FOR CONTRACT NO.: **11-2T0404**

INFORMATION HANDOUT

CITY OF SAN DIEGO
WATER AVAILABILITY LETTER

MATERIALS INFORMATION

MATERIALS INFORMATION BROCHURE

AGREEMENTS

CALIFORNIA COASTAL COMISSION – COASTAL DEVELOPMENT PERMIT

CALIFORNIA DEPARTMENT OF FISH AND GAME – SECTION 1602 AGREEMENT.

UNITED STATES FISH AND WILDLIFE SERVICE – PROGRAMMATIC BIOLOGICAL OPINION.

REPORTS

FOUNDATION REPORT Br. No. 57C0786

FOUNDATION REPORT Br. No. 57C0787

FOUNDATION REPORT Br. No. 57E0075 and 57E0076

REVISED FOUNDATION RCOMMENDATION Br. No. 57-0785 RL

REVISED FOUNDATION RCOMMENDATION Br. No. 57-0786 RL

FOUNDATION REPORT

ROUTE: 11-SD-5,805-R49.9/R51.7, 42.6/56.5

THE CITY OF SAN DIEGO

March 27, 2009

California Department of Transportation
4050 Taylor Street, MS 122
San Diego CA, 92110

Dear Mr. Majid Kharrati:

Subject: Water Source Letter for Carroll Canyon Road

Sufficient quantity of potable water is available within the project limits for construction of the Carroll Canyon Rd and I-805 HOV lanes.

Water meters may be rented for a fee from the Meter Shop Supervisor at Chollas Operations, 2797 Caminito Chollas in accordance with Water Department's DI 55.27 (attached). A meter shall be installed whenever water is required by the Contractor. The Contractor shall pay the regular monthly fee for water and, in addition, a fee for quantity of water used.

Any usage of unpurchased water by the Contractor during construction process is subject to a fine of $500 or six (6) months imprisonment, or both, under State Penal Code Section 499. In addition, the Contractor is subject to a civil liability to the City for such misappropriation.

If you have any questions regarding this, please contact me at (619) 533-4653.

Sincerely,

Mark L. Koll

Mark Koll
Project Manager

MK:bj

Attachment:

cc: Abi Palaseyed, Senior Civil Engineer, Right of Way Division

DISTRICT 11

MATERIALS INFORMATION BROCHURE

MATERIALS ENGINEERING BRANCH

11-SD-5, 805
KP R49.9/R51.7
KP 42.6/46.5
11-2T0401

CT CALIFORNIA DEPARTMENT OF TRANSPORTATION

State of California

Business, Transportation and Housing Agency

Memorandum

To : LEON EDMONDS
Office Engineer
District 11

Date: June 3, 2009

File: 11-SD-5, 805
KP R49.9/R51.7
KP 42.6/46.5
EA 11-2T0401

From : **DEPARTMENT OF TRANSPORTATION - DISTRICT 11**
Materials Engineering Branch

Subject: Materials Information Brochure

Attached herewith for your consideration

MATERIALS INFORMATION

FOR PROPOSED PROJECT ON ROUTES 5 AND 805

IN SAN DIEGO COUNTY

STATE ROUTES 5 AND 805

For Construction of a portion of Routes 5 and 805 in San Diego County

Arthur F. Padilla
District Materials Engineer

AFP: ra

cc: MPeinado (330)
AJacobo (340)
SAlvi (340)
Project File (mib 2T0401.doc)

MATERIALS INFORMATION

11-SD-5, 805
KP R49.9/R51.7
KP 42.6/46.5
EA 2T0401

NOTE: Information contained herein has been compiled in accordance with Section 2-1.03 of the Standard Specifications. Additional information is available for review at the District 11, Materials Laboratory, 7177 Opportunity Road, San Diego, California.

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INDEX OF PLANS

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

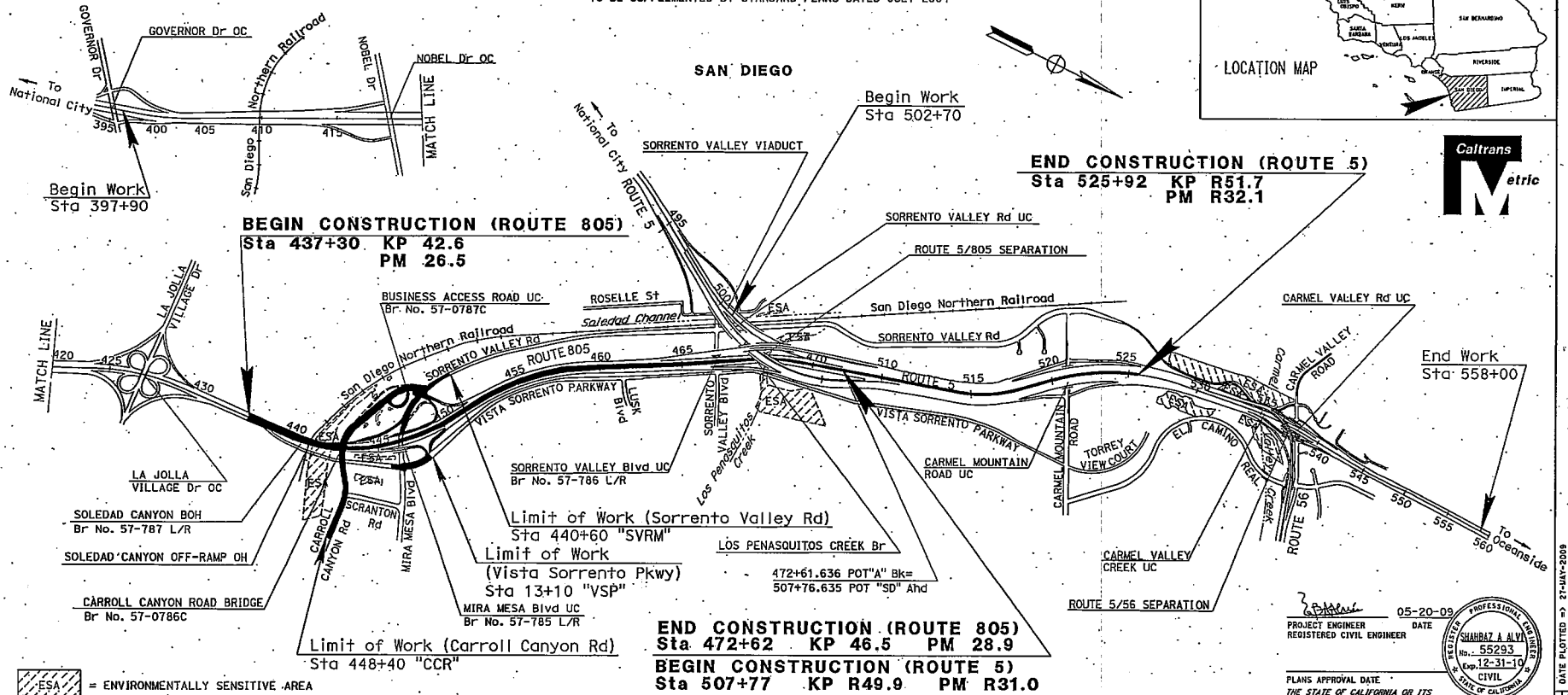
PROJECT PLANS FOR CONSTRUCTION ON
STATE HIGHWAY

IN SAN DIEGO COUNTY IN SAN DIEGO ON ROUTE 805 FROM 0.3 KM SOUTH OF SOLEDAD CANYON BRIDGE AND OVERHEAD TO 0.6 KM NORTH OF ROUTE 5/805 SEPARATION AND ON ROUTE 5 FROM 0.6 KM NORTH OF ROUTE 5/805 SEPARATION TO 0.5 KM NORTH OF CARMEL MOUNTAIN ROAD UNDERCROSSING

TO BE SUPPLEMENTED BY STANDARD PLANS DATED JULY 2004

Dist	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No.	TOTAL SHEETS
11	SD	5,805	R49.9/R51.7, 42.6/46.5	1	

LOCATION MAP



Caltrans Metric

PROJECT MANAGER: ARTURO G. JACOBO
DESIGN ENGINEER: MAJID KHARRATI

THE CONTRACTOR SHALL POSSESS THE CLASS (OR CLASSES) OF LICENSE AS SPECIFIED IN THE "NOTICE TO BIDDERS."

05-20-09
PROJECT ENGINEER REGISTERED CIVIL ENGINEER — DATE

REGISTERED PROFESSIONAL ENGINEER — SHAHBAZ A ALVI — No. 55293 — Exp. 12-31-10 — CIVIL — STATE OF CALIFORNIA

PLANS APPROVAL DATE

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

CONTRACT No. 11-2T0404

LAST REVISION 05-26-09 — DATE PLOTTED => 27-MAY-2009 — TIME PLOTTED => 11:39

BORDER LAST REVISED 4/11/2008 | CALTRANS WEB SITE IS: HTTP//WWW.DOT.CA.GOV/ | RELATIVE BORDER SCALE IS IN MILLIMETERS 0 20 40 60 80 | USERNAME => s114819 DGN FILE => b2T040ab001.dgn | CU 11275 | EA 2T0401

MATERIALS INFORMATION

R-VALUE

The recommended design R-value of 15 is based on a previous Materials Report within the project vicinity.

GROUNDWATER

According to a previous Materials Report, groundwater was not encountered within the project limits.

CORROSION ANALYSIS

Based on previous corrosion investigations within the project vicinity, the in-place materials tested are considered to be corrosive to metal. Any imported fill material should be tested to determine if it is corrosive.

RECOMMENDED CULVERT ALTERNATIVES

Recommendations for New Culverts:

1. The following Plastic Pipe Culverts meeting the minimum and maximum fill height requirements: Corrugated High Density Polyethylene (HDPE) - Type S and Type C, Ribbed HDPE, Ribbed Polyvinyl Chloride (PVC), and Corrugated PVC.

2. Type II Reinforced Concrete Pipe (RCP) using the standard design.

3. The following Steel Pipe Culverts meeting the minimum and maximum fill height requirements: Corrugated Steel Pipe with bituminous coating and paved invert, Steel Spiral Rib Pipes with Polymerized Asphalt Invert, and Spiral Rib Pipes with Polymeric Sheet Coating.

EARTHWORK QUANTITIES

The following earthwork quantities are from the June 2, 2009 Engineer's Estimate.

Roadway Excavation	124,841 m^3
Embankment	73,569 m^3
Hot Mixed Asphalt (Type A)	24,871 tonnes
Concrete Pavement	10,727 m^3
Class 2 Aggregate Base	24,259 m^3

MATERIAL SOURCES

A current list of mining operations eligible to sell materials to the State of California in San Diego County, can be found at the following California Office of Mine Reclamation website:

www.consrv.ca.gov/omr/ab_3098_list/

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
Carlsbad Fish and Wildlife Office
6010 Hidden Valley Road, Suite 101
Carlsbad, California 92011

In Reply Refer To:
FWS-SDG-08B0418-09F0555

MAR 31 2009

Mr. Robert James
California Department of Transportation
District 11
4050 Taylor Street
San Diego, California 92110

Subject: Formal Section 7 Consultation for the Interstate 805/Carroll Canyon Road Extension Project, City of San Diego, San Diego County, California

Dear Mr. James:

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion on the proposed Interstate 805/Carroll Canyon Road Extension project, in accordance with section 7 of the Endangered Species Act of 1973 (Act), as amended (16 U.S.C. 1531 *et seq.*). The biological opinion addresses the possible effects of the road extension project on the federally endangered San Diego fairy shrimp (*Branchinecta sandiegonensis*; "SD fairy shrimp"). We are providing this biological opinion directly to your agency, the California Department of Transportation (Caltrans), because the project will receive Federal funding through the Federal Highway Administration (FHWA), and for this project, FHWA has designated Caltrans as the non-Federal representative responsible for carrying out section 7 consultation under the Act.

The federally threatened coastal California gnatcatcher (*Polioptila californica californica;* "gnatcatcher") was documented in the western half of the project area immediately north of the proposed Carroll Canyon Road extension in 2002 (Alberts 2002). Subsequent protocol surveys by Varanus (2003) and Caltrans (2008a) did not locate gnatcatchers anywhere in the proposed project footprint. Based on this information indicating that the project site is not presently occupied by gnatcatcher, the Service concurs with your determination that the project, as proposed, is not likely to adversely affect the gnatcatcher, and the gnatcatcher is not addressed in the biological opinion.

We acknowledge that there is potential for gnatcatcher to re-occupy the site prior to project clearing and grading activities. Thus, Caltrans is implementing specific measures to ensure that impacts to gnatcatchers are addressed by the project. Specifically, within the proposed project footprint, preconstruction surveys for the gnatcatcher will be conducted by a Service-approved biologist. If gnatcatchers are observed during the pre-construction survey, Caltrans will contact the Service to determine if additional consultation is necessary.

TAKE PRIDE® IN AMERICA

Caltrans is also offsetting the permanent loss of 0.6 acres [0.24 hectares (ha)] of coastal sage scrub by providing conservation and management of 1.2 ac (0.5 ha) of occupied coastal sage scrub in perpetuity. This conservation action will be coordinated and agreed to with the Service prior to initiating project impacts and implemented within 1 year of the date of this biological opinion. In addition, coastal sage scrub temporarily impacted by construction will be restored in-kind, to the maximum extent practicable, using appropriate native species. A restoration/ landscape plan with success criteria and remedial measures will be coordinated and agreed to by the Service prior to application in the field. These conservation measures committed to by Caltrans will ensure that project area impacts to coastal sage scrub, the primary habitat for gnatcatchers, is offset and that coastal sage scrub will remain in the project area to again provide live in or dispersal habitat for gnatcatchers.

In 2007, a single male federally endangered least Bell's vireo (*Vireo belli pusillus*; "vireo") was documented by URS (2008) along Carroll Canyon Creek within 500 feet (ft) [152 meters (m)] of the proposed Carroll Canyon Road extension. Subsequent protocol surveys in 2008 (Caltrans 2009a) did not detect any vireos within 500 ft (152 m) of the proposed project footprint. The 500-ft (152-m) boundary is used to delimit the distance for which construction noise is likely to result in measurable effects to nesting vireos.

As with the gnatcatcher, Caltrans is implementing specific measures to ensure that the proposed project does not result in unanticipated adverse effects to individual vireo and to support conservation of the species in general. Specifically, Caltrans will conduct vegetation clearing within the construction limits from September 16 to February 14 to avoid the vireo breeding season. If vegetation clearing must occur during the vireo breeding season, then pre-construction surveys for vireo will be conducted to ensure that no breeding or nesting birds are present within or immediately adjacent to the areas impacted. The survey will be conducted by a Service-approved biologist to determine the presence of vireos within 500 ft (152 m) of the proposed project footprint. Should an active nest be located, Caltrans will contact the Service to determine if additional consultation is necessary.

Because the primary effect to vireo from construction-related noise would likely be reduced reproductive capability, non-native plants (*i.e.*, *Arundo donax*) will be removed from 0.54 ac (0.22 ha) of riparian habitat along Carroll Canyon Creek west of I-805. This measure will offset any potential loss in reproduction by enhancing the available nesting habitat for vireo in proximity to the project site (*i.e.*, along Carroll Canyon Creek). The Service will be notified prior to removal to allow sufficient time to review plans and provide any necessary avoidance measures. Based on the current survey information and the conservation measures proposed by Caltrans, the Service concurs with your determination that the project, as proposed, is not likely to adversely affect the vireo, and the vireo is not addressed in the biological opinion.

This biological opinion is based on information provided in the following: (1) Biological Assessment prepared by Caltrans dated January 16, 2009; (2) Draft Initial Study with Proposed Mitigated Negative Declaration/Environmental Assessment prepared by Caltrans dated

January 2009; and (3) correspondence, notes, and other information compiled during discussions with Caltrans on the subject project. The complete project file addressing this consultation is maintained at the Service's Carlsbad Fish and Wildlife Office (CFWO).

CONSULTATION HISTORY

We received your agency's request for formal consultation on January 19, 2009. On February 2, 2009, we responded to your request acknowledging initiation of formal consultation. During the consultation period, we met and corresponded with your agency to clarify project information and to discuss conservation measures to avoid, minimize, and offset impacts to the SD fairy shrimp.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The proposed action is FHWA funding for Caltrans to extend Carroll Canyon Road from Scranton Road east of Interstate 805 (I-805) to the intersection of Carroll Canyon Road with Sorrento Valley Road west of I-805 (Figure 1). Caltrans will also provide a business access road from the proposed Carroll Canyon Road to businesses south of Sorrento Valley Road.

The Carroll Canyon Road extension will be an 82-ft (25-m) wide four-lane urban collector approximately 0.52 mile (mi) long [0.8 kilometer (km)]. Approximately 0.31 mi (0.5 km) of the new roadway will be on support columns (*i.e.*, elevated bridge) with the remaining 0.21 mi (0.34 km) on fill (Figure 1). An approximately 328-ft (100-m) long access road for local businesses will be built from the Carroll Canyon Road extension to remove the non-standard distance to the intersection at Sorrento Valley Road and I-805.

North-facing Direct Access Ramps (DARs) from the Carroll Canyon Road extension to the median of I-805 will be constructed, as well as northbound and southbound High Occupancy Vehicle (HOV) lanes within the median from Mira Mesa Boulevard to the existing HOV lanes at Interstate 5. This includes median bridge widening at Sorrento Valley Boulevard undercrossing (UC) (Bridge No.57-786 L/R) and Mira Mesa Boulevard UC (Bridge No. 57-785 L/R). The north-facing DAR is a two-lane facility, which will be connected to HOV lanes. The existing Carroll Canyon overhead (OH) (Bridge No. 57-787 L/R) will be modified to accommodate the DARs, the southbound lanes at the Mira Mesa Boulevard UC (Bridge No. 57-785 L) will be widened to accommodate realignment of the southbound Mira Mesa loop on-ramp, and the diamond on-ramp will be realigned. Modifications also include southbound shoulder widening south of the existing Carroll Canyon OH (Bridge No. 57-787 L) and northbound shoulder widening north of the Mira Mesa Boulevard UC (Bridge No. 57-785 R) and north of the Sorrento Valley Boulevard UC (Bridge No.57-786 R). Minor widening/realignment will occur along Sorrento Valley Road / Mira Mesa Boulevard, the southbound off-ramp, and Scranton Road. Extension of the northbound and southbound HOV lanes includes pavement widening in the median area of I-805 and

Sorrento Valley Boulevard UC (Bridge No. 57-786 L/R). A new signalized intersection will be constructed at the intersection of Carroll Canyon Road and the DARs.

Pedestrian facilities include adding an 8-ft (2.4-m) wide sidewalk along the southern side of the proposed Carroll Canyon Road extension. Bike facilities encompassing 6 ft (1.8 m) of the shoulder will be provided along both shoulders of Carroll Canyon Road.

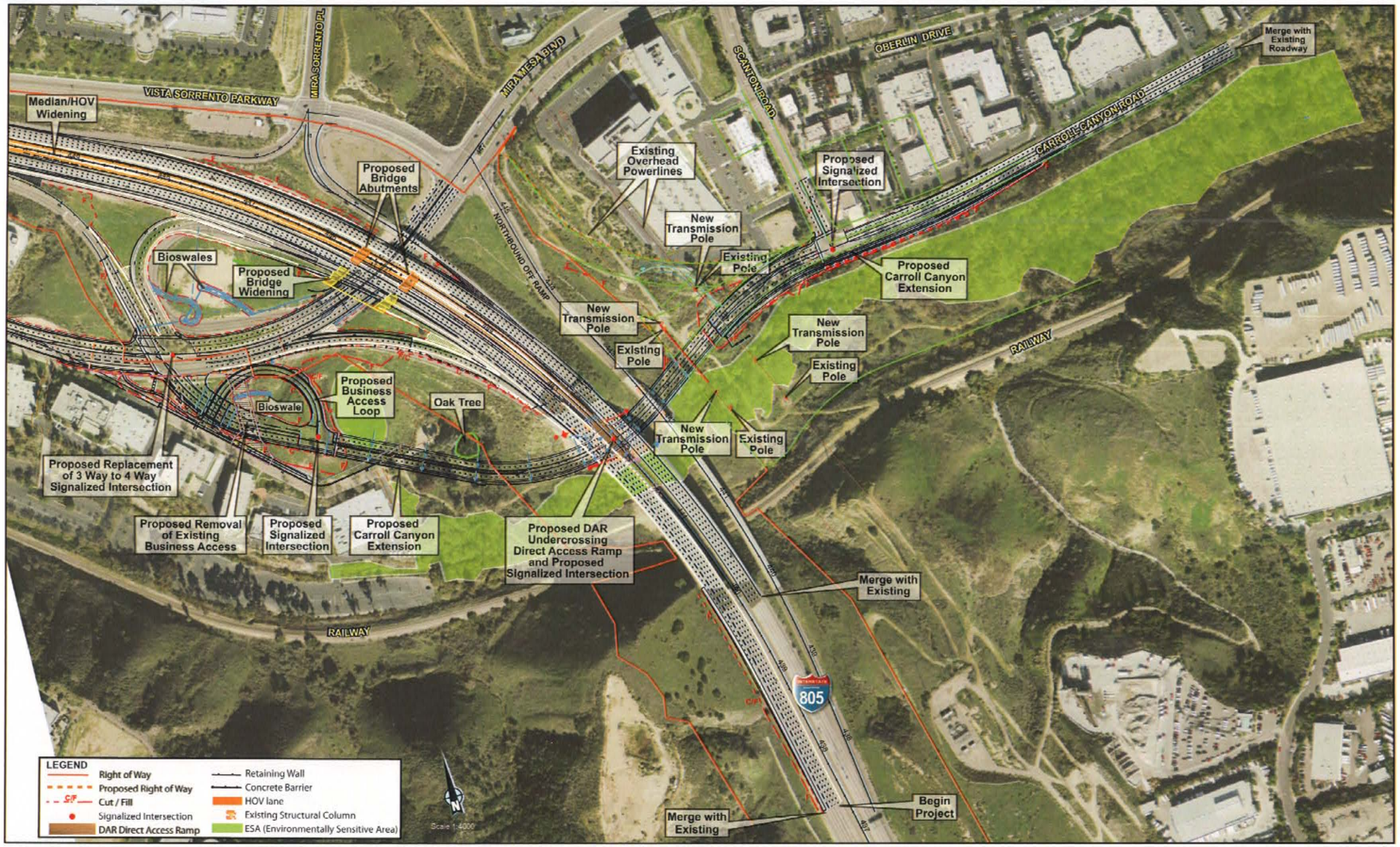
Two staging areas are proposed. One is located on the east side of I-805 north of Carroll Canyon Road, and the other is on the west side of I-805. Two construction access roads will be created resulting in one access road on each side of I-805, both on the north side of Carroll Canyon Creek. One concrete batch plant is proposed on the east side of I-805. Although the exact location of the staging areas, access roads, and concrete batch plant is not presently known, these project features will be located in disturbed, ornamental planting, or developed areas [with the exception of up to 0.2 ac (0.08 ha) of impact to disturbed coastal sage scrub] and will not impact any riparian habitat.

The proposed project also includes the closure of a stretch of dirt road with SD fairy shrimp occupied road pools. A portion of the road will be closed to vehicles using vehicle barriers. A new maximum 12-ft (3.6-m) wide dirt bypass road will be constructed to replace the closed portion of the road (Figure 2). This road will allow for continued access to existing infrastructure (man-holes) while avoiding the remaining SD fairy shrimp occupied road pools.

The proposed project will impact 28.22 ac (11.4 ha) of land supporting native, disturbed, ornamental, and developed areas. Approximately 17.05 ac (8 ha) of these impacts will be permanent and 11.17 ac (4 ha) will be temporary (Table 1).

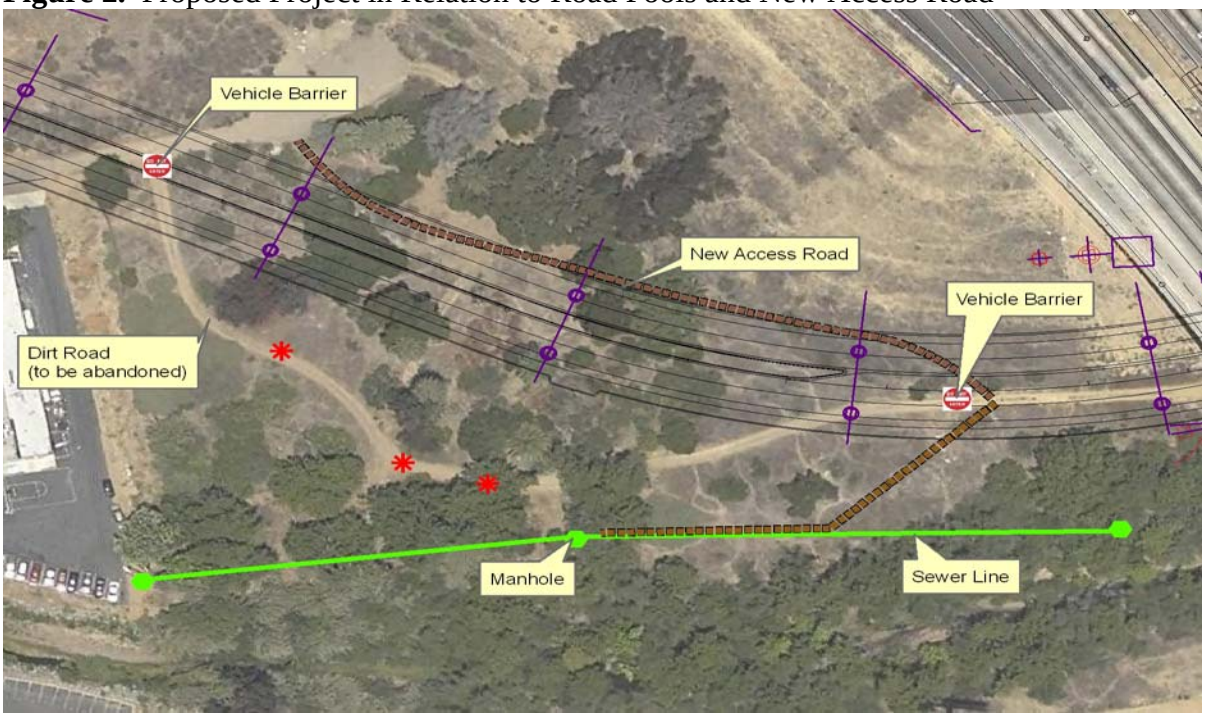
According to 50 CFR § 402.02 pursuant to section 7 of the Act, the "action area" includes all areas to be affected directly or indirectly by the Federal action. Areas directly impacted include all areas within the project footprint, including construction vehicle access routes, staging areas, and grading areas. Habitat immediately adjacent to the project footprint may be indirectly impacted or degraded by construction activities or later in time due to the developed nature of the road. Thus, we have defined the action area for the proposed project to encompasses the project's direct impact footprint, which is approximately 28.2 ac (11.4 ha) and contains one road pool occupied by SD fairy shrimp (Figure 1), as well as a 0.64-ac (0.26-ha) area that extends south from the project footprint out to an existing dirt road that contains three road pools occupied by SD fairy shrimp (Figure 2). Subsequent analyses of the environmental baseline, effects of the action, and levels of incidental take are based upon the action area.

Figure 1. Proposed Project Alignment and Infrastructure



[Fig 1 Source: I-805 HOV Extension/Carroll Canyon Rd. Extension Project Draft IS/EA & Proposed MND]

Figure 2. Proposed Project in Relation to Road Pools and New Access Road

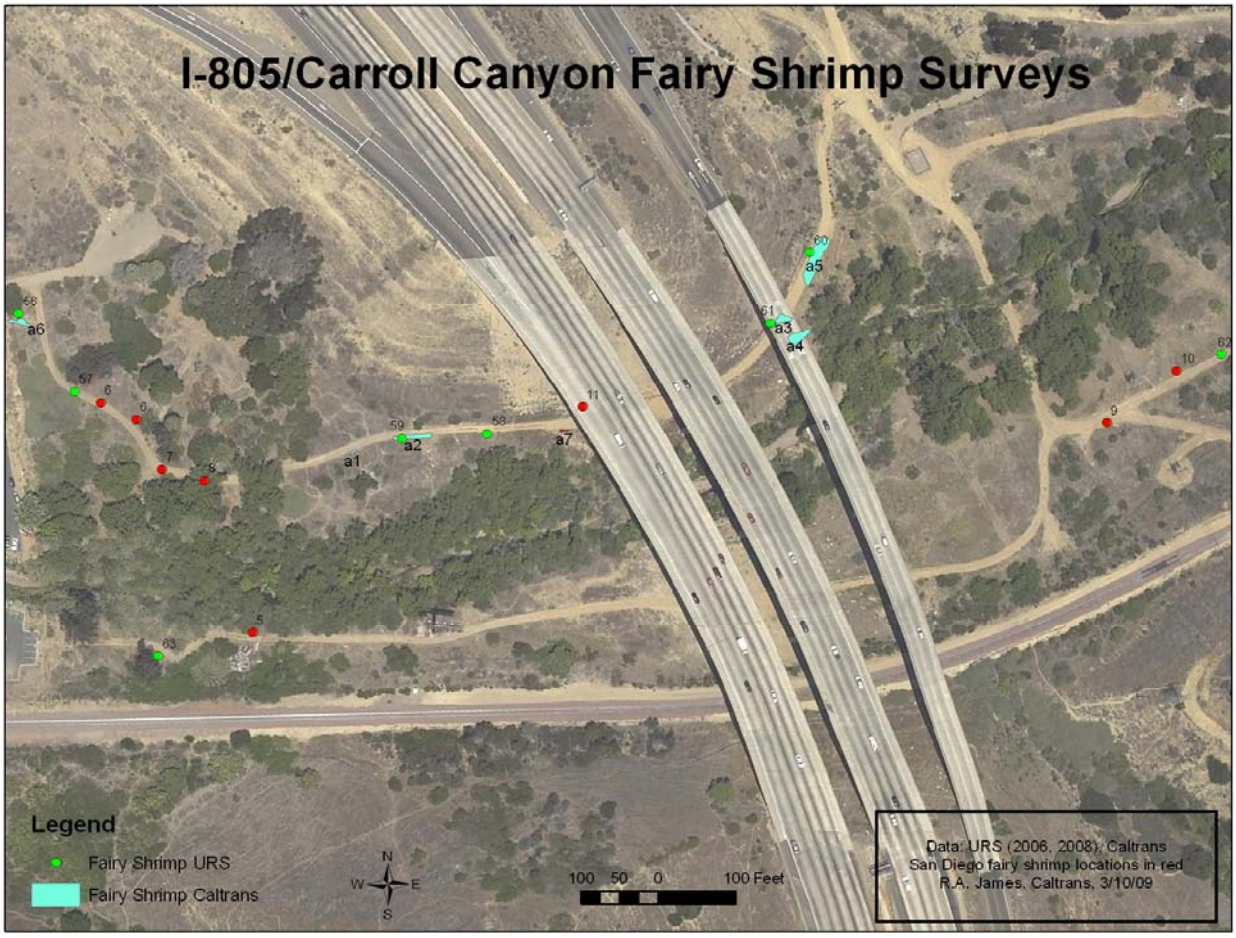


[Fig 2 Source: I-805 HOV Extension/Carroll Canyon Rd. Extension Project Draft IS/EA & Proposed MND]
Note: Pools supporting San Diego fairy shrimp are shown by red asterisks. Pools supporting versatile fairy shrimp are not shown. See Figure 3 for a depiction of pools in action area.

Table 1. Impacts: Interstate 805/Carroll Canyon Road Extension Project

	Permanent (acres)	Temporary (acres)
Coastal sage scrub	0.45	0.4
Coastal sage scrub – disturbed	0.15	0.77
Disturbed	9.4	6
Ornamental	2.65	4
Developed	4.4	0
Total	17.05	11.17

Figure 3. Fairy Shrimp and Pool Locations



[Fig 3 Source: I-805 HOV Extension/Carroll Canyon Rd. Extension Project Draft IS/EA & Proposed MND]
Note: Pools a9 and a10 are not represented in this figure. a9 is adjacent to a7 and a10 is adjacent to a3.

Conservation Measures

Caltrans has agreed to implement the following conservation measures as part of the proposed action to avoid, minimize, and offset impacts to SD fairy shrimp.

1. To offset impacts to SD fairy shrimp occupied road pool a7/11 [23 square ft (0.0002 ha)], at least 46 square ft (0.005 ha) of SD fairy shrimp occupied pool habitat will be perpetually preserved and/or restored and managed. This conservation action in support of SD fairy shrimp recovery will be coordinated and agreed upon with the Service prior to initiating project impacts and implemented within 1 year of the date of this biological opinion.

2. Water runoff associated with the new road surfaces and landscaping will be directed away from the onsite road pools containing SD fairy shrimp. No permanent irrigation or water from irrigation systems associated with the project will be permitted to enter the onsite road pools containing SD fairy shrimp.

3. Areas supporting avoided vernal pools supporting SD fairy shrimp, which fall outside the alignment footprint, will be designated as Environmentally Sensitive Areas (ESA) and depicted as such on project maps and plans. No personnel or equipment will be allowed within these areas at any time, unless approved by Caltrans biologists to carry out biological surveys or other conservation measures to enhance SD fairy shrimp habitat.

4. A temporary fence (with silt barriers and/or other appropriate erosion control measures) will be installed around the limits of project impacts (including construction staging areas and access routes and concrete batch plant) to prevent additional impacts to SD fairy shrimp and to prevent the spread of silt from the construction zone into ESAs adjoining the work limits. Fencing will be installed in a manner that does not impact ESAs. Temporary construction fencing will be removed upon project completion.

5. The existing dirt access road located on the north side of Carroll Canyon Creek, west of I-805, and parallel to the proposed Carroll Canyon Road extension where SD fairy shrimp road pools are located will be blocked off from all future vehicle access. Barriers will be installed in a manner to discourage vehicles from accessing the dirt road.

6. Caltrans will hire a Service-approved biologist (project biologist) with a minimum 3 years of vernal pool experience, who will be responsible for overseeing compliance with protective measures. The biologist will monitor construction, at a minimum weekly, to ensure avoidance of SD fairy shrimp-occupied road pools 5-10 and their immediate watersheds. The biologist will also be onsite during installation of ESA fencing and during work immediately adjacent to any of the avoided SD fairy shrimp pools to ensure compliance with the project's conservation measures aimed at avoiding and minimizing impacts to SD fairy shrimp and to produce reports that document compliance with these measures. Caltrans will submit the biologist's name, address, telephone number, and work schedule on the project to the Service at least 7 days prior to the planned date of initiating impacts to SD fairy shrimp habitat. The project biologist will perform the following duties:

    a. Train all supervisors, (sub) contractors, construction personnel, and employees on the biological resources associated with this project and ensure that this training is completed prior to initiating work on the proposed project. At a minimum, training will include: 1) the purpose for resource protection; 2) a description of the SD fairy shrimp, their habitats and general ecology, and sensitivity to human activities; 3) the conservation measures that are being implemented during project construction;

4) the protocol to resolve conflicts that may arise at any time during the construction process; and 5) the general provisions of the Act, the need to adhere to the provisions of the Act, and the penalties associated with violating the Act. Included in this program will be a fact sheet that includes color photographs of the SD fairy shrimp and its habitat, which will be shown to the employees. Following the education program, the fact sheet will be posted in the contractor and Resident Engineer's office, where they will remain through the duration of the project.

b. Inspect the fencing and erosion control measures within or up-slope of ESAs a minimum of once per week and immediately before any predicated rain events and immediately after any actual rain events to direct repairs of any breaches in the fence or erosion control measures.

c. Halt work, if necessary, and confer with the Service to ensure the proper implementation of conservation measures aimed avoiding and minimizing impacts to SD fairy shrimp. The biologist will report any infraction to the Service within 24 hours of its occurrence.

d. Submit a final report to the Service within 60 days of project completion that includes: as-built construction drawings with an overlay of SD fairy shrimp pools that were impacted or avoided; photographs of the avoided SD fairy shrimp pools; and other relevant information documenting that anticipated impacts to habitat for SD fairy shrimp were not exceeded and that general compliance with the project's conservation measures was achieved.

7. Caltrans will ensure that the following conditions are implemented during project construction:

a. Employees will strictly limit their activities, vehicles, equipment, and construction materials to the fenced project footprint.

b. Disposal or temporary placement of excess fill, brush or other debris will not be allowed in waters of the United States, their banks and/or any depression features or their watersheds.

c. All equipment maintenance, staging, and dispensing of fuel, oil, coolant, or any other such activities will occur in designated areas within the project impact limits but away from [>100 ft (30 m)] from road pools. These designated areas will be located in previously compacted and disturbed areas to the maximum extent practicable in such a manner as to prevent any runoff from entering waters of the United States and avoided onsite road pools and will be shown on the construction

plans. Contractor equipment will be checked for leaks prior to operation and repaired as necessary. "No-fueling zones" will be designated on construction plans.

STATUS OF THE SPECIES

Listing Status

The SD fairy shrimp was federally listed as endangered on February 3, 1997, (62 *Federal Register* 4925). In September 1998, the Service published the *Recovery Plan for Vernal Pools of Southern California* (Recovery Plan) (Service 1998). The SD fairy shrimp is included in this Recovery Plan. Critical habitat for the SD fairy shrimp was designated on October 23, 2000, (65 *Federal Register* 63438). Critical habitat was remanded, but not vacated, by the Central District Court of California on June 12, 2002. Critical habitat was re-proposed on April 22, 2003, (68 *Federal Register* 19887). Revised critical habitat for the SD fairy shrimp was designated on December 12, 2007 (72 *Federal Register* 70648). No designated critical habitat for the SD fairy shrimp will be affected by the project.

Species Description

The SD fairy shrimp is a small, freshwater crustacean in the family Branchinectidae of the Order Anostraca. The species was originally described by Fugate (1993) from samples collected on Del Mar Mesa, San Diego County. Male SD fairy shrimp are distinguished from males of other species of Branchinecta by differences found at the distal tip of the second antennae. Females are distinguishable from females of other species of Branchinecta by the shape and length of the brood sac, the length of the ovary, and by the presence of paired dorsolateral (located on the sides, toward the back) spines on five of the abdominal segments (Fugate 1993). Adult male SD fairy shrimp range in size form 0.35 to 0.63 in (9 to 16 mm) and adult females are 0.31 to 0.55 in (8 to 14 mm) long.

Distribution

The range of the SD fairy shrimp includes Orange and San Diego counties in southern California, and northwestern Baja California, Mexico (Service 1998, Brown *et al.* 1993). In Baja California, SD fairy shrimp have been recorded at two localities: Valle de Palmas, south of Tecate and Baja Mar, north of Ensenada. A single isolated female was previously reported from vernal pools in Isla Vista, Santa Barbara County, California; however, directed surveys have not located any additional individuals (62 *Federal Register* 4925).

In Orange County, SD fairy shrimp have been documented at Fairview Park (CNDDB occurrence #11, 1996), Newport Banning Ranch, Irvine Ranch Land Reserve, and within the San Juan Creek watershed at Chiquita Ridge and Radio Tower Road.

In San Diego County, the species occurs in vernal pools from Marine Corps Base Camp Pendleton (MCBCP), inland to Ramona and south through Del Mar Mesa, Proctor Valley, and Otay Mesa. Over 279 and 1,899 pools on MCBCP and Marine Corps Air Station Miramar (MCAS-Miramar) are known to be occupied by SD fairy shrimp, respectively (Service 2008). Of the 62 vernal pool complexes[1] mapped by the City of San Diego[2], 29 were found to be occupied by SD fairy shrimp and occur at the following localities: Del Mar Mesa (1), Carmel Mountain (1), Mira Mesa (6), Nobel Drive (3), Kearny Mesa (3), Mission Trails Regional Park (1), and Otay Mesa (14) (City of San Diego 2004).

Additional vernal pool complexes with occurrences of SD fairy shrimp located in San Diego County, but not included in the City of San Diego's Inventory include: Carlsbad, San Marcos, Ramona, Poway, Santee, Rancho Santa Fe, Murphy Canyon, Otay Lakes, Imperial Beach, East Otay Mesa, Marron Valley, and Proctor Valley (CNDDB Occurrence # 27, 2001).

Habitat Affinity

SD fairy shrimp are restricted to vernal pools and vernal pool-like depressions (*e.g.*, ruts in dirt roads). Vernal pools are ephemeral wetlands that occur from southern Oregon through California into northern Baja California, Mexico (Service 1998). They require a unique combination of climatic, topographic, geologic, and evolutionary factors for their formation and persistence. They form in regions with Mediterranean climates where shallow depressions fill with water during fall and winter rains and then dry up when the water evaporates in the spring (Collie and Lathrop 1976; Holland 1976; Holland and Jain 1977, 1988).

Downward percolation of water within the pools is prevented by an impervious subsurface layer consisting of claypan, hardpan, or volcanic stratum (Holland 1976, Holland and Jain 1988). Seasonal inundation makes vernal pools too wet for adjacent upland plant species adapted to drier soil conditions, while rapid drying during late spring makes pool basins unsuitable for typical marsh or aquatic species that require a more persistent source of water. Local upland vegetation communities associated with vernal pools include needlegrass grassland, annual grassland, coastal sage scrub, maritime succulent scrub, and chaparral (Service 1998).

SD fairy shrimp tend to inhabit shallow, small vernal pools and vernal pool-like depressions that range in temperature from 50° to 79° Fahrenheit (F) [10° to 26° Celsius (C)]. They are ecologically dependent on seasonal fluctuations in their habitat, such as absence or presence of water during specific times of the year, duration of inundation, and other environmental factors

[1] Vernal pool complexes are defined as a series of vernal pool groups that are hydrologically connected with similar soil types and species compositions. They were first described and surveyed by Beauchamp and Cass 1979 and subsequently updated in 1986a (Bauder) and 1998 (Recovery Plan).

[2] The City of San Diego conducted non-protocol surveys for San Diego fairy shrimp. Therefore this inventory may under-represent the true number of vernal pools with occurrences of San Diego fairy shrimp.

that likely include specific salinity, conductivity, dissolved solids, and pH levels (Gonzalez *et al.* 1996, Hathaway and Simovich 1996, and Holtz 2003)

Life History

San Diego fairy shrimp are non-selective, particle-feeding filter-feeders, or omnivores. Detritus, bacteria, algal cells, and other items between 0.3 to 100 microns may be filtered and ingested (Eriksen and Belk 1999). Adult fairy shrimp are usually observed from January to March; however, in years with early or late rainfall, the hatching period may be extended (65 *Federal Register* 63438). SD fairy shrimp have a two-stage life cycle and spend the majority of their life cycle in the cyst stage (Templeton and Levin 1979, Schaal and Leverich 1981, Herzig 1985, Hairston and De Stasio 1988, Venable 1989). After hatching, SD fairy shrimp reach sexual maturity in about 7 to 17 days, depending on water temperature and persist for about 4 to 6 weeks (Hathaway and Simovich 1996). Fairy shrimp mate upon reaching maturity, and female SD fairy shrimp produce between 164 and 479 cysts (eggs) over their lifetime (Simovich and Hathaway 1997). The cysts are either dropped by the females to settle into the mud at the bottom of the pool, or they remain in the brood sac until the female dies and sinks to the bottom (Eriksen and Belk 1999). Fairy shrimp cysts may persist in the soil for several years until conditions are favorable for successful reproduction (Simovich and Hathaway 1997). The cysts will hatch in 3 to 5 days when water temperatures are between 50° and 70 ° F (10° and 20° C) (Hathaway and Simovich 1996). Not all cysts are likely to hatch in a season, thus providing a mechanism for survival if water quality and ponding conditions are not favorable in a given year (Simovich and Hathaway 1997, Ripley *et. al.*, 2004).

Population Trend

The loss of vernal pools that have the potential to support SD fairy shrimp has resulted in a range-wide reduction in diversity and abundance of SD fairy shrimp. Urban and water development, flood control, and highway and utility projects, as well as conversion of wildlands to agricultural use, have eliminated or degraded vernal pools and/or their watersheds in southern California (Jones and Stokes Associates 1987). Historically, vernal pools covered approximately 200 square mi (518 square km) of San Diego County (Bauder and McMillan 1998). Approximately 95 to 97 percent of vernal pools within San Diego County have been lost (Bauder 1986b, Bauder and McMillan 1998, Oberbauer 1990). Most of the remaining vernal pools in San Diego County occur on Redding soils, primarily on MCAS-Miramar (Service 1998).

At the time of listing, San Diego fairy shrimp were known to inhabit a minimum of 25 vernal pool complexes in coastal areas of San Diego, Orange, and Santa Barbara counties, and northwestern Baja California, Mexico (62 *Federal Register* 4925). However, the names and locations of all complexes were not specified in the listing rule, and therefore, it is difficult to ascertain the status of these complexes. Currently, 137 complexes occupied by SD fairy shrimp have been identified in the U.S.; an additional 3 complexes that were identified as occupied at listing have since been

extirpated (Service 2008). Most of these additional complexes fall within the extant range of the SD fairy shrimp known at the time of listing. We expect that these additional complexes and occurrences were occupied at the time of listing, but had not been identified due to lack of survey effort, and do not represent an actual expansion of SD fairy shrimp distribution and range into previously unoccupied areas. Rather, they provide a better understanding of the historical distribution and range of the SD fairy shrimp that was unknown at the time of listing. Therefore, we estimate that the overall SD fairy shrimp distribution has not decreased or increased appreciably since listing. A summary of occupied vernal pool complexes is provided in Appendix 1 of the *San Diego Fairy Shrimp (Branchinecta sandiegonensis) 5-Year Review: Summary and Evaluation* (Service 2008).

Impacts to vernal pools from development have been offset through the restoration, enhancement, and management of habitat. In some cases, due to security of the site and the active management of the vernal pools, the species status has improved. In addition, grants have been awarded to restore habitat in several areas including Otay Mesa, the San Diego National Wildlife Refuge, and Sweetwater Authority lands. Sites that have been restored benefit from fencing and management, which further removes threats from the site that were occurring prior to the restoration efforts.

Current Threats

The SD fairy shrimp still faces the same threats that were identified in the final listing rule throughout its range. These threats can be divided into three major categories: 1) direct destruction of vernal pools and vernal pool habitat as a result of construction, vehicle traffic, domestic animal grazing, dumping, and deep plowing; 2) indirect threats which degrade or destroy vernal pools and vernal pool habitat over time including altered hydrology (*e.g.*, damming or draining), invasion of non-native species, habitat fragmentation, and associated deleterious effects resulting from adjoining urban land uses; and 3) long-term threats including the effect of isolation on genetic diversity and locally adapted genotypes, air and water pollution, climatic variations, and changes in nutrient availability (Bauder 1986a, Service 1998, Bohonak 2005).

Rangewide Conservation Needs

Based on current population trends, threats analysis, and new genetic information, the SD fairy shrimp has the following needs to survive and recover:

1. Vernal pool habitat should be restored and enhanced; this includes expansion of existing populations and re-establishment of populations where habitat and historical conditions are appropriate.
2. Vernal pool management plans should be developed and implemented to maintain hydrologic regimes; watershed and habitat functions; and species viability.
3. Land protection strategies should be developed to prevent further loss and fragmentation of existing habitat.

4. Vernal pool complexes not identified in the Recovery Plan as necessary to stabilize or reclassify the population should be re-evaluated based on their genetic structure to ensure the genetic variation within the SD fairy shrimp population is maintained.

ENVIRONMENTAL BASELINE

Regulations implementing the Act (50 CFR §402.02) define the environmental baseline as the past and present impacts of all Federal, State, or private actions and other human activities in the action area. Also included in the environmental baseline are the anticipated impacts of all proposed Federal projects in the action area that have undergone section 7 consultation, and the impacts of State and private actions which are contemporaneous with the consultation in progress.

The proposed project is located within the northwest portion of the City of San Diego, 1.5 mi (2.4 km) south of the I-805 and Interstate 5 interchange. Topography in the project area consists of a moderate south-facing canyon slope draining into the riparian corridor of Carroll Canyon Creek. The creek flows to Penasquitos Lagoon and out to the Pacific Ocean, approximately 5 river mi (8 km) downstream. The general project area has been previously disturbed by the I-805 Bridge and associated fill, a railroad on the south side of the creek, and dirt roads. Land uses in the vicinity of the site include commercial, business, and transportation.

Within the action area, the 28.22-ac (11.4-ha) project site consists of coastal sage scrub [1.77 ac (0.72 ha)], disturbed (*i.e.*, dirt roads) [15.4 ac (6.23 ha)], ornamental plantings [6.65 ac (2.7 ha)], and developed areas [4.4 ac (1.78 ha)]. Several pools occur in the dirt roads within the action area. The coastal sage scrub habitat is a small island immediately south of the Mira Mesa Boulevard on-ramp to southbound I-805 and north of Sorrento Valley Road where it dead-ends.

Dry and wet season SD fairy shrimp surveys were conducted in the project area during multiple years starting in 2006 (EcoAnalysts, Inc. 2006; URS 2006a, 2006b, 2008, Caltrans 2009a, 2009c). SD fairy shrimp and versatile fairy shrimp (*Branchinecta lindahli*) were found in 6 pools and 15 pools in the survey area, respectively, with both species found in 3 pools (Figure 3 and Appendix A).

All of the pools in the project area consist of tire ruts and ditches within the confines of dirt roads (*i.e.*, road pools) that occur along Carroll Canyon Creek (Figure 3). The pools do not support any vernal pool flora, although they may support plants with wetland indicator status (Caltrans 2009a). These pools occur within the Carroll Canyon Creek floodplain and are disjunct from those found in the I12 complex, which are the nearest natural vernal pools to the project area, occurring on a mesa approximately 0.25 mile (0.4 km) to the south. The road pools within the project area are not likely to be historic vernal pools, but ones created by use of the roads and which became occupied by fairy shrimp over time. How fairy shrimp were introduced to these road pools is unknown. However, it is plausible that cysts from nearby occupied pools (*e.g.*, the I12 complex)

were either transferred to the road pools on vehicle tires or the bodies of wetland-dependent animals (*e.g.*, waterfowl).

The road pools in the project area are currently subject to continual degradation primarily due to vehicle traffic and are of low conservation value, as evidenced by the lack of vernal pool flora and the presence of the versatile fairy shrimp, which is known to occur in disturbed pools.

EFFECTS OF THE ACTION

Effects of the action refer to the direct and indirect effects of an action on the species or critical habitat that will be added to the environmental baseline, along with the effects of other activities that are interrelated and interdependent with that action. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. Indirect effects are those that are caused by the proposed action and are later in time, but are still reasonably certain to occur.

Direct Effects

SD fairy shrimp historically occurred in vernal pool complexes throughout the Mira Mesa ecosystem, which is part of the San Diego Central Coastal Mesa Management Area identified in the Recovery Plan (Service 1998). Many of these vernal pool complexes have been developed, converted to agriculture, and/or degraded by OHV use. The Recovery Plan identifies several vernal pool complexes on Mira Mesa. The vernal pool complex within the action area is not identified in the Recovery Plan.

Within the project's direct impact footprint, pool a7/11 [approximately 23 square ft (0.0002 ha)] is the only road pool containing SD fairy shrimp, though nine other road pools [approximately 1,836 square ft (0.017 ha) supporting the more common versatile fairy shrimp will be impacted (Appendix A and Figure 3). The other three road pools occupied by SD fairy shrimp in the action area are outside of the direct impact footprint (*i.e.*, pools 6, 7 and 8) (Figure 3). However, grading for the proposed project could result in unintentional fill and/or runoff entering these three pools. To avoid these impacts, areas outside of the project's direct impact footprint will be designated as ESA's and fenced prior to initiating project construction. Erosion control (*i.e.*, silt barriers) measures will be implemented in a manner to avoid unintentional fill and runoff into the pools. Additionally, a Service-approved biologist will monitor construction to ensure damage to these pools is avoided.

Because the SD fairy shrimp road pool to be impacted is highly disturbed and not likely in a historic vernal pool complex, it has low long-term conservation value. Soil containing fairy shrimp cysts will not be salvaged from this or any of the other road pools because pools in the action area are known to contain versatile fairy shrimp and are therefore not suitable for

inoculating other created, restored, or enhanced pools. The Recovery Plan does not acknowledge this complex nor identify it as necessary for the stabilization and/or downlisting of SD fairy shrimp.

Caltrans proposes to offset the impacts to 23 square ft (0.0002 ha) of SD fairy shrimp habitat by preserving and/or restoring 46 square ft (0.0004 ha) of SD fairy shrimp habitat off site at a location approved by the Service that is expected to be of higher long-term conservation value. If restoration is proposed, Caltrans will prepare and implement a restoration plan agreed to by the Service. Caltrans will also place a preservation mechanism (*i.e.*, deed restriction, conservation easement, *etc.*) over, as well as prepare and implement a perpetual management, maintenance, and monitoring plan for, the vernal pools to be preserved and/or restored off site.

As stated above, the status of SD fairy shrimp has remained unchanged from the time of listing. This project will not change that determination. The overall acreage of impacts is small relative to the overall habitat available for SD fairy shrimp range-wide and the quality of the pools is poor (road ruts along an established dirt road). Loss of the individual fairy shrimp and cyst bank within this one road pool is not expected to result in an appreciable reduction in the number, reproduction, or distribution of the SD fairy shrimp range-wide. We expect the proposed preservation and/or restoration to adequately offset this small impact and to support recovery of the SD fairy shrimp.

Indirect Effects

The proposed project will introduce additional road infrastructure and landscaping to the project site that could cause increased runoff into three avoided road pools with SD fairy shrimp (*i.e.*, pools 6, 7, and 8). Runoff from the bridge and landscaping could contain contaminants, fertilizer and/or sediments potentially harmful to the SD fairy shrimp. The introduction of eroded sediments or polluted runoff to occupied pools could alter the specific water chemistry (Gonzalez *et al.* 1996) and temperature (Hathaway and Simovich 1996) required by SD fairy shrimp, thus negatively affecting their ability to mature and reproduce (Gonzalez *et al.* 1996, Holtz 2003). To avoid and/or minimize this potential impact, water runoff associated with the new road surfaces and landscaping will be directed away from the onsite road pools containing SD fairy shrimp. No permanent irrigation or water from irrigation systems associated with the project will be permitted to enter the onsite road pools containing SD fairy shrimp.

The road pools in the action area are currently subject to continual degradation from use of the existing roads on which the pools occur. The proposed project will facilitate additional human access into the area supporting the three avoided pools occupied by SD fairy shrimp, which may lead to impacts to these pools such as trash accumulation, human and pet intrusion, trampling, vandalism, and invasion of nonnative species. Caltrans will minimize this potential effect by blocking off both ends of the existing dirt road leading to the avoided pools. However, the barriers will not be maintained by Caltrans as the property is owned by the City of San Diego and not in a

Caltrans right-of-way. Over time, the barriers may be breached, and the benefit of this conservation measure may be short lived.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, Tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

The Service is not aware of any future actions that may result in cumulative effects to the SD fairy shrimp in the action area of this project.

CONCLUSION

After reviewing the current status of the SD fairy shrimp, the environmental baseline for the action area, the direct and indirect effects of the proposed action, and the cumulative effects, it is our opinion that the action, as proposed, is not likely to jeopardize the continued existence of the SD fairy shrimp. We reached this conclusion by considering the following:

1. The loss of one degraded road pool and the individual SD fairy shrimp and cyst bank it supports is not expected to appreciably reduce the long-term viability of this species. The loss of approximately 23 square ft (0.0002 ha) of road pool is not large relative to the extent of habitat remaining over the SD fairy shrimp's range. The road pool to be impacted is of low long-term conservation value.

2. Impacts to SD fairy shrimp habitat will be offset through the preservation and/or restoration of a greater area of habitat at a location that is expected to be of higher long-term conservation value.

3. Implementation of a perpetual maintenance and monitoring plan for the preserved and/or restored SD fairy shrimp habitat will ensure that quality habitat for the SD fairy shrimp is available over the long-term thus supporting recovery of the species.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavior patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as

intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

AMOUNT OR EXTENT OF TAKE

The reproductive success of SD fairy shrimp is dependent on seasonal fluctuations in their habitat, such as presence or absence of water during specific times of the year, duration of inundation, and other environmental factors that likely include specific salinity, conductivity, dissolved solids, and pH levels. Therefore, the population of SD fairy shrimp within any pool varies dramatically and can include both adult shrimp and the cyst bank of the pool. The Service is unable to quantify the precise number of SD fairy shrimp and cysts that will be killed by the proposed action because the population size within the road rut pool is unknown and difficult to estimate due to the dynamic conditions associated with SD fairy shrimp habitat. The level of incidental take of fairy shrimp is thus provided in terms of habitat impacts as follows:

- SD fairy shrimp and cysts within road pool a7/11 will be taken in the form of direct mortality by grading and filling activities; the take threshold will be exceeded if any areas supporting SD fairy shrimp outside the 23-square ft (0.0002-ha) a7/11 pool are impacted.

EFFECT OF TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to SD fairy shrimp.

REASONABLE AND PRUDENT MEASURES

We have not identified any additional reasonable and prudent measures beyond the minimization measures committed to by Caltrans, and described in the project description of this biological opinion, that are necessary or appropriate to further minimize the incidental take of the SD fairy shrimp during project implementation.

TERMS AND CONDITIONS

To be exempt from the prohibitions of section 9 of the Act, Caltrans must comply with terms and conditions which implement the reasonable and prudent measures described above. Since no further reasonable and prudent measures are identified, no terms and conditions are necessary.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to use their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

> Caltrans should work with the City of San Diego to ensure the barriers blocking access to the road pools occupied by SD fairy shrimp are perpetually maintained to exclude vehicles and other unauthorized access.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes the amendment to formal consultation on the I-805/Carroll Canyon Road Extension Project outlined in materials submitted to us. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

With regard to 2 above, many of the pools within the action area are not currently known to support SD fairy shrimp, and we have addressed impacts in this biological opinion only to pools known to be occupied by SD fairy shrimp as of the 2009 surveys. However, because these unoccupied pools and the SD fairy shrimp occupied pools exist within proximity to each other and along roads open to public access, over time SD fairy shrimp cysts could be introduced by vehicles or wildlife into unoccupied pools. If construction is unexpectedly delayed beyond the anticipated 2011 completion date, we recommend you contact us to determine whether it may be appropriate to conduct additional fairy shrimp surveys.

If you have any questions regarding this document, please contact Kurt Roblek at (760) 431-9440, extension 308.

Sincerely,

Jim A. Bartel
Field Supervisor

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APPENDIX 1. Fairy Shrimp Survey Summary

FAIRY SHRIMP SURVEYS AT I-805/CARROLL CANYON ROAD EXTENSION																			
Year	**Survey Type**	**Pools Sampled**																	
		a1	**a2/ 59**	**a3/ 61**	**a4**	**a5/ 60**	**a6/ 56**	**a7/ 11**	**a9**	**a10**	**5**	**6**	**7**	**8**	**9**	**10**	**57**	**58**	**62**	**63**
2006	Wet											S/L	L		L					
2006	Dry							S			S	S	S	S	S	S				
2007-08	Wet	L	L	L			L	S									L	L	L	L
2008-09	Wet	L	L	L	L	L	L		L	L										
Impacted		**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**Yes**	**No**	**No**
Surface Area (sq.ft.)		20	244	196	309	915	152	23	25	25	1076	86	194	258	172	172	22	43	43	97

S = B. sandiegoensis L = B. lindahli

CALIFORNIA DEPARTMENT OF FISH AND GAME
South Coast Region
4949 Viewridge Avenue
San Diego, California 92123

Notification No. 1600-2009-0121-R5

AGREEMENT REGARDING PROPOSED STREAM OR LAKE ALTERATION

THIS AGREEMENT, entered into between the State of California, Department of Fish and Game, hereinafter called the Department, and the State of California, Department of Transportation (Point of Contact: Mr. Arturo Jacobo), District 11, 4050 Taylor Street, San Diego, CA 92110, hereinafter called the Applicant, is as follows:

RECITALS

WHEREAS, pursuant to Section 1602 of California Fish and Game Code, the Applicant, on the 18th day of May, 2009, notified the Department that they intend to divert or obstruct the natural flow of, or change the bed, channel, or bank of, or use material from the streambed(s) of, the following water(s): Carroll Canyon Creek in the City of San Diego, San Diego County, California, (Section 9/Township 15S/Range 3W, Del Mar Quadrangle).

WHEREAS, the Department (represented by Pam Beare through a site visit on the 29th day of April, 2009) has determined that such operations may substantially adversely affect those existing fish and wildlife resources within Carroll Canyon Creek within the project limits, specifically identified as follows: **Amphibians**: Pacific tree frog (*Pseudacris regilla*), California tree frog (*Pseudacris cadaverina*), **Reptiles**: western fence lizard (*Sceloporus occidentalis*), common side-blotched lizard (*Uta stansburiana*), western skink (*Eumeces skiltonianus*), common kingsnake (*Lampropeltis getula*), gophersnake (*Pituophis catenifer*), western rattlesnake (*Crotalus viridis*); **Birds**: white-tailed kite (*Elanus leucurus majusculus*), Cooper's hawk (*Accipiter cooperii*), red-shouldered hawk (*Buteo lineatus elegans*), red-tailed hawk (*Buteo jamaicensis*), American kestrel (*Falco sparverius*), mourning dove (*Zenaida macroura*), black-chinned hummingbird (*Archilochus alexandri*), Anna's hummingbird (*Calypte anna*), Costa's hummingbird (*Calypte costae*), Vaux's swift (*Chaetura vauxi vauxi*), white-throated swift (*Aeronautes saxatalis saxatalis*), belted kingfisher (*Ceryle alcyon*), Nuttall's woodpecker (*Picoides nuttallii*), northern flicker (*Colaptes auratus*), ash-throated flycatcher (*Myiarchus cinerascens cinerascens*), Pacific slope flycatcher (*Empidonax difficilis*), black phoebe (*Sayornis nigricans*), Cassin's kingbird (*Tyrannus vociferans*), western kingbird (*Tyrannus verticalis*), northern rough-winged swallow (*Stelgidopteryx serripennis*), cliff swallow (*Petrochelidon pyrrhonota*), bush tit (*Psaltriparus minimus*), Bewick's wren (*Thryomanes bewickii*), house wren (*Troglodytes aedon*), ruby-crowned kinglet (*Regulus calendula*), Swainson's thrush (*Catharus ustulatus*), warbling vireo (*Vireo gilvus swainsoni*), least Bell's vireo (*Vireo belli pusillus*), Hutton's vireo (*Vireo huttoni*), yellow-rumped warbler (*Dendroica coronata*), orange-crowned warbler (*Vermivora celata*), yellow warbler (*Dendroica petechia*), black-throated grey warbler (*Dendroica nigrescens*), common yellowthroat (*Geothlypis trichas*), black-headed grosbeak (*Pheucticus melanocephalus*), blue grosbeak (*Passerina caerulea*), spotted towhee (*Pipilo maculatus*), California towhee (*Pipilo crissalis*), Brewer's blackbird (*Euphagus cyanocephalus*), hooded oriole (*Icterus cucullatus*), Bullock's oriole (*Icterus bullockii parvus*), lesser goldfinch (*Carduelis psaltria hesperophilus*); **Mammals**: desert cottontail (*Sylvilagus audubonii*), striped skunk (*Mephitis mephitis*), coyote (*Canis latrans*), raccoon (*Procyon lotor*), mule deer (*Odocoileus hemionus*), and all other aquatic and wildlife resources, including the riparian vegetation, such as coast live oak (*Quercus agrifolia* var. *agrifolia*), western sycamore (*Platanus racemosa*), arroyo willow (*Salix lasiolepis*), etc. which provides habitat for those species.

THEREFORE, the Department hereby proposes measures to protect fish and wildlife resources during the Applicant's work. The Applicant hereby agrees to accept the following measures/conditions as part of the proposed work.

If the Applicant's work changes from that stated in the notification specified above, this Agreement is no longer valid and a new notification shall be submitted to the Department of Fish and Game. Failure to comply with the provisions of this Agreement and with other pertinent code sections, including but not limited to Fish and Game Code Sections 5650, 5652, 5901, 5931, 5937, and 5948, may result in prosecution.

Nothing in this Agreement authorizes the Applicant to trespass on any land or property, nor does it relieve the Applicant of responsibility for compliance with applicable federal, state, or local laws or ordinances. A consummated Agreement does not constitute Department of Fish and Game endorsement of the proposed operation, or assure the Department's concurrence with permits required from other agencies.

Term and Effective Date

This Agreement becomes effective the date of Department's signature and terminates December 31, 2012 for project construction only. This Agreement shall remain in effect for that time necessary to satisfy the terms/conditions of this Agreement.

Extensions

Pursuant to Section 1600 *et seq.*, the Applicant may request one extension of this Agreement; the Applicant shall request extension of the Agreement prior to its termination. The one extension may be granted for up to five years from the date of termination of the Agreement and is subject to Department approval. The extension request and fees shall be submitted to the Department's South Coast Region at the above address. If the Applicant fails to request the extension prior to the Agreement's termination, then the Applicant shall submit a new notification with fees and required information to the Department. Any construction/impacts that occur under an expired Agreement are a violation of Fish and Game Code 1600 *et seq.*

Suspension and Revocation

The Department reserves the right to cancel this Agreement, after giving notice to the Applicant, if the Department determines that the Applicant has breached any of the terms or conditions of the Agreement.

The Department reserves the right to suspend or cancel this Agreement for other reasons, including but not limited to the following:

a) The Department determines that the information provided by the Applicant in support of the Notification/Agreement is incomplete or inaccurate;
b) The Department obtains new information that was not known to it in preparing the terms and conditions of the Agreement;
c) The project or project activities as described in the Notification/Agreement have changed;
d) The conditions affecting fish and wildlife resources change or the Department determines that project activities will result in a substantial adverse effect on the environment.

Before any suspension or cancellation of the Agreement, the Department will notify the Applicant in writing of the circumstances which the Department believes warrant suspension or cancellation. The Applicant will have seven (7) working days from the date of receipt of this notification to respond in writing to the circumstances described in the Department's notification. During the seven (7) day response period, the Applicant shall immediately cease any project activities which the Department specified in its notification. The Applicant shall not continue the specified activities until that time when the Department notifies the Applicant in writing that adequate methods and/or measures have been identified and agreed upon to mitigate or eliminate the significant adverse effect.

Amendment

This Agreement may be amended at any time by mutual agreement of the parties. Any amendments to this Agreement shall be made in a separate writing, signed by the parties, and attached to this Agreement. Any approved amendments shall become part of this Agreement.

Liability

The Applicant agrees that it shall be responsible for any violations of this Agreement, whether committed by the Applicant or any person acting on behalf of the Applicant, including its agents, officers, and employees, representatives, or contractors and subcontractors. This Agreement does not constitute the Department's endorsement of the authorized Project Activity.

It is understood the Department has entered into this Agreement for purposes of establishing protective features for fish and wildlife. The decision to proceed with the project is the sole responsibility of the Applicant, and is not required by this Agreement. It is further agreed that all liability and/or incurred cost related to or arising from the Applicant's project and the implementation of the fish and wildlife protective conditions of this Agreement remain the sole responsibility of the Applicant. The Applicant agrees to hold harmless the State of California and the Department against any related claim made by any party or parties for personal injury or any other damages.

Enforcement

The Department reserves the right to enter the project site at any time to ensure compliance with the terms/conditions of this Agreement.

Project Location and Description

The project is located under and adjacent to Interstate 805 where it crosses Carroll Canyon Creek, in the City of San Diego. The Applicant proposes to alter the stream by extending Carroll Canyon Road from Scranton Road, under I-805, to Sorrento Valley Road, and construct a high occupancy vehicle connector and direct access ramps from Carroll Canyon Road to I-805. Although permanent impacts to the creek have been reduced by incorporating a retaining wall and bridge structure instead of fill for the Carroll Canyon Road extension, both temporary and permanent impacts to riparian woodland adjacent to the creek are anticipated. The purpose of the project is to alleviate traffic congestion at peak travel hours.

CONDITIONS

The following provisions constitute the limit of activities agreed to and resolved by this Agreement. The signing of this Agreement does not imply that the Applicant is precluded from doing other activities at the site. However, activities not specifically agreed to and resolved by this Agreement shall be subject to separate notification pursuant to Fish and Game Code Sections 1600 *et seq.*

General

1. The agreed work includes activities associated with the Project Location and Description that is provided above. Specific work areas and mitigation measures are described on/in the plans and documents submitted by the Applicant, including the *Natural Environment Study, I-805/Carroll Canyon Extension* (State of California, Department of Transportation, August 2008), *Memorandum: Biology Review of Proposed Retaining Wall 445R and Additional Impact just East of I-805 (Supplement to Natural Environment Study for I-805/Carroll Canyon Road Extension)* (Robert A. James, April 28, 2009), *Biological Opinion, Interstate 805/Carroll Canyon Road Extension Project* (U.S. Fish and Wildlife Service, March 31, 2009), *I-805/Carroll Canyon Road Extension Project, City and County of San Diego, California, Initial Study with Mitigated Negative Declaration/Environmental Assessment with Finding of No Significant Impact* (State of California Department of Transportation, April 2009), and *Floodplain Study, Carroll Canyon Road Extension from Scranton Road to Sorrento Valley Road, City of San Diego, San Diego County, California* (Parsons Brinckerhoff, July 2005); the project shall be implemented as proposed unless directed differently by this agreement.

2. The Applicant shall provide a copy of this Agreement to all contractors, subcontractors, and project supervisors. The Applicant shall ensure that all project personnel abide by all terms and conditions of this agreement. Copies of the Agreement shall be readily available at work sites at all times during periods of active work and must be presented to any Department personnel, or personnel from another agency, upon demand.

3. The Applicant shall notify the Department, in writing, at least five (5) days prior to initiation of construction (project) activities and at least five (5) days prior to completion of construction (project) activities. Notification shall be sent to the Department's South Coast Office at the address above, ATTN: Streambed Alteration Program – SAA # 1600-2009-0121-R5.

Impacts

4. The Applicant shall not impact more than 0.18 acre of riparian vegetation, consisting of coast live oak, western sycamore and arroyo willow. This impact is currently not well defined and although most is anticipated to be temporary, some may be permanent. In addition, the indirect impacts to stream habitats from project lighting have not been adequately quantified.

5. The extent of temporary, permanent and indirect impacts to riparian habitats shall be more accurately defined. Temporary and permanent: Prior to the start of construction, including clearing and grubbing, the limits of riparian vegetation adjacent to the project shall be determined and accurately mapped. The sycamore trees transplanted as mitigation for a previous project (seismic retrofit of the I-805 bridge over Carroll Canyon Creek) shall also be accurately mapped. The mapping shall be submitted to the Department for review and approval before construction can begin. Once construction is underway and the extent of all impacts (false-work, utility relocation, the retaining wall and bridge, and all temporary access, etc.) has been determined, these limits shall be added to the mapping described above to determine the area of temporary and permanent impacts. The extent of impact to the previous mitigation will also be evaluated and if needed additional mitigation will be determined by the Department. Any trees that are trimmed but left in place, shall be monitored for no less that 5 years, and any that have been adversely affected shall be compensated at a 10:1 ratio in a location acceptable to the Department. Indirect: Impacts that may result from project lighting shall be determined by comparing the level of illumination in the adjacent riparian habitats before and after the project. The method for making this evaluation shall be submitted to the Department for review and approval 60 days prior to the start of construction. Any increase in illumination shall first be mitigated by reducing the impact with currently available technology, even if that technology is not generally used by Caltrans. Any areas that are still illuminated in excess of current levels shall be compensated as permanent impacts at a ratio determined by the Department.

Compensatory Mitigation

6. The Applicant shall compensate for the loss of 0.18 acre of stream habitats, and reduced habitat values on additional acreage as follows. Temporary impacts shall be compensated on site as proposed by planting 12 sycamores, 47 coast live oaks, and 7 cottonwoods (these numbers are based on the preliminary estimate and are subject to change once impacts are finalized). In addition, the Applicant has proposed and shall implement a project to remove invasive exotic plant species in riparian areas adjacent to the project site as shown on Figure 16 of the Natural Environment Study. Permanent impacts, and any loss of habitat value resulting from indirect impacts that cannot be reduced on site, shall be compensated with creation and/or restoration of riparian habitat in a location with long-term conservation value and acceptable to the Department (a location on Carmel Valley Creek near the confluence of McGonigle and Deer Canyons is currently being considered). The acreage needed as compensatory mitigation shall be determined by the Department. For all lands provided as compensation for permanent or indirect impacts, the Applicant shall ensure conservation in perpetuity by providing a legal mechanism that will prevent the mitigation lands from being used for any purpose

other than native habitat; this mechanism shall be approved by the Department and shall be finalized prior to any transfer of the land. The Applicant shall ensure the target habitat values are maintained in perpetuity by developing a Habitat Management Plan (HMP) for all mitigation sites. The HMP(s), which shall include an endowment adequate to ensure its implementation, shall be submitted to the Department for review and approval within 1 year of initiation of restoration at each site; the endowment shall be in place within 90 days of the HMP being finalized, and the HMP shall take effect as soon as each site has met its restoration success criteria. The Applicant shall be responsible for implementation of the HMP in perpetuity.

7. The Applicant shall submit plans for the restoration of all temporary impacts and the exotics removal to the Department for review and approval at least 90 days prior to the scheduled commencement of the restoration or removal work. A habitat mitigation and monitoring plan, or plans, for all mitigation of permanent and indirect impacts shall be submitted to the Department for review and approval within six months of when the impacts have been quantified. The plan(s) shall be prepared by persons with expertise in southern California ecosystems and native plant revegetation techniques. The plan(s) shall include, at a minimum: (a) the location of the mitigation site, topography, grading plans if applicable, and erosion control measures; (b) the plant species to be used, container sizes, and seeding rates; (c) a schematic depicting the restoration and planting plan; (d) planting schedule; (e) a description of the irrigation methodology; (f) measures to control exotic vegetation on site; (g) specific success criteria; (h) a detailed maintenance and monitoring program; (i) contingency measures should the success criteria not be met; (j) identification of the party responsible for meeting the success criteria; and (k) the method that will be used to provide for conservation of the mitigation site and its habitats in perpetuity. Only locally endemic species shall be used in the planting plan.

8. All mitigation for temporary impacts shall be installed as soon as construction at that location has been completed. All mitigation for permanent impacts shall be installed within one year of the initiation of project impacts. Any delay in the installation of mitigation will require an amendment to this Agreement, and may result in the application of higher mitigation ratios to offset the additional temporal loss of habitat function.

9. Disturbance or removal of vegetation shall not exceed the limits approved by the Department. The Applicant shall mitigate at a minimum 5:1 ratio for impacts beyond those authorized in this Agreement. In the event that additional mitigation is required, the type and location of mitigation must be approved by the Department.

10. For each mitigation and restoration site, the Applicant shall submit a report to the Department, within 60 days after completion of site preparation and planting, acknowledging the completion of the installation phase of the mitigation, and documenting its as-built conditions. The report shall include a plan or diagram showing the mitigation area and the final as-built locations of plantings, irrigation, and other installations. Photographs from representative vantage points shall also be included to document the as-built conditions.

11. The goal of the restoration shall be creation of self sustaining habitats with species composition and plant densities similar to nearby natural habitats. The Applicant shall ensure that those planting and maintaining the sites have demonstrated success in native habitat restoration, and an understanding of the function of the target vegetation communities. Any irrigation of the mitigation/restoration areas shall be done in a manner that promotes establishment of the desired habitat type, without creating a plant community that will not function well, or persist, once irrigation is removed. An annual report documenting the status of the habitat restoration areas shall be submitted to the Department by Dec. 1 of each year for 5 years after planting, or until the success criteria have been met, whichever is longer. The report shall include, at a minimum, a description of the methods used (methods must be appropriate for evaluating the site relative to the success criteria), the number of plants replaced by species along with the date of replacement, an evaluation of the revegetation effort,

a description of any remedial actions that are needed along with a schedule for accomplishing those actions, and photos from designated photo stations. The Applicant is responsible for replacement planting, maintenance and monitoring until the success criteria are met; maintenance and monitoring shall continue for 5 years after the last replacement planting is done. In addition to meeting the success criteria, the mitigation/restoration sites shall not receive any supplemental irrigation for the final two (2) consecutive years, there shall be no non-native perennial plants and non-native annuals shall not make up more than 5% of the entire cover of the site, no more than 5% of the site shall consist of unplanned bare ground, and the site shall be completely free of those species on List A of the California Invasive Plant Council's most recent list of "Exotic Pest Plants of Greatest Ecological Concern in California." If any invasive exotic plants are allowed to shed seed within any mitigation/restoration site, the Applicant shall add an additional 5 years of maintenance and monitoring over the entire site.

12. The work area and/or mitigation site(s) shall be secured from trespass when, as determined by the Department, fish or wildlife resources are vulnerable to damage from public access.

13. If any sensitive species are observed in project or monitoring surveys, the Applicant shall submit a California Native Species Field Survey Form and survey map to the Natural Diversity Database (NDDB) within ten working days of the sightings. The form and instructions for completing the form are available on-line at http://www.dfg.ca.gov/biogeodata/cnddb/. The form and survey map shall be sent to the Department of Fish and Game, California Natural Diversity Database, 1807 13th Street, Suite 202, Sacramento, CA 95814, with copies sent to the Department's South Coast Office at the address above, ATTN: Streambed Alteration Program – SAA #1600-2009-0043-R5.

14. Maintenance and monitoring of all mitigation sites shall continue until the Applicant has requested and received written concurrence from the Department that the success criteria have been met.

Resource Protection

15. The Applicant shall have a qualified biologist onsite as needed to ensure that no impacts occur to the adjacent habitats and species.

16. All stream and riparian habitats outside of the project footprint shall be designated as an Environmentally Sensitive Area (ESA) and depicted as such on project plans. Prior to any vegetation clearing, grading or construction activities within the project limits or mitigation areas, the Applicant shall install temporary construction fencing to identify the agreed limits of disturbance and prevent damage to adjacent habitat. The biological monitor shall be onsite during installation of the temporary construction fencing. Except for the biological monitor and for exotics removal work, no personnel, vehicles, equipment or any project related activities or disturbance shall be allowed within the ESA at any time. All temporary fences, barriers, and/or flagging shall be completely removed from the project site and properly disposed of upon completion of project activities.

17. The Applicant shall not remove vegetation within or adjacent to the stream or riparian habitats from February 15 to September 15 to avoid impacts to nesting birds. However, the Applicant may remove vegetation during this time if a qualified biologist conducts a survey for nesting birds within one week prior to vegetation removal, both within the area of vegetation clearing and in adjacent habitats that may be impacted by this activity. If an active nest is found, the nest and an appropriate buffer shall be designated as an ESA, and no work shall occur within this area until the young have fledged and will no longer be impacted by the project. The buffer area shall be determined in consultation with the Department.

18. Any pile driving associated with the project shall only be conducted between September 16 and February 14 to reduce noise affects to nesting birds in the vicinity.

19. Except for pile driving, once construction at a specific location has started, and it continues without interruption, work may occur from February 15 to September 15, if a qualified biologist has evaluated all stream and riparian habitats adjacent to the project and determined that no nesting sensitive bird species will be impacted. If nesting birds will likely be impacted, work shall cease in the area until the young have fledged and will no longer be impacted by the project, or appropriate measures are taken to avoid such impacts. For the purpose of this condition, sensitive bird species include those listed pursuant to the Endangered Species Act, the California Endangered Species Act, and California Department of Fish and Game Fully Protected Species and Species of Special Concern.

20. The Applicant shall ensure that wildlife cannot become trapped in construction areas. All debris piles shall be removed before they become inhabited. Steep-walled trenches shall not be left open when not being worked on and shall be checked for trapped wildlife before work resumes. The Applicant shall take appropriate measures to prevent wildlife from inhabiting stockpiled materials, such as pipe, and these shall be checked before being moved. The biological monitor shall be called to remove any wildlife that cannot escape on its own.

21. During any nighttime construction adjacent to stream and riparian habitats, all project lighting shall be directed away from sensitive habitats, at the work area only, and be the minimum needed to ensure safety. During the nesting season, light glare shields shall also be used to reduce the extent of illumination into adjoining stream and riparian habitat areas.

22. Any materials used for erosion control measures during or after construction, within or adjacent to the stream or riparian habitats, shall consist only of materials that are free from toxic chemicals, are biodegradable, and cannot ensnare fish or wildlife.

23. All project and project related activities shall be conducted in a manner that will not adversely affect water quality within any stream, or stream or riparian habitats outside of the project footprint.

24. The Department recommends the use of native plants to the greatest extent feasible in the landscape areas adjacent and/or near the mitigation/open space and wetland/riparian areas. The Applicant shall not plant, seed or otherwise introduce invasive exotic plant species to the landscaped areas adjacent and/or near the mitigation/open space and wetland/riparian areas. Exotic plant species not to be used include those species listed on the California Invasive Plant Council's *Invasive Plant Inventory*, available through their web site at http://www.cal-ipc.org/ip/inventory/index.php. This list includes such species as: pepper trees, pampas grass, fountain grass, ice plant, myoporum, tree of heaven, black locust, capeweed, periwinkle, sweet alyssum, English ivy, French broom, Scotch broom, and Spanish broom.

Equipment and Access

25. Access to the work site shall be via existing roads and access ramps.

26. Staging and storage areas for equipment and materials shall be located within the project footprint and as far as possible from stream and riparian habitats.

27. No equipment maintenance shall occur within or near any stream channel or riparian areas, or where petroleum products or other pollutants could enter these areas under any flow.

28. Vehicles and equipment shall not be driven, operated or parked in water covered portions of a stream or lake, or where wetland vegetation, riparian vegetation, or aquatic organisms may be destroyed.

29. Any vehicles or equipment driven, operated or parked within the project footprint adjacent to the stream or riparian/wetland habitats, shall be checked and maintained daily to prevent leaks of materials that if introduced to water could be harmful to aquatic life.

Pollution, Sedimentation, and Litter

30. Water containing mud, silt or other materials or pollutants from the project or project related activities shall not be allowed to enter a lake, stream, or riparian/wetland habitats, be placed in locations where they may be washed into a lake, stream, or riparian/wetland habitats, or be placed in locations that may be subjected to high storm flows.

31. Silty/turbid water shall not be discharged into the stream. Erosion/silt control measures shall be utilized throughout all phases of operation where silt laden water from exposed slopes or disturbed areas could enter waters of the state. Any silt settling basins shall be located away from the stream to prevent discolored, silt-bearing water from reaching the stream during any flow level. Erosion control measures shall be monitored during and after each storm event. Modification, repairs, and improvement to erosion control measures shall be made as needed to maintain function. Upon Department determination that turbidity/siltation levels resulting from project related activities constitute a threat to aquatic life, activities associated with the turbidity/siltation shall be halted until effective Department-approved control devices are installed.

32. Spoil sites shall not be located within a stream/lake, where spoil may be washed back into a stream/lake, or where it will cover aquatic or riparian vegetation.

33. No debris, soil, silt, sand, bark, slash, sawdust, rubbish, construction waste, cement or concrete or washings thereof, asphalt, paint, oil or petroleum products or other materials from any construction, or project related activity of any nature, shall be allowed to contaminate the soil or enter into or be placed where it may be washed by rainfall or runoff into a stream, lake or riparian habitat. When operations are completed, any excess materials or debris shall be removed.

34. Upon Department determination that turbidity/siltation/pollution levels resulting from any project-related activities constitute a threat to aquatic life, those activities shall be halted until effective Department-approved control measures are installed, and any necessary abatement procedures are initiated.

35. The Applicant shall keep the project site free of litter and waste that could attract predators, and shall comply with all litter and pollution laws. All contractors, subcontractors, and employees shall also obey these laws and it shall be the responsibility of the Applicant to ensure compliance.

CONCURRENCE

CALIFORNIA DEPARTMENT OF TRANSPORTATION

Arturo Jacobo — Date: 6/8/09
Name (signature)

ARTURO JACOBO
Name (printed)

PRO JECT MANAGER
Title

CALIFORNIA DEPARTMENT OF FISH AND GAME

Date: 10 JUNE 09

Stephen M. Juarez
Environmental Program Manager
South Coast Region

Prepared by Pam Beare, Staff Environmental Scientist

RECORDING REQUESTED BY
CITY OF SAN DIEGO
DEVELOPMENT SERVICES
PERMIT INTAKE, MAIL STATION 501

WHEN RECORDED MAIL TO
PROJECT MANAGEMENT
PERMIT CLERK
MAIL STATION 501

SPACE ABOVE THIS LINE FOR RECORDER'S USE

JOB ORDER NUMBER: 523920

COASTAL DEVELOPMENT PERMIT NO. 631853
CARROLL CANYON ROAD EXTENSION PROJECT NO. 175786
DEVELOPMENT SERVICES DEPARTMENT

This Coastal Development Permit No. 631853 is granted by the Development Services Department of the City of San Diego to California Department of Transportation, Permittee, pursuant to San Diego Municipal Code [SDMC] section 126.0501. The site is located within the public right-of-way of Carroll Canyon Road, Mira Mesa Boulevard and Interstate 805 from just east of Scranton Road west to Sorrento Valley Road of the Mira Mesa and Torrey Pines Community Plan areas. The project site is legally described as public right-of-way.

Subject to the terms and conditions set forth in this Permit, permission is granted to Permittee to extend Carroll Canyon Road from just east of Scranton Road west to Sorrento Valley Road, improve Mira Mesa Boulevard and the on and off-ramps from Interstate 805 to Mira Mesa Boulevard and work within the Interstate 805 right-of-way to construct north and southbound high-occupancy vehicle lanes on Interstate 805 from Interstate 5 to Carroll Canyon Road, including construction of north-facing direct access ramps in the City of San Diego, San Diego County, described and identified by size, dimension, quantity, type, and location on the approved exhibits [Exhibit "A"] dated April 3, 2009, on file in the Development Services Department.

The project shall include:

a. The extension of Carroll Canyon Road from just east of Scranton Road west to Sorrento Valley Road, improve Mira Mesa Boulevard and the on and off-ramps from Interstate 805 to Mira Mesa Boulevard and work within the Interstate 805 right-of-way to construct north and southbound high-occupancy vehicle lanes on Interstate 805 from Interstate 5 to Carroll Canyon Road, including construction of north-facing direct access ramps in the City of San Diego, San Diego County;

b. Landscaping (planting, irrigation and landscape related improvements); and

c. Accessory improvements determined by the Development Services Department to be consistent with the land use and development standards in effect for this site per the adopted community plan, California Environmental Quality Act Guidelines, public and private improvement requirements of the City Engineer, the underlying zone(s), conditions of this Permit, and any other applicable regulations of the SDMC in effect for this site.

STANDARD REQUIREMENTS:

1. This permit must be utilized within thirty-six (36) months after the date on which all rights of appeal have expired. Failure to utilize and maintain utilization of this permit as described in the SDMC will automatically void the permit unless an Extension of Time has been granted. Any such Extension of Time must meet all SDMC requirements and applicable guidelines in affect at the time the extension is considered by the appropriate decision maker.

2. No permit for the construction or operation of any facility or improvement described herein shall be granted, nor shall any activity authorized by this Permit be conducted on the premises until:

a. The Permittee signs and returns the Permit to the Development Services Department.

3. Prior to the initiation of construction authorized by this Permit, an enhancement fee shall be deposited with the Development Services Department for the Los Peñasquitos Watershed Restoration and Enhancement Program. The enhancement fee shall be computed on the basis of site grading at a rate of $0.005 per square foot for all areas graded, with an additional rate of $0.03 per square foot for all impervious surfaces created by the development. The enhancement fee shall be computed by the Permittee and verified by the Development Services Department.

4. Unless this Permit has been revoked by the City of San Diego the property included by reference within this Permit shall be used only for the purposes and under the terms and conditions set forth in this Permit unless otherwise authorized by the Development Services Department.

5. This Permit is a covenant running with the subject right-of-way and shall be binding upon the Permittee and any successor or successors, and the interests of any successor shall be subject to each and every condition set out in this Permit and all referenced documents.

6. The continued use of this Permit shall be subject to the regulations of this and any other applicable governmental agency.

7. Issuance of this Permit by the City of San Diego does not authorize the Permittee for this permit to violate any Federal, State or City laws, ordinances, regulations or policies including, but not limited to, the Endangered Species Act of 1973 [ESA] and any amendments thereto (16 U.S.C. § 1531 et seq.).

8. The Permittee shall secure all necessary building permits. The Permittee is informed that to secure these permits, substantial modifications to the improvements to comply with applicable building, fire, mechanical and plumbing codes and State law requiring access for disabled people may be required.

9. Construction plans shall be in substantial conformity to Exhibit "A." No changes, modifications or alterations shall be made unless appropriate application(s) or amendment(s) to this Permit have been granted.

10. All of the conditions contained in this Permit have been considered and have been determined to be necessary in order to make the findings required for this Permit. It is the intent of the City that the holder of this Permit be required to comply with each and every condition in order to be afforded the special rights which the holder of the Permit is entitled as a result of obtaining this Permit.

In the event that any condition of this Permit, on a legal challenge by the Permittee of this Permit, is found or held by a court of competent jurisdiction to be invalid, unenforceable, or unreasonable, this Permit shall be void. However, in such an event, the Permittee shall have the right, by paying applicable processing fees, to bring a request for a new permit without the "invalid" conditions(s) back to the discretionary body which approved the Permit for a determination by that body as to whether all of the findings necessary for the issuance of the proposed permit can still be made in the absence of the "invalid" condition(s). Such hearing shall be a hearing de novo and the discretionary body shall have the absolute right to approve, disapprove, or modify the proposed permit and the condition(s) contained therein.

11. The Permittee shall defend, indemnify, and hold harmless the City, its agents, officers, and employees from any and all claims, actions, proceedings, damages, judgments, or costs, including attorney's fees, against the City or its agents, officers, or employees, relating to the issuance of this permit including, but not limited to, any action to attack, set aside, void, challenge, or annul this development approval and any environmental document or decision. The City will promptly notify applicant of any claim, action, or proceeding and, if the City should fail to cooperate fully in the defense, the Permittee shall not thereafter be responsible to defend, indemnify, and hold harmless the City or its agents, officers, and employees. The City may elect to conduct its own defense, participate in its own defense, or obtain independent legal counsel in defense of any claim related to this indemnification. In the event of such election, Permittee shall pay all of the costs related thereto, including without limitation reasonable attorney's fees and costs. In the event of a disagreement between the City and Permittee regarding litigation issues, the City shall have the authority to control the litigation and make litigation related decisions, including, but not limited to, settlement or other disposition of the matter. However, the Permittee shall not be required to pay or perform any settlement unless such settlement is approved by Permittee.

12. This Permit may be developed in phases.

INFORMATION ONLY:

- Any party on whom fees, dedications, reservations, or other exactions have been imposed as conditions of approval of this development permit, may protest the imposition within ninety days of the approval of this development permit by filing a written protest with the City Clerk pursuant to California Government Code §66020.

- This development may be subject to impact fees at the time of construction permit issuance.

APPROVED by the Development Services Department of the City of San Diego on April 3, 2009.

Permit Type/PTS Approval No.: CDP No. 631853
Date of Approval: April 3, 2009

AUTHENTICATED BY THE DEVELOPMENT SERVICES DEPARTMENT
CITY OF SAN DIEGO

John S. Fisher
Development Project Manager

NOTE: Notary acknowledgment must be attached per Civil Code section 1189 et seq.

The undersigned Permittee, by execution hereof, agrees to each and every condition of this Permit and promises to perform each and every obligation of Permittee hereunder.

California Department of Transportation
Permittee

By _____
Arturo Jacobo
Project Manager
California Department of Transportation

NOTE: Notary acknowledgments must be attached per Civil Code section 1189 et seq.

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT

State of California

County of San Diego

On May 18, 2009 (Date) before me, Raquel Herrera, Notary Public (Here Insert Name and Title of the Officer)

personally appeared ---------- John S. Fisher ---------- (Name(s) of Signer(s))

who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/~~are~~ subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(~~ies~~), and that by his/her/their signature(~~s~~) on the instrument the person(~~s~~), or the entity upon behalf of which the person(~~s~~) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature Raquel Herrera (Signature of Notary Public)

RAQUEL HERRERA
Commission # 1779596
Notary Public - California
San Diego County
My Comm. Expires Nov 12, 2011

Place Notary Seal Above

OPTIONAL

Though the information below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent removal and reattachment of this form to another document.

Description of Attached Document

Title or Type of Document: CDP No. 631853, Carroll Canyon Road Extension; Project No. 175786

Document Date: April 3, 2009 Number of Pages: 7

Signer(s) Other Than Named Above: _____

Capacity(ies) Claimed by Signer(s)

Signer's Name: _____
☐ Individual
☐ Corporate Officer — Title(s): _____
☐ Partner — ☐ Limited ☐ General
☐ Attorney in Fact
☐ Trustee
☐ Guardian or Conservator
☐ Other: _____
Signer Is Representing: _____

RIGHT THUMBPRINT OF SIGNER
Top of thumb here

Signer's Name: _____
☐ Individual
☐ Corporate Officer — Title(s): _____
☐ Partner — ☐ Limited ☐ General
☐ Attorney in Fact
☐ Trustee
☐ Guardian or Conservator
☐ Other: _____
Signer Is Representing: _____

RIGHT THUMBPRINT OF SIGNER
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CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT

State of California

County of San Diego }

On May 5, 2009 (Date) before me, Lorna G. Timog (Here Insert Name and Title of the Officer)

personally appeared Arturo Gonzalez Jacobo (Name(s) of Signer(s))

who proved to me on the basis of satisfactory evidence to be the person~~(s)~~ whose name~~(s)~~ is/~~are~~ subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity~~(ies)~~, and that by his/~~her/their~~ signature~~(s)~~ on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature Lorna G. Timog (Signature of Notary Public)

LORNA G. TIMOG
Commission # 1837268
Notary Public - California
San Diego County
My Comm. Expires Feb 20, 2013

Place Notary Seal Above

OPTIONAL

Though the information below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent removal and reattachment of this form to another document.

Description of Attached Document

Title or Type of Document: Coastal Development Permit No. 631853

Document Date: April 3, 2009 Number of Pages: 5

Signer(s) Other Than Named Above: _____

Capacity(ies) Claimed by Signer(s)

Signer's Name: Arturo G. Jacobo

- ☐ Individual
- ☐ Corporate Officer — Title(s): _____
- ☐ Partner — ☐ Limited ☐ General
- ☐ Attorney in Fact
- ☐ Trustee
- ☐ Guardian or Conservator
- ☑ Other: Project Manager

Signer Is Representing: Department of Transportation

RIGHT THUMBPRINT OF SIGNER
Top of thumb here

Signer's Name: _____

- ☐ Individual
- ☐ Corporate Officer — Title(s): _____
- ☐ Partner — ☐ Limited ☐ General
- ☐ Attorney in Fact
- ☐ Trustee
- ☐ Guardian or Conservator
- ☐ Other: _____

Signer Is Representing: _____

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DEVELOPMNT SERVICES RESOLUTION NO. CM-6041
COASTAL DEVELOPMENT PERMIT NO. 631853
CARROLL CANYON ROAD EXTENSION PROJECT NO. 175786

WHEREAS, California Department of Transportation, Owner/Permittee, filed an application with the City of San Diego for a permit to extend Carroll Canyon Road from just east of Scranton Road west to Sorrento Valley Road, improve Mira Mesa Boulevard and the on and off-ramps from Interstate 805 to Mira Mesa Boulevard and work within the Interstate 805 right-of-way to construct north and southbound high-occupancy vehicle lanes on Interstate 805 from Interstate 5 to Carroll Canyon Road, including construction of north-facing direct access ramps in the City of San Diego, San Diego County (as described in and by reference to the approved Exhibits "A" and corresponding conditions of approval for the associated Permit No. 631853), on portions of a public right-of-way;

WHEREAS, the project site is located within the public right-of-way of Carroll Canyon Road, Mira Mesa Boulevard and Interstate 805 from just east of Scranton Road west to Sorrento Valley Road of the Mira Mesa and Torrey Pines Community Plan areas;

WHEREAS, the project site is legally described as public right-of-way;

WHEREAS, on April 3, 2009, the Development Services Department of the City of San Diego considered Coastal Development Permit No. 631853 pursuant to the Land Development Code of the City of San Diego;

BE IT RESOLVED by the Development Services Department of the City of San Diego as follows:

That the Development Services Department adopts the following written Findings, dated April 3, 2009.

FINDINGS:

Coastal Development Permit - Section 126.0708

A.

1. **The proposed coastal development will not encroach upon any existing physical access way that is legally used by the public or any proposed public accessway identified in a Local Coastal Program land use plan; and the proposed coastal development will enhance and protect public views to and along the ocean and other scenic coastal areas as specified in the Local Coastal Program land use plan.** The improvement of public right-of-way will not encroach upon existing physical access ways legally used by the public or any proposed access ways identified in a Local Coastal Program land use plan due to the nature of the project the public access in and through the project area, which is public right-of-way, will improve public access not encroach upon it. The improvement of public right-of-way will have no effect upon public views to and along the ocean and other scenic coastal areas which are specified in the Local Coastal Program land use plan.

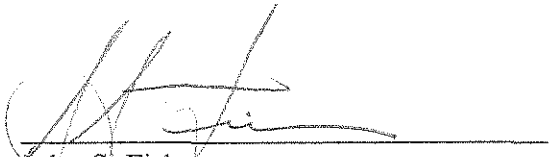
2. **The proposed coastal development will not adversely affect environmentally**

sensitive lands. The improvement of public right-of-way authorized by the Coastal Development Permit contains no environmentally sensitive lands. As such the coastal development will not adversely affect environmentally sensitive lands.

3. **The proposed coastal development is in conformity with the certified Local Coastal Program land use plan and complies with all regulations of the certified Implementation Program.** The improvement of public right-of-way authorized by the Coastal Development Permit conforms to the Mira Mesa and Torrey Pines Community Plan Land Use Maps which identify the public right-of-ways as circulation element roadways. The improvement of public right-of-way authorized by the Coastal Development Permit will comply with all regulations of the certified Implementation Program.

4. **For every Coastal Development Permit issued for any coastal development between the nearest public road and the sea or the shoreline of any body of water located within the Coastal Overlay Zone the coastal development is in conformity with the public access and public recreation policies of Chapter 3 of the California Coastal Act.** The improvement of public right-of-way authorized by the Coastal Development Permit is not between the nearest public road and the sea or the shoreline of any body of water located within the Coastal Overlay Zone. Further, improvement of public right-of-way authorized by the Coastal Development Permit will conform to the public access and public recreation policies of Chapter 3 of the California Coastal Act as the project approved by the Coastal Development Permit is the improvement of existing public right-of-way.

BE IT FURTHER RESOLVED that, based on the findings hereinbefore adopted by the Development Services Department, Coastal Development Permit No. 631853 is hereby GRANTED by the Development Services Department to the referenced Owner/Permittee, in the form, exhibits, terms and conditions as set forth in Permit No. 631853, a copy of which is attached hereto and made a part hereof.



John S. Fisher
Development Project Manager
Development Services

Adopted on: April 3, 2009

Job Order No. 523920

cc: Legislative Recorder, Development Services Department

State of California Business, Transportation and Housing Agency

Memorandum

Flex your power!
Be energy efficient!

To: MS. CHUNG-YUAN WEN
Structure Design
Office of Bridge Design-South 2
Bridge Design Branch 21
Diamond Bar, CA

Date: April 13, 2009

File: 11-2T0401
Carroll Canyon Rd. Br.
Br. #57C-0786

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
Geotechnical Services
Office of Geotechnical Design – South 2 MS #5
Design Branch B

Subject: Foundation Report

This report presents the foundation recommendations for the proposed Carroll Canyon Road Bridge (Br. #57C-0786), as well as the Abutment 1 retaining wall and the Abutment 15 wingwall footing. The Office of Geotechnical Design-South 2, Design Branch B completed a foundation investigation pursuant to the December 8, 2008 decision by Structures Design, Office of Bridge Design-South 2, that Caltrans Office of Geotechnical Design will take over the foundation design for this structure. This decision was made after it was determined that the consultant subsurface investigation borings were not drilled deep enough to adequately determine specified pile tip elevations, as well as other related issues. This Foundation Report supercedes all other foundation recommendations for this structure provided by Caltrans or any consultant. The Carroll Canyon Road Bridge (Br. #57C-0786) is being designed by the consultant TY Lin, Int'l. which has provided the Office of Geotechnical Design, South-2 the design information used in this report to provide foundation recommendations.

The following foundation recommendations are based on subsurface information gathered during a recent foundation investigation (January/February 2008) performed by Caltrans. With regards to the current foundation recommendations, all elevations referenced within this report and shown on the recent Log of Test Boring (LOTB) sheets are based on the 1929 NGVD datum, unless otherwise noted.

Project Description

The proposed bridge site is located in the northern part of the city of San Diego, where Interstate 805 (I-805) and an off-ramp pass over Carroll Canyon Creek and a railroad. The existing northbound and southbound freeway bridges are designated as Soledad Canyon BOH (Br. #57-0787 L/R) and the northbound off-ramp bridge to Mira Mesa Blvd., located just to the east of the I-805 bridges, is designated as Soledad Canyon Off-Ramp OH (57-0787S).

The proposed Carroll Canyon Road Bridge is to connect Sorrento Valley Road, on the west side of I-805, with Mira Mesa Blvd, on the east side of I-805, passing beneath the existing I-805 left

and right bridges, as well as the Soledad Canyon Off-Ramp OH bridge. Additionally, the proposed Carroll Canyon Direct Access Ramp (DAR) is to intersect with the Carroll Canyon Road bridge near its mid-point. The Carroll Canyon Road Bridge (Br. #57C-0786) is to be a cast-in-place, prestressed, concrete box-girder structure with seat abutments and two-column bents. Additionally, a retaining wall is to be constructed on the left side of Abutment 1, and a wingwall support footing is to be located adjacent to Abutment 15.

Geology

The foundation investigation performed in January/February 2009 consisted of 12 mud rotary borings. Of the borings, four were drilled with a Christensen CS 1000 drill rig, four were drilled with a Central Mine Equipment (CME) 75 drill rig, two were drilled with an Acker MP5 drill rig, and two were drilled with a Mobile B-47 drill rig.

The proposed bridge site is located in an area of ancient sedimentary marine terraces cut by creeks, which generally flow east to west. Alluvial material is generally found in the creek bottoms, with sedimentary formational material exposed on the canyon sides, above the creek bed. As-built plans from 1970 reveal that the original topography at the bridge site sloped from south to north, with the creek flowing approximately beneath where Abutments 7 of the Soledad Canyon BOH left and right bridges now exist. During bridge construction, approximately 33.5 m (110 ft) of fill material was placed where Abutment 7 now exists, and the stream was re-routed to the south, so that it passes between what is now Bents 4 and 5.

The 2009 foundation investigation at the bridge site generally revealed alluvial material overlying sedimentary formational material. The proposed Abutment 1 and Bent 2 are located where the sedimentary formational material is exposed at the ground surface. Bents 3 through 14 and Abutment 15 are located where alluvium overlies the sedimentary formational material. The alluvial material varies in thickness across the bridge site, ranging from about 3.4 m (11 ft) thick in boring R-09-005, at the Bent 4 location, to about 14 m (46 ft) thick in Boring R-09-010, near the Bent 6 location. Generally, the alluvial material consists of loose to very dense, fine to coarse, poorly graded to well graded interbedded layers of silts and sand, with some fine to coarse gravels and cobbles, as well as minor clay layers.

Underlying the alluvium is sedimentary formational material which generally consists of interbedded sandstone, siltstone, and conglomerate layers. The sandstone and siltstone range from decomposed to slightly weathered, very soft to very hard, and intensely to slightly fractured. Generally, the sandstone and siltstone layers overlie the conglomerate which consists of very hard, subrounded to subangular igneous clasts within a decomposed to slightly weathered, very soft to very hard, weakly to strongly cemented sand and silt matrix.

For specific details regarding alluvium thickness and descriptions, as well as sedimentary formation descriptions, refer to the LOTB sheets for the proposed new bridge. As-built LOTB sheets for the existing Soledad Canyon BOH and Soledad Canyon Offramp BOH Bridges are available from Engineering Services Structure Maintenance and at the Transportation Laboratory.

Ground Water

During the 2009 subsurface investigation, it was noticed that when the borings penetrated into the conglomerate layer underlying the siltstone/sandstone layers, artesian conditions were encountered. Therefore, it appears that the overlying siltstone/sandstone layers are acting as confining layers for the artesian ground water. Ground water was measured in three borings: R-09-003, R-09-007, and R-09-009. In boring R-09-003, located near Bent 14 left column, artesian conditions were recorded, with the static ground water level measured 0.5 m (1.6 ft) above the ground surface at elevation 32.3 m (elev. 106.0 ft) on January 28, 2009. In boring R-09-007, located near Bent 10 column location, artesian conditions were recorded, with the static ground water level measured 0.34 m (1.1 ft) above the ground surface at elevation 31.7 m (elev. 104.0 ft) on February 4, 2009. In boring R-09-009, located at Abutment 15 location, ground water was measured at elevation 31.1 m (elev. 102.0 ft) on February 4, 2009. In borings R-09-002, near Bent 3 location, and boring R-09-005, near Bent 4 location, artesian conditions were noticed, but the static ground water level was not measured at these boring locations. Additionally, in boring R-09-005 a sulfur odor was detected in the artesian water coming out of the boring. All other borings were immediately backfilled after completion of drilling operations, and no attempt was made to measure ground water in those borings, although artesian conditions were noticed.

Measured ground water elevations are also shown on the LOTB sheets. Ground water levels indicated in this report and shown on the LOTB sheets reflect the measured ground water level 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 seasonal conditions and water levels in the creek, as well as the artesian pressure the ground water is under, at time of construction.

Scour Potential

The subsurface investigation, performed in 2009, generally revealed potentially scourable alluvial material overlying the sedimentary formational material beneath most of the proposed bridge site. At the proposed Abutment 1 and Bent 2 locations the sedimentary formational material is exposed at the ground surface. As well, the proposed Abutment 1 and Bent 2 locations are far above the creek channel, therefore scour would not appear to be a problem at those locations.

At Bents 3 through 14 and Abutment 15 locations, potentially scourable alluvial material overlies the sedimentary formational material. The approximate depths of potentially scourable alluvial material in borings located nearest the proposed support locations are presented in Table 1, below.

Table 1 – Approximate Depth of Potentially Scourable Material

Support Location	Boring Nearest Support Location	Approximate Depth of Potentially Scourable Material in Nearest Boring	Approximate Elevation of Bottom of Potentially Scourable Material at Support Location
Bent 3	R-09-002	3.7 m (12.2 ft)	24.5 m (80.5 ft)
Bent 4	R-09-005	3.4 m (11.3 ft)	24.6 m (80.7 ft)
Bent 5	R-09-008	9.6 m (31.4 ft)	20.9 m (68.7 ft)
Bents 6, 7A, 7B	R-09-010	14.1 m (46.1 ft)	17.0 m (55.9 ft)
Bents 8A, 8B, 9A, 9B, 10	R-09-007	13.4 m (44.0 ft)	18.0 m (58.9 ft)
Bents 11A, 11B, 12	R-09-006	13.2 m (43.2 ft)	18.6 m (61.0 ft)
Bent 13	R-09-004	13.4 m (44.0 ft)	18.8 m (61.7 ft)
Bent 14	R-09-003	12.9 m (42.2 ft)	19.0 m (62.3 ft)
Abutment 15	R-09-009	6.3 m (20.6 ft)	25.4 m (83.4 ft)

The Final Hydraulic Report, dated January 29, 2009, provided by the Office of Design and Technical Services, Structure Hydraulics, states that the estimated stage for a 100-year flood is elevation 29.9 m (98 ft). The current stream channel flows between Bents 4 and 5 of the Soledad Canyon BOH bridges, whereas the proposed Carroll Canyon Road Bridge is located between Bents 5 and 6 of the Soledad Canyon BOH bridges. The hydraulic report states, "Since our project is located between Bents 5 and 6, no contraction, abutment, or local scour is anticipated. For the area along Sorrento Creek adjacent to the proposed project it is anticipated that there will be no contraction, abutment, or local scour because the project is located outside of the anticipated flow....". For more detailed scour and hydraulics information, please refer to the Final Hydraulic Report indicated above.

Corrosion

Corrosion test results for soil samples collected from borings R-09-003, R-09-006, R-09-011, are shown below in Table 2. All of the soil samples tested are considered non-corrosive by current Caltrans standards.

Table 2 – Corrosion Test Summary

Location	pH	Minimum Resistivity (Ohm-Cm)	Sulfate Content (ppm)	Chloride Content (ppm)
Boring R-09-003 Elev. 31.85 – 25.75 m (Elev. 104.5 – 84.5 ft)	6.8	905	231	135
Boring R-09-006 Elev. 31.75 – 23.55 m (Elev. 104.2 – 77.3 ft)	6.8	475	369	375
Boring R-09-011 Elev. 34.20 – 26.86 m (Elev. 113.1 – 88.1 ft)	7.2	630	225	270

Note: Caltrans currently defines a corrosive environment as an area where the soil has either a chloride concentration of 500 ppm or greater, a sulfate concentration of 2000 ppm or greater, or has a pH of 5.5 or less. With the exception of MSE walls, soil and water are not tested for chlorides and sulfates if the minimum resistivity is greater than 1,000 ohm-cm.

Fault and Seismic Data

The structure site is potentially subject to strong ground motions from nearby earthquake sources during the design life of the new structure. The site is located about 5.5 km (3.4 mi.) northeast of the Newport-Inglewood-Rose Canyon/E Fault (NIE, Mw=7.0, strike-slip). Based on the 1996 Caltrans California Seismic Hazard Map, the bridge is within peak horizontal bedrock acceleration (PBA) zone of 0.5g. The Office of Geotechnical Design, South 2, will provide Seismic Design Recommendations in a separate memorandum, which will be forwarded to your office when completed.

Liquefaction Potential

Liquefaction potential of the alluvial soils will be addressed in the Seismic Design Recommendations, which will be forwarded to your office when completed.

Foundation Recommendations

The following recommendations are for the proposed Carroll Canyon Road Bridge (Br. #57C-0786), the Abutment 1 left side retaining wall and the Abutment 15 wingwall footing, as shown on the General Plan dated December 19, 2008. At Abutment 1 support location, the Abutment 1 retaining wall, and the Abutment 15 wingwall footing, spread footings are recommended for support. At Bents 2 through 14 and Abutment 15 support locations Cast-In-Drilled-Hole (CIDH) piles are recommended for support. Permanent steel casings are also recommended at Bents 4 through 14 locations.

Abutment 1 and Abutment 15 Wingwall footing Locations

At Abutment 1 support location and the Abutment 15 wingwall location, spread footings are recommended for support. The Abutment 1 footing is proposed to be located on both the sedimentary formational material on the left side of the footing, and on engineered fill material on the right side of the footing. The Abutment 15 wingwall footing is proposed to be on newly place fill material. Table 3, below, presents the Abutment 1 and Abutment 15 wingwall footing spread footing design information provided by the structure designer, TY Lin, Int'l.

Table 3: Abutment 1 and Abutment 15 Wingwall Footing
Spread Footing Design Information Provided by the Structure Designer, TY Lin, Int'l.

Support Location	Bottom of Footing Elevation	Footing Size		Permissible Settlement Under Service Load	Service Limit State I						
					Total Load				Permanent Load		
					Vertical Load	Effective Dimensions		Horizontal Load in Long. Direction	Vertical Load	Effective Dimensions	
		B	L			B'	L'			B'	L'
Abutment 1	34.17 m (112.1 ft) & 34.92 m (114.6 ft)	3.66 m (12.0 ft)	25.95 m (85.1 ft)	25.4 mm (1 in)	17,293 kN (3888 kips)	2.91 m (9.5 ft)	25.95 m (85.1 ft)	3,822 kN (859 kips)	14,651 kN (3294 kips)	2.78 m (9.1 ft)	25.95 m (85.1 ft)
Abutment 15 Wingwall Footing	41.09 m (134.8 ft)	1.83 m (6.0 ft)	1.83 m (6.0 ft)	25.4 mm (1 in)	182 kN (41 kips)	0.93 m (3.1 ft)	1.69 m (5.5 ft)	96 kN (21.6 kips)	182 kN (41 kips)	0.93 m (3.1 ft)	1.69 m (5.5 ft)

The recommended Allowable Bearing Capacities and bottom of footing elevations are listed below in Table 4.

Table 4: Foundation Design Recommendations for Abutment 1 and Abutment 15 Wingwall Spread Footings

Support Location	Footing Size		Bottom of Footing Elevation	Minimum Footing Embedment Depth	Total Permissible Support Settlement	WSD (LRFD Service I Limit State Load Combination)	
	B	L				Permissible Gross Contact Stress	Allowable Gross Bearing Capacity
Abutment 1	3.66 m (12.0 ft)	25.95 m (85.1 ft)	34.17 m (112.1 ft) & 34.92 m (114.6 ft)	1.52 m (5.0 ft)	25.4 mm (1.0 in)	335 kPa (7.0 ksf)	445.0 kPa (9.3 ksf)
Abutment 15 Wingwall Footing	1.83 m (6.0 ft)	1.83 m (6.0 ft)	41.09 m (134.8 ft)	2.41 m (8.0 ft)	25.4 mm (1.0 in)	977 kPa (20.4 ksf)	192 kPa (4.0 ksf)

Notes: 1) Recommendations are based on the foundation geometry and the load provided by TY Lin in the Foundation Design Data Sheet. The footing contact area is taken as equal to the effective footing area, where applicable.
2) See MTD 4-1 for definitions and applications of the recommended design parameters.

The recommended Allowable Bearing Capacities to be used for design, provided in Table 4, above, are based on the following design criteria:

1) The spread footings have a minimum width as shown in Table 4.

2) The spread footings are to be constructed at or below the recommended elevations shown in Table 4.

3) At Abutment 1 support location and the Abutment 1 wingwall footing location, the footings are to be positioned such that there will be a minimum horizontal distance of 1.2 m (4.0 ft) from the near face/top of the footing to the face of the finished slope.

4) The maximum slope in front of the Abutment 1 footing and the Abutment 15 wingwall footing is not to exceed 1:1½ (vertical:horizontal).

5) All newly placed engineered fill material is to be compacted to 95% Relative Compaction (RC). The limits of 95% RC of engineered fill are to conform to the limits specified for relative compaction of embankments under retaining wall footings without piles as defined in section 19-5.03 of the Standard Specifications.

If any of the above minimum footing widths or horizontal embedment depths are reduced, bottom of footing elevations raised, or abutment slopes increased, the Office of Geotechnical Design-South 2, Branch B, is to be contacted for reevaluation.

Abutment 1 Retaining Wall

The proposed Type 1 retaining wall at the Abutment 1 left side location may be supported on spread footings. The proposed bottom of footing elevations for the four wall segments are above the native ground surface, except for one corner of the wall segment nearest Abutment 1. The native formational material beneath the retaining wall segment closest to Abutment 1 will

most likely be removed to facilitate construction of the abutment. Therefore, that portion and all the remaining retaining wall segments will be constructed on newly placed fill.

The recommendations for bottom of footing elevations, and Allowable Bearing Capacities are listed below in Table 5.

Table 5 – Spread Footing Design Recommendations for Abutment 1 Retaining Wall

Wall Segment	Design Height of Wall "H"	Bottom of Footing Elevation	Recommended Bearing Limits	
			WSD [1]	LFD [2]
			Allowable Bearing Capacity (q_{all})	Nominal Bearing Resistance (q_n)
Segment 1	4800 mm (15.7 ft.)	34.94 m (114.6 ft.)	170 kPa (3.6 ksf)	N/A
Segment 2	3600 mm (11.8 ft.)	35.91 m (117.8 ft.)	135 kPa (2.8 ksf)	N/A
Segment 3	2400 mm (7.9 ft.)	36.82 m (120.8 ft.)	105 kPa (2.2 ksf)	N/A
Segment 4	1800 mm (5.9 ft.)	37.28 m (122.3 ft.)	90 kPa (1.9 ksf)	N/A

Notes: 1) Working Stress Design (WSD). The Maximum Contact Pressure, (q_{max}), is not to exceed the recommended Gross Allowable Bearing Capacity, (q_{all}). 2) Load Factor Design, (LFD). The Maximum Contact Pressure, (q_{max}), divided by the Strength Reduction Factor, (ϕ), is not to exceed the Nominal Bearing Resistance, (q_n).

The recommended Allowable Bearing Capacities provided in Table 5, above, are based upon the following design criteria:

1) All retaining walls will be Standard Type 1 retaining walls as shown in the "Standard Plans (July 1999)" on sheet B3-1 for Loading Case 1.

2) All spread footings shall be constructed at or below the recommended bottom of footing elevations as shown in Table 5, above.

3) All retaining wall spread footings that will be constructed on the embankment slope are to be positioned such that they have a minimum horizontal footing embedment of 1.2 m (4 ft), measured from the top of footing at the toe to the face of the finished slope. The finished slope is not to exceed a 1:1½ (vertical: horizontal) ratio.

4) All newly placed engineered fill material is to be compacted to 95% Relative Compaction (RC). The limits of 95% RC of engineered fill are to conform to the limits specified for relative compaction of embankments under retaining wall footings without piles as defined in section 19-5.03 of the Standard Specifications.

If any of the above horizontal embedment depths are reduced, the Loading Case changed, or wall heights or maximum slope increased, the Office of Geotechnical Design-South 2, Branch B is to be contacted for reevaluation.

Bent 2 through Bent 14, Abutment 15 and DAR Abutment Locations

At Bent 2 through Bent 14, Abutment 15 and the DAR Abutment locations, Cast-In-Drilled-Hole (CIDH) piles are recommended for support of the proposed structures. Additionally, at Bent 3 through Bent 14, permanent steel casings are also recommended to facilitate pile construction. Table 6 and 7, below, show the foundation design information provided by the consultant TY Lin.

Table 6: General Foundation Information Provided by Structure Designer, TY Lin, Int'l.

Support Location	Pile Type	Finished Grade Elevation	Pile Cut-off Elevation	Permissible Settlement Under Service Load
Bent 2L	2400 mm (96 in) CIDH	33.0 m (108.3 ft)	29.0 m (95.1 ft)	25.4 mm (1 in)
Bent 2R	2400 mm (96 in) CIDH	29.5 m (96.8 ft)	28.0 m (91.9 ft)	25.4 mm (1 in)
Bent 3L	2400 mm (96 in) CIDH	29.0 m (95.1 ft)	28.0 m (91.9 ft)	25.4 mm (1 in)
Bent 3R	2400 mm (96 in) CIDH	28.0 m (91.9 ft)	27.0 m (88.6 ft)	25.4 mm (1 in)
Bent 4L	2400 mm (96 in) CIDH	28.2 m (92.5 ft)	27.0 m (88.6 ft)	25.4 mm (1 in)
Bent 4R	2400 mm (96 in) CIDH	28.2 m (92.5 ft)	27.0 m (88.6 ft)	25.4 mm (1 in)
Bent 5L	2400 mm (96 in) CIDH	31.0 m (101.7 ft)	30.0 m (98.4 ft)	25.4 mm (1 in)
Bent 5R	2400 mm (96 in) CIDH	30.5 m (100.1 ft)	29.0 m (95.1 ft)	25.4 mm (1 in)
Bent 6L	2400 mm (96 in) CIDH	34.0 m (111.5 ft)	33.0 m (108.3 ft)	25.4 mm (1 in)
Bent 6R	2400 mm (96 in) CIDH	31.0 m (101.7 ft)	30.0 m (98.4 ft)	25.4 mm (1 in)
Bent 7A	2400 mm (96 in) CIDH	34.5 m (113.2 ft)	30.5 m (100.1 ft)	25.4 mm (1 in)
Bent 7B	2400 mm (96 in) CIDH	32.0 m (105.0 ft)	30.5 m (100.1 ft)	25.4 mm (1 in)
Bent 8A	2400 mm (96 in) CIDH	36.5 m (119.8 ft)	30.5 m (100.1 ft)	25.4 mm (1 in)
Bent 8B	2400 mm (96 in) CIDH	38.0 m (124.7 ft)	30.5 m (100.1 ft)	25.4 mm (1 in)
Bent 9A	2400 mm (96 in) CIDH	32.0 m (105.0 ft)	30.5 m (100.1 ft)	25.4 mm (1 in)

Table 6 (continued): General Foundation Information Provided by Structure Designer, TY Lin, Int'l.

Support Location	Pile Type	Finished Grade Elevation	Pile Cut-off Elevation	Permissible Settlement Under Service Load
Bent 9B	2400 mm (96 in) CIDH	32.0 m (105.0 ft)	30.5 m (100.1 ft)	25.4 mm (1 in)
Bent 10	2400 mm (96 in) CIDH	32.0 m (105.0 ft)	30.5 m (100.1 ft)	25.4 mm (1 in)
Bent 11A	2400 mm (96 in) CIDH	39.0 m (128.0 ft)	30.5 m (100.1 ft)	25.4 mm (1 in)
Bent 11B	2400 mm (96 in) CIDH	32.0 m (105.0 ft)	30.5 m (100.1 ft)	25.4 mm (1 in)
Bent 12L	2400 mm (96 in) CIDH	39.0 m (128.0 ft)	35.0 m (114.8 ft)	25.4 mm (1 in)
Bent 12R	2400 mm (96 in) CIDH	32.0 m (105.0 ft)	31.0 m (101.7 ft)	25.4 mm (1 in)
Bent 13L	2400 mm (96 in) CIDH	34.0 m (111.5 ft)	33.0 m (108.3 ft)	25.4 mm (1 in)
Bent 13R	2400 mm (96 in) CIDH	32.5 m (106.6 ft)	31.0 m (101.7ft)	25.4 mm (1 in)
Bent 14L	2400 mm (96 in) CIDH	31.8 m (104.3 ft)	31.0 m (101.7ft)	25.4 mm (1 in)
Bent 14R	2400 mm (96 in) CIDH	31.2 m (102.4 ft)	30.0 m (98.4ft)	25.4 mm (1 in)
Abutment 15 Segment 1	1200 mm (48 in) CIDH	39.0 m to 37.0 m* (128.0 ft to 121.4 ft)	35.6 m (116.8 ft)	25.4 mm (1 in)
Abutment 15 Segment 2	1200 mm (48 in) CIDH	39.0 m to 37.0 m* (128.0 ft to 121.4 ft)	34.4 m (112.9 ft)	25.4 mm (1 in)
Abutment 15 Segment 3	1200 mm (48 in) CIDH	39.0 m to 37.0 m* (128.0 ft to 121.4 ft)	33.2 m (108.9 ft)	25.4 mm (1 in)
Abutment 15 Segment 4	1500 mm (60 in) CIDH	36.0 m to 31.0 m* (118.1 ft to 101.7 ft)	31.7 m (104.0 ft)	25.4 mm (1 in)
Abutment 15 Segment 5	1500 mm (60 in) CIDH	36.0 m to 31.0 m* (118.1 ft to 101.7 ft)	30.5 m (100.1 ft)	25.4 mm (1 in)
Abutment 15 Segment 6	1500 mm (60 in) CIDH	36.0 m to 31.0 m* (118.1 ft to 101.7 ft)	29.3 m (96.1 ft)	25.4 mm (1 in)
DAR Abutment	900 mm (36 in) CIDH	43.3 m to 43.8 m** (142.1 ft to 143.7 m)	42.0 m (137.8 ft)	25.4 mm (1 in)

Notes: *Finished grade elevation varies across length of abutment due to abutment pile cap being stepped.
**Finished grade elevation varies due to abutment located on slope.

Table 7: Foundation Design Loads Provided by Structure Designer, TY Lin, Int'l.

Support Location	Service 1 Limit State			Strength Limit State (Controlling Group)				Extreme Event Limit State (Controlling Group)			
	Total Loads		Permanent Loads	Compression		Tension		Compression		Tension	
	Per Support	Max Per Pile	Per Support	Per Support	Max Per Pile	Per Support	Max Per Pile	Per Support	Max Per Pile	Per Support	Max Per Pile
Bent 2L	N/A	18,541 kN (4168 kips)	13,517 kN (3039 kips)	N/A	25,999 kN (5845 kips)	N/A	0	N/A	23,092 kN (5192 kips)	N/A	0
Bent 2R	N/A	19,021 kN (4276 kips)	13,682 kN (3076 kips)	N/A	26,467 kN (5950 kips)	N/A	0	N/A	23,216 kN (5219 kips)	N/A	0
Bent 3L	N/A	19,869 kN (4467 kips)	15,021 kN (3377 kips)	N/A	27,451 kN (6172 kips)	N/A	0	N/A	23,448 kN (5272 kips)	N/A	0
Bent 3R	N/A	20,585 kN (4628 kips)	15,145 kN (3405 kips)	N/A	28,642 kN (6439 kips)	N/A	0	N/A	23,572 kN (5299 kips)	N/A	0
Bent 4L	N/A	19,839 kN (4460 kips)	14,767 kN (3320 kips)	N/A	27,349 kN (6149 kips)	N/A	0	N/A	22,384 kN (5032 kips)	N/A	0
Bent 4R	N/A	20,457 kN (4599 kips)	14,794 kN (3326 kips)	N/A	28,418 kN (6389 kips)	N/A	0	N/A	22,411 kN (5038 kips)	N/A	0
Bent 5L	N/A	21,169 kN (4759 kips)	16,066 kN (3612 kips)	N/A	29,110 kN (6545 kips)	N/A	0	N/A	26,103 kN (5868 kips)	N/A	0
Bent 5R	N/A	21,872 kN (4917 kips)	16,177 kN (3637 kips)	N/A	30,284 kN (6808 kips)	N/A	0	N/A	26,214 kN (5893 kips)	N/A	0
Bent 6L	N/A	13,180 kN (2963 kips)	9,350 kN (2102 kips)	N/A	19,860 kN (4465 kips)	N/A	0	N/A	19,804 kN (4452 kips)	N/A	1103 kN (248 kips)
Bent 6R	N/A	13,825 kN (3108 kips)	9,652 kN (2170 kips)	N/A	21,457 kN (4824 kips)	N/A	0	N/A	20,107 kN (4520 kips)	N/A	800 kN (180 kips)
Bent 7A	N/A	8,703 kN (1957 kips)	6,285 kN (1413 kips)	N/A	12,307 kN (2767 kips)	N/A	0	N/A	10,529 kN (2367 kips)	N/A	0
Bent 7B	N/A	8,559 kN (1924 kips)	6,445 kN (1449 kips)	N/A	11,903 kN (2676 kips)	N/A	0	N/A	10,890 kN (2448 kips)	N/A	0
Bent 8A	N/A	9,985 kN (2245 kips)	7,477 kN (1681 kips)	N/A	13,882 kN (3121 kips)	N/A	0	N/A	9,746 kN (2191 kips)	N/A	0
Bent 8B	N/A	10,013 kN (2251kips)	7,539 kN (1695 kips)	N/A	13,824 kN (3108 kips)	N/A	0	N/A	8,959 kN (2014 kips)	N/A	0
Bent 9A	N/A	10,851 kN (2440 kips)	7,432 kN (1671 kips)	N/A	14,865 kN (3342 kips)	N/A	0	N/A	10,294 kN (2314 kips)	N/A	0
Bent 9B	N/A	9,261 kN (2082 kips)	6,512 kN (1464 kips)	N/A	12,410 kN (2790 kips)	N/A	0	N/A	6,873 kN (1545 kips)	N/A	0
Bent 10	N/A	8,778 kN (1973 kips)	6,249 kN (1405 kips)	N/A	12,397 kN (2787 kips)	N/A	0	N/A	11,125kN (2501 kips)	N/A	0
Bent 11A	N/A	7,628 kN (1715 kips)	5,756 kN (1294 kips)	N/A	10,715 kN (2409 kips)	N/A	0	N/A	10,770 kN (2421 kips)	N/A	0

Table 7 (continued): Foundation Design Loads Provided by Structure Designer, TY Lin, Int'l.

Support Location	Service 1 Limit State			Strength Limit State (Controlling Group)				Extreme Event Limit State (Controlling Group)			
	Total Loads		Permanent Loads	Compression		Tension		Compression		Tension	
	Per Support	Max Per Pile	Per Support	Per Support	Max Per Pile	Per Support	Max Per Pile	Per Support	Max Per Pile	Per Support	Max Per Pile
Bent 11B	N/A	8,589 kN (1931 kips)	6,512 kN (1464 kips)	N/A	12,010 kN (2700 kips)	N/A	0	N/A	11,690 kN (2628 kips)	N/A	0
Bent 12L	N/A	10,567 kN (2376 kips)	6,712 kN (1509 kips)	N/A	14,489 kN (3257 kips)	N/A	0	N/A	13,812 kN (3105 kips)	N/A	387 kN (87 kips)
Bent 12R	N/A	11,217 kN (2522 kips)	7,117 kN (1600 kips)	N/A	15,423 kN (3467 kips)	N/A	0	N/A	14,217 kN (3196 kips)	N/A	0
Bent 13L	N/A	15,232 kN (3424 kips)	9,532 kN (2143 kips)	N/A	20640 kN (4640 kips)	N/A	0	N/A	16,471 kN (3703 kips)	N/A	0
Bent 13R	N/A	15,824 kN (3558 kips)	9,719 kN (2185 kips)	N/A	21,582 kN (4852 kips)	N/A	0	N/A	16,659 kN (3745 kips)	N/A	0
Bent 14L	N/A	21,526 kN (4839 kips)	15,862 kN (3566 kips)	N/A	29,336 kN (6595 kips)	N/A	0	N/A	25,093 kN (5641 kips)	N/A	0
Bent 14R	N/A	22,087 kN (4966 kips)	15,924 kN (3580 kips)	N/A	30,285 kN (6809 kips)	N/A	0	N/A	25,156 kN (5656 kips)	N/A	0
Abutment 15 1.2 m diam.	14,760 kN (3318 kips)	3,380 kN (760 kips)	13,450 kN (3024 kips)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Abutment 15 1.5 m diam.	30,900 kN (6947 kips)	4,160 kN (935 kips)	28,700 kN (6452 kips)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
DAR Abutment	10,290 kN (2313 kips)	2,780 kN (625 kips)	9,480 kN (2131 kips)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

The specified pile tip elevations for Bent 2 through Bent 14 CIDH piles are shown below in Table 8, and Abutment 15 and the DAR Abutment CIDH piles are shown in Table 9.

Note: Downdrag loads, due to potential soil liquefaction in combination with the Extreme Event compression loads provided by the structure designer, TY Lin, Int'l. were evaluated at Bents 4 through 14. At Bent 11A location, where the highest potential liquefaction loading may occur, it was determined after the addition of the downdrag load (approximately 250 kips) to the Extreme Event loading, the Strength Limit State compression loads still controlled the specified pile tip elevations. At all the other Bent locations, the downdrag forces will be less. Therefore, design tip elevations including potential downdrag forces are not provided in this report. Should the designer need an estimate of the potential downdrag forces per bent, they can be provided upon request.

Table 8: Foundation Design Recommendations for Bent 2 through Bent 14 Locations

Support Location	Pile Type	Cut-Off Elevation	Service-I Limit State Load per Column	Total Permissible Support Settlement	Required Nominal Resistance				Specified Tip Elevation (Casing)	Design Tip Elevation	Specified Tip Elevation
					Strength Limit		Extreme Event				
					Comp. (φ=0.7)	Tension (φ=0.7)	Comp. (φ=1)	Tension (φ=1)			
Bent 2L	2400 mm (96 in) CIDH	29.0 m (95.1 ft)	18,550 kN (4170 kips)	25.4 mm (1 in)	37,150 kN (8360 kips)	0	23,100 kN (5200 kips)	0	N/A	2.4 m (a-I) 10.4 m (a-II)	2.4 m (8.0 ft)
Bent 2R	2400 mm (96 in) CIDH	28.0 m (91.9 ft)	19,050 kN (4290 kips)	25.4 mm (1 in)	37,850 kN (8510 kips)	0	23,250 kN (5230 kips)	0	N/A	0.3 m (a-I) 10.4 m (a-II)	0.3 m (1.0 ft)
Bent 3L	2400 mm (96 in) CIDH	28.0 m (91.9 ft)	19,900 kN (4480 kips)	25.4 mm (1 in)	39,250 kN (8830 kips)	0	23,450 kN (5280 kips)	0	N/A	-1.6 m (a-I) 8.5 m (a-II)	-1.6 m (-5.2 ft)
Bent 3R	2400 mm (96 in) CIDH	27.0 m (88.6 ft)	20,600 kN (4640 kips)	25.4 mm (1 in)	40,950 kN (9210 kips)	0	23,600 kN (5310 kips)	0	N/A	-2.7 m (a-I) 8.5 m (a-II)	-2.7 m (-9.0 ft)
Bent 4L	2400 mm (96 in) CIDH	27.0 m (88.6 ft)	19,850 kN (4470 kips)	25.4 mm (1 in)	39,100 kN (8790 kips)	0	22,400 kN (5040 kips)	0	23.1 m (75.7 ft)	-4.5 m (a-I) 6.1 m (a-II)	-4.5 m (-15.0 ft)
Bent 4R	2400 mm (96 in) CIDH	27.0 m (88.6 ft)	20,500 kN (4610 kips)	25.4 mm (1 in)	40,600 kN (9130 kips)	0	22,450 kN (5050 kips)	0	23.1 m (75.7 ft)	-5.2 m (a-I) 6.1 m (a-II)	-5.2 m (-17.0 ft)
Bent 5L	2400 mm (96 in) CIDH	30.0 m (98.4 ft)	21,200 kN (4770 kips)	25.4 mm (1 in)	41,600 kN (9360 kips)	0	26,150 kN (5880 kips)	0	19.4 m (63.7 ft)	-6.7 m (a-I) 2.4 m (a-II)	-6.7 m (-22.0 ft)
Bent 5R	2400 mm (96 in) CIDH	29.0 m (95.1 ft)	21,900 kN (4930 kips)	25.4 mm (1 in)	43,300kN (9740 kips)	0	26,250 kN (5910 kips)	0	19.4 m (63.7 ft)	-7.6 m (a-I) 2.4 m (a-II)	-7.6 m (-25.0 ft)
Bent 6L	2400 mm (96 in) CIDH	33.0 m (108.3 ft)	13,200 kN (2970 kips)	25.4 mm (1 in)	28,400 kN (6390 kips)	0	19,850 kN (4470 kips)	1103 kN (248 kips)	15.5 m (50.9 ft)	-2.4 m (a-I) 2.7 m (a-II) 13.7 m (b-II)	-2.4 m (-8.0 ft)
Bent 6R	2400 mm (96 in) CIDH	30.0 m (98.4 ft)	13,850 kN (3120 kips)	25.4 mm (1 in)	30,700 kN (6910 kips)	0	20,150 kN (4530 kips)	800 kN (180 kips)	15.5 m (50.9 ft)	-3.9 m (a-I) 2.7 m (a-II) 13.7 m (b-II)	-3.9 m (-13.0 ft)
Bent 7A	2400 mm (96 in) CIDH	30.5 m (100.1 ft)	8,750 kN (1970 kips)	25.4 mm (1 in)	17,600 kN (3960 kips)	0	10,550 kN (2380 kips)	0	15.5 m (50.9 ft)	3.4 m (a-I) 8.2 m (a-II)	3.4 m (11.0 ft)
Bent 7B	2400 mm (96 in) CIDH	30.5 m (100.1 ft)	8,600 kN (1940 kips)	25.4 mm (1 in)	17,050 kN (3840 kips)	0	10,900 kN (2460 kips)	0	15.5 m (50.9 ft)	3.4 m (a-I) 8.2 m (a-II)	3.4 m (11.0 ft)
Bent 8A	2400 mm (96 in) CIDH	30.5 m (100.1 ft)	10,000 kN (2250 kips)	25.4 mm (1 in)	19,850 kN (4470 kips)	0	9,750 kN (2200 kips)	0	16.4 m (53.9 ft)	3.0 m (a-I) 9.8 m (a-II)	3.0 m (10.0 ft)
Bent 8B	2400 mm (96 in) CIDH	30.5 m (100.1 ft)	10,050 kN (2260 kips)	25.4 mm (1 in)	19,750 kN (4440 kips)	0	9,000 kN (2030 kips)	0	16.4 m (53.9 ft)	3.0 m (a-I) 9.8 m (a-II)	3.0 m (10.0 ft)
Bent 9A	2400 mm (96 in) CIDH	30.5 m (100.1 ft)	10,900 kN (2450 kips)	25.4 mm (1 in)	21,250 kN (4780 kips)	0	10,300 kN (2320 kips)	0	16.4 m (53.9 ft)	1.8 m (a-I) 9.4 m (a-II)	1.8 m (6.0 ft)
Bent 9B	2400 mm (96 in) CIDH	30.5 m (100.1 ft)	9,300 kN (2100 kips)	25.4 mm (1 in)	17,750 kN (4000 kips)	0	6,900 kN (1560 kips)	0	16.4 m (53.9 ft)	3.6 m (a-I) 11.3 m (a-II)	3.6 m (12.0 ft)

Table 8 (continued): Foundation Design Recommendations for Bent 2 through Bent 14 Locations

Support Location	Pile Type	Cut-Off Elevation	Service-I Limit State Load per Column	Total Permissible Support Settlement	Required Nominal Resistance				Specified Tip Elevation (Casing)	Design Tip Elevation	Specified Tip Elevation
					Strength Limit		Extreme Event				
					Comp. (φ=0.7)	Tension (φ=0.7)	Comp. (φ=1)	Tension (φ=1)			
Bent 10	2400 mm (96 in) CIDH	30.5 m (100.1 ft)	8,800 kN (1980 kips)	25.4 mm (1 in)	17,750 kN (4000 kips)	0	11,150kN (2510 kips)	0	16.4 m (53.9 ft)	3.6 m (a-I) 8.8 m (a-II)	3.6 m (12.0 ft)
Bent 11A	2400 mm (96 in) CIDH	30.5 m (100.1 ft)	7,650 kN (1720 kips)	25.4 mm (1 in)	15,350 kN (3460 kips)	0	10,800 kN (2430 kips)	0	16.4 m (53.9 ft)	5.8 m (a-I) 8.5 m (a-II)	5.8 m (19.0 ft)
Bent 11B	2400 mm (96 in) CIDH	30.5 m (100.1 ft)	8,600 kN (1940 kips)	25.4 mm (1 in)	17,200 kN (3870 kips)	0	11,700 kN (2640 kips)	0	16.4 m (53.9 ft)	4.3 m (a-I) 8.5 m (a-II)	4.3 m (14.0 ft)
Bent 12L	2400 mm (96 in) CIDH	35.0 m (114.8 ft)	10,600 kN (2390 kips)	25.4 mm (1 in)	20,700 kN (4660 kips)	0	13,850 kN (3120 kips)	387 kN (87 kips)	17.1 m (56.0 ft)	3.4 m (a-I) 7.6 m (a-II) 15.8 m (b-II)	3.4 m (11.0 ft)
Bent 12R	2400 mm (96 in) CIDH	31.0 m (101.7 ft)	11,250 kN (2530 kips)	25.4 mm (1 in)	22,050 kN (4960 kips)	0	14,250 kN (3210 kips)	0	17.1 m (56.0 ft)	2.1 m (a-I) 7.6 m (a-II)	2.1 m (7.0 ft)
Bent 13L	2400 mm (96 in) CIDH	33.0 m (108.3 ft)	15,250 kN (3430 kips)	25.4 mm (1 in)	29,500 kN (6640 kips)	0	16,500 kN (3710 kips)	0	17.3 m (56.7 ft)	-1.5 m (a-I) 6.7 m (a-II)	-1.5 m (-5.0 ft)
Bent 13R	2400 mm (96 in) CIDH	31.0 m (101.7 ft)	15,850 kN (3570 kips)	25.4 mm (1 in)	30,850 kN (6940 kips)	0	16,700 kN (3760 kips)	0	17.3 m (56.7 ft)	-2.4 m (a-I) 6.7 m (a-II)	-2.4 m (-8.0 ft)
Bent 14L	2400 mm (96 in) CIDH	31.0 m (101.7 ft)	21,550 kN (4850 kips)	25.4 mm (1 in)	41,950 kN (9440 kips)	0	25,100 kN (5650 kips)	0	17.5 m (57.3 ft)	-8.2 m (a-I) 1.8 m (a-II)	-8.2 m (-27.0 ft)
Bent 14R	2400 mm (96 in) CIDH	30.0 m (98.4 ft)	22,100 kN (4970 kips)	25.4 mm (1 in)	43,300 kN (9740 kips)	0	25,200 kN (5670 kips)	0	17.5 m (57.3 ft)	-9.1 m (a-I) 1.8 m (a-II)	-9.1 m (-30.0 ft)

Note: Design tip elevations are controlled by (a-I) Compression (Strength Limit), (a-II) Compression (Extreme Event), (b-II) Tension (Extreme Event)

Table 9: Foundation Design Recommendations for Abutment 15 and DAR Abutment

Location	Pile Type	Cut-Off Elevation*	LRFD Service-I Limit State Load per Support		LRFD Service-I Limit State Total Load per Pile (Compression)**	Nominal Resistance	Design Tip Elevation	Specified Tip Elevation
			Total	Permanent				
Abutment 15	1200 mm (48 in) CIDH	35.7 m – 33.3 m (117.1 ft – 109.3 ft)	14,775 kN (3330 kips)	13,450 kN (3030 kips)	3,400 kN (770 kips)	6,800 kN (1540 kips)	14.9 m (a) (48.9 ft)	14.9 m (48.9 ft)
Abutment 15	1500 mm (60 in) CIDH	31.8 m – 29.4 m (104.3 ft-96.5 ft)	30,900 kN (6950 kips)	28,700 kN (6460 kips)	4,200 kN (950 kips)	8,400 kN (1900 kips)	14.6 m (a) (47.9 ft)	14.6 m (47.9 ft)
DAR Abutment	900 mm (36 in) CIDH	42.1 m (138.1 ft)	10,300 kN (2320 kips)	9,500 kN (2140 kips)	2,800 kN (630 kips)	5,600 kN (1,260 kips)	23.8 m (a) (78.1 ft)	23.8 m (78.1 ft)

Note: 1) Design tip elevation is controlled by: (a) Compression
*Abutment 15 footing is stepped
**Maximum factored load per pile as provided by designer

The Pile Data Table for Bent 2 through Bent 14, Abutment 15 and the DAR Abutment is presented in Table 10, below. The ultimate geotechnical pile capacity for the CIDH piles will meet or exceed the required nominal resistance in compression.

Table 10: Pile Data Table

Location	Pile Type	Nominal Resistance		Casing Tip Elevation	Design Tip Elevation	Specified Tip Elevation
		Compression	Tension			
Bent 2L	2400 mm (96 in) CIDH	37,150 kN (8360 kips)	0	N/A	2.4 m (a-I) 10.4 m (a-II)	2.4 m (8.0 ft)
Bent 2R	2400 mm (96 in) CIDH	37,850 kN (8510 kips)	0	N/A	0.3 m (a-I) 10.4 m (a-II)	0.3 m (1.0 ft)
Bent 3L	2400 mm (96 in) CIDH	39,250 kN (8830 kips)	0	N/A	-1.6 m (a-I) 8.5 m (a-II)	-1.6 m (-5.2 ft)
Bent 3R	2400 mm (96 in) CIDH	40,950 kN (9210 kips)	0	N/A	-2.7 m (a-I) 8.5 m (a-II)	-2.7 m (-9.0 ft)
Bent 4L	2400 mm (96 in) CIDH	39,100 kN (8790 kips)	0	23.1 m (75.7 ft)	-4.5 m (a-I) 6.1 m (a-II)	-4.5 m (-15.0 ft)
Bent 4R	2400 mm (96 in) CIDH	40,600 kN (9130 kips)	0	23.1 m (75.7 ft)	-5.2 m (a-I) 6.1 m (a-II)	-5.2 m (-17.0 ft)
Bent 5L	2400 mm (96 in) CIDH	41,600 kN (9360 kips)	0	19.4 m (63.7 ft)	-6.7 m (a-I) 2.4 m (a-II)	-6.7 m (-22.0 ft)
Bent 5R	2400 mm (96 in) CIDH	43,300kN (9740 kips)	0	19.4 m (63.7 ft)	-7.6 m (a-I) 2.4 m (a-II)	-7.6 m (-25.0 ft)
Bent 6L	2400 mm (96 in) CIDH	28,400 kN (6390 kips)	0	15.5 m (50.9 ft)	-2.4 m (a-I) 2.7 m (a-II) 13.7 m (b-II)	-2.4 m (-8.0 ft)
Bent 6R	2400 mm (96 in) CIDH	30,700 kN (6910 kips)	0	15.5 m (50.9 ft)	-3.9 m (a-I) 2.7 m (a-II) 13.7 m (b-II)	-3.9 m (-13.0 ft)
Bent 7A	2400 mm (96 in) CIDH	17,600 kN (3960 kips)	0	15.5 m (50.9 ft)	3.4 m (a-I) 8.2 m (a-II)	3.4 m (11.0 ft)
Bent 7B	2400 mm (96 in) CIDH	17,050 kN (3840 kips)	0	15.5 m (50.9 ft)	3.4 m (a-I) 8.2 m (a-II)	3.4 m (11.0 ft)
Bent 8A	2400 mm (96 in) CIDH	19,850 kN (4470 kips)	0	16.4 m (53.9 ft)	3.0 m (a-I) 9.8 m (a-II)	3.0 m (10.0 ft)
Bent 8B	2400 mm (96 in) CIDH	19,750 kN (4440 kips)	0	16.4 m (53.9 ft)	3.0 m (a-I) 9.8 m (a-II)	3.0 m (10.0 ft)
Bent 9A	2400 mm (96 in) CIDH	21,250 kN (4780 kips)	0	16.4 m (53.9 ft)	1.8 m (a-I) 9.4 m (a-II)	1.8 m (6.0 ft)

Table 10 (continued): Pile Data Table

Location	Pile Type	Nominal Resistance		Casing Tip Elevation	Design Tip Elevation	Specified Tip Elevation
		Compression	Tension			
Bent 9B	2400 mm (96 in) CIDH	17,750 kN (4000 kips)	0	16.4 m (53.9 ft)	3.6 m (a-I) 11.3 m (a-II)	3.6 m (12.0 ft)
Bent 10	2400 mm (96 in) CIDH	17,750 kN (4000 kips)	0	16.4 m (53.9 ft)	3.6 m (a-I) 8.8 m (a-II)	3.6 m (12.0 ft)
Bent 11A	2400 mm (96 in) CIDH	15,350 kN (3460 kips)	0	16.4 m (53.9 ft)	5.8 m (a-I) 8.5 m (a-II)	5.8 m (19.0 ft)
Bent 11B	2400 mm (96 in) CIDH	17,200 kN (3870 kips)	0	16.4 m (53.9 ft)	4.3 m (a-I) 8.5 m (a-II)	4.3 m (14.0 ft)
Bent 12L	2400 mm (96 in) CIDH	20,700 kN (4660 kips)	0	17.1 m (56.0 ft)	3.4 m (a-I) 7.6 m (a-II) 15.8 m (b-II)	3.4 m (11.0 ft)
Bent 12R	2400 mm (96 in) CIDH	22,050 kN (4960 kips)	0	17.1 m (56.0 ft)	2.1 m (a-I) 7.6 m (a-II)	2.1 m (7.0 ft)
Bent 13L	2400 mm (96 in) CIDH	29,500 kN (6640 kips)	0	17.3 m (56.7 ft)	-1.5 m (a-I) 6.7 m (a-II)	-1.5 m (-5.0 ft)
Bent 13R	2400 mm (96 in) CIDH	30,850 kN (6940 kips)	0	17.3 m (56.7 ft)	-2.4 m (a-I) 6.7 m (a-II)	-2.4 m (-8.0 ft)
Bent 14L	2400 mm (96 in) CIDH	41,950 kN (9440 kips)	0	17.5 m (57.3 ft)	-8.2 m (a-I) 1.8 m (a-II)	-8.2 m (-27.0 ft)
Bent 14R	2400 mm (96 in) CIDH	43,300 kN (9740 kips)	0	17.5 m (57.3 ft)	-9.1 m (a-I) 1.8 m (a-II)	-9.1 m (-30.0 ft)
Abutment 15	1200 mm (48 in) CIDH	6,800 kN (1540 kips)	0	N/A	14.9 m (a) (48.9 ft)	14.9 m (48.9 ft)
Abutment 15	1500 mm (60 in) CIDH	8,400 kN (1900 kips)	0	N/A	14.6 m (a) (47.9 ft)	14.6 m (47.9 ft)
DAR Abutment	900 mm (36 in) CIDH	5,600 kN (1,260 kips)	0	N/A	23.8 m (a) (78.1 ft)	23.8 m (78.1 ft)

Notes: 1) Design tip elevations for Bents are controlled by: (a-I) Compression (Strength Limit), (a-II) Compression (Extreme Event), (b-II) Tension (Extreme Event)
2) Design tip elevations for Abutment 15 and DAR Abutment are controlled by: (a) Compression
3) Abutment 15 footing is stepped

General Notes:

1) All support locations are to be plotted in plan view on the Log of Test Borings as stated in "Memo to Designers" 4-2. The plotting of support locations should be made prior to requesting a final foundation review.

2) When applicable, the structure engineer shall show on the plans, in the pile data table, the design pile tip elevation required to meet the lateral load demands. If the design pile tip elevation required to meet lateral load demands exceeds the specified pile tip elevations given within this report, the Office of Geotechnical Design-South 2, Branch B shall be contacted for further recommendations.

Construction Considerations:

Cores Samples

1) Core samples from the 2009 Caltrans foundation investigation are available for viewing by bidders at the California Department of Transportation, Transportation Laboratory, 5900 Folsom Blvd., Sacramento, CA. The bidders are to allow the State five (5) working days to prepare and display the cores.

2) During the 2009 field investigation, core samples were collected from several borings at 1.52 m (5 ft) intervals, when possible, and were submitted to the laboratory for strength testing. Some of the samples were so weak that they were unable to be tested. Per Standard Specifications, laboratory strength test data are available for viewing at California Department of Transportation, Transportation Laboratory, 5900 Folsom Blvd., Sacramento, CA.

Spread Footings

1) At the Abutment 1 support location, the bottom of footing elevation is proposed to be placed on native sedimentary formational material on the left side of the footing and on newly placed engineered fill on the right side of the footing. As well, the Abutment 1 retaining wall footings and Abutment 15 wingwall footing are proposed to be placed on newly placed engineered fill. For those portions of the footing that are to be placed on the sedimentary formational material, the concrete for the proposed support footings shall be placed neat against the sedimentary formational material at the bottom of the footing excavation. Should the bottom of the footing excavation be disturbed, then the bottom of the footing excavation shall be extended down at 0.15 m (0.5 ft) intervals until undisturbed formational material is observed and approved by the Engineer. The subexcavated material is to be replaced with either structure backfill or engineered fill compacted to 95% relative compaction. For the footings that are proposed to be placed on newly placed fill material, should the bottom of the footing excavation be disturbed, the disturbed fill material shall be recompacted to 95% relative compaction prior to placement of the concrete for the structure support footings.

CIDH Piles

1) Artesian ground water was encountered during the 2009 field investigation and it is anticipated that the contractor will encounter artesian ground water during CIDH pile construction. During the 2009 field investigation artesian conditions were noticed in boring R-09-003 located near Bent 14 location, in boring R-09-007 located near Bent 10 location, in boring R-09-002 near Bent 3 location, and in boring R-09-005 near Bent 4 location. The artesian water appeared to be originating from a conglomerate layer encountered at depth during the drilling operations. The static ground water levels indicated on the LOTB sheets reflect the measured ground water levels at the time of the Caltrans investigation. At the time of construction, the ground water surface elevations may be significantly higher or lower than those shown on the LOTB due to seasonal conditions, amount of water flowing in the creek, and artesian pressure in the underlying conglomerate layer.

2) During the 2009 subsurface investigation, in boring R-09-005, located near the Bent 4 location, the artesian ground water and core samples recovered from the underlying conglomerate formation, were noticed to have a sulfur odor. The contractor should be aware that during construction of the CIDH piles, the sulfur content in the ground water being discharged during construction may require containment of the water and disposal offsite.

3) At the proposed Carroll Canyon Road Bridge, the sedimentary formational material beneath the bridge site is extremely variable in hardness and weathering, ranging from very soft to very hard, decomposed to slightly weathered. Additionally, at depth, a conglomerate layer was encountered which consists of very hard, subrounded to subangular igneous clasts within a decomposed to slightly weathered, very soft to very hard, weakly to strongly cemented sand and silt matrix. The structure of this material results in discontinuous, non-fractured, fresh to slightly weathered, moderately hard to very hard cobble to boulder sized blocks within an intensely fractured, very intensely weathered to decomposed, moderately soft to very soft, rock material. Therefore, at all support locations where CIDH piles are to be constructed, the contractor should anticipate variable drilling conditions in the formational material similar to the drilling conditions of very dense soils with very to extremely hard cobbles and boulders. The contractor should also anticipate the need to alternate from soft and hard rock drilling techniques to extend the drilled holes for the CIDH piles to the SPTE.

4) During the 2008 subsurface investigation, large variations in the weathering, fracturing, and hardness of the sedimentary formational bedrock material, occurring within relatively short distances both laterally and vertically, were observed, and are shown in the LOTB sheets. In the sandstone/siltstone and conglomerate sedimentary formational units, the contractor should anticipate varying rock drilling conditions (alternating soft and hard rock drilling) across all the pier locations. The variations in rock conditions (described above) will occur from one pile location to the next pile location. The contractor should also be prepared for potential caving conditions within the conglomerate formational unit. The amount of difficulty the contractor will experience will be dependent upon the methods and means the contractor chooses to use to construct the CIDH piles.

5) The contractor will need to use care while drilling the shafts for the CIDH piles. Due to the non-cemented nature of portions of the conglomerate formational unit, rapid insertion and removal of the drilling tools during the drilling process can cause excessive scouring and caving of the walls of the drilled shaft.

6) Due to the anticipation that concrete placement for the CIDH piles will require slurry displacement methods, the calculated geotechnical capacity of all CIDH piles is based on skin friction and no end-bearing was considered. The skin friction zones used to calculate geotechnical capacity of the CIDH piles are summarized below in Table 11.

Table 11: CIDH Pile Skin Friction Zone Elevations

Location	Skin Friction Zone Start Elevation	Skin Friction Zone End Elevation
Bent 2L	29.0 m (95.1 ft)	3.7 m (12.0 ft)
Bent 2R	28.0 m (91.9 ft)	1.5 m (5.0 ft)
Bent 3L	24.5 m (80.3 ft)	-0.4 m (-1.2 ft)
Bent 3L	24.5 m (80.3 ft)	-1.5 m (-5.0 ft)
Bent 4L	22.5 m (73.7 ft)	-3.4 m (-11.0 ft)
Bent 4R	22.5 m (73.7 ft)	-4.0 m (-13.0 ft)
Bent 5L	18.8 m (61.7 ft)	-5.5 m (-18.0 ft)
Bent 5R	18.8 m (61.7 ft)	-6.4 m (-21.0 ft)
Bent 6L	14.9 m (48.9 ft)	-1.2 m (-4.0 ft)
Bent 6R	14.9 m (48.9 ft)	-2.7 m (-9.0 ft)
Bent 7A	14.9 m (48.9 ft)	4.6 m (15.0 ft)
Bent 7B	14.9 m (48.9 ft)	4.6 m (15.0 ft)
Bent 8A	15.8 m (51.9 ft)	4.3 m (14.0 ft)
Bent 8B	15.8 m (51.9 ft)	4.3 m (14.0 ft)
Bent 9A	15.8 m (51.9 ft)	3.0 m (10.0 ft)
Bent 9B	15.8 m (51.9 ft)	4.9 m (16.0 ft)
Bent 10	15.8 m (51.9 ft)	4.9 m (16.0 ft)
Bent 11A	15.8 m (51.9 ft)	7.0 m (23.0 ft)
Bent 11B	15.8 m (51.9 ft)	5.5 m (18.0 ft)
Bent 12L	16.5 m (54.0 ft)	4.6 m (15.0 ft)
Bent 12R	16.5 m (54.0 ft)	3.4 m (11.0 ft)
Bent 13L	16.7 m (54.7 ft)	-0.3 m (-1.0 ft)

Table 11 (continued): CIDH Pile Skin Friction Zone Elevations

Location	Skin Friction Zone Start Elevation	Skin Friction Zone End Elevation
Bent 13R	16.7 m (54.7 ft)	-1.2 m (-4.0 ft)
Bent 14L	16.9 m (55.3 ft)	-7.0 m (-23.0 ft)
Bent 14R	16.9 m (55.3 ft)	-7.9 m (-26.0 ft)
Abutment 15 1.2 m diam.	25.3 m (83.0 ft)	16.2 m (53.0 ft)
Abutment 15 1.5 m diam.	25.3 m (83.0 ft)	15.8 m (51.8 ft)
DAR Abutment	40.5 m (132.8 ft)	24.7 m (81.0 ft)

7) If the CIDH piles are to be constructed using slurry displacement method, the slurry shall consist of mineral or synthetic slurry only. Use of water shall not be allowed as slurry.

Permanent and Temporary Steel Casings

The contractor should anticipate numerous difficulties while installing the permanent and temporary steel casings:

1) Caving conditions are anticipated in the alluvial materials overlying the sedimentary formational material at Bent 4 through Bent 14 locations. To facilitate construction, at Bent 4 through Bent 14 locations, permanent steel casings, installed approximately 1.52 m (5 ft) into the top of the sedimentary formational material, are recommended.

2) The recommended permanent steel casings, at Bent 4 through Bent 14 locations, are intended to minimize construction difficulties due to caving of the loose alluvial material overlying the sedimentary formational material. The permanent steel casings will not eliminate the potential for caving within the sedimentary formational material below the casing tip elevation. The methods and means used by the contractor to install the permanent steel casings and seal the contact between the casing tips and sedimentary formation material, will directly determine the construction difficulties the contractor will encounter with the overlying alluvium while excavating the CIDH pile in the underlying formational material.

3) At Bent 3 through Bent 10 and Bent 11A through Bent 14, the specified pile tip elevation is located within a conglomerate layer. Due to the potentially soft nature of the matrix material in this formation, the contractor may encounter caving conditions during CIDH pile construction. The contractor should anticipate the need to use telescoping temporary casing to control caving in this layer. Due to the chaotic nature of the conglomerate layer, the contractor should take necessary precautions, when drilling in this formation, to prevent the possibility of cobble and boulder sized material caving into or causing the CIDH pile excavation to deflect from vertical during construction.

4) If telescoping temporary casing is used in the conglomerate layer to control caving, the contractor should size the permanent steel casing accordingly to prevent damage to the permanent steel casing during CIDH pile excavation.

5) The contractor should not assume that installation of the permanent steel casing will allow the contractor to drill and place concrete for the CIDH piles in the dry. The intent of the permanent steel casing is only to minimize construction difficulties due to caving of the loose alluvial material overlying the sedimentary formational material.

6) During construction of the CIDH piles, the contractor should choose appropriately sized drilling tools so as to make sure not to damage or puncture the wall of the permanent steel casing while inserting and removing the drilling tools. Puncturing the wall of the steel casing may allow alluvium to enter the drilled hole. Alluvium flowing through the punctured casing and into the borehole can potentially lead to subsidence at the ground surface.

7) During construction of the CIDH piles, the contractor should make sure to maintain a positive head between the ground water surface and the fluid level inside the permanent steel casing. If a positive head is not maintained, it can potentially lead to caving of the walls of the drilled hole, and construction difficulties. Additionally, the contractor should be aware that artesian groundwater conditions exist at the site; therefore once the drilled holes for the CIDH piles advance into the conglomerate formation, the ground water static piesometric head may rise to or above the existing ground surface during construction.

The recommendations contained in this report are based on specific project information regarding structure type, support locations, and design loads that have been provided by the Consultant TY Lin, Int'l. If any conceptual changes are made during final project design, the Office of Geotechnical Design-South 2, Design Branch B, should review those changes to determine if these foundation recommendations are still applicable. Any questions regarding the above recommendations should be directed to the attention of Erich Neupert, (916) 227-4565, or Mark DeSalvatore, (916) 227-5391, at the Office of Geotechnical Design-South 2, Branch B.

Prepared by: Date: 4/13/09

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FOUNDATION REPORT
I-805 HOV/Carroll Canyon Rd Extension
Business Access Undercrossing
San Diego, California

April 16, 2009

Structural Engineer:
TYLININTERNATIONAL

Owner:

Geotechnical Consultant / Report Preparer:

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FOUNDATION REPORT

I-805 HOV / Carroll Canyon Road Extension
Bridge No. 57C-0787

Business Access Road Undercrossing
San Diego, California

Contract Number: 38008-017046.00

April 16, 2009

Prepared for:

Ms. Chung-Yuan Wen, Ph.D., P.E.
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Caltrans District 11, San Diego County, Route I-805
Kilometer Post Total Project Limits: R43.2
Structure Number: 57C-0787
Structure Name: Carroll Canyon Road Bridge
Expenditure Authorization: 2T0401

Prepared by:

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April 16, 2009

Contract Number: 38008-017046.00

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Subject: **Foundation Report**
I-805 HOV / Carroll Canyon Road Extension
Bridge No. 57C-0787
Business Access Road Undercrossing
San Diego, California

Dear Ms. Wen:

In accordance with SANDAG Task Order No. 46 and Amendment No. 1, Bureau Veritas North America, Inc. (BVNA) is pleased to submit this Foundation Report for the proposed Business Access Road Undercrossing (BAUC) of the I-805 HOV / Carroll Canyon Road Extension project. A geotechnical technical memo was prepared summarizing the geotechnical design parameters and recommendations in connection with the BAUC. This report summarizes the geotechnical conditions at the project site and our conclusions and recommendations for the BAUC. BVNA appreciates the opportunity to provide geotechnical services for this project and we look forward to continuing our role as your geotechnical consultant on this project.

Respectfully submitted,
Bureau Veritas North America, Inc.

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I.6: FIGURE 6 – CALIFORNIA SEISMIC HAZARD MAP, CALTRANS 1996
I.7: CARROLL CANYON ROAD BRIDGE LOTBS
I.8: DIRECT ACCESS RAMP LOTBS
I.9: BUSINESS ACCESS UNDERCROSSING LOTBS
I. 10: MISCELLANEOUS RETAINING WALLS LOTBS
I. 11: AS BUILT LOTBS
I. 12: CONE PENETRATION TESTING REPORTS

APPENDIX II: LABORATORY TESTING RESULTS

APPENDIX III: ANALYSES AND CALCULATIONS
III.1: SEISMIC ANALYSES DATA

1.0. SCOPE OF SERVICES

Bureau Veritas North America, Inc. (BVNA) prepared this Foundation Report (FR) for the proposed Business Access Road Undercrossing (BAUC) component of the I-805 HOV / Carroll Canyon Road Extension project (CCR project) located in San Diego, California at Interstate-805 (I-805), Kilometer Post 42.6 to 46.2. The purpose of this report is to document geotechnical site conditions; provide analyses of anticipated site conditions as they pertain to the project described herein; and to recommend geotechnical design parameters and construction criteria for the project. The report also establishes a geotechnical baseline to assess the existence and scope of any changed conditions identified during construction. The report is intended for the use by the project engineers, construction personnel, bidders, and contractors.

The scope and type of work performed to obtain the information supporting the foundation recommendations included:

Review of Existing Data

BVNA reviewed the following geotechnical documentation:

- In-house geotechnical documents and maps, topographic maps, environmental maps, and as-built documentation of existing facilities relevant to the project site
- The AASHTO LRFD Bridge Design Specification, 4th Edition, dated 2007
- The Caltrans Guidelines for Structures Foundation Reports dated March 2006
- The Caltrans Soil and Rock Logging, Classification, and Presentation Manual dated June 2007
- The Department of Transportation Structures Preliminary Geotechnical Report, File No.: 11-SD-805-PM 23.6 to PM 26.8, I-805 Managed Lanes, 11-081630, dated December 2007
- The Department of Transportation Preliminary Geotechnical/Geological Report For Seismic Retrofit Design, dated February 1995
- The Department of Transportation Preliminary Geotechnical/Geological Report (Addendum No.1) For Seismic Retrofit Design, dated May 1995
- The Department of Transportation District Preliminary Geotechnical Report For Interstate 805 Widening and HOV Lanes, from State Route 52 Interchange to Interstate 5 Merge, dated March 2008
- A floodplain study prepared by Parsons Brinckerhoff dated July 2005 and finalized on November 05, 2008 for the project site
- A geotechnical investigation prepared by Group Delta Consultants dated April 25, 2003 for the Carroll Canyon Road Extension Project, Project No. SR 281

A complete listing of the project documentation utilized is included in Section 14.0, References.

Site Reconnaissance

BVNA performed numerous site reconnaissance visits to observe the general surficial site conditions; to evaluate the field locations of existing underground utilities; to determine the existing topographical, physical, and environmental access constraints for the field exploration program; and to establish test boring and Cone Penetration Test (CPT) locations. Caltrans District 11 Office of Surveys surveyed and flagged the numerous test boring and CPT locations proposed by BVNA and Caltrans.

Field Exploration

The field exploration program consisted of drilling forty (40) test borings using a 203.2-millimeter (8.0-inch) diameter hollow-stem auger; nineteen (19) test borings using a sonic drilling method with a 152.4-millimeter (6.0-inch) diameter drill bit; and twenty-seven (27) CPTs. The test borings and CPTs extended to maximum depths of approximately 45.7 meters (150.0 feet) and 10.2 meters (33.5 feet) below the existing ground surface, respectively. The test borings were logged in the field by engineers and geologists from BVNA. Four (4) of the test borings drilled using a hollow stem auger were located along the alignment of the proposed BAUC and several additional borings were drilled nearby in support of the CCR bridge and miscellaneous retaining walls. Bulk and relatively undisturbed soil and rock samples, representative of the various subsurface materials encountered, were obtained from the test borings and transported to our laboratory for further testing and evaluation. Data from the field exploration program was evaluated to obtain the information supporting the foundation recommendations included in this report.

Approximate locations of the test borings and CPTs are shown on Appendix I.3: Figure 3-Field Exploration Map and the Logs of Test Borings (LOTBs) (Appendices I.7 to I.10). The data from the field exploration program are presented on the LOTBs and CPTs in Appendix I. The LOTBs are separated into four (4) subsections for each of the specific components of the overall project (i.e., I.7: Carroll Canyon Road Bridge; I.8: Direct Access Ramp; I.9: Business Access Undercrossing; and I.10: Miscellaneous Retaining Walls). Data for the entire field exploration program are presented in Appendix I. All elevations included inb this report are in meters (feet) and are referenced to the 1929 NGVD Datum.

Laboratory Testing

BVNA performed laboratory testing on selected bulk and relatively undisturbed soil and rock samples obtained from the test borings to evaluate the engineering properties of the foundation materials. The following tests were performed in general conformance with applicable American Society for Testing and Materials (ASTM) and California Test Method (CTM) procedures:

- In-situ moisture content and unit weight (ASTM D2216 and D4767)
- Particle size distribution and No. 200-wash (ASTM D422 and ASTM D1140)
- Atterberg Limits (ASTM D4318)
- Consolidation (ASTM D2435)
- Direct Shear (ASTM D3080)
- Maximum Dry Density and Optimum Moisture Content (ASTM D1557)
- Expansion Index (ASTM D4829)
- Corrosivity series including sulfate content, chloride content, pH-value, and resistivity (CTM 417, 422, and 643)

The strength parameters assigned to the various geologic units (i.e., fill, alluvium, terrace deposits, and Ardath Shale) and utilized for the foundation and slope stability analyses, were developed from the above laboratory testing program. A summary of the laboratory testing program and the test results are presented in Appendix II. The in-situ density and moisture contents are depicted on the LOTBs in Appendix I.

Mapping

Appendix I.4: Figure 4-Geotechnical Map depicts field mapping of the surface geology performed by BVNA for the overall project site.

Assessment of Soil Conditions and Geologic Hazards

BVNA assessed the general subsurface soil and rock conditions and geologic hazards (i.e., ground water, compressible alluvial soils, rock, expansive soils, corrosive soils, floodplain, slope stability, liquefaction, lateral spreading) to establish the BAUC foundation design recommendations, earthwork criteria, and construction considerations.

Data Analyses

The field and laboratory data were analyzed to develop the foundation recommendations in this report and included the following:

- Seismic Analyses Data (Appendix III.1)
- Spread Foundation Analyses Results (Section 9.1: Table 3 and Table 4)

Report Preparation

This report presents BVNA's foundation design recommendations, earthwork criteria and construction considerations including Tables, Figures and Appendices.

2.0. PROJECT DESCRIPTION

The project site is located north of Sorrento Valley Road, south of Mira Mesa Boulevard and west of I-805 in San Diego, California. Appendix I.1: Figure 1-Site Location Map depicts the location of the BAUC and the approximate alignment of the CCR extension. Appendix I.2: Figure 2-Project Plan depicts the various proposed and existing project components. The CCR project will extend the Carroll Canyon Road (CCR) westerly from its existing intersection with Scranton Road, under the I-805 freeway bridge, to the intersection of Sorrento Valley Road and comprises 4 components including the CCR Bridge, the Direct Access Ramp (DAR) retaining walls, the BAUC, and the miscellaneous retaining walls (MRW).

The proposed CCR extension will eliminate the existing north-south section of Sorrento Valley Road that provides the sole access to several businesses located along the southern side of Sorrento Valley Road. The proposed BAUC will restore access to the existing businesses with construction of a new access road that passes beneath the proposed CCR extension and loops around to an intersection with the north side of the CCR.

The BAUC bridge will be approximately 24.0 meters (78.7 feet) long, 29.0 meters (95.1 feet) wide and a maximum of 10.0 meters (32.8 feet) high. The structure will be a cast-in-place, reinforced concrete box girder. The BAUC abutments may be supported on continuous spread foundations founded within the underlying terrace deposits.

The design loading criterion presented on the project plans for the various structural components of the BAUC abutments are presented on the project plans prepared by T.Y. Lin 8.

3.0. SITE GEOLOGY AND SUBSURFACE CONDITIONS

Site geology and subsurface conditions are discussed in the subsections below.

3.1 Topography and Regional Geologic Setting

The proposed BAUC is located near the western end of the of the proposed CCR extension between Sorrento Valley Road on the south and Mira Mesa Boulevard on the north, in San Diego, California, as shown in Appendix I.2: Figure 2-Project Plan. The topography at the project site slopes gently southwest at a gradient of approximately 5.5 to 1 (horizontal to vertical). Elevations at the project site range from a high of approximately 30.0 meters (98.4 feet) to a low of approximately 26.0 meters (85.3feet). The site drainage generally occurs as a sheet flow to the south and west towards Carroll Creek. Vegetation within the project site generally consists of grass, weeds, and a few small shrubs. Existing improvements adjacent to the project site include several commercial buildings located south of Sorrento Valley Road along with various overhead and underground utilities.

The site is located in San Diego County within the Peninsular Ranges Geologic Province. This province is underlain by a basement complex of Late Cretaceous-age undifferentiated granitic rocks of the Southern California Batholith and Jurassic-age prebatholithic metavolcanic rocks. The basement complex is non-conformably overlain by a thick sedimentary sequence of marine and non-marine rocks that were deposited within the San Diego Embayment. These sedimentary deposits range in age from Late Cretaceous to recent. The most abundant deposits of the embayment are Eocene-age marine, lagoonal, and non-marine rocks (Kennedy, 1975).

Two major northwest-trending fault zones traverse the San Diego metropolitan area: the Rose Canyon fault zone on the west and the Elsinore fault zone on the east. These fault zones traverse the San Diego area in a predominant north to north-northwest direction.

3.2. Pertinent Soil Conditions and Geologic Hazards

Pertinent soil conditions and geologic hazards are discussed in the following sections.

Fault Rupture

Published geologic maps and literature pertaining to the general site area indicates that there are no known major or active faults on or in the immediate vicinity of the site (see section 14.0. References: 29, 32 and 33). Evidence for active faulting on site was not observed during our site investigation. Based on the California Seismic Hazard Map, Caltrans 1996, a fault with activity within the late Quaternary period (700,000-years) is considered “active”. An “active” fault is defined by the California Geologic Survey as one which has “had surface displacement within Holocene time (about the last 11,000 years)”. The project site is outside any Alquist Priolo Earthquake Fault Zone. Therefore, the potential for surface rupture due to faulting at the site during the design life of the proposed structures is considered low.

The closest distance in kilometers (miles) from the site to the projection of rupture surface area along the fault traces from the major active earthquake faults that could possibly affect the site are listed below:

Rose Canyon (Type B)	6.1 km (3.8 mi)
Coronado Bank (Type B)	26.4 km (16.4 mi)
Newport-Inglewood (Offshore) (Type B)	36.4 km (22.6 mi)
Elsinore-Julian (Type A)	54.2 km (33.7 mi)
San Andreas – Southern (Type A)	127.8 km (79.4 mi)

Seismic Shaking Potential

The seismic hazard most likely to impact the site is ground shaking resulting from an earthquake on one of the major active regional faults. Design considerations for the hazard of seismic shaking are presented in Section 7.0, Seismic Study.

Liquefaction, Seismic Settlement, and Lateral Spreading

The two fundamental conditions associated with the occurrence of seismically induced liquefaction are cohesionless sands combined with ground water above a depth of about 15.2 meters (50.0 feet). Research indicates that uniformly graded, rounded, very fine to fine grained sands in a low-density condition are most susceptible to liquefaction. The potential for liquefaction under the same conditions of ground shaking intensity and duration will decrease for sands that are more well graded, more irregular and gritty, more coarse and more dense. Also, a pronounced decrease in liquefaction potential will occur with the increase in fine-grained (i.e., silt and clay) content. Seed and others have suggested that a non-liquefiable classification be assigned if the clay faction is 15 percent or greater (Guidelines for Evaluating and Mitigating Seismic Hazards in California, Special Publication 117, CDMG, Ch. 6, 1997). Dynamic settlement due to earthquake shaking can occur in both dry and saturated sands.

The initial subsurface exploration program encountered occasional loose alluvial sand zones with a near-surface ground water table in the area of the CCR bridge platform and adjoining bents. Therefore, a detailed subsurface exploration program was performed including continuous data acquisition using CPTs and hollow-stem auger test borings with successive sampling intervals within the platform area. An analysis of liquefaction potential in the vicinity of the CCR bridge platform is presented in the CCR Bridge Structure Foundation report.

The project area encompassing the BAUC is not considered to be susceptible to liquefaction and associated hazards, including lateral spreading due to the generally dense nature of the underlying terrace deposits and Ardath Shale.

Subsidence

The site is not located in an area of known ground subsidence, occurring due to the withdrawal of subsurface fluids. Accordingly, the potential for subsidence occurring at the site due to the withdrawal of oil, gas, or water is considered remote.

Landsliding

There are no known landslides on or in the immediate vicinity of the project site, and the site is not located in the path of any known landslide.

Tsunamis and Inundation Seiches

The site is located inland, approximately 6.4 kilometers (4.0 miles) up Soledad Valley from the Pacific Ocean and at a minimum elevation of approximately 26.0 meters (85.3 feet) above mean sea level (MSL). Therefore, tsunamis (seismic sea waves) are not considered a hazard at the site.

The site is not located near to or down slope of, any large body of water that could affect the site in the event of an earthquake-induced failure or seiche (oscillation in a body of water due to earthquake shaking).

3.3. Project Site Soils

Based on review of existing geotechnical documents, surface geologic mapping, and subsurface exploration, the project site is underlain by existing fill, alluvium, terrace deposits, and Ardath Shale. Appendix I.4: Figure 4-Geotechnical Map presents the general distribution of the geologic units within the project limits. The interpreted geologic conditions underlying the proposed BAUC are indicated in Appendix I.5: Figure 5-Geologic Cross Section AA-AA'. Descriptions of the geologic units encountered are provided below.

Existing Fill

Existing fill soils were observed in forty-three (43) out of fifty-nine (59) test borings drilled for the overall project. Appendix I.3: Figure 3-Field Exploration Map shows the test borings that encountered existing fill soils along with their respective depths. The existing fill soils were generally found in the vicinity of the commercial development within the western margins of the project with a depth up to 3.5 meters (11.5 feet); the northern embankment for the Soledad Canyon Bridge within the central-northern margins of the project with a depth up to 30.5 meters (100 feet); and the SDG&E easement access road within the eastern margins of the project with a depth up to 18.2 meters (59.7 feet). The composition of the existing fill ranges from silty sand to sandy clay, with gravel and cobbles. As encountered in the test borings, the fill soils were in a moist to wet state, ranged from medium brown to dark reddish brown in color, and the consistency ranged from loose to medium dense (granular fill) and moderately stiff to stiff (fine-grained fill).

Alluvium

Holocene-aged alluvium was observed in the active stream channel of Carroll Creek, while outside the creek channel the alluvium exhibited addition of soil development and increased consolidation. The alluvium observed in the stream channel was composed of fine to coarse grained sand, with abundant gravel and cobbles. The alluvium encountered in the test borings ranged from silty clay to poorly graded sand with variable concentrations of gravel and cobbles. The variable composition and laterally discontinuous nature of the alluvial deposits encountered reflect the various depositional sequences consistent with the stream channel setting. As encountered in the test borings, the alluvial soils were in a moist to wet state, ranged from dark

brown to dark grey in color and the consistency ranged from loose to very dense. The alluvium appeared to be derived from bedrock sources that lie near and east of the site.

Terrace Deposits

Quaternary-aged terrace deposits were observed in road cuts and hillside outcrop exposures. Terrace deposits were encountered intermittently throughout the project site in twenty-five (25) out of fifty-nine (59) test borings drilled. The terrace deposits occur locally as a veneer of silt, clay, sand and conglomerate that represent fluvial deposits laid down in the past by Carroll Creek when it flowed at a higher elevation. The terrace deposits were observed to be moist to wet, with a hard to very dense, friable consistency. The basal portions of the terrace deposits were observed in the surface exposures and in the test borings to be comprised of gravel and cobble conglomerate with a silty sand matrix. In the test borings that encountered terrace deposits, they were observed to overlie Ardath Shale.

3.4. Project Site Rocks

The rock underlying the site consists of a sedimentary rock and is part of the Ardath Shale geologic unit.

Ardath Shale

Eocene-aged Ardath Shale is the sedimentary bedrock unit found to underlie the entire site at depth. Ardath Shale was encountered within the project site at depth in forty-one (41) out of fifty-nine (59) test borings drilled. The Ardath Shale was observed to consist of siltstone and claystone and occasional sandstone interbeds with thin laminations of medium and dark gray colors. The Ardath Shale was observed to be moist to wet, with a hard consistency. Some layers of the Ardath Shale were observed to be weakly fissile, while other layers were observed to be concretionary.

3.5. Earth Material Strength Parameters

Soil strength parameters for engineering analysis were developed from laboratory testing and engineering evaluation. Table 1: Soil Parameters presents typical soil and rock values assigned to each of the different earth materials.

Table 1: Soil Parameters

Soil Types	Cohesion, c	Friction Angle, ϕ	Effective Unit Weight, γ
Existing Fill	14.36 kN/m^2 (300 psf)	28°	19.16 kN/m^3 (122 pcf)
Caltrans Structure Backfill	0 kN/m^2 (0 psf)	34°	19.63 kN/m^3 (125 pcf)
Alluvium	19.16 kN/m^2 (400 psf)	25°	18.06 kN/m^3 (115 pcf)
Terrace Deposits	16.76 kN/m^2 (350 psf)	34°	19.63 kN/m^3 (125 pcf)
Ardath Shale	47.88 kN/m^2 (1,000 psf)	38°	20.41 kN/m^3 (130 pcf)

4.0. GROUND WATER

The ground water level (GWL) was encountered in the majority of test borings at an elevation that approximates the adjacent Carroll Creek level. The GWLs encountered in the platform area ranged from 25.2 meters (82.7 feet) to 27.6 meters (90.5 feet) MSL. The GWLs in other test borings vary significantly outside the platform area and aren't considered to reflect static GWL; these variable GWLs reflect locally perched groundwater and anomalies from drilling methods (i.e., smearing), impervious nature of the Ardath Shale geologic unit, and the relatively short period of time from drilling to GWL measurement. Appendix I.3: Figure 3-Field Exploration Map presents all of the GWL elevations MSL where encountered in the test borings. Appendices I.7 to I.10 include the GWL elevations MSL and the dates measured where encountered in the test borings.

Groundwater is not expected to be a constraint to the proposed construction of the BAUC abutment footings, since groundwater was not encountered during our subsurface exploration within the BAUC footprint (borings O-08-016, O-08-017, O-08-021, O-08-022). However, experience indicates that near-surface groundwater conditions can develop in areas where no such groundwater conditions were previously encountered, especially in areas where a substantial increase in surface water infiltration results from landscape irrigation or unusually heavy precipitation. In the event that groundwater is encountered the abutment footing excavations, the contractor will have to employ proper dewatering methodology during construction.

5.0. SCOUR EVALUATION

Due to the close proximity of the site to Carroll Creek, the potential for flooding exists during high flow events. The site is within the 100-year floodplain of Carroll Creek. Based on a floodplain study prepared for the project, the site is located within a floodplain, but not within the relatively high energy floodway (see Section 14.0. References: 34). As indicated in the floodplain study report, the location of the project within the floodplain is in areas of ineffective flow and/or backwater. Impacts on the proposed improvements due to potential scour are considered low. It is anticipated that site development will include appropriate drainage provisions for control and discharge of surface runoff.

6.0. CORROSION EVALUATION

The corrosion potential of the on-site materials to steel and buried concrete was evaluated within the overall project site. Laboratory testing was performed in accordance with applicable CTMs on representative samples of the existing fill soils, alluvial soils, terrace deposits, and Ardath Shale to evaluate pH, minimum resistivity, chloride, and soluble sulfate content. General recommendations to address the corrosion potential of the on-site materials are provided herein. If additional recommendations are desired, it is recommended that an appropriate specialist be consulted. Table 2: Soil Corrosion Test Summary, presents the results of our corrosion testing adjacent to the proposed BAUC along the proposed CCR bridge alignment.

Table 2: Soil Corrosion Test Summary

Boring Number	Elevation	Sulfate Content (CTM 417)	Chloride Content (CTM 422)	pH-value (CTM 643)	Minimum Resistivity (CTM 643)
A-08-007	30.8 m – 29.9 m	260 ppm	160 ppm	6.5	1,004 ohms-cms
A-08-009	35.0 m – 34.2 m	500 ppm	290 ppm	6.5	650 ohms-cms
A-08-046	32.5 m – 31.5 m	520 ppm	1,100 ppm	6.4	328 ohms-cms
A-08-048	29.6 m – 29.0 m	450 ppm	390 ppm	7.2	508 ohms-cms
A-08-049	28.1 m – 27.2 m	14 ppm	75 ppm	6.2	2,208 ohms-cms
A-08-050	27.4 m – 26.5 m	530 ppm	120 ppm	7.1	682 ohms-cms
A-08-051	25.1 m – 24.2 m	250 ppm	96 ppm	6.6	937 ohms-cms

In accordance with the Caltrans criteria (Caltrans Corrosion Guidelines, Version 1.0, 2003), a corrosive area is an area where the soil contains 500 ppm chlorides or greater; sulfates of 2000 ppm or greater; a pH of 5.5 or less; or a minimum resistivity of 1,000 ohms-cms or less. Therefore, the project area is considered to be corrosive. Imported fill materials should be tested to check that their corrosion potential is not more severe than those assumed.

An appropriate specialist should be consulted regarding special requirements for ground contact concrete and metallic elements, as considered necessary by the Engineer.

7.0. SEISMIC STUDY

The site is located in southern California which is a seismically active region that is subject to hazards from moderate to large earthquakes. Ground shaking resulting from earthquakes should be expected over the lifetime of the proposed structures. The closest known active fault is the Newport-Inglewood (NIE) fault, which trends north-northwest and is about 6.1 kilometers (3.8 miles) west of the project site. According to the California Seismic Hazard Map, Caltrans 1996, the NIE fault is capable of a Maximum Credible Earthquake of Moment Magnitude, Mw=7.0. A copy of the California Seismic Hazard Map, Caltrans 1996 is attached in Appendix I.6. Section 3.2: Pertinent Soil Conditions or Geologic Hazards presents a detailed discussion regarding fault rupture, liquefaction, seismic settlement, and lateral spreading.

Dynamic Analysis Parameters

The California Seismic Hazard Map, Caltrans 1996 indicates that based on deterministic values, the design site acceleration is controlled by a Maximum Credible Earthquake (MCE) of Mw=7.0 on the NIE fault. Based on the California Seismic Hazard Map, Caltrans 1996, a MCE of Mw=7.0 on the NIE fault could produce a peak bedrock acceleration (PBA) of about 0.5g.

Soil Profile Type

The BAUC site should be classified as Soil Type C as defined in Appendix D of Caltrans Seismic Design Criteria (SDC) 2006, Version 1.4.

Acceleration Response Spectrum Curve

A standard Acceleration Response Spectrum (ARS) based on Figure 5 of Appendix B of SDC 2006, Version 1.4 is recommended for design. The ARS is based on a MCE of Mw=7.0, a PBA=0.5g, and Soil Type C and has been modified to account for near fault directivity effect (as per SDC Section 6.1.2.1). Appendix III.1 presents the recommended modified design ARS.

8.0. AS-BUILT FOUNDATION DATA

Appendix I.11: As-Built LOTBs depicts As-Built foundation data of the Soledad Canyon Bridge & OH relative to the Earthquake Retrofit Project No. SR 281. The As-Built LOTBs indicate that the existing Soledad Canyon Bridge is supported by a series of bents between two abutments constructed on CIDH and steel piles founded within the underlying Ardath Shale.

9.0. FOUNDATION RECOMMENDATIONS

The footings for Abutments 1 and 2 supporting the proposed BAUC bridge will be spread footings. The abutment footings should be embedded at least 0.3 meters (1.0 foot) into undisturbed terrace deposits.

Specific geotechnical design parameters and site earthwork recommendations for the BAUC project are presented in the following sections.

9.1. Shallow Foundations

It is recommended that the Abutments 1 and 2 for the proposed BAUC be supported on spread footings founded within underlying dense, undisturbed terrace deposits. The construction of the proposed approach slabs to Abutments 1 and 2 should be constructed in accordance with Section 9.2 of this report.

Footing Design Parameters

The foundations should be designed in accordance with the structural considerations, Caltrans specifications, and should incorporate the recommendations provided in the following paragraphs. The footing dimensions should be evaluated by the structural engineer.

Working Stress Design (WSD) was used to design the abutment footings as specified in the Caltrans Memo to Designers 4-1, April 2008. Table 3: Foundation Design Parameters presents the foundation design recommendations. The footing dimensions shown in Table 3 were developed based on the total permissible settlement of 50.8 millimeters (2.0 inches) based on the Caltrans' current practice for shallow footings as specified in the Caltrans Memo to Designers 4-1, Attachment-1, April 2008.

Table 3: Foundation Design Parameters

Support No.	Design Method	Finish Grade Elevation (1)	Bottom of Footing Elevation	Minimum Footing Size (2)		Permissible Settlement Under Service Load (3)
				B	L	
Abutment 1	WSD	25.5 m	23.6 m	6,096 mm	29,554 mm	50.8 mm
Abutment 2	WSD	25.8 m	23.6 m	6,096 mm	29,275 mm	50.8 mm

Notes: (1) 1929 NGVD Datum
(2) B = Short plan dimension of footing; L = Long plan dimension of the footing
(3) For single span structures with seat abutments
WSD = Working Stress Design

Bearing Capacity

The bearing capacity estimates for the spread footings were made in accordance with the guidelines presented in Section 4, Foundations of the 2003 Bridge Design Specifications by Caltrans. Table 4: Bearing Capacity Values presents the bearing capacity values for the spread footings.

Table 4: Bearing Capacity Values

Working Stress Design (WSD)		
Soil Type	Permissible Gross Contact Stress (Settlement), q_{pg}	Allowable Gross Bearing Capacity, q_{all}
Terrace Deposits (1)	1,316 kPa (27.5 ksf)	430 kPa (9 ksf)

Notes: (1) Listed bearing values may be used for Ardath Shale, if encountered.

Lateral Earth Stresses

Lateral active pressures imposed on Abutments 1 and 2, should be 5.6 kN/m^3 (36.0 pcf) equivalent fluid pressure for Caltrans structure backfill.

The lateral resistance of spread footings may be designed using a coefficient of friction and passive pressure. It is recommended that a coefficient of friction of 0.4 be utilized for undisturbed terrace deposits. It is recommended that a passive pressure of 66.7 kN/m^3 (425.0 pcf) equivalent fluid pressure be utilized for Caltrans structure backfill and undisturbed terrace deposits. The passive pressure may be utilized at the surface for level conditions and starting at 0.6 meters (2.0 feet) below the surface for a 2 to 1 (horizontal to vertical) descending fill slope condition. The maximum passive pressure utilized shall be 305.4 kN/m^2 (6,375.0 psf). A factor of safety of 1.5 should be used when evaluating the lateral resistance. Sliding resistance shall be calculated using only the base resistance or passive resistance values, or 50 percent of base resistance plus 50 percent of passive resistance behind the footing. The passive resistance may be increased by one-third for short duration loads like wind or seismic forces. Note: lateral deflections are necessary to develop passive resistance.

9.2. Temporary Excavations

Excavation of the on-site soils may be achieved with conventional heavy-duty grading equipment in good operating condition. Temporary, unsurcharged excavation slopes may be sloped back at an inclination of 1 to 1 (horizontal to vertical) within existing fill and alluvium. Temporary excavations within the terrace deposits may be sloped at an inclination of ¾ to 1 (horizontal to vertical).

Heavy loads should not be allowed within 3.0 meters (9.8 feet) of the tops of excavated slopes. A greater setback may be necessary when considering heavy vehicles, such as concrete trucks and cranes. The Engineer should be advised of such heavy loadings so that specific setback requirements may be established. Storm water should be directed away from temporary slopes.

10.0. SLOPE STABILITY ANALYSES

Minor fill slopes will be constructed in connection with the approach slabs for Abutments 1 and 2. These slopes will be grossly stable provided that they are graded in accordance with the Caltrans Standard Specifications.

11.0. GENERAL NOTES TO DESIGNER

The structural engineer shall show on the plans, a table with the foundation design parameters, including the design method, finish grade elevations, the bottom of footing elevations, the minimum footing dimensions, and permissible settlement under service load for Abutments 1 and 2. Type “B” excavation is to be shown on the plans at Abutments 1 and 2. Support locations are to be plotted on the Log of Test Borings, in plan view, as stated in “Memos to Designers” 4-2. The plotting of the support locations should be made prior to the foundation review.

12.0. CONSTRUCTION CONSIDERATIONS

Construction considerations for spread footings are presented below.

1. The existing fill soils and terrace deposits may be excavated using conventional, heavy-duty excavators in good operating condition.

2. Temporary excavations will be required for construction of spread footings. The use of temporary shoring may be necessary for the approaches to Abutments 1 and 2 due to the presence on an existing adjacent ascending fill slope. The Occupational Safety and Health Administration (OSHA) regulations provide trench sloping and shoring design parameters for excavations up to 6.0 meters (19.7 feet) deep, based on a description of the soil types encountered. BVNA recommends that the following OSHA Classifications be used for temporary excavations and other purposes:

   Fill Material and Alluvium: Type B
   Terrace Deposits and Ardath Shale: Type A

   Excavations should be inspected by the Engineer and the performance evaluated.

3. Temporary slopes above the water table in the fill and alluvial soils should be inclined no steeper than 1 to 1 (horizontal to vertical). Temporary excavations that encounter seepage

may need shoring or may be stabilized by placing sandbags or gravel along the base of the seepage zone.

4. Heavy loads should not be allowed within 3.0 meters (9.8 feet) of the tops of excavated slopes. A greater setback may be necessary when considering heavy vehicles, such as concrete trucks and cranes. The Engineer should be advised of such heavy loadings so that specific setback requirements may be established. Storm water should be directed away from temporary slopes. It should be noted that temporary excavations are susceptible to local failures depending on the duration of the excavation. Ground water seepage zones may be encountered during excavation for Abutments 1 and 2, particularly during the wet weather season; therefore, dewatering measures might be necessary. Where seepage zones occur, loose or yielding conditions may develop at the bottom of the excavations, which would require removal of saturated materials prior to placing concrete. Saturated yielding conditions should be inspected by the Engineer to determine the appropriate remedial measures.

13.0. DISCLAIMERS AND CONTACT INFORMATION

The recommendations contained in this report are based on specific project information regarding structure type, location, and design loads that have been provided to BVNA. If any conceptual changes are made during final project design, BVNA should review those changes to determine if these foundation recommendations are still applicable. Any questions regarding the above recommendations should be directed to the attention of Scott Moors, (805) 656-6074 at BVNA.

The recommendations and opinions expressed in this report are based on field and laboratory data developed by BVNA, review of background documents, project plans prepared by T.Y. Lin, and communications with T.Y. Lin and Caltrans. It should be noted that this study did not evaluate the possible presence of hazardous materials on any portion of the site.

Should the proposed grades vary significantly from the existing or if any development configuration changes, structural loads change, or the foundation subgrade conditions vary significantly; the recommendations contained herein may need to be modified accordingly. Due to the limited nature of the field explorations, conditions not observed and described in this report may be present on the site. It should be understood that conditions different from those anticipated in this report may be encountered during grading operations (e.g., the extent of removal of unsuitable soil) and that additional effort may be required to mitigate them.

This document is intended to be used only in its entirety. No portion of the document, by itself, is designed to completely represent any aspect of the project described herein. BVNA should be contacted if the reader requires additional information or has questions regarding the content, interpretations presented, or completeness of this document.

BVNA has endeavored to perform our evaluation using the degree of care and skill ordinarily exercised under similar circumstances by reputable geotechnical professionals with experience in this area in similar soil conditions. No other warranty, either expressed or implied, is made as to the conclusions and recommendations contained in this report.

14.0. REFERENCES

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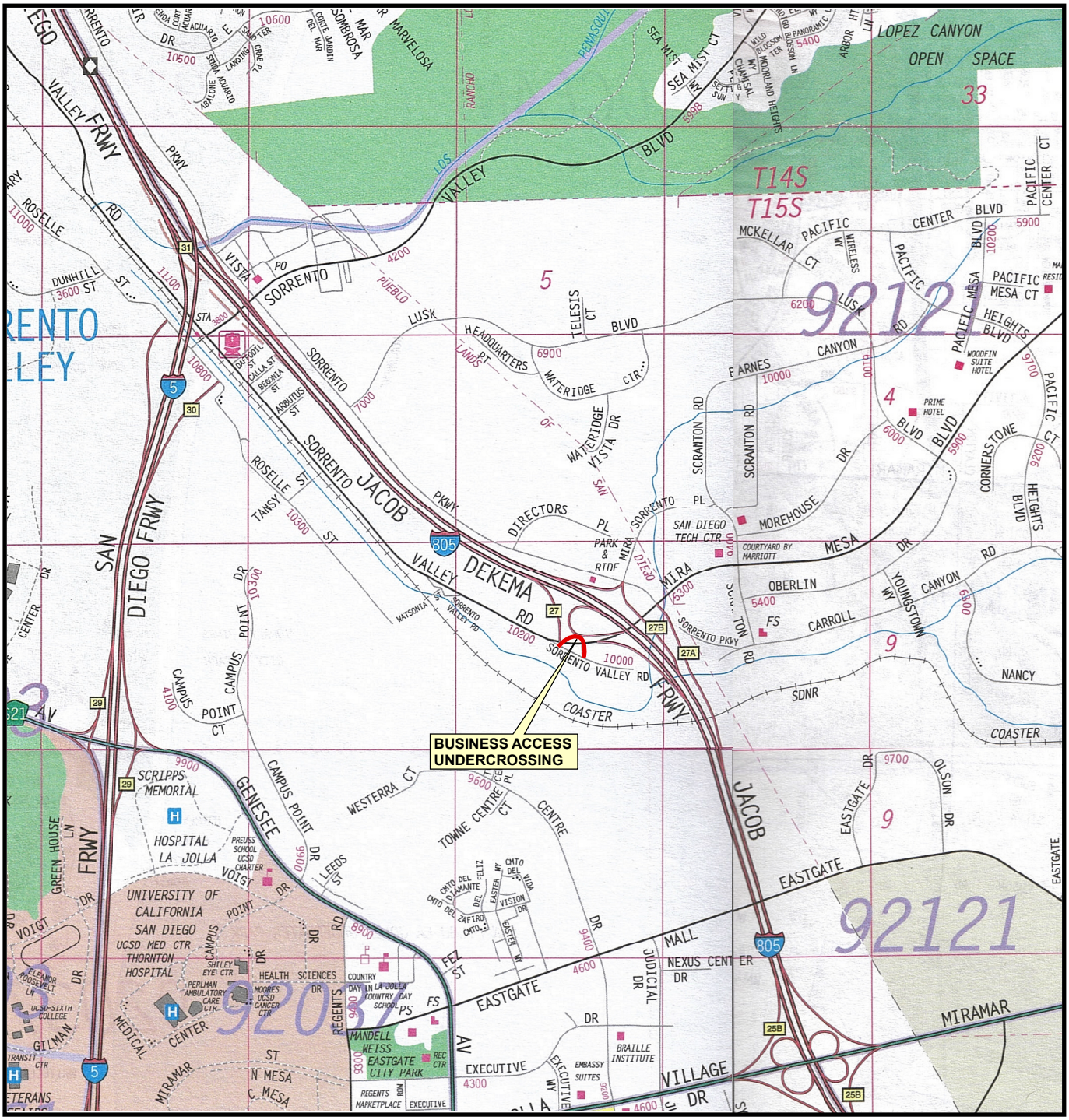
APPENDIX I

FIGURES, LOG OF TEST BORINGS (LOTB), AND CONE PENETRATION TESTING



REFERENCE: THE THOMAS GUIDE, SAN DIEGO COUNTY STREET GUIDE, 2007, PAGE 1208 GRID E-7

N

APPROXIMATE SCALE

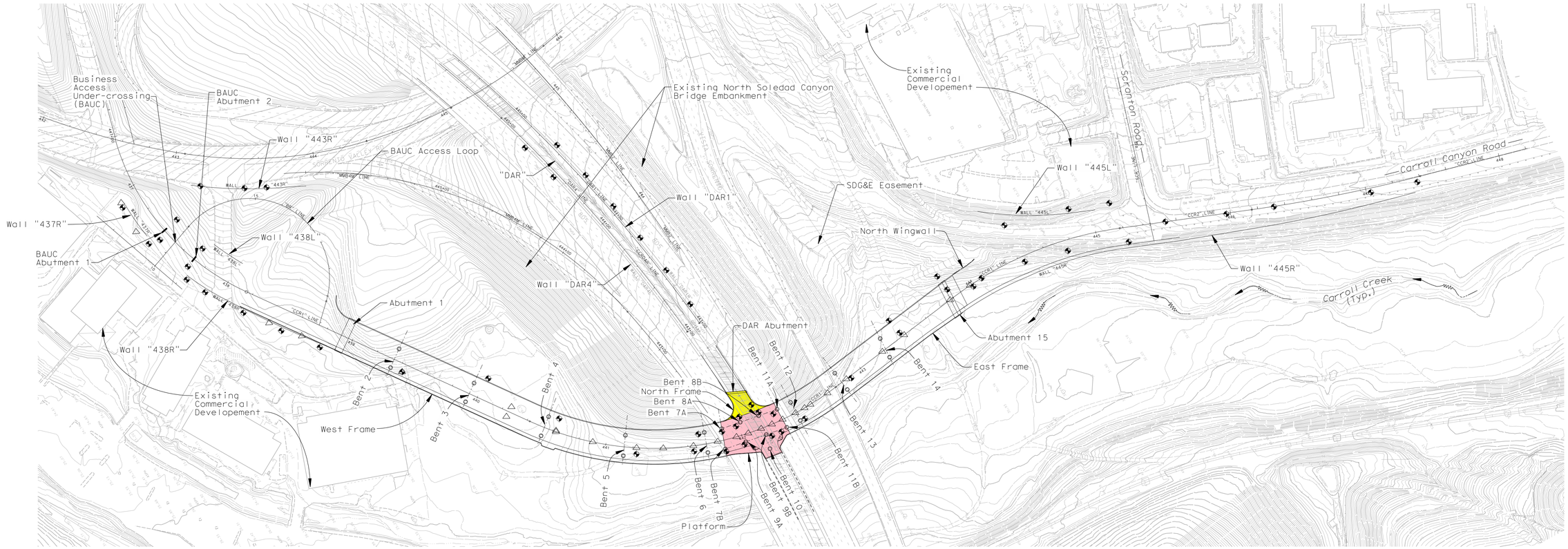
1 CENTIMETER: 228 METERS
(1 INCH: 1,900 FEET)

NOTE: This figure may contain areas of color. BVNA cannot be responsible for any subsequent misinterpretation of the information resulting from black and white reproductions of this figure.

SCHEMATIC ONLY - NOT TO SCALE - NOT A CONSTRUCTION DRAWING

BUREAU VERITAS NORTH AMERICA, INC.
Testing Engineers San Diego
7895 Convoy Court, Suite 18
San Diego, CA 92111

Title:	**Site Location Map**		
Project:	BUSINESS ACCESS UNDERCROSSING		
Drawn:	MPP	Contract No:	38008-017046.00 (SANDAG T.O. 46)
Date:	April, 2008	Figure No:	1 (Appendix I.1)

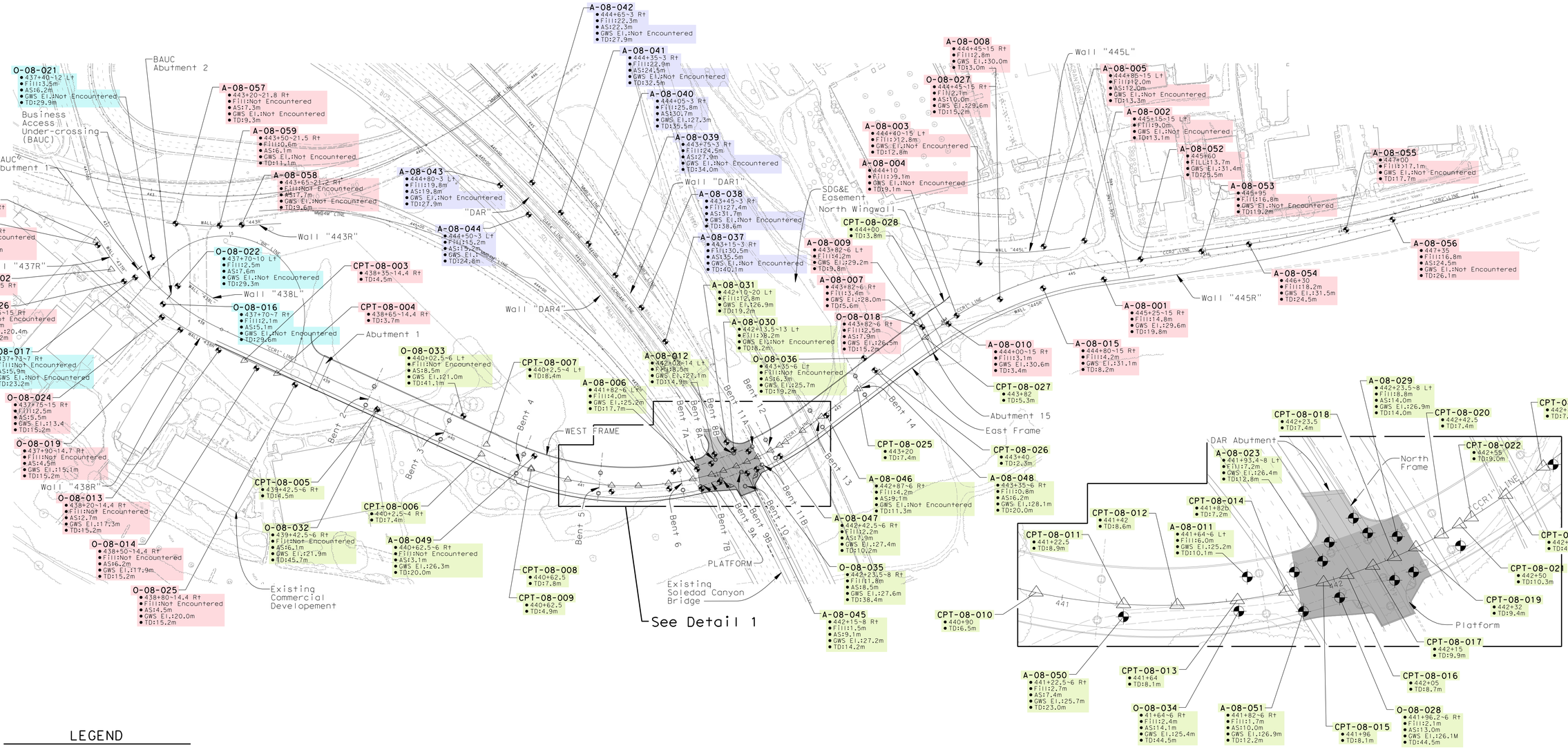


FOR SCHEMATIC USE ONLY - NOT A CONSTRUCTION DRAWING

BUREAU VERITAS NORTH AMERICA, INC.
7890 Convoy Court, Suite 18
San Diego, CA 92111
Tel (858) 715-5800 Fax (858) 715-5810

Title:	**Project Plan**		
Project:	BUSINESS ACCESS UNDERCROSSING		
Drawn:	JDJ	Contract No.:	38008-017046.00
Date:	February 2009	Figure No.:	2 (Appendix I.2)

\DAR Walls\BAUC_FIG2_ProjectPlan.dgn



LEGEND

- Carroll Canyon Road Bridge
- Direct Access Ramp
- Business Access Undercrossing
- Miscellaneous Retaining Walls

O-08-035
- 442+23.5~8 Rt — (Station location in meters)
- Fill:1.8m — (Depth below surface to bottom of fill)
- AS:8.5m — (Depth below surface to Ardath Shale contact)
- GWS El.:27.6m — (Elevation of ground water surface mean sea level)
- TD:38.4m — (Total depth of Test Boring / CPT)

Note: The Legend depicts color coding to differentiate between field exploration operations relevant to each of the 4 components of the overall project (i.e., CCR Bridge, Business Access Undercrossing, DAR Retaining Walls, Miscellaneous Retaining Walls) and are included in companion LOTB subappendices. However, all of the field exploration information is relevant to each of the 4 project components to depict a broader subsurface site characterization.

DETAIL 1

NO SCALE

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BUREAU VERITAS NORTH AMERICA, INC.
7890 Convoy Court, Suite 18
San Diego, CA 92111
Tel (858) 715-5800 Fax (858) 715-5810

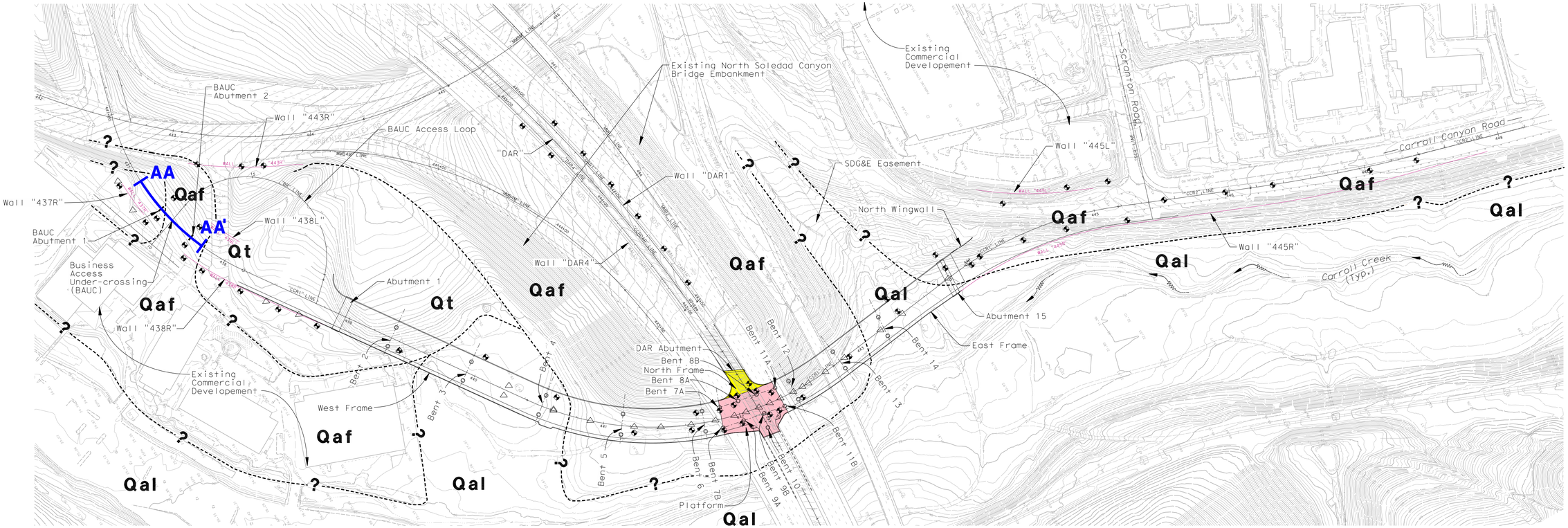
Title:	**Field Exploration Map**		
Project:	BUSINESS ACCESS UNDERCROSSING		
Drawn:	JDJ	Contract No.:	38008-017046.00
Date:	February 2009	Figure No.:	3 (Appendix I.3)

LEGEND

Qaf	Artificial Fill
Qal	Alluvium
Qt	Terrace Deposits
	Approximate Geologic Contact; queried where uncertain
AA AA'	Section (Typ.)[1,2]

NOTES:

1. Distances along AA-AA' were measured along the "CCR1" Line
2. Section AA-AA' is presented as Appendix I.5



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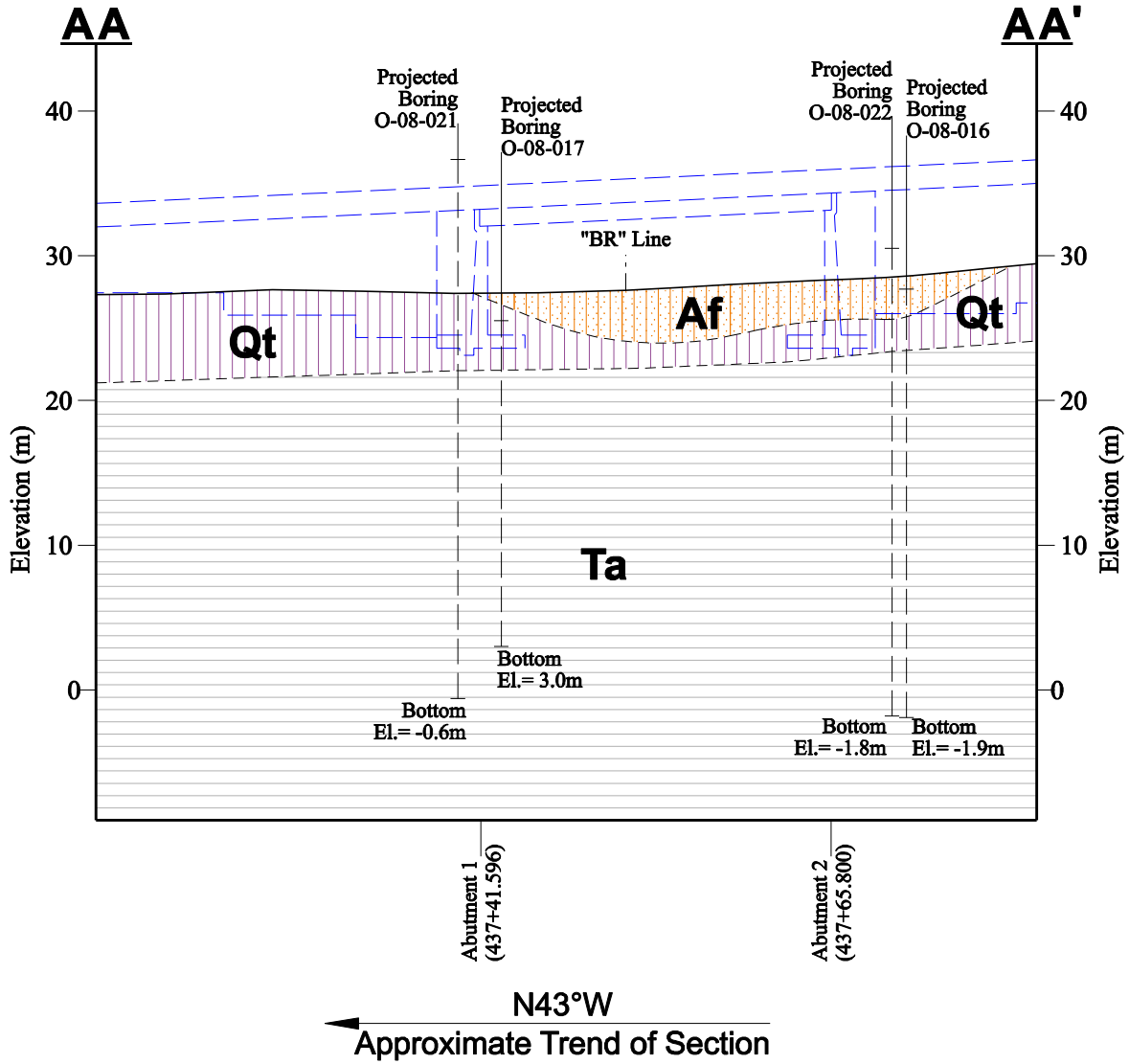
BUREAU VERITAS NORTH AMERICA, INC.
7890 Convoy Court, Suite 18
San Diego, CA 92111
Tel (858) 715-5800 Fax (858) 715-5810

Title:	**Geotechnical Map**		
Project:	BUSINESS ACCESS UNDERCROSSING		
Drawn:	JDJ	Contract No.:	38008-017046.00
Date:	March 2009	Figure No.:	4 (Appendix I.4)

\Business Access Undercrossing\BAUC_FIG4_GeotechnicalMap.dgn

SECTION MEASURED ALONG "CCR1" LINE



LEGEND

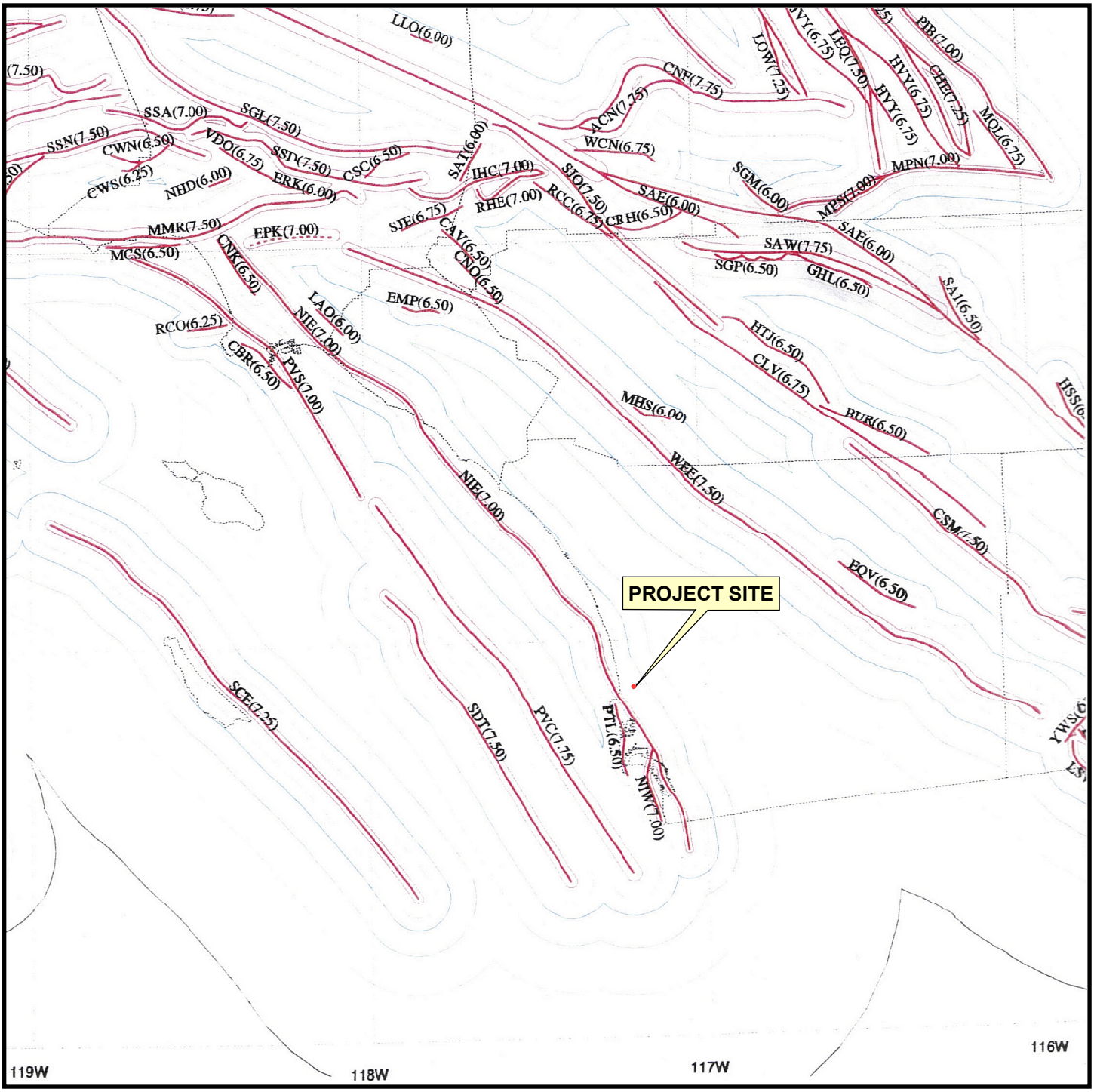
- Artifical Fill (Af)
- Terrace Deposits (Qt)
- Ardath Shale Bedrock (Ta)

Graphic Scale (Meters)
0 5 10 20
1:500

FOR SCHEMATIC USE ONLY - NOT A CONSTRUCTION DRAWING

BUREAU VERITAS NORTH AMERICA, INC.
7890 Convoy Court, Suite 18
San Diego, CA 92111
Tel (858) 715-5800 Fax (858) 715-5810

Title:	Geologic Cross Section (Measured Along "CCR1" Line)
Project:	BUSINESS ACCESS UNDERCROSSING
Drawn: JDJ	Contract No.: 38008-017046.00
Date: February 2009	Figure No.: 5 (Appendix I.5)



REFERENCE: MAUCHLIN, L., 1996, "CALIFORNIA SEISMIC HAZARD MAP 1996", CALIFORNIA DEPARTMENT OF TRANSPORTATION

N

APPROXIMATE SCALE

1 CENTIMETER: 15,750 METERS
(1 INCH: 40 KILOMETERS)

NOTE: This figure may contain areas of color. BVNA cannot be responsible for any subsequent misinterpretation of the information resulting from black and white reproductions of this figure.

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BUREAU VERITAS NORTH AMERICA, INC.
Testing Engineers San Diego
7895 Convoy Court, Suite 18
San Diego, CA 92111

Title: **California Seismic Hazard Map, Caltrans 1996**

Project:	BUSINESS ACCESS UNDERCROSSING		
Drawn:	MPP	Contract No:	38008-017046.00 (SANDAG T.O. 46)
Date:	April, 2008	Figure No:	6 (Appendix I.6)

APPENDIX I.7

CARROLL CANYON ROAD BRIDGE LOTBs

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

GROUP SYMBOLS AND NAMES

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

FIELD AND LABORATORY TESTING

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

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

APPARENT DENSITY OF COHESIONLESS SOILS

Description	SPT N_{60} (Blows / 300 mm)
Very loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE

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

PERCENT OR PROPORTION OF SOILS

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

PARTICLE SIZE

Description		Size
Boulder		> 300 mm
Cobble		76 mm to 300 mm
Gravel	Coarse	19 mm to 76 mm
	Fine	No. 4 to 19 mm
Sand	Coarse	No. 10 to No. 4
	Medium	No. 40 to No. 10
	Fine	No. 200 to No. 40

SOIL LEGEND

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401	

CARROLL CANYON ROAD BRIDGE

LOG OF TEST BORINGS SHEET NO. 1 OF 22

OGS CIVIL LOG OF TEST BORINGS SHEET

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: 10/14/08, 3/9/09

SHEET OF

FILE => 57-c0786-z-lotb01.dgn

USERNAME => mpcronjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:06:55 PM

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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7895 CONVOY CT.
SAN DIEGO, CA. 92111

CEMENTATION

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

BOREHOLE IDENTIFICATION

Symbol	Hole Type	Description
Size	A	Auger Boring
Size	R P	Rotary drilled boring Rotary percussion boring (air)
Size	R	Rotary drilled diamond core
Size	HD HA	Hand driven (25 mm soil tube) Hand Auger
●	D	Dynamic Cone Penetration Boring
▲	CPT	Cone Penetration Test (ASTM D 5778-95)
[ ]	O	Other

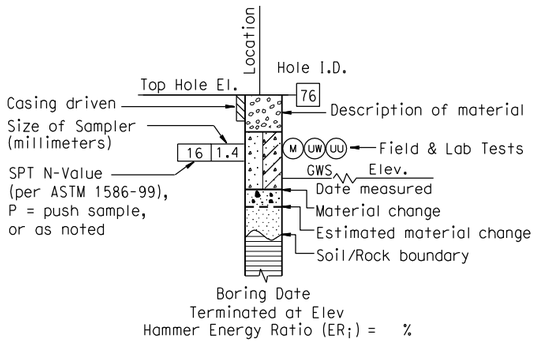
Note: Size in millimeters.

CONSISTENCY OF COHESIVE SOILS

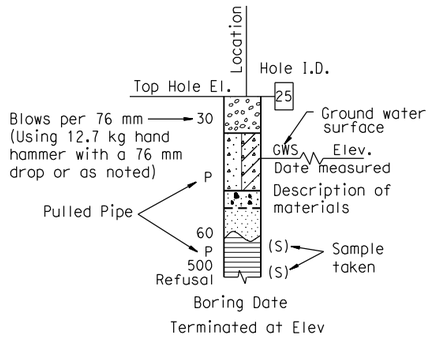
Description	Unconfined Compressive Strength (tsm)	Pocket Penetrometer Measurement (tsm)	Torvane Measurement (tsm)	Field Approximation
Very Soft	< 24	< 24	< 12	Easily penetrated several inches by fist
Soft	24 to 48	24 to 48	12 to 24	Easily penetrated several inches by thumb
Medium Stiff	48 to 96	48 to 96	24 to 48	Penetrated several inches by thumb with moderate effort
Stiff	96 to 192	96 to 192	48 to 96	Readily indented by thumb but penetrated only with great effort
Very Stiff	192 to 383	192 to 383	96 to 192	Readily indented by thumbnail
Hard	> 383	> 383	> 192	Indented by thumbnail with difficulty

PLASTICITY OF FINE-GRAINED SOILS

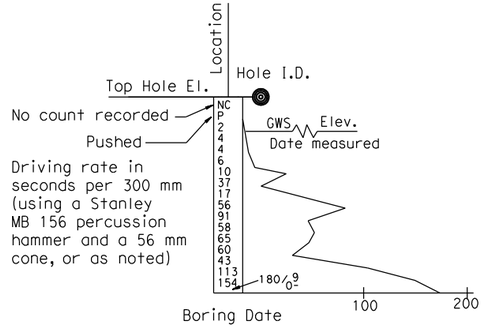
Description	Criteria
Nonplastic	A 3 mm thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.



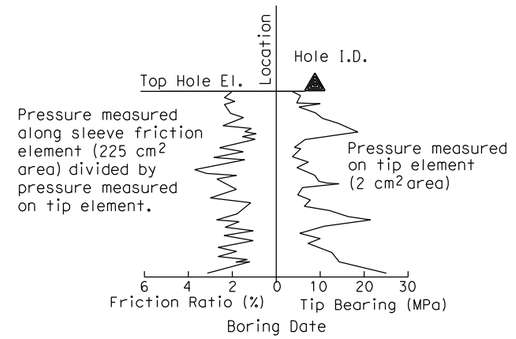
ROTARY BORING



HAND BORING



DYNAMIC CONE PENETRATION BORING



CONE PENETRATION TEST (CPT) SOUNDING

SOIL LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 2 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES		SHEET	OF
10/14/08	3/9/09		

FILE => 57-c0786-z-lotb02.dgn

USERNAME => mparcinjape DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:07:03 PM

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

Caltrans Metric

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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BUREAU VERITAS NORTH AMERICA, INC.
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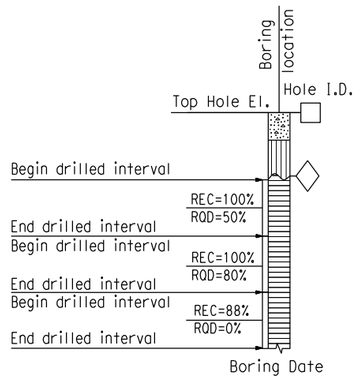
SAN DIEGO, CA. 92111

PERCENT CORE RECOVERY (REC) & ROCK QUALITY DESIGNATION (RQD)

$$REC = \frac{\sum \text{Length of the recovered core pieces}}{\text{Total length of core run}} \times 100\%$$

$$RQD = \frac{\sum \text{Length of intact core pieces} \geq 100\ mm}{\text{Total length of core run}} \times 100\%$$



RELATIVE STRENGTH OF INTACT ROCK

Term	Uniaxial Compressive Strength (MPa)
Extremely Strong	> 207
Very Strong	100 - 207
Strong	49 - 100
Medium Strong	25 - 49
Weak	5 - 25
Very Weak	1 - 5
Extremely Weak	< 1

BEDDING SPACING

Description	Thickness / Spacing
Massive	Greater than 3 m
Very thickly bedded	1 m to 3 m
Thickly bedded	300 mm to 1 m
Moderately bedded	100 mm to 300 mm
Thinly bedded	30 mm to 100 mm
Very thinly bedded	10 mm to 30 mm
Laminated	Less than 10 mm

LEGEND OF ROCK MATERIALS

- IGNEOUS ROCK
- SEDIMENTARY ROCK
- METAMORPHIC ROCK

ROCK HARDNESS

Description	Criteria
Extremely Hard	Specimen cannot be scratched with a pocket knife or sharp pick; can only be chipped with repeated heavy hammer blows.
Very Hard	Specimen cannot be scratched with a pocket knife or sharp pick. Breaks with repeated heavy hammer blows.
Hard	Specimen can be scratched with a pocket knife or sharp pick with difficulty (heavy pressure). Heavy hammer blows required to break specimen.
Moderately Hard	Specimen can be scratched with pocket knife or sharp pick with light or moderate pressure. Core breaks with moderate hammer pressure.
Moderately Soft	Specimen can be grooved 5 mm deep with a pocket knife or sharp pick with moderate or heavy pressure. Breaks with light hammer blow or heavy manual pressure.
Soft	Specimen can be grooved or gouged easily by a pocket knife or sharp pick with light pressure, can be scratched with fingernail. Breaks with light to moderate manual pressure.
Very Soft	Specimen can be readily indented, grooved or gouged with fingernail, or carved with a pocket knife. Breaks with light manual pressure.

FRACTURE DENSITY

Description	Observed Fracture Density
Unfractured	No fractures.
Very slightly fractured	Lengths greater than 1 m.
Slightly fractured	Lengths from 300 mm to 1000 mm with few lengths less than 300 mm or greater than 1000 mm.
Moderately fractured	Lengths mostly in 100 mm to 300 mm range with most lengths about 200 mm.
Intensely fractured	Lengths average from 30 mm to 100 mm with scattered fragmented intervals with lengths less than 100 mm.
Very intensely fractured	Mostly chips and fragments with a few scattered short core lengths.

Combination descriptors (such as "Very intensely to intensely fractured") are used where equal distribution of both fracture density characteristics is present over a significant interval or exposure, or where characteristics are "in between" the descriptor definitions. Only two adjacent descriptors may be combined.

WEATHERING DESCRIPTORS FOR INTACT ROCK

Description	Diagnostic features: Chemical Weathering-Discoloration and/or oxidation — Body of Rock	Diagnostic features: Chemical Weathering-Discoloration and/or oxidation — Fracture Surfaces	Diagnostic features: Mechanical Weathering-Grain boundary conditions (disaggregation) primarily for granitics and some coarse-grained sediments	Diagnostic features: Texture and Solutioning — Texture	Diagnostic features: Texture and Solutioning — Solutioning	General Characteristics
Fresh	No discoloration, not oxidized.	No discoloration or oxidation.	No separation, intact (tight).	No change.	No solutioning.	Hammer rings when crystalline rocks are struck.
Slightly Weathered	Discoloration or oxidation is limited to surface of, or short distance from, fractures; some feldspar crystals are dull.	Minor to complete discoloration or oxidation of most surfaces.	No visible separation, intact (tight).	Preserved.	Minor leaching of some soluble minerals may be noted.	Hammer rings when crystalline rocks are struck. Body of rock not weakened.
Moderately Weathered	Discoloration or oxidation extends from fractures usually throughout; Fe-Mg minerals are "rusty," feldspar crystals are "cloudy."	All fracture surfaces are discolored or oxidized.	Partial separation of boundaries visible.	Generally preserved.	Soluble minerals may be mostly leached.	Hammer does not ring when rock is struck. Body of rock is slightly weakened.
Intensely Weathered	Discoloration or oxidation throughout; all feldspars and Fe-Mg minerals are altered to clay to some extent; or chemical alteration produces in-situ disaggregation, see grain boundary conditions.	All fracture surfaces are discolored or oxidized, surfaces friable.	Partial separation, rock is friable; in semiarid conditions granitics are disaggregated.	Texture altered by chemical disintegration (hydration, argillation).	Leaching of soluble minerals may be complete.	Dull sound when struck with hammer, usually can be broken with moderate to heavy manual pressure or by light hammer blow without reference to planes of weakness such as incipient or hairline fractures, or veinlets. Rock is significantly weakened.
Decomposed	Discolored or oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe-Mg minerals are completely altered to clay.		Complete separation of grain boundaries (disaggregated).	Resembles a soil, partial or complete remnant rock structure may be preserved; leaching of soluble minerals usually complete.		Can be granulated by hand. Resistant minerals such as quartz may be present as "stringers" or "dikes."

Combination descriptors (such as "slightly weathered to fresh") are permissible where equal distribution of both weathering characteristics is present over significant intervals or where characteristics present are "in between" the diagnostic feature. However, combination descriptors should not be used where significant, identifiable zones can be delineated. Only two adjacent descriptors may be combined. "Very intensely weathered" is the combination descriptor for "intensely weathered to decomposed."

ROCK LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 3 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES: 10/14/08 | 3/9/09 | SHEET | OF

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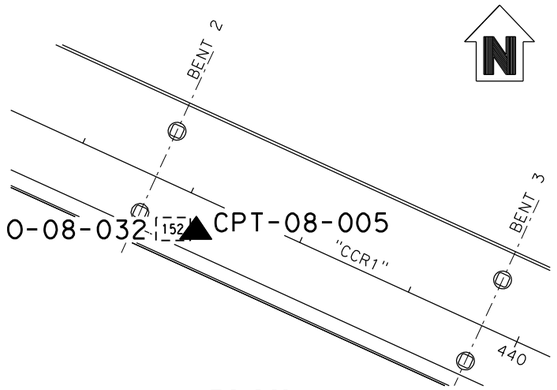
Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



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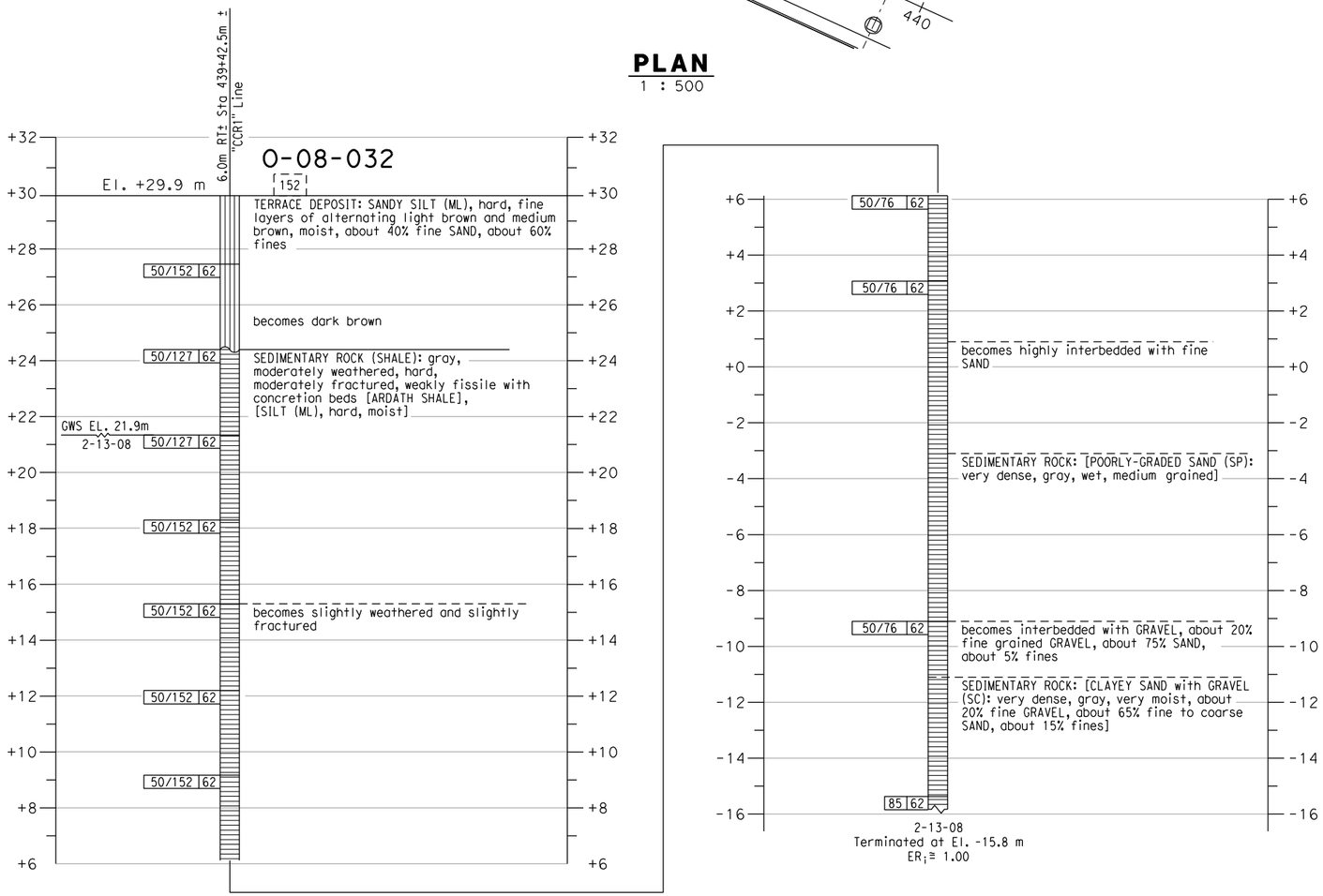

PROFILE
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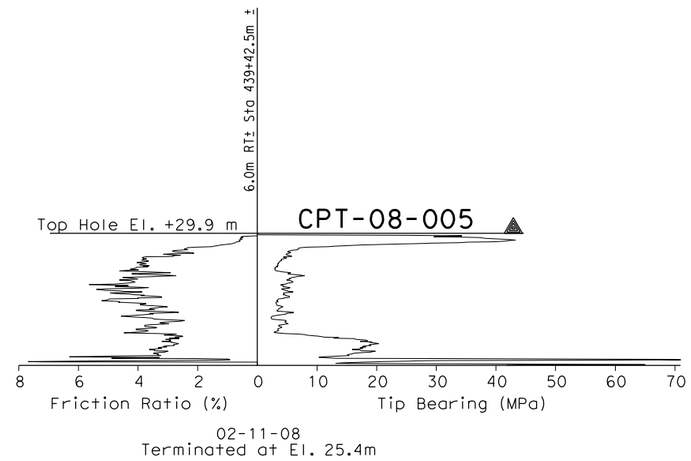
HORIZONTAL 1 : 500



CONE PENETRATION TEST (CPT) SOUNDING

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.
2. Automatic trip and safety hammer systems consisting of hammer weight of 62.5 kg falling a distance of 762 mm were used to advance the drive samplers in accordance with ASTM D1586.
3. The average hammer energy ratio (ER$_i$) reflects the percentage efficiency of SPT blowcounts (N-value). The estimated ER$_i$ for the various drilling equipment used was as follows:
   Boart Longyear:
   Longyear 1405: ER$_i$≅1.45
   Prosonic Track Mounted: ER$_i$≅1.00
   Prosonic 1: ER$_i$≅1.45
   Minisonic: ER$_i$≅1.00
   Test America:
   CME 95: ER$_i$≅1.45
   Pacific Drilling:
   Unimog: ER$_i$≅1.27
   Mole: ER$_i$≅1.00
   Minimole: ER$_i$≅1.00
4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (RQD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES		GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN G. CUSTENBORDER			DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 4 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER						

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES: 10/14/08 3/9/09

SHEET OF

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Bench Mark
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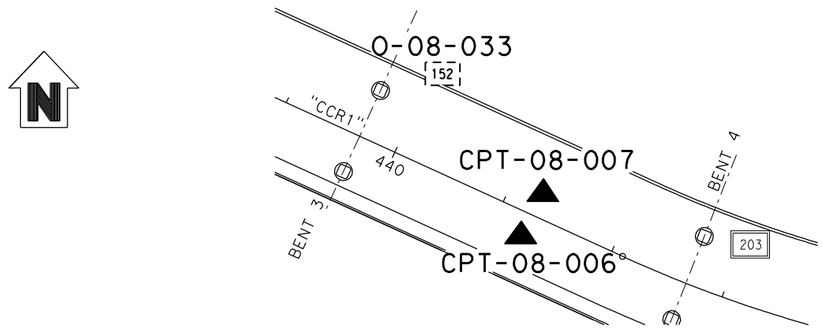

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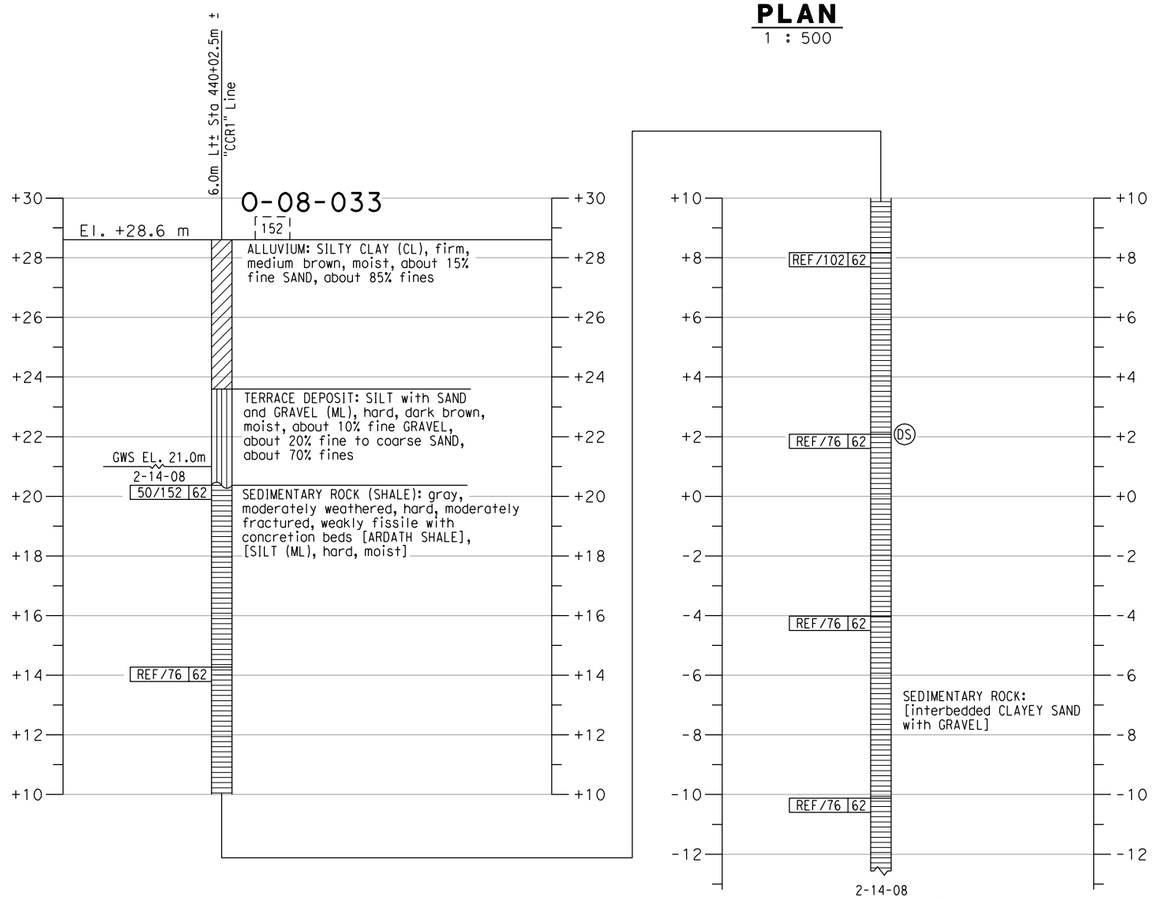

2-14-08
Terminated at El. -12.6 m
$ER_i \cong 1.00$

PROFILE
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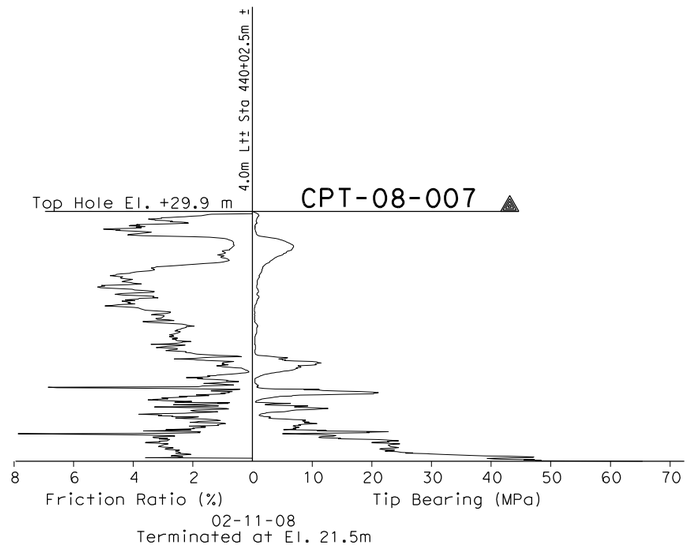
HORIZONTAL 1 : 500



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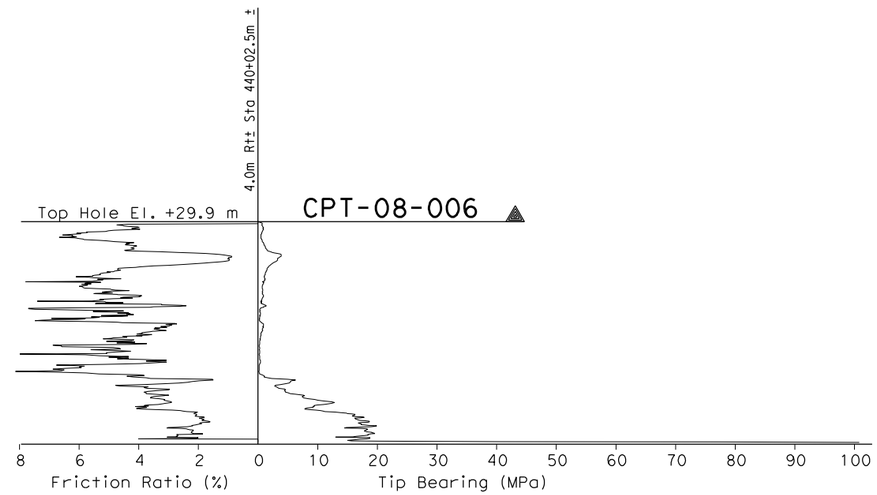

02-11-08
Terminated at El. 22.5m

CONE PENETRATION TEST (CPT) SOUNDINGS

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

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FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER	DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 5 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER		CU 11275 EA 2T0401	DISREGARD PRINTS BEARING EARLIER REVISION DATES →	REVISION DATES: 10/14/08, 3/9/09

OGS CIVIL LOG OF TEST BORINGS SHEET

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

SHEET OF

USERNAME => mparanjape DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:07:26 PM

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Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

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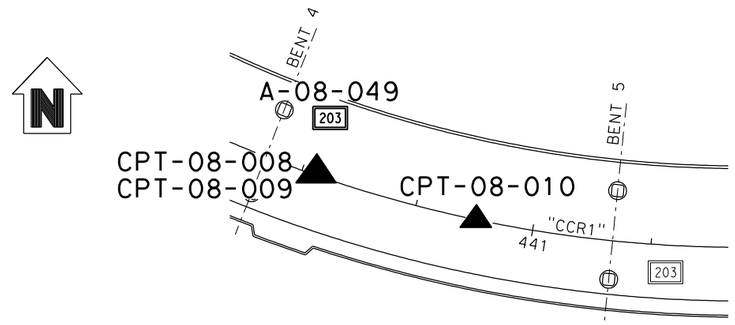

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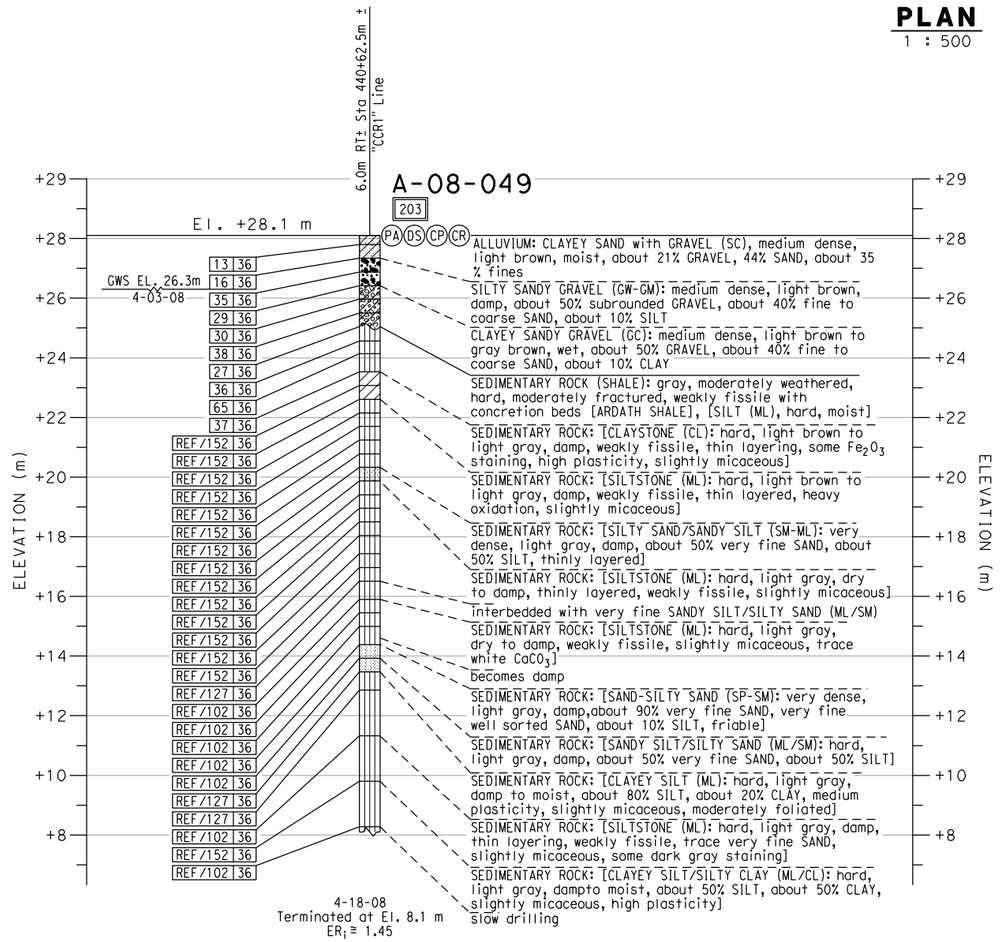

PROFILE
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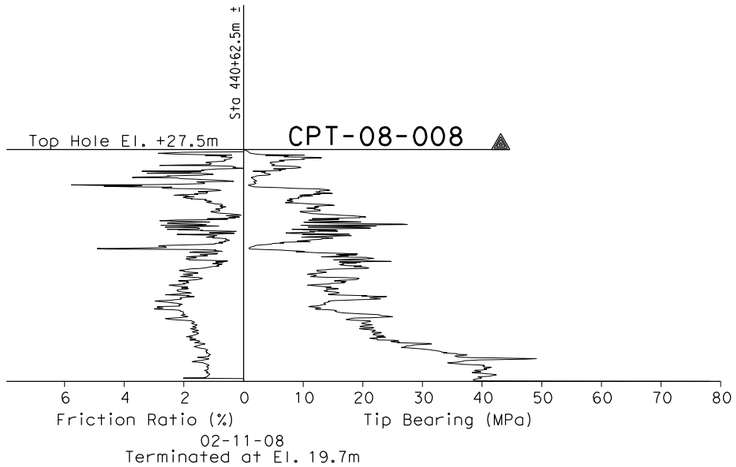

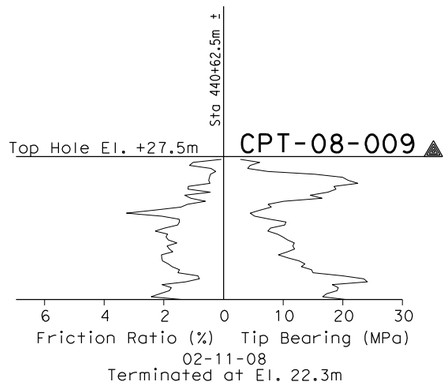

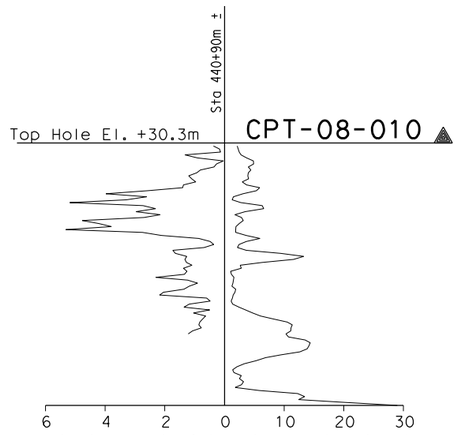

CONE PENETRATION TEST (CPT) SOUNDINGS

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ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 6 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER			

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES

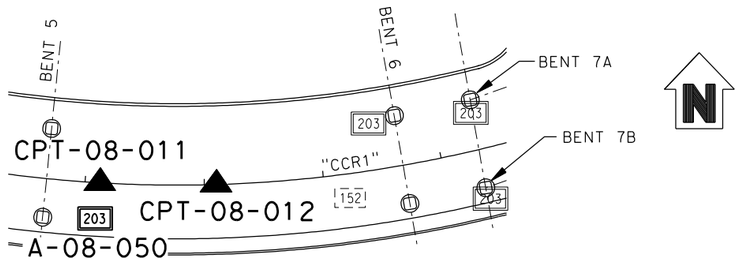
REVISION DATES: 10/14/08, 3/9/09

SHEET OF

FILE => 57-c0786-z-lotb06.dgn

USERNAME => mparanjape DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:07:33 PM

Bench Mark
All elevations shown in the LOTBs are in meters
and are referenced to the NGVD 1929 Datum.



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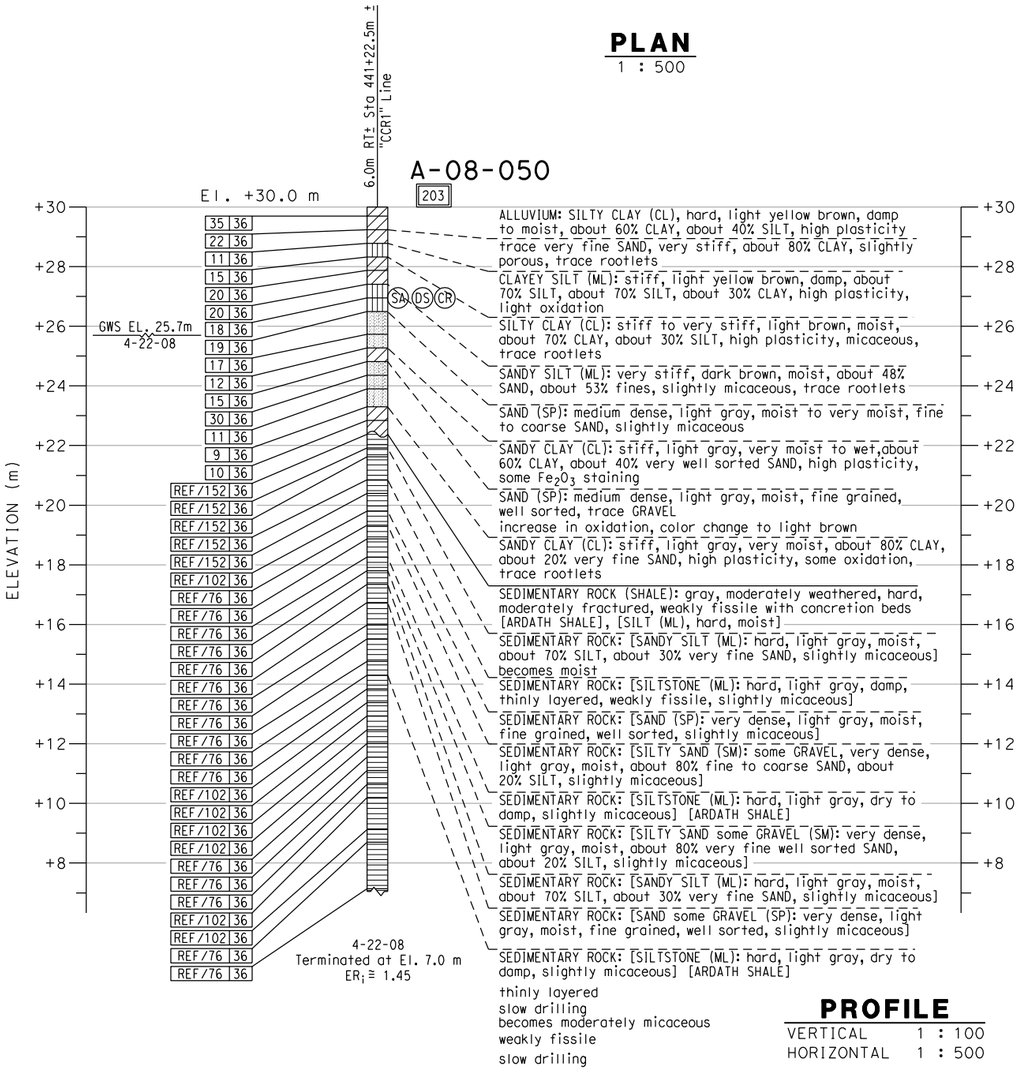

PROFILE
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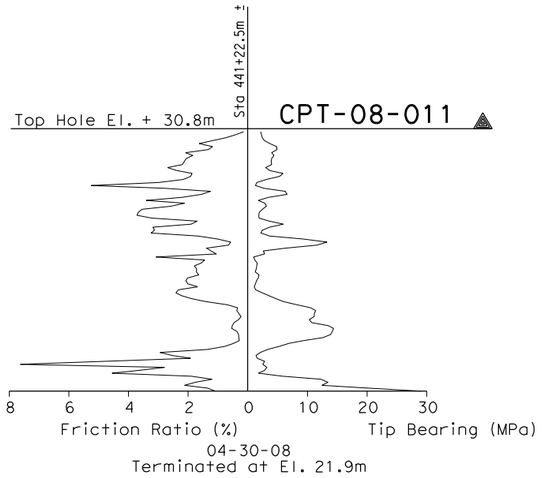
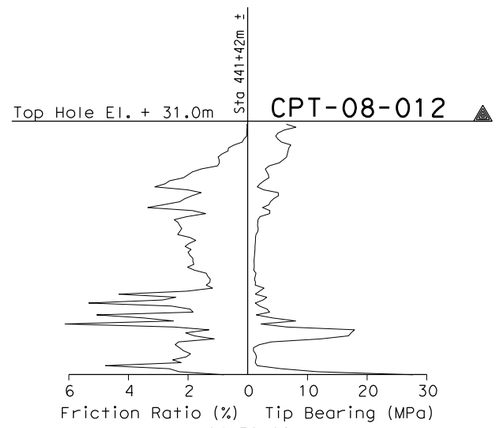
HORIZONTAL 1 : 500



CONE PENETRATION TEST (CPT) SOUNDING



CONE PENETRATION TEST (CPT) SOUNDING

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
VAN OLIN
NO. 2578
EXP. 6-30-10
GEOTECHNICAL
STATE OF CALIFORNIA

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SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.

2. Automatic trip and safety hammer systems consisting of hammer weight of 62.5 kg falling a distance of 762 mm were used to advance the drive samplers in accordance with ASTM D1586.

3. The average hammer energy ratio (ER_i) reflects the percentage efficiency of SPT blowcounts (N-value). The estimated ER_i for the various drilling equipment used was as follows:
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   Longyear 1405: $ER_i \cong 1.45$
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   Prosonic 1: $ER_i \cong 1.45$
   Minisonic: $ER_i \cong 1.00$
   Test America:
   CME 95: $ER_i \cong 1.45$
   Pacific Drilling:
   Unimog: $ER_i \cong 1.27$
   Mole: $ER_i \cong 1.00$
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ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 7 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES: 10/14/08, 3/9/09

SHEET OF

FILE => 57-c0786-z-lotb07.dgn

USERNAME => mpcronjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:07:42 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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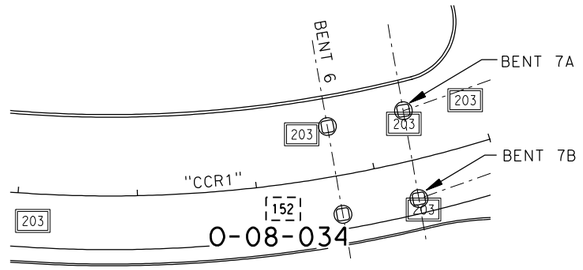
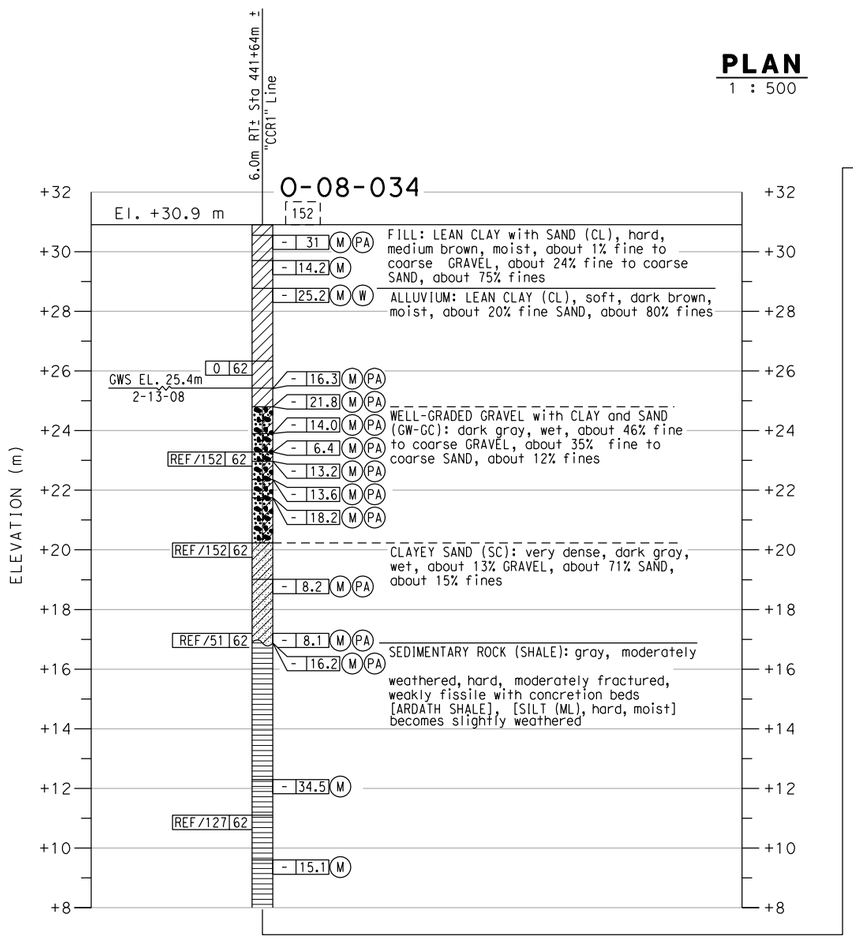
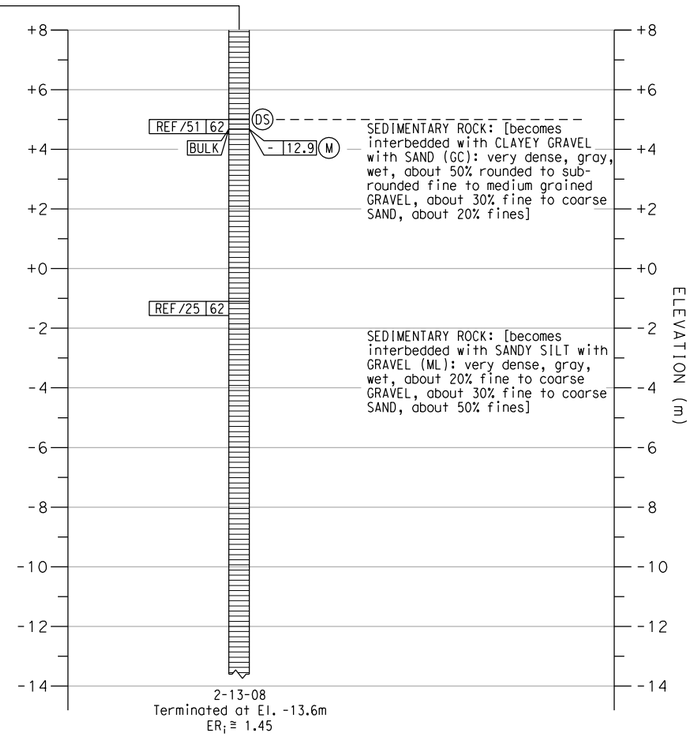
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111



PLAN
1 : 500





PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

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   Pacific Drilling:
   Unimog: $ER_i \cong 1.27$
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ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	DEPARTMENT OF TRANSPORTATION	DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 8 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER	CU 11275 EA 2T0401	DISREGARD PRINTS BEARING EARLIER REVISION DATES →	REVISION DATES: 10/14/08, 3/9/09

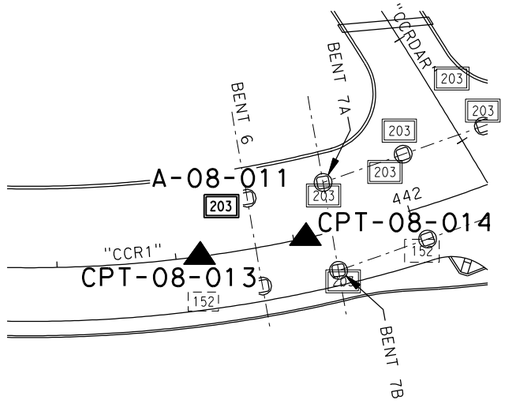
OGS CIVIL LOG OF TEST BORINGS SHEET

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

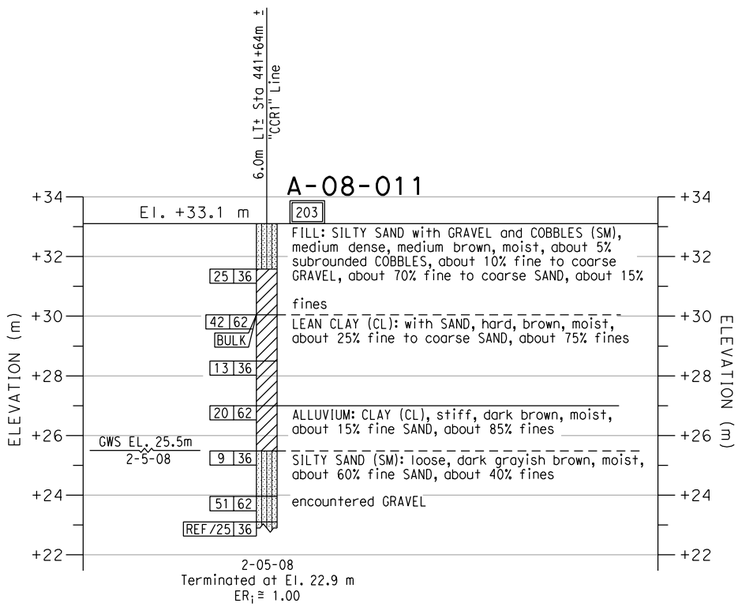
FILE => 57-c0786-z-1otb08.dgn

USERNAME => mporonjape DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:07:51 PM

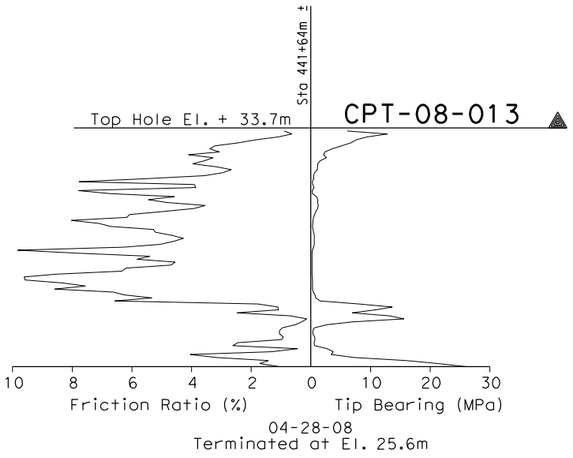
Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



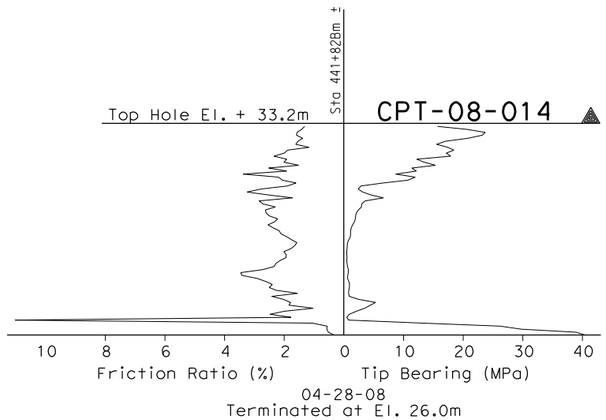
PLAN
1 : 500



PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500



CONE PENETRATION TEST (CPT) SOUNDING



CONE PENETRATION TEST (CPT) SOUNDING

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

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ENGINEERING SERVICES		GEOTECHNICAL SERVICES			
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY:	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786
NAME:	CHECKED BY: G. CUSTENBORDER	V. OLIN G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8

CARROLL CANYON ROAD BRIDGE

LOG OF TEST BORINGS SHEET NO. 9 OF 22

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES: 10/14/08, 3/9/09

SHEET OF

FILE => 57-c0786-z-lotb09.dgn

USERNAME => mporcinjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:07:59 PM

Bench Mark
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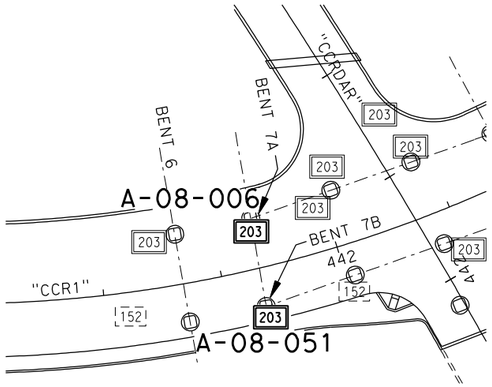

PLAN
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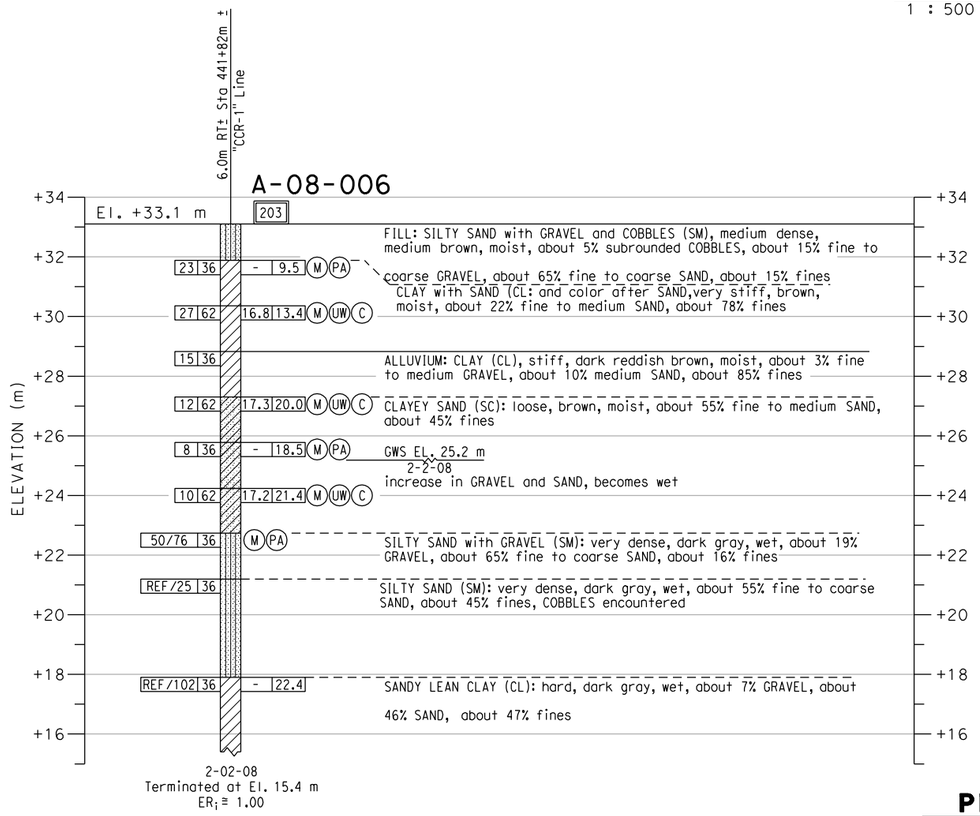

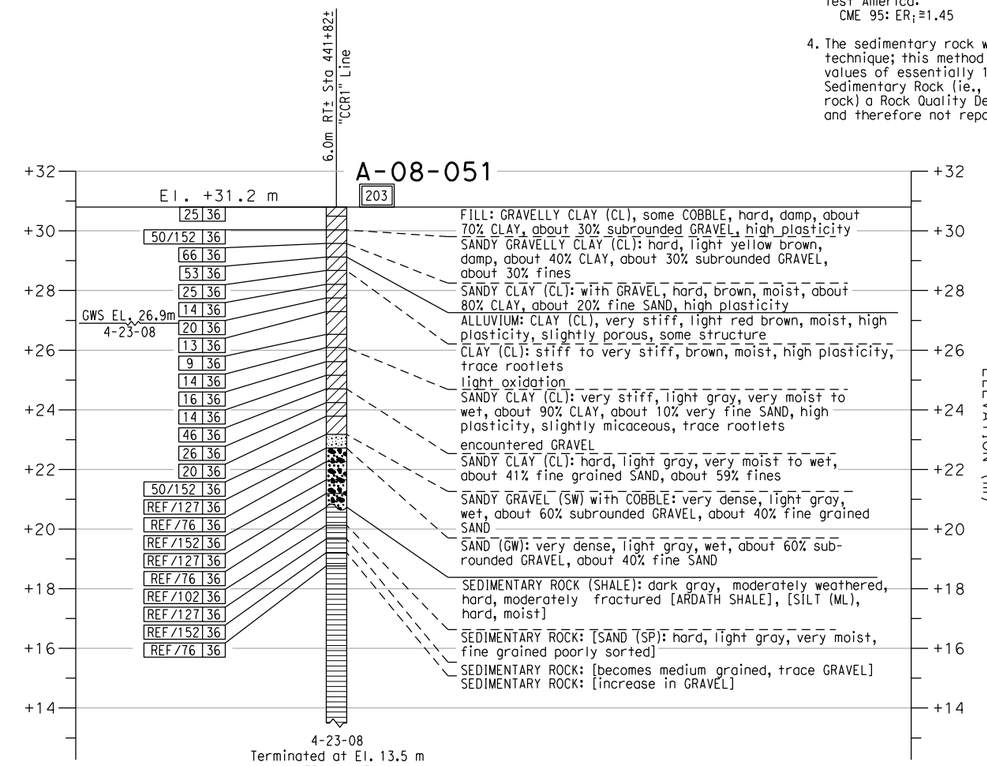

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

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ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 10 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER			

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES										SHEET	OF
10/14/08	3/9/09										

FILE => 57-c0786-z-lotb10.dgn

USERNAME => mporonjae DATE PLOTTED => 3/10/2009 TIME PLOTTED => 11:08:07 PM

Bench Mark
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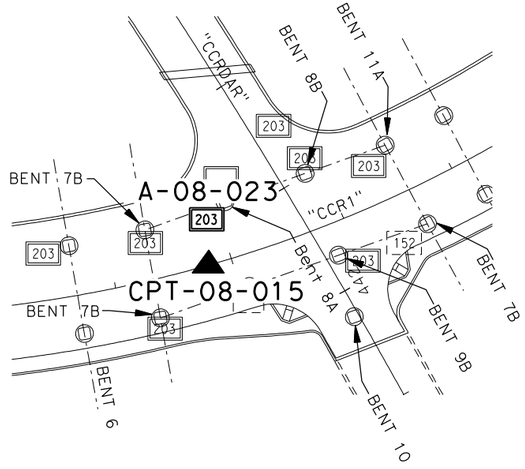

PLAN
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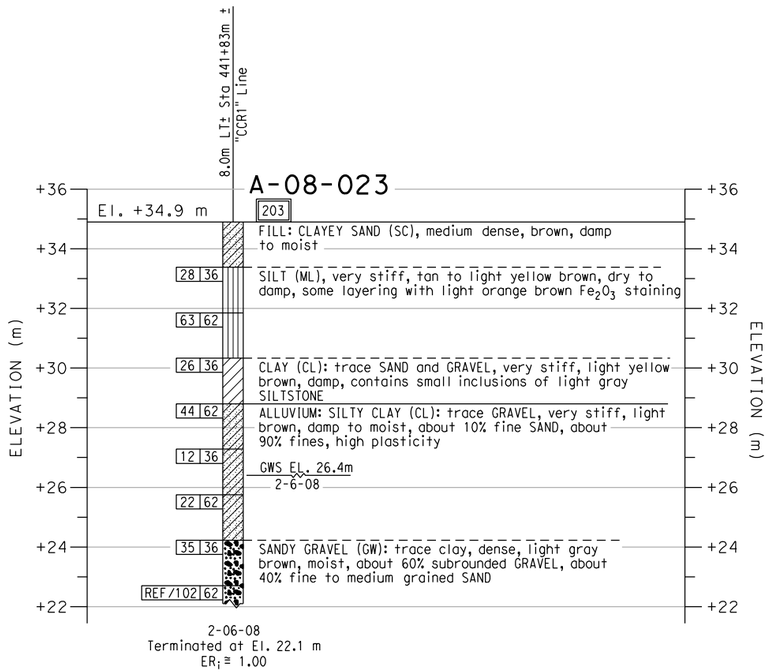
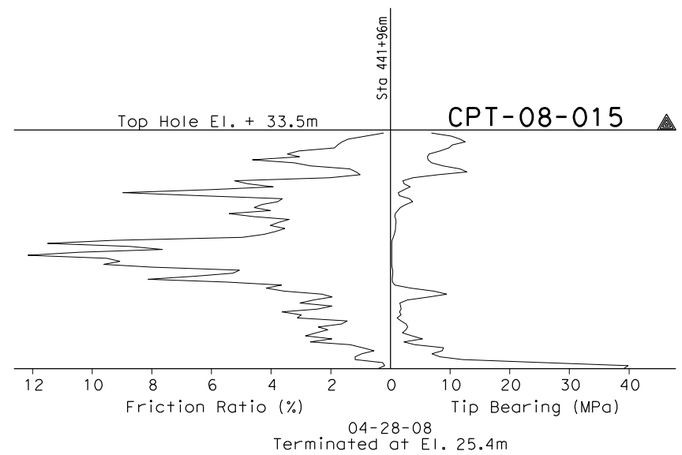


PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500



CONE PENETRATION TEST (CPT) SOUNDING

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

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ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 11 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

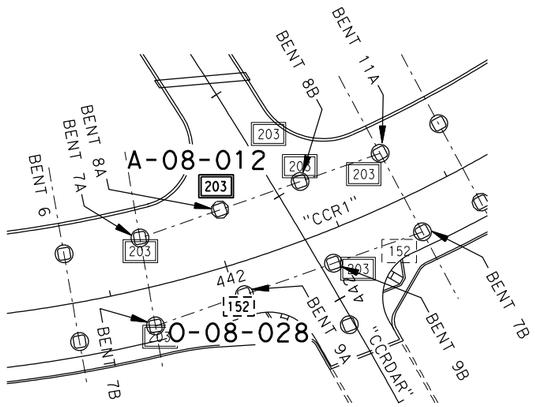
REVISION DATES: 10/14/08 3/9/09

SHEET OF

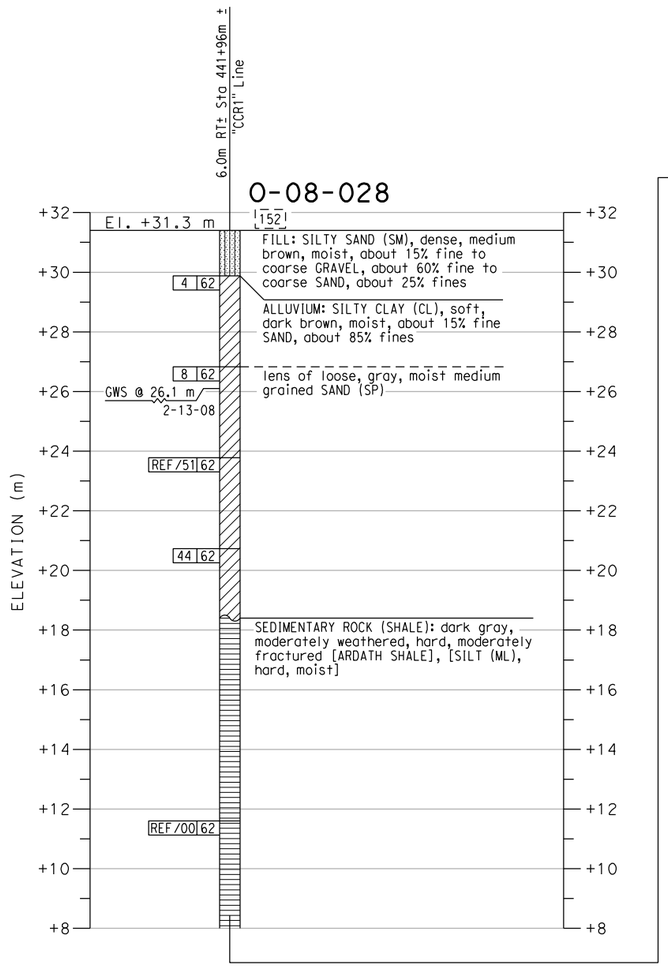
FILE => 57-c0786-z-lotb11.dgn

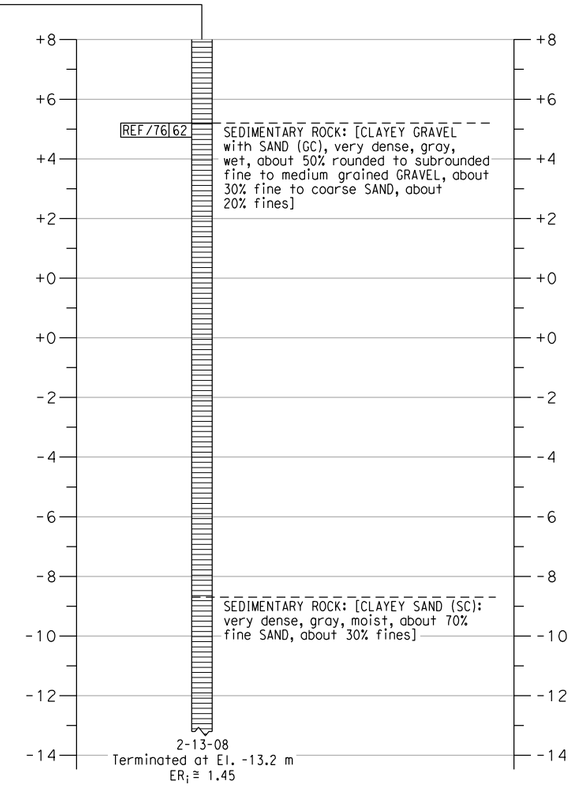
USERNAME => mparcinjape DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:08:15 PM

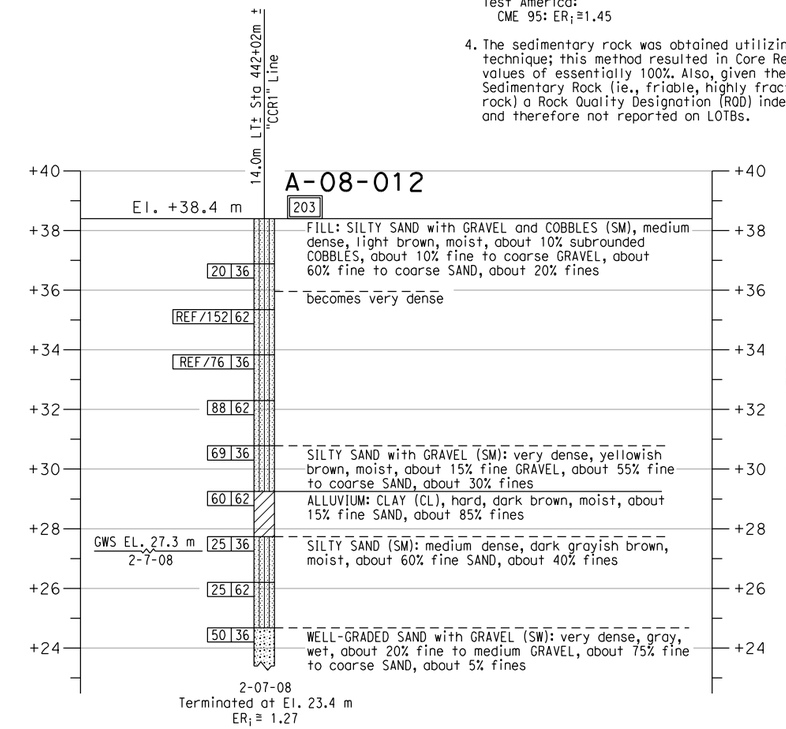
Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
1 : 500







PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

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ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 12 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER			

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES: 10/14/08, 3/9/09

SHEET OF

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USERNAME => mparonjpe DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:08:22 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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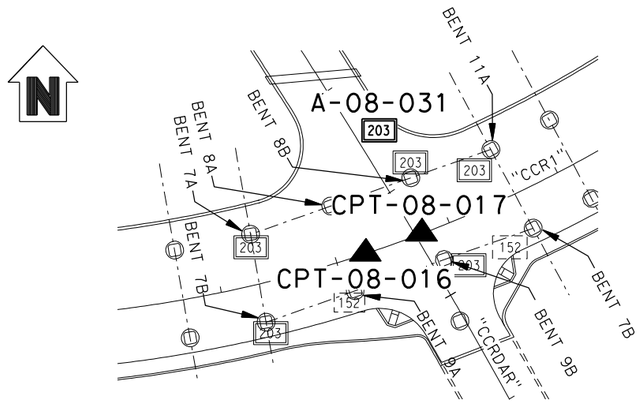
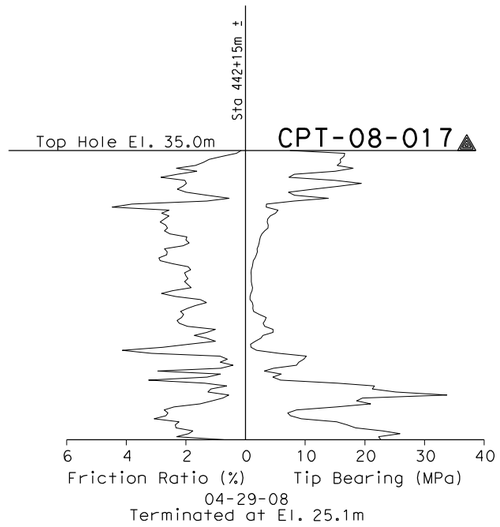
SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

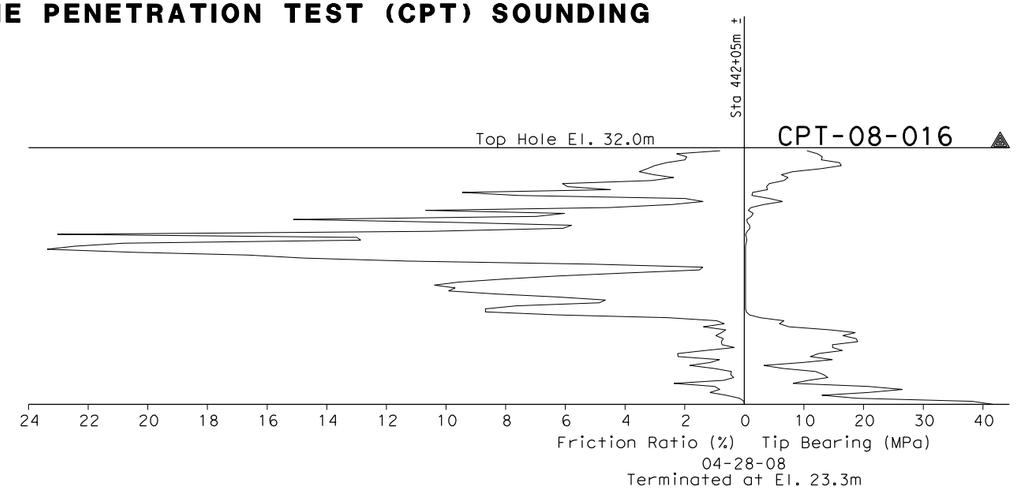
BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111



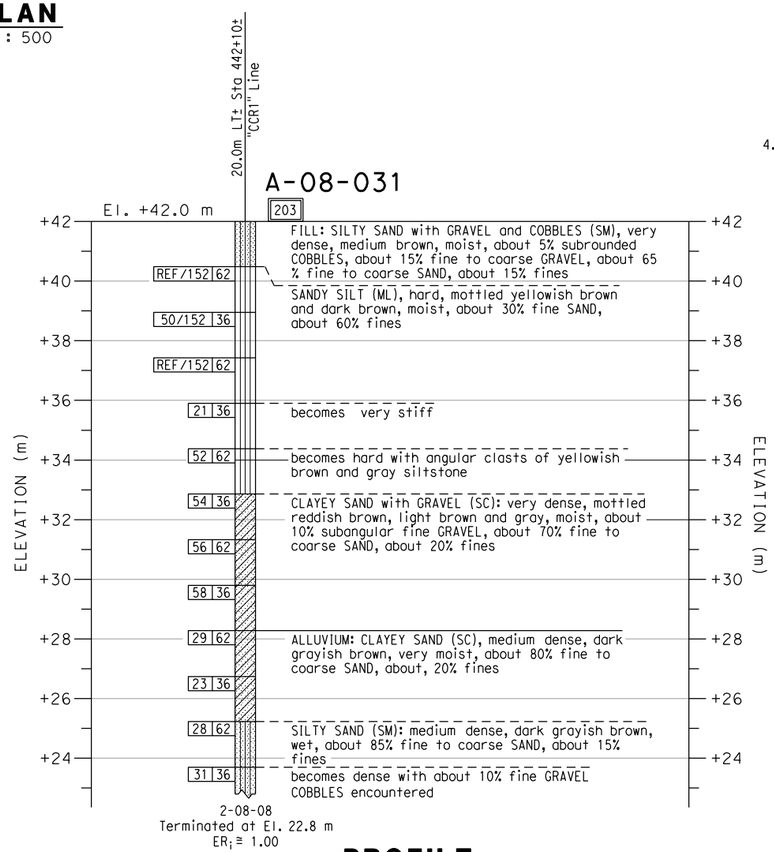
PLAN
1 : 500



CONE PENETRATION TEST (CPT) SOUNDING



CONE PENETRATION TEST (CPT) SOUNDING



PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.

2. Automatic trip and safety hammer systems consisting of hammer weight of 62.5 kg falling a distance of 762 mm were used to advance the drive samplers in accordance with ASTM D1586.

3. The average hammer energy ratio (ER_i) reflects the percentage efficiency of SPT blowcounts (N-value). The estimated ER_i for the various drilling equipment used was as follows:
   Boart Longyear:
   Longyear 1405: $ER_i \cong 1.45$
   Prosonic Track Mounted: $ER_i \cong 1.00$
   Prosonic 1: $ER_i \cong 1.45$
   Minisonic: $ER_i \cong 1.00$
   Test America:
   CME 95: $ER_i \cong 1.45$
   Pacific Drilling:
   Unimog: $ER_i \cong 1.27$
   Mole: $ER_i \cong 1.00$
   Minimole: $ER_i \cong 1.00$

4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (ROD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 13 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

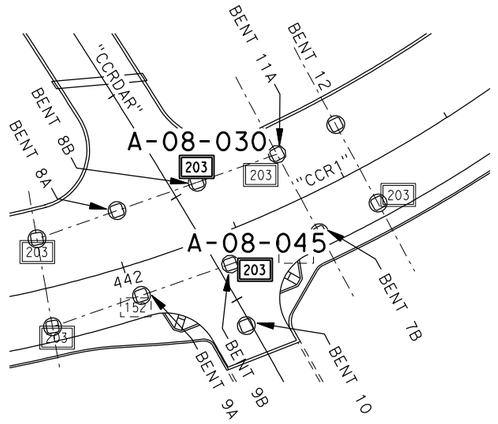
DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES										SHEET	OF
10/14/08	3/9/09										

FILE => 57-c0786-z-lotb13.dgn

USERNAME => mporanjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:08:29 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
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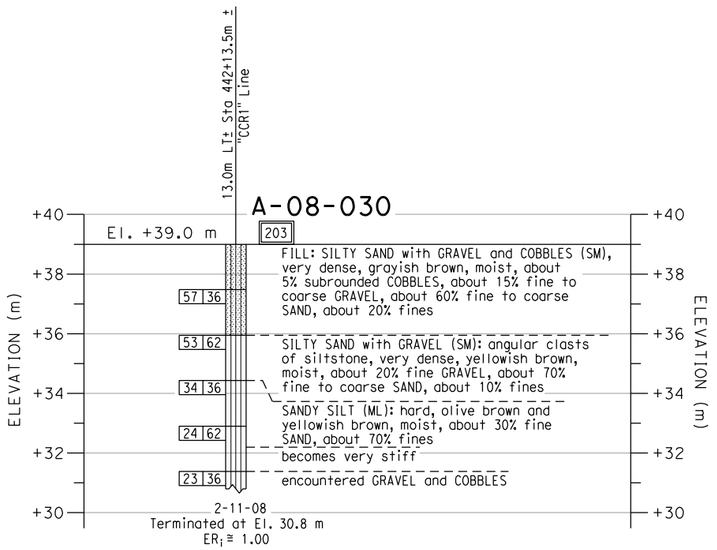

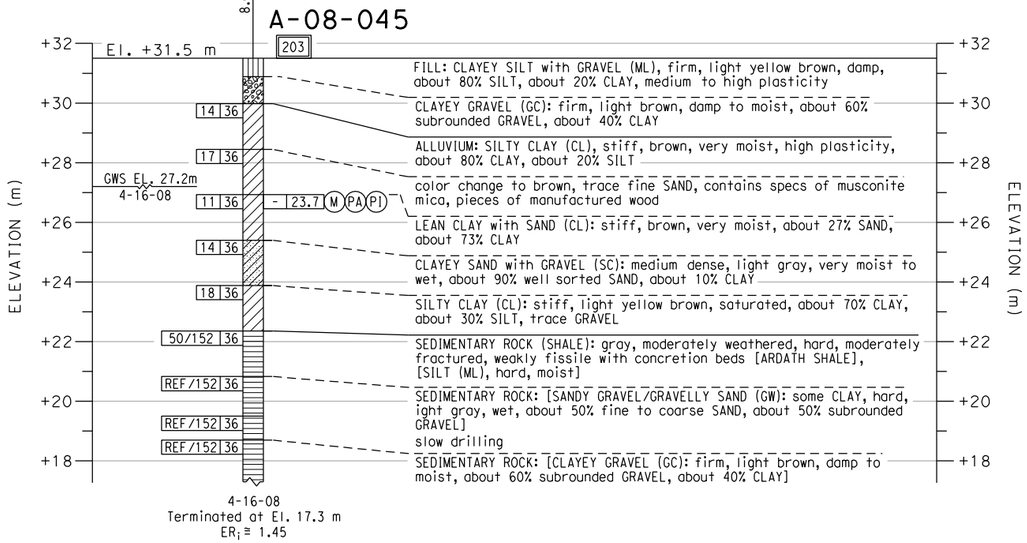

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.
2. Automatic trip and safety hammer systems consisting of hammer weight of 62.5 kg falling a distance of 762 mm were used to advance the drive samplers in accordance with ASTM D1586.
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   Boart Longyear:
   Longyear 1405: $ER_i \cong 1.45$
   Prosonic Track Mounted: $ER_i \cong 1.00$
   Prosonic 1: $ER_i \cong 1.45$
   Minisonic: $ER_i \cong 1.00$
   Pacific Drilling:
   Unimog: $ER_i \cong 1.27$
   Mole: $ER_i \cong 1.00$
   Minimole: $ER_i \cong 1.00$
   Test America:
   CME 95: $ER_i \cong 1.45$
4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (ROD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES		GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN G. CUSTENBORDER			DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 14 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER						

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

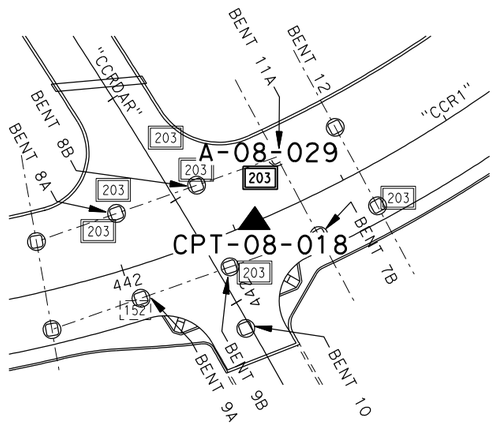
DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES: 10/14/08 | 3/9/09 | SHEET | OF

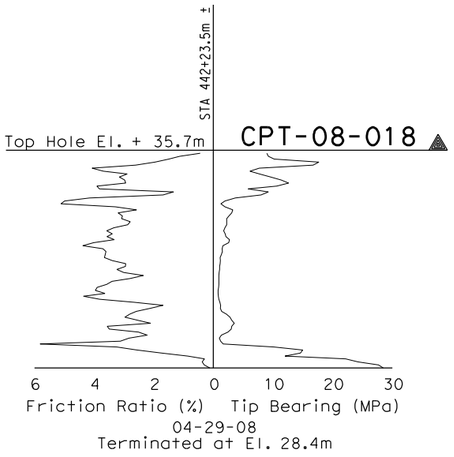
FILE => 57-c0786-z-lotb14.dgn

USERNAME => mporcnjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:08:37 PM

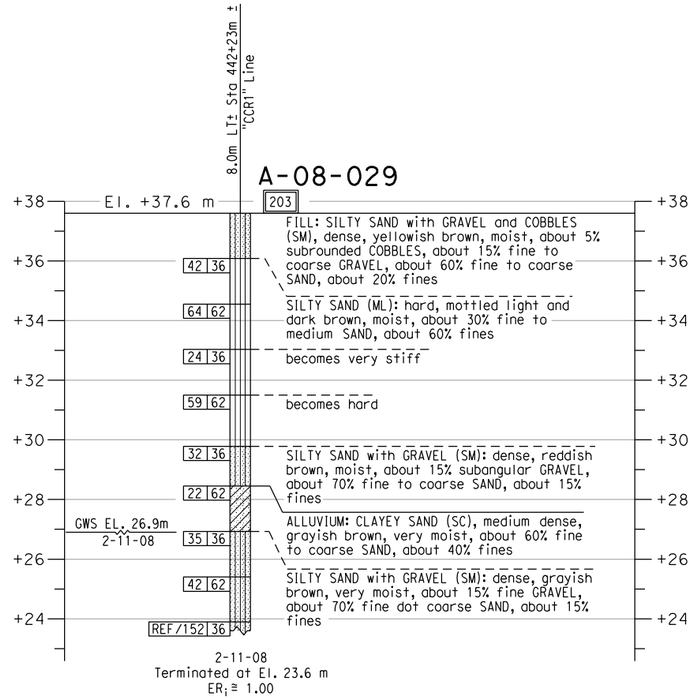
Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
1 : 500



CONE PENETRATION TEST (CPT) SOUNDING



PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

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   - Prosonic Track Mounted: $ER_i \cong 1.00$
   - Prosonic 1: $ER_i \cong 1.45$
   - Minisonic: $ER_i \cong 1.00$

   Pacific Drilling:
   - Unimog: $ER_i \cong 1.27$
   - Mole: $ER_i \cong 1.00$
   - Minimole: $ER_i \cong 1.00$

   Test America:
   - CME 95: $ER_i \cong 1.45$

4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (ROD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES		GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER			DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 15 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER						

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

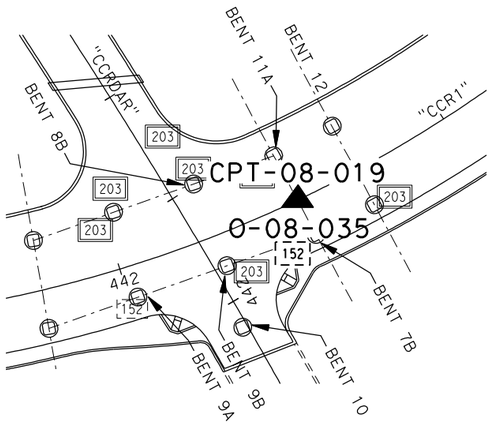
REVISION DATES: 10/14/08, 3/9/09

SHEET OF

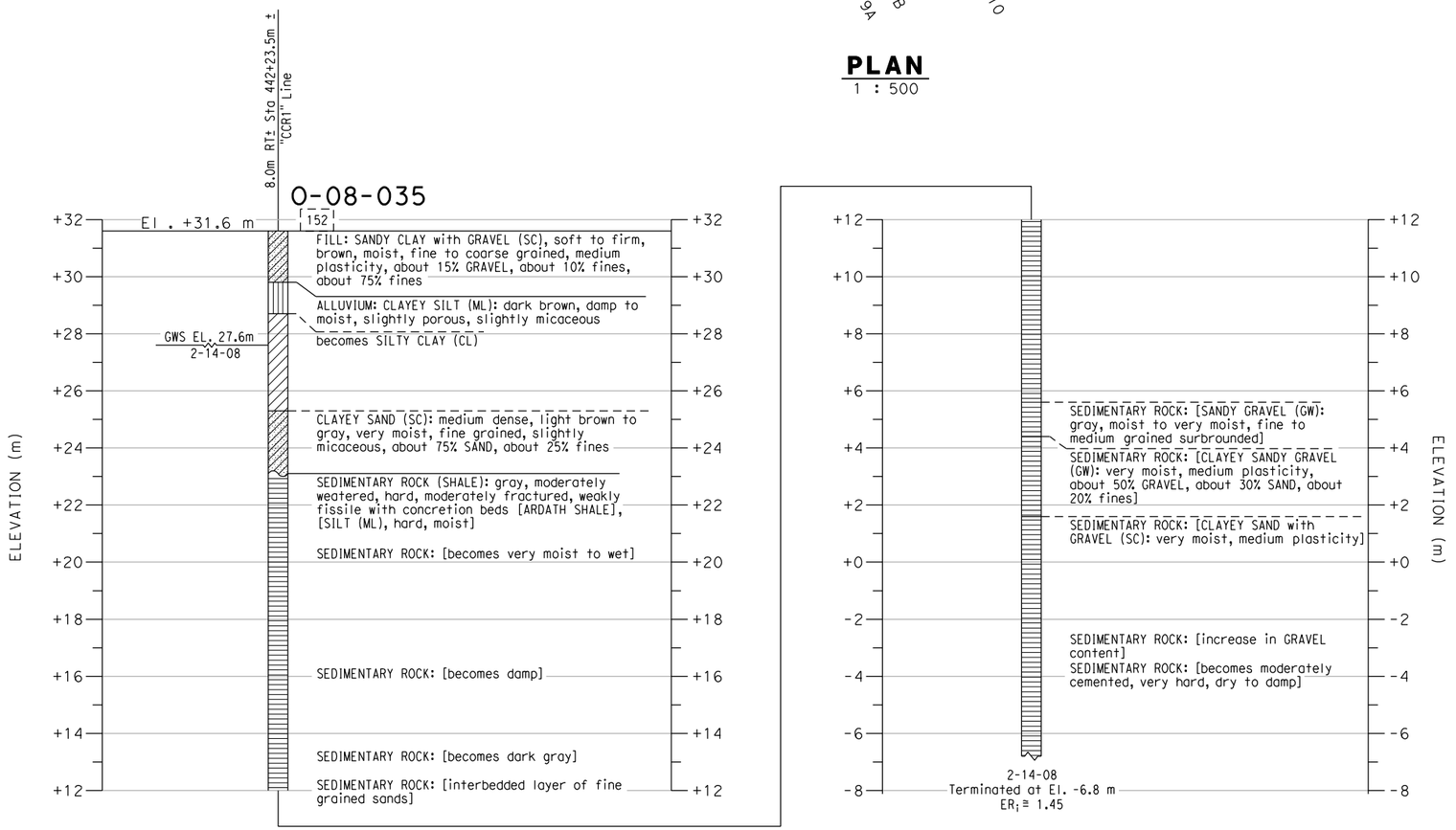
FILE => 57-c0786-z-lotb15.dgn

USERNAME => mporonjape DATE PLOTTED => 3/10/2009 TIME PLOTTED => 11:08:44 PM

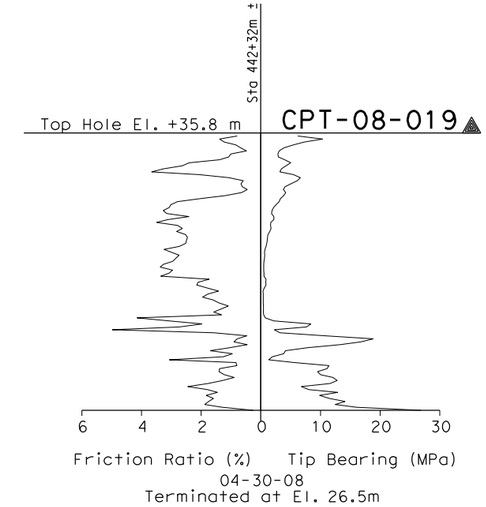
Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
1 : 500



PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500



CONE PENETRATION TEST (CPT) SOUNDING

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

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   Longyear 1405: ER$_i$≅1.45
   Prosonic Track Mounted: ER$_i$≅1.00
   Prosonic 1: ER$_i$≅1.45
   Minisonic: ER$_i$≅1.00
   Pacific Drilling:
   Unimog: ER$_i$≅1.27
   Mole: ER$_i$≅1.00
   Minimole: ER$_i$≅1.00
   Test America:
   CME 95: ER$_i$≅1.45

4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (RQD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 16 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES: 10/14/08, 3/9/09

SHEET OF

FILE => 57-c0786-z-lotb16.dgn

USERNAME => mporcinjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:08:50 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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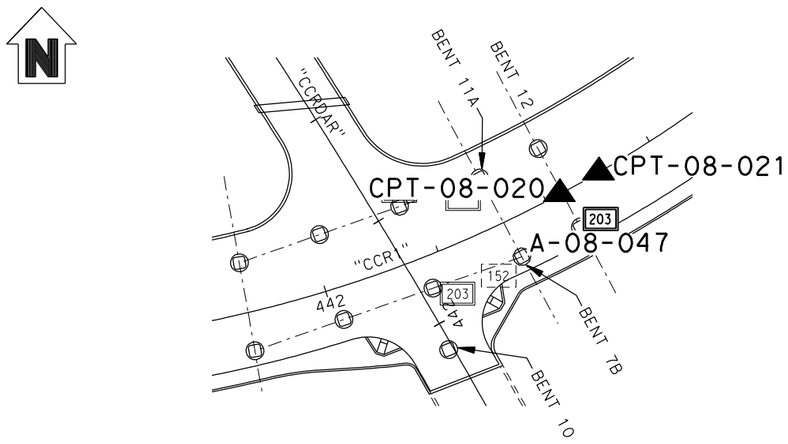
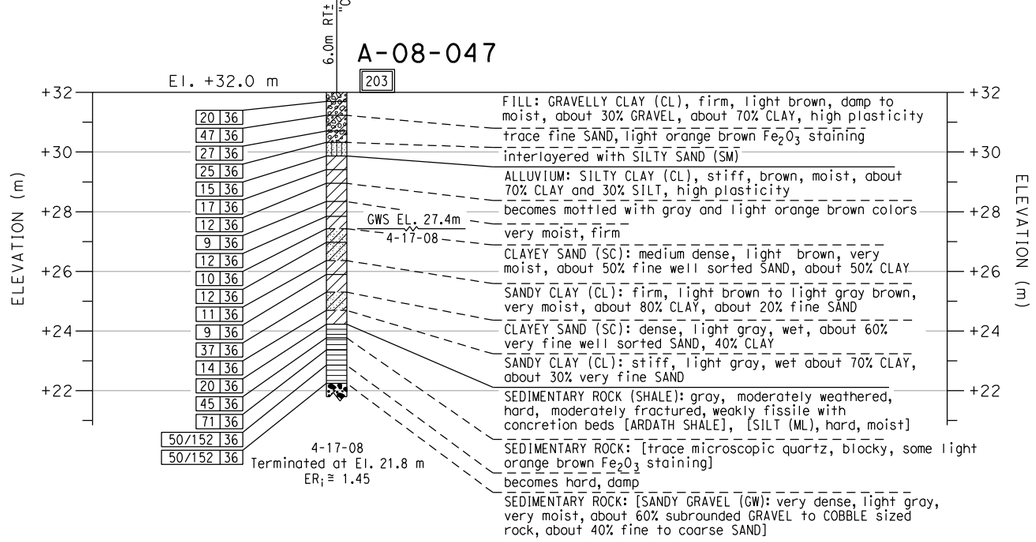
7895 CONVOY CT.
SAN DIEGO, CA. 92111



PLAN
1 : 500



PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

NOTES:
1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.
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   CME 95: $ER_i \cong 1.45$
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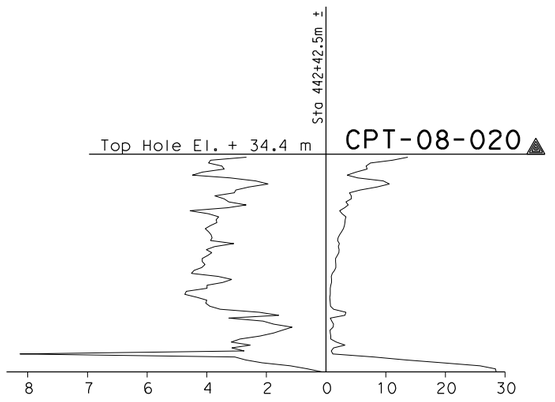
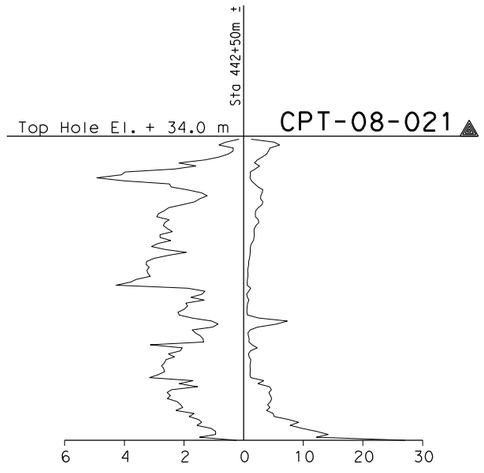




CONE PENETRATION TEST (CPT) SOUNDINGS

ENGINEERING SERVICES		GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER			DESIGN BRANCH	57-C0786	LOG OF TEST BORINGS SHEET NO. 17 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER					POST MILES KP43.2/PM26.8	

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

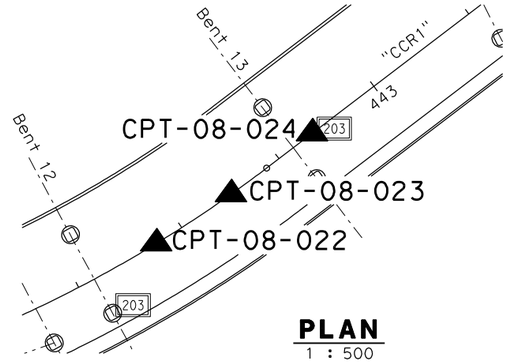
DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES							SHEET	OF
10/14/08	3/9/09							

FILE => 57-c0786-z-lotb17.dgn

USERNAME => mporonjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:08:57 PM

Bench Mark
All elevations shown in the LOTBs are in meters
and are referenced to the NGVD 1929 Datum.



PLAN
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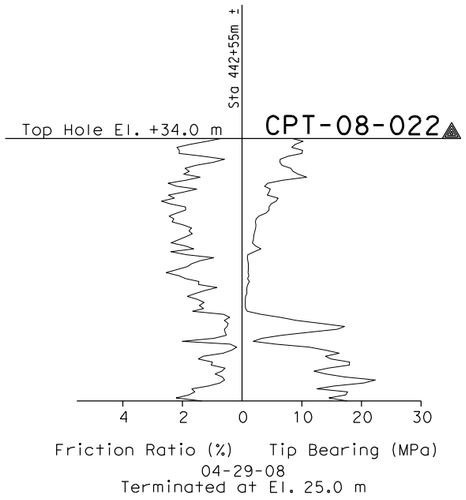

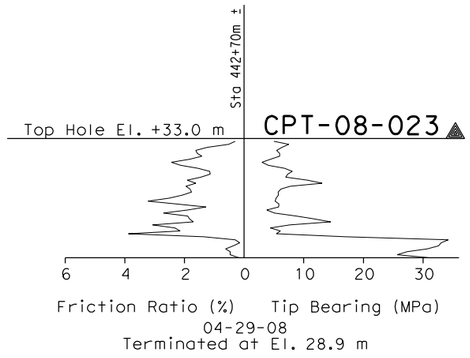

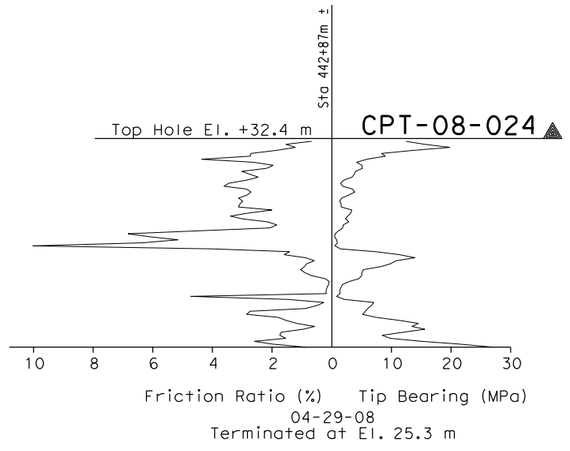

CONE PENETRATION TEST (CPT) SOUNDINGS

PROFILE

VERTICAL : AS SHOWN
HORIZONTAL : AS SHOWN

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

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   Longyear 1405: $ER_i \cong 1.45$
   Prosonic Track Mounted: $ER_i \cong 1.00$
   Prosonic 1: $ER_i \cong 1.45$
   Minisonic: $ER_i \cong 1.00$
   Test America:
   CME 95: $ER_i \cong 1.45$
   Pacific Drilling:
   Unimog: $ER_i \cong 1.27$
   Mole: $ER_i \cong 1.00$
   Minimole: $ER_i \cong 1.00$
4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (RQD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 18 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

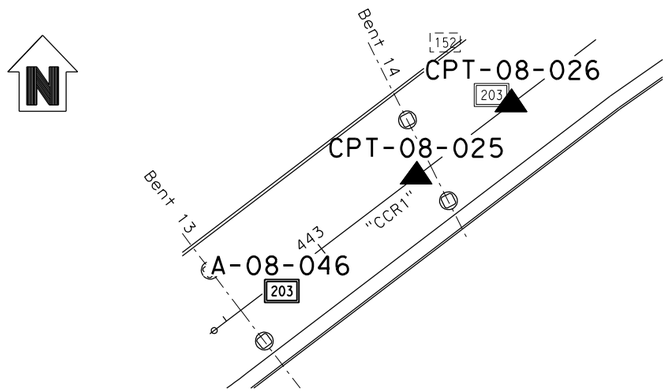
REVISION DATES: 10/14/08, 3/9/09

SHEET OF

FILE => 57-c0786-z-lotb18.dgn

USERNAME => mporonjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:09:04 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



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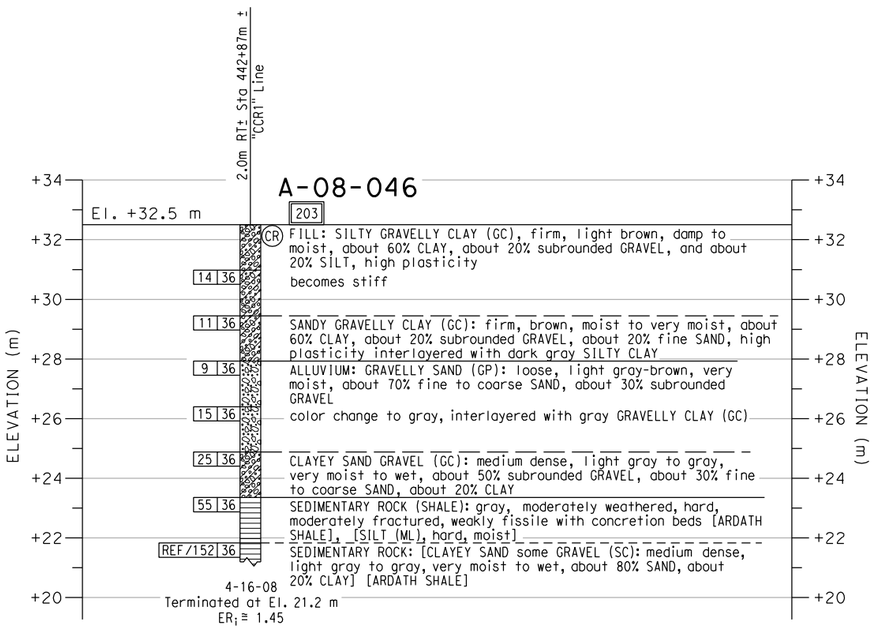

PROFILE
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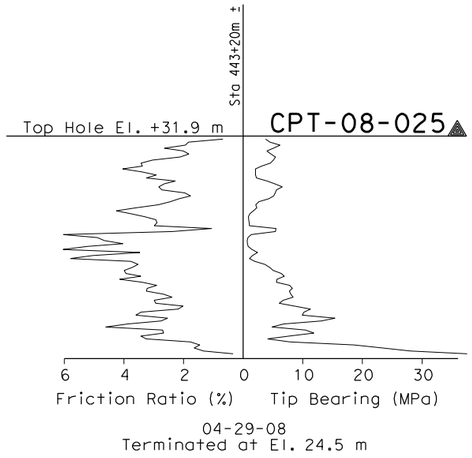
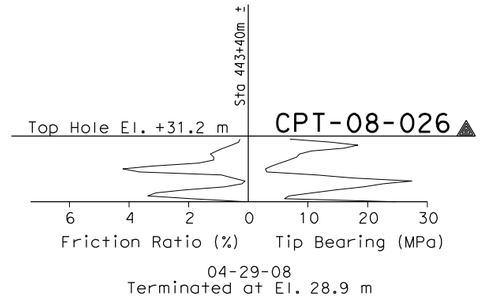
HORIZONTAL 1 : 500





CONE PENETRATION TEST (CPT) SOUNDINGS

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.
2. Automatic trip and safety hammer systems consisting of hammer weight of 62.5 kg falling a distance of 762 mm were used to advance the drive samplers in accordance with ASTM D1586.
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   Longyear 1405: ER$_i$ ≅ 1.45
   Prosonic Track Mounted: ER$_i$ ≅ 1.00
   Prosonic 1: ER$_i$ ≅ 1.45
   Minisonic: ER$_i$ ≅ 1.00
   Test America:
   CME 95: ER$_i$ ≅ 1.45
   Pacific Drilling:
   Unimog: ER$_i$ ≅ 1.27
   Mole: ER$_i$ ≅ 1.00
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ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 19 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

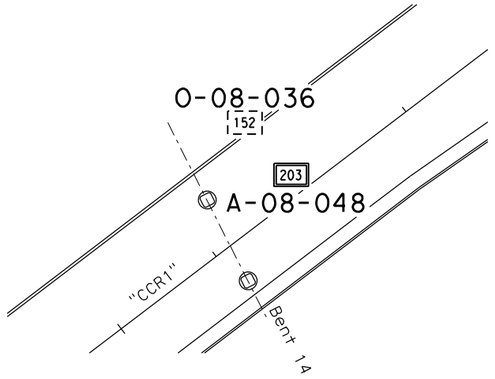
DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES										SHEET	OF
10/14/08	3/9/09										

FILE => 57-c0786-z-lotb19.dgn

USERNAME => mporanjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:09:10 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



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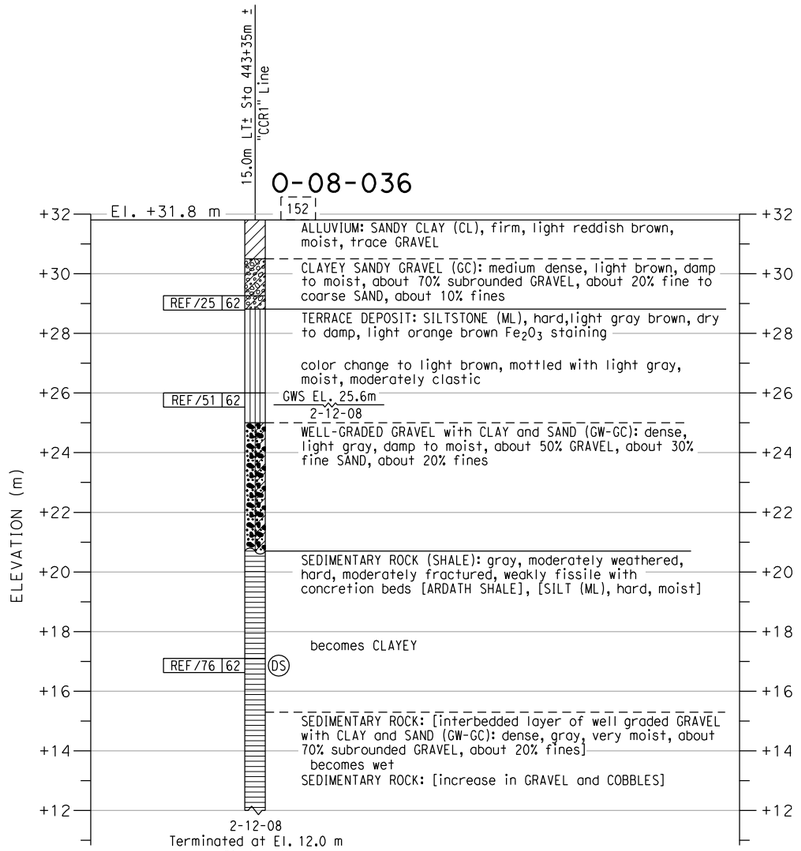

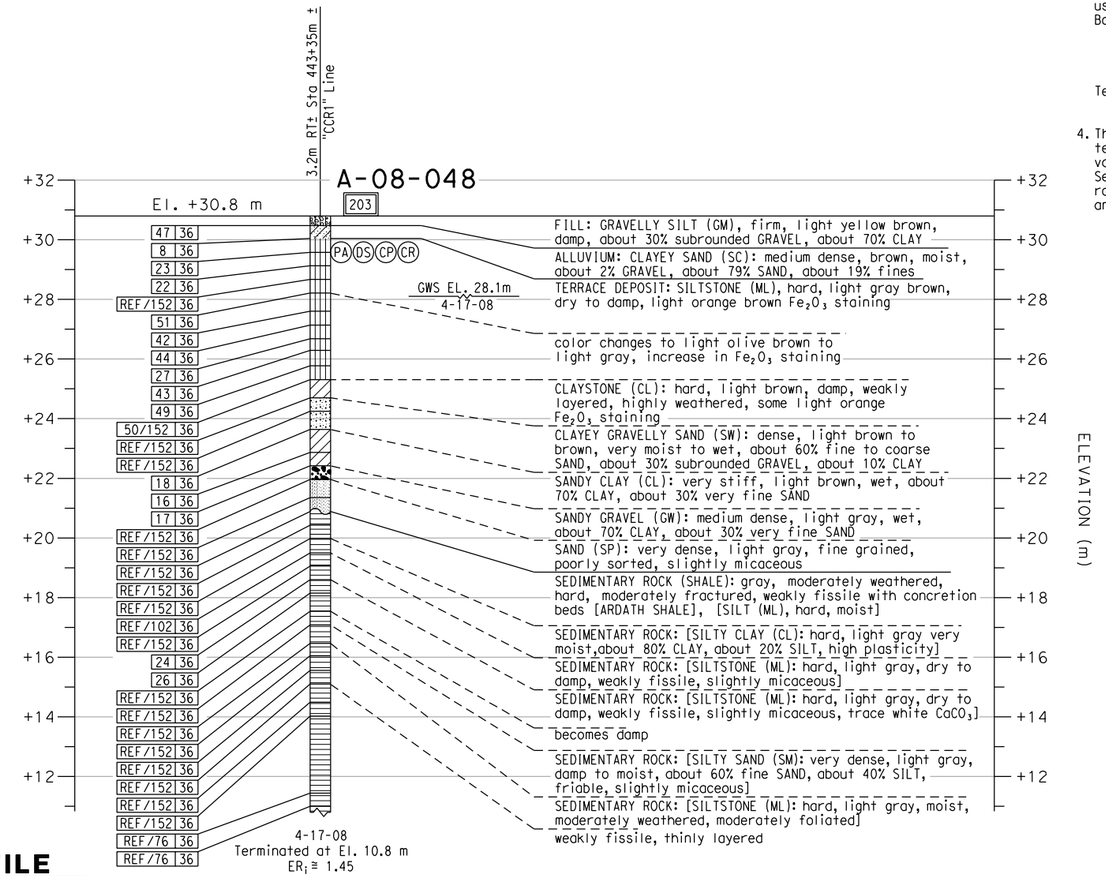

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

PLANS APPROVAL DATE

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SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

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   Minisonic: $ER_i \cong 1.00$
   Test America:
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   Pacific Drilling:
   Unimog: $ER_i \cong 1.27$
   Mole: $ER_i \cong 1.00$
   Minimole: $ER_i \cong 1.00$
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ENGINEERING SERVICES		GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER			DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 20 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER				CU 11275 EA 2T0401	DISREGARD PRINTS BEARING EARLIER REVISION DATES →	REVISION DATES: 10/14/08, 3/9/09; SHEET OF

OGS CIVIL LOG OF TEST BORINGS SHEET

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

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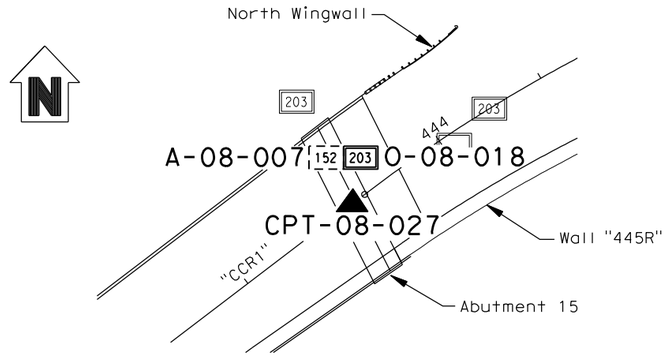

PLAN
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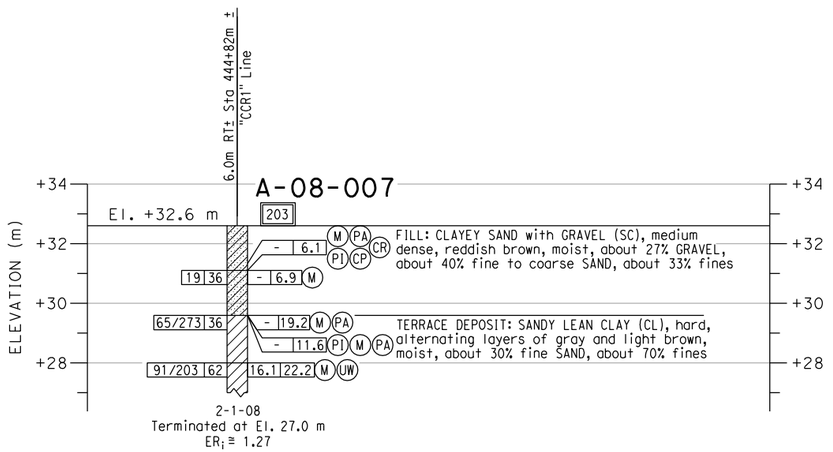
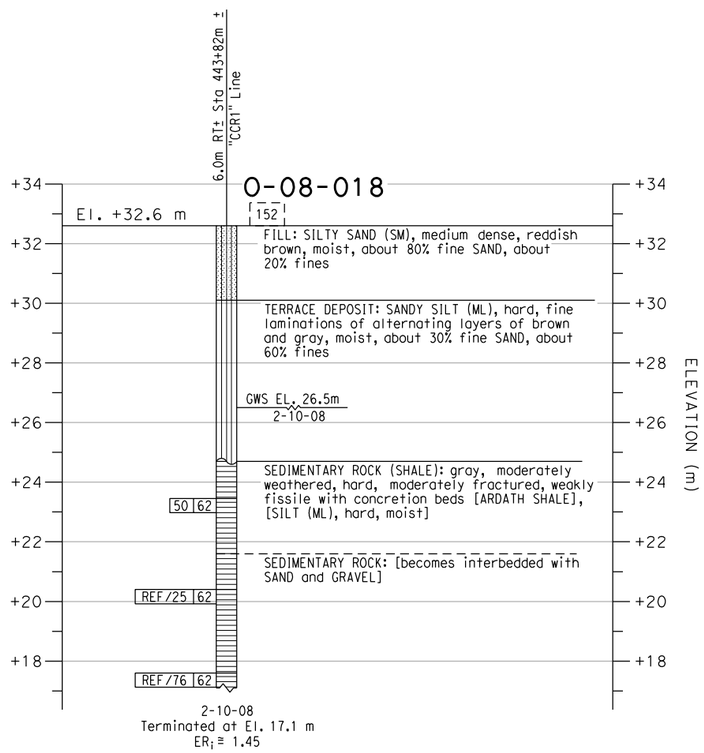
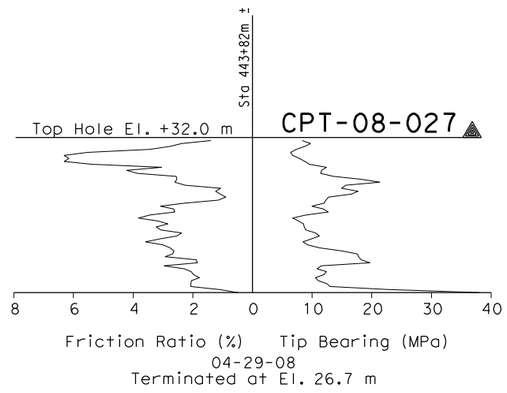




PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500



CONE PENETRATION TEST (CPT) SOUNDING

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

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ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 21 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER			

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES										SHEET	OF
10/14/08	3/9/09										

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Bench Mark
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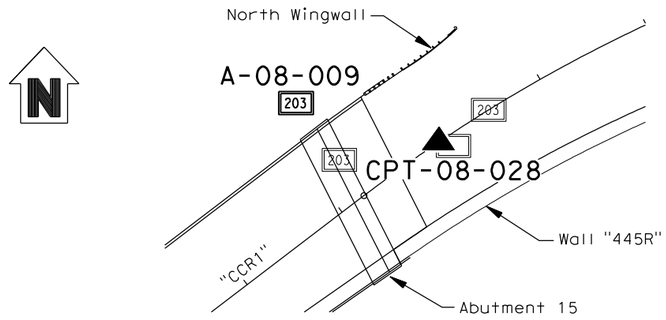

PLAN
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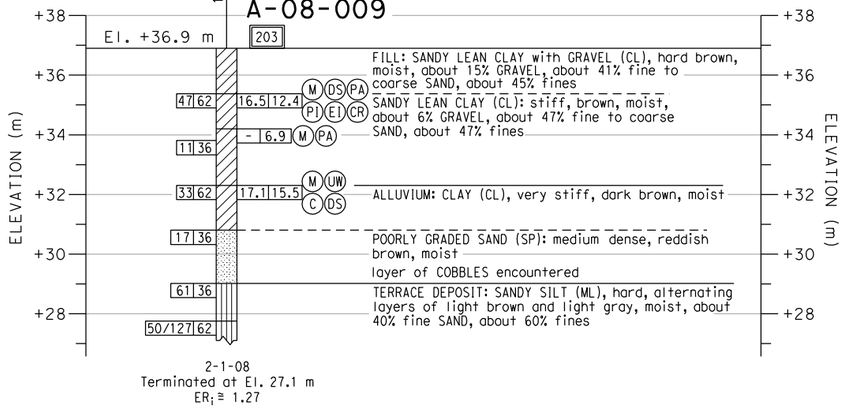
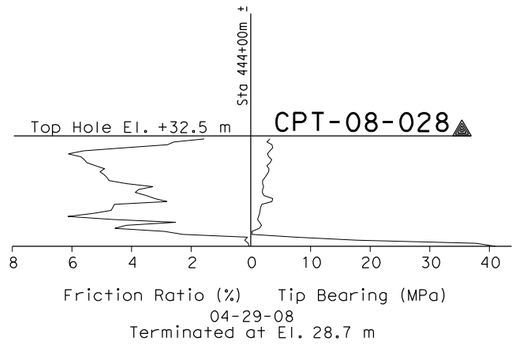


PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500



CONE PENETRATION TEST (CPT) SOUNDING

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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7895 CONVOY CT.
SAN DIEGO, CA. 92111

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ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 22 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES: 10/14/08 3/9/09

SHEET OF

FILE => 57-c0786-z-lotb22.dgn

USERNAME => mporonjqe DATE PLOTTED => 3/10/2009 TIME PLOTTED => 11:08:30 PM

APPENDIX I.8

DIRECT ACCESS RAMP LOTBs

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

GROUP SYMBOLS AND NAMES

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

FIELD AND LABORATORY TESTING

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

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

APPARENT DENSITY OF COHESIONLESS SOILS

Description	SPT N_{60} (Blows / 300 mm)
Very loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE

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

PERCENT OR PROPORTION OF SOILS

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

PARTICLE SIZE

Description		Size
Boulder		> 300 mm
Cobble		76 mm to 300 mm
Gravel	Coarse	19 mm to 76 mm
	Fine	No. 4 to 19 mm
Sand	Coarse	No. 10 to No. 4
	Medium	No. 40 to No. 10
	Fine	No. 200 to No. 40

SOIL LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-E0075/76
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401	

DIRECT ACCESS RAMP

LOG OF TEST BORINGS SHEET NO. 1 OF 11

OGS CIVIL LOG OF TEST BORINGS SHEET

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: 10/14/08, 3/9/09

SHEET OF

FILE => 57-e0075_76-z-lotb01.dgn

USERNAME => mporonjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:14:50 PM

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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CEMENTATION

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

BOREHOLE IDENTIFICATION

Symbol	Hole Type	Description
Size	A	Auger Boring
Size	R P	Rotary drilled boring Rotary percussion boring (air)
Size	R	Rotary drilled diamond core
Size	HD HA	Hand driven (25 mm soil tube) Hand Auger
●	D	Dynamic Cone Penetration Boring
▲	CPT	Cone Penetration Test (ASTM D 5778-95)
[ ]	O	Other

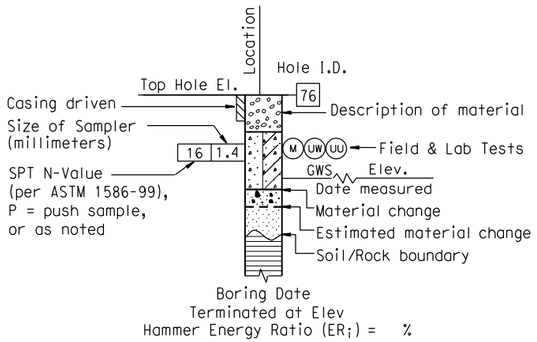
Note: Size in millimeters.

CONSISTENCY OF COHESIVE SOILS

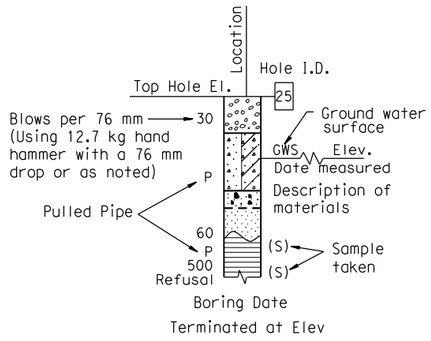
Description	Unconfined Compressive Strength (tsm)	Pocket Penetrometer Measurement (tsm)	Torvane Measurement (tsm)	Field Approximation
Very Soft	< 24	< 24	< 12	Easily penetrated several inches by fist
Soft	24 to 48	24 to 48	12 to 24	Easily penetrated several inches by thumb
Medium Stiff	48 to 96	48 to 96	24 to 48	Penetrated several inches by thumb with moderate effort
Stiff	96 to 192	96 to 192	48 to 96	Readily indented by thumb but penetrated only with great effort
Very Stiff	192 to 383	192 to 383	96 to 192	Readily indented by thumbnail
Hard	> 383	> 383	> 192	Indented by thumbnail with difficulty

PLASTICITY OF FINE-GRAINED SOILS

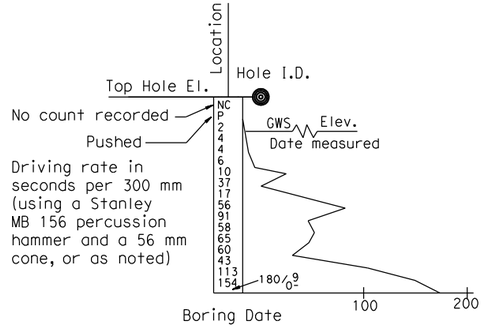
Description	Criteria
Nonplastic	A 3 mm thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.



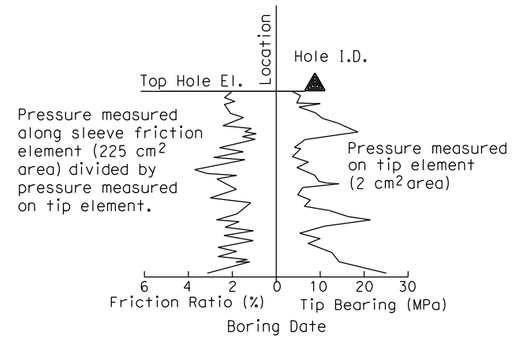
ROTARY BORING



HAND BORING



DYNAMIC CONE PENETRATION BORING



CONE PENETRATION TEST (CPT) SOUNDING

SOIL LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	DIRECT ACCESS RAMP
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	57-E0075/76	
NAME:	CHECKED BY: G. CUSTENBORDER				POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 2 OF 11

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES		SHEET	OF
10/14/08	3/9/09		

FILE => 57-e0075_76-z-lotb02.dgn

USERNAME => mparcinjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:14:58 PM

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

Caltrans Metric

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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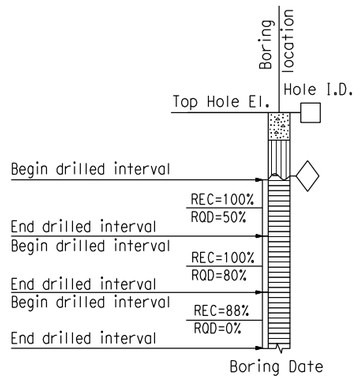
PERCENT CORE RECOVERY (REC) & ROCK QUALITY DESIGNATION (RQD)

$$REC = \frac{\sum \text{Length of the recovered core pieces}}{\text{Total length of core run}} \times 100\%$$

$$RQD = \frac{\sum \text{Length of intact core pieces} \geq 100\ mm}{\text{Total length of core run}} \times 100\%$$



RELATIVE STRENGTH OF INTACT ROCK

Term	Uniaxial Compressive Strength (MPa)
Extremely Strong	> 207
Very Strong	100 - 207
Strong	49 - 100
Medium Strong	25 - 49
Weak	5 - 25
Very Weak	1 - 5
Extremely Weak	< 1

BEDDING SPACING

Description	Thickness / Spacing
Massive	Greater than 3 m
Very thickly bedded	1 m to 3 m
Thickly bedded	300 mm to 1 m
Moderately bedded	100 mm to 300 mm
Thinly bedded	30 mm to 100 mm
Very thinly bedded	10 mm to 30 mm
Laminated	Less than 10 mm

LEGEND OF ROCK MATERIALS

- IGNEOUS ROCK
- SEDIMENTARY ROCK
- METAMORPHIC ROCK

ROCK HARDNESS

Description	Criteria
Extremely Hard	Specimen cannot be scratched with a pocket knife or sharp pick; can only be chipped with repeated heavy hammer blows.
Very Hard	Specimen cannot be scratched with a pocket knife or sharp pick. Breaks with repeated heavy hammer blows.
Hard	Specimen can be scratched with a pocket knife or sharp pick with difficulty (heavy pressure). Heavy hammer blows required to break specimen.
Moderately Hard	Specimen can be scratched with pocket knife or sharp pick with light or moderate pressure. Core breaks with moderate hammer pressure.
Moderately Soft	Specimen can be grooved 5 mm deep with a pocket knife or sharp pick with moderate or heavy pressure. Breaks with light hammer blow or heavy manual pressure.
Soft	Specimen can be grooved or gouged easily by a pocket knife or sharp pick with light pressure, can be scratched with fingernail. Breaks with light to moderate manual pressure.
Very Soft	Specimen can be readily indented, grooved or gouged with fingernail, or carved with a pocket knife. Breaks with light manual pressure.

FRACTURE DENSITY

Description	Observed Fracture Density
Unfractured	No fractures.
Very slightly fractured	Lengths greater than 1 m.
Slightly fractured	Lengths from 300 mm to 1000 mm with few lengths less than 300 mm or greater than 1000 mm.
Moderately fractured	Lengths mostly in 100 mm to 300 mm range with most lengths about 200 mm.
Intensely fractured	Lengths average from 30 mm to 100 mm with scattered fragmented intervals with lengths less than 100 mm.
Very intensely fractured	Mostly chips and fragments with a few scattered short core lengths.

Combination descriptors (such as "Very intensely to intensely fractured") are used where equal distribution of both fracture density characteristics is present over a significant interval or exposure, or where characteristics are "in between" the descriptor definitions. Only two adjacent descriptors may be combined.

WEATHERING DESCRIPTORS FOR INTACT ROCK

Description	Diagnostic features: Chemical Weathering-Discoloration and/or oxidation — Body of Rock	Diagnostic features: Chemical Weathering-Discoloration and/or oxidation — Fracture Surfaces	Diagnostic features: Mechanical Weathering-Grain boundary conditions (disaggregation) primarily for granitics and some coarse-grained sediments	Diagnostic features: Texture and Solutioning — Texture	Diagnostic features: Texture and Solutioning — Solutioning	General Characteristics
Fresh	No discoloration, not oxidized.	No discoloration or oxidation.	No separation, intact (tight).	No change.	No solutioning.	Hammer rings when crystalline rocks are struck.
Slightly Weathered	Discoloration or oxidation is limited to surface of, or short distance from, fractures; some feldspar crystals are dull.	Minor to complete discoloration or oxidation of most surfaces.	No visible separation, intact (tight).	Preserved.	Minor leaching of some soluble minerals may be noted.	Hammer rings when crystalline rocks are struck. Body of rock not weakened.
Moderately Weathered	Discoloration or oxidation extends from fractures usually throughout; Fe-Mg minerals are "rusty," feldspar crystals are "cloudy."	All fracture surfaces are discolored or oxidized.	Partial separation of boundaries visible.	Generally preserved.	Soluble minerals may be mostly leached.	Hammer does not ring when rock is struck. Body of rock is slightly weakened.
Intensely Weathered	Discoloration or oxidation throughout; all feldspars and Fe-Mg minerals are altered to clay to some extent; or chemical alteration produces in-situ disaggregation, see grain boundary conditions.	All fracture surfaces are discolored or oxidized, surfaces friable.	Partial separation, rock is friable; in semiarid conditions granitics are disaggregated.	Texture altered by chemical disintegration (hydration, argillation).	Leaching of soluble minerals may be complete.	Dull sound when struck with hammer, usually can be broken with moderate to heavy manual pressure or by light hammer blow without reference to planes of weakness such as incipient or hairline fractures, or veinlets. Rock is significantly weakened.
Decomposed	Discolored or oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe-Mg minerals are completely altered to clay.		Complete separation of grain boundaries (disaggregated).	Resembles a soil, partial or complete remnant rock structure may be preserved; leaching of soluble minerals usually complete.		Can be granulated by hand. Resistant minerals such as quartz may be present as "stringers" or "dikes."

Combination descriptors (such as "slightly weathered to fresh") are permissible where equal distribution of both weathering characteristics is present over significant intervals or where characteristics present are "in between" the diagnostic feature. However, combination descriptors should not be used where significant, identifiable zones can be delineated. Only two adjacent descriptors may be combined. "Very intensely weathered" is the combination descriptor for "intensely weathered to decomposed."

ROCK LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-E0075/76
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS			POST MILES KP43.2/PM26.8
NAME:	CHECKED BY: G. CUSTENBORDER	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER	DESIGN BRANCH	CU 11275 EA 2T0401

DIRECT ACCESS RAMP

LOG OF TEST BORINGS SHEET NO. 3 OF 11

OGS CIVIL LOG OF TEST BORINGS SHEET

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									SHEET	OF
10/14/08	3/9/09									

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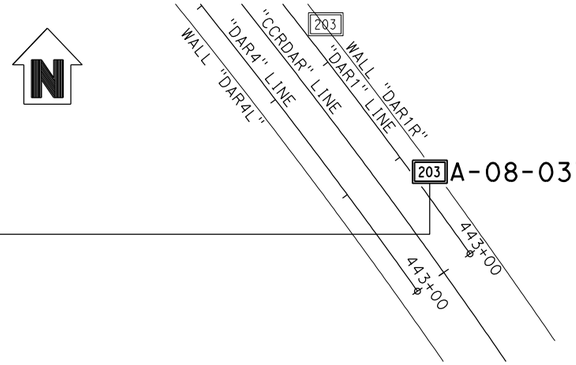
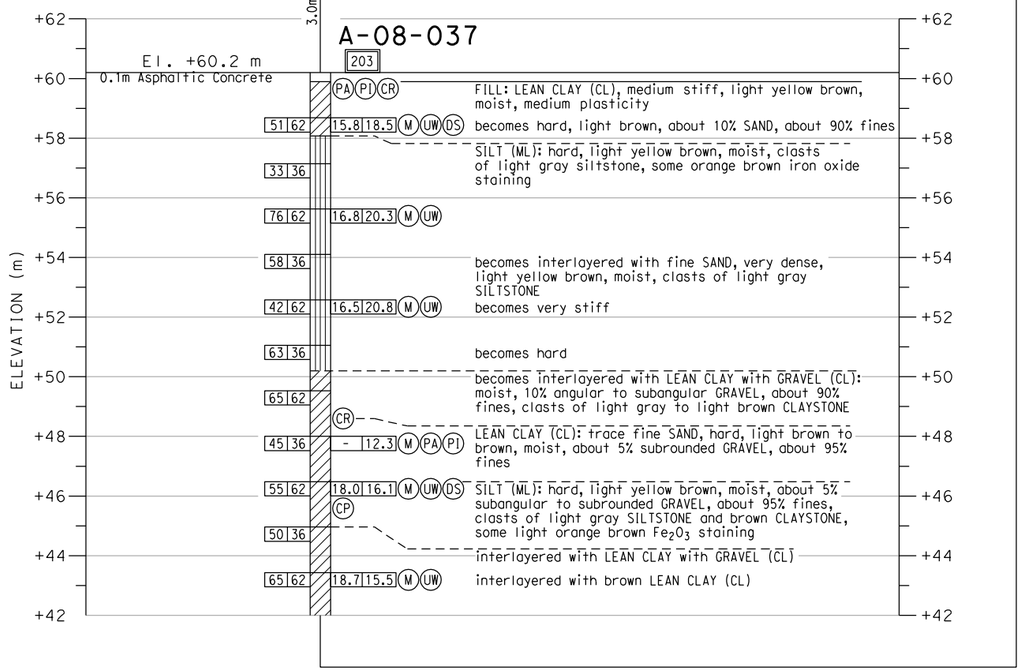
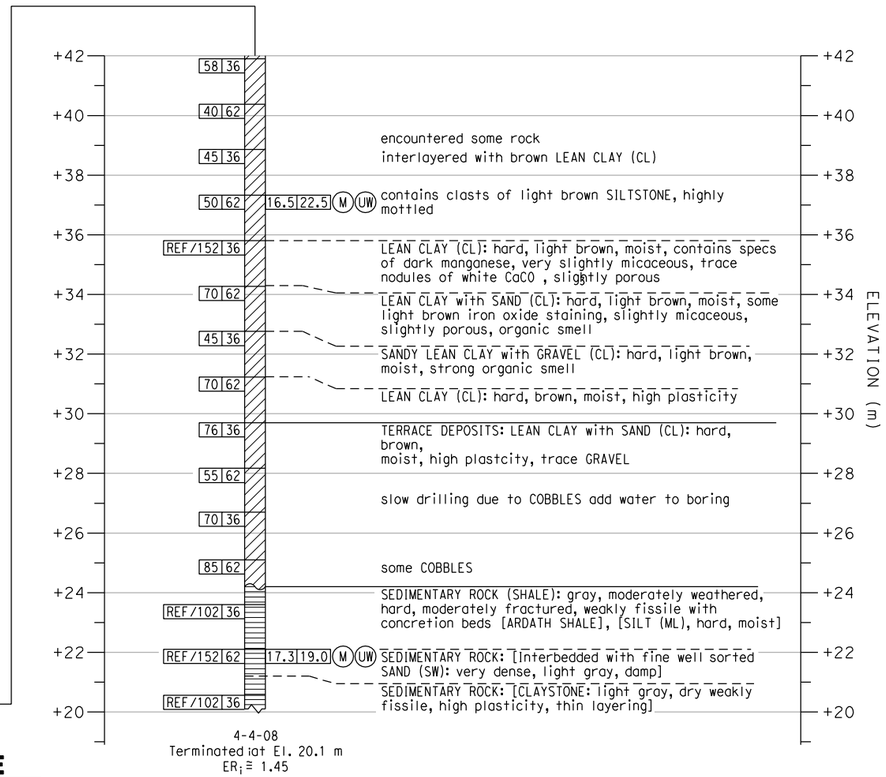
USERNAME => mporonjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:15:06 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
1 : 500





PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.
2. Automatic trip and safety hammer systems consisting of hammer weight of 62.5 kg falling a distance of 762 mm were used to advance the drive samplers in accordance with ASTM D1586.
3. The average hammer energy ratio (ER_i) reflects the percentage efficiency of SPT blowcounts (N-value). The estimated ER_i for the various drilling equipment used was as follows:
   Boart Longyear:
   Longyear 1405: ER_i≅1.45
   Prosonic Track Mounted: ER_i≅1.00
   Prosonic 1: ER_i≅1.45
   Minisonic: ER_i≅1.00
   Pacific Drilling:
   Unimog: ER_i≅1.27
   Mole: ER_i≅1.00
   Minimole: ER_i≅1.00
   Test America:
   CME 95: ER_i≅1.45
4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (RQD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-E0075/76	DIRECT ACCESS RAMP
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 4 OF 11
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES										SHEET	OF
10/14/08	3/9/09										

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USERNAME => mparonjape DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:15:16 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

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REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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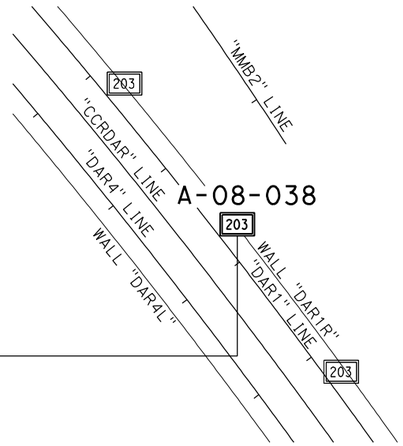

PLAN
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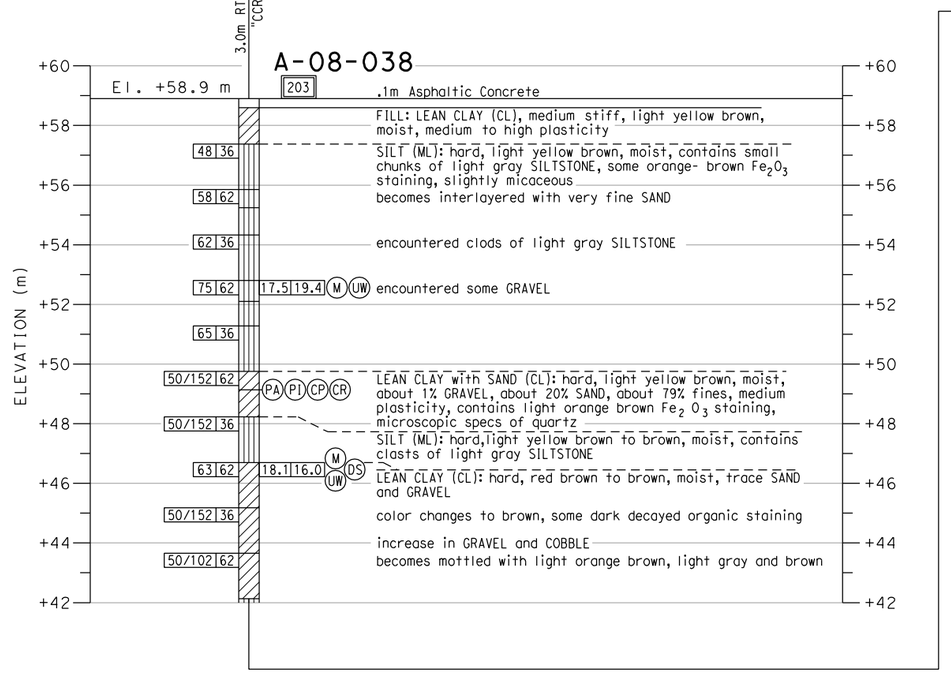
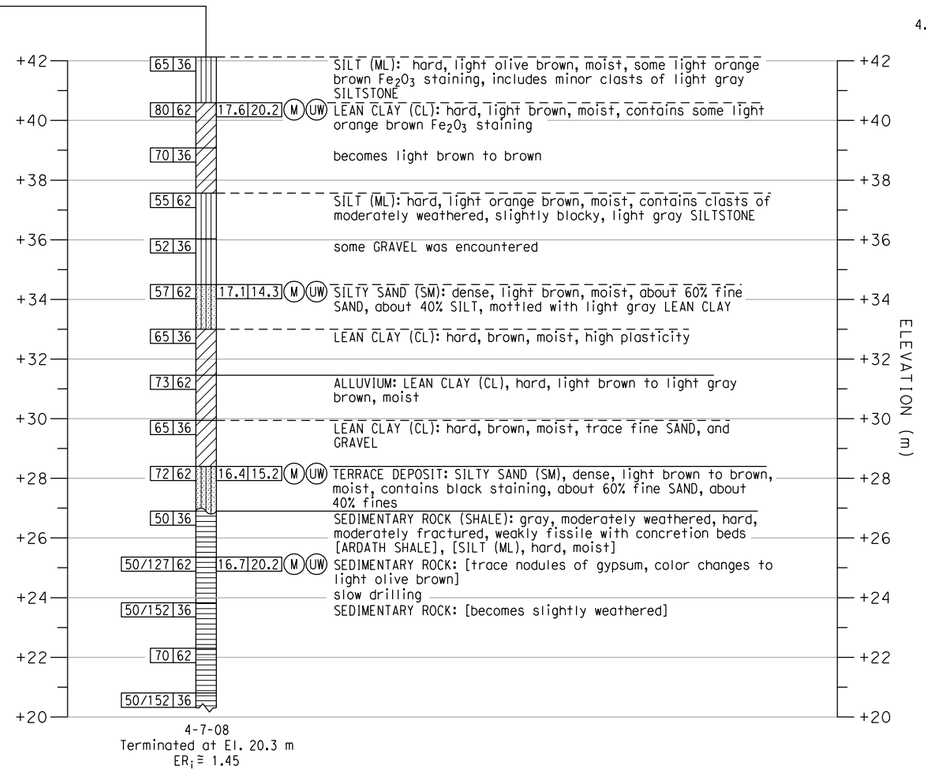


PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500



4-7-08
Terminated at El. 20.3 m
ER_i = 1.45

NOTES:

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   Prosonic 1: ER_i ≅ 1.45
   Minisonic: ER_i ≅ 1.00
   Test America:
   CME 95: ER_i ≅ 1.45
   Pacific Drilling:
   Unimog: ER_i ≅ 1.27
   Mole: ER_i ≅ 1.00
   Minimole: ER_i ≅ 1.00

4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (RQD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-E0075/76	DIRECT ACCESS RAMP
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 5 OF 11
NAME:	CHECKED BY: G. CUSTENBORDER	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER			

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES: 10/14/08, 3/9/09

SHEET OF

FILE => 57-e0075_76-z-lotb05.dgn

USERNAME => mporonjae DATE PLOTTED => 3/10/2009 TIME PLOTTED => 11:15:23 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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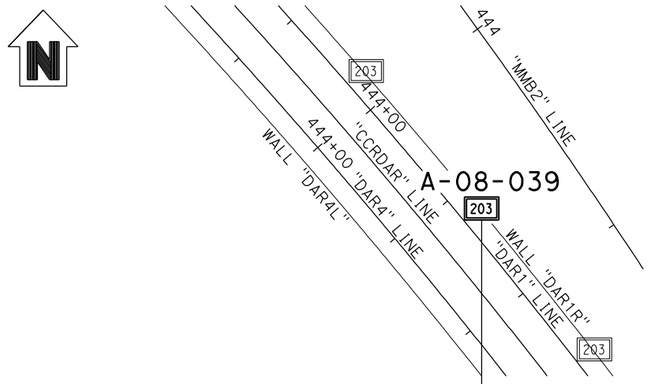

PLAN
1 : 500

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   Minisonic: $ER_i \cong 1.00$
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   Unimog: $ER_i \cong 1.27$
   Mole: $ER_i \cong 1.00$
   Minimole: $ER_i \cong 1.00$
   Test America:
   CME 95: $ER_i \cong 1.45$

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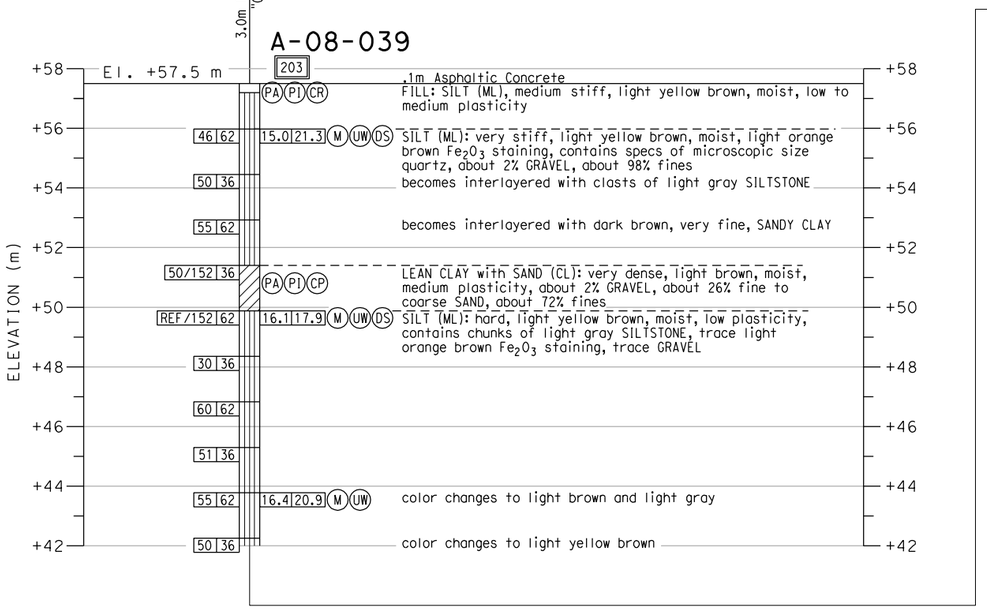

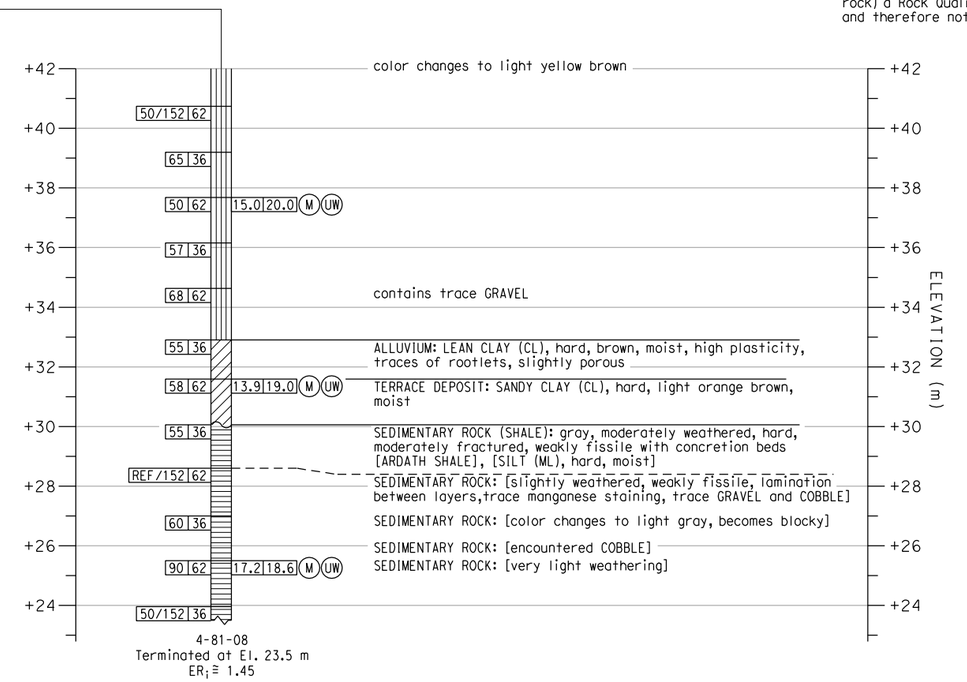

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-E0075/76	DIRECT ACCESS RAMP
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 6 OF 11
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES								SHEET	OF
10/14/08	3/9/09								

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USERNAME => mporonjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 11:15:29 PM

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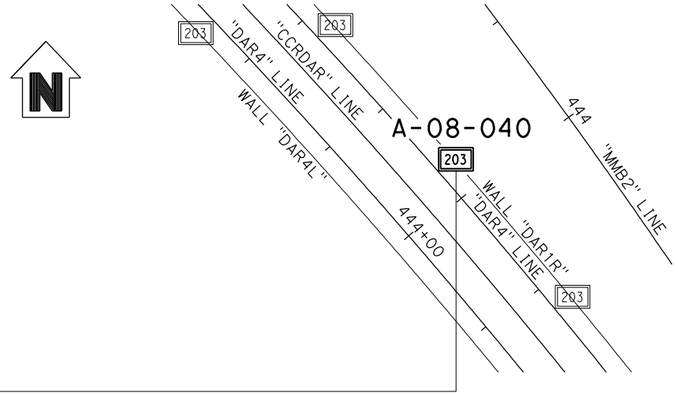
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
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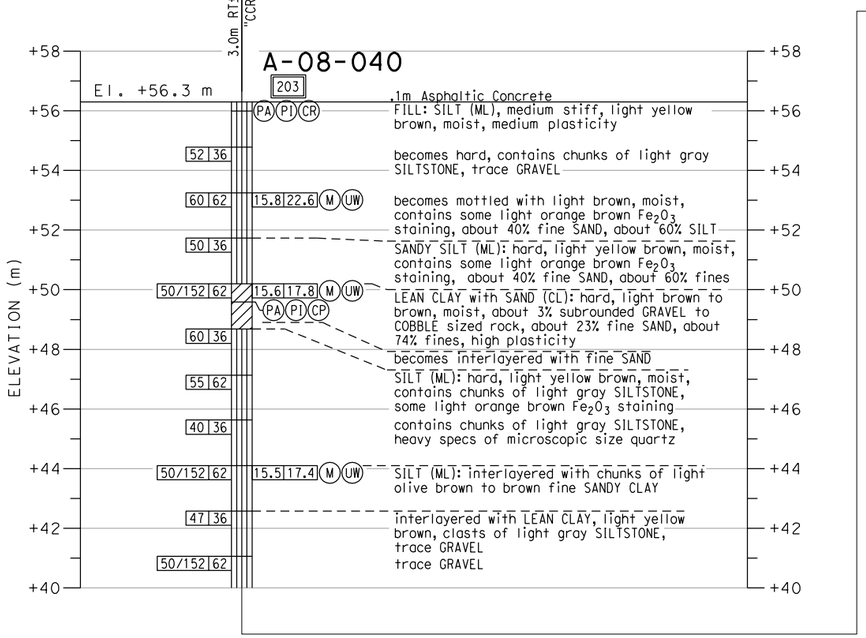

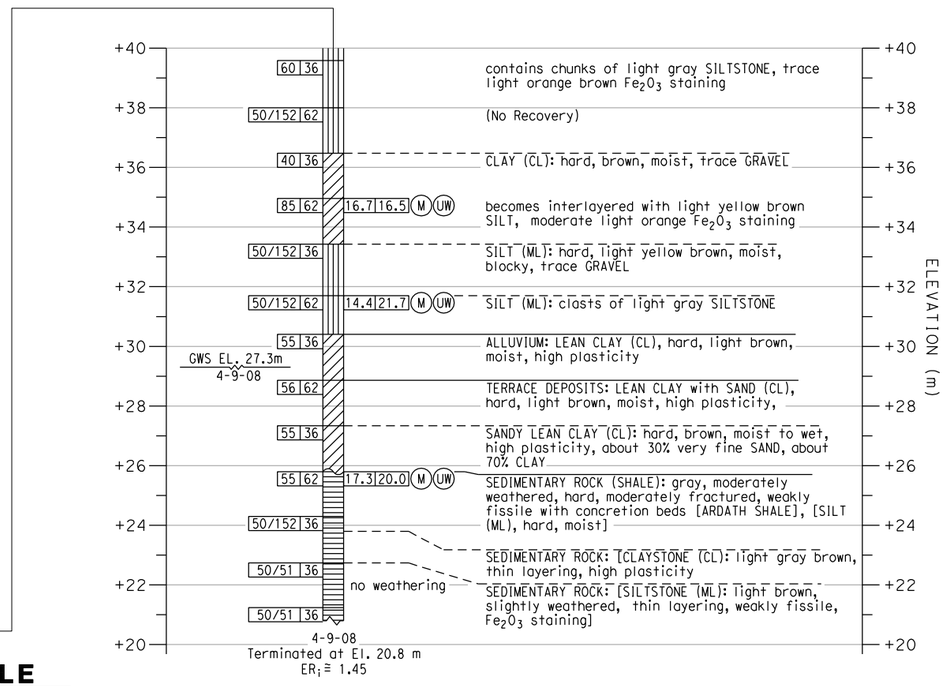

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

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   Prosonic 1: $ER_i \cong 1.45$
   Minisonic: $ER_i \cong 1.00$
   Pacific Drilling:
   Unimog: $ER_i \cong 1.27$
   Mole: $ER_i \cong 1.00$
   Minimole: $ER_i \cong 1.00$
   Test America:
   CME 95: $ER_i \cong 1.45$

4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (RQD) index is not relevant and therefore not reported on LOTBs.

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FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 7 OF 11
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES										SHEET	OF
10/14/08	3/9/09										

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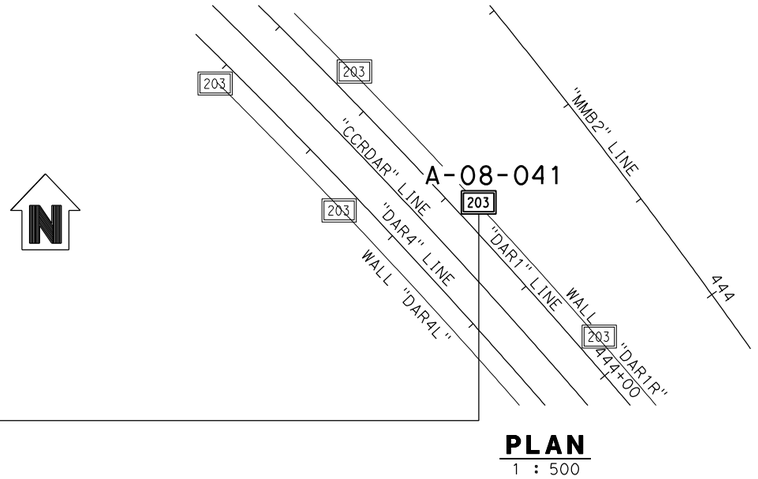
USERNAME => mparonjape DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:15:35 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



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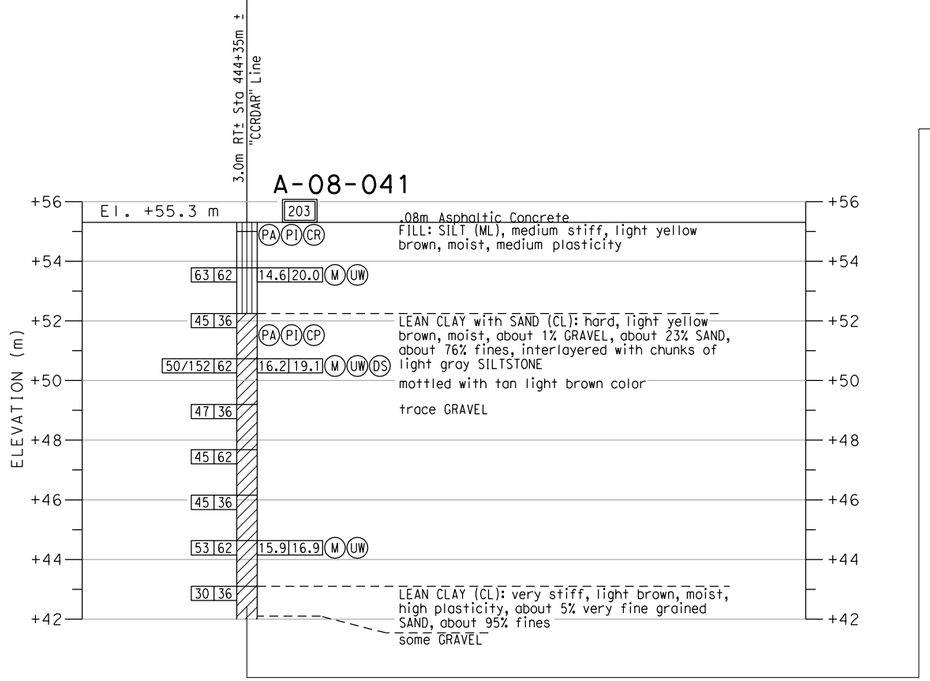
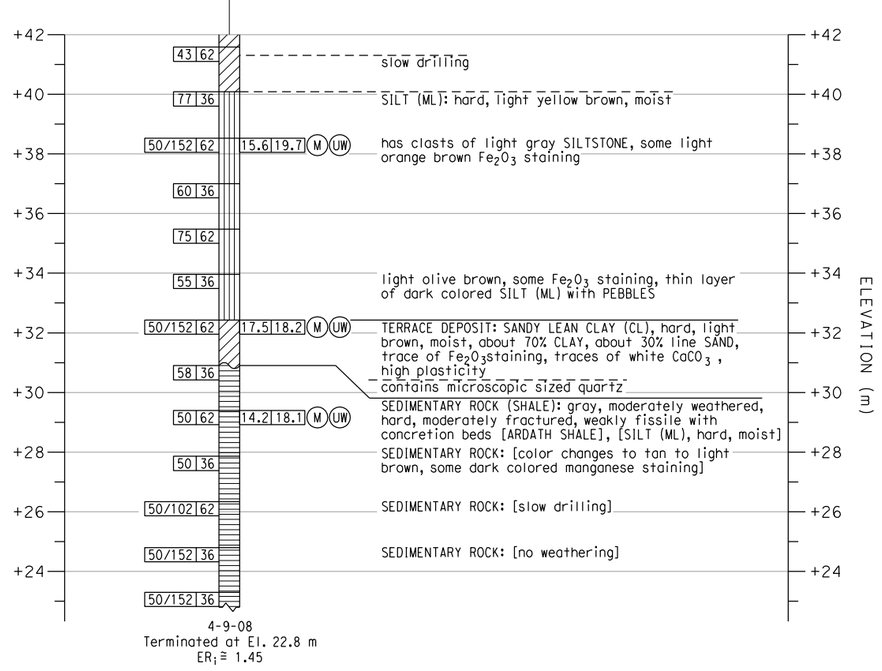


PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500



4-9-08
Terminated at El. 22.8 m
$ER_i \cong 1.45$

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

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   Test America:
   CME 95: $ER_i \cong 1.45$
   Pacific Drilling:
   Unimog: $ER_i \cong 1.27$
   Mole: $ER_i \cong 1.00$
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FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 8 OF 11
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401	DISREGARD PRINTS BEARING EARLIER REVISION DATES →	REVISION DATES: 10/14/08, 3/9/09

OGS CIVIL LOG OF TEST BORINGS SHEET

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

FILE => 57-e0075_76-z-lotb08.dgn

USERNAME => mporcnjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:15:41 PM

Bench Mark
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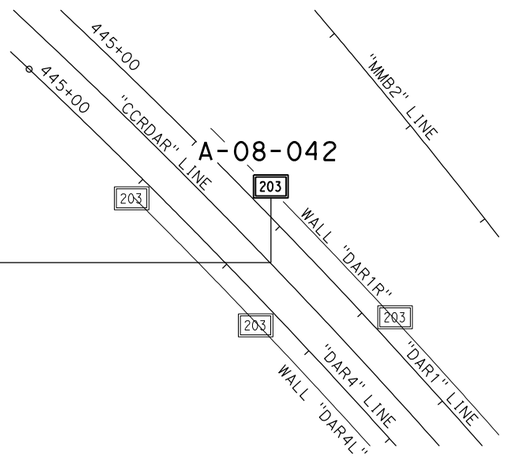

PLAN
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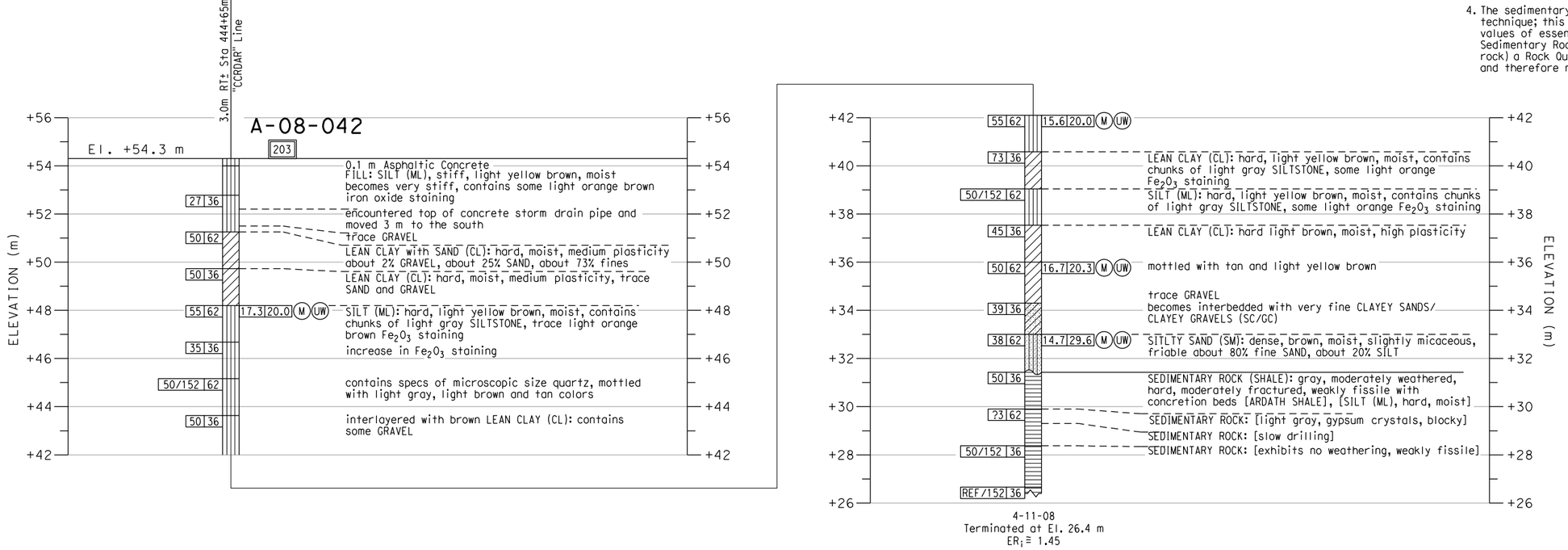

4-11-08
Terminated at El. 26.4 m
$ER_i \cong 1.45$

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

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FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 9 OF 11
NAME:	CHECKED BY: G. CUSTENBORDER		CU 11275 EA 2T0401			

OGS CIVIL LOG OF TEST BORINGS SHEET

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: 10/14/08 | 3/9/09 | SHEET | OF

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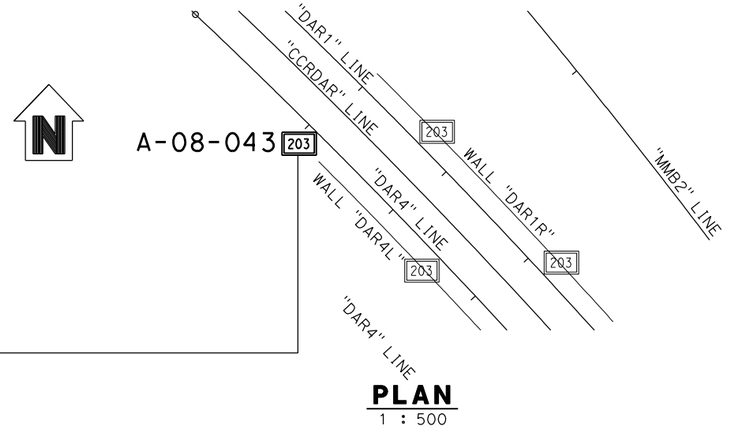

PLAN
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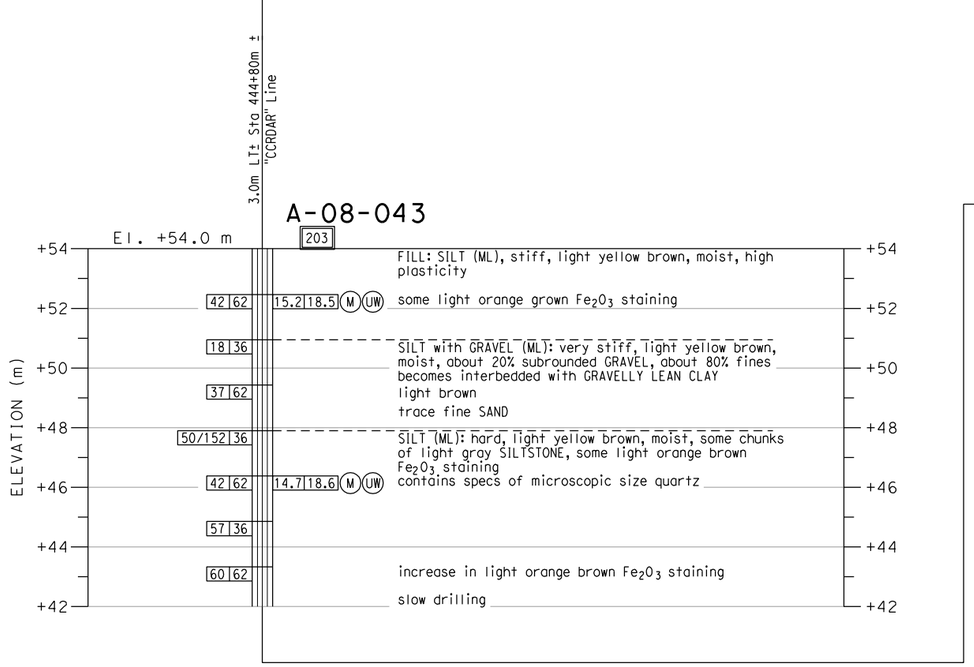

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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NAME:	CHECKED BY: G. CUSTENBORDER			DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 10 OF 11	

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

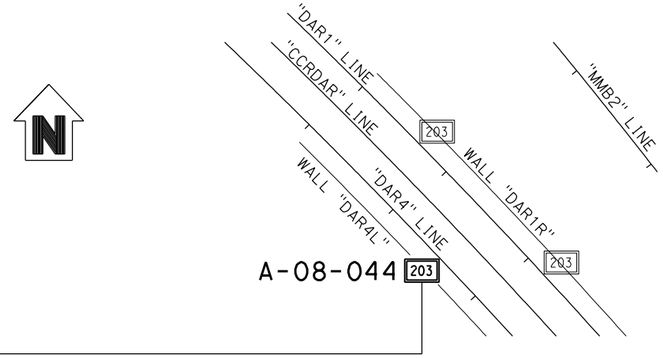
DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES								SHEET	OF
10/14/08	3/9/09								

FILE => 57-e0075_76-z-lotb10.dgn

USERNAME => mparcinjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:15:53 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
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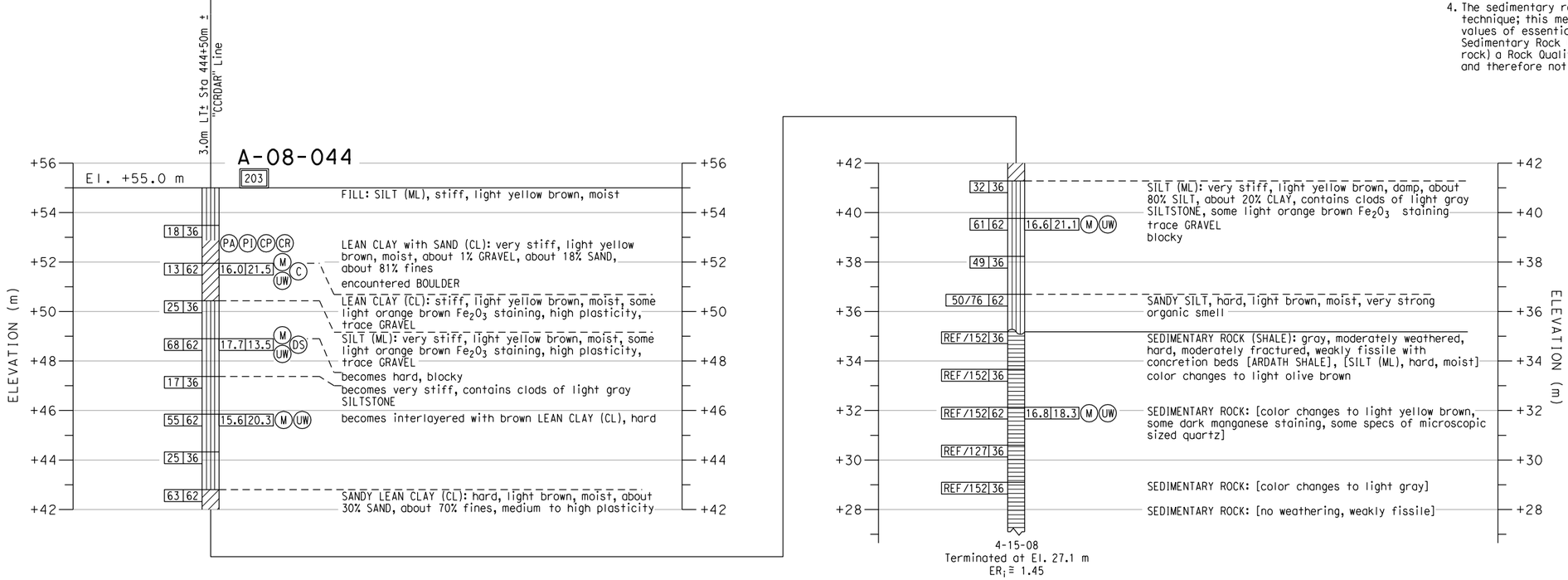

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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   CME 95: $ER_i \cong 1.45$
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NAME:	CHECKED BY: G. CUSTENBORDER			DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 11 OF 11

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES: 10/14/08, 3/9/09

SHEET OF

FILE => 57-e0075_76-z-lotb11.dgn

USERNAME => mporonjoe DATE PLOTTED => 3/10/2009 TIME PLOTTED => 11:15:59 PM

APPENDIX I.9

BUSINESS ACCESS UNDERCROSSING LOTBs

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

GROUP SYMBOLS AND NAMES

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

FIELD AND LABORATORY TESTING

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

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SAN DIEGO, CA. 92111

APPARENT DENSITY OF COHESIONLESS SOILS

Description	SPT N_{60} (Blows / 300 mm)
Very loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE

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

PERCENT OR PROPORTION OF SOILS

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

PARTICLE SIZE

Description		Size
Boulder		> 300 mm
Cobble		76 mm to 300 mm
Gravel	Coarse	19 mm to 76 mm
	Fine	No. 4 to 19 mm
Sand	Coarse	No. 10 to No. 4
	Medium	No. 40 to No. 10
	Fine	No. 200 to No. 40

SOIL LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0787	BUSINESS ACCESS ROAD UC
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 1 OF 7
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401	DISREGARD PRINTS BEARING EARLIER REVISION DATES →	REVISION DATES: 10/14/08, 3/9/09 — SHEET — OF

OGS CIVIL LOG OF TEST BORINGS SHEET

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

FILE => 57-c0787-z-1otb01.dgn

USERNAME => mpcronjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:12:31 PM

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

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CEMENTATION

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

BOREHOLE IDENTIFICATION

Symbol	Hole Type	Description
Size	A	Auger Boring
Size	R P	Rotary drilled boring Rotary percussion boring (air)
Size	R	Rotary drilled diamond core
Size	HD HA	Hand driven (25 mm soil tube) Hand Auger
●	D	Dynamic Cone Penetration Boring
▲	CPT	Cone Penetration Test (ASTM D 5778-95)
[ ]	O	Other

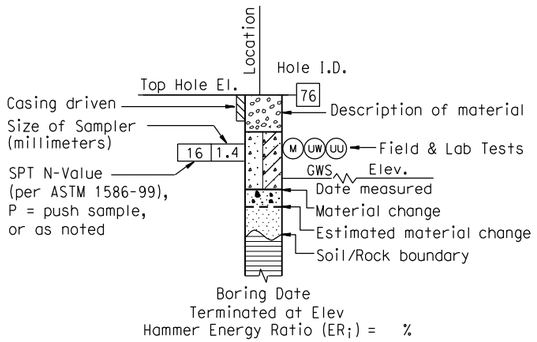
Note: Size in millimeters.

CONSISTENCY OF COHESIVE SOILS

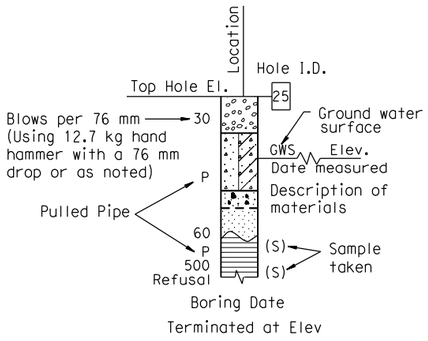
Description	Unconfined Compressive Strength (tsm)	Pocket Penetrometer Measurement (tsm)	Torvane Measurement (tsm)	Field Approximation
Very Soft	< 24	< 24	< 12	Easily penetrated several inches by fist
Soft	24 to 48	24 to 48	12 to 24	Easily penetrated several inches by thumb
Medium Stiff	48 to 96	48 to 96	24 to 48	Penetrated several inches by thumb with moderate effort
Stiff	96 to 192	96 to 192	48 to 96	Readily indented by thumb but penetrated only with great effort
Very Stiff	192 to 383	192 to 383	96 to 192	Readily indented by thumbnail
Hard	> 383	> 383	> 192	Indented by thumbnail with difficulty

PLASTICITY OF FINE-GRAINED SOILS

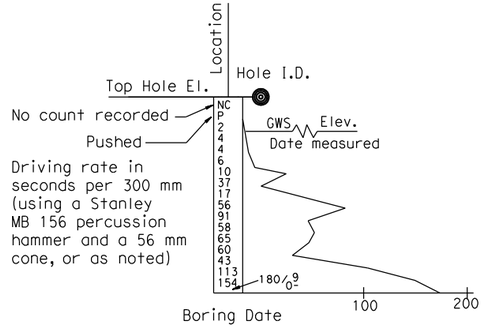
Description	Criteria
Nonplastic	A 3 mm thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.



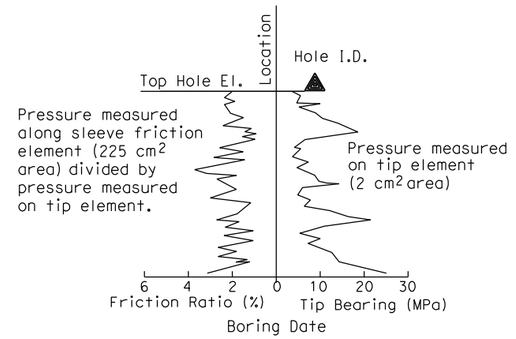
ROTARY BORING



HAND BORING



DYNAMIC CONE PENETRATION BORING



CONE PENETRATION TEST (CPT) SOUNDING

SOIL LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0787	BUSINESS ACCESS ROAD UC
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 2 OF 7
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES: 10/14/08, 3/9/09 | SHEET | OF

FILE => 57-c0787-z-lotb02.dgn

USERNAME => mparcinjape DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:12:40 PM

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

Caltrans Metric

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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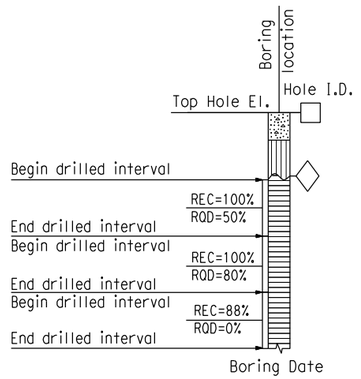
PERCENT CORE RECOVERY (REC) & ROCK QUALITY DESIGNATION (RQD)

$$REC = \frac{\sum \text{Length of the recovered core pieces}}{\text{Total length of core run}} \times 100\%$$

$$RQD = \frac{\sum \text{Length of intact core pieces} \geq 100\ mm}{\text{Total length of core run}} \times 100\%$$



RELATIVE STRENGTH OF INTACT ROCK

Term	Uniaxial Compressive Strength (MPa)
Extremely Strong	> 207
Very Strong	100 - 207
Strong	49 - 100
Medium Strong	25 - 49
Weak	5 - 25
Very Weak	1 - 5
Extremely Weak	< 1

BEDDING SPACING

Description	Thickness / Spacing
Massive	Greater than 3 m
Very thickly bedded	1 m to 3 m
Thickly bedded	300 mm to 1 m
Moderately bedded	100 mm to 300 mm
Thinly bedded	30 mm to 100 mm
Very thinly bedded	10 mm to 30 mm
Laminated	Less than 10 mm

LEGEND OF ROCK MATERIALS

- IGNEOUS ROCK
- SEDIMENTARY ROCK
- METAMORPHIC ROCK

ROCK HARDNESS

Description	Criteria
Extremely Hard	Specimen cannot be scratched with a pocket knife or sharp pick; can only be chipped with repeated heavy hammer blows.
Very Hard	Specimen cannot be scratched with a pocket knife or sharp pick. Breaks with repeated heavy hammer blows.
Hard	Specimen can be scratched with a pocket knife or sharp pick with difficulty (heavy pressure). Heavy hammer blows required to break specimen.
Moderately Hard	Specimen can be scratched with pocket knife or sharp pick with light or moderate pressure. Core breaks with moderate hammer pressure.
Moderately Soft	Specimen can be grooved 5 mm deep with a pocket knife or sharp pick with moderate or heavy pressure. Breaks with light hammer blow or heavy manual pressure.
Soft	Specimen can be grooved or gouged easily by a pocket knife or sharp pick with light pressure, can be scratched with fingernail. Breaks with light to moderate manual pressure.
Very Soft	Specimen can be readily indented, grooved or gouged with fingernail, or carved with a pocket knife. Breaks with light manual pressure.

FRACTURE DENSITY

Description	Observed Fracture Density
Unfractured	No fractures.
Very slightly fractured	Lengths greater than 1 m.
Slightly fractured	Lengths from 300 mm to 1000 mm with few lengths less than 300 mm or greater than 1000 mm.
Moderately fractured	Lengths mostly in 100 mm to 300 mm range with most lengths about 200 mm.
Intensely fractured	Lengths average from 30 mm to 100 mm with scattered fragmented intervals with lengths less than 100 mm.
Very intensely fractured	Mostly chips and fragments with a few scattered short core lengths.

Combination descriptors (such as "Very intensely to intensely fractured") are used where equal distribution of both fracture density characteristics is present over a significant interval or exposure, or where characteristics are "in between" the descriptor definitions. Only two adjacent descriptors may be combined.

WEATHERING DESCRIPTORS FOR INTACT ROCK

Description	Diagnostic features: Chemical Weathering-Discoloration and/or oxidation — Body of Rock	Diagnostic features: Chemical Weathering-Discoloration and/or oxidation — Fracture Surfaces	Diagnostic features: Mechanical Weathering-Grain boundary conditions (disaggregation) primarily for granitics and some coarse-grained sediments	Diagnostic features: Texture and Solutioning — Texture	Diagnostic features: Texture and Solutioning — Solutioning	General Characteristics
Fresh	No discoloration, not oxidized.	No discoloration or oxidation.	No separation, intact (tight).	No change.	No solutioning.	Hammer rings when crystalline rocks are struck.
Slightly Weathered	Discoloration or oxidation is limited to surface of, or short distance from, fractures; some feldspar crystals are dull.	Minor to complete discoloration or oxidation of most surfaces.	No visible separation, intact (tight).	Preserved.	Minor leaching of some soluble minerals may be noted.	Hammer rings when crystalline rocks are struck. Body of rock not weakened.
Moderately Weathered	Discoloration or oxidation extends from fractures usually throughout; Fe-Mg minerals are "rusty," feldspar crystals are "cloudy."	All fracture surfaces are discolored or oxidized.	Partial separation of boundaries visible.	Generally preserved.	Soluble minerals may be mostly leached.	Hammer does not ring when rock is struck. Body of rock is slightly weakened.
Intensely Weathered	Discoloration or oxidation throughout; all feldspars and Fe-Mg minerals are altered to clay to some extent; or chemical alteration produces in-situ disaggregation, see grain boundary conditions.	All fracture surfaces are discolored or oxidized, surfaces friable.	Partial separation, rock is friable; in semiarid conditions granitics are disaggregated.	Texture altered by chemical disintegration (hydration, argillation).	Leaching of soluble minerals may be complete.	Dull sound when struck with hammer, usually can be broken with moderate to heavy manual pressure or by light hammer blow without reference to planes of weakness such as incipient or hairline fractures, or veinlets. Rock is significantly weakened.
Decomposed	Discolored or oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe-Mg minerals are completely altered to clay.		Complete separation of grain boundaries (disaggregated).	Resembles a soil, partial or complete remnant rock structure may be preserved; leaching of soluble minerals usually complete.		Can be granulated by hand. Resistant minerals such as quartz may be present as "stringers" or "dikes."

Combination descriptors (such as "slightly weathered to fresh") are permissible where equal distribution of both weathering characteristics is present over significant intervals or where characteristics present are "in between" the diagnostic feature. However, combination descriptors should not be used where significant, identifiable zones can be delineated. Only two adjacent descriptors may be combined. "Very intensely weathered" is the combination descriptor for "intensely weathered to decomposed."

ROCK LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0787	BUSINESS ACCESS ROAD UC
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 3 OF 7
NAME:	CHECKED BY: G. CUSTENBORDER	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER	CU 11275 EA 2T0401	DISREGARD PRINTS BEARING EARLIER REVISION DATES →	REVISION DATES: 10/14/08, 3/9/09 — SHEET OF

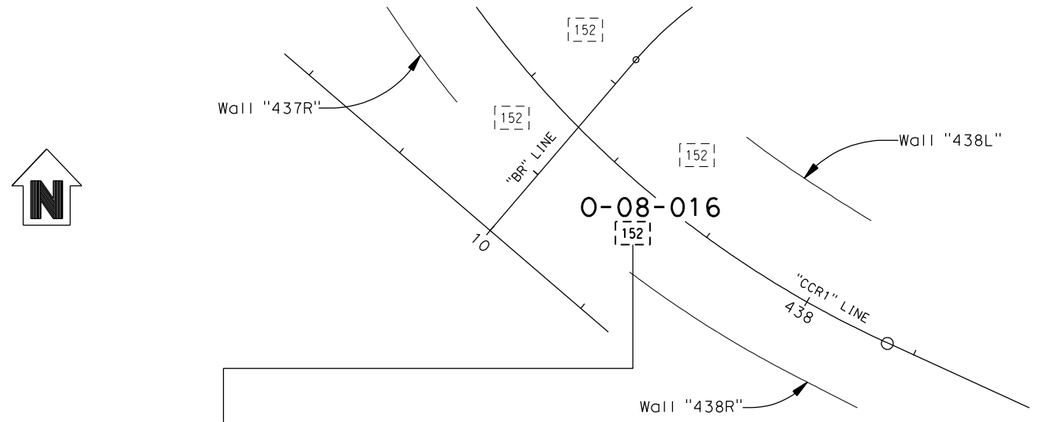
OGS CIVIL LOG OF TEST BORINGS SHEET

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

FILE => 57-c0787-z-1otb03.dgn

USERNAME => mporonjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:12:48 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
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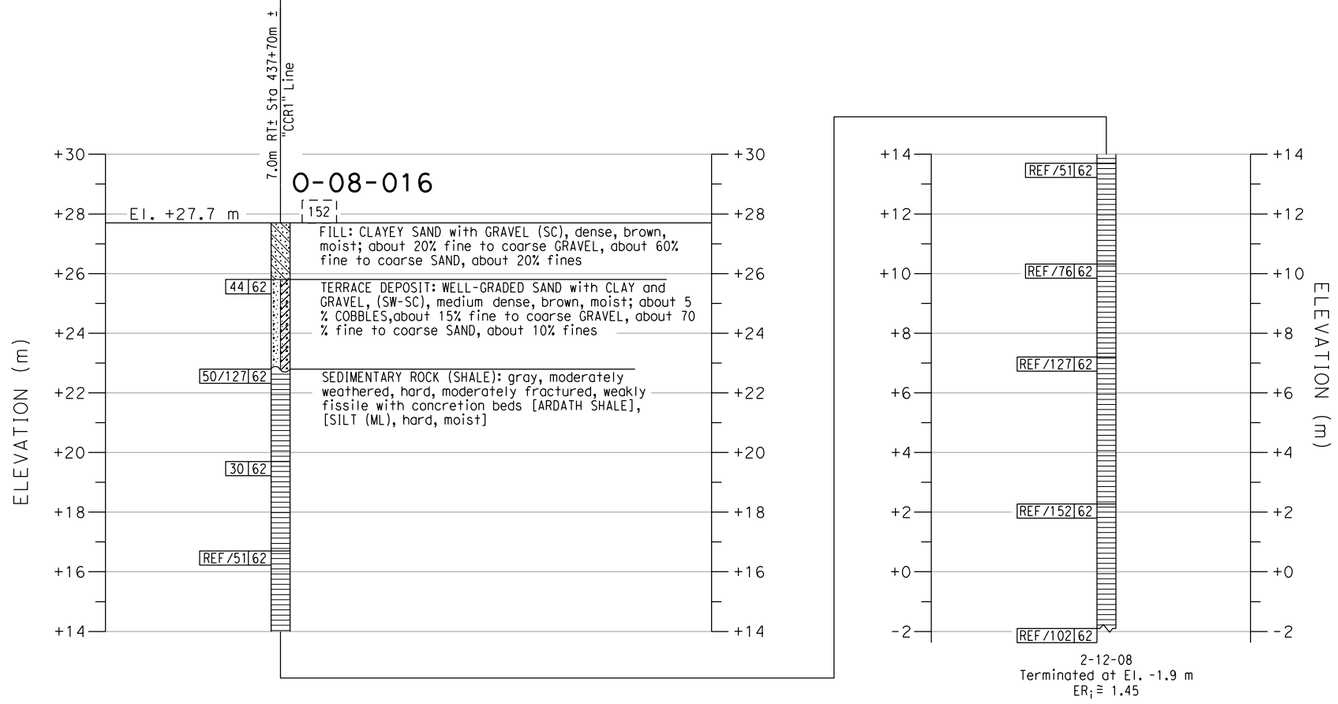

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

REGISTERED PROFESSIONAL ENGINEER
VAN OLIN
NO. 2578
EXP. 6-30-10
GEOTECHNICAL
STATE OF CALIFORNIA

PLANS APPROVAL DATE

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SAN DIEGO, CA. 92111

NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.

2. Automatic trip and safety hammer systems consisting of hammer weight of 62.5 kg falling a distance of 762 mm were used to advance the drive samplers in accordance with ASTM D1586.

3. The average hammer energy ratio (ER_i) reflects the percentage efficiency of SPT blowcounts (N-value). The estimated ER_i for the various drilling equipment used was as follows:
   Boart Longyear:
   Longyear 1405: $ER_i \cong 1.45$
   Prosonic Track Mounted: $ER_i \cong 1.00$
   Prosonic 1: $ER_i \cong 1.45$
   Minisonic: $ER_i \cong 1.00$
   Test America:
   CME 95: $ER_i \cong 1.45$
   Pacific Drilling:
   Unimog: $ER_i \cong 1.27$
   Mole: $ER_i \cong 1.00$
   Minimole: $ER_i \cong 1.00$

4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (ROD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0787	BUSINESS ACCESS ROAD UC
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 4 OF 7
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES: 10/14/08, 3/9/09

SHEET OF

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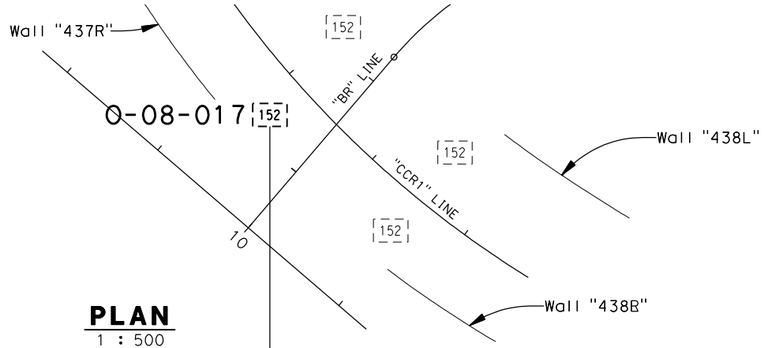

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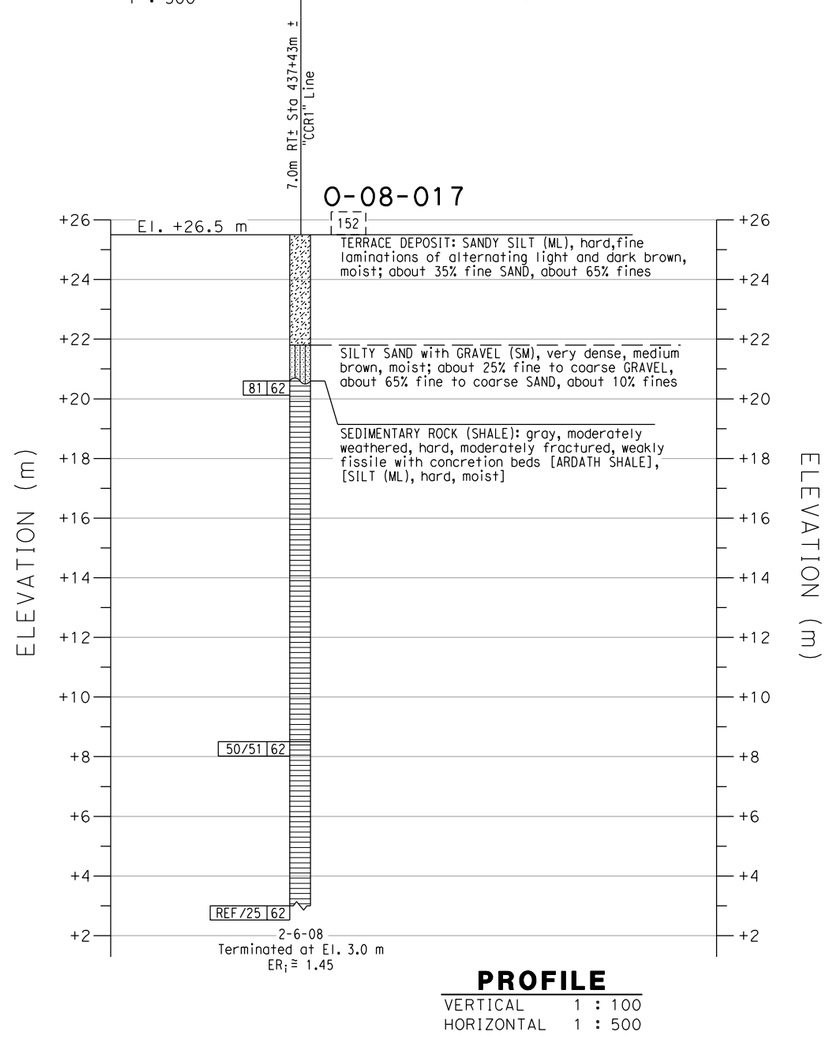

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 5 OF 7
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES										SHEET	OF
10/14/08	3/9/09										

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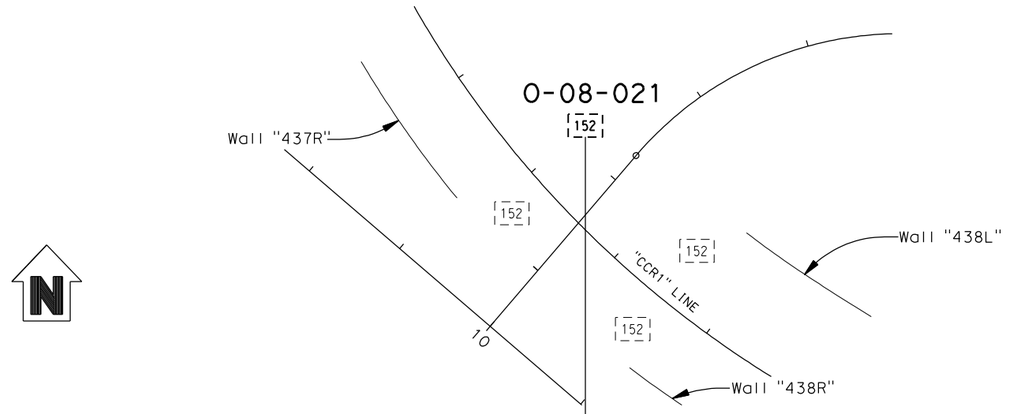

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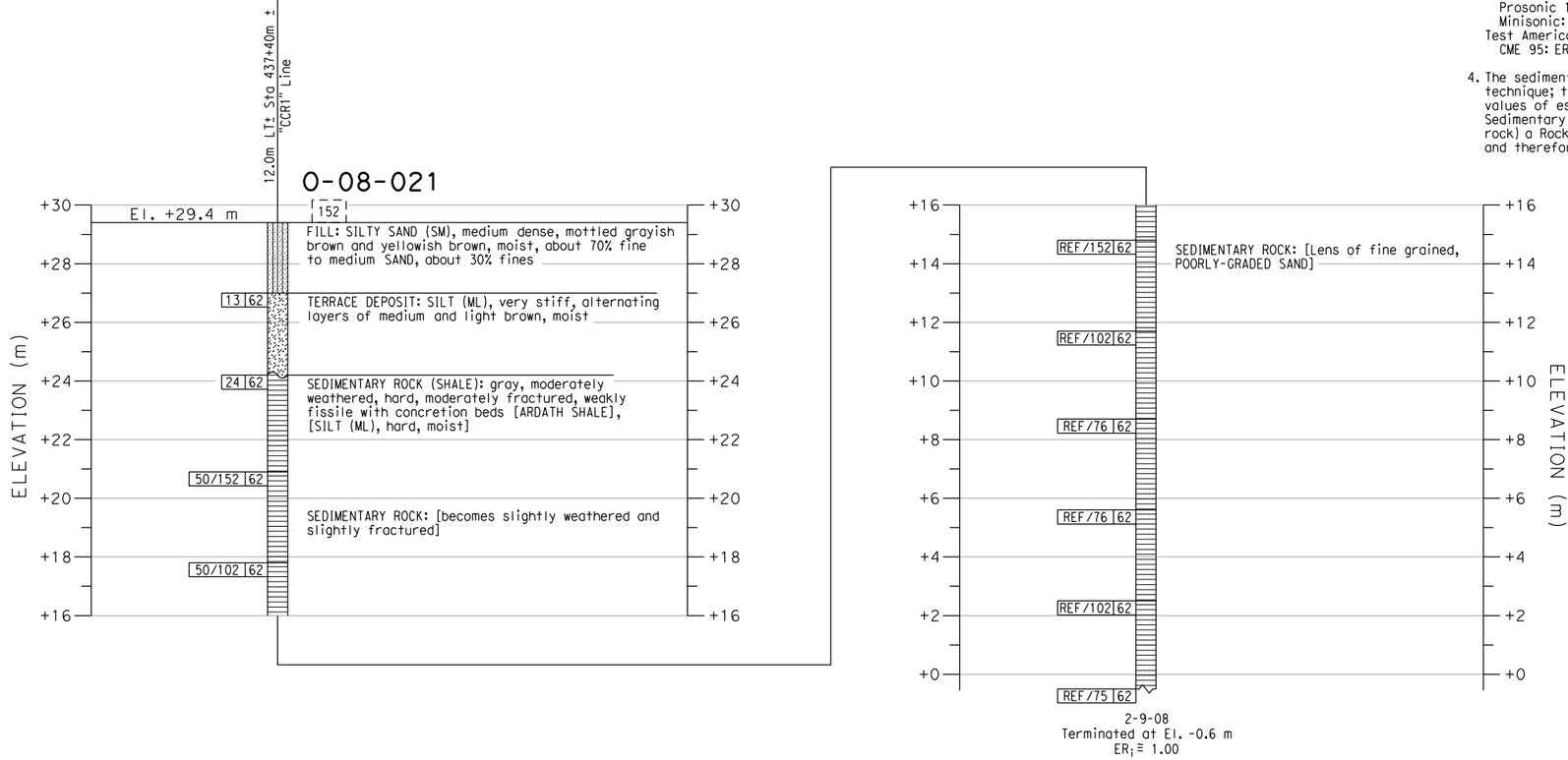

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.
2. Automatic trip and safety hammer systems consisting of hammer weight of 62.5 kg falling a distance of 762 mm were used to advance the drive samplers in accordance with ASTM D1586.
3. The average hammer energy ratio (ER_i) reflects the percentage efficiency of SPT blowcounts (N-value). The estimated ER_i for the various drilling equipment used was as follows:
   Boart Longyear:
   Longyear 1405: $ER_i \cong 1.45$
   Prosonic Track Mounted: $ER_i \cong 1.00$
   Prosonic 1: $ER_i \cong 1.45$
   Minisonic: $ER_i \cong 1.00$
   Test America:
   CME 95: $ER_i \cong 1.45$
   Pacific Drilling:
   Unimog: $ER_i \cong 1.27$
   Mole: $ER_i \cong 1.00$
   Minimole: $ER_i \cong 1.00$
4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (RQD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0787	BUSINESS ACCESS ROAD UC
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 6 OF 7
NAME:	CHECKED BY: G. CUSTENBORDER	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER			

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES

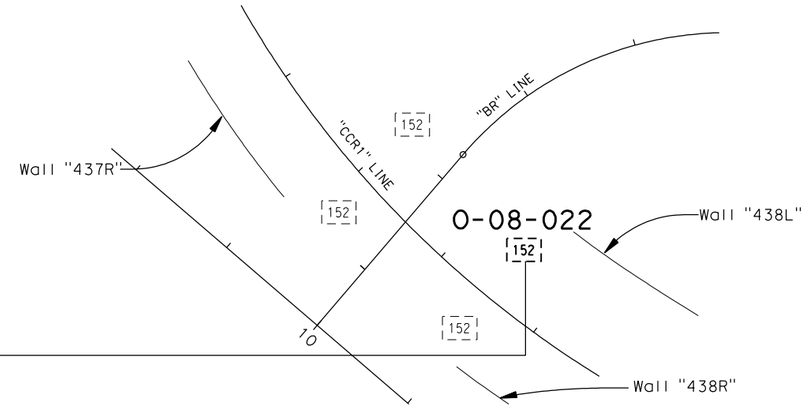
REVISION DATES: 10/14/08, 3/9/09

SHEET OF

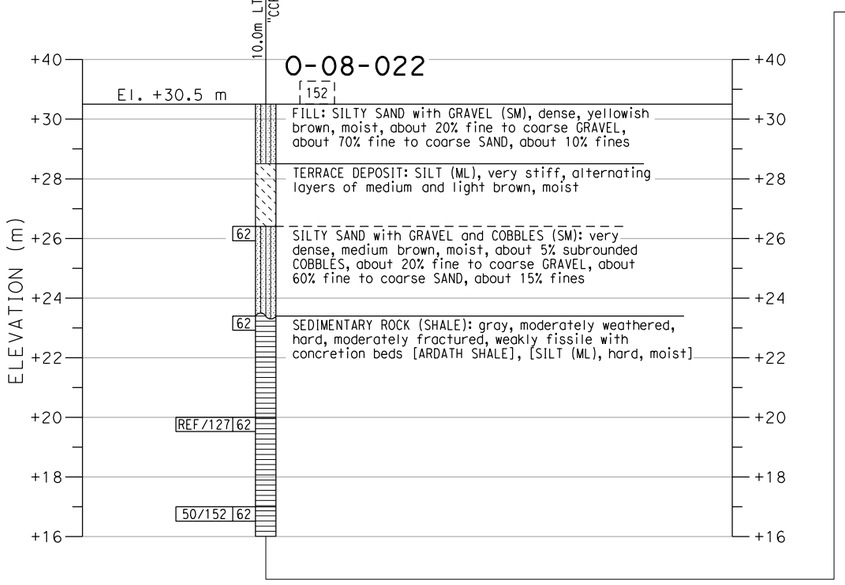
FILE => 57-c0787-z-lotb06.dgn

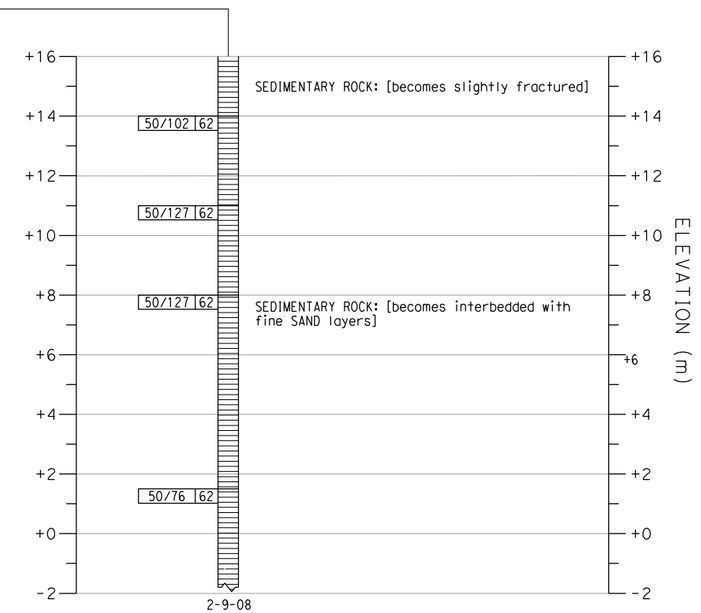
USERNAME => mparonjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:13:09 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
1 : 500





PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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   Minisonic: $ER_i \cong 1.00$
   Test America:
   CME 95: $ER_i \cong 1.45$
   Pacific Drilling:
   Unimog: $ER_i \cong 1.27$
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FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 7 OF 7
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401		

OGS CIVIL LOG OF TEST BORINGS SHEET

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: 10/14/08, 3/9/09

SHEET OF

FILE => 57-c0787-z-lotb07.dgn

USERNAME => mparonjape DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:13:14 PM

APPENDIX I.10

MISCELLANEOUS RETAINING WALLS LOTBs

APPENDIX I.10.1

TYPE I WALL 437R LOTBs

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

GROUP SYMBOLS AND NAMES

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

FIELD AND LABORATORY TESTING

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

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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7895 CONVOY CT.
SAN DIEGO, CA. 92111

APPARENT DENSITY OF COHESIONLESS SOILS

Description	SPT N_{60} (Blows / 300 mm)
Very loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE

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

PERCENT OR PROPORTION OF SOILS

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

PARTICLE SIZE

Description		Size
Boulder		> 300 mm
Cobble		76 mm to 300 mm
Gravel	Coarse	19 mm to 76 mm
	Fine	No. 4 to 19 mm
Sand	Coarse	No. 10 to No. 4
	Medium	No. 40 to No. 10
	Fine	No. 200 to No. 40

SOIL LEGEND

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "437R"
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	MISCELLANEOUS RETAINING WALLS
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401		LOG OF TEST BORINGS SHEET NO. 1 OF 4

OGS CIVIL LOG OF TEST BORINGS SHEET

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: 10/14/08 | 3/9/09 | SHEET | OF

FILE => MRW01.dgn

USERNAME => mpcronjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2119:55 PM

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

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CEMENTATION

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

BOREHOLE IDENTIFICATION

Symbol	Hole Type	Description
Size	A	Auger Boring
Size	R P	Rotary drilled boring Rotary percussion boring (air)
Size	R	Rotary drilled diamond core
Size	HD HA	Hand driven (25 mm soil tube) Hand Auger
●	D	Dynamic Cone Penetration Boring
▲	CPT	Cone Penetration Test (ASTM D 5778-95)
[ ]	O	Other

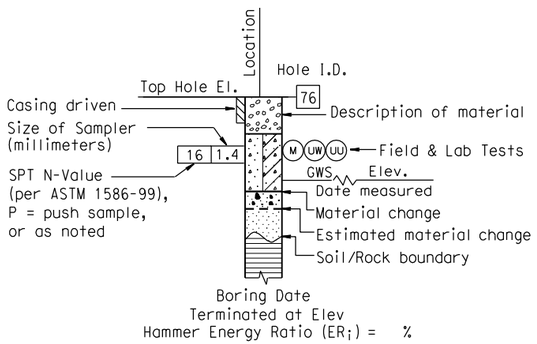
Note: Size in millimeters.

CONSISTENCY OF COHESIVE SOILS

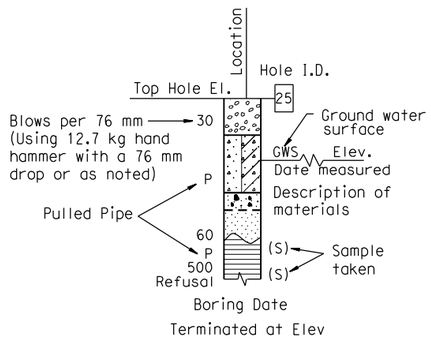
Description	Unconfined Compressive Strength (tsm)	Pocket Penetrometer Measurement (tsm)	Torvane Measurement (tsm)	Field Approximation
Very Soft	< 24	< 24	< 12	Easily penetrated several inches by fist
Soft	24 to 48	24 to 48	12 to 24	Easily penetrated several inches by thumb
Medium Stiff	48 to 96	48 to 96	24 to 48	Penetrated several inches by thumb with moderate effort
Stiff	96 to 192	96 to 192	48 to 96	Readily indented by thumb but penetrated only with great effort
Very Stiff	192 to 383	192 to 383	96 to 192	Readily indented by thumbnail
Hard	> 383	> 383	> 192	Indented by thumbnail with difficulty

PLASTICITY OF FINE-GRAINED SOILS

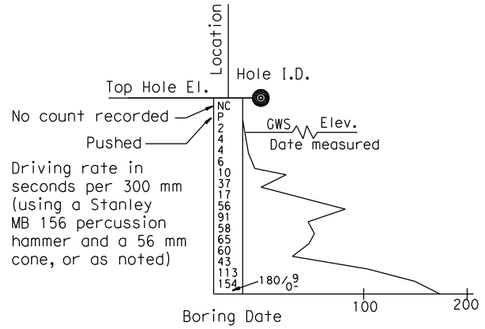
Description	Criteria
Nonplastic	A 3 mm thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.



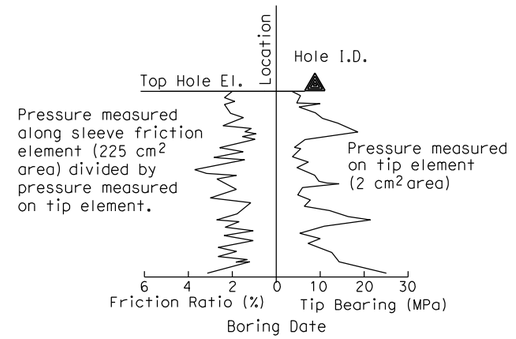
ROTARY BORING



HAND BORING



DYNAMIC CONE PENETRATION BORING



CONE PENETRATION TEST (CPT) SOUNDING

SOIL LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "437R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 2 OF 4
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES								SHEET	OF
10/14/08	3/9/09								

FILE => MRW02.dgn

USERNAME => mparcinjape DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:20:04 PM

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
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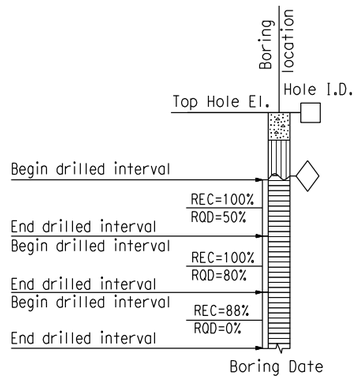
PERCENT CORE RECOVERY (REC) & ROCK QUALITY DESIGNATION (RQD)

$$REC = \frac{\sum \text{Length of the recovered core pieces}}{\text{Total length of core run}} \times 100\%$$

$$RQD = \frac{\sum \text{Length of intact core pieces} \geq 100\ mm}{\text{Total length of core run}} \times 100\%$$



RELATIVE STRENGTH OF INTACT ROCK

Term	Uniaxial Compressive Strength (MPa)
Extremely Strong	> 207
Very Strong	100 - 207
Strong	49 - 100
Medium Strong	25 - 49
Weak	5 - 25
Very Weak	1 - 5
Extremely Weak	< 1

BEDDING SPACING

Description	Thickness / Spacing
Massive	Greater than 3 m
Very thickly bedded	1 m to 3 m
Thickly bedded	300 mm to 1 m
Moderately bedded	100 mm to 300 mm
Thinly bedded	30 mm to 100 mm
Very thinly bedded	10 mm to 30 mm
Laminated	Less than 10 mm

LEGEND OF ROCK MATERIALS

- IGNEOUS ROCK
- SEDIMENTARY ROCK
- METAMORPHIC ROCK

ROCK HARDNESS

Description	Criteria
Extremely Hard	Specimen cannot be scratched with a pocket knife or sharp pick; can only be chipped with repeated heavy hammer blows.
Very Hard	Specimen cannot be scratched with a pocket knife or sharp pick. Breaks with repeated heavy hammer blows.
Hard	Specimen can be scratched with a pocket knife or sharp pick with difficulty (heavy pressure). Heavy hammer blows required to break specimen.
Moderately Hard	Specimen can be scratched with pocket knife or sharp pick with light or moderate pressure. Core breaks with moderate hammer pressure.
Moderately Soft	Specimen can be grooved 5 mm deep with a pocket knife or sharp pick with moderate or heavy pressure. Breaks with light hammer blow or heavy manual pressure.
Soft	Specimen can be grooved or gouged easily by a pocket knife or sharp pick with light pressure, can be scratched with fingernail. Breaks with light to moderate manual pressure.
Very Soft	Specimen can be readily indented, grooved or gouged with fingernail, or carved with a pocket knife. Breaks with light manual pressure.

FRACTURE DENSITY

Description	Observed Fracture Density
Unfractured	No fractures.
Very slightly fractured	Lengths greater than 1 m.
Slightly fractured	Lengths from 300 mm to 1000 mm with few lengths less than 300 mm or greater than 1000 mm.
Moderately fractured	Lengths mostly in 100 mm to 300 mm range with most lengths about 200 mm.
Intensely fractured	Lengths average from 30 mm to 100 mm with scattered fragmented intervals with lengths less than 100 mm.
Very intensely fractured	Mostly chips and fragments with a few scattered short core lengths.

Combination descriptors (such as "Very intensely to intensely fractured") are used where equal distribution of both fracture density characteristics is present over a significant interval or exposure, or where characteristics are "in between" the descriptor definitions. Only two adjacent descriptors may be combined.

WEATHERING DESCRIPTORS FOR INTACT ROCK

Description	Diagnostic features: Chemical Weathering-Discoloration and/or oxidation — Body of Rock	Diagnostic features: Chemical Weathering-Discoloration and/or oxidation — Fracture Surfaces	Diagnostic features: Mechanical Weathering-Grain boundary conditions (disaggregation) primarily for granitics and some coarse-grained sediments	Diagnostic features: Texture and Solutioning — Texture	Diagnostic features: Texture and Solutioning — Solutioning	General Characteristics
Fresh	No discoloration, not oxidized.	No discoloration or oxidation.	No separation, intact (tight).	No change.	No solutioning.	Hammer rings when crystalline rocks are struck.
Slightly Weathered	Discoloration or oxidation is limited to surface of, or short distance from, fractures; some feldspar crystals are dull.	Minor to complete discoloration or oxidation of most surfaces.	No visible separation, intact (tight).	Preserved.	Minor leaching of some soluble minerals may be noted.	Hammer rings when crystalline rocks are struck. Body of rock not weakened.
Moderately Weathered	Discoloration or oxidation extends from fractures usually throughout; Fe-Mg minerals are "rusty," feldspar crystals are "cloudy."	All fracture surfaces are discolored or oxidized.	Partial separation of boundaries visible.	Generally preserved.	Soluble minerals may be mostly leached.	Hammer does not ring when rock is struck. Body of rock is slightly weakened.
Intensely Weathered	Discoloration or oxidation throughout; all feldspars and Fe-Mg minerals are altered to clay to some extent; or chemical alteration produces in-situ disaggregation, see grain boundary conditions.	All fracture surfaces are discolored or oxidized, surfaces friable.	Partial separation, rock is friable; in semiarid conditions granitics are disaggregated.	Texture altered by chemical disintegration (hydration, argillation).	Leaching of soluble minerals may be complete.	Dull sound when struck with hammer, usually can be broken with moderate to heavy manual pressure or by light hammer blow without reference to planes of weakness such as incipient or hairline fractures, or veinlets. Rock is significantly weakened.
Decomposed	Discolored or oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe-Mg minerals are completely altered to clay.		Complete separation of grain boundaries (disaggregated).	Resembles a soil, partial or complete remnant rock structure may be preserved; leaching of soluble minerals usually complete.		Can be granulated by hand. Resistant minerals such as quartz may be present as "stringers" or "dikes."

Combination descriptors (such as "slightly weathered to fresh") are permissible where equal distribution of both weathering characteristics is present over significant intervals or where characteristics present are "in between" the diagnostic feature. However, combination descriptors should not be used where significant, identifiable zones can be delineated. Only two adjacent descriptors may be combined. "Very intensely weathered" is the combination descriptor for "intensely weathered to decomposed."

ROCK LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "437R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 3 OF 4
NAME:	CHECKED BY: G. CUSTENBORDER	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER	CU 11275 EA 2T0401	DISREGARD PRINTS BEARING EARLIER REVISION DATES →	REVISION DATES: 10/14/08, 3/9/09

OGS CIVIL LOG OF TEST BORINGS SHEET

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

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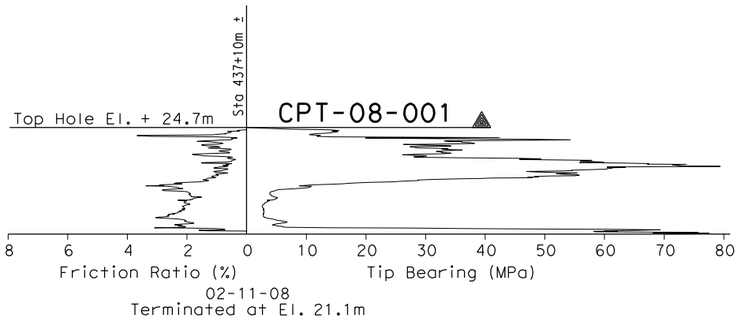
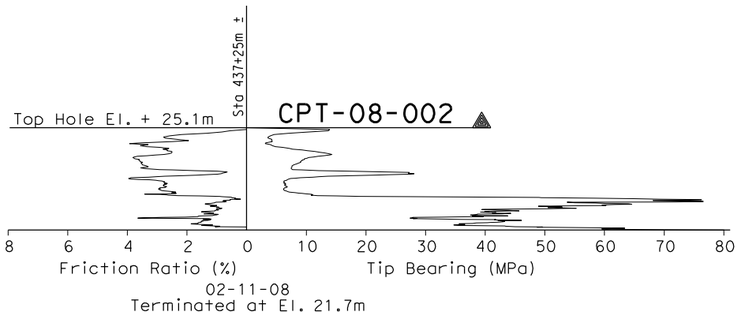
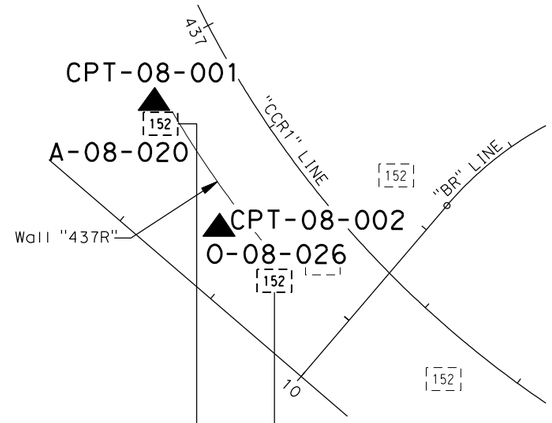
DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:20:13 PM
USERNAME => mporonjae

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.

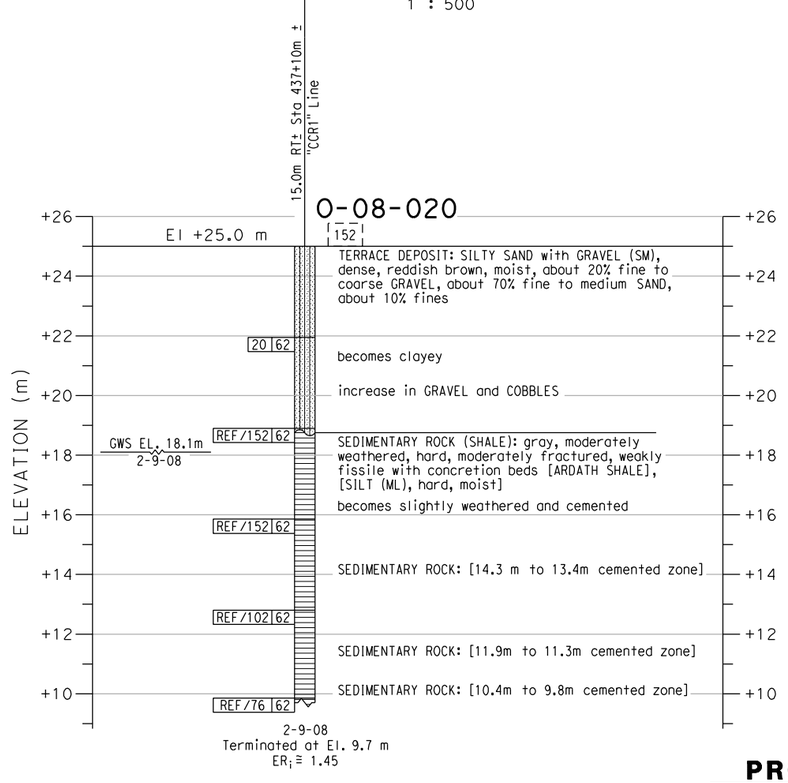


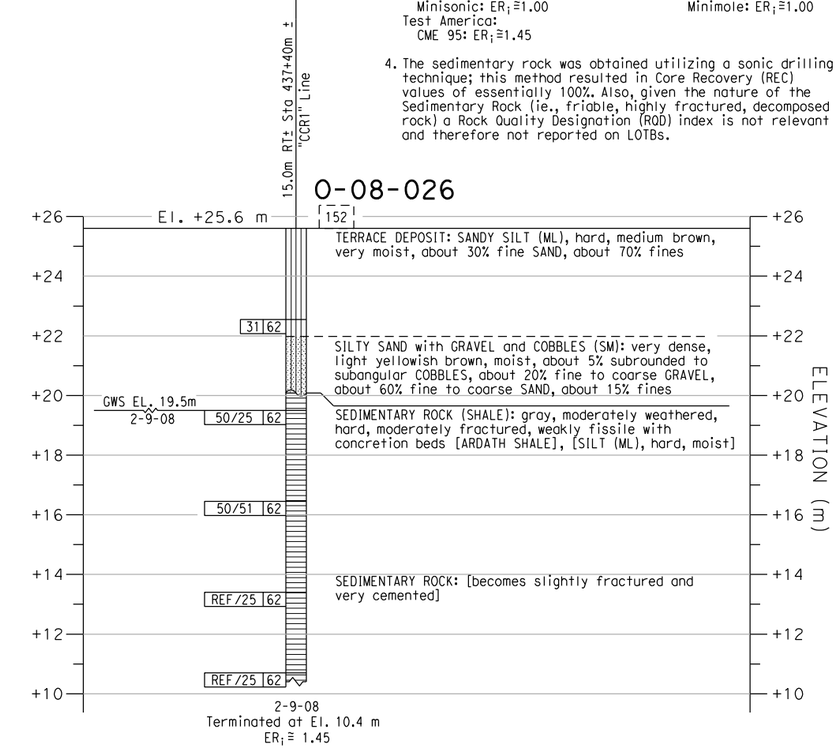


CONE PENETRATION TEST (CPT) SOUNDINGS



PLAN
1 : 500





PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.
2. Automatic trip and safety hammer systems consisting of hammer weight of 62.5 kg falling a distance of 762 mm were used to advance the drive samplers in accordance with ASTM D1586.
3. The average hammer energy ratio (ER_i) reflects the percentage efficiency of SPT blowcounts (N-value). The estimated ER_i for the various drilling equipment used was as follows:
   Boart Longyear:
   Longyear 1405: $ER_i \cong 1.45$
   Prosonic Track Mounted: $ER_i \cong 1.00$
   Prosonic 1: $ER_i \cong 1.45$
   Minisonic: $ER_i \cong 1.00$
   Pacific Drilling:
   Unimog: $ER_i \cong 1.27$
   Mole: $ER_i \cong 1.00$
   Minimole: $ER_i \cong 1.00$
   Test America:
   CME 95: $ER_i \cong 1.45$
4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (ROD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "437R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS		DESIGN BRANCH	POST MILES	LOG OF TEST BORINGS SHEET NO. 4 OF 4
NAME:	CHECKED BY: G. CUSTENBORDER	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		KP43.2/PM26.8	
OGS CIVIL LOG OF TEST BORINGS SHEET	ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS 0 10 20 30 40 50 60 70 80 90 100		CU 11275 EA 2T0401	DISREGARD PRINTS BEARING EARLIER REVISION DATES	REVISION DATES 10/14/08 3/9/09 — SHEET OF

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USERNAME => mporonjoe DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:20:23 PM

APPENDIX I.10.2

TYPE I WALL 438L LOTBs

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

GROUP SYMBOLS AND NAMES

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

FIELD AND LABORATORY TESTING

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

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SAN DIEGO, CA. 92111

APPARENT DENSITY OF COHESIONLESS SOILS

Description	SPT N_{60} (Blows / 300 mm)
Very loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE

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

PERCENT OR PROPORTION OF SOILS

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

PARTICLE SIZE

Description		Size
Boulder		> 300 mm
Cobble		76 mm to 300 mm
Gravel	Coarse	19 mm to 76 mm
	Fine	No. 4 to 19 mm
Sand	Coarse	No. 10 to No. 4
	Medium	No. 40 to No. 10
	Fine	No. 200 to No. 40

SOIL LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "438L" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 1 OF 4
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401	DISREGARD PRINTS BEARING EARLIER REVISION DATES →	REVISION DATES: 10/14/08, 3/9/09 — SHEET — OF

OGS CIVIL LOG OF TEST BORINGS SHEET

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USERNAME => mporonjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:21:14 PM

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

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CEMENTATION

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

BOREHOLE IDENTIFICATION

Symbol	Hole Type	Description
Size	A	Auger Boring
Size	R P	Rotary drilled boring Rotary percussion boring (air)
Size	R	Rotary drilled diamond core
Size	HD HA	Hand driven (25 mm soil tube) Hand Auger
●	D	Dynamic Cone Penetration Boring
▲	CPT	Cone Penetration Test (ASTM D 5778-95)
[ ]	O	Other

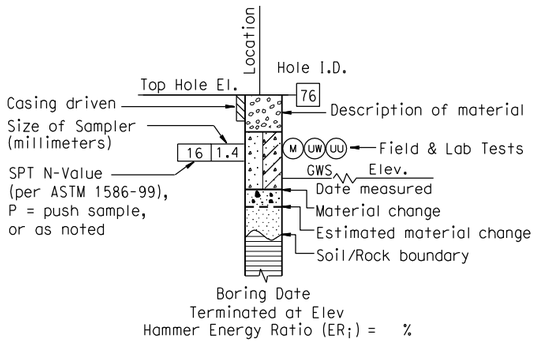
Note: Size in millimeters.

CONSISTENCY OF COHESIVE SOILS

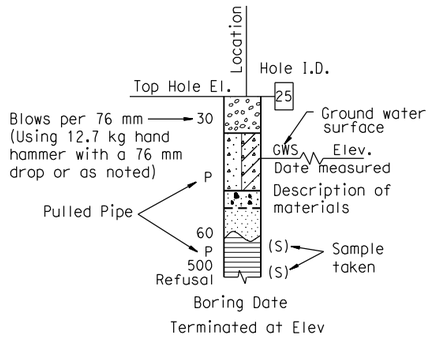
Description	Unconfined Compressive Strength (tsm)	Pocket Penetrometer Measurement (tsm)	Torvane Measurement (tsm)	Field Approximation
Very Soft	< 24	< 24	< 12	Easily penetrated several inches by fist
Soft	24 to 48	24 to 48	12 to 24	Easily penetrated several inches by thumb
Medium Stiff	48 to 96	48 to 96	24 to 48	Penetrated several inches by thumb with moderate effort
Stiff	96 to 192	96 to 192	48 to 96	Readily indented by thumb but penetrated only with great effort
Very Stiff	192 to 383	192 to 383	96 to 192	Readily indented by thumbnail
Hard	> 383	> 383	> 192	Indented by thumbnail with difficulty

PLASTICITY OF FINE-GRAINED SOILS

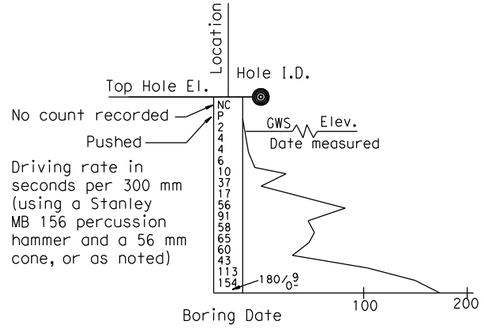
Description	Criteria
Nonplastic	A 3 mm thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.



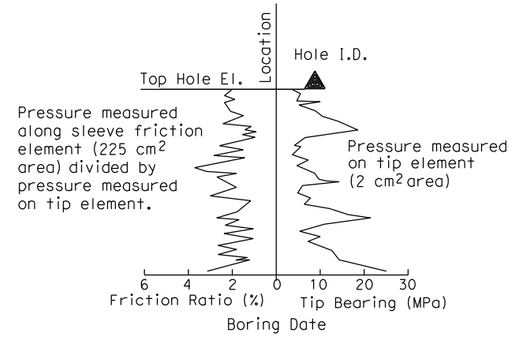
ROTARY BORING



HAND BORING



DYNAMIC CONE PENETRATION BORING



CONE PENETRATION TEST (CPT) SOUNDING

SOIL LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "438L" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 2 OF 4
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES									SHEET	OF
10/14/08	3/9/09									

FILE => MRW12.dgn

USERNAME => mparcinjape DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:21:23 PM

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

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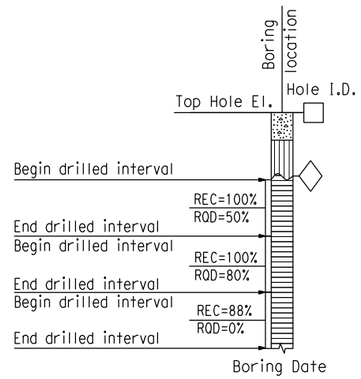
SAN DIEGO, CA. 92111

PERCENT CORE RECOVERY (REC) & ROCK QUALITY DESIGNATION (RQD)

$$REC = \frac{\sum \text{Length of the recovered core pieces}}{\text{Total length of core run}} \times 100\%$$

$$RQD = \frac{\sum \text{Length of intact core pieces} \geq 100\ mm}{\text{Total length of core run}} \times 100\%$$



RELATIVE STRENGTH OF INTACT ROCK

Term	Uniaxial Compressive Strength (MPa)
Extremely Strong	> 207
Very Strong	100 - 207
Strong	49 - 100
Medium Strong	25 - 49
Weak	5 - 25
Very Weak	1 - 5
Extremely Weak	< 1

BEDDING SPACING

Description	Thickness / Spacing
Massive	Greater than 3 m
Very thickly bedded	1 m to 3 m
Thickly bedded	300 mm to 1 m
Moderately bedded	100 mm to 300 mm
Thinly bedded	30 mm to 100 mm
Very thinly bedded	10 mm to 30 mm
Laminated	Less than 10 mm

LEGEND OF ROCK MATERIALS

- IGNEOUS ROCK
- SEDIMENTARY ROCK
- METAMORPHIC ROCK

ROCK HARDNESS

Description	Criteria
Extremely Hard	Specimen cannot be scratched with a pocket knife or sharp pick; can only be chipped with repeated heavy hammer blows.
Very Hard	Specimen cannot be scratched with a pocket knife or sharp pick. Breaks with repeated heavy hammer blows.
Hard	Specimen can be scratched with a pocket knife or sharp pick with difficulty (heavy pressure). Heavy hammer blows required to break specimen.
Moderately Hard	Specimen can be scratched with pocket knife or sharp pick with light or moderate pressure. Core breaks with moderate hammer pressure.
Moderately Soft	Specimen can be grooved 5 mm deep with a pocket knife or sharp pick with moderate or heavy pressure. Breaks with light hammer blow or heavy manual pressure.
Soft	Specimen can be grooved or gouged easily by a pocket knife or sharp pick with light pressure, can be scratched with fingernail. Breaks with light to moderate manual pressure.
Very Soft	Specimen can be readily indented, grooved or gouged with fingernail, or carved with a pocket knife. Breaks with light manual pressure.

FRACTURE DENSITY

Description	Observed Fracture Density
Unfractured	No fractures.
Very slightly fractured	Lengths greater than 1 m.
Slightly fractured	Lengths from 300 mm to 1000 mm with few lengths less than 300 mm or greater than 1000 mm.
Moderately fractured	Lengths mostly in 100 mm to 300 mm range with most lengths about 200 mm.
Intensely fractured	Lengths average from 30 mm to 100 mm with scattered fragmented intervals with lengths less than 100 mm.
Very intensely fractured	Mostly chips and fragments with a few scattered short core lengths.

Combination descriptors (such as "Very intensely to intensely fractured") are used where equal distribution of both fracture density characteristics is present over a significant interval or exposure, or where characteristics are "in between" the descriptor definitions. Only two adjacent descriptors may be combined.

WEATHERING DESCRIPTORS FOR INTACT ROCK

Description	Diagnostic features: Chemical Weathering-Discoloration and/or oxidation — Body of Rock	Diagnostic features: Chemical Weathering-Discoloration and/or oxidation — Fracture Surfaces	Diagnostic features: Mechanical Weathering-Grain boundary conditions (disaggregation) primarily for granitics and some coarse-grained sediments	Diagnostic features: Texture and Solutioning — Texture	Diagnostic features: Texture and Solutioning — Solutioning	General Characteristics
Fresh	No discoloration, not oxidized.	No discoloration or oxidation.	No separation, intact (tight).	No change.	No solutioning.	Hammer rings when crystalline rocks are struck.
Slightly Weathered	Discoloration or oxidation is limited to surface of, or short distance from, fractures; some feldspar crystals are dull.	Minor to complete discoloration or oxidation of most surfaces.	No visible separation, intact (tight).	Preserved.	Minor leaching of some soluble minerals may be noted.	Hammer rings when crystalline rocks are struck. Body of rock not weakened.
Moderately Weathered	Discoloration or oxidation extends from fractures usually throughout; Fe-Mg minerals are "rusty," feldspar crystals are "cloudy."	All fracture surfaces are discolored or oxidized.	Partial separation of boundaries visible.	Generally preserved.	Soluble minerals may be mostly leached.	Hammer does not ring when rock is struck. Body of rock is slightly weakened.
Intensely Weathered	Discoloration or oxidation throughout; all feldspars and Fe-Mg minerals are altered to clay to some extent; or chemical alteration produces in-situ disaggregation, see grain boundary conditions.	All fracture surfaces are discolored or oxidized, surfaces friable.	Partial separation, rock is friable; in semiarid conditions granitics are disaggregated.	Texture altered by chemical disintegration (hydration, argillation).	Leaching of soluble minerals may be complete.	Dull sound when struck with hammer, usually can be broken with moderate to heavy manual pressure or by light hammer blow without reference to planes of weakness such as incipient or hairline fractures, or veinlets. Rock is significantly weakened.
Decomposed	Discolored or oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe-Mg minerals are completely altered to clay.		Complete separation of grain boundaries (disaggregated).	Resembles a soil, partial or complete remnant rock structure may be preserved; leaching of soluble minerals usually complete.		Can be granulated by hand. Resistant minerals such as quartz may be present as "stringers" or "dikes."

Combination descriptors (such as "slightly weathered to fresh") are permissible where equal distribution of both weathering characteristics is present over significant intervals or where characteristics present are "in between" the diagnostic feature. However, combination descriptors should not be used where significant, identifiable zones can be delineated. Only two adjacent descriptors may be combined. "Very intensely weathered" is the combination descriptor for "intensely weathered to decomposed."

ROCK LEGEND

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "438L" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 3 OF 4
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401	DISREGARD PRINTS BEARING EARLIER REVISION DATES →	REVISION DATES: 10/14/08, 3/9/09; SHEET OF

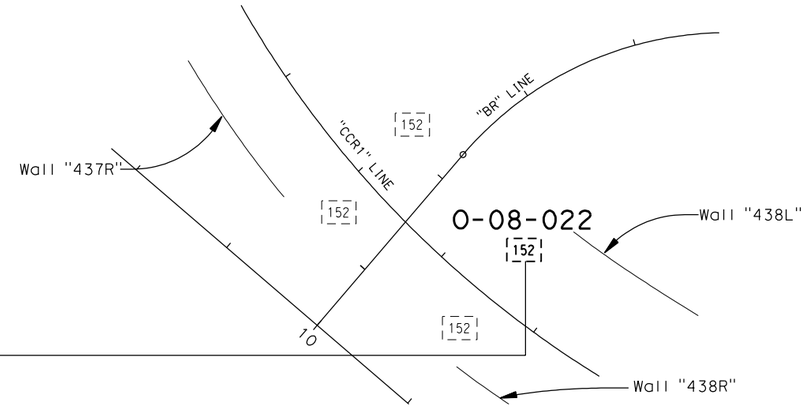
OGS CIVIL LOG OF TEST BORINGS SHEET

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

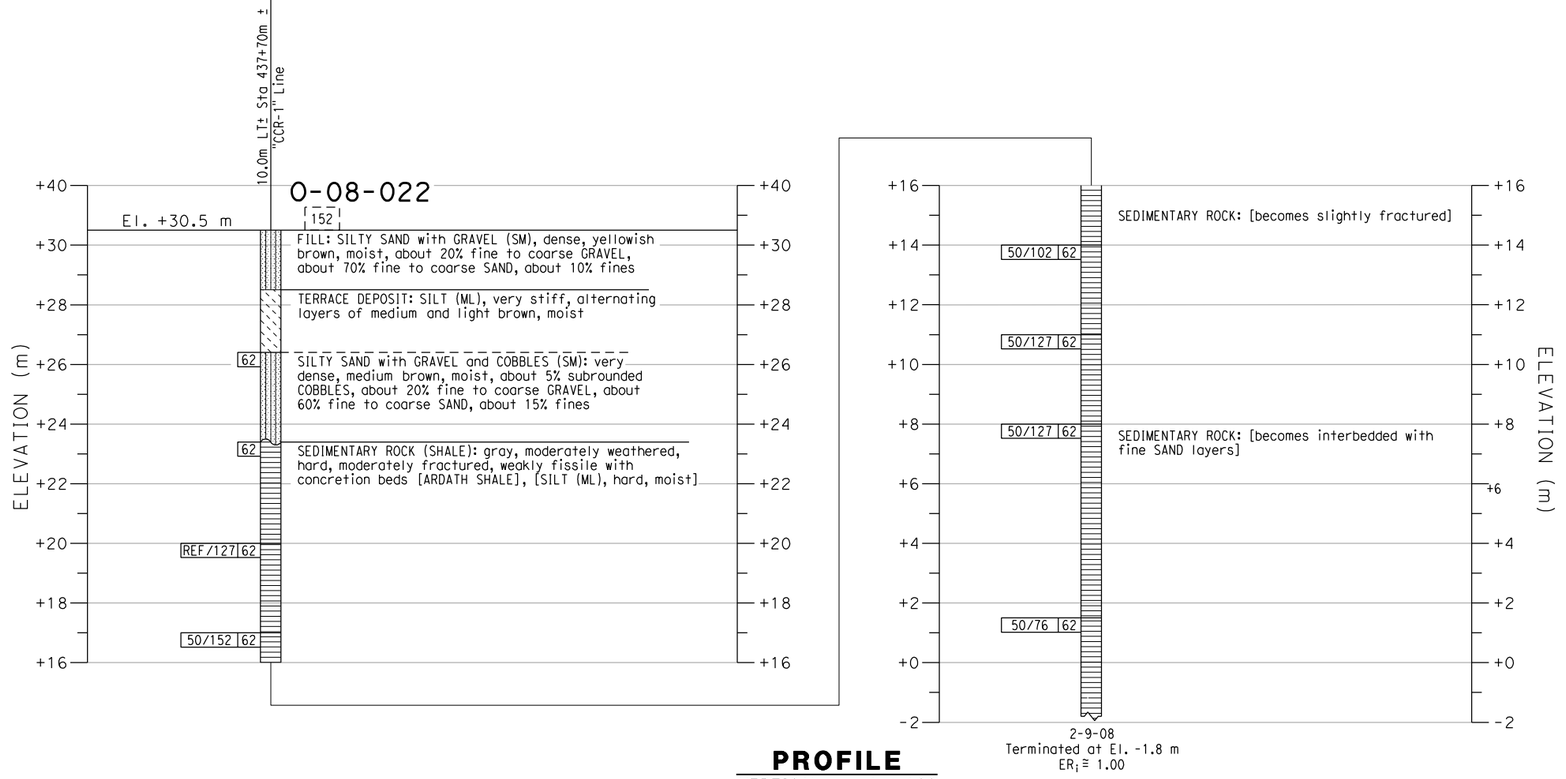
FILE => MRW13.dgn

USERNAME => mporonjae DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:21:32 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
1 : 500



PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

Caltrans Metric

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SAN DIEGO, CA. 92111

NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.
2. Automatic trip and safety hammer systems consisting of hammer weight of 62.5 kg falling a distance of 762 mm were used to advance the drive samplers in accordance with ASTM D1586.
3. The average hammer energy ratio (ER$_i$) reflects the percentage efficiency of SPT blowcounts (N-value). The estimated ER$_i$ for the various drilling equipment used was as follows:
   Boart Longyear:
   Longyear 1405: ER$_i$≅1.45
   Prosonic Track Mounted: ER$_i$≅1.00
   Prosonic 1: ER$_i$≅1.45
   Minisonic: ER$_i$≅1.00
   Test America:
   CME 95: ER$_i$≅1.45
   Pacific Drilling:
   Unimog: ER$_i$≅1.27
   Mole: ER$_i$≅1.00
   Minimole: ER$_i$≅1.00
4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (RQD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "438L" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 4 OF 4
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401		

OGS CIVIL LOG OF TEST BORINGS SHEET

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: 10/14/08, 3/9/09

SHEET OF

FILE => MRW14.dgn

USERNAME => mparanjape DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:21:42 PM

APPENDIX I.10.3

TYPE I WALL 438R LOTBs

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

GROUP SYMBOLS AND NAMES

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

FIELD AND LABORATORY TESTING

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

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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7895 CONVOY CT.
SAN DIEGO, CA. 92111

APPARENT DENSITY OF COHESIONLESS SOILS

Description	SPT N_{60} (Blows / 300 mm)
Very loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE

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

PERCENT OR PROPORTION OF SOILS

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

PARTICLE SIZE

Description		Size
Boulder		> 300 mm
Cobble		76 mm to 300 mm
Gravel	Coarse	19 mm to 76 mm
	Fine	No. 4 to 19 mm
Sand	Coarse	No. 10 to No. 4
	Medium	No. 40 to No. 10
	Fine	No. 200 to No. 40

SOIL LEGEND

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "438R"
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	MISCELLANEOUS RETAINING WALLS
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401		LOG OF TEST BORINGS SHEET NO. 1 OF 6

OGS CIVIL LOG OF TEST BORINGS SHEET

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: 10/14/08 | 3/9/09 | SHEET | OF

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

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REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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CEMENTATION

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

BOREHOLE IDENTIFICATION

Symbol	Hole Type	Description
Size	A	Auger Boring
Size	R P	Rotary drilled boring Rotary percussion boring (air)
Size	R	Rotary drilled diamond core
Size	HD HA	Hand driven (25 mm soil tube) Hand Auger
●	D	Dynamic Cone Penetration Boring
▲	CPT	Cone Penetration Test (ASTM D 5778-95)
[ ]	O	Other

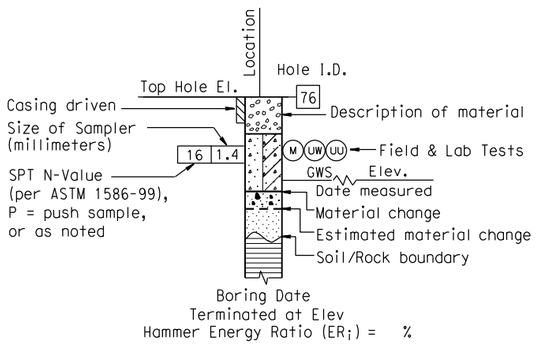
Note: Size in millimeters.

CONSISTENCY OF COHESIVE SOILS

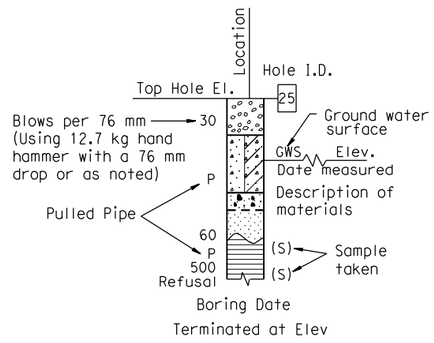
Description	Unconfined Compressive Strength (tsm)	Pocket Penetrometer Measurement (tsm)	Torvane Measurement (tsm)	Field Approximation
Very Soft	< 24	< 24	< 12	Easily penetrated several inches by fist
Soft	24 to 48	24 to 48	12 to 24	Easily penetrated several inches by thumb
Medium Stiff	48 to 96	48 to 96	24 to 48	Penetrated several inches by thumb with moderate effort
Stiff	96 to 192	96 to 192	48 to 96	Readily indented by thumb but penetrated only with great effort
Very Stiff	192 to 383	192 to 383	96 to 192	Readily indented by thumbnail
Hard	> 383	> 383	> 192	Indented by thumbnail with difficulty

PLASTICITY OF FINE-GRAINED SOILS

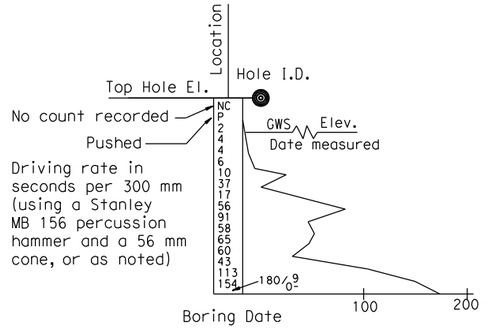
Description	Criteria
Nonplastic	A 3 mm thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.



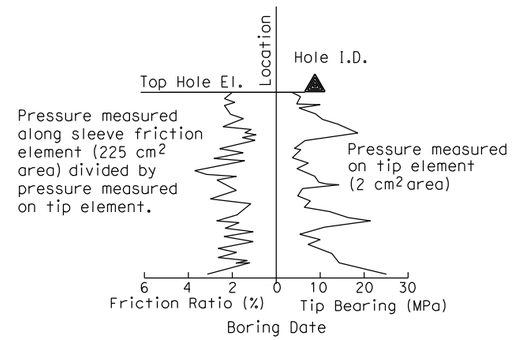
ROTARY BORING



HAND BORING



DYNAMIC CONE PENETRATION BORING



CONE PENETRATION TEST (CPT) SOUNDING

SOIL LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "438R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 2 OF 6
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES		SHEET	OF
10/14/08	3/9/09		

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

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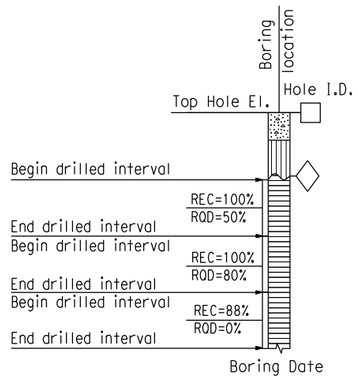
PERCENT CORE RECOVERY (REC) & ROCK QUALITY DESIGNATION (RQD)

$$REC = \frac{\sum \text{Length of the recovered core pieces}}{\text{Total length of core run}} \times 100\%$$

$$RQD = \frac{\sum \text{Length of intact core pieces} \geq 100\ mm}{\text{Total length of core run}} \times 100\%$$



RELATIVE STRENGTH OF INTACT ROCK

Term	Uniaxial Compressive Strength (MPa)
Extremely Strong	> 207
Very Strong	100 - 207
Strong	49 - 100
Medium Strong	25 - 49
Weak	5 - 25
Very Weak	1 - 5
Extremely Weak	< 1

BEDDING SPACING

Description	Thickness / Spacing
Massive	Greater than 3 m
Very thickly bedded	1 m to 3 m
Thickly bedded	300 mm to 1 m
Moderately bedded	100 mm to 300 mm
Thinly bedded	30 mm to 100 mm
Very thinly bedded	10 mm to 30 mm
Laminated	Less than 10 mm

LEGEND OF ROCK MATERIALS

- IGNEOUS ROCK
- SEDIMENTARY ROCK
- METAMORPHIC ROCK

ROCK HARDNESS

Description	Criteria
Extremely Hard	Specimen cannot be scratched with a pocket knife or sharp pick; can only be chipped with repeated heavy hammer blows.
Very Hard	Specimen cannot be scratched with a pocket knife or sharp pick. Breaks with repeated heavy hammer blows.
Hard	Specimen can be scratched with a pocket knife or sharp pick with difficulty (heavy pressure). Heavy hammer blows required to break specimen.
Moderately Hard	Specimen can be scratched with pocket knife or sharp pick with light or moderate pressure. Core breaks with moderate hammer pressure.
Moderately Soft	Specimen can be grooved 5 mm deep with a pocket knife or sharp pick with moderate or heavy pressure. Breaks with light hammer blow or heavy manual pressure.
Soft	Specimen can be grooved or gouged easily by a pocket knife or sharp pick with light pressure, can be scratched with fingernail. Breaks with light to moderate manual pressure.
Very Soft	Specimen can be readily indented, grooved or gouged with fingernail, or carved with a pocket knife. Breaks with light manual pressure.

FRACTURE DENSITY

Description	Observed Fracture Density
Unfractured	No fractures.
Very slightly fractured	Lengths greater than 1 m.
Slightly fractured	Lengths from 300 mm to 1000 mm with few lengths less than 300 mm or greater than 1000 mm.
Moderately fractured	Lengths mostly in 100 mm to 300 mm range with most lengths about 200 mm.
Intensely fractured	Lengths average from 30 mm to 100 mm with scattered fragmented intervals with lengths less than 100 mm.
Very intensely fractured	Mostly chips and fragments with a few scattered short core lengths.

Combination descriptors (such as "Very intensely to intensely fractured") are used where equal distribution of both fracture density characteristics is present over a significant interval or exposure, or where characteristics are "in between" the descriptor definitions. Only two adjacent descriptors may be combined.

WEATHERING DESCRIPTORS FOR INTACT ROCK

Description	Diagnostic features: Chemical Weathering-Discoloration and/or oxidation — Body of Rock	Diagnostic features: Chemical Weathering-Discoloration and/or oxidation — Fracture Surfaces	Diagnostic features: Mechanical Weathering-Grain boundary conditions (disaggregation) primarily for granitics and some coarse-grained sediments	Diagnostic features: Texture and Solutioning — Texture	Diagnostic features: Texture and Solutioning — Solutioning	General Characteristics
Fresh	No discoloration, not oxidized.	No discoloration or oxidation.	No separation, intact (tight).	No change.	No solutioning.	Hammer rings when crystalline rocks are struck.
Slightly Weathered	Discoloration or oxidation is limited to surface of, or short distance from, fractures; some feldspar crystals are dull.	Minor to complete discoloration or oxidation of most surfaces.	No visible separation, intact (tight).	Preserved.	Minor leaching of some soluble minerals may be noted.	Hammer rings when crystalline rocks are struck. Body of rock not weakened.
Moderately Weathered	Discoloration or oxidation extends from fractures usually throughout; Fe-Mg minerals are "rusty," feldspar crystals are "cloudy."	All fracture surfaces are discolored or oxidized.	Partial separation of boundaries visible.	Generally preserved.	Soluble minerals may be mostly leached.	Hammer does not ring when rock is struck. Body of rock is slightly weakened.
Intensely Weathered	Discoloration or oxidation throughout; all feldspars and Fe-Mg minerals are altered to clay to some extent; or chemical alteration produces in-situ disaggregation, see grain boundary conditions.	All fracture surfaces are discolored or oxidized, surfaces friable.	Partial separation, rock is friable; in semiarid conditions granitics are disaggregated.	Texture altered by chemical disintegration (hydration, argillation).	Leaching of soluble minerals may be complete.	Dull sound when struck with hammer, usually can be broken with moderate to heavy manual pressure or by light hammer blow without reference to planes of weakness such as incipient or hairline fractures, or veinlets. Rock is significantly weakened.
Decomposed	Discolored or oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe-Mg minerals are completely altered to clay.		Complete separation of grain boundaries (disaggregated).	Resembles a soil, partial or complete remnant rock structure may be preserved; leaching of soluble minerals usually complete.		Can be granulated by hand. Resistant minerals such as quartz may be present as "stringers" or "dikes."

Combination descriptors (such as "slightly weathered to fresh") are permissible where equal distribution of both weathering characteristics is present over significant intervals or where characteristics present are "in between" the diagnostic feature. However, combination descriptors should not be used where significant, identifiable zones can be delineated. Only two adjacent descriptors may be combined. "Very intensely weathered" is the combination descriptor for "intensely weathered to decomposed."

ROCK LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "438R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 3 OF 6
NAME:	CHECKED BY: G. CUSTENBORDER	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER			

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

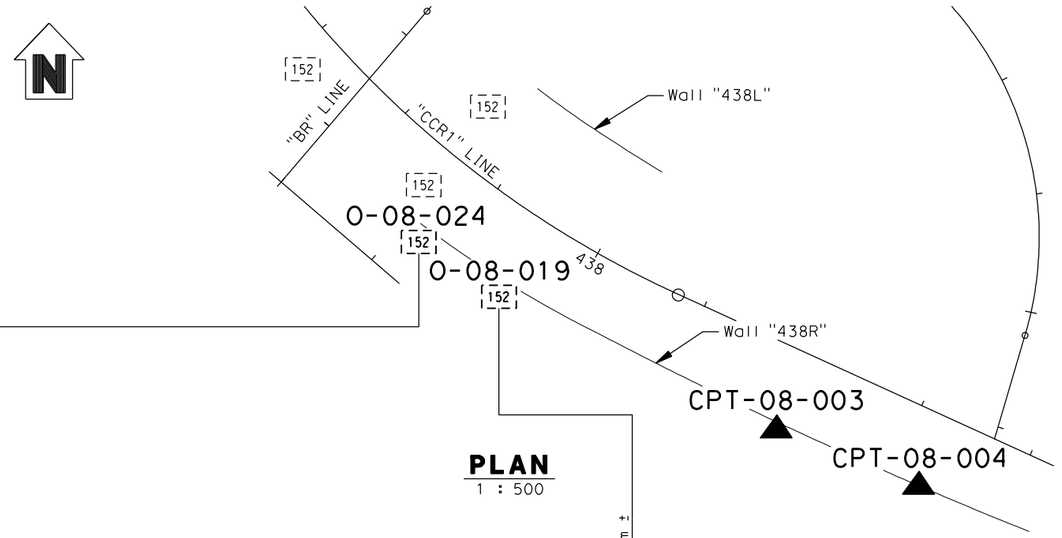
REVISION DATES: 10/14/08, 3/9/09

SHEET OF

FILE => MRW07.dgn

USERNAME => mporonjae DATE PLOTTED => 3/13/2009 TIME PLOTTED => 10:08:03 AM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



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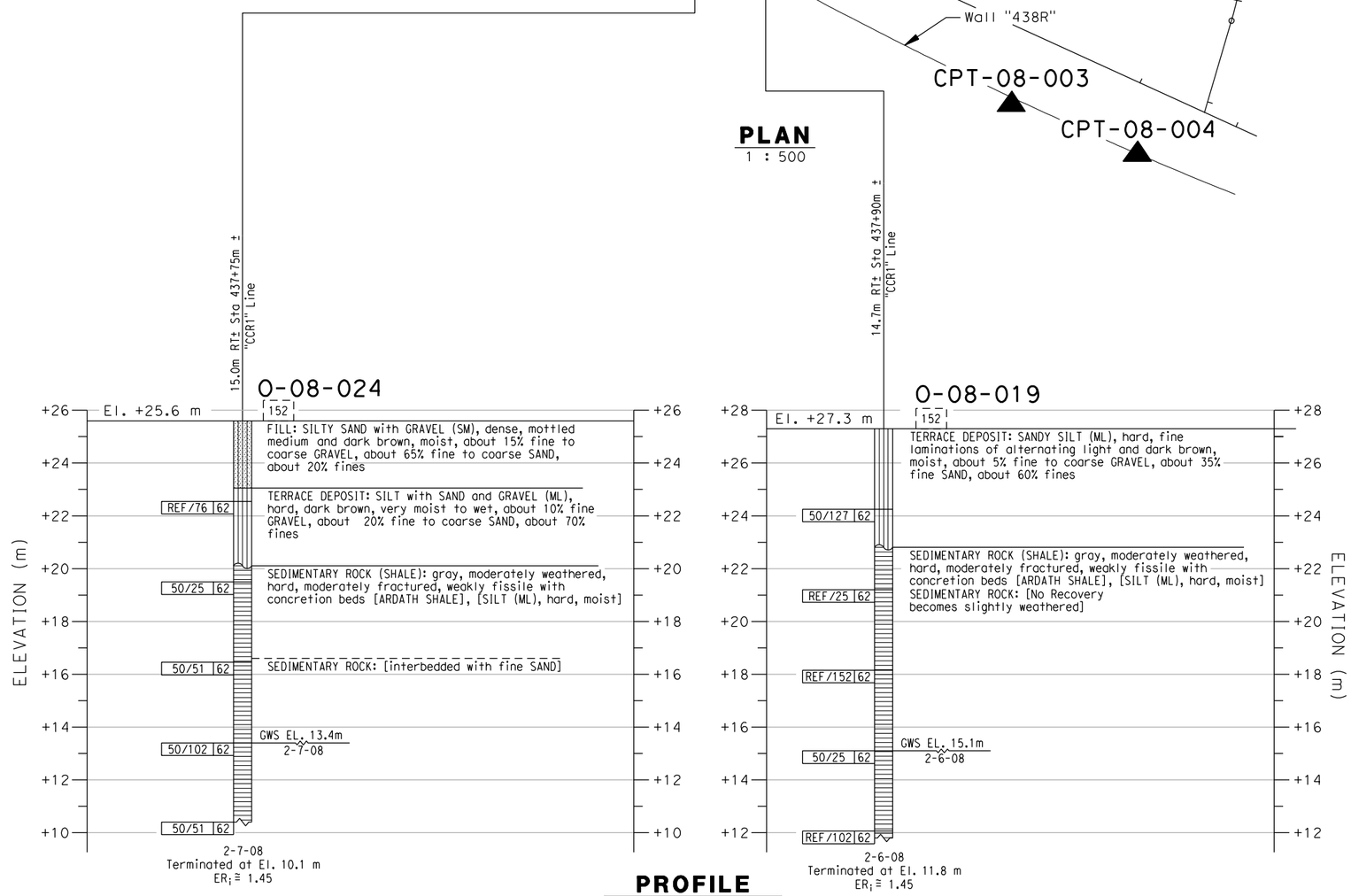
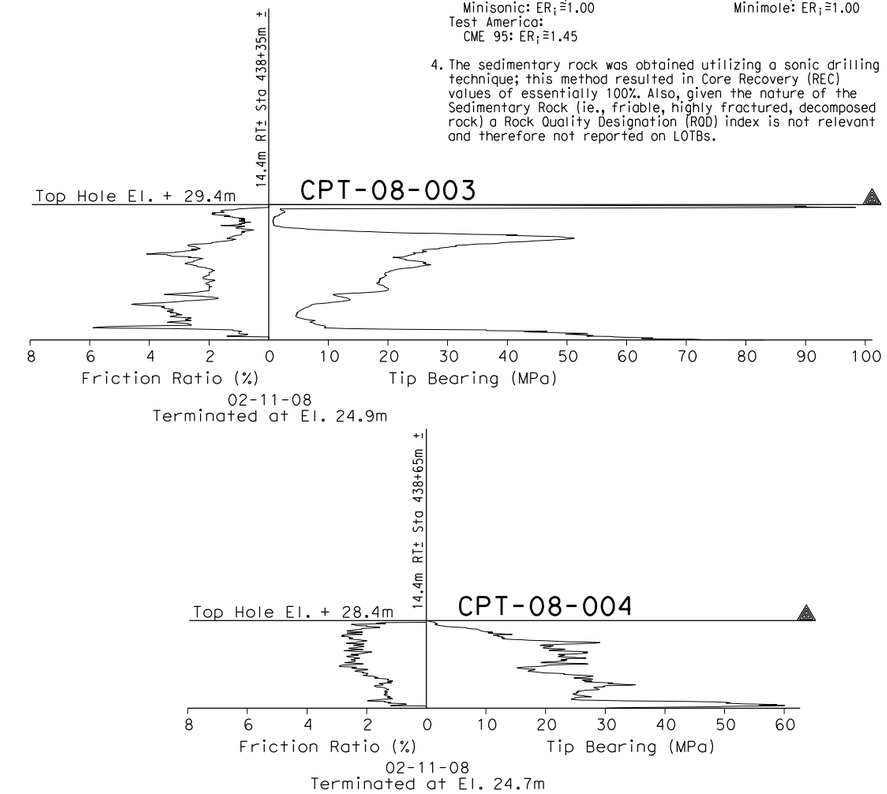


PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500



CONE PENETRATION TEST (CPT) SOUNDINGS

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

Caltrans Metric

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.
2. Automatic trip and safety hammer systems consisting of hammer weight of 62.5 kg falling a distance of 762 mm were used to advance the drive samplers in accordance with ASTM D1586.
3. The average hammer energy ratio (ER$_i$) reflects the percentage efficiency of SPT blowcounts (N-value). The estimated ER$_i$ for the various drilling equipment used was as follows:
   Boart Longyear:
   Longyear 1405: ER$_i$ ≅ 1.45
   Prosonic Track Mounted: ER$_i$ ≅ 1.00
   Prosonic 1: ER$_i$ ≅ 1.45
   Minisonic: ER$_i$ ≅ 1.00
   Test America:
   CME 95: ER$_i$ ≅ 1.45
   Pacific Drilling:
   Unimog: ER$_i$ ≅ 1.27
   Mole: ER$_i$ ≅ 1.00
   Minimole: ER$_i$ ≅ 1.00
4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (RQD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "438R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 4 OF 6
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401		

OGS CIVIL LOG OF TEST BORINGS SHEET

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										SHEET	OF
10/14/08	3/9/09										

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Bench Mark
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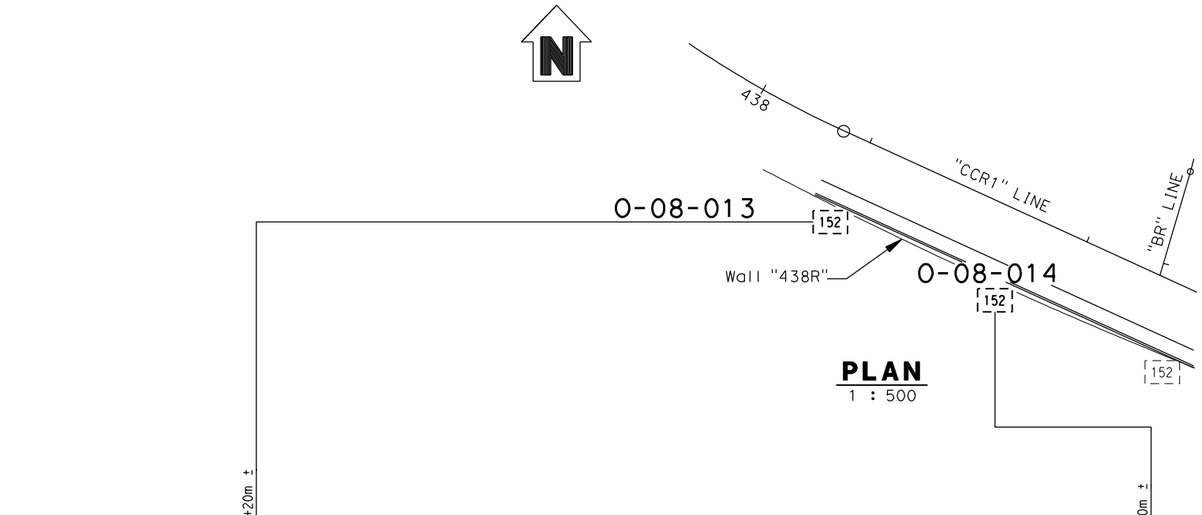

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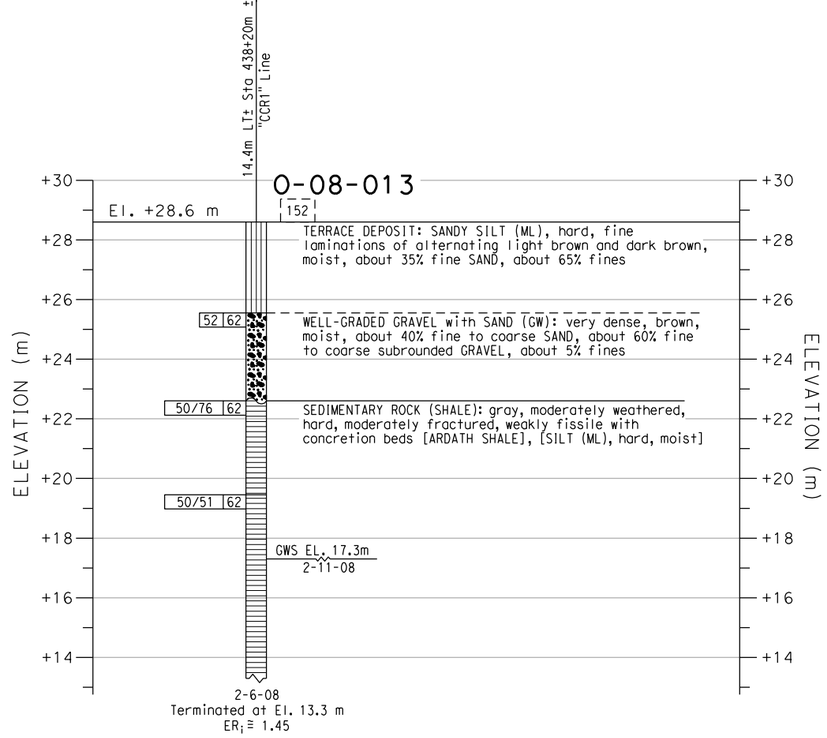

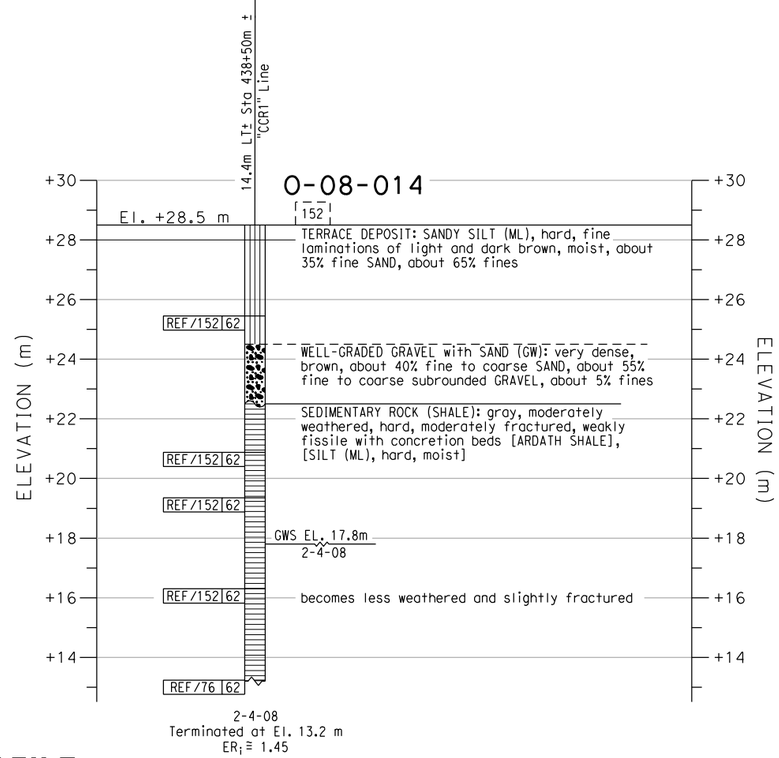

PROFILE
VERTICAL
HORIZONTAL

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

Caltrans Metric

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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7895 CONVOY CT.
SAN DIEGO, CA. 92111

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ENGINEERING SERVICES		GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "438R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER			DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 5 OF 6
NAME:	CHECKED BY: G. CUSTENBORDER						

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES: 10/14/08 | 3/9/09

SHEET OF

FILE => MRW09.dgn

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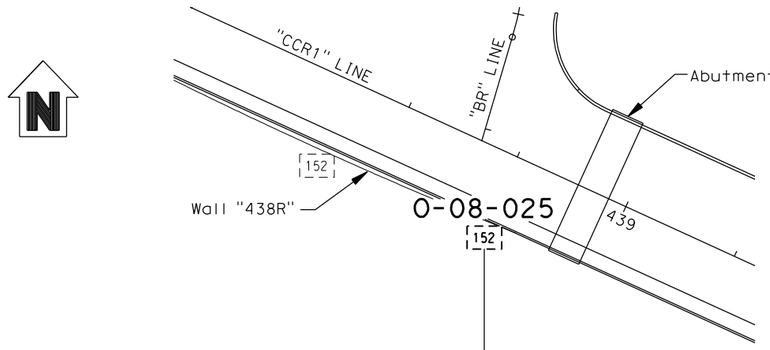
Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



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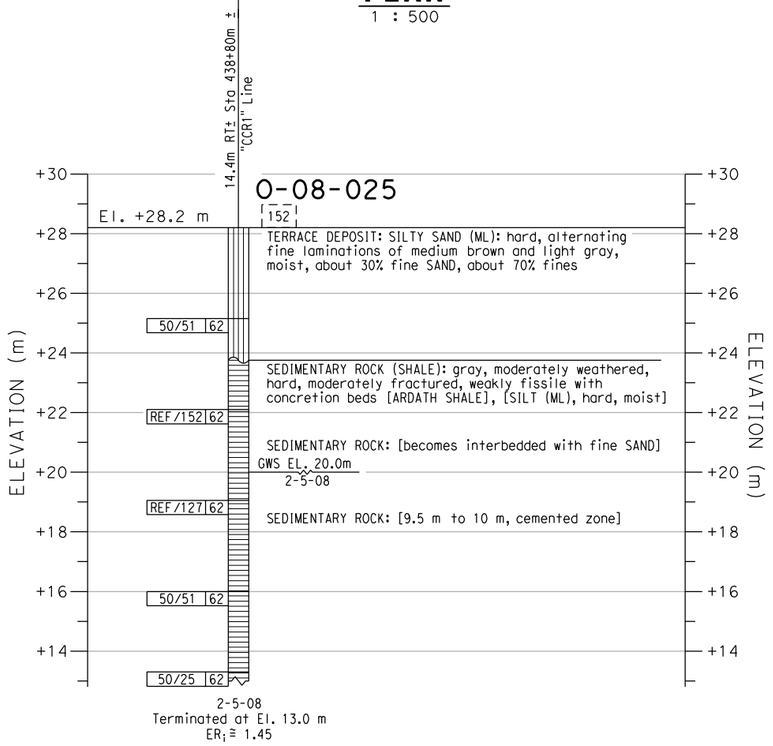

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

NOTES:
1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.
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DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

REGISTERED PROFESSIONAL ENGINEER
VAN OLIN
NO. 2578
EXP. 6-30-10
GEOTECHNICAL
STATE OF CALIFORNIA

PLANS APPROVAL DATE

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ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "438R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 6 OF 6
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES	SHEET	OF
10/14/08		

USERNAME => mporcon|ope DATE PLOTTED => 3/13/2009 TIME PLOTTED => 10:08:24 AM

FILE => MRW10.dgn

APPENDIX I.10.4

TYPE I WALL 443R LOTBs

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

GROUP SYMBOLS AND NAMES

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

FIELD AND LABORATORY TESTING

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

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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7895 CONVOY CT.
SAN DIEGO, CA. 92111

APPARENT DENSITY OF COHESIONLESS SOILS

Description	SPT N_{60} (Blows / 300 mm)
Very loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE

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

PERCENT OR PROPORTION OF SOILS

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

PARTICLE SIZE

Description		Size
Boulder		> 300 mm
Cobble		76 mm to 300 mm
Gravel	Coarse	19 mm to 76 mm
	Fine	No. 4 to 19 mm
Sand	Coarse	No. 10 to No. 4
	Medium	No. 40 to No. 10
	Fine	No. 200 to No. 40

SOIL LEGEND

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "443R"
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	MISCELLANEOUS RETAINING WALLS
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401		LOG OF TEST BORINGS SHEET NO. 1 OF 5

OGS CIVIL LOG OF TEST BORINGS SHEET

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: 10/14/08 | 3/9/09 | SHEET | OF

FILE => MRW15.dgn

USERNAME => mpcronjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:26:26 PM

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
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7895 CONVOY CT.
SAN DIEGO, CA. 92111

CEMENTATION

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

BOREHOLE IDENTIFICATION

Symbol	Hole Type	Description
Size	A	Auger Boring
Size	R P	Rotary drilled boring Rotary percussion boring (air)
Size	R	Rotary drilled diamond core
Size	HD HA	Hand driven (25 mm soil tube) Hand Auger
●	D	Dynamic Cone Penetration Boring
▲	CPT	Cone Penetration Test (ASTM D 5778-95)
[ ]	O	Other

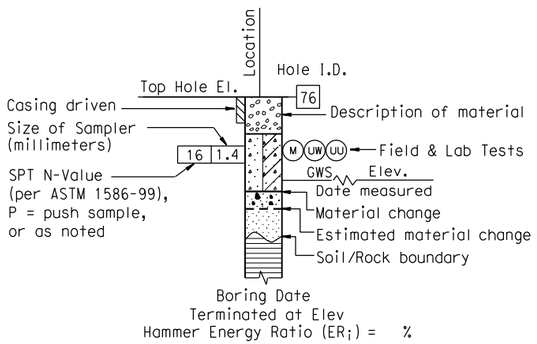
Note: Size in millimeters.

CONSISTENCY OF COHESIVE SOILS

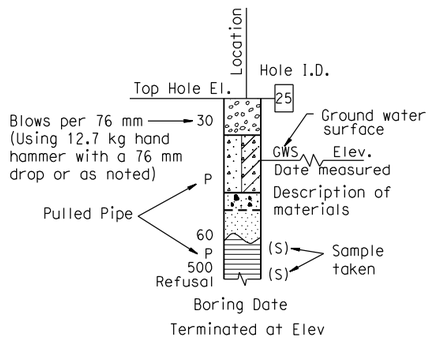
Description	Unconfined Compressive Strength (tsm)	Pocket Penetrometer Measurement (tsm)	Torvane Measurement (tsm)	Field Approximation
Very Soft	< 24	< 24	< 12	Easily penetrated several inches by fist
Soft	24 to 48	24 to 48	12 to 24	Easily penetrated several inches by thumb
Medium Stiff	48 to 96	48 to 96	24 to 48	Penetrated several inches by thumb with moderate effort
Stiff	96 to 192	96 to 192	48 to 96	Readily indented by thumb but penetrated only with great effort
Very Stiff	192 to 383	192 to 383	96 to 192	Readily indented by thumbnail
Hard	> 383	> 383	> 192	Indented by thumbnail with difficulty

PLASTICITY OF FINE-GRAINED SOILS

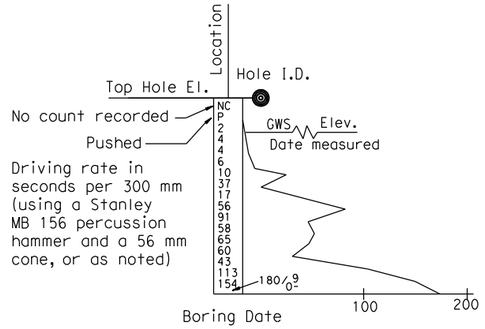
Description	Criteria
Nonplastic	A 3 mm thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.



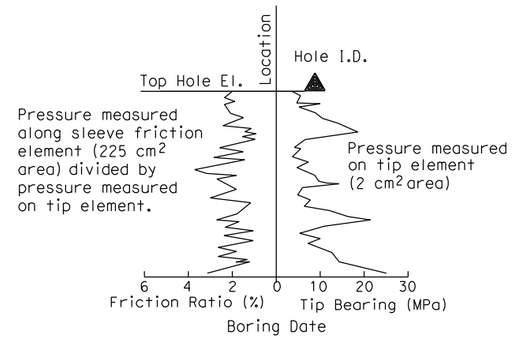
ROTARY BORING



HAND BORING



DYNAMIC CONE PENETRATION BORING



CONE PENETRATION TEST (CPT) SOUNDING

SOIL LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "443R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 2 OF 5
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES		SHEET	OF
10/14/08	3/9/09		

FILE => MRW16.dgn

USERNAME => mparcinjape DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:26:35 PM

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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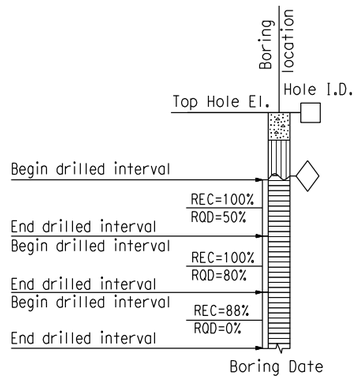
SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

PERCENT CORE RECOVERY (REC) & ROCK QUALITY DESIGNATION (RQD)

$$REC = \frac{\sum \text{Length of the recovered core pieces}}{\text{Total length of core run}} \times 100\%$$

$$RQD = \frac{\sum \text{Length of intact core pieces} \geq 100\ mm}{\text{Total length of core run}} \times 100\%$$



RELATIVE STRENGTH OF INTACT ROCK

Term	Uniaxial Compressive Strength (MPa)
Extremely Strong	> 207
Very Strong	100 - 207
Strong	49 - 100
Medium Strong	25 - 49
Weak	5 - 25
Very Weak	1 - 5
Extremely Weak	< 1

BEDDING SPACING

Description	Thickness / Spacing
Massive	Greater than 3 m
Very thickly bedded	1 m to 3 m
Thickly bedded	300 mm to 1 m
Moderately bedded	100 mm to 300 mm
Thinly bedded	30 mm to 100 mm
Very thinly bedded	10 mm to 30 mm
Laminated	Less than 10 mm

LEGEND OF ROCK MATERIALS

- IGNEOUS ROCK
- SEDIMENTARY ROCK
- METAMORPHIC ROCK

ROCK HARDNESS

Description	Criteria
Extremely Hard	Specimen cannot be scratched with a pocket knife or sharp pick; can only be chipped with repeated heavy hammer blows.
Very Hard	Specimen cannot be scratched with a pocket knife or sharp pick. Breaks with repeated heavy hammer blows.
Hard	Specimen can be scratched with a pocket knife or sharp pick with difficulty (heavy pressure). Heavy hammer blows required to break specimen.
Moderately Hard	Specimen can be scratched with pocket knife or sharp pick with light or moderate pressure. Core breaks with moderate hammer pressure.
Moderately Soft	Specimen can be grooved 5 mm deep with a pocket knife or sharp pick with moderate or heavy pressure. Breaks with light hammer blow or heavy manual pressure.
Soft	Specimen can be grooved or gouged easily by a pocket knife or sharp pick with light pressure, can be scratched with fingernail. Breaks with light to moderate manual pressure.
Very Soft	Specimen can be readily indented, grooved or gouged with fingernail, or carved with a pocket knife. Breaks with light manual pressure.

FRACTURE DENSITY

Description	Observed Fracture Density
Unfractured	No fractures.
Very slightly fractured	Lengths greater than 1 m.
Slightly fractured	Lengths from 300 mm to 1000 mm with few lengths less than 300 mm or greater than 1000 mm.
Moderately fractured	Lengths mostly in 100 mm to 300 mm range with most lengths about 200 mm.
Intensely fractured	Lengths average from 30 mm to 100 mm with scattered fragmented intervals with lengths less than 100 mm.
Very intensely fractured	Mostly chips and fragments with a few scattered short core lengths.

Combination descriptors (such as "Very intensely to intensely fractured") are used where equal distribution of both fracture density characteristics is present over a significant interval or exposure, or where characteristics are "in between" the descriptor definitions. Only two adjacent descriptors may be combined.

WEATHERING DESCRIPTORS FOR INTACT ROCK

Description	Diagnostic features: Chemical Weathering-Discoloration and/or oxidation — Body of Rock	Diagnostic features: Chemical Weathering-Discoloration and/or oxidation — Fracture Surfaces	Diagnostic features: Mechanical Weathering-Grain boundary conditions (disaggregation) primarily for granitics and some coarse-grained sediments	Diagnostic features: Texture and Solutioning — Texture	Diagnostic features: Texture and Solutioning — Solutioning	General Characteristics
Fresh	No discoloration, not oxidized.	No discoloration or oxidation.	No separation, intact (tight).	No change.	No solutioning.	Hammer rings when crystalline rocks are struck.
Slightly Weathered	Discoloration or oxidation is limited to surface of, or short distance from, fractures; some feldspar crystals are dull.	Minor to complete discoloration or oxidation of most surfaces.	No visible separation, intact (tight).	Preserved.	Minor leaching of some soluble minerals may be noted.	Hammer rings when crystalline rocks are struck. Body of rock not weakened.
Moderately Weathered	Discoloration or oxidation extends from fractures usually throughout; Fe-Mg minerals are "rusty," feldspar crystals are "cloudy."	All fracture surfaces are discolored or oxidized.	Partial separation of boundaries visible.	Generally preserved.	Soluble minerals may be mostly leached.	Hammer does not ring when rock is struck. Body of rock is slightly weakened.
Intensely Weathered	Discoloration or oxidation throughout; all feldspars and Fe-Mg minerals are altered to clay to some extent; or chemical alteration produces in-situ disaggregation, see grain boundary conditions.	All fracture surfaces are discolored or oxidized, surfaces friable.	Partial separation, rock is friable; in semiarid conditions granitics are disaggregated.	Texture altered by chemical disintegration (hydration, argillation).	Leaching of soluble minerals may be complete.	Dull sound when struck with hammer, usually can be broken with moderate to heavy manual pressure or by light hammer blow without reference to planes of weakness such as incipient or hairline fractures, or veinlets. Rock is significantly weakened.
Decomposed	Discolored or oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe-Mg minerals are completely altered to clay.		Complete separation of grain boundaries (disaggregated).	Resembles a soil, partial or complete remnant rock structure may be preserved; leaching of soluble minerals usually complete.		Can be granulated by hand. Resistant minerals such as quartz may be present as "stringers" or "dikes."

Combination descriptors (such as "slightly weathered to fresh") are permissible where equal distribution of both weathering characteristics is present over significant intervals or where characteristics present are "in between" the diagnostic feature. However, combination descriptors should not be used where significant, identifiable zones can be delineated. Only two adjacent descriptors may be combined. "Very intensely weathered" is the combination descriptor for "intensely weathered to decomposed."

ROCK LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "443R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 3 OF 5
NAME:	CHECKED BY: G. CUSTENBORDER	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER			

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES: 10/14/08, 3/9/09

SHEET OF

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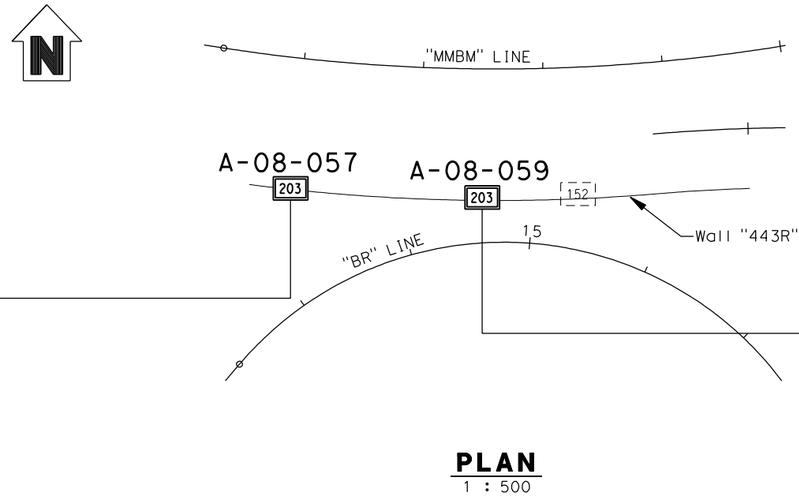
USERNAME => mporonjae DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:26:44 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
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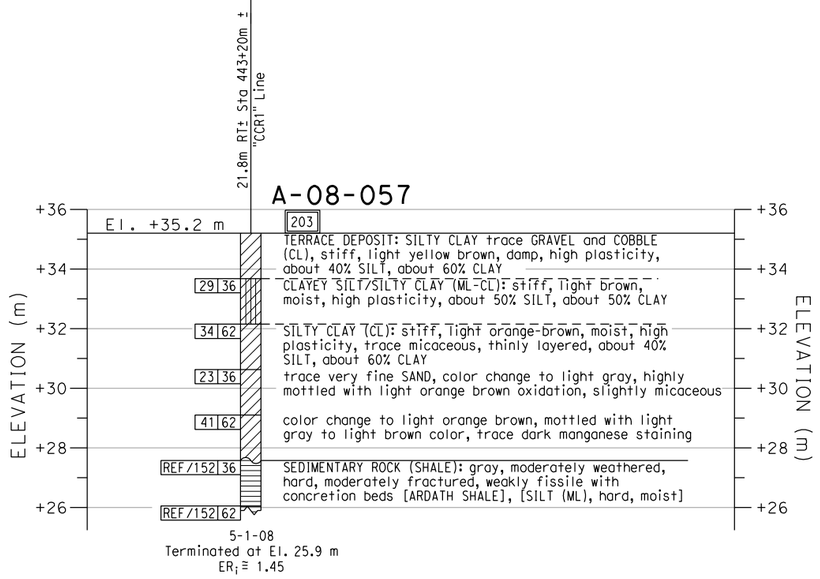

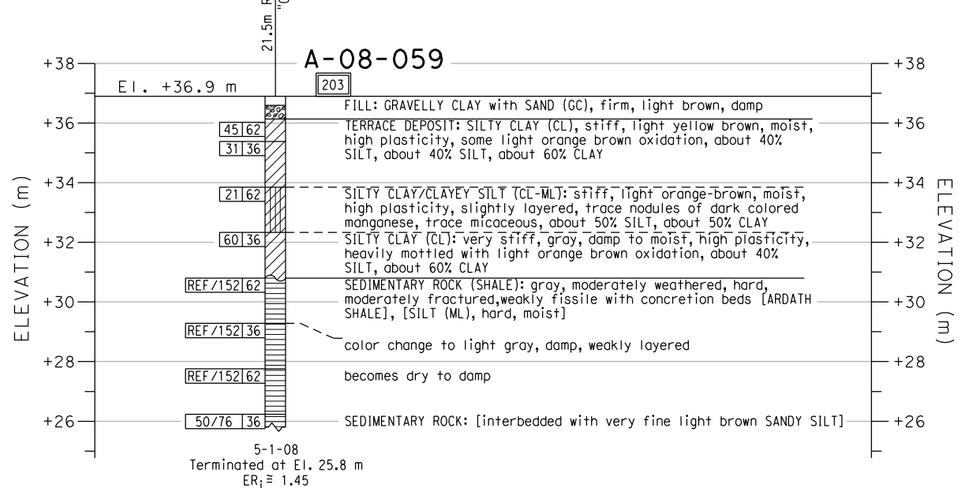

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.
2. Automatic trip and safety hammer systems consisting of hammer weight of 62.5 kg falling a distance of 762 mm were used to advance the drive samplers in accordance with ASTM D1586.
3. The average hammer energy ratio (ER$_i$) reflects the percentage efficiency of SPT blowcounts (N-value). The estimated ER$_i$ for the various drilling equipment used was as follows:
   Boart Longyear:
   Longyear 1405: ER$_i$ ≅ 1.45
   Prosonic Track Mounted: ER$_i$ ≅ 1.00
   Prosonic 1: ER$_i$ ≅ 1.45
   Minisonic: ER$_i$ ≅ 1.00
   Test America:
   CME 95: ER$_i$ ≅ 1.45
   Pacific Drilling:
   Unimog: ER$_i$ ≅ 1.27
   Mole: ER$_i$ ≅ 1.00
   Minimole: ER$_i$ ≅ 1.00
4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (RQD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES		GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "443R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER			DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 4 OF 5
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401			

OGS CIVIL LOG OF TEST BORINGS SHEET

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										SHEET	OF
10/14/08	3/9/09										

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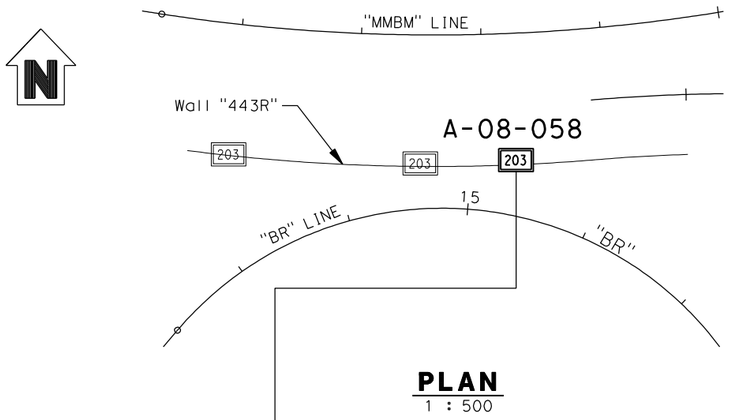
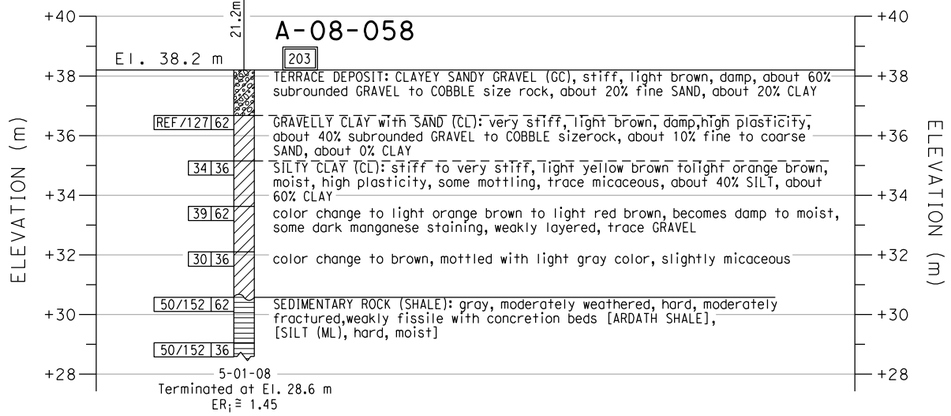
Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
1 : 500



PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

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   Pacific Drilling:
   Unimog: ER$_i$≅1.27
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FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 5 OF 5
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401		

OGS CIVIL LOG OF TEST BORINGS SHEET

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										SHEET	OF
10/14/08	3/9/09										

FILE => MRW19.dgn

USERNAME => mporan/jpe DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:27:01 PM

APPENDIX I.10.5

CRIB WALL 445L LOTBs

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

GROUP SYMBOLS AND NAMES

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

FIELD AND LABORATORY TESTING

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

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SAN DIEGO, CA. 92111

APPARENT DENSITY OF COHESIONLESS SOILS

Description	SPT N_{60} (Blows / 300 mm)
Very loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE

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

PERCENT OR PROPORTION OF SOILS

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

PARTICLE SIZE

Description		Size
Boulder		> 300 mm
Cobble		76 mm to 300 mm
Gravel	Coarse	19 mm to 76 mm
	Fine	No. 4 to 19 mm
Sand	Coarse	No. 10 to No. 4
	Medium	No. 40 to No. 10
	Fine	No. 200 to No. 40

SOIL LEGEND

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "445L" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 1 OF 5
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401	DISREGARD PRINTS BEARING EARLIER REVISION DATES →	REVISION DATES 10/14/08, 3/9/09; SHEET; OF

OGS CIVIL LOG OF TEST BORINGS SHEET

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

FILE => MRW31.dgn

USERNAME => mpcronjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:28:43 PM

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
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BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

CEMENTATION

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

BOREHOLE IDENTIFICATION

Symbol	Hole Type	Description
Size	A	Auger Boring
Size	R P	Rotary drilled boring Rotary percussion boring (air)
Size	R	Rotary drilled diamond core
Size	HD HA	Hand driven (25 mm soil tube) Hand Auger
●	D	Dynamic Cone Penetration Boring
▲	CPT	Cone Penetration Test (ASTM D 5778-95)
[ ]	O	Other

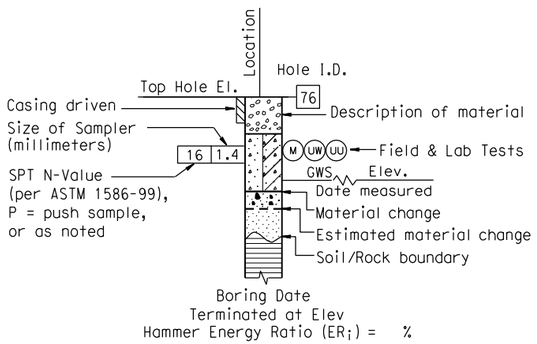
Note: Size in millimeters.

CONSISTENCY OF COHESIVE SOILS

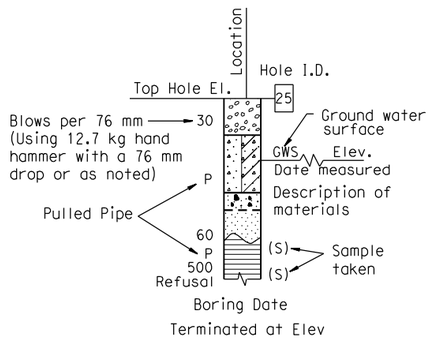
Description	Unconfined Compressive Strength (tsm)	Pocket Penetrometer Measurement (tsm)	Torvane Measurement (tsm)	Field Approximation
Very Soft	< 24	< 24	< 12	Easily penetrated several inches by fist
Soft	24 to 48	24 to 48	12 to 24	Easily penetrated several inches by thumb
Medium Stiff	48 to 96	48 to 96	24 to 48	Penetrated several inches by thumb with moderate effort
Stiff	96 to 192	96 to 192	48 to 96	Readily indented by thumb but penetrated only with great effort
Very Stiff	192 to 383	192 to 383	96 to 192	Readily indented by thumbnail
Hard	> 383	> 383	> 192	Indented by thumbnail with difficulty

PLASTICITY OF FINE-GRAINED SOILS

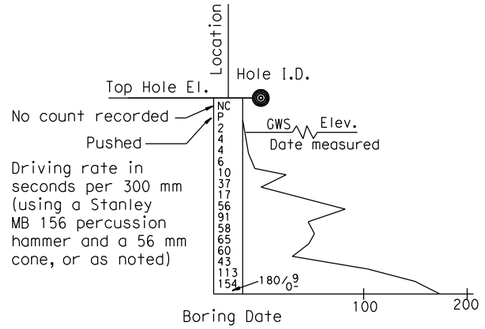
Description	Criteria
Nonplastic	A 3 mm thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.



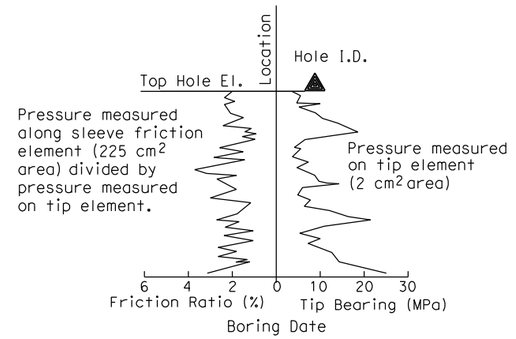
ROTARY BORING



HAND BORING



DYNAMIC CONE PENETRATION BORING



CONE PENETRATION TEST (CPT) SOUNDING

SOIL LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "445L" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 2 OF 5
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES									SHEET	OF
10/14/08	3/9/09									

FILE => MRW32.dgn

USERNAME => mparcinjape DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:28:52 PM

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

Caltrans Metric

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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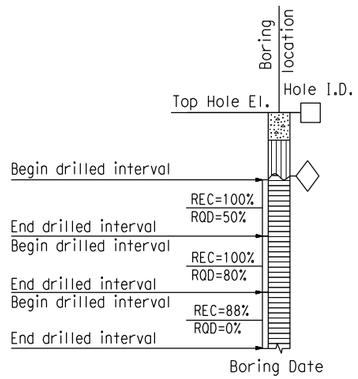
PERCENT CORE RECOVERY (REC) & ROCK QUALITY DESIGNATION (RQD)

$$REC = \frac{\sum \text{Length of the recovered core pieces}}{\text{Total length of core run}} \times 100\%$$

$$RQD = \frac{\sum \text{Length of intact core pieces} \geq 100\ mm}{\text{Total length of core run}} \times 100\%$$



RELATIVE STRENGTH OF INTACT ROCK

Term	Uniaxial Compressive Strength (MPa)
Extremely Strong	> 207
Very Strong	100 - 207
Strong	49 - 100
Medium Strong	25 - 49
Weak	5 - 25
Very Weak	1 - 5
Extremely Weak	< 1

BEDDING SPACING

Description	Thickness / Spacing
Massive	Greater than 3 m
Very thickly bedded	1 m to 3 m
Thickly bedded	300 mm to 1 m
Moderately bedded	100 mm to 300 mm
Thinly bedded	30 mm to 100 mm
Very thinly bedded	10 mm to 30 mm
Laminated	Less than 10 mm

LEGEND OF ROCK MATERIALS

- IGNEOUS ROCK
- SEDIMENTARY ROCK
- METAMORPHIC ROCK

ROCK HARDNESS

Description	Criteria
Extremely Hard	Specimen cannot be scratched with a pocket knife or sharp pick; can only be chipped with repeated heavy hammer blows.
Very Hard	Specimen cannot be scratched with a pocket knife or sharp pick. Breaks with repeated heavy hammer blows.
Hard	Specimen can be scratched with a pocket knife or sharp pick with difficulty (heavy pressure). Heavy hammer blows required to break specimen.
Moderately Hard	Specimen can be scratched with pocket knife or sharp pick with light or moderate pressure. Core breaks with moderate hammer pressure.
Moderately Soft	Specimen can be grooved 5 mm deep with a pocket knife or sharp pick with moderate or heavy pressure. Breaks with light hammer blow or heavy manual pressure.
Soft	Specimen can be grooved or gouged easily by a pocket knife or sharp pick with light pressure, can be scratched with fingernail. Breaks with light to moderate manual pressure.
Very Soft	Specimen can be readily indented, grooved or gouged with fingernail, or carved with a pocket knife. Breaks with light manual pressure.

FRACTURE DENSITY

Description	Observed Fracture Density
Unfractured	No fractures.
Very slightly fractured	Lengths greater than 1 m.
Slightly fractured	Lengths from 300 mm to 1000 mm with few lengths less than 300 mm or greater than 1000 mm.
Moderately fractured	Lengths mostly in 100 mm to 300 mm range with most lengths about 200 mm.
Intensely fractured	Lengths average from 30 mm to 100 mm with scattered fragmented intervals with lengths less than 100 mm.
Very intensely fractured	Mostly chips and fragments with a few scattered short core lengths.

Combination descriptors (such as "Very intensely to intensely fractured") are used where equal distribution of both fracture density characteristics is present over a significant interval or exposure, or where characteristics are "in between" the descriptor definitions. Only two adjacent descriptors may be combined.

WEATHERING DESCRIPTORS FOR INTACT ROCK

Description	Diagnostic features: Chemical Weathering-Discoloration and/or oxidation — Body of Rock	Diagnostic features: Chemical Weathering-Discoloration and/or oxidation — Fracture Surfaces	Diagnostic features: Mechanical Weathering-Grain boundary conditions (disaggregation) primarily for granitics and some coarse-grained sediments	Diagnostic features: Texture and Solutioning — Texture	Diagnostic features: Texture and Solutioning — Solutioning	General Characteristics
Fresh	No discoloration, not oxidized.	No discoloration or oxidation.	No separation, intact (tight).	No change.	No solutioning.	Hammer rings when crystalline rocks are struck.
Slightly Weathered	Discoloration or oxidation is limited to surface of, or short distance from, fractures; some feldspar crystals are dull.	Minor to complete discoloration or oxidation of most surfaces.	No visible separation, intact (tight).	Preserved.	Minor leaching of some soluble minerals may be noted.	Hammer rings when crystalline rocks are struck. Body of rock not weakened.
Moderately Weathered	Discoloration or oxidation extends from fractures usually throughout; Fe-Mg minerals are "rusty," feldspar crystals are "cloudy."	All fracture surfaces are discolored or oxidized.	Partial separation of boundaries visible.	Generally preserved.	Soluble minerals may be mostly leached.	Hammer does not ring when rock is struck. Body of rock is slightly weakened.
Intensely Weathered	Discoloration or oxidation throughout; all feldspars and Fe-Mg minerals are altered to clay to some extent; or chemical alteration produces in-situ disaggregation, see grain boundary conditions.	All fracture surfaces are discolored or oxidized, surfaces friable.	Partial separation, rock is friable; in semiarid conditions granitics are disaggregated.	Texture altered by chemical disintegration (hydration, argillation).	Leaching of soluble minerals may be complete.	Dull sound when struck with hammer, usually can be broken with moderate to heavy manual pressure or by light hammer blow without reference to planes of weakness such as incipient or hairline fractures, or veinlets. Rock is significantly weakened.
Decomposed	Discolored or oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe-Mg minerals are completely altered to clay.		Complete separation of grain boundaries (disaggregated).	Resembles a soil, partial or complete remnant rock structure may be preserved; leaching of soluble minerals usually complete.		Can be granulated by hand. Resistant minerals such as quartz may be present as "stringers" or "dikes."

Combination descriptors (such as "slightly weathered to fresh") are permissible where equal distribution of both weathering characteristics is present over significant intervals or where characteristics present are "in between" the diagnostic feature. However, combination descriptors should not be used where significant, identifiable zones can be delineated. Only two adjacent descriptors may be combined. "Very intensely weathered" is the combination descriptor for "intensely weathered to decomposed."

ROCK LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "445L" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS		DESIGN BRANCH	POST MILES	LOG OF TEST BORINGS SHEET NO. 3 OF 5
NAME:	CHECKED BY: G. CUSTENBORDER	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		KP43.2/PM26.8	

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES: 10/14/08, 3/9/09

SHEET OF

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USERNAME => mporonjae DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:29:01 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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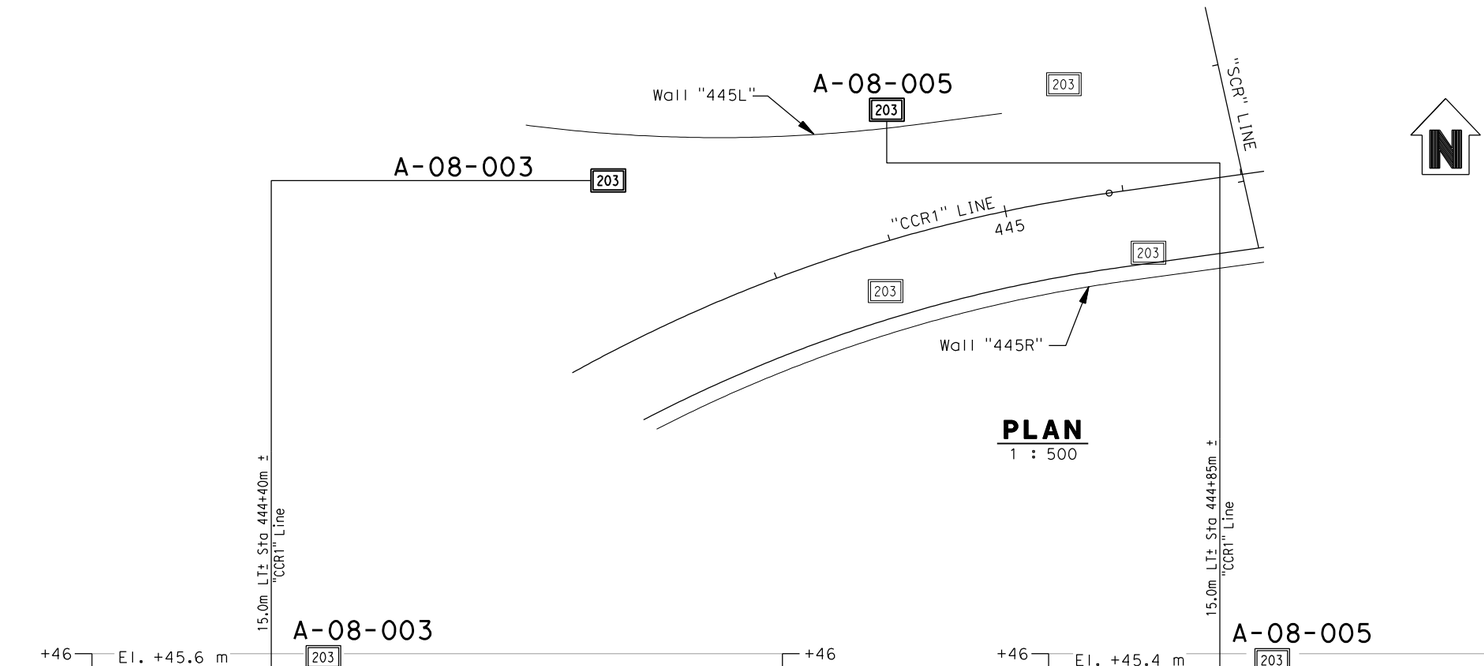

PLAN
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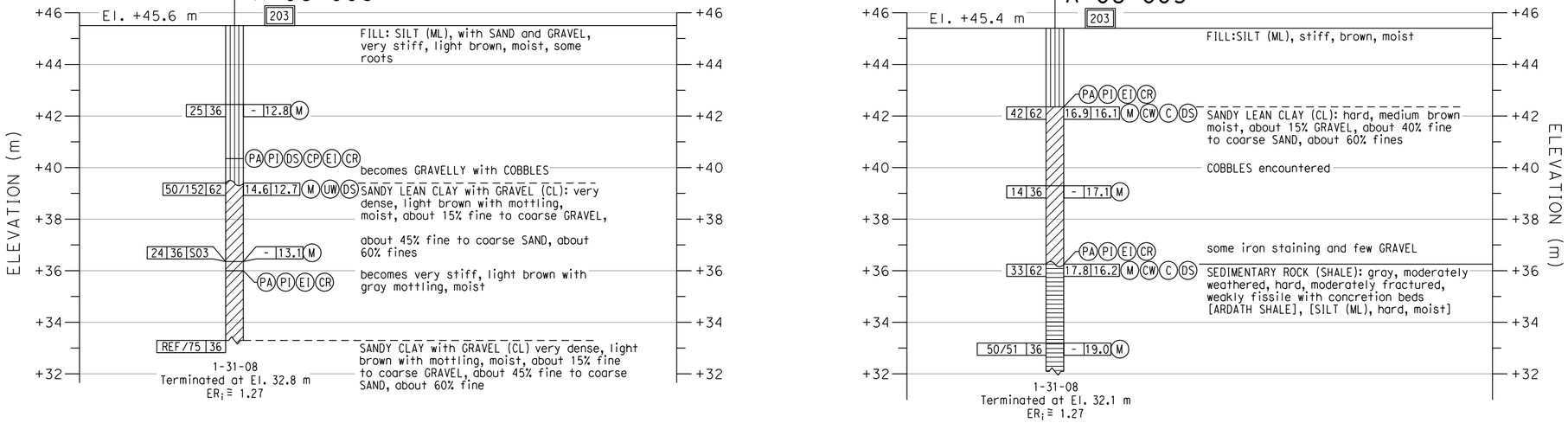

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

NOTES:
1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.
2. Automatic trip and safety hammer systems consisting of hammer weight of 62.5 kg falling a distance of 762 mm were used to advance the drive samplers in accordance with ASTM D1586.
3. The average hammer energy ratio (ER_i) reflects the percentage efficiency of SPT blowcounts (N-value). The estimated ER_i for the various drilling equipment used was as follows:
   Boart Longyear:
   Longyear 1405: $ER_i \cong 1.45$
   Prosonic Track Mounted: $ER_i \cong 1.00$
   Prosonic 1: $ER_i \cong 1.45$
   Minisonic: $ER_i \cong 1.00$
   Pacific Drilling:
   Unimog: $ER_i \cong 1.27$
   Mole: $ER_i \cong 1.00$
   Minimole: $ER_i \cong 1.00$
   Test America:
   CME 95: $ER_i \cong 1.45$
4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (RQD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES		GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "445L" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER			DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 4 OF 5
NAME:	CHECKED BY: G. CUSTENBORDER						

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES								SHEET	OF
10/14/08	3/9/09								

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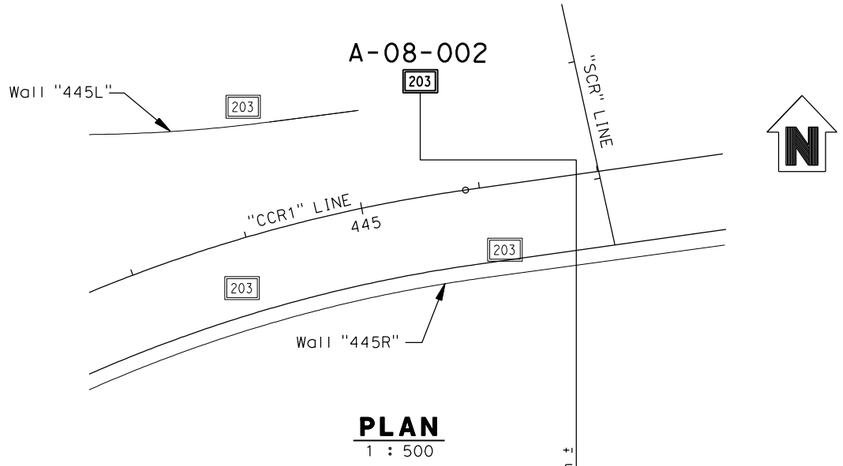
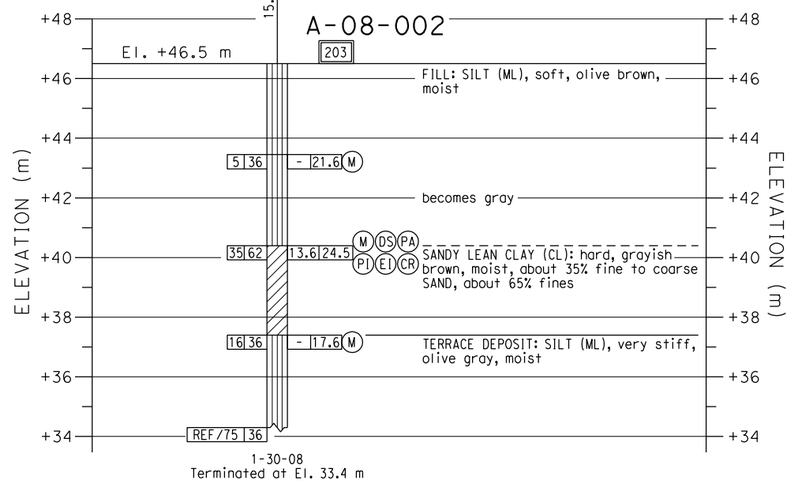


PLAN
1 : 500



PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.

2. Automatic trip and safety hammer systems consisting of hammer weight of 62.5 kg falling a distance of 762 mm were used to advance the drive samplers in accordance with ASTM D1586.

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   Prosonic Track Mounted: $ER_i \cong 1.00$
   Prosonic 1: $ER_i \cong 1.45$
   Minisonic: $ER_i \cong 1.00$
   Test America:
   CME 95: $ER_i \cong 1.45$
   Pacific Drilling:
   Unimog: $ER_i \cong 1.27$
   Mole: $ER_i \cong 1.00$
   Minimole: $ER_i \cong 1.00$

4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (ROD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "445L" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 5 OF 5
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401		

OGS CIVIL LOG OF TEST BORINGS SHEET

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: 10/14/08 | 3/9/09 | SHEET | OF

FILE => MRW35.dgn

USERNAME => mparonjpe DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:29:17 PM

APPENDIX I.10.6

BATTERED MSE WALL 445R LOTBs

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

GROUP SYMBOLS AND NAMES

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

FIELD AND LABORATORY TESTING

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

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

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SAN DIEGO, CA. 92111

APPARENT DENSITY OF COHESIONLESS SOILS

Description	SPT N_{60} (Blows / 300 mm)
Very loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE

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

PERCENT OR PROPORTION OF SOILS

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

PARTICLE SIZE

Description		Size
Boulder		> 300 mm
Cobble		76 mm to 300 mm
Gravel	Coarse	19 mm to 76 mm
	Fine	No. 4 to 19 mm
Sand	Coarse	No. 10 to No. 4
	Medium	No. 40 to No. 10
	Fine	No. 200 to No. 40

SOIL LEGEND

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401	

RW "445R"
MISCELLANEOUS RETAINING WALLS
LOG OF TEST BORINGS SHEET NO. 1 OF 11

OGS CIVIL LOG OF TEST BORINGS SHEET

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: 10/14/08 | 3/9/09

SHEET OF

FILE => MRW20.dgn

USERNAME => mpcronjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:30:05 PM

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

CEMENTATION

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

BOREHOLE IDENTIFICATION

Symbol	Hole Type	Description
Size	A	Auger Boring
Size	R P	Rotary drilled boring Rotary percussion boring (air)
Size	R	Rotary drilled diamond core
Size	HD HA	Hand driven (25 mm soil tube) Hand Auger
●	D	Dynamic Cone Penetration Boring
▲	CPT	Cone Penetration Test (ASTM D 5778-95)
[ ]	O	Other

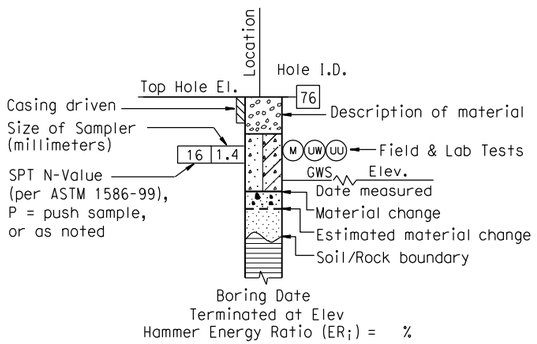
Note: Size in millimeters.

CONSISTENCY OF COHESIVE SOILS

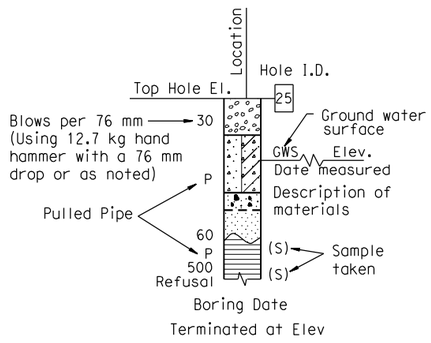
Description	Unconfined Compressive Strength (tsm)	Pocket Penetrometer Measurement (tsm)	Torvane Measurement (tsm)	Field Approximation
Very Soft	< 24	< 24	< 12	Easily penetrated several inches by fist
Soft	24 to 48	24 to 48	12 to 24	Easily penetrated several inches by thumb
Medium Stiff	48 to 96	48 to 96	24 to 48	Penetrated several inches by thumb with moderate effort
Stiff	96 to 192	96 to 192	48 to 96	Readily indented by thumb but penetrated only with great effort
Very Stiff	192 to 383	192 to 383	96 to 192	Readily indented by thumbnail
Hard	> 383	> 383	> 192	Indented by thumbnail with difficulty

PLASTICITY OF FINE-GRAINED SOILS

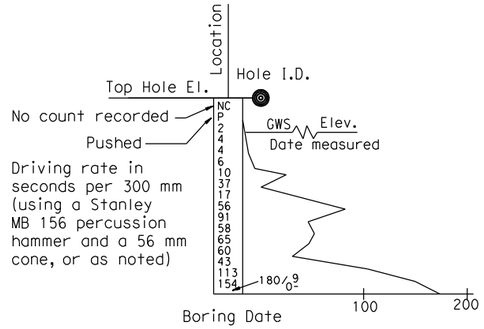
Description	Criteria
Nonplastic	A 3 mm thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.



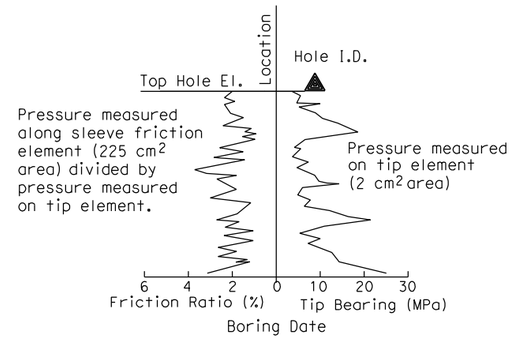
ROTARY BORING



HAND BORING



DYNAMIC CONE PENETRATION BORING



CONE PENETRATION TEST (CPT) SOUNDING

SOIL LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES			
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN — DESIGN BRANCH
NAME:	CHECKED BY: G. CUSTENBORDER			

BRIDGE NO.
POST MILES KP43.2/PM26.8

RW "445R"
MISCELLANEOUS RETAINING WALLS
LOG OF TEST BORINGS SHEET NO. 2 OF 11

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES: 10/14/08 3/9/09

SHEET OF

FILE => MRW21.dgn

USERNAME => mparcinjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:30:14 PM

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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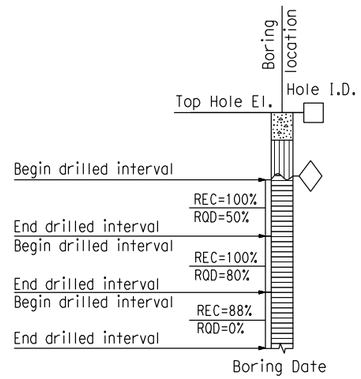
PERCENT CORE RECOVERY (REC) & ROCK QUALITY DESIGNATION (RQD)

$$REC = \frac{\sum \text{Length of the recovered core pieces}}{\text{Total length of core run}} \times 100\%$$

$$RQD = \frac{\sum \text{Length of intact core pieces} \geq 100\ mm}{\text{Total length of core run}} \times 100\%$$



RELATIVE STRENGTH OF INTACT ROCK

Term	Uniaxial Compressive Strength (MPa)
Extremely Strong	> 207
Very Strong	100 - 207
Strong	49 - 100
Medium Strong	25 - 49
Weak	5 - 25
Very Weak	1 - 5
Extremely Weak	< 1

BEDDING SPACING

Description	Thickness / Spacing
Massive	Greater than 3 m
Very thickly bedded	1 m to 3 m
Thickly bedded	300 mm to 1 m
Moderately bedded	100 mm to 300 mm
Thinly bedded	30 mm to 100 mm
Very thinly bedded	10 mm to 30 mm
Laminated	Less than 10 mm

LEGEND OF ROCK MATERIALS

- IGNEOUS ROCK
- SEDIMENTARY ROCK
- METAMORPHIC ROCK

ROCK HARDNESS

Description	Criteria
Extremely Hard	Specimen cannot be scratched with a pocket knife or sharp pick; can only be chipped with repeated heavy hammer blows.
Very Hard	Specimen cannot be scratched with a pocket knife or sharp pick. Breaks with repeated heavy hammer blows.
Hard	Specimen can be scratched with a pocket knife or sharp pick with difficulty (heavy pressure). Heavy hammer blows required to break specimen.
Moderately Hard	Specimen can be scratched with pocket knife or sharp pick with light or moderate pressure. Core breaks with moderate hammer pressure.
Moderately Soft	Specimen can be grooved 5 mm deep with a pocket knife or sharp pick with moderate or heavy pressure. Breaks with light hammer blow or heavy manual pressure.
Soft	Specimen can be grooved or gouged easily by a pocket knife or sharp pick with light pressure, can be scratched with fingernail. Breaks with light to moderate manual pressure.
Very Soft	Specimen can be readily indented, grooved or gouged with fingernail, or carved with a pocket knife. Breaks with light manual pressure.

FRACTURE DENSITY

Description	Observed Fracture Density
Unfractured	No fractures.
Very slightly fractured	Lengths greater than 1 m.
Slightly fractured	Lengths from 300 mm to 1000 mm with few lengths less than 300 mm or greater than 1000 mm.
Moderately fractured	Lengths mostly in 100 mm to 300 mm range with most lengths about 200 mm.
Intensely fractured	Lengths average from 30 mm to 100 mm with scattered fragmented intervals with lengths less than 100 mm.
Very intensely fractured	Mostly chips and fragments with a few scattered short core lengths.

Combination descriptors (such as "Very intensely to intensely fractured") are used where equal distribution of both fracture density characteristics is present over a significant interval or exposure, or where characteristics are "in between" the descriptor definitions. Only two adjacent descriptors may be combined.

WEATHERING DESCRIPTORS FOR INTACT ROCK

Description	Diagnostic features: Chemical Weathering-Discoloration and/or oxidation — Body of Rock	Diagnostic features: Chemical Weathering-Discoloration and/or oxidation — Fracture Surfaces	Diagnostic features: Mechanical Weathering-Grain boundary conditions (disaggregation) primarily for granitics and some coarse-grained sediments	Diagnostic features: Texture and Solutioning — Texture	Diagnostic features: Texture and Solutioning — Solutioning	General Characteristics
Fresh	No discoloration, not oxidized.	No discoloration or oxidation.	No separation, intact (tight).	No change.	No solutioning.	Hammer rings when crystalline rocks are struck.
Slightly Weathered	Discoloration or oxidation is limited to surface of, or short distance from, fractures; some feldspar crystals are dull.	Minor to complete discoloration or oxidation of most surfaces.	No visible separation, intact (tight).	Preserved.	Minor leaching of some soluble minerals may be noted.	Hammer rings when crystalline rocks are struck. Body of rock not weakened.
Moderately Weathered	Discoloration or oxidation extends from fractures usually throughout; Fe-Mg minerals are "rusty," feldspar crystals are "cloudy."	All fracture surfaces are discolored or oxidized.	Partial separation of boundaries visible.	Generally preserved.	Soluble minerals may be mostly leached.	Hammer does not ring when rock is struck. Body of rock is slightly weakened.
Intensely Weathered	Discoloration or oxidation throughout; all feldspars and Fe-Mg minerals are altered to clay to some extent; or chemical alteration produces in-situ disaggregation, see grain boundary conditions.	All fracture surfaces are discolored or oxidized, surfaces friable.	Partial separation, rock is friable; in semiarid conditions granitics are disaggregated.	Texture altered by chemical disintegration (hydration, argillation).	Leaching of soluble minerals may be complete.	Dull sound when struck with hammer, usually can be broken with moderate to heavy manual pressure or by light hammer blow without reference to planes of weakness such as incipient or hairline fractures, or veinlets. Rock is significantly weakened.
Decomposed	Discolored or oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe-Mg minerals are completely altered to clay.		Complete separation of grain boundaries (disaggregated).	Resembles a soil, partial or complete remnant rock structure may be preserved; leaching of soluble minerals usually complete.		Can be granulated by hand. Resistant minerals such as quartz may be present as "stringers" or "dikes."

Combination descriptors (such as "slightly weathered to fresh") are permissible where equal distribution of both weathering characteristics is present over significant intervals or where characteristics present are "in between" the diagnostic feature. However, combination descriptors should not be used where significant, identifiable zones can be delineated. Only two adjacent descriptors may be combined. "Very intensely weathered" is the combination descriptor for "intensely weathered to decomposed."

ROCK LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "445R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 3 OF 11
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401	DISREGARD PRINTS BEARING EARLIER REVISION DATES →	REVISION DATES: 10/14/08, 3/9/09; SHEET OF

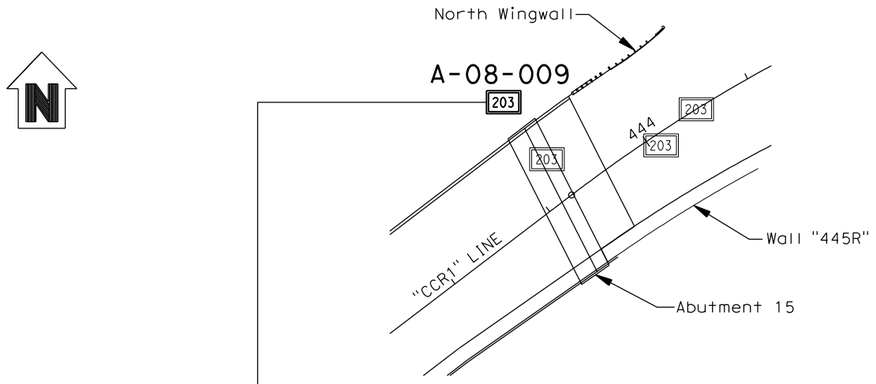
OGS CIVIL LOG OF TEST BORINGS SHEET

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

FILE => MRW22.dgn

USERNAME => mporonjqe DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:30:23 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
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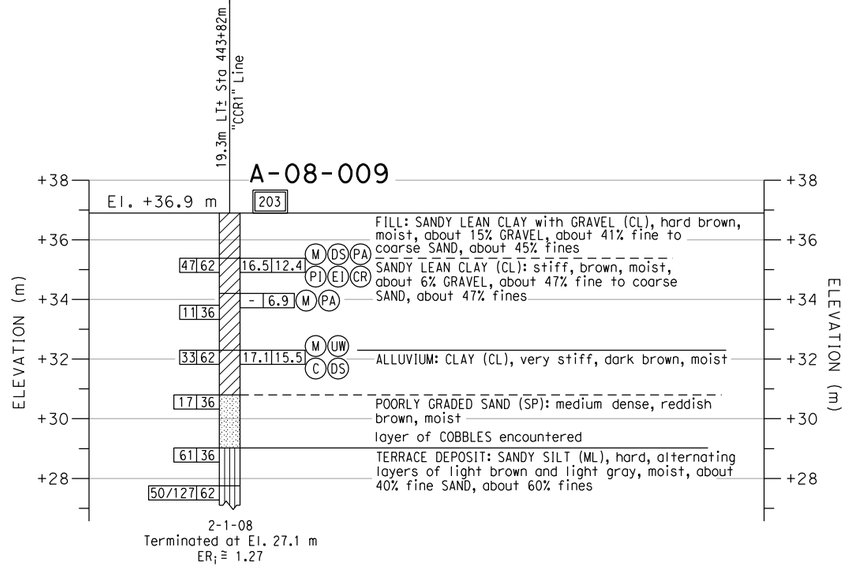

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.
2. Automatic trip and safety hammer systems consisting of hammer weight of 62.5 kg falling a distance of 762 mm were used to advance the drive samplers in accordance with ASTM D1586.
3. The average hammer energy ratio (ER_i) reflects the percentage efficiency of SPT blowcounts (N-value). The estimated ER_i for the various drilling equipment used was as follows:
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   Longyear 1405: $ER_i \cong 1.45$
   Prosonic Track Mounted: $ER_i \cong 1.00$
   Prosonic 1: $ER_i \cong 1.45$
   Minisonic: $ER_i \cong 1.00$
   Test America:
   CME 95: $ER_i \cong 1.45$
   Pacific Drilling:
   Unimog: $ER_i \cong 1.27$
   Mole: $ER_i \cong 1.00$
   Minimole: $ER_i \cong 1.00$
4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (RQD) index is not relevant and therefore not reported on LOTBs.

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FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER	DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 4 OR 11
NAME:	CHECKED BY: G. CUSTENBORDER				

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES										SHEET	OF
10/14/08	3/9/09										

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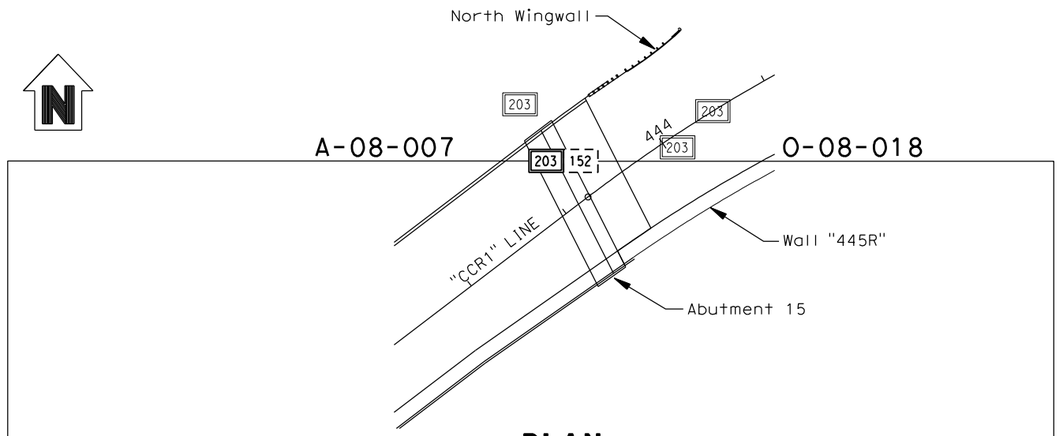

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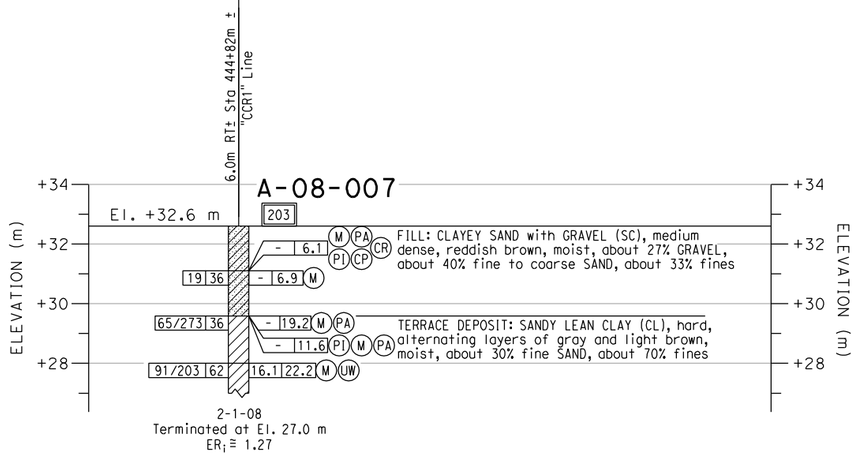

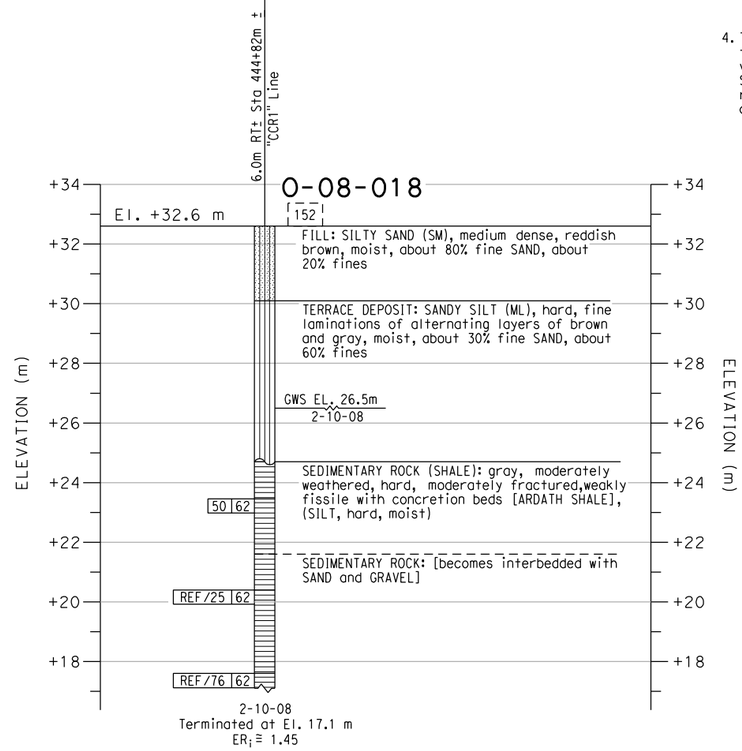

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

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   Minisonic: ER$_i$ ≅1.00
   Test America:
   CME 95: ER$_i$ ≅1.45
   Pacific Drilling:
   Unimog: ER$_i$ ≅1.27
   Mole: ER$_i$ ≅1.00
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ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "445R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 5 OF 11
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401		

OGS CIVIL LOG OF TEST BORINGS SHEET

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										SHEET	OF
10/14/08	3/9/09										

USERNAME => mparonjape DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:30:38 PM

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Bench Mark
All elevations shown in the LOTBs are in meters
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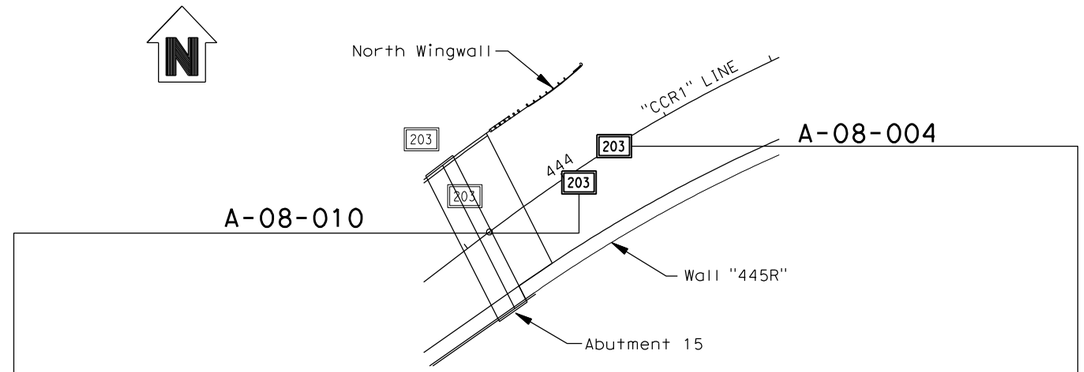

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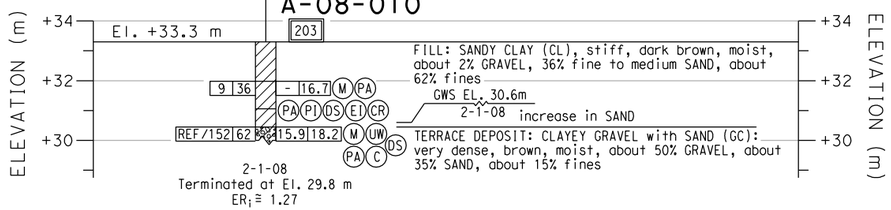

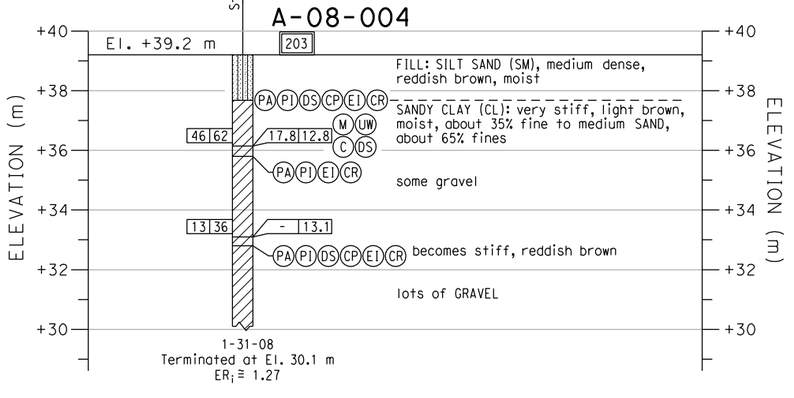

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "445R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS				
NAME:	CHECKED BY: G. CUSTENBORDER	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER	DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 6 OF 11

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES										SHEET	OF
10/14/08	3/9/09										

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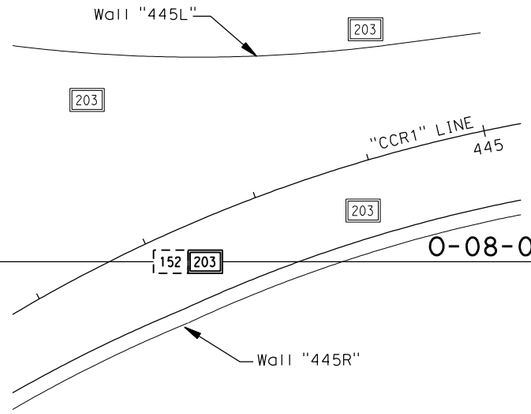
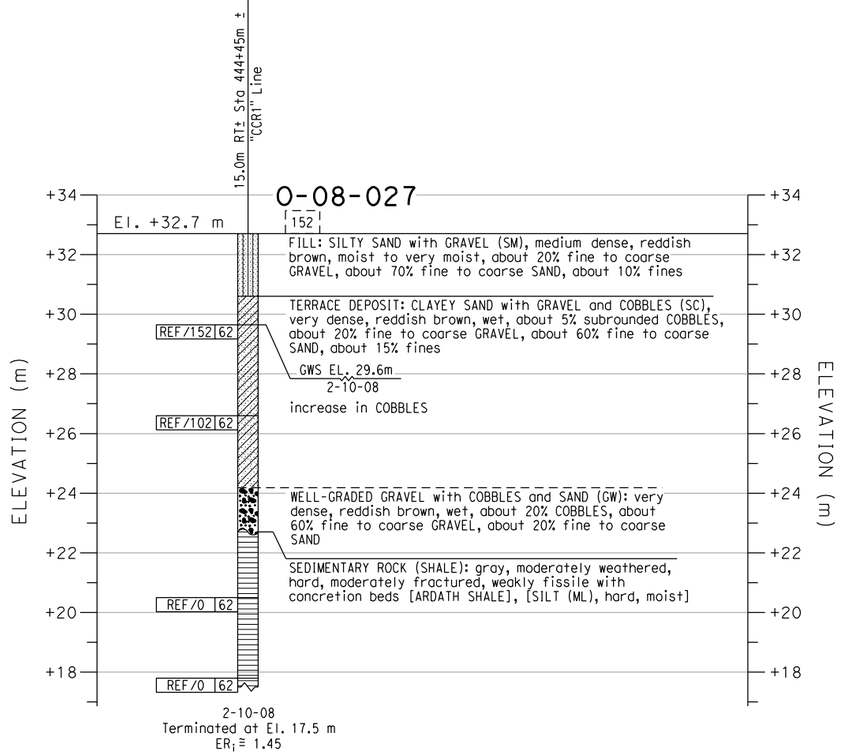
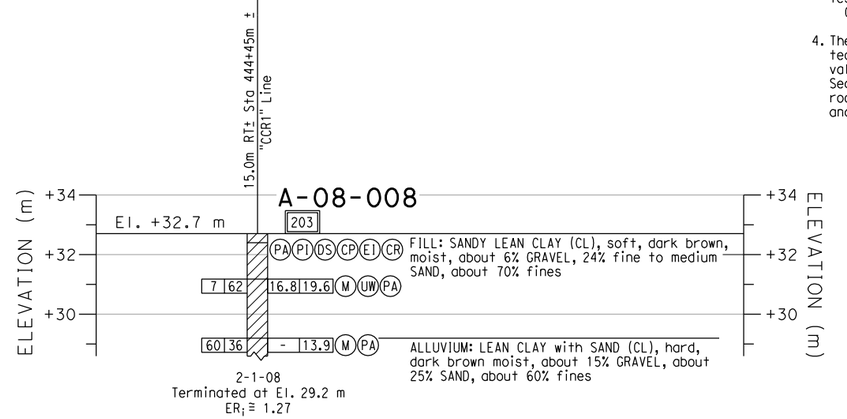
Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
1 : 500





PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.
2. Automatic trip and safety hammer systems consisting of hammer weight of 62.5 kg falling a distance of 762 mm were used to advance the drive samplers in accordance with ASTM D1586.
3. The average hammer energy ratio (ER$_i$) reflects the percentage efficiency of SPT blowcounts (N-value). The estimated ER$_i$ for the various drilling equipment used was as follows:
   Boart Longyear:
   Longyear 1405: ER$_i$ ≅ 1.45
   Prosonic Track Mounted: ER$_i$ ≅ 1.00
   Prosonic 1: ER$_i$ ≅ 1.45
   Minisonic: ER$_i$ ≅ 1.00
   Test America:
   CME 95: ER$_i$ ≅ 1.45
   Pacific Drilling:
   Unimog: ER$_i$ ≅ 1.27
   Mole: ER$_i$ ≅ 1.00
   Minimole: ER$_i$ ≅ 1.00
4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (RQD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES		GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "445R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER			DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 7 OF 11
NAME:	CHECKED BY: G. CUSTENBORDER						

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

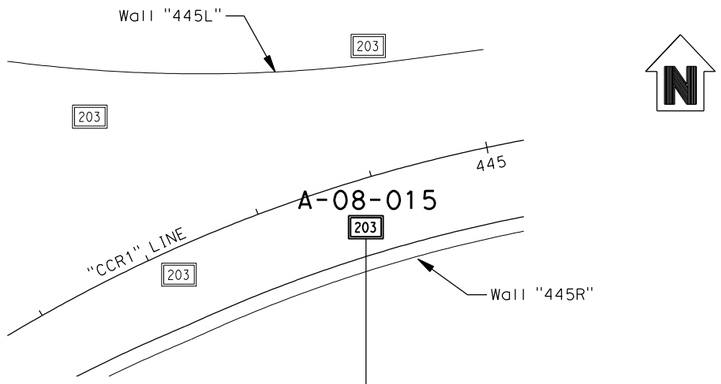
DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES										SHEET	OF
10/14/08	3/9/09										

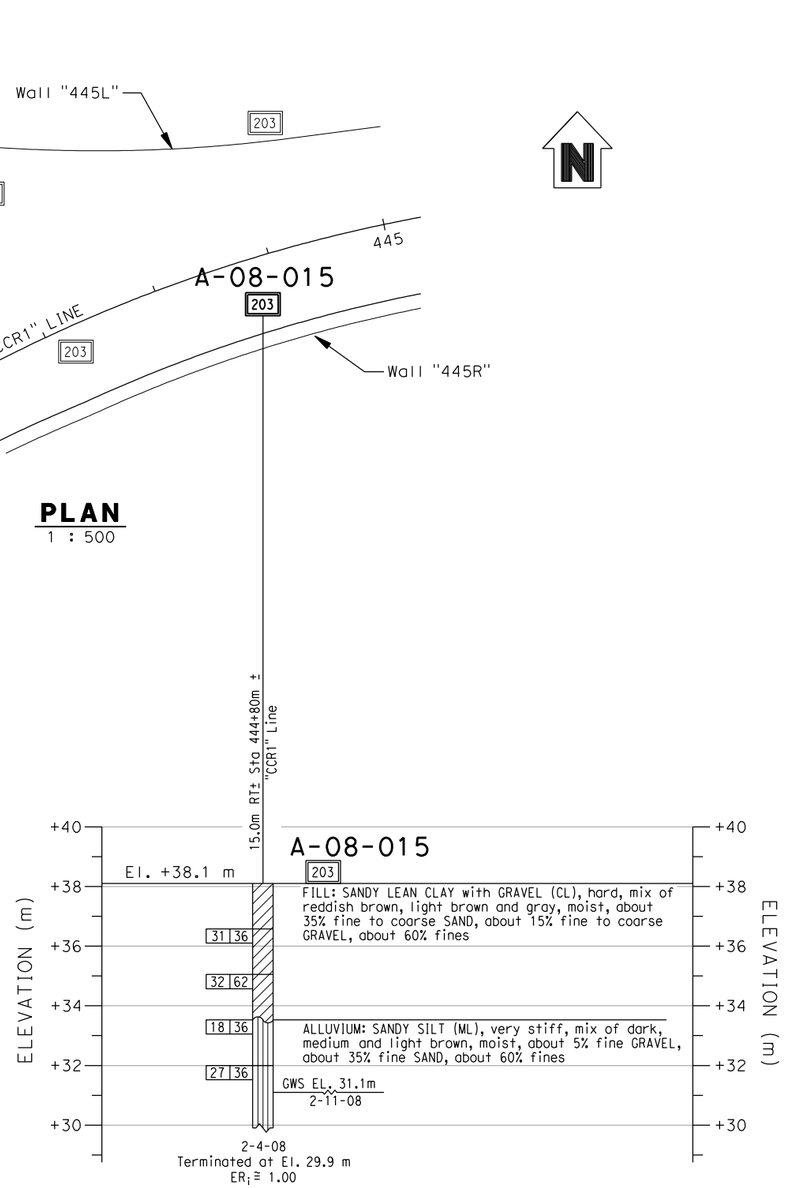
FILE => MRW26.dgn

USERNAME => mparcinjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:30:51 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
1 : 500



PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

Caltrans Metric

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.

2. Automatic trip and safety hammer systems consisting of hammer weight of 62.5 kg falling a distance of 762 mm were used to advance the drive samplers in accordance with ASTM D1586.

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   Minisonic: ER$_i$ ≅ 1.00
   Test America:
   CME 95: ER$_i$ ≅ 1.45
   Pacific Drilling:
   Unimog: ER$_i$ ≅ 1.27
   Mole: ER$_i$ ≅ 1.00
   Minimole: ER$_i$ ≅ 1.00

4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (ROD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "445R"
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	MISCELLANEOUS RETAINING WALLS
NAME:	CHECKED BY: G. CUSTENBORDER					LOG OF TEST BORINGS SHEET NO. 8 OF 11

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

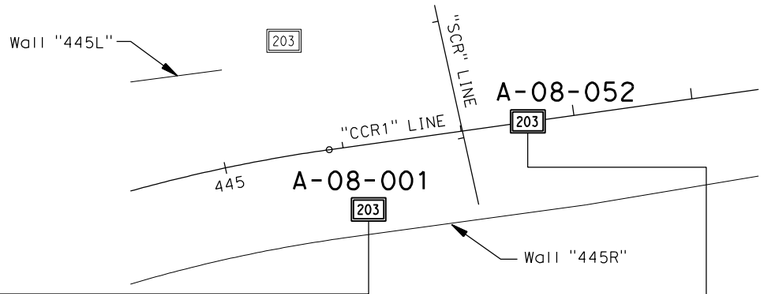
DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES									SHEET	OF
10/14/08	3/9/09									

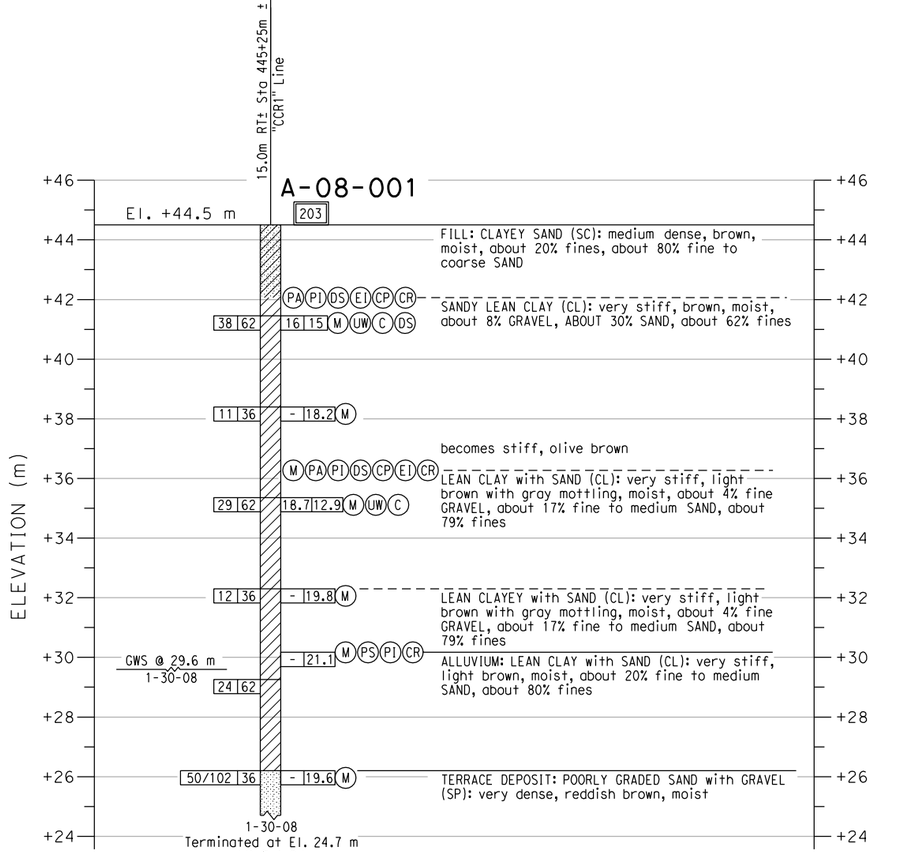
FILE => MRW27.dgn

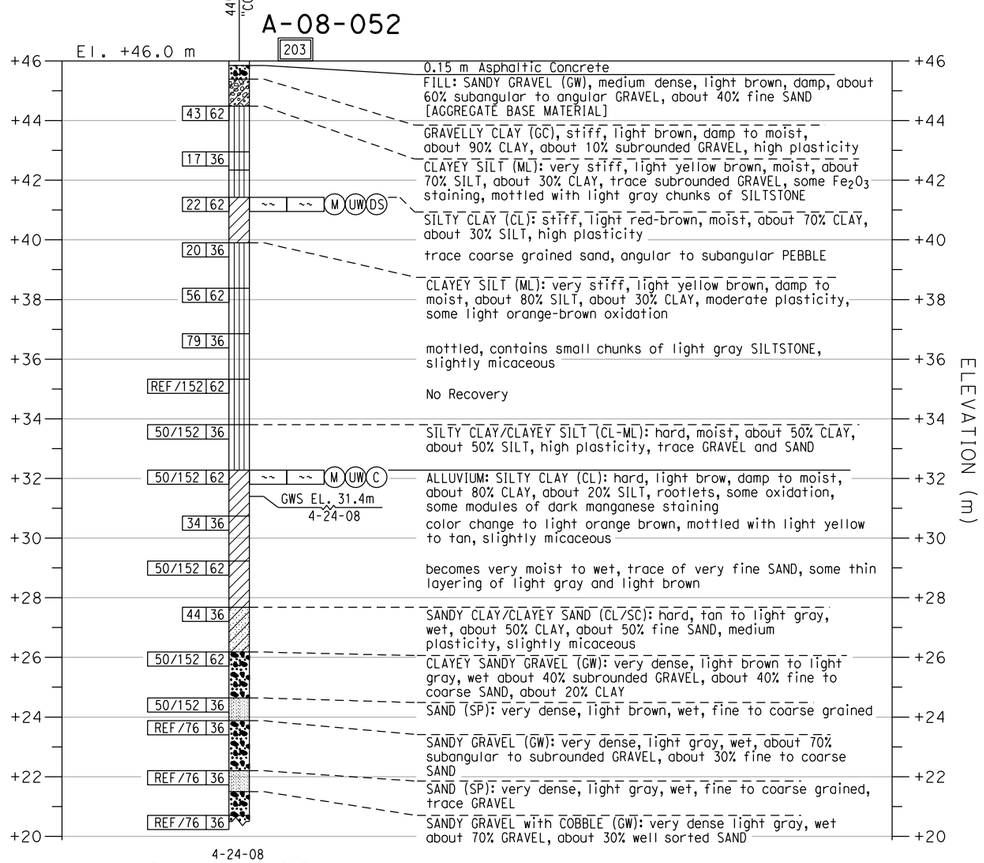
USERNAME => mporcinjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:31:00 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
1 : 500





PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.
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   Longyear 1405: $ER_i \cong 1.45$
   Prosonic Track Mounted: $ER_i \cong 1.00$
   Prosonic 1: $ER_i \cong 1.45$
   Minisonic: $ER_i \cong 1.00$
   Test America:
   CME 95: $ER_i \cong 1.45$
   Pacific Drilling:
   Unimog: $ER_i \cong 1.27$
   Mole: $ER_i \cong 1.00$
   Minimole: $ER_i \cong 1.00$
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ENGINEERING SERVICES		GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "445R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER			DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 9 OF 11
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401			

OGS CIVIL LOG OF TEST BORINGS SHEET

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

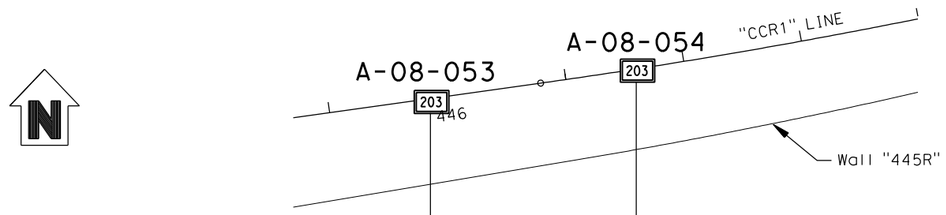
DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES: 10/14/08, 3/9/09 | SHEET | OF

FILE => MRW28.dgn

USERNAME => mporonjae DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:31:06 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
1 : 500

Sta 445+95m ± "CCR1" Line

A-08-053

El. +48.0 m

59	36				0.15 m Asphaltic Concrete FILL: SANDY GRAVEL (GW): dense, tan to light brown, damp about 60% angular GRAVEL, about 40% SAND [AGGREGATE BASE]
					SILTY CLAY (CL), some subrounded GRAVEL, stiff, light yellow brown, damp about 60% CLAY, about 40% SILT, high plasticity
63	62				CLAY with GRAVEL (CL): hard, light brown, damp about 80% CLAY, about 20% subrounded GRAVEL, some light orange brown Fe_2O_3 staining
53	36				CLAYEY SILT (ML): hard, light yellow brown, damp, about 80% SILT, about 20% CLAY, medium plasticity, blocky, disturbed sample
40	62	14.6	15.4	M UW DS	trace GRAVEL contains clods of light gray SILTSTONE, light Fe_2O_3 staining
43	36				trace nodules of white $CaCO_3$, blocky, mottled
57	62				trace clods of light brown SILTY CLAY
					slow drilling
38	36				thin layering, trace dark nodules of manganese
50/152	62				
45	36				SILTY CLAY (CL): hard, brown, moist, about 70% CLAY, about 30% SILT, high plasticity, slightly micaceous, trace fine SAND and GRAVEL
47	62				ALLUVIUM: SANDY CLAYEY GRAVEL (GC), hard, brown, moist, about 70% CLAY, about 30% SAND, mottled with light orange brown oxidation, trace GRAVEL and COBBLE
79	36				
50/76	62				CLAYEY SAND (SC): very dense, light brown, moist, about 80% fine to coarse SAND, about 20% CLAY, trace GRAVEL and COBBLE

4-25-08
Terminated at El. 28.8 m
$ER_i \cong 1.45$

Sta 446+30m ± "CCR1" Line

A-08-054

El. +48.0 m

68	36				0.18 m Asphaltic Concrete FILL: SILTY SANDY GRAVEL (GW), dense, light gray brown, damp about 50% GRAVEL, about 40% SAND, about 10% SILT [AGGREGATE BASE]
70	62				CLAYEY GRAVEL (GC) stiff, light brown, damp about 60% subangular to subrounded GRAVEL, about 40% CLAY
55	36				SILT with GRAVEL (ML): hard, light yellow brown, dry to damp, about 90% SILT, about 10% subrounded GRAVEL
83	62				CLAYEY SILT (ML): hard, light yellow brown, damp, about 90% SILT, about 10% CLAY, medium plasticity, contains light brown clods of CLAY
55	36				some light orange brown Fe_2O_3 staining
REF/152	62				
28	36				SILTY CLAY (CL): very stiff, light yellow brown, damp, about 60% CLAY, about 40% SILT, light orange to red brown oxidation, some inclusions of light gray SILTSTONE, trace fine SAND and GRAVEL
52	62	14.6	12.7	M UW DS	CLAYEY SILT (ML): increase in GRAVEL, slightly micaceous
41	36				SILT (ML): hard, light gray brown, moist, slightly micaceous, mottled, trace very fine SAND and GRAVEL
70	62				GWS EL. 32.4m 4-28-08 CLAYEY SILT (ML): hard, light brown, moist, slightly micaceous, some light brown CLAY clods, trace very fine SAND and GRAVEL
REF/152	36				contains small fragments of asphalt
69/229	62				ALLUVIUM: SANDY CLAY (CL), hard, light brown, moist, about 60% CLAY, about 40% fine SAND, medium plasticity, mottled with light orange brown oxidation, trace GRAVEL
REF/152	36				SANDY GRAVEL some CLAY (GW): very dense, light brown, wet, about 60% subrounded GRAVEL, about 30% fine to coarse SAND, about 10% CLAY, some COBBLE sized crystalline rock
REF/152	36				increase in SAND
REF/102	36				SANDY GRAVEL (GW): very dense, light gray, wet, about 60% subrounded GRAVEL, about 40% fine to coarse SAND, some COBBLE sized crystalline rock
REF/76	36				trace CLAY

4-28-08
Terminated at El. 23.4 m
$ER_i \cong 1.45$

ELEVATION (m)

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.
2. Automatic trip and safety hammer systems consisting of hammer weight of 62.5 kg falling a distance of 762 mm were used to advance the drive samplers in accordance with ASTM D1586.
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   Longyear 1405: $ER_i \cong 1.45$
   Prosonic Track Mounted: $ER_i \cong 1.00$
   Prosonic 1: $ER_i \cong 1.45$
   Minisonic: $ER_i \cong 1.00$
   Test America:
   CME 95: $ER_i \cong 1.45$
   Pacific Drilling:
   Unimog: $ER_i \cong 1.27$
   Mole: $ER_i \cong 1.00$
   Minimole: $ER_i \cong 1.00$
4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (ROD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "445R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 10 OF 11
NAME:	CHECKED BY: G. CUSTENBORDER	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER	CU 11275 EA 2T0401		

OGS CIVIL LOG OF TEST BORINGS SHEET

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: 10/14/08, 3/9/09 | SHEET | OF

FILE => MRW29.dgn

USERNAME => mparonjpe DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:31:13 PM

Bench Mark
All elevations shown in the LOTBs are in meters
and are referenced to the NGVD 1929 Datum.

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

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REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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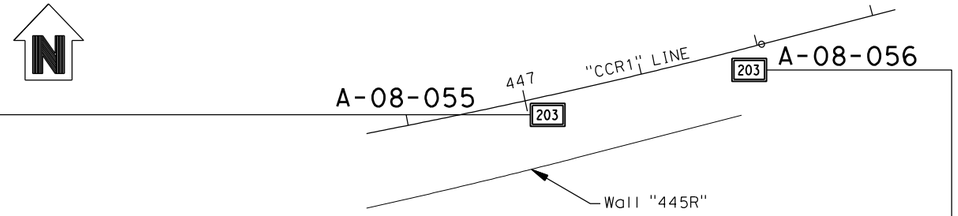

PLAN
1 : 500

A-08-055

El. +50.0 m

50/152	62	15.1	13.2	M	UW	DS	0.15 m Asphaltic Concrete FILL: SILTY SAND GRAVEL (GM), dense, light brown, damp, 0.38 m thick, Base Material GRAVELLY SILT (ML): stiff to very stiff, light yellow brown, damp, about 30% subrounded GRAVEL, about 70% SILT
37	36						contains clods of brown CLAY (CL), some inclusions of light gray SILTSTONE
REF/152	62						CLAYEY SILT with GRAVEL (ML): very stiff, light yellow brown, damp, mottled with light orange brown to light red brown colors, about 90% SILT, about 10% CLAY
							becomes dry to damp, blocky
50/152	36						GRAVELLY SILT with COBBLES (ML): very stiff yellow brown, damp, some light orange brown Fe_2O_3 staining, about 20% subrounded GRAVEL, about 80% SILT
80	62						slow drilling
50/76	36						CLAYEY SILT some GRAVEL (ML): very stiff to hard, light yellow brown, damp, mottled with light orange brown Fe_2O_3, contains inclusions of light gray SILTSTONE, about 90% SILT, about 10% CLAY
50/152	62						blocky
REF/152	36						slightly micaceous
67	62						
44	36						SILTY CLAY (CL): trace very fine SAND, some subrounded GRAVEL, stiff to very stiff, light brown, moist, mottled with light orange brown and light gray green colors, slightly micaceous, about 40% SILT, about 60% CLAY
REF/152	62						
48	36						slow drilling Interlayered with light green fine SANDY SILT, color change to gray brown, increase in CLAY content, high plasticity, trace pebble size SILTSTONE

4-29-08
Terminated at El. 32.3 m
$ER_i \cong 1.45$

A-08-056

El. +50.0 m

43	36						0.18 m Asphaltic Concrete FILL: SILTY SANDY GRAVEL (GW), dense, tan, damp, about 50% angular to subangular GRAVEL, about 40% fine SAND, about 10% SILT [AGGREGATE BASE]
50/152	62						SILT with GRAVEL (ML), very stiff to hard, light yellow brown, damp, about 90% SILT, about 10% subrounded GRAVEL, medium plasticity
							becomes blocky, encountered cobble-sized rock
68	36						contains clods of light gray SILTSTONE, some light orange brown oxidation, trace of nodules of white CaCo
50/152	62						
30	36						
50/152	62						interlayered with brown SILTY CLAY (CL), very stiff
69	36						SILTY CLAY (CL): hard, light brown, damp, about 60% CLAY, about 40% SILT, high plasticity, mottled with light orange brown to brown colors, trace GRAVEL and SAND
62	36						GRAVELLY CLAY (GC): hard, light brown to brown, damp, about 80% CLAY, about 20% subrounded CLAY, high plasticity, mottled with light orange brown to brown colors, trace SAND and COBBLE
55	62						mottled with light yellow brown, light red brown to dark brown, trace manganese staining, GRAVEL becomes angular to rounded
44	36						SILTY CLAY (CL): hard, brown to gray brown, moist, about 70% CLAY, about 30% SILT, high plasticity, highly mottled, trace GRAVEL
85	62	115	13.0	M	UW	DS	ALLUVIUM: SANDY CLAY (CL), hard, gray brown, moist, about 90% CLAY, about 10% fine SAND, high plasticity, weakly layered, mottled with dark manganese staining, some light orange brown oxidation
REF/152	36						SILTY SAND (SM): very dense, light brown, moist, about 90% very fine SAND, about 10% SILT, some light orange-brown oxidation
50/76	62						CLAYEY SAND/SANDY CLAY (SC/CL): very dense, light brown, moist, to very moist, about 50% fine SAND, about 50% CLAY
REF/152	36						GRAVELLY SILTY SAND (SM): very dense, light brown, moist, about 70% fine SAND, about 20% SILT, about 10% rounded GRAVEL
REF/152	36						interlayered with light gray SANDS (SP): becomes wet and GRAVEL becomes subrounded to rounded
REF/152	36						SEDIMENTARY ROCK (SHALE): gray, moderately weathered, hard, moderately fractured,weakly fissile with concretion beds [ARDATH SHALE], [SILT (ML), hard, moist]

4-8-08
Terminated at El. 23.9 m
$ER_i \cong 1.45$

ELEVATION (m): +50, +48, +46, +44, +42, +40, +38, +36, +34, +32, +30, +28, +26, +24

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

NOTES:

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   Minimole: $ER_i \cong 1.00$
4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (ROD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "445R"
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	DEPARTMENT OF TRANSPORTATION	DESIGN BRANCH	POST MILES	MISCELLANEOUS RETAINING WALLS
NAME:	CHECKED BY: G. CUSTENBORDER	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER	CU 11275 EA 2T0401	KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 11 OF 11

OGS CIVIL LOG OF TEST BORINGS SHEET

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: 10/14/08, 3/9/09

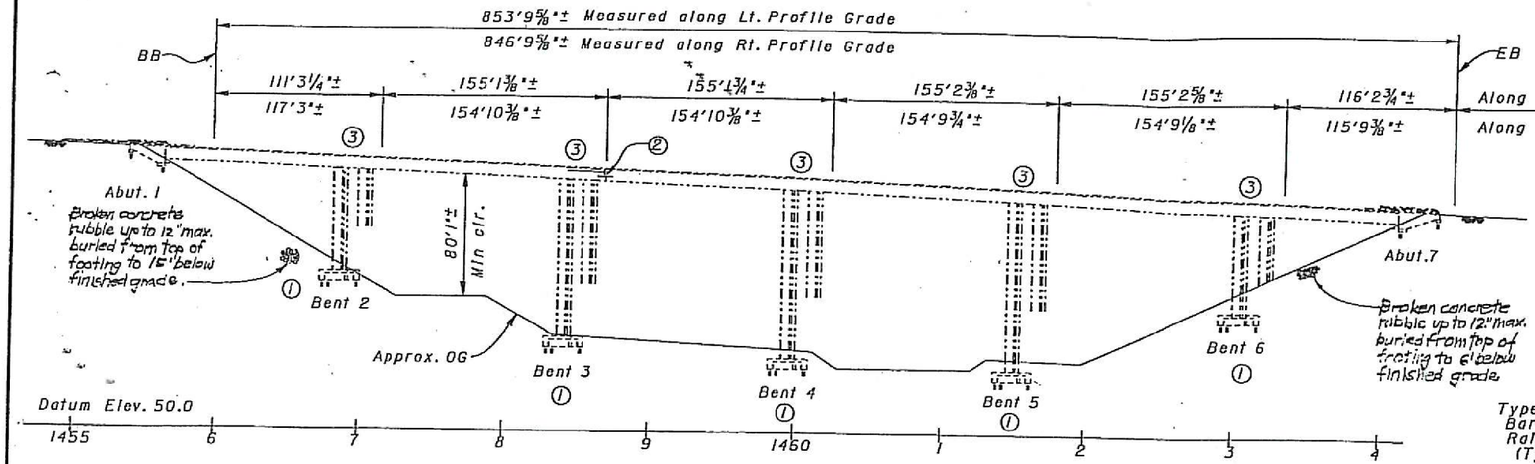
SHEET OF

FILE => MRW30.dgn

USERNAME => mporonjape DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:31:21 PM

APPENDIX I.11

AS BUILT LOTBs



ELEVATION
1"-50'

Bent	Existing Skew Angle	
	Left Bridge	Right Bridge
2	17°14'41"±	16°44'03"±
3	19°49'35"±	19°14'01"±
4	22°38'05"±	21°43'54"±
5	25°35'48"±	24°13'43"±
6	30°06'31"±	26°43'25"±

AS BUILT

CORRECTIONS BY Rich Fillmore
Dokken Engineering
CONTRACT NO. 11-067504
8/30/98

QUANTITIES

ACCESS OPENING, SOFFIT	101	EA
BRIDGE REMOVAL (PORTION), LOCATION C	LUMP	SUM
STRUCTURE EXCAVATION (BRIDGE)	5,950	CY
STRUCTURE BACKFILL (BRIDGE)	4,470	CY
24" CAST-IN-DRILLED-HOLE CONCRETE PILING	13,250	LF
PRESTRESSING HIGH STRENGTH RODS	57,100	LB
STRUCTURAL CONCRETE, BRIDGE FOOTING	1,525	CY
STRUCTURAL CONCRETE, BRIDGE	327	CY
DIAPHRAGM BOLSTER	14	EA
DRILL AND BOND DOWEL	11,530	LF
CORE CONCRETE (2")	5,300	LF
CORE CONCRETE (6")	232	LF
CORE CONCRETE (10")	120	LF
CORE CONCRETE (1 1/4")	980	LF
BAR REINFORCING STEEL (BRIDGE)	900,000	LB
MISCELLANEOUS METAL (RESTRAINER - PIPE TYPE)	12,600	LB
MISCELLANEOUS METAL (RESTRAINER - CABLE TYPE)	5,340	LB

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

DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
11	SD	5, 805	R30.4/R30.7, 26.3/28.5	58	105

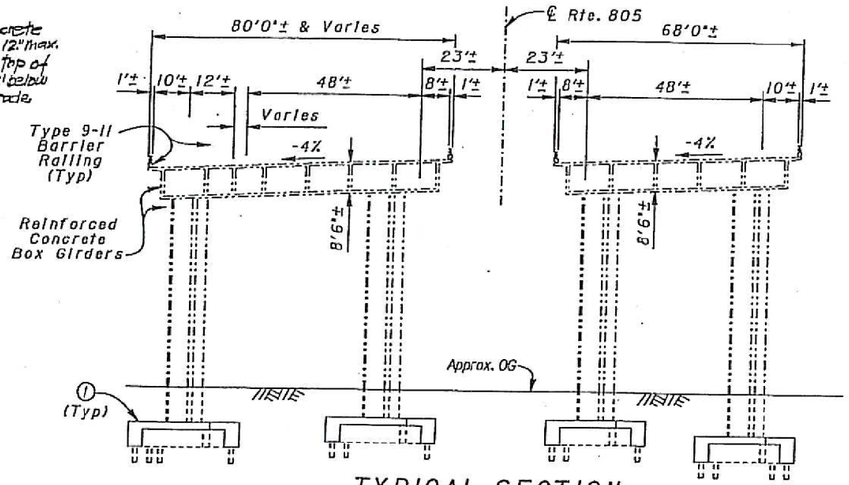
M J Cullen
REGISTERED ENGINEER - CIVIL

REGISTERED PROFESSIONAL ENGINEER — M. J. Cullen — No. 040620 — Exp. 3-31-99 — CIVIL — STATE OF CALIFORNIA

9-23-96
PLANS APPROVAL DATE

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

RETROFIT LEGEND
① Strengthen all footings and add piles.
② Hinge restrainers.
③ Bent Cap strengthening.



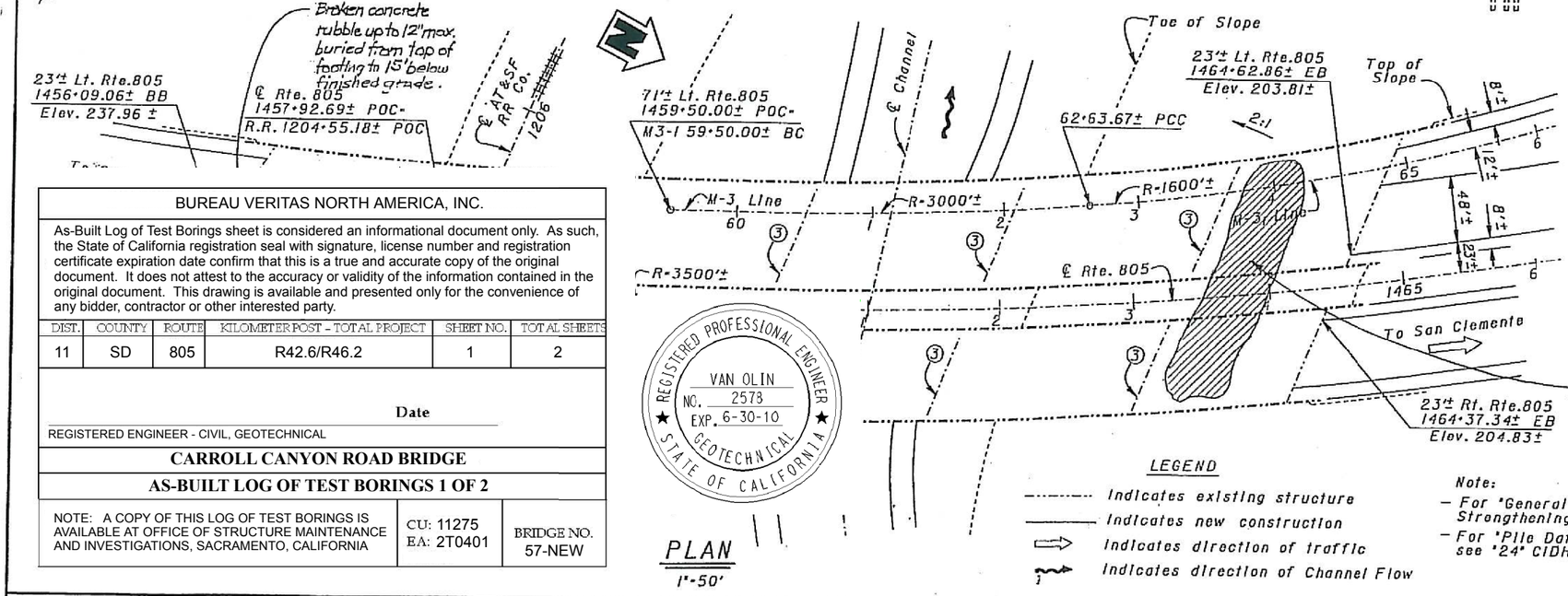
TYPICAL SECTION
1"-20'

INDEX TO PLANS

SHEET NO.	TITLE
1	GENERAL PLAN
2	FOOTING DETAILS NO. 1 - LEFT BRIDGE
3	FOOTING DETAILS NO. 2 - LEFT BRIDGE
4	FOOTING DETAILS - RIGHT BRIDGE
5	24" CIDH CONCRETE PILE
6	BENT CAP STRENGTHENING DETAILS NO. 1
7	BENT CAP STRENGTHENING DETAILS NO. 2
8	BENT CAP STRENGTHENING DETAILS NO. 3
9	HINGE LAYOUT - LEFT BRIDGE
10	HINGE LAYOUT - RIGHT BRIDGE
11	HINGE RESTRAINER DETAILS
12	DECK AND SOFFIT OPENINGS
13	LIMITS OF PAYMENT FOR EXCAVATION & BACKFILL
14	LOG OF TEST BORINGS NO. 1
15	LOG OF TEST BORINGS NO. 2

STANDARD PLANS DATED JULY 1992

A10A	ABBREVIATIONS
A10B	SYMBOLS
B0-1	BRIDGE DETAILS



PLAN
1"-50'

LEGEND
Indicates existing structure
Indicates new construction
Indicates direction of traffic
Indicates direction of Channel Flow

Note:
- For "General Notes", see "Bent Cap Strengthening Details No. 3" sheet.
- For "Pile Data on Left & Right Bridge" see "24" CIDH Concrete Pile" sheet.

STANDARD PLAN SHEET NO.
DETAIL NO.

BUREAU VERITAS NORTH AMERICA, INC.

As-Built Log of Test Borings sheet is considered an informational document only. As such, the State of California registration seal with signature, license number and registration certificate expiration date confirm that this is a true and accurate copy of the original document. It does not attest to the accuracy or validity of the information contained in the original document. This drawing is available and presented only for the convenience of any bidder, contractor or other interested party.

DIST.	COUNTY	ROUTE	KILOMETER POST - TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
11	SD	805	R42.6/R46.2	1	2

Date
REGISTERED ENGINEER - CIVIL, GEOTECHNICAL

CARROLL CANYON ROAD BRIDGE

AS-BUILT LOG OF TEST BORINGS 1 OF 2

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

CU: 11275
EA: 2T0401

BRIDGE NO. 57-NEW

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN — NO. 2578 — EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

Ted Jensen 8/96
DESIGN ENGINEER

DESIGN	BY M. J Cullen	11-94	CHECKED G. Murugesh	12-95	LOAD FACTOR DESIGN		
DETAILS	BY B.Svoboda/M.Tran	11-94	CHECKED G. Murugesh	12-95	LAYOUT	BY M. J. Cullen 11-95	CHECKED G. Murugesh 12-95
QUANTITIES	BY M. J Cullen	5-96	CHECKED G. Murugesh	5-96	SPECIFICATIONS	BY Karla Meier 8-96	PLANS AND SPECS COMPARED Karla Meier 8-96

DS DSD 2158 (CADD 10/95)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES
STRUCTURE DESIGN 5

CU 11
EA 067801

BRIDGE NO. 57-787R/L
POST MILE 26.8

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

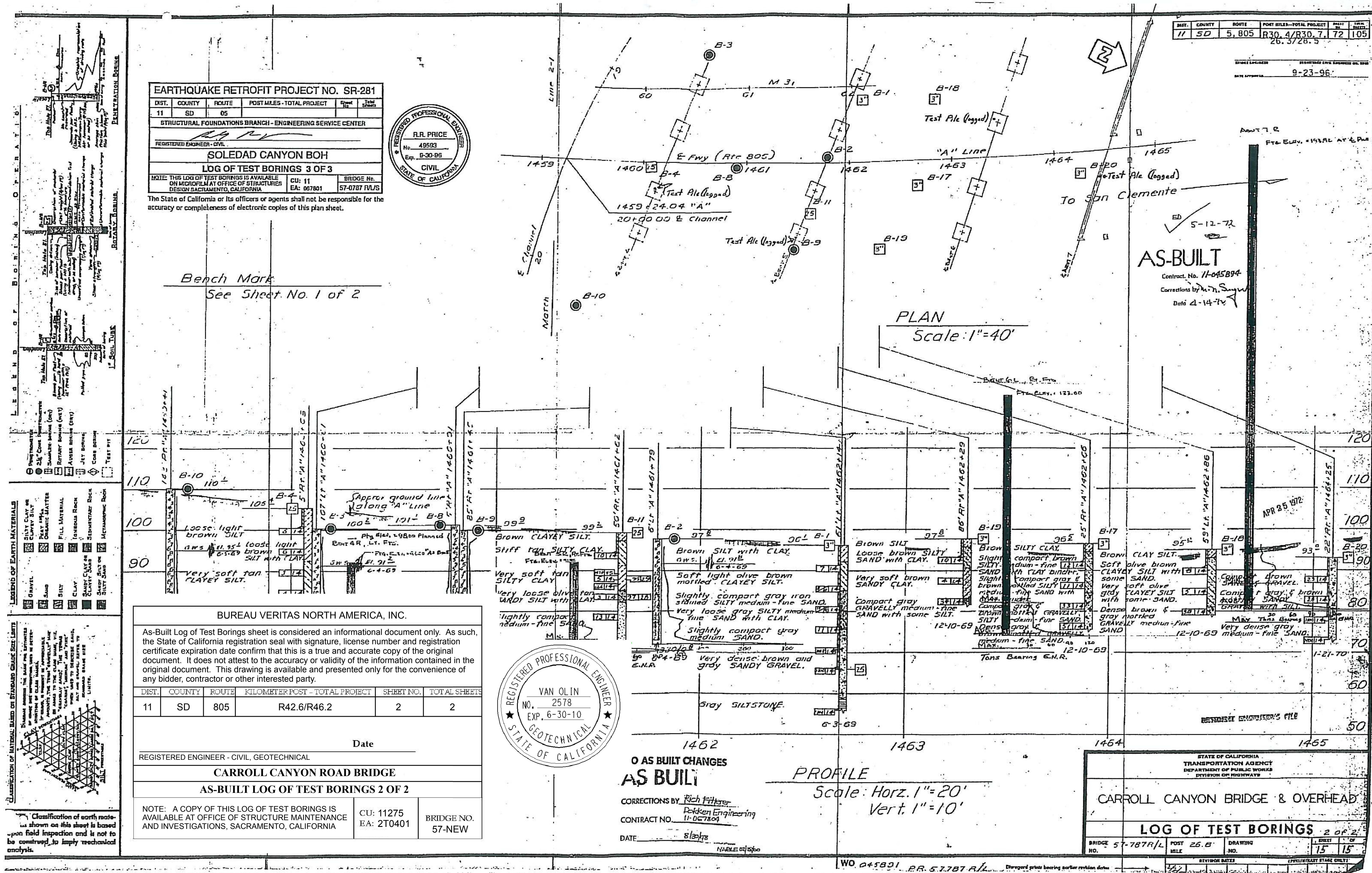
REVISION DATES (PRELIMINARY STAGE ONLY)

USERNAME => $USER
$REQUEST

DATE PLOTTED => $DATE
TIME PLOTTED => $TIME

EARTHQUAKE RETROFIT PROJECT NO. SR 281
SOLEDAD CANYON BRIDGE & OH
GENERAL PLAN

SHEET 1 OF 15


EARTHQUAKE RETROFIT PROJECT NO. SR-281
DIST. 11 COUNTY SD ROUTE 05
STRUCTURAL FOUNDATIONS BRANCH - ENGINEERING SERVICE CENTER
REGISTERED ENGINEER - CIVIL
SOLEDAD CANYON BOH
LOG OF TEST BORINGS 3 OF 3
NOTE: THIS LOG OF TEST BORINGS IS AVAILABLE ON MICROFILM AT OFFICE OF STRUCTURES DESIGN SACRAMENTO, CALIFORNIA
CU: 11 EA: 067801
BRIDGE No. 57-0787 R/L/S
The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.
REGISTERED PROFESSIONAL ENGINEER R.R. PRICE No. 49593 Exp. 9-30-06 CIVIL STATE OF CALIFORNIA
Bench Mark
See Sheet No. 1 of 2
PLAN
Scale: 1"=40'
PROFILE
Scale: Horz. 1"=20'
Vert. 1"=10'
"A" Line
E Fwy (Rte 805)
To San Clemente
Test Pile (logged)
B-1
B-2
B-3
B-4
B-8
B-9
B-10
B-11
B-17
B-18
B-19
B-20
1459
1460
1461
1462
1463
1464
1465
AS-BUILT
Contract No. 11-045894
Corrections by
Date 4-14-72
APR 25 1972
LEGEND OF EARTH MATERIALS
LEGEND OF BORING OPERATIONS
Classification of earth material shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.
BUREAU VERITAS NORTH AMERICA, INC.
As-Built Log of Test Borings sheet is considered an informational document only. As such, the State of California registration seal with signature, license number and registration certificate expiration date confirm that this is a true and accurate copy of the original document. It does not attest to the accuracy or validity of the information contained in the original document. This drawing is available and presented only for the convenience of any bidder, contractor or other interested party.
DIST. 11 COUNTY SD ROUTE 805 KILOMETER POST - TOTAL PROJECT R42.6/R46.2 SHEET NO. 2 TOTAL SHEETS 2
Date
REGISTERED ENGINEER - CIVIL, GEOTECHNICAL
CARROLL CANYON ROAD BRIDGE
AS-BUILT LOG OF TEST BORINGS 2 OF 2
NOTE: A COPY OF THIS LOG OF TEST BORINGS IS AVAILABLE AT OFFICE OF STRUCTURE MAINTENANCE AND INVESTIGATIONS, SACRAMENTO, CALIFORNIA
CU: 11275 EA: 2T0401
BRIDGE NO. 57-NEW
REGISTERED PROFESSIONAL ENGINEER VAN OLIN NO. 2578 EXP. 6-30-10 GEOTECHNICAL STATE OF CALIFORNIA
NO AS BUILT CHANGES
AS BUILT
CORRECTIONS BY Rich Filtser
Pokken Engineering
CONTRACT NO. 11-067804
DATE 8/30/78
STATE OF CALIFORNIA TRANSPORTATION AGENCY DEPARTMENT OF PUBLIC WORKS DIVISION OF HIGHWAYS
CARROLL CANYON BRIDGE & OVERHEAD
LOG OF TEST BORINGS 2 OF 2
BRIDGE NO. 57-787R/L
POST MILE 26.8
SHEET 15 OF 15
11 SD 5, 805 R30.4/R30.7 72 105
9-23-96
WO 045891 BR 57-787 R/L

APPENDIX I.12

CONE PENETRATION TESTING REPORTS

May 5, 2008

Testing Engineers
Attn: Dan Kirkman
7895 Convoy Court, Suite 18
San Diego, California 92111

Subject: CPT Site Investigation
Caroll Canyon
San Diego, California
GREGG Project Number: 08-0174SH

Dear Mr. Kirkman:

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

1	Cone Penetration Tests	(CPTU)	☒
2	Pore Pressure Dissipation Tests	(PPD)	☒
3	Seismic Cone Penetration Tests	(SCPTU)	☒
4	Resistivity Cone Penetration Tests	(RCPTU)	☐
5	UVOST Laser Induced Fluorescence	(UVOST)	☐
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 Drilling & Testing, Inc.

Peter Robertson
Technical Operations

Cone Penetration Test Sounding Summary

-Table 1-

CPT Sounding Identification	Date	Termination Depth (Meters)	Depth of Groundwater Samples (Meters)	Depth of Soil Samples (Meters)	Depth of Pore Pressure Dissipation Tests (Meters)
440+62.5	4/30/08	4.9	-	-	-
440+90	4/30/08	6.4	-	-	-
441+22.5	4/30/08	8.8	-	-	-
441+42	4/30/08	8.5	-	-	7.0
441+64	4/28/08	7.3	-	-	-
441+82b	4/28/08	7.3	-	-	-
441+96	4/28/08	7.3	-	-	6.7
442+05	4/28/08	8.5	-	-	-
442+15	4/29/08	9.8	-	-	-
442+23.5	4/29/08	7.3	-	-	4.9
442+32	4/30/08	9.1	-	-	-
442+42.5	4/29/08	7.3	-	-	-
442+50	4/30/08	10.0	-	-	-
442+55	4/30/08	8.8	-	-	-
442+70	4/30/08	4.0	-	-	-
442+87	4/29/08	7.0	-	-	-
443+20	4/29/08	7.3	-	-	-
443+40	4/29/08	2.3	-	-	-
443+82	4/29/08	5.2	-	-	-
444+00	4/29/08	3.8	-	-	-

Bibliography

Lunne, T., Robertson, P.K. and Powell, J.J.M., "Cone Penetration Testing in Geotechnical Practice" E & FN Spon. ISBN 0 419 23750, 1997

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

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., Sully, J., Woeller, D.J., Lunne, T., Powell, J.J.M., and Gillespie, D.J., "Guidelines for Estimating Consolidation Parameters in Soils from Piezocone Tests", Canadian Geotechnical Journal, Vol. 29, No. 4, August 1992, pp. 539-550.

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.

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.

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

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

TESTING ENGINEERS

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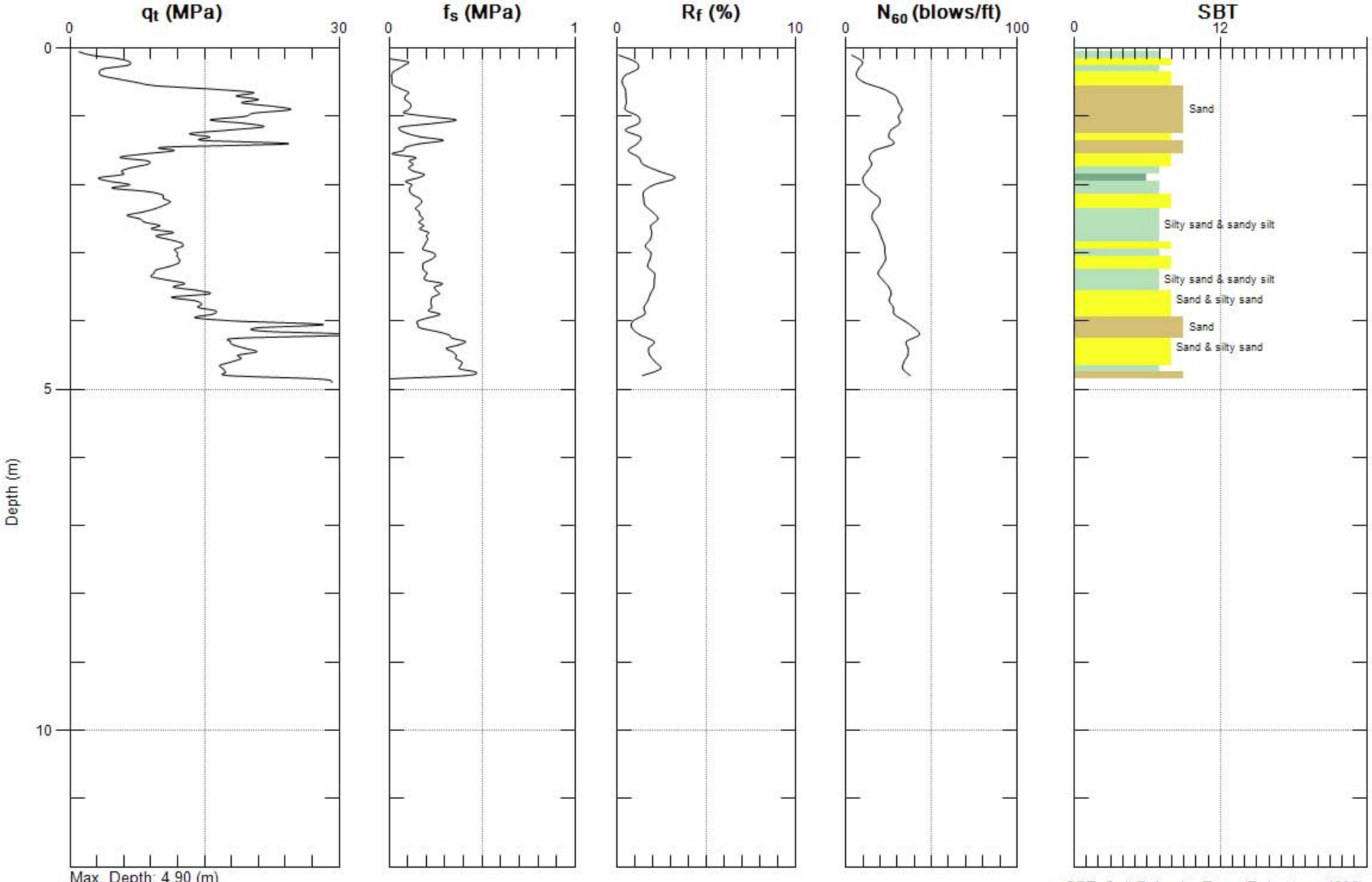
Sounding: 440+62.5
Engineer: D.KIRKMAN
Date: 4/30/2008 11:43



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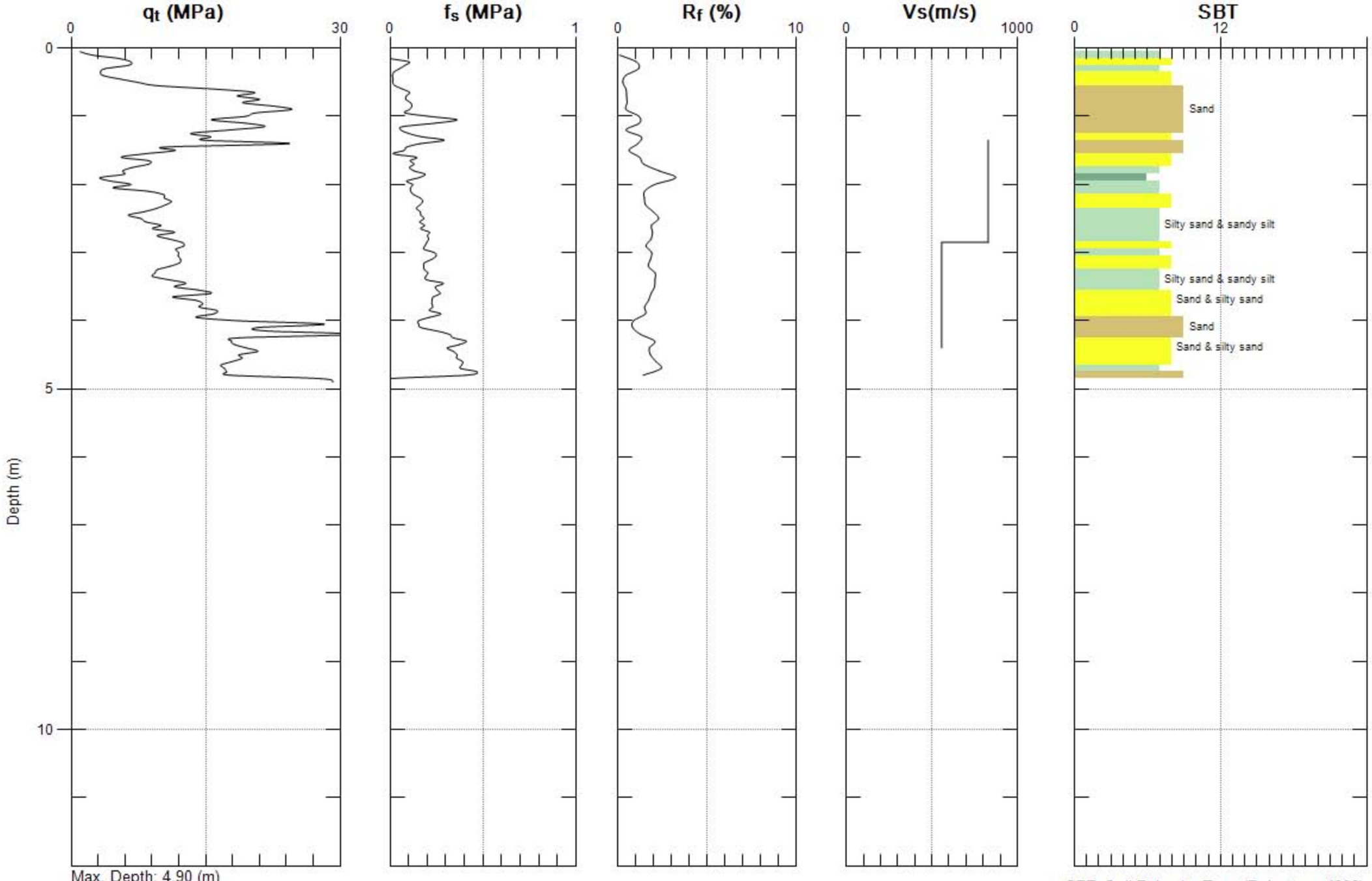
SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 440+62.5
Engineer: D.KIRKMAN
Date: 4/30/2008 11:43



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SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

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Sounding: 440+62.5
Engineer: D.KIRKMAN
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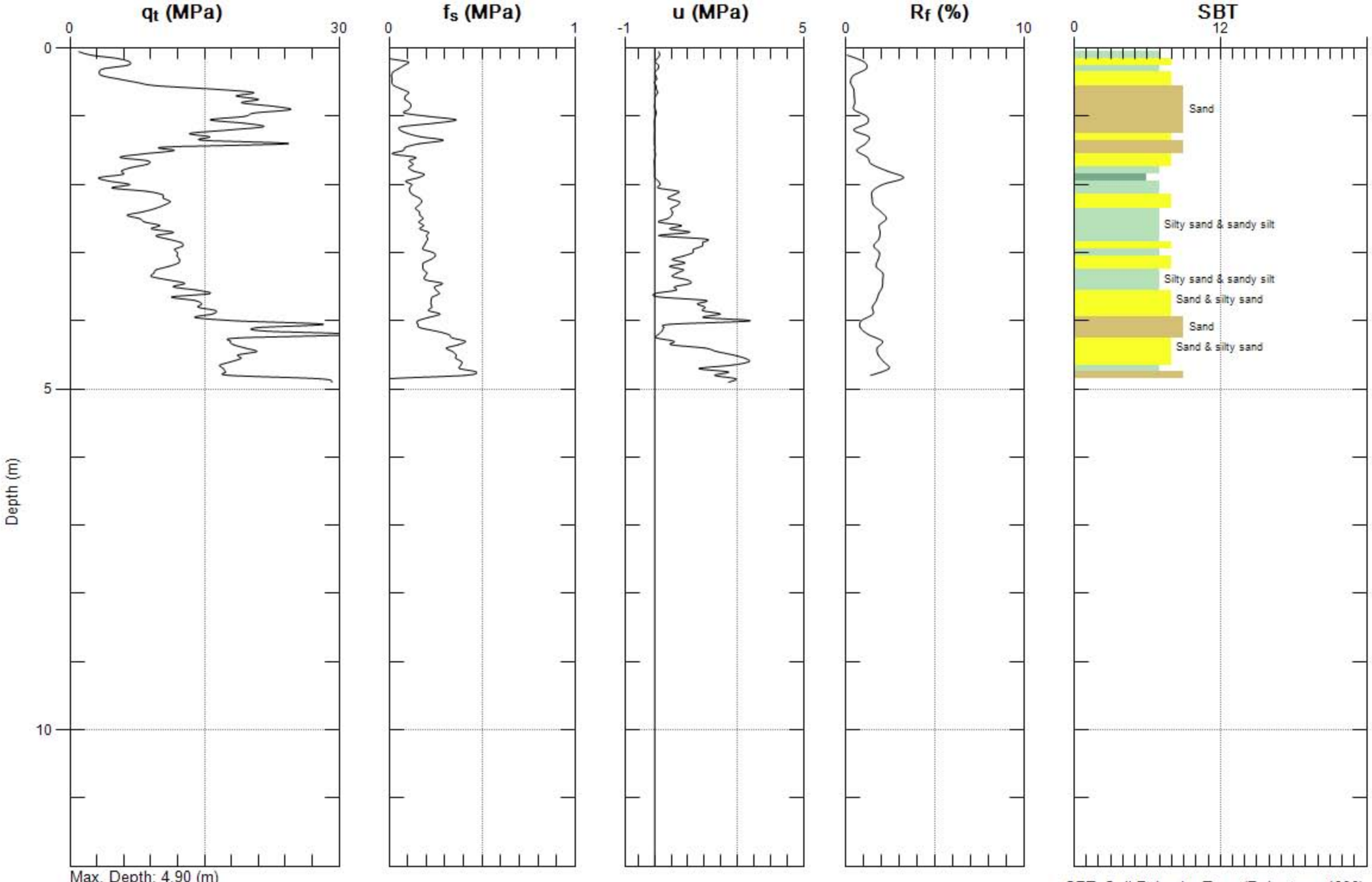

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SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

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Sounding: 440+90
Engineer: D.KIRKMAN
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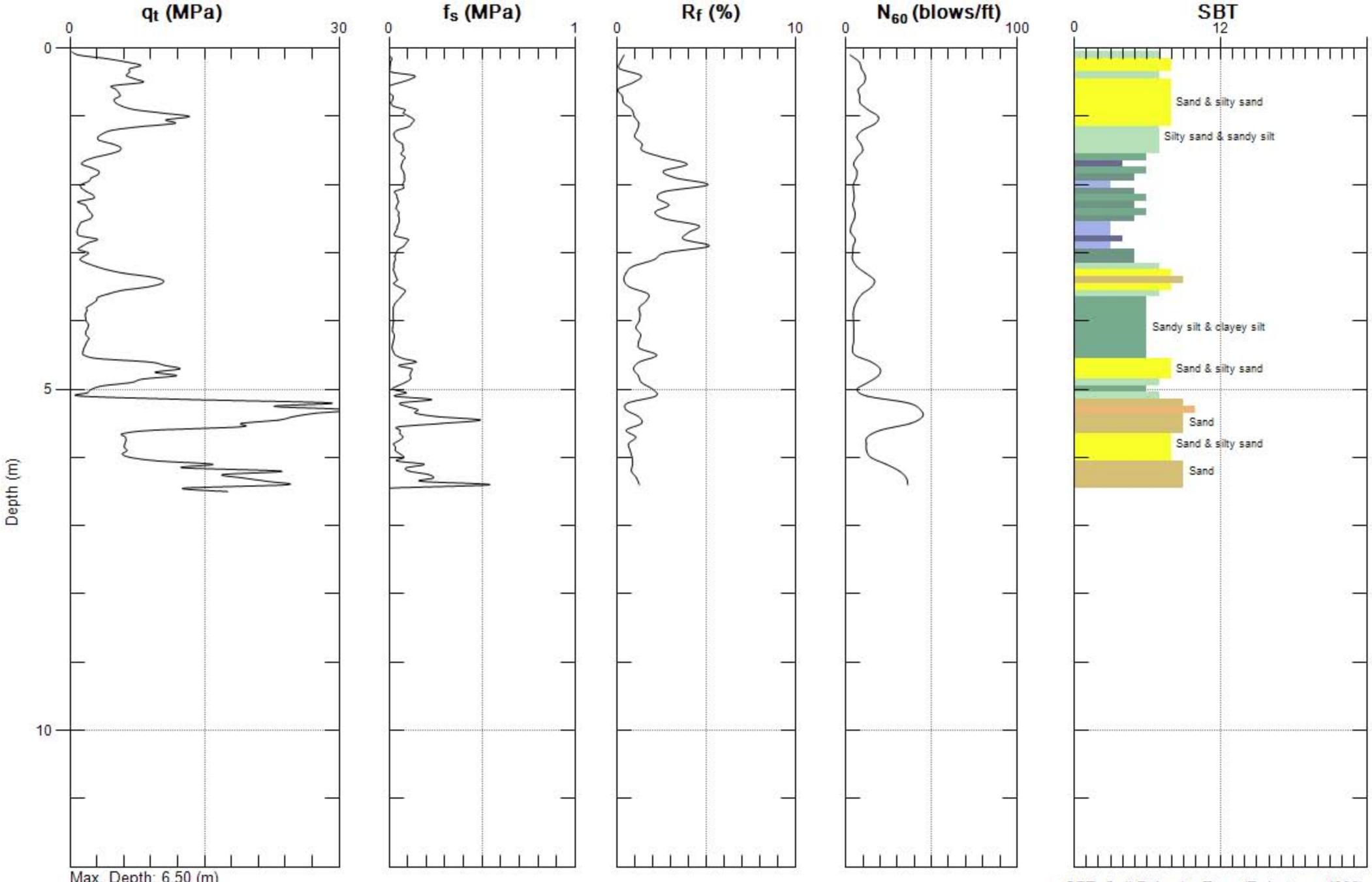

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SBT: Soil Behavior Type (Robertson 1990)

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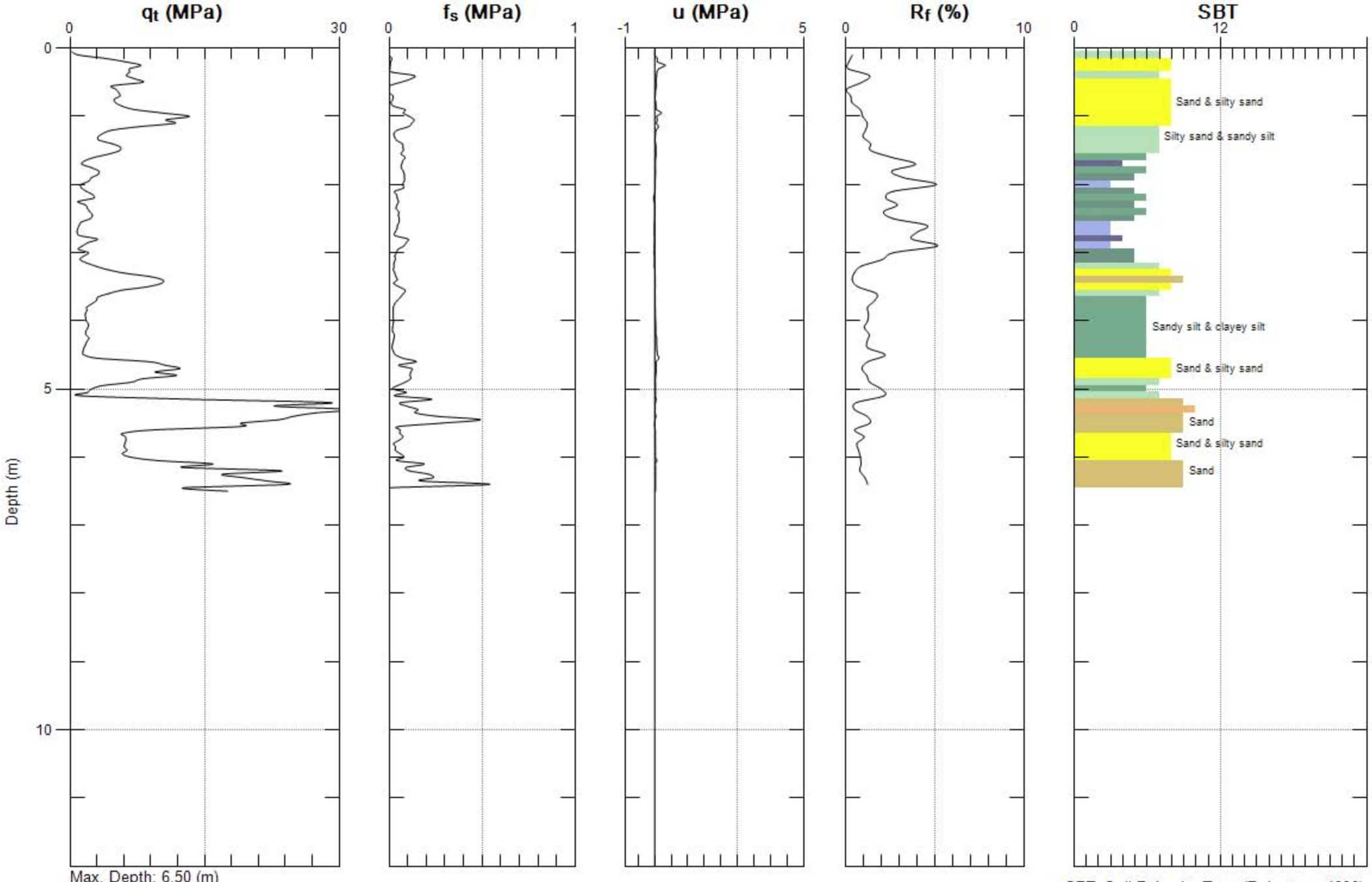
Sounding: 440+90
Engineer: D.KIRKMAN
Date: 4/30/2008 12:29



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SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

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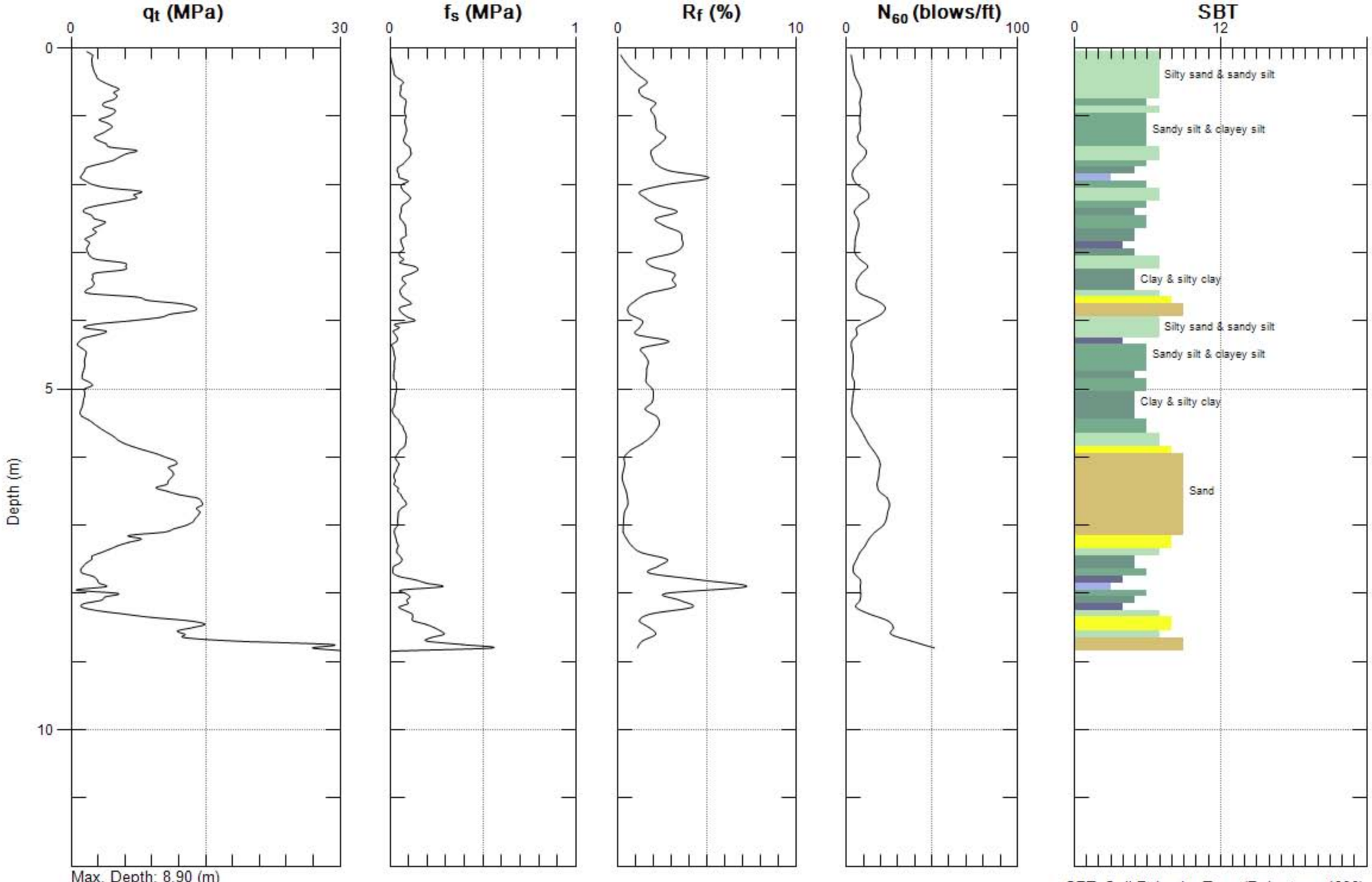
Sounding: 441+22.5
Engineer: D.KIRKMAN
Date: 4/30/2008 01:12



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SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

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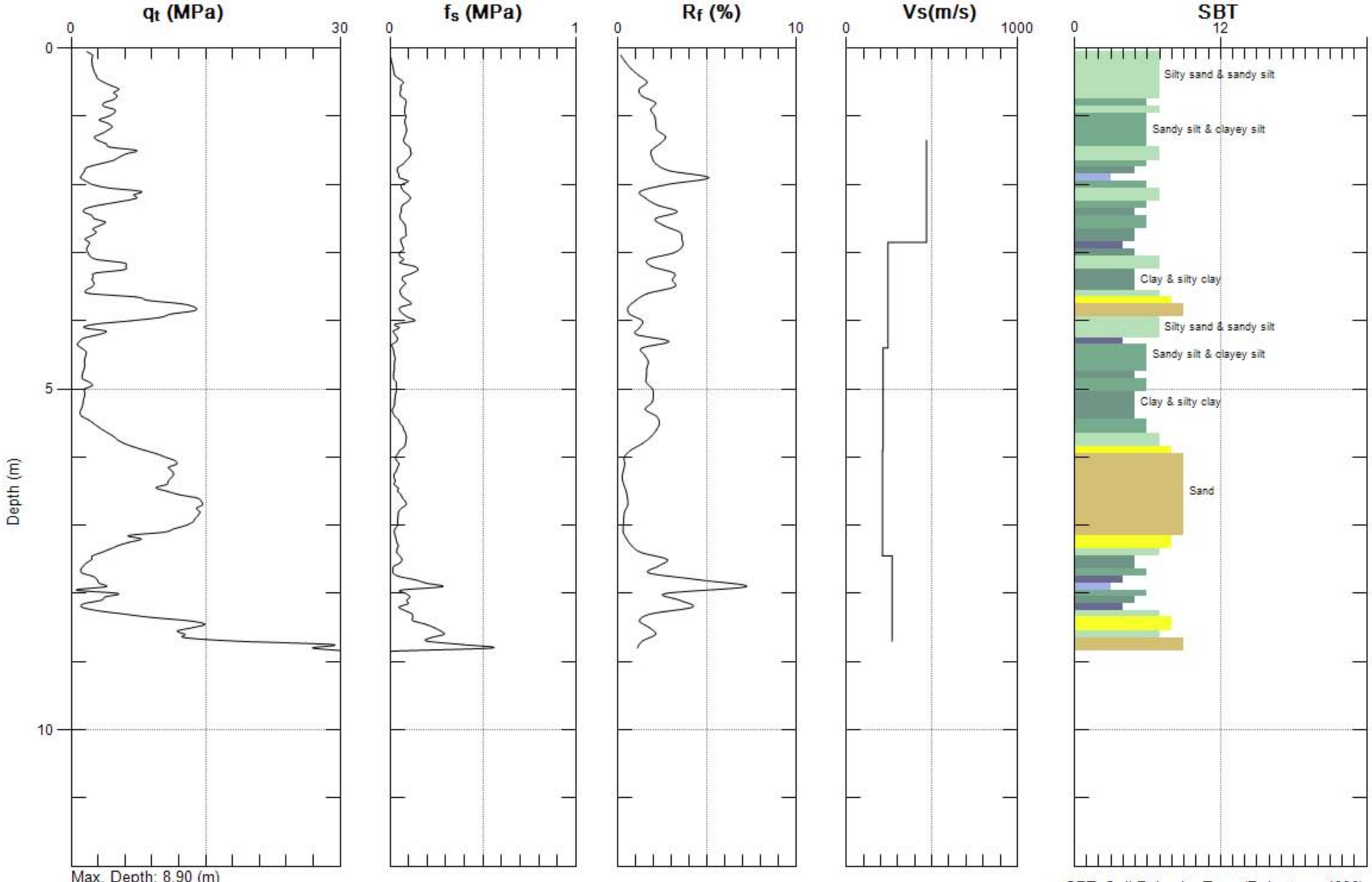
Sounding: 441+22.5
Engineer: D.KIRKMAN
Date: 4/30/2008 01:12



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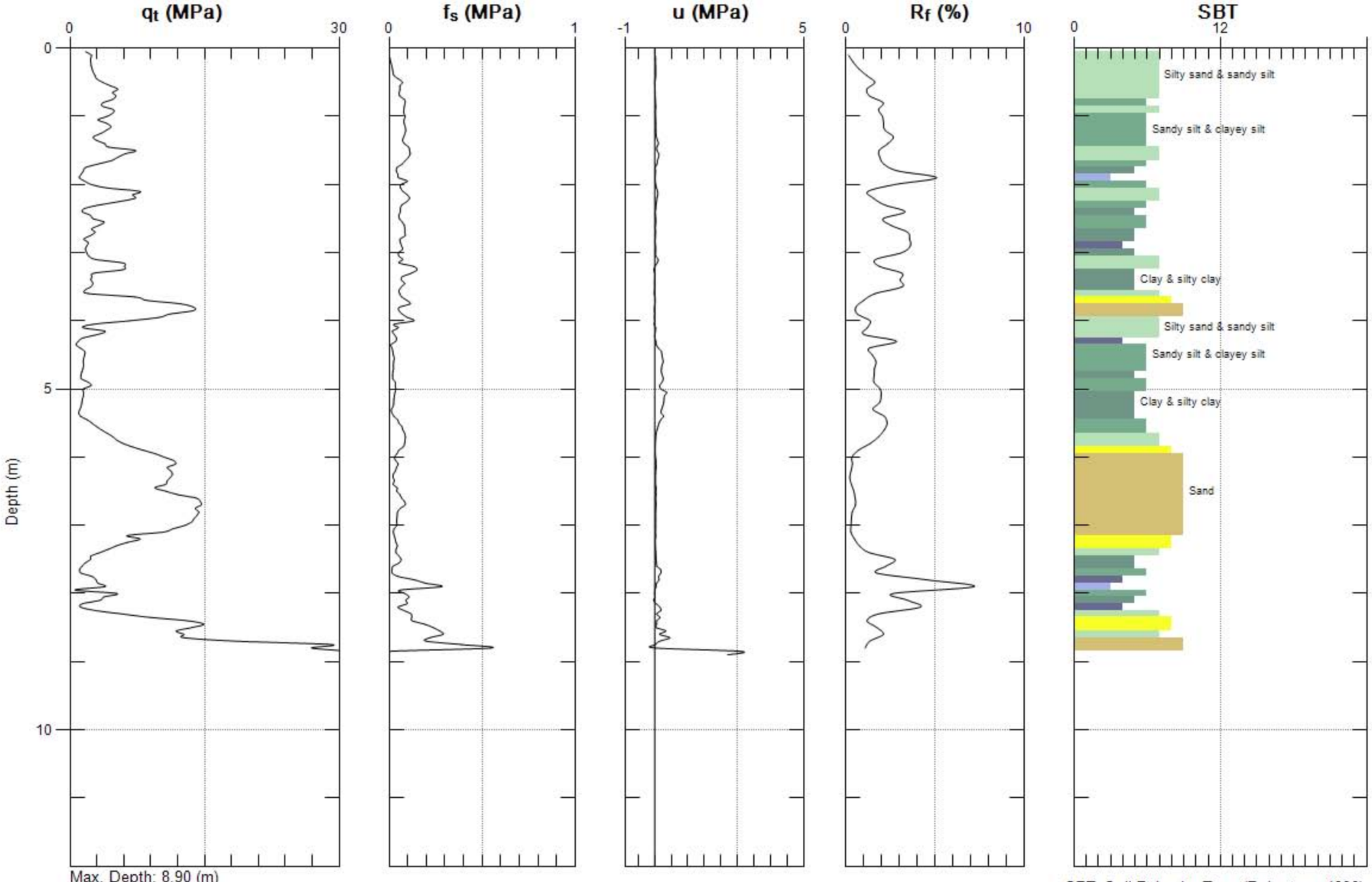
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 441+22.5

Engineer: D.KIRKMAN
Date: 4/30/2008 01:12



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SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

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Sounding: 441+42

Engineer: D.KIRKMAN
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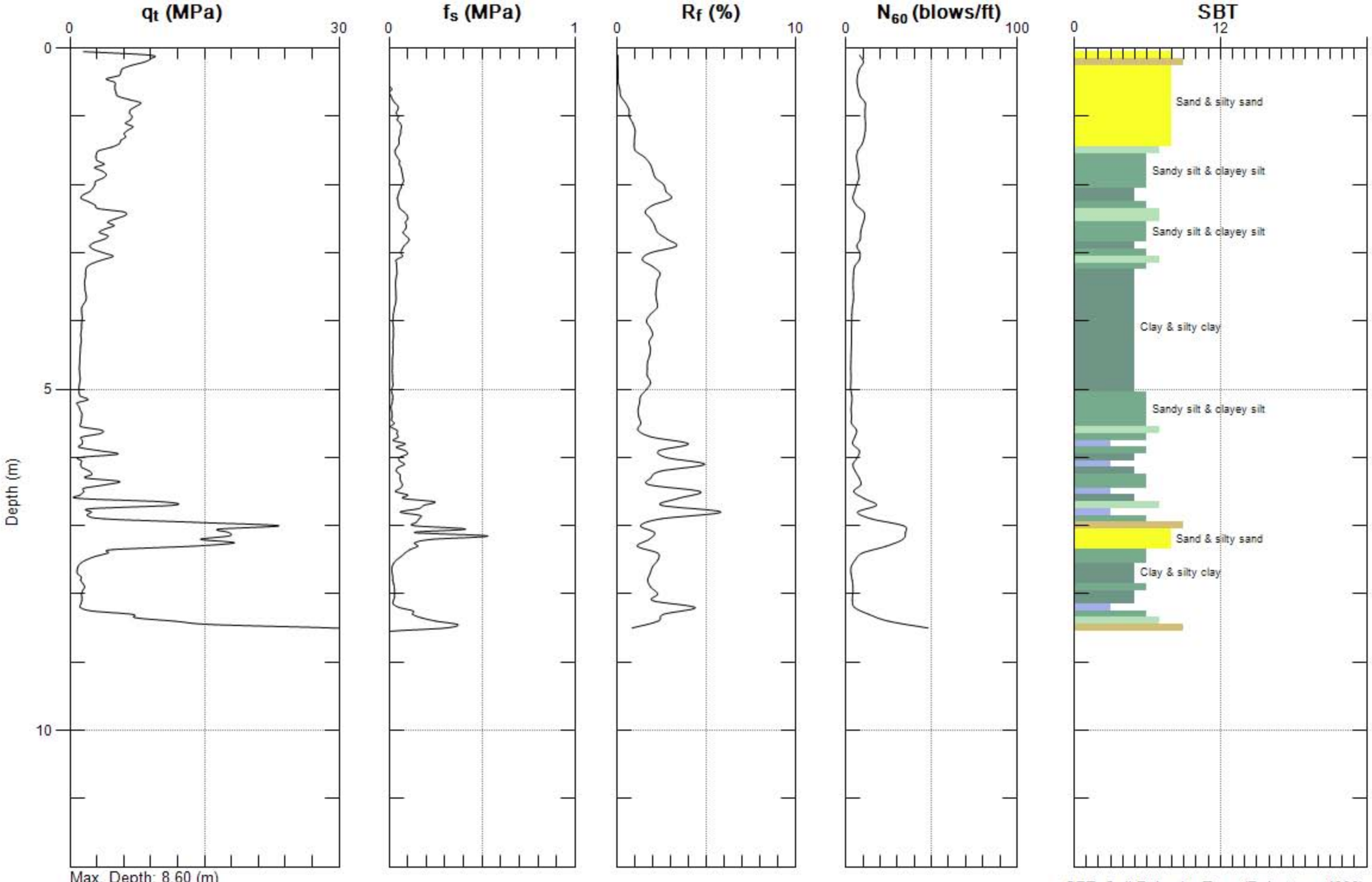

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Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

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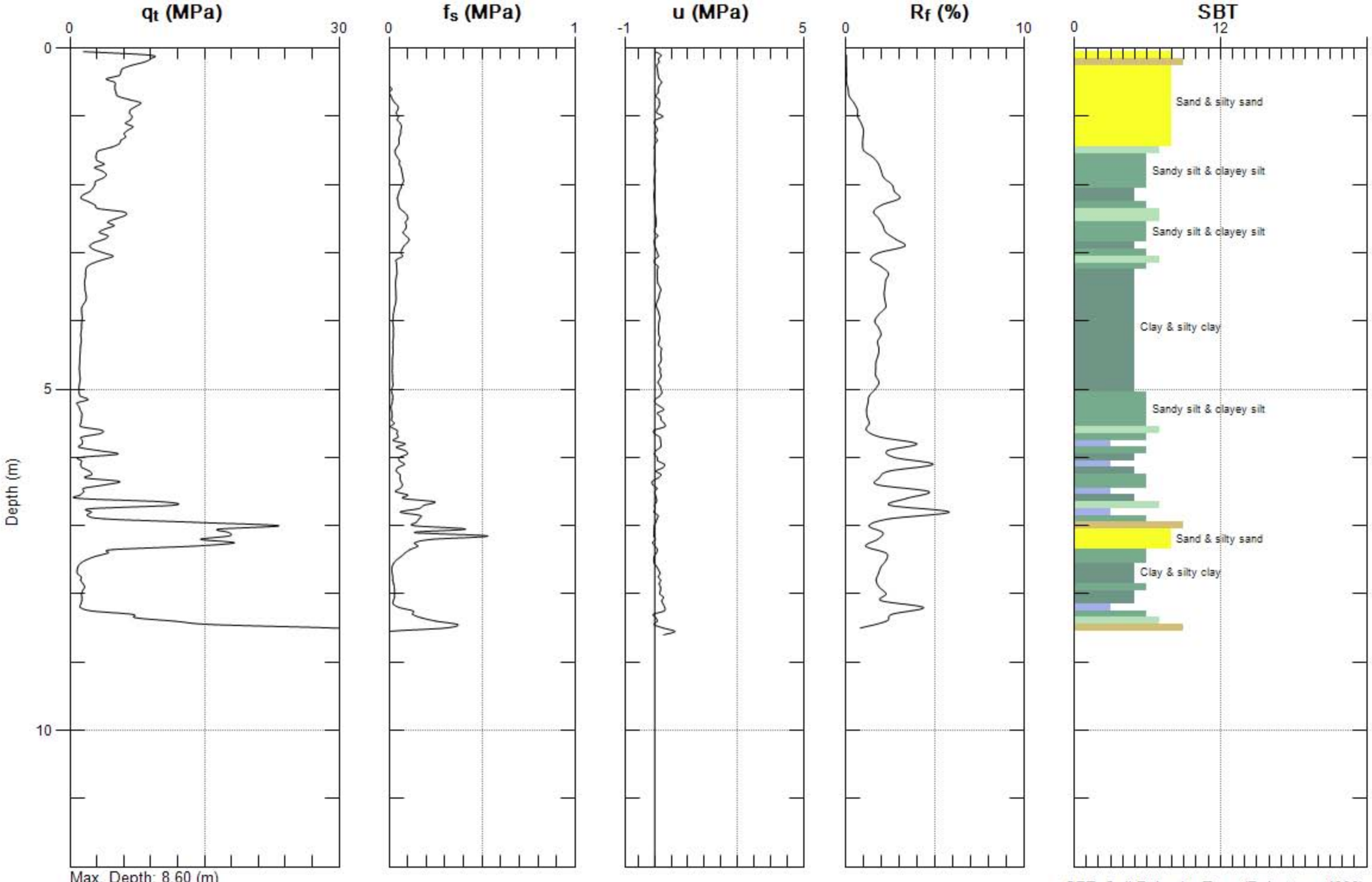
Sounding: 441+42

Engineer: D.KIRKMAN
Date: 4/30/2008 02:10



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Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

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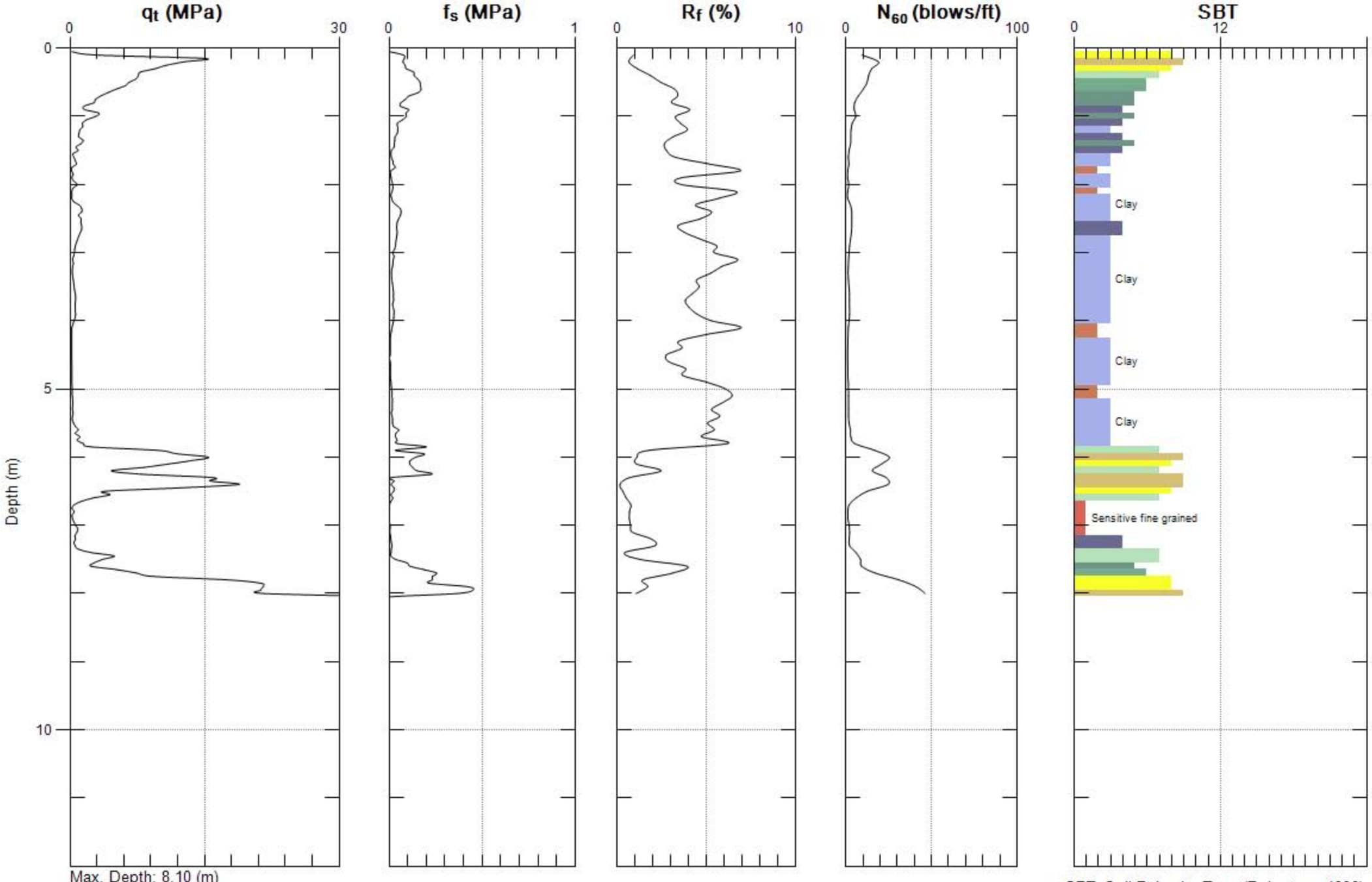
Sounding: 441+64
Engineer: D.KIRKMAN
Date: 4/28/2008 12:17



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Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

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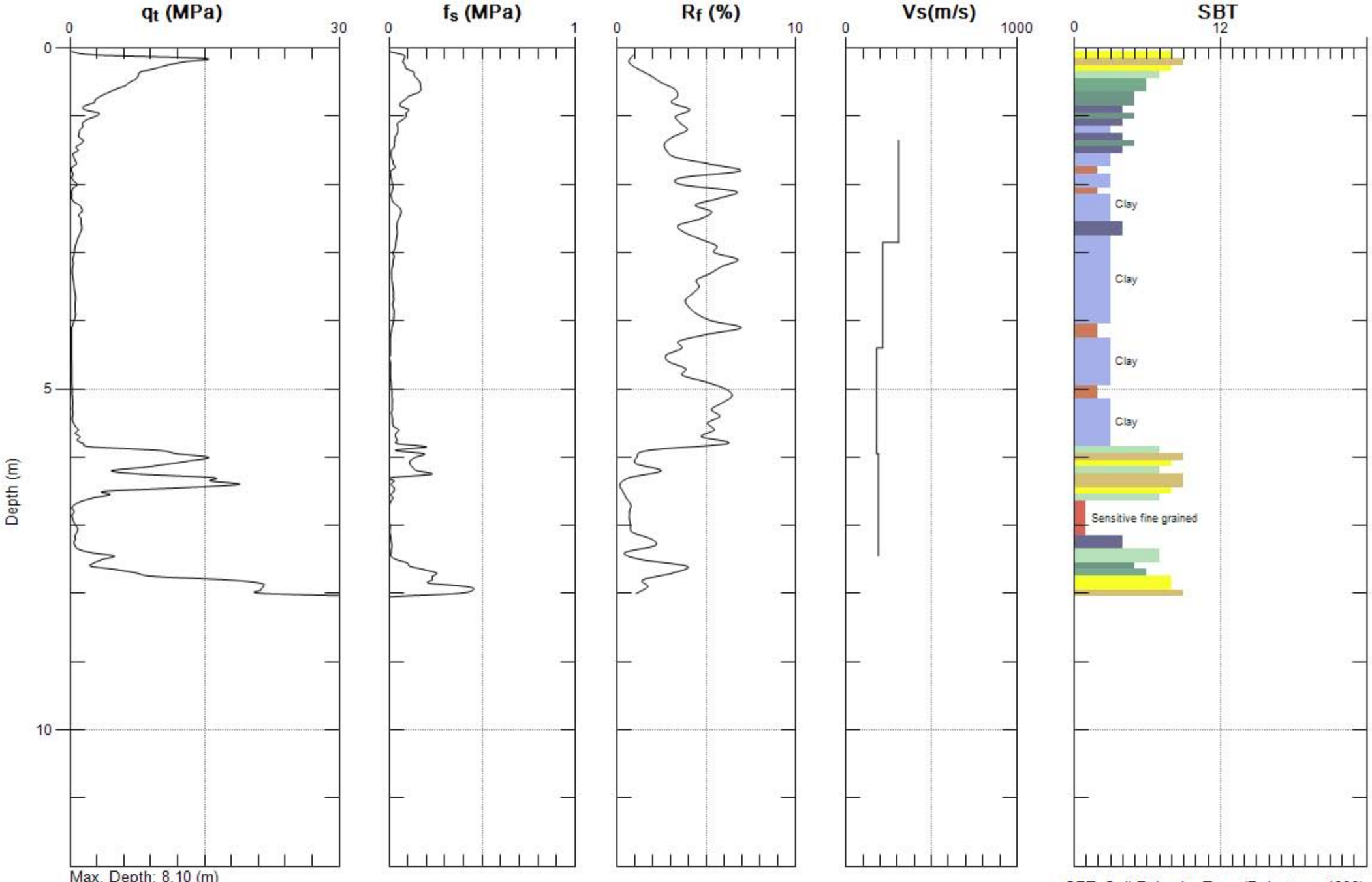
Sounding: 441+64

Engineer: D.KIRKMAN
Date: 4/28/2008 12:17



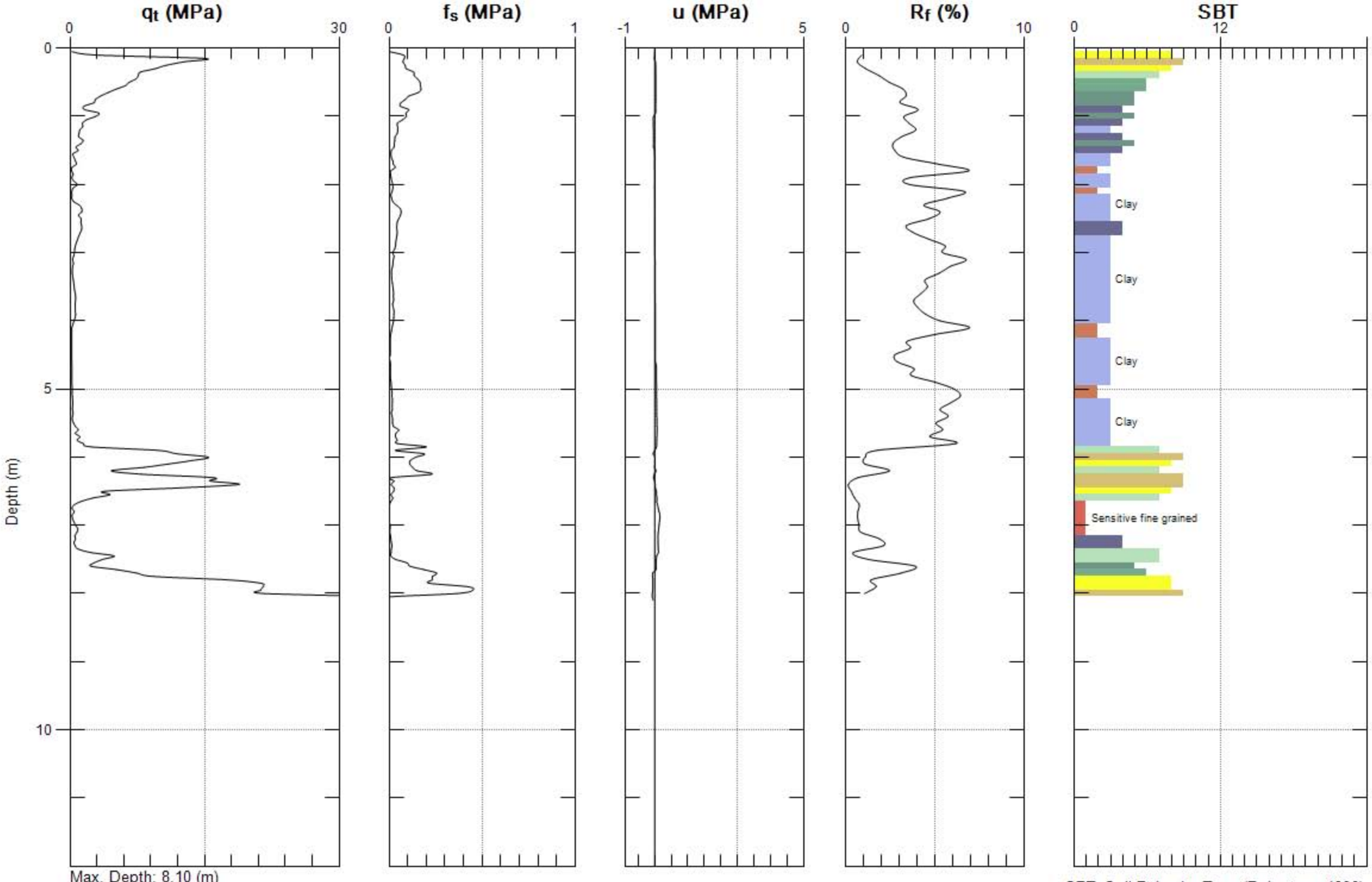
Max. Depth: 8.10 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 441+64

Engineer: D.KIRKMAN
Date: 4/28/2008 12:17

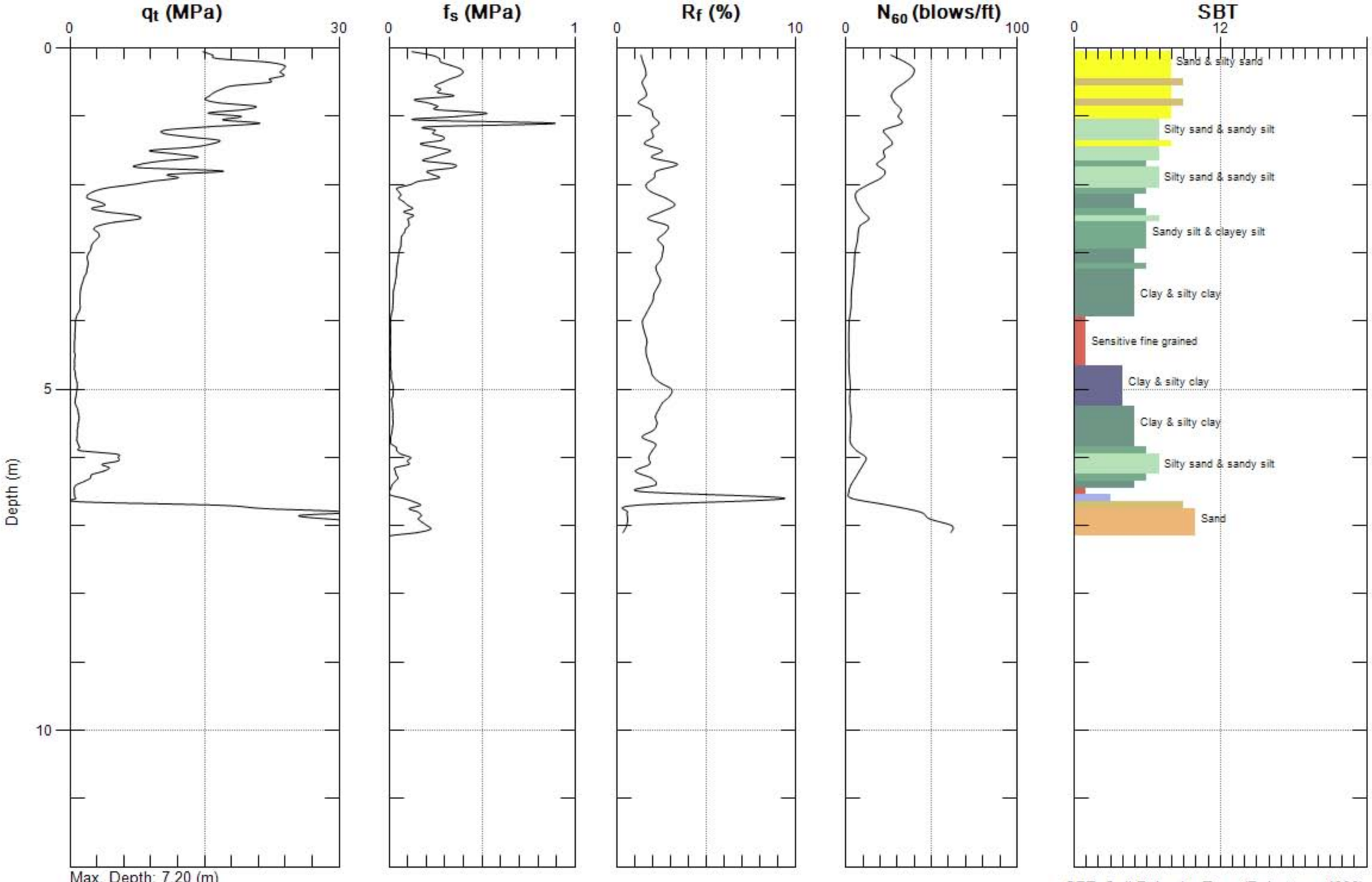


Max. Depth: 8.10 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 441+82B
Engineer: D.KIRKMAN
Date: 4/28/2008 01:46

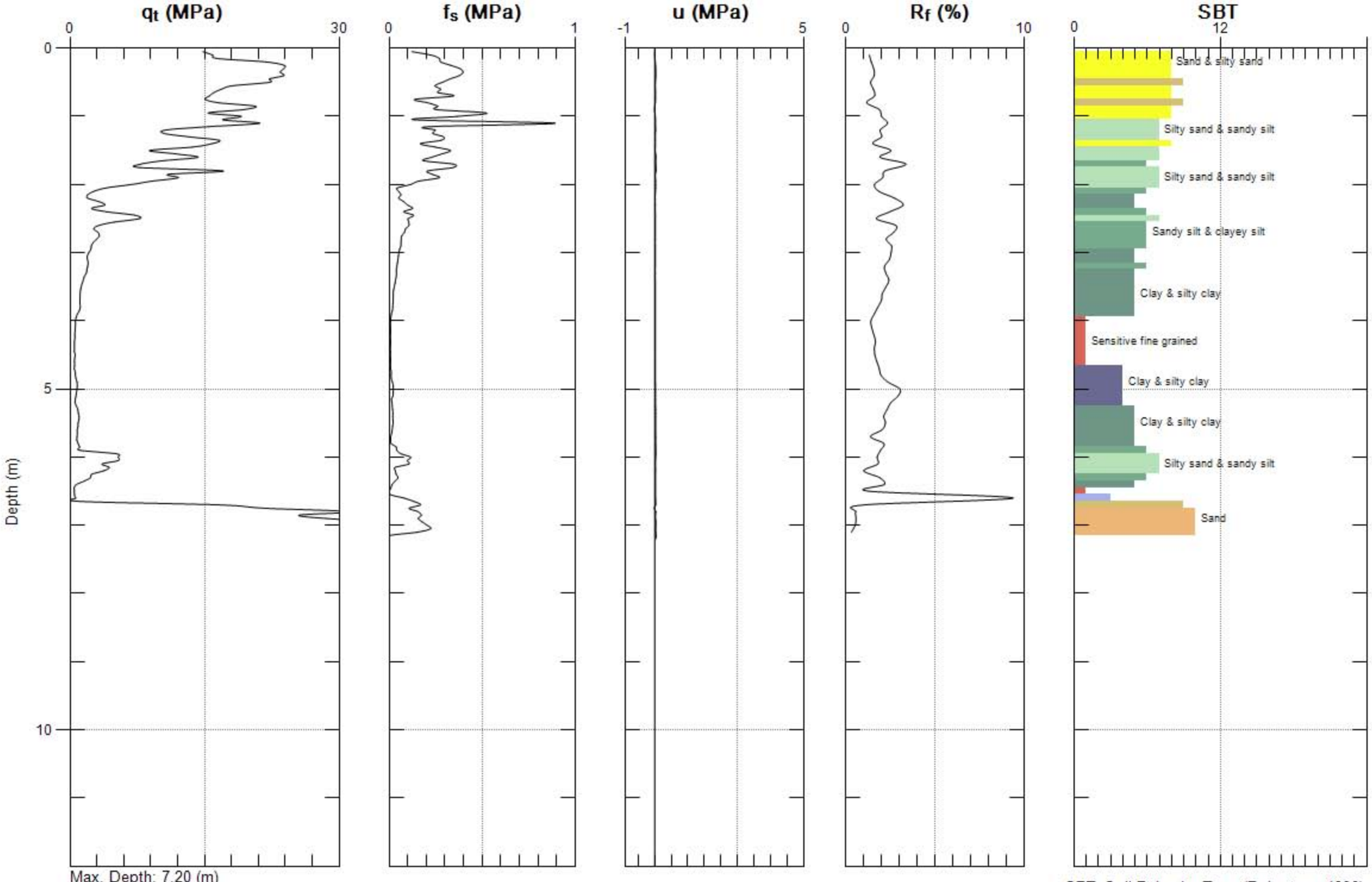


Max. Depth: 7.20 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 441+82B
Engineer: D.KIRKMAN
Date: 4/28/2008 01:46



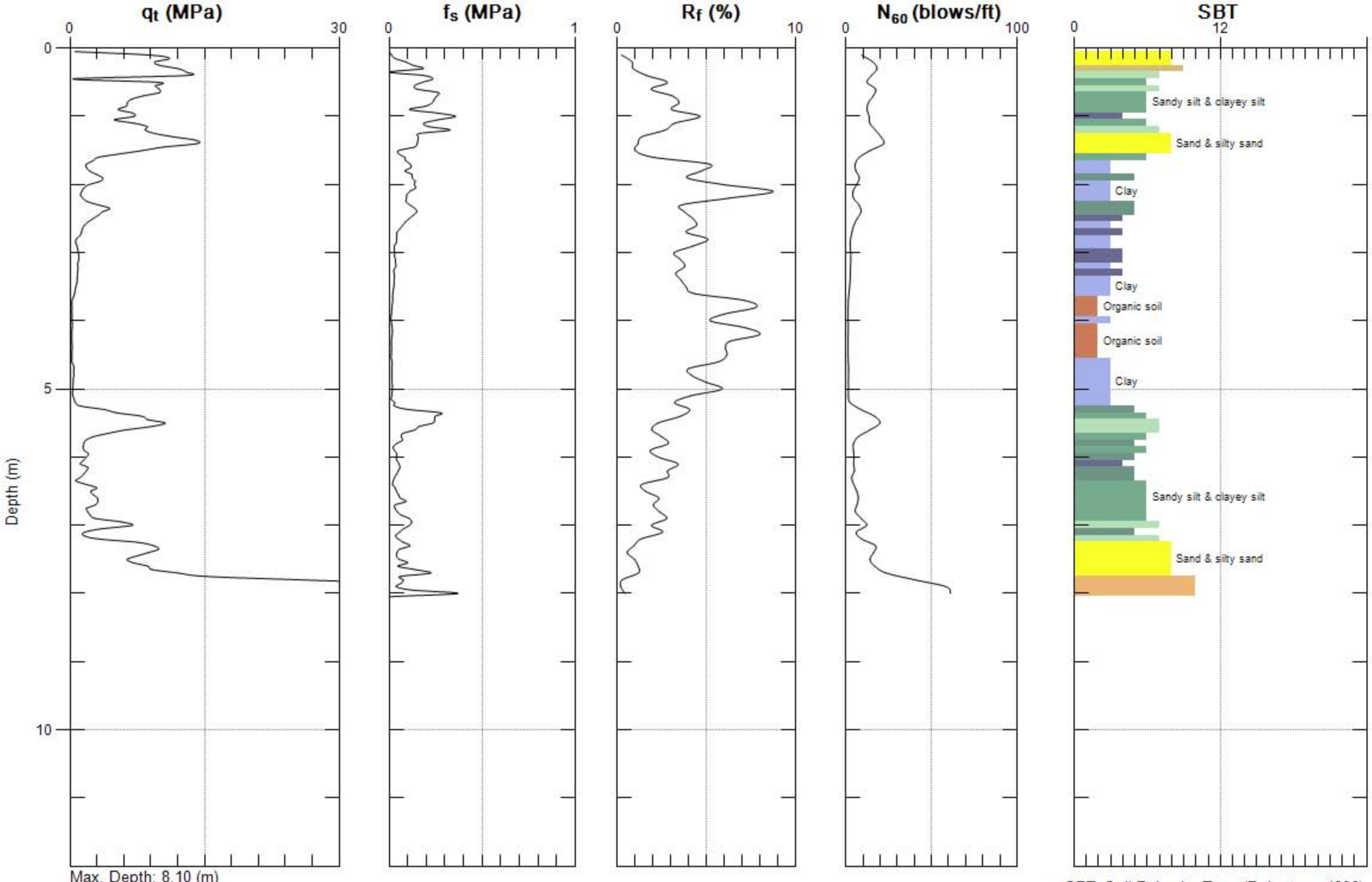
Max. Depth: 7.20 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 441+96

Engineer: D.KIRKMAN
Date: 4/28/2008 02:38

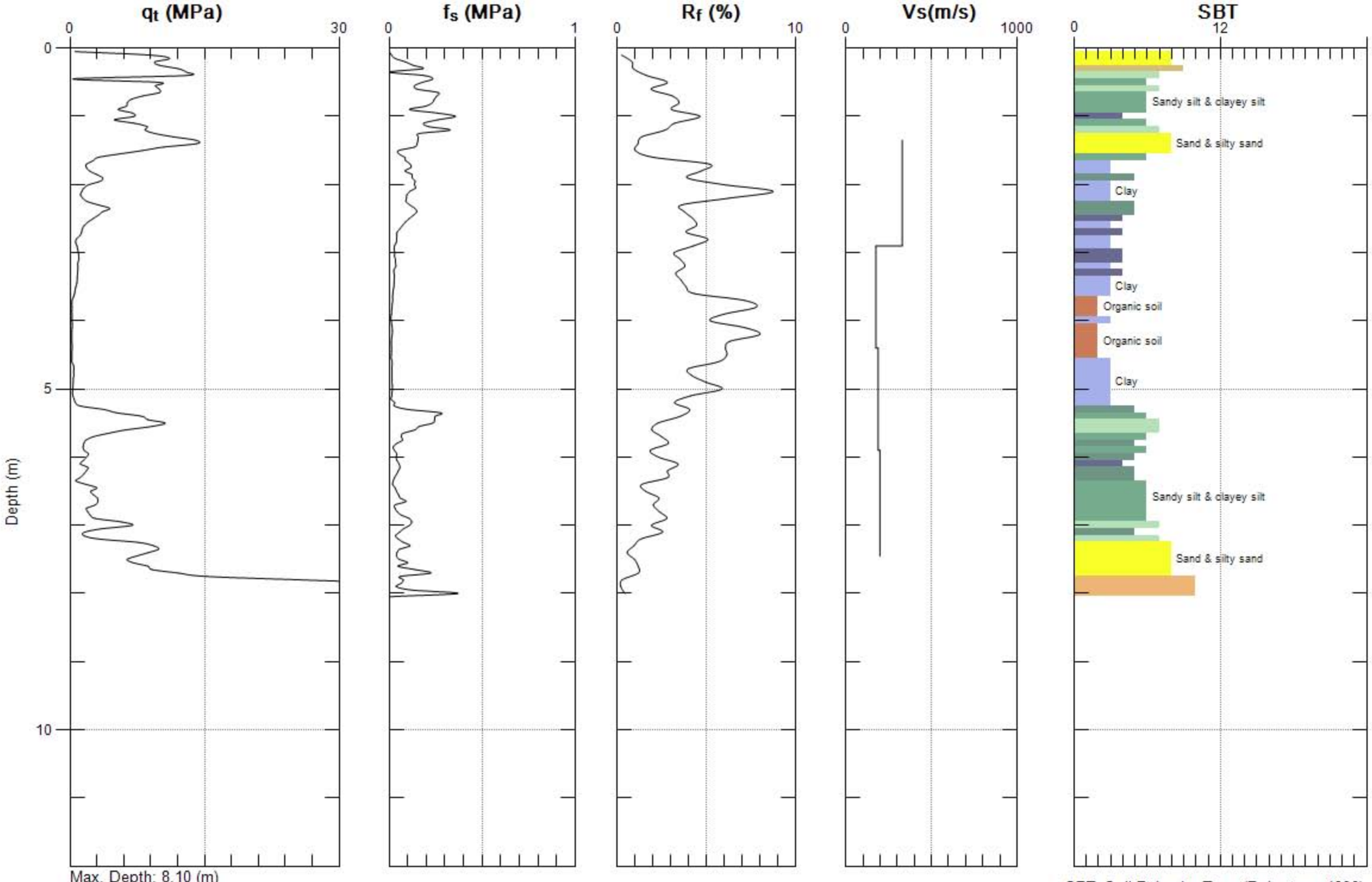


Max. Depth: 8.10 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 441+96
Engineer: D.KIRKMAN
Date: 4/28/2008 02:38

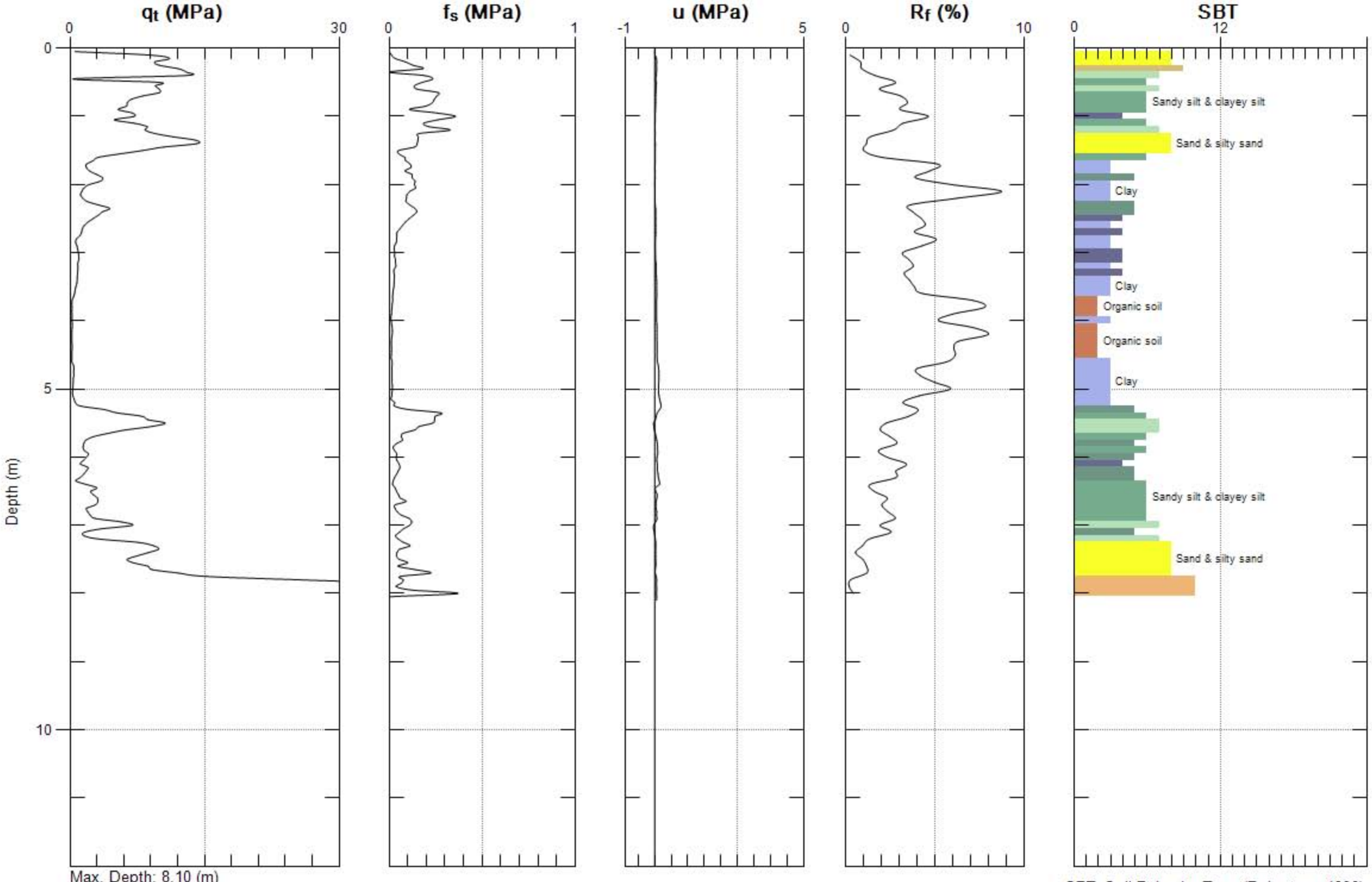


Max. Depth: 8.10 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 441+96
Engineer: D.KIRKMAN
Date: 4/28/2008 02:38

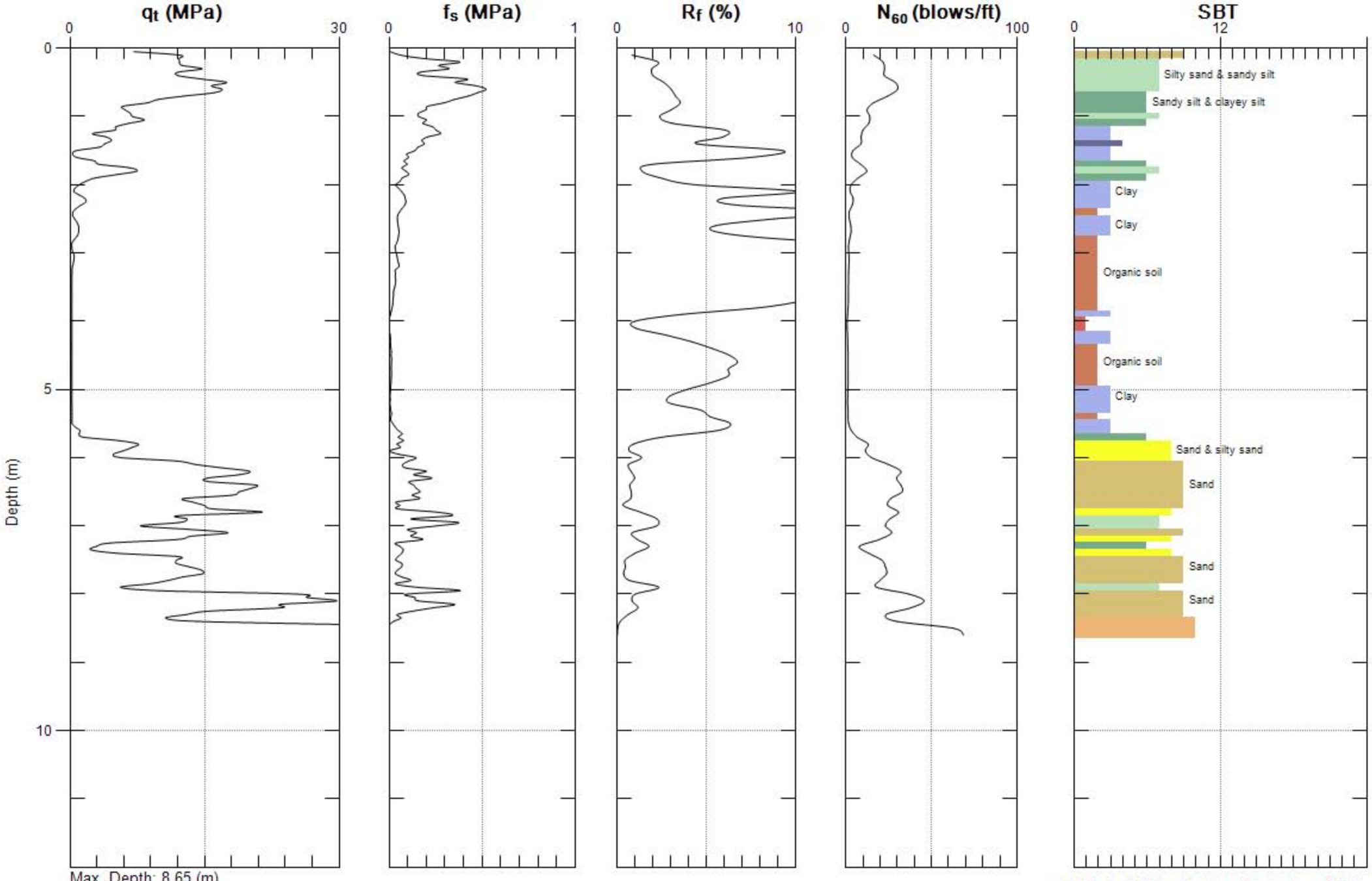


Max. Depth: 8.10 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 442+05
Engineer: D.KIRKMAN
Date: 4/28/2008 03:38



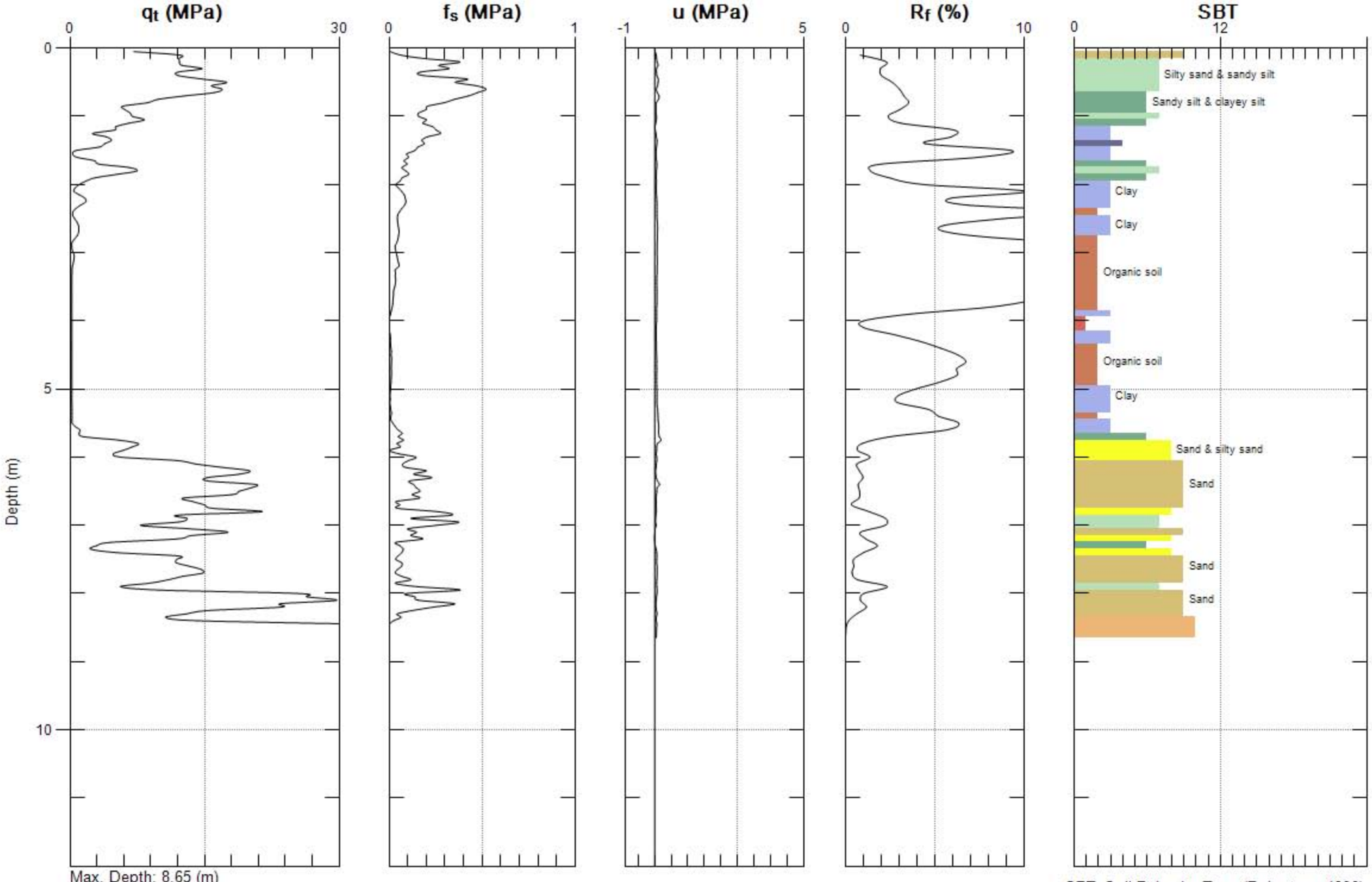
Max. Depth: 8.65 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 442+05

Engineer: D.KIRKMAN
Date: 4/28/2008 03:38

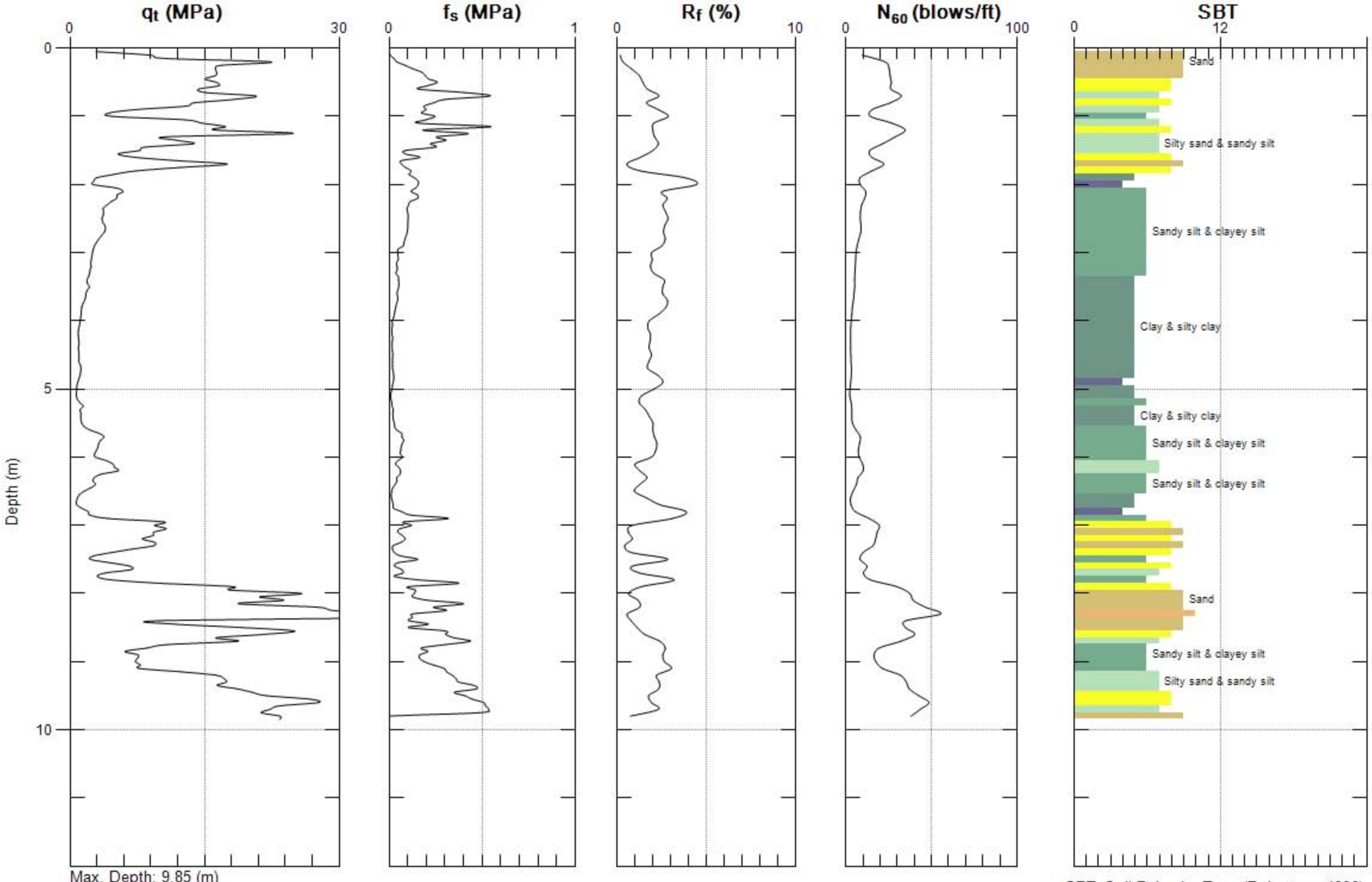


Max. Depth: 8.65 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 442+15
Engineer: D.KIRKMAN
Date: 4/29/2008 07:40

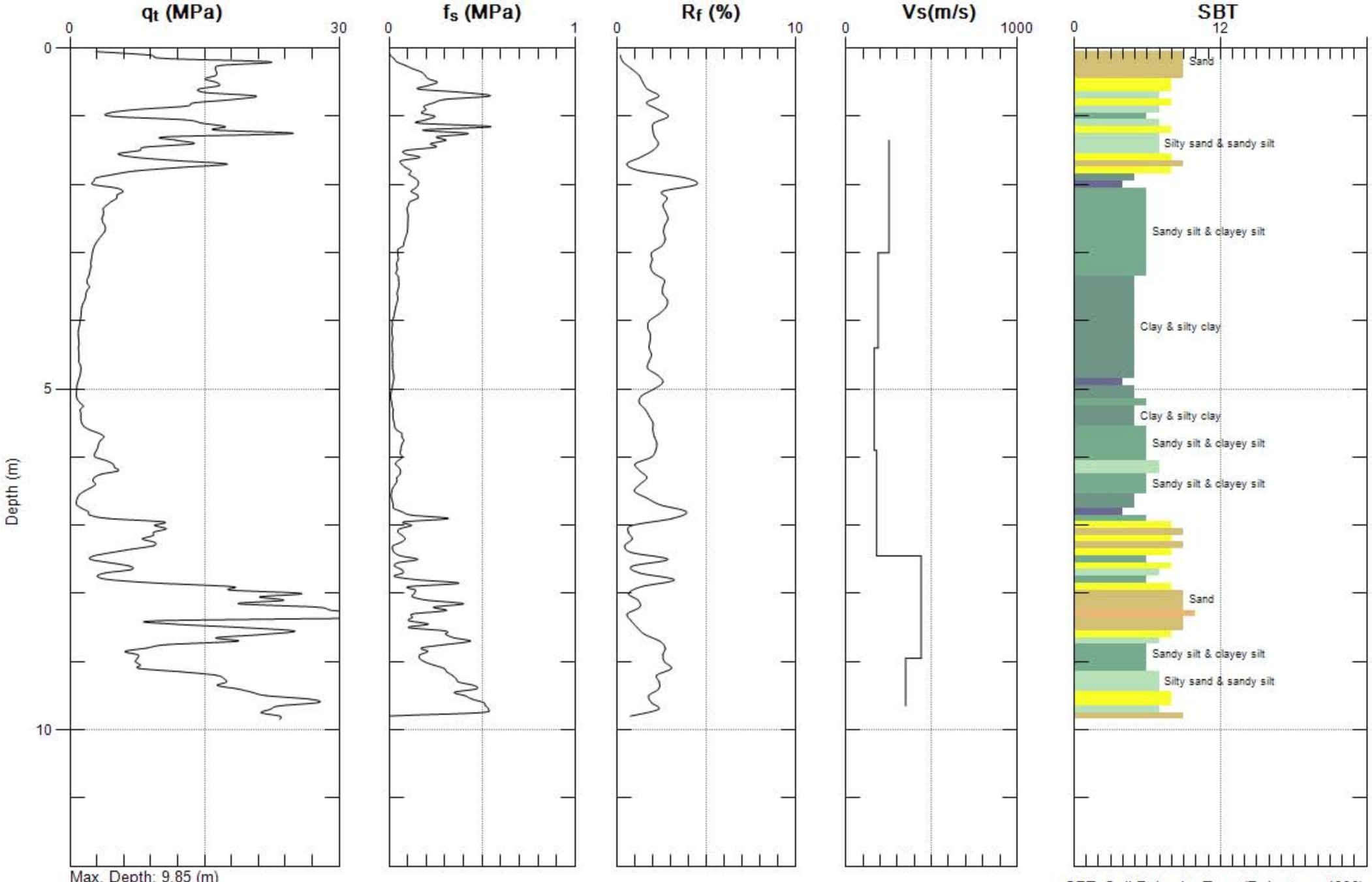


Max. Depth: 9.85 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 442+15
Engineer: D.KIRKMAN
Date: 4/29/2008 07:40

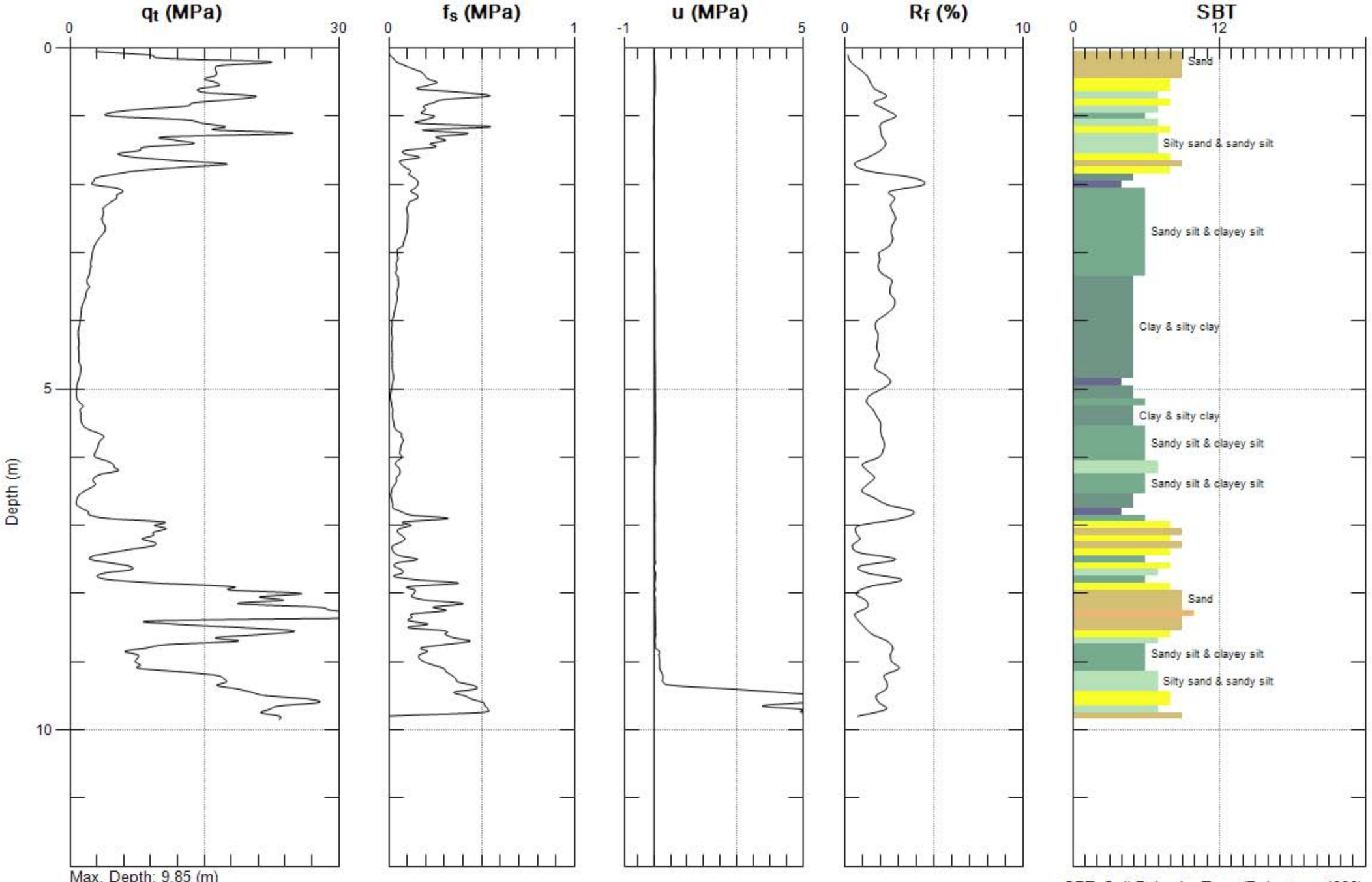


Max. Depth: 9.85 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 442+15
Engineer: D.KIRKMAN
Date: 4/29/2008 07:40



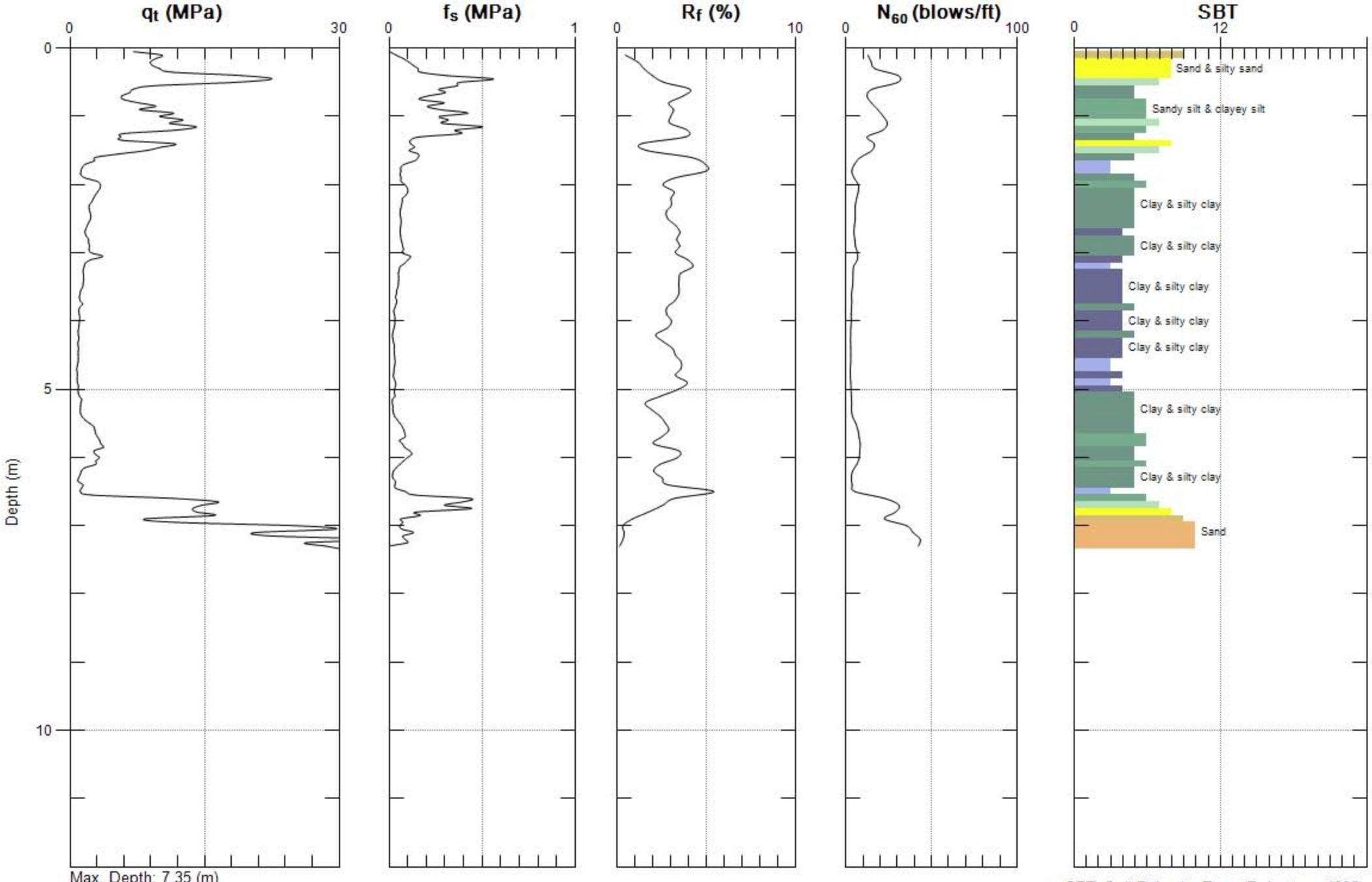
Max. Depth: 9.85 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 442+23.5

Engineer: D.KIRKMAN
Date: 4/29/2008 09:24

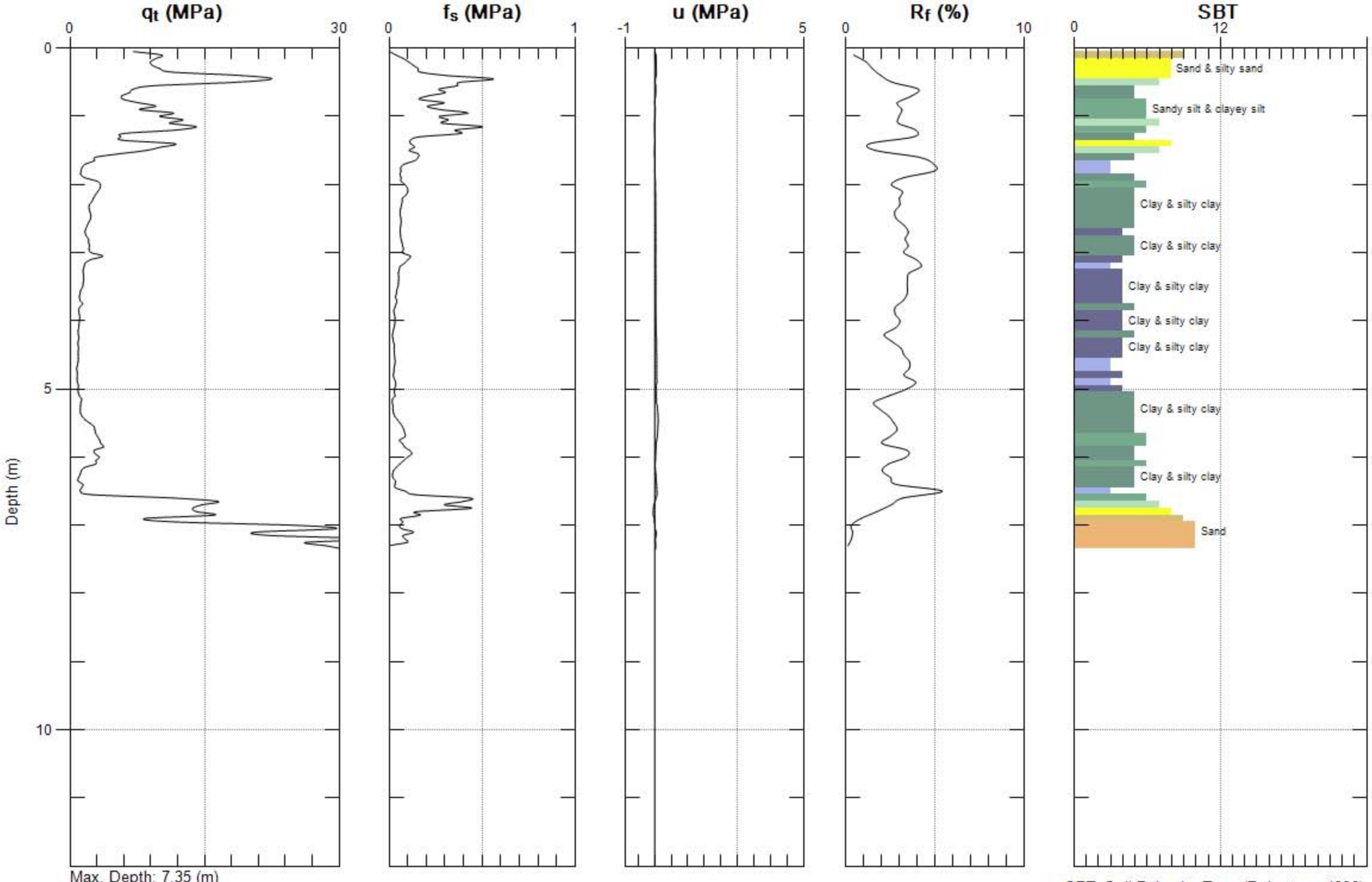


Max. Depth: 7.35 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 442+23.5
Engineer: D.KIRKMAN
Date: 4/29/2008 09:24

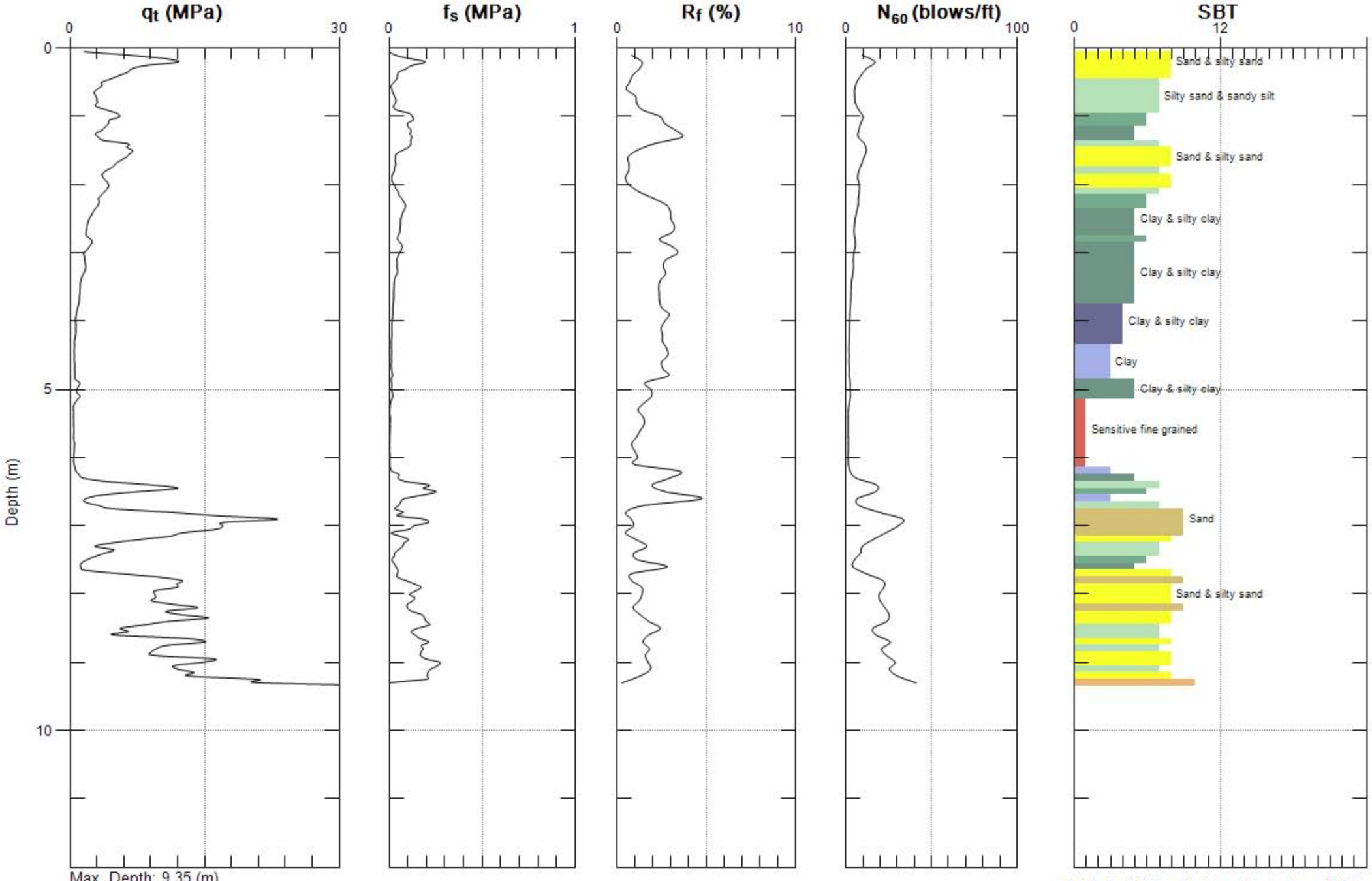


Max. Depth: 7.35 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 442+32
Engineer: D.KIRKMAN
Date: 4/30/2008 10:09



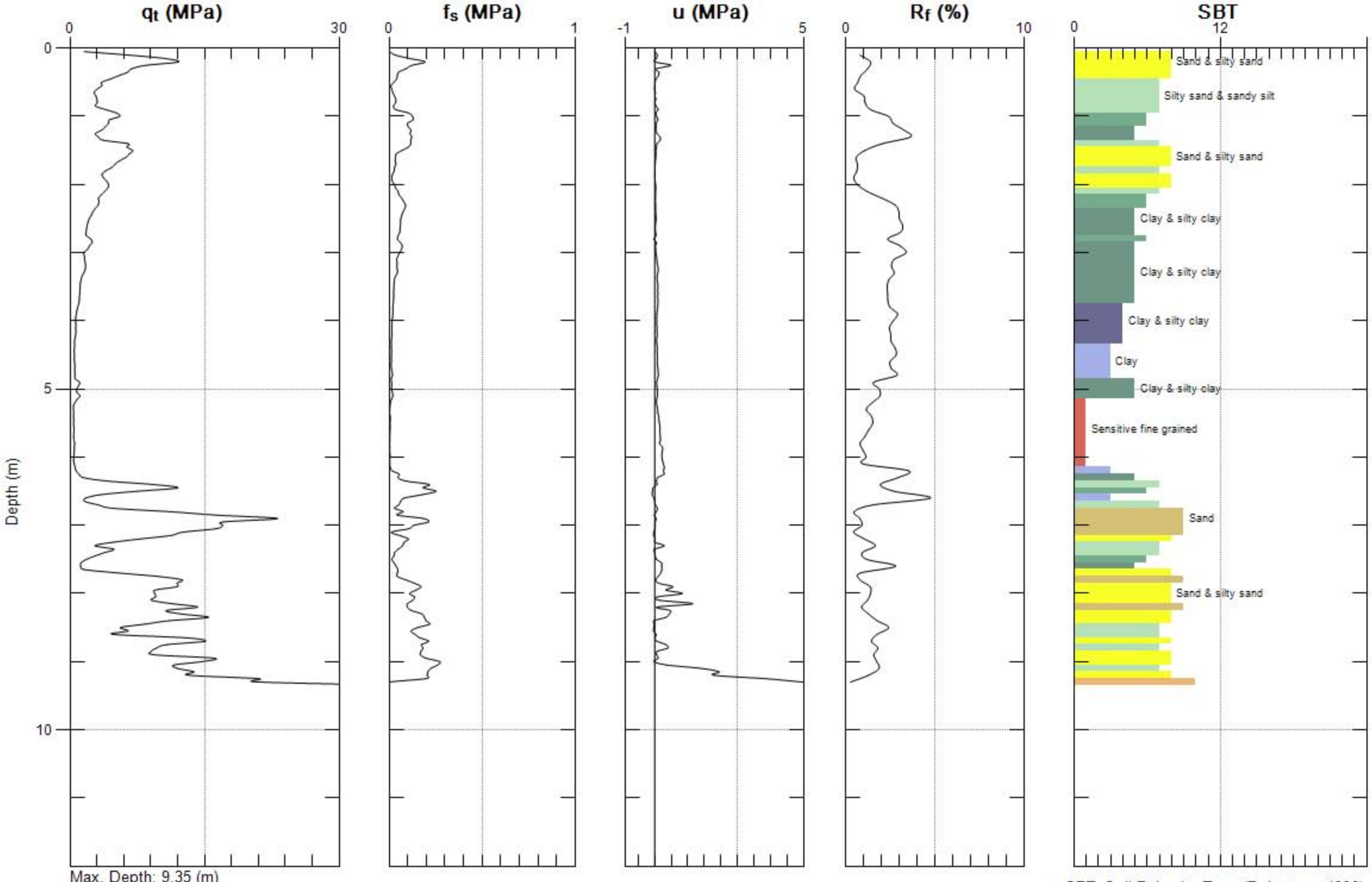
Max. Depth: 9.35 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 442+32

Engineer: D.KIRKMAN
Date: 4/30/2008 10:09

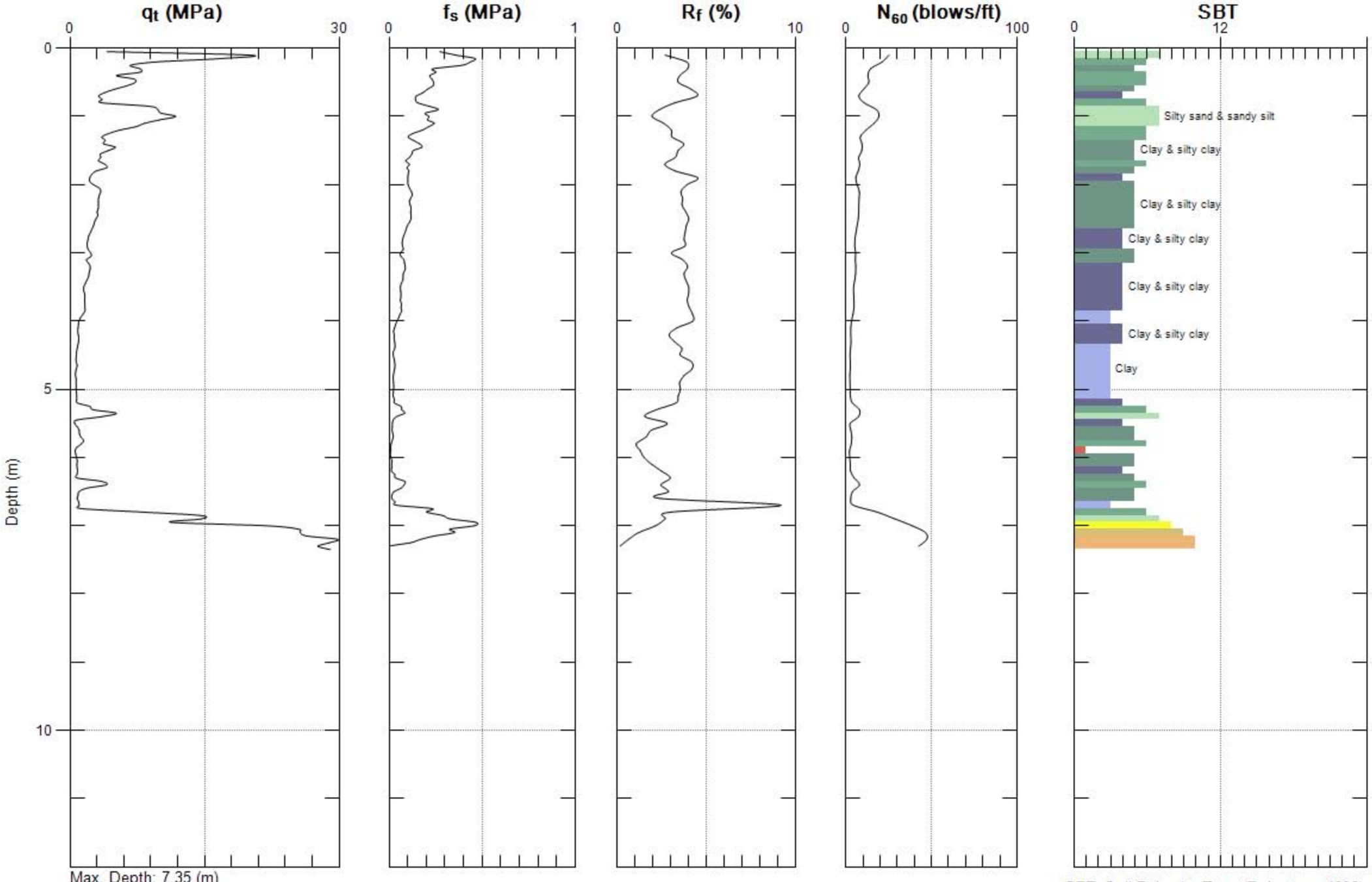


Max. Depth: 9.35 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 442+42.5
Engineer: D.KIRKMAN
Date: 4/29/2008 10:28

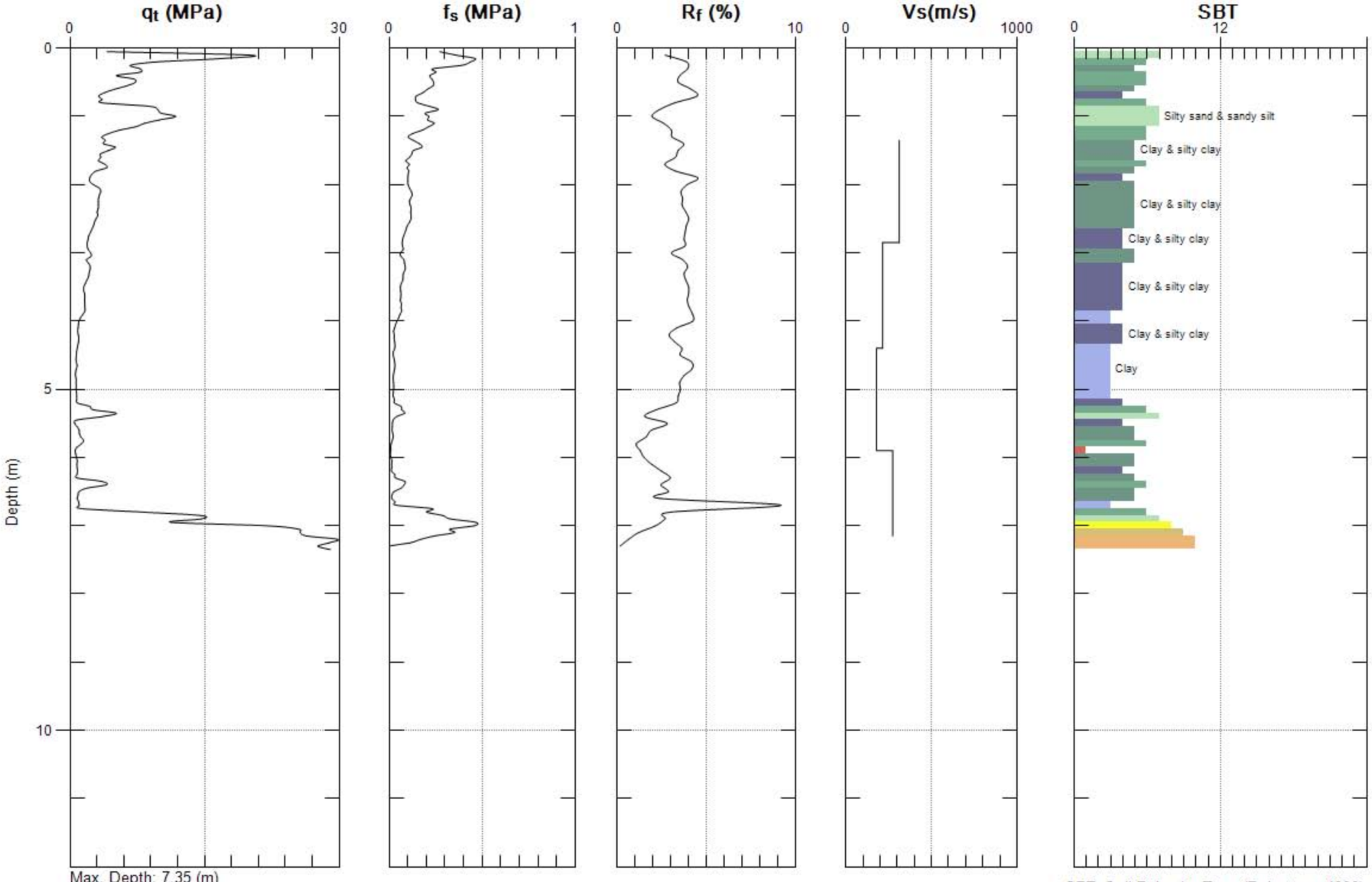


Max. Depth: 7.35 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 442+42.5
Engineer: D.KIRKMAN
Date: 4/29/2008 10:28

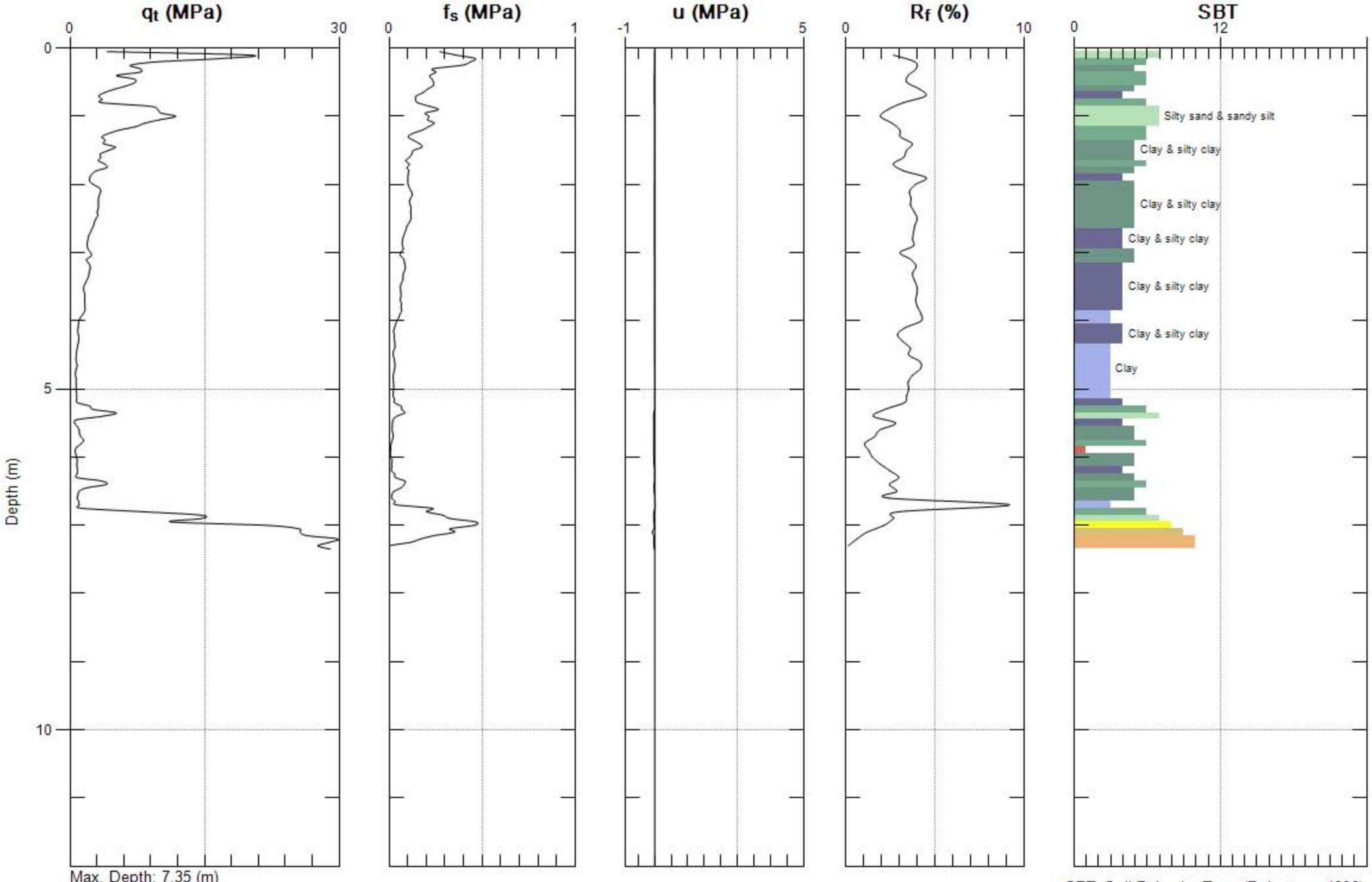


Max. Depth: 7.35 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 442+42.5
Engineer: D.KIRKMAN
Date: 4/29/2008 10:28



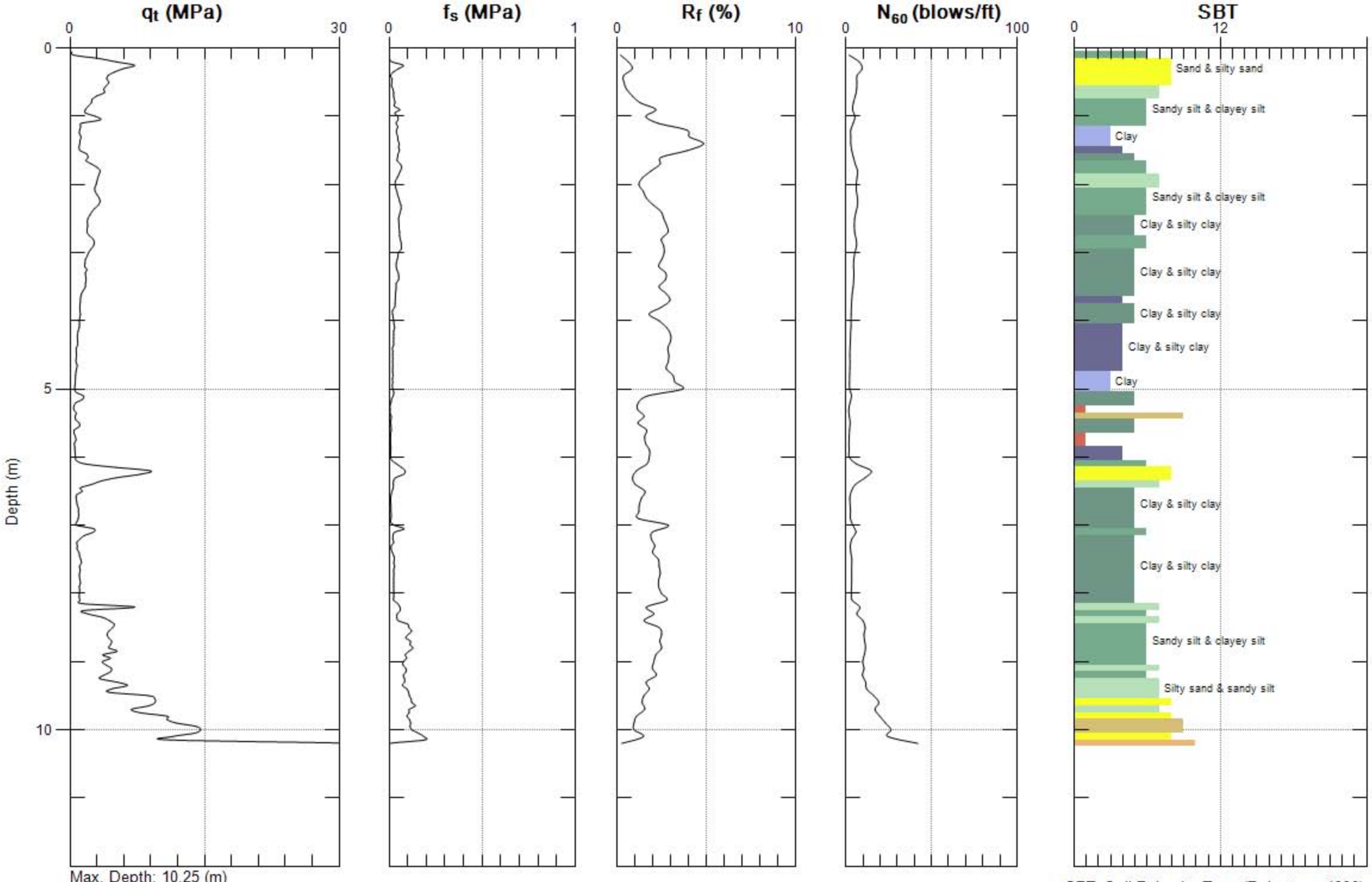
Max. Depth: 7.35 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 442+50

Engineer: D.KIRKMAN
Date: 4/30/2008 09:08



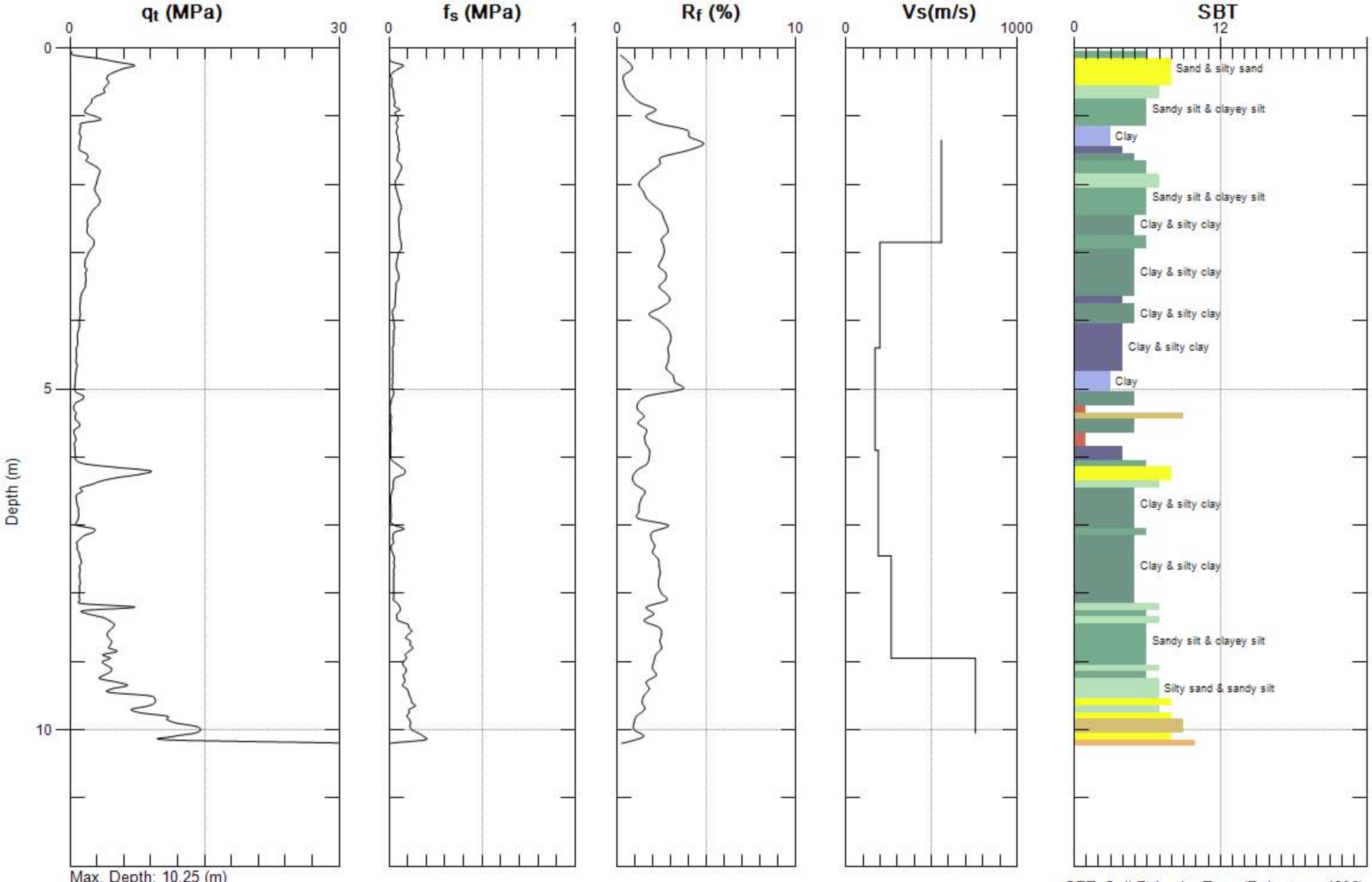
Max. Depth: 10.25 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 442+50

Engineer: D.KIRKMAN
Date: 4/30/2008 09:08



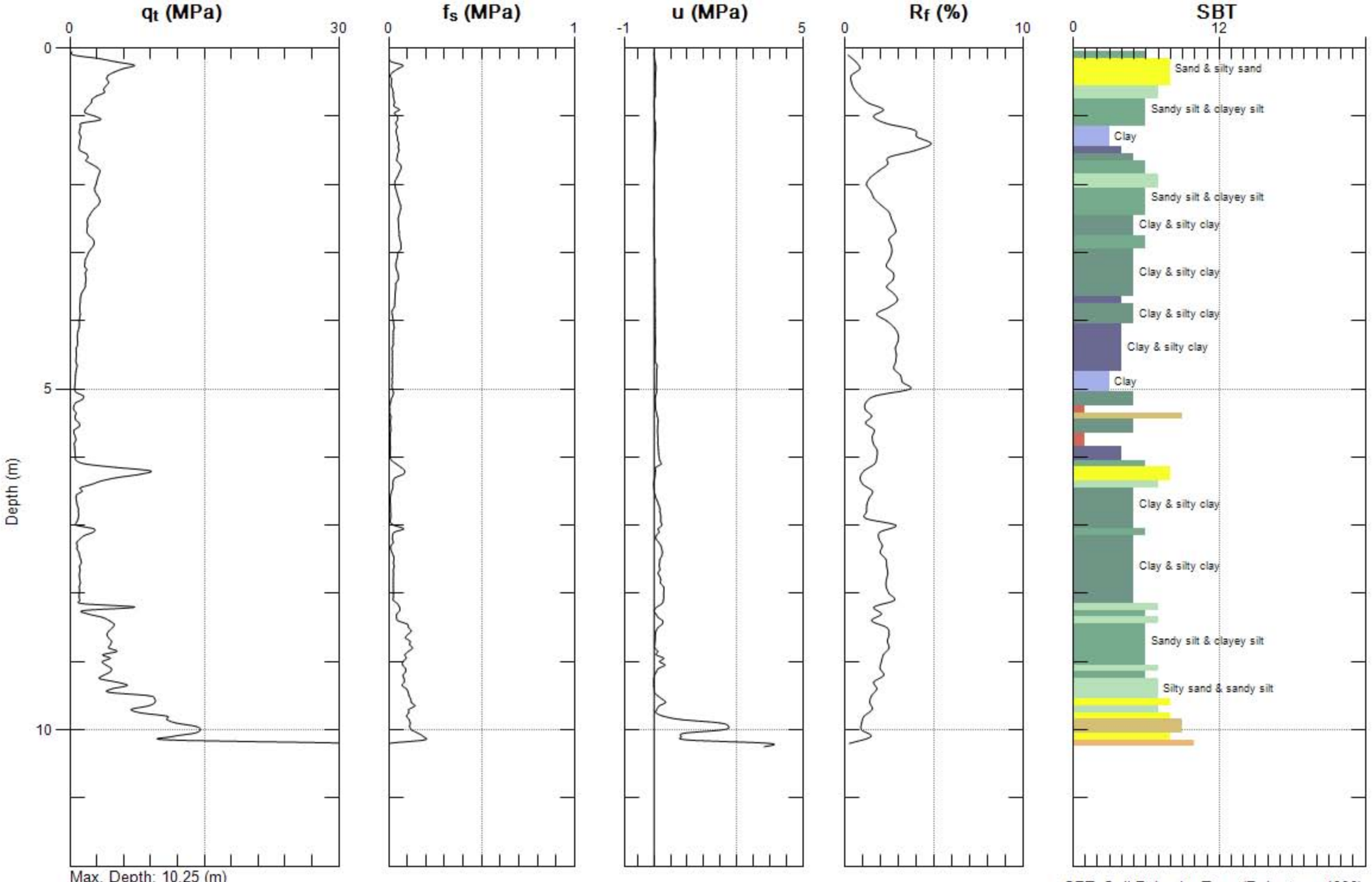
Max. Depth: 10.25 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 442+50

Engineer: D.KIRKMAN
Date: 4/30/2008 09:08



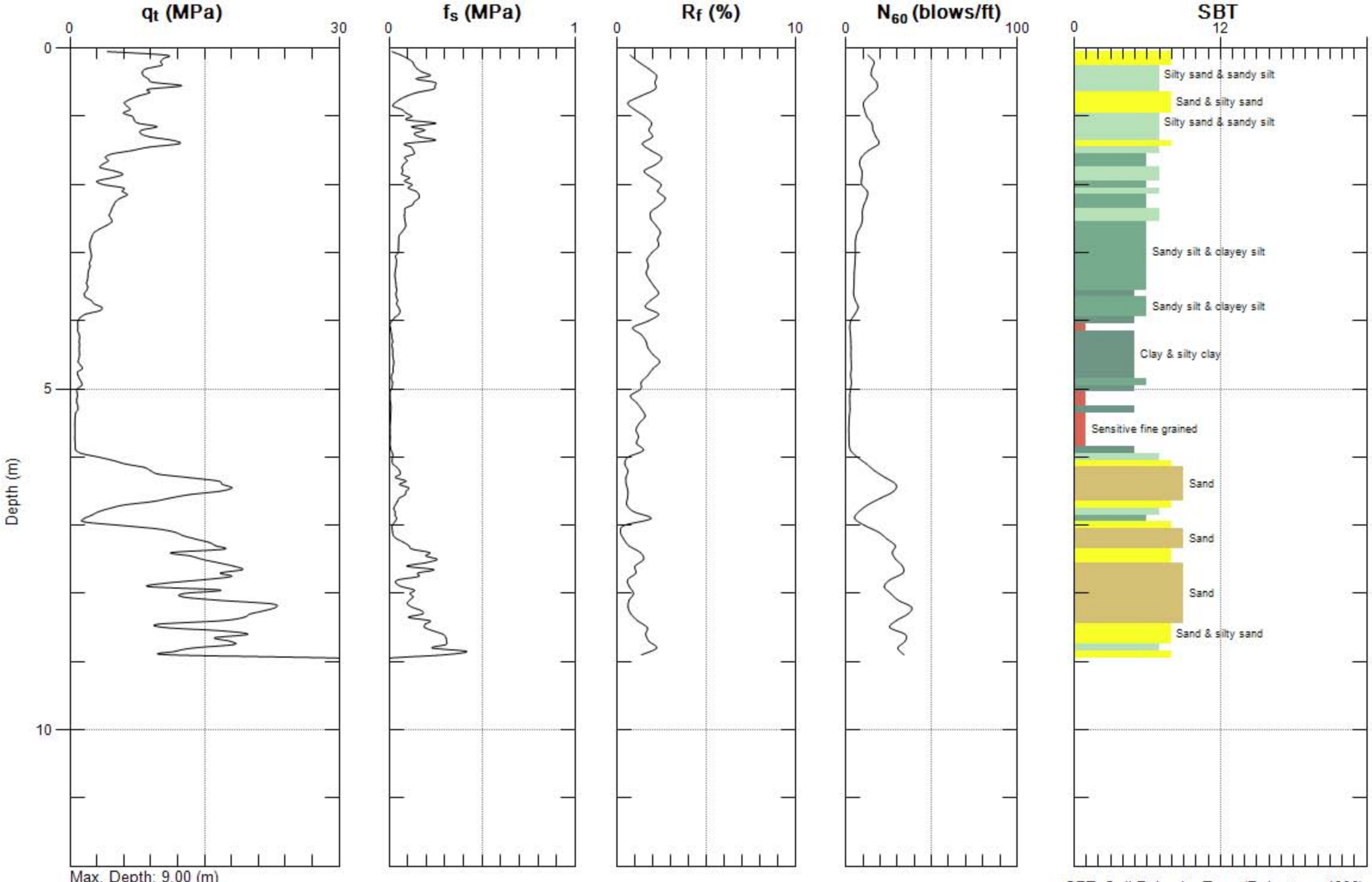
Max. Depth: 10.25 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 442+55

Engineer: D.KIRKMAN
Date: 4/30/2008 08:18



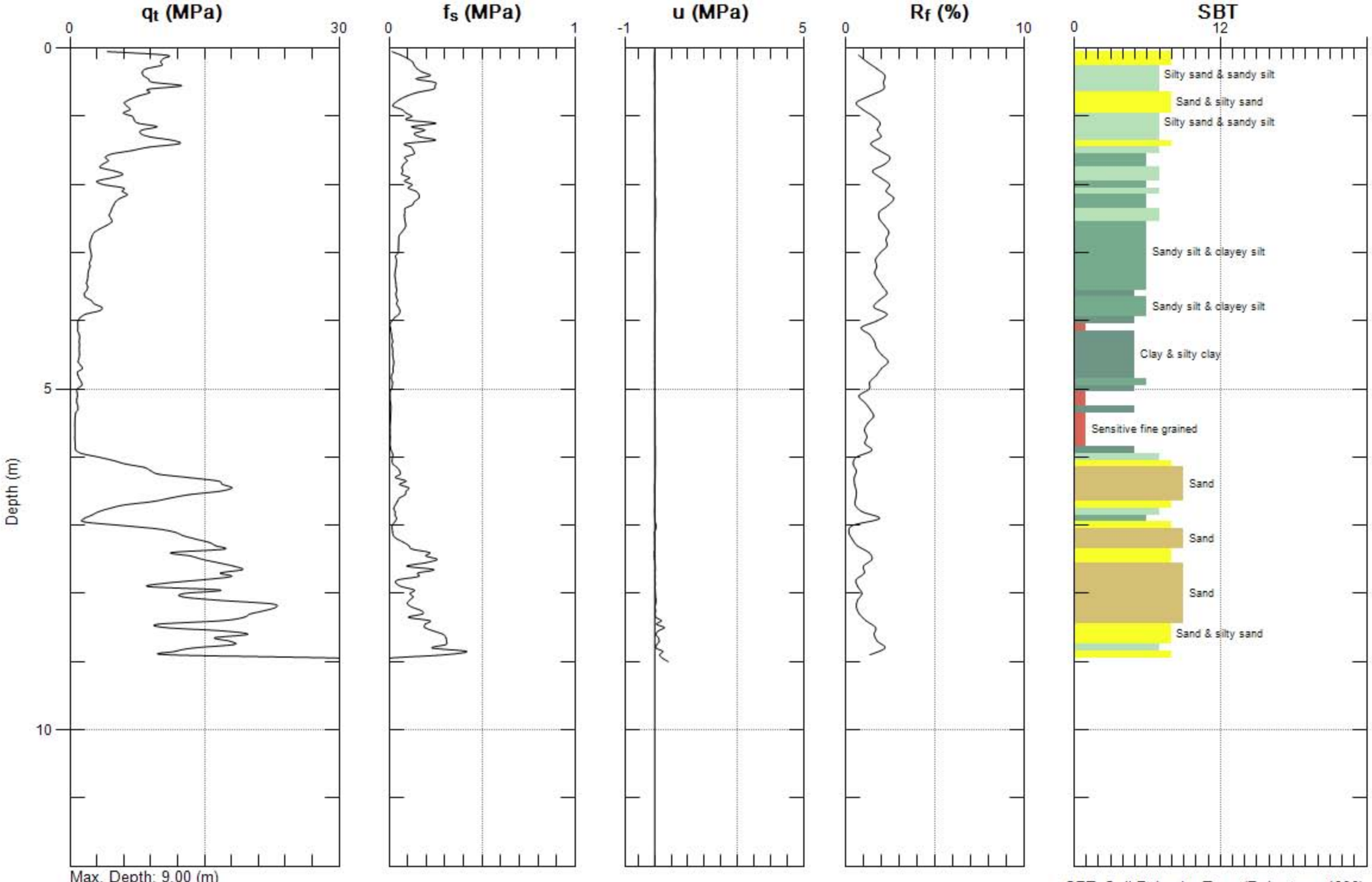
Max. Depth: 9.00 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 442+55

Engineer: D.KIRKMAN
Date: 4/30/2008 08:18



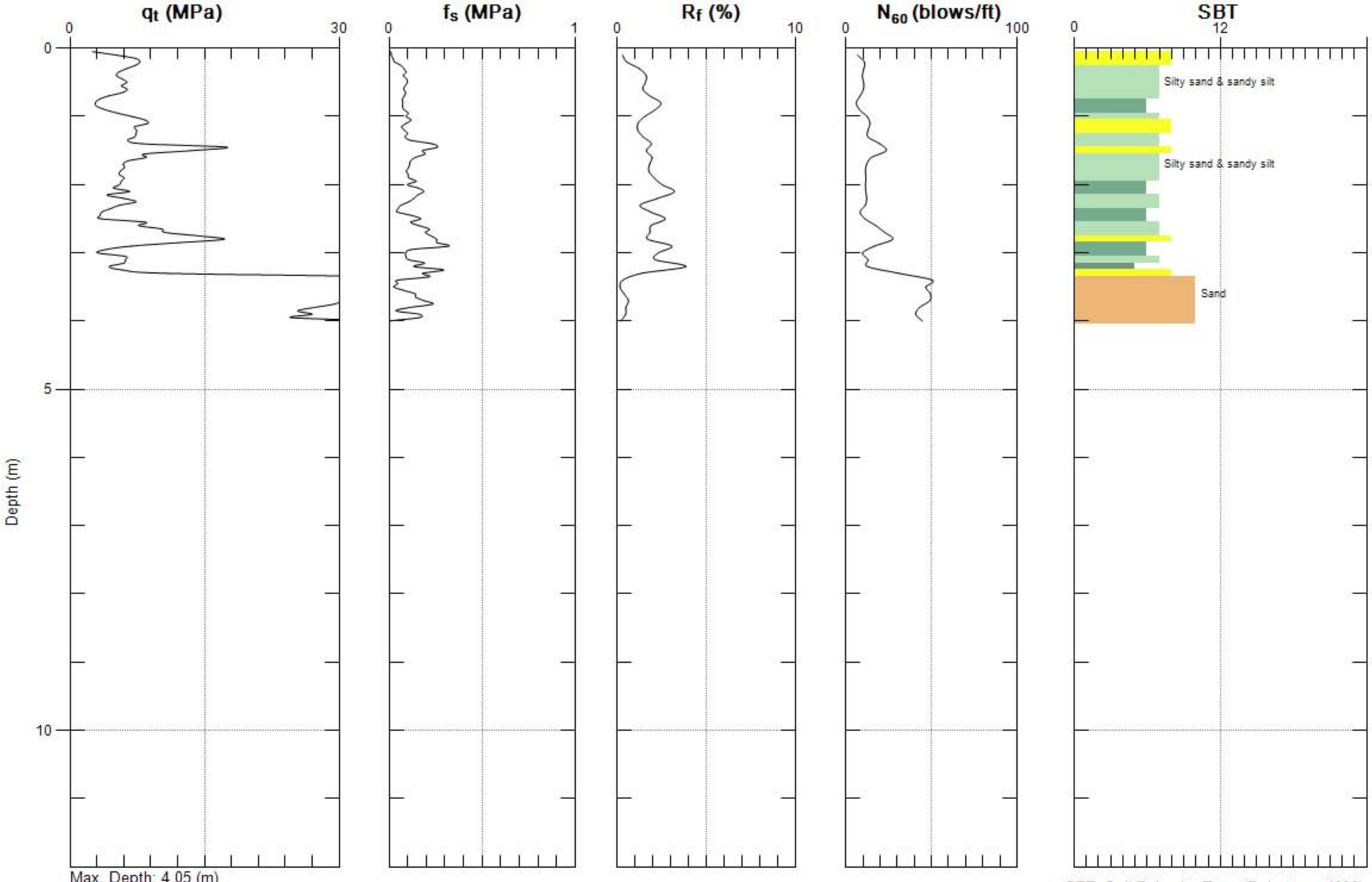
Max. Depth: 9.00 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 442+70

Engineer: D.KIRKMAN
Date: 4/30/2008 07:48



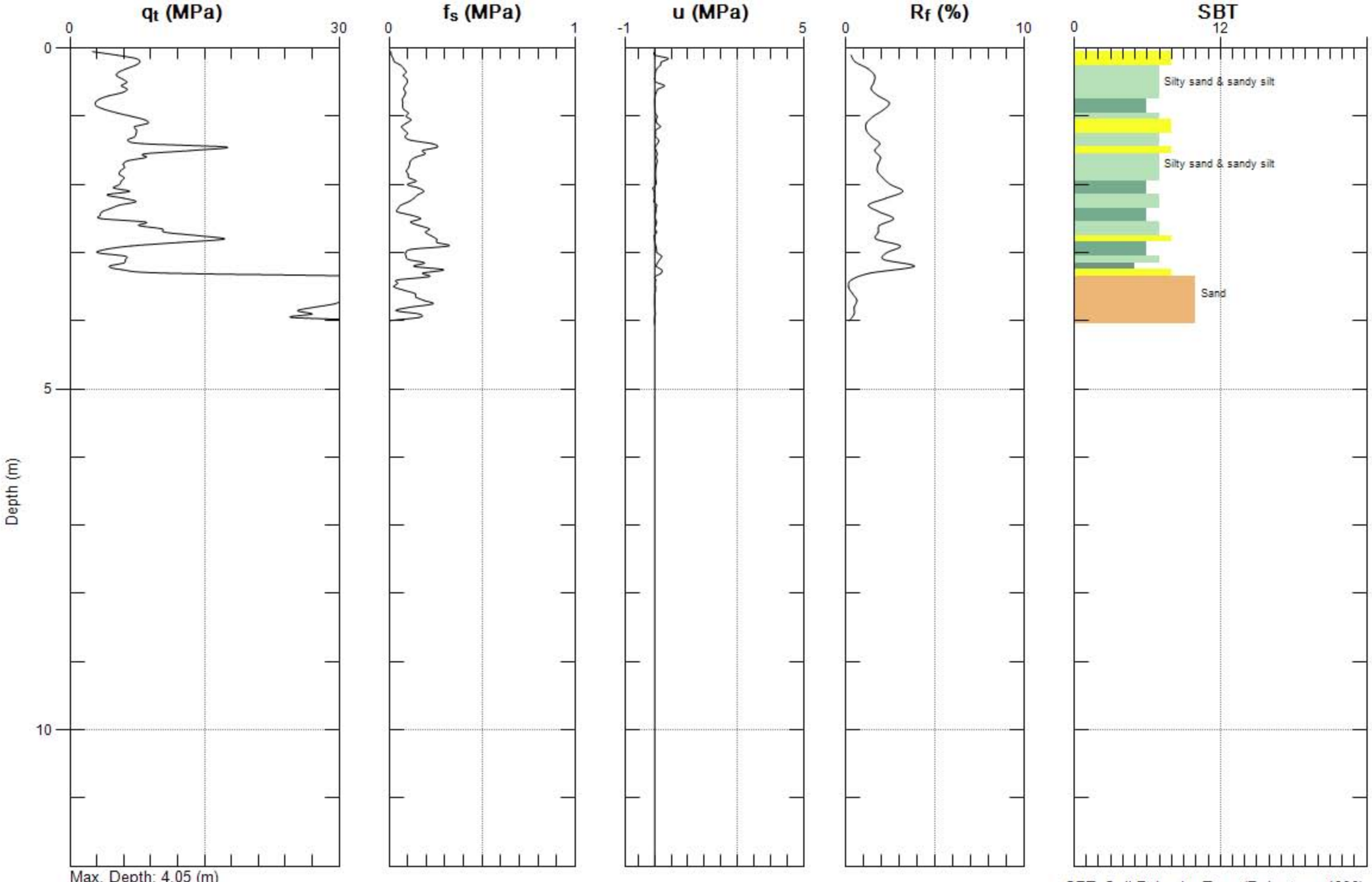
Max. Depth: 4.05 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 442+70

Engineer: D.KIRKMAN
Date: 4/30/2008 07:48



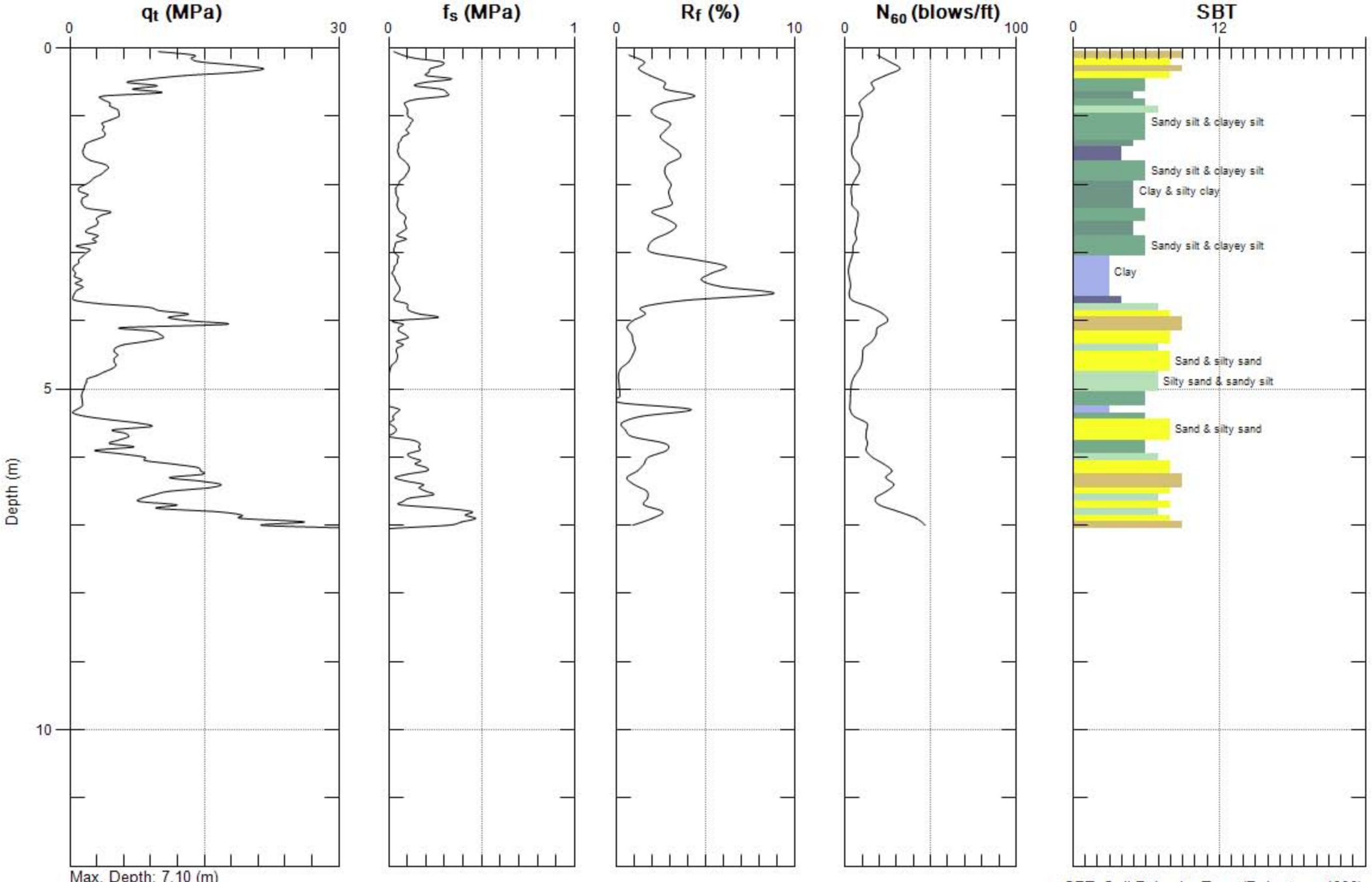
Max. Depth: 4.05 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 442+87

Engineer: D.KIRKMAN
Date: 4/29/2008 12:22



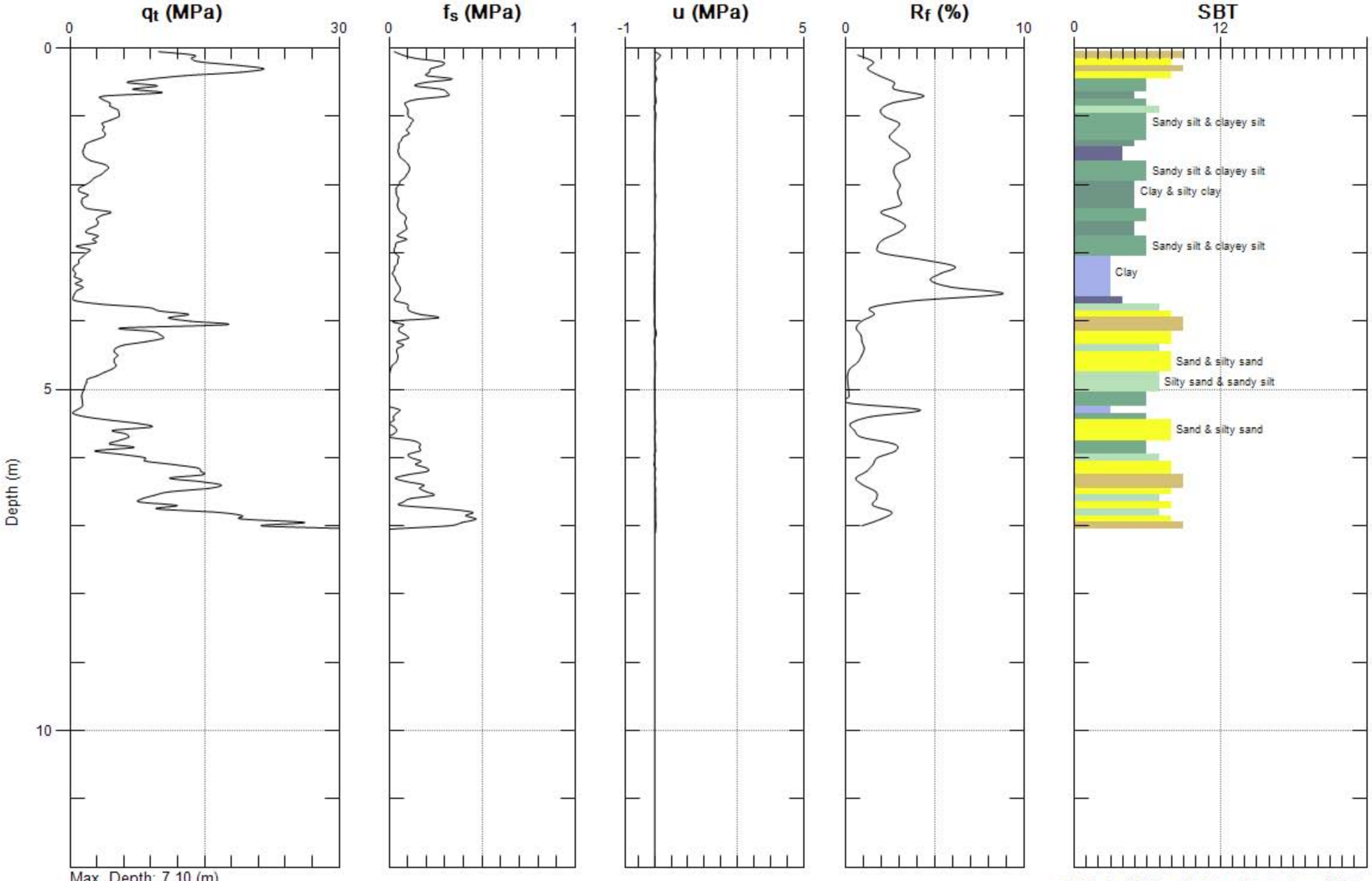
Max. Depth: 7.10 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 442+87

Engineer: D.KIRKMAN
Date: 4/29/2008 12:22



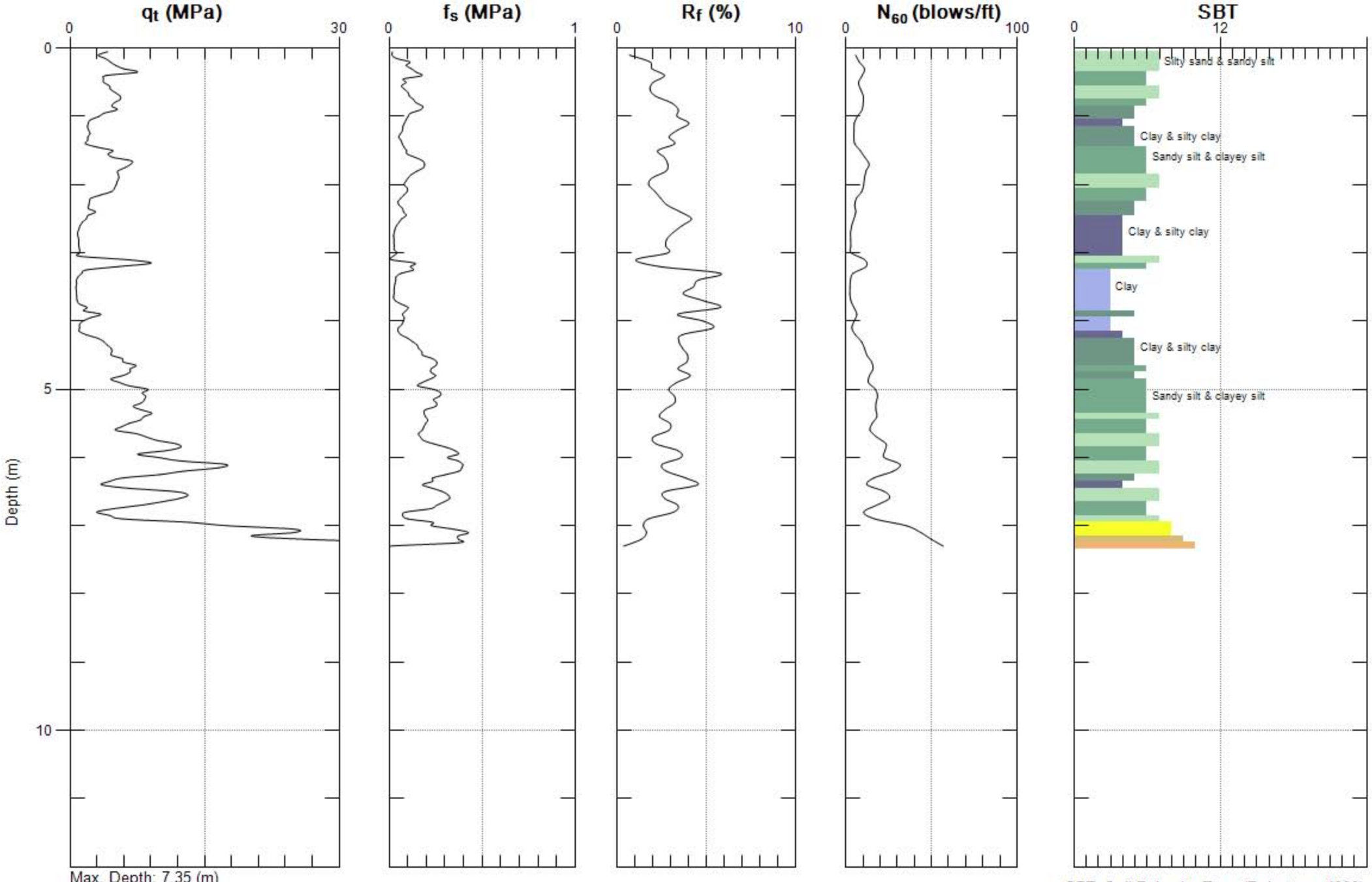
Max. Depth: 7.10 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 443+20

Engineer: D.KIRKMAN
Date: 4/29/2008 01:08

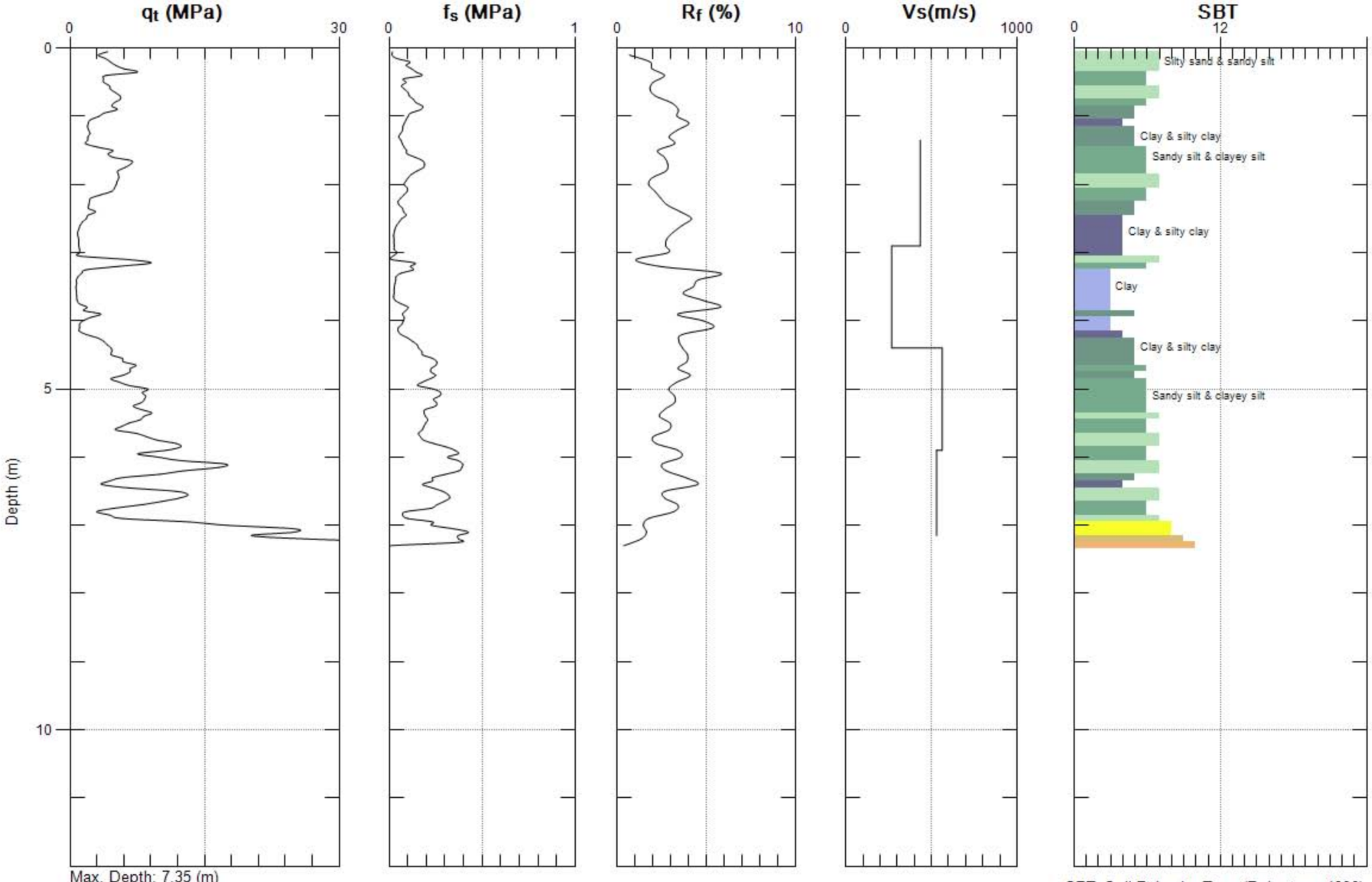


Max. Depth: 7.35 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 443+20
Engineer: D.KIRKMAN
Date: 4/29/2008 01:08

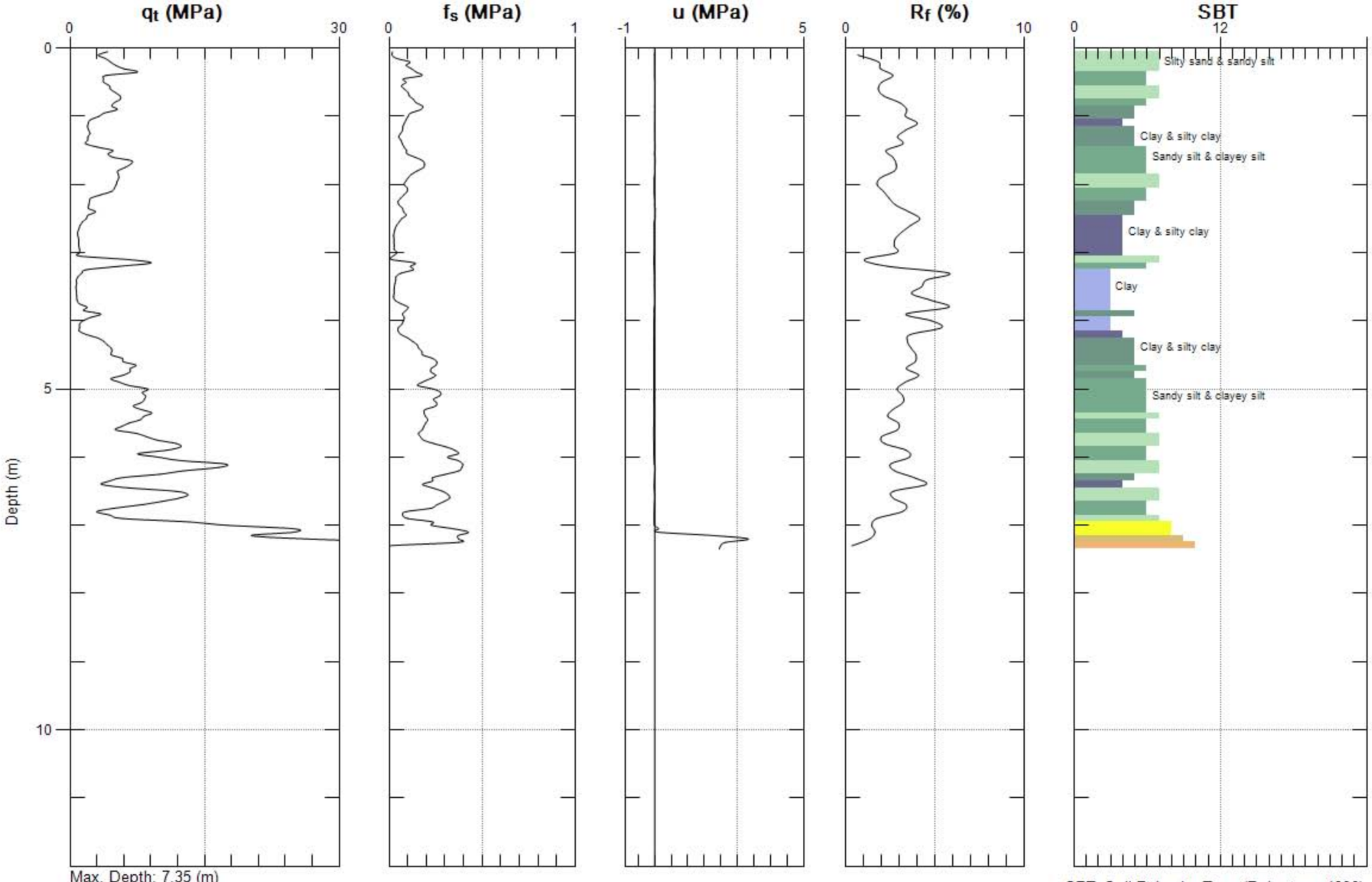


Max. Depth: 7.35 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 443+20
Engineer: D.KIRKMAN
Date: 4/29/2008 01:08

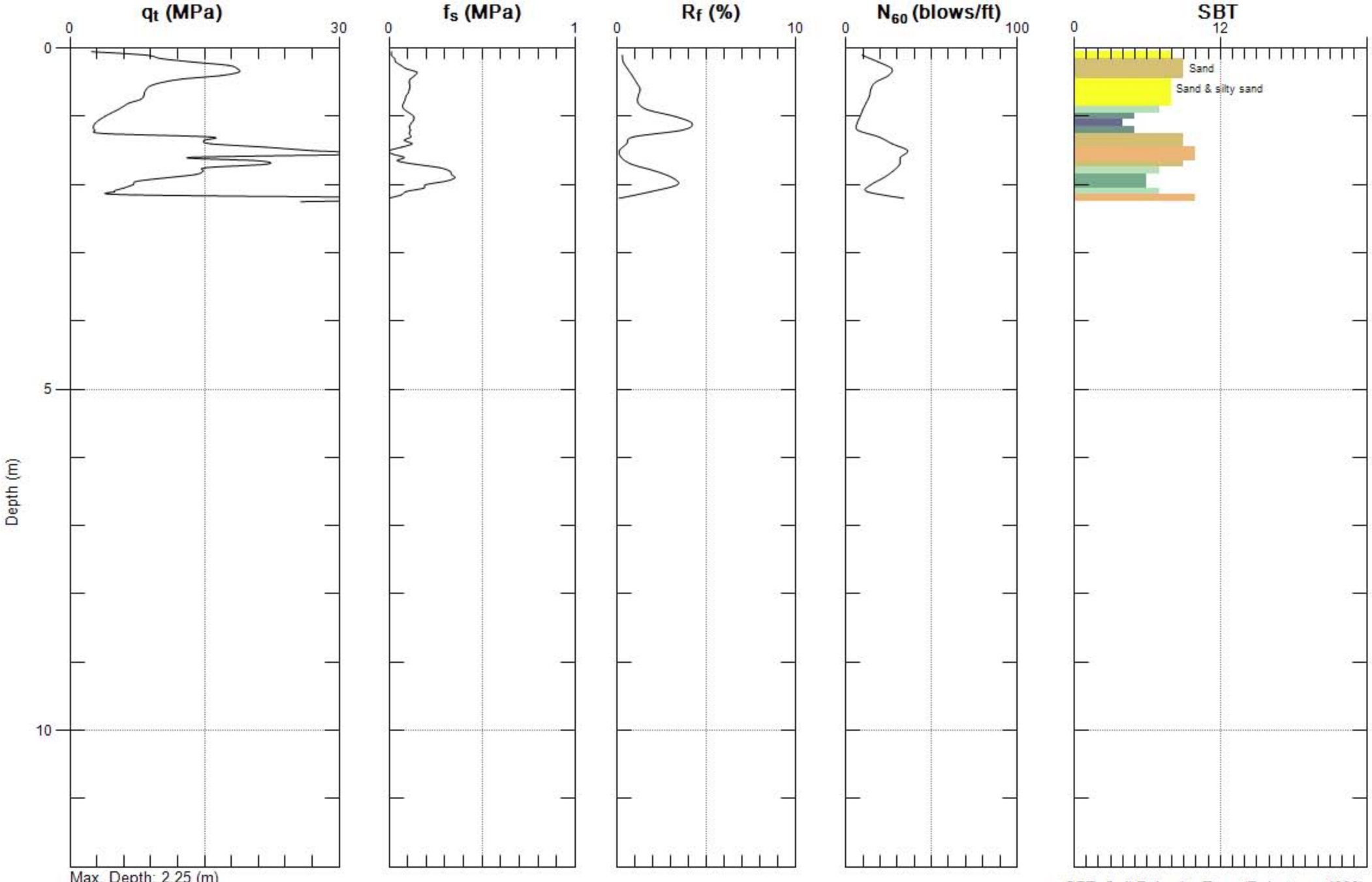


Max. Depth: 7.35 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 443+40
Engineer: D.KIRKMAN
Date: 4/29/2008 02:10

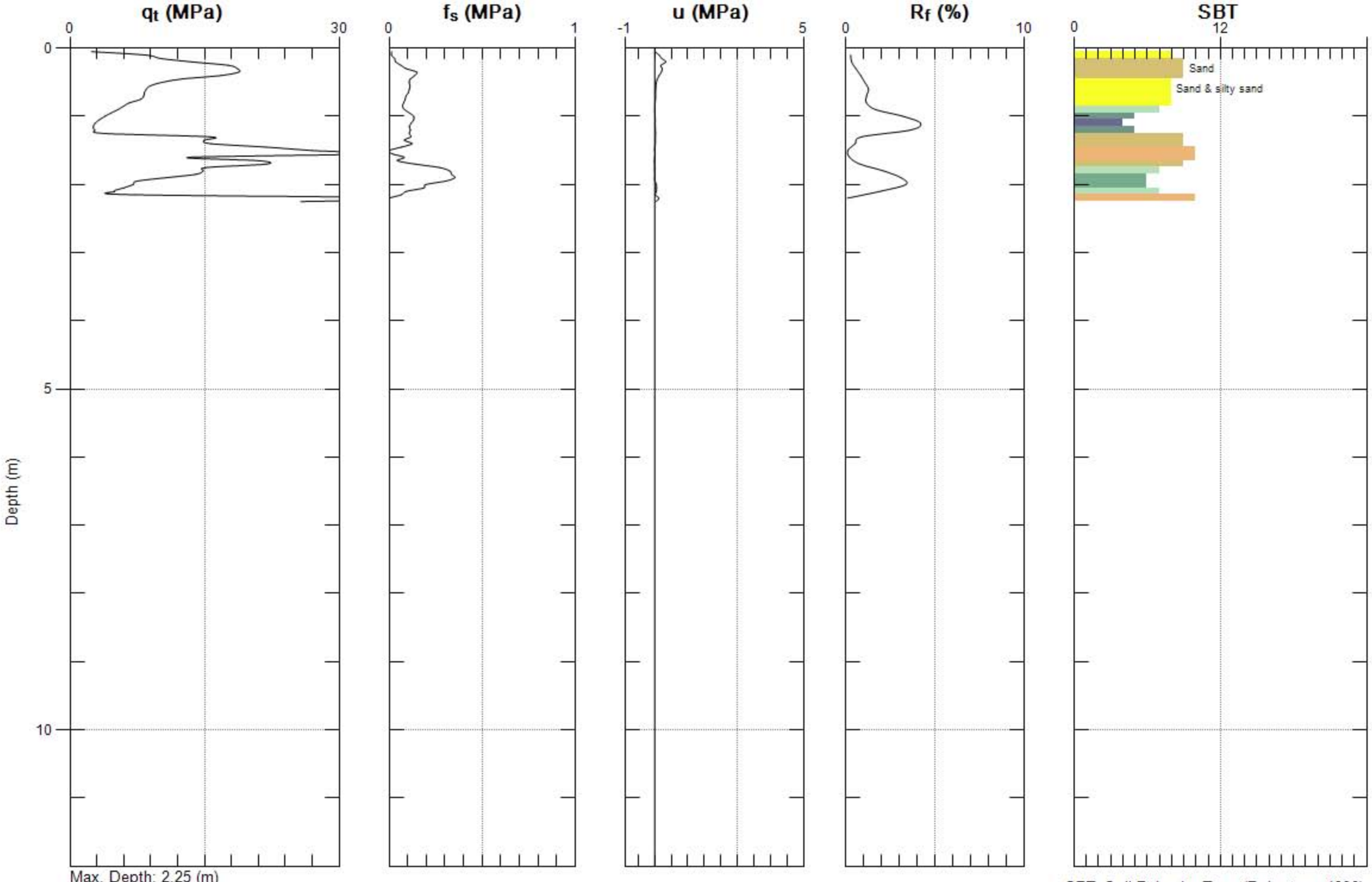


Max. Depth: 2.25 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 443+40
Engineer: D.KIRKMAN
Date: 4/29/2008 02:10



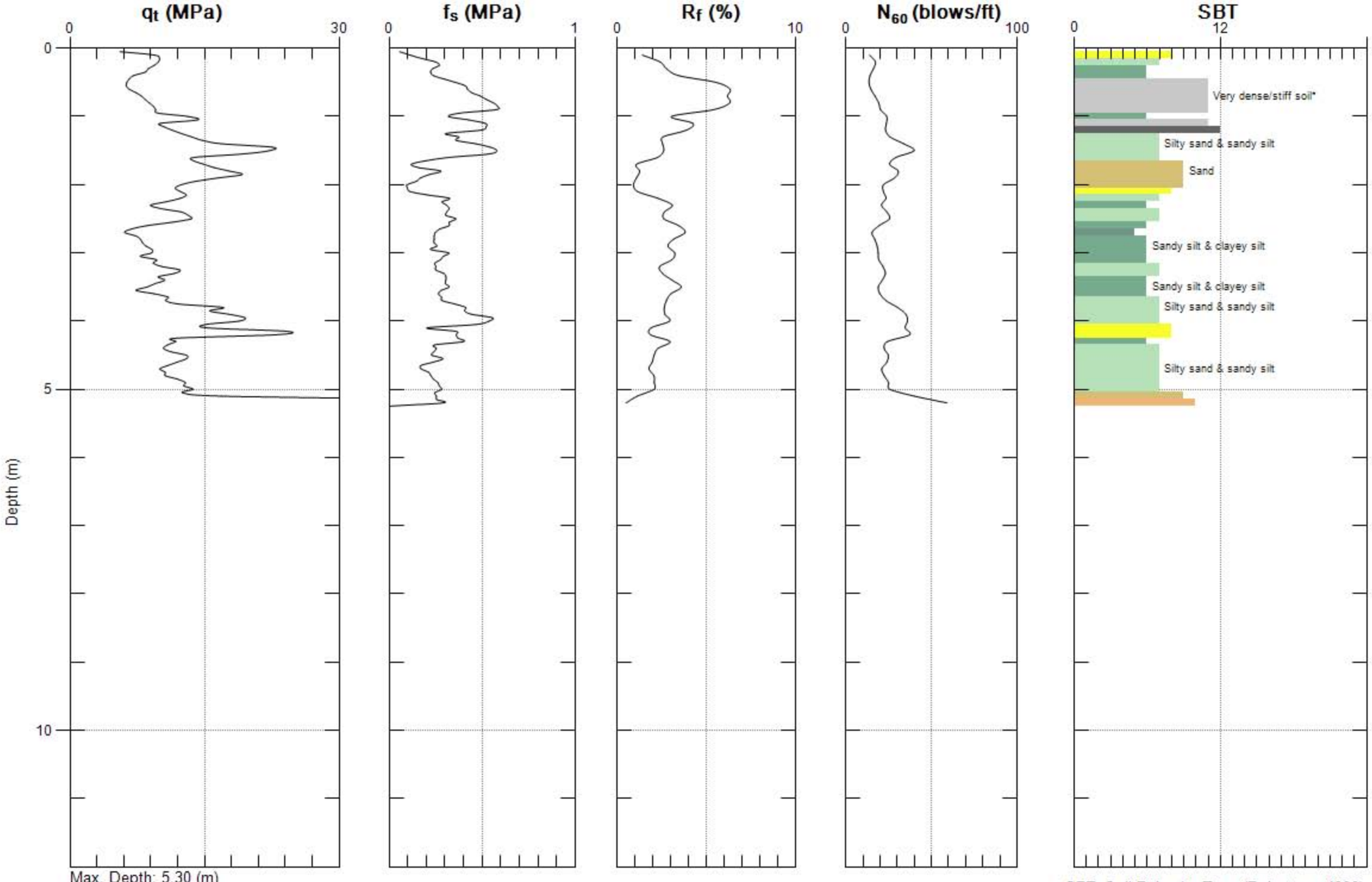
Max. Depth: 2.25 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 443+80

Engineer: D.KIRKMAN
Date: 4/29/2008 02:52



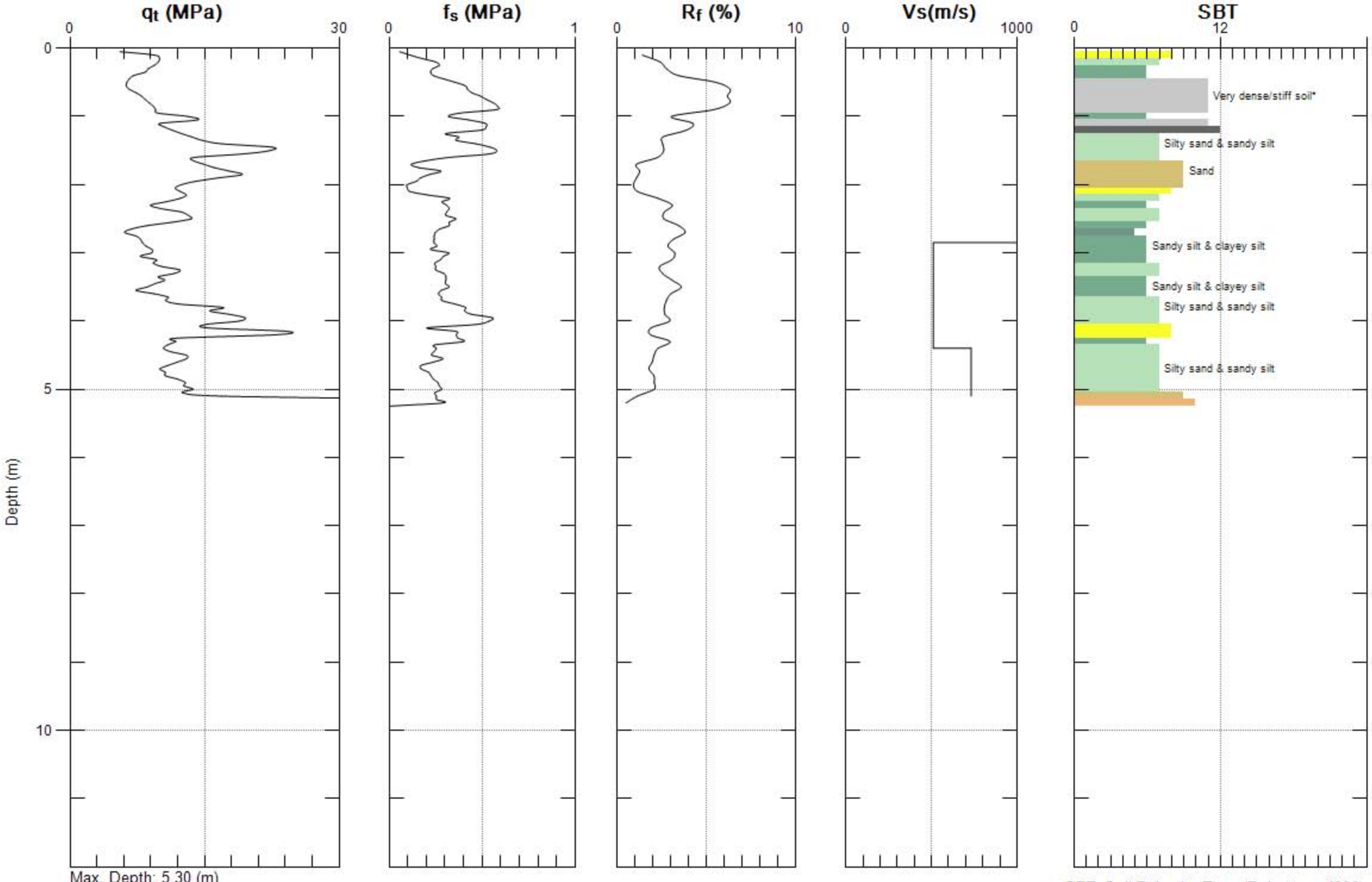
Max. Depth: 5.30 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 443+80

Engineer: D.KIRKMAN
Date: 4/29/2008 02:52



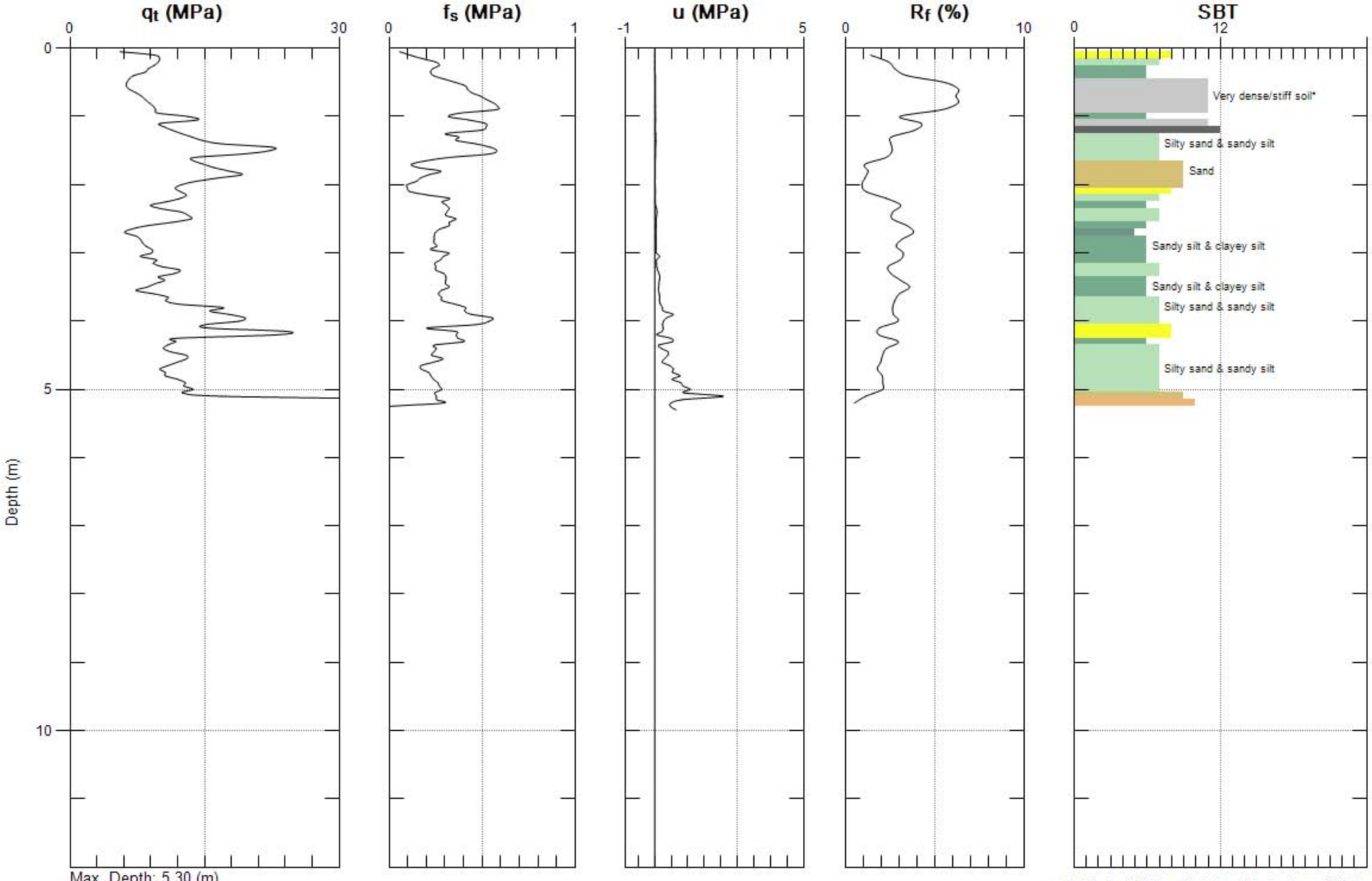
Max. Depth: 5.30 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 443+80

Engineer: D.KIRKMAN
Date: 4/29/2008 02:52



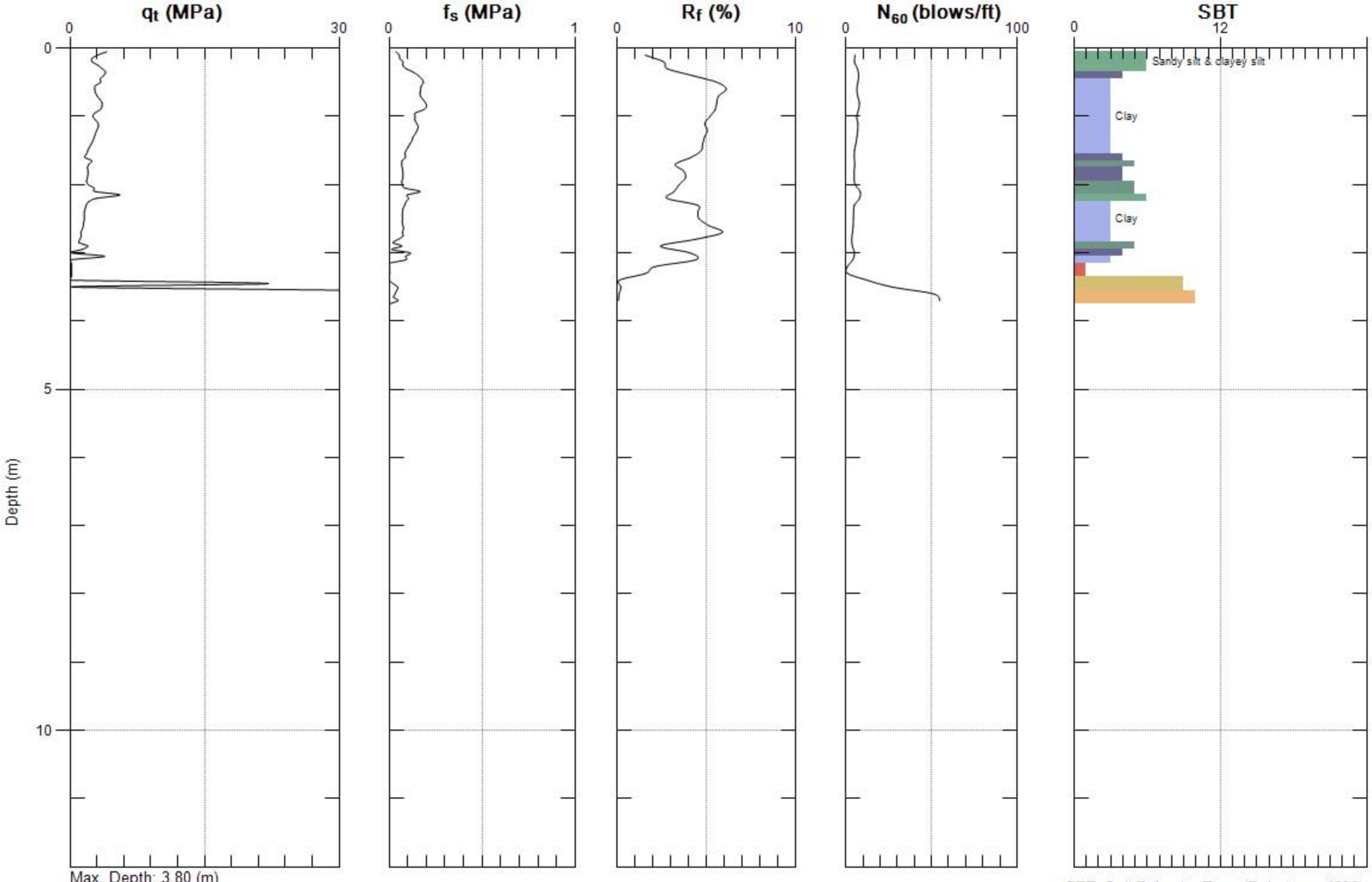
Max. Depth: 5.30 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 444+00

Engineer: D.KIRKMAN
Date: 4/29/2008 03:34



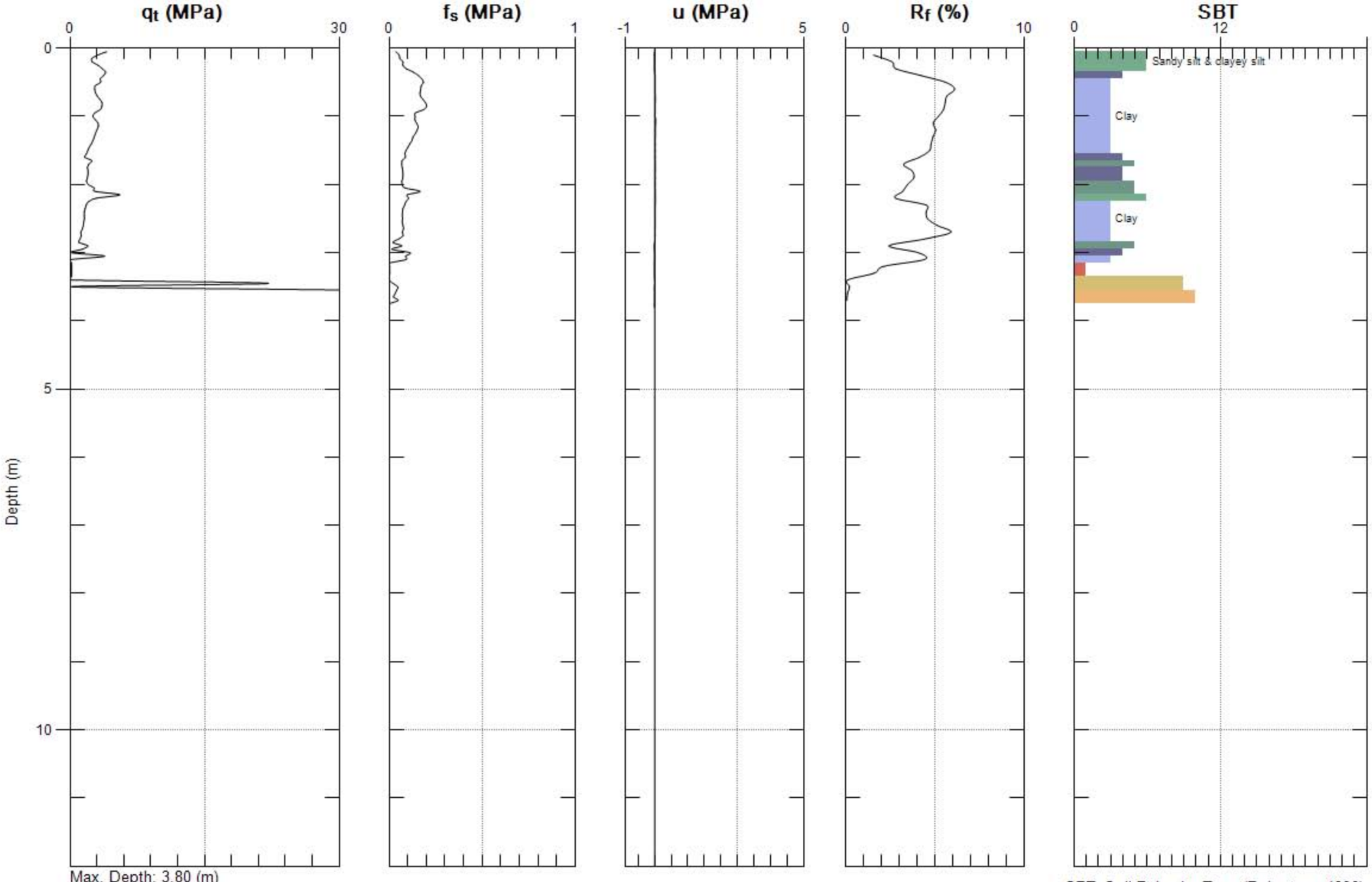
Max. Depth: 3.80 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 444+00

Engineer: D.KIRKMAN
Date: 4/29/2008 03:34



Max. Depth: 3.80 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

SUMMARY

OF

CONE PENETRATION TEST DATA

Project:

Sorrento Valley Road
San Diego, CA
February 11, 2008

Prepared for:

Ms. Manasee Paranjape
Testing Engineers (Bureau Veritas)
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San Diego, CA 92111
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Fax (858) 715-5810 / Office (858) 715-5800

Prepared by:

KEHOE TESTING & ENGINEERING
5415 Industrial Drive
Huntington Beach, CA 92649-1518
Office (714) 901-7270 / Fax (714) 901-7289

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SUMMARY
OF
CONE PENETRATION TEST DATA

1. INTRODUCTION

This report presents the results of a Cone Penetration Test (CPT) program carried out for the project located at Sorrento Valley Road in San Diego, California. The work was performed by Kehoe Testing & Engineering (KTE) on February 11, 2008. The scope of work was performed as directed by Testing Engineers (Bureau Veritas) personnel.

2. SUMMARY OF FIELD WORK

The fieldwork consisted of performing CPT soundings at eight locations to determine the soil lithology. The groundwater measurements were taken in the open CPT hole approximately 10 minutes after completion of CPT. The following **TABLE 2.1** summarizes the CPT soundings performed:

LOCATION	DEPTH OF CPT (ft)	COMMENTS/NOTES:
C-437+1015RT	12	Refusal, hole open to 3.4 m (dry)
C-437+251500RT	11	Refusal, hole open to 3.6 m (dry)
C-438+35144RT	15	Refusal, hole open to 4.2 m (dry)
C-438+65144RT	12	Refusal, hole open to 3.6 m (dry)
C-439+4256RT	15	Refusal, groundwater @ 4.2 m
C-440+02.54RT	24	Refusal, groundwater @ 2.1 m
C-440+0254LT	27	Refusal, groundwater @ 2.1 m
C-440+62.5	26	Refusal, groundwater @ 2.4 m

TABLE 2.1 - Summary of CPT Soundings

3. FIELD EQUIPMENT & PROCEDURES

The CPT soundings were carried out by **KTE** using an integrated electronic cone system manufactured by Vertek. The CPT soundings were performed in accordance with ASTM standards (D5778). The cone penetrometers were pushed using a 30-ton CPT rig. The cone used during the program was a 15 cm^2 cone and recorded the following parameters at approximately 2.5 cm depth intervals:

- Cone Resistance (qc)
- Sleeve Friction (fs)
- Dynamic Pore Pressure (u)
- Inclination
- Penetration Speed
- Pore Pressure Dissipation (at selected depths)

The above parameters were recorded and viewed in real time using a portable computer and stored on a diskette for future analysis and reference. A complete set of baseline readings was taken prior to each sounding to determine temperature shifts and any zero load offsets. Monitoring base line readings ensures that the cone electronics are operating properly.

4. CONE PENETRATION TEST DATA & INTERPRETATION

The Cone Penetration Test data is presented in graphical form in the attached Appendix. Penetration depths are referenced to ground surface. The soil classification on the CPT plots is derived from the CPT Classification Chart (Robertson, 1986) and presents major soil lithologic changes. The stratigraphic interpretation is based on relationships between cone resistance (qc), sleeve friction (fs), and penetration pore pressure (u). The friction ratio (Rf), which is sleeve friction divided by cone resistance, is a calculated parameter that is used to infer soil behavior type. Generally, cohesive soils (clays) have high friction ratios, low cone resistance and generate excess pore water pressures. Cohesionless soils (sands) have lower friction ratios, high cone bearing and generate little (or negative) excess pore water pressures.

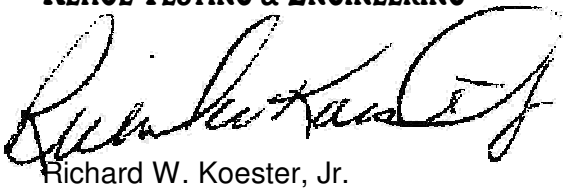
Output from the interpretation program CPTINT provides averaged CPT data over 0.3-meter intervals. The CPTINT output includes Soil Classification Zones, SPT N Values and Undrained Shear Strength (Su). A summary of the equations used for the tabulated parameters is provided in the CPTINT Correlation Table in the Appendix.

The interpretation of soils encountered on this project was carried out using correlations developed by Robertson et al, 1986. It should be noted that it is not always possible to clearly identify a soil type based on qc, fs and u. In these situations, experience, judgment and an assessment of the pore pressure data should be used to infer the soil behavior type.

If you have any questions regarding this information, please do not hesitate to call our office at (714) 901-7270.

Sincerely,

KEHOE TESTING & ENGINEERING



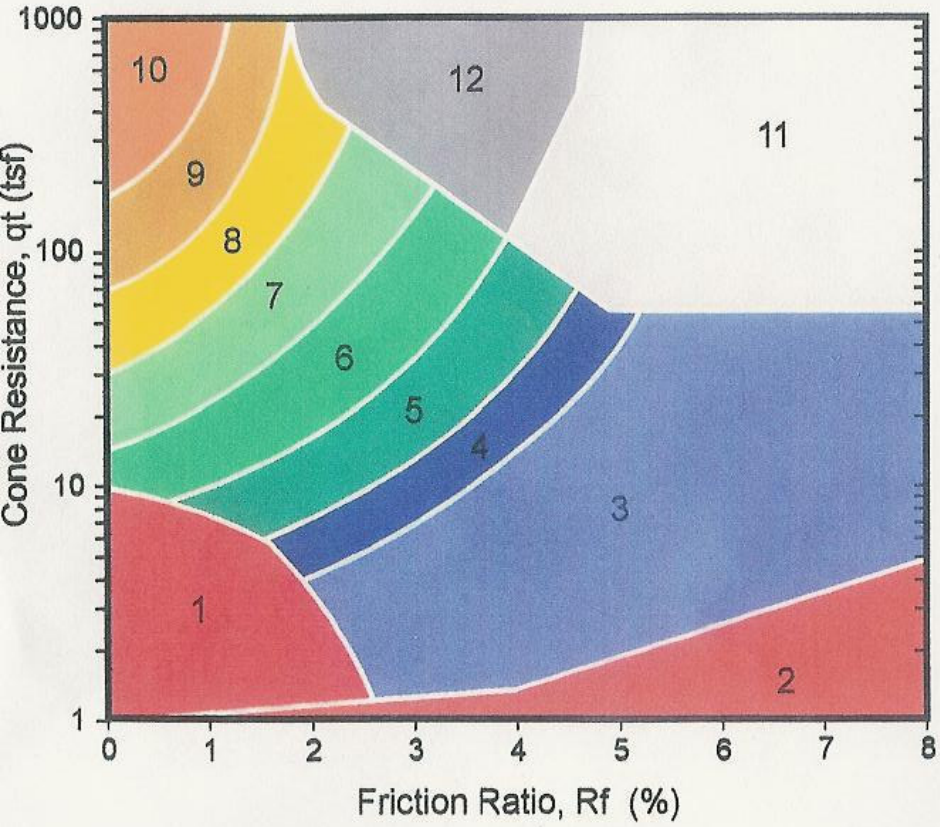
Richard W. Koester, Jr.
General Manager

02/19/08-ld-3-8276

KEHOE TESTING & ENGINEERING

CPT Classification Chart

(after Robertson and Campanella, 1988)



Zone	q_t / N	Soil Behavior Type	UCSCS
1	2	sensitive fine grained	OL-OH
2	1	organic material	Pt-OH
3	1	clay	CH
4	1.5	silty clay to clay	CL-CH
5	2	clayey silt to silty clay	ML-CL
6	2.5	sandy silt to clayey silt	MH-ML
7	3	silty sand to sandy silt	SM-ML
8	4	sand to silty sand	SP-SM
9	5	sand	SP
10	6	gravelly sand to sand	SW-SP
11	1	very stiff fine grained *	CL-MH
12	2	sand to clayey sand *	SP-SC

* overconsolidated or cemented

APPENDIX

Kehoe Testing & Engineering
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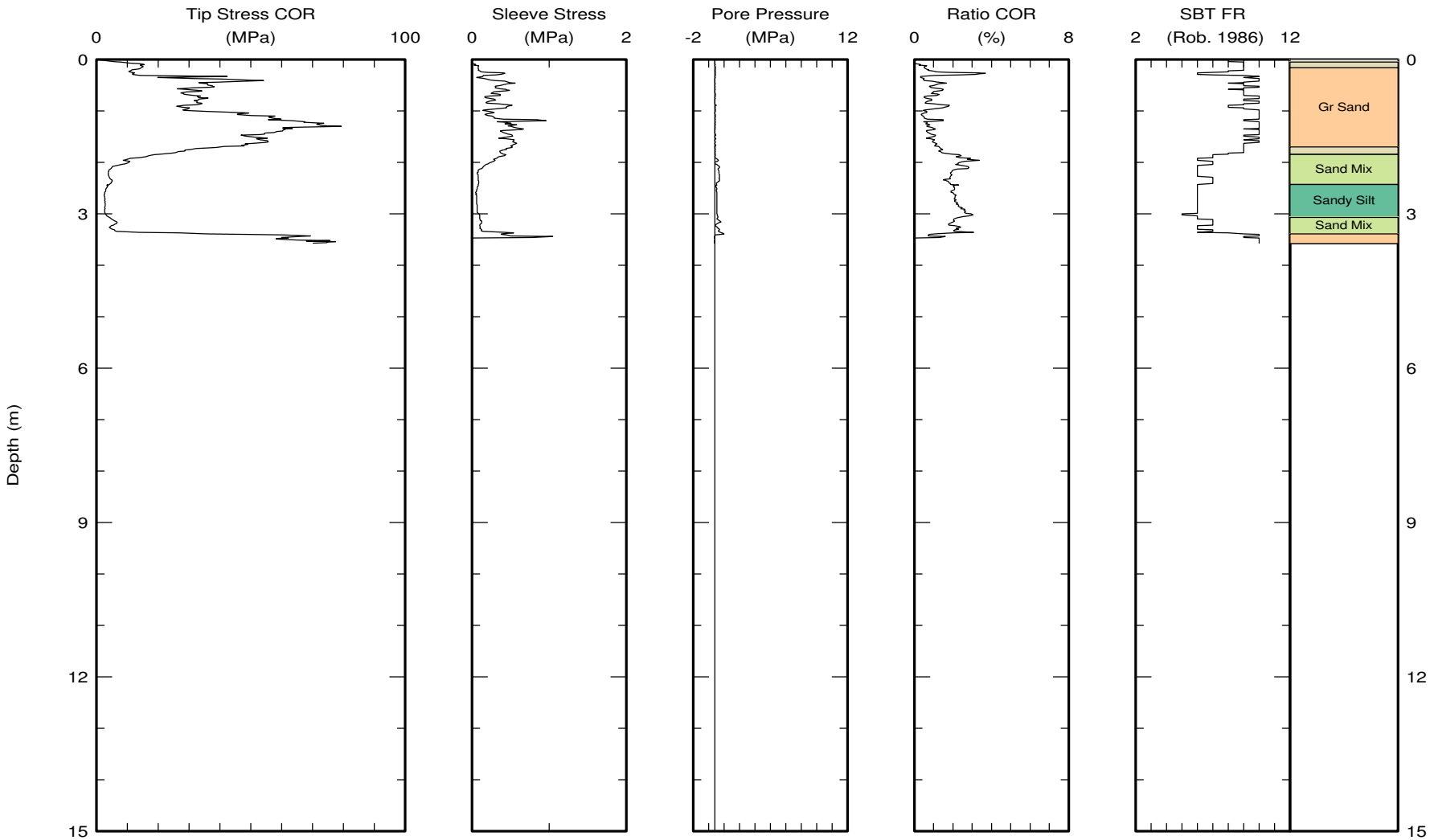
Fax: (714) 901-7289
rich@kehoetesting.com
skehoe@msn.com

CPT Data
30 ton rig

Date: 11/Feb/2008
Test ID: C-437+1015RT
Project: CarrollCanyon

Client: Testing Engineers
Job Site: End of Sorrento Rd.



Maximum depth: 3.58 (m)

Test ID: C-437+1015RT
File: Z11F0809C.ECP

Kehoe Testing & Engineering
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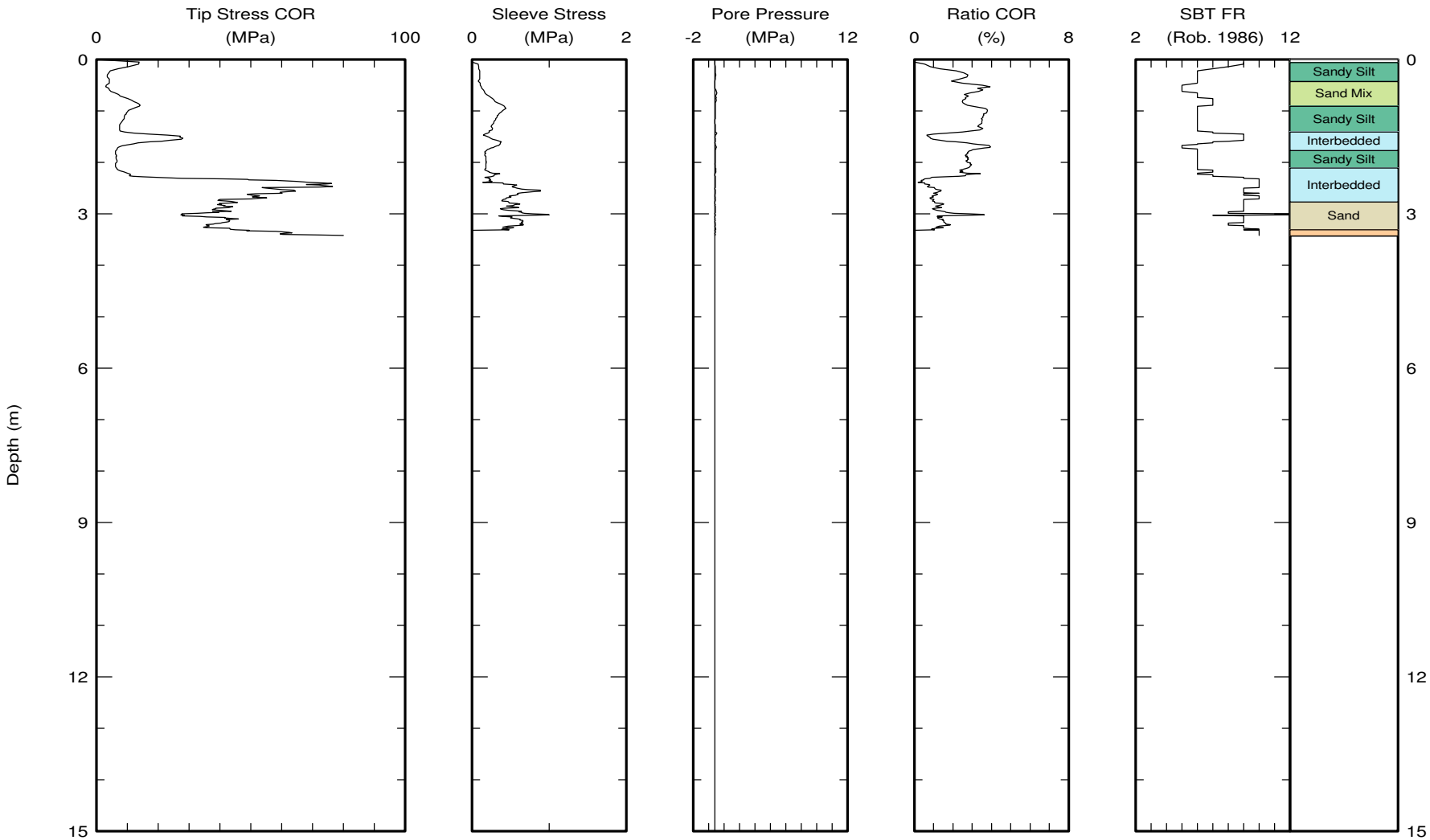
rich@kehoetesting.com
skehoe@msn.com

CPT Data
30 ton rig

Date: 11/Feb/2008
Test ID: C-437+251500RT
Project: CarrollCanyon

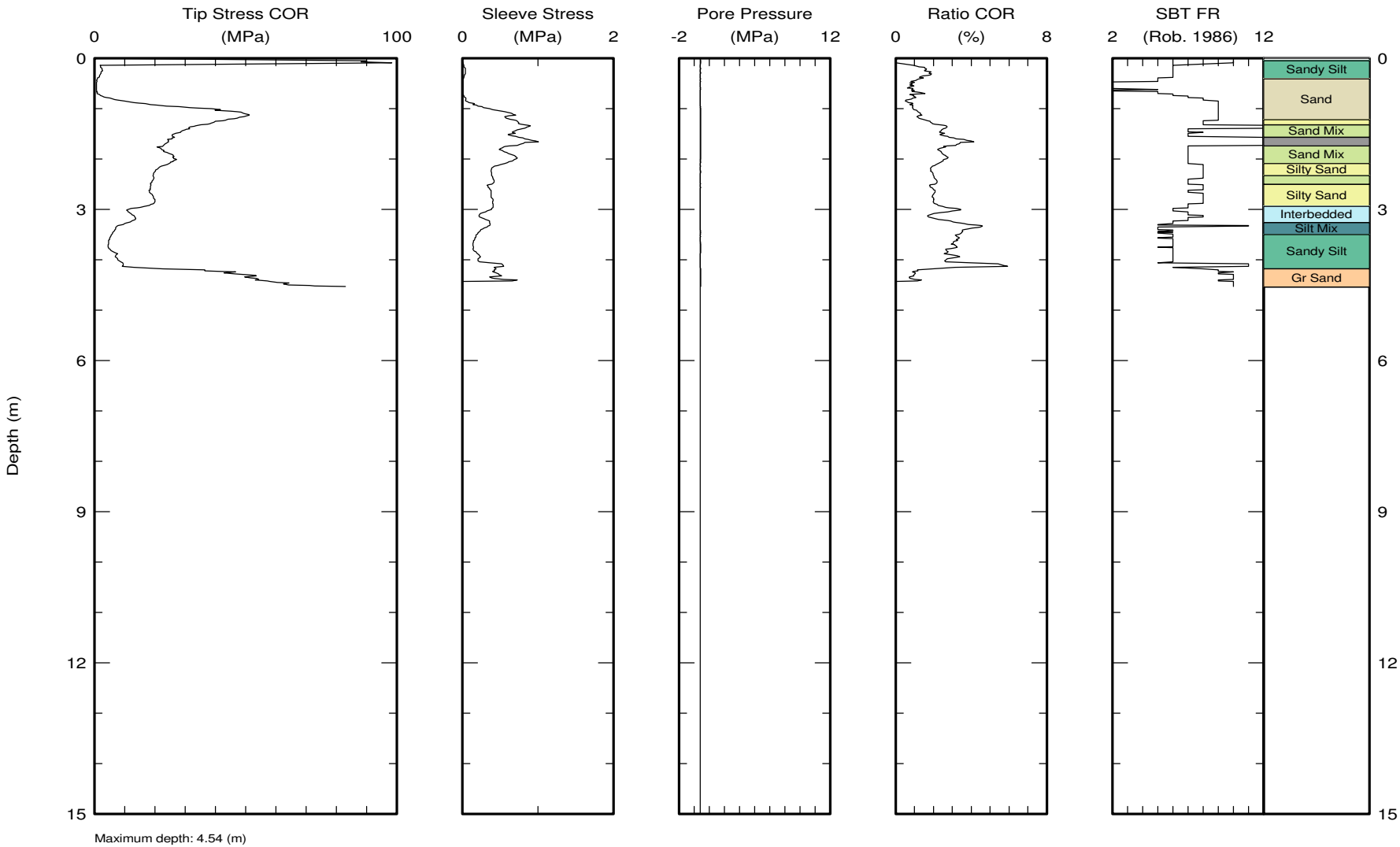
Client: Testing Engineers
Job Site: End of Sorrento Rd.



Maximum depth: 3.43 (m)

Test ID: C-437+251500RT
File: Z11F0808C.ECP

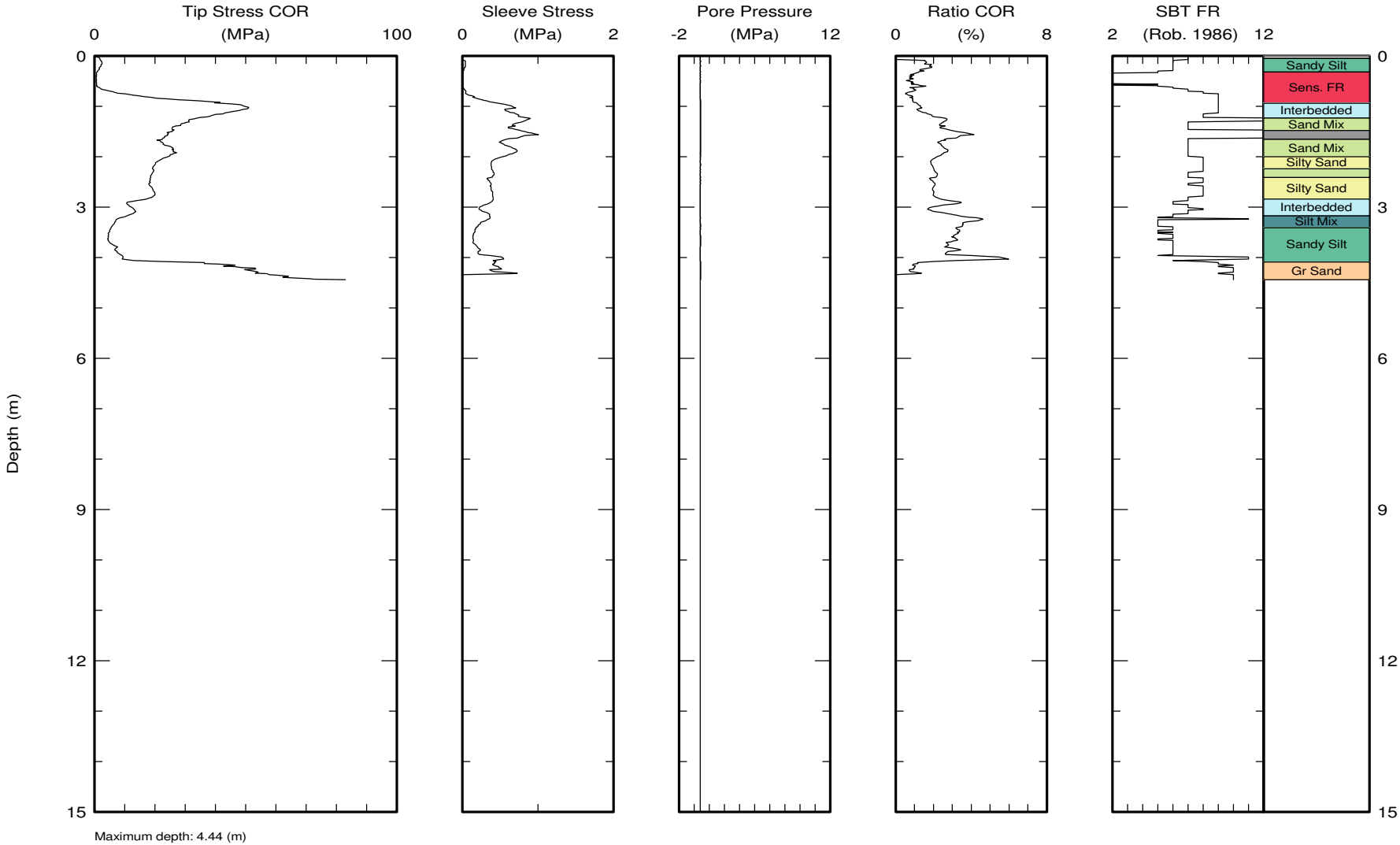
Kehoe Testing & Engineering Office: (714) 901-7270 Fax: (714) 901-7289 rich@kehoetesting.com skehoe@msn.com	CPT Data 30 ton rig	Date: 11/Feb/2008 Test ID: C-437+90147RT Project: CarrollCanyon
	Client: Testing Engineers Job Site: End of Sorrento Rd.	



Maximum depth: 4.54 (m)

Test ID: C-437+90147RT
File: Z11F0805C.ECP

Kehoe Testing & Engineering Office: (714) 901-7270 Fax: (714) 901-7289 rich@kehoetesting.com skehoe@msn.com	CPT Data 30 ton rig	Date: 11/Feb/2008 Test ID: C-438+35144RT Project: CarrollCanyon
	Client: Testing Engineers Job Site: End of Sorrento Rd.	



Maximum depth: 4.44 (m)

Test ID: C-438+35144RT
File: Z11F0806C.ECP

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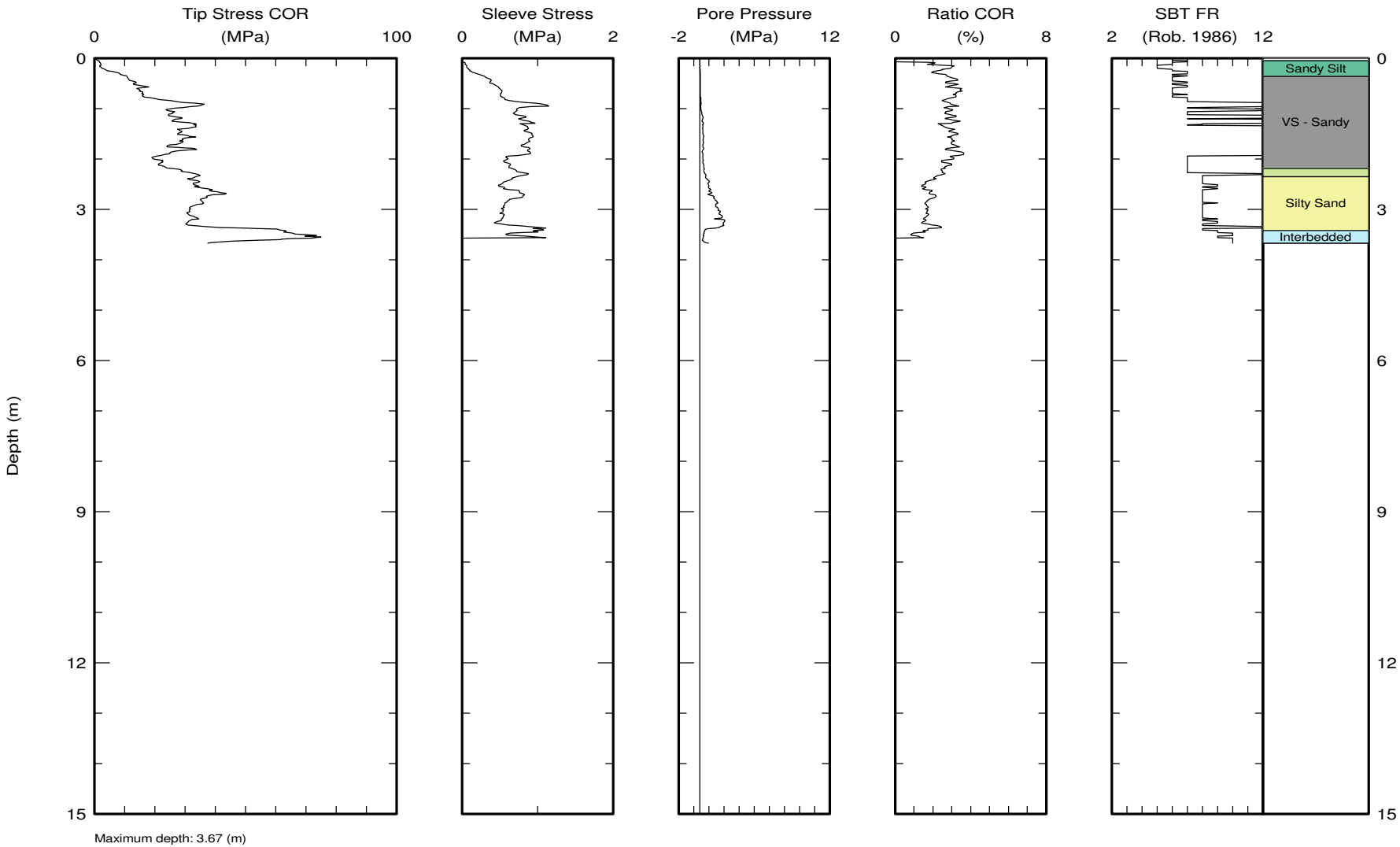
skehoe@msn.com

CPT Data
30 ton rig

Date: 11/Feb/2008
Test ID: C-438+65144RT
Project: CarrollCanyon

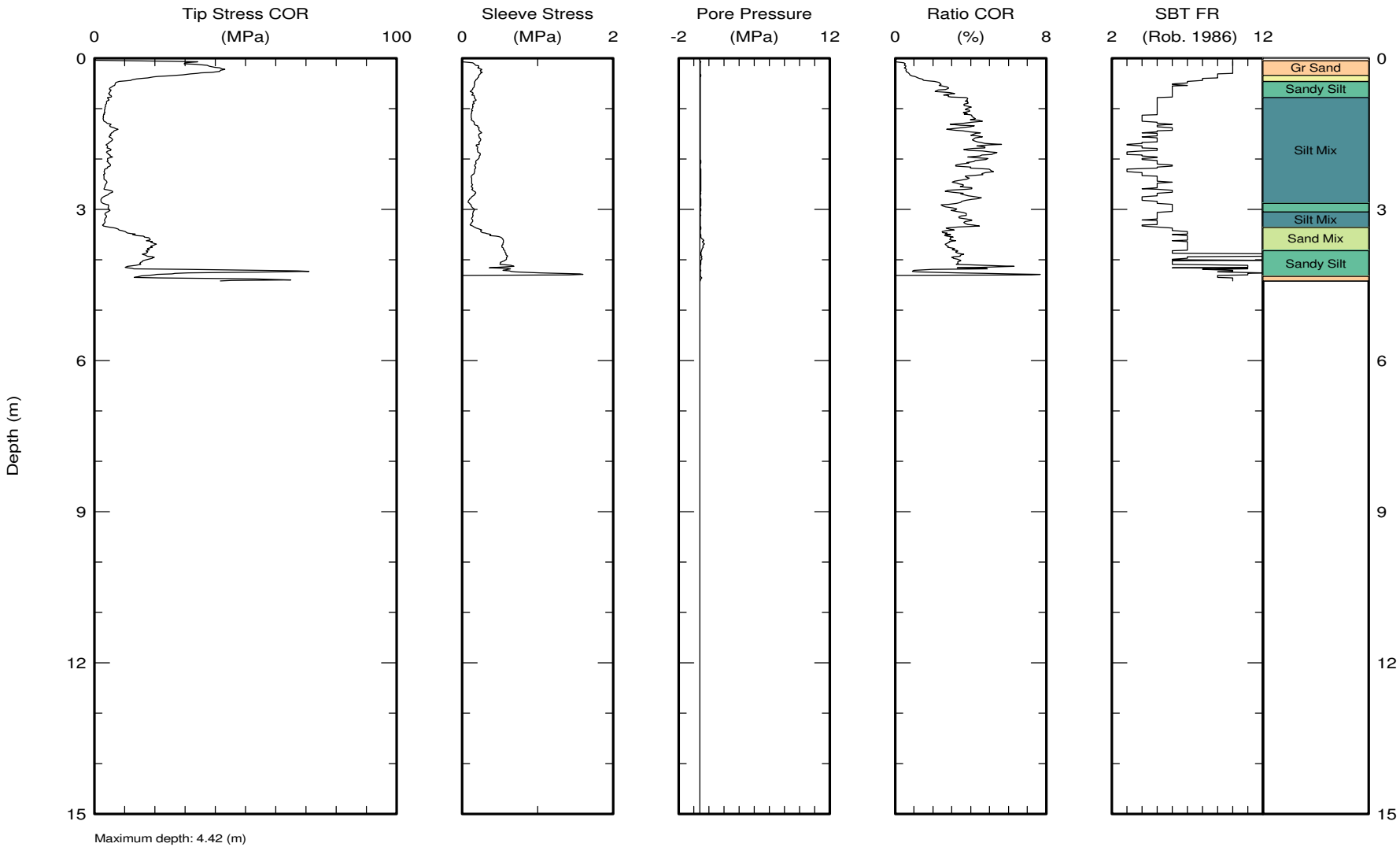
Client: Testing Engineers
Job Site: End of Sorrento Rd.



Maximum depth: 3.67 (m)

Test ID: C-438+65144RT
File: Z11F0807C.ECP

Kehoe Testing & Engineering Office: (714) 901-7270 Fax: (714) 901-7289 rich@kehoetesting.com skehoe@msn.com	CPT Data 30 ton rig	Date: 11/Feb/2008 Test ID: C-439+4256RT Project: CarrollCanyon
	Client: Testing Engineers Job Site: End of Sorrento Rd.	



Maximum depth: 4.42 (m)

Test ID: C-439+4256RT
File: Z11F0804C.ECP

Kehoe Testing & Engineering
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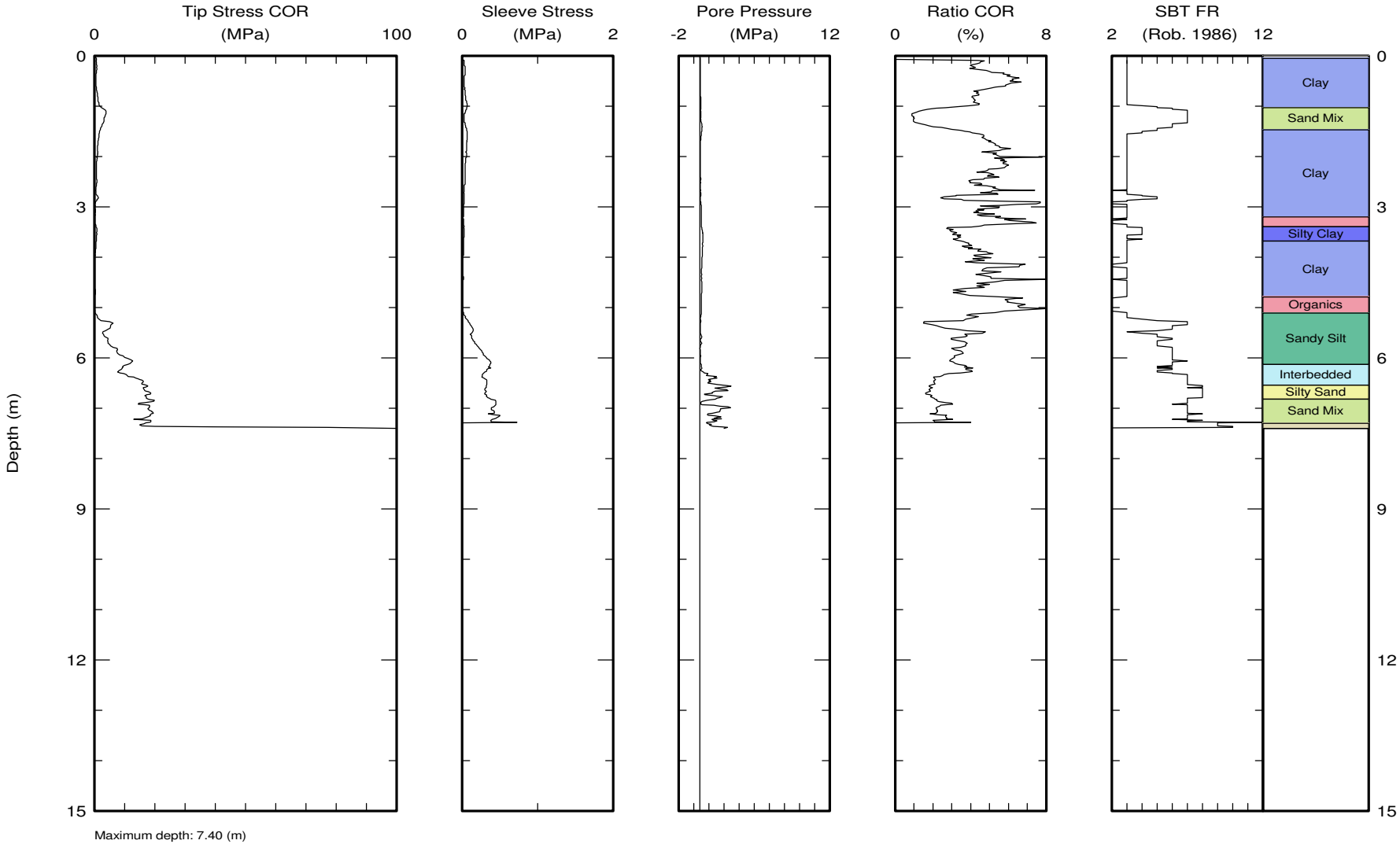
CPT Data
30 ton rig

Date: 11/Feb/2008
Test ID: C-440+02.54RT
Project: CarrollCanyon

Client: Testing Engineers
Job Site: End of Sorrento Rd.



Maximum depth: 7.40 (m)

Test ID: C-440+02.54RT
File: Z11F0803C.ECP

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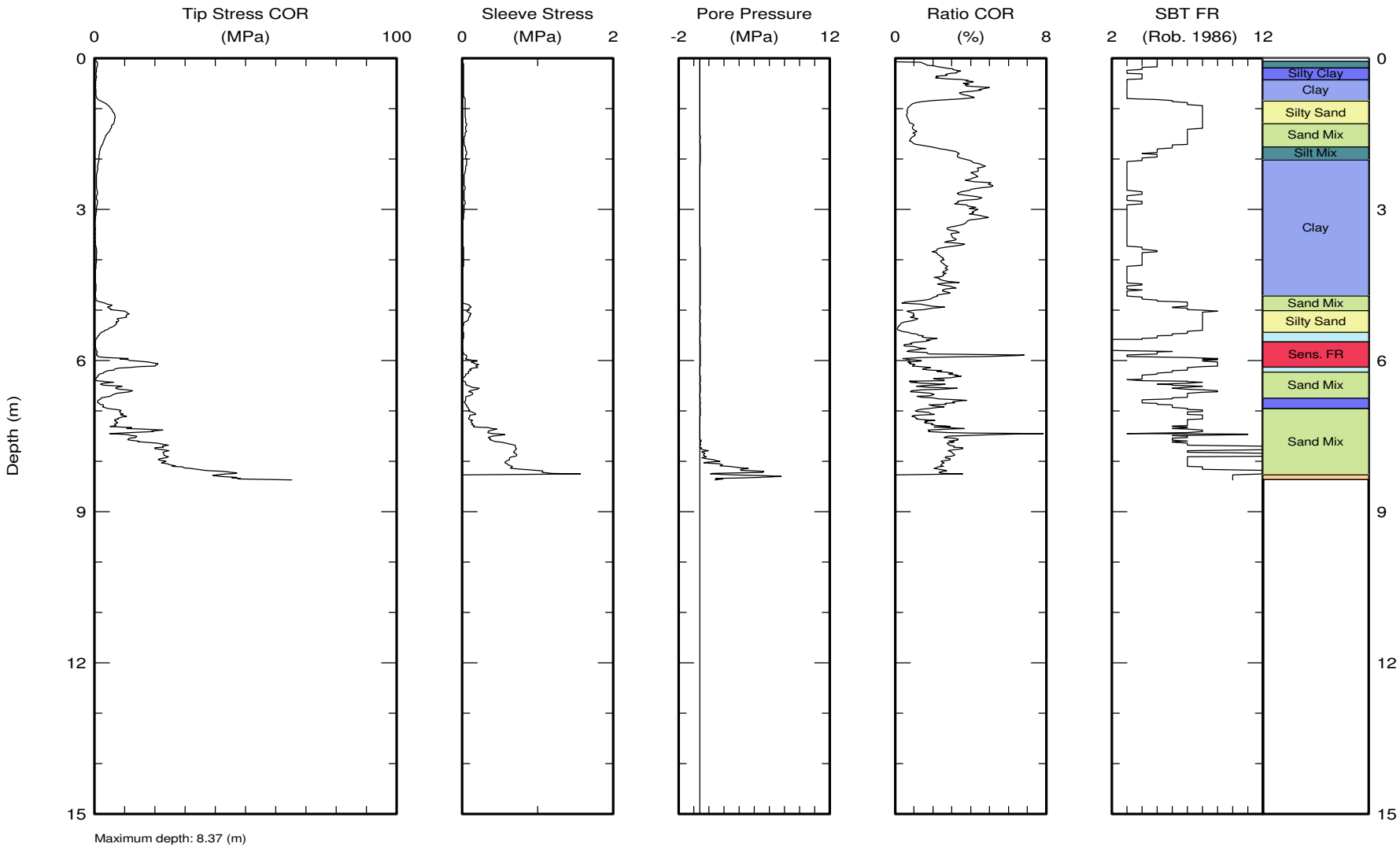
CPT Data
30 ton rig

Date: 11/Feb/2008
Test ID: C-440+0254LT
Project: CarrollCanyon

Client: Testing Engineers
Job Site: End of Sorrento Rd.



Maximum depth: 8.37 (m)

Kehoe Testing & Engineering
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rich@kehoetesting.com
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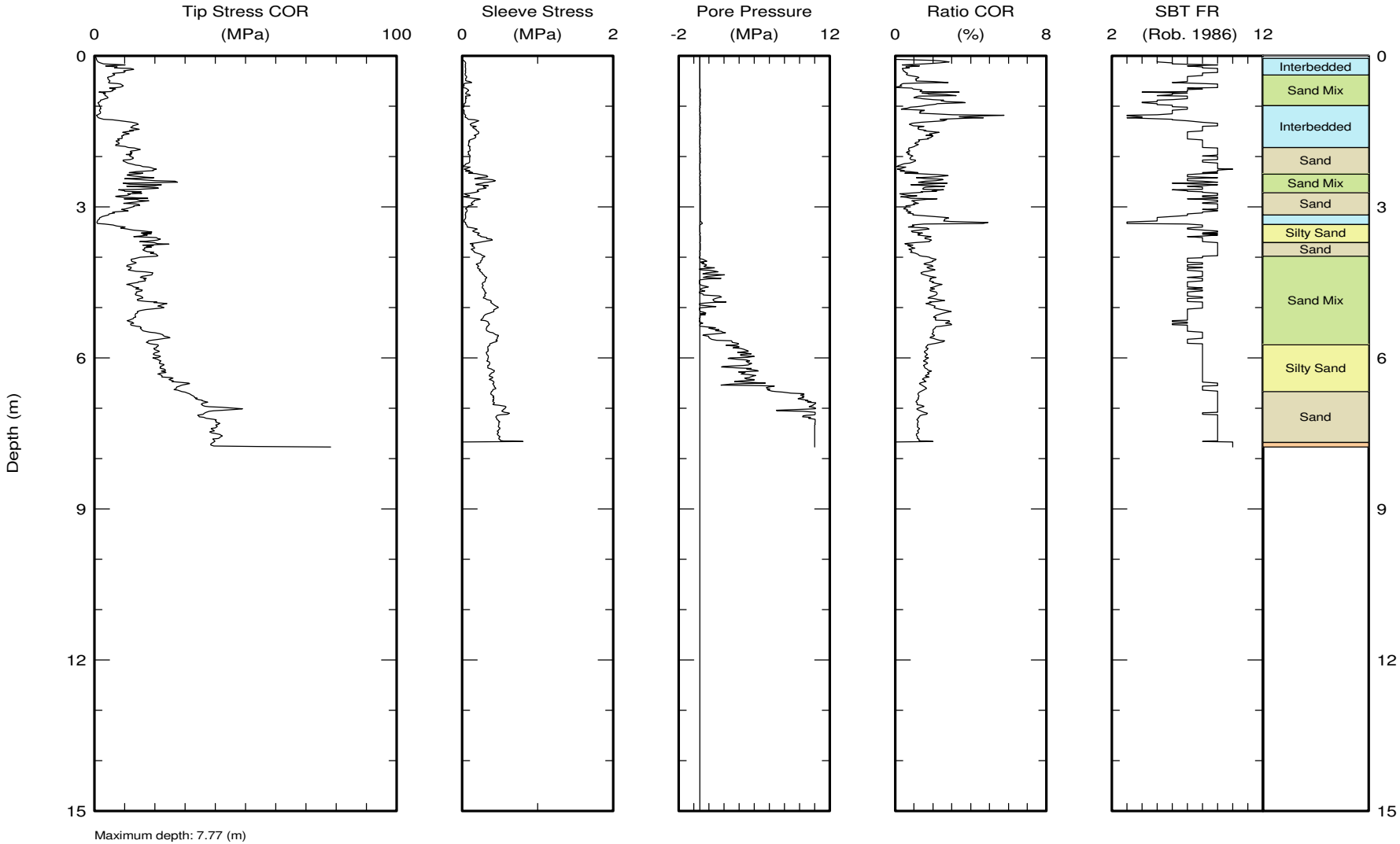
CPT Data
30 ton rig

Date: 11/Feb/2008
Test ID: C-440+62.5
Project: CarrollCanyon

Client: Testing Engineers
Job Site: End of Sorrento Rd.



Maximum depth: 7.77 (m)

Test ID: C-440+62.5
File: Z11F0801C.ECP

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" Depth (meter)	Qc(avg) (MPa)	Fs(avg) (MPa)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (MPa)
0.152	11.687	0.124	1.060	8	29	44	9E9
0.457	34.554	0.337	0.974	9	69	104	9E9
0.762	31.829	0.297	0.933	9	64	96	9E9
1.067	46.422	0.346	0.744	10	77	116	9E9
1.372	62.392	0.502	0.804	10	104	156	9E9
1.676	42.057	0.474	1.126	9	84	126	9E9
1.981	11.012	0.271	2.449	7	37	56	9E9
2.286	4.376	0.082	1.856	7	15	23	9E9
2.591	2.986	0.063	2.108	6	12	18	9E9
2.896	2.865	0.072	2.487	6	12	18	9E9
3.200	5.355	0.113	2.100	6	22	30	9E9
3.505	59.233	0.251	0.424	10	99	127	9E9

"
NPUT FILE: c:\temp\C-437+251500RT.CSV |----------

" Depth (meter)	Qc(avg) (MPa)	Fs(avg) (MPa)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (MPa)
0.152	7.671	0.066	0.857	8	19	29	9E9
0.457	3.800	0.111	2.899	6	15	23	9E9
0.762	10.000	0.267	2.670	6	40	60	9E9
1.067	10.180	0.362	3.554	6	41	62	9E9
1.372	13.458	0.226	1.678	8	34	51	9E9
1.676	11.905	0.274	2.294	7	40	60	9E9
1.981	6.450	0.179	2.771	6	26	39	9E9
2.286	31.964	0.267	0.835	9	64	96	9E9
2.591	57.277	0.580	1.013	9	115	173	9E9
2.896	37.927	0.570	1.502	9	76	114	9E9
3.200	41.281	0.498	1.206	9	83	115	9E9
3.505	65.400	0.000	0.000	10	9E9	9E9	9E9

"
NPUT FILE: c:\temp\C-437+90147RT.CSV |----------

" Depth (meter)	Qc(avg) (MPa)	Fs(avg) (MPa)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (MPa)
0.152	27.072	0.024	0.088	10	45	68	9E9
0.457	1.068	0.015	1.441	5	5	8	0.071
0.762	5.114	0.040	0.791	8	13	20	9E9
1.067	41.204	0.479	1.163	9	82	123	9E9
1.372	33.842	0.766	2.264	8	85	128	9E9
1.676	23.882	0.719	3.011	12	119	179	9E9
1.981	25.300	0.633	2.502	7	84	126	9E9
2.286	20.175	0.397	1.970	8	50	75	9E9
2.591	18.682	0.374	2.000	7	62	93	9E9
2.896	17.143	0.394	2.300	7	57	85	9E9
3.200	11.536	0.303	2.628	7	38	53	9E9
3.505	5.796	0.202	3.491	5	29	38	0.382
3.810	5.476	0.164	2.991	6	22	27	9E9
4.115	19.825	0.378	1.907	8	50	57	9E9
4.420	58.861	0.283	0.481	10	98	106	9E9

"
NPUT FILE: c:\temp\C-438+35144RT.CSV |----------

" Depth (meter)	Qc(avg) (meter)	Fs(avg) (meter)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (meter)
0.152	1.880	0.026	1.383	1	0	0	0.109
0.457	0.732	0.009	1.180	1	0	0	0.000
0.762	13.668	0.117	0.855	1	1	2	0.830
1.067	44.504	0.630	1.416	1	2	3	2.852
1.372	29.170	0.770	2.638	3	3	5	1.792
1.676	23.305	0.668	2.865	3	2	3	1.362
1.981	24.645	0.594	2.409	3	2	3	1.412
2.286	19.233	0.392	2.036	1	1	2	1.015
2.591	18.914	0.374	1.978	1	1	2	0.962
2.896	14.625	0.345	2.356	1	1	2	0.643
3.200	9.871	0.309	3.131	2	1	2	0.296
3.505	5.023	0.165	3.277	2	9E9	9E9	9E9
3.810	6.553	0.189	2.890	2	1	1	0.020
4.115	34.106	0.452	1.325	1	2	3	1.826
4.420	62.867	0.197	0.313	1	3	4	3.709

"
NPUT FILE: c:\temp\C-438+65144RT.CSV |----------

" Depth (meter)	Qc(avg) (MPa)	Fs(avg) (MPa)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (MPa)
0.152	2.995	0.063	2.109	6	12	18	9E9
0.457	12.339	0.367	2.975	6	49	74	9E9
0.762	19.588	0.591	3.018	7	65	98	9E9
1.067	27.578	0.806	2.915	12	138	207	9E9
1.372	30.056	0.862	2.865	12	151	227	9E9
1.676	29.184	0.877	2.997	12	146	219	9E9
1.981	22.109	0.677	3.056	12	111	167	9E9
2.286	29.345	0.704	2.390	7	98	147	9E9
2.591	36.795	0.639	1.728	8	92	138	9E9
2.896	33.924	0.604	1.765	8	86	126	9E9
3.200	31.679	0.553	1.723	8	80	109	9E9
3.505	61.535	0.615	0.998	10	103	131	9E9
3.810	37.900	0.000	0.000	10	9E9	9E9	9E9

"
NPUT FILE: c:\temp\C-439+4256RT.CSV |----------

" Depth (meter)	Qc(avg) (MPa)	Fs(avg) (MPa)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (MPa)
0.152	33.675	0.177	0.526	10	56	84	9E9
0.457	14.665	0.190	1.295	8	37	56	9E9
0.762	4.819	0.152	3.153	6	19	29	9E9
1.067	3.392	0.131	3.865	5	17	26	0.225
1.372	5.411	0.199	3.676	5	27	41	0.359
1.676	5.033	0.222	4.394	4	34	51	0.334
1.981	4.833	0.210	4.340	4	32	48	0.320
2.286	3.581	0.152	4.233	4	24	36	0.236
2.591	4.241	0.145	3.412	5	21	32	0.281
2.896	3.688	0.121	3.270	5	18	27	0.242
3.200	3.556	0.134	3.779	5	18	25	0.233
3.505	13.783	0.397	2.879	7	46	59	9E9
3.810	18.241	0.560	3.065	7	61	74	9E9
4.115	24.804	0.593	2.389	7	83	95	9E9
4.420	29.886	0.419	1.403	9	60	65	9E9

"
NPUT FILE: c:\temp\C-440+025.54LT.CSV |---

Depth (meter)	Qc(avg) (MPa)	Fs(avg) (MPa)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (MPa)
0.152	0.707	0.027	3.761	3	7	11	0.048
0.457	0.569	0.033	5.761	3	6	9	0.038
0.762	0.987	0.043	4.333	3	10	15	0.066
1.067	2.835	0.052	1.814	6	11	17	9E9
1.372	2.594	0.045	1.730	6	10	15	9E9
1.676	1.329	0.066	4.848	3	14	21	0.088
1.981	1.000	0.056	5.580	3	10	15	0.064
2.286	0.737	0.040	5.352	3	7	11	0.047
2.591	0.667	0.033	4.839	3	7	11	0.043
2.896	0.644	0.027	4.068	3	7	11	0.040
3.200	0.279	0.019	6.000	3	3	4	0.017
3.505	0.725	0.027	3.506	3	8	10	0.047
3.810	0.442	0.020	4.086	3	5	6	0.028
4.115	0.255	0.010	3.667	3	3	3	0.013
4.420	0.258	0.013	4.545	3	3	3	0.013
4.724	0.285	0.010	3.333	3	3	3	0.014
5.029	0.273	0.014	4.545	3	3	3	0.014
5.334	3.925	0.101	2.564	6	16	15	9E9
5.639	4.200	0.155	3.661	5	21	19	0.274
5.944	9.533	0.302	3.173	6	38	33	9E9
6.248	9.747	0.322	3.285	6	39	33	9E9
6.553	16.090	0.318	1.940	7	55	45	9E9
6.858	17.455	0.391	2.213	7	59	46	9E9
7.163	17.664	0.400	2.231	7	60	45	9E9
7.468	40.429	0.000	0.000	10	9E9	9E9	9E9

"
NPUT FILE: c:\temp\C-440+0254LT.CSV |----------

" Depth (meter)	Qc(avg) (MPa)	Fs(avg) (MPa)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (MPa)
0.152	0.795	0.016	2.013	4	5	8	0.053
0.457	0.521	0.020	3.871	3	5	8	0.034
0.762	1.280	0.029	2.292	5	6	9	0.084
1.067	6.012	0.041	0.686	8	15	23	9E9
1.372	5.669	0.051	0.904	8	14	21	9E9
1.676	2.929	0.035	1.205	7	10	15	9E9
1.981	1.535	0.057	3.716	4	10	15	0.100
2.286	0.945	0.039	4.135	3	9	14	0.060
2.591	0.823	0.032	3.925	3	8	12	0.052
2.896	0.877	0.032	3.684	3	9	14	0.055
3.200	0.414	0.016	3.966	3	4	6	0.024
3.505	0.357	0.010	2.800	3	4	5	0.019
3.810	0.650	0.017	2.637	4	4	5	0.039
4.115	0.567	0.016	2.824	3	6	7	0.033
4.420	0.425	0.010	2.353	3	4	4	0.023
4.724	0.820	0.010	1.220	5	4	4	0.049
5.029	7.790	0.094	1.212	8	19	19	9E9
5.334	5.500	0.025	0.446	8	14	13	9E9
5.639	0.665	0.010	1.438	5	3	3	0.037
5.944	7.195	0.075	1.044	8	18	16	9E9
6.248	5.165	0.085	1.650	7	17	14	9E9
6.553	6.186	0.098	1.578	7	21	17	9E9
6.858	3.714	0.063	1.703	7	12	9	9E9
7.163	8.038	0.127	1.586	7	27	21	9E9
7.468	12.561	0.381	3.033	6	50	37	9E9
7.772	22.347	0.682	3.043	12	112	80	9E9
8.077	28.342	0.721	2.497	7	96	66	9E9
8.382	45.492	0.324	0.702	10	77	52	9E9

"
NPUT FILE: c:\temp\C-440+62.5.CSV |----------

" Depth (meter)	Qc(avg) (MPa)	Fs(avg) (MPa)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (MPa)
0.152	4.907	0.035	0.707	8	12	18	9E9
0.457	6.738	0.051	0.761	8	17	26	9E9
0.762	4.378	0.058	1.329	7	15	23	9E9
1.067	1.648	0.031	1.864	6	7	11	9E9
1.372	9.872	0.146	1.474	8	25	38	9E9
1.676	8.918	0.135	1.509	7	30	45	9E9
1.981	12.059	0.098	0.810	9	24	36	9E9
2.286	15.668	0.134	0.856	9	31	47	9E9
2.591	16.132	0.270	1.674	8	40	60	9E9
2.896	12.364	0.107	0.867	9	25	38	9E9
3.200	4.055	0.048	1.179	7	14	20	9E9
3.505	14.800	0.204	1.376	8	37	48	9E9
3.810	18.491	0.190	1.025	9	37	45	9E9
4.115	13.311	0.241	1.807	7	45	52	9E9
4.420	15.371	0.284	1.834	8	39	43	9E9
4.724	14.493	0.303	2.067	7	49	51	9E9
5.029	18.115	0.398	2.187	7	61	60	9E9
5.334	13.535	0.320	2.347	7	45	43	9E9
5.639	20.395	0.423	2.038	8	52	47	9E9
5.944	19.990	0.340	1.641	8	52	45	9E9
6.248	21.755	0.379	1.679	8	56	47	9E9
6.553	26.822	0.409	1.469	8	70	56	9E9
6.858	33.652	0.444	1.248	9	71	55	9E9
7.163	37.126	0.513	1.312	9	78	59	9E9
7.468	38.250	0.485	1.203	9	81	59	9E9
7.772	41.392	0.182	0.420	10	72	51	9E9

Program: CPTINT - CPT Cone Interpretation Program
Version: 5.2
Table File by: Dr. R. G. (DICK) Campanella, P.Eng.
Rev. Dated: April 3, 2002

Parameter	Methods	Refer. Number	Valid Soil Type	Valid Zone
Depth average see NOTE #1	Depth averaged over specified range (see menu)		All	All
Parameter Averaging	Averaged over range specified for depth. If no values exist, your choice is zero's or no value		All	All
Qc, Tip Stress	measured tip force/area	#6,#8	All	All
Qt corrtd for U2 see NOTE #2	Qt = Qc + (1 - a) x U2 and a = tip area ratio Defaults to U2 if given or uses U1 or U3 times Const.	#6,#8	All	All
[Note: Input value from input file is used if defined, not calculated]				
Q (Qt Normalized)	$Q = \frac{Qt - sv}{sv'}$	#9 & 13	All	All
Fs	measured sleeve force/area	#6,#8	All	All
Rf Friction Ratio (if Rf>8, Rf=8)	$Rf = \frac{Fs}{Qt} \times 100\%$	#6,#8	All	All
F (Rf Normalized)	$F = \frac{Fs}{(Qt - sv)} \times 100\%$	#9 & 13	All	All
Gamma Total Unit Weight (Soil + Water) see NOTE #3	Based on Rf or Bq Classif. Zone Zone # Gamma = kN/m^3 1 Qt<4bar 15.70 1 Qt=4bar 17.30 2 Rf<5% 13.36 2 Rf=5% 11.80 2 Bq Zone 12.58 3 Qt<10bar 18.86 3 Qt=10bar 19.65 4, 5 & 6 Qt<20bar 18.86 4, 5 & 6 Qt=20bar 19.65 7 18.86 8 & 9 19.65 10 20.44 11 & 12 21.22		All	All

Parameter	Methods	Refer. Number	Valid Soil Type	Valid Zone
U Penetration Pore Pressure see NOTE #4	U1,measured on Face of tip U2,measured Behind Tip at shoulder (std location) U3,measured Behind Friction Sleeve		All	All
Water Table	Depth below ground surface to where pore pressure = 0 Make negative if water level is above ground		All	All
Uo Hydrostatic Pore Pressure see NOTE #4	Uo = water depth,Hw x unit weight water, Gamma or Uo=Hw=depth-depth to water table if depth<water table,Uo = 0		All	All
dU Excess Pore Pressure	dU = U2 - Uo Defaults to U2 if given or uses U1 or U3 x const.		All	All
DPPR (Differential Pore Pressure Ratio)	$DPPR = \frac{dU}{Qt} = \frac{U - Uo}{Qt}$ Defaults to U2 if given or uses U1 or U3 x const.	#6,#8	All	All
Bq	$Bq = \frac{dU}{Qt - sv}$	# 4 # 8 # 13	All	All
OS (Overburden Stress)	OS = sv = S (Gamma x Depth)		All	All
EOS (Effective Overburden Stress)	EOS = sv' = OS - Uo = sv - Uo		All	All
Rf Zone Soil Behavior Type see NOTE #5	Classification chart for Qc and Rf Zone # = Soil Behavior Type 1=sensitive fine grained 2=organic material 3=clay 4=silty clay 5=clayey silt 6=sandy silt 7=silty sand 8=fine sand 9=sand 10=gravelly sand 11=very stiff fine grained ¥ 12=sand to clayey sand ¥ ¥ overconsolidated or cemented	#6 #8, Fig4.3	All	1<Qt<1000bar 0<Rf<8%

Parameter	Methods	Refer. Number	Valid Soil Type	Valid Zone
Bq Zone Soil Behavior Type	Classification chart for Qc and Bq (same zone #'s as Rf above)	#8 Fig 4.3	All	0<Qt<1000bar -0.1<Bq<1.4
Spt N(60) Standard Penetration Test (Blows/foot) at 60% Energy After R&C(1983) see NOTE #6	Qt/N ratio per zone Zone # Qt/N Zone # Qt/N 1 2 7 3 2 1 8 4 3 1 9 5 4 1.5 10 6 5 2 11 1 6 2.5 12 2	# 7 # 8 Fig 4.2	All	All
Spt N1(60) Normalized for Overburden str	Spt N1(60) = Cn x Spt N(60) where Cn = (sv')^(-0.77)	# 8	All	0.5<Cn<1.5
Dr Relative Density see NOTE #7	Specific Sands: $Dr = \frac{100}{C2} * \ln \frac{Qc + C1}{+ C0\ sv' +}$ where: All are NC & UNAGED	# 8		
Compressibility	Sand | C0 | C1 | C2			
moderate high	Ticino | 17.37 | .558 | 2.58 Schmertmann | 15.32 | .520 | 2.75	# 1 # 1	/ Sand-- \	7 to 10 0<Qt<500bar 0<sv'<5bar
all	ALL SANDS: NC, OC, ALL TESTS $Dr = C3 + C4 \log_{10} \frac{+ Qc + C1 +}{+ sv' + C2 +}$ where:	# 5	Sand	7 to 10 (6 possible)
	C0 | C1 | C2 | C3 | C4 0.100 | 0.0981 | 0.5 | -98 | 66			
Phi Friction Angle	Methods: 1) Robertson & Campanella 2) Durgunoglu & Mitchell 3) Janbu beta = +15 degree 4) Janbu beta = 0 degree 5) Janbu beta = -15 degree	#6, #8 # 2 #6, #8 #6, #8 #6, #8	/ Sand-- \	7 to 10 & 6 0<Qt<500bar 0<sv'<4bar 29<phi<49

Parameter	Methods	Refer. Number	Valid Soil Type	Valid Zone
Gmax Maximum Shear Modulus at very small strains	Clay: Gmax = alpha x Qt	# 8 Fig4.18	Clay	1 to 6
	Sand: Digitized figure of Qc vs Gmax with interpolation between sv'curves,R&C method	# 6 # 8 Fig4.13	Sand	(6 possible) 7 to 10 .25<sv'<8bar
CSR(Qc), t/s LEVEL ground Liquefaction SAND Resistance see NOTE #8	Seed's CSR vs N1(60) graph for specified equake Magnitude.Can include silty sand corr. for Zone 7. N1(60) from CPT correlations.	# 11 # 12	Sand	7 to 10 (6 possible)
CSR(Eq), t/s Cyclic Stress Ratio applied by design quake	CSR(Eq) = 0.65 (Amax/g) (sv/svo') rd Amax=max surface acceleratn including Amplification	# 12 # 3	Sand	7 to 10 (6 possible)
[Note: Input value from input file is used if defined, & not calculated]				
rd Reduction Factor to find CSR(Eq)	Digitized graph to use for depth vs rd: 1) Seed's mean 2) Fraser Delta	# 12 # 3	Sand	(6 possible) 7 to 10 0<depth<30m
FL,Safety Factor against Liquefaction	FL = CSR(Qc)/CSR(Eq)	# 3	Sand	7 to 10 (6 possible)
Qcr Critical Bearng required to resist Liquefctn	Qcr backcalculated from CSR(Eq) for a specified FL. Qcr is only for the given GWT,EOS,OS,Amax/g & Eq.Mag	# 12	Sand	7 to 10 (6 possible)
Su, Undrained Shear Strength of CLAY METHODS: see NOTE #9	Nk: Su = Qc - st / Nk	# 8	Clay	1 to 6
	Nke: Su = Qt - U2 / Nke		Clay	1 to 6
	Nkt: Su = Qt - sv / Nkt		Clay	1 to 6
	Nc: Su = Qt / Nc		Clay	1 to 6
	NdU: Su = dU2 (dU1 or dU3) / NdU		Clay	1 to 6

Parameter	Methods	Refer. Number	Valid Soil Type	Valid Zone
Su/EOS	$Su/EOS = \frac{Su}{sv'}$	# 8	Clay	1 to 6
Ko (NC) Normally Consolidated	$(Ko)NC = 1 - Sin(f)$ see NOTE #10	# 8	Sand	7 to 10 (6 possible)
Ko (OC) Over Consolidated	$(Ko)OC = (Ko)NC \times OCR^{0.42}$	# 8	Sand	7 to 10 (6 possible)
E25 Youngs Modulus	E25 = alpha x Qt where user input alpha	# 8 4.11&12	Sand	(6) 7 to 10 0<Qt<500bar
M Constrained Modulus	CLAY: M = alpha x Qt where user input alpha SAND: Methods: Qt: M = alpha x Qt Baldi: $\frac{M}{Qt} = C0 \times pa \left(\frac{sv' + C1}{pa}\right)^{C2} \times OCR^{C3 Dr}$	# 8 Tabl4.3 # 8 Fig4.10	Clay Sand Sand	1 to 6 7 to 10 (6 possible) 7 to 10
OCR (Clay) Over-Consolidation Ratio see NOTE #11	$OCR = \left(\frac{Su}{svo'} \Big/ \left(\frac{Su}{svo'} + NC\right)\right)^{1.25}$	# 6 # 8 Fig4.19	Clay	1 to 6
Ic Material Index After J&D(1993) see NOTE #18	$Ic = \left(3 - \log\left(Q(1-Bq)\right)\right)^2 + \left(1.5 + 1.3 \log F\right)^{2+0.5}$	# 13 # 17	All	All
Spt N(60) Standard Penetration Test (Blows/foot) at 60% Energy After J&D(1993) see NOTE #16	$Qc/N = 8.5(1-(Ic/4.75))$ where Qc in bars	# 13	All	All

Parameter	Methods	Refer. Number	Valid Soil Type	Valid Zone
State Parameter State,(e-units) Current Void Void Ratio minus Critical Void Ratio	$State = \frac{+ \ln\left\{\frac{+ 3M + 8.5M/F}{+ Q(1-Bq) +}\right\}}{11.9 - 1.33F}$ $M = \frac{6 \sin fcv}{3 - \sin fcv}$ fcv = const. vol. Phi angle	# 14	All	All
Fines Content FC(%) Percent less than #200 Sieve After Davies,99	FC(%) = 42.4179(Ic) - 54.8574 FC(%) = 0% if Ic < 1.2933 FC(%) = 100% if Ic > 3.6508	# 15	All	All
OCR (Clay) Overcons. Ratio by Pore Press. U1 & U2 or U1 & U3 see NOTE #17	OCR = 0.5 + 1.50(PPD) PPD = (U1 - U2)/Uo or PPD = (U1 - U3)/Uo and default 0.5 & 1.5 are settable	# 16	Clay	1 to 6

1. Depth averaging may be in 0.5, 1, 2.5 or 5 ft. intervals or 0.1, 0.25, 0.5 or 1.0 m intervals, or no depth averaging if zero is selected. The average is the mean value of the readings in the interval. The depth value is the mid-depth of the averaged interval. It is convenient to start at half the depth averaging interval. For example, if you want "even" depths and the depth averaging is set at 0.50 m then start at 0.25 to get values of depth of 0.5, 1.0, 1.5, etc.

2. Basic input CPTU data columns are for Depth, Qc, Fs, U1, U2, U3, INC and TEMP may be selected. In addition the following parameters may also be specified as an INPUT data column: Qt, Gamma, Uo, Spt N, Rf Zone, Bq Zone and CSR(EQ). These values will be used where required to obtain other interpreted parameters. If they are not specified the program will estimate them when they are required. For example, you can create an OUTPUT data file of any of the above parameters and then edit some or all of the values to suite your measurements or your desires to specify their values. You can do that with "Gamma" values to input your measurements of unit weight, or with "Uo" if you want to input values of pore water pressure other than hydrostatic, or with any of the other input parameters. You would use your edited file of adjusted data as your new INPUT data file. Thus, you can specify these parameters if you want to override the Program's values.

You can also use the designated value of "9E9" to denote an unknown value.

You can use the "OTHER" designation to input other data that exists on your input file and identify its units. This allows you to output it, without operating on it, if you choose.

It is best NOT to use depth averaging when using input data that is not continuous at regular depth intervals. Always use DEPTH AVERAGING with extreme caution since the program averages ALL INPUT parameters over the interval chosen irregardless of soil type. Careful use of start and end depth choises can make depth averaging very effective.

3. Since there is no data in the file within the initial depth interval, a default Gamma (unit weight) must be specified from the surface to the starting depth. This is done in the "Param" Menu in units of kN/m^3 (1kN/m^3=6.36pcf). Also, you can specify the values of Gamma to be used by the program as in NOTE #2 above.

4. If pore pressures are not measured by the cone then the program will take Qc as being equal to Qt for all interpretations requiring Qt. Also, Uo may be specified in the input file as a column of Uo vs depth values, if the water pressures are not hydrostatic. See NOTE #2 for more info on customizing input data.

5. You can choose to use either the Rf classif. Zone or the Bq classif. Zone to divide soil into Undrained Parameters (Zones 1 to 6) and Drained Parameters (Zones 7 to 10) in the "Param" Menu. (However, in order to use the Bq Zone you must have Pore Pressure, U2, data.) Also, you may choose to switch Zone 6 to a Drained Zone from its Undrained Zone status. This is done if you feel that the soil identified as Zone 6 (sandy silt) is really coaser (using other sources of information) and/or you want it analyzed as a Drained rather than Undrained soil. Finally, the soil behavior names in each zone were shortened in version 5.0 for simplicity. For example, Zone 6 was named "sandy silt to clayey silt" but was shortened to "sandy silt".

6. Spt N is the same as Spt N(60) for 60% transferred energy. This value is calculated from the Qt/N ratios given for each Soil Zone (you can specify either Rf or Bq Zone) and these values are used in the Level Ground Liquefaction analysis. Values of Spt N may be specified in the Input File, if indepedently measured values are to be used. We suggest that you not use depth averaging if you only have selected Spt N values at a few depths. You may use "9E9" for missing data.

7. If Dr values are negative then soil is very loose or likely more of an undrained soil like a silty sand rather than a drained soil for which the Dr correlations were developed. Use Dr interpretations very cautiously since they also assume the soil is free draining, uncemented, unaged and has the same compressibility of grains as the soil used for the correlations in chamber calibration tests.

8. The simplified sand liquefaction analysis for level ground according to Seed et al requires Spt N1(60) and earthquake magnitude to obtain the cyclic stress ratio to cause liquefaction, CSR(Qc). The design maximum ground acceleration, the depth-reduction factor, Rd, and overburden total and effective stresses are required to calculate the cyclic stress ratio applied by the design earthquake, CSR(EQ). The program estimates the N1(60) values from the cone stresses, the operator identifies the earthquake magnitude and Seed et al chart is used to get CSR(Qc). The program also calculates CSR(EQ) from the user specified maximum ground acceleration including any amplification factors, the calculated overburden stresses and either Seed's mean or the Fraser Delta Rd factor. The Fraser Delta is used only when amplification factors of the order of 2 or more are used. See Reference Nos. 3, 6, 11 and 12 for more information. The user can INPUT specific values for Spt N, CSR(EQ), Soil Zones, Gamma's, etc. in order to customize the analysis for the existing data base of information. It is recommended that you do not use depth averaging when using specific input data but make calculations at specific depths where external input data exists. The calculated value of Qcr is the minimum value of cone bearing stress required at a given depth such that the factor of safety against liquefaction, or the ratio FL = CSR(Qc)/CSR(EQ) have the specified value for a given earthquake magnitude, max. ground acceleration, depth reduction factor, and calculated overburden stresses. This value of Qcr is useful to identify the required minimum level of soil improvement for a given design condition.

9. The NdU method to calculate undrained shear strength has been extended to allow the user to choose either dU1, or dU2 or dU3 provided such pore pressure measurements exist.

10. The Overconsolidation Ratio, OCR, for the sand must be estimated by the user in the "Param" menu if you want to estimate Ko in the sand layers. For the typical normally consolidated sand, OCR = 1.0.

11. It is currently only possible to estimate the OCR for a clay, which makes use of the correlations obtained from extensive laboratory tests.

12. An improved calculation and print routine was added to version 5.0 which uses swap routines to reduce memory requirements, but slows down the calculations.

13. The classification charts for Rf has been extended at all boundaries such that values of Rf>8 and values of Qc<1.00 are possible. The Bq classification chart which requires dU2 and can now accept values of Bq>1.2 and Qt<1. Unfortunately, this feature does not work.

14. Version 5.1ppd added several enhancements to the program. You may input an average vertical flow gradient, which is applied over the entire profile depth to be analysed so adjust the depth of interest accordingly. Zero gives hydrostatic and no flow, a negative gradient is upward flow which increases pore pressure and reduces vertical effective stress. A positive gradient gives downward flow.

15. A State Parameter or current void ratio minus critical void ratio is calculated according to the paper by Ref. 14, Plewes, Davies and Jefferies, 1994.

16. An alternate method to estimate SPT from CPT is provided according to Ref. 13, Jefferies and Davies, 1993 in ASTM.

17. An alternate method to estimate OCR in clays is provided which uses the measured pore pressure difference, ppd, so both U1 and U2 or U1 and U3 must be measured at the same time. (see Ref. 16)

18. Version 5.2 added the value Ic (Material Index) according to Jefferies & Davies, 1993, 1991 (Ref. 13 & 17) which combines all Normalized parameters Q, F and Bq.
(Note: QtN was changed to Q and RfN to F.)

18A. In Version 5.2, if at any depth the value of Bq>1 (in very sensitive saturated soil)then Bq is made equal to 0.99. Also, if Rf>8 it is made 7.99. These changes have a negligable effect on the results.

19. FC(%) or percent of dry weight less than #200 sieve (.074mm) was also added according to Davies, 1999 Ref.#15)

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APPENDIX II

LABORATORY TESTING RESULTS

Table II.1

Boring No.	Depth below grade (m)	Sample Type	In-situ Moisture (ASTM D2216)	Dry Unit Weight (ASTM D4767)	Particle Size Analysis (ASTM D422)				Plasticity Index & Liquid Limit (AASHTO T 89 & T90)			Consolidation (ASTM D2435)	Direct Shear (ASTM D3080)				Compaction Curve (ASTM D1557)		Expansion Index (ASTM D4829)	Corrosivity Testing			
													Undisturbed		Remolded								
			ω (% of dry wt)	γ (kN/m³)	GRAVEL (%) RETAINED on #4 Sieve	SAND (%) PASSING #4 and RETAINED on #200 sieve	FINES (SILT + CLAY) (%) PASSING No. 200	FINES (SILT + CLAY) (%) CLAY	LL	PL	PI		C (kPa)	ϕ °	C (kPa)	ϕ °	Maximum Dry Density (kN/m³)	Optimum Moisture Content (%)	EI value	Sulfate Content (ppm) (CTM 417)	Chloride Content (ppm) (CTM 422)	pH value (CTM 643)	Resistivity value (ohms-cms) (CTM 643)
CCR BRIDGE																							
A-08-006	1.5	SPT	9.5		0.0	22.3	77.7																
	3.0	Ring	13.4	16.9								see graph											
	4.6	SPT																					
	6.1	Ring	20.0	17.3																			
	7.6	SPT	18.5		1.0	54.7	44.3																
	9.1	Ring	21.4	17.2								see graph											
	10.7	SPT	20.0		19.0	65.0	16.0																
	15.2	SPT	22.4		7.3	45.9	46.8																
A-08-031	14.0	Ring											19.2	33.0									
O-08-033	26.5	Ring											1.2	46.0									
O-08-034	0.3	small bag	31.0		1.0	23.5	75.5																
	1.2	small bag	14.2																				
	2.1	small bag	25.2				80.0																
	5.5	small bag	16.3		46.0	35.0	12.0	7.0															
	6.1	small bag	21.8		5.9	58.7	21.4	14.0															
	7.0	small bag	14.0		44.3	39.0	7.7	9.0															
	7.6	small bag	6.4		53.7	38.8	5.0	2.5															
	7.9	small bag	13.2		38.9	41.5	12.6	7.0															
	8.5	small bag	13.6		56.1	34.5	6.6	2.8															
	9.1	small bag	16.2		12.7	70.6	11.5	5.2															
	11.9	small bag	8.2		39.9	44.4	11.0	4.7															
	13.7	Ring																					
	13.7	small bag	8.1		47.7	35.0	11.3	6.0															
	14.0	small bag	16.2		0.0	12.0	53.0	35.0															
	18.6	small bag	34.5																				
	19.8	Ring																					
	21.3	small bag	15.1																				
	25.9	Ring											15.6	35.0									
	26.2	small bag	12.9																				
O- 08-036	15.2	Ring											24.4	34.0									
A-08-045	4.6	SPT	23.7				72.6		39.6	14.7	24.9												
A-08-046	0.3	Bulk																		520	1,100	6.4	328

Table II.1

Boring No.	Depth below grade (m)	Sample Type	In-situ Moisture (ASTM D2216)	Dry Unit Weight (ASTM D4767)	Particle Size Analysis (ASTM D422)				Plasticity Index & Liquid Limit (AASHTO T 89 & T90)			Consolidation (ASTM D2435)	Direct Shear (ASTM D3080)				Compaction Curve (ASTM D1557)		Expansion Index (ASTM D4829)	Corrosivity Testing			
													Undisturbed		Remolded								
			ω (% of dry wt)	γ (kN/m³)	GRAVEL (%) RETAINED on #4 Sieve	SAND (%) PASSING #4 and RETAINED on #200 sieve	FINES (SILT + CLAY) (%) PASSING No. 200	FINES (SILT + CLAY) (%) CLAY	LL	PL	PI		C (kPa)	ϕ°	C (kPa)	ϕ°	Maximum Dry Density (kN/m³)	Optimum Moisture Content (%)	EI value	Sulfate Content (ppm) (CTM 417)	Chloride Content (ppm) (CTM 422)	pH value (CTM 643)	Resistivity value (ohms-cms) (CTM 643)
A-08-048	1.2	Bulk			2.0	79.4	18.6								7.4	28.0	19.3	10.5		450	390	7.2	508
A-08-049	0.0	Bulk			21	43.9	35.1								15.6	28.0	19.9	9.5		14	75	6.2	2,208
A-08-050	2.6	Bulk			0	47.5	52.5								12.0	28.0	18.9	11.5		530	120	7.1	682
A-08-051	6.1	Bulk			0	41.2	58.8								8.9	29.0	18.7	13.0		250	96	6.6	937
DAR																							
A-08-037	0.3	Bulk			0.0	25.8	74.2		37.6	17.4	20.2									31	11	6.8	1,873
	1.5	Ring	18.5	15.8									18.7	29.0									
	4.6	Ring	20.3	16.8																			
	7.6	Ring	20.8	16.5																			
	11.6	Bulk																		590	820	6.7	408
	12.2	SPT	12.3		22.0	38.5	39.5		36.4	11.4	25.0												
	13.7	Ring	16.1	18.0									24.0	29.0									
	14.3	Bulk															18.5	12.0					
	16.8	Ring	15.5	18.7																			
	22.9	Ring	22.5	16.5																			
	38.1	Ring	19.0	17.3																			
A-08-038	6.1	Ring	19.4	17.5																			
	9.8	Bulk			1.0	20.1	78.9		41.8	16.8	25.0						18.8	11.0		770	21	7.4	937
	12.2	Ring	16.2	18.1									41.7	20.0									
	18.3	Ring	20.2	17.6																			
	24.4	Ring	14.3	17.1																			
	27.4	Ring											33.5	27.0									
	30.5	Ring	15.2	16.4																			
	33.5	Ring	20.2	16.7																			
A-08-039	0.3	Bulk			0.0	33.5	66.5		43.2	17.2	26.0									14	11	6.4	1,806
	1.5	Ring	21.3	15.0									10.5	34.0									
	6.7	Bulk			2.0	26.0	72.0		42.4	15.2	27.2						19.1	11.0					
	7.6	Ring	17.9	16.1									4.8	32.0									
	13.7	Ring	20.9	16.4																			
	19.8	Ring	20.0	15.0																			
	25.9	Ring	19.0	13.9																			
	32.0	Ring	18.6	17.2																			

Table II.1

Boring No.	Depth below grade (m)	Sample Type	In-situ Moisture (ASTM D2216)	Dry Unit Weight (ASTM D4767)	Particle Size Analysis (ASTM D422)				Plasticity Index & Liquid Limit (AASHTO T 89 & T90)			Consolidation (ASTM D2435)	Direct Shear (ASTM D3080)				Compaction Curve (ASTM D1557)		Expansion Index (ASTM D4829)	Corrosivity Testing			
													Undisturbed		Remolded								
			ω (% of dry wt)	γ (kN/m³)	GRAVEL (%) RETAINED on #4 Sieve	SAND (%) PASSING #4 and RETAINED on #200 sieve	FINES (SILT + CLAY) (%) PASSING No. 200	FINES (SILT + CLAY) (%) CLAY	LL	PL	PI		C (kPa)	φ°	C (kPa)	φ°	Maximum Dry Density (kN/m³)	Optimum Moisture Content (%)	EI value	Sulfate Content (ppm) (CTM 417)	Chloride Content (ppm) (CTM 422)	pH value (CTM 643)	Resistivity value (ohms-cms) (CTM 643)
A-08-040	0.3	Bulk			0.0	26.1	73.9		41.4	15.2	26.2									46	11	6.9	1,472
	3.0	Ring	22.6	15.8																			
	6.1	Ring	17.8	15.6																			
	6.7	Bulk			3.0	22.7	74.3		40.2	14.7	25.5						19.2	12.0					
	12.2	Ring	17.4	15.5																			
	21.3	Ring	16.5	16.7																			
	24.4	Ring	21.7	14.4																			
	30.5	Ring	20.0	17.3																			
A-08-041	0.3	Bulk			0.0	29.5	70.5		36.8	18.0	18.8									32	11	6.3	2,141
	1.5	Ring	20	14.6																			
	6.7	Bulk			1.0	23.4	75.6		37.3	16.1	21.2						18.8	13.0					
	4.6	Ring	19.1	16.2									14.8	29.0									
	10.7	Ring	16.9	15.9																			
	16.8	Ring	19.7	15.6																			
	22.9	Ring	18.2	17.5																			
	25.9	Ring	18.1	14.2																			
A-08-042	6.7	Bulk			2.0	24.7	73.3		39.0	15.1	23.9						18.5	12.5					
	6.1	Ring	20.0	17.3																			
	12.2	Ring	20.0	15.6																			
	18.3	Ring	20.3	16.7																			
	21.3	Ring	29.6	14.7																			
A-08-043	1.5	Ring	18.5	15.2																			
	7.6	Ring	18.6	14.7																			
	13.7	Ring	10.2	18.7																			
	16.8	Ring	18.4	16.6																			
	19.8	Ring	18.7	14.0																			
A-08-044	2.1	Bulk			1.0	18.0	81.0		42.0	16.6	25.4						18.8	12.5		150	64	6.9	1,137
	3.0	Ring	21.5	16.0								see graph											
	6.1	Ring	13.5	17.7									13.4	34.0									
	9.1	Ring	20.3	15.6																			
	15.2	Ring	21.1	16.6																			
	22.9	Ring	18.3	16.8																			
MRW																							
A-08-001	2..4	Bulk				30.0	62.0		46.0	16.0	30.0				14.6	24.0	18.6	12.5	82.0	400	400	7.8	515

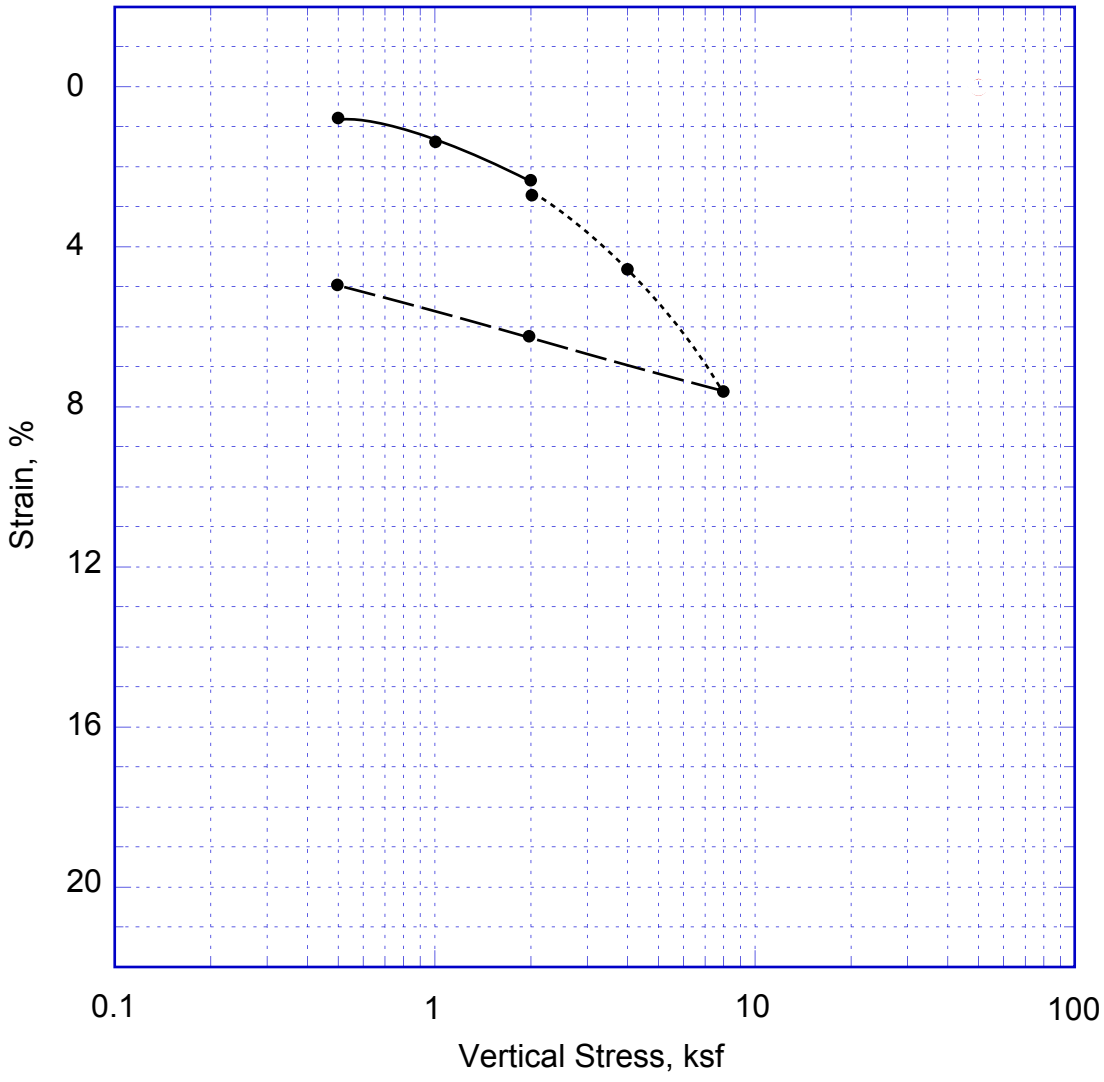
Table II.1

Boring No.	Depth below grade (m)	Sample Type	In-situ Moisture (ASTM D2216)	Dry Unit Weight (ASTM D4767)	Particle Size Analysis (ASTM D422)				Plasticity Index & Liquid Limit (AASHTO T 89 & T90)			Consolidation (ASTM D2435)	Direct Shear (ASTM D3080)				Compaction Curve (ASTM D1557)		Expansion Index (ASTM D4829)	Corrosivity Testing			
													Undisturbed		Remolded								
			ω (% of dry wt)	γ (kN/m³)	GRAVEL (%) RETAINED on #4 Sieve	SAND (%) PASSING #4 and RETAINED on #200 sieve	FINES (SILT + CLAY) (%) PASSING No. 200	FINES (SILT + CLAY) (%) CLAY	LL	PL	PI		C (kPa)	ϕ °	C (kPa)	ϕ °	Maximum Dry Density (kN/m³)	Optimum Moisture Content (%)	EI value	Sulfate Content (ppm) (CTM 417)	Chloride Content (ppm) (CTM 422)	pH value (CTM 643)	Resistivity value (ohms-cms) (CTM 643)
	3.0	Ring	15.0	16.0								see graph	4.1	40.0									
	6.1	SPT	18.2																				
	8.2	Bulk	18.4		4.0	17.0	79.0		43.0	15.0	28.0				13.9	25.0	18.5	12.0	90.0	280	150	6.7	870
	9.1	Ring	12.9	18.7								see graph											
	12.2	S	19.8																				
	14.0	Bulk	21.1		0.0	19.0	81.0		42.0	16.0	26.0									410	330	6.6	515
	15.2	Ring	22.8	16.5								see graph											
	18.3	SPT	19.6																				
A-08-002	3.0	SPT	21.6																				
	6.1	Ring	24.5	13.6								see graph	4.5	37.0									
	6.1	Bulk			4.0	33.0	63.0		39.0	13.0	26.0								74.0	380	500	7.1	468
	9.1	SPT	17.6																				
A-08-003	3.0	SPT	12.8																				
	5.2	Bulk			16.0	27.0	57.0		43.0	15.0	28.0				14.9	24.0	18.8	12.5	94.0	460	680	7.7	381
	6.1	Ring	12.7	14.6									15.8	32.0									
	9.1	SPT	13.1																				
	9.4	Bulk			17.0	50.0	33.0		40.0	14.0	26.0								73.0	520	650	6.9	401
A-08-004	1.5	Bulk			6.0	34.0	60.0		30.0	12.0	18.0				15.3	25.0	19.6	10.0	57.0	390	980	6.8	341
	3.0	Ring	12.8	17.8								see graph	18.3	37.0									
	3.3	Bulk			17.0	32.0	51.0		33.0	14.0	19.0								48.0	510	890	7.4	341
	6.1	SPT	13.1																				
	6.4	Bulk			4.0	36.0	60.0		36.0	26.0	10.0				8.4	27.0	19.4	11.5	55.0	310	420	7.3	515
A-08-005	3.0	Ring	16.1	16.9								see graph	10.6	37.0									
	3.0	Bulk			15.0	23.0	62.0		45.0	16.0	29.0								85.0	510	700	7.0	375
	6.1	SPT	17.1																				
	9.1	Ring	16.2	17.8								see graph	28.0	34.0									
	9.1	Bulk			11.0	25.0	64.0		37.0	15.0	22.0								51.0	200	350	6.9	488
	12.2	SPT	19.0																				
A-08-007	1.5	SPT	6.9																				
	1.8	Bulk	6.1		27.0	39.7	33.3		25.5	11.2	14.0						20.4	9.0		260	160	6.5	1,004
	3.0	SPT	19.2		0.0	30.1	69.9																
	3.4	Bulk	11.6		5.0	24.1	70.9		46.7	16.2	30.5												
	4.6	Ring	22.2	16.1								see graph	13.2	43.0									

Table II.1

Boring No.	Depth below grade (m)	Sample Type	In-situ Moisture (ASTM D2216)	Dry Unit Weight (ASTM D4767)	Particle Size Analysis (ASTM D422)				Plasticity Index & Liquid Limit (AASHTO T 89 & T90)			Consolidation (ASTM D2435)	Direct Shear (ASTM D3080)				Compaction Curve (ASTM D1557)		Expansion Index (ASTM D4829)	Corrosivity Testing			
													Undisturbed		Remolded								
			ω (% of dry wt)	γ (kN/m³)	GRAVEL (%) RETAINED on #4 Sieve	SAND (%) PASSING #4 and RETAINED on #200 sieve	FINES (SILT + CLAY) (%)		LL	PL	PI		C (kPa)	ϕ°	C (kPa)	ϕ°	Maximum Dry Density (kN/m³)	Optimum Moisture Content (%)	EI value	Sulfate Content (ppm) (CTM 417)	Chloride Content (ppm) (CTM 422)	pH value (CTM 643)	Resistivity value (ohms-cms) (CTM 643)
							PASSING No. 200	CLAY															
A-08-008	0.3	Bulk			6.0	23.5	70.5		40.2	13.0	27.2				8.9	26.0	18.4	13.0	49.0	790	780	6.8	388
	1.5	Ring	19.6	16.8	3.8	24.1	72.1																
	3.0	SPT	13.9		15.0	25.0	60.0																
A-08-009	1.5	Ring	12.4	16.5	14.0	40.8	45.2																
	1.8	Bulk			12.0	32.0	56.0		36.0	14.3	21.7								42.0	500	290	6.5	650
	3.0	SPT	6.9		6.0	46.7	47.3																
	3.4	Bulk																					
	4.6	Ring	15.5	17.1								see graph	51.7	37.0									
A-08-010	1.5	SPT	16.7		2.0	35.6	62.4																
	2.4	Bulk			18.0	34.5	47.5		37.3	8.7	28.6				7.9	28.0	19.0	10.5	47.0	640	170	6.8	603
	3.0	Bulk	18.2	15.9	49.0	35.3	15.7					see graph	20.6	25.0									
A-08-052	4.6	Ring	19.4	16.1									14.6	27.0									
	13.7	Ring	16.8	16.3								see graph											
A-08-053	6.1	Ring	15.4	14.6									15.3	28.0									
A-08-054	12.2	Ring	13.3	17.2									24.2	28.0									
A-08-055	1.5	Ring	13.2	15.1									12.7	30.0									
A-08-056	16.8	Ring	13.1	18.1								see graph	21.8	34.0									

Soil Consolidation



——————— Sample Loaded @ Field Moisture

---------- Sample Saturated

— — — — — Sample Tested Under Rebound Loading

Boring Location: A-08-001 [445+25 10 RT]
Depth: 3.0 m
Soil Classification (USCS): CL

NOTE: This figure may contain areas of color. TESD cannot be responsible for any subsequent misinterpretation of the information resulting from black and white reproductions of this figure.

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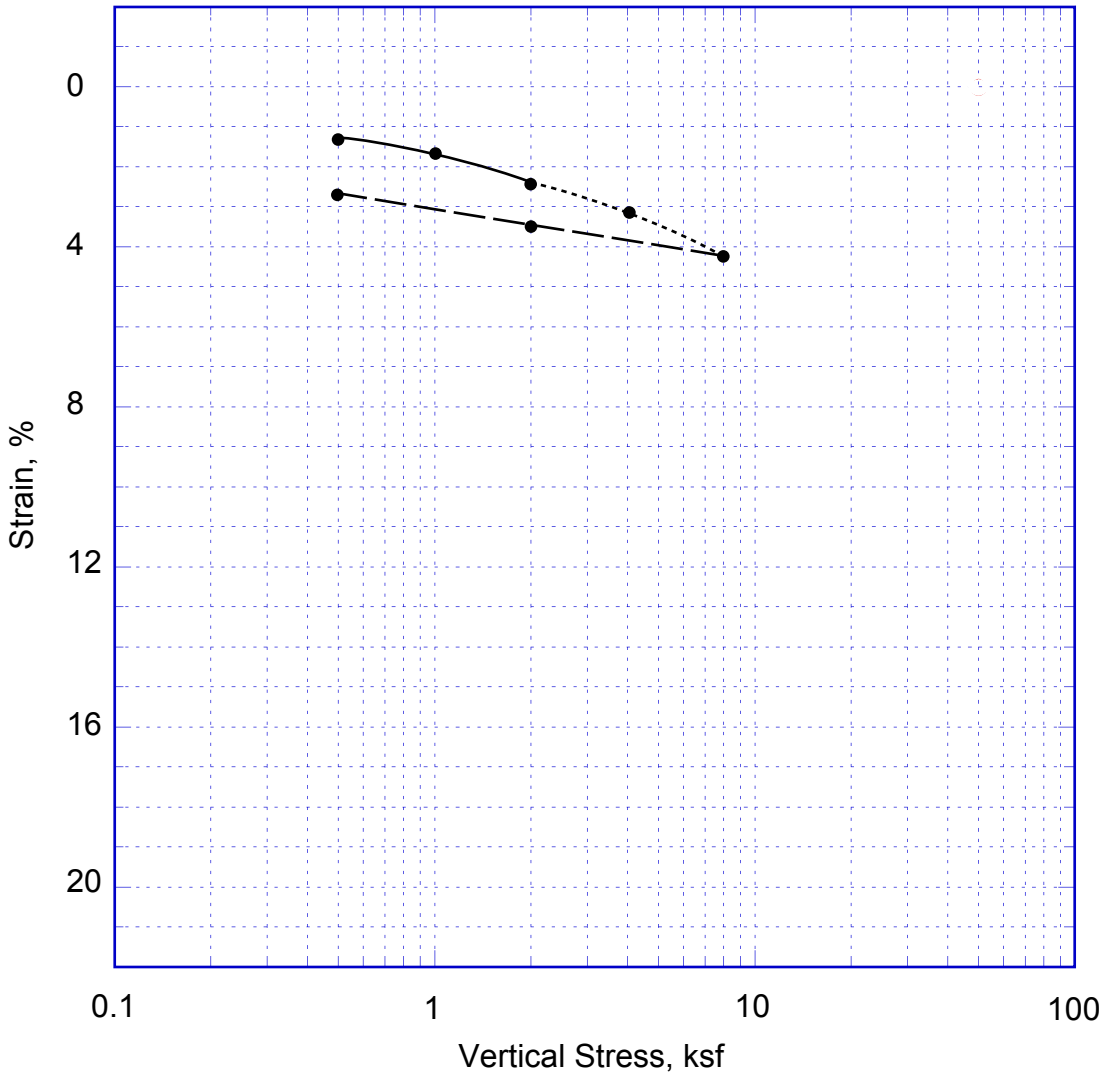
San Diego, CA 92111
Tel: (858) 715-5800 Fax: (858) 715-5810

Title:	**Consolidation Test Result**
Project:	I805 / Miscellaneous Retaining Walls

Drawn:	NJT	Contract No:	38008-017046.00
Date:	October, 2008	Figure:	II-1

Soil Consolidation



——————— Sample Loaded @ Field Moisture

---------- Sample Saturated

— — — — — Sample Tested Under Rebound Loading

Boring Location: A-08-001 [445+25 10 RT]
Depth: 9.1 m
Soil Classification (USCS): CL

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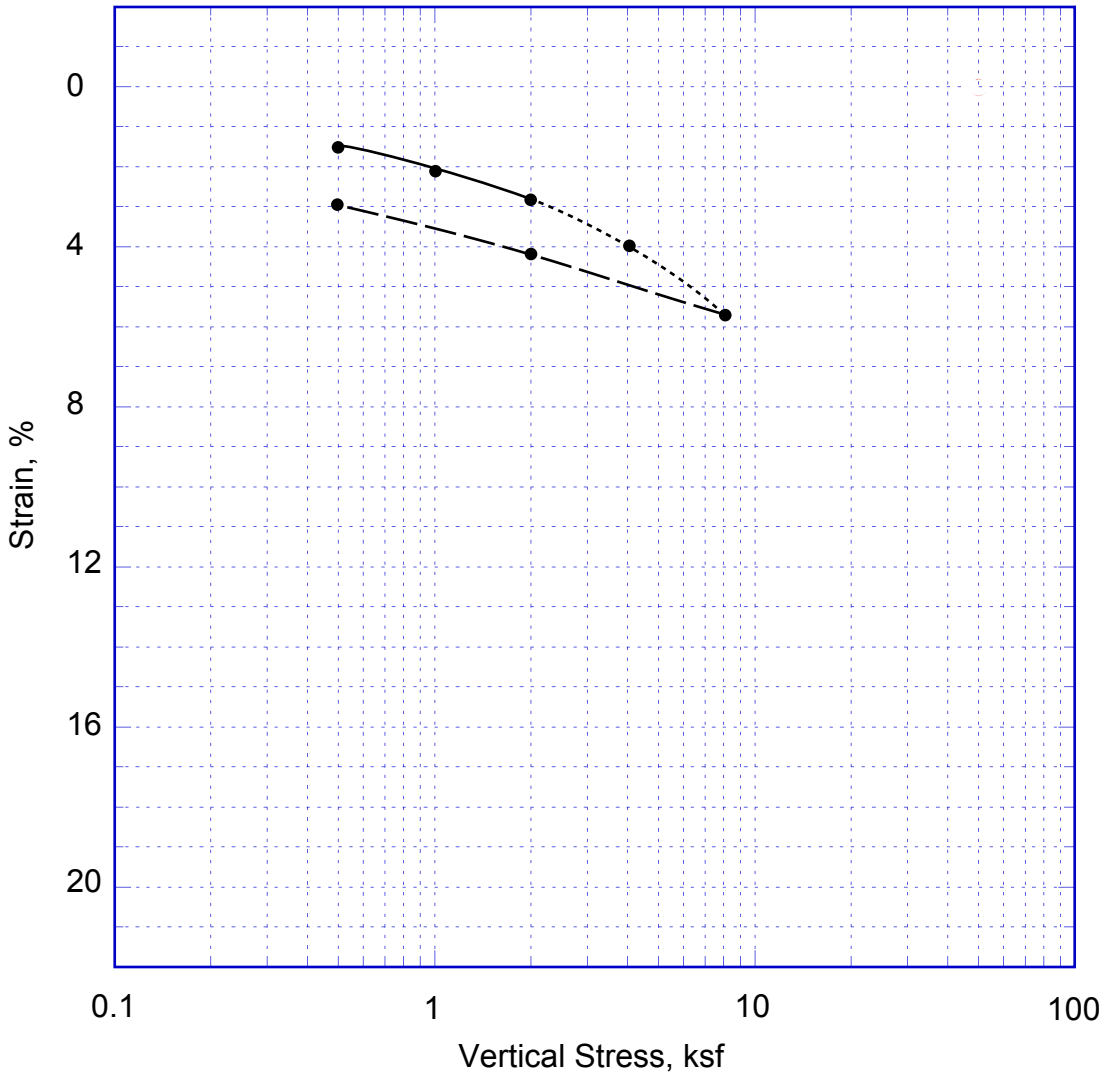
Title:	**Consolidation Test Result**
Project:	I805 / Miscellaneous Retaining Walls

Drawn:	NJT	Contract No:	38008-017046.00
Date:	October, 2008	Figure:	II-2

Soil Consolidation



——————— Sample Loaded @ Field Moisture

---------- Sample Saturated

— — — — — Sample Tested Under Rebound Loading

SCHEMATIC ONLY - NOT A CONSTRUCTION DRAWING

Boring Location: A-08-001 [445+25 10 RT]
Depth: 15.2 m
Soil Classification (USCS): CL

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San Diego, CA 92111
Tel: (858) 715-5800 Fax: (858) 715-5810

Title:	**Consolidation Test Result**
Project:	I805 / Miscellaneous Retaining Walls

Drawn:	NJT	Contract No:	38008-017046.00
Date:	October, 2008	Figure:	II-3

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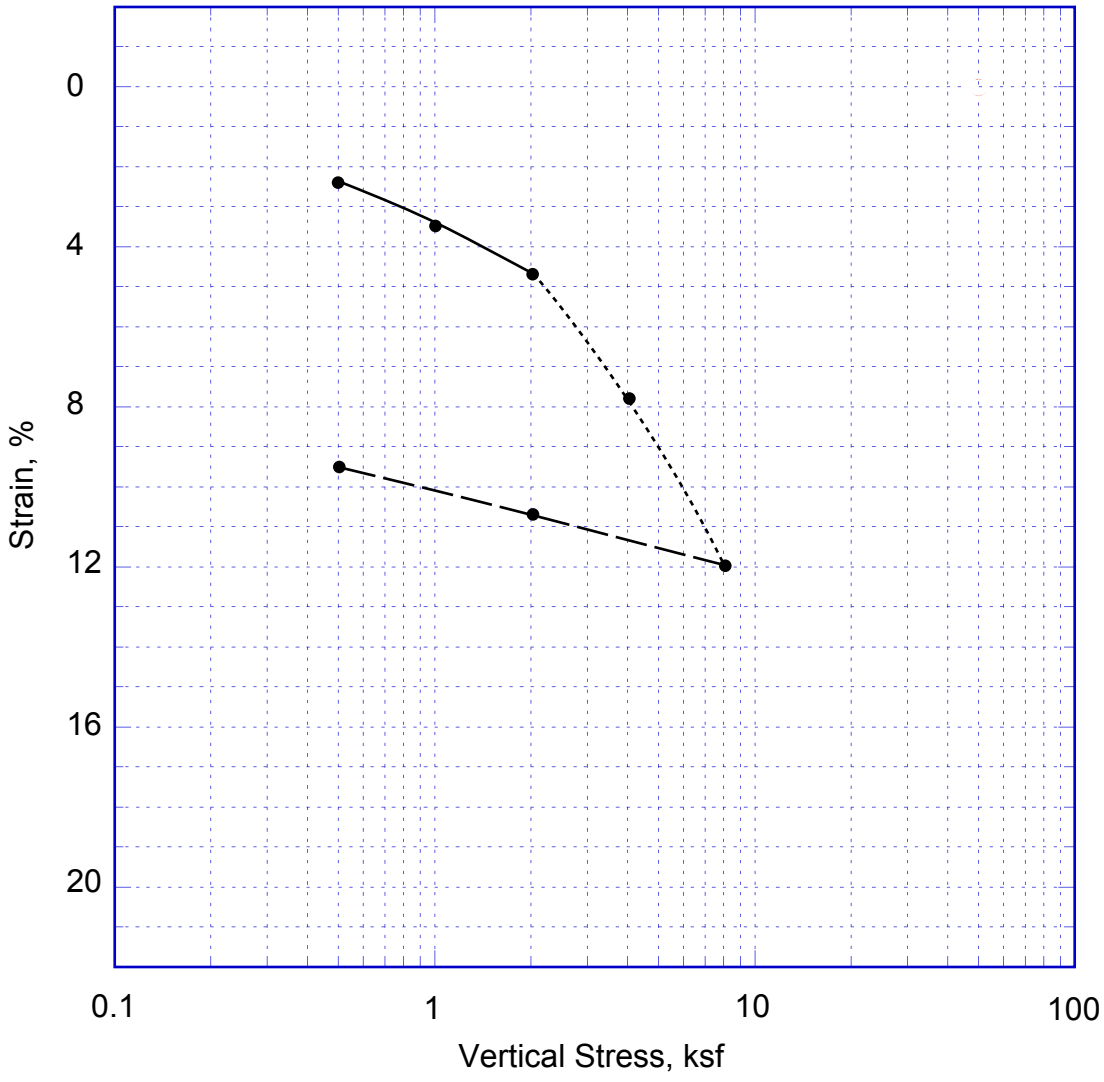
Soil Consolidation



Sample Loaded @ Field Moisture

Sample Saturated

Sample Tested Under Rebound Loading

SCHEMATIC ONLY - NOT A CONSTRUCTION DRAWING

Boring Location: A-08-002 [445+15 15 RT]
Depth: 6.1 m
Soil Classification (USCS): CL

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San Diego, CA 92111
Tel: (858) 715-5800 Fax: (858) 715-5810

Title: **Consolidation Test Result**

Project:	I805 / Miscellaneous Retaining Walls		
Drawn:	NJT	Contract No:	38008-017046.00
Date:	October, 2008	Figure:	II-4

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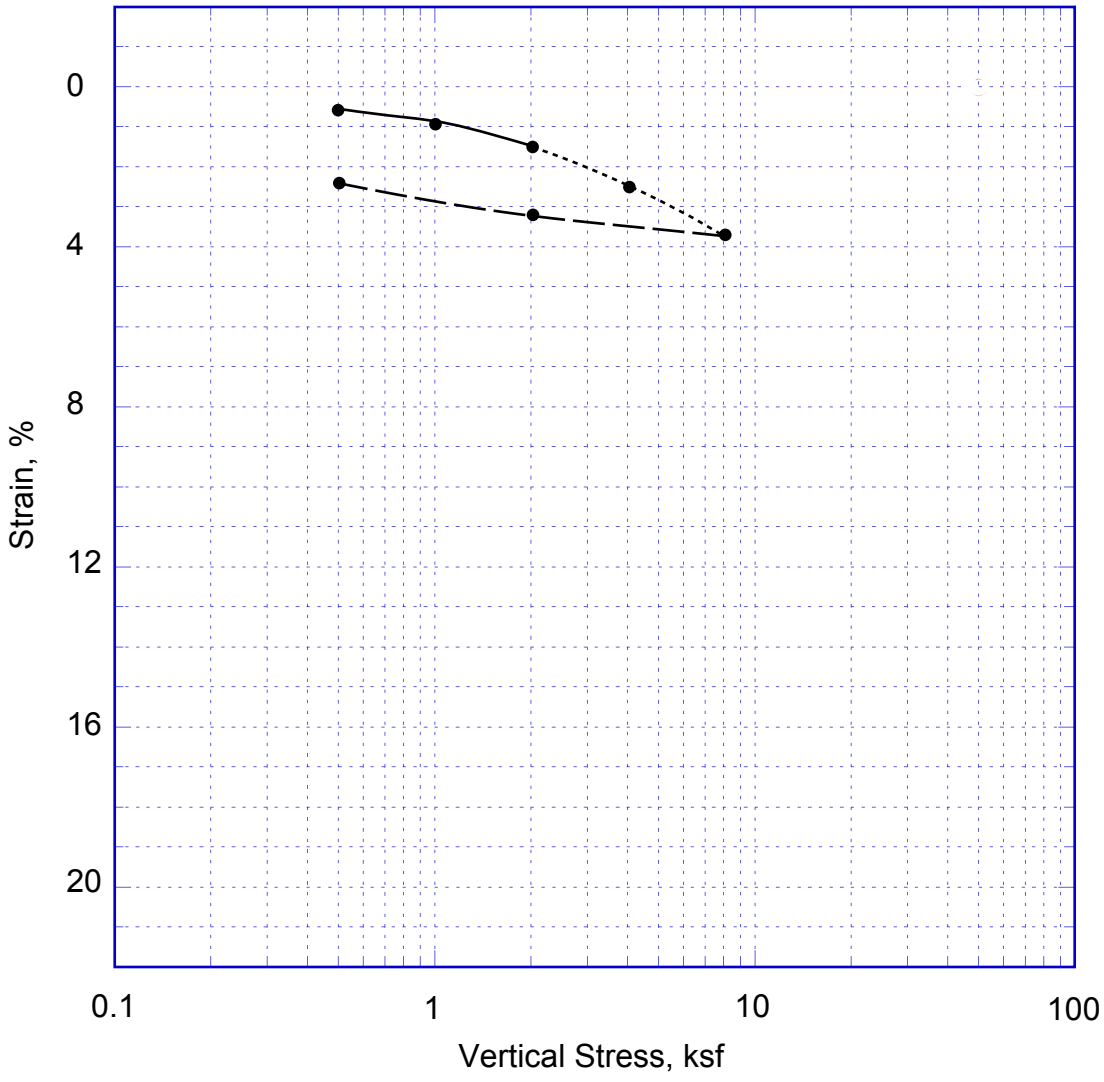
Soil Consolidation



——————— Sample Loaded @ Field Moisture

---------- Sample Saturated

— — — — — Sample Tested Under Rebound Loading

Boring Location: A-08-004 [444+10 CL]
Depth: 3.0 m
Soil Classification (USCS): CL

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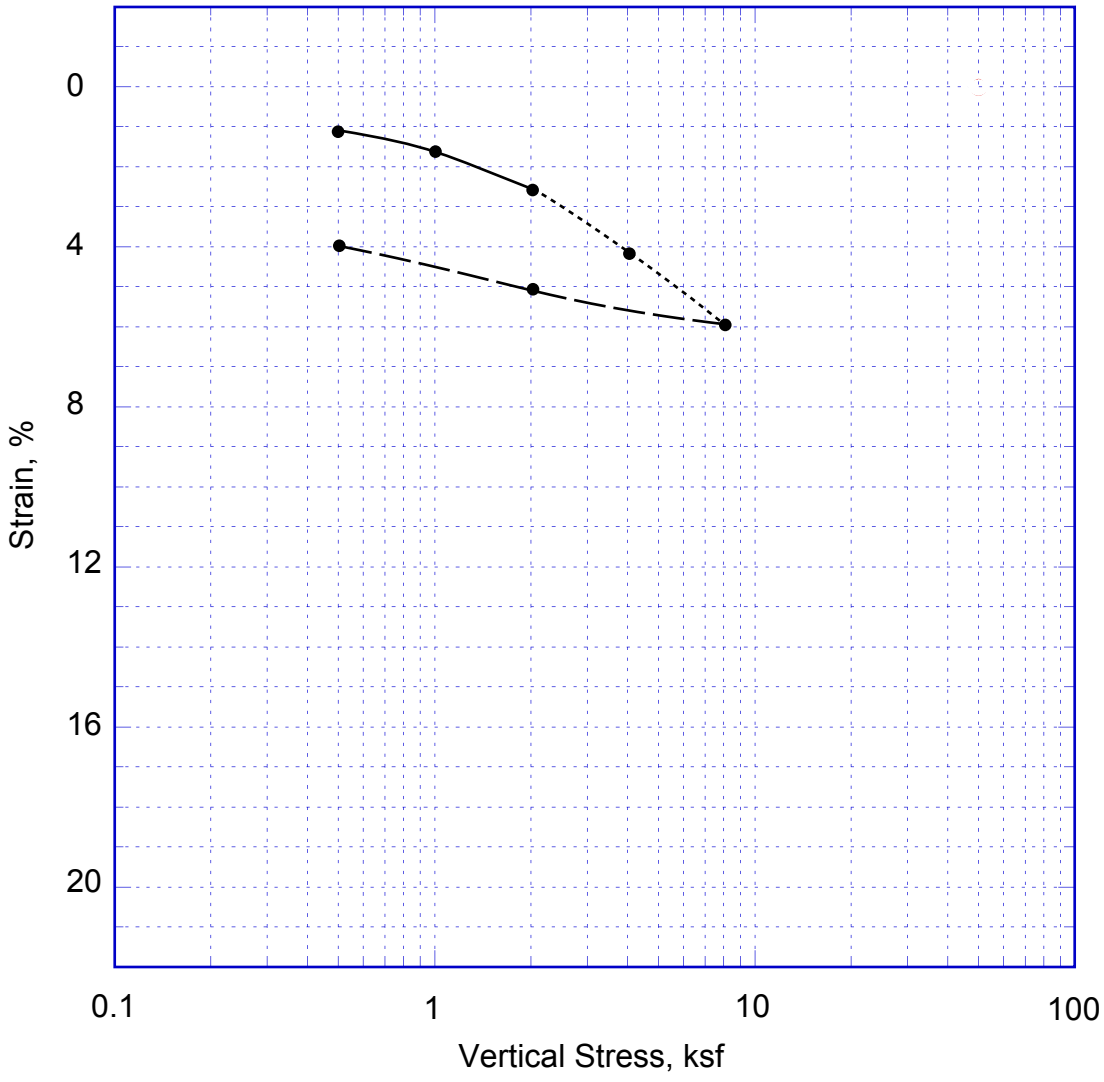
Title:	**Consolidation Test Result**
Project:	I805 / Miscellaneous Retaining Walls

Drawn:	NJT	Contract No:	38008-017046.00
Date:	October, 2008	Figure:	II-5

Soil Consolidation



——————— Sample Loaded @ Field Moisture

---------- Sample Saturated

— — — — — Sample Tested Under Rebound Loading

Boring Location: A-08-005 [444+85 15 LT]
Depth: 3.0 m
Soil Classification (USCS): CL

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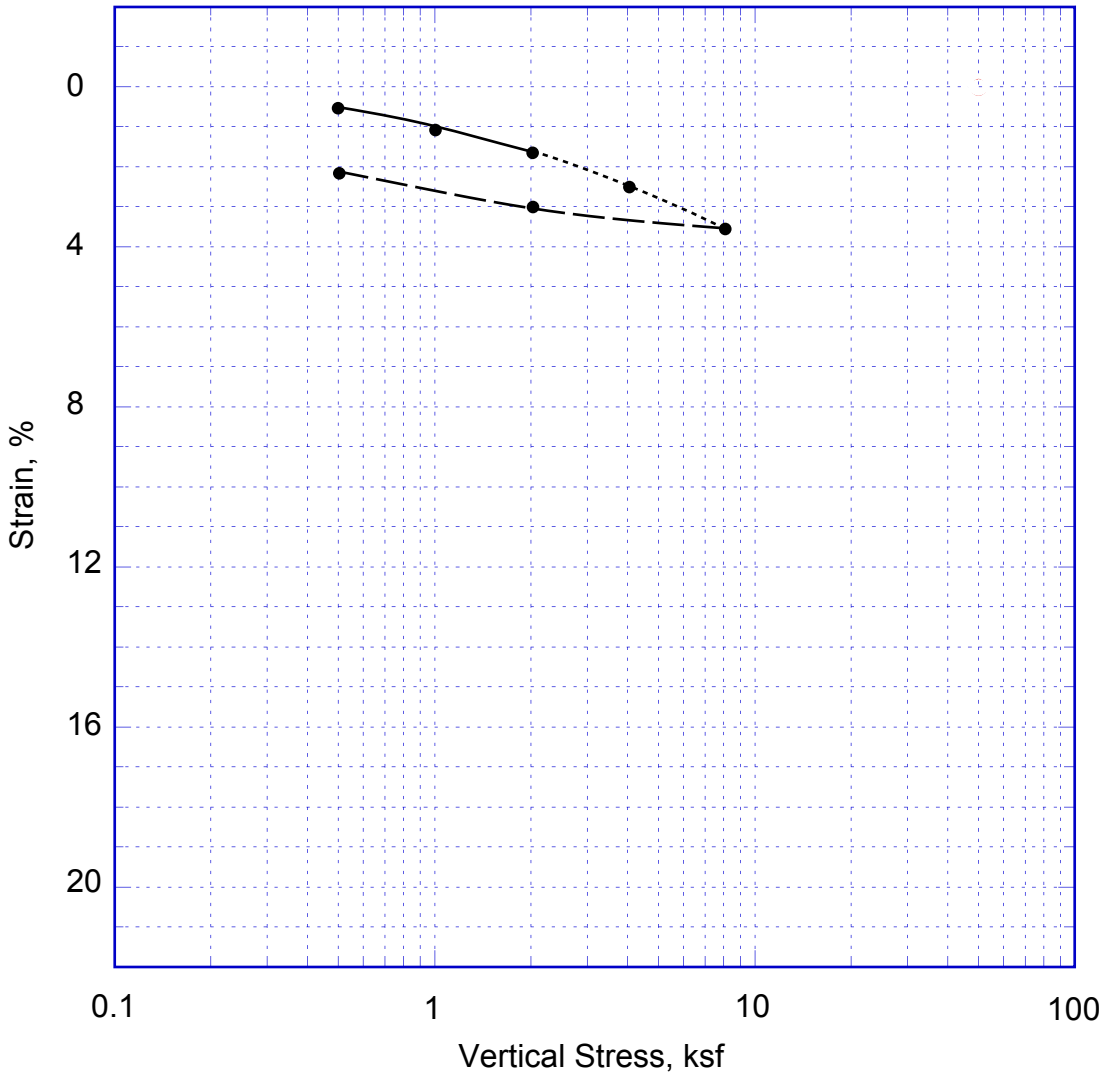
Title:	**Consolidation Test Result**
Project:	I805 / Miscellaneous Retaining Walls

Drawn:	NJT	Contract No:	38008-017046.00
Date:	October, 2008	Figure:	II-6

Soil Consolidation



——————— Sample Loaded @ Field Moisture

---------- Sample Saturated

— — — — — Sample Tested Under Rebound Loading

Boring Location: A-08-005 [444+85 15 LT]
Depth: 9.1 m
Soil Classification (USCS): CL

NOTE: This figure may contain areas of color. TESD cannot be responsible for any subsequent misinterpretation of the information resulting from black and white reproductions of this figure.

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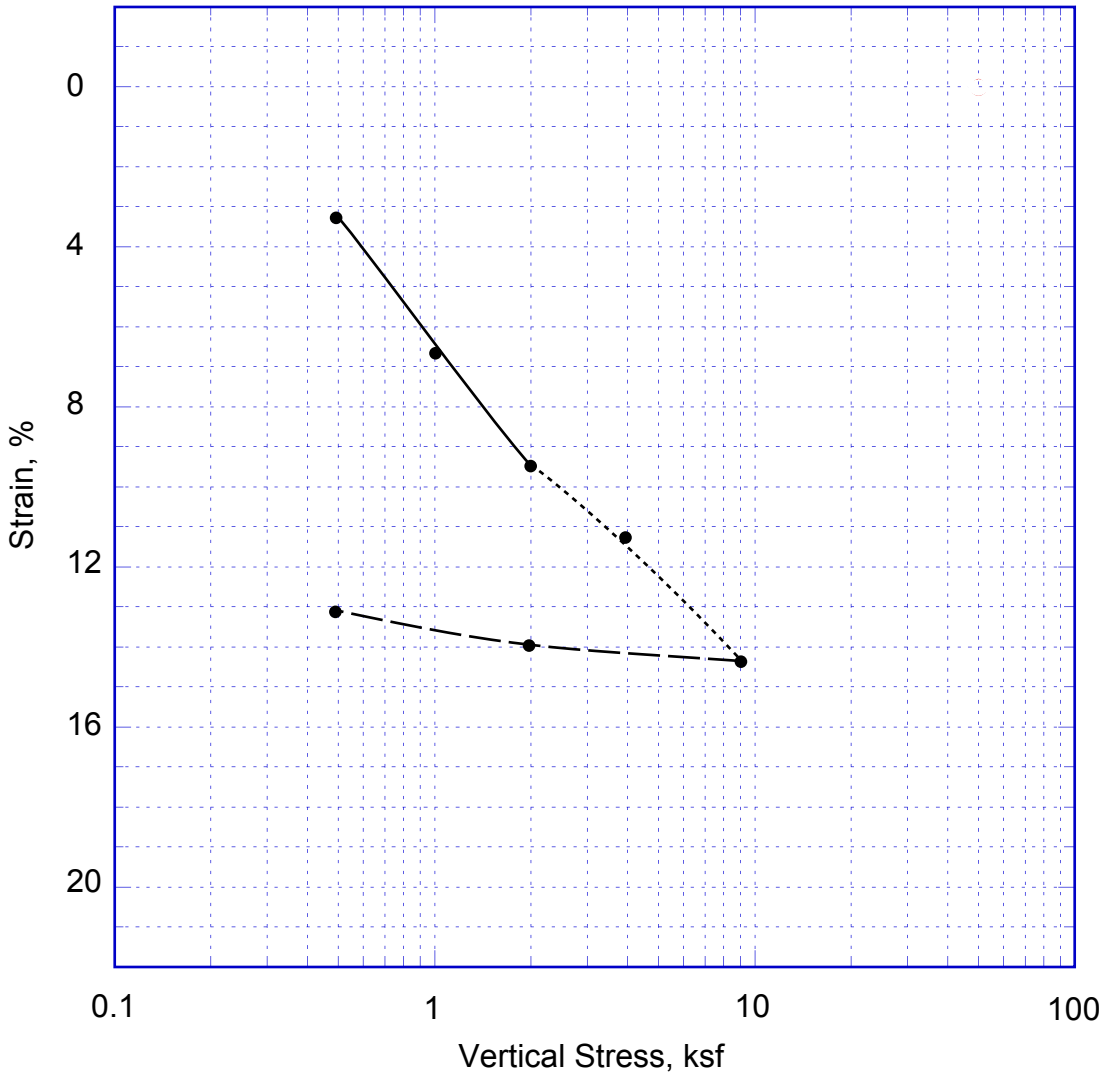
Title:	**Consolidation Test Result**
Project:	I805 / Miscellaneous Retaining Walls

Drawn:	NJT	Contract No:	38008-017046.00
Date:	October, 2008	Figure:	II-7

Soil Consolidation



Sample Loaded @ Field Moisture

Sample Saturated

Sample Tested Under Rebound Loading

SCHEMATIC ONLY - NOT A CONSTRUCTION DRAWING

Boring Location: A-08-006 [441+82 6LT]
Depth: 3.0 m
Soil Classification (USCS): SC

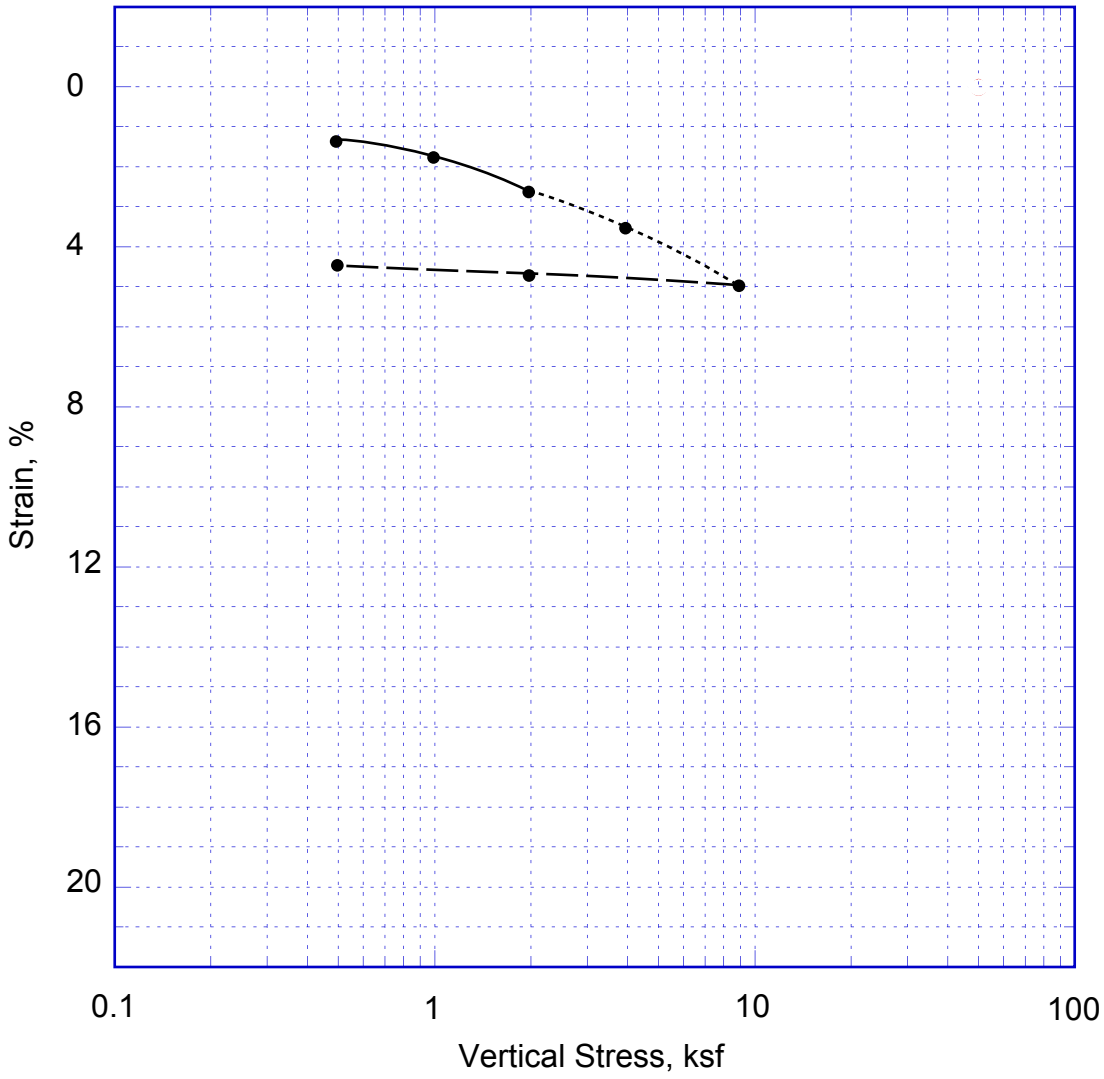
Bureau Veritas North America, Inc.
7895 Convoy Court, Suite 18
San Diego, CA 92111
Tel: (858) 715-5800 Fax: (858) 715-5810

Title: **Consolidation Test Result**

Project:	Carroll Canyon Road Bridge		
Drawn:	NJT	Contract No:	38008-017046.00
Date:	September, 2008	Figure:	II-8

NOTE: This figure may contain areas of color. TESD cannot be responsible for any subsequent misinterpretation of the information resulting from black and white reproductions of this figure.

Soil Consolidation



——————— Sample Loaded @ Field Moisture

---------- Sample Saturated

— — — — — Sample Tested Under Rebound Loading

SCHEMATIC ONLY - NOT A CONSTRUCTION DRAWING

Boring Location: A-08-006 [441+82 6LT]
Depth: 9.1 m
Soil Classification (USCS): SM

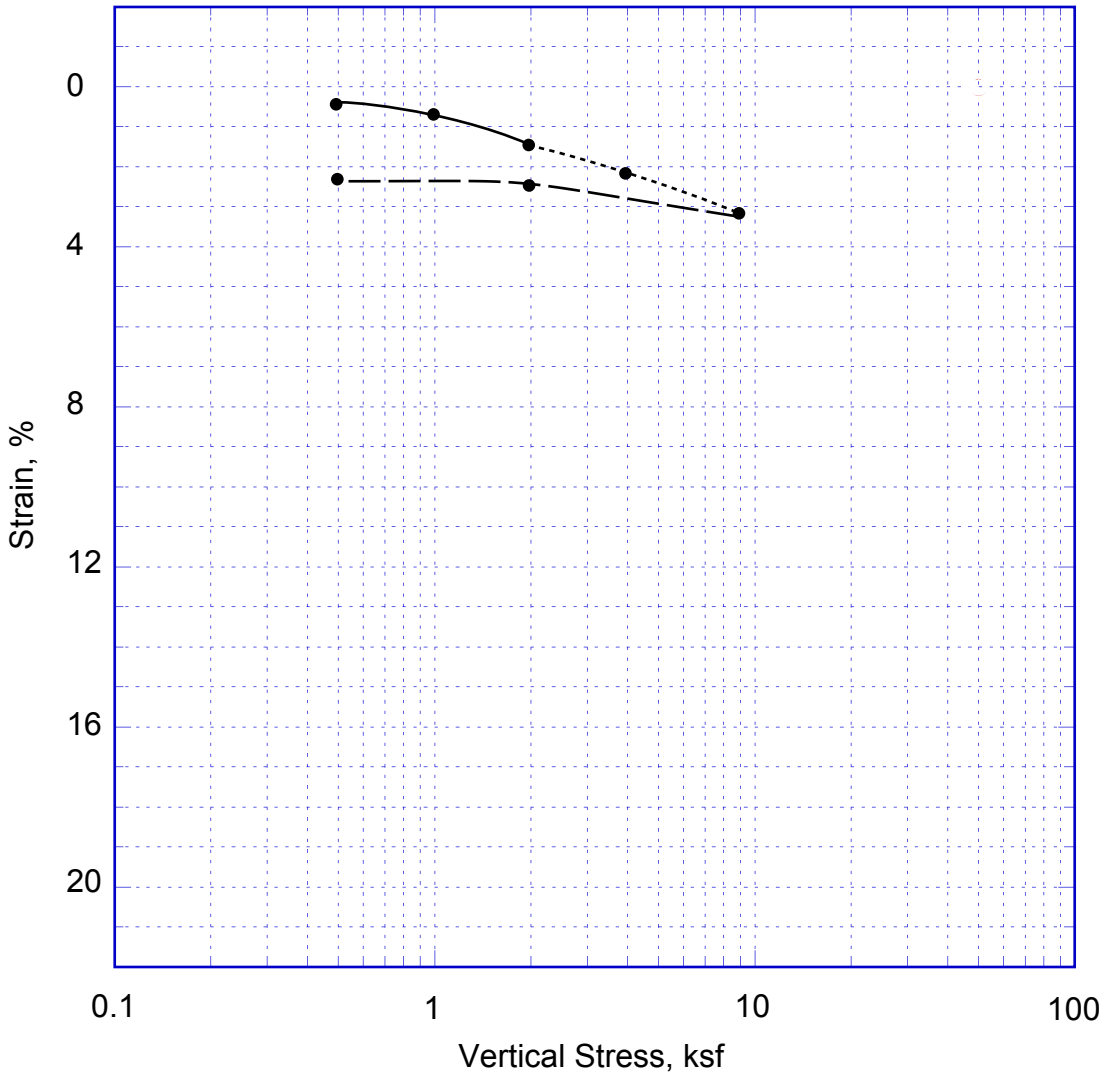
Bureau Veritas North America, Inc.
7895 Convoy Court, Suite 18
San Diego, CA 92111
Tel: (858) 715-5800 Fax: (858) 715-5810

Title: **Consolidation Test Result**

Project:	Carroll Canyon Road Bridge		
Drawn:	NJT	Contract No:	38008-017046.00
Date:	September, 2008	Figure:	II-9

NOTE: This figure may contain areas of color. TESD cannot be responsible for any subsequent misinterpretation of the information resulting from black and white reproductions of this figure.

Soil Consolidation



——————— Sample Loaded @ Field Moisture

---------- Sample Saturated

— — — — — Sample Tested Under Rebound Loading

SCHEMATIC ONLY - NOT A CONSTRUCTION DRAWING

Boring Location: A-08-007 [443+82 6RT]
Depth: 4.6 m
Soil Classification (USCS): SC

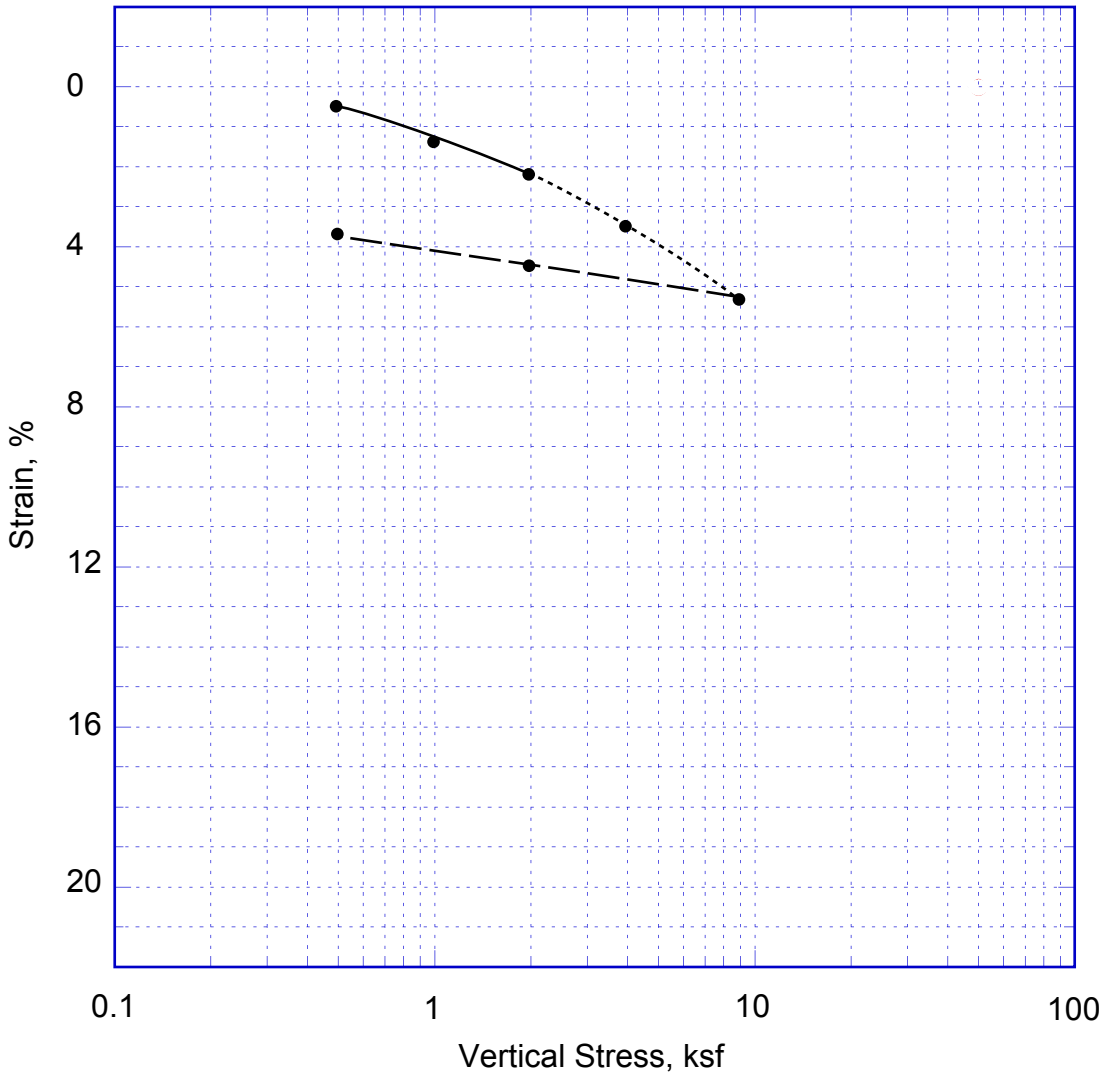
Bureau Veritas North America, Inc.
7895 Convoy Court, Suite 18
San Diego, CA 92111
Tel: (858) 715-5800 Fax: (858) 715-5810

Title: **Consolidation Test Result**

Project:	Carroll Canyon Road Bridge		
Drawn:	NJT	Contract No:	38008-017046.00
Date:	September, 2008	Figure:	II-10

NOTE: This figure may contain areas of color. TESD cannot be responsible for any subsequent misinterpretation of the information resulting from black and white reproductions of this figure.

Soil Consolidation



Sample Loaded @ Field Moisture

Sample Saturated

Sample Tested Under Rebound Loading

SCHEMATIC ONLY - NOT A CONSTRUCTION DRAWING

Boring Location: A-08-009 [443+82 6LT]
Depth: 4.6 m
Soil Classification (USCS): SC

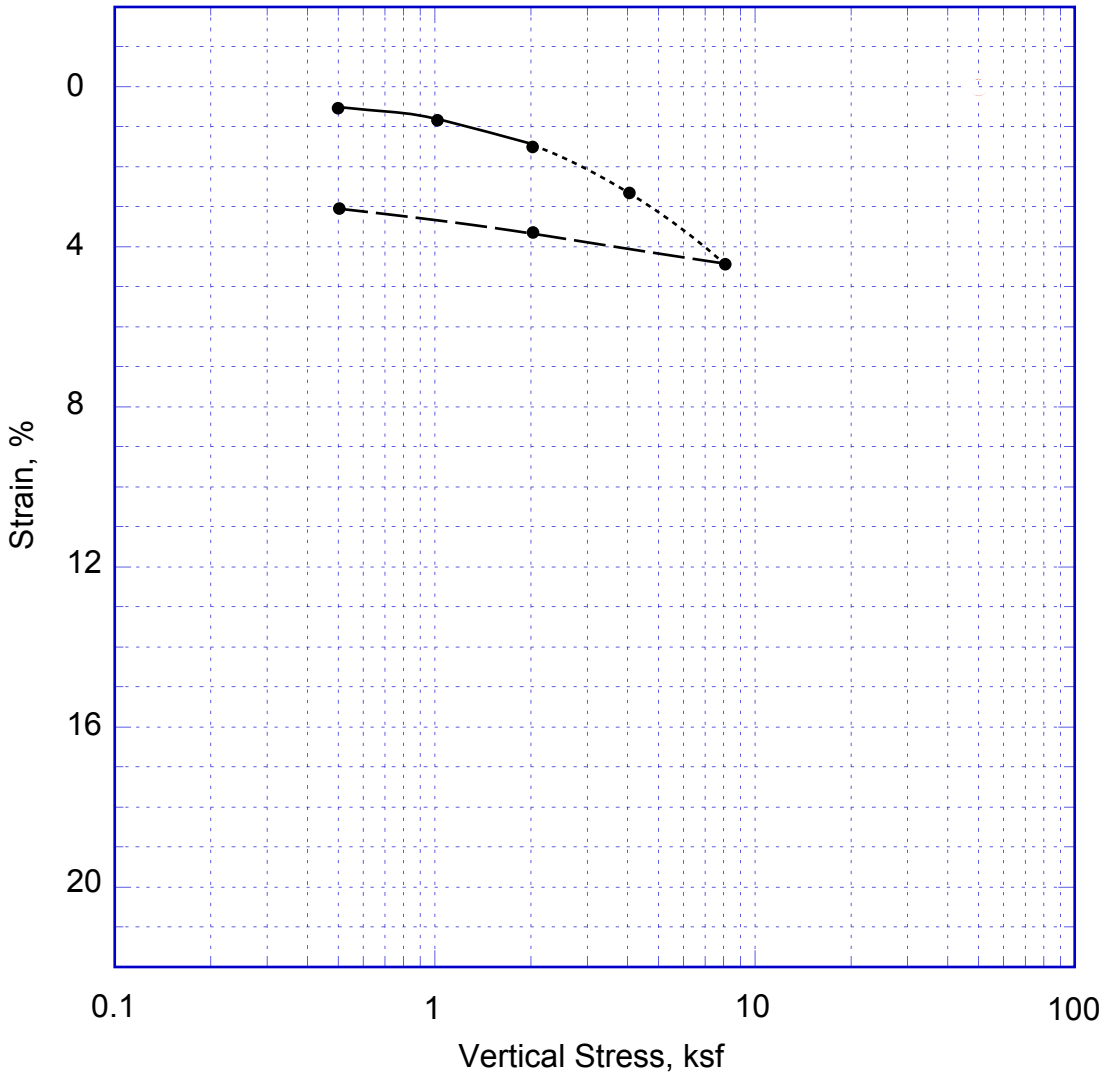
Bureau Veritas North America, Inc.
7895 Convoy Court, Suite 18
San Diego, CA 92111
Tel: (858) 715-5800 Fax: (858) 715-5810

Title: **Consolidation Test Result**

Project:	Carroll Canyon Road Bridge		
Drawn:	NJT	Contract No:	38008-017046.00
Date:	September, 2008	Figure:	II-11

NOTE: This figure may contain areas of color. TESD cannot be responsible for any subsequent misinterpretation of the information resulting from black and white reproductions of this figure.

Soil Consolidation



Sample Loaded @ Field Moisture

Sample Saturated

Sample Tested Under Rebound Loading

SCHEMATIC ONLY - NOT A CONSTRUCTION DRAWING

Boring Location: A-08-010 [444+00 15 RT]
Depth: 3.0 m
Soil Classification (USCS): SM

Bureau Veritas North America, Inc.
7895 Convoy Court, Suite 18
San Diego, CA 92111
Tel: (858) 715-5800 Fax: (858) 715-5810

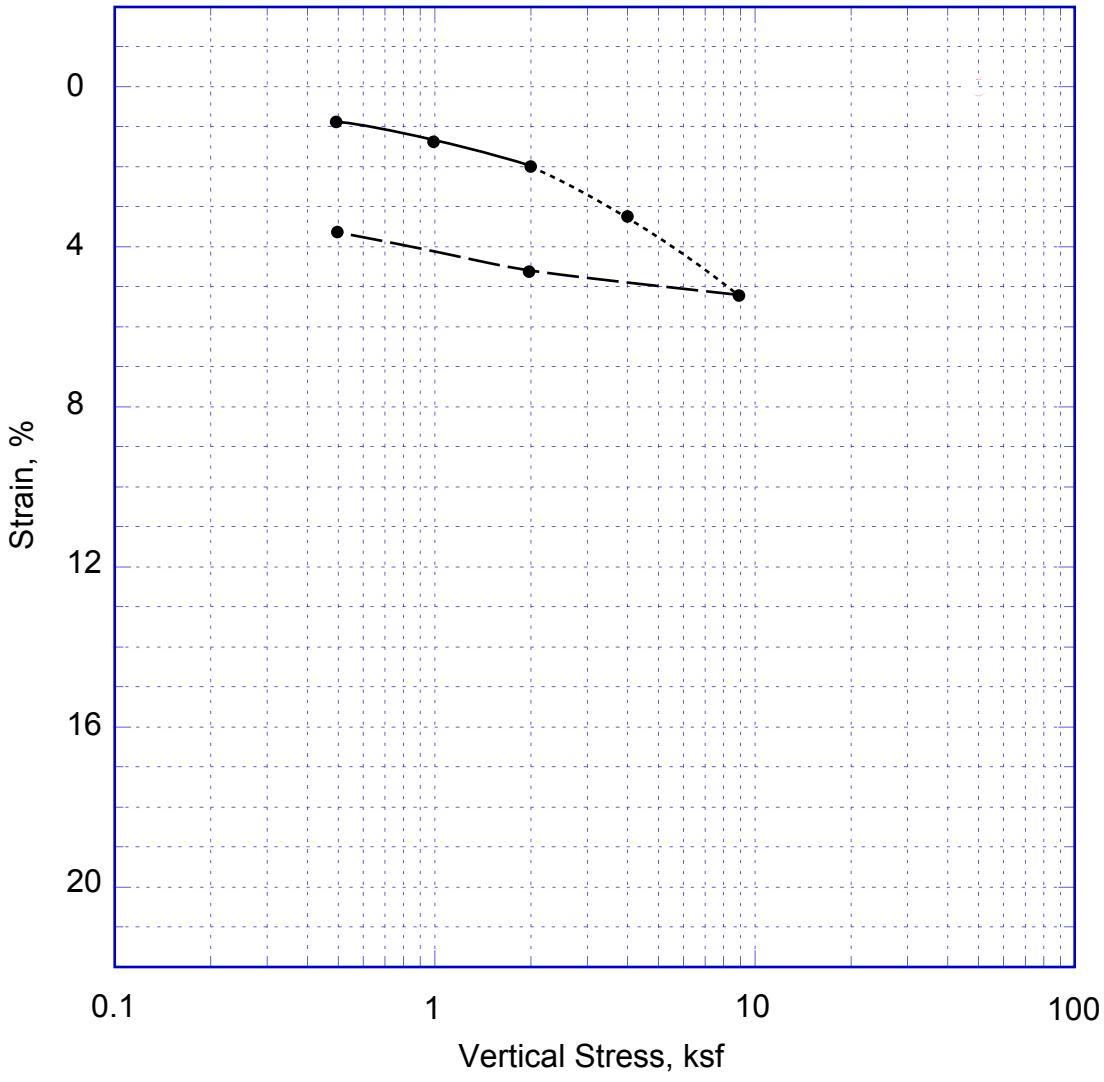
Title: **Consolidation Test Result**

Project: I805 / Miscellaneous Retaining Walls

Drawn:	NJT	Contract No:	38008-017046.00
Date:	October, 2008	Figure:	II-12

NOTE: This figure may contain areas of color. TESD cannot be responsible for any subsequent misinterpretation of the information resulting from black and white reproductions of this figure.

Soil Consolidation



——————— Sample Loaded @ Field Moisture

---------- Sample Saturated

— — — — — Sample Tested Under Rebound Loading

Boring Location: A-08-044 [444+50 3RT]
Depth: 3.0 m
Soil Classification (USCS): SC

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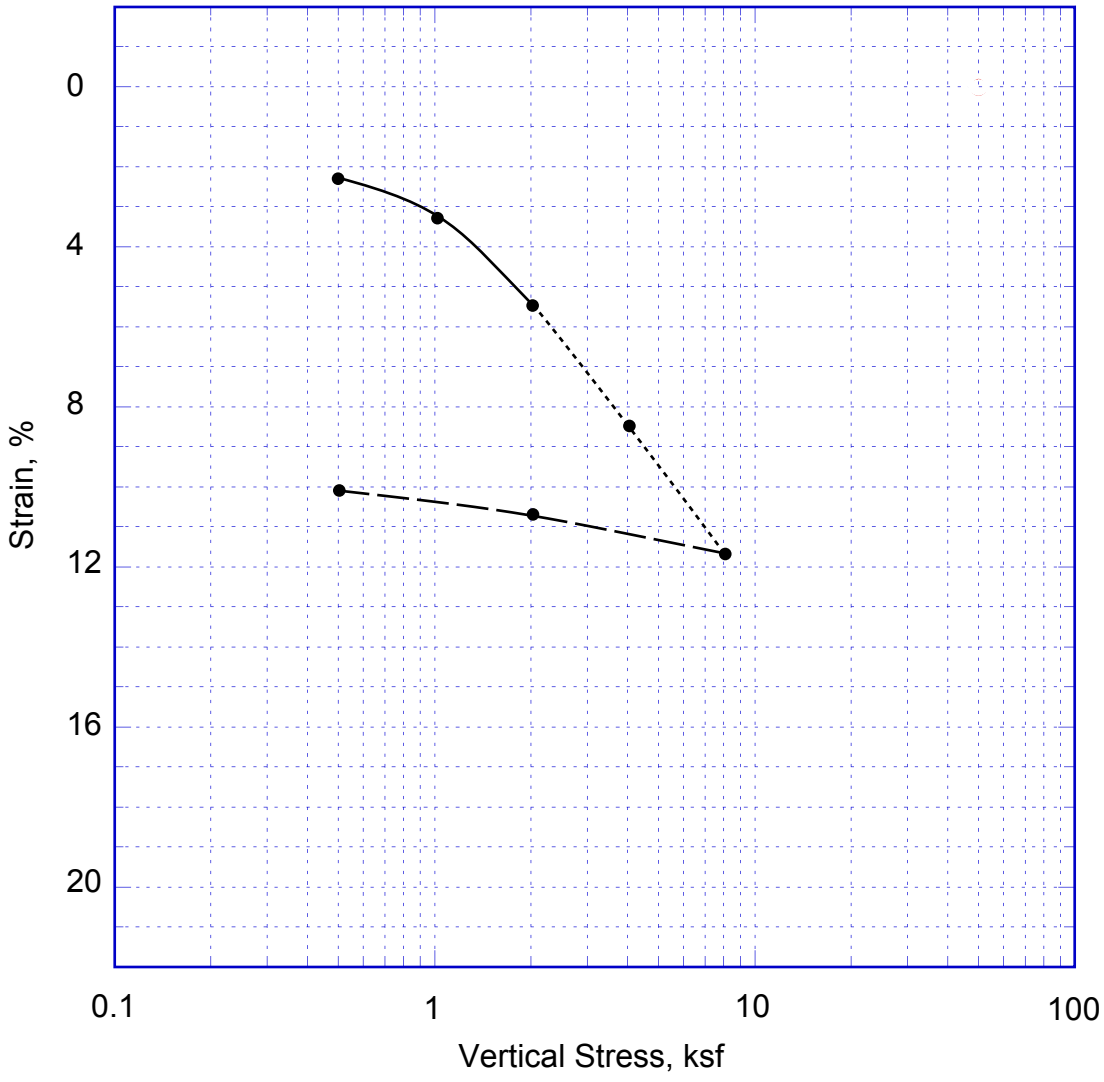
San Diego, CA 92111
Tel: (858) 715-5800 Fax: (858) 715-5810

Title:	**Consolidation Test Result**
Project:	DAR Retaining Walls

Drawn:	NJT	Contract No:	38008-017046.00
Date:	December, 2008	Figure:	II-13

Soil Consolidation



Sample Loaded @ Field Moisture

Sample Saturated

Sample Tested Under Rebound Loading

SCHEMATIC ONLY - NOT A CONSTRUCTION DRAWING

Boring Location: A-08-052 [445+60]
Depth: 13.7 m
Soil Classification (USCS): CL

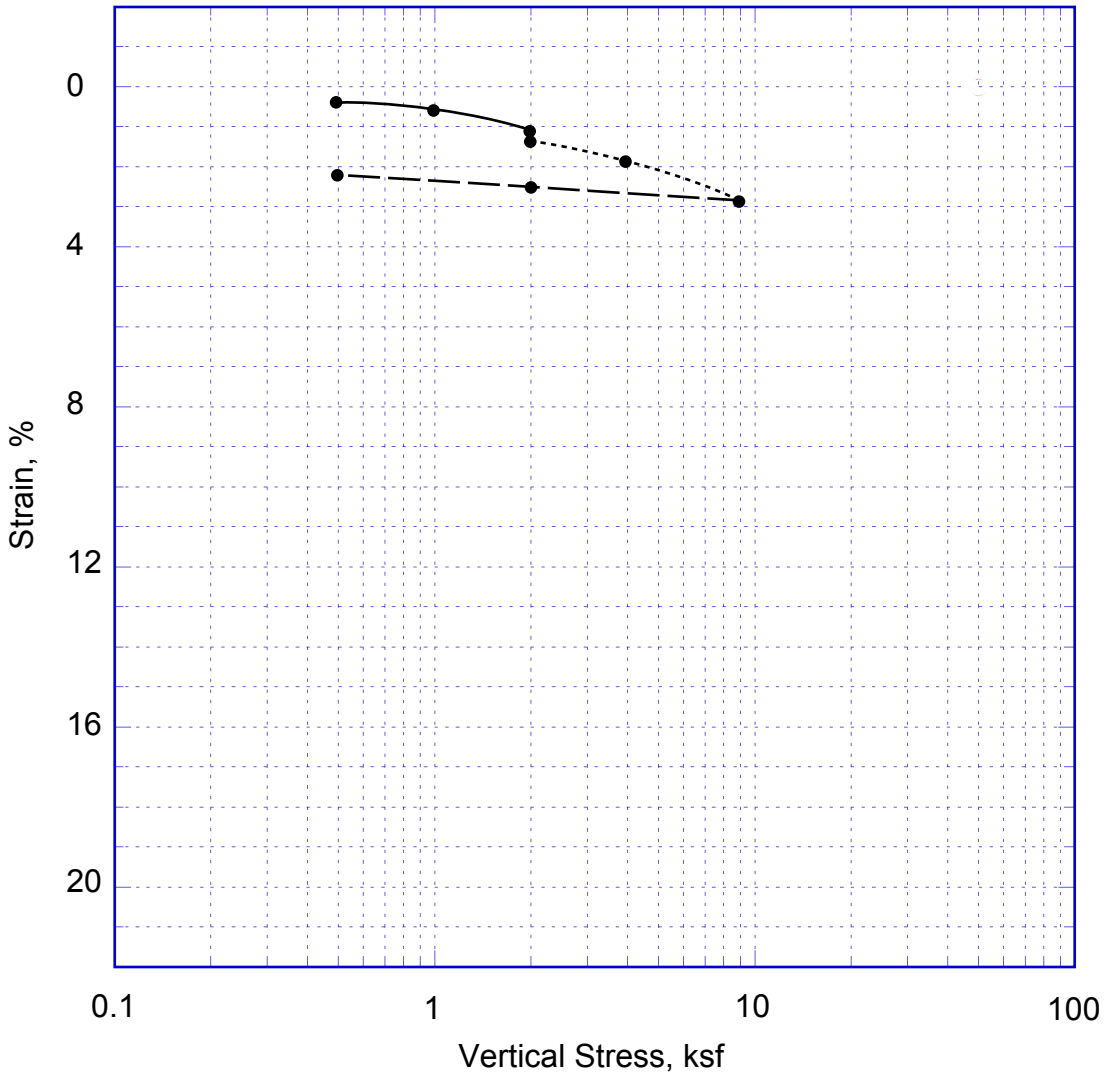
Bureau Veritas North America, Inc.
7895 Convoy Court, Suite 18
San Diego, CA 92111
Tel: (858) 715-5800 Fax: (858) 715-5810

Title: **Consolidation Test Result**

Project:	I805 / Miscellaneous Retaining Walls		
Drawn:	NJT	Contract No:	38008-017046.00
Date:	October, 2008	Figure:	II-14

NOTE: This figure may contain areas of color. TESD cannot be responsible for any subsequent misinterpretation of the information resulting from black and white reproductions of this figure.

Soil Consolidation



Sample Loaded @ Field Moisture

Sample Saturated

Sample Tested Under Rebound Loading

SCHEMATIC ONLY - NOT A CONSTRUCTION DRAWING

Boring Location: A-08-056 [447+35]
Depth: 16.8 m
Soil Classification (USCS): SC

Bureau Veritas North America, Inc.
7895 Convoy Court, Suite 18
San Diego, CA 92111
Tel: (858) 715-5800 Fax: (858) 715-5810

Title: **Consolidation Test Result**

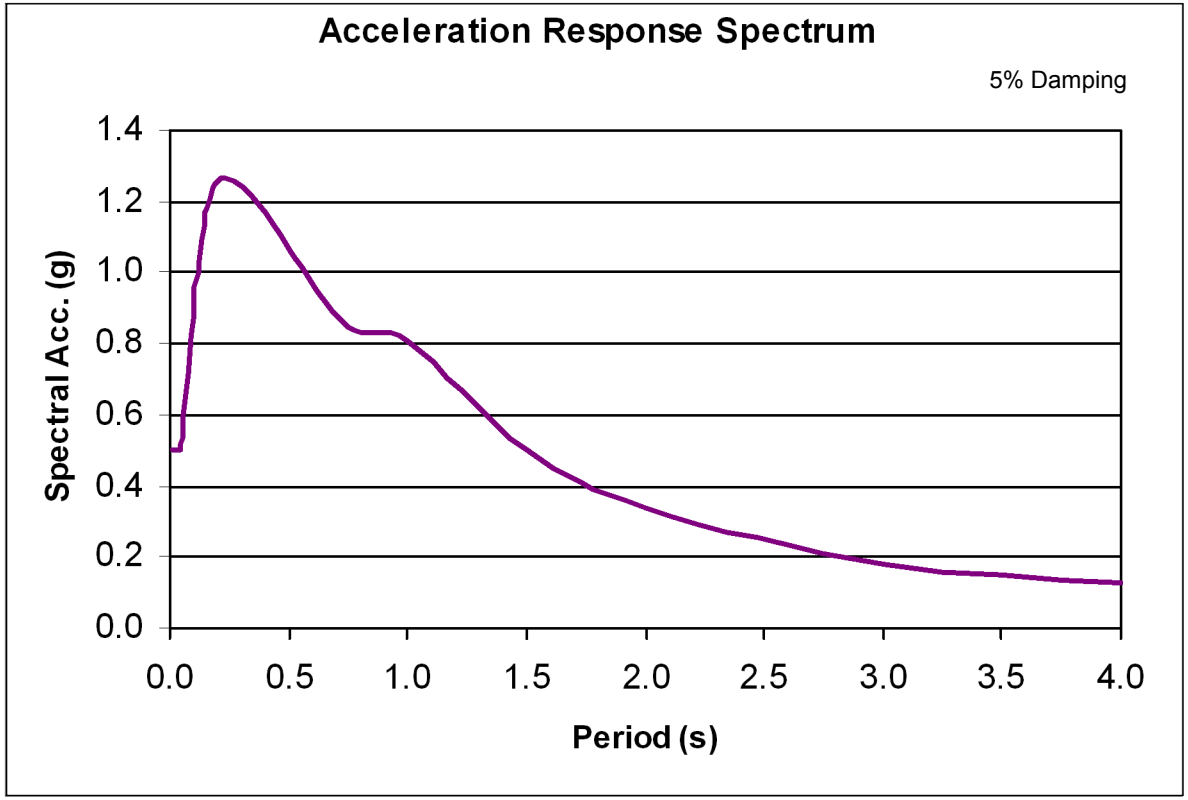
Project:	Miscellaneous Retaining Walls		
Drawn:	NJT	Contract No:	38008-017046.00
Date:	December, 2008	Figure:	II-15

NOTE: This figure may contain areas of color. BVNA cannot be responsible for any subsequent misinterpretation of the information resulting from black and white reproductions of this figure.

APPENDIX III

ANALYSES AND CALCULATIONS

Period (s)	ARS (g)[1]
0.010	0.5003
0.020	0.5003
0.030	0.5002
0.050	0.5002
0.075	0.7192
0.100	0.9186
0.120	1.0367
0.150	1.1555
0.170	1.2073
0.200	1.2558
0.240	1.2638
0.300	1.2437
0.400	1.1678
0.500	1.0668
0.750	0.8472
1.000	0.8084
1.500	0.5033
2.000	0.3342
3.000	0.1766
4.000	0.1246



Fault: Newport-Inglewood-Rose Canyon/East
Style: Strike-Slip
Magnitude 7
R(km) 5.8
PBA 0.5g
Note: ARS curve was obtained from Fig B-5 of Seismic Design Criteria, June 2006, Version 1.4
[1] Spectral Acceleration Values were magnified by 20% for T >= 1.0 seconds, since project site is within 15 km of an active fault zone

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BUREAU VERITAS NORTH AMERICA, INC.
Testing Engineers San Diego
7895 Convoy Court, Suite 18
San Diego, CA 92111

Title:	**Acceleration Response Spectrum**		
Project:	BUSINESS ACCESS UNDERCROSSING		
Drawn:	MPP	Contract No:	38008-017046.00 (SANDAG T.O. 46)
Date:	April, 2008	Figure No:	Appendix III.1

FOUNDATION REPORT
I-805 HOV/Carroll Canyon Rd Extension
Direct Access Ramp
San Diego, California

June 01, 2009

Structural Engineer:
TY LIN INTERNATIONAL

Owner:

Geotechnical Consultant / Report Preparer:

Bureau Veritas North America, Inc.
7895 Convoy Court, Suite 18
San Diego, CA 92111
www.us.bureauveritas.com

FOUNDATION REPORT

I-805 HOV / Carroll Canyon Road Extension
Structure No. 57-E0075/76

Direct Access Ramp
San Diego, California

Contract Number: 38008-017046.00

June 01, 2009

Prepared for:

Ms. Chung-Yuan Wen, Ph.D., P.E.
Senior Bridge Engineer, Branch Chief
Department of Transportation
Division of Engineering Services
Office of Bridge Design – Southern California
21073 Pathfinder Road, Suite 200
Diamond Bar, California 91765

Caltrans District 11, San Diego County, Route I-805
Kilometer Post Total Project Limits: R43.2
Structure Number: 57E-0075/76
Structure Name: Direct Access Ramp
Expenditure Authorization: 2T0401

Prepared by:

Bureau Veritas North America, Inc.
7895 Convoy Court, Suite 18
San Diego, California 92111

June 01, 2009

Contract Number: 38008-017046.00

Ms. Chung-Yuan Wen, Ph.D., P.E.
Senior Bridge Engineer, Branch Chief
Department of Transportation
Division of Engineering Services
Office of Bridge Design – Southern California
21073 Pathfinder Road, Suite 200
Diamond Bar, CA 91765

Subject: **Foundation Report**
I-805 HOV / Carroll Canyon Road Extension
Structure No. 57-E0075/76
Direct Access Ramp
San Diego, California

Dear Ms. Wen:

In accordance with SANDAG Task Order No. 46 and Amendment No. 1, Bureau Veritas North America, Inc. (BVNA) is pleased to submit this Foundation Report for the proposed Direct Access Ramp structure (DAR) of the I-805 HOV / Carroll Canyon Road Extension project. A geotechnical technical memo was previously prepared summarizing the geotechnical design parameters and recommendations in connection with the DAR. This report summarizes the geotechnical conditions at the project site and our conclusions and recommendations for the DAR. BVNA appreciates the opportunity to provide geotechnical services for this project and we look forward to continuing our role as your geotechnical consultant on this project.

Respectfully submitted,
Bureau Veritas North America, Inc.

REGISTERED GEOLOGIST GENE CUSTENBORDER No 1319 CERTIFIED ENGINEERING GEOLOGIST Exp 11-30-10 STATE OF CALIFORNIA

Gene Custenborder, CEG 1319
Senior Engineering Geologist

REGISTERED PROFESSIONAL ENGINEER VAN OLIN No. C-60076 No. GE-2578 Exp. 6/30/10 RGE, RGE CIVIL-GEOTECHNICAL STATE OF CALIFORNIA

Van Olin, GE 2578
Principal Geotechnical Engineer

6/4/09

REGISTERED GEOLOGIST D. SCOTT MOORS NO. 1901 CERTIFIED ENGINEERING GEOLOGIST STATE OF CALIFORNIA

Scott Moors, CEG 1901
Principal Engineering Geologist
GC/VO/SM: cs

Distribution: (4) Addressee
(1) T.Y. Lin International, Jim Rucker

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1.0. SCOPE OF SERVICES

Bureau Veritas North America, Inc. (BVNA) prepared this Draft Structure Foundation Report (FR) for the proposed Direct Access Ramp structure (DAR) associated with the I-805 HOV / Carroll Canyon Road (CCR) Extension project (CCR project) located in San Diego, California at Interstate-805 (I-805), Kilometer Post 42.6 to 46.2. The purpose of this report is to document geotechnical site conditions; provide analyses of anticipated site conditions as they pertain to the project described herein; and to recommend geotechnical design and construction criteria for the project. The report also establishes a geotechnical baseline to assess the existence and scope of any changed conditions. The report is intended for the use by the project engineers, construction personnel, bidders, and contractors.

The scope and type of work performed to obtain the information supporting the foundation recommendations included:

Review of Existing Data

BVNA reviewed the following geotechnical documentation:

- In-house geotechnical documents and maps, topographic maps, environmental maps, and as-built documentation of existing facilities relevant to the project site
- The AASHTO LRFD Bridge Design Specification, 4th Edition, dated 2007
- The Caltrans Guidelines for Structures Foundation Reports dated March 2006
- The Caltrans Soil and Rock Logging, Classification, and Presentation Manual dated June 2007
- The Department of Transportation Structures Preliminary Geotechnical Report, File No.: 11-SD-805-PM 23.6 to PM 26.8, I-805 Managed Lanes, 11-081630, dated December 2007
- The Department of Transportation Preliminary Geotechnical/Geological Report For Seismic Retrofit Design, dated February 1995
- The Department of Transportation Preliminary Geotechnical/Geological Report (Addendum No.1) For Seismic Retrofit Design, dated May 1995
- The Department of Transportation District Preliminary Geotechnical Report For Interstate 805 Widening and HOV Lanes, from State Route 52 Interchange to Interstate 5 Merge, dated March 2008
- A floodplain study prepared by Parsons Brinckerhoff dated July 2005 and finalized on November 05, 2008 for the project site
- A geotechnical investigation prepared by Group Delta Consultants dated April 25, 2003 for the Carroll Canyon Road Extension Project, Project No. SR 281

A complete listing of the project documentation utilized is included in Section 13.0. References.

Site Reconnaissance

BVNA performed site reconnaissance visits to observe the general surficial site conditions; to evaluate the field locations of existing underground utilities; to determine the existing topographical, physical, and environmental access constraints for the field exploration program; and to establish test boring and Cone Penetration Test (CPT) locations. Caltrans District 11 Office of Surveys surveyed and flagged the numerous test boring and CPT locations proposed by BVNA.

Field Exploration

The field exploration program consisted of drilling forty (40) test borings using a 203.2-millimeter (8.0-inch) diameter hollow-stem auger; nineteen (19) test borings using a sonic drilling method with a 152.4-millimeter (6.0-inch) diameter drill bit; and twenty-seven (27) CPTs. The test borings and CPTs extended to maximum depths of approximately 45.7 meters (150.0 feet) and 10.2 meters (33.5 feet) below the existing ground surface, respectively. The test borings were logged in the field by engineers and geologists from BVNA. Eight (8) of the test borings drilled using a hollow stem auger were located along the alignment of the proposed DAR. Bulk and relatively undisturbed soil and rock samples, representative of the various subsurface materials encountered, were obtained from the test borings and transported to our laboratory for further testing and evaluation. Data from the field exploration program was evaluated to obtain the information supporting the foundation recommendations included in this report.

Approximate locations of the test borings and CPTs are shown on Appendix I.3: Figure 3-Field Exploration Map and the Logs of Test Borings (LOTBs) (Appendices I.7 to I.10). The data from the field exploration program are presented on the LOTBs and CPTs in Appendix I. The LOTBs are separated into four (4) subsections for each of the specific components of the overall project (i.e., I.7: Carroll Canyon Road Bridge; I.8: Direct Access Ramp; I.9: Business Access Undercrossing; and I.10: Miscellaneous Retaining Walls). Data for the entire field exploration program are presented in Appendix I. All elevations included in this report are in meters (feet) and are referenced to the 1929 NGVD Datum.

Laboratory Testing

BVNA performed laboratory testing on selected bulk and relatively undisturbed soil and rock samples obtained from the test borings to evaluate the engineering properties of the foundation materials. The following tests were performed in general conformance with applicable American Society for Testing and Materials (ASTM) and California Test Methods (CTM) procedures:

- In-situ moisture content and unit weight (ASTM D2216 and D4767)
- Particle size distribution and No. 200-wash (ASTM D422 and ASTM D1140)
- Atterberg Limits (ASTM D4318)
- Consolidation (ASTM D2435)
- Direct Shear (ASTM D3080)
- Maximum Dry Density and Optimum Moisture Content (ASTM D1557)
- Expansion Index (ASTM D4829)
- Corrosivity series including sulfate content, chloride content, pH-value, and resistivity (CTM 417, 422, and 643)

The strength parameters assigned to the various geologic units (i.e., fill, alluvium, terrace deposits, and Ardath Shale) and utilized for the foundation and slope stability analyses were developed from the above laboratory testing program. A summary of the laboratory testing program and the test results are presented in Appendix II. The in-situ density and moisture contents are depicted on the LOTBs in Appendix I.

Mapping

Appendix I.4: Figure 4-Geotechnical Map depicts field mapping of the surface geology performed by BVNA for the overall project site.

Assessment of Soil Conditions and Geologic Hazards

BVNA assessed the general subsurface soil and rock conditions and geologic hazards (i.e., ground water, compressible alluvial soils, rock, expansive soils, corrosive soils, floodplain, slope stability, liquefaction, lateral spreading) to establish the DAR design recommendations, earthwork criteria, and construction considerations.

Data Analyses

The field and laboratory data were analyzed to develop the foundation recommendations in this report and included the following:

- Seismic Analysis (Appendix III.1)
- Lateral Earth Pressure Distributions (Appendix III.2)
- Slope Stability Analyses
  – Global Stability Analysis (Appendix III.3.1)
  – Embankment Stability Analysis (Appendix III.3.2)

Report Preparation

This report presents BVNA's foundation design recommendations, earthwork criteria and construction considerations including Tables, Figures and Appendices.

2.0. PROJECT DESCRIPTION

The project site is located in San Diego, California. Appendix I.1: Figure 1-Site Location Map depicts the location of the DAR and approximate alignment of the CCR extension. Appendix I.2: Figure 2-Project Plan depicts the various proposed and existing project components. The CCR project will extend the Carroll Canyon Road (CCR) westerly from its existing intersection with Scranton Road, under the I-805 freeway bridge, to the intersection of Sorrento Valley Road and comprises four (4) components including the CCR Bridge, the DAR, the Business Access Undercrossing (BAUC), and the miscellaneous retaining walls (MRW).

The DAR site is a large freeway embankment fill leading to and supporting the north abutment of the Interstate-805 (I-805) Soledad Canyon Bridge. The proposed DAR is planned in the median between the northbound and southbound lanes of I-805 that will descend below the freeway to connect to the proposed Carroll Canyon Road Bridge. The DAR will provide an entrance and exit for the northbound and southbound freeway HOV lanes, respectively. The DAR will include two parallel retaining walls that will extend approximately 250.0 meters (819.7 feet) northwest from the proposed CCR Bridge to the Mira Mesa undercrossing to the north. The width between the retaining walls will vary from 17.3 meters (56.7 feet) to 12.2 meters (40.0 feet) to accommodate two (2) access lanes, a median, and shoulders. The narrowest width between the walls will be at the I-805 Soledad Canyon Bridge north abutment. The height of the retaining walls varies from 0.9 meters (2.9 feet) to 12.8 meters (42.0 feet) at

the Soledad Canyon Bridge north abutment. The DAR retaining walls will include soldier piles, tie-backs and strut braces to provide vertical, horizontal and moment equilibrium. Where lateral support is required and struts are not possible (due to vertical clearance issues), the DAR retaining walls will be cantilevered or will incorporate tiebacks.

3.0. SITE GEOLOGY AND SUBSURFACE CONDITIONS

Site geology and subsurface conditions are discussed in the subsections below.

3.1. Topography and Regional Geologic Setting

The DAR is located on a large freeway fill embankment on the northern bank of Carroll Creek, a westerly flowing ephemeral stream in San Diego, California, as shown in Appendix I.2: Figure 2-Project Plan. The embankment slopes at a gradient of approximately 2 to 1 (horizontal to vertical). Elevations in the immediate vicinity of the project site range from a low of approximately 26.0 meters (85.3 feet) in the creek bottom near the western portion of the site to a high of approximately 62.0 meters (203.4 feet) at the top of the I-805 embankment in the north-central portion of the site. Site drainage generally occurs as sheet flow to the south and west towards the Carroll Creek. Vegetation within the DAR project site generally consists of grasses and weeds.

The site is located in San Diego County within the Peninsular Ranges Geologic Province. This province is underlain by a basement complex of Late Cretaceous-age undifferentiated granitic rocks of the Southern California Batholith and Jurassic-age prebatholithic metavolcanic rocks. The basement complex is non-conformably overlain by a thick sedimentary sequence of marine and non-marine rocks that were deposited within the San Diego Embayment. These sedimentary deposits range in age from Late Cretaceous to recent. The most abundant deposits of the embayment are Eocene-age marine, lagoonal, and non-marine rocks (Kennedy, 1975).

Two major northwest-trending fault zones traverse the San Diego metropolitan area: the Rose Canyon fault zone on the west and the Elsinore fault zone on the east. These fault zones traverse the San Diego area in a predominant north to north-northwest direction.

3.2. Pertinent Soil Conditions and Geologic Hazards

Pertinent soil conditions and geologic hazards are discussed in the following section.

<u>Fault Rupture</u>

Published geologic maps and literature pertaining to the general site area indicate that there are no known major or active faults on or in the immediate vicinity of the site (see Section 13.0. References: 29, 32 and 33). Evidence for active faulting on site was not observed during our site investigation. Based on the California Seismic Hazard Map, Caltrans 1996, a fault with activity within the late Quaternary period (700,000-years) is considered “active”. An “active” fault is defined by the California Geologic Survey as one which has “had surface displacement within Holocene time (about the last 11,000 years)”. The project site is outside any Alquist Priolo Earthquake Fault Zone. Therefore, the potential for surface rupture due to faulting at the site during the design life of the proposed structures is considered low.

The closest distance in kilometers (miles) from the site to the projection of rupture surface area along the fault traces from the major active earthquake faults that could possibly affect the site are listed below:

Rose Canyon (Type B)	6.1 km (3.8 mi)
Coronado Bank (Type B) -	26.4 km (16.4 mi)
Newport-Inglewood (Offshore) (Type B)	36.4 km (22.6 mi)
Elsinore-Julian (Type A)	54.2 km (33.7 mi)
San Andreas – Southern (Type A)	127.8 km (79.4 mi)

Seismic Shaking Potential

The seismic hazard most likely to impact the site is ground shaking resulting from an earthquake on one of the major active regional faults. Design considerations for the hazard of seismic shaking are presented in Section 7.0, Seismic Study.

Liquefaction, Seismic Settlement, and Lateral Spreading

The two fundamental conditions associated with the occurrence of seismically induced liquefaction are cohesionless sands combined with ground water above a depth of about 15.2 meters (50.0 feet). Research indicates that uniformly graded, rounded, very fine to fine grained sands in a low-density condition are most susceptible to liquefaction. The potential for liquefaction under the same conditions of ground shaking intensity and duration will decrease for sands that are more well graded, more irregular and gritty, more coarse and more dense. Also, a pronounced decrease in liquefaction potential will occur with the increase in fine-grained (i.e., silt and clay) content. Seed and others have suggested that a non-liquefiable classification be assigned if the clay faction is 15 percent or greater (Guidelines for Evaluating and Mitigating Seismic Hazards in California, Special Publication 117, CDMG, Ch. 6, 1997). Dynamic settlement due to earthquake shaking can occur in both dry and saturated sands.

The initial subsurface exploration program encountered occasional loose alluvial sand zones with a near-surface ground water table in the area of the CCR bridge platform and adjoining bents. Therefore, a detailed subsurface exploration program was performed including continuous data acquisition using CPTs and hollow-stem auger test borings with successive sampling intervals within the platform area. An analysis of liquefaction potential in the vicinity of the CCR bridge platform is presented in the CCR Bridge Structure Foundation report.

Liquefaction analyses were performed using the CivilTech software program LiquefyPro – Version 5; both the Seed and Modified Robertson methods were used, which gave a Cyclic Stress Ratio (CSR, earthquake “load”) that was compared with the Cyclic Resistance Ratio (CRR, soil “strength”) of the soil. The CRR calculations were based upon input data obtained from the CPTs and test borings. All of the potential liquefaction induced settlements were performed utilizing the Tokimatsu & Seed method. Detailed information regarding liquefaction analysis is presented in a published National Center for Earthquake Engineering Research (NCEER) document (see Section 13.0. References: 40).

In summary, the analyses indicated that there was a potential for localized liquefaction for the design-event earthquake. However, due to the variable thickness of the overlying non-liquefiable layers and the somewhat discontinuous and isolated distribution of the underlying liquefiable soils, the potential for lateral spreading within the CCR Bridge and DAR footprints during the life of the structures is low.

Subsidence

The site is not located in an area of known ground subsidence, occurring due to the withdrawal of subsurface fluids. Accordingly, the potential for subsidence occurring at the site due to the withdrawal of oil, gas, or water is considered remote.

Landsliding

There are no known landslides on or in the immediate vicinity of the project site, and the site is not located in the path of any known landslide.

Tsunamis and Inundation Seiches

The site is located inland, approximately 6.4 kilometers (4.0 miles) up Soledad Valley from the Pacific Ocean and at a minimum elevation of approximately 26.0 meters (85.3 feet) above mean sea level (MSL). Therefore, tsunamis (seismic sea waves) are not considered a hazard at the site.

The site is not located near to or down slope of, any large body of water that could affect the site in the event of an earthquake-induced failure or seiche (oscillation in a body of water due to earthquake shaking).

3.3. Project Site Soils

Based on review of existing geotechnical documents, surface geologic mapping, and subsurface exploration, the project site is underlain by existing fill, alluvium, terrace deposits, and Ardath Shale. Appendix I.4: Figure 4-Geotechnical Map depicts the general distribution of the geologic units within the project limits. Appendix III.3 includes Cross Section G-G' which depicts the interpreted geologic units underlying the Soledad Canyon Bridge embankment, immediately adjacent to the DAR retaining walls and along the connection to the CCR Bridge. Descriptions of the units are provided below.

Existing Fill

Existing fill soils were observed in forty-three (43) out of fifty-nine (59) test borings drilled for the overall project. Appendix I.3: Figure 3-Field Exploration Map shows the test borings that encountered existing fill soils along with their respective depths. The existing fill soils were generally found in the vicinity of the commercial development within the western margins of the project with a depth up to 3.5 meters (11.5 feet); the northern embankment for the Soledad Canyon Bridge within the central-northern margins of the project with a depth up to 30.5 meters (100.0 feet); and the SDG&E easement access road within the eastern margins of the project with a depth up to 18.2 meters (59.7 feet). The composition of the existing fill ranges from silty sand to sandy clay, with gravel and cobbles. As encountered in the test borings, the fill soils were in a moist to wet

state, ranged from medium brown to dark reddish brown in color, and the consistency ranged from loose to dense (granular fill) and moderately stiff to stiff (fine-grained fill).

Rubble Fill

As-built drawings for the earthquake retrofit for the Soledad Canyon Bridge (see Section 13.0. References: 17) depict a rubble fill consisting of broken concrete north of Bent 6 of the existing Soledad Canyon Bridge. Notes on the as-built drawings indicate that the concrete rubble measures up to 0.3 meters (12.0 inches) maximum. Considering the reported size of the rubble, voids are likely to be present within the rubble fill. Based on the as-built drawings, the rubble fill should be anticipated to consist of a loose to medium dense mix of fine grained soil and gravel with irregularly shaped cobble and boulder size material. It is anticipated that this rubble will be encountered during construction of the DAR. A copy of the as-built sheets is included as Appendix I. 11 of this report.

The extent of the rubble fill could not be investigated in detail because exploratory equipment could not access the relatively steep and high embankment in which it is located. However, as mapped on the as built drawings, the rubble fill spans nearly the entire width of the north and south bound bridges. The mapped dimensions of the rubble fill are approximately 54.9 meters (180.0 feet) in a general east-west orientation by 15.2 meters (50.0 feet) in a general north-south orientation. Notes on the as-builts indicate the rubble was confined to a vertical zone from the top of footing to 1.8 meters (6.0 feet) below finished grade. A copy of the as built sheets is included as Appendix I. 10 of this report. According to the as-builts, the top of the Bent 6 footings have a cover that ranges from 3.0 meters (10.0 feet) to 4.5 meters (14.8 feet) thick. Thus, according to the as-builts, the vertical thickness of the rubble fill is inferred to range from 1.2 meters (4 feet) to 2.7 meters (8.8 feet) thick.

Alluvium

Holocene-aged alluvium was observed in the active stream channel of Carroll Creek, while outside the creek channel the alluvium exhibited soil development and increased consolidation. The alluvium observed in the stream channel was composed of fine to coarse grained sand, with abundant gravel and cobbles. The alluvium encountered in the test borings ranged from silty clay to poorly graded sand with variable concentrations of gravel and cobbles. The variable composition and laterally discontinuous nature of the alluvial deposits encountered reflect the various depositional sequences consistent with the stream channel setting. As encountered in the test borings, the alluvial soils were in a moist to wet state, ranged from dark brown to dark grey in color and the consistency ranged from loose to very dense. The alluvium appeared to be derived from bedrock sources that lie near and east of the site.

Terrace Deposits

Quaternary-aged terrace deposits were observed in road cuts and hillside outcrop exposures. Terrace deposits were encountered intermittently throughout the project site in twenty-five (25) out of fifty-nine (59) test borings drilled. The terrace deposits occur locally as a veneer of silt, clay, sand and conglomerate that represent fluvial deposits laid down in the past by Carroll Creek when it flowed at a higher elevation. The terrace deposits were observed to be moist to wet, with a hard to very dense, friable consistency. The basal portions of the terrace deposits were observed in the surface exposures and in the test borings to be comprised of gravel and

cobble conglomerate with a silty sand matrix. In the test borings that encountered terrace deposits, they were observed to overlie Ardath Shale.

3.4. Project Site Rocks

The rock underlying the site consists of a sedimentary rock and is part of the Ardath Shale geologic unit.

Ardath Shale

Eocene-aged Ardath Shale is the sedimentary bedrock unit found to underlie the entire site at depth. Ardath Shale was encountered within the project site at depth in forty-one (41) out of fifty-nine (59) test borings drilled. The Ardath Shale was observed to consist of siltstone and claystone and occasional sandstone interbeds with thin laminations of medium and dark gray colors. The Ardath Shale was observed to be moist to wet, with a hard consistency. Some layers of the Ardath Shale were observed to be weakly fissile, while other layers were observed to be concretionary.

3.5 Earth Material Strength Parameters

Soil strength parameters for engineering analysis were developed from the laboratory testing and engineering evaluation. Table 1: Soil Parameters presents typical soil and rock values assigned to each of the different earth materials.

Table 1: Soil Parameters

SOIL TYPES	COHESION, c	FRICTION ANGLE, ϕ	EFFECTIVE UNIT WEIGHT, γ
Existing Fill	14.36 kN/m^2 (300 psf)	28°	19.16 kN/m^3 (122 pcf)
Alluvium	19.16 kN/m^2 (400 psf)	25°	18.06 kN/m^3 (115 pcf)
Alluvium (residual)	19.16 kN/m^2 (400 psf)	22°	18.06 kN/m^3 (115 pcf)
Terrace Deposits	16.76 kN/m^2 (350 psf)	34°	19.63 kN/m^3 (125 pcf)
Ardath Shale	47.88 kN/m^2 (1,000 psf)	38°	20.41 kN/m^3 (130 pcf)

4.0. GROUNDWATER

The ground water level (GWL) was encountered in the majority of test borings at an elevation that approximates the adjacent Carroll Creek level. The GWLs encountered in the platform area ranged from 25.2 meters (82.7 feet) to 27.6 meters (90.5 feet) MSL. The GWLs in other test borings vary significantly outside the platform area and aren't considered to reflect static GWL; these variable GWLs reflect locally perched groundwater and anomalies from drilling methods (i.e., smearing), impervious nature of the Ardath Shale geologic unit, and the relatively short period of time from drilling to GWL measurement. Appendix I.3: Figure 3-Field Exploration Map presents all of the GWL elevations MSL where encountered in the test borings. Appendices I.2 to I.15 include the GWL elevations MSL and the dates measured where encountered in the test borings.

Groundwater is not expected to be a constraint to the proposed construction of the DAR walls, since the deepest tip elevation of the soldier piles will not extend below elevation of 35.0 meters (114.8 feet). However, our experience indicates that near-surface groundwater conditions can develop in areas where no such groundwater conditions were previously encountered, especially in areas where a substantial increase in surface water infiltration results from landscape irrigation or unusually heavy precipitation.

5.0. SCOUR EVALUATION

Due to the close proximity of the site to Carroll Creek, the potential for flooding exists during high flow events. The site is within the 100-year floodplain of Carroll Creek. Based on a floodplain study prepared for the project, the site is located within a floodplain, but not within the relatively high energy floodway (see Section 13.0. References: 34). As indicated in the floodplain study report, the location of the project within the floodplain is in areas of ineffective flow and/or backwater. Impacts on the proposed improvements due to potential scour are considered low. It is anticipated that site development will include appropriate drainage provisions for control and discharge of surface runoff.

6.0. CORROSION EVALUATION

The corrosion potential of the on-site materials to steel and buried concrete was evaluated within the overall project site. Laboratory testing was performed in accordance with applicable CTMs on representative samples of the existing fill soils, alluvial soils, terrace deposits, and Ardath Shale to evaluate pH, minimum resistivity, chloride, and soluble sulfate content. General recommendations to address the corrosion potential of the on-site materials are provided herein. If additional recommendations are desired, it is recommended that an appropriate specialist be consulted. Table 3: Soil Corrosion Test Summary, presents the results of our corrosion testing adjacent to the proposed DAR retaining walls within CCR project alignment.

Table 2: Soil Corrosion Test Summary

Boring Number	Depth	Sulfate Content (CTM 417)	Chloride Content (CTM 422)	pH-value (CTM 643)	Resistivity (CTM 643)
A-08-037	0.3 m	31 ppm	11 ppm	6.8	1,873 ohms-cms
A-08-037	11.6 m	590 ppm	820 ppm	6.7	408 ohms-cms
A-08-038	9.8 m	770 ppm	21 ppm	7.4	937 ohms-cms
A-08-039	0.3 m	14 ppm	11 ppm	6.4	1,806 ohms-cms
A-08-040	0.3 m	46 ppm	11 ppm	6.9	1,472 ohms-cms
A-08-041	0.3 m	32 ppm	11 ppm	6.3	2,141 ohms-cms
A-08-044	3.0 m	150 ppm	64 ppm	6.9	1,137 ohms-cms

In accordance with the Caltrans criteria (Caltrans Corrosion Guidelines, Version 1.0, 2003), a corrosive area is an area where the soil contains 500 ppm chlorides or greater; sulfates of 2000 ppm or greater; a pH of 5.5 or less; or a minimum resistivity of 1,000 ohms-cms or less.

Therefore, the project area is considered to be corrosive. Imported fill materials should be tested to check that their corrosion potential is not more severe than those assumed.

An appropriate specialist should be consulted regarding special requirements for ground contact concrete and metallic elements, as considered necessary by the Engineer.

7.0. SEISMIC STUDY

The site is located in southern California which is a seismically active region that is subject to hazards from moderate to large earthquakes. Ground shaking resulting from earthquakes should be expected over the lifetime of the proposed structures. The closest known active fault is the Newport-Inglewood (NIE) fault, which trends north-northwest and is about 6.1 kilometers (3.8 miles) west of the project site. According to the California Seismic Hazard Map, Caltrans 1996, the NIE fault is capable of a Maximum Credible Earthquake of Moment Magnitude, Mw=7.0. A copy of the California Seismic Hazard Map, Caltrans 1996 is attached in Appendix I.6. Section 3.2: Pertinent Soil Conditions or Geologic Hazards presents a detailed discussion regarding fault rupture, liquefaction, seismic settlement, and lateral spreading.

Dynamic Analysis Parameters

The California Seismic Hazard Map, Caltrans 1996 indicates that based on deterministic values, the design site acceleration is controlled by a Maximum Credible Earthquake (MCE) of Mw=7.0 on the NIE fault. Based on the California Seismic Hazard Map, Caltrans 1996, a MCE of Mw=7.0 on the NIE fault could produce a peak bedrock acceleration (PBA) of about 0.5g.

Soil Profile Type

The DAR within the CCR project site should be classified as Soil Type D as defined in Appendix D of Caltrans Seismic Design Criteria (SDC) 2006, Version 1.4.

Acceleration Response Spectrum Curve

A standard Acceleration Response Spectrum (ARS) based on Figure 8 of Appendix B of SDC 2006, Version 1.4 is recommended for design. The ARS is based on a MCE of Mw=7.0, a PBA=0.5g, and Soil Type D and has been modified to account for near fault directivity effect (as per SDC Section 6.1.2.1). Appendix III.1 presents the recommended modified design ARS.

8.0. AS-BUILT FOUNDATION DATA

Appendix I.11: As-Built LOTBs depicts As-Built foundation data of the Soledad Canyon Bridge & OH relative to the Earthquake Retrofit Project No. SR 281. The As-Built LOTBs indicate that the existing Soledad Canyon Bridge is supported by a series of bents between two abutments constructed on CIDH and steel piles founded into the underlying Ardath Shale.

9.0. GEOTECHNICAL DESIGN PARAMETERS

Recommended geotechnical design parameters for the design of the DAR including lateral earth pressures, tie-back anchors and soldier piles are presented in the following sections. A slope stability analysis was also performed to evaluate the stability of the existing Soledad Canyon Bridge north embankment. The existing deep fill soils encountered during our subsurface exploration appear to be well compacted and are deemed suitable for supporting the proposed DAR.

9.1. Lateral Earth Pressures

Due to the heights of the proposed DAR retaining walls and their proximity to the I-805, BVNA has provided recommendations for the following 3 wall scenarios:

- Cantilevered Soldier Pile Walls (Appendix III.2.1),
- Soldier Pile Walls with single tieback or strut brace (Appendix III.2.2), and
- Soldier Pile Walls with multiple levels of tiebacks or struts (Appendix III.2.3)

The tolerable movements of the DAR Wall structures shall not exceed 25.4 millimeters (1.0 inch) in the vertical direction and 101.6 millimeters (4.0 inches) in the lateral direction, or as deemed appropriate by the Structural Engineer. Due to the anticipated lateral deflections (in the range of about 25.4 millimeters [1.0 inch] to 101.6 millimeters [4.0 inches] over the majority of the wall profiles) an active state of in-situ stress is considered appropriate for the existing fill soil retained by the DAR.

Appendices III.2.1 to III.2.3 depict the lateral earth pressure distributions for the three wall scenarios. The lateral reduction factors associated with the lateral loading on the soldier piles for the proposed DAR retaining walls are tabulated below:

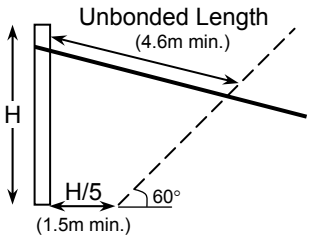
Table 3 - Lateral Reduction Factors in Direction Normal to Loading

Pile Spacing (1)	Reduction Factor
greater than or equal to 3D	1.00
2D	0.68
less than or equal to D	0.30

Note: (1) D = Soldier Pile diameter

9.2. Tieback Anchors

Tieback anchors should have a minimum unbonded length that extends between the wall and a plane at an inclination of 60 degrees from the horizontal, initiating from a point a horizontal distance from the toe of the wall, of H divided by 5 (where H is the total retained wall height) and a minimum distance of 1.5 meters as indicated in the adjacent figure. For all cases, the minimum unbonded length shall not be less than 4.6 meters.



Conventional drilled anchors (gravity grouted) may be designed for an allowable bond stresses ranging from 38.3 kiloPascals to 57.5 kiloPascals (800 pounds per square foot to 1,200 pounds per square foot). Pressure grouted anchors may be designed for an allowable bond stress of 115.0 kiloPascals (2,400 pounds per square). Only the resistance developed within the bonded length should be used in resisting lateral loads. If anchors are spaced at least 1.8 meters (6.0 feet) on center, no reduction in the capacity of the anchors need be considered due to effects of group action.

The anchors may be installed at angles of 15 to 30 degrees below the horizontal. The unbonded portion of the anchor tendons shall be sleeved in plastic. If the anchor tendons are sleeved, it is acceptable to grout the entire length of the anchor. The purpose of the sleeving of unbonded tie-back anchor zones is to exclude lateral stresses from those zones. Any portion of tieback anchors that extend through the rubble fill (see Section 3.3) shall be sleeved and considered unbonded.

9.3. Soldier Piles

A recommended skin friction value of 38.3 kiloPascals (1,200 pounds per square foot) applied below the toe of the DAR retaining walls shall be used to determine soldier pile tip elevations for vertical equilibrium.

Global slope stability analyses were performed to develop a baseline soldier pile embedment depth. The cross section was analyzed utilizing the computer software program Slide, version 5.0, created by Rocscience®. The Bishop Simplified method of analysis was used to locate the critical slip surface for static and pseudo-static conditions. The subsurface conditions were modeled based upon data from the subsurface exploration program and the earth materials were assigned the strength characteristics presented in Table 1. The minimum specified safety factor is 1.5 and 1.1 for static and seismic, respectively. In accordance with Section 3.10 of the Caltrans Guidelines for Structures Foundation Reports, 2006; a seismic factor (k) equal to one-third of the horizontal peak bedrock acceleration (i.e., 0.167g) was added as a horizontal force, while the effects of vertical acceleration were omitted.

The analyses indicate a minimum embedment depth of 3.0 meters (10.0 feet), produce acceptable factors of safety, as shown on Appendices III.3.1.1 and III.3.1.2 for static and seismic conditions, respectively. The minimum safety factors yielded during the analyses were in excess of 1.5 and 1.1 for static and seismic conditions, respectively.

The analysis did not incorporate the tiebacks or struts in modeling the DAR wall section, since this inclusion would constitute a soil-structure interaction analysis, which was addressed by T.Y. Lin International, Inc. The inclusion of such restraints would result in a shallower embedment depth.

10.0. EMBANKMENT STABILITY ANALYSES

Slope stability analyses including static and pseudo-static conditions were performed to evaluate the existing Soledad Canyon Bridge north embankment.

Cross Section G-G' along the existing Soledad Canyon Bridge north embankment was modeled and analyzed utilizing the computer software program Slide, version 5.0, created by Rocscience®. The Bishop Simplified method of analysis was used to locate the critical slip

surface for static and pseudo-static conditions. The subsurface soil/rock conditions were modeled from the subsurface exploration program and were assigned the strength characteristics presented in Table 1. In accordance with Section 3.10 of the Caltrans Guidelines for Structures Foundation Reports, 2006; a seismic factor (k) equal to one-third of the horizontal peak bedrock acceleration (i.e., 0.167) was added as a horizontal force, while the effects of vertical acceleration were omitted.

The minimum specified safety factors are 1.5 and 1.1 for static and pseudo-static conditions, respectively. Minimum safety factors obtained along Section G-G' were in excess of 1.5 and 1.1 for static and seismic conditions, respectively. Appendix III.3.2: Embankment Stability Analyses Results includes graphical outputs of the slope stability analyses.

11.0. CONSTRUCTION CONSIDERATIONS

Construction considerations for the proposed DAR are presented below.

Project Excavations

The existing fill soils may be excavated using conventional heavy-duty excavators in good operating condition. Construction of solider piles and/or tiebacks may be accomplished with heavy-duty spin-auger drill rigs. Localized oversize materials may be present in the fill which may require additional effort if encountered during soldier pile or tie-back installation. If encountered during construction, rotary hammer or percussion equipment may be required. Soldier pile holes may need to be cased.

In addition to the potential for localized oversize materials in the fill, difficult drilling conditions should be anticipated during construction of soldier piles and tieback anchors in the vicinity of the concrete rubble fill located north of Bent 6 of the I-805 Soledad Canyon Bridges (see Appendix I.4: Figure 4-Geotechnical Map). As mapped on the as built drawings, the rubble fill spans nearly the entire width of the north and south bound bridges. Information regarding the location of the rubble fill, based upon as-built data from the seismic retrofit project (Section 13.0. References: 17) is provided in Section 3.3. Project Site Soils. Rotary hammer or percussion drilling equipment may be needed if the rubble is encountered during tieback anchor construction, and anchor holes may need to be cased. Any portion of tieback anchors that extend through the rubble fill shall be sleeved and considered unbonded. Additional grout take should be anticipated for tieback anchors in the rubble fill.

Groundwater is not expected to be a constraint to the proposed construction of the DAR walls, since the deepest tip elevation of the soldier piles will not extend below elevation of 35.0 meters (114.8 feet) MSL. However, experience indicates that near-surface groundwater conditions or seepage can develop in areas where no such conditions were previously encountered, especially in areas where a substantial increase in surface water infiltration results from landscape irrigation or unusually heavy precipitation. It is recommended that the contractor be experienced with techniques for wet-hole soldier pile and/or tieback installations.

12.0. DISCLAIMERS AND CONTACT INFORMATION

The recommendations contained in this report are based on specific project information regarding structure type, location, and design loads that have been provided to BVNA. If any conceptual changes are made during final project design, BVNA should review those changes to determine if these foundation recommendations are still applicable. Any questions regarding the above recommendations should be directed to the attention of Scott Moors, (805) 656-6074 at BVNA.

The recommendations and opinions expressed in this report are based on field and laboratory data developed by BVNA, review of background documents, project plans prepared by T.Y. Lin, and communications with T.Y. Lin and Caltrans. It should be noted that this study did not evaluate the possible presence of hazardous materials on any portion of the site.

Should the proposed grades vary significantly from the existing or if any development configuration changes, structural loads change, or the foundation subgrade conditions vary significantly; the recommendations presented herein may need to be modified accordingly.

Due to the limited nature of the field explorations, conditions not observed and described in this report may be present on the site. It should be understood that conditions different from those anticipated in this report may be encountered during grading operations (e.g., the extent of removal of unsuitable soil) and that additional effort may be required to mitigate them.

This document is intended to be used only in its entirety. No portion of the document, by itself, is designed to completely represent any aspect of the project described herein. BVNA should be contacted if the reader requires additional information or has questions regarding the content, interpretations presented, or completeness of this document.

BVNA has endeavored to perform our evaluation using the degree of care and skill ordinarily exercised under similar circumstances by reputable geotechnical professionals with experience in this area in similar soil conditions. No other warranty, either expressed or implied, is made as to the conclusions and recommendations contained in this report.

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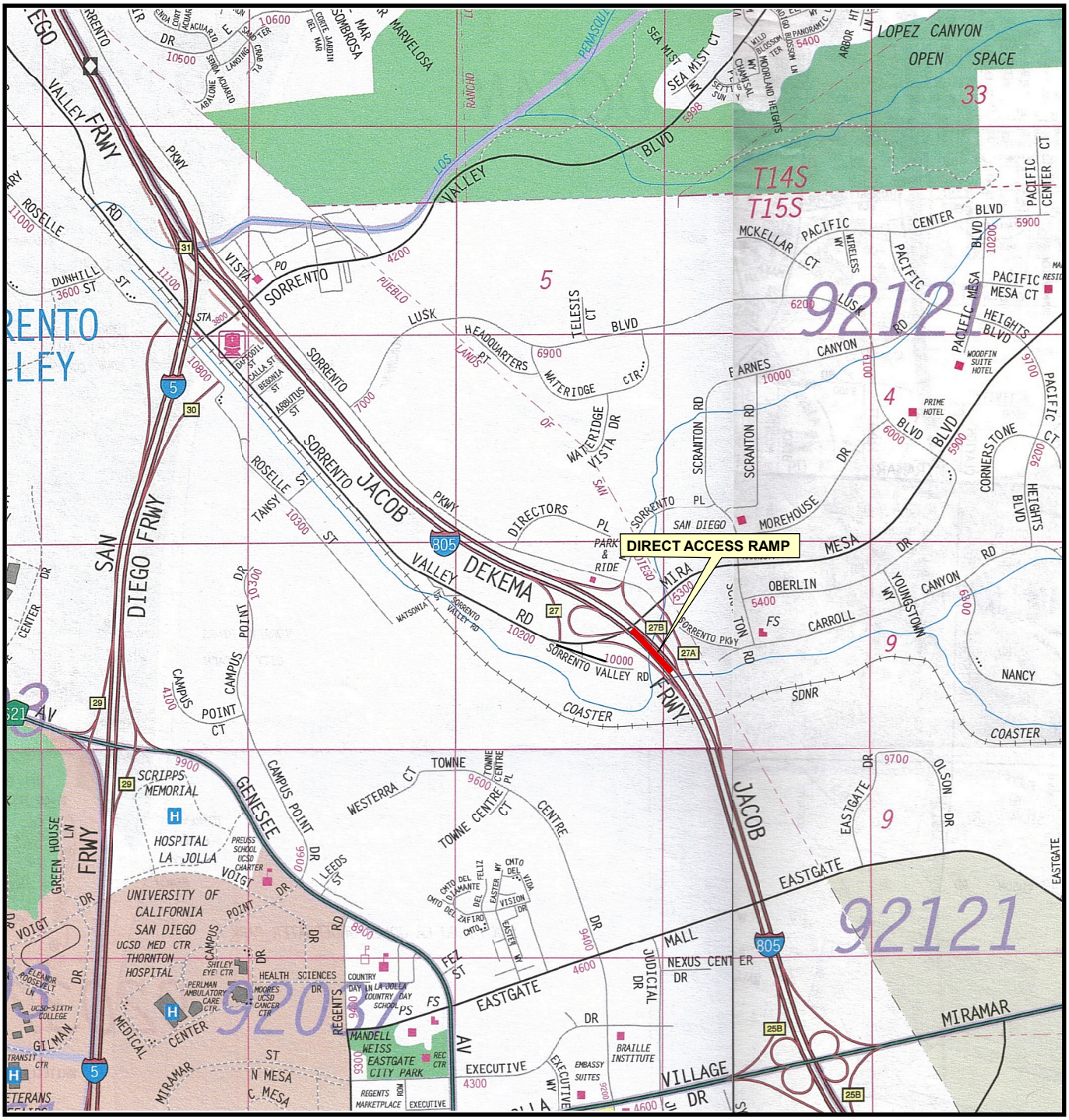
APPENDIX I

FIGURES, LOG OF TEST BORINGS (LOTB), AND CONE PENETRATION TESTING



REFERENCE: THE THOMAS GUIDE, SAN DIEGO COUNTY STREET GUIDE, 2007, PAGE 1208 GRID E-7

N

APPROXIMATE SCALE

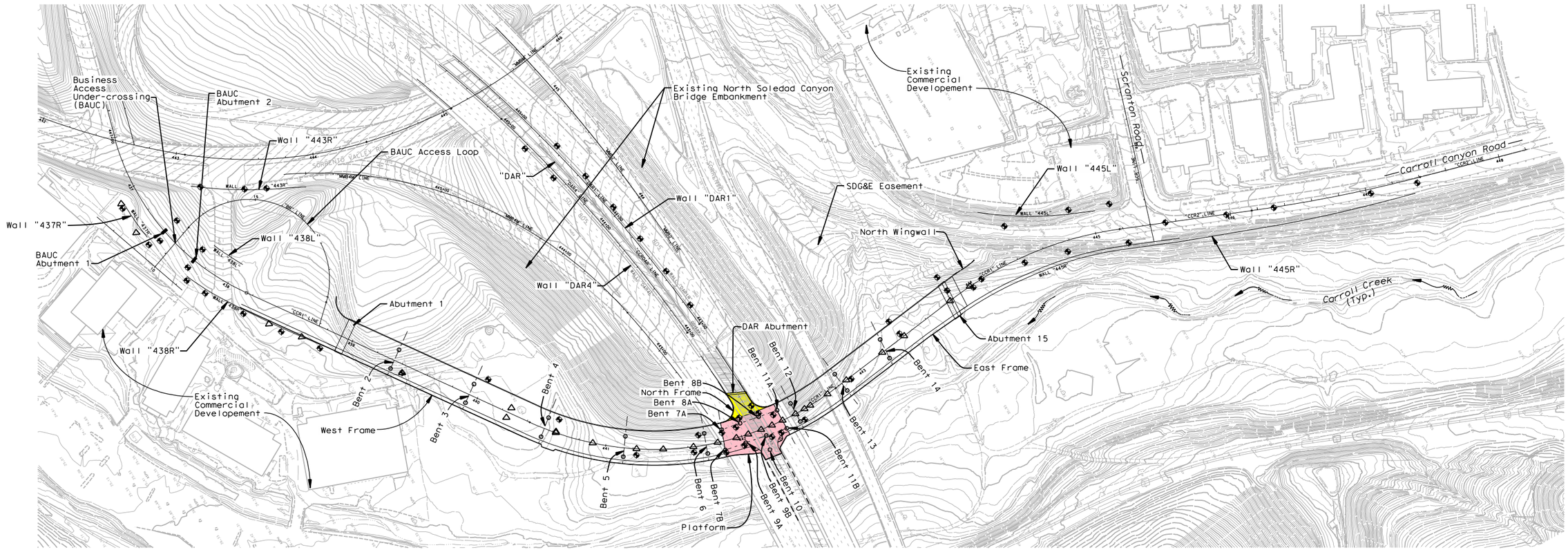
1 CENTIMETER: 228 METERS
(1 INCH: 1,900 FEET)

NOTE: This figure may contain areas of color. BVNA cannot be responsible for any subsequent misinterpretation of the information resulting from black and white reproductions of this figure.

SCHEMATIC ONLY - NOT TO SCALE - NOT A CONSTRUCTION DRAWING

BUREAU VERITAS NORTH AMERICA, INC.
Testing Engineers San Diego
7895 Convoy Court, Suite 18
San Diego, CA 92111

Title:	**Site Location Map**
Project:	DIRECT ACCESS RAMP
Drawn: MPP	Contract No: 38008-017046.00 (SANDAG T.O. 46)
Date: April, 2008	Figure No: 1 (Appendix I.1)



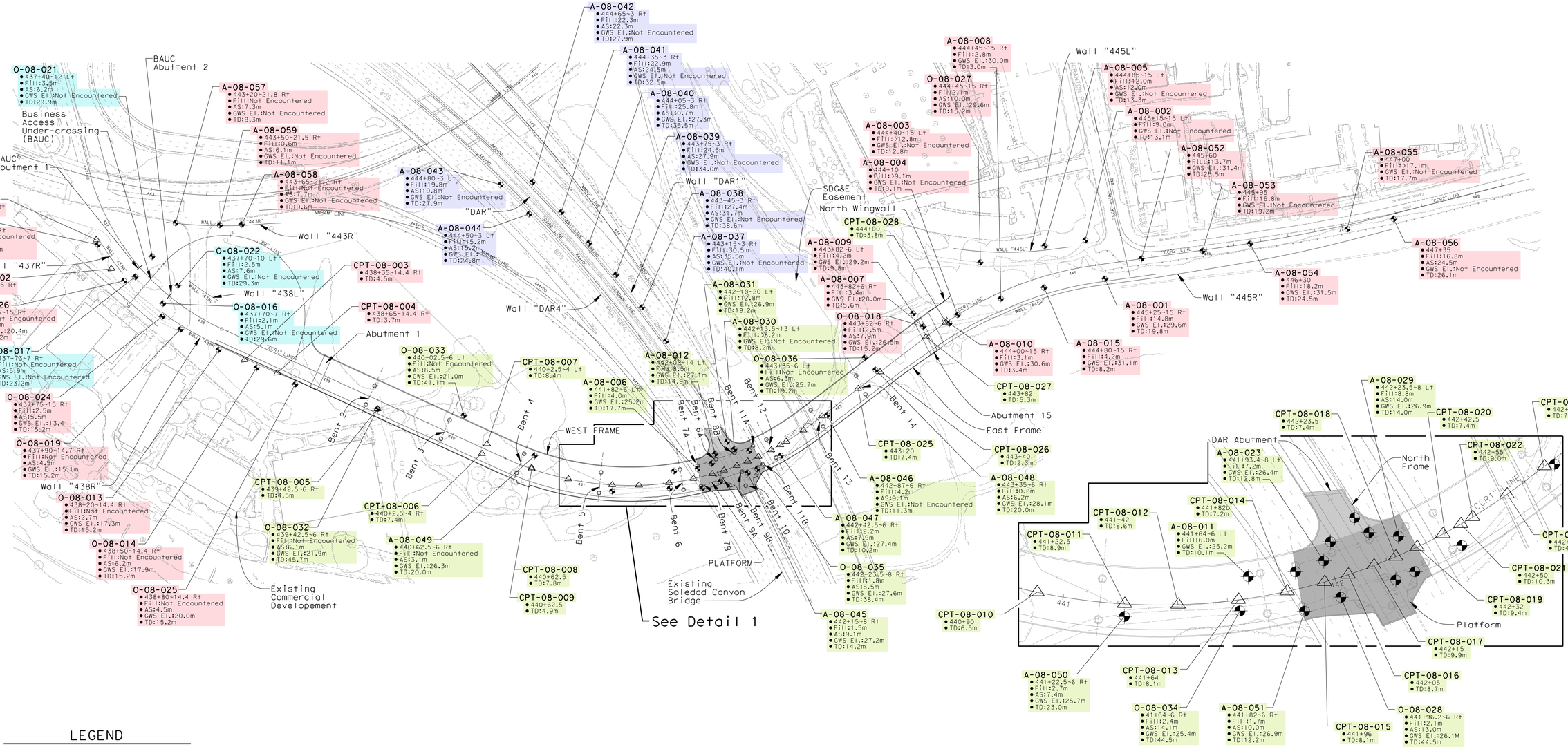
FOR SCHEMATIC USE ONLY - NOT A CONSTRUCTION DRAWING

BUREAU VERITAS NORTH AMERICA, INC.
7890 Convoy Court, Suite 18
San Diego, CA 92111
Tel (858) 715-5800 Fax (858) 715-5810

Title:	**Project Plan**		
Project:	DIRECT ACCESS RAMP		
Drawn:	JDJ	Contract No.:	38008-017046.00
Date:	December 2008	Figure No.:	2 (Appendix I.2)

\DAR Walls\DAR_FIG2_ProjectPlan.dgn

SCALE: 1:1500



LEGEND

- Carroll Canyon Road Bridge
- Direct Access Ramp
- Business Access Undercrossing
- Miscellaneous Retaining Walls

O-08-035
- 442+23.5~8 Rt — (Station location in meters)
- Fill:1.8m — (Depth below surface to bottom of fill)
- AS:8.5m — (Depth below surface to Ardath Shale contact)
- GWS El.:27.6m — (Elevation of ground water surface mean sea level)
- TD:38.4m — (Total depth of Test Boring / CPT)

Note: The Legend depicts color coding to differentiate between field exploration operations relevant to each of the 4 components of the overall project (i.e., CCR Bridge, Business Access Undercrossing, DAR Retaining Walls, Miscellaneous Retaining Walls) and are included in companion LOTB subappendices. However, all of the field exploration information is relevant to each of the 4 project components to depict a broader subsurface site characterization.

DETAIL 1

NO SCALE

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BUREAU VERITAS NORTH AMERICA, INC.
7890 Convoy Court, Suite 18
San Diego, CA 92111
Tel (858) 715-5800 Fax (858) 715-5810

Title:	**Field Exploration Map**		
Project:	DIRECT ACCESS RAMP		
Drawn:	JDJ	Contract No.:	38008-017046.00
Date:	December, 2008	Figure No.:	3 (Appendix I.3)

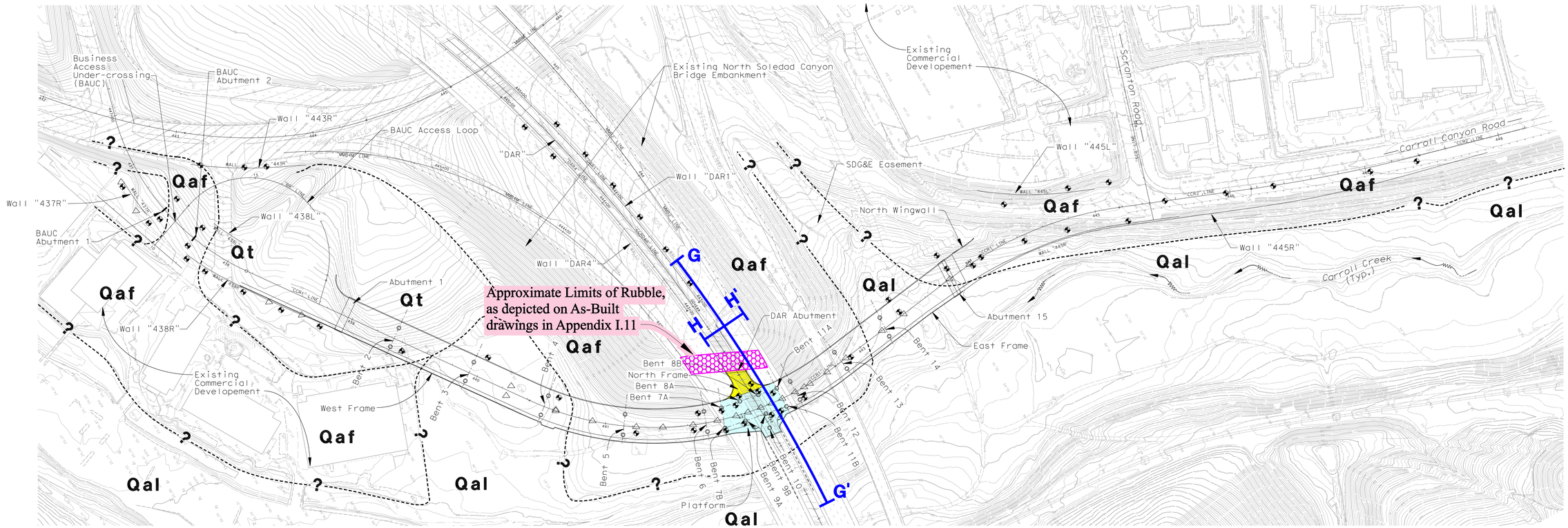
\DAR Walls\DAR_FIG3_FieldExplMap.dgn

LEGEND

Qaf	Artificial Fill
Qal	Alluvium
Qt	Terrace Deposits
	Approximate Geologic Contact; queried where uncertain
H — H'	Section (Typ.)[1,2,3]

NOTES:

1. Distances along G-G' were measured along the "CCRDAR" Line
2. Section G-G' is presented as Appendix I.5 and was used for Slope Stability Analyses in Appendix III.3.2
3. Section H-H' was used for Global Stability Analyses as presented in Appenix III.3.1



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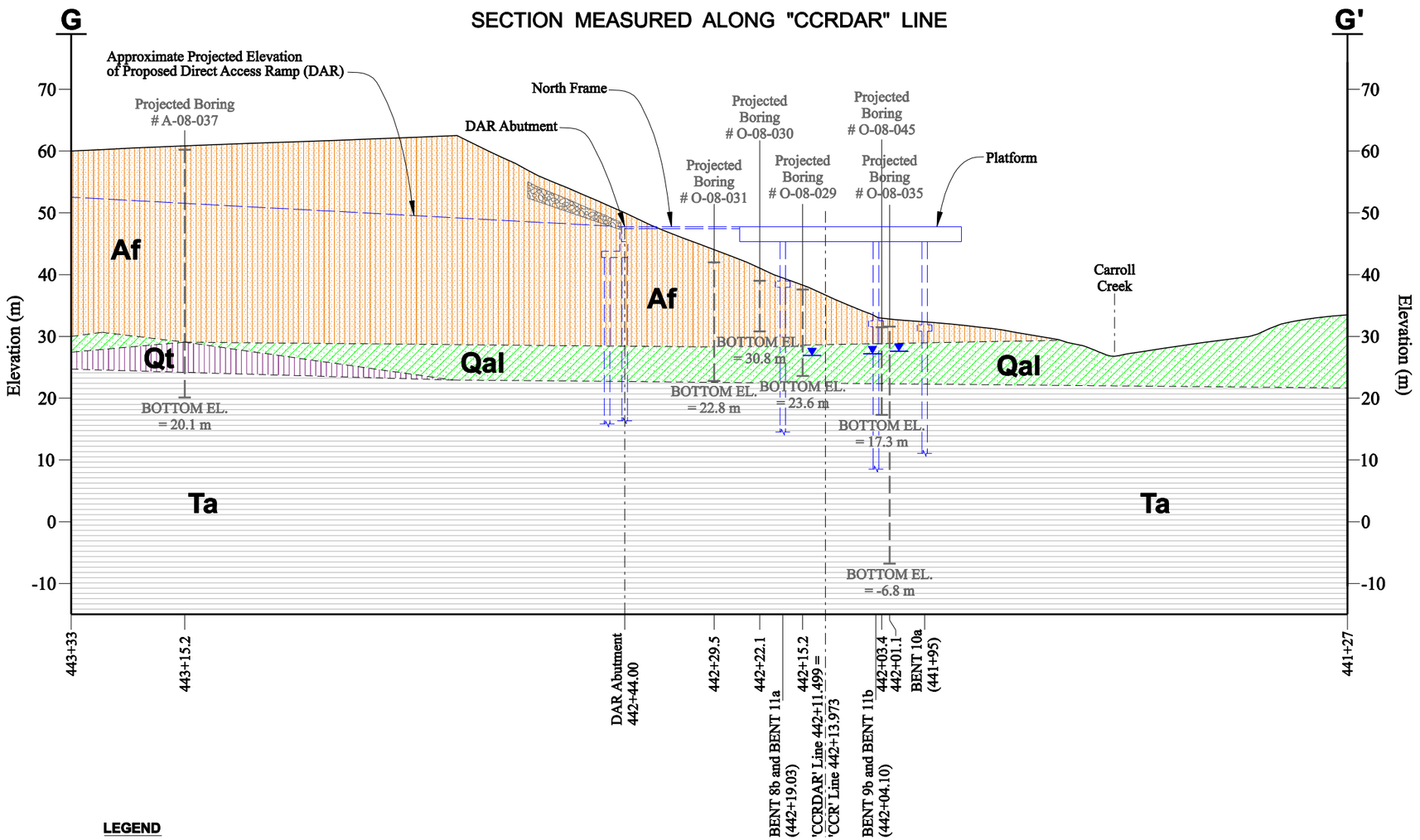
BUREAU VERITAS NORTH AMERICA, INC.
7890 Convoy Court, Suite 18
San Diego, CA 92111
Tel (858) 715-5800 Fax (858) 715-5810

Title:	**Geotechnical Map**		
Project:	DIRECT ACCESS RAMP		
Drawn:	JDJ	Contract No.:	38008-017046.00
Date:	March 2009	Figure No.:	4 (Appendix I.4)

\DAR Walls\DAR_FIG4_GeotechnicalMap.dgn

SECTION MEASURED ALONG "CCRDAR" LINE



LEGEND

- Artifical Fill (Af)
- Alluvium (Qal)
- Terrace Deposits (Qt)
- Ardath Shale Bedrock (Ta)
- Approximate limits of rubble, as depicted on As-Built Drawings

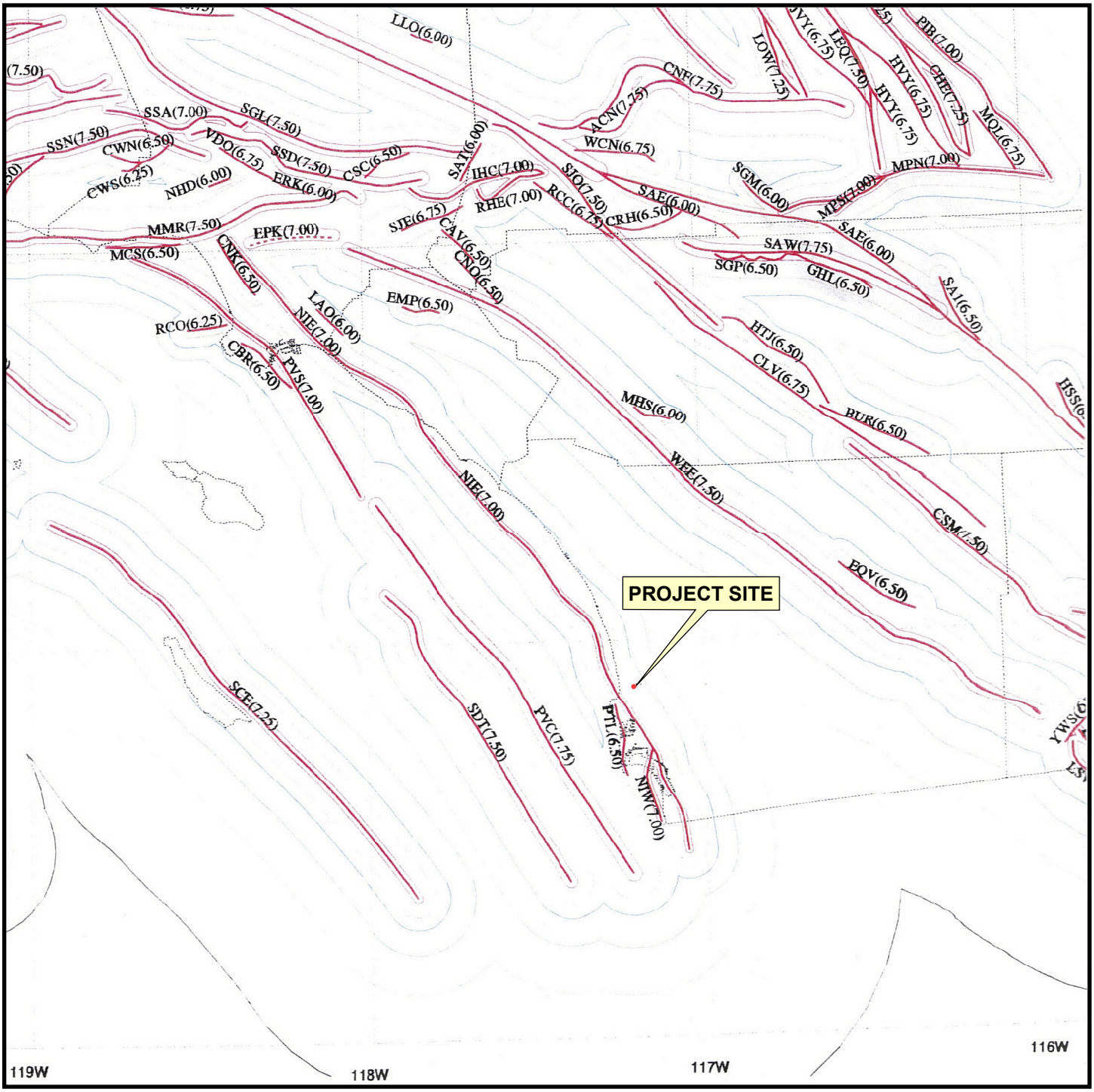
N31°W
Trend of Section

Graphic Scale (Meters)
0 5 10 20 40
1:800

BUREAU VERITAS NORTH AMERICA, INC.
7890 Convoy Court, Suite 18
San Diego, CA 92111
Tel (858) 715-5800 Fax (858) 715-5810

Title:	**Geologic Cross Section (Measured Along "CCRDAR" Line)**
Project:	DIRECT ACCESS RAMP
Drawn: JDJ	Contract No.: 38008-017046.00
Date: January 2009	Figure No.: 5 (Appendix I.5)

\DAR Walls\DAR_FIG5_Geologic_XSection.dgn



REFERENCE: MAUCHLIN, L., 1996, "CALIFORNIA SEISMIC HAZARD MAP 1996", CALIFORNIA DEPARTMENT OF TRANSPORTATION

N

APPROXIMATE SCALE

1 CENTIMETER: 15,750 METERS
(1 INCH: 40 KILOMETERS)

NOTE: This figure may contain areas of color. BVNA cannot be responsible for any subsequent misinterpretation of the information resulting from black and white reproductions of this figure.

SCHEMATIC ONLY - NOT TO SCALE - NOT A CONSTRUCTION DRAWING

BUREAU VERITAS NORTH AMERICA, INC.
Testing Engineers San Diego
7895 Convoy Court, Suite 18
San Diego, CA 92111

Title: **California Seismic Hazard Map, Caltrans 1996**

Project:	DIRECT ACCESS RAMP		
Drawn:	MPP	Contract No:	38008-017046.00 (SANDAG T.O. 46)
Date:	April, 2008	Figure No:	6 (Appendix I.6)

APPENDIX I.7

CARROLL CANYON ROAD BRIDGE LOTBs

Table I.7
Types of Drill Rigs Used

Boring Number	Location	Reference	Project	Drilling Company	Rig Type	Diameter (mm)	Hammer Type
A-08-001	445+25 10 RT (15 RT on plan)	"CCR1" Line	Misc RW	Pacific	Unimog	203	Safety Auto
A-08-002	445+15 15 L (~ 10' offset south and downslope)	"CCR1" Line	Misc RW	Pacific	Unimog	203	Safety Auto
A-08-003	444+40 15LT	"CCR1" Line	Misc RW	Pacific	Unimog	203	Safety Auto
A-08-004	444+10 CL	"CCR1" Line	Misc RW	Pacific	Unimog	203	Safety Auto
A-08-005	444+85 15LT (~15' offset south	"CCR1" Line	Misc RW	Pacific	Unimog	203	Safety Auto
A-08-006	441+82 6LT	"CCR1" Line	CCR Bridge	Pacific	Mole	203	Safety Auto
A-08-007	443+82 6RT	"CCR1" Line	Misc RW/ CCR Bridge	Pacific	Unimog	203	Safety Auto
A-08-008	444+45 15RT	"CCR1" Line	Misc RW	Pacific	Unimog	203	Safety Auto
A-08-009	443+82 6LT (~10' offset North of stake)	"CCR1" Line	Misc RW/ CCR Bridge	Pacific	Unimog	203	Safety Auto
A-08-010	444+00 15RT	"CCR1" Line	Misc RW	Pacific	Unimog	203	Safety Auto
A-08-011	441+64 6LT	"CCR1" Line	CCR Bridge	Pacific	Mole	203	Safety Auto
A-08-012	442+02 14LT	"CCR1" Line	CCR Bridge	Pacific	Unimog	203	Safety Auto
A-08-015	444+80 15RT	"CCR1" Line	Misc RW	Pacific	Mini Mole	203	Safety Auto
A-08-023	441+93.04 8LT	"CCR1" Line	CCR Bridge	Pacific	Mole	203	Safety Auto
A-08-029	442+23.5 8LT	"CCR1" Line	CCR Bridge	Pacific	Mole	203	Safety Auto
A-08-030	442+13.5 13LT	"CCR1" Line	CCR Bridge	Pacific	Mole	203	Safety Auto
A-08-031	442+10 20LT	"CCR1" Line	CCR Bridge	Pacific	Mole	203	Safety Auto
A-08-037	443+15 3RT	"CCRDAR" Line	DAR	Test America	CME-95	203	Safety Auto
A-08-038	443+45 3RT	"CCRDAR" Line	DAR	Test America	CME-95	203	Safety Auto
A-08-039	443+75 3RT	"CCRDAR" Line	DAR	Test America	CME-95	203	Safety Auto
A-08-040	444+05 3RT	"CCRDAR" Line	DAR	Test America	CME-95	203	Safety Auto
A-08-041	444+35 3RT	"CCRDAR" Line	DAR	Test America	CME-95	203	Safety Auto
A-08-042	444+65 3RT	"CCRDAR" Line	DAR	Test America	CME-95	203	Safety Auto
A-08-043	444+80 3LT	"CCRDAR" Line	DAR	Test America	CME-95	203	Safety Auto

Table I.7
Types of Drill Rigs Used

Boring Number	Location	Reference	Project	Drilling Company	Rig Type	Diameter (mm)	Hammer Type
A-08-044	444+50 3LT	"CCRDAR" Line	DAR	Test America	CME-95	203	Safety Auto
A-08-045	442+15 8RT	"CCR1" Line	CCR Bridge	Test America	CME-95	203	Safety Auto
A-08-046	442+87 6RT	"CCR1" Line	CCR Bridge	Test America	CME-95	203	Safety Auto
A-08-047	442+42.5 6RT	"CCR1" Line	CCR Bridge	Test America	CME-95	203	Safety Auto
A-08-048	443+35 6RT	"CCR1" Line	CCR Bridge	Test America	CME-95	203	Safety Auto
A-08-049	440+62.5 6RT	"CCR1" Line	CCR Bridge	Test America	CME-95	203	Safety Auto
A-08-050	441+22.5 6RT	"CCR1" Line	CCR Bridge	Test America	CME-95	203	Safety Auto
A-08-051	441+82 6RT	"CCR1" Line	CCR Bridge	Test America	CME-95	203	Safety Auto
A-08-052	445+60	"CCR2" Line	Misc RW	Test America	CME-95	203	Safety Auto
A-08-053	445+95	"CCR2" Line	Misc RW	Test America	CME-95	203	Safety Auto
A-08-054	446+30	"CCR2" Line	Misc RW	Test America	CME-95	203	Safety Auto
A-08-055	447+00	"CCR2" Line	Misc RW	Test America	CME-95	203	Safety Auto
A-08-056	447+35	"CCR2" Line	Misc RW	Test America	CME-95	203	Safety Auto
A-08-057	443+20 21.8 RT #68	"MMBMOD" Line	Misc RW	Test America	CME-95	203	Safety Auto
A-08-058	443+65 21.2 RT #65	"MMBMOD" Line	Misc RW	Test America	CME-95	203	Safety Auto
A-08-059	443+50 21.5 RT #66	"MMBMOD" Line	Misc RW	Test America	CME-95	203	Safety Auto
O-08-013	438+20 14.4 RT	"CCR1" Line	Misc RW	Boart L	Longyear 1405	152	Safety Auto
O-08-014	438+50 14.4 RT	"CCR1" Line	Misc RW	Boart L	Longyear 1405	152	Safety Auto
O-08-016	437+70 7RT	"CCR1" Line	BAUC	Boart L	Prosonic 1	152	Safety Auto
O-08-017	437+43 7RT	"CCR1" Line	BAUC	Boart L	Prosonic 1	152	Safety Auto
O-08-018	443+82 6RT	"CCR1" Line	Misc RW/ CCR Bridge	Boart L	Longyear 1405	152	Safety Auto
O-08-019	437+90 14.7RT	"CCR1" Line	Misc RW	Boart L	Longyear 1405	152	Safety Auto
O-08-020	437+10 15RT	"CCR1" Line	Misc RW	Boart L	Longyear 1405	152	Safety Auto
O-08-021	437+40 12LT	"CCR1" Line	BAUC	Boart L	Prosonic Track Mounted	152	Safety Auto
O-08-022	437+70 10LT	"CCR1" Line	BAUC	Boart L	Prosonic Track Mounted	152	Safety Auto

Table I.7
Types of Drill Rigs Used

Boring Number	Location	Reference	Project	Drilling Company	Rig Type	Diameter (mm)	Hammer Type
O-08-024	437+75 15RT	"CCR1" Line	Misc RW	Boart L	Longyear 1405	152	Safety Auto
O-08-025	438+80 14.4RT	"CCR1" Line	Misc RW	Boart L	Longyear 1405	152	Safety Auto
O-08-026	437+40 15RT	"CCR1" Line	Misc RW	Boart L	Longyear 1405	152	Safety Auto
O-08-027	444+45 15RT	"CCR1" Line	Misc RW	Boart L	Longyear 1405	152	Safety Auto
O-08-028	441+96.2 6RT	"CCR1" Line	CCR Bridge	Boart L	Prosonic 1	152	Safety Auto
O-08-032	439+42.5 6RT	"CCR1" Line	CCR Bridge	Boart L	Prosonic Track Mounted	152	Safety Auto
O-08-033	440+02.5 6LT	"CCR1" Line	CCR Bridge	Boart L	Prosonic Track Mounted	152	Safety Auto
O-08-034	441+64 6RT	"CCR1" Line	CCR Bridge	Boart L	Prosonic 1	152	Safety Auto
O-08-035	442+23.5 8RT	"CCR1" Line	CCR Bridge	Boart L	Prosonic 1	152	Safety Auto
O-08-036	443+35 6LT	"CCR1" Line	CCR Bridge	Boart L	Mini Sonic	152	Safety Auto

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

GROUP SYMBOLS AND NAMES

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

FIELD AND LABORATORY TESTING

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

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

APPARENT DENSITY OF COHESIONLESS SOILS

Description	SPT N_{60} (Blows / 300 mm)
Very loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE

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

PERCENT OR PROPORTION OF SOILS

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

PARTICLE SIZE

Description		Size
Boulder		> 300 mm
Cobble		76 mm to 300 mm
Gravel	Coarse	19 mm to 76 mm
	Fine	No. 4 to 19 mm
Sand	Coarse	No. 10 to No. 4
	Medium	No. 40 to No. 10
	Fine	No. 200 to No. 40

SOIL LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 1 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401	DISREGARD PRINTS BEARING EARLIER REVISION DATES →	REVISION DATES: 10/14/08, 3/9/09; SHEET; OF

OGS CIVIL LOG OF TEST BORINGS SHEET

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

FILE => 57-c0786-z-lotb01.dgn

USERNAME => mpcronjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:06:55 PM

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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

SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

CEMENTATION

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

BOREHOLE IDENTIFICATION

Symbol	Hole Type	Description
Size	A	Auger Boring
Size	R P	Rotary drilled boring Rotary percussion boring (air)
Size	R	Rotary drilled diamond core
Size	HD HA	Hand driven (25 mm soil tube) Hand Auger
●	D	Dynamic Cone Penetration Boring
▲	CPT	Cone Penetration Test (ASTM D 5778-95)
[ ]	O	Other

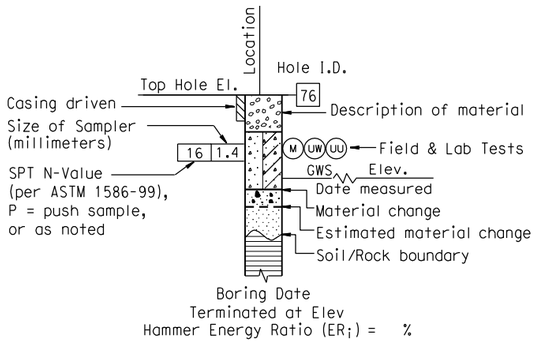
Note: Size in millimeters.

CONSISTENCY OF COHESIVE SOILS

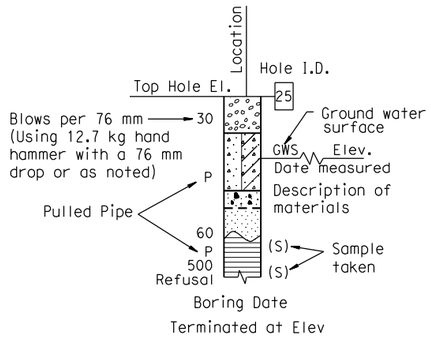
Description	Unconfined Compressive Strength (tsm)	Pocket Penetrometer Measurement (tsm)	Torvane Measurement (tsm)	Field Approximation
Very Soft	< 24	< 24	< 12	Easily penetrated several inches by fist
Soft	24 to 48	24 to 48	12 to 24	Easily penetrated several inches by thumb
Medium Stiff	48 to 96	48 to 96	24 to 48	Penetrated several inches by thumb with moderate effort
Stiff	96 to 192	96 to 192	48 to 96	Readily indented by thumb but penetrated only with great effort
Very Stiff	192 to 383	192 to 383	96 to 192	Readily indented by thumbnail
Hard	> 383	> 383	> 192	Indented by thumbnail with difficulty

PLASTICITY OF FINE-GRAINED SOILS

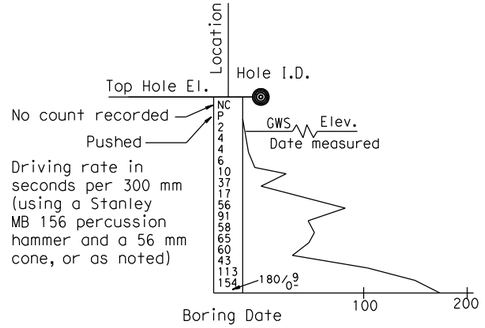
Description	Criteria
Nonplastic	A 3 mm thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.



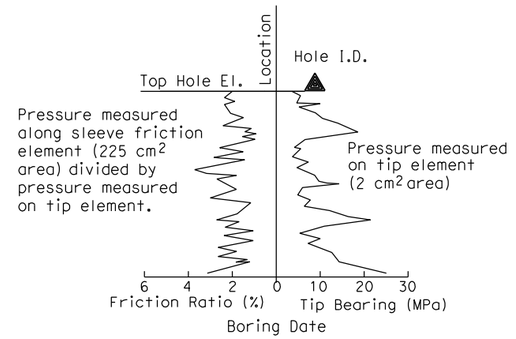
ROTARY BORING



HAND BORING



DYNAMIC CONE PENETRATION BORING



CONE PENETRATION TEST (CPT) SOUNDING

SOIL LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 2 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES: 10/14/08 3/9/09

SHEET OF

FILE => 57-c0786-z-lotb02.dgn

USERNAME => mparcinjape DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:07:03 PM

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

Caltrans Metric

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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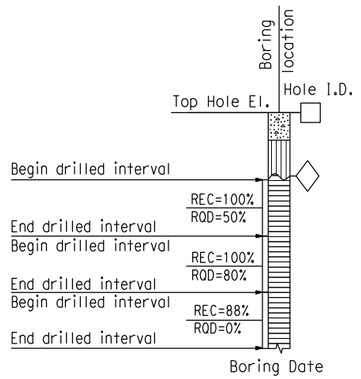
SAN DIEGO, CA. 92111

PERCENT CORE RECOVERY (REC) & ROCK QUALITY DESIGNATION (RQD)

$$REC = \frac{\sum \text{Length of the recovered core pieces}}{\text{Total length of core run}} \times 100\%$$

$$RQD = \frac{\sum \text{Length of intact core pieces} \geq 100\ mm}{\text{Total length of core run}} \times 100\%$$



RELATIVE STRENGTH OF INTACT ROCK

Term	Uniaxial Compressive Strength (MPa)
Extremely Strong	> 207
Very Strong	100 - 207
Strong	49 - 100
Medium Strong	25 - 49
Weak	5 - 25
Very Weak	1 - 5
Extremely Weak	< 1

BEDDING SPACING

Description	Thickness / Spacing
Massive	Greater than 3 m
Very thickly bedded	1 m to 3 m
Thickly bedded	300 mm to 1 m
Moderately bedded	100 mm to 300 mm
Thinly bedded	30 mm to 100 mm
Very thinly bedded	10 mm to 30 mm
Laminated	Less than 10 mm

LEGEND OF ROCK MATERIALS

- IGNEOUS ROCK
- SEDIMENTARY ROCK
- METAMORPHIC ROCK

ROCK HARDNESS

Description	Criteria
Extremely Hard	Specimen cannot be scratched with a pocket knife or sharp pick; can only be chipped with repeated heavy hammer blows.
Very Hard	Specimen cannot be scratched with a pocket knife or sharp pick. Breaks with repeated heavy hammer blows.
Hard	Specimen can be scratched with a pocket knife or sharp pick with difficulty (heavy pressure). Heavy hammer blows required to break specimen.
Moderately Hard	Specimen can be scratched with pocket knife or sharp pick with light or moderate pressure. Core breaks with moderate hammer pressure.
Moderately Soft	Specimen can be grooved 5 mm deep with a pocket knife or sharp pick with moderate or heavy pressure. Breaks with light hammer blow or heavy manual pressure.
Soft	Specimen can be grooved or gouged easily by a pocket knife or sharp pick with light pressure, can be scratched with fingernail. Breaks with light to moderate manual pressure.
Very Soft	Specimen can be readily indented, grooved or gouged with fingernail, or carved with a pocket knife. Breaks with light manual pressure.

FRACTURE DENSITY

Description	Observed Fracture Density
Unfractured	No fractures.
Very slightly fractured	Lengths greater than 1 m.
Slightly fractured	Lengths from 300 mm to 1000 mm with few lengths less than 300 mm or greater than 1000 mm.
Moderately fractured	Lengths mostly in 100 mm to 300 mm range with most lengths about 200 mm.
Intensely fractured	Lengths average from 30 mm to 100 mm with scattered fragmented intervals with lengths less than 100 mm.
Very intensely fractured	Mostly chips and fragments with a few scattered short core lengths.

Combination descriptors (such as "Very intensely to intensely fractured") are used where equal distribution of both fracture density characteristics is present over a significant interval or exposure, or where characteristics are "in between" the descriptor definitions. Only two adjacent descriptors may be combined.

WEATHERING DESCRIPTORS FOR INTACT ROCK

Description	Diagnostic features: Chemical Weathering-Discoloration and/or oxidation — Body of Rock	Diagnostic features: Chemical Weathering-Discoloration and/or oxidation — Fracture Surfaces	Diagnostic features: Mechanical Weathering-Grain boundary conditions (disaggregation) primarily for granitics and some coarse-grained sediments	Diagnostic features: Texture and Solutioning — Texture	Diagnostic features: Texture and Solutioning — Solutioning	General Characteristics
Fresh	No discoloration, not oxidized.	No discoloration or oxidation.	No separation, intact (tight).	No change.	No solutioning.	Hammer rings when crystalline rocks are struck.
Slightly Weathered	Discoloration or oxidation is limited to surface of, or short distance from, fractures; some feldspar crystals are dull.	Minor to complete discoloration or oxidation of most surfaces.	No visible separation, intact (tight).	Preserved.	Minor leaching of some soluble minerals may be noted.	Hammer rings when crystalline rocks are struck. Body of rock not weakened.
Moderately Weathered	Discoloration or oxidation extends from fractures usually throughout; Fe-Mg minerals are "rusty," feldspar crystals are "cloudy."	All fracture surfaces are discolored or oxidized.	Partial separation of boundaries visible.	Generally preserved.	Soluble minerals may be mostly leached.	Hammer does not ring when rock is struck. Body of rock is slightly weakened.
Intensely Weathered	Discoloration or oxidation throughout; all feldspars and Fe-Mg minerals are altered to clay to some extent; or chemical alteration produces in-situ disaggregation, see grain boundary conditions.	All fracture surfaces are discolored or oxidized, surfaces friable.	Partial separation, rock is friable; in semiarid conditions granitics are disaggregated.	Texture altered by chemical disintegration (hydration, argillation).	Leaching of soluble minerals may be complete.	Dull sound when struck with hammer, usually can be broken with moderate to heavy manual pressure or by light hammer blow without reference to planes of weakness such as incipient or hairline fractures, or veinlets. Rock is significantly weakened.
Decomposed	Discolored or oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe-Mg minerals are completely altered to clay.		Complete separation of grain boundaries (disaggregated).	Resembles a soil, partial or complete remnant rock structure may be preserved; leaching of soluble minerals usually complete.		Can be granulated by hand. Resistant minerals such as quartz may be present as "stringers" or "dikes."

Combination descriptors (such as "slightly weathered to fresh") are permissible where equal distribution of both weathering characteristics is present over significant intervals or where characteristics present are "in between" the diagnostic feature. However, combination descriptors should not be used where significant, identifiable zones can be delineated. Only two adjacent descriptors may be combined. "Very intensely weathered" is the combination descriptor for "intensely weathered to decomposed."

ROCK LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 3 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES									SHEET	OF
10/14/08	3/9/09									

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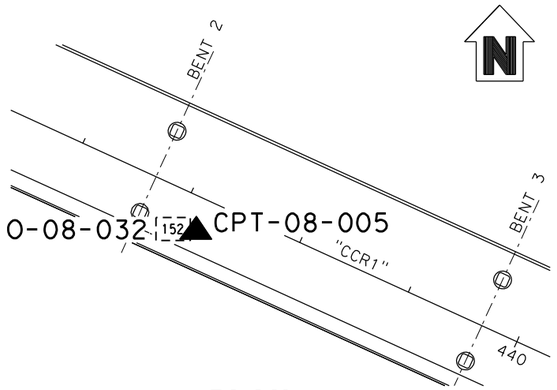
USERNAME => mpcronjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:07:10 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



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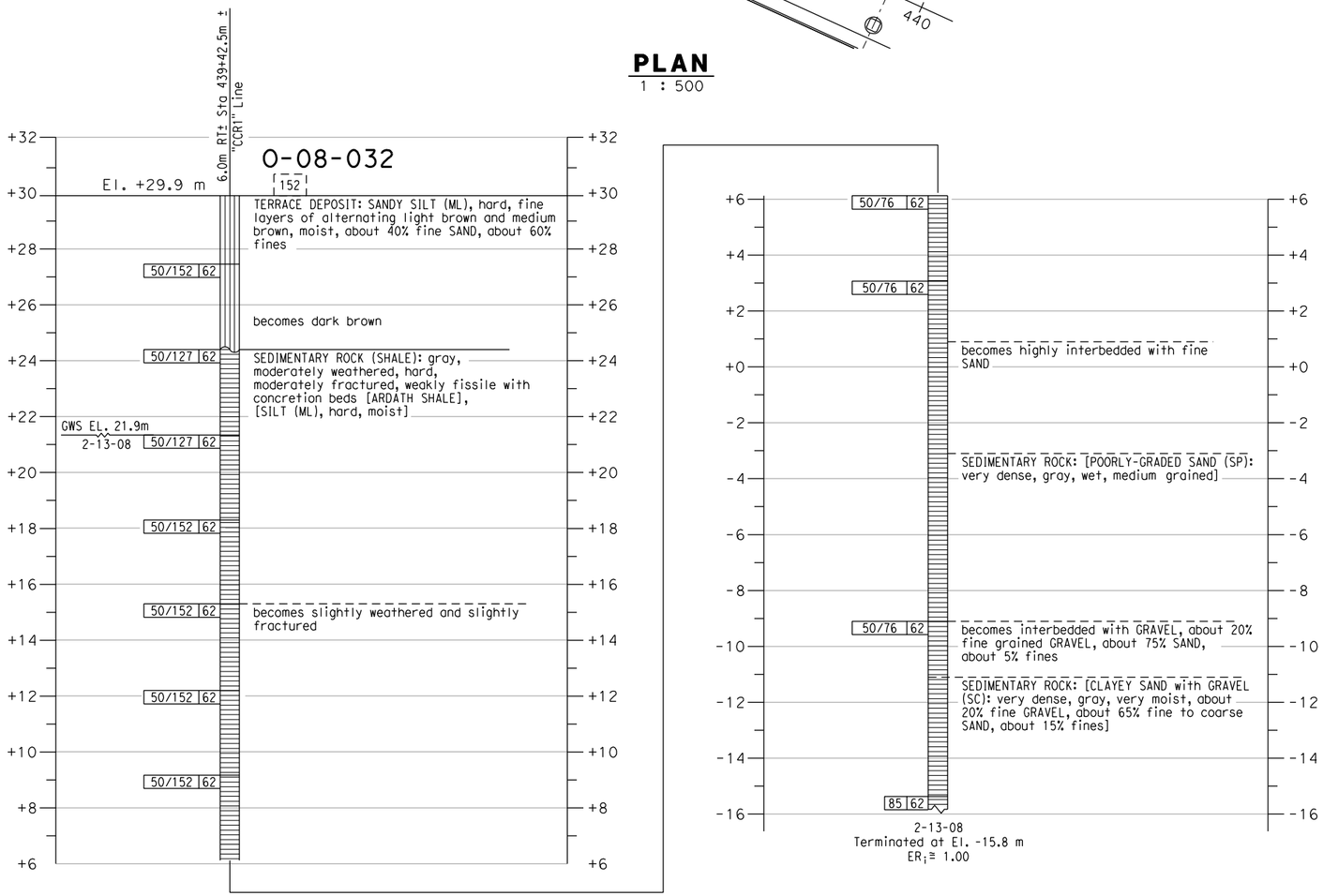
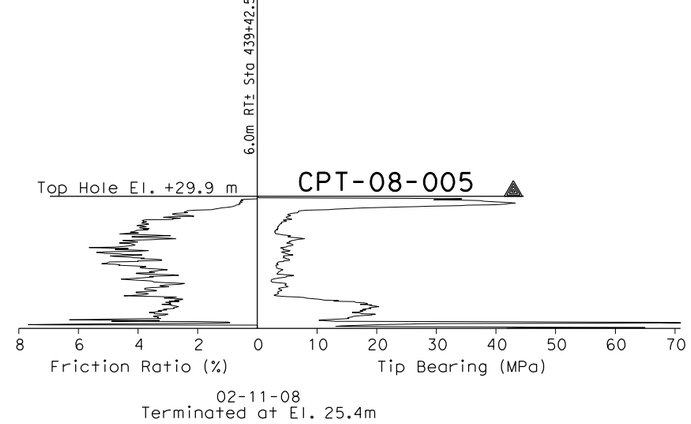


PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500



CONE PENETRATION TEST (CPT) SOUNDING

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

Caltrans Metric

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.
2. Automatic trip and safety hammer systems consisting of hammer weight of 62.5 kg falling a distance of 762 mm were used to advance the drive samplers in accordance with ASTM D1586.
3. The average hammer energy ratio (ER_i) reflects the percentage efficiency of SPT blowcounts (N-value). The estimated ER_i for the various drilling equipment used was as follows:
   Boart Longyear:
   Longyear 1405: $ER_i \cong 1.45$
   Prosonic Track Mounted: $ER_i \cong 1.00$
   Prosonic 1: $ER_i \cong 1.45$
   Minisonic: $ER_i \cong 1.00$
   Test America:
   CME 95: $ER_i \cong 1.45$
   Pacific Drilling:
   Unimog: $ER_i \cong 1.27$
   Mole: $ER_i \cong 1.00$
   Minimole: $ER_i \cong 1.00$
4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (RQD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES		GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER			DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 4 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER						

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES: 10/14/08, 3/9/09

SHEET OF

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USERNAME => mporonjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:07:20 PM

Bench Mark
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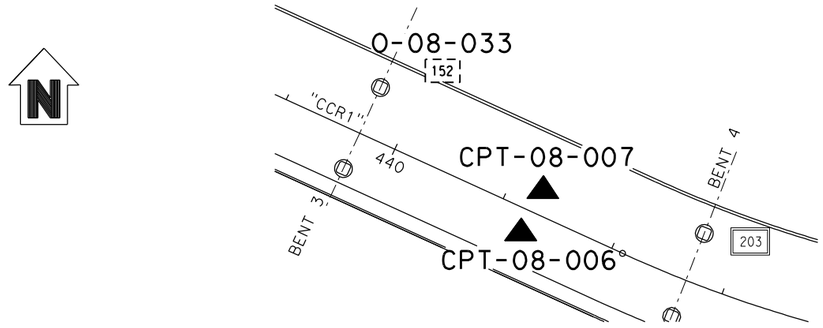

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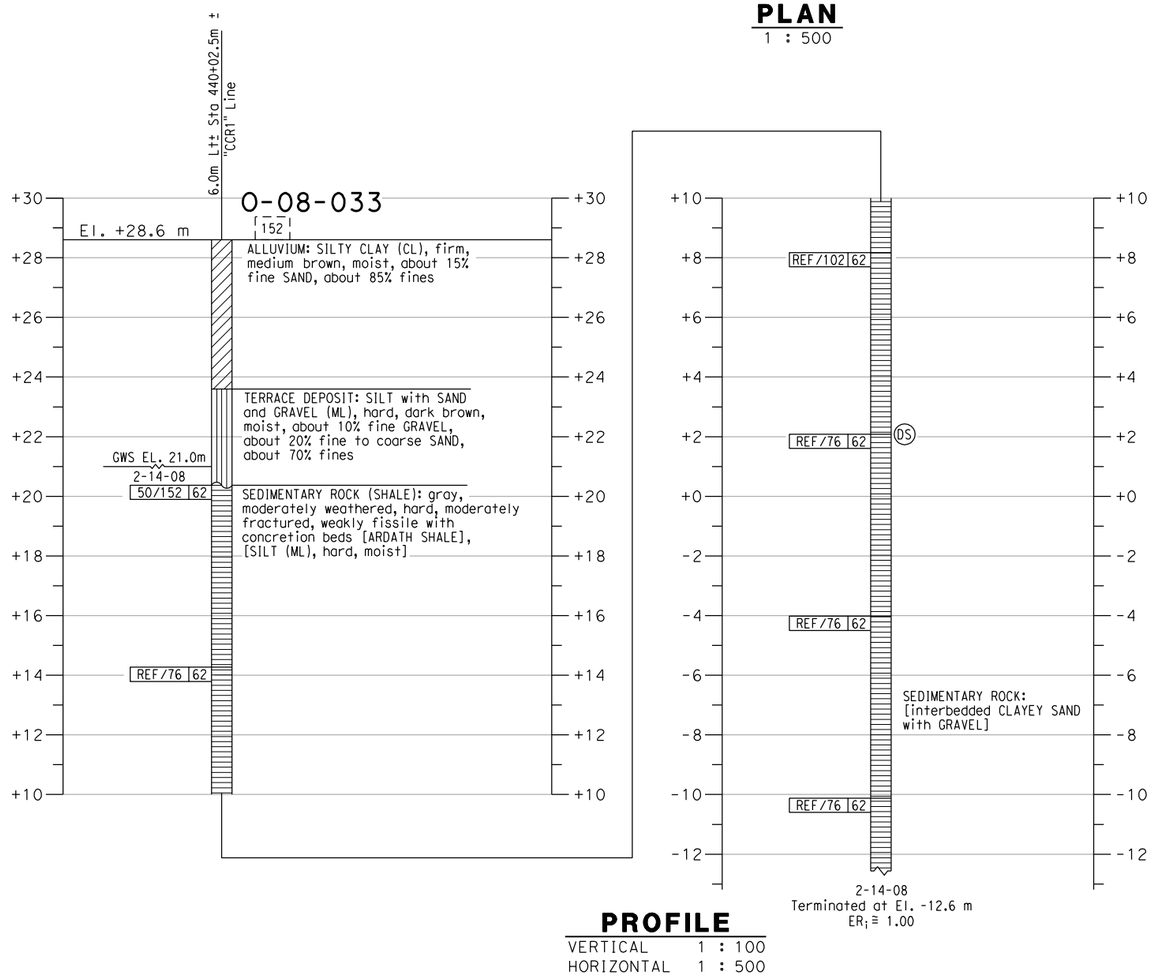

2-14-08
Terminated at El. -12.6 m
$ER_i \cong 1.00$

PROFILE
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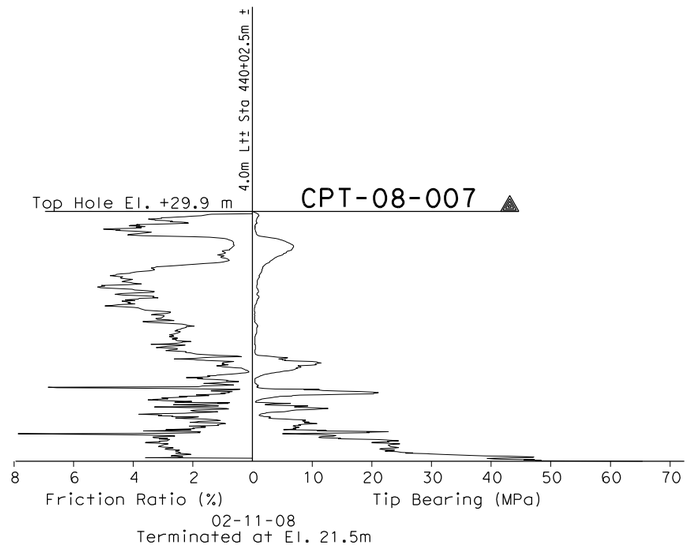
HORIZONTAL 1 : 500



02-11-08
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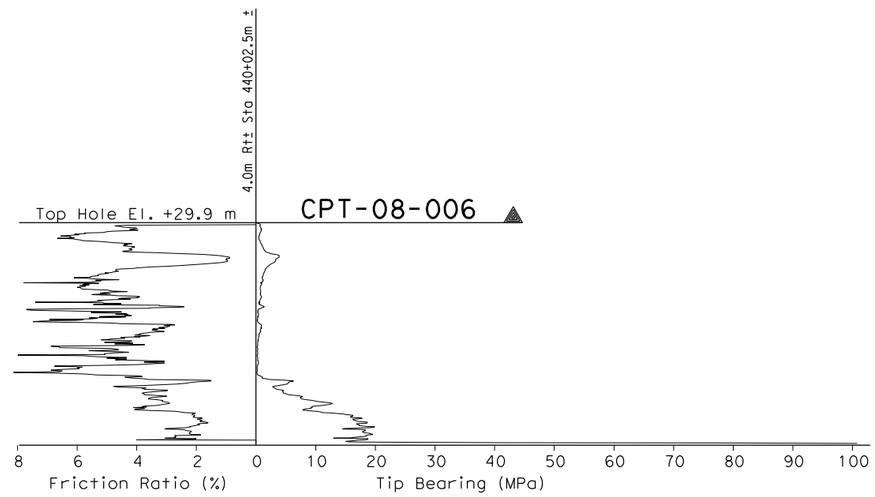

02-11-08
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CONE PENETRATION TEST (CPT) SOUNDINGS

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

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FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER	DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 5 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER				

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES: 10/14/08, 3/9/09

SHEET OF

FILE => 57-c0786-z-lotb05.dgn

USERNAME => mparanjape DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:07:26 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

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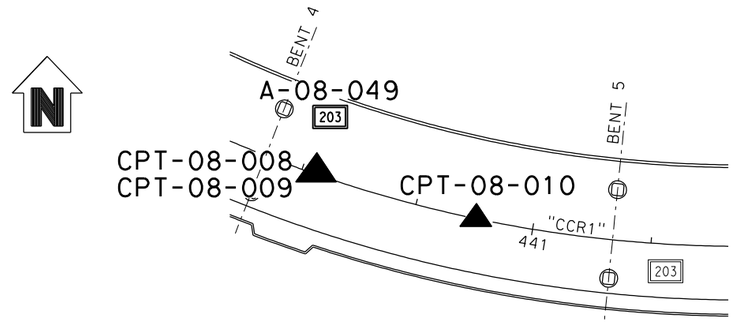

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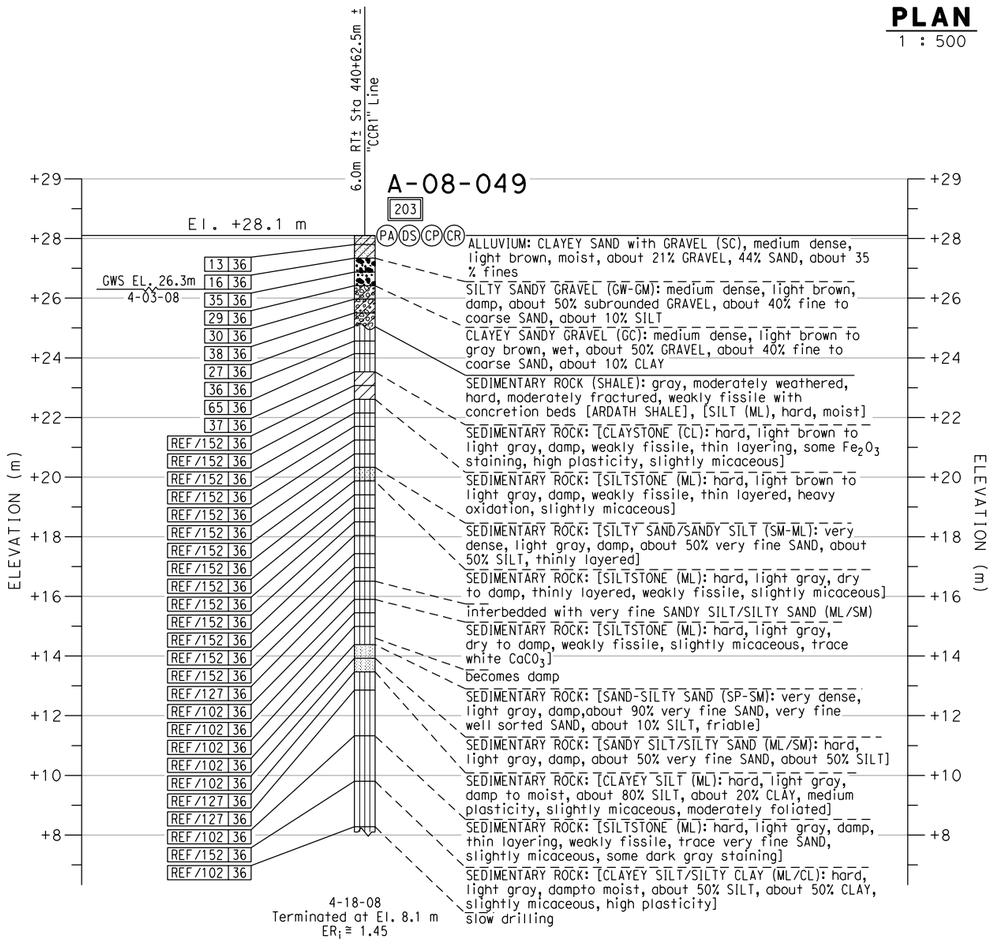

PROFILE
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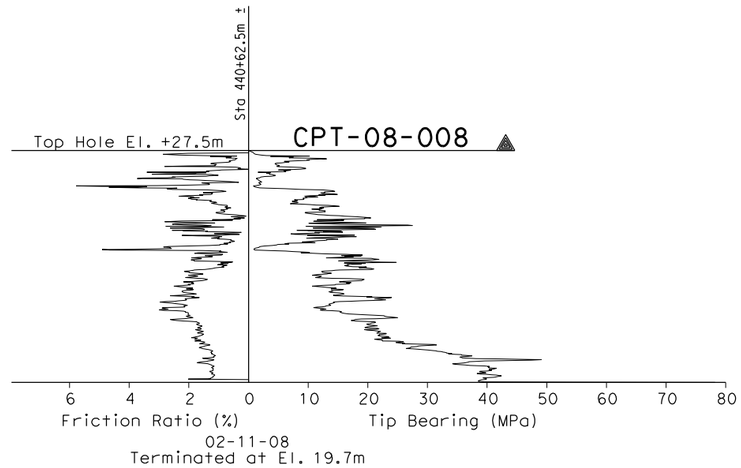
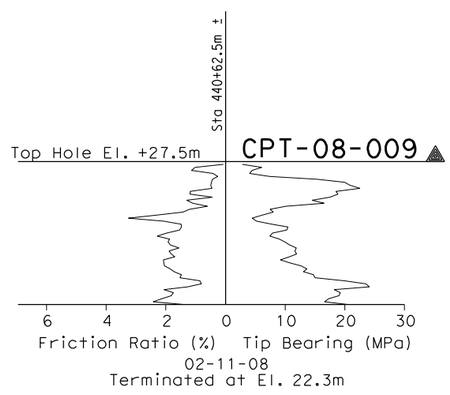
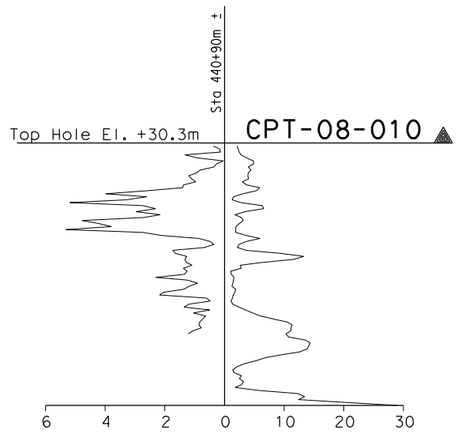
HORIZONTAL 1 : 500







CONE PENETRATION TEST (CPT) SOUNDINGS

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   CME 95: ER_i≅1.45
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ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 6 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER			

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES

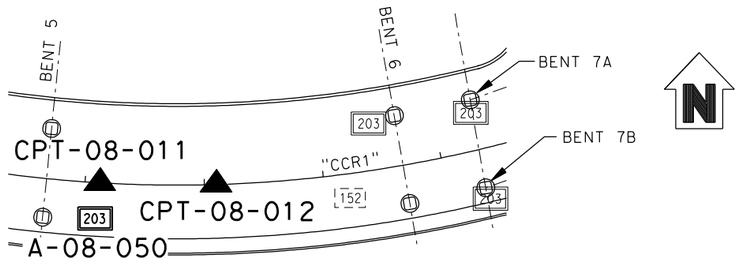
REVISION DATES: 10/14/08, 3/9/09

SHEET OF

FILE => 57-c0786-z-lotb06.dgn

USERNAME => mparanjape DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:07:33 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



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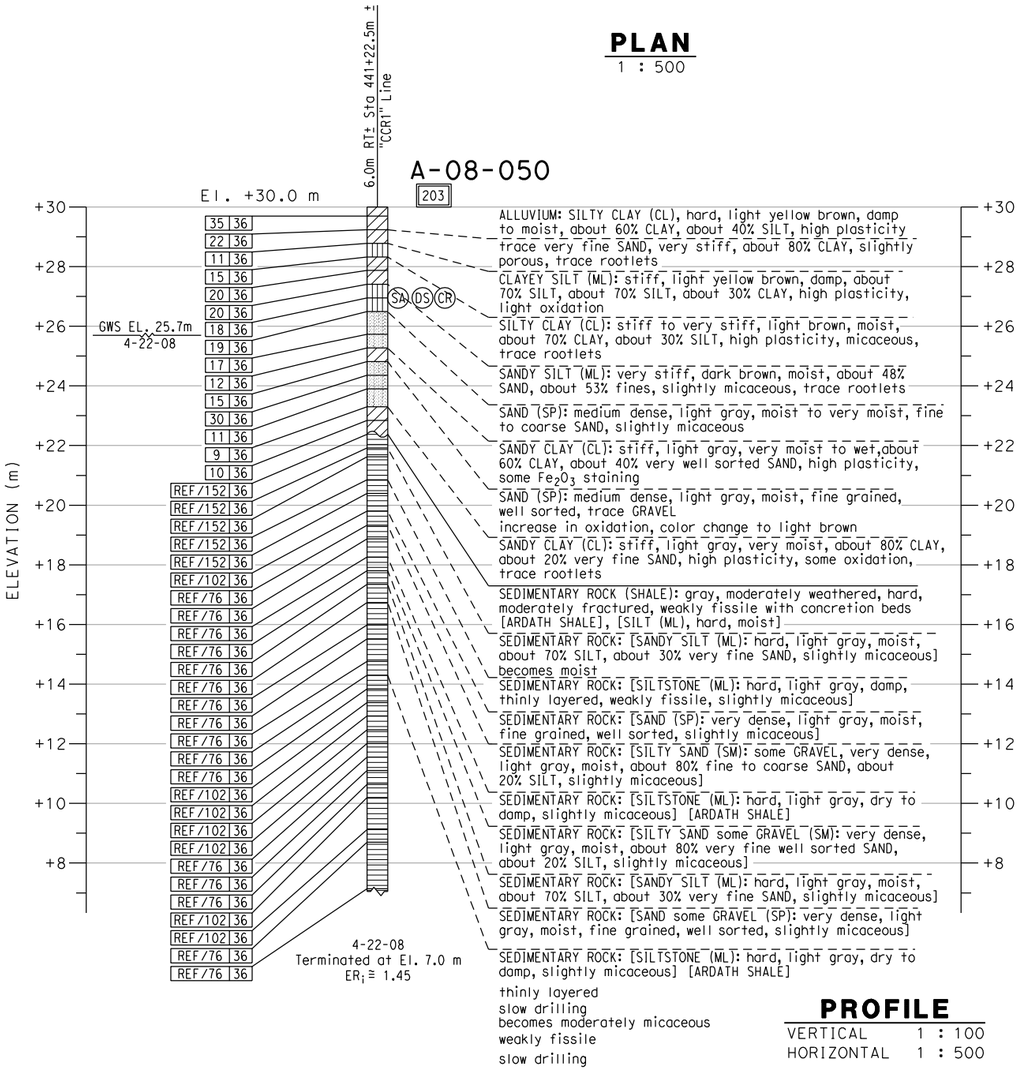
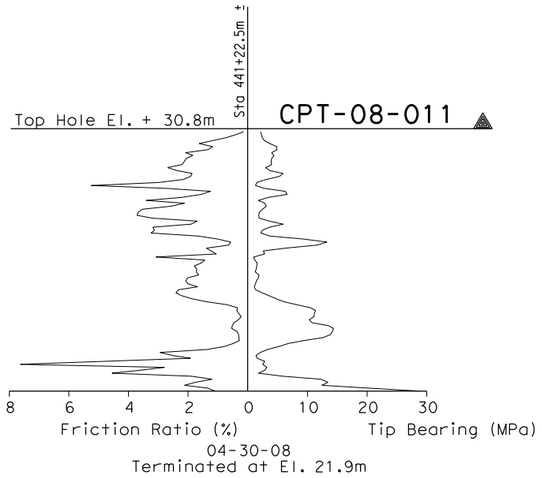
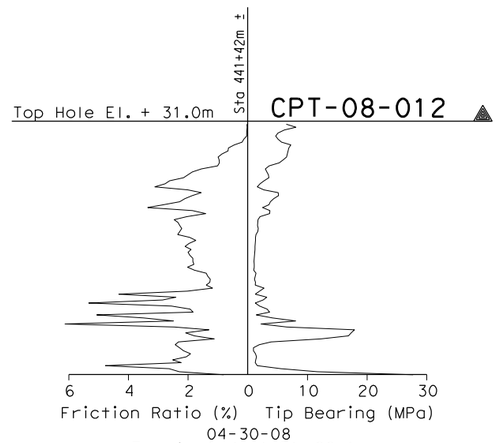


PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500



CONE PENETRATION TEST (CPT) SOUNDING



CONE PENETRATION TEST (CPT) SOUNDING

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:
1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.
2. Automatic trip and safety hammer systems consisting of hammer weight of 62.5 kg falling a distance of 762 mm were used to advance the drive samplers in accordance with ASTM D1586.
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   Minisonic: ER$_i$ ≅ 1.00
   Test America:
   CME 95: ER$_i$ ≅ 1.45
   Pacific Drilling:
   Unimog: ER$_i$ ≅ 1.27
   Mole: ER$_i$ ≅ 1.00
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ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 7 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

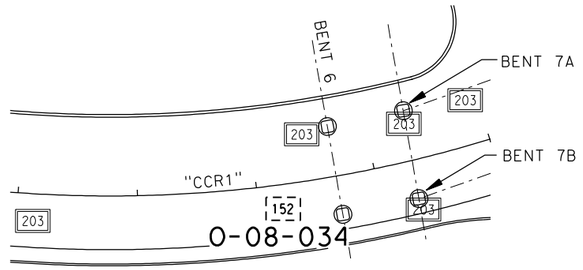
REVISION DATES: 10/14/08, 3/9/09

SHEET OF

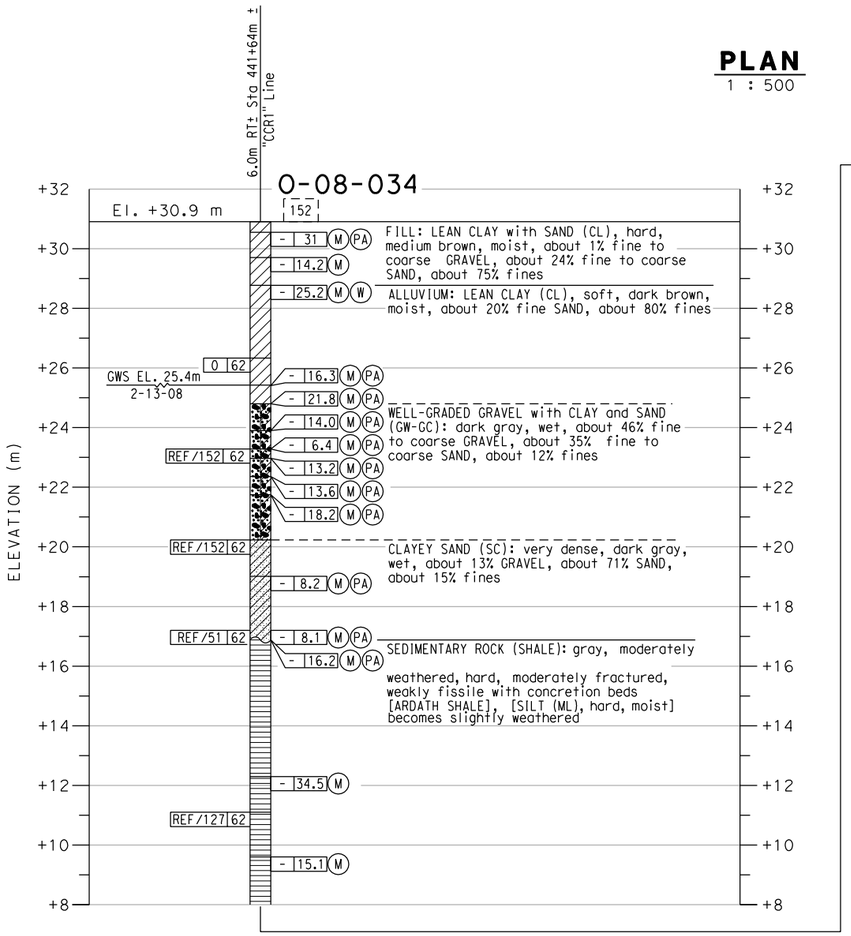
FILE => 57-c0786-z-lotb07.dgn

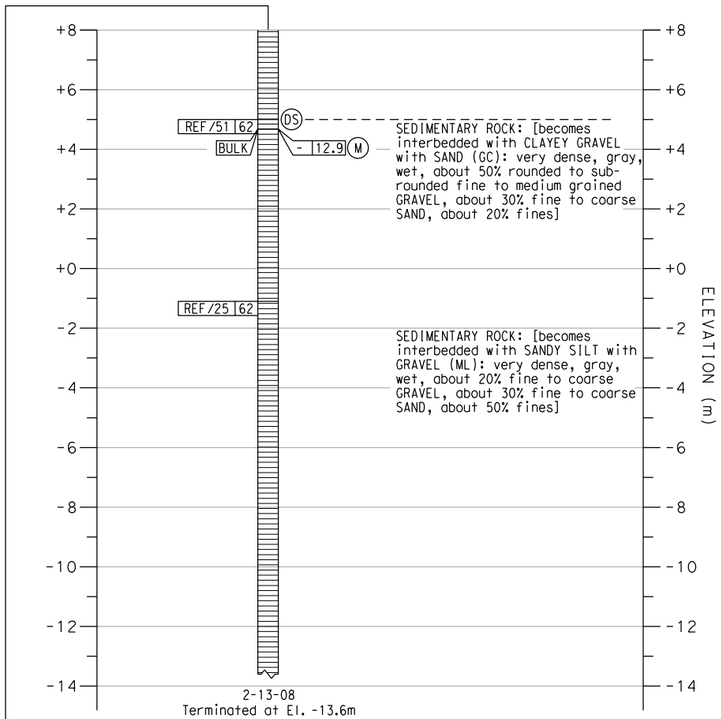
USERNAME => mpcronjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:07:42 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
1 : 500





PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

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ENGINEERING SERVICES		GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER			DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 8 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401		DISREGARD PRINTS BEARING EARLIER REVISION DATES →	REVISION DATES: 10/14/08, 3/9/09; SHEET; OF

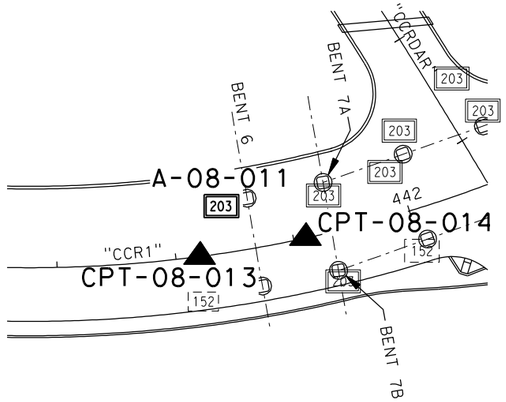
OGS CIVIL LOG OF TEST BORINGS SHEET

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

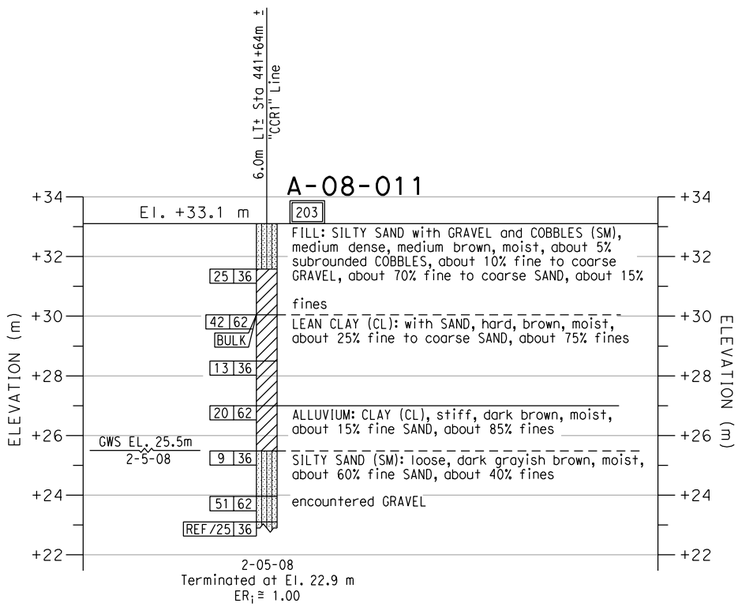
FILE => 57-c0786-z-1otb08.dgn

USERNAME => mporonjape DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:07:51 PM

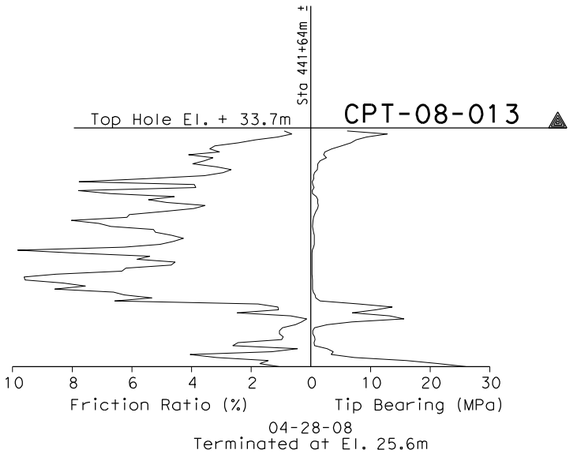
Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



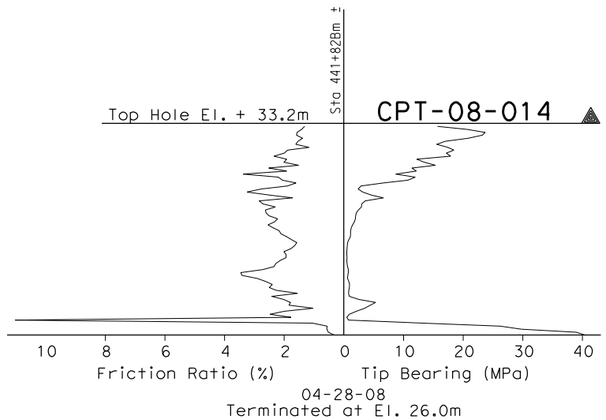
PLAN
1 : 500



PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500



CONE PENETRATION TEST (CPT) SOUNDING



CONE PENETRATION TEST (CPT) SOUNDING

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

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ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 9 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES										SHEET	OF
10/14/08	3/9/09										

FILE => 57-c0786-z-lotb09.dgn

USERNAME => mporcinjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:07:59 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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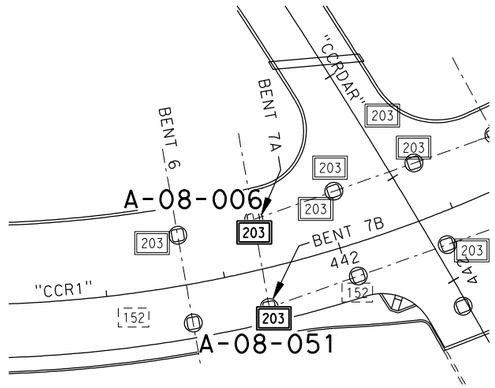
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111



PLAN
1 : 500

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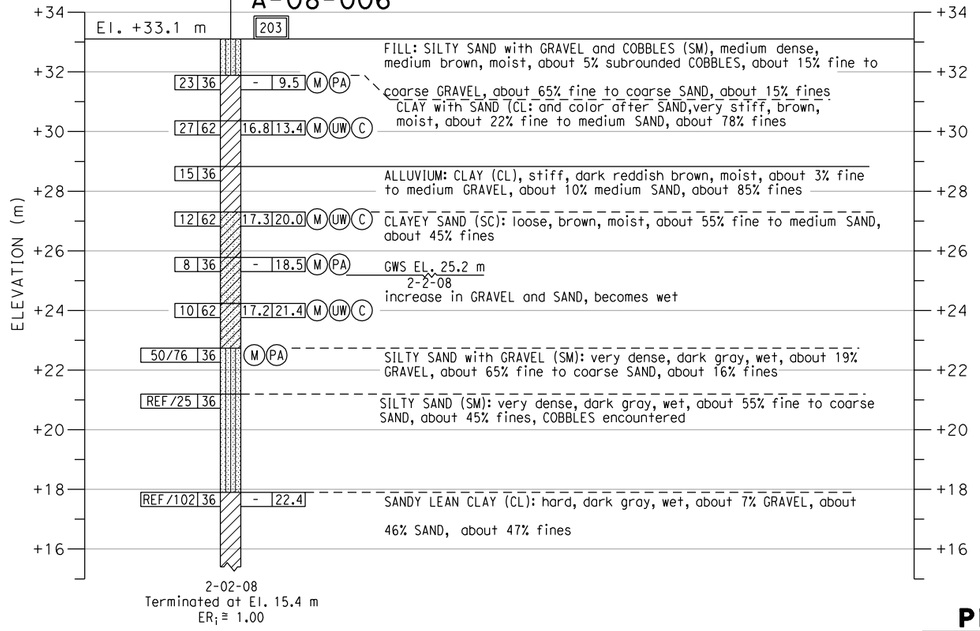
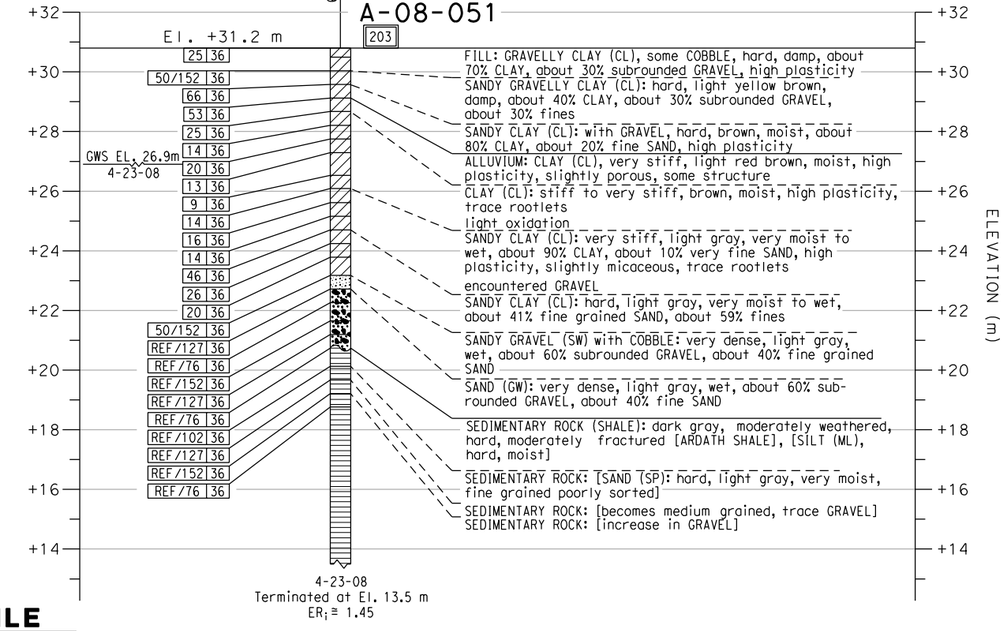




PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

ENGINEERING SERVICES	GEOTECHNICAL SERVICES			
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN
NAME:	CHECKED BY: G. CUSTENBORDER			DESIGN BRANCH

BRIDGE NO. 57-C0786
POST MILES KP43.2/PM26.8

CARROLL CANYON ROAD BRIDGE
LOG OF TEST BORINGS SHEET NO. 10 OF 22

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES

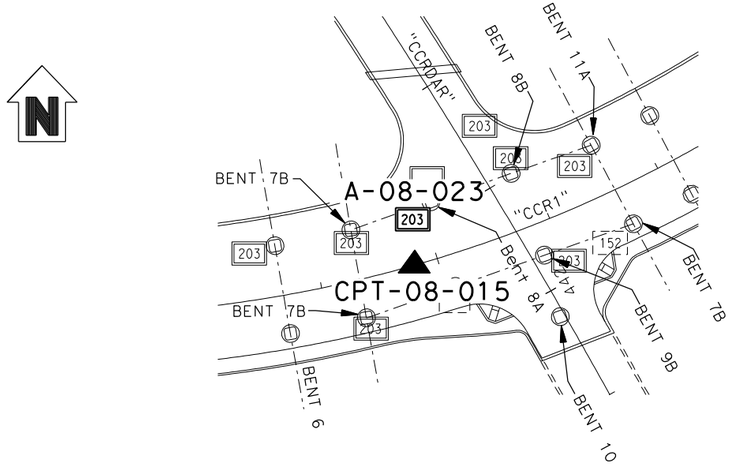
REVISION DATES: 10/14/08, 3/9/09

SHEET OF

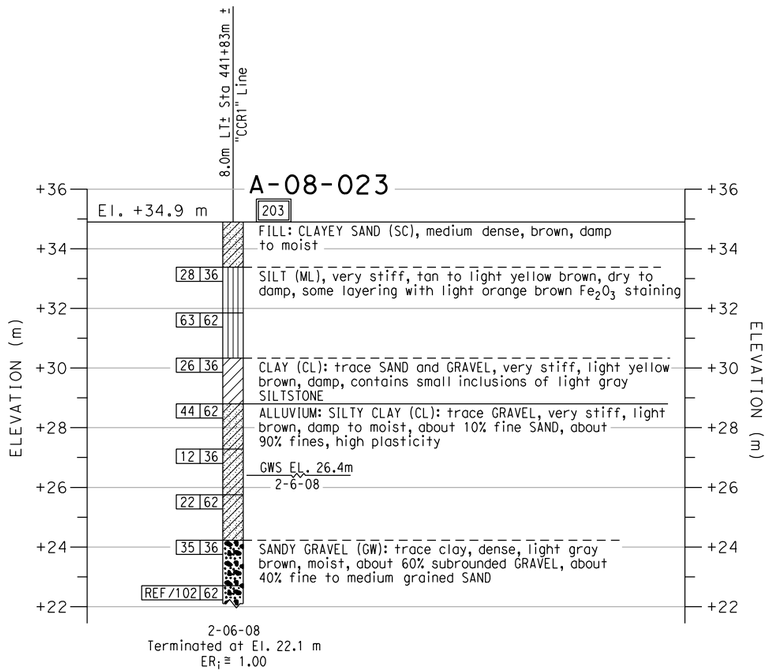
FILE => 57-c0786-z-lotb10.dgn

USERNAME => mporonjoe DATE PLOTTED => 3/10/2009 TIME PLOTTED => 11:08:07 PM

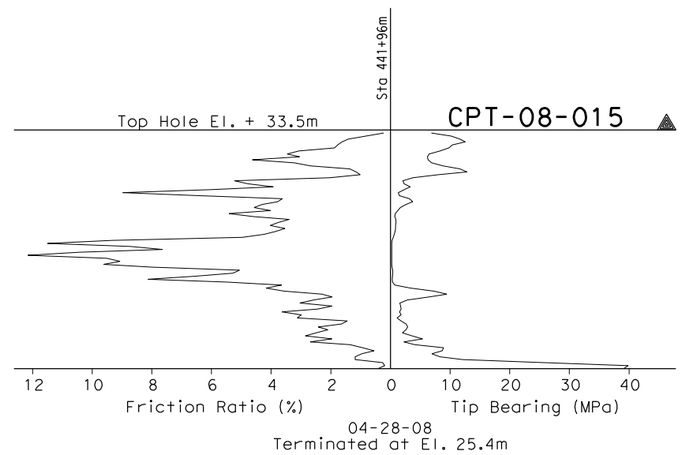
Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
1 : 500



PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500



CONE PENETRATION TEST (CPT) SOUNDING

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

REGISTERED PROFESSIONAL ENGINEER
VAN OLIN
NO. 2578
EXP. 6-30-10
GEOTECHNICAL
STATE OF CALIFORNIA

PLANS APPROVAL DATE

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SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

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ENGINEERING SERVICES		GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN G. CUSTENBORDER			DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 11 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER						

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

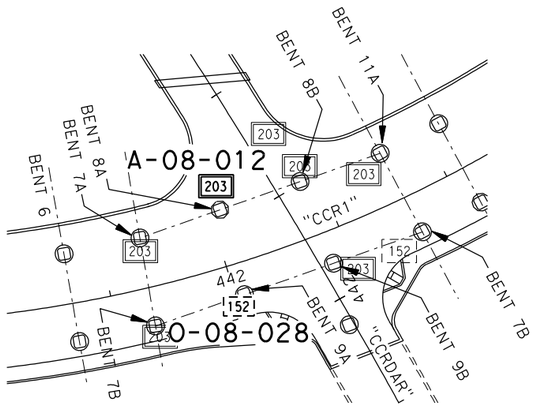
REVISION DATES: 10/14/08, 3/9/09

SHEET OF

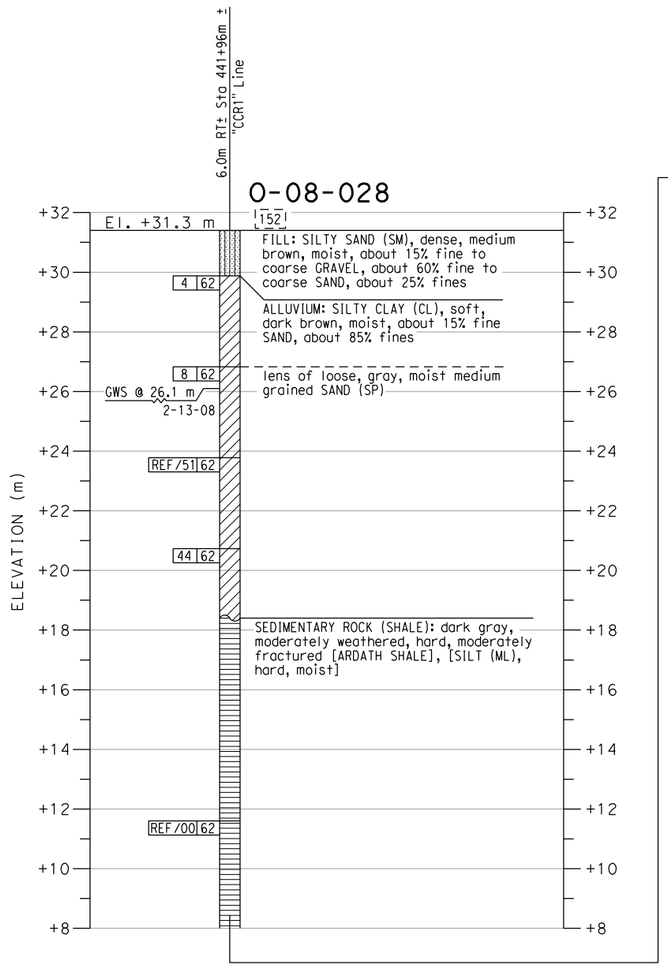
FILE => 57-c0786-z-lotb11.dgn

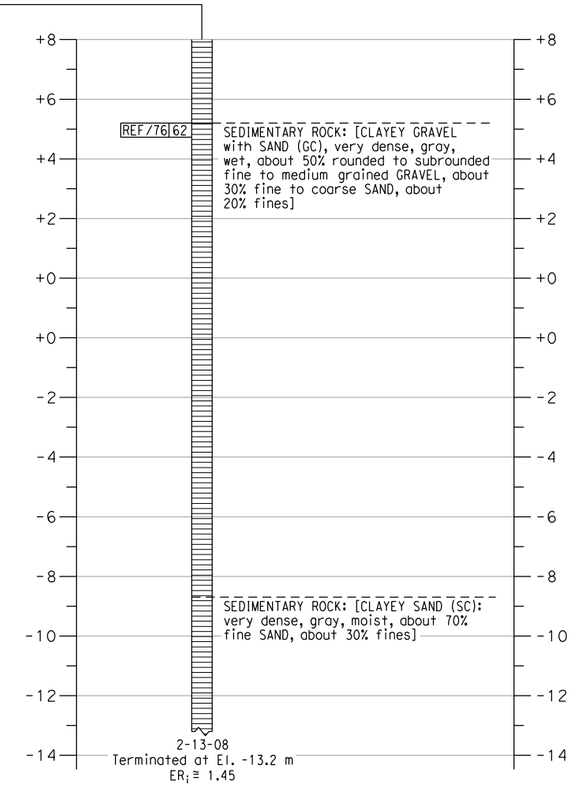
USERNAME => mparcinjape DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:08:15 PM

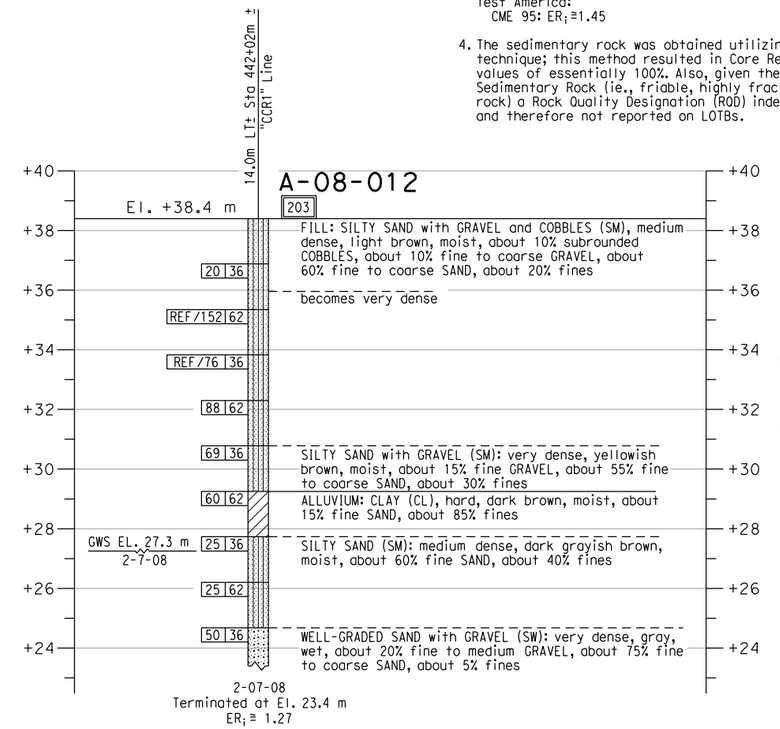
Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
1 : 500







PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

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ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER	DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 12 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER		CU 11275 EA 2T0401		

OGS CIVIL LOG OF TEST BORINGS SHEET

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										SHEET	OF
10/14/08	3/9/09										

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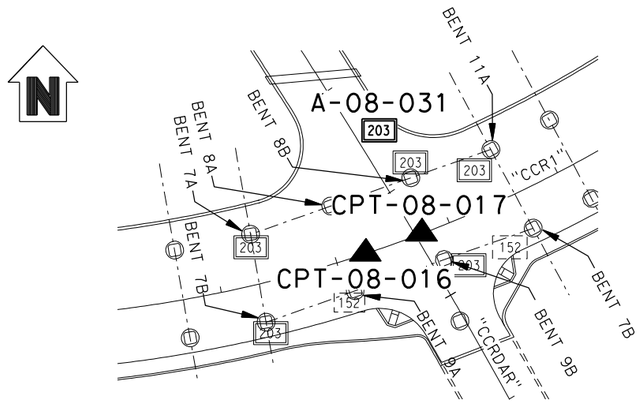
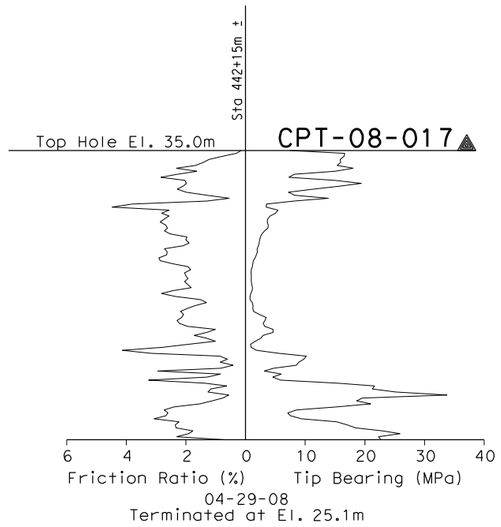
USERNAME => mporanjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:08:22 PM

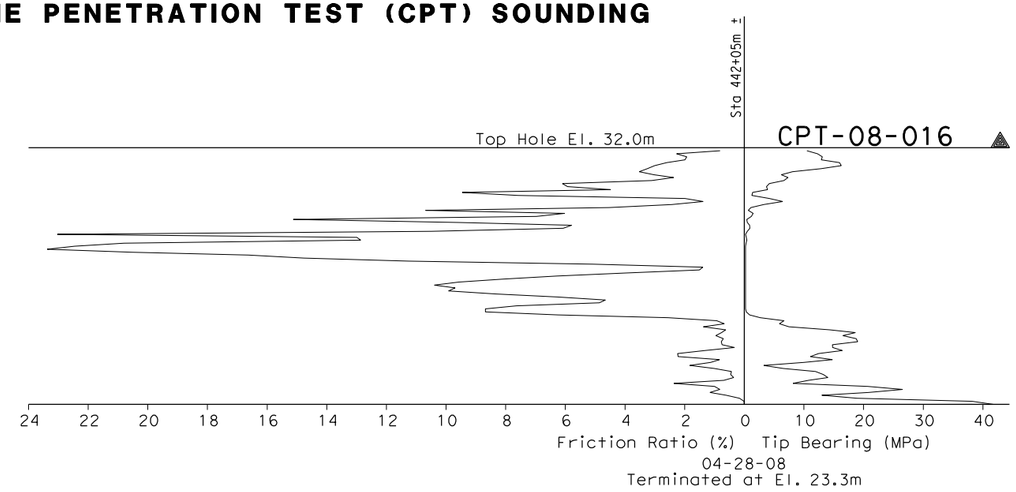
Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



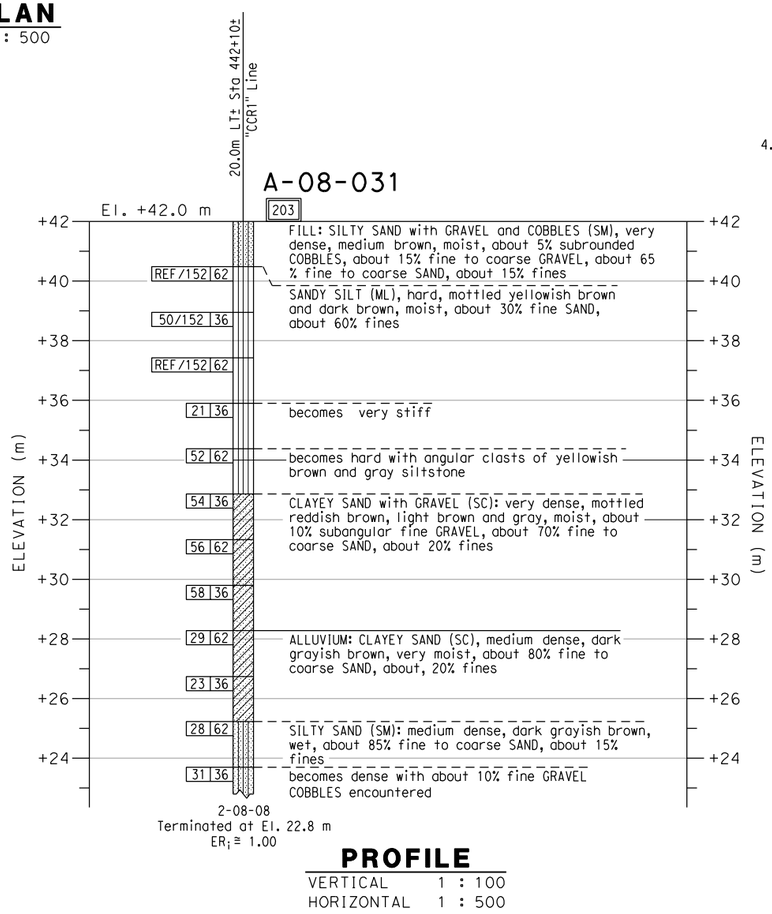
PLAN
1 : 500



CONE PENETRATION TEST (CPT) SOUNDING



CONE PENETRATION TEST (CPT) SOUNDING



PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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

SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.
2. Automatic trip and safety hammer systems consisting of hammer weight of 62.5 kg falling a distance of 762 mm were used to advance the drive samplers in accordance with ASTM D1586.
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   Boart Longyear:
   Longyear 1405: ER$_i$≅1.45
   Prosonic Track Mounted: ER$_i$≅1.00
   Prosonic 1: ER$_i$≅1.45
   Minisonic: ER$_i$≅1.00
   Test America:
   CME 95: ER$_i$≅1.45
   Pacific Drilling:
   Unimog: ER$_i$≅1.27
   Mole: ER$_i$≅1.00
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ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 13 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

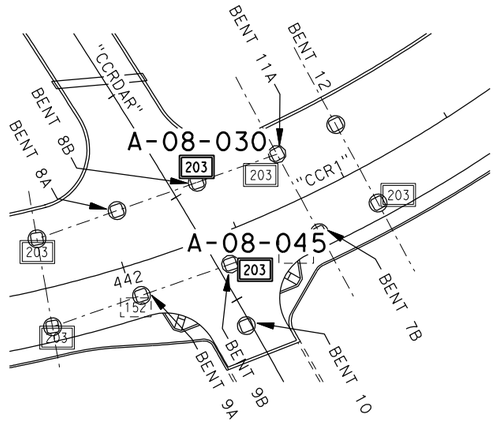
DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES										SHEET	OF
10/14/08	3/9/09										

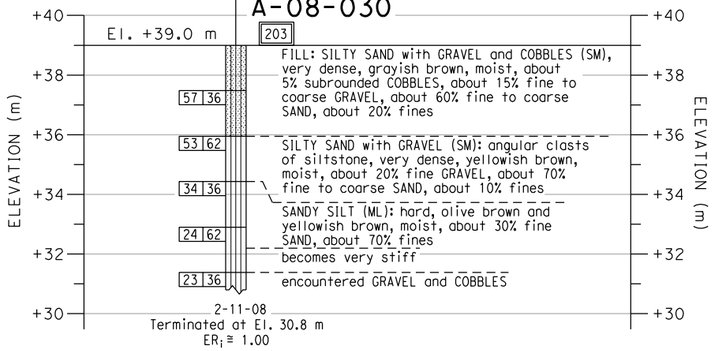
FILE => 57-c0786-z-lotb13.dgn

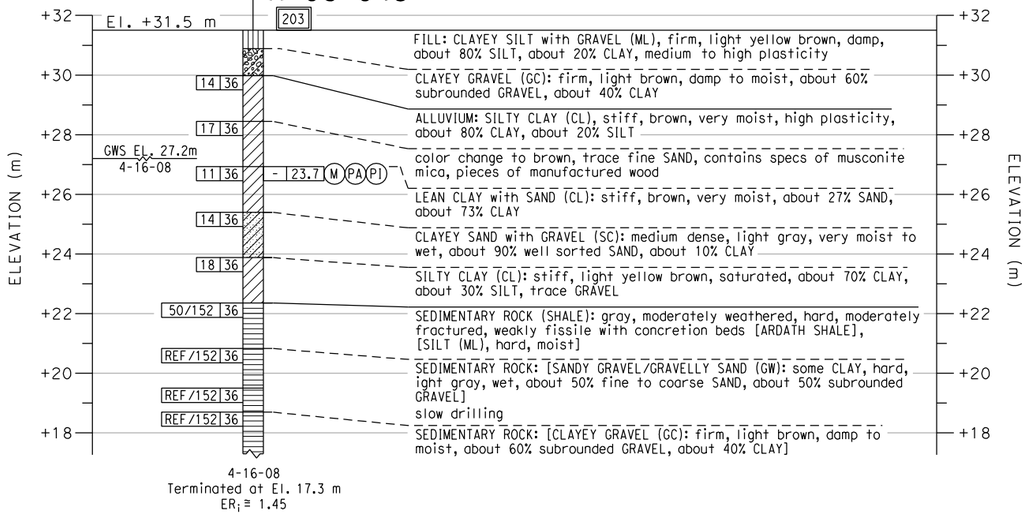
USERNAME => mporanjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:08:29 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
1 : 500





PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:
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   Prosonic 1: $ER_i \cong 1.45$
   Minisonic: $ER_i \cong 1.00$
   Test America:
   CME 95: $ER_i \cong 1.45$
   Pacific Drilling:
   Unimog: $ER_i \cong 1.27$
   Mole: $ER_i \cong 1.00$
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ENGINEERING SERVICES		GEOTECHNICAL SERVICES				
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
NAME:	CHECKED BY: G. CUSTENBORDER			DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 14 OF 22

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

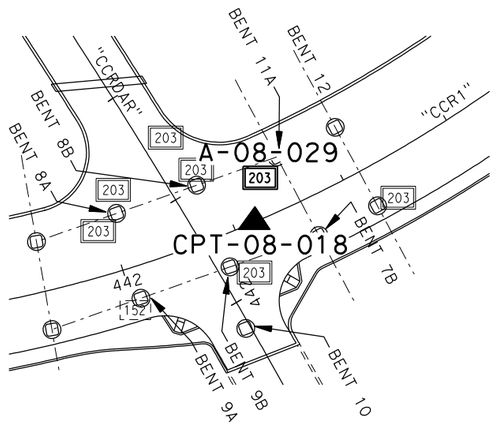
DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES: 10/14/08 | 3/9/09 | SHEET | OF

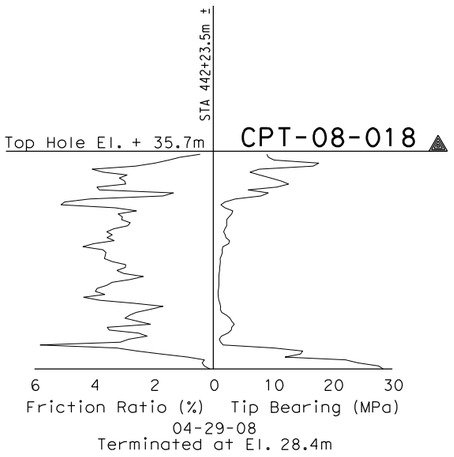
FILE => 57-c0786-z-lotb14.dgn

USERNAME => mporcnjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:08:37 PM

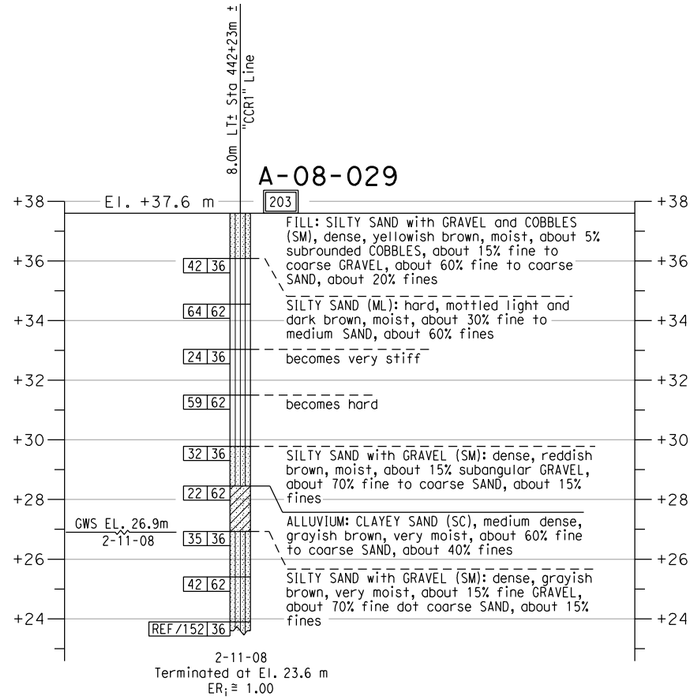
Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
1 : 500



CONE PENETRATION TEST (CPT) SOUNDING



PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:
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   CME 95: ER$_i$ ≅ 1.45
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ENGINEERING SERVICES		GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER			DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 15 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER						

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES

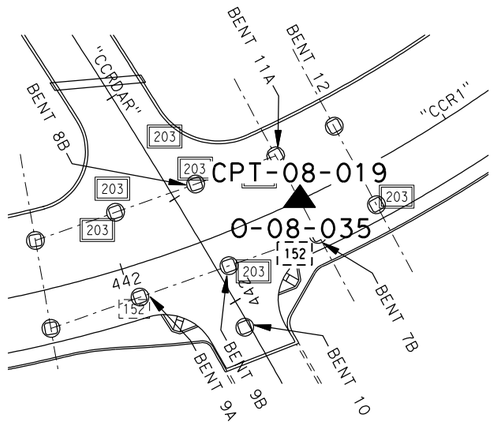
REVISION DATES: 10/14/08, 3/9/09

SHEET OF

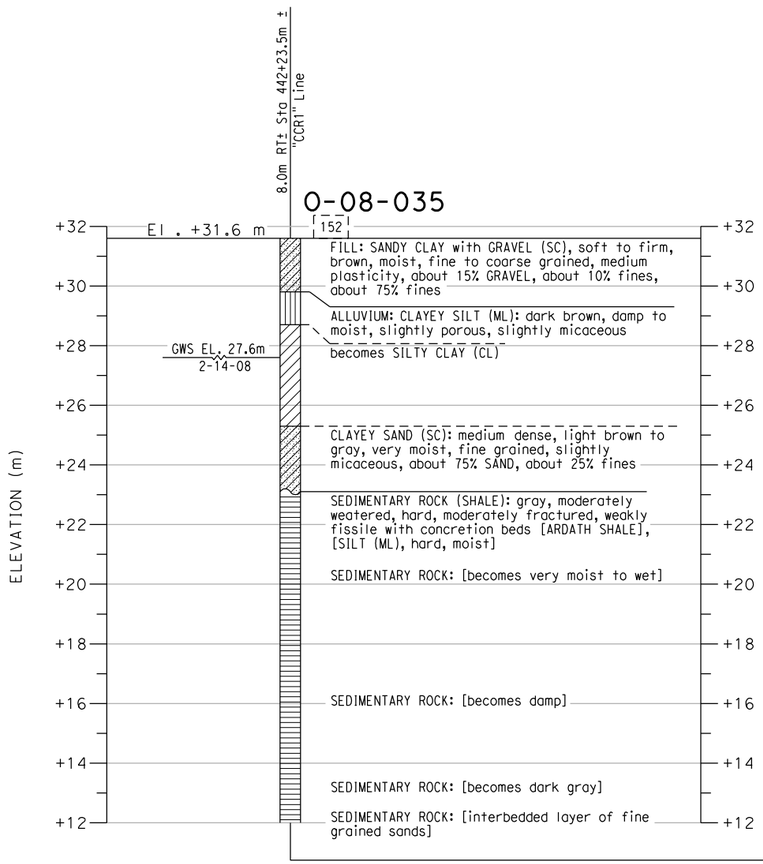
FILE => 57-c0786-z-lotb15.dgn

USERNAME => mporonjape DATE PLOTTED => 3/10/2009 TIME PLOTTED => 11:08:44 PM

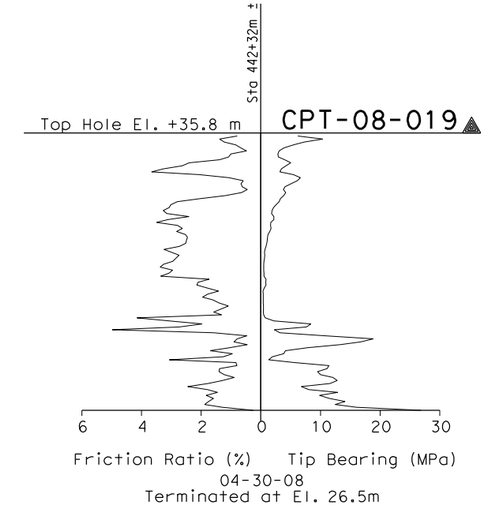
Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
1 : 500



PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500



CONE PENETRATION TEST (CPT) SOUNDING

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

REGISTERED PROFESSIONAL ENGINEER
VAN OLIN
NO. 2578
EXP. 6-30-10
GEOTECHNICAL
STATE OF CALIFORNIA

PLANS APPROVAL DATE

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401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

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   Test America:
   CME 95: ER$_i$≅1.45
   Pacific Drilling:
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ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 16 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES: 10/14/08, 3/9/09

SHEET OF

FILE => 57-c0786-z-lotb16.dgn

USERNAME => mporcinjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:08:50 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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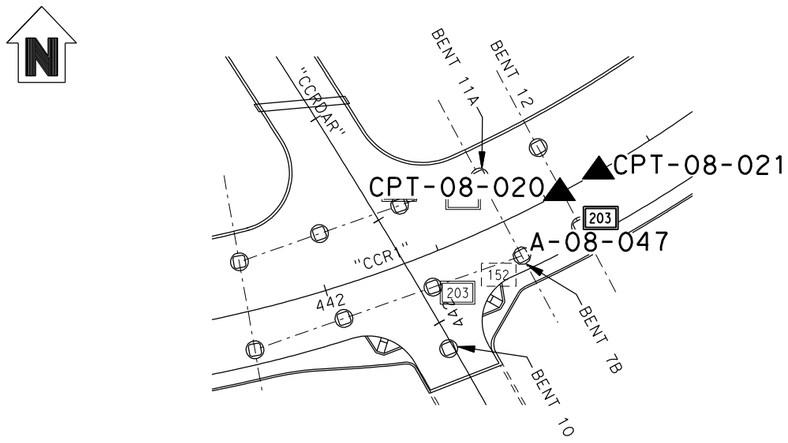
BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111



PLAN
1 : 500

NOTES:

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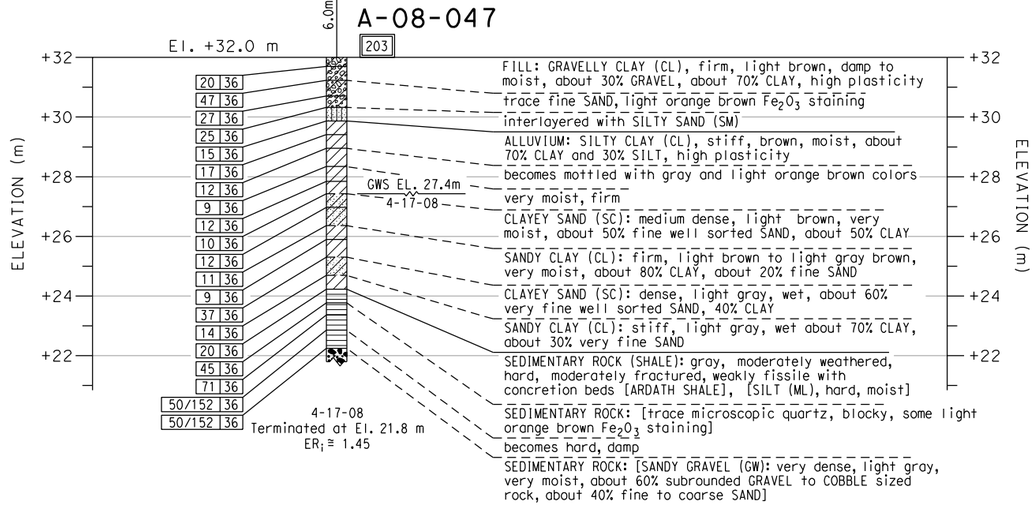
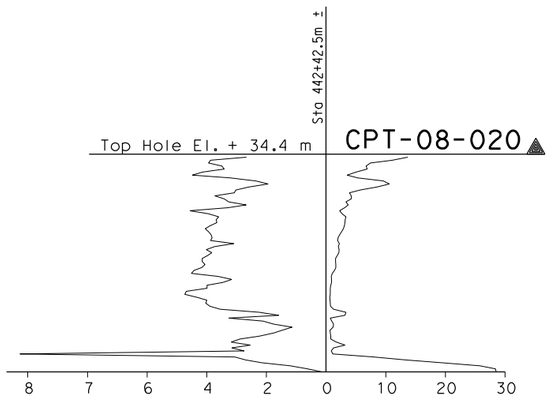
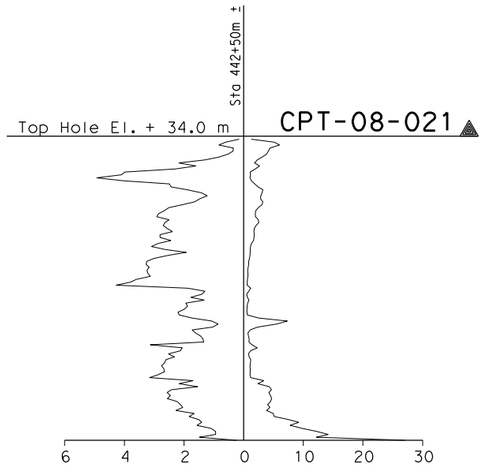


PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500





CONE PENETRATION TEST (CPT) SOUNDINGS

ENGINEERING SERVICES		GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER			DESIGN BRANCH	57-C0786	LOG OF TEST BORINGS SHEET NO. 17 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER					POST MILES KP43.2/PM26.8	

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES							SHEET	OF
10/14/08	3/9/09							

USERNAME => mporonjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:08:57 PM

FILE => 57-c0786-z-lotb17.dgn

Bench Mark
All elevations shown in the LOTBs are in meters
and are referenced to the NGVD 1929 Datum.

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
VAN OLIN
NO. 2578
EXP. 6-30-10
GEOTECHNICAL
STATE OF CALIFORNIA

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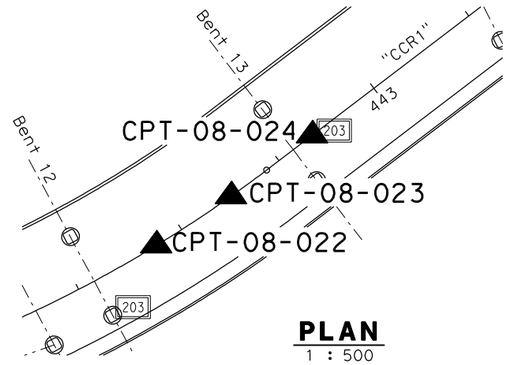
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111



PLAN
1 : 500

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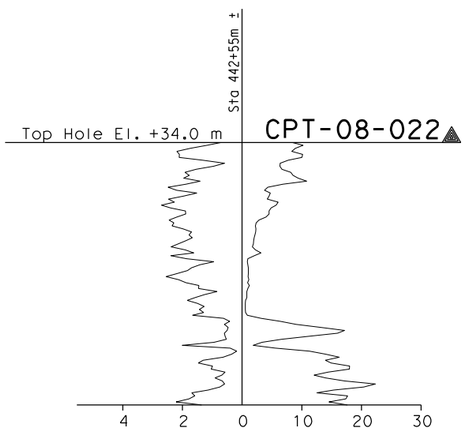
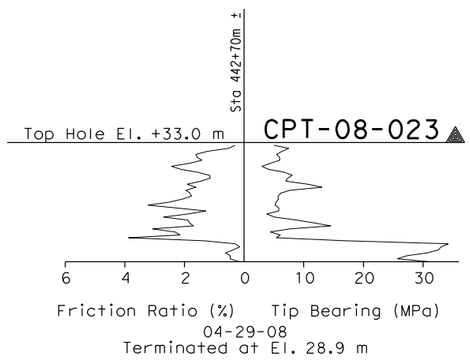
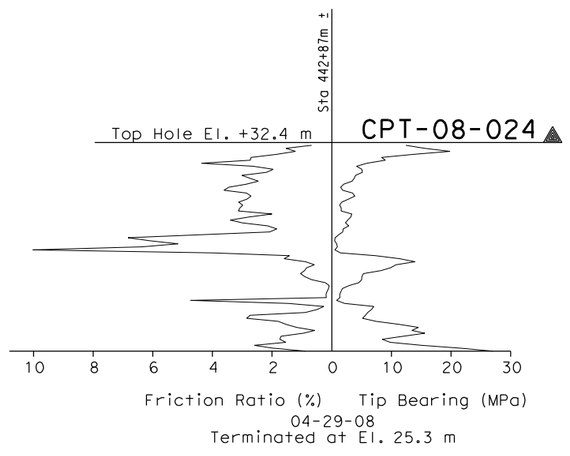






CONE PENETRATION TEST (CPT) SOUNDINGS

PROFILE

VERTICAL : AS SHOWN
HORIZONTAL : AS SHOWN

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 18 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

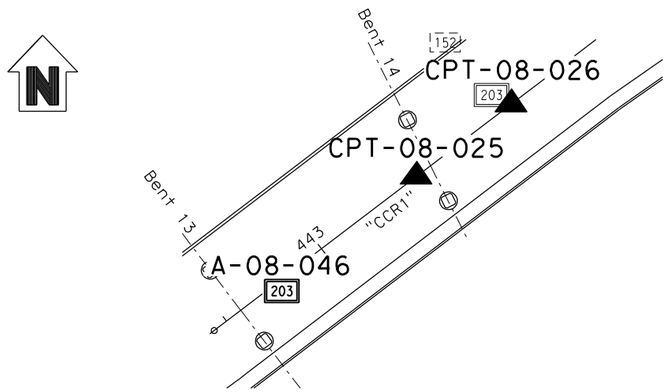
REVISION DATES: 10/14/08 3/9/09

SHEET OF

FILE => 57-c0786-z-lotb18.dgn

USERNAME => mporonjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:09:04 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



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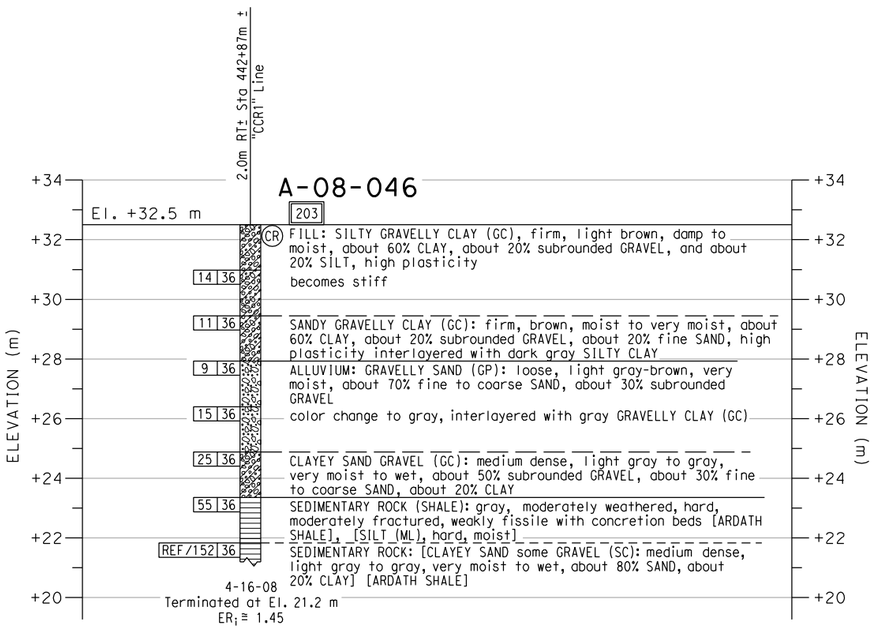
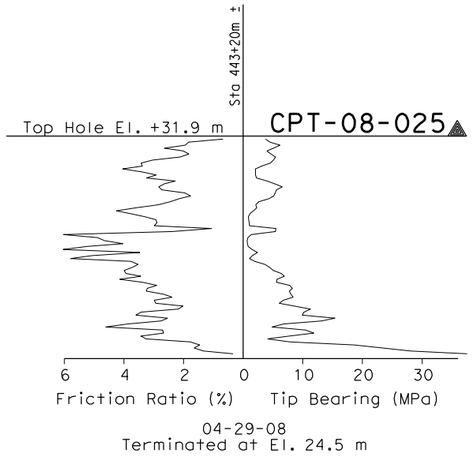
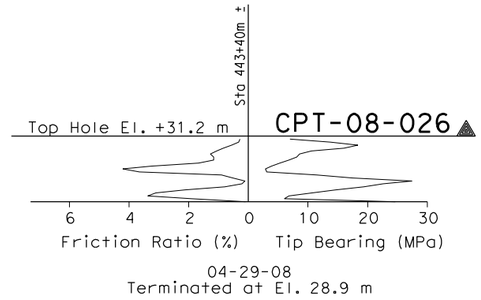


PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500





CONE PENETRATION TEST (CPT) SOUNDINGS

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.

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   Boart Longyear:
   Longyear 1405: ER$_i$≅1.45
   Prosonic Track Mounted: ER$_i$≅1.00
   Prosonic 1: ER$_i$≅1.45
   Minisonic: ER$_i$≅1.00
   Test America:
   CME 95: ER$_i$≅1.45
   Pacific Drilling:
   Unimog: ER$_i$≅1.27
   Mole: ER$_i$≅1.00
   Minimole: ER$_i$≅1.00

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ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 19 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES										SHEET	OF
10/14/08	3/9/09										

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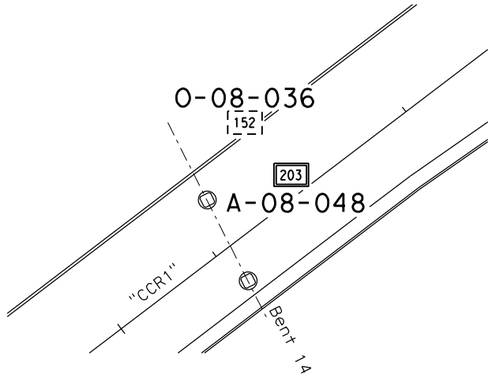
USERNAME => mporanjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:09:10 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



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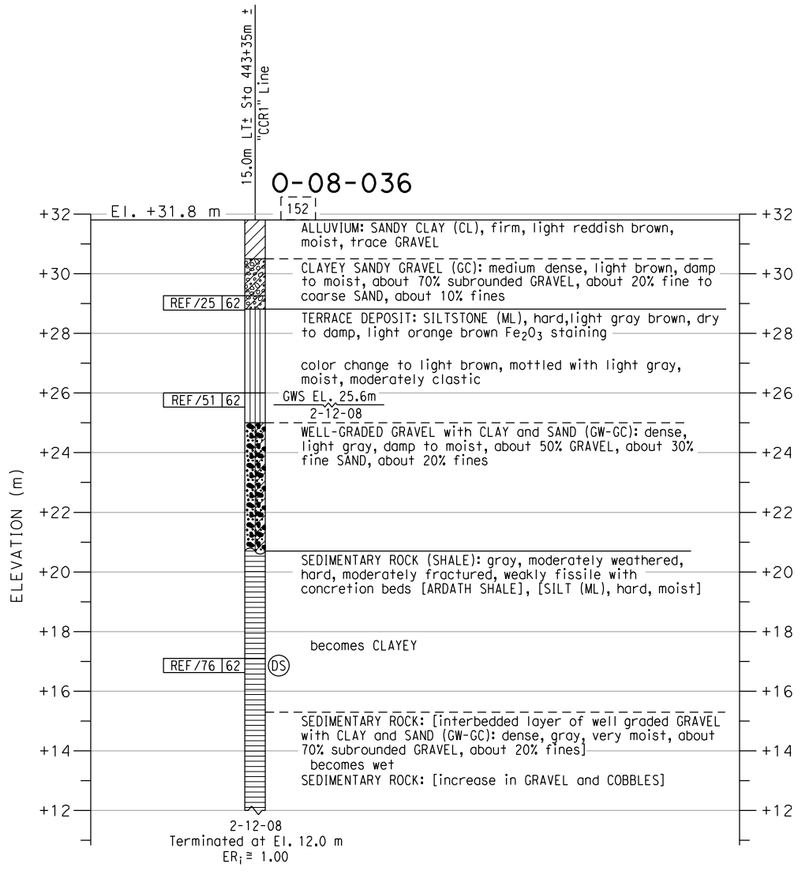

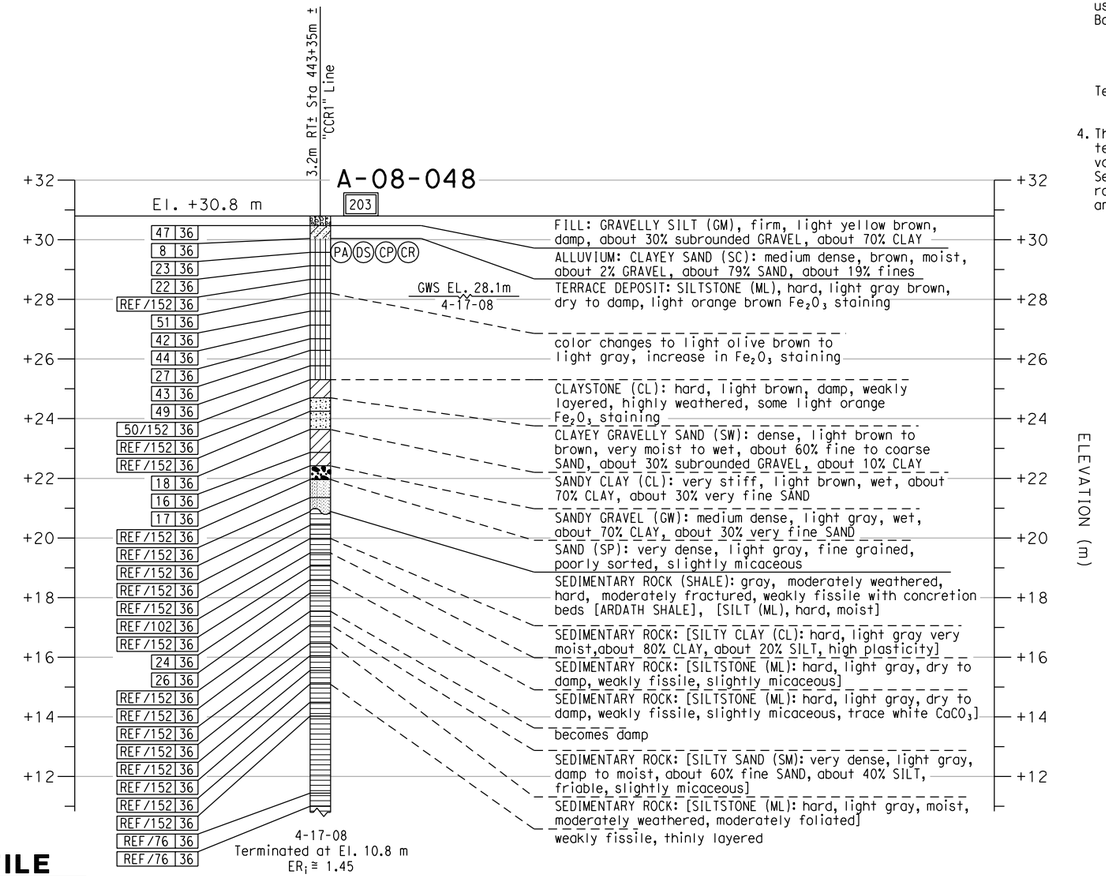

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SANDAG
401 B STREET,
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BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

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   Prosonic 1: $ER_i \cong 1.45$
   Minisonic: $ER_i \cong 1.00$
   Test America:
   CME 95: $ER_i \cong 1.45$
   Pacific Drilling:
   Unimog: $ER_i \cong 1.27$
   Mole: $ER_i \cong 1.00$
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ENGINEERING SERVICES		GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER			DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 20 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER				CU 11275 EA 2T0401	DISREGARD PRINTS BEARING EARLIER REVISION DATES →	REVISION DATES 10/14/08, 3/9/09; SHEET; OF

OGS CIVIL LOG OF TEST BORINGS SHEET

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

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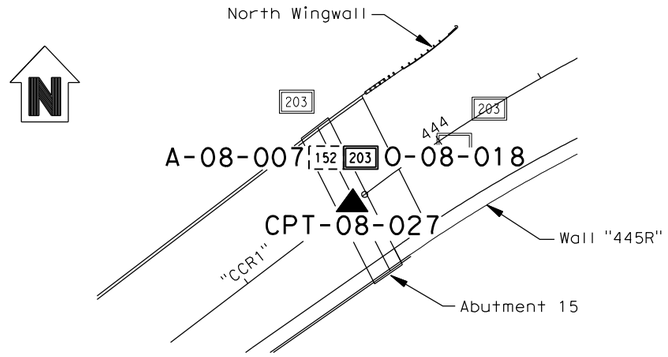

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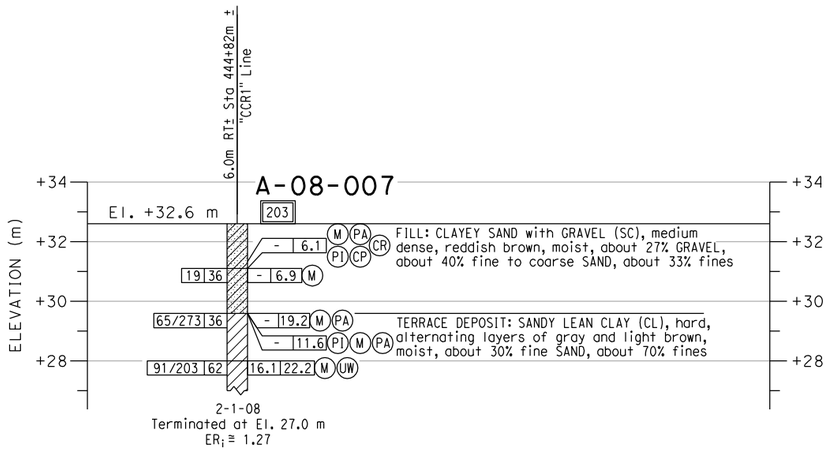

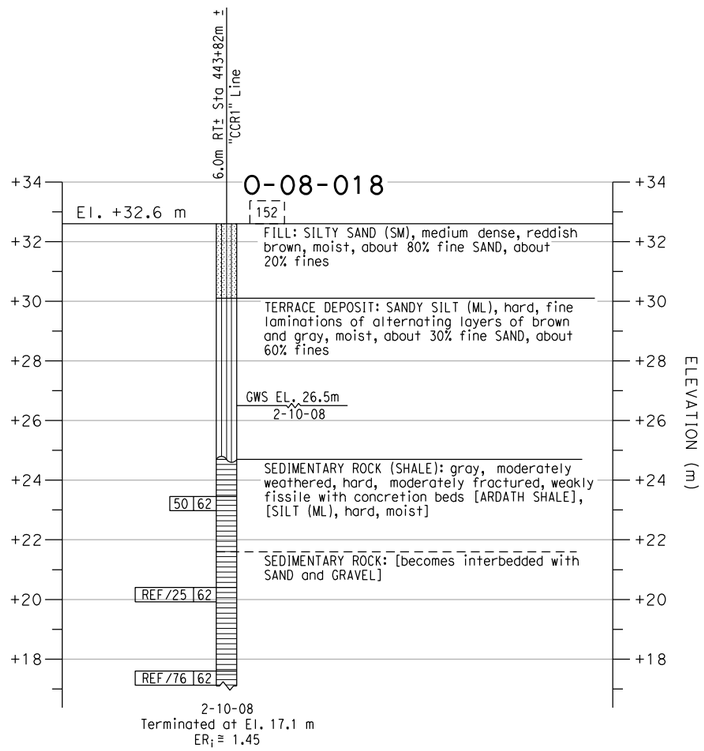

PROFILE
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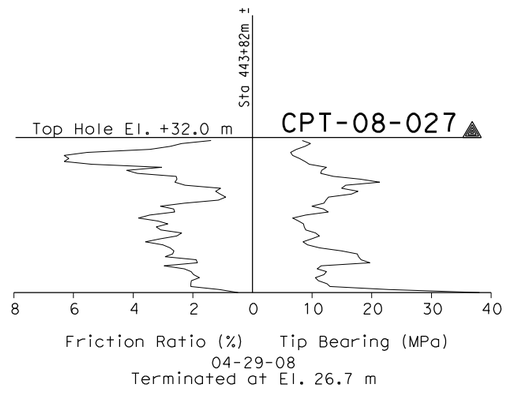
HORIZONTAL 1 : 500



CONE PENETRATION TEST (CPT) SOUNDING

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SANDAG
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SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

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   - Prosonic 1: $ER_i \cong 1.45$
   - Minisonic: $ER_i \cong 1.00$

   Pacific Drilling:
   - Unimog: $ER_i \cong 1.27$
   - Mole: $ER_i \cong 1.00$
   - Minimole: $ER_i \cong 1.00$

   Test America:
   - CME 95: $ER_i \cong 1.45$

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ENGINEERING SERVICES		GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER			DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 21 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER						

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES										SHEET	OF
10/14/08	3/9/09										

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Bench Mark
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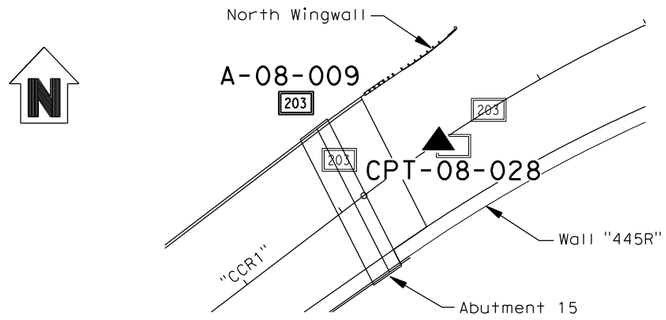

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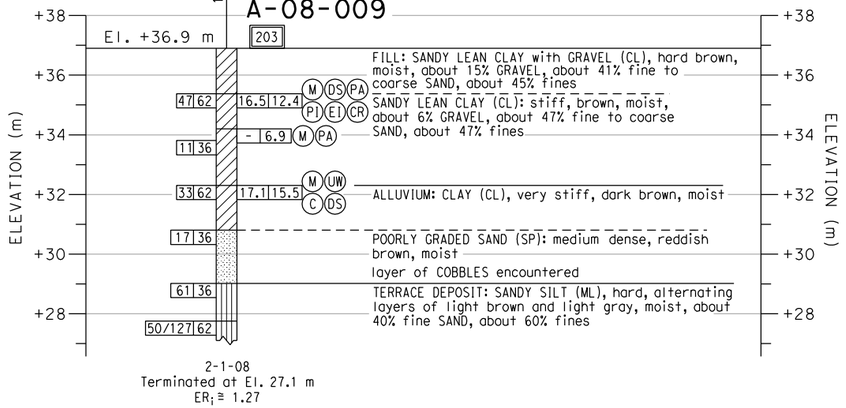

PROFILE
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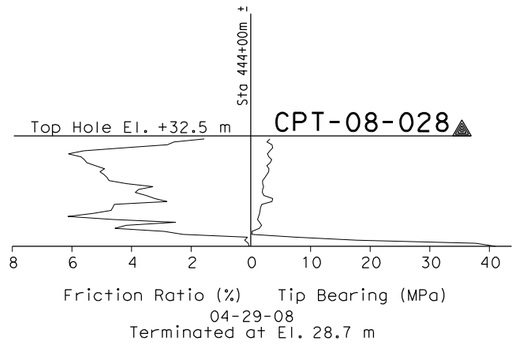
HORIZONTAL 1 : 500



CONE PENETRATION TEST (CPT) SOUNDING

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SAN DIEGO, CA. 92101

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7895 CONVOY CT.
SAN DIEGO, CA. 92111

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FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 22 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES: 10/14/08, 3/9/09

SHEET OF

FILE => 57-c0786-z-lotb22.dgn

USERNAME => mporonjoe DATE PLOTTED => 3/10/2009 TIME PLOTTED => 11:08:30 PM

APPENDIX I.8

DIRECT ACCESS RAMP LOTBs

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

GROUP SYMBOLS AND NAMES

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

FIELD AND LABORATORY TESTING

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

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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APPARENT DENSITY OF COHESIONLESS SOILS

Description	SPT N_{60} (Blows / 300 mm)
Very loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE

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

PERCENT OR PROPORTION OF SOILS

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

PARTICLE SIZE

Description		Size
Boulder		> 300 mm
Cobble		76 mm to 300 mm
Gravel	Coarse	19 mm to 76 mm
	Fine	No. 4 to 19 mm
Sand	Coarse	No. 10 to No. 4
	Medium	No. 40 to No. 10
	Fine	No. 200 to No. 40

SOIL LEGEND

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	DIRECT ACCESS RAMP
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	57-E0075/76	
NAME:	CHECKED BY: G. CUSTENBORDER				POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 1 OF 11

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES: 10/14/08, 3/9/09

SHEET OF

FILE => 57-e0075_76-z-lotb01.dgn

USERNAME => mporonjope DATE PLOTTED => 3/4/2009 TIME PLOTTED => 3:35:37 PM

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

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CEMENTATION

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

BOREHOLE IDENTIFICATION

Symbol	Hole Type	Description
Size	A	Auger Boring
Size	R P	Rotary drilled boring Rotary percussion boring (air)
Size	R	Rotary drilled diamond core
Size	HD HA	Hand driven (25 mm soil tube) Hand Auger
●	D	Dynamic Cone Penetration Boring
▲	CPT	Cone Penetration Test (ASTM D 5778-95)
[ ]	O	Other

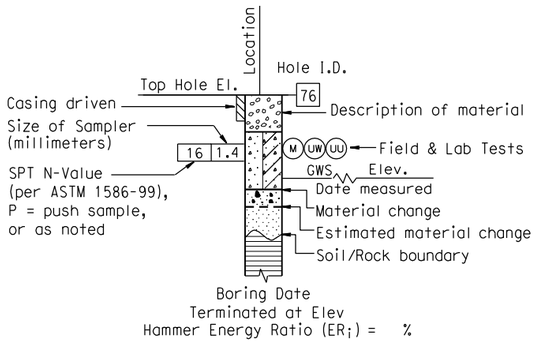
Note: Size in millimeters.

CONSISTENCY OF COHESIVE SOILS

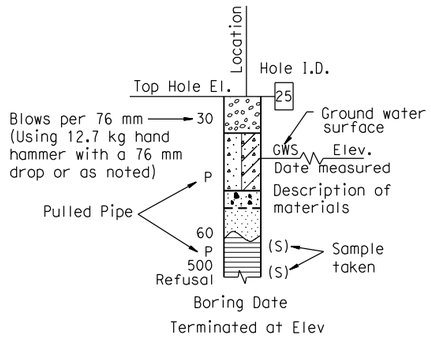
Description	Unconfined Compressive Strength (tsm)	Pocket Penetrometer Measurement (tsm)	Torvane Measurement (tsm)	Field Approximation
Very Soft	< 24	< 24	< 12	Easily penetrated several inches by fist
Soft	24 to 48	24 to 48	12 to 24	Easily penetrated several inches by thumb
Medium Stiff	48 to 96	48 to 96	24 to 48	Penetrated several inches by thumb with moderate effort
Stiff	96 to 192	96 to 192	48 to 96	Readily indented by thumb but penetrated only with great effort
Very Stiff	192 to 383	192 to 383	96 to 192	Readily indented by thumbnail
Hard	> 383	> 383	> 192	Indented by thumbnail with difficulty

PLASTICITY OF FINE-GRAINED SOILS

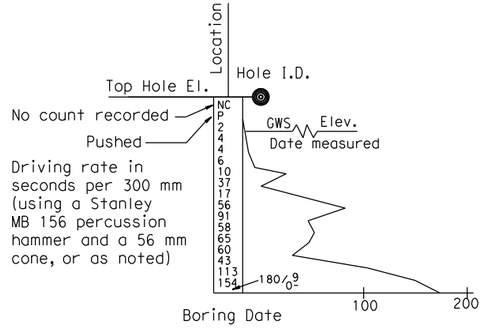
Description	Criteria
Nonplastic	A 3 mm thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.



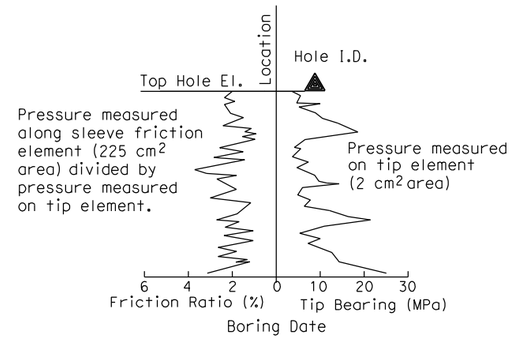
ROTARY BORING



HAND BORING



DYNAMIC CONE PENETRATION BORING



CONE PENETRATION TEST (CPT) SOUNDING

SOIL LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	DIRECT ACCESS RAMP
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	57-E0075/76	
NAME:	CHECKED BY: G. CUSTENBORDER				POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 2 OF 11

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES		SHEET	OF
10/14/08	3/9/09		

FILE => 57-e0075_76-z-lotb02.dgn

USERNAME => mparcinjope DATE PLOTTED => 3/4/2009 TIME PLOTTED => 3:35:46 PM

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
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Caltrans Metric

REGISTERED GEOTECHNICAL ENGINEER

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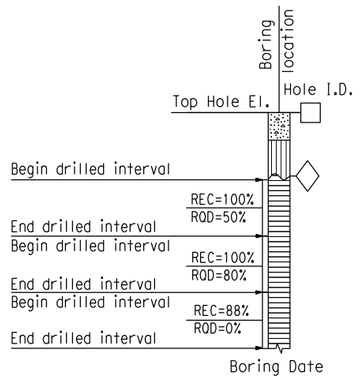
PERCENT CORE RECOVERY (REC) & ROCK QUALITY DESIGNATION (RQD)

$$REC = \frac{\sum \text{Length of the recovered core pieces}}{\text{Total length of core run}} \times 100\%$$

$$RQD = \frac{\sum \text{Length of intact core pieces} \geq 100\ mm}{\text{Total length of core run}} \times 100\%$$



RELATIVE STRENGTH OF INTACT ROCK

Term	Uniaxial Compressive Strength (MPa)
Extremely Strong	> 207
Very Strong	100 - 207
Strong	49 - 100
Medium Strong	25 - 49
Weak	5 - 25
Very Weak	1 - 5
Extremely Weak	< 1

BEDDING SPACING

Description	Thickness / Spacing
Massive	Greater than 3 m
Very thickly bedded	1 m to 3 m
Thickly bedded	300 mm to 1 m
Moderately bedded	100 mm to 300 mm
Thinly bedded	30 mm to 100 mm
Very thinly bedded	10 mm to 30 mm
Laminated	Less than 10 mm

LEGEND OF ROCK MATERIALS

- IGNEOUS ROCK
- SEDIMENTARY ROCK
- METAMORPHIC ROCK

ROCK HARDNESS

Description	Criteria
Extremely Hard	Specimen cannot be scratched with a pocket knife or sharp pick; can only be chipped with repeated heavy hammer blows.
Very Hard	Specimen cannot be scratched with a pocket knife or sharp pick. Breaks with repeated heavy hammer blows.
Hard	Specimen can be scratched with a pocket knife or sharp pick with difficulty (heavy pressure). Heavy hammer blows required to break specimen.
Moderately Hard	Specimen can be scratched with pocket knife or sharp pick with light or moderate pressure. Core breaks with moderate hammer pressure.
Moderately Soft	Specimen can be grooved 5 mm deep with a pocket knife or sharp pick with moderate or heavy pressure. Breaks with light hammer blow or heavy manual pressure.
Soft	Specimen can be grooved or gouged easily by a pocket knife or sharp pick with light pressure, can be scratched with fingernail. Breaks with light to moderate manual pressure.
Very Soft	Specimen can be readily indented, grooved or gouged with fingernail, or carved with a pocket knife. Breaks with light manual pressure.

FRACTURE DENSITY

Description	Observed Fracture Density
Unfractured	No fractures.
Very slightly fractured	Lengths greater than 1 m.
Slightly fractured	Lengths from 300 mm to 1000 mm with few lengths less than 300 mm or greater than 1000 mm.
Moderately fractured	Lengths mostly in 100 mm to 300 mm range with most lengths about 200 mm.
Intensely fractured	Lengths average from 30 mm to 100 mm with scattered fragmented intervals with lengths less than 100 mm.
Very intensely fractured	Mostly chips and fragments with a few scattered short core lengths.

Combination descriptors (such as "Very intensely to intensely fractured") are used where equal distribution of both fracture density characteristics is present over a significant interval or exposure, or where characteristics are "in between" the descriptor definitions. Only two adjacent descriptors may be combined.

WEATHERING DESCRIPTORS FOR INTACT ROCK

Description	Diagnostic features: Chemical Weathering-Discoloration and/or oxidation — Body of Rock	Diagnostic features: Chemical Weathering-Discoloration and/or oxidation — Fracture Surfaces	Diagnostic features: Mechanical Weathering-Grain boundary conditions (disaggregation) primarily for granitics and some coarse-grained sediments	Diagnostic features: Texture and Solutioning — Texture	Diagnostic features: Texture and Solutioning — Solutioning	General Characteristics
Fresh	No discoloration, not oxidized.	No discoloration or oxidation.	No separation, intact (tight).	No change.	No solutioning.	Hammer rings when crystalline rocks are struck.
Slightly Weathered	Discoloration or oxidation is limited to surface of, or short distance from, fractures; some feldspar crystals are dull.	Minor to complete discoloration or oxidation of most surfaces.	No visible separation, intact (tight).	Preserved.	Minor leaching of some soluble minerals may be noted.	Hammer rings when crystalline rocks are struck. Body of rock not weakened.
Moderately Weathered	Discoloration or oxidation extends from fractures usually throughout; Fe-Mg minerals are "rusty," feldspar crystals are "cloudy."	All fracture surfaces are discolored or oxidized.	Partial separation of boundaries visible.	Generally preserved.	Soluble minerals may be mostly leached.	Hammer does not ring when rock is struck. Body of rock is slightly weakened.
Intensely Weathered	Discoloration or oxidation throughout; all feldspars and Fe-Mg minerals are altered to clay to some extent; or chemical alteration produces in-situ disaggregation, see grain boundary conditions.	All fracture surfaces are discolored or oxidized, surfaces friable.	Partial separation, rock is friable; in semiarid conditions granitics are disaggregated.	Texture altered by chemical disintegration (hydration, argillation).	Leaching of soluble minerals may be complete.	Dull sound when struck with hammer, usually can be broken with moderate to heavy manual pressure or by light hammer blow without reference to planes of weakness such as incipient or hairline fractures, or veinlets. Rock is significantly weakened.
Decomposed	Discolored or oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe-Mg minerals are completely altered to clay.		Complete separation of grain boundaries (disaggregated).	Resembles a soil, partial or complete remnant rock structure may be preserved; leaching of soluble minerals usually complete.		Can be granulated by hand. Resistant minerals such as quartz may be present as "stringers" or "dikes."

Combination descriptors (such as "slightly weathered to fresh") are permissible where equal distribution of both weathering characteristics is present over significant intervals or where characteristics present are "in between" the diagnostic feature. However, combination descriptors should not be used where significant, identifiable zones can be delineated. Only two adjacent descriptors may be combined. "Very intensely weathered" is the combination descriptor for "intensely weathered to decomposed."

ROCK LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-E0075/76	DIRECT ACCESS RAMP
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 3 OF 11
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES: 10/14/08 | 3/9/09 | SHEET | OF

FILE => 57-e0075_76-z-lotb03.dgn

USERNAME => mporcinjope DATE PLOTTED => 3/4/2009 TIME PLOTTED => 3:35:58 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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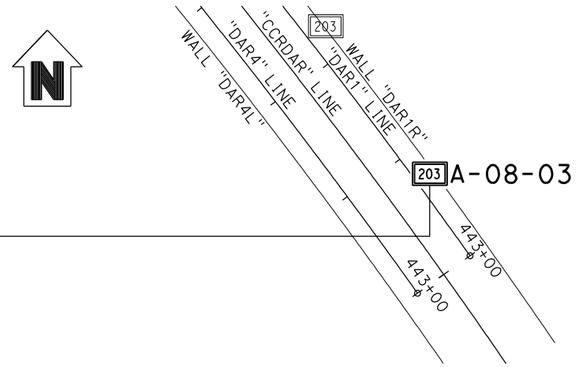
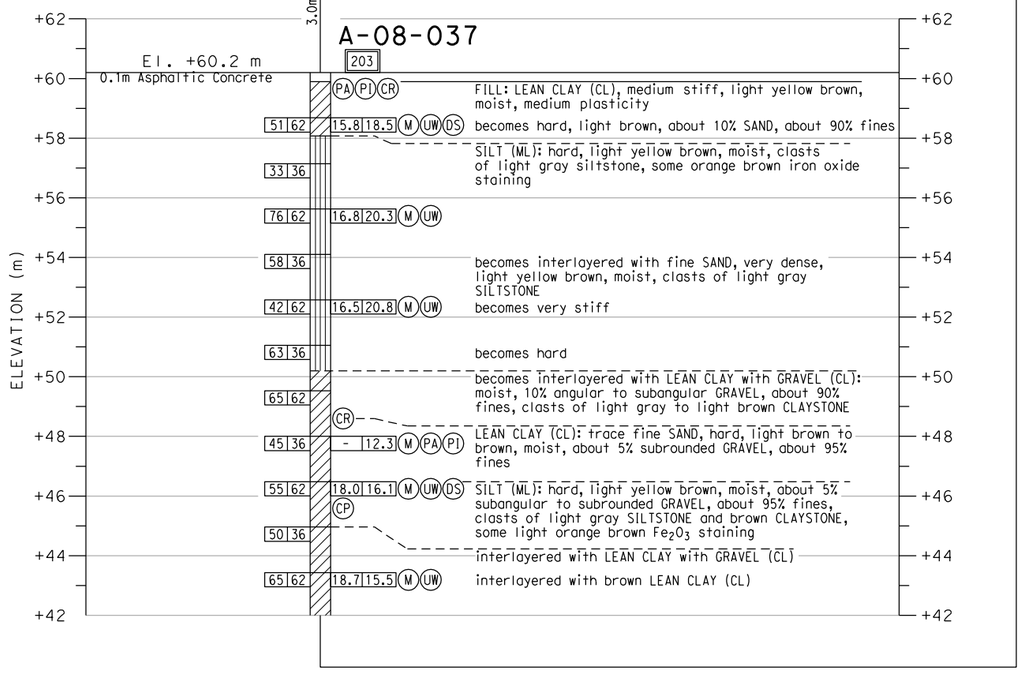
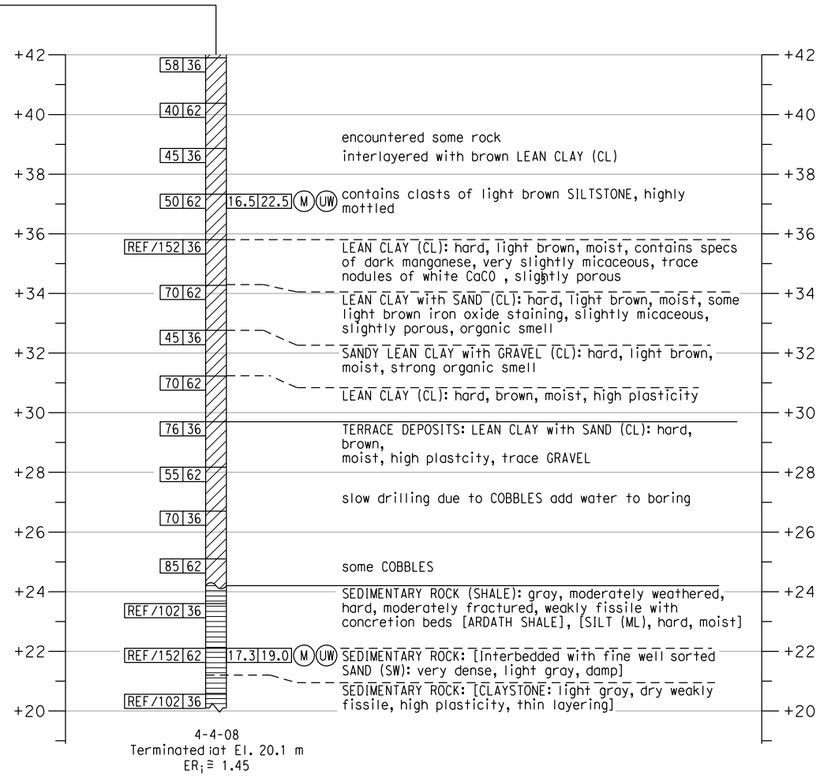


PLAN
1 : 500





PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.

2. Automatic trip and safety hammer systems consisting of hammer weight of 62.5 kg falling a distance of 762 mm were used to advance the drive samplers in accordance with ASTM D1586.

3. The average hammer energy ratio (ER_i) reflects the percentage efficiency of SPT blowcounts (N-value). The estimated ER_i for the various drilling equipment used was as follows:
   Boart Longyear:
   Longyear 1405: $ER_i \cong 1.45$
   Prosonic Track Mounted: $ER_i \cong 1.00$
   Prosonic 1: $ER_i \cong 1.45$
   Minisonic: $ER_i \cong 1.00$
   Pacific Drilling:
   Unimog: $ER_i \cong 1.27$
   Mole: $ER_i \cong 1.00$
   Minimole: $ER_i \cong 1.00$
   Test America:
   CME 95: $ER_i \cong 1.45$

4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (ROD) index is not relevant and therefore not reported on LOTBs.

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FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 4 OF 11
NAME:	CHECKED BY: G. CUSTENBORDER	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER			

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

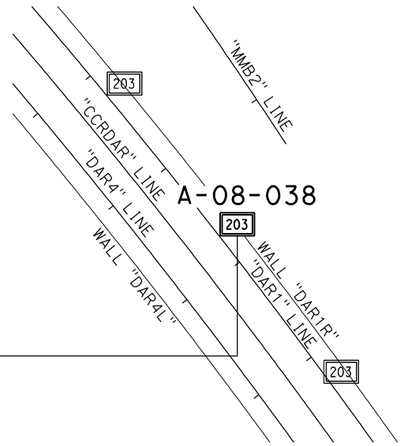
DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES										SHEET	OF
10/14/08	3/9/09										

FILE => 57-e0075_76-z-lotb04.dgn

USERNAME => mparonjape DATE PLOTTED => 3/4/2009 TIME PLOTTED => 3:36:05 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



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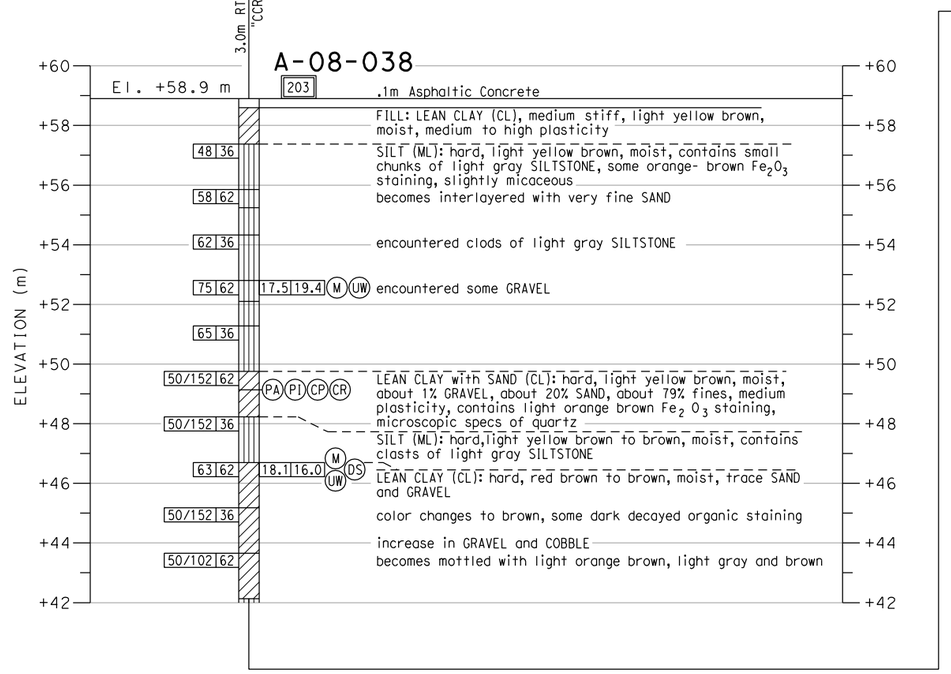
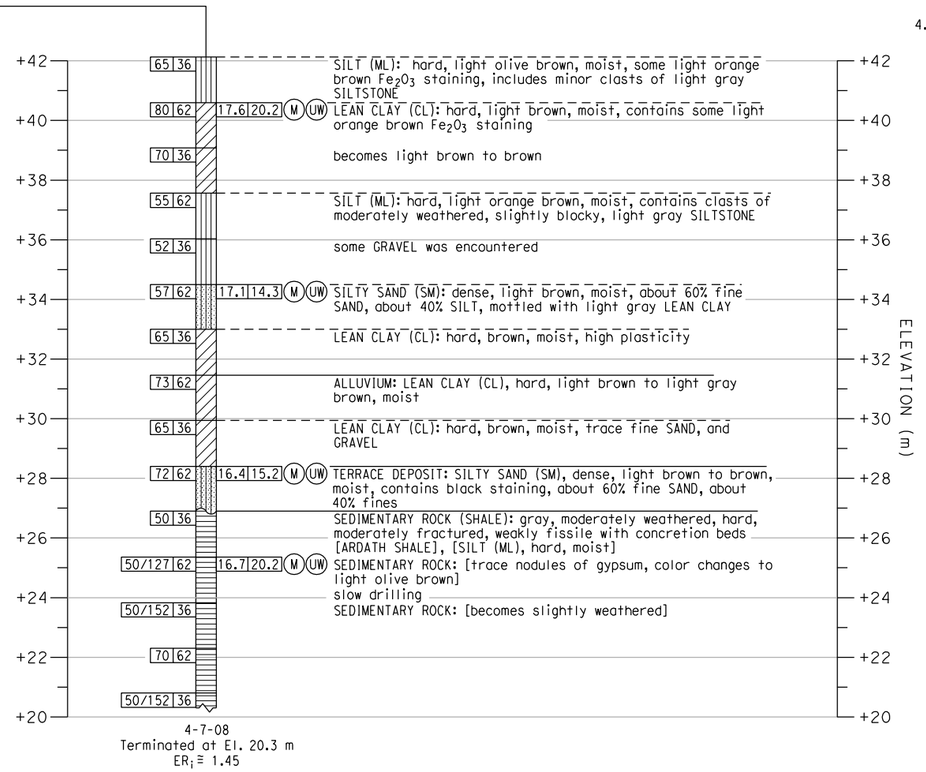


PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500



4-7-08
Terminated at El. 20.3 m
ER_i = 1.45

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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BUREAU VERITAS NORTH AMERICA, INC.
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NOTES:

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   CME 95: ER_i ≅ 1.45
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FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER			DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 5 OF 11
NAME:	CHECKED BY: G. CUSTENBORDER						

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES									SHEET	OF
10/14/08	3/9/09									

FILE => 57-e0075_76-z-lotb05.dgn

USERNAME => mporonjae DATE PLOTTED => 3/4/2009 TIME PLOTTED => 3:36:12 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
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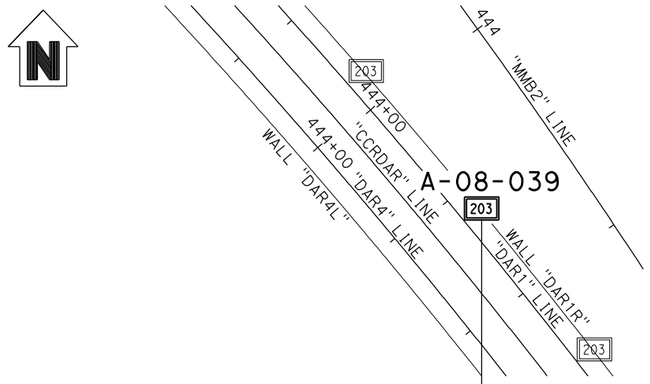

PLAN
1 : 500

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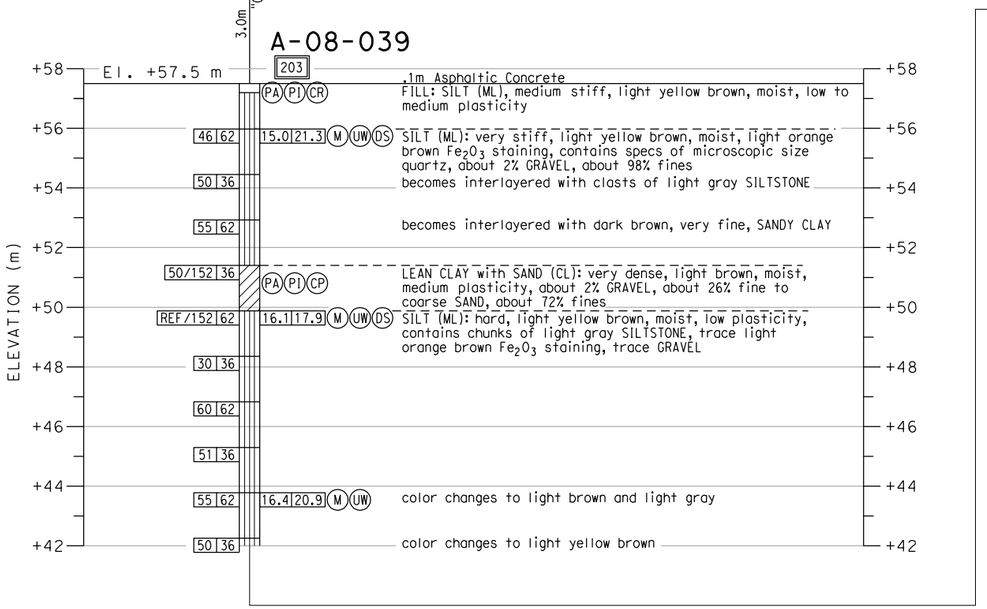

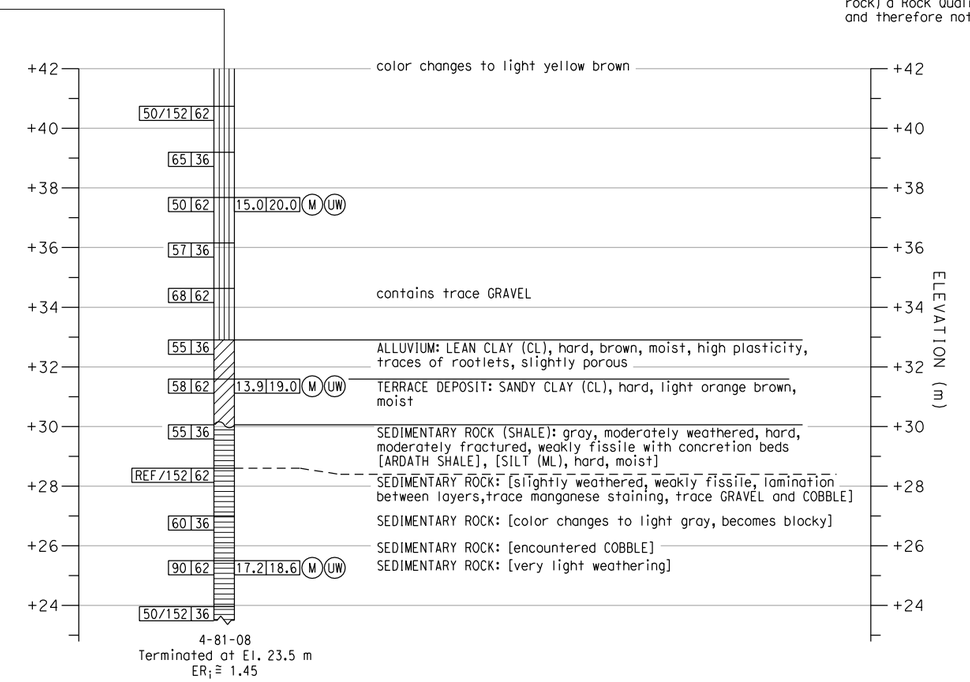

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

ENGINEERING SERVICES		GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-E0075/76	DIRECT ACCESS RAMP
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN G. CUSTENBORDER			DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 6 OF 11
NAME:	CHECKED BY: G. CUSTENBORDER						

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES								SHEET	OF
10/14/08	3/9/09								

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Bench Mark
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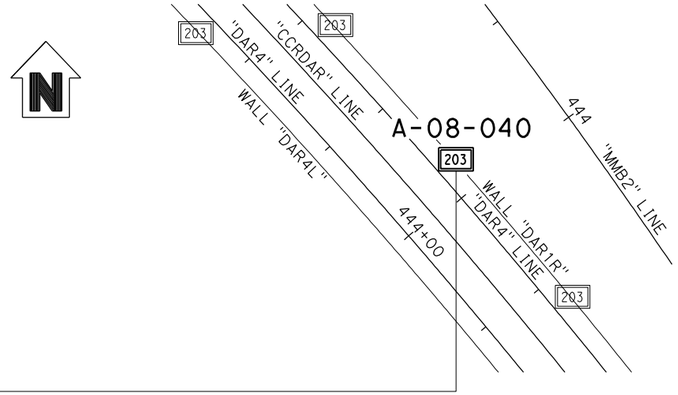

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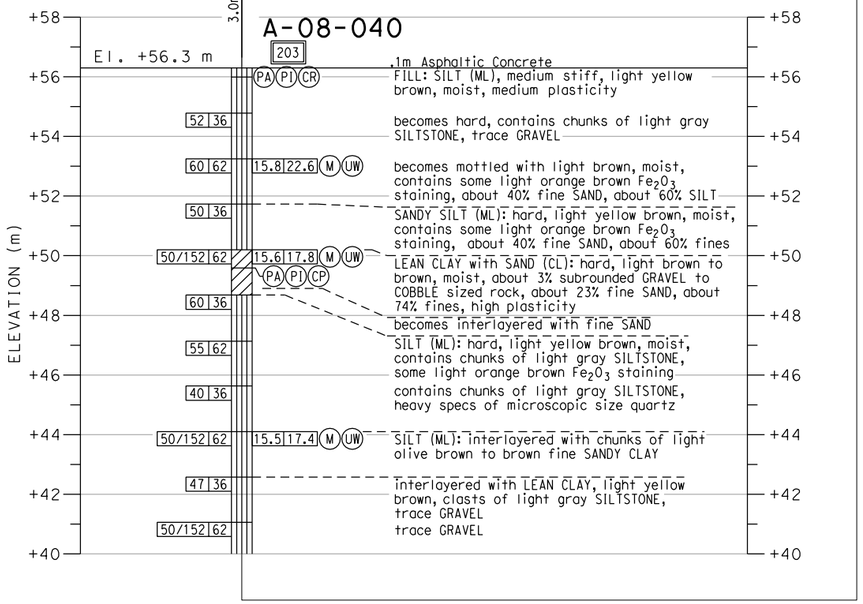

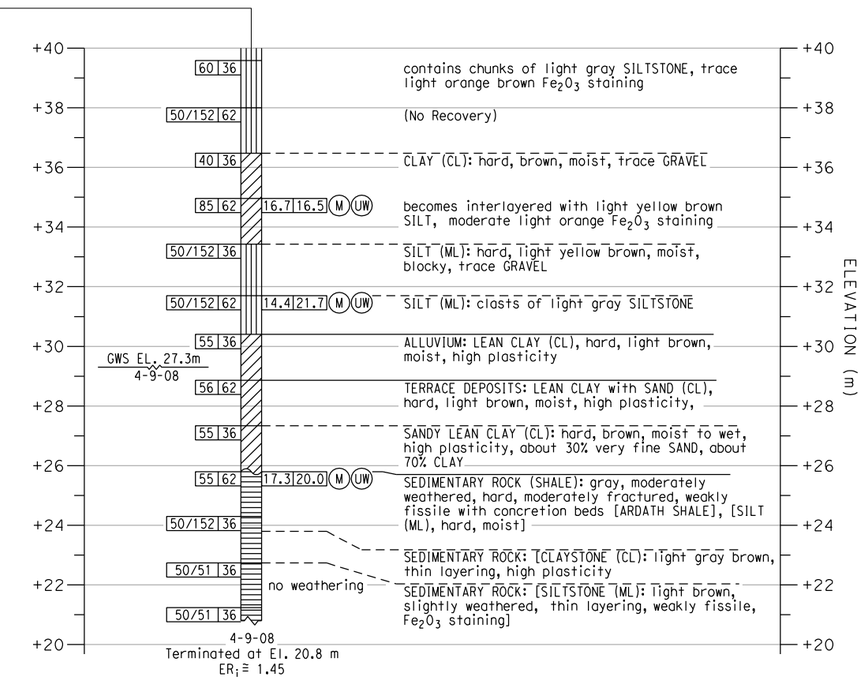

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

Caltrans Metric

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.
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   Minisonic: $ER_i \cong 1.00$
   Test America:
   CME 95: $ER_i \cong 1.45$
   Pacific Drilling:
   Unimog: $ER_i \cong 1.27$
   Mole: $ER_i \cong 1.00$
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ENGINEERING SERVICES		GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	DIRECT ACCESS RAMP
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN G. CUSTENBORDER			DESIGN BRANCH	57-E0075/76	LOG OF TEST BORINGS SHEET NO. 7 OF 11
NAME:	CHECKED BY: G. CUSTENBORDER					POST MILES KP43.2/PM26.8	

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES										SHEET	OF
10/14/08	3/9/09										

FILE => 57-e0075_76-z-lotb07.dgn

USERNAME => mparonjape DATE PLOTTED => 3/4/2009 TIME PLOTTED => 3:36:25 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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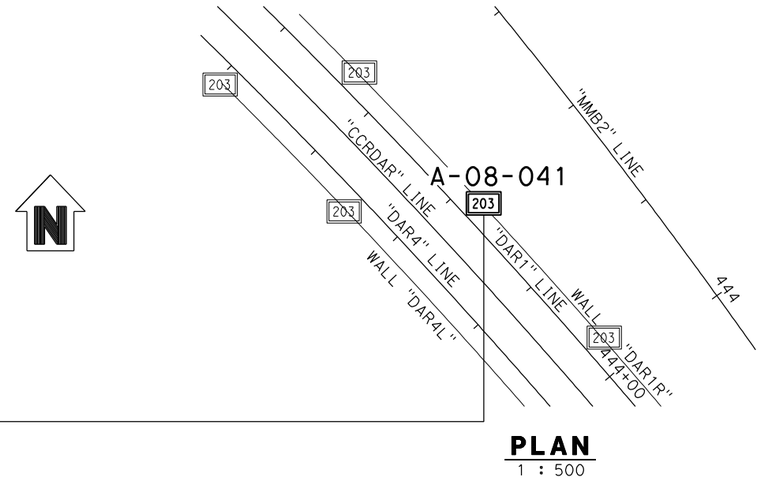
SAN DIEGO, CA. 92111



PLAN
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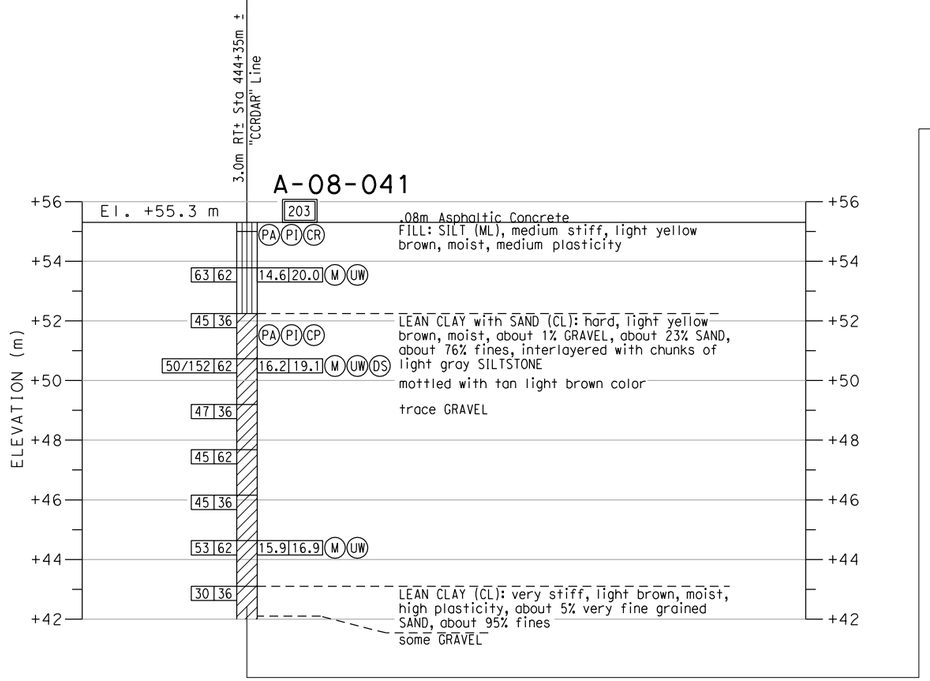
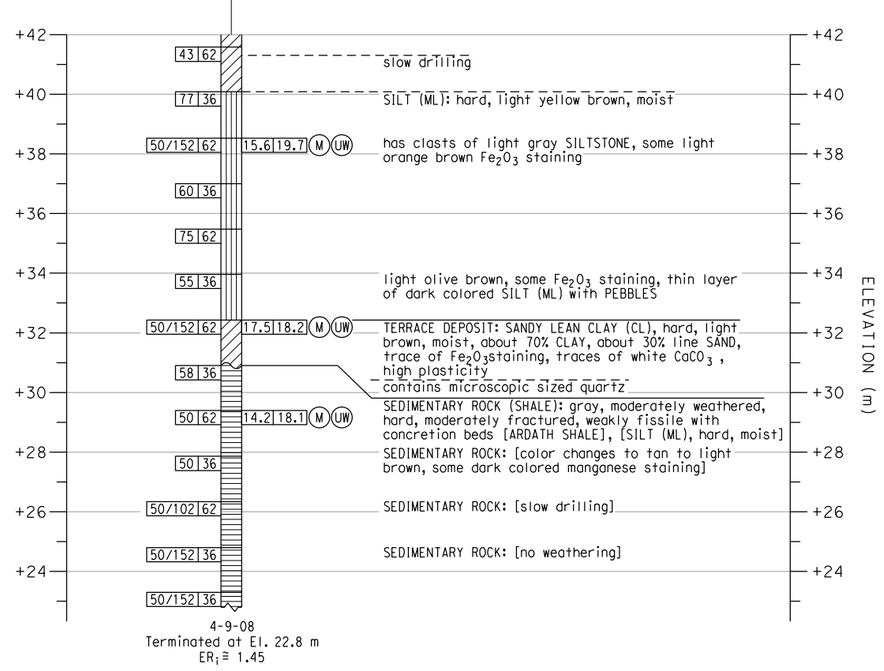


PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500



4-9-08
Terminated at El. 22.8 m
$ER_i \cong 1.45$

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   Prosonic 1: $ER_i \cong 1.45$
   Minisonic: $ER_i \cong 1.00$
   Test America:
   CME 95: $ER_i \cong 1.45$
   Pacific Drilling:
   Unimog: $ER_i \cong 1.27$
   Mole: $ER_i \cong 1.00$
   Minimole: $ER_i \cong 1.00$

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FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN G. CUSTENBORDER			DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 8 OF 11
NAME:	CHECKED BY: G. CUSTENBORDER						

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES										SHEET	OF
10/14/08	3/9/09										

FILE => 57-e0075_76-z-lotb08.dgn

USERNAME => mporcnjope DATE PLOTTED => 3/4/2009 TIME PLOTTED => 3:36:32 PM

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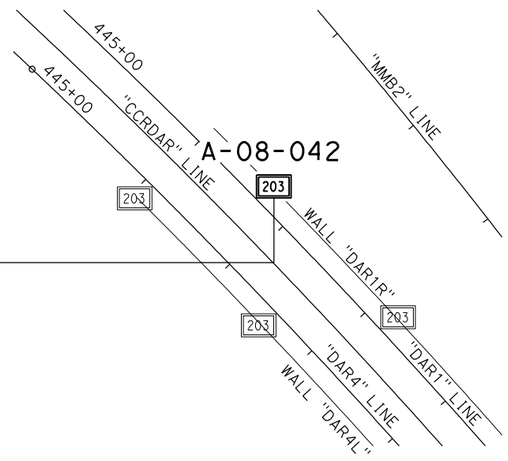
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



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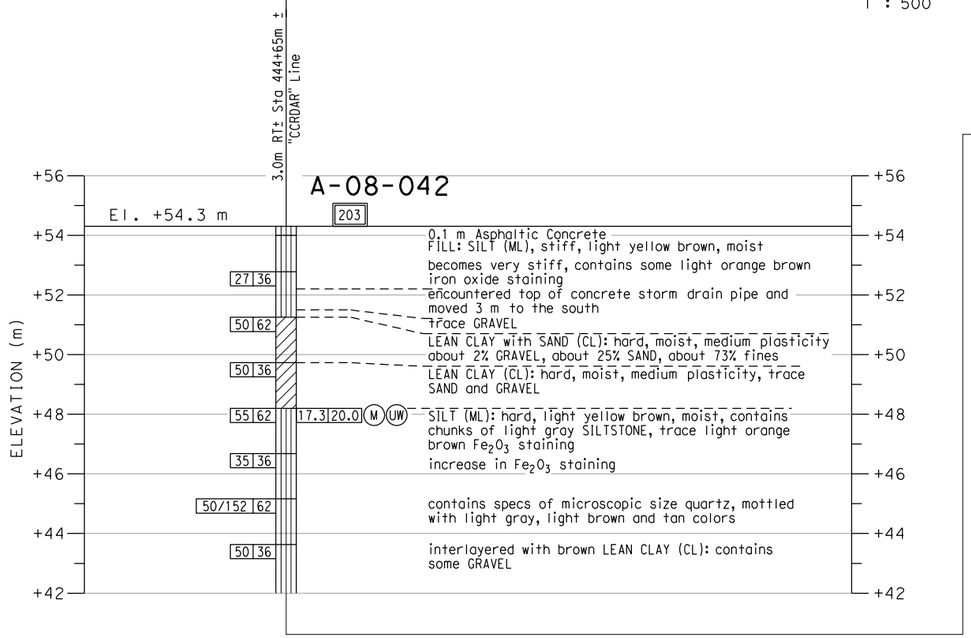

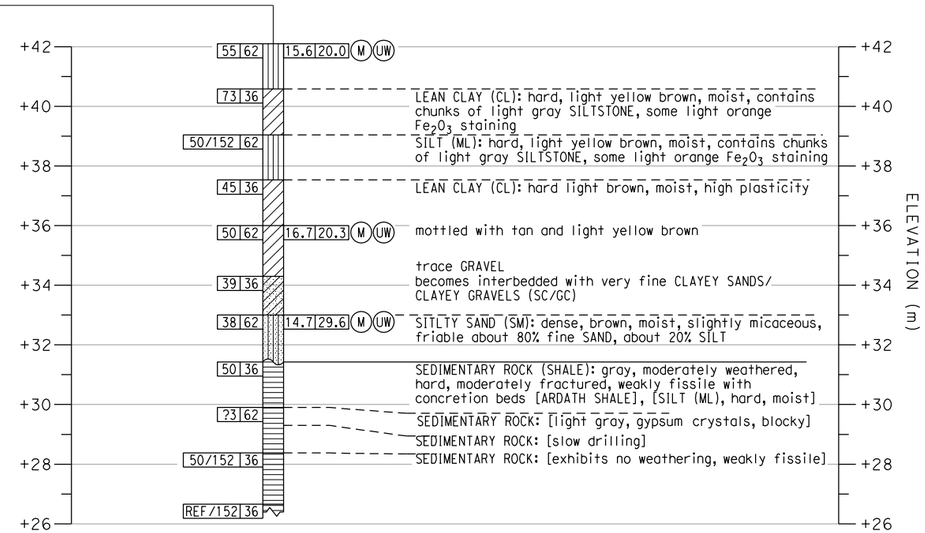

4-11-08
Terminated at El. 26.4 m
$ER_i \cong 1.45$

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

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FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 9 OF 11
NAME:	CHECKED BY: G. CUSTENBORDER		CU 11275 EA 2T0401		DISREGARD PRINTS BEARING EARLIER REVISION DATES →	REVISION DATES 10/14/08 3/9/09 SHEET OF

OGS CIVIL LOG OF TEST BORINGS SHEET

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

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Bench Mark
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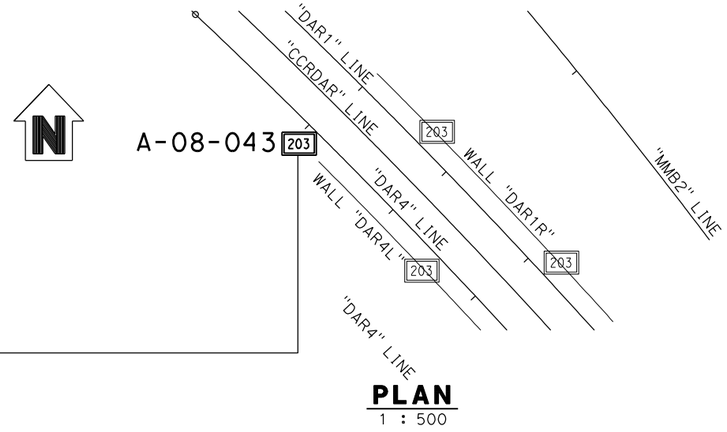

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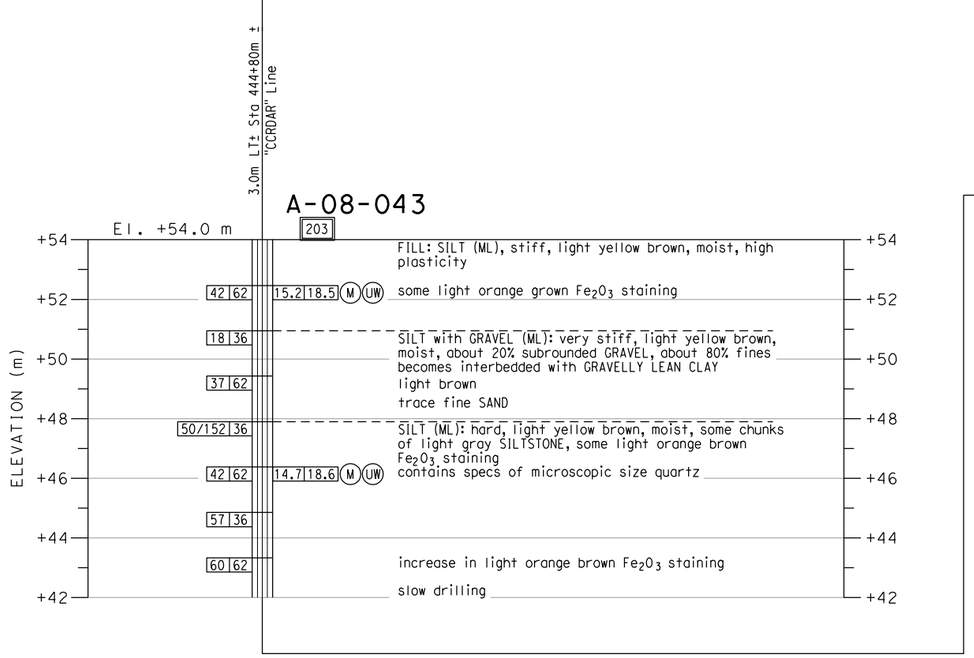

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 10 OF 11
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES: 10/14/08 3/9/09 | SHEET | OF

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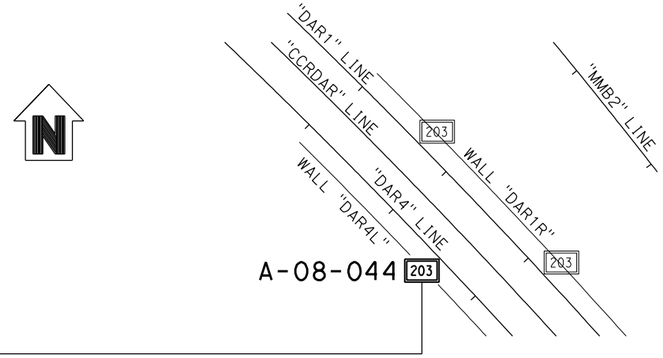
Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
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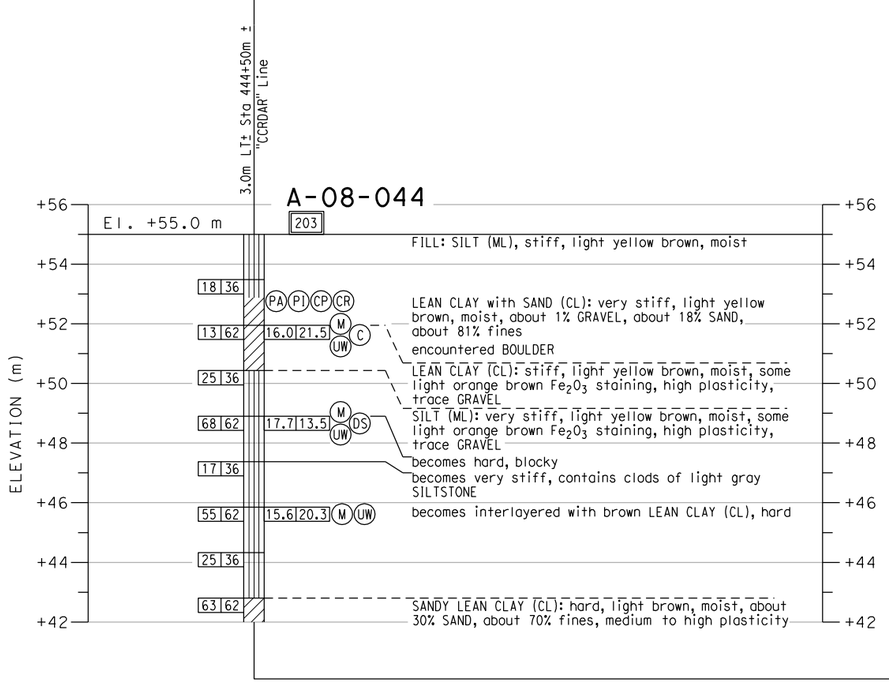

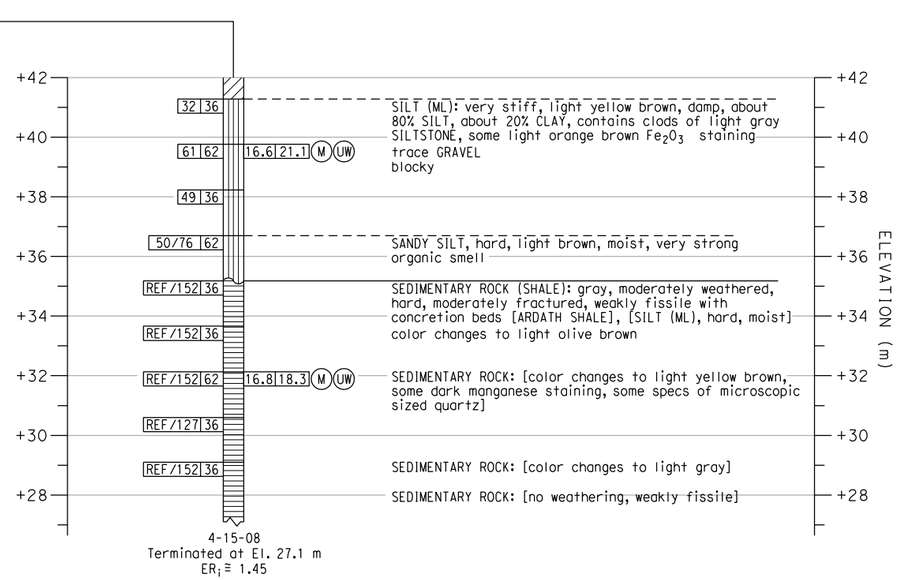

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

Caltrans Metric

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER			DESIGN BRANCH	57-E0075/76	
NAME:	CHECKED BY: G. CUSTENBORDER					POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 11 OF 11

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES: 10/14/08, 3/9/09

SHEET OF

FILE => 57-e0075_76-z-lotb11.dgn

USERNAME => mporonjoe DATE PLOTTED => 3/4/2009 TIME PLOTTED => 3:36:50 PM

APPENDIX I.9

BUSINESS ACCESS UNDERCROSSING LOTBs

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

GROUP SYMBOLS AND NAMES

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

FIELD AND LABORATORY TESTING

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

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SAN DIEGO, CA. 92111

APPARENT DENSITY OF COHESIONLESS SOILS

Description	SPT N_{60} (Blows / 300 mm)
Very loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE

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

PERCENT OR PROPORTION OF SOILS

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

PARTICLE SIZE

Description		Size
Boulder		> 300 mm
Cobble		76 mm to 300 mm
Gravel	Coarse	19 mm to 76 mm
	Fine	No. 4 to 19 mm
Sand	Coarse	No. 10 to No. 4
	Medium	No. 40 to No. 10
	Fine	No. 200 to No. 40

SOIL LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0787	BUSINESS ACCESS ROAD UC
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 1 OF 7
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401	DISREGARD PRINTS BEARING EARLIER REVISION DATES →	REVISION DATES: 10/14/08, 3/9/09; SHEET; OF

OGS CIVIL LOG OF TEST BORINGS SHEET

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

FILE => 57-c0787-z-1otb01.dgn

USERNAME => mpcronjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:12:31 PM

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

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CEMENTATION

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

BOREHOLE IDENTIFICATION

Symbol	Hole Type	Description
Size	A	Auger Boring
Size	R P	Rotary drilled boring Rotary percussion boring (air)
Size	R	Rotary drilled diamond core
Size	HD HA	Hand driven (25 mm soil tube) Hand Auger
●	D	Dynamic Cone Penetration Boring
▲	CPT	Cone Penetration Test (ASTM D 5778-95)
[ ]	O	Other

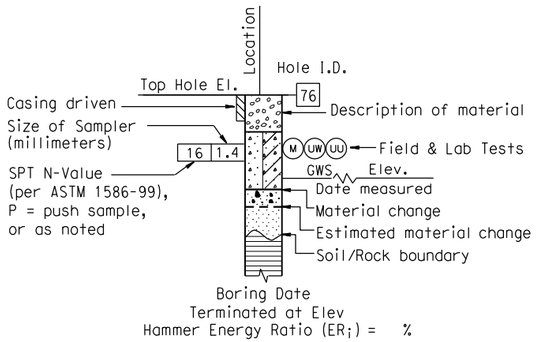
Note: Size in millimeters.

CONSISTENCY OF COHESIVE SOILS

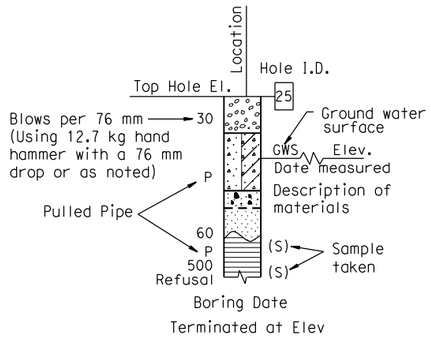
Description	Unconfined Compressive Strength (tsm)	Pocket Penetrometer Measurement (tsm)	Torvane Measurement (tsm)	Field Approximation
Very Soft	< 24	< 24	< 12	Easily penetrated several inches by fist
Soft	24 to 48	24 to 48	12 to 24	Easily penetrated several inches by thumb
Medium Stiff	48 to 96	48 to 96	24 to 48	Penetrated several inches by thumb with moderate effort
Stiff	96 to 192	96 to 192	48 to 96	Readily indented by thumb but penetrated only with great effort
Very Stiff	192 to 383	192 to 383	96 to 192	Readily indented by thumbnail
Hard	> 383	> 383	> 192	Indented by thumbnail with difficulty

PLASTICITY OF FINE-GRAINED SOILS

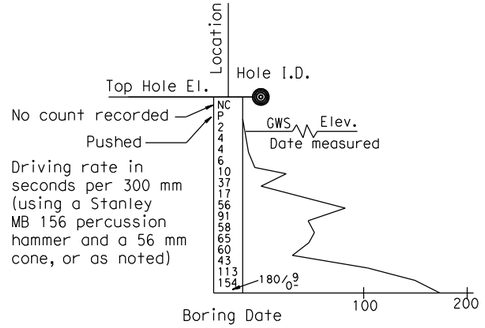
Description	Criteria
Nonplastic	A 3 mm thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.



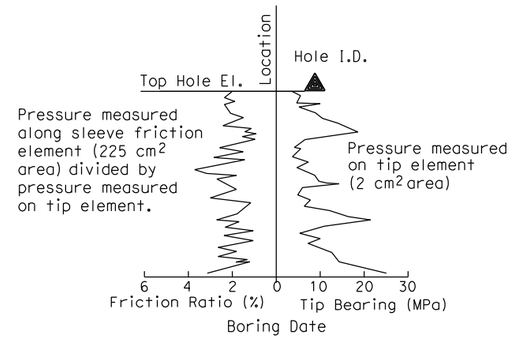
ROTARY BORING



HAND BORING



DYNAMIC CONE PENETRATION BORING



CONE PENETRATION TEST (CPT) SOUNDING

SOIL LEGEND

ENGINEERING SERVICES		GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	BUSINESS ACCESS ROAD UC
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER			DESIGN BRANCH	57-C0787	
NAME:	CHECKED BY: G. CUSTENBORDER					POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 2 OF 7

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES		SHEET	OF
10/14/08	3/9/09		

FILE => 57-c0787-z-lotb02.dgn

USERNAME => mparcinjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:12:40 PM

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

Caltrans Metric

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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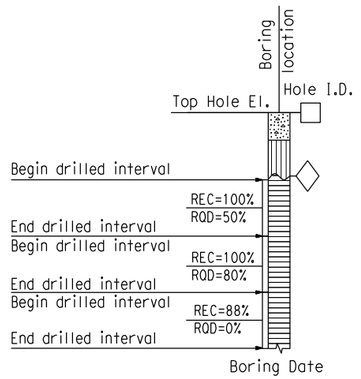
PERCENT CORE RECOVERY (REC) & ROCK QUALITY DESIGNATION (RQD)

$$REC = \frac{\sum \text{Length of the recovered core pieces}}{\text{Total length of core run}} \times 100\%$$

$$RQD = \frac{\sum \text{Length of intact core pieces} \geq 100\ mm}{\text{Total length of core run}} \times 100\%$$



RELATIVE STRENGTH OF INTACT ROCK

Term	Uniaxial Compressive Strength (MPa)
Extremely Strong	> 207
Very Strong	100 - 207
Strong	49 - 100
Medium Strong	25 - 49
Weak	5 - 25
Very Weak	1 - 5
Extremely Weak	< 1

BEDDING SPACING

Description	Thickness / Spacing
Massive	Greater than 3 m
Very thickly bedded	1 m to 3 m
Thickly bedded	300 mm to 1 m
Moderately bedded	100 mm to 300 mm
Thinly bedded	30 mm to 100 mm
Very thinly bedded	10 mm to 30 mm
Laminated	Less than 10 mm

LEGEND OF ROCK MATERIALS

- IGNEOUS ROCK
- SEDIMENTARY ROCK
- METAMORPHIC ROCK

ROCK HARDNESS

Description	Criteria
Extremely Hard	Specimen cannot be scratched with a pocket knife or sharp pick; can only be chipped with repeated heavy hammer blows.
Very Hard	Specimen cannot be scratched with a pocket knife or sharp pick. Breaks with repeated heavy hammer blows.
Hard	Specimen can be scratched with a pocket knife or sharp pick with difficulty (heavy pressure). Heavy hammer blows required to break specimen.
Moderately Hard	Specimen can be scratched with pocket knife or sharp pick with light or moderate pressure. Core breaks with moderate hammer pressure.
Moderately Soft	Specimen can be grooved 5 mm deep with a pocket knife or sharp pick with moderate or heavy pressure. Breaks with light hammer blow or heavy manual pressure.
Soft	Specimen can be grooved or gouged easily by a pocket knife or sharp pick with light pressure, can be scratched with fingernail. Breaks with light to moderate manual pressure.
Very Soft	Specimen can be readily indented, grooved or gouged with fingernail, or carved with a pocket knife. Breaks with light manual pressure.

FRACTURE DENSITY

Description	Observed Fracture Density
Unfractured	No fractures.
Very slightly fractured	Lengths greater than 1 m.
Slightly fractured	Lengths from 300 mm to 1000 mm with few lengths less than 300 mm or greater than 1000 mm.
Moderately fractured	Lengths mostly in 100 mm to 300 mm range with most lengths about 200 mm.
Intensely fractured	Lengths average from 30 mm to 100 mm with scattered fragmented intervals with lengths less than 100 mm.
Very intensely fractured	Mostly chips and fragments with a few scattered short core lengths.

Combination descriptors (such as "Very intensely to intensely fractured") are used where equal distribution of both fracture density characteristics is present over a significant interval or exposure, or where characteristics are "in between" the descriptor definitions. Only two adjacent descriptors may be combined.

WEATHERING DESCRIPTORS FOR INTACT ROCK

Description	Diagnostic features: Chemical Weathering-Discoloration and/or oxidation — Body of Rock	Diagnostic features: Chemical Weathering-Discoloration and/or oxidation — Fracture Surfaces	Diagnostic features: Mechanical Weathering-Grain boundary conditions (disaggregation) primarily for granitics and some coarse-grained sediments	Diagnostic features: Texture and Solutioning — Texture	Diagnostic features: Texture and Solutioning — Solutioning	General Characteristics
Fresh	No discoloration, not oxidized.	No discoloration or oxidation.	No separation, intact (tight).	No change.	No solutioning.	Hammer rings when crystalline rocks are struck.
Slightly Weathered	Discoloration or oxidation is limited to surface of, or short distance from, fractures; some feldspar crystals are dull.	Minor to complete discoloration or oxidation of most surfaces.	No visible separation, intact (tight).	Preserved.	Minor leaching of some soluble minerals may be noted.	Hammer rings when crystalline rocks are struck. Body of rock not weakened.
Moderately Weathered	Discoloration or oxidation extends from fractures usually throughout; Fe-Mg minerals are "rusty," feldspar crystals are "cloudy."	All fracture surfaces are discolored or oxidized.	Partial separation of boundaries visible.	Generally preserved.	Soluble minerals may be mostly leached.	Hammer does not ring when rock is struck. Body of rock is slightly weakened.
Intensely Weathered	Discoloration or oxidation throughout; all feldspars and Fe-Mg minerals are altered to clay to some extent; or chemical alteration produces in-situ disaggregation, see grain boundary conditions.	All fracture surfaces are discolored or oxidized, surfaces friable.	Partial separation, rock is friable; in semiarid conditions granitics are disaggregated.	Texture altered by chemical disintegration (hydration, argillation).	Leaching of soluble minerals may be complete.	Dull sound when struck with hammer, usually can be broken with moderate to heavy manual pressure or by light hammer blow without reference to planes of weakness such as incipient or hairline fractures, or veinlets. Rock is significantly weakened.
Decomposed	Discolored or oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe-Mg minerals are completely altered to clay.		Complete separation of grain boundaries (disaggregated).	Resembles a soil, partial or complete remnant rock structure may be preserved; leaching of soluble minerals usually complete.		Can be granulated by hand. Resistant minerals such as quartz may be present as "stringers" or "dikes."

Combination descriptors (such as "slightly weathered to fresh") are permissible where equal distribution of both weathering characteristics is present over significant intervals or where characteristics present are "in between" the diagnostic feature. However, combination descriptors should not be used where significant, identifiable zones can be delineated. Only two adjacent descriptors may be combined. "Very intensely weathered" is the combination descriptor for "intensely weathered to decomposed."

ROCK LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0787	BUSINESS ACCESS ROAD UC
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 3 OF 7
NAME:	CHECKED BY: G. CUSTENBORDER	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER			

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES: 10/14/08 | 3/9/09 | SHEET | OF

FILE => 57-c0787-z-lotb03.dgn

USERNAME => mpcronjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:12:48 PM

Bench Mark
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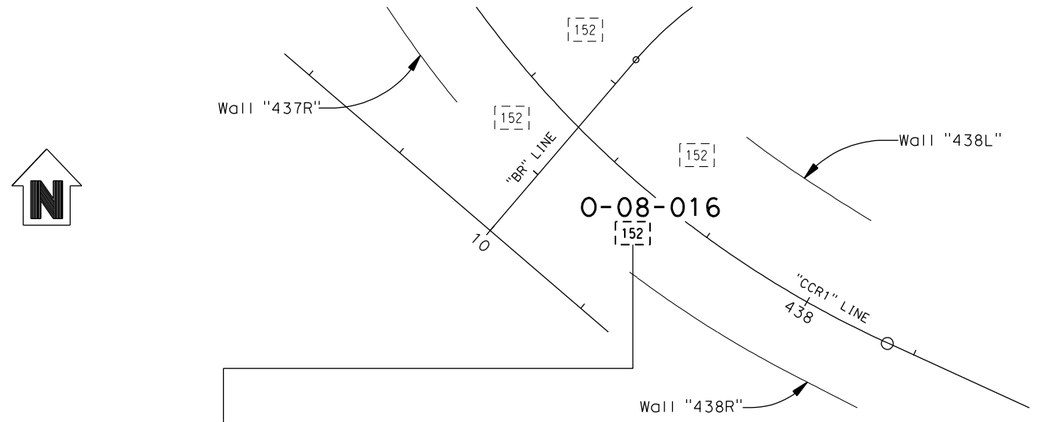
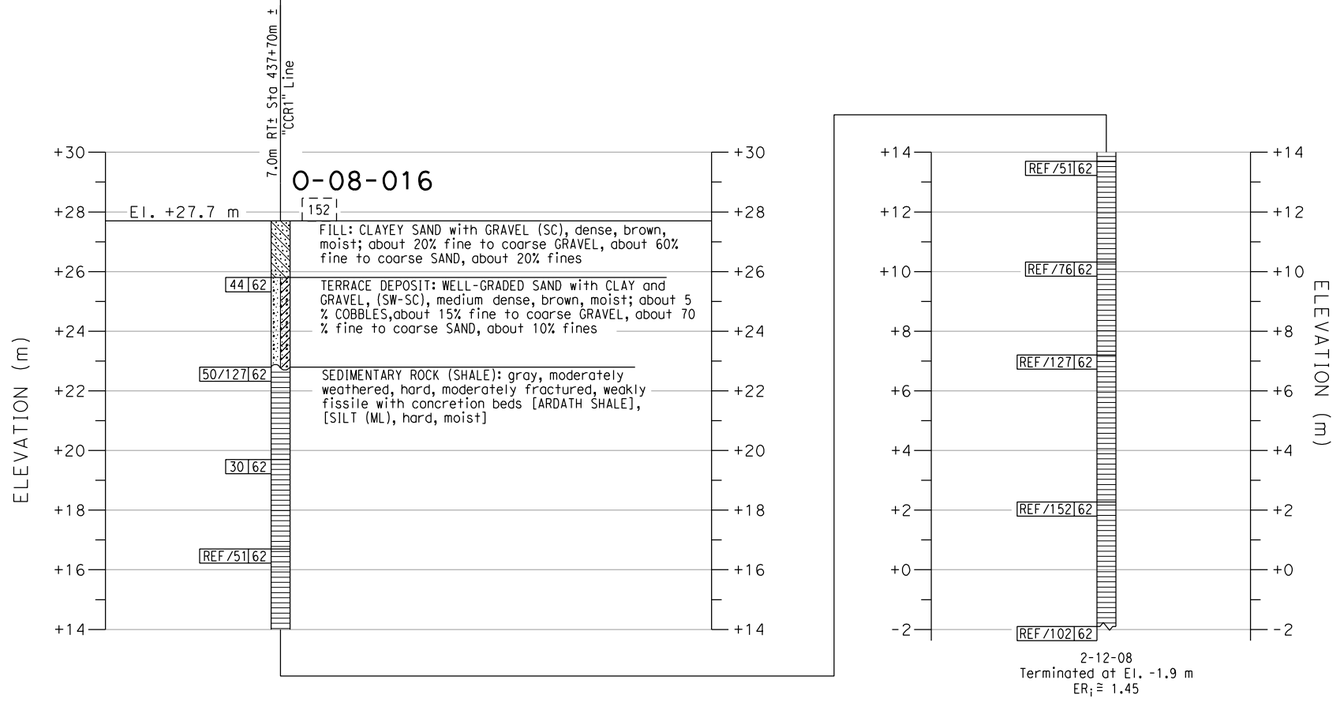


PLAN
1 : 500



PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.

2. Automatic trip and safety hammer systems consisting of hammer weight of 62.5 kg falling a distance of 762 mm were used to advance the drive samplers in accordance with ASTM D1586.

3. The average hammer energy ratio (ER_i) reflects the percentage efficiency of SPT blowcounts (N-value). The estimated ER_i for the various drilling equipment used was as follows:
   Boart Longyear:
   Longyear 1405: $ER_i \cong 1.45$
   Prosonic Track Mounted: $ER_i \cong 1.00$
   Prosonic 1: $ER_i \cong 1.45$
   Minisonic: $ER_i \cong 1.00$
   Test America:
   CME 95: $ER_i \cong 1.45$
   Pacific Drilling:
   Unimog: $ER_i \cong 1.27$
   Mole: $ER_i \cong 1.00$
   Minimole: $ER_i \cong 1.00$

4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (RQD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0787	BUSINESS ACCESS ROAD UC
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 4 OF 7
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES: 10/14/08, 3/9/09

SHEET OF

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Bench Mark
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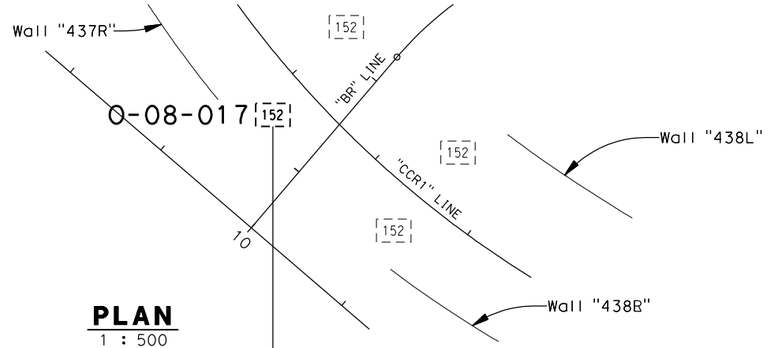
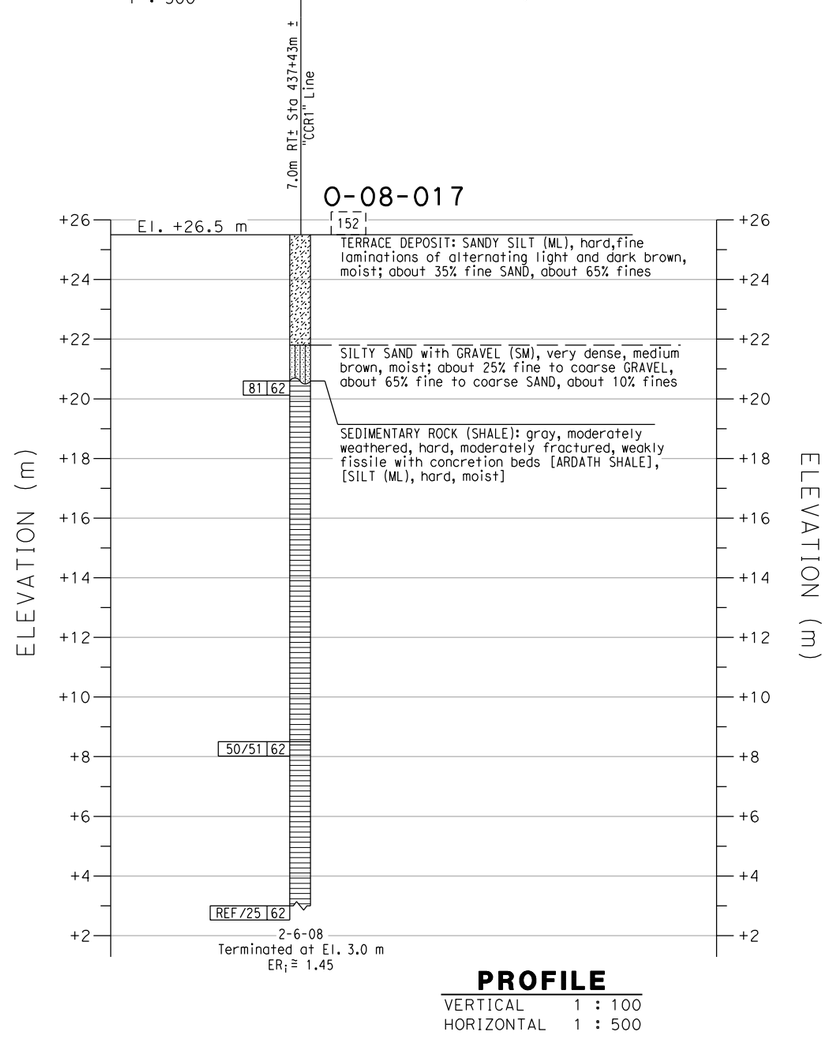


PLAN
1 : 500



PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

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ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0787	BUSINESS ACCESS ROAD UC
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 5 OF 7
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

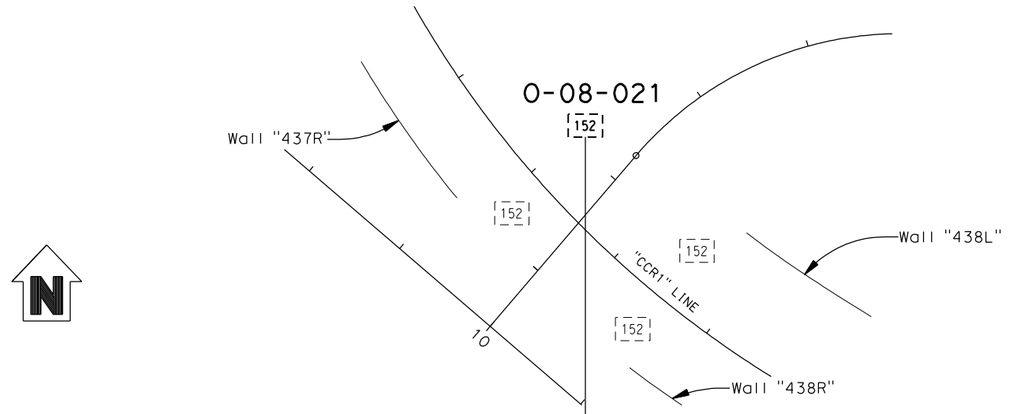
DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES: 10/14/08 | 3/9/09 | SHEET | OF

FILE => 57-c0787-z-lotb05.dgn

USERNAME => mparcinjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:13:04 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



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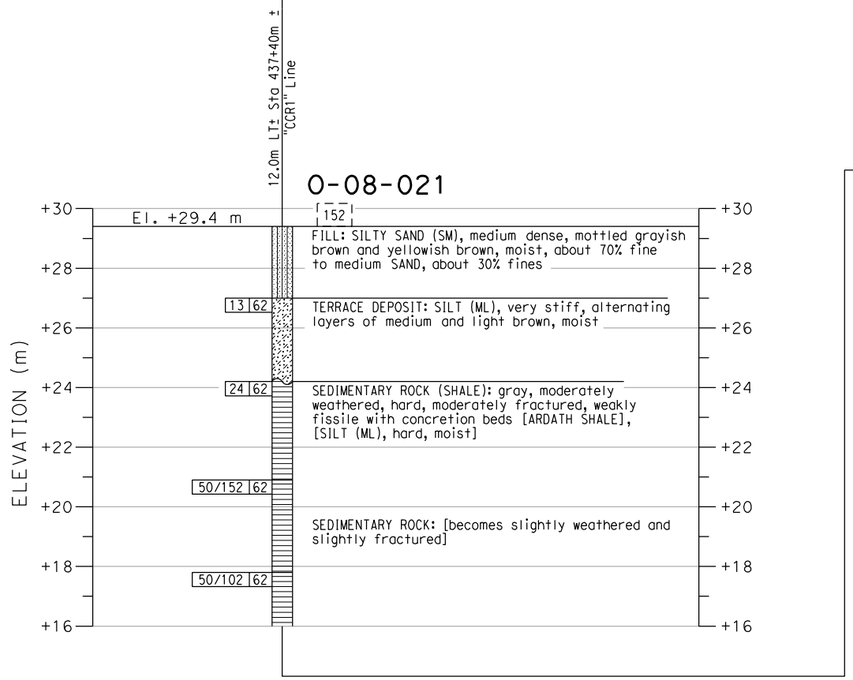

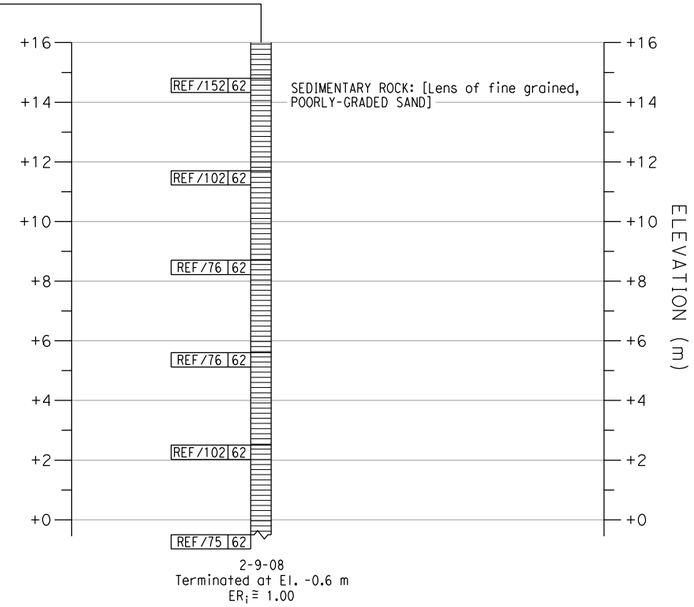

2-9-08
Terminated at El. -0.6 m
ER_i = 1.00

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.
2. Automatic trip and safety hammer systems consisting of hammer weight of 62.5 kg falling a distance of 762 mm were used to advance the drive samplers in accordance with ASTM D1586.
3. The average hammer energy ratio (ER_i) reflects the percentage efficiency of SPT blowcounts (N-value). The estimated ER_i for the various drilling equipment used was as follows:
   Boart Longyear:
   Longyear 1405: $ER_i \cong 1.45$
   Prosonic Track Mounted: $ER_i \cong 1.00$
   Prosonic 1: $ER_i \cong 1.45$
   Minisonic: $ER_i \cong 1.00$
   Test America:
   CME 95: $ER_i \cong 1.45$
   Pacific Drilling:
   Unimog: $ER_i \cong 1.27$
   Mole: $ER_i \cong 1.00$
   Minimole: $ER_i \cong 1.00$
4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (ROD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0787	BUSINESS ACCESS ROAD UC
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 6 OF 7
NAME:	CHECKED BY: G. CUSTENBORDER	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER	CU 11275 EA 2T0401	DISREGARD PRINTS BEARING EARLIER REVISION DATES →	REVISION DATES: 10/14/08, 3/9/09

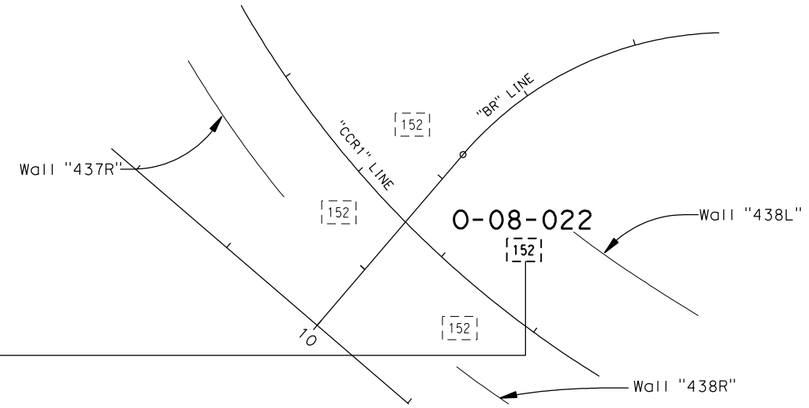
OGS CIVIL LOG OF TEST BORINGS SHEET

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

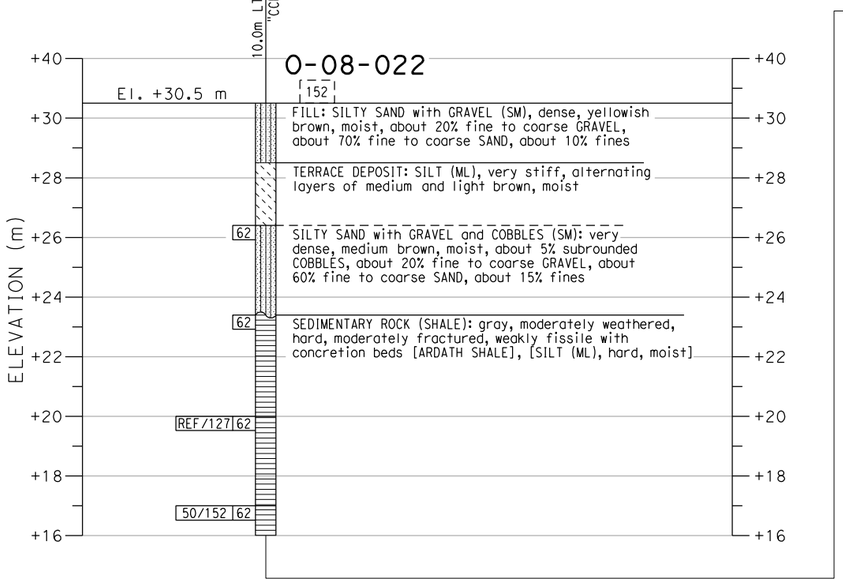
FILE => 57-c0787-z-lotb06.dgn

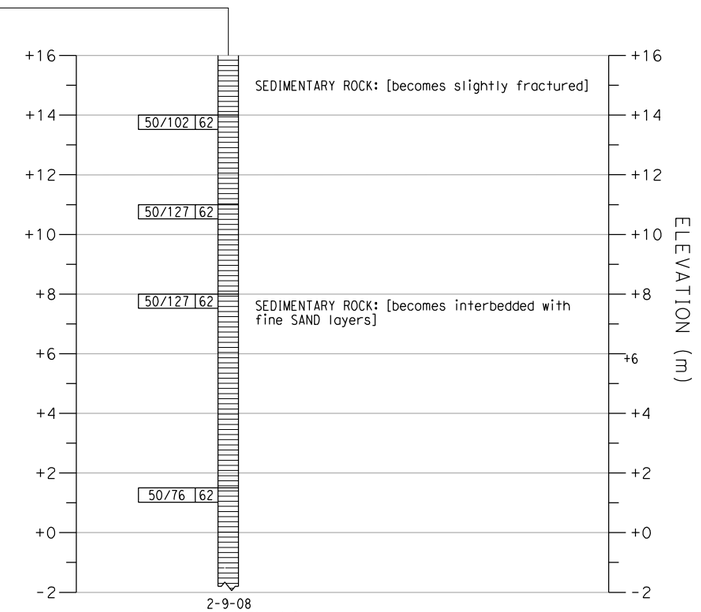
USERNAME => mparonjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:13:09 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
1 : 500





PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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NOTES:

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   Longyear 1405: ER$_i$≅1.45
   Prosonic Track Mounted: ER$_i$≅1.00
   Prosonic 1: ER$_i$≅1.45
   Minisonic: ER$_i$≅1.00
   Pacific Drilling:
   Unimog: ER$_i$≅1.27
   Mole: ER$_i$≅1.00
   Minimole: ER$_i$≅1.00
   Test America:
   CME 95: ER$_i$≅1.45
4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (RQD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0787	BUSINESS ACCESS ROAD UC
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 7 OF 7
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401		

OGS CIVIL LOG OF TEST BORINGS SHEET

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: 10/14/08, 3/9/09

SHEET OF

FILE => 57-c0787-z-lotb07.dgn

USERNAME => mparonjape DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:13:14 PM

APPENDIX I.10

MISCELLANEOUS RETAINING WALLS LOTBs

APPENDIX I.10.1

TYPE I WALL 437R LOTBs

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

GROUP SYMBOLS AND NAMES

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

FIELD AND LABORATORY TESTING

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

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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BUREAU VERITAS NORTH AMERICA, INC.
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SAN DIEGO, CA. 92111

APPARENT DENSITY OF COHESIONLESS SOILS

Description	SPT N_{60} (Blows / 300 mm)
Very loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE

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

PERCENT OR PROPORTION OF SOILS

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

PARTICLE SIZE

Description		Size
Boulder		> 300 mm
Cobble		76 mm to 300 mm
Gravel	Coarse	19 mm to 76 mm
	Fine	No. 4 to 19 mm
Sand	Coarse	No. 10 to No. 4
	Medium	No. 40 to No. 10
	Fine	No. 200 to No. 40

SOIL LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "437R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 1 OF 4
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401		

OGS CIVIL LOG OF TEST BORINGS SHEET

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: 10/14/08 | 3/9/09 | SHEET | OF

USERNAME => mpcronjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2119:55 PM

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

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SAN DIEGO, CA. 92111

CEMENTATION

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

BOREHOLE IDENTIFICATION

Symbol	Hole Type	Description
Size	A	Auger Boring
Size	R P	Rotary drilled boring Rotary percussion boring (air)
Size	R	Rotary drilled diamond core
Size	HD HA	Hand driven (25 mm soil tube) Hand Auger
●	D	Dynamic Cone Penetration Boring
▲	CPT	Cone Penetration Test (ASTM D 5778-95)
[ ]	O	Other

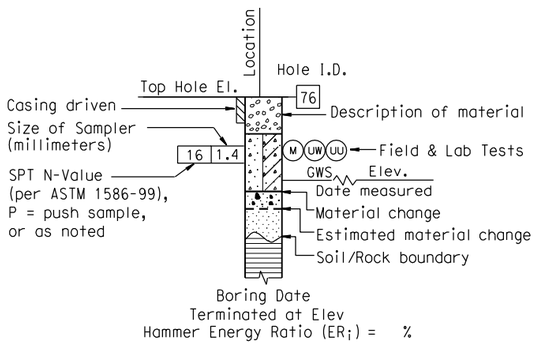
Note: Size in millimeters.

CONSISTENCY OF COHESIVE SOILS

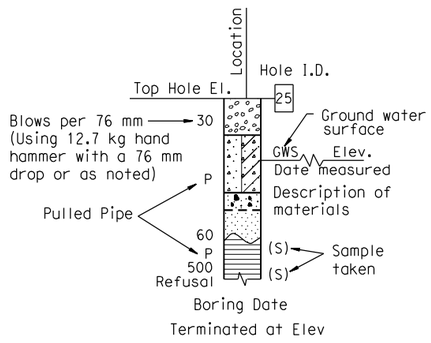
Description	Unconfined Compressive Strength (tsm)	Pocket Penetrometer Measurement (tsm)	Torvane Measurement (tsm)	Field Approximation
Very Soft	< 24	< 24	< 12	Easily penetrated several inches by fist
Soft	24 to 48	24 to 48	12 to 24	Easily penetrated several inches by thumb
Medium Stiff	48 to 96	48 to 96	24 to 48	Penetrated several inches by thumb with moderate effort
Stiff	96 to 192	96 to 192	48 to 96	Readily indented by thumb but penetrated only with great effort
Very Stiff	192 to 383	192 to 383	96 to 192	Readily indented by thumbnail
Hard	> 383	> 383	> 192	Indented by thumbnail with difficulty

PLASTICITY OF FINE-GRAINED SOILS

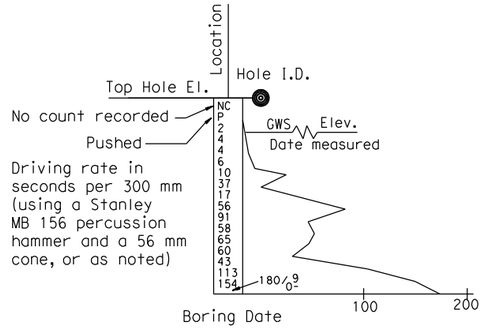
Description	Criteria
Nonplastic	A 3 mm thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.



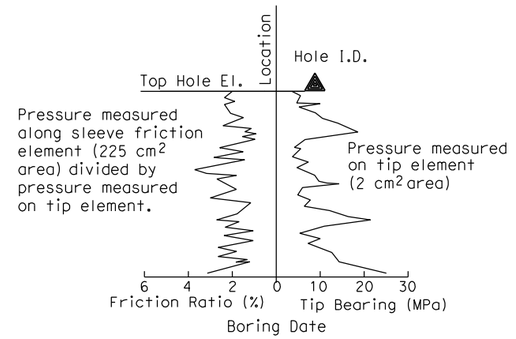
ROTARY BORING



HAND BORING



DYNAMIC CONE PENETRATION BORING



CONE PENETRATION TEST (CPT) SOUNDING

SOIL LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "437R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 2 OF 4
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES									SHEET	OF
10/14/08	3/9/09									

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USERNAME => mparcinjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:20:04 PM

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

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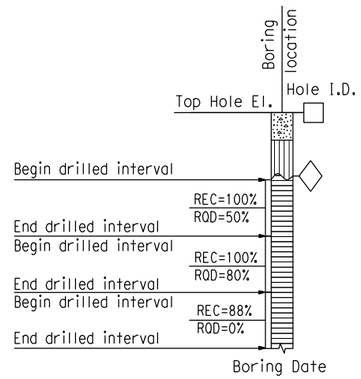
SAN DIEGO, CA. 92111

PERCENT CORE RECOVERY (REC) & ROCK QUALITY DESIGNATION (RQD)

$$REC = \frac{\sum \text{Length of the recovered core pieces}}{\text{Total length of core run}} \times 100\%$$

$$RQD = \frac{\sum \text{Length of intact core pieces} \geq 100\ mm}{\text{Total length of core run}} \times 100\%$$



RELATIVE STRENGTH OF INTACT ROCK

Term	Uniaxial Compressive Strength (MPa)
Extremely Strong	> 207
Very Strong	100 - 207
Strong	49 - 100
Medium Strong	25 - 49
Weak	5 - 25
Very Weak	1 - 5
Extremely Weak	< 1

BEDDING SPACING

Description	Thickness / Spacing
Massive	Greater than 3 m
Very thickly bedded	1 m to 3 m
Thickly bedded	300 mm to 1 m
Moderately bedded	100 mm to 300 mm
Thinly bedded	30 mm to 100 mm
Very thinly bedded	10 mm to 30 mm
Laminated	Less than 10 mm

LEGEND OF ROCK MATERIALS

- IGNEOUS ROCK
- SEDIMENTARY ROCK
- METAMORPHIC ROCK

ROCK HARDNESS

Description	Criteria
Extremely Hard	Specimen cannot be scratched with a pocket knife or sharp pick; can only be chipped with repeated heavy hammer blows.
Very Hard	Specimen cannot be scratched with a pocket knife or sharp pick. Breaks with repeated heavy hammer blows.
Hard	Specimen can be scratched with a pocket knife or sharp pick with difficulty (heavy pressure). Heavy hammer blows required to break specimen.
Moderately Hard	Specimen can be scratched with pocket knife or sharp pick with light or moderate pressure. Core breaks with moderate hammer pressure.
Moderately Soft	Specimen can be grooved 5 mm deep with a pocket knife or sharp pick with moderate or heavy pressure. Breaks with light hammer blow or heavy manual pressure.
Soft	Specimen can be grooved or gouged easily by a pocket knife or sharp pick with light pressure, can be scratched with fingernail. Breaks with light to moderate manual pressure.
Very Soft	Specimen can be readily indented, grooved or gouged with fingernail, or carved with a pocket knife. Breaks with light manual pressure.

FRACTURE DENSITY

Description	Observed Fracture Density
Unfractured	No fractures.
Very slightly fractured	Lengths greater than 1 m.
Slightly fractured	Lengths from 300 mm to 1000 mm with few lengths less than 300 mm or greater than 1000 mm.
Moderately fractured	Lengths mostly in 100 mm to 300 mm range with most lengths about 200 mm.
Intensely fractured	Lengths average from 30 mm to 100 mm with scattered fragmented intervals with lengths less than 100 mm.
Very intensely fractured	Mostly chips and fragments with a few scattered short core lengths.

Combination descriptors (such as "Very intensely to intensely fractured") are used where equal distribution of both fracture density characteristics is present over a significant interval or exposure, or where characteristics are "in between" the descriptor definitions. Only two adjacent descriptors may be combined.

WEATHERING DESCRIPTORS FOR INTACT ROCK

Description	Diagnostic features: Chemical Weathering-Discoloration and/or oxidation — Body of Rock	Diagnostic features: Chemical Weathering-Discoloration and/or oxidation — Fracture Surfaces	Diagnostic features: Mechanical Weathering-Grain boundary conditions (disaggregation) primarily for granitics and some coarse-grained sediments	Diagnostic features: Texture and Solutioning — Texture	Diagnostic features: Texture and Solutioning — Solutioning	General Characteristics
Fresh	No discoloration, not oxidized.	No discoloration or oxidation.	No separation, intact (tight).	No change.	No solutioning.	Hammer rings when crystalline rocks are struck.
Slightly Weathered	Discoloration or oxidation is limited to surface of, or short distance from, fractures; some feldspar crystals are dull.	Minor to complete discoloration or oxidation of most surfaces.	No visible separation, intact (tight).	Preserved.	Minor leaching of some soluble minerals may be noted.	Hammer rings when crystalline rocks are struck. Body of rock not weakened.
Moderately Weathered	Discoloration or oxidation extends from fractures usually throughout; Fe-Mg minerals are "rusty," feldspar crystals are "cloudy."	All fracture surfaces are discolored or oxidized.	Partial separation of boundaries visible.	Generally preserved.	Soluble minerals may be mostly leached.	Hammer does not ring when rock is struck. Body of rock is slightly weakened.
Intensely Weathered	Discoloration or oxidation throughout; all feldspars and Fe-Mg minerals are altered to clay to some extent; or chemical alteration produces in-situ disaggregation, see grain boundary conditions.	All fracture surfaces are discolored or oxidized, surfaces friable.	Partial separation, rock is friable; in semiarid conditions granitics are disaggregated.	Texture altered by chemical disintegration (hydration, argillation).	Leaching of soluble minerals may be complete.	Dull sound when struck with hammer, usually can be broken with moderate to heavy manual pressure or by light hammer blow without reference to planes of weakness such as incipient or hairline fractures, or veinlets. Rock is significantly weakened.
Decomposed	Discolored or oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe-Mg minerals are completely altered to clay.		Complete separation of grain boundaries (disaggregated).	Resembles a soil, partial or complete remnant rock structure may be preserved; leaching of soluble minerals usually complete.		Can be granulated by hand. Resistant minerals such as quartz may be present as "stringers" or "dikes."

Combination descriptors (such as "slightly weathered to fresh") are permissible where equal distribution of both weathering characteristics is present over significant intervals or where characteristics present are "in between" the diagnostic feature. However, combination descriptors should not be used where significant, identifiable zones can be delineated. Only two adjacent descriptors may be combined. "Very intensely weathered" is the combination descriptor for "intensely weathered to decomposed."

ROCK LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "437R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS		DESIGN BRANCH	POST MILES	LOG OF TEST BORINGS SHEET NO. 3 OF 4
NAME:	CHECKED BY: G. CUSTENBORDER	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER	CU 11275 EA 2T0401	KP43.2/PM26.8	

OGS CIVIL LOG OF TEST BORINGS SHEET

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

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

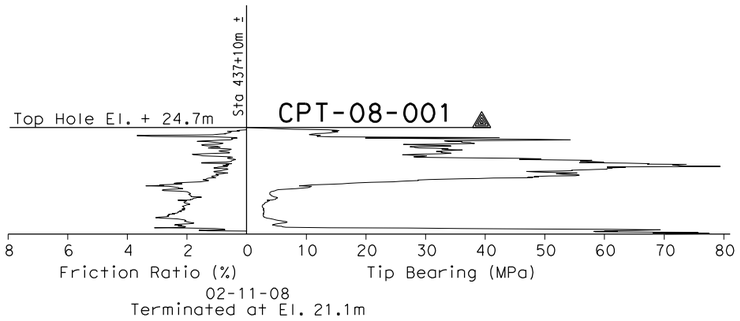
REVISION DATES: 10/14/08, 3/9/09

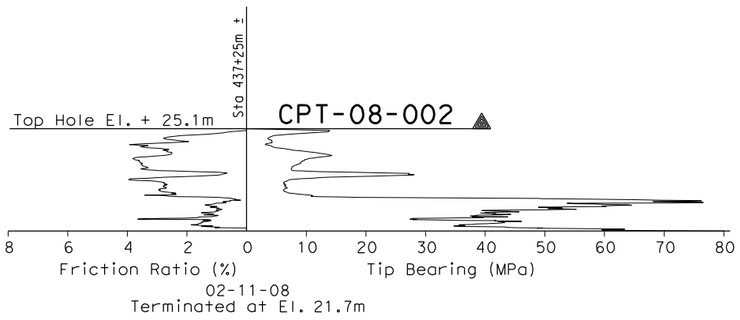
SHEET OF

FILE => MRW03.dgn

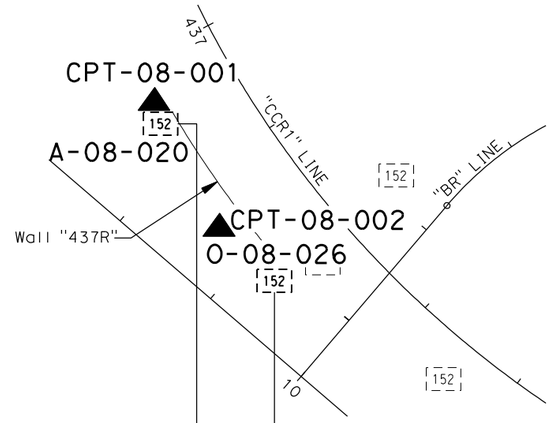
USERNAME => mporonjae DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:20:13 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.

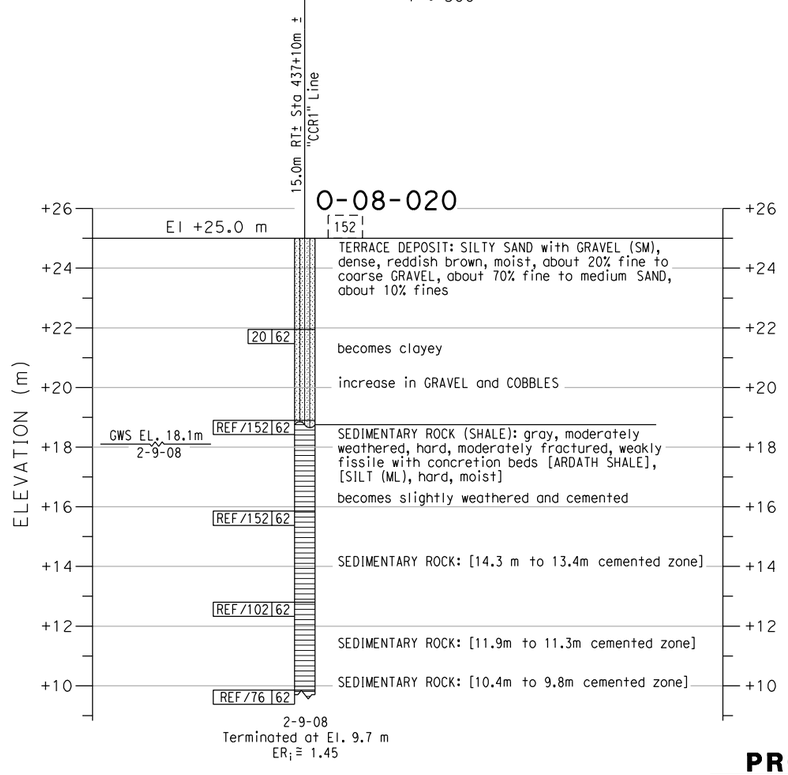


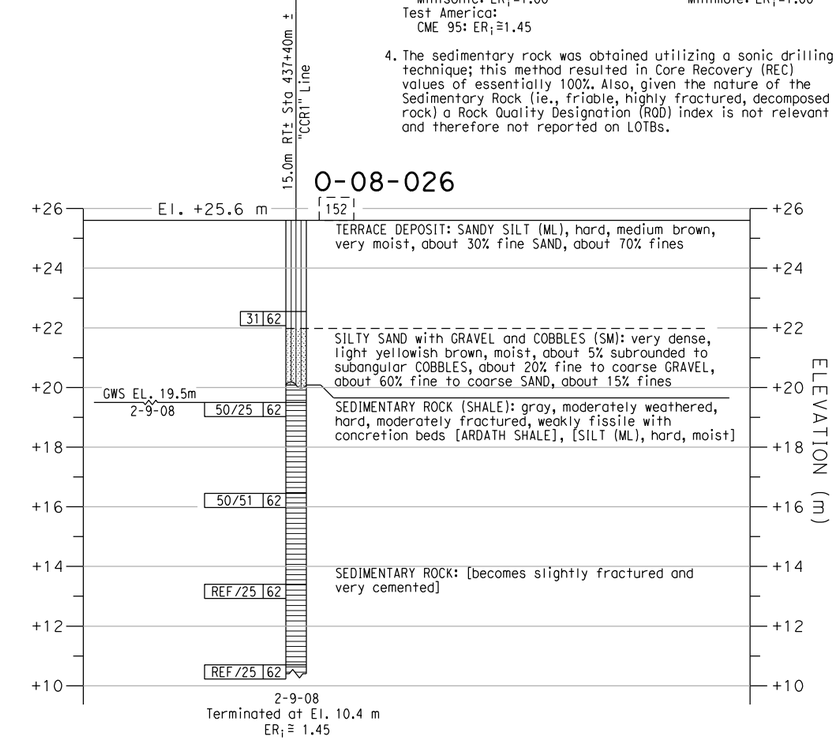


CONE PENETRATION TEST (CPT) SOUNDINGS



PLAN
1 : 500





PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SAN DIEGO, CA. 92111

NOTES:
1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.
2. Automatic trip and safety hammer systems consisting of hammer weight of 62.5 kg falling a distance of 762 mm were used to advance the drive samplers in accordance with ASTM D1586.
3. The average hammer energy ratio (ER_i) reflects the percentage efficiency of SPT blowcounts (N-value). The estimated ER_i for the various drilling equipment used was as follows:
   Boart Longyear:
   Longyear 1405: $ER_i \cong 1.45$
   Prosonic Track Mounted: $ER_i \cong 1.00$
   Prosonic 1: $ER_i \cong 1.45$
   Minisonic: $ER_i \cong 1.00$
   Pacific Drilling:
   Unimog: $ER_i \cong 1.27$
   Mole: $ER_i \cong 1.00$
   Minimole: $ER_i \cong 1.00$
   Test America:
   CME 95: $ER_i \cong 1.45$
4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (ROD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "437R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS		DESIGN BRANCH	POST MILES	LOG OF TEST BORINGS SHEET NO. 4 OF 4
NAME:	CHECKED BY: G. CUSTENBORDER	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		KP43.2/PM26.8	
OGS CIVIL LOG OF TEST BORINGS SHEET	ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS 0 10 20 30 40 50 60 70 80 90 100		CU 11275 EA 2T0401	DISREGARD PRINTS BEARING EARLIER REVISION DATES	REVISION DATES 10/14/08 3/9/09; SHEET; OF

FILE => MRW04.dgn

USERNAME => mporonjoe DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:20:23 PM

APPENDIX I.10.2

TYPE I WALL 438L LOTBs

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

GROUP SYMBOLS AND NAMES

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

FIELD AND LABORATORY TESTING

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

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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APPARENT DENSITY OF COHESIONLESS SOILS

Description	SPT N_{60} (Blows / 300 mm)
Very loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE

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

PERCENT OR PROPORTION OF SOILS

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

PARTICLE SIZE

Description		Size
Boulder		> 300 mm
Cobble		76 mm to 300 mm
Gravel	Coarse	19 mm to 76 mm
	Fine	No. 4 to 19 mm
Sand	Coarse	No. 10 to No. 4
	Medium	No. 40 to No. 10
	Fine	No. 200 to No. 40

SOIL LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "438L" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 1 OF 4
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401		

OGS CIVIL LOG OF TEST BORINGS SHEET

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: 10/14/08 | 3/9/09 | SHEET | OF

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USERNAME => mpcronjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:21:14 PM

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

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CEMENTATION

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

BOREHOLE IDENTIFICATION

Symbol	Hole Type	Description
Size	A	Auger Boring
Size	R P	Rotary drilled boring Rotary percussion boring (air)
Size	R	Rotary drilled diamond core
Size	HD HA	Hand driven (25 mm soil tube) Hand Auger
●	D	Dynamic Cone Penetration Boring
▲	CPT	Cone Penetration Test (ASTM D 5778-95)
[ ]	O	Other

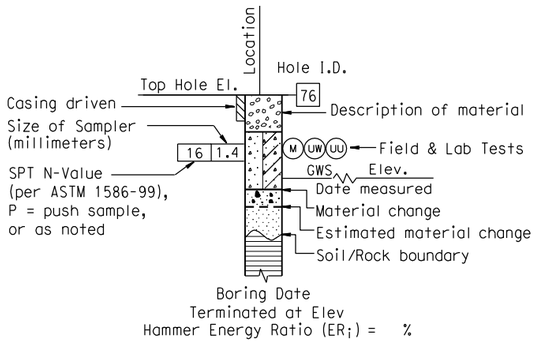
Note: Size in millimeters.

CONSISTENCY OF COHESIVE SOILS

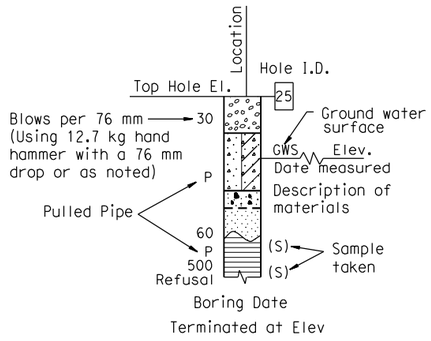
Description	Unconfined Compressive Strength (tsm)	Pocket Penetrometer Measurement (tsm)	Torvane Measurement (tsm)	Field Approximation
Very Soft	< 24	< 24	< 12	Easily penetrated several inches by fist
Soft	24 to 48	24 to 48	12 to 24	Easily penetrated several inches by thumb
Medium Stiff	48 to 96	48 to 96	24 to 48	Penetrated several inches by thumb with moderate effort
Stiff	96 to 192	96 to 192	48 to 96	Readily indented by thumb but penetrated only with great effort
Very Stiff	192 to 383	192 to 383	96 to 192	Readily indented by thumbnail
Hard	> 383	> 383	> 192	Indented by thumbnail with difficulty

PLASTICITY OF FINE-GRAINED SOILS

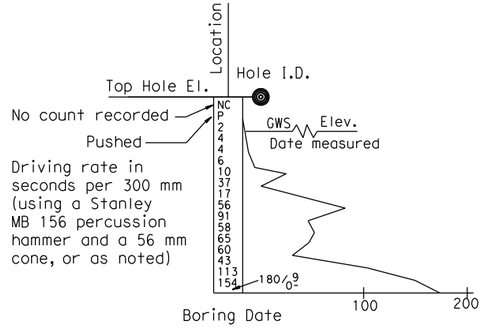
Description	Criteria
Nonplastic	A 3 mm thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.



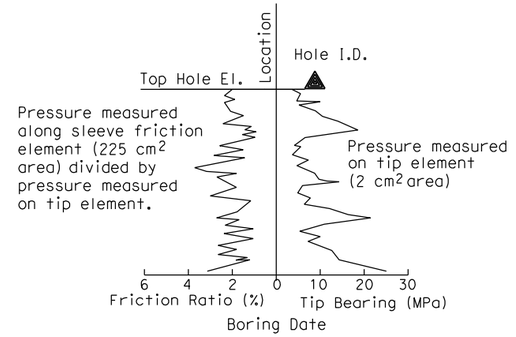
ROTARY BORING



HAND BORING



DYNAMIC CONE PENETRATION BORING



CONE PENETRATION TEST (CPT) SOUNDING

SOIL LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "438L" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 2 OF 4
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES: 10/14/08, 3/9/09 | SHEET | OF

FILE => MRW12.dgn

USERNAME => mparcinjape DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:21:23 PM

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

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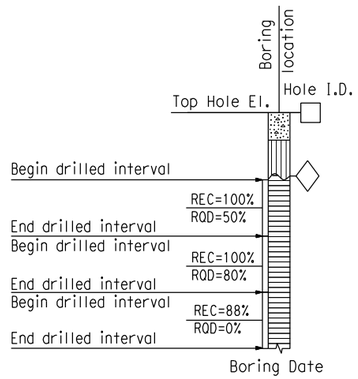
PERCENT CORE RECOVERY (REC) & ROCK QUALITY DESIGNATION (RQD)

$$REC = \frac{\sum \text{Length of the recovered core pieces}}{\text{Total length of core run}} \times 100\%$$

$$RQD = \frac{\sum \text{Length of intact core pieces} \geq 100\ mm}{\text{Total length of core run}} \times 100\%$$



RELATIVE STRENGTH OF INTACT ROCK

Term	Uniaxial Compressive Strength (MPa)
Extremely Strong	> 207
Very Strong	100 - 207
Strong	49 - 100
Medium Strong	25 - 49
Weak	5 - 25
Very Weak	1 - 5
Extremely Weak	< 1

BEDDING SPACING

Description	Thickness / Spacing
Massive	Greater than 3 m
Very thickly bedded	1 m to 3 m
Thickly bedded	300 mm to 1 m
Moderately bedded	100 mm to 300 mm
Thinly bedded	30 mm to 100 mm
Very thinly bedded	10 mm to 30 mm
Laminated	Less than 10 mm

LEGEND OF ROCK MATERIALS

- IGNEOUS ROCK
- SEDIMENTARY ROCK
- METAMORPHIC ROCK

ROCK HARDNESS

Description	Criteria
Extremely Hard	Specimen cannot be scratched with a pocket knife or sharp pick; can only be chipped with repeated heavy hammer blows.
Very Hard	Specimen cannot be scratched with a pocket knife or sharp pick. Breaks with repeated heavy hammer blows.
Hard	Specimen can be scratched with a pocket knife or sharp pick with difficulty (heavy pressure). Heavy hammer blows required to break specimen.
Moderately Hard	Specimen can be scratched with pocket knife or sharp pick with light or moderate pressure. Core breaks with moderate hammer pressure.
Moderately Soft	Specimen can be grooved 5 mm deep with a pocket knife or sharp pick with moderate or heavy pressure. Breaks with light hammer blow or heavy manual pressure.
Soft	Specimen can be grooved or gouged easily by a pocket knife or sharp pick with light pressure, can be scratched with fingernail. Breaks with light to moderate manual pressure.
Very Soft	Specimen can be readily indented, grooved or gouged with fingernail, or carved with a pocket knife. Breaks with light manual pressure.

FRACTURE DENSITY

Description	Observed Fracture Density
Unfractured	No fractures.
Very slightly fractured	Lengths greater than 1 m.
Slightly fractured	Lengths from 300 mm to 1000 mm with few lengths less than 300 mm or greater than 1000 mm.
Moderately fractured	Lengths mostly in 100 mm to 300 mm range with most lengths about 200 mm.
Intensely fractured	Lengths average from 30 mm to 100 mm with scattered fragmented intervals with lengths less than 100 mm.
Very intensely fractured	Mostly chips and fragments with a few scattered short core lengths.

Combination descriptors (such as "Very intensely to intensely fractured") are used where equal distribution of both fracture density characteristics is present over a significant interval or exposure, or where characteristics are "in between" the descriptor definitions. Only two adjacent descriptors may be combined.

WEATHERING DESCRIPTORS FOR INTACT ROCK

Description	Diagnostic features					General Characteristics
	Chemical Weathering-Discoloration and/or oxidation		Mechanical Weathering-Grain boundary conditions (disaggregation) primarily for granitics and some coarse-grained sediments	Texture and Solutioning		
	Body of Rock	Fracture Surfaces		Texture	Solutioning	
Fresh	No discoloration, not oxidized.	No discoloration or oxidation.	No separation, intact (tight).	No change.	No solutioning.	Hammer rings when crystalline rocks are struck.
Slightly Weathered	Discoloration or oxidation is limited to surface of, or short distance from, fractures; some feldspar crystals are dull.	Minor to complete discoloration or oxidation of most surfaces.	No visible separation, intact (tight).	Preserved.	Minor leaching of some soluble minerals may be noted.	Hammer rings when crystalline rocks are struck. Body of rock not weakened.
Moderately Weathered	Discoloration or oxidation extends from fractures usually throughout; Fe-Mg minerals are "rusty," feldspar crystals are "cloudy."	All fracture surfaces are discolored or oxidized.	Partial separation of boundaries visible.	Generally preserved.	Soluble minerals may be mostly leached.	Hammer does not ring when rock is struck. Body of rock is slightly weakened.
Intensely Weathered	Discoloration or oxidation throughout; all feldspars and Fe-Mg minerals are altered to clay to some extent; or chemical alteration produces in-situ disaggregation, see grain boundary conditions.	All fracture surfaces are discolored or oxidized, surfaces friable.	Partial separation, rock is friable; in semiarid conditions granitics are disaggregated.	Texture altered by chemical disintegration (hydration, argillation).	Leaching of soluble minerals may be complete.	Dull sound when struck with hammer, usually can be broken with moderate to heavy manual pressure or by light hammer blow without reference to planes of weakness such as incipient or hairline fractures, or veinlets. Rock is significantly weakened.
Decomposed	Discolored or oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe-Mg minerals are completely altered to clay.		Complete separation of grain boundaries (disaggregated).	Resembles a soil, partial or complete remnant rock structure may be preserved; leaching of soluble minerals usually complete.		Can be granulated by hand. Resistant minerals such as quartz may be present as "stringers" or "dikes."

Combination descriptors (such as "slightly weathered to fresh") are permissible where equal distribution of both weathering characteristics is present over significant intervals or where characteristics present are "in between" the diagnostic feature. However, combination descriptors should not be used where significant, identifiable zones can be delineated. Only two adjacent descriptors may be combined. "Very intensely weathered" is the combination descriptor for "intensely weathered to decomposed."

ROCK LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "438L" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS		DESIGN BRANCH	POST MILES	LOG OF TEST BORINGS SHEET NO. 3 OF 4
NAME:	CHECKED BY: G. CUSTENBORDER	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		KP43.2/PM26.8	

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

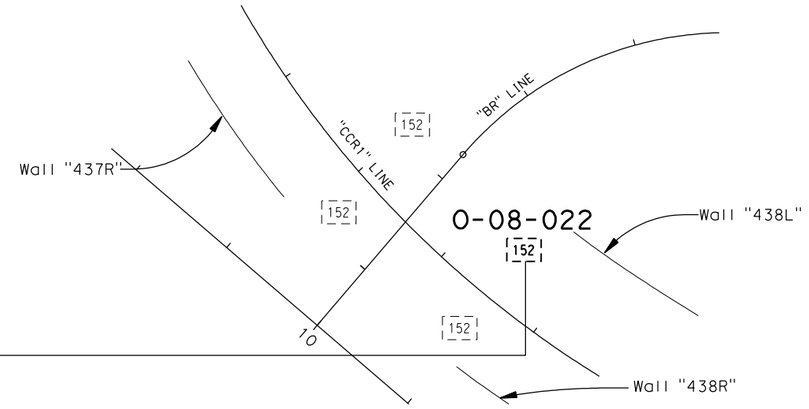
REVISION DATES: 10/14/08, 3/9/09

SHEET OF

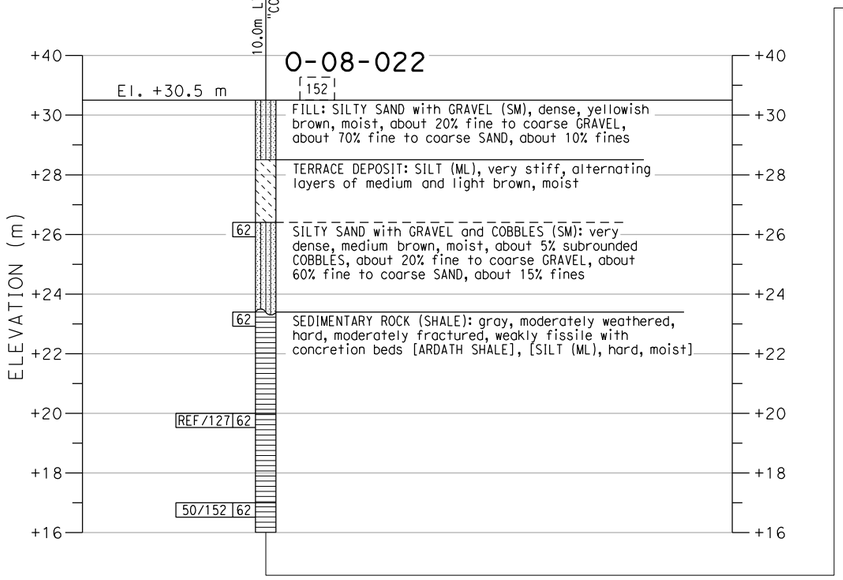
FILE => MRW13.dgn

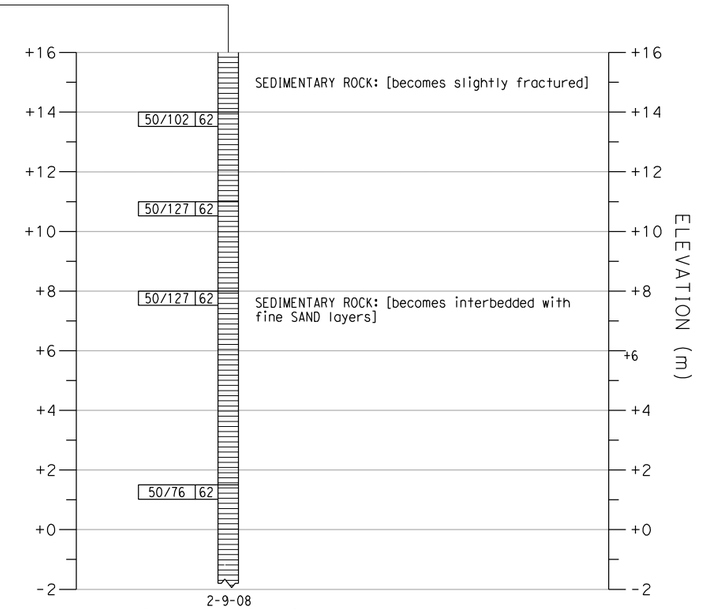
USERNAME => mporonjae DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:21:32 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
1 : 500





PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.
2. Automatic trip and safety hammer systems consisting of hammer weight of 62.5 kg falling a distance of 762 mm were used to advance the drive samplers in accordance with ASTM D1586.
3. The average hammer energy ratio (ER_i) reflects the percentage efficiency of SPT blowcounts (N-value). The estimated ER_i for the various drilling equipment used was as follows:
   Boart Longyear:
   Longyear 1405: $ER_i \cong 1.45$
   Prosonic Track Mounted: $ER_i \cong 1.00$
   Prosonic 1: $ER_i \cong 1.45$
   Minisonic: $ER_i \cong 1.00$
   Pacific Drilling:
   Unimog: $ER_i \cong 1.27$
   Mole: $ER_i \cong 1.00$
   Minimole: $ER_i \cong 1.00$
   Test America:
   CME 95: $ER_i \cong 1.45$
4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (RQD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "438L" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 4 OF 4
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES: 10/14/08, 3/9/09

SHEET OF

FILE => MRW14.dgn

USERNAME => mparanjape DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:21:42 PM

APPENDIX I.10.3

TYPE I WALL 438R LOTBs

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

GROUP SYMBOLS AND NAMES

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

FIELD AND LABORATORY TESTING

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

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

APPARENT DENSITY OF COHESIONLESS SOILS

Description	SPT N_{60} (Blows / 300 mm)
Very loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE

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

PERCENT OR PROPORTION OF SOILS

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

PARTICLE SIZE

Description		Size
Boulder		> 300 mm
Cobble		76 mm to 300 mm
Gravel	Coarse	19 mm to 76 mm
	Fine	No. 4 to 19 mm
Sand	Coarse	No. 10 to No. 4
	Medium	No. 40 to No. 10
	Fine	No. 200 to No. 40

SOIL LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "438R"
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	MISCELLANEOUS RETAINING WALLS
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401		LOG OF TEST BORINGS SHEET NO. 1 OF 6

OGS CIVIL LOG OF TEST BORINGS SHEET

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: 10/14/08 | 3/9/09 | SHEET | OF

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

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REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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CEMENTATION

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

BOREHOLE IDENTIFICATION

Symbol	Hole Type	Description
Size	A	Auger Boring
Size	R P	Rotary drilled boring Rotary percussion boring (air)
Size	R	Rotary drilled diamond core
Size	HD HA	Hand driven (25 mm soil tube) Hand Auger
●	D	Dynamic Cone Penetration Boring
▲	CPT	Cone Penetration Test (ASTM D 5778-95)
[ ]	O	Other

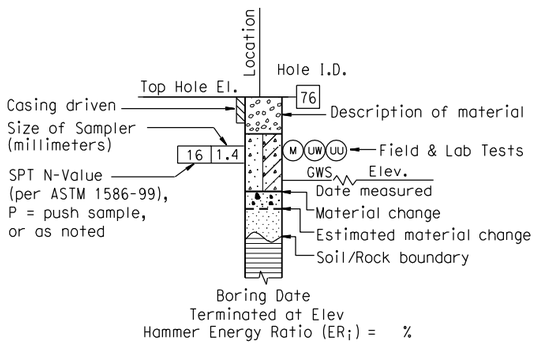
Note: Size in millimeters.

CONSISTENCY OF COHESIVE SOILS

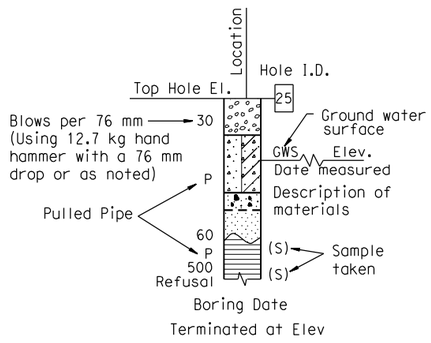
Description	Unconfined Compressive Strength (tsm)	Pocket Penetrometer Measurement (tsm)	Torvane Measurement (tsm)	Field Approximation
Very Soft	< 24	< 24	< 12	Easily penetrated several inches by fist
Soft	24 to 48	24 to 48	12 to 24	Easily penetrated several inches by thumb
Medium Stiff	48 to 96	48 to 96	24 to 48	Penetrated several inches by thumb with moderate effort
Stiff	96 to 192	96 to 192	48 to 96	Readily indented by thumb but penetrated only with great effort
Very Stiff	192 to 383	192 to 383	96 to 192	Readily indented by thumbnail
Hard	> 383	> 383	> 192	Indented by thumbnail with difficulty

PLASTICITY OF FINE-GRAINED SOILS

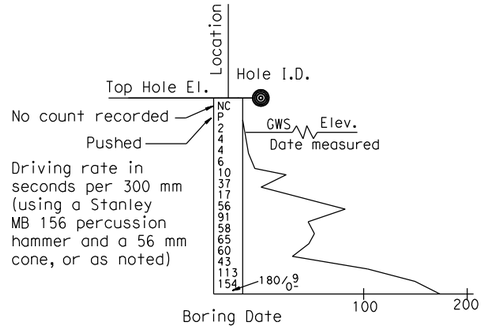
Description	Criteria
Nonplastic	A 3 mm thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.



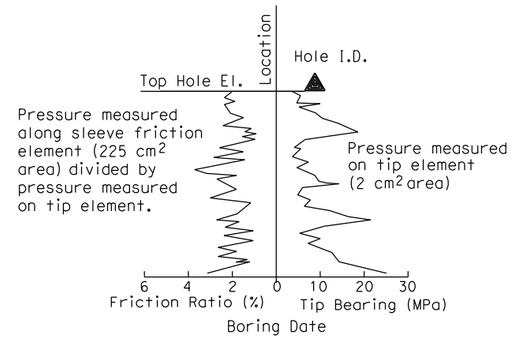
ROTARY BORING



HAND BORING



DYNAMIC CONE PENETRATION BORING



CONE PENETRATION TEST (CPT) SOUNDING

SOIL LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "438R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 2 OF 6
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES									SHEET	OF
10/14/08	3/9/09									

FILE => MRW06.dgn

USERNAME => mparcinjape DATE PLOTTED => 3/13/2009 TIME PLOTTED => 10:07:56 AM

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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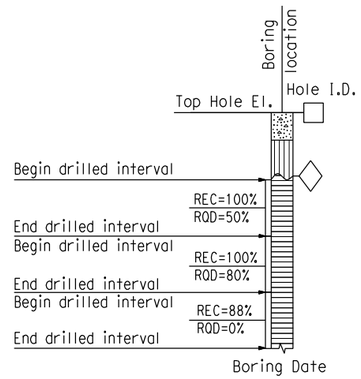
SAN DIEGO, CA. 92111

PERCENT CORE RECOVERY (REC) & ROCK QUALITY DESIGNATION (RQD)

$$REC = \frac{\sum \text{Length of the recovered core pieces}}{\text{Total length of core run}} \times 100\%$$

$$RQD = \frac{\sum \text{Length of intact core pieces} \geq 100\ mm}{\text{Total length of core run}} \times 100\%$$



RELATIVE STRENGTH OF INTACT ROCK

Term	Uniaxial Compressive Strength (MPa)
Extremely Strong	> 207
Very Strong	100 - 207
Strong	49 - 100
Medium Strong	25 - 49
Weak	5 - 25
Very Weak	1 - 5
Extremely Weak	< 1

BEDDING SPACING

Description	Thickness / Spacing
Massive	Greater than 3 m
Very thickly bedded	1 m to 3 m
Thickly bedded	300 mm to 1 m
Moderately bedded	100 mm to 300 mm
Thinly bedded	30 mm to 100 mm
Very thinly bedded	10 mm to 30 mm
Laminated	Less than 10 mm

LEGEND OF ROCK MATERIALS

- IGNEOUS ROCK
- SEDIMENTARY ROCK
- METAMORPHIC ROCK

ROCK HARDNESS

Description	Criteria
Extremely Hard	Specimen cannot be scratched with a pocket knife or sharp pick; can only be chipped with repeated heavy hammer blows.
Very Hard	Specimen cannot be scratched with a pocket knife or sharp pick. Breaks with repeated heavy hammer blows.
Hard	Specimen can be scratched with a pocket knife or sharp pick with difficulty (heavy pressure). Heavy hammer blows required to break specimen.
Moderately Hard	Specimen can be scratched with pocket knife or sharp pick with light or moderate pressure. Core breaks with moderate hammer pressure.
Moderately Soft	Specimen can be grooved 5 mm deep with a pocket knife or sharp pick with moderate or heavy pressure. Breaks with light hammer blow or heavy manual pressure.
Soft	Specimen can be grooved or gouged easily by a pocket knife or sharp pick with light pressure, can be scratched with fingernail. Breaks with light to moderate manual pressure.
Very Soft	Specimen can be readily indented, grooved or gouged with fingernail, or carved with a pocket knife. Breaks with light manual pressure.

FRACTURE DENSITY

Description	Observed Fracture Density
Unfractured	No fractures.
Very slightly fractured	Lengths greater than 1 m.
Slightly fractured	Lengths from 300 mm to 1000 mm with few lengths less than 300 mm or greater than 1000 mm.
Moderately fractured	Lengths mostly in 100 mm to 300 mm range with most lengths about 200 mm.
Intensely fractured	Lengths average from 30 mm to 100 mm with scattered fragmented intervals with lengths less than 100 mm.
Very intensely fractured	Mostly chips and fragments with a few scattered short core lengths.

Combination descriptors (such as "Very intensely to intensely fractured") are used where equal distribution of both fracture density characteristics is present over a significant interval or exposure, or where characteristics are "in between" the descriptor definitions. Only two adjacent descriptors may be combined.

WEATHERING DESCRIPTORS FOR INTACT ROCK

Description	Diagnostic features: Chemical Weathering-Discoloration and/or oxidation — Body of Rock	Diagnostic features: Chemical Weathering-Discoloration and/or oxidation — Fracture Surfaces	Diagnostic features: Mechanical Weathering-Grain boundary conditions (disaggregation) primarily for granitics and some coarse-grained sediments	Diagnostic features: Texture and Solutioning — Texture	Diagnostic features: Texture and Solutioning — Solutioning	General Characteristics
Fresh	No discoloration, not oxidized.	No discoloration or oxidation.	No separation, intact (tight).	No change.	No solutioning.	Hammer rings when crystalline rocks are struck.
Slightly Weathered	Discoloration or oxidation is limited to surface of, or short distance from, fractures; some feldspar crystals are dull.	Minor to complete discoloration or oxidation of most surfaces.	No visible separation, intact (tight).	Preserved.	Minor leaching of some soluble minerals may be noted.	Hammer rings when crystalline rocks are struck. Body of rock not weakened.
Moderately Weathered	Discoloration or oxidation extends from fractures usually throughout; Fe-Mg minerals are "rusty," feldspar crystals are "cloudy."	All fracture surfaces are discolored or oxidized.	Partial separation of boundaries visible.	Generally preserved.	Soluble minerals may be mostly leached.	Hammer does not ring when rock is struck. Body of rock is slightly weakened.
Intensely Weathered	Discoloration or oxidation throughout; all feldspars and Fe-Mg minerals are altered to clay to some extent; or chemical alteration produces in-situ disaggregation, see grain boundary conditions.	All fracture surfaces are discolored or oxidized, surfaces friable.	Partial separation, rock is friable; in semiarid conditions granitics are disaggregated.	Texture altered by chemical disintegration (hydration, argillation).	Leaching of soluble minerals may be complete.	Dull sound when struck with hammer, usually can be broken with moderate to heavy manual pressure or by light hammer blow without reference to planes of weakness such as incipient or hairline fractures, or veinlets. Rock is significantly weakened.
Decomposed	Discolored or oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe-Mg minerals are completely altered to clay.		Complete separation of grain boundaries (disaggregated).	Resembles a soil, partial or complete remnant rock structure may be preserved; leaching of soluble minerals usually complete.		Can be granulated by hand. Resistant minerals such as quartz may be present as "stringers" or "dikes."

Combination descriptors (such as "slightly weathered to fresh") are permissible where equal distribution of both weathering characteristics is present over significant intervals or where characteristics present are "in between" the diagnostic feature. However, combination descriptors should not be used where significant, identifiable zones can be delineated. Only two adjacent descriptors may be combined. "Very intensely weathered" is the combination descriptor for "intensely weathered to decomposed."

ROCK LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "438R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 3 OF 6
NAME:	CHECKED BY: G. CUSTENBORDER	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER			

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

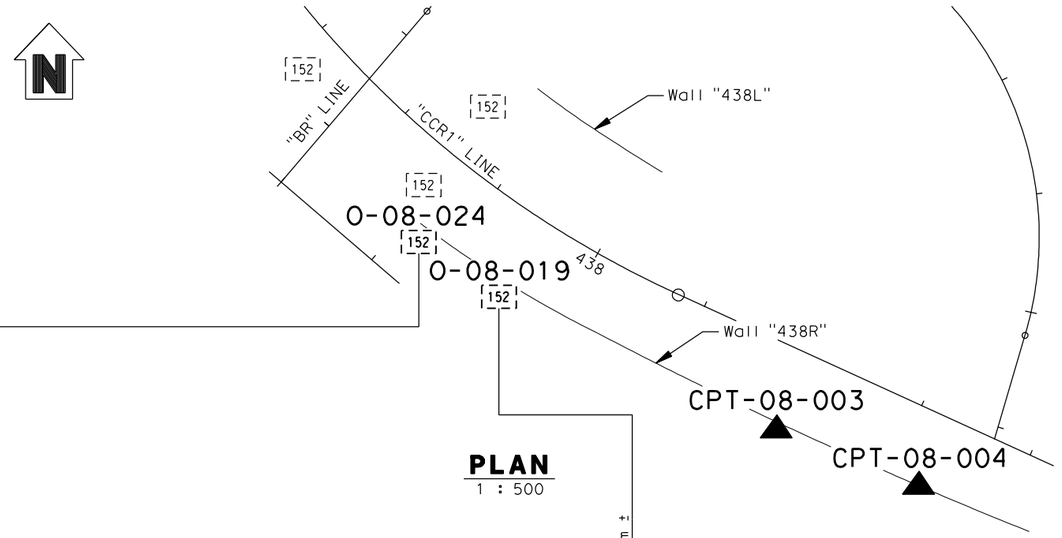
REVISION DATES: 10/14/08, 3/9/09

SHEET OF

FILE => MRW07.dgn

USERNAME => mporonjae DATE PLOTTED => 3/13/2009 TIME PLOTTED => 10:08:03 AM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



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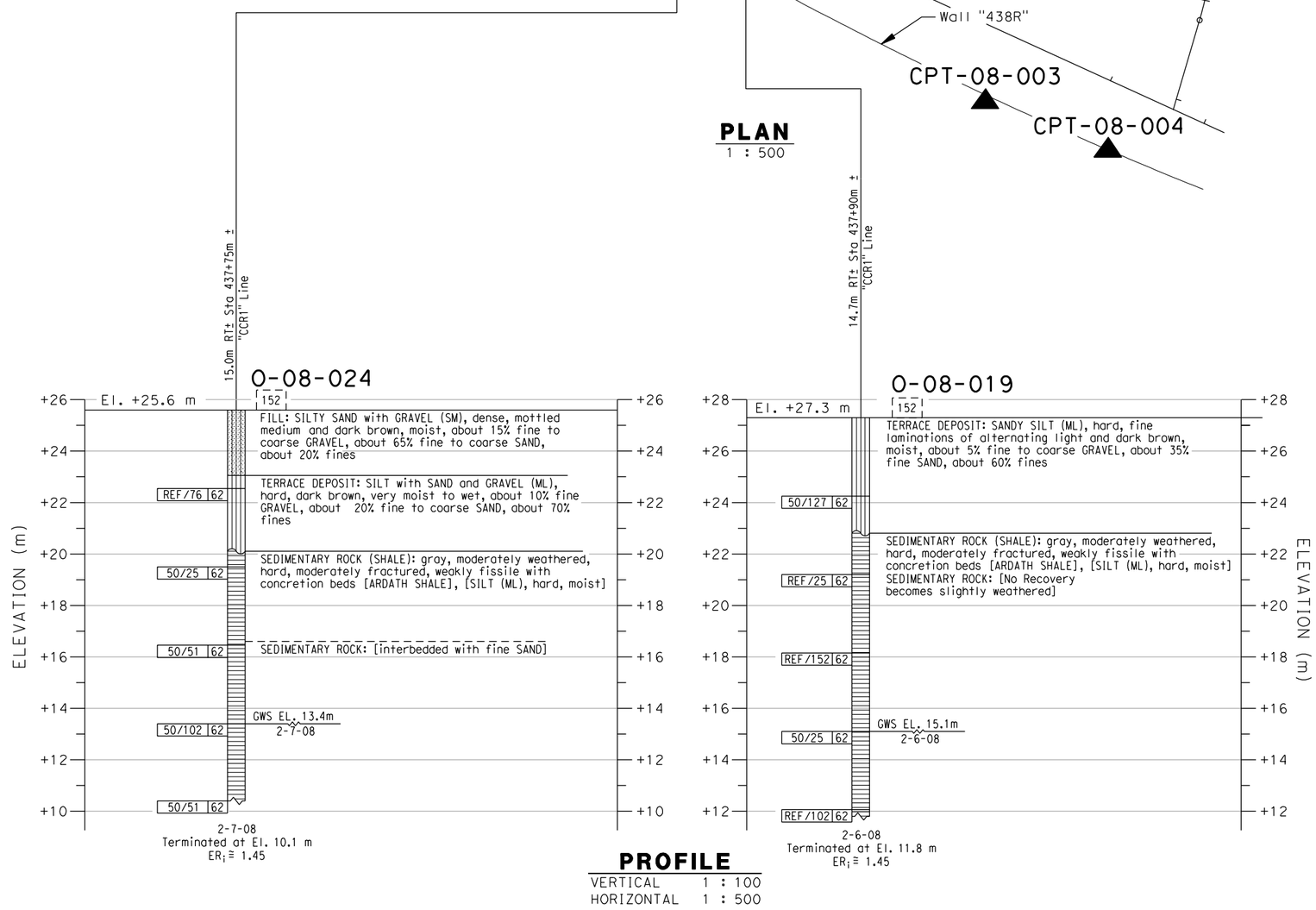

PROFILE
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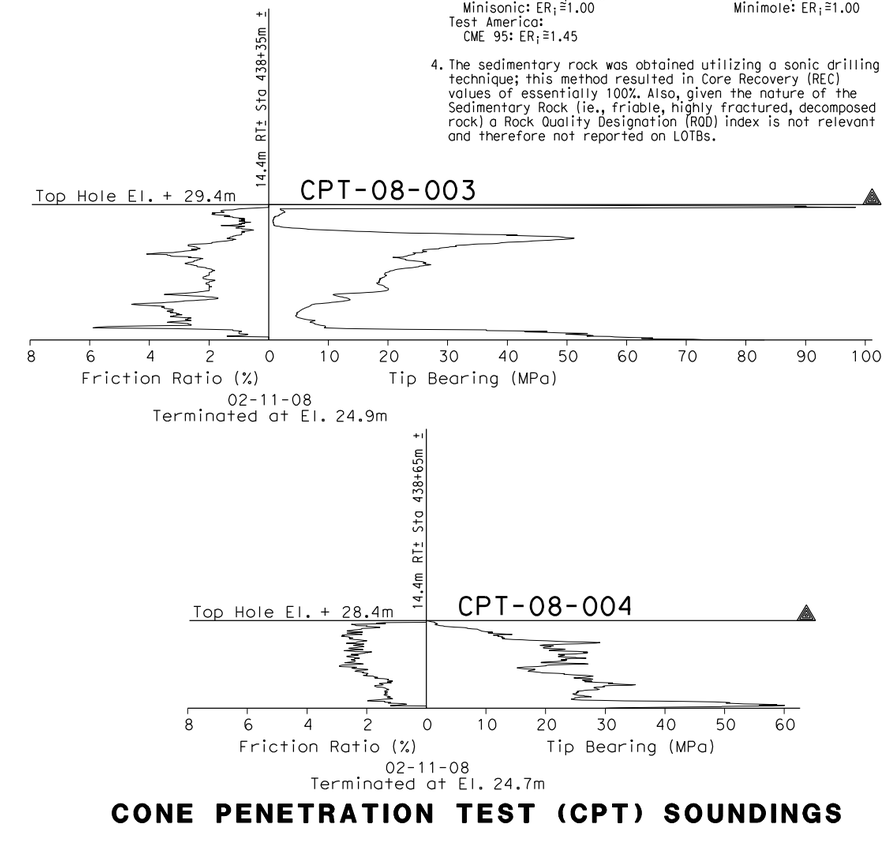
HORIZONTAL 1 : 500



CONE PENETRATION TEST (CPT) SOUNDINGS

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.
2. Automatic trip and safety hammer systems consisting of hammer weight of 62.5 kg falling a distance of 762 mm were used to advance the drive samplers in accordance with ASTM D1586.
3. The average hammer energy ratio (ER$_i$) reflects the percentage efficiency of SPT blowcounts (N-value). The estimated ER$_i$ for the various drilling equipment used was as follows:
   Boart Longyear:
   Longyear 1405: ER$_i$ ≅ 1.45
   Prosonic Track Mounted: ER$_i$ ≅ 1.00
   Prosonic 1: ER$_i$ ≅ 1.45
   Minisonic: ER$_i$ ≅ 1.00
   Test America:
   CME 95: ER$_i$ ≅ 1.45
   Pacific Drilling:
   Unimog: ER$_i$ ≅ 1.27
   Mole: ER$_i$ ≅ 1.00
   Minimole: ER$_i$ ≅ 1.00
4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (RQD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES		GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "438R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN G. CUSTENBORDER			DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 4 OF 6
NAME:	CHECKED BY: G. CUSTENBORDER						

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES										SHEET	OF
10/14/08	3/9/09										

FILE => MRW08.dgn

USERNAME => mporcinjope DATE PLOTTED => 3/13/2009 TIME PLOTTED => 10:08:12 AM

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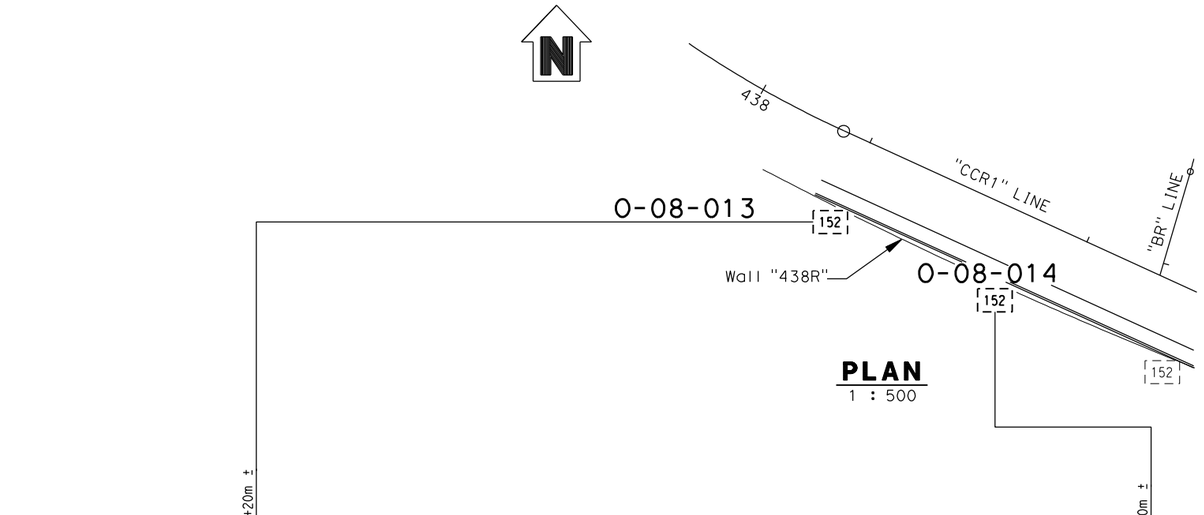

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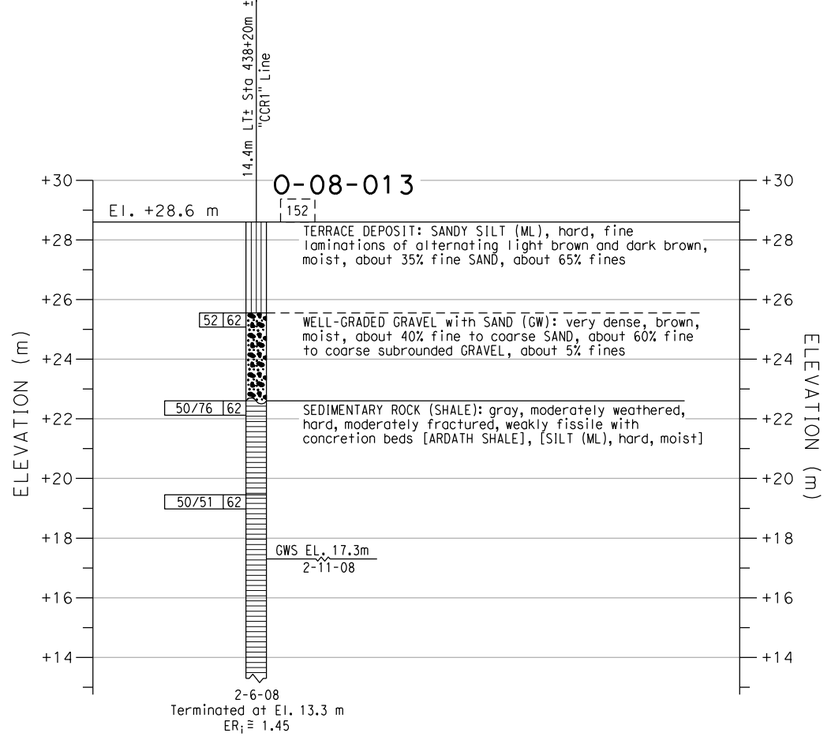

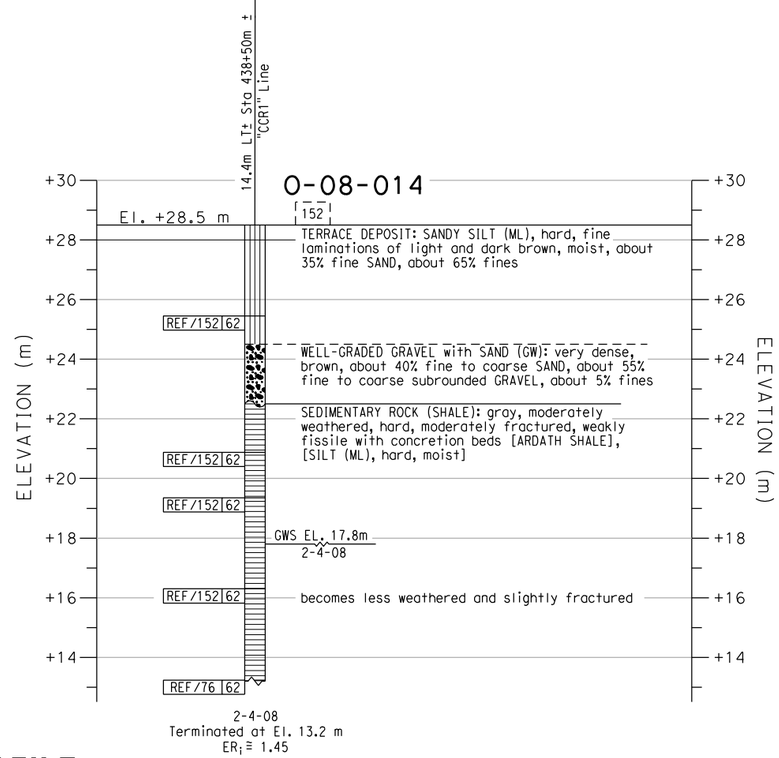

PROFILE
VERTICAL
HORIZONTAL

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

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   Test America:
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ENGINEERING SERVICES		GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "438R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER			DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 5 OF 6
NAME:	CHECKED BY: G. CUSTENBORDER						

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES: 10/14/08, 3/9/09

SHEET OF

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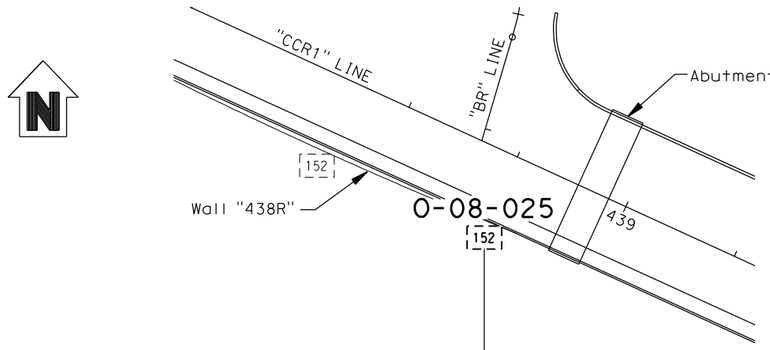
Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



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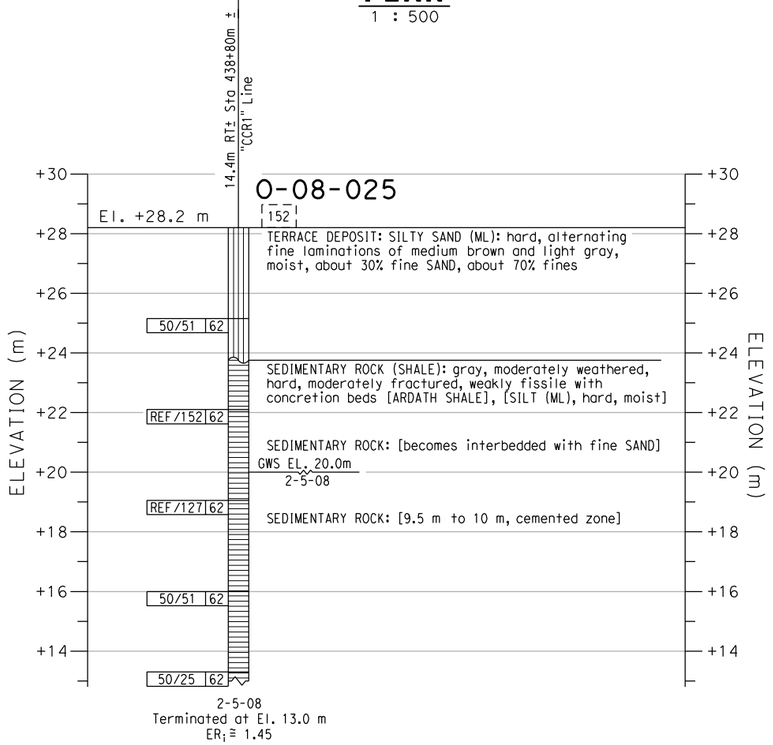

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

REGISTERED PROFESSIONAL ENGINEER
VAN OLIN
NO. 2578
EXP. 6-30-10
GEOTECHNICAL
STATE OF CALIFORNIA

PLANS APPROVAL DATE

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   Unimog: ER$_i$ ≅ 1.27
   Mole: ER$_i$ ≅ 1.00
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FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER			DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 6 OF 6
NAME:	CHECKED BY: G. CUSTENBORDER						

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES										SHEET	OF
10/14/08											

USERNAME => mporcinjope DATE PLOTTED => 3/13/2009 TIME PLOTTED => 10:08:24 AM

FILE => MRW10.dgn

APPENDIX I.10.4

TYPE I WALL 443R LOTBs

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

GROUP SYMBOLS AND NAMES

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

FIELD AND LABORATORY TESTING

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

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

APPARENT DENSITY OF COHESIONLESS SOILS

Description	SPT N_{60} (Blows / 300 mm)
Very loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE

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

PERCENT OR PROPORTION OF SOILS

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

PARTICLE SIZE

Description		Size
Boulder		> 300 mm
Cobble		76 mm to 300 mm
Gravel	Coarse	19 mm to 76 mm
	Fine	No. 4 to 19 mm
Sand	Coarse	No. 10 to No. 4
	Medium	No. 40 to No. 10
	Fine	No. 200 to No. 40

SOIL LEGEND

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "443R"
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	MISCELLANEOUS RETAINING WALLS
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401		LOG OF TEST BORINGS SHEET NO. 1 OF 5

OGS CIVIL LOG OF TEST BORINGS SHEET

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: 10/14/08 | 3/9/09 | SHEET | OF

FILE => MRW15.dgn

USERNAME => mpcronjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:26:26 PM

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

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BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

CEMENTATION

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

BOREHOLE IDENTIFICATION

Symbol	Hole Type	Description
Size	A	Auger Boring
Size	R P	Rotary drilled boring Rotary percussion boring (air)
Size	R	Rotary drilled diamond core
Size	HD HA	Hand driven (25 mm soil tube) Hand Auger
●	D	Dynamic Cone Penetration Boring
▲	CPT	Cone Penetration Test (ASTM D 5778-95)
[ ]	O	Other

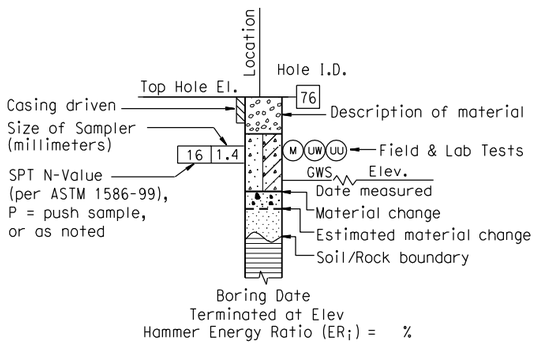
Note: Size in millimeters.

CONSISTENCY OF COHESIVE SOILS

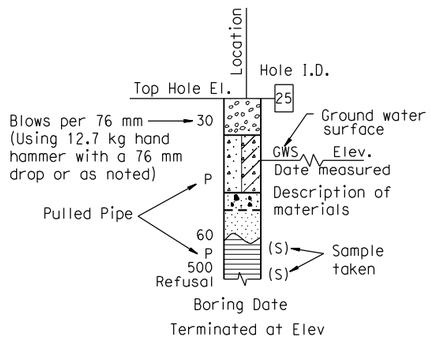
Description	Unconfined Compressive Strength (tsm)	Pocket Penetrometer Measurement (tsm)	Torvane Measurement (tsm)	Field Approximation
Very Soft	< 24	< 24	< 12	Easily penetrated several inches by fist
Soft	24 to 48	24 to 48	12 to 24	Easily penetrated several inches by thumb
Medium Stiff	48 to 96	48 to 96	24 to 48	Penetrated several inches by thumb with moderate effort
Stiff	96 to 192	96 to 192	48 to 96	Readily indented by thumb but penetrated only with great effort
Very Stiff	192 to 383	192 to 383	96 to 192	Readily indented by thumbnail
Hard	> 383	> 383	> 192	Indented by thumbnail with difficulty

PLASTICITY OF FINE-GRAINED SOILS

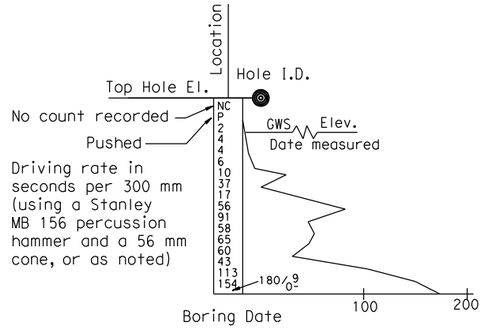
Description	Criteria
Nonplastic	A 3 mm thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.



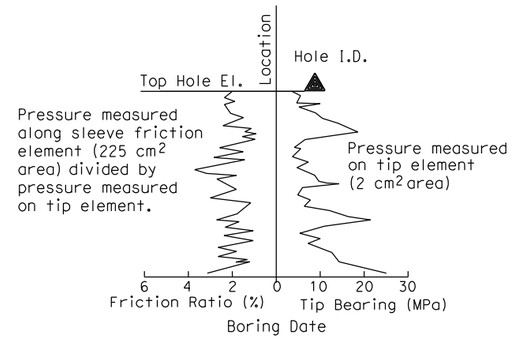
ROTARY BORING



HAND BORING



DYNAMIC CONE PENETRATION BORING



CONE PENETRATION TEST (CPT) SOUNDING

SOIL LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "443R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 2 OF 5
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES		SHEET	OF
10/14/08	3/9/09		

FILE => MRW16.dgn

USERNAME => mparcinjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:26:35 PM

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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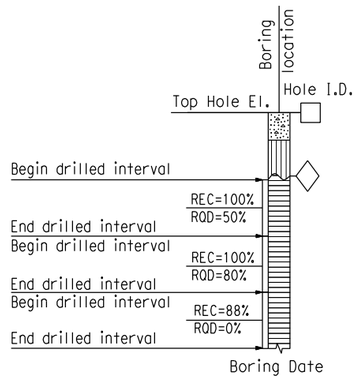
SAN DIEGO, CA. 92111

PERCENT CORE RECOVERY (REC) & ROCK QUALITY DESIGNATION (RQD)

$$REC = \frac{\sum \text{Length of the recovered core pieces}}{\text{Total length of core run}} \times 100\%$$

$$RQD = \frac{\sum \text{Length of intact core pieces} \geq 100\ mm}{\text{Total length of core run}} \times 100\%$$



RELATIVE STRENGTH OF INTACT ROCK

Term	Uniaxial Compressive Strength (MPa)
Extremely Strong	> 207
Very Strong	100 - 207
Strong	49 - 100
Medium Strong	25 - 49
Weak	5 - 25
Very Weak	1 - 5
Extremely Weak	< 1

BEDDING SPACING

Description	Thickness / Spacing
Massive	Greater than 3 m
Very thickly bedded	1 m to 3 m
Thickly bedded	300 mm to 1 m
Moderately bedded	100 mm to 300 mm
Thinly bedded	30 mm to 100 mm
Very thinly bedded	10 mm to 30 mm
Laminated	Less than 10 mm

LEGEND OF ROCK MATERIALS

- IGNEOUS ROCK
- SEDIMENTARY ROCK
- METAMORPHIC ROCK

ROCK HARDNESS

Description	Criteria
Extremely Hard	Specimen cannot be scratched with a pocket knife or sharp pick; can only be chipped with repeated heavy hammer blows.
Very Hard	Specimen cannot be scratched with a pocket knife or sharp pick. Breaks with repeated heavy hammer blows.
Hard	Specimen can be scratched with a pocket knife or sharp pick with difficulty (heavy pressure). Heavy hammer blows required to break specimen.
Moderately Hard	Specimen can be scratched with pocket knife or sharp pick with light or moderate pressure. Core breaks with moderate hammer pressure.
Moderately Soft	Specimen can be grooved 5 mm deep with a pocket knife or sharp pick with moderate or heavy pressure. Breaks with light hammer blow or heavy manual pressure.
Soft	Specimen can be grooved or gouged easily by a pocket knife or sharp pick with light pressure, can be scratched with fingernail. Breaks with light to moderate manual pressure.
Very Soft	Specimen can be readily indented, grooved or gouged with fingernail, or carved with a pocket knife. Breaks with light manual pressure.

FRACTURE DENSITY

Description	Observed Fracture Density
Unfractured	No fractures.
Very slightly fractured	Lengths greater than 1 m.
Slightly fractured	Lengths from 300 mm to 1000 mm with few lengths less than 300 mm or greater than 1000 mm.
Moderately fractured	Lengths mostly in 100 mm to 300 mm range with most lengths about 200 mm.
Intensely fractured	Lengths average from 30 mm to 100 mm with scattered fragmented intervals with lengths less than 100 mm.
Very intensely fractured	Mostly chips and fragments with a few scattered short core lengths.

Combination descriptors (such as "Very intensely to intensely fractured") are used where equal distribution of both fracture density characteristics is present over a significant interval or exposure, or where characteristics are "in between" the descriptor definitions. Only two adjacent descriptors may be combined.

WEATHERING DESCRIPTORS FOR INTACT ROCK

Description	Diagnostic features					General Characteristics
	Chemical Weathering-Discoloration and/or oxidation		Mechanical Weathering-Grain boundary conditions (disaggregation) primarily for granitics and some coarse-grained sediments	Texture and Solutioning		
	Body of Rock	Fracture Surfaces		Texture	Solutioning	
Fresh	No discoloration, not oxidized.	No discoloration or oxidation.	No separation, intact (tight).	No change.	No solutioning.	Hammer rings when crystalline rocks are struck.
Slightly Weathered	Discoloration or oxidation is limited to surface of, or short distance from, fractures; some feldspar crystals are dull.	Minor to complete discoloration or oxidation of most surfaces.	No visible separation, intact (tight).	Preserved.	Minor leaching of some soluble minerals may be noted.	Hammer rings when crystalline rocks are struck. Body of rock not weakened.
Moderately Weathered	Discoloration or oxidation extends from fractures usually throughout; Fe-Mg minerals are "rusty," feldspar crystals are "cloudy."	All fracture surfaces are discolored or oxidized.	Partial separation of boundaries visible.	Generally preserved.	Soluble minerals may be mostly leached.	Hammer does not ring when rock is struck. Body of rock is slightly weakened.
Intensely Weathered	Discoloration or oxidation throughout; all feldspars and Fe-Mg minerals are altered to clay to some extent; or chemical alteration produces in-situ disaggregation, see grain boundary conditions.	All fracture surfaces are discolored or oxidized, surfaces friable.	Partial separation, rock is friable; in semiarid conditions granitics are disaggregated.	Texture altered by chemical disintegration (hydration, argillation).	Leaching of soluble minerals may be complete.	Dull sound when struck with hammer, usually can be broken with moderate to heavy manual pressure or by light hammer blow without reference to planes of weakness such as incipient or hairline fractures, or veinlets. Rock is significantly weakened.
Decomposed	Discolored or oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe-Mg minerals are completely altered to clay.		Complete separation of grain boundaries (disaggregated).	Resembles a soil, partial or complete remnant rock structure may be preserved; leaching of soluble minerals usually complete.		Can be granulated by hand. Resistant minerals such as quartz may be present as "stringers" or "dikes."

Combination descriptors (such as "slightly weathered to fresh") are permissible where equal distribution of both weathering characteristics is present over significant intervals or where characteristics present are "in between" the diagnostic feature. However, combination descriptors should not be used where significant, identifiable zones can be delineated. Only two adjacent descriptors may be combined. "Very intensely weathered" is the combination descriptor for "intensely weathered to decomposed."

ROCK LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "443R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 3 OF 5
NAME:	CHECKED BY: G. CUSTENBORDER	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER	CU 11275 EA 2T0401	DISREGARD PRINTS BEARING EARLIER REVISION DATES →	REVISION DATES: 10/14/08, 3/9/09

OGS CIVIL LOG OF TEST BORINGS SHEET

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

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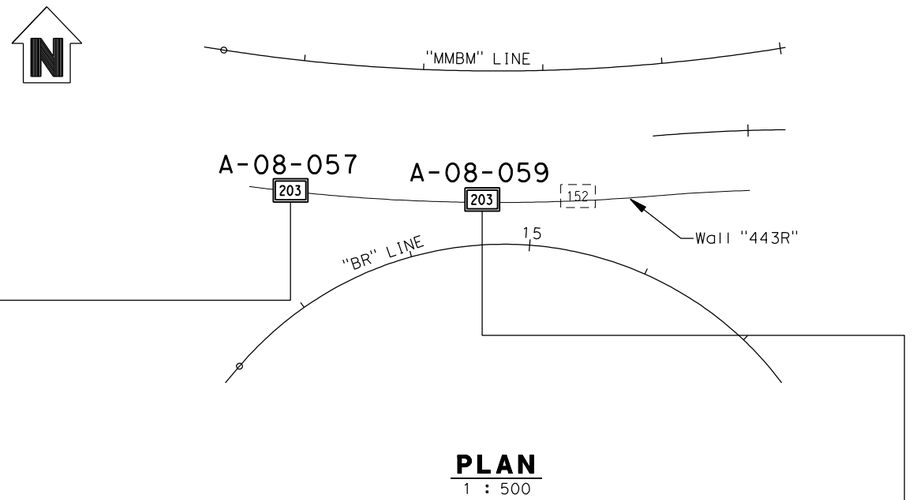
Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
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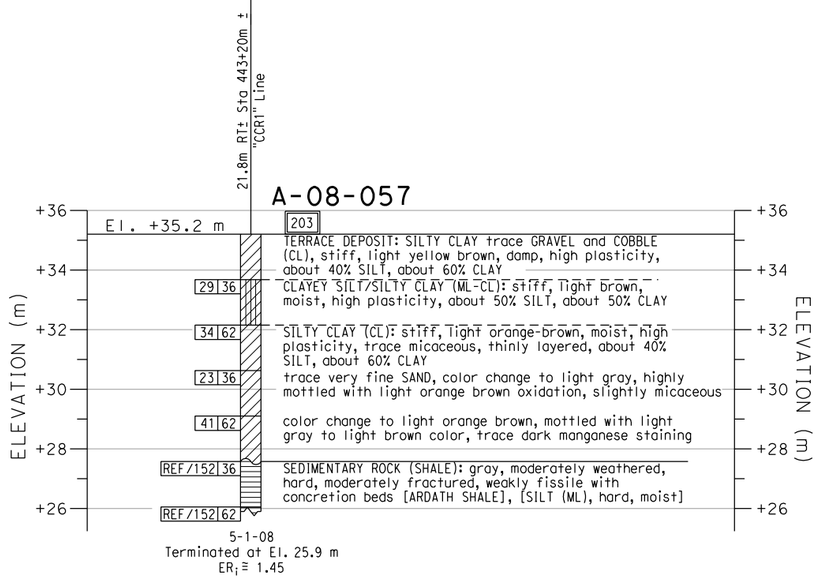

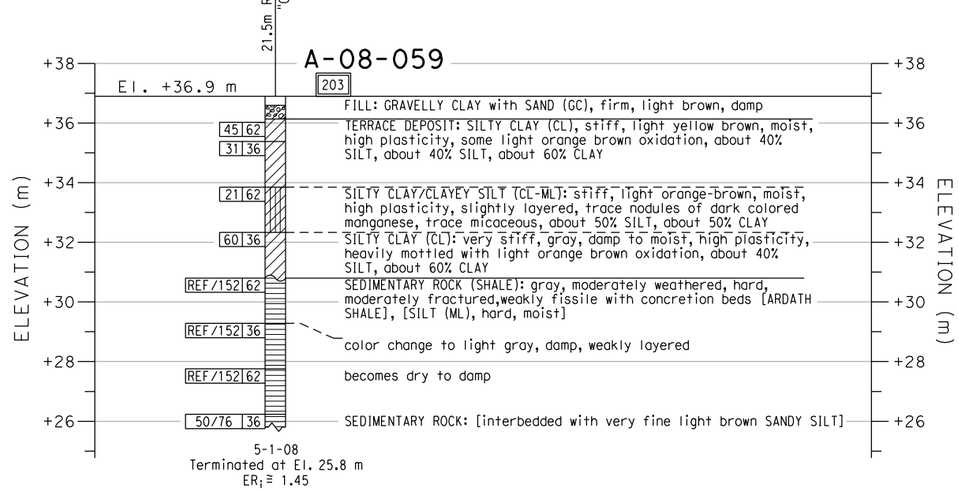

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.
2. Automatic trip and safety hammer systems consisting of hammer weight of 62.5 kg falling a distance of 762 mm were used to advance the drive samplers in accordance with ASTM D1586.
3. The average hammer energy ratio (ER$_i$) reflects the percentage efficiency of SPT blowcounts (N-value). The estimated ER$_i$ for the various drilling equipment used was as follows:
   Boart Longyear:
   Longyear 1405: ER$_i$ ≅ 1.45
   Prosonic Track Mounted: ER$_i$ ≅ 1.00
   Prosonic 1: ER$_i$ ≅ 1.45
   Minisonic: ER$_i$ ≅ 1.00
   Test America:
   CME 95: ER$_i$ ≅ 1.45
   Pacific Drilling:
   Unimog: ER$_i$ ≅ 1.27
   Mole: ER$_i$ ≅ 1.00
   Minimole: ER$_i$ ≅ 1.00
4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (ROD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES		GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "443R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER			DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 4 OF 5
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401			

OGS CIVIL LOG OF TEST BORINGS SHEET

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										SHEET	OF
10/14/08	3/9/09										

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Bench Mark
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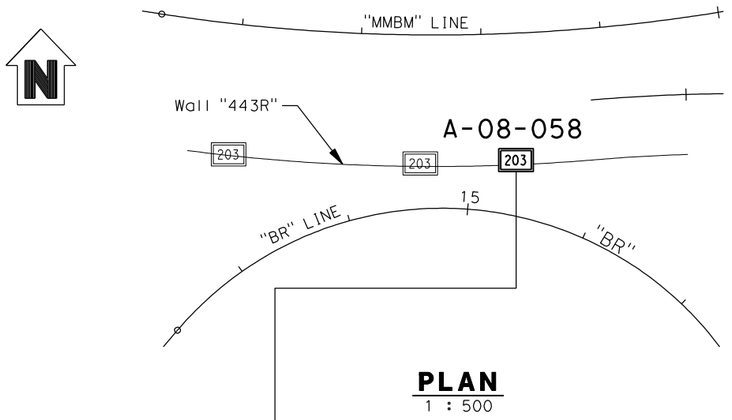

PLAN
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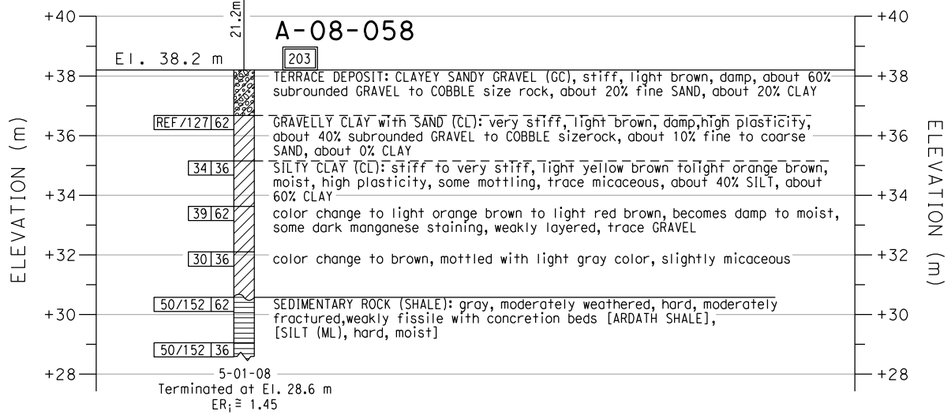

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SAN DIEGO, CA. 92111

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1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.
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   Test America:
   CME 95: ER$_i$≅1.45
   Pacific Drilling:
   Unimog: ER$_i$≅1.27
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FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 5 OF 5
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401		

OGS CIVIL LOG OF TEST BORINGS SHEET

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										SHEET	OF
10/14/08	3/9/09										

FILE => MRW19.dgn

USERNAME => mporan/jpe DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:27:01 PM

APPENDIX I.10.5

CRIB WALL 445L LOTBs

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

GROUP SYMBOLS AND NAMES

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

FIELD AND LABORATORY TESTING

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

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SAN DIEGO, CA. 92111

APPARENT DENSITY OF COHESIONLESS SOILS

Description	SPT N_{60} (Blows / 300 mm)
Very loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE

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

PERCENT OR PROPORTION OF SOILS

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

PARTICLE SIZE

Description		Size
Boulder		> 300 mm
Cobble		76 mm to 300 mm
Gravel	Coarse	19 mm to 76 mm
	Fine	No. 4 to 19 mm
Sand	Coarse	No. 10 to No. 4
	Medium	No. 40 to No. 10
	Fine	No. 200 to No. 40

SOIL LEGEND

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "445L" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 1 OF 5
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401	DISREGARD PRINTS BEARING EARLIER REVISION DATES →	REVISION DATES: 10/14/08, 3/9/09 — SHEET — OF

OGS CIVIL LOG OF TEST BORINGS SHEET

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

FILE => MRW31.dgn

USERNAME => mpcronjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:28:43 PM

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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CEMENTATION

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

BOREHOLE IDENTIFICATION

Symbol	Hole Type	Description
Size	A	Auger Boring
Size	R P	Rotary drilled boring Rotary percussion boring (air)
Size	R	Rotary drilled diamond core
Size	HD HA	Hand driven (25 mm soil tube) Hand Auger
●	D	Dynamic Cone Penetration Boring
▲	CPT	Cone Penetration Test (ASTM D 5778-95)
[ ]	O	Other

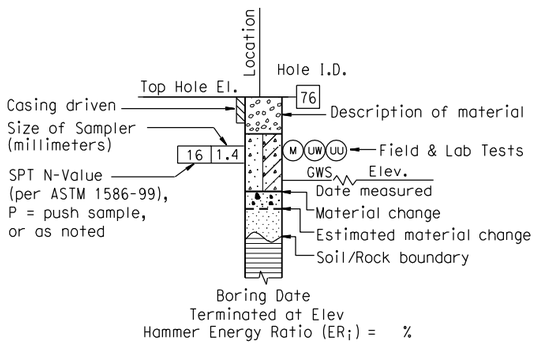
Note: Size in millimeters.

CONSISTENCY OF COHESIVE SOILS

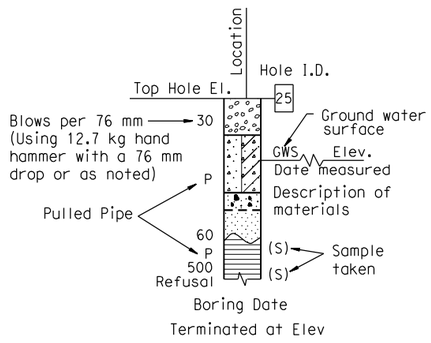
Description	Unconfined Compressive Strength (tsm)	Pocket Penetrometer Measurement (tsm)	Torvane Measurement (tsm)	Field Approximation
Very Soft	< 24	< 24	< 12	Easily penetrated several inches by fist
Soft	24 to 48	24 to 48	12 to 24	Easily penetrated several inches by thumb
Medium Stiff	48 to 96	48 to 96	24 to 48	Penetrated several inches by thumb with moderate effort
Stiff	96 to 192	96 to 192	48 to 96	Readily indented by thumb but penetrated only with great effort
Very Stiff	192 to 383	192 to 383	96 to 192	Readily indented by thumbnail
Hard	> 383	> 383	> 192	Indented by thumbnail with difficulty

PLASTICITY OF FINE-GRAINED SOILS

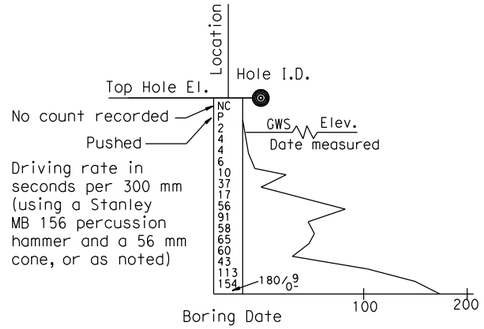
Description	Criteria
Nonplastic	A 3 mm thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.



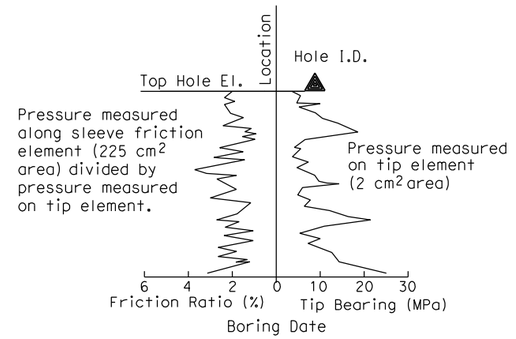
ROTARY BORING



HAND BORING



DYNAMIC CONE PENETRATION BORING



CONE PENETRATION TEST (CPT) SOUNDING

SOIL LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "445L" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 2 OF 5
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES		SHEET	OF
10/14/08	3/9/09		

USERNAME => mparcinjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:28:52 PM

FILE => MRW32.dgn

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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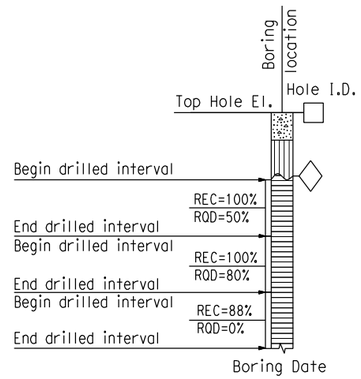
PERCENT CORE RECOVERY (REC) & ROCK QUALITY DESIGNATION (RQD)

$$REC = \frac{\sum \text{Length of the recovered core pieces}}{\text{Total length of core run}} \times 100\%$$

$$RQD = \frac{\sum \text{Length of intact core pieces} \geq 100\ mm}{\text{Total length of core run}} \times 100\%$$



RELATIVE STRENGTH OF INTACT ROCK

Term	Uniaxial Compressive Strength (MPa)
Extremely Strong	> 207
Very Strong	100 - 207
Strong	49 - 100
Medium Strong	25 - 49
Weak	5 - 25
Very Weak	1 - 5
Extremely Weak	< 1

BEDDING SPACING

Description	Thickness / Spacing
Massive	Greater than 3 m
Very thickly bedded	1 m to 3 m
Thickly bedded	300 mm to 1 m
Moderately bedded	100 mm to 300 mm
Thinly bedded	30 mm to 100 mm
Very thinly bedded	10 mm to 30 mm
Laminated	Less than 10 mm

LEGEND OF ROCK MATERIALS

- IGNEOUS ROCK
- SEDIMENTARY ROCK
- METAMORPHIC ROCK

ROCK HARDNESS

Description	Criteria
Extremely Hard	Specimen cannot be scratched with a pocket knife or sharp pick; can only be chipped with repeated heavy hammer blows.
Very Hard	Specimen cannot be scratched with a pocket knife or sharp pick. Breaks with repeated heavy hammer blows.
Hard	Specimen can be scratched with a pocket knife or sharp pick with difficulty (heavy pressure). Heavy hammer blows required to break specimen.
Moderately Hard	Specimen can be scratched with pocket knife or sharp pick with light or moderate pressure. Core breaks with moderate hammer pressure.
Moderately Soft	Specimen can be grooved 5 mm deep with a pocket knife or sharp pick with moderate or heavy pressure. Breaks with light hammer blow or heavy manual pressure.
Soft	Specimen can be grooved or gouged easily by a pocket knife or sharp pick with light pressure, can be scratched with fingernail. Breaks with light to moderate manual pressure.
Very Soft	Specimen can be readily indented, grooved or gouged with fingernail, or carved with a pocket knife. Breaks with light manual pressure.

FRACTURE DENSITY

Description	Observed Fracture Density
Unfractured	No fractures.
Very slightly fractured	Lengths greater than 1 m.
Slightly fractured	Lengths from 300 mm to 1000 mm with few lengths less than 300 mm or greater than 1000 mm.
Moderately fractured	Lengths mostly in 100 mm to 300 mm range with most lengths about 200 mm.
Intensely fractured	Lengths average from 30 mm to 100 mm with scattered fragmented intervals with lengths less than 100 mm.
Very intensely fractured	Mostly chips and fragments with a few scattered short core lengths.

Combination descriptors (such as "Very intensely to intensely fractured") are used where equal distribution of both fracture density characteristics is present over a significant interval or exposure, or where characteristics are "in between" the descriptor definitions. Only two adjacent descriptors may be combined.

WEATHERING DESCRIPTORS FOR INTACT ROCK

Description	Diagnostic features: Chemical Weathering-Discoloration and/or oxidation — Body of Rock	Diagnostic features: Chemical Weathering-Discoloration and/or oxidation — Fracture Surfaces	Diagnostic features: Mechanical Weathering-Grain boundary conditions (disaggregation) primarily for granitics and some coarse-grained sediments	Diagnostic features: Texture and Solutioning — Texture	Diagnostic features: Texture and Solutioning — Solutioning	General Characteristics
Fresh	No discoloration, not oxidized.	No discoloration or oxidation.	No separation, intact (tight).	No change.	No solutioning.	Hammer rings when crystalline rocks are struck.
Slightly Weathered	Discoloration or oxidation is limited to surface of, or short distance from, fractures; some feldspar crystals are dull.	Minor to complete discoloration or oxidation of most surfaces.	No visible separation, intact (tight).	Preserved.	Minor leaching of some soluble minerals may be noted.	Hammer rings when crystalline rocks are struck. Body of rock not weakened.
Moderately Weathered	Discoloration or oxidation extends from fractures usually throughout; Fe-Mg minerals are "rusty," feldspar crystals are "cloudy."	All fracture surfaces are discolored or oxidized.	Partial separation of boundaries visible.	Generally preserved.	Soluble minerals may be mostly leached.	Hammer does not ring when rock is struck. Body of rock is slightly weakened.
Intensely Weathered	Discoloration or oxidation throughout; all feldspars and Fe-Mg minerals are altered to clay to some extent; or chemical alteration produces in-situ disaggregation, see grain boundary conditions.	All fracture surfaces are discolored or oxidized, surfaces friable.	Partial separation, rock is friable; in semiarid conditions granitics are disaggregated.	Texture altered by chemical disintegration (hydration, argillation).	Leaching of soluble minerals may be complete.	Dull sound when struck with hammer, usually can be broken with moderate to heavy manual pressure or by light hammer blow without reference to planes of weakness such as incipient or hairline fractures, or veinlets. Rock is significantly weakened.
Decomposed	Discolored or oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe-Mg minerals are completely altered to clay.		Complete separation of grain boundaries (disaggregated).	Resembles a soil, partial or complete remnant rock structure may be preserved; leaching of soluble minerals usually complete.		Can be granulated by hand. Resistant minerals such as quartz may be present as "stringers" or "dikes."

Combination descriptors (such as "slightly weathered to fresh") are permissible where equal distribution of both weathering characteristics is present over significant intervals or where characteristics present are "in between" the diagnostic feature. However, combination descriptors should not be used where significant, identifiable zones can be delineated. Only two adjacent descriptors may be combined. "Very intensely weathered" is the combination descriptor for "intensely weathered to decomposed."

ROCK LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "445L" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS		DESIGN BRANCH	POST MILES	LOG OF TEST BORINGS SHEET NO. 3 OF 5
NAME:	CHECKED BY: G. CUSTENBORDER	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		KP43.2/PM26.8	

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES: 10/14/08, 3/9/09

SHEET OF

FILE => MRW33.dgn

USERNAME => mporonjae DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:29:01 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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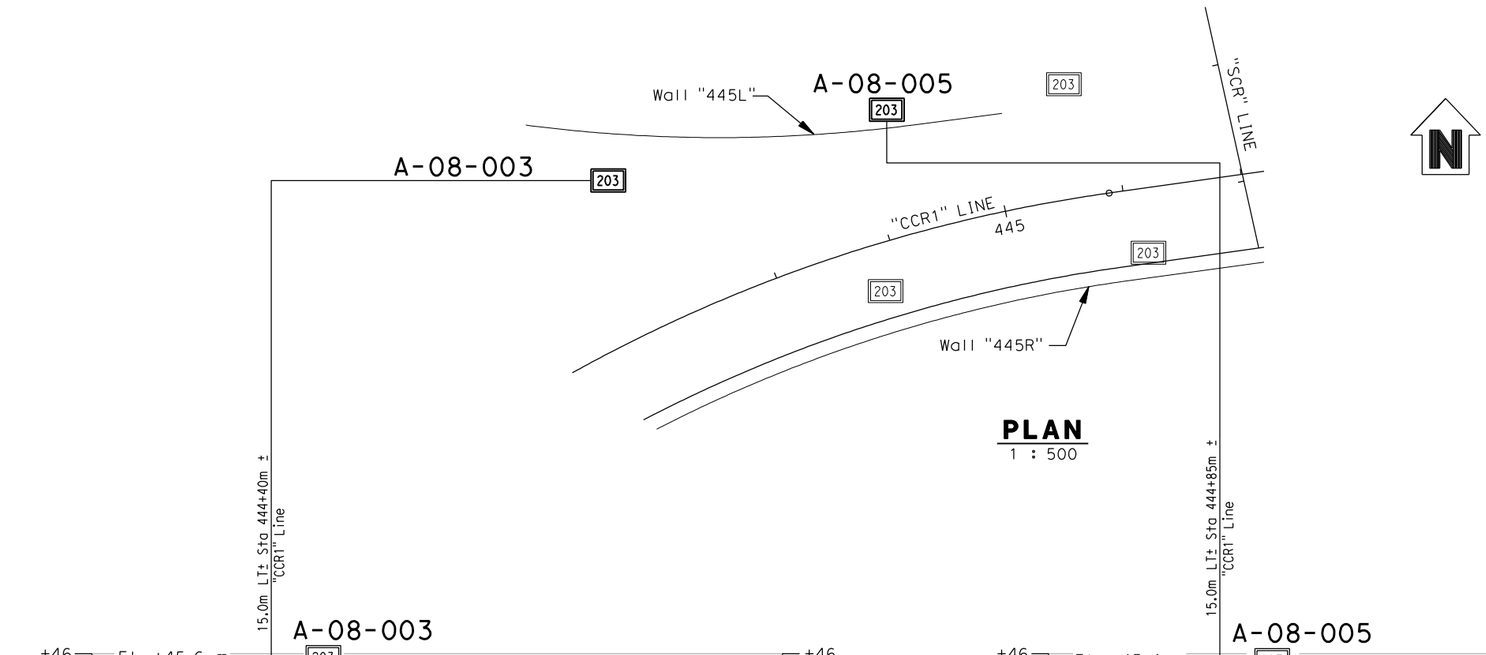
SAN DIEGO, CA. 92111



PLAN
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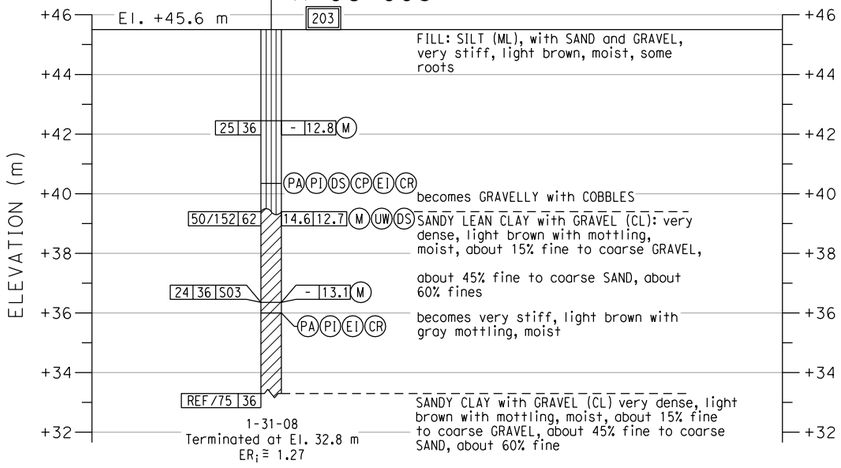

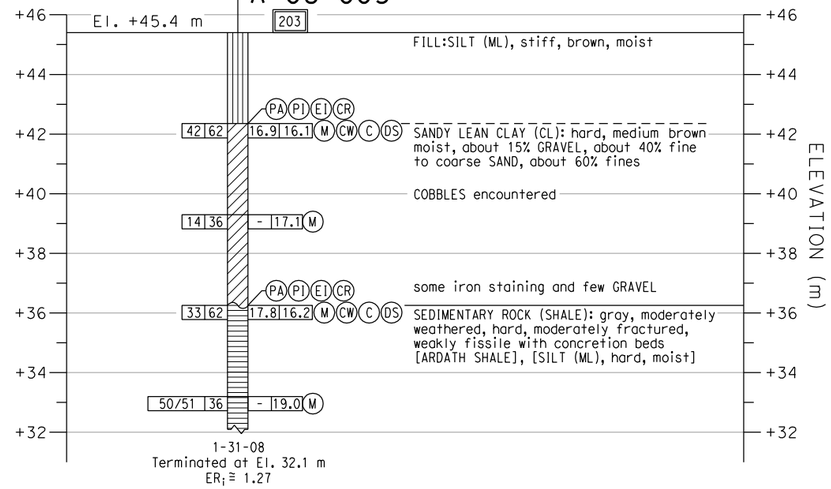

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.

2. Automatic trip and safety hammer systems consisting of hammer weight of 62.5 kg falling a distance of 762 mm were used to advance the drive samplers in accordance with ASTM D1586.

3. The average hammer energy ratio (ER_i) reflects the percentage efficiency of SPT blowcounts (N-value). The estimated ER_i for the various drilling equipment used was as follows:
   Boart Longyear:
   Longyear 1405: $ER_i \cong 1.45$
   Prosonic Track Mounted: $ER_i \cong 1.00$
   Prosonic 1: $ER_i \cong 1.45$
   Minisonic: $ER_i \cong 1.00$
   Pacific Drilling:
   Unimog: $ER_i \cong 1.27$
   Mole: $ER_i \cong 1.00$
   Minimole: $ER_i \cong 1.00$
   Test America:
   CME 95: $ER_i \cong 1.45$

4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (RQD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES		GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "445L" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER			DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 4 OF 5
NAME:	CHECKED BY: G. CUSTENBORDER						

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES									SHEET	OF
10/14/08	3/9/09									

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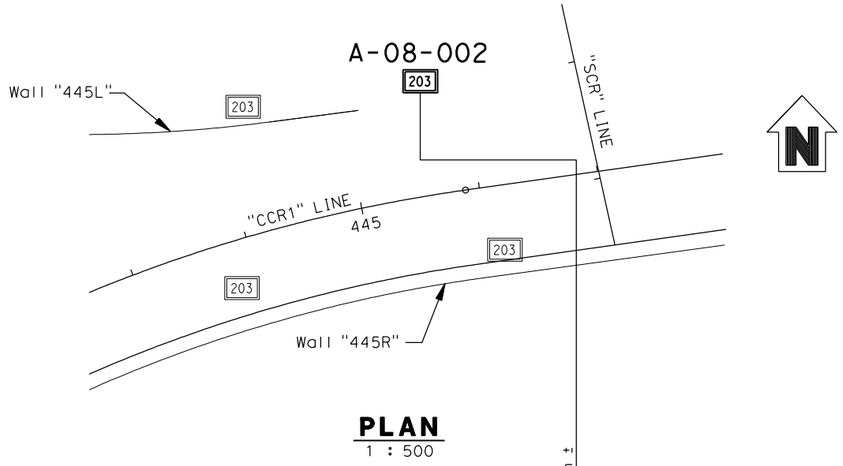
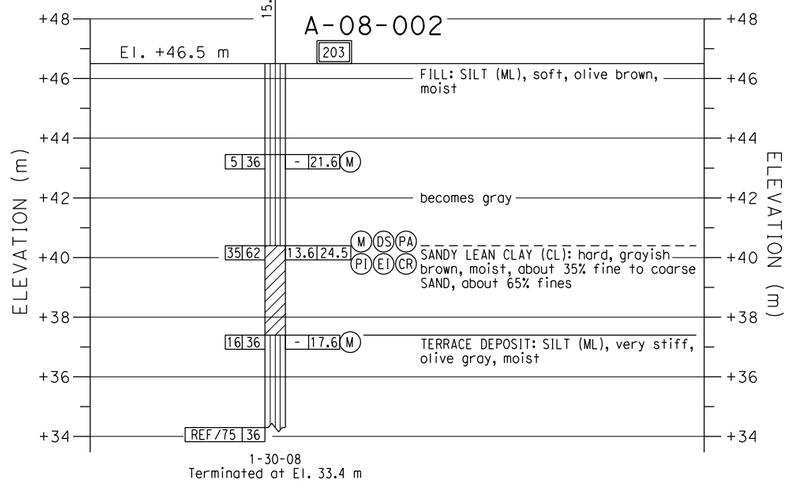
Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
1 : 500



PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

Caltrans Metric

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SAN DIEGO, CA. 92111

NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.

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   Longyear 1405: $ER_i \cong 1.45$
   Prosonic Track Mounted: $ER_i \cong 1.00$
   Prosonic 1: $ER_i \cong 1.45$
   Minisonic: $ER_i \cong 1.00$
   Pacific Drilling:
   Unimog: $ER_i \cong 1.27$
   Mole: $ER_i \cong 1.00$
   Minimole: $ER_i \cong 1.00$
   Test America:
   CME 95: $ER_i \cong 1.45$

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ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "445L" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 5 OF 5
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401		

OGS CIVIL LOG OF TEST BORINGS SHEET

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: 10/14/08 | 3/9/09 | SHEET | OF

FILE => MRW35.dgn

USERNAME => mparonjpe DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:29:17 PM

APPENDIX I.10.6

BATTERED MSE WALL 445R LOTBs

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

GROUP SYMBOLS AND NAMES

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

FIELD AND LABORATORY TESTING

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

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SANDAG
401 B STREET,
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SAN DIEGO, CA. 92111

APPARENT DENSITY OF COHESIONLESS SOILS

Description	SPT N_{60} (Blows / 300 mm)
Very loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE

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

PERCENT OR PROPORTION OF SOILS

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

PARTICLE SIZE

Description		Size
Boulder		> 300 mm
Cobble		76 mm to 300 mm
Gravel	Coarse	19 mm to 76 mm
	Fine	No. 4 to 19 mm
Sand	Coarse	No. 10 to No. 4
	Medium	No. 40 to No. 10
	Fine	No. 200 to No. 40

SOIL LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "445R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 1 OF 11
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401	DISREGARD PRINTS BEARING EARLIER REVISION DATES →	REVISION DATES: 10/14/08, 3/9/09 — SHEET — OF

OGS CIVIL LOG OF TEST BORINGS SHEET

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

FILE => MRW20.dgn

USERNAME => mpcronjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:30:05 PM

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

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CEMENTATION

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

BOREHOLE IDENTIFICATION

Symbol	Hole Type	Description
Size	A	Auger Boring
Size	R P	Rotary drilled boring Rotary percussion boring (air)
Size	R	Rotary drilled diamond core
Size	HD HA	Hand driven (25 mm soil tube) Hand Auger
●	D	Dynamic Cone Penetration Boring
▲	CPT	Cone Penetration Test (ASTM D 5778-95)
[ ]	O	Other

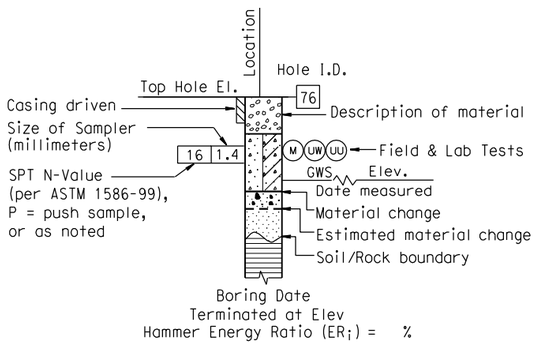
Note: Size in millimeters.

CONSISTENCY OF COHESIVE SOILS

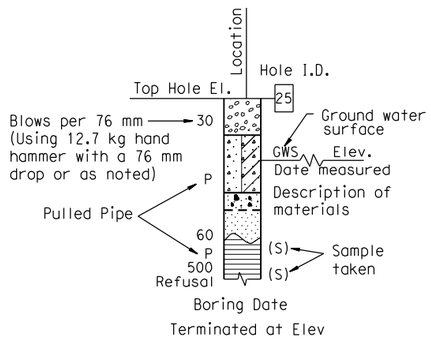
Description	Unconfined Compressive Strength (tsm)	Pocket Penetrometer Measurement (tsm)	Torvane Measurement (tsm)	Field Approximation
Very Soft	< 24	< 24	< 12	Easily penetrated several inches by fist
Soft	24 to 48	24 to 48	12 to 24	Easily penetrated several inches by thumb
Medium Stiff	48 to 96	48 to 96	24 to 48	Penetrated several inches by thumb with moderate effort
Stiff	96 to 192	96 to 192	48 to 96	Readily indented by thumb but penetrated only with great effort
Very Stiff	192 to 383	192 to 383	96 to 192	Readily indented by thumbnail
Hard	> 383	> 383	> 192	Indented by thumbnail with difficulty

PLASTICITY OF FINE-GRAINED SOILS

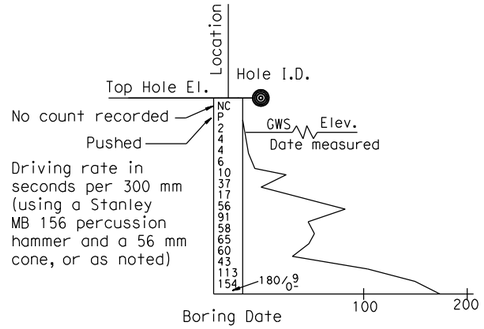
Description	Criteria
Nonplastic	A 3 mm thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.



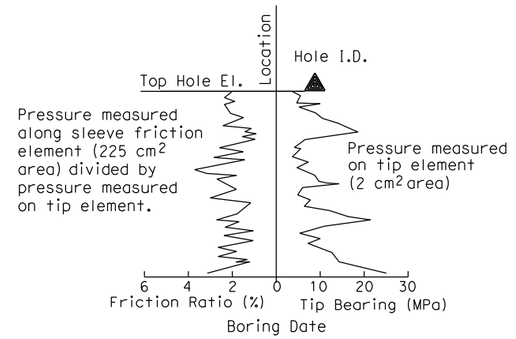
ROTARY BORING



HAND BORING



DYNAMIC CONE PENETRATION BORING



CONE PENETRATION TEST (CPT) SOUNDING

SOIL LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "445R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 2 OF 11
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES									SHEET	OF
10/14/08	3/9/09									

FILE => MRW21.dgn

USERNAME => mparcinjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:30:14 PM

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
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REGISTERED GEOTECHNICAL ENGINEER

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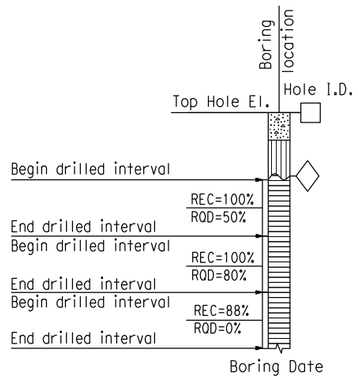
PERCENT CORE RECOVERY (REC) & ROCK QUALITY DESIGNATION (RQD)

$$REC = \frac{\sum \text{Length of the recovered core pieces}}{\text{Total length of core run}} \times 100\%$$

$$RQD = \frac{\sum \text{Length of intact core pieces} \geq 100\ mm}{\text{Total length of core run}} \times 100\%$$



RELATIVE STRENGTH OF INTACT ROCK

Term	Uniaxial Compressive Strength (MPa)
Extremely Strong	> 207
Very Strong	100 - 207
Strong	49 - 100
Medium Strong	25 - 49
Weak	5 - 25
Very Weak	1 - 5
Extremely Weak	< 1

BEDDING SPACING

Description	Thickness / Spacing
Massive	Greater than 3 m
Very thickly bedded	1 m to 3 m
Thickly bedded	300 mm to 1 m
Moderately bedded	100 mm to 300 mm
Thinly bedded	30 mm to 100 mm
Very thinly bedded	10 mm to 30 mm
Laminated	Less than 10 mm

LEGEND OF ROCK MATERIALS

- IGNEOUS ROCK
- SEDIMENTARY ROCK
- METAMORPHIC ROCK

ROCK HARDNESS

Description	Criteria
Extremely Hard	Specimen cannot be scratched with a pocket knife or sharp pick; can only be chipped with repeated heavy hammer blows.
Very Hard	Specimen cannot be scratched with a pocket knife or sharp pick. Breaks with repeated heavy hammer blows.
Hard	Specimen can be scratched with a pocket knife or sharp pick with difficulty (heavy pressure). Heavy hammer blows required to break specimen.
Moderately Hard	Specimen can be scratched with pocket knife or sharp pick with light or moderate pressure. Core breaks with moderate hammer pressure.
Moderately Soft	Specimen can be grooved 5 mm deep with a pocket knife or sharp pick with moderate or heavy pressure. Breaks with light hammer blow or heavy manual pressure.
Soft	Specimen can be grooved or gouged easily by a pocket knife or sharp pick with light pressure, can be scratched with fingernail. Breaks with light to moderate manual pressure.
Very Soft	Specimen can be readily indented, grooved or gouged with fingernail, or carved with a pocket knife. Breaks with light manual pressure.

FRACTURE DENSITY

Description	Observed Fracture Density
Unfractured	No fractures.
Very slightly fractured	Lengths greater than 1 m.
Slightly fractured	Lengths from 300 mm to 1000 mm with few lengths less than 300 mm or greater than 1000 mm.
Moderately fractured	Lengths mostly in 100 mm to 300 mm range with most lengths about 200 mm.
Intensely fractured	Lengths average from 30 mm to 100 mm with scattered fragmented intervals with lengths less than 100 mm.
Very intensely fractured	Mostly chips and fragments with a few scattered short core lengths.

Combination descriptors (such as "Very intensely to intensely fractured") are used where equal distribution of both fracture density characteristics is present over a significant interval or exposure, or where characteristics are "in between" the descriptor definitions. Only two adjacent descriptors may be combined.

WEATHERING DESCRIPTORS FOR INTACT ROCK

Description	Diagnostic features					General Characteristics
	Chemical Weathering-Discoloration and/or oxidation		Mechanical Weathering-Grain boundary conditions (disaggregation) primarily for granitics and some coarse-grained sediments	Texture and Solutioning		
	Body of Rock	Fracture Surfaces		Texture	Solutioning	
Fresh	No discoloration, not oxidized.	No discoloration or oxidation.	No separation, intact (tight).	No change.	No solutioning.	Hammer rings when crystalline rocks are struck.
Slightly Weathered	Discoloration or oxidation is limited to surface of, or short distance from, fractures; some feldspar crystals are dull.	Minor to complete discoloration or oxidation of most surfaces.	No visible separation, intact (tight).	Preserved.	Minor leaching of some soluble minerals may be noted.	Hammer rings when crystalline rocks are struck. Body of rock not weakened.
Moderately Weathered	Discoloration or oxidation extends from fractures usually throughout; Fe-Mg minerals are "rusty," feldspar crystals are "cloudy."	All fracture surfaces are discolored or oxidized.	Partial separation of boundaries visible.	Generally preserved.	Soluble minerals may be mostly leached.	Hammer does not ring when rock is struck. Body of rock is slightly weakened.
Intensely Weathered	Discoloration or oxidation throughout; all feldspars and Fe-Mg minerals are altered to clay to some extent; or chemical alteration produces in-situ disaggregation, see grain boundary conditions.	All fracture surfaces are discolored or oxidized, surfaces friable.	Partial separation, rock is friable; in semiarid conditions granitics are disaggregated.	Texture altered by chemical disintegration (hydration, argillation).	Leaching of soluble minerals may be complete.	Dull sound when struck with hammer, usually can be broken with moderate to heavy manual pressure or by light hammer blow without reference to planes of weakness such as incipient or hairline fractures, or veinlets. Rock is significantly weakened.
Decomposed	Discolored or oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe-Mg minerals are completely altered to clay.		Complete separation of grain boundaries (disaggregated).	Resembles a soil, partial or complete remnant rock structure may be preserved; leaching of soluble minerals usually complete.		Can be granulated by hand. Resistant minerals such as quartz may be present as "stringers" or "dikes."

Combination descriptors (such as "slightly weathered to fresh") are permissible where equal distribution of both weathering characteristics is present over significant intervals or where characteristics present are "in between" the diagnostic feature. However, combination descriptors should not be used where significant, identifiable zones can be delineated. Only two adjacent descriptors may be combined. "Very intensely weathered" is the combination descriptor for "intensely weathered to decomposed."

ROCK LEGEND

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FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER	DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 3 OF 11
NAME:	CHECKED BY: G. CUSTENBORDER		CU 11275 EA 2T0401	DISREGARD PRINTS BEARING EARLIER REVISION DATES →	REVISION DATES 10/14/08, 3/9/09; SHEET OF

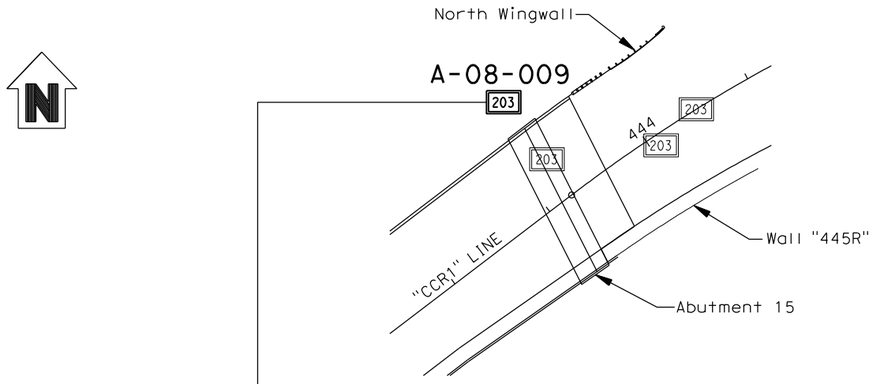
OGS CIVIL LOG OF TEST BORINGS SHEET

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

FILE => MRW22.dgn

USERNAME => mporonjae DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:30:23 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
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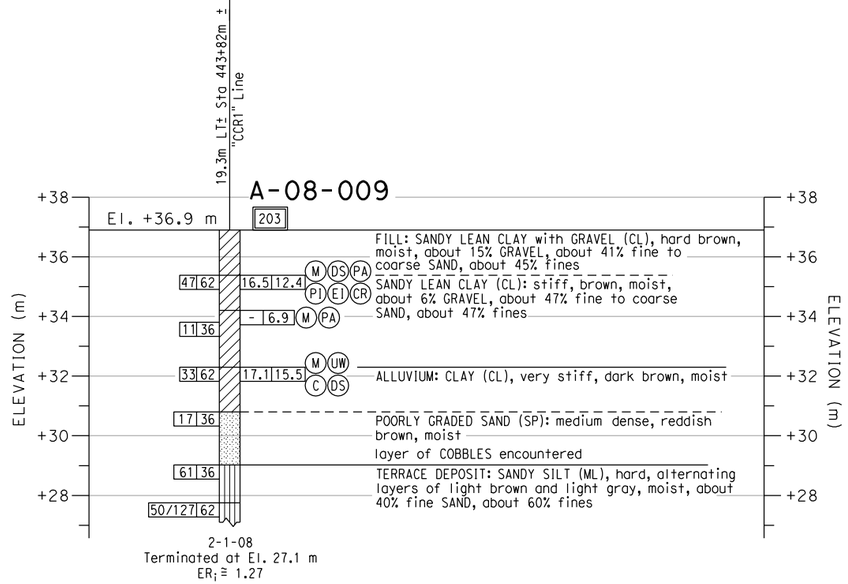

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.
2. Automatic trip and safety hammer systems consisting of hammer weight of 62.5 kg falling a distance of 762 mm were used to advance the drive samplers in accordance with ASTM D1586.
3. The average hammer energy ratio (ER_i) reflects the percentage efficiency of SPT blowcounts (N-value). The estimated ER_i for the various drilling equipment used was as follows:
   Boart Longyear:
   Longyear 1405: $ER_i \cong 1.45$
   Prosonic Track Mounted: $ER_i \cong 1.00$
   Prosonic 1: $ER_i \cong 1.45$
   Minisonic: $ER_i \cong 1.00$
   Test America:
   CME 95: $ER_i \cong 1.45$
   Pacific Drilling:
   Unimog: $ER_i \cong 1.27$
   Mole: $ER_i \cong 1.00$
   Minimole: $ER_i \cong 1.00$
4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (RQD) index is not relevant and therefore not reported on LOTBs.

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FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER	DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 4 OR 11
NAME:	CHECKED BY: G. CUSTENBORDER				

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

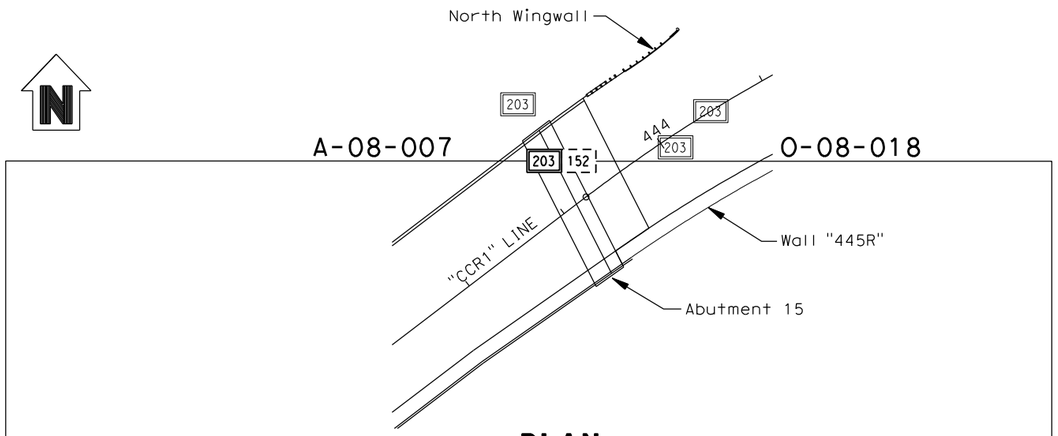
DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES										SHEET	OF
10/14/08	3/9/09										

FILE => MRW23.dgn

USERNAME => mparonjape DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:30:32 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



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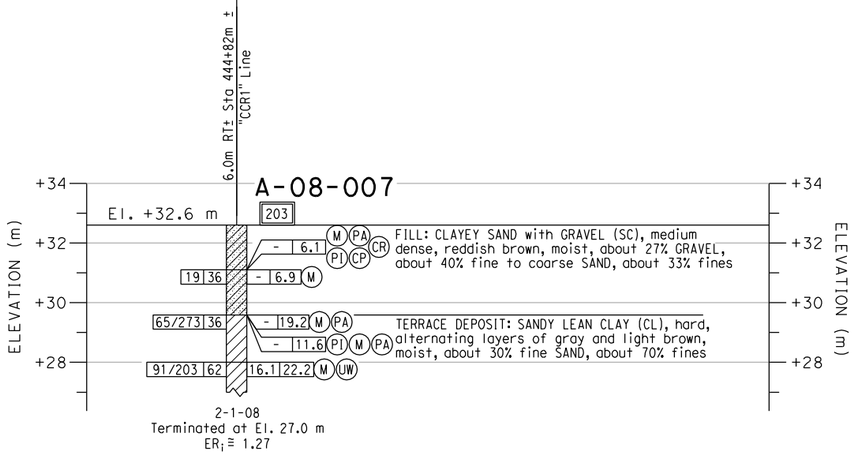

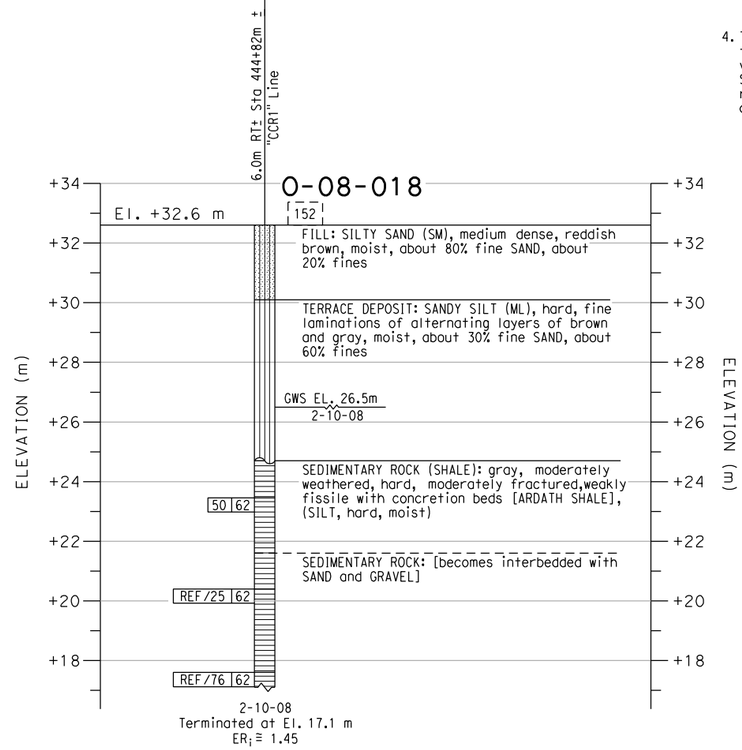

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

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FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 5 OF 11
NAME:	CHECKED BY: G. CUSTENBORDER	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER			

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES										SHEET	OF
10/14/08	3/9/09										

USERNAME => mparonjape DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:30:38 PM

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Bench Mark
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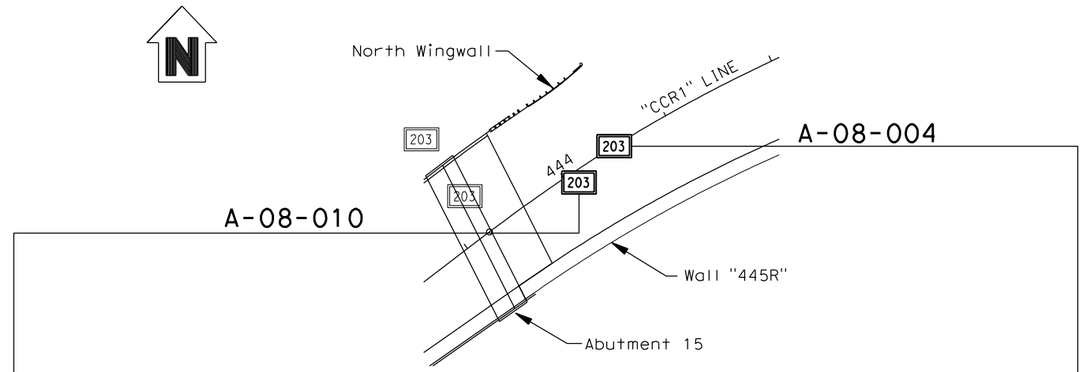

PLAN
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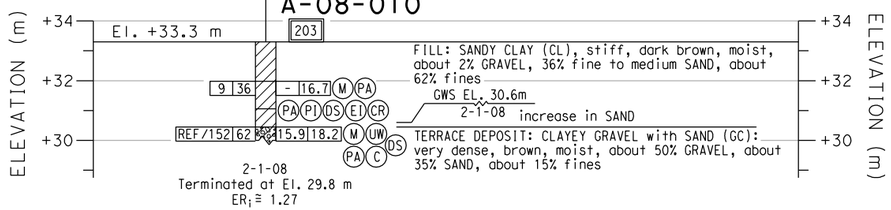

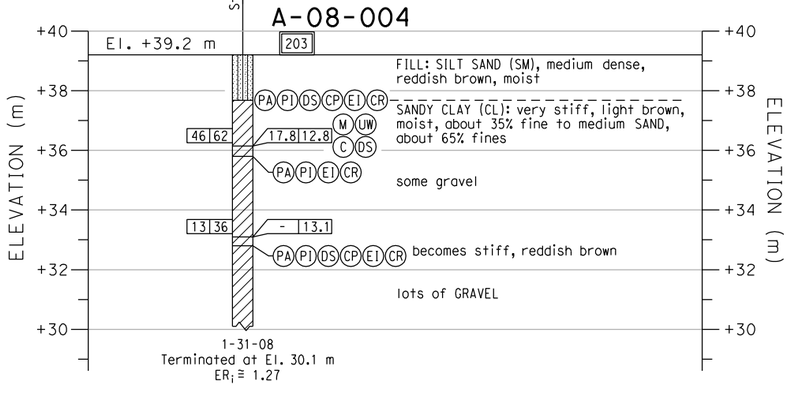

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

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   Minimole: ER$_i$ ≅ 1.00

4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (RQD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "445R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 6 OF 11
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401		

OGS CIVIL LOG OF TEST BORINGS SHEET

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

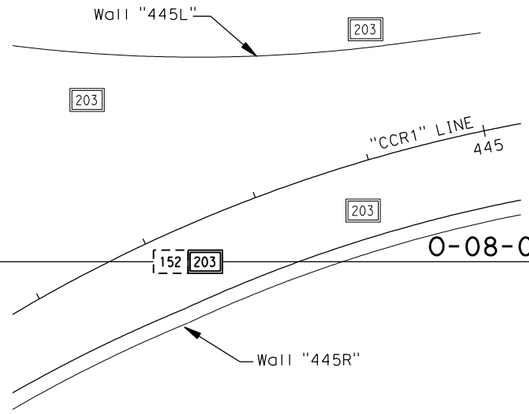
DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES										SHEET	OF
10/14/08	3/9/09										

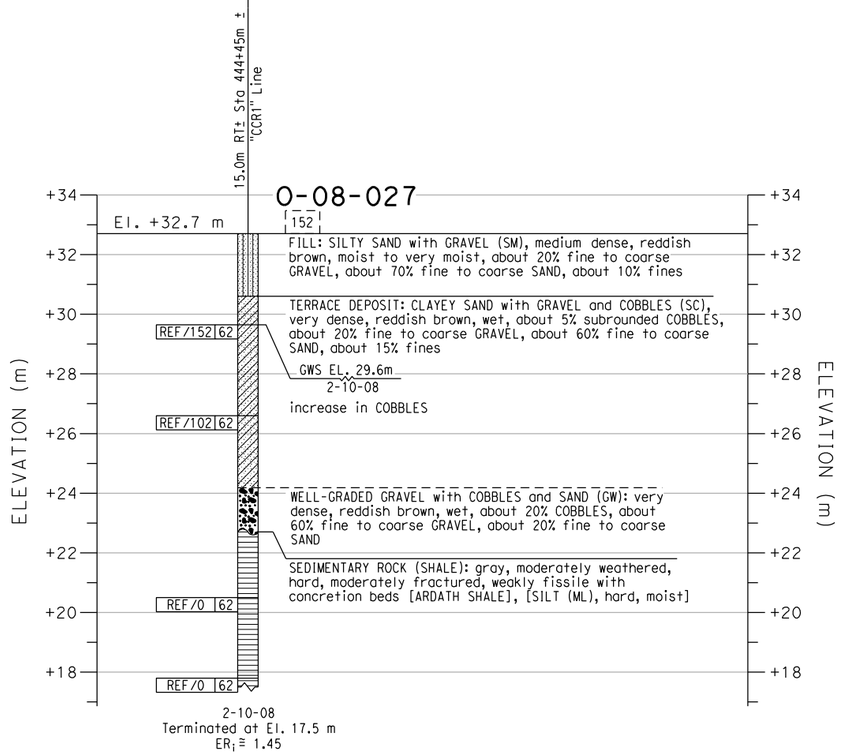
USERNAME => mparcinjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:30:45 PM

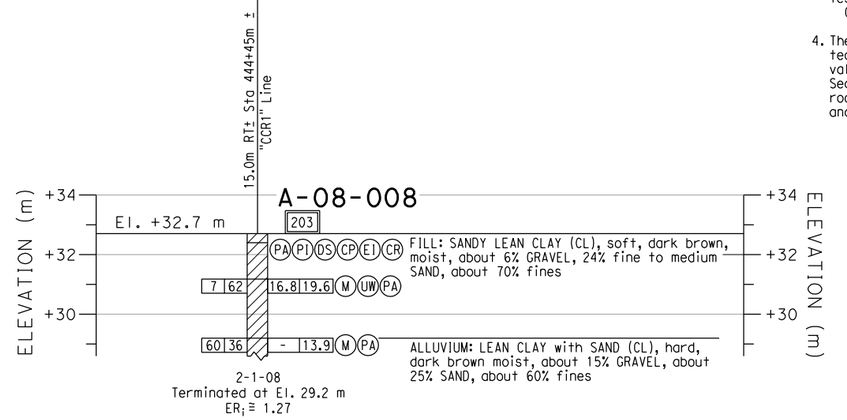
FILE => MRW25.dgn

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
1 : 500





PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.
2. Automatic trip and safety hammer systems consisting of hammer weight of 62.5 kg falling a distance of 762 mm were used to advance the drive samplers in accordance with ASTM D1586.
3. The average hammer energy ratio (ER$_i$) reflects the percentage efficiency of SPT blowcounts (N-value). The estimated ER$_i$ for the various drilling equipment used was as follows:
   Boart Longyear:
   Longyear 1405: ER$_i$ ≅ 1.45
   Prosonic Track Mounted: ER$_i$ ≅ 1.00
   Prosonic 1: ER$_i$ ≅ 1.45
   Minisonic: ER$_i$ ≅ 1.00
   Test America:
   CME 95: ER$_i$ ≅ 1.45
   Pacific Drilling:
   Unimog: ER$_i$ ≅ 1.27
   Mole: ER$_i$ ≅ 1.00
   Minimole: ER$_i$ ≅ 1.00
4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (RQD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES		GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "445R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN G. CUSTENBORDER			DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 7 OF 11
NAME:	CHECKED BY: G. CUSTENBORDER						

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

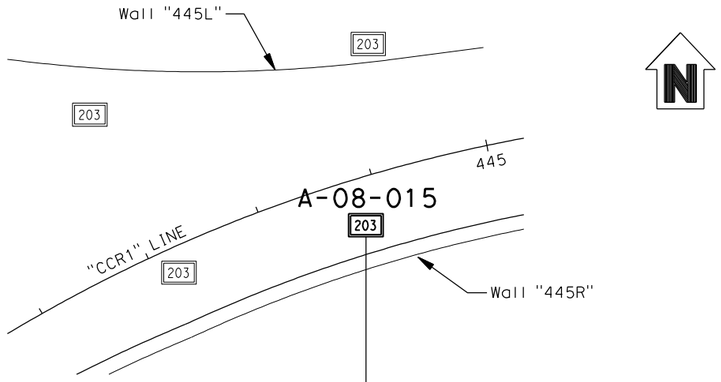
DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES									SHEET	OF
10/14/08	3/9/09									

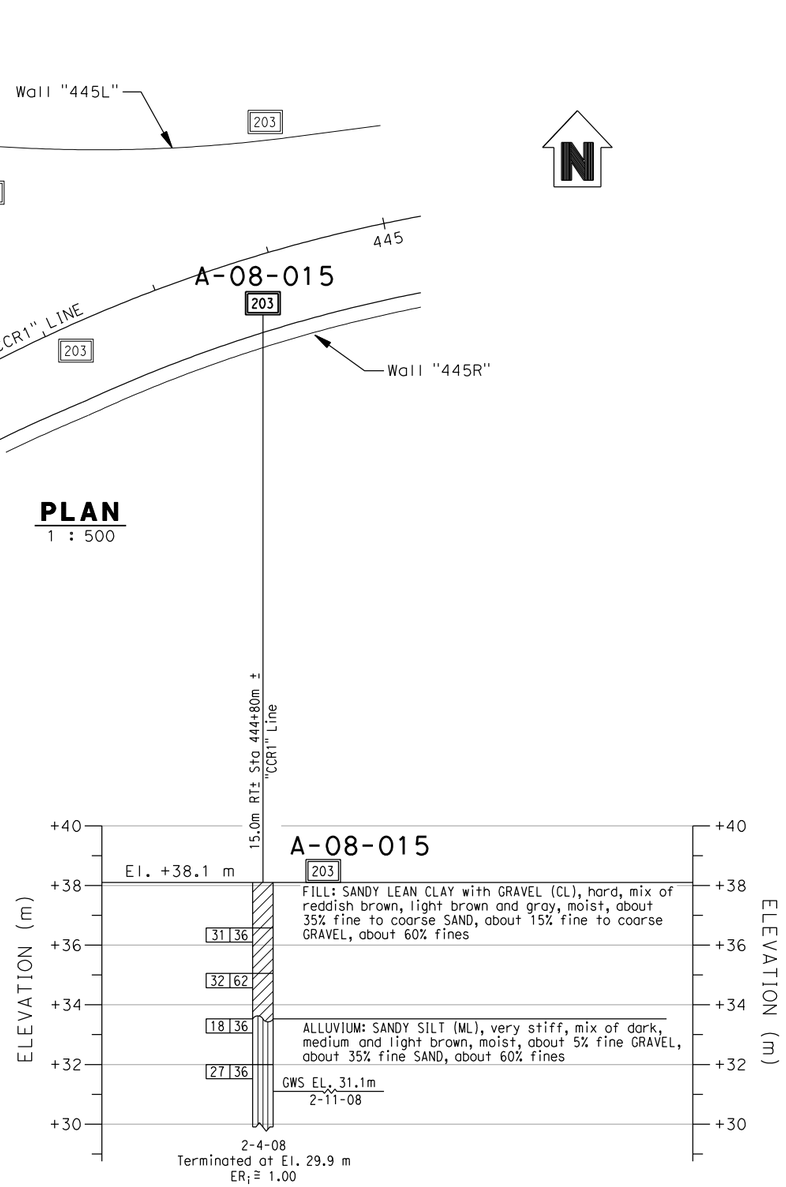
FILE => MRW26.dgn

USERNAME => mparcinjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:30:51 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
1 : 500



PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.

2. Automatic trip and safety hammer systems consisting of hammer weight of 62.5 kg falling a distance of 762 mm were used to advance the drive samplers in accordance with ASTM D1586.

3. The average hammer energy ratio (ER_i) reflects the percentage efficiency of SPT blowcounts (N-value). The estimated ER_i for the various drilling equipment used was as follows:
   Boart Longyear:
   Longyear 1405: $ER_i \cong 1.45$
   Prosonic Track Mounted: $ER_i \cong 1.00$
   Prosonic 1: $ER_i \cong 1.45$
   Minisonic: $ER_i \cong 1.00$
   Test America:
   CME 95: $ER_i \cong 1.45$
   Pacific Drilling:
   Unimog: $ER_i \cong 1.27$
   Mole: $ER_i \cong 1.00$
   Minimole: $ER_i \cong 1.00$

4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (ROD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES		GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "445R"
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN G. CUSTENBORDER			DESIGN BRANCH	POST MILES	MISCELLANEOUS RETAINING WALLS
NAME:	CHECKED BY: G. CUSTENBORDER					KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 8 OF 11

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

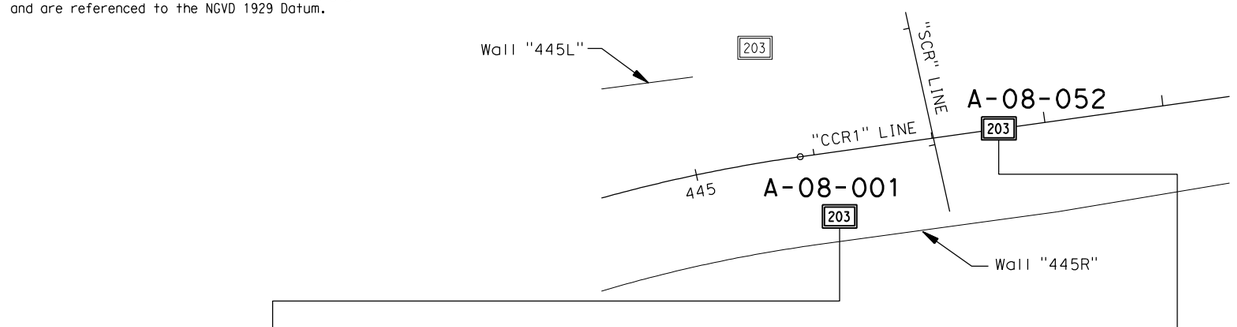
DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES									SHEET	OF
~~10/14/08~~	3/9/09									

USERNAME => mporcinjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:31:00 PM

FILE => MRW27.dgn

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
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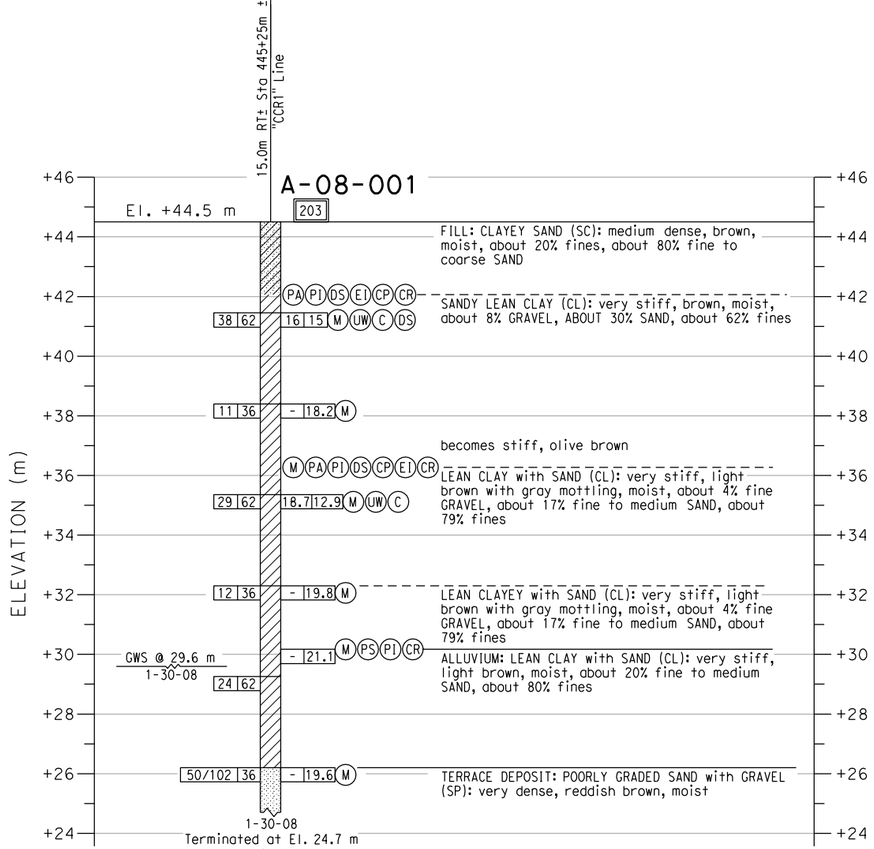

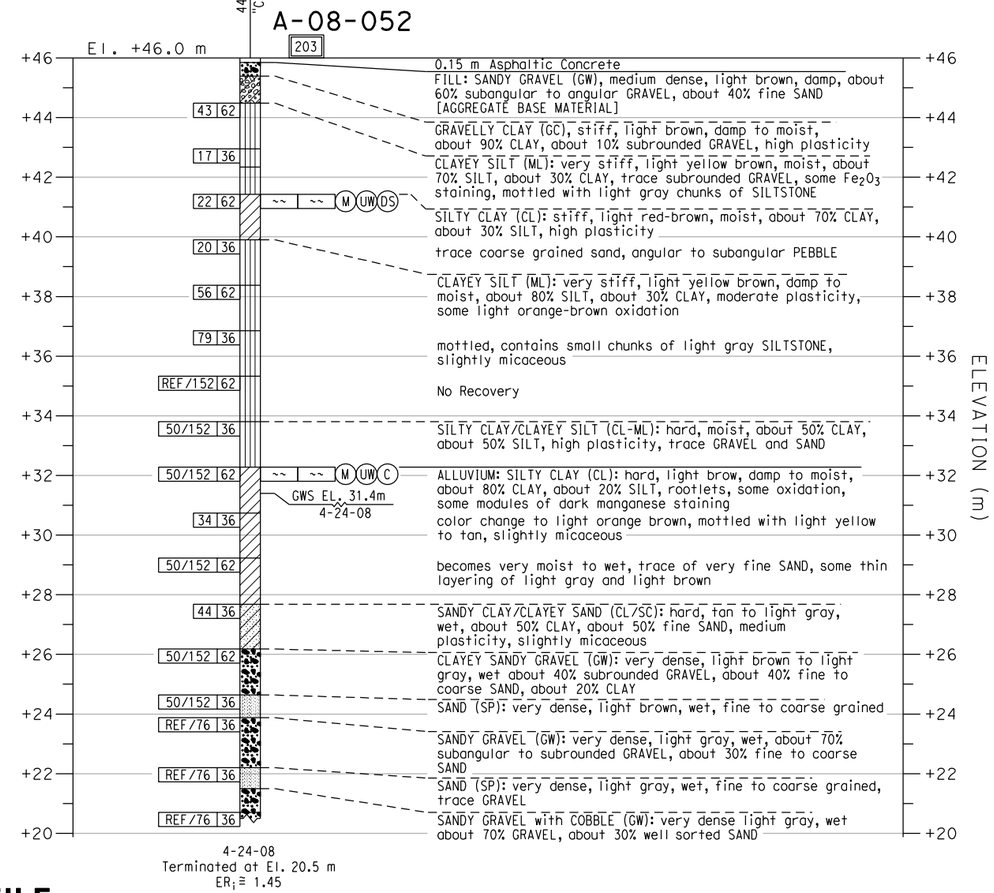

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.
2. Automatic trip and safety hammer systems consisting of hammer weight of 62.5 kg falling a distance of 762 mm were used to advance the drive samplers in accordance with ASTM D1586.
3. The average hammer energy ratio (ER_i) reflects the percentage efficiency of SPT blowcounts (N-value). The estimated ER_i for the various drilling equipment used was as follows:
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   Longyear 1405: $ER_i \cong 1.45$
   Prosonic Track Mounted: $ER_i \cong 1.00$
   Prosonic 1: $ER_i \cong 1.45$
   Minisonic: $ER_i \cong 1.00$
   Test America:
   CME 95: $ER_i \cong 1.45$
   Pacific Drilling:
   Unimog: $ER_i \cong 1.27$
   Mole: $ER_i \cong 1.00$
   Minimole: $ER_i \cong 1.00$
4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (ROD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "445R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 9 OF 11
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401	DISREGARD PRINTS BEARING EARLIER REVISION DATES →	REVISION DATES 10/14/08 3/9/09 — SHEET OF

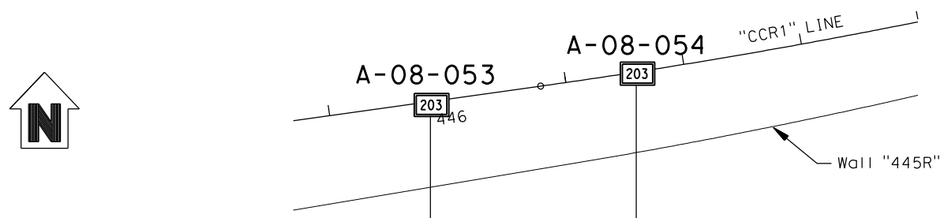
OGS CIVIL LOG OF TEST BORINGS SHEET

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

FILE => MRW28.dgn

USERNAME => mporonjoe DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:31:06 PM

Bench Mark
All elevations shown in the LOTBs are in meters
and are referenced to the NGVD 1929 Datum.



PLAN
1 : 500

Sta 445+95m ± "CCR1" Line

A-08-053

El. +48.0 m

59	36					0.15 m Asphaltic Concrete FILL: SANDY GRAVEL (GW): dense, tan to light brown, damp about 60% angular GRAVEL, about 40% SAND [AGGREGATE BASE]
						SILTY CLAY (CL), some subrounded GRAVEL, stiff, light yellow brown, damp about 60% CLAY, about 40% SILT, high plasticity
63	62					CLAY with GRAVEL (CL): hard, light brown, damp about 80% CLAY, about 20% subrounded GRAVEL, some light orange brown Fe_2O_3 staining
53	36					CLAYEY SILT (ML): hard, light yellow brown, damp, about 80% SILT, about 20% CLAY, medium plasticity, blocky, disturbed sample
40	62	14.6	15.4	M	UW DS	trace GRAVEL contains clods of light gray SILTSTONE, light Fe_2O_3 staining
43	36					trace nodules of white $CaCO_3$, blocky, mottled
57	62					trace clods of light brown SILTY CLAY
						slow drilling
38	36					thin layering, trace dark nodules of manganese
50/152	62					
45	36					SILTY CLAY (CL): hard, brown, moist, about 70% CLAY, about 30% SILT, high plasticity, slightly micaceous, trace fine SAND and GRAVEL
47	62					ALLUVIUM: SANDY CLAYEY GRAVEL (GC), hard, brown, moist, about 70% CLAY, about 30% SAND, mottled with light orange brown oxidation, trace GRAVEL and COBBLE
79	36					
50/76	62					CLAYEY SAND (SC): very dense, light brown, moist, about 80% fine to coarse SAND, about 20% CLAY, trace GRAVEL and COBBLE

4-25-08
Terminated at El. 28.8 m
$ER_i \cong 1.45$

Sta 446+30m ± "CCR1" Line

A-08-054

El. +48.0 m

68	36					0.18 m Asphaltic Concrete FILL: SILTY SANDY GRAVEL (GW), dense, light gray brown, damp about 50% GRAVEL, about 40% SAND, about 10% SILT [AGGREGATE BASE]
						CLAYEY GRAVEL (GC) stiff, light brown, damp about 60% subangular to subrounded GRAVEL, about 40% CLAY
70	62					SILT with GRAVEL (ML): hard, light yellow brown, dry to damp, about 90% SILT, about 10% subrounded GRAVEL
55	36					CLAYEY SILT (ML): hard, light yellow brown, damp, about 90% SILT, about 10% CLAY, medium plasticity, contains light brown clods of CLAY
83	62					some light orange brown Fe_2O_3 staining
55	36					
REF/152	62					
28	36					SILTY CLAY (CL): very stiff, light yellow brown, damp, about 60% CLAY, about 40% SILT, light orange to red brown oxidation, some inclusions of light gray SILTSTONE, trace fine SAND and GRAVEL
52	62	14.6	12.7	M	UW DS	CLAYEY SILT (ML): increase in GRAVEL, slightly micaceous
41	36					SILT (ML): hard, light gray brown, moist, slightly micaceous, mottled, trace very fine SAND and GRAVEL
70	62					GWS EL. 32.4m 4-28-08 CLAYEY SILT (ML): hard, light brown, moist, slightly micaceous, some light brown CLAY clods, trace very fine SAND and GRAVEL
REF/152	36					contains small fragments of asphalt
69/229	62					ALLUVIUM: SANDY CLAY (CL), hard, light brown, moist, about 60% CLAY, about 40% fine SAND, medium plasticity, mottled with light orange brown oxidation, trace GRAVEL
REF/152	36					SANDY GRAVEL some CLAY (GW): very dense, light brown, wet, about 60% subrounded GRAVEL, about 30% fine to coarse SAND, about 10% CLAY, some COBBLE sized crystalline rock
REF/152	36					increase in SAND
REF/102	36					SANDY GRAVEL (GW): very dense, light gray, wet, about 60% subrounded GRAVEL, about 40% fine to coarse SAND, some COBBLE sized crystalline rock
REF/76	36					trace CLAY

4-28-08
Terminated at El. 23.4 m
$ER_i \cong 1.45$

ELEVATION (m)

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.
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   Longyear 1405: $ER_i \cong 1.45$
   Prosonic Track Mounted: $ER_i \cong 1.00$
   Prosonic 1: $ER_i \cong 1.45$
   Minisonic: $ER_i \cong 1.00$
   Test America:
   CME 95: $ER_i \cong 1.45$
   Pacific Drilling:
   Unimog: $ER_i \cong 1.27$
   Mole: $ER_i \cong 1.00$
   Minimole: $ER_i \cong 1.00$
4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (ROD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "445R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 10 OF 11
NAME:	CHECKED BY: G. CUSTENBORDER	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER	CU 11275 EA 2T0401		

OGS CIVIL LOG OF TEST BORINGS SHEET

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: 10/14/08, 3/9/09

SHEET OF

FILE => MRW29.dgn

USERNAME => mparonjpe DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:31:13 PM

Bench Mark
All elevations shown in the LOTBs are in meters
and are referenced to the NGVD 1929 Datum.

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

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REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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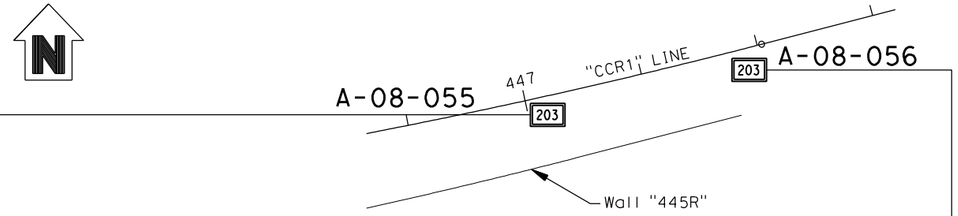


PLAN
1 : 500

A-08-055

El. +50.0 m

50/152	62	15.1	13.2	M	UW	DS
37	36					
REF/152	62					
50/152	36					
80	62					
50/76	36					
50/152	62					
REF/152	36					
67	62					
44	36					
REF/152	62					
48	36					

0.15 m Asphaltic Concrete
FILL: SILTY SAND GRAVEL (GM), dense, light brown, damp, 0.38 m thick, Base Material
GRAVELLY SILT (ML): stiff to very stiff, light yellow brown, damp, about 30% subrounded GRAVEL, about 70% SILT
Contains clods of brown CLAY (CL), some inclusions of light gray SILTSTONE
CLAYEY SILT with GRAVEL (ML): very stiff, light yellow brown, damp, mottled with light orange brown to light red brown colors, about 90% SILT, about 10% CLAY
becomes dry to damp, blocky
GRAVELLY SILT with COBBLES (ML): very stiff yellow brown, damp, some light orange brown Fe_2O_3 staining, about 20% subrounded GRAVEL, about 80% SILT
slow drilling
CLAYEY SILT some GRAVEL (ML): very stiff to hard, light yellow brown, damp, mottled with light orange brown Fe_2O_3, contains inclusions of light gray SILTSTONE, about 90% SILT, about 10% CLAY
blocky
slightly micaceous
SILTY CLAY (CL): trace very fine SAND, some subrounded GRAVEL, stiff to very stiff, light brown, moist, mottled with light orange brown and light gray green colors, slightly micaceous, about 40% SILT, about 60% CLAY
slow drilling Interlayered with light green fine SANDY SILT, color change to gray brown, increase in CLAY content, high plasticity, trace pebble size SILTSTONE

4-29-08
Terminated at El. 32.3 m
$ER_i \cong 1.45$

A-08-056

El. +50.0 m

43	36					
50/152	62					
68	36					
50/152	62					
30	36					
50/152	62					
69	36					
62	36					
55	62					
44	36					
85	62	115	13.0	M	UW	DS
REF/152	36					
50/76	62					
REF/152	36					
REF/152	36					
REF/152	36					

0.18 m Asphaltic Concrete
FILL: SILTY SANDY GRAVEL (GW), dense, tan, damp, about 50% angular to subangular GRAVEL, about 40% fine SAND, about 10% SILT [AGGREGATE BASE]
SILT with GRAVEL (ML), very stiff to hard, light yellow brown, damp, about 90% SILT, about 10% subrounded GRAVEL, medium plasticity
becomes blocky, encountered cobble-sized rock
contains clods of light gray SILTSTONE, some light orange brown oxidation, trace of nodules of white CaCo
interlayered with brown SILTY CLAY (CL), very stiff
SILTY CLAY (CL): hard, light brown, damp, about 60% CLAY, about 40% SILT, high plasticity, mottled with light orange brown to brown colors, trace GRAVEL and SAND
GRAVELLY CLAY (GC): hard, light brown to brown, damp, about 80% CLAY, about 20% subrounded CLAY, high plasticity, mottled with light orange brown to brown colors, trace SAND and COBBLE
mottled with light yellow brown, light red brown to dark brown, trace manganese staining, GRAVEL becomes angular to rounded
SILTY CLAY (CL): hard, brown to gray brown, moist, about 70% CLAY, about 30% SILT, high plasticity, highly mottled, trace GRAVEL
ALLUVIUM: SANDY CLAY (CL), hard, gray brown, moist, about 90% CLAY, about 10% fine SAND, high plasticity, weakly layered, mottled with dark manganese staining, some light orange brown oxidation
SILTY SAND (SM): very dense, light brown, moist, about 90% very fine SAND, about 10% SILT, some light orange-brown oxidation
CLAYEY SAND/SANDY CLAY (SC/CL): very dense, light brown, moist, to very moist, about 50% fine SAND, about 50% CLAY
GRAVELLY SILTY SAND (SM): very dense, light brown, moist, about 70% fine SAND, about 20% SILT, about 10% rounded GRAVEL
interlayered with light gray SANDS (SP): becomes wet and GRAVEL becomes subrounded to rounded
SEDIMENTARY ROCK (SHALE): gray, moderately weathered, hard, moderately fractured, weakly fissile with concretion beds [ARDATH SHALE], [SILT (ML), hard, moist]

4-8-08
Terminated at El. 23.9 m
$ER_i \cong 1.45$

ELEVATION (m)

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.
2. Automatic trip and safety hammer systems consisting of hammer weight of 62.5 kg falling a distance of 762 mm were used to advance the drive samplers in accordance with ASTM D1586.
3. The average hammer energy ratio (ER_i) reflects the percentage efficiency of SPT blowcounts (N-value). The estimated ER_i for the various drilling equipment used was as follows:
   Boart Longyear:
   Longyear 1405: $ER_i \cong 1.45$
   Prosonic Track Mounted: $ER_i \cong 1.00$
   Prosonic 1: $ER_i \cong 1.45$
   Minisonic: $ER_i \cong 1.00$
   Test America:
   CME 95: $ER_i \cong 1.45$
   Pacific Drilling:
   Unimog: $ER_i \cong 1.27$
   Mole: $ER_i \cong 1.00$
   Minimole: $ER_i \cong 1.00$
4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (RQD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "445R"
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS		DESIGN BRANCH	POST MILES	MISCELLANEOUS RETAINING WALLS
NAME:	CHECKED BY: G. CUSTENBORDER	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER	CU 11275 EA 2T0401	KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 11 OF 11

OGS CIVIL LOG OF TEST BORINGS SHEET

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

DISREGARD PRINTS BEARING EARLIER REVISION DATES

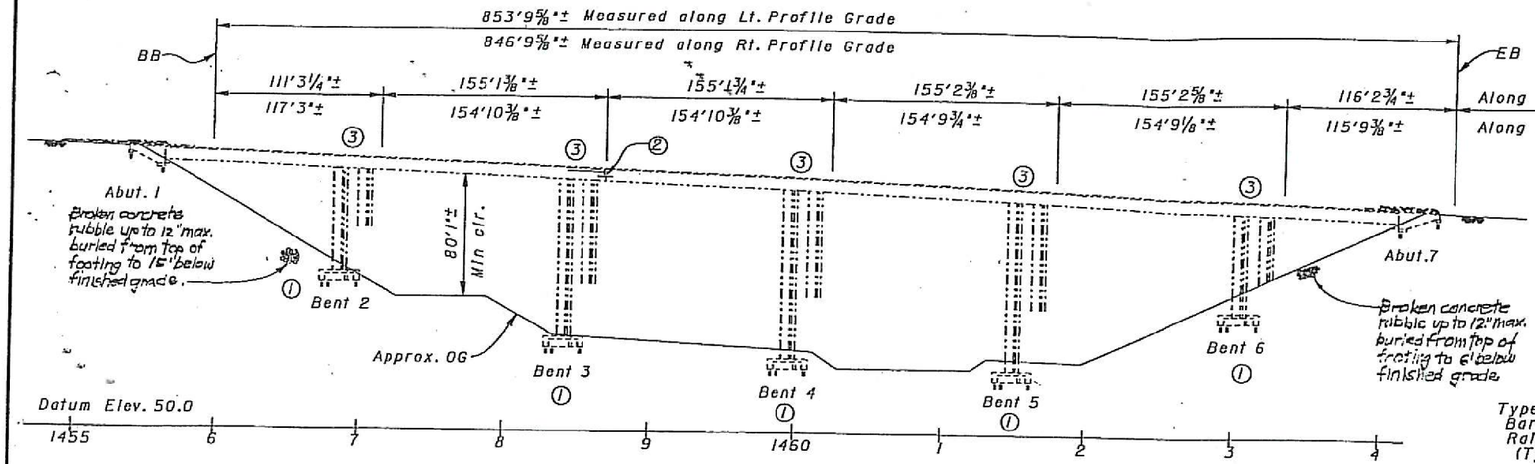
REVISION DATES: 10/14/08, 3/9/09 | SHEET | OF

FILE => MRW30.dgn

USERNAME => mporcinjape DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:31:21 PM

APPENDIX I.11

AS BUILT LOTBs



ELEVATION
1"-50'

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

DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
11	SD	5.805	R30.4/R30.7, 26.3/28.5	58	105

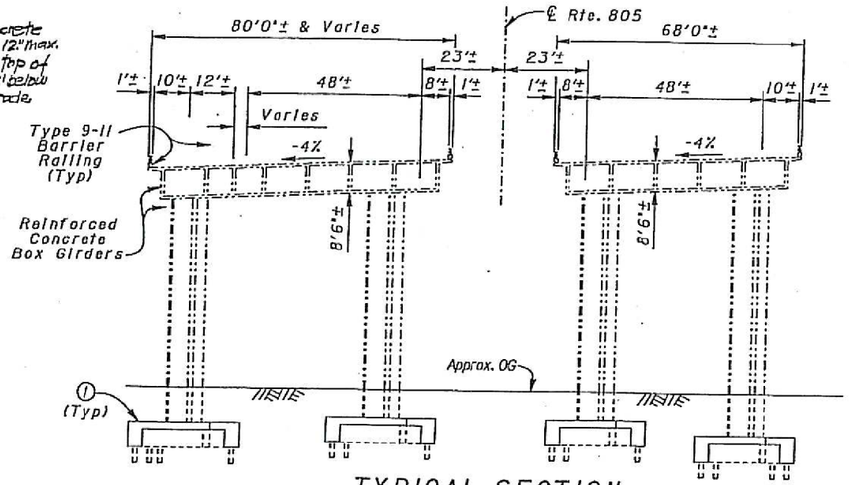
M J Cullen
REGISTERED ENGINEER - CIVIL

REGISTERED PROFESSIONAL ENGINEER — M. J. Cullen — No. 040620 — Exp. 3-31-99 — CIVIL — STATE OF CALIFORNIA

9-23-96
PLANS APPROVAL DATE

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

RETROFIT LEGEND
① Strengthen all footings and add piles.
② Hinge restrainers.
③ Bent Cap strengthening.



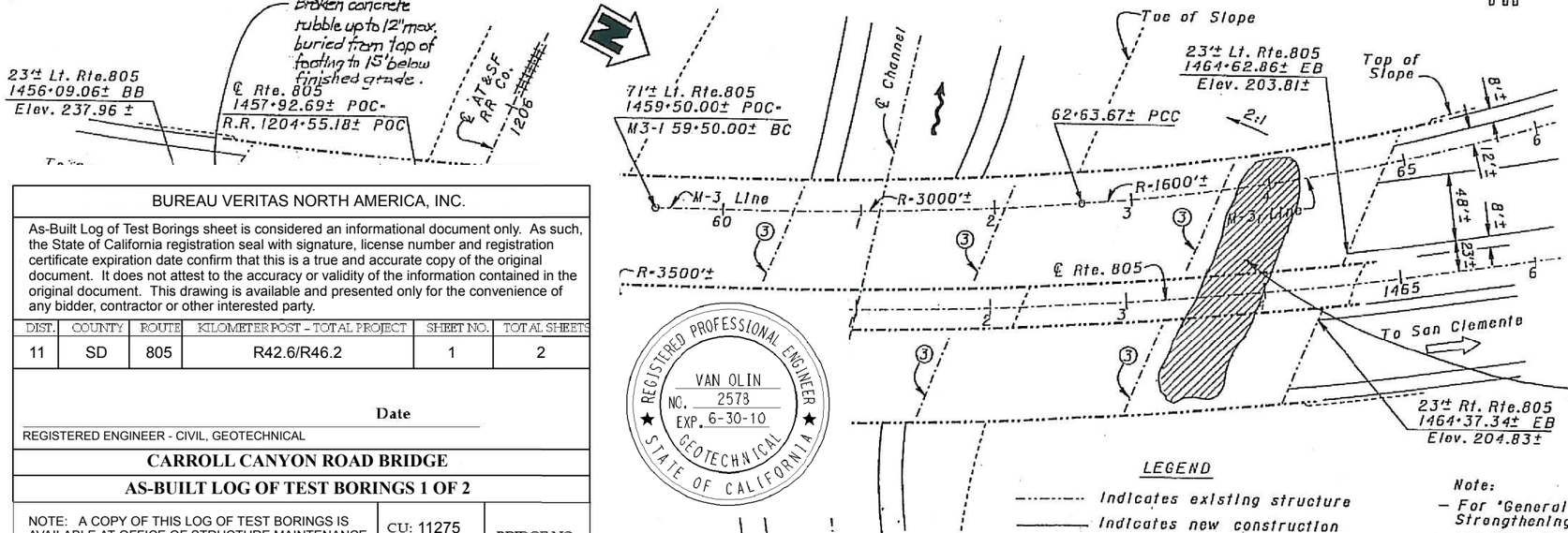
TYPICAL SECTION
1"-20'

Bent	Existing Skew Angle	
	Left Bridge	Right Bridge
2	17°14'41"±	16°44'03"±
3	19°49'35"±	19°14'01"±
4	22°38'05"±	21°43'54"±
5	25°35'48"±	24°13'43"±
6	30°06'31"±	26°43'25"±

AS BUILT
CORRECTIONS BY Rich Fillmore
Dokken Engineering
CONTRACT NO. 11-067504
8/30/98

QUANTITIES

ACCESS OPENING, SOFFIT	101	EA
BRIDGE REMOVAL (PORTION), LOCATION C	LUMP	SUM
STRUCTURE EXCAVATION (BRIDGE)	5,950	CY
STRUCTURE BACKFILL (BRIDGE)	4,470	CY
24" CAST-IN-DRILLED-HOLE CONCRETE PILING	13,250	LF
PRESTRESSING HIGH STRENGTH RODS	57,100	LB
STRUCTURAL CONCRETE, BRIDGE FOOTING	1,525	CY
STRUCTURAL CONCRETE, BRIDGE	327	CY
DIAPHRAGM BOLSTER	14	EA
DRILL AND BOND DOWEL	11,530	LF
CORE CONCRETE (2")	5,300	LF
CORE CONCRETE (6")	232	LF
CORE CONCRETE (10")	120	LF
CORE CONCRETE (1 1/4")	980	LF
BAR REINFORCING STEEL (BRIDGE)	900,000	LB
MISCELLANEOUS METAL (RESTRAINER - PIPE TYPE)	12,600	LB
MISCELLANEOUS METAL (RESTRAINER - CABLE TYPE)	5,340	LB



PLAN
1"-50'

LEGEND
Indicates existing structure
Indicates new construction
Indicates direction of traffic
Indicates direction of Channel Flow

Note:
- For "General Notes", see "Bent Cap Strengthening Details No. 3" sheet.
- For "Pile Data on Left & Right Bridge" see "24" CIDH Concrete Pile" sheet.

STANDARD PLAN SHEET NO.
DETAIL NO.

INDEX TO PLANS

SHEET NO.	TITLE
1	GENERAL PLAN
2	FOOTING DETAILS NO. 1 - LEFT BRIDGE
3	FOOTING DETAILS NO. 2 - LEFT BRIDGE
4	FOOTING DETAILS - RIGHT BRIDGE
5	24" CIDH CONCRETE PILE
6	BENT CAP STRENGTHENING DETAILS NO. 1
7	BENT CAP STRENGTHENING DETAILS NO. 2
8	BENT CAP STRENGTHENING DETAILS NO. 3
9	HINGE LAYOUT - LEFT BRIDGE
10	HINGE LAYOUT - RIGHT BRIDGE
11	HINGE RESTRAINER DETAILS
12	DECK AND SOFFIT OPENINGS
13	LIMITS OF PAYMENT FOR EXCAVATION & BACKFILL
14	LOG OF TEST BORINGS NO. 1
15	LOG OF TEST BORINGS NO. 2

STANDARD PLANS DATED JULY 1992

A10A	ABBREVIATIONS
A10B	SYMBOLS
B0-1	BRIDGE DETAILS

BUREAU VERITAS NORTH AMERICA, INC.

As-Built Log of Test Borings sheet is considered an informational document only. As such, the State of California registration seal with signature, license number and registration certificate expiration date confirm that this is a true and accurate copy of the original document. It does not attest to the accuracy or validity of the information contained in the original document. This drawing is available and presented only for the convenience of any bidder, contractor or other interested party.

DIST.	COUNTY	ROUTE	KILOMETER POST - TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
11	SD	805	R42.6/R46.2	1	2

Date
REGISTERED ENGINEER - CIVIL, GEOTECHNICAL

CARROLL CANYON ROAD BRIDGE

AS-BUILT LOG OF TEST BORINGS 1 OF 2

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

CU: 11275
EA: 2T0401

BRIDGE NO. 57-NEW

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN — NO. 2578 — EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

℄ Ted Jensen 8/96
DESIGN ENGINEER

DESIGN	BY M. J Cullen	11-94	CHECKED G. Murugesh	12-95	LOAD FACTOR DESIGN		
DETAILS	BY B.Svoboda/M.Tran	11-94	CHECKED G. Murugesh	12-95	LAYOUT	BY M. J. Cullen 11-95	CHECKED G. Murugesh 12-95
QUANTITIES	BY M. J Cullen	5-96	CHECKED G. Murugesh	5-96	SPECIFICATIONS	BY Karla Meier 8-96	PLANS AND SPECS COMPARED Karla Meier 8-96

DS DSD 2158 (CADD 10/95)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES
STRUCTURE DESIGN 5

CU 11
EA 067801

BRIDGE NO. 57-787R/L
POST MILE 26.8

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

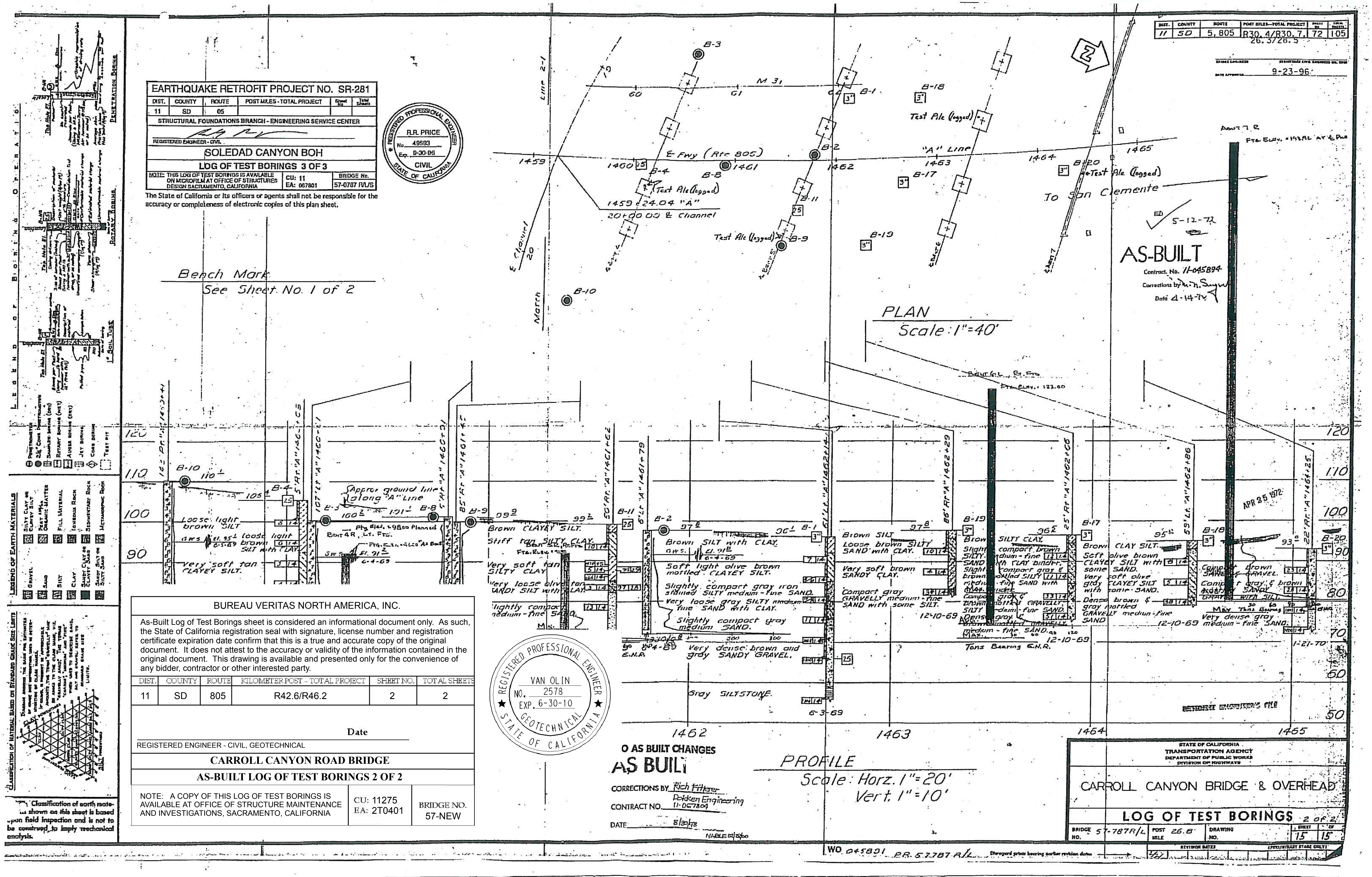
REVISION DATES (PRELIMINARY STAGE ONLY)

USERNAME => $USER
$REQUEST

DATE PLOTTED => $DATE
TIME PLOTTED => $TIME

EARTHQUAKE RETROFIT PROJECT NO. SR 281
SOLEDAD CANYON BRIDGE & OH
GENERAL PLAN

SHEET 1 OF 15


EARTHQUAKE RETROFIT PROJECT NO. SR-281
DIST. 11 COUNTY SD ROUTE 05
STRUCTURAL FOUNDATIONS BRANCH - ENGINEERING SERVICE CENTER
REGISTERED ENGINEER - CIVIL
SOLEDAD CANYON BOH
LOG OF TEST BORINGS 3 OF 3
NOTE: THIS LOG OF TEST BORINGS IS AVAILABLE ON MICROFILM AT OFFICE OF STRUCTURES DESIGN SACRAMENTO, CALIFORNIA
CU: 11 EA: 067801
BRIDGE No. 57-0787 R/L/S
The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.
REGISTERED PROFESSIONAL ENGINEER R.R. PRICE No. 49593 Exp. 9-30-06 CIVIL STATE OF CALIFORNIA
Bench Mark
See Sheet No. 1 of 2
E Fwy (Rte 805)
"A" Line
To San Clemente
Test Pile (logged)
PLAN
Scale: 1"=40'
AS-BUILT
Contract No. 11-045894
Date 4-14-72
PROFILE
Scale: Horz. 1"=20'
Vert. 1"=10'
Approx. ground line along "A" Line
Brown CLAYEY SILT.
Brown SILT with CLAY.
Very dense brown and gray SANDY GRAVEL.
Gray SILTSTONE.
Tons Bearing E.N.R.
APR 25 1972
1462
1463
1464
1465
BUREAU VERITAS NORTH AMERICA, INC.
As-Built Log of Test Borings sheet is considered an informational document only. As such, the State of California registration seal with signature, license number and registration certificate expiration date confirm that this is a true and accurate copy of the original document. It does not attest to the accuracy or validity of the information contained in the original document. This drawing is available and presented only for the convenience of any bidder, contractor or other interested party.
DIST. 11 COUNTY SD ROUTE 805 KILOMETER POST - TOTAL PROJECT R42.6/R46.2 SHEET NO. 2 TOTAL SHEETS 2
Date
REGISTERED ENGINEER - CIVIL, GEOTECHNICAL
CARROLL CANYON ROAD BRIDGE
AS-BUILT LOG OF TEST BORINGS 2 OF 2
NOTE: A COPY OF THIS LOG OF TEST BORINGS IS AVAILABLE AT OFFICE OF STRUCTURE MAINTENANCE AND INVESTIGATIONS, SACRAMENTO, CALIFORNIA
CU: 11275 EA: 2T0401
BRIDGE NO. 57-NEW
REGISTERED PROFESSIONAL ENGINEER VAN OLIN NO. 2578 EXP. 6-30-10 GEOTECHNICAL STATE OF CALIFORNIA
NO AS BUILT CHANGES
AS BUILT
CORRECTIONS BY Rich Fitzer
CONTRACT NO. 11-067804
STATE OF CALIFORNIA TRANSPORTATION AGENCY DEPARTMENT OF PUBLIC WORKS DIVISION OF HIGHWAYS
CARROLL CANYON BRIDGE & OVERHEAD
LOG OF TEST BORINGS 2 OF 2
LEGEND OF EARTH MATERIALS
LEGEND OF BORING OPERATIONS
Classification of earth material shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.

APPENDIX I.12

CONE PENETRATION TESTING REPORTS

May 5, 2008

Testing Engineers
Attn: Dan Kirkman
7895 Convoy Court, Suite 18
San Diego, California 92111

Subject: CPT Site Investigation
Caroll Canyon
San Diego, California
GREGG Project Number: 08-0174SH

Dear Mr. Kirkman:

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

1	Cone Penetration Tests	(CPTU)	☒
2	Pore Pressure Dissipation Tests	(PPD)	☒
3	Seismic Cone Penetration Tests	(SCPTU)	☒
4	Resistivity Cone Penetration Tests	(RCPTU)	☐
5	UVOST Laser Induced Fluorescence	(UVOST)	☐
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 Drilling & Testing, Inc.

Peter Robertson
Technical Operations

Cone Penetration Test Sounding Summary

-Table 1-

CPT Sounding Identification	Date	Termination Depth (Meters)	Depth of Groundwater Samples (Meters)	Depth of Soil Samples (Meters)	Depth of Pore Pressure Dissipation Tests (Meters)
440+62.5	4/30/08	4.9	-	-	-
440+90	4/30/08	6.4	-	-	-
441+22.5	4/30/08	8.8	-	-	-
441+42	4/30/08	8.5	-	-	7.0
441+64	4/28/08	7.3	-	-	-
441+82b	4/28/08	7.3	-	-	-
441+96	4/28/08	7.3	-	-	6.7
442+05	4/28/08	8.5	-	-	-
442+15	4/29/08	9.8	-	-	-
442+23.5	4/29/08	7.3	-	-	4.9
442+32	4/30/08	9.1	-	-	-
442+42.5	4/29/08	7.3	-	-	-
442+50	4/30/08	10.0	-	-	-
442+55	4/30/08	8.8	-	-	-
442+70	4/30/08	4.0	-	-	-
442+87	4/29/08	7.0	-	-	-
443+20	4/29/08	7.3	-	-	-
443+40	4/29/08	2.3	-	-	-
443+82	4/29/08	5.2	-	-	-
444+00	4/29/08	3.8	-	-	-

Bibliography

Lunne, T., Robertson, P.K. and Powell, J.J.M., "Cone Penetration Testing in Geotechnical Practice" E & FN Spon. ISBN 0 419 23750, 1997

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

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., Sully, J., Woeller, D.J., Lunne, T., Powell, J.J.M., and Gillespie, D.J., "Guidelines for Estimating Consolidation Parameters in Soils from Piezocone Tests", Canadian Geotechnical Journal, Vol. 29, No. 4, August 1992, pp. 539-550.

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.

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.

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

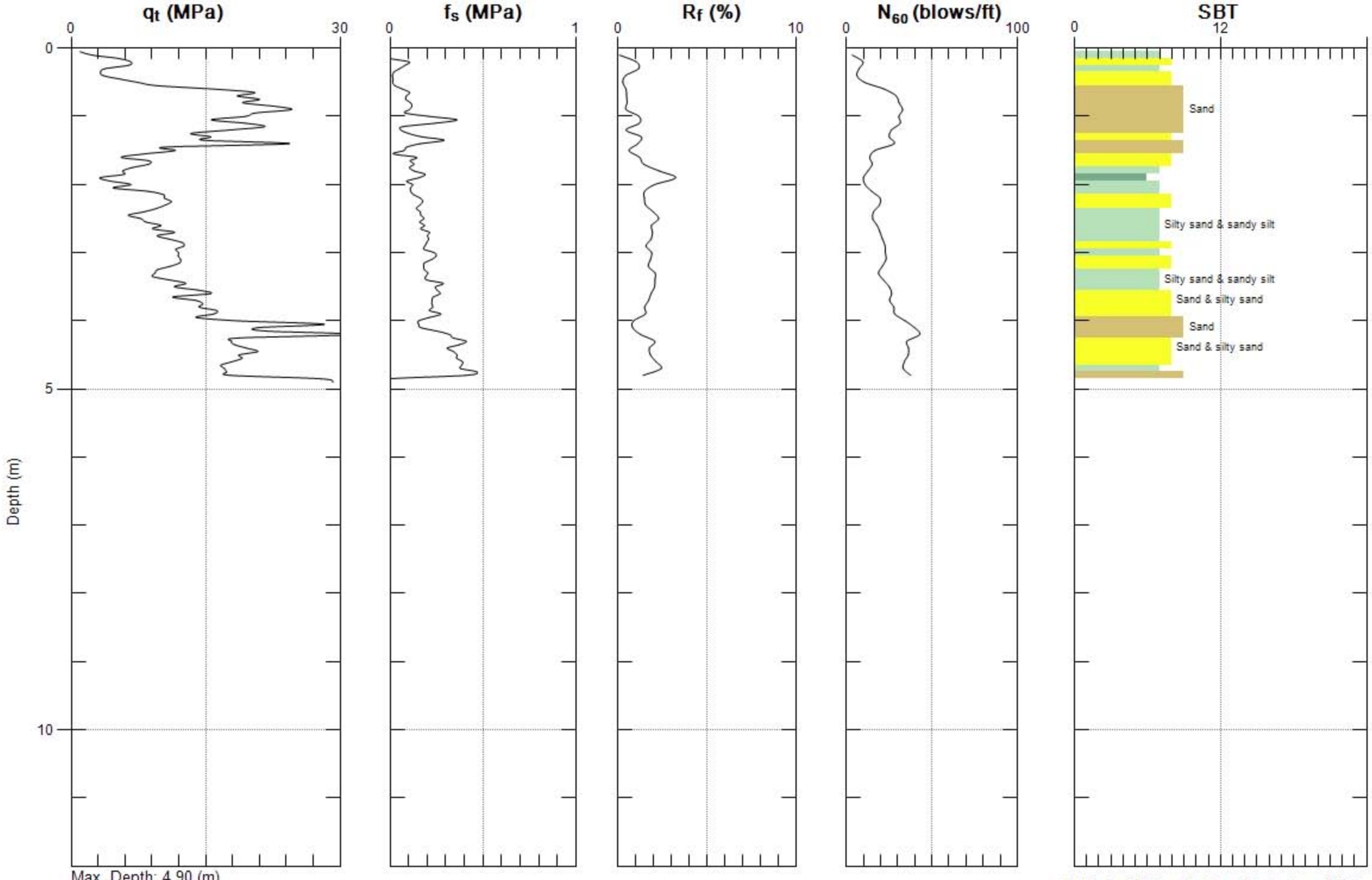
Woeller, D.J., P.K. Robertson, T.J. Boyd and Dave Thomas, "Detection of Polyaromatic Hydrocarbon Contaminants Using the UVIF-CPT", 53rd Canadian Geotechnical Conference Montreal, QC October pp. 733-739, 2000.

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

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 440+62.5
Engineer: D.KIRKMAN
Date: 4/30/2008 11:43

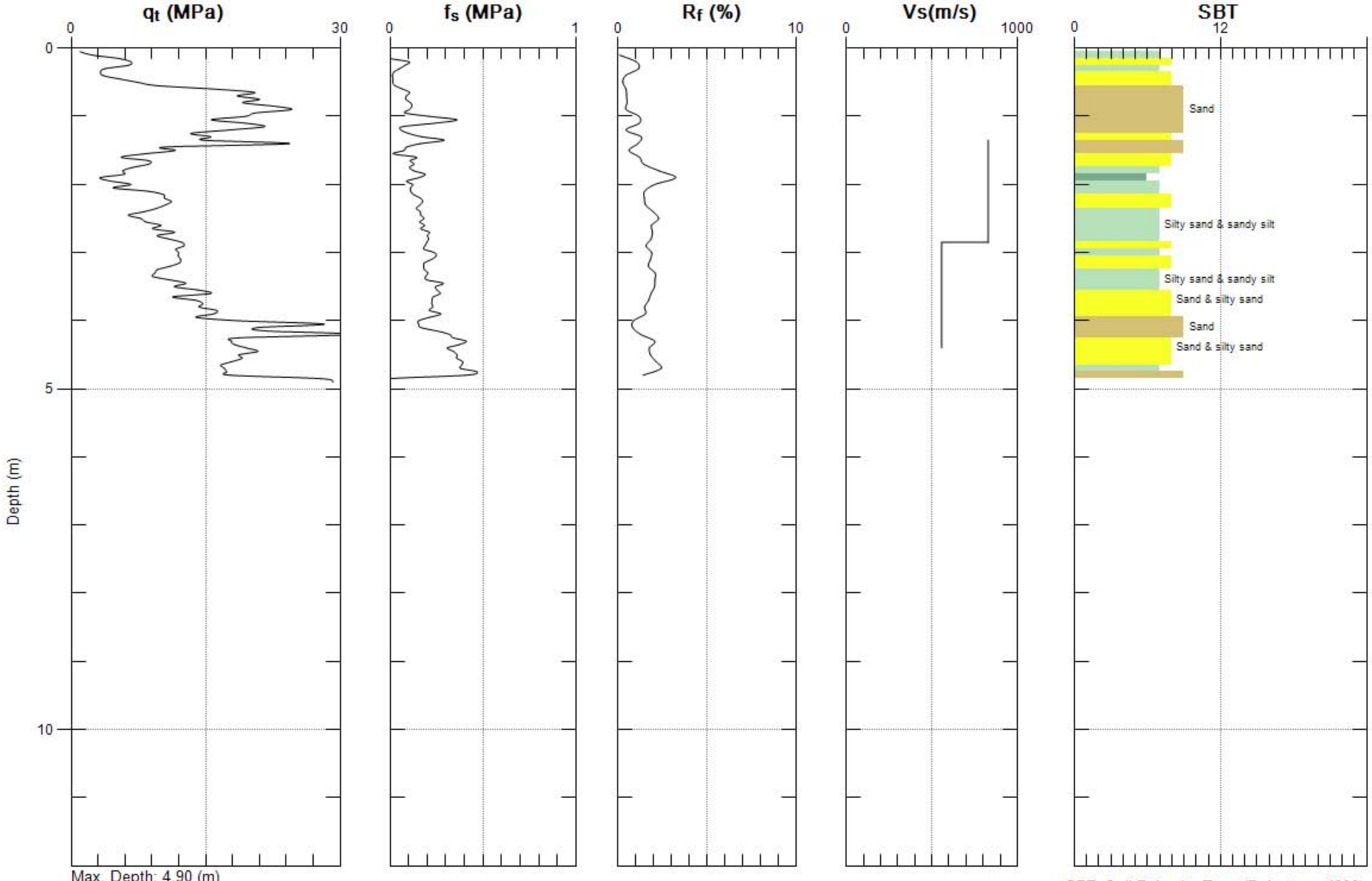


Max. Depth: 4.90 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 440+62.5
Engineer: D.KIRKMAN
Date: 4/30/2008 11:43



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Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

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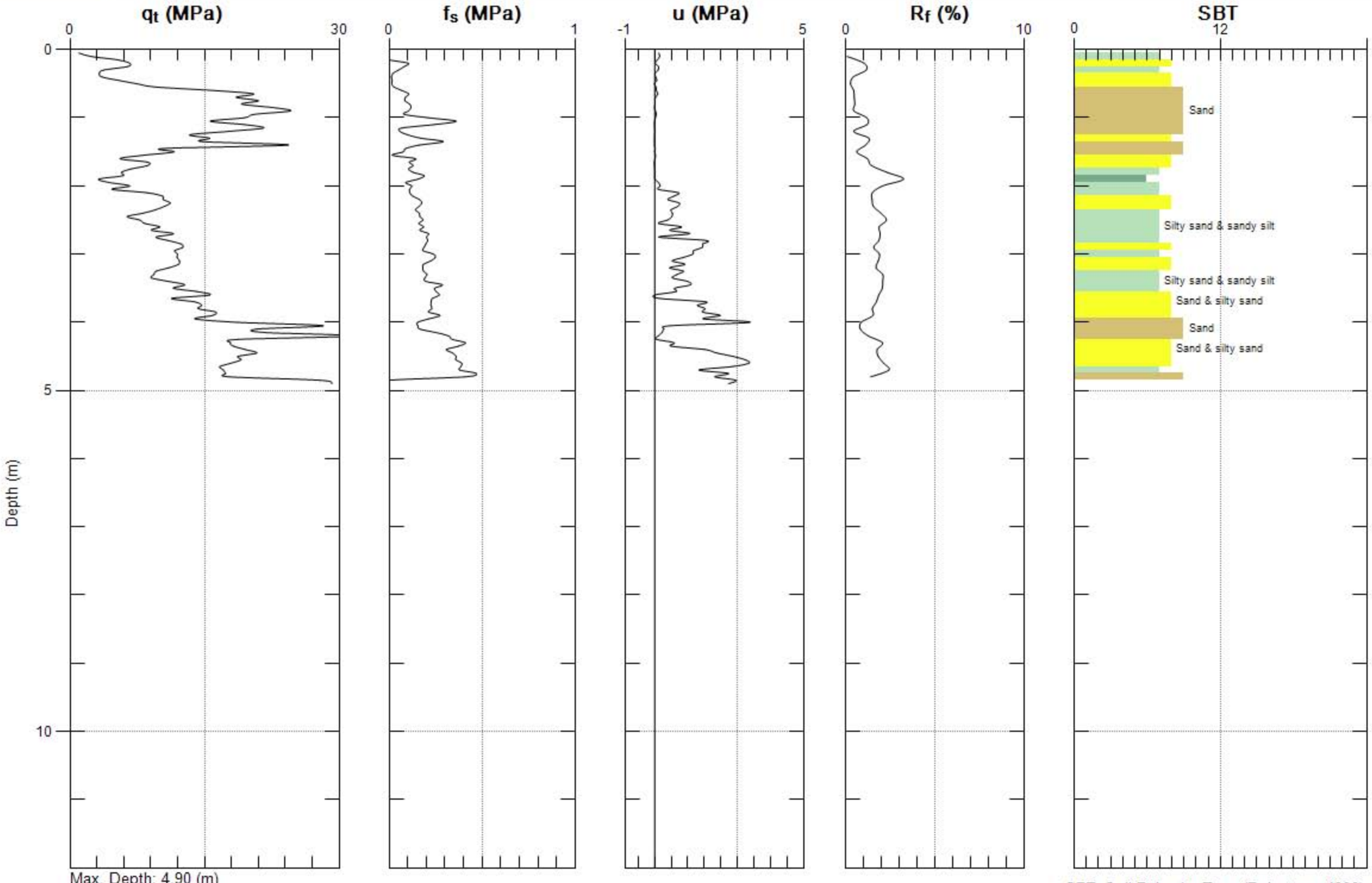
Sounding: 440+62.5
Engineer: D.KIRKMAN
Date: 4/30/2008 11:43



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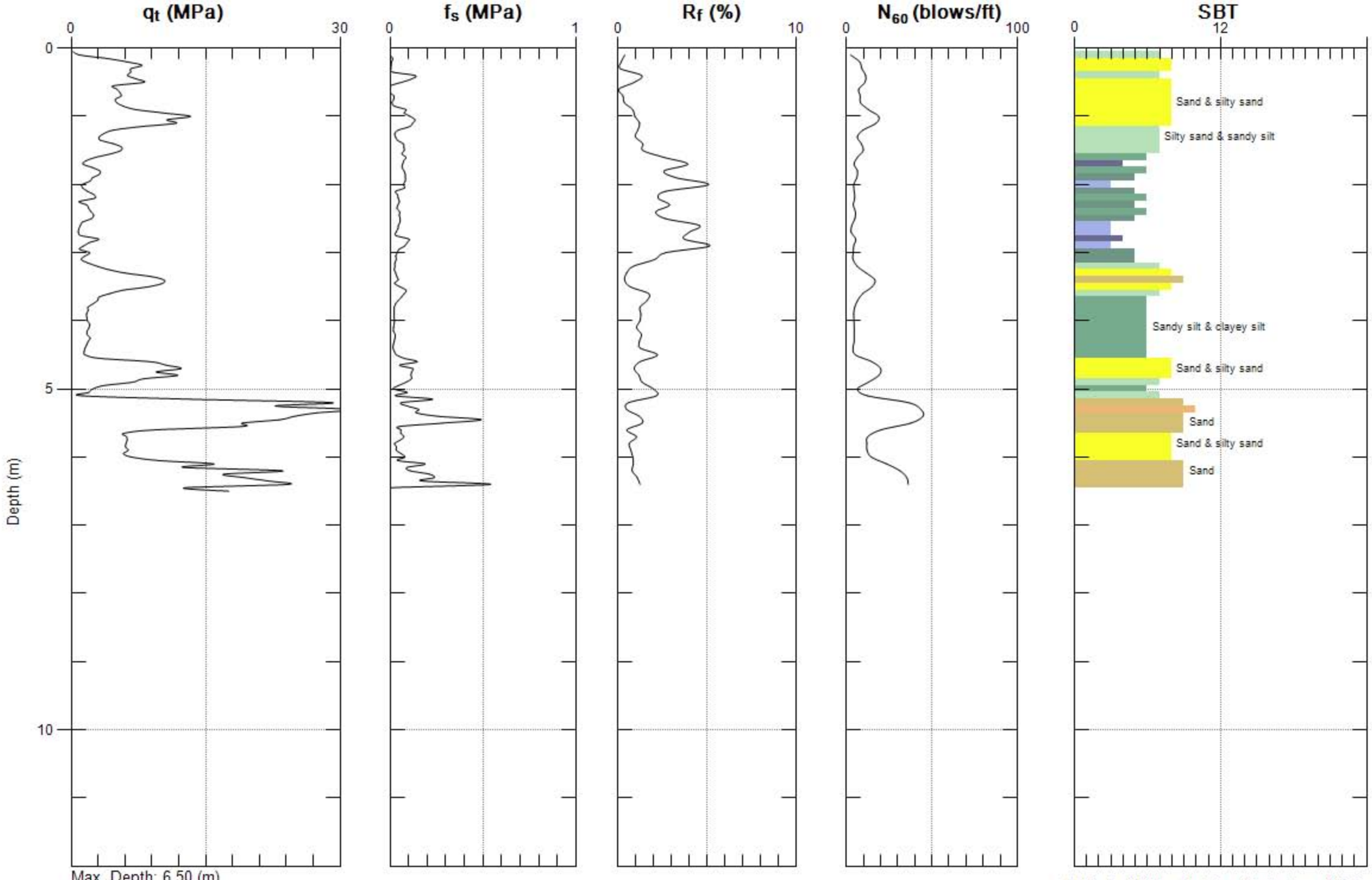
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 440+90
Engineer: D.KIRKMAN
Date: 4/30/2008 12:29



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Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

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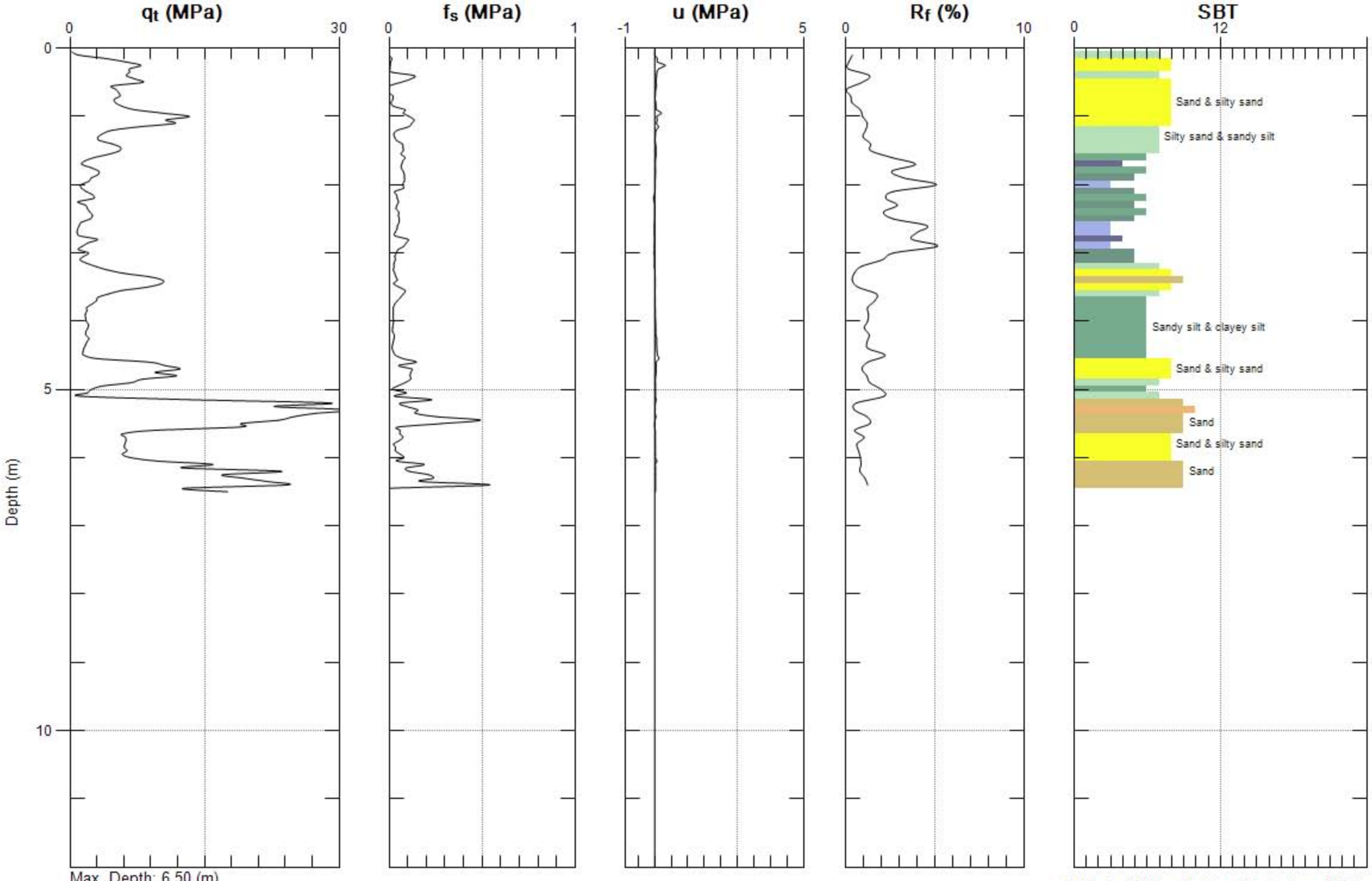
Sounding: 440+90
Engineer: D.KIRKMAN
Date: 4/30/2008 12:29



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Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

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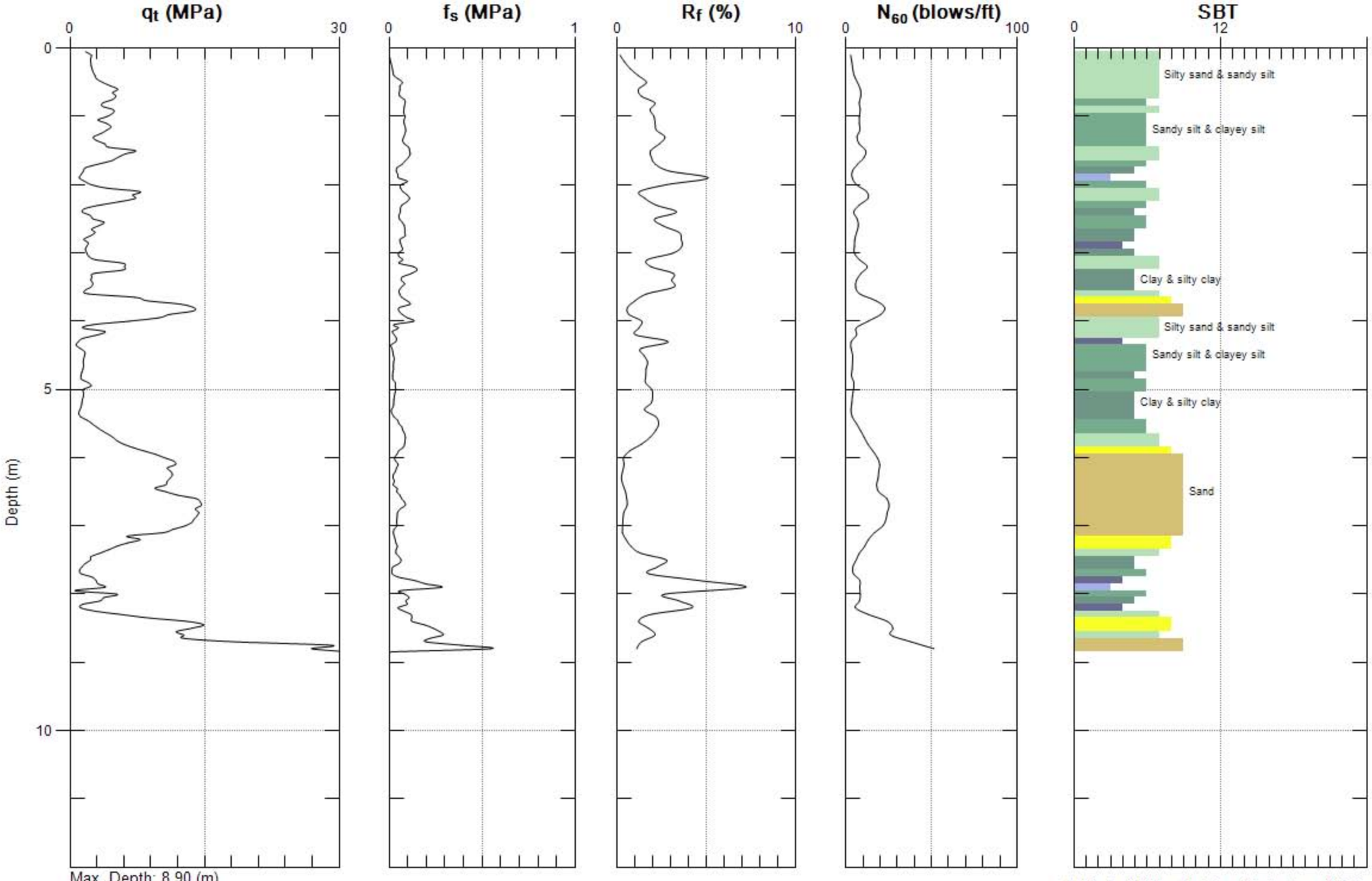
Sounding: 441+22.5
Engineer: D.KIRKMAN
Date: 4/30/2008 01:12



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Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

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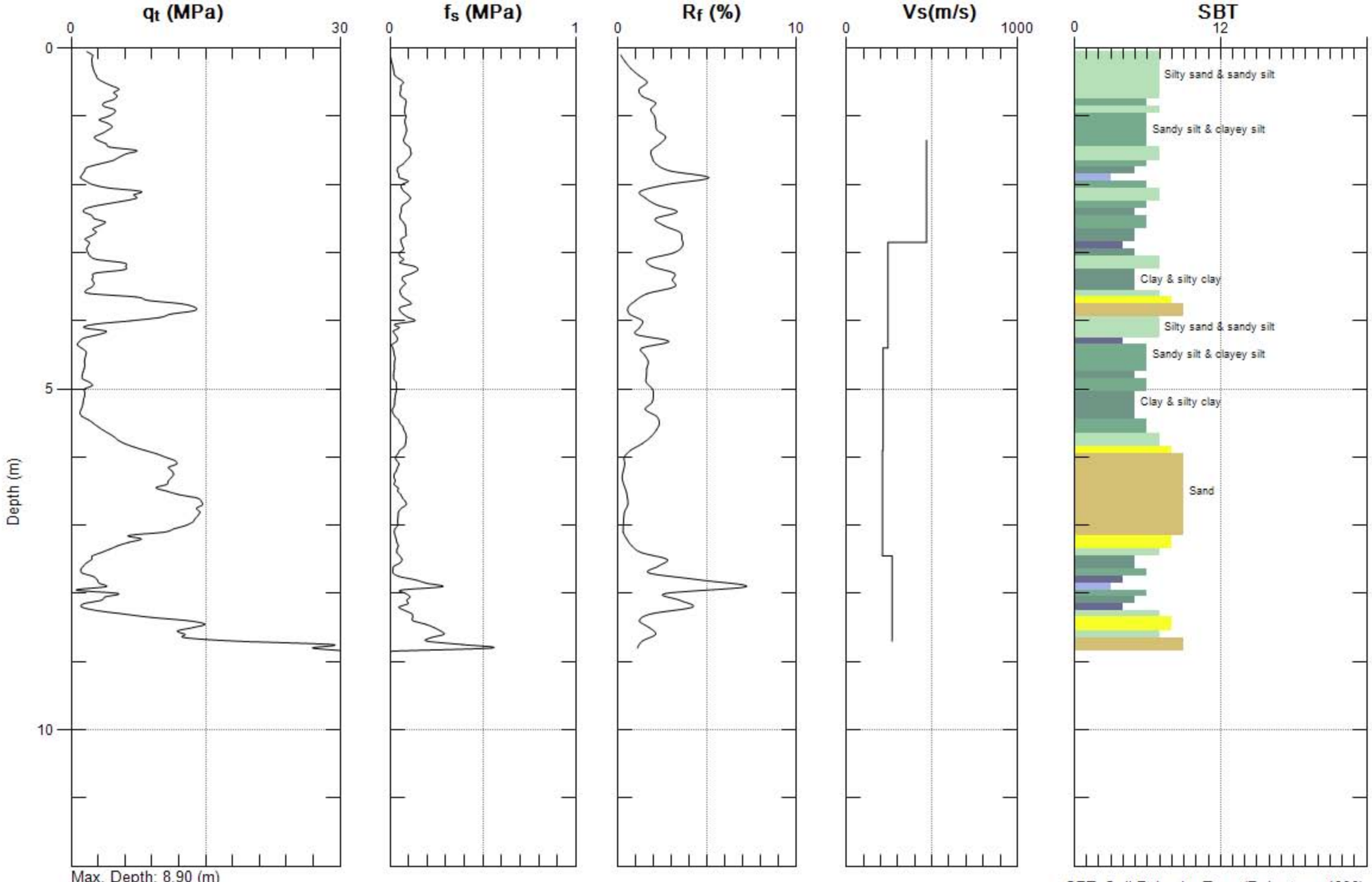
Sounding: 441+22.5
Engineer: D.KIRKMAN
Date: 4/30/2008 01:12



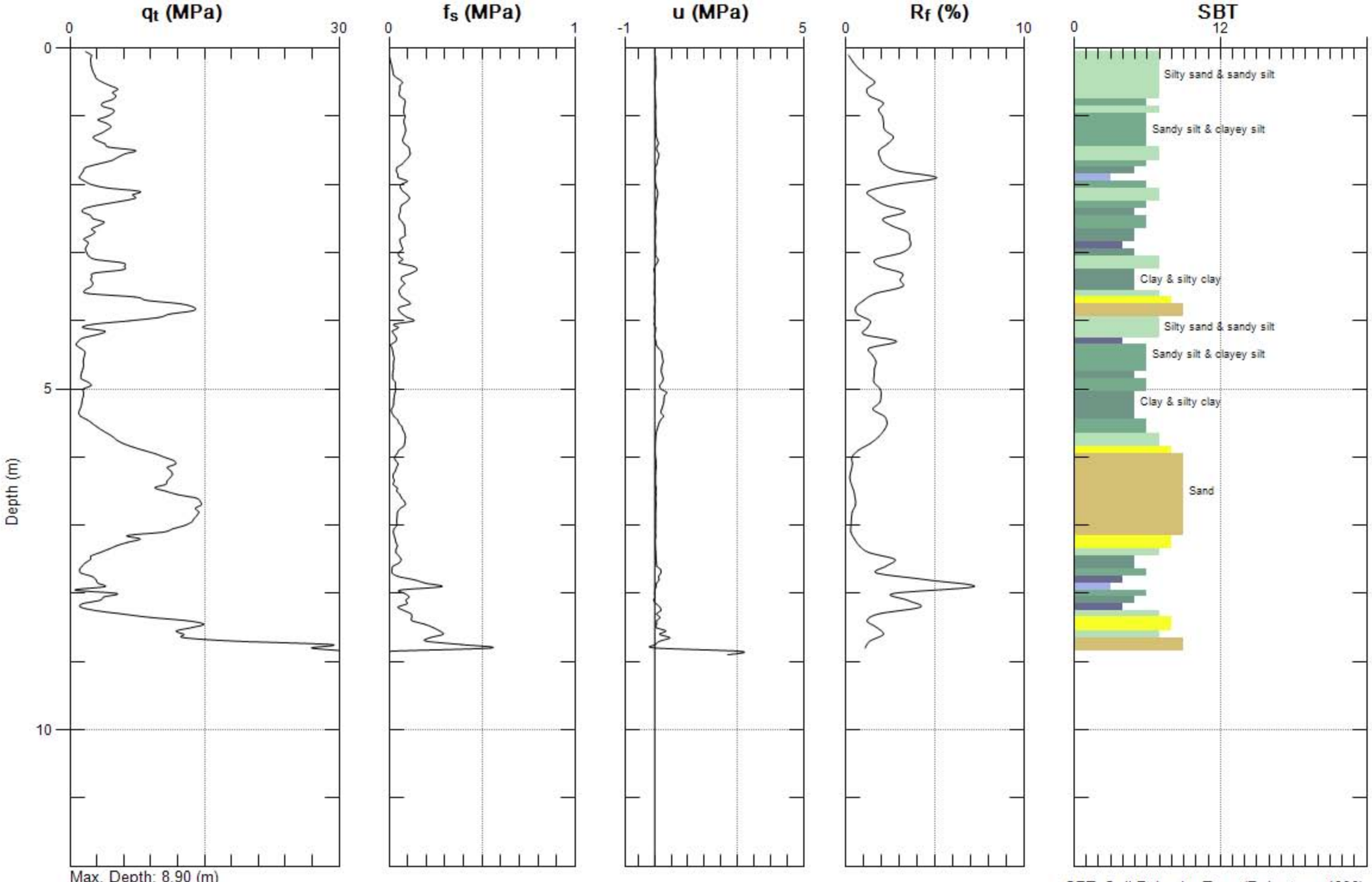
Max. Depth: 8.90 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 441+22.5

Engineer: D.KIRKMAN
Date: 4/30/2008 01:12



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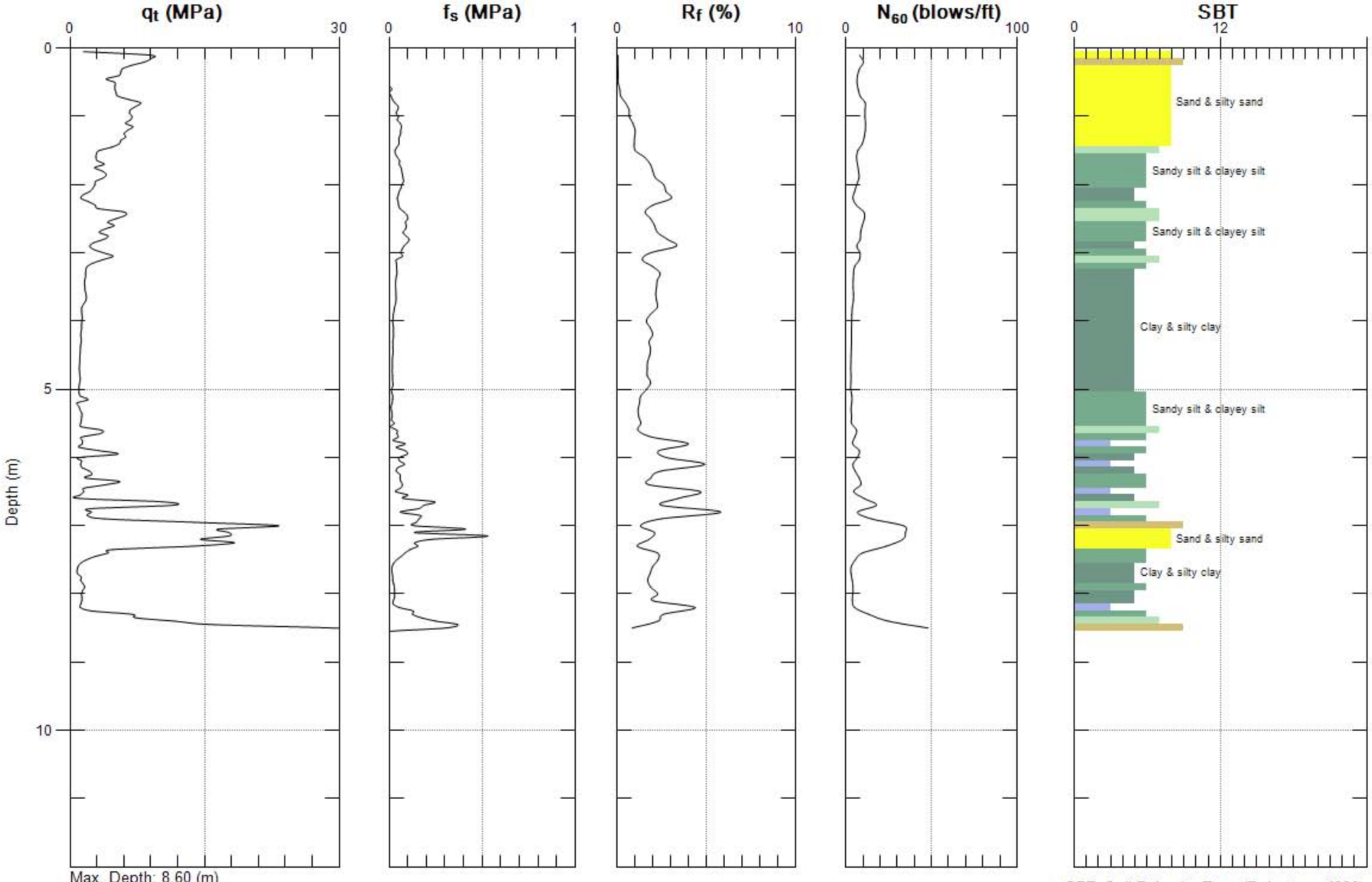
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 441+42

Engineer: D.KIRKMAN
Date: 4/30/2008 02:10



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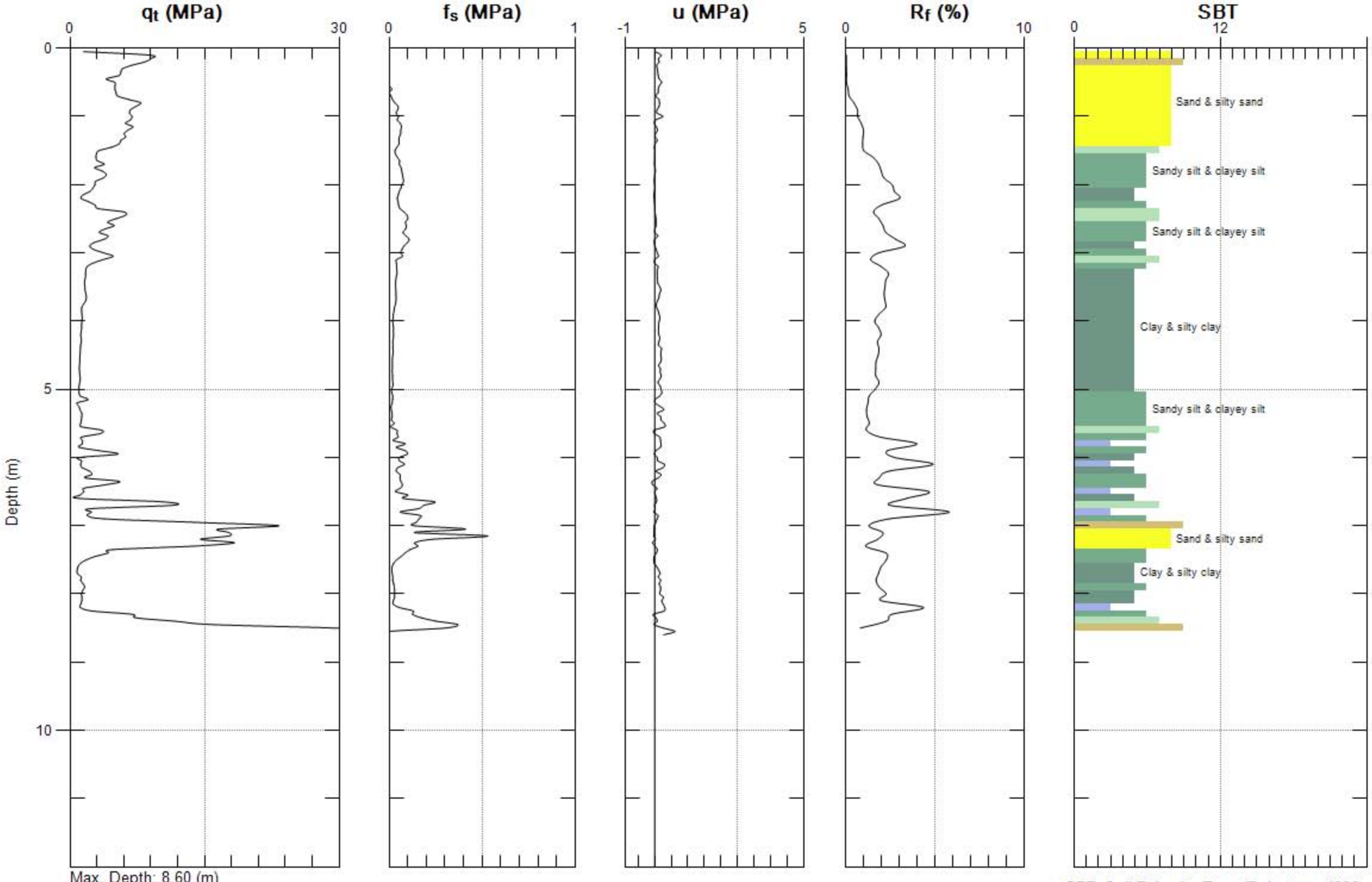
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 441+42

Engineer: D.KIRKMAN
Date: 4/30/2008 02:10



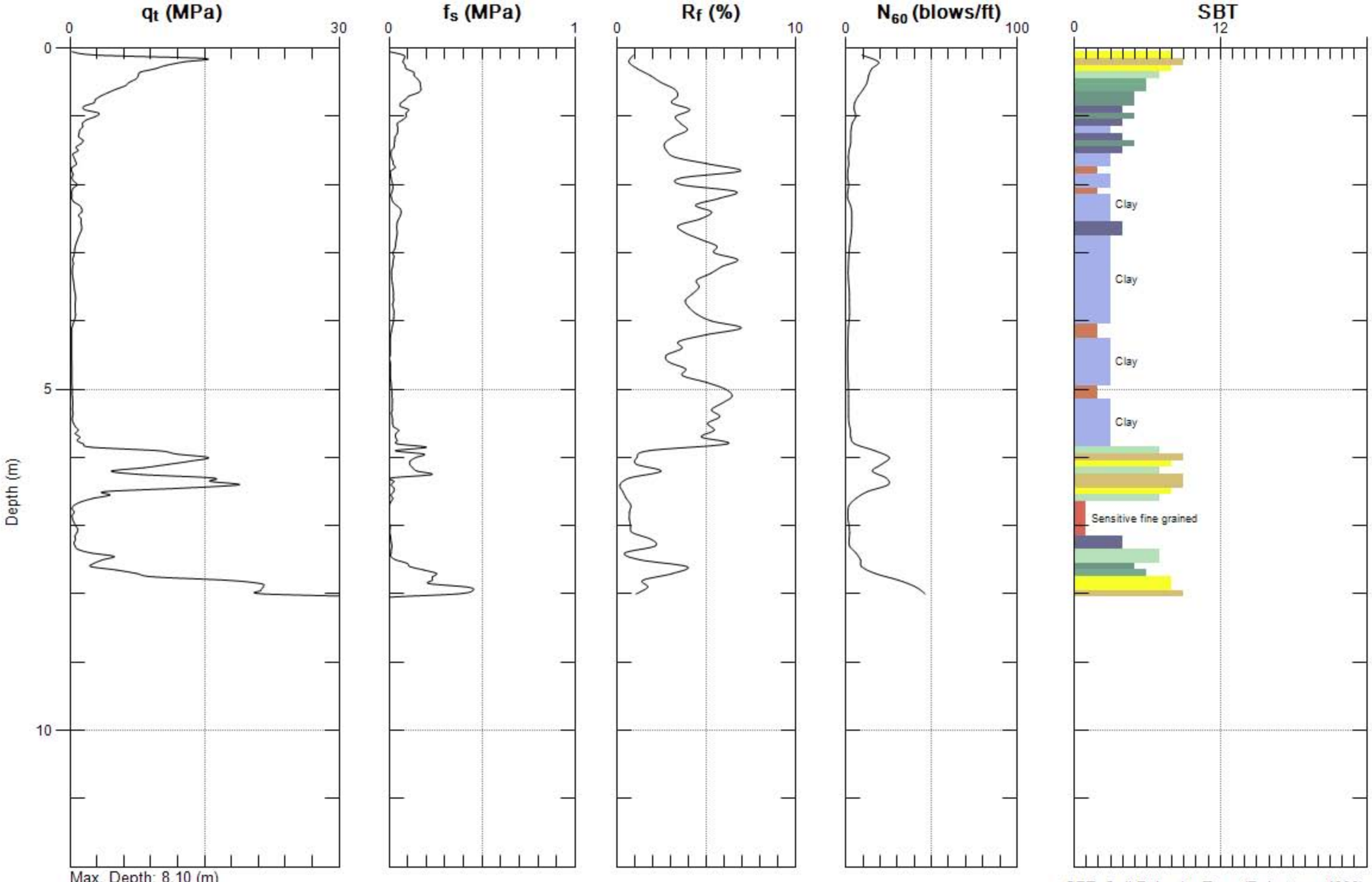
Max. Depth: 8.60 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 441+64

Engineer: D.KIRKMAN
Date: 4/28/2008 12:17

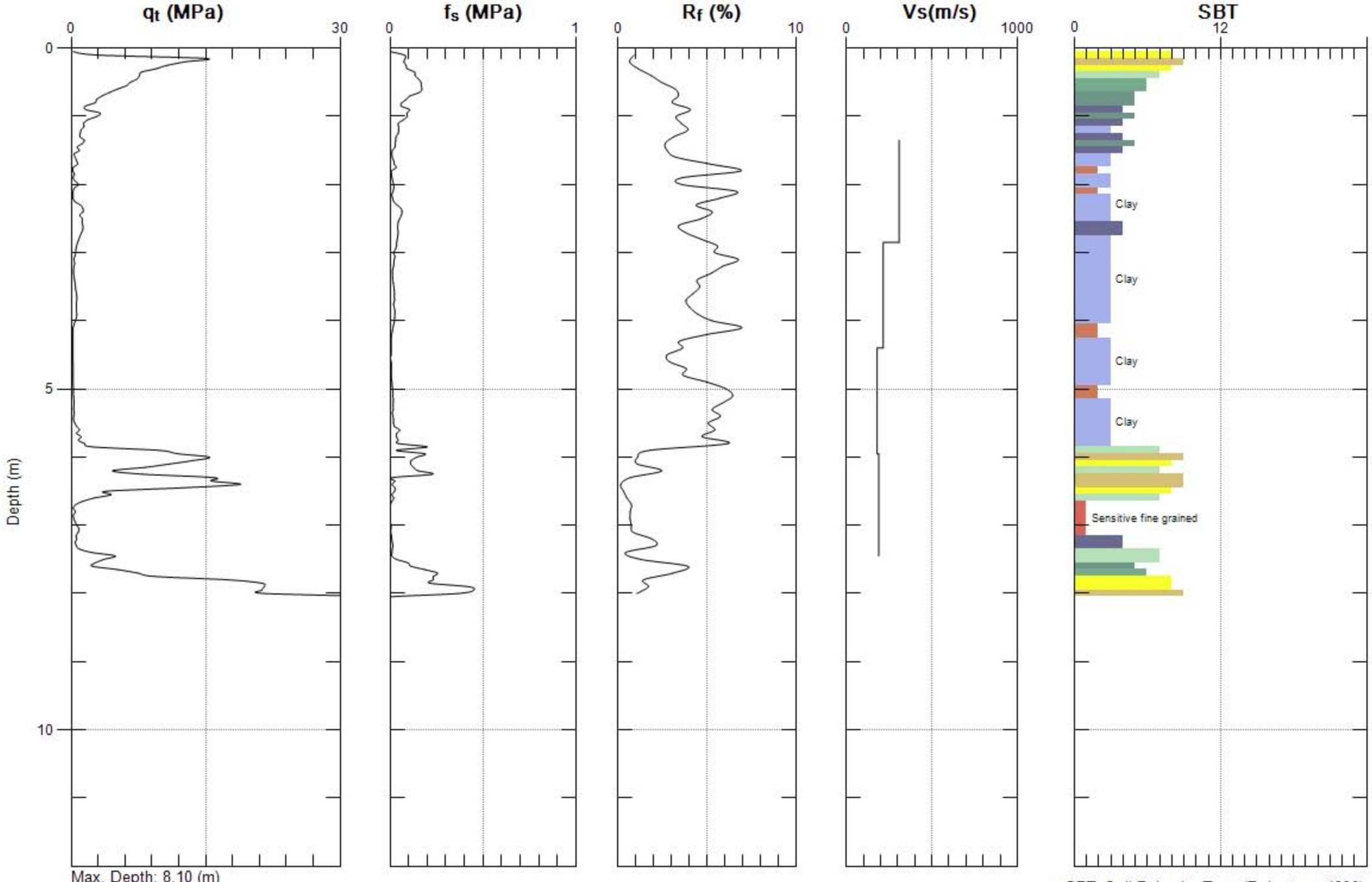


Max. Depth: 8.10 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 441+64
Engineer: D.KIRKMAN
Date: 4/28/2008 12:17



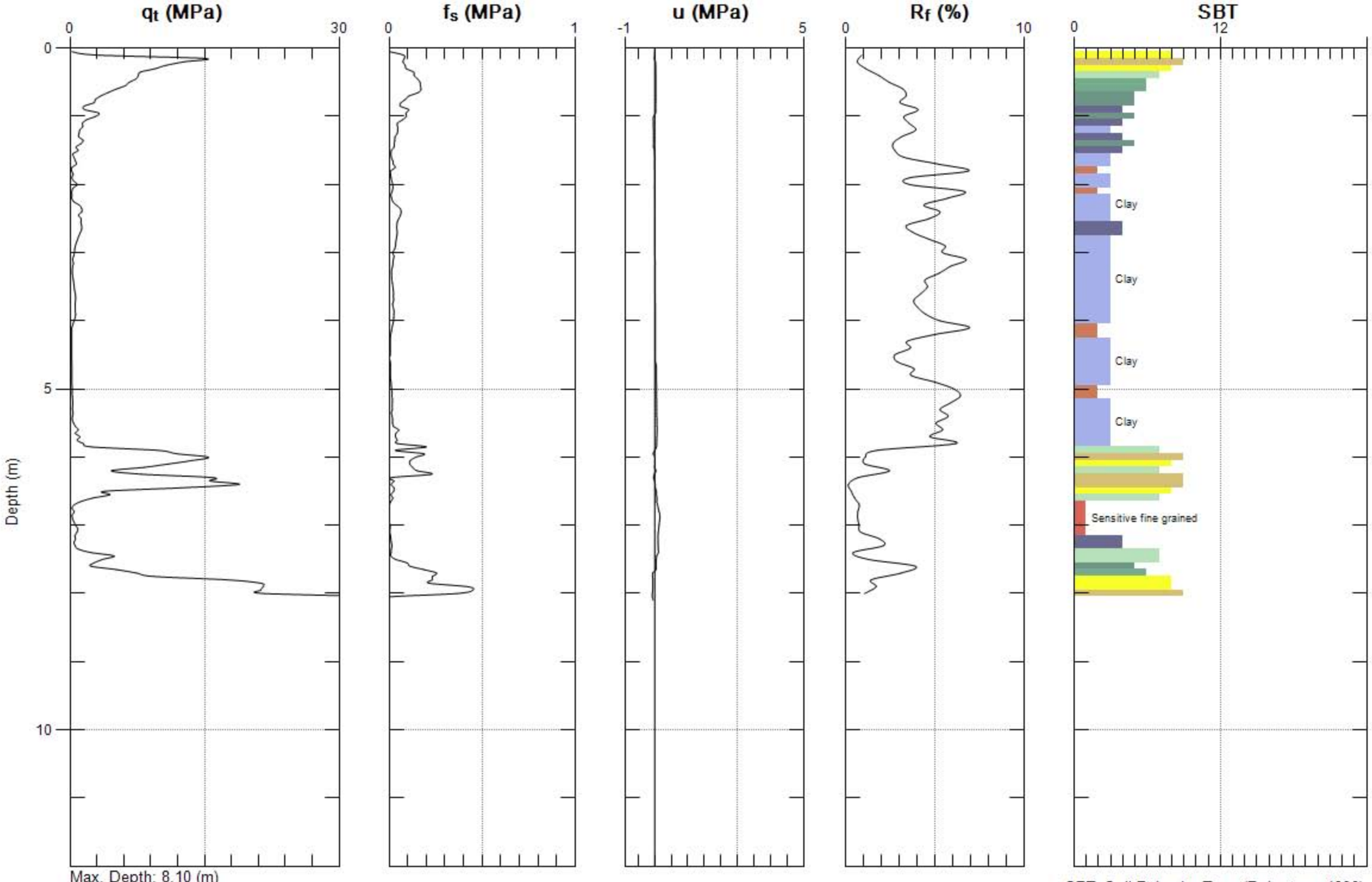
Max. Depth: 8.10 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 441+64

Engineer: D.KIRKMAN
Date: 4/28/2008 12:17

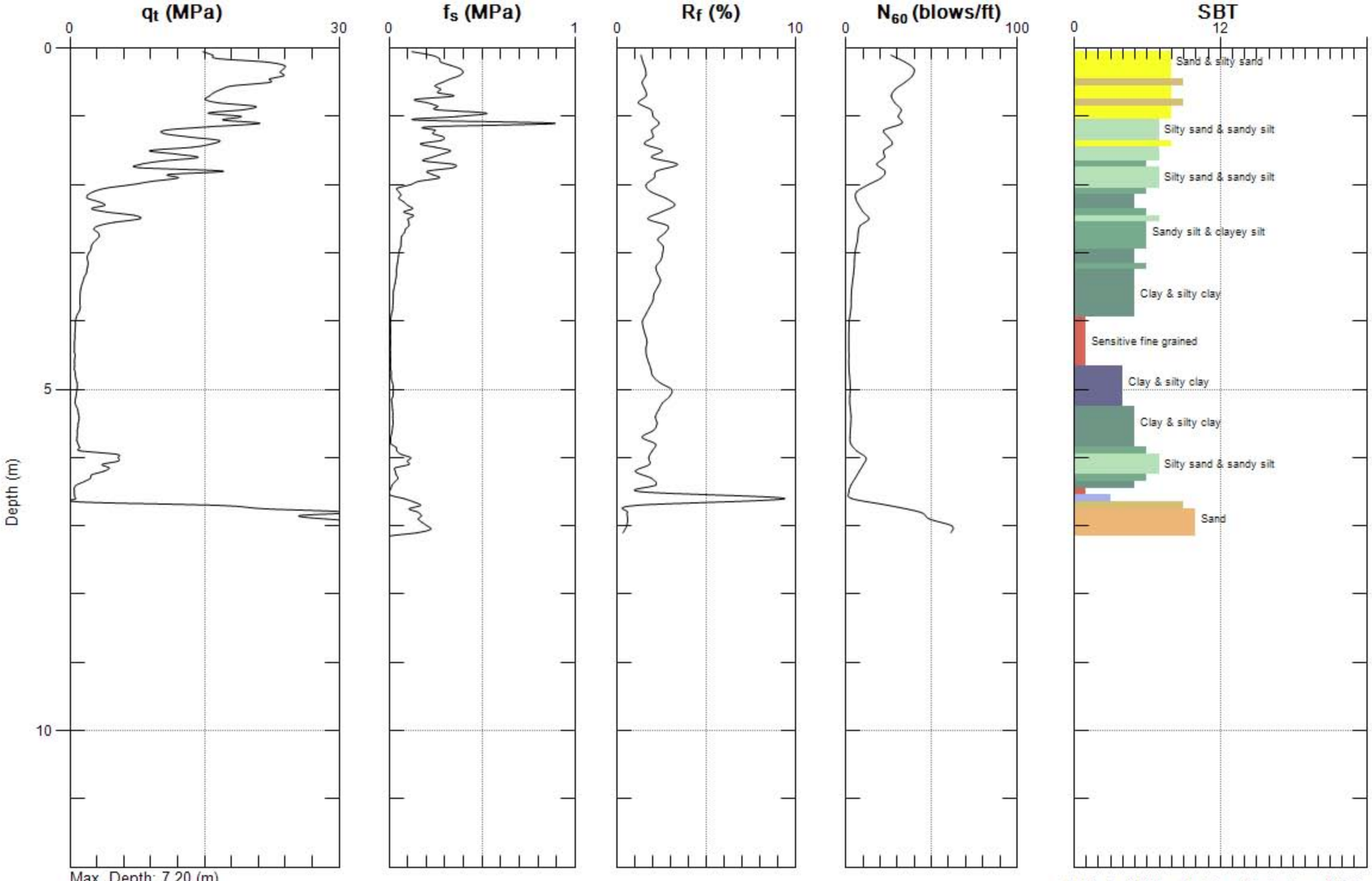


Max. Depth: 8.10 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 441+82B
Engineer: D.KIRKMAN
Date: 4/28/2008 01:46

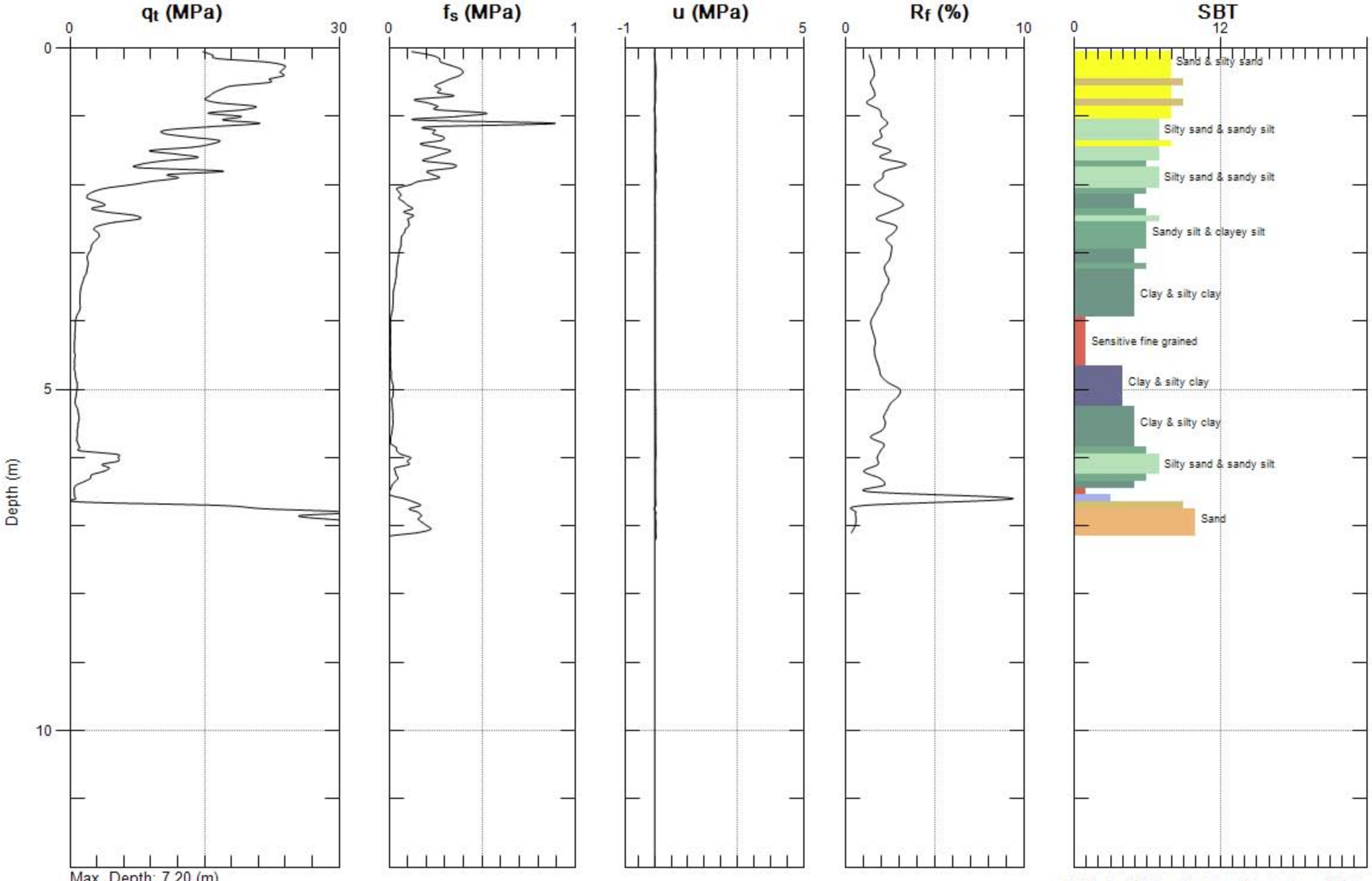


Max. Depth: 7.20 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 441+82B
Engineer: D.KIRKMAN
Date: 4/28/2008 01:46

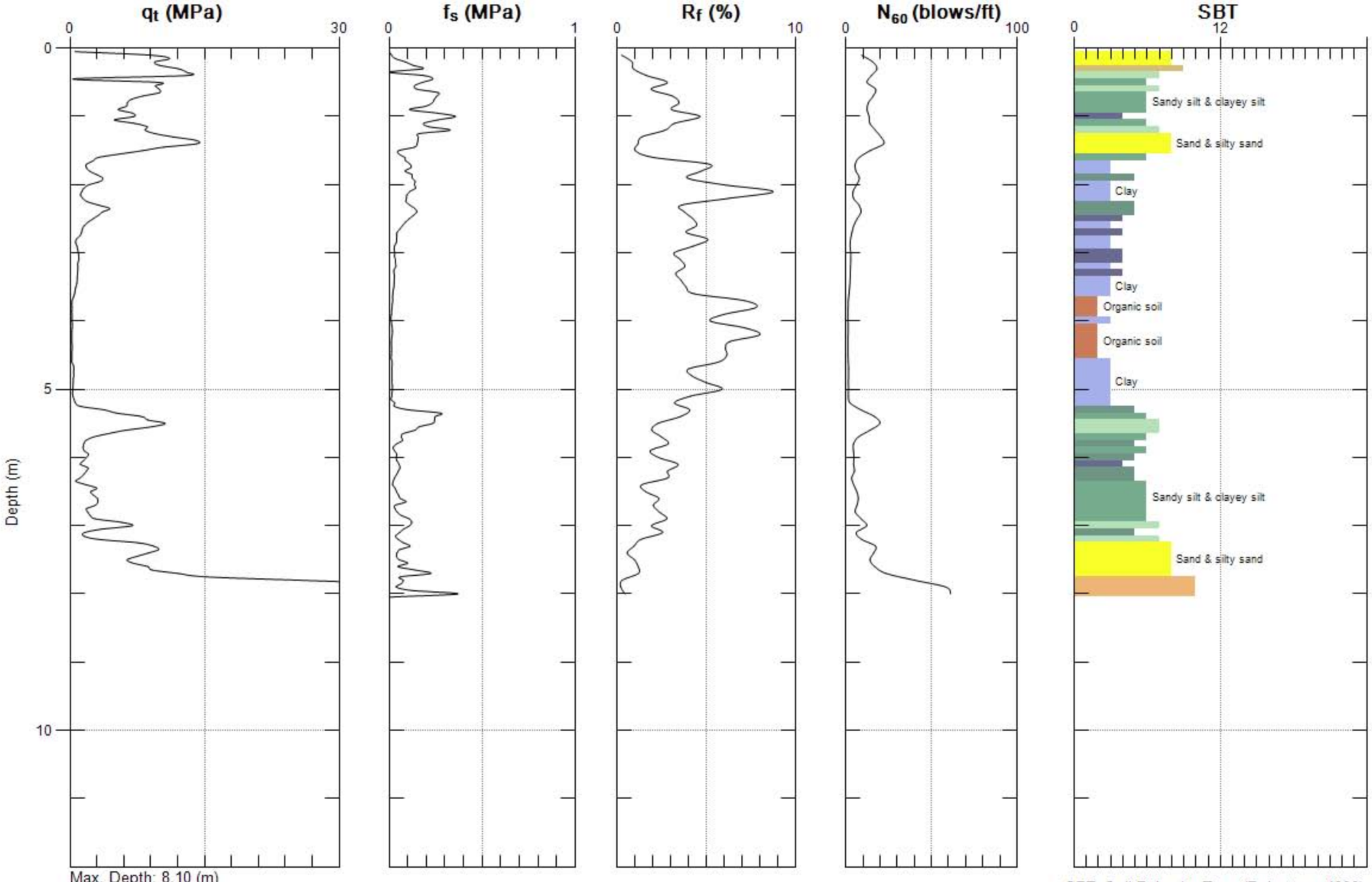


Max. Depth: 7.20 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 441+96
Engineer: D.KIRKMAN
Date: 4/28/2008 02:38

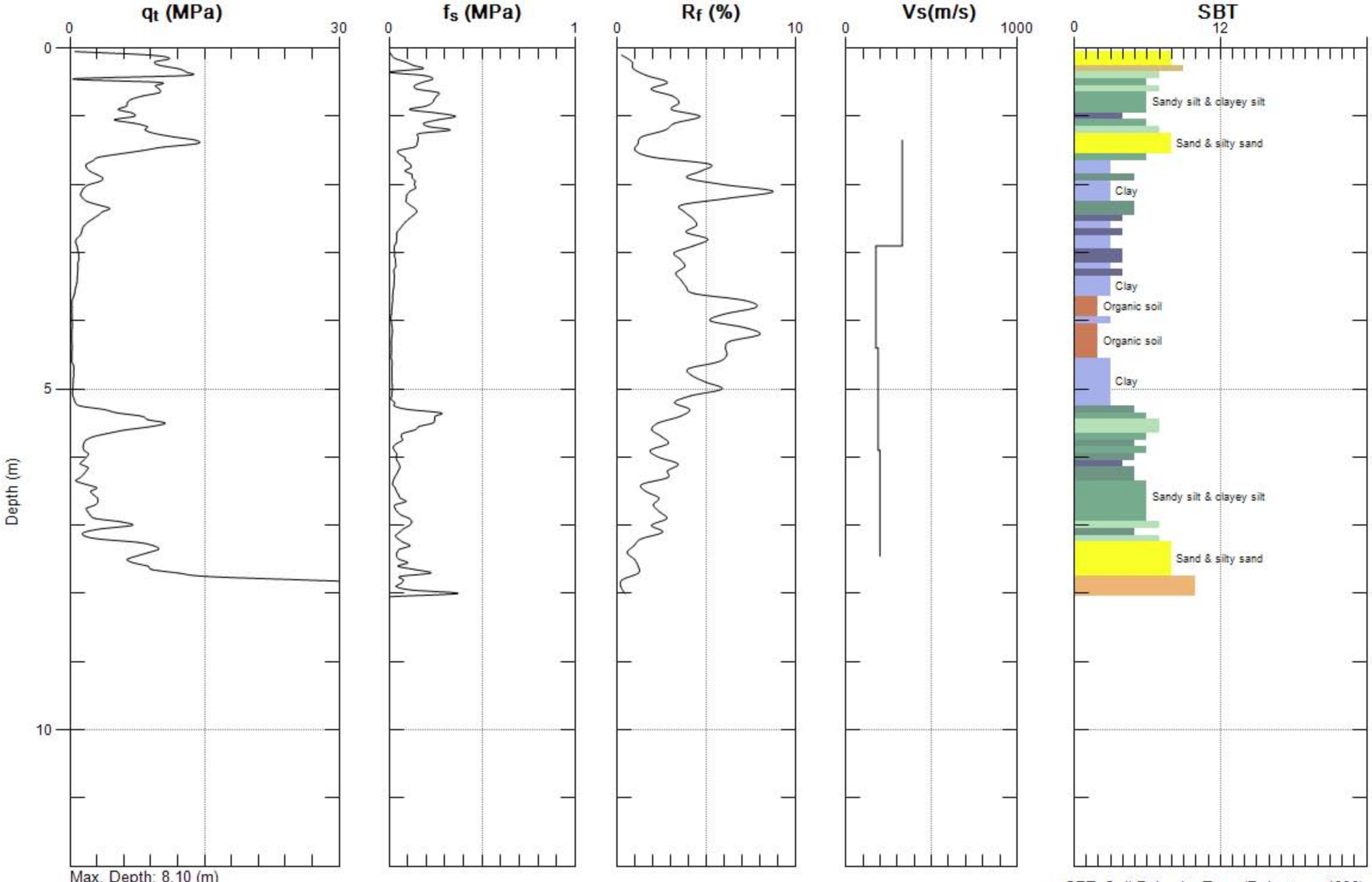


Max. Depth: 8.10 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 441+96
Engineer: D.KIRKMAN
Date: 4/28/2008 02:38



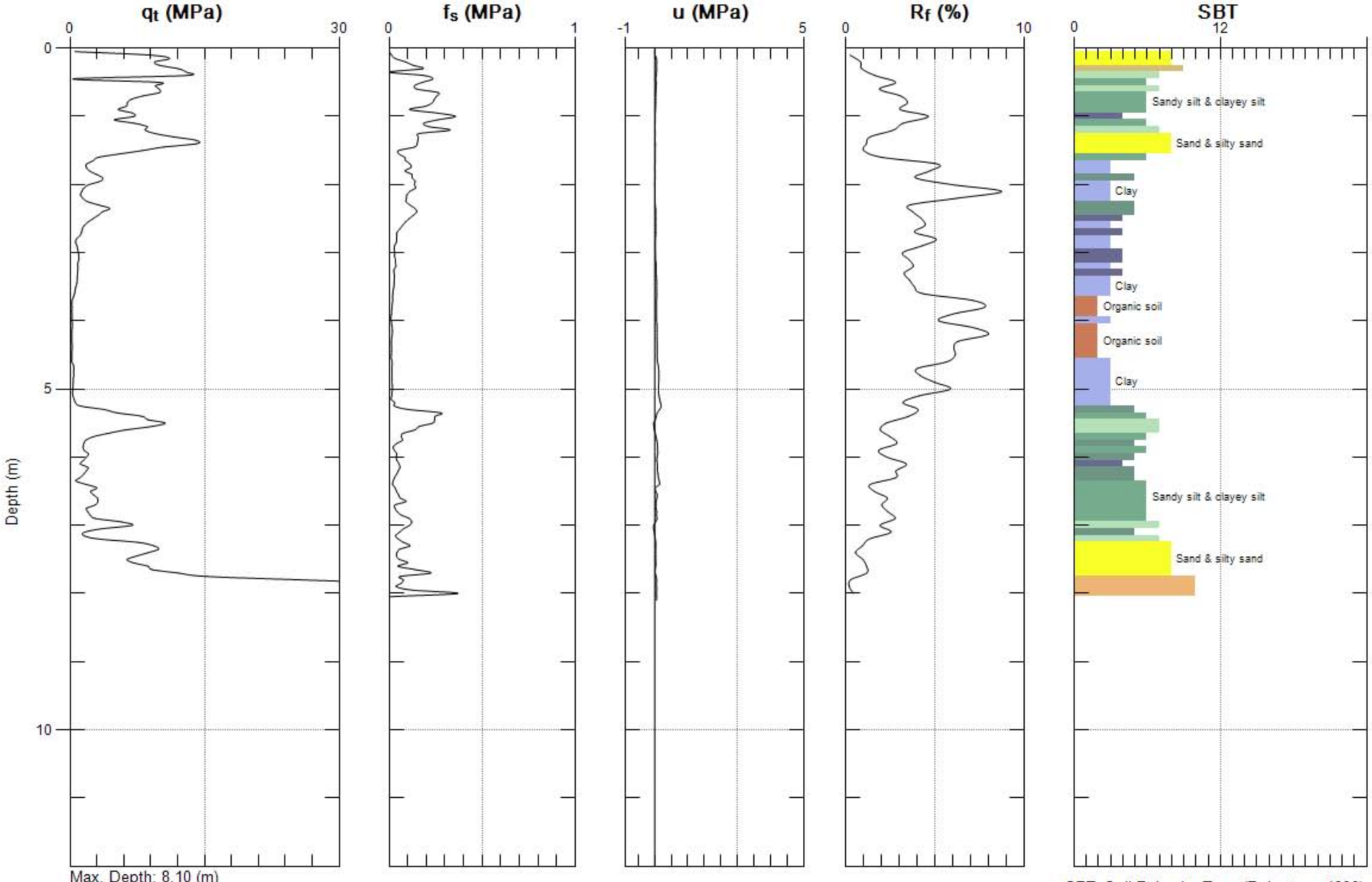
Max. Depth: 8.10 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 441+96

Engineer: D.KIRKMAN
Date: 4/28/2008 02:38

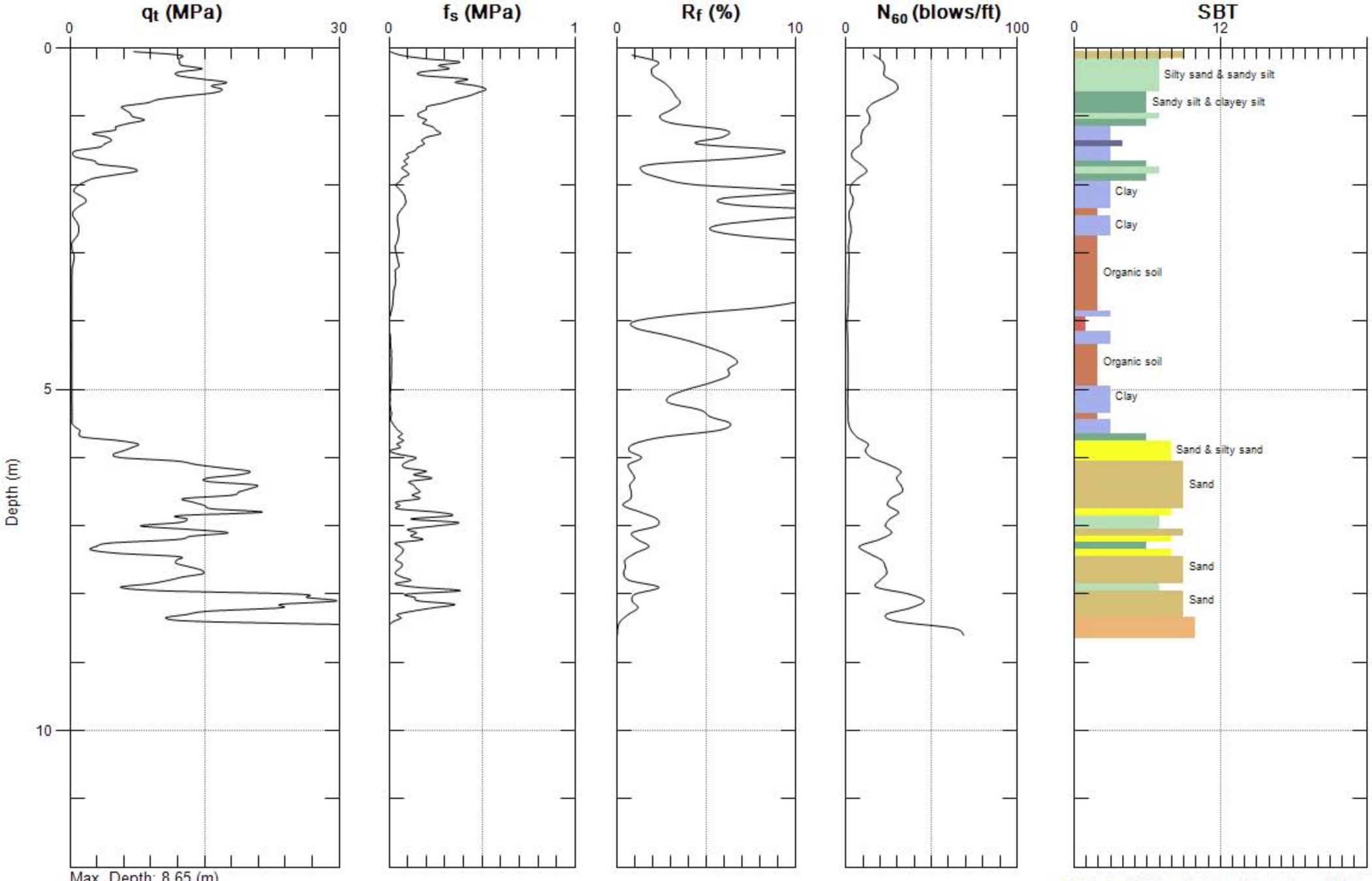


Max. Depth: 8.10 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 442+05
Engineer: D.KIRKMAN
Date: 4/28/2008 03:38



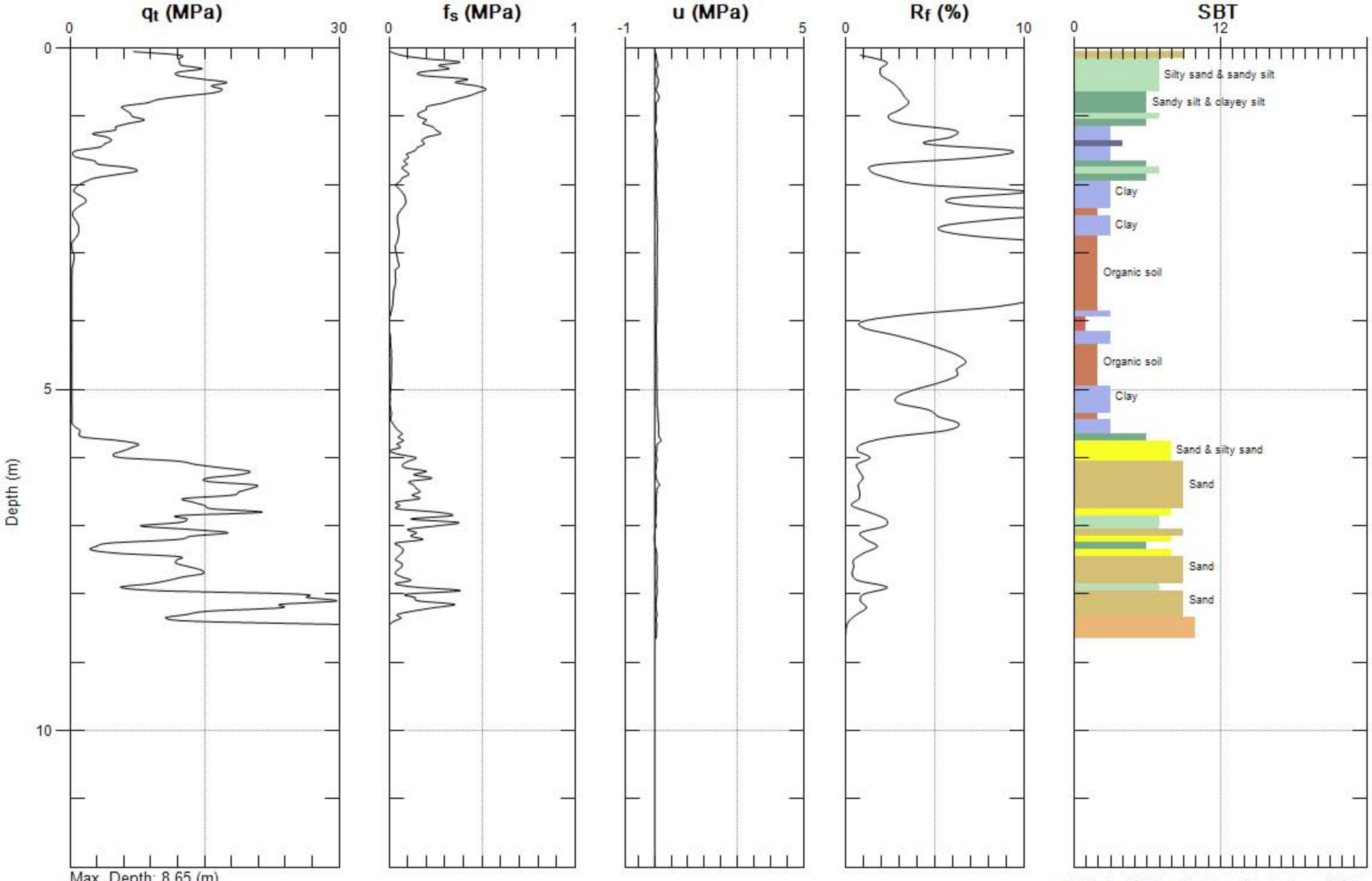
Max. Depth: 8.65 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 442+05

Engineer: D.KIRKMAN
Date: 4/28/2008 03:38

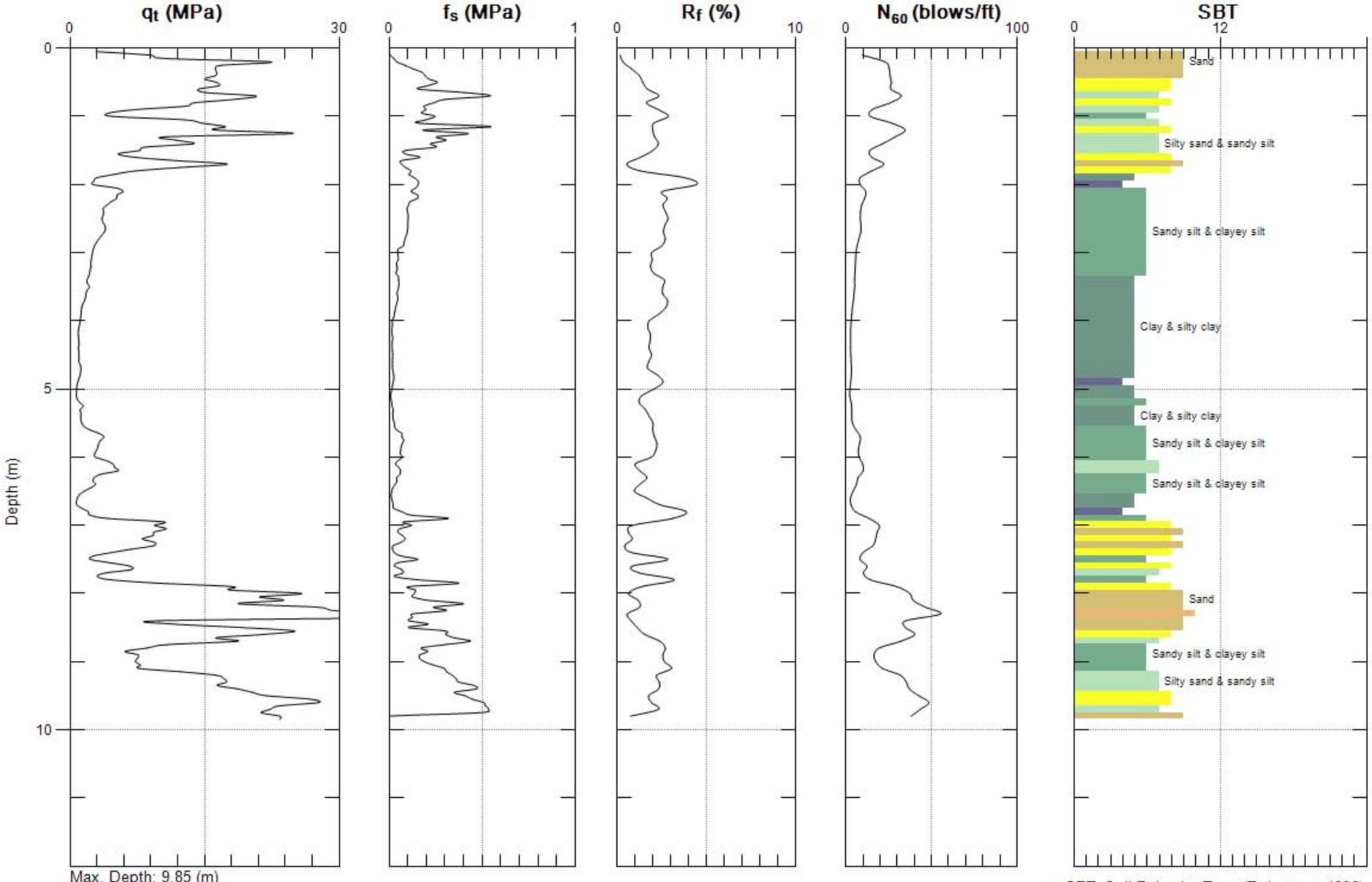


Max. Depth: 8.65 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 442+15
Engineer: D.KIRKMAN
Date: 4/29/2008 07:40

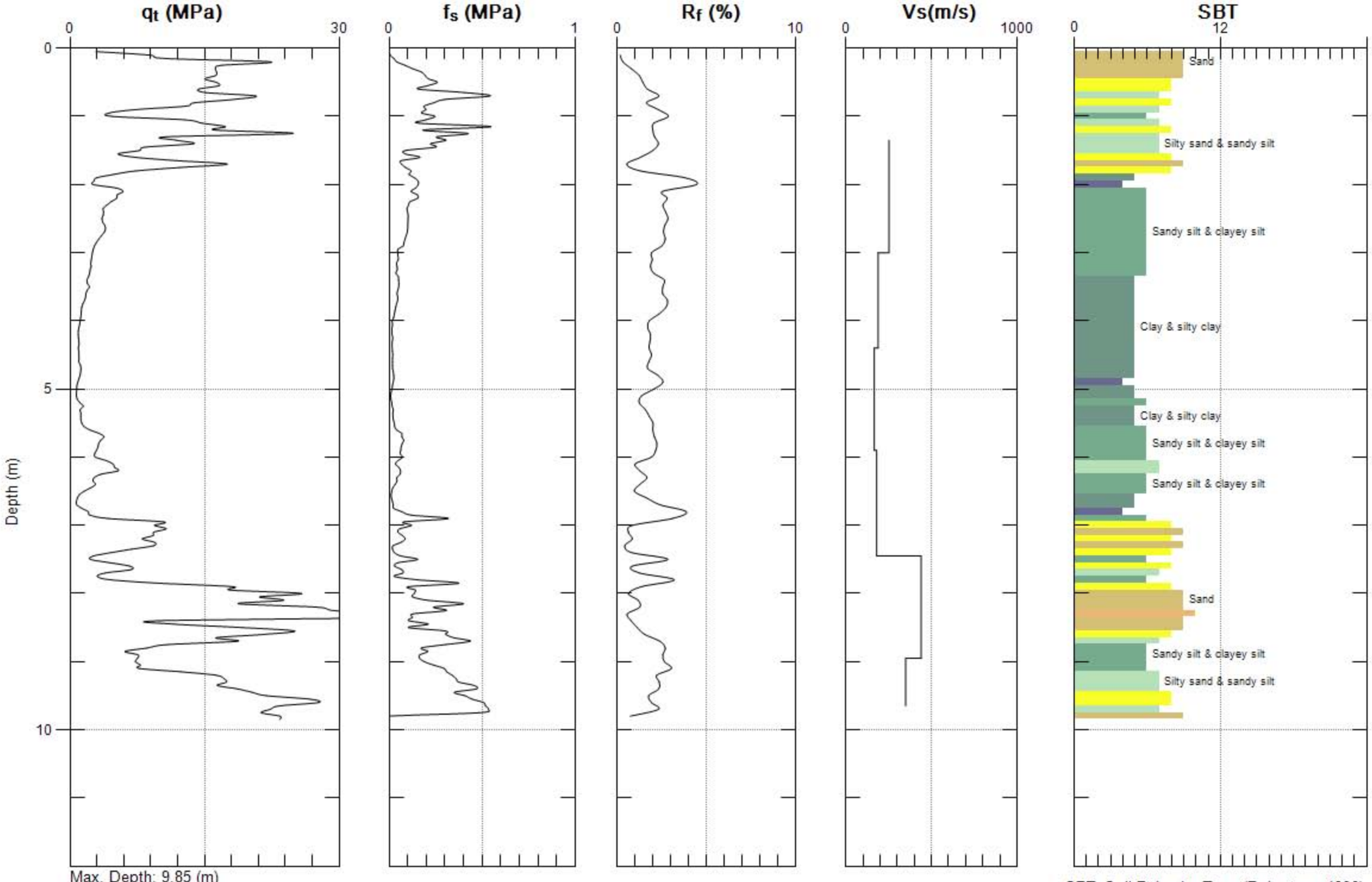


Max. Depth: 9.85 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 442+15
Engineer: D.KIRKMAN
Date: 4/29/2008 07:40

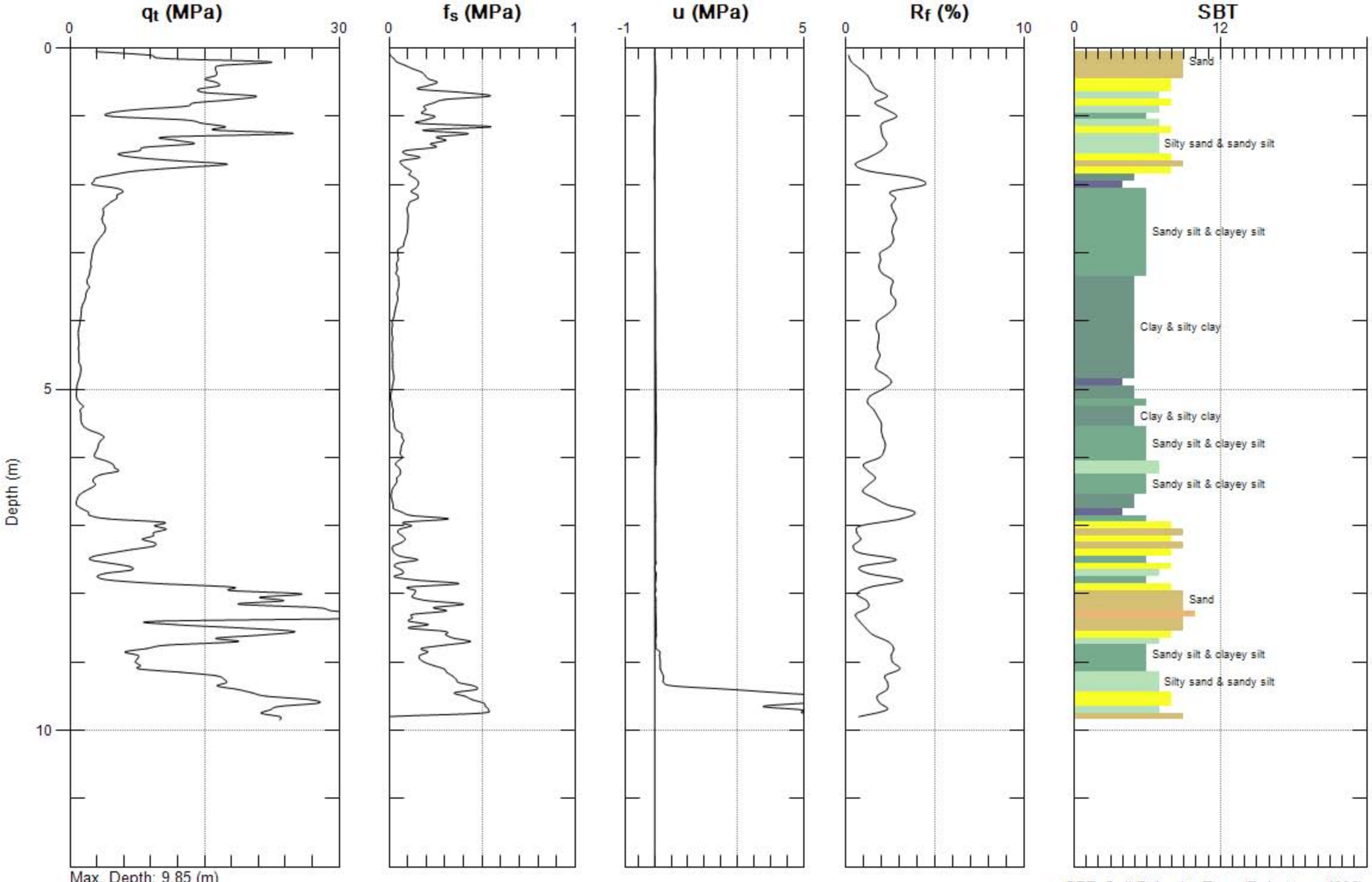


Max. Depth: 9.85 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 442+15
Engineer: D.KIRKMAN
Date: 4/29/2008 07:40

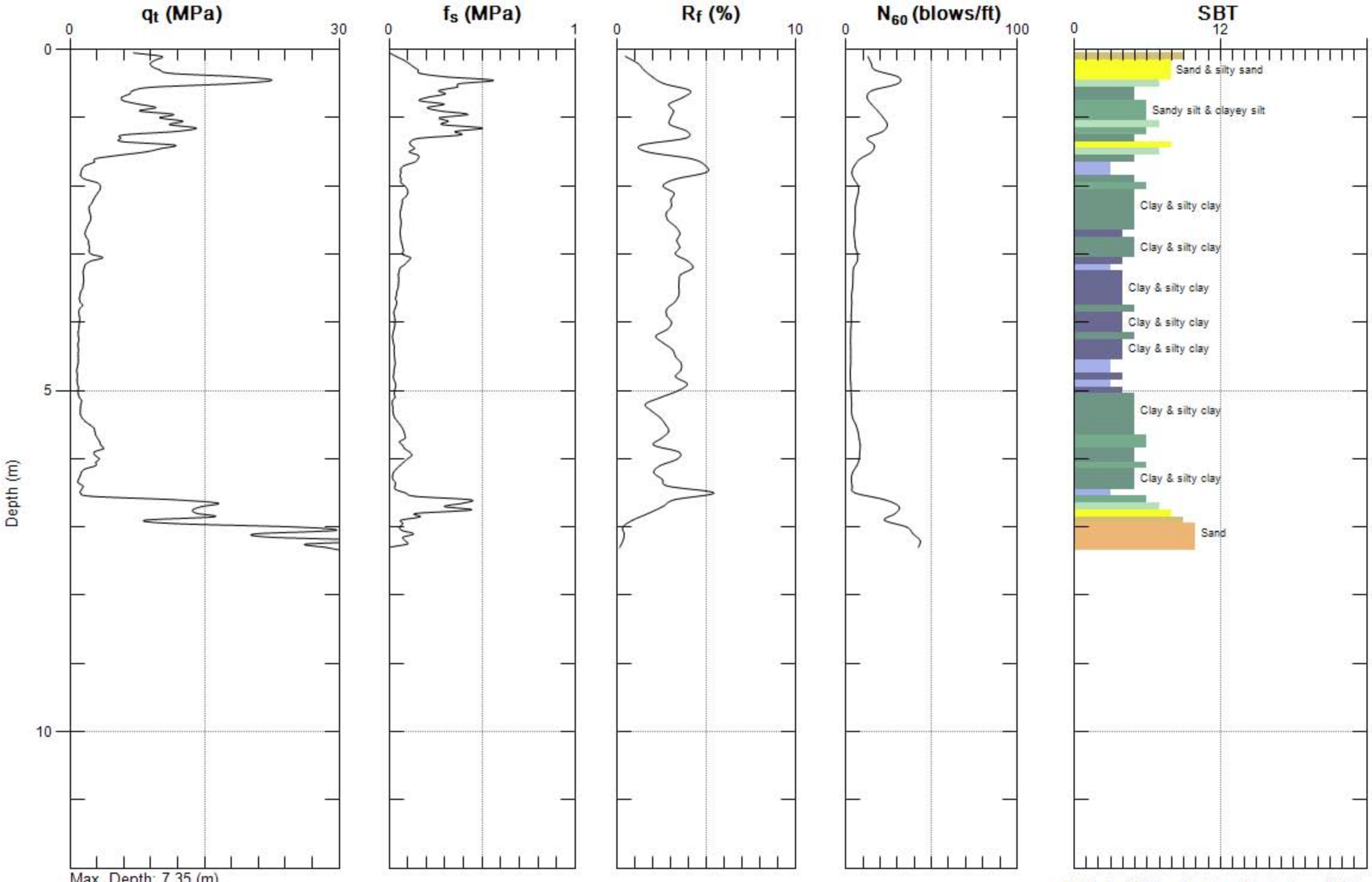


Max. Depth: 9.85 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 442+23.5
Engineer: D.KIRKMAN
Date: 4/29/2008 09:24

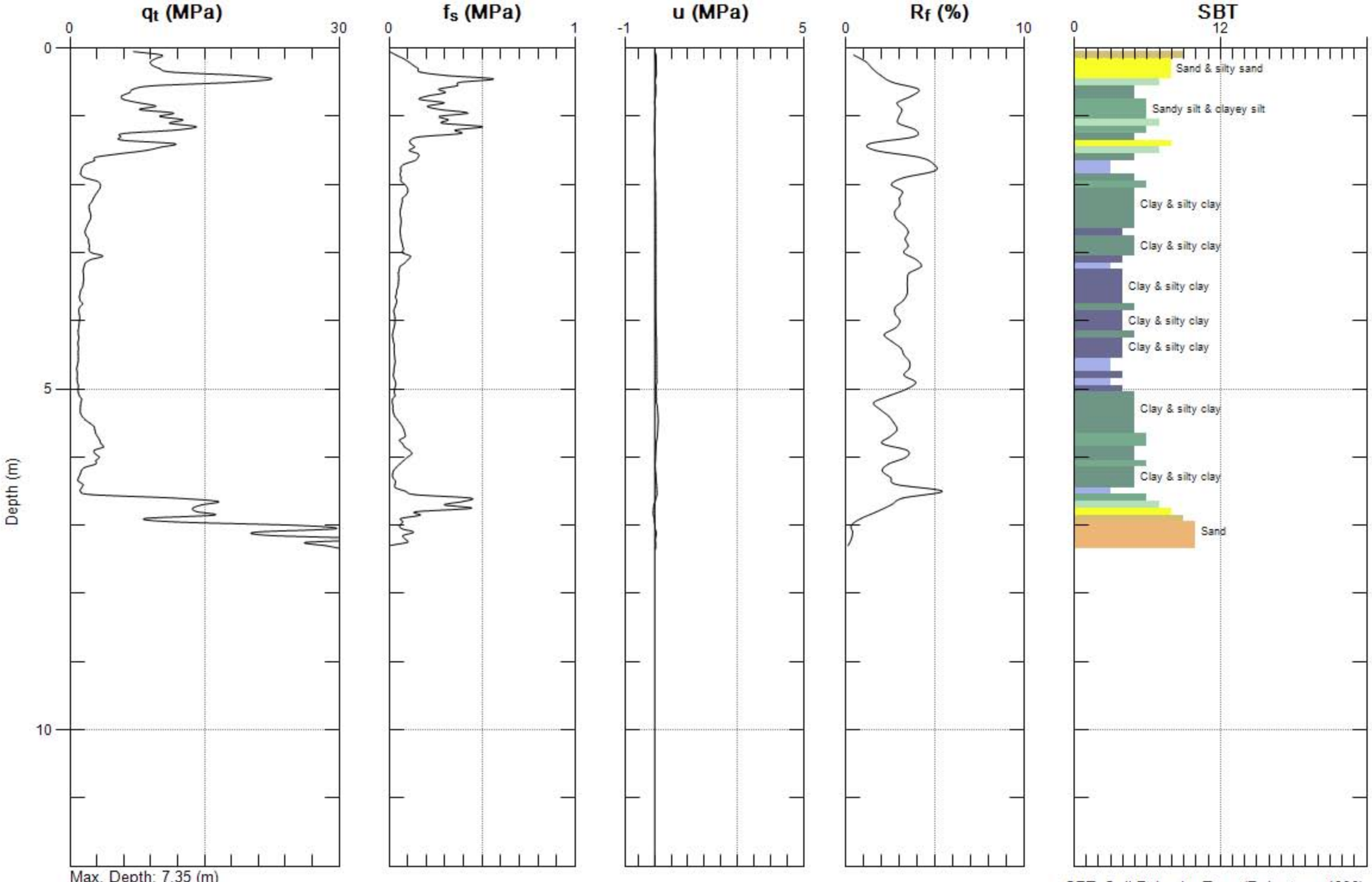


Max. Depth: 7.35 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 442+23.5
Engineer: D.KIRKMAN
Date: 4/29/2008 09:24

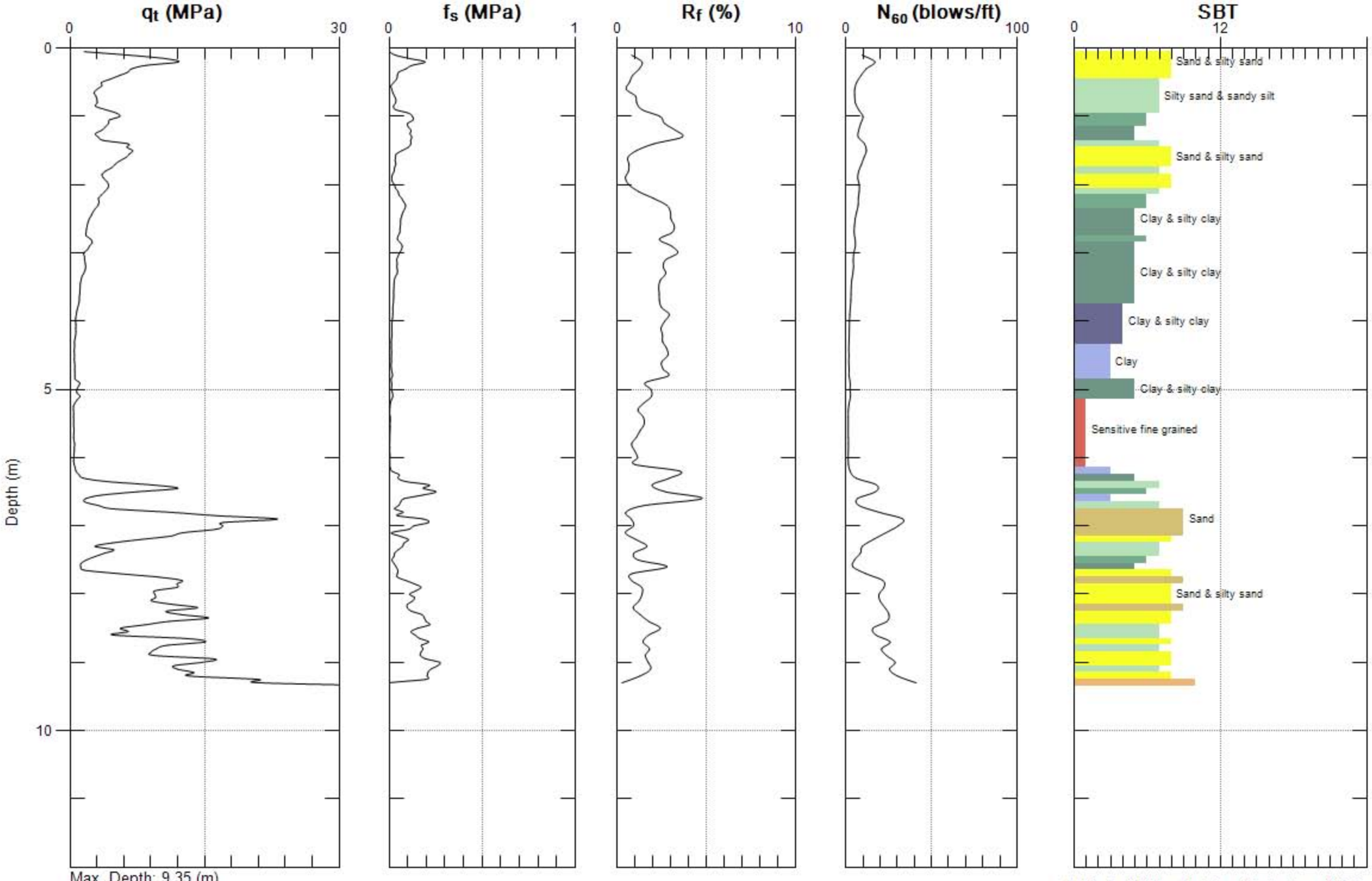


Max. Depth: 7.35 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 442+32
Engineer: D.KIRKMAN
Date: 4/30/2008 10:09

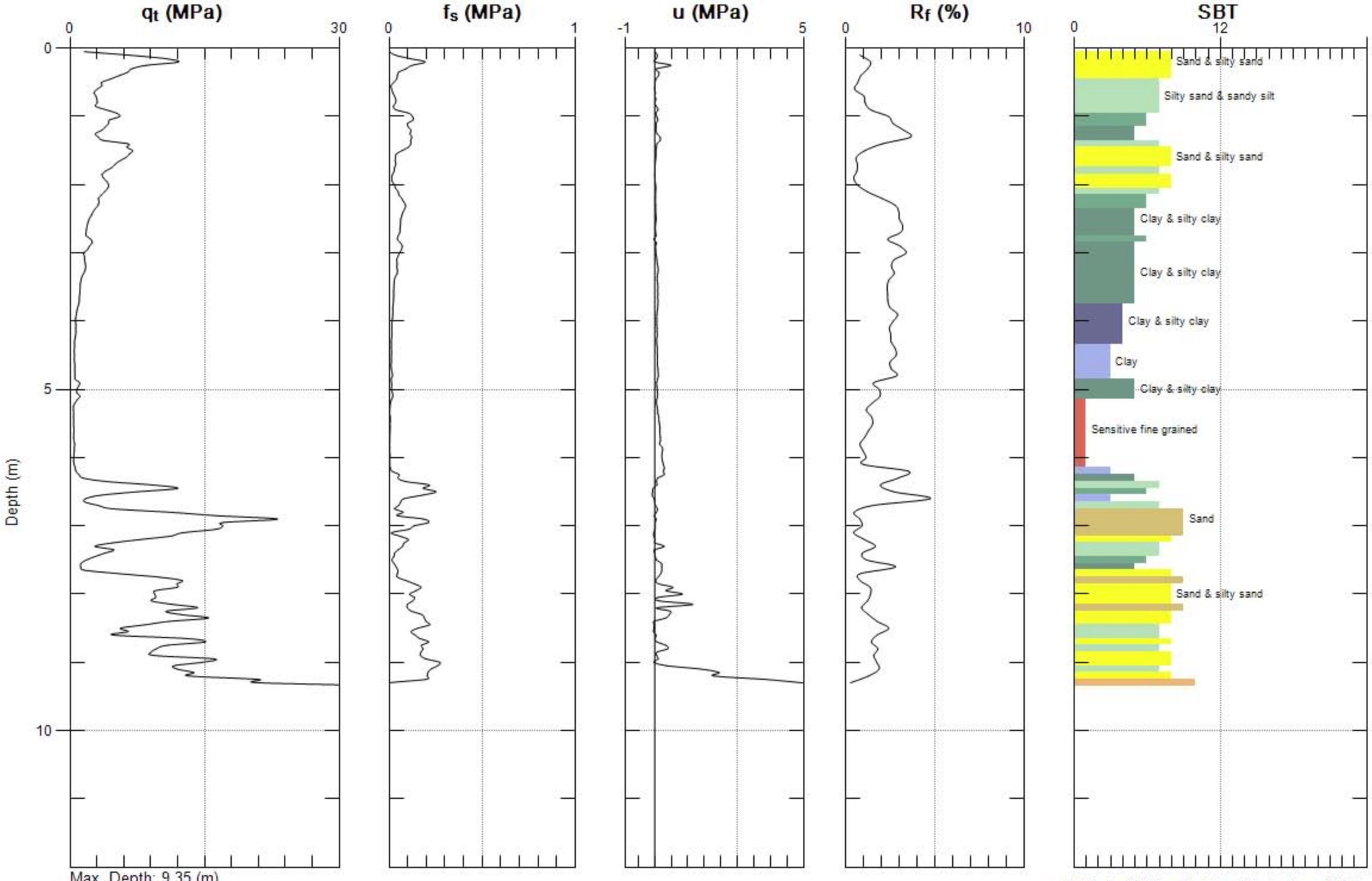


Max. Depth: 9.35 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 442+32
Engineer: D.KIRKMAN
Date: 4/30/2008 10:09



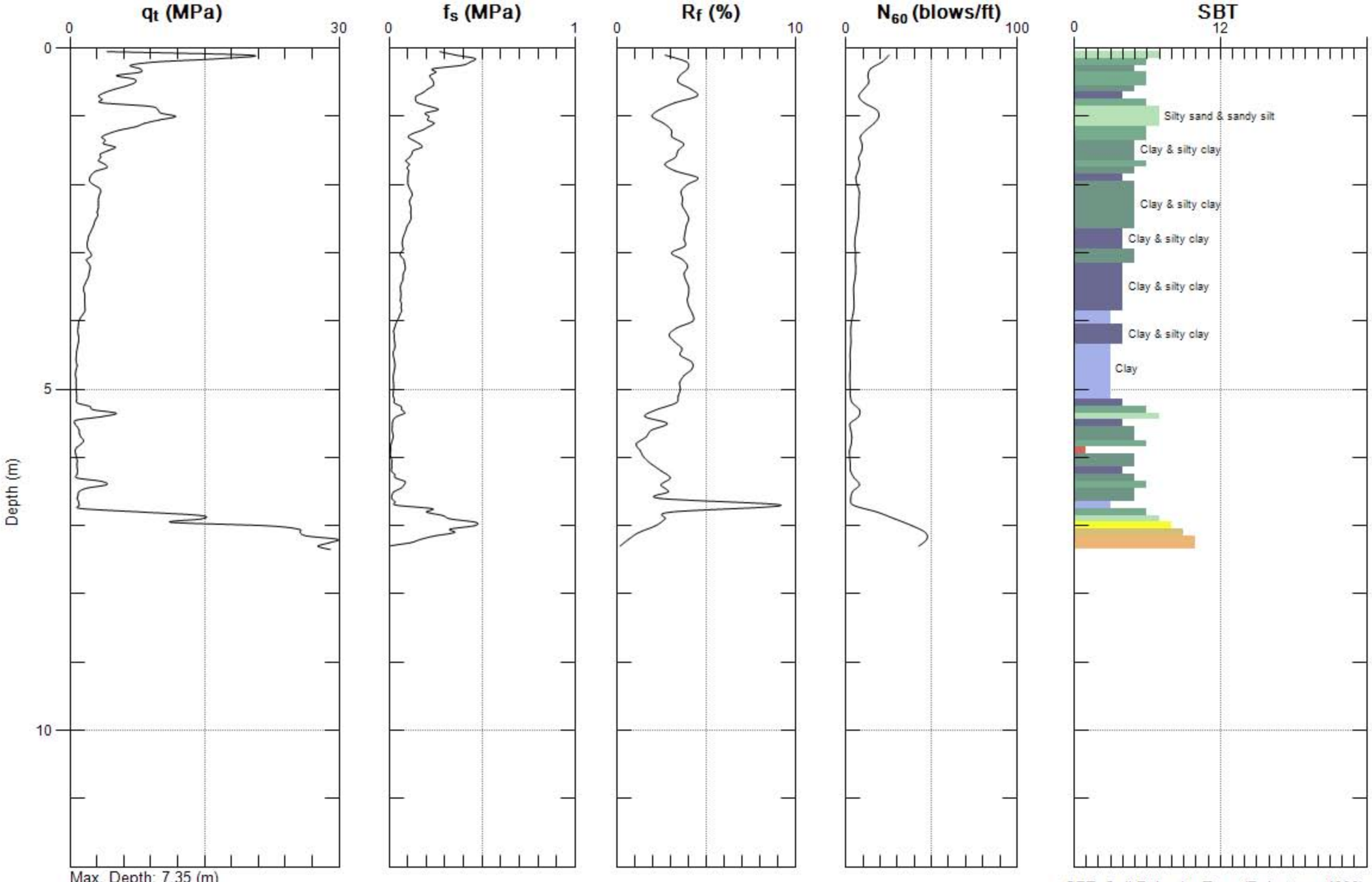
Max. Depth: 9.35 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 442+42.5

Engineer: D.KIRKMAN
Date: 4/29/2008 10:28

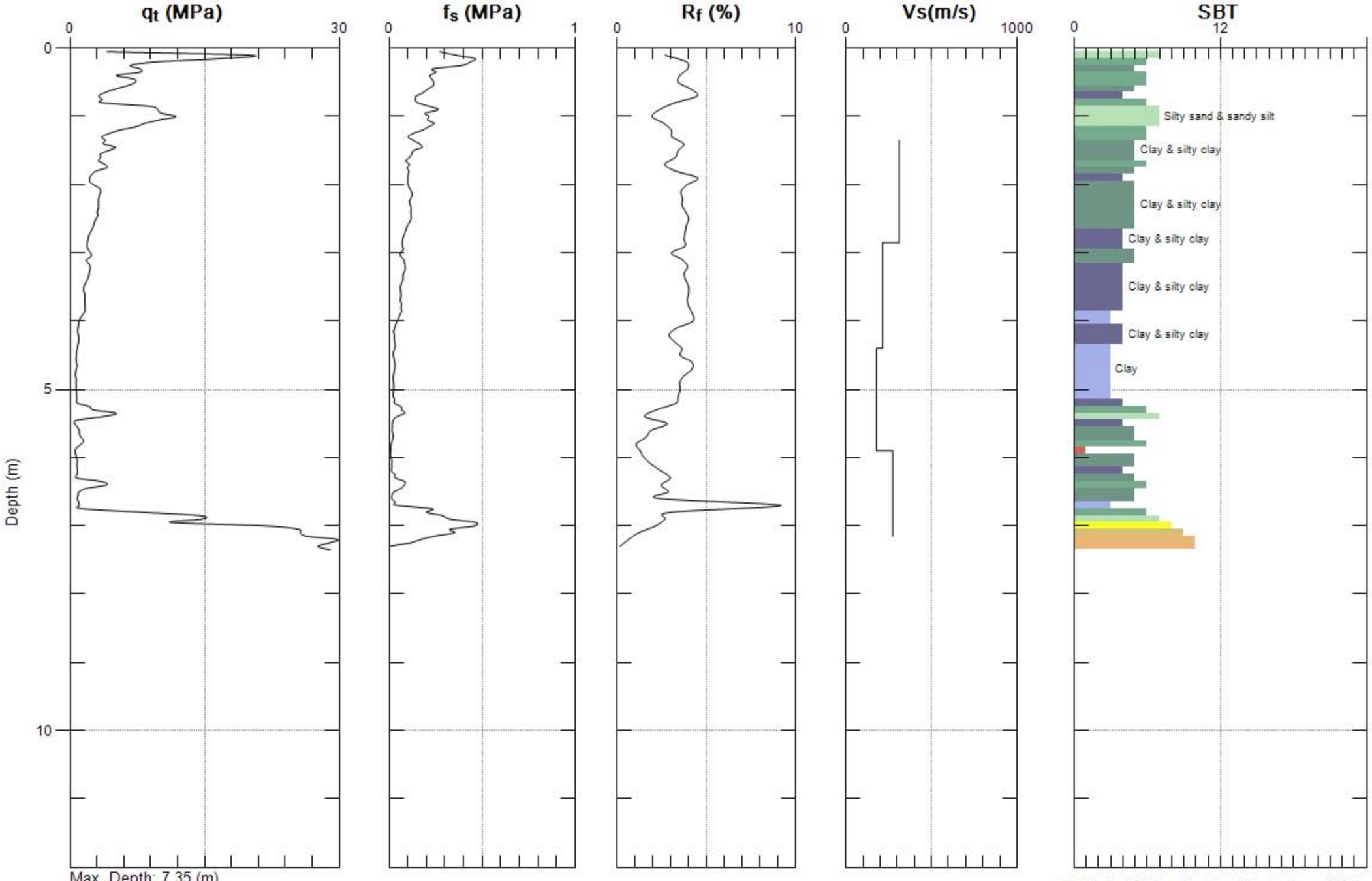


Max. Depth: 7.35 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 442+42.5
Engineer: D.KIRKMAN
Date: 4/29/2008 10:28

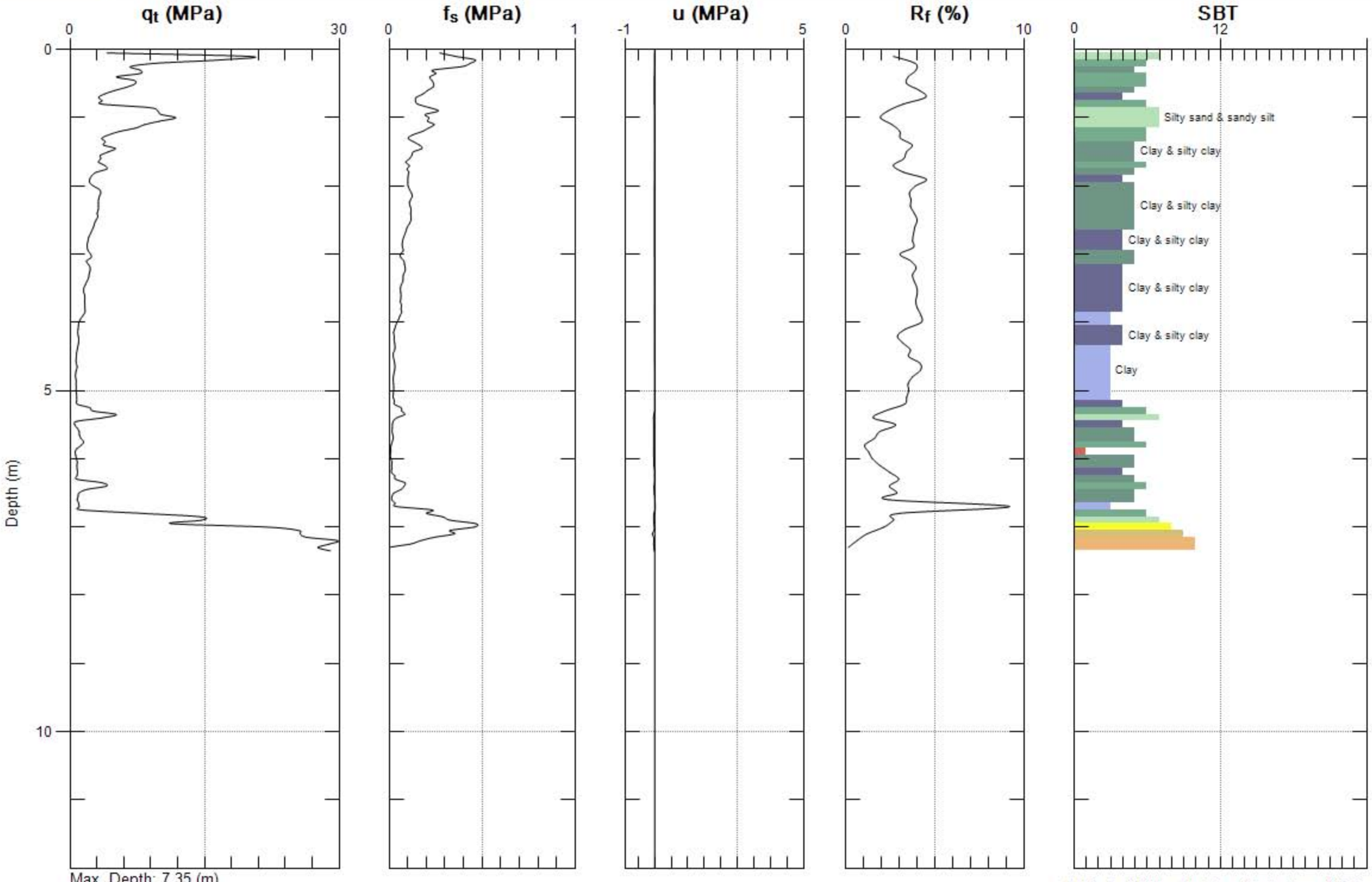


Max. Depth: 7.35 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 442+42.5
Engineer: D.KIRKMAN
Date: 4/29/2008 10:28



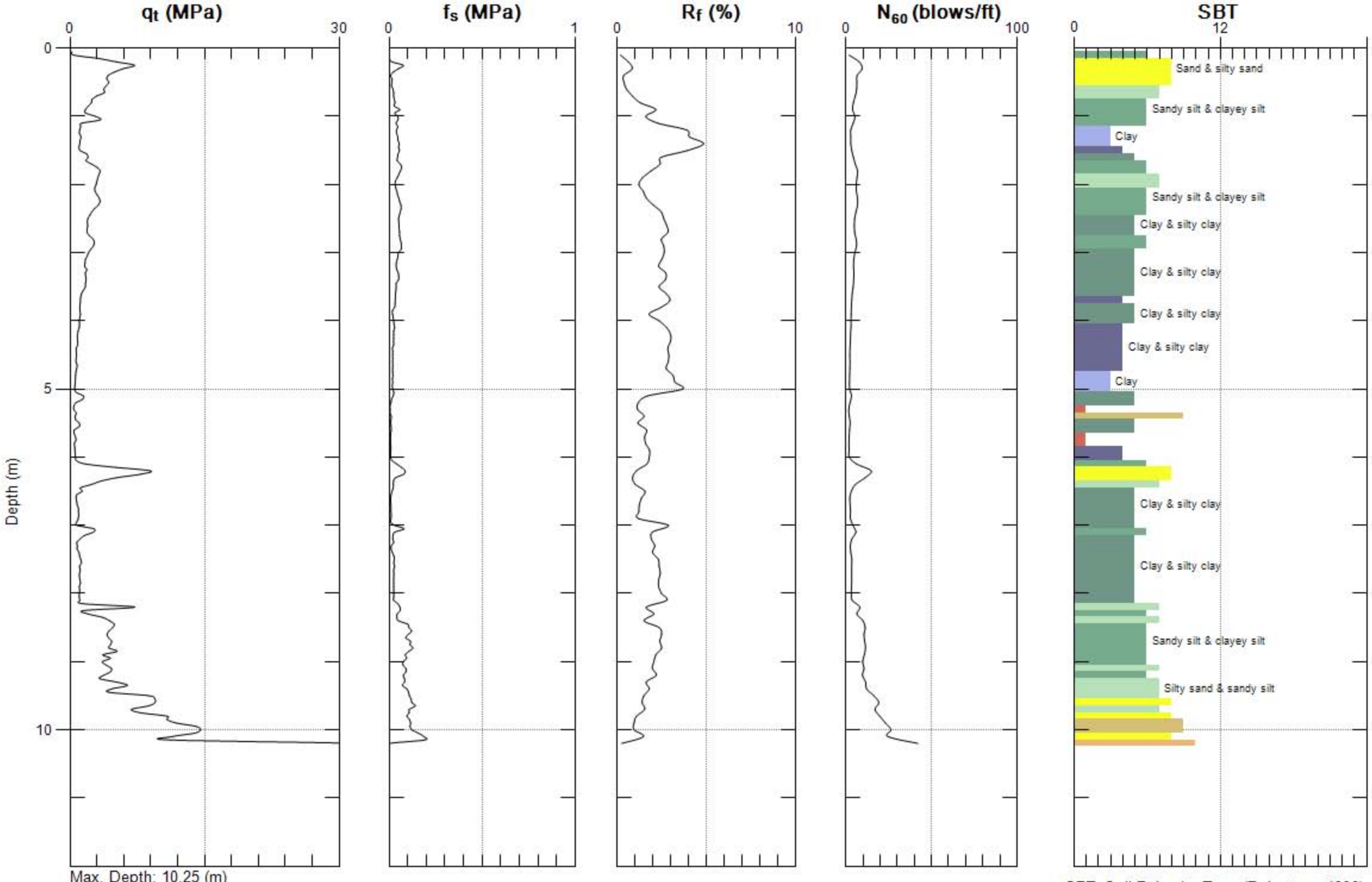
Max. Depth: 7.35 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 442+50

Engineer: D.KIRKMAN
Date: 4/30/2008 09:08



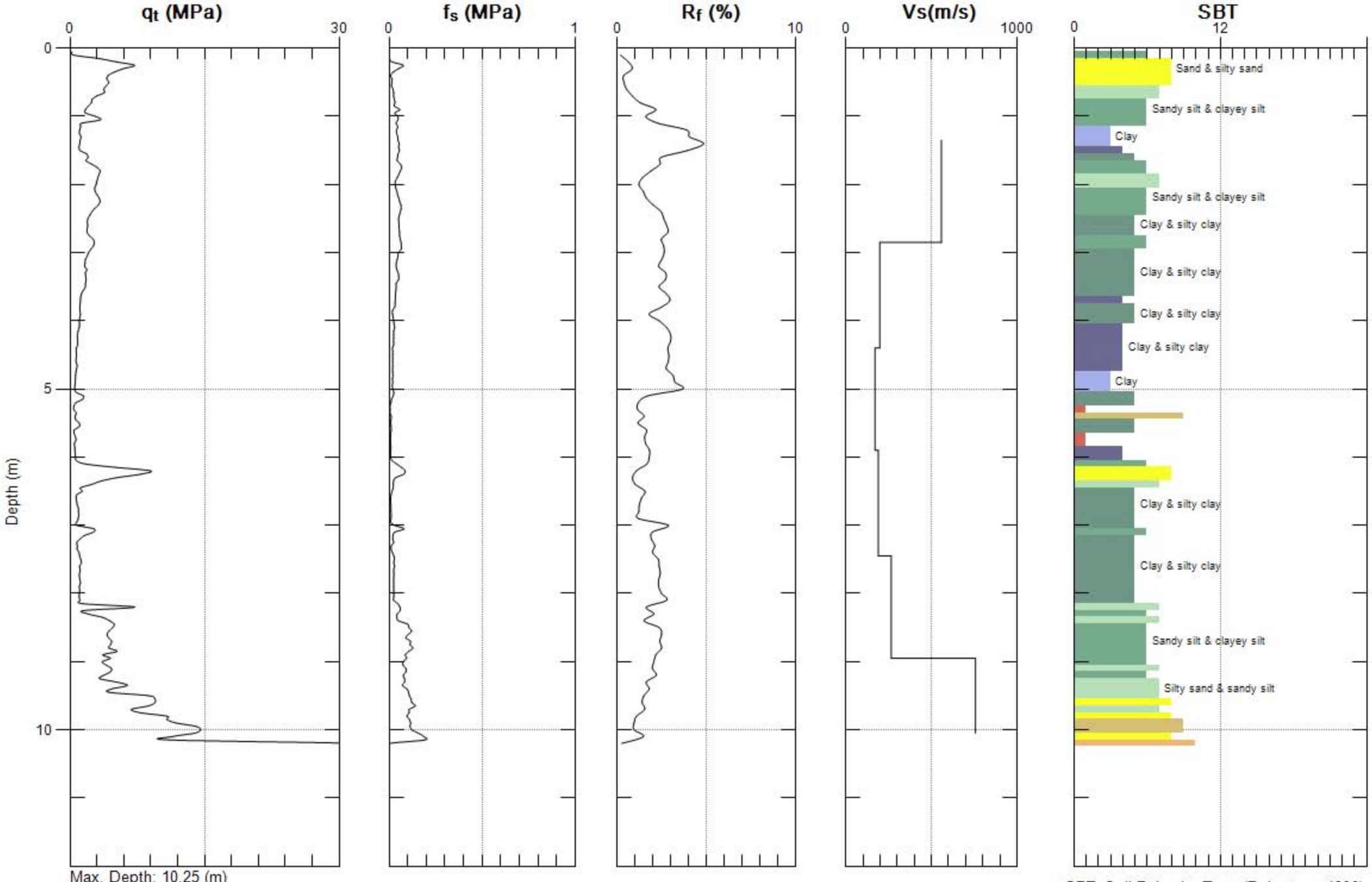
Max. Depth: 10.25 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 442+50

Engineer: D.KIRKMAN
Date: 4/30/2008 09:08



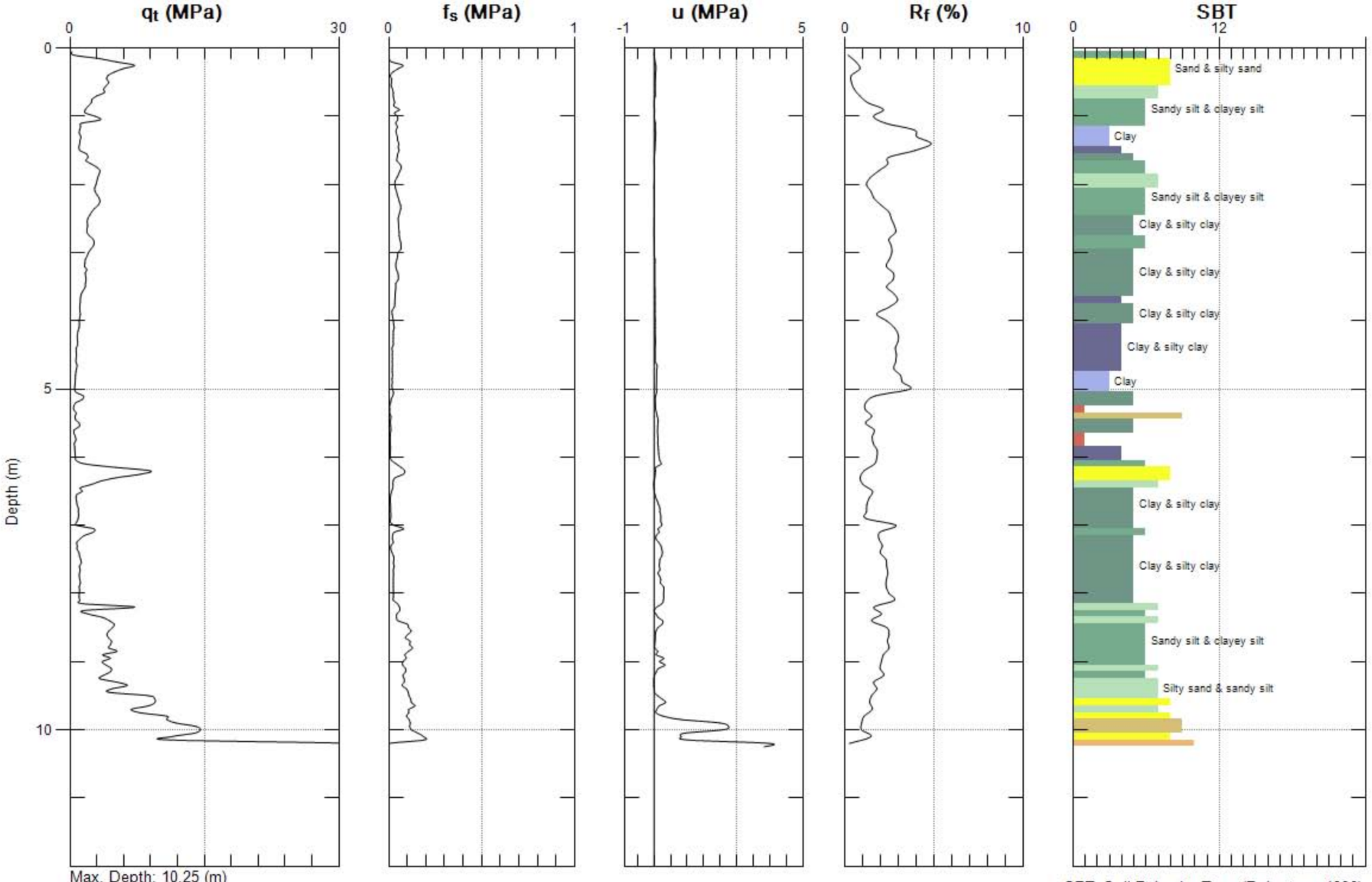
Max. Depth: 10.25 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 442+50

Engineer: D.KIRKMAN
Date: 4/30/2008 09:08



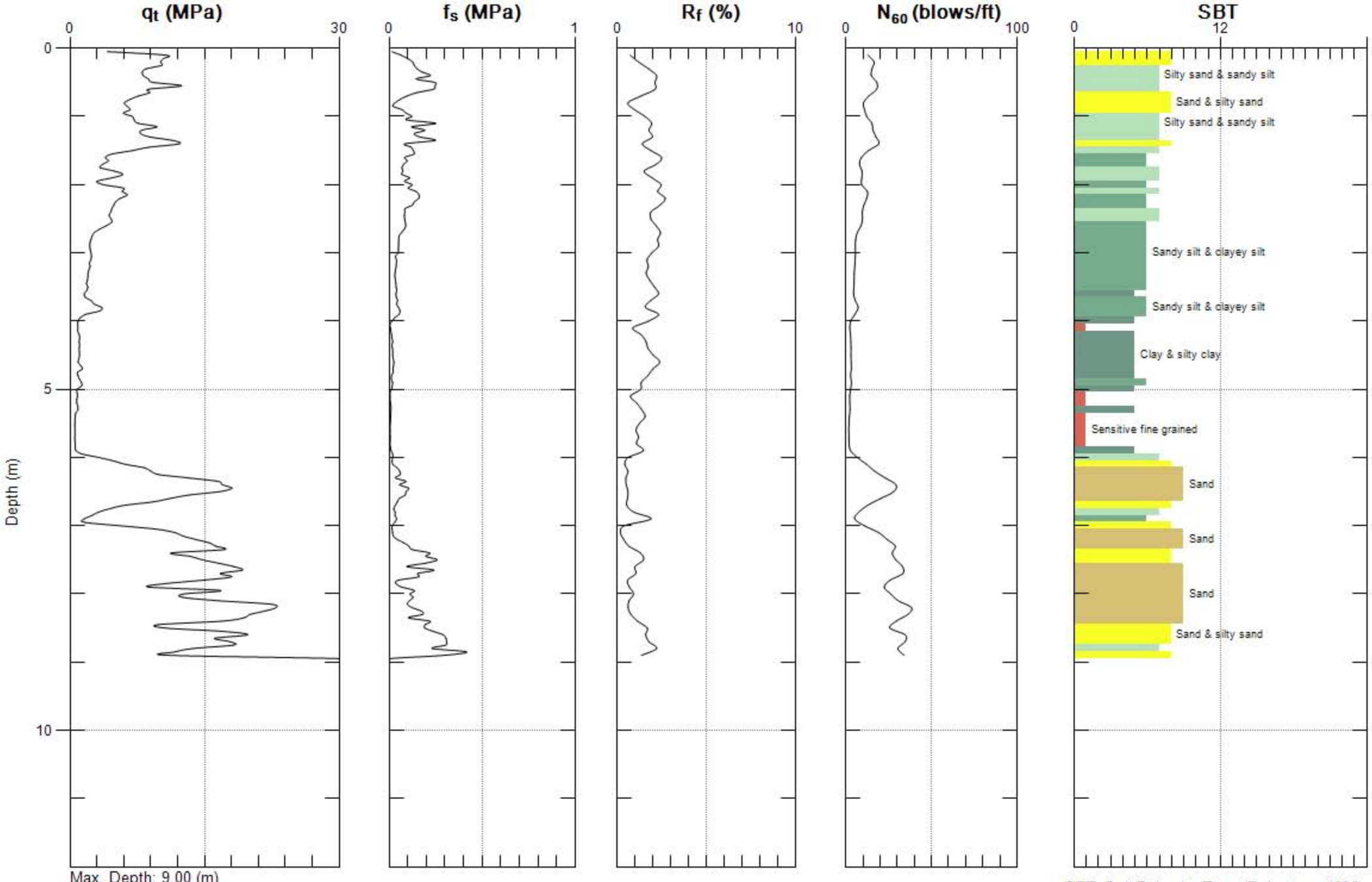
Max. Depth: 10.25 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 442+55

Engineer: D.KIRKMAN
Date: 4/30/2008 08:18

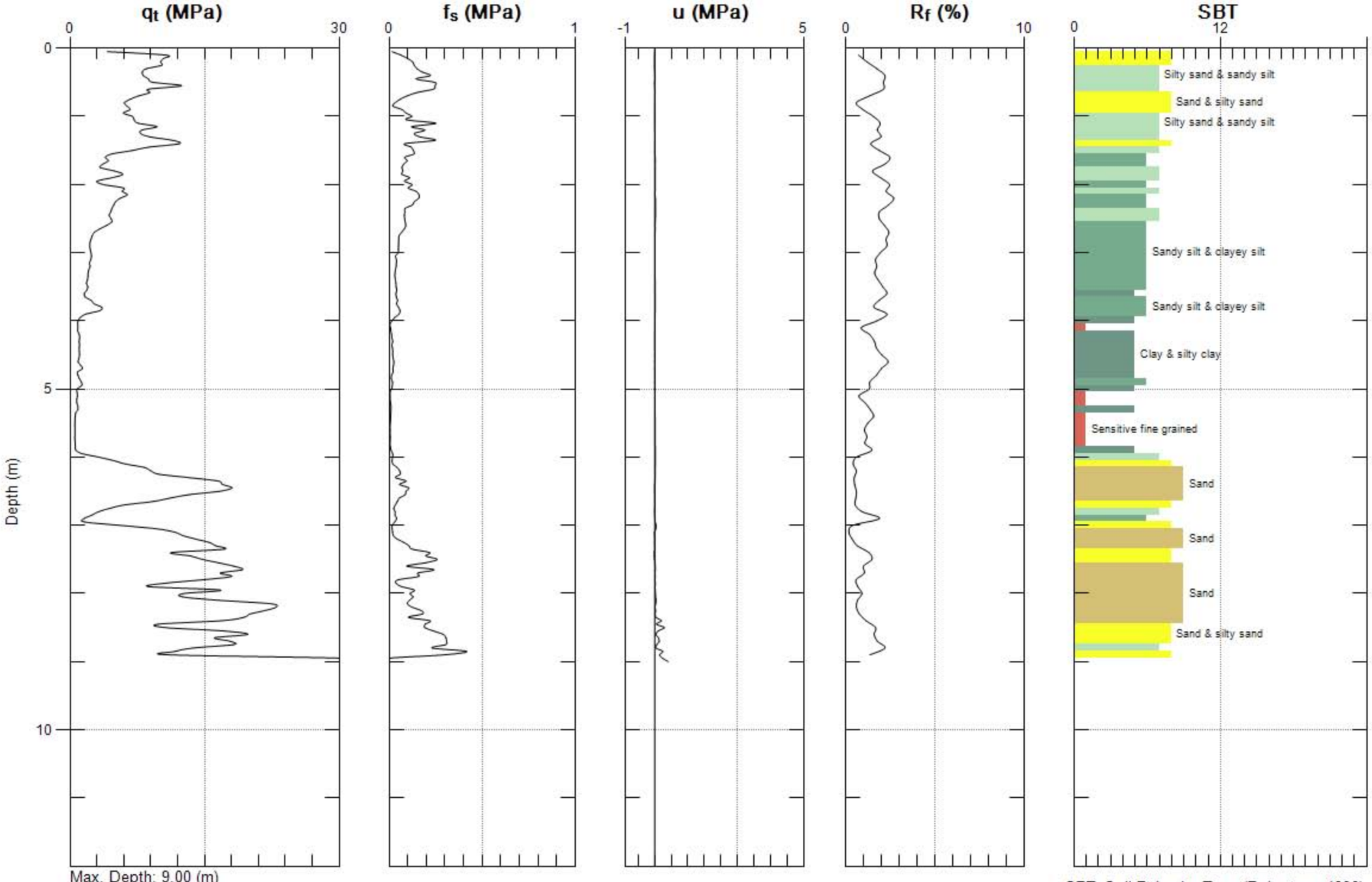


Max. Depth: 9.00 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 442+55
Engineer: D.KIRKMAN
Date: 4/30/2008 08:18



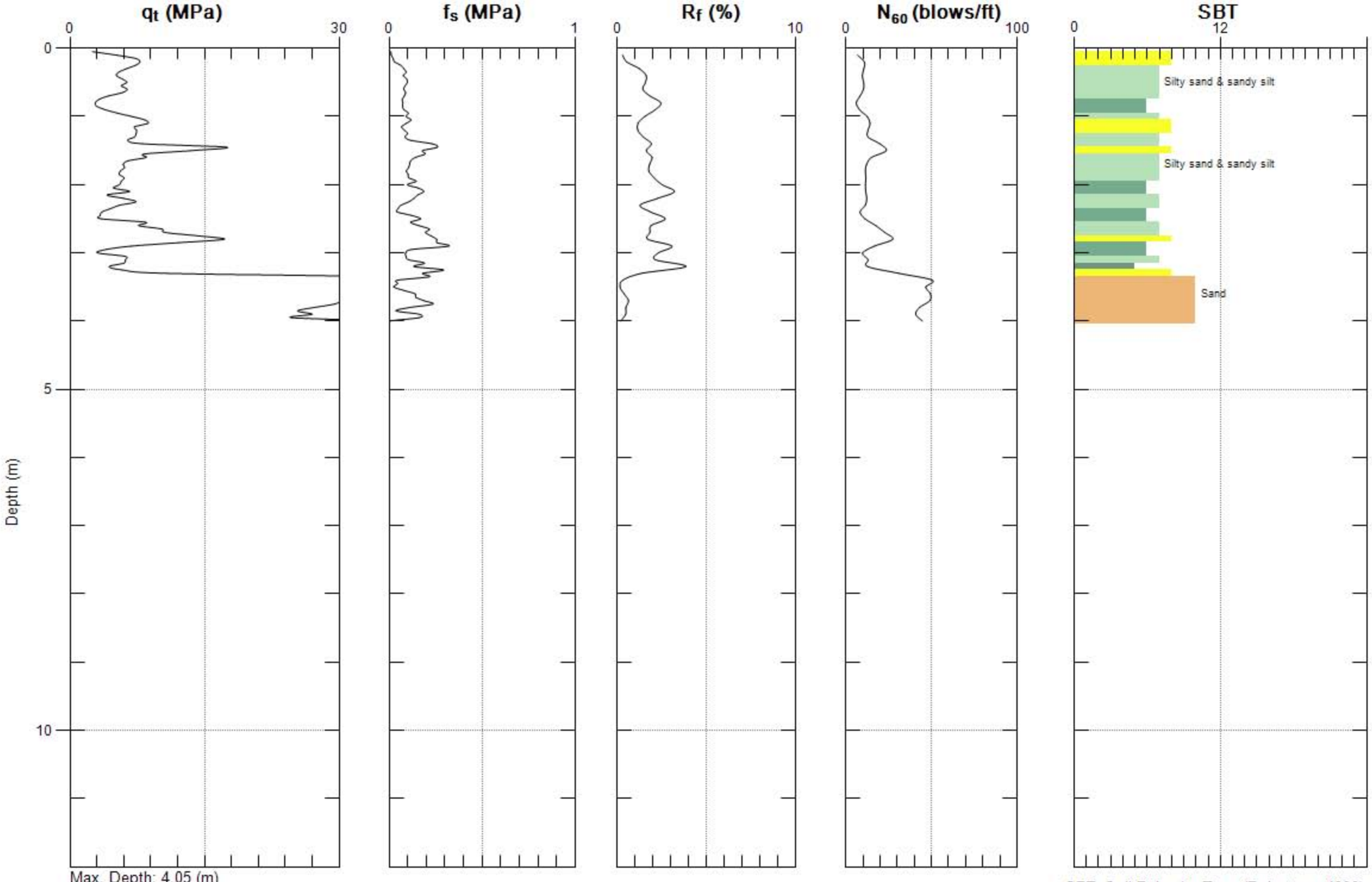
Max. Depth: 9.00 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 442+70

Engineer: D.KIRKMAN
Date: 4/30/2008 07:48



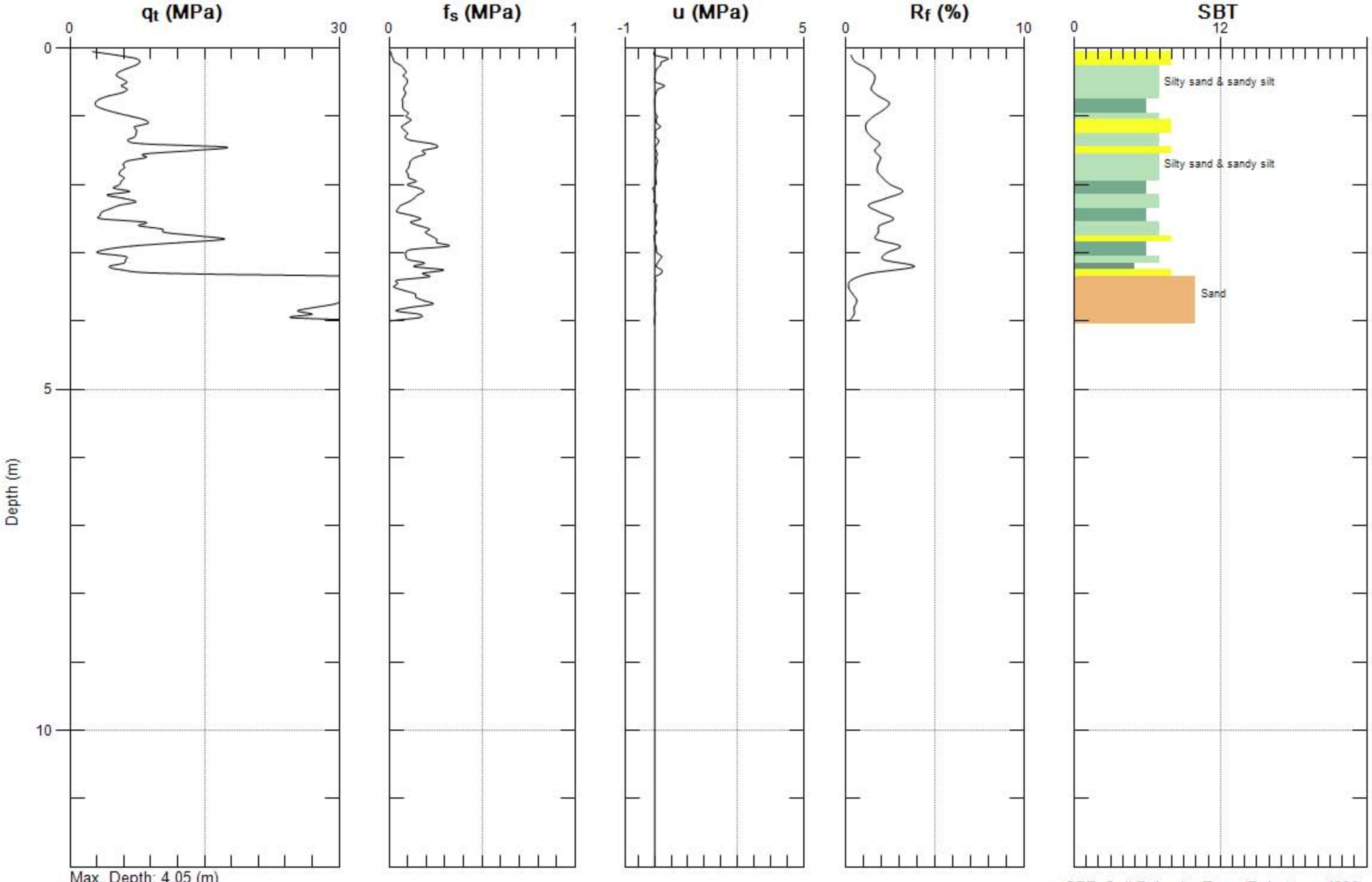
Max. Depth: 4.05 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 442+70

Engineer: D.KIRKMAN
Date: 4/30/2008 07:48

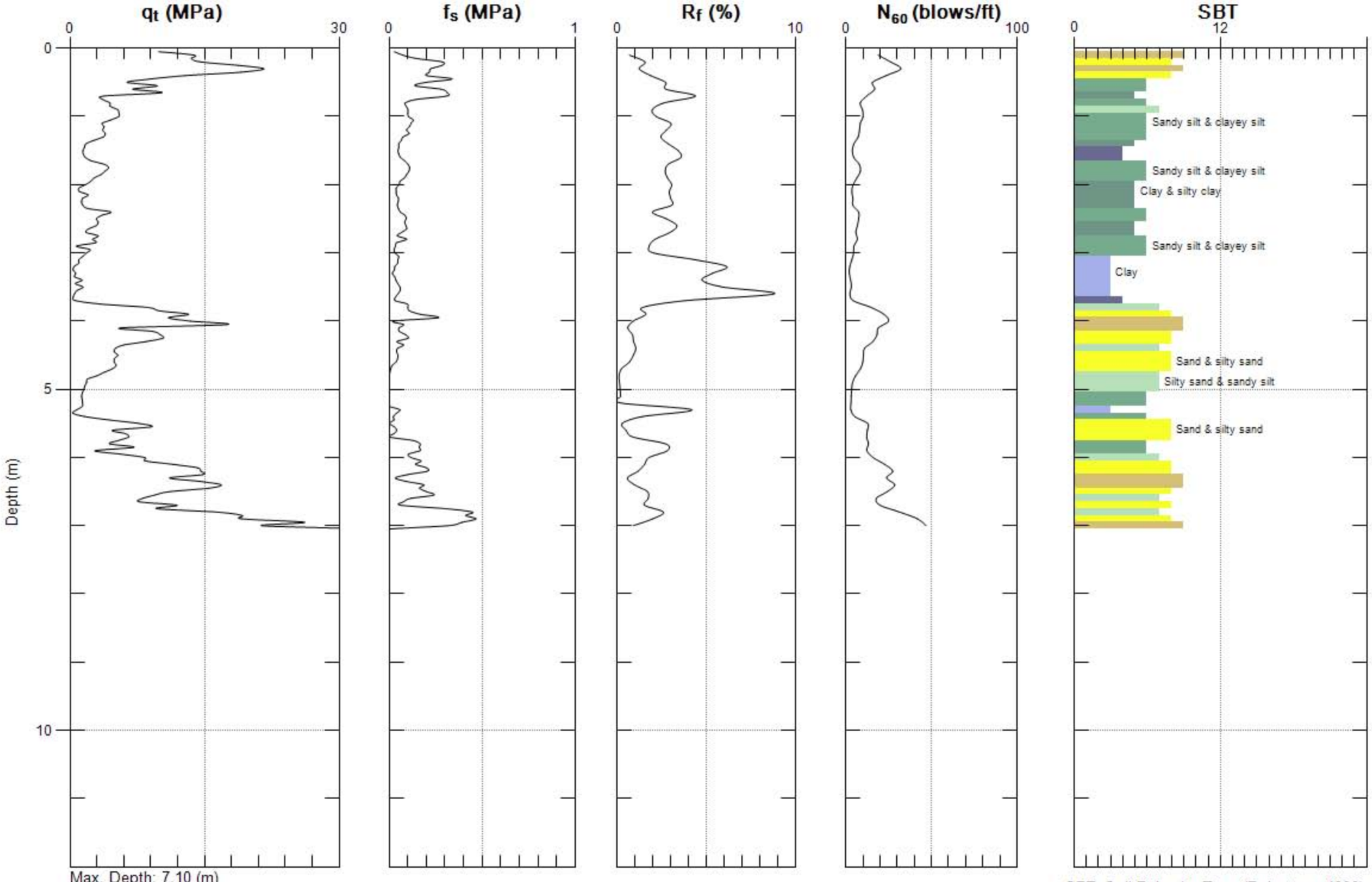


Max. Depth: 4.05 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 442+87
Engineer: D.KIRKMAN
Date: 4/29/2008 12:22



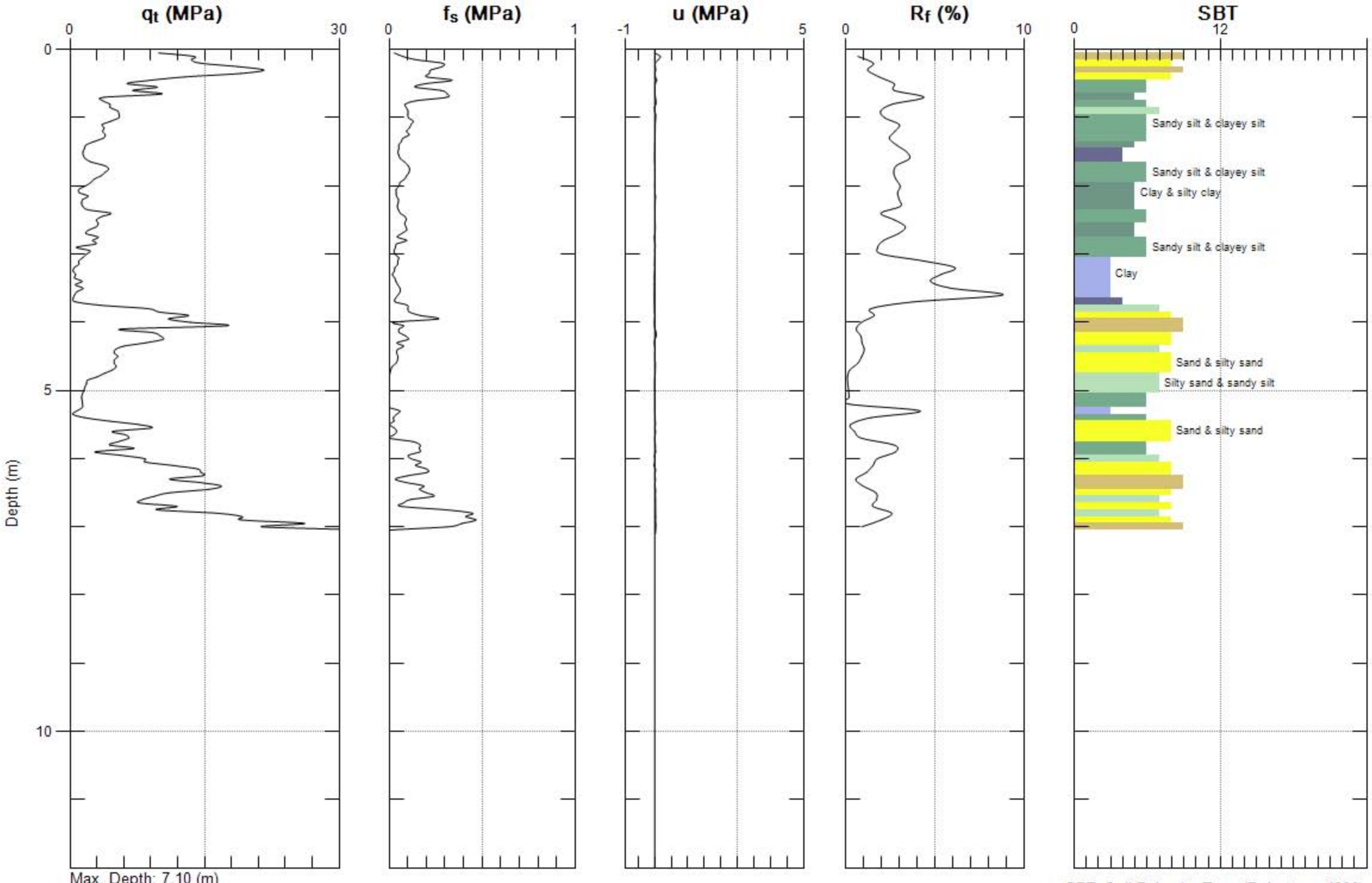
Max. Depth: 7.10 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 442+87

Engineer: D.KIRKMAN
Date: 4/29/2008 12:22

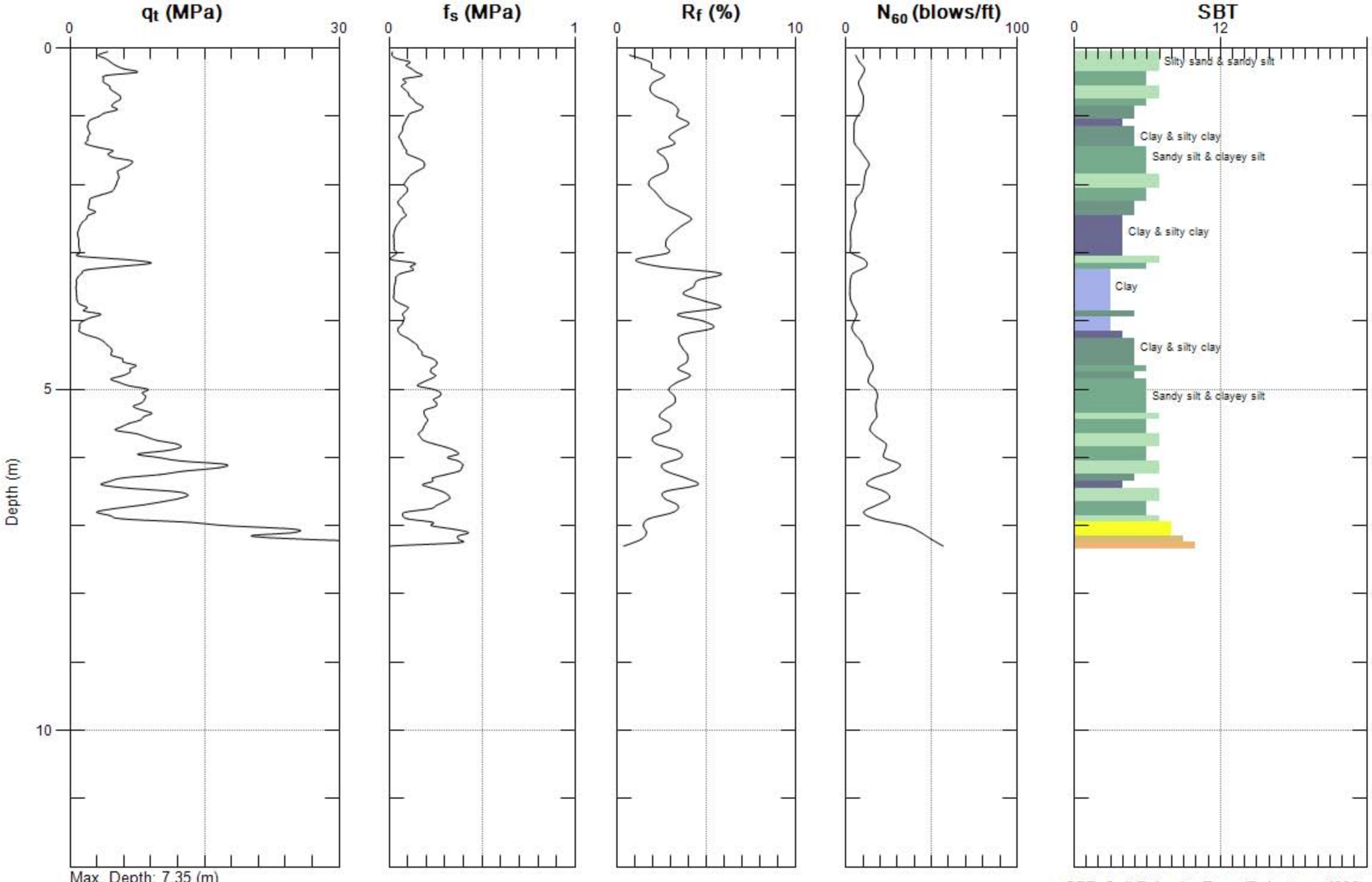


Max. Depth: 7.10 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 443+20
Engineer: D.KIRKMAN
Date: 4/29/2008 01:08

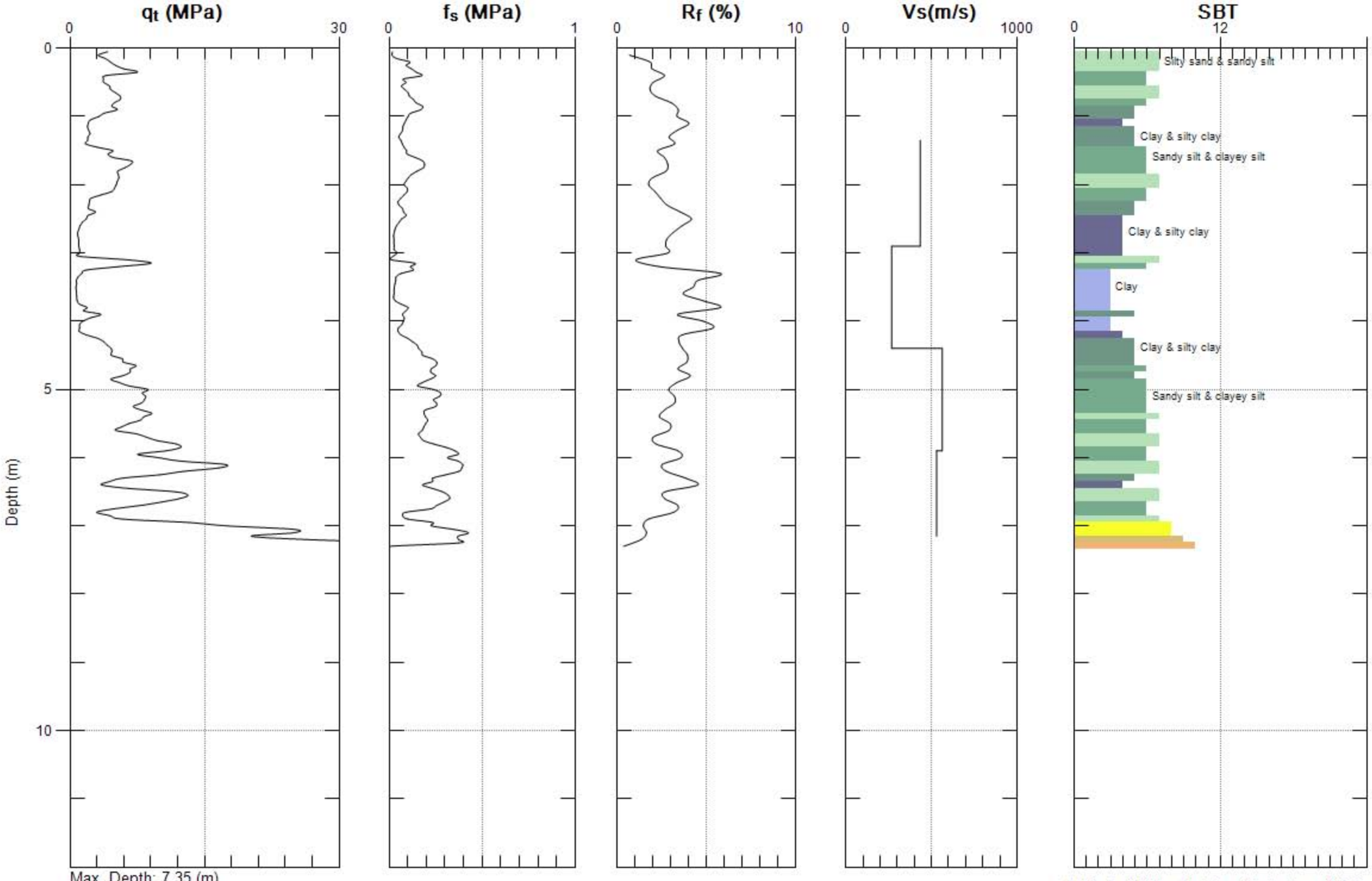


Max. Depth: 7.35 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 443+20
Engineer: D.KIRKMAN
Date: 4/29/2008 01:08



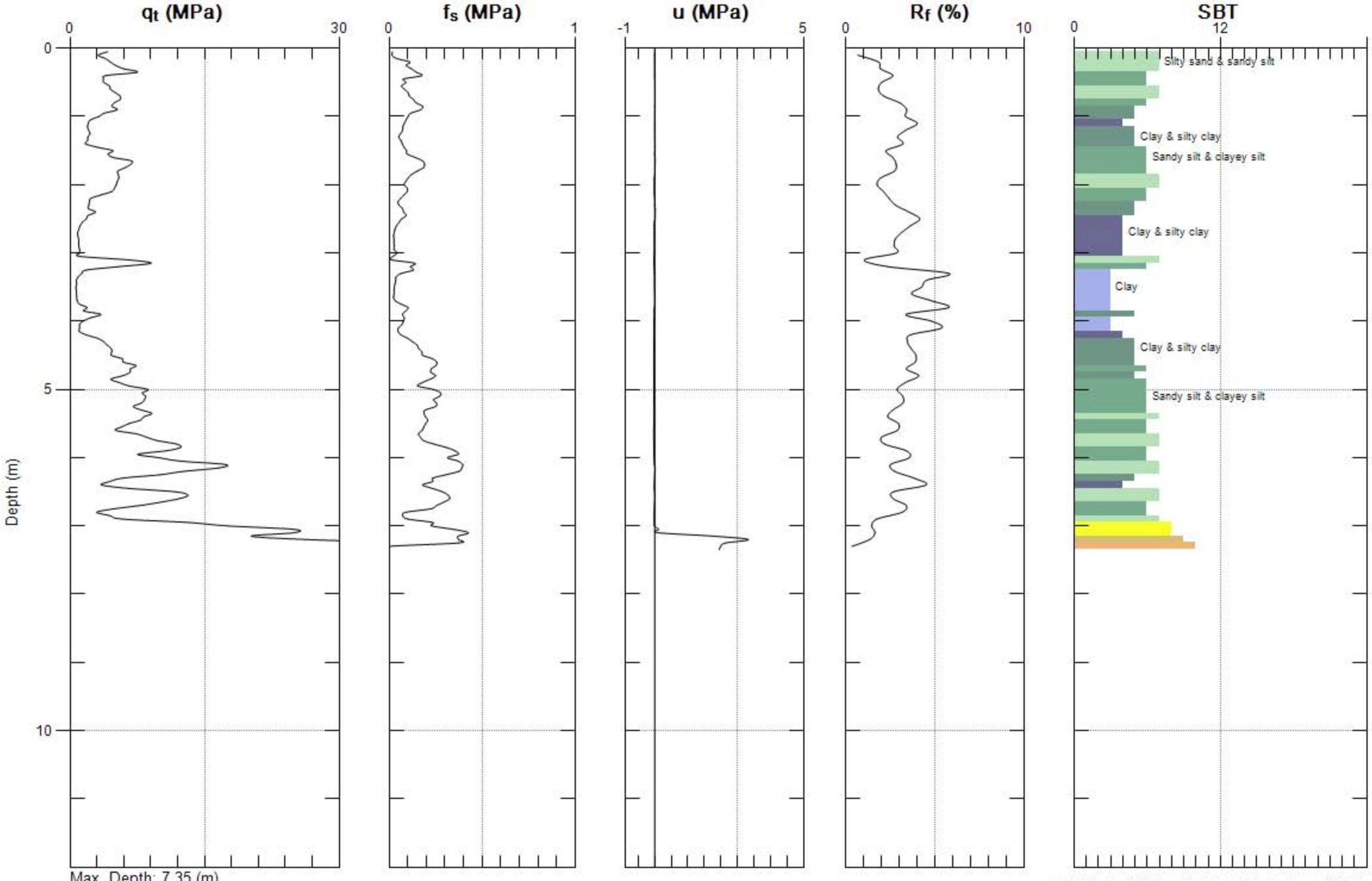
Max. Depth: 7.35 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 443+20

Engineer: D.KIRKMAN
Date: 4/29/2008 01:08



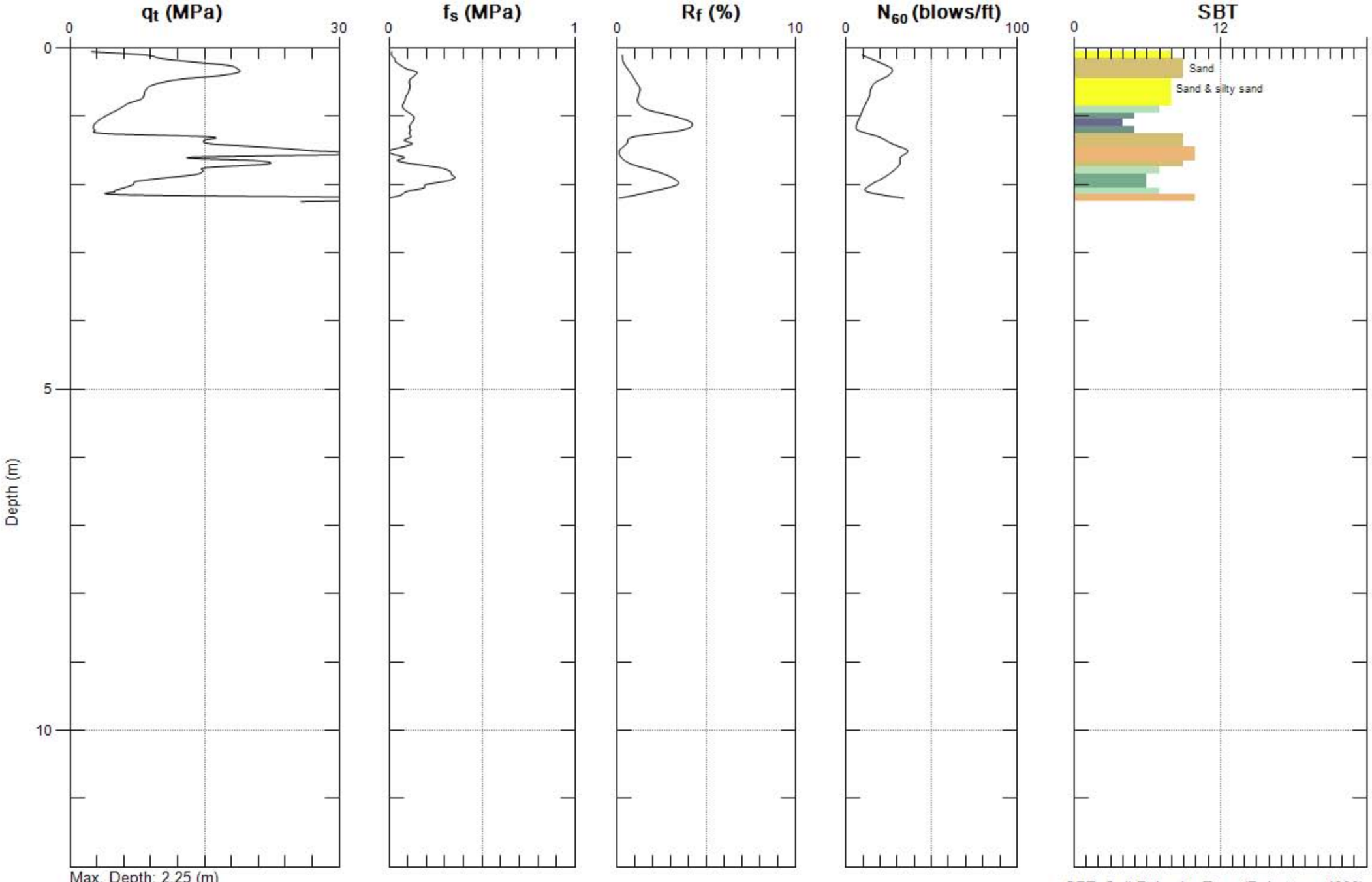
Max. Depth: 7.35 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 443+40

Engineer: D.KIRKMAN
Date: 4/29/2008 02:10

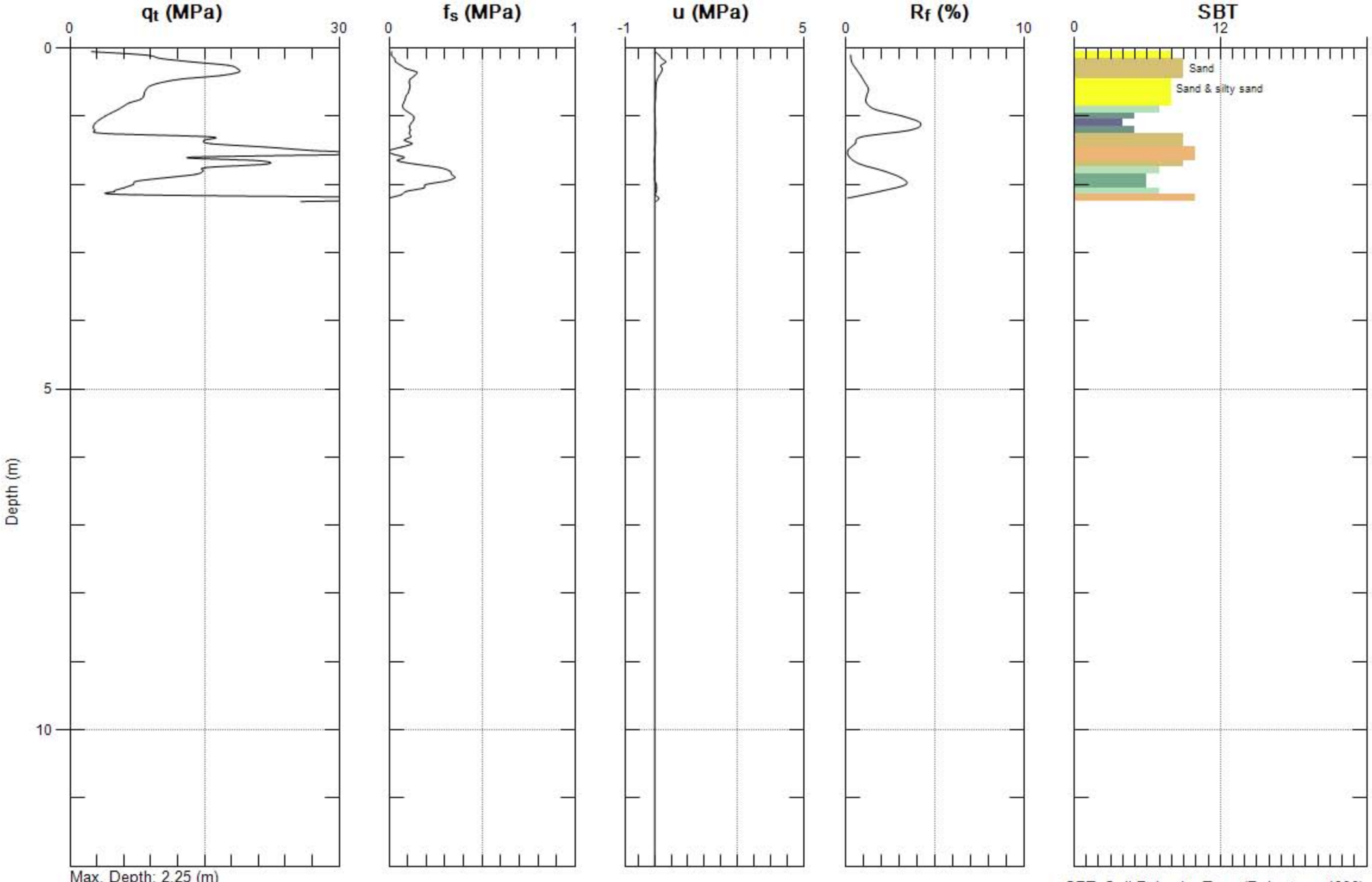


Max. Depth: 2.25 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 443+40
Engineer: D.KIRKMAN
Date: 4/29/2008 02:10

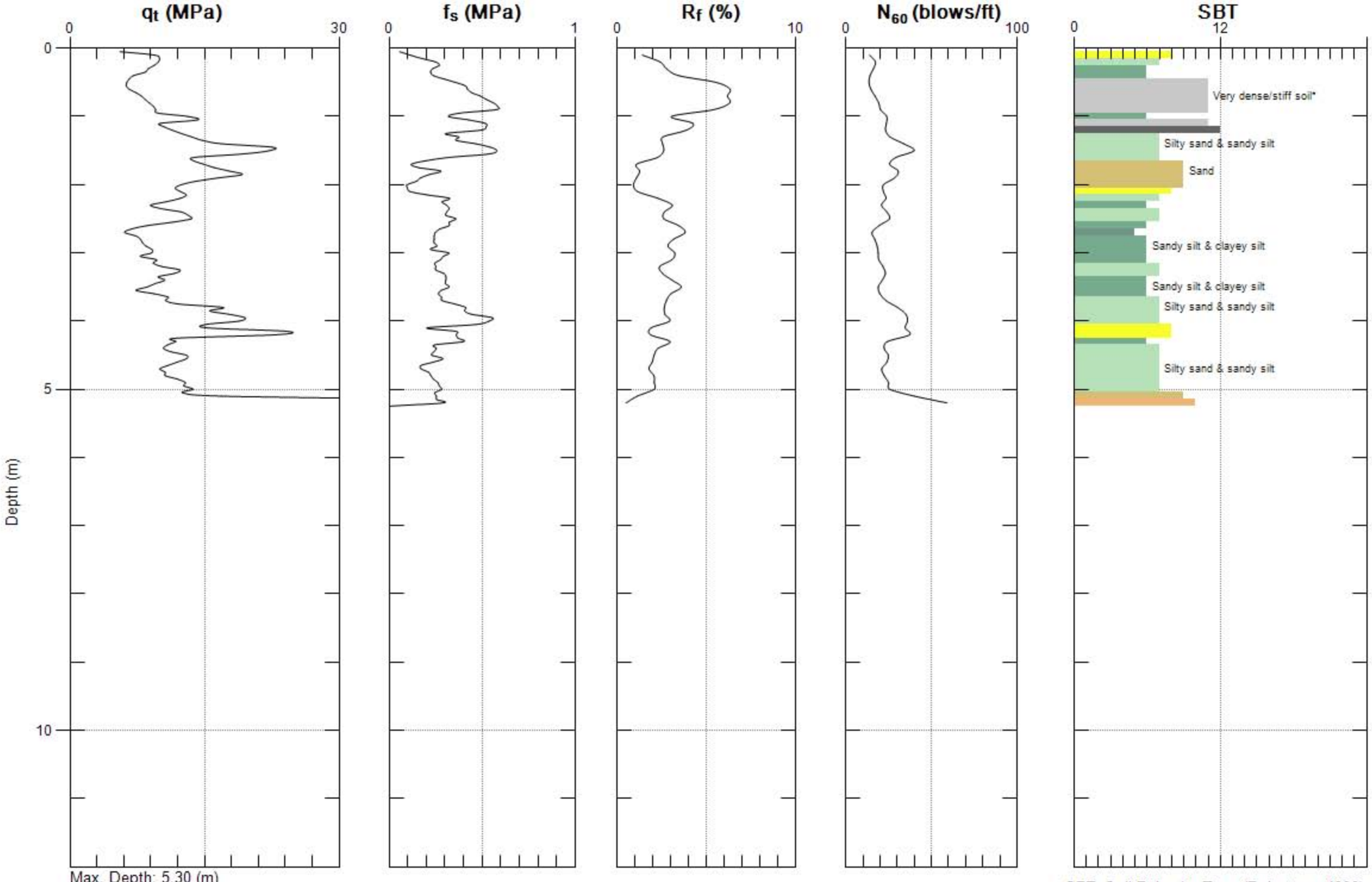


Max. Depth: 2.25 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 443+80
Engineer: D.KIRKMAN
Date: 4/29/2008 02:52

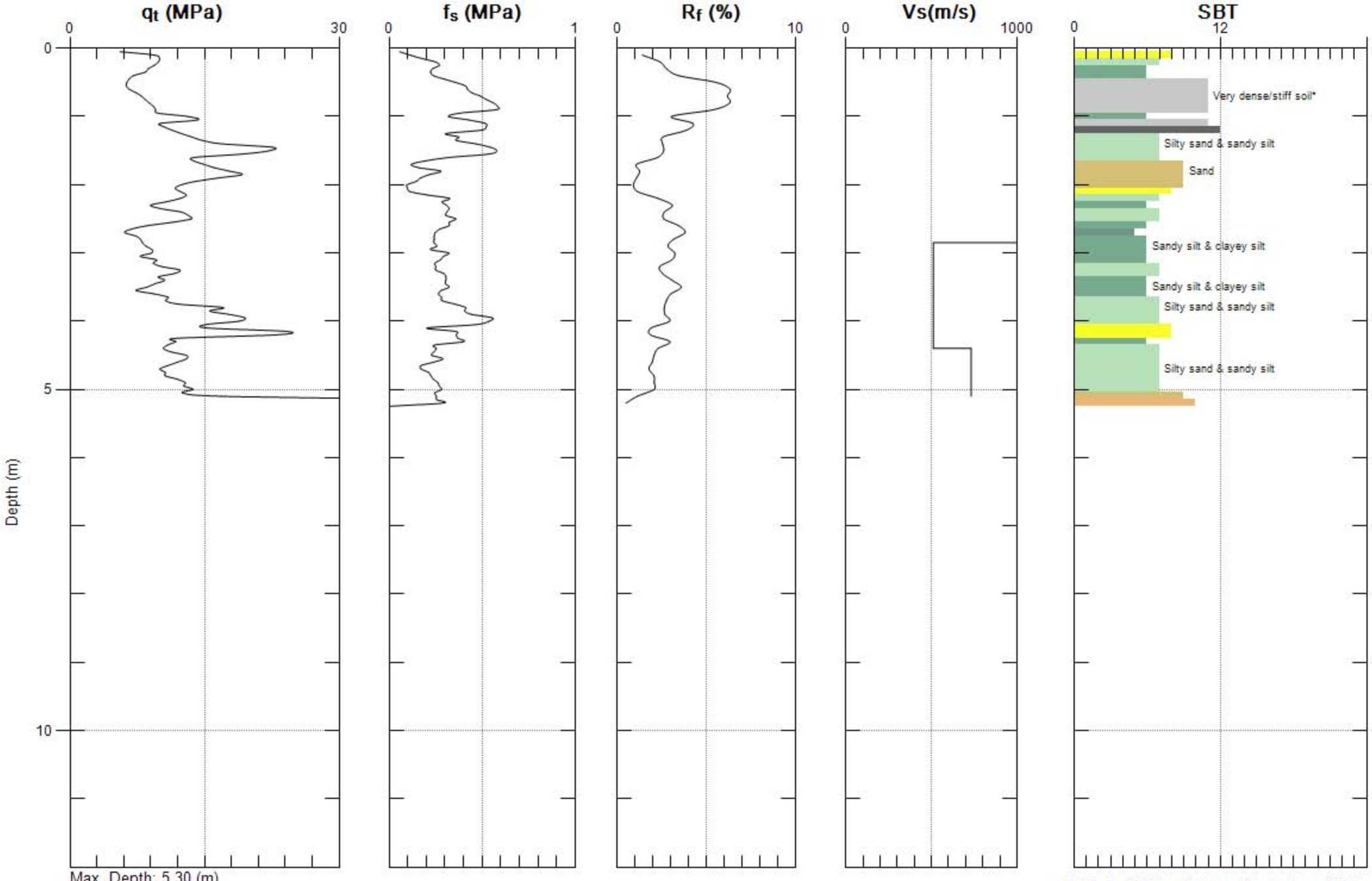


Max. Depth: 5.30 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 443+80
Engineer: D.KIRKMAN
Date: 4/29/2008 02:52



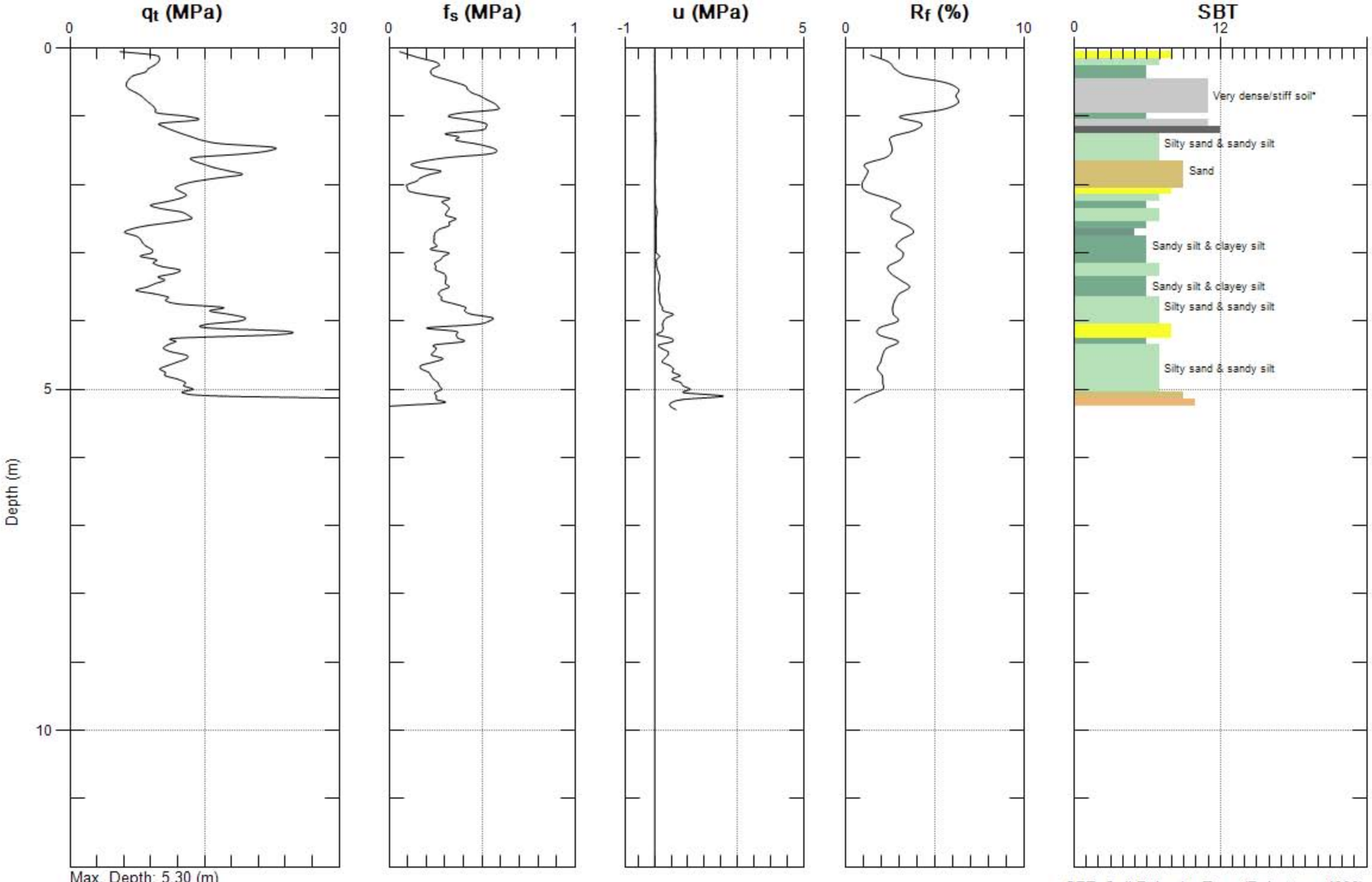
Max. Depth: 5.30 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 443+80

Engineer: D.KIRKMAN
Date: 4/29/2008 02:52



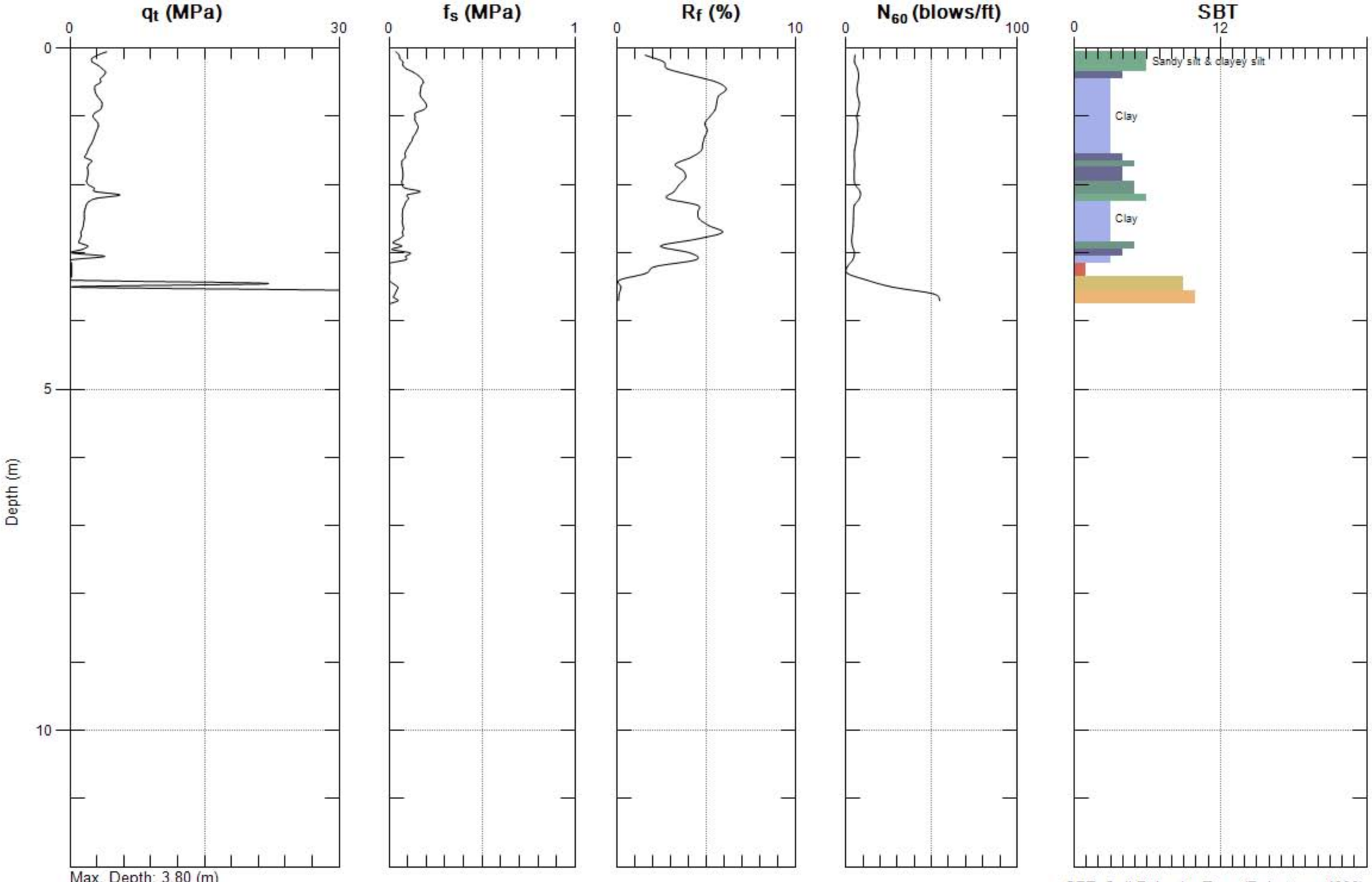
Max. Depth: 5.30 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 444+00

Engineer: D.KIRKMAN
Date: 4/29/2008 03:34



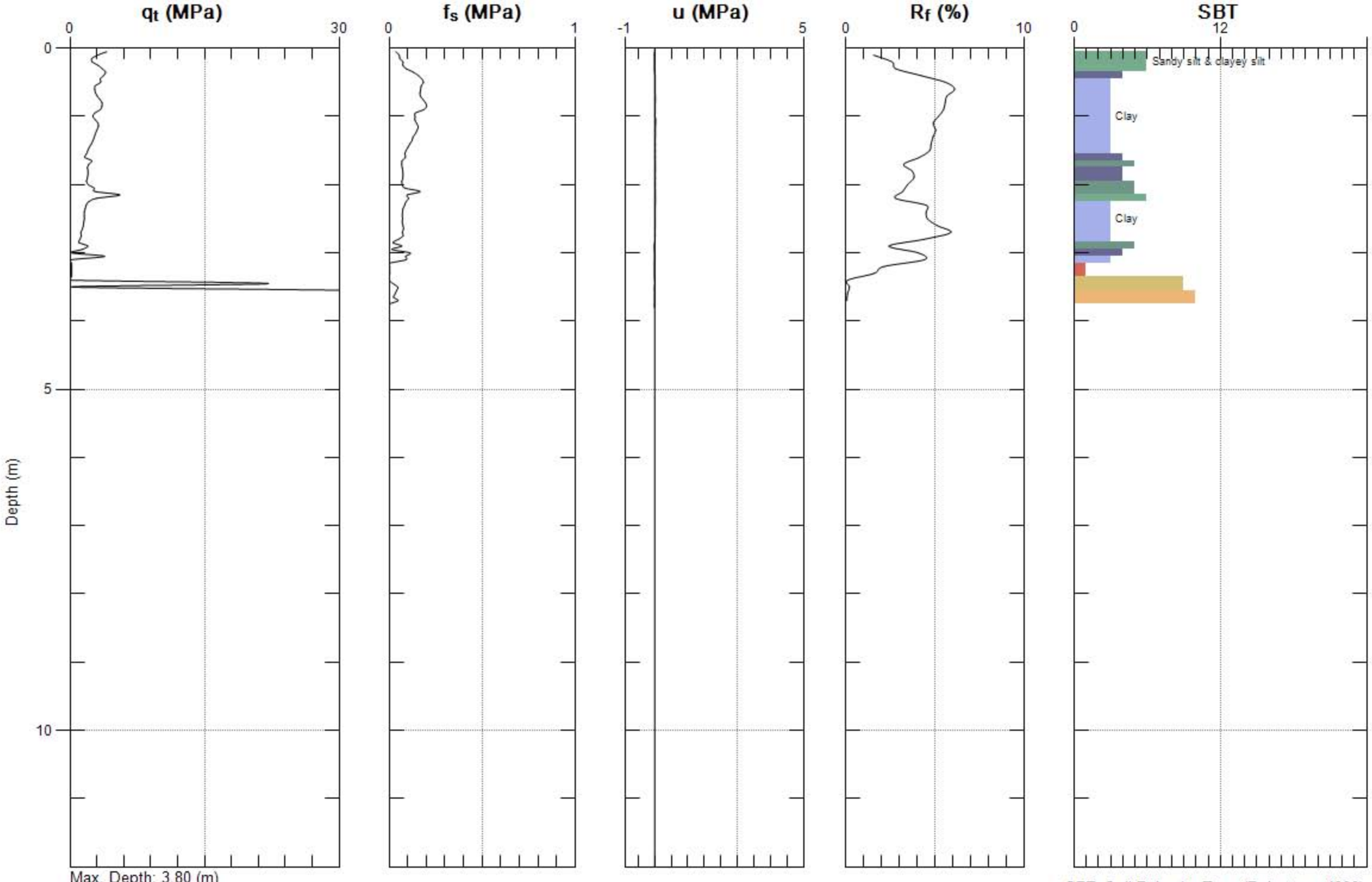
Max. Depth: 3.80 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

TESTING ENGINEERS

Site: CARROLL CANYON
Sounding: 444+00

Engineer: D.KIRKMAN
Date: 4/29/2008 03:34



Max. Depth: 3.80 (m)
Avg. Interval: 0.10 (m)

SBT: Soil Behavior Type (Robertson 1990)

SUMMARY

OF

CONE PENETRATION TEST DATA

Project:

Sorrento Valley Road
San Diego, CA
February 11, 2008

Prepared for:

Ms. Manasee Paranjape
Testing Engineers (Bureau Veritas)
7895 Convoy Court, Ste 18
San Diego, CA 92111
Office (800) 487-0355
Fax (858) 715-5810 / Office (858) 715-5800

Prepared by:

KEHOE TESTING & ENGINEERING
5415 Industrial Drive
Huntington Beach, CA 92649-1518
Office (714) 901-7270 / Fax (714) 901-7289

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3. **FIELD EQUIPMENT & PROCEDURES**

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- CPT Classification/Soil Behavior Chart
- Interpretation Output (CPTINT)
- CPTINT Correlation Table

SUMMARY
OF
CONE PENETRATION TEST DATA

1. INTRODUCTION

This report presents the results of a Cone Penetration Test (CPT) program carried out for the project located at Sorrento Valley Road in San Diego, California. The work was performed by Kehoe Testing & Engineering (KTE) on February 11, 2008. The scope of work was performed as directed by Testing Engineers (Bureau Veritas) personnel.

2. SUMMARY OF FIELD WORK

The fieldwork consisted of performing CPT soundings at eight locations to determine the soil lithology. The groundwater measurements were taken in the open CPT hole approximately 10 minutes after completion of CPT. The following **TABLE 2.1** summarizes the CPT soundings performed:

LOCATION	DEPTH OF CPT (ft)	COMMENTS/NOTES:
C-437+1015RT	12	Refusal, hole open to 3.4 m (dry)
C-437+251500RT	11	Refusal, hole open to 3.6 m (dry)
C-438+35144RT	15	Refusal, hole open to 4.2 m (dry)
C-438+65144RT	12	Refusal, hole open to 3.6 m (dry)
C-439+4256RT	15	Refusal, groundwater @ 4.2 m
C-440+02.54RT	24	Refusal, groundwater @ 2.1 m
C-440+0254LT	27	Refusal, groundwater @ 2.1 m
C-440+62.5	26	Refusal, groundwater @ 2.4 m

TABLE 2.1 - Summary of CPT Soundings

3. FIELD EQUIPMENT & PROCEDURES

The CPT soundings were carried out by **KTE** using an integrated electronic cone system manufactured by Vertek. The CPT soundings were performed in accordance with ASTM standards (D5778). The cone penetrometers were pushed using a 30-ton CPT rig. The cone used during the program was a 15 cm^2 cone and recorded the following parameters at approximately 2.5 cm depth intervals:

- Cone Resistance (qc)
- Sleeve Friction (fs)
- Dynamic Pore Pressure (u)
- Inclination
- Penetration Speed
- Pore Pressure Dissipation (at selected depths)

The above parameters were recorded and viewed in real time using a portable computer and stored on a diskette for future analysis and reference. A complete set of baseline readings was taken prior to each sounding to determine temperature shifts and any zero load offsets. Monitoring base line readings ensures that the cone electronics are operating properly.

4. CONE PENETRATION TEST DATA & INTERPRETATION

The Cone Penetration Test data is presented in graphical form in the attached Appendix. Penetration depths are referenced to ground surface. The soil classification on the CPT plots is derived from the CPT Classification Chart (Robertson, 1986) and presents major soil lithologic changes. The stratigraphic interpretation is based on relationships between cone resistance (qc), sleeve friction (fs), and penetration pore pressure (u). The friction ratio (Rf), which is sleeve friction divided by cone resistance, is a calculated parameter that is used to infer soil behavior type. Generally, cohesive soils (clays) have high friction ratios, low cone resistance and generate excess pore water pressures. Cohesionless soils (sands) have lower friction ratios, high cone bearing and generate little (or negative) excess pore water pressures.

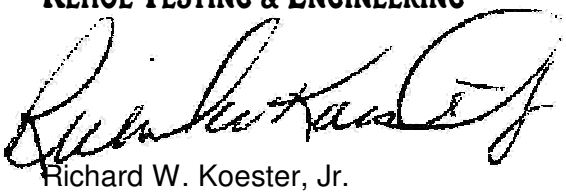
Output from the interpretation program CPTINT provides averaged CPT data over 0.3-meter intervals. The CPTINT output includes Soil Classification Zones, SPT N Values and Undrained Shear Strength (Su). A summary of the equations used for the tabulated parameters is provided in the CPTINT Correlation Table in the Appendix.

The interpretation of soils encountered on this project was carried out using correlations developed by Robertson et al, 1986. It should be noted that it is not always possible to clearly identify a soil type based on qc, fs and u. In these situations, experience, judgment and an assessment of the pore pressure data should be used to infer the soil behavior type.

If you have any questions regarding this information, please do not hesitate to call our office at (714) 901-7270.

Sincerely,

KEHOE TESTING & ENGINEERING



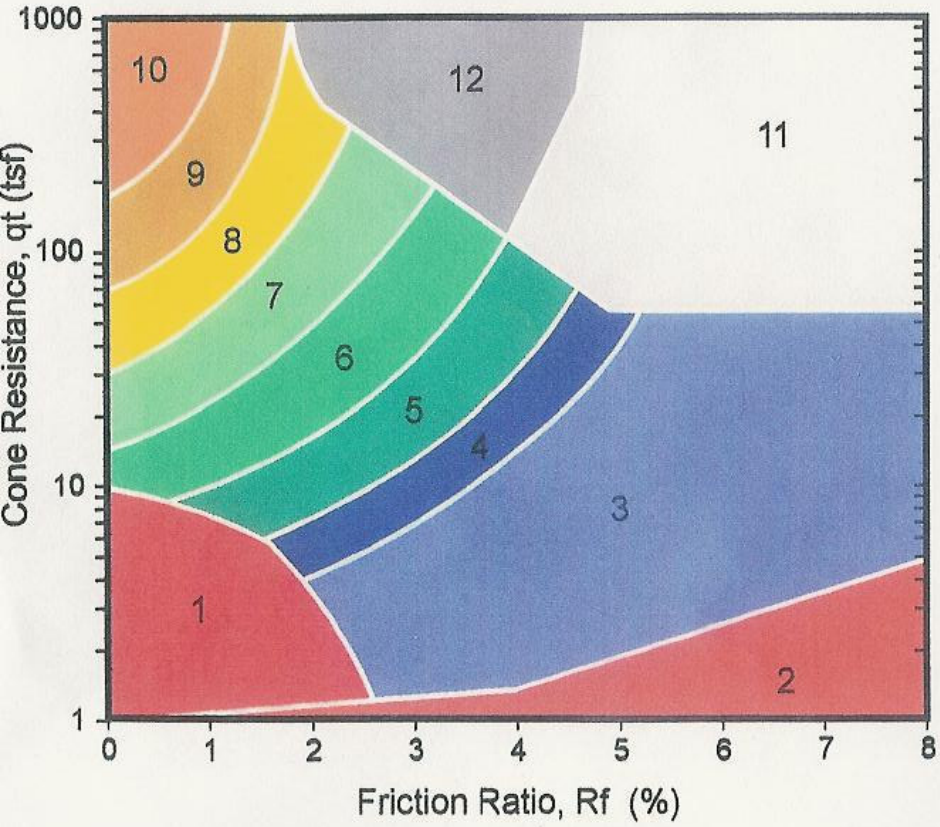
Richard W. Koester, Jr.
General Manager

02/19/08-ld-3-8276

KEHOE TESTING & ENGINEERING

CPT Classification Chart

(after Robertson and Campanella, 1988)



Zone	q_t / N	Soil Behavior Type	UCSCS
1	2	sensitive fine grained	OL-OH
2	1	organic material	Pt-OH
3	1	clay	CH
4	1.5	silty clay to clay	CL-CH
5	2	clayey silt to silty clay	ML-CL
6	2.5	sandy silt to clayey silt	MH-ML
7	3	silty sand to sandy silt	SM-ML
8	4	sand to silty sand	SP-SM
9	5	sand	SP
10	6	gravelly sand to sand	SW-SP
11	1	very stiff fine grained *	CL-MH
12	2	sand to clayey sand *	SP-SC

* overconsolidated or cemented

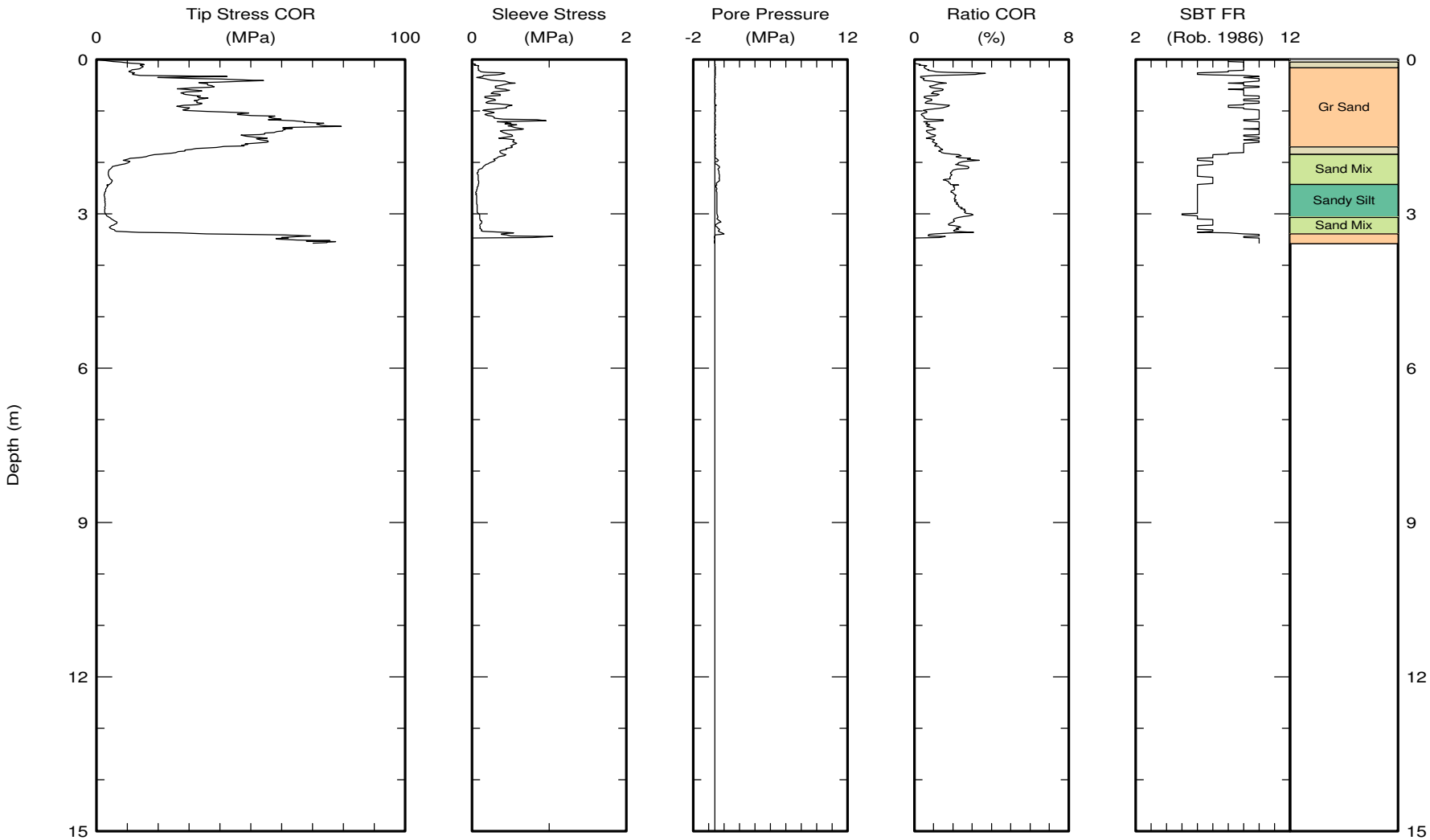
APPENDIX

Kehoe Testing & Engineering
Office: (714) 901-7270
Fax: (714) 901-7289
rich@kehoetesting.com
skehoe@msn.com

CPT Data
30 ton rig

Date: 11/Feb/2008
Test ID: C-437+1015RT
Project: CarrollCanyon

Client: Testing Engineers
Job Site: End of Sorrento Rd.



Maximum depth: 3.58 (m)

Test ID: C-437+1015RT
File: Z11F0809C.ECP

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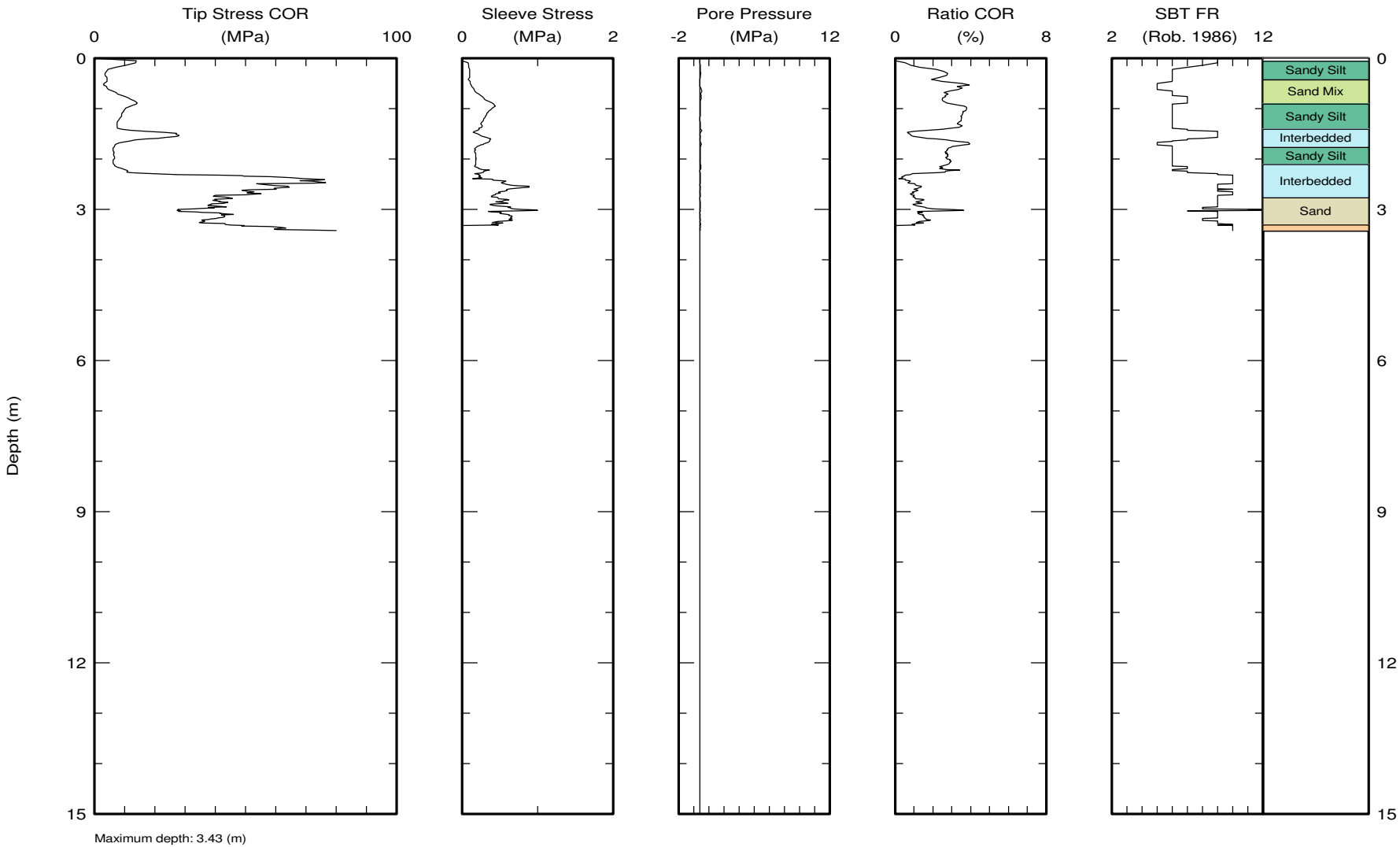
skehoe@msn.com

CPT Data
30 ton rig

Date: 11/Feb/2008
Test ID: C-437+251500RT
Project: CarrollCanyon

Client: Testing Engineers
Job Site: End of Sorrento Rd.



Maximum depth: 3.43 (m)

Test ID: C-437+251500RT
File: Z11F0808C.ECP

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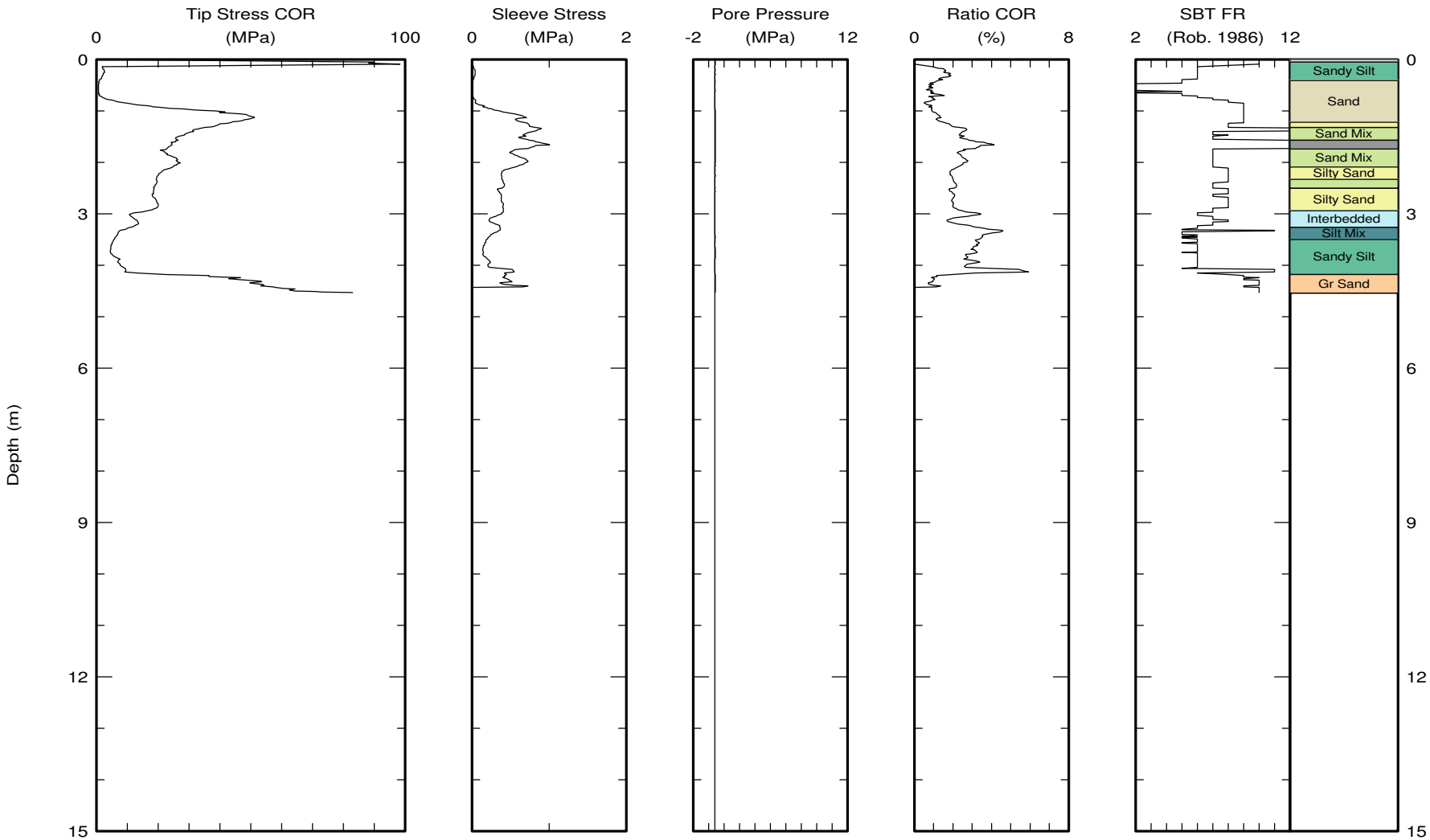
skehoe@msn.com

CPT Data
30 ton rig

Date: 11/Feb/2008
Test ID: C-437+90147RT
Project: CarrollCanyon

Client: Testing Engineers
Job Site: End of Sorrento Rd.



Maximum depth: 4.54 (m)

Test ID: C-437+90147RT
File: Z11F0805C.ECP

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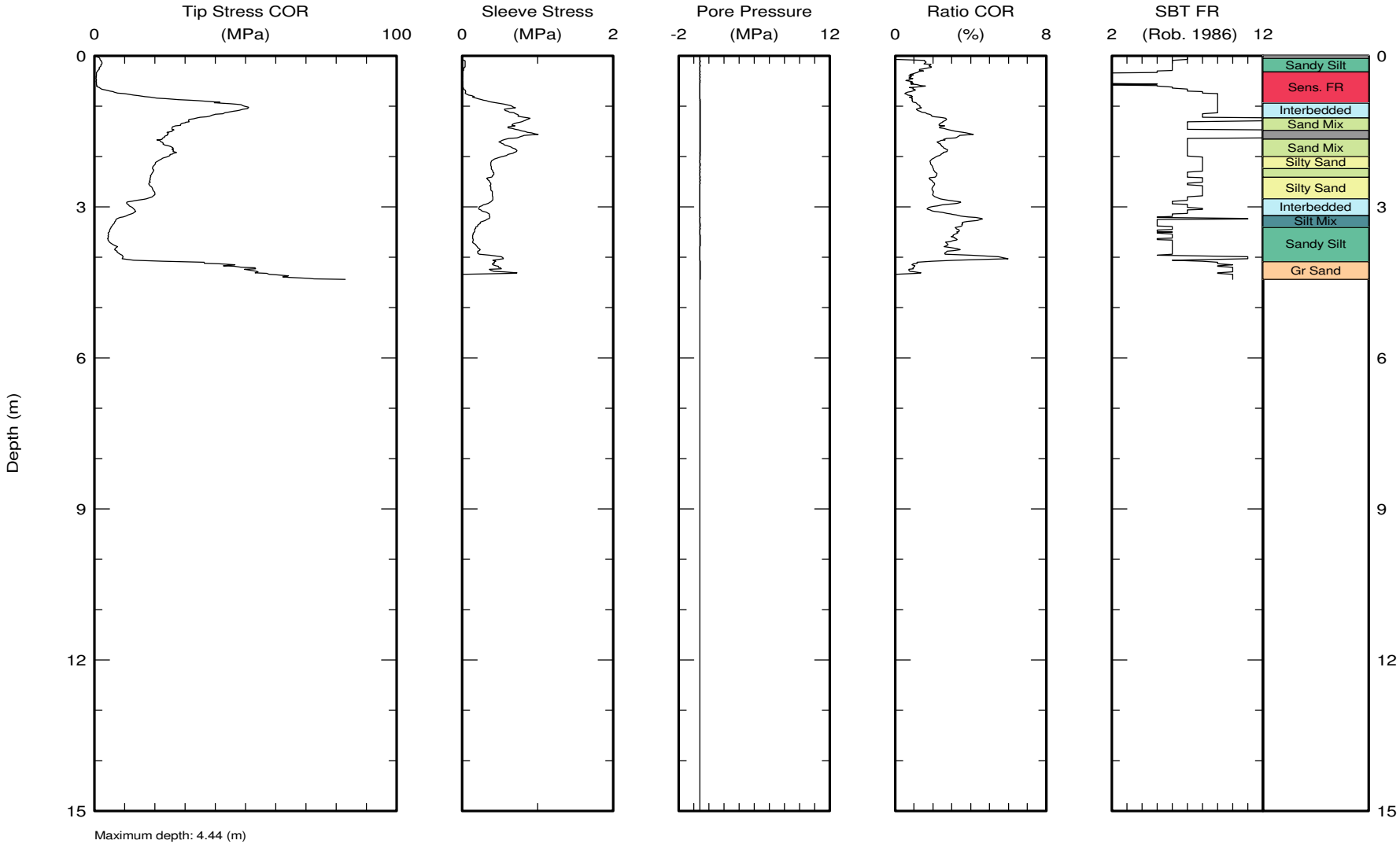
skehoe@msn.com

CPT Data
30 ton rig

Date: 11/Feb/2008
Test ID: C-438+35144RT
Project: CarrollCanyon

Client: Testing Engineers
Job Site: End of Sorrento Rd.



Maximum depth: 4.44 (m)

Test ID: C-438+35144RT
File: Z11F0806C.ECP

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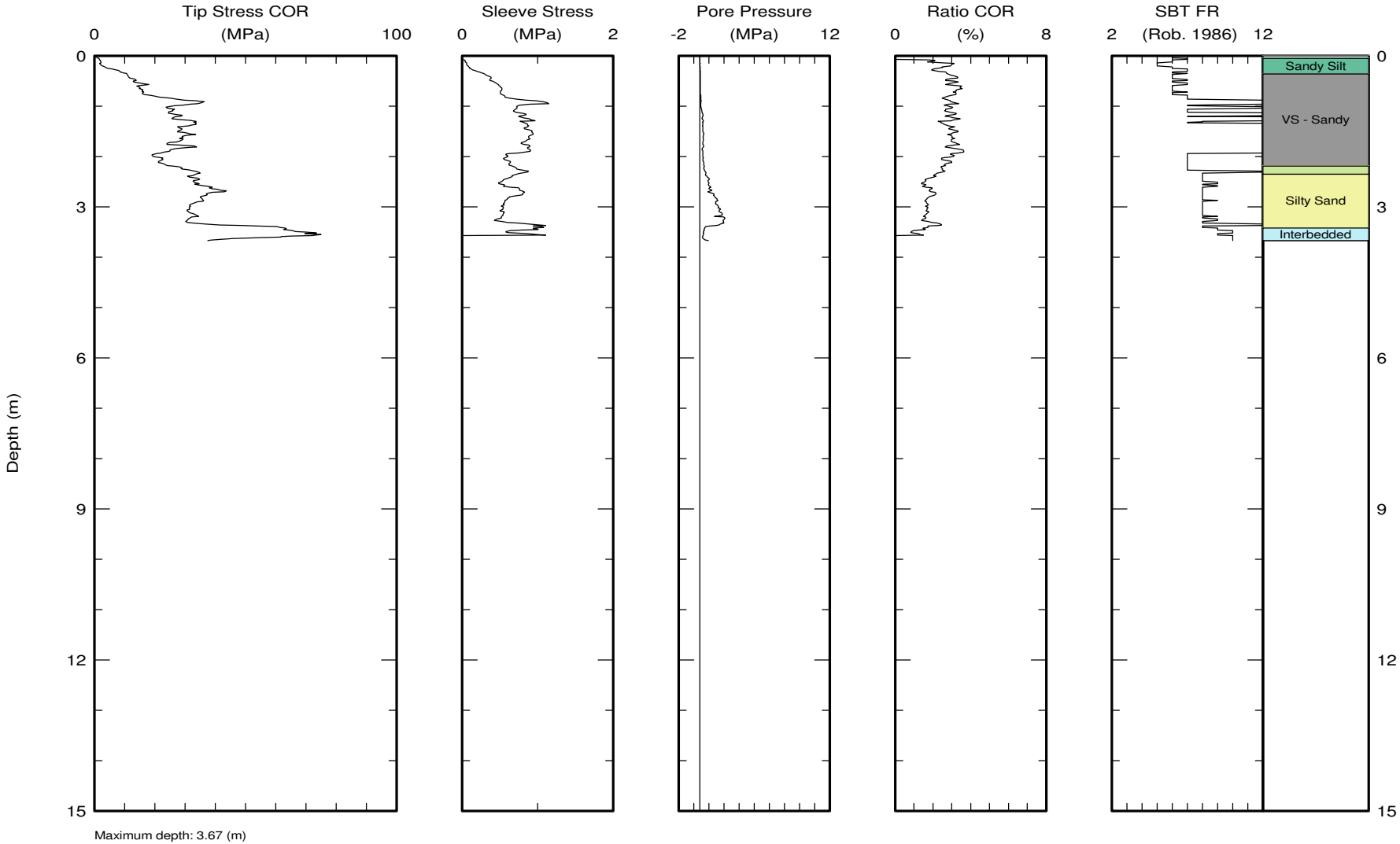
CPT Data
30 ton rig

Date: 11/Feb/2008
Test ID: C-438+65144RT
Project: CarrollCanyon

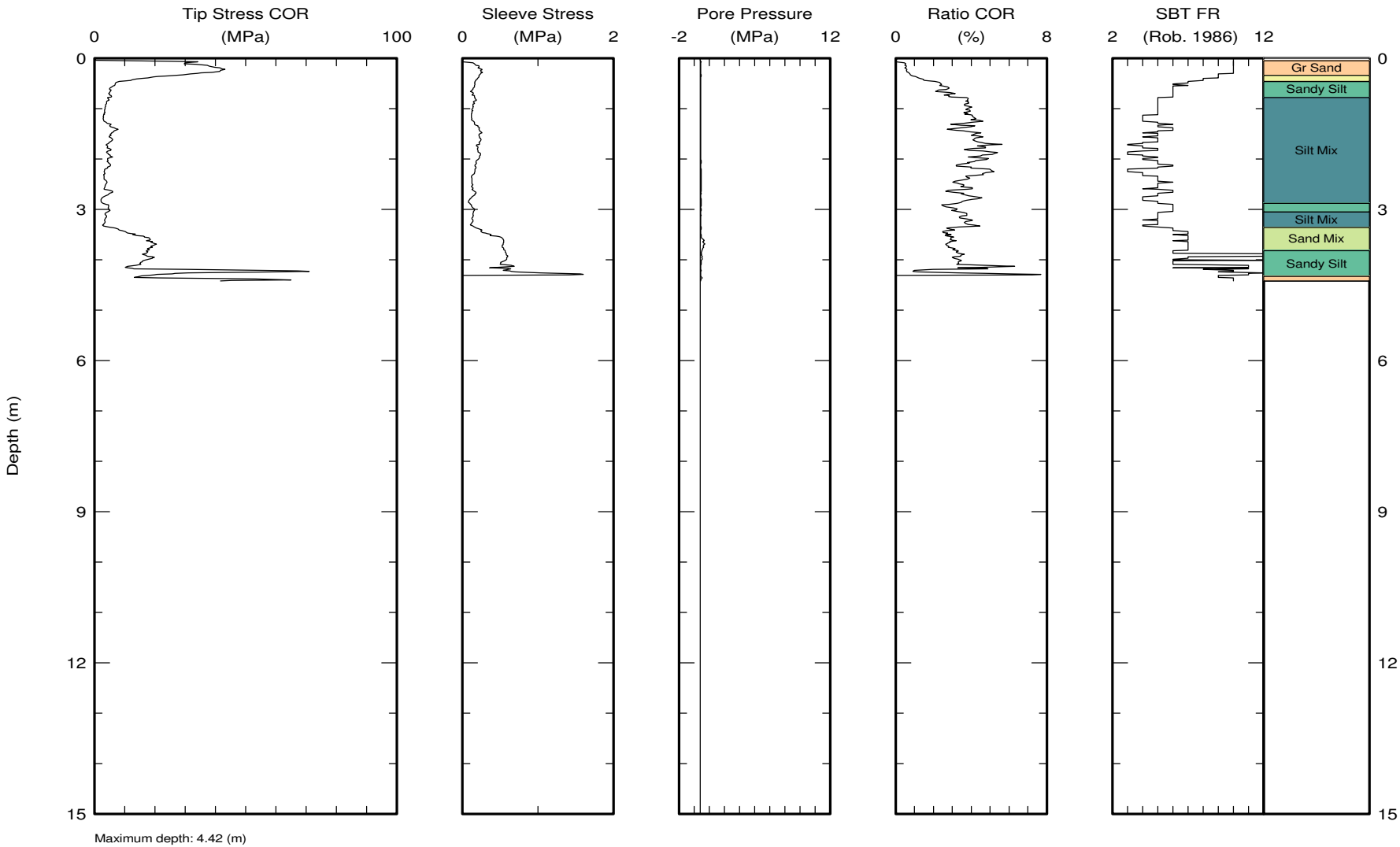
Client: Testing Engineers
Job Site: End of Sorrento Rd.



Maximum depth: 3.67 (m)

Test ID: C-438+65144RT
File: Z11F0807C.ECP

Kehoe Testing & Engineering Office: (714) 901-7270 Fax: (714) 901-7289 rich@kehoetesting.com skehoe@msn.com	CPT Data 30 ton rig	Date: 11/Feb/2008 Test ID: C-439+4256RT Project: CarrollCanyon
	Client: Testing Engineers Job Site: End of Sorrento Rd.	



Maximum depth: 4.42 (m)

Test ID: C-439+4256RT
File: Z11F0804C.ECP

Kehoe Testing & Engineering
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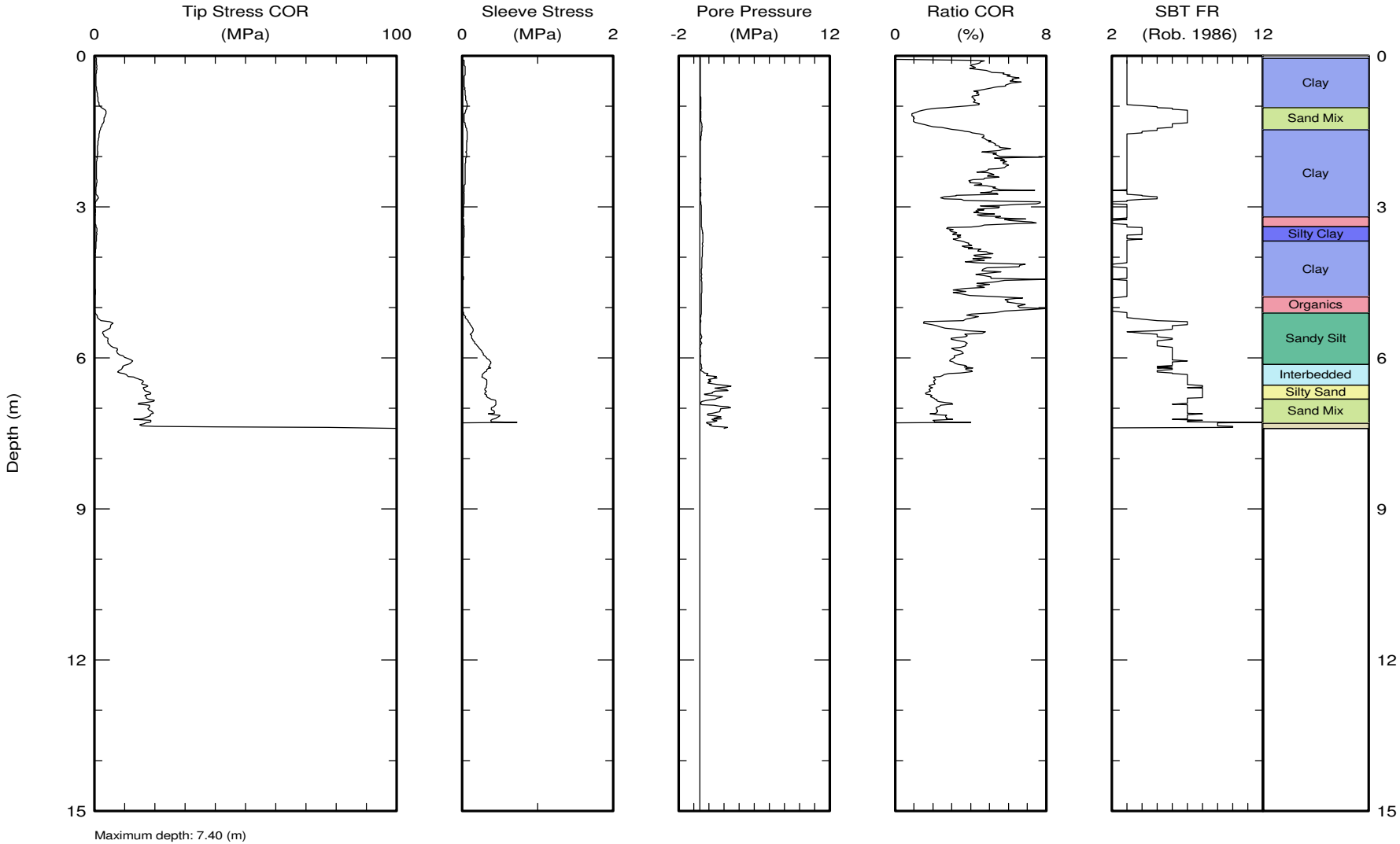
skehoe@msn.com

CPT Data
30 ton rig

Date: 11/Feb/2008
Test ID: C-440+02.54RT
Project: CarrollCanyon

Client: Testing Engineers
Job Site: End of Sorrento Rd.



Maximum depth: 7.40 (m)

Test ID: C-440+02.54RT
File: Z11F0803C.ECP

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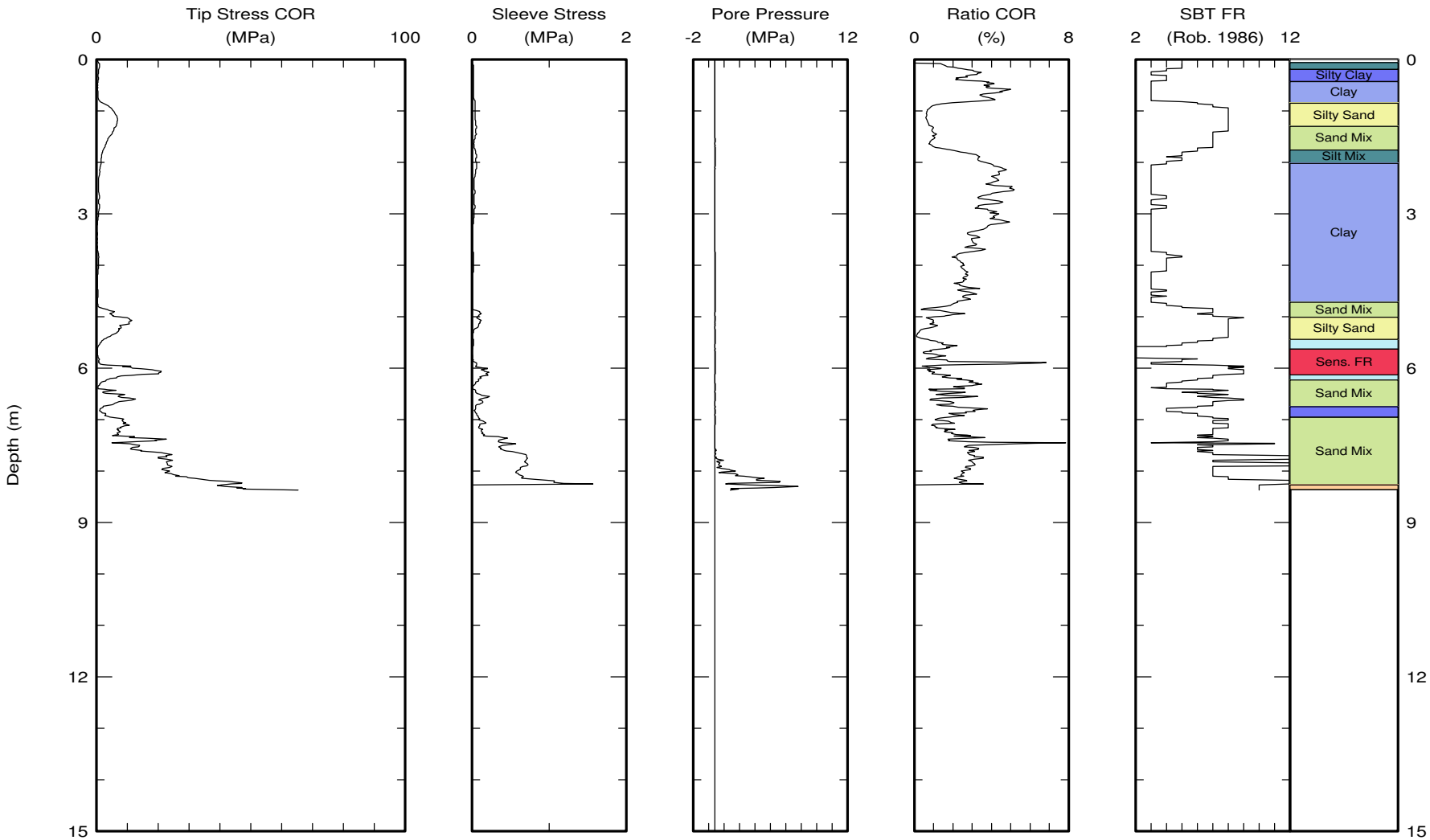
skehoe@msn.com

CPT Data
30 ton rig

Date: 11/Feb/2008
Test ID: C-440+0254LT
Project: CarrollCanyon

Client: Testing Engineers
Job Site: End of Sorrento Rd.



Maximum depth: 8.37 (m)

Test ID: C-440+0254LT
File: Z11F0802C.ECP

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Office: (714) 901-7270
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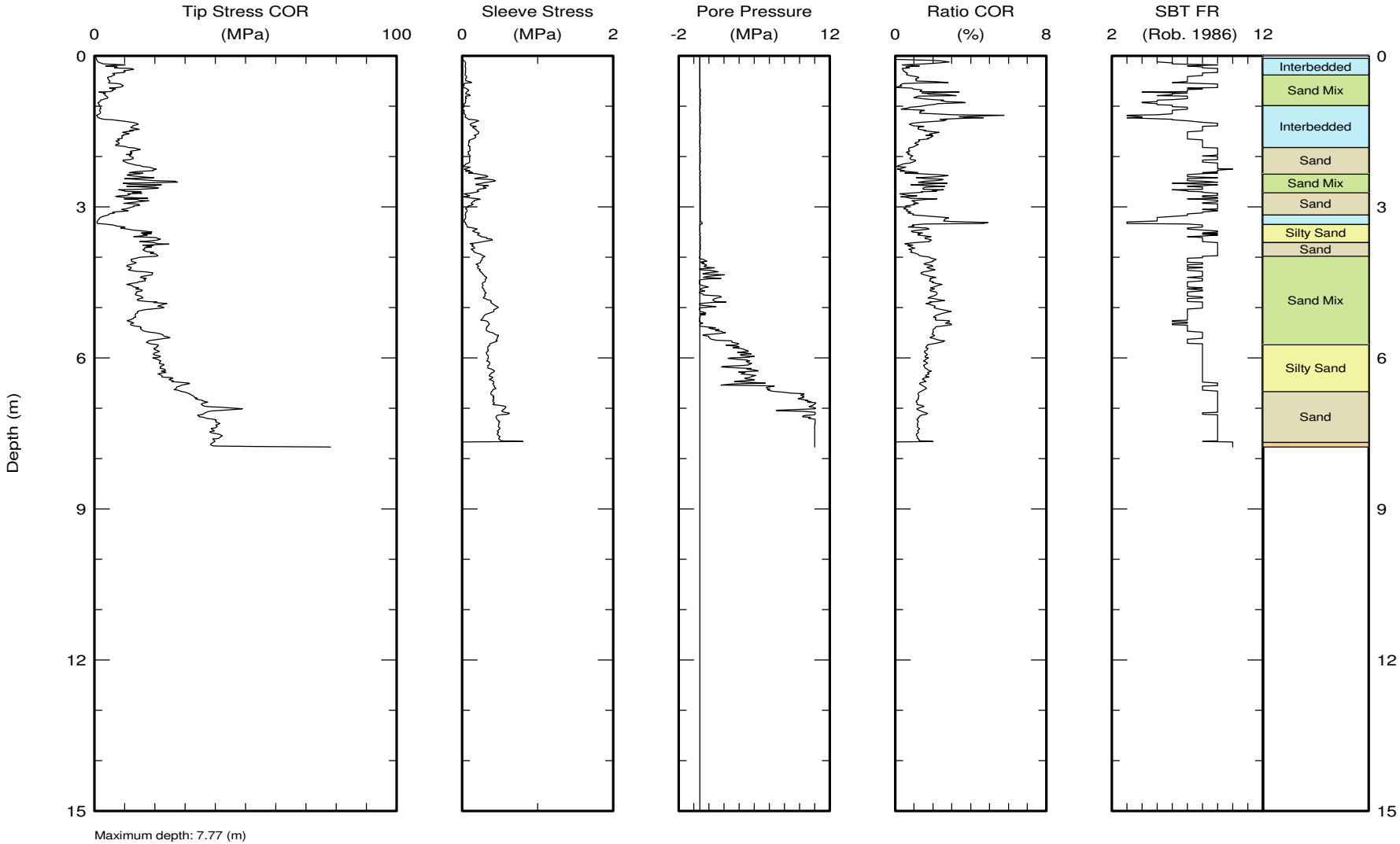
rich@kehoetesting.com
skehoe@msn.com

CPT Data
30 ton rig

Date: 11/Feb/2008
Test ID: C-440+62.5
Project: CarrollCanyon

Client: Testing Engineers
Job Site: End of Sorrento Rd.



Maximum depth: 7.77 (m)

Test ID: C-440+62.5
File: Z11F0801C.ECP

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" Depth (meter)	Qc(avg) (MPa)	Fs(avg) (MPa)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (MPa)
0.152	11.687	0.124	1.060	8	29	44	9E9
0.457	34.554	0.337	0.974	9	69	104	9E9
0.762	31.829	0.297	0.933	9	64	96	9E9
1.067	46.422	0.346	0.744	10	77	116	9E9
1.372	62.392	0.502	0.804	10	104	156	9E9
1.676	42.057	0.474	1.126	9	84	126	9E9
1.981	11.012	0.271	2.449	7	37	56	9E9
2.286	4.376	0.082	1.856	7	15	23	9E9
2.591	2.986	0.063	2.108	6	12	18	9E9
2.896	2.865	0.072	2.487	6	12	18	9E9
3.200	5.355	0.113	2.100	6	22	30	9E9
3.505	59.233	0.251	0.424	10	99	127	9E9

"
NPUT FILE: c:\temp\C-437+251500RT.CSV |----------

" Depth (meter)	Qc(avg) (MPa)	Fs(avg) (MPa)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (MPa)
0.152	7.671	0.066	0.857	8	19	29	9E9
0.457	3.800	0.111	2.899	6	15	23	9E9
0.762	10.000	0.267	2.670	6	40	60	9E9
1.067	10.180	0.362	3.554	6	41	62	9E9
1.372	13.458	0.226	1.678	8	34	51	9E9
1.676	11.905	0.274	2.294	7	40	60	9E9
1.981	6.450	0.179	2.771	6	26	39	9E9
2.286	31.964	0.267	0.835	9	64	96	9E9
2.591	57.277	0.580	1.013	9	115	173	9E9
2.896	37.927	0.570	1.502	9	76	114	9E9
3.200	41.281	0.498	1.206	9	83	115	9E9
3.505	65.400	0.000	0.000	10	9E9	9E9	9E9

"
NPUT FILE: c:\temp\C-437+90147RT.CSV |----------

" Depth (meter)	Qc(avg) (MPa)	Fs(avg) (MPa)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (MPa)
0.152	27.072	0.024	0.088	10	45	68	9E9
0.457	1.068	0.015	1.441	5	5	8	0.071
0.762	5.114	0.040	0.791	8	13	20	9E9
1.067	41.204	0.479	1.163	9	82	123	9E9
1.372	33.842	0.766	2.264	8	85	128	9E9
1.676	23.882	0.719	3.011	12	119	179	9E9
1.981	25.300	0.633	2.502	7	84	126	9E9
2.286	20.175	0.397	1.970	8	50	75	9E9
2.591	18.682	0.374	2.000	7	62	93	9E9
2.896	17.143	0.394	2.300	7	57	85	9E9
3.200	11.536	0.303	2.628	7	38	53	9E9
3.505	5.796	0.202	3.491	5	29	38	0.382
3.810	5.476	0.164	2.991	6	22	27	9E9
4.115	19.825	0.378	1.907	8	50	57	9E9
4.420	58.861	0.283	0.481	10	98	106	9E9

"
NPUT FILE: c:\temp\C-438+35144RT.CSV |----------

" Depth (meter)	Qc(avg) (meter)	Fs(avg) (meter)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (meter)
0.152	1.880	0.026	1.383	1	0	0	0.109
0.457	0.732	0.009	1.180	1	0	0	0.000
0.762	13.668	0.117	0.855	1	1	2	0.830
1.067	44.504	0.630	1.416	1	2	3	2.852
1.372	29.170	0.770	2.638	3	3	5	1.792
1.676	23.305	0.668	2.865	3	2	3	1.362
1.981	24.645	0.594	2.409	3	2	3	1.412
2.286	19.233	0.392	2.036	1	1	2	1.015
2.591	18.914	0.374	1.978	1	1	2	0.962
2.896	14.625	0.345	2.356	1	1	2	0.643
3.200	9.871	0.309	3.131	2	1	2	0.296
3.505	5.023	0.165	3.277	2	9E9	9E9	9E9
3.810	6.553	0.189	2.890	2	1	1	0.020
4.115	34.106	0.452	1.325	1	2	3	1.826
4.420	62.867	0.197	0.313	1	3	4	3.709

"
NPUT FILE: c:\temp\C-438+65144RT.CSV |----------

" Depth (meter)	Qc(avg) (MPa)	Fs(avg) (MPa)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (MPa)
0.152	2.995	0.063	2.109	6	12	18	9E9
0.457	12.339	0.367	2.975	6	49	74	9E9
0.762	19.588	0.591	3.018	7	65	98	9E9
1.067	27.578	0.806	2.915	12	138	207	9E9
1.372	30.056	0.862	2.865	12	151	227	9E9
1.676	29.184	0.877	2.997	12	146	219	9E9
1.981	22.109	0.677	3.056	12	111	167	9E9
2.286	29.345	0.704	2.390	7	98	147	9E9
2.591	36.795	0.639	1.728	8	92	138	9E9
2.896	33.924	0.604	1.765	8	86	126	9E9
3.200	31.679	0.553	1.723	8	80	109	9E9
3.505	61.535	0.615	0.998	10	103	131	9E9
3.810	37.900	0.000	0.000	10	9E9	9E9	9E9

"
NPUT FILE: c:\temp\C-439+4256RT.CSV |----------

" Depth (meter)	Qc(avg) (MPa)	Fs(avg) (MPa)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (MPa)
0.152	33.675	0.177	0.526	10	56	84	9E9
0.457	14.665	0.190	1.295	8	37	56	9E9
0.762	4.819	0.152	3.153	6	19	29	9E9
1.067	3.392	0.131	3.865	5	17	26	0.225
1.372	5.411	0.199	3.676	5	27	41	0.359
1.676	5.033	0.222	4.394	4	34	51	0.334
1.981	4.833	0.210	4.340	4	32	48	0.320
2.286	3.581	0.152	4.233	4	24	36	0.236
2.591	4.241	0.145	3.412	5	21	32	0.281
2.896	3.688	0.121	3.270	5	18	27	0.242
3.200	3.556	0.134	3.779	5	18	25	0.233
3.505	13.783	0.397	2.879	7	46	59	9E9
3.810	18.241	0.560	3.065	7	61	74	9E9
4.115	24.804	0.593	2.389	7	83	95	9E9
4.420	29.886	0.419	1.403	9	60	65	9E9

"
NPUT FILE: c:\temp\C-440+025.54LT.CSV |---

Depth (meter)	Qc(avg) (MPa)	Fs(avg) (MPa)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (MPa)
0.152	0.707	0.027	3.761	3	7	11	0.048
0.457	0.569	0.033	5.761	3	6	9	0.038
0.762	0.987	0.043	4.333	3	10	15	0.066
1.067	2.835	0.052	1.814	6	11	17	9E9
1.372	2.594	0.045	1.730	6	10	15	9E9
1.676	1.329	0.066	4.848	3	14	21	0.088
1.981	1.000	0.056	5.580	3	10	15	0.064
2.286	0.737	0.040	5.352	3	7	11	0.047
2.591	0.667	0.033	4.839	3	7	11	0.043
2.896	0.644	0.027	4.068	3	7	11	0.040
3.200	0.279	0.019	6.000	3	3	4	0.017
3.505	0.725	0.027	3.506	3	8	10	0.047
3.810	0.442	0.020	4.086	3	5	6	0.028
4.115	0.255	0.010	3.667	3	3	3	0.013
4.420	0.258	0.013	4.545	3	3	3	0.013
4.724	0.285	0.010	3.333	3	3	3	0.014
5.029	0.273	0.014	4.545	3	3	3	0.014
5.334	3.925	0.101	2.564	6	16	15	9E9
5.639	4.200	0.155	3.661	5	21	19	0.274
5.944	9.533	0.302	3.173	6	38	33	9E9
6.248	9.747	0.322	3.285	6	39	33	9E9
6.553	16.090	0.318	1.940	7	55	45	9E9
6.858	17.455	0.391	2.213	7	59	46	9E9
7.163	17.664	0.400	2.231	7	60	45	9E9
7.468	40.429	0.000	0.000	10	9E9	9E9	9E9

"
NPUT FILE: c:\temp\C-440+0254LT.CSV |----------

" Depth (meter)	Qc(avg) (MPa)	Fs(avg) (MPa)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (MPa)
0.152	0.795	0.016	2.013	4	5	8	0.053
0.457	0.521	0.020	3.871	3	5	8	0.034
0.762	1.280	0.029	2.292	5	6	9	0.084
1.067	6.012	0.041	0.686	8	15	23	9E9
1.372	5.669	0.051	0.904	8	14	21	9E9
1.676	2.929	0.035	1.205	7	10	15	9E9
1.981	1.535	0.057	3.716	4	10	15	0.100
2.286	0.945	0.039	4.135	3	9	14	0.060
2.591	0.823	0.032	3.925	3	8	12	0.052
2.896	0.877	0.032	3.684	3	9	14	0.055
3.200	0.414	0.016	3.966	3	4	6	0.024
3.505	0.357	0.010	2.800	3	4	5	0.019
3.810	0.650	0.017	2.637	4	4	5	0.039
4.115	0.567	0.016	2.824	3	6	7	0.033
4.420	0.425	0.010	2.353	3	4	4	0.023
4.724	0.820	0.010	1.220	5	4	4	0.049
5.029	7.790	0.094	1.212	8	19	19	9E9
5.334	5.500	0.025	0.446	8	14	13	9E9
5.639	0.665	0.010	1.438	5	3	3	0.037
5.944	7.195	0.075	1.044	8	18	16	9E9
6.248	5.165	0.085	1.650	7	17	14	9E9
6.553	6.186	0.098	1.578	7	21	17	9E9
6.858	3.714	0.063	1.703	7	12	9	9E9
7.163	8.038	0.127	1.586	7	27	21	9E9
7.468	12.561	0.381	3.033	6	50	37	9E9
7.772	22.347	0.682	3.043	12	112	80	9E9
8.077	28.342	0.721	2.497	7	96	66	9E9
8.382	45.492	0.324	0.702	10	77	52	9E9

"
NPUT FILE: c:\temp\C-440+62.5.CSV |----------

" Depth (meter)	Qc(avg) (MPa)	Fs(avg) (MPa)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (MPa)
0.152	4.907	0.035	0.707	8	12	18	9E9
0.457	6.738	0.051	0.761	8	17	26	9E9
0.762	4.378	0.058	1.329	7	15	23	9E9
1.067	1.648	0.031	1.864	6	7	11	9E9
1.372	9.872	0.146	1.474	8	25	38	9E9
1.676	8.918	0.135	1.509	7	30	45	9E9
1.981	12.059	0.098	0.810	9	24	36	9E9
2.286	15.668	0.134	0.856	9	31	47	9E9
2.591	16.132	0.270	1.674	8	40	60	9E9
2.896	12.364	0.107	0.867	9	25	38	9E9
3.200	4.055	0.048	1.179	7	14	20	9E9
3.505	14.800	0.204	1.376	8	37	48	9E9
3.810	18.491	0.190	1.025	9	37	45	9E9
4.115	13.311	0.241	1.807	7	45	52	9E9
4.420	15.371	0.284	1.834	8	39	43	9E9
4.724	14.493	0.303	2.067	7	49	51	9E9
5.029	18.115	0.398	2.187	7	61	60	9E9
5.334	13.535	0.320	2.347	7	45	43	9E9
5.639	20.395	0.423	2.038	8	52	47	9E9
5.944	19.990	0.340	1.641	8	52	45	9E9
6.248	21.755	0.379	1.679	8	56	47	9E9
6.553	26.822	0.409	1.469	8	70	56	9E9
6.858	33.652	0.444	1.248	9	71	55	9E9
7.163	37.126	0.513	1.312	9	78	59	9E9
7.468	38.250	0.485	1.203	9	81	59	9E9
7.772	41.392	0.182	0.420	10	72	51	9E9

Program: CPTINT - CPT Cone Interpretation Program
Version: 5.2
Table File by: Dr. R. G. (DICK) Campanella, P.Eng.
Rev. Dated: April 3, 2002

Parameter	Methods	Refer. Number	Valid Soil Type	Valid Zone
Depth average see NOTE #1	Depth averaged over specified range (see menu)		All	All
Parameter Averaging	Averaged over range specified for depth. If no values exist, your choice is zero's or no value		All	All
Qc, Tip Stress	measured tip force/area	#6,#8	All	All
Qt corrtd for U2 see NOTE #2	Qt = Qc + (1 - a) x U2 and a = tip area ratio Defaults to U2 if given or uses U1 or U3 times Const.	#6,#8	All	All
[Note: Input value from input file is used if defined, not calculated]				
Q (Qt Normalized)	$Q = \frac{Qt - sv}{sv'}$	#9 & 13	All	All
Fs	measured sleeve force/area	#6,#8	All	All
Rf Friction Ratio (if Rf>8, Rf=8)	$Rf = \frac{Fs}{Qt} \times 100\%$	#6,#8	All	All
F (Rf Normalized)	$F = \frac{Fs}{(Qt - sv)} \times 100\%$	#9 & 13	All	All
Gamma Total Unit Weight (Soil + Water) see NOTE #3	Based on Rf or Bq Classif. Zone Zone # Gamma = kN/m^3 1 Qt<4bar 15.70 1 Qt=4bar 17.30 2 Rf<5% 13.36 2 Rf=5% 11.80 2 Bq Zone 12.58 3 Qt<10bar 18.86 3 Qt=10bar 19.65 4, 5 & 6 Qt<20bar 18.86 4, 5 & 6 Qt=20bar 19.65 7 18.86 8 & 9 19.65 10 20.44 11 & 12 21.22		All	All

Parameter	Methods	Refer. Number	Valid Soil Type	Valid Zone
U Penetration Pore Pressure see NOTE #4	U1,measured on Face of tip U2,measured Behind Tip at shoulder (std location) U3,measured Behind Friction Sleeve		All	All
Water Table	Depth below ground surface to where pore pressure = 0 Make negative if water level is above ground		All	All
Uo Hydrostatic Pore Pressure see NOTE #4	Uo = water depth,Hw x unit weight water, Gamma or Uo=Hw=depth-depth to water table if depth<water table,Uo = 0		All	All
dU Excess Pore Pressure	dU = U2 - Uo Defaults to U2 if given or uses U1 or U3 x const.		All	All
DPPR (Differential Pore Pressure Ratio)	$DPPR = \frac{dU}{Qt} = \frac{U - Uo}{Qt}$ Defaults to U2 if given or uses U1 or U3 x const.	#6,#8	All	All
Bq	$Bq = \frac{dU}{Qt - sv}$	# 4 # 8 # 13	All	All
OS (Overburden Stress)	OS = sv = S (Gamma x Depth)		All	All
EOS (Effective Overburden Stress)	EOS = sv' = OS - Uo = sv - Uo		All	All
Rf Zone Soil Behavior Type see NOTE #5	Classification chart for Qc and Rf Zone # = Soil Behavior Type 1=sensitive fine grained 2=organic material 3=clay 4=silty clay 5=clayey silt 6=sandy silt 7=silty sand 8=fine sand 9=sand 10=gravelly sand 11=very stiff fine grained ¥ 12=sand to clayey sand ¥ ¥ overconsolidated or cemented	#6 #8, Fig4.3	All	1<Qt<1000bar 0<Rf<8%

Parameter	Methods	Refer. Number	Valid Soil Type	Valid Zone
Bq Zone Soil Behavior Type	Classification chart for Qc and Bq (same zone #'s as Rf above)	#8 Fig 4.3	All	0<Qt<1000bar -0.1<Bq<1.4
Spt N(60) Standard Penetration Test (Blows/foot) at 60% Energy After R&C(1983) see NOTE #6	Qt/N ratio per zone Zone # Qt/N Zone # Qt/N 1 2 7 3 2 1 8 4 3 1 9 5 4 1.5 10 6 5 2 11 1 6 2.5 12 2	# 7 # 8 Fig 4.2	All	All
Spt N1(60) Normalized for Overburden str	Spt N1(60) = Cn x Spt N(60) where Cn = (sv')^(-0.77)	# 8	All	0.5<Cn<1.5
Dr Relative Density see NOTE #7	Specific Sands: $Dr = \frac{100}{C2} * \ln \frac{Qc}{C1 + C0\ sv' +}$ where: All are NC & UNAGED	# 8		
Compressibility	Sand | C0 | C1 | C2			
moderate high	Ticino | 17.37 | .558 | 2.58 Schmertmann | 15.32 | .520 | 2.75	# 1 # 1	/ Sand-- \	7 to 10 0<Qt<500bar 0<sv'<5bar
all	ALL SANDS: NC, OC, ALL TESTS $Dr = C3 + C4 \log_{10} \frac{Qc + C1 +}{sv' + C2 + C0 +}$ where:	# 5		
	C0 | C1 | C2 | C3 | C4 0.100 | 0.0981 | 0.5 | -98 | 66		Sand	7 to 10 (6 possible)
Phi Friction Angle	Methods: 1) Robertson & Campanella 2) Durgunoglu & Mitchell 3) Janbu beta = +15 degree 4) Janbu beta = 0 degree 5) Janbu beta = -15 degree	#6, #8 # 2 #6, #8 #6, #8 #6, #8	/ Sand-- \	7 to 10 & 6 0<Qt<500bar 0<sv'<4bar 29<phi<49

Parameter	Methods	Refer. Number	Valid Soil Type	Valid Zone
Gmax Maximum Shear Modulus at very small strains	Clay: Gmax = alpha x Qt	# 8 Fig4.18	Clay	1 to 6
	Sand: Digitized figure of Qc vs Gmax with interpolation between sv'curves,R&C method	# 6 # 8 Fig4.13	Sand	(6 possible) 7 to 10 .25<sv'<8bar
CSR(Qc), t/s LEVEL ground + Liquefaction SAND Resistance see NOTE #8	Seed's CSR vs N1(60) graph for specified equake Magni-tude.Can include silty sand corr. for Zone 7. N1(60) from CPT correlations.	# 11 # 12	Sand	7 to 10 (6 possible)
CSR(Eq), t/s Cyclic Stress Ratio applied by design quake	CSR(Eq) = 0.65 (Amax/g) (sv/svo') rd Amax=max surface acceleratn including Amplification	# 12 # 3	Sand	7 to 10 (6 possible)
[Note: Input value from input file is used if defined, & not calculated]				
rd Reduction Factor to find CSR(Eq)	Digitized graph to use for depth vs rd: 1) Seed's mean 2) Fraser Delta	# 12 # 3	Sand	(6 possible) 7 to 10 0<depth<30m
FL,Safety Factor against Liquefaction	FL = CSR(Qc)/CSR(Eq)	# 3	Sand	7 to 10 (6 possible)
Qcr Critical Bearng required to resist Liquefctn	Qcr backcalculated from CSR(Eq) for a specified FL. Qcr is only for the given GWT,EOS,OS,Amax/g & Eq.Mag	# 12	Sand	7 to 10 (6 possible)
Su, Undrained Shear Strength of CLAY METHODS: see NOTE #9	Nk: Su = Qc - st / Nk	# 8	Clay	1 to 6
	Nke: Su = Qt - U2 / Nke		Clay	1 to 6
	Nkt: Su = Qt - sv / Nkt		Clay	1 to 6
	Nc: Su = Qt / Nc		Clay	1 to 6
	NdU: Su = dU2 (dU1 or dU3) / NdU		Clay	1 to 6

Parameter	Methods	Refer. Number	Valid Soil Type	Valid Zone
Su/EOS	$Su/EOS = \frac{Su}{sv'}$	# 8	Clay	1 to 6
Ko (NC) Normally Consolidated	$(Ko)NC = 1 - Sin(f)$ see NOTE #10	# 8	Sand	7 to 10 (6 possible)
Ko (OC) Over Consolidated	$(Ko)OC = (Ko)NC \times OCR^{0.42}$	# 8	Sand	7 to 10 (6 possible)
E25 Youngs Modulus	E25 = alpha x Qt where user input alpha	# 8 4.11&12	Sand	(6) 7 to 10 0<Qt<500bar
M Constrained Modulus	CLAY: M = alpha x Qt where user input alpha	# 8 Tabl4.3	Clay	1 to 6
	SAND: Methods: Qt: M = alpha x Qt		Sand	7 to 10 (6 possible)
	Baldi: $\frac{M}{Qt} = C0 \times pa \left(\frac{sv' + C1}{pa}\right)^{C2} \times OCR^{C3 Dr}$	# 8 Fig4.10	Sand	7 to 10
OCR (Clay) Over-Consolidation Ratio see NOTE #11	$OCR = \left(\frac{\frac{Su}{svo'}}{\left(\frac{Su}{svo'} + NC\right)}\right)^{1.25}$	# 6 # 8 Fig4.19	Clay	1 to 6
Ic Material Index After J&D(1993) see NOTE #18	$Ic = \left(3 - \log\left(Q(1-Bq)\right)\right)^{2} + \left(1.5 + 1.3\log F\right)^{2+0.5}$	# 13 # 17	All	All
Spt N(60) Standard Penetration Test (Blows/foot) at 60% Energy After J&D(1993) see NOTE #16	$Qc/N = 8.5(1-(Ic/4.75))$ where Qc in bars	# 13	All	All

Parameter	Methods	Refer. Number	Valid Soil Type	Valid Zone
State Parameter State,(e-units) Current Void Void Ratio minus Critical Void Ratio	$State = \ln\left[\frac{3M + 8.5M/F}{Q(1-Bq) + \frac{11.9 - 1.33F}{6 \sin fcv}}\right]$ $M = \frac{6 \sin fcv}{3 - \sin fcv}$ fcv = const. vol. Phi angle	# 14	All	All
Fines Content FC(%) Percent less than #200 Sieve After Davies,99	FC(%) = 42.4179(Ic) - 54.8574 FC(%) = 0% if Ic < 1.2933 FC(%) = 100% if Ic > 3.6508	# 15	All	All
OCR (Clay) Overcons. Ratio by Pore Press. U1 & U2 or U1 & U3 see NOTE #17	OCR = 0.5 + 1.50(PPD) PPD = (U1 - U2)/Uo or PPD = (U1 - U3)/Uo and default 0.5 & 1.5 are settable	# 16	Clay	1 to 6

1. Depth averaging may be in 0.5, 1, 2.5 or 5 ft. intervals or 0.1, 0.25, 0.5 or 1.0 m intervals, or no depth averaging if zero is selected. The average is the mean value of the readings in the interval. The depth value is the mid-depth of the averaged interval. It is convenient to start at half the depth averaging interval. For example, if you want "even" depths and the depth averaging is set at 0.50 m then start at 0.25 to get values of depth of 0.5, 1.0, 1.5, etc.

2. Basic input CPTU data columns are for Depth, Qc, Fs, U1, U2, U3, INC and TEMP may be selected. In addition the following parameters may also be specified as an INPUT data column: Qt, Gamma, Uo, Spt N, Rf Zone, Bq Zone and CSR(EQ). These values will be used where required to obtain other interpreted parameters. If they are not specified the program will estimate them when they are required. For example, you can create an OUTPUT data file of any of the above parameters and then edit some or all of the values to suite your measurements or your desires to specify their values. You can do that with "Gamma" values to input your measurements of unit weight, or with "Uo" if you want to input values of pore water pressure other than hydrostatic, or with any of the other input parameters. You would use your edited file of adjusted data as your new INPUT data file. Thus, you can specify these parameters if you want to override the Program's values.

You can also use the designated value of "9E9" to denote an unknown value.

You can use the "OTHER" designation to input other data that exists on your input file and identify its units. This allows you to output it, without operating on it, if you choose.

It is best NOT to use depth averaging when using input data that is not continuous at regular depth intervals. Always use DEPTH AVERAGING with extreme caution since the program averages ALL INPUT parameters over the interval chosen irregardless of soil type. Careful use of start and end depth choises can make depth averaging very effective.

3. Since there is no data in the file within the initial depth interval, a default Gamma (unit weight) must be specified from the surface to the starting depth. This is done in the "Param" Menu in units of kN/m^3 (1kN/m^3=6.36pcf). Also, you can specify the values of Gamma to be used by the program as in NOTE #2 above.

4. If pore pressures are not measured by the cone then the program will take Qc as being equal to Qt for all interpretations requiring Qt. Also, Uo may be specified in the input file as a column of Uo vs depth values, if the water pressures are not hydrostatic. See NOTE #2 for more info on customizing input data.

5. You can choose to use either the Rf classif. Zone or the Bq classif. Zone to divide soil into Undrained Parameters (Zones 1 to 6) and Drained Parameters (Zones 7 to 10) in the "Param" Menu. (However, in order to use the Bq Zone you must have Pore Pressure, U2, data.) Also, you may choose to switch Zone 6 to a Drained Zone from its Undrained Zone status. This is done if you feel that the soil identified as Zone 6 (sandy silt) is really coaser (using other sources of information) and/or you want it analyzed as a Drained rather than Undrained soil. Finally, the soil behavior names in each zone were shortened in version 5.0 for simplicity. For example, Zone 6 was named "sandy silt to clayey silt" but was shortened to "sandy silt".

6. Spt N is the same as Spt N(60) for 60% transferred energy. This value is calculated from the Qt/N ratios given for each Soil Zone (you can specify either Rf or Bq Zone) and these values are used in the Level Ground Liquefaction analysis. Values of Spt N may be specified in the Input File, if indepedently measured values are to be used. We suggest that you not use depth averaging if you only have selected Spt N values at a few depths. You may use "9E9" for missing data.

7. If Dr values are negative then soil is very loose or likely more of an undrained soil like a silty sand rather than a drained soil for which the Dr correlations were developed. Use Dr interpretations very cautiously since they also assume the soil is free draining, uncemented, unaged and has the same compressibility of grains as the soil used for the correlations in chamber calibration tests.

8. The simplified sand liquefaction analysis for level ground according to Seed et al requires Spt N1(60) and earthquake magnitude to obtain the cyclic stress ratio to cause liquefaction, CSR(Qc). The design maximum ground acceleration, the depth-reduction factor, Rd, and overburden total and effective stresses are required to calculate the cyclic stress ratio applied by the design earthquake, CSR(EQ). The program estimates the N1(60) values from the cone stresses, the operator identifies the earthquake magnitude and Seed et al chart is used to get CSR(Qc). The program also calculates CSR(EQ) from the user specified maximum ground acceleration including any amplification factors, the calculated overburden stresses and either Seed's mean or the Fraser Delta Rd factor. The Fraser Delta is used only when amplification factors of the order of 2 or more are used. See Reference Nos. 3, 6, 11 and 12 for more information. The user can INPUT specific values for Spt N, CSR(EQ), Soil Zones, Gamma's, etc. in order to customize the analysis for the existing data base of information. It is recommended that you do not use depth averaging when using specific input data but make calculations at specific depths where external input data exists. The calculated value of Qcr is the minimum value of cone bearing stress required at a given depth such that the factor of safety against liquefaction, or the ratio FL = CSR(Qc)/CSR(EQ) have the specified value for a given earthquake magnitude, max. ground acceleration, depth reduction factor, and calculated overburden stresses. This value of Qcr is useful to identify the required minimum level of soil improvement for a given design condition.

9. The NdU method to calculate undrained shear strength has been extended to allow the user to choose either dU1, or dU2 or dU3 provided such pore pressure measurements exist.

10. The Overconsolidation Ratio, OCR, for the sand must be estimated by the user in the "Param" menu if you want to estimate Ko in the sand layers. For the typical normally consolidated sand, OCR = 1.0.

11. It is currently only possible to estimate the OCR for a clay, which makes use of the correlations obtained from extensive laboratory tests.

12. An improved calculation and print routine was added to version 5.0 which uses swap routines to reduce memory requirements, but slows down the calculations.

13. The classification charts for Rf has been extended at all boundaries such that values of Rf>8 and values of Qc<1.00 are possible. The Bq classification chart which requires dU2 and can now accept values of Bq>1.2 and Qt<1. Unfortunately, this feature does not work.

14. Version 5.1ppd added several enhancements to the program. You may input an average vertical flow gradient, which is applied over the entire profile depth to be analysed so adjust the depth of interest accordingly. Zero gives hydrostatic and no flow, a negative gradient is upward flow which increases pore pressure and reduces vertical effective stress. A positive gradient gives downward flow.

15. A State Parameter or current void ratio minus critical void ratio is calculated according to the paper by Ref. 14, Plewes, Davies and Jefferies, 1994.

16. An alternate method to estimate SPT from CPT is provided according to Ref. 13, Jefferies and Davies, 1993 in ASTM.

17. An alternate method to estimate OCR in clays is provided which uses the measured pore pressure difference, ppd, so both U1 and U2 or U1 and U3 must be measured at the same time. (see Ref. 16)

18. Version 5.2 added the value Ic (Material Index) according to Jefferies & Davies, 1993, 1991 (Ref. 13 & 17) which combines all Normalized parameters Q, F and Bq.
(Note: QtN was changed to Q and RfN to F.)

18A. In Version 5.2, if at any depth the value of Bq>1 (in very sensitive saturated soil)then Bq is made equal to 0.99. Also, if Rf>8 it is made 7.99. These changes have a negligable effect on the results.

19. FC(%) or percent of dry weight less than #200 sieve (.074mm) was also added according to Davies, 1999 Ref.#15)

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APPENDIX II

LABORATORY TESTING RESULTS

Table II.1

Boring No.	Depth below grade (m)	Sample Type	In-situ Moisture (ASTM D2216)	Dry Unit Weight (ASTM D4767)	Particle Size Analysis (ASTM D422)				Plasticity Index & Liquid Limit (AASHTO T 89 & T90)			Consolidation (ASTM D2435)	Direct Shear (ASTM D3080)				Compaction Curve (ASTM D1557)		Expansion Index (ASTM D4829)	Corrosivity Testing			
													Undisturbed		Remolded								
			ω (% of dry wt)	γ (kN/m³)	GRAVEL (%) RETAINED on #4 Sieve	SAND (%) PASSING #4 and RETAINED on #200 sieve	FINES (SILT + CLAY) (%) PASSING No. 200	FINES (SILT + CLAY) (%) CLAY	LL	PL	PI		C (kPa)	ϕ °	C (kPa)	ϕ °	Maximum Dry Density (kN/m³)	Optimum Moisture Content (%)	EI value	Sulfate Content (ppm) (CTM 417)	Chloride Content (ppm) (CTM 422)	pH value (CTM 643)	Resistivity value (ohms-cms) (CTM 643)
CCR BRIDGE																							
A-08-006	1.5	SPT	9.5		0.0	22.3	77.7																
	3.0	Ring	13.4	16.9								see graph											
	4.6	SPT																					
	6.1	Ring	20.0	17.3																			
	7.6	SPT	18.5		1.0	54.7	44.3																
	9.1	Ring	21.4	17.2								see graph											
	10.7	SPT	20.0		19.0	65.0	16.0																
	15.2	SPT	22.4		7.3	45.9	46.8																
A-08-031	14.0	Ring											19.2	33.0									
O-08-033	26.5	Ring											1.2	46.0									
O-08-034	0.3	small bag	31.0		1.0	23.5	75.5																
	1.2	small bag	14.2																				
	2.1	small bag	25.2				80.0																
	5.5	small bag	16.3		46.0	35.0	12.0	7.0															
	6.1	small bag	21.8		5.9	58.7	21.4	14.0															
	7.0	small bag	14.0		44.3	39.0	7.7	9.0															
	7.6	small bag	6.4		53.7	38.8	5.0	2.5															
	7.9	small bag	13.2		38.9	41.5	12.6	7.0															
	8.5	small bag	13.6		56.1	34.5	6.6	2.8															
	9.1	small bag	16.2		12.7	70.6	11.5	5.2															
	11.9	small bag	8.2		39.9	44.4	11.0	4.7															
	13.7	Ring																					
	13.7	small bag	8.1		47.7	35.0	11.3	6.0															
	14.0	small bag	16.2		0.0	12.0	53.0	35.0															
	18.6	small bag	34.5																				
	19.8	Ring																					
	21.3	small bag	15.1																				
	25.9	Ring											15.6	35.0									
	26.2	small bag	12.9																				
O- 08-036	15.2	Ring											24.4	34.0									
A-08-045	4.6	SPT	23.7				72.6		39.6	14.7	24.9												
A-08-046	0.3	Bulk																		520	1,100	6.4	328

Table II.1

Boring No.	Depth below grade (m)	Sample Type	In-situ Moisture (ASTM D2216)	Dry Unit Weight (ASTM D4767)	Particle Size Analysis (ASTM D422)				Plasticity Index & Liquid Limit (AASHTO T 89 & T90)			Consolidation (ASTM D2435)	Direct Shear (ASTM D3080)				Compaction Curve (ASTM D1557)		Expansion Index (ASTM D4829)	Corrosivity Testing			
													Undisturbed		Remolded								
			ω (% of dry wt)	γ (kN/m³)	GRAVEL (%) RETAINED on #4 Sieve	SAND (%) PASSING #4 and RETAINED on #200 sieve	FINES (SILT + CLAY) (%) PASSING No. 200	CLAY	LL	PL	PI		C (kPa)	ϕ °	C (kPa)	ϕ °	Maximum Dry Density (kN/m³)	Optimum Moisture Content (%)	EI value	Sulfate Content (ppm) (CTM 417)	Chloride Content (ppm) (CTM 422)	pH value (CTM 643)	Resistivity value (ohms-cms) (CTM 643)
A-08-048	1.2	Bulk			2.0	79.4	18.6								7.4	28.0	19.3	10.5		450	390	7.2	508
A-08-049	0.0	Bulk			21	43.9	35.1								15.6	28.0	19.9	9.5		14	75	6.2	2,208
A-08-050	2.6	Bulk			0	47.5	52.5								12.0	28.0	18.9	11.5		530	120	7.1	682
A-08-051	6.1	Bulk			0	41.2	58.8								8.9	29.0	18.7	13.0		250	96	6.6	937
DAR																							
A-08-037	0.3	Bulk			0.0	25.8	74.2		37.6	17.4	20.2									31	11	6.8	1,873
	1.5	Ring	18.5	15.8									18.7	29.0									
	4.6	Ring	20.3	16.8																			
	7.6	Ring	20.8	16.5																			
	11.6	Bulk																		590	820	6.7	408
	12.2	SPT	12.3		22.0	38.5	39.5		36.4	11.4	25.0												
	13.7	Ring	16.1	18.0									24.0	29.0									
	14.3	Bulk															18.5	12.0					
	16.8	Ring	15.5	18.7																			
	22.9	Ring	22.5	16.5																			
	38.1	Ring	19.0	17.3																			
A-08-038	6.1	Ring	19.4	17.5																			
	9.8	Bulk			1.0	20.1	78.9		41.8	16.8	25.0						18.8	11.0		770	21	7.4	937
	12.2	Ring	16.2	18.1									41.7	20.0									
	18.3	Ring	20.2	17.6																			
	24.4	Ring	14.3	17.1																			
	27.4	Ring											33.5	27.0									
	30.5	Ring	15.2	16.4																			
	33.5	Ring	20.2	16.7																			
A-08-039	0.3	Bulk			0.0	33.5	66.5		43.2	17.2	26.0									14	11	6.4	1,806
	1.5	Ring	21.3	15.0									10.5	34.0									
	6.7	Bulk			2.0	26.0	72.0		42.4	15.2	27.2						19.1	11.0					
	7.6	Ring	17.9	16.1									4.8	32.0									
	13.7	Ring	20.9	16.4																			
	19.8	Ring	20.0	15.0																			
	25.9	Ring	19.0	13.9																			
	32.0	Ring	18.6	17.2																			

Table II.1

Boring No.	Depth below grade (m)	Sample Type	In-situ Moisture (ASTM D2216)	Dry Unit Weight (ASTM D4767)	Particle Size Analysis (ASTM D422)				Plasticity Index & Liquid Limit (AASHTO T 89 & T90)			Consolidation (ASTM D2435)	Direct Shear (ASTM D3080)				Compaction Curve (ASTM D1557)		Expansion Index (ASTM D4829)	Corrosivity Testing			
													Undisturbed		Remolded								
			ω (% of dry wt)	γ (kN/m³)	GRAVEL (%) RETAINED on #4 Sieve	SAND (%) PASSING #4 and RETAINED on #200 sieve	FINES (SILT + CLAY) (%) PASSING No. 200	FINES (SILT + CLAY) (%) CLAY	LL	PL	PI		C (kPa)	ϕ°	C (kPa)	ϕ°	Maximum Dry Density (kN/m³)	Optimum Moisture Content (%)	EI value	Sulfate Content (ppm) (CTM 417)	Chloride Content (ppm) (CTM 422)	pH value (CTM 643)	Resistivity value (ohms-cms) (CTM 643)
A-08-040	0.3	Bulk			0.0	26.1	73.9		41.4	15.2	26.2									46	11	6.9	1,472
	3.0	Ring	22.6	15.8																			
	6.1	Ring	17.8	15.6																			
	6.7	Bulk			3.0	22.7	74.3		40.2	14.7	25.5						19.2	12.0					
	12.2	Ring	17.4	15.5																			
	21.3	Ring	16.5	16.7																			
	24.4	Ring	21.7	14.4																			
	30.5	Ring	20.0	17.3																			
A-08-041	0.3	Bulk			0.0	29.5	70.5		36.8	18.0	18.8									32	11	6.3	2,141
	1.5	Ring	20	14.6																			
	6.7	Bulk			1.0	23.4	75.6		37.3	16.1	21.2						18.8	13.0					
	4.6	Ring	19.1	16.2									14.8	29.0									
	10.7	Ring	16.9	15.9																			
	16.8	Ring	19.7	15.6																			
	22.9	Ring	18.2	17.5																			
	25.9	Ring	18.1	14.2																			
A-08-042	6.7	Bulk			2.0	24.7	73.3		39.0	15.1	23.9						18.5	12.5					
	6.1	Ring	20.0	17.3																			
	12.2	Ring	20.0	15.6																			
	18.3	Ring	20.3	16.7																			
	21.3	Ring	29.6	14.7																			
A-08-043	1.5	Ring	18.5	15.2																			
	7.6	Ring	18.6	14.7																			
	13.7	Ring	10.2	18.7																			
	16.8	Ring	18.4	16.6																			
	19.8	Ring	18.7	14.0																			
A-08-044	2.1	Bulk			1.0	18.0	81.0		42.0	16.6	25.4						18.8	12.5		150	64	6.9	1,137
	3.0	Ring	21.5	16.0								see graph											
	6.1	Ring	13.5	17.7									13.4	34.0									
	9.1	Ring	20.3	15.6																			
	15.2	Ring	21.1	16.6																			
	22.9	Ring	18.3	16.8																			
MRW																							
A-08-001	2..4	Bulk				30.0	62.0		46.0	16.0	30.0				14.6	24.0	18.6	12.5	82.0	400	400	7.8	515

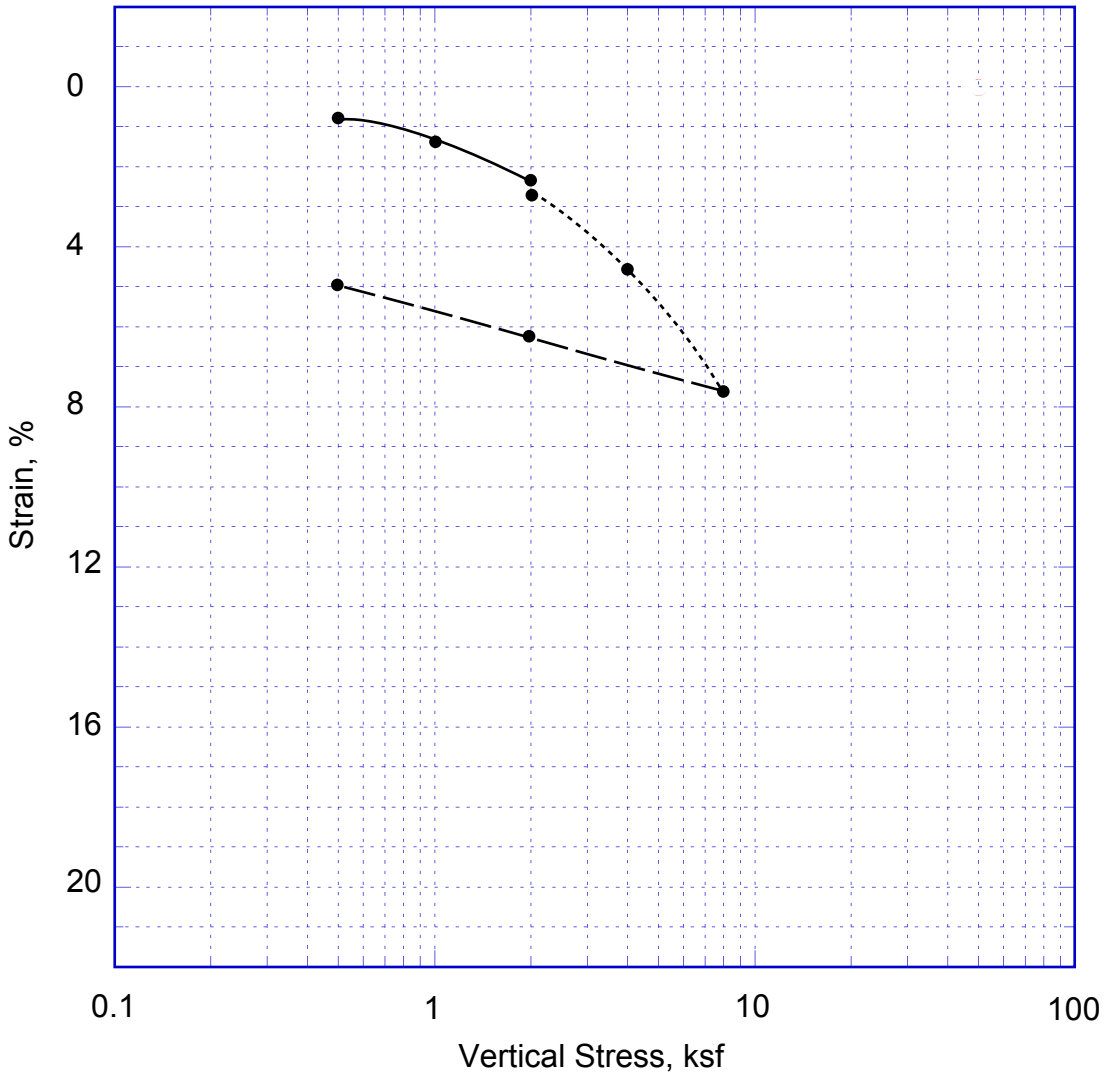
Table II.1

Boring No.	Depth below grade (m)	Sample Type	In-situ Moisture (ASTM D2216)	Dry Unit Weight (ASTM D4767)	Particle Size Analysis (ASTM D422)				Plasticity Index & Liquid Limit (AASHTO T 89 & T90)			Consolidation (ASTM D2435)	Direct Shear (ASTM D3080)				Compaction Curve (ASTM D1557)		Expansion Index (ASTM D4829)	Corrosivity Testing			
													Undisturbed		Remolded								
			ω (% of dry wt)	γ (kN/m³)	GRAVEL (%) RETAINED on #4 Sieve	SAND (%) PASSING #4 and RETAINED on #200 sieve	FINES (SILT + CLAY) (%) PASSING No. 200	FINES (SILT + CLAY) (%) CLAY	LL	PL	PI		C (kPa)	ϕ°	C (kPa)	ϕ°	Maximum Dry Density (kN/m³)	Optimum Moisture Content (%)	EI value	Sulfate Content (ppm) (CTM 417)	Chloride Content (ppm) (CTM 422)	pH value (CTM 643)	Resistivity value (ohms-cms) (CTM 643)
	3.0	Ring	15.0	16.0								see graph	4.1	40.0									
	6.1	SPT	18.2																				
	8.2	Bulk	18.4		4.0	17.0	79.0		43.0	15.0	28.0				13.9	25.0	18.5	12.0	90.0	280	150	6.7	870
	9.1	Ring	12.9	18.7								see graph											
	12.2	S	19.8																				
	14.0	Bulk	21.1		0.0	19.0	81.0		42.0	16.0	26.0									410	330	6.6	515
	15.2	Ring	22.8	16.5								see graph											
	18.3	SPT	19.6																				
A-08-002	3.0	SPT	21.6																				
	6.1	Ring	24.5	13.6								see graph	4.5	37.0									
	6.1	Bulk			4.0	33.0	63.0		39.0	13.0	26.0								74.0	380	500	7.1	468
	9.1	SPT	17.6																				
A-08-003	3.0	SPT	12.8																				
	5.2	Bulk			16.0	27.0	57.0		43.0	15.0	28.0				14.9	24.0	18.8	12.5	94.0	460	680	7.7	381
	6.1	Ring	12.7	14.6									15.8	32.0									
	9.1	SPT	13.1																				
	9.4	Bulk			17.0	50.0	33.0		40.0	14.0	26.0								73.0	520	650	6.9	401
A-08-004	1.5	Bulk			6.0	34.0	60.0		30.0	12.0	18.0				15.3	25.0	19.6	10.0	57.0	390	980	6.8	341
	3.0	Ring	12.8	17.8								see graph	18.3	37.0									
	3.3	Bulk			17.0	32.0	51.0		33.0	14.0	19.0								48.0	510	890	7.4	341
	6.1	SPT	13.1																				
	6.4	Bulk			4.0	36.0	60.0		36.0	26.0	10.0				8.4	27.0	19.4	11.5	55.0	310	420	7.3	515
A-08-005	3.0	Ring	16.1	16.9								see graph	10.6	37.0									
	3.0	Bulk			15.0	23.0	62.0		45.0	16.0	29.0								85.0	510	700	7.0	375
	6.1	SPT	17.1																				
	9.1	Ring	16.2	17.8								see graph	28.0	34.0									
	9.1	Bulk			11.0	25.0	64.0		37.0	15.0	22.0								51.0	200	350	6.9	488
	12.2	SPT	19.0																				
A-08-007	1.5	SPT	6.9																				
	1.8	Bulk	6.1		27.0	39.7	33.3		25.5	11.2	14.0						20.4	9.0		260	160	6.5	1,004
	3.0	SPT	19.2		0.0	30.1	69.9																
	3.4	Bulk	11.6		5.0	24.1	70.9		46.7	16.2	30.5												
	4.6	Ring	22.2	16.1								see graph	13.2	43.0									

Table II.1

Boring No.	Depth below grade (m)	Sample Type	In-situ Moisture (ASTM D2216)	Dry Unit Weight (ASTM D4767)	Particle Size Analysis (ASTM D422)				Plasticity Index & Liquid Limit (AASHTO T 89 & T90)			Consolidation (ASTM D2435)	Direct Shear (ASTM D3080)				Compaction Curve (ASTM D1557)		Expansion Index (ASTM D4829)	Corrosivity Testing			
													Undisturbed		Remolded								
			ω (% of dry wt)	γ (kN/m³)	GRAVEL (%) RETAINED on #4 Sieve	SAND (%) PASSING #4 and RETAINED on #200 sieve	FINES (SILT + CLAY) (%)		LL	PL	PI		C (kPa)	ϕ°	C (kPa)	ϕ°	Maximum Dry Density (kN/m³)	Optimum Moisture Content (%)	EI value	Sulfate Content (ppm) (CTM 417)	Chloride Content (ppm) (CTM 422)	pH value (CTM 643)	Resistivity value (ohms-cms) (CTM 643)
							PASSING No. 200	CLAY															
A-08-008	0.3	Bulk			6.0	23.5	70.5		40.2	13.0	27.2				8.9	26.0	18.4	13.0	49.0	790	780	6.8	388
	1.5	Ring	19.6	16.8	3.8	24.1	72.1																
	3.0	SPT	13.9		15.0	25.0	60.0																
A-08-009	1.5	Ring	12.4	16.5	14.0	40.8	45.2																
	1.8	Bulk			12.0	32.0	56.0		36.0	14.3	21.7								42.0	500	290	6.5	650
	3.0	SPT	6.9		6.0	46.7	47.3																
	3.4	Bulk																					
	4.6	Ring	15.5	17.1								see graph	51.7	37.0									
A-08-010	1.5	SPT	16.7		2.0	35.6	62.4																
	2.4	Bulk			18.0	34.5	47.5		37.3	8.7	28.6				7.9	28.0	19.0	10.5	47.0	640	170	6.8	603
	3.0	Bulk	18.2	15.9	49.0	35.3	15.7					see graph	20.6	25.0									
A-08-052	4.6	Ring	19.4	16.1									14.6	27.0									
	13.7	Ring	16.8	16.3								see graph											
A-08-053	6.1	Ring	15.4	14.6									15.3	28.0									
A-08-054	12.2	Ring	13.3	17.2									24.2	28.0									
A-08-055	1.5	Ring	13.2	15.1									12.7	30.0									
A-08-056	16.8	Ring	13.1	18.1								see graph	21.8	34.0									

Soil Consolidation



——————— Sample Loaded @ Field Moisture

---------- Sample Saturated

— — — — — Sample Tested Under Rebound Loading

Boring Location: A-08-001 [445+25 10 RT]
Depth: 3.0 m
Soil Classification (USCS): CL

NOTE: This figure may contain areas of color. TESD cannot be responsible for any subsequent misinterpretation of the information resulting from black and white reproductions of this figure.

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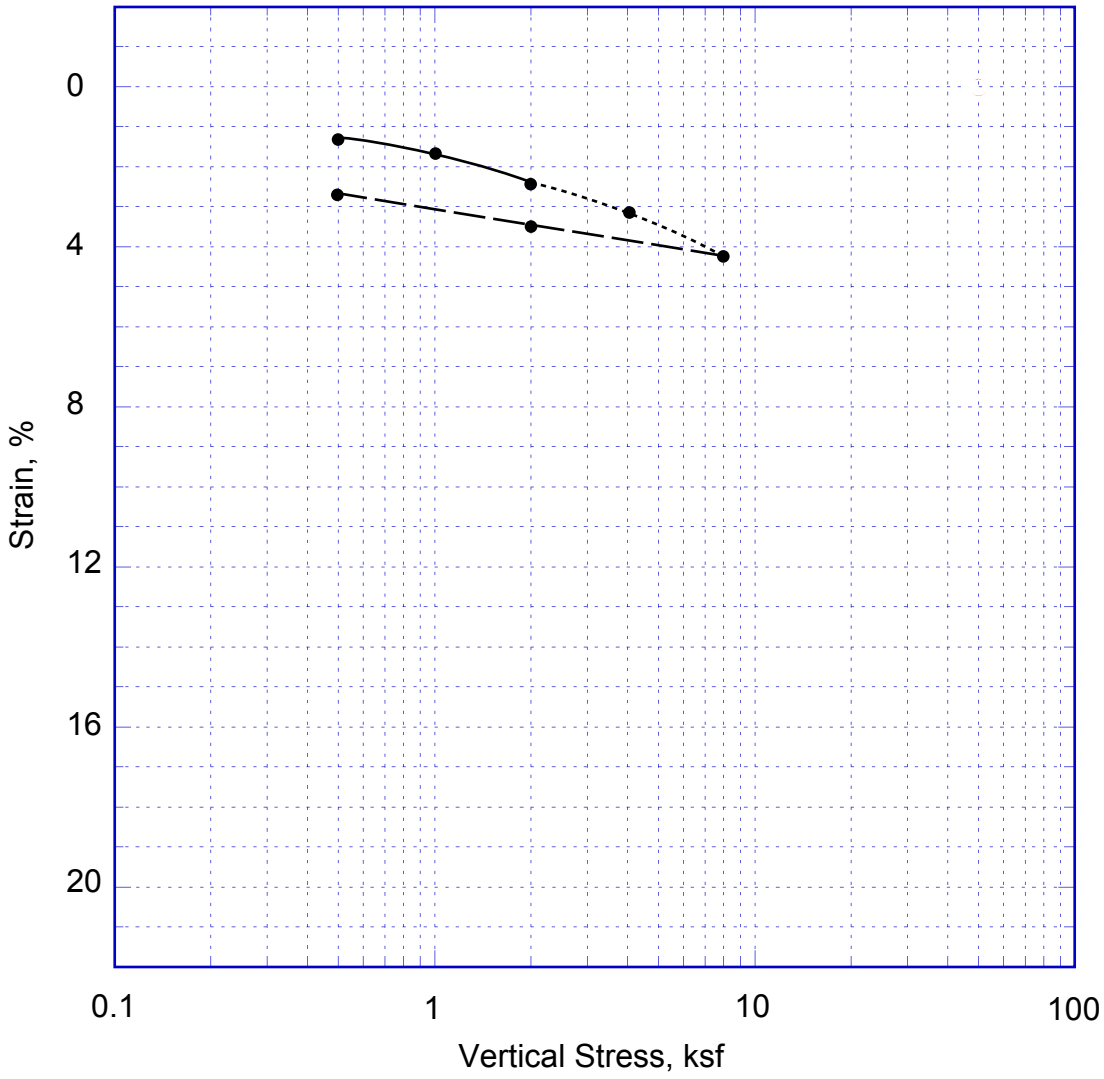
Bureau Veritas North America, Inc.
7895 Convoy Court, Suite 18
San Diego, CA 92111
Tel: (858) 715-5800 Fax: (858) 715-5810

Title:	**Consolidation Test Result**
Project:	I805 / Miscellaneous Retaining Walls

Drawn:	NJT	Contract No:	38008-017046.00
Date:	October, 2008	Figure:	II-1

Soil Consolidation



——————— Sample Loaded @ Field Moisture

---------- Sample Saturated

— — — — — Sample Tested Under Rebound Loading

Boring Location: A-08-001 [445+25 10 RT]
Depth: 9.1 m
Soil Classification (USCS): CL

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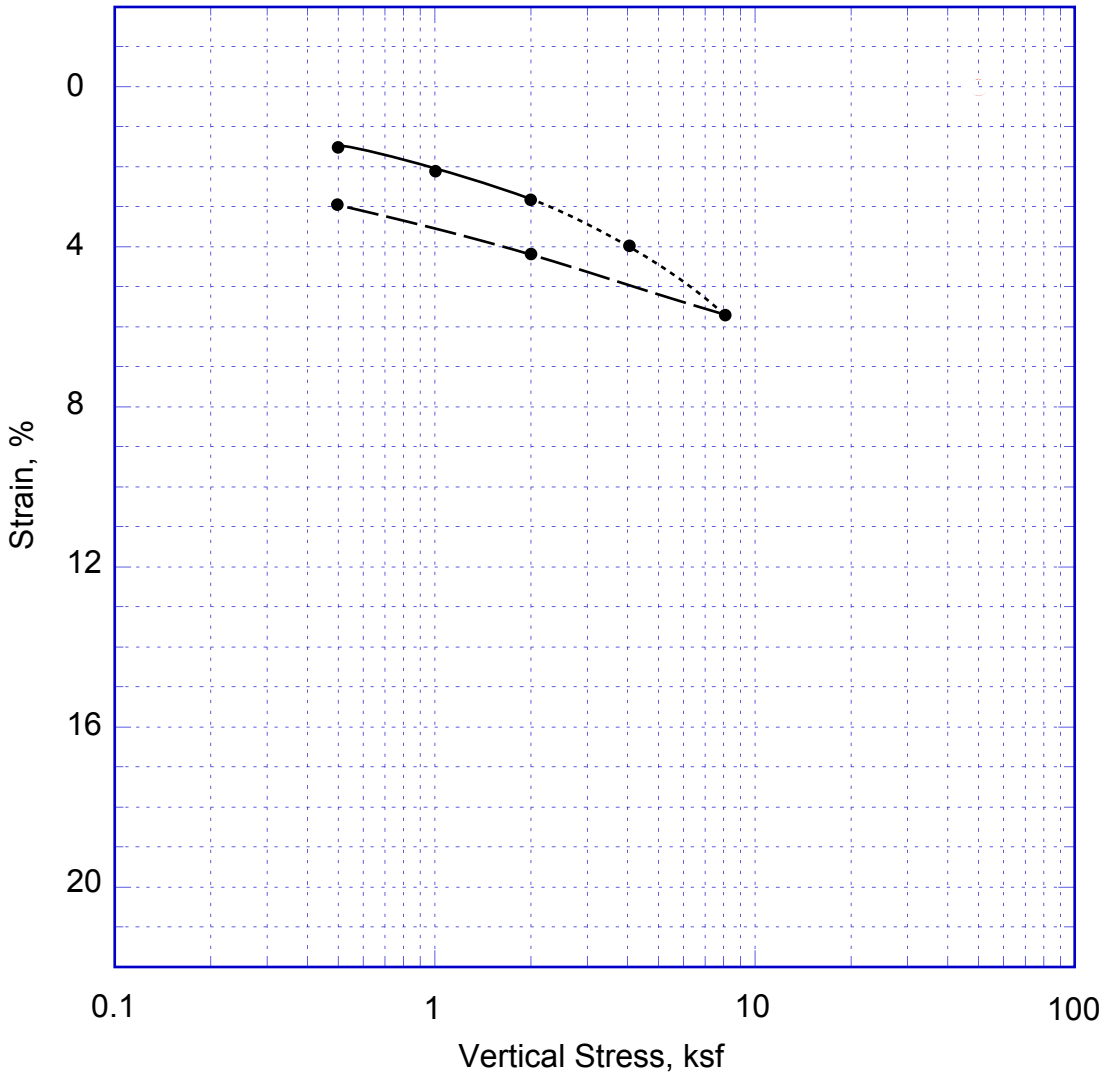
Title:	**Consolidation Test Result**
Project:	I805 / Miscellaneous Retaining Walls

Drawn:	NJT	Contract No:	38008-017046.00
Date:	October, 2008	Figure:	II-2

Soil Consolidation



——————— Sample Loaded @ Field Moisture

---------- Sample Saturated

— — — — — Sample Tested Under Rebound Loading

Boring Location: A-08-001 [445+25 10 RT]
Depth: 15.2 m
Soil Classification (USCS): CL

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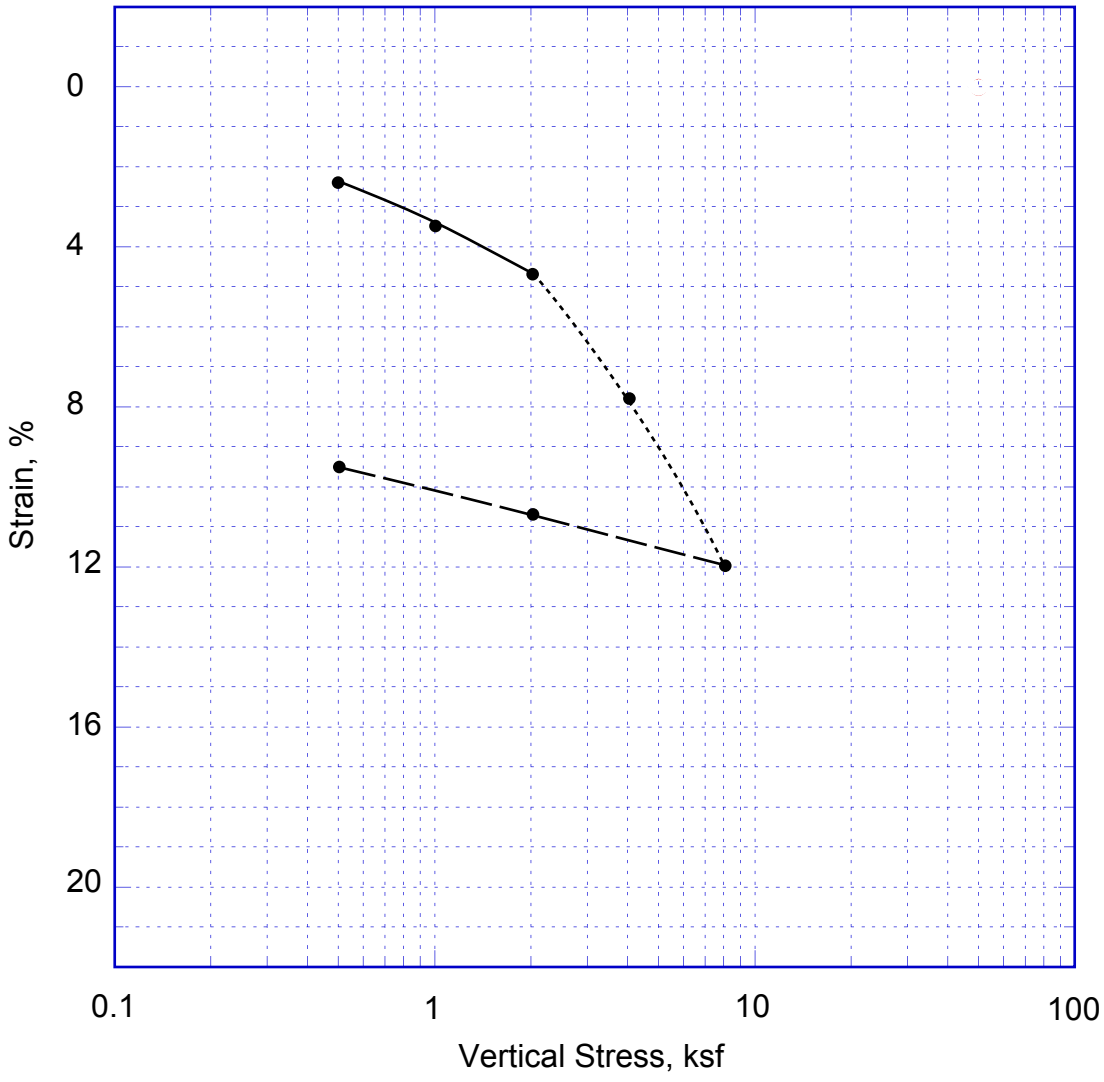
Title:	**Consolidation Test Result**
Project:	I805 / Miscellaneous Retaining Walls

Drawn:	NJT	Contract No:	38008-017046.00
Date:	October, 2008	Figure:	II-3

Soil Consolidation



Sample Loaded @ Field Moisture

Sample Saturated

Sample Tested Under Rebound Loading

SCHEMATIC ONLY - NOT A CONSTRUCTION DRAWING

Boring Location: A-08-002 [445+15 15 RT]
Depth: 6.1 m
Soil Classification (USCS): CL

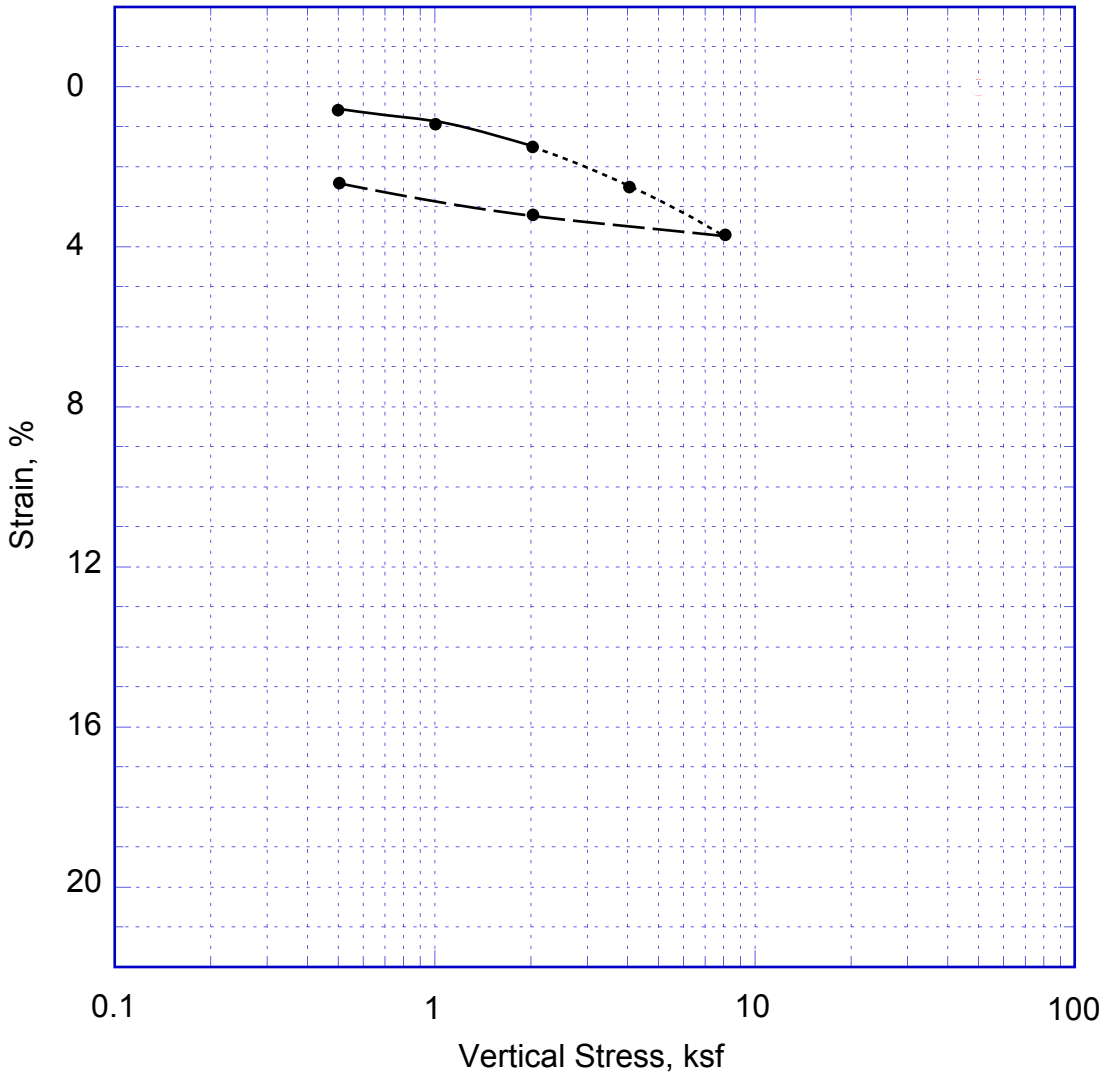
Bureau Veritas North America, Inc.
7895 Convoy Court, Suite 18
San Diego, CA 92111
Tel: (858) 715-5800 Fax: (858) 715-5810

Title: **Consolidation Test Result**

Project:	I805 / Miscellaneous Retaining Walls		
Drawn:	NJT	Contract No:	38008-017046.00
Date:	October, 2008	Figure:	II-4

NOTE: This figure may contain areas of color. TESD cannot be responsible for any subsequent misinterpretation of the information resulting from black and white reproductions of this figure.

Soil Consolidation



Sample Loaded @ Field Moisture

Sample Saturated

Sample Tested Under Rebound Loading

SCHEMATIC ONLY - NOT A CONSTRUCTION DRAWING

Boring Location: A-08-004 [444+10 CL]
Depth: 3.0 m
Soil Classification (USCS): CL

Bureau Veritas North America, Inc.
7895 Convoy Court, Suite 18
San Diego, CA 92111
Tel: (858) 715-5800 Fax: (858) 715-5810

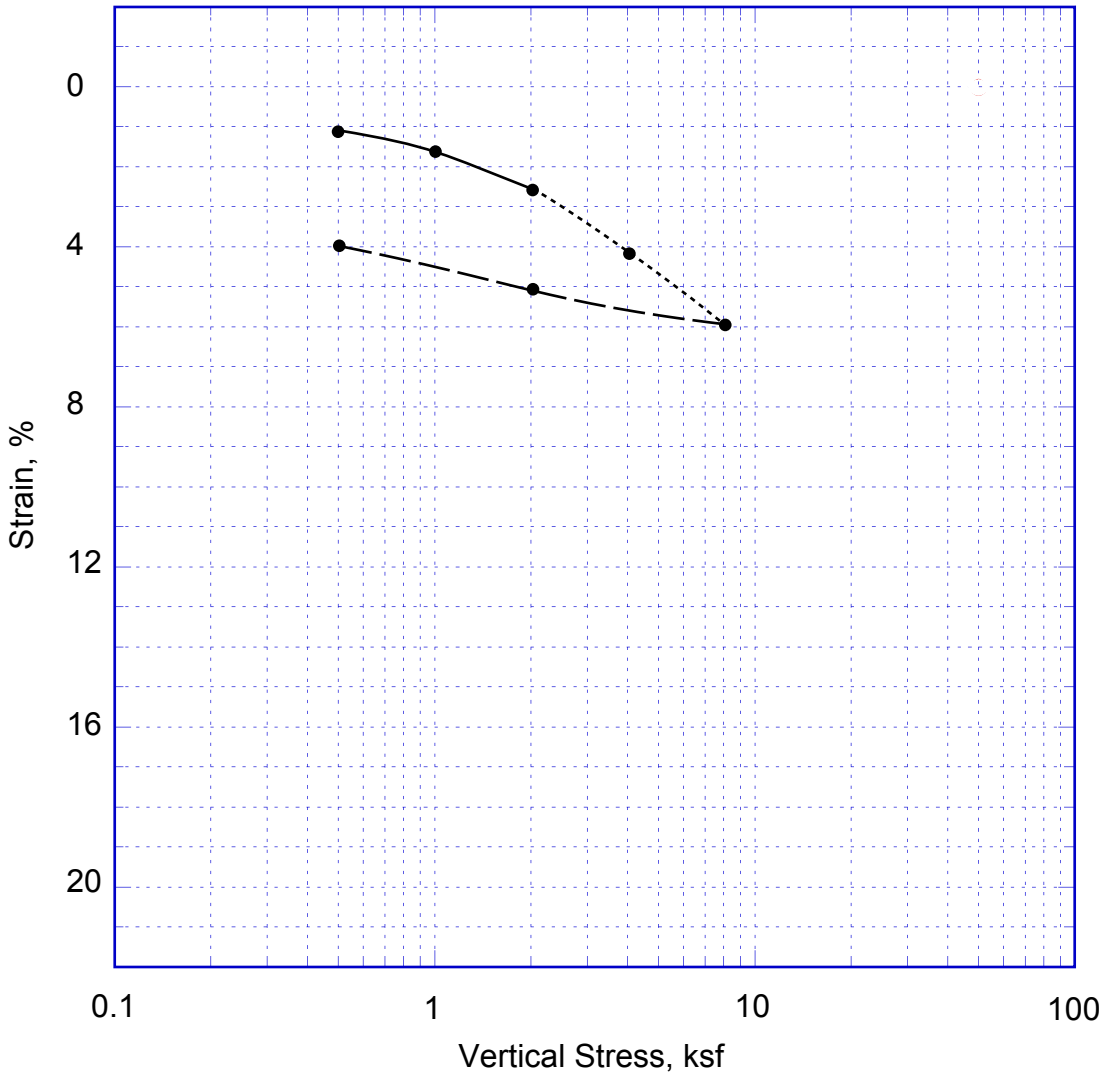
Title: **Consolidation Test Result**

Project: I805 / Miscellaneous Retaining Walls

Drawn:	NJT	Contract No:	38008-017046.00
Date:	October, 2008	Figure:	II-5

NOTE: This figure may contain areas of color. TESD cannot be responsible for any subsequent misinterpretation of the information resulting from black and white reproductions of this figure.

Soil Consolidation



——————— Sample Loaded @ Field Moisture

---------- Sample Saturated

— — — — — Sample Tested Under Rebound Loading

SCHEMATIC ONLY - NOT A CONSTRUCTION DRAWING

Boring Location: A-08-005 [444+85 15 LT]
Depth: 3.0 m
Soil Classification (USCS): CL

Bureau Veritas North America, Inc.
7895 Convoy Court, Suite 18
San Diego, CA 92111
Tel: (858) 715-5800 Fax: (858) 715-5810

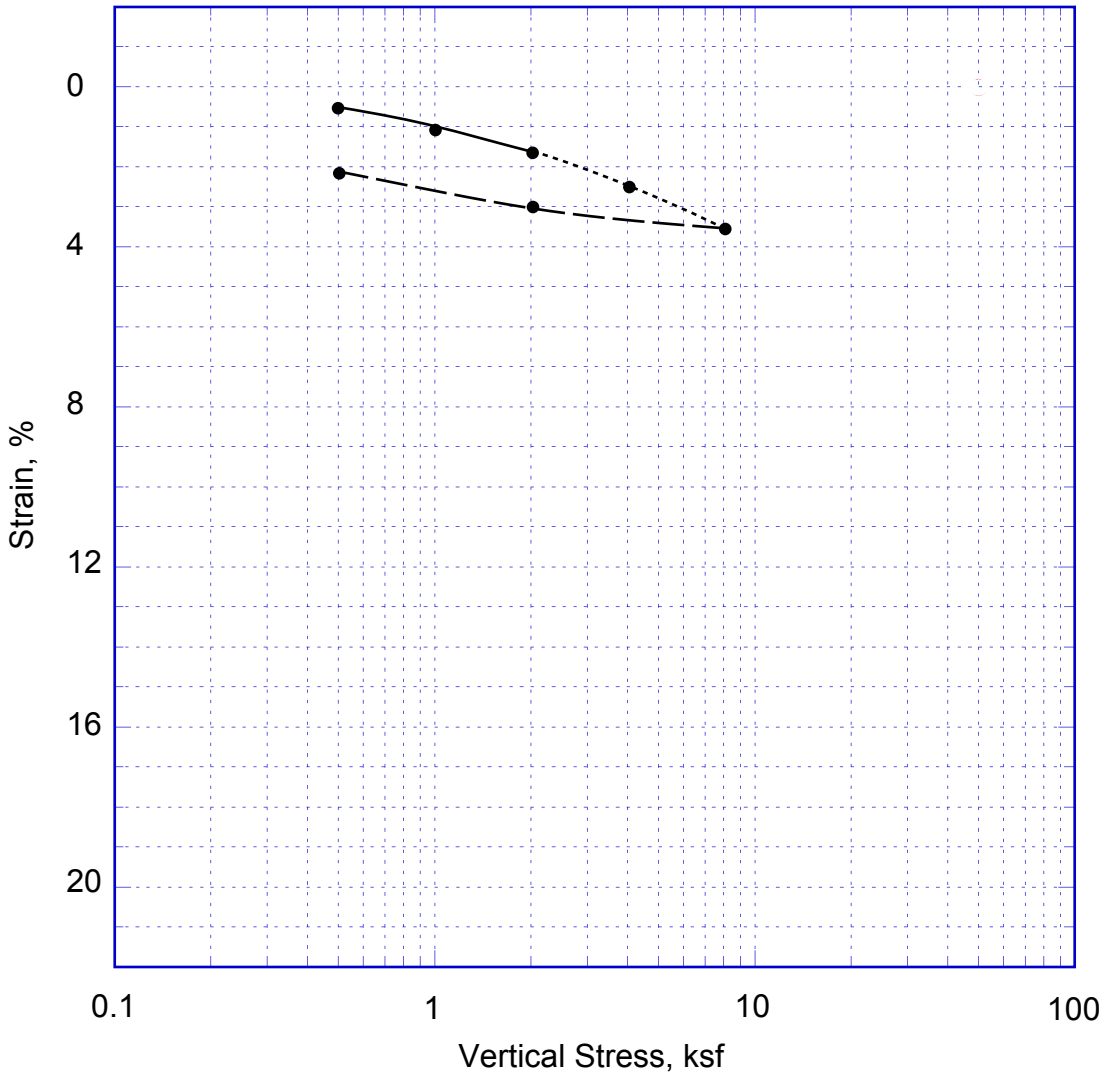
Title: **Consolidation Test Result**

Project: I805 / Miscellaneous Retaining Walls

Drawn:	NJT	Contract No:	38008-017046.00
Date:	October, 2008	Figure:	II-6

NOTE: This figure may contain areas of color. TESD cannot be responsible for any subsequent misinterpretation of the information resulting from black and white reproductions of this figure.

Soil Consolidation



——————— Sample Loaded @ Field Moisture

---------- Sample Saturated

— — — — — Sample Tested Under Rebound Loading

SCHEMATIC ONLY - NOT A CONSTRUCTION DRAWING

Boring Location: A-08-005 [444+85 15 LT]
Depth: 9.1 m
Soil Classification (USCS): CL

Bureau Veritas North America, Inc.
7895 Convoy Court, Suite 18
San Diego, CA 92111
Tel: (858) 715-5800 Fax: (858) 715-5810

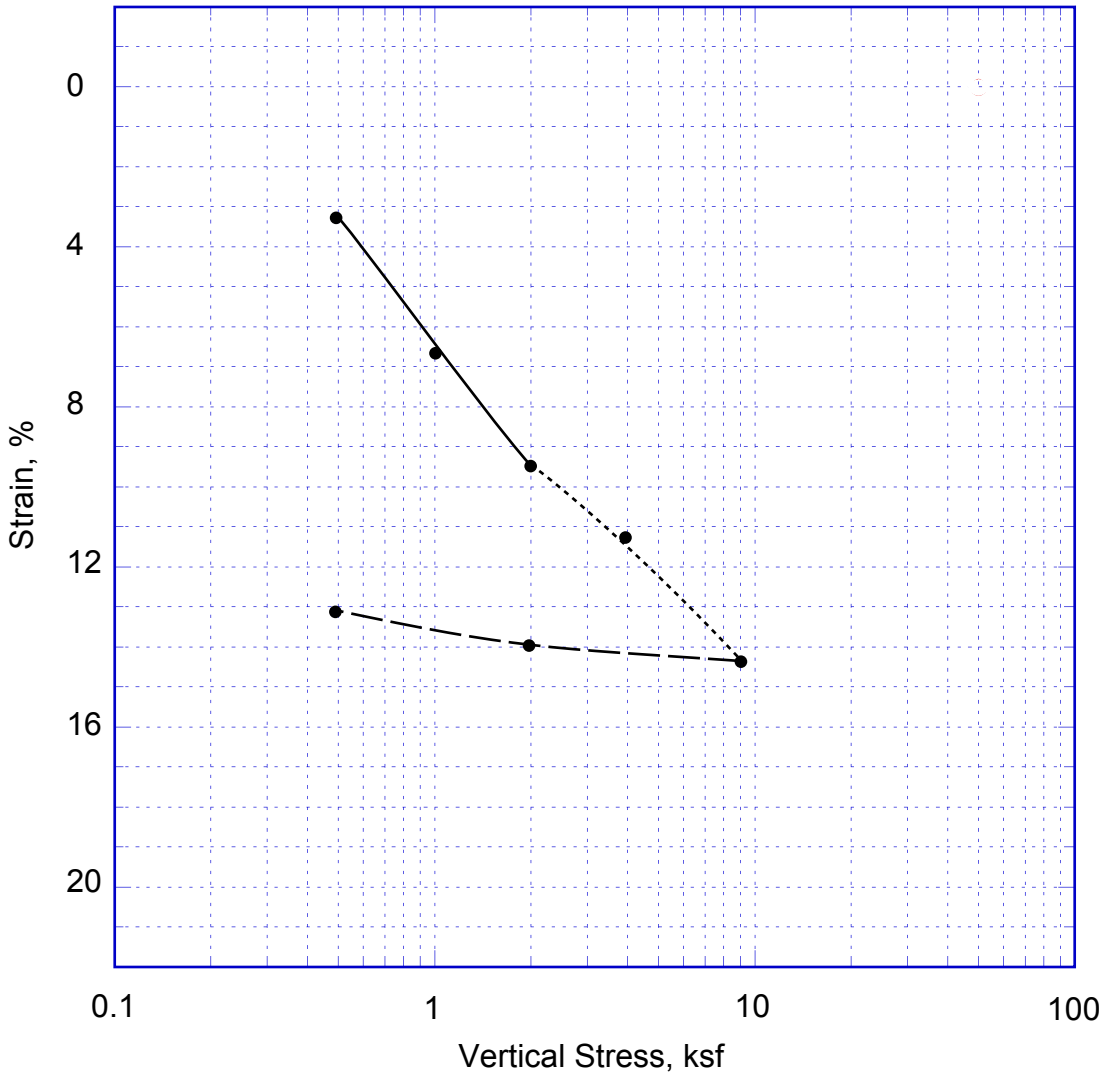
Title: **Consolidation Test Result**

Project: I805 / Miscellaneous Retaining Walls

Drawn:	NJT	Contract No:	38008-017046.00
Date:	October, 2008	Figure:	II-7

NOTE: This figure may contain areas of color. TESD cannot be responsible for any subsequent misinterpretation of the information resulting from black and white reproductions of this figure.

Soil Consolidation



——————— Sample Loaded @ Field Moisture

---------- Sample Saturated

— — — — — Sample Tested Under Rebound Loading

SCHEMATIC ONLY - NOT A CONSTRUCTION DRAWING

Boring Location: A-08-006 [441+82 6LT]
Depth: 3.0 m
Soil Classification (USCS): SC

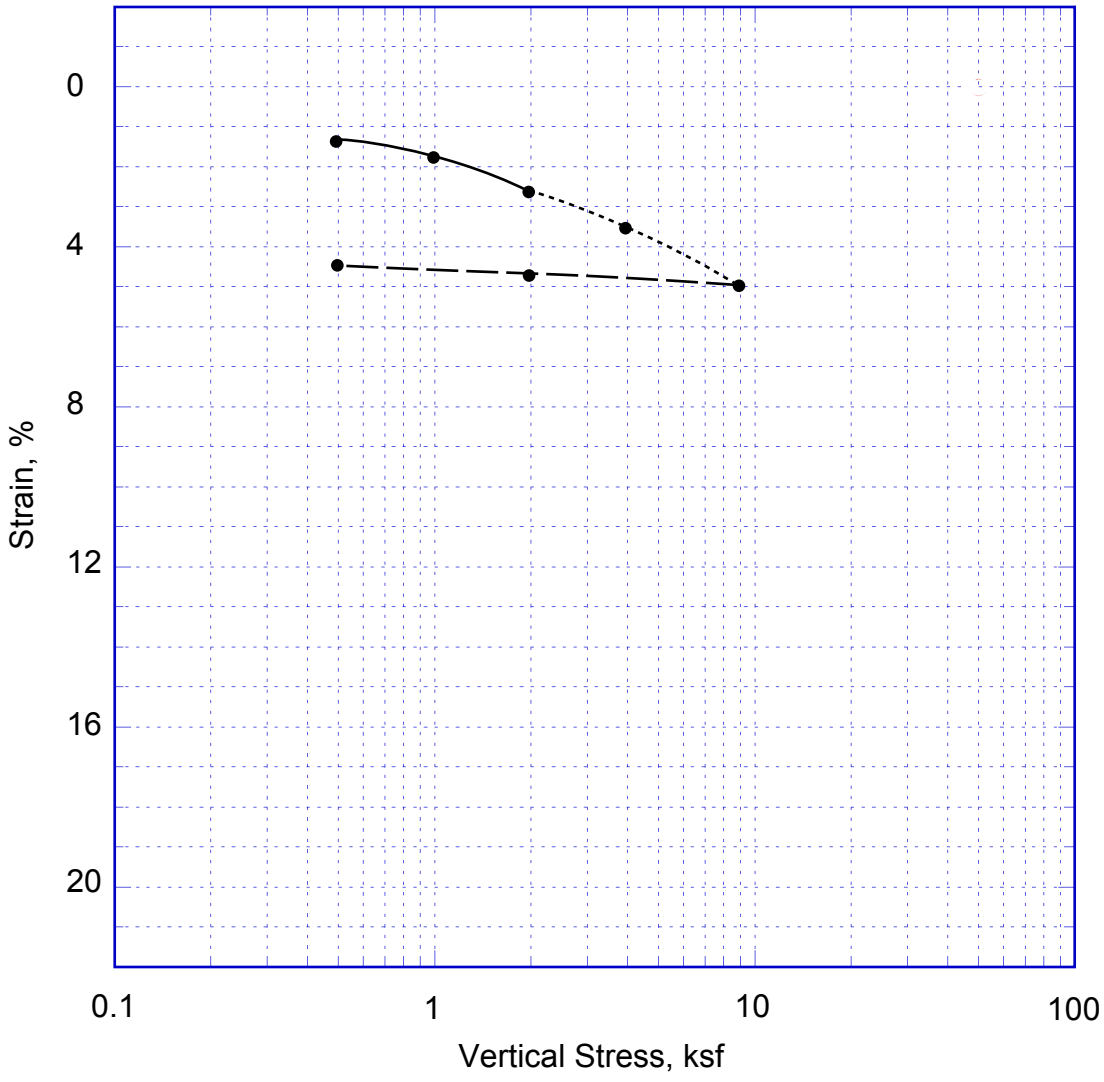
Bureau Veritas North America, Inc.
7895 Convoy Court, Suite 18
San Diego, CA 92111
Tel: (858) 715-5800 Fax: (858) 715-5810

Title: **Consolidation Test Result**

Project:	Carroll Canyon Road Bridge		
Drawn:	NJT	Contract No:	38008-017046.00
Date:	September, 2008	Figure:	II-8

NOTE: This figure may contain areas of color. TESD cannot be responsible for any subsequent misinterpretation of the information resulting from black and white reproductions of this figure.

Soil Consolidation



Sample Loaded @ Field Moisture

Sample Saturated

Sample Tested Under Rebound Loading

SCHEMATIC ONLY - NOT A CONSTRUCTION DRAWING

Boring Location: A-08-006 [441+82 6LT]
Depth: 9.1 m
Soil Classification (USCS): SM

Bureau Veritas North America, Inc.
7895 Convoy Court, Suite 18
San Diego, CA 92111
Tel: (858) 715-5800 Fax: (858) 715-5810

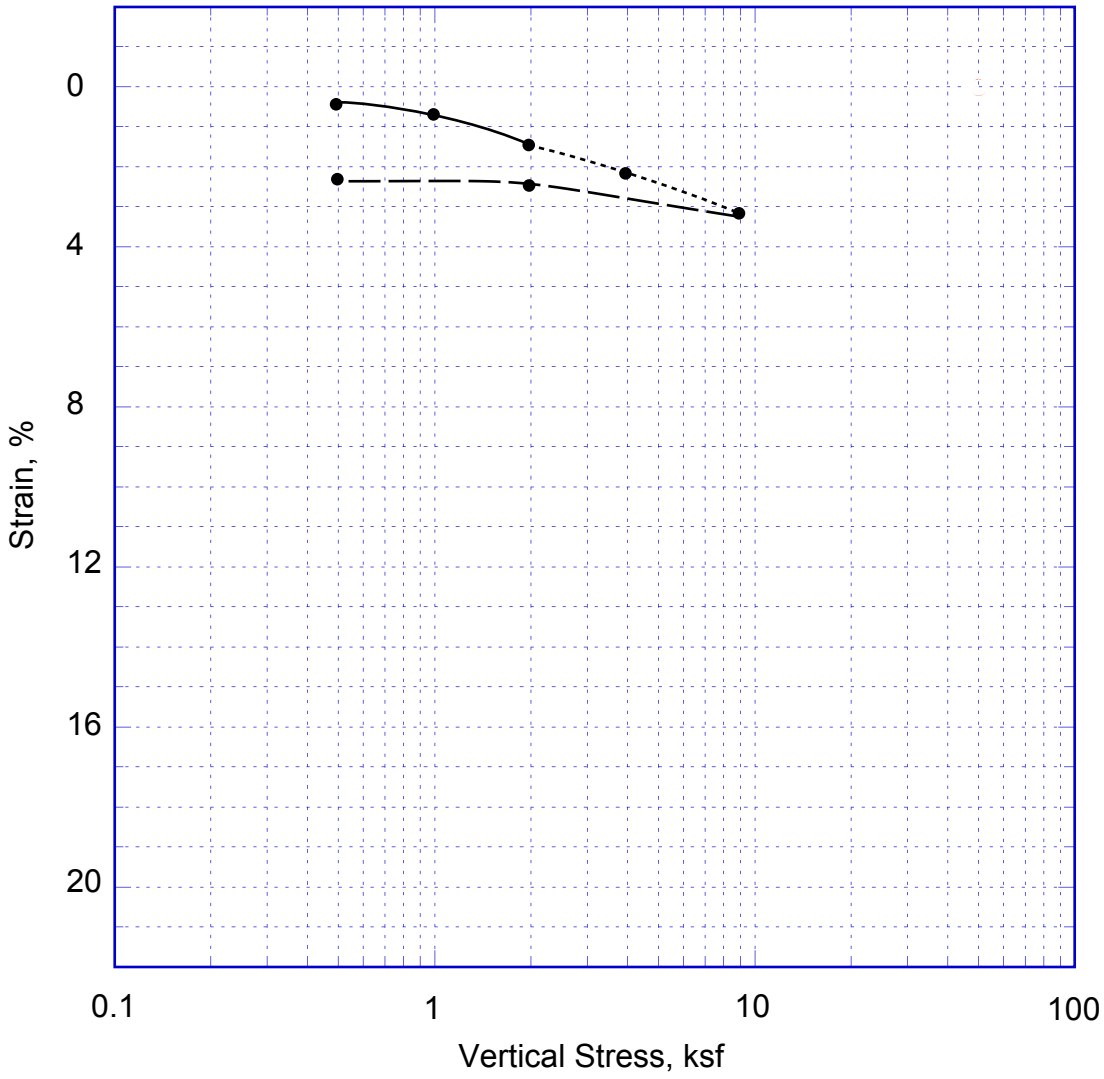
Title: **Consolidation Test Result**

Project: Carroll Canyon Road Bridge

Drawn:	NJT	Contract No:	38008-017046.00
Date:	September, 2008	Figure:	II-9

NOTE: This figure may contain areas of color. TESD cannot be responsible for any subsequent misinterpretation of the information resulting from black and white reproductions of this figure.

Soil Consolidation



——————— Sample Loaded @ Field Moisture

---------- Sample Saturated

— — — — — Sample Tested Under Rebound Loading

SCHEMATIC ONLY - NOT A CONSTRUCTION DRAWING

Boring Location: A-08-007 [443+82 6RT]
Depth: 4.6 m
Soil Classification (USCS): SC

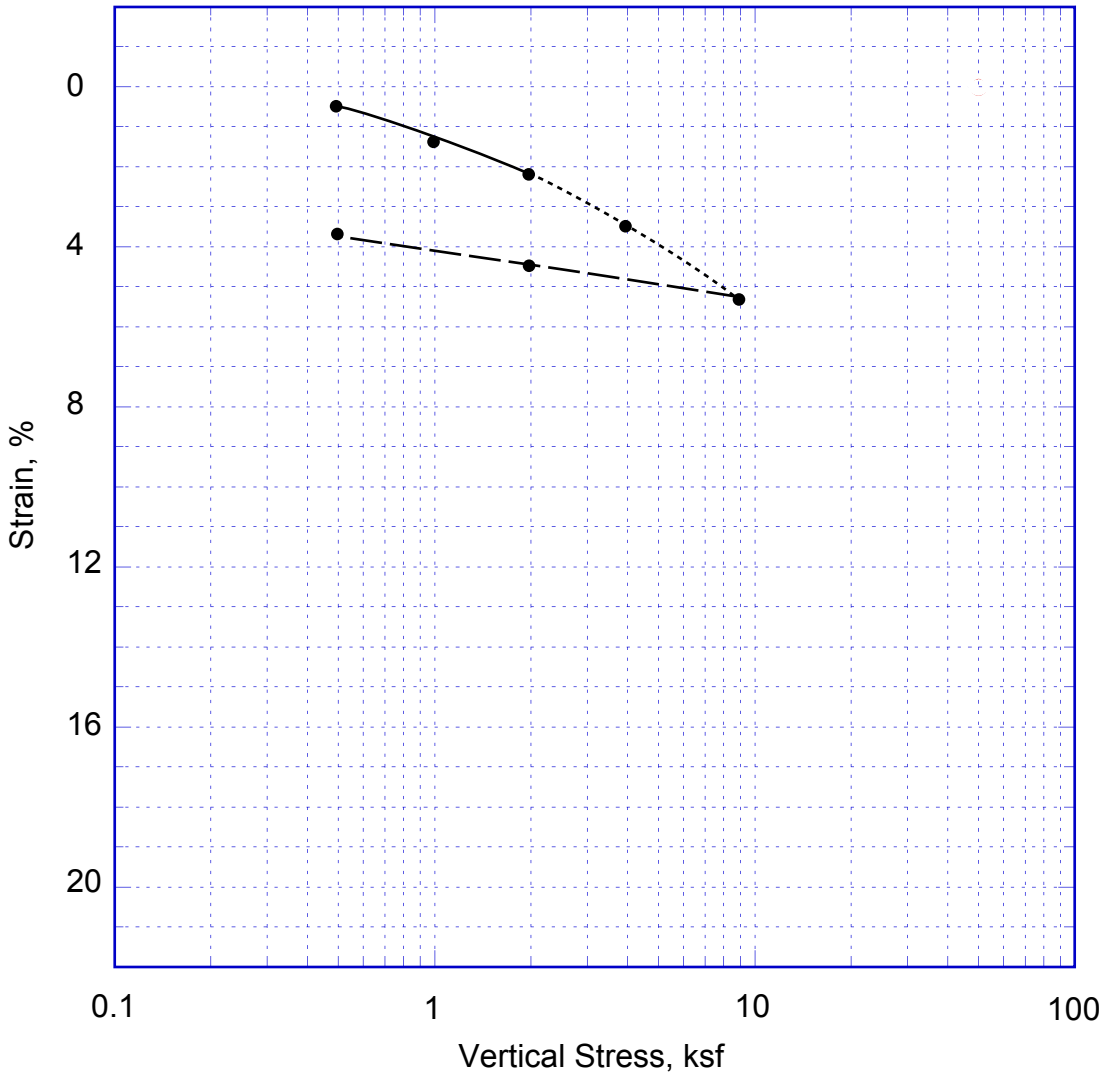
Bureau Veritas North America, Inc.
7895 Convoy Court, Suite 18
San Diego, CA 92111
Tel: (858) 715-5800 Fax: (858) 715-5810

Title: **Consolidation Test Result**

Project:	Carroll Canyon Road Bridge		
Drawn:	NJT	Contract No:	38008-017046.00
Date:	September, 2008	Figure:	II-10

NOTE: This figure may contain areas of color. TESD cannot be responsible for any subsequent misinterpretation of the information resulting from black and white reproductions of this figure.

Soil Consolidation



——————— Sample Loaded @ Field Moisture

---------- Sample Saturated

— — — — — Sample Tested Under Rebound Loading

SCHEMATIC ONLY - NOT A CONSTRUCTION DRAWING

Boring Location: A-08-009 [443+82 6LT]
Depth: 4.6 m
Soil Classification (USCS): SC

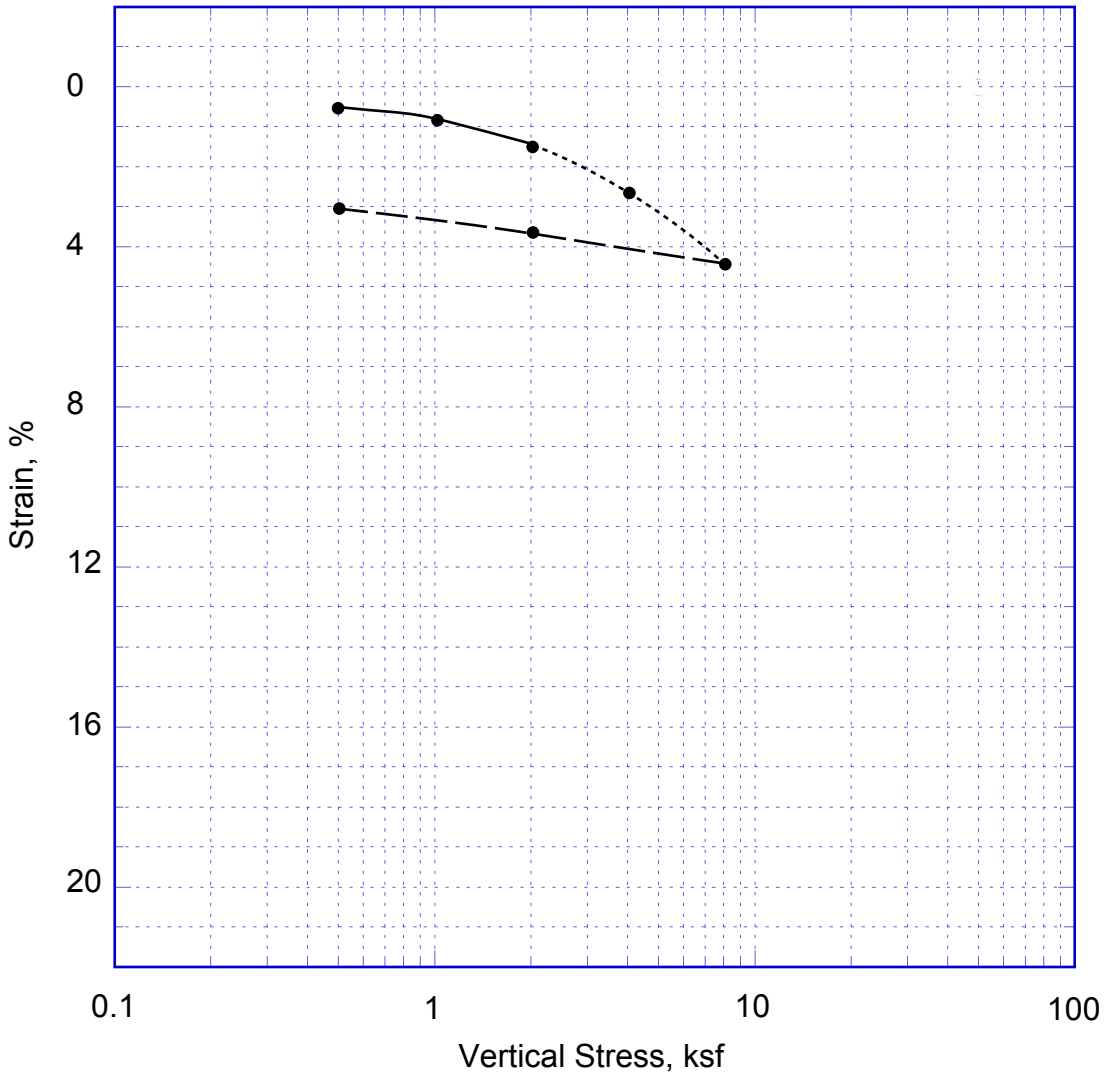
Bureau Veritas North America, Inc.
7895 Convoy Court, Suite 18
San Diego, CA 92111
Tel: (858) 715-5800 Fax: (858) 715-5810

Title: **Consolidation Test Result**

Project:	Carroll Canyon Road Bridge		
Drawn:	NJT	Contract No:	38008-017046.00
Date:	September, 2008	Figure:	II-11

NOTE: This figure may contain areas of color. TESD cannot be responsible for any subsequent misinterpretation of the information resulting from black and white reproductions of this figure.

Soil Consolidation



——————— Sample Loaded @ Field Moisture

---------- Sample Saturated

— — — — — Sample Tested Under Rebound Loading

SCHEMATIC ONLY - NOT A CONSTRUCTION DRAWING

Boring Location: A-08-010 [444+00 15 RT]
Depth: 3.0 m
Soil Classification (USCS): SM

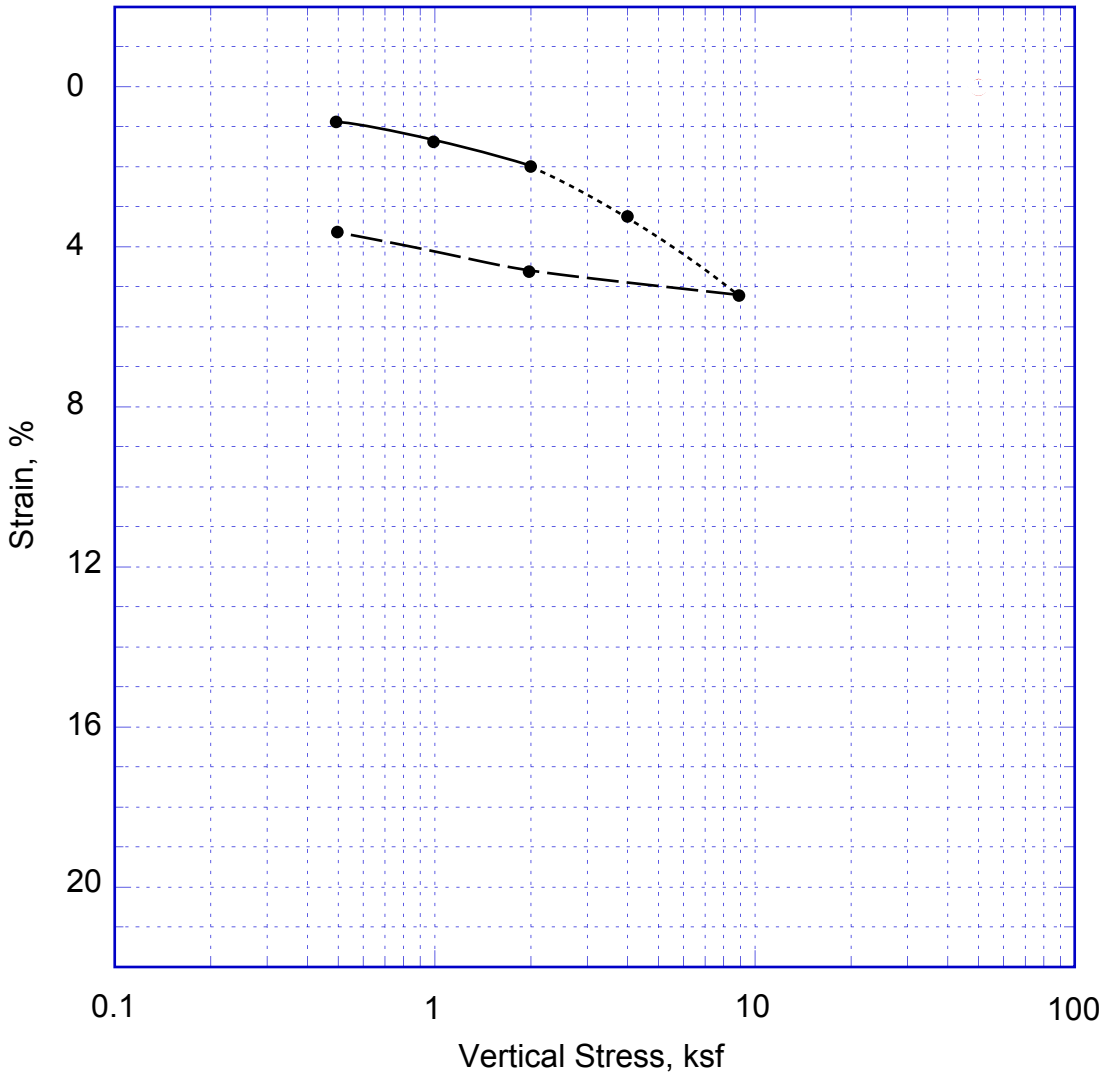
Bureau Veritas North America, Inc.
7895 Convoy Court, Suite 18
San Diego, CA 92111
Tel: (858) 715-5800 Fax: (858) 715-5810

Title: **Consolidation Test Result**

Project:	I805 / Miscellaneous Retaining Walls		
Drawn:	NJT	Contract No:	38008-017046.00
Date:	October, 2008	Figure:	II-12

NOTE: This figure may contain areas of color. TESD cannot be responsible for any subsequent misinterpretation of the information resulting from black and white reproductions of this figure.

Soil Consolidation



Sample Loaded @ Field Moisture

Sample Saturated

Sample Tested Under Rebound Loading

SCHEMATIC ONLY - NOT A CONSTRUCTION DRAWING

Boring Location: A-08-044 [444+50 3RT]
Depth: 3.0 m
Soil Classification (USCS): SC

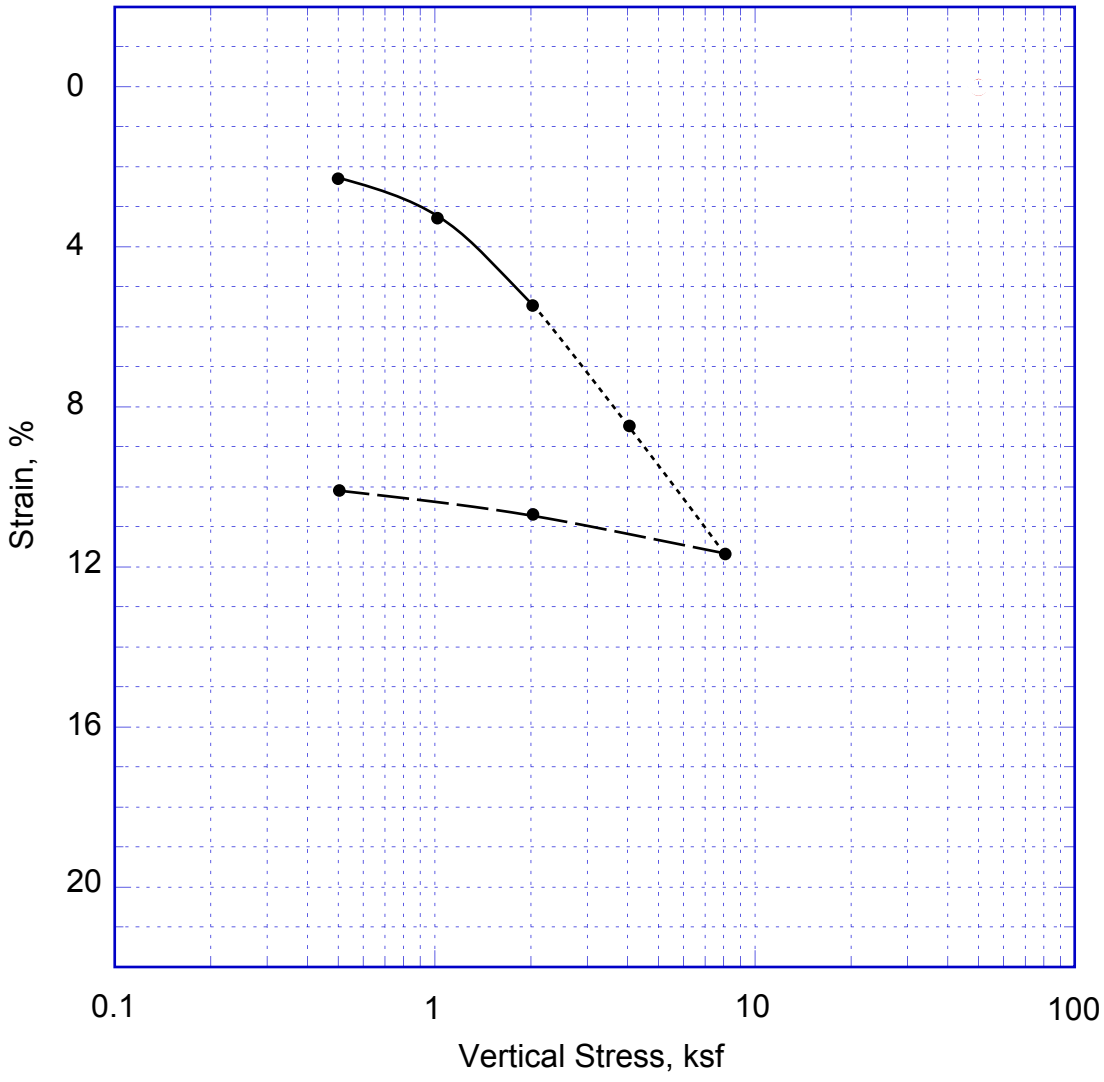
Bureau Veritas North America, Inc.
7895 Convoy Court, Suite 18
San Diego, CA 92111
Tel: (858) 715-5800 Fax: (858) 715-5810

Title: **Consolidation Test Result**

Project:	DAR Retaining Walls		
Drawn:	NJT	Contract No:	38008-017046.00
Date:	December, 2008	Figure:	II-13

NOTE: This figure may contain areas of color. BVNA cannot be responsible for any subsequent misinterpretation of the information resulting from black and white reproductions of this figure.

Soil Consolidation



Sample Loaded @ Field Moisture

Sample Saturated

Sample Tested Under Rebound Loading

SCHEMATIC ONLY - NOT A CONSTRUCTION DRAWING

Boring Location: A-08-052 [445+60]
Depth: 13.7 m
Soil Classification (USCS): CL

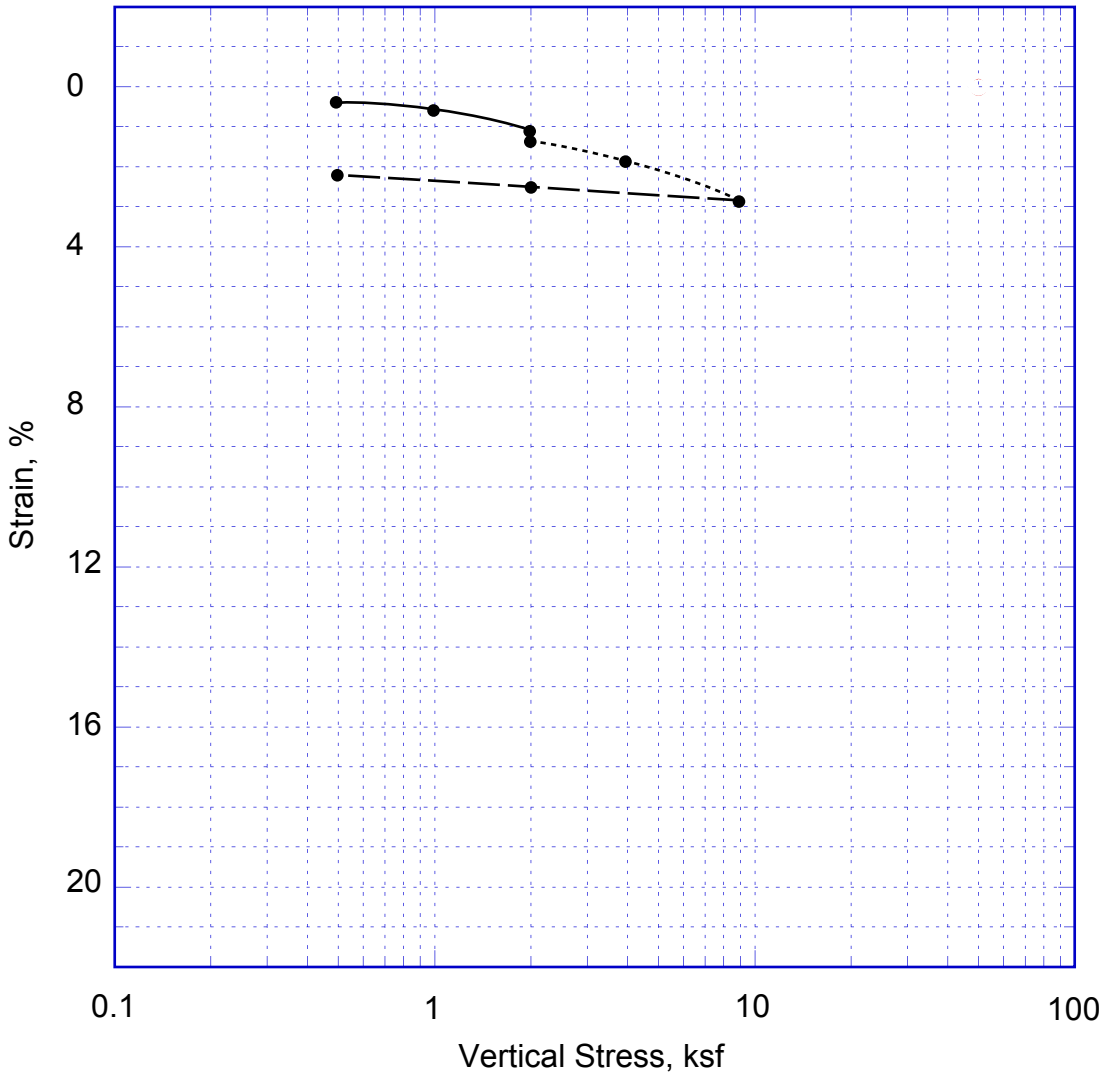
Bureau Veritas North America, Inc.
7895 Convoy Court, Suite 18
San Diego, CA 92111
Tel: (858) 715-5800 Fax: (858) 715-5810

Title:	**Consolidation Test Result**
Project:	I805 / Miscellaneous Retaining Walls

Drawn:	NJT	Contract No:	38008-017046.00
Date:	October, 2008	Figure:	II-14

NOTE: This figure may contain areas of color. TESD cannot be responsible for any subsequent misinterpretation of the information resulting from black and white reproductions of this figure.

Soil Consolidation



——————— Sample Loaded @ Field Moisture

---------- Sample Saturated

— — — — — Sample Tested Under Rebound Loading

SCHEMATIC ONLY - NOT A CONSTRUCTION DRAWING

Boring Location: A-08-056 [447+35]
Depth: 16.8 m
Soil Classification (USCS): SC

Bureau Veritas North America, Inc.
7895 Convoy Court, Suite 18
San Diego, CA 92111
Tel: (858) 715-5800 Fax: (858) 715-5810

Title: **Consolidation Test Result**

Project:	Miscellaneous Retaining Walls		
Drawn:	NJT	Contract No:	38008-017046.00
Date:	December, 2008	Figure:	II-15

NOTE: This figure may contain areas of color. BVNA cannot be responsible for any subsequent misinterpretation of the information resulting from black and white reproductions of this figure.

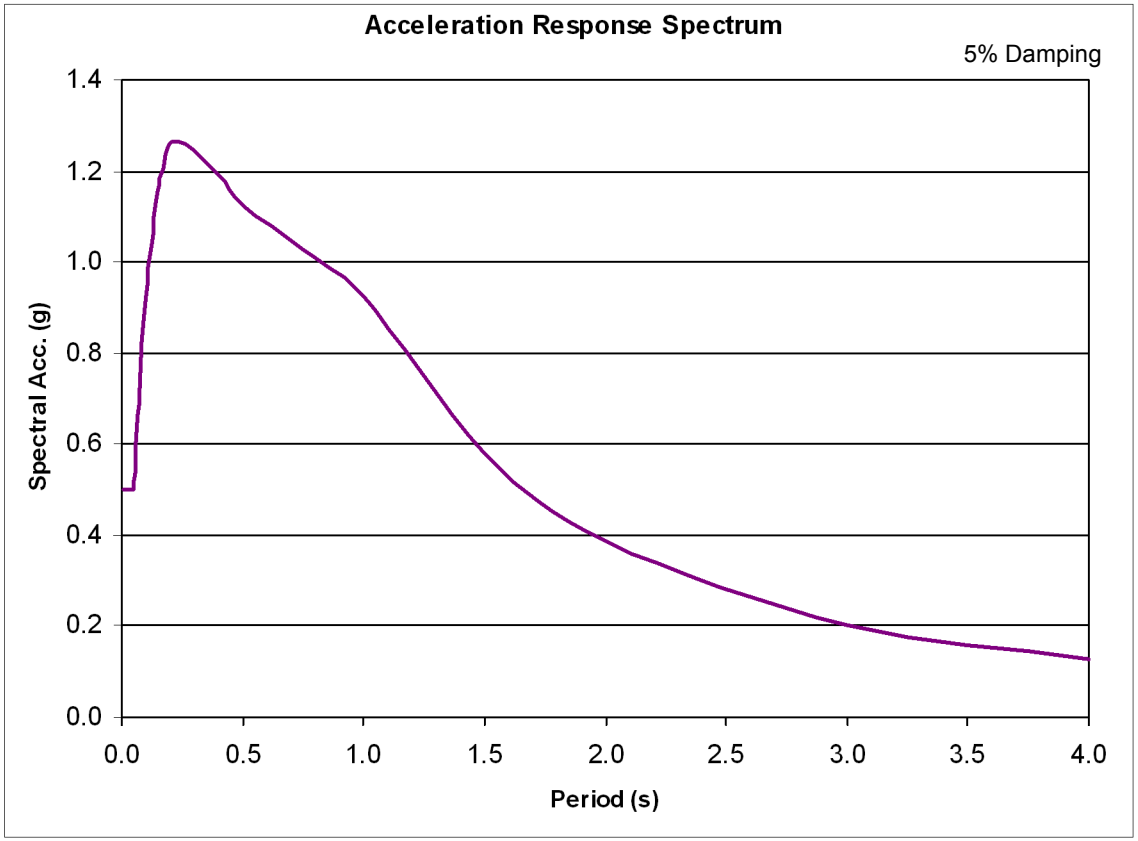
APPENDIX III

ANALYSES AND CALCULATIONS

APPENDIX III.1

SEISMIC ANALYSES DATA

Period (s)	ARS (g)[1]
0.010	0.5003
0.020	0.5003
0.030	0.5002
0.050	0.5002
0.075	0.7192
0.100	0.9186
0.120	1.0367
0.150	1.1564
0.170	1.2091
0.200	1.2591
0.240	1.2660
0.300	1.2467
0.400	1.1898
0.500	1.1249
0.750	1.0258
1.000	0.9267
1.500	0.5807
2.000	0.3856
3.000	0.2038
4.000	0.1277



Fault: Newport-Inglewood-Rose Canyon/East
Style: Strike-Slip
Magnitude 7
R(km) 6.1
PBA 0.5g
Note: ARS curve was obtained from Fig B-8 of Seismic Design Criteria, June 2006, Version 1.4
[1] Spectral Acceleration Values were magnified by 20% for T >= 1.0 seconds, since project site is within 15 km of an active fault zone

SCHEMATIC ONLY - NOT TO SCALE - NOT A CONSTRUCTION DRAWING

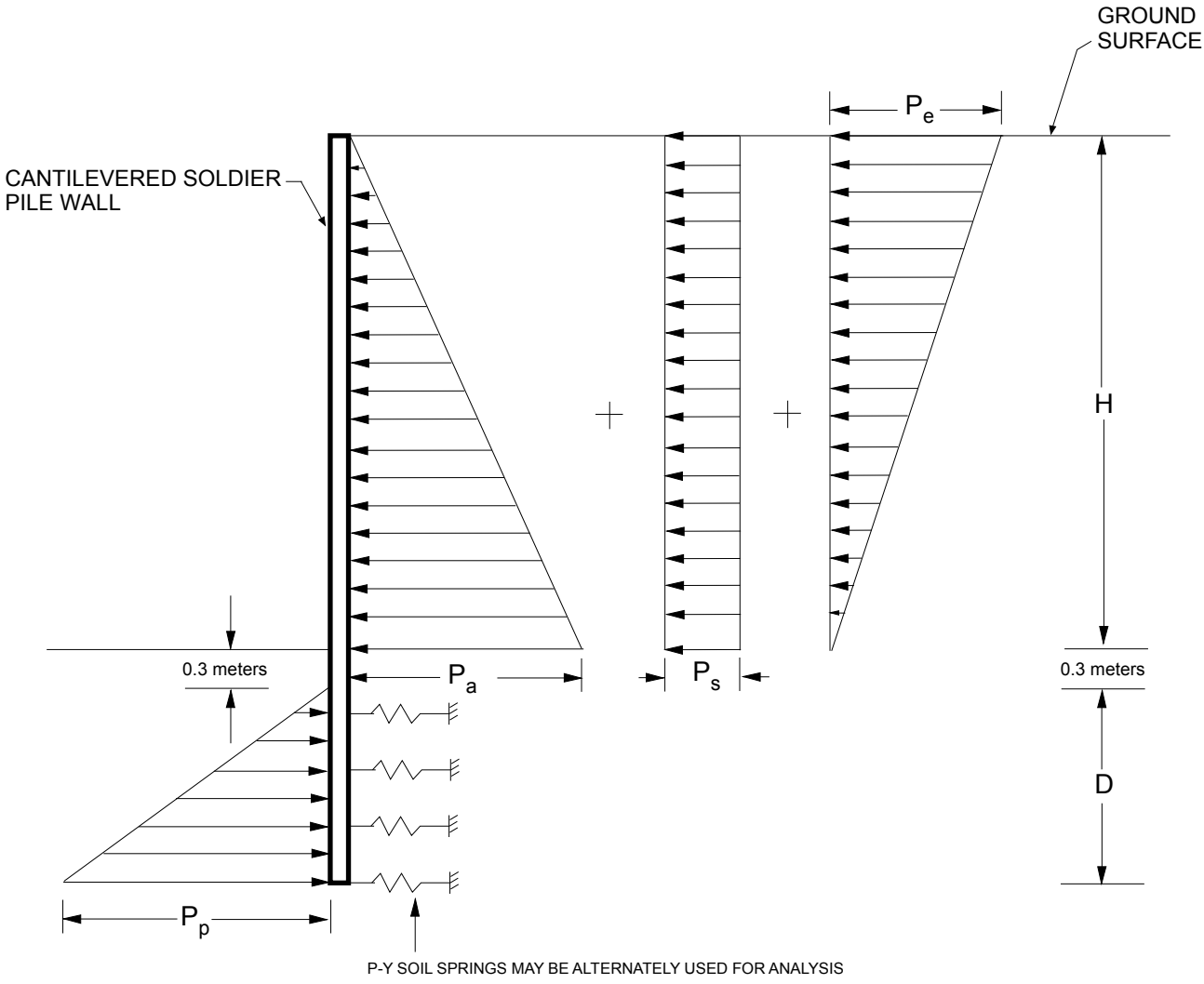
BUREAU VERITAS NORTH AMERICA, INC.
Testing Engineers San Diego
7895 Convoy Court, Suite 18
San Diego, CA 92111

Title:	**Acceleration Response Spectrum**		
Project:	DIRECT ACCESS RAMP		
Drawn:	MPP	Contract No:	38008-017046.00 (SANDAG T.O. 46)
Date:	April, 2008	Figure No:	Appendix III.1

APPENDIX III.2

LATERAL EARTH PRESSURE DISTRIBUTIONS

LATERAL EARTH PRESSURE DISTRIBUTION ON CANTILEVERED SOLDIER PILE WALL



NOTES:

1. ACTIVE PRESSURE, P_a
   P_a = 5.97H kPa (equivalent to 38H psf in imperial units)
2. CONSTRUCTION TRAFFIC SURCHAGE PRESSURE, P_s
   P_s = 5.75 kPa (equivalent to 120 psf in imperial units)
3. PASSIVE PRESSURE, P_p
   P_p = 58.92D kPa (equivalent to 375D psf in imperial units)
4. LATERAL PRESSURE DUE TO EARTHQUAKE LOADING, P_e
   P_e = 3.14H kPa (equivalent to 20H psf in imperial units)
5. SURCHARGES FROM EXCAVATED SOIL OR CONSTRUCTION MATERIALS ARE NOT INCLUDED
6. 'H' and 'D' ARE IN METERS

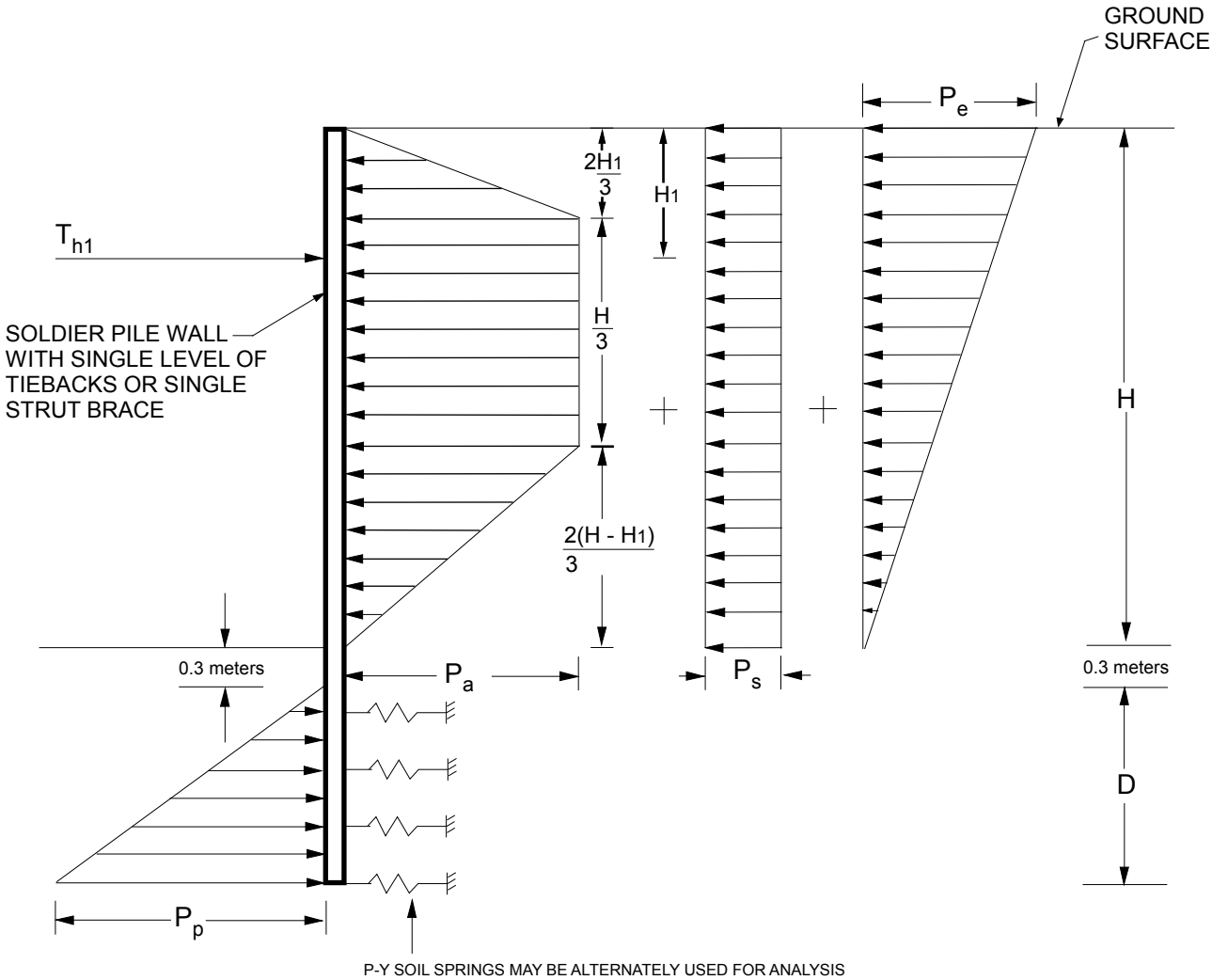
SCHEMATIC ONLY - NOT TO SCALE - NOT A CONSTRUCTION DRAWING

BUREAU VERITAS NORTH AMERICA, INC.
Testing Engineers San Diego
7895 Convoy Court, Suite 18
San Diego, CA 92111

Title:	**Lateral Earth Pressure on Cantilevered Soldier Pile Wall**
Project:	DIRECT ACCESS RAMP
Drawn: MPP	Contract No: 38008-017046.00 (SANDAG T.O. 46)
Date: April, 2008	Figure No: Appendix III.2.1

NOTE: This figure may contain areas of color. BVNA cannot be responsible for any subsequent misinterpretation of the information resulting from black and white reproductions of this figure.

LATERAL EARTH PRESSURE DISTRIBUTION ON SOLDIER PILE WALL WITH SINGLE LEVEL OF TIEBACKS OR SINGLE STRUT BRACE



NOTES:

1. LATERAL EARTH PRESSURE, P_a
   P_a = 5.66H kPa (equivalent to 36H psf in imperial units)
2. CONSTRUCTION TRAFFIC SURCHAGE PRESSURE, P_s
   P_s = 5.75 kPa (equivalent to 120 psf in imperial units)
3. PASSIVE PRESSURE, P_p
   P_p = 58.92D kPa (equivalent to 375D psf in imperial units)
4. LATERAL PRESSURE DUE TO EARTHQUAKE LOADING, P_e
   P_e = 3.14H kPa (equivalent to 20H psf in imperial units)
5. SURCHARGES FROM EXCAVATED SOIL OR CONSTRUCTION MATERIALS ARE NOT INCLUDED
6. 'H', 'H_1' and 'D' ARE IN METERS.

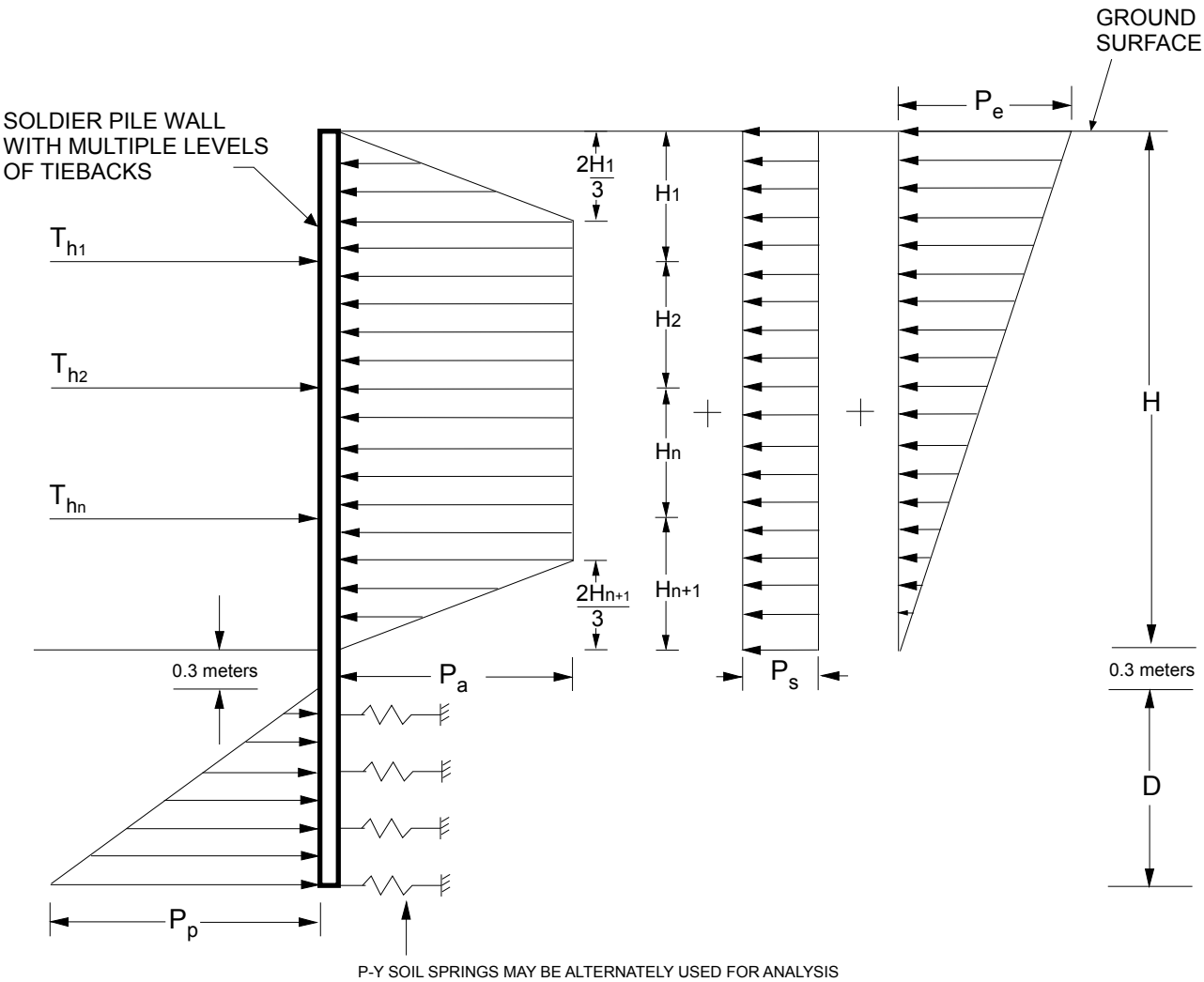
SCHEMATIC ONLY - NOT TO SCALE - NOT A CONSTRUCTION DRAWING

BUREAU VERITAS NORTH AMERICA, INC.
Testing Engineers San Diego
7895 Convoy Court, Suite 18
San Diego, CA 92111

Title:	**Lateral Earth Pressure on Soldier Pile Wall with Single Level of Tieback/ Strut Brace**
Project:	DIRECT ACCESS RAMP
Drawn: MPP	Contract No: 38008-017046.00 (SANDAG T.O. 46)
Date: April, 2008	Figure No: Appendix III.2.2

NOTE: This figure may contain areas of color. BVNA cannot be responsible for any subsequent misinterpretation of the information resulting from black and white reproductions of this figure.

LATERAL EARTH PRESSURE DISTRIBUTION ON SOLDIER PILE WALL WITH MULTIPLE LEVELS OF TIEBACKS



NOTES:

1. LATERAL EARTH PRESSURE, P_a
   P_a = 5.66H kPa (equivalent to 36H psf in imperial units)
2. CONSTRUCTION TRAFFIC SURCHAGE PRESSURE, P_s
   P_s = 5.75 kPa (equivalent to 120 psf in imperial units)
3. PASSIVE PRESSURE, P_p
   P_p = 58.92D kPa (equivalent to 375D psf in imperial units)
4. LATERAL PRESSURE DUE TO EARTHQUAKE LOADING, P_e
   P_e = 3.14H kPa (equivalent to 20H psf in imperial units)
5. SURCHARGES FROM EXCAVATED SOIL OR CONSTRUCTION MATERIALS ARE NOT INCLUDED
6. 'H', 'H_1', 'H_n', 'H_{n+1}', and 'D' ARE IN METERS.

SCHEMATIC ONLY - NOT TO SCALE - NOT A CONSTRUCTION DRAWING

BUREAU VERITAS NORTH AMERICA, INC.
Testing Engineers San Diego
7895 Convoy Court, Suite 18
San Diego, CA 92111

Title:	**Lateral Earth Pressure on Soldier Pile Wall with Multiple Levels of Tiebacks/Struts**
Project:	DIRECT ACCESS RAMP
Drawn: MPP	Contract No: 38008-017046.00 (SANDAG T.O. 46)
Date: April, 2008	Figure No: Appendix III.2.3

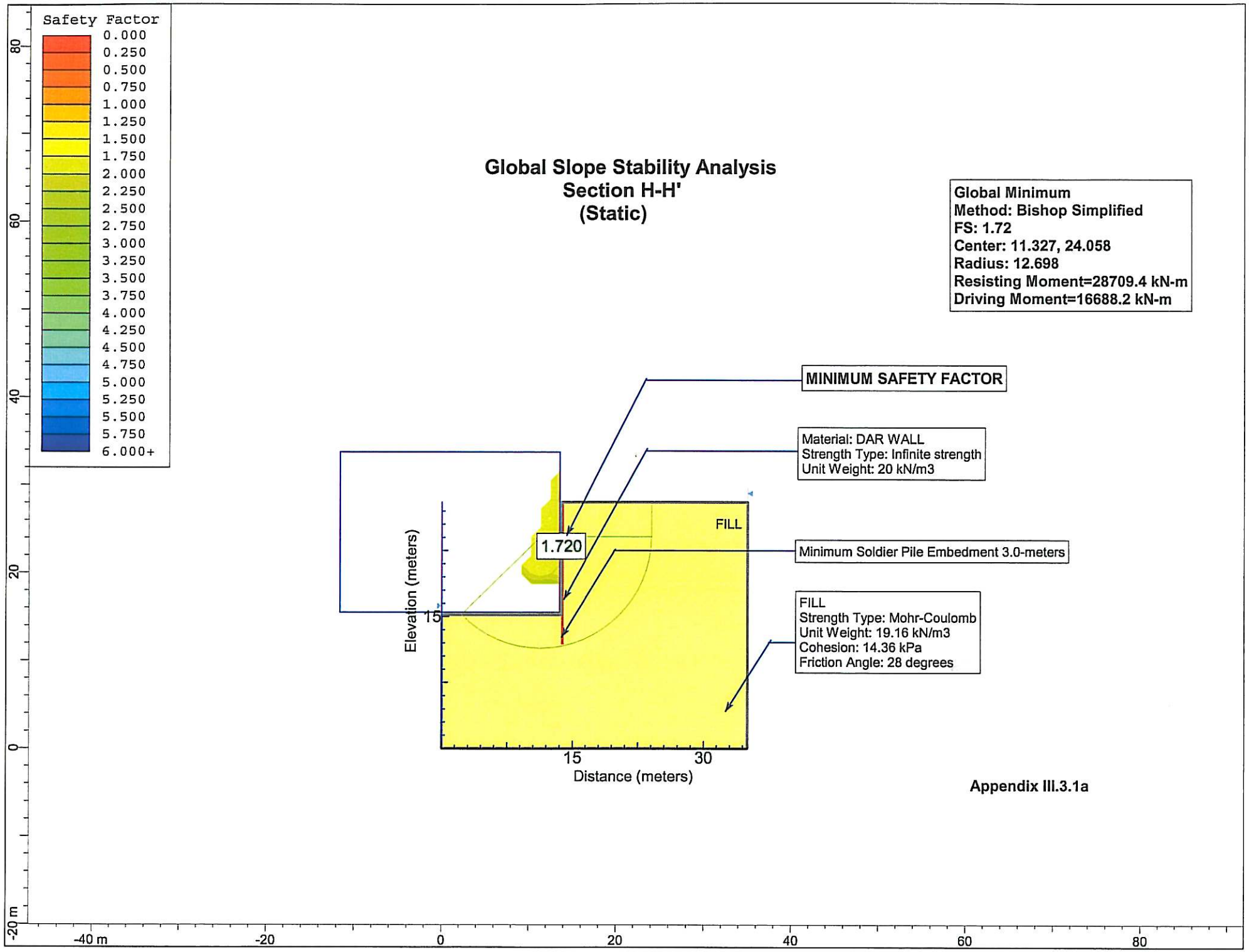
NOTE: This figure may contain areas of color. BVNA cannot be responsible for any subsequent misinterpretation of the information resulting from black and white reproductions of this figure.

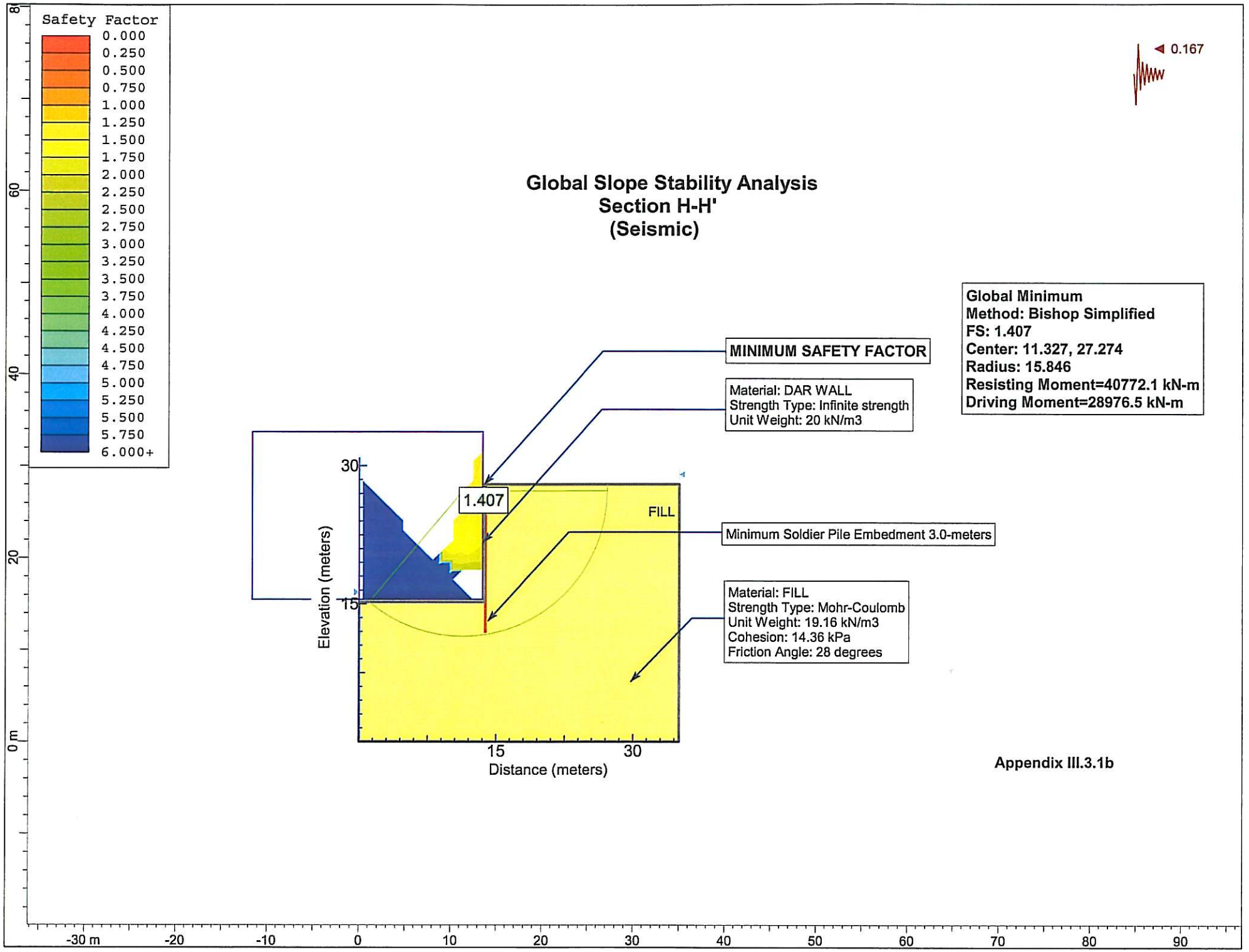
APPENDIX III.3

SLOPE STABILITY ANALYSES RESULTS

APPENDIX III.3.1

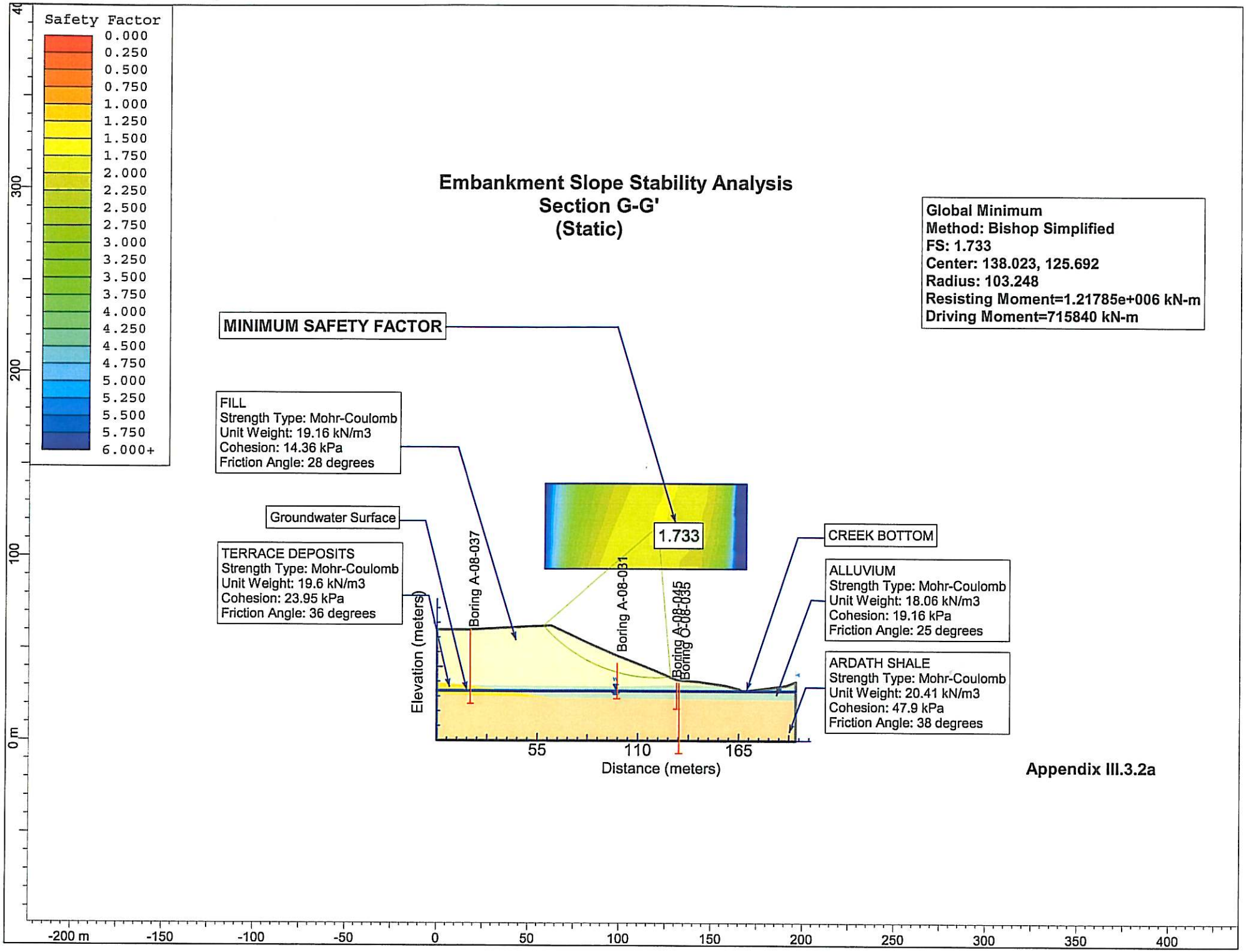
GLOBAL STABILITY ANALYSES RESULTS


Safety Factor
0.000
0.250
0.500
0.750
1.000
1.250
1.500
1.750
2.000
2.250
2.500
2.750
3.000
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
Global Slope Stability Analysis
Section H-H'
(Static)
Global Minimum
Method: Bishop Simplified
FS: 1.72
Center: 11.327, 24.058
Radius: 12.698
Resisting Moment=28709.4 kN-m
Driving Moment=16688.2 kN-m
MINIMUM SAFETY FACTOR
Material: DAR WALL
Strength Type: Infinite strength
Unit Weight: 20 kN/m3
Minimum Soldier Pile Embedment 3.0-meters
FILL
Strength Type: Mohr-Coulomb
Unit Weight: 19.16 kN/m3
Cohesion: 14.36 kPa
Friction Angle: 28 degrees
1.720
FILL
Elevation (meters)
15
15
30
Distance (meters)
Appendix III.3.1a
80
60
40
20
0
-20 m
-40 m
-20
0
20
40
60
80

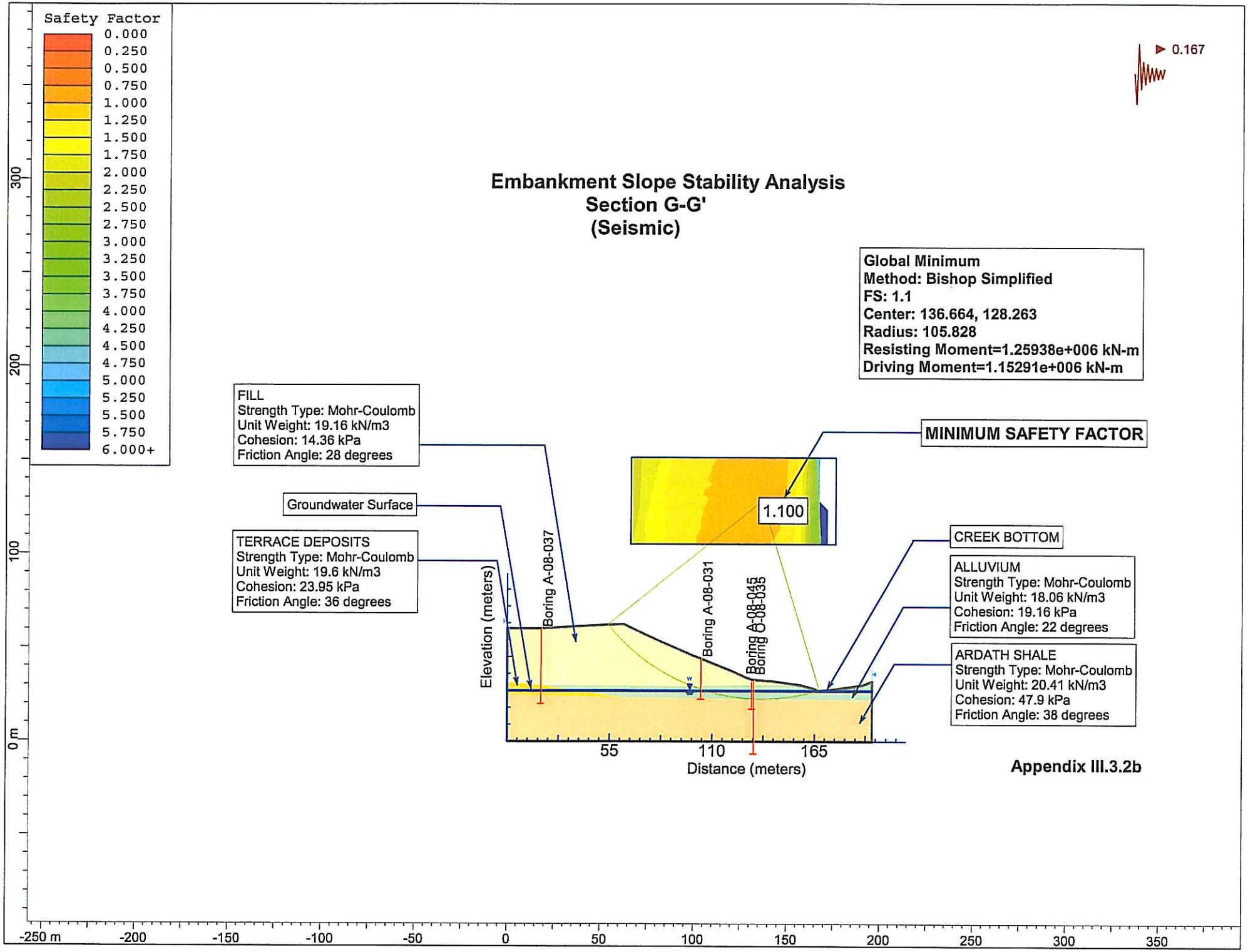

Safety Factor
0.000
0.250
0.500
0.750
1.000
1.250
1.500
1.750
2.000
2.250
2.500
2.750
3.000
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
0.167
Global Slope Stability Analysis
Section H-H'
(Seismic)
Global Minimum
Method: Bishop Simplified
FS: 1.407
Center: 11.327, 27.274
Radius: 15.846
Resisting Moment=40772.1 kN-m
Driving Moment=28976.5 kN-m
MINIMUM SAFETY FACTOR
Material: DAR WALL
Strength Type: Infinite strength
Unit Weight: 20 kN/m3
1.407
FILL
Minimum Soldier Pile Embedment 3.0-meters
Material: FILL
Strength Type: Mohr-Coulomb
Unit Weight: 19.16 kN/m3
Cohesion: 14.36 kPa
Friction Angle: 28 degrees
Elevation (meters)
Distance (meters)
80
60
40
20
0 m
-30 m
-20
-10
0
10
20
30
40
50
60
70
80
90
15
30
Appendix III.3.1b

APPENDIX III.3.2

EMBANKMENT STABILITY ANALYSES RESULTS



Appendix III.3.2a


Safety Factor
0.000
0.250
0.500
0.750
1.000
1.250
1.500
1.750
2.000
2.250
2.500
2.750
3.000
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
0.167
Embankment Slope Stability Analysis
Section G-G'
(Seismic)
Global Minimum
Method: Bishop Simplified
FS: 1.1
Center: 136.664, 128.263
Radius: 105.828
Resisting Moment=1.25938e+006 kN-m
Driving Moment=1.15291e+006 kN-m
FILL
Strength Type: Mohr-Coulomb
Unit Weight: 19.16 kN/m3
Cohesion: 14.36 kPa
Friction Angle: 28 degrees
MINIMUM SAFETY FACTOR
1.100
Groundwater Surface
TERRACE DEPOSITS
Strength Type: Mohr-Coulomb
Unit Weight: 19.6 kN/m3
Cohesion: 23.95 kPa
Friction Angle: 36 degrees
CREEK BOTTOM
ALLUVIUM
Strength Type: Mohr-Coulomb
Unit Weight: 18.06 kN/m3
Cohesion: 19.16 kPa
Friction Angle: 22 degrees
ARDATH SHALE
Strength Type: Mohr-Coulomb
Unit Weight: 20.41 kN/m3
Cohesion: 47.9 kPa
Friction Angle: 38 degrees
Boring A-08-037
Boring A-08-031
Boring A-08-045
Boring A-08-035
Elevation (meters)
300
200
100
0 m
55
110
165
Distance (meters)
-250 m
-200
-150
-100
-50
0
50
100
150
200
250
300
350
Appendix III.3.2b

State of California Business, Transportation and Housing Agency

Memorandum

To: MS. CHUNG-YUAN WEN
Structure Design
Office of Bridge Design – South 2
Bridge Design Branch 21
Diamond Bar, CA

Attention: Mr. Kumar Ghosh

Date: November 19, 2008

File: 11-SD-805 KP 43.546
11-267601
Mira Mesa Blvd UC (Widening)
Br. # 57-0785 R/L

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
Geotechnical Services
Office of Geotechnical Design – South 2, MS#5
Design Branch C

Subject: **Revised Foundation Recommendations**

A request for revised foundation recommendations was prepared by your Office on September 4, 2008. This revision request includes a foundation type recommendation for the proposed median widening and a new recommendation for the southbound, left side widening of Mira Mesa Boulevard Undercrossing, bridge number 57-0785 R/L. The recommendations in this report supercede the recommendations dated April 1, 2008 prepared by our office.

Our office has completed a foundation investigation for the proposed widening. The investigation consisted of a review of the "As-built" plans, and fieldwork consisting of a new mud rotary boring at the proposed project site. All elevations referenced in this memo are in meters (feet), and are referenced to the 1929 NGVD Datum. The foundation recommendations were based on the General Plans provided by DSD dated 3/06/08.

Project / Site Description

The existing project site is located in the City of Sorrento Valley, California, on State Route 805, south of Interstate Route 5. The proposed project consists of widening the median section to connect the left and right bridges, and widening the outside of the left bridge (southbound side).

Geology

The "As-built" Log of Test Boring (LOTB) describes the soils consisting of dense to very dense, silty gravelly SAND with clay, to lean CLAY with silt, sand and cobbles overlying iron stained light gray siltstone. The new boring, R-08-001 is located in the median near Abutment 1. This new boring revealed soils consisting of very stiff to hard lean clay with silt and some fine to coarse gravel. For site specific soil information, please refer to the LOTBs. A new set of LOTBs has been prepared for this project and has been forwarded to your office.

Ground water was not encountered during the 1969 field investigation for the original bridge, or during the field investigation of 2008. It should be noted that ground water levels will fluctuate with the change of seasons and other factors including local irrigation.

Seismicity

The controlling fault for this site is the Newport-Inglewood-Rose Canyon/East fault (NIE, strike slip type). The site is located approximately 4.8 km (3 mi) southwest of the fault. The NIE fault is capable of generating a Maximum Credible Earthquake Moment Magnitude, Mw = 7.0. The corresponding Peak Bedrock Acceleration (PBA) for the NIE fault at the site is estimated to be 0.5g. For specific seismic design recommendations and site-specific criteria, Mahmoud Khojasteh of our office, should be contacted.

Corrosivity

No corrosion data was found in this Office's files for this site. However, the subsurface information shown on the "As-built" LOTBs could be interpreted as being non-corrosive. A review of nearby structures with similar soil descriptions indicates that the soils are non-corrosive. Normal design techniques and construction methods may be used.

Construction History of the Existing Bridge Foundation

The existing Mira Mesa Boulevard Undercrossing was built in 1972. It features a left and right bridge. Each bridge consists of a simple span Cast-in-place Prestressed box girder (9 cell) on Reinforced Concrete open end diaphragm abutments on spread footings. The allowable footing pressure at each support location is 2 tsf. The estimated Bottom of Footing Elevation (BOFE) for the supports is shown in Table 1 below.

Table 1

Estimated Existing Bottom of Footing Elevation			
Support Location	Top of Bridge Deck Elevation	Depth from Deck to bottom of Spread Footing	Estimated BOFE
Abut 1, Left	173.48 ft	14 ft	159.48 ft
Abut 1, Right	173.92 ft	14 ft	159.92 ft
Abut 2, Left	166.52 ft	14 ft	152.52 ft
Abut 2, Right	167.20 ft	14 ft	153.2 ft

Foundation Recommendations

The following foundation recommendations are for the proposed widening of Mira Mesa Boulevard Undercrossing, as shown on the Bridge Site Submittal, dated 2/1/08 and plotted 05-Aug-2008. The proposed median widening may be supported on spread footing foundations. The left bridge outside widening may be supported on driven steel H-piles.

Median Widening

Structure Design has provided the information for spread footings shown in Table 2 below. This information has been used to determine the foundation recommendations for the median widening.

Table 2

Spread Footing Design Data Provided by Structure Design											
Support Location	Bottom of Footing Elevation	Footing Size		Permissible Settlement Under Service Load*	Service Limit State I						
					Total Load				Permanent Load *		
					Vertical Load	Effective Demensions		Horizontal Load in Long Direction	Vertical Load	Effective Dimentions	
		B	L			B'	L'			B'	L'
Abut 1	47.53 m (155.9 ft)	4.57 m (15.0 ft)	9.17 m (30.0 ft)	25.4 mm (1 in)	7865 kN (1768 kip)	4.48 m (14.7 ft)	9.17 m (30.0 ft)	507 kN (114 kip)	6192 kN (1392kip)	4.39 m (14.4 ft)	9.174 m (30.0 ft)
Abut 2	45.67 m (149.8 ft)	4.57 m (15.0 ft)	9.17 m (30.0 ft)	25.4 mm (1 in)	7865 kN (1768 kip)	4.48 m (14.7 ft)	9.17 m (30.0 ft)	472 kN (106 kip)	6192 kN (1392 kip)	4.39 m (14.4 ft)	9.174 m (30.0 ft)

Note: *See Table 3.4.1-2 in the AASHTO LRFD Bridge Design Specifications for components of permanent load. Total and Permanent Loads are NET for Bents and Gross for Abutments.

The proposed median widening may be supported on spread footings, as shown in Table 3 below. The recommended Allowable Gross Bearing Capacity and bottom of footing elevations are listed in Table 3 below.

Table 3

Foundation Design Recommendations for Spread Footings						
Support Locations	Footing Size		Bottom of Footing Elevation	Minimum Footing Embedment Depth	WSD (LRFD Service I Limit State Load Combination)	
	B	L			Permissible Gross Contact Stress	Allowable Gross Bearing Capacity
Abut 1	4.57 m (15.0 ft)	9.17 m (30.0 ft)	47.53 m (155.9 ft)	1.53 m (5.0 ft)	72 kPa (1.5 ksf)	192 kPa (4.0 ksf)
Abut 2	4.57 m (15.0 ft)	9.17 m (30.0 ft)	45.67 m (149.8 ft)	1.53 m (5.0 ft)	72 kPa (1.5 ksf)	192 kPa (4.0 ksf)

Notes: 1) Recommendations are based on the foundation geometry and the load provided by Structure Design in the Foundation Design Data Sheet. The footing contact area is taken as equal to the effective footing area, where applicable.
2) See MTD 4-1 for definitions and applications of the recommended design parameters.

The recommended Allowable Gross Bearing Capacity to be used for design, provided in Table 3, above, is based on the following design criteria:

1) The abutment footing has a minimum width (B) as shown in the table above.

2) The abutment spread footing is to be constructed at or below the recommended elevation as shown in the table above.

If any of the above; minimum footing width, or horizontal embedment depth are reduced, or bottom of footing elevation raised, our office is to be contacted for re-evaluation.

Left Bridge Outside Widening

The information for pile foundations shown in Table 4 and Table 5 below, has been provided by Structure Design and was used to determine the foundation recommendations provided in Table 6 and Table 7 below.

Table 4

General Information Provided by Structure Design								
Support Location	Design Method	Pile Type	Finished Grade Elevation	Cut-off Elevation	Pile Cap Size		Permissible Settlement Under Service Load	Number of Piles per Support
					B	L		
Abut 1	WSD	HP250x85 (HP10x57)	Varies	46.57 m (152.7 ft)	1.52 m (5.0 ft)	17.37 m (57.0 ft)	N/A	17
Abut 2	WSD	HP250x85 (HP10x57)	Varies	44.43 m (145.7 ft)	1.52 m (5.0 ft)	17.37 m (57.0 ft)	N/A	17

Table 5

Foundation Design Loads Provided by Structure Design											
Support Location	Service 1 Limit State			Strength Limit State (Controlling Group)				Extreme Event Limit State (Controlling Group)			
	Total Load		Permanent Load	Compression		Tension		Compression		Tension	
	Per Support	Max per Pile	Per Support	Per Support	Max per Pile	Per Support	Max per Pile	Per Support	Max per Pile	Per Support	Max per Pile
Abut 1	10285 kN (2312 kip)	605 kN (136 kip)	7028 kN (1580 kip)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Abut 2	10285 kN (2312 kip)	605 kN (136 kip)	7028 kN (1580 kip)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

The proposed left bridge outside widening may be supported on driven steel H-piles. The Specified Pile Tip Elevation (SPTE) is provided in Table 6 below.

Table 6

Abutment Foundations Design Recommendations									
Proposed Support Location	Pile Type	Cut-off Elevation	LRFD Service-I Limit State Load per Support		LRFD Service-I Limit State Total Load per Pile (Compression)	Nominal Resistance	Design Tip Elevations	Specified Tip Elevation	Nominal Driving Resistance Required
			Total	Permanent					
Abut. 1	HP250x85 (HP10x57)	46.57 m (152.7 ft)	10285 kN (2312 kips)	7028 kN (1580 kips)	605 kN (136 kips)	1210 kN (272 kips)	39.4 m (a) (129.3 ft) (a)	39.4 m (129.3 ft)	1210 kN (272 kips)
Abut. 2	HP250x85 (HP10x57)	44.43 m (145.7 ft)	10285 kN (2312 kips)	7028 kN (1580 kips)	605 kN (136 kips)	1210 kN (272 kips)	37.3 m (a) (122.4 ft) (a)	37.3 m (122.4 ft)	1210 kN (272 kips)

Notes: 1) Design tip elevations are controlled by: (a) Compression.
2) Design tip elevation for Lateral Load is typically provided by SD.

The Pile Data Table for the Left Bridge Outside Widening is presented in Table 7, below. The ultimate geotechnical pile capacity for the Driven Steel H-piles will meet or exceed the required nominal resistance in compression.

Table 7

Pile Data Table						
Support Location	Pile Type	Nominal Resistance		Design Tip Elevation	Specified Tip Elevation	Nominal Driving Resistance
		Compression	Tension			
Abut 1	HP250x85 (HP10x57)	1210 kN (272 kips)	0	39.4 m (a) (129.3 ft) (a)	39.4 m (129.3 ft)	1210 kN (272 kips)
Abut 2	HP250x85 (HP10x57)	1210 kN (272 kips)	0	37.3 m (a) (122.4 ft) (a)	37.3 m (122.4 ft)	1210 kN (272 kips)

Notes: 1) Design tip elevations for abutments are controlled by: Compression.

General Notes

1. Support locations are to be plotted on the LOTB's on the plan view as stated in "Memos to Designers" 4-2. The plotting of support locations should be made prior to requesting a foundation review.

2. Should there be any reduction in the support spread footing width, or increase in the maximum allowed bottom of footing elevation, a request to reevaluate the recommended gross allowable bearing capacity should be sent to our Office.

Construction Considerations

1. When the footing excavations are completed to final grade, the excavations are to be inspected and approved by a representative from our Office prior to placing any steel, forms or concrete into the footing excavation.

2. The footing concrete at the support locations shall be placed neat against undisturbed soil at the bottom of the footing excavation. If the soils at the bottom of the excavation are disturbed or loosened, they shall be re-compacted to 95% relative density prior to placing any concrete or steel.

3. The calculated geotechnical capacity of the H-piles is based on a combination of skin friction and end bearing.

4. Any H-pile that achieves refusal within 1.0 m (3.3 ft) of the SPTE may be considered satisfactory and cut off with written approval from the Engineer. Refusal shall be defined as a pile achieving two times the required nominal resistance in compression as shown on the Contract Plans. Two times the required nominal resistance in compression shall be 2420 kN (545 kips).

5. Due to variations of the top of bedrock elevation as well as the hardness, and the degree of weathering of the bedrock material beneath the abutment widenings, hard and erratic driving of the H-piles should be anticipated. The contractor should anticipate that some piles will require splicing or cutting-off in the field.

6. Difficult driving should be anticipated at all support locations due to the presence of dense to very dense soils containing occasional lenses of gravel, underlying the proposed bridge site.

Due to anticipated hard driving, driven precast concrete piling is not recommended.

7. The design of the proposed bridge widenings should incorporate a closure pour to allow for any settlement of the widening to occur prior to joining the existing structure.

The recommendations contained in this report are based on specific project information regarding proposed structure support locations that have been provided to Office of Geotechnical Design – South 2. If any conceptual changes are made during final project design, our Office should review those changes to determine if the foundation recommendations contained in this report are still applicable.

Any questions regarding the above recommendations should be directed to Gina Pursell, (916) 227-4539, or Shawn Wei, (916) 227-5252, of Office of Geotechnical Design – South 2, Branch C.

Prepared by: Date: 11/19/2008

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c: OGDS2 – SWei
OGDS2 - AAbghari
Specs & Estimates - John Stayton
Geology project file
RE pending file

State of California Business, Transportation and Housing Agency

Memorandum

To: MS. CHUNG-YUAN WEN
Branch Chief
Bridge Design Branch 21

Date: April 7, 2008

File: 11-SD-805 KP 43.56
11-2T0401

Attention: Mr. Kumar Ghosh

Sorrento Valley Blvd UC (Widening)
Br. # 57-0786

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
Geotechnical Services - MS#5
Office of Geotechnical Design – South 2, Branch C

Subject: **Foundation Recommendations Addendum**

This addendum was written to include new information provided to our Office pertaining to corrosion. This report will supercede the Foundation Recommendations dated April 1, 2008.

A request for foundation recommendations was made by the Division of Structure Design (DSD), Bridge Design Branch 21 on January 17, 2008, for the proposed median widening of Sorrento Valley Boulevard Undercrossing, bridge number 57-0786 R/L. Our office has completed a foundation investigation for the proposed widening. The investigation consisted of a review of the "As-built" plans, and field work consisting of two new rotary mud borings at the proposed project site. All elevations referenced in this memo are in feet (meters), and are referenced to the 1929 NGVD Datum. The foundation recommendations were based on the General Plans provided by DSD dated 12/24/07, and plotted 17-Jan-2008.

Project / Site Description

The existing project site is located in the City of Sorrento Valley, on State Route 805, south of Interstate Route 5. The existing bridge is a simple span Cast-in-place Prestressed box girder (8 cell) on reinforced concrete open end diaphragm abutments on 10BP57 (70 ton bearing) piles. The proposed project consists of widening the median section to connect the left and right bridges.

Geology

Foundation soil at the site generally consists of about forty-five feet of very loose to compact silty sand with clay and very soft to medium stiff lean clay with silt and fine sand overlying dense sandy gravel with clay. For site specific soil information, please refer to the Log of Test Borings (LOTBs). A new set of LOTBs is being prepared for this project and will be forwarded when complete.

Ground water was encountered at elevation 25.4 to 26.4 ft (7.7 to 8.0 m) in May of 1969 and at 25.2 ft (7.7 m) in March of 2008. It should be noted that ground water levels will fluctuate with the change of seasons and other factors including local irrigation.

Seismicity

The controlling fault for this site is the Newport-Inglewood-Rose Canyon/East fault (NIE, strike slip). The site is located approximately 3.7 km (2.3 mi) southwest of the fault. The NIE fault is capable of generating a Maximum Credible Earthquake Moment Magnitude, Mw = 7.0. The corresponding Peak Bedrock Acceleration (PBA) is estimated to be 0.5g. For specific seismic design recommendations and site specific criteria, Mahmoud Khojasteh of our office, should be contacted.

Corrosivity

The soil at the site has been tested for corrosion. The site has proven corrosive. The following results were reported from Materials Engineering and Testing Services, Corrosion Technology Branch, Dated April 7, 2008. Design techniques and construction methods will need to take into account the corrosive environment.

Corrosion Data

Boring	Sample Depth	Sample Date	Minimum Resistivity (ohm-cm)	Sulfate Content (ppm)	Chloride Content (ppm)
R-08-001	31-32.5 ft	3/11/2008	401	515	2717

Note: For structural elements the Department considers a site to be corrosive if one or more of the following conditions exist for the representative soil and/or water samples taken at the site: Chloride concentration is 500 ppm or greater, sulfate concentration is 2000 ppm or greater or the pH is 5.5 or less.

Construction History of the Existing Bridge Foundation

The existing Sorrento Valley Boulevard Undercrossing was built in 1972 and consists of a simple span Cast-in-place Prestressed box girder (8 cell) on Reinforced Concrete open end diaphragm abutments on driven steel 10BP57 piles. The design load for these piles is 70 ton. The "As-built" pile data is shown in the table 1 below.

As-built Pile Data

Location	Bottom of Pile cap Elevation	Specified Pile Tip Elevation	Estimated Pile Tip Elevation	As-Built Min Pile Tip Elev	As-Built Ave Pile Tip Elev	As-Built Max Pile Tip Elev
Abut 1	44.0 ft	-25.0 ft	-30.0 ft	-24.5 ft	-28.0 ft	-29.0 ft
Abut 2	42.0 ft	-25.0 ft	-30.0 ft	-23.5 ft	-27.7 ft	-30.8 ft

Foundation Recommendations

The following foundation recommendations are for the proposed Sorrento Valley Blvd Undercrossing Widening, Bridge number 57-0786. These recommendations are based on the General Plans provided by DSD dated 12/24/07, and plotted 17-Jan-2008.

The proposed structure widening may be supported on 70 ton (625 kN) design load driven steel H-piles. Due to the high elevation of the groundwater, CIDH piles less than 600 mm (24 inches) in diameter are not recommended for the support locations.

Driven Steel H-Pile Data

Support Location	Pile type	Design Loading	Nominal Resistance		Design Tip Elevations *	Specified Pile Tip Elevations
			Compression	Tension		
Abut 1	**Steel H Piles HP10x57** (HP 250x85)	**70 ton** 625kN	**140 ton** (1250 kN)	**0 ton** (0 kN)	**-30.0 ft,** (9.1 m) [1]	**-30.0 ft,** (9.1 m) [1]
Abut 2	**Steel H Piles HP10x57** (HP 250x85)	**70 ton** 625kN	**140 ton** (1250 kN)	**0 ton** (0 kN)	**-30.0 ft,** (9.1 m) [1]	**-30.0 ft,** (9.1 m) [1]

*Note: Design tip elevations are controlled by the following demands: [1] Compression.

General Notes

1. Support locations are to be plotted on the LOTB's on the plan view as stated in "Memos to Designers" 4-2. The plotting of support locations should be made prior to requesting a foundation review.

2. Design tip elevations for lateral loads are to be determined by Office of Bridge Design. The Specified Pile Tip Elevation (SPTE) for each support location is to be controlled by the deepest design tip elevation for either compression, tension or lateral loads. If the required lateral design tip elevation is deeper than the SPTE provided above, the Office of Geotechnical Design must be notified to reevaluate the design tip elevations.

Construction Considerations

1. Due to the anticipated elevation of the groundwater, CIDH piles less than 600 mm (24 inches) in diameter are not recommended for the support locations.

2. The geotechnical capacity of the driven steel piles is based on skin friction and end bearing. The contractor should anticipate attaining bearing for these piles varying across the support location and that the piles may require splicing or cutting off in the field.

3. Steel H piles shall be driven with lugs installed to reduce the length of the piles to be driven. The lugs shall be placed in accordance with Bridge Construction Memo # 130-5.0.

4. Pile bearing will be assessed according to the Standard Specifications, Section 49-1.08 "Pile Driving Acceptance Criteria". At both support locations, any driven steel pile that achieves two times the required design loading as shown on the contract plans, within 5 ft (1.5 m) of the SPTE may be considered satisfactory and cut off with written approval from the Engineer. Two times the design loading will be 1250 kN (140 tons).

5. The contractor should anticipate that some of the driven steel piles may not achieve bearing at

the end of driving at the SPTE due to the nature of the underlying cohesive soils. Any driven steel piles that do not achieve bearing at the end of driving should be restruck after a minimum setup period. A minimum setup period of 12 hours is recommended.

6. The design of the proposed widenings should incorporate a closure pour to allow for any settlement of the widenings to occur prior to joining the existing structures.

The recommendations contained in this report are based on specific project information regarding structure support locations that have been provided to Office of Geotechnical Design – South 2. If any conceptual changes are made during final project design, our Office should review those changes to determine if the foundation recommendations contained in this report are still applicable.

Any questions regarding the above recommendations should be directed to Gina Pursell, (916) 227-4539, or Shawn Wei, (916) 227-5252, of Office of Geotechnical Design – South 2, Branch C.

Prepared by: Date: 4-07-08

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Specs & Estimates - John Stayton
Geology project file – North
Geology project file – South
RE pending file

FOUNDATION REPORT
I-805 HOV/Carroll Canyon Rd Extension
Miscellaneous Retaining Walls
San Diego, California

June 23, 2009

Structural Engineer:
TYLIN INTERNATIONAL

Owner:

Geotechnical Consultant / Report Preparer:

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FOUNDATION REPORT

I-805 HOV / Carroll Canyon Road Extension

Miscellaneous Retaining Walls
San Diego, California

Contract Number: 38008-017046.00

June 23, 2009

Prepared for:

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Kilometer Post Total Project Limits: R43.2
Expenditure Authorization: 2T0401

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June 23, 2009

Contract Number: 38008-017046.00

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Subject: **Foundation Report**
I-805 HOV / Carroll Canyon Road Extension
Miscellaneous Retaining Walls
San Diego, California

Dear Ms. Wen:

In accordance with SANDAG Task Order No. 46 and Amendment No. 1, Bureau Veritas North America, Inc. (BVNA) is pleased to submit this Foundation Report for the proposed Miscellaneous Retaining Walls (MRW) of the I-805 HOV / Carroll Canyon Road Extension project. A geotechnical technical memo was previously prepared summarizing the geotechnical design parameters and recommendations in connection with the MRW. This report summarizes the geotechnical conditions at the project site and our conclusions and recommendations for the MRW. BVNA appreciates the opportunity to provide geotechnical services for this project and we look forward to continuing our role as your geotechnical consultant on this project.

Respectfully submitted,
Bureau Veritas North America, Inc.

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1.0. SCOPE OF SERVICES

Bureau Veritas North America, Inc. (BVNA) prepared this Foundation Report (FR) for the proposed Miscellaneous Retaining Walls (MRW) associated with the I-805 HOV / Carroll Canyon Road Extension project (CCR project) located in San Diego, California at Interstate-805 (I-805), Kilometer Post 42.6 to 46.2. The purpose of this report is to document geotechnical site conditions; provide analyses of anticipated site conditions as they pertain to the project described herein; and to recommend geotechnical design and construction criteria for the project. The report also establishes a geotechnical baseline to assess the existence and scope of any changed conditions. The report is intended for the use by the project engineers, construction personnel, bidders, and contractors.

The scope and type of work performed to obtain the information supporting the foundation recommendations included:

Review of Existing Data

BVNA reviewed the following geotechnical documentation:

- In-house geotechnical documents and maps, topographic maps, environmental maps, and as-built documentation of existing facilities relevant to the project site
- The AASHTO LRFD Bridge Design Specification, 4th Edition, dated 2007
- The Caltrans Guidelines for Structures Foundation Reports dated March 2006
- The Caltrans Soil and Rock Logging, Classification, and Presentation Manual dated June 2007
- The Department of Transportation, Structures Preliminary Geotechnical Report, File No.: 11-SD-805-PM 23.6 TO PM 26.8, I-805 Managed Lanes, 11-081630, dated December 2007
- The Department of Transportation Preliminary Geotechnical/Geological Report For Seismic Retrofit Design, dated February 1995
- The Department of Transportation Preliminary Geotechnical/Geological Report (Addendum No.1) For Seismic Retrofit Design, dated May 1995
- The Department of Transportation District Preliminary Geotechnical Report For Interstate 805 Widening and HOV Lanes, from State Route 52 Interchange to Interstate 5 Merge, dated March 2008
- A floodplain study prepared by Parsons Brinckerhoff dated July 2005 and finalized on November 05, 2008 for the project site
- A geotechnical investigation prepared by Group Delta Consultants dated April 25, 2003 for the Carroll Canyon Road Extension Project, Project No. SR 281

A complete listing of the project documentation utilized is included in Section 13.0, References.

Site Reconnaissance

BVNA performed numerous site reconnaissance visits to observe the general surficial site conditions; to evaluate the field locations of existing underground utilities; to determine the existing topographical, physical, and environmental access constraints for the field exploration program; and to establish test boring and Cone Penetration Test (CPT) locations. Caltrans

District 11 Office of Surveys surveyed and flagged the numerous test boring and CPT locations proposed by BVNA.

Field Exploration

The field exploration program consisted of drilling forty (40) test borings using a 203.2-millimeter (8.0-inch) diameter hollow-stem auger; nineteen (19) test borings using a sonic drilling method with a 152.4-millimeter (6.0-inch) diameter drill bit; and twenty-seven (27) CPTs. The test borings and CPTs extended to maximum depths of approximately 45.7 meters (150.0 feet) and 10.2 meters (33.5 feet) below the existing ground surface, respectively. The test borings were logged in the field by engineers and geologists from BVNA. Sixteen (16) of the test borings drilled using a hollow stem auger and ten (10) of the test borings using a sonic drilling method were located along the alignment of the proposed MRW. Bulk and relatively undisturbed soil and rock samples, representative of the various subsurface materials encountered, were obtained from the test borings and transported to our laboratory for further evaluation and testing. Data from the field exploration program was evaluated to obtain the information supporting the foundation recommendations included in this report.

Approximate locations of the test borings and CPTs are shown on Appendix I.3: Figure 3-Field Exploration Map and the Logs of Test Borings (LOTBs) (Appendices I.12 to I.15). The data from the field exploration program are presented on the LOTBs and CPTs in Appendix I. The LOTBs are separated into four (4) subsections for each of the specific components of the overall project (i.e., I.12: Carroll Canyon Road Bridge; I.13: Direct Access Ramp Retaining Walls; I.14: Business Access Undercrossing; and I.15: Miscellaneous Retaining Walls). Appendix I.15: Miscellaneous Retaining Walls LOTBs are separated into six (6) subsection for each of the proposed walls (i.e., I.15.1: 437R, I.15.2: 438L, I.15.3: 438R, I.15.4: 443R, I.15.5: 445L, I.15.6: 445R). Data for the entire field exploration program are presented in Appendix I. All elevations included in this report are in meters (feet) and are referenced to the 1929 NGVD Datum.

Laboratory Testing

BVNA performed laboratory testing on selected bulk and relatively undisturbed soil and rock samples obtained from the test borings to evaluate engineering properties of the foundation materials. The following tests were performed in general conformance with applicable American Society for Testing and Materials (ASTM) and California Test Method (CTM) procedures:

- In-situ moisture content and unit weight (ASTM D2216 and D4767)
- Particle size distribution and No. 200-wash (ASTM D422 and ASTM D1140)
- Atterberg Limits (ASTM D4318)
- Consolidation (ASTM D2435)
- Direct Shear (ASTM D3080)
- Maximum Dry Density and Optimum Moisture Content (ASTM D1557)
- Expansion Index (ASTM D4829)
- Corrosivity series including sulfate content, chloride content, pH-value, and resistivity (CTM 417, 422, and 643)

The strength parameters assigned to the various geologic units (i.e., fill, alluvium, terrace deposits, and Ardath Shale) and utilized for the foundation and slope stability analyses were developed from the above laboratory testing program. A summary of the laboratory testing program and the test results are presented in Appendix II. The in-situ density and moisture contents are depicted on the LOTBs in Appendix I.

Mapping

Appendix I.4: Figure 4-Geotechnical Map depicts field mapping of the surface geology performed by BVNA for the overall project site.

Assessment of Soil Conditions and Geologic Hazards

BVNA assessed the general subsurface soil and rock conditions and geologic hazards (i.e. ground water, compressible alluvial soils, rock, expansive soils, corrosive soils, floodplain, slope stability, liquefaction, lateral spreading) to establish the MRW foundation design recommendations, earthwork criteria, and construction considerations.

Data Analyses

The field and laboratory data were analyzed to develop the foundation recommendations in this report and included the following:

- Seismic Analysis (Appendix III.1)
- Slope Stability Analyses (Appendix III.2 and III.3)
- Foundation Analyses Results (Section 9.0)

Report Preparation

This report presents BVNA's foundation design recommendations, earthwork criteria, and construction considerations including Tables, Figures and Appendices.

2.0. PROJECT DESCRIPTION

The project site is located in San Diego, California. Appendix I.1: Figure 1-Site Location Map depicts the locations of the proposed six walls and approximate alignment of the CCR extension. Appendix I.2: Figure 2-Project Plan depicts the various proposed and existing project components. The CCR project will extend the Carroll Canyon Road (CCR) westerly from its existing intersection with Scranton Road, under the I-805 freeway bridge, to the intersection of Sorrento Valley Road and comprises 4 components including the CCR Bridge, the Direct Access Ramp (DAR) retaining walls, the Business Access Undercrossing (BAUC), and the MRW.

There are six retaining walls proposed at various locations along the north and south sides of the proposed CCR extension alignment. The walls are identified as 437R, 438R, 438L, 443R, 445R, and 445L. The lengths of the walls vary from approximately 30 meters (98 feet) to 400 meters (1,312 feet). The heights of the walls vary from 1.8 meters (5.9 feet) to 12.1 meters (40 feet). Wall 445R is proposed as a battered mechanically stabilized earth (MSE) retaining wall and Wall 445L is proposed as a crib-type retaining wall. The remaining retaining walls will

be Type 1, cantilever, cast-in-place retaining walls. A summary of the six walls is tabulated below.

Table 1: Miscellaneous Retaining Walls

Wall No.	Wall Type	Approximate Wall Length	Maximum Wall Height
437R	TYPE I	53 meters	8.5 meters
438L	TYPE I	25 meters	9.7 meters
438R	TYPE I	126 meters	10.3 meters
443R	TYPE I	84 meters	6.0 meters
445L	CRIB	88 meters	1.8 meters
445R	Battered MSE	400 meters	12.1 meters

3.0. SITE GEOLOGY AND SUBSURFACE CONDITIONS

Site geology and subsurface conditions are discussed in the subsections below.

3.1. Topography and Regional Geologic Setting

The six (6) proposed MRW are located to the north and south of the proposed CCR extension alignment in San Diego, California, as shown in Appendix I.2: Figure 1- Project Plan. The topography at the project site gently slopes southwest at a gradient of approximately 5.5 to 1 (horizontal to vertical). Elevations at the project site range from a high of approximately 50.0 meters (164.0 feet) along CCR to a low of approximately 26.0 meters (85.3 feet) along Sorrento Valley Road. The site drainage generally occurs as a sheet flow to the south and west towards Carroll Creek. Vegetation within the project site generally consists of grass, weeds, a few small shrubs, and an oak tree.

The site is located in San Diego County within the Peninsular Ranges Geologic Province. This province is underlain by a basement complex of Late Cretaceous-age undifferentiated granitic rocks of the Southern California Batholith and Jurassic-age prebatholithic metavolcanic rocks. The basement complex is non-conformably overlain by a thick sedimentary sequence of marine and non-marine rocks that were deposited within the San Diego Embayment. These sedimentary deposits range in age from Late Cretaceous to recent. The most abundant deposits of the embayment are Eocene-age marine, lagoonal, and non-marine rocks (Kennedy, 1975).

Two major northwest-trending fault zones traverse the San Diego metropolitan area: the Rose Canyon fault zone on the west and the Elsinore fault zone on the east. These fault zones traverse the San Diego area in a predominant north to north-northwest direction.

3.2. Pertinent Soil Conditions and Geologic Hazards

Pertinent soil conditions and geologic hazards are discussed in the following sections.

Fault Rupture

Published geologic maps and literature pertaining to the general site area indicate that there are no known major or active faults on or in the immediate vicinity of the site (see Section 13.0 References: 29, 32, 33). Evidence for active faulting on site was not observed during our site investigation. Based on the California Seismic Hazard Map, Caltrans 1996, a fault with activity within the late Quaternary period (700,000-years) is considered "active". An "active" fault is defined by the California Geologic Survey as one which has "had surface displacement within Holocene time (about the last 11,000 years)". The project site is outside any Alquist Priolo Earthquake Fault Zone. Therefore, the potential for surface rupture due to faulting at the site during the design life of the proposed structures is considered low.

The closest distance in kilometers (miles) from the site to the projection of rupture surface area along the fault traces from the major active earthquake faults that could possibly affect the site are listed below:

Rose Canyon/ Newport-Inglewood (Type B) -	6.1 km (3.8 mi)
Coronado Bank (Type B) -	26.4 km (16.4 mi)
Elsinore-Julian (Type A) -	54.2 km (33.7 mi)
San Andreas – Southern (Type A) -	127.8 km (79.4 mi)

Seismic Shaking Potential

The seismic hazard most likely to impact the site is ground shaking resulting from an earthquake on one of the major active regional faults. Design considerations for the hazard of seismic shaking are presented in Section 7.0, Seismic Study.

Liquefaction, Seismic Settlement, and Lateral Spreading

The two fundamental conditions associated with the occurrence of seismically induced liquefaction are cohesionless sands combined with ground water above a depth of about 15.2 meters (50.0 feet). Research indicates that uniformly graded, rounded, very fine to fine grained sands in a low-density condition are most susceptible to liquefaction. The potential for liquefaction under the same conditions of ground shaking intensity and duration will decrease for sands that are more well graded, more irregular and gritty, more coarse and more dense. Also, a pronounced decrease in liquefaction potential will occur with the increase in fine-grained (i.e., silt and clay) content. Seed and others have suggested that a non-liquefiable classification be assigned if the clay faction is 15 percent or greater (Guidelines for Evaluating and Mitigating Seismic Hazards in California, Special Publication 117, CDMG, Ch. 6, 1997). Dynamic settlement due to earthquake shaking can occur in both dry and saturated sands.

The initial subsurface exploration program encountered occasional loose alluvial sand zones with a near-surface ground water table in the area of the CCR bridge platform and adjoining bents. Therefore, a detailed subsurface exploration program was performed including continuous data acquisition using CPTs and hollow-stem auger test borings with successive sampling intervals within the platform area. An analysis of liquefaction potential in the vicinity of the CCR bridge platform is presented in the CCR Bridge Foundation report.

The project areas comprising the MRW are not considered susceptible to liquefaction and associated hazards, including lateral spreading, due to the generally fine-grained and/or dense nature of the site soils underlying the MRW.

Subsidence

The site is not located in an area of known ground subsidence, occurring due to the withdrawal of subsurface fluids. Accordingly, the potential for subsidence occurring at the site due to the withdrawal of oil, gas, or water is considered remote.

Landsliding

There are no known landslides on or in the immediate vicinity of the project site, and the site is not located in the path of any known landslide.

Tsunamis and Inundation Seiches

The site is located inland, approximately 6.4 kilometers (4.0 miles) up Soledad Valley from the Pacific Ocean and at a minimum elevation of approximately 26.0 meters (85.3 feet) above mean sea level (MSL). Therefore, tsunamis (seismic sea waves) are not considered a hazard at the site.

The site is not located near to or down slope of, any large body of water that could affect the site in the event of an earthquake-induced failure or seiche (oscillation in a body of water due to earthquake shaking).

3.3. Project Site Soils

Based on review of existing geotechnical documents, surface geologic mapping, and subsurface exploration, the project site is underlain by existing fill, alluvium, terrace deposits, and Ardath Shale. Appendix I.4: Figure 4-Geotechnical Map presents the general distribution of the geologic units within the project limits. The interpreted geologic conditions underlying the proposed walls are indicated on four cross sections presented in Appendix I.5, I.6, I.7 and I.8. Descriptions of the geologic units encountered are provided below.

Existing Fill

Existing fill soils were observed in forty-three (43) out of fifty-nine (59) test borings drilled for the overall project. Appendix I.3: Figure 3-Field Exploration Map shows the test borings that encountered existing fill soils along with their respective depths. The existing fill soils were generally found in the vicinity of the commercial development within the western margins of the project with a depth up to 3.5 meters (11.5 feet); the northern embankment for the Soledad Canyon Bridge within the central-northern margins of the project with a depth up to 30.5 meters (100.1 feet); and the SDG&E easement access road within the eastern margins of the project with a depth up to 18.2 meters (59.7 feet). The composition of the existing fill ranges from silty sand to sandy clay, with gravel and cobbles. As encountered in the test borings, the fill soils were in a moist to wet state, ranged from medium brown to dark reddish brown in color, and the consistency ranged from loose to dense (granular fill) and moderately stiff to stiff (fine-grained fill).

Alluvium

Holocene-aged alluvium was observed in the active stream channel of Carroll Creek, while outside the creek channel the alluvium exhibited addition of soil development and increased consolidation. The alluvium observed in the stream channel was composed of fine to coarse grained sand, with abundant gravel and cobbles. The alluvium encountered in the test borings ranged from silty clay to poorly graded sand with variable concentrations of gravel and cobbles. The variable composition and laterally discontinuous nature of the alluvial deposits encountered reflect the various depositional sequences consistent with the stream channel setting. As encountered in the test borings, the alluvial soils were in a moist to wet state, ranged from dark brown to dark grey in color and the consistency ranged from loose to very dense. The alluvium appeared to be derived from bedrock sources that lie near and east of the site.

Terrace Deposits

Quaternary-aged terrace deposits were observed in road cuts and hillside outcrop exposures. Terrace deposits were encountered intermittently throughout the project site in twenty-five (25) out of fifty-nine (59) test borings drilled. The terrace deposits occur locally as a veneer of silt, clay, sand and conglomerate that represent fluvial deposits laid down in the past by Carroll Creek when it flowed at a higher elevation. The terrace deposits were observed to be moist to wet, with a hard to very dense, friable consistency. The basal portions of the terrace deposits were observed in the surface exposures and in the test borings to be comprised of gravel and cobble conglomerate with a silty sand matrix. In the test borings that encountered terrace deposits, they were observed to overlie Ardath Shale.

3.4. Project Site Rocks

The rock underlying the site consists of a sedimentary rock and is part of the Ardath Shale geologic unit.

Ardath Shale

Eocene-aged Ardath Shale is the sedimentary bedrock unit found to underlie the entire site at depth. Ardath Shale was encountered within the project site at depth in forty-one (41) out of fifty-nine (59) test borings drilled. The Ardath Shale was observed to consist of siltstone and claystone and occasional sandstone interbeds with thin laminations of medium and dark gray colors. The Ardath Shale was observed to be moist to wet, with a hard consistency. Some layers of the Ardath Shale were observed to be weakly fissile, while other layers were observed to be concretionary.

3.5 Earth Material Strength Parameters

Soil strength parameters for engineering analysis were developed from our laboratory testing and engineering evaluation. Table 2: Soil Parameters presents typical soil and rock values assigned to each of the different earth materials.

Table 2: Soil Parameters

SOIL TYPES	COHESION, c	FRICTION ANGLE, ϕ	MOIST UNIT WEIGHT, γ
Existing Fill	14.36 kN/m^2 (300 psf)	28°	19.16 kN/m^3 (122 pcf)
Caltrans Structure Backfill	0 kN/m^2 (0 psf)	34°	19.63 kN/m^3 (125 pcf)
Caltrans Class 2 Base	0 kN/m^2 (0 psf)	36°	19.63 kN/m^3 (125 pcf)
Alluvium	19.15 kN/m^2 (400 psf)	25°	18.06 kN/m^3 (115 pcf)
Terrace Deposits	16.76 kN/m^2 (350 psf)	34°	19.63 kN/m^3 (125 pcf)
Ardath Shale	47.88 kN/m^2 (1,000 psf)	38°	20.41 kN/m^3 (130 pcf)

4.0. GROUNDWATER

The groundwater level (GWL) was encountered in the majority of test borings at an elevation that approximates the adjacent Carroll Creek level. The GWLs encountered in the platform area ranged from 25.2 meters (82.7 feet) to 27.6 meters (90.5 feet) MSL. The GWLs in other test borings vary significantly outside the platform area and aren't considered to reflect static GWL; these variable GWLs reflect locally perched groundwater and anomalies from drilling methods (i.e., smearing), impervious nature of the Ardath Shale geologic unit, and the relatively short period of time from drilling to GWL measurement. Appendix I.3: Figure 3-Field Exploration Map presents all of the GWL elevations MSL where encountered in the test borings. Appendices I.2 to I.15 include the GWL elevations MSL and the dates measured where encountered in the test borings.

Groundwater is not expected to be a constraint to the proposed construction of the MRW footings, since the groundwater levels are deeper than the proposed footing bottoms. However, near-surface groundwater conditions can develop in areas where no such groundwater conditions were previously encountered, especially in areas where a substantial increase in surface water infiltration results from landscape irrigation or unusually heavy precipitation. In the event that groundwater is encountered the footing excavations, the contractor will have to employ proper dewatering methodology during construction.

5.0. SCOUR EVALUATION

Due to the close proximity of the site to Carroll Creek, the potential for flooding exists during high flow events. The site is within the 100-year floodplain of Carroll Creek. Based on a floodplain study prepared for the project, the site is located within a floodplain, but not within the relatively high energy floodway (see Section 13.0 References: 34). As indicated in the floodplain study report, the location of the project within the floodplain is in areas of ineffective flow and/or backwater. Impacts on the proposed improvements due to potential scour are considered low. It is anticipated that site development will include appropriate drainage provisions for control and discharge of surface runoff.

6.0. CORROSION EVALUATION

The corrosion potential of the on-site materials to steel and buried concrete was evaluated within the overall project site. Laboratory testing was performed in accordance with applicable CTMs on representative samples of the existing fill soils, alluvial soils, terrace deposits, and Ardath Shale to evaluate pH, minimum resistivity, chloride, and soluble sulfate content. General recommendations to address the corrosion potential of the on-site materials are provided herein. If additional recommendations are desired, it is recommended that an appropriate specialist be consulted. Table 3: Soil Corrosion Test Summary, presents the results of our corrosion testing adjacent to the proposed MRW along the CCR project alignment.

Table 3: Soil Corrosion Test Summary

Boring Number	Depth	Sulfate Content (CTM 417)	Chloride Content (CTM 422)	pH-value (CTM 643)	Minimum Resistivity (CTM 643)
A-08-001	2.4 m	400 ppm	400 ppm	7.8	515 ohms-cms
A-08-001	8.2 m	280 ppm	150 ppm	6.7	870 ohms-cms
A-08-001	14.0 m	410 ppm	330 ppm	6.6	515 ohms-cms
A-08-002	6.1 m	380 ppm	500 ppm	7.1	468 ohms-cms
A-08-003	5.2 m	460 ppm	680 ppm	7.7	381 ohms-cms
A-08-003	9.5 m	520 ppm	650 ppm	6.9	401 ohms-cms
A-08-004	1.5 m	390 ppm	980 ppm	6.8	341 ohms-cms
A-08-004	3.4 m	510 ppm	890 ppm	7.4	341 ohms-cms
A-08-004	6.4 m	310 ppm	420 ppm	7.3	515 ohms-cms
A-08-005	3.1 m	510 ppm	700 ppm	7.0	375 ohms-cms
A-08-005	6.2 m	200 ppm	350 ppm	6.9	488 ohms-cms
A-08-007	1.8 m	260 ppm	160 ppm	6.5	1,004 ohms-cms
A-08-008	0.3 m	790 ppm	780 ppm	6.8	388 ohms-cms
A-08-009	1.8 m	500 ppm	290 ppm	6.5	650 ohms-cms
A-08-010	2.4 m	640 ppm	170 ppm	6.8	803 ohms-cms

In accordance with the Caltrans criteria (Caltrans Corrosion Guidelines, Version 1.0, 2003), a corrosive area is an area where the soil contains 500 ppm chlorides or greater; sulfates of 2000 ppm or greater; or the pH is 5.5 or less. Therefore, the project area is considered to be corrosive. Imported fill materials should be tested to check that their corrosion potential is not more severe than those assumed.

An appropriate specialist should be consulted regarding special requirements for ground contact concrete and metallic elements, as considered necessary by the Engineer.

7.0. SEISMIC STUDY

The site is located in southern California which is a seismically active region that is subject to hazards from moderate to large earthquakes. Ground shaking resulting from earthquakes should be expected over the lifetime of the proposed structures. The closest known active fault is the Rose Canyon/ Newport-Inglewood (NIE) fault, which trends north-northwest and is about 6.1 kilometers (3.8 miles) west of the project site. According to the California Seismic Hazard Map, Caltrans 1996, the NIE fault is capable of a Maximum Credible Earthquake of Moment Magnitude, Mw=7.0. A copy of the California Seismic Hazard Map, Caltrans 1996 is attached in Appendix I.9. Section 3.2: Pertinent Soil Conditions or Geologic Hazards presents a detailed discussion regarding fault rupture, liquefaction, seismic settlement, and lateral spreading.

Dynamic Analysis Parameters

The California Seismic Hazard Map, Caltrans 1996 indicates that based on deterministic values, the design site acceleration is controlled by a Maximum Credible Earthquake (MCE) of Mw=7.0 on the NIE fault. Based on the California Seismic Hazard Map, Caltrans 1996, a MCE of Mw=7.0 on the NIE fault could produce a peak bedrock acceleration (PBA) of about 0.5g.

Soil Profile Type

The miscellaneous retaining walls within the CCR project site should be classified as Soil Type D as defined in Appendix D of Caltrans Seismic Design Criteria (SDC) 2006, Version 1.4.

Acceleration Response Spectrum Curve

A standard Acceleration Response Spectrum (ARS) based on Figure 8 of Appendix B of SDC 2006, Version 1.4 is recommended for design. The ARS is based on a MCE of Mw=7.0, a PBA=0.5g, and Soil Type D and has been modified to account for near fault directivity effect (as per SDC Section 6.1.2.1). Appendix III.1 presents the recommended modified design ARS.

8.0. AS-BUILT FOUNDATION DATA

Appendix I.16: As-Built LOTBs depicts As-Built foundation data of the Soledad Canyon Bridge & OH relative to the Earthquake Retrofit Project No. SR 281. The As-Built LOTBs indicate that the existing Soledad Canyon Bridge is supported by a series of bents between two abutments constructed on CIDH piles founded into the underlying Ardath Shale.

9.0. FOUNDATION RECOMMENDATIONS

The footings for Type 1 retaining walls and crib walls shall be designed to conform to 50.8 millimeters (2.0 inches) and 25.4 millimeters (1.0 inch) in 12 meters (39.4 feet) of total and differential settlement, respectively. The footings shall have a minimum embedment of 1.0 meter (3.3 feet) from the lowest adjacent grade. The outer edge of the footing bottom shall be a minimum horizontal distance of 1.5 meters (4.9 feet) from any adjacent descending slope (see Figure 10 for typical details). The footings for Wall 445R shall have a minimum embedment of 1.35 meters (4.4 feet) from the lowest adjacent grade as shown in Figure 11-Battered MSE Wall 445R Detail.

Specific foundation recommendations including geotechnical parameters are presented in the following sections.

9.1 Retaining Wall 437R (Type I Wall)

Anticipated Foundation Soil Conditions

LOTBs O-08-20 and O-08-26 generally depict subsurface conditions for Wall 437R. The station numbers indicated in the following paragraphs refer to the plan stations indicated on the retaining wall plan sheets (see Section 13.0 References: 41).

Retaining Wall 437R is underlain primarily by dense terrace deposits to the east of approximate plan station +33, which consist of silty sands with varying amounts of cobbles, gravel, and clay. The original grades to the west of approximate station +33 will be raised to achieve finish grade elevations for the Wall 437R. It is anticipated that these finish grade elevations will be obtained by placement of fill soils. It is recommended that these fill soils consist of Caltrans Class 2 Base.

Foundation Recommendations

Any existing fill soils encountered during construction are considered compressible and unsuitable for the support of structural loads in their present condition. These soils should be overexcavated within the footprints of the footings and backfill zones of the retaining walls. The actual depth of removal should be evaluated by the Engineer during grading.

The anticipated bearing materials for Wall 437R are dense terrace deposits east of approximate plan station +33. West of station +33 the wall footing should bear on Caltrans Class 2 Base placed over dense terrace deposits. Where footings are designed for embedment into terrace deposits, footings shall be deepened as necessary to achieve a minimum of 0.3 meter embedment into competent terrace deposit. A construction joint shall be provided in the wall (not extending through the footing) at any transition in bearing material (i.e. terrace deposit to Caltrans Class 2 Base material). Typical details for limits of select backfill placement and slope setback requirements are presented in Figure 10.

Recommended bearing materials, bearing capacity values, lateral resistance values are provided below in Tables 6, 7, and 8, respectively.

Construction Considerations

It is anticipated that excavations for Wall 437R may be accomplished with the use of standard (heavy) earthwork equipment.

9.2 Retaining Wall 438L (Type I Wall)

Anticipated Foundation Soil Conditions

LOTB O-08-22 generally depicts subsurface conditions for Wall 438L. The station numbers indicated in the following paragraphs refer to the plan stations indicated on the retaining wall plan sheets (see Section 13.0 References: 42).

Retaining Wall 438L is underlain primarily by dense terrace deposits to the west of approximate plan station +17, which consist of silty sands with varying amounts of cobbles, gravel, and clay. The original grades to the east of approximate station +17 will be raised to achieve finish grade elevations for the Wall 438L. It is anticipated that these finish grade elevations will be obtained by placement of fill soils. It is recommended that these fill soils consist of Caltrans Class 2 Base.

Foundation Recommendations

Any existing fill soils encountered during construction are considered compressible and unsuitable for the support of structural loads in their present condition. These soils should be overexcavated within the footprints of the footings and backfill zones of the retaining walls. The actual depth of removal should be evaluated by the Engineer during grading.

The anticipated bearing materials for Wall 438L are dense terrace deposits west of approximate plan station +17 and Caltrans Class 2 Base to the east. Where footings are designed for embedment into terrace deposits, footings shall be deepened as necessary to achieve a minimum of 0.3 meter embedment into competent terrace deposit. A construction joint shall be provided in the wall (not extending through the footing) at any transition in bearing material (i.e. terrace deposit to Caltrans Class 2 Base material). Typical details for limits of select backfill placement and slope setback requirements are presented in Figure 10.

Recommended bearing materials, bearing capacity values, lateral resistance values are provided below in tables 6, 7, and 8, respectively.

Construction Considerations

It is anticipated that excavations for Wall 438L may be accomplished with the use of standard (heavy) earthwork equipment.

9.3 Retaining Wall 438R (Type I Wall)

Anticipated Foundation Soil Conditions

LOTBs O-08-13, O-08-14, O-08-19, O-08-24, and O-08-25 generally depict subsurface conditions for Wall 438L. The station numbers indicated in the following paragraphs refer to the plan stations indicated on the retaining wall plan sheets (see Section 13.0 References: 43).

Retaining Wall 438R is underlain primarily by dense terrace deposits to the west of approximate plan station +35, which consist of silty sands with varying amounts of cobbles, gravel, and clay. The original grades to the east of approximate station +35 will be raised to achieve finish grade elevation for Wall 438R. It is anticipated that these finish grade elevations will be obtained by placement of fill soils. It is recommended that these fill soils consist of Caltrans Class 2 Base.

Foundation Recommendations

Any existing fill soils encountered during construction are considered compressible and unsuitable for the support of structural loads in their present condition. These soils should be overexcavated within the footprints of the footings and backfill zones of the retaining walls. The actual depth of removal should be evaluated by the Engineer during grading.

The anticipated bearing materials for Wall 438R are dense terrace deposits west of approximate plan station +35 and Caltrans Class 2 Base to the east. Where footings are designed for embedment into terrace deposits, footings shall be deepened as necessary to achieve a minimum of 0.3-meter embedment into competent terrace deposit. A construction joint shall be provided in the wall (not extending through the footing) at any transition in bearing material (i.e. terrace deposit to Caltrans Class 2 Base material). Typical details for limits of select backfill placement and slope setback requirements are presented in Figure 10.

Recommended bearing materials, bearing capacity values, lateral resistance values are provided below in tables 6, 7, and 8, respectively.

Construction Considerations

It is anticipated that excavations for Wall 438L may be accomplished with the use of standard (heavy) earthwork equipment.

9.4 Retaining Wall 443R (Type I Wall)

Anticipated Foundation Soil Conditions

LOTBs A-08-57, A-08-58, and A-08-59 generally depict subsurface conditions for Wall 443R.

Retaining Wall 443R is underlain primarily by dense terrace deposits consisting of silty sands with varying amounts of cobbles, gravel, and clay.

Foundation Recommendations

Any existing fill soils encountered during construction are considered compressible and unsuitable for the support of structural loads in their present condition. These soils should be overexcavated within the footprints of the footings and backfill zones of the retaining walls. The actual depth of removal should be evaluated by the Engineer during grading.

The recommended bearing material for Wall 443R is dense terrace deposits. Where footings are designed for embedment into terrace deposits, footings shall be deepened as necessary to achieve a minimum of 0.3-meter embedment into competent terrace deposit.

Recommended bearing materials, bearing capacity values, lateral resistance values are provided below in tables 6, 7, and 8, respectively.

Construction Considerations

It is anticipated that excavations for Wall 443R may be accomplished with the use of standard (heavy) earthwork equipment.

9.5 Retaining Wall 445L (Crib Wall)

Anticipated Foundation Soil Conditions

LOTBs A-08-02, A-08-03 and A-08-05 generally depict subsurface conditions for Wall 445L.

Retaining Wall 445L is underlain by existing fill consisting primarily of stiff to hard silt and lean clay with varying amounts of sand and gravel.

Foundation Recommendations

The recommended bearing material for Wall 445L is the existing fill.

Recommended bearing materials, bearing capacity values, lateral resistance values are provided below in tables 6, 7, and 8, respectively.

Construction Considerations

It is anticipated that excavations for Wall 445L may be accomplished with the use of standard (heavy) earthwork equipment.

9.6 Retaining Wall 445R (Battered MSE Wall)

Anticipated Foundation Soil Conditions

LOTBs A-08-01, A-08-04, A-08-07, A-08-08, A-08-09, A-08-10, A-08-15, O-08-18, O-08-27, A-08-52, A-08-53, A-08-54, A-08-55, and A-08-56 generally depict subsurface conditions for Wall 445R.

Retaining Wall 445R is underlain primarily by existing fill consisting primarily of stiff to hard silt and lean clay with varying amounts of sand and gravel. The western end of the wall will bear on

alluvium consisting of silty clay to poorly graded sand with variable concentrations of gravel and cobbles.

Foundation Recommendations

The recommended bearing material for Wall 445R is 1.0 meter of select backfill overlying the existing fill or alluvium as indicated on Figure 11 - Battered MSE Wall 445R Detail.

The footings for Wall 445R shall have a minimum embedment of 1.35 meters (4.4 feet) from the lowest adjacent grade as shown in Figure 11- Battered MSE Wall 445R Detail.

The reinforced soil structure will incorporate placement of geogrids to obtain the minimum factor of safety against global stability. The Table 4: Geogrid Table presents the geogrid parameters used in the design of the Wall 445R.

Table 4: Geogrid Table

Design Height	Geogrid Length	Geogrid Spacing	Grid Tensile Strength	Grid Pullout Adhesion
0 – 3 m	2.4 m	0.45 m	35 kN/m	5 kN/m^2
3 – 6 m	4.8 m	0.45 m	60 kN/m	5 kN/m^2
6 – 9 m (1)	7.2 m	0.45 m	60 kN/m	5 kN/m^2
9 – 12 m (1)	9.6 m	0.45 m	60 kN/m	5 kN/m^2
> 12 m (1)	10.0 m	0.45 m	60 kN/m	5 kN/m^2

Note: (1) For wall sections with Design Height exceeding 6.0 meters the upper 3.0 meters of the wall have been designed for geogrid reinforcement with tensile strength of 35 kN/m and a grid length of 5.0 meters.

West End of Wall 445R at CCR Bridge Abutment: Where the MSE wall abuts the east CCR bridge abutment, the geogrid length recommended in Table 4 may not be possible and the curving wall will require overlapping of the grids. Where the wall curves to meet the bridge abutment, grids should be overlapped in accordance with the manufacturer's recommendations.

The MSE wall shall be embedded a minimum depth of 1.35 meters below the lowest adjacent finish grade, as depicted on Figure 11.

The MSE wall backfill shall be free from organic, deleterious, and other unsuitable materials as determined by the Engineer; and shall conform to the requirements set forth in Table 5 below.

Table 5: MSE Wall Backfill Requirements

Property	Value	CA Test No.
Sieve Size	Percent Passing	202
37.5 mm	100	202
19 mm	70-100	202
4.75 mm	20-70	202
0.42 mm	0-70	202
0.075 mm	0-60	202

Quality Requirements		
Test	Operating	
Sand Equivalent	10 minimum	217
Plasticity Index	30 maximum	204
pH	5 to 9	643

If the proposed backfill materials do not meet the requirements in Table 5 above, they should have minimum shear strength parameters as follows:

Cohesion greater than or equal to 14.36 kN/m^2 (300 psf)

Friction angle greater than or equal to 28 degrees

Recommended bearing materials, bearing capacity values, lateral resistance values are provided below in tables 6, 7, and 8, respectively.

Construction Considerations

Construction of Wall 445R at the west end of the wall where the MSE wall abuts the east CCR bridge abutment will require special construction considerations.

It is anticipated that excavations for Wall 445R may be accomplished with the use of standard (heavy) earthwork equipment.

The temporary excavation for Wall 445R was evaluated and found to have a calculated safety factor for static conditions in excess of 1.3 (refer to Appendix III.3.6, page A-136). The temporary excavation for Wall 445R will encroach onto the existing paved surfaces of Carroll Canyon Road and Scranton Road. Provisions for appropriate traffic control will be required and should be evaluated by the Engineer. Existing surface and subsurface improvements and utilities may also be affected by the temporary excavation. The presence of existing improvements and utilities should be investigated, and potential impacts due to the excavation of the temporary slope should be evaluated by the Engineer.

The use of temporary shoring may be necessary for the Wall 445R due to the presence of an existing adjacent ascending fill slope. The Occupational Safety and Health Administration (OSHA) regulations provide trench sloping and shoring design parameters for excavations up to 6.0 meters (19.7 feet) deep, based on a description of the soil types encountered. BVNA recommends that the following OSHA Classifications be used for temporary excavations and other purposes:

Existing Fill, Caltrans Class 2 Base Material, and Terrace Deposits: Type B

Excavations should be inspected by the Engineer and the performance evaluated.

9.7 Select Backfill Requirements

Select backfill specified as bearing material for portions of retaining Walls 437R, 438L, 438R, and 445R shall conform to the specifications of Caltrans Class 2 Aggregate Base.

9.8 Bearing Materials

Recommended bearing materials for each proposed retaining wall are summarized in Table 6 below. Specific discussions regarding recommended bearing materials for each wall are provided in the preceding sections.

Table 6: Retaining Wall Bearing Material

Wall No.	Wall Type (Maximum Wall Height)	Bearing Material
437R	TYPE I (8.5 meters)	Terrace Deposits and Caltrans Class 2 Base
438L	TYPE I (9.7 meters)	Terrace Deposits and Caltrans Class 2 Base
438R	TYPE I (10.3 meters)	Terrace Deposits and Caltrans Class 2 Base
443R	TYPE I (6.0 meters)	Terrace Deposits
445L	CRIB (1.8 meters)	Existing Fill/ Alluvium
445R	Battered MSE (12.1 meters)	Caltrans Class II Aggregate Base over Existing Fill and Alluvium

9.9 Bearing Capacity

The bearing capacity estimates for the spread footings were made in accordance with the guidelines presented in Section 4, Foundations of the 2003 Bridge Design Specifications by Caltrans. In addition, the bottom of the footings should be embedded a minimum of 1.0 meter (3.3 feet) below the lowest adjacent grade. The recommended bearing capacity values for the spread footings are presented in Table 7, below.

Table 7: Bearing Capacity Values

Working Stress Design (WSD)			
Soil Type	**Wall Types**	**Allowable Gross Bearing Capacity, q_{all}**	**Permissible Gross Contact Stress (Settlement), q_{pg}**
Existing Fill/ Alluvium	445L, 445R	191.6 kPa (4 ksf)	574.8 kPa (12 ksf)
Caltrans Class 2 Base	437R (west of Station No. 437+33), 438L (east of Station No. 438+18), 438R (east of Station No. 438+35)	287.4 kPa (6 ksf)	862.2 kPa (18 ksf)
Terrace Deposits	437R (east of Station No. 437+33), 438L (west of Station No. 438+18), 438R (west of Station No. 438+35), 443R	430.0 kPa (9 ksf)	1,290 kPa (27 ksf)

9.10 Lateral Resistance

The active pressure exerted on the retaining walls will be derived from the Caltrans structure backfill material and may be calculated using 5.79H kilopascal (36H pounds per square foot), where H is the retained backfill height in meters.

The lateral resistance values for the proposed spread footings should be designed using the values listed in Table 8 below:

Table 8: Lateral Resistance

Soil Type	Wall Type	Passive Pressure		Coefficient of Friction
		Equivalent Fluid Pressure	Maximum Pressure Value	
Existing Fill/ Alluvium	445L	53.05 kN/m^3 (0.338 kcf)	242.8 kN/m^2 (5.07 ksf)	0.35
Caltrans Class 2 Base	438R, 438L, 445R	75.6 kN/m^3 (0.481 kcf)	345.9 kN/m^2 (7.2 ksf)	0.40
Terrace Deposits	437R, 443R	69.4 kN/m^3 (0.442 kcf)	317.7 kN/m^2 (6.6 ksf)	0.40

A factor of safety of 1.5 should be used when evaluating the lateral resistance. Sliding resistance shall be calculated using only the base resistance or passive resistance values, or 50 percent of base resistance plus 50 percent of passive resistance behind the footing. The passive resistance may be increased by one-third for short duration loads like wind or seismic forces.

10.0. SLOPE STABILITY ANALYSES

Slope stability analyses including static and pseudo-static conditions were performed to evaluate the global stability for the Type I Walls 437R and 438R, along with the battered MSE Wall 445R. The cross sections were analyzed utilizing the computer software program Slide, version 5.0, created by Rocscience®. The Bishop Simplified method of analysis was used to locate the critical slip surface for static and pseudo-static conditions. The subsurface conditions were modeled based upon data from the subsurface exploration program and the earth materials were assigned the strength characteristics presented in Table 2. The minimum specified safety factor is 1.5 and 1.1 for static and seismic, respectively. In accordance with Section 3.10 of the Caltrans Guidelines for Structures Foundation Reports, 2006; a seismic factor (k) equal to a third of the horizontal peak bedrock acceleration (i.e., 0.167g) was added as a horizontal force, while the effects of vertical acceleration were omitted.

Walls 437R and 438R

Global stability analyses were also performed for Walls 437R and 438R and the graphical outputs have been presented in Appendix III.2: Slope Stability Analyses Results for Type I Walls 437R and 438R. The results of the analyses indicated that the calculated safety factors were in excess of 1.5 and 1.1 for static and pseudo-static conditions, respectively.

Wall 445R

Slope stability analyses including static and pseudo-static conditions were performed to evaluate the proposed Wall 445R along the seven (7) cross sections shown in Appendix III.3.1. The geogrid reinforcement was also modeled into the sections using the parameters presented in Table 6. The graphical outputs of the slope stability analyses results are presented in

Appendix III.3. The results of the analyses indicated that the calculated safety factors were in excess of 1.5 and 1.1 for static and pseudo-static conditions, respectively.

11.0. CONSTRUCTION CONSIDERATIONS

Construction considerations for spread footings are presented below.

Spread Footings

1. Temporary excavations will be required for construction of spread footings. The use of temporary shoring may be necessary as some locations due to the presence of existing infrastructure. The Occupational Safety and Health Administration (OSHA) regulations provide trench sloping and shoring design parameters for excavations up to 6.0 meters (19.7 feet) deep, based on a description of the soil types encountered. BVNA recommends that the following OSHA Classifications be used for temporary excavations and other purposes:

   Existing Fill, Select Backfill Material, and Terrace Deposits: Type B

   Excavations should be inspected by the Engineer and the performance evaluated.

2. Temporary slopes above the water table in the fill soils should be inclined no steeper than 1 to 1 (horizontal to vertical). Temporary excavations that encounter seepage may need shoring or may be stabilized by placing sandbags or gravel along the base of the seepage zone.

3. Heavy loads should not be allowed within 3.0 meters (10 feet) of the tops of excavated slopes. A greater setback may be necessary when considering heavy vehicles, such as concrete trucks and cranes. The Engineer should be advised of such heavy loadings so that specific setback requirements may be established. Storm water should be directed away from temporary slopes. It should be noted that temporary excavations are susceptible to local failures depending on the duration of the excavation. Ground water seepage zones may be encountered during excavation, particularly during the wet weather season; therefore, dewatering measures might be necessary. Where seepage zones occur, loose or yielding conditions may develop at the bottom of the excavations, which would require removal and replacement of saturated materials with select structural fill soils. In lieu of complete removal and replacement, partial removal and placement of a stabilization section consisting of clean drain rock and geosynthetics may be more cost-effective. Saturated yielding conditions should be inspected by the Engineer to determine the appropriate remedial measures.

4. If foundation materials at the bottom of the excavation are disturbed during the excavation, these should be removed and recompacted to a minimum 95 percent relative compaction, based on CTM 216.

12.0. DISCLAIMERS AND CONTACT INFORMATION

The recommendations contained in this report are based on specific project information regarding structure type, location, and design loads that have been provided to BVNA. If any conceptual changes are made during final project design, BVNA should review those changes to determine if these foundation recommendations are still applicable. Any questions regarding the above recommendations should be directed to the attention of Scott Moors, (805) 656-6074 at BVNA.

The recommendations and opinions expressed in this report are based on field and laboratory data developed by BVNA, review of background documents, project plans prepared by T.Y. Lin dated October 27, 2008, and communications with T.Y. Lin and Caltrans. It should be noted that this study did not evaluate the possible presence of hazardous materials on any portion of the site.

Should the proposed grades vary significantly from the existing or if any development configuration changes, structural loads change, or the foundation subgrade conditions vary significantly; our recommendations may need to be modified accordingly.

Due to the limited nature of our field explorations, conditions not observed and described in this report may be present on the site. It should be understood that conditions different from those anticipated in this report may be encountered during grading operations (e.g., the extent of removal of unsuitable soil) and that additional effort may be required to mitigate them.

This document is intended to be used only in its entirety. No portion of the document, by itself, is designed to completely represent any aspect of the project described herein. BVNA should be contacted if the reader requires additional information or has questions regarding the content, interpretations presented, or completeness of this document.

BVNA has endeavored to perform our evaluation using the degree of care and skill ordinarily exercised under similar circumstances by reputable geotechnical professionals with experience in this area in similar soil conditions. No other warranty, either expressed or implied, is made as to the conclusions and recommendations contained in this report.

13.0. REFERENCES

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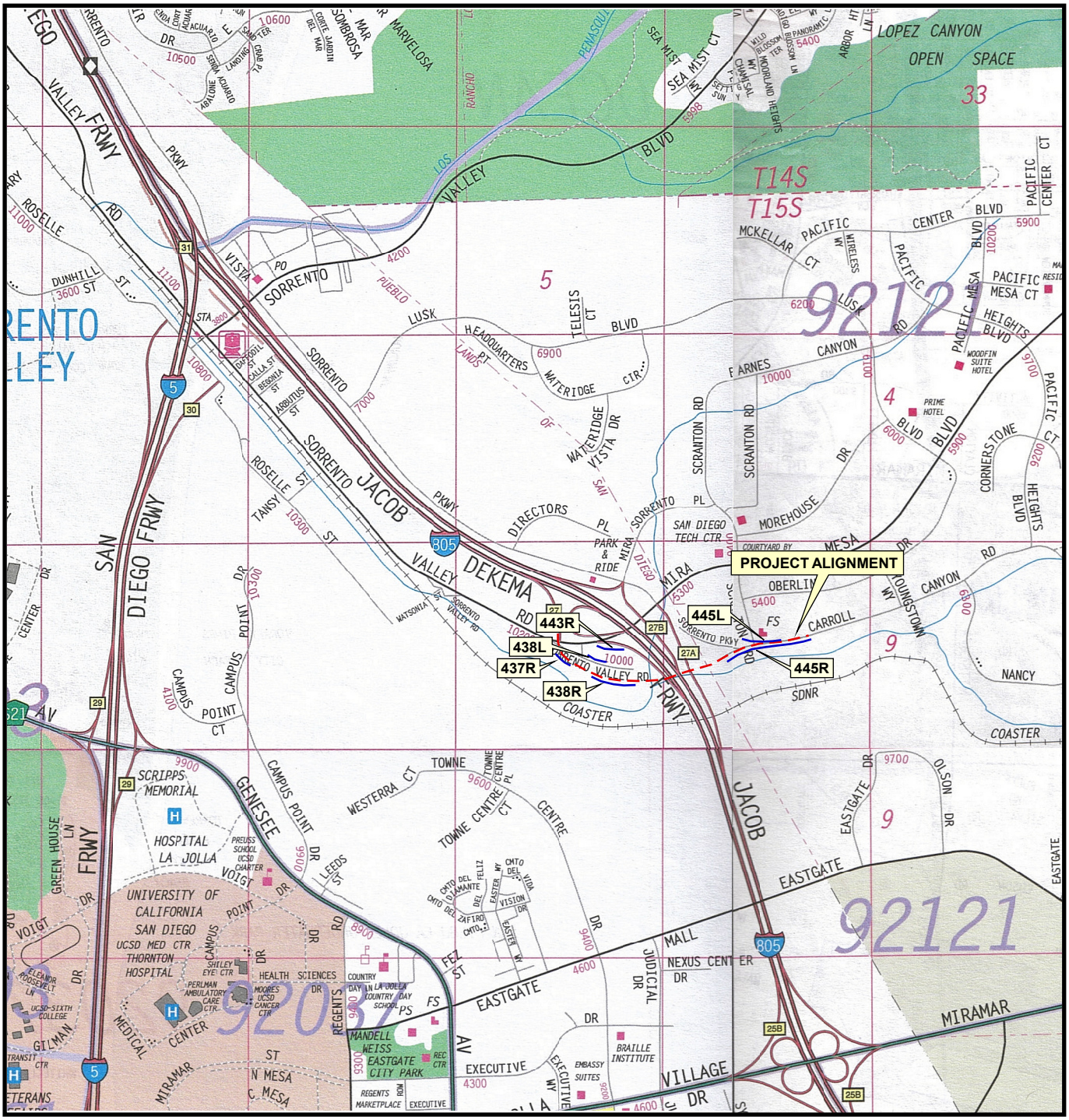
APPENDIX I

FIGURES, LOG OF TEST BORINGS (LOTB), AND CONE PENETRATION TESTING



REFERENCE: THE THOMAS GUIDE, SAN DIEGO COUNTY STREET GUIDE, 2007, PAGE 1208 GRID E-7

SCHEMATIC ONLY - NOT TO SCALE - NOT A CONSTRUCTION DRAWING

APPROXIMATE SCALE

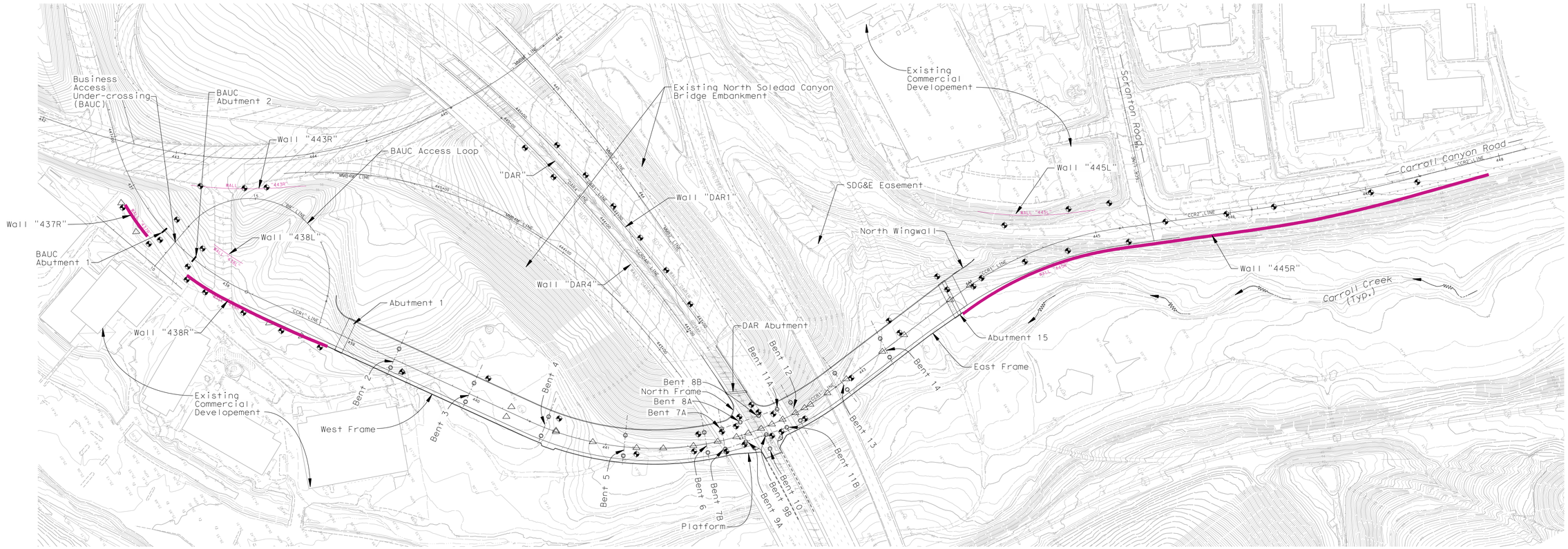
1 CENTIMETER: 228 METERS
(1 INCH: 1,900 FEET)

NOTE: This figure may contain areas of color. BVNA cannot be responsible for any subsequent misinterpretation of the information resulting from black and white reproductions of this figure.

BUREAU VERITAS NORTH AMERICA, INC.
Testing Engineers San Diego
7895 Convoy Court, Suite 18
San Diego, CA 92111

Title:	**Site Location Map**		
Project:	Miscellaneous Retaining Walls		
Drawn:	MPP	Contract No:	38008-017046.00 (SANDAG T.O. 46)
Date:	March, 2009	Figure No:	1 (Appendix I.1)

NTS



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San Diego, CA 92111
Tel (858) 715-5800 Fax (858) 715-5810

Title:	**Project Plan**		
Project:	MISCELLANEOUS RETAINING WALLS		
Drawn:	JDJ	Contract No.:	38008-017046.00
Date:	February 2009	Figure No.:	2 (Appendix I.2)

\Miscellaneous Retaining Walls\MRW_FIG2_ProjectPlan.dgn

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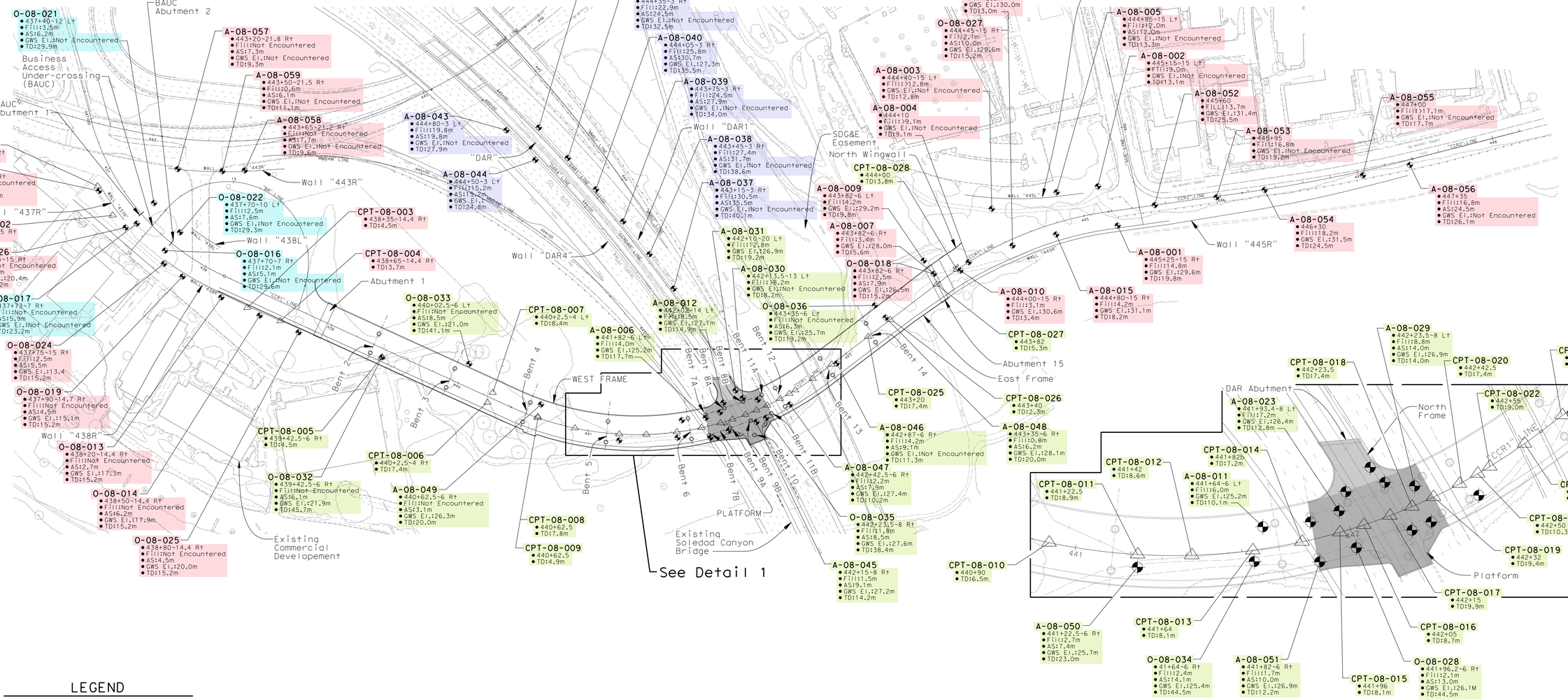

DETAIL 1

NO SCALE

LEGEND

- Carroll Canyon Road Bridge
- Direct Access Ramp
- Business Access Undercrossing
- Miscellaneous Retaining Walls

O-08-035
- 442+23.5~8 Rt — (Station location in meters)
- Fill:1.8m — (Depth below surface to bottom of fill)
- AS:8.5m — (Depth below surface to Ardath Shale contact)
- GWS El.:27.6m — (Elevation of ground water surface mean sea level)
- TD:38.4m — (Total depth of Test Boring / CPT)

Note: The Legend depicts color coding to differentiate between field exploration operations relevant to each of the 4 components of the overall project (i.e., CCR Bridge, Business Access Undercrossing, DAR Retaining Walls, Miscellaneous Retaining Walls) and are included in companion LOTB subappendices. However, all of the field exploration information is relevant to each of the 4 project components to depict a broader subsurface site characterization.

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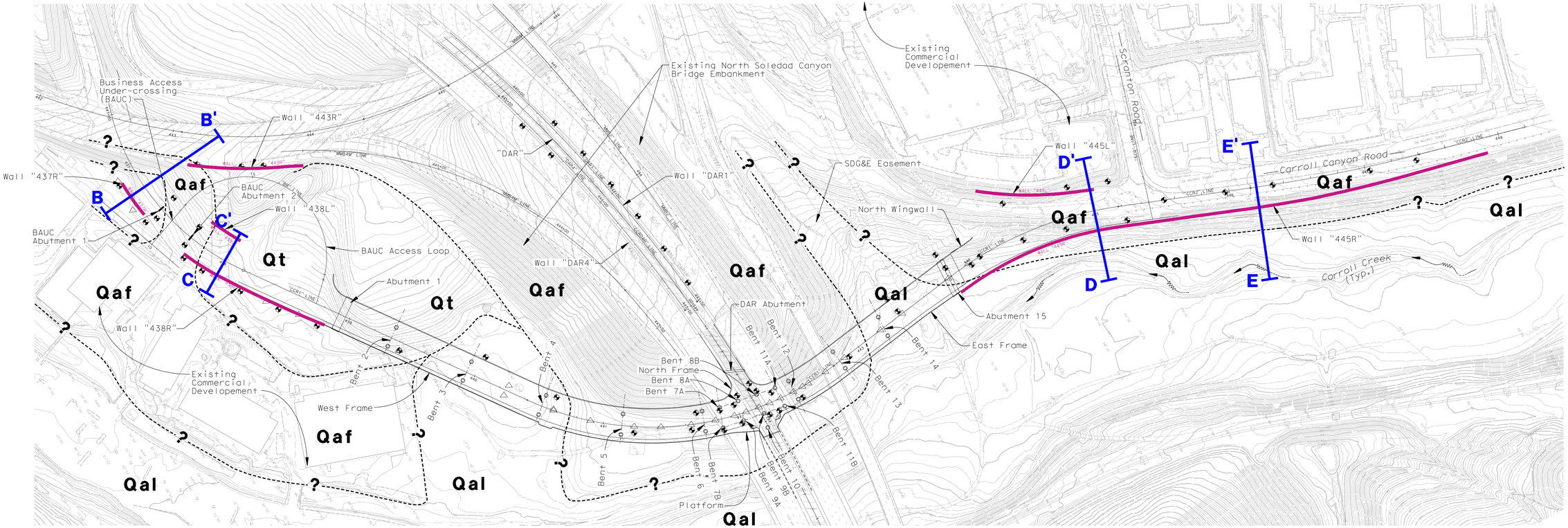
Title:	**Field Exploration Map**		
Project:	MISCELLANEOUS RETAINING WALLS		
Drawn:	JDJ	Contract No.:	38008-017046.00
Date:	February 2009	Figure No.:	3 (Appendix I.3)

\Miscellaneous Retaining Walls\MRW_FIG3_FieldExplMap.dgn

LEGEND

Qaf	Artificial Fill
Qal	Alluvium
Qt	Terrace Deposits
	Approximate Geologic Contact; queried where uncertain
E E'	Section (Typ.)

NTS



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Title:	**Geotechnical Map**		
Project:	MISCELLANEOUS RETAINING WALLS		
Drawn:	JDJ	Contract No.:	38008-017046.00
Date:	March 2008	Figure No.:	4 (Appendix I.4)

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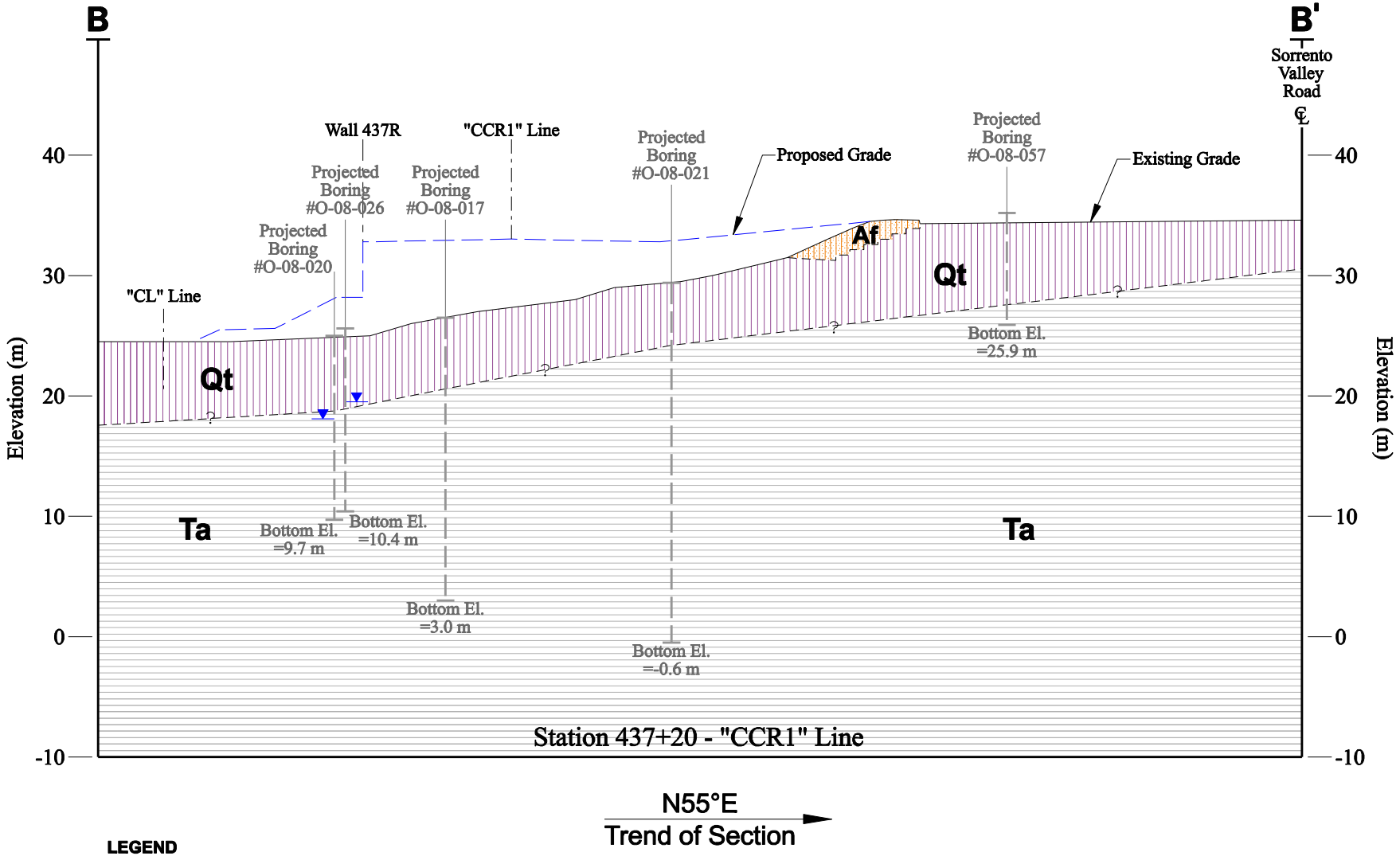

LEGEND

- Artifical Fill (Af)
- Alluvium (Qal)
- Terrace Deposits (Qt)
- Ardath Shale Bedrock (Ta)
- Approximate Groundwater Elevation Encountered During Drilling

Graphic Scale (Meters)
0 5 10 20
1:500

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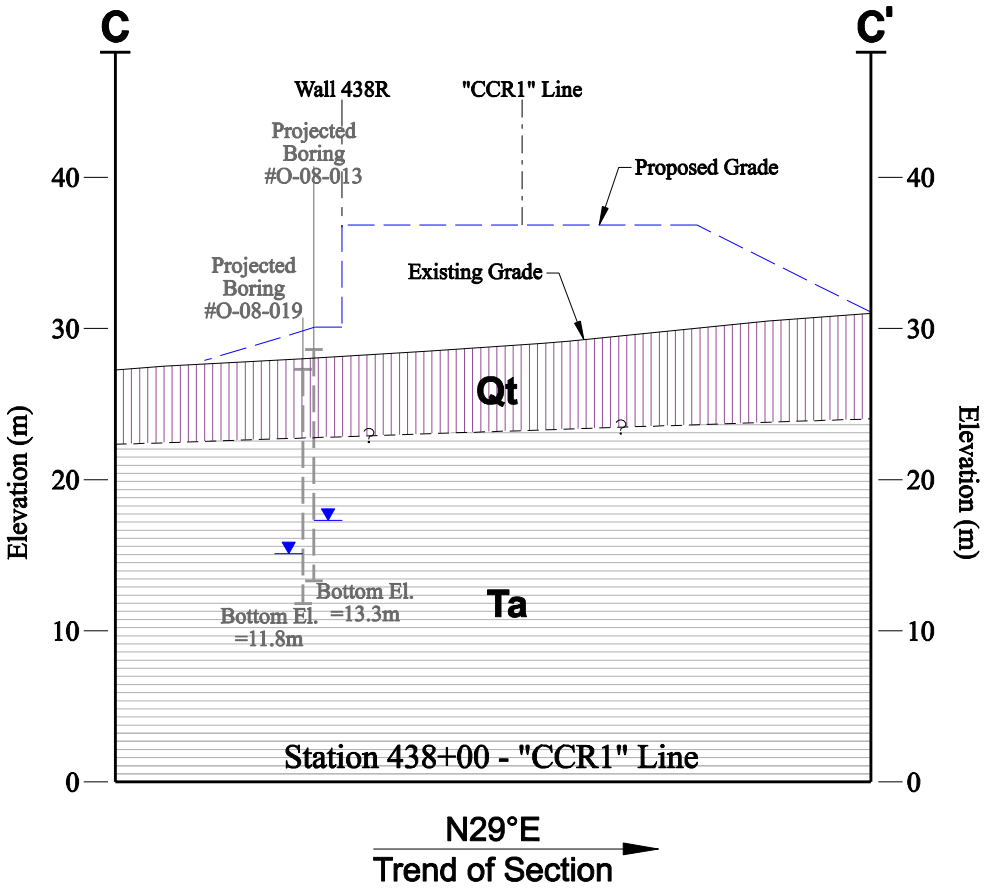
Title:	SECTION A-A'
Project:	MISCELLANEOUS RETAINING WALLS
Drawn: JDJ	Contract No.: 38008-017046.00
Date: March 2009	Figure No.: 5 (Appendix I.5)



LEGEND

- Artifical Fill (Af)
- Alluvium (Qal)
- Terrace Deposits (Qt)
- Ardath Shale Bedrock (Ta)
- Approximate Groundwater Elevation Encountered During Drilling

Graphic Scale (Meters)
0 5 10 20
1:500

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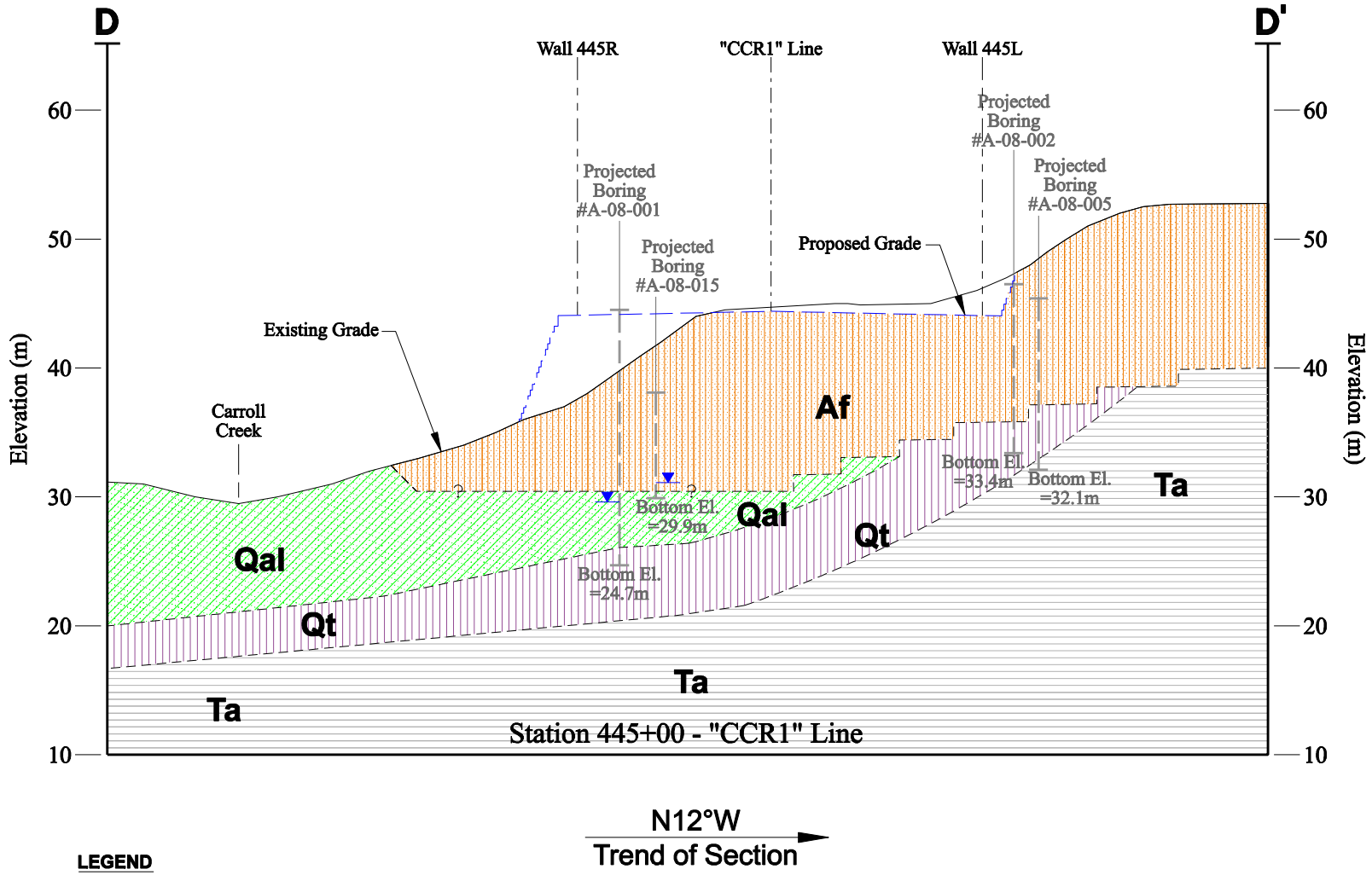
Title: SECTION B-B'	
Project: MISCELLANEOUS RETAINING WALLS	
Drawn: JDJ	Contract No.: 38008-017046.00
Date: March 2009	Figure No.: 6 (Appendix I.6)



LEGEND

- Artifical Fill (Af)
- Alluvium (Qal)
- Terrace Deposits (Qt)
- Ardath Shale Bedrock (Ta)
- Approximate Groundwater Elevation Encountered During Drilling

Graphic Scale (Meters)
0 5 10 20
1:500

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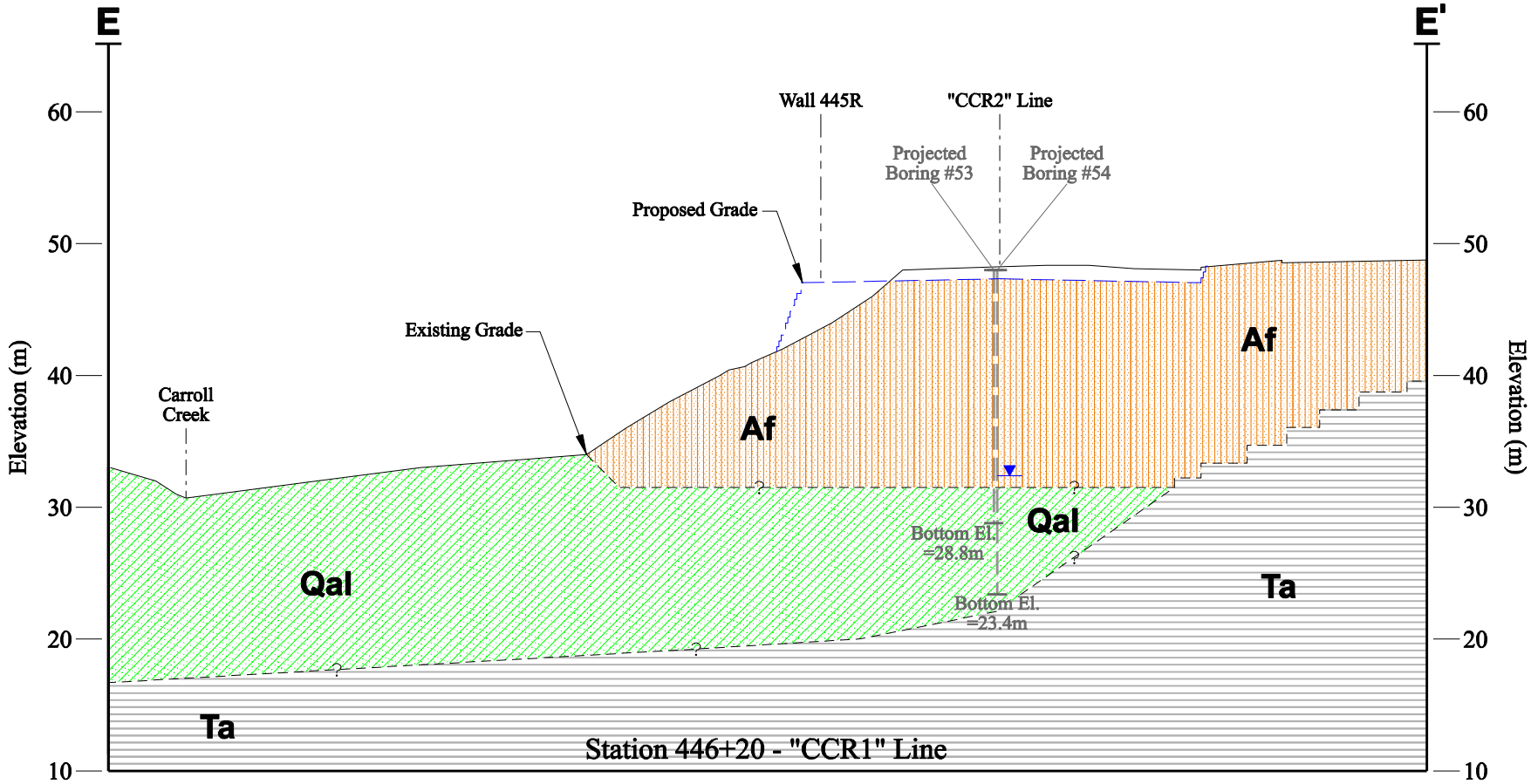
Tel (858) 715-5800 Fax (858) 715-5810

Title:	SECTION C-C'
Project:	MISCELLANEOUS RETAINING WALLS
Drawn: JDJ	Contract No.: 38008-017046.00
Date: March 2009	Figure No.: 7 (Appendix I.7)



N8°W
Trend of Section

LEGEND

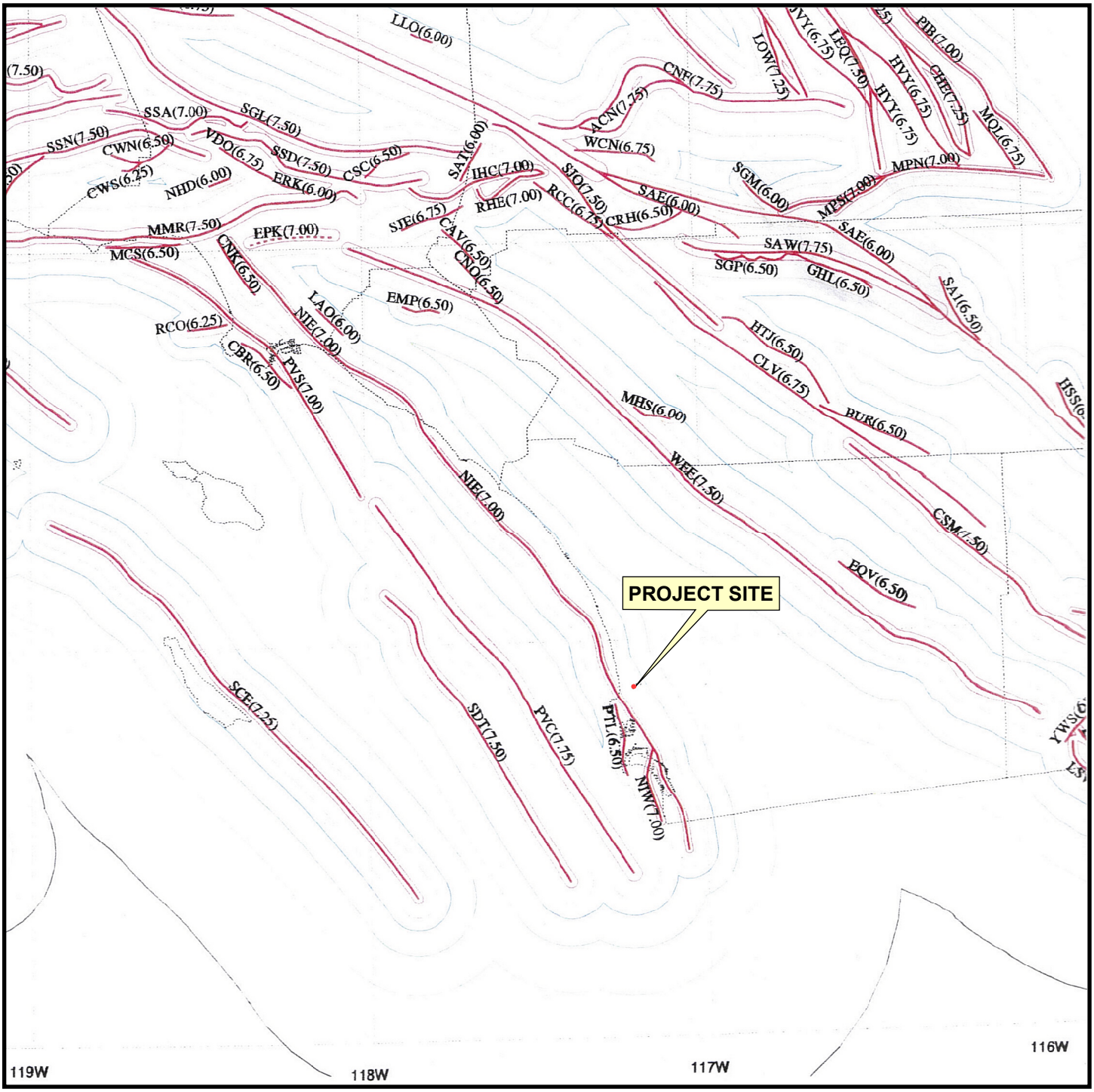
- Artifical Fill (Af)
- Alluvium (Qal)
- Terrace Deposits (Qt)
- Ardath Shale Bedrock (Ta)
- Approximate Groundwater Elevation Encountered During Drilling

Graphic Scale (Meters)
0 5 10 20
1:500

FOR SCHEMATIC USE ONLY - NOT A CONSTRUCTION DRAWING

BUREAU VERITAS NORTH AMERICA, INC.
7890 Convoy Court, Suite 18
San Diego, CA 92111
Tel (858) 715-5800 Fax (858) 715-5810

Title:	SECTION D-D'
Project:	MISCELLANEOUS RETAINING WALLS
Drawn: JDJ	Contract No.: 38008-017046.00
Date: March 2009	Figure No.: 8 (Appendix I.8)



REFERENCE: MAUCHLIN, L., 1996, "CALIFORNIA SEISMIC HAZARD MAP 1996", CALIFORNIA DEPARTMENT OF TRANSPORTATION

N

APPROXIMATE SCALE

1 CENTIMETER: 15,750 METERS
(1 INCH: 40 KILOMETERS)

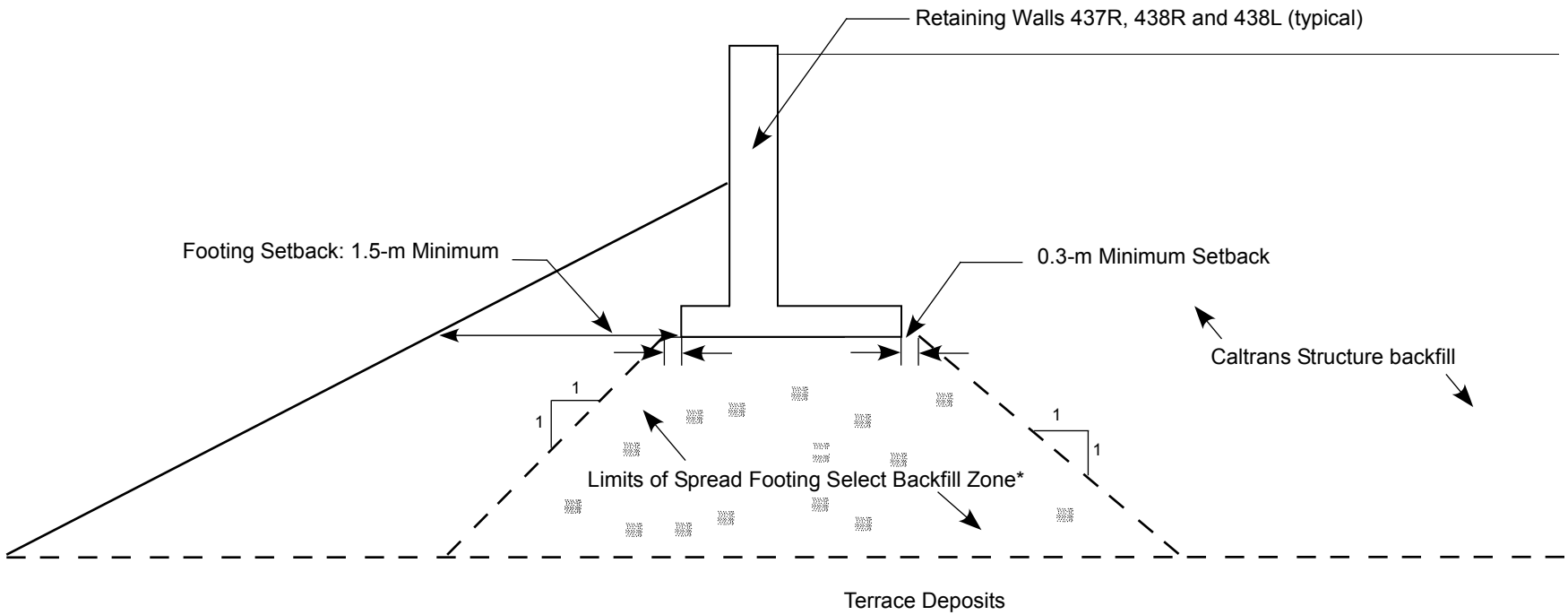
NOTE: This figure may contain areas of color. BVNA cannot be responsible for any subsequent misinterpretation of the information resulting from black and white reproductions of this figure.

SCHEMATIC ONLY - NOT TO SCALE - NOT A CONSTRUCTION DRAWING

BUREAU VERITAS NORTH AMERICA, INC.
Testing Engineers San Diego
7895 Convoy Court, Suite 18
San Diego, CA 92111

Title:	**California Seismic Hazard Map, Caltrans 1996**		
Project:	Miscellaneous Retaining Walls		
Drawn:	MPP	Contract No:	38008-017046.00 (SANDAG T.O. 46)
Date:	March, 2009	Figure No:	9 (Appendix I.9)

Wall 437R, 438R and 438L Footing Bearing Zone



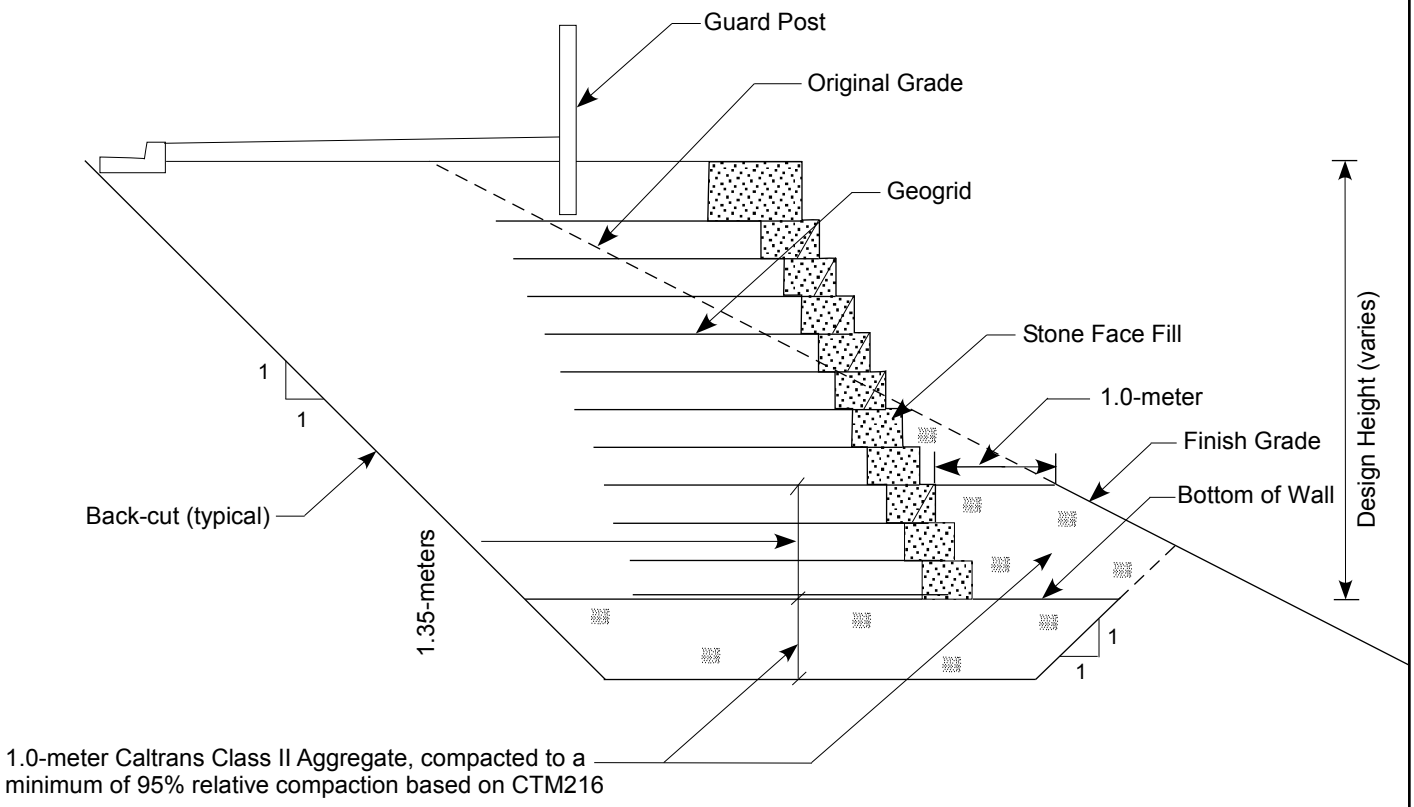
SCHEMATIC ONLY - NOT TO SCALE - NOT A CONSTRUCTION DRAWING

* Select Backfill Shall Conform to the Specifications of Caltrans Class II Base

BUREAU VERITAS NORTH AMERICA, INC.
Testing Engineers San Diego
7895 Convoy Court, Suite 18
San Diego, CA 92111

Title:	**Walls 437R, 438R and 438L Bearing Zone**		
Project:	Miscellaneous Retaining Walls		
Drawn:	MPP	Contract No:	38008-017046.00 (SANDAG T.O. 46)
Date:	March, 2009	Figure No:	10 (Appendix I.10)

Battered MSE Wall 445R Detail



SCHEMATIC ONLY - NOT TO SCALE - NOT A CONSTRUCTION DRAWING

BUREAU VERITAS NORTH AMERICA, INC.
Testing Engineers San Diego
7895 Convoy Court, Suite 18
San Diego, CA 92111

Title:	**Battered MSE Wall 445R Detail**		
Project:	Miscellaneous Retaining Walls		
Drawn:	MPP	Contract No:	38008-017046.00 (SANDAG T.O. 46)
Date:	March, 2009	Figure No:	11 (Appendix I.11)

APPENDIX I.12

CARROLL CANYON ROAD BRIDGE LOTBs

Table I.7
Types of Drill Rigs Used

Boring Number	Location	Reference	Project	Drilling Company	Rig Type	Diameter (mm)	Hammer Type
A-08-001	445+25 10 RT (15 RT on plan)	"CCR1" Line	Misc RW	Pacific	Unimog	203	Safety Auto
A-08-002	445+15 15 L (~ 10' offset south and downslope)	"CCR1" Line	Misc RW	Pacific	Unimog	203	Safety Auto
A-08-003	444+40 15LT	"CCR1" Line	Misc RW	Pacific	Unimog	203	Safety Auto
A-08-004	444+10 CL	"CCR1" Line	Misc RW	Pacific	Unimog	203	Safety Auto
A-08-005	444+85 15LT (~15' offset south	"CCR1" Line	Misc RW	Pacific	Unimog	203	Safety Auto
A-08-006	441+82 6LT	"CCR1" Line	CCR Bridge	Pacific	Mole	203	Safety Auto
A-08-007	443+82 6RT	"CCR1" Line	Misc RW/ CCR Bridge	Pacific	Unimog	203	Safety Auto
A-08-008	444+45 15RT	"CCR1" Line	Misc RW	Pacific	Unimog	203	Safety Auto
A-08-009	443+82 6LT (~10' offset North of stake)	"CCR1" Line	Misc RW/ CCR Bridge	Pacific	Unimog	203	Safety Auto
A-08-010	444+00 15RT	"CCR1" Line	Misc RW	Pacific	Unimog	203	Safety Auto
A-08-011	441+64 6LT	"CCR1" Line	CCR Bridge	Pacific	Mole	203	Safety Auto
A-08-012	442+02 14LT	"CCR1" Line	CCR Bridge	Pacific	Unimog	203	Safety Auto
A-08-015	444+80 15RT	"CCR1" Line	Misc RW	Pacific	Mini Mole	203	Safety Auto
A-08-023	441+93.04 8LT	"CCR1" Line	CCR Bridge	Pacific	Mole	203	Safety Auto
A-08-029	442+23.5 8LT	"CCR1" Line	CCR Bridge	Pacific	Mole	203	Safety Auto
A-08-030	442+13.5 13LT	"CCR1" Line	CCR Bridge	Pacific	Mole	203	Safety Auto
A-08-031	442+10 20LT	"CCR1" Line	CCR Bridge	Pacific	Mole	203	Safety Auto
A-08-037	443+15 3RT	"CCRDAR" Line	DAR	Test America	CME-95	203	Safety Auto
A-08-038	443+45 3RT	"CCRDAR" Line	DAR	Test America	CME-95	203	Safety Auto
A-08-039	443+75 3RT	"CCRDAR" Line	DAR	Test America	CME-95	203	Safety Auto
A-08-040	444+05 3RT	"CCRDAR" Line	DAR	Test America	CME-95	203	Safety Auto
A-08-041	444+35 3RT	"CCRDAR" Line	DAR	Test America	CME-95	203	Safety Auto
A-08-042	444+65 3RT	"CCRDAR" Line	DAR	Test America	CME-95	203	Safety Auto
A-08-043	444+80 3LT	"CCRDAR" Line	DAR	Test America	CME-95	203	Safety Auto

Table I.7
Types of Drill Rigs Used

Boring Number	Location	Reference	Project	Drilling Company	Rig Type	Diameter (mm)	Hammer Type
A-08-044	444+50 3LT	"CCRDAR" Line	DAR	Test America	CME-95	203	Safety Auto
A-08-045	442+15 8RT	"CCR1" Line	CCR Bridge	Test America	CME-95	203	Safety Auto
A-08-046	442+87 6RT	"CCR1" Line	CCR Bridge	Test America	CME-95	203	Safety Auto
A-08-047	442+42.5 6RT	"CCR1" Line	CCR Bridge	Test America	CME-95	203	Safety Auto
A-08-048	443+35 6RT	"CCR1" Line	CCR Bridge	Test America	CME-95	203	Safety Auto
A-08-049	440+62.5 6RT	"CCR1" Line	CCR Bridge	Test America	CME-95	203	Safety Auto
A-08-050	441+22.5 6RT	"CCR1" Line	CCR Bridge	Test America	CME-95	203	Safety Auto
A-08-051	441+82 6RT	"CCR1" Line	CCR Bridge	Test America	CME-95	203	Safety Auto
A-08-052	445+60	"CCR2" Line	Misc RW	Test America	CME-95	203	Safety Auto
A-08-053	445+95	"CCR2" Line	Misc RW	Test America	CME-95	203	Safety Auto
A-08-054	446+30	"CCR2" Line	Misc RW	Test America	CME-95	203	Safety Auto
A-08-055	447+00	"CCR2" Line	Misc RW	Test America	CME-95	203	Safety Auto
A-08-056	447+35	"CCR2" Line	Misc RW	Test America	CME-95	203	Safety Auto
A-08-057	443+20 21.8 RT #68	"MMBMOD" Line	Misc RW	Test America	CME-95	203	Safety Auto
A-08-058	443+65 21.2 RT #65	"MMBMOD" Line	Misc RW	Test America	CME-95	203	Safety Auto
A-08-059	443+50 21.5 RT #66	"MMBMOD" Line	Misc RW	Test America	CME-95	203	Safety Auto
O-08-013	438+20 14.4 RT	"CCR1" Line	Misc RW	Boart L	Longyear 1405	152	Safety Auto
O-08-014	438+50 14.4 RT	"CCR1" Line	Misc RW	Boart L	Longyear 1405	152	Safety Auto
O-08-016	437+70 7RT	"CCR1" Line	BAUC	Boart L	Prosonic 1	152	Safety Auto
O-08-017	437+43 7RT	"CCR1" Line	BAUC	Boart L	Prosonic 1	152	Safety Auto
O-08-018	443+82 6RT	"CCR1" Line	Misc RW/ CCR Bridge	Boart L	Longyear 1405	152	Safety Auto
O-08-019	437+90 14.7RT	"CCR1" Line	Misc RW	Boart L	Longyear 1405	152	Safety Auto
O-08-020	437+10 15RT	"CCR1" Line	Misc RW	Boart L	Longyear 1405	152	Safety Auto
O-08-021	437+40 12LT	"CCR1" Line	BAUC	Boart L	Prosonic Track Mounted	152	Safety Auto
O-08-022	437+70 10LT	"CCR1" Line	BAUC	Boart L	Prosonic Track Mounted	152	Safety Auto

Table I.7
Types of Drill Rigs Used

Boring Number	Location	Reference	Project	Drilling Company	Rig Type	Diameter (mm)	Hammer Type
O-08-024	437+75 15RT	"CCR1" Line	Misc RW	Boart L	Longyear 1405	152	Safety Auto
O-08-025	438+80 14.4RT	"CCR1" Line	Misc RW	Boart L	Longyear 1405	152	Safety Auto
O-08-026	437+40 15RT	"CCR1" Line	Misc RW	Boart L	Longyear 1405	152	Safety Auto
O-08-027	444+45 15RT	"CCR1" Line	Misc RW	Boart L	Longyear 1405	152	Safety Auto
O-08-028	441+96.2 6RT	"CCR1" Line	CCR Bridge	Boart L	Prosonic 1	152	Safety Auto
O-08-032	439+42.5 6RT	"CCR1" Line	CCR Bridge	Boart L	Prosonic Track Mounted	152	Safety Auto
O-08-033	440+02.5 6LT	"CCR1" Line	CCR Bridge	Boart L	Prosonic Track Mounted	152	Safety Auto
O-08-034	441+64 6RT	"CCR1" Line	CCR Bridge	Boart L	Prosonic 1	152	Safety Auto
O-08-035	442+23.5 8RT	"CCR1" Line	CCR Bridge	Boart L	Prosonic 1	152	Safety Auto
O-08-036	443+35 6LT	"CCR1" Line	CCR Bridge	Boart L	Mini Sonic	152	Safety Auto

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

GROUP SYMBOLS AND NAMES

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

FIELD AND LABORATORY TESTING

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

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

APPARENT DENSITY OF COHESIONLESS SOILS

Description	SPT N_{60} (Blows / 300 mm)
Very loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE

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

PERCENT OR PROPORTION OF SOILS

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

PARTICLE SIZE

Description		Size
Boulder		> 300 mm
Cobble		76 mm to 300 mm
Gravel	Coarse	19 mm to 76 mm
	Fine	No. 4 to 19 mm
Sand	Coarse	No. 10 to No. 4
	Medium	No. 40 to No. 10
	Fine	No. 200 to No. 40

SOIL LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401	

CARROLL CANYON ROAD BRIDGE

LOG OF TEST BORINGS SHEET NO. 1 OF 22

OGS CIVIL LOG OF TEST BORINGS SHEET

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

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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

SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

CEMENTATION

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

BOREHOLE IDENTIFICATION

Symbol	Hole Type	Description
Size	A	Auger Boring
Size	R P	Rotary drilled boring Rotary percussion boring (air)
Size	R	Rotary drilled diamond core
Size	HD HA	Hand driven (25 mm soil tube) Hand Auger
●	D	Dynamic Cone Penetration Boring
▲	CPT	Cone Penetration Test (ASTM D 5778-95)
[ ]	O	Other

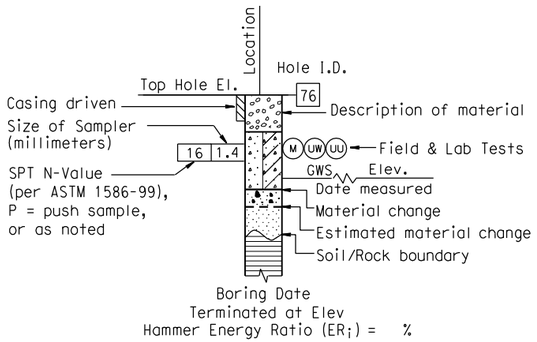
Note: Size in millimeters.

CONSISTENCY OF COHESIVE SOILS

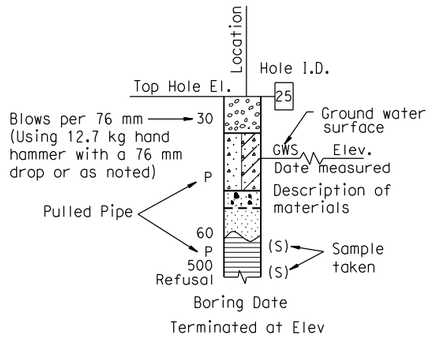
Description	Unconfined Compressive Strength (tsm)	Pocket Penetrometer Measurement (tsm)	Torvane Measurement (tsm)	Field Approximation
Very Soft	< 24	< 24	< 12	Easily penetrated several inches by fist
Soft	24 to 48	24 to 48	12 to 24	Easily penetrated several inches by thumb
Medium Stiff	48 to 96	48 to 96	24 to 48	Penetrated several inches by thumb with moderate effort
Stiff	96 to 192	96 to 192	48 to 96	Readily indented by thumb but penetrated only with great effort
Very Stiff	192 to 383	192 to 383	96 to 192	Readily indented by thumbnail
Hard	> 383	> 383	> 192	Indented by thumbnail with difficulty

PLASTICITY OF FINE-GRAINED SOILS

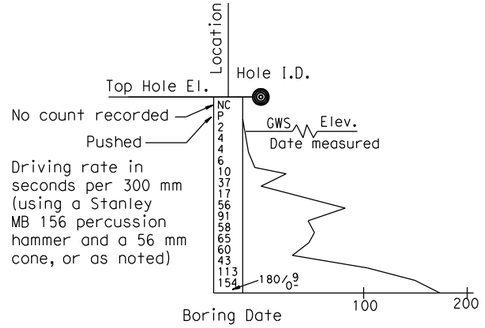
Description	Criteria
Nonplastic	A 3 mm thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.



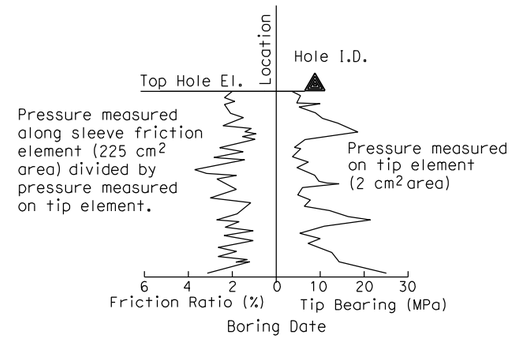
ROTARY BORING



HAND BORING



DYNAMIC CONE PENETRATION BORING



CONE PENETRATION TEST (CPT) SOUNDING

SOIL LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 2 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES		SHEET	OF
10/14/08	3/9/09		

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FILE => 57-c0786-z-lotb02.dgn

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

Caltrans Metric

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
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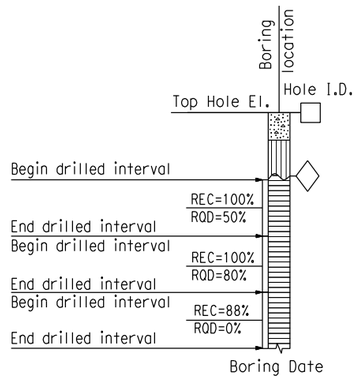
SAN DIEGO, CA. 92111

PERCENT CORE RECOVERY (REC) & ROCK QUALITY DESIGNATION (RQD)

$$REC = \frac{\sum \text{Length of the recovered core pieces}}{\text{Total length of core run}} \times 100\%$$

$$RQD = \frac{\sum \text{Length of intact core pieces} \geq 100\ mm}{\text{Total length of core run}} \times 100\%$$



RELATIVE STRENGTH OF INTACT ROCK

Term	Uniaxial Compressive Strength (MPa)
Extremely Strong	> 207
Very Strong	100 - 207
Strong	49 - 100
Medium Strong	25 - 49
Weak	5 - 25
Very Weak	1 - 5
Extremely Weak	< 1

BEDDING SPACING

Description	Thickness / Spacing
Massive	Greater than 3 m
Very thickly bedded	1 m to 3 m
Thickly bedded	300 mm to 1 m
Moderately bedded	100 mm to 300 mm
Thinly bedded	30 mm to 100 mm
Very thinly bedded	10 mm to 30 mm
Laminated	Less than 10 mm

LEGEND OF ROCK MATERIALS

- IGNEOUS ROCK
- SEDIMENTARY ROCK
- METAMORPHIC ROCK

ROCK HARDNESS

Description	Criteria
Extremely Hard	Specimen cannot be scratched with a pocket knife or sharp pick; can only be chipped with repeated heavy hammer blows.
Very Hard	Specimen cannot be scratched with a pocket knife or sharp pick. Breaks with repeated heavy hammer blows.
Hard	Specimen can be scratched with a pocket knife or sharp pick with difficulty (heavy pressure). Heavy hammer blows required to break specimen.
Moderately Hard	Specimen can be scratched with pocket knife or sharp pick with light or moderate pressure. Core breaks with moderate hammer pressure.
Moderately Soft	Specimen can be grooved 5 mm deep with a pocket knife or sharp pick with moderate or heavy pressure. Breaks with light hammer blow or heavy manual pressure.
Soft	Specimen can be grooved or gouged easily by a pocket knife or sharp pick with light pressure, can be scratched with fingernail. Breaks with light to moderate manual pressure.
Very Soft	Specimen can be readily indented, grooved or gouged with fingernail, or carved with a pocket knife. Breaks with light manual pressure.

FRACTURE DENSITY

Description	Observed Fracture Density
Unfractured	No fractures.
Very slightly fractured	Lengths greater than 1 m.
Slightly fractured	Lengths from 300 mm to 1000 mm with few lengths less than 300 mm or greater than 1000 mm.
Moderately fractured	Lengths mostly in 100 mm to 300 mm range with most lengths about 200 mm.
Intensely fractured	Lengths average from 30 mm to 100 mm with scattered fragmented intervals with lengths less than 100 mm.
Very intensely fractured	Mostly chips and fragments with a few scattered short core lengths.

Combination descriptors (such as "Very intensely to intensely fractured") are used where equal distribution of both fracture density characteristics is present over a significant interval or exposure, or where characteristics are "in between" the descriptor definitions. Only two adjacent descriptors may be combined.

WEATHERING DESCRIPTORS FOR INTACT ROCK

Description	Diagnostic features					General Characteristics
	Chemical Weathering-Discoloration and/or oxidation		Mechanical Weathering-Grain boundary conditions (disaggregation) primarily for granitics and some coarse-grained sediments	Texture and Solutioning		
	Body of Rock	Fracture Surfaces		Texture	Solutioning	
Fresh	No discoloration, not oxidized.	No discoloration or oxidation.	No separation, intact (tight).	No change.	No solutioning.	Hammer rings when crystalline rocks are struck.
Slightly Weathered	Discoloration or oxidation is limited to surface of, or short distance from, fractures; some feldspar crystals are dull.	Minor to complete discoloration or oxidation of most surfaces.	No visible separation, intact (tight).	Preserved.	Minor leaching of some soluble minerals may be noted.	Hammer rings when crystalline rocks are struck. Body of rock not weakened.
Moderately Weathered	Discoloration or oxidation extends from fractures usually throughout; Fe-Mg minerals are "rusty," feldspar crystals are "cloudy."	All fracture surfaces are discolored or oxidized.	Partial separation of boundaries visible.	Generally preserved.	Soluble minerals may be mostly leached.	Hammer does not ring when rock is struck. Body of rock is slightly weakened.
Intensely Weathered	Discoloration or oxidation throughout; all feldspars and Fe-Mg minerals are altered to clay to some extent; or chemical alteration produces in-situ disaggregation, see grain boundary conditions.	All fracture surfaces are discolored or oxidized, surfaces friable.	Partial separation, rock is friable; in semiarid conditions granitics are disaggregated.	Texture altered by chemical disintegration (hydration, argillation).	Leaching of soluble minerals may be complete.	Dull sound when struck with hammer, usually can be broken with moderate to heavy manual pressure or by light hammer blow without reference to planes of weakness such as incipient or hairline fractures, or veinlets. Rock is significantly weakened.
Decomposed	Discolored or oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe-Mg minerals are completely altered to clay.		Complete separation of grain boundaries (disaggregated).	Resembles a soil, partial or complete remnant rock structure may be preserved; leaching of soluble minerals usually complete.		Can be granulated by hand. Resistant minerals such as quartz may be present as "stringers" or "dikes."

Combination descriptors (such as "slightly weathered to fresh") are permissible where equal distribution of both weathering characteristics is present over significant intervals or where characteristics present are "in between" the diagnostic feature. However, combination descriptors should not be used where significant, identifiable zones can be delineated. Only two adjacent descriptors may be combined. "Very intensely weathered" is the combination descriptor for "intensely weathered to decomposed."

ROCK LEGEND

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 3 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

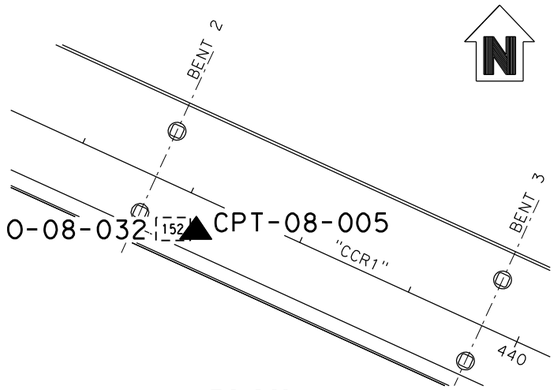
DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES									SHEET	OF
10/14/08	3/9/09									

FILE => 57-c0786-z-lotb03.dgn

USERNAME => mpcronjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:07:10 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



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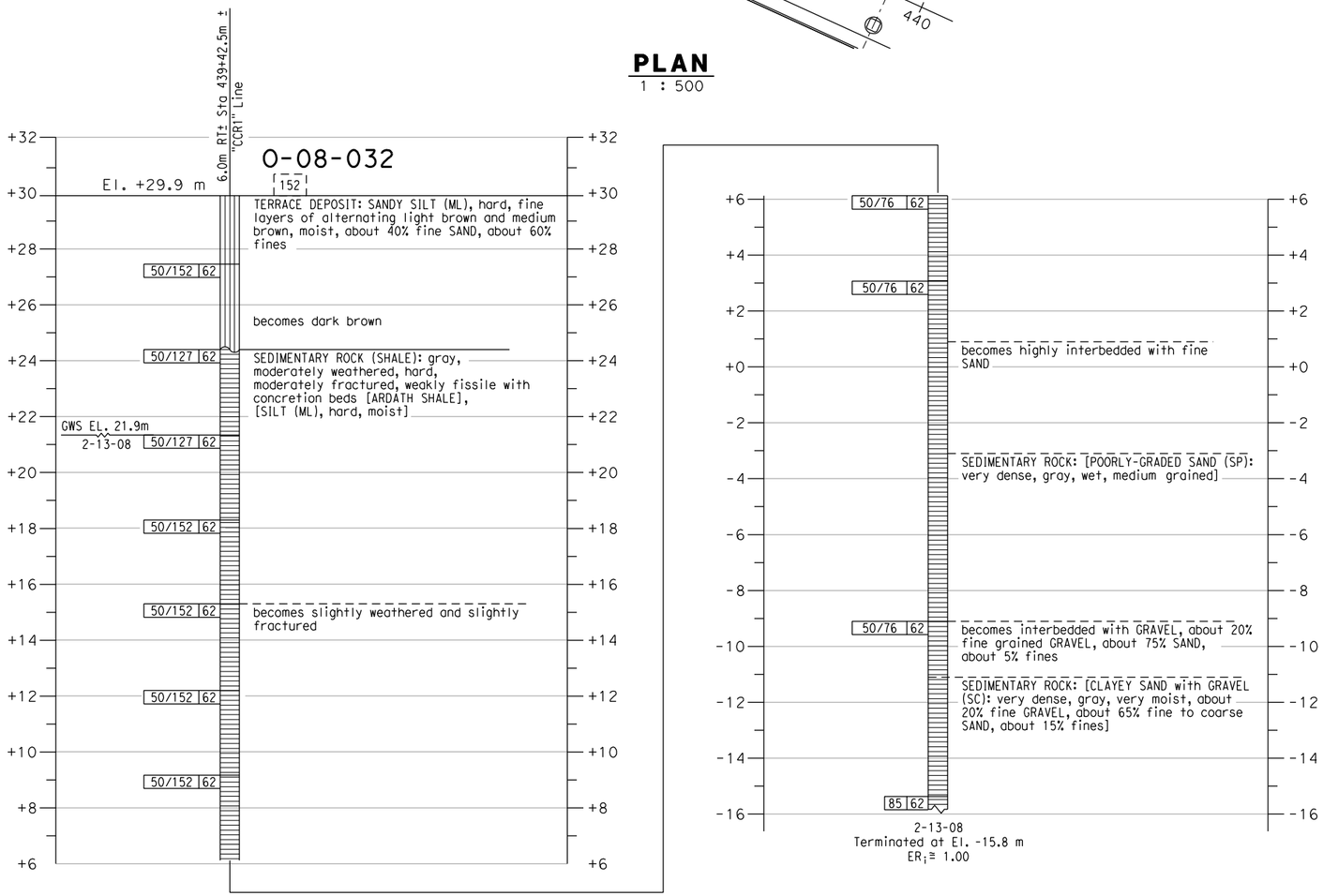

PROFILE
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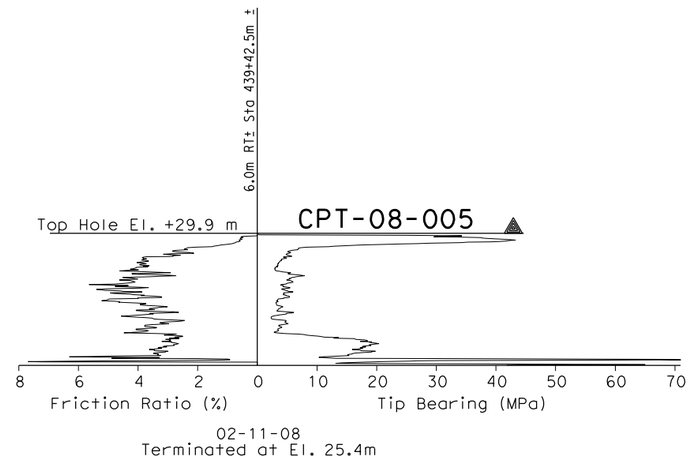
HORIZONTAL 1 : 500



CONE PENETRATION TEST (CPT) SOUNDING

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.
2. Automatic trip and safety hammer systems consisting of hammer weight of 62.5 kg falling a distance of 762 mm were used to advance the drive samplers in accordance with ASTM D1586.
3. The average hammer energy ratio (ER_i) reflects the percentage efficiency of SPT blowcounts (N-value). The estimated ER_i for the various drilling equipment used was as follows:
   Boart Longyear:
   Longyear 1405: $ER_i \cong 1.45$
   Prosonic Track Mounted: $ER_i \cong 1.00$
   Prosonic 1: $ER_i \cong 1.45$
   Minisonic: $ER_i \cong 1.00$
   Test America:
   CME 95: $ER_i \cong 1.45$
   Pacific Drilling:
   Unimog: $ER_i \cong 1.27$
   Mole: $ER_i \cong 1.00$
   Minimole: $ER_i \cong 1.00$
4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (RQD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 4 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES: 10/14/08, 3/9/09

SHEET OF

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Bench Mark
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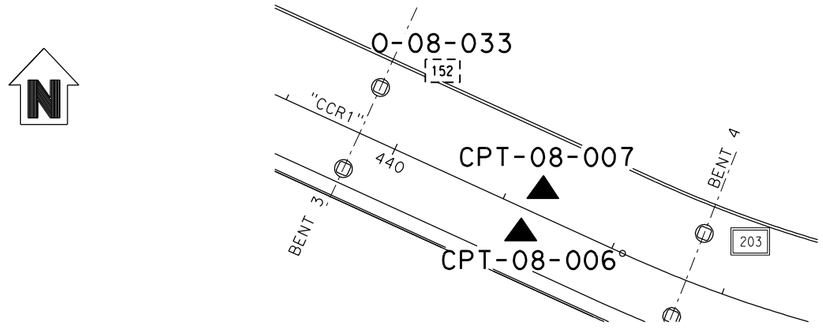

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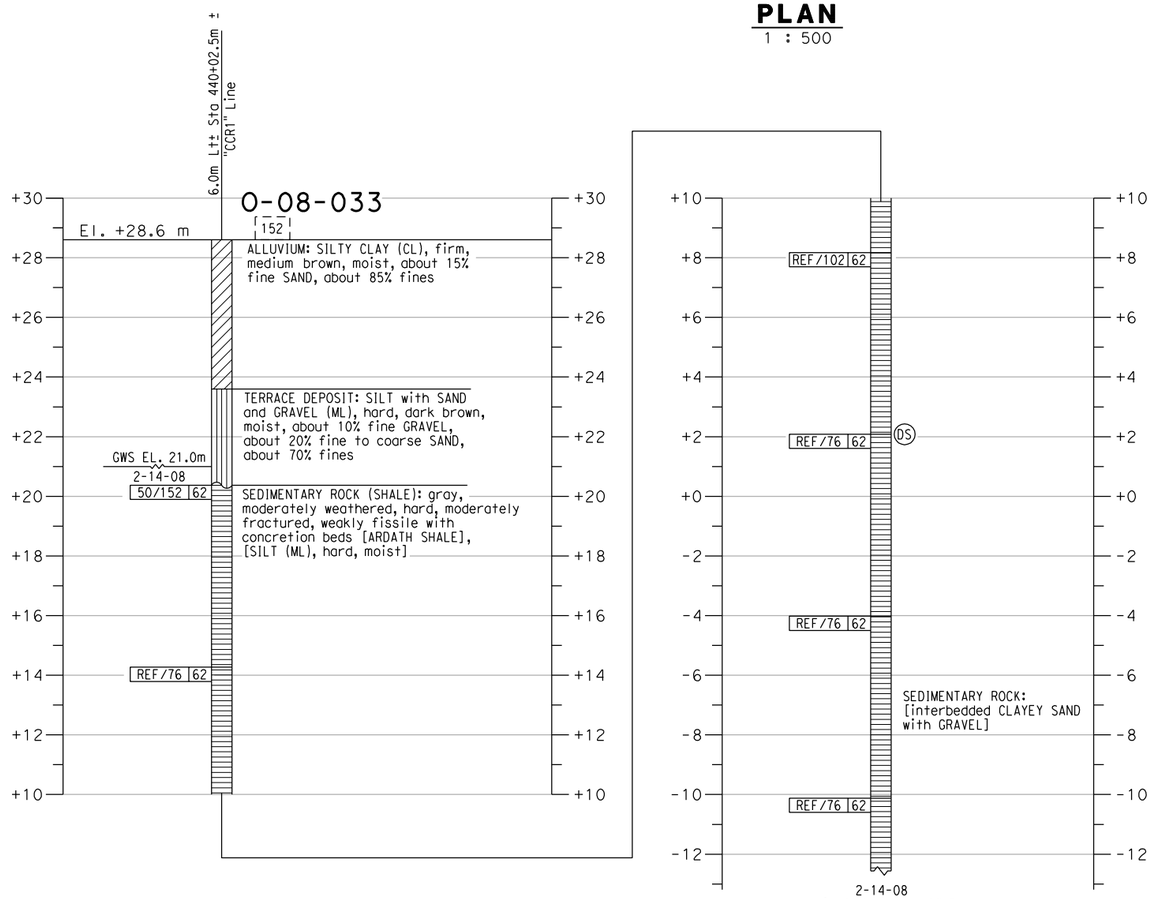

2-14-08
Terminated at El. -12.6 m
$ER_i \cong 1.00$

PROFILE
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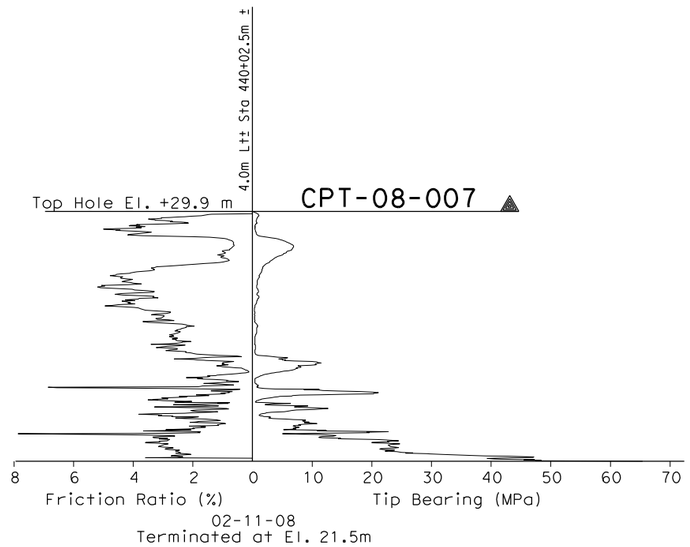
HORIZONTAL 1 : 500



02-11-08
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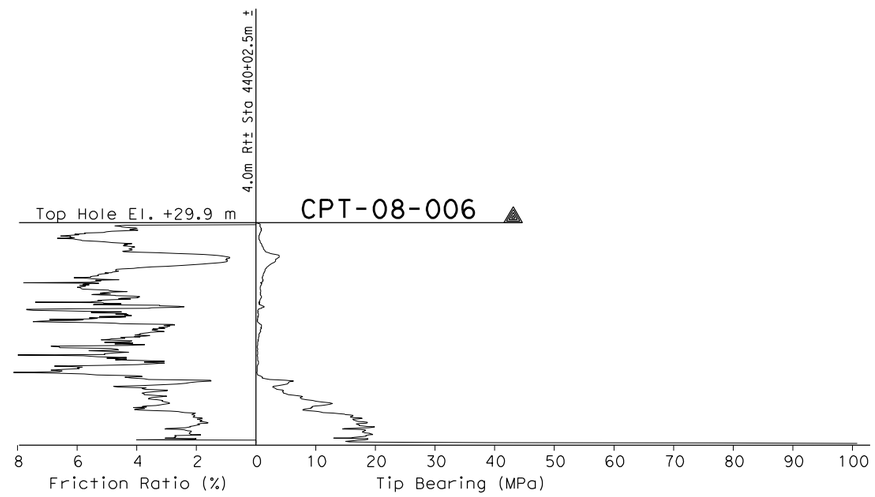

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CONE PENETRATION TEST (CPT) SOUNDINGS

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

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FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER	DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 5 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER		CU 11275 EA 2T0401	DISREGARD PRINTS BEARING EARLIER REVISION DATES →	REVISION DATES: 10/14/08, 3/9/09

OGS CIVIL LOG OF TEST BORINGS SHEET

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

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USERNAME => mparanjape DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:07:26 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

Caltrans Metric

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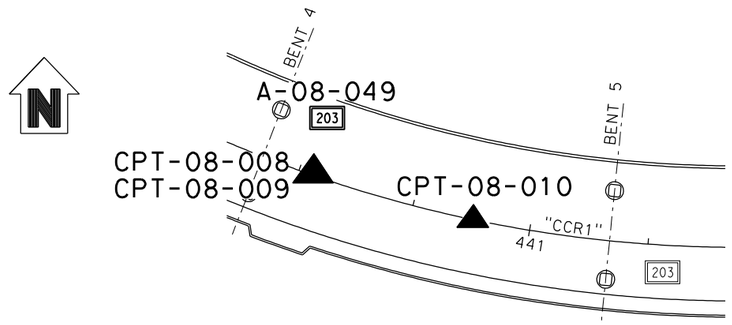

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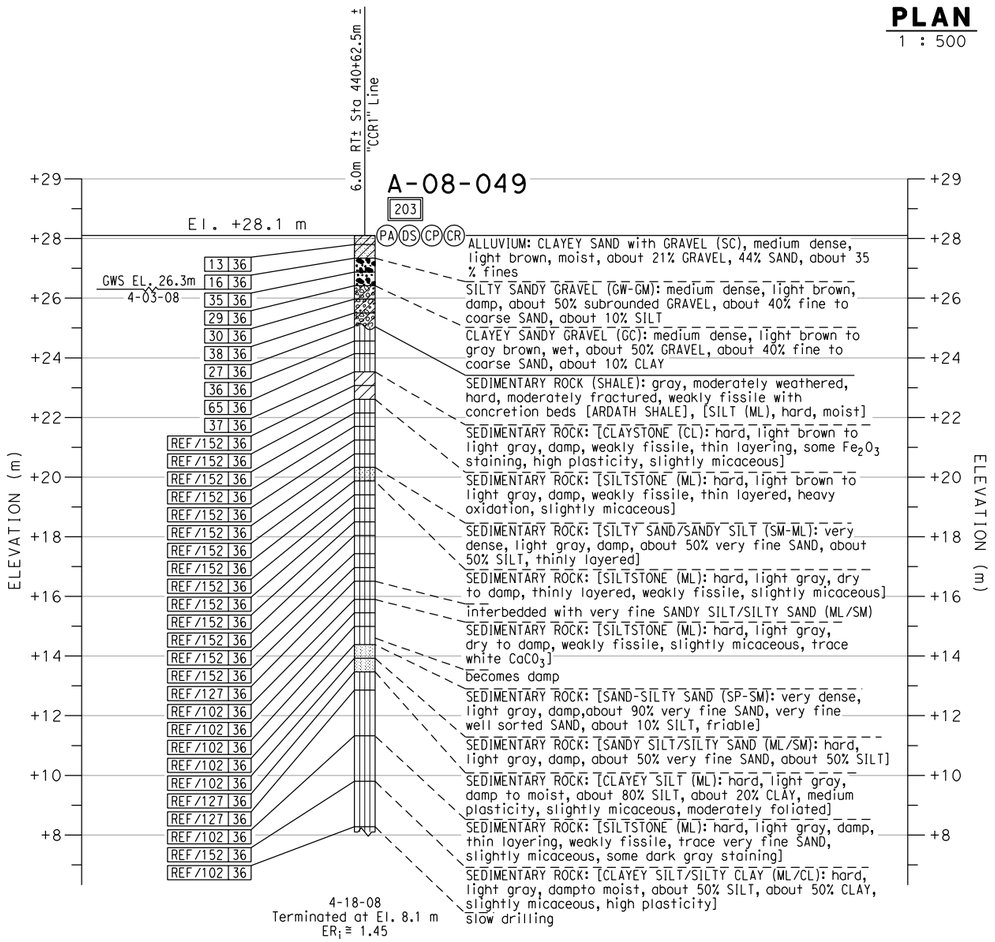

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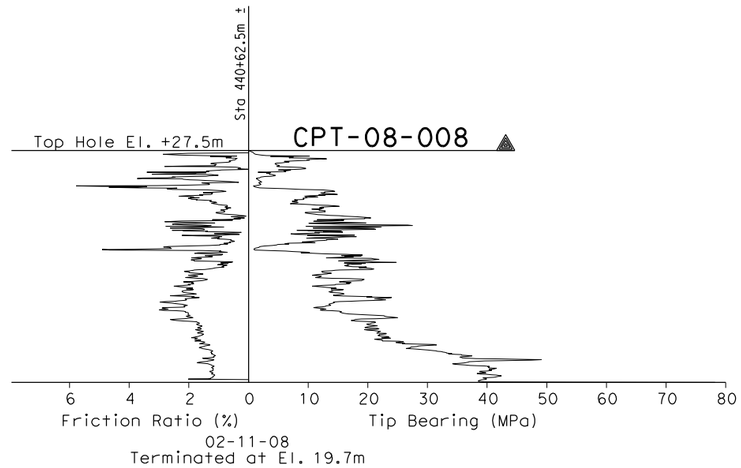

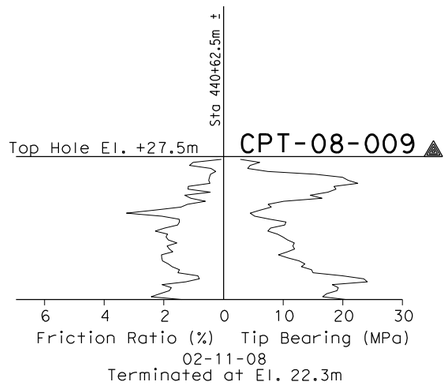

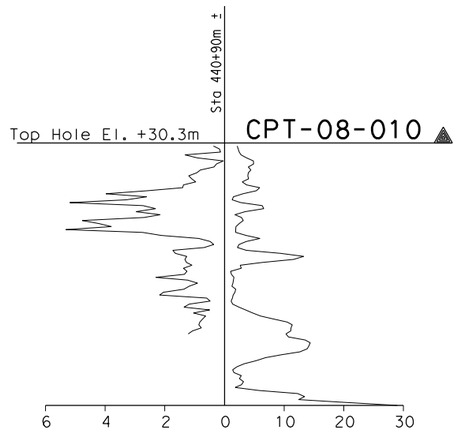

CONE PENETRATION TEST (CPT) SOUNDINGS

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ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 6 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER	CU 11275 EA 2T0401	DISREGARD PRINTS BEARING EARLIER REVISION DATES	REVISION DATES: 10/14/08, 3/9/09; SHEET; OF

OGS CIVIL LOG OF TEST BORINGS SHEET

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Bench Mark
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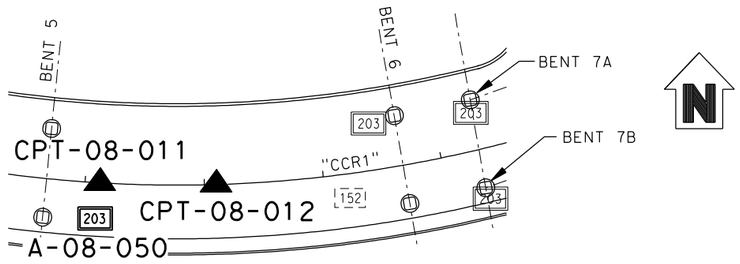

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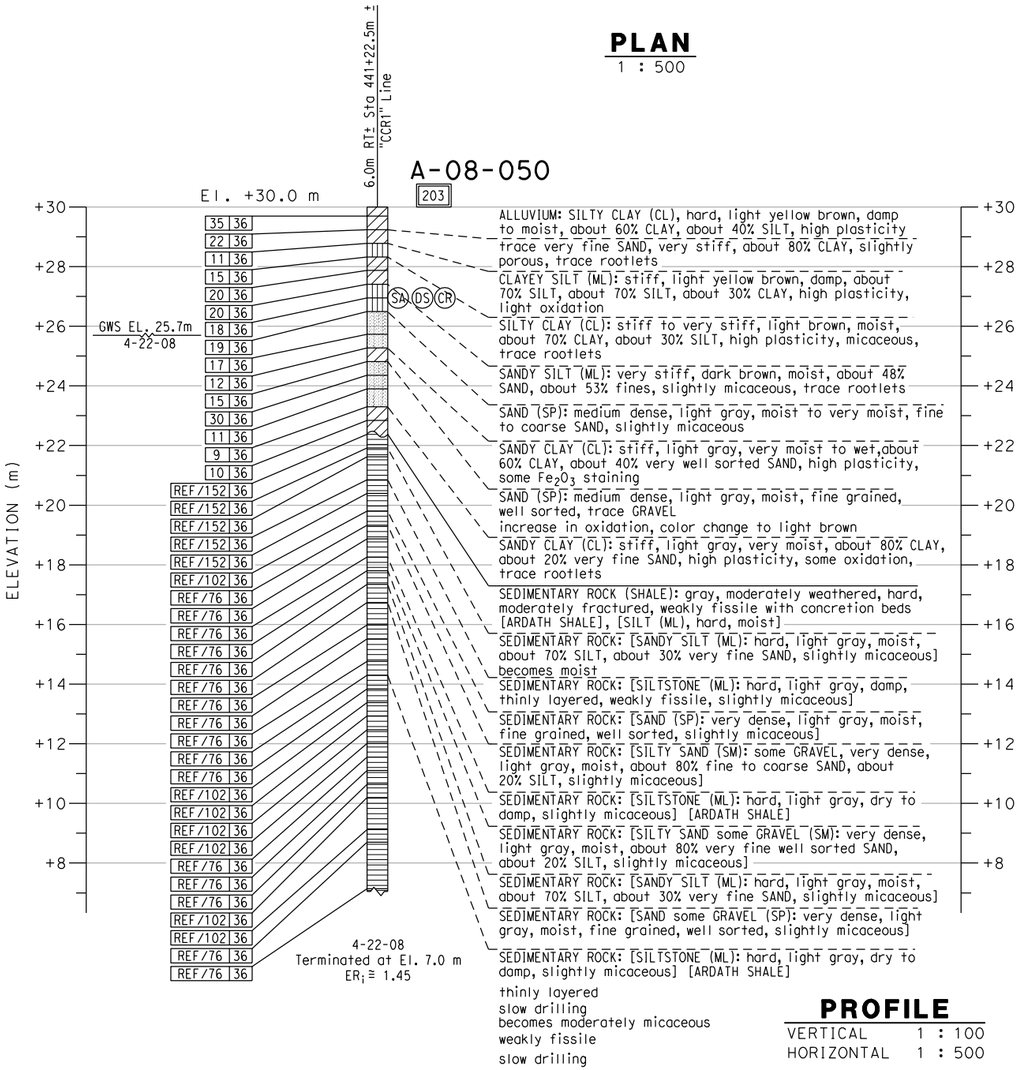

PROFILE
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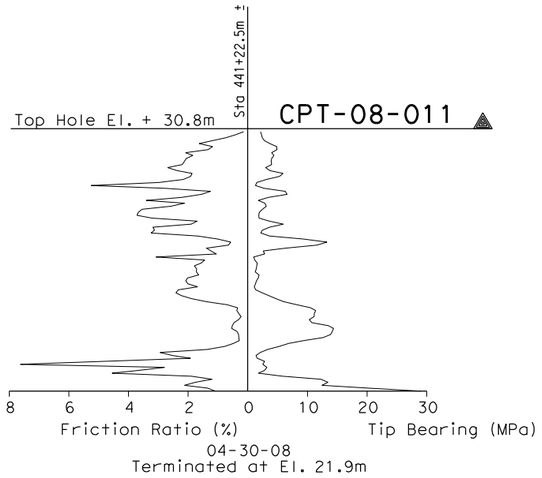
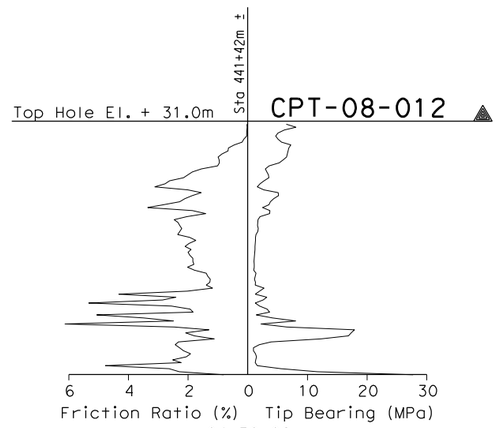
HORIZONTAL 1 : 500



CONE PENETRATION TEST (CPT) SOUNDING



CONE PENETRATION TEST (CPT) SOUNDING

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 7 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401		

OGS CIVIL LOG OF TEST BORINGS SHEET

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: 10/14/08, 3/9/09

SHEET OF

USERNAME => mporonjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:07:42 PM

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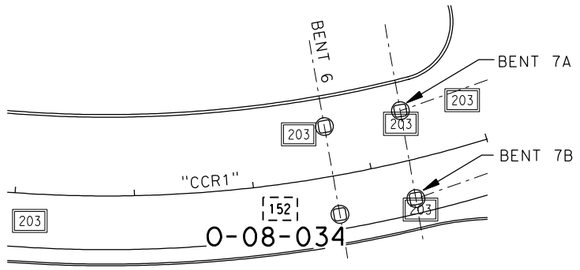
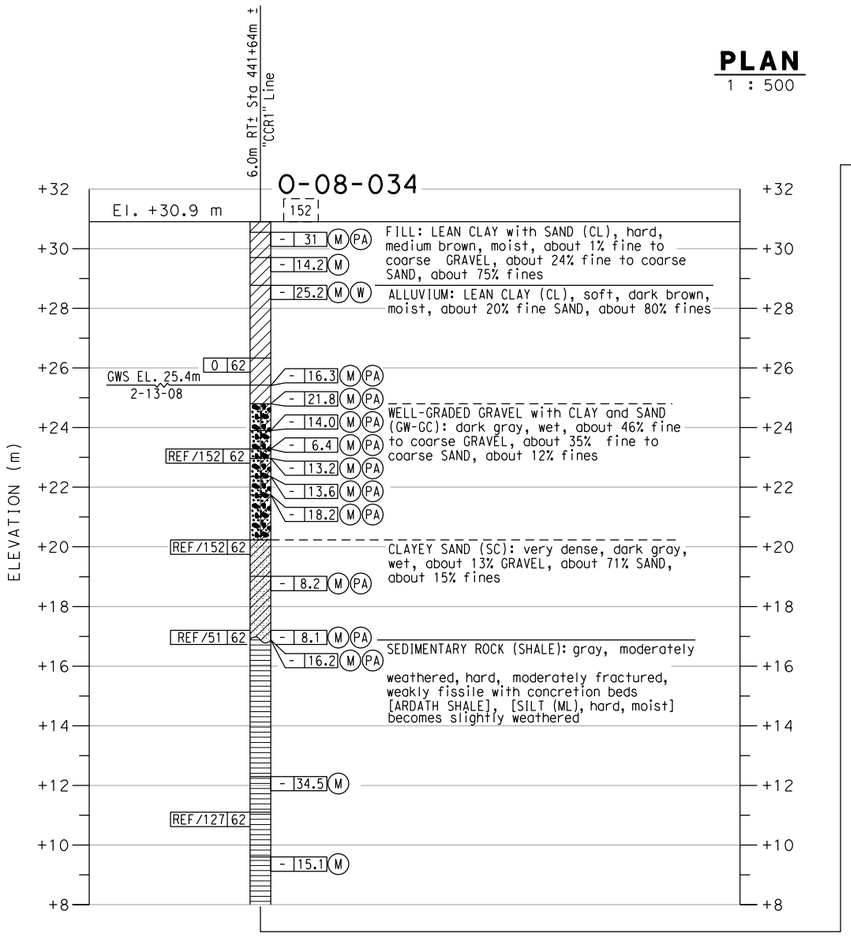
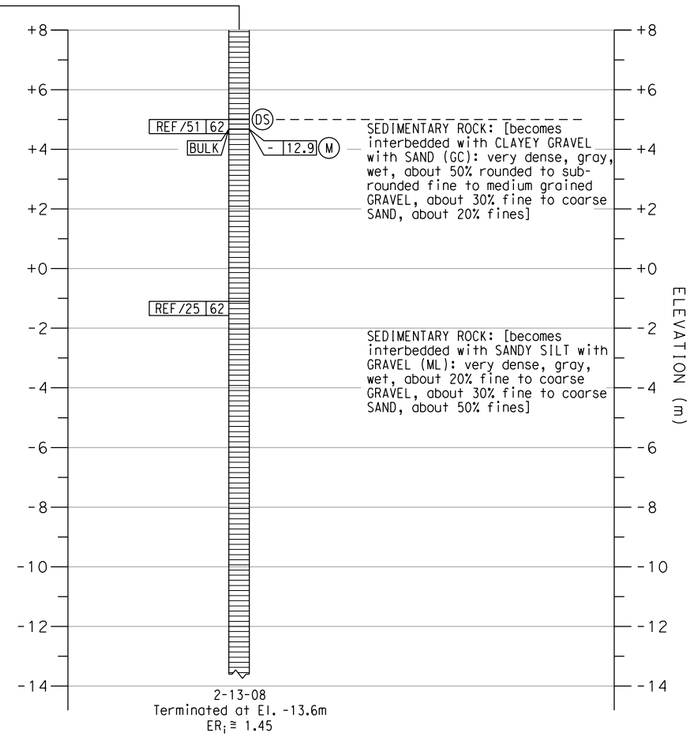
Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
1 : 500





PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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

SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.

2. Automatic trip and safety hammer systems consisting of hammer weight of 62.5 kg falling a distance of 762 mm were used to advance the drive samplers in accordance with ASTM D1586.

3. The average hammer energy ratio (ER_i) reflects the percentage efficiency of SPT blowcounts (N-value). The estimated ER_i for the various drilling equipment used was as follows:
   Boart Longyear:
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   Prosonic 1: $ER_i \cong 1.45$
   Minisonic: $ER_i \cong 1.00$
   Test America:
   CME 95: $ER_i \cong 1.45$
   Pacific Drilling:
   Unimog: $ER_i \cong 1.27$
   Mole: $ER_i \cong 1.00$
   Minimole: $ER_i \cong 1.00$

4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (ROD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES		GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER			DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 8 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER						

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

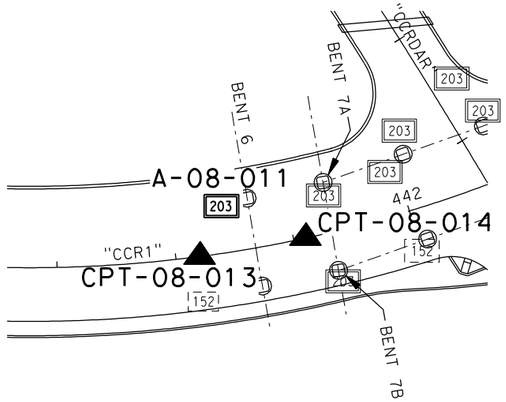
REVISION DATES: 10/14/08, 3/9/09

SHEET OF

FILE => 57-c0786-z-lotb08.dgn

USERNAME => mporanjape DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:07:51 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
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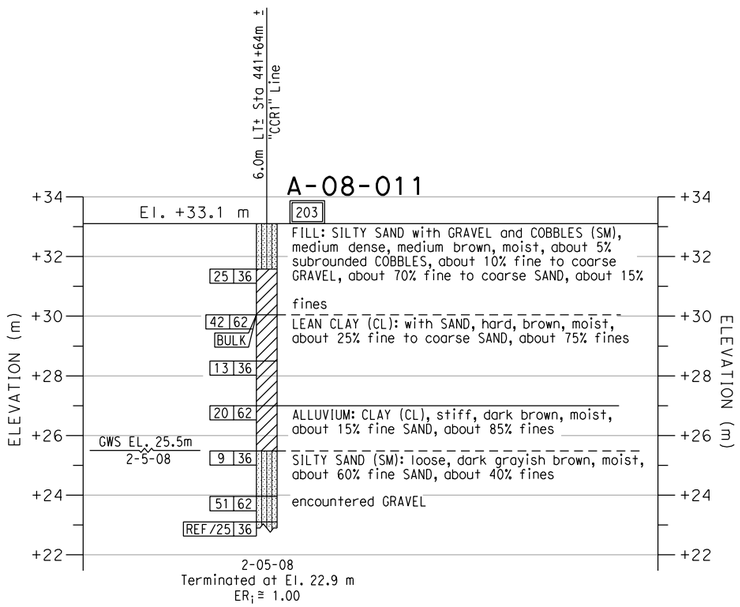
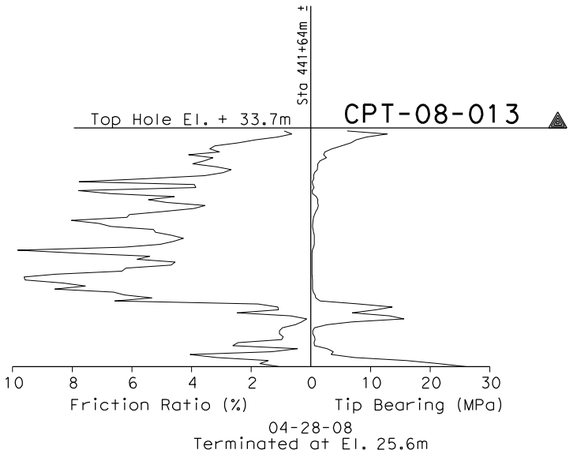
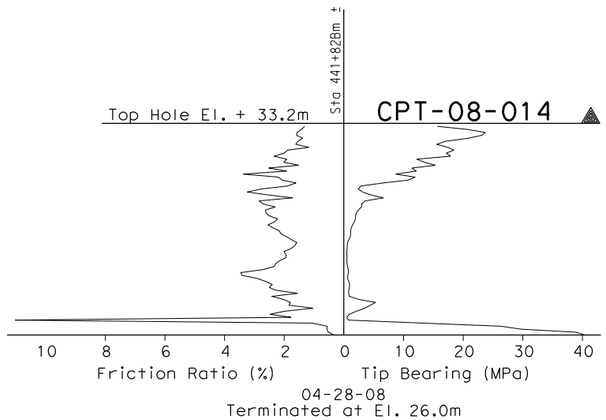


PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500



CONE PENETRATION TEST (CPT) SOUNDING



CONE PENETRATION TEST (CPT) SOUNDING

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

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   Minisonic: ER$_i$ ≅ 1.00
   Test America:
   CME 95: ER$_i$ ≅ 1.45
   Pacific Drilling:
   Unimog: ER$_i$ ≅ 1.27
   Mole: ER$_i$ ≅ 1.00
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ENGINEERING SERVICES		GEOTECHNICAL SERVICES			
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY:	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786
NAME:	CHECKED BY: G. CUSTENBORDER	V. OLIN G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8

CARROLL CANYON ROAD BRIDGE

LOG OF TEST BORINGS SHEET NO. 9 OF 22

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES

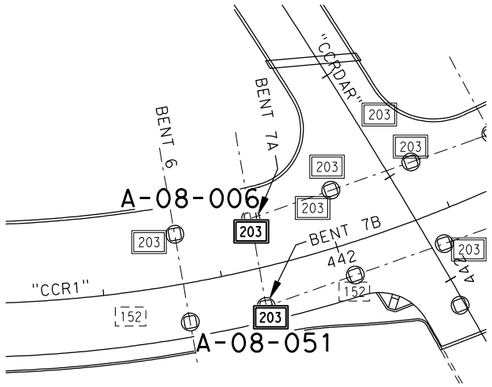
REVISION DATES: 10/14/08, 3/9/09

SHEET OF

FILE => 57-c0786-z-lotb09.dgn

USERNAME => mporcinjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:07:59 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
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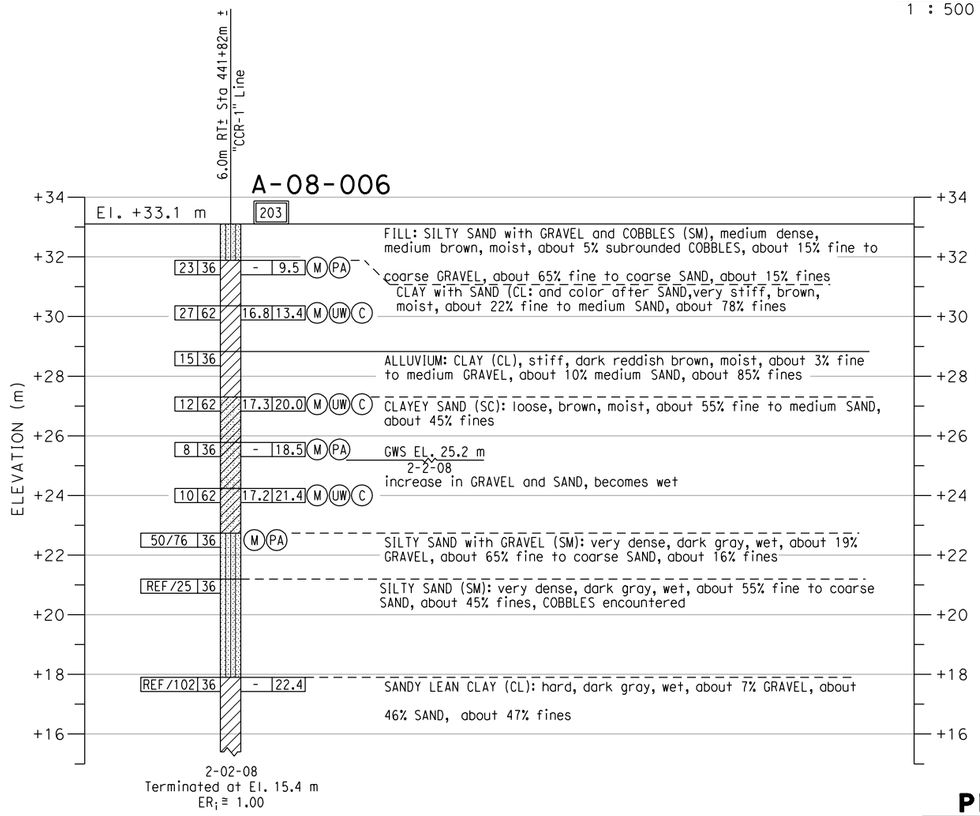

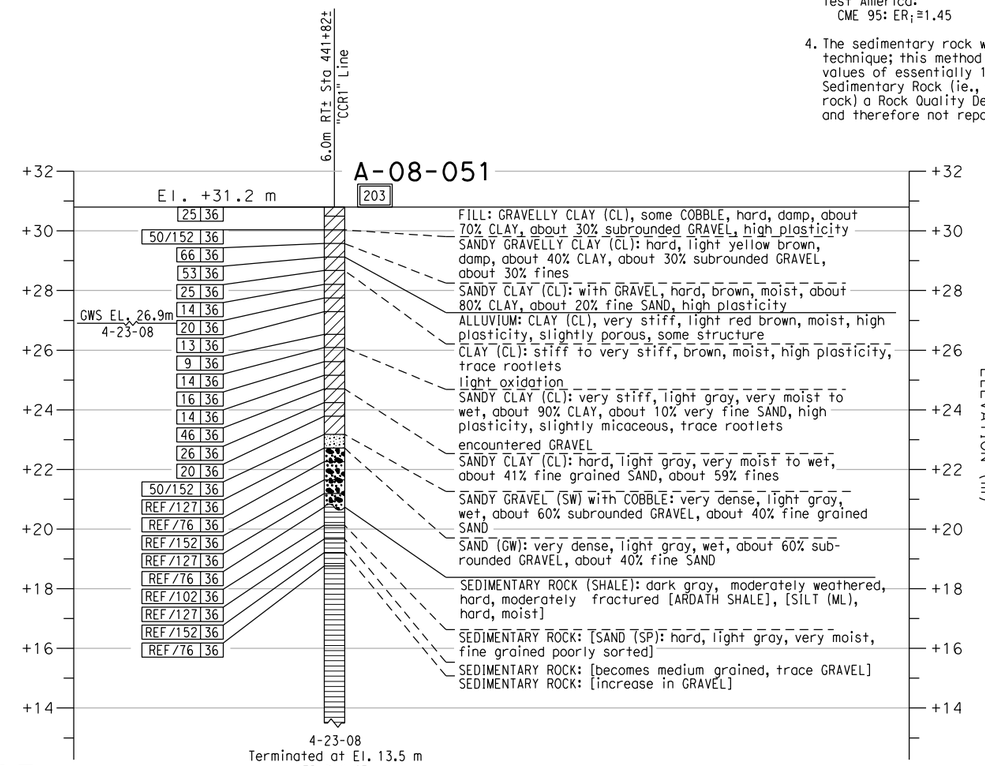

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

Caltrans Metric

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

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ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 10 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER			

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES

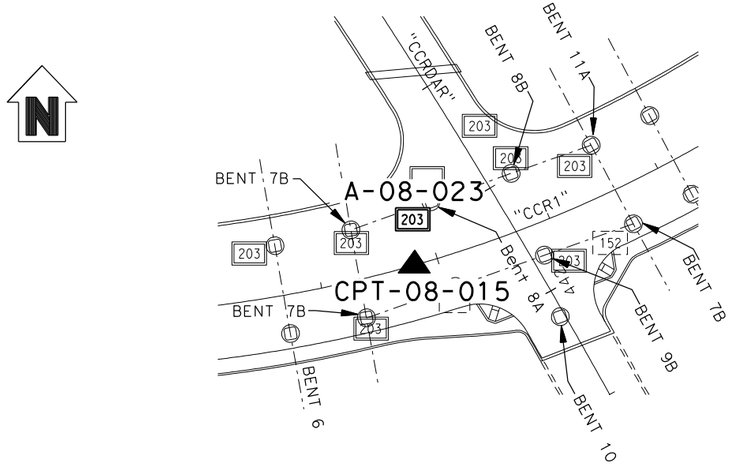
REVISION DATES: 10/14/08, 3/9/09

SHEET OF

FILE => 57-c0786-z-lotb10.dgn

USERNAME => mporonjoe DATE PLOTTED => 3/10/2009 TIME PLOTTED => 11:08:07 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
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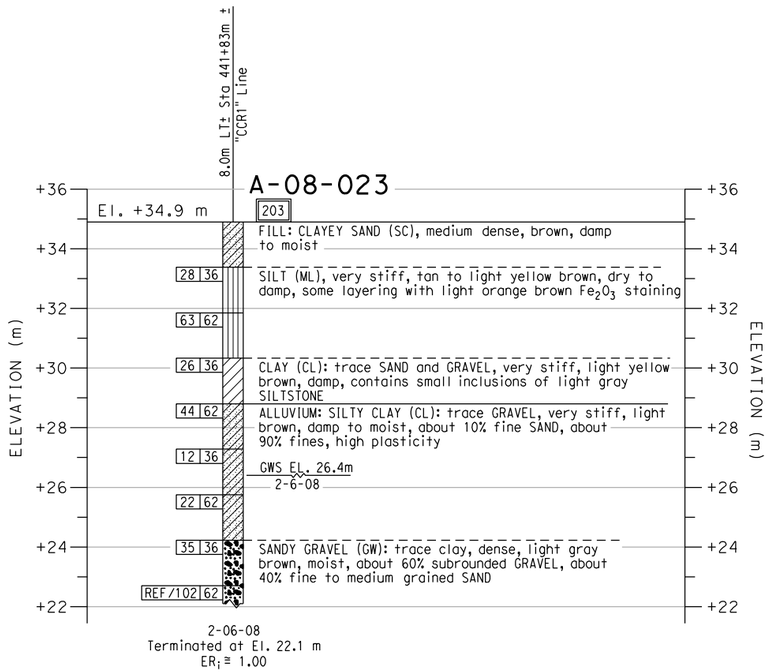
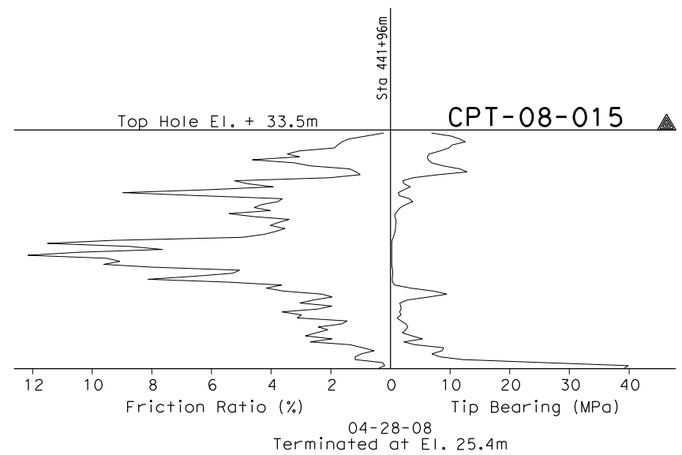


PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500



CONE PENETRATION TEST (CPT) SOUNDING

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

PLANS APPROVAL DATE

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401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

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ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 11 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

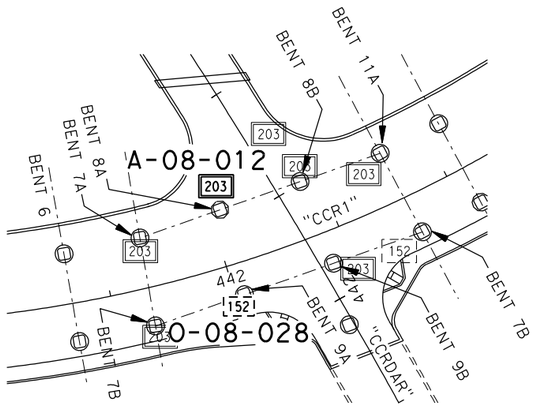
REVISION DATES: 10/14/08 3/9/09

SHEET OF

FILE => 57-c0786-z-lotb11.dgn

USERNAME => mparcinjape DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:08:15 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
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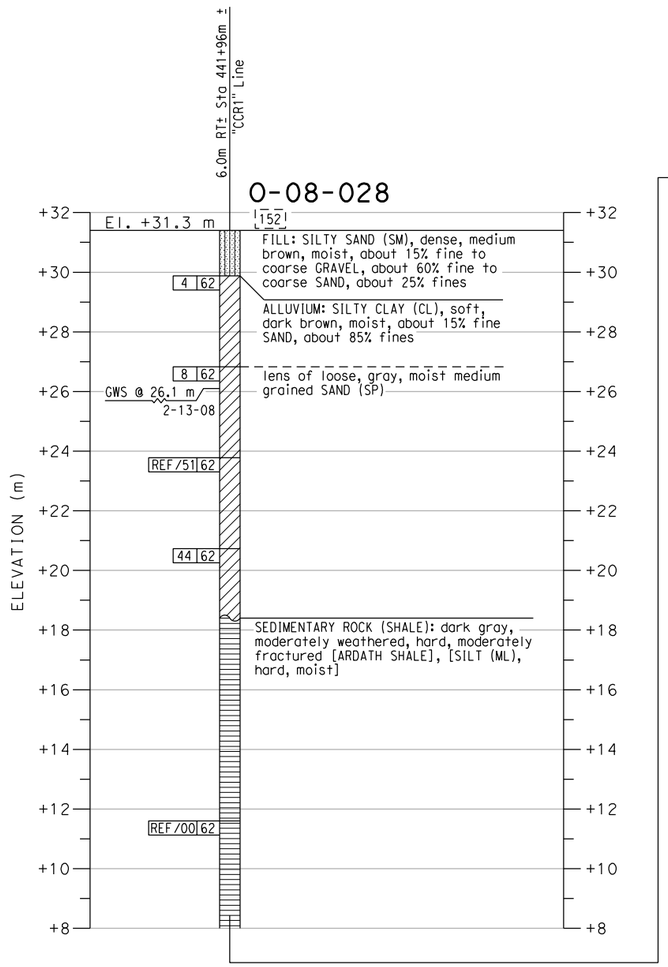

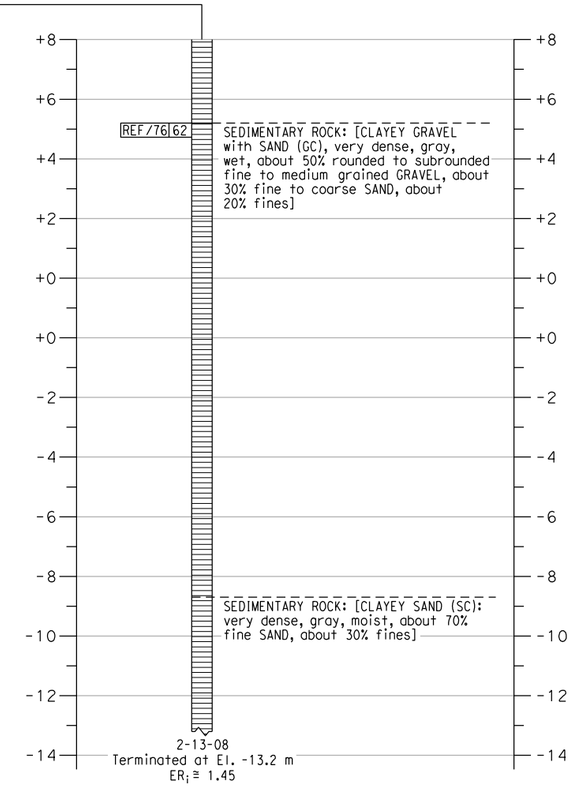

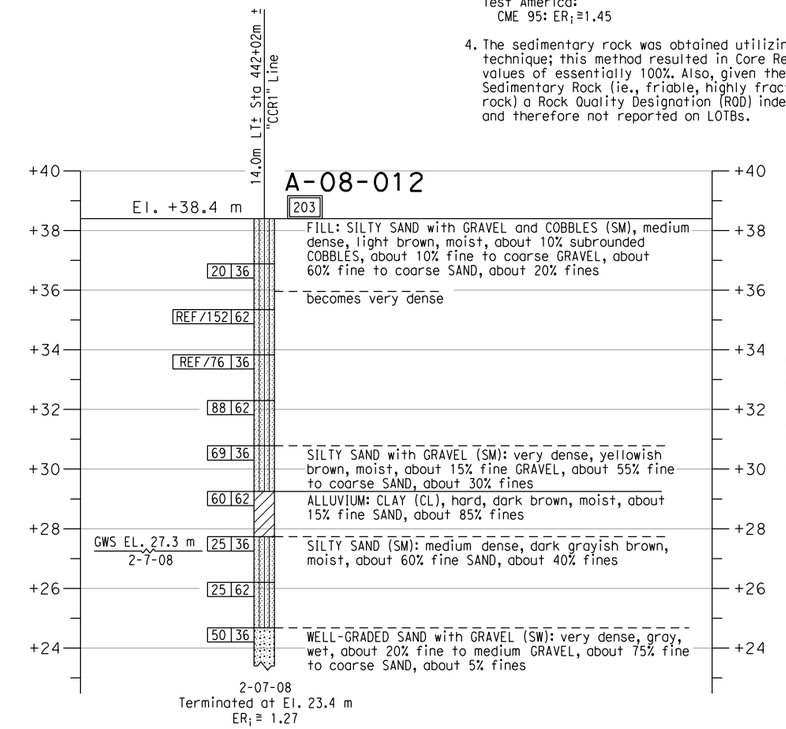

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SANDAG
401 B STREET,
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BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

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FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 12 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER			

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES: 10/14/08, 3/9/09

SHEET OF

FILE => 57-c0786-z-lotb12.dgn

USERNAME => mporanjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:08:22 PM

Bench Mark
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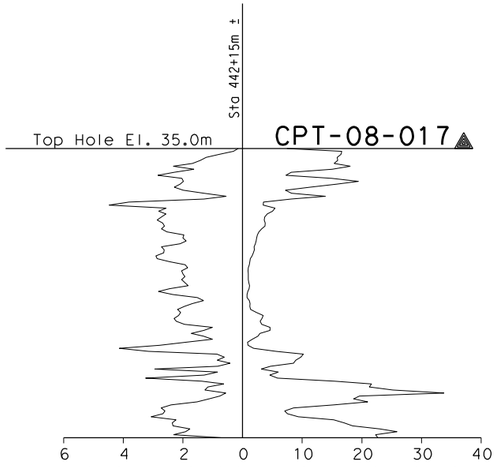
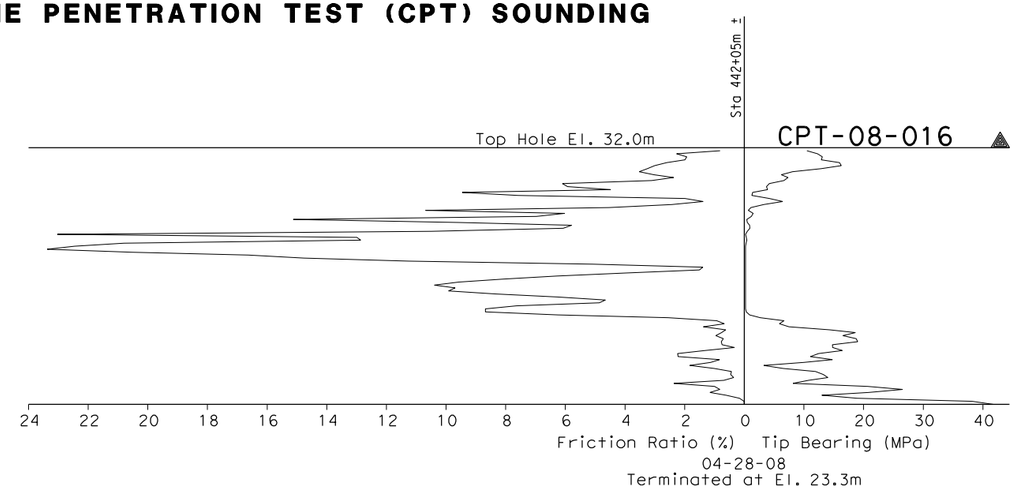
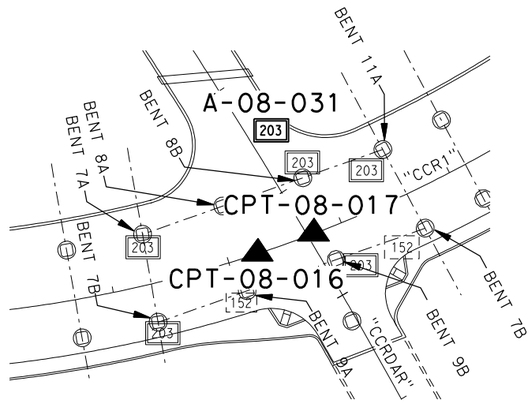


CONE PENETRATION TEST (CPT) SOUNDING



CONE PENETRATION TEST (CPT) SOUNDING



PLAN
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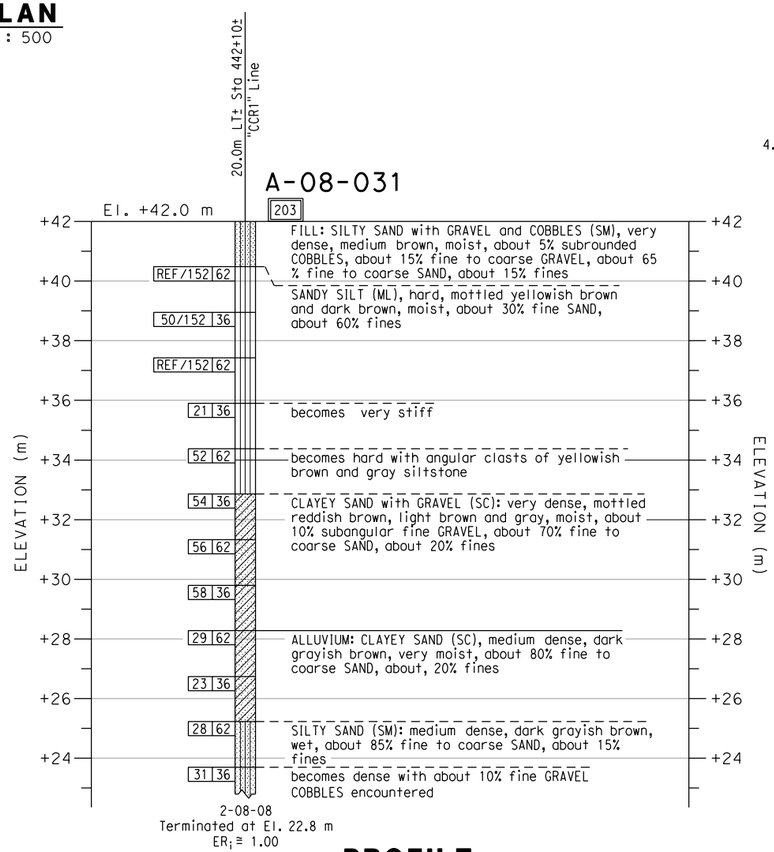

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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   Mole: ER$_i$≅1.00
   Minimole: ER$_i$≅1.00
4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (ROD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 13 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

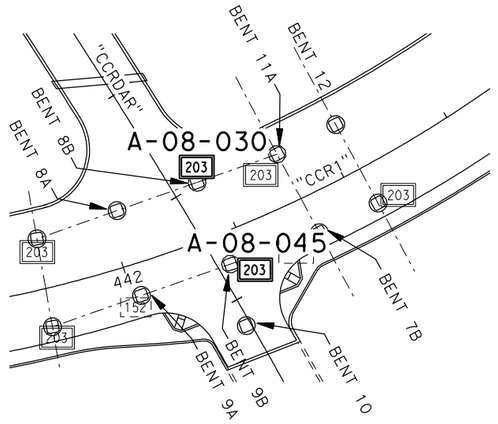
DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES										SHEET	OF
10/14/08	3/9/09										

FILE => 57-c0786-z-lotb13.dgn

USERNAME => mporanjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:08:29 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
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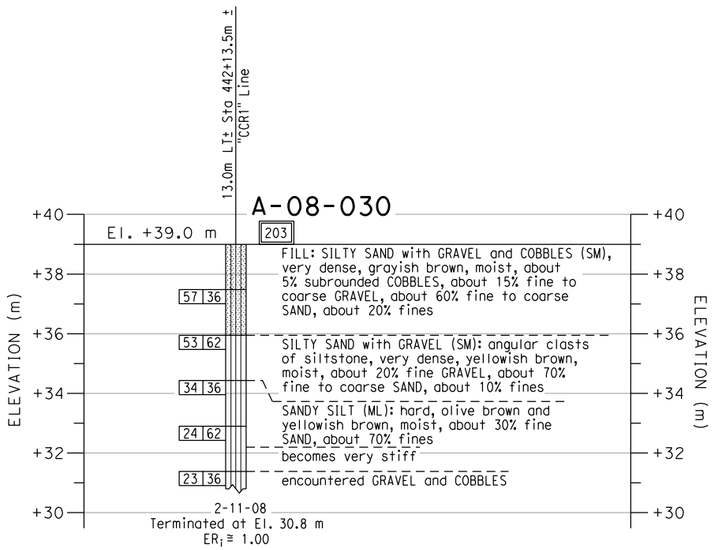

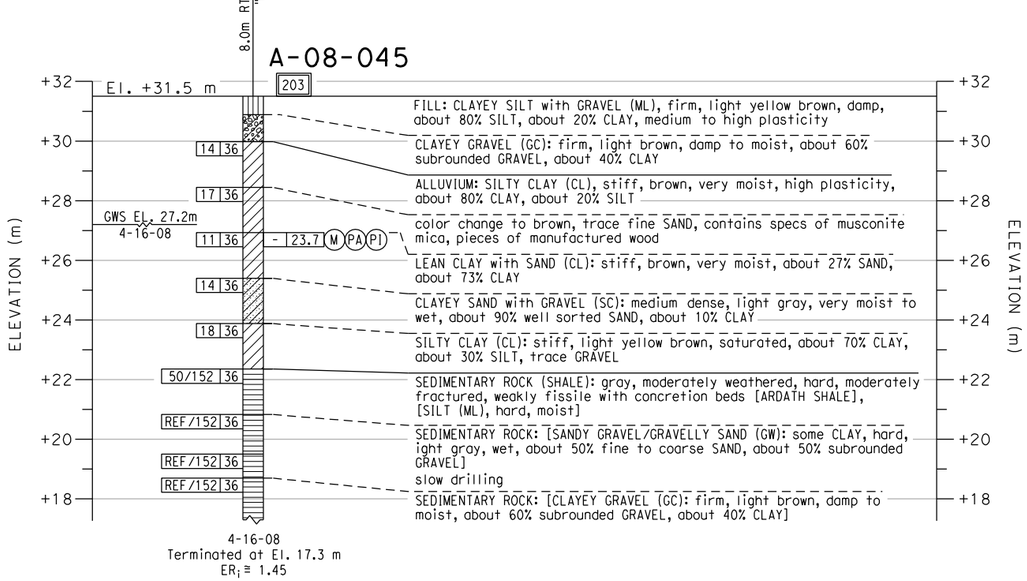

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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

SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.
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   Longyear 1405: $ER_i \cong 1.45$
   Prosonic Track Mounted: $ER_i \cong 1.00$
   Prosonic 1: $ER_i \cong 1.45$
   Minisonic: $ER_i \cong 1.00$
   Test America:
   CME 95: $ER_i \cong 1.45$
   Pacific Drilling:
   Unimog: $ER_i \cong 1.27$
   Mole: $ER_i \cong 1.00$
   Minimole: $ER_i \cong 1.00$
4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (ROD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES		GEOTECHNICAL SERVICES				
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
NAME:	CHECKED BY: G. CUSTENBORDER			DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 14 OF 22

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

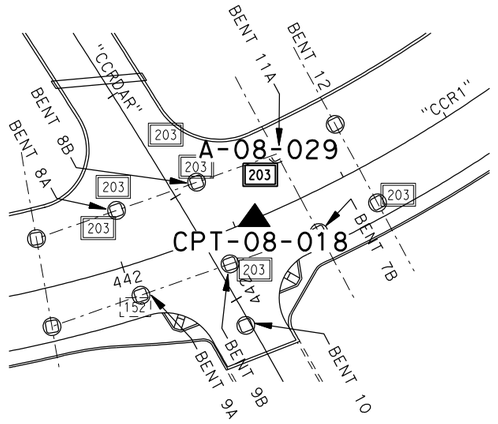
DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES								SHEET	OF
10/14/08	3/9/09								

FILE => 57-c0786-z-lotb14.dgn

USERNAME => mporcinjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:08:37 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
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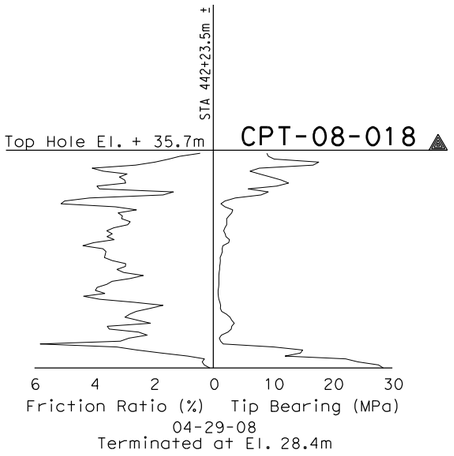
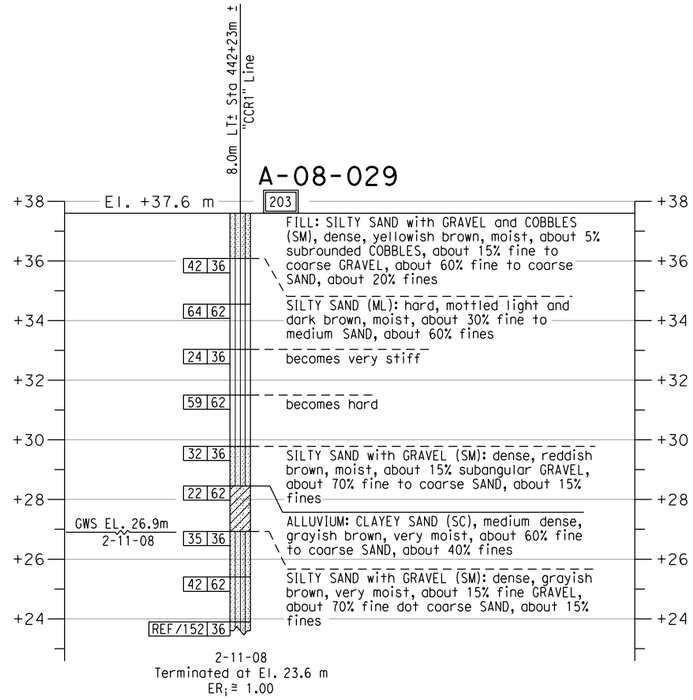


CONE PENETRATION TEST (CPT) SOUNDING



PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.
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   Boart Longyear:
   Longyear 1405: $ER_i \cong 1.45$
   Prosonic Track Mounted: $ER_i \cong 1.00$
   Prosonic 1: $ER_i \cong 1.45$
   Minisonic: $ER_i \cong 1.00$
   Test America:
   CME 95: $ER_i \cong 1.45$
   Pacific Drilling:
   Unimog: $ER_i \cong 1.27$
   Mole: $ER_i \cong 1.00$
   Minimole: $ER_i \cong 1.00$
4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (ROD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 15 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401	DISREGARD PRINTS BEARING EARLIER REVISION DATES →	REVISION DATES: 10/14/08, 3/9/09

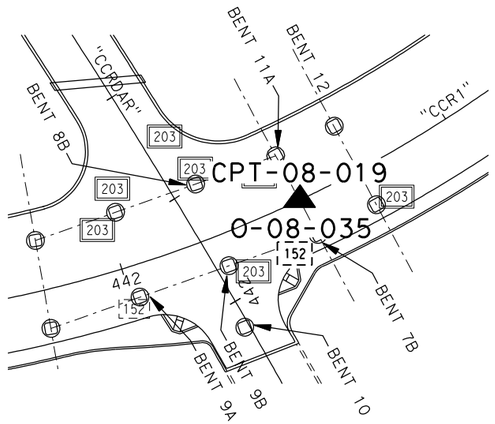
OGS CIVIL LOG OF TEST BORINGS SHEET

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

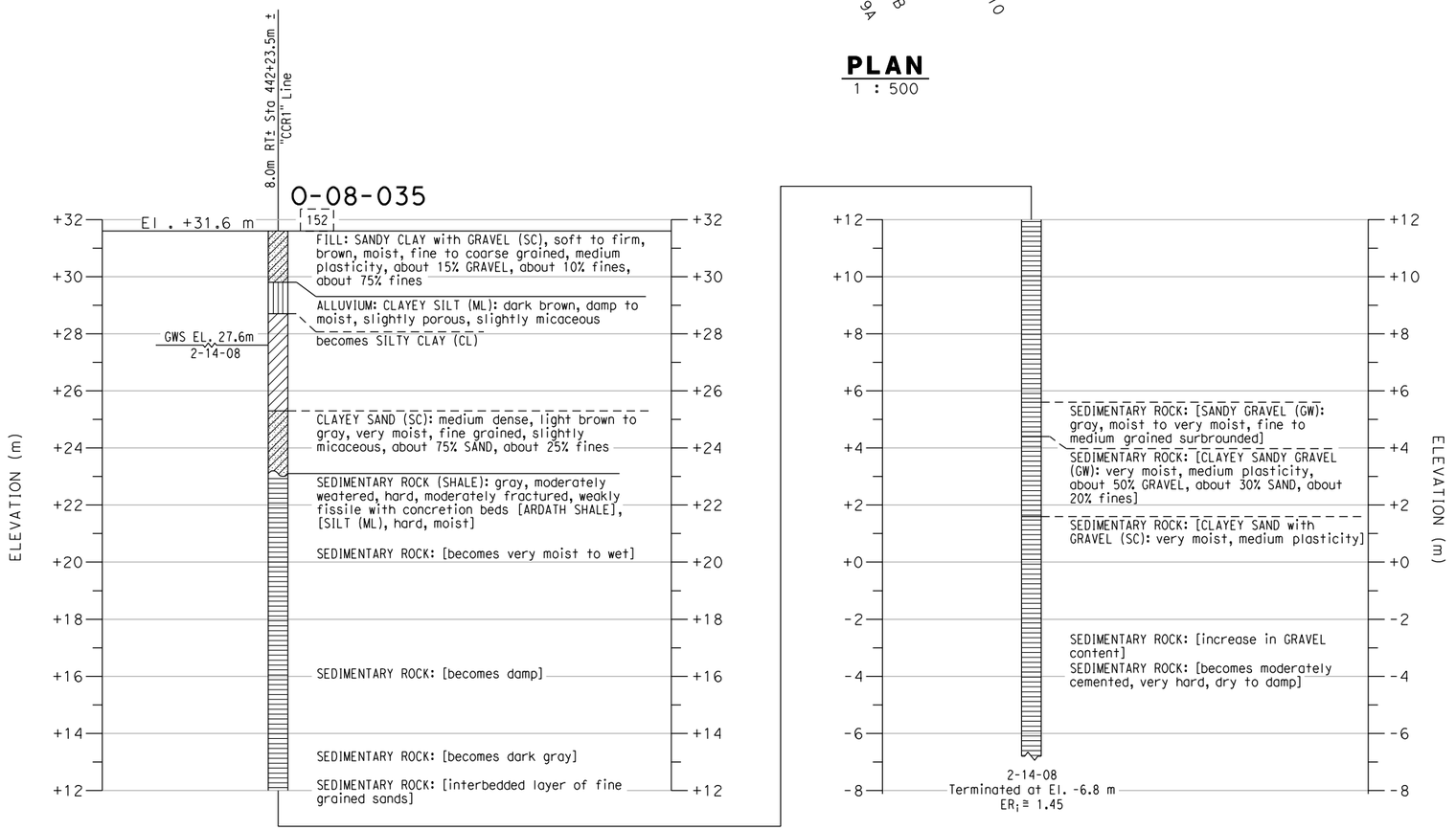
FILE => 57-c0786-z-lotb15.dgn

USERNAME => mporonjae DATE PLOTTED => 3/10/2009 TIME PLOTTED => 11:08:44 PM

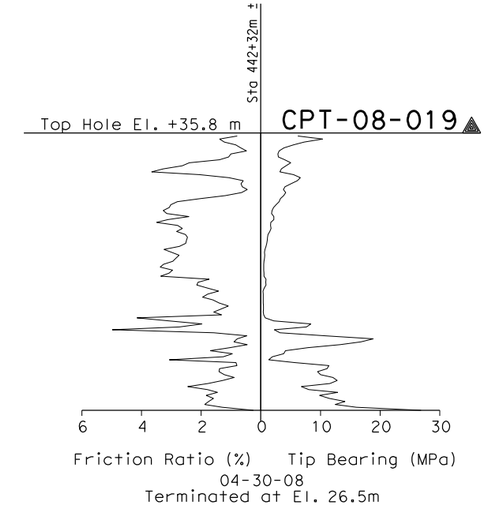
Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
1 : 500



PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500



CONE PENETRATION TEST (CPT) SOUNDING

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

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   Minisonic: ER$_i$≅1.00
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   Unimog: ER$_i$≅1.27
   Mole: ER$_i$≅1.00
   Minimole: ER$_i$≅1.00
   Test America:
   CME 95: ER$_i$≅1.45

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ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 16 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

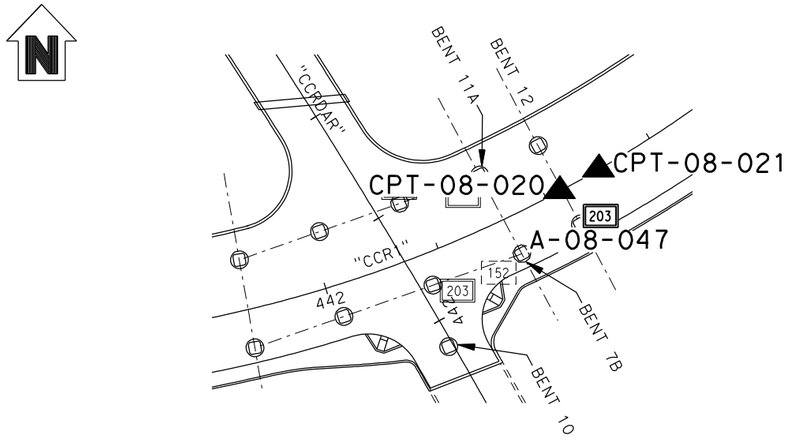
REVISION DATES: 10/14/08, 3/9/09

SHEET OF

FILE => 57-c0786-z-lotb16.dgn

USERNAME => mporcinjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:08:50 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
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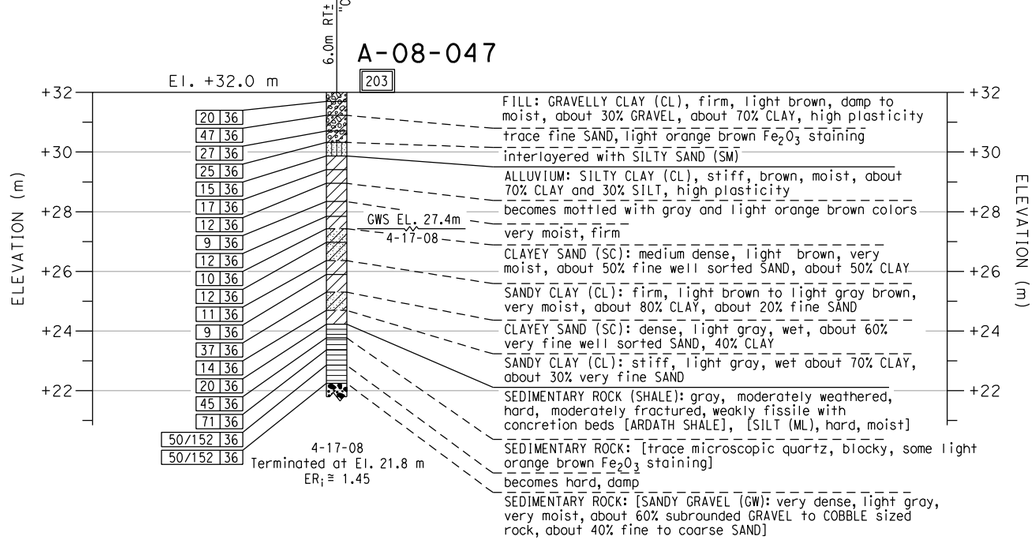
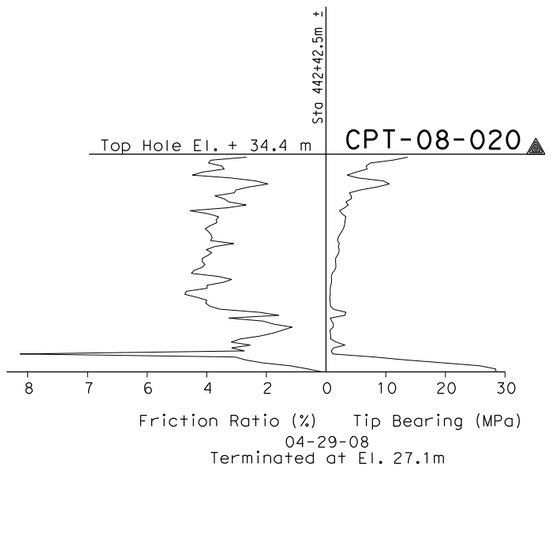
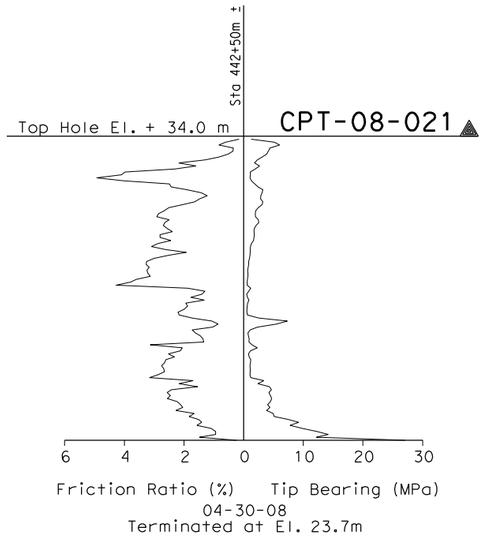


PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500





CONE PENETRATION TEST (CPT) SOUNDINGS

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:
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ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 17 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES: 10/14/08 | 3/9/09 | SHEET | OF

USERNAME => mporonjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:08:57 PM

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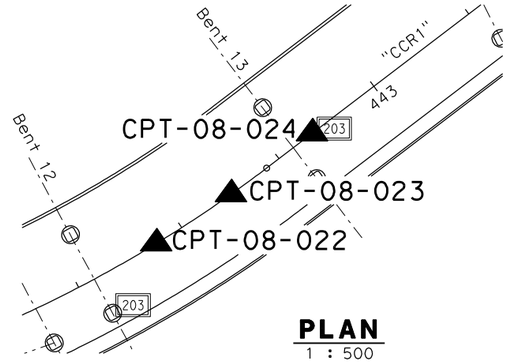
Bench Mark
All elevations shown in the LOTBs are in meters
and are referenced to the NGVD 1929 Datum.



PLAN
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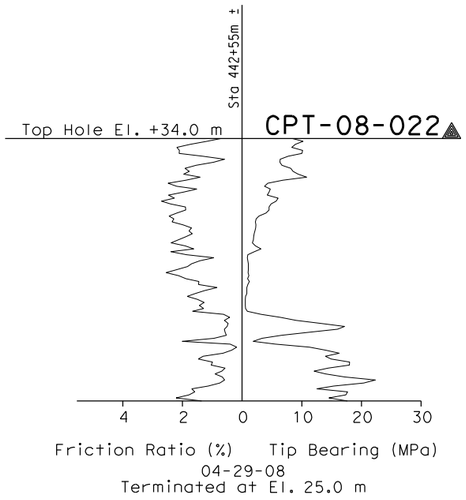

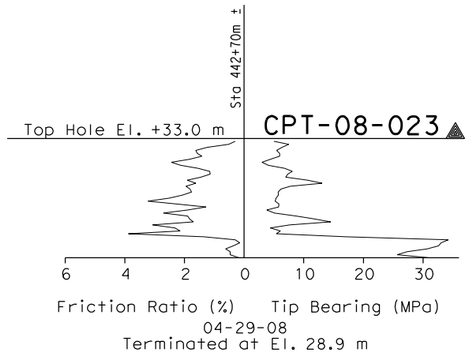

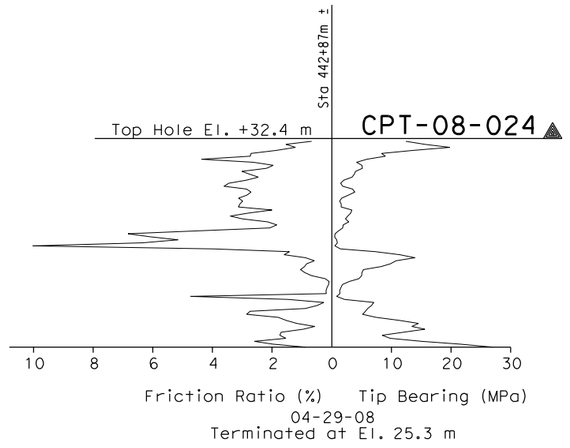

CONE PENETRATION TEST (CPT) SOUNDINGS

PROFILE

VERTICAL : AS SHOWN
HORIZONTAL : AS SHOWN

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

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ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 18 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

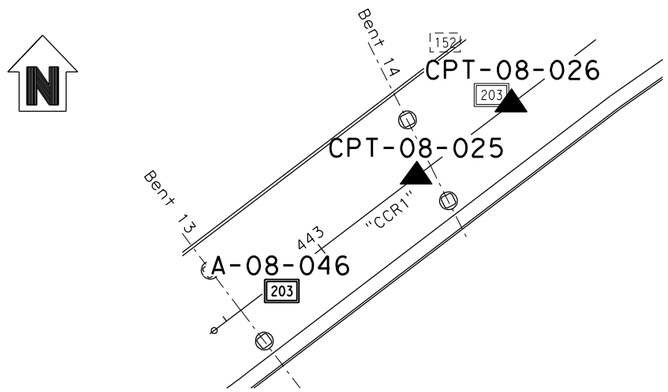
DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES										SHEET	OF
10/14/08	3/9/09										

FILE => 57-c0786-z-lotb18.dgn

USERNAME => mporonjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:09:04 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
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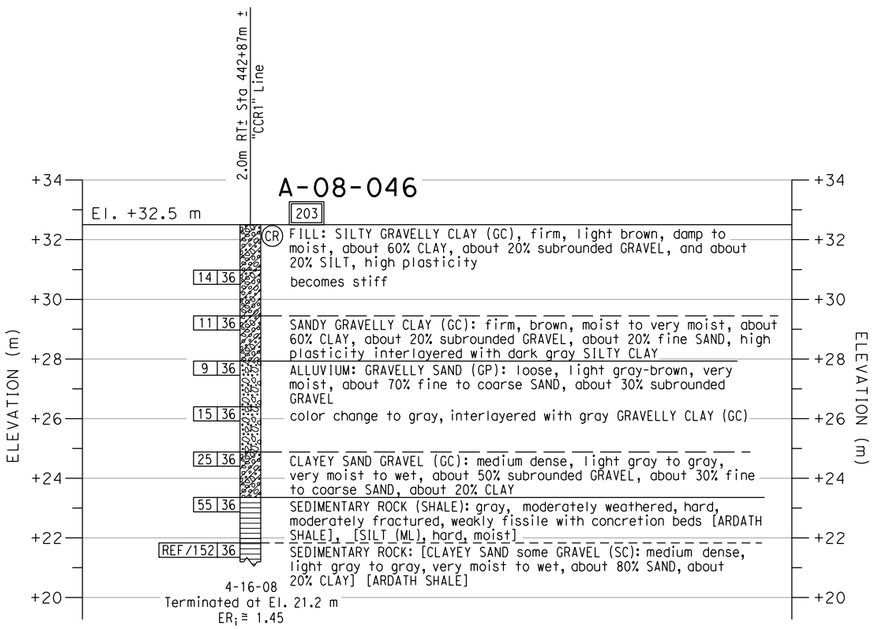
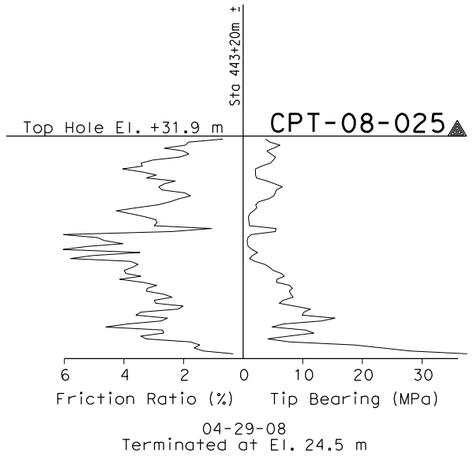
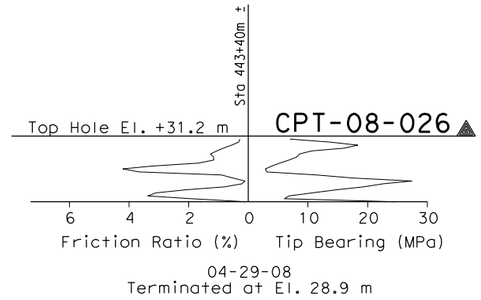


PROFILE

VERTICAL	1 : 100
HORIZONTAL	1 : 500





CONE PENETRATION TEST (CPT) SOUNDINGS

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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

SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.
2. Automatic trip and safety hammer systems consisting of hammer weight of 62.5 kg falling a distance of 762 mm were used to advance the drive samplers in accordance with ASTM D1586.
3. The average hammer energy ratio (ER$_i$) reflects the percentage efficiency of SPT blowcounts (N-value). The estimated ER$_i$ for the various drilling equipment used was as follows:
   Boart Longyear:
   Longyear 1405: ER$_i$ ≅ 1.45
   Prosonic Track Mounted: ER$_i$ ≅ 1.00
   Prosonic 1: ER$_i$ ≅ 1.45
   Minisonic: ER$_i$ ≅ 1.00
   Test America:
   CME 95: ER$_i$ ≅ 1.45
   Pacific Drilling:
   Unimog: ER$_i$ ≅ 1.27
   Mole: ER$_i$ ≅ 1.00
   Minimole: ER$_i$ ≅ 1.00
4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (RQD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES		GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN			DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 19 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER	G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

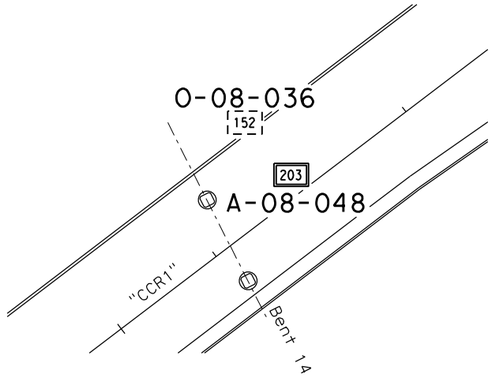
DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES										SHEET	OF
10/14/08	3/9/09										

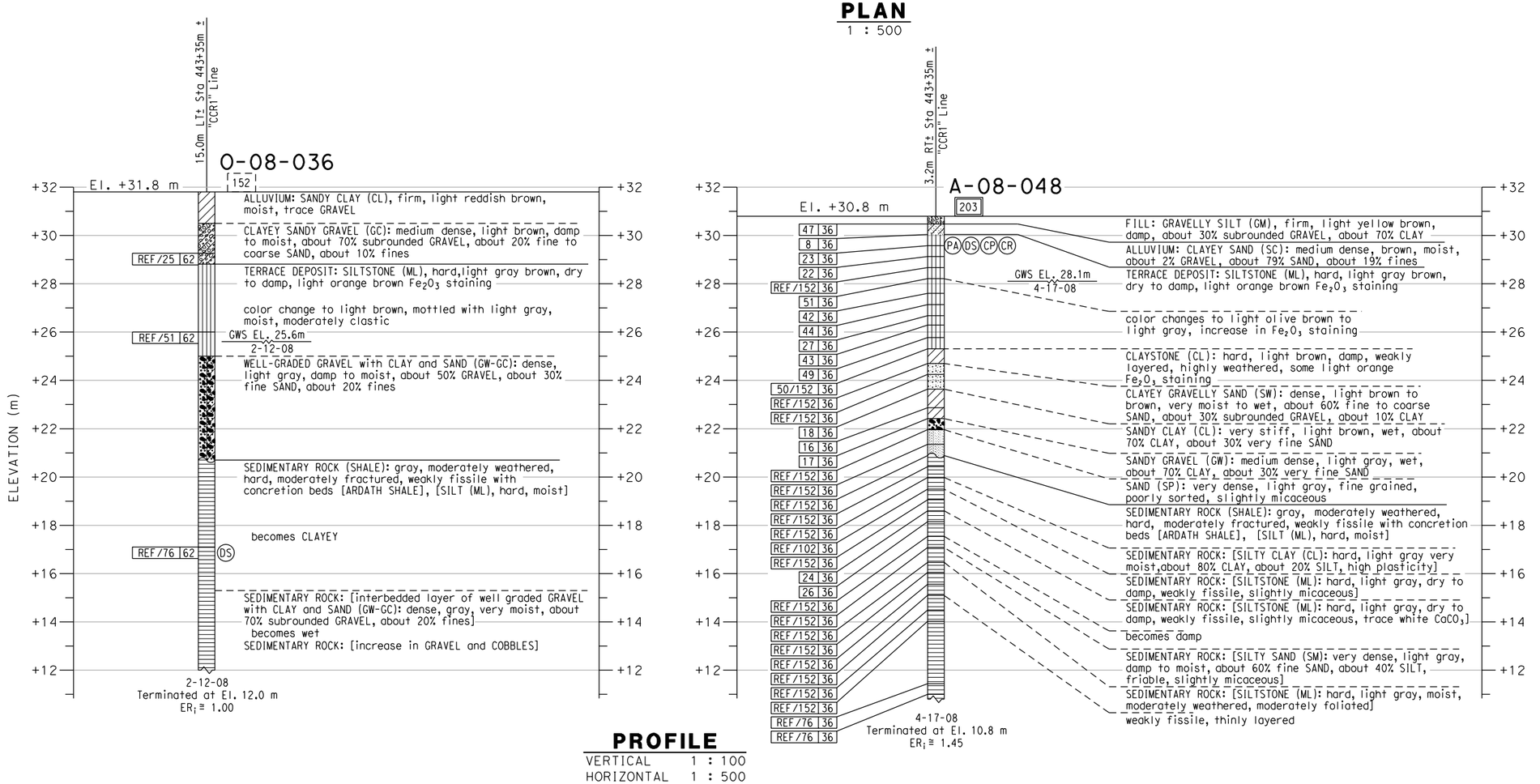
FILE => 57-c0786-z-lotb19.dgn

USERNAME => mporanjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:09:10 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
1 : 500



PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER	DEPARTMENT OF TRANSPORTATION	DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 20 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401	DISREGARD PRINTS BEARING EARLIER REVISION DATES →	REVISION DATES: 10/14/08, 3/9/09

OGS CIVIL LOG OF TEST BORINGS SHEET

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

SHEET OF

USERNAME => mporonjape DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:09:16 PM

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Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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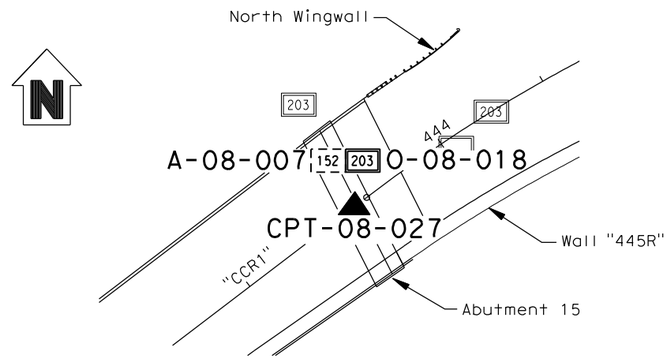

PLAN
1 : 500

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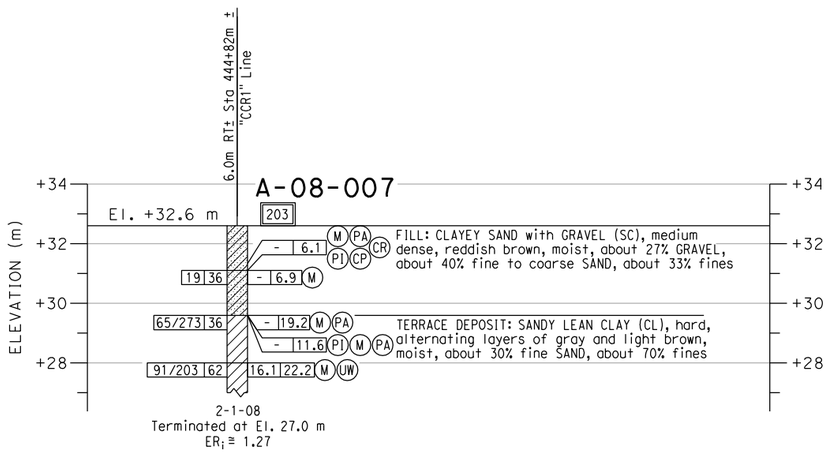

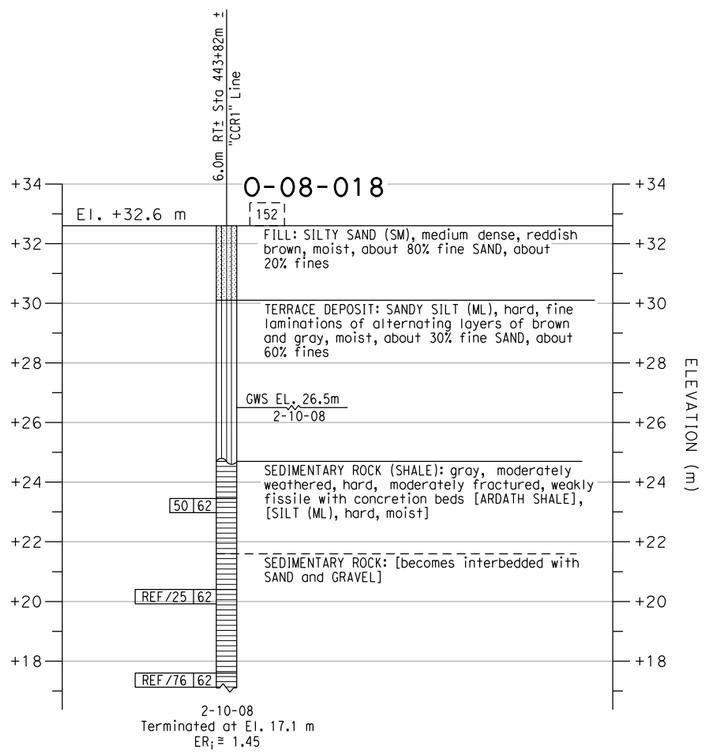

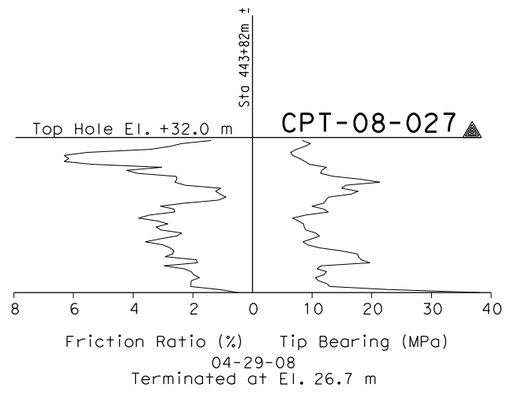

CONE PENETRATION TEST (CPT) SOUNDING

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0786	CARROLL CANYON ROAD BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 21 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER			
OGS CIVIL LOG OF TEST BORINGS SHEET	ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS 0 10 20 30 40 50 60 70 80 90 100		CU 11275 EA 2T0401	DISREGARD PRINTS BEARING EARLIER REVISION DATES →	REVISION DATES 10/14/08 3/9/09 — SHEET — OF

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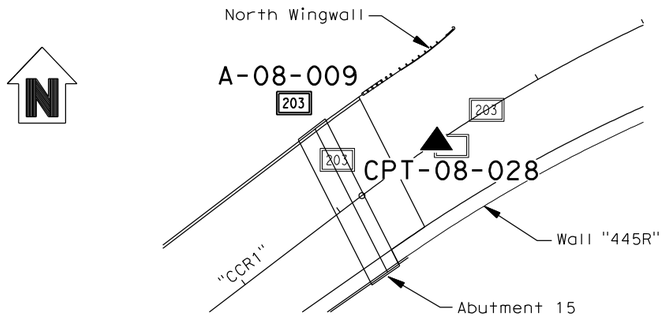
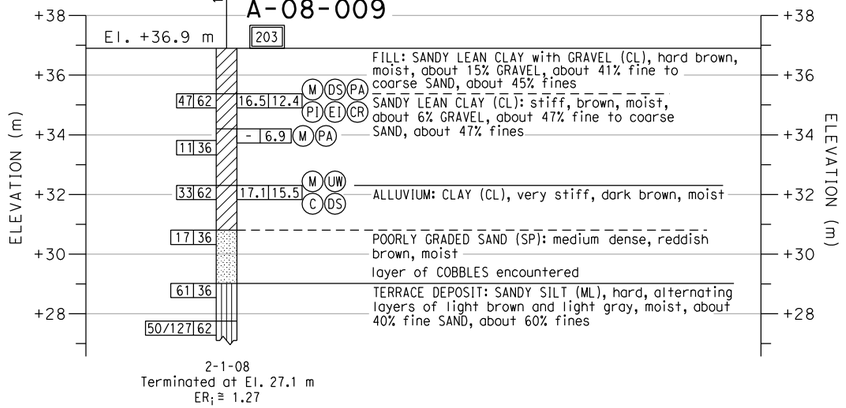
USERNAME => mporonjape DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:09:24 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
1 : 500



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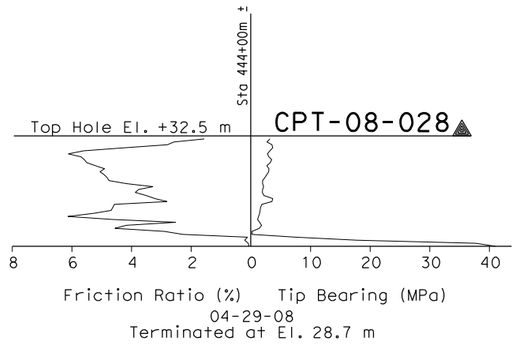

CONE PENETRATION TEST (CPT) SOUNDING

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 22 OF 22
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES: 10/14/08, 3/9/09

SHEET OF

FILE => 57-c0786-z-lotb22.dgn

USERNAME => mporcayo DATE PLOTTED => 3/10/2009 TIME PLOTTED => 11:09:30 PM

APPENDIX I.13

DIRECT ACCESS RAMP LOTBs

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

GROUP SYMBOLS AND NAMES

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

FIELD AND LABORATORY TESTING

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

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

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APPARENT DENSITY OF COHESIONLESS SOILS

Description	SPT N_{60} (Blows / 300 mm)
Very loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE

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

PERCENT OR PROPORTION OF SOILS

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

PARTICLE SIZE

Description		Size
Boulder		> 300 mm
Cobble		76 mm to 300 mm
Gravel	Coarse	19 mm to 76 mm
	Fine	No. 4 to 19 mm
Sand	Coarse	No. 10 to No. 4
	Medium	No. 40 to No. 10
	Fine	No. 200 to No. 40

SOIL LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-E0075/76
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401	

DIRECT ACCESS RAMP

LOG OF TEST BORINGS SHEET NO. 1 OF 11

OGS CIVIL LOG OF TEST BORINGS SHEET

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: 10/14/08 | 3/9/09 | SHEET | OF

FILE => 57-e0075_76-z-lotb01.dgn

USERNAME => mpcronjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:14:50 PM

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
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7895 CONVOY CT.
SAN DIEGO, CA. 92111

CEMENTATION

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

BOREHOLE IDENTIFICATION

Symbol	Hole Type	Description
Size	A	Auger Boring
Size	R P	Rotary drilled boring Rotary percussion boring (air)
Size	R	Rotary drilled diamond core
Size	HD HA	Hand driven (25 mm soil tube) Hand Auger
●	D	Dynamic Cone Penetration Boring
▲	CPT	Cone Penetration Test (ASTM D 5778-95)
[ ]	O	Other

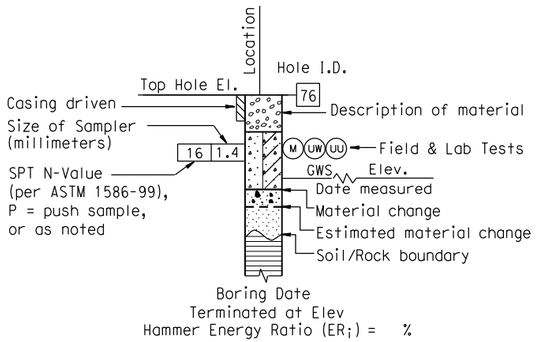
Note: Size in millimeters.

CONSISTENCY OF COHESIVE SOILS

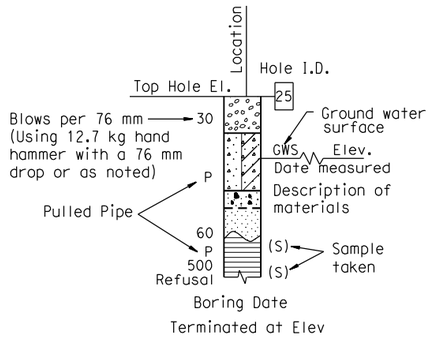
Description	Unconfined Compressive Strength (tsm)	Pocket Penetrometer Measurement (tsm)	Torvane Measurement (tsm)	Field Approximation
Very Soft	< 24	< 24	< 12	Easily penetrated several inches by fist
Soft	24 to 48	24 to 48	12 to 24	Easily penetrated several inches by thumb
Medium Stiff	48 to 96	48 to 96	24 to 48	Penetrated several inches by thumb with moderate effort
Stiff	96 to 192	96 to 192	48 to 96	Readily indented by thumb but penetrated only with great effort
Very Stiff	192 to 383	192 to 383	96 to 192	Readily indented by thumbnail
Hard	> 383	> 383	> 192	Indented by thumbnail with difficulty

PLASTICITY OF FINE-GRAINED SOILS

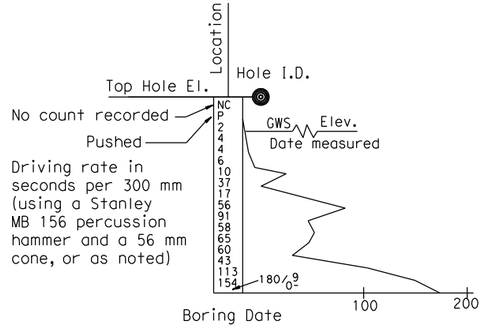
Description	Criteria
Nonplastic	A 3 mm thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.



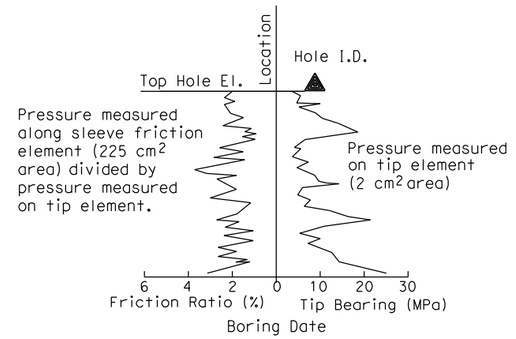
ROTARY BORING



HAND BORING



DYNAMIC CONE PENETRATION BORING



CONE PENETRATION TEST (CPT) SOUNDING

SOIL LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-E0075/76	DIRECT ACCESS RAMP
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 2 OF 11
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES								SHEET	OF
10/14/08	3/9/09								

FILE => 57-e0075_76-z-lotb02.dgn

USERNAME => mparcinjape DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:14:58 PM

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

Caltrans Metric

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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BUREAU VERITAS NORTH AMERICA, INC.
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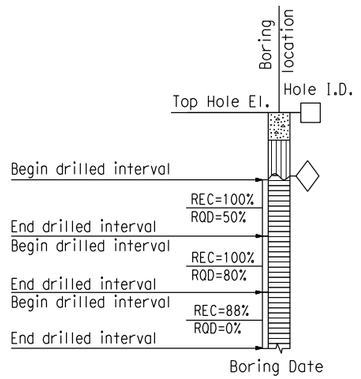
SAN DIEGO, CA. 92111

PERCENT CORE RECOVERY (REC) & ROCK QUALITY DESIGNATION (RQD)

$$REC = \frac{\sum \text{Length of the recovered core pieces}}{\text{Total length of core run}} \times 100\%$$

$$RQD = \frac{\sum \text{Length of intact core pieces} \geq 100\ mm}{\text{Total length of core run}} \times 100\%$$



RELATIVE STRENGTH OF INTACT ROCK

Term	Uniaxial Compressive Strength (MPa)
Extremely Strong	> 207
Very Strong	100 - 207
Strong	49 - 100
Medium Strong	25 - 49
Weak	5 - 25
Very Weak	1 - 5
Extremely Weak	< 1

BEDDING SPACING

Description	Thickness / Spacing
Massive	Greater than 3 m
Very thickly bedded	1 m to 3 m
Thickly bedded	300 mm to 1 m
Moderately bedded	100 mm to 300 mm
Thinly bedded	30 mm to 100 mm
Very thinly bedded	10 mm to 30 mm
Laminated	Less than 10 mm

LEGEND OF ROCK MATERIALS

- IGNEOUS ROCK
- SEDIMENTARY ROCK
- METAMORPHIC ROCK

ROCK HARDNESS

Description	Criteria
Extremely Hard	Specimen cannot be scratched with a pocket knife or sharp pick; can only be chipped with repeated heavy hammer blows.
Very Hard	Specimen cannot be scratched with a pocket knife or sharp pick. Breaks with repeated heavy hammer blows.
Hard	Specimen can be scratched with a pocket knife or sharp pick with difficulty (heavy pressure). Heavy hammer blows required to break specimen.
Moderately Hard	Specimen can be scratched with pocket knife or sharp pick with light or moderate pressure. Core breaks with moderate hammer pressure.
Moderately Soft	Specimen can be grooved 5 mm deep with a pocket knife or sharp pick with moderate or heavy pressure. Breaks with light hammer blow or heavy manual pressure.
Soft	Specimen can be grooved or gouged easily by a pocket knife or sharp pick with light pressure, can be scratched with fingernail. Breaks with light to moderate manual pressure.
Very Soft	Specimen can be readily indented, grooved or gouged with fingernail, or carved with a pocket knife. Breaks with light manual pressure.

FRACTURE DENSITY

Description	Observed Fracture Density
Unfractured	No fractures.
Very slightly fractured	Lengths greater than 1 m.
Slightly fractured	Lengths from 300 mm to 1000 mm with few lengths less than 300 mm or greater than 1000 mm.
Moderately fractured	Lengths mostly in 100 mm to 300 mm range with most lengths about 200 mm.
Intensely fractured	Lengths average from 30 mm to 100 mm with scattered fragmented intervals with lengths less than 100 mm.
Very intensely fractured	Mostly chips and fragments with a few scattered short core lengths.

Combination descriptors (such as "Very intensely to intensely fractured") are used where equal distribution of both fracture density characteristics is present over a significant interval or exposure, or where characteristics are "in between" the descriptor definitions. Only two adjacent descriptors may be combined.

WEATHERING DESCRIPTORS FOR INTACT ROCK

Description	Diagnostic features					General Characteristics
	Chemical Weathering-Discoloration and/or oxidation		Mechanical Weathering-Grain boundary conditions (disaggregation) primarily for granitics and some coarse-grained sediments	Texture and Solutioning		
	Body of Rock	Fracture Surfaces		Texture	Solutioning	
Fresh	No discoloration, not oxidized.	No discoloration or oxidation.	No separation, intact (tight).	No change.	No solutioning.	Hammer rings when crystalline rocks are struck.
Slightly Weathered	Discoloration or oxidation is limited to surface of, or short distance from, fractures; some feldspar crystals are dull.	Minor to complete discoloration or oxidation of most surfaces.	No visible separation, intact (tight).	Preserved.	Minor leaching of some soluble minerals may be noted.	Hammer rings when crystalline rocks are struck. Body of rock not weakened.
Moderately Weathered	Discoloration or oxidation extends from fractures usually throughout; Fe-Mg minerals are "rusty," feldspar crystals are "cloudy."	All fracture surfaces are discolored or oxidized.	Partial separation of boundaries visible.	Generally preserved.	Soluble minerals may be mostly leached.	Hammer does not ring when rock is struck. Body of rock is slightly weakened.
Intensely Weathered	Discoloration or oxidation throughout; all feldspars and Fe-Mg minerals are altered to clay to some extent; or chemical alteration produces in-situ disaggregation, see grain boundary conditions.	All fracture surfaces are discolored or oxidized, surfaces friable.	Partial separation, rock is friable; in semiarid conditions granitics are disaggregated.	Texture altered by chemical disintegration (hydration, argillation).	Leaching of soluble minerals may be complete.	Dull sound when struck with hammer, usually can be broken with moderate to heavy manual pressure or by light hammer blow without reference to planes of weakness such as incipient or hairline fractures, or veinlets. Rock is significantly weakened.
Decomposed	Discolored or oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe-Mg minerals are completely altered to clay.		Complete separation of grain boundaries (disaggregated).	Resembles a soil, partial or complete remnant rock structure may be preserved; leaching of soluble minerals usually complete.		Can be granulated by hand. Resistant minerals such as quartz may be present as "stringers" or "dikes."

Combination descriptors (such as "slightly weathered to fresh") are permissible where equal distribution of both weathering characteristics is present over significant intervals or where characteristics present are "in between" the diagnostic feature. However, combination descriptors should not be used where significant, identifiable zones can be delineated. Only two adjacent descriptors may be combined. "Very intensely weathered" is the combination descriptor for "intensely weathered to decomposed."

ROCK LEGEND

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-E0075/76	DIRECT ACCESS RAMP
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 3 OF 11
NAME:	CHECKED BY: G. CUSTENBORDER	G. CUSTENBORDER				

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES: 10/14/08 | 3/9/09 | SHEET | OF

USERNAME => mporonjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:15:06 PM

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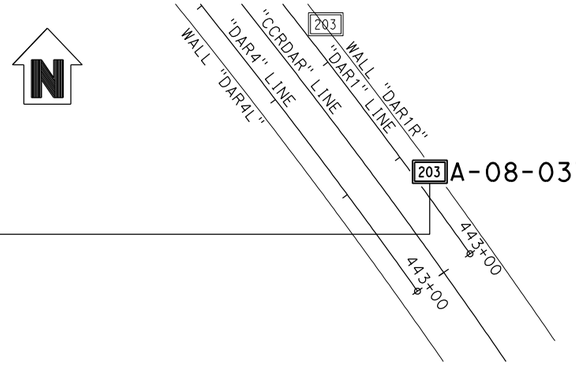
Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
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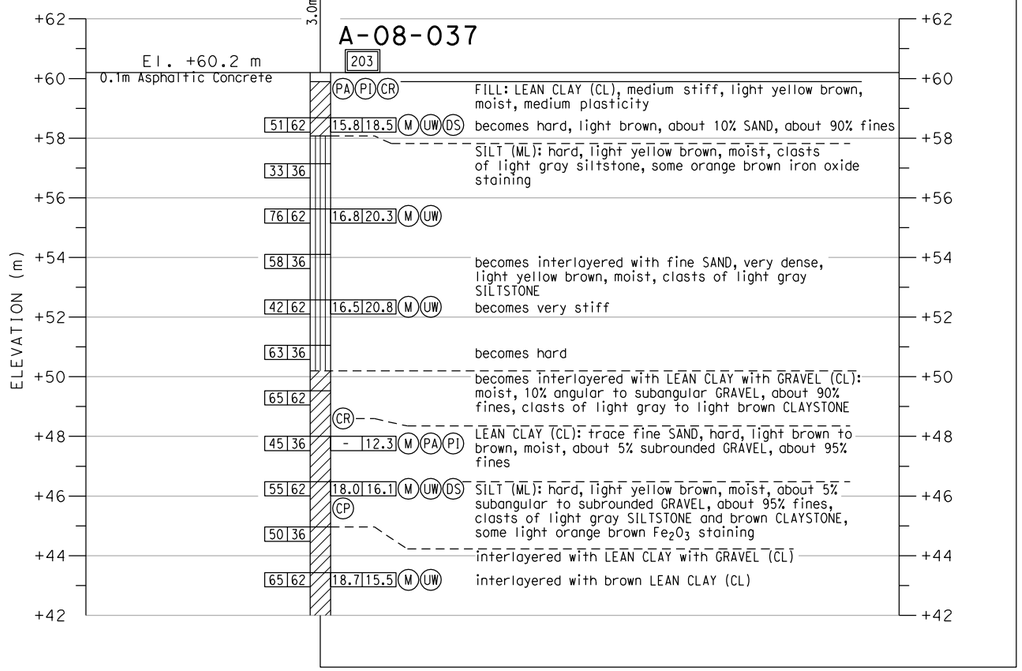

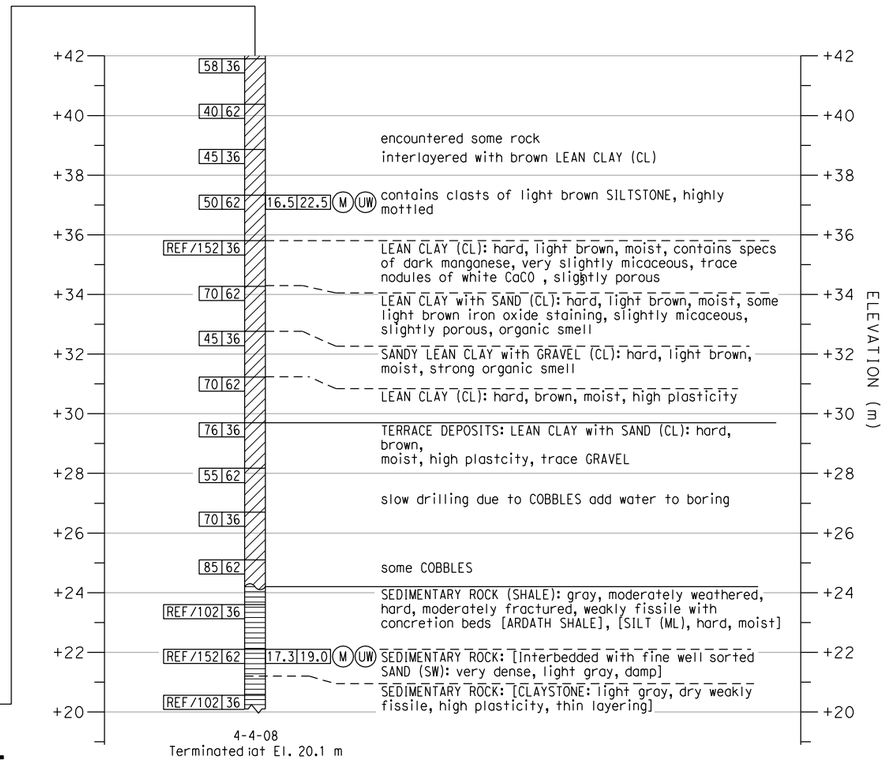

4-4-08
Terminated at El. 20.1 m
$ER_i \cong 1.45$

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.
2. Automatic trip and safety hammer systems consisting of hammer weight of 62.5 kg falling a distance of 762 mm were used to advance the drive samplers in accordance with ASTM D1586.
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   Longyear 1405: $ER_i \cong 1.45$
   Prosonic Track Mounted: $ER_i \cong 1.00$
   Prosonic 1: $ER_i \cong 1.45$
   Minisonic: $ER_i \cong 1.00$
   Pacific Drilling:
   Unimog: $ER_i \cong 1.27$
   Mole: $ER_i \cong 1.00$
   Minimole: $ER_i \cong 1.00$
   Test America:
   CME 95: $ER_i \cong 1.45$
4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (ROD) index is not relevant and therefore not reported on LOTBs.

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FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 4 OF 11
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES										SHEET	OF
10/14/08	3/9/09										

FILE => 57-e0075_76-z-lotb04.dgn

USERNAME => mparonjape DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:15:16 PM

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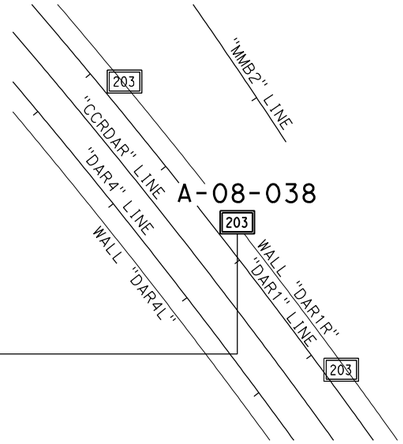
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
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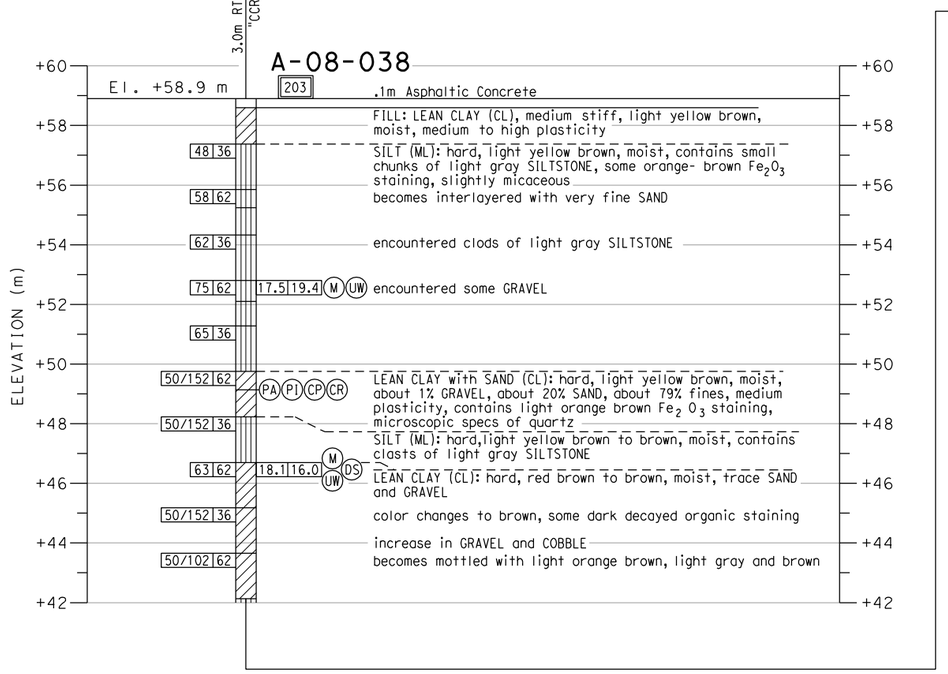
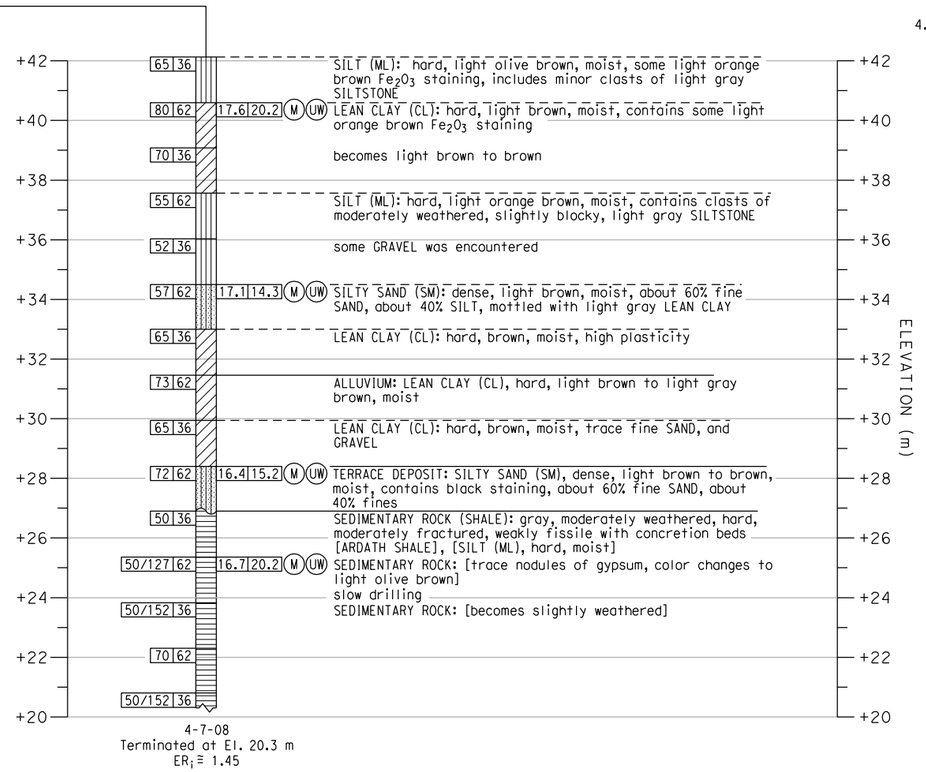


PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500



4-7-08
Terminated at El. 20.3 m
ER_i = 1.45

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

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   CME 95: $ER_i \cong 1.45$
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FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER			DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 5 OF 11
NAME:	CHECKED BY: G. CUSTENBORDER						

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES: 10/14/08, 3/9/09

SHEET OF

FILE => 57-e0075_76-z-lotb05.dgn

USERNAME => mporonjae DATE PLOTTED => 3/10/2009 TIME PLOTTED => 11:15:23 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

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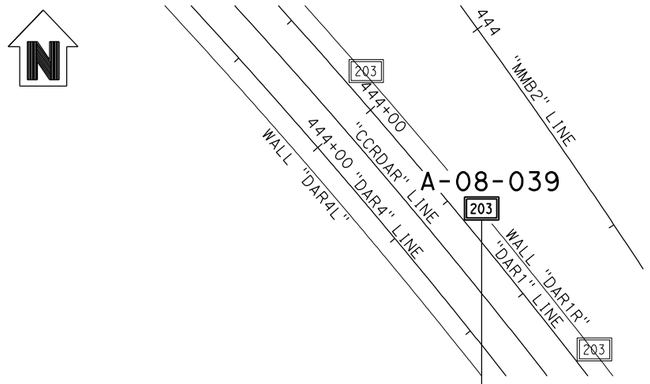

PLAN
1 : 500

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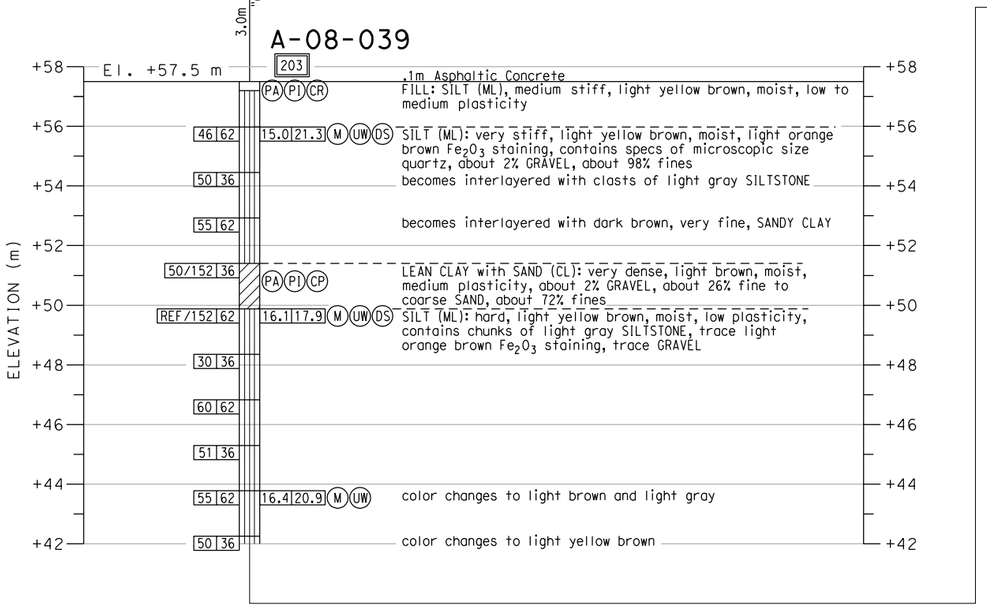

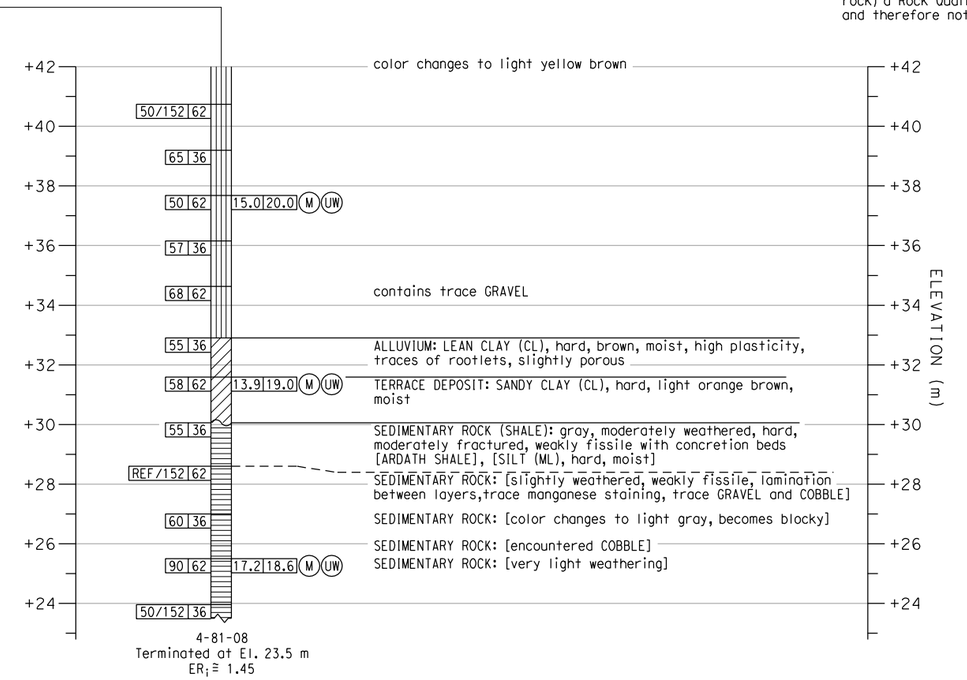

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

ENGINEERING SERVICES		GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-E0075/76	DIRECT ACCESS RAMP
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN G. CUSTENBORDER			DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 6 OF 11
NAME:	CHECKED BY: G. CUSTENBORDER						

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES							SHEET	OF
10/14/08	3/9/09							

USERNAME => mporonjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:15:29 PM

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Bench Mark
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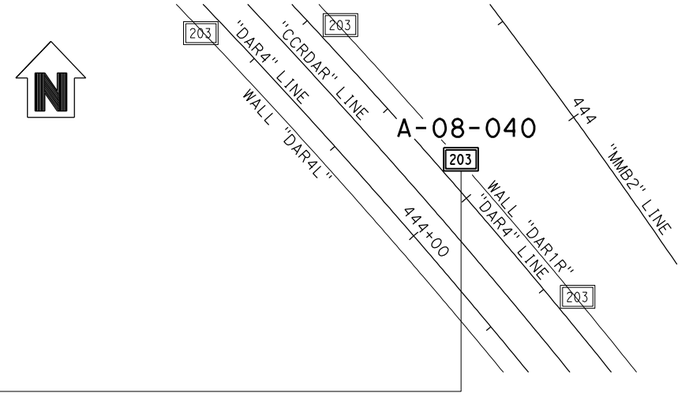

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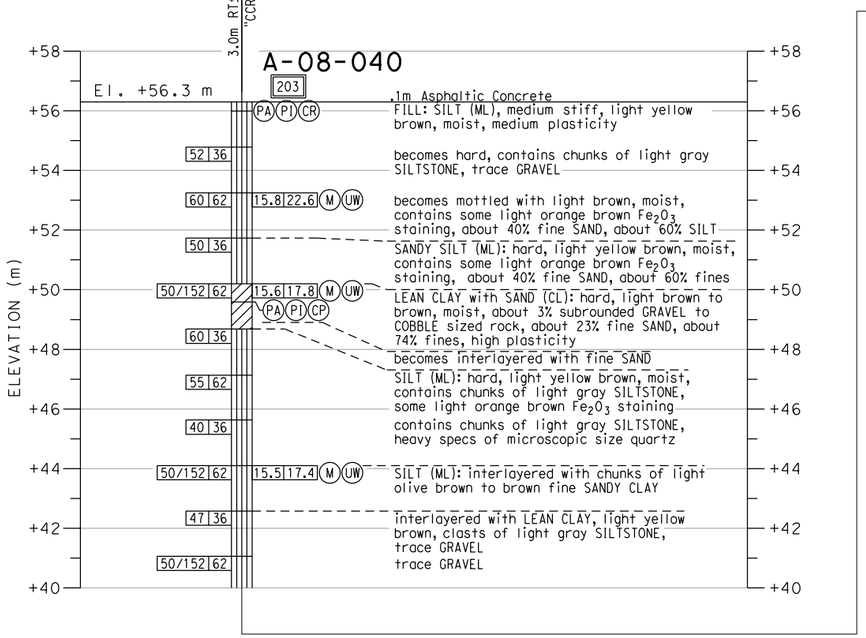

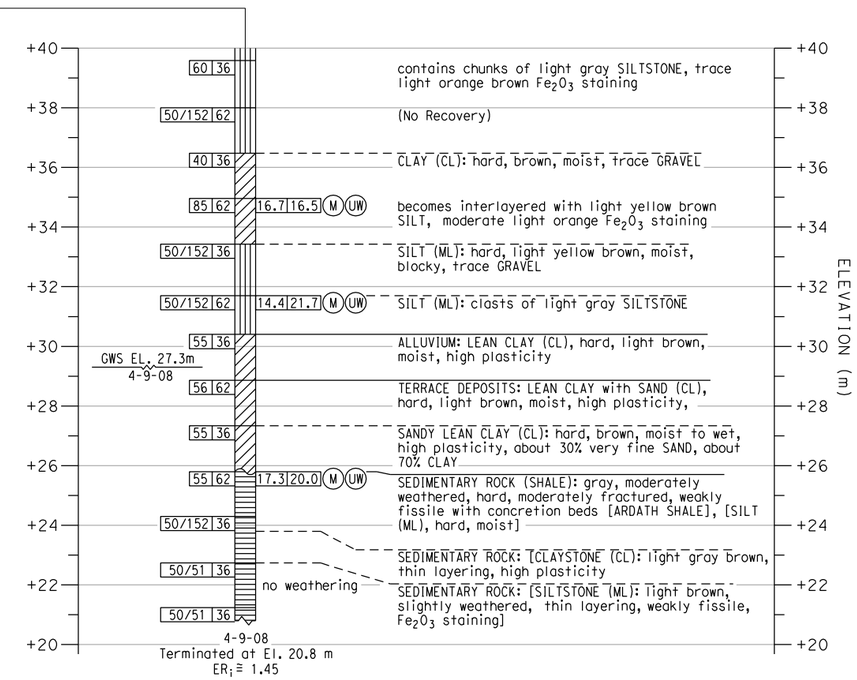

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

Caltrans Metric

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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   Mole: $ER_i \cong 1.00$
   Minimole: $ER_i \cong 1.00$
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ENGINEERING SERVICES		GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-E0075/76	DIRECT ACCESS RAMP
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN G. CUSTENBORDER			DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 7 OF 11
NAME:	CHECKED BY: G. CUSTENBORDER						

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

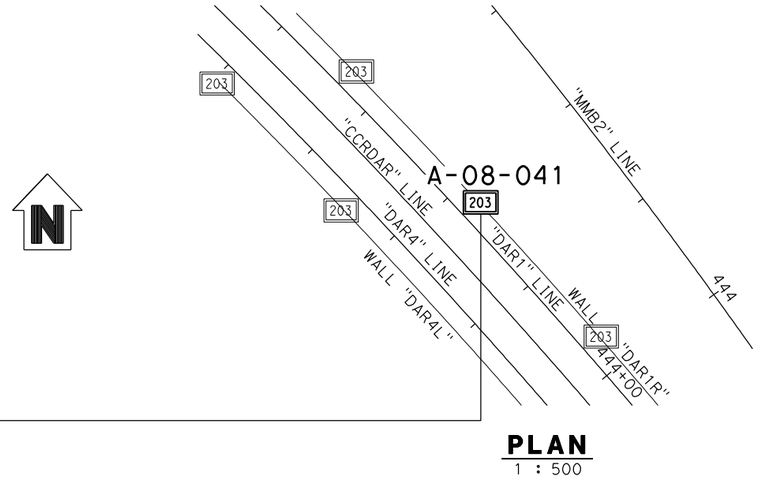
DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES										SHEET	OF
10/14/08	3/9/09										

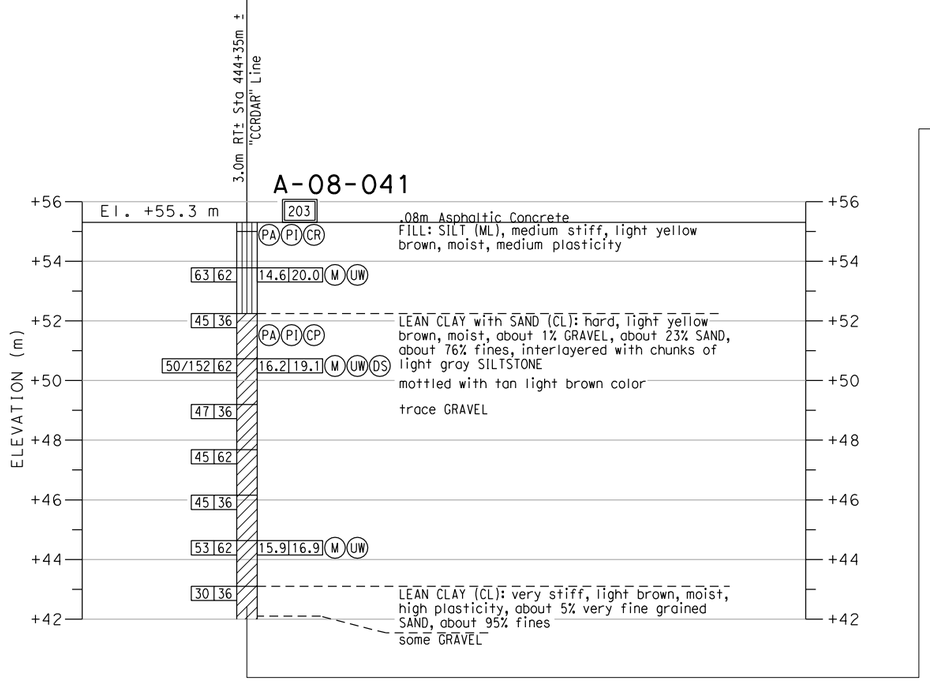
FILE => 57-e0075_76-z-lotb07.dgn

USERNAME => mparonjape DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:15:35 PM

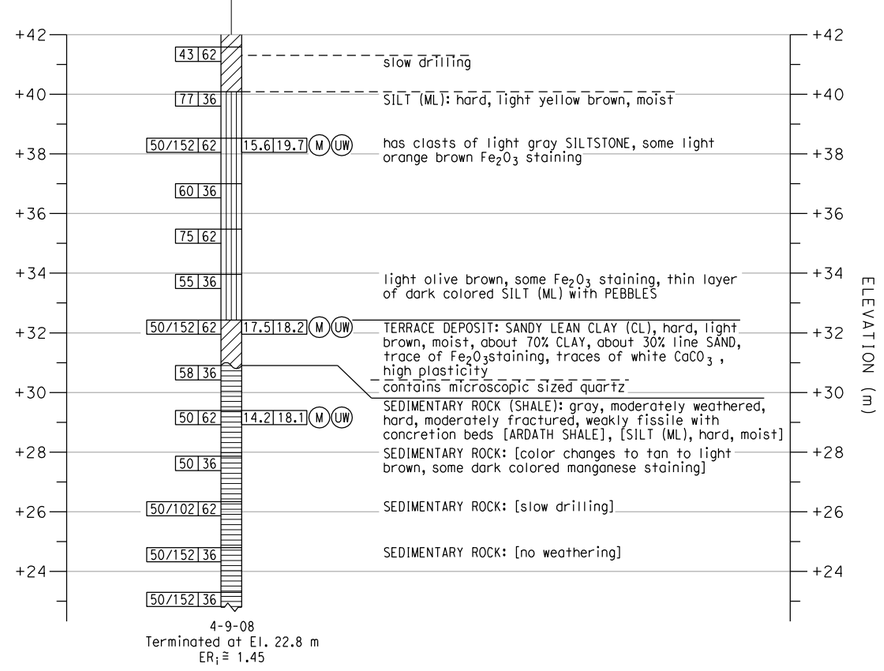
Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
1 : 500



PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500



4-9-08
Terminated at El. 22.8 m
$ER_i \cong 1.45$

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

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   Minisonic: $ER_i \cong 1.00$
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   CME 95: $ER_i \cong 1.45$
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FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 8 OF 11
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401	DISREGARD PRINTS BEARING EARLIER REVISION DATES →	REVISION DATES: 10/14/08, 3/9/09

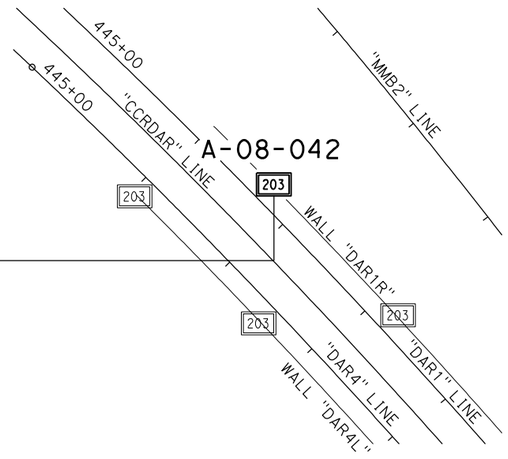
OGS CIVIL LOG OF TEST BORINGS SHEET

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

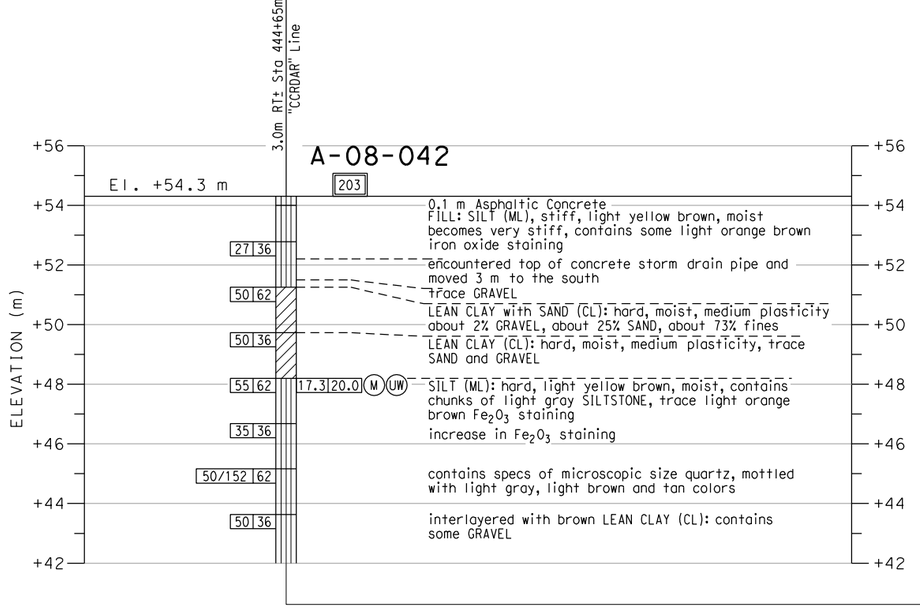
FILE => 57-e0075_76-z-lotb08.dgn

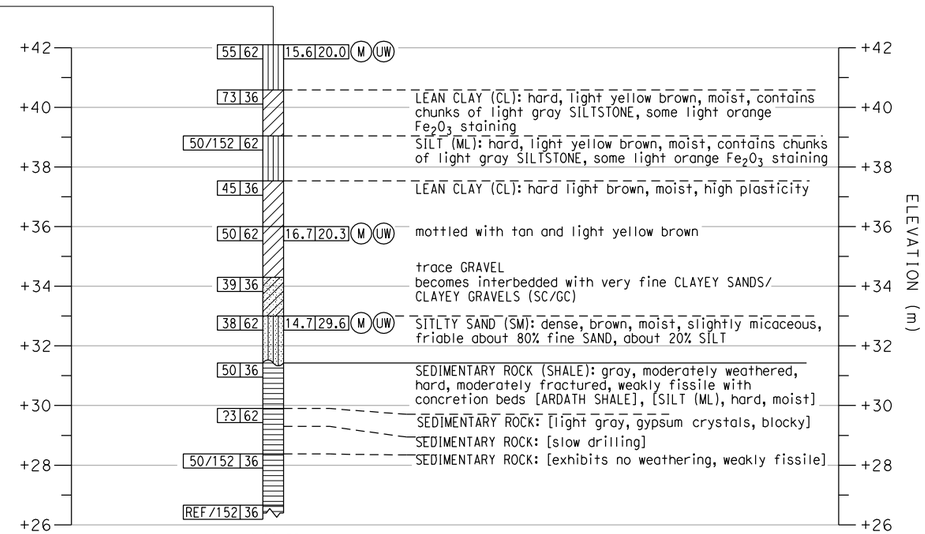
USERNAME => mporcinjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:15:41 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
1 : 500





4-11-08
Terminated at El. 26.4 m
$ER_i \cong 1.45$

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

Caltrans Metric

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

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FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN G. CUSTENBORDER			DESIGN BRANCH	57-E0075/76	
NAME:	CHECKED BY: G. CUSTENBORDER					POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 9 OF 11

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

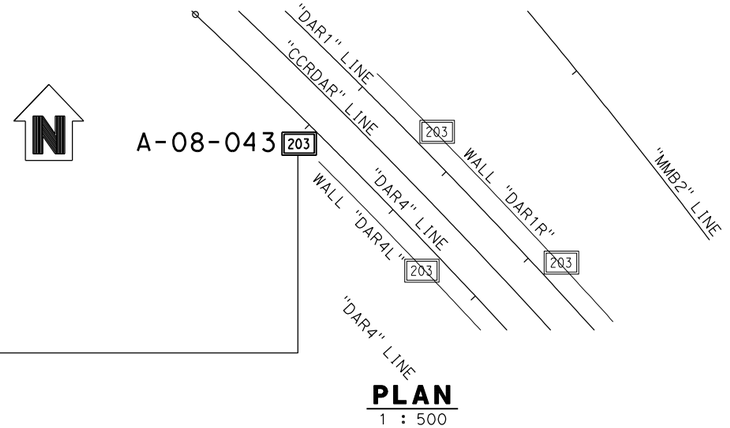
DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES: 10/14/08 | 3/9/09 | SHEET | OF

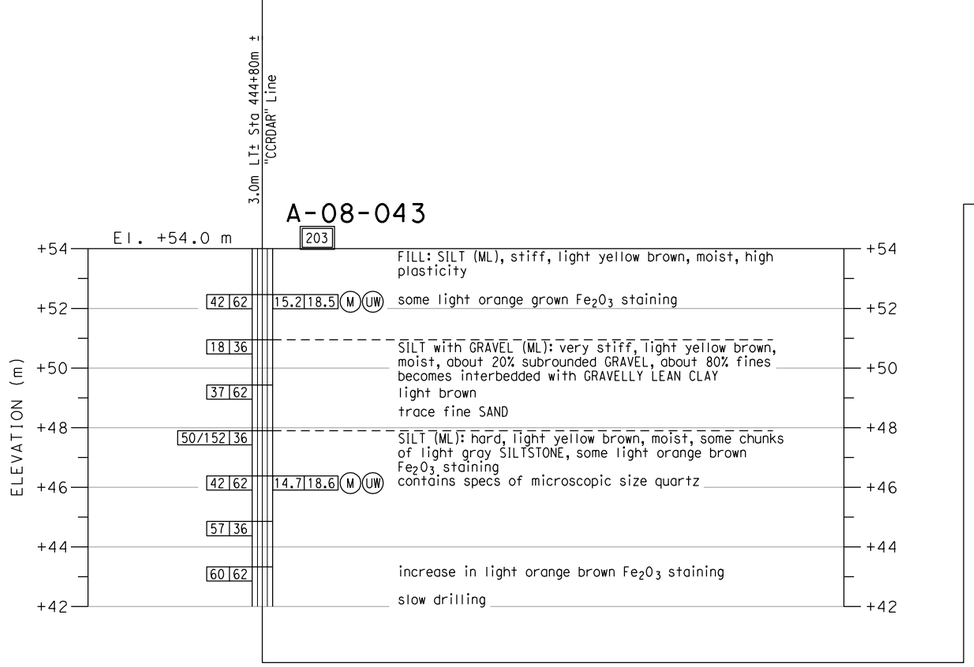
FILE => 57-e0075_76-z-lotb09.dgn

USERNAME => mporcinjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:15:47 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
1 : 500



PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 10 OF 11
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES: 10/14/08 3/9/09

SHEET OF

FILE => 57-e0075_76-z-lotb10.dgn

USERNAME => mparcinjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:15:53 PM

Bench Mark
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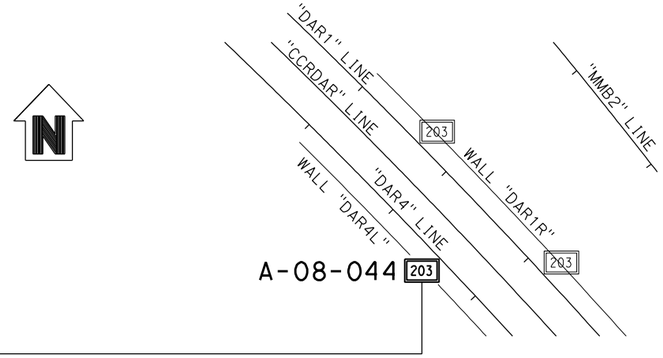
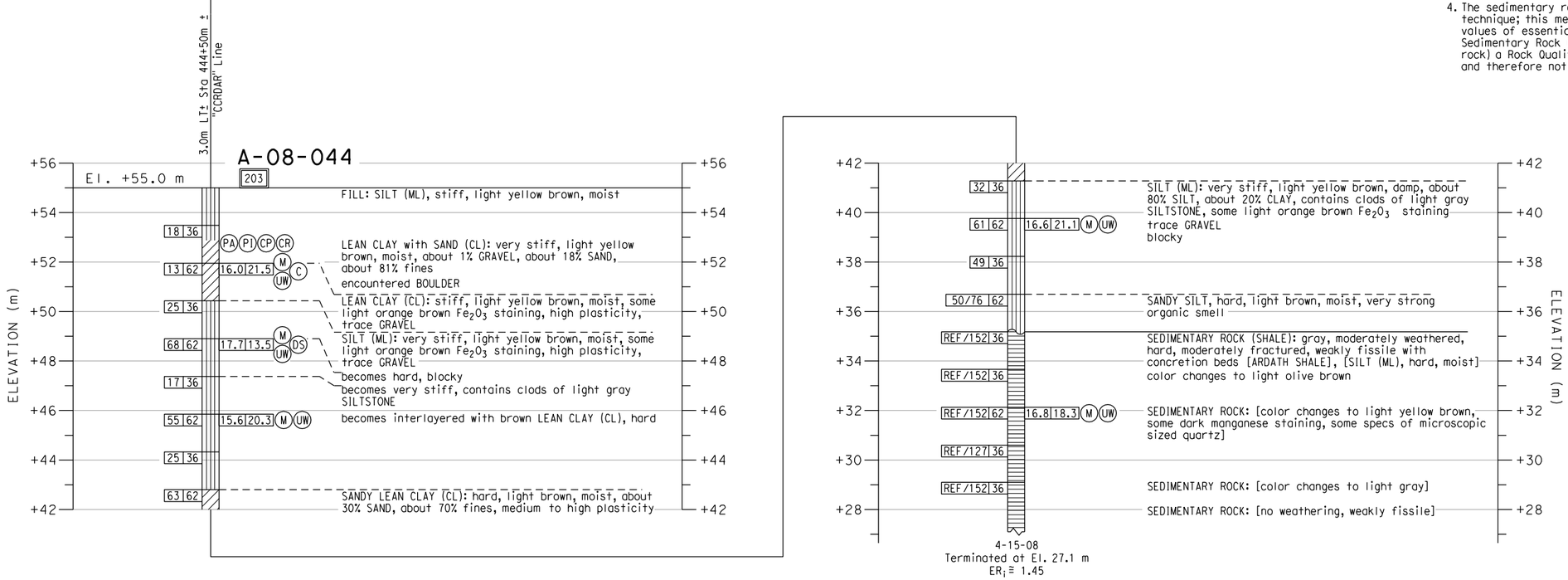


PLAN
1 : 500



PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

PLANS APPROVAL DATE

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FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER			DESIGN BRANCH	57-E0075/76	
NAME:	CHECKED BY: G. CUSTENBORDER					POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 11 OF 11
OGS CIVIL LOG OF TEST BORINGS SHEET	ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS 0 10 20 30 40 50 60 70 80 90 100			CU 11275 EA 2T0401	DISREGARD PRINTS BEARING EARLIER REVISION DATES →	REVISION DATES 10/14/08 3/9/09	SHEET OF

USERNAME => mporonjoe DATE PLOTTED => 3/10/2009 TIME PLOTTED => 11:15:59 PM

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APPENDIX I.14

BUSINESS ACCESS UNDERCROSSING LOTBs

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

GROUP SYMBOLS AND NAMES

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

FIELD AND LABORATORY TESTING

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

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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7895 CONVOY CT.
SAN DIEGO, CA. 92111

APPARENT DENSITY OF COHESIONLESS SOILS

Description	SPT N_{60} (Blows / 300 mm)
Very loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE

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

PERCENT OR PROPORTION OF SOILS

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

PARTICLE SIZE

Description		Size
Boulder		> 300 mm
Cobble		76 mm to 300 mm
Gravel	Coarse	19 mm to 76 mm
	Fine	No. 4 to 19 mm
Sand	Coarse	No. 10 to No. 4
	Medium	No. 40 to No. 10
	Fine	No. 200 to No. 40

SOIL LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0787	BUSINESS ACCESS ROAD UC
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 1 OF 7
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401	DISREGARD PRINTS BEARING EARLIER REVISION DATES →	REVISION DATES: 10/14/08, 3/9/09 — SHEET — OF

OGS CIVIL LOG OF TEST BORINGS SHEET

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

FILE => 57-c0787-z-1otb01.dgn

USERNAME => mpcronjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:12:31 PM

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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CEMENTATION

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

BOREHOLE IDENTIFICATION

Symbol	Hole Type	Description
Size	A	Auger Boring
Size	R P	Rotary drilled boring Rotary percussion boring (air)
Size	R	Rotary drilled diamond core
Size	HD HA	Hand driven (25 mm soil tube) Hand Auger
●	D	Dynamic Cone Penetration Boring
▲	CPT	Cone Penetration Test (ASTM D 5778-95)
[ ]	O	Other

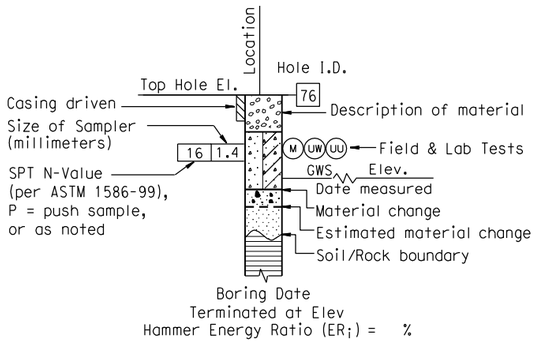
Note: Size in millimeters.

CONSISTENCY OF COHESIVE SOILS

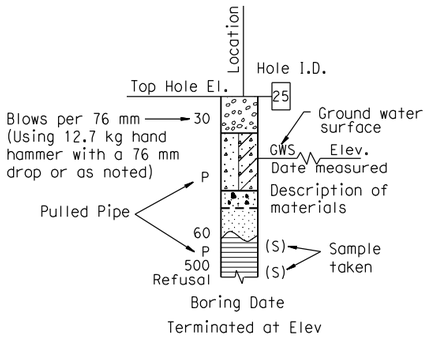
Description	Unconfined Compressive Strength (tsm)	Pocket Penetrometer Measurement (tsm)	Torvane Measurement (tsm)	Field Approximation
Very Soft	< 24	< 24	< 12	Easily penetrated several inches by fist
Soft	24 to 48	24 to 48	12 to 24	Easily penetrated several inches by thumb
Medium Stiff	48 to 96	48 to 96	24 to 48	Penetrated several inches by thumb with moderate effort
Stiff	96 to 192	96 to 192	48 to 96	Readily indented by thumb but penetrated only with great effort
Very Stiff	192 to 383	192 to 383	96 to 192	Readily indented by thumbnail
Hard	> 383	> 383	> 192	Indented by thumbnail with difficulty

PLASTICITY OF FINE-GRAINED SOILS

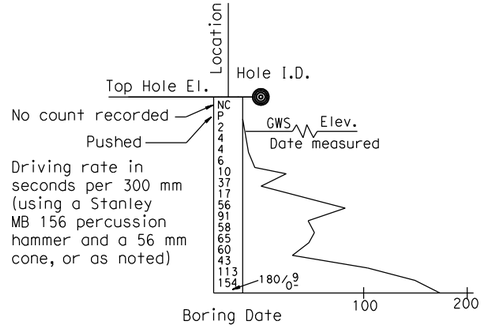
Description	Criteria
Nonplastic	A 3 mm thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.



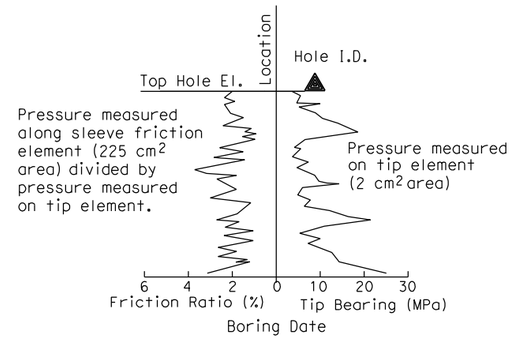
ROTARY BORING



HAND BORING



DYNAMIC CONE PENETRATION BORING



CONE PENETRATION TEST (CPT) SOUNDING

SOIL LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	BUSINESS ACCESS ROAD UC
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	57-C0787	LOG OF TEST BORINGS SHEET NO. 2 OF 7
NAME:	CHECKED BY: G. CUSTENBORDER				POST MILES KP43.2/PM26.8	

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES		SHEET	OF
10/14/08	3/9/09		

FILE => 57-c0787-z-lotb02.dgn

USERNAME => mparcinjape DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:12:40 PM

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

Caltrans Metric

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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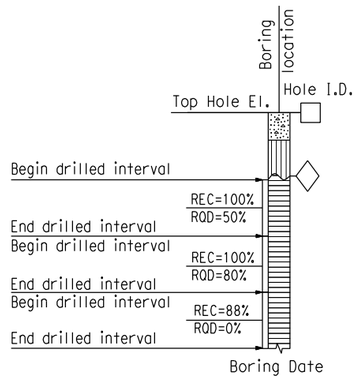
PERCENT CORE RECOVERY (REC) & ROCK QUALITY DESIGNATION (RQD)

$$REC = \frac{\sum \text{Length of the recovered core pieces}}{\text{Total length of core run}} \times 100\%$$

$$RQD = \frac{\sum \text{Length of intact core pieces} \geq 100\ mm}{\text{Total length of core run}} \times 100\%$$



RELATIVE STRENGTH OF INTACT ROCK

Term	Uniaxial Compressive Strength (MPa)
Extremely Strong	> 207
Very Strong	100 - 207
Strong	49 - 100
Medium Strong	25 - 49
Weak	5 - 25
Very Weak	1 - 5
Extremely Weak	< 1

BEDDING SPACING

Description	Thickness / Spacing
Massive	Greater than 3 m
Very thickly bedded	1 m to 3 m
Thickly bedded	300 mm to 1 m
Moderately bedded	100 mm to 300 mm
Thinly bedded	30 mm to 100 mm
Very thinly bedded	10 mm to 30 mm
Laminated	Less than 10 mm

LEGEND OF ROCK MATERIALS

- IGNEOUS ROCK
- SEDIMENTARY ROCK
- METAMORPHIC ROCK

ROCK HARDNESS

Description	Criteria
Extremely Hard	Specimen cannot be scratched with a pocket knife or sharp pick; can only be chipped with repeated heavy hammer blows.
Very Hard	Specimen cannot be scratched with a pocket knife or sharp pick. Breaks with repeated heavy hammer blows.
Hard	Specimen can be scratched with a pocket knife or sharp pick with difficulty (heavy pressure). Heavy hammer blows required to break specimen.
Moderately Hard	Specimen can be scratched with pocket knife or sharp pick with light or moderate pressure. Core breaks with moderate hammer pressure.
Moderately Soft	Specimen can be grooved 5 mm deep with a pocket knife or sharp pick with moderate or heavy pressure. Breaks with light hammer blow or heavy manual pressure.
Soft	Specimen can be grooved or gouged easily by a pocket knife or sharp pick with light pressure, can be scratched with fingernail. Breaks with light to moderate manual pressure.
Very Soft	Specimen can be readily indented, grooved or gouged with fingernail, or carved with a pocket knife. Breaks with light manual pressure.

FRACTURE DENSITY

Description	Observed Fracture Density
Unfractured	No fractures.
Very slightly fractured	Lengths greater than 1 m.
Slightly fractured	Lengths from 300 mm to 1000 mm with few lengths less than 300 mm or greater than 1000 mm.
Moderately fractured	Lengths mostly in 100 mm to 300 mm range with most lengths about 200 mm.
Intensely fractured	Lengths average from 30 mm to 100 mm with scattered fragmented intervals with lengths less than 100 mm.
Very intensely fractured	Mostly chips and fragments with a few scattered short core lengths.

Combination descriptors (such as "Very intensely to intensely fractured") are used where equal distribution of both fracture density characteristics is present over a significant interval or exposure, or where characteristics are "in between" the descriptor definitions. Only two adjacent descriptors may be combined.

WEATHERING DESCRIPTORS FOR INTACT ROCK

Description	Diagnostic features: Chemical Weathering-Discoloration and/or oxidation — Body of Rock	Diagnostic features: Chemical Weathering-Discoloration and/or oxidation — Fracture Surfaces	Diagnostic features: Mechanical Weathering-Grain boundary conditions (disaggregation) primarily for granitics and some coarse-grained sediments	Diagnostic features: Texture and Solutioning — Texture	Diagnostic features: Texture and Solutioning — Solutioning	General Characteristics
Fresh	No discoloration, not oxidized.	No discoloration or oxidation.	No separation, intact (tight).	No change.	No solutioning.	Hammer rings when crystalline rocks are struck.
Slightly Weathered	Discoloration or oxidation is limited to surface of, or short distance from, fractures; some feldspar crystals are dull.	Minor to complete discoloration or oxidation of most surfaces.	No visible separation, intact (tight).	Preserved.	Minor leaching of some soluble minerals may be noted.	Hammer rings when crystalline rocks are struck. Body of rock not weakened.
Moderately Weathered	Discoloration or oxidation extends from fractures usually throughout; Fe-Mg minerals are "rusty," feldspar crystals are "cloudy."	All fracture surfaces are discolored or oxidized.	Partial separation of boundaries visible.	Generally preserved.	Soluble minerals may be mostly leached.	Hammer does not ring when rock is struck. Body of rock is slightly weakened.
Intensely Weathered	Discoloration or oxidation throughout; all feldspars and Fe-Mg minerals are altered to clay to some extent; or chemical alteration produces in-situ disaggregation, see grain boundary conditions.	All fracture surfaces are discolored or oxidized, surfaces friable.	Partial separation, rock is friable; in semiarid conditions granitics are disaggregated.	Texture altered by chemical disintegration (hydration, argillation).	Leaching of soluble minerals may be complete.	Dull sound when struck with hammer, usually can be broken with moderate to heavy manual pressure or by light hammer blow without reference to planes of weakness such as incipient or hairline fractures, or veinlets. Rock is significantly weakened.
Decomposed	Discolored or oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe-Mg minerals are completely altered to clay.		Complete separation of grain boundaries (disaggregated).	Resembles a soil, partial or complete remnant rock structure may be preserved; leaching of soluble minerals usually complete.		Can be granulated by hand. Resistant minerals such as quartz may be present as "stringers" or "dikes."

Combination descriptors (such as "slightly weathered to fresh") are permissible where equal distribution of both weathering characteristics is present over significant intervals or where characteristics present are "in between" the diagnostic feature. However, combination descriptors should not be used where significant, identifiable zones can be delineated. Only two adjacent descriptors may be combined. "Very intensely weathered" is the combination descriptor for "intensely weathered to decomposed."

ROCK LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0787	BUSINESS ACCESS ROAD UC
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 3 OF 7
NAME:	CHECKED BY: G. CUSTENBORDER	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER	CU 11275 EA 2T0401	DISREGARD PRINTS BEARING EARLIER REVISION DATES →	REVISION DATES: 10/14/08, 3/9/09 — SHEET OF

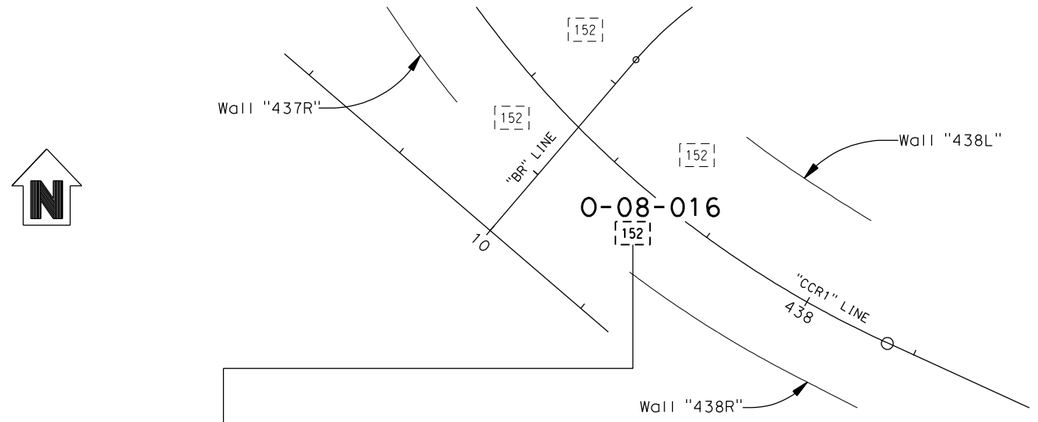
OGS CIVIL LOG OF TEST BORINGS SHEET

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

FILE => 57-c0787-z-lotb03.dgn

USERNAME => mpcronjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:12:48 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
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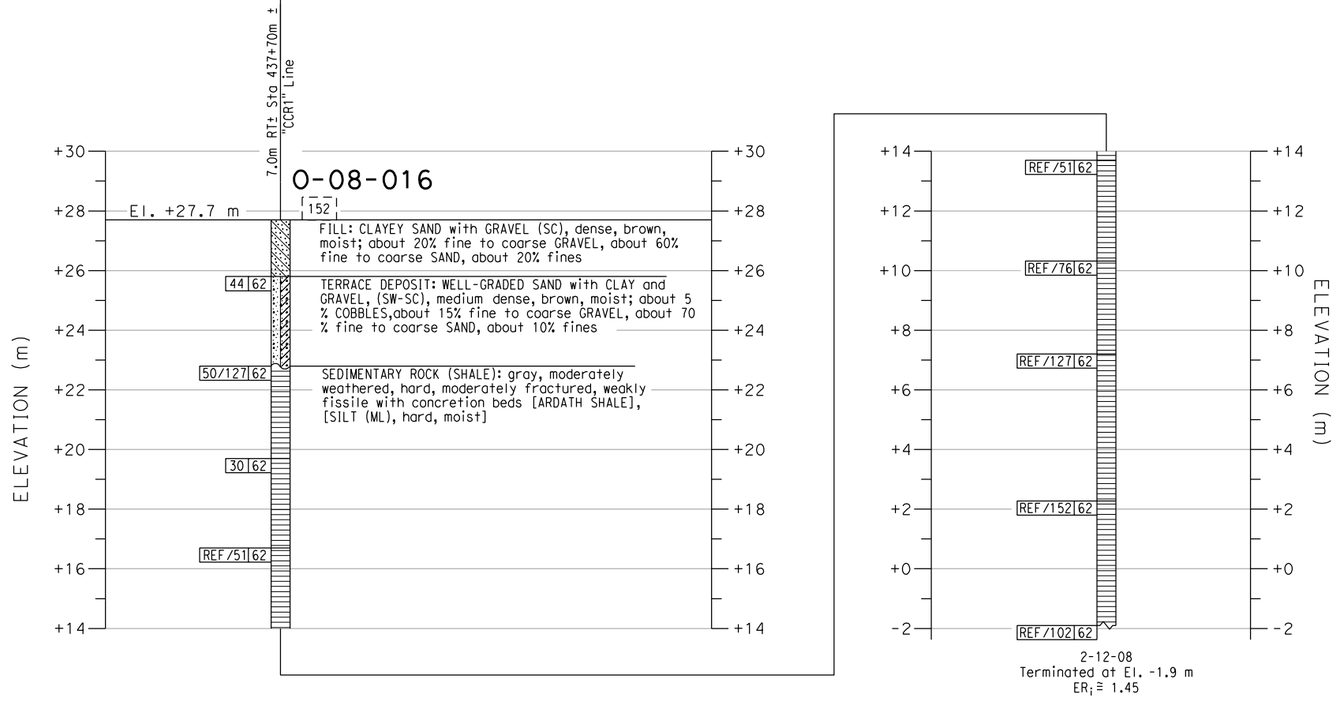

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

REGISTERED PROFESSIONAL ENGINEER
VAN OLIN
NO. 2578
EXP. 6-30-10
GEOTECHNICAL
STATE OF CALIFORNIA

PLANS APPROVAL DATE

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SAN DIEGO, CA. 92111

NOTES:
1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.
2. Automatic trip and safety hammer systems consisting of hammer weight of 62.5 kg falling a distance of 762 mm were used to advance the drive samplers in accordance with ASTM D1586.
3. The average hammer energy ratio (ER_i) reflects the percentage efficiency of SPT blowcounts (N-value). The estimated ER_i for the various drilling equipment used was as follows:
   Boart Longyear:
   Longyear 1405: $ER_i \cong 1.45$
   Prosonic Track Mounted: $ER_i \cong 1.00$
   Prosonic 1: $ER_i \cong 1.45$
   Minisonic: $ER_i \cong 1.00$
   Test America:
   CME 95: $ER_i \cong 1.45$
   Pacific Drilling:
   Unimog: $ER_i \cong 1.27$
   Mole: $ER_i \cong 1.00$
   Minimole: $ER_i \cong 1.00$
4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (ROD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0787	BUSINESS ACCESS ROAD UC
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	DEPARTMENT OF TRANSPORTATION	DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 4 OF 7
NAME:	CHECKED BY: G. CUSTENBORDER	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER	CU 11275 EA 2T0401	DISREGARD PRINTS BEARING EARLIER REVISION DATES →	REVISION DATES: 10/14/08, 3/9/09

OGS CIVIL LOG OF TEST BORINGS SHEET

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

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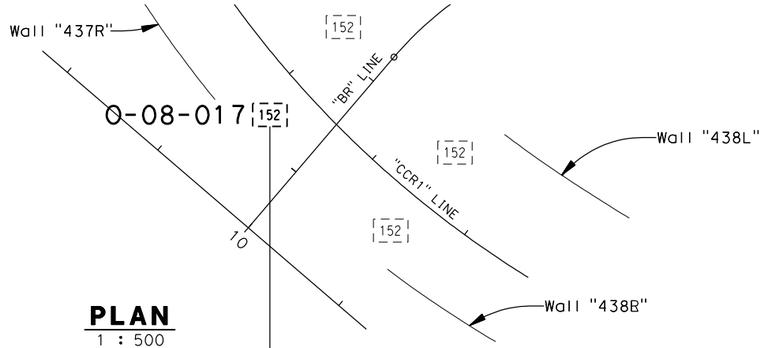

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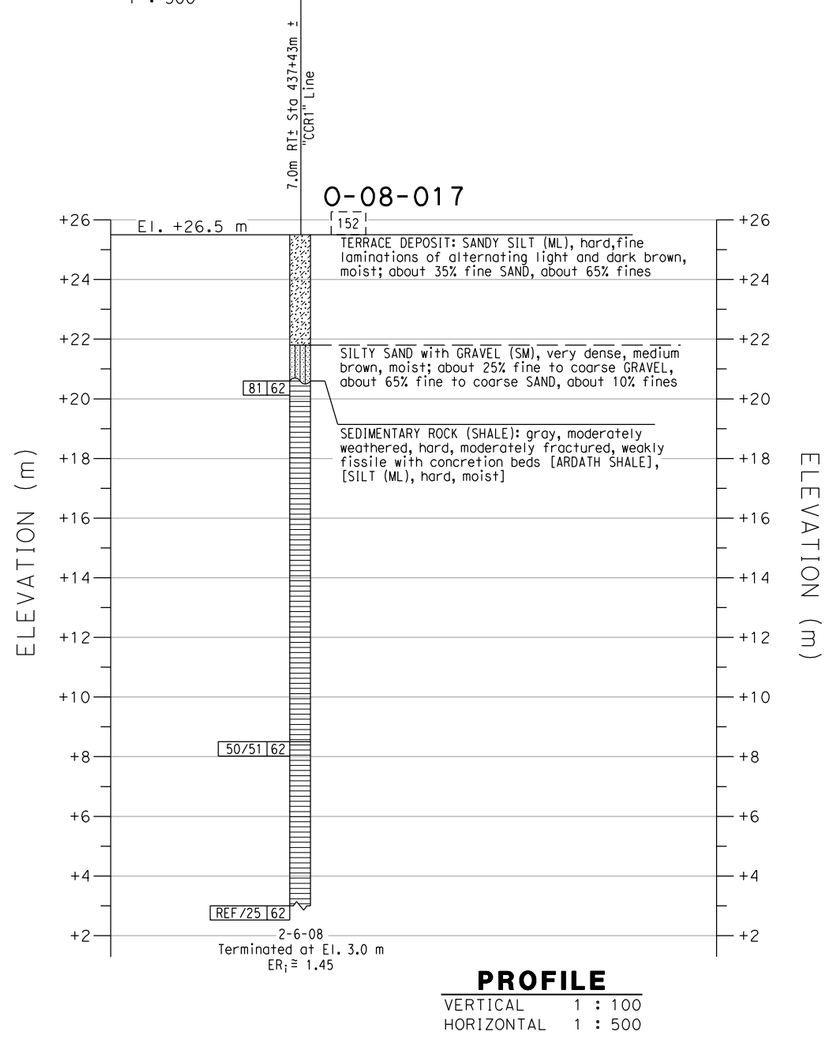

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

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REGISTERED PROFESSIONAL ENGINEER
VAN OLIN
NO. 2578
EXP. 6-30-10
GEOTECHNICAL
STATE OF CALIFORNIA

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   Minisonic: $ER_i \cong 1.00$
   Test America:
   CME 95: $ER_i \cong 1.45$
   Pacific Drilling:
   Unimog: $ER_i \cong 1.27$
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FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 5 OF 7
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

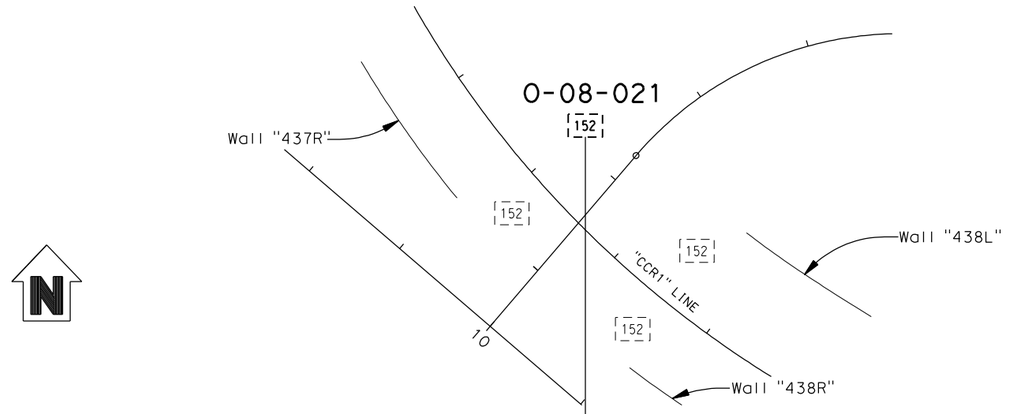
REVISION DATES: 10/14/08 | 3/9/09

SHEET OF

FILE => 57-c0787-z-lotb05.dgn

USERNAME => mparcinjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:13:04 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



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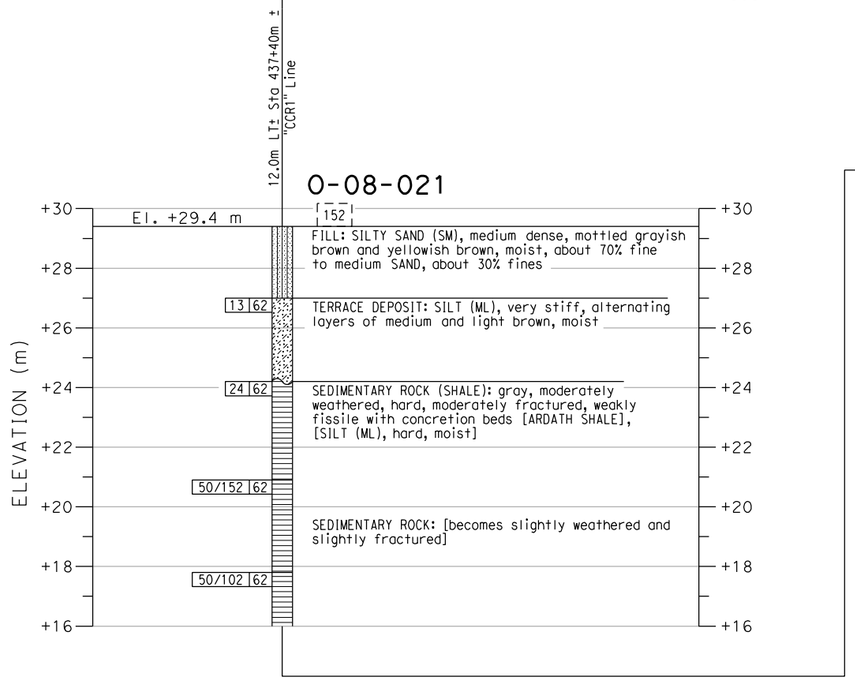

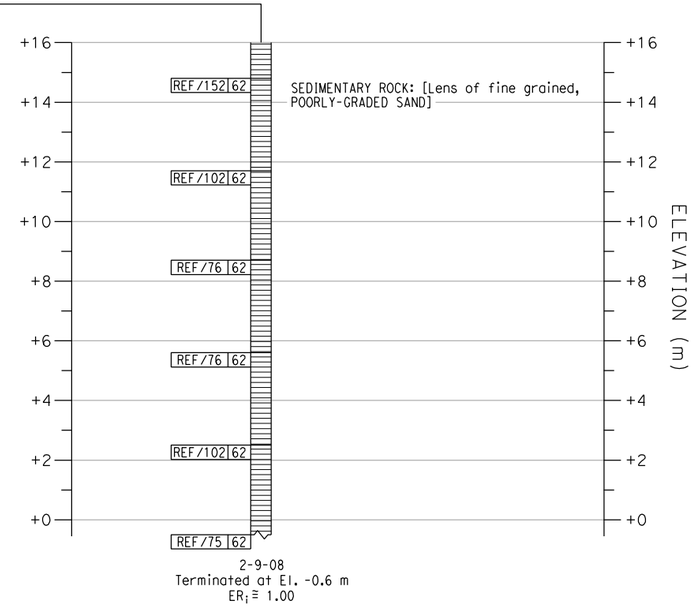

2-9-08
Terminated at El. -0.6 m
ER_i = 1.00

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER	DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 6 OF 7
NAME:	CHECKED BY: G. CUSTENBORDER		CU 11275 EA 2T0401	DISREGARD PRINTS BEARING EARLIER REVISION DATES →	REVISION DATES: 10/14/08, 3/9/09

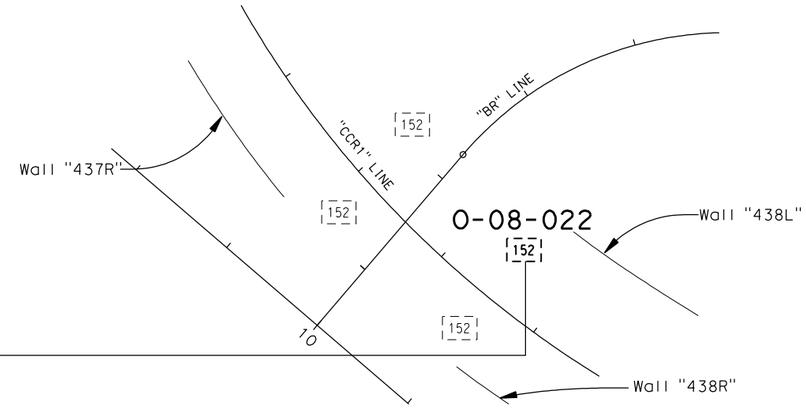
OGS CIVIL LOG OF TEST BORINGS SHEET

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

FILE => 57-c0787-z-lotb06.dgn

USERNAME => mparonjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:13:09 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
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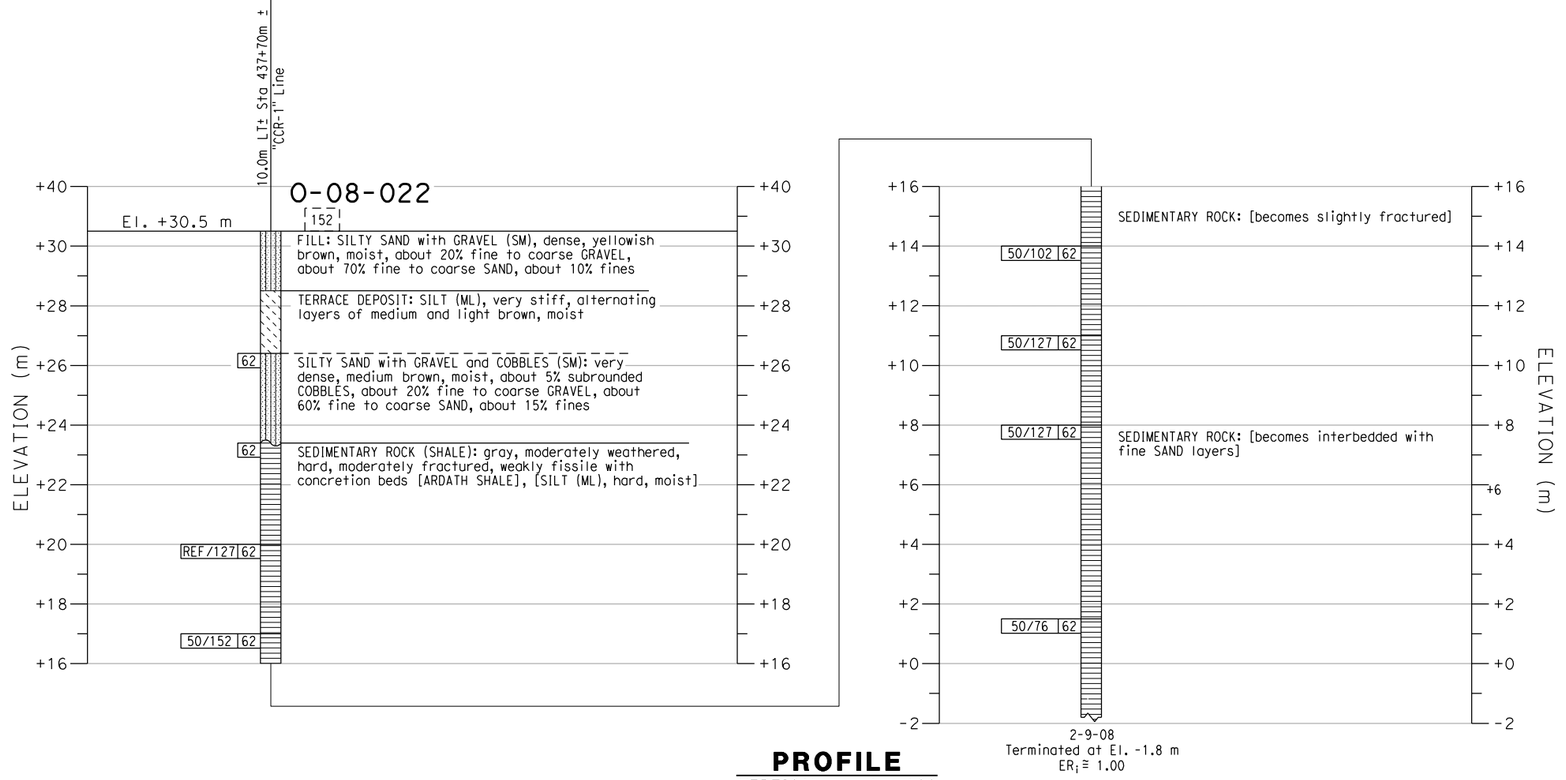

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

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SAN DIEGO, CA. 92111

NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.
2. Automatic trip and safety hammer systems consisting of hammer weight of 62.5 kg falling a distance of 762 mm were used to advance the drive samplers in accordance with ASTM D1586.
3. The average hammer energy ratio (ER$_i$) reflects the percentage efficiency of SPT blowcounts (N-value). The estimated ER$_i$ for the various drilling equipment used was as follows:
   Boart Longyear:
   Longyear 1405: ER$_i$≅1.45
   Prosonic Track Mounted: ER$_i$≅1.00
   Prosonic 1: ER$_i$≅1.45
   Minisonic: ER$_i$≅1.00
   Test America:
   CME 95: ER$_i$≅1.45
   Pacific Drilling:
   Unimog: ER$_i$≅1.27
   Mole: ER$_i$≅1.00
   Minimole: ER$_i$≅1.00
4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (RQD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-C0787	BUSINESS ACCESS ROAD UC
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 7 OF 7
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401		

OGS CIVIL LOG OF TEST BORINGS SHEET

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: 10/14/08, 3/9/09

SHEET OF

FILE => 57-c0787-z-lotb07.dgn

USERNAME => mparonjape DATE PLOTTED => 3/10/2009 TIME PLOTTED => 1:13:14 PM

APPENDIX I.15

MISCELLANEOUS RETAINING WALLS LOTBs

APPENDIX I.15.1

TYPE I WALL 437R LOTBs

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

GROUP SYMBOLS AND NAMES

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

FIELD AND LABORATORY TESTING

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

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

APPARENT DENSITY OF COHESIONLESS SOILS

Description	SPT N_{60} (Blows / 300 mm)
Very loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE

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

PERCENT OR PROPORTION OF SOILS

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

PARTICLE SIZE

Description		Size
Boulder		> 300 mm
Cobble		76 mm to 300 mm
Gravel	Coarse	19 mm to 76 mm
	Fine	No. 4 to 19 mm
Sand	Coarse	No. 10 to No. 4
	Medium	No. 40 to No. 10
	Fine	No. 200 to No. 40

SOIL LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "437R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 1 OF 4
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401	DISREGARD PRINTS BEARING EARLIER REVISION DATES →	REVISION DATES: 10/14/08, 3/9/09 — SHEET — OF

OGS CIVIL LOG OF TEST BORINGS SHEET

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

FILE => MRW01.dgn

USERNAME => mpcronjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2119:55 PM

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

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CEMENTATION

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

BOREHOLE IDENTIFICATION

Symbol	Hole Type	Description
Size	A	Auger Boring
Size	R P	Rotary drilled boring Rotary percussion boring (air)
Size	R	Rotary drilled diamond core
Size	HD HA	Hand driven (25 mm soil tube) Hand Auger
●	D	Dynamic Cone Penetration Boring
▲	CPT	Cone Penetration Test (ASTM D 5778-95)
[ ]	O	Other

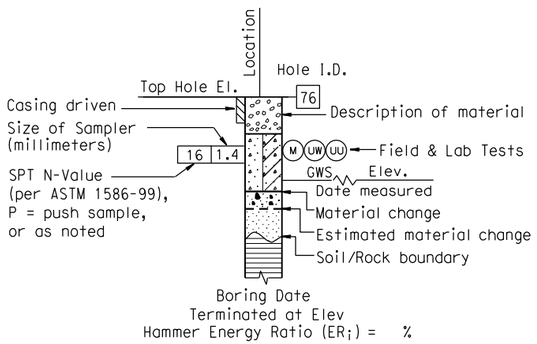
Note: Size in millimeters.

CONSISTENCY OF COHESIVE SOILS

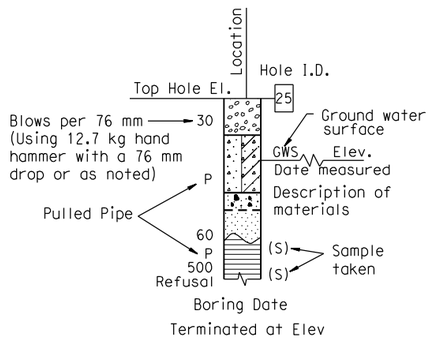
Description	Unconfined Compressive Strength (tsm)	Pocket Penetrometer Measurement (tsm)	Torvane Measurement (tsm)	Field Approximation
Very Soft	< 24	< 24	< 12	Easily penetrated several inches by fist
Soft	24 to 48	24 to 48	12 to 24	Easily penetrated several inches by thumb
Medium Stiff	48 to 96	48 to 96	24 to 48	Penetrated several inches by thumb with moderate effort
Stiff	96 to 192	96 to 192	48 to 96	Readily indented by thumb but penetrated only with great effort
Very Stiff	192 to 383	192 to 383	96 to 192	Readily indented by thumbnail
Hard	> 383	> 383	> 192	Indented by thumbnail with difficulty

PLASTICITY OF FINE-GRAINED SOILS

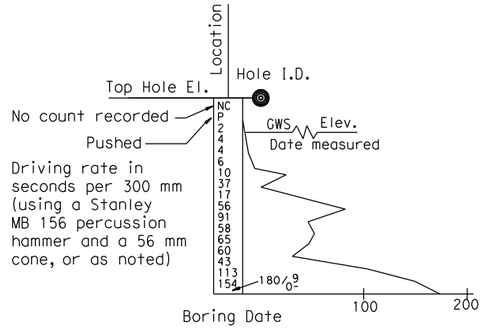
Description	Criteria
Nonplastic	A 3 mm thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.



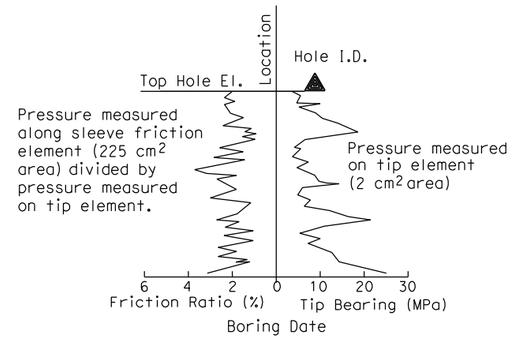
ROTARY BORING



HAND BORING



DYNAMIC CONE PENETRATION BORING



CONE PENETRATION TEST (CPT) SOUNDING

SOIL LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "437R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 2 OF 4
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES: 10/14/08, 3/9/09 | SHEET | OF

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USERNAME => mparcinjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:20:04 PM

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

Caltrans Metric

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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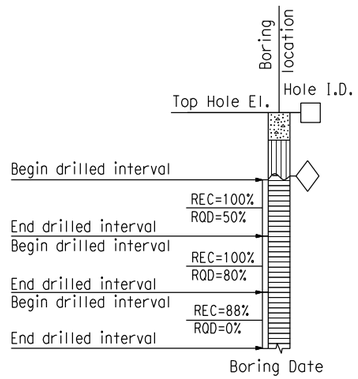
PERCENT CORE RECOVERY (REC) & ROCK QUALITY DESIGNATION (RQD)

$$REC = \frac{\sum \text{Length of the recovered core pieces}}{\text{Total length of core run}} \times 100\%$$

$$RQD = \frac{\sum \text{Length of intact core pieces} \geq 100\ mm}{\text{Total length of core run}} \times 100\%$$



RELATIVE STRENGTH OF INTACT ROCK

Term	Uniaxial Compressive Strength (MPa)
Extremely Strong	> 207
Very Strong	100 - 207
Strong	49 - 100
Medium Strong	25 - 49
Weak	5 - 25
Very Weak	1 - 5
Extremely Weak	< 1

BEDDING SPACING

Description	Thickness / Spacing
Massive	Greater than 3 m
Very thickly bedded	1 m to 3 m
Thickly bedded	300 mm to 1 m
Moderately bedded	100 mm to 300 mm
Thinly bedded	30 mm to 100 mm
Very thinly bedded	10 mm to 30 mm
Laminated	Less than 10 mm

LEGEND OF ROCK MATERIALS

- IGNEOUS ROCK
- SEDIMENTARY ROCK
- METAMORPHIC ROCK

ROCK HARDNESS

Description	Criteria
Extremely Hard	Specimen cannot be scratched with a pocket knife or sharp pick; can only be chipped with repeated heavy hammer blows.
Very Hard	Specimen cannot be scratched with a pocket knife or sharp pick. Breaks with repeated heavy hammer blows.
Hard	Specimen can be scratched with a pocket knife or sharp pick with difficulty (heavy pressure). Heavy hammer blows required to break specimen.
Moderately Hard	Specimen can be scratched with pocket knife or sharp pick with light or moderate pressure. Core breaks with moderate hammer pressure.
Moderately Soft	Specimen can be grooved 5 mm deep with a pocket knife or sharp pick with moderate or heavy pressure. Breaks with light hammer blow or heavy manual pressure.
Soft	Specimen can be grooved or gouged easily by a pocket knife or sharp pick with light pressure, can be scratched with fingernail. Breaks with light to moderate manual pressure.
Very Soft	Specimen can be readily indented, grooved or gouged with fingernail, or carved with a pocket knife. Breaks with light manual pressure.

FRACTURE DENSITY

Description	Observed Fracture Density
Unfractured	No fractures.
Very slightly fractured	Lengths greater than 1 m.
Slightly fractured	Lengths from 300 mm to 1000 mm with few lengths less than 300 mm or greater than 1000 mm.
Moderately fractured	Lengths mostly in 100 mm to 300 mm range with most lengths about 200 mm.
Intensely fractured	Lengths average from 30 mm to 100 mm with scattered fragmented intervals with lengths less than 100 mm.
Very intensely fractured	Mostly chips and fragments with a few scattered short core lengths.

Combination descriptors (such as "Very intensely to intensely fractured") are used where equal distribution of both fracture density characteristics is present over a significant interval or exposure, or where characteristics are "in between" the descriptor definitions. Only two adjacent descriptors may be combined.

WEATHERING DESCRIPTORS FOR INTACT ROCK

Description	Diagnostic features: Chemical Weathering-Discoloration and/or oxidation — Body of Rock	Diagnostic features: Chemical Weathering-Discoloration and/or oxidation — Fracture Surfaces	Diagnostic features: Mechanical Weathering-Grain boundary conditions (disaggregation) primarily for granitics and some coarse-grained sediments	Diagnostic features: Texture and Solutioning — Texture	Diagnostic features: Texture and Solutioning — Solutioning	General Characteristics
Fresh	No discoloration, not oxidized.	No discoloration or oxidation.	No separation, intact (tight).	No change.	No solutioning.	Hammer rings when crystalline rocks are struck.
Slightly Weathered	Discoloration or oxidation is limited to surface of, or short distance from, fractures; some feldspar crystals are dull.	Minor to complete discoloration or oxidation of most surfaces.	No visible separation, intact (tight).	Preserved.	Minor leaching of some soluble minerals may be noted.	Hammer rings when crystalline rocks are struck. Body of rock not weakened.
Moderately Weathered	Discoloration or oxidation extends from fractures usually throughout; Fe-Mg minerals are "rusty," feldspar crystals are "cloudy."	All fracture surfaces are discolored or oxidized.	Partial separation of boundaries visible.	Generally preserved.	Soluble minerals may be mostly leached.	Hammer does not ring when rock is struck. Body of rock is slightly weakened.
Intensely Weathered	Discoloration or oxidation throughout; all feldspars and Fe-Mg minerals are altered to clay to some extent; or chemical alteration produces in-situ disaggregation, see grain boundary conditions.	All fracture surfaces are discolored or oxidized, surfaces friable.	Partial separation, rock is friable; in semiarid conditions granitics are disaggregated.	Texture altered by chemical disintegration (hydration, argillation).	Leaching of soluble minerals may be complete.	Dull sound when struck with hammer, usually can be broken with moderate to heavy manual pressure or by light hammer blow without reference to planes of weakness such as incipient or hairline fractures, or veinlets. Rock is significantly weakened.
Decomposed	Discolored or oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe-Mg minerals are completely altered to clay.		Complete separation of grain boundaries (disaggregated).	Resembles a soil, partial or complete remnant rock structure may be preserved; leaching of soluble minerals usually complete.		Can be granulated by hand. Resistant minerals such as quartz may be present as "stringers" or "dikes."

Combination descriptors (such as "slightly weathered to fresh") are permissible where equal distribution of both weathering characteristics is present over significant intervals or where characteristics present are "in between" the diagnostic feature. However, combination descriptors should not be used where significant, identifiable zones can be delineated. Only two adjacent descriptors may be combined. "Very intensely weathered" is the combination descriptor for "intensely weathered to decomposed."

ROCK LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "437R"
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS				MISCELLANEOUS RETAINING WALLS
NAME:	CHECKED BY: G. CUSTENBORDER	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER	DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 3 OF 4

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

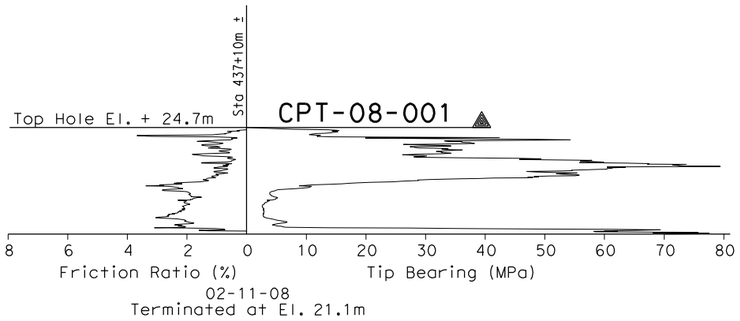
REVISION DATES: 10/14/08, 3/9/09

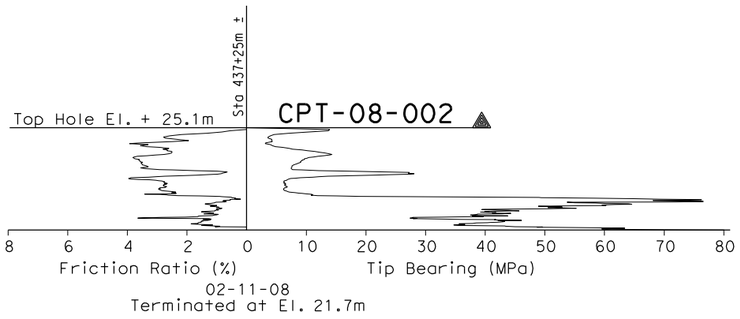
SHEET OF

FILE => MRW03.dgn

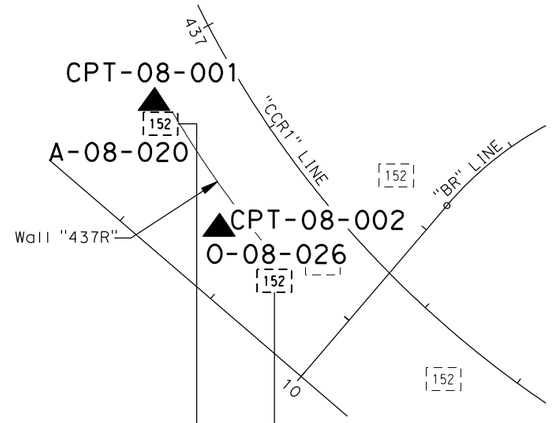
USERNAME => mporonjape DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:20:13 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.

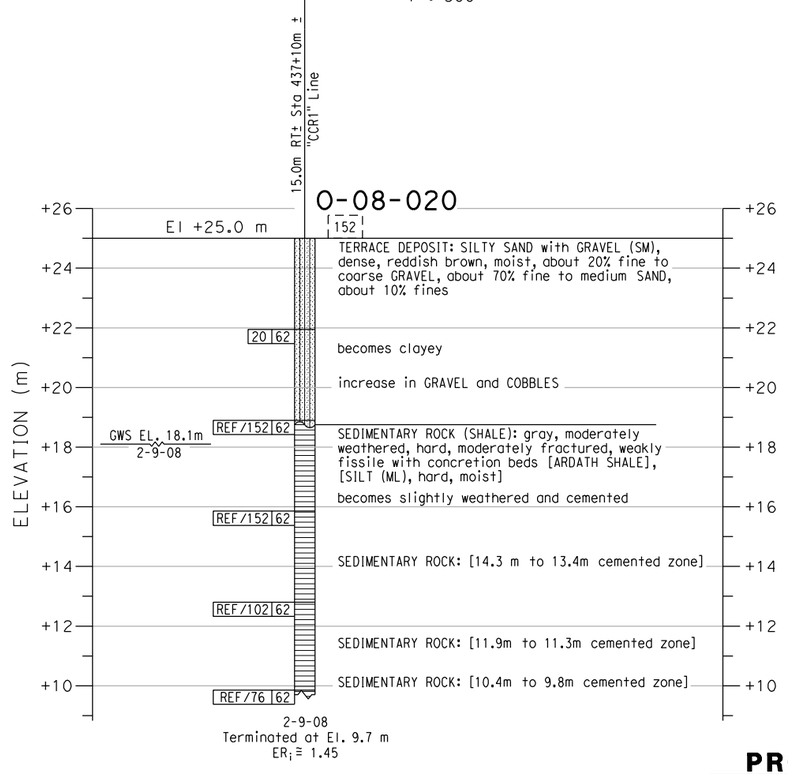


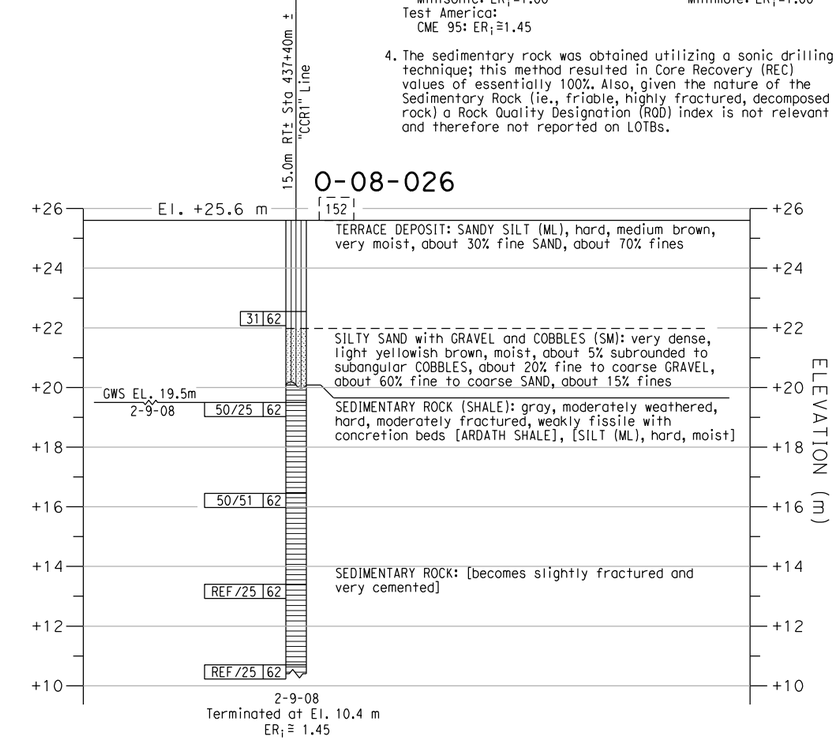


CONE PENETRATION TEST (CPT) SOUNDINGS



PLAN
1 : 500





PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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2. Automatic trip and safety hammer systems consisting of hammer weight of 62.5 kg falling a distance of 762 mm were used to advance the drive samplers in accordance with ASTM D1586.
3. The average hammer energy ratio (ER_i) reflects the percentage efficiency of SPT blowcounts (N-value). The estimated ER_i for the various drilling equipment used was as follows:
   Boart Longyear:
   Longyear 1405: $ER_i \cong 1.45$
   Prosonic Track Mounted: $ER_i \cong 1.00$
   Prosonic 1: $ER_i \cong 1.45$
   Minisonic: $ER_i \cong 1.00$
   Pacific Drilling:
   Unimog: $ER_i \cong 1.27$
   Mole: $ER_i \cong 1.00$
   Minimole: $ER_i \cong 1.00$
   Test America:
   CME 95: $ER_i \cong 1.45$
4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (ROD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "437R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS		DESIGN BRANCH	POST MILES	LOG OF TEST BORINGS SHEET NO. 4 OF 4
NAME:	CHECKED BY: G. CUSTENBORDER	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER	CU 11275 EA 2T0401	KP43.2/PM26.8	

OGS CIVIL LOG OF TEST BORINGS SHEET

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										SHEET	OF
10/14/08	3/9/09										

FILE => MRW04.dgn

USERNAME => mporonjoe DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:20:23 PM

APPENDIX I.15.2

TYPE I WALL 438L LOTBs

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

GROUP SYMBOLS AND NAMES

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

FIELD AND LABORATORY TESTING

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

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SAN DIEGO, CA. 92111

APPARENT DENSITY OF COHESIONLESS SOILS

Description	SPT N_{60} (Blows / 300 mm)
Very loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE

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

PERCENT OR PROPORTION OF SOILS

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

PARTICLE SIZE

Description		Size
Boulder		> 300 mm
Cobble		76 mm to 300 mm
Gravel	Coarse	19 mm to 76 mm
	Fine	No. 4 to 19 mm
Sand	Coarse	No. 10 to No. 4
	Medium	No. 40 to No. 10
	Fine	No. 200 to No. 40

SOIL LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "438L" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 1 OF 4
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401	DISREGARD PRINTS BEARING EARLIER REVISION DATES →	REVISION DATES: 10/14/08, 3/9/09 — SHEET — OF

OGS CIVIL LOG OF TEST BORINGS SHEET

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

FILE => MRW11.dgn

USERNAME => mporonjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:21:14 PM

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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CEMENTATION

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

BOREHOLE IDENTIFICATION

Symbol	Hole Type	Description
Size	A	Auger Boring
Size	R P	Rotary drilled boring Rotary percussion boring (air)
Size	R	Rotary drilled diamond core
Size	HD HA	Hand driven (25 mm soil tube) Hand Auger
●	D	Dynamic Cone Penetration Boring
▲	CPT	Cone Penetration Test (ASTM D 5778-95)
[ ]	O	Other

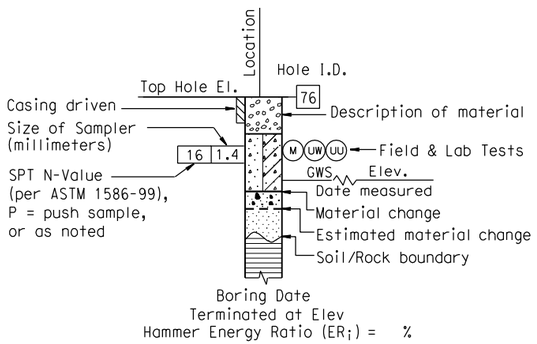
Note: Size in millimeters.

CONSISTENCY OF COHESIVE SOILS

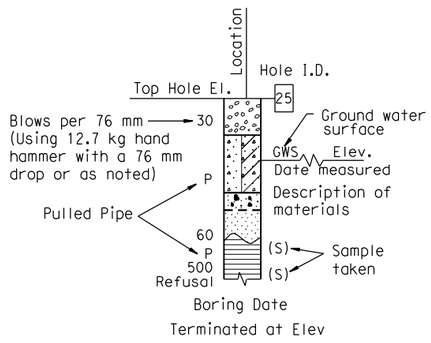
Description	Unconfined Compressive Strength (tsm)	Pocket Penetrometer Measurement (tsm)	Torvane Measurement (tsm)	Field Approximation
Very Soft	< 24	< 24	< 12	Easily penetrated several inches by fist
Soft	24 to 48	24 to 48	12 to 24	Easily penetrated several inches by thumb
Medium Stiff	48 to 96	48 to 96	24 to 48	Penetrated several inches by thumb with moderate effort
Stiff	96 to 192	96 to 192	48 to 96	Readily indented by thumb but penetrated only with great effort
Very Stiff	192 to 383	192 to 383	96 to 192	Readily indented by thumbnail
Hard	> 383	> 383	> 192	Indented by thumbnail with difficulty

PLASTICITY OF FINE-GRAINED SOILS

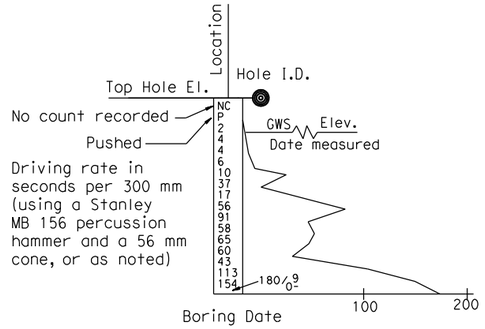
Description	Criteria
Nonplastic	A 3 mm thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.



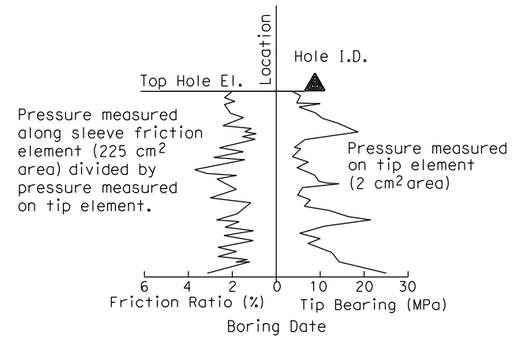
ROTARY BORING



HAND BORING



DYNAMIC CONE PENETRATION BORING



CONE PENETRATION TEST (CPT) SOUNDING

SOIL LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "438L" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 2 OF 4
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES		SHEET	OF
10/14/08	3/9/09		

USERNAME => mparcinjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:21:23 PM

FILE => MRW12.dgn

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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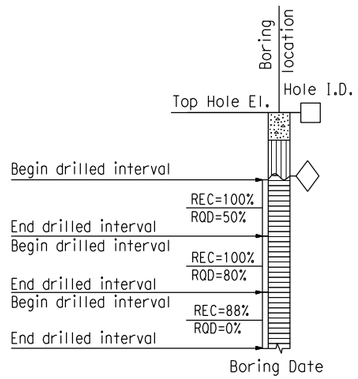
PERCENT CORE RECOVERY (REC) & ROCK QUALITY DESIGNATION (RQD)

$$REC = \frac{\sum \text{Length of the recovered core pieces}}{\text{Total length of core run}} \times 100\%$$

$$RQD = \frac{\sum \text{Length of intact core pieces} \geq 100\ mm}{\text{Total length of core run}} \times 100\%$$



RELATIVE STRENGTH OF INTACT ROCK

Term	Uniaxial Compressive Strength (MPa)
Extremely Strong	> 207
Very Strong	100 - 207
Strong	49 - 100
Medium Strong	25 - 49
Weak	5 - 25
Very Weak	1 - 5
Extremely Weak	< 1

BEDDING SPACING

Description	Thickness / Spacing
Massive	Greater than 3 m
Very thickly bedded	1 m to 3 m
Thickly bedded	300 mm to 1 m
Moderately bedded	100 mm to 300 mm
Thinly bedded	30 mm to 100 mm
Very thinly bedded	10 mm to 30 mm
Laminated	Less than 10 mm

LEGEND OF ROCK MATERIALS

- IGNEOUS ROCK
- SEDIMENTARY ROCK
- METAMORPHIC ROCK

ROCK HARDNESS

Description	Criteria
Extremely Hard	Specimen cannot be scratched with a pocket knife or sharp pick; can only be chipped with repeated heavy hammer blows.
Very Hard	Specimen cannot be scratched with a pocket knife or sharp pick. Breaks with repeated heavy hammer blows.
Hard	Specimen can be scratched with a pocket knife or sharp pick with difficulty (heavy pressure). Heavy hammer blows required to break specimen.
Moderately Hard	Specimen can be scratched with pocket knife or sharp pick with light or moderate pressure. Core breaks with moderate hammer pressure.
Moderately Soft	Specimen can be grooved 5 mm deep with a pocket knife or sharp pick with moderate or heavy pressure. Breaks with light hammer blow or heavy manual pressure.
Soft	Specimen can be grooved or gouged easily by a pocket knife or sharp pick with light pressure, can be scratched with fingernail. Breaks with light to moderate manual pressure.
Very Soft	Specimen can be readily indented, grooved or gouged with fingernail, or carved with a pocket knife. Breaks with light manual pressure.

FRACTURE DENSITY

Description	Observed Fracture Density
Unfractured	No fractures.
Very slightly fractured	Lengths greater than 1 m.
Slightly fractured	Lengths from 300 mm to 1000 mm with few lengths less than 300 mm or greater than 1000 mm.
Moderately fractured	Lengths mostly in 100 mm to 300 mm range with most lengths about 200 mm.
Intensely fractured	Lengths average from 30 mm to 100 mm with scattered fragmented intervals with lengths less than 100 mm.
Very intensely fractured	Mostly chips and fragments with a few scattered short core lengths.

Combination descriptors (such as "Very intensely to intensely fractured") are used where equal distribution of both fracture density characteristics is present over a significant interval or exposure, or where characteristics are "in between" the descriptor definitions. Only two adjacent descriptors may be combined.

WEATHERING DESCRIPTORS FOR INTACT ROCK

Description	Diagnostic features					General Characteristics
	Chemical Weathering-Discoloration and/or oxidation		Mechanical Weathering-Grain boundary conditions (disaggregation) primarily for granitics and some coarse-grained sediments	Texture and Solutioning		
	Body of Rock	Fracture Surfaces		Texture	Solutioning	
Fresh	No discoloration, not oxidized.	No discoloration or oxidation.	No separation, intact (tight).	No change.	No solutioning.	Hammer rings when crystalline rocks are struck.
Slightly Weathered	Discoloration or oxidation is limited to surface of, or short distance from, fractures; some feldspar crystals are dull.	Minor to complete discoloration or oxidation of most surfaces.	No visible separation, intact (tight).	Preserved.	Minor leaching of some soluble minerals may be noted.	Hammer rings when crystalline rocks are struck. Body of rock not weakened.
Moderately Weathered	Discoloration or oxidation extends from fractures usually throughout; Fe-Mg minerals are "rusty," feldspar crystals are "cloudy."	All fracture surfaces are discolored or oxidized.	Partial separation of boundaries visible.	Generally preserved.	Soluble minerals may be mostly leached.	Hammer does not ring when rock is struck. Body of rock is slightly weakened.
Intensely Weathered	Discoloration or oxidation throughout; all feldspars and Fe-Mg minerals are altered to clay to some extent; or chemical alteration produces in-situ disaggregation, see grain boundary conditions.	All fracture surfaces are discolored or oxidized, surfaces friable.	Partial separation, rock is friable; in semiarid conditions granitics are disaggregated.	Texture altered by chemical disintegration (hydration, argillation).	Leaching of soluble minerals may be complete.	Dull sound when struck with hammer, usually can be broken with moderate to heavy manual pressure or by light hammer blow without reference to planes of weakness such as incipient or hairline fractures, or veinlets. Rock is significantly weakened.
Decomposed	Discolored or oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe-Mg minerals are completely altered to clay.		Complete separation of grain boundaries (disaggregated).	Resembles a soil, partial or complete remnant rock structure may be preserved; leaching of soluble minerals usually complete.		Can be granulated by hand. Resistant minerals such as quartz may be present as "stringers" or "dikes."

Combination descriptors (such as "slightly weathered to fresh") are permissible where equal distribution of both weathering characteristics is present over significant intervals or where characteristics present are "in between" the diagnostic feature. However, combination descriptors should not be used where significant, identifiable zones can be delineated. Only two adjacent descriptors may be combined. "Very intensely weathered" is the combination descriptor for "intensely weathered to decomposed."

ROCK LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "438L" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER	DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 3 OF 4
NAME:	CHECKED BY: G. CUSTENBORDER		CU 11275 EA 2T0401	DISREGARD PRINTS BEARING EARLIER REVISION DATES →	REVISION DATES 10/14/08, 3/9/09 — SHEET — OF

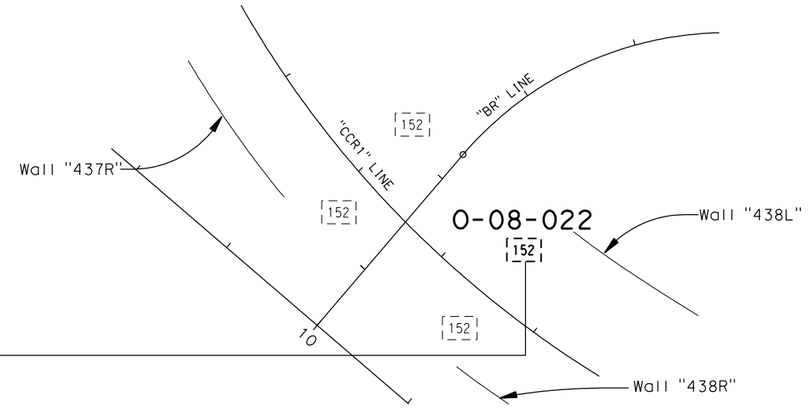
OGS CIVIL LOG OF TEST BORINGS SHEET

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

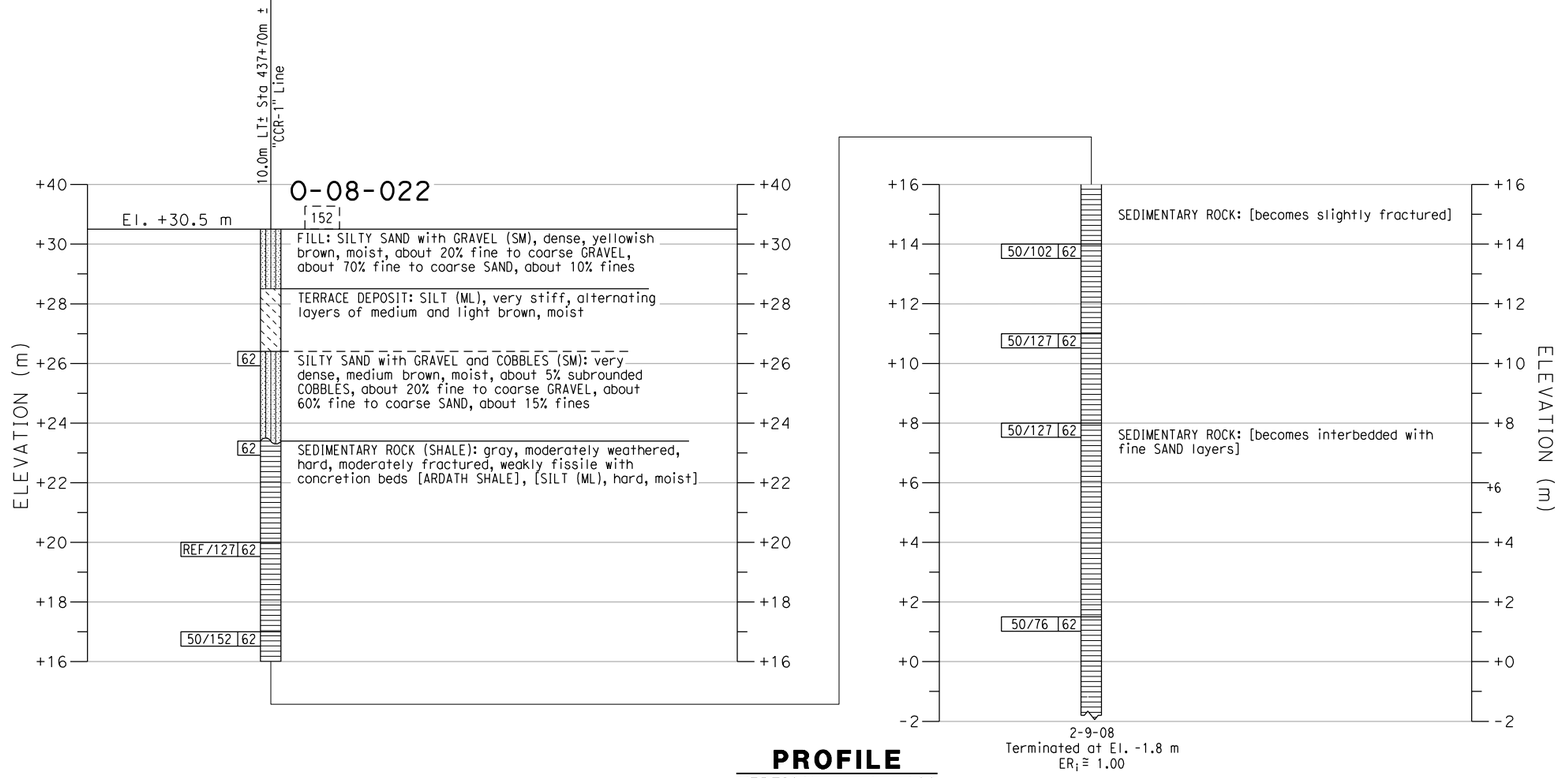
FILE => MRW13.dgn

USERNAME => mporonjae DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:21:32 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
1 : 500



PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.
2. Automatic trip and safety hammer systems consisting of hammer weight of 62.5 kg falling a distance of 762 mm were used to advance the drive samplers in accordance with ASTM D1586.
3. The average hammer energy ratio (ER$_i$) reflects the percentage efficiency of SPT blowcounts (N-value). The estimated ER$_i$ for the various drilling equipment used was as follows:
   Boart Longyear:
   Longyear 1405: ER$_i$≅1.45
   Prosonic Track Mounted: ER$_i$≅1.00
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   Minisonic: ER$_i$≅1.00
   Test America:
   CME 95: ER$_i$≅1.45
   Pacific Drilling:
   Unimog: ER$_i$≅1.27
   Mole: ER$_i$≅1.00
   Minimole: ER$_i$≅1.00
4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (RQD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "438L" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 4 OF 4
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401		

OGS CIVIL LOG OF TEST BORINGS SHEET

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: 10/14/08, 3/9/09

SHEET OF

FILE => MRW14.dgn

USERNAME => mparanjape DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:21:42 PM

APPENDIX I.15.3

TYPE I WALL 438R LOTBs

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

GROUP SYMBOLS AND NAMES

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

FIELD AND LABORATORY TESTING

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

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

APPARENT DENSITY OF COHESIONLESS SOILS

Description	SPT N_{60} (Blows / 300 mm)
Very loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE

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

PERCENT OR PROPORTION OF SOILS

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

PARTICLE SIZE

Description		Size
Boulder		> 300 mm
Cobble		76 mm to 300 mm
Gravel	Coarse	19 mm to 76 mm
	Fine	No. 4 to 19 mm
Sand	Coarse	No. 10 to No. 4
	Medium	No. 40 to No. 10
	Fine	No. 200 to No. 40

SOIL LEGEND

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "438R"
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	MISCELLANEOUS RETAINING WALLS
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401		LOG OF TEST BORINGS SHEET NO. 1 OF 6

OGS CIVIL LOG OF TEST BORINGS SHEET

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: 10/14/08 | 3/9/09 | SHEET | OF

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USERNAME => mpcronjope DATE PLOTTED => 3/13/2009 TIME PLOTTED => 10:07:48 AM

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

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CEMENTATION

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

BOREHOLE IDENTIFICATION

Symbol	Hole Type	Description
Size	A	Auger Boring
Size	R P	Rotary drilled boring Rotary percussion boring (air)
Size	R	Rotary drilled diamond core
Size	HD HA	Hand driven (25 mm soil tube) Hand Auger
●	D	Dynamic Cone Penetration Boring
▲	CPT	Cone Penetration Test (ASTM D 5778-95)
[ ]	O	Other

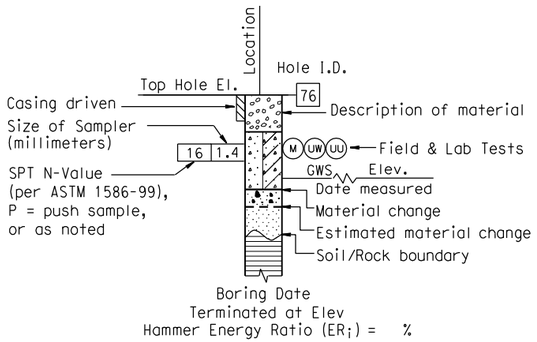
Note: Size in millimeters.

CONSISTENCY OF COHESIVE SOILS

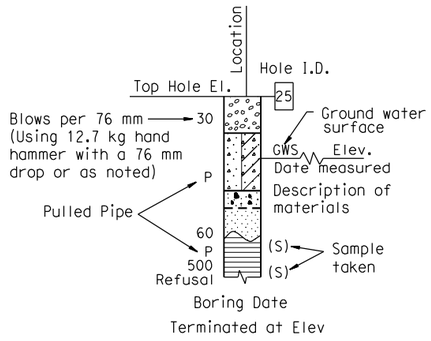
Description	Unconfined Compressive Strength (tsm)	Pocket Penetrometer Measurement (tsm)	Torvane Measurement (tsm)	Field Approximation
Very Soft	< 24	< 24	< 12	Easily penetrated several inches by fist
Soft	24 to 48	24 to 48	12 to 24	Easily penetrated several inches by thumb
Medium Stiff	48 to 96	48 to 96	24 to 48	Penetrated several inches by thumb with moderate effort
Stiff	96 to 192	96 to 192	48 to 96	Readily indented by thumb but penetrated only with great effort
Very Stiff	192 to 383	192 to 383	96 to 192	Readily indented by thumbnail
Hard	> 383	> 383	> 192	Indented by thumbnail with difficulty

PLASTICITY OF FINE-GRAINED SOILS

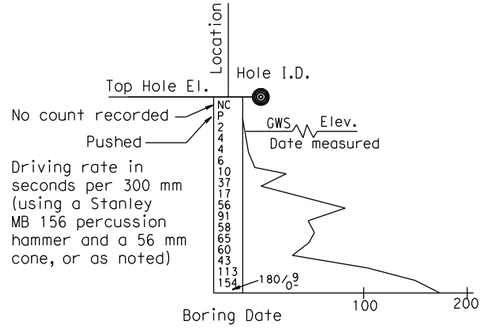
Description	Criteria
Nonplastic	A 3 mm thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.



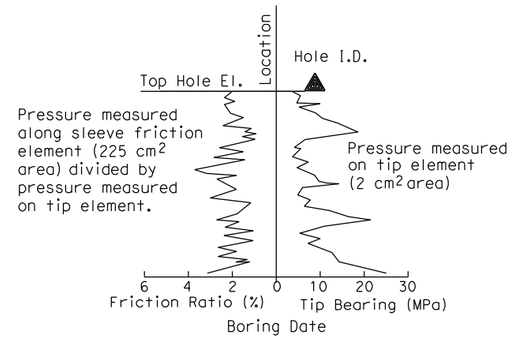
ROTARY BORING



HAND BORING



DYNAMIC CONE PENETRATION BORING



CONE PENETRATION TEST (CPT) SOUNDING

SOIL LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "438R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 2 OF 6
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES		SHEET	OF
10/14/08	3/9/09		

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

Caltrans Metric

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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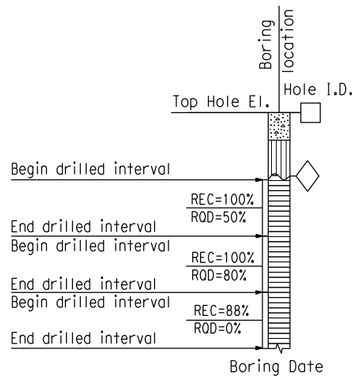
PERCENT CORE RECOVERY (REC) & ROCK QUALITY DESIGNATION (RQD)

$$REC = \frac{\sum \text{Length of the recovered core pieces}}{\text{Total length of core run}} \times 100\%$$

$$RQD = \frac{\sum \text{Length of intact core pieces} \geq 100\ mm}{\text{Total length of core run}} \times 100\%$$



RELATIVE STRENGTH OF INTACT ROCK

Term	Uniaxial Compressive Strength (MPa)
Extremely Strong	> 207
Very Strong	100 - 207
Strong	49 - 100
Medium Strong	25 - 49
Weak	5 - 25
Very Weak	1 - 5
Extremely Weak	< 1

BEDDING SPACING

Description	Thickness / Spacing
Massive	Greater than 3 m
Very thickly bedded	1 m to 3 m
Thickly bedded	300 mm to 1 m
Moderately bedded	100 mm to 300 mm
Thinly bedded	30 mm to 100 mm
Very thinly bedded	10 mm to 30 mm
Laminated	Less than 10 mm

LEGEND OF ROCK MATERIALS

- IGNEOUS ROCK
- SEDIMENTARY ROCK
- METAMORPHIC ROCK

ROCK HARDNESS

Description	Criteria
Extremely Hard	Specimen cannot be scratched with a pocket knife or sharp pick; can only be chipped with repeated heavy hammer blows.
Very Hard	Specimen cannot be scratched with a pocket knife or sharp pick. Breaks with repeated heavy hammer blows.
Hard	Specimen can be scratched with a pocket knife or sharp pick with difficulty (heavy pressure). Heavy hammer blows required to break specimen.
Moderately Hard	Specimen can be scratched with pocket knife or sharp pick with light or moderate pressure. Core breaks with moderate hammer pressure.
Moderately Soft	Specimen can be grooved 5 mm deep with a pocket knife or sharp pick with moderate or heavy pressure. Breaks with light hammer blow or heavy manual pressure.
Soft	Specimen can be grooved or gouged easily by a pocket knife or sharp pick with light pressure, can be scratched with fingernail. Breaks with light to moderate manual pressure.
Very Soft	Specimen can be readily indented, grooved or gouged with fingernail, or carved with a pocket knife. Breaks with light manual pressure.

FRACTURE DENSITY

Description	Observed Fracture Density
Unfractured	No fractures.
Very slightly fractured	Lengths greater than 1 m.
Slightly fractured	Lengths from 300 mm to 1000 mm with few lengths less than 300 mm or greater than 1000 mm.
Moderately fractured	Lengths mostly in 100 mm to 300 mm range with most lengths about 200 mm.
Intensely fractured	Lengths average from 30 mm to 100 mm with scattered fragmented intervals with lengths less than 100 mm.
Very intensely fractured	Mostly chips and fragments with a few scattered short core lengths.

Combination descriptors (such as "Very intensely to intensely fractured") are used where equal distribution of both fracture density characteristics is present over a significant interval or exposure, or where characteristics are "in between" the descriptor definitions. Only two adjacent descriptors may be combined.

WEATHERING DESCRIPTORS FOR INTACT ROCK

Description	Diagnostic features: Chemical Weathering-Discoloration and/or oxidation — Body of Rock	Diagnostic features: Chemical Weathering-Discoloration and/or oxidation — Fracture Surfaces	Diagnostic features: Mechanical Weathering-Grain boundary conditions (disaggregation) primarily for granitics and some coarse-grained sediments	Diagnostic features: Texture and Solutioning — Texture	Diagnostic features: Texture and Solutioning — Solutioning	General Characteristics
Fresh	No discoloration, not oxidized.	No discoloration or oxidation.	No separation, intact (tight).	No change.	No solutioning.	Hammer rings when crystalline rocks are struck.
Slightly Weathered	Discoloration or oxidation is limited to surface of, or short distance from, fractures; some feldspar crystals are dull.	Minor to complete discoloration or oxidation of most surfaces.	No visible separation, intact (tight).	Preserved.	Minor leaching of some soluble minerals may be noted.	Hammer rings when crystalline rocks are struck. Body of rock not weakened.
Moderately Weathered	Discoloration or oxidation extends from fractures usually throughout; Fe-Mg minerals are "rusty," feldspar crystals are "cloudy."	All fracture surfaces are discolored or oxidized.	Partial separation of boundaries visible.	Generally preserved.	Soluble minerals may be mostly leached.	Hammer does not ring when rock is struck. Body of rock is slightly weakened.
Intensely Weathered	Discoloration or oxidation throughout; all feldspars and Fe-Mg minerals are altered to clay to some extent; or chemical alteration produces in-situ disaggregation, see grain boundary conditions.	All fracture surfaces are discolored or oxidized, surfaces friable.	Partial separation, rock is friable; in semiarid conditions granitics are disaggregated.	Texture altered by chemical disintegration (hydration, argillation).	Leaching of soluble minerals may be complete.	Dull sound when struck with hammer, usually can be broken with moderate to heavy manual pressure or by light hammer blow without reference to planes of weakness such as incipient or hairline fractures, or veinlets. Rock is significantly weakened.
Decomposed	Discolored or oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe-Mg minerals are completely altered to clay.		Complete separation of grain boundaries (disaggregated).	Resembles a soil, partial or complete remnant rock structure may be preserved; leaching of soluble minerals usually complete.		Can be granulated by hand. Resistant minerals such as quartz may be present as "stringers" or "dikes."

Combination descriptors (such as "slightly weathered to fresh") are permissible where equal distribution of both weathering characteristics is present over significant intervals or where characteristics present are "in between" the diagnostic feature. However, combination descriptors should not be used where significant, identifiable zones can be delineated. Only two adjacent descriptors may be combined. "Very intensely weathered" is the combination descriptor for "intensely weathered to decomposed."

ROCK LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "438R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 3 OF 6
NAME:	CHECKED BY: G. CUSTENBORDER	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER			

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES: 10/14/08, 3/9/09

SHEET OF

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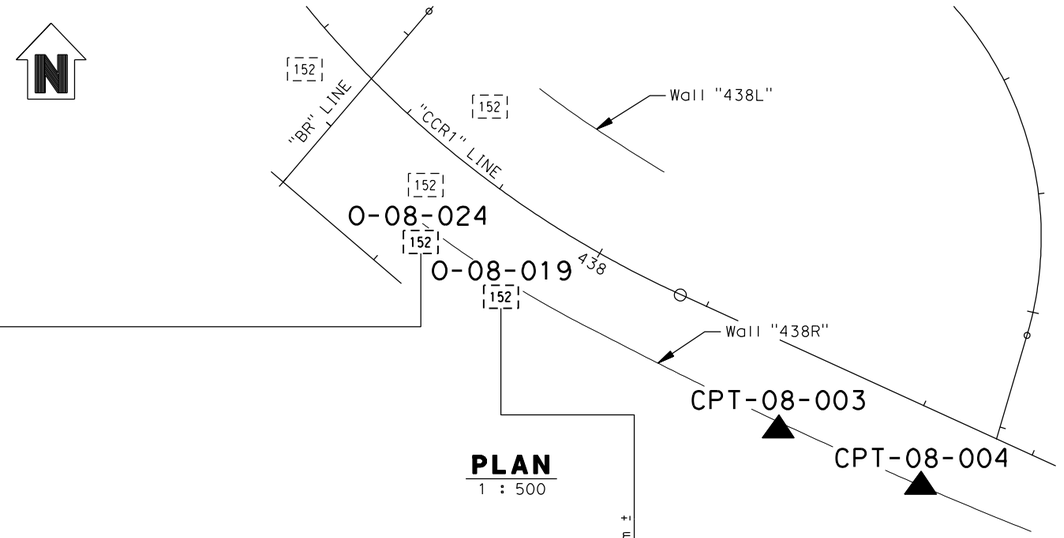
Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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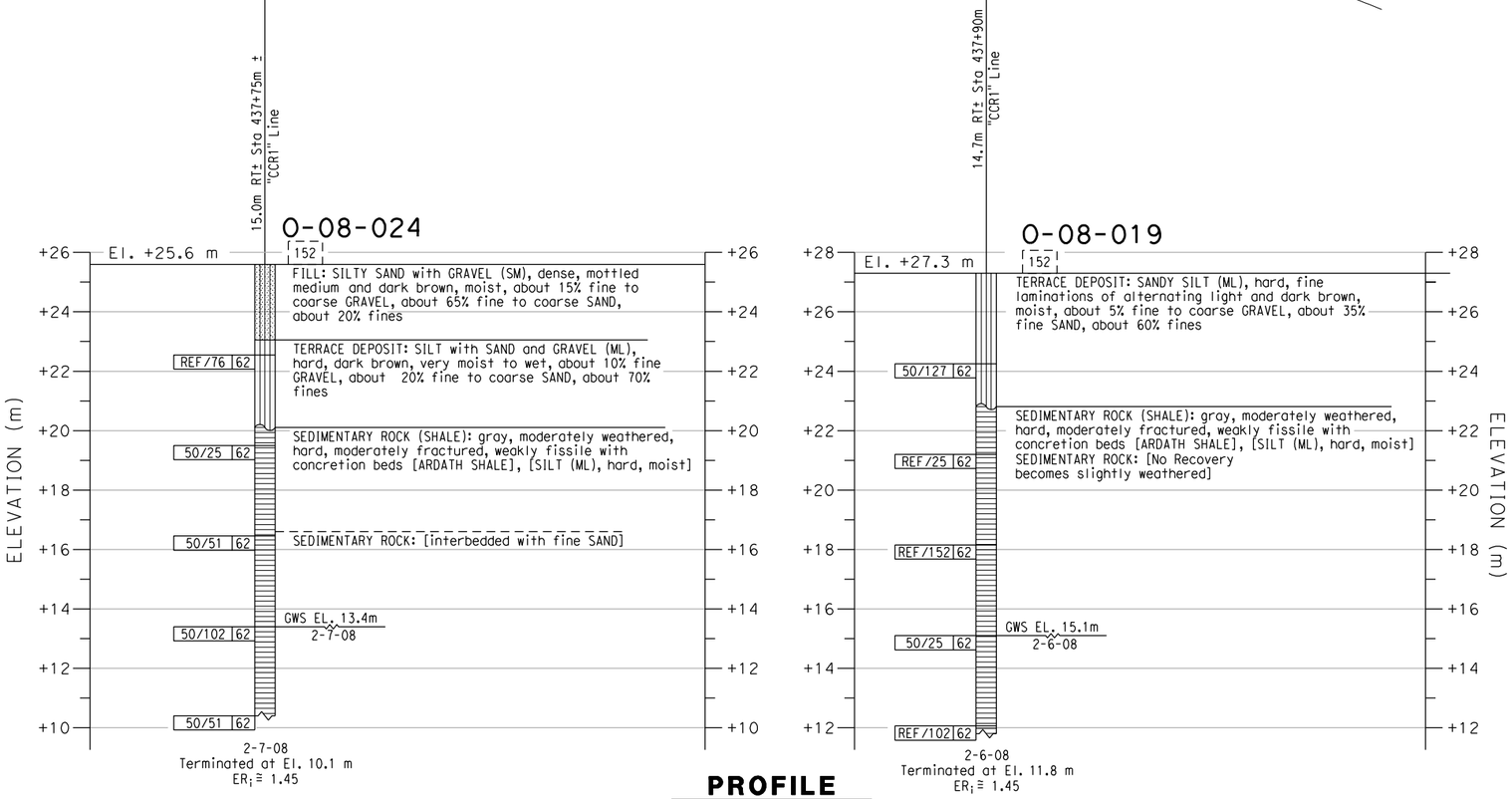
SAN DIEGO, CA. 92111

NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.
2. Automatic trip and safety hammer systems consisting of hammer weight of 62.5 kg falling a distance of 762 mm were used to advance the drive samplers in accordance with ASTM D1586.
3. The average hammer energy ratio (ER_i) reflects the percentage efficiency of SPT blowcounts (N-value). The estimated ER_i for the various drilling equipment used was as follows:
   Boart Longyear:
   Longyear 1405: $ER_i \cong 1.45$
   Prosonic Track Mounted: $ER_i \cong 1.00$
   Prosonic 1: $ER_i \cong 1.45$
   Minisonic: $ER_i \cong 1.00$
   Test America:
   CME 95: $ER_i \cong 1.45$
   Pacific Drilling:
   Unimog: $ER_i \cong 1.27$
   Mole: $ER_i \cong 1.00$
   Minimole: $ER_i \cong 1.00$
4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (ROD) index is not relevant and therefore not reported on LOTBs.



PROFILE
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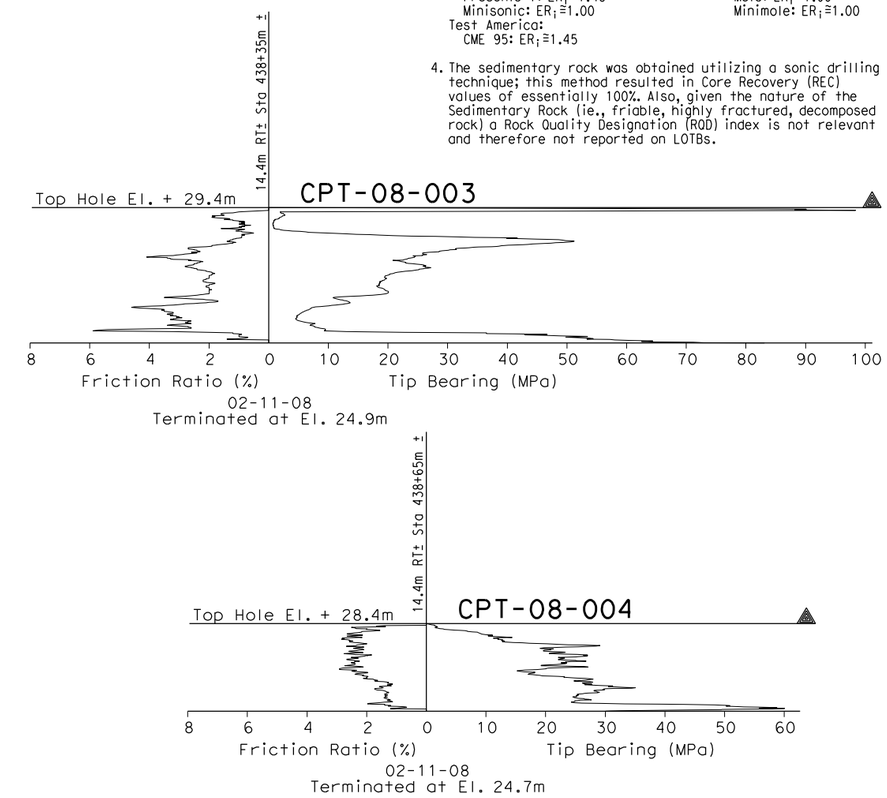
HORIZONTAL 1 : 500



CONE PENETRATION TEST (CPT) SOUNDINGS

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "438R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 4 OF 6
NAME:	CHECKED BY: G. CUSTENBORDER	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER			

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES										SHEET	OF
10/14/08	3/9/09										

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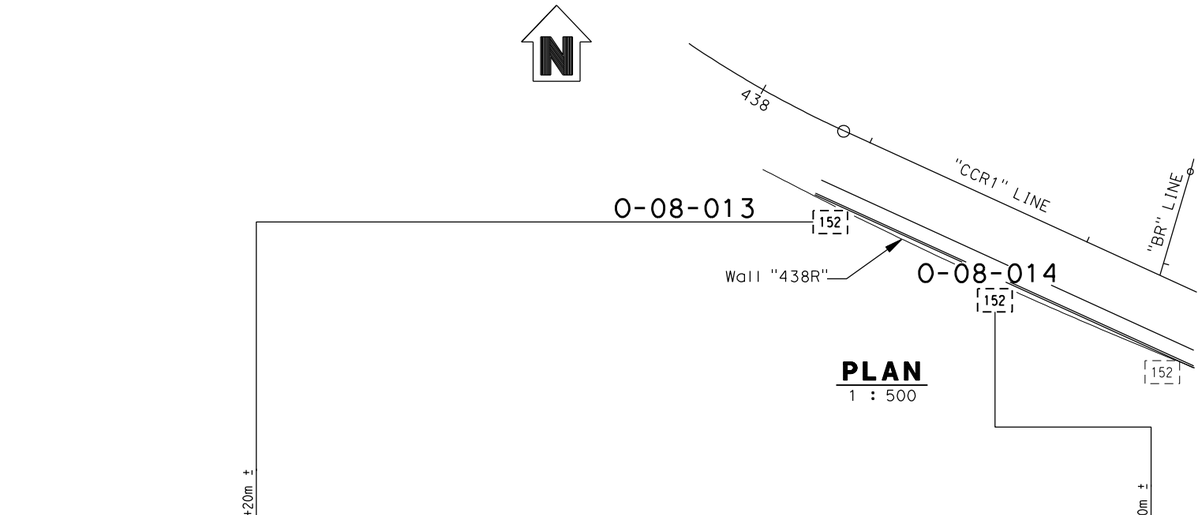

PLAN
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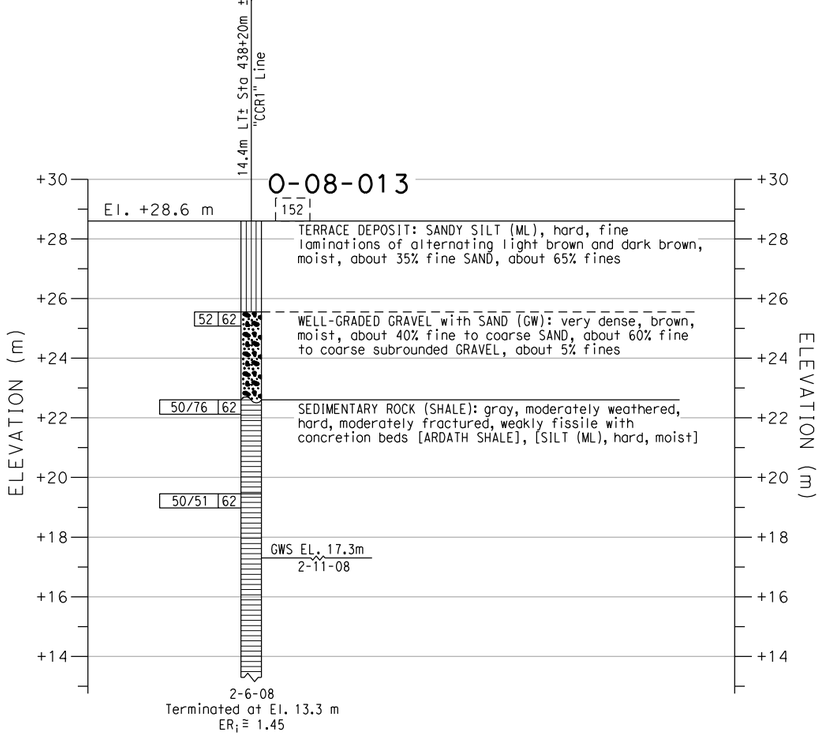

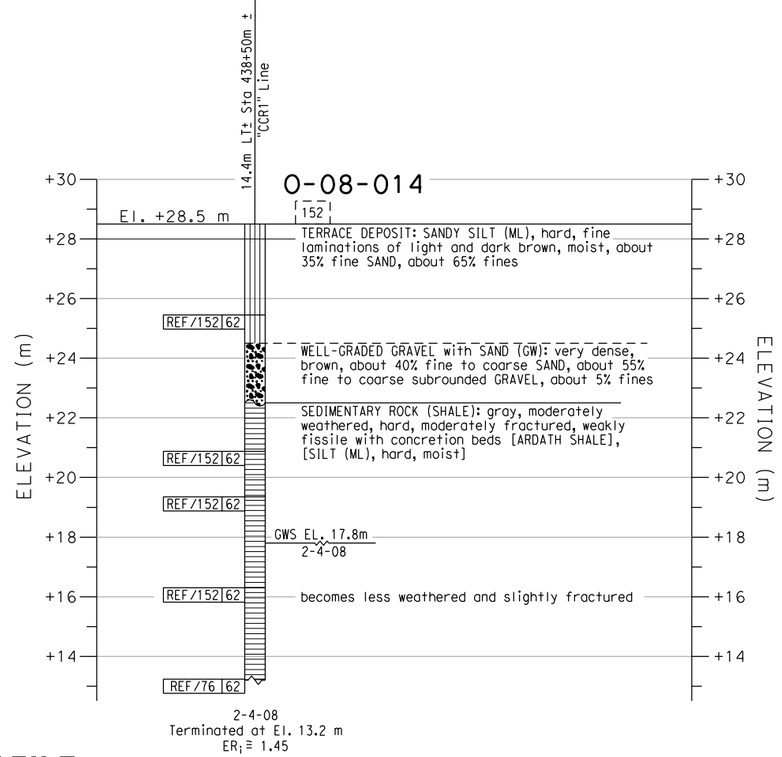

PROFILE
VERTICAL
HORIZONTAL

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.

2. Automatic trip and safety hammer systems consisting of hammer weight of 62.5 kg falling a distance of 762 mm were used to advance the drive samplers in accordance with ASTM D1586.

3. The average hammer energy ratio (ER$_i$) reflects the percentage efficiency of SPT blowcounts (N-value). The estimated ER$_i$ for the various drilling equipment used was as follows:
   Boart Longyear:
   Longyear 1405: ER$_i$ ≅ 1.45
   Prosonic Track Mounted: ER$_i$ ≅ 1.00
   Prosonic 1: ER$_i$ ≅ 1.45
   Minisonic: ER$_i$ ≅ 1.00
   Test America:
   CME 95: ER$_i$ ≅ 1.45
   Pacific Drilling:
   Unimog: ER$_i$ ≅ 1.27
   Mole: ER$_i$ ≅ 1.00
   Minimole: ER$_i$ ≅ 1.00

4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (RQD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES		GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "438R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER			DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 5 OF 6
NAME:	CHECKED BY: G. CUSTENBORDER						

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

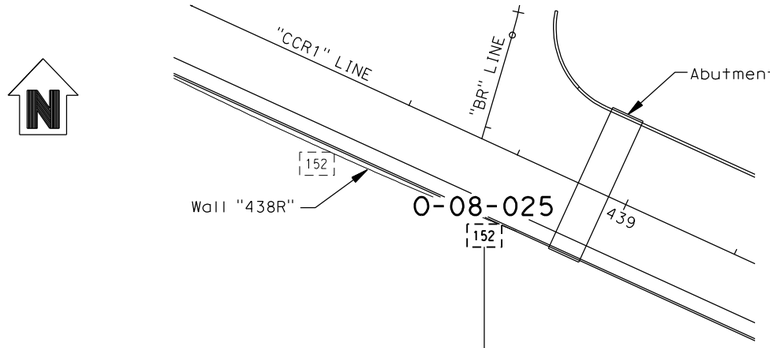
REVISION DATES: 10/14/08, 3/9/09

SHEET OF

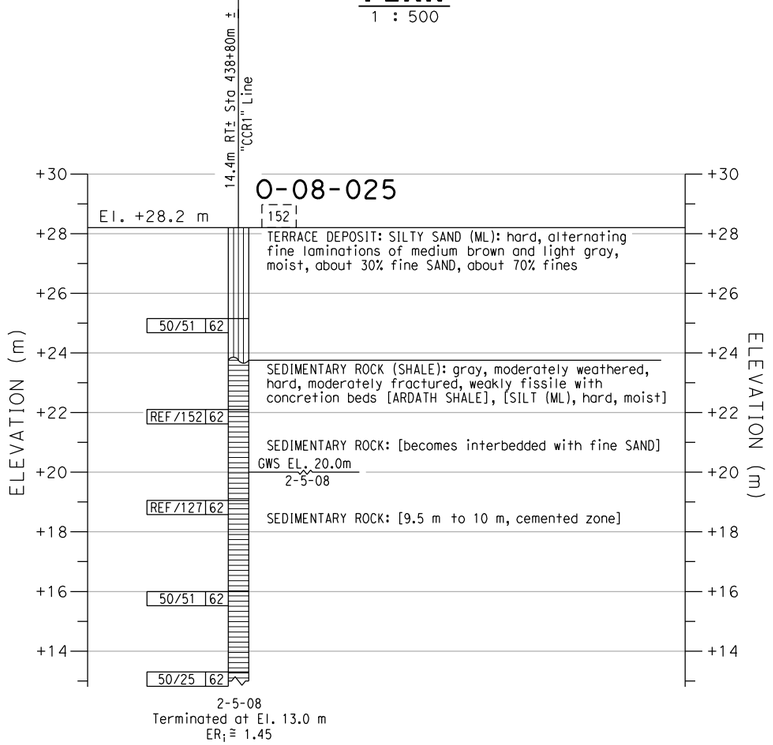
USERNAME => mporonjape DATE PLOTTED => 3/13/2009 TIME PLOTTED => 10:08:18 AM

FILE => MRW09.dgn

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
1 : 500



PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

NOTES:
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   Test America:
   CME 95: ER$_i$ ≅ 1.45
   Pacific Drilling:
   Unimog: ER$_i$ ≅ 1.27
   Mole: ER$_i$ ≅ 1.00
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DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "438R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 6 OF 6
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES: 10/14/08

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FILE => MRW10.dgn

USERNAME => mporcon|ope DATE PLOTTED => 3/13/2009 TIME PLOTTED => 10:08:24 AM

APPENDIX I.15.4

TYPE I WALL 443R LOTBs

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

GROUP SYMBOLS AND NAMES

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

FIELD AND LABORATORY TESTING

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

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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APPARENT DENSITY OF COHESIONLESS SOILS

Description	SPT N_{60} (Blows / 300 mm)
Very loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE

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

PERCENT OR PROPORTION OF SOILS

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

PARTICLE SIZE

Description		Size
Boulder		> 300 mm
Cobble		76 mm to 300 mm
Gravel	Coarse	19 mm to 76 mm
	Fine	No. 4 to 19 mm
Sand	Coarse	No. 10 to No. 4
	Medium	No. 40 to No. 10
	Fine	No. 200 to No. 40

SOIL LEGEND

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "443R"
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	MISCELLANEOUS RETAINING WALLS
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401		LOG OF TEST BORINGS SHEET NO. 1 OF 5

OGS CIVIL LOG OF TEST BORINGS SHEET

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: 10/14/08 | 3/9/09 | SHEET | OF

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USERNAME => mpcronjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:26:26 PM

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

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CEMENTATION

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

BOREHOLE IDENTIFICATION

Symbol	Hole Type	Description
Size	A	Auger Boring
Size	R P	Rotary drilled boring Rotary percussion boring (air)
Size	R	Rotary drilled diamond core
Size	HD HA	Hand driven (25 mm soil tube) Hand Auger
●	D	Dynamic Cone Penetration Boring
▲	CPT	Cone Penetration Test (ASTM D 5778-95)
[ ]	O	Other

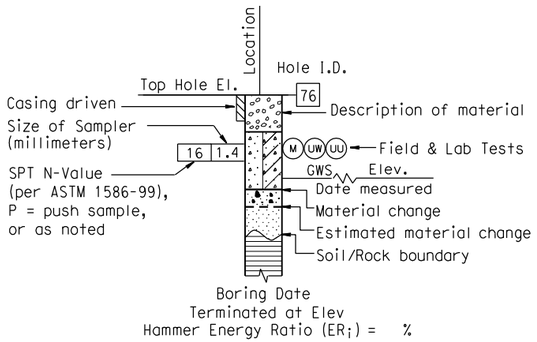
Note: Size in millimeters.

CONSISTENCY OF COHESIVE SOILS

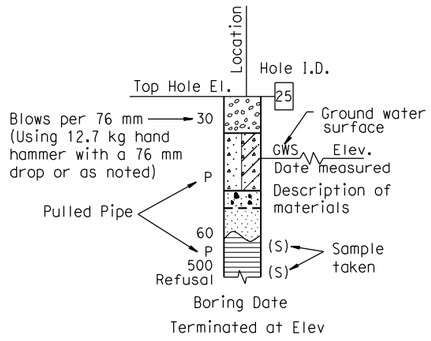
Description	Unconfined Compressive Strength (tsm)	Pocket Penetrometer Measurement (tsm)	Torvane Measurement (tsm)	Field Approximation
Very Soft	< 24	< 24	< 12	Easily penetrated several inches by fist
Soft	24 to 48	24 to 48	12 to 24	Easily penetrated several inches by thumb
Medium Stiff	48 to 96	48 to 96	24 to 48	Penetrated several inches by thumb with moderate effort
Stiff	96 to 192	96 to 192	48 to 96	Readily indented by thumb but penetrated only with great effort
Very Stiff	192 to 383	192 to 383	96 to 192	Readily indented by thumbnail
Hard	> 383	> 383	> 192	Indented by thumbnail with difficulty

PLASTICITY OF FINE-GRAINED SOILS

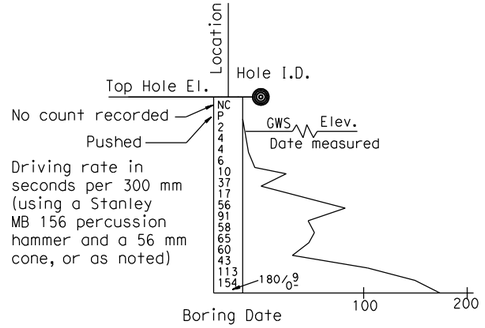
Description	Criteria
Nonplastic	A 3 mm thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.



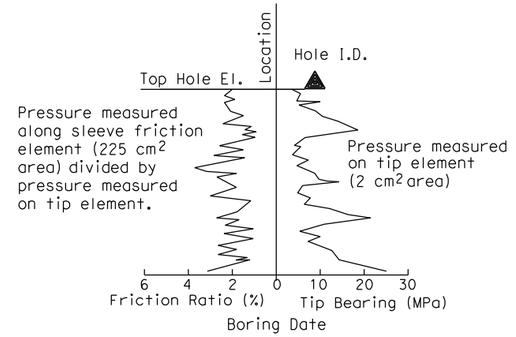
ROTARY BORING



HAND BORING



DYNAMIC CONE PENETRATION BORING



CONE PENETRATION TEST (CPT) SOUNDING

SOIL LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "443R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 2 OF 5
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

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REVISION DATES									SHEET	OF
10/14/08	3/9/09									

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

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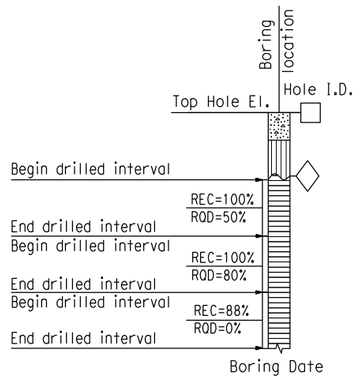
PERCENT CORE RECOVERY (REC) & ROCK QUALITY DESIGNATION (RQD)

$$REC = \frac{\sum \text{Length of the recovered core pieces}}{\text{Total length of core run}} \times 100\%$$

$$RQD = \frac{\sum \text{Length of intact core pieces} \geq 100\ mm}{\text{Total length of core run}} \times 100\%$$



RELATIVE STRENGTH OF INTACT ROCK

Term	Uniaxial Compressive Strength (MPa)
Extremely Strong	> 207
Very Strong	100 - 207
Strong	49 - 100
Medium Strong	25 - 49
Weak	5 - 25
Very Weak	1 - 5
Extremely Weak	< 1

BEDDING SPACING

Description	Thickness / Spacing
Massive	Greater than 3 m
Very thickly bedded	1 m to 3 m
Thickly bedded	300 mm to 1 m
Moderately bedded	100 mm to 300 mm
Thinly bedded	30 mm to 100 mm
Very thinly bedded	10 mm to 30 mm
Laminated	Less than 10 mm

LEGEND OF ROCK MATERIALS

- IGNEOUS ROCK
- SEDIMENTARY ROCK
- METAMORPHIC ROCK

ROCK HARDNESS

Description	Criteria
Extremely Hard	Specimen cannot be scratched with a pocket knife or sharp pick; can only be chipped with repeated heavy hammer blows.
Very Hard	Specimen cannot be scratched with a pocket knife or sharp pick. Breaks with repeated heavy hammer blows.
Hard	Specimen can be scratched with a pocket knife or sharp pick with difficulty (heavy pressure). Heavy hammer blows required to break specimen.
Moderately Hard	Specimen can be scratched with pocket knife or sharp pick with light or moderate pressure. Core breaks with moderate hammer pressure.
Moderately Soft	Specimen can be grooved 5 mm deep with a pocket knife or sharp pick with moderate or heavy pressure. Breaks with light hammer blow or heavy manual pressure.
Soft	Specimen can be grooved or gouged easily by a pocket knife or sharp pick with light pressure, can be scratched with fingernail. Breaks with light to moderate manual pressure.
Very Soft	Specimen can be readily indented, grooved or gouged with fingernail, or carved with a pocket knife. Breaks with light manual pressure.

FRACTURE DENSITY

Description	Observed Fracture Density
Unfractured	No fractures.
Very slightly fractured	Lengths greater than 1 m.
Slightly fractured	Lengths from 300 mm to 1000 mm with few lengths less than 300 mm or greater than 1000 mm.
Moderately fractured	Lengths mostly in 100 mm to 300 mm range with most lengths about 200 mm.
Intensely fractured	Lengths average from 30 mm to 100 mm with scattered fragmented intervals with lengths less than 100 mm.
Very intensely fractured	Mostly chips and fragments with a few scattered short core lengths.

Combination descriptors (such as "Very intensely to intensely fractured") are used where equal distribution of both fracture density characteristics is present over a significant interval or exposure, or where characteristics are "in between" the descriptor definitions. Only two adjacent descriptors may be combined.

WEATHERING DESCRIPTORS FOR INTACT ROCK

Description	Diagnostic features: Chemical Weathering-Discoloration and/or oxidation — Body of Rock	Diagnostic features: Chemical Weathering-Discoloration and/or oxidation — Fracture Surfaces	Diagnostic features: Mechanical Weathering-Grain boundary conditions (disaggregation) primarily for granitics and some coarse-grained sediments	Diagnostic features: Texture and Solutioning — Texture	Diagnostic features: Texture and Solutioning — Solutioning	General Characteristics
Fresh	No discoloration, not oxidized.	No discoloration or oxidation.	No separation, intact (tight).	No change.	No solutioning.	Hammer rings when crystalline rocks are struck.
Slightly Weathered	Discoloration or oxidation is limited to surface of, or short distance from, fractures; some feldspar crystals are dull.	Minor to complete discoloration or oxidation of most surfaces.	No visible separation, intact (tight).	Preserved.	Minor leaching of some soluble minerals may be noted.	Hammer rings when crystalline rocks are struck. Body of rock not weakened.
Moderately Weathered	Discoloration or oxidation extends from fractures usually throughout; Fe-Mg minerals are "rusty," feldspar crystals are "cloudy."	All fracture surfaces are discolored or oxidized.	Partial separation of boundaries visible.	Generally preserved.	Soluble minerals may be mostly leached.	Hammer does not ring when rock is struck. Body of rock is slightly weakened.
Intensely Weathered	Discoloration or oxidation throughout; all feldspars and Fe-Mg minerals are altered to clay to some extent; or chemical alteration produces in-situ disaggregation, see grain boundary conditions.	All fracture surfaces are discolored or oxidized, surfaces friable.	Partial separation, rock is friable; in semiarid conditions granitics are disaggregated.	Texture altered by chemical disintegration (hydration, argillation).	Leaching of soluble minerals may be complete.	Dull sound when struck with hammer, usually can be broken with moderate to heavy manual pressure or by light hammer blow without reference to planes of weakness such as incipient or hairline fractures, or veinlets. Rock is significantly weakened.
Decomposed	Discolored or oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe-Mg minerals are completely altered to clay.		Complete separation of grain boundaries (disaggregated).	Resembles a soil, partial or complete remnant rock structure may be preserved; leaching of soluble minerals usually complete.		Can be granulated by hand. Resistant minerals such as quartz may be present as "stringers" or "dikes."

Combination descriptors (such as "slightly weathered to fresh") are permissible where equal distribution of both weathering characteristics is present over significant intervals or where characteristics present are "in between" the diagnostic feature. However, combination descriptors should not be used where significant, identifiable zones can be delineated. Only two adjacent descriptors may be combined. "Very intensely weathered" is the combination descriptor for "intensely weathered to decomposed."

ROCK LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "443R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS		DESIGN BRANCH	POST MILES	LOG OF TEST BORINGS SHEET NO. 3 OF 5
NAME:	CHECKED BY: G. CUSTENBORDER	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		KP43.2/PM26.8	

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES: 10/14/08, 3/9/09

SHEET OF

FILE => MRW17.dgn

USERNAME => mporonjae DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:26:44 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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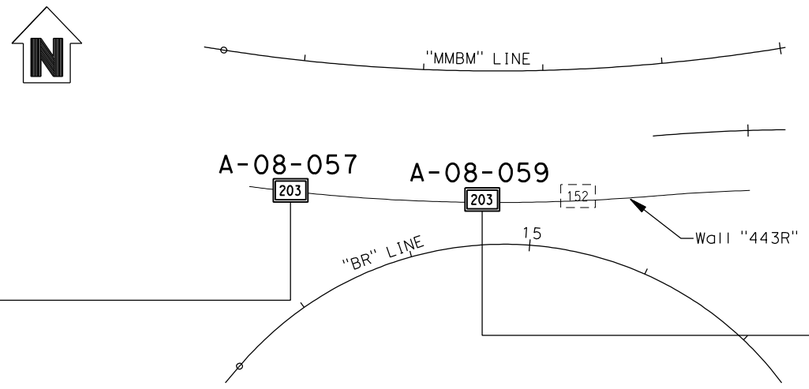

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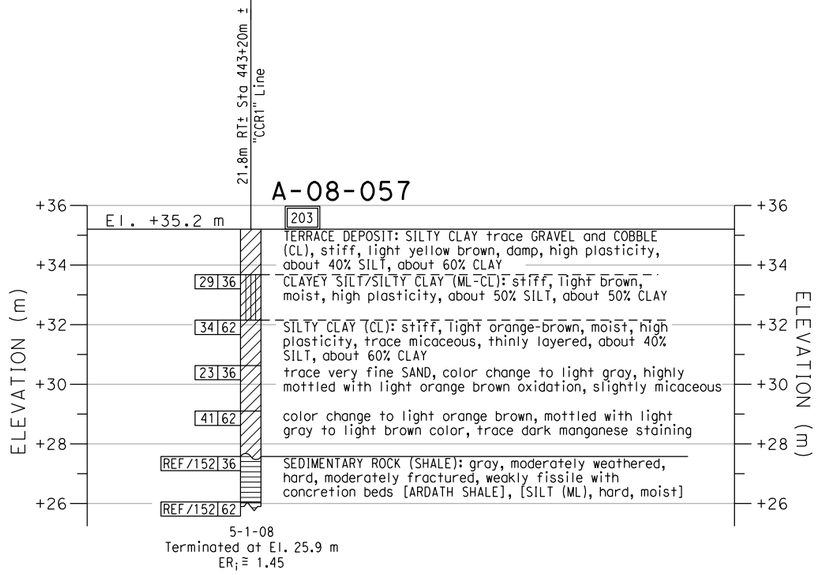

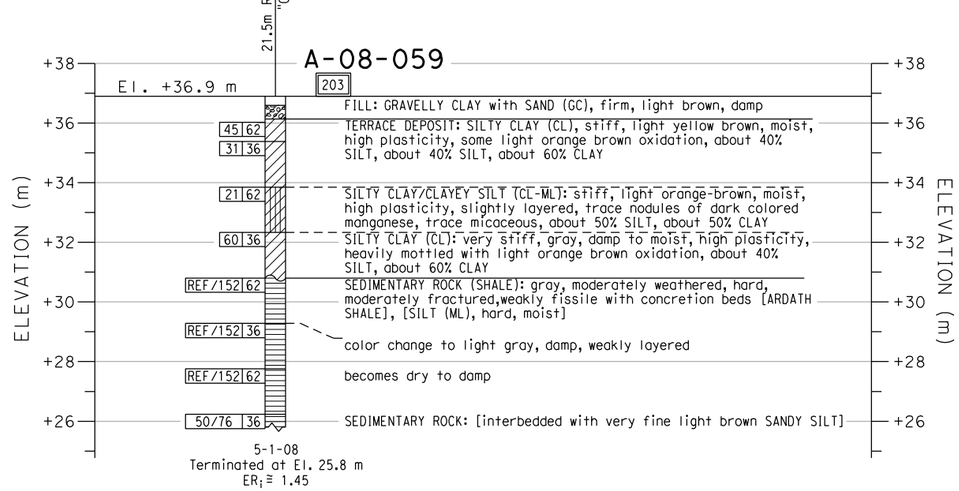

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

NOTES:
1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.
2. Automatic trip and safety hammer systems consisting of hammer weight of 62.5 kg falling a distance of 762 mm were used to advance the drive samplers in accordance with ASTM D1586.
3. The average hammer energy ratio (ER$_i$) reflects the percentage efficiency of SPT blowcounts (N-value). The estimated ER$_i$ for the various drilling equipment used was as follows:
   Boart Longyear:
   Longyear 1405: ER$_i$ ≅ 1.45
   Prosonic Track Mounted: ER$_i$ ≅ 1.00
   Prosonic 1: ER$_i$ ≅ 1.45
   Minisonic: ER$_i$ ≅ 1.00
   Test America:
   CME 95: ER$_i$ ≅ 1.45
   Pacific Drilling:
   Unimog: ER$_i$ ≅ 1.27
   Mole: ER$_i$ ≅ 1.00
   Minimole: ER$_i$ ≅ 1.00
4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (RQD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "443R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 4 OF 5
NAME:	CHECKED BY: G. CUSTENBORDER	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER	CU 11275 EA 2T0401	DISREGARD PRINTS BEARING EARLIER REVISION DATES →	REVISION DATES: 10/14/08, 3/9/09; SHEET OF

OGS CIVIL LOG OF TEST BORINGS SHEET

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

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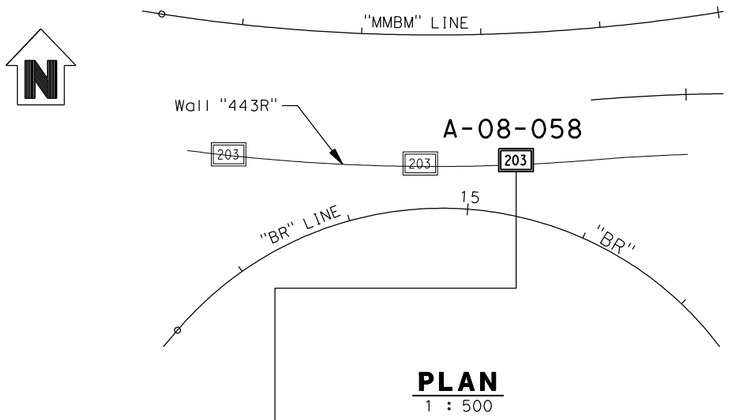
Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
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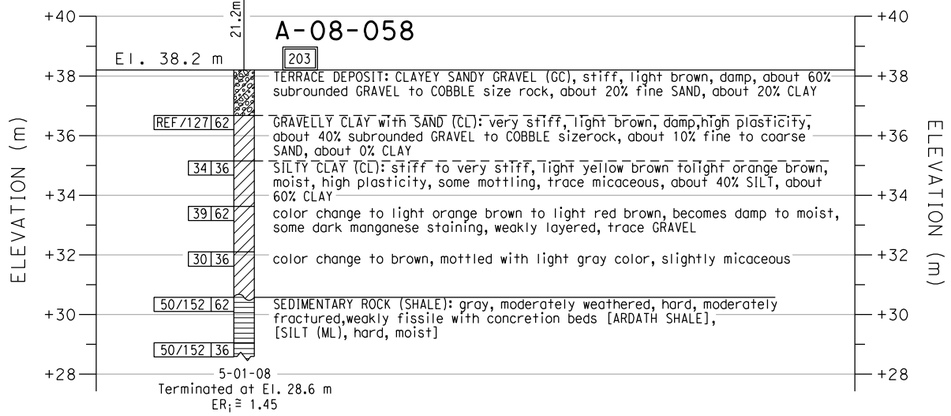

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SAN DIEGO, CA. 92111

NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.
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   Minisonic: ER$_i$≅1.00
   Test America:
   CME 95: ER$_i$≅1.45
   Pacific Drilling:
   Unimog: ER$_i$≅1.27
   Mole: ER$_i$≅1.00
   Minimole: ER$_i$≅1.00
4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (RQD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "443R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 5 OF 5
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401		

OGS CIVIL LOG OF TEST BORINGS SHEET

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										SHEET	OF
10/14/08	3/9/09										

USERNAME => mporan/jpe DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:27:01 PM

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APPENDIX I.15.5

CRIB WALL 445L LOTBs

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

GROUP SYMBOLS AND NAMES

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

FIELD AND LABORATORY TESTING

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

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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APPARENT DENSITY OF COHESIONLESS SOILS

Description	SPT N_{60} (Blows / 300 mm)
Very loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE

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

PERCENT OR PROPORTION OF SOILS

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

PARTICLE SIZE

Description		Size
Boulder		> 300 mm
Cobble		76 mm to 300 mm
Gravel	Coarse	19 mm to 76 mm
	Fine	No. 4 to 19 mm
Sand	Coarse	No. 10 to No. 4
	Medium	No. 40 to No. 10
	Fine	No. 200 to No. 40

SOIL LEGEND

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "445L" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 1 OF 5
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401	DISREGARD PRINTS BEARING EARLIER REVISION DATES →	REVISION DATES: 10/14/08, 3/9/09 — SHEET — OF

OGS CIVIL LOG OF TEST BORINGS SHEET

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

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

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CEMENTATION

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

BOREHOLE IDENTIFICATION

Symbol	Hole Type	Description
Size	A	Auger Boring
Size	R P	Rotary drilled boring Rotary percussion boring (air)
Size	R	Rotary drilled diamond core
Size	HD HA	Hand driven (25 mm soil tube) Hand Auger
●	D	Dynamic Cone Penetration Boring
▲	CPT	Cone Penetration Test (ASTM D 5778-95)
[ ]	O	Other

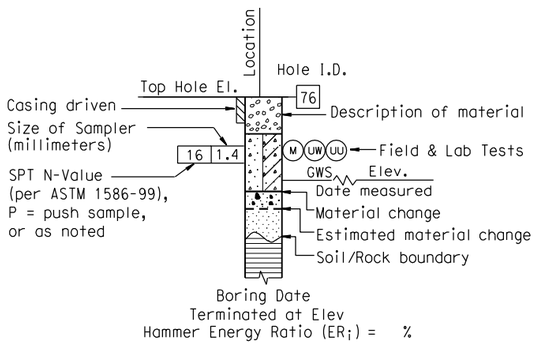
Note: Size in millimeters.

CONSISTENCY OF COHESIVE SOILS

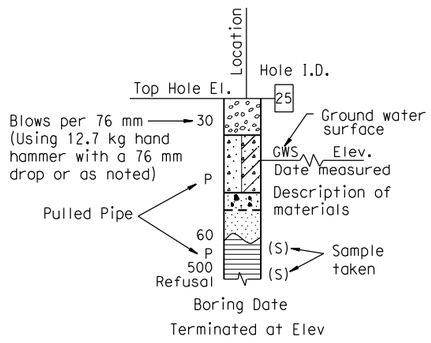
Description	Unconfined Compressive Strength (tsm)	Pocket Penetrometer Measurement (tsm)	Torvane Measurement (tsm)	Field Approximation
Very Soft	< 24	< 24	< 12	Easily penetrated several inches by fist
Soft	24 to 48	24 to 48	12 to 24	Easily penetrated several inches by thumb
Medium Stiff	48 to 96	48 to 96	24 to 48	Penetrated several inches by thumb with moderate effort
Stiff	96 to 192	96 to 192	48 to 96	Readily indented by thumb but penetrated only with great effort
Very Stiff	192 to 383	192 to 383	96 to 192	Readily indented by thumbnail
Hard	> 383	> 383	> 192	Indented by thumbnail with difficulty

PLASTICITY OF FINE-GRAINED SOILS

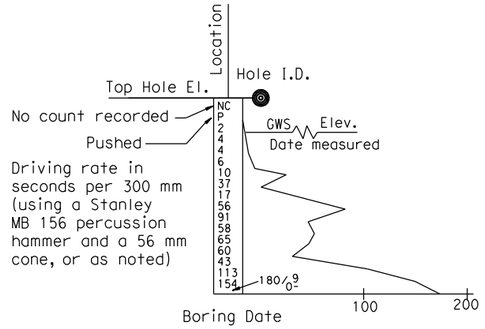
Description	Criteria
Nonplastic	A 3 mm thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.



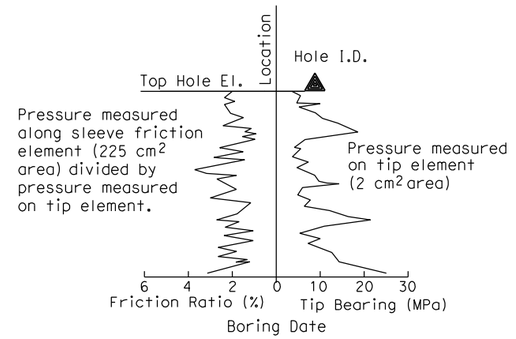
ROTARY BORING



HAND BORING



DYNAMIC CONE PENETRATION BORING



CONE PENETRATION TEST (CPT) SOUNDING

SOIL LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "445L" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 2 OF 5
NAME:	CHECKED BY: G. CUSTENBORDER					

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES								SHEET	OF
10/14/08	3/9/09								

FILE => MRW32.dgn

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

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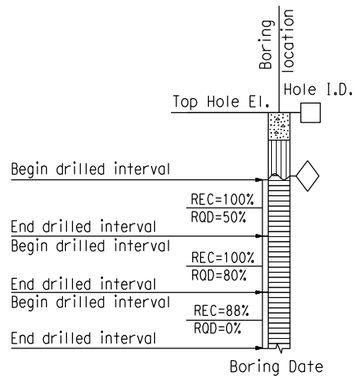
SAN DIEGO, CA. 92111

PERCENT CORE RECOVERY (REC) & ROCK QUALITY DESIGNATION (RQD)

$$REC = \frac{\sum \text{Length of the recovered core pieces}}{\text{Total length of core run}} \times 100\%$$

$$RQD = \frac{\sum \text{Length of intact core pieces} \geq 100\ mm}{\text{Total length of core run}} \times 100\%$$



RELATIVE STRENGTH OF INTACT ROCK

Term	Uniaxial Compressive Strength (MPa)
Extremely Strong	> 207
Very Strong	100 - 207
Strong	49 - 100
Medium Strong	25 - 49
Weak	5 - 25
Very Weak	1 - 5
Extremely Weak	< 1

BEDDING SPACING

Description	Thickness / Spacing
Massive	Greater than 3 m
Very thickly bedded	1 m to 3 m
Thickly bedded	300 mm to 1 m
Moderately bedded	100 mm to 300 mm
Thinly bedded	30 mm to 100 mm
Very thinly bedded	10 mm to 30 mm
Laminated	Less than 10 mm

LEGEND OF ROCK MATERIALS

- IGNEOUS ROCK
- SEDIMENTARY ROCK
- METAMORPHIC ROCK

ROCK HARDNESS

Description	Criteria
Extremely Hard	Specimen cannot be scratched with a pocket knife or sharp pick; can only be chipped with repeated heavy hammer blows.
Very Hard	Specimen cannot be scratched with a pocket knife or sharp pick. Breaks with repeated heavy hammer blows.
Hard	Specimen can be scratched with a pocket knife or sharp pick with difficulty (heavy pressure). Heavy hammer blows required to break specimen.
Moderately Hard	Specimen can be scratched with pocket knife or sharp pick with light or moderate pressure. Core breaks with moderate hammer pressure.
Moderately Soft	Specimen can be grooved 5 mm deep with a pocket knife or sharp pick with moderate or heavy pressure. Breaks with light hammer blow or heavy manual pressure.
Soft	Specimen can be grooved or gouged easily by a pocket knife or sharp pick with light pressure, can be scratched with fingernail. Breaks with light to moderate manual pressure.
Very Soft	Specimen can be readily indented, grooved or gouged with fingernail, or carved with a pocket knife. Breaks with light manual pressure.

FRACTURE DENSITY

Description	Observed Fracture Density
Unfractured	No fractures.
Very slightly fractured	Lengths greater than 1 m.
Slightly fractured	Lengths from 300 mm to 1000 mm with few lengths less than 300 mm or greater than 1000 mm.
Moderately fractured	Lengths mostly in 100 mm to 300 mm range with most lengths about 200 mm.
Intensely fractured	Lengths average from 30 mm to 100 mm with scattered fragmented intervals with lengths less than 100 mm.
Very intensely fractured	Mostly chips and fragments with a few scattered short core lengths.

Combination descriptors (such as "Very intensely to intensely fractured") are used where equal distribution of both fracture density characteristics is present over a significant interval or exposure, or where characteristics are "in between" the descriptor definitions. Only two adjacent descriptors may be combined.

WEATHERING DESCRIPTORS FOR INTACT ROCK

Description	Diagnostic features					General Characteristics
	Chemical Weathering-Discoloration and/or oxidation		Mechanical Weathering-Grain boundary conditions (disaggregation) primarily for granitics and some coarse-grained sediments	Texture and Solutioning		
	Body of Rock	Fracture Surfaces		Texture	Solutioning	
Fresh	No discoloration, not oxidized.	No discoloration or oxidation.	No separation, intact (tight).	No change.	No solutioning.	Hammer rings when crystalline rocks are struck.
Slightly Weathered	Discoloration or oxidation is limited to surface of, or short distance from, fractures; some feldspar crystals are dull.	Minor to complete discoloration or oxidation of most surfaces.	No visible separation, intact (tight).	Preserved.	Minor leaching of some soluble minerals may be noted.	Hammer rings when crystalline rocks are struck. Body of rock not weakened.
Moderately Weathered	Discoloration or oxidation extends from fractures usually throughout; Fe-Mg minerals are "rusty," feldspar crystals are "cloudy."	All fracture surfaces are discolored or oxidized.	Partial separation of boundaries visible.	Generally preserved.	Soluble minerals may be mostly leached.	Hammer does not ring when rock is struck. Body of rock is slightly weakened.
Intensely Weathered	Discoloration or oxidation throughout; all feldspars and Fe-Mg minerals are altered to clay to some extent; or chemical alteration produces in-situ disaggregation, see grain boundary conditions.	All fracture surfaces are discolored or oxidized, surfaces friable.	Partial separation, rock is friable; in semiarid conditions granitics are disaggregated.	Texture altered by chemical disintegration (hydration, argillation).	Leaching of soluble minerals may be complete.	Dull sound when struck with hammer, usually can be broken with moderate to heavy manual pressure or by light hammer blow without reference to planes of weakness such as incipient or hairline fractures, or veinlets. Rock is significantly weakened.
Decomposed	Discolored or oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe-Mg minerals are completely altered to clay.		Complete separation of grain boundaries (disaggregated).	Resembles a soil, partial or complete remnant rock structure may be preserved; leaching of soluble minerals usually complete.		Can be granulated by hand. Resistant minerals such as quartz may be present as "stringers" or "dikes."

Combination descriptors (such as "slightly weathered to fresh") are permissible where equal distribution of both weathering characteristics is present over significant intervals or where characteristics present are "in between" the diagnostic feature. However, combination descriptors should not be used where significant, identifiable zones can be delineated. Only two adjacent descriptors may be combined. "Very intensely weathered" is the combination descriptor for "intensely weathered to decomposed."

ROCK LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "445L" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS		DESIGN BRANCH	POST MILES	LOG OF TEST BORINGS SHEET NO. 3 OF 5
NAME:	CHECKED BY: G. CUSTENBORDER	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		KP43.2/PM26.8	

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES: 10/14/08, 3/9/09

SHEET OF

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USERNAME => mporonjae DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:29:01 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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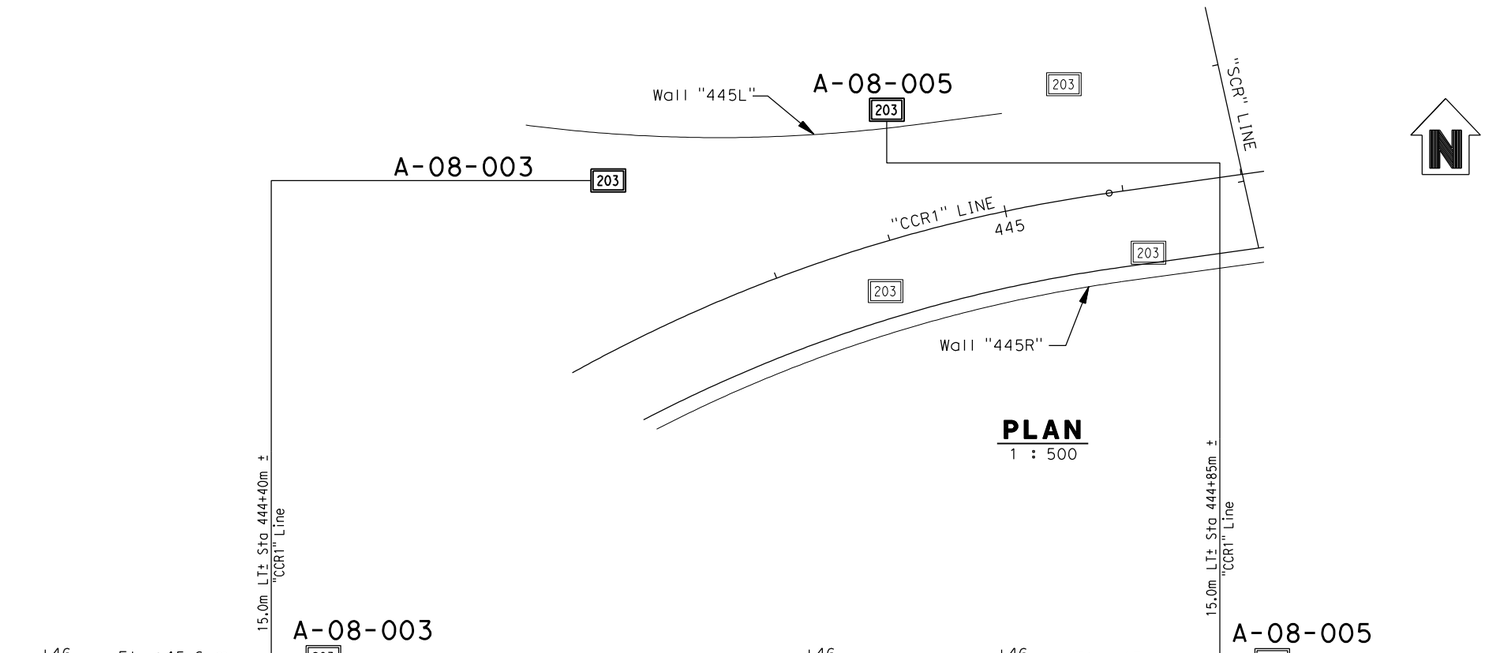

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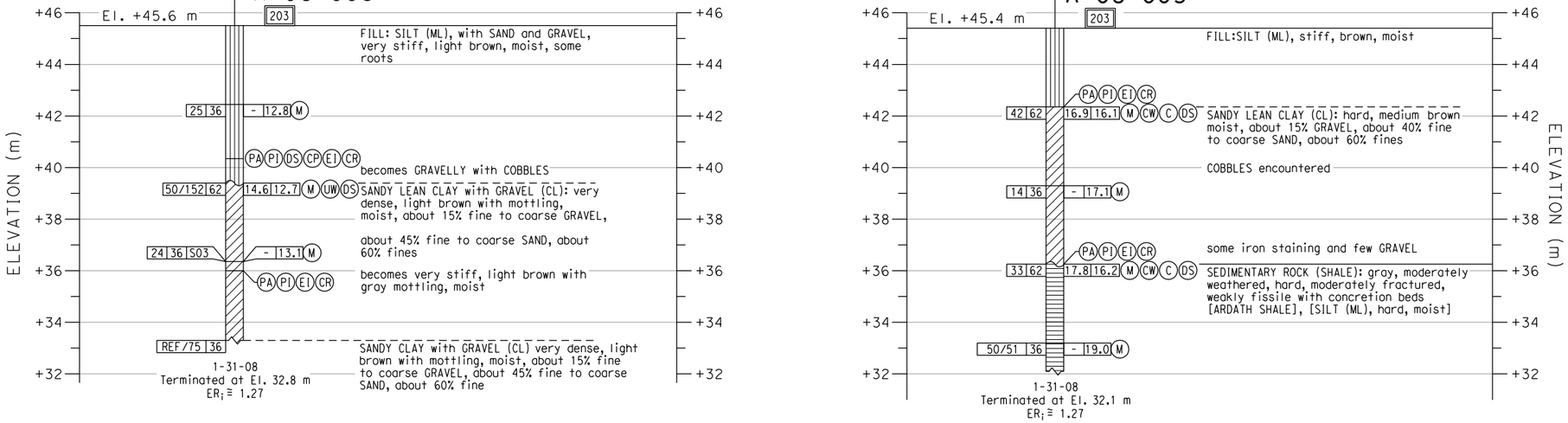

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

NOTES:
1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.
2. Automatic trip and safety hammer systems consisting of hammer weight of 62.5 kg falling a distance of 762 mm were used to advance the drive samplers in accordance with ASTM D1586.
3. The average hammer energy ratio (ER_i) reflects the percentage efficiency of SPT blowcounts (N-value). The estimated ER_i for the various drilling equipment used was as follows:
   Boart Longyear:
   Longyear 1405: $ER_i \cong 1.45$
   Prosonic Track Mounted: $ER_i \cong 1.00$
   Prosonic 1: $ER_i \cong 1.45$
   Minisonic: $ER_i \cong 1.00$
   Pacific Drilling:
   Unimog: $ER_i \cong 1.27$
   Mole: $ER_i \cong 1.00$
   Minimole: $ER_i \cong 1.00$
   Test America:
   CME 95: $ER_i \cong 1.45$
4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (RQD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES		GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "445L" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER			DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 4 OF 5
NAME:	CHECKED BY: G. CUSTENBORDER						

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES									SHEET	OF
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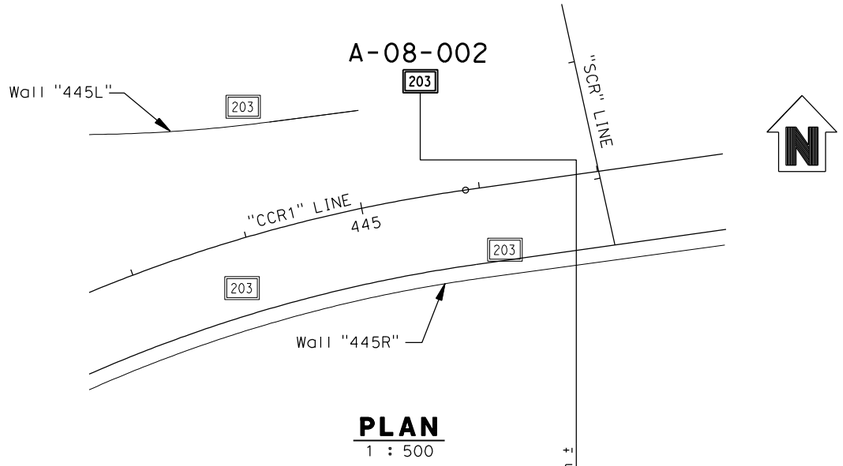

PLAN
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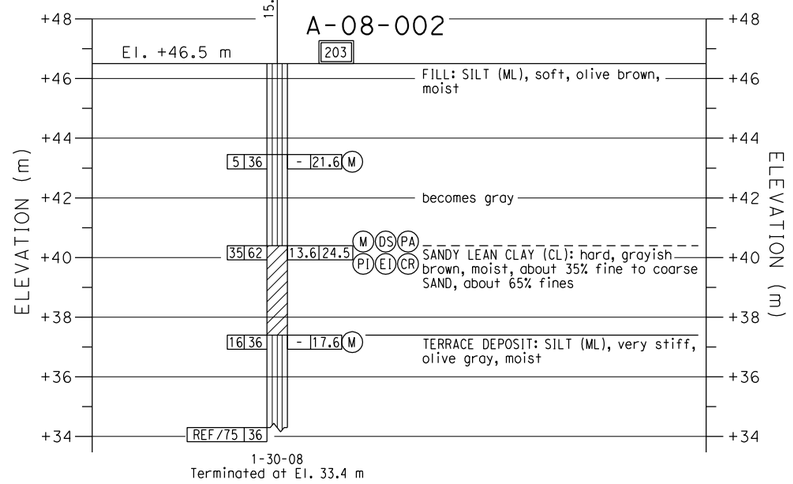

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

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SAN DIEGO, CA. 92111

NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.

2. Automatic trip and safety hammer systems consisting of hammer weight of 62.5 kg falling a distance of 762 mm were used to advance the drive samplers in accordance with ASTM D1586.

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   - Prosonic Track Mounted: $ER_i \cong 1.00$
   - Prosonic 1: $ER_i \cong 1.45$
   - Minisonic: $ER_i \cong 1.00$

   Pacific Drilling:
   - Unimog: $ER_i \cong 1.27$
   - Mole: $ER_i \cong 1.00$
   - Minimole: $ER_i \cong 1.00$

   Test America:
   - CME 95: $ER_i \cong 1.45$

4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (ROD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "445L" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 5 OF 5
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401		

OGS CIVIL LOG OF TEST BORINGS SHEET

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

DISREGARD PRINTS BEARING EARLIER REVISION DATES

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APPENDIX I.15.6

BATTERED MSE WALL 445R LOTBs

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

GROUP SYMBOLS AND NAMES

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

FIELD AND LABORATORY TESTING

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

Caltrans Metric

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11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

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APPARENT DENSITY OF COHESIONLESS SOILS

Description	SPT N_{60} (Blows / 300 mm)
Very loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE

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

PERCENT OR PROPORTION OF SOILS

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

PARTICLE SIZE

Description		Size
Boulder		> 300 mm
Cobble		76 mm to 300 mm
Gravel	Coarse	19 mm to 76 mm
	Fine	No. 4 to 19 mm
Sand	Coarse	No. 10 to No. 4
	Medium	No. 40 to No. 10
	Fine	No. 200 to No. 40

SOIL LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "445R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 1 OF 11
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401		

OGS CIVIL LOG OF TEST BORINGS SHEET

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: 10/14/08 | 3/9/09 | SHEET | OF

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USERNAME => mpcronjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:30:05 PM

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
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SAN DIEGO, CA. 92111

CEMENTATION

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

BOREHOLE IDENTIFICATION

Symbol	Hole Type	Description
Size	A	Auger Boring
Size	R P	Rotary drilled boring Rotary percussion boring (air)
Size	R	Rotary drilled diamond core
Size	HD HA	Hand driven (25 mm soil tube) Hand Auger
●	D	Dynamic Cone Penetration Boring
▲	CPT	Cone Penetration Test (ASTM D 5778-95)
[ ]	O	Other

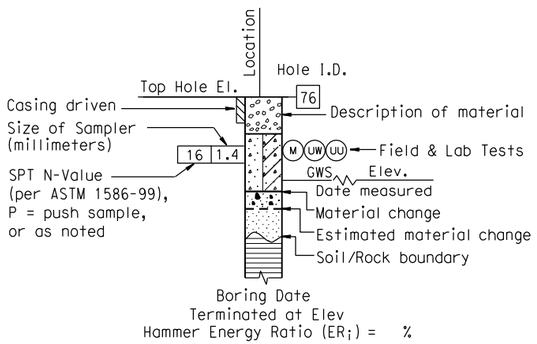
Note: Size in millimeters.

CONSISTENCY OF COHESIVE SOILS

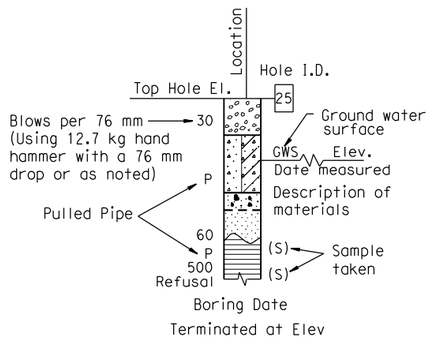
Description	Unconfined Compressive Strength (tsm)	Pocket Penetrometer Measurement (tsm)	Torvane Measurement (tsm)	Field Approximation
Very Soft	< 24	< 24	< 12	Easily penetrated several inches by fist
Soft	24 to 48	24 to 48	12 to 24	Easily penetrated several inches by thumb
Medium Stiff	48 to 96	48 to 96	24 to 48	Penetrated several inches by thumb with moderate effort
Stiff	96 to 192	96 to 192	48 to 96	Readily indented by thumb but penetrated only with great effort
Very Stiff	192 to 383	192 to 383	96 to 192	Readily indented by thumbnail
Hard	> 383	> 383	> 192	Indented by thumbnail with difficulty

PLASTICITY OF FINE-GRAINED SOILS

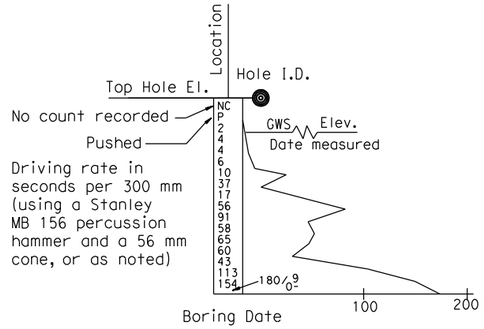
Description	Criteria
Nonplastic	A 3 mm thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.



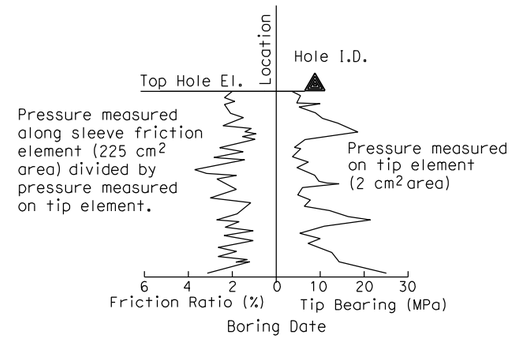
ROTARY BORING



HAND BORING



DYNAMIC CONE PENETRATION BORING



CONE PENETRATION TEST (CPT) SOUNDING

SOIL LEGEND

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "445R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 2 OF 11
NAME:	CHECKED BY: G. CUSTENBORDER					

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CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES		SHEET	OF
10/14/08	3/9/09		

USERNAME => mparcinjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:30:14 PM

FILE => MRW21.dgn

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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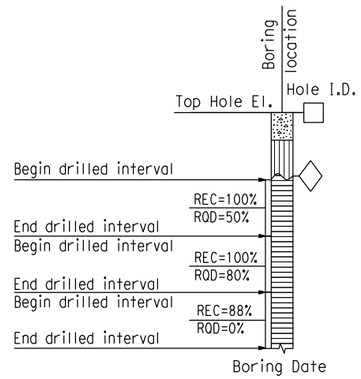
PERCENT CORE RECOVERY (REC) & ROCK QUALITY DESIGNATION (RQD)

$$REC = \frac{\sum \text{Length of the recovered core pieces}}{\text{Total length of core run}} \times 100\%$$

$$RQD = \frac{\sum \text{Length of intact core pieces} \geq 100\ mm}{\text{Total length of core run}} \times 100\%$$



RELATIVE STRENGTH OF INTACT ROCK

Term	Uniaxial Compressive Strength (MPa)
Extremely Strong	> 207
Very Strong	100 - 207
Strong	49 - 100
Medium Strong	25 - 49
Weak	5 - 25
Very Weak	1 - 5
Extremely Weak	< 1

BEDDING SPACING

Description	Thickness / Spacing
Massive	Greater than 3 m
Very thickly bedded	1 m to 3 m
Thickly bedded	300 mm to 1 m
Moderately bedded	100 mm to 300 mm
Thinly bedded	30 mm to 100 mm
Very thinly bedded	10 mm to 30 mm
Laminated	Less than 10 mm

LEGEND OF ROCK MATERIALS

- IGNEOUS ROCK
- SEDIMENTARY ROCK
- METAMORPHIC ROCK

ROCK HARDNESS

Description	Criteria
Extremely Hard	Specimen cannot be scratched with a pocket knife or sharp pick; can only be chipped with repeated heavy hammer blows.
Very Hard	Specimen cannot be scratched with a pocket knife or sharp pick. Breaks with repeated heavy hammer blows.
Hard	Specimen can be scratched with a pocket knife or sharp pick with difficulty (heavy pressure). Heavy hammer blows required to break specimen.
Moderately Hard	Specimen can be scratched with pocket knife or sharp pick with light or moderate pressure. Core breaks with moderate hammer pressure.
Moderately Soft	Specimen can be grooved 5 mm deep with a pocket knife or sharp pick with moderate or heavy pressure. Breaks with light hammer blow or heavy manual pressure.
Soft	Specimen can be grooved or gouged easily by a pocket knife or sharp pick with light pressure, can be scratched with fingernail. Breaks with light to moderate manual pressure.
Very Soft	Specimen can be readily indented, grooved or gouged with fingernail, or carved with a pocket knife. Breaks with light manual pressure.

FRACTURE DENSITY

Description	Observed Fracture Density
Unfractured	No fractures.
Very slightly fractured	Lengths greater than 1 m.
Slightly fractured	Lengths from 300 mm to 1000 mm with few lengths less than 300 mm or greater than 1000 mm.
Moderately fractured	Lengths mostly in 100 mm to 300 mm range with most lengths about 200 mm.
Intensely fractured	Lengths average from 30 mm to 100 mm with scattered fragmented intervals with lengths less than 100 mm.
Very intensely fractured	Mostly chips and fragments with a few scattered short core lengths.

Combination descriptors (such as "Very intensely to intensely fractured") are used where equal distribution of both fracture density characteristics is present over a significant interval or exposure, or where characteristics are "in between" the descriptor definitions. Only two adjacent descriptors may be combined.

WEATHERING DESCRIPTORS FOR INTACT ROCK

Description	Diagnostic features					General Characteristics
	Chemical Weathering-Discoloration and/or oxidation		Mechanical Weathering-Grain boundary conditions (disaggregation) primarily for granitics and some coarse-grained sediments	Texture and Solutioning		
	Body of Rock	Fracture Surfaces		Texture	Solutioning	
Fresh	No discoloration, not oxidized.	No discoloration or oxidation.	No separation, intact (tight).	No change.	No solutioning.	Hammer rings when crystalline rocks are struck.
Slightly Weathered	Discoloration or oxidation is limited to surface of, or short distance from, fractures; some feldspar crystals are dull.	Minor to complete discoloration or oxidation of most surfaces.	No visible separation, intact (tight).	Preserved.	Minor leaching of some soluble minerals may be noted.	Hammer rings when crystalline rocks are struck. Body of rock not weakened.
Moderately Weathered	Discoloration or oxidation extends from fractures usually throughout; Fe-Mg minerals are "rusty," feldspar crystals are "cloudy."	All fracture surfaces are discolored or oxidized.	Partial separation of boundaries visible.	Generally preserved.	Soluble minerals may be mostly leached.	Hammer does not ring when rock is struck. Body of rock is slightly weakened.
Intensely Weathered	Discoloration or oxidation throughout; all feldspars and Fe-Mg minerals are altered to clay to some extent; or chemical alteration produces in-situ disaggregation, see grain boundary conditions.	All fracture surfaces are discolored or oxidized, surfaces friable.	Partial separation, rock is friable; in semiarid conditions granitics are disaggregated.	Texture altered by chemical disintegration (hydration, argillation).	Leaching of soluble minerals may be complete.	Dull sound when struck with hammer, usually can be broken with moderate to heavy manual pressure or by light hammer blow without reference to planes of weakness such as incipient or hairline fractures, or veinlets. Rock is significantly weakened.
Decomposed	Discolored or oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe-Mg minerals are completely altered to clay.		Complete separation of grain boundaries (disaggregated).	Resembles a soil, partial or complete remnant rock structure may be preserved; leaching of soluble minerals usually complete.		Can be granulated by hand. Resistant minerals such as quartz may be present as "stringers" or "dikes."

Combination descriptors (such as "slightly weathered to fresh") are permissible where equal distribution of both weathering characteristics is present over significant intervals or where characteristics present are "in between" the diagnostic feature. However, combination descriptors should not be used where significant, identifiable zones can be delineated. Only two adjacent descriptors may be combined. "Very intensely weathered" is the combination descriptor for "intensely weathered to decomposed."

ROCK LEGEND

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "445R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 3 OF 11
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401	DISREGARD PRINTS BEARING EARLIER REVISION DATES →	REVISION DATES: 10/14/08, 3/9/09; SHEET OF

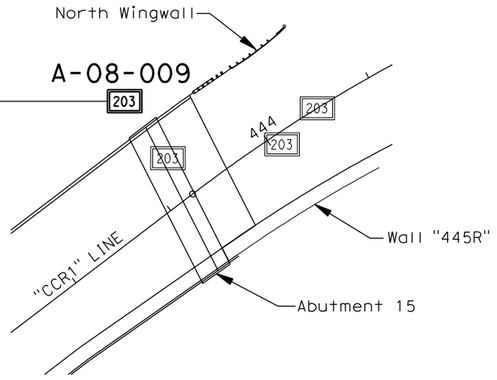
OGS CIVIL LOG OF TEST BORINGS SHEET

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

FILE => MRW22.dgn

USERNAME => mporonjae DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:30:23 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



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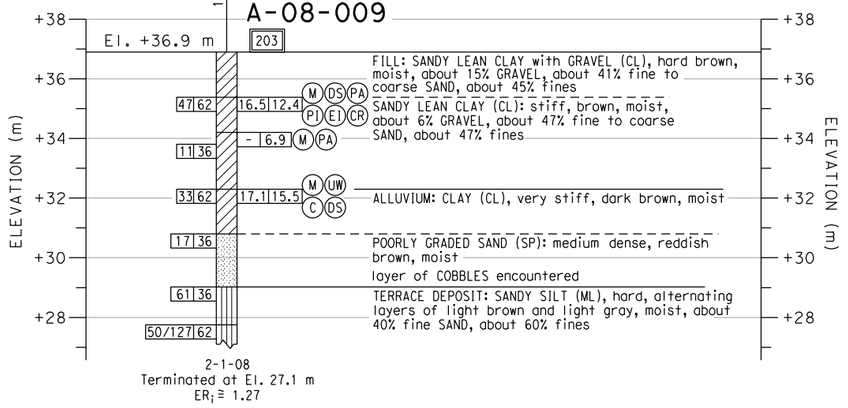

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.
2. Automatic trip and safety hammer systems consisting of hammer weight of 62.5 kg falling a distance of 762 mm were used to advance the drive samplers in accordance with ASTM D1586.
3. The average hammer energy ratio (ER_i) reflects the percentage efficiency of SPT blowcounts (N-value). The estimated ER_i for the various drilling equipment used was as follows:
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   Test America:
   CME 95: $ER_i \cong 1.45$
   Pacific Drilling:
   Unimog: $ER_i \cong 1.27$
   Mole: $ER_i \cong 1.00$
   Minimole: $ER_i \cong 1.00$
4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (RQD) index is not relevant and therefore not reported on LOTBs.

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FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER	DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 4 OR 11
NAME:	CHECKED BY: G. CUSTENBORDER				

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES										SHEET	OF
10/14/08	3/9/09										

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USERNAME => mparonjape DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:30:32 PM

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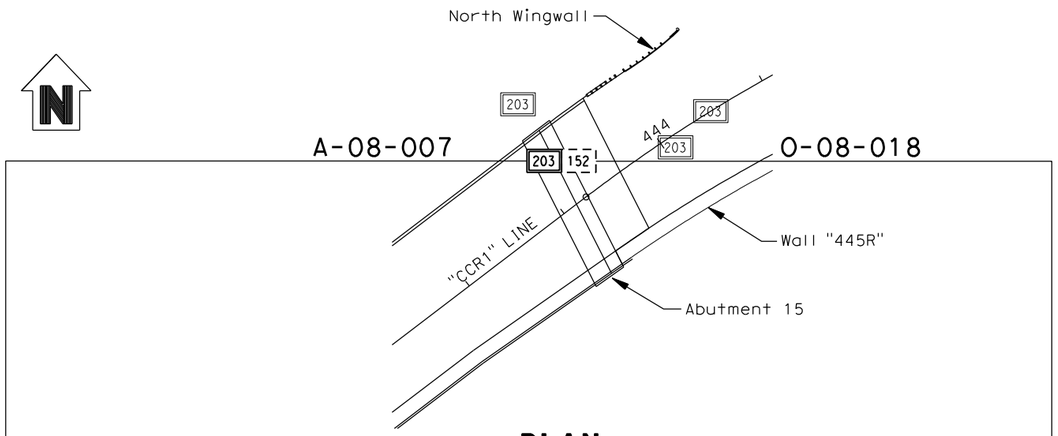
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



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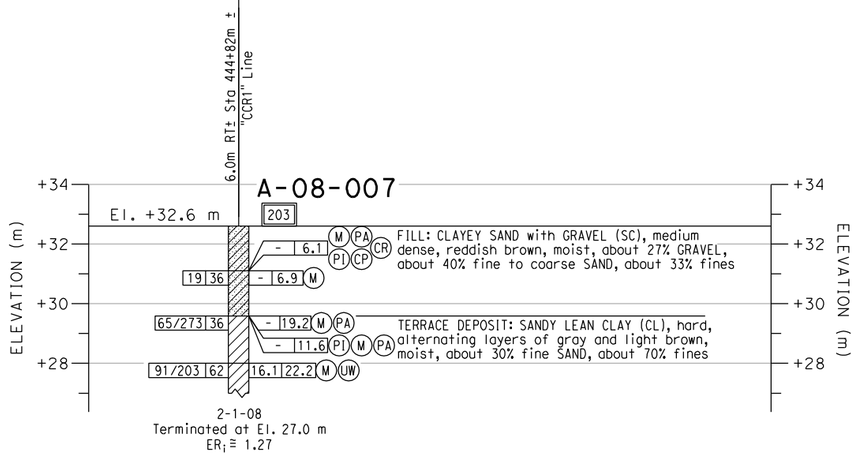

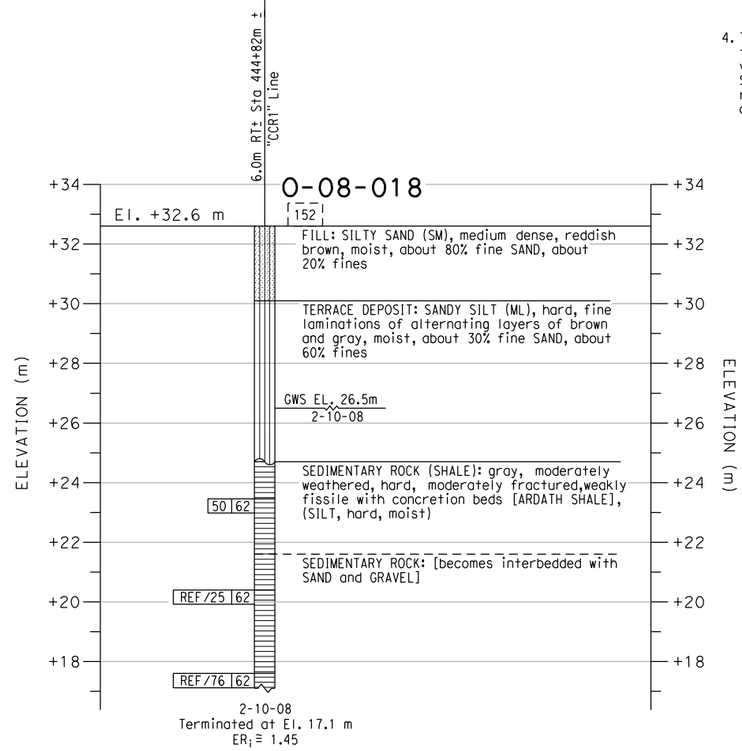

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

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FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 5 OF 11
NAME:	CHECKED BY: G. CUSTENBORDER	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER			

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES										SHEET	OF
10/14/08	3/9/09										

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USERNAME => mparonjpe DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:30:38 PM

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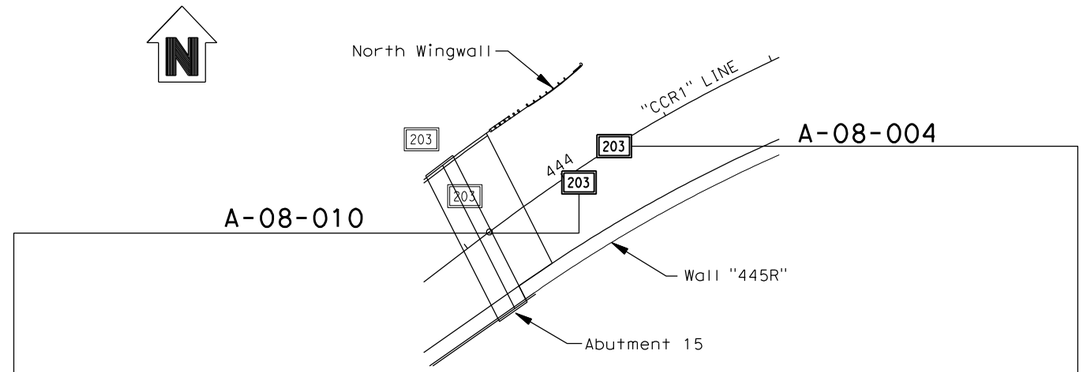
All elevations shown in the LOTBs are in meters
and are referenced to the NGVD 1929 Datum.



PLAN
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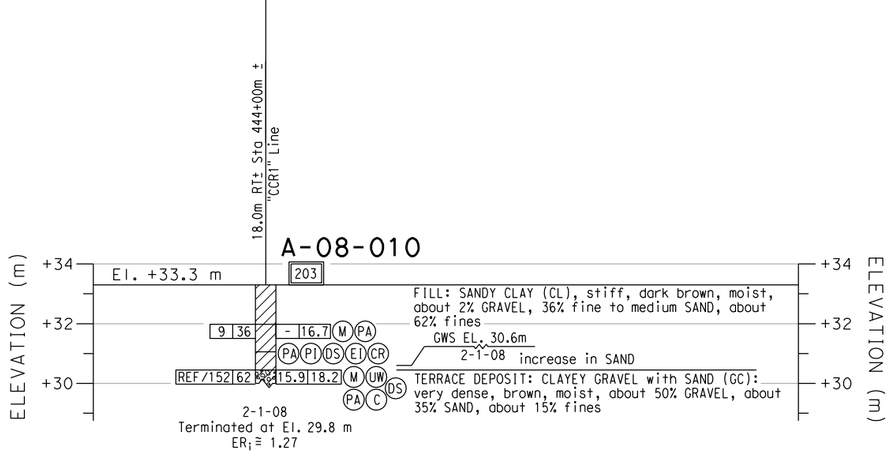

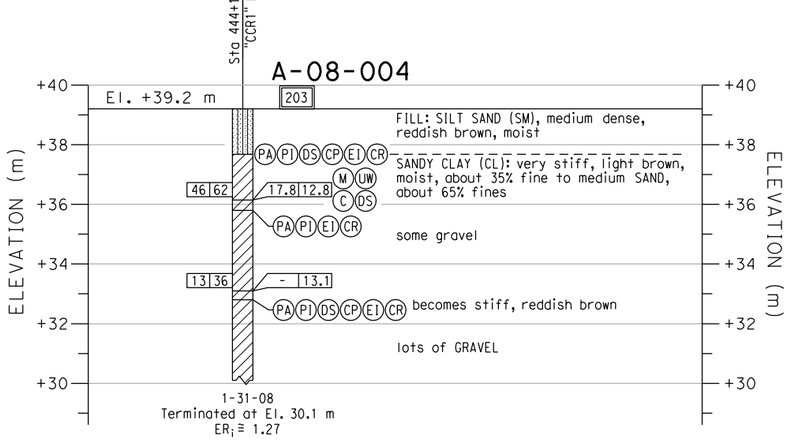

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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ENGINEERING SERVICES		GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "445R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN G. CUSTENBORDER			DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 6 OF 11
NAME:	CHECKED BY: G. CUSTENBORDER						

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES								SHEET	OF
10/14/08	3/9/09								

FILE => MRW25.dgn

USERNAME => mparcinjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:30:45 PM

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

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REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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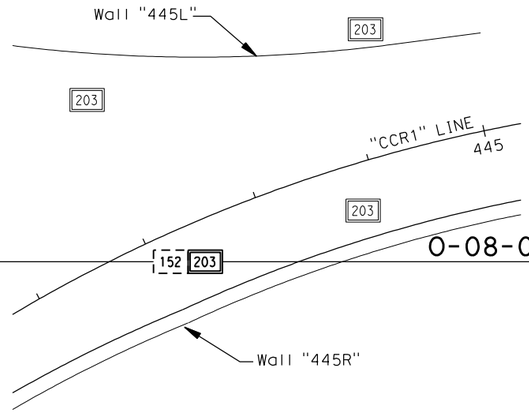

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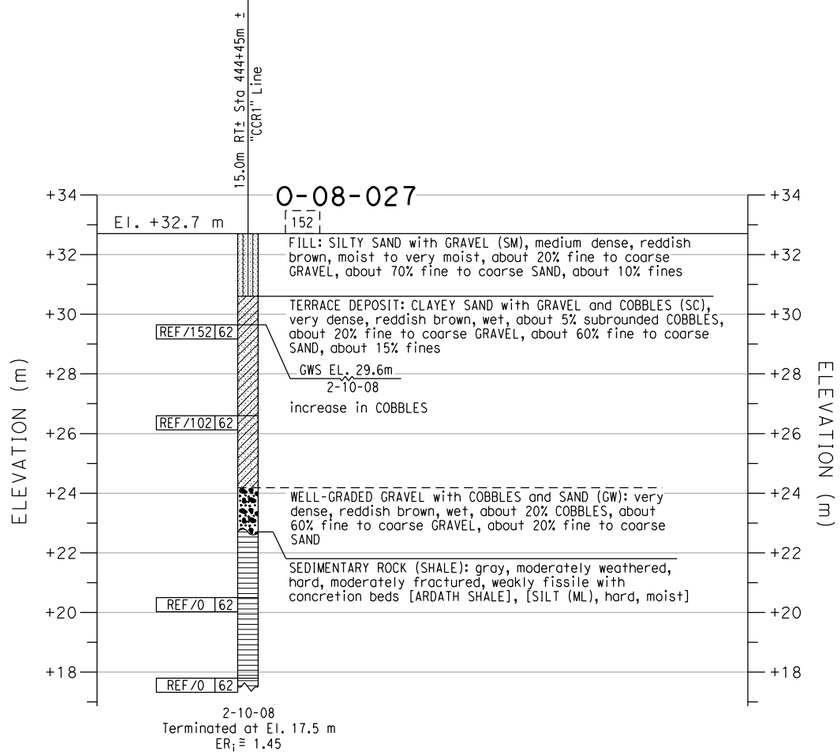

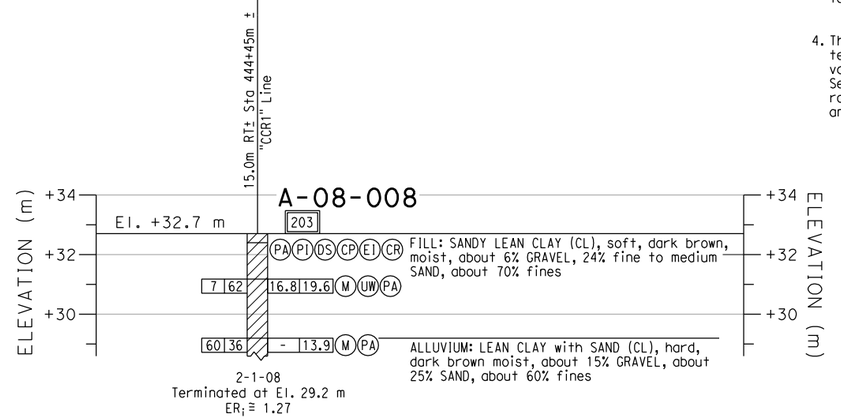

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

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FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN G. CUSTENBORDER		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 7 OF 11
NAME:	CHECKED BY: G. CUSTENBORDER			CU 11275 EA 2T0401		

OGS CIVIL LOG OF TEST BORINGS SHEET

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: 10/14/08 3/9/09 | SHEET | OF

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USERNAME => mparcinjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:30:51 PM

Bench Mark
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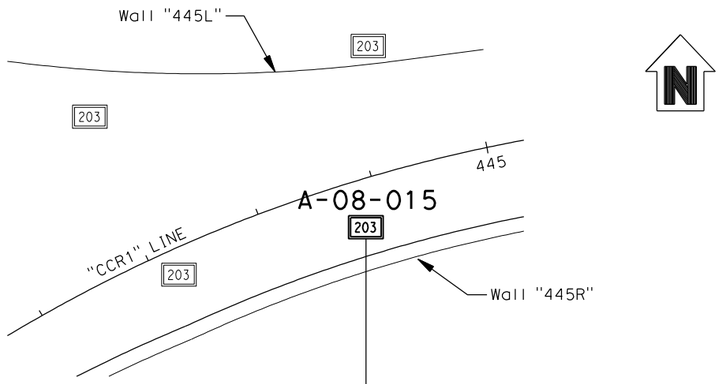

PLAN
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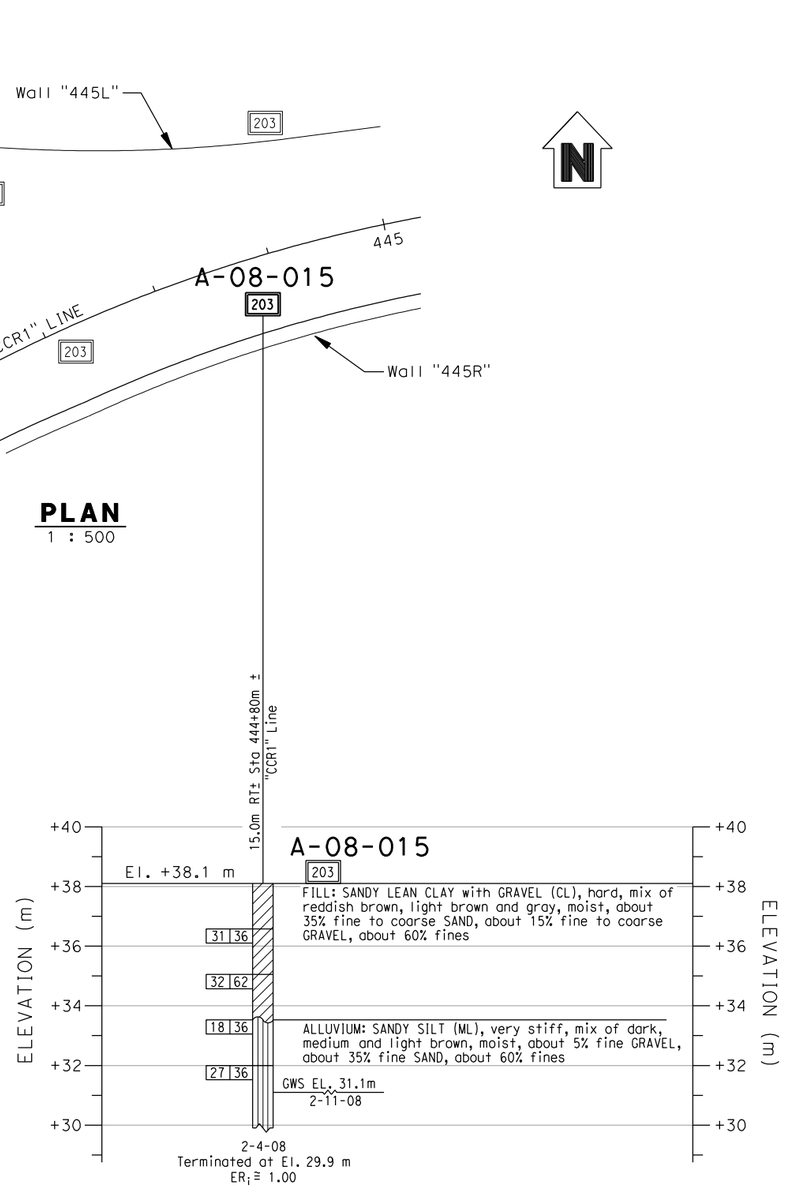

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

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   Minisonic: ER$_i$ ≅ 1.00
   Pacific Drilling:
   Unimog: ER$_i$ ≅ 1.27
   Mole: ER$_i$ ≅ 1.00
   Minimole: ER$_i$ ≅ 1.00
   Test America:
   CME 95: ER$_i$ ≅ 1.45

4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (RQD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES		GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "445R"
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN G. CUSTENBORDER			DESIGN BRANCH	POST MILES	MISCELLANEOUS RETAINING WALLS
NAME:	CHECKED BY: G. CUSTENBORDER					KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 8 OF 11

OGS CIVIL LOG OF TEST BORINGS SHEET

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

CU 11275
EA 2T0401

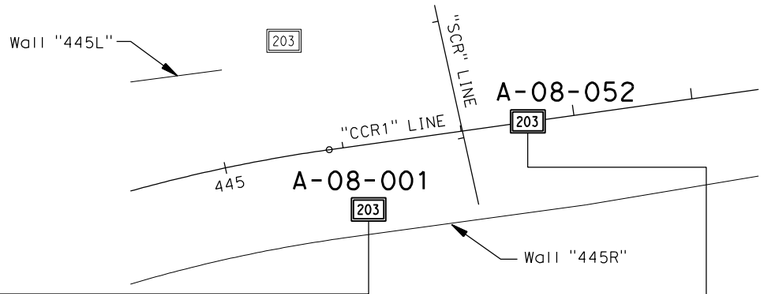
DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES									SHEET	OF
~~10/14/08~~	3/9/09									

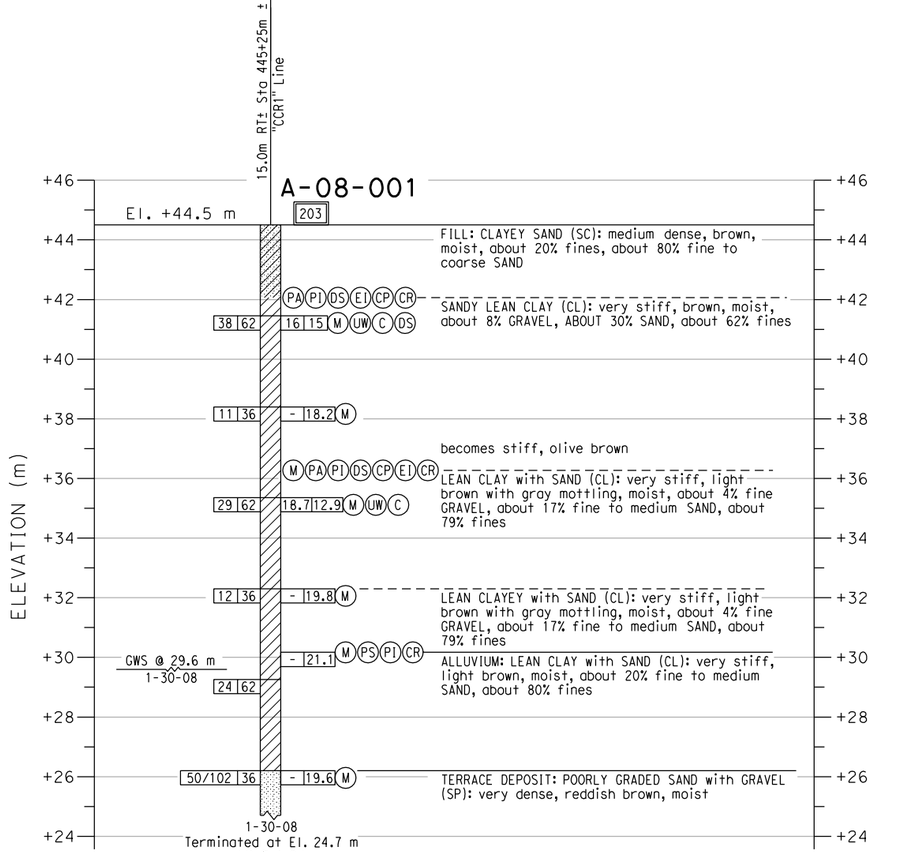
USERNAME => mporcinjope DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:31:00 PM

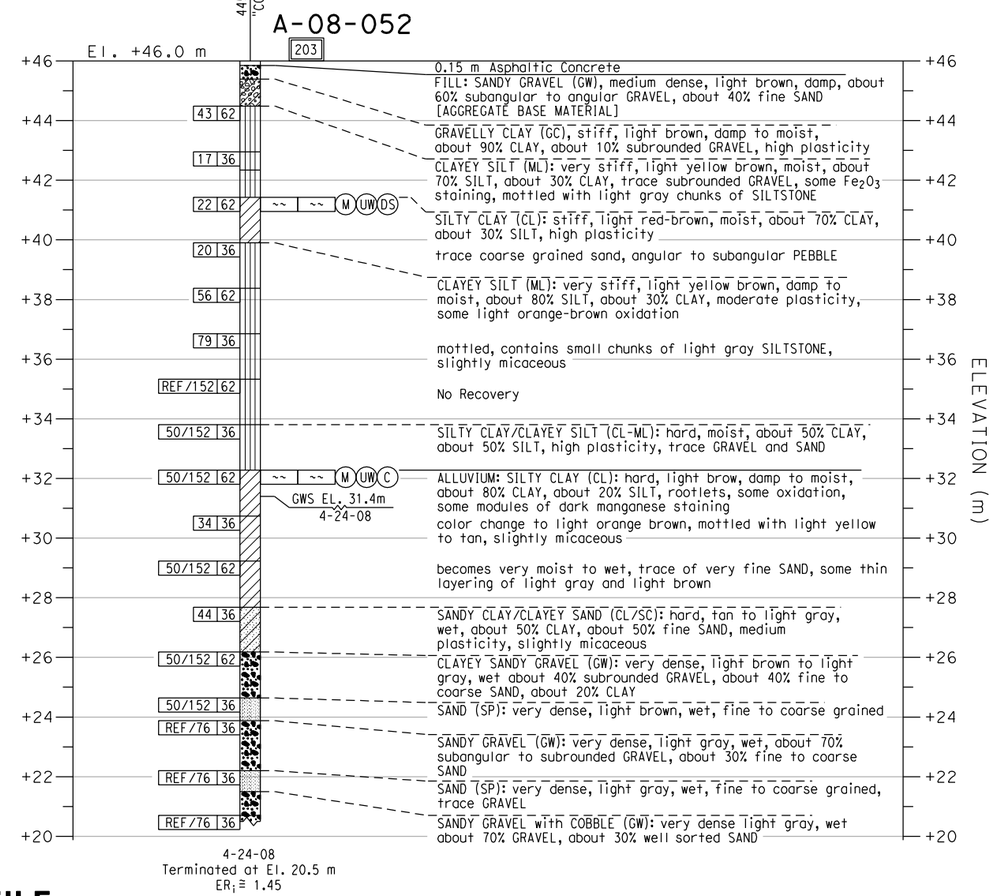
FILE => MRW27.dgn

Bench Mark
All elevations shown in the LOTBs are in meters and are referenced to the NGVD 1929 Datum.



PLAN
1 : 500





PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.
2. Automatic trip and safety hammer systems consisting of hammer weight of 62.5 kg falling a distance of 762 mm were used to advance the drive samplers in accordance with ASTM D1586.
3. The average hammer energy ratio (ER_i) reflects the percentage efficiency of SPT blowcounts (N-value). The estimated ER_i for the various drilling equipment used was as follows:
   Boart Longyear:
   Longyear 1405: $ER_i \cong 1.45$
   Prosonic Track Mounted: $ER_i \cong 1.00$
   Prosonic 1: $ER_i \cong 1.45$
   Minisonic: $ER_i \cong 1.00$
   Test America:
   CME 95: $ER_i \cong 1.45$
   Pacific Drilling:
   Unimog: $ER_i \cong 1.27$
   Mole: $ER_i \cong 1.00$
   Minimole: $ER_i \cong 1.00$
4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (ROD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES		GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "445R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER			DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 9 OF 11
NAME:	CHECKED BY: G. CUSTENBORDER				CU 11275 EA 2T0401	DISREGARD PRINTS BEARING EARLIER REVISION DATES →	REVISION DATES 10/14/08 3/9/09 — SHEET — OF

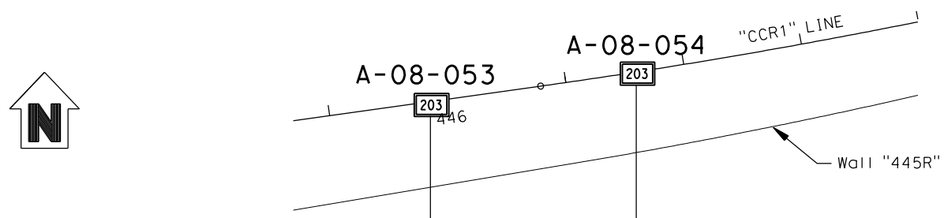
OGS CIVIL LOG OF TEST BORINGS SHEET

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

FILE => MRW28.dgn

USERNAME => mporonjae DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:31:06 PM

Bench Mark
All elevations shown in the LOTBs are in meters
and are referenced to the NGVD 1929 Datum.



PLAN
1 : 500

Sta 445+95m ± "CCR1" Line

A-08-053

El. +48.0 m

59	36				0.15 m Asphaltic Concrete FILL: SANDY GRAVEL (GW): dense, tan to light brown, damp about 60% angular GRAVEL, about 40% SAND [AGGREGATE BASE]
					SILTY CLAY (CL), some subrounded GRAVEL, stiff, light yellow brown, damp about 60% CLAY, about 40% SILT, high plasticity
63	62				CLAY with GRAVEL (CL): hard, light brown, damp about 80% CLAY, about 20% subrounded GRAVEL, some light orange brown Fe_2O_3 staining
53	36				CLAYEY SILT (ML): hard, light yellow brown, damp, about 80% SILT, about 20% CLAY, medium plasticity, blocky, disturbed sample
40	62	14.6	15.4	M UW DS	trace GRAVEL contains clods of light gray SILTSTONE, light Fe_2O_3 staining
43	36				trace nodules of white $CaCO_3$, blocky, mottled
57	62				trace clods of light brown SILTY CLAY
					slow drilling
38	36				thin layering, trace dark nodules of manganese
50/152	62				
45	36				SILTY CLAY (CL): hard, brown, moist, about 70% CLAY, about 30% SILT, high plasticity, slightly micaceous, trace fine SAND and GRAVEL
47	62				ALLUVIUM: SANDY CLAYEY GRAVEL (GC), hard, brown, moist, about 70% CLAY, about 30% SAND, mottled with light orange brown oxidation, trace GRAVEL and COBBLE
79	36				
50/76	62				CLAYEY SAND (SC): very dense, light brown, moist, about 80% fine to coarse SAND, about 20% CLAY, trace GRAVEL and COBBLE

4-25-08
Terminated at El. 28.8 m
$ER_i \cong 1.45$

Sta 446+30m ± "CCR1" Line

A-08-054

El. +48.0 m

68	36				0.18 m Asphaltic Concrete FILL: SILTY SANDY GRAVEL (GW), dense, light gray brown, damp about 50% GRAVEL, about 40% SAND, about 10% SILT [AGGREGATE BASE]
70	62				CLAYEY GRAVEL (GC) stiff, light brown, damp about 60% subangular to subrounded GRAVEL, about 40% CLAY SILT with GRAVEL (ML): hard, light yellow brown, dry to damp, about 90% SILT, about 10% subrounded GRAVEL
55	36				CLAYEY SILT (ML): hard, light yellow brown, damp, about 90% SILT, about 10% CLAY, medium plasticity, contains light brown clods of CLAY
83	62				some light orange brown Fe_2O_3 staining
55	36				
REF/152	62				
					SILTY CLAY (CL): very stiff, light yellow brown, damp, about 60% CLAY, about 40% SILT, light orange to red brown oxidation, some inclusions of light gray SILTSTONE, trace fine SAND and GRAVEL
28	36				
52	62	14.6	12.7	M UW DS	CLAYEY SILT (ML): increase in GRAVEL, slightly micaceous
41	36				SILT (ML): hard, light gray brown, moist, slightly micaceous, mottled, trace very fine SAND and GRAVEL
					GWS EL. 32.4m 4-28-08
70	62				CLAYEY SILT (ML): hard, light brown, moist, slightly micaceous, some light brown CLAY clods, trace very fine SAND and GRAVEL
REF/152	36				contains small fragments of asphalt
69/229	62				ALLUVIUM: SANDY CLAY (CL), hard, light brown, moist, about 60% CLAY, about 40% fine SAND, medium plasticity, mottled with light orange brown oxidation, trace GRAVEL
REF/152	36				SANDY GRAVEL some CLAY (GW): very dense, light brown, wet, about 60% subrounded GRAVEL, about 30% fine to coarse SAND, about 10% CLAY, some COBBLE sized crystalline rock
REF/152	36				increase in SAND
REF/102	36				SANDY GRAVEL (GW): very dense, light gray, wet, about 60% subrounded GRAVEL, about 40% fine to coarse SAND, some COBBLE sized crystalline rock
REF/76	36				trace CLAY

4-28-08
Terminated at El. 23.4 m
$ER_i \cong 1.45$

ELEVATION (m)

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

REGISTERED PROFESSIONAL ENGINEER
VAN OLIN
NO. 2578
EXP. 6-30-10
GEOTECHNICAL
STATE OF CALIFORNIA

PLANS APPROVAL DATE

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SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111

NOTES:

1. 62 mm diameter samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 62 mm and an outside diameter (O.D.) of 83 mm.
2. Automatic trip and safety hammer systems consisting of hammer weight of 62.5 kg falling a distance of 762 mm were used to advance the drive samplers in accordance with ASTM D1586.
3. The average hammer energy ratio (ER_i) reflects the percentage efficiency of SPT blowcounts (N-value). The estimated ER_i for the various drilling equipment used was as follows:
   Boart Longyear:
   Longyear 1405: $ER_i \cong 1.45$
   Prosonic Track Mounted: $ER_i \cong 1.00$
   Prosonic 1: $ER_i \cong 1.45$
   Minisonic: $ER_i \cong 1.00$
   Test America:
   CME 95: $ER_i \cong 1.45$
   Pacific Drilling:
   Unimog: $ER_i \cong 1.27$
   Mole: $ER_i \cong 1.00$
   Minimole: $ER_i \cong 1.00$
4. The sedimentary rock was obtained utilizing a sonic drilling technique; this method resulted in Core Recovery (REC) values of essentially 100%. Also, given the nature of the Sedimentary Rock (ie., friable, highly fractured, decomposed rock) a Rock Quality Designation (ROD) index is not relevant and therefore not reported on LOTBs.

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "445R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 10 OF 11
NAME:	CHECKED BY: G. CUSTENBORDER	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER	CU 11275 EA 2T0401		

OGS CIVIL LOG OF TEST BORINGS SHEET

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: 10/14/08, 3/9/09

SHEET OF

USERNAME => mparonjpe DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:31:13 PM

FILE => MRW29.dgn

Bench Mark
All elevations shown in the LOTBs are in meters
and are referenced to the NGVD 1929 Datum.

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	805	R42.6/R46.2		

REGISTERED GEOTECHNICAL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN NO. 2578 EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

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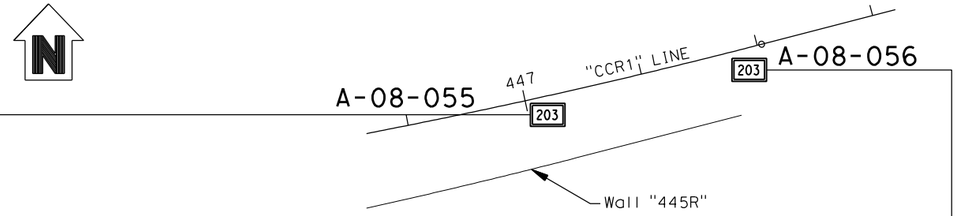
SANDAG
401 B STREET,
SAN DIEGO, CA. 92101

BUREAU VERITAS NORTH AMERICA, INC.
7895 CONVOY CT.
SAN DIEGO, CA. 92111



PLAN
1 : 500

A-08-055

El. +50.0 m

Blows	Rec	Remarks	Description	Elevation
			0.15 m Asphaltic Concrete	+50
50/152	62	15.1 13.2 M UW DS	FILL: SILTY SAND GRAVEL (GM), dense, light brown, damp, 0.38 m thick, Base Material	
			GRAVELLY SILT (ML): stiff to very stiff, light yellow brown, damp, about 30% subrounded GRAVEL, about 70% SILT	+48
37	36		contains clods of brown CLAY (CL), some inclusions of light gray SILTSTONE	
REF/152	62		CLAYEY SILT with GRAVEL (ML): very stiff, light yellow brown, damp, mottled with light orange brown to light red brown colors, about 90% SILT, about 10% CLAY	+46
			becomes dry to damp, blocky	+44
50/152	36		GRAVELLY SILT with COBBLES (ML): very stiff yellow brown, damp, some light orange brown Fe_2O_3 staining, about 20% subrounded GRAVEL, about 80% SILT	
80	62		slow drilling	+42
50/76	36		CLAYEY SILT some GRAVEL (ML): very stiff to hard, light yellow brown, damp, mottled with light orange brown Fe_2O_3, contains inclusions of light gray SILTSTONE, about 90% SILT, about 10% CLAY	+40
50/152	62		blocky	
REF/152	36		slightly micaceous	+38
67	62			+36
44	36		SILTY CLAY (CL): trace very fine SAND, some subrounded GRAVEL, stiff to very stiff, light brown, moist, mottled with light orange brown and light gray green colors, slightly micaceous, about 40% SILT, about 60% CLAY	+34
REF/152	62			
48	36		slow drilling Interlayered with light green fine SANDY SILT, color change to gray brown, increase in CLAY content, high plasticity, trace pebble size SILTSTONE	+32

4-29-08
Terminated at El. 32.3 m
$ER_i \cong 1.45$

A-08-056

El. +50.0 m

Blows	Rec	Remarks	Description	Elevation
			0.18 m Asphaltic Concrete	+50
43	36		FILL: SILTY SANDY GRAVEL (GW), dense, tan, damp, about 50% angular to subangular GRAVEL, about 40% fine SAND, about 10% SILT [AGGREGATE BASE]	
50/152	62		SILT with GRAVEL (ML), very stiff to hard, light yellow brown, damp, about 90% SILT, about 10% subrounded GRAVEL, medium plasticity	+48
68	36		becomes blocky, encountered cobble-sized rock	+46
50/152	62		contains clods of light gray SILTSTONE, some light orange brown oxidation, trace of nodules of white CaCo	+44
30	36			+42
50/152	62		interlayered with brown SILTY CLAY (CL), very stiff	+40
69	36		SILTY CLAY (CL): hard, light brown, damp, about 60% CLAY, about 40% SILT, high plasticity, mottled with light orange brown to brown colors, trace GRAVEL and SAND	+38
62	36		GRAVELLY CLAY (GC): hard, light brown to brown, damp, about 80% CLAY, about 20% subrounded CLAY, high plasticity, mottled with light orange brown to brown colors, trace SAND and COBBLE	
55	62		mottled with light yellow brown, light red brown to dark brown, trace manganese staining, GRAVEL becomes angular to rounded	+36
44	36		SILTY CLAY (CL): hard, brown to gray brown, moist, about 70% CLAY, about 30% SILT, high plasticity, highly mottled, trace GRAVEL	+34
85	62	115 13.0 M UW DS	ALLUVIUM: SANDY CLAY (CL), hard, gray brown, moist, about 90% CLAY, about 10% fine SAND, high plasticity, weakly layered, mottled with dark manganese staining, some light orange brown oxidation	+32
REF/152	36		SILTY SAND (SM): very dense, light brown, moist, about 90% very fine SAND, about 10% SILT, some light orange-brown oxidation	+30
50/76	62		CLAYEY SAND/SANDY CLAY (SC/CL): very dense, light brown, moist, to very moist, about 50% fine SAND, about 50% CLAY	
REF/152	36		GRAVELLY SILTY SAND (SM): very dense, light brown, moist, about 70% fine SAND, about 20% SILT, about 10% rounded GRAVEL	+28
REF/152	36		interlayered with light gray SANDS (SP): becomes wet and GRAVEL becomes subrounded to rounded	+26
REF/152	36		SEDIMENTARY ROCK (SHALE): gray, moderately weathered, hard, moderately fractured,weakly fissile with concretion beds [ARDATH SHALE], [SILT (ML), hard, moist]	+24

4-8-08
Terminated at El. 23.9 m
$ER_i \cong 1.45$

ELEVATION (m)

PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500

NOTES:

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ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RW "445R" MISCELLANEOUS RETAINING WALLS
FUNCTIONAL SUPERVISOR	DRAWN BY: J. JOHNS		DESIGN BRANCH	POST MILES KP43.2/PM26.8	LOG OF TEST BORINGS SHEET NO. 11 OF 11
NAME:	CHECKED BY: G. CUSTENBORDER	FIELD INVESTIGATIONS BY: V. OLIN, G. CUSTENBORDER	CU 11275 EA 2T0401	DISREGARD PRINTS BEARING EARLIER REVISION DATES →	REVISION DATES: 10/14/08, 3/9/09

OGS CIVIL LOG OF TEST BORINGS SHEET

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

FILE => MRW30.dgn

USERNAME => mporonjape DATE PLOTTED => 3/10/2009 TIME PLOTTED => 2:31:21 PM

APPENDIX I.16

AS BUILT LOTBs

DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
11	SD	5.805	R30.4/R30.7, 26.3/28.5	58	105

M J Cullen
REGISTERED ENGINEER - CIVIL

REGISTERED PROFESSIONAL ENGINEER — M. J. Cullen — No. 040620 — Exp. 3-31-99 — CIVIL — STATE OF CALIFORNIA

9-23-96
PLANS APPROVAL DATE

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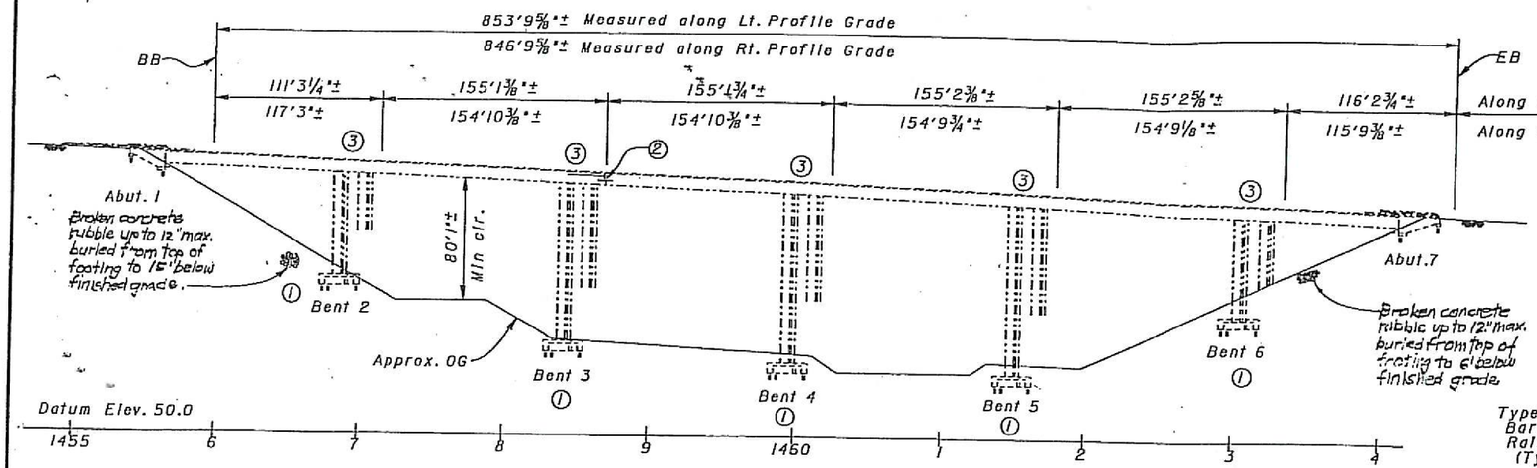
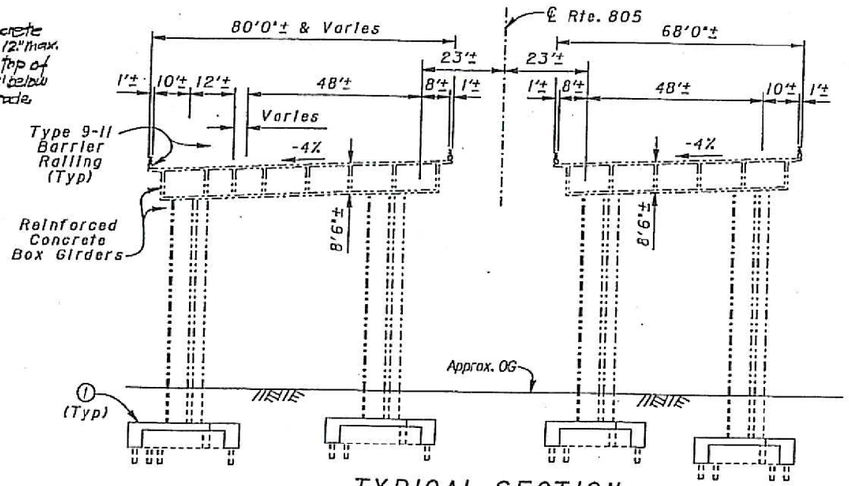
NOTE:
THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL



ELEVATION
1"-50'

RETROFIT LEGEND
① Strengthen all footings and add piles.
② Hinge restrainers.
③ Bent Cap strengthening.



TYPICAL SECTION
1"-20'

Bent	Existing Skew Angle	
	Left Bridge	Right Bridge
2	17°14'41"±	16°44'03"±
3	19°49'35"±	19°14'01"±
4	22°38'05"±	21°43'54"±
5	25°35'48"±	24°13'43"±
6	30°06'31"±	26°43'25"±

AS BUILT

CORRECTIONS BY Rich Fillmore
Dokken Engineering
CONTRACT NO. 11-067504
8/30/98

QUANTITIES

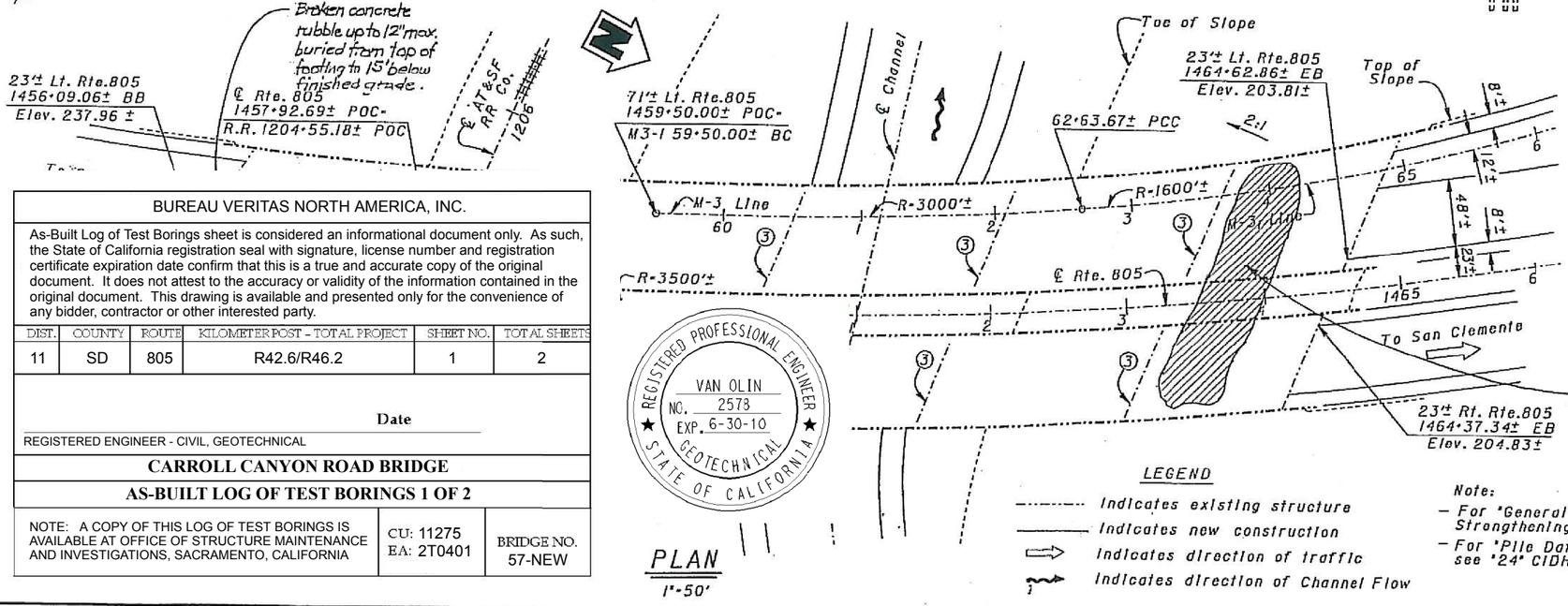
ACCESS OPENING, SOFFIT	101	EA
BRIDGE REMOVAL (PORTION), LOCATION C	LUMP	SUM
STRUCTURE EXCAVATION (BRIDGE)	5,950	CY
STRUCTURE BACKFILL (BRIDGE)	4,470	CY
24" CAST-IN-DRILLED-HOLE CONCRETE PILING	13,250	LF
PRESTRESSING HIGH STRENGTH RODS	57,100	LB
STRUCTURAL CONCRETE, BRIDGE FOOTING	1,525	CY
STRUCTURAL CONCRETE, BRIDGE	327	CY
DIAPHRAGM BOLSTER	14	EA
DRILL AND BOND DOWEL	11,530	LF
CORE CONCRETE (2")	5,300	LF
CORE CONCRETE (6")	232	LF
CORE CONCRETE (10")	120	LF
CORE CONCRETE (1 1/4")	980	LF
BAR REINFORCING STEEL (BRIDGE)	900,000	LB
MISCELLANEOUS METAL (RESTRAINER - PIPE TYPE)	12,600	LB
MISCELLANEOUS METAL (RESTRAINER - CABLE TYPE)	5,340	LB

INDEX TO PLANS

SHEET NO.	TITLE
1	GENERAL PLAN
2	FOOTING DETAILS NO. 1 - LEFT BRIDGE
3	FOOTING DETAILS NO. 2 - LEFT BRIDGE
4	FOOTING DETAILS - RIGHT BRIDGE
5	24" CIDH CONCRETE PILE
6	BENT CAP STRENGTHENING DETAILS NO. 1
7	BENT CAP STRENGTHENING DETAILS NO. 2
8	BENT CAP STRENGTHENING DETAILS NO. 3
9	HINGE LAYOUT - LEFT BRIDGE
10	HINGE LAYOUT - RIGHT BRIDGE
11	HINGE RESTRAINER DETAILS
12	DECK AND SOFFIT OPENINGS
13	LIMITS OF PAYMENT FOR EXCAVATION & BACKFILL
14	LOG OF TEST BORINGS NO. 1
15	LOG OF TEST BORINGS NO. 2

STANDARD PLANS DATED JULY 1992

A10A	ABBREVIATIONS
A10B	SYMBOLS
B0-1	BRIDGE DETAILS



PLAN
1"-50'

LEGEND
Indicates existing structure
Indicates new construction
Indicates direction of traffic
Indicates direction of Channel Flow

Note:
- For "General Notes", see "Bent Cap Strengthening Details No. 3" sheet.
- For "Pile Data on Left & Right Bridge" see "24" CIDH Concrete Pile" sheet.

STANDARD PLAN SHEET NO.
DETAIL NO.

BUREAU VERITAS NORTH AMERICA, INC.

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DIST.	COUNTY	ROUTE	KILOMETER POST - TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
11	SD	805	R42.6/R46.2	1	2

Date
REGISTERED ENGINEER - CIVIL, GEOTECHNICAL

CARROLL CANYON ROAD BRIDGE

AS-BUILT LOG OF TEST BORINGS 1 OF 2

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

CU: 11275
EA: 2T0401

BRIDGE NO. 57-NEW

REGISTERED PROFESSIONAL ENGINEER — VAN OLIN — NO. 2578 — EXP. 6-30-10 — GEOTECHNICAL — STATE OF CALIFORNIA

Ted Jensen 8/96
DESIGN ENGINEER

DESIGN	BY M. J Cullen	11-94	CHECKED G. Murugesh	12-95	LOAD FACTOR DESIGN		
DETAILS	BY B.Svoboda/M.Tran	11-94	CHECKED G. Murugesh	12-95	LAYOUT	BY M. J. Cullen 11-95	CHECKED G. Murugesh 12-95
QUANTITIES	BY M. J Cullen	5-96	CHECKED G. Murugesh	5-96	SPECIFICATIONS	BY Karla Meier 8-96	PLANS AND SPECS COMPARED Karla Meier 8-96

DS DSD 2158 (CADD 10/95)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES
STRUCTURE DESIGN 5

CU 11
EA 067801

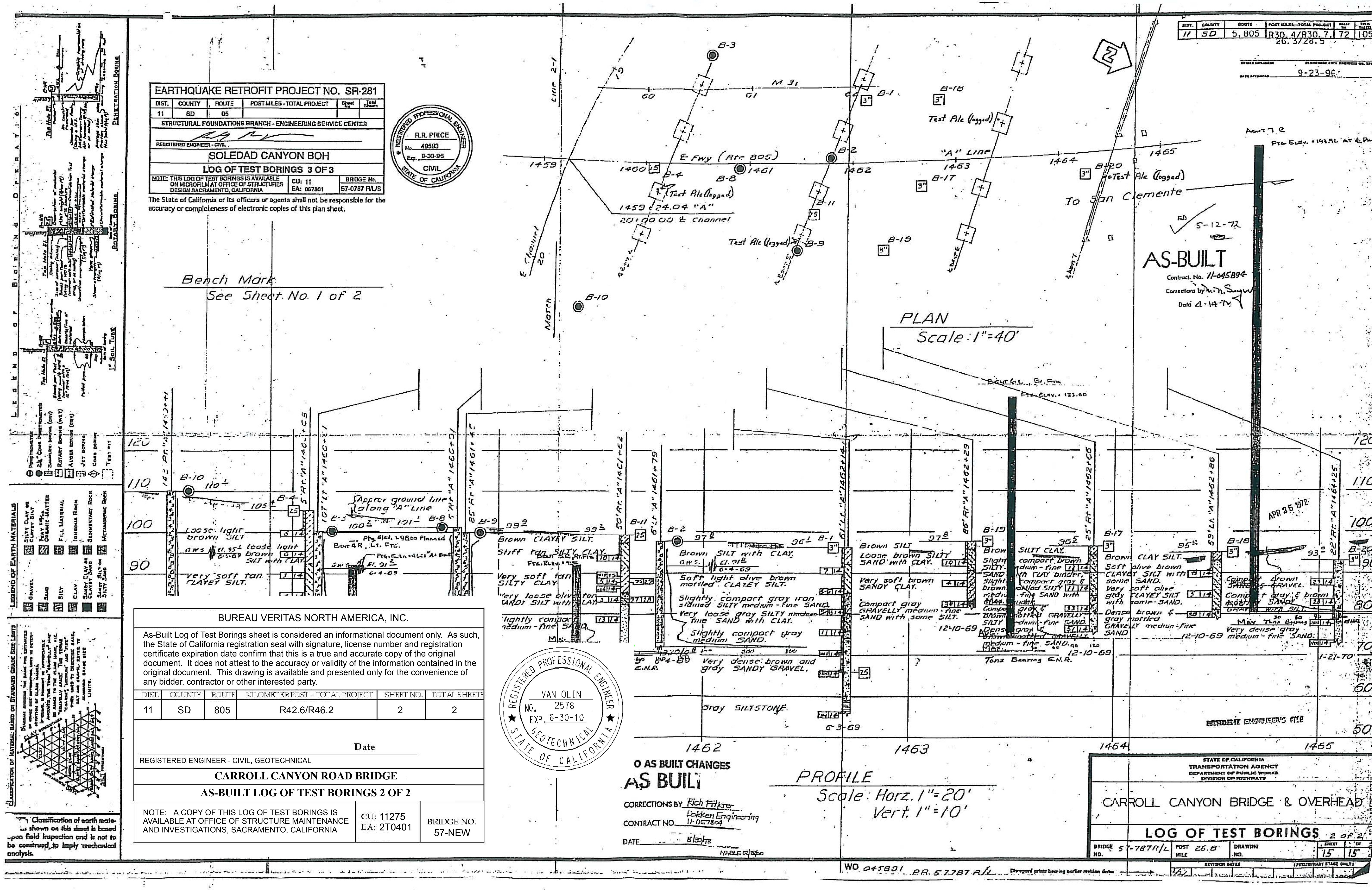
BRIDGE NO.	EARTHQUAKE RETROFIT PROJECT NO. SR 281
57-787R/L	SOLEDAD CANYON BRIDGE & OH
POST MILE 26.8	GENERAL PLAN

DISREGARD PRINTS BEARING EARLIER REVISION DATES →
REVISION DATES (PRELIMINARY STAGE ONLY): 5-7-96 | 5-22-96 | 6-14-96 | 7-10-96 | 7-15-96 | 8-5-96 | 8-21-96 | 9-11-96

SHEET 1 OF 15

USERNAME => $USER
$REQUEST

DATE PLOTTED => $DATE
TIME PLOTTED => $TIME



BUREAU VERITAS NORTH AMERICA, INC.

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DIST.	COUNTY	ROUTE	KILOMETER POST - TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
11	SD	805	R42.6/R46.2	2	2

Date

REGISTERED ENGINEER - CIVIL, GEOTECHNICAL

CARROLL CANYON ROAD BRIDGE

AS-BUILT LOG OF TEST BORINGS 2 OF 2

NOTE: A COPY OF THIS LOG OF TEST BORINGS IS AVAILABLE AT OFFICE OF STRUCTURE MAINTENANCE AND INVESTIGATIONS, SACRAMENTO, CALIFORNIA	CU: 11275 EA: 2T0401	BRIDGE NO. 57-NEW

APPENDIX II

LABORATORY TESTING RESULTS

Table II.1

Boring No.	Depth below grade (m)	Sample Type	In-situ Moisture (ASTM D2216)	Dry Unit Weight (ASTM D4767)	Particle Size Analysis (ASTM D422)				Plasticity Index & Liquid Limit (AASHTO T 89 & T90)			Consolidation (ASTM D2435)	Direct Shear (ASTM D3080)				Compaction Curve (ASTM D1557)		Expansion Index (ASTM D4829)	Corrosivity Testing			
													Undisturbed		Remolded								
			ω (% of dry wt)	γ (kN/m³)	GRAVEL (%) RETAINED on #4 Sieve	SAND (%) PASSING #4 and RETAINED on #200 sieve	FINES (SILT + CLAY) (%) PASSING No. 200	FINES (SILT + CLAY) (%) CLAY	LL	PL	PI		C (kPa)	ϕ °	C (kPa)	ϕ °	Maximum Dry Density (kN/m³)	Optimum Moisture Content (%)	EI value	Sulfate Content (ppm) (CTM 417)	Chloride Content (ppm) (CTM 422)	pH value (CTM 643)	Resistivity value (ohms-cms) (CTM 643)
CCR BRIDGE																							
A-08-006	1.5	SPT	9.5		0.0	22.3	77.7																
	3.0	Ring	13.4	16.9								see graph											
	4.6	SPT																					
	6.1	Ring	20.0	17.3																			
	7.6	SPT	18.5		1.0	54.7	44.3																
	9.1	Ring	21.4	17.2								see graph											
	10.7	SPT	20.0		19.0	65.0	16.0																
	15.2	SPT	22.4		7.3	45.9	46.8																
A-08-031	14.0	Ring											19.2	33.0									
O-08-033	26.5	Ring											1.2	46.0									
O-08-034	0.3	small bag	31.0		1.0	23.5	75.5																
	1.2	small bag	14.2																				
	2.1	small bag	25.2				80.0																
	5.5	small bag	16.3		46.0	35.0	12.0	7.0															
	6.1	small bag	21.8		5.9	58.7	21.4	14.0															
	7.0	small bag	14.0		44.3	39.0	7.7	9.0															
	7.6	small bag	6.4		53.7	38.8	5.0	2.5															
	7.9	small bag	13.2		38.9	41.5	12.6	7.0															
	8.5	small bag	13.6		56.1	34.5	6.6	2.8															
	9.1	small bag	16.2		12.7	70.6	11.5	5.2															
	11.9	small bag	8.2		39.9	44.4	11.0	4.7															
	13.7	Ring																					
	13.7	small bag	8.1		47.7	35.0	11.3	6.0															
	14.0	small bag	16.2		0.0	12.0	53.0	35.0															
	18.6	small bag	34.5																				
	19.8	Ring																					
	21.3	small bag	15.1																				
	25.9	Ring											15.6	35.0									
	26.2	small bag	12.9																				
O- 08-036	15.2	Ring											24.4	34.0									
A-08-045	4.6	SPT	23.7				72.6		39.6	14.7	24.9												
A-08-046	0.3	Bulk																		520	1,100	6.4	328

Table II.1

Boring No.	Depth below grade (m)	Sample Type	In-situ Moisture (ASTM D2216)	Dry Unit Weight (ASTM D4767)	Particle Size Analysis (ASTM D422)				Plasticity Index & Liquid Limit (AASHTO T 89 & T90)			Consolidation (ASTM D2435)	Direct Shear (ASTM D3080)				Compaction Curve (ASTM D1557)		Expansion Index (ASTM D4829)	Corrosivity Testing			
													Undisturbed		Remolded								
			ω (% of dry wt)	γ (kN/m³)	GRAVEL (%) RETAINED on #4 Sieve	SAND (%) PASSING #4 and RETAINED on #200 sieve	FINES (SILT + CLAY) (%) PASSING No. 200	FINES (SILT + CLAY) (%) CLAY	LL	PL	PI		C (kPa)	ϕ°	C (kPa)	ϕ°	Maximum Dry Density (kN/m³)	Optimum Moisture Content (%)	EI value	Sulfate Content (ppm) (CTM 417)	Chloride Content (ppm) (CTM 422)	pH value (CTM 643)	Resistivity value (ohms-cms) (CTM 643)
A-08-048	1.2	Bulk			2.0	79.4	18.6								7.4	28.0	19.3	10.5		450	390	7.2	508
A-08-049	0.0	Bulk			21	43.9	35.1								15.6	28.0	19.9	9.5		14	75	6.2	2,208
A-08-050	2.6	Bulk			0	47.5	52.5								12.0	28.0	18.9	11.5		530	120	7.1	682
A-08-051	6.1	Bulk			0	41.2	58.8								8.9	29.0	18.7	13.0		250	96	6.6	937
DAR																							
A-08-037	0.3	Bulk			0.0	25.8	74.2		37.6	17.4	20.2									31	11	6.8	1,873
	1.5	Ring	18.5	15.8									18.7	29.0									
	4.6	Ring	20.3	16.8																			
	7.6	Ring	20.8	16.5																			
	11.6	Bulk																		590	820	6.7	408
	12.2	SPT	12.3		22.0	38.5	39.5		36.4	11.4	25.0												
	13.7	Ring	16.1	18.0									24.0	29.0									
	14.3	Bulk															18.5	12.0					
	16.8	Ring	15.5	18.7																			
	22.9	Ring	22.5	16.5																			
	38.1	Ring	19.0	17.3																			
A-08-038	6.1	Ring	19.4	17.5																			
	9.8	Bulk			1.0	20.1	78.9		41.8	16.8	25.0						18.8	11.0		770	21	7.4	937
	12.2	Ring	16.2	18.1									41.7	20.0									
	18.3	Ring	20.2	17.6																			
	24.4	Ring	14.3	17.1																			
	27.4	Ring											33.5	27.0									
	30.5	Ring	15.2	16.4																			
	33.5	Ring	20.2	16.7																			
A-08-039	0.3	Bulk			0.0	33.5	66.5		43.2	17.2	26.0									14	11	6.4	1,806
	1.5	Ring	21.3	15.0									10.5	34.0									
	6.7	Bulk			2.0	26.0	72.0		42.4	15.2	27.2						19.1	11.0					
	7.6	Ring	17.9	16.1									4.8	32.0									
	13.7	Ring	20.9	16.4																			
	19.8	Ring	20.0	15.0																			
	25.9	Ring	19.0	13.9																			
	32.0	Ring	18.6	17.2																			

Table II.1

Boring No.	Depth below grade (m)	Sample Type	In-situ Moisture (ASTM D2216)	Dry Unit Weight (ASTM D4767)	Particle Size Analysis (ASTM D422)				Plasticity Index & Liquid Limit (AASHTO T 89 & T90)			Consolidation (ASTM D2435)	Direct Shear (ASTM D3080)				Compaction Curve (ASTM D1557)		Expansion Index (ASTM D4829)	Corrosivity Testing			
													Undisturbed		Remolded								
			ω (% of dry wt)	γ (kN/m³)	GRAVEL (%) RETAINED on #4 Sieve	SAND (%) PASSING #4 and RETAINED on #200 sieve	FINES (SILT + CLAY) (%) PASSING No. 200	FINES (SILT + CLAY) (%) CLAY	LL	PL	PI		C (kPa)	ϕ°	C (kPa)	ϕ°	Maximum Dry Density (kN/m³)	Optimum Moisture Content (%)	EI value	Sulfate Content (ppm) (CTM 417)	Chloride Content (ppm) (CTM 422)	pH value (CTM 643)	Resistivity value (ohms-cms) (CTM 643)
A-08-040	0.3	Bulk			0.0	26.1	73.9		41.4	15.2	26.2									46	11	6.9	1,472
	3.0	Ring	22.6	15.8																			
	6.1	Ring	17.8	15.6																			
	6.7	Bulk			3.0	22.7	74.3		40.2	14.7	25.5						19.2	12.0					
	12.2	Ring	17.4	15.5																			
	21.3	Ring	16.5	16.7																			
	24.4	Ring	21.7	14.4																			
	30.5	Ring	20.0	17.3																			
A-08-041	0.3	Bulk			0.0	29.5	70.5		36.8	18.0	18.8									32	11	6.3	2,141
	1.5	Ring	20	14.6																			
	6.7	Bulk			1.0	23.4	75.6		37.3	16.1	21.2						18.8	13.0					
	4.6	Ring	19.1	16.2									14.8	29.0									
	10.7	Ring	16.9	15.9																			
	16.8	Ring	19.7	15.6																			
	22.9	Ring	18.2	17.5																			
	25.9	Ring	18.1	14.2																			
A-08-042	6.7	Bulk			2.0	24.7	73.3		39.0	15.1	23.9						18.5	12.5					
	6.1	Ring	20.0	17.3																			
	12.2	Ring	20.0	15.6																			
	18.3	Ring	20.3	16.7																			
	21.3	Ring	29.6	14.7																			
A-08-043	1.5	Ring	18.5	15.2																			
	7.6	Ring	18.6	14.7																			
	13.7	Ring	10.2	18.7																			
	16.8	Ring	18.4	16.6																			
	19.8	Ring	18.7	14.0																			
A-08-044	2.1	Bulk			1.0	18.0	81.0		42.0	16.6	25.4						18.8	12.5		150	64	6.9	1,137
	3.0	Ring	21.5	16.0								see graph											
	6.1	Ring	13.5	17.7									13.4	34.0									
	9.1	Ring	20.3	15.6																			
	15.2	Ring	21.1	16.6																			
	22.9	Ring	18.3	16.8																			
MRW																							
A-08-001	2..4	Bulk				30.0	62.0		46.0	16.0	30.0				14.6	24.0	18.6	12.5	82.0	400	400	7.8	515

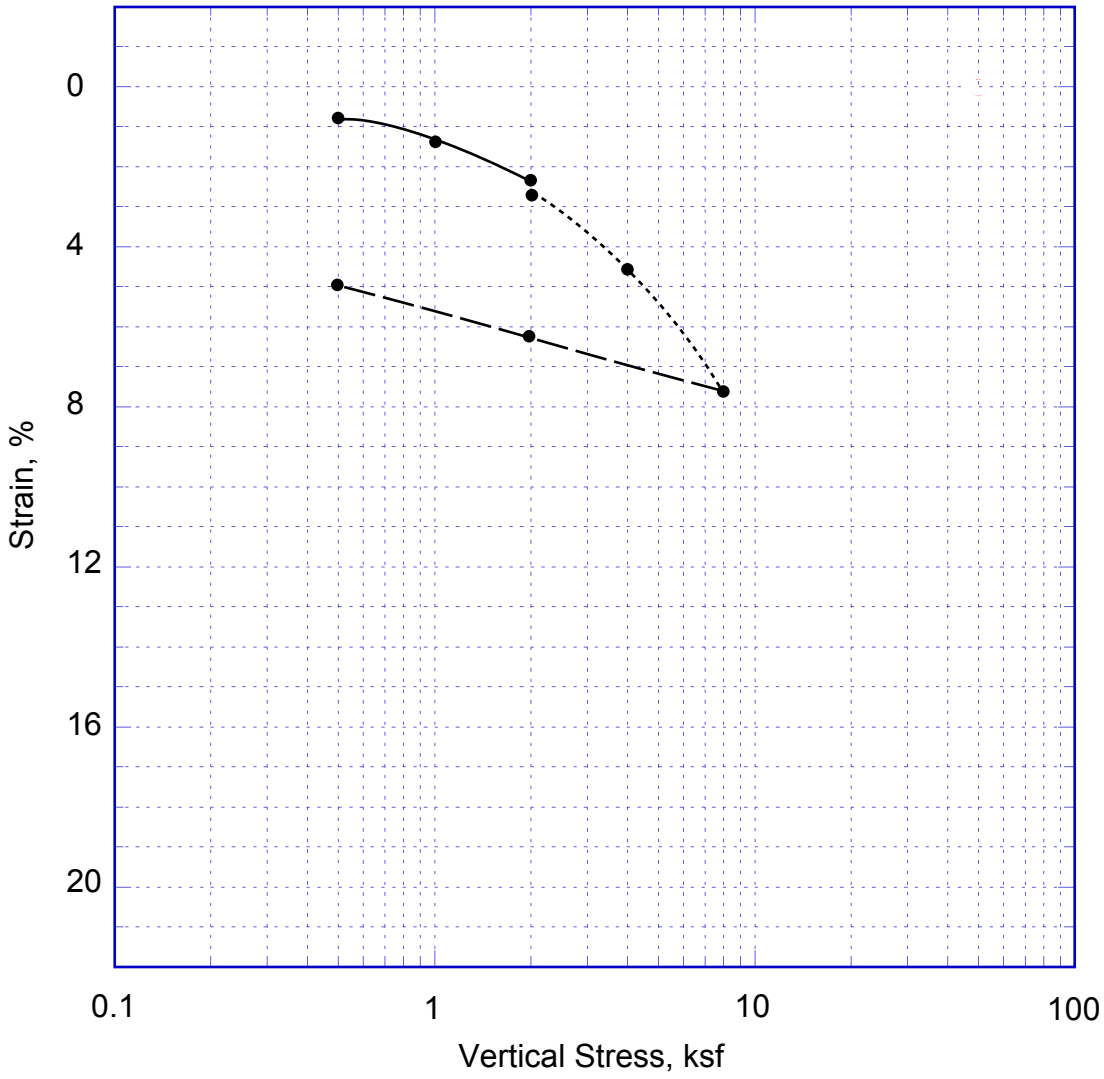
Table II.1

Boring No.	Depth below grade (m)	Sample Type	In-situ Moisture (ASTM D2216)	Dry Unit Weight (ASTM D4767)	Particle Size Analysis (ASTM D422)				Plasticity Index & Liquid Limit (AASHTO T 89 & T90)			Consolidation (ASTM D2435)	Direct Shear (ASTM D3080)				Compaction Curve (ASTM D1557)		Expansion Index (ASTM D4829)	Corrosivity Testing			
													Undisturbed		Remolded								
			w (% of dry wt)	γ (kN/m³)	GRAVEL (%) RETAINED on #4 Sieve	SAND (%) PASSING #4 and RETAINED on #200 sieve	FINES (SILT + CLAY) (%) PASSING No. 200	FINES (SILT + CLAY) (%) CLAY	LL	PL	PI		C (kPa)	ϕ°	C (kPa)	ϕ°	Maximum Dry Density (kN/m³)	Optimum Moisture Content (%)	EI value	Sulfate Content (ppm) (CTM 417)	Chloride Content (ppm) (CTM 422)	pH value (CTM 643)	Resistivity value (ohms-cms) (CTM 643)
	3.0	Ring	15.0	16.0								see graph	4.1	40.0									
	6.1	SPT	18.2																				
	8.2	Bulk	18.4		4.0	17.0	79.0		43.0	15.0	28.0				13.9	25.0	18.5	12.0	90.0	280	150	6.7	870
	9.1	Ring	12.9	18.7								see graph											
	12.2	S	19.8																				
	14.0	Bulk	21.1		0.0	19.0	81.0		42.0	16.0	26.0									410	330	6.6	515
	15.2	Ring	22.8	16.5								see graph											
	18.3	SPT	19.6																				
A-08-002	3.0	SPT	21.6																				
	6.1	Ring	24.5	13.6								see graph	4.5	37.0									
	6.1	Bulk			4.0	33.0	63.0		39.0	13.0	26.0								74.0	380	500	7.1	468
	9.1	SPT	17.6																				
A-08-003	3.0	SPT	12.8																				
	5.2	Bulk			16.0	27.0	57.0		43.0	15.0	28.0				14.9	24.0	18.8	12.5	94.0	460	680	7.7	381
	6.1	Ring	12.7	14.6									15.8	32.0									
	9.1	SPT	13.1																				
	9.4	Bulk			17.0	50.0	33.0		40.0	14.0	26.0								73.0	520	650	6.9	401
A-08-004	1.5	Bulk			6.0	34.0	60.0		30.0	12.0	18.0				15.3	25.0	19.6	10.0	57.0	390	980	6.8	341
	3.0	Ring	12.8	17.8								see graph	18.3	37.0									
	3.3	Bulk			17.0	32.0	51.0		33.0	14.0	19.0								48.0	510	890	7.4	341
	6.1	SPT	13.1																				
	6.4	Bulk			4.0	36.0	60.0		36.0	26.0	10.0				8.4	27.0	19.4	11.5	55.0	310	420	7.3	515
A-08-005	3.0	Ring	16.1	16.9								see graph	10.6	37.0									
	3.0	Bulk			15.0	23.0	62.0		45.0	16.0	29.0								85.0	510	700	7.0	375
	6.1	SPT	17.1																				
	9.1	Ring	16.2	17.8								see graph	28.0	34.0									
	9.1	Bulk			11.0	25.0	64.0		37.0	15.0	22.0								51.0	200	350	6.9	488
	12.2	SPT	19.0																				
A-08-007	1.5	SPT	6.9																				
	1.8	Bulk	6.1		27.0	39.7	33.3		25.5	11.2	14.0						20.4	9.0		260	160	6.5	1,004
	3.0	SPT	19.2		0.0	30.1	69.9																
	3.4	Bulk	11.6		5.0	24.1	70.9		46.7	16.2	30.5												
	4.6	Ring	22.2	16.1								see graph	13.2	43.0									

Table II.1

Boring No.	Depth below grade (m)	Sample Type	In-situ Moisture (ASTM D2216)	Dry Unit Weight (ASTM D4767)	Particle Size Analysis (ASTM D422)				Plasticity Index & Liquid Limit (AASHTO T 89 & T90)			Consolidation (ASTM D2435)	Direct Shear (ASTM D3080)				Compaction Curve (ASTM D1557)		Expansion Index (ASTM D4829)	Corrosivity Testing			
													Undisturbed		Remolded								
			ω (% of dry wt)	γ (kN/m³)	GRAVEL (%) RETAINED on #4 Sieve	SAND (%) PASSING #4 and RETAINED on #200 sieve	FINES (SILT + CLAY) (%)		LL	PL	PI		C (kPa)	ϕ°	C (kPa)	ϕ°	Maximum Dry Density (kN/m³)	Optimum Moisture Content (%)	EI value	Sulfate Content (ppm) (CTM 417)	Chloride Content (ppm) (CTM 422)	pH value (CTM 643)	Resistivity value (ohms-cms) (CTM 643)
							PASSING No. 200	CLAY															
A-08-008	0.3	Bulk			6.0	23.5	70.5		40.2	13.0	27.2				8.9	26.0	18.4	13.0	49.0	790	780	6.8	388
	1.5	Ring	19.6	16.8	3.8	24.1	72.1																
	3.0	SPT	13.9		15.0	25.0	60.0																
A-08-009	1.5	Ring	12.4	16.5	14.0	40.8	45.2																
	1.8	Bulk			12.0	32.0	56.0		36.0	14.3	21.7								42.0	500	290	6.5	650
	3.0	SPT	6.9		6.0	46.7	47.3																
	3.4	Bulk																					
	4.6	Ring	15.5	17.1								see graph	51.7	37.0									
A-08-010	1.5	SPT	16.7		2.0	35.6	62.4																
	2.4	Bulk			18.0	34.5	47.5		37.3	8.7	28.6				7.9	28.0	19.0	10.5	47.0	640	170	6.8	603
	3.0	Bulk	18.2	15.9	49.0	35.3	15.7					see graph	20.6	25.0									
A-08-052	4.6	Ring	19.4	16.1									14.6	27.0									
	13.7	Ring	16.8	16.3								see graph											
A-08-053	6.1	Ring	15.4	14.6									15.3	28.0									
A-08-054	12.2	Ring	13.3	17.2									24.2	28.0									
A-08-055	1.5	Ring	13.2	15.1									12.7	30.0									
A-08-056	16.8	Ring	13.1	18.1								see graph	21.8	34.0									

Soil Consolidation



——————— Sample Loaded @ Field Moisture

---------- Sample Saturated

— — — — — Sample Tested Under Rebound Loading

Boring Location: A-08-001 [445+25 10 RT]
Depth: 3.0 m
Soil Classification (USCS): CL

NOTE: This figure may contain areas of color. TESD cannot be responsible for any subsequent misinterpretation of the information resulting from black and white reproductions of this figure.

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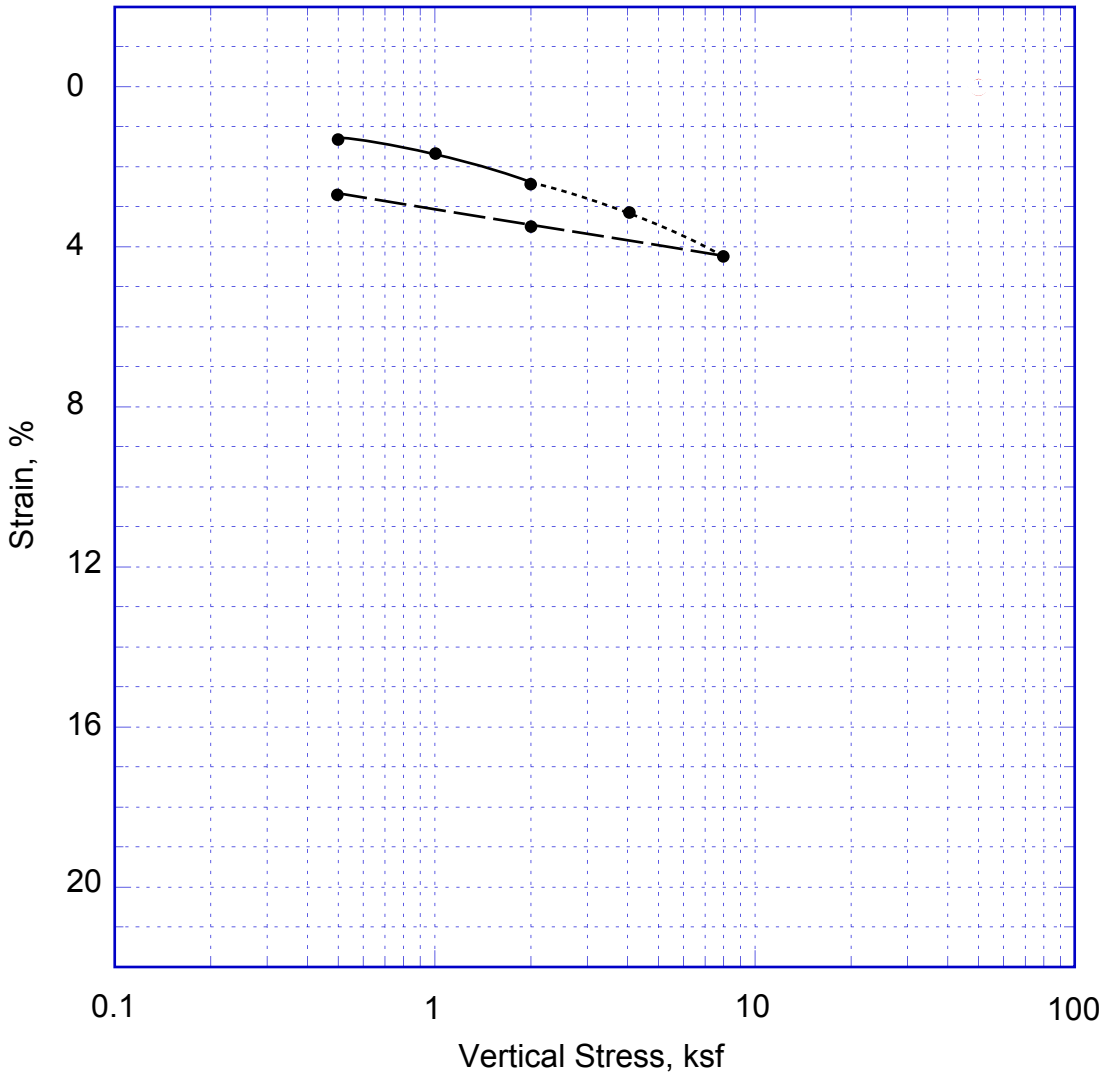
Bureau Veritas North America, Inc.
7895 Convoy Court, Suite 18
San Diego, CA 92111
Tel: (858) 715-5800 Fax: (858) 715-5810

Title:	**Consolidation Test Result**		
Project:	I805 / Miscellaneous Retaining Walls		
Drawn:	NJT	Contract No:	38008-017046.00
Date:	October, 2008	Figure:	II-1

Soil Consolidation



——————— Sample Loaded @ Field Moisture

---------- Sample Saturated

— — — — — Sample Tested Under Rebound Loading

Boring Location: A-08-001 [445+25 10 RT]
Depth: 9.1 m
Soil Classification (USCS): CL

NOTE: This figure may contain areas of color. TESD cannot be responsible for any subsequent misinterpretation of the information resulting from black and white reproductions of this figure.

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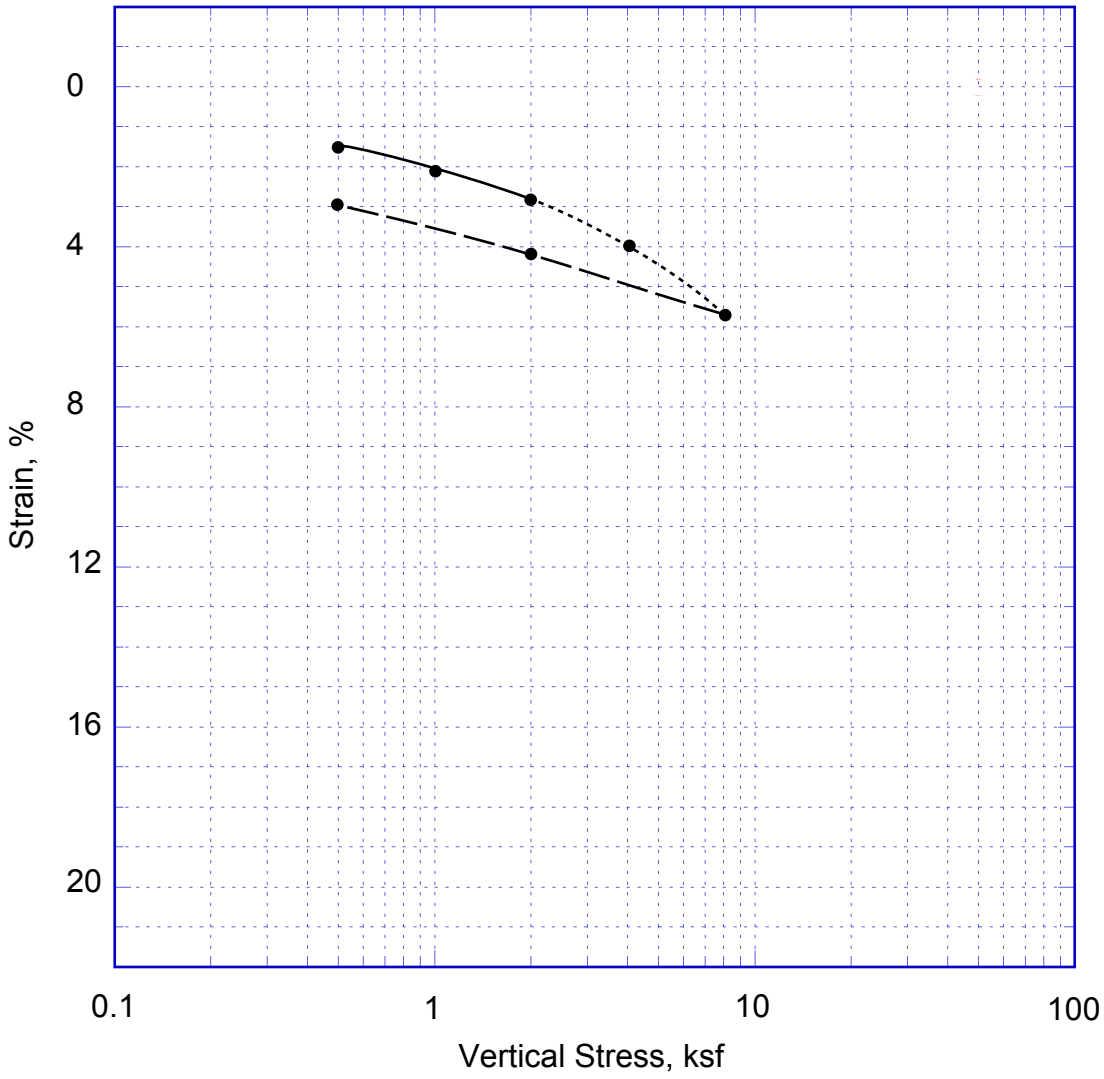
Bureau Veritas North America, Inc.
7895 Convoy Court, Suite 18
San Diego, CA 92111
Tel: (858) 715-5800 Fax: (858) 715-5810

Title:	**Consolidation Test Result**
Project:	I805 / Miscellaneous Retaining Walls

Drawn:	NJT	Contract No:	38008-017046.00
Date:	October, 2008	Figure:	II-2

Soil Consolidation



——————— Sample Loaded @ Field Moisture

---------- Sample Saturated

— — — — — Sample Tested Under Rebound Loading

Boring Location: A-08-001 [445+25 10 RT]
Depth: 15.2 m
Soil Classification (USCS): CL

NOTE: This figure may contain areas of color. TESD cannot be responsible for any subsequent misinterpretation of the information resulting from black and white reproductions of this figure.

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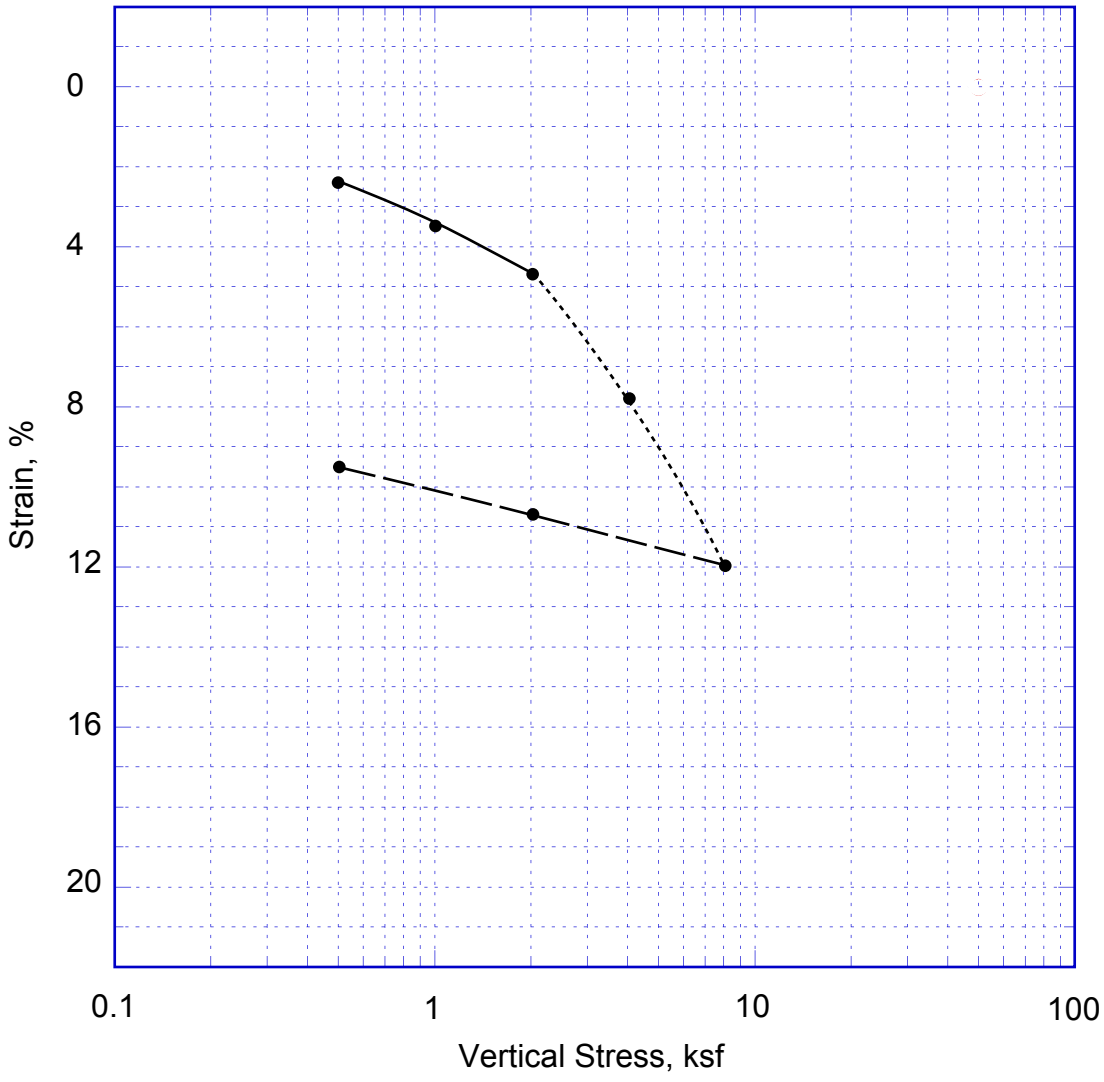
Bureau Veritas North America, Inc.
7895 Convoy Court, Suite 18
San Diego, CA 92111
Tel: (858) 715-5800 Fax: (858) 715-5810

Title:	**Consolidation Test Result**
Project:	I805 / Miscellaneous Retaining Walls

Drawn:	NJT	Contract No:	38008-017046.00
Date:	October, 2008	Figure:	II-3

Soil Consolidation



——————— Sample Loaded @ Field Moisture

---------- Sample Saturated

— — — — — Sample Tested Under Rebound Loading

Boring Location: A-08-002 [445+15 15 RT]
Depth: 6.1 m
Soil Classification (USCS): CL

NOTE: This figure may contain areas of color. TESD cannot be responsible for any subsequent misinterpretation of the information resulting from black and white reproductions of this figure.

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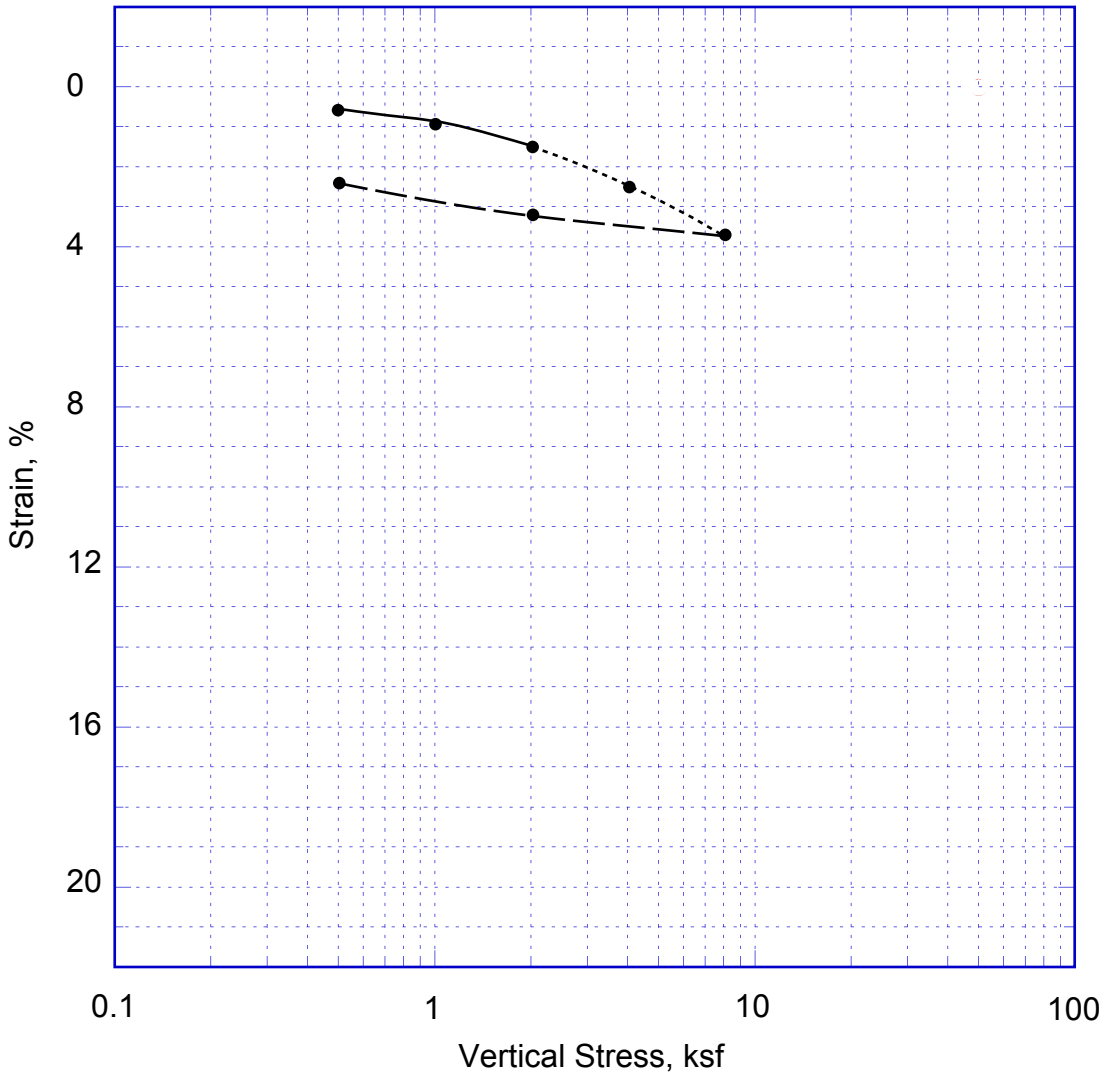
San Diego, CA 92111
Tel: (858) 715-5800 Fax: (858) 715-5810

Title:	**Consolidation Test Result**
Project:	I805 / Miscellaneous Retaining Walls

Drawn:	NJT	Contract No:	38008-017046.00
Date:	October, 2008	Figure:	II-4

Soil Consolidation



——————— Sample Loaded @ Field Moisture

---------- Sample Saturated

— — — — — Sample Tested Under Rebound Loading

Boring Location: A-08-004 [444+10 CL]
Depth: 3.0 m
Soil Classification (USCS): CL

NOTE: This figure may contain areas of color. TESD cannot be responsible for any subsequent misinterpretation of the information resulting from black and white reproductions of this figure.

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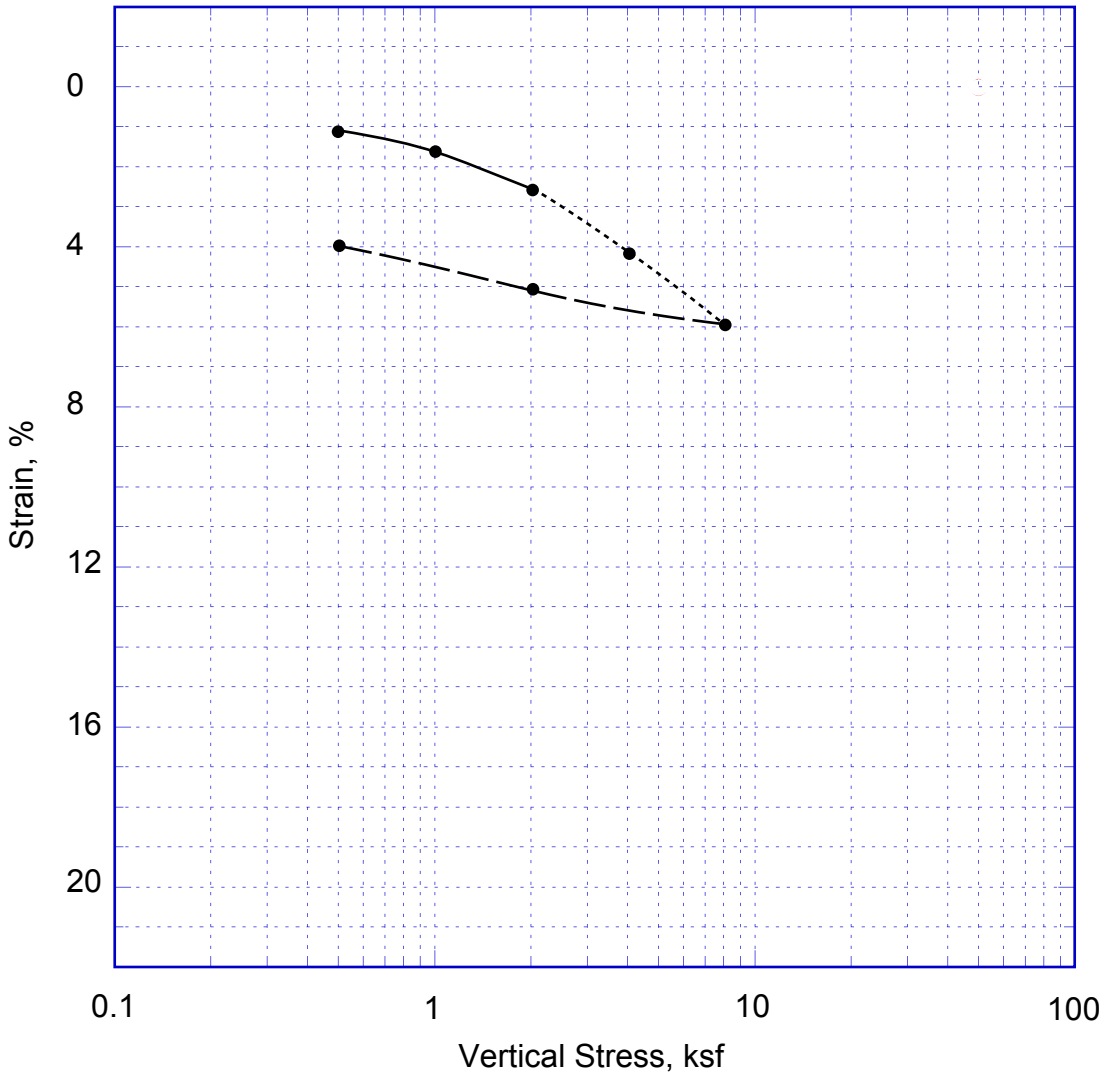
Bureau Veritas North America, Inc.
7895 Convoy Court, Suite 18
San Diego, CA 92111
Tel: (858) 715-5800 Fax: (858) 715-5810

Title:	**Consolidation Test Result**
Project:	I805 / Miscellaneous Retaining Walls

Drawn:	NJT	Contract No:	38008-017046.00
Date:	October, 2008	Figure:	II-5

Soil Consolidation



——————— Sample Loaded @ Field Moisture

---------- Sample Saturated

— — — — — Sample Tested Under Rebound Loading

SCHEMATIC ONLY - NOT A CONSTRUCTION DRAWING

Boring Location: A-08-005 [444+85 15 LT]
Depth: 3.0 m
Soil Classification (USCS): CL

Bureau Veritas North America, Inc.
7895 Convoy Court, Suite 18
San Diego, CA 92111
Tel: (858) 715-5800 Fax: (858) 715-5810

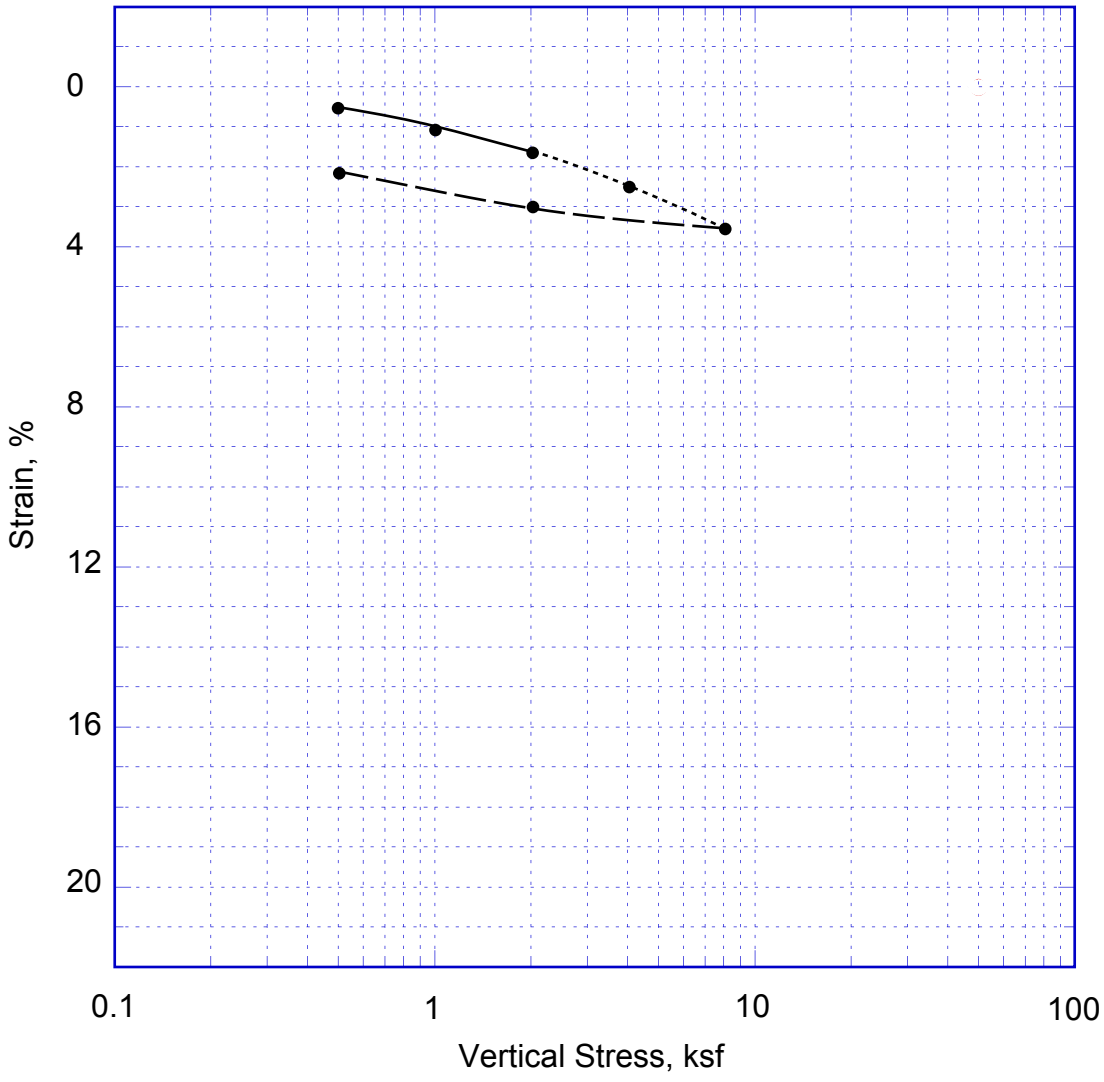
Title: **Consolidation Test Result**

Project: I805 / Miscellaneous Retaining Walls

Drawn:	NJT	Contract No:	38008-017046.00
Date:	October, 2008	Figure:	II-6

NOTE: This figure may contain areas of color. TESD cannot be responsible for any subsequent misinterpretation of the information resulting from black and white reproductions of this figure.

Soil Consolidation



——————— Sample Loaded @ Field Moisture

---------- Sample Saturated

— — — — — Sample Tested Under Rebound Loading

Boring Location: A-08-005 [444+85 15 LT]
Depth: 9.1 m
Soil Classification (USCS): CL

NOTE: This figure may contain areas of color. TESD cannot be responsible for any subsequent misinterpretation of the information resulting from black and white reproductions of this figure.

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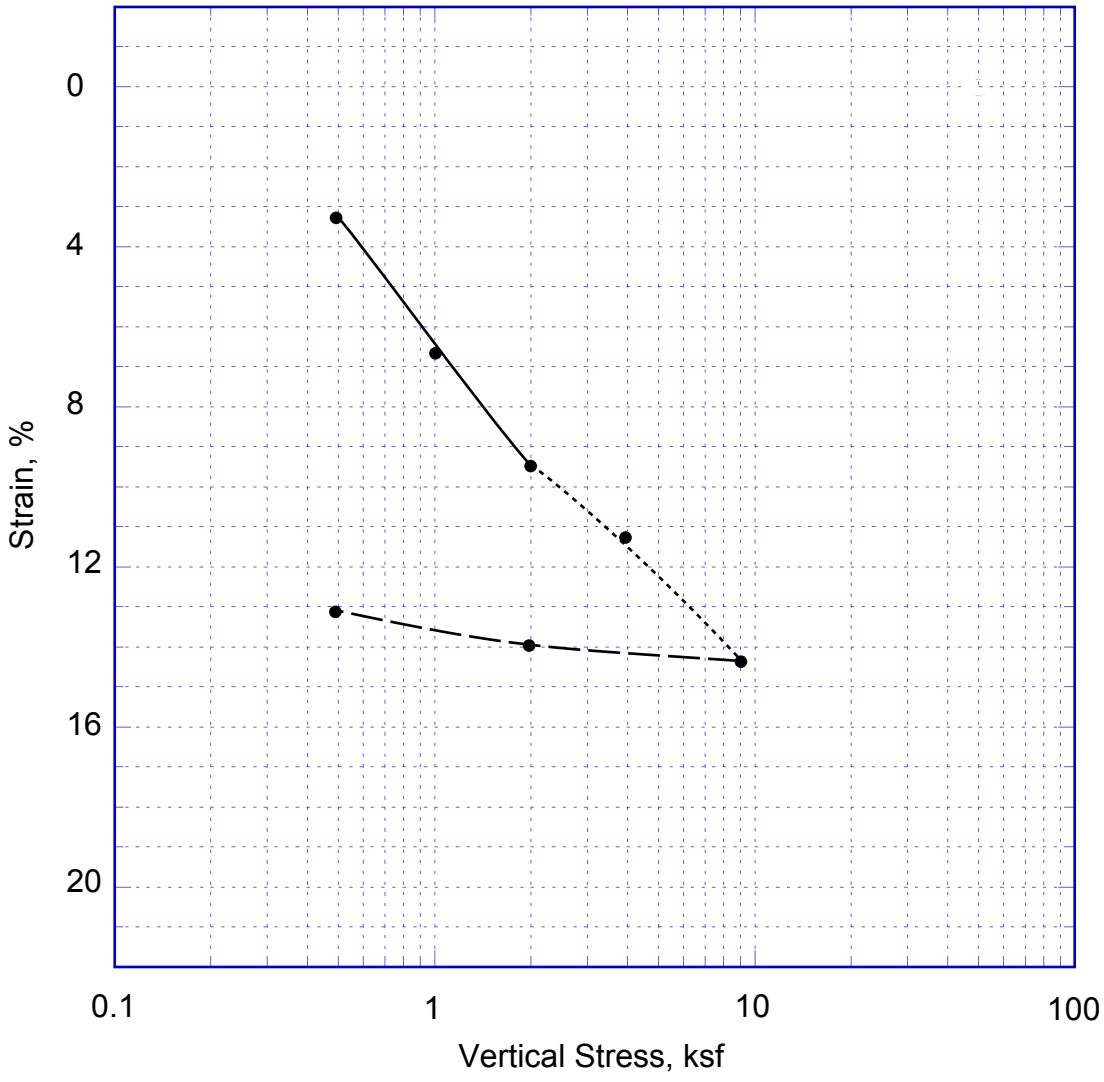
Bureau Veritas North America, Inc.
7895 Convoy Court, Suite 18
San Diego, CA 92111
Tel: (858) 715-5800 Fax: (858) 715-5810

Title:	**Consolidation Test Result**
Project:	I805 / Miscellaneous Retaining Walls

Drawn:	NJT	Contract No:	38008-017046.00
Date:	October, 2008	Figure:	II-7

Soil Consolidation



Sample Loaded @ Field Moisture

Sample Saturated

Sample Tested Under Rebound Loading

SCHEMATIC ONLY - NOT A CONSTRUCTION DRAWING

Boring Location: A-08-006 [441+82 6LT]
Depth: 3.0 m
Soil Classification (USCS): SC

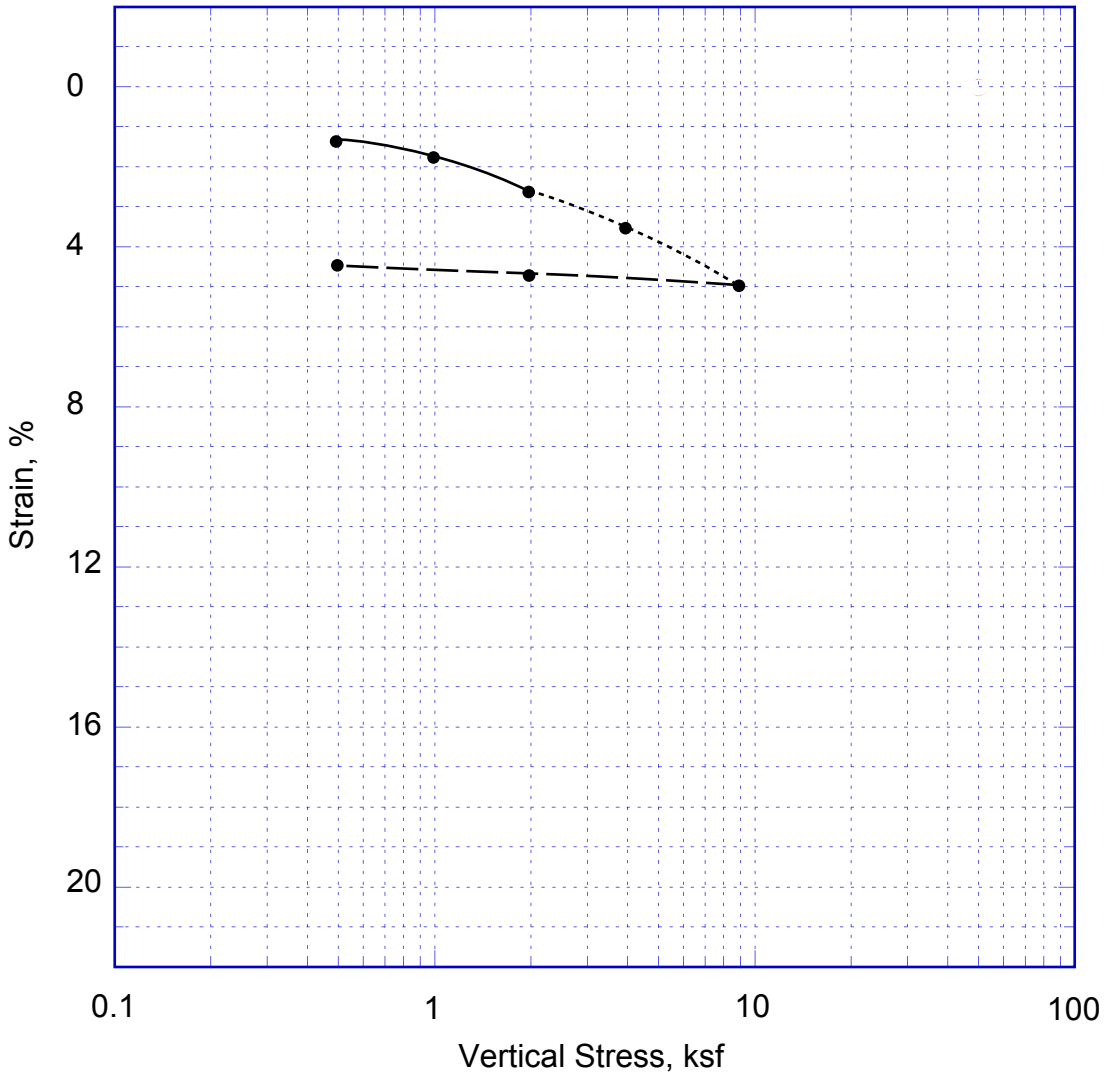
Bureau Veritas North America, Inc.
7895 Convoy Court, Suite 18
San Diego, CA 92111
Tel: (858) 715-5800 Fax: (858) 715-5810

Title: **Consolidation Test Result**

Project:	Carroll Canyon Road Bridge		
Drawn:	NJT	Contract No:	38008-017046.00
Date:	September, 2008	Figure:	II-8

NOTE: This figure may contain areas of color. TESD cannot be responsible for any subsequent misinterpretation of the information resulting from black and white reproductions of this figure.

Soil Consolidation



——————— Sample Loaded @ Field Moisture

---------- Sample Saturated

— — — — — Sample Tested Under Rebound Loading

SCHEMATIC ONLY - NOT A CONSTRUCTION DRAWING

Boring Location: A-08-006 [441+82 6LT]
Depth: 9.1 m
Soil Classification (USCS): SM

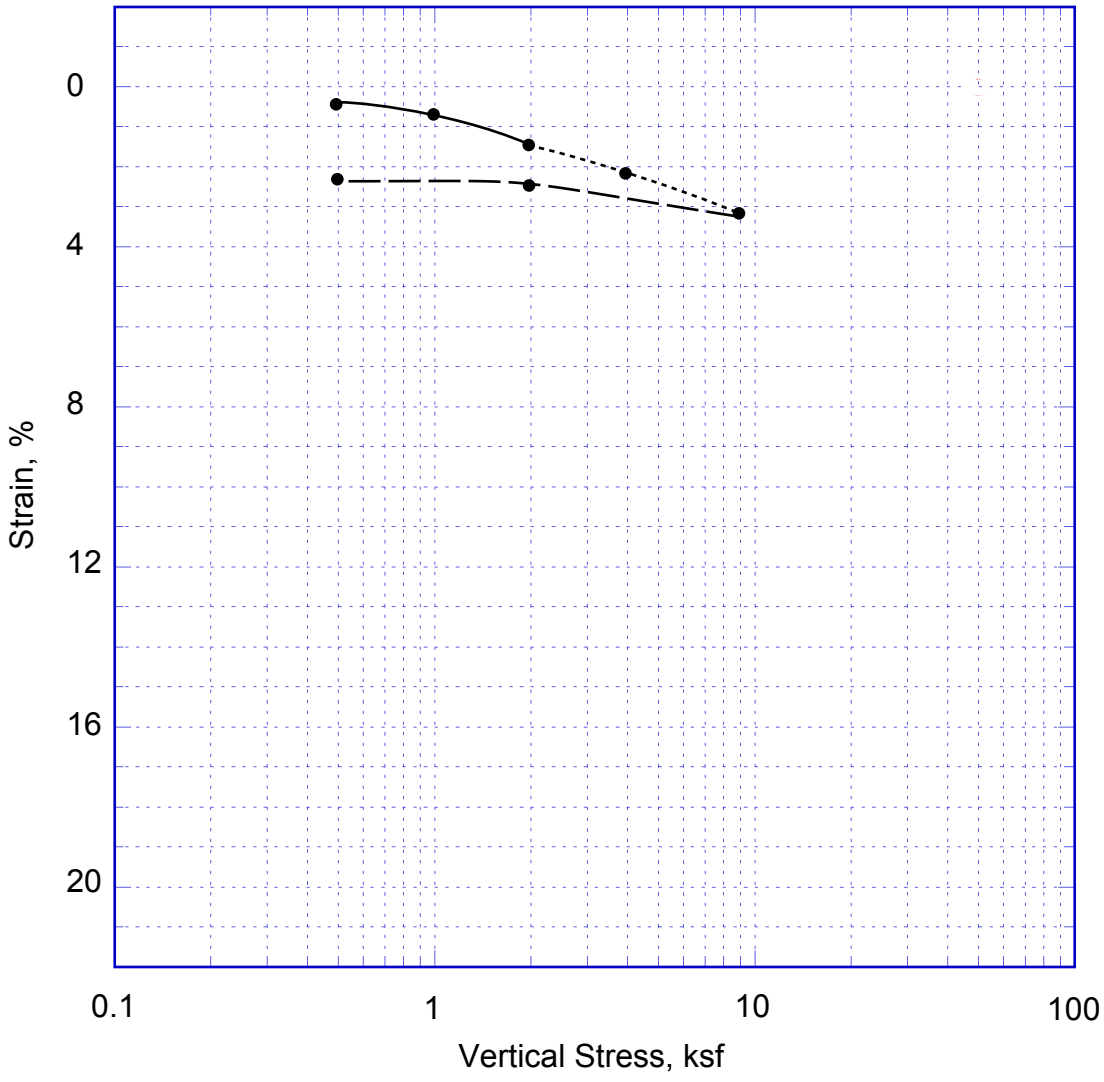
Bureau Veritas North America, Inc.
7895 Convoy Court, Suite 18
San Diego, CA 92111
Tel: (858) 715-5800 Fax: (858) 715-5810

Title:	**Consolidation Test Result**
Project:	Carroll Canyon Road Bridge

Drawn:	NJT	Contract No:	38008-017046.00
Date:	September, 2008	Figure:	II-9

NOTE: This figure may contain areas of color. TESD cannot be responsible for any subsequent misinterpretation of the information resulting from black and white reproductions of this figure.

Soil Consolidation



——————— Sample Loaded @ Field Moisture

---------- Sample Saturated

— — — — — Sample Tested Under Rebound Loading

SCHEMATIC ONLY - NOT A CONSTRUCTION DRAWING

Boring Location: A-08-007 [443+82 6RT]
Depth: 4.6 m
Soil Classification (USCS): SC

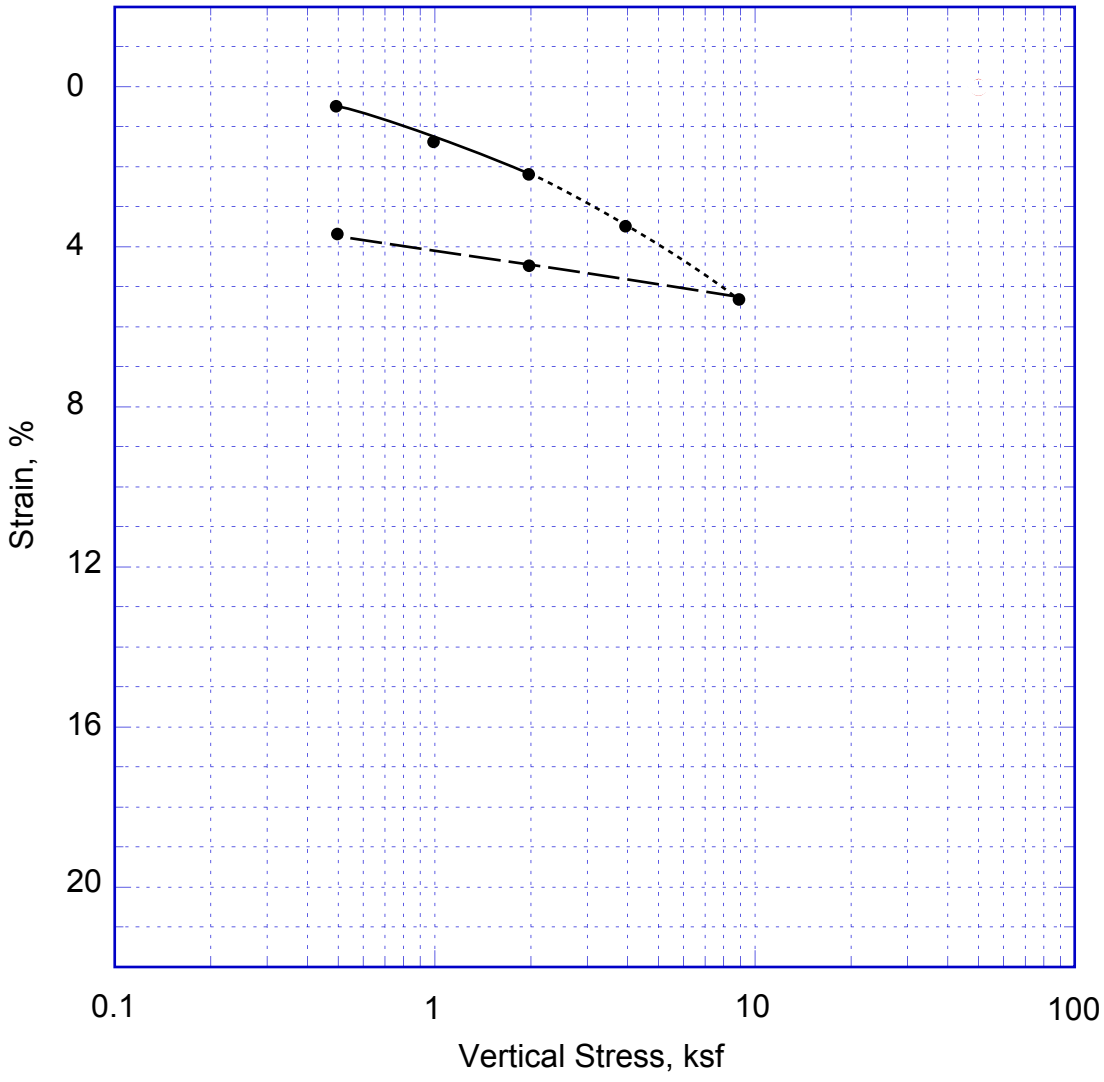
Bureau Veritas North America, Inc.
7895 Convoy Court, Suite 18
San Diego, CA 92111
Tel: (858) 715-5800 Fax: (858) 715-5810

Title: **Consolidation Test Result**

Project:	Carroll Canyon Road Bridge		
Drawn:	NJT	Contract No:	38008-017046.00
Date:	September, 2008	Figure:	II-10

NOTE: This figure may contain areas of color. TESD cannot be responsible for any subsequent misinterpretation of the information resulting from black and white reproductions of this figure.

Soil Consolidation



——————— Sample Loaded @ Field Moisture

---------- Sample Saturated

— — — — — Sample Tested Under Rebound Loading

SCHEMATIC ONLY - NOT A CONSTRUCTION DRAWING

Boring Location: A-08-009 [443+82 6LT]
Depth: 4.6 m
Soil Classification (USCS): SC

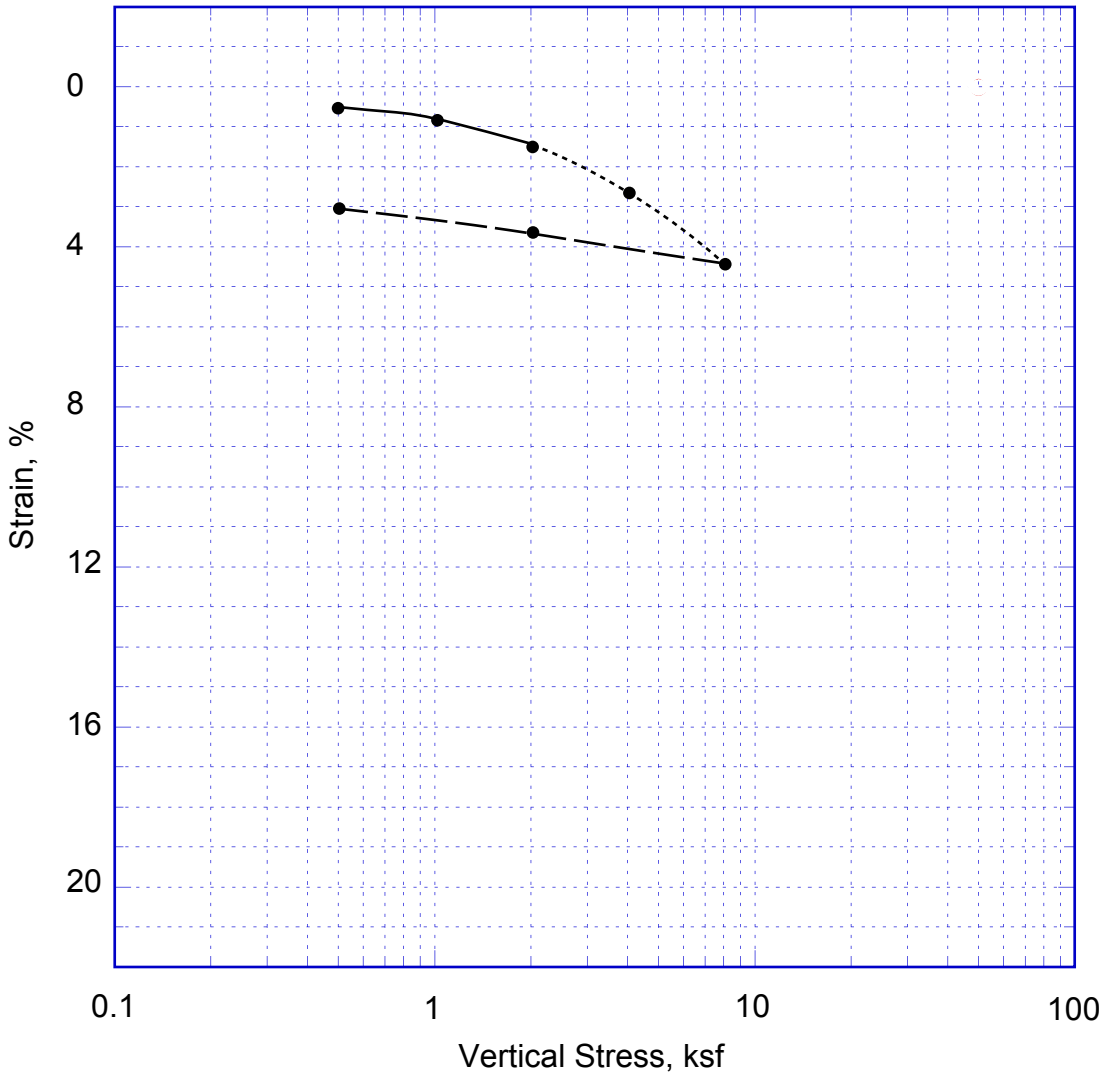
Bureau Veritas North America, Inc.
7895 Convoy Court, Suite 18
San Diego, CA 92111
Tel: (858) 715-5800 Fax: (858) 715-5810

Title: **Consolidation Test Result**

Project:	Carroll Canyon Road Bridge		
Drawn:	NJT	Contract No:	38008-017046.00
Date:	September, 2008	Figure:	II-11

NOTE: This figure may contain areas of color. TESD cannot be responsible for any subsequent misinterpretation of the information resulting from black and white reproductions of this figure.

Soil Consolidation



——————— Sample Loaded @ Field Moisture

---------- Sample Saturated

— — — — — Sample Tested Under Rebound Loading

SCHEMATIC ONLY - NOT A CONSTRUCTION DRAWING

Boring Location: A-08-010 [444+00 15 RT]
Depth: 3.0 m
Soil Classification (USCS): SM

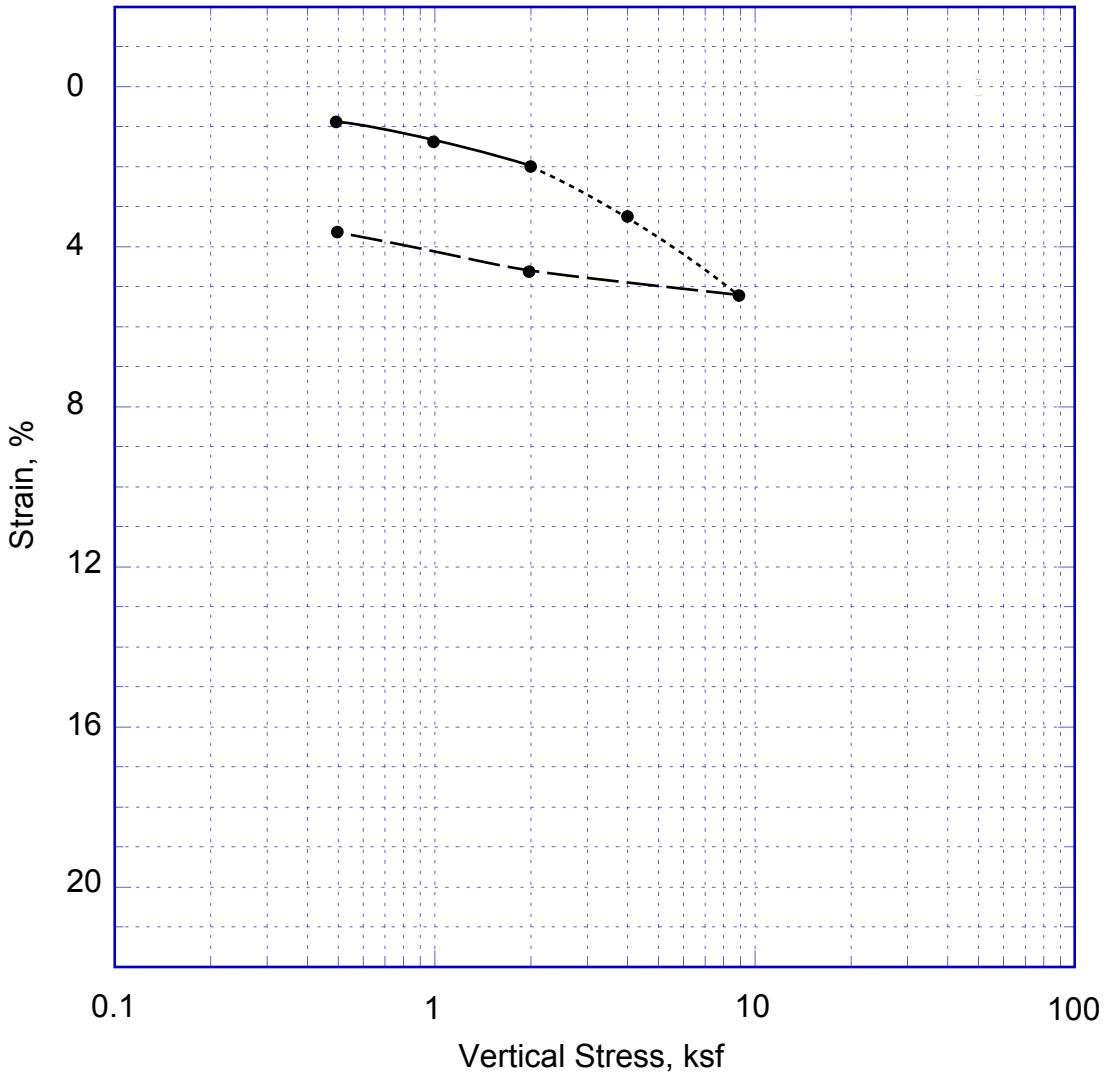
Bureau Veritas North America, Inc.
7895 Convoy Court, Suite 18
San Diego, CA 92111
Tel: (858) 715-5800 Fax: (858) 715-5810

Title: **Consolidation Test Result**

Project:	I805 / Miscellaneous Retaining Walls		
Drawn:	NJT	Contract No:	38008-017046.00
Date:	October, 2008	Figure:	II-12

NOTE: This figure may contain areas of color. TESD cannot be responsible for any subsequent misinterpretation of the information resulting from black and white reproductions of this figure.

Soil Consolidation



——————— Sample Loaded @ Field Moisture

---------- Sample Saturated

— — — — — Sample Tested Under Rebound Loading

Boring Location: A-08-044 [444+50 3RT]
Depth: 3.0 m
Soil Classification (USCS): SC

NOTE: This figure may contain areas of color. BVNA cannot be responsible for any subsequent misinterpretation of the information resulting from black and white reproductions of this figure.

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Bureau Veritas North America, Inc.
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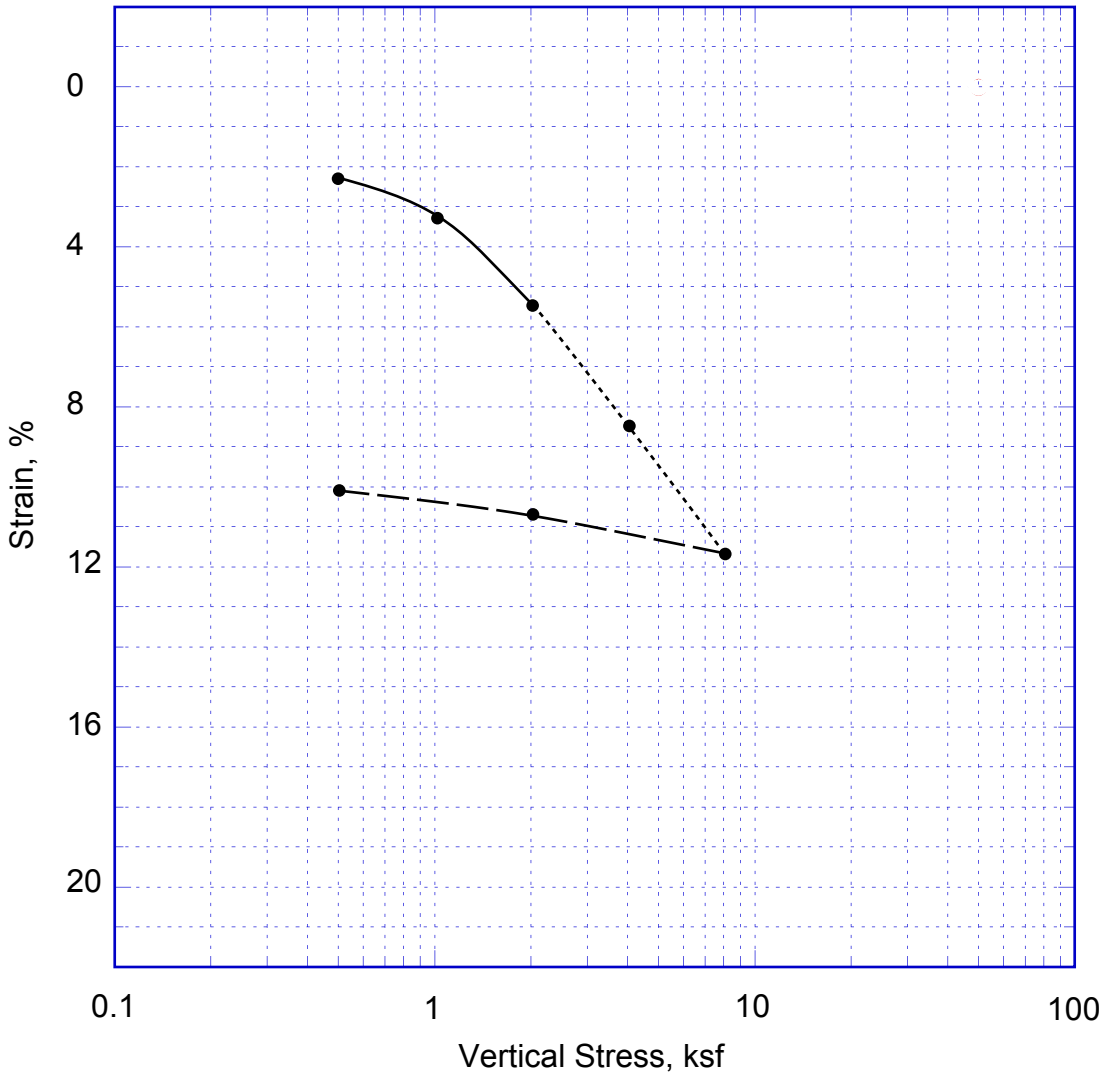
San Diego, CA 92111
Tel: (858) 715-5800 Fax: (858) 715-5810

Title:	**Consolidation Test Result**
Project:	DAR Retaining Walls

Drawn:	NJT	Contract No:	38008-017046.00
Date:	December, 2008	Figure:	II-13

Soil Consolidation



Sample Loaded @ Field Moisture

Sample Saturated

Sample Tested Under Rebound Loading

SCHEMATIC ONLY - NOT A CONSTRUCTION DRAWING

Boring Location: A-08-052 [445+60]
Depth: 13.7 m
Soil Classification (USCS): CL

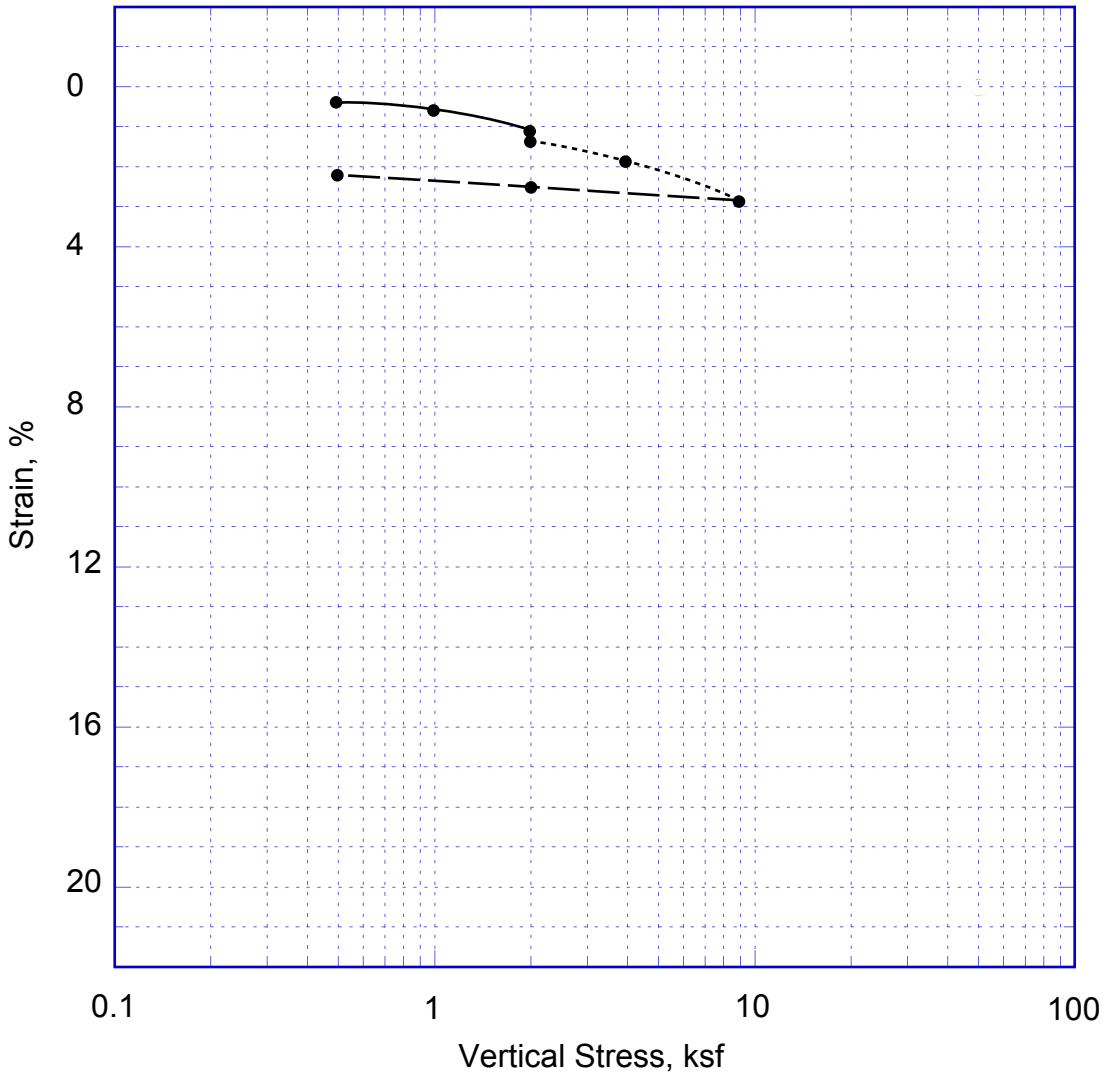
Bureau Veritas North America, Inc.
7895 Convoy Court, Suite 18
San Diego, CA 92111
Tel: (858) 715-5800 Fax: (858) 715-5810

Title:	**Consolidation Test Result**
Project:	I805 / Miscellaneous Retaining Walls

Drawn:	NJT	Contract No:	38008-017046.00
Date:	October, 2008	Figure:	II-14

NOTE: This figure may contain areas of color. TESD cannot be responsible for any subsequent misinterpretation of the information resulting from black and white reproductions of this figure.

Soil Consolidation



——————— Sample Loaded @ Field Moisture

---------- Sample Saturated

— — — — — Sample Tested Under Rebound Loading

SCHEMATIC ONLY - NOT A CONSTRUCTION DRAWING

Boring Location: A-08-056 [447+35]
Depth: 16.8 m
Soil Classification (USCS): SC

Bureau Veritas North America, Inc.
7895 Convoy Court, Suite 18
San Diego, CA 92111
Tel: (858) 715-5800 Fax: (858) 715-5810

Title: **Consolidation Test Result**

Project: Miscellaneous Retaining Walls

Drawn:	NJT	Contract No:	38008-017046.00
Date:	December, 2008	Figure:	II-15

NOTE: This figure may contain areas of color. BVNA cannot be responsible for any subsequent misinterpretation of the information resulting from black and white reproductions of this figure.

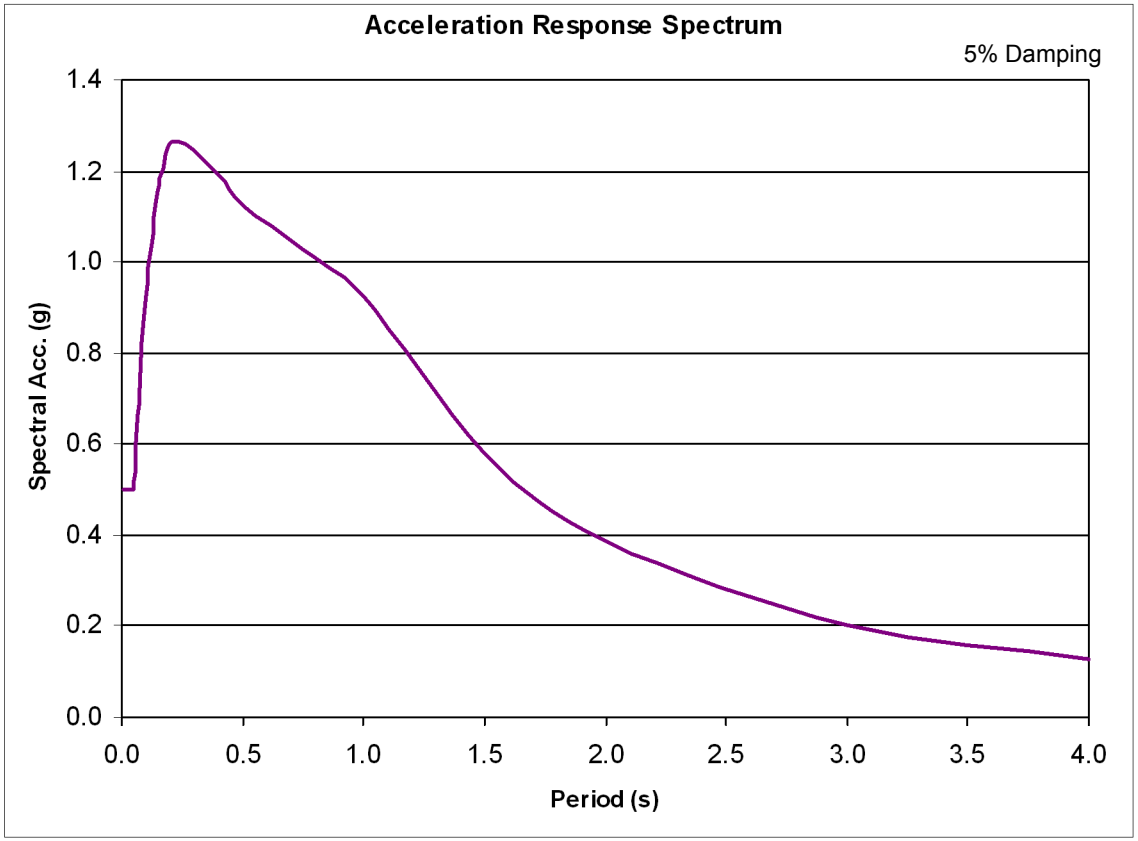
APPENDIX III

ANALYSES AND CALCULATIONS

APPENDIX III.1

SEISMIC ANALYSES DATA

Period (s)	ARS (g)[1]
0.010	0.5003
0.020	0.5003
0.030	0.5002
0.050	0.5002
0.075	0.7192
0.100	0.9186
0.120	1.0367
0.150	1.1564
0.170	1.2091
0.200	1.2591
0.240	1.2660
0.300	1.2467
0.400	1.1898
0.500	1.1249
0.750	1.0258
1.000	0.9267
1.500	0.5807
2.000	0.3856
3.000	0.2038
4.000	0.1277



Fault: Newport-Inglewood-Rose Canyon/East
Style: Strike-Slip
Magnitude 7
R(km) 6.1
PBA 0.5g
Note: ARS curve was obtained from Fig B-8 of Seismic Design Criteria, June 2006, Version 1.4
[1] Spectral Acceleration Values were magnified by 20% for T >= 1.0 seconds, since project site is within 15 km of an active fault zone

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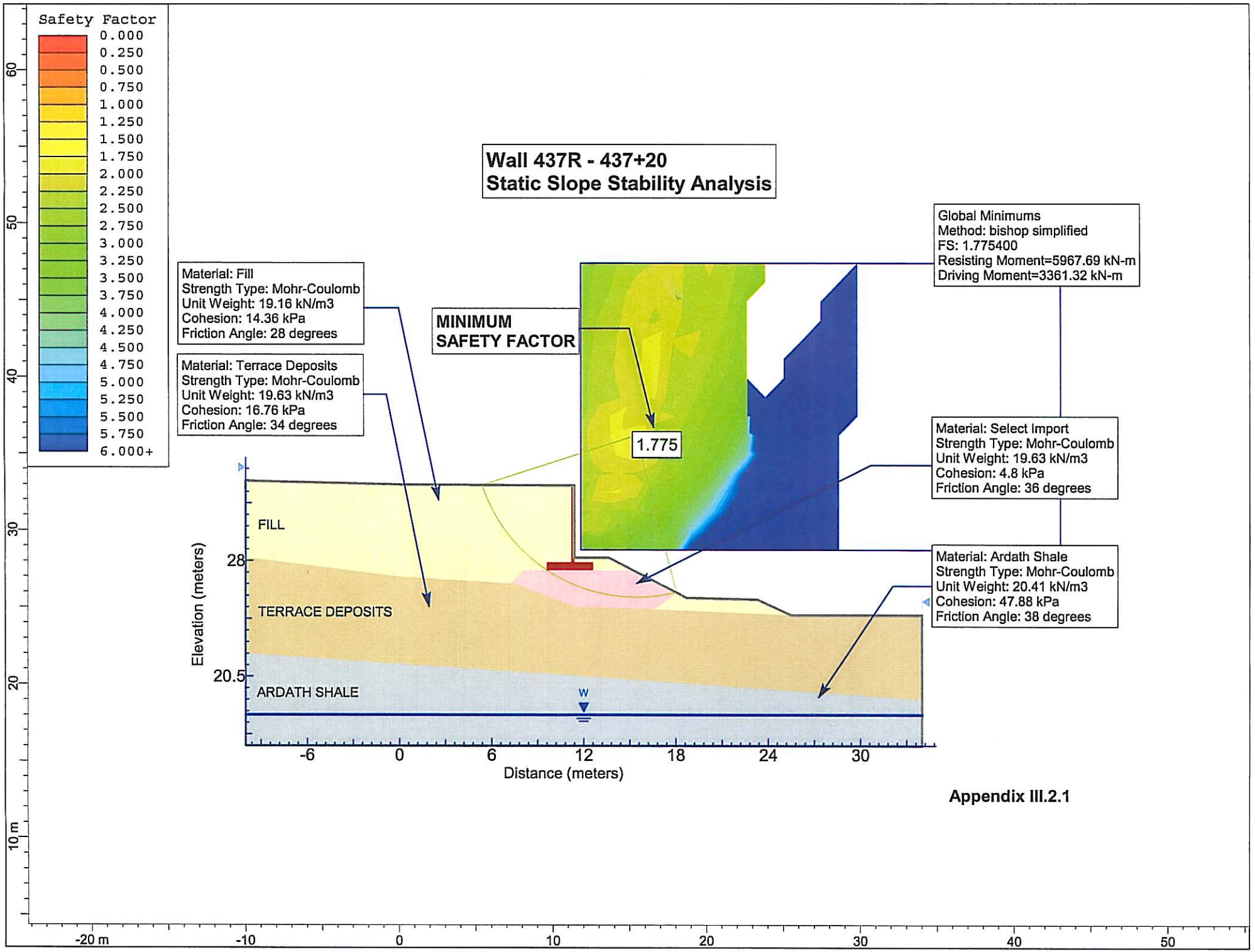
BUREAU VERITAS NORTH AMERICA, INC.
Testing Engineers San Diego
7895 Convoy Court, Suite 18
San Diego, CA 92111

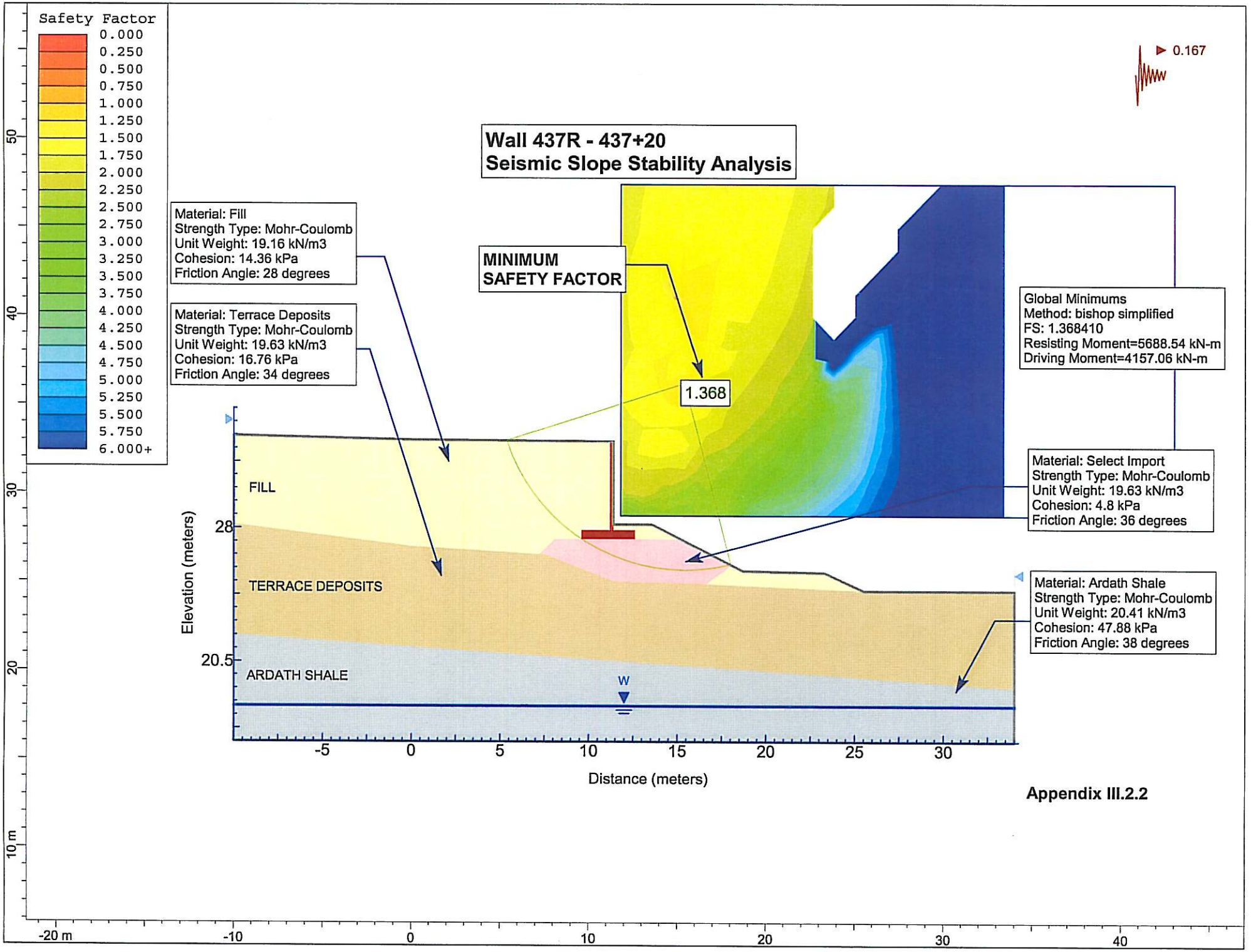
Title: **Acceleration Response Spectrum**

Project:	MISCELLANEOUS RETAINING WALLS		
Drawn:	MPP	Contract No:	38008-017046.00 (SANDAG T.O. 46)
Date:	April, 2008		Appendix III.1

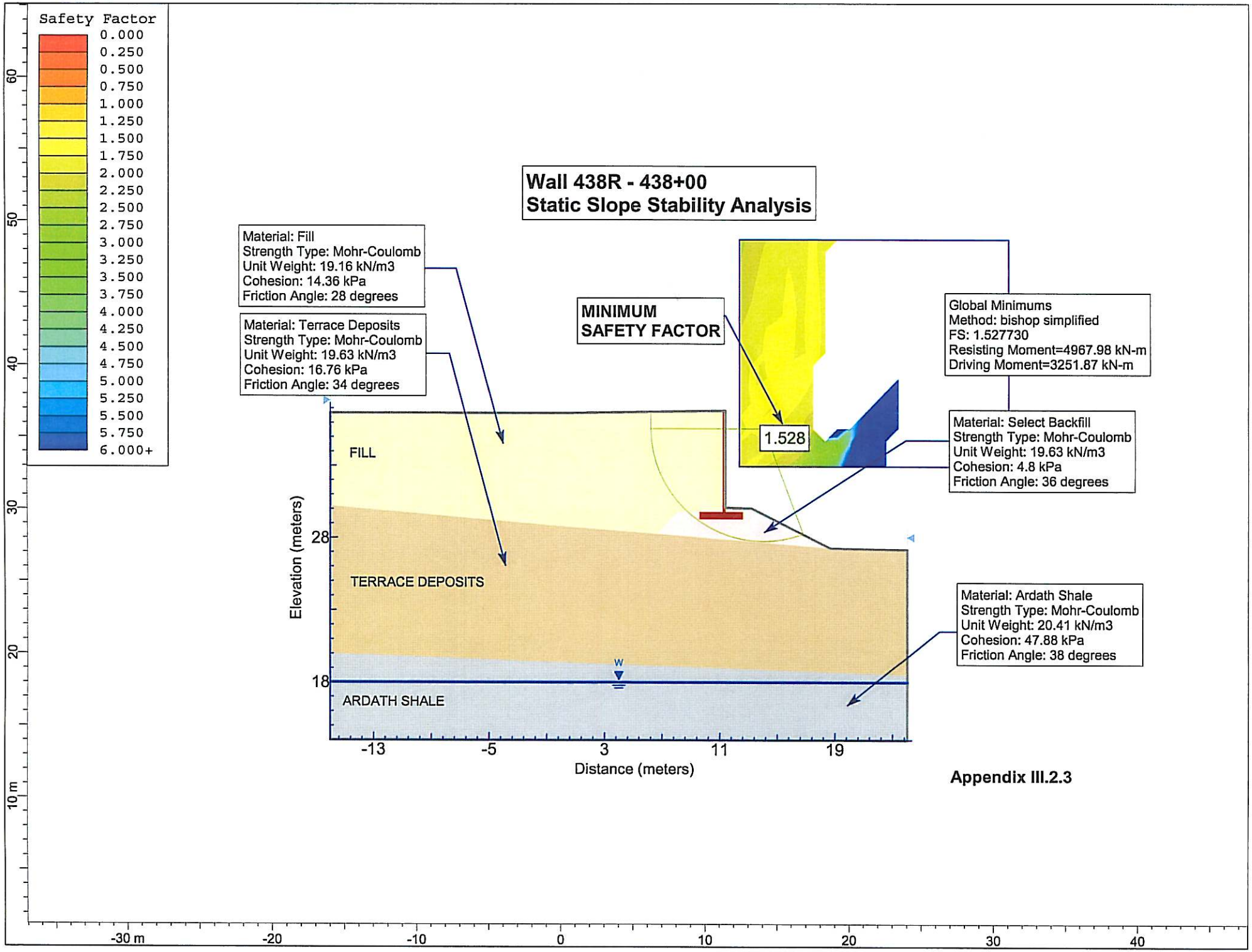
APPENDIX III.2

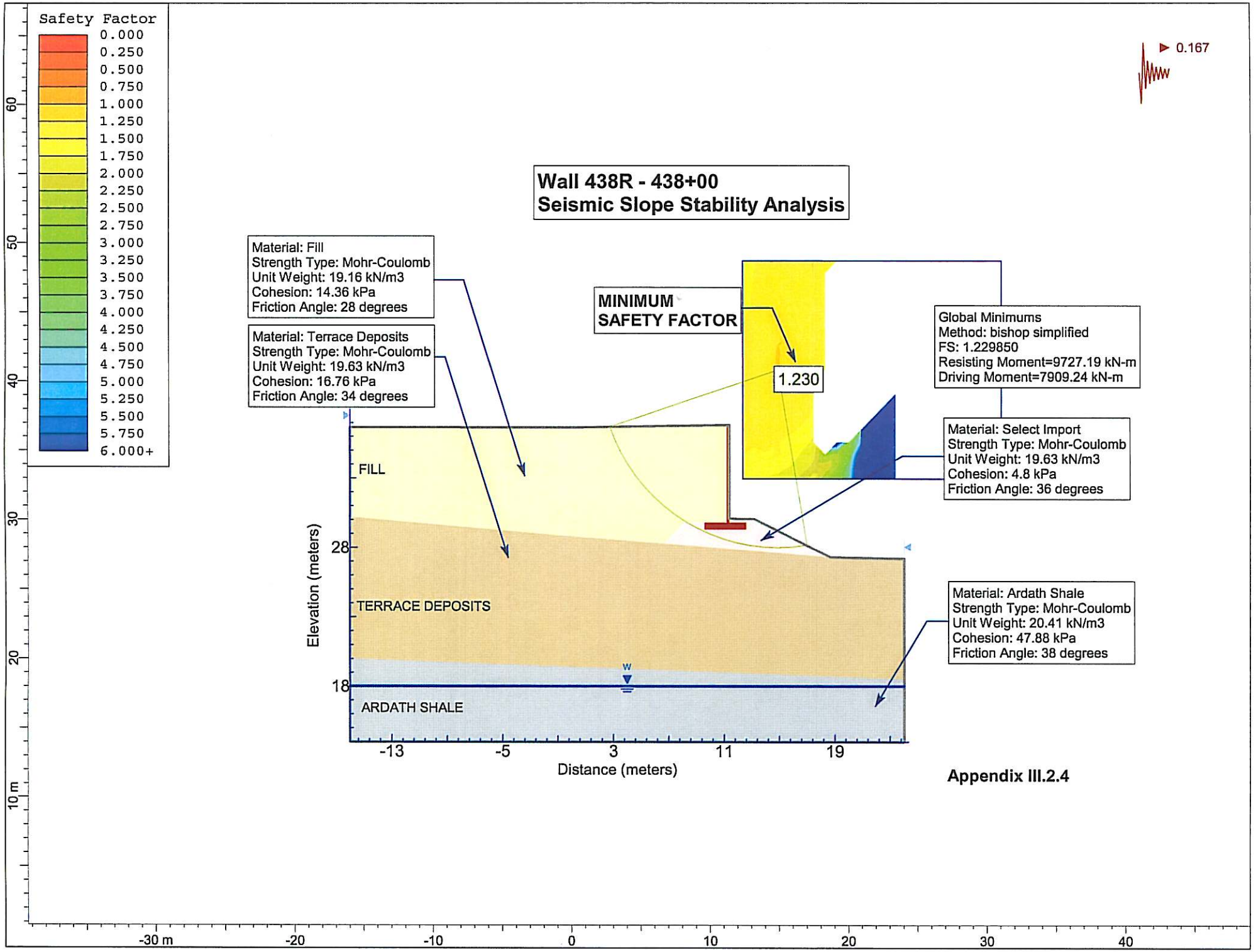
SLOPE STABILITY ANALYSES RESULTS (WALLS 437R AND 438R)


Safety Factor
0.000
0.250
0.500
0.750
1.000
1.250
1.500
1.750
2.000
2.250
2.500
2.750
3.000
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
Wall 437R - 437+20
Static Slope Stability Analysis
Global Minimums
Method: bishop simplified
FS: 1.775400
Resisting Moment=5967.69 kN-m
Driving Moment=3361.32 kN-m
Material: Fill
Strength Type: Mohr-Coulomb
Unit Weight: 19.16 kN/m3
Cohesion: 14.36 kPa
Friction Angle: 28 degrees
MINIMUM
SAFETY FACTOR
1.775
Material: Terrace Deposits
Strength Type: Mohr-Coulomb
Unit Weight: 19.63 kN/m3
Cohesion: 16.76 kPa
Friction Angle: 34 degrees
Material: Select Import
Strength Type: Mohr-Coulomb
Unit Weight: 19.63 kN/m3
Cohesion: 4.8 kPa
Friction Angle: 36 degrees
Material: Ardath Shale
Strength Type: Mohr-Coulomb
Unit Weight: 20.41 kN/m3
Cohesion: 47.88 kPa
Friction Angle: 38 degrees
FILL
TERRACE DEPOSITS
ARDATH SHALE
W
28
20.5
Elevation (meters)
-6
0
6
12
18
24
30
Distance (meters)
Appendix III.2.1
60
50
40
30
20
10 m
-20 m
-10
0
10
20
30
40
50



Appendix III.2.2

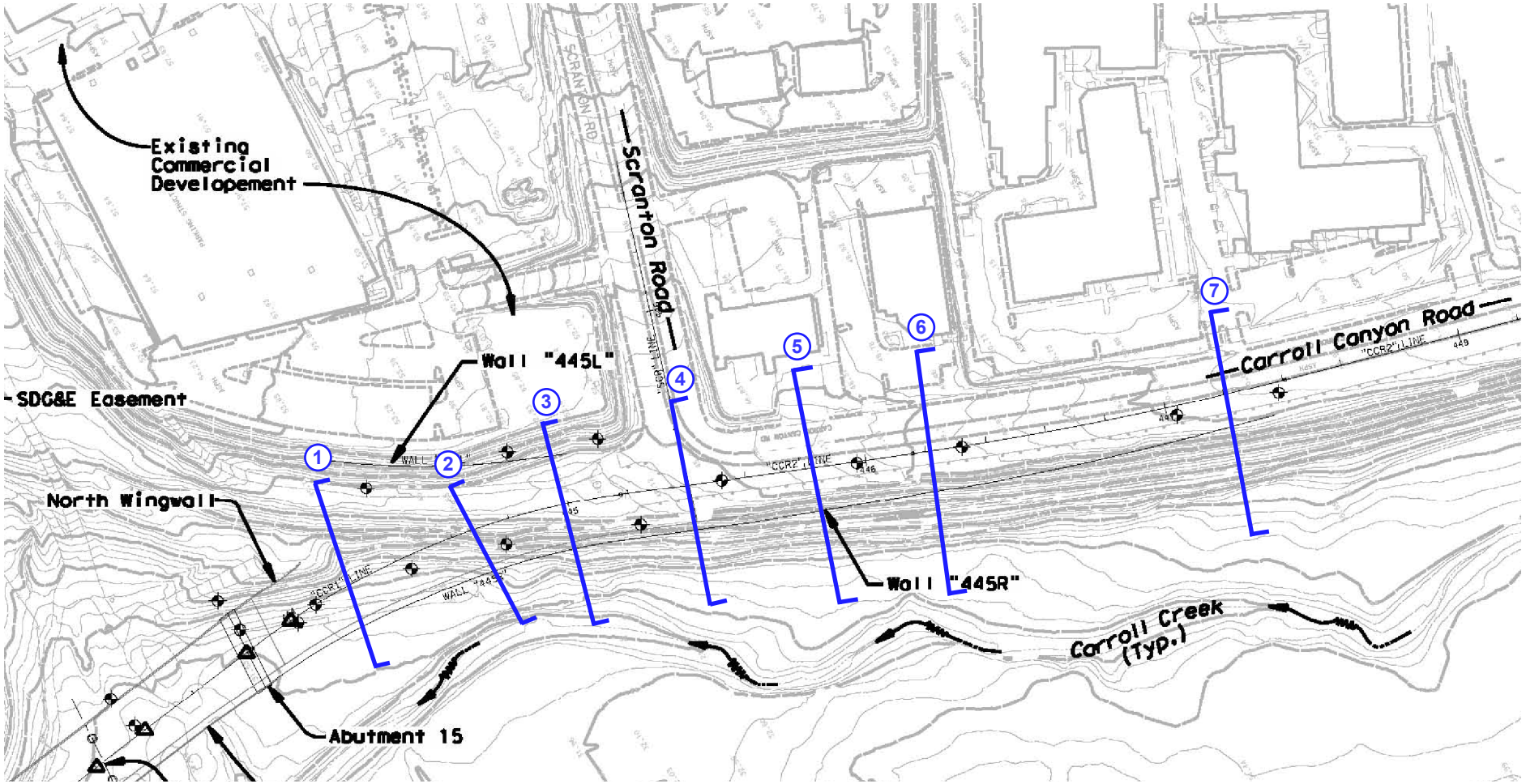

Safety Factor
0.000
0.250
0.500
0.750
1.000
1.250
1.500
1.750
2.000
2.250
2.500
2.750
3.000
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
Wall 438R - 438+00
Static Slope Stability Analysis
Material: Fill
Strength Type: Mohr-Coulomb
Unit Weight: 19.16 kN/m3
Cohesion: 14.36 kPa
Friction Angle: 28 degrees
Material: Terrace Deposits
Strength Type: Mohr-Coulomb
Unit Weight: 19.63 kN/m3
Cohesion: 16.76 kPa
Friction Angle: 34 degrees
MINIMUM
SAFETY FACTOR
1.528
Global Minimums
Method: bishop simplified
FS: 1.527730
Resisting Moment=4967.98 kN-m
Driving Moment=3251.87 kN-m
Material: Select Backfill
Strength Type: Mohr-Coulomb
Unit Weight: 19.63 kN/m3
Cohesion: 4.8 kPa
Friction Angle: 36 degrees
FILL
TERRACE DEPOSITS
ARDATH SHALE
W
Material: Ardath Shale
Strength Type: Mohr-Coulomb
Unit Weight: 20.41 kN/m3
Cohesion: 47.88 kPa
Friction Angle: 38 degrees
Elevation (meters)
28
18
-13
-5
3
11
19
Distance (meters)
Appendix III.2.3
10 m
60
50
40
30
20
-30 m
-20
-10
0
10
20
30
40



Appendix III.2.4

APPENDIX III.3

SLOPE STABILITY ANALYSES RESULTS (BATTERED MSE WALL 445R)



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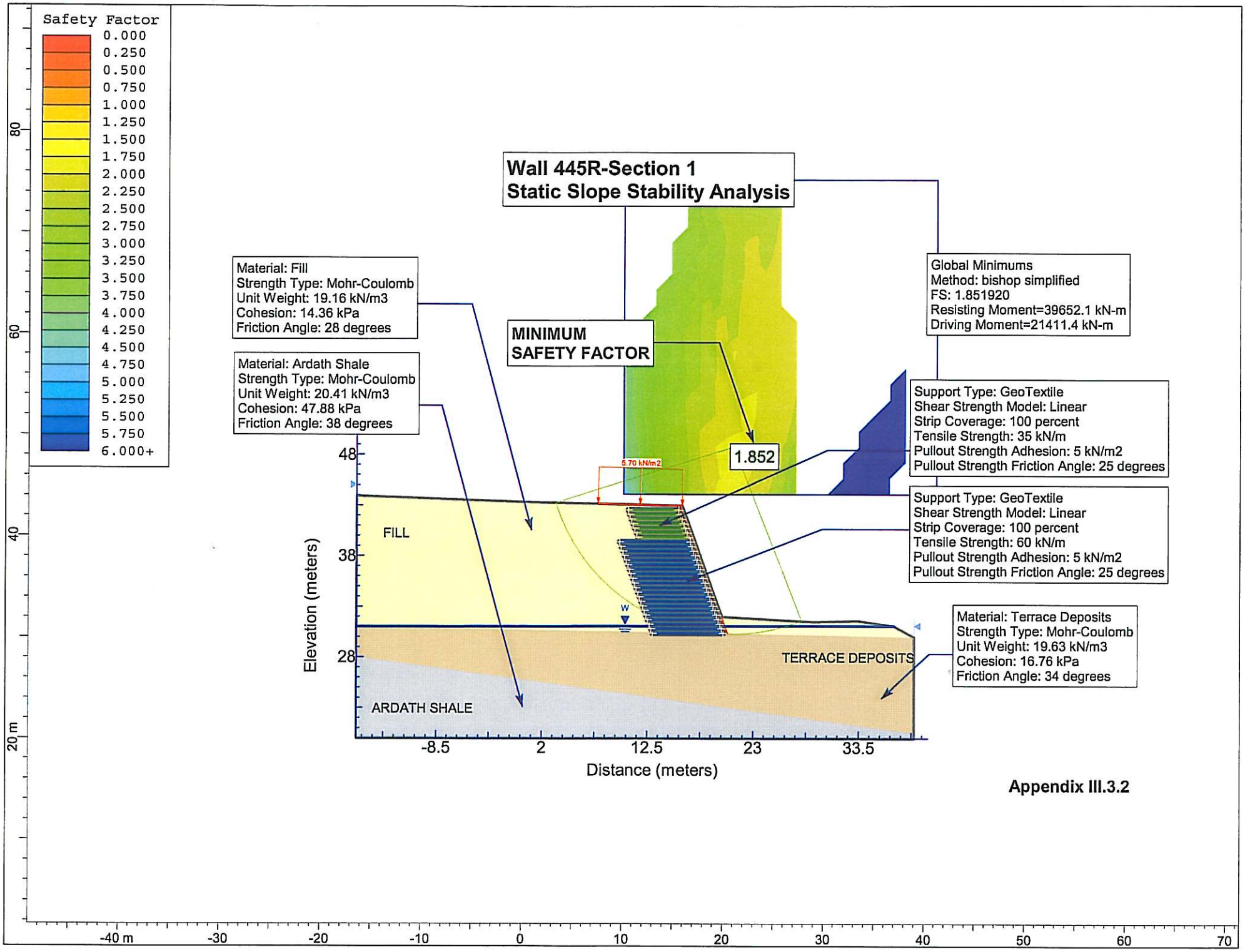
Legend:

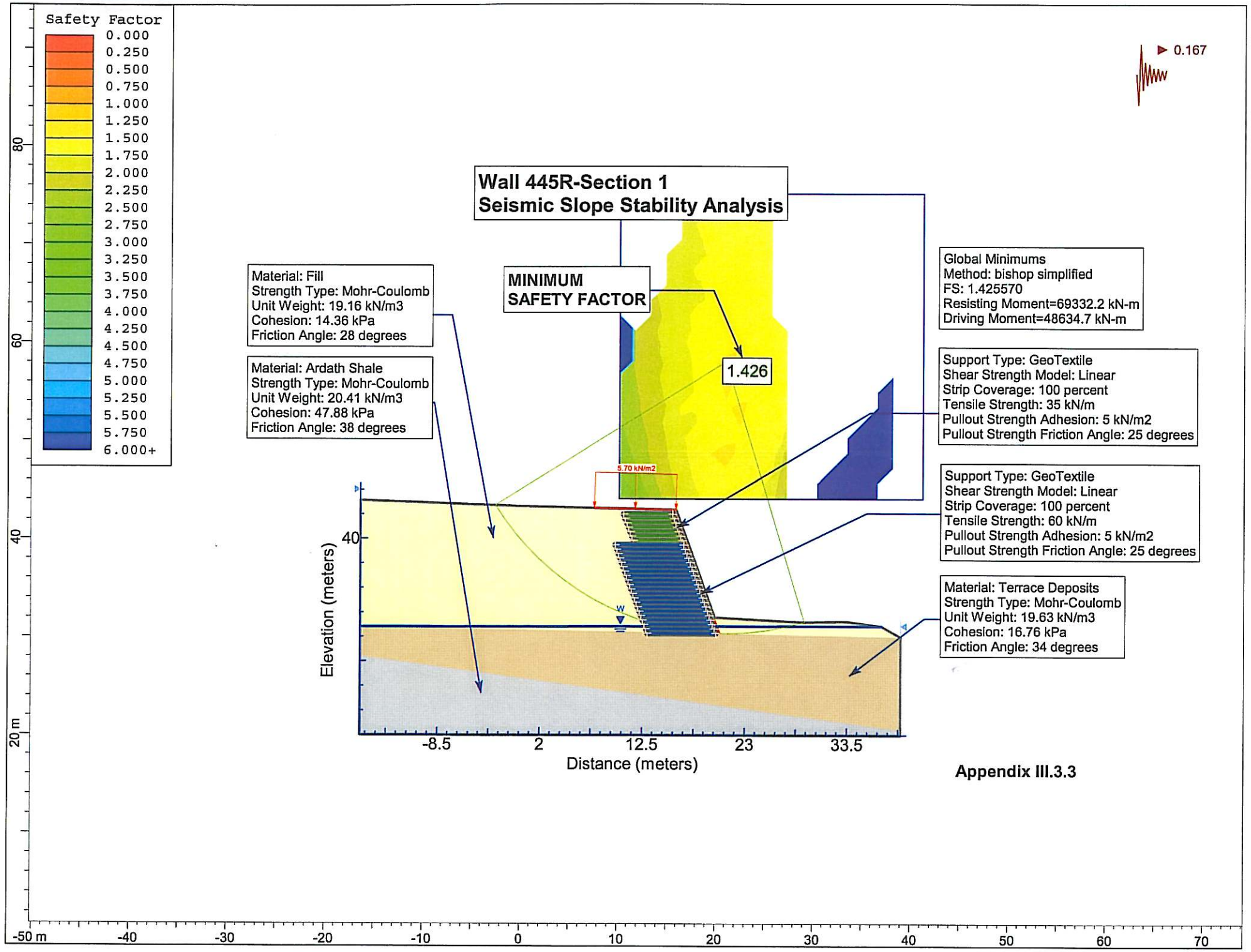
7 Location and Number of Slope Stability Cross Sections

BUREAU VERITAS NORTH AMERICA, INC.
Testing Engineers San Diego
7895 Convoy Court, Suite 18
San Diego, CA 92111

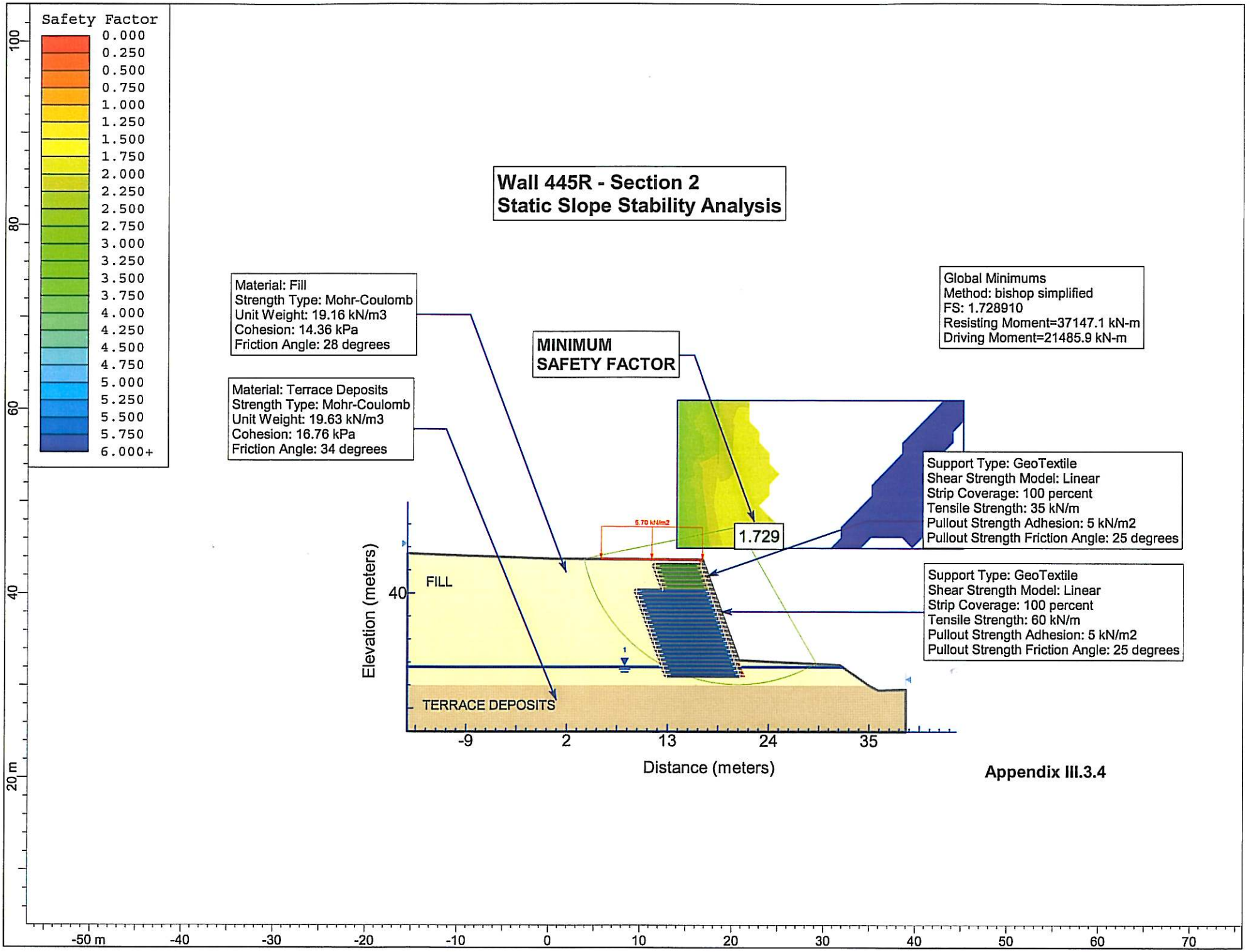
Title:	**Wall 445R Cross Section Locations**		
Project:	Miscellaneous Retaining Walls		
Drawn:	NJT	Contract No:	38008-017046.00 (SANDAG T.O. 46)
Date:	March, 2009	Figure No:	Appendix III.3.1

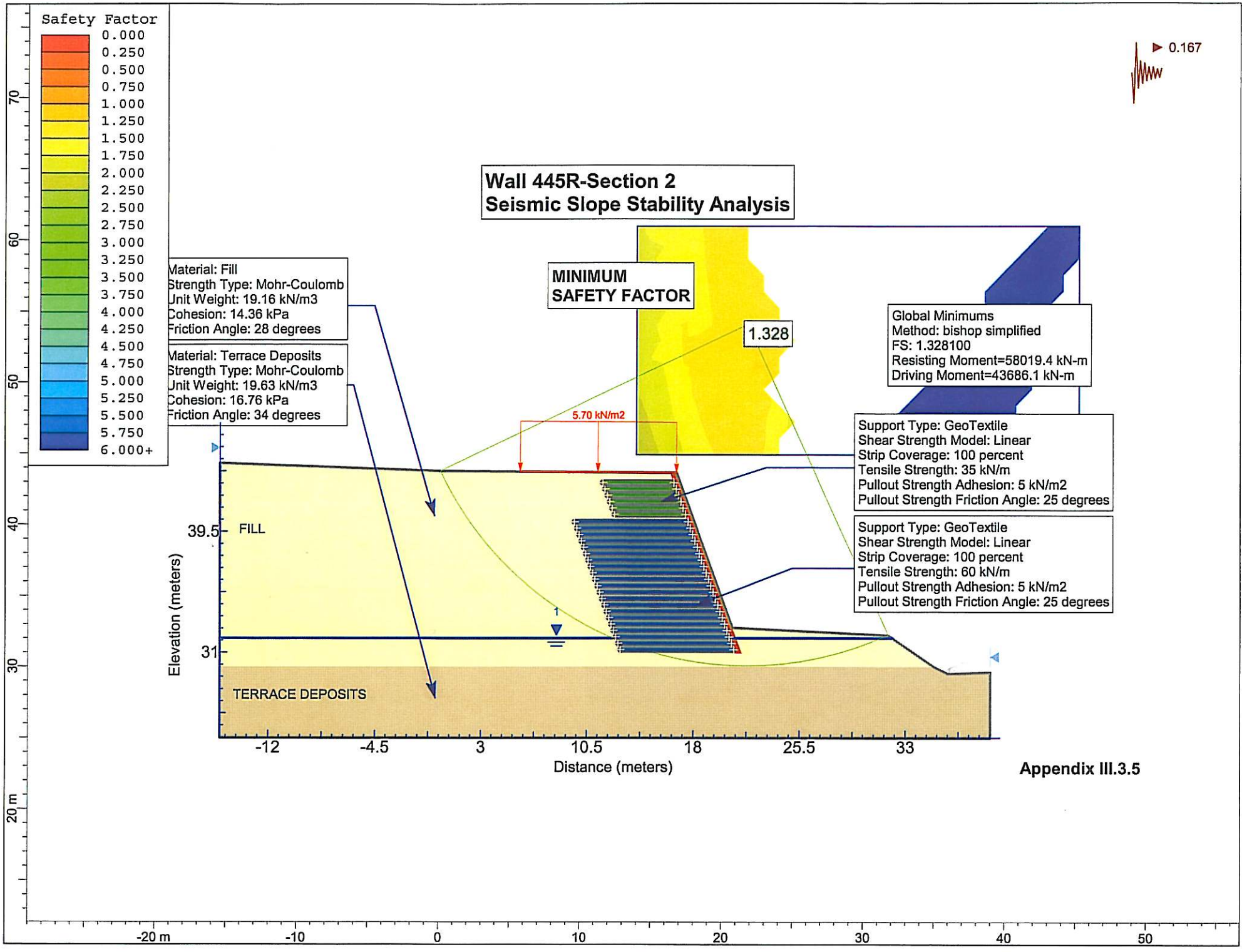


Appendix III.3.2



Appendix III.3.3


Safety Factor
0.000
0.250
0.500
0.750
1.000
1.250
1.500
1.750
2.000
2.250
2.500
2.750
3.000
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
Wall 445R - Section 2
Static Slope Stability Analysis
Material: Fill
Strength Type: Mohr-Coulomb
Unit Weight: 19.16 kN/m3
Cohesion: 14.36 kPa
Friction Angle: 28 degrees
Material: Terrace Deposits
Strength Type: Mohr-Coulomb
Unit Weight: 19.63 kN/m3
Cohesion: 16.76 kPa
Friction Angle: 34 degrees
MINIMUM
SAFETY FACTOR
1.729
Global Minimums
Method: bishop simplified
FS: 1.728910
Resisting Moment=37147.1 kN-m
Driving Moment=21485.9 kN-m
Support Type: GeoTextile
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 35 kN/m
Pullout Strength Adhesion: 5 kN/m2
Pullout Strength Friction Angle: 25 degrees
Support Type: GeoTextile
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 60 kN/m
Pullout Strength Adhesion: 5 kN/m2
Pullout Strength Friction Angle: 25 degrees
5.70 kN/m2
FILL
TERRACE DEPOSITS
Elevation (meters)
Distance (meters)
Appendix III.3.4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0.500
0.750
1.000
1.250
1.500
1.750
2.000
2.250
2.500
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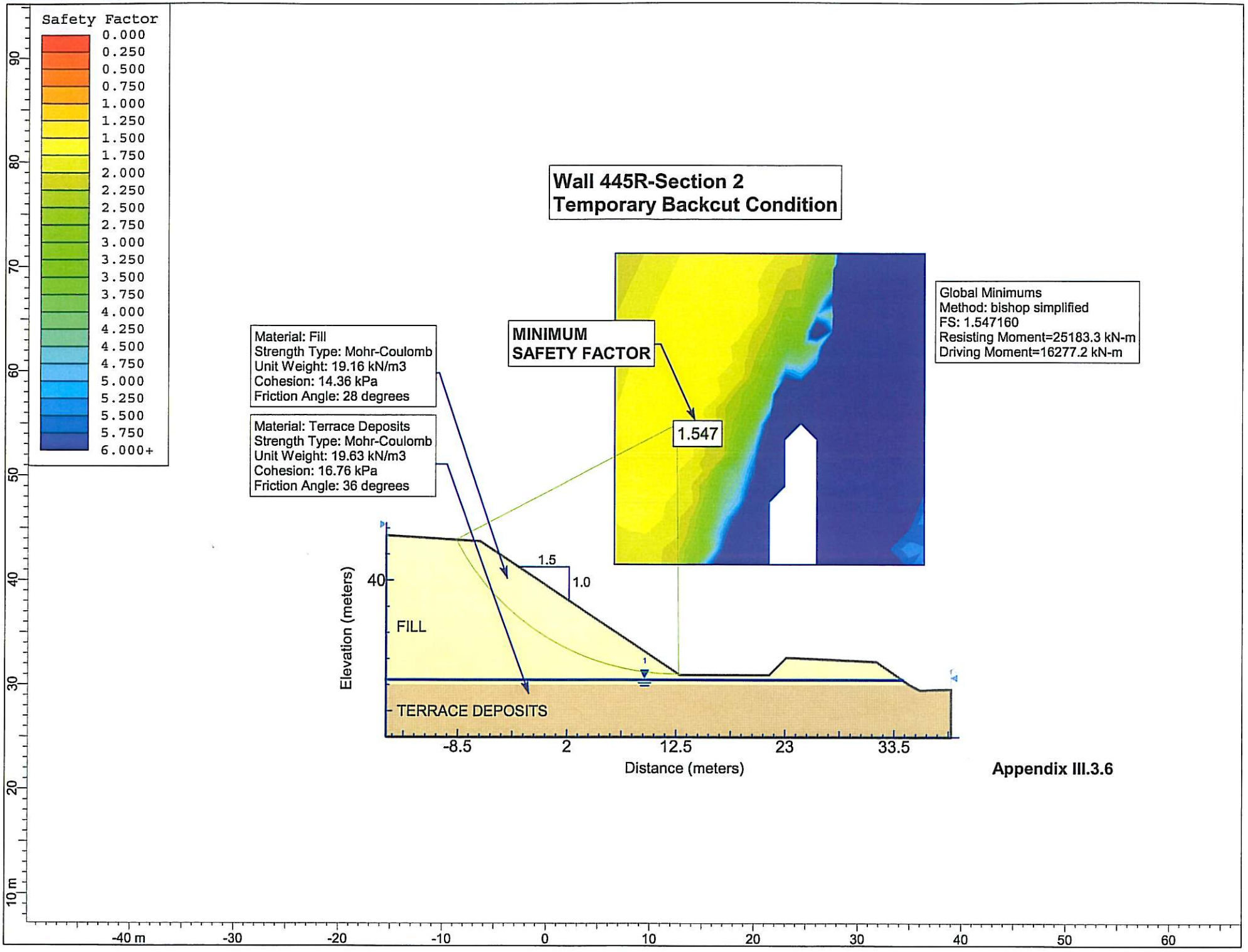
3.000
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
0.167
Wall 445R-Section 2
Seismic Slope Stability Analysis
MINIMUM
SAFETY FACTOR
1.328
Global Minimums
Method: bishop simplified
FS: 1.328100
Resisting Moment=58019.4 kN-m
Driving Moment=43686.1 kN-m
Material: Fill
Strength Type: Mohr-Coulomb
Unit Weight: 19.16 kN/m3
Cohesion: 14.36 kPa
Friction Angle: 28 degrees
Material: Terrace Deposits
Strength Type: Mohr-Coulomb
Unit Weight: 19.63 kN/m3
Cohesion: 16.76 kPa
Friction Angle: 34 degrees
5.70 kN/m2
Support Type: GeoTextile
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 35 kN/m
Pullout Strength Adhesion: 5 kN/m2
Pullout Strength Friction Angle: 25 degrees
Support Type: GeoTextile
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 60 kN/m
Pullout Strength Adhesion: 5 kN/m2
Pullout Strength Friction Angle: 25 degrees
39.5
FILL
31
TERRACE DEPOSITS
1
Elevation (meters)
-12
-4.5
3
10.5
18
25.5
33
Distance (meters)
Appendix III.3.5
20 m
-20 m
-10
0
10
20
30
40
50


Safety Factor
0.000
0.250
0.500
0.750
1.000
1.250
1.500
1.750
2.000
2.250
2.500
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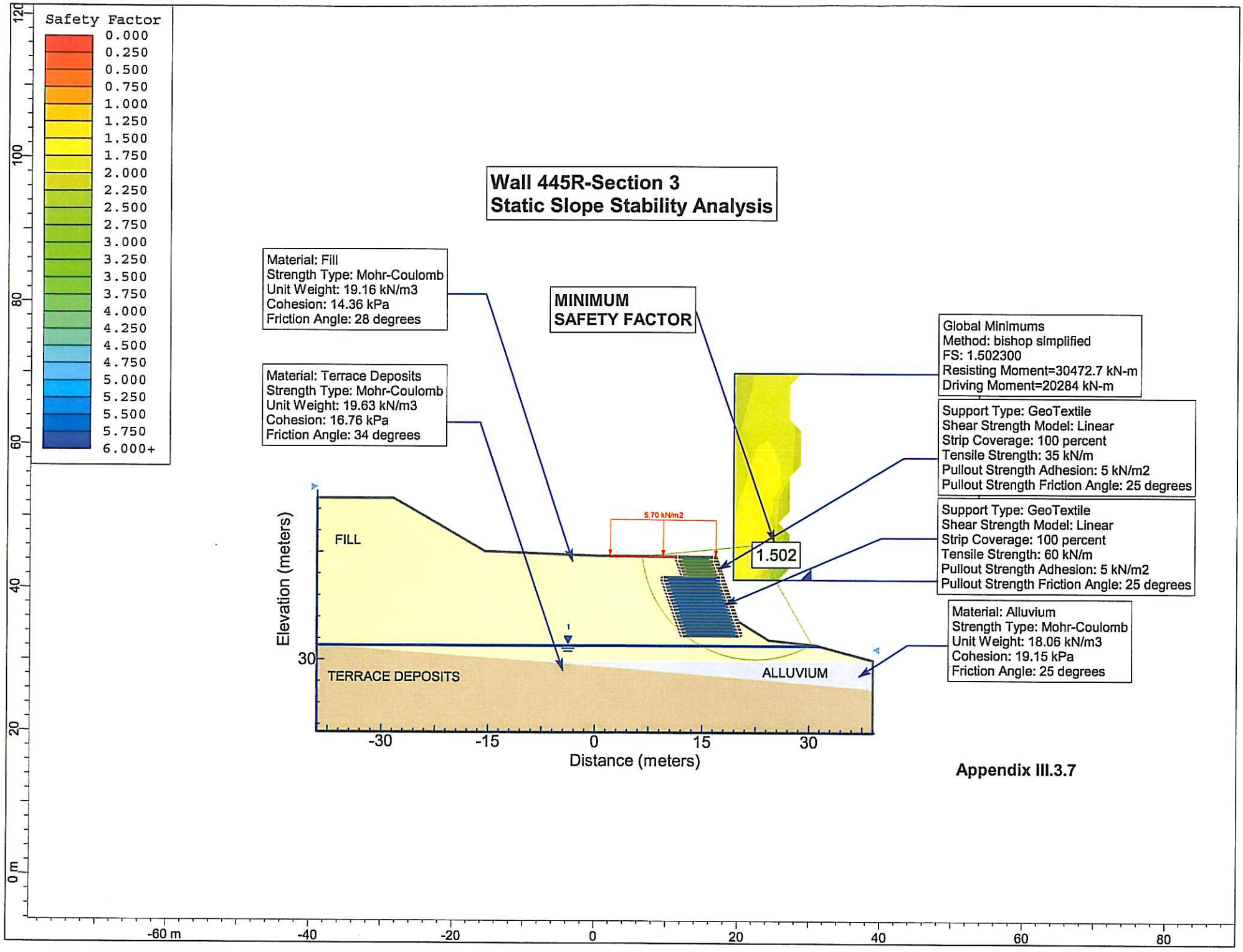
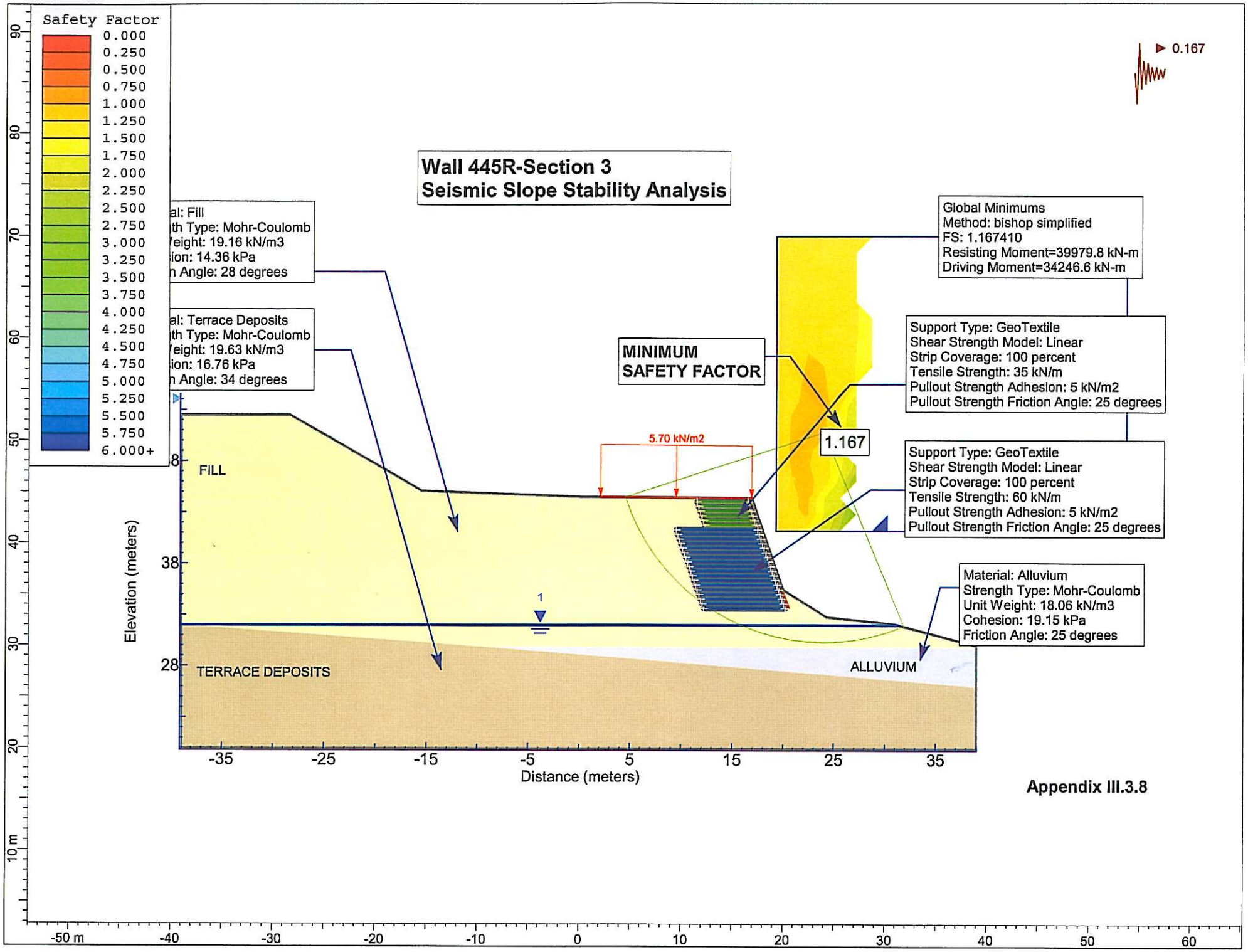
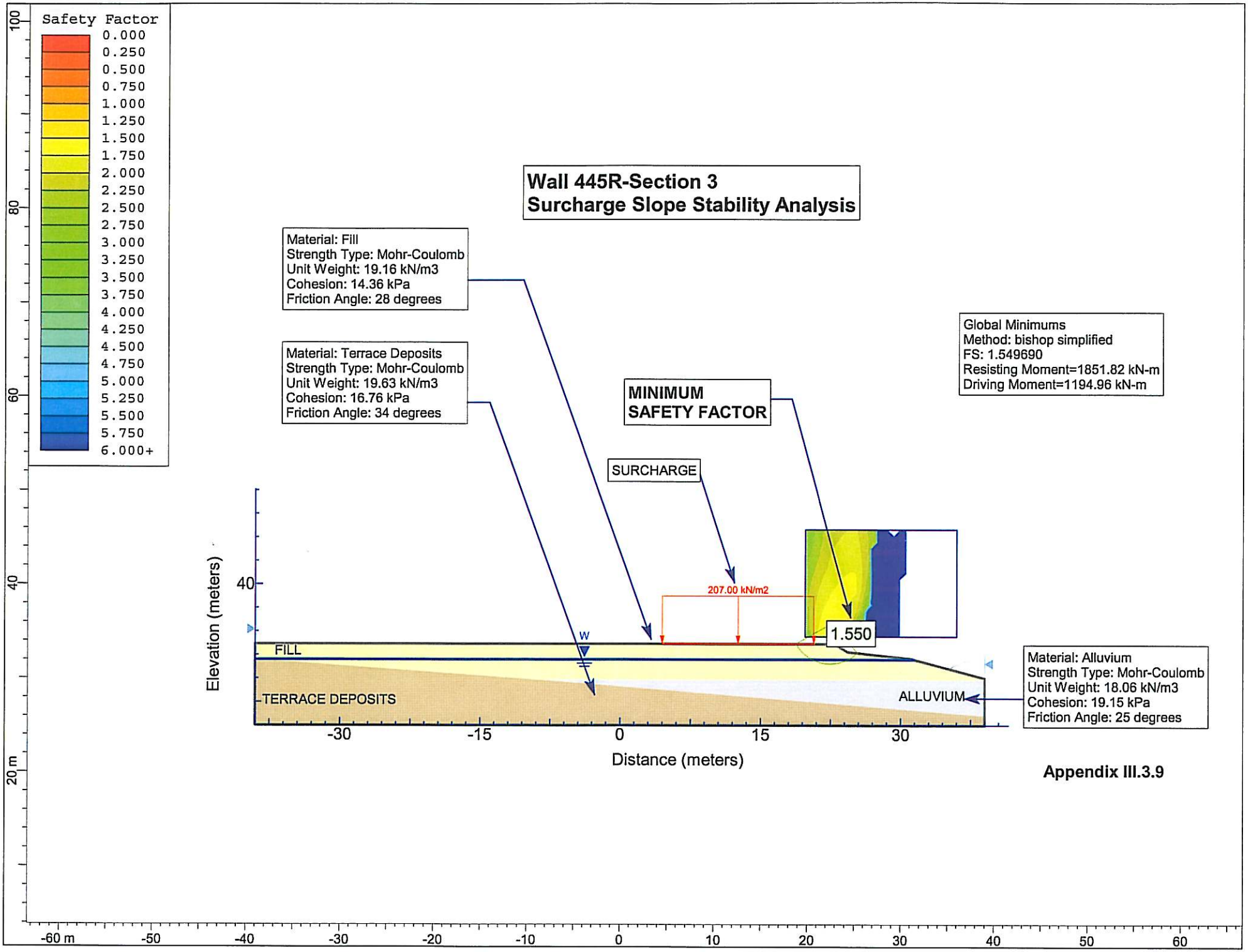
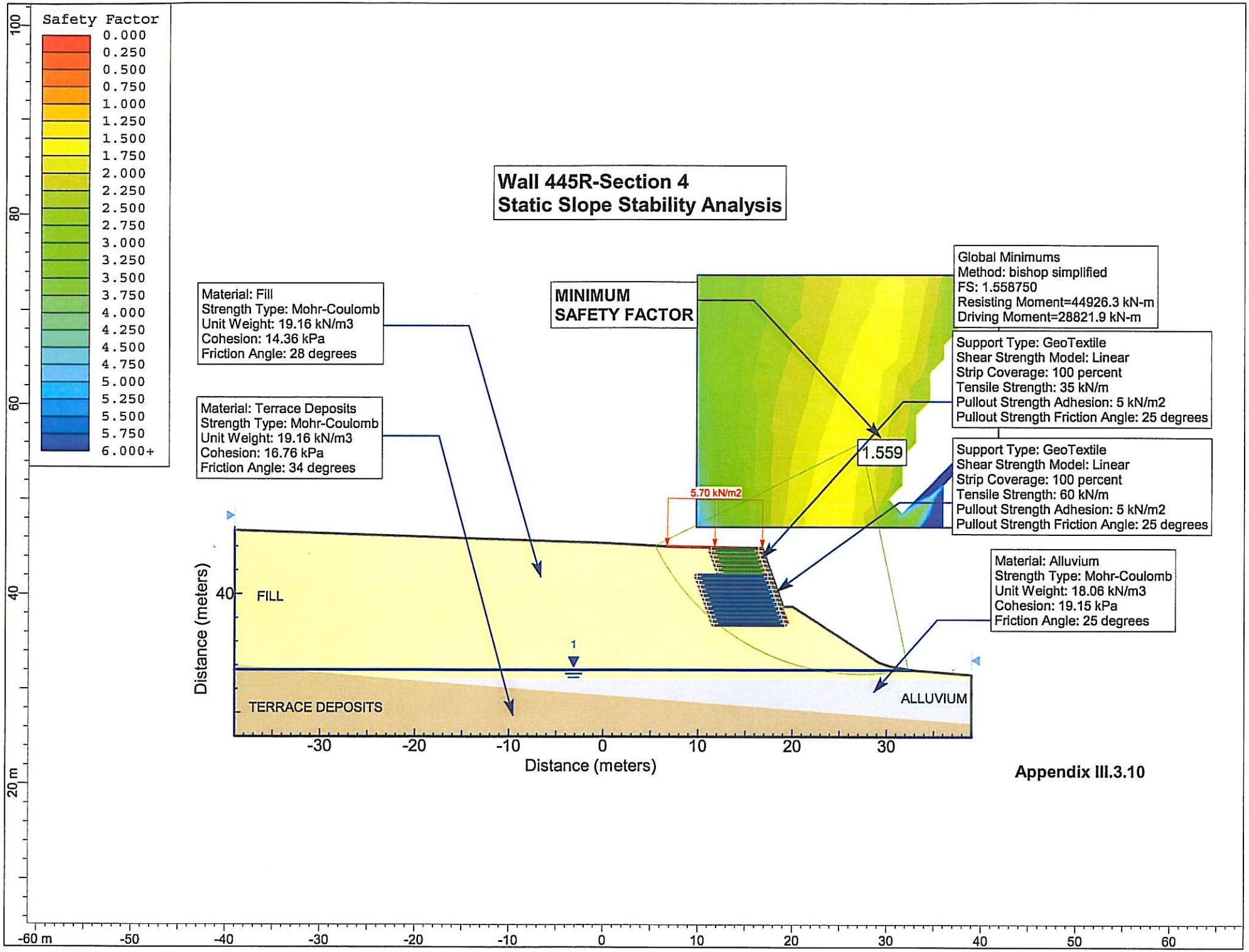
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
Wall 445R-Section 2
Temporary Backcut Condition
Material: Fill
Strength Type: Mohr-Coulomb
Unit Weight: 19.16 kN/m3
Cohesion: 14.36 kPa
Friction Angle: 28 degrees
Material: Terrace Deposits
Strength Type: Mohr-Coulomb
Unit Weight: 19.63 kN/m3
Cohesion: 16.76 kPa
Friction Angle: 36 degrees
MINIMUM
SAFETY FACTOR
1.547
Global Minimums
Method: bishop simplified
FS: 1.547160
Resisting Moment=25183.3 kN-m
Driving Moment=16277.2 kN-m
1.5
1.0
FILL
TERRACE DEPOSITS
Elevation (meters)
40
-8.5
2
12.5
23
33.5
Distance (meters)
Appendix III.3.6
90
80
70
60
50
40
30
20
10 m
-40 m
-30
-20
-10
0
10
20
30
40
50
60

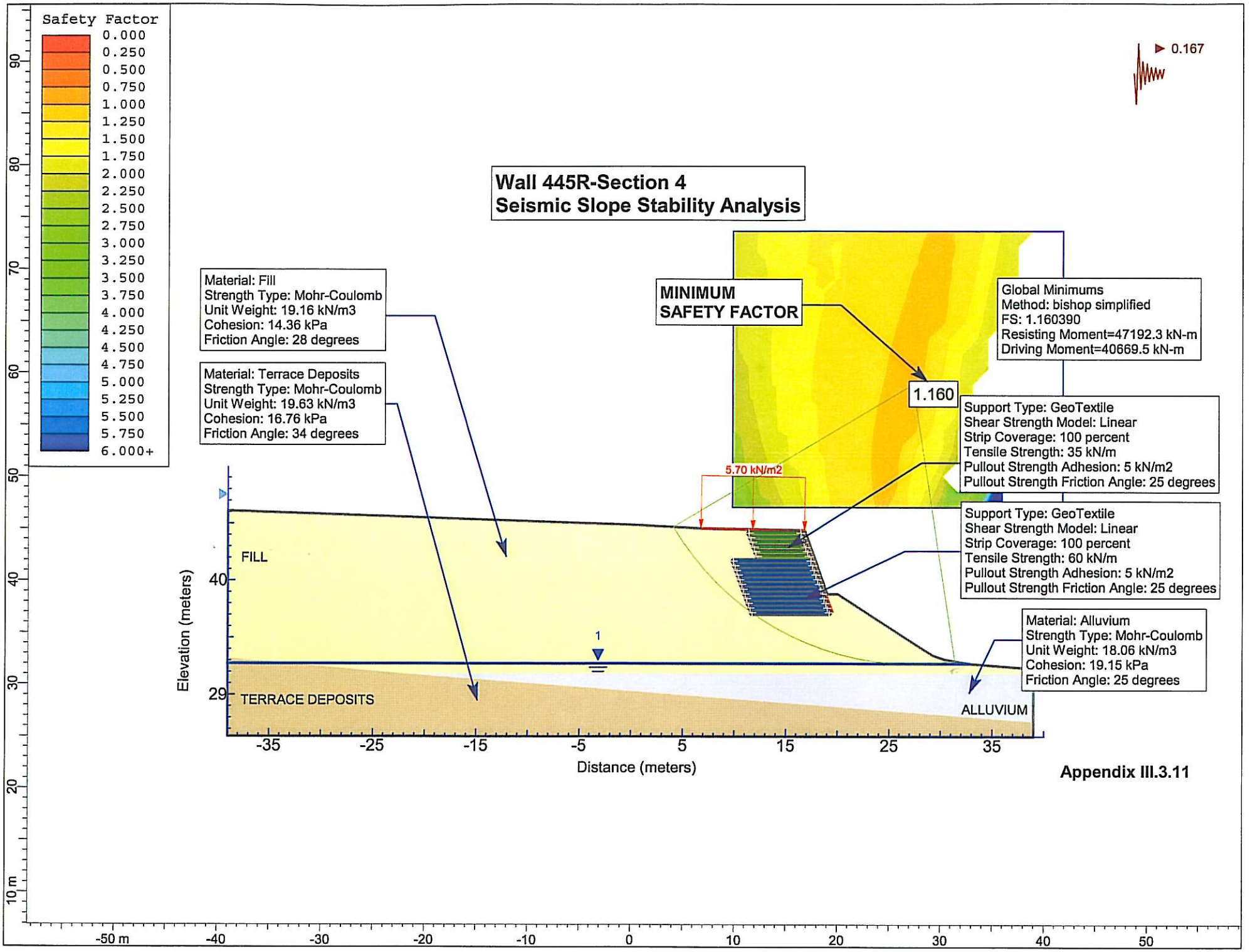


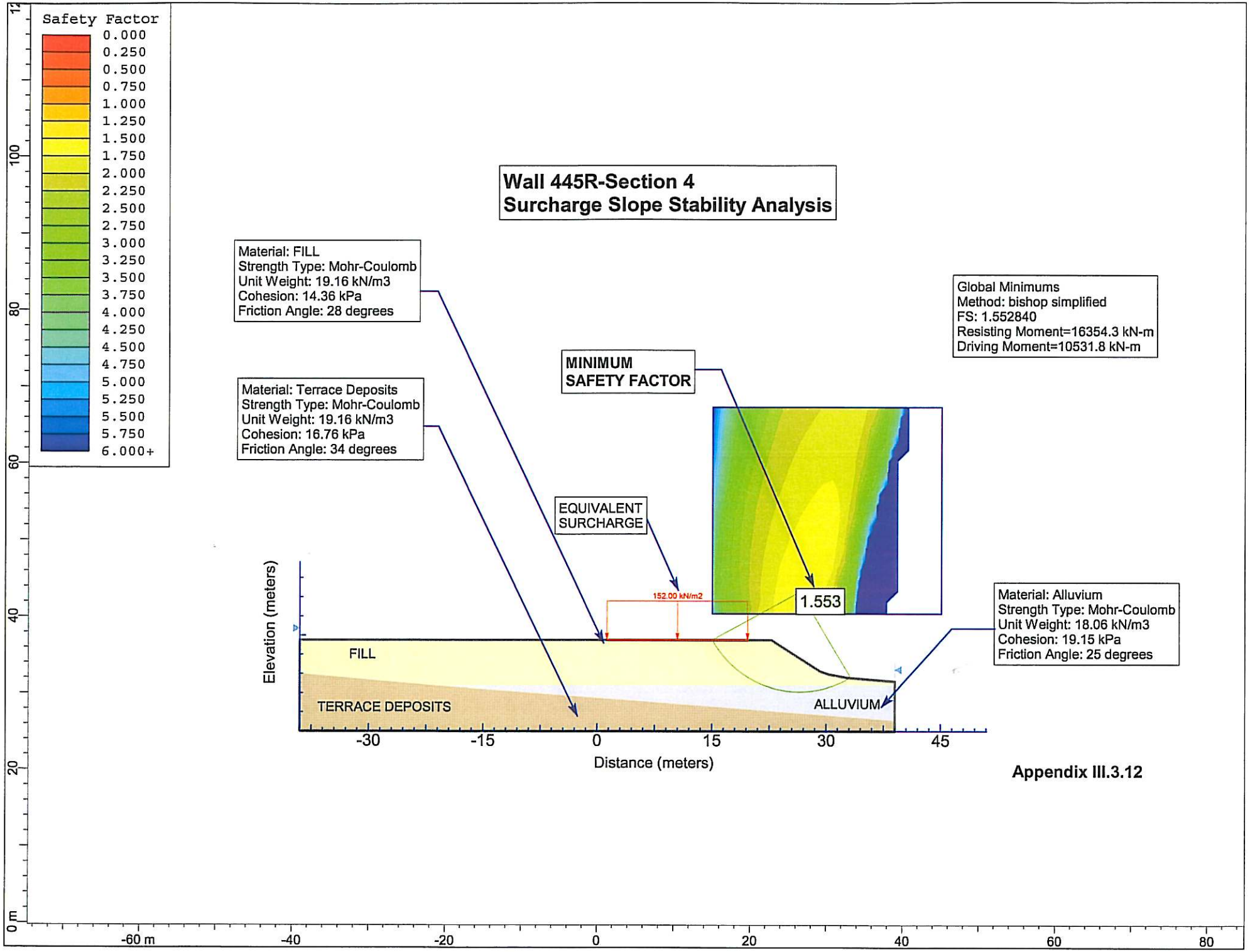
Appendix III.3.7


Safety Factor
0.000
0.250
0.500
0.750
1.000
1.250
1.500
1.750
2.000
2.250
2.500
2.750
3.000
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
0.167
Wall 445R-Section 3
Seismic Slope Stability Analysis
al: Fill
th Type: Mohr-Coulomb
/eight: 19.16 kN/m3
ion: 14.36 kPa
n Angle: 28 degrees
al: Terrace Deposits
th Type: Mohr-Coulomb
/eight: 19.63 kN/m3
ion: 16.76 kPa
n Angle: 34 degrees
Global Minimums
Method: bishop simplified
FS: 1.167410
Resisting Moment=39979.8 kN-m
Driving Moment=34246.6 kN-m
MINIMUM
SAFETY FACTOR
1.167
Support Type: GeoTextile
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 35 kN/m
Pullout Strength Adhesion: 5 kN/m2
Pullout Strength Friction Angle: 25 degrees
Support Type: GeoTextile
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 60 kN/m
Pullout Strength Adhesion: 5 kN/m2
Pullout Strength Friction Angle: 25 degrees
5.70 kN/m2
FILL
TERRACE DEPOSITS
ALLUVIUM
Material: Alluvium
Strength Type: Mohr-Coulomb
Unit Weight: 18.06 kN/m3
Cohesion: 19.15 kPa
Friction Angle: 25 degrees
Elevation (meters)
Distance (meters)
Appendix III.3.8

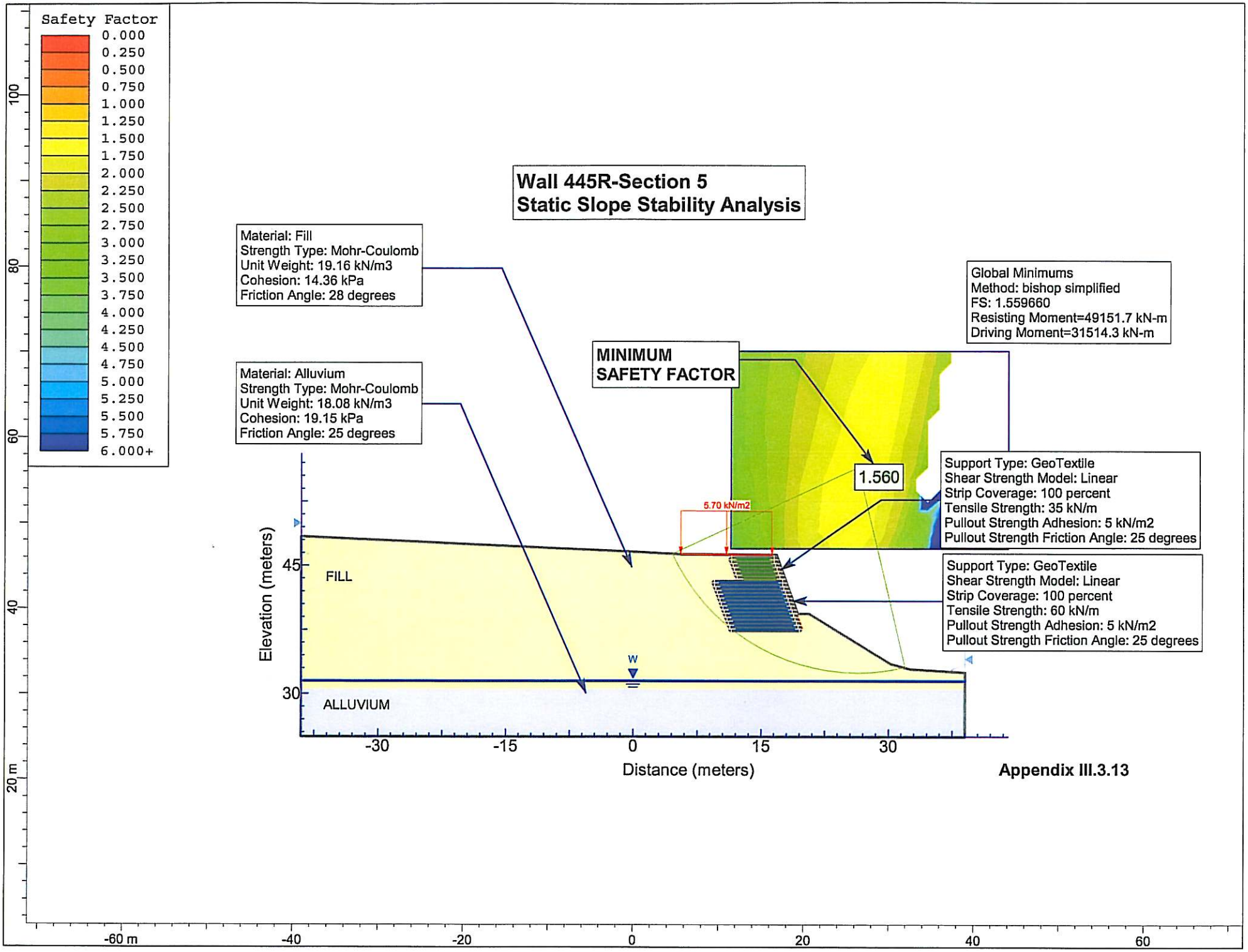

Safety Factor
0.000
0.250
0.500
0.750
1.000
1.250
1.500
1.750
2.000
2.250
2.500
2.750
3.000
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
Wall 445R-Section 3
Surcharge Slope Stability Analysis
Material: Fill
Strength Type: Mohr-Coulomb
Unit Weight: 19.16 kN/m3
Cohesion: 14.36 kPa
Friction Angle: 28 degrees
Material: Terrace Deposits
Strength Type: Mohr-Coulomb
Unit Weight: 19.63 kN/m3
Cohesion: 16.76 kPa
Friction Angle: 34 degrees
Global Minimums
Method: bishop simplified
FS: 1.549690
Resisting Moment=1851.82 kN-m
Driving Moment=1194.96 kN-m
MINIMUM
SAFETY FACTOR
SURCHARGE
207.00 kN/m2
1.550
W
FILL
TERRACE DEPOSITS
ALLUVIUM
Material: Alluvium
Strength Type: Mohr-Coulomb
Unit Weight: 18.06 kN/m3
Cohesion: 19.15 kPa
Friction Angle: 25 degrees
Elevation (meters)
Distance (meters)
Appendix III.3.9


Safety Factor
0.000
0.250
0.500
0.750
1.000
1.250
1.500
1.750
2.000
2.250
2.500
2.750
3.000
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
Wall 445R-Section 4
Static Slope Stability Analysis
Material: Fill
Strength Type: Mohr-Coulomb
Unit Weight: 19.16 kN/m3
Cohesion: 14.36 kPa
Friction Angle: 28 degrees
Material: Terrace Deposits
Strength Type: Mohr-Coulomb
Unit Weight: 19.16 kN/m3
Cohesion: 16.76 kPa
Friction Angle: 34 degrees
MINIMUM
SAFETY FACTOR
Global Minimums
Method: bishop simplified
FS: 1.558750
Resisting Moment=44926.3 kN-m
Driving Moment=28821.9 kN-m
Support Type: GeoTextile
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 35 kN/m
Pullout Strength Adhesion: 5 kN/m2
Pullout Strength Friction Angle: 25 degrees
1.559
Support Type: GeoTextile
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 60 kN/m
Pullout Strength Adhesion: 5 kN/m2
Pullout Strength Friction Angle: 25 degrees
5.70 kN/m2
Material: Alluvium
Strength Type: Mohr-Coulomb
Unit Weight: 18.06 kN/m3
Cohesion: 19.15 kPa
Friction Angle: 25 degrees
FILL
TERRACE DEPOSITS
ALLUVIUM
Distance (meters)
Distance (meters)
Appendix III.3.10


Safety Factor
0.000
0.250
0.500
0.750
1.000
1.250
1.500
1.750
2.000
2.250
2.500
2.750
3.000
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
0.167
Wall 445R-Section 4
Seismic Slope Stability Analysis
Material: Fill
Strength Type: Mohr-Coulomb
Unit Weight: 19.16 kN/m3
Cohesion: 14.36 kPa
Friction Angle: 28 degrees
Material: Terrace Deposits
Strength Type: Mohr-Coulomb
Unit Weight: 19.63 kN/m3
Cohesion: 16.76 kPa
Friction Angle: 34 degrees
MINIMUM
SAFETY FACTOR
1.160
Global Minimums
Method: bishop simplified
FS: 1.160390
Resisting Moment=47192.3 kN-m
Driving Moment=40669.5 kN-m
Support Type: GeoTextile
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 35 kN/m
Pullout Strength Adhesion: 5 kN/m2
Pullout Strength Friction Angle: 25 degrees
5.70 kN/m2
Support Type: GeoTextile
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 60 kN/m
Pullout Strength Adhesion: 5 kN/m2
Pullout Strength Friction Angle: 25 degrees
Material: Alluvium
Strength Type: Mohr-Coulomb
Unit Weight: 18.06 kN/m3
Cohesion: 19.15 kPa
Friction Angle: 25 degrees
FILL
TERRACE DEPOSITS
ALLUVIUM
1
Elevation (meters)
Distance (meters)
Appendix III.3.11



Appendix III.3.12


Safety Factor
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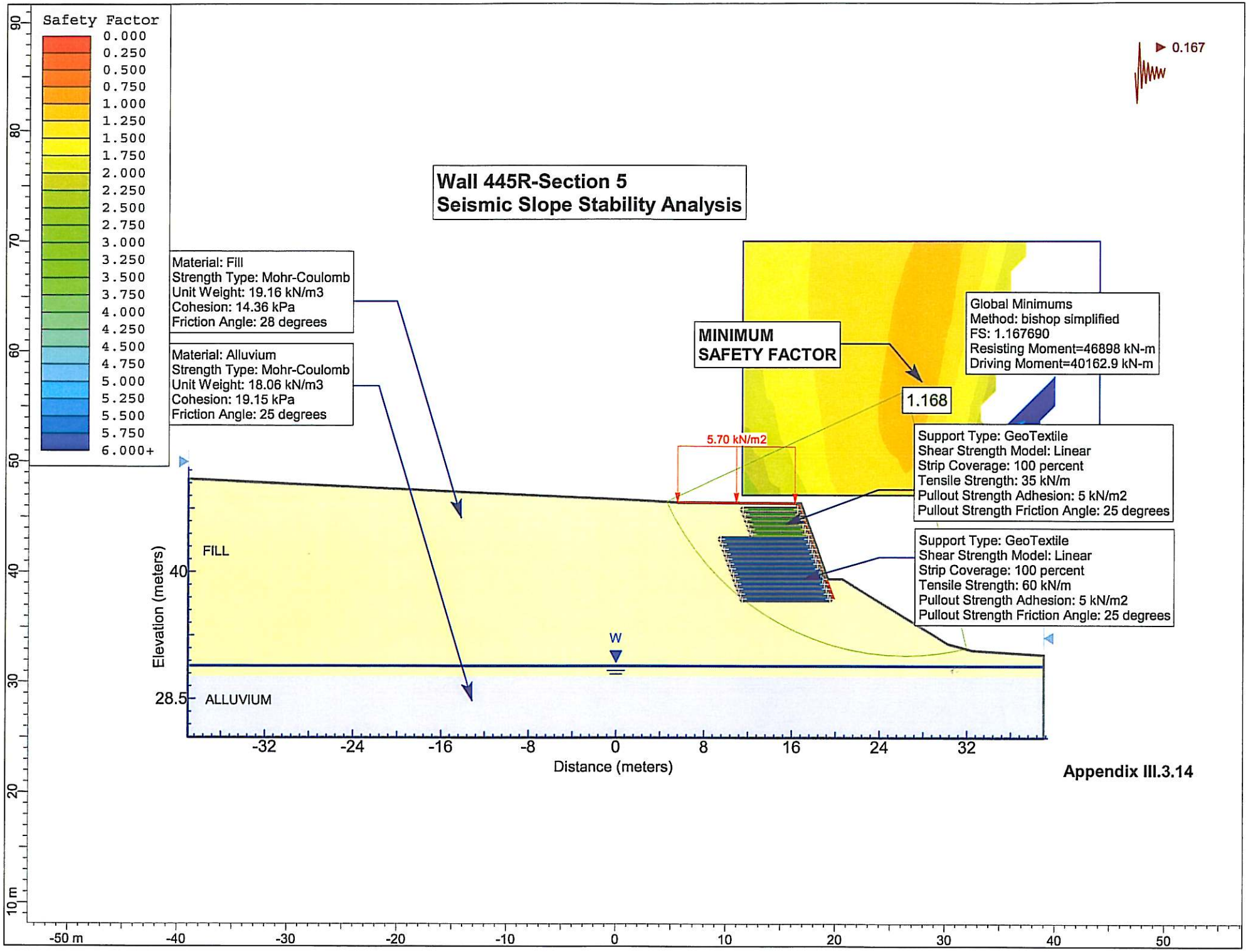
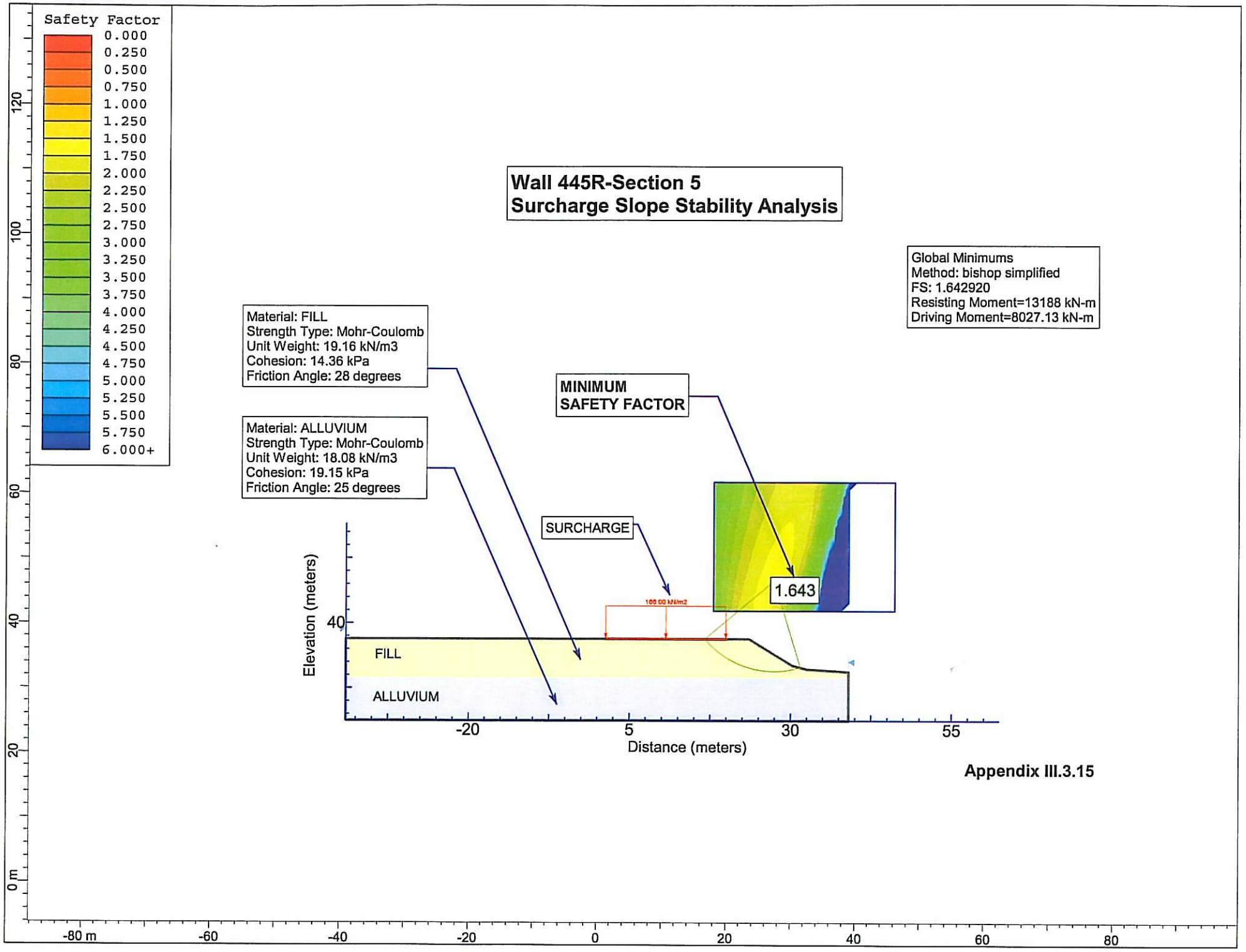
0.250
0.500
0.750
1.000
1.250
1.500
1.750
2.000
2.250
2.500
2.750
3.000
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
Wall 445R-Section 5
Static Slope Stability Analysis
Material: Fill
Strength Type: Mohr-Coulomb
Unit Weight: 19.16 kN/m3
Cohesion: 14.36 kPa
Friction Angle: 28 degrees
Material: Alluvium
Strength Type: Mohr-Coulomb
Unit Weight: 18.08 kN/m3
Cohesion: 19.15 kPa
Friction Angle: 25 degrees
Global Minimums
Method: bishop simplified
FS: 1.559660
Resisting Moment=49151.7 kN-m
Driving Moment=31514.3 kN-m
MINIMUM
SAFETY FACTOR
1.560
5.70 kN/m2
Support Type: GeoTextile
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 35 kN/m
Pullout Strength Adhesion: 5 kN/m2
Pullout Strength Friction Angle: 25 degrees
Support Type: GeoTextile
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 60 kN/m
Pullout Strength Adhesion: 5 kN/m2
Pullout Strength Friction Angle: 25 degrees
FILL
ALLUVIUM
W
Elevation (meters)
45
30
-30
-15
0
15
30
Distance (meters)
Appendix III.3.13
20 m
40
60
80
100
-60 m
-40
-20
0
20
40
60



Appendix III.3.14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0.500
0.750
1.000
1.250
1.500
1.750
2.000
2.250
2.500
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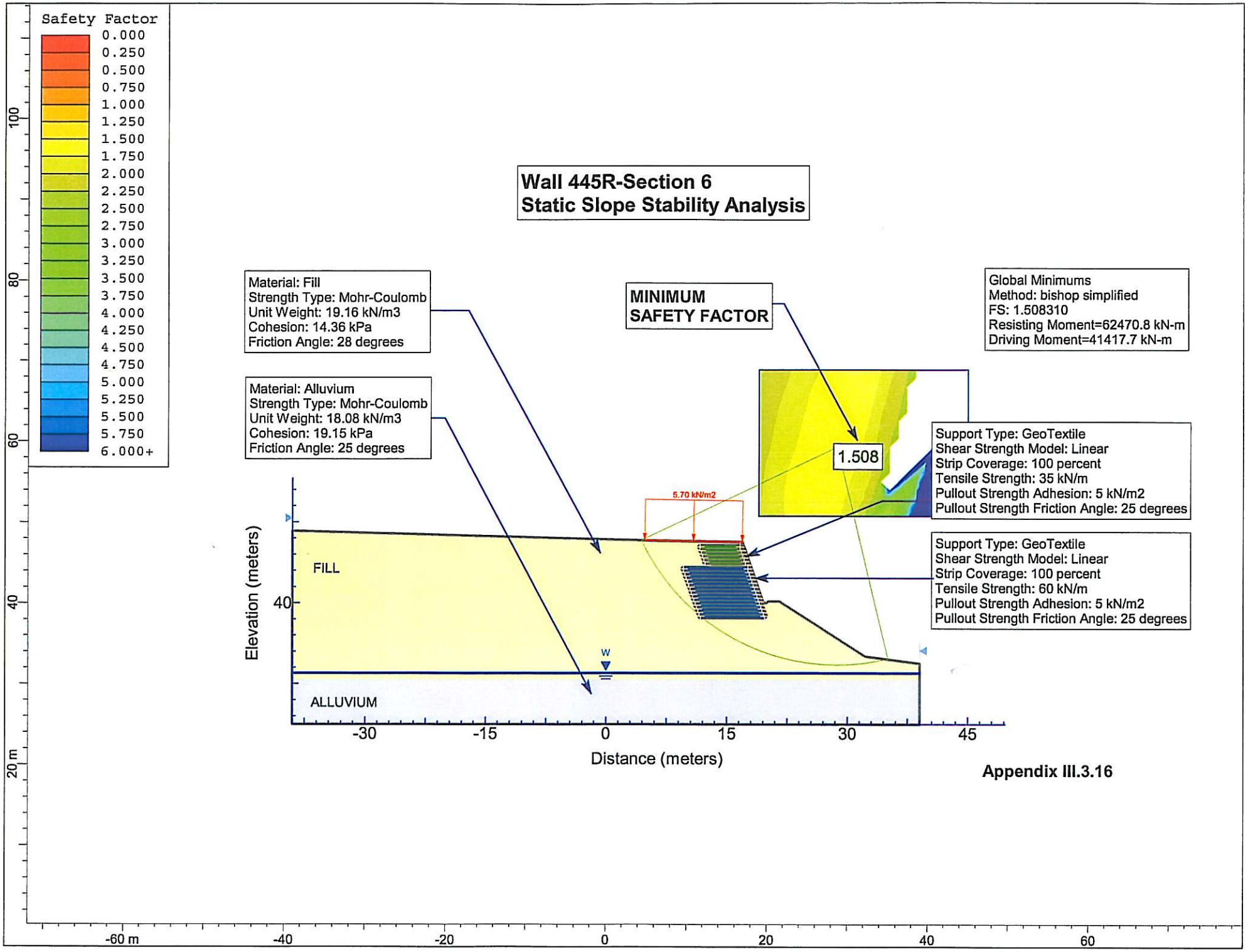
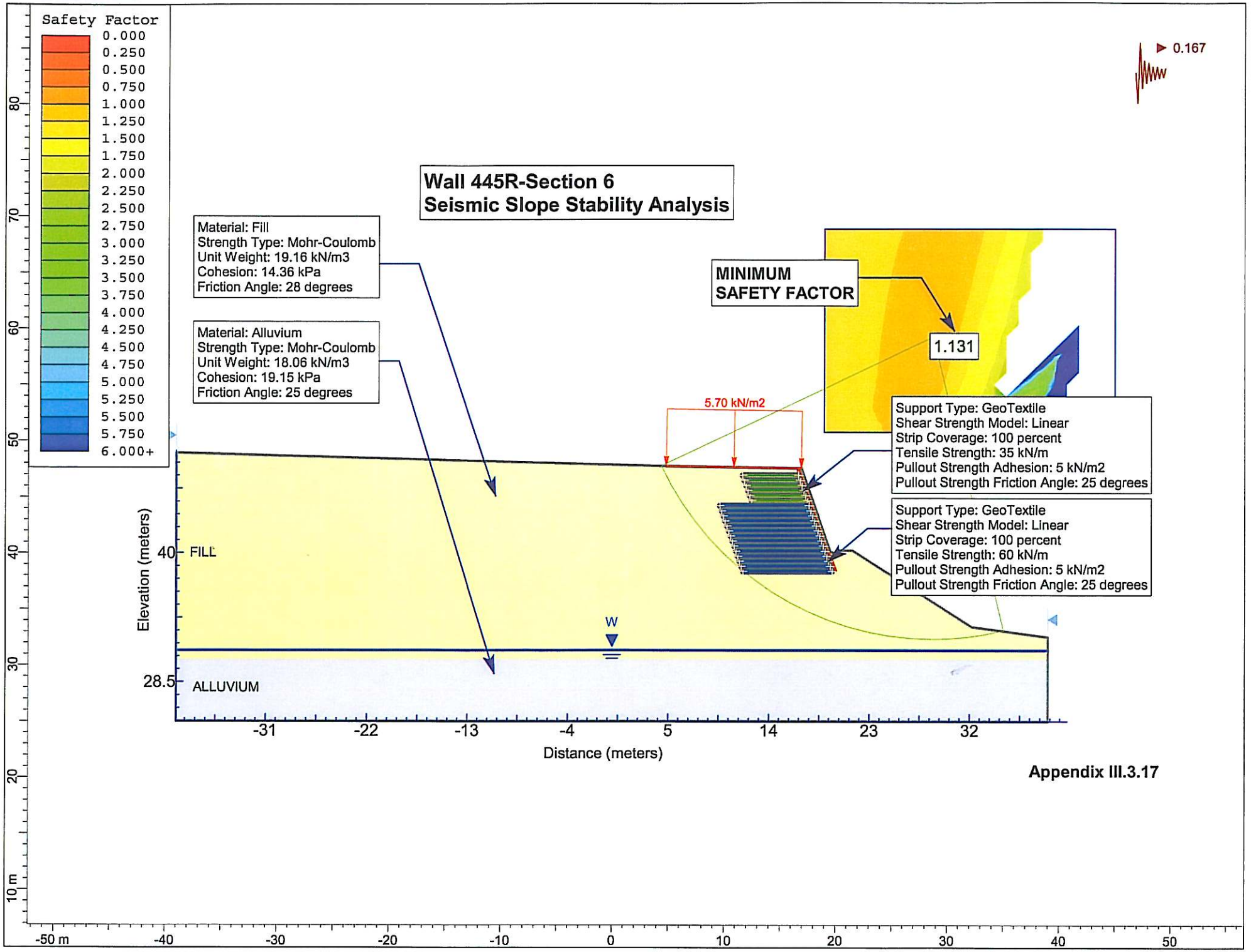
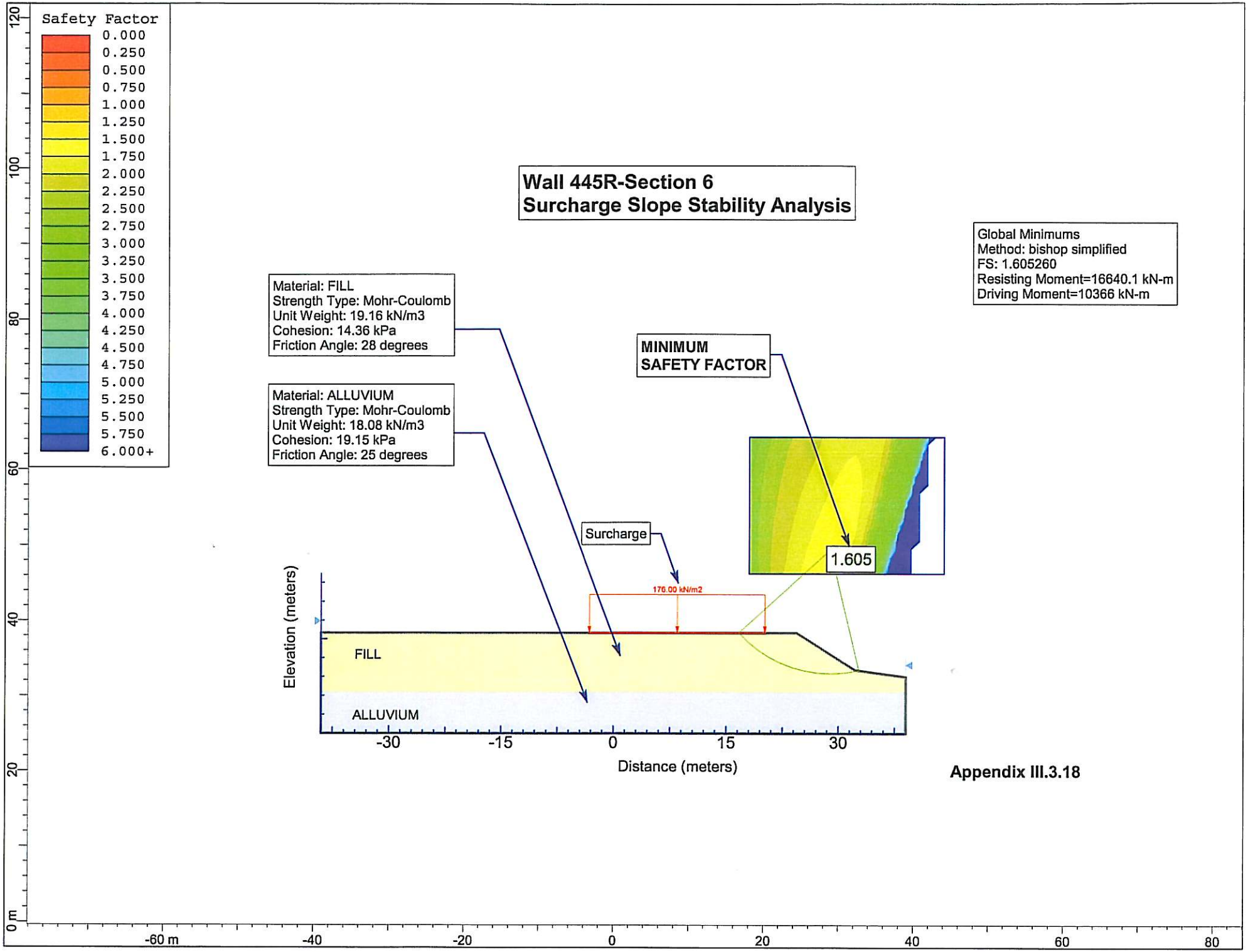
3.000
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
Wall 445R-Section 5
Surcharge Slope Stability Analysis
Global Minimums
Method: bishop simplified
FS: 1.642920
Resisting Moment=13188 kN-m
Driving Moment=8027.13 kN-m
Material: FILL
Strength Type: Mohr-Coulomb
Unit Weight: 19.16 kN/m3
Cohesion: 14.36 kPa
Friction Angle: 28 degrees
Material: ALLUVIUM
Strength Type: Mohr-Coulomb
Unit Weight: 18.08 kN/m3
Cohesion: 19.15 kPa
Friction Angle: 25 degrees
MINIMUM
SAFETY FACTOR
SURCHARGE
1.643
FILL
ALLUVIUM
Elevation (meters)
Distance (meters)
Appendix III.3.15



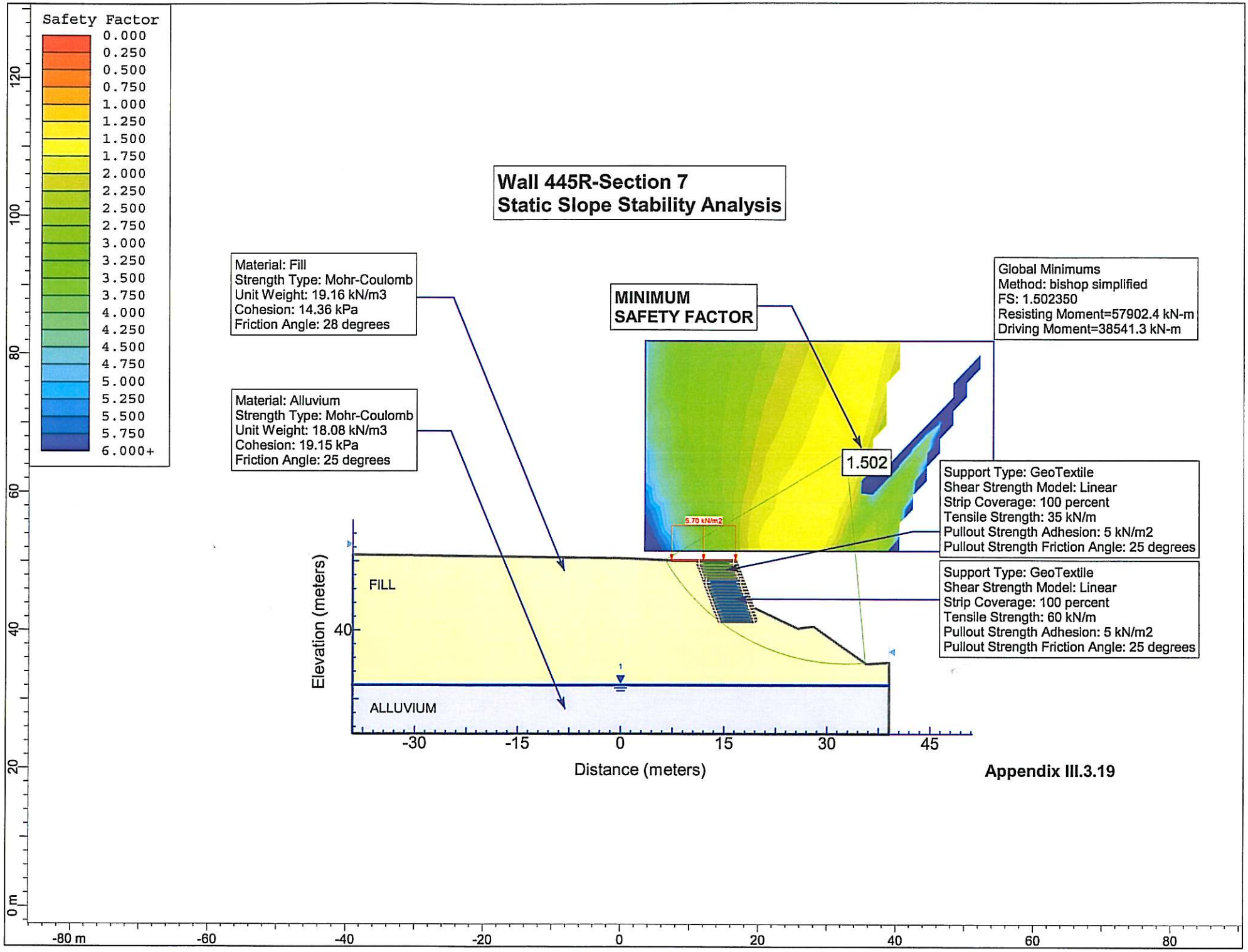
Appendix III.3.16

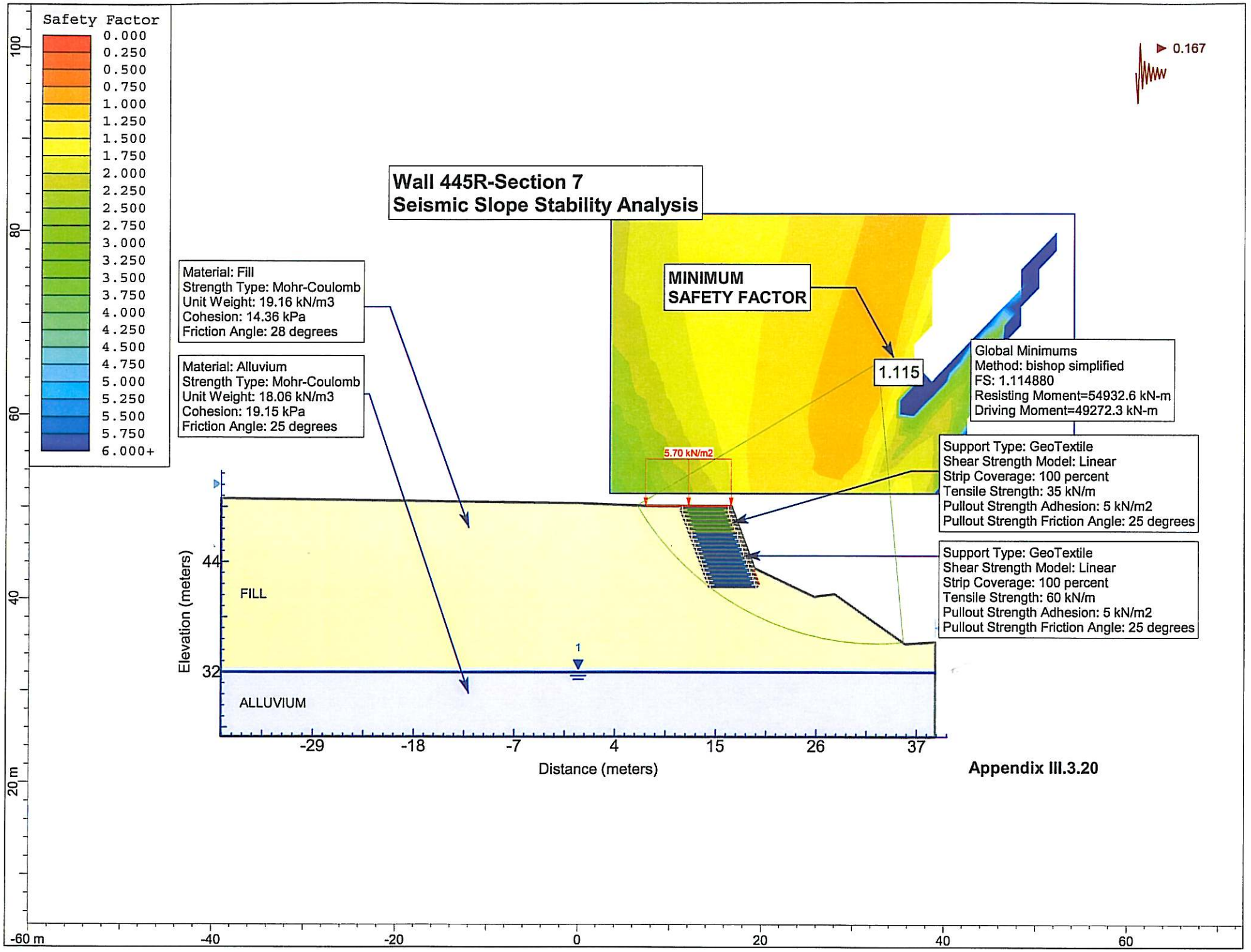


Appendix III.3.17

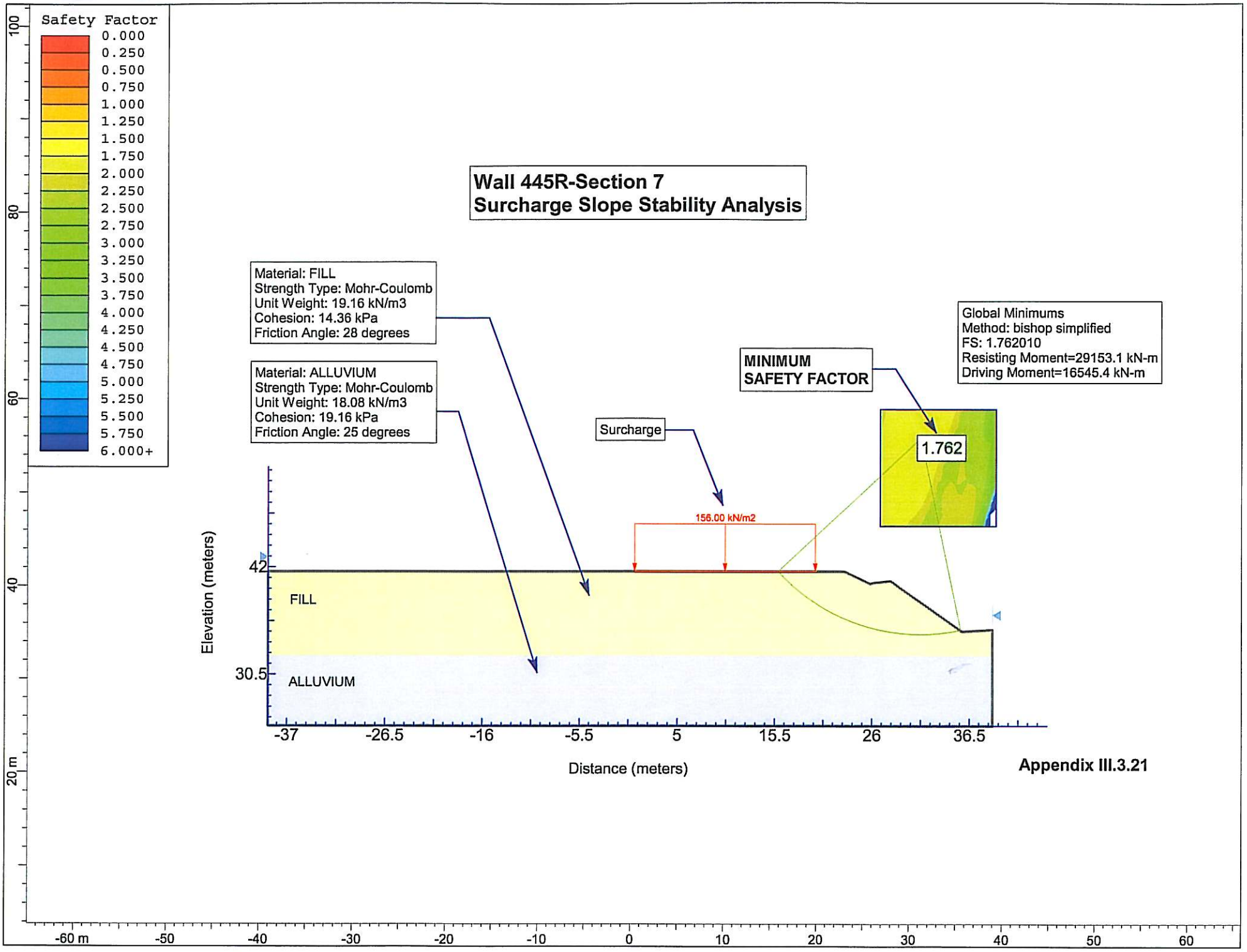


Appendix III.3.18

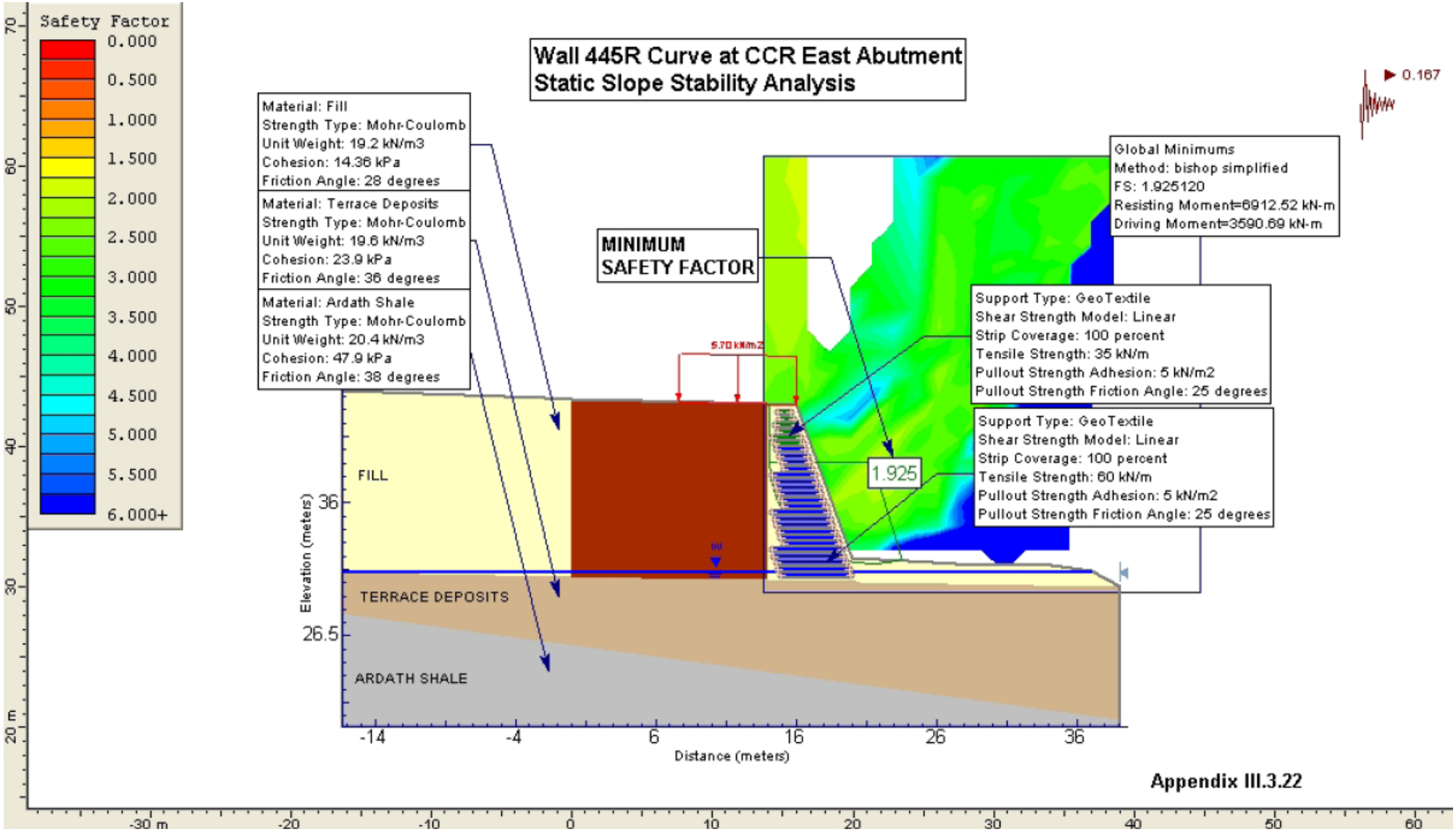

Safety Factor
0.000
0.250
0.500
0.750
1.000
1.250
1.500
1.750
2.000
2.250
2.500
2.750
3.000
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
Wall 445R-Section 7
Static Slope Stability Analysis
Material: Fill
Strength Type: Mohr-Coulomb
Unit Weight: 19.16 kN/m3
Cohesion: 14.36 kPa
Friction Angle: 28 degrees
Material: Alluvium
Strength Type: Mohr-Coulomb
Unit Weight: 18.08 kN/m3
Cohesion: 19.15 kPa
Friction Angle: 25 degrees
MINIMUM
SAFETY FACTOR
1.502
Global Minimums
Method: bishop simplified
FS: 1.502350
Resisting Moment=57902.4 kN-m
Driving Moment=38541.3 kN-m
5.70 kN/m2
Support Type: GeoTextile
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 35 kN/m
Pullout Strength Adhesion: 5 kN/m2
Pullout Strength Friction Angle: 25 degrees
Support Type: GeoTextile
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 60 kN/m
Pullout Strength Adhesion: 5 kN/m2
Pullout Strength Friction Angle: 25 degrees
FILL
ALLUVIUM
Elevation (meters)
Distance (meters)
Appendix III.3.19



Appendix III.3.20



Appendix III.3.21


Safety Factor
0.000
0.500
1.000
1.500
2.000
2.500
3.000
3.500
4.000
4.500
5.000
5.500
6.000+
Wall 445R Curve at CCR East Abutment
Static Slope Stability Analysis
Material: Fill
Strength Type: Mohr-Coulomb
Unit Weight: 19.2 kN/m3
Cohesion: 14.36 kPa
Friction Angle: 28 degrees
Material: Terrace Deposits
Strength Type: Mohr-Coulomb
Unit Weight: 19.6 kN/m3
Cohesion: 23.9 kPa
Friction Angle: 36 degrees
Material: Ardath Shale
Strength Type: Mohr-Coulomb
Unit Weight: 20.4 kN/m3
Cohesion: 47.9 kPa
Friction Angle: 38 degrees
MINIMUM
SAFETY FACTOR
Global Minimums
Method: bishop simplified
FS: 1.925120
Resisting Moment=6912.52 kN-m
Driving Moment=3590.69 kN-m
Support Type: GeoTextile
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 35 kN/m
Pullout Strength Adhesion: 5 kN/m2
Pullout Strength Friction Angle: 25 degrees
Support Type: GeoTextile
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 60 kN/m
Pullout Strength Adhesion: 5 kN/m2
Pullout Strength Friction Angle: 25 degrees
5.70 kN/m2
1.925
0.167
FILL
TERRACE DEPOSITS
ARDATH SHALE
Elevation (meters)
36
26.5
-14
-4
6
16
26
36
Distance (meters)
20 m
-30 m
-20
-10
0
10
20
30
40
50
60
70
Appendix III.3.22