Table of Contents

1. Foundation Report for Bridge Seismic Retrofit by Micropiles. Bridge No. 35-0244G

2. Foundation Report for Bridge Seismic Retrofit by Micropiles. Bridge No. 35-0245F

3. Water Quality Information Handout

4. Non-Stormwater Information package

State of California
DEPARTMENT OF TRANSPORTATION

Business, Transportation and Housing Agency

Memorandum

Flex your power!
Be energy efficient!

To: MR. GORDON DANKE
Senior Project Engineer – Branch 9
Structures Design
Office of Bridge Design-West

Date: December 09, 2010

Attention: Phil Lutz

File: 04-SM-92/280-PM 10.8
04-1A7701
Bridge No 35-0244G

From: TUNG NGUYEN
Transportation Engineer
Office of Geotechnical Design – West
Geotechnical Services
Division of Engineering Services

MAHMOOD MOMENZADEH
Chief, Branch C
Office of Geotechnical Design-West
Geotechnical Services
Division of Engineering Services

Subject: Foundation Report for Bridge Seismic Retrofit by Micropiles

INTRODUCTION

This foundation report (FR) provides geotechnical recommendations for seismic retrofit of Bents No 3 and 9 for Northbound I-280 – Westbound SR92 Connector Overcrossing (Bridge No 35-0244G) in the San Mateo County, California. The purpose of the retrofit is to adequately increase the bridge resistance to earthquakes and minimize the potential for its collapse.

This FR documents site geology and subsurface conditions, provides analyses of site conditions as they pertain to the project and recommends geotechnical input for the foundation retrofit design.

To accomplish the above stated purpose, the following works were conducted:

- Field reconnaissance to observe and document site conditions
- Review geology open file and as-built report of foundation recommendations
- Site subsurface investigation
- Engineering analyses for foundation design

PROJECT DESCRIPTION

The project site is located on the SR92/I-280 Interchange, in the County of San Mateo at PM of 10.8. The connector was built in 1974 and has 10 spans and carries one lane of traffic from I-280 northbound to SR92 westbound. It is planned to add micropiles to the

current pile foundation of Bents No 3 and 9 (Bents) to accommodate seismic loads under the Load and Resistance Factor Design (LRFD) provided by the Office of Bridge Design-West of October 01, 2010. Micropile foundation system was adopted because it is more flexible than conventional piling systems for construction below the existing bridge with low overhead.

SITE GEOLOGY AND SUBSURFACE CONDITIONS

Regional Setting and Area Geology

The project is located in the Coast Range Geomorphic province, which is defined by rugged mountains and narrow valleys trending roughly northwest along 684 mi (1100 km) of the California coast. The geology of the Coast Ranges is different on either side of the San Andreas Fault. Franciscan rocks, tectonic blocks of igneous, metamorphic, and marine sedimentary rocks altered and weathered to varying degrees, comprise most of the material to the east of the fault, while to the west marine sedimentary rocks lie depositionally above a granitic basement. After regional uplift exposed the shallow marine rocks, erosion and subsequent deposition by streams resulted in abundant subaerial stream and fan deposits.

Geologic mapping by Brabb, *et al* (1998) indicate the project site to be underlain by fill and rocks of the Franciscan Formation, including but not limited to serpentinite; mélange, a chaotic mixture of argillaceous shale, siltstone, and sandstone; minor chert and greenstone (see attached Geologic Map). Foundation materials on the northern half of the site are composed of serpentinite and those on the southern half sheared Franciscan rocks (Melange). Brabb *et al* (1998) describe the fill as loose to very well consolidated gravel, sand, silt, clay, and rock fragments in various amounts. Serpentinite is described as greenish-gray to bluish-gray sheared rock containing more competent blocks typically less than 10 ft (3 m). Franciscan sheared rocks (mélange) are described as graywacke, siltstone, and shale locally sheared and containing blocks of other Franciscan rocks.

Field Investigation and Subsurface Conditions

The Office of Geotechnical Design-West conducted a subsurface investigation in December 2008 and January 2009. The following table lists borings and their associated bent locations, approximate latitude and longitude, and approximate elevations:

	Bridge 35-0244G	
	Bent 3	Bent 9
Boring	R-08-005	R-09-006
Northing	4151287.6	4151394.7
Easting	558594.7	558352.2
Elevation (ft)	+378	+407
Depth (ft)	113.5	120.0

The subsurface investigation consisted of two mud rotary borings (Nos. R-08-005 and R-09-006). The mud rotary borings were advanced using a self-casing wireline drilling method to depths shown on the above table. Boring R-09-006 was drilled using an Acker drill rig with an automatic hammer. Boring R-08-005 was drilled with a track mounted CS 2000 with an automatic hammer. Sampling was achieved by using a Standard Penetration Test sampler at 5 ft intervals as well as continuous coring in all borings. Selected soil/rock samples were collected and submitted for laboratory tests such as water content, Atterberg Limits, grain size analysis, corrosion analysis, and unconfined compressive strength.

Topography

The project site is situated within a valley created by the San Andreas fault and is adjacent to and above Crystal Springs Reservoir. The SR92/I-280 interchange occupies a local low-point, with only westbound SR92 exiting the interchange to a lower elevation. SR92 was constructed via cuts in bedrock at the project location. Later construction of I-280 required the construction of two overcrossings (crossing SR92), two flyover connector ramps (Bridges 35-0245F and 35-0244G), one cut-and-cover tunnel and various roadway connectors. Final geometries were established by a combination of cuts and fills. The highest bent elevations are located within the median of I-280, and the lowest in the median of SR92.

Pertinent Soil Conditions or Geologic Hazards

Due to the fractured and sheared nature of the rocks throughout the project site, caving conditions may be encountered during pile construction. In addition, the variability of rock quality may pose problems for deep excavation. Blocks of hard to very hard rock will be encountered abruptly and at elevations that can not be determined for each individual pile proposed. The contractor should be prepared to encounter such blocks throughout the project site at different elevations. At Bent 3 very hard, slightly fractured

graywacke was encountered and continued to the bottom of the boring. In addition, the serpentine and clayey rock at the site are expansive and would likely squeeze in drill holes for micropiles based on the Atterberg test results and moderate to high expansion of the rock cores when extruded from the core barrel.

Bent 9 is located approximately 200 ft from the hinge line of a 2:1 (H:V) slope above SR92. The current proposed retrofit design would require micropiles be placed adjacent to this slopes, which has not experienced any deep erosion or landslide. Therefore, there will be no additional lateral loading from landsliding.

Project Site Soils

Soils at the project site are of two types: fill placed during the construction of the SR92/I-280 interchange and native residual soils comprised of deeply weathered bedrock. Soils generally quickly give way to bedrock at shallow depths.

Boring R-08-005 was drilled at Bent 3 and consisted of firm, gray brown, moist gravelly clay with sand to a depth of 12 ft. Boring R-09-006 was drilled at Bent 9 and consisted of 5 ft of stiff, brown, wet sandy clay with gravel.

Project Site Rocks

Project site rocks vary in quality and type across the project site. In general, the rocks are Franciscan serpentinite, argillite and graywacke ranging from fresh to decomposed, very soft to very hard, weak to very strong, and slightly fractured to sheared. Where bedrock has been deeply weathered, it has been treated as a soil where such descriptions better describe the properties of the material. In all such cases the parent rock is obvious and can be described as weathered bedrock. Depths to bedrock encountered in borings should be considered approximate. Because of the nature of the Franciscan Formation, it should be expected that depths to hard rock will vary throughout the project site.

Boring R-08-005 was drilled southwest of Bent 3. Subsurface conditions consist of 10 ft to 13 ft of fill comprised of stiff to very stiff gravelly lean clay with sand. The fill is underlain by Franciscan mélange consisting of blocks of slightly to very intensely fractured, fresh to moderately weathered graywacke separated by intensely fractured to locally sheared, moderately weathered to decomposed argillaceous shale. Graywacke thicknesses vary from several inches of broken chips to several tens of feet in the bottom of boring R-08-005. Hard to very hard, slightly weathered to fresh, slightly fractured

graywacke was encountered at a depth of 87 ft in boring R-08-005. This graywacke extended to the bottom of the boring at a depth of 113.5 ft (elev. +264.5 ft).

Boring R-09-006 (Bent 9) is located north of SR92. Subsurface conditions consist of 5 ft of stiff, brown, wet sandy clay with gravel. This overlies intensely fractured to locally sheared, moderately weathered to decomposed serpentinite, and lesser amounts of intensely weathered to decomposed, very intensely fractured to sheared, moderately hard to very soft argillite.

As mentioned above, the soft serpentine and argillite at the site are susceptible to squeeze into drill holes or excavations.

The Logs of Test Borings (LOTB) and the results of laboratory tests are presented in the Appendixes A and B, respectively.

GROUNDWATER

Groundwater was not measured during drilling because the holes were drilled using mud rotary. However, the first groundwater level taken on January 2009 from a piezometer installed in nearby boring shows that groundwater level is 8 ft below the ground surface. Based on the As-built LOTB and measured data up-to-date, the groundwater level is anticipated to be at a depth of approximately 8 to 20 ft below the ground surface and fluctuating with time.

SCOUR EVALUATION

Scour is not a concern for this project.

CORROSION EVALUATION

Result of a corrosion test on soil sample showed that soil is non-corrosive. However, foundation should be designed for the marine environment.

SEISMIC STUDY

Hossain Salimi of Office of Geotechnical Design West provided seismic recommendations for this project as shown in the included Appendix C.

AS-BUILT FOUNDATION DATA

As-built LOTB show that borings were drilled using wet rotary or auger method with SPT between September 1969 and March 1971 with the depth varying from 45 to 90 ft. The elevations of borings shown in the LOTB are about 10 ft lower than current elevations at Bents 3 and 9 indicating that Bents 3 and 9 are on fill. Moreover, SPT blow counts shown in the LOTB are higher than blow counts recorded in the current borings, which are possibly due to the use of lower hammer efficiency than standard energy level and/or change in topography and condition of the site. As-built foundation plans show that bridge abutments are supported on spread footings and all bents are single columns supported by CIDH piles. The CIDH pile data of the Bents are shown in Table No 1.

Table No 1. Existing CIDH Pile Data

Bent No	Report Cutoff Elevation, ft	Specified Tip Elevation, ft	Design Load, kips	CIDH Pile Diameter, ft
3	+353	+312	3300	8
9	+397	+325	3600	6

Our engineering analysis based on existing data shows that the design loads shown in Table No 1 were likely achieved by side friction capacity without ignoring the first 5 ft as well as one CIDH pile diameter at the bottom. Moreover, for side friction calculation, the materials were treated as Cohesionless Intermediate Geomaterials (IGM) with engineering properties derived from SPT blow counts. All these factors apparently lead to non-conservative pile axial capacities.

FOUNDATION RECOMMENDATIONS

We performed axial load analyses for micropiles with the grouted bond zone diameter of 12-inch at the location of Bents 3 and 9 to meet the LRFD loads provided to us by Structure Design. According to the current boring data, the site subsurface conditions consist of cohesive and cohesionless soils, cohesive and cohesionless IGM, and rock materials as shown in the included soil/rock profiles Appendix D. The foundation system and soil/rock parameters used in the analyses are based on FHWA-NHI-05-039 of December 2005 Publication, an average bond nominal strength α_{bns} of 24 psi in compression and 17 psi in tension was assumed to estimate the pile length for the initial assessment and planning purpose only. These values shall be verified based on the micropile performance and proof tests. The following table summarizes the micropile

foundations under extreme condition with the LRFD implementation (using Resistance Factor $\varphi = 1.0$ for compression and $\varphi = 0.7$ for tension).

Table No 2. Pile Data Table

Support Location	Pile Type	Cutoff Elevation (ft)	Design Load (kips) Extreme Event		Design Tip Elevation (ft)	Specified Tip Elevation (ft)
			Compression	Tension		
Bent 3	12" Micropile	+376.5	525	368	+302*	+302*
Bent 9	12" Micropile	+401.5	532	368	+327*	+327*

*The tip elevations controlled by tension are shown for estimating purposes only. The bond zone length and plunge length to be determined by Contractor.

The axial group effect of piles for a center to center spacing of equal 2.5 ft or more is insignificant because the cap is supported on the rock or very stiff clay material. It is then critical that the bearing soil/rock below the cap is not disturbed during the construction.

The pile length below the pile cap bottom consist of two major zones: the upper 20 ft zone with permanent casing along which no resistance is assumed and the lower pressure grouted zone of the pile extending below the upper 20 ft zone of casing from which the micropile capacities were derived from the skin friction resistance. The drilling and grouting method used by contractor shall achieve the minimum α_{bns} values mentioned above.

Based on FHWA-NHI-05-039 of December 2005 publication and site subsurface condition, the above mentioned α_{bns} can be achieved by using Type B grouting which consists of full depth casing of the drill hole prior and during initial grouting and subsequent pressure grouting through the casing while casing is withdrawn to 20 ft below the pile cap. Alternatively, other methods such as drilling with hollow bar below the permanent casing advanced to the pile tip with pressure grouting may be adopted. Regardless of the construction method used, the pile tip elevations for the production piles at each Bent are to be determined and checked by performance and proof load tests based on the project plans and the Caltrans specifications.

Two performance tests, one at each Bent, are recommended to verify the micropile capacities with the α_{bns} design value. Each test shall consist of tension load increasing to 1.0DL (Design Load) and then compression load to the failure. We recommend that the reaction micropiles shall have the same length as a test micropile pile. We also recommend that the structural capacity of the pile and the test frame load capacity should sufficiently exceed beyond the required geotechnical capacity of the pile mentioned in Table 2 above.

Five percent of production micropiles shall be performed with proof test in tension load only to confirm that production micropile performance is consistent with the performance test and meets the specifications. The tension load test shall be loaded to 1.0DL.

CONSTRUCTION CONSIDERATIONS

The maximum slope for excavation can be 3/4:1 (Horizontal to Vertical) at Bent No 3 and 1:1 at Bent No 9. The excavation should follow the Cal/OSHA excavation requirements.

The methods of drilling and grouting are the main factors affecting the skin friction of micropiles. Therefore, suitable methods should be considered to achieve the required capacities. As described in the prior section, full depth drill hole casing with auger drilling and Type B grouting or hollow bar with continuously drilling and grouting at the same time may be used with provision of achieving the minimum α_{bns} specified above. The grouting and drilling method used also shall consider the caving and squeeze potential of the soft rock at the site.

The performance and proof tests shall be performed based on the Caltrans plans and specifications. Data obtained from these tests shall be made available to Geotechnical Design West on time for review.

Construction of micropiles shall have minimum impact on the existing piles/columns integrity. No micropile shall be installed within 5 ft of a micropile previously installed up to 24 hours to limit the occurrence of suspected grout communication.

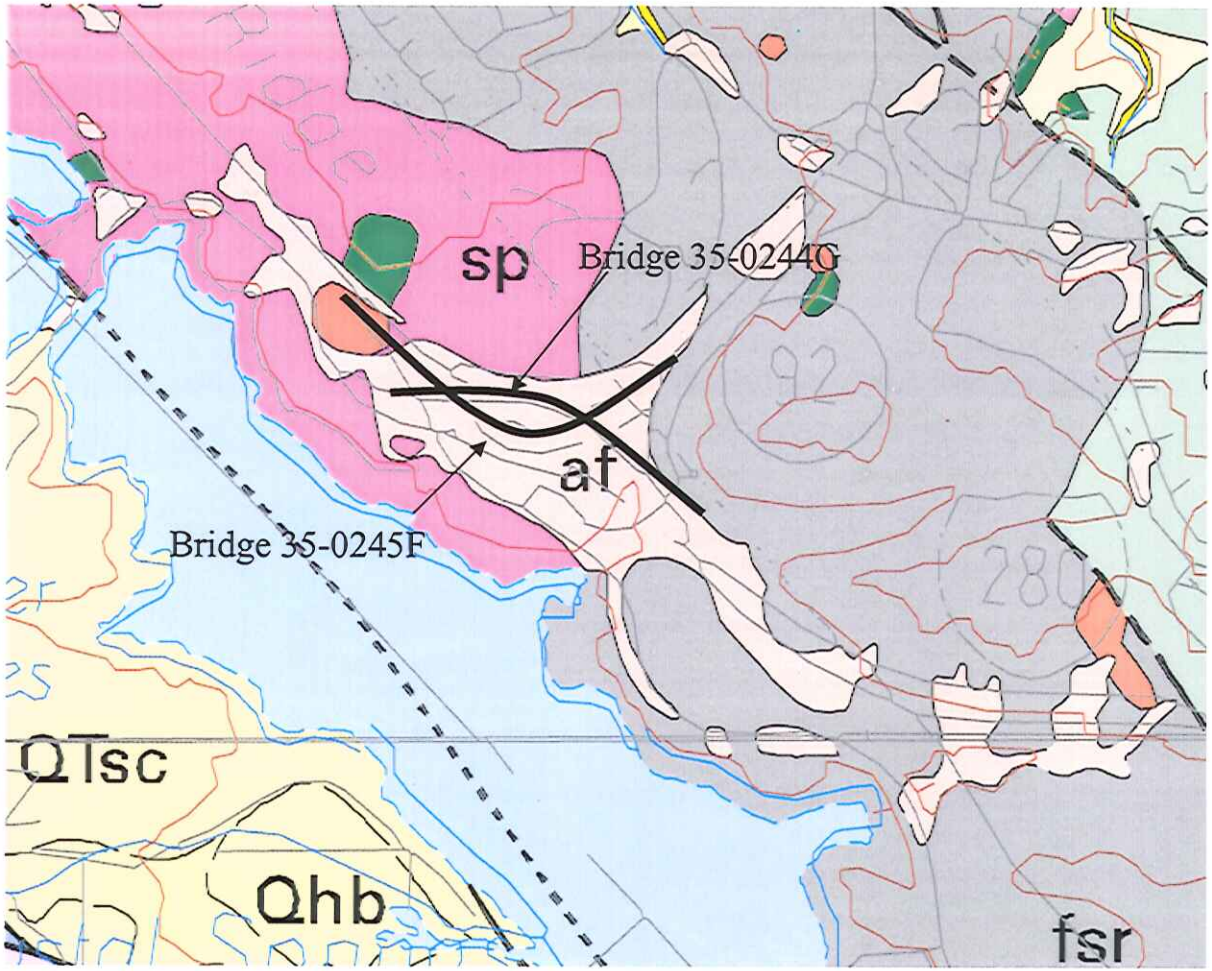
Difficult drilling conditions are anticipated due to the presence of hard rock. Groundwater is anticipated during the micropile installation. Contractors should be referred to the LOTB and laboratory test data for soil/rock types and properties.

DISCLAIMER AND CONTACT INFORMATION

The recommendations contained in this report are based on specific project information regarding structure type and location. If any conceptual changes are made during final project design, the Office of Geotechnical Design – West, Design Branch C 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 Tung Nguyen, 510-622-1775 or Mahmood Momenzadeh, 510-286-5732, at the Office of Geotechnical Design-West, Branch C.

c: TPokrywka, GWilcox, MMomenzadeh, CRisden, TNguyen, Daily File, Route File, Translab File, John Stayton, Specs and Estimate, John Mook, PCE-PPRM , Project Manager, District Design Chief

TNguyen/mm



1 .5 0

N

DESCRIPTION OF MAP UNITS

af — **Artificial fill (Historic)**—Loose to very well consolidated gravel, sand, silt, clay, rock fragments, organic matter, and man-made debris in various combinations. Thickness is variable and may exceed 30 m in places. Some is compacted and quite firm, but fill made before 1965 is nearly everywhere not compacted and consists simply of dumped materials

Qhb — **Basin deposits (Holocene)**—Very fine silty clay to clay deposits occupying flat-floored basins at the distal edge of alluvial fans adjacent to the bay mud (Qhbm). Also contains unconsolidated, locally organic, plastic silt and silty clay deposited in very flat valley floors

QTsc — **Santa Clara Formation (lower Pleistocene and upper Pliocene)**—Gray to red-brown poorly indurated conglomerate, sandstone, and mudstone in irregular and lenticular beds. Conglomerate consists mainly of subangular to subrounded cobbles in a sandy matrix but locally includes pebbles and boulders. Cobbles and pebbles are mainly chert, greenstone, and graywacke with some schist, serpentinite, and limestone. On Coal Mine Ridge, south of Portola Valley, conglomerate contains boulders of an older conglomerate as long as one meter. Gray to buff claystone and siltstone beds on Coal Mine Ridge contain carbonized wood fragments as large as 60 cm in diameter.

fs — **Sandstone**—Greenish-gray to buff, fine- to coarse-grained sandstone (graywacke), with interbedded siltstone and shale. Siltstone and shale interbeds constitute less than 20 percent of unit, but in places form sequences as much as several tens of meters thick. In many places, shearing has obscured bedding relations; rock in which shale has been sheared to gouge constitutes about 10 percent of unit. Gouge is concentrated in zones that are commonly less than 30 m wide but in places may be as much as 150 m wide. Total thickness of unit is unknown but is probably at least many hundreds of meters

fg — **Greenstone**—Dark-green to red altered basaltic rocks, including flows, pillow lavas, breccias, tuff breccias, tuffs, and minor related intrusive rocks, in unknown proportions. Unit includes some Franciscan chert and limestone bodies that are too small to show on map. Greenstone crops out in lenticular bodies varying in thickness from a few meters to many hundreds of meters

fc — **Chert**—White, green, red, and orange chert, in places interbedded with reddish-brown shale. Chert and shale commonly are rhythmically banded in thin layers, but chert also crops out in very thick layers. In San Carlos, chert has been altered along faults to tan- to buff-colored clay. Chert and shale crop out in lenticular bodies as much as 75 m thick; chert bodies are commonly associated with Franciscan greenstone.

fsr — **Sheared rock (melange)**—Predominantly graywacke, siltstone, and shale, substantial portions of which have been sheared, but includes hard blocks of all other Franciscan rock types. Total thickness of unit is unknown, but is probably at least several tens of meters

sp — **Serpentinite (Cretaceous and/or Jurassic)**—Greenish-gray to bluish-green sheared serpentinite, enclosing variably abundant blocks of unsheared rock. Blocks are commonly less than 3 m in diameter, but range in size from several centimeters to several meters; they consist of greenish-black serpentinite, schist, rodingite, ultramafic rock, and silica-carbonate rock, nearly all of which are too small to be shown on the map

Geology of the Onshore Part of San Mateo County, California: Derived from the Digital Database Open-File 98-137

By E.E. Brabb, R.W. Graymer, and D.L. Jones

1998

Caltrans

Geologic Map

04-SM-280 **PM 10.8**

EA 04-1A7701 **February 1, 2009**

APPENDIX A

LOG OF TEST BORINGS

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	SM	280	10.2/10.7		

REGISTERED GEOLOGIST — DATE 07-15-09

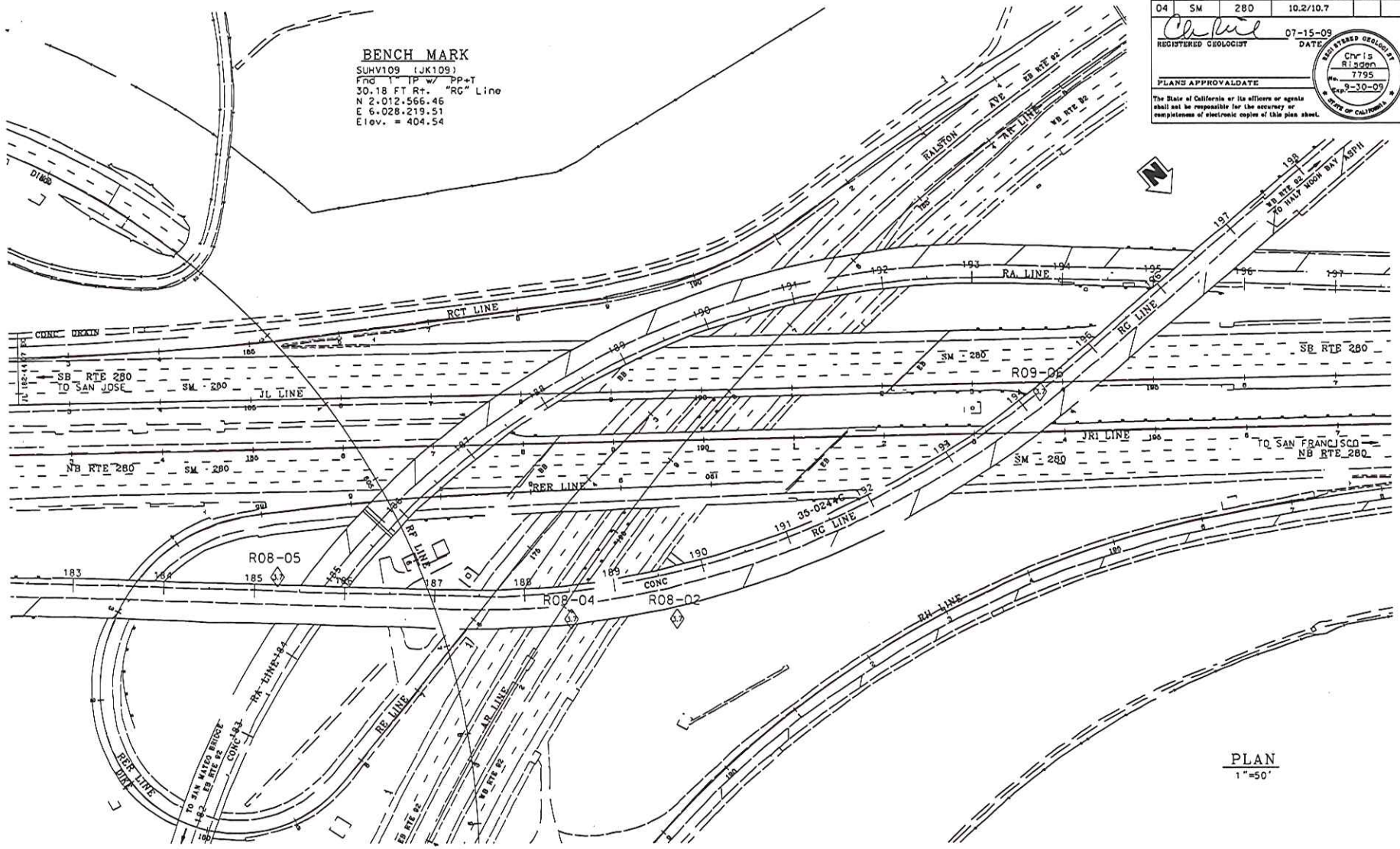
Chris Ridgen No. 7795 Exp. 9-30-09 — REGISTERED GEOLOGIST — STATE OF CALIFORNIA

PLANS APPROVAL DATE

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

BENCH MARK

SUHV109 (JK109)
Fnd 1" IP w/ "PP+T
30.18 FT Rt. "RC" Line
N 2,012,566.46
E 6,028,219.51
Elev. = 404.54



PLAN
1"=50'

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES OFFICE OF GEOTECHNICAL DESIGN BRANCH	BRIDGE NO. 35-0244C	N280/W92 CONNECTOR OC (RETROFIT)
FUNCTIONAL SUPERVISOR NAME: C. Wilcox	DRAWN BY: M. Reynolds 03/09	FIELD INVESTIGATION BY: C. Risden			POST MILES 10.2/10.7	LOG OF TEST BORINGS
OGS CIVIL LOG OF TEST BORINGS SHEET	CHECKED BY: B. Price	ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3	CU 04 EA 1A7701	FILE •) $REQUEST	DIERSCARD PRINTS BEARING EARLIER REVISION DATES	REVISION DATES — SHEET 1 OF 10

USERNAME -$USER DATE PLOTTED -)$DATE TIME PLOTTED -)$TIME

DATE PLOTTED -:HOUR:MIN TIME PLOTTED -:HOUR:MIN USERNAME -:USER

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
04	SM	280	10.2/10.7		

REGISTERED GEOLOGIST — DATE: 07-15-09

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.

Chris Risden 7795 — REGISTERED GEOLOGIST — Exp. 9-30-09 — STATE OF CALIFORNIA

NOTE: This LOTB sheet was prepared in accordance with the Caltrans Soil & Rock Logging, Classification, and Presentation Manual (June 2007).

*NR: Not Recorded.

185+00 186+00 187+00

PROFILE
HOR. 1"=20'
VER. 1"=5'

12-22/24-08
Terminated at El 264.5', ER: =84%

260
265
270
275
280
285
290
295
300
305
310
315
320
325
330
335
340
345
350
355
360
365
370
375
380
385

-unfractured.
-very hard, very strong.
-slightly weathered, slightly fractured.
-moderately weathered.
-(with some SERPENTINE fragments).
-No recovery.
-very intensely weathered, soft, SANDY CLAY, very stiff, dry, nonplastic.
-moderately weathered, moderately soft.
CALCITE vein.
sheared, very intensely weathered.
frocture zone of elev. 335.5' contains fine GRAVEL.
moderately hard to hard, intensely fractured, CALCITE veining.
not fractured,very weak.
some CALCITE veining, less GRAYWACKE.
intensely weathered, soft to moderately hard, sheared.
soft, sheared, (SANDY CLAY, stiff, nonplastic).
-dark grey to black, very intensely weathered.
-very intensely weathered.
sheared, extremely weak shears contain CLAY, firm, grey green.
-very hard, very strong.
-moderately weathered.
-No recovery.
-very intensely weathered, soft, very stiff, dry, nonplastic.
-moderately weathered, moderately soft.
-No recovery.
-moderately weathered.
-frocture zone, moderately weathered.
-very intensely fractured, (SANDY CLAY, hard, dry, nonplastic).
-hard, moderately fractured, 3" wide fracture zone.
-very intensely fractured, sheared.
-soft, very intensely fractured, sheared.
-moderately soft to hard, very intensely fractured, intensely sheared.
-hard, slightly to moderately fractured, strong to very strong.
-1" wide fracture zone.
-moderately fractured, fractures are slightly rough, some healed (CaCo), weak.
-moderately weathered.
-very hard, very strong.
-unfractured.

METAMORPHIC ROCK (Argillite and Serpentine), dark grey to olive green.
METAMORPHIC ROCK (Argillite), dark grey to black, moderately soft to moderately hard, very intensely fractured, intensely weathered, locally sheared in angular fragments.
CLAYEY SAND with GRAVEL (SC), firm, grey, moist, 25% GRAVEL, 30% SAND, 45% FINES, moderate plasticity.
METAMORPHIC ROCK (Argillite and Graywacke), dark grey to black, moderately soft to moderately hard, very intensely fractured, intensely weathered, extremely weak shears contain CLAY, firm, grey green.
METAMORPHIC ROCK (Argillite), dark grey to black, moderately soft to moderately hard, intensely fractured, intensely weathered.
METAMORPHIC ROCK (Argillite), dark grey to black, moderately soft to moderately hard, intensely fractured, intensely weathered.
METAMORPHIC ROCK (Metagraywacke), dark grey, moderately weathered, moderately hard to hard, intensely fractured, CALCITE veining.
METAMORPHIC ROCK (Argillite), soft, very intensely fractured, sheared, very intensely weathered.
METAMORPHIC ROCK (Metagraywacke), dark grey, moderately weathered, hard, not fractured,very weak.
METAMORPHIC ROCK (Argillite), dark grey to black, moderately weathered, moderately soft, very intensely fractured, sheared.
METAMORPHIC ROCK (Metagraywacke), dark grey, moderately weathered, hard, slightly to moderately fractured, strong to very strong.
METAMORPHIC ROCK (Metagraywacke), grey, slightly weathered, hard, moderately fractured, fractures are slightly rough, some healed (CaCo), weak.
METAMORPHIC ROCK (Argillite), grey, intensely weathered, moderately soft to hard, very intensely fractured, intensely sheared.
METAMORPHIC ROCK (Metagraywacke and Argillite), grey, moderately weathered, soft, very intensely fractured, sheared.
METAMORPHIC ROCK (Argillite), grey, intensely weathered.
METAMORPHIC ROCK (Metagraywacke), grey, moderately weathered, hard, moderately fractured, 3" wide fracture zone.
METAMORPHIC ROCK (Metagraywacke), grey, moderately weathered, very intensely fractured, (SANDY CLAY, hard, dry, nonplastic).
METAMORPHIC ROCK (Argillite and Graywacke), intensely weathered, soft, intensely fractured, sheared.
fracture zone, moderately weathered.
METAMORPHIC ROCK (Argillite), grey, intensely weathered, soft, intensely fractured, sheared.
very intensely fractured, (SANDY CLAY, hard, dry, nonplastic).
METAMORPHIC ROCK (Metagraywacke), grey, moderately weathered, hard, moderately fractured, 3" wide fracture zone.
METAMORPHIC ROCK (Metagraywacke), grey, slightly weathered, hard, moderately fractured, fractures are slightly rough, some healed (CaCo), weak.
1" wide fracture zone.
METAMORPHIC ROCK (Metagraywacke), very slightly weathered, hard, slightly to moderately fractured, strong to very strong.
-slightly weathered, slightly fractured.
-very hard, very strong.
-unfractured.

IGNEOUS ROCK (Pyroxenite), dark green, moderately weathered, hard. (Fill?)
CLAYEY SAND with GRAVEL (SC), firm, grey brown, moist, 21% GRAVEL, 46%SAND, 33% FINES, subangular to rounded, fine GRAVEL, well graded.
No recovery.
METAMORPHIC ROCK (Argillite and Serpentine), dark grey to olive green, intensely weathered, moderately soft, intensely fractured to locally sheared, extremely weak shears contain CLAY, firm, grey green.
moist, moderately plastic.
METAMORPHIC ROCK (Argillite), dark grey to black, moderately soft to moderately hard, very intensely fractured, intensely weathered, locally sheared in angular fragments.
-very intensely weathered.
CLAYEY SAND with GRAVEL (SC), firm, grey, moist, 25% GRAVEL, 30% SAND, 45% FINES, moderate plasticity.
-dark grey to black, very intensely weathered.
soft, sheared, (SANDY CLAY, stiff, nonplastic).
METAMORPHIC ROCK (Argillite and Graywacke), dark grey to black, intensely weathered, soft to moderately hard, sheared.
some CALCITE veining, less GRAYWACKE.
No recovery.
METAMORPHIC ROCK (Metagraywacke), dark grey, moderately weathered, hard, not fractured,very weak.
METAMORPHIC ROCK (Argillite), dark grey to black, moderately weathered, moderately soft, very intensely fractured, sheared.
METAMORPHIC ROCK (Metagraywacke), dark grey, moderately weathered, moderately hard to hard, intensely fractured, CALCITE veining.
frocture zone of elev. 335.5' contains fine GRAVEL.
METAMORPHIC ROCK (Argillite), soft, very intensely fractured, sheared, very intensely weathered.
CALCITE vein.
-moderately weathered, moderately soft.
-very intensely weathered, soft, SANDY CLAY, very stiff, dry, nonplastic.
-No recovery.
-(with some SERPENTINE fragments).
-No recovery.
-moderately weathered.
-frocture zone, moderately weathered.
-very intensely fractured, (SANDY CLAY, hard, dry, nonplastic).
-hard, moderately fractured, 3" wide fracture zone.
-very intensely fractured, sheared.
-soft, very intensely fractured, sheared.
-moderately soft to hard, very intensely fractured, intensely sheared.
-hard, slightly to moderately fractured, strong to very strong.
-1" wide fracture zone.
-moderately fractured, fractures are slightly rough, some healed (CaCo), weak.
-moderately weathered.
-very hard, very strong.
-unfractured.

R08-05
378'
15', Lt Sta 185+25
RC Line

(FOR BORING LOCATION SEE PLAN, LOTB SHEET 1 OF 10)

BENCH MARK
SUHV109 (JK109)
Fnd 1" IP w/ PP+T
30.18 Ft Rt. "RC" Line
N 2,012,566.46
E 6,028,219.51
Elev. = 404.54

ENGINEERING SERVICES
FUNCTIONAL SUPERVISOR
NAME: C. Wilcox
DGS CIVIL LOG OF TEST BORINGS SHEET

GEOTECHNICAL SERVICES
DRAWN BY: M. Reynolds 03/09
CHECKED BY: B. Price
FIELD INVESTIGATION BY: C. Risden

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
DIVISION OF ENGINEERING SERVICES
OFFICE OF GEOTECHNICAL DESIGN
DESIGN BRANCH

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS

BRIDGE NO.	
35-0244G	
POST MILES	
10.2/10.7	

N280W92 CONNECTOR OC (RETROFIT)

LOG OF TEST BORINGS

DISTRICT/BRANCH/SECTION BEARING DATUM — REVISION DATES

SHEET 2 OF 10

CU 04
EA 1A7701
FILE ** REQUEST

BENCH MARK

SUHV109 (JK109)
Fnd 1" IP w/ PP+T
30.18 FT Rt. "RG" Line
N 2,012,566.46
E 6,028,219.51
Elev. = 404.54

(FOR BORING LOCATION SEE PLAN, LOTB SHEET 1 OF 10)

PROFILE
HOR. 1"=20'
VER. 1"=5'

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	SM	280	10.8/10.7		

REGISTERED GEOLOGIST — DATE 07-10-09

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.

Chris Risden No. 1795 Exp. 9-30-09 — STATE OF CALIFORNIA

ENGINEERING SERVICES — FUNCTIONAL SUPERVISOR: C. Wilcox

GEOTECHNICAL SERVICES — DRAWN BY: M. Reynolds 08/08 — CHECKED BY: B. Price — FIELD INVESTIGATION BY: C. Risden

STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

DIVISION OF ENGINEERING SERVICES, OFFICE OF GEOTECHNICAL DESIGN, DESIGN BRANCH

CU 04 EA 1A770

BRIDGE NO. 35-0244G — POST MILE 10.2/10.

N280W92 CONNECTOR OC (RETROFIT)

LOG OF TEST BORINGS

3 | 10

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

BENCH MARK
SUHV109 (JK109)
Fnd 1" IP w/ PP+T
30.18 FT Rt. "RG" Line
N 2,012,566.46
E 6,028,219.51
Elev. = 404.54

(FOR BORING LOCATION SEE PLAN, LOTB SHEET 1 OF 10)

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
04	SM	280	10.2/10.7		

REGISTERED GEOLOGIST — 07-16-09 DATE

PLANS APPROVAL DATE

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

Chris Risden 2795 Exp. 9-30-09 — STATE OF CALIFORNIA

ENGINEERING SERVICES — FUNCTIONAL SUPERVISOR: DAVID C. WILCOX

GEOTECHNICAL SERVICES — DRAWN BY: M. Reynolds 05/09 — CHECKED BY: B. Price — FIELD INVESTIGATION BY: J. Moore

STATE OF CALIFORNIA — DEPARTMENT OF TRANSPORTATION

DIVISION OF ENGINEERING SERVICES — OFFICE OF GEOTECHNICAL DESIGN — DESIGN BRANCH

CU 04 — EA 1A7701

BRIDGE NO. 35-0244C — POST MILE 10.2/10.7

N280W92 CONNECTOR OC (RETROFIT)

LOG OF TEST BORINGS

4 | 10

194+00
195+00
196+00
PROFILE
HOR. 1"=20'
VER. 1"=5'
ER₁=83%
Terminated at El 287'
01-06-09
285
290
295
300
305
310
315
320
325
330
335
340
345
350
355
360
365
370
375
380
385
390
395
400
405
410
415
R09-06
407'
0' Lt Sta 194+25
RE Line
Sandy CLAY with GRAVEL (CL), stiff, brown, wet, moderate plasticity.
ASPHALT
METAMORPHIC ROCK (Serpentine), dark green, hard, slightly weathered, slightly fractured.
-gray green to brown, intensely weathered, soft, very intensely fractured, sheared, CLAYEY SAND or CLAYEY GRAVEL with SAND, stiff, moist, nonplastic), -fracture zone, 2" thick angular fragments of ARGILLITE, block, moderately weathered, moderately soft.
-4" fracture zone.
-decomposed, soft, very intensely fractured, (SILTY SAND, firm, grey green brown, moist, 5% GRAVEL, 70% SAND, 25% FINES, nonplastic).
No recovery.
-olive green, (SILTY SAND, firm, grey green brown, moist, 5% GRAVEL, 70% SAND, 25% FINES, nonplastic).
METAMORPHIC ROCK (Argillite and Serpentine), olive green to block, moderately to intensely weathered, moderately soft, very intensely fractured.
-very intensely weathered, (CLAYEY SAND, grey, 5% GRAVEL, 45% SAND, 50% FINES), moderate plasticity.
METAMORPHIC ROCK (Serpentine), blue green, intensely weathered, soft, sheared, -moderately weathered, moderately soft, very intensely fractured, sheared.
METAMORPHIC ROCK (Greywacke), olive green, slightly weathered, hard, intensely fractured.
No recovery.
METAMORPHIC ROCK (Serpentine/ Metagreywacke), weathered, hard, intensely fractured, rust colored areas, foliated structure, ovoid block spots.
METAMORPHIC ROCK (Serpentine and Argillite), blue green to grey, very intensely weathered, very soft, very intensely fractured, very intensely weathered, (CLAY with SAND, very stiff, dry).
METAMORPHIC ROCK (Serpentine), blue green to grey, very intensely weathered, very soft, very intensely fractured, very intensely weathered, (CLAY with SAND, very stiff, dry).
No recovery.
METAMORPHIC ROCK (Serpentine and Argillite), grey to light blue green, very intensely weathered, soft to very soft, very intensely fractured, extremely weak, (SILTY CLAY, very stiff, dry, slight plasticity).
-extremely weak.
METAMORPHIC ROCK (Argillite), dark grey, slightly weathered, moderately hard, moderately fractured.
METAMORPHIC ROCK (Serpentine and Argillite), grey to light blue green, very intensely weathered, soft to very soft, very intensely fractured, (SILTY CLAY, very stiff, dry, slight plasticity).
-extremely weak.
-light green blue to grey, very soft, (CLAY with SAND, very stiff, grey to olive green, dry, hard, low plasticity).
-intensely weathered.
-moderately weathered, soft, sheared, extremely weak.
-slightly weathered.
-intensely weathered.
METAMORPHIC ROCK (Serpentine), dark green to block, moderately soft, sheared, moderately weathered, -very intensely weathered, very soft.
Terminated at El 287'
01-06-09
ER₁=83%
GWS EL. 390'
01-09-09
-4" fracture zone.
-decomposed, soft, very intensely fractured, (SILTY SAND, firm, grey green brown, moist, 5% GRAVEL, 70% SAND, 25% FINES, nonplastic).
No recovery.
-olive green, (SILTY SAND, firm, grey green brown, moist, 5% GRAVEL, 70% SAND, 25% FINES, nonplastic).
METAMORPHIC ROCK (Argillite and Serpentine), olive green to block, moderately to intensely weathered, moderately soft, very intensely fractured.
-very intensely weathered, (CLAYEY SAND, grey, 5% GRAVEL, 45% SAND, 50% FINES), moderate plasticity.
METAMORPHIC ROCK (Serpentine), blue green, intensely weathered, soft, sheared, -moderately weathered, moderately soft, very intensely fractured, sheared.
METAMORPHIC ROCK (Greywacke), olive green, slightly weathered, hard, intensely fractured.
No recovery.
METAMORPHIC ROCK (Serpentine/ Metagreywacke), weathered, hard, intensely fractured, rust colored areas, foliated structure, ovoid block spots.
METAMORPHIC ROCK (Serpentine and Argillite), blue green to grey, very intensely weathered, very soft, very intensely fractured, very intensely weathered, (CLAY with SAND, very stiff, dry).
METAMORPHIC ROCK (Serpentine), blue green to grey, very intensely weathered, very soft, very intensely fractured, very intensely weathered, (CLAY with SAND, very stiff, dry).
No recovery.
METAMORPHIC ROCK (Serpentine and Argillite), grey to light blue green, very intensely weathered, soft to very soft, very intensely fractured, extremely weak, (SILTY CLAY, very stiff, dry, slight plasticity).
-extremely weak.
METAMORPHIC ROCK (Argillite), dark grey, slightly weathered, moderately hard, moderately fractured.
METAMORPHIC ROCK (Serpentine and Argillite), grey to light blue green, very intensely weathered, soft to very soft, very intensely fractured, (SILTY CLAY, very stiff, dry, slight plasticity).
-extremely weak.
-light green blue to grey, very soft, (CLAY with SAND, very stiff, grey to olive green, dry, hard, low plasticity).
-intensely weathered.
-moderately weathered, soft, sheared, extremely weak.
-slightly weathered.
-intensely weathered.
METAMORPHIC ROCK (Serpentine), dark green to block, moderately soft, sheared, moderately weathered, -very intensely weathered, very soft.
Terminated at El 287'
01-06-09
ER₁=83%
NOTE: *NR: Not Recorded.
BENCH MARK
SUHV109 (JK109)
Fnd T in PK w/ PP+T
30.18 FT Rt. "RG" Line
N 2,012,566.46
E 6,028,219.51
Elev. = 404.54
FOR BORING LOCATION SEE PLAN, LOTB SHEET 1 OF 101
ENGINEERING SERVICES
GEOTECHNICAL SERVICES
FUNCTIONAL SUPERVISOR
NAME C. Wilcox
DRAWN BY: M. Reynolds 03/09
CHECKED BY: B. Price
FIELD INVESTIGATION BY:
C. Risden
ORIGINAL PLAN IN INCHES
FOR REDUCED PLANS
0 1 2 3
DIVISION OF ENGINEERING SERVICES
OFFICE OF GEOTECHNICAL
DESIGN BRANCH
STATE OF
CALIFORNIA
DEPARTMENT OF TRANSPORTATION
BRIDGE NO. 35-0244G
POST MILES 10.2/10.7
N280W92 CONNECTOR OC (RETROFIT)
LOG OF TEST BORINGS
DISREGARD PRINTS BEARING EARLIER REVISION DATES
CU 04
EA 1A7701
FILE => SEQUOIA
SHEET 5 OF 10
USERNAME -MUSER DATE PLOTTED -JOBDATE TIME PLOTTED -XTIME
DIST 04 COUNTY SM ROUTE 280 POST MILES TOTAL PROJECT 10.2/10.7 SHEET No. SHEETS TOTAL
REGISTERED GEOLOGIST DATE 07-15-09
PLANS APPROVAL DATE
The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.
REGISTERED GEOLOGIST Chris Risden 7795 No. 9-30-09 STATE OF CALIFORNIA
NOB CIVIL LOG OF TEST BORINGS SHEET

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

DIST	COUNTY	ROUTE	TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	SM	280	10.2/10.7		

REGISTERED GEOLOGIST 07-10-09 DATE

Chris Risden 7795 9-30-09 — REGISTERED GEOLOGIST — STATE OF CALIFORNIA

PLANS APPROVAL DATE

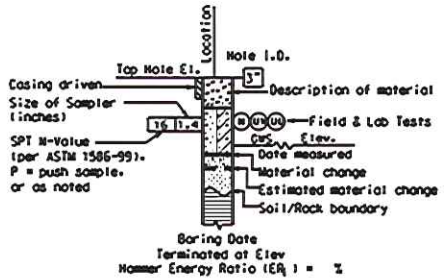
The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

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

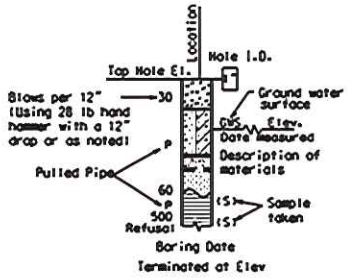
CONSISTENCY OF COHESIVE SOILS				
Description	Unconfined Compressive Strength (tsf)	Pocket Penetrometer Measurement (tsf)	Torvane Measurement (tsf)	Field Approximation
Very Soft	• 0.25	• 0.25	• 0.12	Easily penetrated several inches by fist
Soft	0.25 to 0.50	0.25 to 0.50	0.12 to 0.25	Easily penetrated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

BOREHOLE IDENTIFICATION		
Symbol	Hole Type	Description
	A	Auger Boring
	R P	Rotary drilled boring Rotary percussion boring (air)
	R	Rotary drilled diamond core
	HD HA	Hand driven (1-inch soil tube) Hand Auger
	D	Dynamic Cone Penetration Boring
	CPT	Cone Penetration Test (ASTM D 5778-95)
	O	Other
Bore Size in inches.		

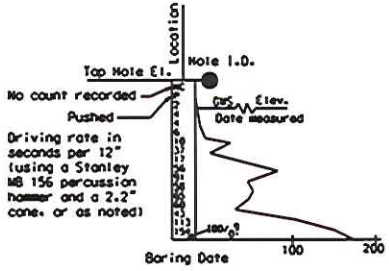
PLASTICITY OF FINE-GRAINED SOILS	
Description	Criteria
Nonplastic	A 1/8-inch thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the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



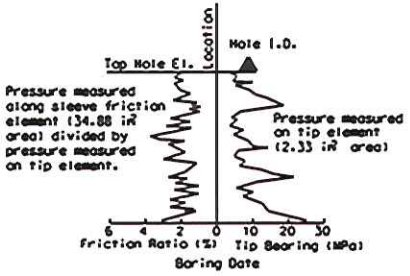
ROTARY BORING



HAND BORING



DYNAMIC CONE PENETRATION BORING



CONE PENETRATION TEST (CPT) SOUNDING

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES OFFICE OF GEOTECHNICAL DESIGN BRANCH	SOIL LEGEND LOG OF TEST BORINGS
FUNCTIONAL SUPERVISOR	PREPARED BY M. Reynolds 08/08			
C. Wilcox	CHECKED BY C. Risden	C. Risden		

CU 04 EA 1A7701

05-0244G

10.2/10.7

SHEET 6 OF 10

FILE -1 BREQUENT

USERNAME = RISDEN DATE PLOTTED = 07/10/09 TIME PLOTTED = 07:38

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

GROUP SYMBOLS AND NAMES

Graphic/Symbol	Group Names
GW	Well-graded GRAVEL Well-graded GRAVEL with SAND
GP	Poorly graded GRAVEL Poorly graded GRAVEL with SAND
GW-GM	Well-graded GRAVEL with SILT Well-graded GRAVEL with SILT and SAND
GW-GC	Well-graded GRAVEL with CLAY (or SILTY CLAY) Well-graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)
GP-GM	Poorly graded GRAVEL with SILT Poorly graded GRAVEL with SILT and SAND
GP-GC	Poorly graded GRAVEL with CLAY (or SILTY CLAY) Poorly graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)
GM	SILTY GRAVEL SILTY GRAVEL with SAND
GC	CLAYEY GRAVEL CLAYEY GRAVEL with SAND
GC-GM	SILTY, CLAYEY GRAVEL SILTY, CLAYEY GRAVEL with SAND
SW	Well-graded SAND Well-graded SAND with GRAVEL
SP	Poorly graded SAND Poorly graded SAND with GRAVEL
SW-SM	Well-graded SAND with SILT Well-graded SAND with SILT and GRAVEL
SW-SC	Well-graded SAND with CLAY (or SILTY CLAY) Well-graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)
SP-SM	Poorly graded SAND with SILT Poorly graded SAND with SILT and GRAVEL
SP-SC	Poorly graded SAND with CLAY (or SILTY CLAY) Poorly graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)
SM	SILTY SAND SILTY SAND with GRAVEL
SC	CLAYEY SAND CLAYEY SAND with GRAVEL
SC-SM	SILTY, CLAYEY SAND SILTY, CLAYEY SAND with GRAVEL
PT	PEAT
	COBBLES COBBLES and BOULDERS BOULDERS

Graphic/Symbol	Group Names
CL	Lean CLAY Lean CLAY with SAND Lean CLAY with GRAVEL SANDY lean CLAY SANDY lean CLAY with GRAVEL GRAVELLY lean CLAY GRAVELLY lean CLAY with SAND
CL-ML	SILTY CLAY SILTY CLAY with SAND SILTY CLAY with GRAVEL SANDY SILTY CLAY SANDY SILTY CLAY with GRAVEL GRAVELLY SILTY CLAY GRAVELLY SILTY CLAY with SAND
ML	SILT SILT with SAND SILT with GRAVEL SANDY SILT SANDY SILT with GRAVEL GRAVELLY SILT GRAVELLY SILT with SAND
OL	ORGANIC lean CLAY ORGANIC lean CLAY with SAND ORGANIC lean CLAY with GRAVEL SANDY ORGANIC lean CLAY SANDY ORGANIC lean CLAY with GRAVEL GRAVELLY ORGANIC lean CLAY GRAVELLY ORGANIC lean CLAY with SAND
OL	ORGANIC SILT ORGANIC SILT with SAND ORGANIC SILT with GRAVEL SANDY ORGANIC SILT SANDY ORGANIC SILT with GRAVEL GRAVELLY ORGANIC SILT GRAVELLY ORGANIC SILT with SAND
CH	Fat CLAY Fat CLAY with SAND Fat CLAY with GRAVEL SANDY fat CLAY SANDY fat CLAY with GRAVEL GRAVELLY fat CLAY GRAVELLY fat CLAY with SAND
MH	Elastic SILT Elastic SILT with SAND Elastic SILT with GRAVEL SANDY elastic SILT SANDY elastic SILT with GRAVEL GRAVELLY elastic SILT GRAVELLY elastic SILT with SAND
OH	ORGANIC fat CLAY ORGANIC fat CLAY with SAND ORGANIC fat CLAY with GRAVEL SANDY ORGANIC fat CLAY SANDY ORGANIC fat CLAY with GRAVEL GRAVELLY ORGANIC fat CLAY GRAVELLY ORGANIC fat CLAY with SAND
OH	ORGANIC elastic SILT ORGANIC elastic SILT with SAND ORGANIC elastic SILT with GRAVEL SANDY ORGANIC elastic SILT SANDY ORGANIC elastic SILT with GRAVEL GRAVELLY ORGANIC elastic SILT GRAVELLY ORGANIC elastic SILT with SAND
OL/OH	ORGANIC SOIL ORGANIC SOIL with SAND ORGANIC SOIL with GRAVEL SANDY ORGANIC SOIL SANDY ORGANIC SOIL with GRAVEL GRAVELLY ORGANIC SOIL GRAVELLY ORGANIC SOIL with SAND

FIELD AND LABORATORY TESTING

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

APPARENT DENSITY OF COHESIONLESS SOILS	
Description	SPT N_{60} (Blows / 12 inches)
Very loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	¢ 50

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

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

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

DIST	COUNTY	ROUTE	TOTAL PROJECT	No	PROJECT ENGINEER
04	SM	280	10.2/10.7	00	00

REGISTERED GEOLOGIST — DATE 07-16-08

THIS STANDARD DESIGNED BY Chris Rieden 7795 9-30-09 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 electronic copies of this plan sheet.

ENGINEERING SERVICES	GEOTECHNICAL SERVICES
FUNCTIONAL SUPERVISOR: C. Wilcox	PREPARED BY: M. Reynolds 08/08
	CHECKED BY: C. Rieden
	C. Rieden

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DIVISION OF ENGINEERING SERVICES
OFFICE OF GEOTECHNICAL
DESIGN BRANCH

WBS Element	36-08440
Project Number	10.2/10.7

SOIL LEGEND
LOG OF TEST BORINGS

CU 04 1A770 — FILE -I REQUEST

REVISION DATES	SHEET	OF
	7	10

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

DIST	COUNTY	ROUTE	POST MILE TOTAL PROJECT	No.	TOTAL SHEETS
04	SM	280	10.2/10.7		

REGISTERED GEOLOGIST — DATE 07-16-09

PLANS APPROVAL DATE

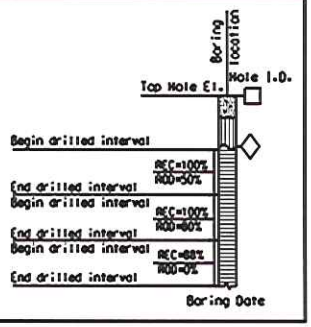
The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

Chris Risden 7795 9-30-09 STATE OF CALIFORNIA

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

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

$$ROD = \frac{\sum \text{Length of intact core pieces} \geq 4"}{\text{Total length of core run (inches)}} \times 100\%$$



RELATIVE STRENGTH OF INTACT ROCK

Term	Uniaxial Compressive Strength (PSI)
Extremely Strong	¢ 30,000
Very Strong	14,500 - 30,000
Strong	7,000 - 14,500
Medium Strong	3,500 - 7,000
Weak	700 - 3,500
Very Weak	150 - 700
Extremely Weak	¢ 150

BEDDING SPACING

Description	Thickness / Spacing
Massive	Greater than 10 ft
Very thickly bedded	3 to 10 ft
Thickly bedded	1 to 3 ft
Moderately bedded	3-5/8" to 1 ft
Thinly bedded	1-1/4" to 3-5/8"
Very thinly bedded	3/8" to 1-1/4"
Laminated	Less than 3/8"

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 1/6" 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 3 feet.
Slightly Fractured	Lengths from 1 to 3 feet with few lengths less than 1 foot or greater than 3 feet.
Moderately Fractured	Lengths mostly in 4" to 1 foot range with most lengths about 8"
Intensely Fractured	Lengths average from 1 to 4" with scattered fragmented intervals with lengths less than 4"
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

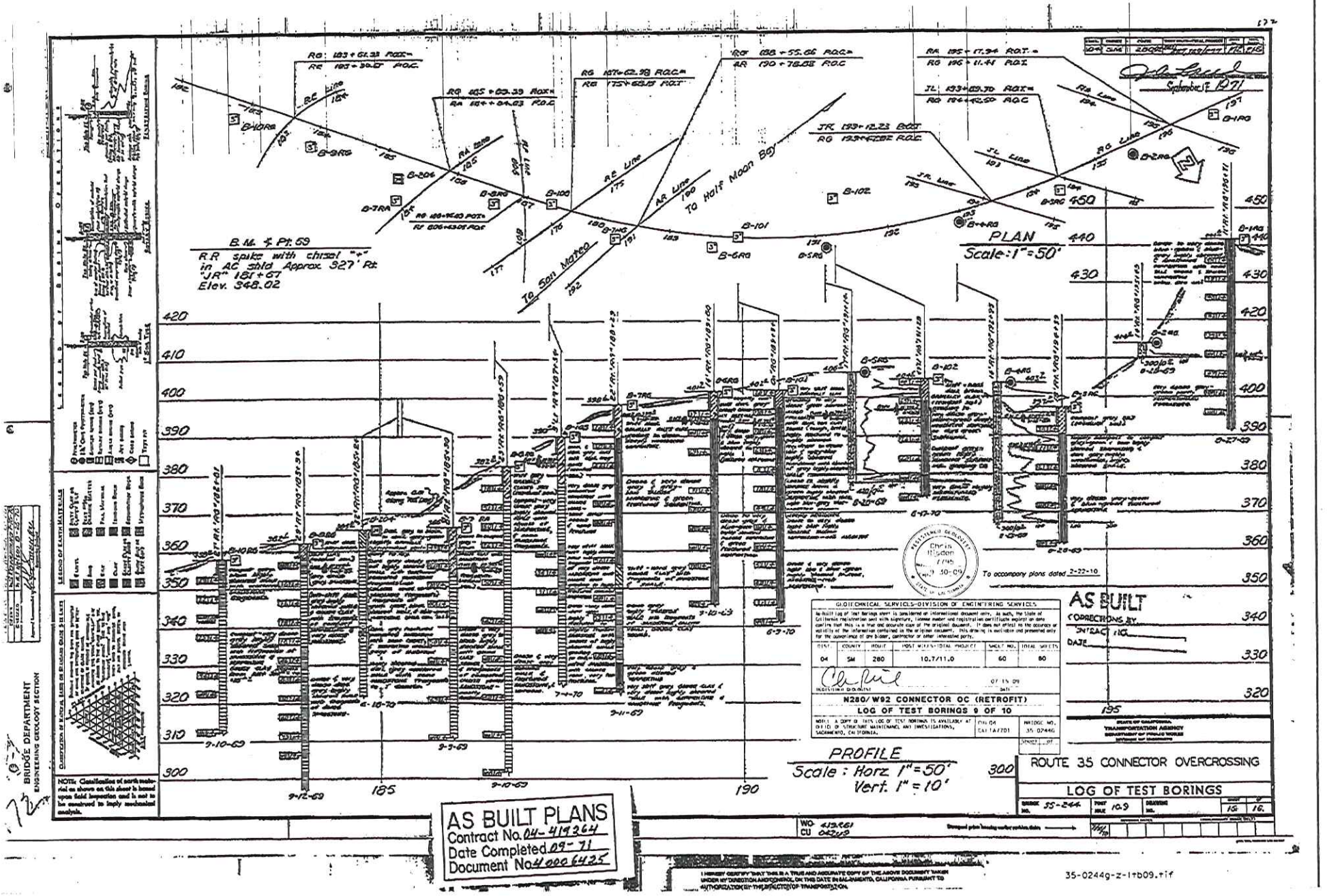
Description	Diagnostic features: Chemical Weathering-Discoloration and/or oxidation — Body of Rock	Diagnostic features: Chemical Weathering-Discoloration and/or oxidation — Fracture Surfaces	Diagnostic features: Mechanical Weathering-Grain boundary conditions (disaggregation) primarily for granitics 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."

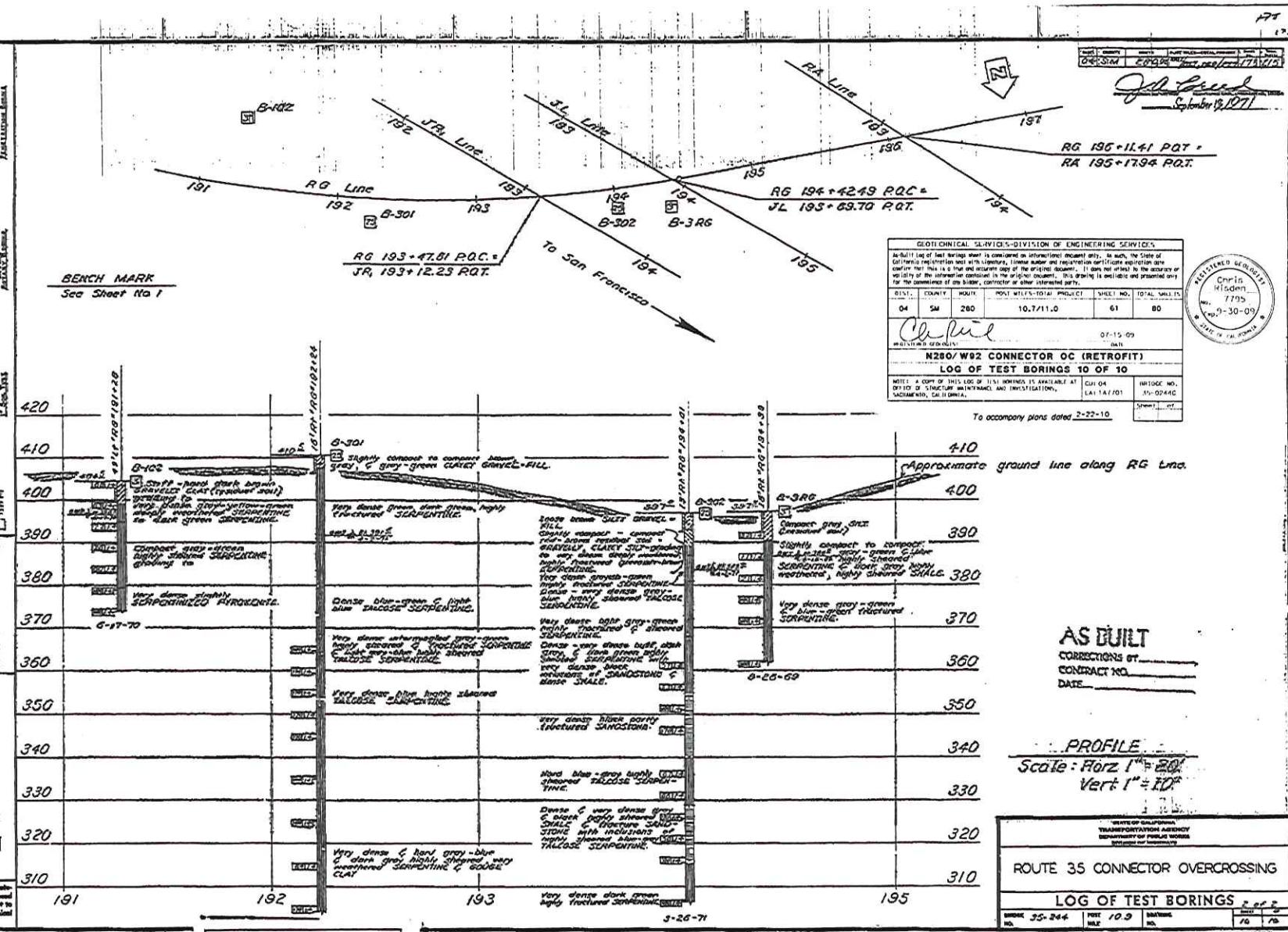
ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA	DIVISION OF ENGINEERING SERVICES OFFICE OF GEOTECHNICAL		ROCK LEGEND
FUNCTIONAL SUPERVISOR	PREPARED BY M. Reynolds 08/09	FIELD INVESTIGATION BY:	DEPARTMENT OF TRANSPORTATION	DESIGN BRANCH	35-0244G / 10.2/10.7	LOG OF TEST BORINGS
C. Wilcox	CHECKED BY C. Risden	C. Risden				

CU 04 EA 1A7701 — PLOT = REQUEST

REVISION DATES — SHEET 8 OF 10



PLAN
Scale: 1" = 50'
B.M. & Pt. 69
R.R. spike with chisel "+" in AC shld Approx. 327' Rt. "JR" 181+67
Elev. 348.02
To Half Moon Bay
To San Mateo
PROFILE
Scale: Horz. 1" = 50'
Vert. 1" = 10'
To accompany plans dated 2-22-10
AS BUILT
CORRECTIONS BY
CONTRACT NO.
DATE
GEOTECHNICAL SERVICES-DIVISION OF ENGINEERING SERVICES
DIST. 04 | COUNTY SM | ROUTE 280 | POST MILES-TOTAL PROJECT 10.7/11.0 | SHEET NO. 60 | TOTAL SHEETS 80
N280/W92 CONNECTOR OC (RETROFIT)
LOG OF TEST BORINGS 9 OF 10
BRIDGE NO. 35-0244G
STATE OF CALIFORNIA TRANSPORTATION AGENCY
ROUTE 35 CONNECTOR OVERCROSSING
LOG OF TEST BORINGS
BRIDGE NO. 35-244
POST MILE 10.9
DRAWING NO.
SHEET 16 OF 16
BRIDGE DEPARTMENT
ENGINEERING GEOLOGY SECTION
NOTE: Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.
AS BUILT PLANS
Contract No. 04-419364
Date Completed 09-71
Document No. 4000 6425
35-0244g-z-1tb09.tif



GEOTECHNICAL SERVICES-DIVISION OF ENGINEERING SERVICES

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	POST MILES-TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
04	SM	280	10.7/11.0	61	80

REGISTERED GEOLOGIST — 07-15-09 DATE

REGISTERED GEOLOGIST Chris Risden 7795 Exp. 9-30-09 STATE OF CALIFORNIA

N280/W92 CONNECTOR OC (RETROFIT)

LOG OF TEST BORINGS 10 OF 10

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

CU: 04 LA: 1A7701 BRIDGE NO. 35-0244C

To accompany plans dated 2-22-10

AS BUILT
CORRECTIONS BY
CONTRACT NO.
DATE

PROFILE
Scale: Horz 1" = 20'
Vert 1" = 10'

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

ROUTE 35 CONNECTOR OVERCROSSING

LOG OF TEST BORINGS 2 of 2

BRIDGE NO. 35-244 POST MILE 10.9 DRAWING NO. 10 10

WO 419261
CU 04209

BRIDGE DEPARTMENT
ENGINEERING GEOLOGY SECTION

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

AS BUILT PLANS
Contract No. 04-419264
Date Completed 09-71
Document No. 4000 6425

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

6-17-74

35-0244g-z-1tb10.tif

ClibPDF - www.fastio.com

APPENDIX B

LABORATORY TEST RESULTS

Use the following table to identify a soil/rock sample boring and it's corresponding LOTB number:

Soil/Rock Sample Boring	Boring Number
B44G-3	R-08-005
B44G-9	R-09-006

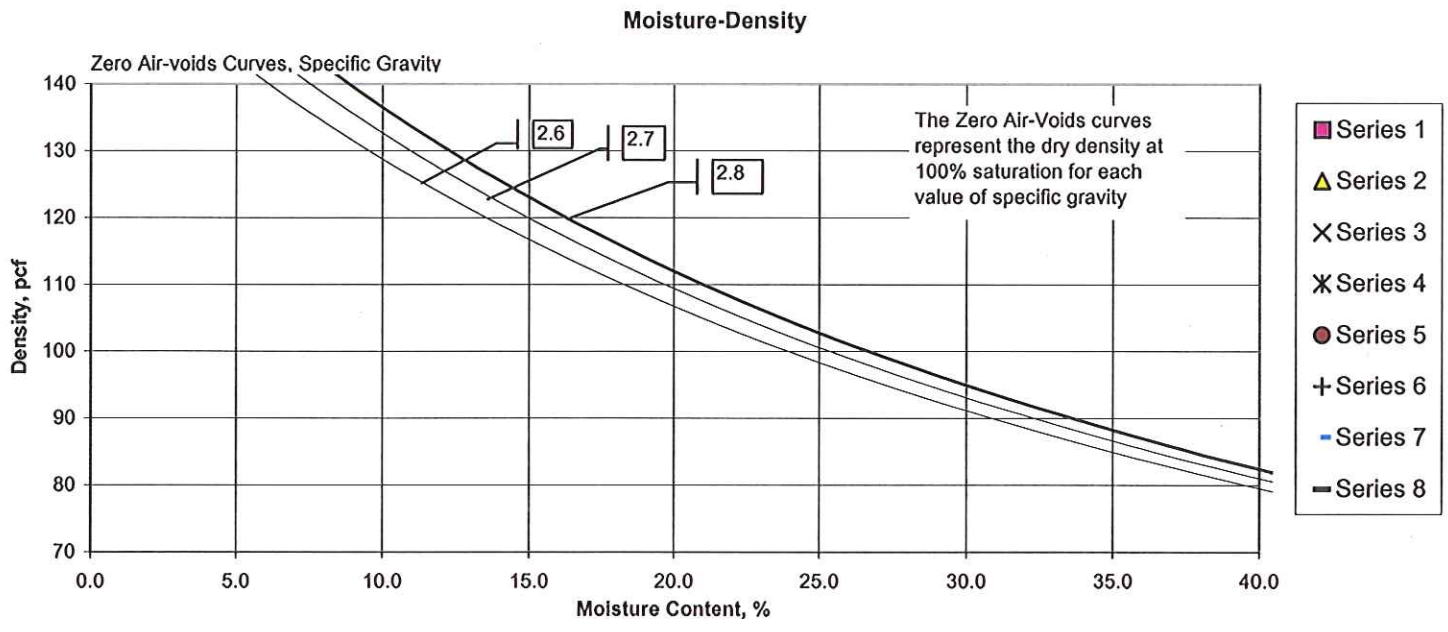
Moisture-Density-Porosity Report

Cooper Testing Labs, Inc. (ASTM D 2937)

Job No:	603-012a	Date:	01/23/09
Client:	PB	By:	RU
Project:	92/280 Retrofit - 04-1A7701	Remarks:	

Boring:	B44G-3	B44G-3	B44G-3	B44G-3	B44G-6	B44G-6	B45F-4	B45F-4
Sample:								
Depth, ft:	5-6.5	15-16.5	20-21.5	35-36.5	14.5-16	49.5-51	5-6.5	20-21.5
Visual Description:	Gray Lean Clayey SAND w/ Gravel	Gray Sandy Lean CLAY	Dark Gray Lean Clayey SAND w/ Gravel	Dark Gray Sandy Lean CLAY	Mottled Bluish Gray Clayey SAND	Mottled Bluish Gray Silty SAND	Brown Fat Clayey SAND w/ Gravel	Gray Sandy Lean CLAY w/ Gravel
Actual G_s								
Assumed G_s								
Total Vol cc								
Vol Solids,cc								
Vol Voids,cc								
Moisture, %	18.0	13.4	12.2	10.7	15.8	22.7	28.4	8.0
Wet Unit wt, pcf								
Dry Unit wt, pcf								
Saturation, %								
Porosity, %								
Air filled Poros.,%								
Water filled Poros.,%								
Void Ratio								
Series	1	2	3	4	5	6	7	8

Note: If an assumed specific gravity (Gs) was used then the saturation, porosities, and void ratio should be considered approximate.



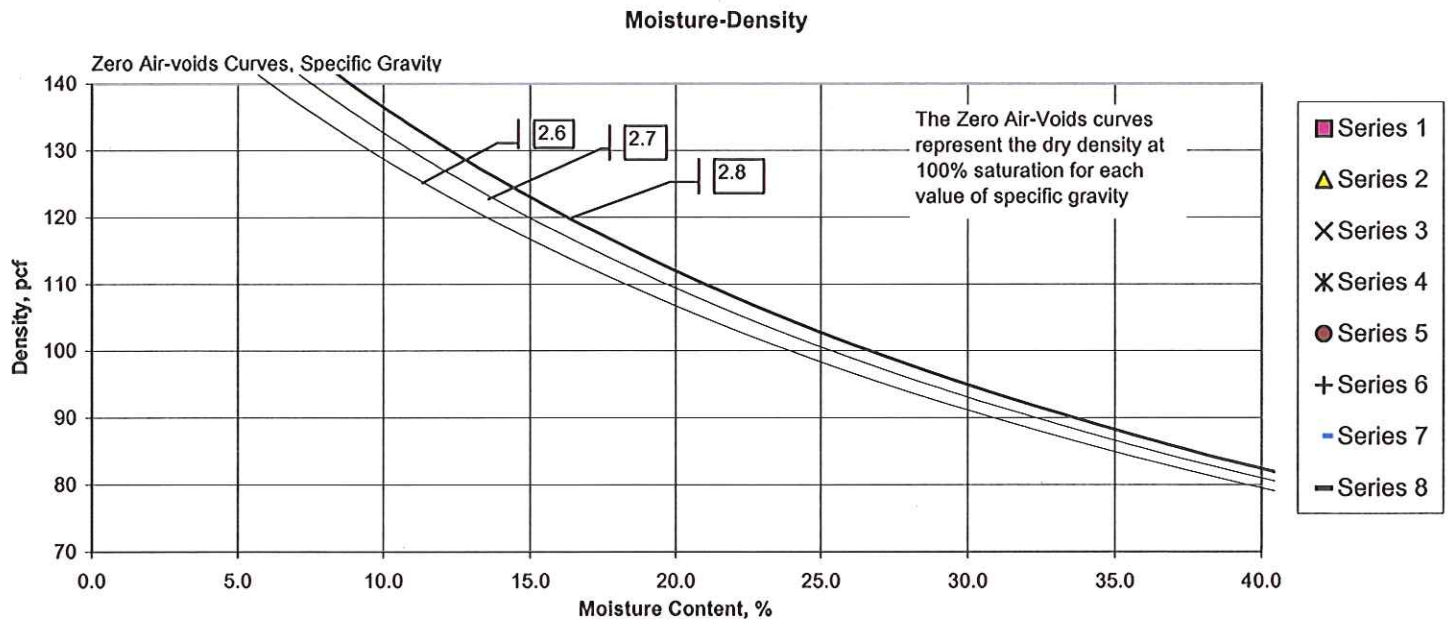
Moisture-Density-Porosity Report

Cooper Testing Labs, Inc. (ASTM D 2937)

Job No:	603-012b	**Date:**	01/23/09
Client:	PB	**By:**	RU
Project:	92/280 Retrofit - 04-1A7701	**Remarks:**	

Boring:	B45F-4	B45F-4	B45F-4	B45F-6	B45F-6	B45F-6	B45F-5	B44G-9
Sample:								
Depth, ft:	35-36.5	65-66.5	80-81.5	20-21.5	55-56.5	75-76.5	5-6.5	20-21.5
Visual Description:	Dark Gray Lean Clayey SAND	Gray Lean Clayey SAND	Gray Lean Clayey SAND w/ Gravel	Bluish Gray Sandy SILT	Bluish Gray Silty SAND	Gray Elastic Silty SAND	Brown Fat Clayey SAND w/ Gravel	Brown Silty SAND
Actual G_s								
Assumed G_s								
Total Vol cc								
Vol Solids,cc								
Vol Voids,cc								
Moisture, %	10.8	9.8	18.8	18.1	27.5	15.2	19.1	38.6
Wet Unit wt, pcf								
Dry Unit wt, pcf								
Saturation, %								
Porosity, %								
Air filled Poros.,%								
Water filled Poros.,%								
Void Ratio								
Series	1	2	3	4	5	6	7	8

Note: If an assumed specific gravity (Gs) was used then the saturation, porosities, and void ratio should be considered approximate.



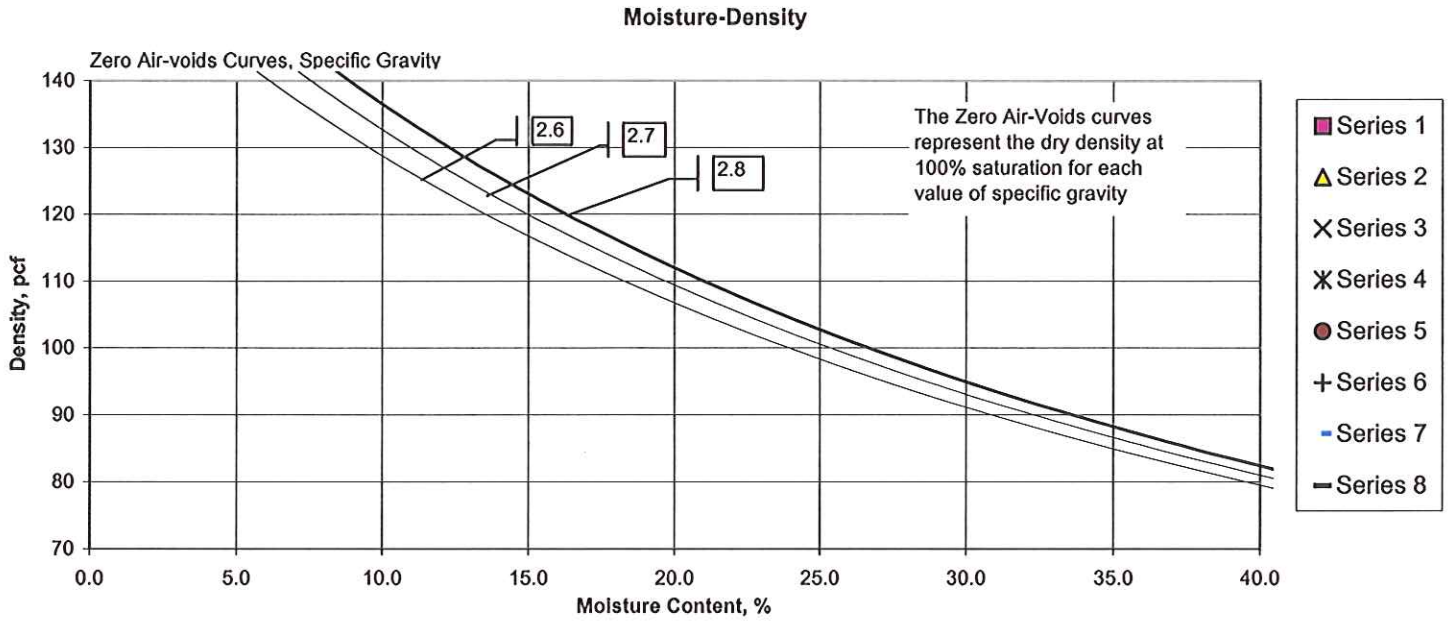
Moisture-Density-Porosity Report

Cooper Testing Labs, Inc. (ASTM D 2937)

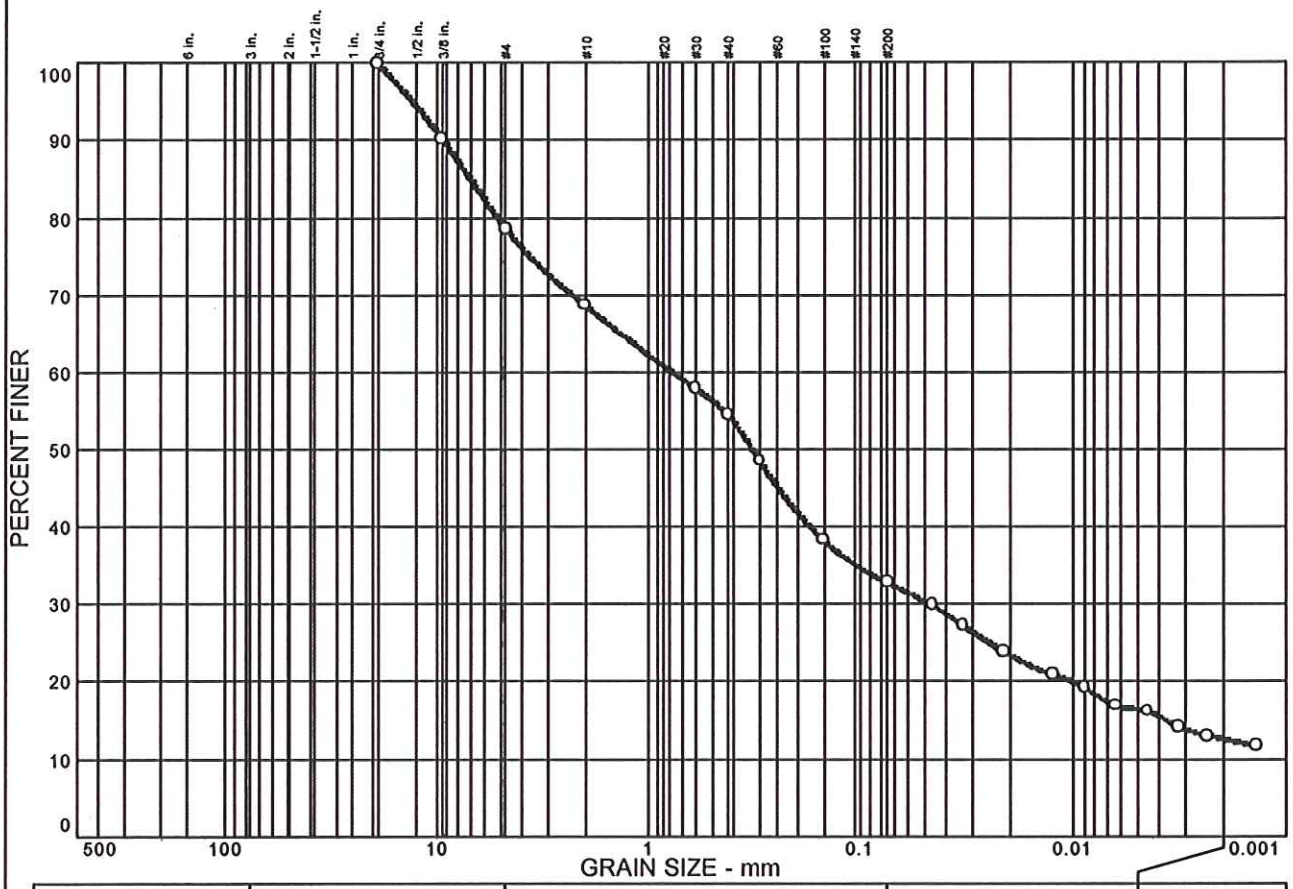
Job No:	603-012c	**Date:**	01/23/09
Client:	PB	**By:**	RU
Project:	92/280 Retrofit - 04-1A7701	**Remarks:**	

Boring:	B44G-9	B44G-9	B44G-9	B44G-9	B44G-9	B44G-9		
Sample:								
Depth, ft:	25-26.5	30-31.5	50-51.5	60-61.5	80-81.5	100-101.5		
Visual Description:	Brown Silty SAND	Gray Lean Clayey SAND	Gray Lean Clayey SAND	Gray Sandy Lean CLAY	Gray Fat Clayey SAND	Bluish Gray Silty SAND		
Actual G_s								
Assumed G_s								
Total Vol cc								
Vol Solids,cc								
Vol Voids,cc								
Moisture, %	24.6	17.3	13.0	20.2	30.2	12.8		
Wet Unit wt, pcf								
Dry Unit wt, pcf								
Saturation, %								
Porosity, %								
Air filled Poros.,%								
Water filled Poros.,%								
Void Ratio								
Series	1	2	3	4	5	6	7	8

Note: If an assumed specific gravity (Gs) was used then the saturation, porosities, and void ratio should be considered approximate.



Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	21.4	45.8	20.2	12.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
3/8 in.	90.3		
#4	78.6		
#10	68.7		
#30	57.9		
#40	54.5		
#50	48.5		
#100	38.3		
#200	32.8		
0.0462 mm.	29.9		
0.0331 mm.	27.3		
0.0213 mm.	23.9		
0.0125 mm.	20.9		
0.0089 mm.	19.3		
0.0064 mm.	16.9		
0.0045 mm.	16.2		
0.0032 mm.	14.2		
0.0024 mm.	13.0		
0.0014 mm.	11.7		

* (no specification provided)

Soil Description

Gray Lean Clayey SAND w/ Gravel

Atterberg Limits

PL= 19 LL= 37 PI= 18

Coefficients

D_{85}= 6.98 D_{60}= 0.772 D_{50}= 0.325
D_{30}= 0.0469 D_{15}= 0.0036 D_{10}=
C_u= C_c=

Classification

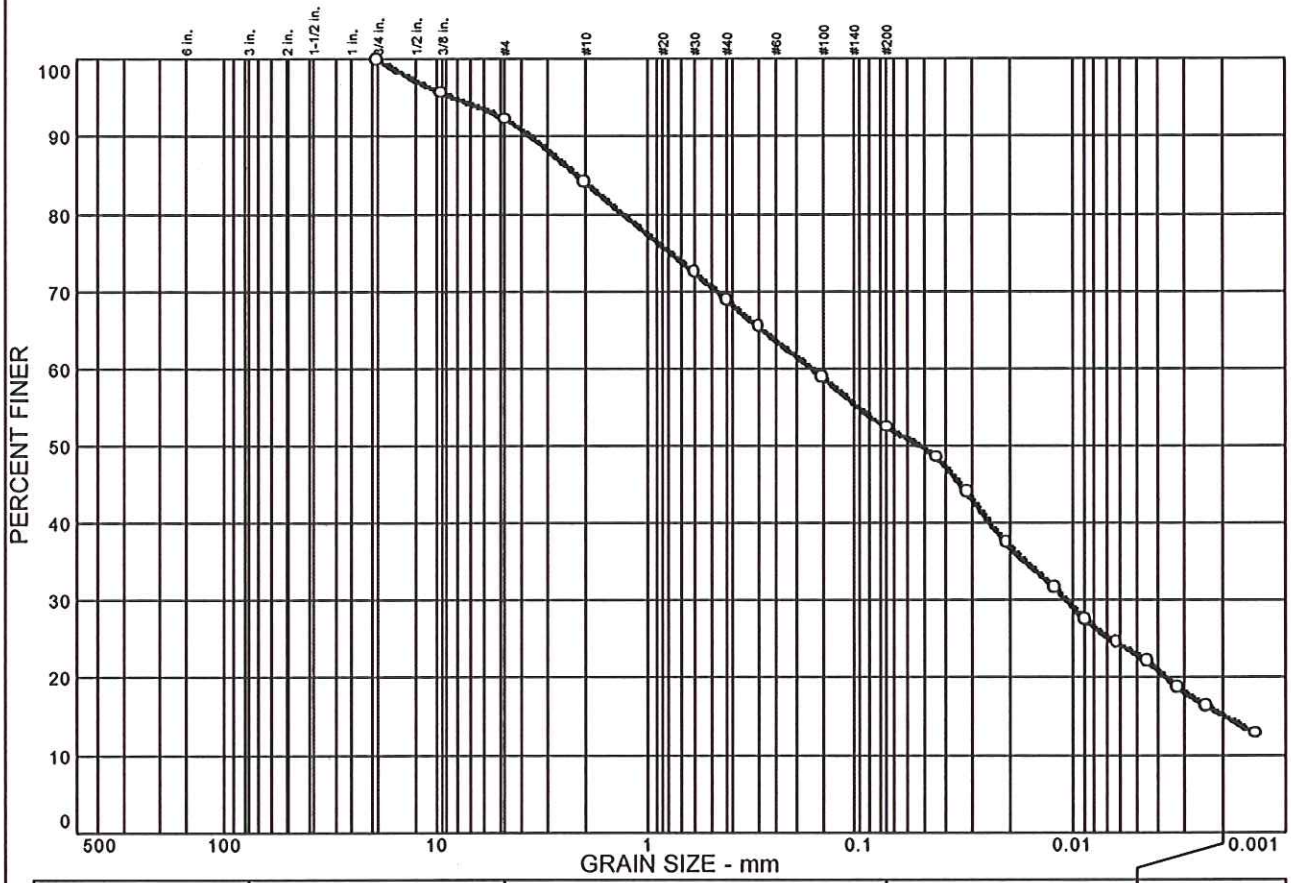
USCS= SC AASHTO=

Remarks

Sample No.: **Source of Sample:** B44G-3 **Date:**
Location: **Elev./Depth:** 5-6.5'

COOPER TESTING LABORATORY	**Client:** PB **Project:** 92/280 Retrofit - 04-1A7701 **Project No:** 603-012 **Figure**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	7.7	39.9	37.1	15.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
3/8 in.	95.7		
#4	92.3		
#10	84.2		
#30	72.4		
#40	68.9		
#50	65.4		
#100	58.9		
#200	52.4		
0.0439 mm.	48.5		
0.0317 mm.	44.0		
0.0206 mm.	37.4		
0.0122 mm.	31.6		
0.0088 mm.	27.5		
0.0063 mm.	24.6		
0.0045 mm.	22.1		
0.0032 mm.	18.8		
0.0024 mm.	16.4		
0.0014 mm.	12.8		

* (no specification provided)

Soil Description

Gray Sandy Lean CLAY

Atterberg Limits

PL= 16 LL= 28 PI= 12

Coefficients

D_{85}= 2.16 D_{60}= 0.168 D_{50}= 0.0519
D_{30}= 0.0107 D_{15}= 0.0019 D_{10}=
C_u= C_c=

Classification

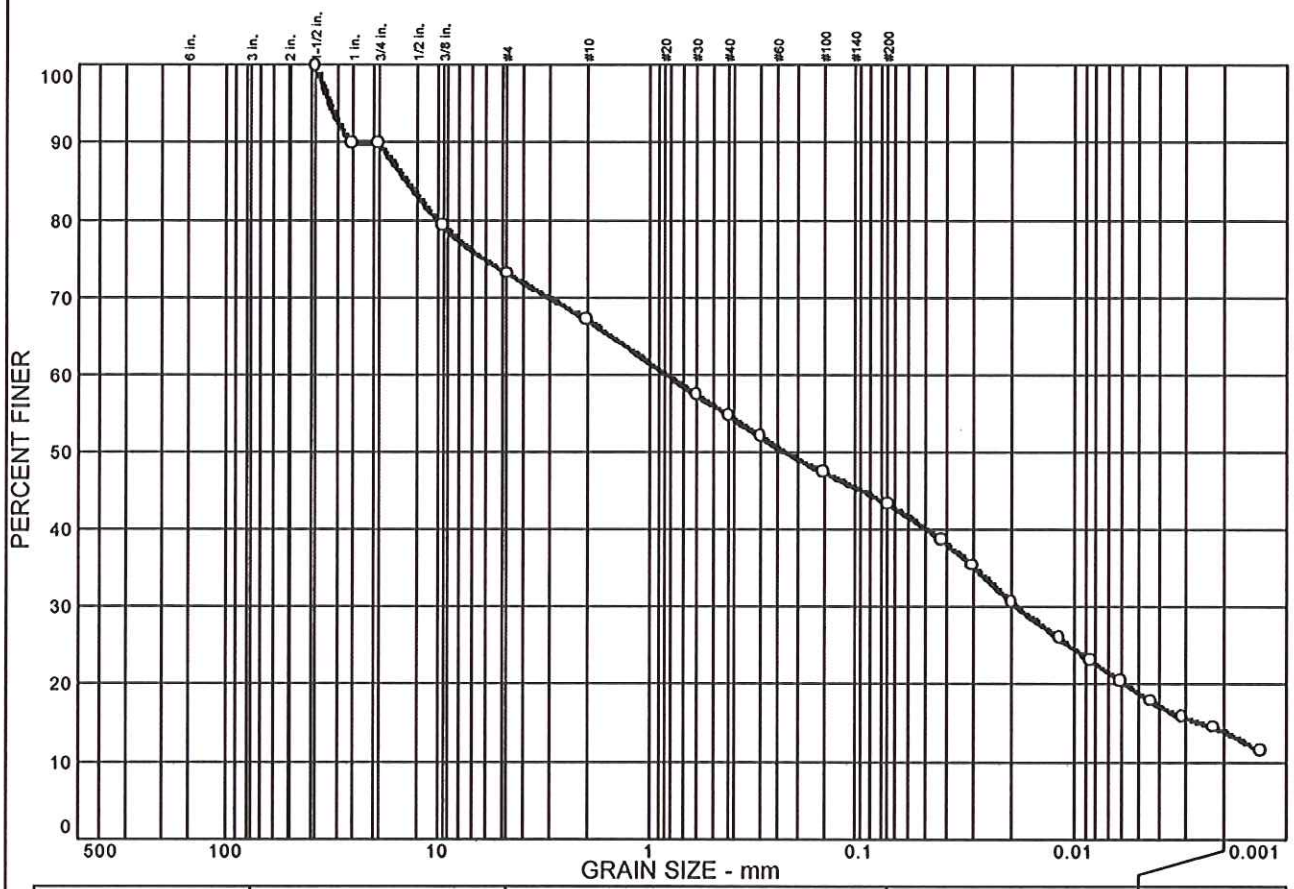
USCS= CL AASHTO=

Remarks

Sample No.: **Source of Sample:** B44G-3 **Date:**
Location: **Elev./Depth:** 15-16.5'

COOPER TESTING LABORATORY	**Client:** PB **Project:** 92/280 Retrofit - 04-1A7701 **Project No:** 603-012 **Figure**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	26.9	29.8	29.3	14.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1 in.	90.0		
3/4 in.	90.0		
3/8 in.	79.3		
#4	73.1		
#10	67.1		
#30	57.4		
#40	54.8		
#50	52.0		
#100	47.4		
#200	43.3		
0.0418 mm.	38.6		
0.0303 mm.	35.4		
0.0199 mm.	30.7		
0.0119 mm.	26.0		
0.0085 mm.	23.1		
0.0061 mm.	20.5		
0.0044 mm.	17.9		
0.0031 mm.	15.8		
0.0022 mm.	14.5		
0.0013 mm.	11.4		

* (no specification provided)

Soil Description

Dark Gray Lean Clayey SAND w/ Gravel

Atterberg Limits

PL= 15 LL= 28 PI= 13

Coefficients

D_{85}= 14.1 D_{60}= 0.833 D_{50}= 0.228
D_{30}= 0.0185 D_{15}= 0.0025 D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO=

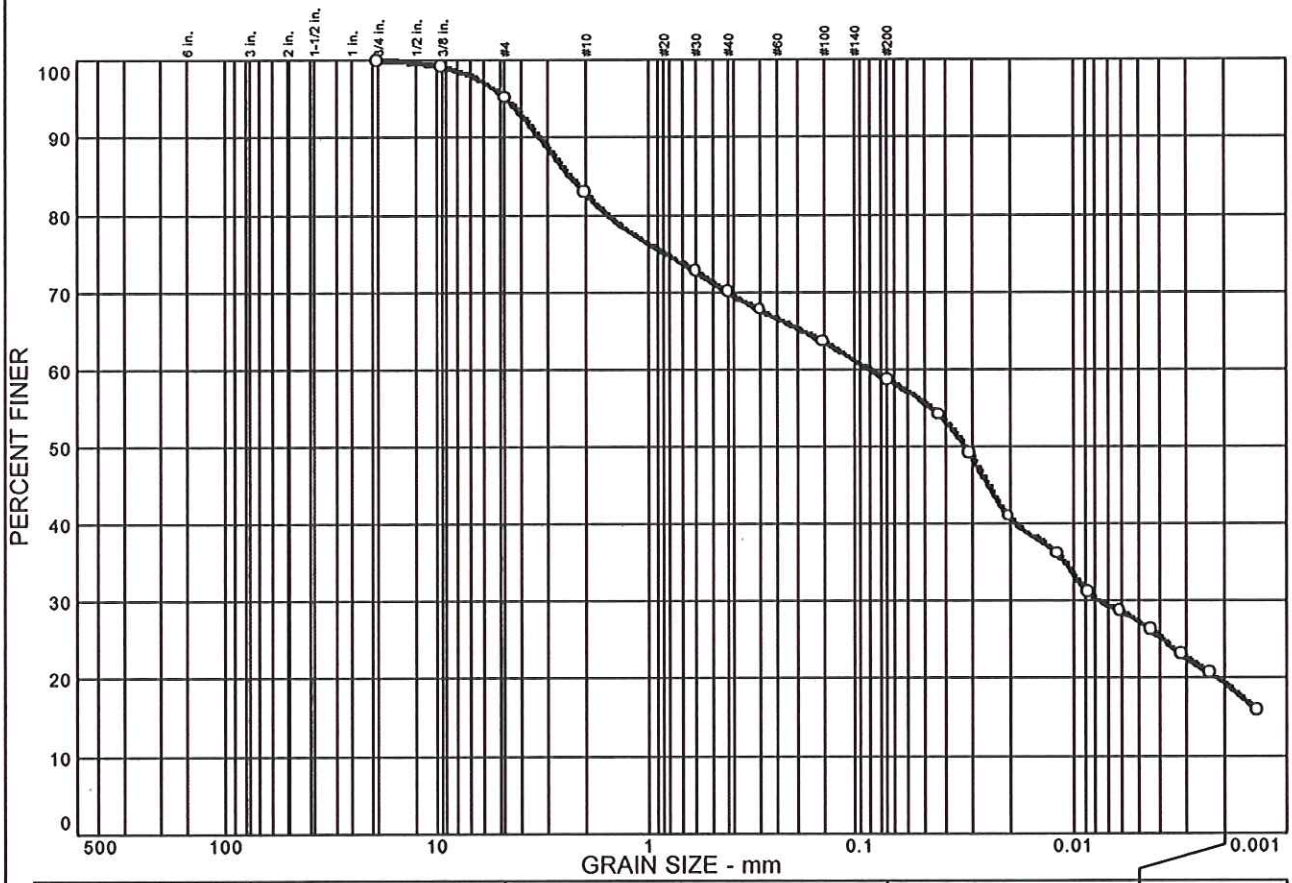
Remarks

Due to small sample size the sample was split on the #40 sieve.

Sample No.: **Source of Sample:** B44G-3 **Date:**
Location: **Elev./Depth:** 20-21.5'

COOPER TESTING LABORATORY	**Client:** PB **Project:** 92/280 Retrofit - 04-1A7701 **Project No:** 603-012 **Figure**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	4.8	36.5	39.2	19.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
3/8 in.	99.2		
#4	95.2		
#10	82.9		
#30	72.7		
#40	70.0		
#50	67.7		
#100	63.6		
#200	58.7		
0.0426 mm.	54.1		
0.0309 mm.	49.2		
0.0203 mm.	41.0		
0.0120 mm.	36.1		
0.0086 mm.	31.2		
0.0062 mm.	28.8		
0.0044 mm.	26.3		
0.0032 mm.	23.1		
0.0023 mm.	20.7		
0.0014 mm.	15.9		

* (no specification provided)

Soil Description

Dark Gray Sandy Lean CLAY

Atterberg Limits

PL= 14 LL= 25 PI= 11

Coefficients

D_{85}= 2.33 D_{60}= 0.0902 D_{50}= 0.0322
D_{30}= 0.0076 D_{15}= D_{10}=
C_u= C_c=

Classification

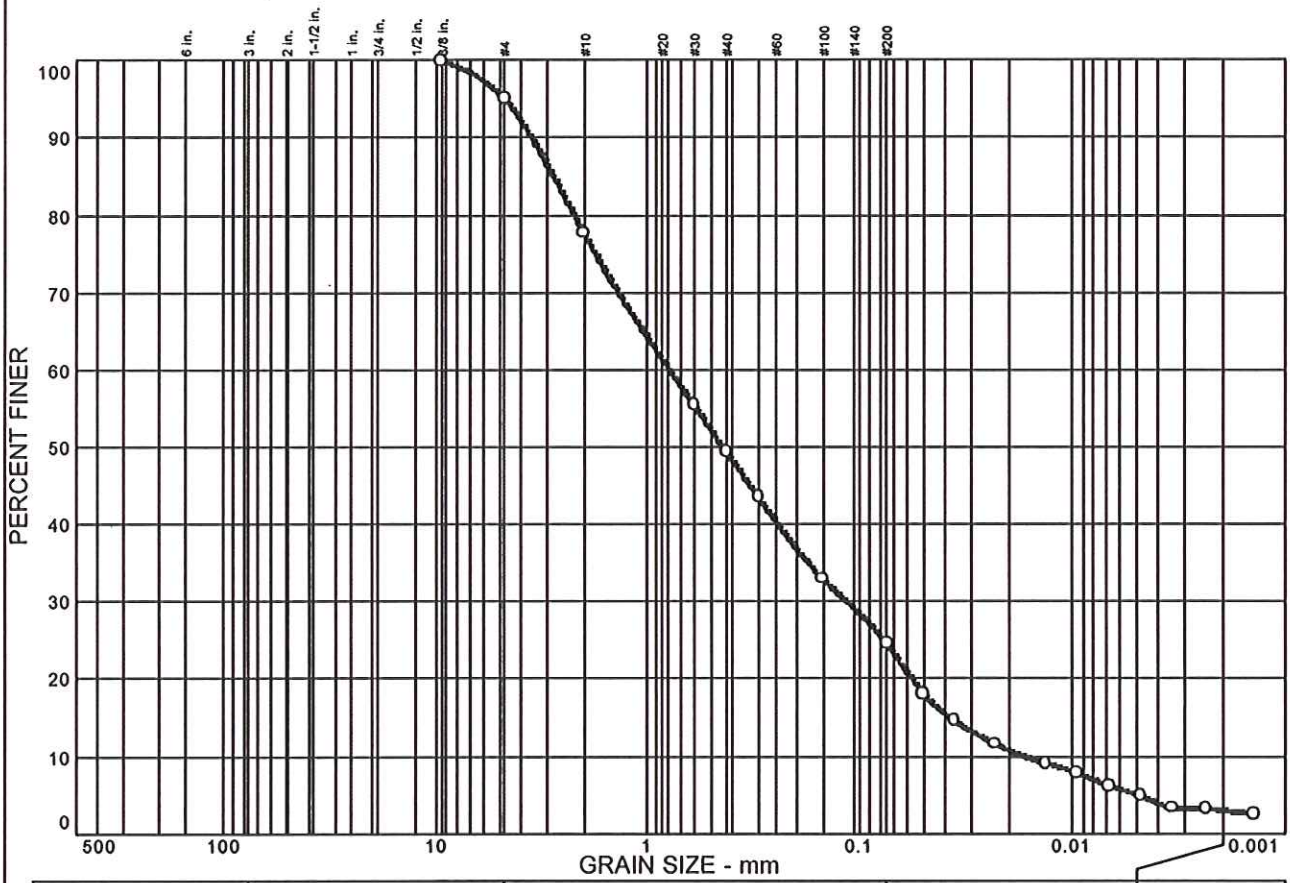
USCS= CL AASHTO=

Remarks

Sample No.: **Source of Sample:** B44G-3 **Date:**
Location: **Elev./Depth:** 35-36.5'

COOPER TESTING LABORATORY	**Client:** PB **Project:** 92/280 Retrofit - 04-1A7701 **Project No:** 603-012 **Figure**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	5.0	70.4	21.6	3.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
#4	95.0		
#10	77.7		
#30	55.4		
#40	49.4		
#50	43.5		
#100	33.0		
#200	24.6		
0.0504 mm.	18.1		
0.0360 mm.	14.7		
0.0230 mm.	11.6		
0.0134 mm.	9.1		
0.0095 mm.	7.9		
0.0068 mm.	6.2		
0.0048 mm.	4.9		
0.0034 mm.	3.3		
0.0024 mm.	3.2		
0.0014 mm.	2.5		

* (no specification provided)

Soil Description

Brown Silty SAND

Atterberg Limits

PL= 43 LL= 48 PI= 5

Coefficients

D_{85}= 2.78 D_{60}= 0.783 D_{50}= 0.440
D_{30}= 0.115 D_{15}= 0.0374 D_{10}= 0.0169
C_u= 46.35 C_c= 1.01

Classification

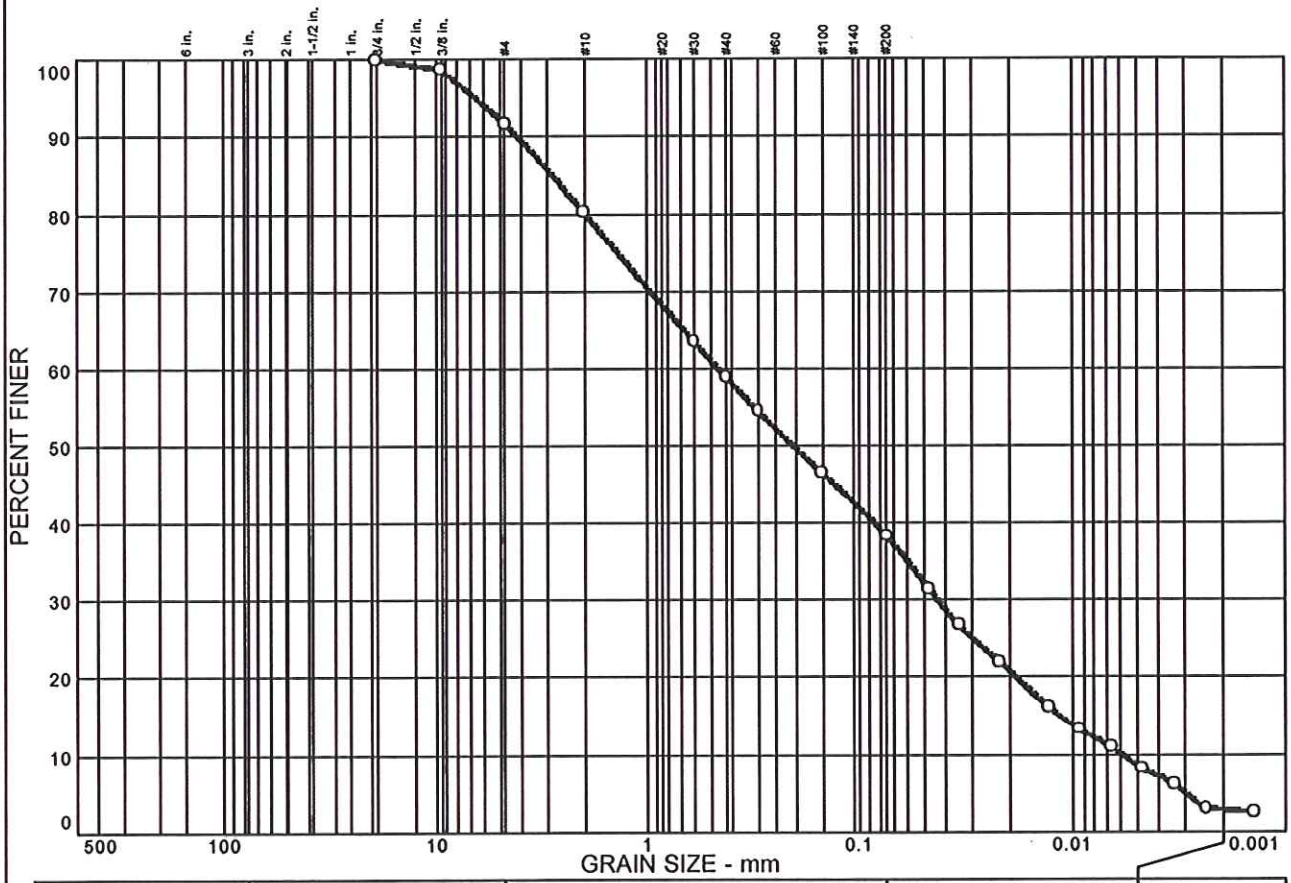
USCS= SM AASHTO=

Remarks

Sample No.: **Source of Sample:** B44G-9 **Date:**
Location: **Elev./Depth:** 20-21.5'

COOPER TESTING LABORATORY	**Client:** PB **Project:** 92/280 Retrofit - 04-1A7701 **Project No:** 603-012 **Figure**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	8.3	53.4	35.5	2.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
3/8 in.	98.7		
#4	91.7		
#10	80.2		
#30	63.5		
#40	58.9		
#50	54.5		
#100	46.5		
#200	38.3		
0.0475 mm.	31.4		
0.0343 mm.	26.7		
0.0221 mm.	22.0		
0.0131 mm.	16.1		
0.0093 mm.	13.3		
0.0067 mm.	11.0		
0.0048 mm.	8.2		
0.0034 mm.	6.2		
0.0024 mm.	3.0		
0.0014 mm.	2.5		

* (no specification provided)

Soil Description

Brown Silty SAND

Atterberg Limits

PL= 29 LL= 38 PI= 9

Coefficients

D_{85}= 2.82 D_{60}= 0.462 D_{50}= 0.205
D_{30}= 0.0434 D_{15}= 0.0116 D_{10}= 0.0059
C_u= 78.11 C_c= 0.69

Classification

USCS= SM AASHTO=

Remarks

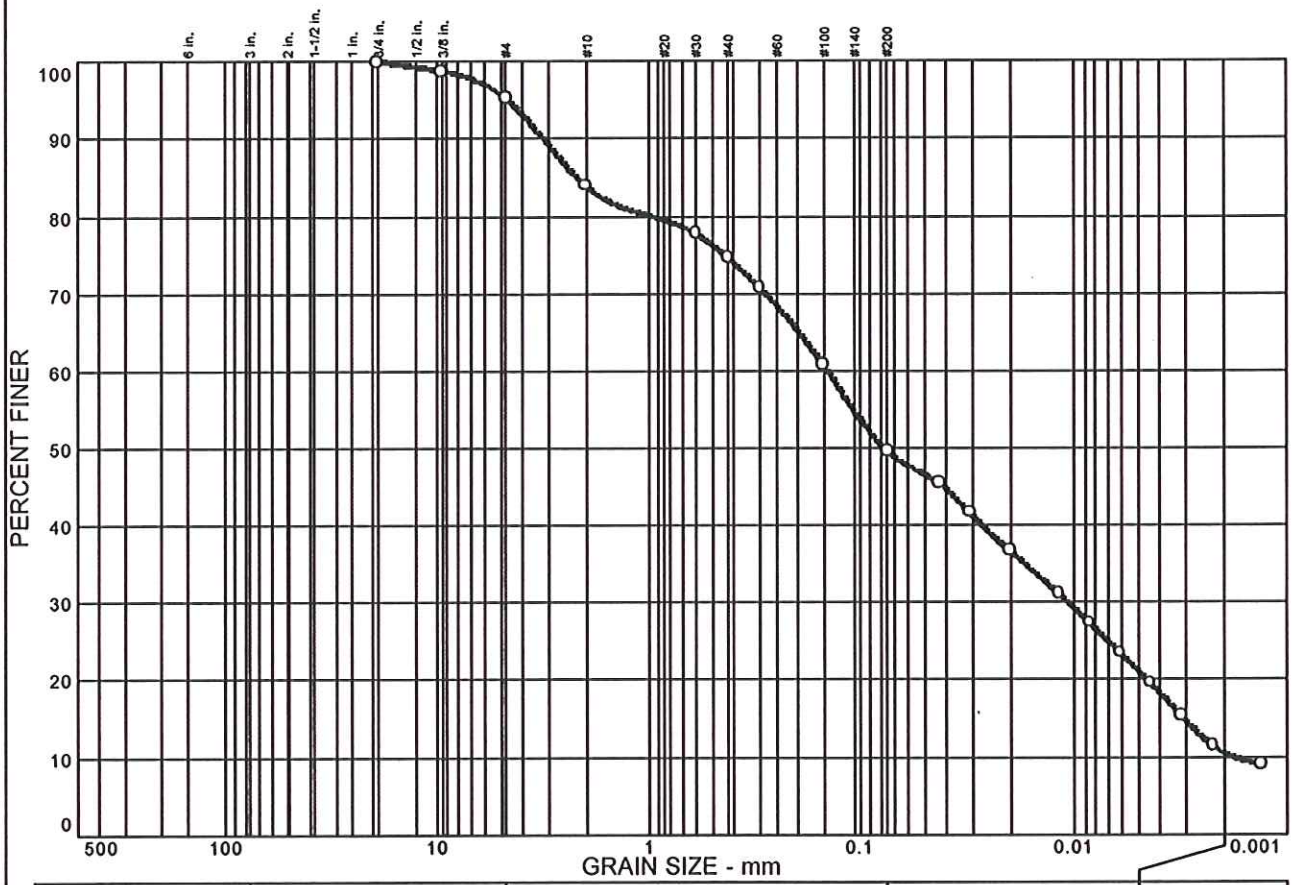
Sample No.: **Source of Sample:** B44G-9 **Date:**
Location: **Elev./Depth:** 25-26.5'

COOPER TESTING LABORATORY

Client: PB
Project: 92/280 Retrofit - 04-1A7701

Project No: 603-012 **Figure**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	4.7	45.7	39.0	10.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
3/8 in.	98.8		
#4	95.3		
#10	84.0		
#30	77.8		
#40	74.7		
#50	70.8		
#100	60.8		
#200	49.6		
0.0431 mm.	45.5		
0.0311 mm.	41.7		
0.0201 mm.	36.7		
0.0119 mm.	31.2		
0.0086 mm.	27.4		
0.0062 mm.	23.5		
0.0044 mm.	19.6		
0.0032 mm.	15.4		
0.0023 mm.	11.5		
0.0013 mm.	9.0		

* (no specification provided)

Soil Description

Gray Lean Clayey SAND

Atterberg Limits

PL= 20 LL= 43 PI= 23

Coefficients

D_{85}= 2.19 D_{60}= 0.143 D_{50}= 0.0778
D_{30}= 0.0107 D_{15}= 0.0031 D_{10}= 0.0018
C_u= 79.98 C_c= 0.45

Classification

USCS= SC AASHTO=

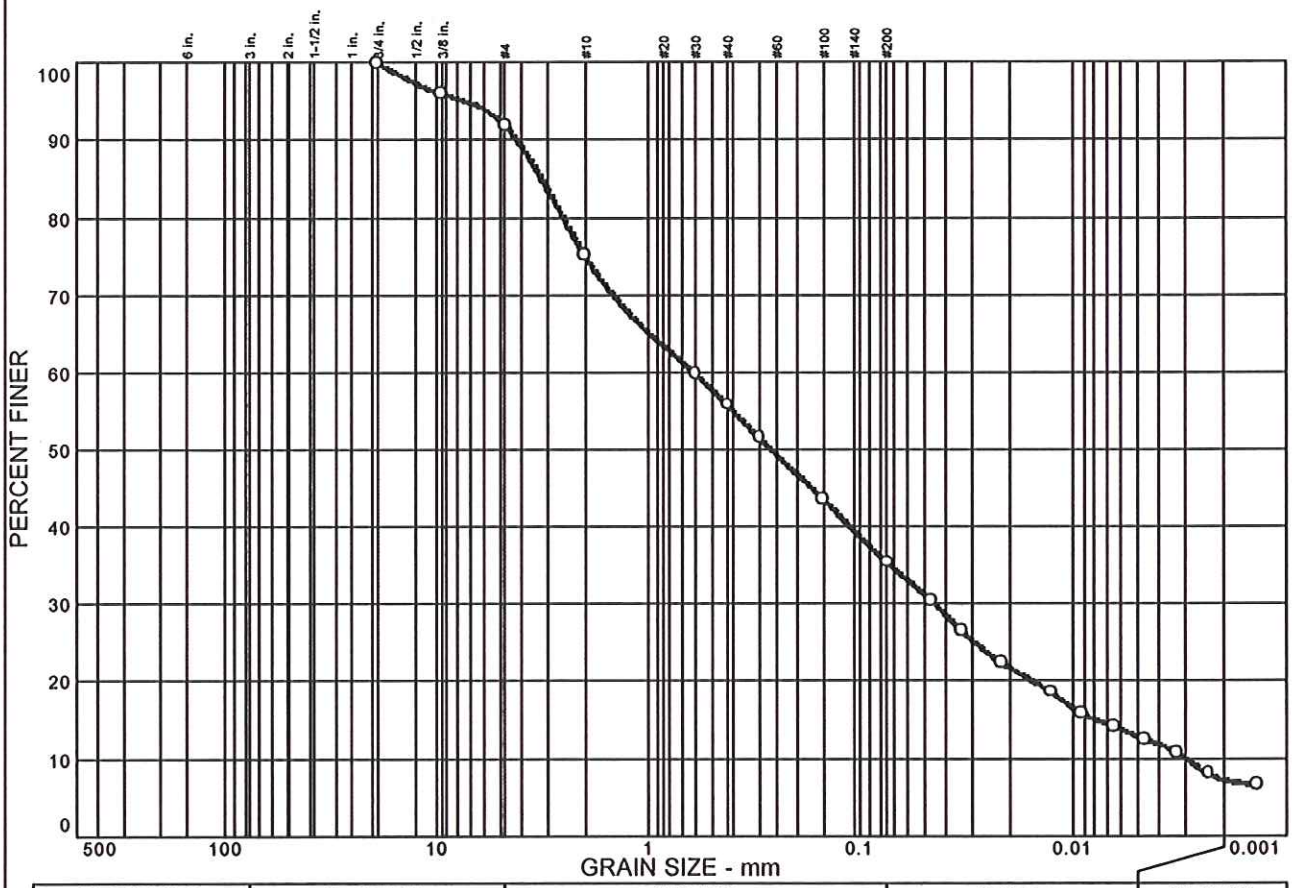
Remarks

Sample No.: **Source of Sample:** B44G-9 **Date:**
Location: **Elev./Depth:** 30-31.5'

COOPER TESTING LABORATORY

Client: PB
Project: 92/280 Retrofit - 04-1A7701
Project No: 603-012 **Figure**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	8.1	56.5	28.2	7.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
3/8 in.	96.0		
#4	91.9		
#10	75.1		
#30	59.8		
#40	55.8		
#50	51.5		
#100	43.6		
#200	35.4		
0.0467 mm.	30.5		
0.0337 mm.	26.6		
0.0218 mm.	22.4		
0.0128 mm.	18.6		
0.0091 mm.	15.9		
0.0065 mm.	14.2		
0.0046 mm.	12.5		
0.0033 mm.	10.8		
0.0023 mm.	8.0		
0.0014 mm.	6.6		

* (no specification provided)

Soil Description

Gray Lean Clayey SAND

Atterberg Limits

PL= 16 LL= 32 PI= 16

Coefficients

D_{85}= 3.20 D_{60}= 0.611 D_{50}= 0.264
D_{30}= 0.0448 D_{15}= 0.0078 D_{10}= 0.0030
C_u= 205.00 C_c= 1.10

Classification

USCS= SC AASHTO=

Remarks

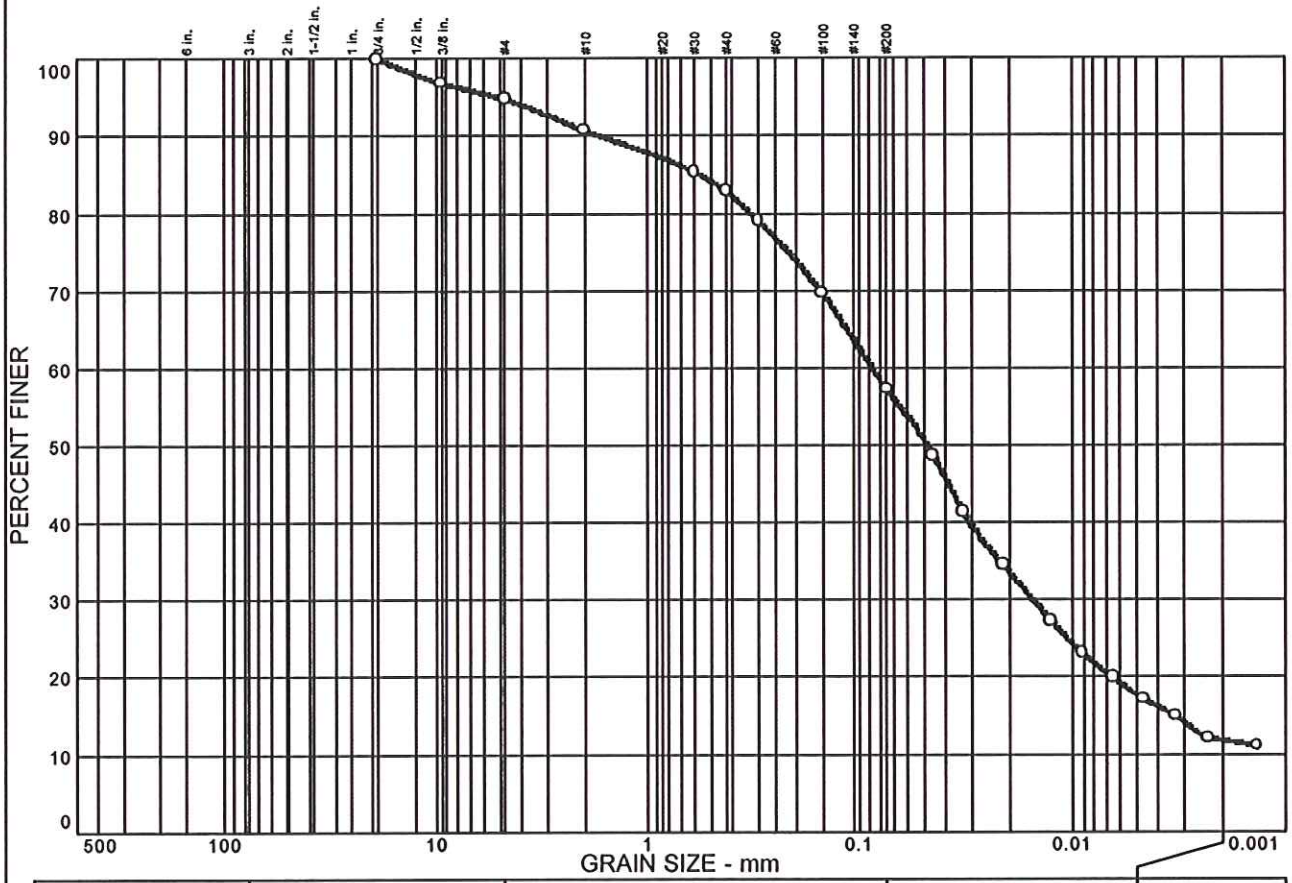
Sample No.: **Source of Sample:** B44G-9 **Date:**
Location: **Elev./Depth:** 50-51.5'

COOPER TESTING LABORATORY

Client: PB
Project: 92/280 Retrofit - 04-1A7701

Project No: 603-012 **Figure**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	5.2	37.5	45.5	11.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
3/8 in.	96.9		
#4	94.8		
#10	90.8		
#30	85.4		
#40	82.9		
#50	79.1		
#100	69.7		
#200	57.3		
0.0453 mm.	48.7		
0.0330 mm.	41.4		
0.0214 mm.	34.6		
0.0127 mm.	27.3		
0.0091 mm.	23.2		
0.0065 mm.	20.0		
0.0046 mm.	17.2		
0.0033 mm.	15.0		
0.0023 mm.	12.1		
0.0014 mm.	11.1		

* (no specification provided)

Soil Description

Gray Sandy Lean CLAY

Atterberg Limits

PL= 24 LL= 43 PI= 19

Coefficients

D_{85}= 0.562 D_{60}= 0.0877 D_{50}= 0.0483
D_{30}= 0.0154 D_{15}= 0.0033 D_{10}=
C_u= C_c=

Classification

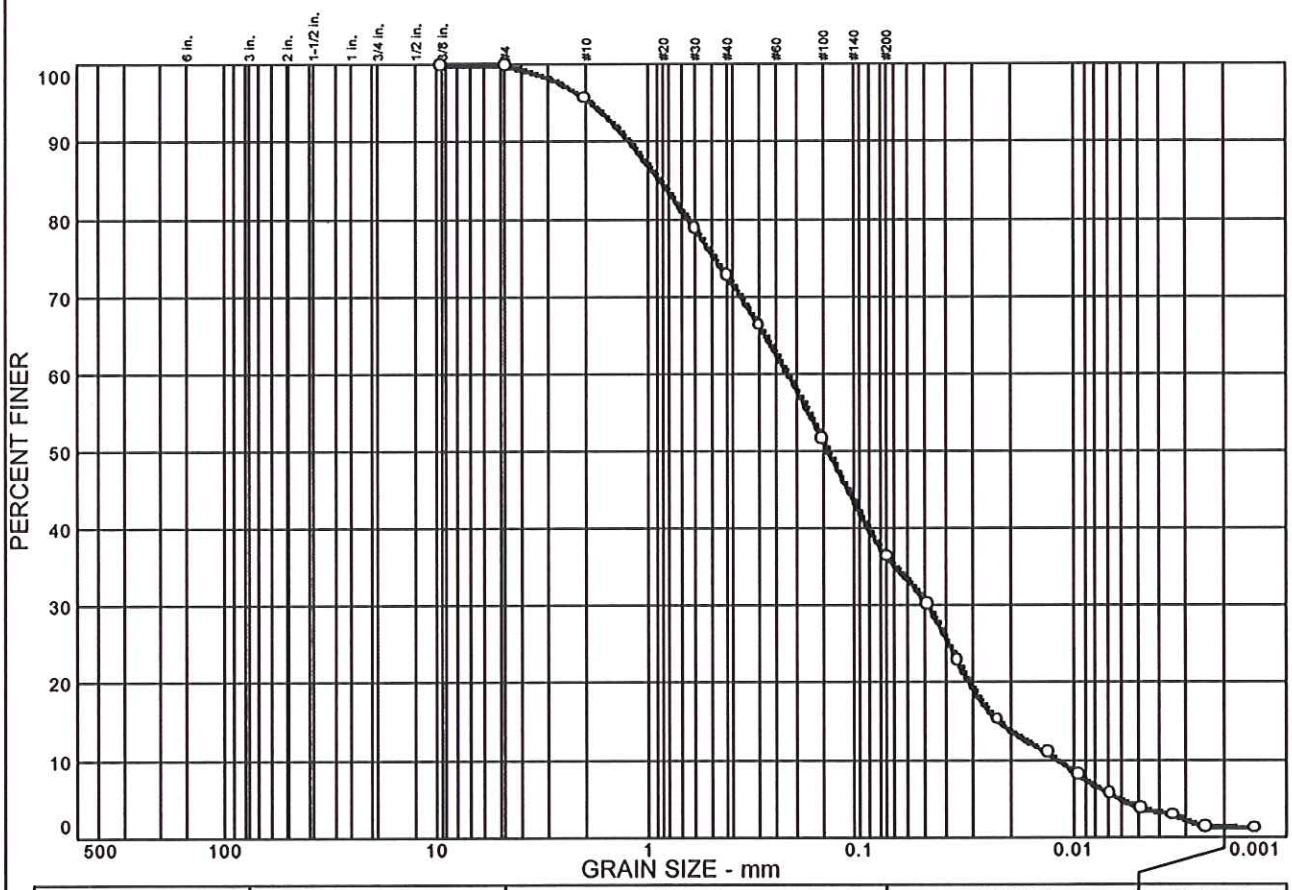
USCS= CL AASHTO=

Remarks

Sample No.: **Source of Sample:** B44G-9 **Date:**
Location: **Elev./Depth:** 60-61.5'

COOPER TESTING LABORATORY	Client: PB Project: 92/280 Retrofit - 04-1A7701 Project No: 603-012 Figure

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.1	63.5	35.2	1.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
#4	99.9		
#10	95.7		
#30	78.7		
#40	72.7		
#50	66.3		
#100	51.5		
#200	36.4		
0.0488 mm.	30.2		
0.0354 mm.	22.8		
0.0229 mm.	15.2		
0.0134 mm.	10.9		
0.0096 mm.	8.0		
0.0068 mm.	5.6		
0.0048 mm.	3.7		
0.0034 mm.	2.8		
0.0024 mm.	1.3		
0.0014 mm.	1.1		

* (no specification provided)

Soil Description

Gray Fat Clayey SAND

Atterberg Limits

PL= 37 LL= 96 PI= 59

Coefficients

D_{85}= 0.874 D_{60}= 0.219 D_{50}= 0.141
D_{30}= 0.0483 D_{15}= 0.0225 D_{10}= 0.0120
C_u= 18.25 C_c= 0.89

Classification

USCS= SC AASHTO=

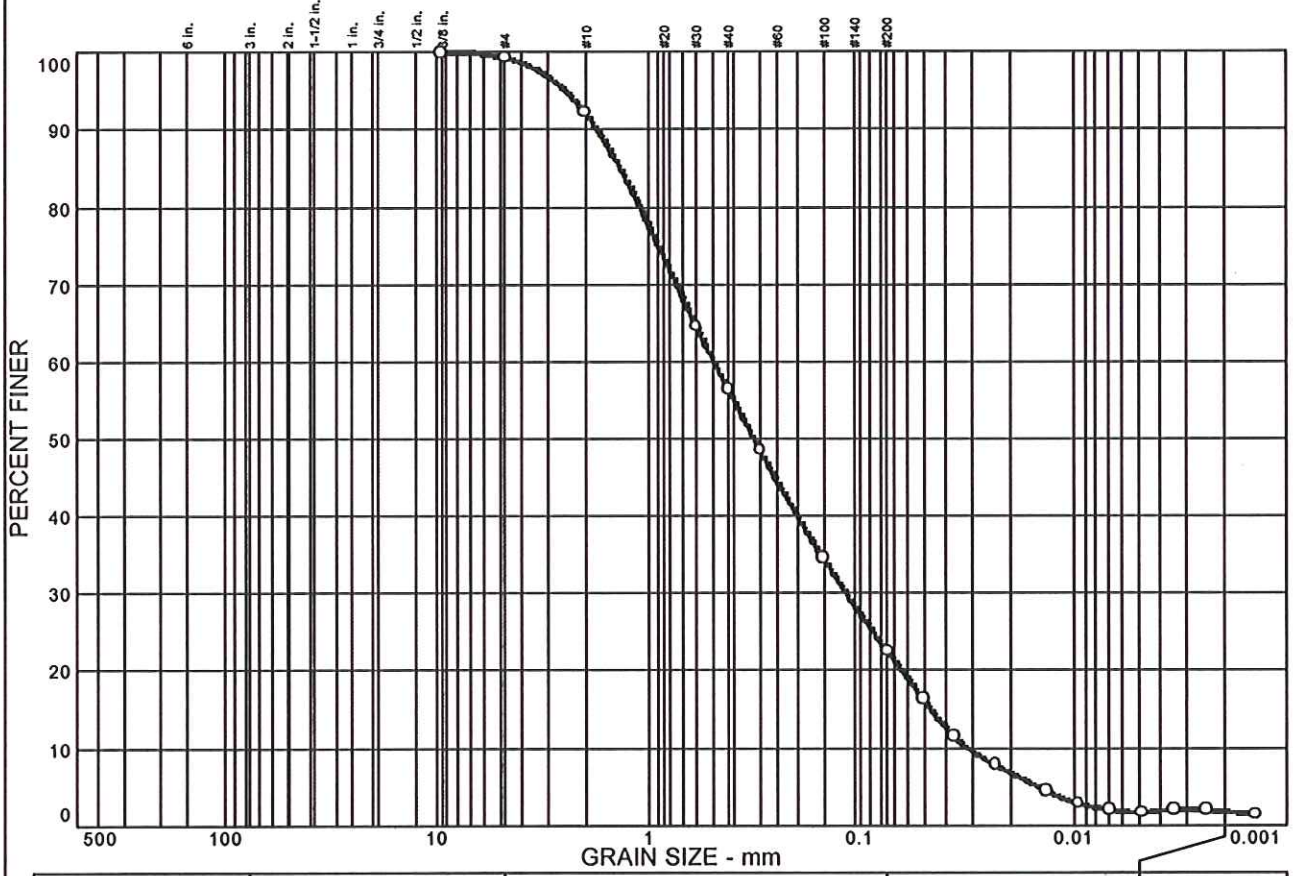
Remarks

Sample No.: **Source of Sample:** B44G-9 **Date:**
Location: **Elev./Depth:** 80-81.5'

COOPER TESTING LABORATORY

Client: PB
Project: 92/280 Retrofit - 04-1A7701
Project No: 603-012 **Figure**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.7	76.8	20.8	1.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
#4	99.3		
#10	92.3		
#30	64.6		
#40	56.4		
#50	48.5		
#100	34.5		
#200	22.5		
0.0507 mm.	16.3		
0.0364 mm.	11.5		
0.0233 mm.	7.8		
0.0136 mm.	4.5		
0.0097 mm.	2.8		
0.0069 mm.	2.0		
0.0049 mm.	1.6		
0.0034 mm.	2.0		
0.0024 mm.	1.9		
0.0014 mm.	1.4		

* (no specification provided)

Soil Description

Bluish Gray Silty SAND

Atterberg Limits

PL= 25 LL= 38 PI= 13

Coefficients

D_{85}= 1.37 D_{60}= 0.496 D_{50}= 0.321
D_{30}= 0.117 D_{15}= 0.0466 D_{10}= 0.0315
C_u= 15.72 C_c= 0.88

Classification

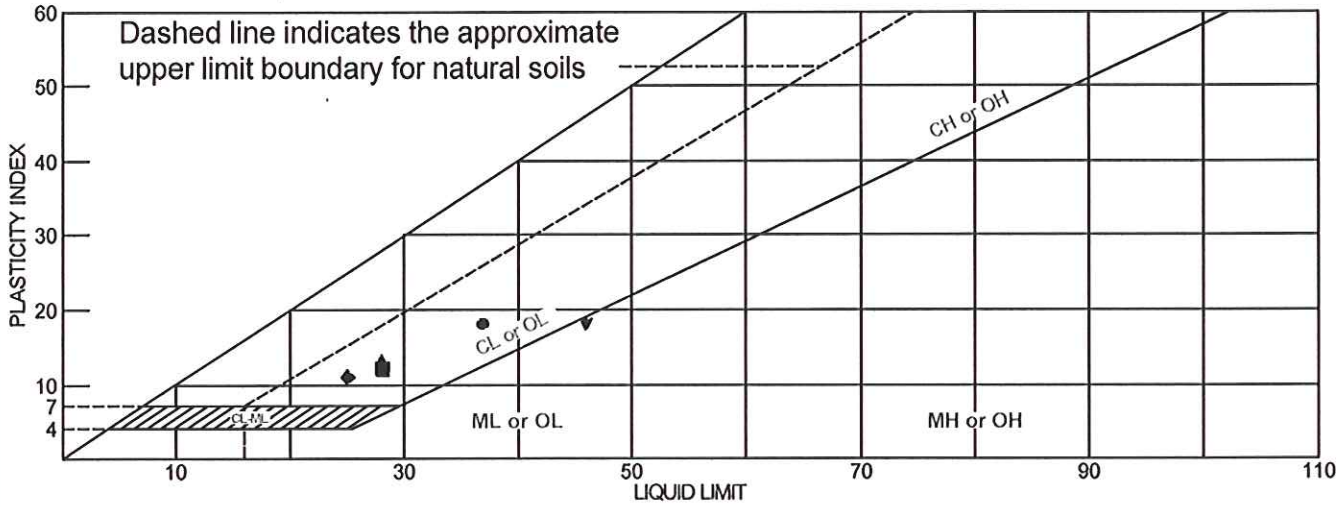
USCS= SM AASHTO=

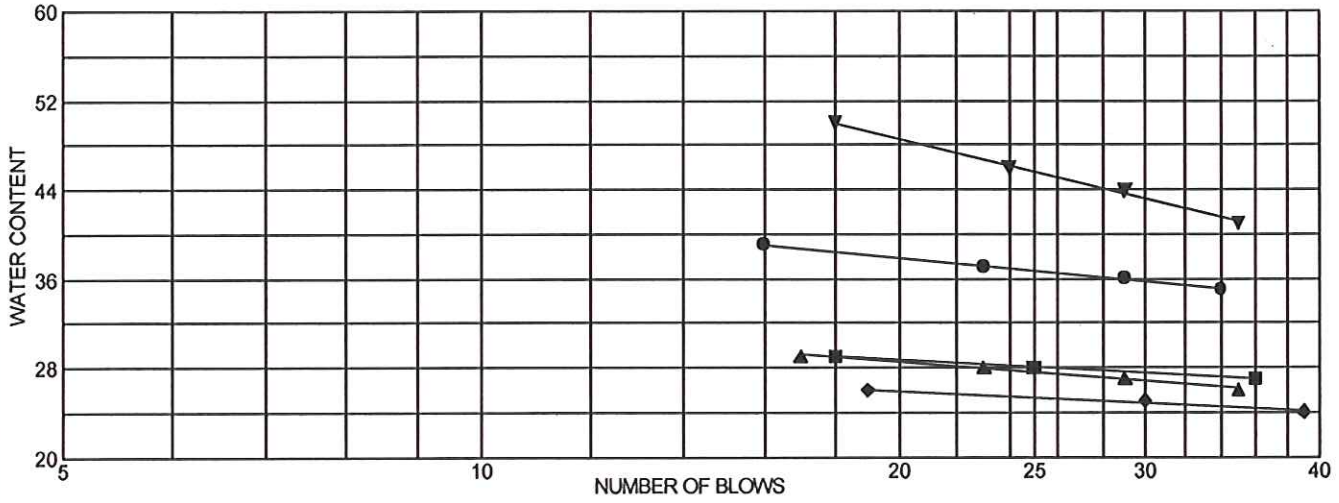
Remarks

Sample No.: **Source of Sample:** B44G-9 **Date:**
Location: **Elev./Depth:** 100-101.5'

COOPER TESTING LABORATORY	**Client:** PB **Project:** 92/280 Retrofit - 04-1A7701 **Project No:** 603-012 **Figure**

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Gray Lean Clayey SAND w/ Gravel	37	19	18	54.5	32.8	SC
■	Gray Sandy Lean CLAY	28	16	12	68.9	52.4	CL
▲	Dark Gray Lean Clayey SAND w/ Gravel	28	15	13	54.8	43.3	
◆	Dark Gray Sandy Lean CLAY	25	14	11	70.0	58.7	CL
▼	Mottled Bluish Gray Silty SAND	46	28	18	66.9	40.7	

Project No. 603-012 **Client:** PB

Project: 92/280 Retrofit - 04-1A7701

● **Source:** B44G-3 **Elev./Depth:** 5-6.5'
■ **Source:** B44G-3 **Elev./Depth:** 15-16.5'
▲ **Source:** B44G-3 **Elev./Depth:** 20-21.5'
◆ **Source:** B44G-3 **Elev./Depth:** 35-36.5'
▼ **Source:** B44G-6 **Elev./Depth:** 49.5-51'

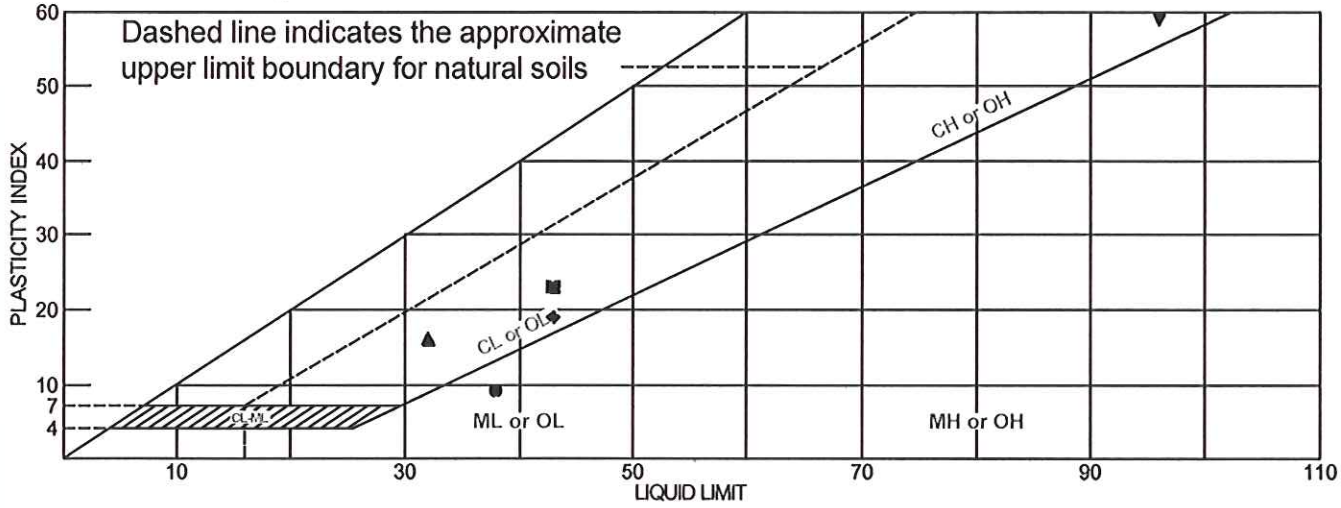
Remarks:
●
■
▲
◆
▼

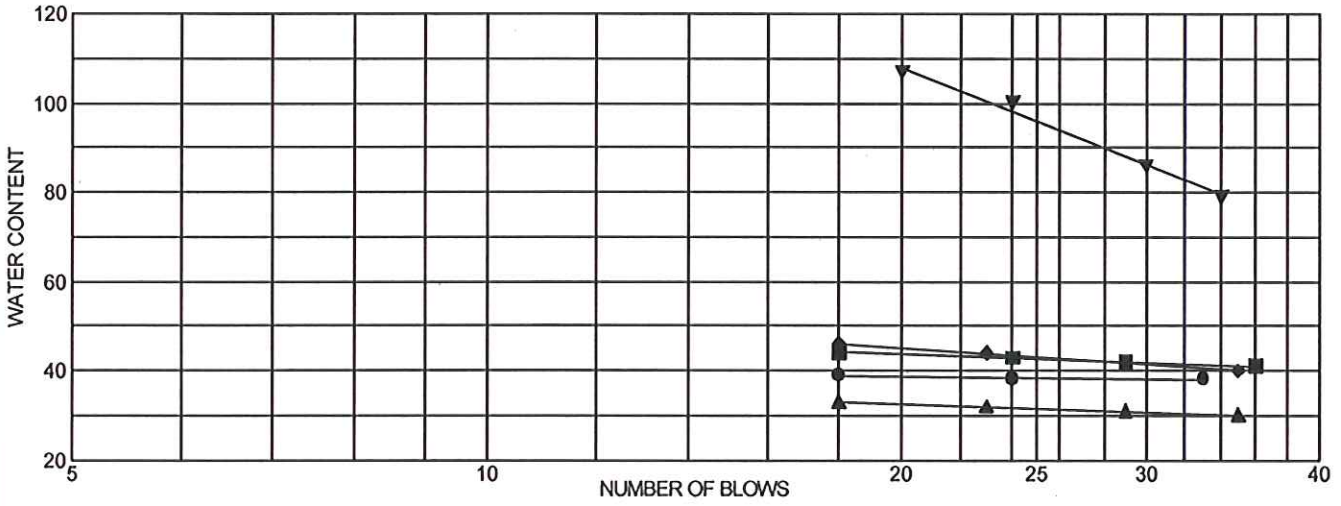
LIQUID AND PLASTIC LIMITS TEST REPORT

COOPER TESTING LABORATORY

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown Silty SAND	38	29	9	58.9	38.3	SM
■	Gray Lean Clayey SAND	43	20	23	74.7	49.6	SC
▲	Gray Lean Clayey SAND	32	16	16	55.8	35.4	SC
◆	Gray Sandy Lean CLAY	43	24	19	82.9	57.3	CL
▼	Gray Fat Clayey SAND	96	37	59	72.7	36.4	SC

Project No. 603-012 **Client:** PB

Project: 92/280 Retrofit - 04-1A7701

●	**Source:** B44G-9	**Elev./Depth:** 25-26.5'
■	**Source:** B44G-9	**Elev./Depth:** 30-31.5'
▲	**Source:** B44G-9	**Elev./Depth:** 50-51.5'
◆	**Source:** B44G-9	**Elev./Depth:** 60-61.5'
▼	**Source:** B44G-9	**Elev./Depth:** 80-81.5'

LIQUID AND PLASTIC LIMITS TEST REPORT

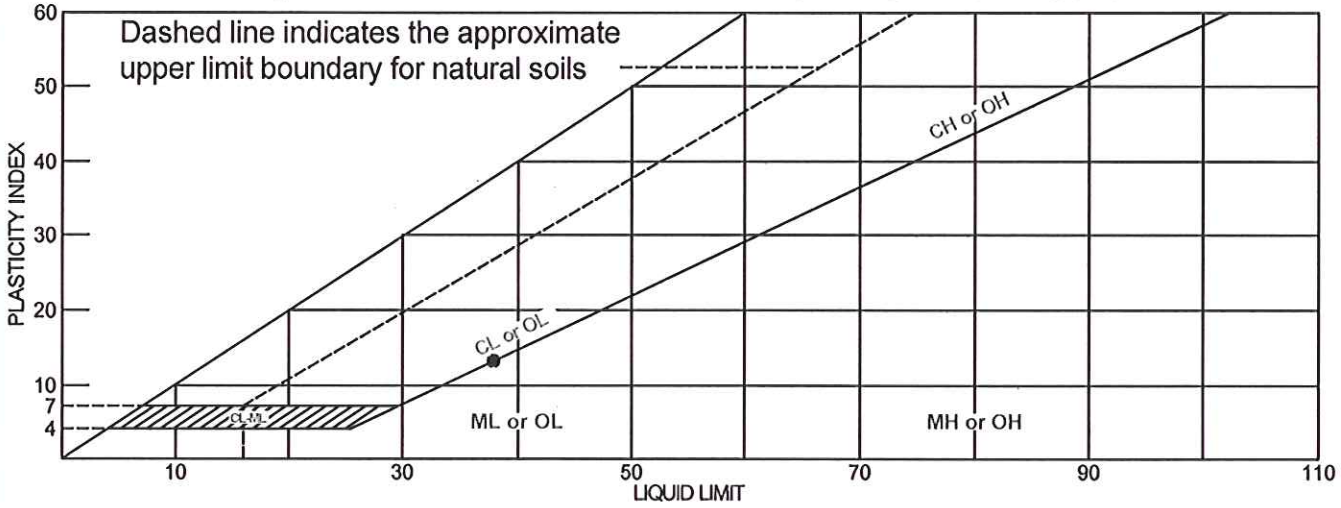
COOPER TESTING LABORATORY

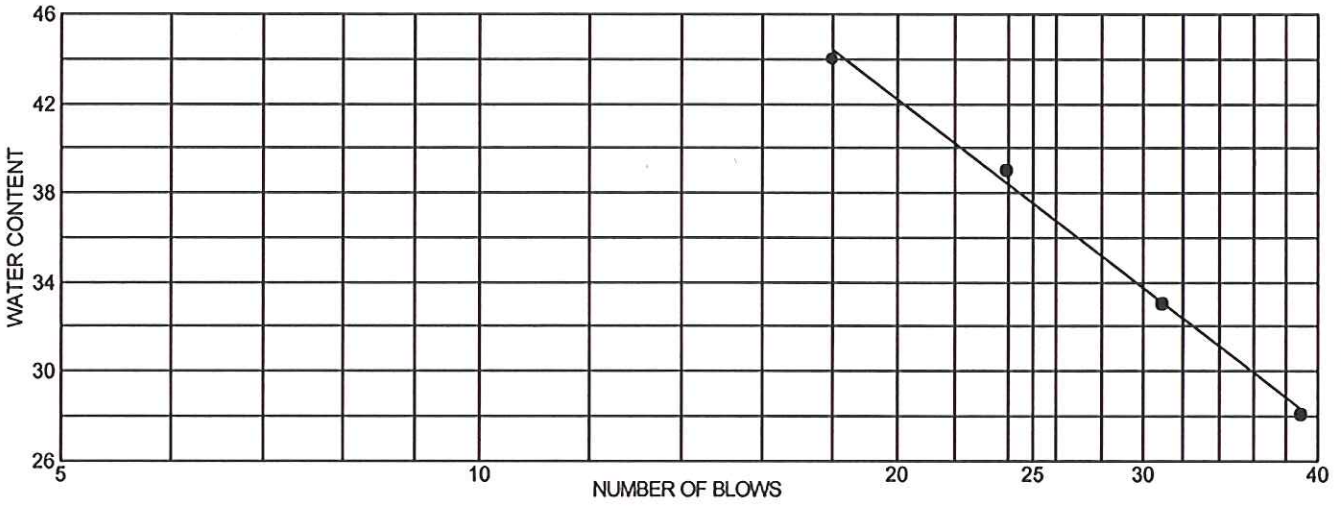
Remarks:

● ■ ▲ ◆ ▼

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Bluish Gray Silty SAND	38	25	13	56.4	22.5	SM

Project No. 603-012 **Client:** PB

Project: 92/280 Retrofit - 04-1A7701

● **Source:** B44G-9 **Elev./Depth:** 100-101.5'

Remarks:

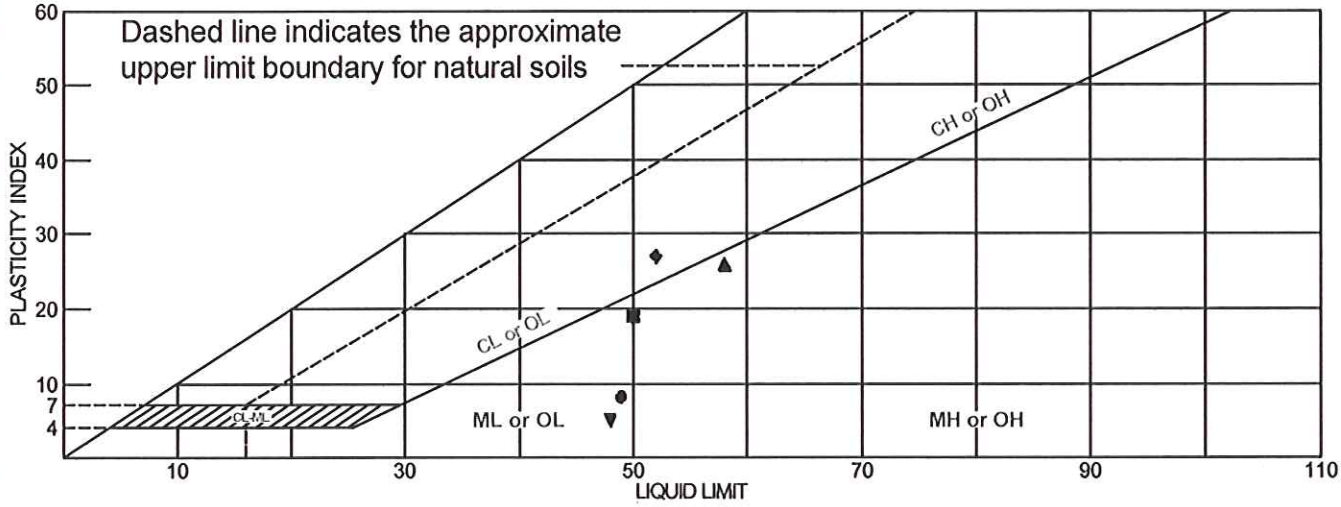
●

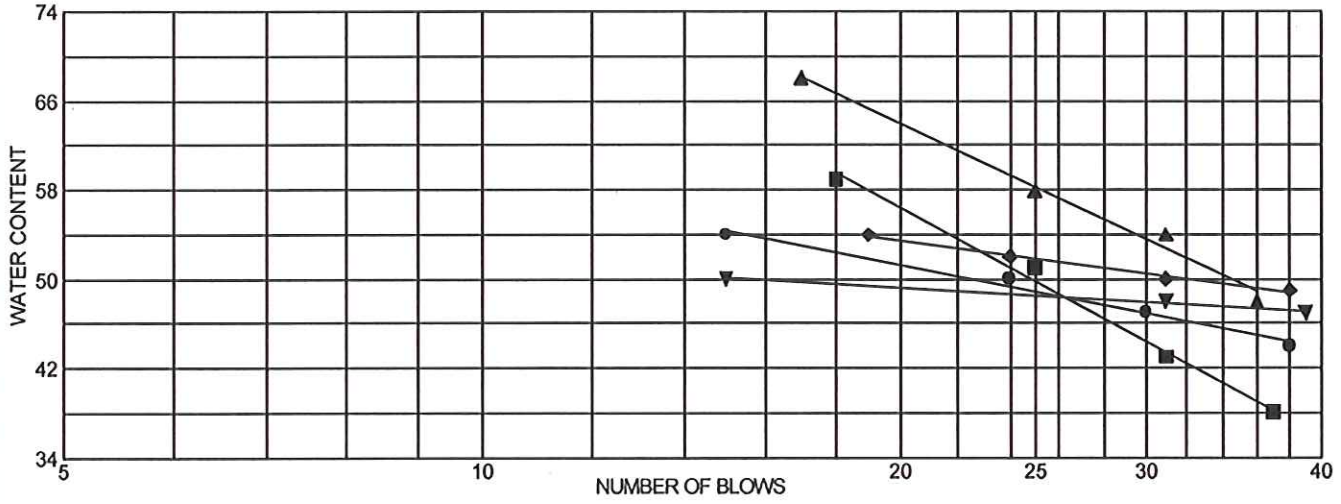
LIQUID AND PLASTIC LIMITS TEST REPORT

COOPER TESTING LABORATORY

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Bluish Gray Sandy SILT	49	41	8	78.8	57.2	ML
■	Bluish Gray Silty SAND	50	31	19	73.5	31.0	SM
▲	Gray Elastic Silty SAND	58	32	26	61.5	28.0	SM
◆	Brown Fat Clayey SAND w/ Gravel	52	25	27	50.4	35.2	SC
▼	Brown Silty SAND	48	43	5	49.4	24.6	SM

Project No. 603-012 **Client:** PB

Project: 92/280 Retrofit - 04-1A7701

● **Source:** B45F-6 **Elev./Depth:** 20-21.5'
■ **Source:** B45F-6 **Elev./Depth:** 55-56.5'
▲ **Source:** B45F-6 **Elev./Depth:** 75-76.5'
◆ **Source:** B45F-5 **Elev./Depth:** 5-6.5'
▼ **Source:** B44G-9 **Elev./Depth:** 20-21.5'

LIQUID AND PLASTIC LIMITS TEST REPORT

COOPER TESTING LABORATORY

Remarks:

● ■ ▲ ◆ ▼

Figure

COOPER TESTING LABORATORY

Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D3148)

CTL Job No.:	603-012A	Boring:	B44G-3	Date:	2/5/2009
Client:	Parsons Brinckerhoff	Sample:		By:	PJ
Project Name:	92/280 Retrofit	Depth,ft.:	13-14	Checked:	PJ
Project No.:	04-1A7701				

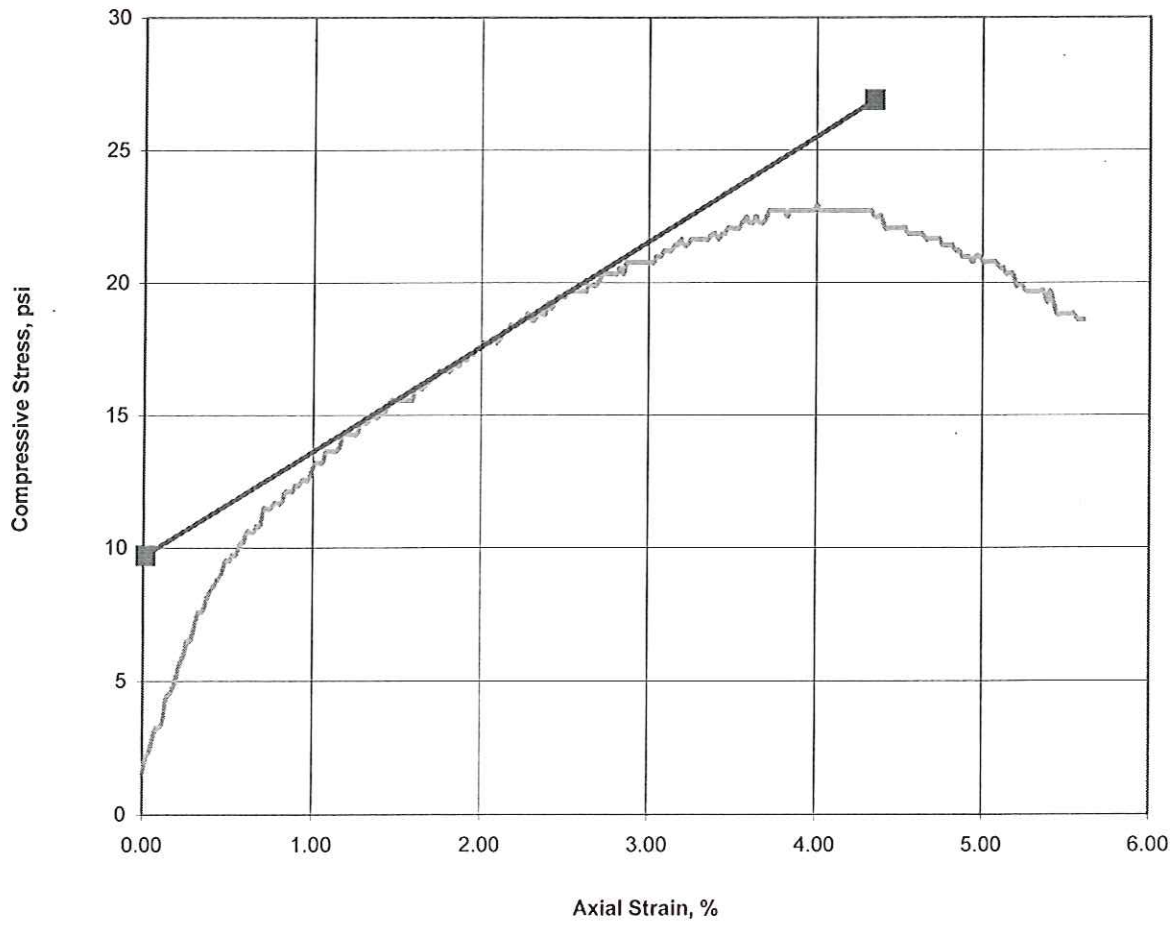
Visual Description: Greenish Gray Sandy CLAY (Weathered Rock)

Moisture Condition at Test: Sample was washed and in a moist state.

Test Temperature, (°C): Ambient

Remarks: Deviation from straightness and parallelism measured using digital dial calipers.

Sample Height, in.	4.94	**Unconfined Compressive Strength, psi**	**23**
Sample Diameter, in.	2.43		
Height / Diameter	2.04		
Sample Area, in^2	4.62		
Wet Density, pcf	144.8	**Young's Modulus (E) (psi)**	**400**
Dry Density, pcf	131.7		
Moisture Content, %	10.0		
Strain Rate, % / min	0.51		



COOPER TESTING LABORATORY

Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D3148)

CTL Job No.:	603-012B	Boring:	B44G-3	Date:	2/5/2009
Client:	Parsons Brinckerhoff	Sample:		By:	PJ
Project Name:	92/280 Retrofit	Depth,ft.:	37-38	Checked:	PJ
Project No.:	04-1A7701				

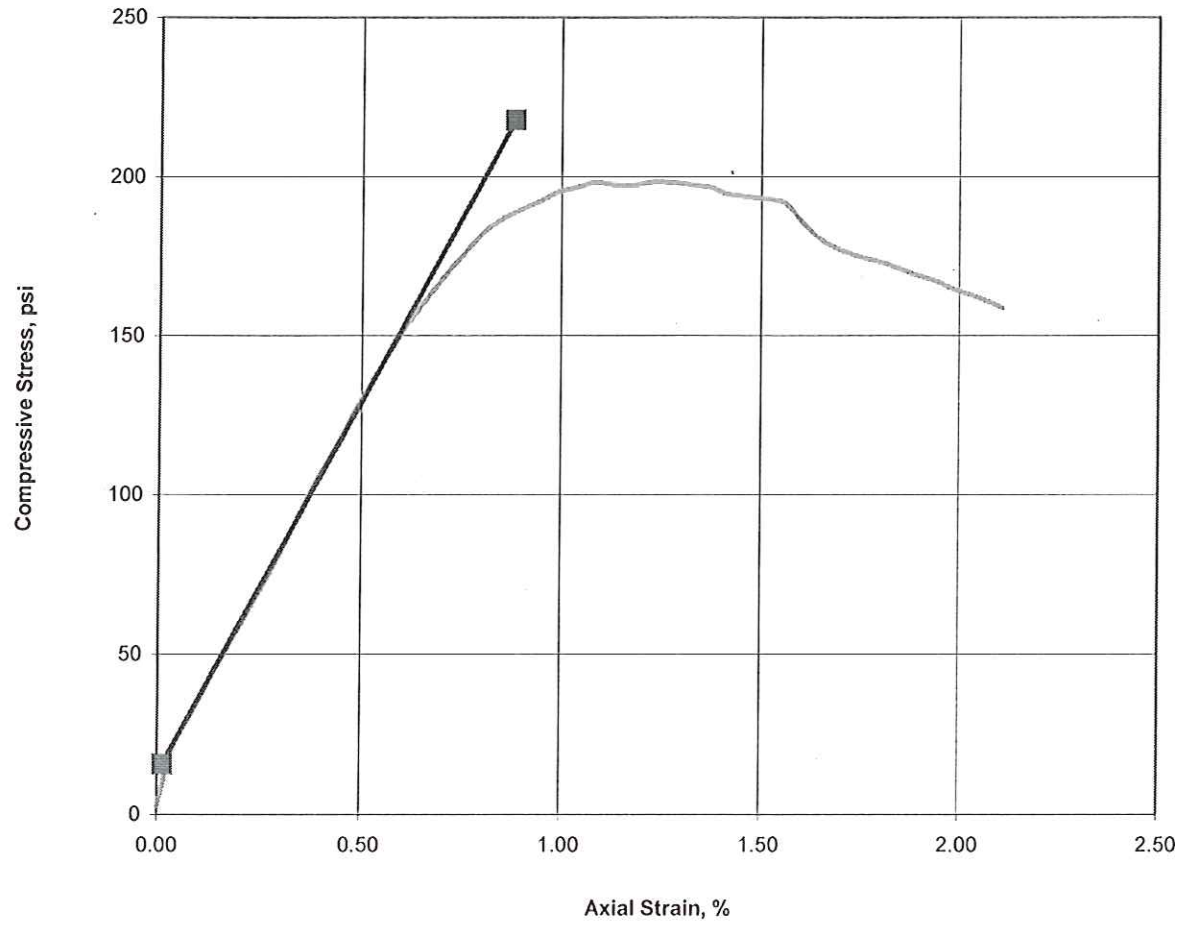
Visual Description: Bluish Gray Sandy CLAY (Weathered Rock)

Moisture Condition at Test: Sample was washed and in a moist state.

Test Temperature, (°C): Ambient

Remarks: Deviation from straightness and parallelism measured using digital dial calipers. Samples were finished by capping the ends with high-strength capping plaster in as thin a layer as

Sample Height, in.	4.29	**Unconfined Compressive Strength, psi**	**198**
Sample Diameter, in.	2.42		
Height / Diameter	1.78		
Sample Area, in^2	4.59		
Wet Density, pcf	156.0	**Young's Modulus (E) (psi)**	**23,200**
Dry Density, pcf	149.8		
Moisture Content, %	4.2		
Strain Rate, % / min	1.16		



COOPER TESTING LABORATORY

Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D3148)

CTL Job No.:	603-012C	Boring:	B44G-3	Date:	2/5/2009
Client:	Parsons Brinckerhoff	Sample:		By:	PJ
Project Name:	92/280 Retrofit	Depth,ft.:	89-90	Checked:	PJ
Project No.:	04-1A7701				

Visual Description: Bluish Gray Rock

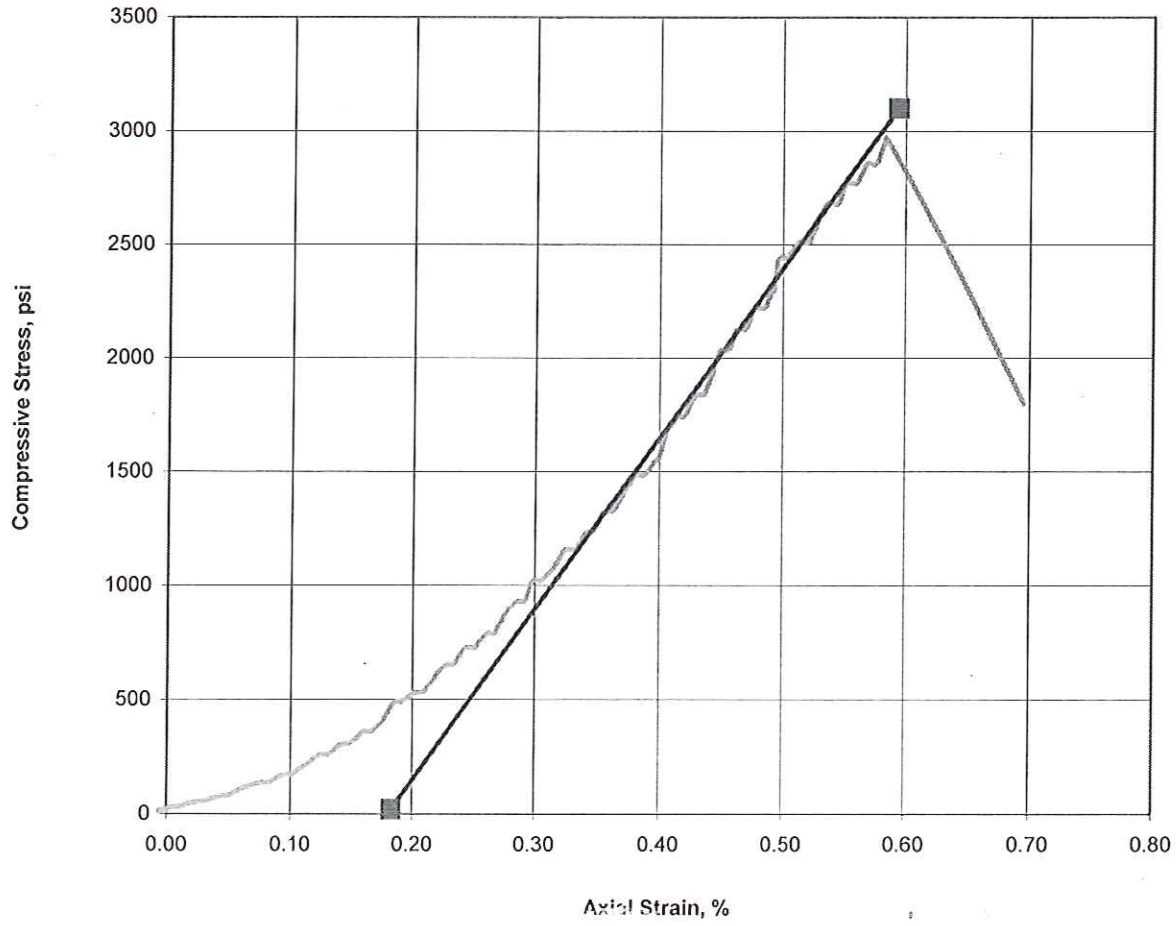
Moisture Condition at Test: Sample was washed and in a moist state.

Test Temperature, (°C): Ambient

Remarks: Sample failed explosively. Deviation from straightness and parallelism measured using digital dial calipers. Samples were finished by capping the ends with high-strength capping plaster in as thin a layer as practicable.

Sample Height, in.	4.93
Sample Diameter, in.	2.40
Height / Diameter	2.05
Sample Area, in^2	4.52
Wet Density, pcf	164.9
Dry Density, pcf	161.6
Moisture Content, %	2.0
Strain Rate, % / min	0.23

Unconfined Compressive Strength, psi	**2969**
Young's Modulus (E) (psi)	**749,400**



COOPER TESTING LABORATORY

Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D3148)

CTL Job No.:	603-012D	Boring:	B44G-3	Date:	2/5/2009
Client:	Parsons Brinckerhoff	Sample:		By:	PJ
Project Name:	92/280 Retrofit	Depth,ft.:	92-93	Checked:	PJ
Project No.:	04-1A7701				

Visual Description: Bluish Gray Rock

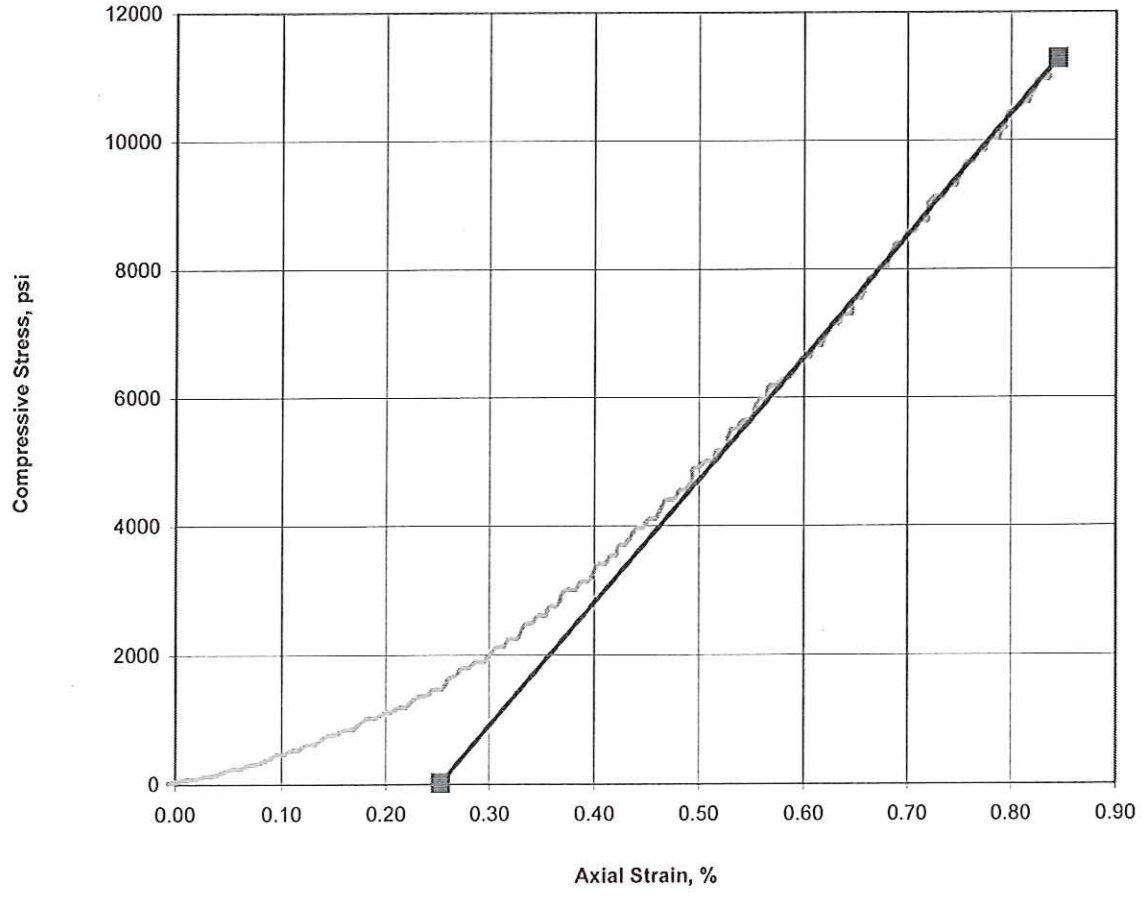
Moisture Condition at Test: Sample was washed and in a moist state.

Test Temperature, (°C): Ambient

Remarks: This stress-strain curve only contains data up to the maximum capacity of the equipment (50,000 lbs). The UC strength was subsequently obtained on equipment where the strain could not be measured. Deviation from straightness and parallelism measured using digital dial calipers. Samples were finished by capping the ends with high-strength capping plaster in as thin a layer as practicable.

Sample Height, in.	5.01
Sample Diameter, in.	2.40
Height / Diameter	2.09
Sample Area, in^2	4.52
Wet Density, pcf	167.1
Dry Density, pcf	165.5
Moisture Content, %	1.0
Strain Rate, % / min	0.22

Unconfined Compressive Strength, psi	**14032**
Young's Modulus (E) (psi)	**1,902,000**



COOPER TESTING LABORATORY

Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D3148)

CTL Job No.:	603-012E	Boring:	B44G-3	Date:	2/5/2009
Client:	Parsons Brinckerhoff	Sample:		By:	PJ
Project Name:	92/280 Retrofit	Depth,ft.:	101-102	Checked:	PJ
Project No.:	04-1A7701				

Visual Description: Bluish Gray Rock

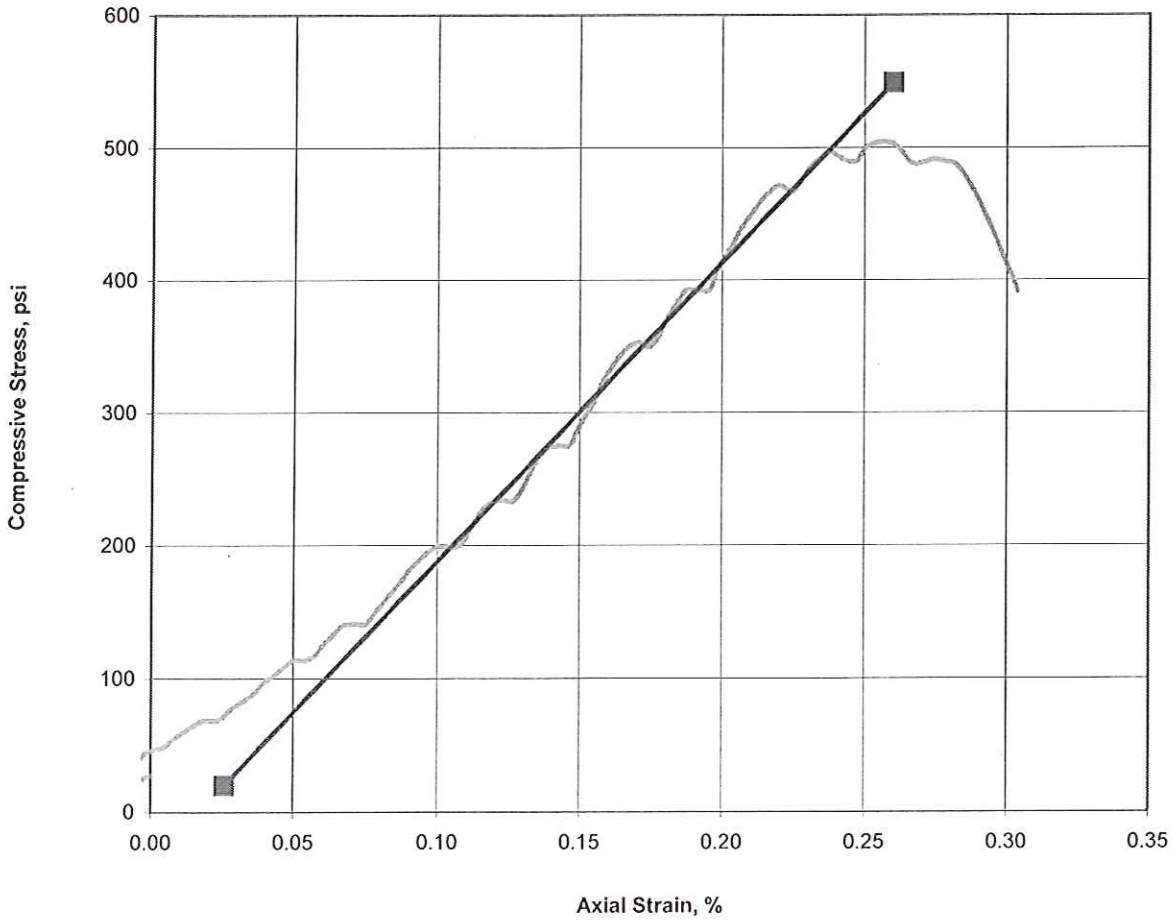
Moisture Condition at Test: Sample was washed and in a moist state.

Test Temperature, (°C): Ambient

Remarks: Sample failed along a pre-existing fracture. Deviation from straightness and parallelism measured using digital dial calipers. Samples were finished by capping the ends with high-strength capping plaster in as thin a layer as practicable.

Sample Height, in.	5.00
Sample Diameter, in.	2.39
Height / Diameter	2.09
Sample Area, in^2	4.47
Wet Density, pcf	167.3
Dry Density, pcf	164.9
Moisture Content, %	1.5
Strain Rate, % / min	0.22

Unconfined Compressive Strength, psi	**504**
Young's Modulus (E) (psi)	**225,900**



COOPER TESTING LABORATORY

Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D3148)

CTL Job No.:	603-012F	Boring:	B44G-3	Date:	2/5/2009
Client:	Parsons Brinckerhoff	Sample:		By:	PJ
Project Name:	92/280 Retrofit	Depth,ft.:	112-113	Checked:	PJ
Project No.:	04-1A7701				

Visual Description: Bluish Gray Rock

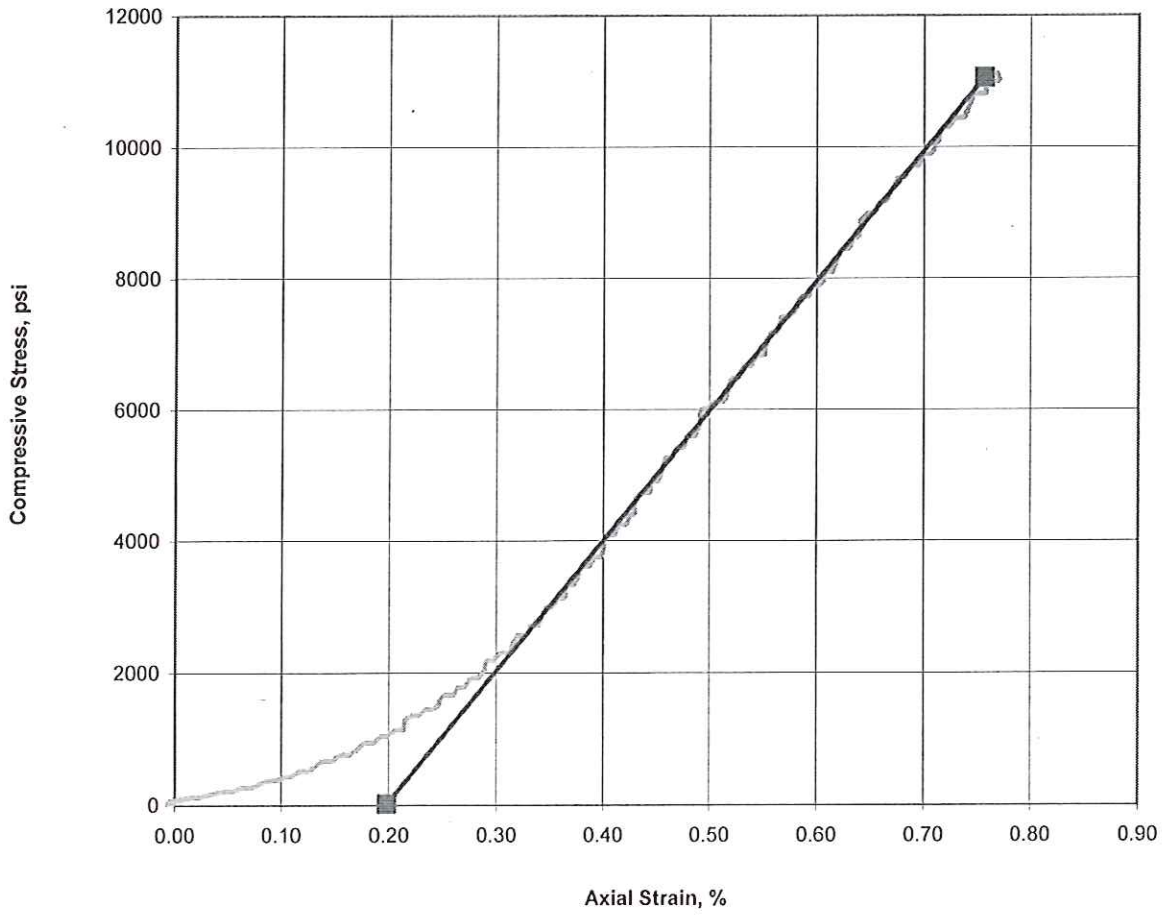
Moisture Condition at Test: Sample was washed and in a moist state.

Test Temperature, (°C): Ambient

Remarks: This stress-strain curve only contains data up to the maximum capacity of the equipment (50,000 lbs). The UC strength was subsequently obtained on equipment where the strain could not be measured. Deviation from straightness and parallelism measured using digital dial calipers. Samples were finished by capping the ends with high-strength capping plaster in as thin a layer as practicable.

Sample Height, in.	4.96
Sample Diameter, in.	2.40
Height / Diameter	2.07
Sample Area, in^2	4.52
Wet Density, pcf	167.4
Dry Density, pcf	165.8
Moisture Content, %	1.0
Strain Rate, % / min	0.23

Unconfined Compressive Strength, psi	**19160**
Young's Modulus (E) (psi)	**1,975,000**



COOPER TESTING LABORATORY

Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D3148)

CTL Job No.:	603-013X	Boring:	B44G-9	Date:	2/5/2009
Client:	Parsons Brinckerhoff	Sample:		By:	PJ
Project Name:	92/280 Retrofit	Depth,ft.:	59-60	Checked:	PJ
Project No.:	04-1A7701				

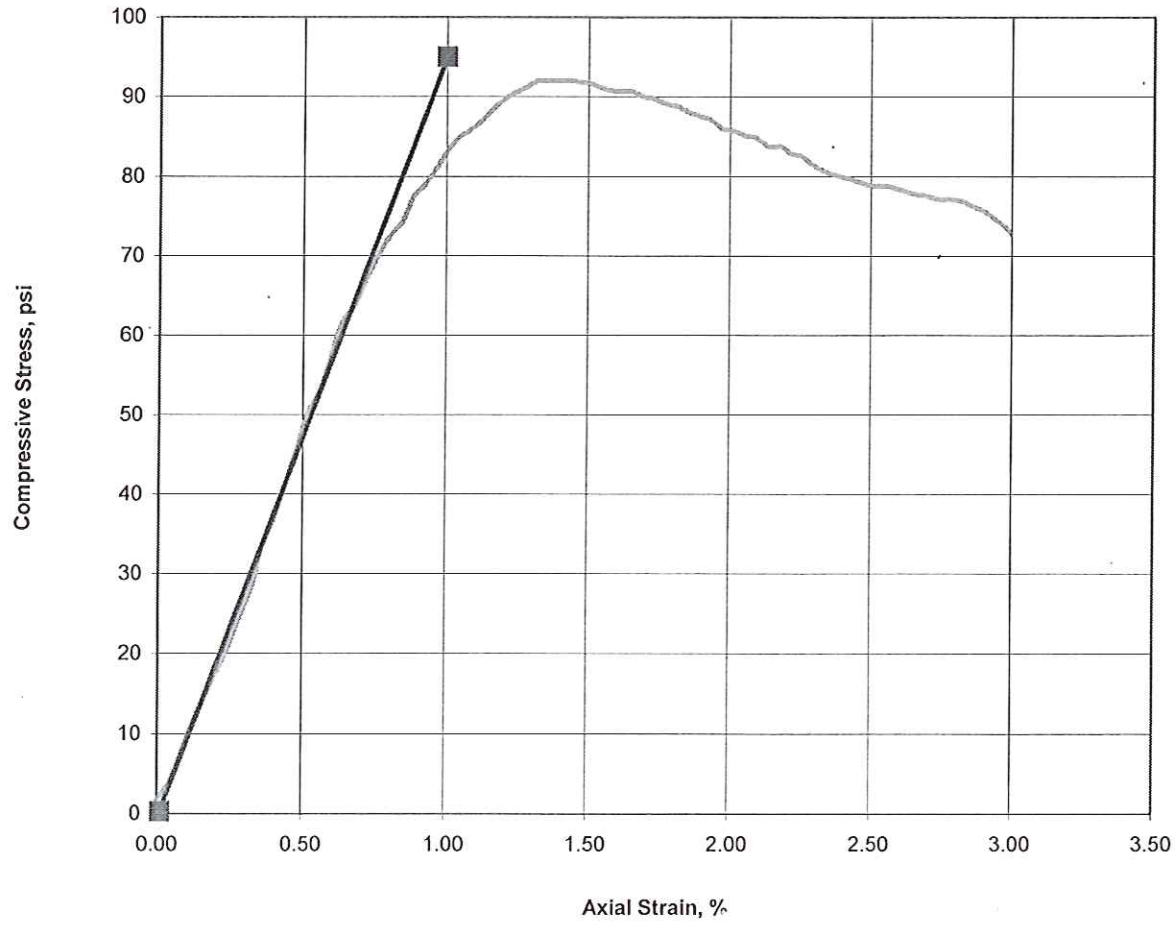
Visual Description: Greenish Brown Clayey SAND (Weathered Rock)

Moisture Condition at Test: Sample was washed and in a moist state.

Test Temperature, (°C): Ambient

Remarks: Deviation from straightness and parallelism measured using digital dial calipers. Samples were finished by capping the ends with high-strength capping plaster in as thin a layer as practicable.

Sample Height, in.	5.01	**Unconfined Compressive Strength, psi**	**92**
Sample Diameter, in.	2.43		
Height / Diameter	2.06		
Sample Area, in^2	4.64		
Wet Density, pcf	136.9	**Young's Modulus (E) (psi)**	**9,600**
Dry Density, pcf	119.5		
Moisture Content, %	14.6		
Strain Rate, % / min	0.92		



COOPER TESTING LABORATORY

Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D3148)

CTL Job No.:	603-012Y	Boring:	B44G-9	Date:	2/5/2009
Client:	Parsons Brinckerhoff	Sample:		By:	PJ
Project Name:	92/280 Retrofit	Depth,ft.:	69-70	Checked:	PJ
Project No.:	04-1A7701				

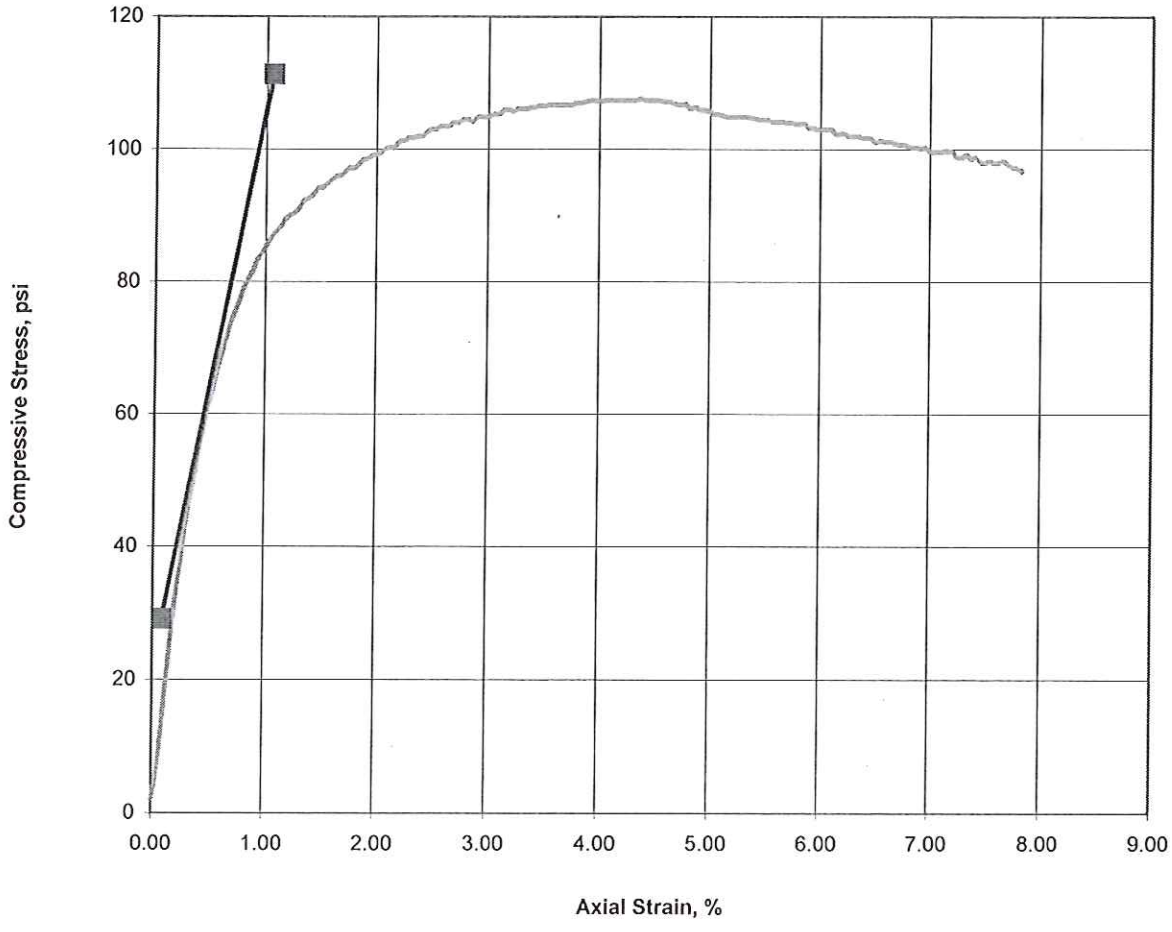
Visual Description: Bluish Gray Sandy CLAY (Weathered Rock)

Moisture Condition at Test: Sample was washed and in a moist state.

Test Temperature, (°C): Ambient

Remarks: Deviation from straightness and parallelism measured using digital dial calipers. Samples were finished by capping the ends with high-strength capping plaster in as thin a layer as practicable.

Sample Height, in.	4.92	**Unconfined Compressive Strength, psi**	**108**
Sample Diameter, in.	2.47		
Height / Diameter	2.00		
Sample Area, in^2	4.78		
Wet Density, pcf	130.2	**Young's Modulus (E) (psi)**	**8,390**
Dry Density, pcf	111.5		
Moisture Content, %	16.7		
Strain Rate, % / min	0.94		



COOPER TESTING LABORATORY

Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D3148)

CTL Job No.:	603-012Z	Boring:	B44G-9	Date:	2/5/2009
Client:	Parsons Brinckerhoff	Sample:		By:	PJ
Project Name:	92/280 Retrofit	Depth,ft.:	78-79	Checked:	PJ
Project No.:	04-1A7701				

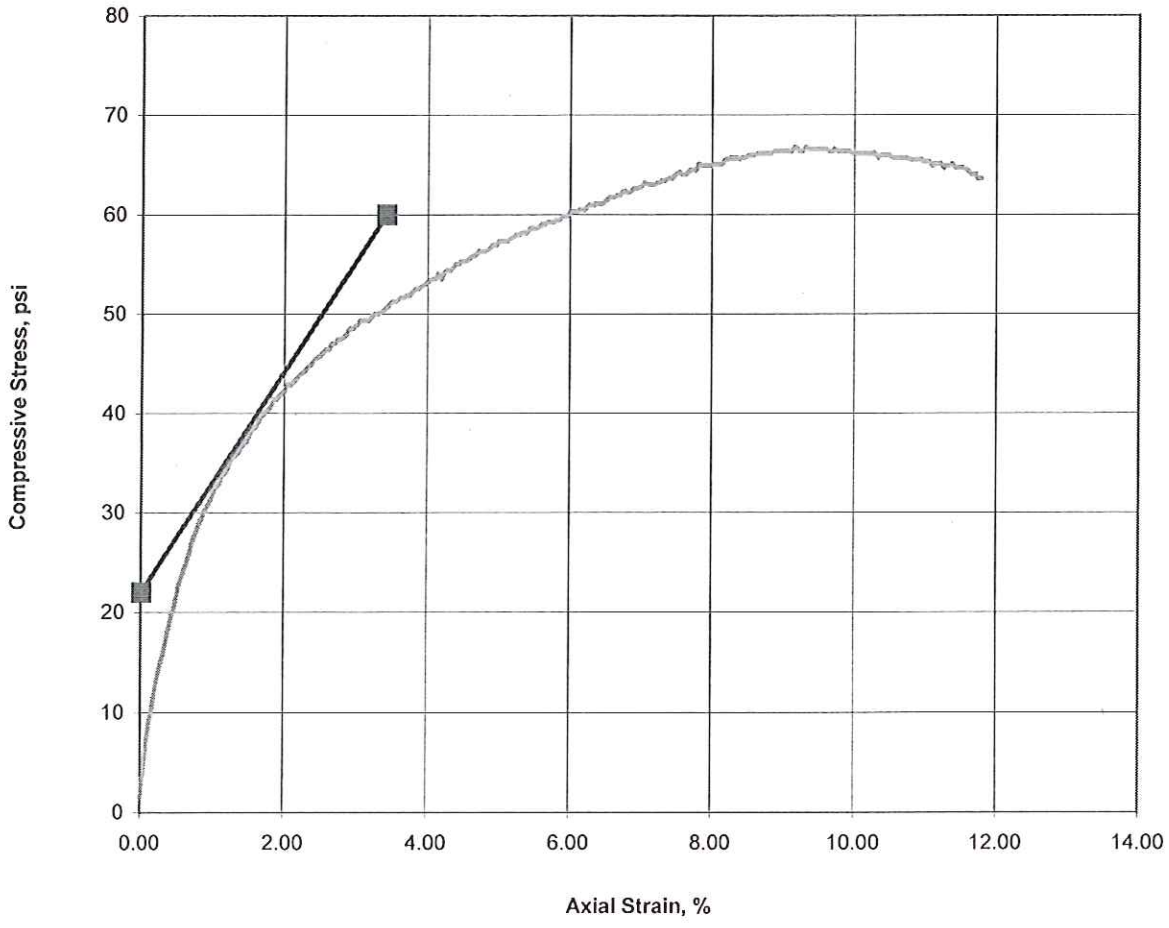
Visual Description: Very Dark Greenish Gray Sandy CLAY (Weathered Rock)

Moisture Condition at Test: Sample was washed and in a moist state.

Test Temperature, (°C): Ambient

Remarks: Deviation from straightness and parallelism measured using digital dial calipers.

Sample Height, in.	5.00	**Unconfined Compressive Strength, psi**	**67**
Sample Diameter, in.	2.46		
Height / Diameter	2.03		
Sample Area, in^2	4.76		
Wet Density, pcf	128.6	**Young's Modulus (E) (psi)**	**1,120**
Dry Density, pcf	105.7		
Moisture Content, %	21.7		
Strain Rate, % / min	1.00		



COOPER TESTING LABORATORY

Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D3148)

CTL Job No.:	603-012ZA	Boring:	B44G-9	Date:	2/5/2009
Client:	Parsons Brinckerhoff	Sample:		By:	PJ
Project Name:	92/280 Retrofit	Depth,ft.:	89-90	Checked:	PJ
Project No.:	04-1A7701				

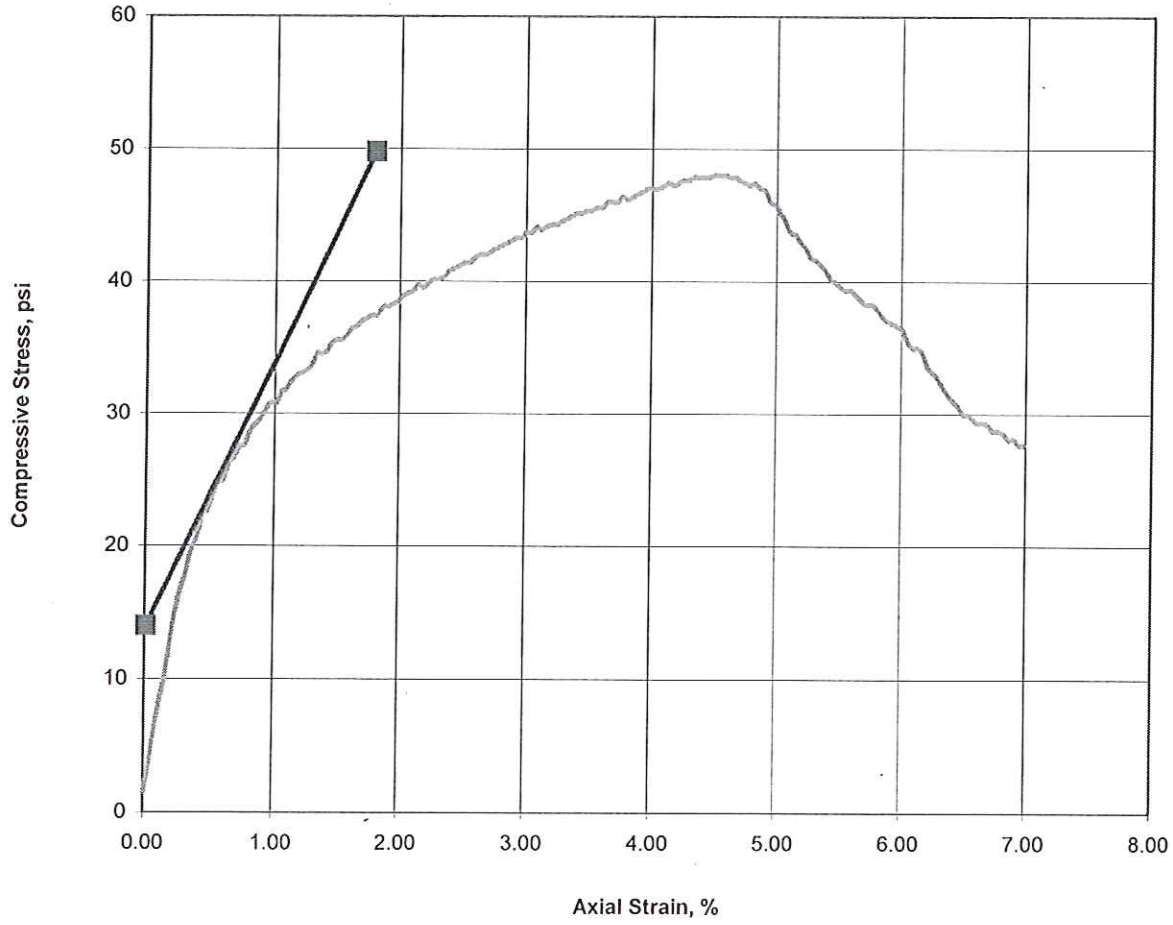
Visual Description: Bluish Gray Sandy CLAY (Weathered Rock)

Moisture Condition at Test: Sample was washed and in a moist state.

Test Temperature, (°C): Ambient

Remarks: Deviation from straightness and parallelism measured using digital dial calipers.

Sample Height, in.	4.97	**Unconfined Compressive Strength, psi**	**48**
Sample Diameter, in.	2.47		
Height / Diameter	2.01		
Sample Area, in^2	4.81		
Wet Density, pcf	140.2	**Young's Modulus (E) (psi)**	**2,000**
Dry Density, pcf	122.8		
Moisture Content, %	14.2		
Strain Rate, % / min	1.01		



TEST NO. 6779 - 2P

DATE RECEIVED JAN 16 2009

CALC. BY _____ APPROVED BY _____

DATE REPORTED FEB 13 2009

BILLED

☐ DISTRICT DIRECTOR ☐ TRANS. LAB
☐ DIS. MAT LS. ENGR. ☐ PAV'T. SECT
☐ RESIDENT ENGINEER ☐ ACCOUNTING
☐ CONSTRUCTION ☐

TL-101 (REV. 9-76) STATE OF CALIFORNIA SAMPLE IDENTIFICATION NO.
DEPARTMENT OF TRANSPORTATION C

☐ PRELIMINARY TESTS Sample Sent To
☐ PROCESS TESTS ☐ HDQTRS. LAB FIELD NO.
☐ ACCEPTANCE TESTS ☐ BRANCH LAB DIST. LAB NO.
☐ INDEPENDENT ASSURANCE TESTS ☐ DIST. LAB LOT NO.
☐ DIST. LAB ☐ SHIPMENT NO. P.O. OR REQ. NO.
☐ TRANS. LAB
☐ SPECIAL TESTS AUTHORIZATION NO.

6779-2P

JAN 16 2009

SAMPLE OF NATIVE SOIL
FOR USE IN EA 1A7701 I-210 PBO
SAMPLE FROM 92/280 IC
DEPTH 0-10'
LOCATION OF SOURCE Bore-9

THIS SAMPLE IS SHIPPED IN _____ (NO. CONTAINERS) AND IS ONE OF A GROUP OF _____ SAMPLES REPRESENTING _____ (TONS, GALS., BBLS., STA., ETC.)

OWNER OR MANUFACTURER
TOTAL QUANTITY AVAILABLE TEST RESULTS DESIRED ☒ NORMAL ☐ PRIORITY DATE NEEDED
REMARKS CORROSION

COVER ADDITIONAL INFORMATION WITH LETTER
DATE SAMPLED
BY TITLE
DIST., CO., RTE., P.M. 04-SAM-280 PM 10.8
LIMITS
CONT. NO.
FED. NO.
RES. ENGR. OR SUPT. CHRIS RISDEN
ADDRESS
CONTRACTOR (510) 622-8757

DISTRICT OFFICE

GRADING ANALYSIS

SIEVE	AS RECEIVED	RET. CR.	ADJ. OR COMB. GRADE	AS USED	SPECIF. LIMITS SOUGHT ☐
3					
2½					
2					
1½					
1					
¾					
½					
⅜					
4					
8					
16					
30					
50					
100					
200					
5μ					
1μ					

GRADING AS USED WAS OBTAINED AS FOLLOWS:
% BY WT. % BY VOL. TEST NO. DESCRIPTION

RESISTIVITY = 3053

REMARKS PH = 8.5

SURFACE
BASE
SUBBASE
GRAVEL EQUIVALENT FACTOR
TRAFFIC INDEX
R VALUE: EXUDATION PRESSURE
EXPANSION PRESSURE
AT EQUILIBRUM SPEC.
INDICATED MINIMUM THICKNESS OF COVER FOR ABOVE CONDITIONS (FEET)

REPORT OF TESTS ON SOIL

IF CONTRACT, USE CONTRACT ITEM

SOURCE	CHARGE	EXPENDITURE AUTHORIZATION

SPECIAL DESIGNATION (USE WHEN APPLICABLE)	ACTIVITY OR OBJECT	AMOUNT

TEST SPECIMEN	A	B	C	D
DATE TESTED				
COMPACTOR FOOT PRESSURE P.S.I.				
INITIAL MOISTURE %				
SOAK WATER ML				
WATER ADDED-ML (TOTAL)				
WATER ADDED %				
MOISTURE AT COMPACTION %				
WET WT. OF BRIQUETTE-GMS				
HEIGHT OF BRIQUETTE-INCHES				
DRY DENSITY OF BRIQ. - # CU. FT.				
STABILOMETER P_H AT 2000 LBS.				
DISPLACEMENT				
R-VALUE BY STABILOMETER				
EXUDATION PRES. P.S.I.				
THICK. BY STAB. FEET				
EXPANSION DIAL READING				
THICK. BY EXP. PRESS. FEET				
R-VALUE BY EXPANSION				

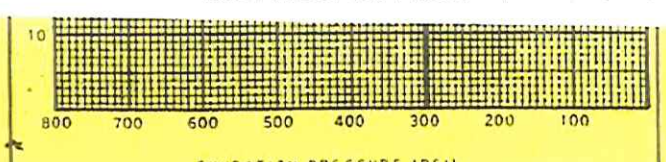
TEST RESULTS		SPEC.
LL. P.L P.I.		
CV		
SIEVE	AS REC'D	
	CRUSHED	
	COMBINED	
SAND EQUIVALENT	GRADE 100 REV.	
	500 REV.	
DURABILITY	D_f	
	D_i	
% CRUSHED PARTICLES		

SP. GR. ☐ BULK (OVEN) ☐ BULK (SSD) ☐ APPARENT

	FINE	C
AS REC'D.		
CRUSHED		

REL. COMPACTION D

	IN PLACE	OP
DENSITY		
MOISTURE		
% REL. COMP.		
SPEC.		



-TL-361 (Rev. 10/78)

APPENDIX C

SEISMIC STUDY

State of California
DEPARTMENT OF TRANSPORTATION

Business, Transportation and Housing Agency

Memorandum

Flex your power!
Be energy efficient!

To: MR. GORDON DANKE
Branch Chief
Design Branch 9
Office of Bridge Design - West
Division of Engineering Services

Attention: Mr. Phil Lutz

Date: May 20, 2009

File: 04-SM-280-PM 10.2
04-1A7701
N280-W92 Conn. OC
Bridge No. 35-0244G

From: HOSSAIN SALIMI
Senior Materials and Research Engineer
Division of Engineering Services
Geotechnical Services - MS 5
Office of Geotechnical Design – West

Subject: Final Seismic Design Recommendations

This memorandum is in response to your request dated February May 5, 2009, and presents the final seismic design recommendations for the seismic retrofit of the existing 10-span N280-W92 Connector Overcrossing (Bridge No. 35-0244G and previously referred to as Route 35 OC) on Route 280 in San Mateo County. It should be noted that the preliminary seismic design recommendations (PSDR) were submitted to you in a report dated June 25, 2007.

The existing structure was built in the early seventies, and consists of 10 supports (abutments 1, bents 2 thru 10, and abutment 11). The foundations for the bents consist of single large diameter Cast-in-Drilled-Hole (CIDH) pile extensions six or eight foot in diameter.

The 2007 PSDR report was based on the 1996 Caltrans Seismic Hazard Map. However, Caltrans has updated the map to the 2008 California Seismic Hazard Map (CSHM), which is based on the latest United States Geological Survey (USGS) and California Geological Survey (CGS) maps. The new map shows the San Andreas Fault zone (Strike-slip) with a maximum moment magnitude, Mmax=7.9 located less than a kilometer southwest of the site.

Based on the deterministic Seismic Hazard Analysis and using the Next Generation Attenuation Relationship equations incorporated into the CSHM, the peak bedrock acceleration is approximately 0.6g. However, the Probabilistic Seismic Hazard Analysis based on a 975-year return period (5% probability of exceedance in 50 years) yields a

higher response spectrum and is governing. There are no known faults projecting towards or passing directly through the project site. Therefore, the potential for surface rupture at the site due to fault movement is considered low.

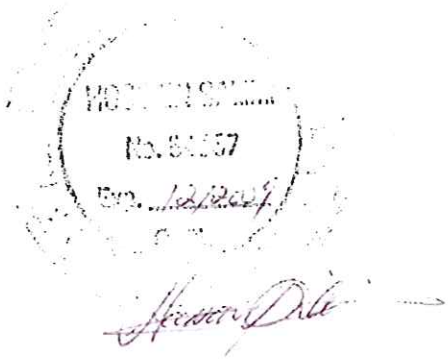
The Acceleration Response Spectrum (ARS) was generated for the bridge. However, due to the proximity of the site to the fault, the ARS curve has been modified. The modifications are such that there is no increase in spectral acceleration in periods less than 0.5 seconds and a 20% increase for periods greater than one second. A linear interpolation was used between 0.5 and one second. The preliminary ARS curve is shown in Figure 1.

All other recommendations as outlined in the aforementioned SPDR are still valid and considered final.

If there are any questions, please contact Hossain Salimi at (916) 227-7147.

Attachment

c: TPokrywka (OGD-W)
MMacaranes (OGD-W)
TNguyen (OGD-W)
Project file



04-SM-280
04-1A7701
Bridge No. 35-0245F
Bridge No. 35-0244G

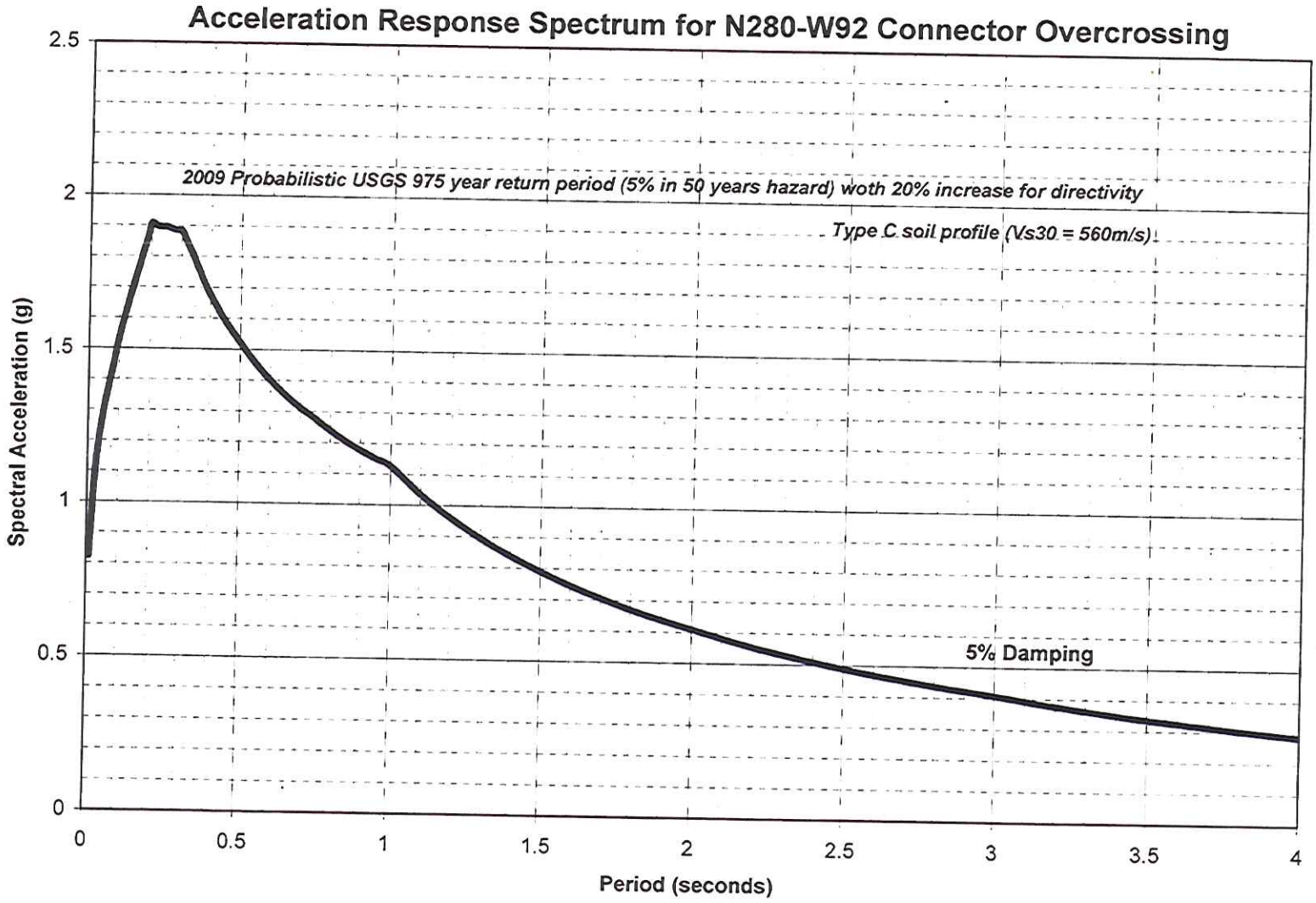


Figure 1

APPENDIX D

SOIL/ROCK PROFILES

Bridge 35-0244G, Bent 3

NUMBER OF LAYERS = 11

WATER TABLE DEPTH = 20.0 FT.

SOIL INFORMATION

LAYER NO 1----CLAY

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA	= 0.550E+00
END BEARING COEFFICIENT-Nc	= 0.600E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.100E+01
INTERNAL FRICTION ANGLE, DEG.	= 0.000E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.120E+03
DEPTH, FT	= 0.000E+00

AT THE BOTTOM

DEPTH, FT	= 0.100E+02

LAYER NO 2----CLAY

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA	= 0.550E+00
END BEARING COEFFICIENT-Nc	= 0.840E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.166E+04
INTERNAL FRICTION ANGLE, DEG.	= 0.000E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.145E+03
DEPTH, FT	= 0.100E+02

AT THE BOTTOM

DEPTH, FT	= 0.200E+02

LAYER NO 3----CLAY

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA	= 0.550E+00

END BEARING COEFFICIENT-Nc = 0.900E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT = 0.175E+04
INTERNAL FRICTION ANGLE, DEG. = 0.000E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST = 0.120E+02
SOIL UNIT WEIGHT, LB/CU FT = 0.145E+03
DEPTH, FT = 0.200E+02

AT THE BOTTOM

DEPTH, FT = 0.275E+02

LAYER NO 4----CLAY SHALE

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA = 0.500E+00
END BEARING COEFFICIENT-Nc = 0.700E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT = 0.143E+05
INTERNAL FRICTION ANGLE, DEG. = 0.000E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST = 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT = 0.145E+03
DEPTH, FT = 0.275E+02

AT THE BOTTOM

DEPTH, FT = 0.420E+02

LAYER NO 5----SAND

AT THE TOP

SKIN FRICTION COEFFICIENT- BETA = 0.587E+00
UNDRAINED SHEAR STRENGTH, LB/SQ FT = 0.000E+00
INTERNAL FRICTION ANGLE, DEG. = 0.350E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST = 0.300E+02
SOIL UNIT WEIGHT, LB/CU FT = 0.145E+03
DEPTH, FT = 0.420E+02

AT THE BOTTOM

DEPTH, FT = 0.495E+02

LAYER NO 6----CLAY

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA = 0.523E+00
END BEARING COEFFICIENT-Nc = 0.900E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT = 0.375E+04
INTERNAL FRICTION ANGLE, DEG. = 0.000E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST = 0.330E+02

SOIL UNIT WEIGHT, LB/CU FT = 0.145E+03
DEPTH, FT = 0.495E+02

AT THE BOTTOM

DEPTH, FT = 0.685E+02

LAYER NO 7----GRAVEL

AT THE TOP

ELASTIC MODULUS OF GRAVEL, LB/SQ IN = 0.000E+00
POISSION RATIO OF GRAVEL = 0.400E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST = 0.940E+02
SOIL UNIT WEIGHT, LB/CU FT = 0.145E+03
DEPTH, FT = 0.685E+02

AT THE BOTTOM

DEPTH, FT = 0.850E+02

LAYER NO 8----CLAY

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA = 0.550E+00
END BEARING COEFFICIENT-Nc = 0.900E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT = 0.250E+04
INTERNAL FRICTION ANGLE, DEG. = 0.000E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST = 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT = 0.145E+03
DEPTH, FT = 0.850E+02

AT THE BOTTOM

DEPTH, FT = 0.880E+02

LAYER NO 9----ROCK

AT THE TOP

DIAMETER OF SOCKET, FT = 0.500E+01
SPACING OF DISCONTINUITIES,FT = 0.500E+01
THICKNESS OF INDIVIDUAL DISCONTINUITIES,FT = 0.100E-03
UNIAXIAL COMPRESSION STRENGTH OF ROCK,LB/SQ FT = 0.425E+06
UNIAXIAL COMPRESSION STRENGTH OF CONCRETE,LB/SQ FT = 0.575E+06
ELASTIC MODULUS FOR THE INTACT ROCK, LB/SQ IN. = 0.750E+06
ROCK QUALITY DESIGNATION (RQD) % = 0.590E+02
DEPTH, FT = 0.880E+02

AT THE BOTTOM

DEPTH, FT = 0.100E+03

LAYER NO 10----ROCK

AT THE TOP

DIAMETER OF SOCKET, FT	= 0.500E+01
SPACING OF DISCONTINUITIES,FT	= 0.500E+01
THICKNESS OF INDIVIDUAL DISCONTINUITIES,FT	= 0.100E-03
UNIAXIAL COMPRESSION STRENGTH OF ROCK,LB/SQ FT	= 0.725E+05
UNIAXIAL COMPRESSION STRENGTH OF CONCRETE,LB/SQ FT	= 0.575E+06
ELASTIC MODULUS FOR THE INTACT ROCK, LB/SQ IN.	= 0.225E+06
ROCK QUALITY DESIGNATION (RQD) %	= 0.100E+03
DEPTH, FT	= 0.100E+03

AT THE BOTTOM

DEPTH, FT = 0.105E+03

LAYER NO 11----ROCK

AT THE TOP

DIAMETER OF SOCKET, FT	= 0.500E+01
SPACING OF DISCONTINUITIES,FT	= 0.500E+01
THICKNESS OF INDIVIDUAL DISCONTINUITIES,FT	= 0.100E-03
UNIAXIAL COMPRESSION STRENGTH OF ROCK,LB/SQ FT	= 0.275E+07
UNIAXIAL COMPRESSION STRENGTH OF CONCRETE,LB/SQ FT	= 0.575E+06
ELASTIC MODULUS FOR THE INTACT ROCK, LB/SQ IN.	= 0.200E+07
ROCK QUALITY DESIGNATION (RQD) %	= 0.100E+03
DEPTH, FT	= 0.105E+03

AT THE BOTTOM

DEPTH, FT = 0.114E+03

Bridge 35-0244G, Bent 9

NUMBER OF LAYERS = 10

WATER TABLE DEPTH = 20.0 FT.

SOIL INFORMATION

LAYER NO 1----CLAY

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA	= 0.550E+00
END BEARING COEFFICIENT-Nc	= 0.600E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.100E+01
INTERNAL FRICTION ANGLE, DEG.	= 0.000E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.120E+03
DEPTH, FT	= 0.000E+00

AT THE BOTTOM

DEPTH, FT	= 0.110E+02

LAYER NO 2----SAND

AT THE TOP

SKIN FRICTION COEFFICIENT- BETA	= 0.995E+00
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.000E+00
INTERNAL FRICTION ANGLE, DEG.	= 0.360E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.310E+02
SOIL UNIT WEIGHT, LB/CU FT	= 0.125E+03
DEPTH, FT	= 0.110E+02

AT THE BOTTOM

DEPTH, FT	= 0.170E+02

LAYER NO 3----SAND

AT THE TOP

SKIN FRICTION COEFFICIENT- BETA	= 0.818E+00
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.000E+00
INTERNAL FRICTION ANGLE, DEG.	= 0.310E+02

BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.125E+03
DEPTH, FT	= 0.170E+02

AT THE BOTTOM

DEPTH, FT	= 0.340E+02

LAYER NO 4----CLAY

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA	= 0.550E+00
END BEARING COEFFICIENT-Nc	= 0.900E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.250E+04
INTERNAL FRICTION ANGLE, DEG.	= 0.000E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.140E+02
SOIL UNIT WEIGHT, LB/CU FT	= 0.125E+03
DEPTH, FT	= 0.340E+02

AT THE BOTTOM

DEPTH, FT	= 0.370E+02

LAYER NO 5----SAND

AT THE TOP

SKIN FRICTION COEFFICIENT- BETA	= 0.584E+00
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.000E+00
INTERNAL FRICTION ANGLE, DEG.	= 0.330E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.260E+02
SOIL UNIT WEIGHT, LB/CU FT	= 0.125E+03
DEPTH, FT	= 0.370E+02

AT THE BOTTOM

DEPTH, FT	= 0.550E+02

LAYER NO 6----CLAY SHALE

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA	= 0.500E+00
END BEARING COEFFICIENT-Nc	= 0.700E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.720E+04
INTERNAL FRICTION ANGLE, DEG.	= 0.000E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.134E+03
DEPTH, FT	= 0.550E+02

AT THE BOTTOM

DEPTH, FT = 0.750E+02

LAYER NO 7----GRAVEL

AT THE TOP

ELASTIC MODULUS OF GRAVEL, LB/SQ IN = 0.000E+00
POISSION RATIO OF GRAVEL = 0.400E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST = 0.540E+02
SOIL UNIT WEIGHT, LB/CU FT = 0.129E+03
DEPTH, FT = 0.750E+02

AT THE BOTTOM

DEPTH, FT = 0.850E+02

LAYER NO 8----CLAY SHALE

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA = 0.500E+00
END BEARING COEFFICIENT-Nc = 0.700E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT = 0.350E+04
INTERNAL FRICTION ANGLE, DEG. = 0.000E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST = 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT = 0.140E+03
DEPTH, FT = 0.850E+02

AT THE BOTTOM

DEPTH, FT = 0.100E+03

LAYER NO 9----GRAVEL

AT THE TOP

ELASTIC MODULUS OF GRAVEL, LB/SQ IN = 0.000E+00
POISSION RATIO OF GRAVEL = 0.400E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST = 0.100E+03
SOIL UNIT WEIGHT, LB/CU FT = 0.140E+03
DEPTH, FT = 0.100E+03

AT THE BOTTOM

DEPTH, FT = 0.106E+03

LAYER NO 10----GRAVEL

AT THE TOP

ELASTIC MODULUS OF GRAVEL, LB/SQ IN	= 0.000E+00
POISSION RATIO OF GRAVEL	= 0.400E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.100E+03
SOIL UNIT WEIGHT, LB/CU FT	= 0.140E+03
DEPTH, FT	= 0.106E+03

AT THE BOTTOM

DEPTH, FT	= 0.121E+03

State of California
DEPARTMENT OF TRANSPORTATION

Business, Transportation and Housing Agency

Memorandum

Flex your power!
Be energy efficient!

To: MR. GORDON DANKE
Senior Project Engineer – Branch 9
Structures Design
Office of Bridge Design-West

Date: December 09, 2010

Attention: Phil Lutz

File: 04-SM-92/280-PM 10.8
EA 04-1A7701
Bridge No 35-0245F

From: TUNG NGUYEN
Transportation Engineer
Office of Geotechnical Design – West
Geotechnical Services
Division of Engineering Services

MAHMOOD MOMENZADEH
Chief, Branch C
Office of Geotechnical Design-West
Geotechnical Services
Division of Engineering Services

Subject: Foundation Report for Bridge Seismic Retrofit by Micropiles

INTRODUCTION

This foundation report (FR) provides geotechnical recommendations for seismic retrofit of Bents No 4, 5, and 6 for Southbound I-280 – Eastbound SR92 Connector Overcrossing (Bridge No 35-0245F) in the San Mateo County, California. The purpose of the retrofit is to improve its resistance to earthquakes and minimize the potential for collapse.

This FR documents site geology and subsurface conditions, provides analyses of site conditions as they pertain to the project and recommends geotechnical input for the foundation retrofit design.

To accomplish the above stated purpose, the following works were conducted:

- Field reconnaissance to observe and document site conditions
- Review geology open file and as-built report of foundation recommendations
- Site subsurface investigation
- Engineering analyses for foundation design

PROJECT DESCRIPTION

The project site is located on the SR92/I-280 Interchange, in the County of San Mateo at PM of 10.8. The connector was built in 1973 and has 8 spans and carries two lanes of traffic from I-280 southbound to SR92 eastbound. It is planned to add micropiles to the current pile foundation of Bents No 4, 5, and 6 (Bents) to accommodate factored load

under the Load and Resistance Factor Design (LRFD) provided by the Office of Bridge Design-West of October 01, 2010. Micropile foundation system was adopted because it is more flexible than conventional piling systems for construction below the existing bridge with low overhead.

SITE GEOLOGY AND SUBSURFACE CONDITIONS

Regional Setting and Area Geology

The project is located in the Coast Range Geomorphic province, which is defined by rugged mountains and narrow valleys trending roughly northwest along 684 mi (1100 km) of the California coast. The geology of the Coast Ranges is different on either side of the San Andreas fault. Franciscan rocks, tectonic blocks of igneous, metamorphic, and marine sedimentary rocks altered and weathered to varying degrees, comprise most of the material to the east of the fault, while to the west marine sedimentary rocks lie depositionally above a granitic basement. After regional uplift exposed the shallow marine rocks, erosion and subsequent deposition by streams resulted in abundant subaerial stream and fan deposits.

Geologic mapping by Brabb, *et al* (1998) indicate the project site to be underlain by fill and rocks of the Franciscan Formation, including but not limited to serpentinite; mélange, a chaotic mixture of argillaceous shale, siltstone, and sandstone; minor chert and greenstone (see attached Geologic Map). Foundation materials on the northern half of the site are composed of serpentinite and those on the southern half sheared Franciscan rocks (Melange). Brabb *et al* (1998) describe the fill as loose to very well consolidated gravel, sand, silt, clay, and rock fragments in various amounts. Serpentinite is described as greenish-gray to bluish-gray sheared rock containing more competent blocks typically less than 10 ft (3 m) Franciscan sheared rocks (mélange) are described as graywacke, siltstone, and shale locally sheared and containing blocks of other Franciscan rocks.

Field Investigation and Subsurface Conditions

The Office of Geotechnical Design-West conducted a subsurface investigation in December 2008 and January 2009. The following table lists borings and their associated bent locations, approximate latitude and longitude, and approximate elevations:

	Bridge 35-0245F		
	Bent 4	Bent 5	Bent 6
Boring	R-08-003	R-09-007	R-08-001
Northing	4151295.8	4151278.9	4151291.2
Easting	558567.3	558516.4	558435.3
Elevation (ft)	+386	+395	+375
Depth (ft)	95.0	90.0	97.5

The subsurface investigation consisted of three mud rotary borings (Nos. R-08-001, R-08-003, and R-09-007). The mud rotary borings were advanced using a self-casing wireline drilling method to depths shown on the above table. Borings R-08-001 and R-09-007 were drilled using an Acker drill rig with an automatic hammer. Boring R-08-003 was drilled using a CS 2000 Truck mounted drill rig with an automatic hammer. Sampling was achieved by using a Standard Penetration Test sampler at 5 ft intervals as well as continuous coring in all borings. Selected soil/rock samples were collected and submitted for laboratory tests such as water content, Atterberg Limits, grain size analysis, corrosion analysis, and unconfined compressive strength.

Topography

The project site is situated within a valley created by the San Andreas fault and is adjacent to and above Crystal Springs Reservoir. The SR92/I-280 interchange occupies a local low-point, with only westbound SR92 exiting the interchange to a lower elevation. SR92 was constructed via cuts in bedrock at the project location. Later construction of I-280 required the construction of two overcrossings (crossing SR92), two flyover connector ramps (Bridges 35-0245F and 35-0244G), one cut-and-cover tunnel and various roadway connectors. Final geometries were established by a combination of cuts and fills. The highest bent elevations are located within the median of I-280, and the lowest in the median of SR92.

Pertinent Soil Conditions or Geologic Hazards

Due to the fractured and sheared nature of the rocks throughout the project site, caving conditions may be encountered during pile construction. In addition, the variability of rock quality may pose problems for deep excavation. Blocks of hard to very hard rock will be encountered abruptly and at elevations that can not be determined for each individual pile proposed. The contractor should be prepared to encounter such blocks

throughout the project site at different elevations. At Bent 5 very hard, slightly fractured graywacke was encountered and continued to the bottom of the boring.

Bent 5 is located approximately 70 ft from the hinge line of a 2:1 (H:V) slope above SR92. The current proposed retrofit design would require micropiles be placed adjacent to this slopes, which has not experienced any deep erosion or landslide. Therefore, there will be no additional lateral loading from landsliding.

Project Site Soils

Soils at the project site are of two types: fill placed during the construction of the SR92/I-280 interchange and native residual soils comprised of deeply weathered bedrock. Soils generally quickly give way to bedrock at shallow depths.

The thickest fill location can be found along the cut-and-cover tunnel connector between westbound SR92 and southbound I-280. Boring R-08-003 was drilled at Bent 4 and indicated fill to a depth of 13 ft consisting of stiff, brown, moist gravelly clay with trace sand. Boring R-09-007 near Bent 5, located in the median of I-280, consists of 10 ft of very stiff, dark gray, moist gravelly clay with sand. Boring R-08-001 drilled adjacent to Bent 6 consists of very intensely weathered and sheared serpentinite to a depth of 24 ft. The residual soil can be described as stiff to very stiff, moist, gravelly clay with sand. The gravel fraction is often light to dark green serpentine angular fragments, moderately hard, and moderately weathered.

Project Site Rocks

Project site rocks vary in quality and type across the project site. In general, the rocks are Franciscan serpentinite, argillite and graywacke ranging from fresh to decomposed, very soft to very hard, weak to very strong, and slightly fractured to sheared. Where bedrock has been deeply weathered, it has been treated as a soil where such descriptions better describe the properties of the material. In all such cases the parent rock is obvious and can be described as weathered bedrock. Depths to bedrock encountered in borings should be considered approximate. Because of the nature of the Franciscan Formation, it should be expected that depths to hard rock will vary throughout the project site.

Borings R-08-003 and R-09-007 are located south of SR92 and contain similar lithologies. Subsurface conditions consist of 10 ft to 13 ft of fill comprised of stiff to very stiff gravelly lean clay with sand. The fill is underlain by Franciscan mélange consisting of blocks of slightly to very intensely fractured, fresh to moderately weathered

graywacke separated by intensely fractured to locally sheared, moderately weathered to decomposed argillaceous shale. Graywacke thicknesses vary from several inches of broken chips to several tens of feet in the bottom of boring R-09-007. Hard to very hard, slightly weathered to fresh, slightly fractured graywacke was encountered at a depth of 55 ft in boring R-09-002. This graywacke extended to the bottom of the boring at a depth of 90 ft (elev. +305 ft).

Boring R-08-001 is located along the shoulder of eastbound SR92. Subsurface conditions consist of 0 to 6ft of stiff to very stiff, gray green to brown, moist to wet sandy lean clay with gravel. This overlies intensely fractured to locally sheared, moderately weathered to decomposed serpentinite, and lesser amounts of intensely weathered to decomposed, very intensely fractured to sheared, moderately hard to very soft argillite.

The Logs of Test Borings (LOTB) and the results of laboratory tests are presented in the Appendix A and B, respectively.

GROUND WATER

Groundwater was not measured during drilling because the holes were drilled using mud rotary. However, the first groundwater level taken on January 2009 from a piezometer installed in boring R-08-003 shows that groundwater level is 10 ft below the ground surface. Based on the As-built LOTB and measured data up-to-date, the groundwater level is anticipated to be at a depth of approximately 8 to 11 ft below the ground surface and fluctuating with time.

SCOUR EVALUATION

Scour is not a concern for this project.

CORROSION EVALUATION

Results of corrosion tests on soil samples showed that soils are non-corrosive. However, foundation should be designed for the marine environment.

SEISMIC STUDY

Hossain Salimi of Office of Geotechnical Design West provided seismic recommendations for this project as shown in the included Appendix C.

AS-BUILT FOUNDATION DATA

As-built LOTB show that borings were drilled using wet rotary or auger method with SPT between September 1969 and June 1970 with the depth varying from 50 to 85 ft. The elevations of borings shown in the LOTB are about 20 ft higher than current boring elevation at Bent 6 and about 10 ft lower than current elevation at Bent 4 indicating that Bent 6 is in cut and Bent 4 is on fill. Moreover, SPT blow counts shown in the LOTB are higher than blow counts recorded in the current borings, which are possibly due to the use of lower hammer efficiency than standard energy level and/or change in topography and condition of the site. As-built foundation plans show that bridge abutments are supported on spread footings and all bents are single columns supported by CIDH piles. The CIDH pile data of the Bents are shown in Table No 1.

Table No 1. Existing CIDH Pile Data

Bent No	Report Cutoff Elevation, ft	Specified Tip Elevation, ft	Design Load, kips	Report CIDH Pile Diameter, ft
4	+344	+309	3400	6
5	+389	+345	4400	6
6	+384	+325	4400	6

Our engineering analysis based on existing data shows that the design loads shown in Table No 1 were likely achieved by side friction capacity without ignoring the first 5 ft as well as one CIDH pile diameter at the bottom. Moreover, for side friction calculation, the materials were treated as Cohesionless Intermediate Geomaterials (IGM) with engineering properties derived from SPT blow counts. All these factors apparently lead to non-conservative pile axial capacities.

FOUNDATION RECOMMENDATIONS

We performed axial load analyses for micropiles with the grouted bond zone diameter of 12-inch at the location of Bents 4, 5, and 6 to meet the LRFD loads provided to us by Structure Design. According to the current boring data, the site subsurface conditions consist of cohesive and cohesionless soils, cohesive and cohesionless IGM, and rock materials as shown in the included soil/rock profiles Appendix D. The foundation system and soil/rock parameters used in the analyses are based on FHWA-NHI-05-039 of December 2005 Publication, an average bond nominal strength α_{bns} of 24 psi in compression and 17 psi in tension was assumed to estimate the pile length for the initial

assessment and planning purpose only. These values shall be verified based on the micropile performance and proof tests. The following table summarizes the micropile foundations under extreme condition with the LRFD implementation (using Resistance Factor $\varphi = 1.0$ for compression and $\varphi = 0.7$ for tension).

Table No 2. Pile Data Table

Support Location	Pile Type	Cutoff Elevation (ft)	Design Load (kips) Extreme Event		Design Tip Elevation (ft)	Specified Tip Elevation (ft)
			Compression	Tension		
Bent 4	12" Micropile	+380.5	468	328	+311*	+311*
Bent 5	12" Micropile	+390.0	380	266	+331*	+331*
Bent 6	12" Micropile	+369.5	430	301	+305*	+305*

*The tip elevations controlled by tension are shown for estimating purposes only. The bond zone length and plunge length to be determined by Contractor.

The axial group effect of piles for a center to center spacing of equal 2.5 ft or more is insignificant because the cap is supported on the rock or stiff/very stiff clay material. It is then critical that the bearing soil/rock below the cap is not disturbed during the construction.

The pile length below the pile cap bottom consist of two major zones: the upper 20 ft zone with permanent casing along which no resistance is assumed and the lower pressure grouted zone of the pile extending below the upper 20 ft zone of casing from which the micropile capacities were derived from the skin friction resistance. The drilling and grouting method used by contractor shall achieve the minimum α_{bns} values mentioned above.

Based on FHWA-NHI-05-039 of December 2005 publication and site subsurface condition, the above mentioned α_{bns} can be achieved by using Type B grouting which consists of full depth casing of the drill hole prior and during initial grouting and subsequent pressure grouting through the casing while casing is withdrawn to 20 ft below

the pile cap. Alternatively, other methods such as drilling with hollow bar below the permanent casing advanced to the pile tip with pressure grouting may be adopted. Regardless of the construction method used, the pile tip elevations for the production piles at Bents are to be determined and checked by performance and proof load tests based on the project plans and the Caltrans specifications.

One performance test at Bent 6 is recommended to verify the micropile capacities with the α_{bns} design value. The test shall consist of tension load increasing to 1.0DL (Design Load) and then compression load to the failure. We recommend that the reaction micropiles shall have the same length as a test micropile pile. We also recommend that the structural capacity of the pile and the test frame load capacity should sufficiently exceed beyond the required geotechnical capacity of the pile mentioned in Table 2 above. Furthermore, the performance test at Bent 3 of Bridge No 35-0244G can be implemented for Bent 4 of this Bridge.

Five percent of production micropiles at each Bent shall be performed with proof test in tension load only to confirm that production micropile performance is consistent with the performance test and meets the specifications. The tension load test shall be loaded to 1.0DL.

CONSTRUCTION CONSIDERATIONS

The maximum slope for excavation can be 3/4:1 (Horizontal to Vertical) at Bents No 5 and 6 and 1:1 at Bent No 4. The excavation should follow the Cal/OSHA excavation requirements.

The methods of drilling and grouting are the main factors affecting the skin friction of micropiles. Therefore, suitable methods should be considered to achieve the required capacities. As described in the prior section, full depth drill hole casing with auger drilling and Type B grouting or hollow bar with continuously drilling and grouting at the same time may be used with provision of achieving the minimum α_{bns} specified above. The grouting and drilling method used also shall consider the caving and squeeze potential of the soft rock at the site.

The performance and proof tests shall be performed based on the Caltrans plans and specifications. Data obtained from these tests shall be made available to Geotechnical Design West on time for review.

Construction of micropiles shall have minimum impact on the existing piles/columns integrity. No micropile shall be installed within 5 ft of a micropile previously installed up to 24 hours to limit the occurrence of suspected grout communication.

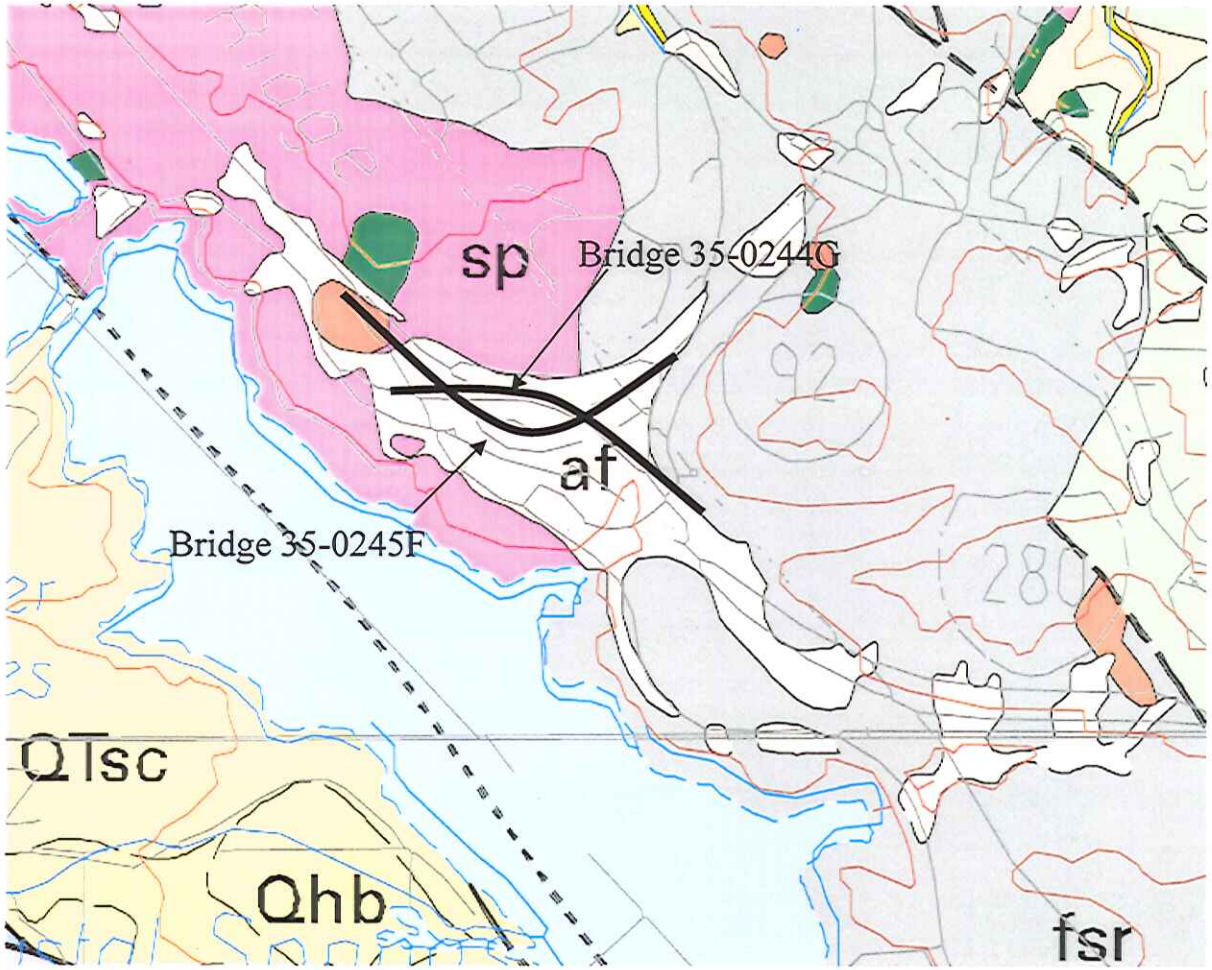
Difficult drilling conditions are anticipated due to the presence of hard rock. Groundwater is anticipated during the micropile installation. Contractors should be referred to the LOTB and laboratory test data for soil/rock types and properties.

DISCLAIMER AND CONTACT INFORMATION

The recommendations contained in this report are based on specific project information regarding structure type and location. If any conceptual changes are made during final project design, the Office of Geotechnical Design – West, Design Branch C 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 Tung Nguyen, 510-622-1775 or Mahmood Momenzadeh, 510-286-5732, at the Office of Geotechnical Design-West, Branch C.

c: TPokrywka, GWilcox, MMomenzadeh, CRisden, TNguyen, Daily File, Route File, Translab File, John Stayton, Specs and Estimate, John Mook, PCE-PPRM , Project Manager, District Design Chief

TNguyen/mm



1 .5 0

DESCRIPTION OF MAP UNITS

af — **Artificial fill (Historic)**—Loose to very well consolidated gravel, sand, silt, clay, rock fragments, organic matter, and man-made debris in various combinations. Thickness is variable and may exceed 30 m in places. Some is compacted and quite firm, but fill made before 1965 is nearly everywhere not compacted and consists simply of dumped materials

Qhb — **Basin deposits (Holocene)**—Very fine silty clay to clay deposits occupying flat-floored basins at the distal edge of alluvial fans adjacent to the bay mud (Qhbm). Also contains unconsolidated, locally organic, plastic silt and silty clay deposited in very flat valley floors

QTsc — **Santa Clara Formation (lower Pleistocene and upper Pliocene)**—Gray to red-brown poorly indurated conglomerate, sandstone, and mudstone in irregular and lenticular beds. Conglomerate consists mainly of subangular to subrounded cobbles in a sandy matrix but locally includes pebbles and boulders. Cobbles and pebbles are mainly chert, greenstone, and graywacke with some schist, serpentinite, and limestone. On Coal Mine Ridge, south of Portola Valley, conglomerate contains boulders of an older conglomerate as long as one meter. Gray to buff claystone and siltstone beds on Coal Mine Ridge contain carbonized wood fragments as large as 60 cm in diameter.

fs — **Sandstone**—Greenish-gray to buff, fine- to coarse-grained sandstone (graywacke), with interbedded siltstone and shale. Siltstone and shale interbeds constitute less than 20 percent of unit, but in places form sequences as much as several tens of meters thick. In many places, shearing has obscured bedding relations; rock in which shale has been sheared to gouge constitutes about 10 percent of unit. Gouge is concentrated in zones that are commonly less than 30 m wide but in places may be as much as 150 m wide. Total thickness of unit is unknown but is probably at least many hundreds of meters

fg — **Greenstone**—Dark-green to red altered basaltic rocks, including flows, pillow lavas, breccias, tuff breccias, tuffs, and minor related intrusive rocks, in unknown proportions. Unit includes some Franciscan chert and limestone bodies that are too small to show on map. Greenstone crops out in lenticular bodies varying in thickness from a few meters to many hundreds of meters

fc — **Chert**—White, green, red, and orange chert, in places interbedded with reddish-brown shale. Chert and shale commonly are rhythmically banded in thin layers, but chert also crops out in very thick layers. In San Carlos, chert has been altered along faults to tan- to buff-colored clay. Chert and shale crop out in lenticular bodies as much as 75 m thick; chert bodies are commonly associated with Franciscan greenstone.

fsr — **Sheared rock (melange)**—Predominantly graywacke, siltstone, and shale, substantial portions of which have been sheared, but includes hard blocks of all other Franciscan rock types. Total thickness of unit is unknown, but is probably at least several tens of meters

sp — **Serpentinite (Cretaceous and/or Jurassic)**—Greenish-gray to bluish-green sheared serpentinite, enclosing variably abundant blocks of unsheared rock. Blocks are commonly less than 3 m in diameter, but range in size from several centimeters to several meters; they consist of greenish-black serpentinite, schist, rodingite, ultramafic rock, and silica-carbonate rock, nearly all of which are too small to be shown on the map

Geology of the Onshore Part of San Mateo County, California: Derived from the Digital Database Open-File 98-137

By E.E. Brabb, R.W. Graymer, and D.L. Jones

1998

Caltrans

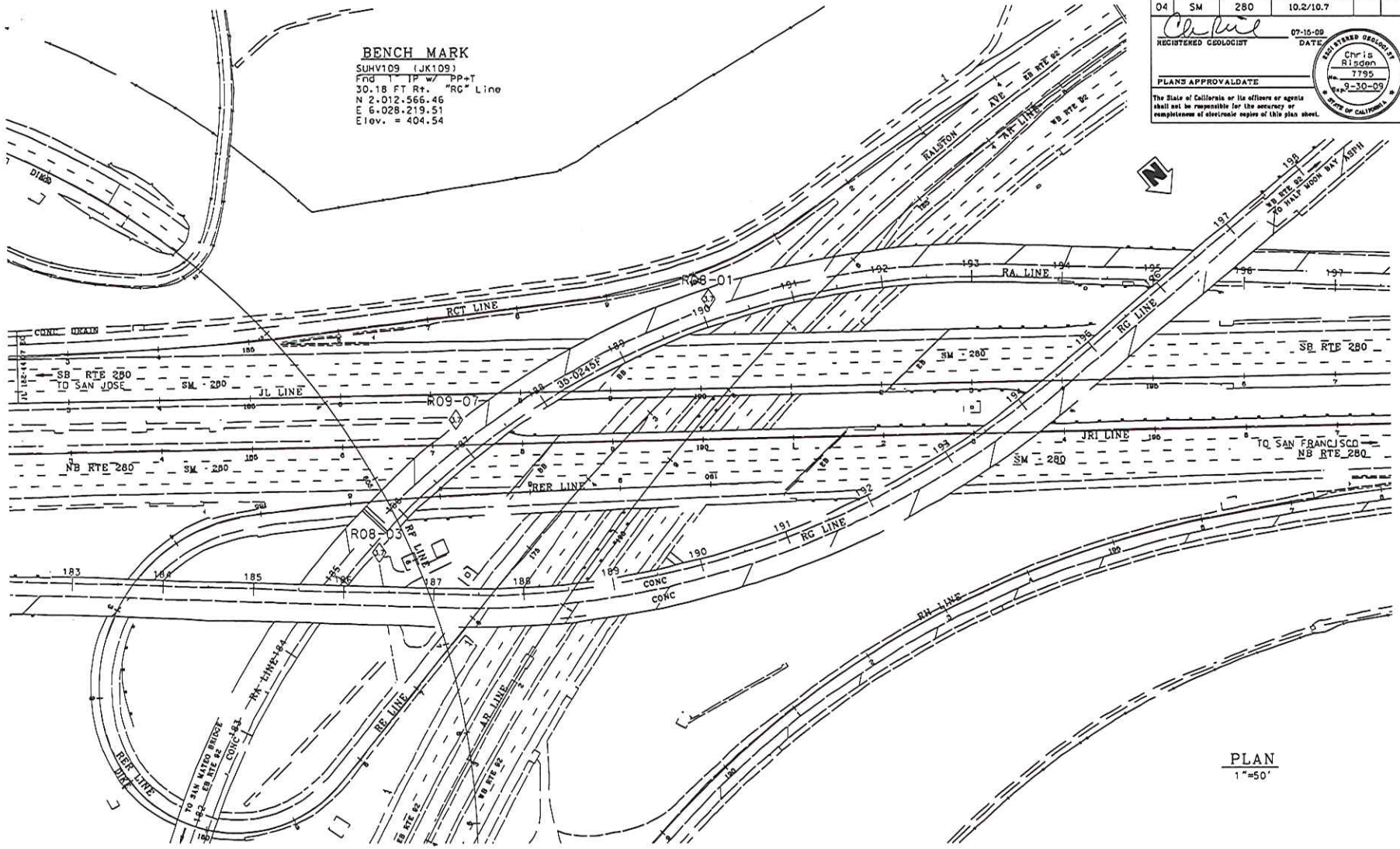
Geologic Map

04-SM-280 **PM 10.8**

EA 04-1A7701 **February 1, 2009**

APPENDIX A

LOG OF TEST BORINGS



DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
04	SM	280	10.2/10.7		

REGISTERED GEOLOGIST — DATE 07-15-09

REGISTERED GEOLOGIST Chris Risden 7795 9-30-09 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 electronic copies of this plan sheet.

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES OFFICE OF GEOTECHNICAL DESIGN BRANCH	BRIDGE NO. 35-0245F	S280/E92 CONNECTOR OC (RETROFIT)
FUNCTIONAL SUPERVISOR	DRAWN BY: M. Reynolds 03/09	FIELD INVESTIGATION BY: C. Risden			POST MILES 10.2/10.7	LOG OF TEST BORINGS
NAME: C. Wilcox	CHECKED BY: B. Price					
OGE CIVIL LOG OF TEST BORINGS SHEET	ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3		CU 04 EA 1A7701	DISREGARD PRINTS BEARING EARLIER REVISION DATES	REVISION DATES	SHEET 1 OF 9
			FILE #) REQUEST			

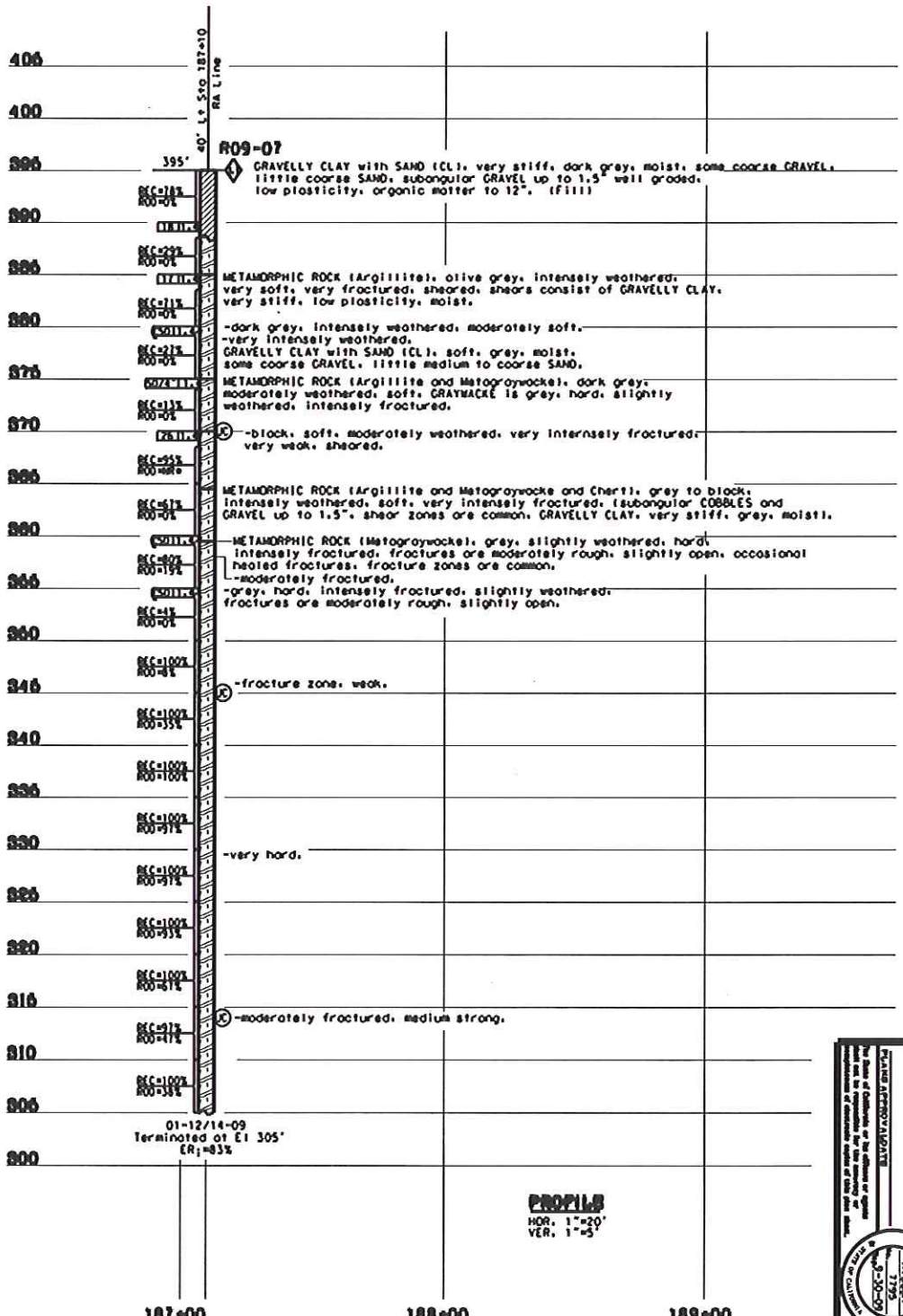
USERNAME →USER DATE PLOTTED →DATE TIME PLOTTED →TIME

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
DIVISION OF ENGINEERING SERVICES
OFFICE OF GEOTECHNICAL DESIGN BRANCH
S280/E92 CONNECTOR OC (RETROFIT)
LOG OF TEST BORINGS
GEOTECHNICAL SERVICES
FUNCTIONAL SUPERVISOR
DRAWN BY M. Reynolds 08/09
CHECKED BY B. Price
FIELD INVESTIGATION BY Karpenko
DATE INVESTIGATED 01-09-09
BRANCH MARK
SUNY109 (JA109)
Find 1" IP w/ PP&T
30.18 ft Rt. "RC" Line
N 2,012,566.46
E 6,028,219.51
Elev. = 404.54
(FOR BORING LOCATION SEE PLAN, LOG SHEET 1 OF 9)
NOTE: This LOG sheet was prepared in accordance with the California Soil & Rock Logging, Classification and Presentation Manual (June 2007).
AMR: Not Recorded.
PROFILE
HOR. 1"=20'
VER. 1"=5'
12-15/17-08
Terminated at El 210'
ER=64%
METASEDIMENTARY ROCK (Greywacke), massive, bluish grey, moderately to severely weathered, hard, moderately to severely fractured, QUARTZ infilled fractures. (BEDROCK)
-100 hard to sample.
METASEDIMENTARY ROCK (Argillite), massive, pale grey, severely weathered, soft, highly sheared, (SANDY CLAY with GRAVEL (CL), very stiff, some fines, little GRAVEL, high plasticity).
METASEDIMENTARY ROCK (Greywacke), massive, bluish grey, moderately to severely weathered, hard, moderately to intensely fractured, QUARTZ infilled fractures. (BEDROCK)
METASEDIMENTARY ROCK (Argillite), massive, pale grey, severely weathered, soft, highly sheared, (SILTY CLAY with GRAVEL (CL), very stiff, some CLAY, little GRAVEL, high plasticity). (BEDROCK)
METASEDIMENTARY ROCK (Greywacke), massive, bluish grey, moderately weathered, hard, moderately fractured, CALCITE infilled fractures. (BEDROCK)
-severely weathered, moderately hard, little shearing.
-moderately hard, 1035 sheared.
-intensely weathered, highly sheared.
-bluish grey, moderately weathered, moderately fractured.
SILTY CLAY with GRAVEL (CL), very stiff, dark bluish grey, 30% subrounded GRAVEL ROLLITE and SERPENTINE, soft, 10% fines, high plasticity, intensely weathered, soft, highly sheared, (SILTY CLAY with GRAVEL (CL), very stiff, high CLAY content, some GRAVEL, high plasticity). (BEDROCK)
heterogeneous (Colluvium).
METASEDIMENTARY ROCK (Argillite), massive, pale to like grey,
CLAYEY SAND with GRAVEL (CL), stiff, brown to greenish brown, moist, about 30% angular GRAVEL (ARGILLITE, weathered, soft, intensely fractured), 5% medium grained SAND, 65% fines, moderate to high plasticity, heterogeneous. (FILL)
No Recovery.
R08-03
365'
10' Rt Sta 185+50
RA Line
CRS EL. 355
01-09-09
185+00
186+00
187+00
SHEET NO. 2 OF 9
DESIGNED BY M. Reynolds
DRAWN BY B. Price
CHECKED BY C. Wilcox
DATE PLOTTED 7/2015
TIME PLOTTED 7/2015
USERNAME \ADOSK
DIST 04 COUNTY SM ROUTE 280 TOTAL PROJECT NO. 10.2/10.3
PLANS APPROVAL DATE 07-16-09
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.
Chris Kitchen No. 3795 REGISTERED GEOLOGIST 06-30-09 STATE OF CALIFORNIA
REGISTERED GEOLOGIST
DATE
ENGINEERING SERVICES
FUNCTIONAL SUPERVISOR
DRAWN BY M. Reynolds 08/09
CHECKED BY B. Price
FIELD INVESTIGATION BY Karpenko
DATE INVESTIGATED 01-09-09
DIVISION OF ENGINEERING SERVICES
OFFICE OF GEOTECHNICAL DESIGN BRANCH
35-0245F
10.2/10.3
S280/E92 CONNECTOR OC (RETROFIT)
LOG OF TEST BORINGS
CU 04 142001
SHEET NO. 2 OF 9

BENCH MARK

SURV109 (JK109)
Fnd 1" IP w/ PP+T
30.18 FT Rt. "RC" Line
N 2,012,566.46
E 6,028,219.51
Elev. = 404.54

(FOR BORING LOCATION SEE PLAN, LOTB SHEET 1 OF 9)



PROFILE
HOR. 1"=20'
VER. 1"=5'

ENGINEERING SERVICES
GEOTECHNICAL SERVICES
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
DIVISION OF ENGINEERING SURVICES
OFFICE OF GEOTECHNICAL DESIGN BRANCH

FUNCTIONAL SUPERVISOR: David G. Wilson
DESIGNED BY: M. Reynolds 08/09
CHECKED BY: B. Price
FIELD INVESTIGATION BY: C. Risdon
CU 04 EA 112704
35-0Z454
10.2/10.3

S280/E92 CONNECTOR OC (RETROFIT)
LOG OF TEST BORINGS

DIST	COUNTY	ROUTE	POST MILE	TOTAL SHEETS
04	SM	280	10.2/10.7	9

REGISTERED GEOLOGIST
07-15-09
DATE

PROFESSIONAL ENGINEER
Chris Risdon
71995
9-30-09
DATE
STATE OF CALIFORNIA

The State of California or the officers or agents thereof, do not represent that the accuracy or completeness of information shown on this plan sheet.

DESIGNED - MUSEK DATE PLOTTED - 9/DATE TIME PLOTTED - 9/TIME

BENCH MARK
SUHV109 (JK109)
Fnd 1" IP w/ PP+T
30.18 FT Rt. "RG" Line
N 2,012,566.46
E 6,028,219.51
Elev. = 404.54

(FOR BORING LOCATION SEE PLAN, LOTB SHEET 1 OF 9)

PROFILE
HOR. 1"=20'
VER. 1"=5'

NOTE: ##R: Not Recorded.

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	SM	280	10.2/10.7		

REGISTERED GEOLOGIST — DATE 09-18-09
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.
Chris Risden 7795 Exp. 9-30-09 STATE OF CALIFORNIA

ENGINEERING SERVICES
FUNCTIONAL SUPERVISOR
NAME G. Wilcox

GEOTECHNICAL SERVICES
DRAWN BY: M. Reynolds 08/08
CHECKED BY: B. Price
FIELD INVESTIGATION BY: R. Mashad, A. Kaddoura, C. Risden

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DIVISION OF ENGINEERING SERVICES
OFFICE OF GEOTECHNICAL
DESIGN BRANCH

CU 04
EA 1A770
FILE => REQUEST

BRIDGE NO. 35-0245F
POST MILE 10.2/10.7

S280E92 CONNECTOR OC (RETROFIT)
LOG OF TEST BORINGS

SHEET 4 OF 9

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

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	SM	280	10.2/10.7		

REGISTERED GEOLOGIST 07-15-09 DATE

PLANS APPROVAL DATE

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

REGISTERED GEOLOGIST Chris Risden 7795 9-30-09 STATE OF CALIFORNIA

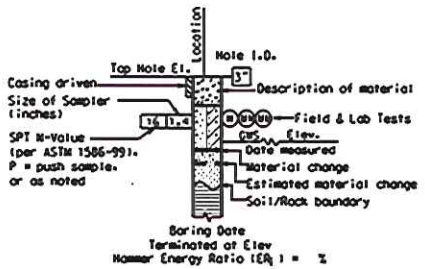
REFERENCE: CALTRANS SOIL & ROCK LOGGING, CLASSIFICATION, AND PRESENTATION MANUAL (JUNE 2007)

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

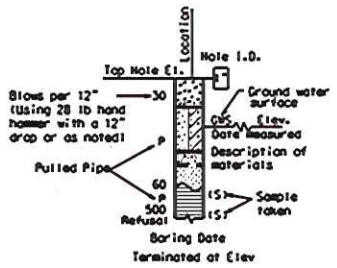
CONSISTENCY OF COHESIVE SOILS				
Description	Unconfined Compressive Strength (tsf)	Pocket Penetrometer Measurement (tsf)	Torvane Measurement (tsf)	Field Approximation
Very Soft	≈ 0.25	≈ 0.25	≈ 0.12	Easily penetrated several inches by fist
Soft	0.25 to 0.50	0.25 to 0.50	0.12 to 0.25	Easily penetrated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

BOREHOLE IDENTIFICATION		
Symbol	Hole Type	Description
	A	Auger Boring
	R P	Rotary drilled boring Rotary percussion boring (air)
	R	Rotary drilled diamond core
	HD HA	Hand driven (1-inch soil tube) Hand Auger
	D	Dynamic Cone Penetration Boring
	CPT	Cone Penetration Test (ASTM D 5778-95)
	O	Other
Notes Size in inches.		

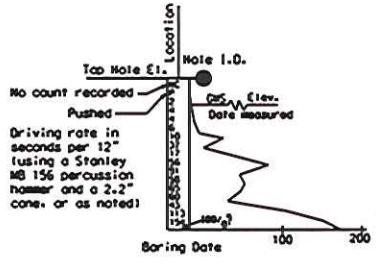
PLASTICITY OF FINE-GRAINED SOILS	
Description	Criteria
Nonplastic	A 1/8-inch thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the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



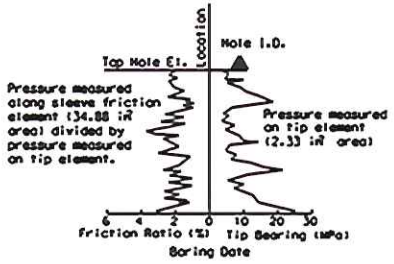
ROTARY BORING



HAND BORING



DYNAMIC CONE PENETRATION BORING



CONE PENETRATION TEST (CPT) SOUNDING

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES OFFICE OF GEOTECHNICAL DESIGN BRANCH	36-0246P 10.2/10.7	SOIL LEGEND
PREPARED BY M. Reynolds 06/08					LOG OF TEST BORINGS
CHECKED BY B. Price	C. Risden				

CU 04 EA 1A7701 FILE -> REQUEST

SHEET 5 OF 9

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

GROUP SYMBOLS AND NAMES

Graphic/Symbol	Group Names
GW	Well-graded GRAVEL Well-graded GRAVEL with SAND
GP	Poorly graded GRAVEL Poorly graded GRAVEL with SAND
GW-GM	Well-graded GRAVEL with SILT Well-graded GRAVEL with SILT and SAND
GW-GC	Well-graded GRAVEL with CLAY (or SILTY CLAY) Well-graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)
GP-GM	Poorly graded GRAVEL with SILT Poorly graded GRAVEL with SILT and SAND
GP-GC	Poorly graded GRAVEL with CLAY (or SILTY CLAY) Poorly graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)
GM	SILTY GRAVEL SILTY GRAVEL with SAND
GC	CLAYEY GRAVEL CLAYEY GRAVEL with SAND
GC-GM	SILTY, CLAYEY GRAVEL SILTY, CLAYEY GRAVEL with SAND
SW	Well-graded SAND Well-graded SAND with GRAVEL
SP	Poorly graded SAND Poorly graded SAND with GRAVEL
SW-SM	Well-graded SAND with SILT Well-graded SAND with SILT and GRAVEL
SW-SC	Well-graded SAND with CLAY (or SILTY CLAY) Well-graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)
SP-SM	Poorly graded SAND with SILT Poorly graded SAND with SILT and GRAVEL
SP-SC	Poorly graded SAND with CLAY (or SILTY CLAY) Poorly graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)
SM	SILTY SAND SILTY SAND with GRAVEL
SC	CLAYEY SAND CLAYEY SAND with GRAVEL
SC-SM	SILTY, CLAYEY SAND SILTY, CLAYEY SAND with GRAVEL
PT	PEAT
	COBBLES COBBLES and BOULDERS BOULDERS

Graphic/Symbol	Group Names
CL	Lean CLAY Lean CLAY with SAND Lean CLAY with GRAVEL SANDY lean CLAY SANDY lean CLAY with GRAVEL GRAVELLY lean CLAY GRAVELLY lean CLAY with SAND
CL-ML	SILTY CLAY SILTY CLAY with SAND SILTY CLAY with GRAVEL SANDY SILTY CLAY SANDY SILTY CLAY with GRAVEL GRAVELLY SILTY CLAY GRAVELLY SILTY CLAY with SAND
ML	SILT SILT with SAND SILT with GRAVEL SANDY SILT SANDY SILT with GRAVEL GRAVELLY SILT GRAVELLY SILT with SAND
OL	ORGANIC lean CLAY ORGANIC lean CLAY with SAND ORGANIC lean CLAY with GRAVEL SANDY ORGANIC lean CLAY SANDY ORGANIC lean CLAY with GRAVEL GRAVELLY ORGANIC lean CLAY GRAVELLY ORGANIC lean CLAY with SAND
OL	ORGANIC SILT ORGANIC SILT with SAND ORGANIC SILT with GRAVEL SANDY ORGANIC SILT SANDY ORGANIC SILT with GRAVEL GRAVELLY ORGANIC SILT GRAVELLY ORGANIC SILT with SAND
CH	Fat CLAY Fat CLAY with SAND Fat CLAY with GRAVEL SANDY fat CLAY SANDY fat CLAY with GRAVEL GRAVELLY fat CLAY GRAVELLY fat CLAY with SAND
MH	Elastic SILT Elastic SILT with SAND Elastic SILT with GRAVEL SANDY elastic SILT SANDY elastic SILT with GRAVEL GRAVELLY elastic SILT GRAVELLY elastic SILT with SAND
OH	ORGANIC fat CLAY ORGANIC fat CLAY with SAND ORGANIC fat CLAY with GRAVEL SANDY ORGANIC fat CLAY SANDY ORGANIC fat CLAY with GRAVEL GRAVELLY ORGANIC fat CLAY GRAVELLY ORGANIC fat CLAY with SAND
OH	ORGANIC elastic SILT ORGANIC elastic SILT with SAND ORGANIC elastic SILT with GRAVEL SANDY ORGANIC elastic SILT SANDY ORGANIC elastic SILT with GRAVEL GRAVELLY ORGANIC elastic SILT GRAVELLY ORGANIC elastic SILT with SAND
OL/OH	ORGANIC SOIL ORGANIC SOIL with SAND ORGANIC SOIL with GRAVEL SANDY ORGANIC SOIL SANDY ORGANIC SOIL with GRAVEL GRAVELLY ORGANIC SOIL GRAVELLY ORGANIC SOIL with SAND

FIELD AND LABORATORY TESTING

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

DIST	COUNTY	ROUTE	TOTAL PROJECT
04	SM	280	10.2/10.7

REGISTERED GEOLOGIST — DATE 07-16-09

REGISTERED GEOLOGIST Chris Rigden No. 7795 9-30-09 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 electronic copies of this plan sheet.

APPARENT DENSITY OF COHESIONLESS SOILS

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

MOISTURE

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

PERCENT OR PROPORTION OF SOILS

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

PARTICLE SIZE

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

ENGINEERING SERVICES — PREPARED BY M. Reynolds 08/09 — CHECKED BY B. Price

GEOTECHNICAL SERVICES — C. Rigden

STATE OF CALIFORNIA — DEPARTMENT OF TRANSPORTATION

DIVISION OF ENGINEERING SERVICES — OFFICE OF GEOTECHNICAL DESIGN BRANCH

04 — 1A7701

SOIL LEGEND

LOG OF TEST BORINGS

6 — 9

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

DIST	COUNTY	ROUTE	TOTAL PROJECT
04	SM	280	10.2/10.7

REGISTERED GEOLOGIST — DATE 07-16-09

PLANS APPROVAL DATE

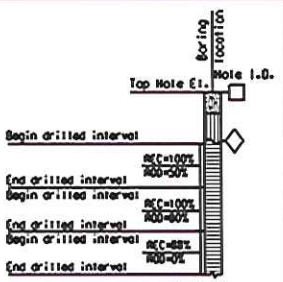
The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

CHRIS RIGDEN — No. 7795 — 9-30-09 — STATE OF CALIFORNIA

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

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

$$RQD = \frac{\sum \text{Length of intact core pieces} \geq 4"}{\text{Total length of core run (inches)}} \times 100\%$$



RELATIVE STRENGTH OF INTACT ROCK

Term	Uniaxial Compressive Strength (PSI)
Extremely Strong	¢ 30,000
Very Strong	14,500 - 30,000
Strong	7,000 - 14,500
Medium Strong	3,500 - 7,000
Weak	700 - 3,500
Very Weak	150 - 700
Extremely Weak	• 150

BEDDING SPACING

Description	Thickness / Spacing
Massive	Greater than 10 ft
Very thickly bedded	3 to 10 ft
Thickly bedded	1 to 3 ft
Moderately bedded	3-5/8" to 1 ft
Thinly bedded	1-1/4" to 3-5/8"
Very thinly bedded	3/8" to 1-1/4"
Laminated	Less than 3/8"

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 1/6" 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 3 feet.
Slightly fractured	Lengths from 1 to 3 feet with few lengths less than 1 foot or greater than 3 feet.
Moderately fractured	Lengths mostly in 4" to 1 foot range with most lengths about 8"
Intensely fractured	Lengths average from 1 to 4" with scattered fragmented intervals with lengths less than 4"
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.

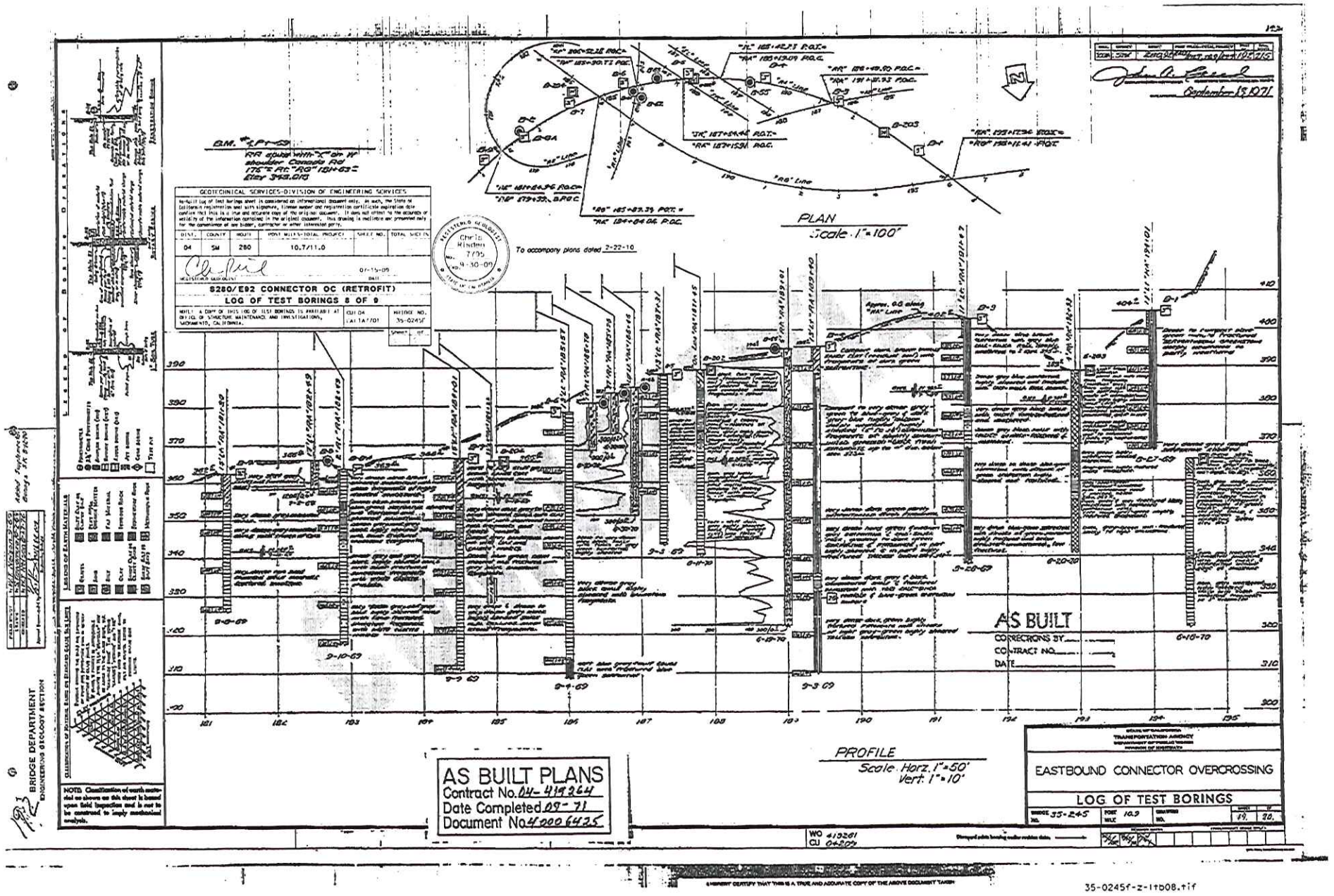
WEATHERING DESCRIPTORS FOR INTACT ROCK

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."

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA	DIVISION OF ENGINEERING SURVICES OFFICE OF GEOTECHNICAL		ROCK LEGEND
FUNCTIONAL SUPERVISOR	PREPARED BY M. Reynolds 08/09	FIELD INVESTIGATION BY: C. Rigden	DEPARTMENT OF TRANSPORTATION	DESIGN BRANCH	55-02456	LOG OF TEST BORINGS
HAND C. Wilcox	CHECKED BY B. Price			DIST 04 EA 1A7701	10.2/10.7	

FILE -1 REQUEST


GEOTECHNICAL SERVICES-DIVISION OF ENGINEERING SERVICES
DIST. 04 | COUNTY SM | ROUTE 280 | POST MILES-TOTAL PROJECT 10.7/11.0
S280/E92 CONNECTOR OC (RETROFIT)
LOG OF TEST BORINGS 8 OF 9
BRIDGE NO. 35-0245F
PLAN
Scale 1"=100'
PROFILE
Scale Horz. 1"=50'
Vert. 1"=10'
To accompany plans dated 2-22-10
AS BUILT
CORRECTIONS BY
CONTRACT NO.
DATE
AS BUILT PLANS
Contract No. 04-439264
Date Completed 09-71
Document No. 4000 6425
BRIDGE DEPARTMENT
ENGINEERING GEOLOGY SECTION
EASTBOUND CONNECTOR OVERCROSSING
LOG OF TEST BORINGS
BRIDGE NO. 35-245
POST MILE 10.9
September 15, 1971
35-0245f-z-ltb08.tif

RA Line
183
192
193
B-305
B-304
B-303
BENCH MARK
See Sheet No. 1
AS BUILT
CONTRACT NO.
DATE
PLAN
Scale: 1" = 10'
Approximate ground line along RA Line.
PROFILE
Scale: 1" = 10'
370
360
350
340
330
320
310
300
290
280
4-1-71
3-31-71
GEOTECHNICAL SERVICES-DIVISION OF ENGINEERING SERVICES
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. 04
COUNTY SM
ROUTE 280
POST MILES-TOTAL PROJECT 10.7/11.0
REGISTERED GEOLOGIST
07-15-09
DATE
S280/E92 CONNECTOR OC (RETROFIT)
LOG OF TEST BORINGS 9 OF 9
NOTE: A COPY OF THIS LOG OF TEST BORINGS IS AVAILABLE AT OFFICE OF STRUCTURE MAINTENANCE AND INVESTIGATIONS, SACRAMENTO, CALIFORNIA.
BRIDGE NO. 35-0245F
REGISTERED GEOLOGIST
Chris Risden
STATE OF CALIFORNIA
To accompany plans dated 2-22-10
EASTBOUND CONNECTOR OVERCROSSING
LOG OF TEST BORINGS
35-245
109
20
AS BUILT PLANS
Contract No. 04-419264
Date Completed 09-71
Document No. 40006425
WO 419204
CU 04209
BRIDGE DEPARTMENT
ENGINEERING GEOLOGY SECTION
September 15, 1971
35-0245f-z-itb09.tif

APPENDIX B

LABORATORY TEST RESULTS

Use the following table to identify a soil/rock sample boring and it's corresponding LOTB number

Soil/Rock Sample Boring	Boring Number
B45F-4	R-08-003
B45F-5	R-09-007
B45F-6	R-08-001

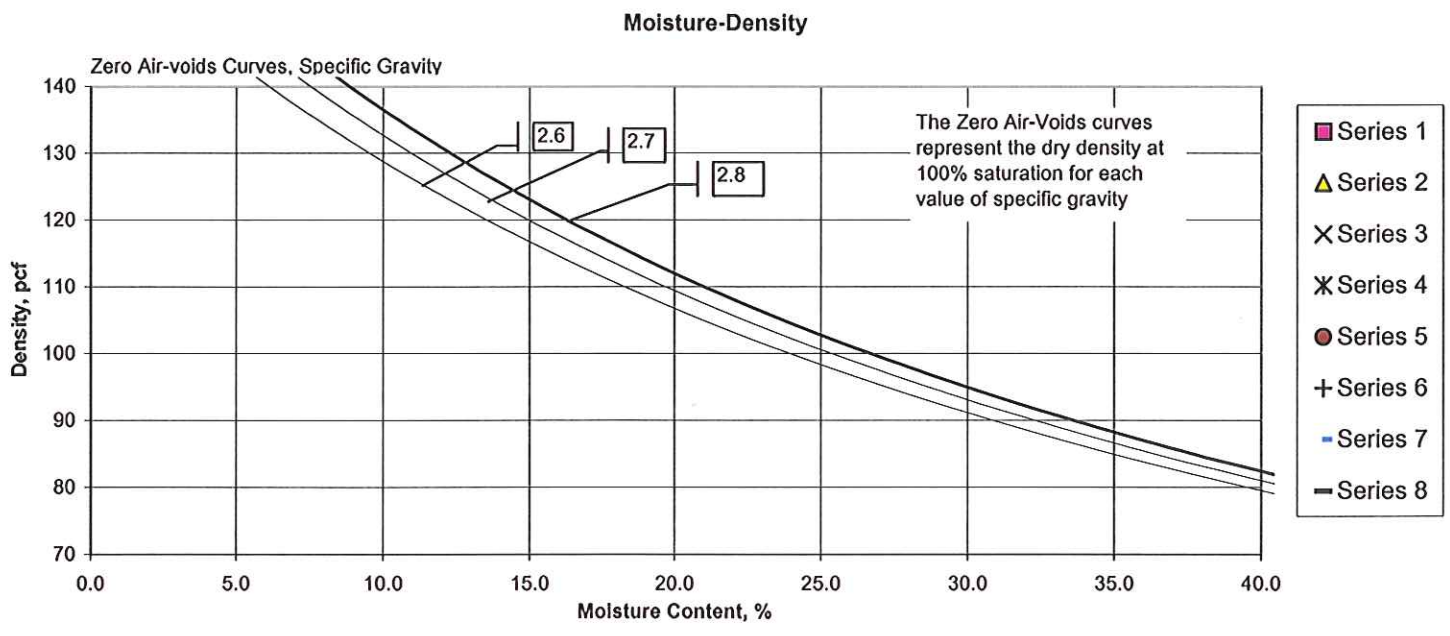
Moisture-Density-Porosity Report

Cooper Testing Labs, Inc. (ASTM D 2937)

Job No:	603-012a	Date:	01/23/09
Client:	PB	By:	RU
Project:	92/280 Retrofit - 04-1A7701	Remarks:	

Boring:	B44G-3	B44G-3	B44G-3	B44G-3	B44G-6	B44G-6	B45F-4	B45F-4
Sample:								
Depth, ft:	5-6.5	15-16.5	20-21.5	35-36.5	14.5-16	49.5-51	5-6.5	20-21.5
Visual Description:	Gray Lean Clayey SAND w/ Gravel	Gray Sandy Lean CLAY	Dark Gray Lean Clayey SAND w/ Gravel	Dark Gray Sandy Lean CLAY	Mottled Bluish Gray Clayey SAND	Mottled Bluish Gray Silty SAND	Brown Fat Clayey SAND w/ Gravel	Gray Sandy Lean CLAY w/ Gravel
Actual G_s								
Assumed G_s								
Total Vol cc								
Vol Solids,cc								
Vol Voids,cc								
Moisture, %	18.0	13.4	12.2	10.7	15.8	22.7	28.4	8.0
Wet Unit wt, pcf								
Dry Unit wt, pcf								
Saturation, %								
Porosity, %								
Air filled Poros.,%								
Water filled Poros.,%								
Void Ratio								
Series	1	2	3	4	5	6	7	8

Note: If an assumed specific gravity (Gs) was used then the saturation, porosities, and void ratio should be considered approximate.



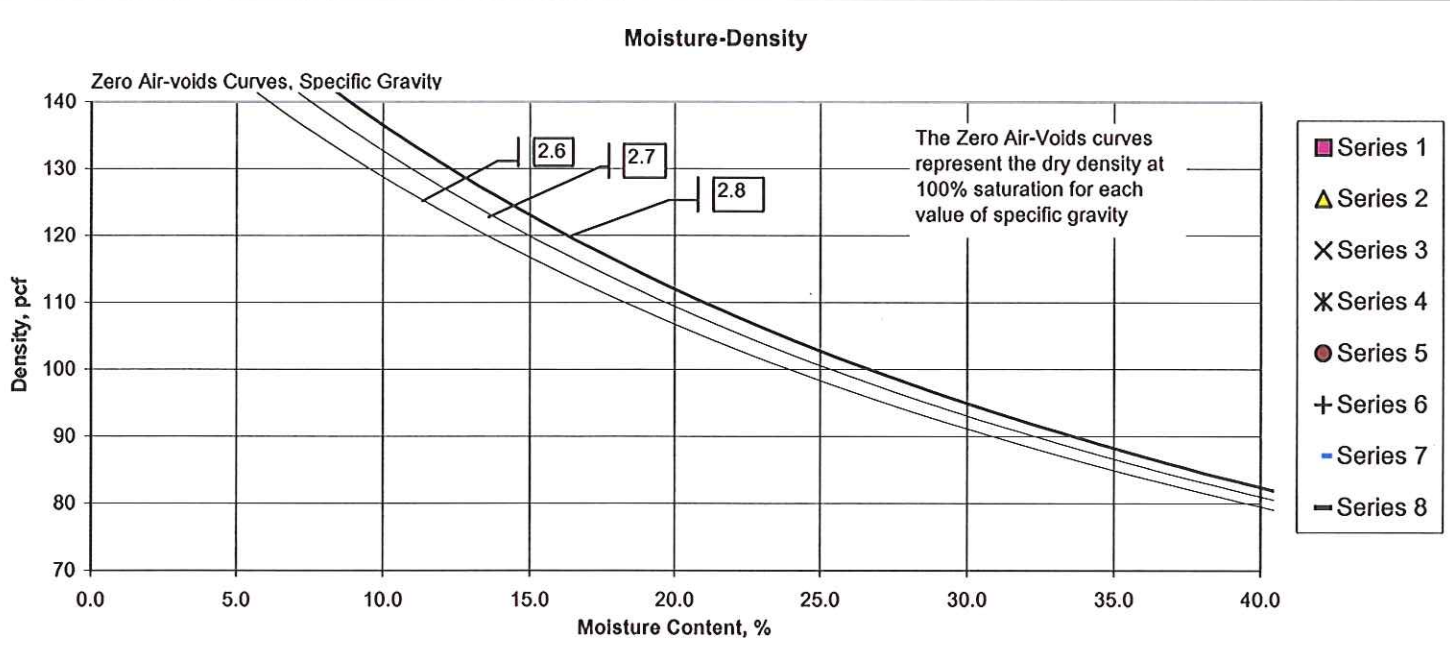
Moisture-Density-Porosity Report

Cooper Testing Labs, Inc. (ASTM D 2937)

Job No:	603-012b	Date:	01/23/09
Client:	PB	By:	RU
Project:	92/280 Retrofit - 04-1A7701	Remarks:	

Boring:	B45F-4	B45F-4	B45F-4	B45F-6	B45F-6	B45F-6	B45F-5	B44G-9
Sample:								
Depth, ft:	35-36.5	65-66.5	80-81.5	20-21.5	55-56.5	75-76.5	5-6.5	20-21.5
Visual Description:	Dark Gray Lean Clayey SAND	Gray Lean Clayey SAND	Gray Lean Clayey SAND w/ Gravel	Bluish Gray Sandy SILT	Bluish Gray Silty SAND	Gray Elastic Silty SAND	Brown Fat Clayey SAND w/ Gravel	Brown Silty SAND
Actual G_s								
Assumed G_s								
Total Vol cc								
Vol Solids,cc								
Vol Voids,cc								
Moisture, %	10.8	9.8	18.8	18.1	27.5	15.2	19.1	38.6
Wet Unit wt, pcf								
Dry Unit wt, pcf								
Saturation, %								
Porosity, %								
Air filled Poros.,%								
Water filled Poros.,%								
Void Ratio								
Series	1	2	3	4	5	6	7	8

Note: If an assumed specific gravity (Gs) was used then the saturation, porosities, and void ratio should be considered approximate.



Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	24.1	32.5	24.4	19.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1 in.	92.8		
3/4 in.	90.2		
3/8 in.	83.9		
#4	75.9		
#10	67.6		
#30	57.5		
#40	55.2		
#50	53.6		
#100	48.4		
#200	43.4		
0.0422 mm.	40.1		
0.0305 mm.	37.1		
0.0200 mm.	32.2		
0.0118 mm.	28.3		
0.0084 mm.	26.3		
0.0060 mm.	24.3		
0.0043 mm.	22.3		
0.0022 mm.	19.3		
0.0013 mm.	17.3		

* (no specification provided)

Soil Description

Brown Fat Clayey SAND w/ Gravel

Atterberg Limits

PL= 24 LL= 61 PI= 37

Coefficients

D_{85}= 10.6 D_{60}= 0.825 D_{50}= 0.182
D_{30}= 0.0154 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO=

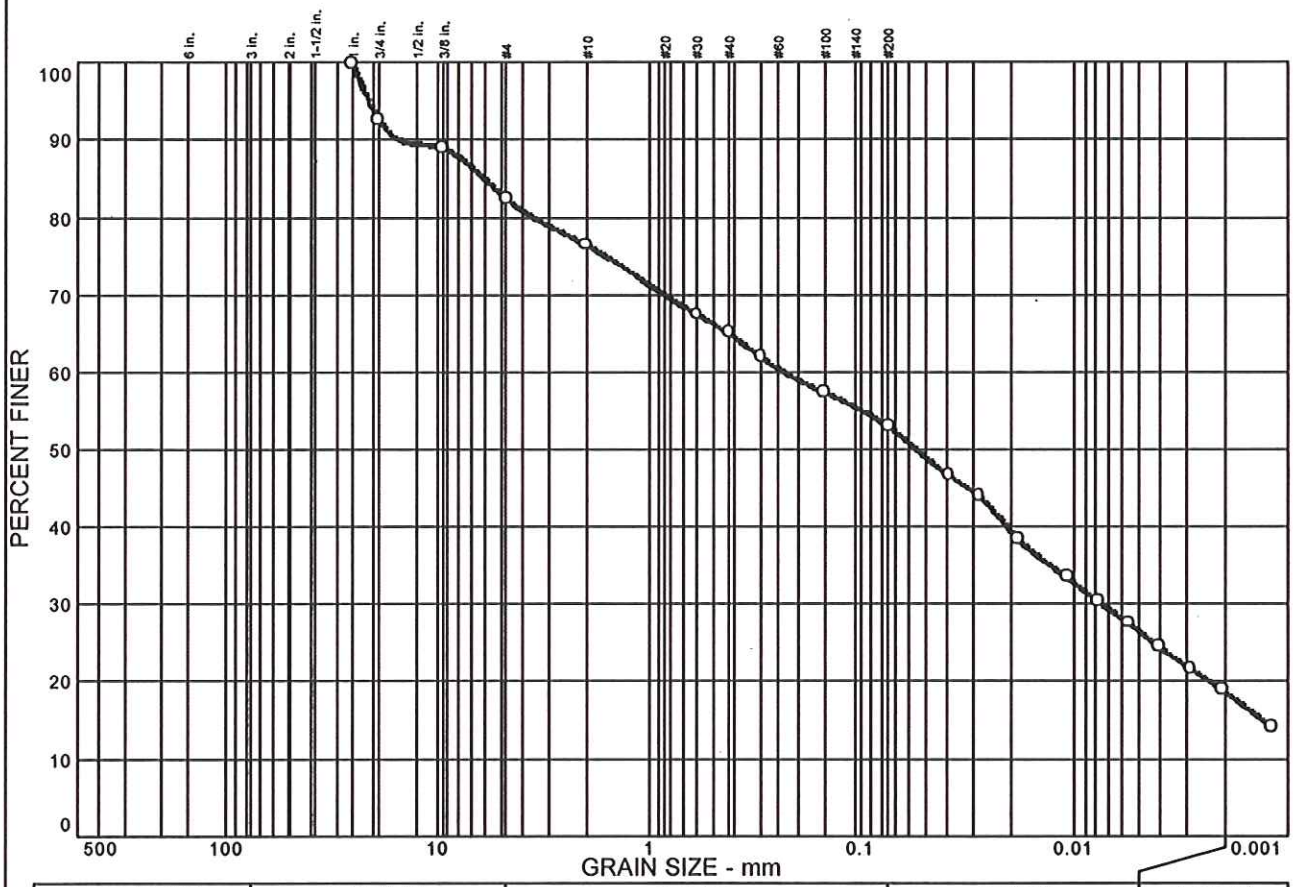
Remarks

Due to small sample size the sample was split on the #40 sieve.

Sample No.: **Source of Sample:** B45F-4 **Date:**
Location: **Elev./Depth:** 5-6.5'

COOPER TESTING LABORATORY	**Client:** PB **Project:** 92/280 Retrofit - 04-1A7701 **Project No:** 603-012 **Figure**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	17.5	29.5	34.3	18.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
3/4 in.	92.7		
3/8 in.	89.0		
#4	82.5		
#10	76.5		
#30	67.5		
#40	65.1		
#50	62.0		
#100	57.4		
#200	53.0		
0.0392 mm.	46.7		
0.0281 mm.	44.0		
0.0184 mm.	38.4		
0.0109 mm.	33.5		
0.0078 mm.	30.4		
0.0056 mm.	27.6		
0.0040 mm.	24.5		
0.0029 mm.	21.7		
0.0021 mm.	19.0		
0.0012 mm.	14.1		

* (no specification provided)

Soil Description

Gray Sandy Lean CLAY w/ Gravel

Atterberg Limits

PL= 16 LL= 43 PI= 27

Coefficients

D_{85}= 5.99 D_{60}= 0.231 D_{50}= 0.0553
D_{30}= 0.0075 D_{15}= 0.0013 D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Due to small sample size the sample was split on the #40 sieve.

Sample No.: **Source of Sample:** B45F-4 **Date:**
Location: **Elev./Depth:** 20-21.5'

COOPER TESTING LABORATORY	**Client:** PB **Project:** 92/280 Retrofit - 04-1A7701 **Project No:** 603-012 **Figure**

Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	6.3	48.2	30.9	14.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
3/8 in.	98.3		
#4	93.7		
#10	71.5		
#30	60.0		
#40	56.9		
#50	54.1		
#100	49.7		
#200	45.5		
0.0441 mm.	41.6		
0.0319 mm.	37.5		
0.0205 mm.	34.1		
0.0122 mm.	28.6		
0.0087 mm.	25.9		
0.0063 mm.	23.1		
0.0045 mm.	20.4		
0.0032 mm.	18.4		
0.0023 mm.	15.9		
0.0014 mm.	9.5		

* (no specification provided)

Soil Description

Dark Gray Lean Clayey SAND

Atterberg Limits

PL= 15 LL= 26 PI= 11

Coefficients

D_{85}= 3.30 D_{60}= 0.600 D_{50}= 0.158
D_{30}= 0.0139 D_{15}= 0.0021 D_{10}= 0.0014
C_u= 422.05 C_c= 0.23

Classification

USCS= SC AASHTO=

Remarks

Sample No.: **Source of Sample:** B45F-4 **Date:**
Location: **Elev./Depth:** 35-36.5'

COOPER TESTING LABORATORY

Client: PB
Project: 92/280 Retrofit - 04-1A7701
Project No: 603-012 **Figure**

Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	4.1	49.3	29.0	17.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
3/8 in.	99.1		
#4	95.9		
#10	82.9		
#30	67.9		
#40	63.5		
#50	59.5		
#100	52.7		
#200	46.6		
0.0454 mm.	42.0		
0.0327 mm.	37.8		
0.0210 mm.	34.7		
0.0124 mm.	29.6		
0.0089 mm.	26.8		
0.0063 mm.	23.6		
0.0045 mm.	20.5		
0.0032 mm.	18.9		
0.0023 mm.	18.0		
0.0013 mm.	15.8		

* (no specification provided)

Soil Description

Gray Lean Clayey SAND

Atterberg Limits

PL= 14 LL= 25 PI= 11

Coefficients

D_{85}= 2.28 D_{60}= 0.314 D_{50}= 0.112
D_{30}= 0.0129 D_{15}= D_{10}=
C_u= C_c=

Classification

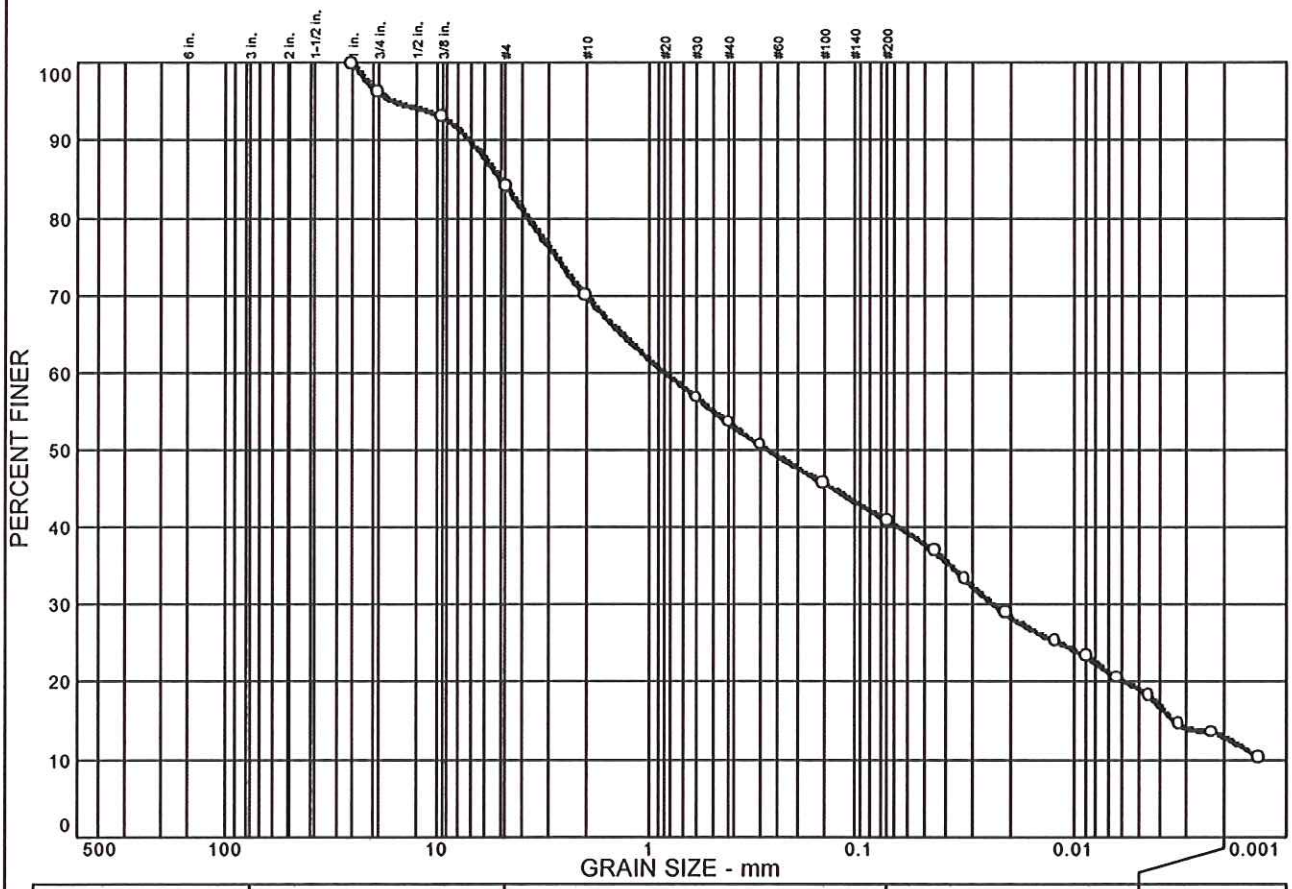
USCS= SC AASHTO=

Remarks

Sample No.: **Source of Sample:** B45F-4 **Date:**
Location: **Elev./Depth:** 65-66.5'

COOPER TESTING LABORATORY	**Client:** PB **Project:** 92/280 Retrofit - 04-1A7701 **Project No:** 603-012 **Figure**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	15.9	43.2	27.9	13.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
3/4 in.	96.3		
3/8 in.	93.1		
#4	84.1		
#10	70.1		
#30	56.8		
#40	53.6		
#50	50.7		
#100	45.8		
#200	40.9		
0.0450 mm.	36.9		
0.0325 mm.	33.3		
0.0210 mm.	28.9		
0.0124 mm.	25.3		
0.0088 mm.	23.3		
0.0063 mm.	20.6		
0.0045 mm.	18.3		
0.0032 mm.	14.6		
0.0023 mm.	13.5		
0.0014 mm.	10.3		

* (no specification provided)

Soil Description

Gray Lean Clayey SAND w/ Gravel

Atterberg Limits

PL= 15 LL= 28 PI= 13

Coefficients

D_{85}= 5.02 D_{60}= 0.838 D_{50}= 0.274
D_{30}= 0.0237 D_{15}= 0.0034 D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Sample No.: **Source of Sample:** B45F-4 **Date:**
Location: **Elev./Depth:** 80-81.5'

COOPER TESTING LABORATORY	**Client:** PB **Project:** 92/280 Retrofit - 04-1A7701 **Project No:** 603-012 **Figure**

Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	23.0	41.8	23.0	12.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
3/4 in.	98.2		
3/8 in.	86.1		
#4	77.0		
#10	65.8		
#30	53.4		
#40	50.4		
#50	48.1		
#100	41.5		
#200	35.2		
0.0437 mm.	32.0		
0.0316 mm.	29.2		
0.0207 mm.	24.4		
0.0122 mm.	21.3		
0.0086 mm.	19.3		
0.0062 mm.	17.2		
0.0044 mm.	15.4		
0.0032 mm.	14.2		
0.0023 mm.	12.6		
0.0013 mm.	11.4		

* (no specification provided)

Soil Description

Brown Fat Clayey SAND w/ Gravel

Atterberg Limits

PL= 25 LL= 52 PI= 27

Coefficients

D_{85}= 8.92 D_{60}= 1.19 D_{50}= 0.402
D_{30}= 0.0342 D_{15}= 0.0040 D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO=

Remarks

Due to small sample size the sample was split on the #40 sieve

Sample No.: **Source of Sample:** B45F-5 **Date:**
Location: **Elev./Depth:** 5-6.5'

COOPER TESTING LABORATORY	**Client:** PB **Project:** 92/280 Retrofit - 04-1A7701 **Project No:** 603-012 **Figure**

Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.6	42.2	49.2	8.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
#4	99.4		
#10	96.1		
#30	82.5		
#40	78.8		
#50	75.1		
#100	67.3		
#200	57.2		
0.0425 mm.	40.2		
0.0313 mm.	30.4		
0.0211 mm.	13.1		
0.0123 mm.	11.0		
0.0087 mm.	10.2		
0.0062 mm.	9.8		
0.0044 mm.	9.0		
0.0031 mm.	8.1		
0.0022 mm.	8.0		
0.0013 mm.	7.8		

* (no specification provided)

Soil Description

Bluish Gray Sandy SILT

Atterberg Limits

PL= 41 LL= 49 PI= 8

Coefficients

D_{85}= 0.740 D_{60}= 0.0855 D_{50}= 0.0581
D_{30}= 0.0310 D_{15}= 0.0224 D_{10}= 0.0073
C_u= 11.68 C_c= 1.54

Classification

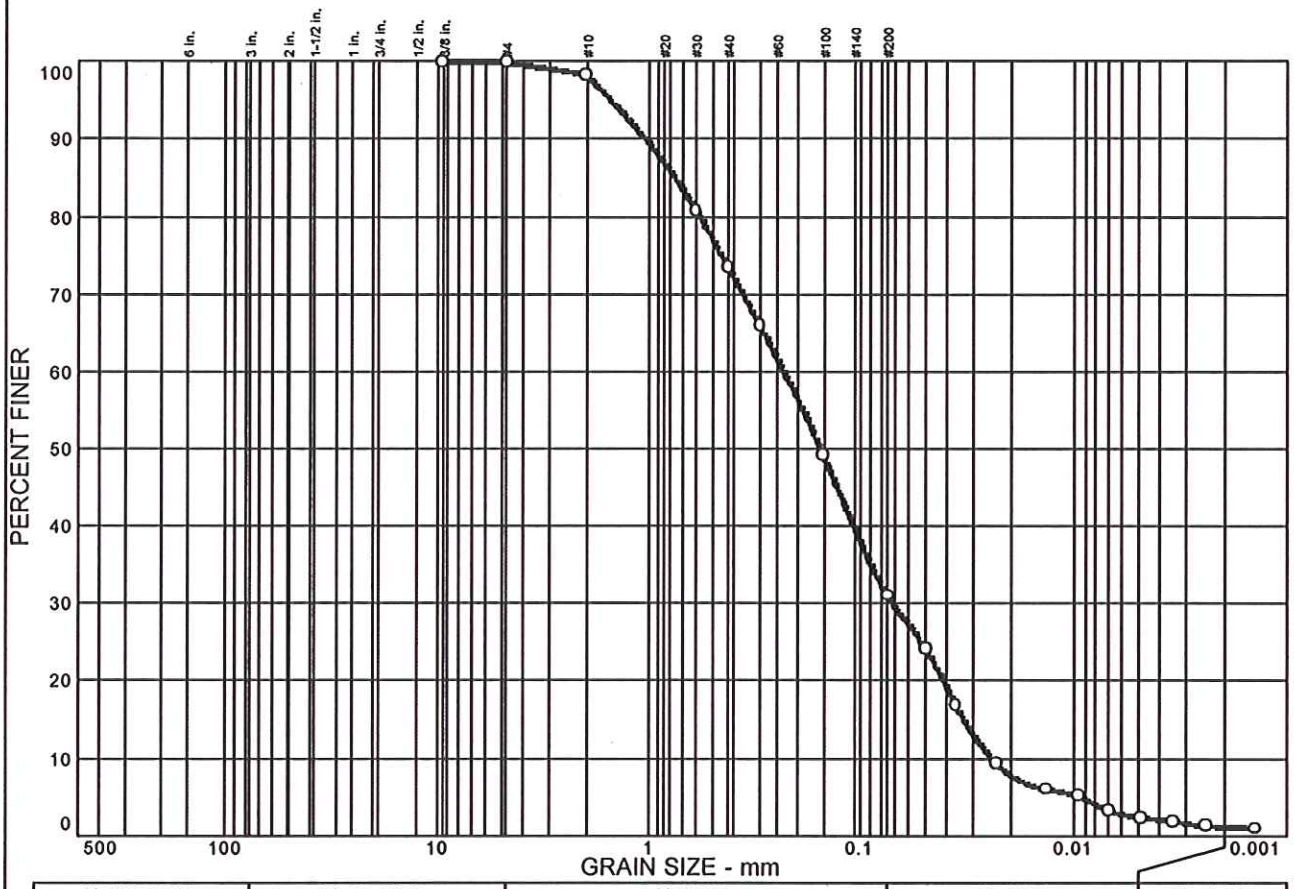
USCS= ML AASHTO=

Remarks

Sample No.: **Source of Sample:** B45F-6 **Date:**
Location: **Elev./Depth:** 20-21.5'

COOPER TESTING LABORATORY	**Client:** PB **Project:** 92/280 Retrofit - 04-1A7701 **Project No:** 603-012 **Figure**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.1	68.9	30.0	1.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
#4	99.9		
#10	98.3		
#30	80.8		
#40	73.5		
#50	65.9		
#100	49.1		
#200	31.0		
0.0498 mm.	24.1		
0.0360 mm.	16.8		
0.0233 mm.	9.3		
0.0136 mm.	6.0		
0.0096 mm.	5.1		
0.0068 mm.	3.2		
0.0049 mm.	2.3		
0.0034 mm.	1.8		
0.0024 mm.	1.2		
0.0014 mm.	0.9		

* (no specification provided)

Soil Description

Bluish Gray Silty SAND

Atterberg Limits

PL= 31 LL= 50 PI= 19

Coefficients

D_{85}= 0.754 D_{60}= 0.231 D_{50}= 0.155
D_{30}= 0.0710 D_{15}= 0.0331 D_{10}= 0.0247
C_u= 9.38 C_c= 0.88

Classification

USCS= SM AASHTO=

Remarks

Sample No.: **Source of Sample:** B45F-6 **Date:**
Location: **Elev./Depth:** 55-56.5'

COOPER TESTING LABORATORY

Client: PB
Project: 92/280 Retrofit - 04-1A7701

Project No: 603-012 **Figure**

Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	2.5	69.5	15.8	12.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
3/8 in.	99.2		
#4	97.5		
#10	91.4		
#30	68.2		
#40	61.5		
#50	54.7		
#100	41.0		
#200	28.0		
0.0492 mm.	25.6		
0.0351 mm.	23.0		
0.0223 mm.	21.3		
0.0130 mm.	19.1		
0.0092 mm.	17.3		
0.0066 mm.	15.6		
0.0047 mm.	14.3		
0.0033 mm.	13.0		
0.0023 mm.	12.5		
0.0014 mm.	11.3		

* (no specification provided)

Soil Description

Gray Elastic Silty SAND

Atterberg Limits

PL= 32 LL= 58 PI= 26

Coefficients

D_{85}= 1.35 D_{60}= 0.393 D_{50}= 0.235
D_{30}= 0.0875 D_{15}= 0.0056 D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

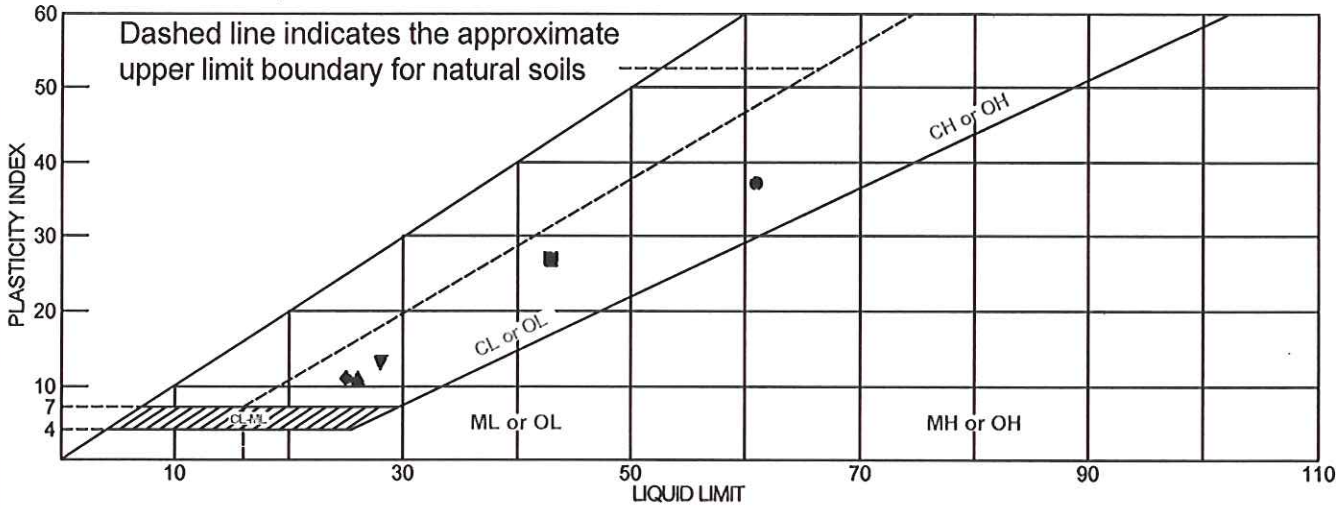
Sample No.: **Source of Sample:** B45F-6 **Date:**
Location: **Elev./Depth:** 75-76.5'

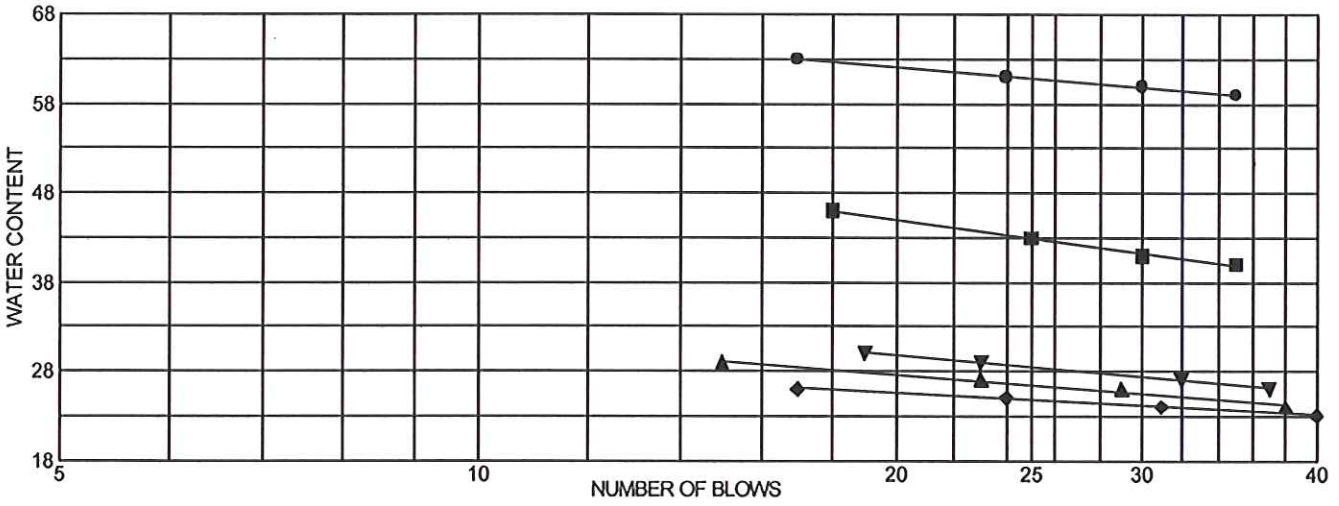
COOPER TESTING LABORATORY

Client: PB
Project: 92/280 Retrofit - 04-1A7701

Project No: 603-012 **Figure**

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown Fat Clayey SAND w/ Gravel	61	24	37	55.2	43.4	SC
■	Gray Sandy Lean CLAY w/ Gravel	43	16	27	65.1	53.0	
▲	Dark Gray Lean Clayey SAND	26	15	11	56.9	45.5	SC
◆	Gray Lean Clayey SAND	25	14	11	63.5	46.6	SC
▼	Gray Lean Clayey SAND w/ Gravel	28	15	13	53.6	40.9	

Project No. 603-012 **Client:** PB

Project: 92/280 Retrofit - 04-1A7701

● **Source:** B45F-4	**Elev./Depth:** 5-6.5'
■ **Source:** B45F-4	**Elev./Depth:** 20-21.5'
▲ **Source:** B45F-4	**Elev./Depth:** 35-36.5'
◆ **Source:** B45F-4	**Elev./Depth:** 65-66.5'
▼ **Source:** B45F-4	**Elev./Depth:** 80-81.5'

Remarks:

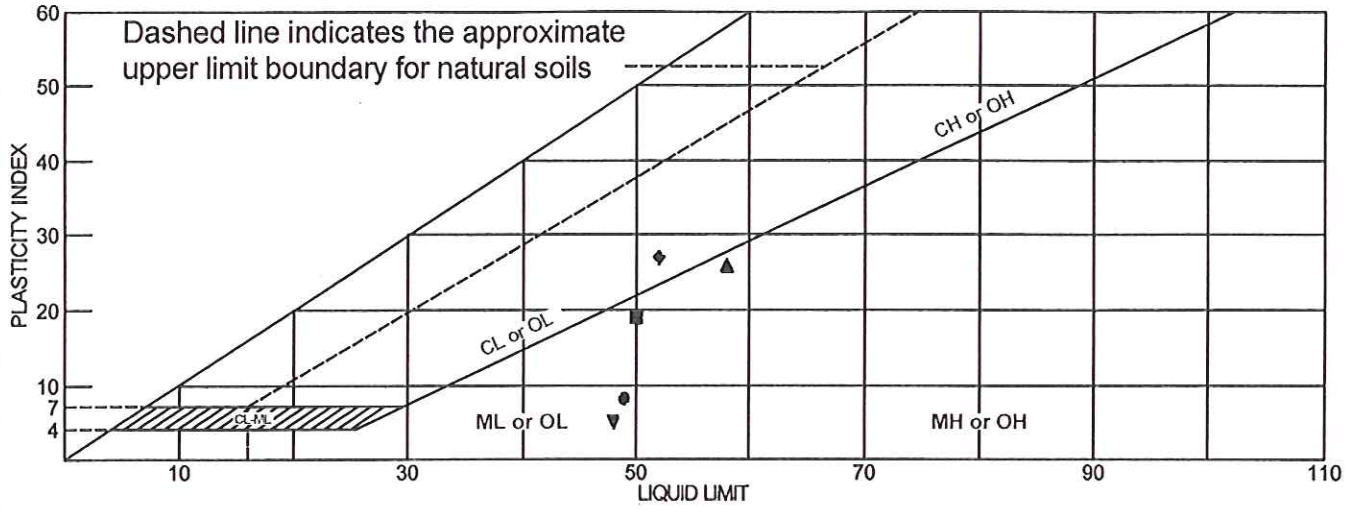
●
■
▲
◆
▼

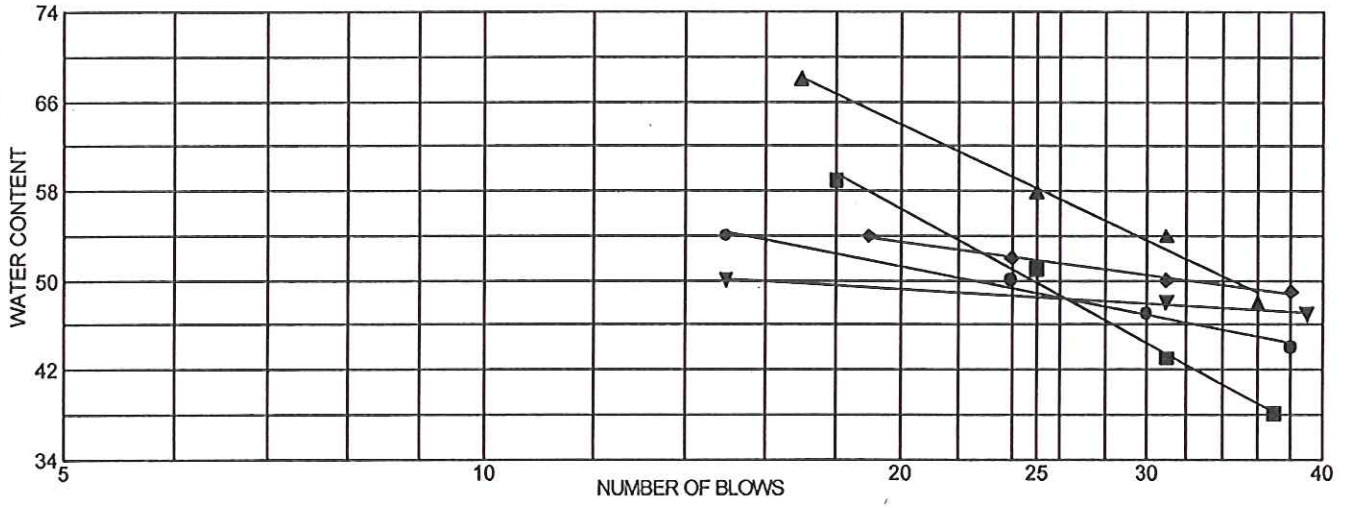
LIQUID AND PLASTIC LIMITS TEST REPORT

COOPER TESTING LABORATORY

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Bluish Gray Sandy SILT	49	41	8	78.8	57.2	ML
■	Bluish Gray Silty SAND	50	31	19	73.5	31.0	SM
▲	Gray Elastic Silty SAND	58	32	26	61.5	28.0	SM
◆	Brown Fat Clayey SAND w/ Gravel	52	25	27	50.4	35.2	SC
▼	Brown Silty SAND	48	43	5	49.4	24.6	SM

Project No. 603-012 **Client:** PB

Project: 92/280 Retrofit - 04-1A7701

● **Source:** B45F-6 **Elev./Depth:** 20-21.5'
■ **Source:** B45F-6 **Elev./Depth:** 55-56.5'
▲ **Source:** B45F-6 **Elev./Depth:** 75-76.5'
◆ **Source:** B45F-5 **Elev./Depth:** 5-6.5'
▼ **Source:** B44G-9 **Elev./Depth:** 20-21.5'

Remarks:
●
■
▲
◆
▼

LIQUID AND PLASTIC LIMITS TEST REPORT

COOPER TESTING LABORATORY

Figure

COOPER TESTING LABORATORY

Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D3148)

CTL Job No.:	603-012M	Boring:	B45F-4	Date:	2/5/2009
Client:	Parsons Brinckerhoff	Sample:		By:	PJ
Project Name:	92/280 Retrofit	Depth,ft.:	38-38.5	Checked:	PJ
Project No.:	04-1A7701				

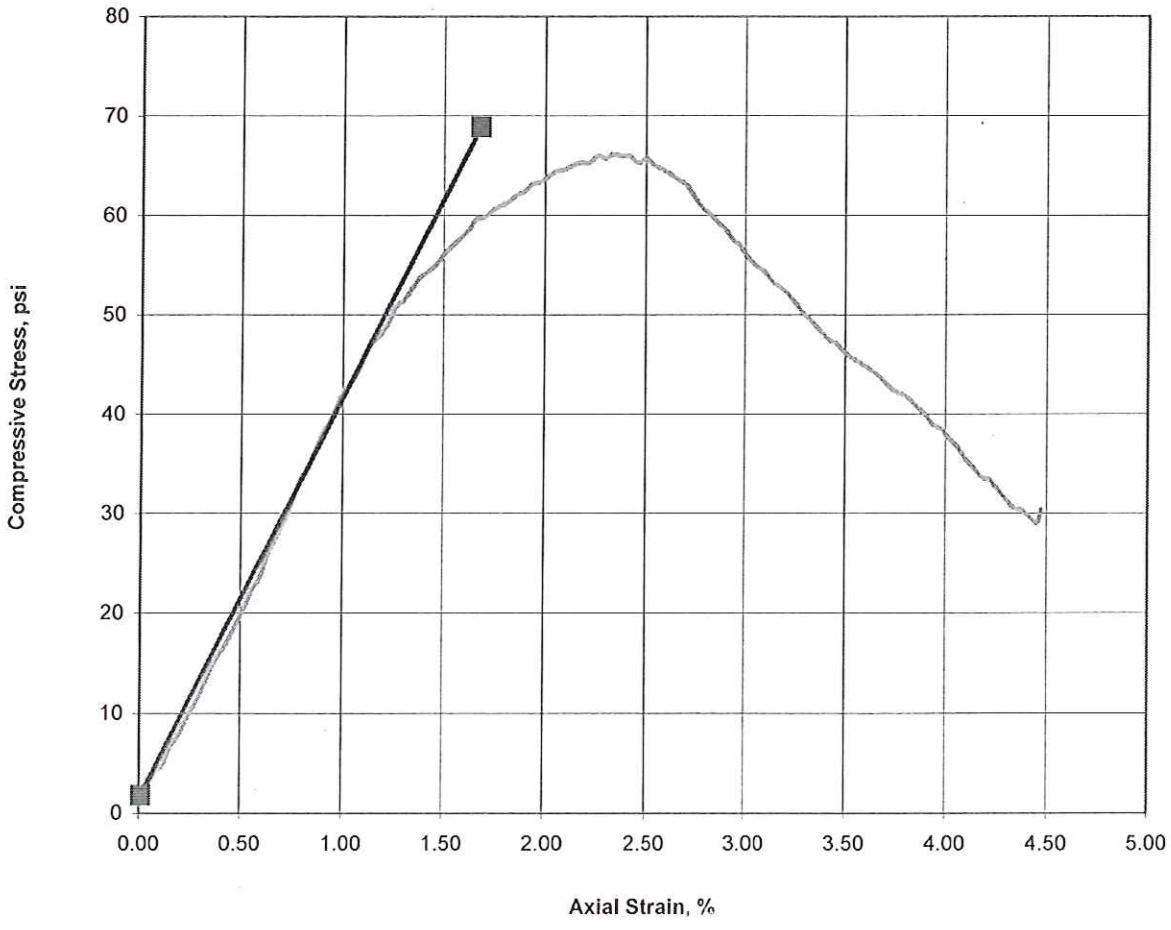
Visual Description: Bluish Gray Sandy CLAY (Weathered Rock)

Moisture Condition at Test: Sample was washed and in a moist state.

Test Temperature, (°C): Ambient

Remarks: Deviation from straightness and parallelism measured using digital dial calipers. Samples were finished by capping the ends with high-strength capping plaster in as thin a layer as practicable.

Sample Height, in.	5.07	**Unconfined Compressive Strength, psi**	**66**
Sample Diameter, in.	2.41		
Height / Diameter	2.11		
Sample Area, in^2	4.55		
Wet Density, pcf	147.2	**Young's Modulus (E) (psi)**	**4,000**
Dry Density, pcf	132.1		
Moisture Content, %	11.4		
Strain Rate, % / min	0.93		



COOPER TESTING LABORATORY

Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D3148)

CTL Job No.:	603-012N	Boring:	B45F-4	Date:	2/5/2009
Client:	Parsons Brinckerhoff	Sample:		By:	PJ
Project Name:	92/280 Retrofit	Depth,ft.:	43-44	Checked:	PJ
Project No.:	04-1A7701				

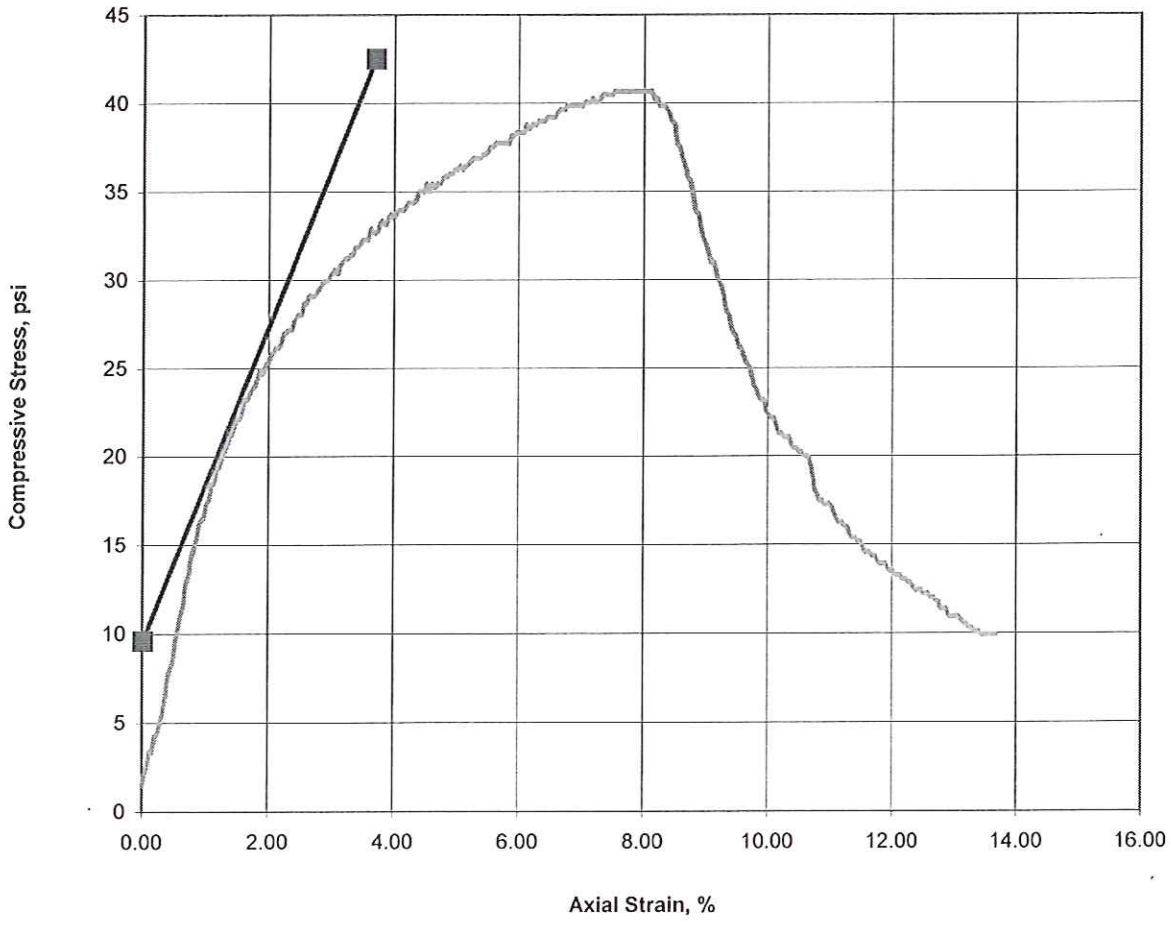
Visual Description: Bluish Gray Sandy CLAY (Weathered Rock)

Moisture Condition at Test: Sample was washed and in a moist state.

Test Temperature, (°C): Ambient

Remarks: Deviation from straightness and parallelism measured using digital dial calipers.

Sample Height, in.	4.94	**Unconfined Compressive Strength, psi**	**41**
Sample Diameter, in.	2.46		
Height / Diameter	2.01		
Sample Area, in^2	4.74		
Wet Density, pcf	150.8	**Young's Modulus (E) (psi)**	**890**
Dry Density, pcf	140.8		
Moisture Content, %	7.2		
Strain Rate, % / min	1.01		



COOPER TESTING LABORATORY

Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D3148)

CTL Job No.: 603-012O Boring: B45F-4 Date: 2/5/2009

Client: Parsons Brinckerhoff Sample: By: PJ

Project Name: 92/280 Retrofit Depth,ft.: 52-53 Checked: PJ

Project No.: 04-1A7701

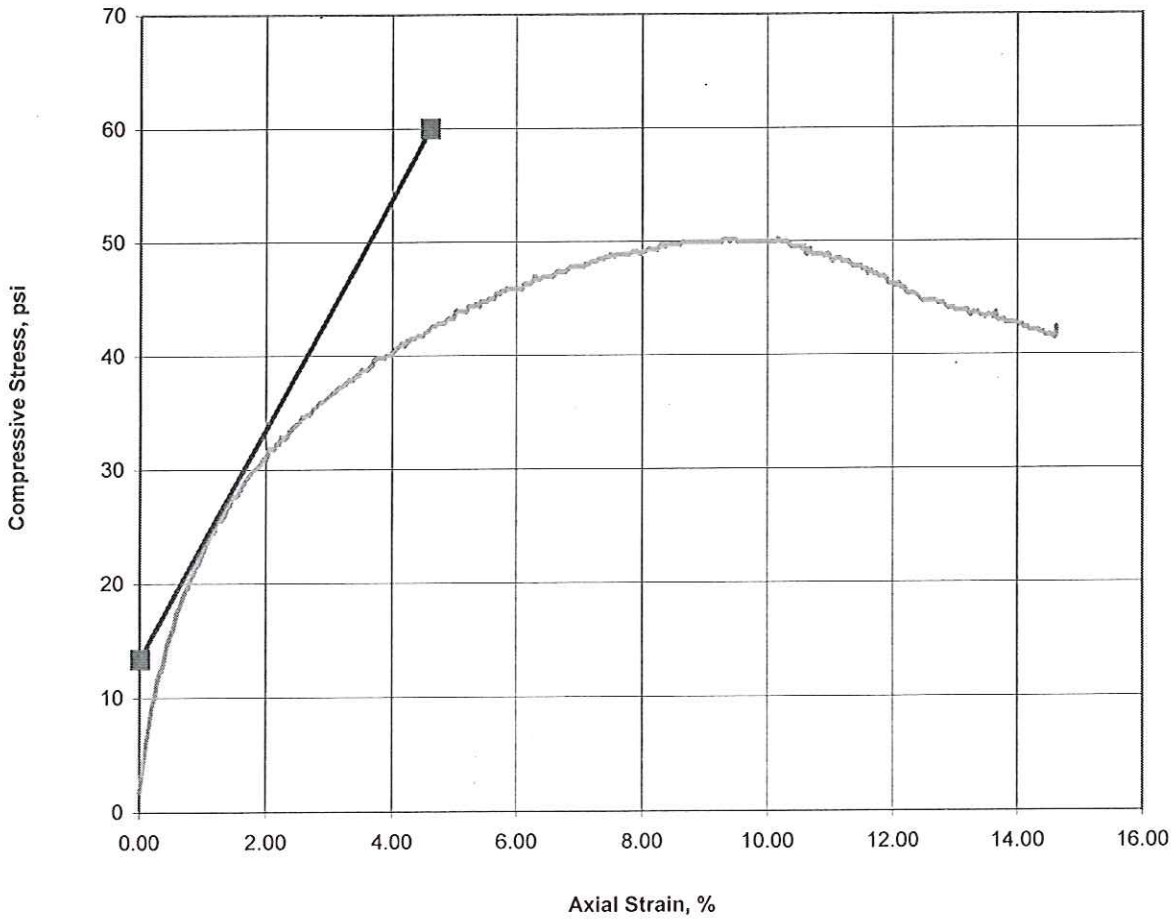
Visual Description: Bluish Gray Sandy CLAY (Weathered Rock)

Moisture Condition at Test: Sample was washed and in a moist state.

Test Temperature, (°C): Ambient

Remarks: Deviation from straightness and parallelism measured using digital dial calipers.

Sample Height, in.	4.93	**Unconfined Compressive Strength, psi**	**50**
Sample Diameter, in.	2.43		
Height / Diameter	2.03		
Sample Area, in^2	4.62		
Wet Density, pcf	148.7	**Young's Modulus (E) (psi)**	**1,010**
Dry Density, pcf	134.6		
Moisture Content, %	10.5		
Strain Rate, % / min	1.01		



COOPER TESTING LABORATORY

Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D3148)

CTL Job No.:	603-012P	Boring:	B45F-4	Date:	2/5/2009
Client:	Parsons Brinckerhoff	Sample:		By:	PJ
Project Name:	92/280 Retrofit	Depth,ft.:	77-78	Checked:	PJ
Project No.:	04-1A7701				

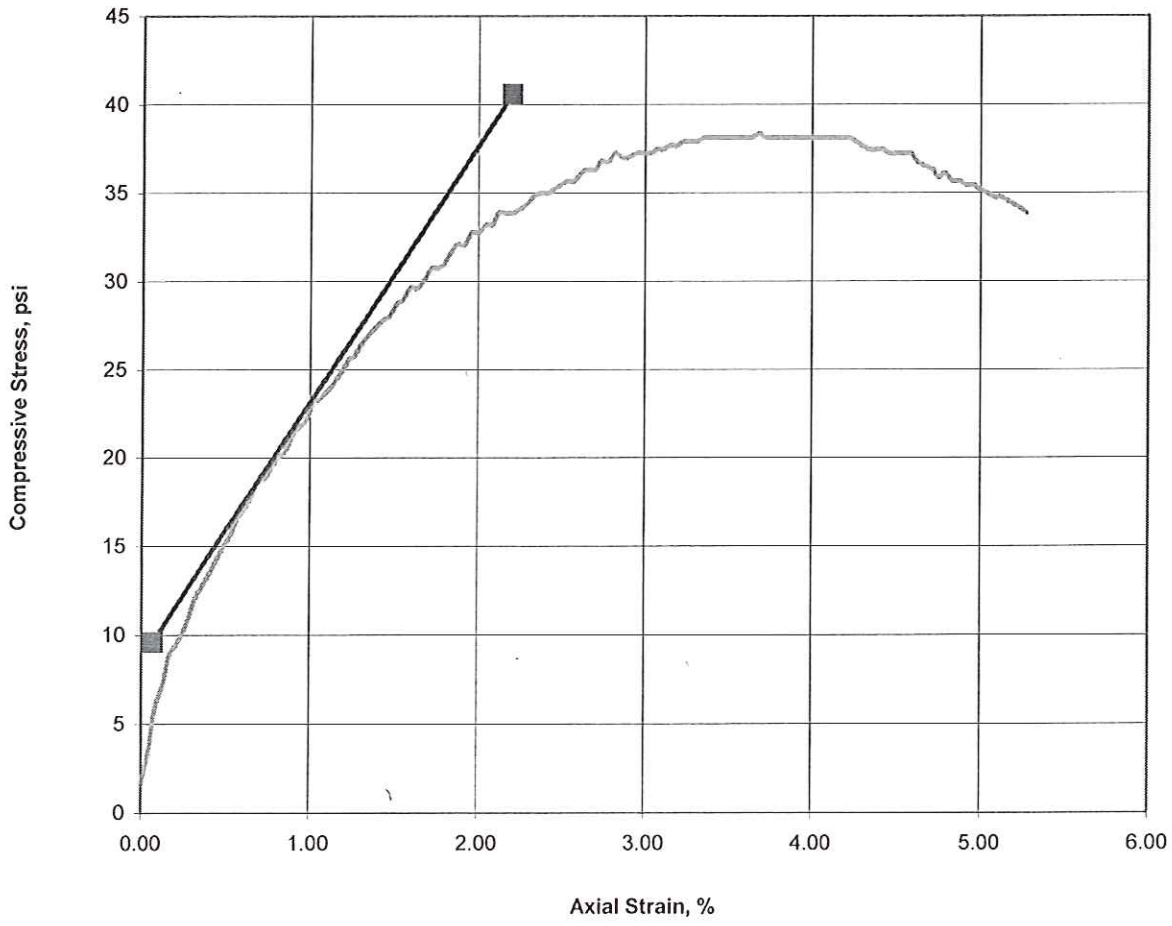
Visual Description: Bluish Gray Sandy CLAY (Weathered Rock)

Moisture Condition at Test: Sample was washed and in a moist state.

Test Temperature, (°C): Ambient

Remarks: Deviation from straightness and parallelism measured using digital dial calipers.

Sample Height, in.	4.93	**Unconfined Compressive Strength, psi**	**38**
Sample Diameter, in.	2.38		
Height / Diameter	2.07		
Sample Area, in^2	4.46		
Wet Density, pcf	149.5	**Young's Modulus (E) (psi)**	**1,460**
Dry Density, pcf	140.7		
Moisture Content, %	6.3		
Strain Rate, % / min	1.01		



COOPER TESTING LABORATORY

Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D3148)

CTL Job No.:	603-012U	Boring:	B45F-5	Date:	2/5/2009
Client:	Parsons Brinckerhoff	Sample:		By:	PJ
Project Name:	92/280 Retrofit	Depth,ft.:	28-29	Checked:	PJ
Project No.:	04-1A7701				

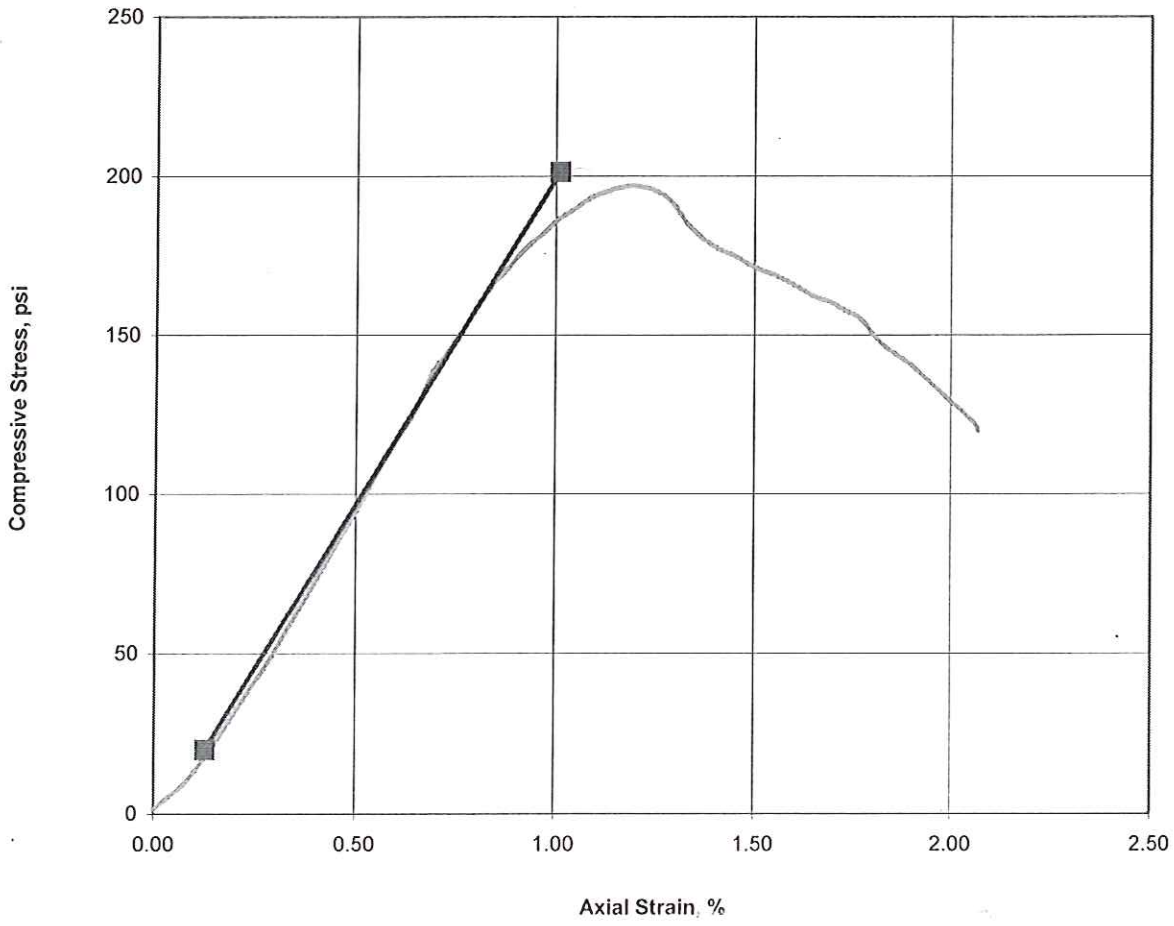
Visual Description: Bluish Gray Sandy CLAY (Weathered Rock)

Moisture Condition at Test: Sample was washed and in a moist state.

Test Temperature, (°C): Ambient

Remarks: Deviation from straightness and parallelism measured using digital dial calipers. Samples were finished by capping the ends with high-strength capping plaster in as thin a layer as practicable.

Sample Height, in.	5.00	**Unconfined Compressive Strength, psi**	**197**
Sample Diameter, in.	2.40		
Height / Diameter	2.08		
Sample Area, in^2	4.54		
Wet Density, pcf	154.0	**Young's Modulus (E) (psi)**	**20,500**
Dry Density, pcf	147.8		
Moisture Content, %	4.2		
Strain Rate, % / min	0.41		



COOPER TESTING LABORATORY

Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D3148)

CTL Job No.:	603-012V	Boring:	B45F-5	Date:	2/5/2009
Client:	Parsons Brinckerhoff	Sample:		By:	PJ
Project Name:	92/280 Retrofit	Depth,ft.:	50-51	Checked:	PJ
Project No.:	04-1A7701				

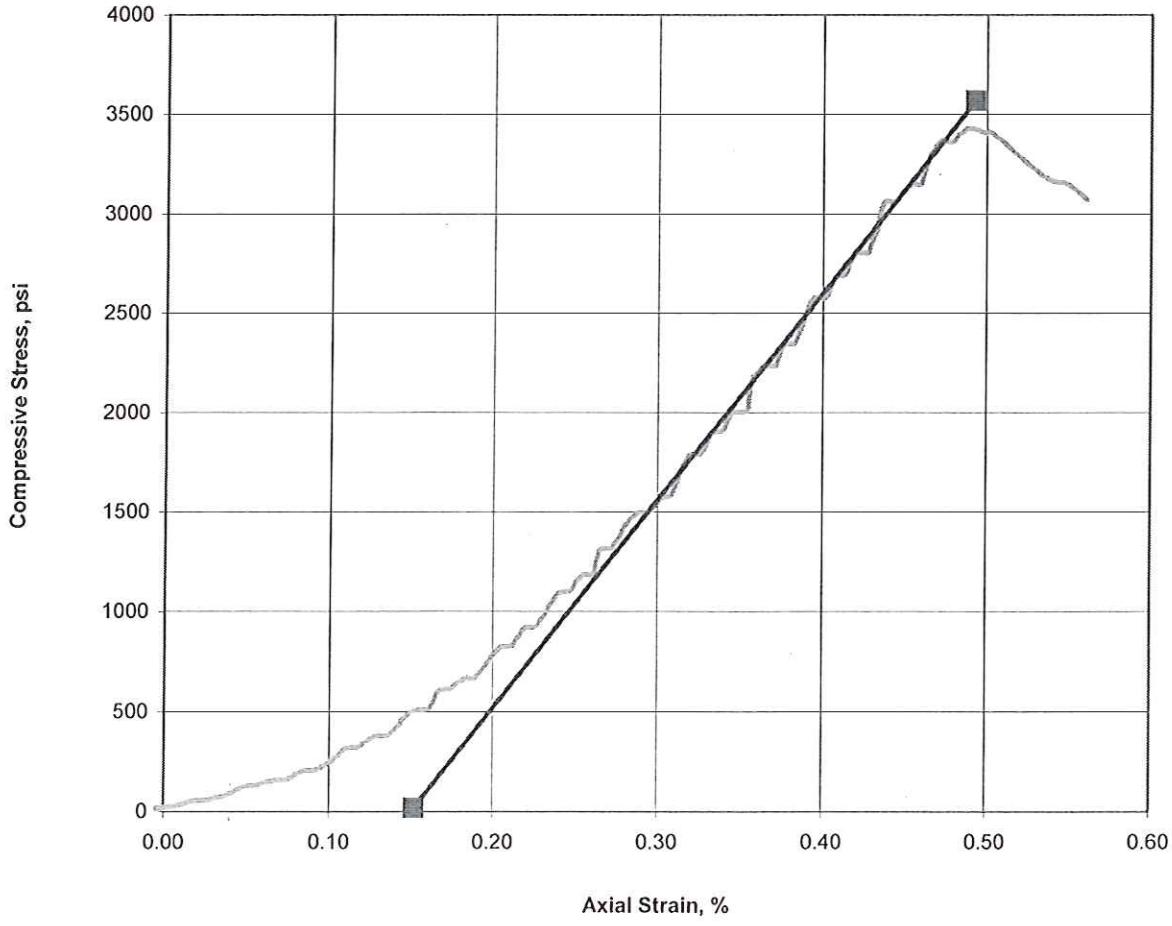
Visual Description: Bluish Gray Rock

Moisture Condition at Test: Sample was washed and in a moist state.

Test Temperature, (°C): Ambient

Remarks: Deviation from straightness and parallelism measured using digital dial calipers. Samples were finished by capping the ends with high-strength capping plaster in as thin a layer as practicable.

Sample Height, in.	4.97	**Unconfined Compressive Strength, psi**	**3429**
Sample Diameter, in.	2.40		
Height / Diameter	2.07		
Sample Area, in^2	4.51		
Wet Density, pcf	165.1	**Young's Modulus (E) (psi)**	**1,041,000**
Dry Density, pcf	162.4		
Moisture Content, %	1.7		
Strain Rate, % / min	0.22		



COOPER TESTING LABORATORY

Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D3148)

CTL Job No.:	603-012W	Boring:	B45F-5	Date:	2/5/2009
Client:	Parsons Brinckerhoff	Sample:		By:	PJ
Project Name:	92/280 Retrofit	Depth,ft.:	85-86	Checked:	PJ
Project No.:	04-1A7701				

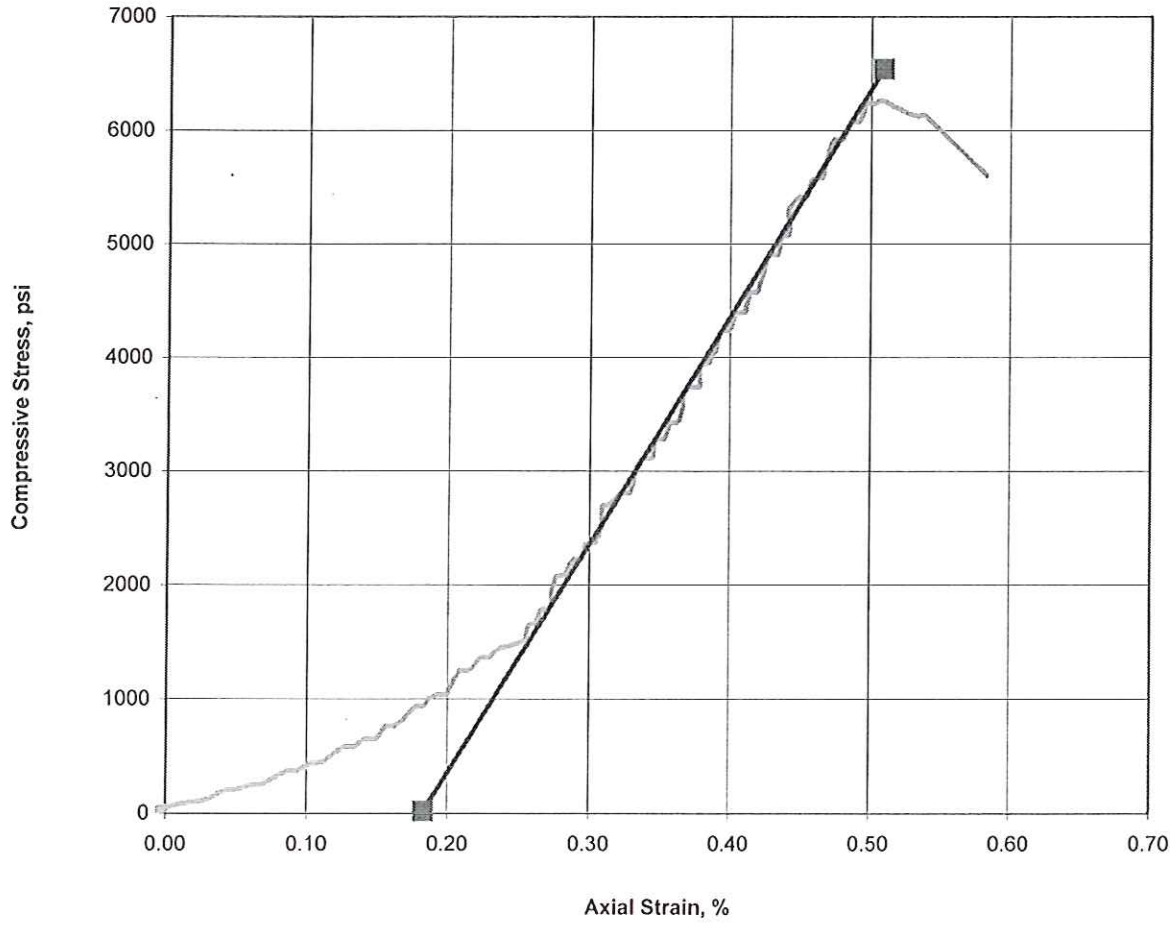
Visual Description: Bluish Gray Rock

Moisture Condition at Test: Sample was washed and in a moist state.

Test Temperature, (°C): Ambient

Remarks: Sample failed explosively. Deviation from straightness and parallelism measured using digital dial calipers. Samples were finished by capping the ends with high-strength capping plaster in as thin a layer as practicable.

Sample Height, in.	4.95	**Unconfined Compressive Strength, psi**	**6262**
Sample Diameter, in.	2.39		
Height / Diameter	2.08		
Sample Area, in^2	4.48		
Wet Density, pcf	164.2	**Young's Modulus (E) (psi)**	**2,000,000**
Dry Density, pcf	161.8		
Moisture Content, %	1.5		
Strain Rate, % / min	0.22		



COOPER TESTING LABORATORY

Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D3148)

CTL Job No.:	603-012Q	Boring:	B45F-6	Date:	2/5/2009
Client:	Parsons Brinckerhoff	Sample:		By:	PJ
Project Name:	92/280 Retrofit	Depth,ft.:	17.5-20	Checked:	PJ
Project No.:	04-1A7701				

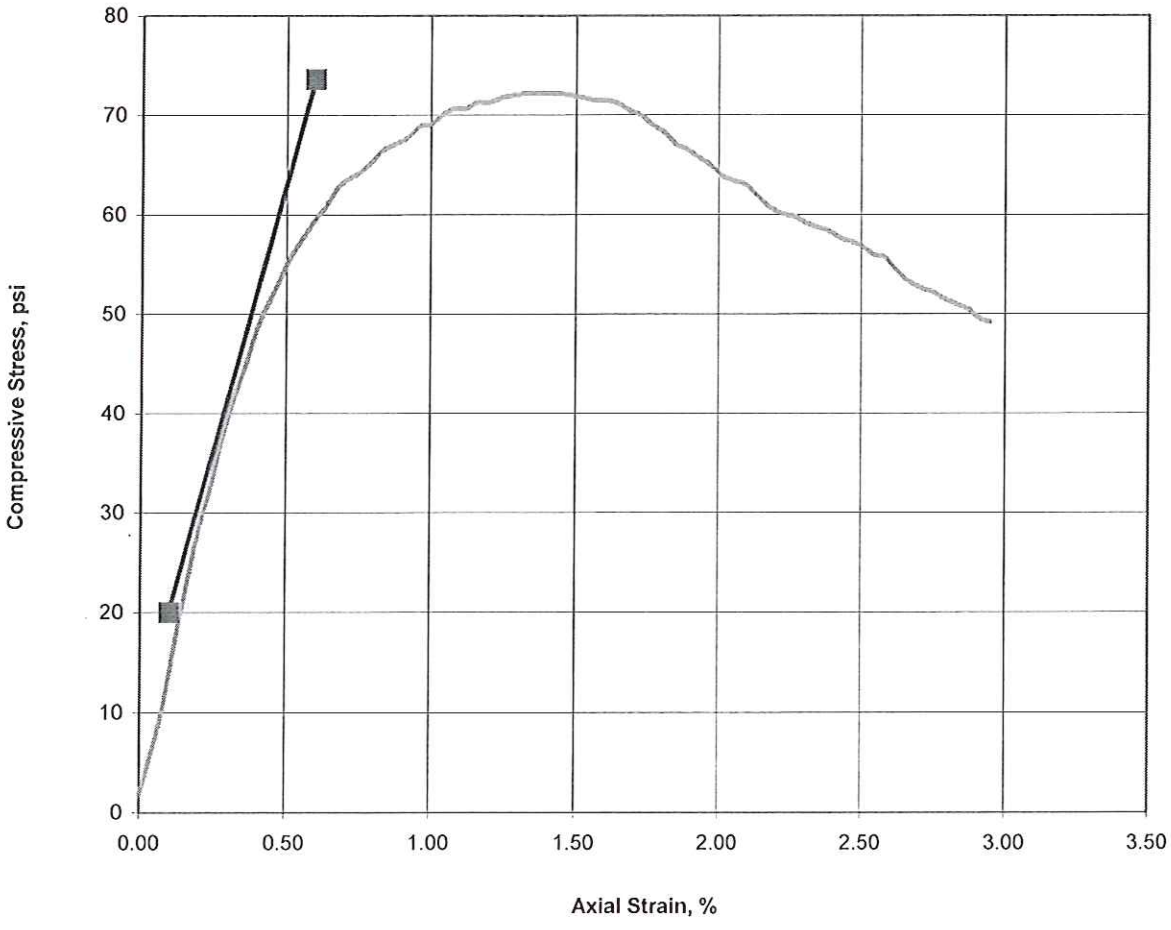
Visual Description: Bluish Gray Rock

Moisture Condition at Test: Sample was washed and in a moist state.

Test Temperature, (°C): Ambient

Remarks: Deviation from straightness and parallelism measured using digital dial calipers. Samples were finished by capping the ends with high-strength capping plaster in as thin a layer as practicable.

Sample Height, in.	5.00	**Unconfined Compressive Strength, psi**	**72**
Sample Diameter, in.	2.41		
Height / Diameter	2.08		
Sample Area, in^2	4.56		
Wet Density, pcf	133.1	**Young's Modulus (E) (psi)**	**10,720**
Dry Density, pcf	115.4		
Moisture Content, %	15.3		
Strain Rate, % / min	0.97		



COOPER TESTING LABORATORY

Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D3148)

CTL Job No.:	603-012R	Boring:	B45F-6	Date:	2/5/2009
Client:	Parsons Brinckerhoff	Sample:		By:	PJ
Project Name:	92/280 Retrofit	Depth,ft.:	52.5-55	Checked:	PJ
Project No.:	04-1A7701				

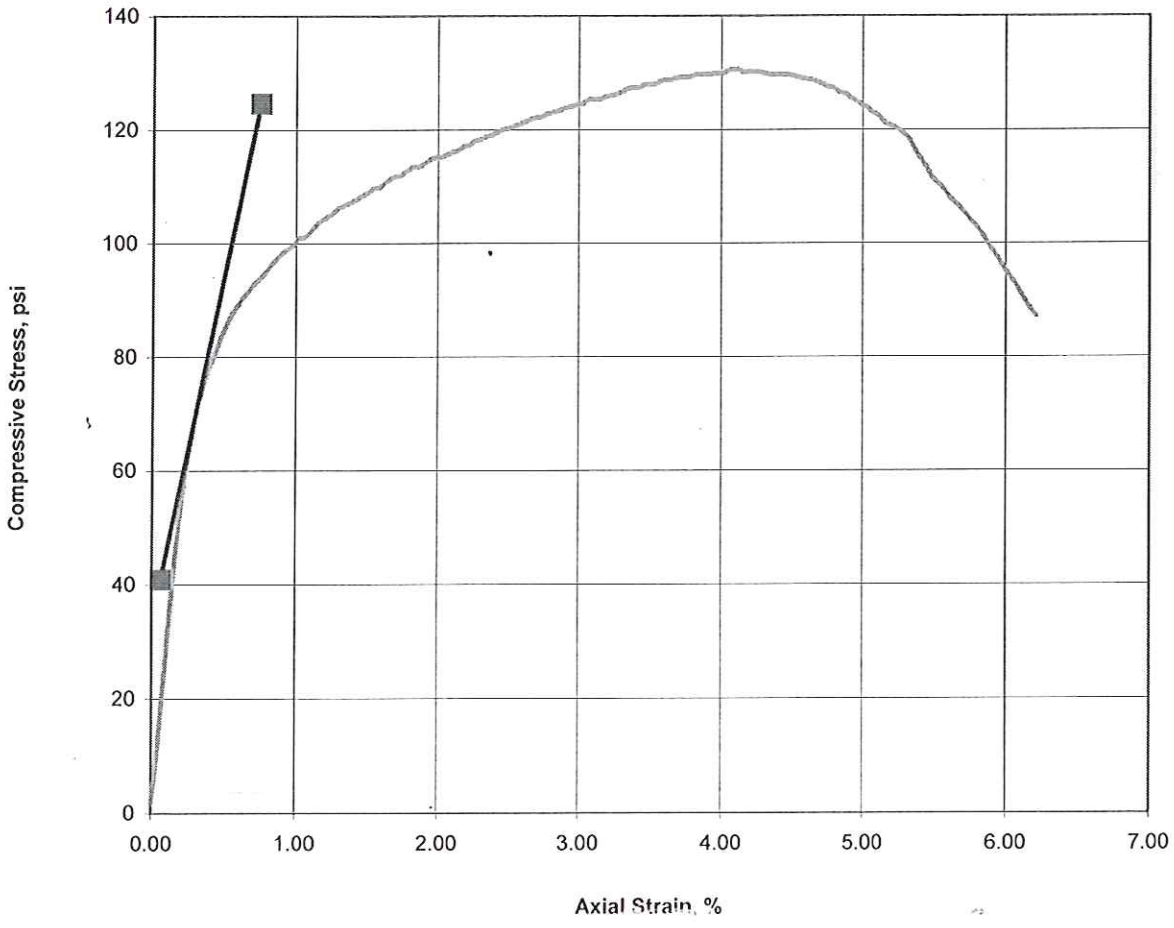
Visual Description: Bluish Gray Rock

Moisture Condition at Test: Sample was washed and in a moist state.

Test Temperature, (°C): Ambient

Remarks: Deviation from straightness and parallelism measured using digital dial calipers. Samples were finished by capping the ends with high-strength capping plaster in as thin a layer as practicable.

Sample Height, in.	5.00	**Unconfined Compressive Strength, psi**	**131**
Sample Diameter, in.	2.30		
Height / Diameter	2.17		
Sample Area, in^2	4.15		
Wet Density, pcf	138.7	**Young's Modulus (E) (psi)**	**12,130**
Dry Density, pcf	121.5		
Moisture Content, %	14.2		
Strain Rate, % / min	0.43		



COOPER TESTING LABORATORY

Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D3148)

CTL Job No.:	603-012S	Boring:	B45F-6	Date:	2/5/2009
Client:	Parsons Brinckerhoff	Sample:		By:	PJ
Project Name:	92/280 Retrofit	Depth,ft.:	88-88.5	Checked:	PJ
Project No.:	04-1A7701				

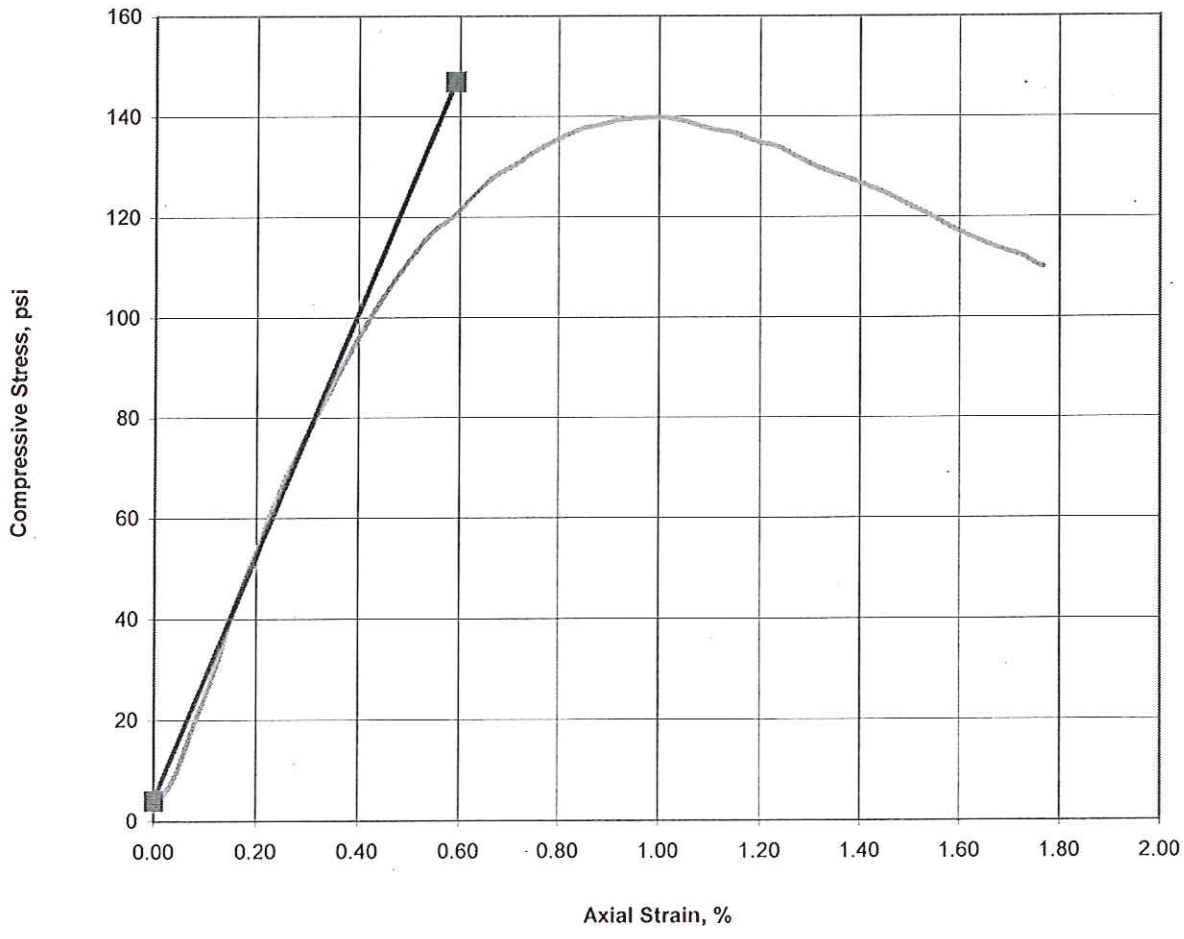
Visual Description: Greenish Gray Rock

Moisture Condition at Test: Sample was washed and in a moist state.

Test Temperature, (°C): Ambient

Remarks: The sample contained significant voids on the sides. Deviation from straightness and parallelism measured using digital dial calipers. Samples were finished by capping the ends with high-strength capping plaster in as thin a layer as practicable.

Sample Height, in.	4.62	**Unconfined Compressive Strength, psi**	**140**
Sample Diameter, in.	2.39		
Height / Diameter	1.93		
Sample Area, in^2	4.48		
Wet Density, pcf	141.1	**Young's Modulus (E) (psi)**	**24,100**
Dry Density, pcf	132.9		
Moisture Content, %	6.2		
Strain Rate, % / min	0.47		



COOPER TESTING LABORATORY

Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D3148)

CTL Job No.:	603-012T	Boring:	B45F-6	Date:	2/5/2009
Client:	Parsons Brinckerhoff	Sample:		By:	PJ
Project Name:	92/280 Retrofit	Depth,ft.:	93-93.5	Checked:	PJ
Project No.:	04-1A7701				

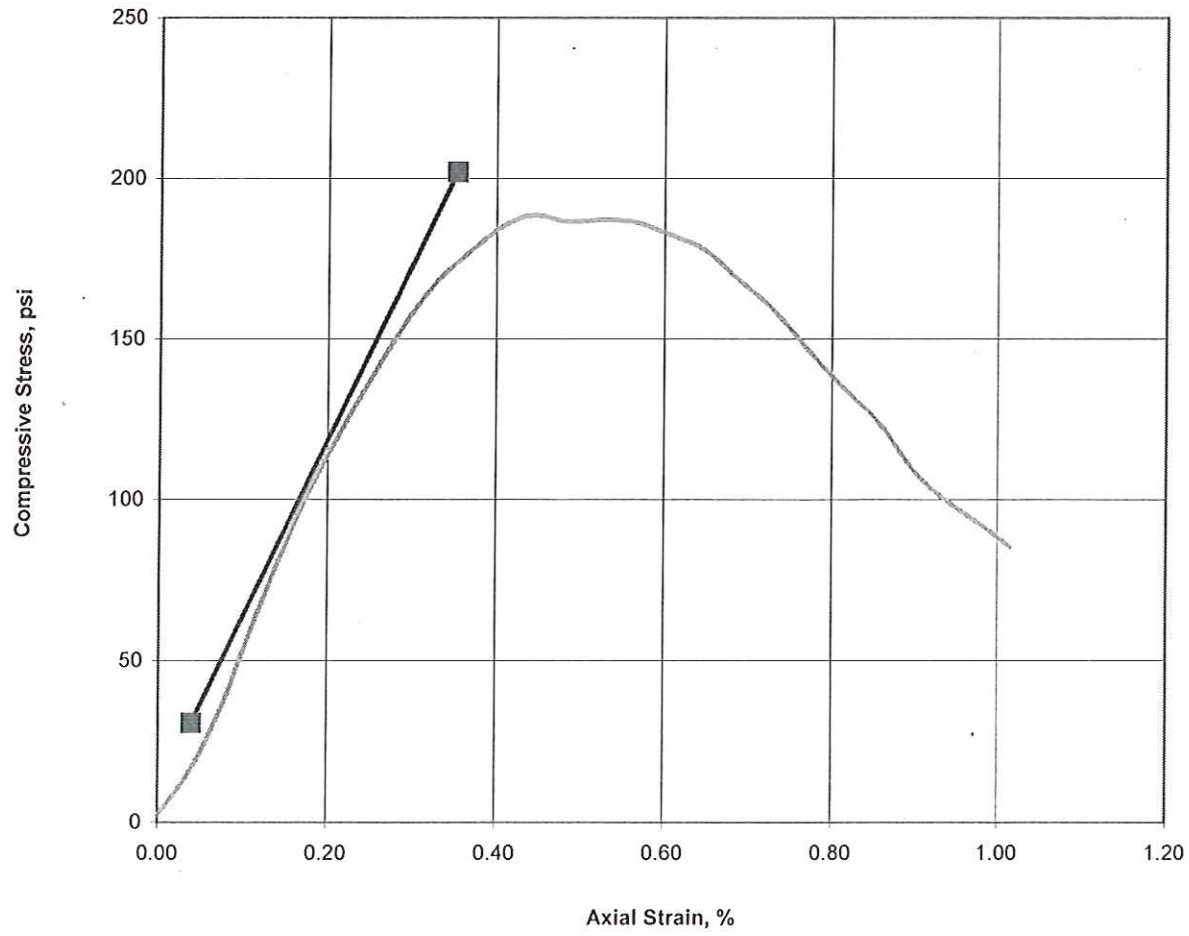
Visual Description: Bluish Gray Rock

Moisture Condition at Test: Sample was washed and in a moist state.

Test Temperature, (°C): Ambient

Remarks: The sample contained significant voids on the sides. Deviation from straightness and parallelism measured using digital dial calipers. Samples were finished by capping the ends with high-strength capping plaster in as thin a layer as practicable.

Sample Height, in.	5.00	**Unconfined Compressive Strength, psi**	**189**
Sample Diameter, in.	2.40		
Height / Diameter	2.09		
Sample Area, in^2	4.51		
Wet Density, pcf	0.0	**Young's Modulus (E) (psi)**	**54,700**
Dry Density, pcf	0.0		
Moisture Content, %	3.3		
Strain Rate, % / min	0.46		



TEST NO. 6-779-3P

DATE RECEIVED JAN 16 2009

CALC. BY _____ APPROVED BY _____

DATE REPORTED FEB 17 2009

BILLED

☐ DISTRICT DIRECTOR ☐ TRANS. LAB
☐ DIS. MAT LS. ENGR ☐ PAV'T. SECT
☐ RESIDENT ENGINEER ☐ ACCOUNTING
☐ CONSTRUCTION ☐

GRADING ANALYSIS

SIEVE	AS RECEIVED	RET. CR.	ADJ. OR COMB. GRADE	AS USED	SPECIF. LIMITS SOUGHT ☐
3					
2½					
2					
1½					
1					
¾					
½					
⅜					
4					
8					
16					
30					
50					
100					
200					
5μ					
1μ					

GRADING AS USED WAS OBTAINED AS FOLLOWS:

% BY WT.	% BY VOL.	TEST NO.	DESCRIPTION

Resistivity = 1353

REMARKS PH = 7.9

SURFACE

BASE

SUBBASE

GRAVEL EQUIVALENT FACTOR

TRAFFIC INDEX

R VALUE
- EXUDATION PRESSURE
- EXPANSION PRESSURE
- AT EQUILIBRUM SPEC.

INDICATED MINIMUM THICKNESS OF COVER FOR ABOVE CONDITIONS (FEET)

REPORT OF TESTS ON

SOIL

IF CONTRACT, USE CONTRACT ITEM

SOURCE	CHARGE	EXPENDITURE AUTHORIZATION

SPECIAL DESIGNATION (USE WHEN APPLICABLE)	ACTIVITY OR OBJECT	AMOUNT

TEST SPECIMEN	A	B	C	D	
DATE TESTED					
COMPACTOR FOOT PRESSURE P.S.I.					
INITIAL MOISTURE %					
SOAK WATER ML					
WATER ADDED-ML (TOTAL)					
WATER ADDED %					
MOISTURE AT COMPACTION %					
WET WT. OF BRIQUETTE-GMS					
HEIGHT OF BRIQUETTE-INCHES					
DRY DENSITY OF BRIQ. - 4 CU. FT.					
STABILOMETER P_H AT 2000 LBS.					
DISPLACEMENT					
R-VALUE BY STABILOMETER					
EXUDATION PRES. P.S.I.					
THICK. BY STAB. FEET					
EXPANSION DIAL READING					
THICK. BY EXP. PRESS. FEET					
R-VALUE BY EXPANSION					

TEST RESULTS		SPEC.
LL P.L P.I.		
CV		
SIEVE	AS REC'D	
	CRUSHED	
	COMBINED	
LART GRADE	100 REV.	
	500 REV.	
DUR D_f		
D_i		
% CRUSHED PARTICLES		

SP. GR. ☐ BULK (OVEN D ☐ BULK (SSD) ☐ APPARENT

	FINE	COAI
AS REC'D.		
CRUSHED		

REL. COMPACTION DA

	IN PLACE	OPTIM
DENSITY		
MOISTURE		
% REL. COMP		
SPEC.		

-TL-361 (Rev. 10/78)

TL-101 (REV. 8-76) STATE OF CALIFORNIA SAMPLE IDENTIFICATION NO.

DEPARTMENT OF TRANSPORTATION C

☐ PRELIMINARY TESTS
☐ PROCESS TESTS
☐ ACCEPTANCE TESTS
INDEPENDENT ASSURANCE TESTS
☐ DIST. LAB
☐ TRANS. LAB
☐ SPECIAL TESTS

Sample Sent To
☐ HDQTRS. LAB
☐ BRANCH LAB
☐ DIST. LAB
SHIPMENT NO.
AUTHORIZATION NO.

FIELD NO.
DIST. LAB NO.
LOT NO.
P. O. OR REQ. NO.

JAN 16 2009

6779-3P

SAMPLE OF NATIVE SOIL

FOR USE IN EA 1A1701 I-240 PM

SAMPLE FROM 92/280 IC

DEPTH 5-10'

LOCATION OF SOURCE B45F-4

THIS SAMPLE IS SHIPPED IN _____ (NO. CONTAINERS) AND IS ONE OF A GROUP OF _____ SAMPLES REPRESENTING _____ (TONS, GALS., BBLS., STA., ETC.)

OWNER OR MANUFACTURER

TOTAL QUANTITY AVAILABLE _____ TEST RESULTS DESIRED _____ ☐ NORMAL ☐ PRIORITY DATE NEEDED _____

REMARKS CORROSION

COVER ADDITIONAL INFORMATION WITH LETTER

DATE SAMPLED _____

BY _____ TITLE _____

DIST., CO., RTE., P.M. 04-SM-280 PM 10.8

LIMITS _____

CONT. NO. _____

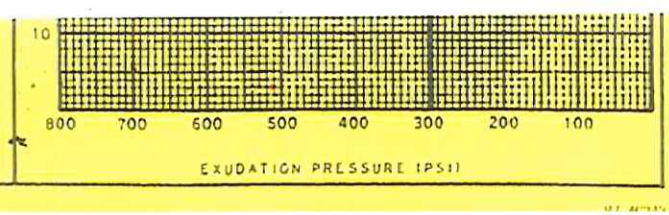
FED. NO. _____

RES. ENGR. OR SUPT. CHRIS RISDEN

ADDRESS _____

CONTRACTOR (510) 622-8757

DISTRICT OFFICE



6779-4P

BILLED

JAN 16 2009

CALC. BY _____ APPROVED BY _____

DATE REPORTED FEB 17 2009

☐ DISTRICT DIR. OR ☐ TRANS. LA
☐ DIS. MAT LS. OR ☐ PAV'T. SEC
☐ RESIDENT ENGINEER ☐ ACCOUNTIN
☐ CONSTRUCTION ☐

GRADING ANALYSIS

SIEVE	AS RECEIVED	RET. CR.	ADJ. OR COMB. GRADE	AS USED	SPECIF. LIMITS ☐ SOUGHT ☐
3					
2½					
2					
1½					
1					
¾					
½					
⅜					
4					
8					
16					
30					
50					
100					
200					
5μ					
1μ					

GRADING AS USED WAS OBTAINED AS FOLLOWS:

% BY WT.	% BY VOL.	TEST NO.	DESCRIPTION
Resistivity = 2057			

REMARKS PH = 8.5

SURFACE

BASE

SUBBASE

GRAVEL EQUIVALENT FACTOR

TRAFFIC INDEX

R VALUE: EXUDATION PRESSURE / EXPANSION PRESSURE / AT EQUILIBRUM SPEC.

INDICATED MINIMUM THICKNESS OF COVER FOR ABOVE CONDITIONS (FEET)

REPORT OF TESTS ON

SOIL

IF CONTRACT, USE CONTRACT ITEM

SOURCE	CHARGE	EXPENDITURE AUTHORIZATION

SPECIAL DESIGNATION (USE WHEN APPLICABLE)	ACTIVITY OR OBJECT	AMOUNT

TEST SPECIMEN	A	B	C	D
DATE TESTED				
COMPACTOR FOOT PRESSURE P.S.I.				
INITIAL MOISTURE %				
SOAK WATER ML				
WATER ADDED-ML (TOTAL)				
WATER ADDED %				
MOISTURE AT COMPACTION %				
WET WT. OF BRIQUETTE-GMS				
HEIGHT OF BRIQUETTE-INCHES				
DRY DENSITY OF BRIQ. - # CU. FT.				
STABILOMETER P_H AT 2000 LBS.				
DISPLACEMENT				
R-VALUE BY STABILOMETER				
EXUDATION PRES. P.S.I.				
THICK. BY STAB FEET				
EXPANSION DIAL READING				
THICK. BY EXP. PRESS. FEET				
R-VALUE BY EXPANSION				

TEST RESULTS		SPEC.
LL P.L P.I.		
CV		
S.E.	AS REC'D	
	CRUSHED	
	COMBINED	
LART	GRADE 100 REV.	
	500 REV.	
DUR	D_f	
	D_c	
% CRUSHED PARTICLES		

SP. GR. ☐ BULK (OVEN) ☐ BULK (SSD) ☐ APPARENT

	FINE	C
AS REC'D.		
CRUSHED		

REL. COMPACTION D

	IN PLACE	OPT
DENSITY		
MOISTURE		
% REL. COMP.		
SPEC.		

TL-101 (REV. 8-76) (2) SAMPLE CERTIFICATION NO.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

☐ PRELIMINARY TESTS
☐ PROCESS TESTS
☐ ACCEPTANCE TESTS
INDEPENDENT ASSURANCE TESTS
☐ DIST. LAB
☐ TRANS. LAB
☐ SPECIAL TESTS

SAMPLE SENT TO
☐ HDQTRS. LAB
☐ BRANCH LAB
☐ DIST. LAB

FIELD NO. _____
DIST. LAB NO. _____
LOT NO. _____
SHIPMENT NO. _____
P. O. OR REQ. NO. _____
AUTHORIZATION NO. _____

6779-4P

JAN 16 2009

SAMPLE OF NATIVE SOIL

FOR USE IN EA 1A7701 1-240 P80

SAMPLE FROM 92/280 IC

DEPTH

LOCATION OF SOURCE 0-10' B4SF-5

THIS SAMPLE IS SHIPPED IN _____ (NO. CONTAINERS) AND IS ONE OF A GROUP OF _____ SAMPLES REPRESENTING _____ (TONS, GALS., BBLS., STA., ETC.)

OWNER OR MANUFACTURER _____

TOTAL QUANTITY AVAILABLE _____ TEST RESULTS DESIRED ☑ NORMAL ☐ PRIORITY DATE NEEDED _____

REMARKS CORROSION

COVER ADDITIONAL INFORMATION WITH LETTER

DATE SAMPLED _____

BY _____ TITLE _____

DIST., CO., RTE., P.M. SM 04-280 PM 10-8

LIMITS _____

CONT. NO. _____

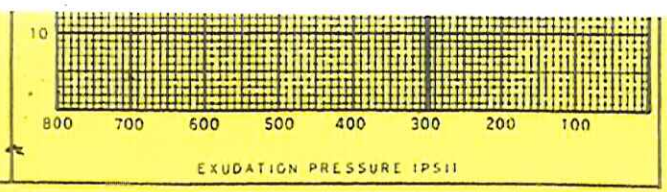
FED. NO. _____

RES. ENGR. OR SUPT. CHRIS RISPEN

ADDRESS _____

CONTRACTOR (510) 622-8757

DISTRICT OFFICE



-TL-361 (Rev. 10/78)

APPENDIX C

SEISMIC STUDY

State of California
DEPARTMENT OF TRANSPORTATION

Business, Transportation and Housing Agency

Memorandum

Flex your power!
Be energy efficient!

To: MR. GORDON DANKE
Branch Chief
Design Branch 9
Office of Bridge Design - West
Division of Engineering Services

Attention: Mr. Phil Lutz

Date: May 19, 2009

File: 04-SM-280-PM 10.2
04-1A7701
S280-E92 Conn. OC
Bridge No. 35-0245F

From: HOSSAIN SALIMI
Senior Materials and Research Engineer
Division of Engineering Services
Geotechnical Services - MS 5
Office of Geotechnical Design – West

Subject: Final Seismic Design Recommendations

This memorandum is in response to your request dated February May 5, 2009, and presents the final seismic design recommendations for the seismic retrofit of the existing 8-span S280-E92 Connector Overcrossing (Bridge No. 35-0245 and previously referred to as Eastbound Connector OC) on Route 280 in San Mateo County. It should be noted that the preliminary seismic design recommendations (PSDR) were submitted to you in a report dated June 25, 2007.

The existing structure was built in the early seventies, and consists of 9 supports (abutments 1, bents 2 thru 8, and abutment 9). The foundations for the bents consist of single large diameter Cast-in-Drilled-Hole (CIDH) pile extensions six or eight foot in diameter.

The 2007 PSDR report was based on the 1996 Caltrans Seismic Hazard Map. However, Caltrans has updated the map to the 2008 California Seismic Hazard Map (CSHM), which is based on the latest United States Geological Survey (USGS) and California Geological Survey (CGS) maps. The new map shows the San Andreas Fault zone (Strike-slip) with a maximum moment magnitude, Mmax=7.9 located less than a kilometer southwest of the site.

Based on the deterministic Seismic Hazard Analysis and using the Next Generation Attenuation Relationship equations incorporated into the CSHM, the peak bedrock acceleration is approximately 0.6g. However, the Probabilistic Seismic Hazard Analysis based on a 975-year return period (5% probability of exceedance in 50 years) yields a

higher response spectrum and is governing. There are no known faults projecting towards or passing directly through the project site. Therefore, the potential for surface rupture at the site due to fault movement is considered low.

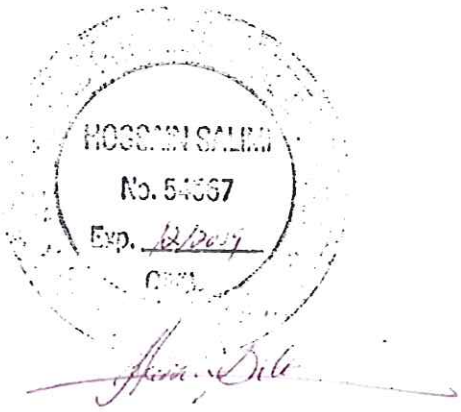
The Acceleration Response Spectrum (ARS) was generated for the bridge. However, due to the proximity of the site to the fault, the ARS curve has been modified. The modifications are such that there is no increase in spectral acceleration in periods less than 0.5 seconds and a 20% increase for periods greater than one second. A linear interpolation was used between 0.5 and one second. The preliminary ARS curve is shown in Figure 1.

All other recommendations as outlined in the aforementioned SPDR are still valid and considered final.

If there are any questions, please contact Hossain Salimi at (916) 227-7147.

Attachment

c: TPokrywka (OGD-W)
MMacaranes (OGD-W)
TNguyen (OGD-W)
Project file



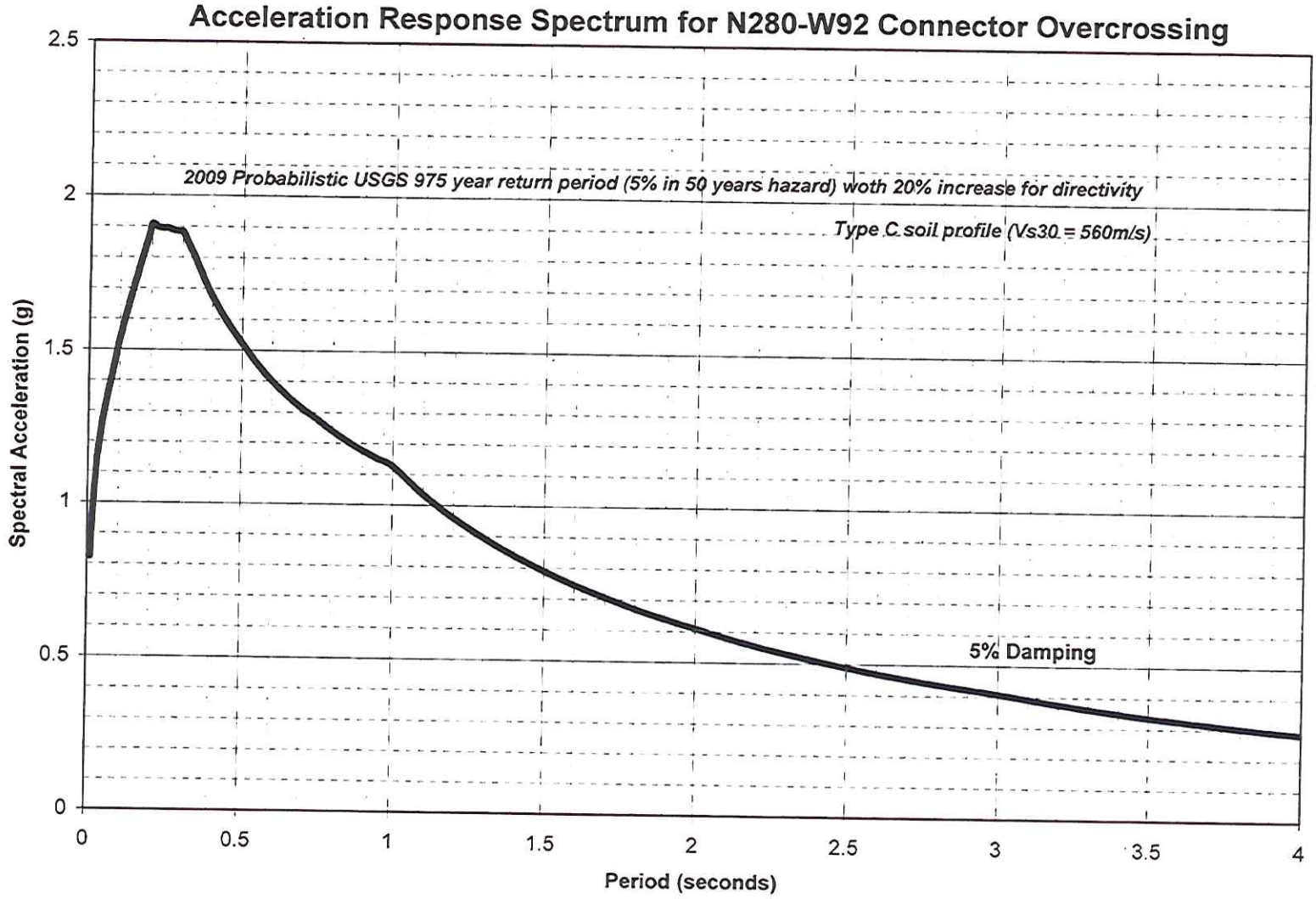

Acceleration Response Spectrum for N280-W92 Connector Overcrossing
2009 Probabilistic USGS 975 year return period (5% in 50 years hazard) woth 20% increase for directivity
Type C soil profile (Vs30 = 560m/s)
5% Damping
Spectral Acceleration (g)
Period (seconds)
2.5
2
1.5
1
0.5
0
0
0.5
1
1.5
2
2.5
3
3.5
4

Figure 1

APPENDIX D

SOIL/ROCK PROFILES

Bridge 35-0245F, Bent 4

NUMBER OF LAYERS = 9

WATER TABLE DEPTH = 10.0 FT.

SOIL INFORMATION

LAYER NO 1----CLAY

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA	= 0.550E+00
END BEARING COEFFICIENT-Nc	= 0.600E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.125E+04
INTERNAL FRICTION ANGLE, DEG.	= 0.000E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.120E+03
DEPTH, FT	= 0.000E+00

AT THE BOTTOM

DEPTH, FT	= 0.700E+01

LAYER NO 2----CLAY

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA	= 0.550E+00
END BEARING COEFFICIENT-Nc	= 0.768E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.125E+04
INTERNAL FRICTION ANGLE, DEG.	= 0.000E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.125E+03
DEPTH, FT	= 0.700E+01

AT THE BOTTOM

DEPTH, FT	= 0.160E+02

LAYER NO 3----CLAY

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA	= 0.550E+00

END BEARING COEFFICIENT-Nc = 0.900E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT = 0.150E+04
INTERNAL FRICTION ANGLE, DEG. = 0.000E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST = 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT = 0.125E+03
DEPTH, FT = 0.160E+02

AT THE BOTTOM

DEPTH, FT = 0.270E+02

LAYER NO 4----SAND

AT THE TOP

SKIN FRICTION COEFFICIENT- BETA = 0.736E+00
UNDRAINED SHEAR STRENGTH, LB/SQ FT = 0.000E+00
INTERNAL FRICTION ANGLE, DEG. = 0.310E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST = 0.160E+02
SOIL UNIT WEIGHT, LB/CU FT = 0.135E+03
DEPTH, FT = 0.270E+02

AT THE BOTTOM

DEPTH, FT = 0.370E+02

LAYER NO 5----CLAY

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA = 0.518E+00
END BEARING COEFFICIENT-Nc = 0.900E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT = 0.385E+04
INTERNAL FRICTION ANGLE, DEG. = 0.000E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST = 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT = 0.125E+03
DEPTH, FT = 0.370E+02

AT THE BOTTOM

DEPTH, FT = 0.450E+02

LAYER NO 6----GRAVEL

AT THE TOP

ELASTIC MODULUS OF GRAVEL, LB/SQ IN = 0.000E+00
POISSION RATIO OF GRAVEL = 0.400E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST = 0.100E+03
SOIL UNIT WEIGHT, LB/CU FT = 0.125E+03
DEPTH, FT = 0.450E+02

AT THE BOTTOM

DEPTH, FT = 0.495E+02

LAYER NO 7----CLAY

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA	= 0.530E+00
END BEARING COEFFICIENT-Nc	= 0.900E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.360E+04
INTERNAL FRICTION ANGLE, DEG.	= 0.000E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.145E+03
DEPTH, FT	= 0.495E+02

AT THE BOTTOM

DEPTH, FT = 0.600E+02

LAYER NO 8----GRAVEL

AT THE TOP

ELASTIC MODULUS OF GRAVEL, LB/SQ IN	= 0.000E+00
POISSION RATIO OF GRAVEL	= 0.400E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.100E+03
SOIL UNIT WEIGHT, LB/CU FT	= 0.145E+03
DEPTH, FT	= 0.600E+02

AT THE BOTTOM

DEPTH, FT = 0.750E+02

LAYER NO 9----GRAVEL

AT THE TOP

ELASTIC MODULUS OF GRAVEL, LB/SQ IN	= 0.000E+00
POISSION RATIO OF GRAVEL	= 0.400E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.610E+02
SOIL UNIT WEIGHT, LB/CU FT	= 0.145E+03
DEPTH, FT	= 0.750E+02

AT THE BOTTOM

DEPTH, FT = 0.104E+03

Bridge 35-0245F, Bent 5

NUMBER OF LAYERS = 6

WATER TABLE DEPTH = 11.0 FT.

SOIL INFORMATION

LAYER NO 1----CLAY

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA	= 0.450E+00
END BEARING COEFFICIENT-Nc	= 0.600E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.500E+04
INTERNAL FRICTION ANGLE, DEG.	= 0.000E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.120E+03
DEPTH, FT	= 0.000E+00

AT THE BOTTOM

DEPTH, FT	= 0.600E+01

LAYER NO 2----SAND

AT THE TOP

SKIN FRICTION COEFFICIENT- BETA	= 0.111E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.000E+00
INTERNAL FRICTION ANGLE, DEG.	= 0.330E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.125E+03
DEPTH, FT	= 0.600E+01

AT THE BOTTOM

DEPTH, FT	= 0.110E+02

LAYER NO 3----CLAY

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA	= 0.535E+00
END BEARING COEFFICIENT-Nc	= 0.864E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.350E+04

INTERNAL FRICTION ANGLE, DEG. = 0.000E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST = 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT = 0.125E+03
DEPTH, FT = 0.110E+02

AT THE BOTTOM

DEPTH, FT = 0.200E+02

LAYER NO 4----CLAY SHALE

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA = 0.500E+00
END BEARING COEFFICIENT-Nc = 0.700E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT = 0.140E+05
INTERNAL FRICTION ANGLE, DEG. = 0.000E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST = 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT = 0.150E+03
DEPTH, FT = 0.200E+02

AT THE BOTTOM

DEPTH, FT = 0.310E+02

LAYER NO 5----GRAVEL

AT THE TOP

ELASTIC MODULUS OF GRAVEL, LB/SQ IN = 0.000E+00
POISSION RATIO OF GRAVEL = 0.400E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST = 0.100E+03
SOIL UNIT WEIGHT, LB/CU FT = 0.145E+03
DEPTH, FT = 0.310E+02

AT THE BOTTOM

DEPTH, FT = 0.500E+02

LAYER NO 6----ROCK

AT THE TOP

DIAMETER OF SOCKET, FT = 0.500E+01
SPACING OF DISCONTINUITIES,FT = 0.500E+01
THICKNESS OF INDIVIDUAL DISCONTINUITIES,FT = 0.100E-03
UNIAXIAL COMPRESSION STRENGTH OF ROCK,LB/SQ FT = 0.500E+06
UNIAXIAL COMPRESSION STRENGTH OF CONCRETE,LB/SQ FT = 0.575E+06
ELASTIC MODULUS FOR THE INTACT ROCK, LB/SQ IN. = 0.100E+07
ROCK QUALITY DESIGNATION (RQD) % = 0.800E+02
DEPTH, FT = 0.500E+02

AT THE BOTTOM

DEPTH, FT = 0.900E+02

Bridge 35-0245F, Bent 6

NUMBER OF LAYERS = 9

WATER TABLE DEPTH = 8.0 FT.

SOIL INFORMATION

LAYER NO 1----CLAY

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA	= 0.550E+00
END BEARING COEFFICIENT-Nc	= 0.600E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.125E+04
INTERNAL FRICTION ANGLE, DEG.	= 0.000E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.120E+03
DEPTH, FT	= 0.000E+00

AT THE BOTTOM

DEPTH, FT	= 0.600E+01

LAYER NO 2----CLAY

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA	= 0.550E+00
END BEARING COEFFICIENT-Nc	= 0.744E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.200E+04
INTERNAL FRICTION ANGLE, DEG.	= 0.000E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.125E+03
DEPTH, FT	= 0.600E+01

AT THE BOTTOM

DEPTH, FT	= 0.800E+01

LAYER NO 3----CLAY

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA	= 0.550E+00
END BEARING COEFFICIENT-Nc	= 0.792E+01

UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.200E+04
INTERNAL FRICTION ANGLE, DEG.	= 0.000E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.133E+03
DEPTH, FT	= 0.800E+01

AT THE BOTTOM

DEPTH, FT	= 0.300E+02

LAYER NO 4----CLAY

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA	= 0.550E+00
END BEARING COEFFICIENT-Nc	= 0.900E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.300E+04
INTERNAL FRICTION ANGLE, DEG.	= 0.000E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.125E+03
DEPTH, FT	= 0.300E+02

AT THE BOTTOM

DEPTH, FT	= 0.400E+02

LAYER NO 5----CLAY SHALE

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA	= 0.500E+00
END BEARING COEFFICIENT-Nc	= 0.700E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.775E+04
INTERNAL FRICTION ANGLE, DEG.	= 0.000E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.135E+03
DEPTH, FT	= 0.400E+02

AT THE BOTTOM

DEPTH, FT	= 0.600E+02

LAYER NO 6----GRAVEL

AT THE TOP

ELASTIC MODULUS OF GRAVEL, LB/SQ IN	= 0.000E+00
POISSION RATIO OF GRAVEL	= 0.400E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.890E+02
SOIL UNIT WEIGHT, LB/CU FT	= 0.125E+03
DEPTH, FT	= 0.600E+02

AT THE BOTTOM

DEPTH, FT = 0.720E+02

LAYER NO 7----GRAVEL

AT THE TOP

ELASTIC MODULUS OF GRAVEL, LB/SQ IN = 0.000E+00
POISSION RATIO OF GRAVEL = 0.400E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST = 0.500E+02
SOIL UNIT WEIGHT, LB/CU FT = 0.125E+03
DEPTH, FT = 0.720E+02

AT THE BOTTOM

DEPTH, FT = 0.870E+02

LAYER NO 8----CLAY SHALE

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA = 0.500E+00
END BEARING COEFFICIENT-Nc = 0.700E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT = 0.118E+05
INTERNAL FRICTION ANGLE, DEG. = 0.000E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST = 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT = 0.135E+03
DEPTH, FT = 0.870E+02

AT THE BOTTOM

DEPTH, FT = 0.940E+02

LAYER NO 9----ROCK

AT THE TOP

DIAMETER OF SOCKET, FT = 0.500E+01
SPACING OF DISCONTINUITIES,FT = 0.500E+01
THICKNESS OF INDIVIDUAL DISCONTINUITIES,FT = 0.100E-03
UNIAXIAL COMPRESSION STRENGTH OF ROCK,LB/SQ FT = 0.627E+05
UNIAXIAL COMPRESSION STRENGTH OF CONCRETE,LB/SQ FT = 0.575E+06
ELASTIC MODULUS FOR THE INTACT ROCK, LB/SQ IN. = 0.100E+07
ROCK QUALITY DESIGNATION (RQD) % = 0.800E+02
DEPTH, FT = 0.940E+02

AT THE BOTTOM

DEPTH, FT = 0.975E+02

WATER QUALITY INFORMATION HANDOUT

CONTRACT NO. 04-1A7704

04-SM-92/280-PM 10.7

Seismic Restoration

To Contractor

California Department of Transportation
District 4
Water Quality Program
111 Grand Avenue
Oakland, California 94612

Disclaimer

A "Disclaimer" is required specifying that the information provided in the Storm Water Information Handout is just a guideline and is to be used for information purposes only and should not be considered a sole source document to adhere to the requirements of the new National Pollutant Discharge Elimination System (NPDES) Construction General Permit (CGP), Number CAS000002, adopted on September 2, 2009. The contractor is required to provide water quality monitoring, sampling and implement best management practices (BMPs) based on standard industry operations, field conditions and conditions encountered based on the contractor's means and methods. The information in this handout is not to be construed in any way as a waiver of the provisions in the CGP. Bidders and contractors are cautioned to make independent investigations and examinations as they deem necessary to satisfy the conditions encountered in performance of work, with respect to the following: sampling and monitoring locations, distribution of watershed areas for sizing of BMPs, and selection of BMPs in order to conform to the requirement of the contract documents and the CGP.

Project Vicinity

Project Vicinity

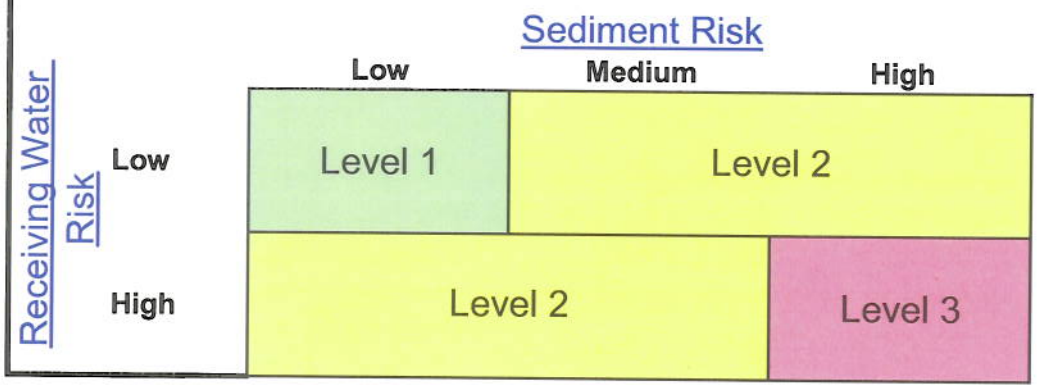
Project Site

Risk Assessment

	A	B	C
1	**Sediment Risk Factor Worksheet**		**Entry**
2	**A) R Factor**		
3	Analyses of data indicated that when factors other than rainfall are held constant, soil loss is directly proportional to a rainfall factor composed of total storm kinetic energy (E) times the maximum 30-min intensity (I30) (Wischmeier and Smith, 1958). The numerical value of R is the average annual sum of EI30 for storm events during a rainfall record of at least 22 years. "Isoerodent" maps were developed based on R values calculated for more than 1000 locations in the Western U.S. Refer to the link below to determine the R factor for the project site.		
4	http://cfpub.epa.gov/npdes/stormwater/LEW/lewCalculator.cfm		
5	**R Factor Value**		9.63
6	**B) K Factor (weighted average, by area, for all site soils)**		
7	The soil-erodibility factor K represents: (1) susceptibility of soil or surface material to erosion, (2) transportability of the sediment, and (3) the amount and rate of runoff given a particular rainfall input, as measured under a standard condition. Fine-textured soils that are high in clay have low K values (about 0.05 to 0.15) because the particles are resistant to detachment. Coarse-textured soils, such as sandy soils, also have low K values (about 0.05 to 0.2) because of high infiltration resulting in low runoff even though these particles are easily detached. Medium-textured soils, such as a silt loam, have moderate K values (about 0.25 to 0.45) because they are moderately susceptible to particle detachment and they produce runoff at moderate rates. Soils having a high silt content are especially susceptible to erosion and have high K values, which can exceed 0.45 and can be as large as 0.65. Silt-size particles are easily detached and tend to crust, producing high rates and large volumes of runoff. Use Site-specific data must be submitted.		
8	Site-specific K factor guidance		
9	**K Factor Value**		0.3
10	**C) LS Factor (weighted average, by area, for all slopes)**		
11	The effect of topography on erosion is accounted for by the LS factor, which combines the effects of a hillslope-length factor, L, and a hillslope-gradient factor, S. Generally speaking, as hillslope length and/or hillslope gradient increase, soil loss increases. As hillslope length increases, total soil loss and soil loss per unit area increase due to the progressive accumulation of runoff in the downslope direction. As the hillslope gradient increases, the velocity and erosivity of runoff increases. Use the LS table located in separate tab of this spreadsheet to determine LS factors. Estimate the weighted LS for the site prior to construction.		
12	LS Table		
13	**LS Factor Value**		2.71
14			
15	**Watershed Erosion Estimate (=RxKxLS) in tons/acre**		7.82919
16	**Site Sediment Risk Factor**		**Low**
17	Low Sediment Risk: < 15 tons/acre		
18	Medium Sediment Risk: >=15 and <75 tons/acre		
19	High Sediment Risk: >= 75 tons/acre		
20			

Receiving Water (RW) Risk Factor Worksheet	Entry	Score
A. Watershed Characteristics	**yes/no**	
A.1. Does the disturbed area discharge (either directly or indirectly) to a **303(d)-listed waterbody impaired by sediment** (For help with impaired waterbodies please check the attached worksheet or visit the link below) or has a **USEPA approved TMDL implementation plan for sediment**?:	no	Low
2006 Approved Sediment-impared WBs Worksheet		
http://www.waterboards.ca.gov/water_issues/programs/tmdl/303d_lists2006_epa.shtml		
OR		
A.2. Does the disturbed area discharge to a waterbody with designated beneficial uses of SPAWN & COLD & MIGRATORY?		
http://www.ice.ucdavis.edu/geowbs/asp/wbquse.asp		

Combined Risk Level Matrix



Project Sediment Risk: Low

Project RW Risk: Low

Project Combined Risk: Level 1

Copy of NOI

Attachment 2

State Water Resources Control Board

NOTICE OF INTENT

TO COMPLY WITH THE TERMS OF THE
GENERAL PERMIT TO DISCHARGE STORM WATER
ASSOCIATED WITH CONSTRUCTION ACTIVITY (WQ ORDER No. 99-08-DWQ)

I. NOI STATUS (SEE INSTRUCTIONS)

MARK ONLY ONE ITEM 1. [X] New Construction 2. [ ] Change of Information for WDID#

II. PROPERTY OWNER

Name	Contact Person		
California Department of Transportation	Gersy Modesto		
Mailing Address	Title		
111 Grand Avenue	Project Manager		
City	State	Zip	Phone
Oakland	CA	94612	(510) 286-7211

Owner Type (*check one*) 1.[ ] Private Individual 2.[ ]Business 3.[ ]Municipal 4.[x]State 5.[ ]Federal 6.[ ]Other

III. DEVELOPER/CONTRACTOR INFORMATION

Developer/Contractor	Contact Person		
Mailing Address	Title		
City	State	Zip	Phone

IV. CONSTRUCTION PROJECT INFORMATION

Site/Project Name	Site Contact Person		
San Mateo 92/280 Interchange			
Physical Address/Location	Latitude	Longitude	County
Intersection of SR 92 and SR 280	37.506%	-122.3%	San Mateo
City (or nearest City)	Zip	Site Phone Number	Emergency Phone Number
San Mateo	94402		

A. Total size of construction site area: 4.1 Acres

B. Total area to be disturbed: 4.1 Acres (% of total 100)

C. Percent of site imperviousness (including rooftops):
Before Construction: 100 %
After Construction: 100 %

D. Tract Number(s): _____, _____

E. Mile Post Marker: 10.7

F. Is the construction site part of a larger common plan of development or sale?
[ ] YES [X] NO

G. Name of plan or development:

H. Construction commencement date: 04/01/2011

I. % of site to be mass graded: _____

J. Projected construction dates:
Complete grading: ____/____/____ Complete project: 12/01/2011

K. Type of Construction (Check all that apply):
1. [ ] Residential 2. [ ] Commercial 3. [ ] Industrial 4. [ ] Reconstruction 5. [X] Transportation
6. [ ] Utility Description: _____ 7. [ ] Other (Please List): _____

V. BILLING INFORMATION

SEND BILL TO:	Name	Contact Person	
[X] OWNER (as in II. above)			
[ ] DEVELOPER (as in III. above)	Mailing Address	Phone/Fax	
[ ] OTHER (enter information at right)	City	State	Zip

VI. REGULATORY STATUS

A. Has a local agency approved a required erosion/sediment control plan? ☒ YES ☐ NO

Does the erosion/sediment control plan address construction activities such as infrastructure and structures? ☒ YES ☐ NO

Name of local agency: California Department of Transportation Phone: (510) 286-5664

B. Is this project or any part thereof, subject to conditions imposed under a CWA Section 404 permit of 401 Water Quality Certification? ☐ YES ☐ No

If yes, provide details: _____

VII. RECEIVING WATER INFORMATION

A. Does the storm water runoff from the construction site discharge to (Check all that apply):

1. ☒ **Indirectly to waters of the U.S.**
2. ☒ **Storm drain system - Enter owner's name:** California Department of Transportation
3. ☐ **Directly to waters of U.S. (e.g. , river, lake, creek, stream, bay, ocean, etc.)**

B. Name of receiving water: (river, lake, creek, stream, bay, ocean): _____

VIII. IMPLEMENTATION OF NPDES PERMIT REQUIREMENTS

A. STORM WATER POLLUTION PREVENTION PLAN (SWPPP) (check one)

☐ A SWPPP has been prepared for this facility and is available for review: Date Prepared: ___/___/___ Date Amended: ___/___/___

☐ A SWPPP will be prepared and ready for review by (enter date): ___/___/___

☒ A tentative schedule has been included in the SWPPP for activities such as grading, street construction, home construction, etc.

B. MONITORING PROGRAM

☐ A monitoring and maintenance schedule has been developed that includes inspection of the construction BMPs before anticipated storm events and after actual storm events and is available for review.

If checked above: A qualified person has been assigned responsibility for pre-storm and post-storm BMP inspections to identify effectiveness and necessary repairs or design changes ☐ YES ☐ NO

Name: _____ Phone: _____

C. PERMIT COMPLIANCE RESPONSIBILITY

A qualified person has been assigned responsibility to ensure full compliance with the Permit, and to implement all elements of the Storm Water Pollution Prevention Plan including:

1. Preparing an annual compliance evaluation ☐ YES ☐ NO

Name: _____ Phone: _____

2. Eliminating all unauthorized discharges ☐ YES ☐ NO

IX. VICINITY MAP AND FEE (must show site location in relation to nearest named streets, intersections, etc.)

Have you included a vicinity map with this submittal? ☐ YES ☐ NO

Have you included payment of the annual fee with this submittal? ☐ YES ☐ NO

X. CERTIFICATIONS

"I certify under penalty of law that this document and all attachments were prepared under my direction and supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine or imprisonment. In addition, I certify that I have read the entire General Permit, including all attachments, and agree to comply with and be bound by all of the provisions, requirements, and prohibitions of the permit, including the development and implementation of a Storm Water Pollution Prevention Plan and a Monitoring Program Plan will be complied with."

Printed Name: _____

Signature: _____ **Date:** _____

Title: _____

Rainfall Data

Rainfall Intensity can be obtained by the following link:

http://www.wrcc.dri.edu/pcpnfreq/nca5y24.gif

Refer to Chapters 800, Highway Drainage Design of Highway Design Manual for information on runoff coefficient and shed map. The weighted runoff coefficient of 0.35 is recommended is recommended for the project area.

NON-STORMWATER INFORMATION PACKAGE

CONTRACT NO. 04-1A7704

04-San Mateo-280-PM 10.7/11.0
Seismic Restoration on 280/92 Interchange Connectors

California Department of Transportation
District 4
Water Quality Program
111 Grand Avenue
Oakland, California 94612

October 2009

TABLE OF CONTENTS

CONTRACT NO. 04-1A7704

1. PROJECT DESCRIPTION

2. CONSTRUCTION ACTIVITIES REQUIRING DEWATERING

3. BMP FOR TREATMENT GROUNDWATER

4. MONITORING, DISPOSAL, AND REUSE OF TREATED GROUNDWATER

ATTACHMENT

A. ESTIMATED GROUNDWATER SEEPAGE RATES IN THE PROJECT AREA

B. DEWATERING LOCATION PLAN

C. LIST OF PUBLICLY OWNED TREATMENT WORKS (POTW) FACILITY

D. SAN MATEO COUNTY-POTW SERVICE AREA

1. **Project Description**

This project proposes to seismically retrofit two connector structures at the 1-280/SR-92 interchanges, Post Mile (PM) SM 280 10.7/11.0 in the San Mateo County. The two connector structures include northbound I-280 to westbound SR-92 connector (Bridge No. 35-0244G) and the southbound I-280 to eastbound SR-92 connector (Bridge No. 35-0245F).

The N280-W92 connector was built in 1974 and carries one land of traffic. It has 10 spans supported on single column bents with pile shaft foundations. The structure type is a combination of reinforced concrete box girder and cast-in-place prestressed girder.

The S280-E92 Connector was built in 1973 and carries two lanes of traffic. It has 8 spans supported on single column bents with pile shaft foundations. The structure type is a combination of reinforced concrete box girder and cast-in-place prestressed girder.

A combination of retrofit methods is proposing including installing column casings, installing hinge extenders, and stiffening the selected columns.

2. **Construction Activities requiring Dewatering**

Ground water will be encountered in the structure excavations while stiffening the selected columns which includes additional CIDH piling and connecting pile cap. The pile diameter varies from 60 to 72 inches, and the piles are to extend approximately 60 to 120 ft below ground surface. The water table in the project area is estimated about 10 ft below the ground surface. The dewatering locations are depicted on the Dewatering Location Plan in Attachment B.

Bridge Name	Stiffened Columns	Number of CIDH Piles
N 280-92 Connector Ramp	Bent 3	8
	Bent 9	8
S280-E92 Connector Ramp	Bent 4	8
	Bent 5	4
	Bent 6	4

3. **BMP for Groundwater Treatment**

The treatment system must be capable of removing sediment and turbidity-producing suspended solids. Primary and secondary treatment may be required, or the design of the treatment system may require combined use of the various treatment components in series to achieve effective treatment. Treatment system must have components to remove sediment and turbidity-producing suspended solids such as:

1. Desilting basins
2. Settling tanks

3. Sediment traps
4. Gravity bag filters
5. Sand media filters
6. Pressurized bag filters
7. Cartridge filters
8. Chemical coagulants including in-line flocculants
9. Temporary holding tanks
10. Any combination of these systems to provide primary and secondary treatment

4. Monitoring, Disposal, and Reuse of Treated Groundwater

Use a flow meter to measure all discharges from dewatering operations.

Provide a method for discharging treated water and include a discharge location. Do not discharge treated water in a way that impacts natural bedding or aquatic life.

Comply with the manufacturer's instructions for all calibrations of the flow meter. Perform calibrations in the presence of the Engineer.

While the active treatment system is operated, perform:

1. Flow rate monitoring to:
   1.1. Record daily discharge volumes
   1.2. Compute average daily volumes

2. Receiving water limitations monitoring. In the receiving storm water drainage system, the discharge must not cause:
   2.1. Downstream turbidity to increase to more than 50 Nephelometric Turbidity Units (NTU) if the natural background turbidity is less than 50 NTU
   2.2. Downstream turbidity to increase more than 10 percent above the natural background turbidity if the natural background turbidity is 50 NTU or greater
   2.3. Normal ambient temperature to be altered more than 5 degrees F
   2.4. Normal ambient pH to fall below 6.5, exceed 8.5, or change more than 0.5 units
   2.5. Dissolved oxygen concentration to fall below 5.0 mg/L

3. Discharge effluent limitations monitoring. The water to be discharged (effluent) must comply with the following:
   3.1. Discharged water turbidity must not be greater than 50 Nephelometric Turbidity Units (NTU)
   3.2. pH of the discharged water must be from 6.5 to 8.5
   3.3. Discharged water must not contain chlorine in excess of 0.02 mg/L (instantaneous maximum)

Inspect temporary active treatment system:

1. Daily if dewatering work occurs daily
2. Weekly if dewatering work does not occur daily

If observations and measurements confirm the water quality limits are exceeded:

1. Submit a Notice of Discharge Report as shown in the Preparation Manual within 3 business days of exceeding the limits
2. Document the reasons and corrective work performed to prevent a reoccurrence in the Notice of Discharge

Maintain the various components to prevent leaks and provide proper function. If a component of the dewatering equipment is not functioning properly, discontinue the dewatering operation and repair or replace the component.

Sediments removed from uncontaminated areas during maintenance of the treatment system must be dried, distributed uniformly, and stabilized at a location within the project limits approved by the Engineer.

Backfill and repair ground disturbance, including holes and depressions, caused by the installation and removal of the temporary active treatment system. Comply with Section 15-1.02, "Preservation of Property," of the Standard Specifications.

ATTACHMENT A

ESTIMATED GROUNDWATER SEEPAGE RATES IN THE PROJECT AREA

State of California
DEPARTMENT OF TRANSPORTATION

Business, Transportation and Housing Agency

Memorandum

Flex your power!
Be energy efficient!

To: MR. KAMRAN NAKHJIRI
District Branch Chief
Office of Water Quality Program

Date: October 14, 2009

Attention: J. Chen

File: 04-SM-280, PM 10.80
04 – 1A7701
Seismic Retrofit

From: CHRISTOPHER RISDEN
Engineering Geologist
Office of Geotechnical Design – West
Geotechnical Services
Division of Engineering Services

GRANT WILCOX
Chief, Branch B
Office of Geotechnical Design - West
Geotechnical Services
Division of Engineering Services

Subject : Seepage Rate for Drilled Shafts

Per your request, the Office of Geotechnical Design West has calculated seepage rates for the drilled shafts proposed for the above-mentioned project. Assumptions were made based on the understanding of the subsurface geology, groundwater depths measured from piezometers located near the proposed shafts, and proposed shaft depths.

Permeability factors (k) were estimated based on permeability tests performed in similar material and were made intentionally conservative for the purposes of stormwater management. Seepage rates are provided in gallons per day and assume a 5 ft diameter drilled shaft, permeability factor of 0.3 ft/day, and a water level 10 ft below the ground surface. The hydraulic gradient was assumed to be flat, maximizing the seepage rate. The subsurface conditions were assumed to be sheared Franciscan Assemblage rock: serpentinite, argillite, and sandstone.

A seepage rate of 35 gallons/day per linear foot of drilled shaft should be used for the purposes of estimating stormwater discharge/treatment. Again, it should be noted that this estimate is conservative. Values will likely be lower. In addition, the contractor should be encouraged to use the wet method of pile installation. This will decrease the volume of discharge water. Should you have any questions, please call Chris Risden at 622-8757.

c: TPokrywka, GWilcox, Daily File, Route File

CRisden/mm

ATTACHMENT B

DEWATERING LOCATION PLAN

Project Location

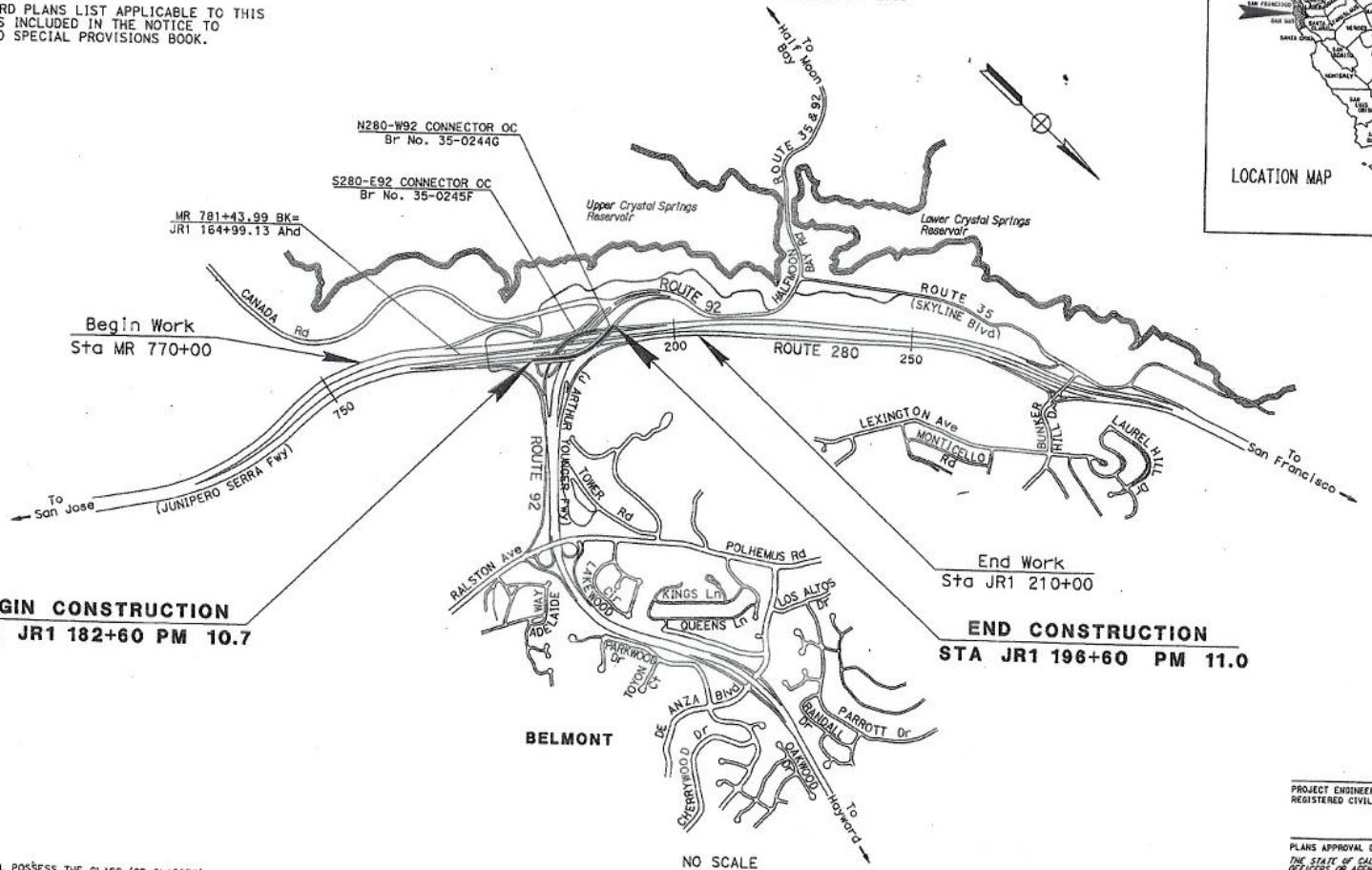
INDEX OF PLANS

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

PROJECT PLANS FOR CONSTRUCTION ON
STATE HIGHWAY
IN SAN MATEO COUNTY
ON ROUTE 280/ROUTE 92 INTERCHANGE
BRIDGE No. 35-0244G AND BRIDGE No. 35-0245F
TO BE SUPPLEMENTED BY STANDARD PLANS DATED MAY 2006

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	SM	280	10.7/11.0	1	?

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



PROJECT ENGINEER
REGISTERED CIVIL ENGINEER — DATE

S.B. Modesto
No. 50338
Exp. 6-30-11
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.

PROJECT MANAGER: AL LEE
DESIGN ENGINEER: DUAT NGUYEN

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

BORDER LAST REVISED 8/1/2008 | CALTRANS WEB SITE IS: HTTP//WWW.DOT.CA.GOV/ | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | USERNAME => a131732 DGN FILE => 41a770a0001.dgn

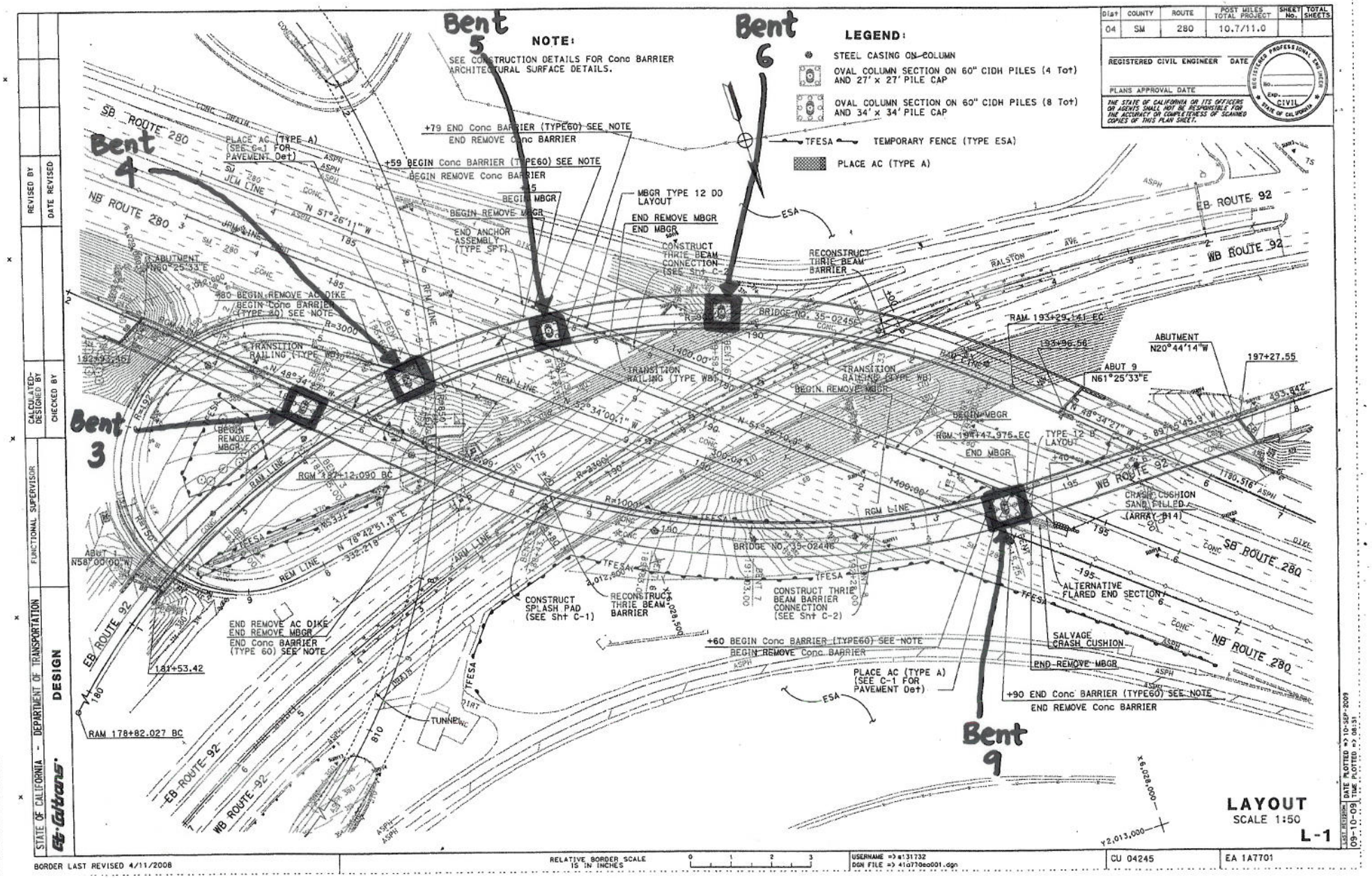
CONTRACT No. 04-1A7704
CU 04245 EA 1A7701

LAST REVISION 09-08-09
DATE PLOTTED => 08-SEP-2009
TIME PLOTTED => 11:01

Note: Dewatering Required in Installing CIDH Pile Foundations.

Locations: "RGM" Line, Bent 3 185+20 Bent 9 194+20

"RAM" Line, Bent 4 185+50 Bent 5 187+40 Bent 6 189+60



Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	SM	280	10.7/11.0		

REGISTERED CIVIL ENGINEER DATE

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.

REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

REVISED BY | DATE REVISED | CALCULATED-DESIGNED BY | CHECKED BY | FUNCTIONAL SUPERVISOR

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION Caltrans DESIGN

BORDER LAST REVISED 4/11/2008 | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | USERNAME => s131732 DGN FILE => s1a770ea0001.dgn | CU 04245 | EA 1A7701

LAST REVISION 09-10-09 | DATE PLOTTED => 10-SEP-2009 | TIME PLOTTED => 08:31

Dewatering Location Plan

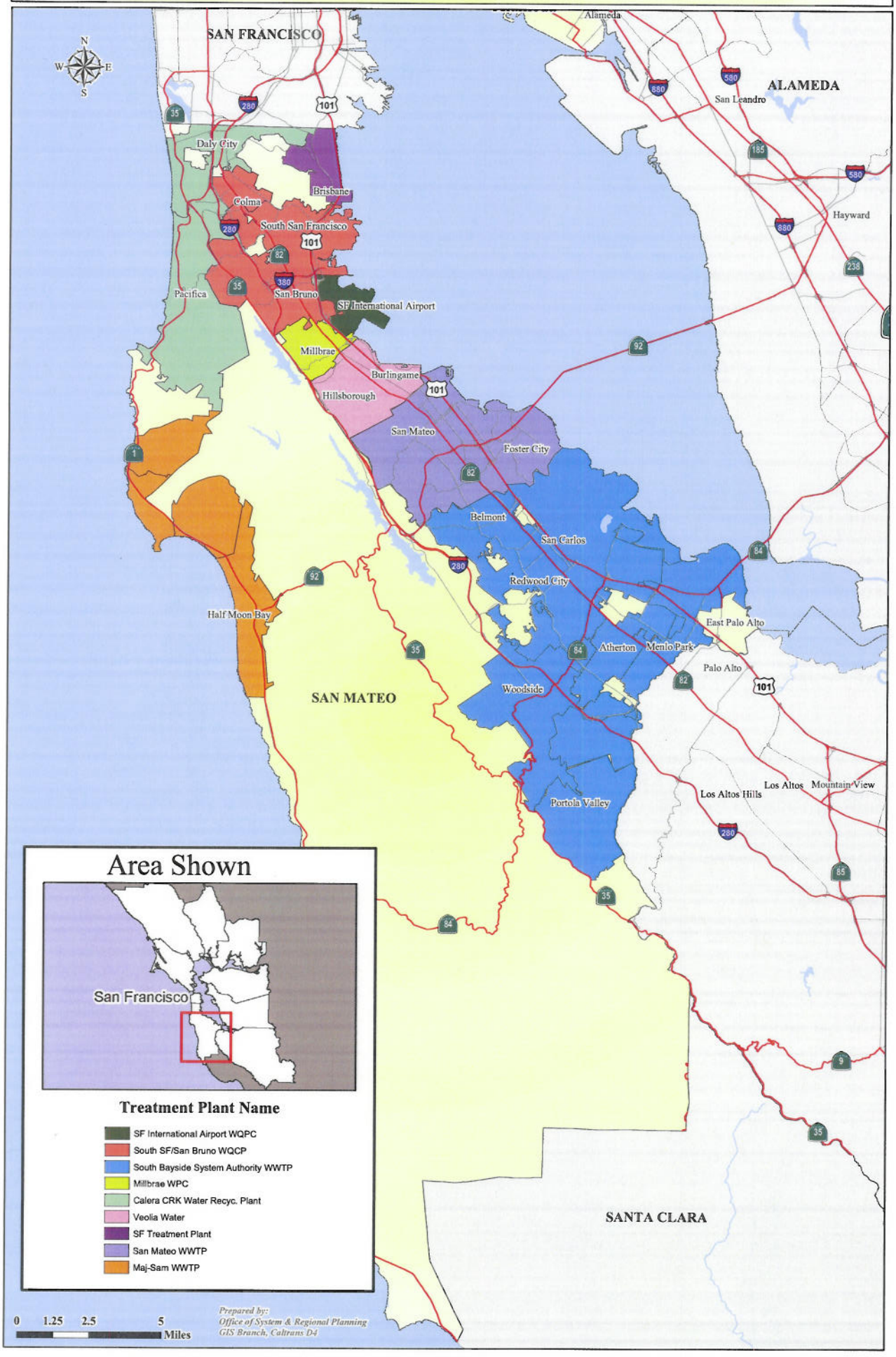
ATTACHMENT C

LIST OF PUBLICLY OWNED TREATMENT WORKS (POTW) FACILITY

List of Publicly Owned Treatment Works (POTW)

	City Discharger	Treatment Plant Name	WDR Discharger Name	Discharger Contact Name	Contact Phone No.	Contact Email	Mail Address	Ct Contact for Groundwater & De-Watering Discharges	Service Area of the POTW
26	San Francisco International Airport WQCP	San Francisco International Airport WQCP	San Francisco International Airport WQCP	Sam Mehta	650-821-7841	sam.mehta@flysfo.com		They would not allow, except if the Reg. Board insisted. Would have to be checked for TPH - contact Stormwater "guru" / Utilities head Mark Costanza @ 650-821-7809	Just the S.F.I. Airport - they said no parts of Hwys 101 or 380 enter their system
27	San Mateo	San Mateo Waste Water Treatment Plant (formerly San Mateo WQCP)	San Mateo WQCP	Kacey Karmendy	650-522-7388	karmendy@ci.sanmateo.ca.us		Per "Best Contact" Vern Bessey @ 650-522-7342 new org. name is SMWTP and serves Cities of San Mateo and Foster City. They disallow clean groundwater and SW if it just has sediment, prefers Baker tanks and discharge to storm drain. Will accept IF contaminated - permit and testing needed, including "site history"	They cover: "San Mateo, half of Hillsborough, Foster City, unincorporated S.M. County, and a very small part of Belmont." Contact Otis Chan 650-522-7305 for GIS information.
28	South S.F.	South S.F./San Bruno WQCP	City of South San Francisco	Dave Castagnola; Terry White	650-829-3844; 650-877-8551	dcastagnola@wqcp.ci.ssf.ca.us; terry.white@ssf.net	Dave Castagnola, City of South San Francisco, 195 Bellenir Road, South San Francisco, CA 94080; Terry White, Deputy Director, Maintenance Service, City of South San Francisco, 550 North Canal St., South San Francisco, CA 94080	Contact : Kevin Maffei for permit information at 650-829-3881. Permit can be expedited, a WQ profile is needed, one-time permit fee of $ 60.00, then $1.83 per 100 Cu ft.	They cover: "South San Francisco, San Bruno, Colma, and a very small part of Daly City." No GIS available. Plant phone # 650-877-8555.
29	San Bruno		City of San Bruno	Scott Munns	650-616-7066	smunns@ci.sanbruno.ca.us	Scott Munns, Director, Public Works, City of San Bruno, 567 El Camino Real, San Bruno, CA 94066	Same as South S.F. / San Bruno WQCP - see line # 28	Part of South S.F. / San Bruno WQCP - see line # 28
30	Colma		Colma City	Ellen Ellsworth	650-757-8888	ellen.ellsworth@colma.ca.gov	Richard Mao, City Engineer, Town of Colma, 1188 El Camino Real, Colma, CA 94014	Same as South S.F. / San Bruno WQCP - see line # 28	Part of South S.F. / San Bruno WQCP - see line # 28
31	Millbrae	Millbrae WPC	Millbrae WPC	Thomas Colletti	650-259-2381	tcolletti@ci.millbrae.ca.us	Thomas Colletti, City of Millbrae, 621 Magnolia Ave., Millbrae, CA 94030	Best contacts: Dick York, 650-259-2393, Supt. Of WWTP; and/or David Ocampo 650-259-2392 Lab Supt. (issues g-water permit) Permit needed, sampling for contaminates needed, etc., -they have done this in the past.	Just the City of Millbrae. Plant phone # is 650-259-2388
32	Pacifica	Calera CRK Water Recycling Plant	Calera CRK Water Recycling Plant	Dave Gromm	650-738-4663	grommd@ci.pacifica.ca.us		Handles the City of Pacifica. Best contact is Brian Martinez @ 650-738-4669. Per Dave Gromm: "new plant has lots of capacity" will accept discharge after permit, testing, etc.	The city of Pacifica and a small part of Daly City
33	Burlingame	Veolia Water (formerly Burlingame WWTP)	Burlingame WWTP	Phil Scott,	650-558-7673; 650-558-7679	pscott@burlingame.org; bsalzon@burlingame.org	Phil Scott, Public Work Superintendant, 501 Primrose, Burlingame, CA 94010	Contact Doug Bell @ 558-7245 or dbell@burlingame.org: "not straightforward" he would need to "run it by 3-4 people" - it could be"handled in different ways" - would probably have to check out the ways this was handled the previous times....etc.	Burlingame and half of Hillsborough. Plant phone # is 650-342-3727
34	Hillsborough		Town of Hillsborough	David Bishop	650-375-7411	dbishop@hillsca.org	Kevin Oconnell, Public Work Director, Town of Hillsborough, 1600 Ellbrunda Ave., Hillsborough, CA 94010-6418	Hillsborough sends their WW to Burlingame and SMWWT plants for treatment- see Lines # A -27 and 33.	Hillsborough sends their WW to Burlingame and SMWWT plants for treatment- see Lines # A -27 and 33.
55	Maj-Sam WWTP	Maj-Sam WWTP	Sewer Authority Mid-Coastside	Tony Pullin	650-726-0124	tony@samcleanswater.org		Contact :Brenda Donald 650-726-0124x105 - she will mail packet of info $50 fee, 10 cents per Gal. Brenda@samcleanswater.org	Rural San Mateo Coast - Hwy 001 from Montara to Half Moon Bay "8 or 9 miles of Coast - and a little bit of Hwy 92" - per Tony Pullin
56			City of Half Moon Bay	Ed Marlow	(650) 726-8260	emarlow@ppsmas.com	Ed Marlow - Interim Assistant City Manager, Department of Public Works, 501 Main Street, City of Half Moon Bay, CA 94019	Same as Maj-Sam - see Line #55	Same as Maj-Sam - see Line #55
57			Granada Sanitary District	Gina Holmes	(650) 726-7093	gsd@netwiz.net	Gina Holms, Administrator, Granada Sanitary District, 455 Avenue, P.O. Box 335, El Granada, CA 94018	Same as Maj-Sam - see Line #55	Same as Maj-Sam - see Line #55
			Dudek Associate ((Granada SD consultant)	chuck Duffy	(760)942-5147	cduffy@dudek.com	605 3rd St., Encinitas, CA 92024	Same as Maj-Sam - see Line #55	Same as Maj-Sam - see Line #55
58			Montara Sanitary District	George Irving	(650) 728-3545	msd@montara.com	George Irving, District Manager, Montara Sanitary District, 8888 Cabrillo Highway, P.O. Box, Montara, CA 94037	Same as Maj-Sam - see Line #55	Same as Maj-Sam - see Line #55
	Treasure Island WPCP	Treasure Island WPCP	SF PUC	Nathan Brennan	(415)242-2256 X1358	mcarlin@sfwater.org; nbrennan@sfwater.org	Michael Carlin, SFPUC, Planning Bureau Manager, 1141 Market St., Suite 401, San Francisco, CA 94103, 415-934-5787	Best contact is Vic Vista @ 415-274-0318 at the "very small" plant on TI. Would want Chloride levels checked - and other sampling, and permit required.	Yerba Buena Island and Treasure Island
59	South Bayside System Authority WWTP	South Bayside System Authority WWTP	South Bayside System Authority	Bob Donaldson	650-594-8411x127	rdonaldson@sbsa.org	Robert Donaldson, South Bayside System Authority, 1400 Radio Road, Redwood City, CA 94065	Contact Ken Kaufman @ 650-594-8411 x 128 or kkaufman@sbsa.org "Individual Evaluation" No website. Need permit and water analysis "usually 1 to 3 day turn-around for Permit	SBSA takes WW from Belmont, San Carlos, all of Redwood City, and Redwood Shores. Has joint operating agreement with "WestBay" and also treats waste from Woodside, Atherton, Portola Valley, and Menlo Park. Good Contacts: Bob Donaldson and Jim Bewley @ 650-591-7121
60			City of Belmont	Kathleen E. Phalen	650-595-7469	kphalen@ci.belmont.ca.us	Kathleen E. Phalen, Associate Civil Engineer, City of Belmont, 1070 Sixth Ave. Suite 306, Belmont, CA 94002	Same as SBSA Authority WWTP - see line 59	Same as SBSA -see Line # A-59
61			City of Redwood City	Peter Ingram; Marilyn Harang	650-780-7466; 650-780-7477	pingram@redwoodcity.org; mharang@redwoodcity.org	Peter Ingram, Director, Public Works Services, City of Redwood City, 1400 Broadway, Redwood City, CA 94063-2505	Same as SBSA Authority WWTP - see line 59	Same as SBSA - see Line # A-59
62			City of San Carlos	Parviz Mokhtari	650-802-4202	parviz.mokhtari@ci.san-carlos.ca.us	Parviz Mokhtari, Director of Public Works, City of San Carlos, 600 Elm St., San Carlos, CA 94070	Same as SBSA Authority WWTP - see line 59	Same as SBSA - see Line # A-59
63			Town of Woodside	Kent Dewell	650-851-6790		Kent Dewell, Town Engineer, Toen of Woodside, P.O. Box 94062, Woodside, CA 94062	Same as SBSA Authority WWTP - see line 59	Same as SBSA - see Line # A-59
64			West Bay SD	Tim Clayton	650-321-0384	tclayton@westbaysd.st.com	Tim Clayton, District Manager, West Bay Sanitary District, 500 Laurel St., Menlo Park, CA 94025	Same as SBSA Authority WWTP - see line 59	Same as SBSA - see Line # A-59
65	For collection system in unincorporated areas	For collection system in unincorporated areas	San Mateo County	Brian Lee	650-599-1497	blee@smcmateo.ca.us	Brian Lee, Department of Public Works, 555 County Center, 5th Floor, Redwood City, CA 94063-1665	Same as SBSA Authority WWTP - see line 59	Same as SBSA - see Line # A-59
66	North San Mateo WWTP	North San Mateo WWTP	North San Mateo County	Patrick Sweetland	650-991-8201	psweetland@dalycity.org	Patrick Sweetland, Director of Water and Wastewater Resources, North San Mateo Sanitary District, 153 Lake Merced Blv., Daily City, CA 94015	Same as SBSA Authority WWTP - see line 59	Same as SBSA - see Line # A-59
106	Satellite system of City and County of SF treatment plant	Satellite system of City and County of SF treatment plant	City of Brisbane	Matthew Fabry	415-508-2134	mfabry@ci.brisbane.ca.us	Matthew Fabry, City of Brisbane, Public Works Department, 50 Park Place, Brisbane, CA 94005-1310	Per Matt Fabry @ 415-508-2134 "they would accept in accordance with the regulations of the permit for SMCO. They would accept some non - Storm Water discharge" - he would like to hear more specifics before assuring acceptance.	Services Brisbane and the Guadalupe Canal area. They send their WW to the SF Combined System. [Only Ct ROW is US 101] They have their service electronically - call Matt Lee at 415-508-2132

ATTACHMENT D

SAN MATEO COUNTY-POTW SERVICE AREA

San Mateo County - POTW Service Areas