to CLAY | 1.5 | 16 | 21 | - | - | 1.6 | 49 |
| 21.65 | 25.8 | 1.6 | 6.5 | silty CLAY to CLAY | 1.5 | 13 | 17 | - | - | 1.2 | 58 |
| 21.81 | 80.0 | 2.0 | 2.5 | silty SAND to sandy SILT | 4.0 | 17 | 20 | 54 | 38 | - | 23 |
| 21.98 | 107.4 | 2.5 | 2.4 | silty SAND to sandy SILT | 4.0 | 23 | 27 | 64 | 39 | - | 19 |
| 22.14 | 122.6 | 2.4 | 1.9 | silty SAND to sandy SILT | 4.0 | 26 | 31 | 68 | 40 | - | 16 |
| 22.30 | 120.1 | 2.6 | 2.2 | silty SAND to sandy SILT | 4.0 | 25 | 30 | 67 | 40 | - | 17 |
| 22.47 | 113.8 | 2.5 | 2.2 | silty SAND to sandy SILT | 4.0 | 24 | 28 | 65 | 40 | - | 18 |
| 22.63 | 105.9 | 2.2 | 2.1 | silty SAND to sandy SILT | 4.0 | 22 | 26 | 63 | 39 | - | 18 |
| 22.80 | 111.2 | 2.4 | 2.2 | silty SAND to sandy SILT | 4.0 | 23 | 28 | 64 | 39 | - | 18 |
| 22.96 | 120.1 | 2.6 | 2.2 | silty SAND to sandy SILT | 4.0 | 25 | 30 | 67 | 40 | - | 17 |
| 23.12 | 130.9 | 2.7 | 2.1 | silty SAND to sandy SILT | 4.0 | 27 | 33 | 69 | 40 | - | 16 |
| 23.29 | 181.5 | 4.1 | 2.2 | silty SAND to sandy SILT | 4.0 | 37 | 45 | 80 | 42 | - | 14 |
| 23.45 | 250.0 | 4.6 | 1.9 | clean SAND to silty SAND | 5.0 | 41 | 50 | 90 | 43 | - | 10 |
| 23.62 | 284.6 | 5.9 | 2.1 | clean SAND to silty SAND | 5.0 | 46 | 57 | 95 | 44 | - | 10 |
| 23.78 | 336.0 | 6.5 | 1.9 | clean SAND to silty SAND | 5.0 | 54 | 67 | 95 | 45 | - | 9 |
| 23.94 | 322.6 | 7.9 | 2.5 | clean SAND to silty SAND | 5.0 | 52 | 65 | 95 | 45 | - | 11 |
| 24.11 | 288.5 | 7.0 | 2.4 | clean SAND to silty SAND | 5.0 | 46 | 58 | 95 | 44 | - | 12 |
| 24.27 | 274.5 | 6.7 | 2.4 | clean SAND to silty SAND | 5.0 | 44 | 55 | 93 | 44 | - | 12 |
| 24.44 | 284.7 | 6.6 | 2.3 | clean SAND to silty SAND | 5.0 | 45 | 57 | 94 | 44 | - | 11 |
| 24.60 | 253.7 | 6.2 | 2.5 | silty SAND to sandy SILT | 4.0 | 50 | 63 | 90 | 43 | - | 13 |

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

**Holguin, Fahan & Associates, Inc.**

**Earth Mechanics**
**04-24C**




Hammer to Rod String Distance 1.8288 (m)
* = Not Determined

# Caltrans Bridge 04-0398
# Maple Ave UC Bridge,
# Fresno Co.

**Caltrans Bridge 04-0398,**
**Maple Ave UC Bridge, Fresno Co.**

This undercrossing is located at Route 168 over Olive Ave in Fresno County. The bridge has set-type abutments on spread footings

Caltrans provided bulk samples taken from this bridge site for determination of fill properties. We have performed UU testing on this sample. Test results are in Appendix C. Caltrans provided maximum density test results using a nuclear gauge. The data showed the in-situ fills had a relative compaction of 95 to 97%.

+60
09/30/2004

09/30/2004

09/30/2004

09/30/2004

09/30/2004

09/30/2004

09/30/2004

10/05/2004

10/05/2004

10/05/2004

10/05/2004

10/05/2004

PEPSI
10/05/2004

10/05/2004

10/05/2004

NOTE: For complete Right of Way and Accurate Access Data, See Right of Way record maps at District Office.

| DIST | COUNTY | ROUTE | KILOMETER POST TOTAL PROJECT | SHEET No |
|---|---|---|---|---|
| 06 | Fre | 180 | R97.1/R103.1 | 12 |

Caltrans Metric

11-20-01
REGISTERED CIVIL ENGINEER

3-25-02
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL OSCAR V. SHERRILL No. 57629 Exp. 12-31-05 CIVIL STATE OF CALIFORNIA

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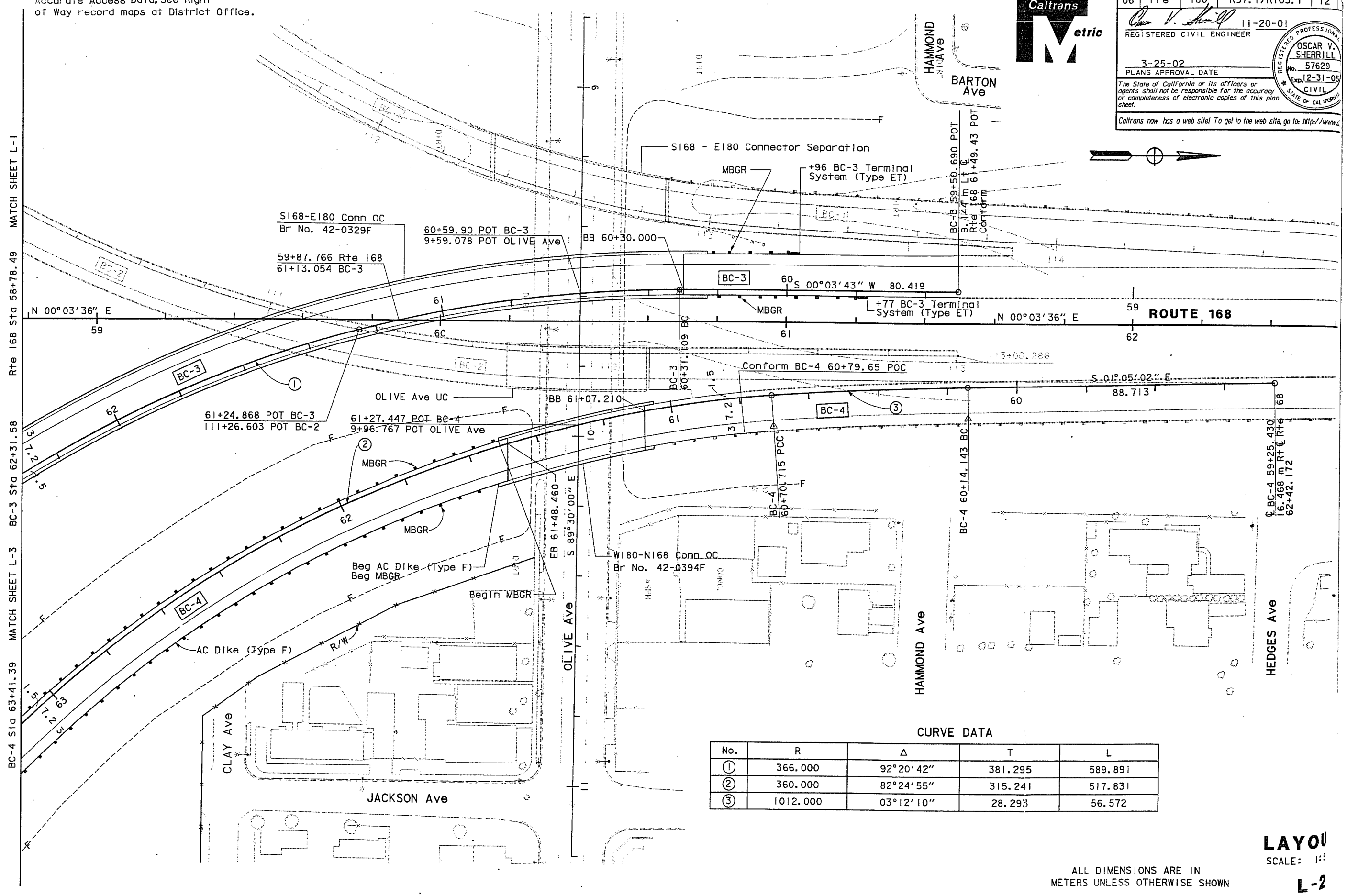


CURVE DATA

| No. | R | Δ | T | L |
|---|---|---|---|---|
| ① | 366.000 | 92°20'42" | 381.295 | 589.891 |
| ② | 360.000 | 82°24'55" | 315.241 | 517.831 |
| ③ | 1012.000 | 03°12'10" | 28.293 | 56.572 |

LAYOU
SCALE: 1:
L-2

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans PROJECT DEVELOPMENT
PROJECT ENGINEER OSCAR SHERRILL
CALCULATED/DESIGNED BY
CHECKED BY
DATE
REVISED BY
DATE REVISED

FOR REDUCED PLANS ORIGINAL SCALE IS IN MILLIMETERS

USERNAME => trplerce
DGN FILE => 634242e02.dgn

CU 06245

EA 342421

| DIST | COUNTY | ROUTE | KILOMETER POST TOTAL PROJECT | SHEET No. |
|---|---|---|---|---|
| 06 | Fre | 180 | R97.1/R103.1 | 60 |

Caltrans Metric

REGISTERED CIVIL ENGINEER 11-28-01

3-25-02
PLANS APPROVAL DATE

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REGISTERED PROFESSIONAL ENGINEER PHILIP E. LUTZ No. C55835 Exp. 12-31-04 CIVIL STATE OF CALIFORNIA

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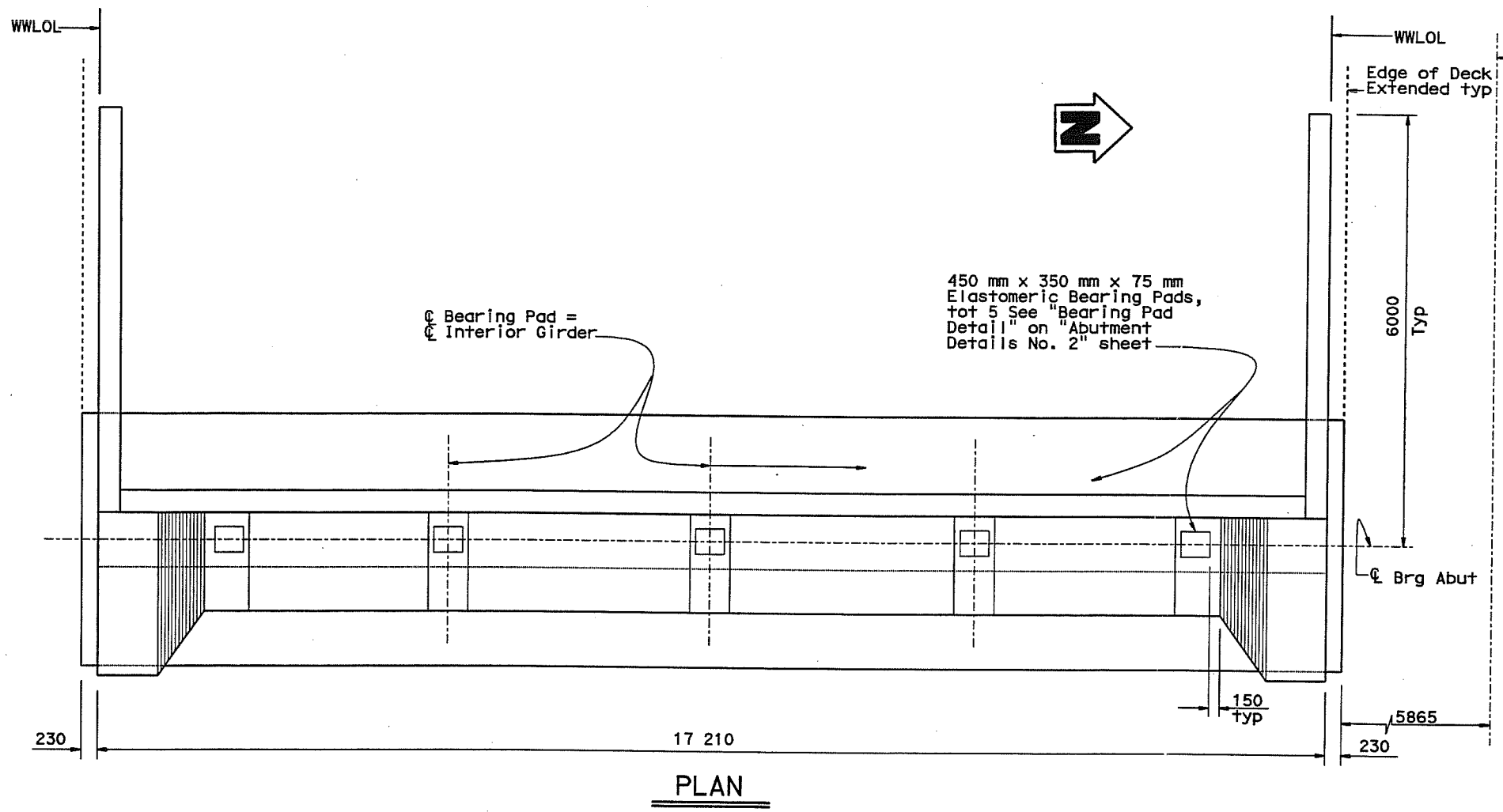
NOTES:

Details are symmetrical about ℄ Rte 180.

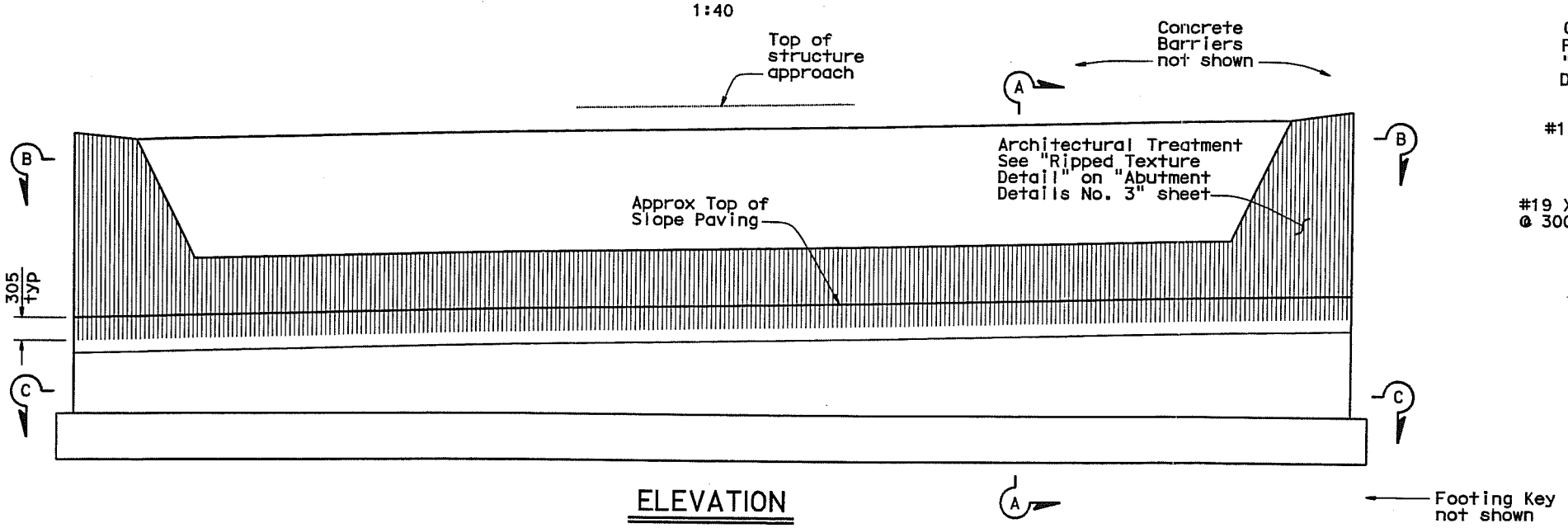
Abut 1 right shown
Abut 2 similar

For Sections B-B, and C-C see "Abutment Details No. 1" sheet

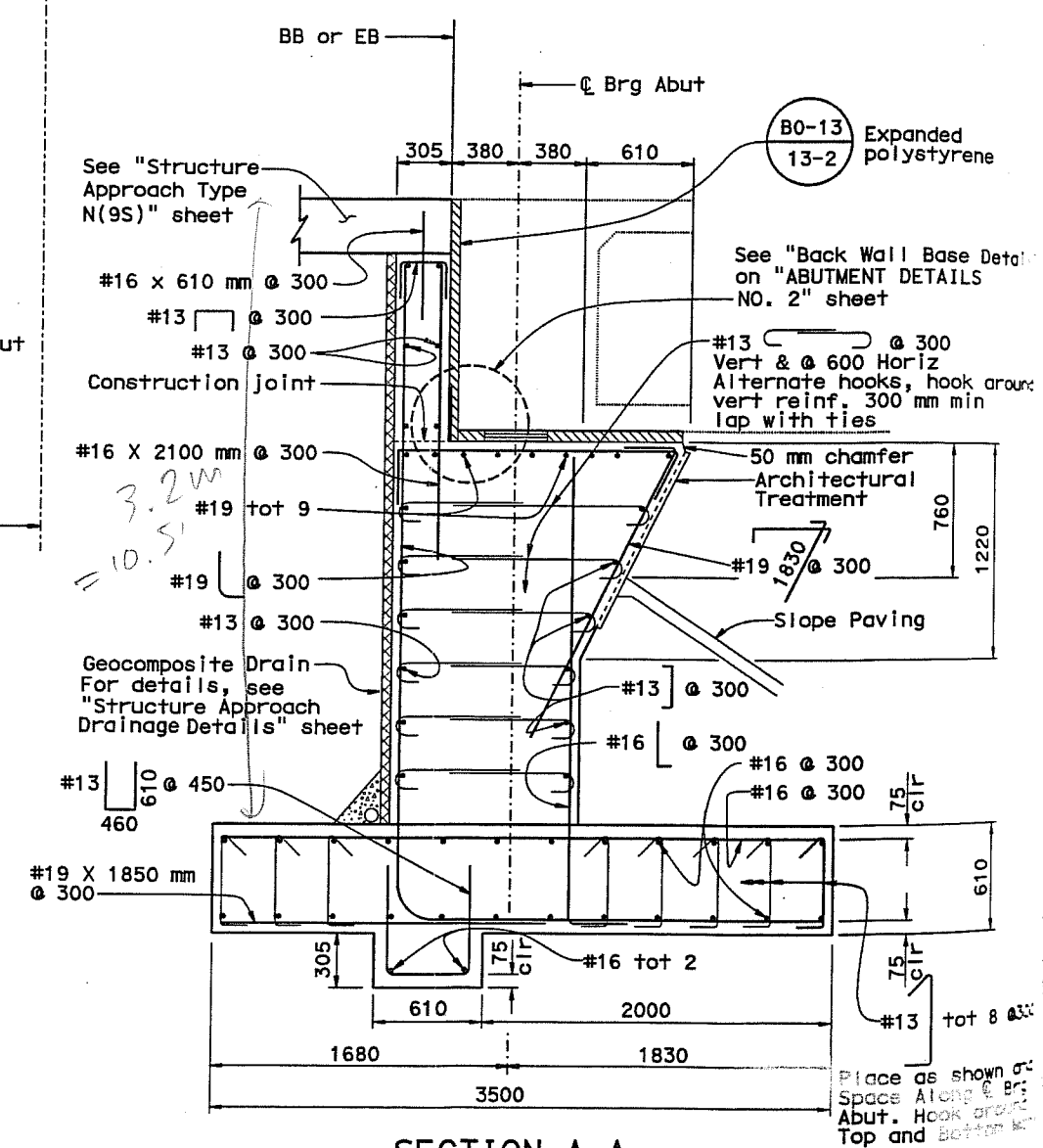
Place Back wall after Prestressing




PLAN
1:40




ELEVATION
1:40




SECTION A-A
1:20

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

| | BY | | CHECKED | |
|---|---|---|---|---|
| DESIGN | B. Leon | 01-01 | P. Lutz | 02-01 |
| DETAILS | S. Pugh | 01-01 | P. Lutz | 06-01 |
| QUANTITIES | O. Rodriguez | 06-01 | H. Hathaway | 06-01 |

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES
STRUCTURE DESIGN 9

BRIDGE NO. 42-0398R/L
KILOMETER POST 97.38

MAPLE AVENUE UNDERCROSSING
ABUTMENT LAYOUT

STRUCTURES DESIGN DETAIL SHEET (METRIC) (REV. 4/20/00)

ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS 0 10 20 30 40 50 60 70 80 90 100

CU 06245
EA 342421

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY) 1-29-01 2-3-01 1-27-01 11-14-01

SHEET 5

FILE => aaabtulyt.dgn

42-0398

| DIST | COUNTY | ROUTE | KILOMETER POST TOTAL PROJECT | SHEET No | TOTAL SHEETS |
|---|---|---|---|---|---|
| 06 | Fre | 180 | R97.1/R103.1 | 608 | 944 |

Caltrans Metric

REGISTERED CIVIL ENGINEER 11-28-01

3-25-02
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER PHILIP E. LUTZ No. C55839 Exp. 12-31-04 CIVIL STATE OF CALIFORNIA

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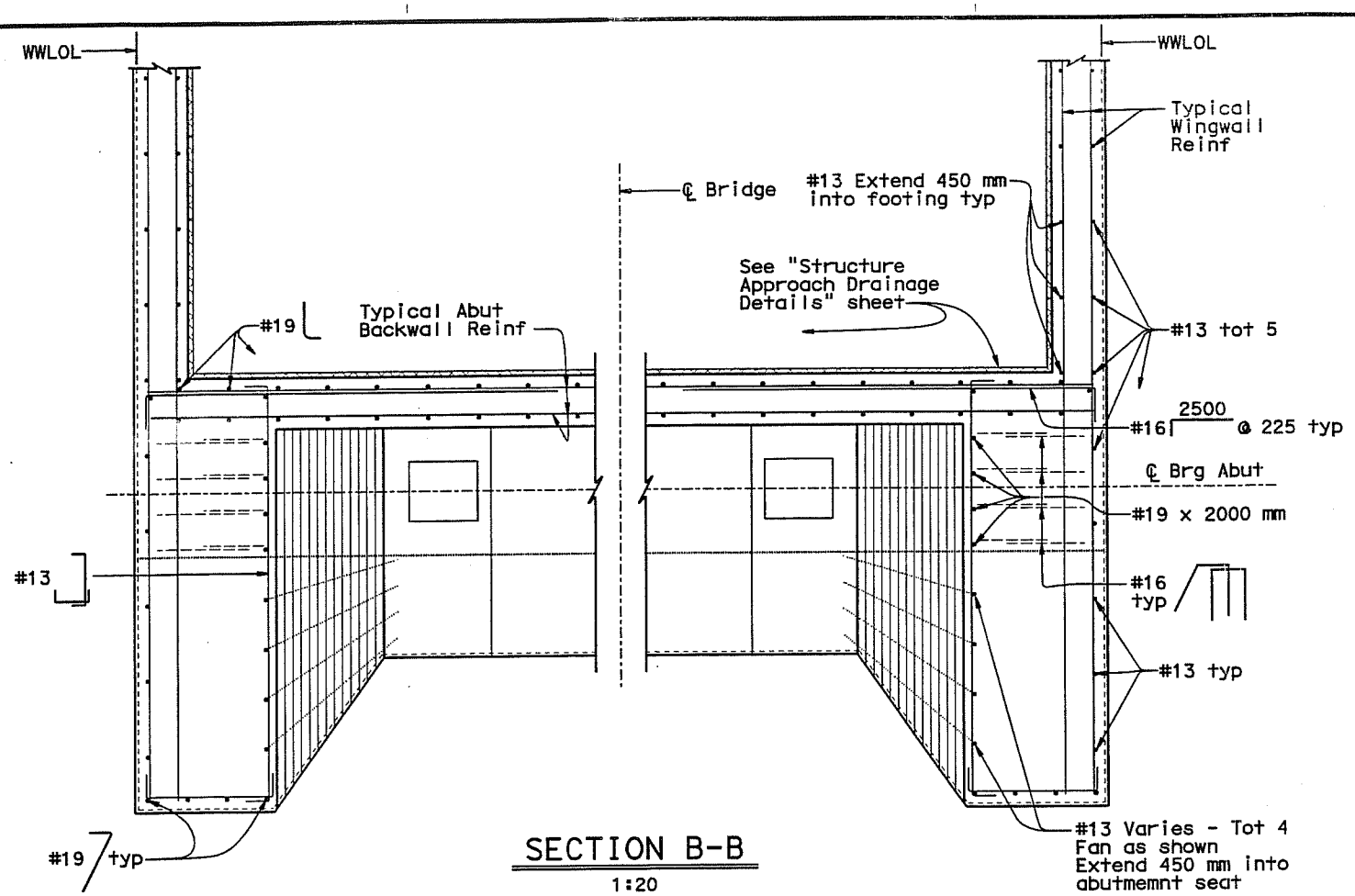
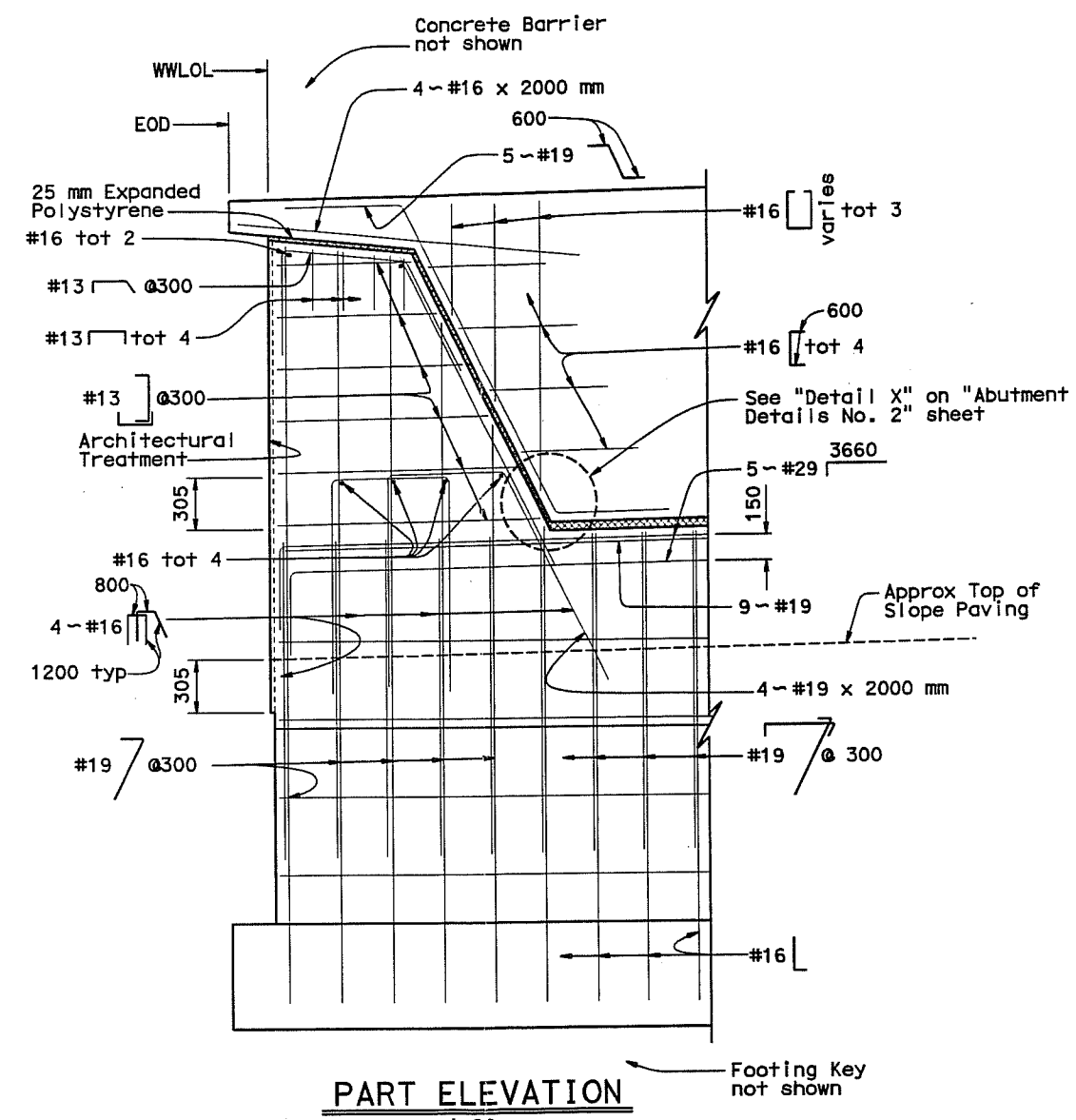



## SECTION B-B
1:20

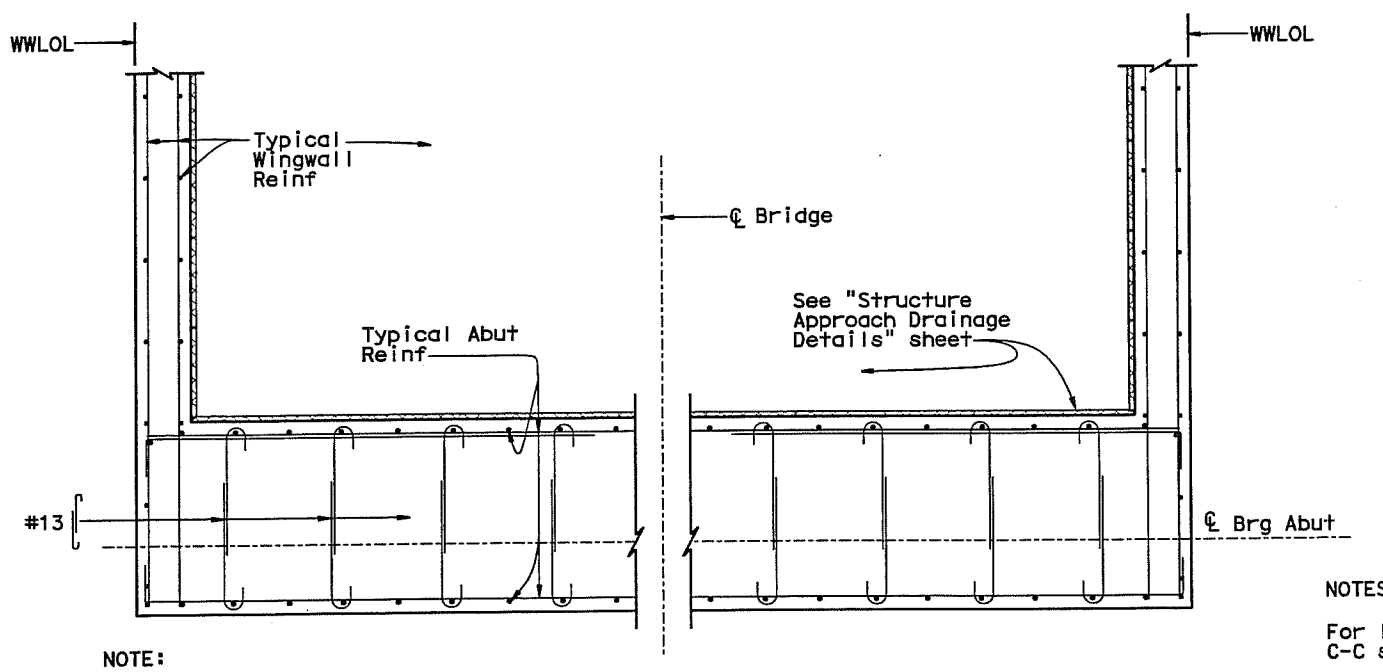
NOTE:

See Detail "X" on "Abutment Details No. 2" sheet

Details are symmetrical about ℄ Rte 180




## PART ELEVATION
1:20




NOTE:

For details and reinforcement not shown see Section B-B

## SECTION C-C
1:20

NOTES:

For location of Section B-B and C-C see "Abutment Layout" sheet

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

| | BY | | CHECKED | |
|---|---|---|---|---|
| DESIGN | B. Leon | 01-01 | P. Lutz | 01-01 |
| DETAILS | S. Pugh | 01-01 | P. Lutz | 01-01 |
| QUANTITIES | O. Rodriguez | 06-01 | H. Hathaway | 06-01 |

STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES STRUCTURE DESIGN 9

BRIDGE NO. 42-0398R/L

KILOMETER POST 97.38

# MAPLE AVENUE UNDERCROSSING
# ABUTMENT DETAILS NO. 1

STRUCTURES DESIGN DETAIL SHEET (METRIC) REV. 4/20/00

ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS 0 10 20 30 40 50 60 70 80 90 100

CU 06245
EA 342421

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY) 2-6-01 5-27-01 10-26-01 11-14-01

SHEET 6 OF 16

FILE => addbtdet01.dgn

USERNAME => trdamon DATE PLOTTED => 12-APR-2002 TIME PLOTTED => 08:42

| DIST | COUNTY | ROUTE | KILOMETER POST TOTAL PROJECT | SHEET No | TOTAL SHEETS |
|---|---|---|---|---|---|
| 06 | Fre | 180 | R97.1/R103.1 | 609 | 944 |

Philip E. Lutz 11-28-01
REGISTERED CIVIL ENGINEER

3-25-02
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER PHILIP E. LUTZ No. C55839 Exp. 12-31-04 CIVIL STATE OF CALIFORNIA

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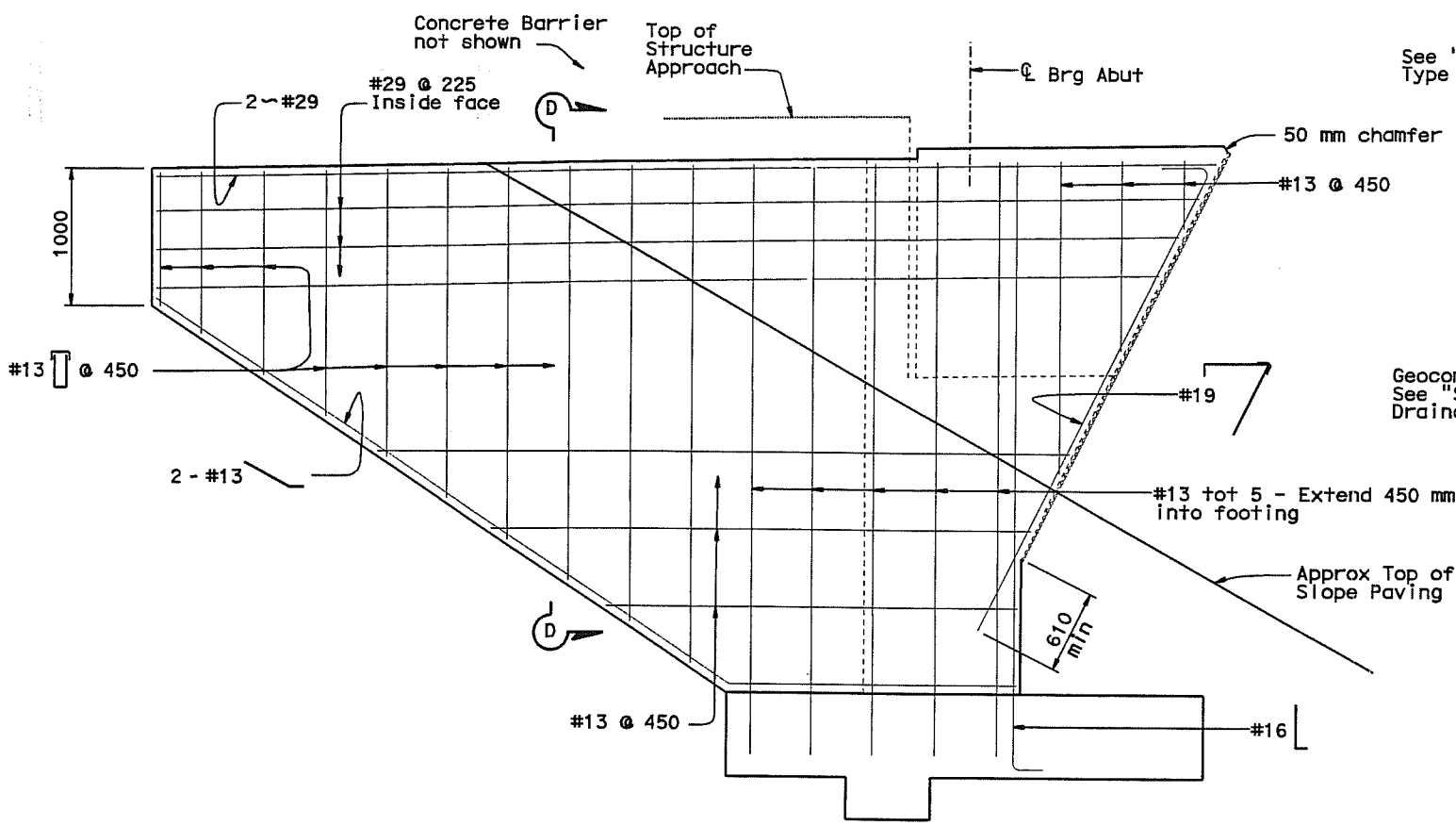
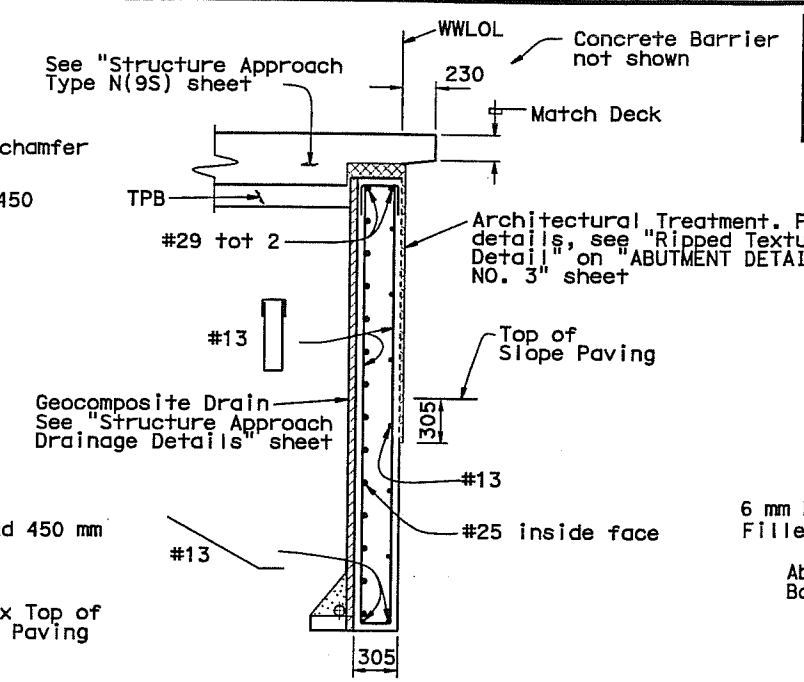
Caltrans Metric



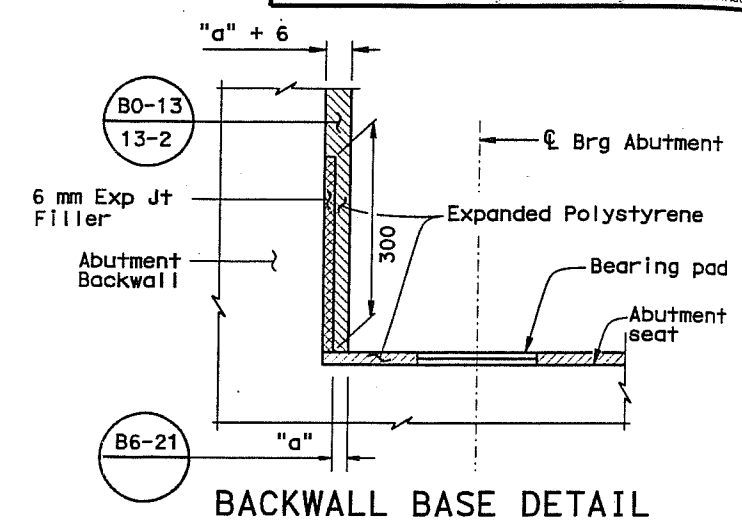

## TYPICAL WINGWALL ELEVATION

1:25



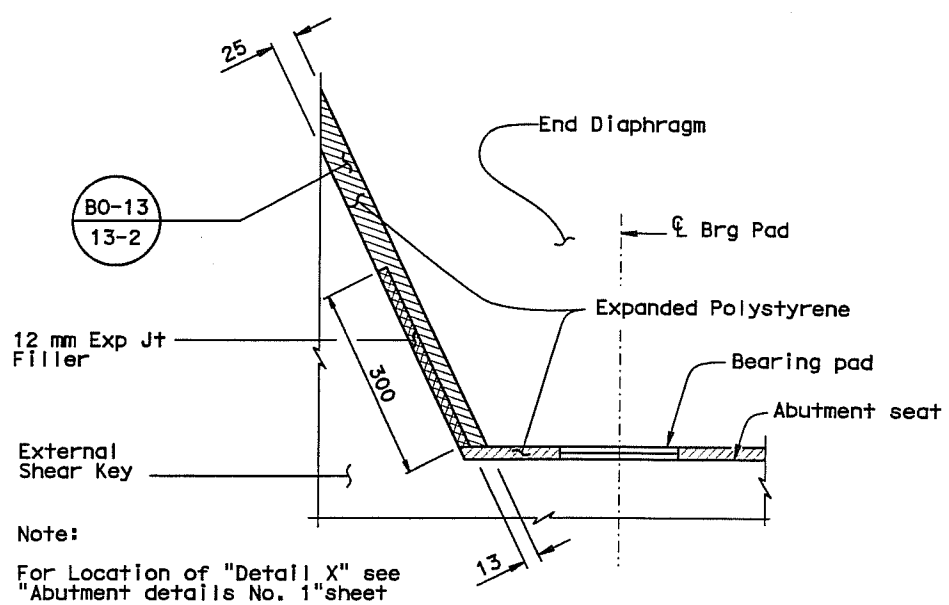

## SECTION D-D

1:25




## BACKWALL BASE DETAIL

No Scale

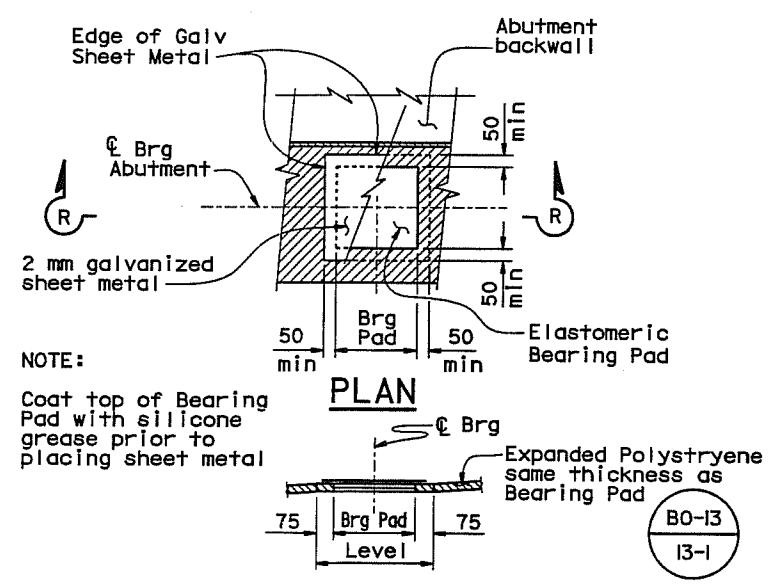



Note:

For Location of "Detail X" see "Abutment details No. 1" sheet

## DETAIL "X"

No Scale




NOTE:

Coat top of Bearing Pad with silicone grease prior to placing sheet metal

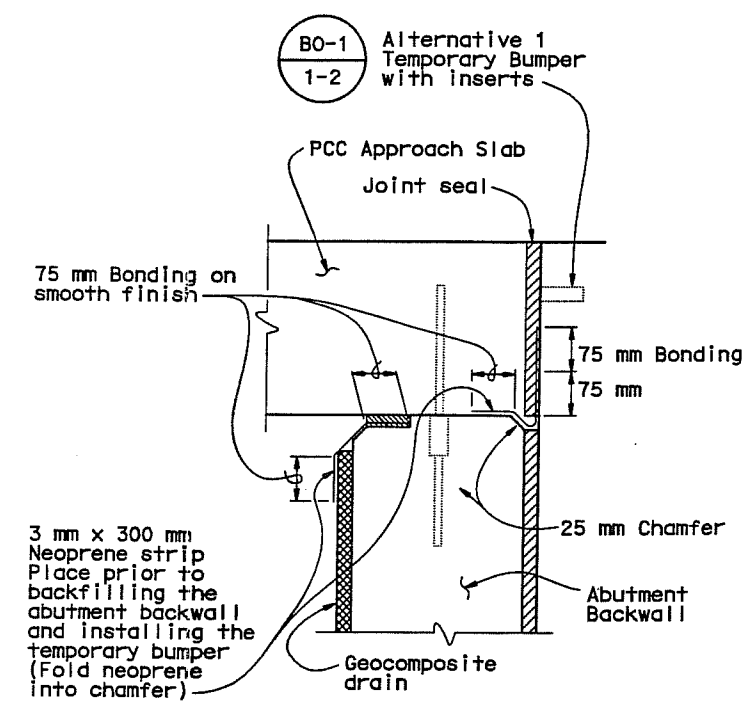
## PLAN

## SECTION R-R

## BEARING PAD DETAIL

No Scale

Details typical at all bearing pads




## JOINT PROTECTION DETAIL

No Scale

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

| | BY | | CHECKED | |
|---|---|---|---|---|
| DESIGN | B. Leon | 01-01 | P. Lutz | 02-01 |
| DETAILS | S. Pugh | 01-01 | P. Lutz | 06-01 |
| QUANTITIES | O. Rodriguez | 06-01 | H. Hathaway | 06-01 |

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES
STRUCTURE DESIGN 9

BRIDGE NO. 42-0398R/L
KILOMETER POST 97.38

# MAPLE AVENUE UNDERCROSSING
## ABUTMENT DETAILS NO. 2

STRUCTURES DESIGN DETAIL SHEET (METRIC) (REV. 4/20/00)

ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS 0 10 20 30 40 50 60 70 80 90 100

CU 06245
EA 342421

FILE => adabtdet01.dgn

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY) 2-14-01 8-28-01 11-14-01

SHT 7

| DIST | COUNTY | ROUTE | KILOMETER POST TOTAL PROJECT | SHEET No | TOTAL SHEETS |
|---|---|---|---|---|---|
| 06 | Fre | 180 | R97.1/R103.1 | 610 | 944 |

REGISTERED CIVIL ENGINEER 2-15-02

3-25-02
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER PHILIP E. LUTZ No. C55839 Exp. 12-31-04 CIVIL STATE OF CALIFORNIA

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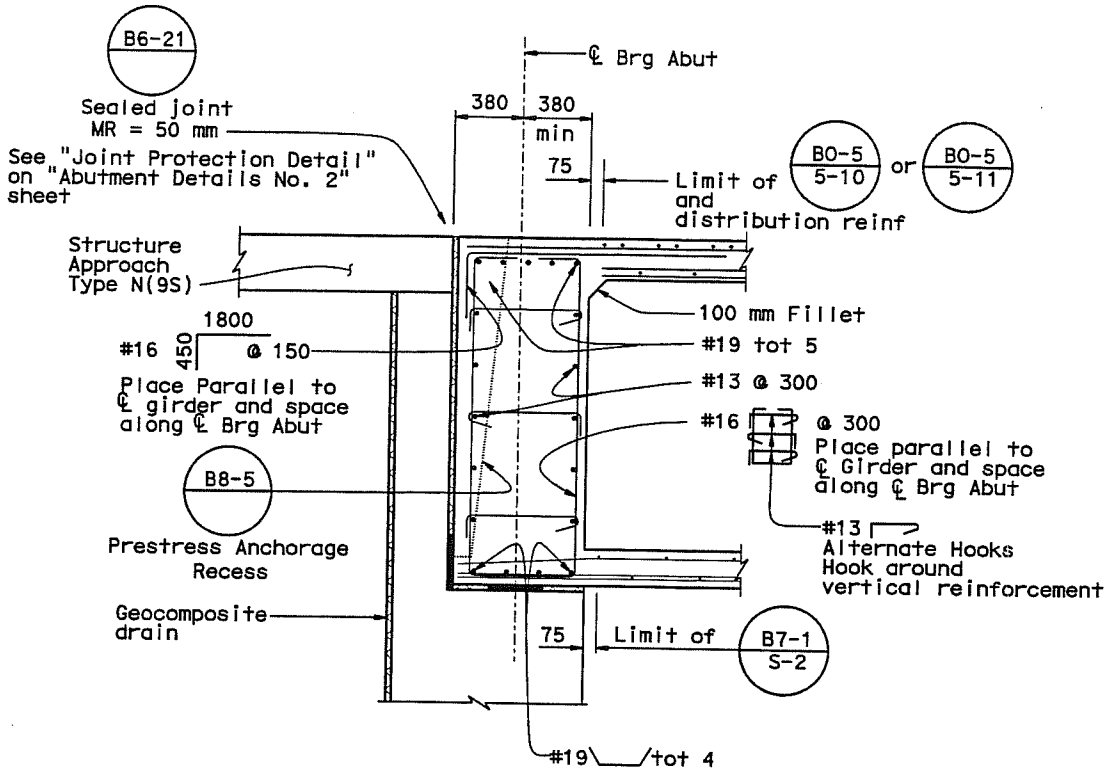
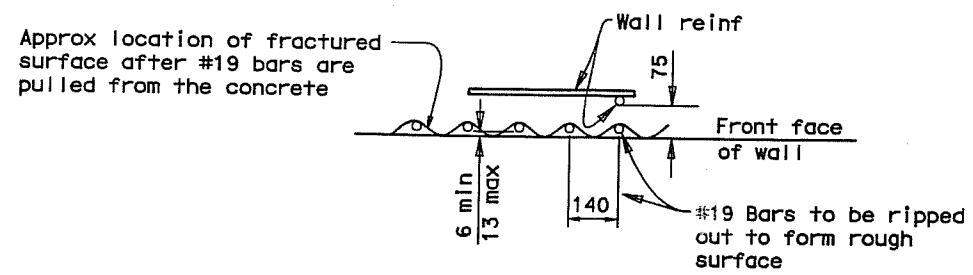



## END DIAPHRAGM SECTION

1:20




## RIPPED TEXTURE DETAIL

1:10

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

| | BY | | CHECKED | |
|---|---|---|---|---|
| DESIGN | B. Leon | 01-01 | P. Lutz | 02-01 |
| DETAILS | S. Pugh | 01-01 | P. Lutz | 06-01 |
| QUANTITIES | O. Rodriguez | 06-01 | H. Hathaway | 06-01 |

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES
STRUCTURE DESIGN 9

BRIDGE NO. 42-0398R/L
KILOMETER POST 97.38

MAPLE AVENUE UNDERCROSSING
ABUTMENT DETAILS NO. 3

STRUCTURES DESIGN DETAIL SHEET (METRIC) (REV. 4/20/00)

ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS 0 10 20 30 40 50 60 70 80 90 100

CU 06245
EA 342421

FILE => ddabtdet03.dgn

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY)

SHEET 429 OF 944

DATE PLOTTED => 12-APR-2002 TIME PLOTTED => 08:43

# APPENDIX B

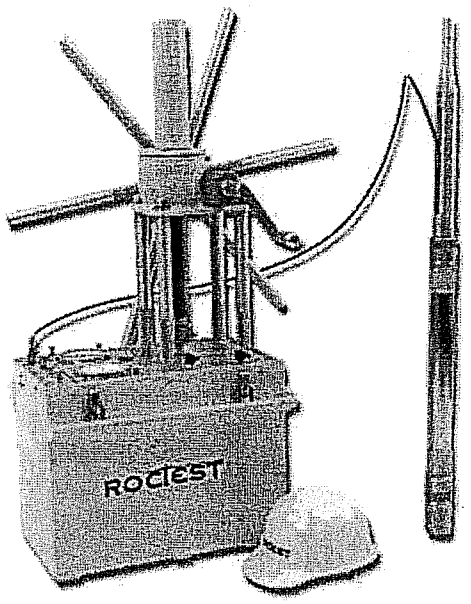
# Pressuremeter Test Device

# PRESSUREMETER
# Model TEXAM®

## APPLICATIONS

The TEXAM® pressuremeter is a reliable and economical instrument for the evaluation of most ground engineering problems. It is used to run in situ loading tests at various depths on a routine basis. The well-proven method developed by Louis Menard is utilized to interpret the test results for calculation of:

- **Bearing capacity** of shallow and deep foundations
- **Settlement** of all types of foundations
- **Deformation** of laterally loaded piles and sheet piles
- **Resistance** of anchors



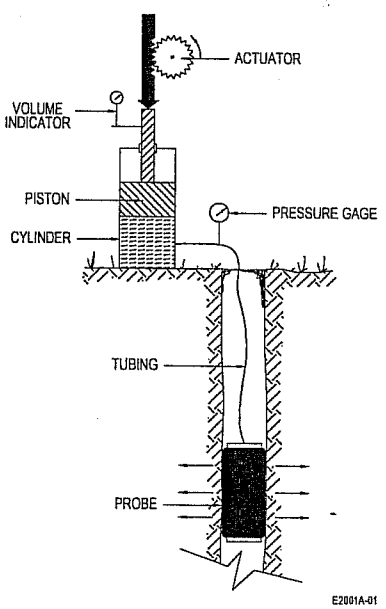

## DESCRIPTION

**The probe** - A cylindrical hollow body fitted with inflatable sheath.

**The control unit**

- A metal case which houses a cylinder with piston, two pressure gages for low and maximum pressure tests, a connector for an auxiliary pressure gage, and the control valves.
- A manual actuator to operate the piston.

**The tubing** - A high-pressure single conduit fitted with a shut-off quick connect to keep the probe and tubing saturated.




## FEATURES

- ✔ RUGGED CONSTRUCTION
- ✔ VERY SIMPLE TO OPERATE
- ✔ MEASUREMENT OF THE TOTAL VOLUMETRIC CHANGE OF THE CAVITY TO AVOID POSSIBLE ERRORS RELATED TO MEASUREMENT OF THE VARIATIONS OF DIAMETER IN ONE PLANE
- ✔ CONTROLLED RATE OF DEFORMATION
- ✔ EASY CYCLIC TESTING
- ✔ OPTIONAL EQUIPMENT IS AVAILABLE FOR:
  - CREEP TESTING
  - SELF BORING
  - AUTOMATION

ROCTEST TELEMAC

## TEST PROCEDURE

The probe is placed at the test depth in a pre-drilled borehole obtained by a method adapted to the soil conditions: augering, rotation with drag bit and bentonite, shelby tube driving, etc. In granular soils below the water table, the probe can be driven directly within a slotted casing.

The test is run either with a constant rate of deformation by using a uniform rate of rotation of the actuator or with equal increments of pressure as for the Menard pressuremeter test.

## TEST RESULTS

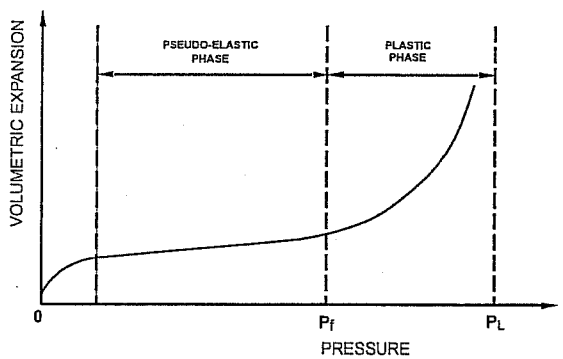
An in situ stress strain curve is obtained by plotting the injected volume versus pressure.

- The "limit pressure" = "$P_L$" is the pressure at which failure occurs and it reflects directly the bearing capacity:

$$Qa = (C/F) \times P_L$$

- The modulus of deformation E is used to calculate settlements and is given by:

$$E = \left((1 + \mu)\ 2V\ \Delta P\right) / \Delta V$$




## SPECIFICATIONS

| CONTROL UNIT | |
|---|---|
| **Dimensions:** | L = 52 cm<br>W = 31 cm<br>H = 46 cm |
| **Weight:** | 30 kg |
| **Max working pressure:** | 10 000 kPa (1500 psi) |
| **Actuator capacity:** | 10 tons |
| **Actuator weight:** | 28 kg |

| PROBES | | | |
|---|---|---|---|
| **Diameter:** | 44 mm (AX) | 60 mm (BX) | 70 mm (NX) |
| **Length:** | 84 cm | 70 cm | 70 cm |
| **Weight:** | 4.5 kg | 4.3 kg | 6.4 kg |

## ACCESSORIES

- Slotted casing assembly for direct driving of the AX size probe in granular soils below the water table
- Self-boring conversion kit for the NX size probe, for the fine gravel-free soils
- Creep test kit for long term testing at constant pressure
- Automation kit for recording or direct plotting of the pressuremeter curve

*Reference:* *"The TEXAM pressuremeter" by J.-L. Briaud, L. Babb and J.-F. Capelle. Geotechnical Testing journal of the American Society for Testing and Materials. July 1983.*

Products and specifications are subject to change without notice.
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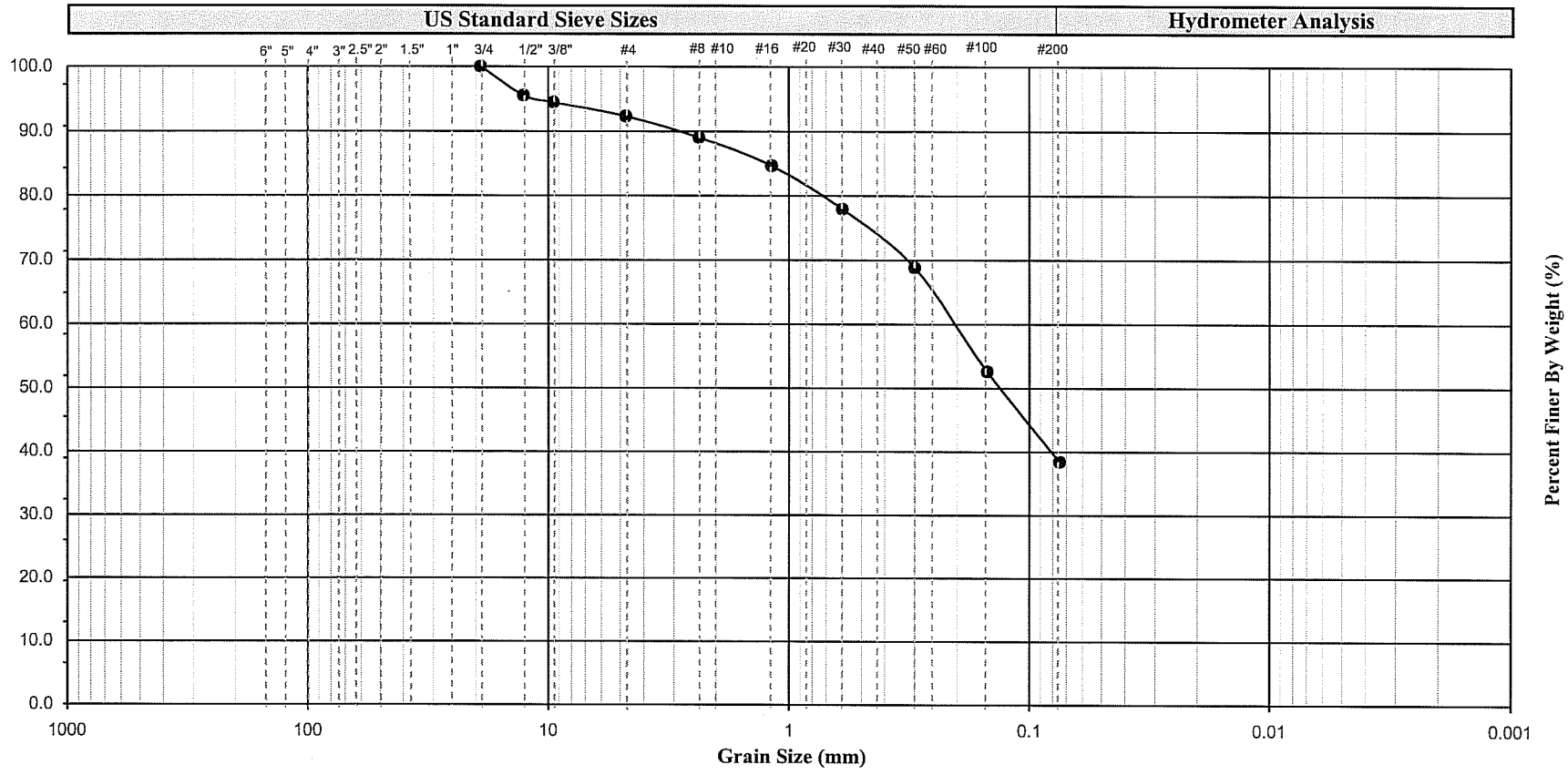
# APPENDIX C

# Laboratory Test Results




| Cobbles | Gravel | | Sand | | | Silt or Clay |
|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | |

| Symbol | Boring Number | Sample Number | Depth (ft) | | Depth (m) | | Soil Color | Soil Description | U.S.C.S. |
|---|---|---|---|---|---|---|---|---|---|
| ● | 04-6 | D-2 | 5.0 | 6.5 | 1.53 | 1.98 | Gray | Clayey sand | SC |
| | | | | | | | | | |
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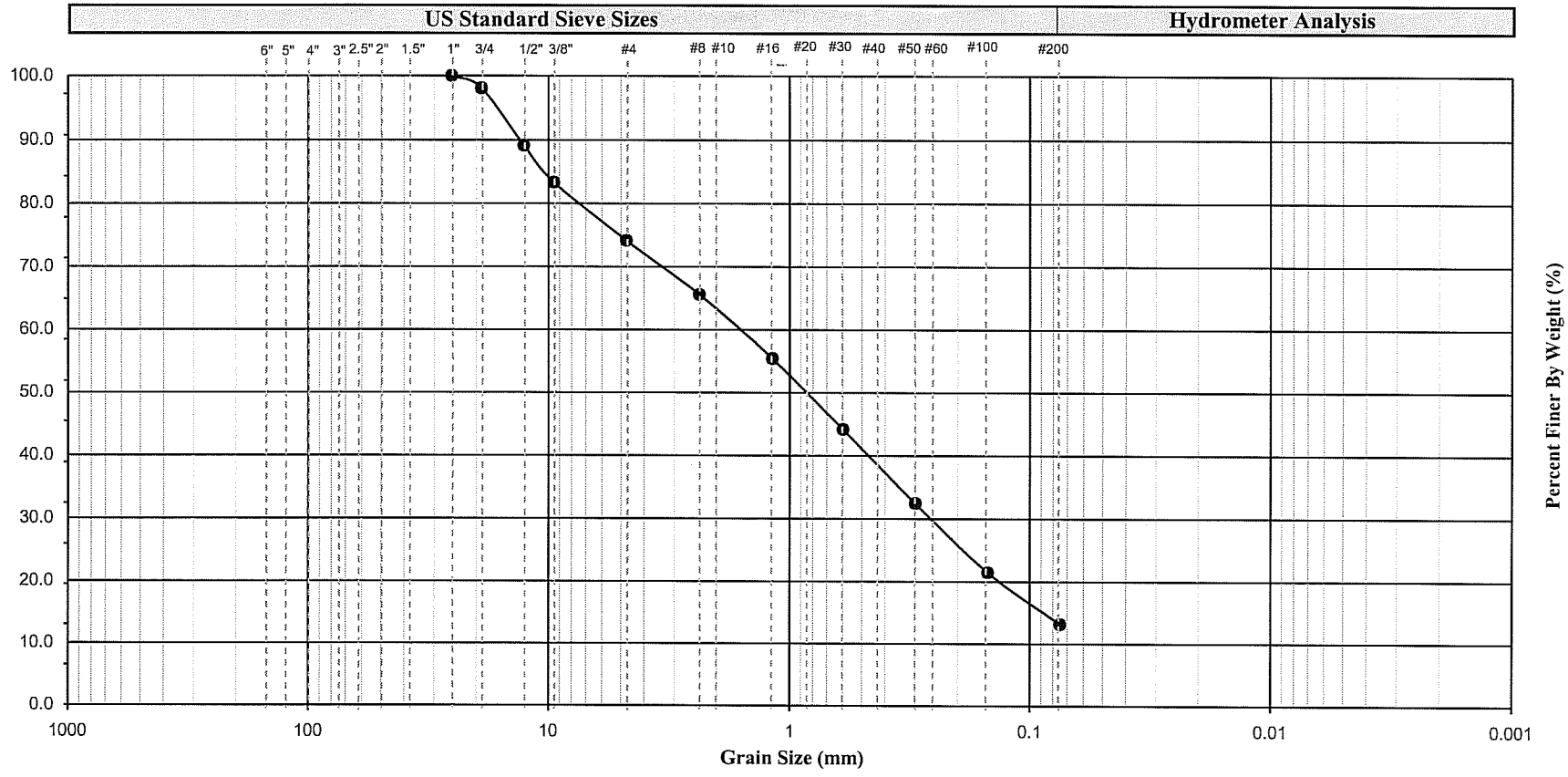
| | | | | | | | | | |
| | | | | | | | | | |
| Remark | | | | | | | | | |

**Earth Mechanics, Inc.**
Geotechnical and Earthquake Engineering

***UCSD / Abutment Research***

**Project No. :** *02-165* **Date :** *10/04/04*

# GRAIN SIZE ANALYSIS
(ASTM D-422-63)




| Cobbles | Gravel | | Sand | | | Silt or Clay |
|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | |

| Symbol | Boring Number | Sample Number | Depth (ft) | | Depth (m) | | Soil Color | Soil Description | U.S.C.S. |
|---|---|---|---|---|---|---|---|---|---|
| ● | 04-6 | B-0 | 0.0 | 1.5 | 0.00 | 0.46 | Brown | Silty sand with gravel | SM |
| | | | | | | | | | |
| | | | | | | | | | |
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| | | | | | | | | | |
| Remark | | | | | | | | | |

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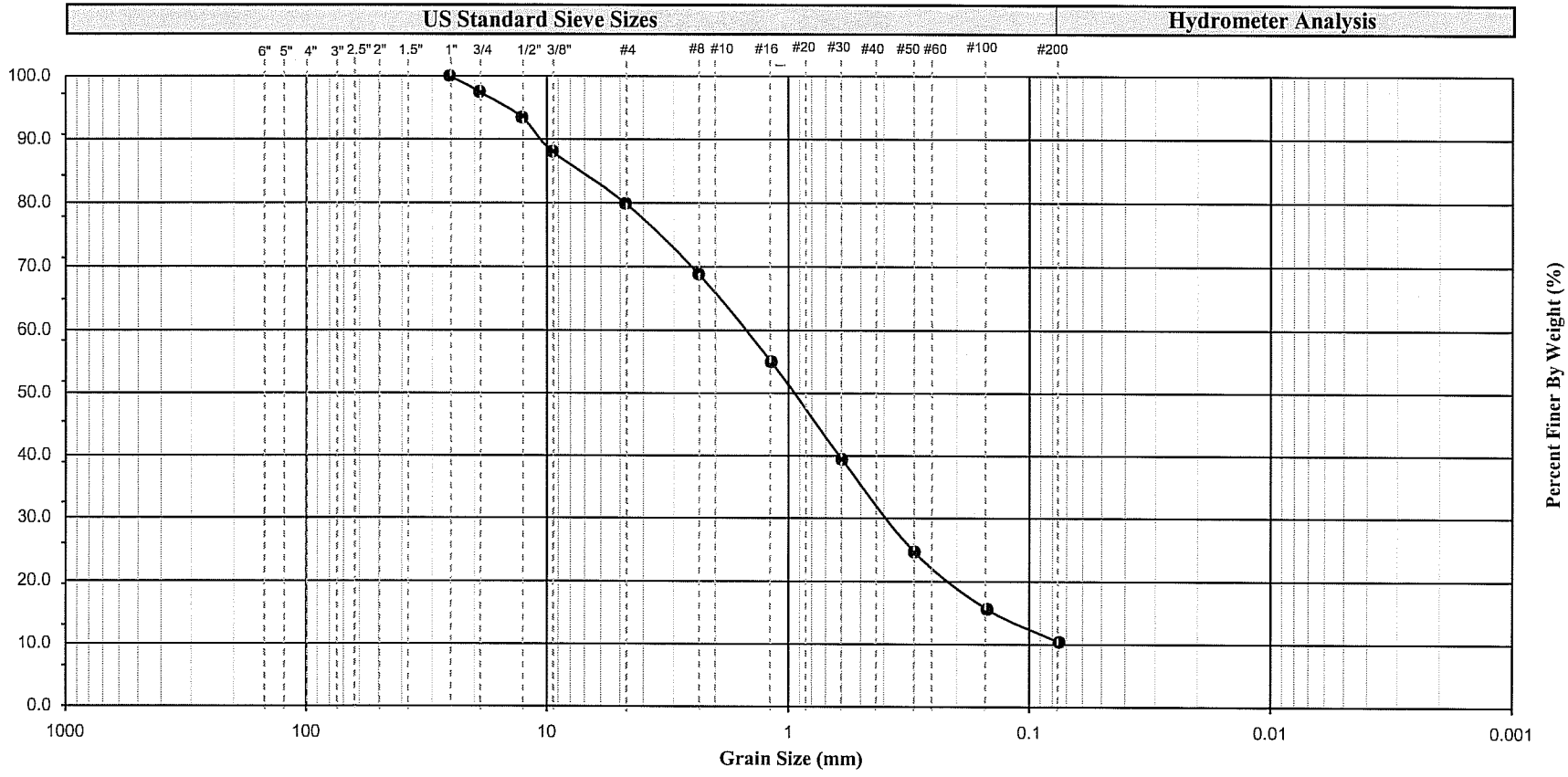
**Project No. :** *02-165* **Date :** *10/04/04*

# GRAIN SIZE ANALYSIS
(ASTM D-422-63)




| Cobbles | Gravel | | Sand | | | Silt or Clay |
|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | |

| Symbol | Boring Number | Sample Number | Depth (ft) | | Depth (m) | | Soil Color | Soil Description | U.S.C.S. |
|---|---|---|---|---|---|---|---|---|---|
| ● | 04-22 | B-0 | 0.0 | 1.5 | 0.00 | 0.46 | Olive Brown | Well graded sand with silt with gravel | SW-SM |
| | | | | | | | | | |
| | | | | | | | | | |
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| | | | | | | | | | |
| Remark | | | | | | | | | |

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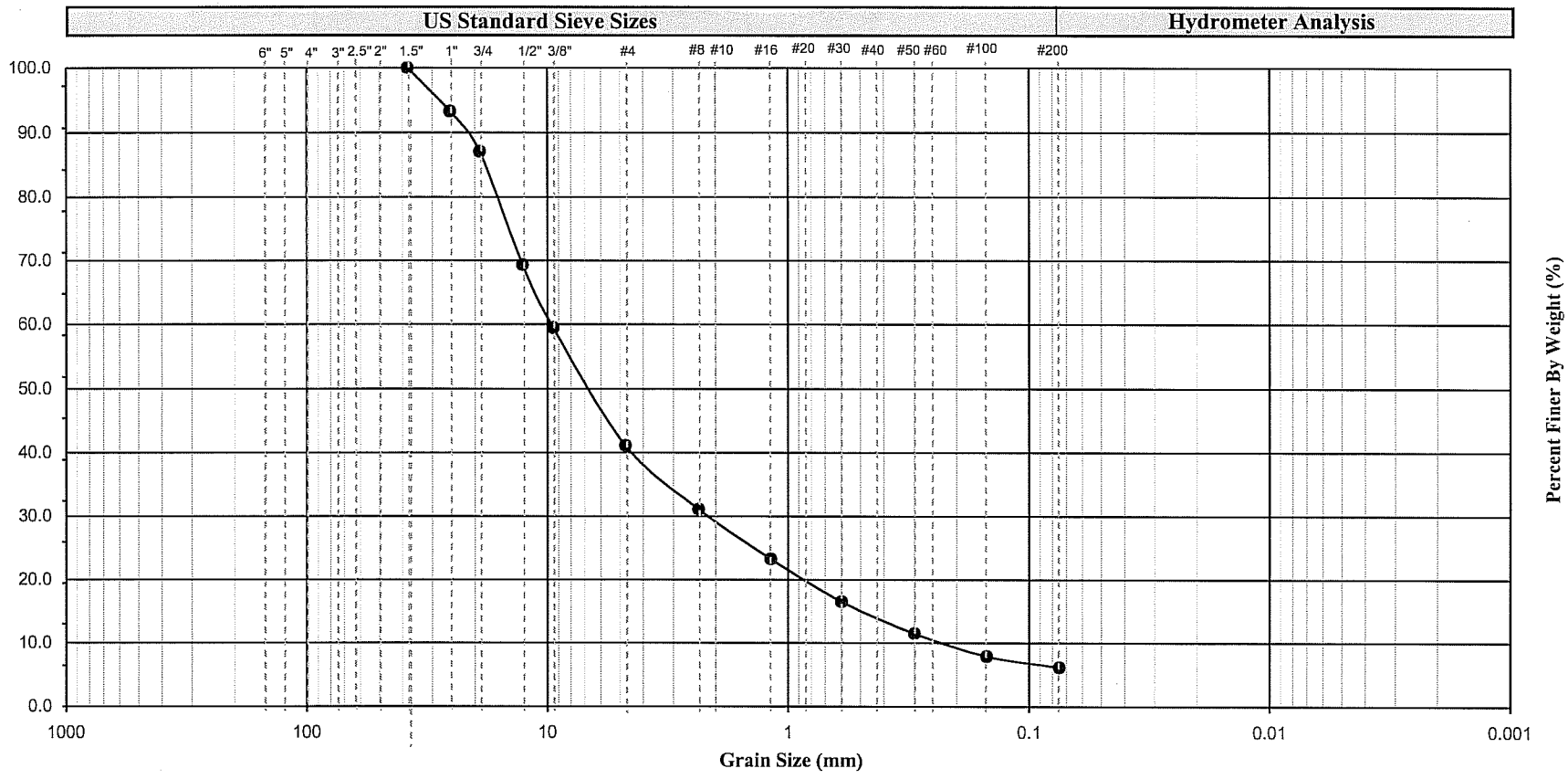
**Project No. :** *02-165* **Date :** *10/04/04*

# GRAIN SIZE ANALYSIS
(ASTM D-422-63)




| Cobbles | Gravel | | Sand | | | Silt or Clay |
|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | |

| Symbol | Boring Number | Sample Number | Depth (ft) | | Depth (m) | | Soil Color | Soil Description | U.S.C.S. |
|---|---|---|---|---|---|---|---|---|---|
| ● | 04-15A | B-0 | 0.0 | 1.5 | 0.00 | 0.46 | Olive Brown | Well graded gravel with silt and sand | GW-GM |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| Remark | Plenty of A/C chips and grinds < 3/8" | | | | | | | | |

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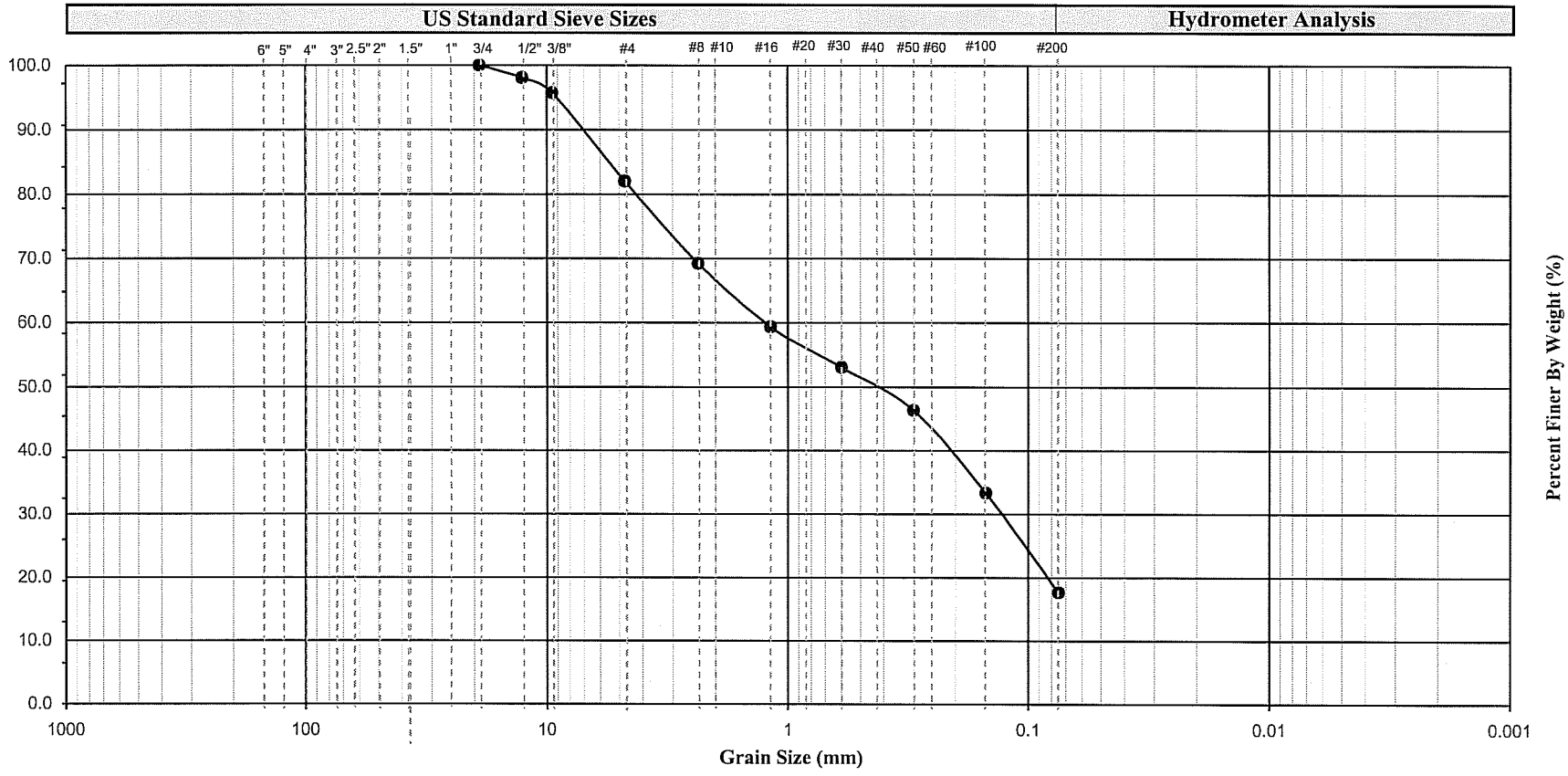
# GRAIN SIZE ANALYSIS
(ASTM D-422-63)




| Cobbles | Gravel | | Sand | | | Silt or Clay |
|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | |

| Symbol | Boring Number | Sample Number | Depth (ft) | | Depth (m) | | Soil Color | Soil Description | U.S.C.S. |
|---|---|---|---|---|---|---|---|---|---|
| ● | 04-17A | B-0 | 0.0 | 1.5 | 0.00 | 0.46 | Dark Brown | Silty sand with gravel | SM |
| | | | | | | | | | |
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| Remark | | | | | | | | | |

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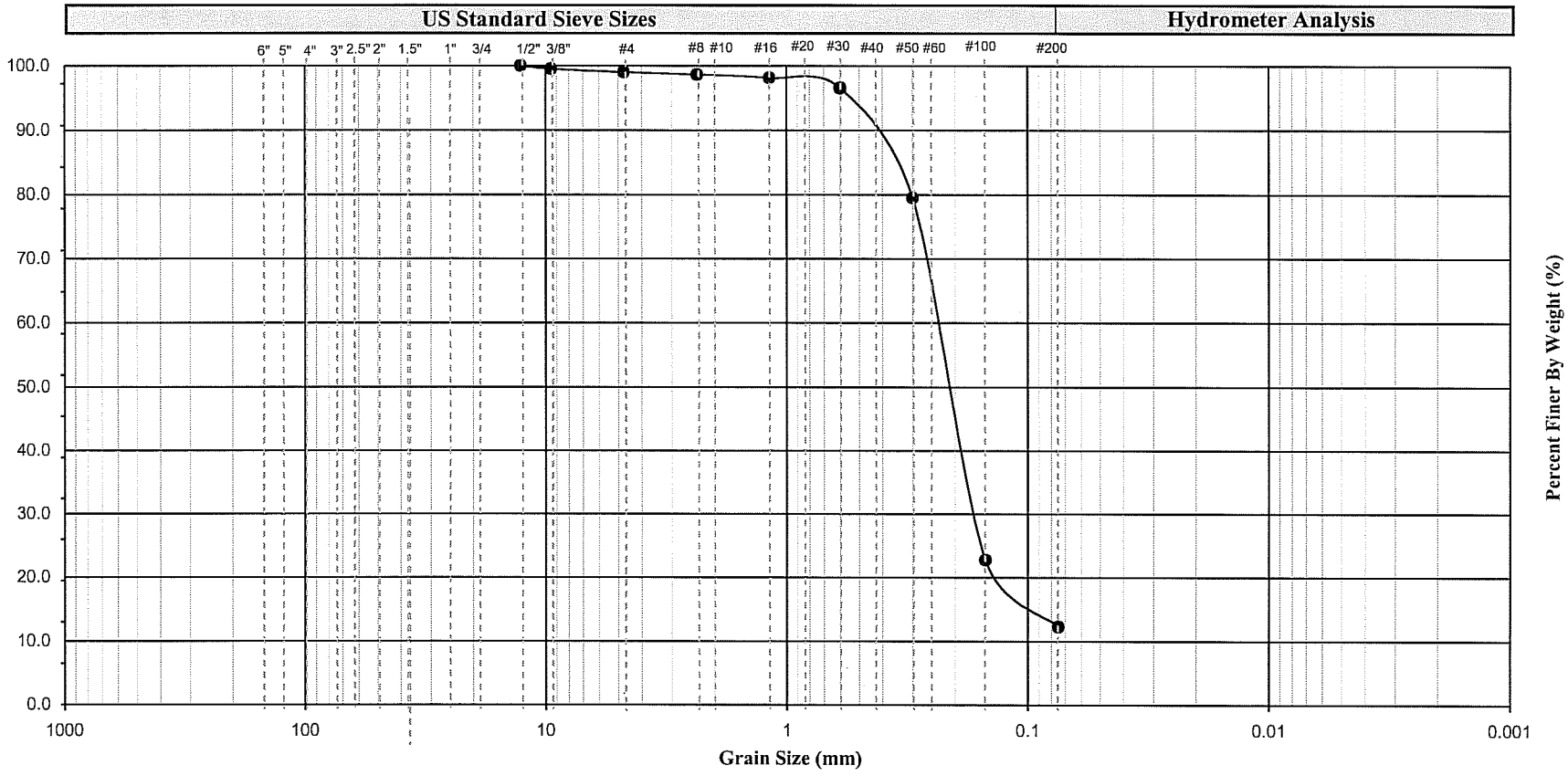
**Project No. :** *02-165* **Date :** *10/04/04*

# GRAIN SIZE ANALYSIS
(ASTM D-422-63)




| Cobbles | Gravel | | Sand | | | Silt or Clay |
|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | |

| Symbol | Boring Number | Sample Number | Depth (ft) | | Depth (m) | | Soil Color | Soil Description | U.S.C.S. |
|---|---|---|---|---|---|---|---|---|---|
| ● | 04-19 | B-0 | 0.0 | 1.5 | 0.00 | 0.46 | Olive Brown | Poorly graded sand with silt | SP-SM |
| | | | | | | | | | |
| | | | | | | | | | |
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| | | | | | | | | | |

**Remark** *Wealy Cemented Sand Stone Nods > #30*

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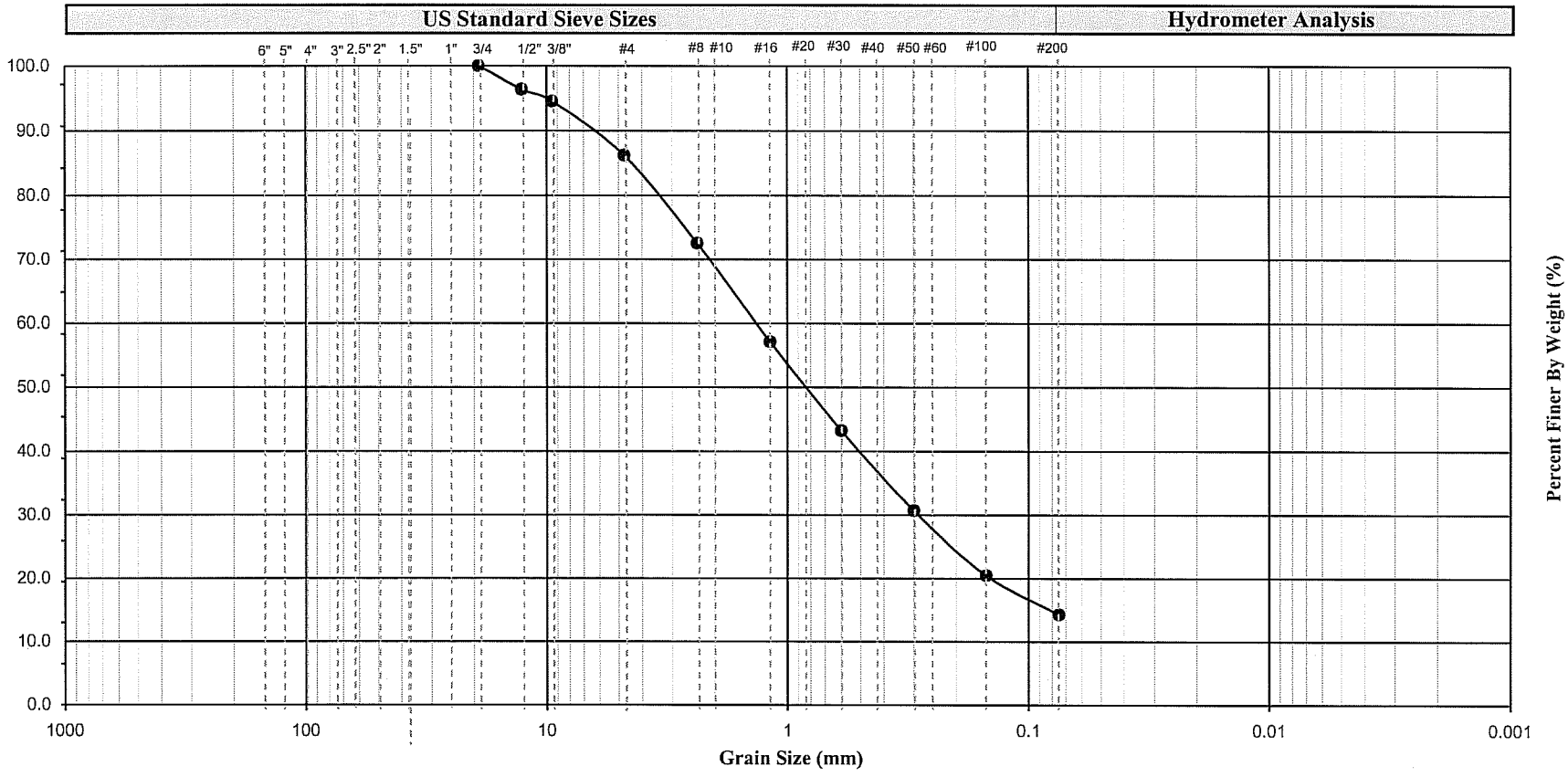
# GRAIN SIZE ANALYSIS
(ASTM D-422-63)




| Cobbles | Gravel | | Sand | | | Silt or Clay |
|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | |

| Symbol | Boring Number | Sample Number | Depth (ft) | | Depth (m) | | Soil Color | Soil Description | U.S.C.S. |
|---|---|---|---|---|---|---|---|---|---|
| ● | 04-20 | B-0 | 0.0 | 1.5 | 0.00 | 0.46 | Brown | Silty sand | SM |
| | | | | | | | | | |
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| | | | | | | | | | |
| Remark | Abundent Mica | | | | | | | | |

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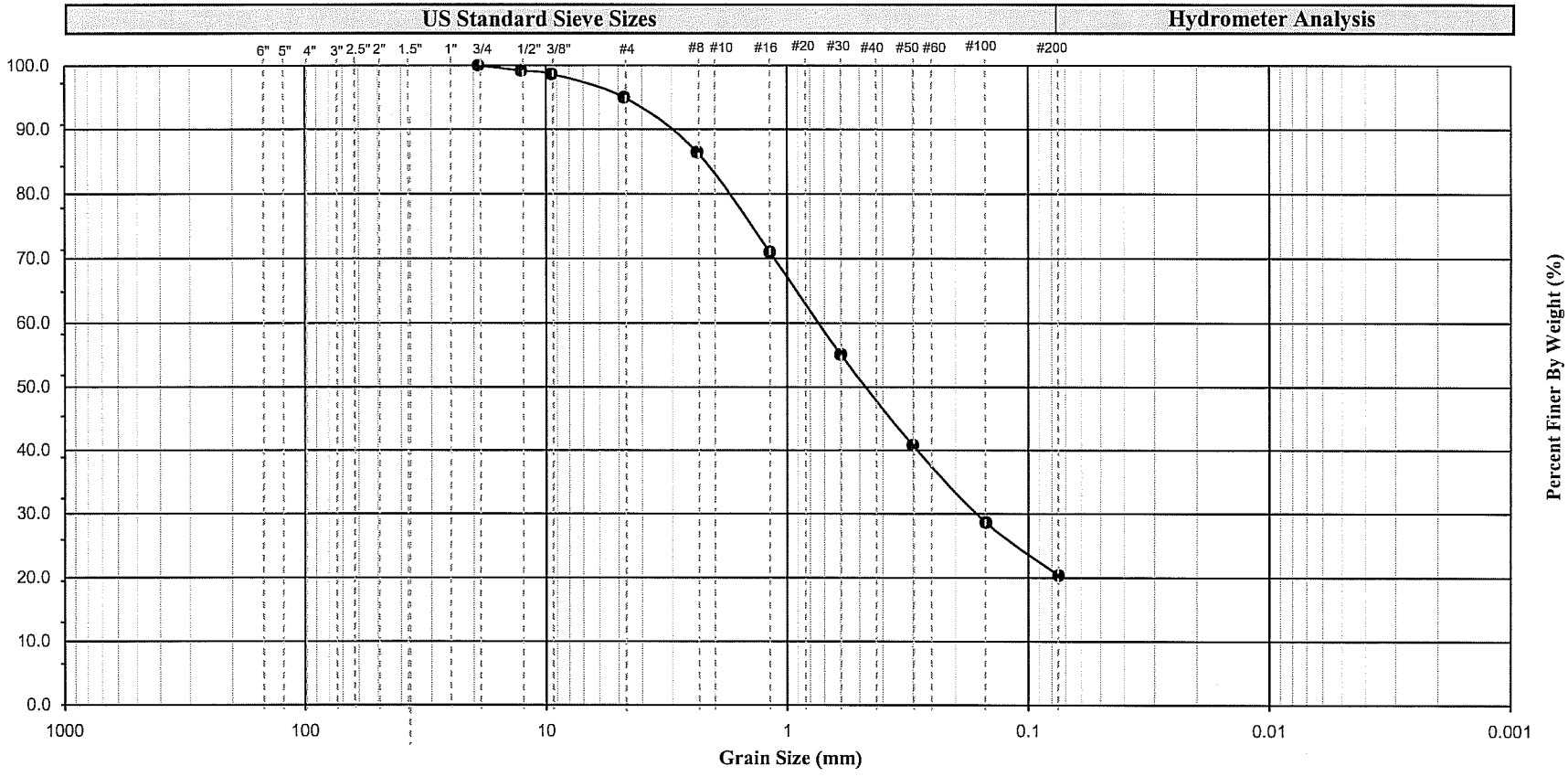
# GRAIN SIZE ANALYSIS
(ASTM D-422-63)




| Cobbles | Gravel | | Sand | | | Silt or Clay |
|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | |

| Symbol | Boring Number | Sample Number | Depth (ft) | | Depth (m) | | Soil Color | Soil Description | U.S.C.S. |
|---|---|---|---|---|---|---|---|---|---|
| ● | 04-21 | B-0 | 0.0 | 1.5 | 0.00 | 0.46 | Brown | Silty sand | SM |
| | | | | | | | | | |
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| | | | | | | | | | |
| Remark | | | | | | | | | |

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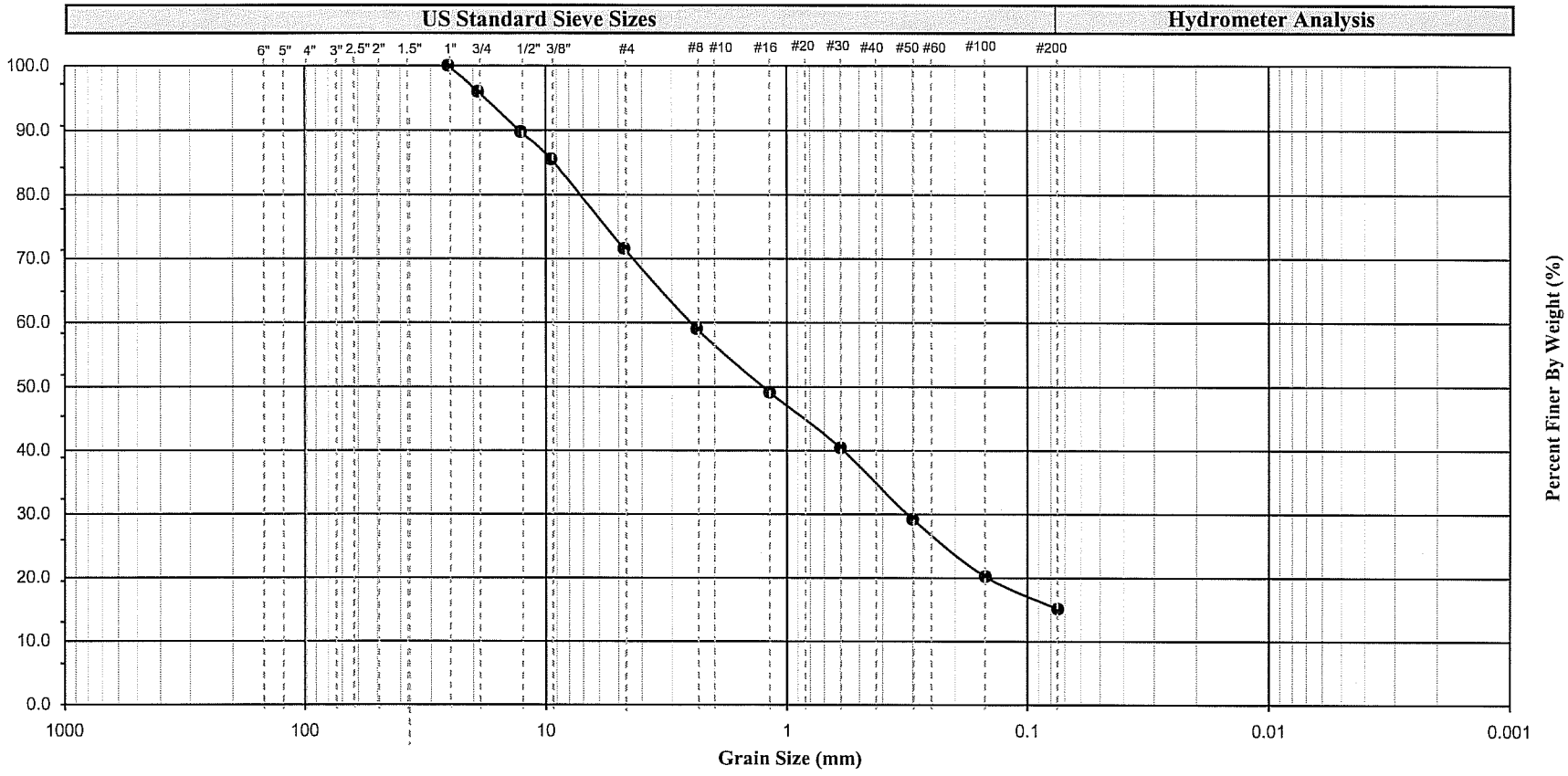
**Project No. :** *02-165* **Date :** *10/04/04*

**GRAIN SIZE ANALYSIS**
**(ASTM D-422-63)**




| Cobbles | Gravel | | Sand | | | Silt or Clay |
|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | |

| Symbol | Boring Number | Sample Number | Depth (ft) | | Depth (m) | | Soil Color | Soil Description | U.S.C.S. |
|---|---|---|---|---|---|---|---|---|---|
| ● | 04-1 | B-0 | 0.0 | 1.5 | 0.00 | 0.46 | Olive | Silty sand with gravel | SM |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| Remark | Plenty of A/C Chunks and Grinds between 3/8" and #100 | | | | | | | | |

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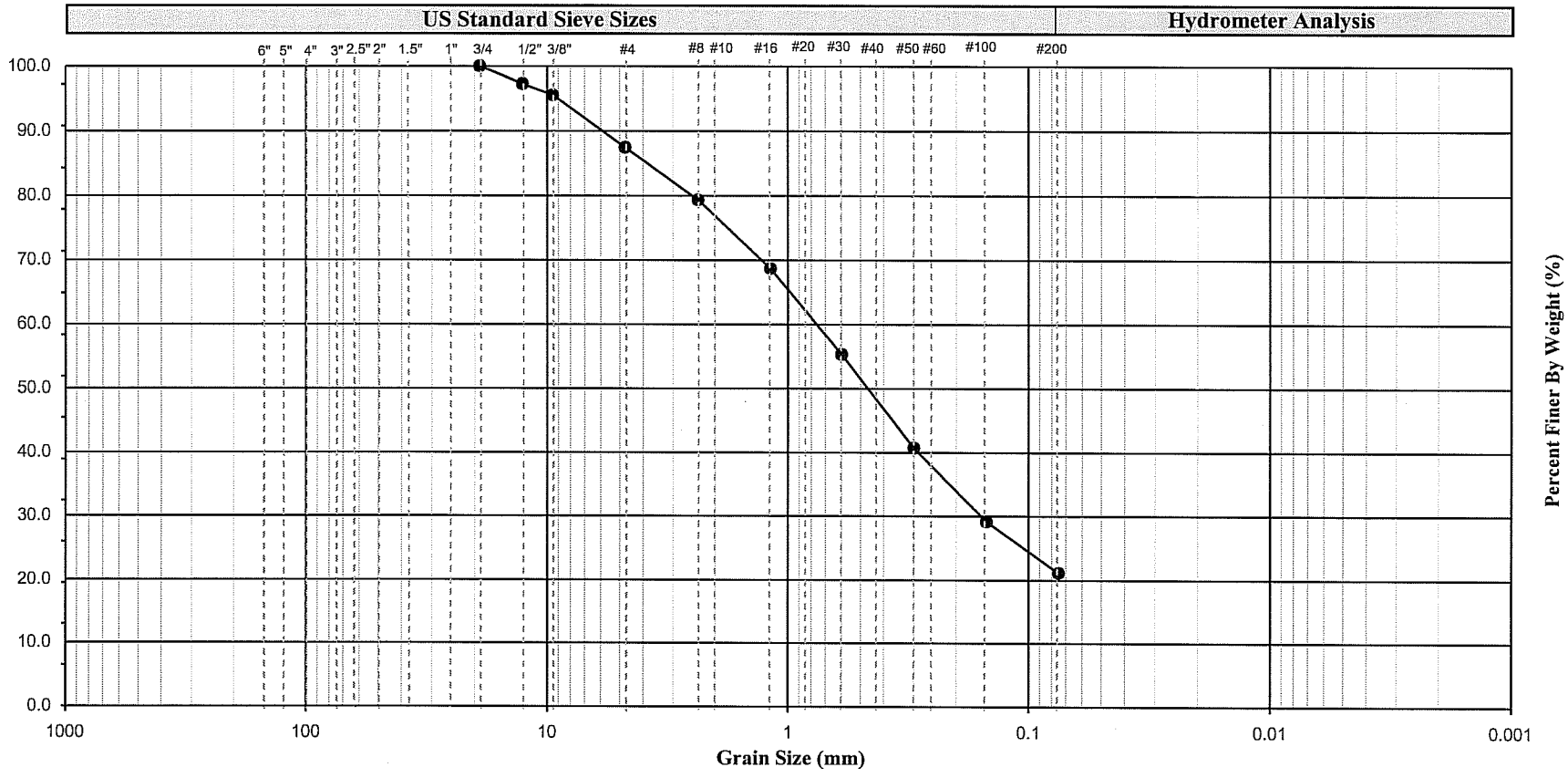
**Project No. :** *02-165* **Date :** *10/04/04*

# GRAIN SIZE ANALYSIS
(ASTM D-422-63)




| Cobbles | Gravel | | Sand | | | Silt or Clay |
|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | |

| Symbol | Boring Number | Sample Number | Depth (ft) | | Depth (m) | | Soil Color | Soil Description | U.S.C.S. |
|---|---|---|---|---|---|---|---|---|---|
| ● | 04-23 | 2 | 5.0 | 6.5 | 1.53 | 1.98 | Brown | Silty sand | SM |
| | | | | | | | | | |
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| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| Remark | | | | | | | | | |

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Geotechnical and Earthquake Engineering

***UCSD / Abutment Research***

**Project No. :** *02-165* **Date :** *11/03/04*

# GRAIN SIZE ANALYSIS
(ASTM D-422-63)

| | | | |
|---|---|---|---|
| JOB NAME : | EMI / UCSD | JOB NUMBER: | EMI#02--165 |
| SAMPLE NUMBER : | 04-1 @ 0 - 5' | TESTED BY : | RMC |
| SAMPLE LOCATION : | - | DATE : | 22-Sep-04 |
| SAMPLE DESCRIPTIONS/CLASSIFICATION : | DK. BROWN SILTY SAND WITH GRAVEL (SM) | | |

| TEST STANDARD | ASTM D-698 - 00 | | | ASTM D-1557- 02 | | |
|---|---|---|---|---|---|---|
| METHOD | A | B | C | A | B | C |
| TRIAL NUMBER | 1 | 2 | 3 | 4 | 5 | |
| WATER ADDED (ML) | 50 | 100 | 150 | 200 | | |
| WT. SOIL + MOLD (GMS) | 3904 | 4029 | 4093 | 4059 | | |
| WT.OF MOLD (GMS) | 2018 | 2018 | 2018 | 2018 | | |
| WT. OF WET SOIL (GMS) | 1886 | 2011 | 2075 | 2041 | | |
| WET DENSITY (PCF) | 124.7 | 133.0 | 137.2 | 135.0 | | |
| CAN NUMBER | R3 | R4 | R5 | R8 | | |
| WET SOIL + TARE (GMS) | 699.83 | 654.01 | 688.67 | 708.37 | | |
| DRY SOIL + TARE (GMS) | 678.55 | 626.72 | 649.77 | 659.77 | | |
| TARE (GMS) | 188.26 | 188.81 | 188.09 | 188.27 | | |
| DRY SOIL (GMS) | 490.29 | 437.91 | 461.68 | 471.50 | | |
| WATER (GMS) | 21.28 | 27.29 | 38.90 | 48.60 | | |
| MOISTURE CONTENT (%) | 4.3 | 6.2 | 8.4 | 10.3 | | |
| DRY DENSITY (PCF) | 119.5 | 125.2 | 126.6 | 122.4 | | |

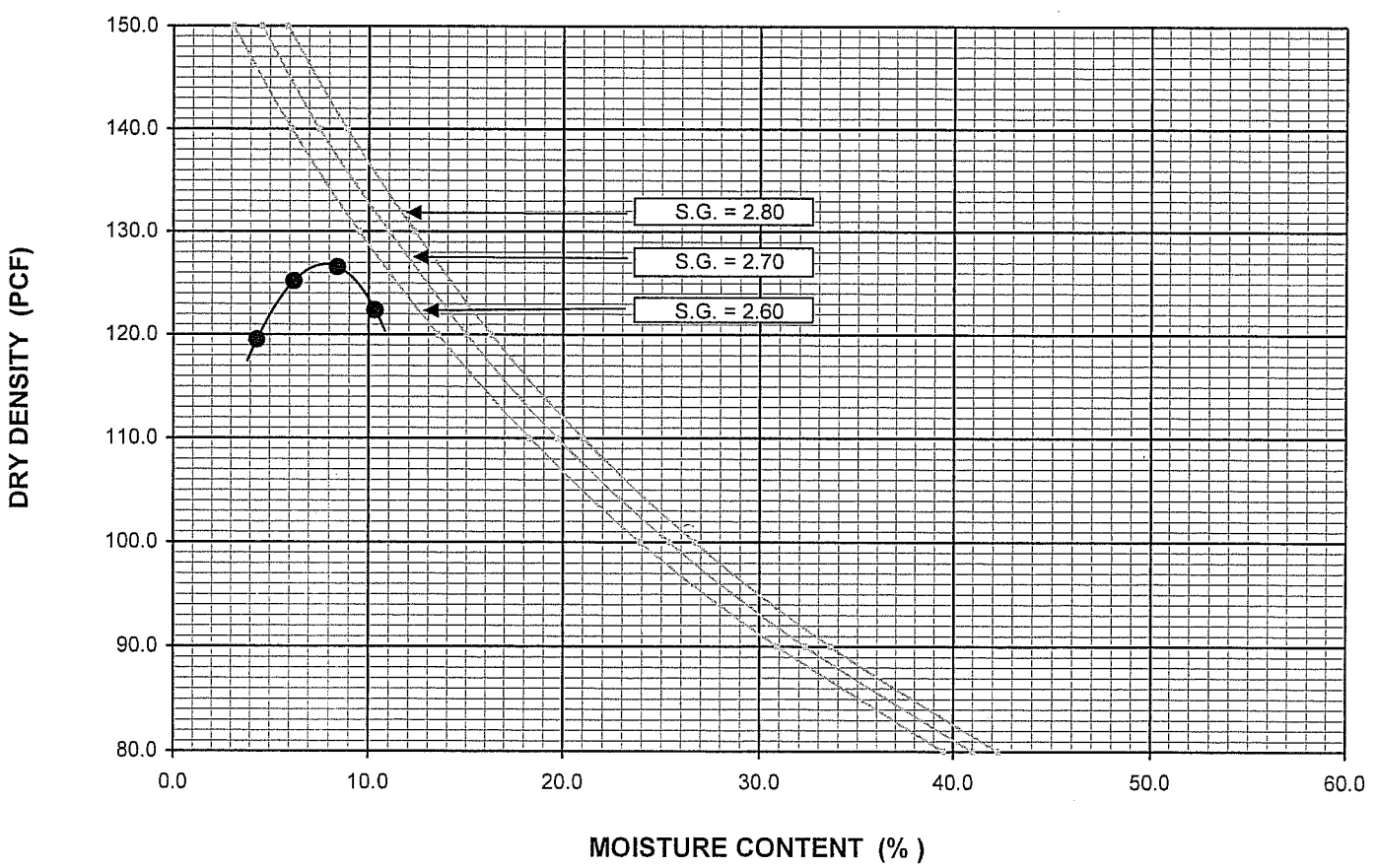
| | | |
|---|---|---|
| DIAMETER OF MOLD: | 4 | In. |
| VOLUME OF MOLD: | 0.0333 | Cu.Ft. |
| SCALPED ON SIEVE SIZE/NO.: | #4 | |
| PERCENT RETAINED,( % ) : | 25.0 | |
| **MAXIMUM DRY DENSITY:** | **127.0** | Pcf. |
| **OPT. MOIST. CONTENT :** | **8.0** | % |

FOR OVERSIZE CORRECTION (ASTM D4718):

| | | | |
|---|---|---|---|
| %,Finer Fraction = | 75.0 | % Moisture = | 2.20 |
| %,Oversize Fraction = | 25.0 | Assumed Sp.Gr. | 2.64 |
| Corrected MDD of Total Materials,(PCF) = | **134.7** | | |
| Corrected OMC of Total Materials, (%) = | **6.0** | | |

REMARKS :

"SAMPLE NOT SUFFICIENT FOR METHOD C"





**ZEISER KLING CONSULTANTS, INC.**
1221 E. Dyer Road, Suite 105; Santa Ana, CA 92705
Tel: (714) 755-1355; Fax: (714) 755-1366


# MAXIMUM DENSITY TEST

| | | | |
|---|---|---|---|
| JOB NAME : | EMI / UCSD | JOB NUMBER: | EMI#02-165 |
| SAMPLE NUMBER : | 04-7 @ 0 - 5' | TESTED BY : | RMC |
| SAMPLE LOCATION : | - | DATE : | 22-Sep-04 |

SAMPLE DESCRIPTIONS/CLASSIFICATION : BROWN SILTY SAND WITH GRAVEL & CLAY (SM/SC)

| TEST STANDARD | ASTM D-698 - 00 | | | **ASTM D-1557- 02** | |
|---|---|---|---|---|---|
| METHOD | A | B | C | **A** | B | C |
| TRIAL NUMBER | 1 | 2 | 3 | 4 | 5 |
| WATER ADDED (ML) | - | - | - | 0 | |
| WT. SOIL + MOLD (GMS) | 4006 | 4150 | 4193 | 4143 | |
| WT.OF MOLD (GMS) | 2018 | 2018 | 2018 | 2018 | |
| WT. OF WET SOIL (GMS) | 1988 | 2132 | 2175 | 2125 | |
| WET DENSITY (PCF) | 131.5 | 141.0 | 143.8 | 140.5 | |
| CAN NUMBER | R9 | R14 | R7 | R15 | |
| WET SOIL + TARE (GMS) | 777.09 | 737.59 | 766.98 | 774.99 | |
| DRY SOIL + TARE (GMS) | 751.89 | 702.39 | 721.50 | 721.31 | |
| TARE (GMS) | 188.66 | 185.13 | 188.56 | 188.85 | |
| DRY SOIL (GMS) | 563.23 | 517.26 | 532.94 | 532.46 | |
| WATER (GMS) | 25.20 | 35.20 | 45.48 | 53.68 | |
| MOISTURE CONTENT (%) | 4.5 | 6.8 | 8.5 | 10.1 | |
| DRY DENSITY (PCF) | 125.9 | 132.0 | 132.5 | 127.7 | |

| | | |
|---|---|---|
| DIAMETER OF MOLD: | 4 | In. |
| VOLUME OF MOLD: | 0.0333 | Cu.Ft. |
| SCALPED ON SIEVE SIZE/NO.: | #4 | |
| PERCENT RETAINED,( % ) : | 2.3 | |
| **MAXIMUM DRY DENSITY:** | **133.0** | Pcf. |
| **OPT. MOIST. CONTENT :** | **8.0** | % |

FOR OVERSIZE CORRECTION (ASTM D4718):

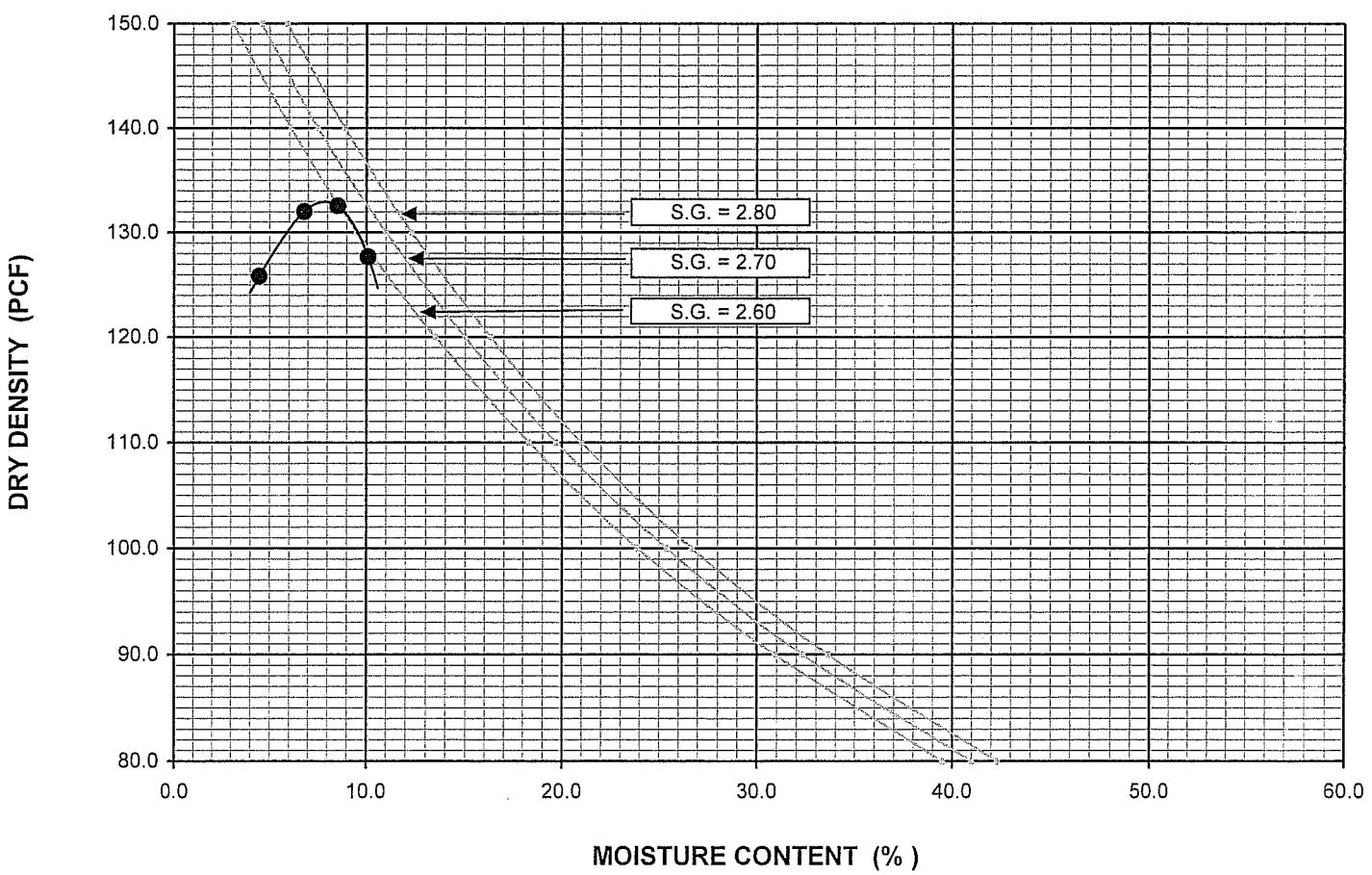
%,Finer Fraction = 97.7 % Moisture = 10.10

%,Oversize Fraction = 2.3 Assumed Sp.Gr. 2.64

Corrected MDD of Total Materials,(PCF) = **133.6**

Corrected OMC of Total Materials, (%) = **7.8**

REMARKS :





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Tel: (714) 755-1355; Fax: (714) 755-1366


# MAXIMUM DENSITY TEST

| | | | |
|---|---|---|---|
| JOB NAME : | EMI / UCSD | JOB NUMBER: | EMI#02-165 |
| SAMPLE NUMBER : | 04-9 @ 0 - 5' | TESTED BY : | RMC |
| SAMPLE LOCATION : | - | DATE : | 23-Sep-04 |
| SAMPLE DESCRIPTIONS/CLASSIFICATION : | GRAYISH BROWN SILTY SAND (SM) | | |

| TEST STANDARD | ASTM D-698 - 00 | | | **ASTM D-1557- 02** | |
|---|---|---|---|---|---|
| METHOD | A | B | C | **A** | B | C |
| TRIAL NUMBER | 1 | 2 | 3 | 4 | 5 |
| WATER ADDED (ML) | - | - | 0 | 50 | |
| WT. SOIL + MOLD (GMS) | 3970 | 4053 | 4062 | 3993 | |
| WT.OF MOLD (GMS) | 2018 | 2018 | 2018 | 2018 | |
| WT. OF WET SOIL (GMS) | 1952 | 2035 | 2044 | 1975 | |
| WET DENSITY (PCF) | 129.1 | 134.6 | 135.2 | 130.6 | |
| CAN NUMBER | R14 | R10 | R2 | R3 | |
| WET SOIL + TARE (GMS) | 687.05 | 657.47 | 624.95 | 670.00 | |
| DRY SOIL + TARE (GMS) | 650.56 | 616.56 | 577.14 | 609.39 | |
| TARE (GMS) | 185.11 | 190.24 | 187.71 | 188.22 | |
| DRY SOIL (GMS) | 465.45 | 426.32 | 389.43 | 421.17 | |
| WATER (GMS) | 36.49 | 40.91 | 47.81 | 60.61 | |
| MOISTURE CONTENT (%) | 7.8 | 9.6 | 12.3 | 14.4 | |
| DRY DENSITY (PCF) | 119.7 | 122.8 | 120.4 | 114.2 | |

| | | |
|---|---|---|
| DIAMETER OF MOLD: | 4 | In. |
| VOLUME OF MOLD: | 0.0333 | Cu.Ft. |
| SCALPED ON SIEVE SIZE/NO.: | #4 | |
| PERCENT RETAINED,( % ) : | 23.5 | |
| **MAXIMUM DRY DENSITY:** | **123.0** | Pcf. |
| **OPT. MOIST. CONTENT :** | **10.0** | % |

FOR OVERSIZE CORRECTION (ASTM D4718):

%,Finer Fraction = 76.5 % Moisture = 12.30

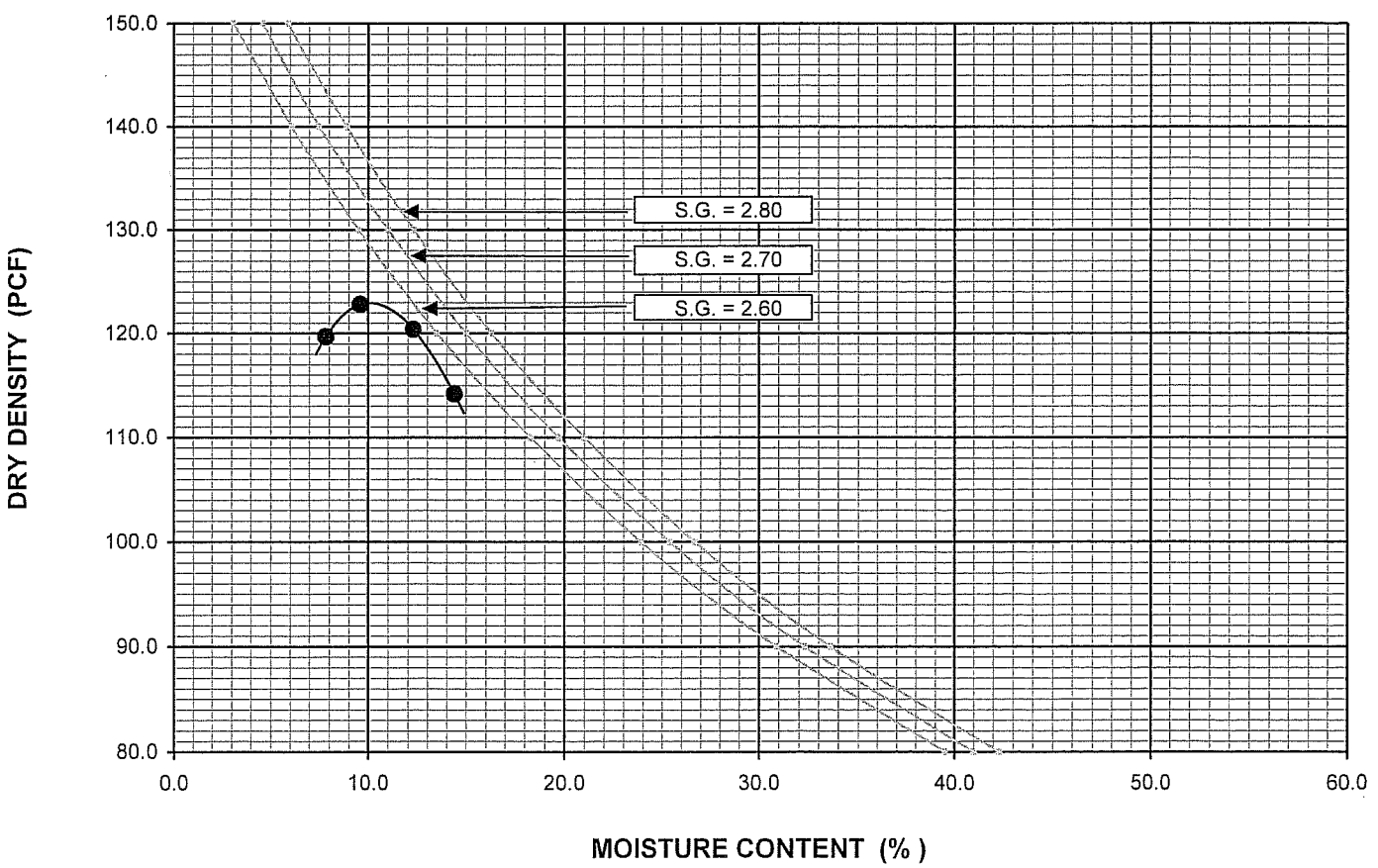
%,Oversize Fraction = 23.5 Assumed Sp.Gr. 2.64

Corrected MDD of Total Materials,(PCF) = **130.8**

Corrected OMC of Total Materials, (%) = **7.6**

REMARKS :

"SAMPLE NOT SUFFICIENT FOR METHOD C"





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# MAXIMUM DENSITY TEST

| | | | |
|---|---|---|---|
| JOB NAME : | EMI / UCSD | JOB NUMBER: | EMI#02-165 |
| SAMPLE NUMBER : | 04-17A @ 2' - 5' | TESTED BY : | RMC |
| SAMPLE LOCATION : | - | DATE : | 23-Sep-04 |
| SAMPLE DESCRIPTIONS / CLASSIFICATION : | BROWN SILTY SAND WITH GRAVEL (SM) | | |

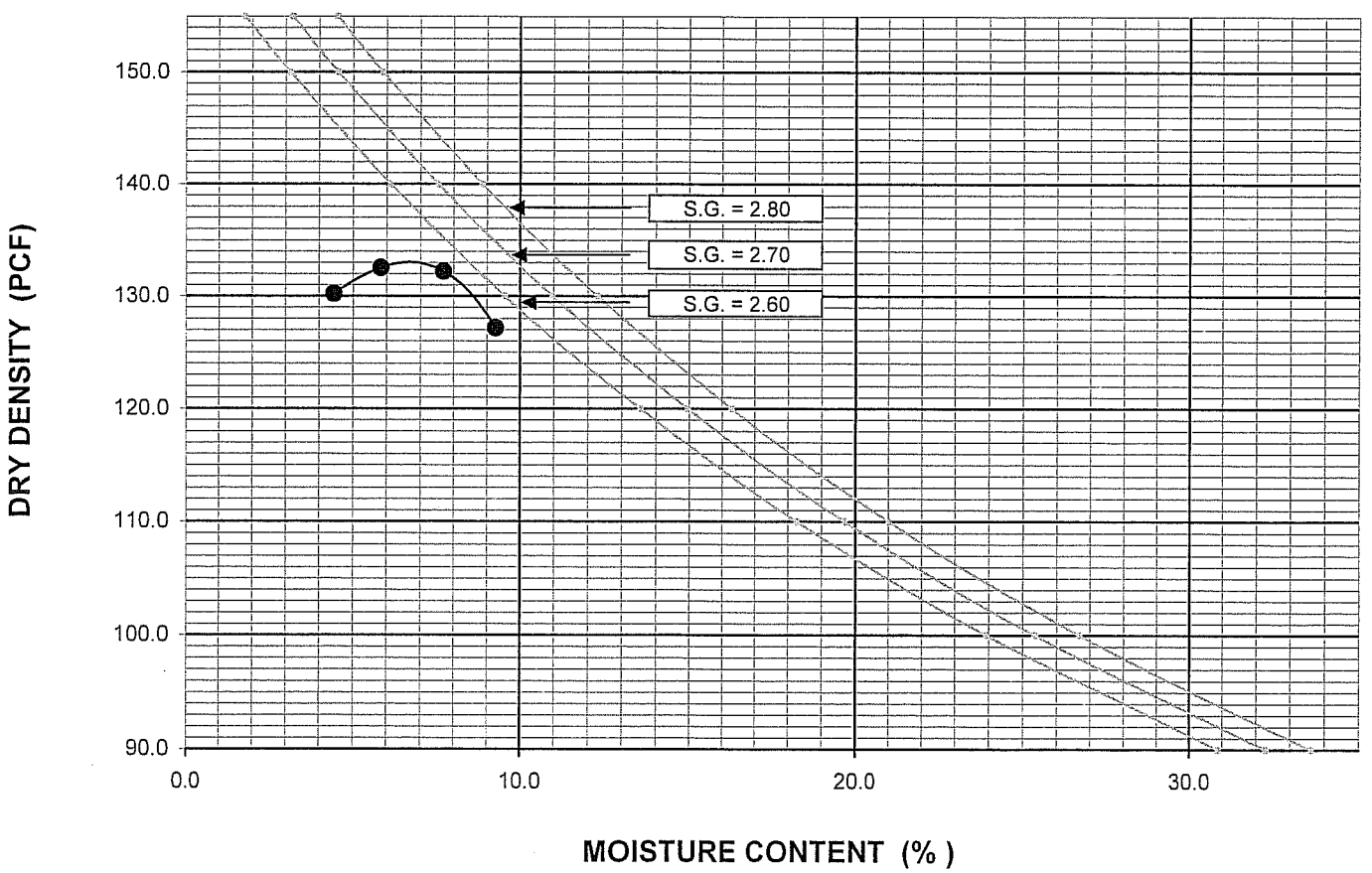
| TEST STANDARD | ASTM D-698 - 00 | | | ASTM D 1557-02 | | |
|---|---|---|---|---|---|---|
| METHOD | A | B | C | A | B | C |
| TRIAL NUMBER | 1 | 2 | 3 | 4 | 5 | |
| WATER ADDED (ML) | - | - | 0 | 100 | | |
| WT. SOIL + MOLD (GMS) | 7345 | 7490 | 7562 | 7445 | | |
| WT.OF MOLD (GMS) | 2718 | 2718 | 2718 | 2718 | | |
| WT. OF WET SOIL (GMS) | 4627 | 4772 | 4844 | 4727 | | |
| WET DENSITY (PCF) | 136.0 | 140.3 | 142.4 | 138.9 | | |
| CAN NUMBER | R8 | R12 | R4 | R5 | | |
| WET SOIL + TARE (GMS) | 1168.20 | 1281.00 | 1402.00 | 1401.00 | | |
| DRY SOIL + TARE (GMS) | 1126.50 | 1220.80 | 1315.40 | 1298.20 | | |
| TARE (GMS) | 188.03 | 188.19 | 189.60 | 188.03 | | |
| DRY SOIL (GMS) | 938.47 | 1032.61 | 1125.80 | 1110.17 | | |
| WATER (GMS) | 41.70 | 60.20 | 86.60 | 102.80 | | |
| MOISTURE CONTENT (%) | 4.4 | 5.8 | 7.7 | 9.3 | | |
| DRY DENSITY (PCF) | 130.2 | 132.5 | 132.2 | 127.2 | | |

| | | |
|---|---|---|
| DIAMETER OF MOLD: | 6 | In. |
| VOLUME OF MOLD: | 0.0750 | Cu.Ft. |
| SCALPED ON SIEVE SIZE/NO.: | 3/4" | |
| PERCENT RETAINED,( % ) : | 1.3 | |
| **MAXIMUM DRY DENSITY:** | **133.0** | Pcf. |
| **OPT. MOIST. CONTENT :** | **7.0** | % |

FOR OVERSIZE CORRECTION (ASTM D4718):

| | | | |
|---|---|---|---|
| %,Finer Fraction = | 98.7 | % Moisture = | - |
| %,Oversize Fraction = | 1.3 | Assumed Sp.Gr. | 2.64 |
| Corrected MDD of Total Materials,(PCF) = | **133.3** | | |
| Corrected OMC of Total Materials, (%) = | **6.9** | | |

REMARKS :





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# MAXIMUM DENSITY TEST

| | | | |
|---|---|---|---|
| JOB NAME : | EMI / UCSD | JOB NUMBER: | EMI#02-165 |
| SAMPLE NUMBER : | 04-19 @ 0 - 5' | TESTED BY : | RMC |
| SAMPLE LOCATION : | | DATE : | 21-Sep-04 |
| SAMPLE DESCRIPTIONS/CLASSIFICATION : | LT. BROWN SILTY SAND ( SM/SP ) | | |

| TEST STANDARD | ASTM D-698 - 00 | | | **ASTM D-1557- 02** | | |
|---|---|---|---|---|---|---|
| METHOD | A | B | C | **A** | B | C |
| TRIAL NUMBER | 1 | 2 | 3 | 4 | 5 | |
| WATER ADDED (ML) | 140 | 260 | 335 | 410 | | |
| WT. SOIL + MOLD (GMS) | 3707 | 3842 | 3879 | 3845 | | |
| WT.OF MOLD (GMS) | 2018 | 2018 | 2018 | 2018 | | |
| WT. OF WET SOIL (GMS) | 1689 | 1824 | 1861 | 1827 | | |
| WET DENSITY (PCF) | 111.7 | 120.6 | 123.1 | 120.8 | | |
| CAN NUMBER | R2 | R10 | R14 | R12 | | |
| WET SOIL + TARE (GMS) | 643.02 | 696.79 | 647.13 | 542.04 | | |
| DRY SOIL + TARE (GMS) | 614.94 | 645.24 | 587.90 | 489.63 | | |
| TARE (GMS) | 187.76 | 190.43 | 185.16 | 189.70 | | |
| DRY SOIL (GMS) | 427.18 | 454.81 | 402.74 | 299.93 | | |
| WATER (GMS) | 28.08 | 51.55 | 59.23 | 52.41 | | |
| MOISTURE CONTENT (%) | 6.6 | 11.3 | 14.7 | 17.5 | | |
| DRY DENSITY (PCF) | 104.8 | 108.4 | 107.3 | 102.9 | | |

| | | |
|---|---|---|
| DIAMETER OF MOLD: | 4 | In. |
| VOLUME OF MOLD: | 0.0333 | Cu.Ft. |
| SCALPED ON SIEVE SIZE/NO.: | #4 | |
| PERCENT RETAINED,( % ) : | 0.0 | |
| **MAXIMUM DRY DENSITY:** | **108.5** | Pcf. |
| **OPT. MOIST. CONTENT :** | **12.5** | % |

FOR OVERSIZE CORRECTION (ASTM D4718):

%,Finer Fraction = - % Moisture = -

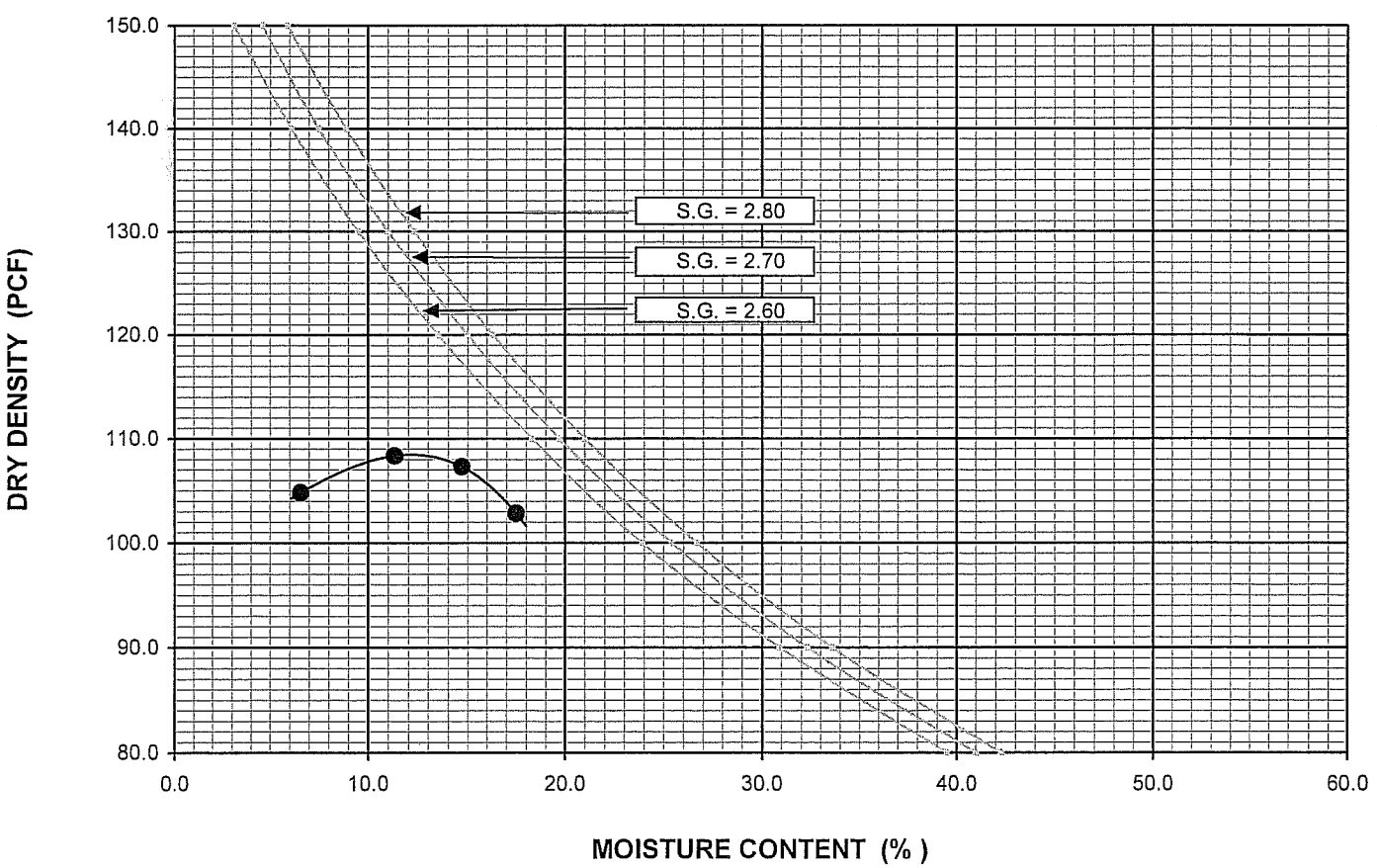
%,Oversize Fraction = 0.0 Assumed Sp.Gr. 2.64

Corrected MDD of Total Materials,(PCF) = -

Corrected OMC of Total Materials, (%) = -

REMARKS :

NO RETAINED ON #4 SIEVE





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**MAXIMUM DENSITY TEST**

| | | | |
|---|---|---|---|
| JOB NAME : | EMI / UCSD | JOB NUMBER: | EMI#02-165 |
| SAMPLE NUMBER : | 04-20 @ 0 - 5' | TESTED BY : | RMC |
| SAMPLE LOCATION : | - | DATE : | 21-Sep-04 |
| SAMPLE DESCRIPTIONS/CLASSIFICATION : | LT. BROWN SILTY SAND (SM) | | |

| TEST STANDARD | ASTM D-698 - 00 | | | ASTM D-1557- 02 | | |
|---|---|---|---|---|---|---|
| METHOD | A | B | C | A | B | C |
| TRIAL NUMBER | 1 | 2 | 3 | 4 | 5 | |
| WATER ADDED (ML) | 0 | 50 | 100 | 150 | | |
| WT. SOIL + MOLD (GMS) | 4132 | 4195 | 4204 | 4133 | | |
| WT.OF MOLD (GMS) | 2018 | 2018 | 2018 | 2018 | | |
| WT. OF WET SOIL (GMS) | 2114 | 2177 | 2186 | 2115 | | |
| WET DENSITY (PCF) | 139.8 | 144.0 | 144.6 | 139.9 | | |
| CAN NUMBER | 21 | 2 | X1 | K | | |
| WET SOIL + TARE (GMS) | 645.85 | 648.03 | 701.75 | 653.31 | | |
| DRY SOIL + TARE (GMS) | 627.15 | 621.06 | 663.78 | 611.52 | | |
| TARE (GMS) | 193.02 | 190.67 | 198.68 | 199.03 | | |
| DRY SOIL (GMS) | 434.13 | 430.39 | 465.10 | 412.49 | | |
| WATER (GMS) | 18.70 | 26.97 | 37.97 | 41.79 | | |
| MOISTURE CONTENT (%) | 4.3 | 6.3 | 8.2 | 10.1 | | |
| DRY DENSITY (PCF) | 134.0 | 135.5 | 133.7 | 127.0 | | |

| | | |
|---|---|---|
| DIAMETER OF MOLD: | 4 | In. |
| VOLUME OF MOLD: | 0.0333 | Cu.Ft. |
| SCALPED ON SIEVE SIZE/NO.: | #4 | |
| PERCENT RETAINED,( % ) : | 8.6 | |
| **MAXIMUM DRY DENSITY:** | **135.5** | Pcf. |
| **OPT. MOIST. CONTENT :** | **6.5** | % |

FOR OVERSIZE CORRECTION (ASTM D4718):

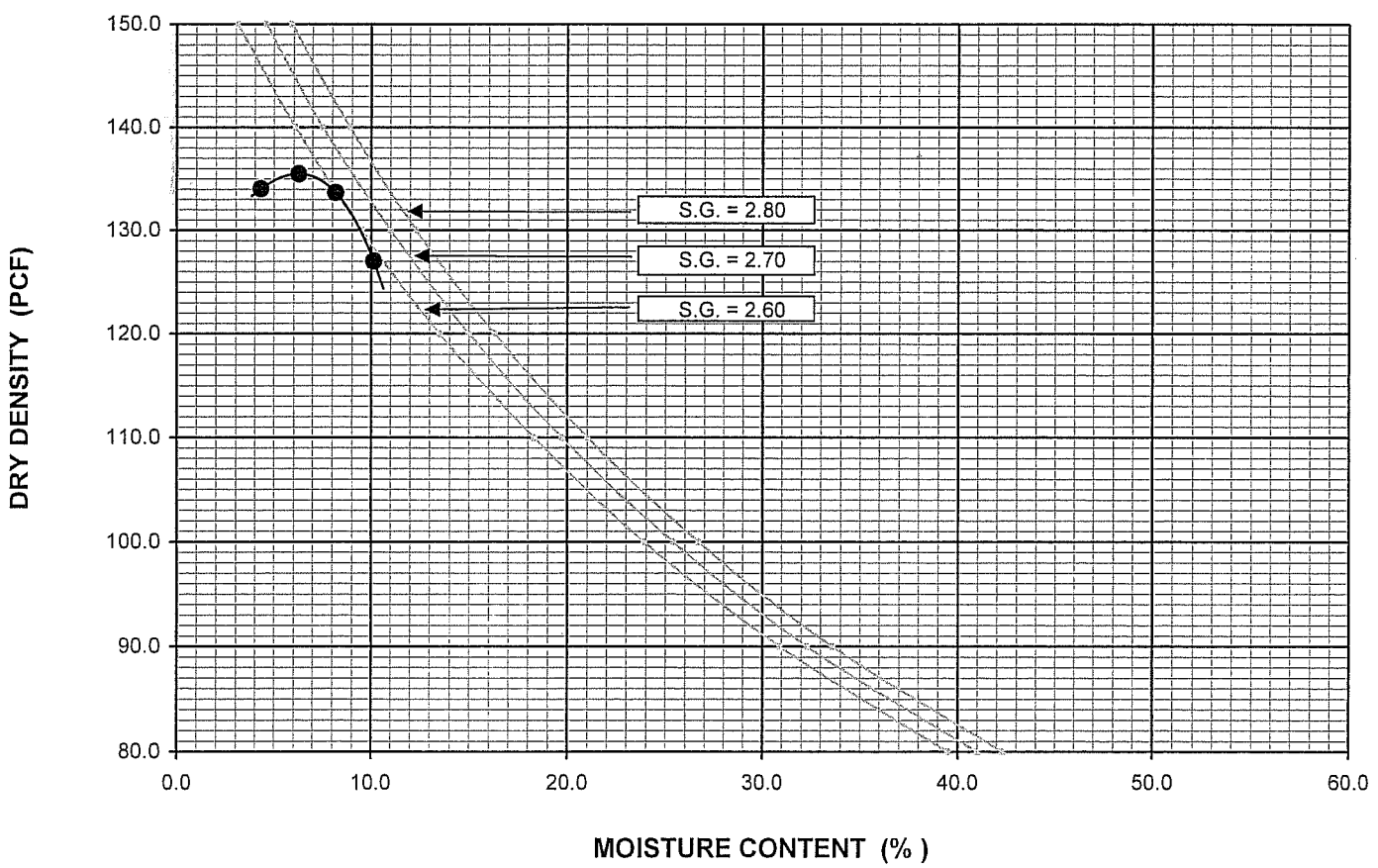
%,Finer Fraction = 91.4 % Moisture = -

%,Oversize Fraction = 8.6 Assumed Sp.Gr. 2.64

Corrected MDD of Total Materials,(PCF) = **137.6**

Corrected OMC of Total Materials, (%) = **5.9**

REMARKS :





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**MAXIMUM DENSITY TEST**

| | | | |
|---|---|---|---|
| JOB NAME : | EMI / UCSD | JOB NUMBER: | EMI#02-165 |
| SAMPLE NUMBER : | 04-21 @ 0 - 5' | TESTED BY : | RMC |
| SAMPLE LOCATION : | - | DATE : | 21-Sep-04 |
| SAMPLE DESCRIPTIONS/CLASSIFICATION : | LT. BROWN SILTY SAND (SM/SP) | | |

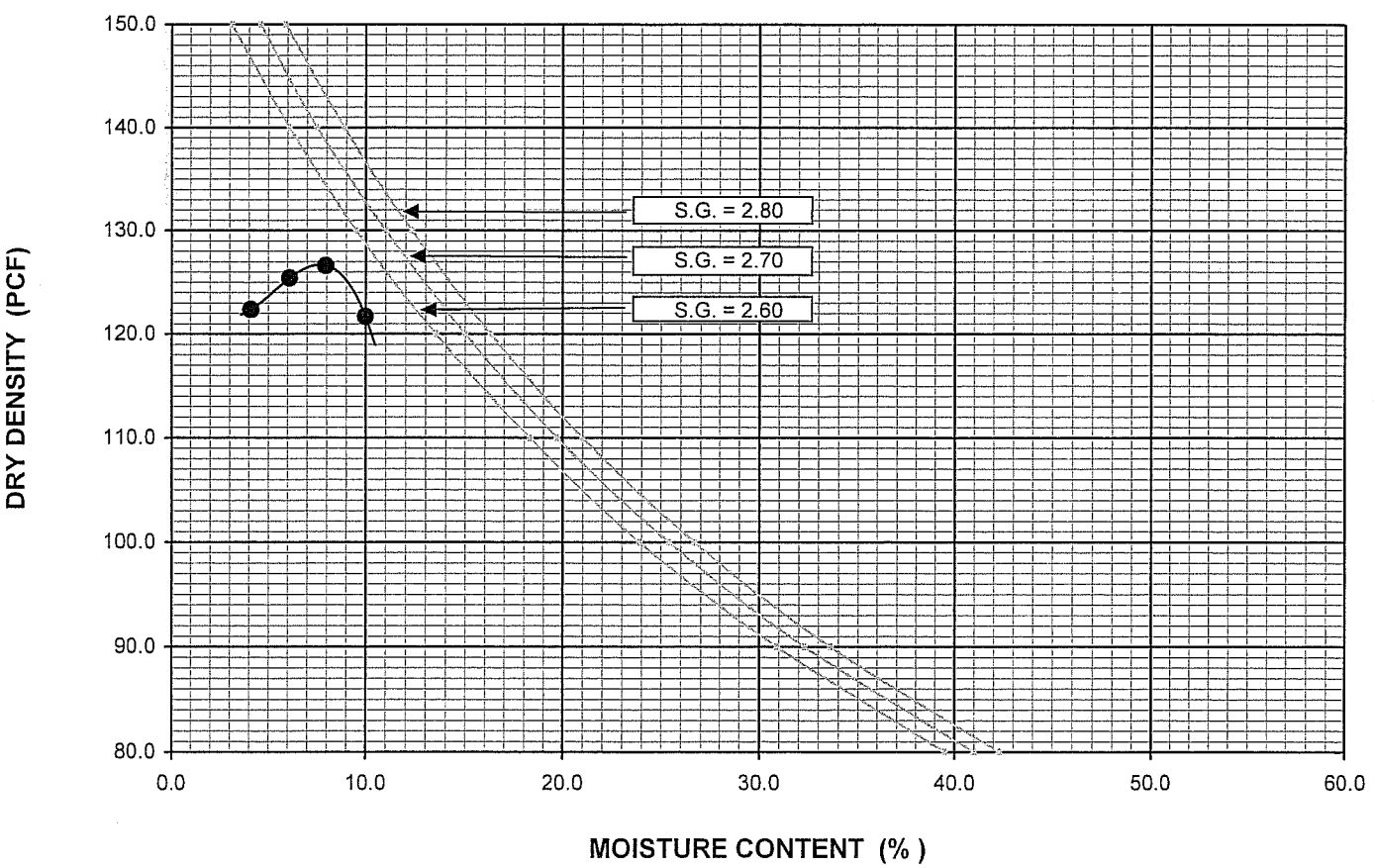
| TEST STANDARD | ASTM D-698 - 00 | | | **ASTM D-1557- 02** | | |
|---|---|---|---|---|---|---|
| METHOD | A | B | C | **A** | B | C |
| TRIAL NUMBER | 1 | 2 | 3 | 4 | 5 | |
| WATER ADDED (ML) | 75 | 125 | 175 | 225 | | |
| WT. SOIL + MOLD (GMS) | 4044 | 4130 | 4185 | 4142 | | |
| WT.OF MOLD (GMS) | 2118 | 2118 | 2118 | 2118 | | |
| WT. OF WET SOIL (GMS) | 1926 | 2012 | 2067 | 2024 | | |
| WET DENSITY (PCF) | 127.4 | 133.1 | 136.7 | 133.9 | | |
| CAN NUMBER | R4 | R5 | R15 | R3 | | |
| WET SOIL + TARE (GMS) | 596.85 | 641.02 | 709.43 | 651.42 | | |
| DRY SOIL + TARE (GMS) | 580.80 | 614.96 | 671.06 | 609.38 | | |
| TARE (GMS) | 188.75 | 188.22 | 188.86 | 188.23 | | |
| DRY SOIL (GMS) | 392.05 | 426.74 | 482.20 | 421.15 | | |
| WATER (GMS) | 16.05 | 26.06 | 38.37 | 42.04 | | |
| MOISTURE CONTENT (%) | 4.1 | 6.1 | 8.0 | 10.0 | | |
| DRY DENSITY (PCF) | 122.4 | 125.4 | 126.6 | 121.7 | | |

| | | |
|---|---|---|
| DIAMETER OF MOLD: | 4 | In. |
| VOLUME OF MOLD: | 0.0333 | Cu.Ft. |
| SCALPED ON SIEVE SIZE/NO.: | #4 | |
| PERCENT RETAINED,( % ) : | 5.4 | |
| **MAXIMUM DRY DENSITY:** | **127.0** | Pcf. |
| **OPT. MOIST. CONTENT :** | **8.0** | % |

FOR OVERSIZE CORRECTION (ASTM D4718):

| | | | |
|---|---|---|---|
| %,Finer Fraction = | 94.6 | % Moisture = | - |
| %,Oversize Fraction = | 5.4 | Assumed Sp.Gr. | 2.64 |
| Corrected MDD of Total Materials,(PCF) = | **128.6** | | |
| Corrected OMC of Total Materials, (%) = | **7.6** | | |

REMARKS :





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**MAXIMUM DENSITY TEST**

| | | | |
|---|---|---|---|
| JOB NAME : | EMI / UCSD | JOB NUMBER: | EMI#02-165 |
| SAMPLE NUMBER : | 04-22 @ 0 - 5' | TESTED BY : | RMC |
| SAMPLE LOCATION : | - | DATE : | 9 21 04 |
| SAMPLE DESCRIPTIONS / CLASSIFICATION : | BROWN SILTY SAND WITH GRAVEL (SM) | | |

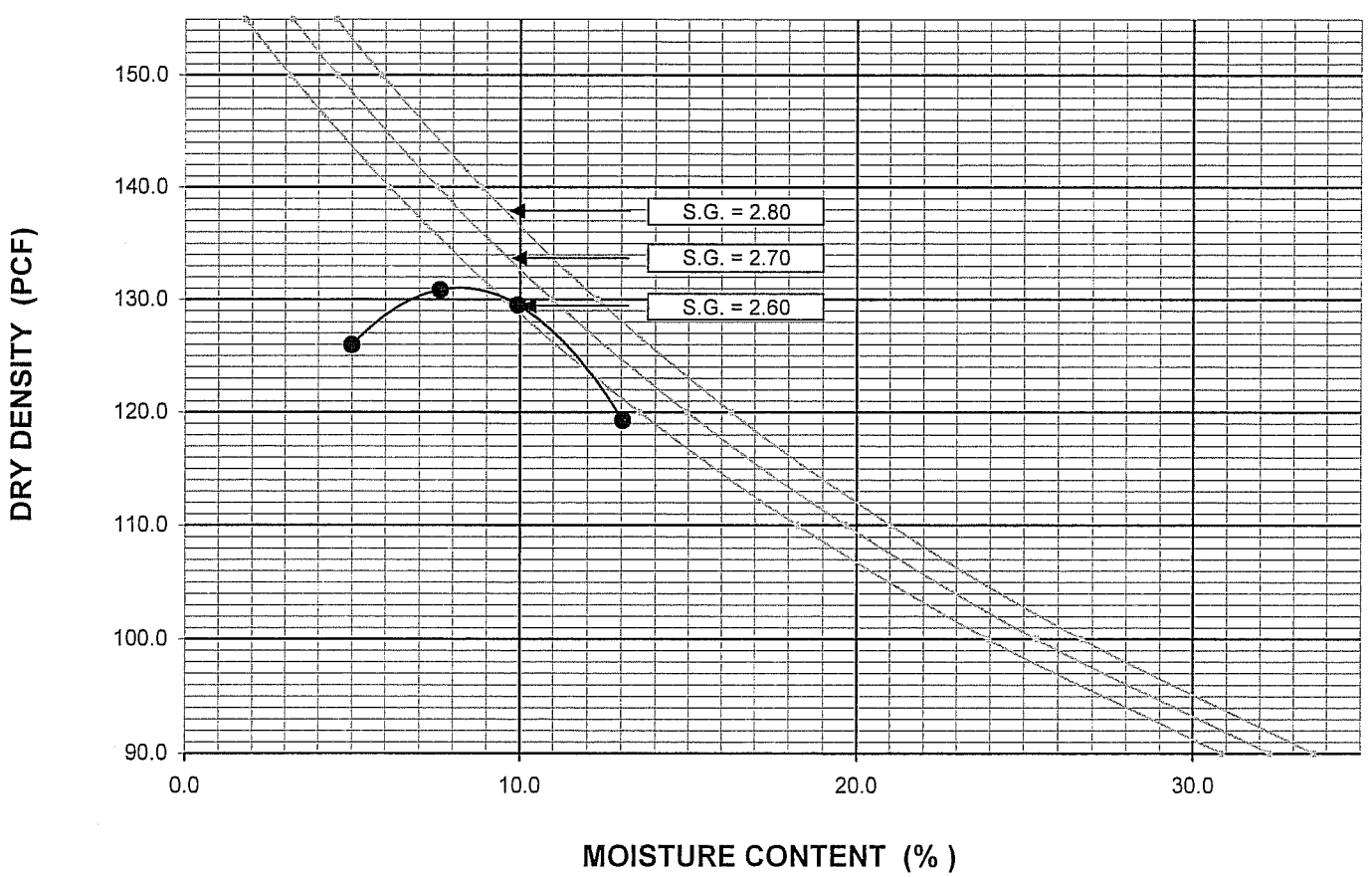
| TEST STANDARD | ASTM D-698 - 00 | | | ASTM D 1557-02 | | |
|---|---|---|---|---|---|---|
| METHOD | A | B | C | A | B | C |
| TRIAL NUMBER | 1 | 2 | 3 | 4 | 5 | |
| WATER ADDED (ML) | 0 | 130 | 260 | 390 | | |
| WT. SOIL + MOLD (GMS) | 7218 | 7509 | 7562 | 7305 | | |
| WT.OF MOLD (GMS) | 2718 | 2718 | 2718 | 2718 | | |
| WT. OF WET SOIL (GMS) | 4500 | 4791 | 4844 | 4587 | | |
| WET DENSITY (PCF) | 132.3 | 140.8 | 142.4 | 134.8 | | |
| CAN NUMBER | R9 | R8 | R7 | R16 | | |
| WET SOIL + TARE (GMS) | 1004.90 | 1055.60 | 1040.60 | 1129.70 | | |
| DRY SOIL + TARE (GMS) | 966.00 | 994.20 | 963.60 | 1021.00 | | |
| TARE (GMS) | 188.70 | 188.30 | 188.70 | 187.70 | | |
| DRY SOIL (GMS) | 777.30 | 805.90 | 774.90 | 833.30 | | |
| WATER (GMS) | 38.90 | 61.40 | 77.00 | 108.70 | | |
| MOISTURE CONTENT (%) | 5.0 | 7.6 | 9.9 | 13.0 | | |
| DRY DENSITY (PCF) | 126.0 | 130.9 | 129.5 | 119.3 | | |

| | | |
|---|---|---|
| DIAMETER OF MOLD: | 6 | In. |
| VOLUME OF MOLD: | 0.0750 | Cu.Ft. |
| SCALPED ON SIEVE SIZE/NO.: | 3/4" | |
| PERCENT RETAINED,( % ) : | 3.7 | |
| **MAXIMUM DRY DENSITY:** | **131.0** | Pcf. |
| **OPT. MOIST. CONTENT :** | **8.5** | % |

FOR OVERSIZE CORRECTION (ASTM D4718):

| | | | |
|---|---|---|---|
| %,Finer Fraction = | 96.3 | % Moisture = | - |
| %,Oversize Fraction = | 3.7 | Assumed Sp.Gr. | 2.64 |
| Corrected MDD of Total Materials,(PCF) = | **132.0** | | |
| Corrected OMC of Total Materials, (%) = | **8.2** | | |

REMARKS :





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**MAXIMUM DENSITY TEST**

# UCSD Abutment Research
# Unconsolidated Undrained Triaxial Tests

| No: | Bridge Name, County | Boring No: | Depth (ft) | Sample No: | Sample Type | Soil Descriptio n | Friction Angle (Degree)<br><br>Cohesion (ksf) |
|---|---|---|---|---|---|---|---|
| 1 | Carmel Valley Rd UC San Diego Co. | 04-1 | 8.5 | 4A | Remolded | SM/ML | 24.1<br>3.5 |
| 2 | Carmel Valley Rd UC San Diego Co. | 04-1 | 9 | 4B | Remolded | SC/CL-ML | 22.5<br>6 |
| 3 | Harbor Blvd UC (Widen) Orange Co. | 04-3 | 5 | 2A | Remolded | SM /GR | 28.1<br>1.44 |
| 4 | Harbor Blvd UC (Widen) Orange | 04-3 | 8 | 3B | In-Situ | SM/GR | 33.2<br>0.67 |
| 5 | Tustin Ave OC (widen) Orange Co. | 04-6 | 5 | 2A | In-Situ | SM/GR | 24.5<br>1.3 |
| 6 | Coldwater Canyon Los Angeles Co. | 04-10 | 16 | D-4-2 | In-Situ | CL | 17.3<br>2.13 |
| 7 | Patterson Slough Fremont Co. | 04-11A | 8 | D-1 | In-Situ | ML/CL | 7.8<br>1.5 |
| 8 | Patterson Slough Fremont Co. | 04-11A | 8 | D-1 | Remolded | ML/CL | 6.9<br>0.92 |
| 9 | Patterson Slough Fremont | 04-11A | 12.5 | D-3 | In-Situ | ML/CL | 15.2<br>4.34 |
| 10 | Route 101/84 Sep. San Mateo Co. | 04-14A | 10 | 3 | In-Situ | CL | 22.8<br>1.28 |
| 11 | Painter Street Humboldt Co. | 04-15A | 7.5 | 3B | In-Situ | ML | 11.5<br>3.9 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 12 | Painter Street Humboldt Co. | 04-15A | 12.5 | D-5 | Remolded | CL | *** |
| 13 | Painter Street Humboldt Co. | 04-16A | 10 | 4 | In-Situ | CL | 7.1<br>3.3 |
| 14 | Meloland Rd OC Imperial Co. | 04-17A | 15 | 6 | In-Situ | CL | 3.1<br>2.55 |
| 15 | Meloland Rd OC Imperial Co. | 04-18A | 10 | 4 | In-Situ | CL | 3.6<br>0.57 |
| 16 | Painter Street Humboldt Co | 04-15A | 12.5 | 3 | In-Situ | ML | 11.5<br>3.9 |
| 17 | Painter Street Humboldt Co | 04-15A | Composit e 1 Cycle | 2.5-7 | Remolded | SP | *** |
| 18 | Painter Street Humboldt Co | 04-15A | Composit 3 Cycles | 2.5-7 | Remolded | SP | 43.3<br>0.13 |
| 19 | Meloland Rd OC Imperial Co. | 04-17A | Bulk,B-0 1 Cycle | 2.5 | Remolded | SM | *** |
| 20 | Meloland Rd OC Imperial Co. | 04-17A | Bulk,B-0 3Cycles | 2.5 | Remolded | SM | 32.4<br>0.83 |
| 21 | Santa Clara River Bridge, Los Angeles Co. | 04-22 | Bulk, B-0 3 Cycles | 0-5 | Remolded | SW-SM | 23.7<br>1.42 |
| 22 | Br#51-234, Santa Barbara Co. | 04-19 | Bulk, B-0 3 Cycles | 0-5 | Remolded | SP/SM | 34.3<br>0.31 |
| 23 | Jackson Bridge, Riverside Co. | 04-21 | Bulk, B-0 3 Cycles | 0-5 | Remolded | SM | 32.6<br>0.43 |
| 24 | Rancho Santa Fe Bridge, San Diego Co. | 04-1 | Bulk, B-0 3 Cycles | 0-5 | Remolded | SM w/ Gravel | 34.7<br>0.25 |
| 25 | Maple Ave UC, Fresno Co. | 04-25 | Bulk, B-0 1 Cycle | 10 | Remolded | SM w/ Gravel | *** |
| 26 | Meloland Rd OC Imperial Co. | 04-17A | Bulk,B-0 1Cycle | 5 | Remolded | SM | *** |
| 27 | Maple Ave UC, Fresno Co. | 04-25 | Bulk, B-0 3 Cycles | 10 | Remolded | SM w/ Gravel | 33.6<br>0.46 |

# UNCONSOLIDATED UNDRAINED TRIAXIAL TEST
ASTM D2850

| | | | | | |
|---|---|---|---|---|---|
| **Project Name:** | UCSD \ Abutment Research\Carmel Valley Rd UC\San Diego | | | **Project No:** | 02-165 |
| **Boring No.:** | 04-1 | **Tested by:** | J.R. | **Date:** | 11/11/04 |
| **Depth (ft):** | 0-5 | **Checked by:** | | **Date:** | |
| **Sample No.** | B-0 | **Sample Type:** | Bulk | | |
| **Soil Description:** | **Silty Sand w Gravel** | **Comments:** | | | |

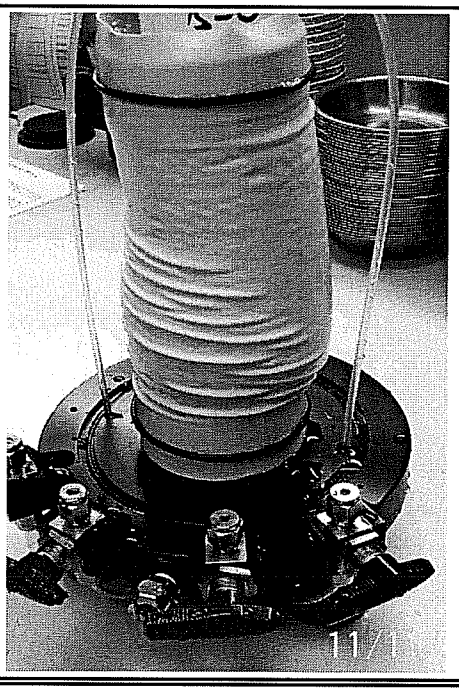
| | 1 | 2 | 3 | | |
|---|---|---|---|---|---|
| Diameter (in.): | 2.862 | 2.862 | 2.862 | Average: | 2.862 |
| Height (in.): | 5.750 | 5.750 | 5.750 | Average: | 5.750 |

| **Moisture Content Calculation** | |
|---|---|
| Wt. Wet Sample + Container (g) : | |
| Wt. Dry Sample + Container (g) : | |
| Container (g) : No. | |
| Moisture Content (%) : | **7.2** |

| **Density and Saturation** | |
|---|---|
| Wt. Wet Sample + Container (g) : | |
| Container (g) : | |
| Wet Density (pcf) : | **129.4** |
| Dry Density (pcf) : | **120.7** |
| Void Ratio : | **0.396** |
| % Saturation : | **49.1** |

Gs=2.70 (assumed)

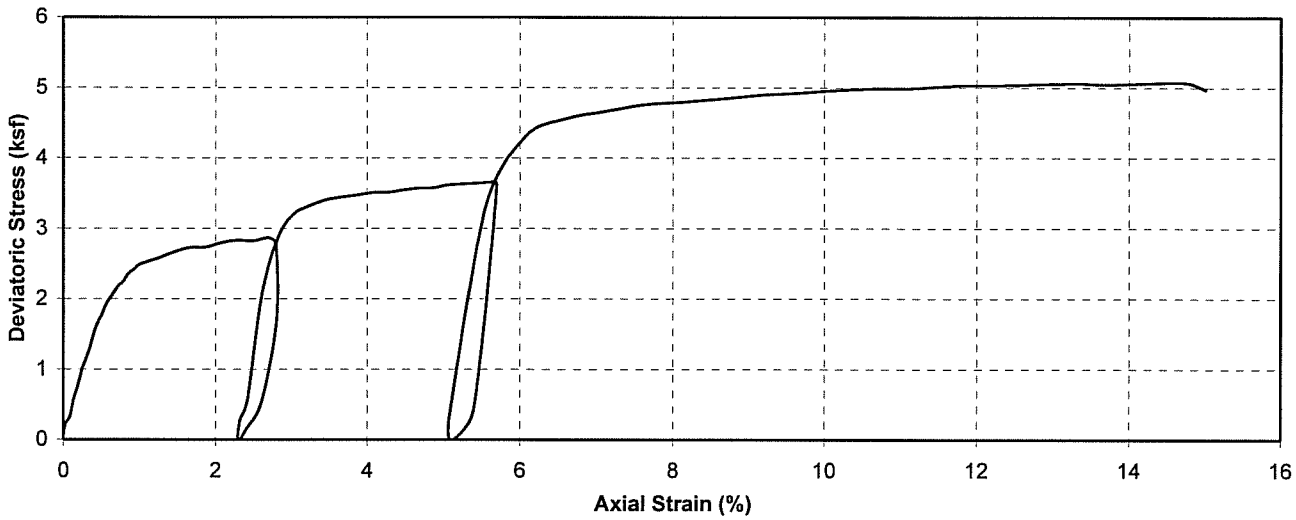
**SKETCH / PHOTO AFTER TEST:**

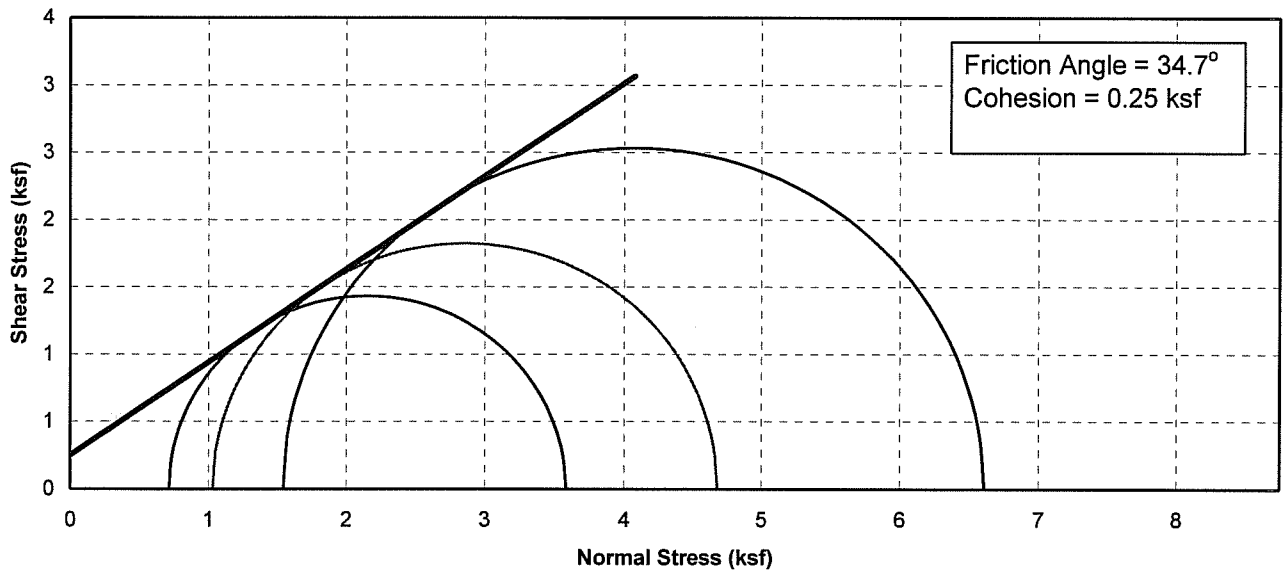


| **Shear** | |
|---|---|
| Cycle | **1, 2, 3** |
| Confining Stress (ksf) : | **0.72, 1.03, 1.54** |
| Deformation Rate (% / min) : | **4** |
| **Failure Criterion:** | |
| the maximum deviator stress | |

| **At Failure** | |
|---|---|
| Cycle | **1, 2, 3** |
| Deviator Stress (ksf) : | **2.87, 3.65, 5.07** |
| Eff. Minor Principal Stress (ksf) : | **0.72, 1.03, 1.54** |
| Eff. Major Principal Stress (ksf) : | **3.58, 4.68, 6.61** |
| Axial Strain (%) : | **2.7, 5.6, 14.8** |

**Earth Mechanics, Inc.**
Geotechnical and Earthquake Engineering




| Boring No. | Sample No. | Depth (ft) | Soil Type | Dry Density (pcf) | Moisture Content (%) | Conf. Stress (ksf) Cycle 1, 2, 3 | Max. Dev. Stress (ksf) Cycle 1, 2, 3 | Initial Saturation (%) |
|---|---|---|---|---|---|---|---|---|
| 04-1 | B-0 | 0-5 | Sity Sand w Gravel | 120.7 | 7.2 | 0.72, 1.03, 1.54 | 2.87, 3.65, 5.07 | 49.1 |

| | |
|---|---|
| **Earth Mechanics, Inc.**<br>Geotechnical and Earthquake Engineering | **Caltrans\UCSD \ Abutment Research** |
| **Project No. :** 02-165 **Date :** 11/11/04 | **UNCONSOLIDATED UNDRAINED TRIAXIAL TEST (ASTM D2850)** |

# UNCONSOLIDATED UNDRAINED TRIAXIAL TEST
ASTM D2850

| | | | | | |
|---|---|---|---|---|---|
| **Project Name:** | UCSD \ Abutment Research\Carmel Valley Rd UC\San Diego Co. | | | **Project No:** | 02-165 |
| **Boring No.:** | 04-1 | **Tested by:** | J.R | **Date:** | 07/21/04 |
| **Depth (ft):** | 8.5 | **Checked by:** | | **Date:** | |
| **Sample No.** | 4A | **Sample Type:** | Remolded | | |
| **Soil Description:** | **Brown, SM/ML** | **Comments:** | | | |

| | 1 | 2 | 3 | | |
|---|---|---|---|---|---|
| Diameter (in.): | 2.429 | 2.432 | 2.43 | Average: | 2.430 |
| Height (in.): | 4.930 | 4.875 | 5.000 | Average: | 4.935 |

| **Moisture Content Calculation** | |
|---|---|
| Wt. Wet Sample + Container (g) : | 173.95 |
| Wt. Dry Sample + Container (g) : | 161.7 |
| Container (g) : No. | 8.48 |
| Moisture Content (%) : | **8.0** |

| **Density and Saturation** | |
|---|---|
| Wt. Wet Sample + Container (g) : | |
| Container (g) : | |
| Wet Density (pcf) : | **125.0** |
| Dry Density (pcf) : | **115.7** |
| Void Ratio : | **0.456** |
| % Saturation : | **47.4** |

Gs=2.70 (assumed)

**SKETCH / PHOTO AFTER TEST:**

| **Shear** | |
|---|---|
| Cycle | **1, 2, 3** |
| Confining Stress (ksf) : | **1.14, 2.3, 4.6** |
| Deformation Rate (% / min) : | **4** |
| **Failure Criterion:** the maximum deviator stress | |

| **At Failure** | |
|---|---|
| Cycle | **1, 2, 3** |
| Deviator Stress (ksf) : | **12.29, 13.64, 17.12** |
| Eff. Minor Principal Stress (ksf) : | **1.14, 2.3, 4.6** |
| Eff. Major Principal Stress (ksf) : | **13.43, 15.93, 21.72** |
| Axial Strain (%) : | **4.1, 5.6, 15.1** |

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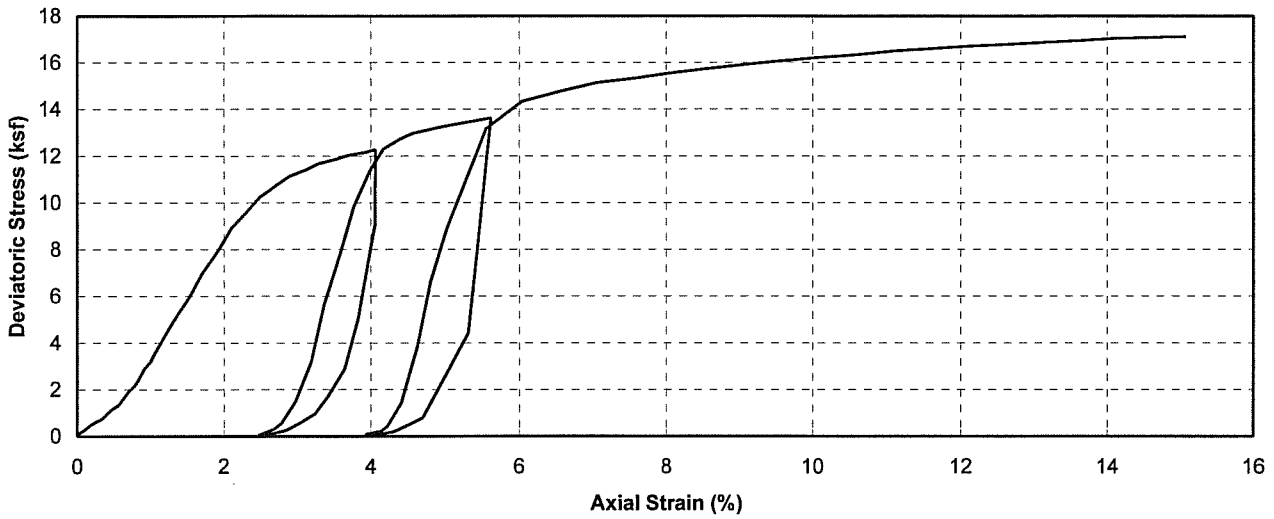
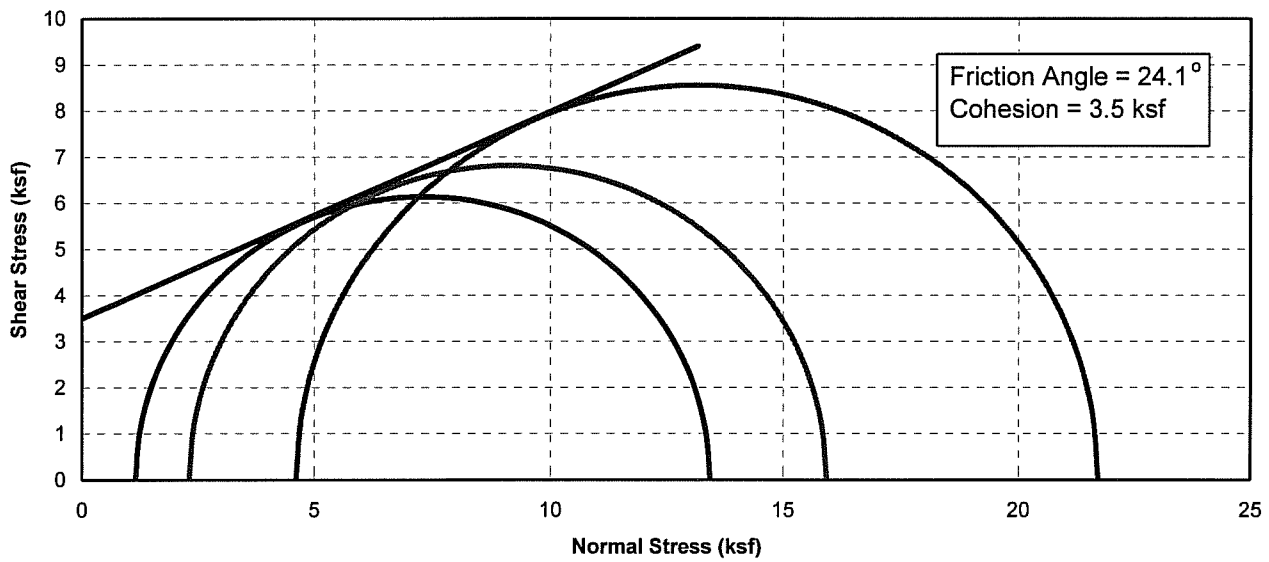
Geotechnical and Earthquake Engineering




| Boring No. | Sample No. | Depth (ft) | Soil Type | Dry Density (pcf) | Moisture Content (%) | Conf. Stress (ksf) Cycle 1, 2, 3 | Max. Dev. Stress (ksf) Cycle 1, 2, 3 | Initial Saturation (%) |
|---|---|---|---|---|---|---|---|---|
| 04-1 | 4A | 8.50 | Brown, SM/ML | 115.7 | 8.0 | 1.14, 2.3, 4.6 | 12.29, 13.64, 17.12 | 47.4 |

| | |
|---|---|
| **Earth Mechanics, Inc.** Geotechnical and Earthquake Engineering | **Caltrans\UCSD \ Abutment Research** |
| **Project No. :** 02-165 **Date :** 07/21/04 | **UNCONSOLIDATED UNDRAINED TRIAXIAL TEST (ASTM D2850)** |

# UNCONSOLIDATED UNDRAINED TRIAXIAL TEST
ASTM D2850

| | | | | | |
|---|---|---|---|---|---|
| **Project Name:** | UCSD \ Abutment Research\Carmel Valley Rd UC\San Diego | | | **Project No:** | 02-165 |
| **Boring No.:** | 04-1 | **Tested by:** | J.R | **Date:** | 07/22/04 |
| **Depth (ft):** | 9 | **Checked by:** | | **Date:** | |
| **Sample No.** | 4B | **Sample Type:** | Remolded | | |
| **Soil Description:** | **Brown,SC/CL- ML** | **Comments:** | | | |

| | 1 | 2 | 3 | | |
|---|---|---|---|---|---|
| Diameter (in.): | 2.43 | 2.422 | 2.441 | Average: | 2.431 |
| Height (in.): | 5.090 | 5.120 | 5.060 | Average: | 5.090 |

| **Moisture Content Calculation** | |
|---|---|
| Wt. Wet Sample + Container (g) : | 179.08 |
| Wt. Dry Sample + Container (g) : | 166.45 |
| Container (g) : No. | 8.48 |
| Moisture Content (%) : | **8.0** |

| **Density and Saturation** | |
|---|---|
| Wt. Wet Sample + Container (g) : | |
| Container (g) : | |
| Wet Density (pcf) : | **125.0** |
| Dry Density (pcf) : | **115.7** |
| Void Ratio : | **0.456** |
| % Saturation : | **47.4** |

Gs=2.70 (assumed)

**SKETCH / PHOTO AFTER TEST:**

| **Shear** | |
|---|---|
| Cycle | **1, 2, 3** |
| Confining Stress (ksf) : | **1.14, 2.29, 4.6** |
| Deformation Rate (% / min) : | **4** |
| **Failure Criterion:** | |
| the maximum deviator stress | |

| **At Failure** | |
|---|---|
| Cycle | **1, 2, 3** |
| Deviator Stress (ksf) : | **19.19, 20.88, 23.35** |
| Eff. Minor Principal Stress (ksf) : | **1.14, 2.29, 4.6** |
| Eff. Major Principal Stress (ksf) : | **20.33, 23.17, 27.94** |
| Axial Strain (%) : | **4.3, 4.8, 7** |

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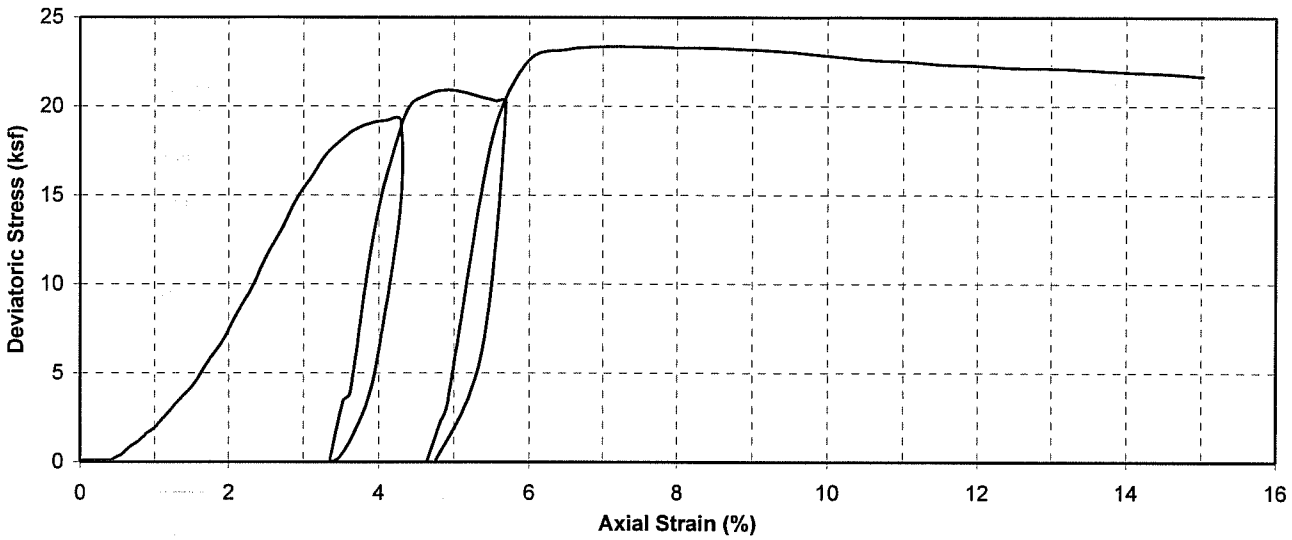
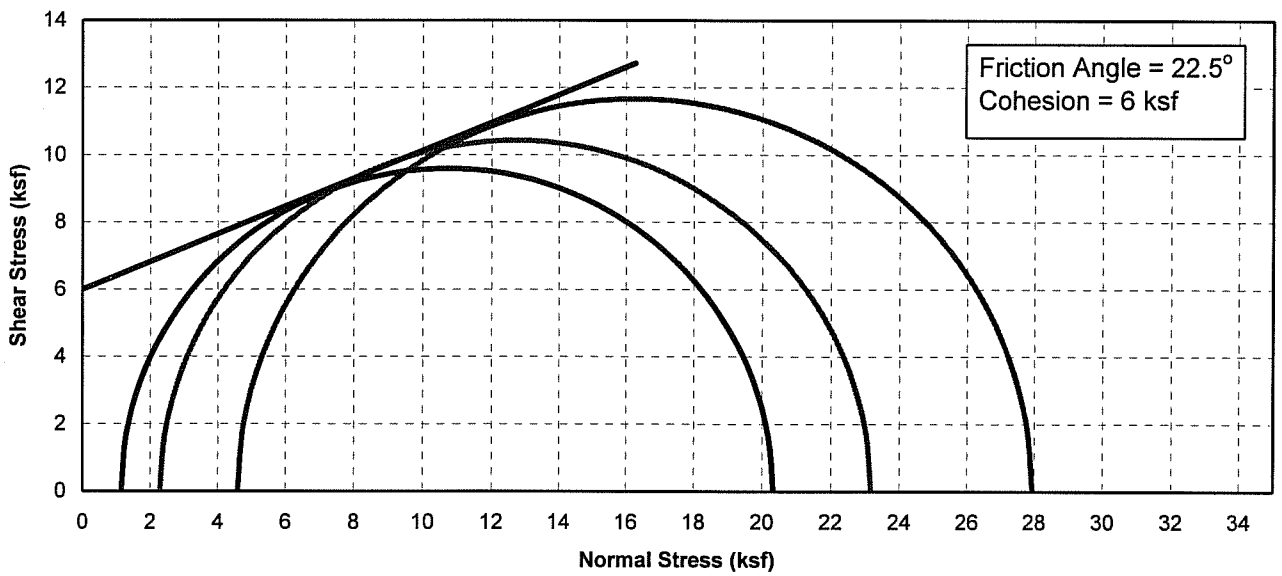
Geotechnical and Earthquake Engineering




| Boring No. | Sample No. | Depth (ft) | Soil Type | Dry Density (pcf) | Moisture Content (%) | Conf. Stress (ksf) Cycle 1, 2, 3 | Max. Dev. Stress (ksf) Cycle 1, 2, 3 | Initial Saturation (%) |
|---|---|---|---|---|---|---|---|---|
| 04-1 | 4B | 9.00 | Brown,SC/CL- ML | 115.7 | 8.0 | 1.14, 2.29, 4.6 | 19.19, 20.88, 23.35 | 47.4 |

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Geotechnical and Earthquake Engineering

**Caltrans\UCSD \ Abutment Research**

**UNCONSOLIDATED UNDRAINED TRIAXIAL TEST (ASTM D2850)**

**Project No. :** 02-165 **Date :** 07/22/04

# UNCONSOLIDATED UNDRAINED TRIAXIAL TEST
ASTM D2850

| | | | | | |
|---|---|---|---|---|---|
| **Project Name:** | UCSD \ Abutment Research\Harbor Blvd UC (Widen)\Orange | | | **Project No:** | 02-165 |
| **Boring No.:** | 04-3 | **Tested by:** | J.R | **Date:** | 07/26/04 |
| **Depth (ft):** | 5 | **Checked by:** | | **Date:** | |
| **Sample No.** | 2A | **Sample Type:** | Remolded | | |
| **Soil Description:** | **SM w/GR** | **Comments:** | | | |

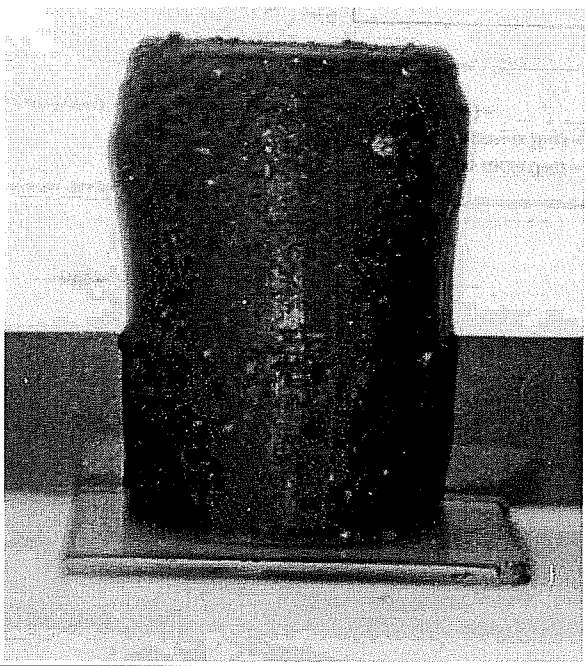
| | 1 | 2 | 3 | | |
|---|---|---|---|---|---|
| Diameter (in.): | 2.43 | 2.42 | 2.414 | Average: | 2.421 |
| Height (in.): | 4.930 | 4.930 | 4.960 | Average: | 4.940 |

| **Moisture Content Calculation** | |
|---|---|
| Wt. Wet Sample + Container (g) : | 185.02 |
| Wt. Dry Sample + Container (g) : | 171.95 |
| Container (g) : No. | 8.48 |
| Moisture Content (%) : | **8.0** |

| **Density and Saturation** | |
|---|---|
| Wt. Wet Sample + Container (g) : | |
| Container (g) : | |
| Wet Density (pcf) : | **125.0** |
| Dry Density (pcf) : | **115.7** |
| Void Ratio : | **0.456** |
| % Saturation : | **47.4** |

Gs=2.70 (assumed)

**SKETCH / PHOTO AFTER TEST:**



| **Shear** | |
|---|---|
| Cycle | **1, 2, 3** |
| Confining Stress (ksf) : | **0.42, 0.86, 1.72** |
| Deformation Rate (% / min) : | **4** |
| **Failure Criterion:** | |
| the maximum deviator stress | |

| **At Failure** | |
|---|---|
| Cycle | **1, 2, 3** |
| Deviator Stress (ksf) : | **5.42, 6.42, 7.63** |
| Eff. Minor Principal Stress (ksf) : | **0.42, 0.86, 1.72** |
| Eff. Major Principal Stress (ksf) : | **5.84, 7.27, 9.34** |
| Axial Strain (%) : | **3.9, 8.2, 14.7** |

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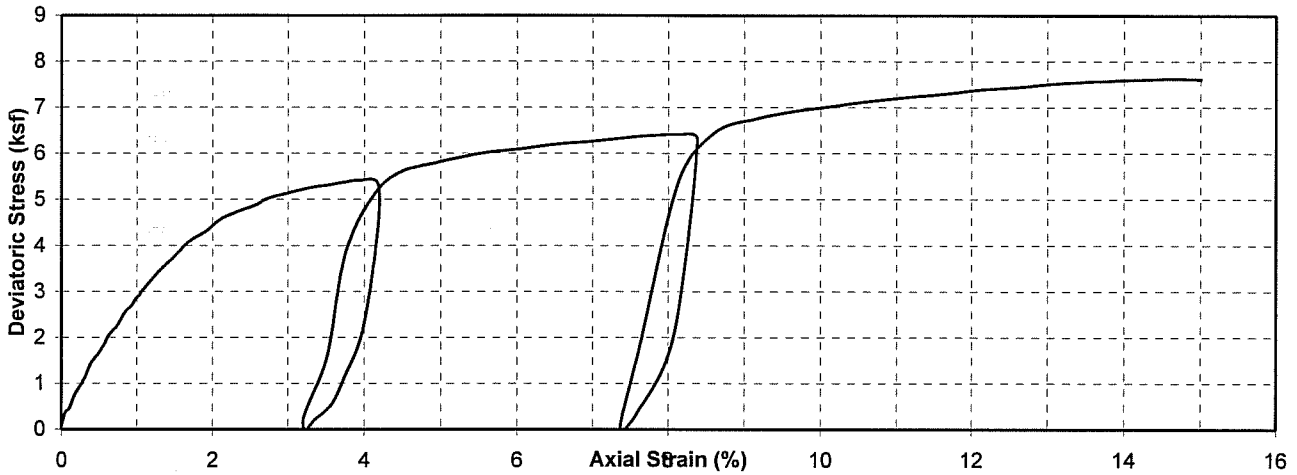
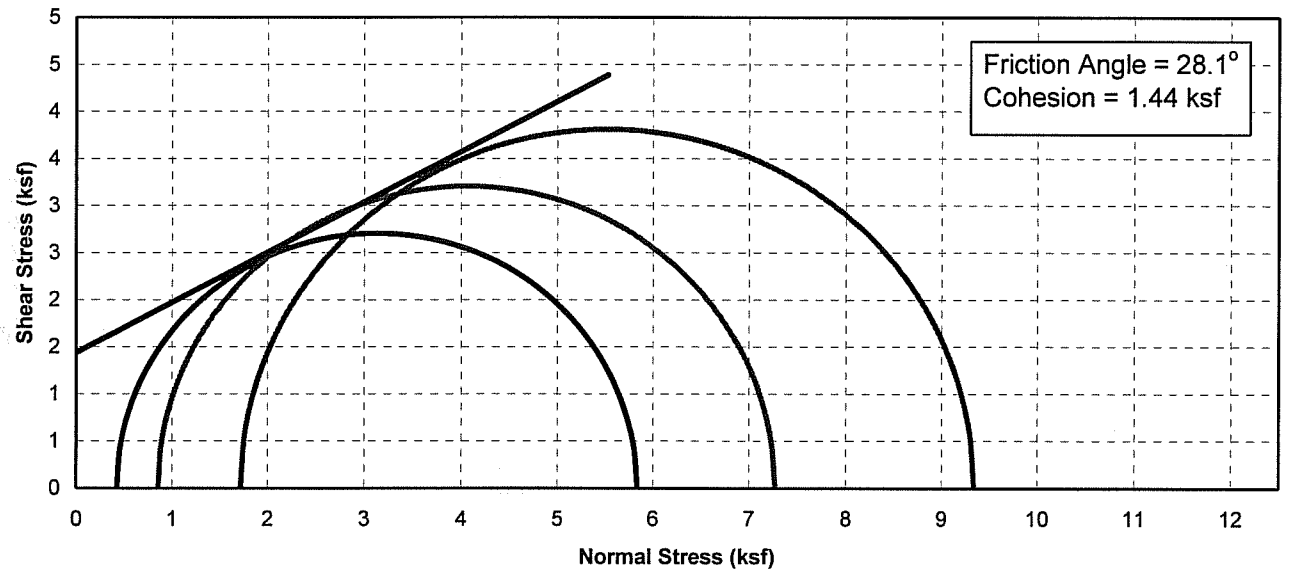
Geotechnical and Earthquake Engineering




| Boring No. | Sample No. | Depth (ft) | Soil Type | Dry Density (pcf) | Moisture Content (%) | Conf. Stress (ksf) Cycle 1, 2, 3 | Max. Dev. Stress (ksf) Cycle 1, 2, 3 | Initial Saturation (%) |
|---|---|---|---|---|---|---|---|---|
| 04-3 | 2A | 5.00 | SM/GR | 115.7 | 8.0 | 0.42, 0.86, 1.72 | 5.42, 6.42, 7.63 | 47.4 |

| | |
|---|---|
| **Earth Mechanics, Inc.** Geotechnical and Earthquake Engineering | **Caltrans\UCSD \ Abutment Research** |
| **Project No. :** 02-165 **Date :** 07/26/04 | **UNCONSOLIDATED UNDRAINED TRIAXIAL TEST (ASTM D2850)** |

# UNCONSOLIDATED UNDRAINED TRIAXIAL TEST
ASTM D2850

| | | | | | |
|---|---|---|---|---|---|
| **Project Name:** | UCSD \ Abutment Research\Harbor Blvd UC (Widen)\Orange Co. | | | **Project No:** | 02-165 |
| **Boring No.:** | 04-3 | **Tested by:** | J.R | **Date:** | 07/26/04 |
| **Depth (ft):** | 8 | **Checked by:** | | **Date:** | |
| **Sample No.** | 3B | **Sample Type:** | In-Situ | | |
| **Soil Description:** | **SM w/GR** | **Comments:** | Slight weackness at the top first ring | | |

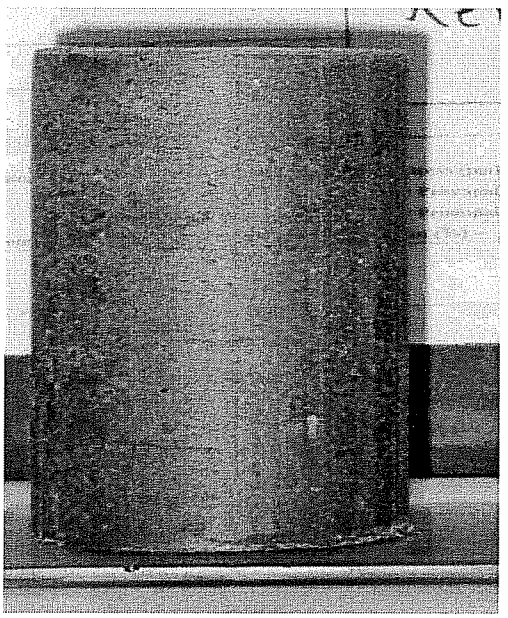
| | 1 | 2 | 3 | | |
|---|---|---|---|---|---|
| Diameter (in.): | 2.42 | 2.41 | 2.43 | Average: | 2.420 |
| Height (in.): | 5.000 | 5.000 | 5.000 | Average: | 5.000 |

| **Moisture Content Calculation** | |
|---|---|
| Wt. Wet Sample + Container (g) : | |
| Wt. Dry Sample + Container (g) : | |
| Container (g) : No. | |
| Moisture Content (%) : | **5.0** |

| **Density and Saturation** | |
|---|---|
| Wt. Wet Sample + Container (g) : | |
| Container (g) : | |
| Wet Density (pcf) : | **120.7** |
| Dry Density (pcf) : | **115.0** |
| Void Ratio : | **0.466** |
| % Saturation : | **29.0** |

Gs=2.70 (assumed)

**SKETCH / PHOTO AFTER TEST:**



| **Shear** | |
|---|---|
| Cycle | **1, 2, 3** |
| Confining Stress (ksf) : | **1.08, 2.14, 4.31** |
| Deformation Rate (% / min) : | **4** |
| **Failure Criterion:** | |
| the maximum deviator stress | |

| **At Failure** | |
|---|---|
| Cycle | **1, 2, 3** |
| Deviator Stress (ksf) : | **5.17, 7.61, 13.05** |
| Eff. Minor Principal Stress (ksf) : | **1.08, 2.14, 4.31** |
| Eff. Major Principal Stress (ksf) : | **6.25, 9.76, 17.36** |
| Axial Strain (%) : | **3.2, 5.1, 14.1** |

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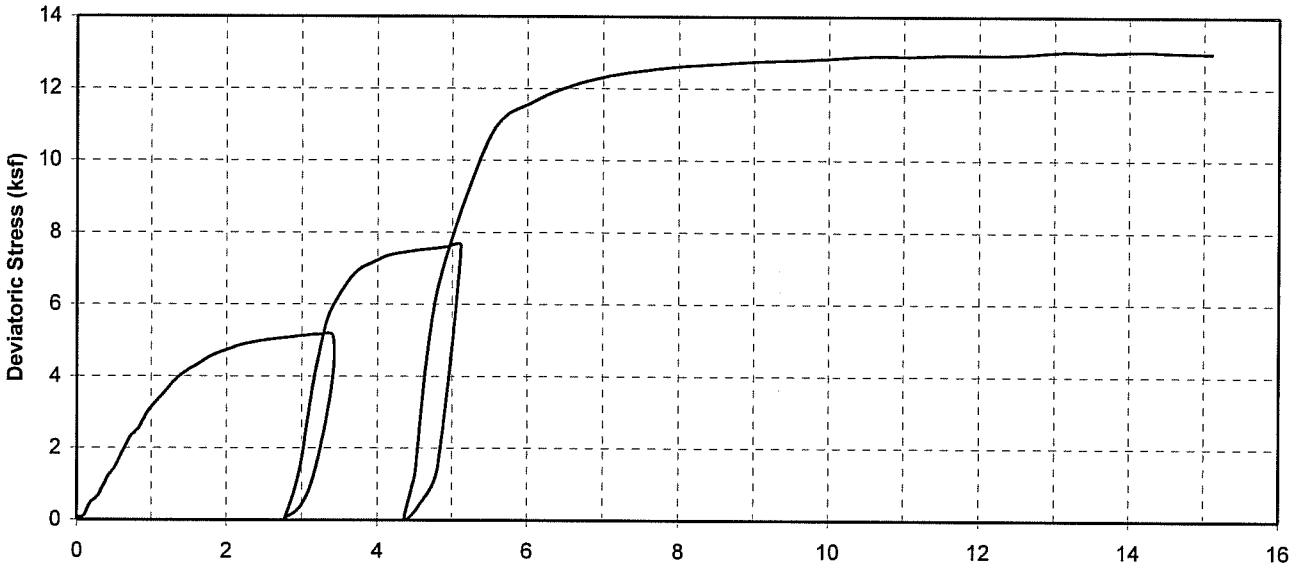


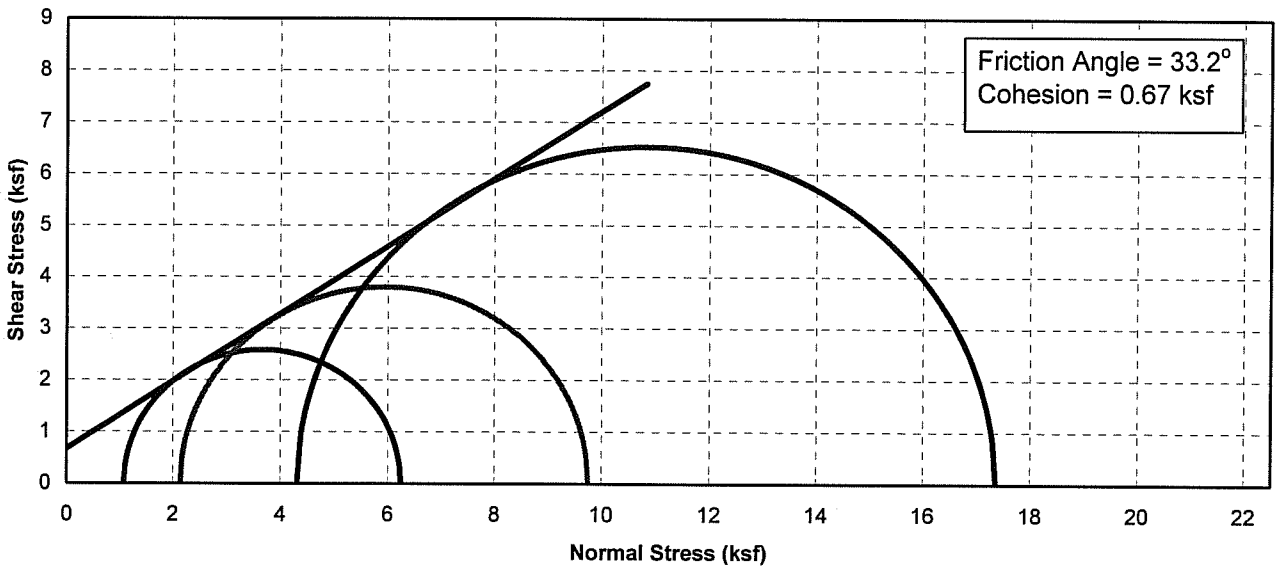


| Boring No. | Sample No. | Depth (ft) | Soil Type | Dry Density (pcf) | Moisture Content (%) | Conf. Stress (ksf) Cycle 1, 2, 3 | Max. Dev. Stress (ksf) Cycle 1, 2, 3 | Initial Saturation (%) |
|---|---|---|---|---|---|---|---|---|
| 04-3 | 3B | 8.00 | SM w/GR | 115.0 | 5.0 | 1.08, 2.14, 4.31 | 5.17, 7.61, 13.05 | 29.0 |

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**Caltrans\UCSD \ Abutment Research**

**UNCONSOLIDATED UNDRAINED TRIAXIAL TEST (ASTM D2850)**

**Project No. :** 02-165 **Date :** 07/26/04

# UNCONSOLIDATED UNDRAINED TRIAXIAL TEST
ASTM D2850

| | | | | | |
|---|---|---|---|---|---|
| **Project Name:** | UCSD \ Abutment Research\Tustin Ave OC(Widen)\Orange Co. | | | **Project No:** | 02-165 |
| **Boring No.:** | 04-6 | **Tested by:** | J.R | **Date:** | 07/27/04 |
| **Depth (ft):** | 5 | **Checked by:** | | **Date:** | |
| **Sample No.** | 2A | **Sample Type:** | In.Situ | | |
| **Soil Description:** | **SM w/GR** | **Comments:** | Slight weackness at the top first ring | | |

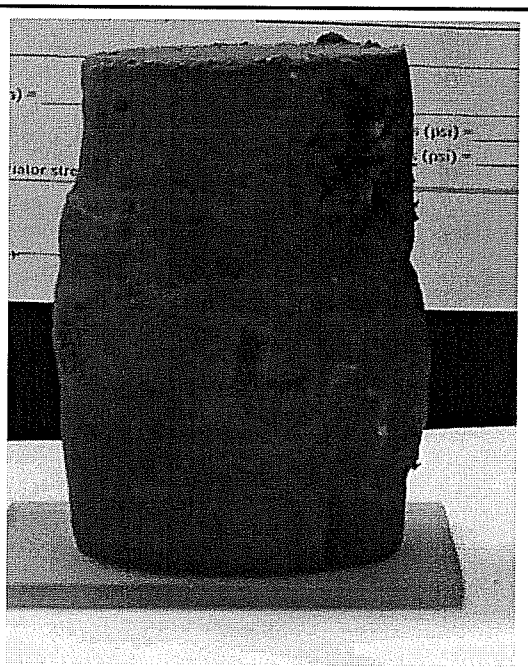
| | 1 | 2 | 3 | | |
|---|---|---|---|---|---|
| Diameter (in.): | 2.42 | 2.421 | 2.423 | Average: | 2.421 |
| Height (in.): | 5.000 | 5.000 | 5.000 | Average: | 5.000 |

| **Moisture Content Calculation** | |
|---|---|
| Wt. Wet Sample + Container (g) : | |
| Wt. Dry Sample + Container (g) : | |
| Container (g) : No. | |
| Moisture Content (%) : | **12.0** |

| **Density and Saturation** | |
|---|---|
| Wt. Wet Sample + Container (g) : | |
| Container (g) : | |
| Wet Density (pcf) : | **133.0** |
| Dry Density (pcf) : | **118.8** |
| Void Ratio : | **0.419** |
| % Saturation : | **77.4** |

Gs=2.70 (assumed)

**SKETCH / PHOTO AFTER TEST:**



| **Shear** | |
|---|---|
| Cycle | **1, 2, 3** |
| Confining Stress (ksf) : | **0.71, 1.43, 2.87** |
| Deformation Rate (% / min) : | **4** |
| **Failure Criterion:** the maximum deviator stress | |

| **At Failure** | |
|---|---|
| Cycle | **1, 2, 3** |
| Deviator Stress (ksf) : | **5.02, 6.08, 8.06** |
| Eff. Minor Principal Stress (ksf) : | **0.71, 1.43, 2.87** |
| Eff. Major Principal Stress (ksf) : | **5.74, 7.51, 10.93** |
| Axial Strain (%) : | **6, 9.8, 15** |

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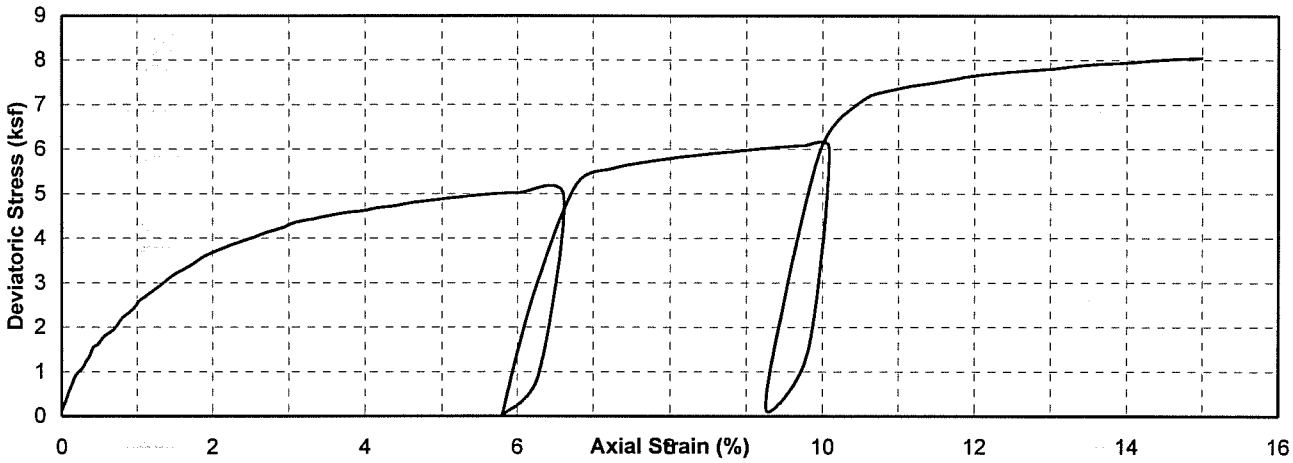
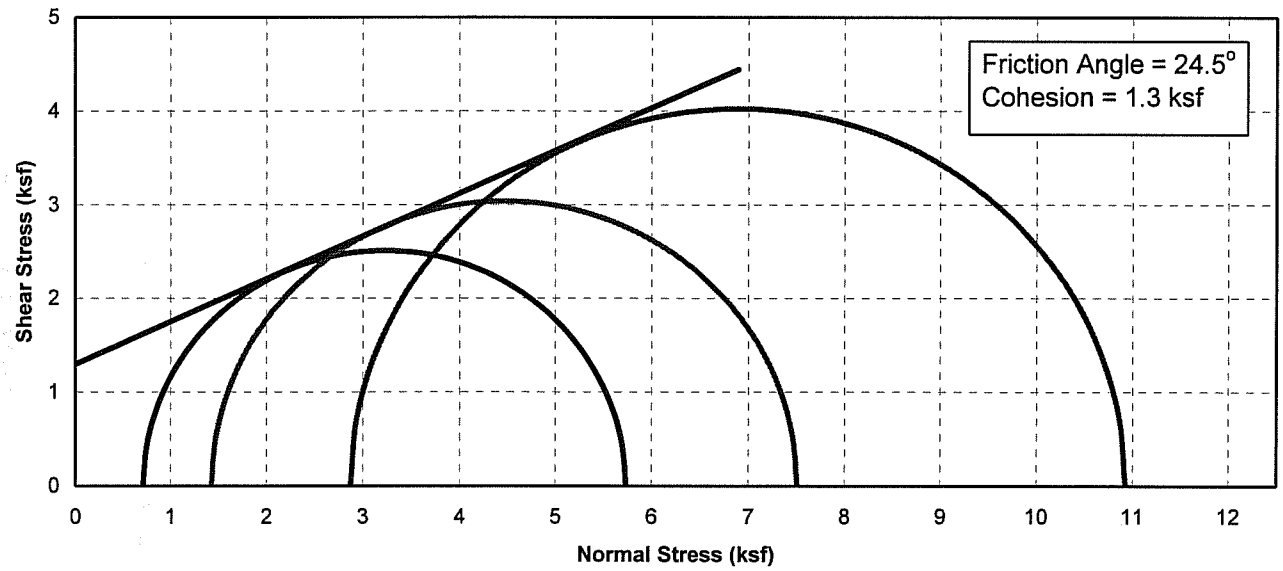
Geotechnical and Earthquake Engineering




| Boring No. | Sample No. | Depth (ft) | Soil Type | Dry Density (pcf) | Moisture Content (%) | Conf. Stress (ksf) Cycle 1, 2, 3 | Max. Dev. Stress (ksf) Cycle 1, 2, 3 | Initial Saturation (%) |
|---|---|---|---|---|---|---|---|---|
| 04-6 | 2A | 5.00 | SM w/GR | 118.8 | 12.0 | 0.71, 1.43, 2.87 | 5.02, 6.08, 8.06 | 77.4 |

**Earth Mechanics, Inc.**
Geotechnical and Earthquake Engineering

**Caltrans\UCSD \ Abutment Research**

**UNCONSOLIDATED UNDRAINED TRIAXIAL TEST (ASTM D2850)**

**Project No. :** 02-165 **Date :** 07/27/04

# UNCONSOLIDATED UNDRAINED TRIAXIAL TEST
ASTM D2850

| | | | | | |
|---|---|---|---|---|---|
| **Project Name:** | UCSD \ Abutment Research\Coldwater Canyon\Los Angeles Co. | | | **Project No:** | 02-165 |
| **Boring No.:** | 04-10 | **Tested by:** | J.R | **Date:** | 09/03/04 |
| **Depth (ft):** | 16 | **Checked by:** | | **Date:** | |
| **Sample No.** | D-4-2 | **Sample Type:** | In-Situ | | |
| **Soil Description:** | **Brown, CL** | **Comments:** | | | |

| | 1 | 2 | 3 | | |
|---|---|---|---|---|---|
| Diameter (in.): | 2.42 | 2.43 | 2.42 | Average: | 2.423 |
| Height (in.): | 5.060 | 5.120 | 5.060 | Average: | 5.080 |

| **Moisture Content Calculation** | |
|---|---|
| Wt. Wet Sample + Container (g) : | 146.96 |
| Wt. Dry Sample + Container (g) : | 129.15 |
| Container (g) : No. | 16.18 |
| Moisture Content (%) : | **13.6** |

| **Density and Saturation** | |
|---|---|
| Wt. Wet Sample + Container (g) : | |
| Container (g) : | |
| Wet Density (pcf) : | **120.3** |
| Dry Density (pcf) : | **105.9** |
| Void Ratio : | **0.591** |
| % Saturation : | **62.2** |

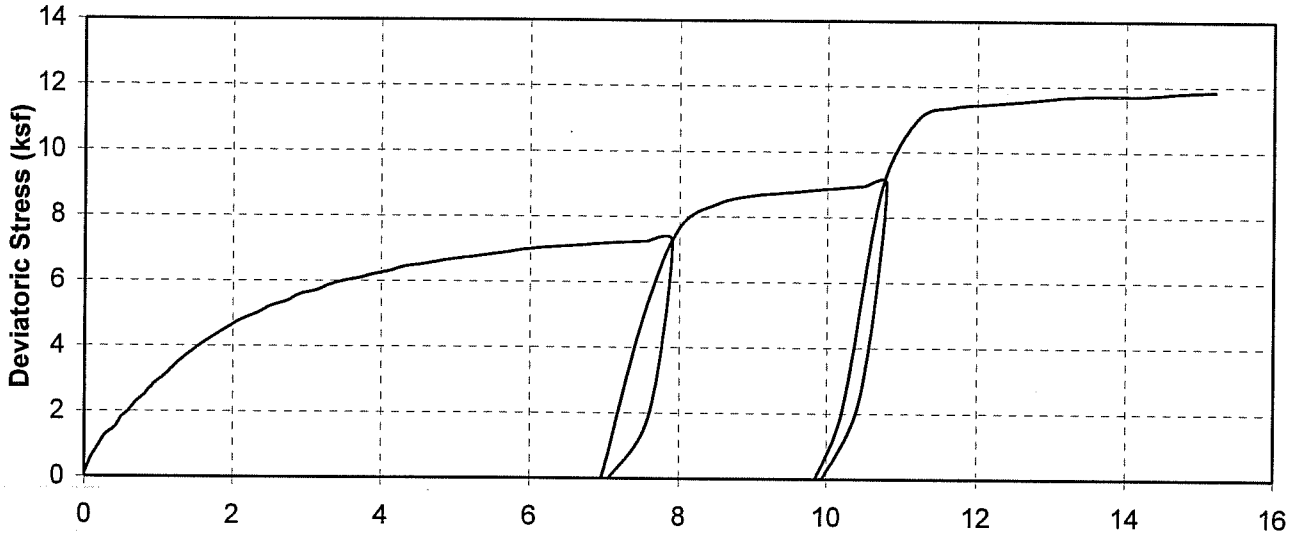
Gs=2.70 (assumed)

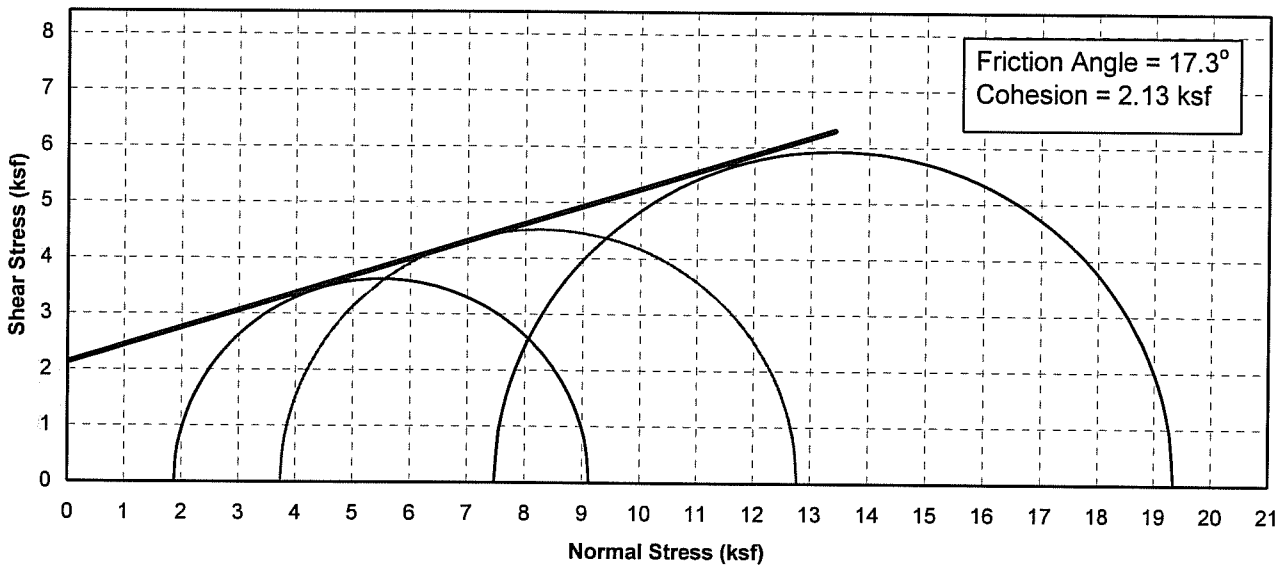
**SKETCH / PHOTO AFTER TEST:**

| **Shear** | |
|---|---|
| Cycle | **1, 2, 3** |
| Confining Stress (ksf) : | **1.88, 3.74, 7.48** |
| Deformation Rate (% / min) : | **4** |
| **Failure Criterion:** | |
| the maximum deviator stress | |

| **At Failure** | |
|---|---|
| Cycle | **1, 2, 3** |
| Deviator Stress (ksf) : | **7.25, 9.04, 11.87** |
| Eff. Minor Principal Stress (ksf) : | **1.88, 3.74, 7.48** |
| Eff. Major Principal Stress (ksf) : | **9.13, 12.77, 19.34** |
| Axial Strain (%) : | **7.5, 10.8, 15.2** |

**Earth Mechanics, Inc.**
Geotechnical and Earthquake Engineering




| Boring No. | Sample No. | Depth (ft) | Soil Type | Dry Density (pcf) | Moisture Content (%) | Conf. Stress (ksf) Cycle 1, 2, 3 | Max. Dev. Stress (ksf) Cycle 1, 2, 3 | Initial Saturation (%) |
|---|---|---|---|---|---|---|---|---|
| 04-10 | D-4-2 | 16.00 | Brown, CL | 105.9 | 13.6 | 1.88<br>3.74<br>7.48 | 7.25<br>9.04<br>11.87 | 62.2 |

**Earth Mechanics, Inc.**
Geotechnical and Earthquake Engineering

**Caltrans\UCSD \ Abutment Research**

**UNCONSOLIDATED UNDRAINED TRIAXIAL TEST (ASTM D2850)**

**Project No. :** 02-165 **Date :** 09/03/04

# UNCONSOLIDATED UNDRAINED TRIAXIAL TEST
ASTM D2850

| | | | | | |
|---|---|---|---|---|---|
| **Project Name:** | UCSD \ Abutment Research\Patterson Slough\Fremont | | | **Project No:** | 02-165 |
| **Boring No.:** | 04-11A | **Tested by:** | J.R | **Date:** | 08/09/04 |
| **Depth (ft):** | 8 | **Checked by:** | | **Date:** | |
| **Sample No.** | D-1 | **Sample Type:** | Remolded | | |
| **Soil Description:** | **Dark Grey, ML/CL** | **Comments:** | | | |

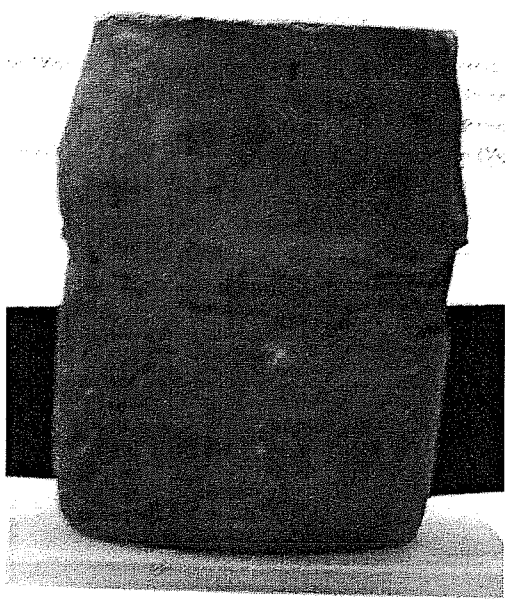
| | 1 | 2 | 3 | | |
|---|---|---|---|---|---|
| Diameter (in.): | 2.421 | 2.424 | 2.422 | Average: | 2.422 |
| Height (in.): | 5.090 | 5.000 | 5.000 | Average: | 5.030 |

| **Moisture Content Calculation** | |
|---|---|
| Wt. Wet Sample + Container (g) : | |
| Wt. Dry Sample + Container (g) : | |
| Container (g) : No. | |
| Moisture Content (%) : | **11.0** |

| **Density and Saturation** | |
|---|---|
| Wt. Wet Sample + Container (g) : | |
| Container (g) : | |
| Wet Density (pcf) : | **134.0** |
| Dry Density (pcf) : | **120.7** |
| Void Ratio : | **0.396** |
| % Saturation : | **75.2** |

Gs=2.70 (assumed)

**SKETCH / PHOTO AFTER TEST:**



| **Shear** | |
|---|---|
| Cycle | **1, 2, 3** |
| Confining Stress (ksf) : | **1.08, 2.15, 4.32** |
| Deformation Rate (% / min) : | **4** |
| **Failure Criterion:** | |
| the maximum deviator stress | |

| **At Failure** | |
|---|---|
| Cycle | **1, 2, 3** |
| Deviator Stress (ksf) : | **2.29, 2.7, 3.11** |
| Eff. Minor Principal Stress (ksf) : | **1.08, 2.15, 4.32** |
| Eff. Major Principal Stress (ksf) : | **3.37, 4.85, 7.43** |
| Axial Strain (%) : | **10.8, 14.9, 19.7** |

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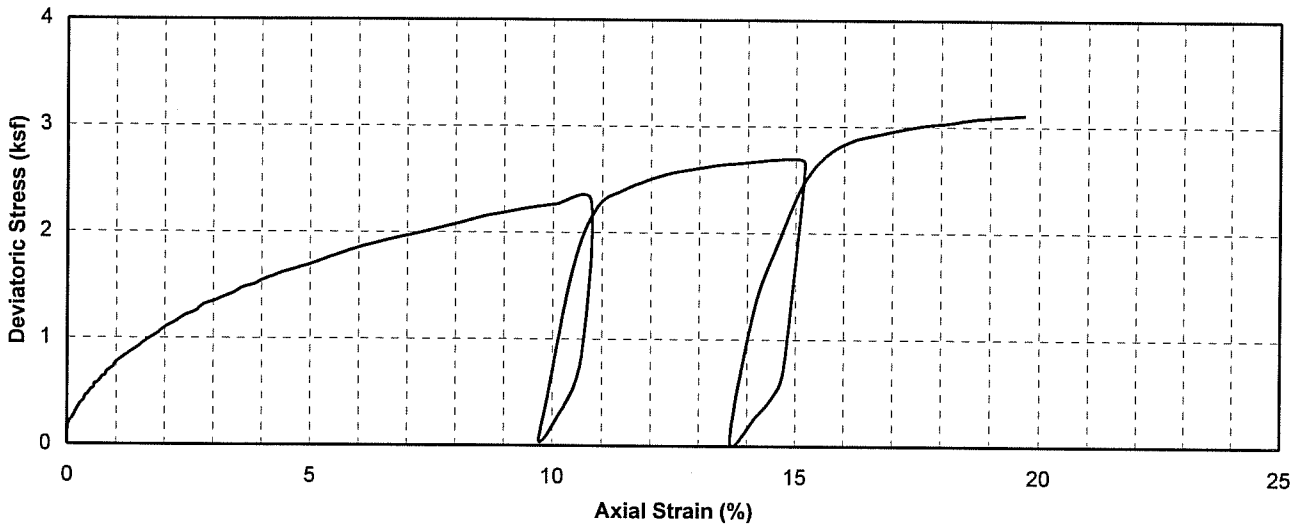


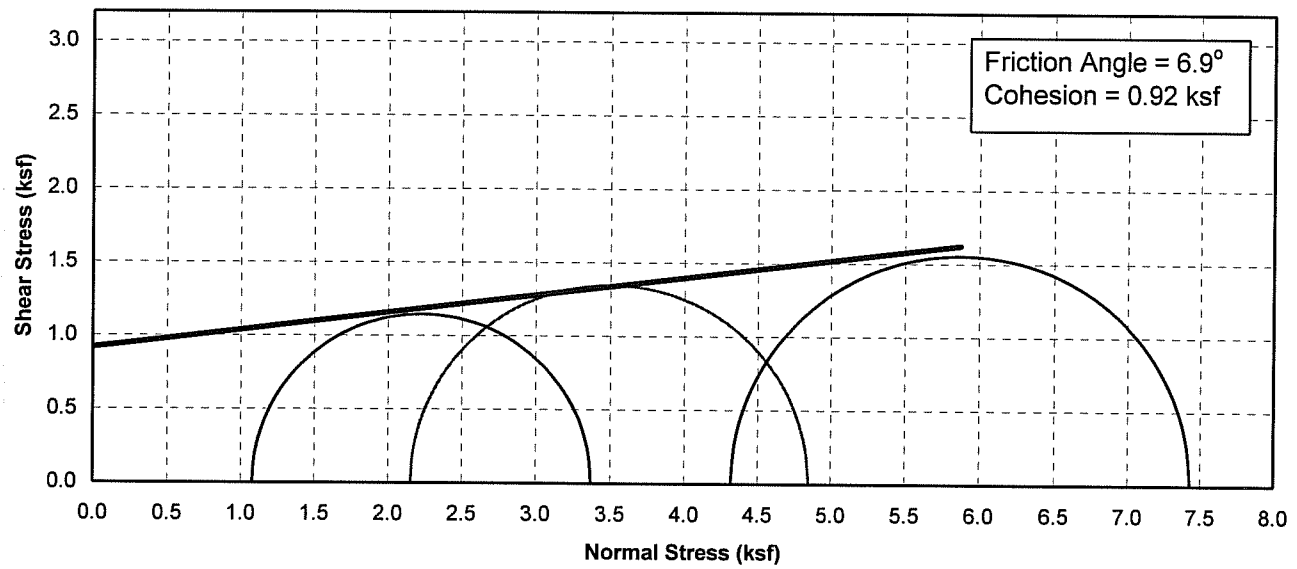


| Boring No. | Sample No. | Depth (ft) | Soil Type | Dry Density (pcf) | Moisture Content (%) | Conf. Stress (ksf) Cycle 1, 2, 3 | Max. Dev. Stress (ksf) Cycle 1, 2, 3 | Initial Saturation (%) |
|---|---|---|---|---|---|---|---|---|
| 04-11A | D-1 | 8.00 | Dark Grey, ML/CL | 120.7 | 11.0 | 1.08, 2.15, 4.32 | 2.29, 2.7, 3.11 | 75.2 |

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**Caltrans\UCSD \ Abutment Research**

**UNCONSOLIDATED UNDRAINED TRIAXIAL TEST (ASTM D2850)**

**Project No. :** 02-165 **Date :** 08/09/04

# UNCONSOLIDATED UNDRAINED TRIAXIAL TEST
ASTM D2850

| | | | | | |
|---|---|---|---|---|---|
| **Project Name:** | UCSD \ Abutment Research\Patterson Slough\Fremont Co. | | | **Project No:** | 02-165 |
| **Boring No.:** | 04-11 | **Tested by:** | J.R | **Date:** | 08/06/04 |
| **Depth (ft):** | 12.5 | **Checked by:** | | **Date:** | |
| **Sample No.** | D3 | **Sample Type:** | In-Situ | | |
| **Soil Description:** | **Dark grey, ML/CL** | **Comments:** | | | |

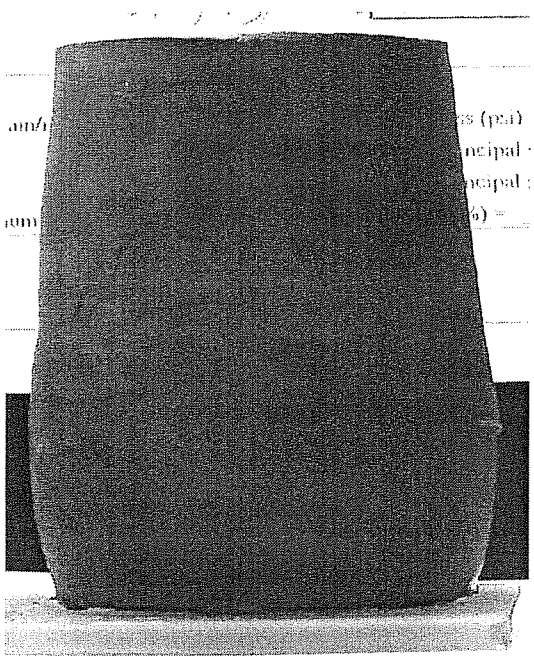
| | 1 | 2 | 3 | | |
|---|---|---|---|---|---|
| Diameter (in.): | 2.421 | 2.422 | 2.42 | Average: | 2.421 |
| Height (in.): | 5.000 | 5.000 | 5.000 | Average: | 5.000 |

| **Moisture Content Calculation** | |
|---|---|
| Wt. Wet Sample + Container (g) : | |
| Wt. Dry Sample + Container (g) : | |
| Container (g) : No. | |
| Moisture Content (%) : | **10.0** |

| **Density and Saturation** | |
|---|---|
| Wt. Wet Sample + Container (g) : | |
| Container (g) : | |
| Wet Density (pcf) : | **134.0** |
| Dry Density (pcf) : | **121.8** |
| Void Ratio : | **0.383** |
| % Saturation : | **70.5** |

Gs=2.70 (assumed)

**SKETCH / PHOTO AFTER TEST:**



| **Shear** | |
|---|---|
| Cycle | **1, 2, 3** |
| Confining Stress (ksf) : | **1.73, 3.46, 6.91** |
| Deformation Rate (% / min) : | **4** |
| **Failure Criterion:** | |
| the maximum deviator stress | |

| **At Failure** | |
|---|---|
| Cycle | **1, 2, 3** |
| Deviator Stress (ksf) : | **12.55, 13.84, 16.2** |
| Eff. Minor Principal Stress (ksf) : | **1.73, 3.46, 6.91** |
| Eff. Major Principal Stress (ksf) : | **14.27, 17.3, 23.11** |
| Axial Strain (%) : | **10.6, 14.6, 24.4** |

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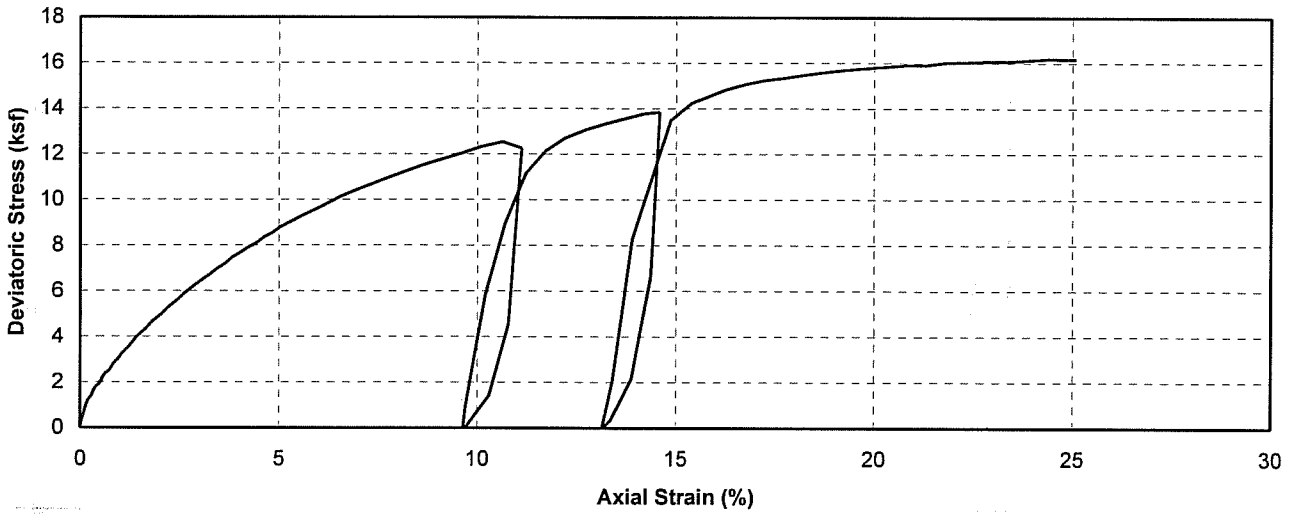


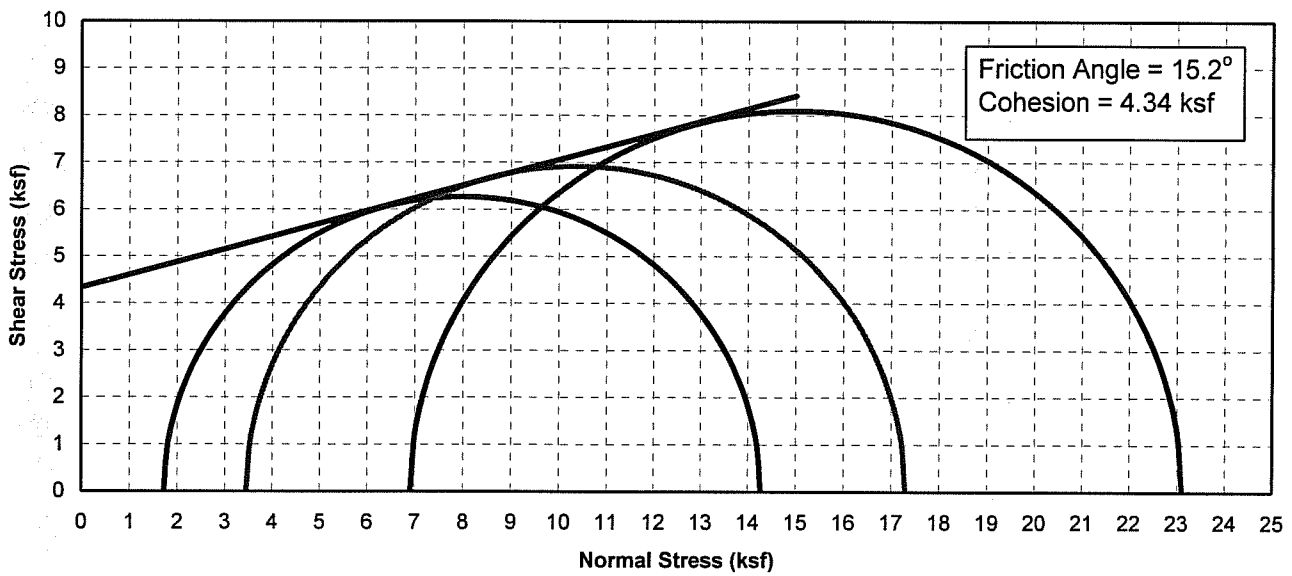


| Boring No. | Sample No. | Depth (ft) | Soil Type | Dry Density (pcf) | Moisture Content (%) | Conf. Stress (ksf) Cycle 1, 2, 3 | Max. Dev. Stress (ksf) Cycle 1, 2, 3 | Initial Saturation (%) |
|---|---|---|---|---|---|---|---|---|
| 04-11A | D3 | 12.50 | Dark grey, ML/CL | 121.8 | 10.0 | 1.73, 3.46, 6.91 | 12.55, 13.84, 16.2 | 70.5 |

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**Caltrans\UCSD \ Abutment Research**

**UNCONSOLIDATED UNDRAINED TRIAXIAL TEST (ASTM D2850)**

**Project No. :** 02-165 **Date :** 08/06/04

# UNCONSOLIDATED UNDRAINED TRIAXIAL TEST
ASTM D2850

| | | | | | |
|---|---|---|---|---|---|
| **Project Name:** | UCSD \ Abutment Research\Route 101/84 Sep.\San Mateo | | | **Project No:** | 02-165 |
| **Boring No.:** | 04-14A | **Tested by:** | J.R. | **Date:** | 08/23/04 |
| **Depth (ft):** | 10 | **Checked by:** | | **Date:** | |
| **Sample No.** | 3 | **Sample Type:** | In-Situ | | |
| **Soil Description:** | **Brown, CL** | **Comments:** | A crack was observed in top first ring | | |

| | 1 | 2 | 3 | | |
|---|---|---|---|---|---|
| Diameter (in.): | 2.421 | 2.423 | 2.423 | Average: | 2.422 |
| Height (in.): | 5.063 | 5.090 | 5.063 | Average: | 5.072 |

| **Moisture Content Calculation** | |
|---|---|
| Wt. Wet Sample + Container (g) : | 118.4 |
| Wt. Dry Sample + Container (g) : | 109.5 |
| Container (g) : No. | 15.9 |
| Moisture Content (%) : | **8.7** |

| **Density and Saturation** | |
|---|---|
| Wt. Wet Sample + Container (g) : | |
| Container (g) : | |
| Wet Density (pcf) : | **136.0** |
| Dry Density (pcf) : | **125.1** |
| Void Ratio : | **0.346** |
| % Saturation : | **67.7** |

Gs=2.70 (assumed)

**SKETCH / PHOTO AFTER TEST:**

| **Shear** | |
|---|---|
| Cycle | **1, 2, 3** |
| Confining Stress (ksf) : | **1.37, 2.73, 5.47** |
| Deformation Rate (% / min) : | **4** |
| **Failure Criterion:** the maximum deviator stress | |

| **At Failure** | |
|---|---|
| Cycle | **1, 2, 3** |
| Deviator Stress (ksf) : | **5.36, 7.44, 10.38** |
| Eff. Minor Principal Stress (ksf) : | **1.37, 2.73, 5.47** |
| Eff. Major Principal Stress (ksf) : | **6.74, 10.16, 15.84** |
| Axial Strain (%) : | **8.5, 13.1, 19.9** |

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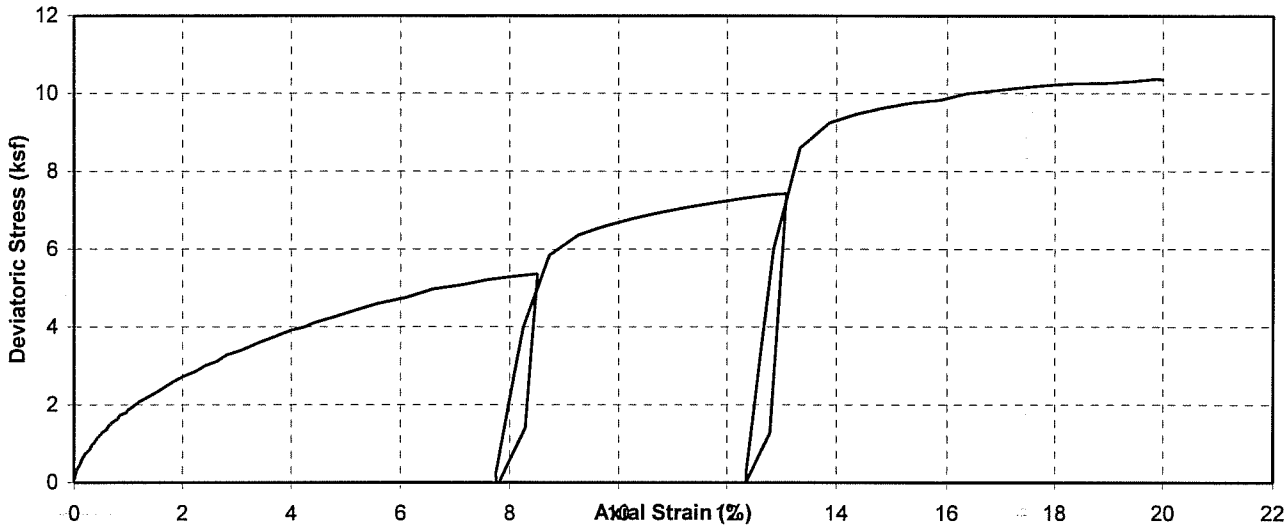
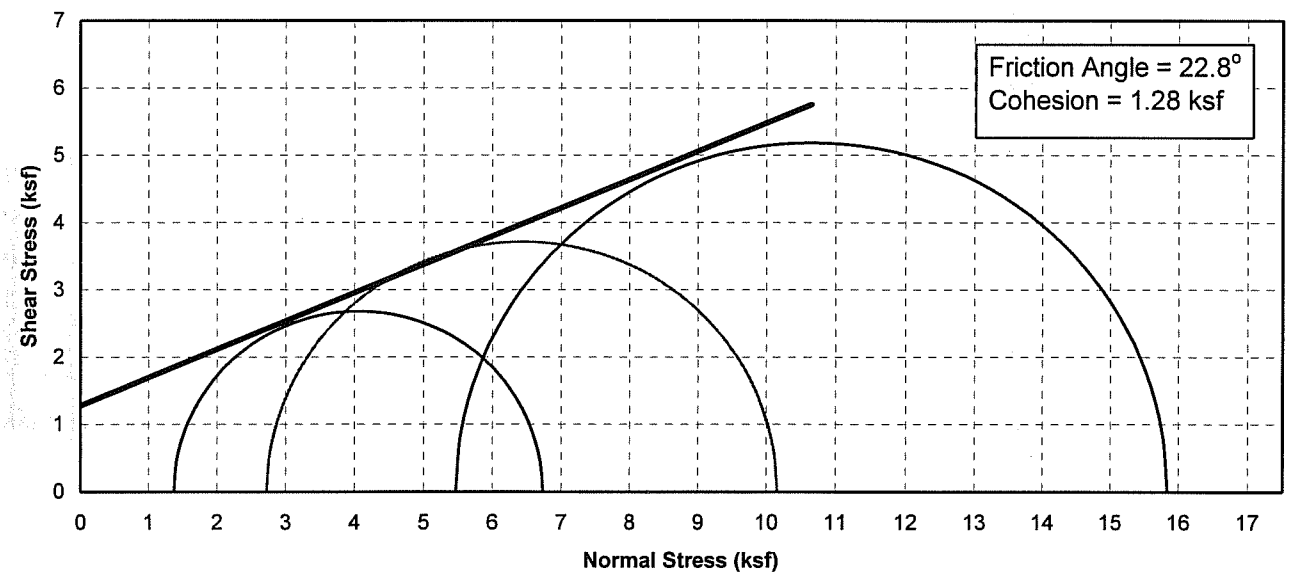



| Boring No. | Sample No. | Depth (ft) | Soil Type | Dry Density (pcf) | Moisture Content (%) | Conf. Stress (ksf) Cycle 1, 2, 3 | Max. Dev. Stress (ksf) Cycle 1, 2, 3 | Initial Saturation (%) |
|---|---|---|---|---|---|---|---|---|
| 04-14A | 3 | 10.00 | Brown, CL | 125.1 | 8.7 | 1.37, 2.73, 5.47 | 5.36, 7.44, 10.38 | 67.7 |

| | |
|---|---|
| **Earth Mechanics, Inc.**<br>Geotechnical and Earthquake Engineering | **Caltrans\UCSD \ Abutment Research** |
| **Project No. :** 02-165 **Date :** 08/23/04 | **UNCONSOLIDATED UNDRAINED TRIAXIAL TEST (ASTM D2850)** |

# UNCONSOLIDATED UNDRAINED TRIAXIAL TEST
ASTM D2850

| | | | | | |
|---|---|---|---|---|---|
| **Project Name:** | UCSD \ Abutment Research\Painter Street, Humboldt Co | | | **Project No:** | 02-165 |
| **Boring No.:** | 04-15A | **Tested by:** | J.R. | **Date:** | 11/02/04 |
| **Depth (ft):** | 2.5-7 | **Checked by:** | | **Date:** | |
| **Sample No.** | B-0, S-1, S-2B, S-3A | **Sample Type:** | composite | | |
| **Sample Description:** | SP, Bulk | **Comments:** | (Bad test) Dense coarse sand w/ gravel | | |

| | 1 | 2 | 3 | | |
|---|---|---|---|---|---|
| Diameter (in.): | 2.8 | 2.8 | 2.8 | Average: | 2.800 |
| Height (in.): | 6.000 | 6.000 | 6.000 | Average: | 6.000 |

| **Moisture Content Calculation** | |
|---|---|
| Wt. Wet Sample + Container (gms): | |
| Wt. Dry Sample + Container (gms): | |
| Container (gms) No. | |
| Moisture Content (%) | **4.0** |

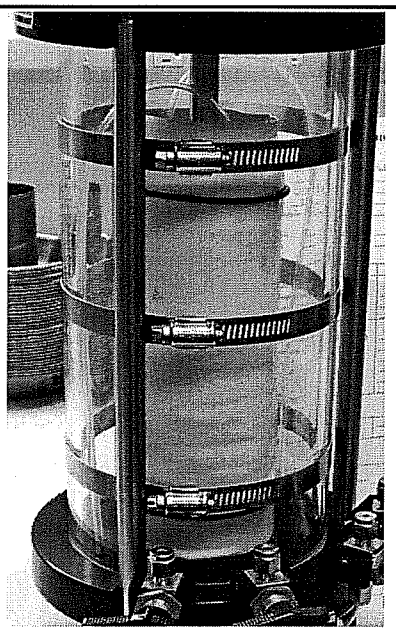
| **Density and Saturation** | |
|---|---|
| Wt. Wet Sample + Container (gms) | |
| Container (gms) | |
| Wet Density (pcf) | **134.7** |
| Dry Density (pcf) | **129.5** |
| Void Ratio | **0.301** |
| % Saturation | **35.9** |

Assume Gs=2.70

| Test Data Filename: | 04-15A,2B,Remold#1.trx |
|---|---|

**SKETCH / PHOTO AFTER TEST:**

PHOTO FILE NAME:



| **Shear** | |
|---|---|
| Rate of Deformation (% strain / min) = | **4** |
| Confining Stress (ksf): | **0.86** |

**Failure Criterion:** **criterion 2 is used**

1. the maximum deviator stress within 15% strain
2. the stress at 10% strain for no peak stress.

| **At Failure** | |
|---|---|
| Deviator Stress (ksf) | **5.19** |
| Eff. Minor Principal Stress (ksf)= | **0.86** |
| Eff. Major Principal Stress (ksf)= | **6.05** |
| Axial Strain (%)= | **6.02** |

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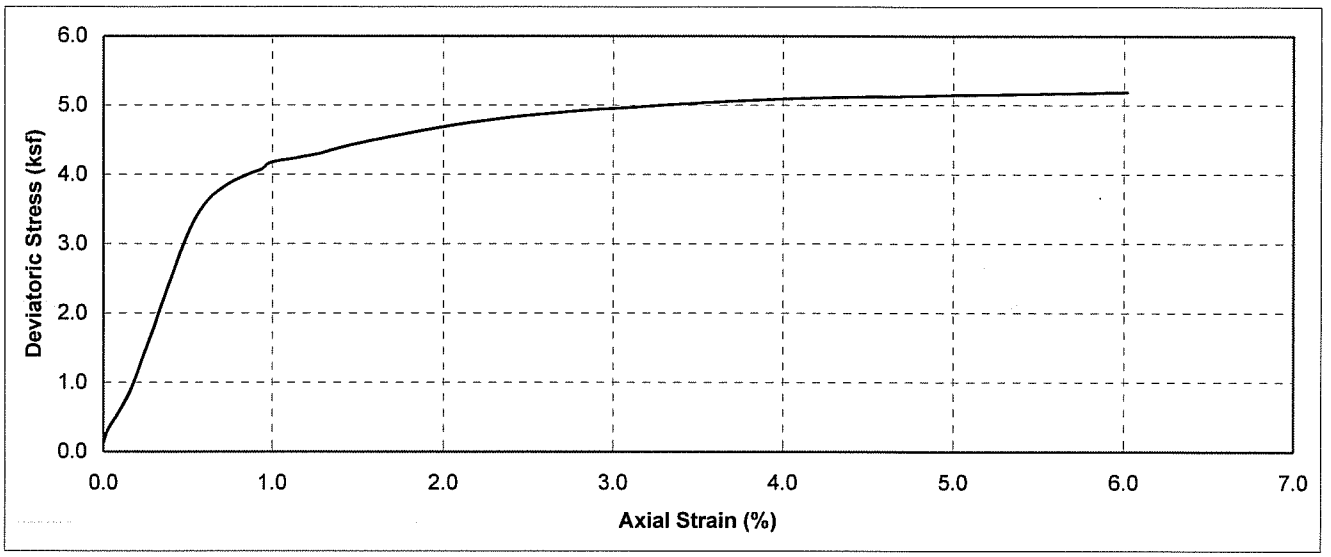
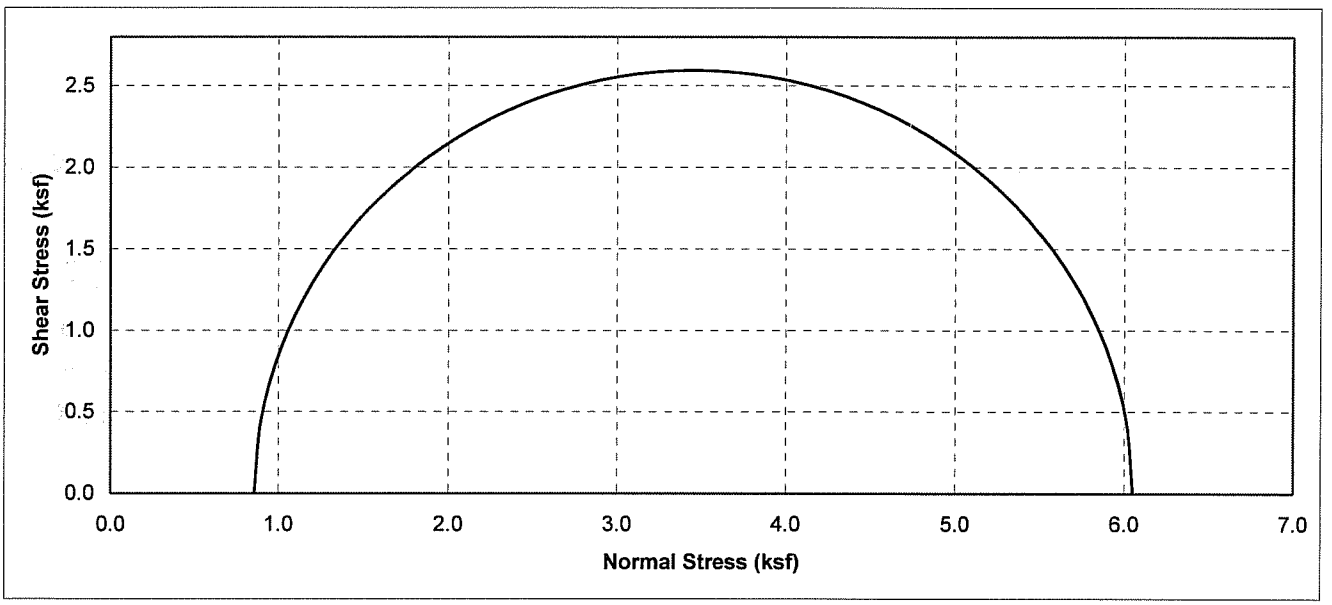



| Boring No. | Sample No. | Depth (ft) | Soil Type | Dry Density (pcf) | Moisture Content (%) | Conf. Stress (ksf) | Max. Dev. Stress (ksf) | Initial Saturation (%) |
|---|---|---|---|---|---|---|---|---|
| 04-15A | B,1,2B,3A | 10 | SP, Bulk | 129.5 | 4.00 | 0.86 | 5.19 | 35.9 |

| | |
|---|---|
| **Earth Mechanics, Inc.**<br>Geotechnical and Earthquake Engineering | **Caltrans\UCSD \ Abutment Research** |
| **Project No. :** 02-165 **Date :** 11/02/04 | **UNCONSOLIDATED UNDRAINED TEST**<br>**(ASTM D2850)** Figure No. : |

# UNCONSOLIDATED UNDRAINED TRIAXIAL TEST
ASTM D2850

| | | | | | |
|---|---|---|---|---|---|
| **Project Name:** | UCSD \ Abutment Research\Painter Street, Humboldt Co | | | **Project No:** | 02-165 |
| **Boring No.:** | 04-15A | **Tested by:** | J.R | **Date:** | 11/04/04 |
| **Depth (ft):** | 2.5-7 | **Checked by:** | | **Date:** | |
| **Sample No.** | B-0, S-1, S-2B, S-3A | **Sample Type:** | composite | | |
| **Sample Description:** | Dense coarse sand w/ gravel | **Comments:** | | | |

| | 1 | 2 | 3 | | |
|---|---|---|---|---|---|
| Diameter (in.): | 2.862 | 2.862 | 2.862 | Average: | 2.862 |
| Height (in.): | 5.750 | 5.750 | 5.750 | Average: | 5.750 |

| **Moisture Content Calculation** | |
|---|---|
| Wt. Wet Sample + Container (gms): | |
| Wt. Dry Sample + Container (gms): | |
| Container (gms) No. | |
| Moisture Content (%) | **4.0** |

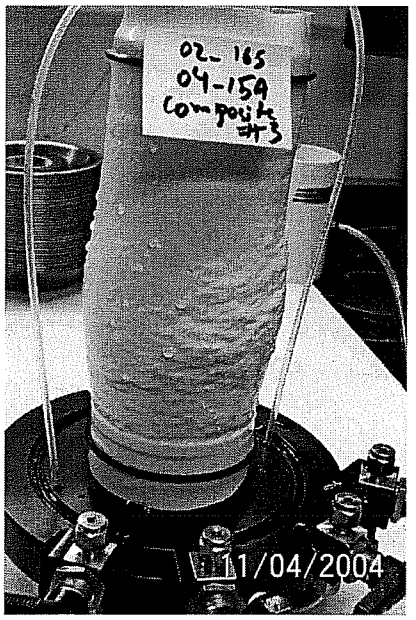
| **Density and Saturation** | |
|---|---|
| Wt. Wet Sample + Container (gms) | |
| Container (gms) | 229.06 |
| Wet Density (pcf) | **129.5** |
| Dry Density (pcf) | **124.5** |
| Void Ratio | **0.353** |
| % Saturation | **30.6** |

Assume Gs=2.70

| | |
|---|---|
| Test Data Filename: | 04-15A,2B,Remold#3.trx |

**SKETCH / PHOTO AFTER TEST:**

PHOTO FILE NAME:




| **Shear** | |
|---|---|
| Rate of Deformation (% strain / min) = | **4** |
| Confining Stress (ksf): | **1.00** |

**Failure Criterion:** **criterion 1 is used**

1. the maximum deviator stress within 15% strain
2. the stress at 10% strain for no peak stress.

| **At Failure** | |
|---|---|
| Deviator Stress (ksf) | **5.64** |
| Eff. Minor Principal Stress (ksf)= | **1.00** |
| Eff. Major Principal Stress (ksf)= | **6.64** |
| Axial Strain (%)= | **6.08** |

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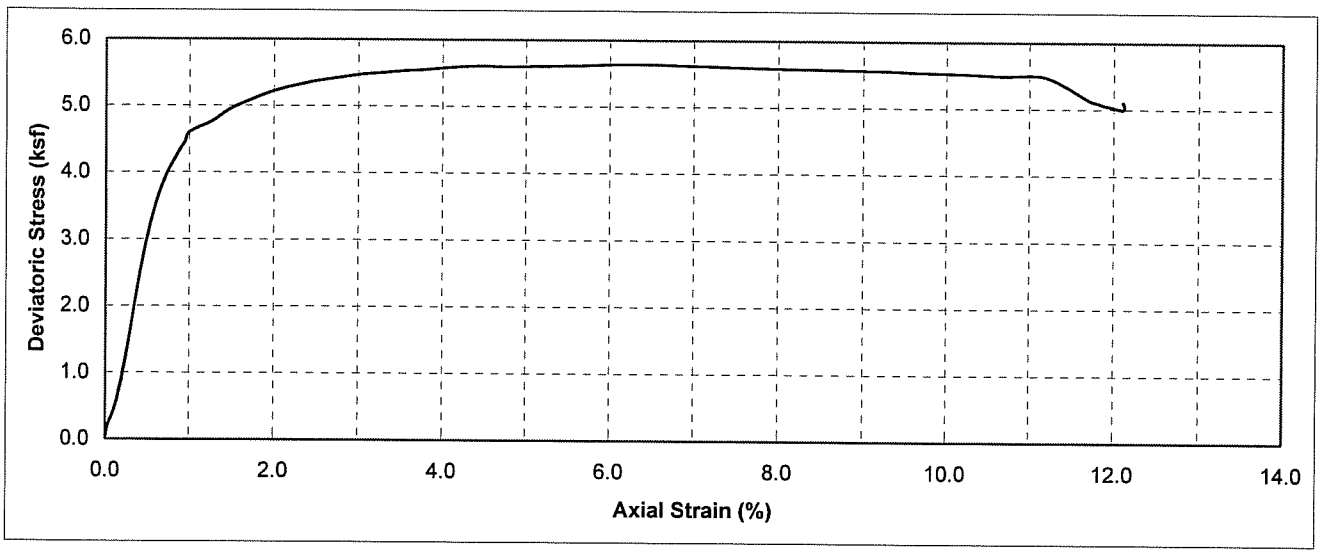
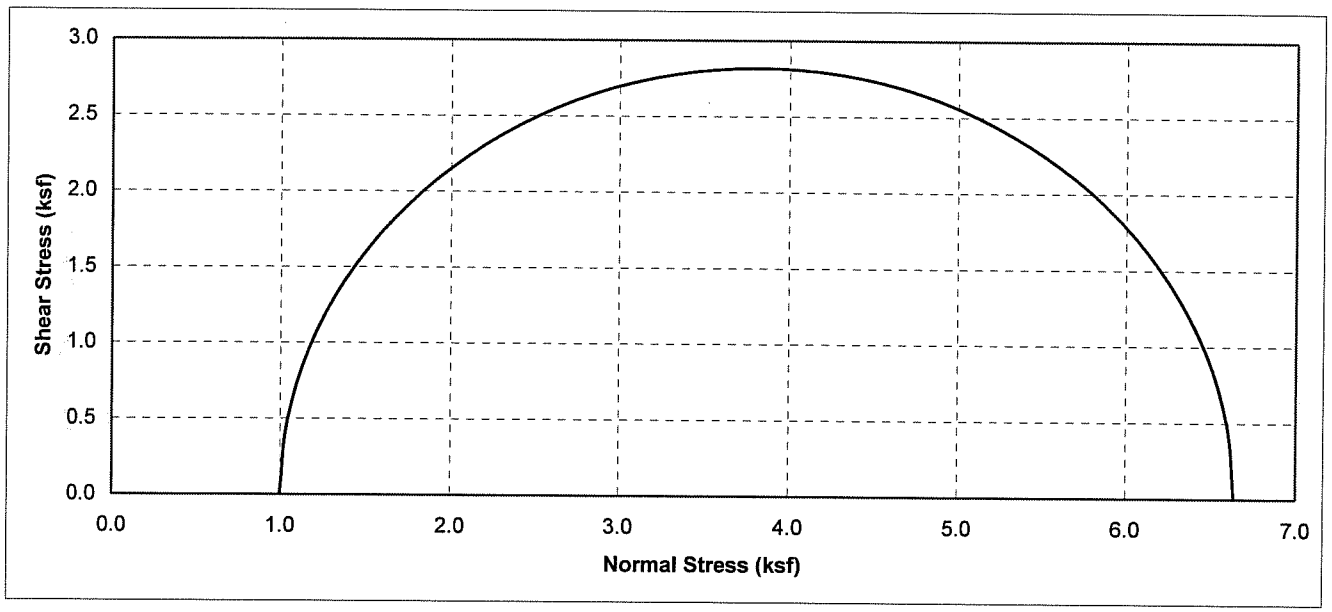



| Boring No. | Sample No. | Depth (ft) | Soil Type | Dry Density (pcf) | Moisture Content (%) | Conf. Stress (ksf) | Max. Dev. Stress (ksf) | Initial Saturation (%) |
|---|---|---|---|---|---|---|---|---|
| 04-15A | Composite | 2.5-7 | Dense coarse sand w/ gravel | 124.5 | 4.00 | 1.00 | 5.64 | 30.6 |

| | |
|---|---|
| **Earth Mechanics, Inc.**<br>Geotechnical and Earthquake Engineering | **Caltrans\UCSD \ Abutment Research** |
| **Project No. :** 02-165 **Date :** 11/04/04 | **UNCONSOLIDATED UNDRAINED TEST**<br>**(ASTM D2850)** Figure No. : |

# UNCONSOLIDATED UNDRAINED TRIAXIAL TEST
ASTM D2850

| | | | | | |
|---|---|---|---|---|---|
| **Project Name:** | UCSD \ Abutment Research\Painter Street, Humboldt Co | | | **Project No:** | 02-165 |
| **Boring No.:** | 04-15A | **Tested by:** | J.R | **Date:** | 08/25/04 |
| **Depth (ft):** | 7.5 | **Checked by:** | | **Date:** | |
| **Sample No.** | 3B | **Sample Type:** | In-Situ | | |
| **Soil Description:** | **Black, ML, Very Stiff Clayey Silt** | **Comments:** | | | |

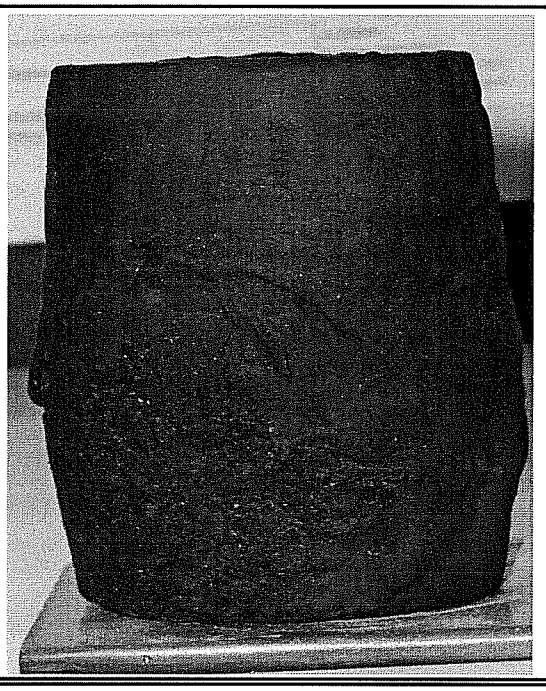
| | 1 | 2 | 3 | | |
|---|---|---|---|---|---|
| Diameter (in.): | 2.423 | 2.421 | 2.44 | Average: | 2.428 |
| Height (in.): | 5.000 | 5.060 | 5.090 | Average: | 5.050 |

| **Moisture Content Calculation** | |
|---|---|
| Wt. Wet Sample + Container (g) : | 156.87 |
| Wt. Dry Sample + Container (g) : | 141.43 |
| Container (g) : No. | 16.08 |
| Moisture Content (%) : | **11.0** |

| **Density and Saturation** | |
|---|---|
| Wt. Wet Sample + Container (g) : | |
| Container (g) : | |
| Wet Density (pcf) : | **128.4** |
| Dry Density (pcf) : | **115.7** |
| Void Ratio : | **0.456** |
| % Saturation : | **64.9** |

Gs=2.70 (assumed)

**SKETCH / PHOTO AFTER TEST:**



| **Shear** | | | |
|---|---|---|---|
| Cycle | **1,** | **2,** | **3** |
| Confining Stress (ksf) : | **1,** | **2.01,** | **4.02** |
| Deformation Rate (% / min) : | | **4** | |
| **Failure Criterion:** | | | |
| the maximum deviator stress | | | |

| **At Failure** | |
|---|---|
| Cycle | **1, 2, 3** |
| Deviator Stress (ksf) : | **8.3, 10.26, 11.38** |
| Eff. Minor Principal Stress (ksf) : | **1, 2.01, 4.02** |
| Eff. Major Principal Stress (ksf) : | **9.31, 12.27, 15.41** |
| Axial Strain (%) : | **11.1, 18.6, 27.6** |

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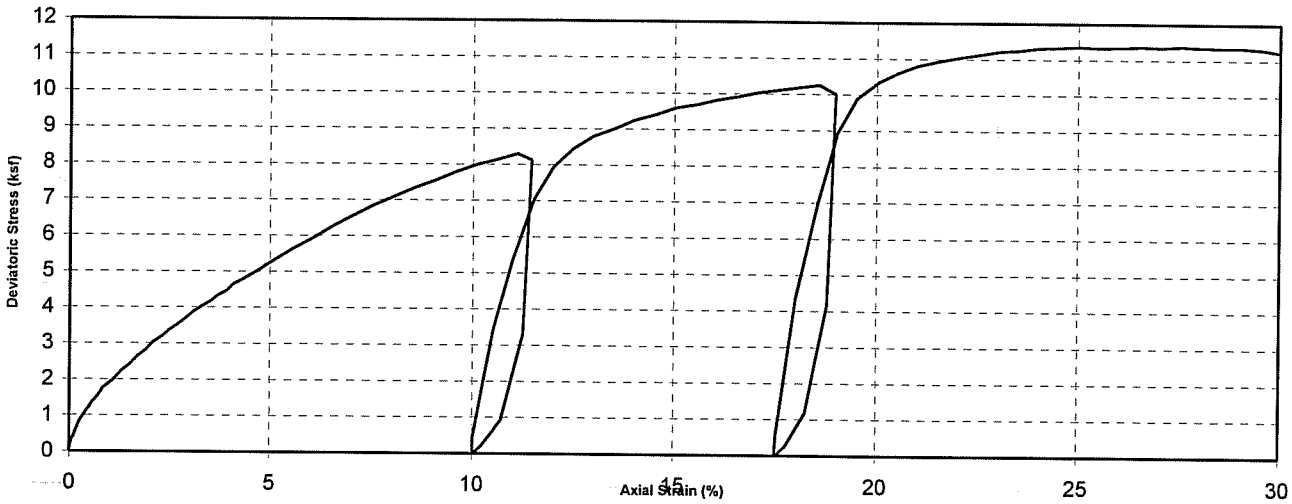
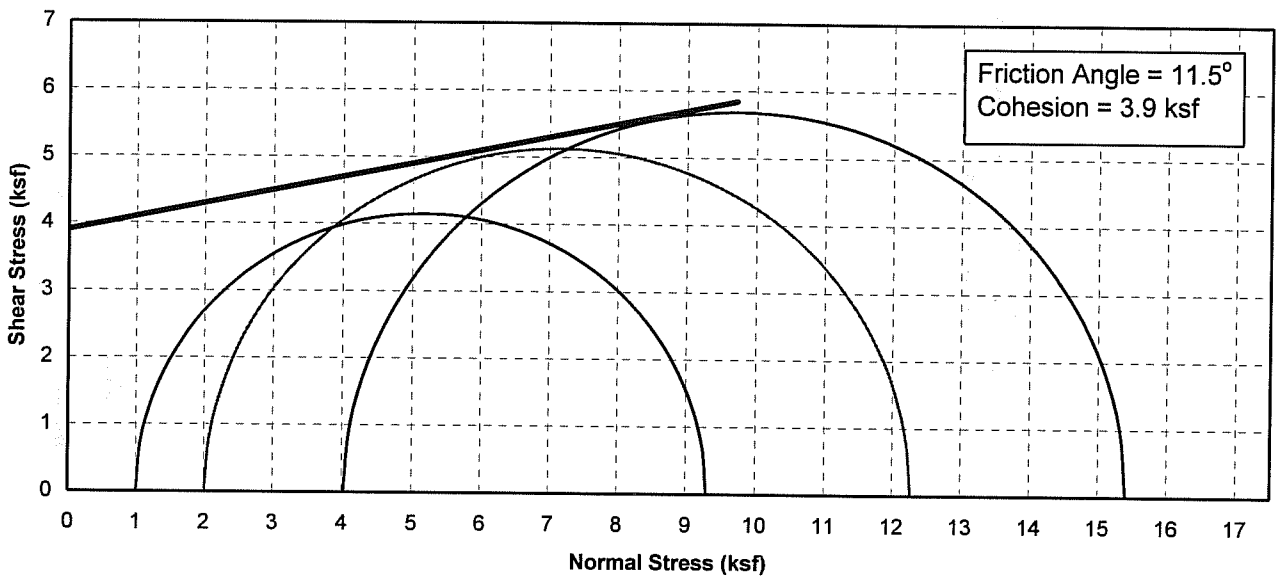
Geotechnical and Earthquake Engineering




| Boring No. | Sample No. | Depth (ft) | Soil Type | Dry Density (pcf) | Moisture Content (%) | Conf. Stress (ksf) Cycle 1, 2, 3 | Max. Dev. Stress (ksf) Cycle 1, 2, 3 | Initial Saturation (%) |
|---|---|---|---|---|---|---|---|---|
| 04-15A | 3B | 7.50 | Black, ML | 115.7 | 11.0 | 1<br>2.01<br>4.02 | 8.3<br>10.26<br>11.38 | 64.9 |

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**Caltrans\UCSD \ Abutment Research**

**UNCONSOLIDATED UNDRAINED TRIAXIAL TEST (ASTM D2850)**

**Project No. :** 02-165 **Date :** 08/25/04

# UNCONSOLIDATED UNDRAINED TRIAXIAL TEST
ASTM D2850

| | | | | | |
|---|---|---|---|---|---|
| **Project Name:** | UCSD \ Abutment Research\Painter Street, Humboldt Co | | | **Project No:** | 02-165 |
| **Boring No.:** | 04-15A | **Tested by:** | J.R. | **Date:** | 10/27/04 |
| **Depth (ft):** | 12.5 | **Checked by:** | | **Date:** | |
| **Sample No.** | D-5 | **Sample Type:** | Remolded | | |

**Sample Description:** Stiff Lean Clay w/Coarse Sand **Comments:**

Grain ize: 0:25:75 0% Fines Finer than #200

| | 1 | 2 | 3 | | |
|---|---|---|---|---|---|
| Diameter (in.): | 2.43 | 2.424 | 2.432 | Average: | 2.429 |
| Height (in.): | 5.060 | 5.090 | 5.090 | Average: | 5.080 |

| **Moisture Content Calculation** | |
|---|---|
| Wt. Wet Sample + Container (gms): | |
| Wt. Dry Sample + Container (gms): | |
| Container (gms) No. | |
| Moisture Content (%) | **16.4** |

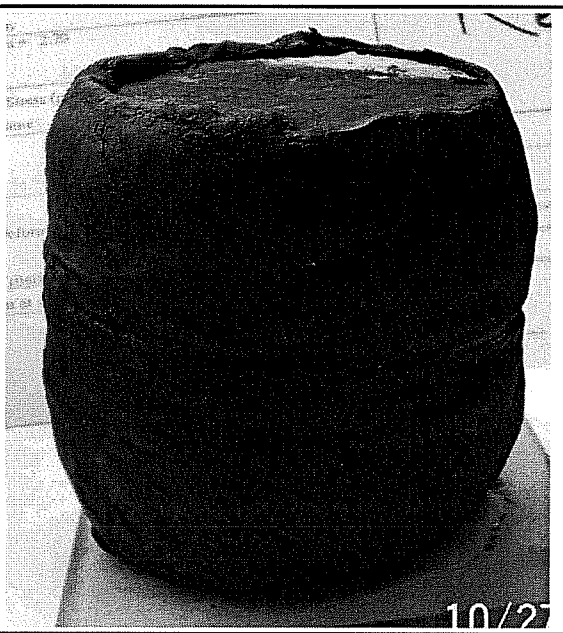
| **Density and Saturation** | |
|---|---|
| Wt. Wet Sample + Container (gms) | |
| Container (gms) | 229.06 |
| Wet Density (pcf) | **135.3** |
| Dry Density (pcf) | **116.2** |
| Void Ratio | **0.450** |
| % Saturation | **98.6** |

Assume Gs=2.70

| Test Data Filename: | 04-15A,D-5,Remold#1.trx |
|---|---|

**SKETCH / PHOTO AFTER TEST:**

PHOTO FILE NAME:




| **Shear** | |
|---|---|
| Rate of Deformation (% strain / min) = | **4** |
| Confining Stress (ksf): | **1.07** |

**Failure Criterion:** **criterion 2 is used**

1. the maximum deviator stress within 15% strain
2. the stress at 10% strain for no peak stress.

| **At Failure** | |
|---|---|
| Deviator Stress (ksf) | **4.06** |
| Eff. Minor Principal Stress (ksf)= | **1.07** |
| Eff. Major Principal Stress (ksf)= | **5.13** |
| Axial Strain (%)= | **10.19** |

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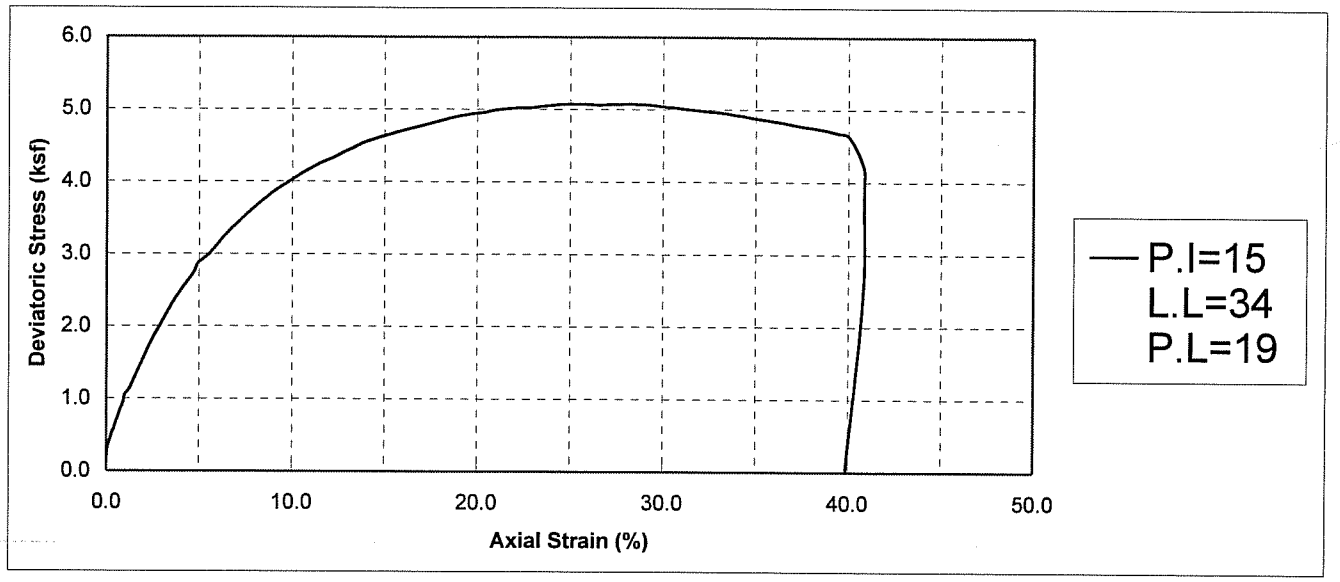


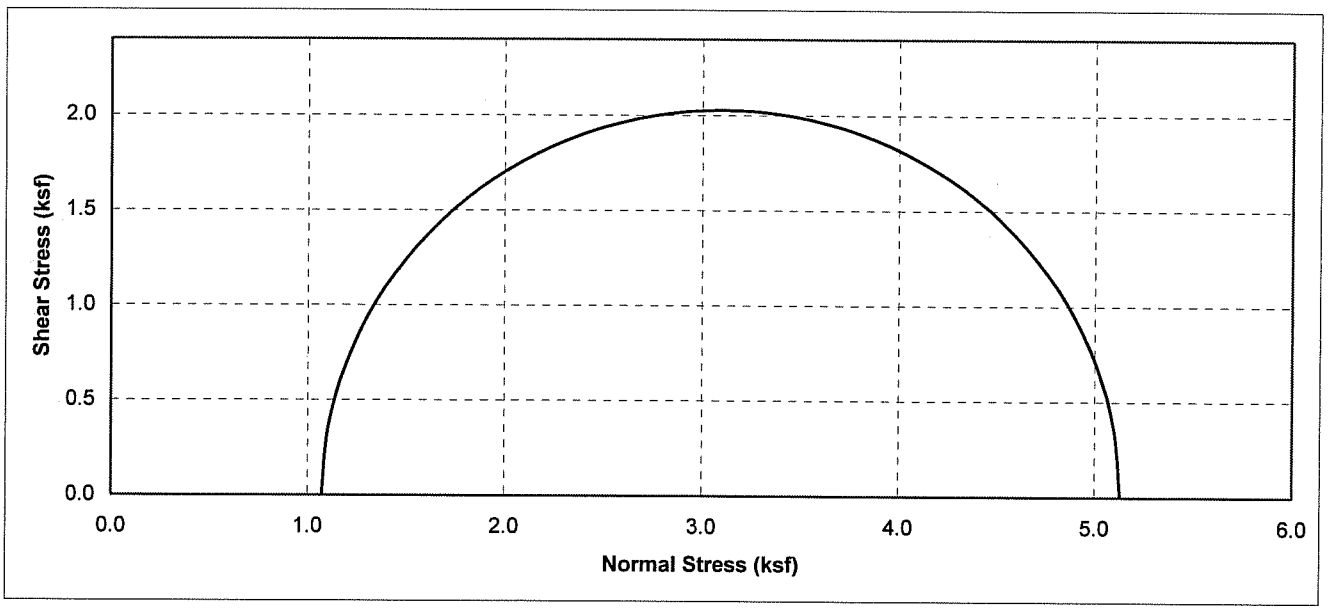


| Boring No. | Sample No. | Depth (ft) | Soil Type | Dry Density (pcf) | Moisture Content (%) | Conf. Stress (ksf) | Max. Dev. Stress (ksf) | Initial Saturation (%) |
|---|---|---|---|---|---|---|---|---|
| 04-15A | D-5 | 12.5 | Black gray , CL | 116.2 | 16.42 | 1.07 | 4.06 | 98.6 |

| | |
|---|---|
| **Earth Mechanics, Inc.**<br>Geotechnical and Earthquake Engineering | **Caltrans\UCSD \ Abutment Research** |
| **Project No. :** 02-165 **Date :** 10/27/04 | **UNCONSOLIDATED UNDRAINED TEST**<br>**(ASTM D2850)** Figure No. : |

# UNCONSOLIDATED UNDRAINED TRIAXIAL TEST
ASTM D2850

| | | | | | |
|---|---|---|---|---|---|
| **Project Name:** | UCSD \ Abutment Research\Painter Street, Humboldt Co | | | **Project No:** | 02-165 |
| **Boring No.:** | 04-15A | **Tested by:** | J.R. | **Date:** | 11/03/04 |
| **Depth (ft):** | 2.5-7 | **Checked by:** | | **Date:** | 11/03/04 |
| **Sample No.** | B-0, S-1, S-2B, S-3A | **Sample Type:** | composite | | |
| **Soil Description:** | **Dense coarse sand w/ gravel** | **Comments:** | | | |

| | 1 | 2 | 3 | | |
|---|---|---|---|---|---|
| Diameter (in.): | 2.862 | 2.862 | 2.862 | Average: | 2.862 |
| Height (in.): | 5.750 | 5.750 | 5.750 | Average: | 5.750 |

| **Moisture Content Calculation** | |
|---|---|
| Wt. Wet Sample + Container (g) : | |
| Wt. Dry Sample + Container (g) : | |
| Container (g) : No. | |
| Moisture Content (%) : | **4.0** |

| **Density and Saturation** | |
|---|---|
| Wt. Wet Sample + Container (g) : | |
| Container (g) : | |
| Wet Density (pcf) : | **134.7** |
| Dry Density (pcf) : | **129.5** |
| Void Ratio : | **0.301** |
| % Saturation : | **35.9** |

Gs=2.70 (assumed)

**SKETCH / PHOTO AFTER TEST:**

| **Shear** | |
|---|---|
| Cycle | **1, 2, 3** |
| Confining Stress (ksf) : | **0.87, 1.01, 1.3** |
| Deformation Rate (% / min) : | **4** |
| **Failure Criterion:** | |
| the maximum deviator stress | |

| **At Failure** | |
|---|---|
| Cycle | **1, 2, 3** |
| Deviator Stress (ksf) : | **4.33, 5.04, 6.18** |
| Eff. Minor Principal Stress (ksf) : | **0.87, 1.01, 1.3** |
| Eff. Major Principal Stress (ksf) : | **5.2, 6.04, 7.47** |
| Axial Strain (%) : | **3.1, 4.9, 7.1** |

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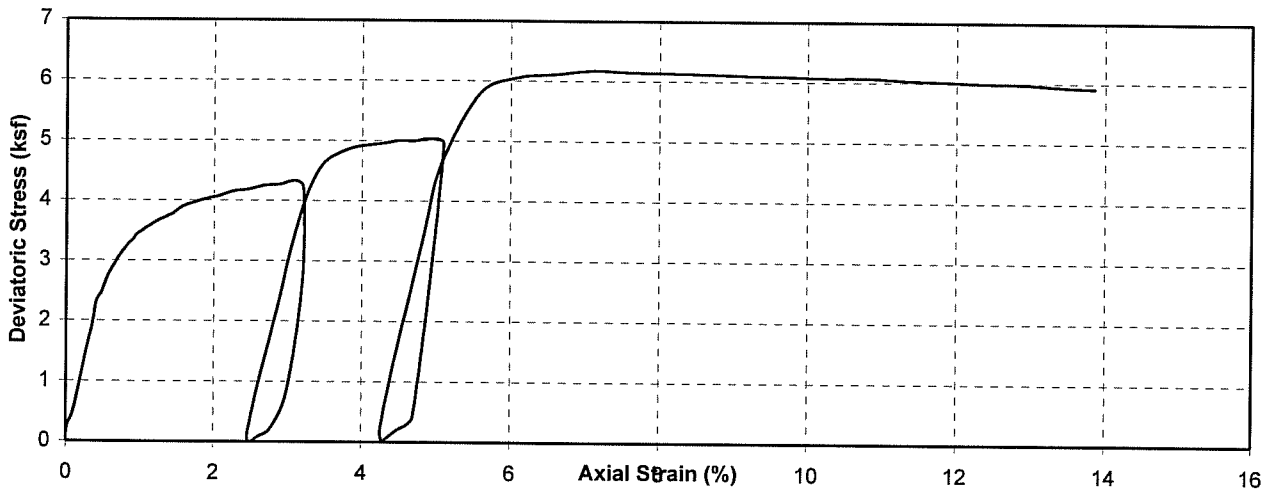


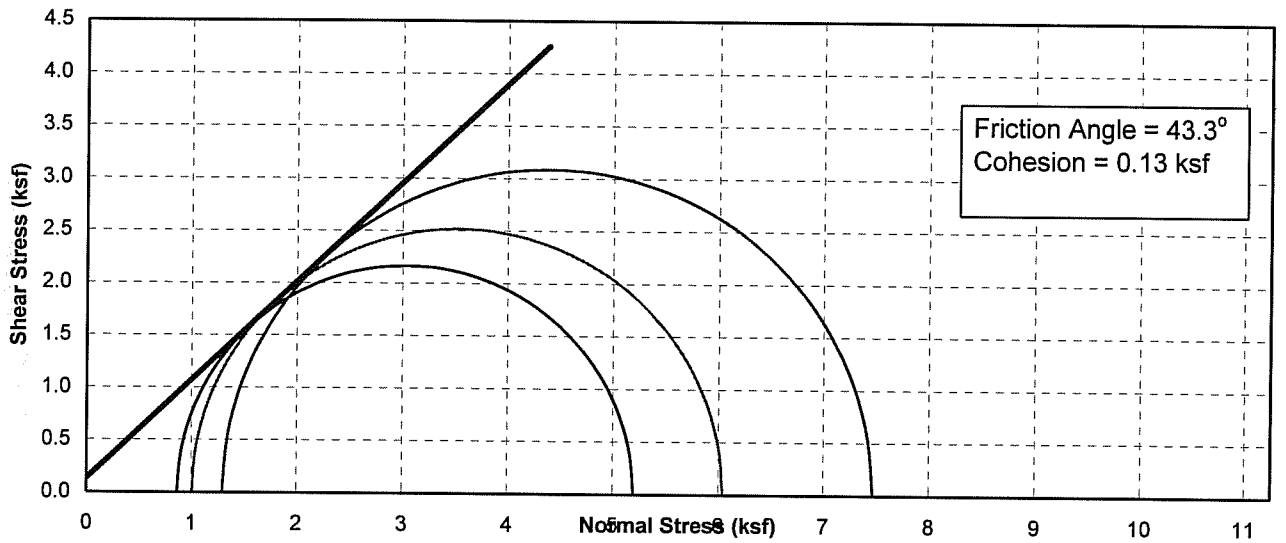


| Boring No. | Sample No. | Depth (ft) | Soil Type | Dry Density (pcf) | Moisture Content (%) | Conf. Stress (ksf) Cycle 1, 2, 3 | Max. Dev. Stress (ksf) Cycle 1, 2, 3 | Initial Saturation (%) |
|---|---|---|---|---|---|---|---|---|
| 04-15A | Composite | 2.5-7 | Dense coarse sand w/ gravel | 129.5 | 4.0 | 0.87<br>1.01<br>1.3 | 4.33<br>5.04<br>6.18 | 35.9 |

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**UNCONSOLIDATED UNDRAINED TRIAXIAL TEST (ASTM D2850)**

**Project No. :** 02-165 **Date :** 11/03/04

# UNCONSOLIDATED UNDRAINED TRIAXIAL TEST
ASTM D2850

| | | | | | |
|---|---|---|---|---|---|
| **Project Name:** | UCSD \ Abutment Research\Painter Street, Humboldt Co | | | **Project No:** | 02-165 |
| **Boring No.:** | 04-16A | **Tested by:** | J.R. | **Date:** | 08/26/04 |
| **Depth (ft):** | 10 | **Checked by:** | | **Date:** | |
| **Sample No.** | 4 | **Sample Type:** | In-Situ | | |
| **Soil Description:** | **CL, Very Stiff Clay with Silt** | **comments:** | | | |

| | 1 | 2 | 3 | | |
|---|---|---|---|---|---|
| Diameter (in.): | 2.421 | 2.423 | 2.423 | Average: | 2.422 |
| Height (in.): | 5.060 | 5.060 | 5.000 | Average: | 5.040 |

| **Moisture Content Calculation** | |
|---|---|
| Wt. Wet Sample + Container (g) : | 157.08 |
| Wt. Dry Sample + Container (g) : | 142.27 |
| Container (g) : No. | 16.64 |
| Moisture Content (%) : | **10.5** |

| **Density and Saturation** | |
|---|---|
| Wt. Wet Sample + Container (g) : | |
| Container (g) : | |
| Wet Density (pcf) : | **127.3** |
| Dry Density (pcf) : | **115.2** |
| Void Ratio : | **0.463** |
| % Saturation : | **61.5** |

Gs=2.70 (assumed)

**SKETCH / PHOTO AFTER TEST:**

| **Shear** | |
|---|---|
| Cycle | **1, 2, 3** |
| Confining Stress (ksf) : | **1.3, 2.59, 5.46** |
| Deformation Rate (% / min) : | **4** |
| **Failure Criterion:** | |
| the maximum deviator stress | |

| **At Failure** | |
|---|---|
| Cycle | **1, 2, 3** |
| Deviator Stress (ksf) : | **7.03, 7.97, 9.08** |
| Eff. Minor Principal Stress (ksf) : | **1.3, 2.59, 5.46** |
| Eff. Major Principal Stress (ksf) : | **8.33, 10.56, 14.54** |
| Axial Strain (%) : | **10.5, 15.5, 24.8** |

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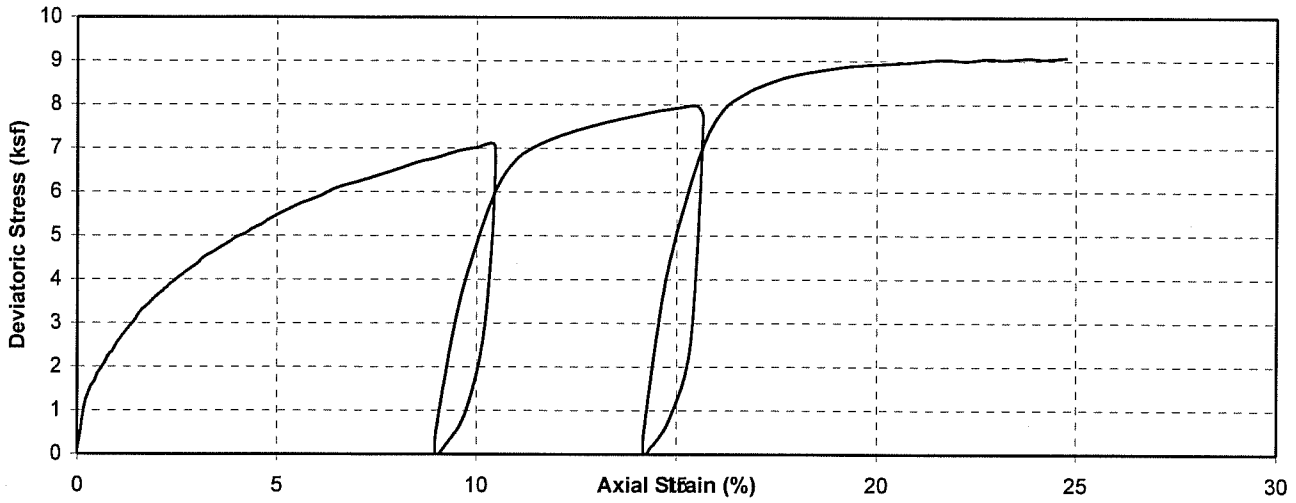
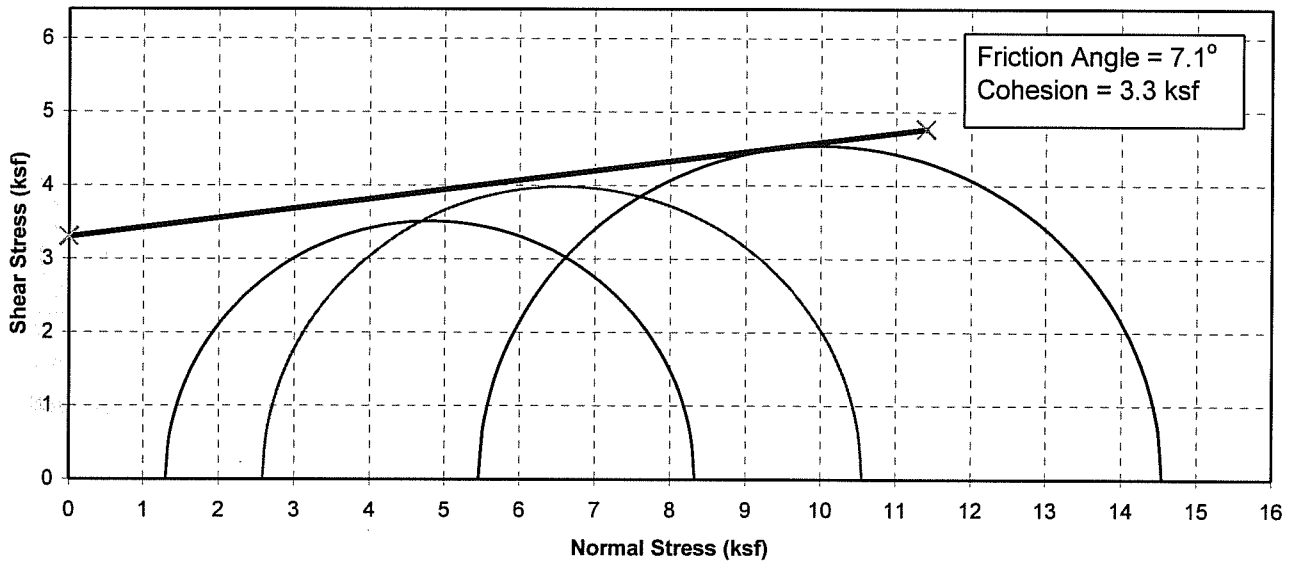



| Boring No. | Sample No. | Depth (ft) | Soil Type | Dry Density (pcf) | Moisture Content (%) | Conf. Stress (ksf) Cycle 1, 2, 3 | Max. Dev. Stress (ksf) Cycle 1, 2, 3 | Initial Saturation (%) |
|---|---|---|---|---|---|---|---|---|
| 04-16A | 4 | 10.00 | CL, Very Stiff Clay with Silt | 115.2 | 10.5 | 1.3<br>2.59<br>5.46 | 7.03,<br>7.97, 9.08 | 61.5 |

| | |
|---|---|
| **Earth Mechanics, Inc.**<br>Geotechnical and Earthquake Engineering | **Caltrans\UCSD \ Abutment Research** |
| **Project No. :** 02-155 **Date :** 08/26/04 | **UNCONSOLIDATED UNDRAINED TRIAXIAL TEST (ASTM D2850)** |

# UNCONSOLIDATED UNDRAINED TRIAXIAL TEST
ASTM D2850

| | | | | | |
|---|---|---|---|---|---|
| **Project Name:** | UCSD \ Abutment Research\Meloland Rd OC\Imperial | | | **Project No:** | 02-165 |
| **Boring No.:** | 04-17A | **Tested by:** | J.R. | **Date:** | 09/02/04 |
| **Depth (ft):** | 15 | **Checked by:** | | **Date:** | |
| **Sample No.** | 6 | **Sample Type:** | In-Situ | | |
| **Soil Description:** | **Brown,CL** | **Comments:** | | | |

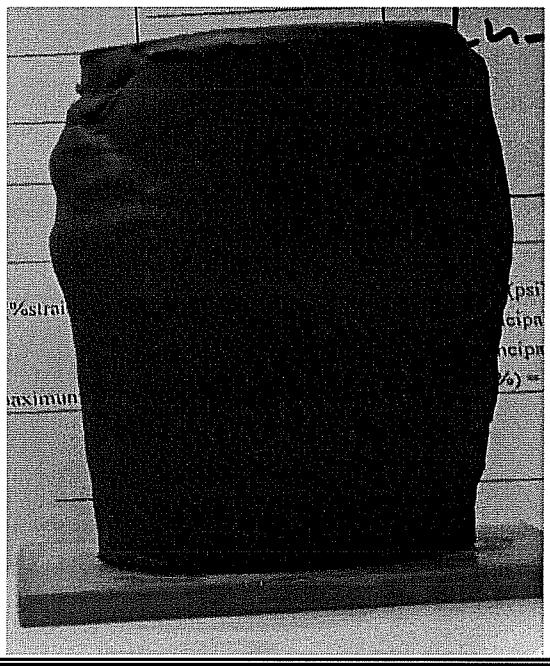
| | 1 | 2 | 3 | | |
|---|---|---|---|---|---|
| Diameter (in.): | 2.422 | 2.421 | 2.423 | Average: | 2.422 |
| Height (in.): | 5.060 | 5.090 | 5.100 | Average: | 5.083 |

| **Moisture Content Calculation** | |
|---|---|
| Wt. Wet Sample + Container (g) : | 93.46 |
| Wt. Dry Sample + Container (g) : | 80.63 |
| Container (g) : No. | 16.18 |
| Moisture Content (%) : | **16.6** |

| **Density and Saturation** | |
|---|---|
| Wt. Wet Sample + Container (g) : | |
| Container (g) : | |
| Wet Density (pcf) : | **122.4** |
| Dry Density (pcf) : | **105.0** |
| Void Ratio : | **0.605** |
| % Saturation : | **74.1** |

Gs=2.70 (assumed)

**SKETCH / PHOTO AFTER TEST:**



| **Shear** | |
|---|---|
| Cycle | **1, 2, 3** |
| Confining Stress (ksf) : | **1.87, 3.73, 7.49** |
| Deformation Rate (% / min) : | **4** |
| **Failure Criterion:** | |
| the maximum deviator stress | |

| **At Failure** | |
|---|---|
| Cycle | **1, 2, 3** |
| Deviator Stress (ksf) : | **5.52, 5.87, 6.09** |
| Eff. Minor Principal Stress (ksf) : | **1.87, 3.73, 7.49** |
| Eff. Major Principal Stress (ksf) : | **7.39, 9.6, 13.58** |
| Axial Strain (%) : | **8.6, 12.6, 17.6** |

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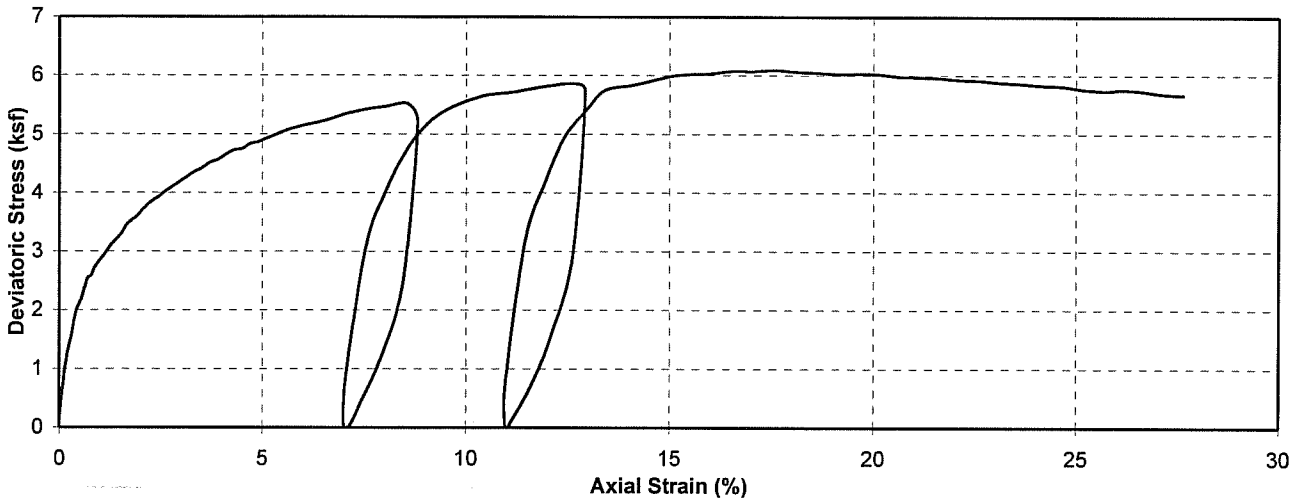


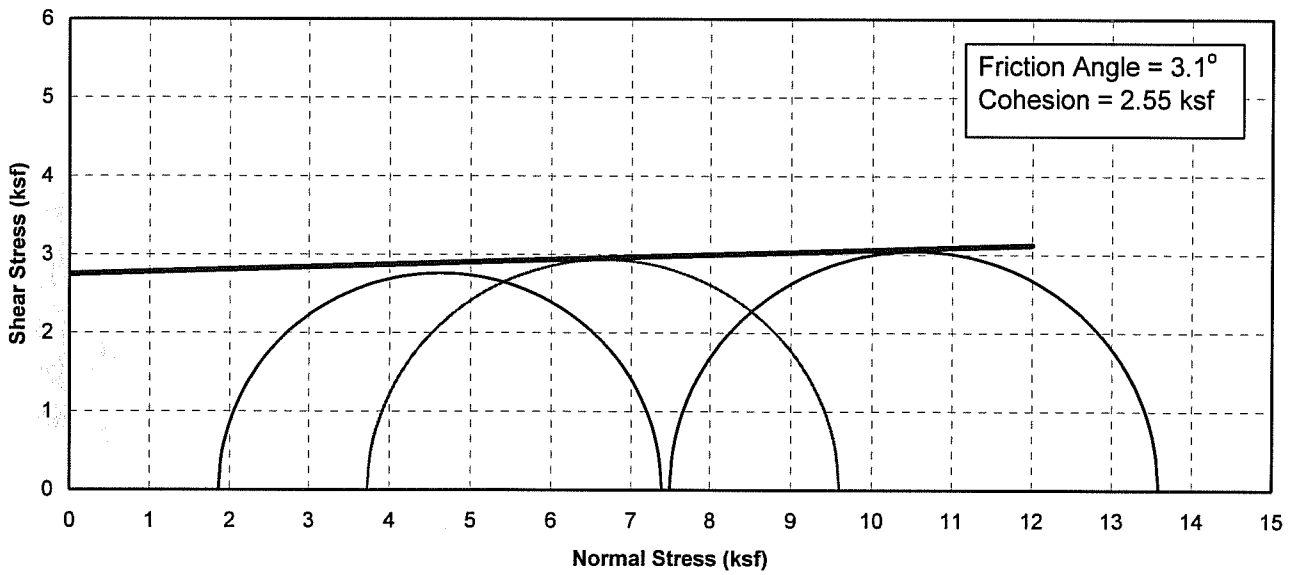


| Boring No. | Sample No. | Depth (ft) | Soil Type | Dry Density (pcf) | Moisture Content (%) | Conf. Stress (ksf) Cycle 1, 2, 3 | Max. Dev. Stress (ksf) Cycle 1, 2, 3 | Initial Saturation (%) |
|---|---|---|---|---|---|---|---|---|
| 04-17A | 6 | 15.00 | Brown,CL | 105.0 | 16.6 | 1.87<br>3.73<br>7.49 | 5.52<br>5.87<br>6.09 | 74.1 |

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**UNCONSOLIDATED UNDRAINED TRIAXIAL TEST (ASTM D2850)**

**Project No. :** 02-165 **Date :** 09/02/04

# UNCONSOLIDATED UNDRAINED TRIAXIAL TEST
ASTM D2850

| | | | | | |
|---|---|---|---|---|---|
| **Project Name:** | UCSD \ Abutment Research\Meloland Rd OC\Imperial Co. | | | **Project No:** | 02-165 |
| **Boring No.:** | 04-17A | **Tested by:** | J.R. | **Date:** | 11/04/04 |
| **Depth (ft):** | 2.5 | **Checked by:** | | **Date:** | 11/04/04 |
| **Sample No.** | Bulk, B-0 | **Sample Type:** | Bulk | | |
| **Soil Description:** | **SM** | **Comments:** | | | |

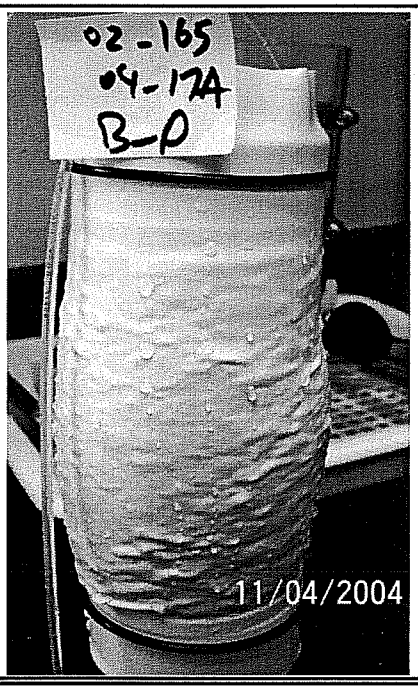
| | 1 | 2 | 3 | | |
|---|---|---|---|---|---|
| Diameter (in.): | 2.862 | 2.862 | 2.862 | Average: | 2.862 |
| Height (in.): | 5.750 | 5.750 | 5.750 | Average: | 5.750 |

| **Moisture Content Calculation** | |
|---|---|
| Wt. Wet Sample + Container (g) : | |
| Wt. Dry Sample + Container (g) : | |
| Container (g) : No. | |
| Moisture Content (%) : | **6.3** |

| **Density and Saturation** | |
|---|---|
| Wt. Wet Sample + Container (g) : | |
| Container (g) : | |
| Wet Density (pcf) : | **135.0** |
| Dry Density (pcf) : | **127.0** |
| Void Ratio : | **0.327** |
| % Saturation : | **52.1** |

Gs=2.70 (assumed)

**SKETCH / PHOTO AFTER TEST:**




| **Shear** | |
|---|---|
| Cycle | **1, 2, 3** |
| Confining Stress (ksf) : | **0.77, 1, 1.28** |
| Deformation Rate (% / min) : | **4** |
| **Failure Criterion:** | |
| the maximum deviator stress | |

| **At Failure** | |
|---|---|
| Cycle | **1, 2, 3** |
| Deviator Stress (ksf) : | **4.73, 5.35, 5.92** |
| Eff. Minor Principal Stress (ksf) : | **0.77, 1, 1.28** |
| Eff. Major Principal Stress (ksf) : | **5.5, 6.35, 7.2** |
| Axial Strain (%) : | **6.6, 9.1, 12.6** |

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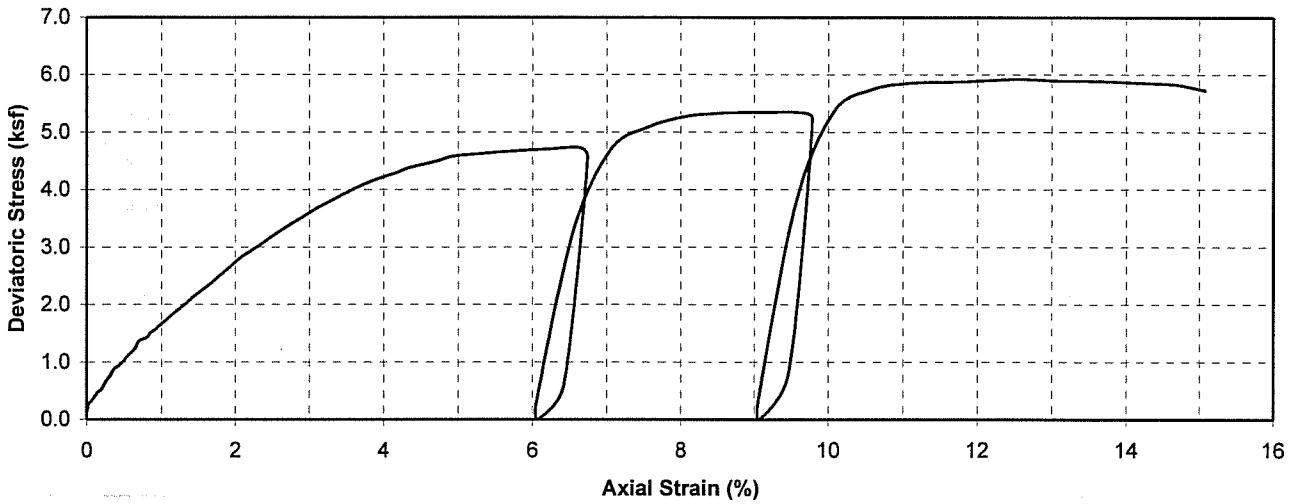
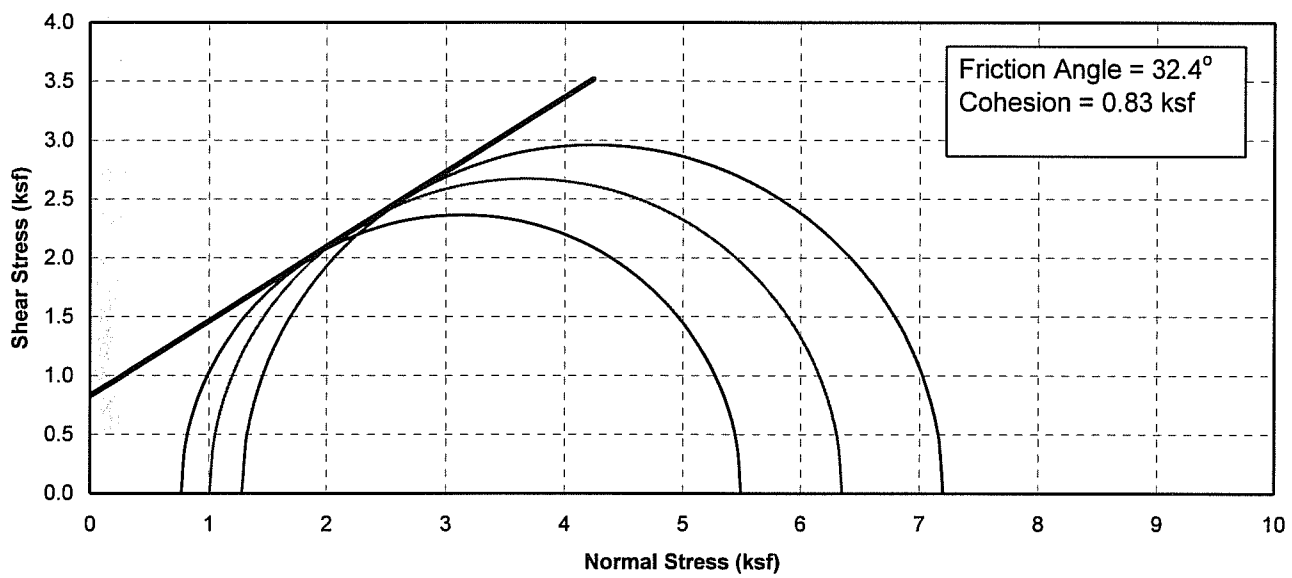



| Boring No. | Sample No. | Depth (ft) | Soil Type | Dry Density (pcf) | Moisture Content (%) | Conf. Stress (ksf) Cycle 1, 2, 3 | Max. Dev. Stress (ksf) Cycle 1, 2, 3 | Initial Saturation (%) |
|---|---|---|---|---|---|---|---|---|
| 04-17A | Bulk, B-0 | 2.50 | SM | 127.0 | 6.3 | 0.77<br>1<br>1.28 | 4.73,<br>5.35, 5.92 | 52.1 |

| | | |
|---|---|---|
| **Earth Mechanics, Inc.**<br>Geotechnical and Earthquake Engineering | | **Caltrans\UCSD \ Abutment Research** |
| **Project No. :** 02-165 | **Date :** 11/04/04 | **UNCONSOLIDATED UNDRAINED TRIAXIAL TEST (ASTM D2850)** |

# UNCONSOLIDATED UNDRAINED TRIAXIAL TEST

ASTM D2850

| | | | | | |
|---|---|---|---|---|---|
| **Project Name:** | UCSD \ Abutment Research\Meloland Rd OC\Imperial | | | **Project No:** | 02-165 |
| **Boring No.:** | 04-17A | **Tested by:** | J.R. | **Date:** | 11/05/04 |
| **Depth (ft):** | 2.5 | **Checked by:** | | **Date:** | 11/05/04 |
| **Sample No.** | B-0 | **Sample Type:** | Bulk | | |
| **Sample Description:** | SM | **Comments:** | | | |

| | 1 | 2 | 3 | | |
|---|---|---|---|---|---|
| Diameter (in.): | 2.862 | 2.862 | 2.862 | Average: | 2.862 |
| Height (in.): | 5.750 | 5.750 | 5.750 | Average: | 5.750 |

| **Moisture Content Calculation** | |
|---|---|
| Wt. Wet Sample + Container (gms): | |
| Wt. Dry Sample + Container (gms): | |
| Container (gms) No. | |
| Moisture Content (%) | **6.3** |

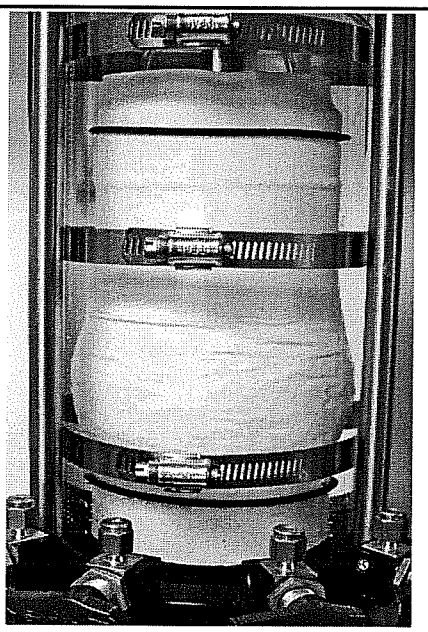
| **Density and Saturation** | |
|---|---|
| Wt. Wet Sample + Container (gms) | |
| Container (gms) | 229.06 |
| Wet Density (pcf) | **135.0** |
| Dry Density (pcf) | **127.0** |
| Void Ratio | **0.327** |
| % Saturation | **52.1** |

Assume Gs=2.70

| Test Data Filename: | 04-17A,B-0,Remold#2.trx |
|---|---|

**SKETCH / PHOTO AFTER TEST:**

PHOTO FILE NAME:



| **Shear** | |
|---|---|
| Rate of Deformation (% strain / min) = | **4** |
| Confining Stress (ksf): | **1.01** |

**Failure Criterion:** **criterion 1 is used**

1. the maximum deviator stress within 15% strain
2. the stress at 10% strain for no peak stress.

| **At Failure** | |
|---|---|
| Deviator Stress (ksf) | **4.33** |
| Eff. Minor Principal Stress (ksf)= | **1.01** |
| Eff. Major Principal Stress (ksf)= | **5.34** |
| Axial Strain (%)= | **14.34** |

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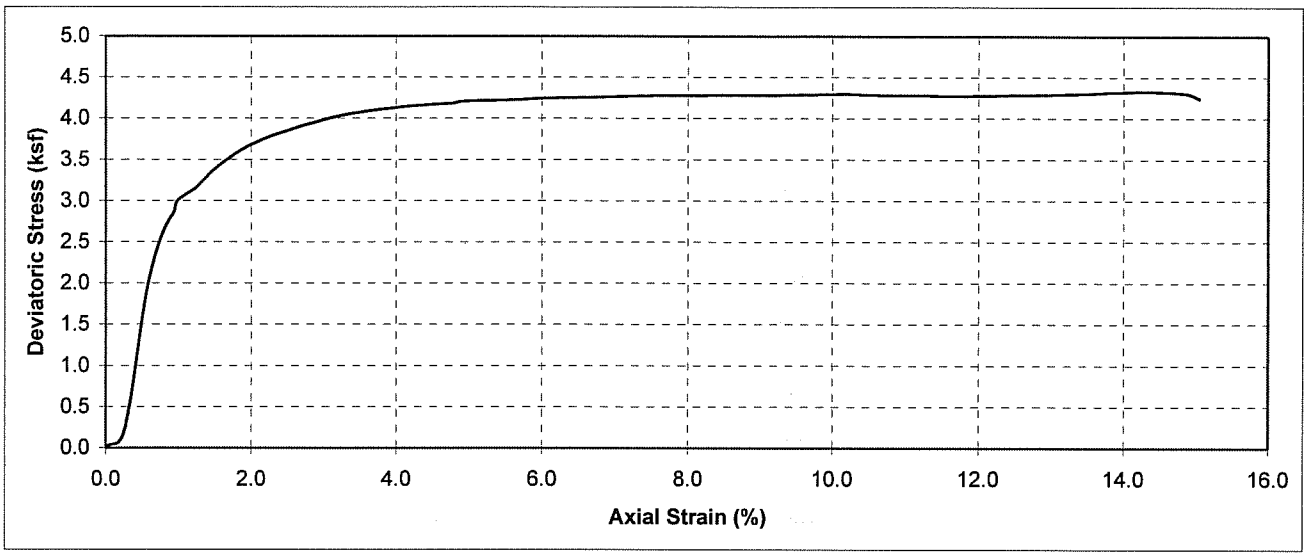
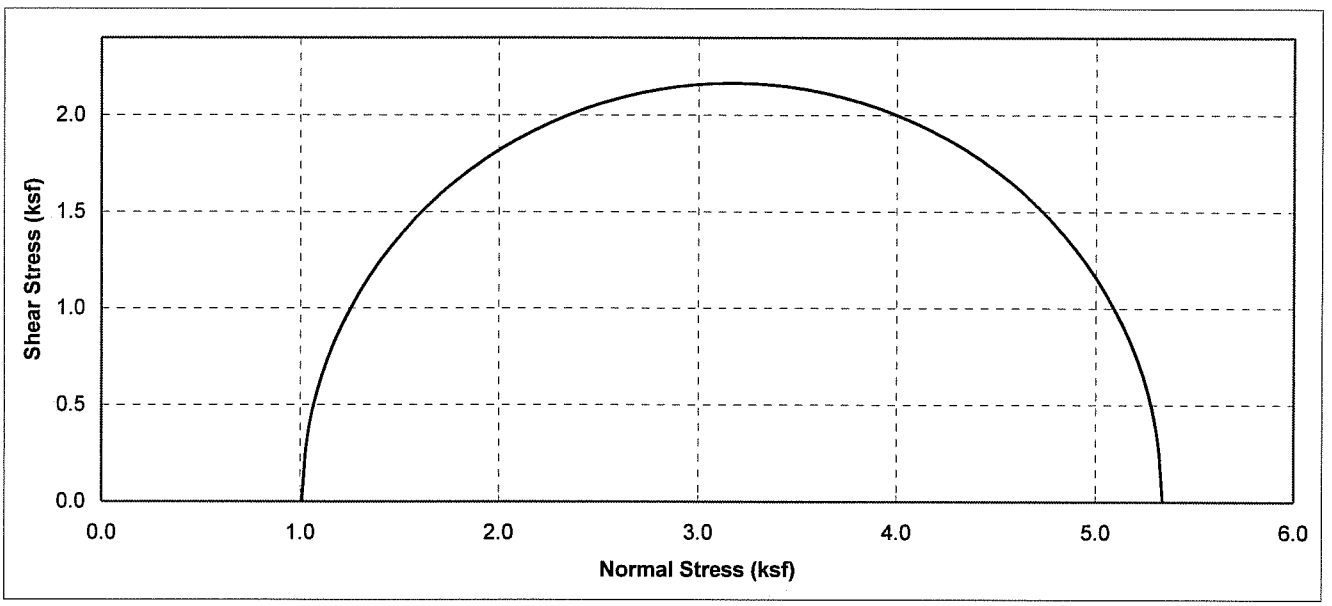



| Boring No. | Sample No. | Depth (ft) | Soil Type | Dry Density (pcf) | Moisture Content (%) | Conf. Stress (ksf) | Max. Dev. Stress (ksf) | Initial Saturation (%) |
|---|---|---|---|---|---|---|---|---|
| 04-17A | B-0 | 2.5 | SM | 127.0 | 6.30 | 1.01 | 4.33 | 52.1 |

| | |
|---|---|
| **Earth Mechanics, Inc.**<br>Geotechnical and Earthquake Engineering | **Caltrans\UCSD \ Abutment Research** |
| **Project No. :** 02-165 **Date :** 11/05/04 | **UNCONSOLIDATED UNDRAINED TEST**<br>**(ASTM D2850)** Figure No. : |

# UNCONSOLIDATED UNDRAINED TRIAXIAL TEST
ASTM D2850

| | | | | | |
|---|---|---|---|---|---|
| **Project Name:** | UCSD \ Abutment Research\Meloland Rd OC\Imperial | | | **Project No:** | 02-165 |
| **Boring No.:** | 04-17A | **Tested by:** | J.R. | **Date:** | 11/04/04 |
| **Depth (ft):** | 5 | **Checked by:** | | **Date:** | |
| **Sample No.** | B-0 | **Sample Type:** | R | | |
| **Sample Description:** | Silty Sand, SM | **Comments:** | | | |

| | 1 | 2 | 3 | | |
|---|---|---|---|---|---|
| Diameter (in.): | 2.862 | 2.862 | 2.862 | Average: | 2.862 |
| Height (in.): | 5.750 | 5.750 | 5.750 | Average: | 5.750 |

| **Moisture Content Calculation** | |
|---|---|
| Wt. Wet Sample + Container (gms): | |
| Wt. Dry Sample + Container (gms): | |
| Container (gms) No. | |
| Moisture Content (%) | **7.5** |

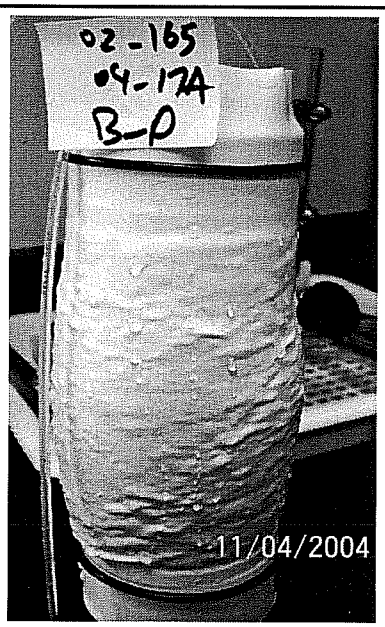
| **Density and Saturation** | |
|---|---|
| Wt. Wet Sample + Container (gms) | |
| Container (gms) | 229.06 |
| Wet Density (pcf) | **135.0** |
| Dry Density (pcf) | **127.0** |
| Void Ratio | **0.327** |
| % Saturation | **62.0** |

Assume Gs=2.70

| Test Data Filename: | 04-17A,B-0,Remold#3.trx |
|---|---|

**SKETCH / PHOTO AFTER TEST:**

PHOTO FILE NAME:



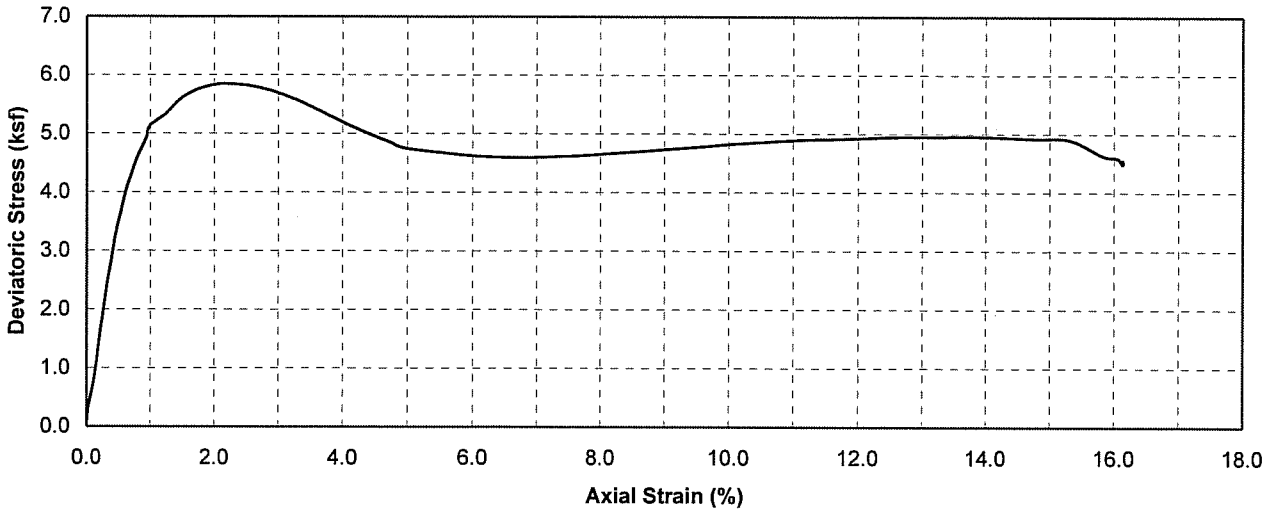

| **Shear** | |
|---|---|
| Rate of Deformation (% strain / min) = | **4** |
| Confining Stress (ksf): | **1.00** |

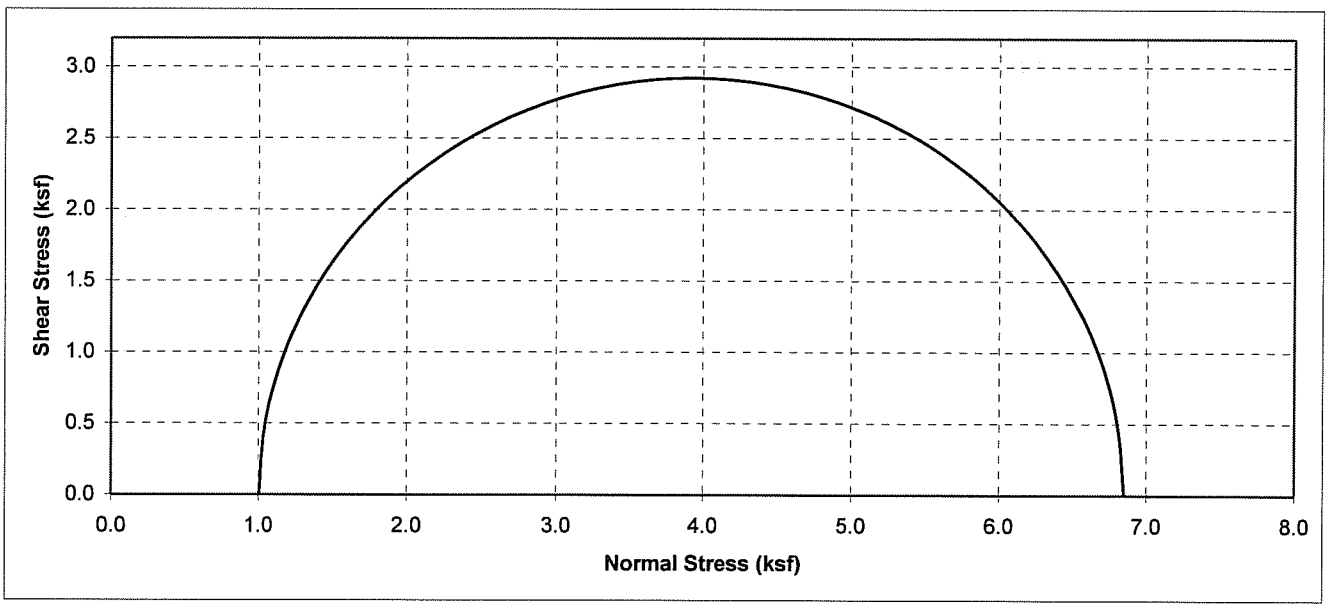
**Failure Criterion:** **criterion 1 is used**

1. the maximum deviator stress within 15% strain
2. the stress at 10% strain for no peak stress.

| **At Failure** | |
|---|---|
| Deviator Stress (ksf) | **5.85** |
| Eff. Minor Principal Stress (ksf)= | **1.00** |
| Eff. Major Principal Stress (ksf)= | **6.85** |
| Axial Strain (%)= | **2.28** |

**Earth Mechanics, Inc.**
Geotechnical and Earthquake Engineering




| Boring No. | Sample No. | Depth (ft) | Soil Type | Dry Density (pcf) | Moisture Content (%) | Conf. Stress (ksf) | Max. Dev. Stress (ksf) | Initial Saturation (%) |
|---|---|---|---|---|---|---|---|---|
| 04-17A | B-0 | 5 | Silty Sand, SM | 127.0 | 7.50 | 1.00 | 5.85 | 62.0 |

| | |
|---|---|
| **Earth Mechanics, Inc.**<br>Geotechnical and Earthquake Engineering | **Caltrans\UCSD \ Abutment Research** |
| **Project No. :** 02-165 **Date :** 11/04/04 | **UNCONSOLIDATED UNDRAINED TEST**<br>**(ASTM D2850)** Figure No. : |

# UNCONSOLIDATED UNDRAINED TRIAXIAL TEST
ASTM D2850

| | | | | | |
|---|---|---|---|---|---|
| **Project Name:** | UCSD \ Abutment Research\Meloland Rd OC\Imperial | | | **Project No:** | 02-165 |
| **Boring No.:** | 04-18A | **Tested by:** | J.R | **Date:** | 09/02/04 |
| **Depth (ft):** | 10 | **Checked by:** | | **Date:** | |
| **Sample No.** | 4 | **Sample Type:** | In-Situ | | |
| **Soil Description:** | **Brown, CL** | **Comments:** | | | |

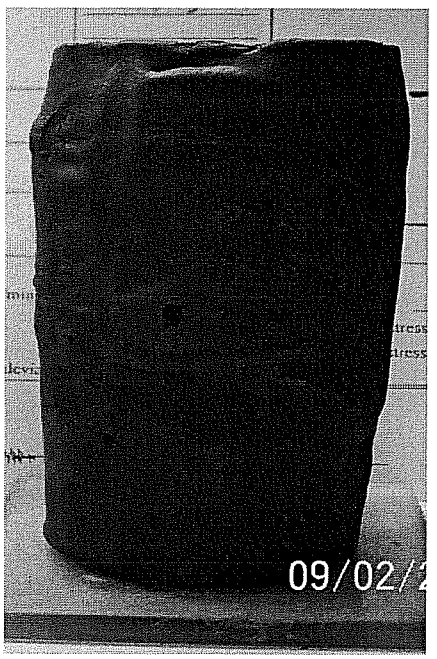
| | 1 | 2 | 3 | | |
|---|---|---|---|---|---|
| Diameter (in.): | 2.421 | 2.422 | 2.422 | Average: | 2.422 |
| Height (in.): | 5.060 | 5.080 | 5.060 | Average: | 5.067 |

| **Moisture Content Calculation** | |
|---|---|
| Wt. Wet Sample + Container (g) : | 145.23 |
| Wt. Dry Sample + Container (g) : | 116.8 |
| Container (g) : No. | 16.18 |
| Moisture Content (%) : | **22.0** |

| **Density and Saturation** | |
|---|---|
| Wt. Wet Sample + Container (g) : | |
| Container (g) : | |
| Wet Density (pcf) : | **114.3** |
| Dry Density (pcf) : | **93.7** |
| Void Ratio : | **0.799** |
| % Saturation : | **74.5** |

Gs=2.70 (assumed)

**SKETCH / PHOTO AFTER TEST:**




| **Shear** | |
|---|---|
| Cycle | **1, 2, 3** |
| Confining Stress (ksf) : | **1.15, 2.3, 4.6** |
| Deformation Rate (% / min) : | **4** |
| **Failure Criterion:** | |
| the maximum deviator stress | |

| **At Failure** | |
|---|---|
| Cycle | **1, 2, 3** |
| Deviator Stress (ksf) : | **1.35, 1.54, 1.8** |
| Eff. Minor Principal Stress (ksf) : | **1.15, 2.3, 4.6** |
| Eff. Major Principal Stress (ksf) : | **2.5, 3.84, 6.4** |
| Axial Strain (%) : | **6.6, 10, 18.4** |

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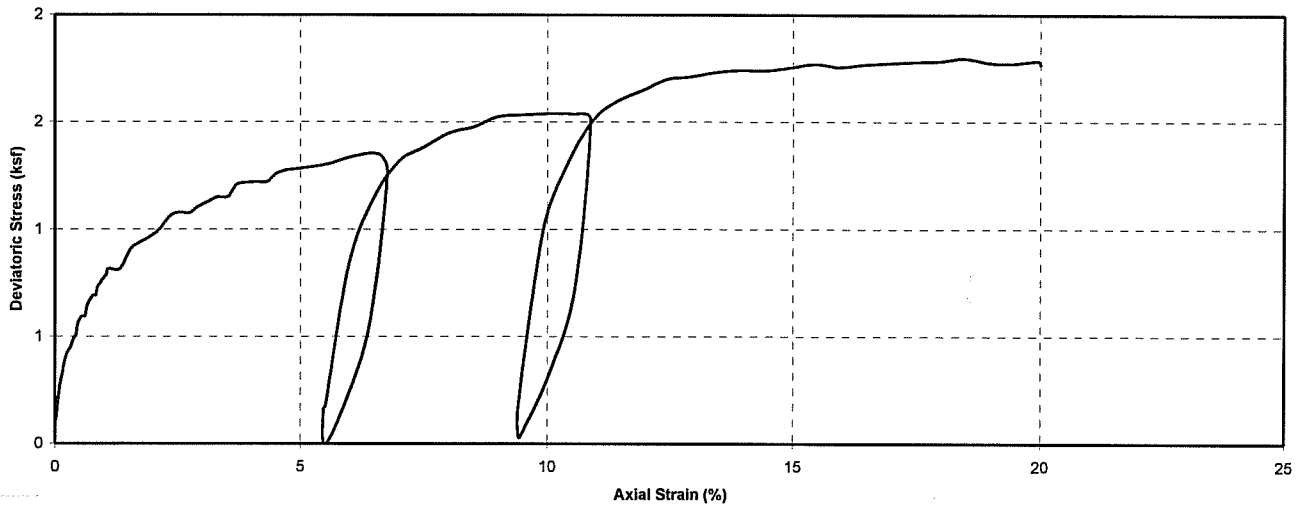
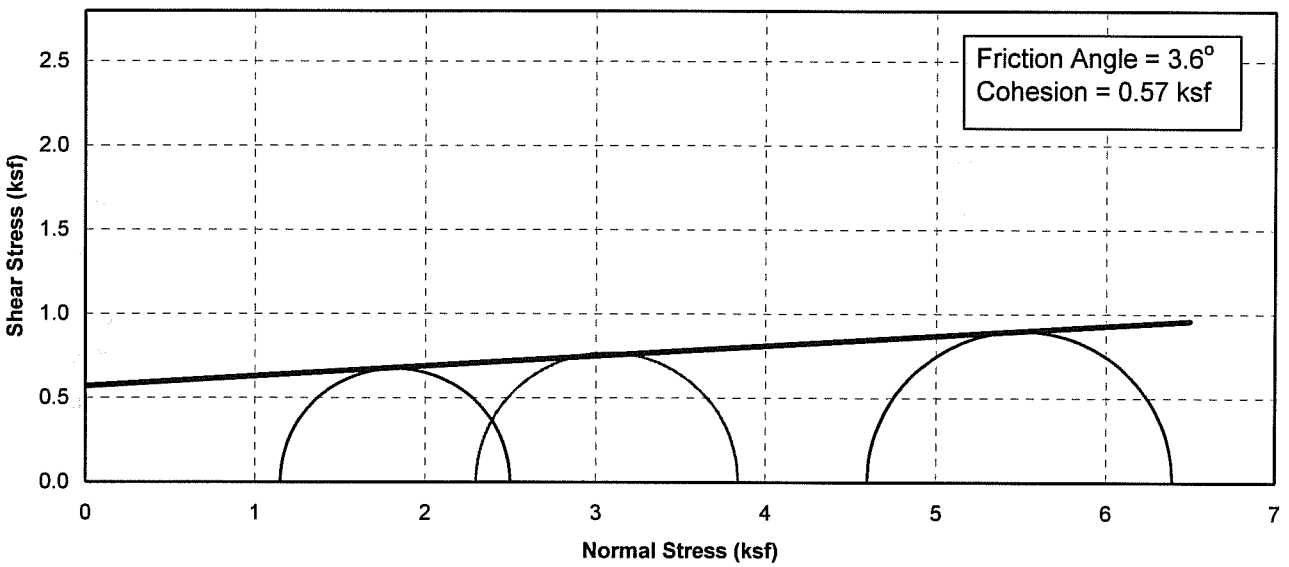



| Boring No. | Sample No. | Depth (ft) | Soil Type | Dry Density (pcf) | Moisture Content (%) | Conf. Stress (ksf) Cycle 1, 2, 3 | Max. Dev. Stress (ksf) Cycle 1, 2, 3 | Initial Saturation (%) |
|---|---|---|---|---|---|---|---|---|
| 04-18A | 4 | 10.00 | Brown, CL | 93.7 | 22.0 | 1.15<br>2.3<br>4.6 | 1.35<br>1.54<br>1.8 | 74.5 |

| | |
|---|---|
| **Earth Mechanics, Inc.**<br>Geotechnical and Earthquake Engineering | **Caltrans\UCSD \ Abutment Research** |
| **Project No. :** 02-165 **Date :** 09/02/04 | **UNCONSOLIDATED UNDRAINED TRIAXIAL TEST (ASTM D2850)** |

# UNCONSOLIDATED UNDRAINED TRIAXIAL TEST
ASTM D2850

| | | | | | |
|---|---|---|---|---|---|
| **Project Name:** | UCSD \ Abutment Research\Bridge#51-234\Santa Barbara Co. | | | **Project No:** | 02-165 |
| **Boring No.:** | 04-19 | **Tested by:** | J.R. | **Date:** | 11/10/04 |
| **Depth (ft):** | 5 | **Checked by:** | | **Date:** | |
| **Sample No.** | B-0 | **Sample Type:** | Bulk | | |
| **Soil Description:** | **SP/SM** | **Comments:** | | | |

| | 1 | 2 | 3 | | |
|---|---|---|---|---|---|
| Diameter (in.): | 2.862 | 2.862 | 2.862 | Average: | 2.862 |
| Height (in.): | 5.750 | 5.750 | 5.750 | Average: | 5.750 |

| **Moisture Content Calculation** | |
|---|---|
| Wt. Wet Sample + Container (g) : | |
| Wt. Dry Sample + Container (g) : | |
| Container (g) : No. | |
| Moisture Content (%) : | **6.5** |

| **Density and Saturation** | |
|---|---|
| Wt. Wet Sample + Container (g) : | |
| Container (g) : | |
| Wet Density (pcf) : | **109.7** |
| Dry Density (pcf) : | **103.0** |
| Void Ratio : | **0.636** |
| % Saturation : | **27.6** |

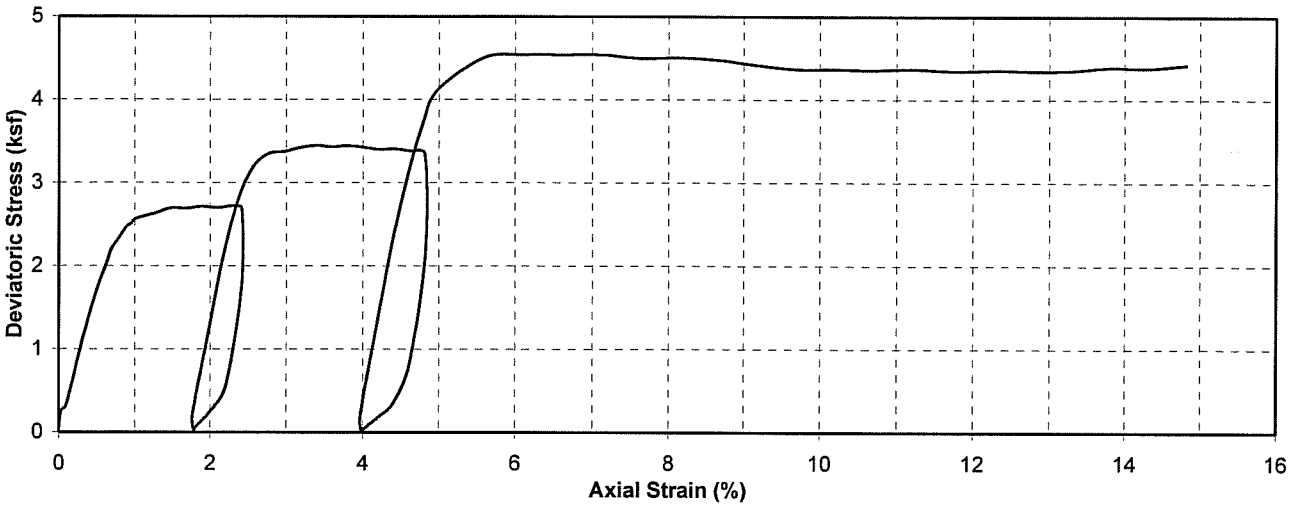
Gs=2.70 (assumed)

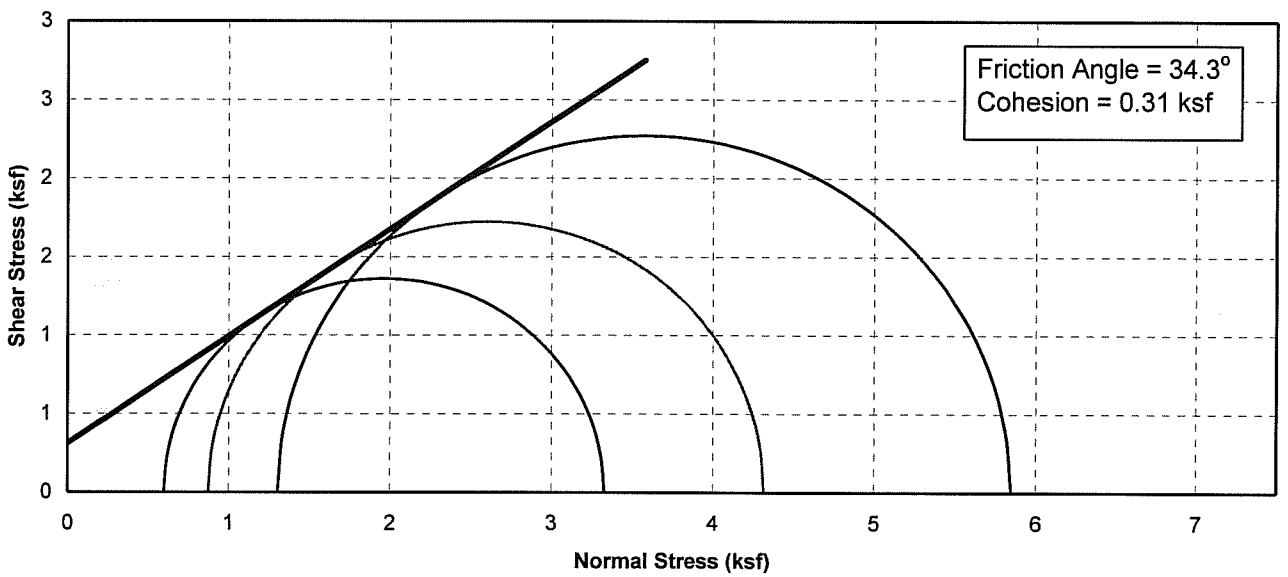
**SKETCH / PHOTO AFTER TEST:**

| **Shear** | |
|---|---|
| Cycle | **1, 2, 3** |
| Confining Stress (ksf) : | **0.6, 0.87, 1.31** |
| Deformation Rate (% / min) : | **4** |
| **Failure Criterion:** the maximum deviator stress | |

| **At Failure** | |
|---|---|
| Cycle | **1, 2, 3** |
| Deviator Stress (ksf) : | **2.72, 3.45, 4.54** |
| Eff. Minor Principal Stress (ksf) : | **0.6, 0.87, 1.31** |
| Eff. Major Principal Stress (ksf) : | **3.32, 4.32, 5.85** |
| Axial Strain (%) : | **2.3, 3.4, 6.1** |

**Earth Mechanics, Inc.**
Geotechnical and Earthquake Engineering




| Boring No. | Sample No. | Depth (ft) | Soil Type | Dry Density (pcf) | Moisture Content (%) | Conf. Stress (ksf) Cycle 1, 2, 3 | Max. Dev. Stress (ksf) Cycle 1, 2, 3 | Initial Saturation (%) |
|---|---|---|---|---|---|---|---|---|
| 04-19 | B-0 | 5.00 | SP/SM | 103.0 | 6.5 | 0.6, 0.87, 1.31 | 2.72, 3.45, 4.54 | 27.6 |

| | |
|---|---|
| **Earth Mechanics, Inc.**<br>Geotechnical and Earthquake Engineering | **Caltrans\UCSD \ Abutment Research** |
| **Project No. :** 02-165 **Date :** 11/10/04 | **UNCONSOLIDATED UNDRAINED TRIAXIAL TEST (ASTM D2850)** |

# UNCONSOLIDATED UNDRAINED TRIAXIAL TEST
ASTM D2850

| | | | | | |
|---|---|---|---|---|---|
| **Project Name:** | UCSD \ Abutment Research\Jackson, Riverside Co. | | | **Project No:** | 02-165 |
| **Boring No.:** | 04-21 | **Tested by:** | J.R. | **Date:** | 11/10/04 |
| **Depth (ft):** | 10 | **Checked by:** | | **Date:** | |
| **Sample No.** | B-0 | **Sample Type:** | Bulk | | |
| **Soil Description:** | **SM** | **Comments:** | | | |

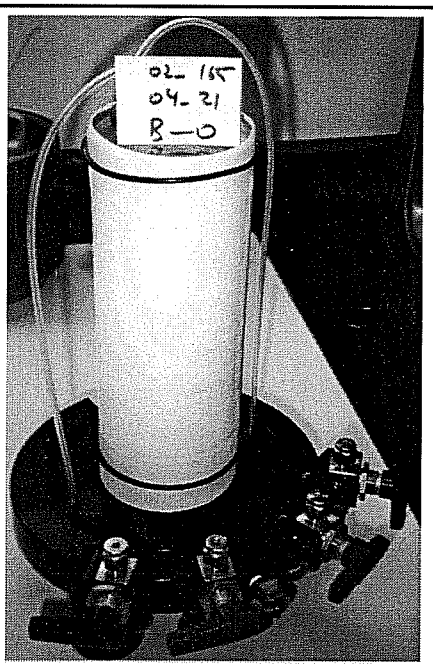
| | 1 | 2 | 3 | | |
|---|---|---|---|---|---|
| Diameter (in.): | 2.862 | 2.862 | 2.862 | Average: | 2.862 |
| Height (in.): | 5.750 | 5.750 | 5.750 | Average: | 5.750 |

| **Moisture Content Calculation** | |
|---|---|
| Wt. Wet Sample + Container (g) : | |
| Wt. Dry Sample + Container (g) : | |
| Container (g) : No. | |
| Moisture Content (%) : | **7.2** |

| **Density and Saturation** | |
|---|---|
| Wt. Wet Sample + Container (g) : | |
| Container (g) : | |
| Wet Density (pcf) : | **129.4** |
| Dry Density (pcf) : | **120.7** |
| Void Ratio : | **0.396** |
| % Saturation : | **49.1** |

Gs=2.70 (assumed)

**SKETCH / PHOTO AFTER TEST:**




| **Shear** | |
|---|---|
| Cycle | **1, 2, 3** |
| Confining Stress (ksf) : | **0.72, 1.03, 1.55** |
| Deformation Rate (% / min) : | **4** |
| **Failure Criterion:** | |
| the maximum deviator stress | |

| **At Failure** | |
|---|---|
| Cycle | **1, 2, 3** |
| Deviator Stress (ksf) : | **3.29, 3.99, 5.25** |
| Eff. Minor Principal Stress (ksf) : | **0.72, 1.03, 1.55** |
| Eff. Major Principal Stress (ksf) : | **4, 5.02, 6.8** |
| Axial Strain (%) : | **2.3, 4.7, 7.7** |

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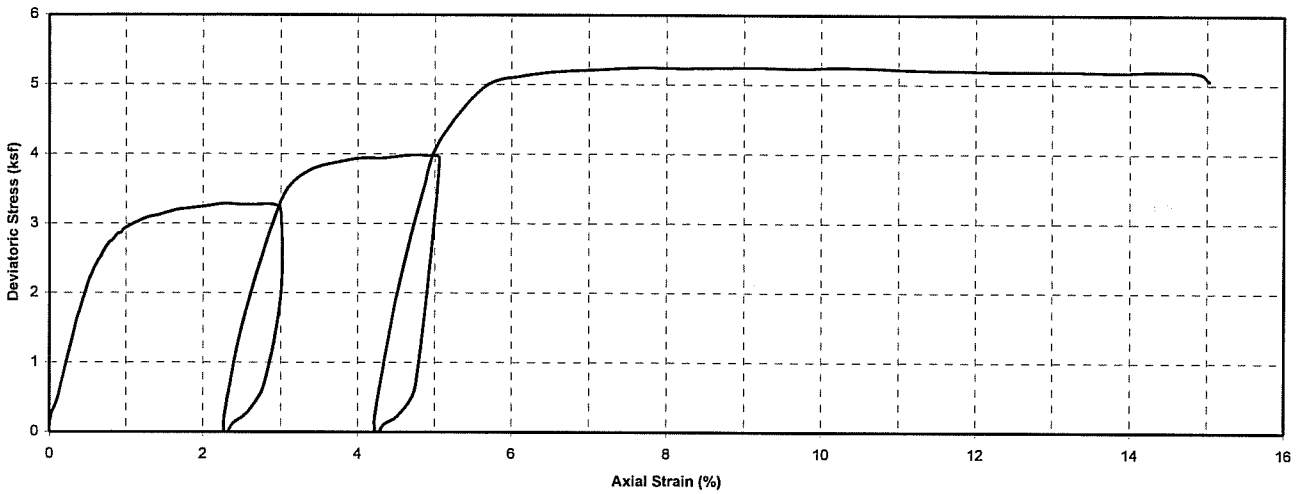
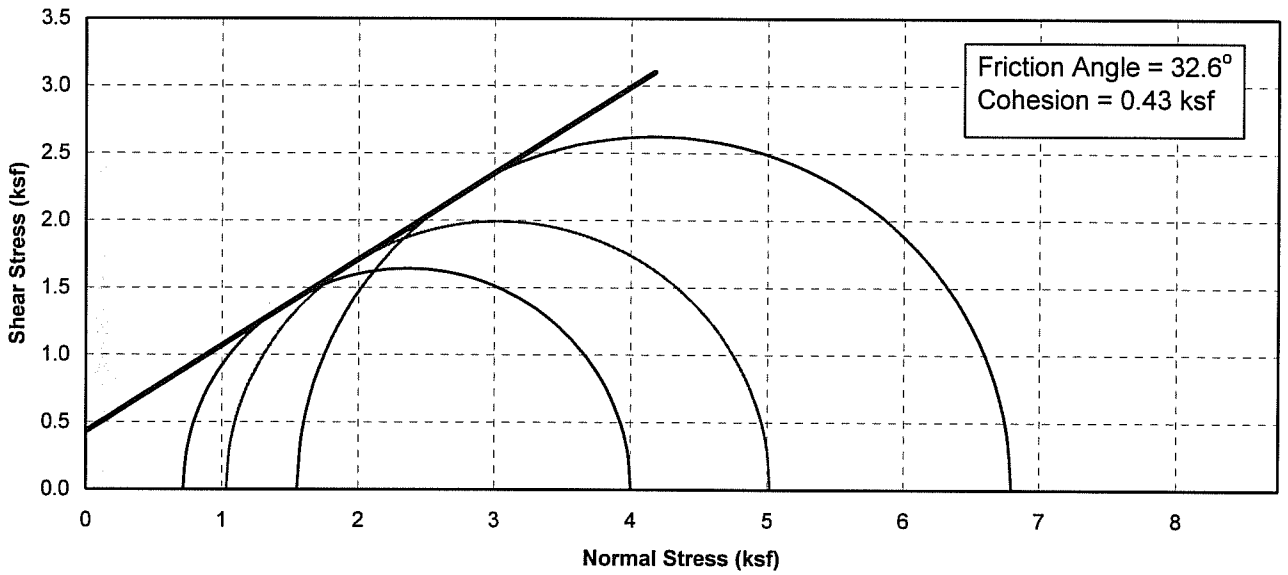



| Boring No. | Sample No. | Depth (ft) | Soil Type | Dry Density (pcf) | Moisture Content (%) | Conf. Stress (ksf) Cycle 1, 2, 3 | Max. Dev. Stress (ksf) Cycle 1, 2, 3 | Initial Saturation (%) |
|---|---|---|---|---|---|---|---|---|
| 04-21 | B-0 | 10.00 | SM | 120.7 | 7.2 | 0.72, 1.03, 1.55 | 3.29, 3.99, 5.25 | 49.1 |

| | |
|---|---|
| **Earth Mechanics, Inc.**<br>Geotechnical and Earthquake Engineering | **Caltrans\UCSD \ Abutment Research** |
| **Project No. :** 02-165 **Date :** 11/10/04 | **UNCONSOLIDATED UNDRAINED TRIAXIAL TEST (ASTM D2850)** |

# UNCONSOLIDATED UNDRAINED TRIAXIAL TEST
ASTM D2850

| | | | | | |
|---|---|---|---|---|---|
| **Project Name:** | UCSD \ Abutment Research\Santa Clara River Bridge | | | **Project No:** | 02-165 |
| **Boring No.:** | 04-22 | **Tested by:** | J.R. | **Date:** | 11/09/04 |
| **Depth (ft):** | 0-5 | **Checked by:** | | **Date:** | |
| **Sample No.** | B-0 | **Sample Type:** | Bulk | | |
| **Soil Description:** | **SW-SM** | **Comments:** | | | |

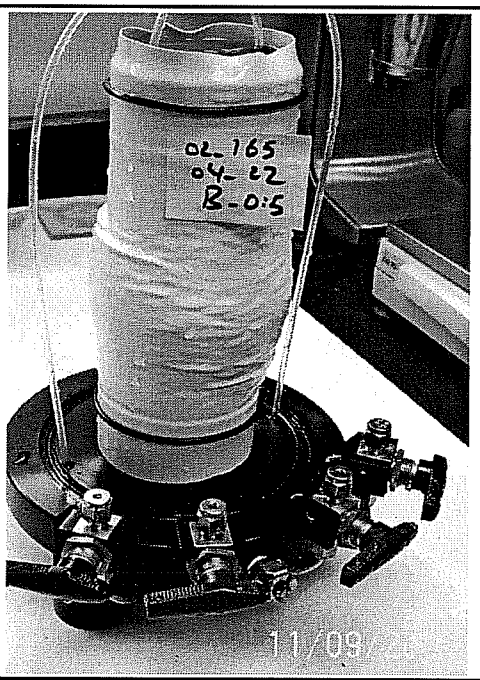
| | 1 | 2 | 3 | | |
|---|---|---|---|---|---|
| Diameter (in.): | 2.862 | 2.862 | 2.862 | Average: | 2.862 |
| Height (in.): | 5.750 | 5.750 | 5.750 | Average: | 5.750 |

| **Moisture Content Calculation** | |
|---|---|
| Wt. Wet Sample + Container (g) : | |
| Wt. Dry Sample + Container (g) : | |
| Container (g) : No. | |
| Moisture Content (%) : | **6.5** |

| **Density and Saturation** | |
|---|---|
| Wt. Wet Sample + Container (g) : | |
| Container (g) : | |
| Wet Density (pcf) : | **132.6** |
| Dry Density (pcf) : | **124.5** |
| Void Ratio : | **0.353** |
| % Saturation : | **49.7** |

Gs=2.70 (assumed)

**SKETCH / PHOTO AFTER TEST:**




| **Shear** | |
|---|---|
| Cycle | **1, 2, 3** |
| Confining Stress (ksf) : | **0.75, 1, 1.25** |
| Deformation Rate (% / min) : | **4** |
| **Failure Criterion:** the maximum deviator stress | |

| **At Failure** | |
|---|---|
| Cycle | **1, 2, 3** |
| Deviator Stress (ksf) : | **5.39, 5.64, 6.08** |
| Eff. Minor Principal Stress (ksf) : | **0.75, 1, 1.25** |
| Eff. Major Principal Stress (ksf) : | **6.14, 6.64, 7.33** |
| Axial Strain (%) : | **4.5, 6.1, 8.7** |

**Earth Mechanics, Inc.**
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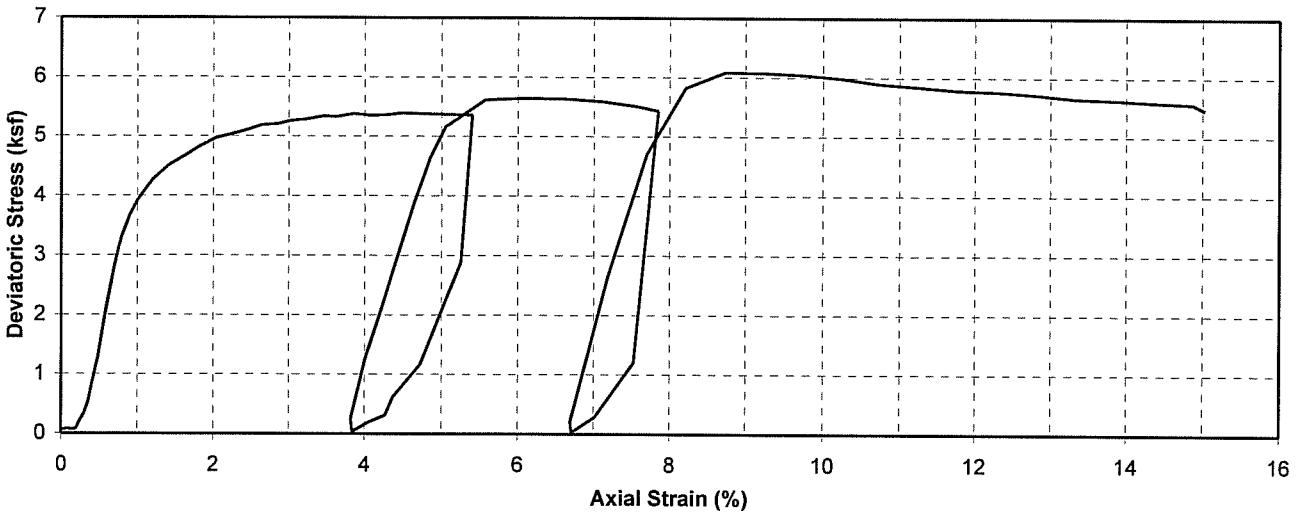
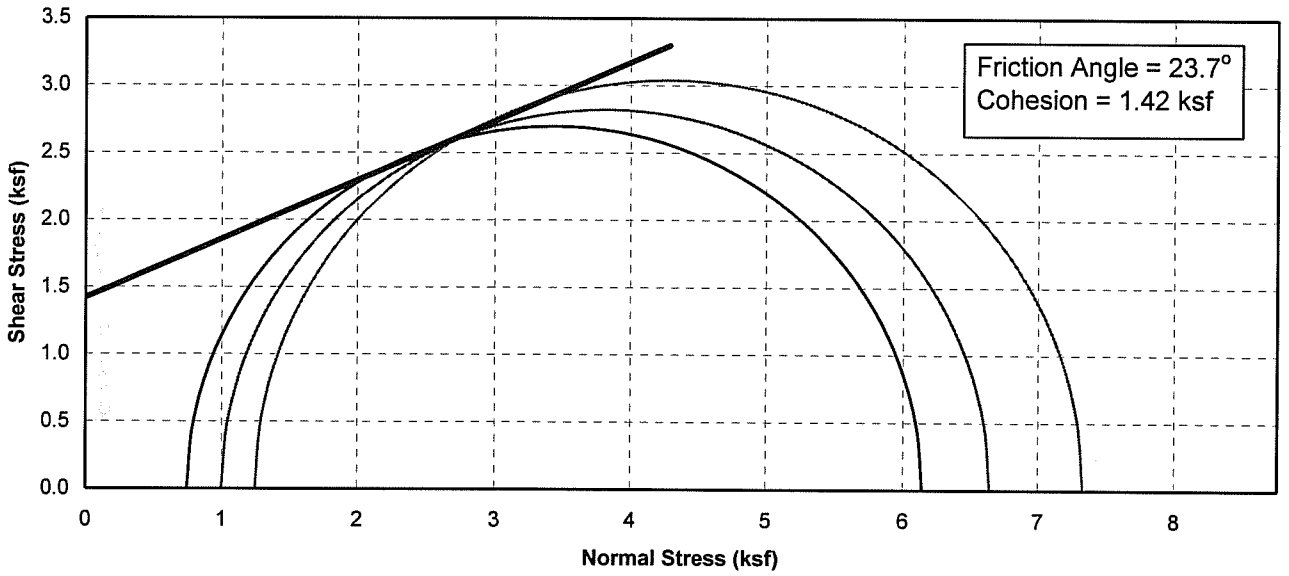



| Boring No. | Sample No. | Depth (ft) | Soil Type | Dry Density (pcf) | Moisture Content (%) | Conf. Stress (ksf) Cycle 1, 2, 3 | Max. Dev. Stress (ksf) Cycle 1, 2, 3 | Initial Saturation (%) |
|---|---|---|---|---|---|---|---|---|
| 04-22 | B-0 | 0-5.00 | SW-SM | 124.5 | 6.5 | 0.75<br>1<br>1.25 | 5.39,<br>5.64, 6.08 | 49.7 |

**Earth Mechanics, Inc.**
Geotechnical and Earthquake Engineering

**Caltrans\UCSD \ Abutment Research**

**UNCONSOLIDATED UNDRAINED TRIAXIAL TEST (ASTM D2850)**

**Project No. :** 02-165 **Date :** 11/09/04

# UNCONSOLIDATED UNDRAINED TRIAXIAL TEST
ASTM D2850

| | | | | | |
|---|---|---|---|---|---|
| **Project Name:** | UCSD \ Abutment Research\Maple Ave UC, Fresno Co. | | | **Project No:** | 02-165 |
| **Boring No.:** | 04-25 | **Tested by:** | J.R. | **Date:** | 11/12/04 |
| **Depth (ft):** | 10 | **Checked by:** | | **Date:** | |
| **Sample No.** | B-0 | **Sample Type:** | Bulk | | |
| **Soil Description:** | **SM w/gravel** | **Comments:** | | | |

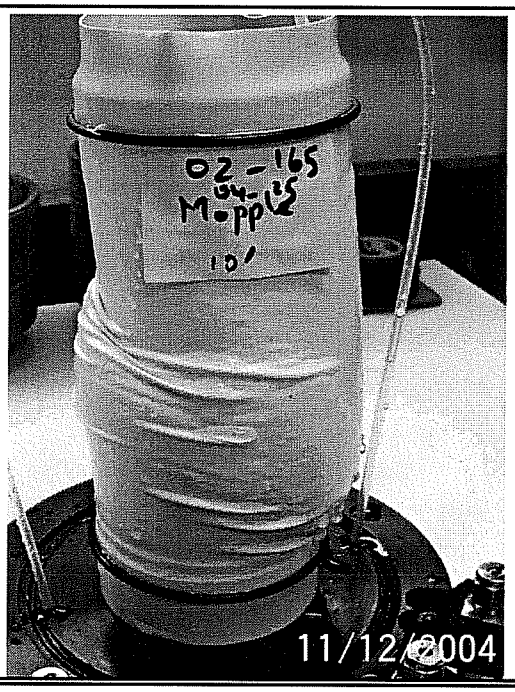
| | 1 | 2 | 3 | | |
|---|---|---|---|---|---|
| Diameter (in.): | 2.862 | 2.862 | 2.862 | Average: | 2.862 |
| Height (in.): | 5.750 | 5.750 | 5.750 | Average: | 5.750 |

| **Moisture Content Calculation** | |
|---|---|
| Wt. Wet Sample + Container (g) : | |
| Wt. Dry Sample + Container (g) : | |
| Container (g) : No. | |
| Moisture Content (%) : | **7.5** |

| **Density and Saturation** | |
|---|---|
| Wt. Wet Sample + Container (g) : | |
| Container (g) : | |
| Wet Density (pcf) : | **129.8** |
| Dry Density (pcf) : | **120.7** |
| Void Ratio : | **0.396** |
| % Saturation : | **51.2** |

Gs=2.70 (assumed)

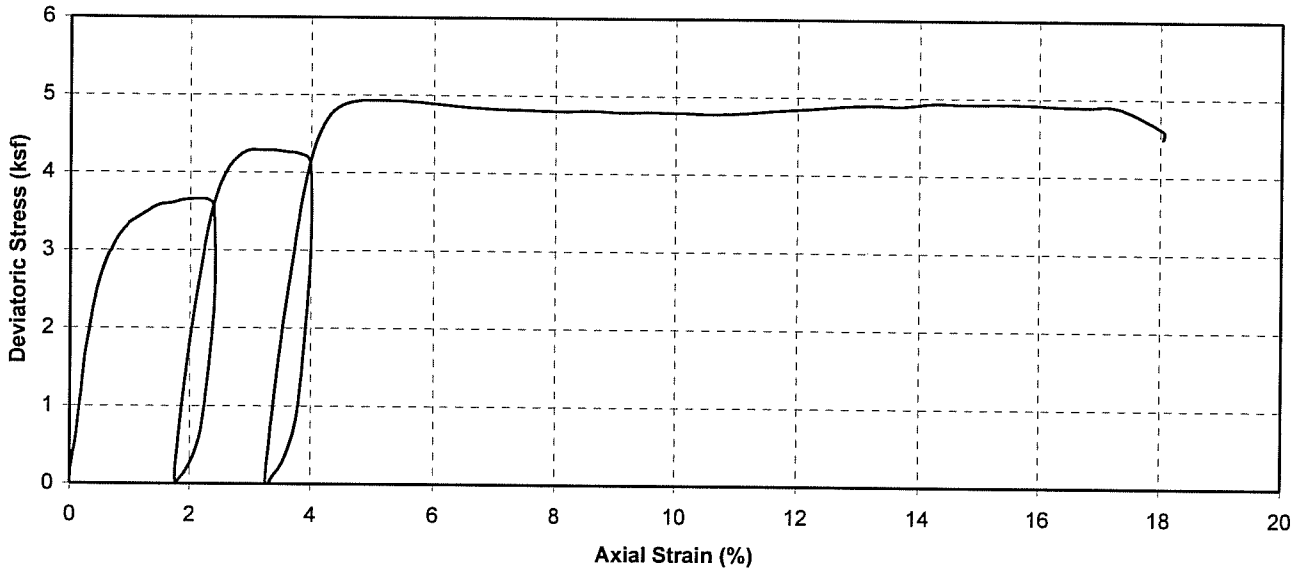
**SKETCH / PHOTO AFTER TEST:**

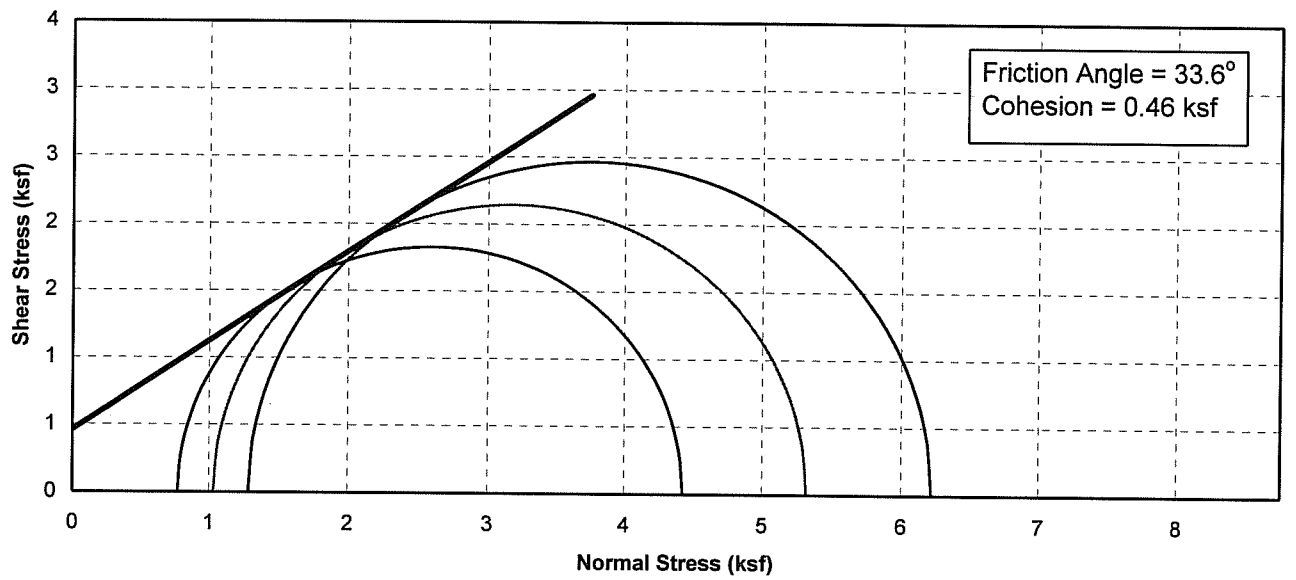



| **Shear** | |
|---|---|
| Cycle | **1, 2, 3** |
| Confining Stress (ksf) : | **0.77, 1.03, 1.29** |
| Deformation Rate (% / min) : | **4** |
| **Failure Criterion:** the maximum deviator stress | |

| **At Failure** | |
|---|---|
| Cycle | **1, 2, 3** |
| Deviator Stress (ksf) : | **3.66, 4.29, 4.93** |
| Eff. Minor Principal Stress (ksf) : | **0.77, 1.03, 1.29** |
| Eff. Major Principal Stress (ksf) : | **4.43, 5.32, 6.22** |
| Axial Strain (%) : | **2.1, 3.2, 14.2** |

**Earth Mechanics, Inc.**
Geotechnical and Earthquake Engineering




| Boring No. | Sample No. | Depth (ft) | Soil Type | Dry Density (pcf) | Moisture Content (%) | Conf. Stress (ksf) Cycle 1, 2, 3 | Max. Dev. Stress (ksf) Cycle 1, 2, 3 | Initial Saturation (%) |
|---|---|---|---|---|---|---|---|---|
| 04-25 | B-0 | 10.00 | SM w/gravel | 120.7 | 7.5 | 0.77<br>1.03<br>1.29 | 3.66,<br>4.29, 4.93 | 51.2 |

**Earth Mechanics, Inc.**
Geotechnical and Earthquake Engineering

**Caltrans\UCSD \ Abutment Research**

**UNCONSOLIDATED UNDRAINED TRIAXIAL TEST (ASTM D2850)**

**Project No. :** 02-165 **Date :** 11/12/04

# UNCONSOLIDATED UNDRAINED TRIAXIAL TEST
ASTM D2850

| | | | | | |
|---|---|---|---|---|---|
| **Project Name:** | UCSD \ Abutment Research\Maple Ave UC, Fresno Co. | | | **Project No:** | 02-165 |
| **Boring No.:** | 04-25 | **Tested by:** | J.R. | **Date:** | 11/12/04 |
| **Depth (ft):** | 10 | **Checked by:** | | **Date:** | |
| **Sample No.** | B-0 | **Sample Type:** | Bulk | | |
| **Sample Description:** | SM | **Comments:** | | | |

| | 1 | 2 | 3 | | |
|---|---|---|---|---|---|
| Diameter (in.): | 2.862 | 2.862 | 2.862 | Average: | 2.862 |
| Height (in.): | 5.750 | 5.750 | 5.750 | Average: | 5.750 |

| **Moisture Content Calculation** | |
|---|---|
| Wt. Wet Sample + Container (gms): | |
| Wt. Dry Sample + Container (gms): | |
| Container (gms) No. | |
| Moisture Content (%) | **7.5** |

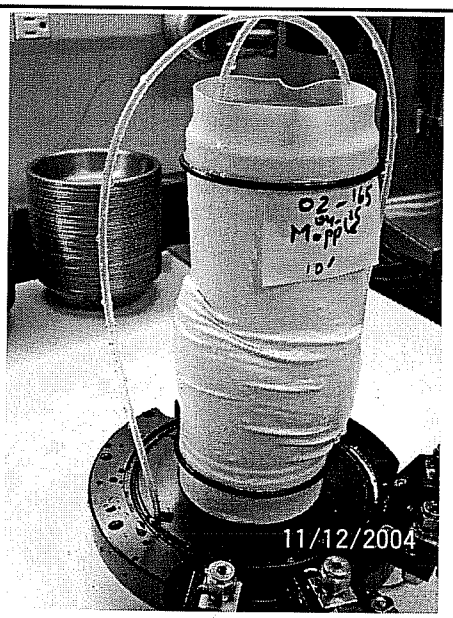
| **Density and Saturation** | |
|---|---|
| Wt. Wet Sample + Container (gms) | |
| Container (gms) | 229.06 |
| Wet Density (pcf) | **129.8** |
| Dry Density (pcf) | **120.7** |
| Void Ratio | **0.395** |
| % Saturation | **51.2** |

Assume Gs=2.70

| Test Data Filename: | 04-25,B-0,Remold#2.trx |
|---|---|

**SKETCH / PHOTO AFTER TEST:**

PHOTO FILE NAME:



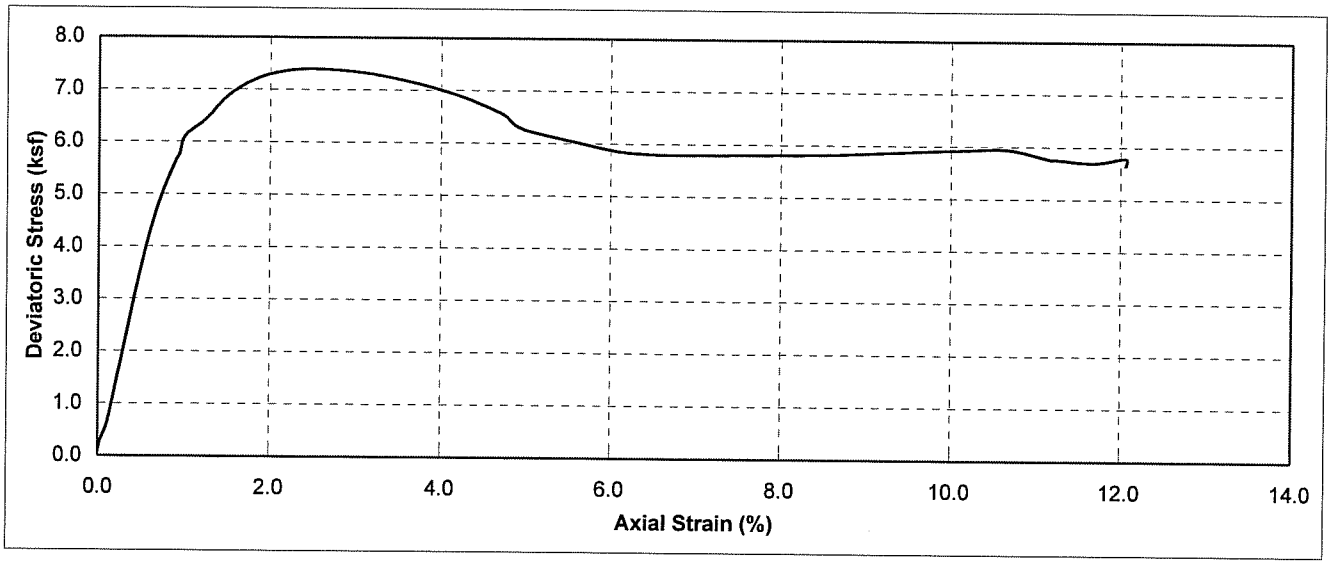

| **Shear** | |
|---|---|
| Rate of Deformation (% strain / min) = | **4** |
| Confining Stress (ksf): | **0.77** |

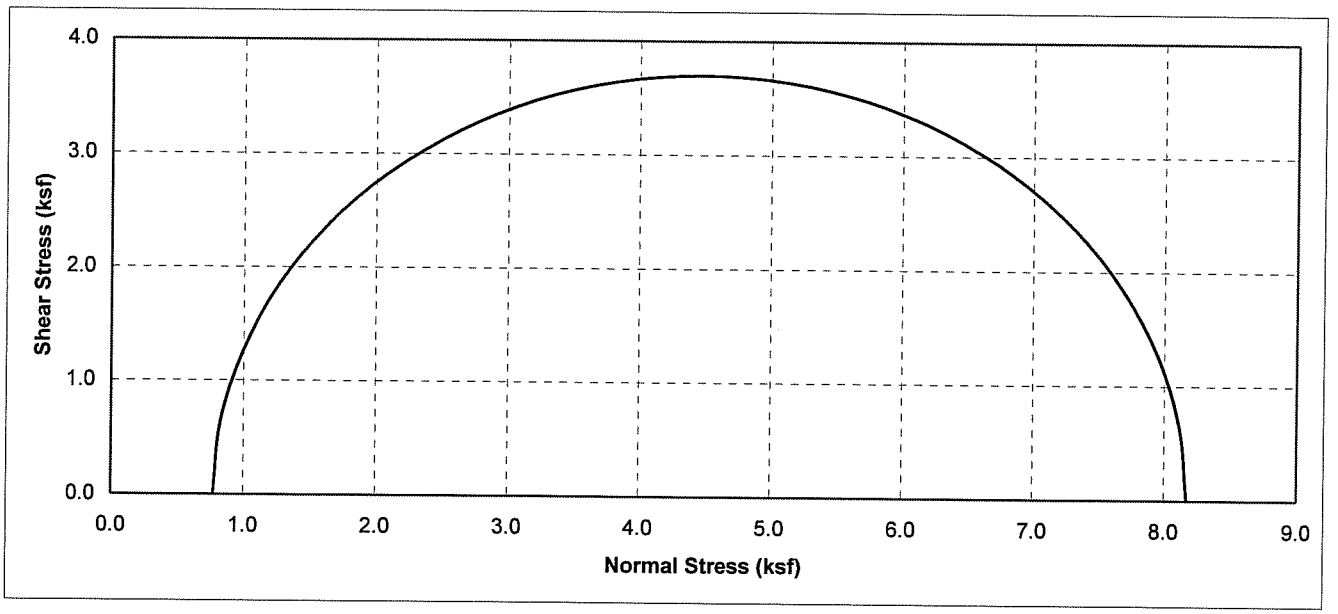
**Failure Criterion:** **criterion 1 is used**

1. the maximum deviator stress within 15% strain
2. the stress at 10% strain for no peak stress.

| **At Failure** | |
|---|---|
| Deviator Stress (ksf) | **7.40** |
| Eff. Minor Principal Stress (ksf)= | **0.77** |
| Eff. Major Principal Stress (ksf)= | **8.17** |
| Axial Strain (%)= | **2.49** |

**Earth Mechanics, Inc.**
Geotechnical and Earthquake Engineering




| Boring No. | Sample No. | Depth (ft) | Soil Type | Dry Density (pcf) | Moisture Content (%) | Conf. Stress (ksf) | Max. Dev. Stress (ksf) | Initial Saturation (%) |
|---|---|---|---|---|---|---|---|---|
| 04-25 | B-0 | 10 | Maple Bridge Abutment "sm" | 120.7 | 7.50 | 0.77 | 7.40 | 51.2 |

| | |
|---|---|
| **Earth Mechanics, Inc.** Geotechnical and Earthquake Engineering | **Caltrans\UCSD \ Abutment Research** |
| **Project No. :** 02-165 **Date :** 11/12/04 | **UNCONSOLIDATED UNDRAINED TEST** **(ASTM D2850)** **Figure No. :** |