

APPENDIX A.2

Previous Boring Logs

Final Geotechnical Summary Report SR-710 Tunnel Technical Study Los Angeles County, California



Prepared For:
California Department of Transportation
100 South Main Street
Los Angeles, CA 90012

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CH2M HILL
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April 2010

Volume I of V



GROUP SYMBOLS AND NAMES			
Graphic / Symbol	Group Names	Graphic / Symbol	Group Names
	Well-graded GRAVEL		Lean CLAY
	Well-graded GRAVEL with SAND		Lean CLAY with SAND
	Poorly graded GRAVEL		Lean CLAY with GRAVEL
	Poorly graded GRAVEL with SAND		SANDY lean CLAY
	Well-graded GRAVEL with SILT		SILTY CLAY
	Well-graded GRAVEL with SILT and SAND		SILTY CLAY with GRAVEL
	Well-graded GRAVEL with CLAY (or SILTY CLAY)		SANDY SILTY CLAY
	Well-graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)		SANDY SILTY CLAY with GRAVEL
	Poorly graded GRAVEL with SILT		GRAVELLY SILTY CLAY
	Poorly graded GRAVEL with SILT and SAND		GRAVELLY SILTY CLAY with SAND
	Poorly graded GRAVEL with CLAY (or SILTY CLAY)		SILT
	Poorly graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)		SILT with SAND
	SILTY GRAVEL		SILT with GRAVEL
	SILTY GRAVEL with SAND		SANDY SILT
	CLAYEY GRAVEL		SANDY SILT with GRAVEL
	CLAYEY GRAVEL with SAND		GRAVELLY SILT
	SILTY, CLAYEY GRAVEL		GRAVELLY SILT with SAND
	SILTY, CLAYEY GRAVEL with SAND		ORGANIC lean CLAY
	Well-graded SAND		ORGANIC lean CLAY with SAND
	Well-graded SAND with GRAVEL		ORGANIC lean CLAY with GRAVEL
	Poorly graded SAND		SANDY ORGANIC lean CLAY
	Poorly graded SAND with GRAVEL		SANDY ORGANIC lean CLAY with GRAVEL
	Well-graded SAND with SILT		GRAVELLY ORGANIC lean CLAY
	Well-graded SAND with SILT and GRAVEL		GRAVELLY ORGANIC lean CLAY with SAND
	Well-graded SAND with CLAY (or SILTY CLAY)		ORGANIC SILT
	Well-graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)		ORGANIC SILT with SAND
	Poorly graded SAND with SILT		ORGANIC SILT with GRAVEL
	Poorly graded SAND with SILT and GRAVEL		SANDY elastic SILT
	Poorly graded SAND with CLAY (or SILTY CLAY)		SANDY elastic SILT with GRAVEL
	Poorly graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)		GRAVELLY elastic SILT
	SILTY SAND		GRAVELLY elastic SILT with SAND
	SILTY SAND with GRAVEL		ORGANIC fat CLAY
	CLAYEY SAND		ORGANIC fat CLAY with SAND
	CLAYEY SAND with GRAVEL		ORGANIC fat CLAY with GRAVEL
	SILTY, CLAYEY SAND		SANDY ORGANIC fat CLAY
	SILTY, CLAYEY SAND with GRAVEL		SANDY ORGANIC fat CLAY with GRAVEL
	PEAT		GRAVELLY ORGANIC fat CLAY
	COBBLES		GRAVELLY ORGANIC fat CLAY with SAND
	COBBLES and BOULDERS		ORGANIC elastic SILT
	BOULDERS		ORGANIC elastic SILT with SAND
			ORGANIC elastic SILT with GRAVEL
			SANDY elastic ELASTIC SILT
			SANDY ORGANIC elastic SILT with GRAVEL
			GRAVELLY ORGANIC elastic SILT
			GRAVELLY ORGANIC elastic SILT with SAND
			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 TESTS	
C	Consolidation (ASTM D 2435-04)
CL	Collapase Potential (ASTM D 5333-03)
CP	Compaction Curve (CTM 216 - 06)
CR	Corrosion, Sulfates, Chlorides (CTM 643 - 99; CTM 417 - 06; CTM 422 - 06)
CU	Consolidated Undrained Triaxial (ASTM D 4767-02)
DS	Direct Shear (ASTM D 3080-04)
EI	Expansion Index (ASTM D 4829-03)
M	Moisture Content (ASTM D 2216-05)
OC	Organic Content (ASTM D 2974-07)
P	Permeability (CTM 220 - 05)
PA	Particle Size Analysis (ASTM D 422-63 [2002])
PI	Liquid Limit, Plastic Limit, Plasticity Index (AASHTO T 89-02, AASHTO T 90-00)
PL	Point Load Index (ASTM D 5731-05)
PM	Pressure Meter
PP	Pocket Penetrometer
R	R-Value (CTM 301 - 00)
SE	Sand Equivalent (CTM 217 - 99)
SG	Specific Gravity (AASHTO T 100-06)
SL	Shrinkage Limit (ASTM D 427-04)
SW	Swell Potential (ASTM D 4546-03)
TV	Pocket Torvane
UC	Unconfined Compression - Soil (ASTM D 2166-06)
	Unconfined Compression - Rock (ASTM D 2938-95)
UU	Unconsolidated Undrained Triaxial (ASTM D 2850-03)
UW	Unit Weight (ASTM D 4767-04)
VS	Vane Shear (AASHTO T 223-96 [2004])

SAMPLER GRAPHIC SYMBOLS	
	Standard Penetration Test (SPT)
	Standard California Sampler
	Modified California Sampler
	Shelby Tube
	Piston Sampler
	NX Rock Core
	HQ Rock Core
	Bulk Sample
	Other (see remarks)

DRILLING METHOD SYMBOLS			
	Auger Drilling		Rotary Drilling
	Dynamic Cone or Hand Driven		Diamond Core

WATER LEVEL SYMBOLS	
	First Water Level Reading (during drilling)
	Static Water Level Reading (short-term)
	Static Water Level Reading (long-term)



Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE

BORING RECORD LEGEND

DIST. 07	COUNTY LA	ROUTE 710	POSTMILE D/D	EA 07-187900
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PROJECT OR BRIDGE NAME
SR-710 Tunnel Technical Study

BRIDGE NUMBER N/A	PREPARED BY	DATE	SHEET 1 of 3
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CONSISTENCY OF COHESIVE SOILS				
Descriptor	Unconfined Compressive Strength (tsf)	Pocket Penetrometer (tsf)	Torvane (tsf)	Field Approximation
Very Soft	< 0.25	< 0.25	< 0.12	Easily penetrated several inches by fist
Soft	0.25 - 0.50	0.25 - 0.50	0.12 - 0.25	Easily penetrated several inches by thumb
Medium Stiff	0.50 - 1.0	0.50 - 1.0	0.25 - 0.50	Can be penetrated several inches by thumb with moderate effort
Stiff	1.0 - 2.0	1.0 - 2.0	0.50 - 1.0	Readily indented by thumb but penetrated only with great effort
Very Stiff	2.0 - 4.0	2.0 - 4.0	1.0 - 2.0	Readily indented by thumbnail
Hard	> 4.0	> 4.0	> 2.0	Indented by thumbnail with difficulty

APPARENT DENSITY OF COHESIONLESS SOILS	
Descriptor	SPT N_{60} - Value (blows / foot)
Very Loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE	
Descriptor	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	
Descriptor	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%

SOIL PARTICLE SIZE		
Descriptor	Size	
Boulder	> 12 inches	
Cobble	3 to 12 inches	
Gravel	Coarse	3/4 inch to 3 inches
	Fine	No. 4 Sieve to 3/4 inch
Sand	Coarse	No. 10 Sieve to No. 4 Sieve
	Medium	No. 40 Sieve to No. 10 Sieve
	Fine	No. 200 Sieve to No. 40 Sieve
Silt and Clay	Passing No. 200 Sieve	

PLASTICITY OF FINE-GRAINED SOILS	
Descriptor	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; it 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.

CEMENTATION	
Descriptor	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.

NOTE: This legend sheet provides descriptors and associated criteria for required soil description components only. Refer to Caltrans Soil and Rock Logging, Classification, and Presentation Manual (July 2007), Section 2, for tables of additional soil description components and discussion of soil description and identification.



Department of Transportation
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DIST. 07	COUNTY LA	ROUTE 710	POSTMILE D/D	EA 07-187900
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PROJECT OR BRIDGE NAME
 SR-710 Tunnel Technical Study

BRIDGE NUMBER N/A	PREPARED BY	DATE	SHEET 2 of 3
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ROCK GRAPHIC SYMBOLS	
	IGNEOUS ROCK
	SEDIMENTARY ROCK
	METAMORPHIC ROCK

BEDDING SPACING	
Descriptor	Thickness or Spacing
Massive	> 10 ft
Very thickly bedded	3 to 10 ft
Thickly bedded	1 to 3 ft
Moderately bedded	3-5/8 inches to 1 ft
Thinly bedded	1-1/4 to 3-5/8 inches
Very thinly bedded	3/8 inch to 1-1/4 inches
Laminated	< 3/8 inch

WEATHERING DESCRIPTORS FOR INTACT ROCK						
Diagnostic Features						
Descriptor	Chemical Weathering-Discoloration-Oxidation		Mechanical Weathering and Grain Boundary Conditions	Texture and Solutioning		General Characteristics
	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 (refer to grain boundary conditions)	All fracture surfaces are discolored or oxidized; surfaces are friable	Partial separation, rock is friable; in semi-arid conditions, granitics are disaggregated	Altered by chemical disintegration such as via hydration or 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 of 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".

Note: Combination descriptors (such as "slightly weathered to fresh") are used 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 shall be combined. "Very intensely weathered" is the combination descriptor for "decomposed to intensely weathered".

RELATIVE STRENGTH OF INTACT ROCK	
Descriptor	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

ROCK HARDNESS	
Descriptor	Criteria
Extremely Hard	Specimen cannot be scratched with pocket knife or sharp pick; can only be chipped with repeated heavy hammer blows
Very hard	Specimen cannot be scratched with pocket knife or sharp pick; breaks with repeated heavy hammer blows
Hard	Specimen can be scratched with pocket knife or sharp pick with 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; breaks with moderate hammer blows
Moderately Soft	Specimen can be grooved 1/8 in. with pocket knife or sharp pick with moderate or heavy pressure; breaks with light hammer blow or heavy hand pressure
Soft	Specimen can be grooved or gouged with pocket knife or sharp pick with light pressure, breaks with light to moderate hand pressure
Very Soft	Specimen can be readily indented, grooved, or gouged with fingernail, or carved with pocket knife; breaks with light hand pressure

CORE RECOVERY CALCULATION (%)
$\frac{\sum \text{Length of the recovered core pieces (in.)}}{\text{Total length of core run (in.)}} \times 100$

FRACTURE DENSITY	
Descriptor	Criteria
Unfractured	No fractures
Very Slightly Fractured	Lengths greater 3 ft
Slightly Fractured	Lengths from 1 to 3 ft, few lengths outside that range
Moderately Fractured	Lengths mostly in range of 4 in. to 1 ft, with most lengths about 8 in.
Intensely Fractured	Lengths average from 1 in. to 4 in. with scattered fragmented intervals with lengths less than 4 in.
Very Intensely Fractured	Mostly chips and fragments with few scattered short core lengths

RQD CALCULATION (%)
$\frac{\sum \text{Length of intact core pieces} > 4 \text{ in.}}{\text{Total length of core run (in.)}} \times 100$



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DIST. 07	COUNTY LA	ROUTE 710	POSTMILE D/D	EA 07-187900
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PROJECT OR BRIDGE NAME
 SR-710 Tunnel Technical Study

BRIDGE NUMBER N/A	PREPARED BY	DATE	SHEET 3 of 3
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Addendum (including non-standard laboratory test designations) to 2010
SR 710 Tunnel Technical Study (CH2M HILL, 2010) Boring Record Legend

GROUP SYMBOLS AND NAMES

Graphic / Symbol	Group Names	Graphic / Symbol	Group Names
	Well-graded GRAVEL		Lean CLAY
	Well-graded GRAVEL with SAND		Lean CLAY with SAND
	Poorly graded GRAVEL		Lean CLAY with GRAVEL
	Poorly graded GRAVEL with SAND		SANDY lean CLAY
	Well-graded GRAVEL with SILT		SANDY lean CLAY with GRAVEL
	Well-graded GRAVEL with SILT and SAND		GRAVELLY lean CLAY
	Well-graded GRAVEL with CLAY (or SILTY CLAY)		GRAVELLY lean CLAY with SAND
	Well-graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)		
	Poorly graded GRAVEL with SILT		SILT
	Poorly graded GRAVEL with SILT and SAND		SILT with SAND
	Poorly graded GRAVEL with CLAY (or SILTY CLAY)		SILT with GRAVEL
	Poorly graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)	SANDY SILT	
	SILTY GRAVEL		SANDY SILT with GRAVEL
	SILTY GRAVEL with SAND		GRAVELLY SILT
	CLAYEY GRAVEL		GRAVELLY SILT with SAND
	CLAYEY GRAVEL with SAND		
	SILTY, CLAYEY GRAVEL		
	SILTY, CLAYEY GRAVEL with SAND	ORGANIC lean CLAY with SAND	
	Well-graded SAND	ORGANIC lean CLAY with GRAVEL	
	Well-graded SAND with GRAVEL	SANDY ORGANIC lean CLAY	
	Poorly graded SAND	SANDY ORGANIC lean CLAY with GRAVEL	
	Poorly graded SAND with GRAVEL	GRAVELLY ORGANIC lean CLAY	
	Well-graded SAND with SILT	GRAVELLY ORGANIC lean CLAY with SAND	
	Well-graded SAND with SILT and GRAVEL		
	Well-graded SAND with CLAY (or SILTY CLAY)		ORGANIC SILT
	Well-graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)		ORGANIC SILT with SAND
	Poorly graded SAND with SILT		Elastic SILT with SAND
	Poorly graded SAND with SILT and GRAVEL		Elastic SILT with GRAVEL
	Poorly graded SAND with CLAY (or SILTY CLAY)		SANDY elastic SILT
	Poorly graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)	SANDY elastic SILT with GRAVEL	
	SILTY SAND	GRAVELLY elastic SILT	
	SILTY SAND with GRAVEL	GRAVELLY elastic SILT with SAND	
	CLAYEY SAND		ORGANIC fat CLAY
	CLAYEY SAND with GRAVEL		ORGANIC fat CLAY with SAND
	SILTY, CLAYEY SAND		ORGANIC fat CLAY with GRAVEL
	SILTY, CLAYEY SAND with GRAVEL		SANDY ORGANIC fat CLAY
	PEAT		GRAVELLY ORGANIC fat CLAY
	COBBLES	GRAVELLY ORGANIC fat CLAY with SAND	
	COBBLES and BOULDERS		
	BOULDERS		

FIELD AND LABORATORY TESTS

- C** Consolidation (ASTM D 2435-04)
- CAI** Cerchar Abrasivity Index
- CL** Collapse Potential (ASTM D 5333-03)
- CR** Corrosion, Sulfates, Chlorides (CTM 643 - 99; CTM 417 - 06; CTM 422 - 06)
- CU** Consolidated Undrained Triaxial (ASTM D 4767-02)
- DS** Direct Shear (ASTM D 3080-04)
- EI** Expansion Index (ASTM D 4829-03)
- EM** Elastic Model with Compressive Strength (ASTM D 7102)
- M** Moisture Content (ASTM D 2216-05)
- OC** Organic Content (ASTM D 2974-07)
- P** Permeability (CTM 220 - 05)
- PA** Particle Size Analysis (ASTM D 422-63 [2002])
- PI** Liquid Limit, Plastic Limit, Plasticity Index (AASHTO T 89-02, AASHTO T 90-00)
- PL** Point Load Index (ASTM D 5731-05)
- PM** Pressure Meter
- PP** Pocket Penetrometer
- PTS** Petrographic Thin Section
- R** R-Value (CTM 301 - 00)
- SG** Specific Gravity (AASHTO T 100-06)
- SD** Slake Durability Index (ASTM D 4645)
- SL** Shrinkage Limit (ASTM D 427-04)
- SW** Swell Potential (ASTM D 4546-03)
- UC** Unconfined Compression - Soil (ASTM D 2166-06) Unconfined Compression - Rock (ASTM D 2938-95)
- UU** Unconsolidated Undrained Triaxial (ASTM D 2850-03)
- UW** Unit Weight (ASTM D 4767-04)
- VS** Vane Shear (AASHTO T 223-96 [2004])

SAMPLER GRAPHIC SYMBOLS

- Standard Penetration Test (SPT)
- Standard California Sampler
- Modified California Sampler
- Shelby Tube
- Piston Sampler
- NX Rock Core
- HQ Rock Core
- Bulk Sample
- Other (see remarks)

DRILLING METHOD SYMBOLS

- Auger Drilling
- Rotary Drilling
- Dynamic Cone or Hand Driven
- Diamond Core

WATER LEVEL SYMBOLS

- First Water Level Reading (during drilling)
- Static Water Level Reading (short-term)
- Static Water Level Reading (long-term)



REPORT TITLE

BORING RECORD LEGEND

DIST. 7	COUNTY L.A.	ROUTE 710	POSTMILE	EA 07-187900
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PROJECT OR BRIDGE NAME
SR 710 North Study

BRIDGE NUMBER NA	PREPARED BY	DATE	PLATE NO.
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LOGGED BY K. Barker	BEGIN DATE 1-6-09	COMPLETION DATE 1-12-09	BOREHOLE LOCATION (Lat/Long or North/East and Datum) 34° 4' 38" / 118° 9' 58" NAD83	HOLE ID R-09-Z1B8
DRILLING CONTRACTOR Caltrans Drilling Services		BOREHOLE LOCATION (Offset, Station, Line) ' Lt Sta Caltrans ROW @ Front St.		SURFACE ELEVATION 419.6 ft NAVD88
DRILLING METHOD Rotary Wire-Line		DRILL RIG CME 85		BOREHOLE DIAMETER 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID) SPT(1.4"),Punch Core(2.5"),Shelby(2.87"),HQ Core		SPT HAMMER TYPE CME Automatic, 140 lb., 30 inch drop		HAMMER EFFICIENCY, ERI 87%
BOREHOLE BACKFILL AND COMPLETION Piezometer Installed on Completion		GROUNDWATER DURING DRILLING AFTER DRILLING (DATE) READINGS NM 25.0 ft on 7-1-09		TOTAL DEPTH OF BORING 200.0 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
0	0														<p>This Boring Record was prepared in accordance with the Caltrans Soil & Rock Logging, Classification and Presentation Manual (June, 2007), except as noted in Appendix A.1 of the Final Geotechnical Summary Report, SR-710 Tunnel Technical Study, Los Angeles County, California, dated April, 2010.</p> <p>Hand Auger 0'-5'</p> <p>PA</p>
417.63	1		SILTY, CLAYEY SAND (SC-SM); medium dense; light olive brown; dry; fine SAND; little low to medium plasticity fines [RECENT ALLUVIUM].		D01			100							
415.63	4		At EL. 414.6 ft, contains trace fine GRAVEL.		S02	5 5 17	22	100							
413.63	6		At EL. 412.6 ft, with olive yellow mottled with light gray.												
411.63	8														
409.63	10				O03			33							
407.63	12														
405.63	14														
403.63	16		At EL. 404.6 ft, becomes black.		S04	3 4 5	9	100		23					
401.63	18		SANDY SILT (ML); stiff; dark grayish brown; dry; few GRAVEL; little coarse to fine SAND; mostly low plasticity fines.												
399.63	20				O05			33							
397.63	22														
395.63	24														
	25														

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CALTRANS BORING RECORD MET+ENG FIXED KRIS - SR-710 CALTRANS BORING LOGS WITH REV Z1B4 Z1B8 Z2B3 Z2B4 Z2B5 AND Z3B11 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10



Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE BORING RECORD				HOLE ID R-09-Z1B8	
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE T/T	EA 07-07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER		PREPARED BY K.Barker		DATE	SHEET 1 of 7

CALTRANS BORING RECORD METH+ENG FIXED KRIS - SR-710 CALTRANS BORING LOGS WITH REV Z1B4 Z1B8 Z2B3 Z2B4 Z2B5 AND Z3B11 ONLY GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
393.63	25		Lean CLAY (CL); soft; very dark grayish brown slightly mottled with rust staining; medium plasticity fines.	S06	0	2		100		32					PI
391.63	26														
389.63	27														
389.63	28														
389.63	29														
389.63	30		SILTY SAND (SM); very dark grayish brown; fine SAND.	O07				33							
387.63	31														
387.63	32														
385.63	33														
385.63	34														
385.63	35														
383.63	36		Poorly graded SAND (SP); medium dense; grayish brown; coarse to medium SAND; weak cementation.	S08	5	7	20	100							
383.63	37														
381.63	38														
381.63	39														
379.63	40		SILTY, CLAYEY SAND (SC-SM); medium dense; grayish brown; trace fine GRAVEL; mostly medium to fine SAND; some low plasticity fines.	O09				17							PA, DS
379.63	41														
377.63	42		SEDIMENTARY ROCK, (SILTSTONE)/MUDSTONE, olive gray, intensely weathered, weak, soft, unfractured, with thin (1") clay lenses. [PUENTE FORMATION]							21	110				
377.63	43														
375.63	44														
375.63	45														
373.63	46			S10	8	13	33	100							
373.63	47														
371.63	48														
371.63	49														
369.63	50			O11			8	100				TV = 8			UW
369.63	51														
367.63	52									22	109				
367.63	53														
365.63	54														
365.63	55														

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Department of Transportation
 Division of Engineering Services
 Geotechnical Services
 Office of Geotechnical Design - South 1

REPORT TITLE BORING RECORD				HOLE ID R-09-Z1B8	
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE T/T	EA 07-07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER		PREPARED BY K.Barker		DATE	SHEET 2 of 7

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
363.63	56		At EL. 364.6 ft, contains pebble to cobble. (continued).	S12	24 23 20	43	100								
361.63	58														
359.63	60			O13			0								UW
357.63	62														
355.63	64														
353.63	66			S14	6 14 18	32	100								
351.63	68		SEDIMENTARY ROCK, (SILTSTONE)/MUDSTONE, massive, medium dark gray to dark gray, moderately weathered, weak, soft, unfractured.												
349.63	70			O15A			0								UW
347.63	72														
345.63	74														
343.63	76			U15B			0								
341.63	78			S15C	12 29 50/5.5"		0								
339.63	80			C16			100	0							See note at the end of the log regarding RQD.
337.63	82			C17			97	47		26	97				PI, PA, UU
335.63	84														
	85														

(continued)



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PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER		PREPARED BY K.Barker		DATE	SHEET 3 of 7

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	85		(continued).		S18	10	41	100							UW
333.63	86					18									See note at the end of the log regarding RQD.
	87				C19			0	0						
331.63	88														
	89		At EL. 330.6 ft, grades to greenish black.												
329.63	90		At EL. 329.6 ft, becomes slightly fractured, not healed, dipping 60 to 50°.		C20			100	100						
	91														
327.63	92														
	93														
325.63	94														
	95				C21			100	100						
323.63	96														
	97														
321.63	98														
	99														
319.63	100				C22			50	50						
	101		At EL. 318.6 ft, becomes unfractured.												
317.63	102														
	103														
315.63	104														
	105		At EL. 314.6 ft, becomes slightly fractured, not healed, dipping 50°.		C23			100	100					PI, PA, UU	
313.63	106														
	107														
311.63	108														
	109														
309.63	110		At EL. 309.6 ft, becomes unfractured.		C24			83	83	23	103				
	111														
307.63	112														
	113														
305.63	114														
	115														

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DIST. 07	COUNTY LA	ROUTE 710	POSTMILE T/T	EA 07-07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER		PREPARED BY K.Barker		DATE	SHEET 4 of 7

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
303.63	116				C25										See note at the end of the log regarding RQD.
301.63	118														
299.63	120		At EL. 299.6 ft, becomes moderately soft.		C26			100	100	21	104				PI, PA, UU, CR
297.63	122									16					
295.63	124														
293.63	126				C27			83	83						
291.63	128														
289.63	130		At EL. 289.6 ft, becomes laminated.		C28			100	100						SD, EM
287.63	132														
285.63	134									23	100				
283.63	136				C29			100	100						
281.63	138		At EL. 281.6 ft, contains 6" lens of fresh, very strong, very hard.												
279.63	140														
277.63	142														
275.63	144		At EL. 279.1 ft, becomes medium strong, very slightly fractured, bedding plane separation.		C30			100	0						

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BRIDGE NUMBER		PREPARED BY K.Barker		DATE	SHEET 5 of 7

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
273.63	146				C31			100	100						See note at the end of the log regarding RQD.
271.63	148									22	105				PTS, SD, EM
269.63	150				C32			100	100						
267.63	152														
265.63	154				C33			100	100						UW, PI, CR
263.63	156														
261.63	158														
259.63	160		At EL. 259.6 ft, becomes soft.		C34			98	98	22	106				
257.63	162														
255.63	164				C35			95	95						
253.63	166														
251.63	168														
249.63	170		At EL. 249.6 ft, with few coarse sand.		C36			100	100						
247.63	172														
245.63	174														
	175														

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BRIDGE NUMBER		PREPARED BY K.Barker		DATE	SHEET 6 of 7

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks			
175	176		At EL. 243.1 ft, contains 3" lens of fresh, very strong, very hard.	C37				100	100	22	102				SD, EM See note at the end of the log regarding RQD.			
243.63	177																	
241.63	178		At EL. 235.1 ft, contains 6" lens of fresh, very strong, very hard.	C38				100	100									
239.63	180																	
237.63	182																	
235.63	184																	
233.63	186		At EL. 235.1 ft, contains 6" lens of fresh, very strong, very hard.	C39				93	93									
231.63	188																	
229.63	190		Bottom of borehole at 200.0 ft bgs	C40				95	95	25	100				UU			
227.63	192																	
225.63	194																	
223.63	196																	
221.63	198		Borehole was converted to piezometer at the completion of drilling.	C41				100	100						SD, EM			
219.63	200																	
217.63	202		RQD values provided in the boring logs are based on intact core pieces obtained between two natural discontinuities. Majority of cores obtained in this boring are weak and does not meet the "sound core" definition provided in standard test method for RQD ASTM D 6032. These RQD values should not be used to evaluate the rock mass quality.					22	102									
215.63	204																	
205	205																	



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BRIDGE NUMBER		PREPARED BY K.Barker		DATE	SHEET 7 of 7

LOGGED BY K. Lai, M Islam, K. Barker	BEGIN DATE 4-14-09	COMPLETION DATE 4-14-09	BOREHOLE LOCATION (Lat/Long or North/East and Datum) 34° 5' 3" / 118° 9' 52" NAD83	HOLE ID R-09-Z2B5
DRILLING CONTRACTOR Caltrans Drilling Services	BOREHOLE LOCATION (Offset, Station, Line) ' Lt Sta Edna St., w/o Dorchester Ave.			SURFACE ELEVATION 452.4 ft NAVD88
DRILLING METHOD Rotary Wire-Line	DRILL RIG CS 2000 (truck)			BOREHOLE DIAMETER 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID) SPT(1.4"),Punch Core(2.5"),HQ Core	SPT HAMMER TYPE Diedrich Automatic, 140 lb., 30 inch drop			HAMMER EFFICIENCY, ERI 84%
BOREHOLE BACKFILL AND COMPLETION Piezometer Installed on Completion	GROUNDWATER DURING DRILLING READINGS NM	AFTER DRILLING (DATE) 10.8 ft on 7-1-09	TOTAL DEPTH OF BORING 300.0 ft	

CALTRANS BORING RECORD MET+ENG FIXED KRIS - SR-710 CALTRANS BORING LOGS WITH REV Z1B4 Z1B8 Z2B3 Z2B4 Z2B5 AND Z3B11 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
0	0		ASPHALT (4").												<p>This Boring Record was prepared in accordance with the Caltrans Soil & Rock Logging, Classification and Presentation Manual (June, 2007), except as noted in Appendix A.1 of the Final Geotechnical Summary Report, SR-710 Tunnel Technical Study, Los Angeles County, California, dated April, 2010.</p> <p>Hand Auger 0.3' - 5'</p> <p>VOC=12.1 ppm</p> <p>PI</p> <p>VOC=28.1 ppm</p> <p>VOC=37.2 ppm</p> <p>VOC=6.3 ppm</p>
450.38	1		SILTY CLAY (CL-ML); soft to medium stiff; dark brown; moist; low plasticity fines; [ALLUVIUM]												
448.38	2														
446.38	3														
446.38	4														
446.38	5		SANDY SILT (ML); medium stiff; dark brown; moist; fine SAND; nonplastic fines.	S01	4	14						PP = 0.3			
446.38	6														
446.38	7														
444.38	8		Lean CLAY with SAND (CL); stiff; dark brown; moist.												
444.38	9														
442.38	10			S02	7	7				19					
442.38	11														
442.38	12														
440.38	13														
438.38	14		SILTY SAND (SM); dense; yellowish brown; moist; fine SAND.												
438.38	15			S03	13	32				17					
438.38	16														
438.38	17														
436.38	18														
436.38	19														
434.38	20			S04	10	33									
434.38	21														
434.38	22		At EL. 431.4 ft, contains coarse to fine SAND.												
434.38	23														
430.38	24														
428.38	25														

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DIST. 07	COUNTY LA	ROUTE 710	POSTMILE T/T	EA 07-07-187900
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY K. Barker, M. Islam	DATE	SHEET 1 of 11	

CALTRANS BORING RECORD MET+ENG FIXED KRIS - SR-710 CALTRANS BORING LOGS WITH REV Z1B4 Z1B8 Z2B3 Z2B4 Z2B5 AND Z3B11 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
426.38	26		SANDY SILT (ML); hard; light brown; moist; some fine SAND; mostly nonplastic to low plasticity fines; interbedded with silty sand (SM).	S05	10 11 11	22									VOC=8.8 ppm
424.38	28														
422.38	30			S06	7 11 8	19				27					PA VOC=8.5 ppm
420.38	32		SILTY SAND (SM); medium dense; yellowish brown; moist; medium to fine SAND; nonplastic fines.												
418.38	34														
416.38	36			S07	3 6 8	14									VOC=2.3 ppm
414.38	38														
412.38	40			S08	9 7 6	13									VOC=33.1 ppm
410.38	42														
408.38	44		SANDY SILT (ML); stiff to very stiff; olive gray; moist; few fine GRAVEL; fine SAND; nonplastic to low plasticity fines.												
406.38	46			S09	4 8 10	18									VOC=21.1 ppm
404.38	48		SILTY SAND (SM); medium dense; light brown; moist; little fine GRAVEL; fine SAND.												
402.38	50			S10	4 8 10	18				21					PA VOC=5.6 ppm
400.38	52		At EL. 401.4 ft, with trace fine GRAVEL; mostly fine SAND; some low plasticity fines.												
398.38	54														
	55														

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BRIDGE NUMBER	PREPARED BY K. Barker, M. Islam	DATE	SHEET 2 of 11	

CALTRANS BORING RECORD MET+ENG FIXED KRIS - SR-710 CALTRANS BORING LOGS WITH REV Z1B4 Z1B8 Z2B3 Z2B4 Z2B5 AND Z3B11 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
396.38	56		At EL. 397.4 ft, grades to medium to fine SAND. SILTY SAND (SM) <i>(continued)</i> .	S11	20 20 14	34									VOC=9.0 ppm
394.38	58		SILTY CLAY (CL-ML); stiff to very stiff; olive brown to olive gray; moist; low plasticity fines.												
392.38	60			S12	6 8 11	19									VOC=17.4 ppm
388.38	64		Fat CLAY (CH); very stiff; olive gray; moist; medium to high plasticity fines.												
386.38	66			S13	5 6 8	14									VOC=4.2 ppm
382.38	70			S14	7 9 15	24									VOC=9.5 ppm
378.38	74				S15	5 9 11	20			21					PI VOC=7.6 ppm
374.38	78		SILTY CLAY (CL-ML); stiff to very stiff; light brown; moist; low plasticity fines.												
372.38	80			S16	4 5 7	12									VOC=9.2 ppm
368.38	84														

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DIST. 07	COUNTY LA	ROUTE 710	POSTMILE T/T	EA 07-07-187900
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BRIDGE NUMBER	PREPARED BY K. Barker, M. Islam	DATE	SHEET 3 of 11	

CALTRANS BORING RECORD MET+ENG FIXED KRIS - SR-710 CALTRANS BORING LOGS WITH REV Z1B4 Z1B8 Z2B3 Z2B4 Z2B5 AND Z3B11 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
366.38	86		SILTY CLAY (CL-ML) <i>(continued)</i> .	S17	6 9 11	20				21					VOC=10.8 ppm
364.38	88		Very stiff; olive gray; low to medium plasticity fines.												
362.38	90			S18	5 8 9	17									VOC=8.8 ppm
356.38	96			S19	5 7 9	16									VOC=11.4 ppm
352.38	100			S20	6 9 13	22									VOC=12.4 ppm
348.38	104														
346.38	106		At EL. 347.4 ft, with few fine SAND.	O21						27	101	PP = 3.75			PI, PA, UU, C
344.38	108		CLAYEY SAND (SC); medium dense; light brown; moist; fine SAND; nonplastic to low plasticity fines.												VOC=6.4 ppm
342.38	110			S22	4 6 8	14									VOC=4.6 ppm
340.38	112														
338.38	114		SANDY lean CLAY (CL); stiff; light brown to light gray; moist to wet; fine SAND; low plasticity fines.												

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CALTRANS BORING RECORD METH+ENG FIXED KRIS - SR-710 CALTRANS BORING LOGS WITH REV Z1B4 Z1B8 Z2B3 Z2B4 Z2B5 AND Z3B11 ONLY GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
336.38	116		SANDY lean CLAY (CL) (continued).	S23	5 5 6	11						PP = 1.5			VOC=11.5 ppm
334.38	118														
332.38	120		At EL. 332.4 ft, grades to very stiff.	S24	5 6 8	14						PP = 3.0			VOC=9.5 ppm
330.38	122														
328.38	124		Fat CLAY (CH); very stiff, light brown to light gray; moist to wet.												
326.38	126			O25						28	95	PP = 2.0			PI, UU
324.38	128														
322.38	130		SANDY lean CLAY (CL); very stiff, light brown to light gray; moist to wet.	S26	10 12 15	27						PP = 4.0			VOC=9.3 ppm VOC=10.7 ppm
320.38	132														
318.38	134														
316.38	136		Very stiff to hard.	S27	12 18 25	43									VOC=8.2 ppm
314.38	138		SEDIMENTARY ROCK (CLAYSTONE)/MUDSTONE, thinly bedded, moderate olive brown and olive gray, slightly weathered, extremely weak, very soft, unfractured, [PUENTE FORMATION]	C26				100	100						See note at the end of log regarding RQD.
312.38	140		At EL. 312.4 ft, becomes laminated, soft.	C27				100	100						VOC=1.6 ppm
310.38	142														
308.38	144														
145															

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ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
306.38	146		At EL. 307.4 ft, becomes slightly fractured, joint, not healed, dipping 30°. (continued).		C28			90	90						VOC=2.8 ppm See note at the end of log regarding RQD.
304.38	148									40	80				VOC=1.1 ppm PI, PA, UU
302.38	150		At EL. 302.4 ft, becomes unfractured.		C29			100	100						
296.38	156		At EL. 297.9 ft, becomes soft to moderately soft. SEDIMENTARY ROCK, (CLAYSTONE)/MUDSTONE, massive, black, slightly weathered, weak, soft to moderately soft, unfractured.		C30			100	84						VOC=1.1 ppm
294.38	158														VOC=2.7 ppm
292.38	160				C31			100	88						
288.38	164														VOC=1.9 ppm
286.38	166		At EL. 287.4 ft, becomes very slightly fractured, shear, dipping 45°.		C32			100	100						VOC=2.6 ppm
284.38	168				C33			120	80						
282.38	170														VOC=1.7 ppm
280.38	172		At EL. 282.4 ft, becomes moderately soft, unfractured.		C34			100	100						
278.38	174				C35			108	80						VOC=1.8 ppm

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BRIDGE NUMBER		PREPARED BY K. Barker, M. Islam		DATE	SHEET 6 of 11

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks										
276.38	176		At EL. 277.4 ft, becomes very slightly fractured, joint, dipping 70°, few subhorizontal silty laminations. (continued).		C36			100	20	23	101				VOC=1.7 ppm See note at the end of log regarding RQD. PI, PA, UC										
274.38	178																								
272.38	180		At EL. 258.4 ft, contains about 50% siltstone, weakly subvertically laminated.		C37			100	33	21	107				VOC=1.6 ppm										
270.38	182																							VOC=3.4 ppm	
268.38	184																								VOC=2.9 ppm
266.38	186		At EL. 253.4 ft, becomes unfractured.		C38			100	100	22	105				VOC=3.7 ppm										
264.38	188																							VOC=20.0 ppm	
262.38	190																								VOC=4.1 ppm
260.38	192																								VOC=25.4 ppm
258.38	194				C39			100	83						VOC=28.1 ppm SD, EM										
256.38	196																								
254.38	198																								
252.38	200																								
250.38	202																								
248.38	204																								
	205																								

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ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
205	205				C43			100	100						See note at the end of log regarding RQD. VOC=2.7 ppm VOC=17.3 ppm VOC=25.0 ppm UU, CR VOC=3.2 ppm VOC=16.5 ppm VOC=4.6 ppm PTS VOC=29.0 ppm
246.38	206		SEDIMENTARY ROCK, (SILTSTONE)/MUDSTONE, laminated, black, slightly weathered, weak, moderately soft, unfractured, subvertical laminations.		C44			100	100						
	207					C45			100	100					
244.38	208					C46			100	100					
	209														
242.38	210					C47			100	82	23	102			
	211														
240.38	212					C48			104	73					
	213														
238.38	214					C49			100	75					
	215														
236.38	216				C50			92	92						
	217														
234.38	218				C51			94	40						
	219														
232.38	220														
	221														
230.38	222														
	223														
228.38	224														
	225														
226.38	226														
	227														
224.38	228														
	229														
222.38	230														
	231														
220.38	232														
	233														
218.38	234														
	235														

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REPORT TITLE BORING RECORD				HOLE ID R-09-Z2B5	
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE T/T	EA 07-07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER		PREPARED BY K. Barker, M. Islam		DATE	SHEET 8 of 11

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
235			(continued).		C51			94	40						See note at the end of log regarding RQD. VOC=2.5 ppm VOC=3.2 ppm SD, EM VOC=1.5 ppm VOC=4.1 ppm VOC=1.0 ppm VOC=5.1 ppm VOC=17.0 ppm VOC=6.2 ppm
216.38	236		At EL. 215.8 ft, observed 2-3" gravel lens, fine, rounded and sub-angular.		C52			100	100						
214.38	238				C53			100	92	21	109				
212.38	240				C54			88	79						
210.38	242				C55			42	10						
208.38	244		At EL. 204.4 ft, becomes extremely weak, very soft.		C56			89	0						
206.38	246		At EL. 200.9 ft, observed breccia lens, fine gravel, sub-rounded, black siltstone matrix. SEDIMENTARY ROCK, (SANDSTONE), fine-grained, massive, dark greenish gray, slightly weathered, extremely weak, very soft, unfractured.		C57			30	0						
204.38	248				C58			67	16						
202.38	250														
200.38	252														
198.38	254														
196.38	256														
194.38	258														
192.38	260														
190.38	262														
188.38	264		SEDIMENTARY ROCK, (SILTSTONE)/MUDSTONE, laminated, dark gray, slightly weathered, weak,												

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REPORT TITLE BORING RECORD				HOLE ID R-09-Z2B5	
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE T/T	EA 07-07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER		PREPARED BY K. Barker, M. Islam		DATE	SHEET 9 of 11

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
186.38	266		moderately soft, unfractured. At EL. 187.4 ft, observed 1' lens of little coarse sand and trace fine gravel. (continued).		C59			111	83	24	100				UU See note at the end of log regarding RQD.
184.38	268		SEDIMENTARY ROCK, (CONGLOMERATE), coarse sand to cobble, dark gray, slightly weathered, extremely weak, very soft, unfractured, sand and clay matrix, clasts are very hard, sub-rounded and sub-angular, metamorphosed granitics, trace shell fragments, (possible shear zone).		C60			111	33						VOC=0.7 ppm
180.38	272				C61			42	0						VOC=2.7 ppm
176.38	276				C62			100	40						VOC=1.0 ppm
172.38	280		SEDIMENTARY ROCK, (SANDSTONE), fine-grained, dark gray, slightly weathered, weak, hard, slightly fractured, joint dipping 45°. At EL. 172.4 ft, observed little coarse and fine gravels, sub-rounded, granitic.		C63			90	0						VOC=14.5 ppm VOC=4.9 ppm
166.38	286				C64			135	40						VOC=4.5 ppm
162.38	290		SEDIMENTARY ROCK, (SILTSTONE)/MUDSTONE, laminated to very thinly bedded, dark gray, slightly weathered, weak, moderately soft, slightly fractured, locally very soft, with sandstone laminations. At EL. 159.9 ft, observed 1' bed of little fine to coarse gravels, sub-angular.		C65			107	50						VOC=3.0 ppm
160.38	292									31	88				SD, EM
158.38	294					C66			100	92					

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DIST. 07	COUNTY LA	ROUTE 710	POSTMILE T/T	EA 07-07-187900
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY K. Barker, M. Islam	DATE	SHEET 10 of 11	

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
156.38	296				C67			120	80						VOC=1.7 ppm See note at the end of log regarding RQD.
154.38	298				C68			100	80						VOC=2.7 ppm
152.38	300		Bottom of borehole at 300.0 ft bgs												VOC=1.6 ppm
150.38	302		Borehole was converted to piezometer at the completion of drilling.												
148.38	304		RQD values provided in the boring logs are based on intact core pieces obtained between two natural discontinuities. Majority of cores obtained in this boring are weak and does not meet the "sound core" definition provided in standard test method for RQD ASTM D 6032. These RQD values should not be used to evaluate the rock mass quality.												



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REPORT TITLE BORING RECORD				HOLE ID R-09-Z2B5	
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE T/T	EA 07-07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER		PREPARED BY K. Barker, M. Islam		DATE	SHEET 11 of 11

CALTRANS BORING RECORD MET+ENG FIXED JOE - CALTRANS WITH REV Z3B2 Z3B5 Z3B7 ONLY SR-710TUNLS CT BORING LOGS11_23_09JPCOPY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

LOGGED BY J. Pratt / T. Halda	BEGIN DATE 1-13-09	COMPLETION DATE 1-22-09	BOREHOLE LOCATION (Lat/Long or North/East and Datum) 1872415.7 ft / 6514868.4 ft NAD83	HOLE ID R-09-Z3B2
DRILLING CONTRACTOR Caltrans In-House			BOREHOLE LOCATION (Offset, Station, Line) ' Lt Sta S. Pasadena Ave & Calif. Blvd	SURFACE ELEVATION 781.4 ft NAVD88
DRILLING METHOD Rotary Wire-Line			DRILL RIG CS 2000 (truck)	BOREHOLE DIAMETER 3.7 in
SAMPLER TYPE(S) AND SIZE(S) (ID) SPT(1.4"), Punch Core(2.5") & HQ Rock Coring			SPT HAMMER TYPE Diedrich Automatic, 140 lb., 30 inch drop	HAMMER EFFICIENCY, ERI 84%
BOREHOLE BACKFILL AND COMPLETION Installed Piezometer for water monitoring			GROUNDWATER DURING DRILLING AFTER DRILLING (DATE) READINGS NM 144.4 ft on 7-1-09	TOTAL DEPTH OF BORING 275.0 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
779.40	1		Woody debris, pine needles.		D01										This Boring Record was prepared in accordance with the Caltrans Soil & Rock Logging, Classification and Presentation Manual (June, 2007), except as noted in Appendix A.1 of the Final Geotechnical Summary Report, SR-710 Tunnel Technical Study, Los Angeles County, California, dated April, 2010. VOC=0.2 PPM UW, PI VOC=1.5 PPM PA VOC=0.5 PPM VOC=0.6 PPM
777.40	4		SILTY SAND (SM); loose; strong brown; moist; fine SAND; nonplastic fines; (probable Recent ponded Alluvial deposit).												
775.40	6		SANDY SILT (ML); very stiff; yellowish brown; moist; fine SAND; nonplastic fines.		S02	2 7 11	18								
773.40	8				C03										
771.40	10				O04										
769.40	12		Well-graded SAND with SILT and GRAVEL (SW-SM); very dense; yellowish brown to pale brown; moist; little fine to coarse GRAVEL; mostly coarse to fine SAND; few fines; dominantly hard (slightly weathered) to soft (intensely weathered) granitic rock fragments (older Quaternary Alluvium, Qoa).							10	129				
767.40	14														
765.40	16				S05	32 20 28	48			9					
763.40	18														
761.40	20				S06	19 27 25	52								
759.40	22														
757.40	24		COBBLES gravel, and sand, hard drilling.												

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DIST. 07	COUNTY LA	ROUTE 710	POSTMILE T/T	EA 07-07-187900
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY J. Pratt, M. Islam	DATE 1-26-09	SHEET 1 of 10	

CALTRANS BORING RECORD MET+ENG FIXED JOE - CALTRANS WITH REV Z3B2 Z3B5 Z3B7 ONLY SR-710TUNLS CT BORING LOGS11_23_09JPCOPY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
755.40	25		SANDY SILT (ML); hard; yellowish brown; moist; nonplastic to low plasticity fines; FeO stained.	S07	12 11 17	28									VOC=0.0.5 PPM
753.40	27		Well-graded SAND with SILT and GRAVEL (SW-SM); very dense; yellowish brown; moist; some fine to coarse GRAVEL; mostly fine to coarse SAND; subangular to subrounded hard (slightly weathered) to minor soft (intensely weathered) granitic and schist rock fragments.	C08											
749.40	32			O09						9	132				VOC=2.3 PPM UW, PA
745.40	36			S10	27 45 41	86									VOC=2.1 PPM
741.40	40		SILT (ML); hard; yellowish brown; moist; nonplastic fines.	S11	13 13 30	43				15					VOC=1.7 PPM
739.40	42		SILTY SAND (SM); very dense; yellowish brown; moist; nonplastic fines.	C12											VOC=3 PPM
737.40	44		Well-graded SAND with SILT, GRAVEL, and COBBLES (SW-SM); very dense; yellowish brown; moist; about 1 to 5% COBBLES; little fine to coarse GRAVEL; mostly coarse to fine SAND; few fines; COBBLES consist of; up to 6 in. diameter subangular to subrounded hard to moderately hard (slightly weathered) granitic rock fragments.	S13	21 42 49	91									VOC=0.8 PPM
733.40	48			C14											VOC=1.9 PPM
731.40	50			S15	60										VOC=2.4 PPM
729.40	52			C16	88/0.2	81									VOC=1.1 PPM

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DIST. 07	COUNTY LA	ROUTE 710	POSTMILE T/T	EA 07-07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER	PREPARED BY J. Pratt, M. Islam	DATE 1-26-09	SHEET 2 of 10		

CALTRANS BORING RECORD MET+ENG FIXED JOE - CALTRANS WITH REV Z3B2 Z3B5 Z3B7 ONLY SR-710TUNLS CT BORING LOGS11_23_09JPCOPY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
725.40	56		Well-graded SAND with SILT, GRAVEL, and COBBLES (SW-SM) (continued).	S17	31	50/0.5				11					VOC=7.1 PPM PA
	57							0							
723.40	58														
	59														
721.40	60			S18	48		92								VOC=4.2 PPM
	61				48										
	62			C19				74							VOC=2.9 PPM
	63														
717.40	64		SILTY SAND (SM); hard; yellowish brown; moist; trace coarse to fine GRAVEL; mostly medium to fine SAND; some nonplastic fines; gradationally interbedded with silty sand.							18					PA
	65			S20	9		69								VOC=135 PPM
715.40	66				31										
	67			C21				63							VOC=0.8 PPM
	68		Well-graded SAND with GRAVEL and COBBLES (SW); very dense; yellowish brown; moist; about 10% COBBLES; about 15 to 25% fine to coarse GRAVEL; COBBLES consist of; up to 4 in. diameter subrounded hard (slightly weathered) granitic rock fragments.												
	69														
711.40	70		SILTY SAND (SM); very dense; yellowish brown; moist; trace fine GRAVEL.	S22	30		100								VOC=2. PPM
	71				50										
	72			C23				97		15					VOC=1.4 PPM
	73														
707.40	74		CLAYEY SAND (SC); dense to very dense; strong brown; moist; nonplastic fines; gradationally interbedded with silty sand, possible hardpan (paleosol).												
	75			S24	16		95								VOC=1.9 PPM
	76				45										
705.40	77		Well-graded SAND with GRAVEL (SW); very dense; yellowish brown to light yellowish brown; moist; about 0 to 10% fine to coarse GRAVEL; fine to coarse SAND; interbedded with up to 10% silty sand, subangular hard sheared granitic rock fragments.	C25				97							VOC=2.3 PPM
	78														
	79														
701.40	80		Poorly graded SAND with GRAVEL (SP); very dense; yellowish brown to light yellowish brown; moist; little coarse to fine GRAVEL; mostly coarse to fine SAND; trace fines.	S26	24		89								VOC=6.1 PPM
	81				48										
	82			C27				91		15					PA
699.40	83														VOC=0.8 PPM
	84														
	85														

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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B2
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE T/T	EA 07-07-187900
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY J. Pratt, M. Islam	DATE 1-26-09	SHEET 3 of 10	

CALTRANS BORING RECORD MET+ENG FIXED JOE - CALTRANS WITH REV Z3B2 Z3B5 Z3B7 ONLY SR-710TUNLS CT BORING LOGS11_23_09JPCOPY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
695.40	85		Poorly graded SAND with GRAVEL (SP) (continued).	S28	50 70 50/0.4'										VOC=4.9 PPM
693.40	87		SILTY SAND (SM); very dense; strong brown to light yellowish brown; moist; trace fine GRAVEL; mostly coarse to fine SAND; interbedded with well graded sand and sandy silt, about 75% silty sand, about 20% well graded sand, crosslaminated.	C29			92								VOC=1.0 PPM
689.40	92			S30	27 35 22	57			15						PA VOC=2.3 PPM
687.40	93			C31			74								VOC=0.4 PPM
685.40	95			S32	42 26 75/0.4'										VOC=0.1 PPM
683.40	96		Well-graded SAND (SW); very dense; light yellowish brown; moist; trace fine to coarse GRAVEL; (up to 1 in. dia.) hard granitic rock fragments.	C33			100								VOC=0.0 PPM
681.40	98		Well-graded SAND with GRAVEL (SW); very dense; light yellowish brown to yellowish brown; moist; about 5% COBBLES; coarse GRAVEL; up to 4 in. diameter subangular hard (slightly weathered) sheared quartz diorite rock fragments, little silt interbeds.												
679.40	99		SILTY SAND (SM); dense to very dense; strong brown to reddish brown; moist; trace GRAVEL; mostly coarse to fine SAND; little nonplastic to low plasticity fines; interbedded with about 20% well graded sand and 25% silt, intensely weathered soil and quartz diorite and schist rock fragments.	S34	24 25 35	60			17						PA VOC=1.9 PPM
677.40	100			C35			91								VOC=0.8 PPM
675.40	101			S36	11 15 20	35									VOC=1.8 PPM
673.40	102			C37			100		18						VOC=0.4 PPM
671.40	103			S38	16 15 31	46									VOC=0.48 PPM
669.40	104		SILTY SAND (SM); very dense; yellowish brown to reddish brown; moist; few fine GRAVEL; mostly coarse to fine SAND; some nonplastic to low plasticity fines; gradationally interbedded with clayey sand, subangular hard (slightly weathered) to soft (intensely weathered) quartz diorite and schist rock fragments, intensely weathered zone (paleosol).	C39			100		12						PA VOC=0.1 PPM
667.40	105														

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PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER	PREPARED BY J. Pratt, M. Islam	DATE 1-26-09	SHEET 4 of 10		

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks	
665.40	115	[Diagonal hatching pattern]	CLAYEY SAND (SC); dense to very dense; very stiff to hard; yellowish brown to reddish brown mottled; moist; nonplastic to low plasticity fines; to sandy lean clay, intensely weathered (paleosol or regolith).	S40	10	36									VOC=0.2 PPM	
	116			C41				69	14							PI VOC=0.2 PPM
663.40	117				CLAYEY SAND (SC); very dense; very stiff; light yellowish brown to yellowish red mottled; moist to wet; nonplastic to low plasticity fines; wet between EL 663.1 to 662.6 ft. minor weakly calcite cemented sand, intensely weathered soft (paleosol/regolith).	S42	26							PP = 3.0 to 4.0		VOC=0.1 PPM
661.40	118		C43	50/2'			100	0							VOC=0.0 PPM	
659.40	121	[Blocky pattern]	METAMORPHIC ROCK, (GNEISS); medium-grained to aphanitic; thinly to moderately foliated (0.2 to 1.0 ft), foliations dip 20°, dark yellowish orange to light brown, decomposed to intensely weathered; very soft to soft; intensely fractured; joints dip from 60 to 80°, very thin slightly open fractures partly filled with clay and FeO (forms rubble), moderately thin totally silica healed fractures below EL +654.4 ft [fractures moderately rough; friable (Well graded SAND with CLAY (SW-SC), very dense). Wilson Quartz Diorite .	S44	60/33										VOC=0.0 PPM	
657.40	122			C45			51	0								VOC=0.0 PPM
655.40	123															VOC=0.0 PPM
653.40	124															VOC=0.0 PPM
651.40	125															VOC=0.0 PPM
649.40	126		METAMORPHIC ROCK, (GNEISS); coarse-grained to very coarse-grained; generally foliated, pale yellowish brown to yellowish gray, intensely weathered, moderately soft to moderately hard, very intensely fractured, joints dip 55°, thin moderately open fractures partly healed with clay and FeO, some thin fractures (3 to 5 mm thick) moderately healed with silica or feldspar and dip 25 to 30°, and 55°; friable; estimated upper contact.	C46				0							VOC=0.0 PPM	
647.40	127														VOC=0.0 PPM	
645.40	128				C47			38	0						VOC=0.0 PPM	
643.40	129				C48			42	0						VOC=0.6 PPM	
641.40	130															
639.40	131															
637.40	132															
	133															
	134															
	135															
	136															
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	145															

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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B2	
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE T/T	EA 07-07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER		PREPARED BY J. Pratt, M. Islam		DATE 1-26-09	SHEET 5 of 10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
635.40	146		(continued). METAMORPHIC ROCK, (GNEISS); medium-grained; generally foliated, pale yellowish brown to dark gray, intensely weathered, decomposed below EL 635.1 ft; moderately hard to hard; intensely fractured; below EL 635.1 ft, very soft (decomposed gneiss altered to clay with slickensides); rubble.		C49			70	10						UW, PL
633.40	148		METAMORPHIC ROCK, (GNEISS); generally foliated, light brownish gray to white, intensely weathered, moderately hard to hard, very intensely to intensely fractured, joints dip 60°, 75°, and 40 to 25°, very closely spaced fractures (7 mm spacing) below EL 633.4 ft; seams infilled with FeO and intensely weathered to decomposed mica (weathered to clay); fractures not healed.		C50			58	0	0	160				VOC=0.4 PPM
629.40	152		METAMORPHIC ROCK, (GNEISS);, light brownish gray to white, intensely weathered, moderately hard to hard, intensely to moderately fractured, joints dip 65 to 75°, closely to moderately spaced (0.4 to 0.1 ft), FeO and clay lined, not healed.												VOC=0.3 PPM
627.40	154		Below EL 629.2 ft., aphanitic to medium-grained, very intensely to intensely fractured, joints dip 25-30° and 65-75° (jointsets), very close to closely spaced (0.05 to 0.3 ft), subvertical joints not healed (FeO and clay infill); low angle joints moderately to totally healed with FeO and silica (0.5 to 10 mm thick).		C51			56	16						
623.40	158		METAMORPHIC ROCK, (GNEISS); generally foliated, light gray to brownish gray, hard, intensely fractured, (decomposed seams); joints dip 80°, 50-55°, 65-25°, FeO and silica lined fractures are moderately healed to not healed; wet clay lined fractures (1 to 10 mm thick) not healed, slightly rough, slickensides on low angle shears, 5 to 30 mm fracture [spacing, lots rubble].		C52			68	8						VOC=1.1 PPM
619.40	162														VOC=0.5 PPM
617.40	164														
615.40	166		METAMORPHIC ROCK, (GNEISS); intensely weathered, hard, very intensely to intensely fractured, fracture zone, forms rubble.		C53			38	0						
613.40	168		METAMORPHIC ROCK, (GNEISS); decomposed to intensely weathered, very soft to soft, possible veins/dike, seams weathered to clay (Well graded SAND with CLAY (SW-SC)).												VOC=0.9 PPM
611.40	170														UW, PL
609.40	172		METAMORPHIC ROCK, (GNEISS); possibly thinly foliated (0.1 to 0.3 ft), yellowish gray, intensely weathered, hard, intensely fractured, continuous joints dip 60 to 70° and 25 to 40°, partly healed with silica and infilled with clay, slightly rough surfaces.		C54			48	0	0	155				VOC=0.4 PPM
607.40	174														
175			(continued)												



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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B2	
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE T/T	EA 07-07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER		PREPARED BY J. Pratt, M. Islam		DATE 1-26-09	SHEET 6 of 10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	175		(continued).												
605.40	176		METAMORPHIC ROCK, (SCHIST); fine- to medium-grained; intensely foliated (<3mm); intensely weathered to decomposed (possible altered mafic dike), dark gray, intensely weathered to decomposed (possible altered mafic dike); moderately hard; intensely to moderately fractured; fractures very closely spaced (10 to 15 mm), partly silica healed, remainder infilled with soft clay (not healed), [slightly to moderately open fractures (0.5 to 3 mm)].		C55			88	7						VOC=0.3 PPM
603.40	177														
601.40	178		METAMORPHIC ROCK, (SCHIST); Chloritic, dark greenish gray, decomposed, very soft to soft, (decomposed to Lean CLAY (CL), medium plasticity, moist).		C56			88	0						VOC=0.9 PPM
599.40	179		METAMORPHIC ROCK, (GNEISS); very thinly foliated, light gray to pale yellowish brown, intensely weathered to decomposed; mostly hard to some soft; very intensely to intensely fractured; soft clay lined fractures not healed (slightly open to moderately open, 0.5 to 2 mm), forms rubble (some Poorly graded GRAVEL with CLAY and SAND (GP-GC)).												
597.40	180		METAMORPHIC ROCK, (GNEISS);, medium light gray, intensely weathered, hard, intensely fractured, joint sets dip 80 to 70°, 60°, and 30°, fractures partly healed with silica and remainder infilled with soft clay (not healed, moderately open, 1 to 2 mm), slightly rough to smooth surfaces; rubble.		C57			85	10						
595.40	181														
593.40	182		METAMORPHIC ROCK, (GNEISS);, fine-grained to medium-grained, medium light gray, intensely weathered to decomposed; hard to some very soft; very intensely to intensely fractured; joints dip 70° to 20°, very closely spaced (10 to 20 mm fracture spacing), siliceous & clay lined (1 to 2 mm), slightly rough to smooth surfaces [breaks down to rubble and coarse sand (some Poorly graded GRAVEL with SAND (GP))].		C58			71	0						
591.40	183														
589.40	184		METAMORPHIC ROCK, (GNEISS);, white to dark greenish gray, decomposed to intensely weathered; very soft to moderately soft; very intensely fractured; very closely spaced fractures (10 mm spacing) dip 70°, altered clay material is moist to wet (mostly Poorly graded GRAVEL with CLAY and SAND (GP-GC), moist to wet).												
587.40	185														
585.40	186		METAMORPHIC ROCK, (GNEISS); fine-grained to aphanitic; thinly to moderately foliated (0.2 to 0.4 ft), greenish gray to medium bluish gray, intensely to moderately weathered, hard, intensely fractured, fractures dip 20 to 30°, and 50°, closely spaced (0.2 to 0.3 ft), chlorite and slickensides on shear and fracture surfaces, fractures/shears partly calcite healed.		C59			80	0						
583.40	187		METAMORPHIC ROCK, (GNEISS);, medium gray to white, mostly decomposed (80%) to intensely weathered; mostly very soft to little hard; intensely fractured; chloritic alteration, (mostly Poorly graded GRAVEL with CLAY and SAND (GP-GC); Pressure meter test (195-201 ft depth).		C60			17	0						
581.40	188														
579.40	189		METAMORPHIC ROCK, (GNEISS);, medium-grained to fine-grained, medium gray to medium light gray, mostly moderately to intensely weathered (75%) with little thin (0.1 to 0.3 ft) decomposed intervals (25%); mostly hard to little very soft; intensely fractured, joints dip 75-70°, 50° & 25°, [closely spaced (0.1 to 0.3 ft), continuous, partly healed with silica, clay lined (not healed), slightly rough surfaces (little Poorly graded SAND with CLAY (SP-SC))].		C61			93	0						VOC=0.9 PPM
577.40	190														
	201														
	202														
	203														
	204														
	205														

(continued)



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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B2	
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE T/T	EA 07-07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER		PREPARED BY J. Pratt, M. Islam		DATE 1-26-09	SHEET 7 of 10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks										
575.40	206	[Material Graphic: Metamorphic Rock (Gneiss)]	METAMORPHIC ROCK, (GNEISS); medium-grained, medium gray to medium light gray, mostly intensely weathered (70%) to some decomposed (30%); mostly moderately hard to some very soft; very intensely to intensely fractured; joints dip 70-80°, 50°, & 25 to 35°, very thin subvertical fractures very closely spaced (7 mm) [and totally silica healed, remaining lower angle joints are partly healed with silica and calcite and not healed with clay infill, slickensides plunge 20° on subvertical shears (some Lean CLAY with SAND (CL))].	C62				100	0				[Drilling Method: Diamond Core]		VOC=1.0 PPM										
573.40	208							86	0						VOC=0.8 PPM										
571.40	210							C63	METAMORPHIC ROCK, (GNEISS); medium gray to medium dark gray, decomposed, very soft to soft, (Lean CLAY (CL), soft).														[Drilling Method: Diamond Core]		VOC=0.5 PPM
569.40	212																								
567.40	214							C64	METAMORPHIC ROCK, (GNEISS); medium-grained to fine-grained; very thinly to thinly foliated (dip 20°), medium gray to medium light gray, intensely to moderately weathered, moderately hard to hard, very intensely to intensely fractured, irregular discontinuous fractures dip 60 to 70° and 20°, fractures partly healed with chlorite and silica, slightly rough surfaces, 35% rubble.														[Drilling Method: Diamond Core]		VOC=0.5 PPM
565.40	216	100	0	VOC=0.5 PPM																					
563.40	218	76	0	VOC=0.5 PPM																					
561.40	220	C65	METAMORPHIC ROCK, (GNEISS); medium-grained, medium light gray to medium gray, mostly intensely to moderately weathered (80%) to little decomposed (20%); mostly moderately hard to little very soft; intensely fractured; joints dip 75°, 50°, and 25°, subvertical joints are very closely spaced (30 mm), low angle joints [are closely spaced (60 to 70 mm), continuous not healed fractures are lined with minor chlorite and rare calcite, moderately to slightly rough surfaces (little Lean CLAY (CL))].									[Drilling Method: Diamond Core]		VOC=0.5 PPM											
559.40	222														100	0	VOC=0.5 PPM								
557.40	224														76	0	VOC=0.5 PPM								
555.40	226														100	0	VOC=0.5 PPM								
553.40	228	C66	METAMORPHIC ROCK, (GNEISS); medium-grained; foliated, medium gray, mostly moderately to intensely weathered (5% decomposed); mostly moderately hard to few soft; very intensely to intensely fractured; joints dip 70° and 20°, closely to very closely spaced (<0.1 to 0.2 ft) [subvertical very thin (0.5 mm thick) fractures moderately healed with silica, moderately rough surfaces]. Below EL 559.2 ft becomes, dark gray, (Pressuremeter test from 221.0 to 227.0 ft depth).									[Drilling Method: Diamond Core]		UW, PTS, PL VOC=0.8 PPM											
551.40	230														77	20	VOC=0.8 PPM								
549.40	232														88	0	VOC=0.8 PPM								
547.40	234	C67	METAMORPHIC ROCK, (GNEISS); medium-grained; foliated, medium light gray to medium gray, moderately to intensely weathered; moderately hard; very intensely to intensely fractured; joints dip 70 to 80° & 20-25°, continuous subvertical joints partly healed with silica and not healed with clay infill [slightly rough surfaces, 80% soft decomposed below EL 551.4 ft].									[Drilling Method: Diamond Core]		VOC=0.8 PPM											
545.40	236														88	0	VOC=0.8 PPM								
543.40	238	C68	IGNEOUS ROCK (QUARTZ DIORITE); medium-grained, medium light gray, moderately to slightly weathered, hard to very hard, intensely fractured, low angle moderately open joints lined with waxy chlorite, slickensides show 65° rake from horizontal in 50° dip shear planes; continuous joints dip 75°, 50°, and 20°, closely (40 mm) to very closely									[Drilling Method: Diamond Core]		VOC=0.8 PPM											
541.40	240														88	0	VOC=0.8 PPM								
539.40	242														88	0	VOC=0.8 PPM								

(10) (continued)



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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B2	
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE T/T	EA 07-07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER		PREPARED BY J. Pratt, M. Islam		DATE 1-26-09	SHEET 8 of 10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
545.40	236	[Symbol]	mm spaced, [moderate and low angle joints closely spaced, subvertical joints very closely spaced and moderately healed with very thin silica (0.5 to 1 mm thick)]. (continued).		C70			94	22						
543.40	238	[Symbol]	METAMORPHIC ROCK, (MARBLE) (partly replaced with QUARTZ DIORITE in patches); medium- to coarse-grained, light gray to medium light gray, moderately to intensely weathered; moderately hard; intensely fractured, low angle moderately open joints lined with waxy chlorite, high and low angle fractures moderately healed with calcite [fractures very closely spaced (20 to 25 mm), possible crinoidal debris in recrystallized mass].												VOC=0.8 PPM
541.40	240	[Symbol]	At EL. 542.4 ft, becomes dark greenish gray, intensely fractured, joints dip 70°, 50 to 45°, and 20°, joints partly healed with calcite and chlorite infill to totally healed with calcite, 10% very soft decomposed interval altered to clay (few Lean CLAY (CL)).		C71			83	15						VOC=0.9 PPM
539.40	242	[Symbol]	METAMORPHIC ROCK, (MARBLE)(partly replaced with QUARTZ DIORITE in patches); medium-grained, dark greenish gray to light brownish gray, moderately to intensely weathered; moderately soft; intensely fractured, joints dip 80°, 50°, and 20°, partly to totally healed with calcite, moderately thin (1 to 2 mm) subvertical calcite veins very closely spaced (15 mm).		C72			92	0						
537.40	244	[Symbol]	METAMORPHIC ROCK, (MARBLE) (partly replaced with QUARTZ DIORITE in mixed patches and layers); medium- to coarse-grained, medium light gray to greenish gray, intensely to moderately weathered, moderately soft to moderately hard, intensely fractured, joints dip 75 to 60°, 50°, and 20°, joints partly to totally calcite healed (1 to 2 mm calcite veins), all continuous, some clay lined not healed open joints.		C73			50	0						
535.40	246	[Symbol]	METAMORPHIC ROCK, (MARBLE); medium-grained, greenish gray, intensely to moderately weathered, moderately hard, very intensely to intensely fractured, joints dip 20 to 30° and 60°, subvertical joints very closely spaced, low angle joints closely spaced, partly to totally calcite healed.		C74			80	0						
533.40	248	[Symbol]	IGNEOUS ROCK (DIORITE to QUARTZ DIORITE); medium- to coarse-grained, medium gray, intensely to moderately weathered, hard to very hard, intensely fractured, continuous joints dip 85 to 70° and 30°, very closely spaced subvertical joints partly healed with calcite and some infilled with clay and slightly open, low angle joints partly healed to totally healed with calcite (1 to 2 mm thick).		C75			80	0						VOC=1.0 PPM
529.40	252	[Symbol]	IGNEOUS ROCK (DIORITE to QUARTZ DIORITE); medium- to coarse-grained, medium gray, intensely to moderately weathered, hard to very hard, intensely fractured, continuous joints dip 85 to 70° and 30°, very closely spaced subvertical joints partly healed with calcite and some infilled with clay and slightly open, low angle joints partly healed to totally healed with calcite (1 to 2 mm thick).		C76			88	8						
527.40	254	[Symbol]	IGNEOUS ROCK (DIORITE to QUARTZ DIORITE); medium- to coarse-grained, medium gray, intensely to moderately weathered; hard; moderately to intensely fractured; continuous subvertical joints dip approximately 70°.		C77			80	7						VOC=0.9 PPM
525.40	256	[Symbol]													
523.40	258	[Symbol]	IGNEOUS ROCK (DIORITE to QUARTZ DIORITE); medium- to coarse-grained, light olive gray to greenish gray, decomposed, very soft, (Lean CLAY (CL), stiff to hard clay (PP=1.0 to >4.5 tsf).		C78			74	9						VOC=1.0 PPM
521.40	260	[Symbol]													
519.40	262	[Symbol]													
517.40	264	[Symbol]													
	265		(continued)												



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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B2	
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE T/T	EA 07-07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER		PREPARED BY J. Pratt, M. Islam		DATE 1-26-09	SHEET 9 of 10

CALTRANS BORING RECORD MET+ENG FIXED JOE - CALTRANS WITH REV Z3B2 Z3B5 Z3B7 ONLY SR-710TUNLS CT BORING LOGS11_23_09JPCOPY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
265			(continued).		C79			70	0						
515.40	266		IGNEOUS ROCK (DIORITE to QUARTZ DIORITE); medium- to coarse-grained, medium dark gray to medium light gray, intensely to moderately weathered, few (8%) decomposed intervals sometimes along fractures; moderately hard to hard (few zones very soft); intensely to moderately fractured, shear dipping 45° is waxey clay lined with slickensides showing 70° rake from horizontal on fracture plane, [slightly rough surface], joints dip 80 to 70°, 50°, and 20°, subvertical joints very closely spaced, low angle joints moderately to closely spaced, partly healed to not healed with calcite, clay lined (few Lean CLAY (CL) intervals)].												VOC=0.9 PPM
267															
513.40	268														
269					C80				90	0					
511.40	270														
271															
509.40	272														
273															
507.40	274				C81										
275															
505.40	276		Bottom of borehole at 275.0 ft bgs Borehole was converted to piezometer at the completion of drilling.												
277															
503.40	278														
279															
501.40	280														
281															
499.40	282														
283															
497.40	284														
285															
495.40	286														
287															
493.40	288														
289															
491.40	290														
291															
489.40	292														
293															
487.40	294														
295															



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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B2	
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE T/T	EA 07-07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER		PREPARED BY J. Pratt, M. Islam		DATE 1-26-09	SHEET 10 of 10

LOGGED BY J. Castle, B. Schell	BEGIN DATE 2-4-09	COMPLETION DATE 2-13-09	BOREHOLE LOCATION (Lat/Long or North/East and Datum) 34° 7' 52.6146" / 118° 9' 17.823" NAD83	HOLE ID R-09-Z3B3
DRILLING CONTRACTOR Cascade Drilling Inc.		BOREHOLE LOCATION (Offset, Station, Line) ' Lt Sta Bellefontaine St at St. John Ave		SURFACE ELEVATION 801.90 ft NAVD 88
DRILLING METHOD Rotary Wash		DRILL RIG Speed Star 30K		BOREHOLE DIAMETER 6 in
SAMPLER TYPE(S) AND SIZE(S) (ID) SPT (1.4"), Cal (2.4"), PQ core (3.2")		SPT HAMMER TYPE Automatic Hammer 140 lb. 30 inch drop		HAMMER EFFICIENCY, ERI 70%
BOREHOLE BACKFILL AND COMPLETION Piezometer Installed on Completion		GROUNDWATER DURING DRILLING AFTER DRILLING (DATE) READINGS NM 136.0 ft on 7-1-09		TOTAL DEPTH OF BORING 275.5 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
0	0		GRASS and LANDSCAPE (Fill).												This Boring Record was prepared in accordance with the Caltrans Soil & Rock Logging, Classification and Presentation Manual (June, 2007) except as noted in Appendix A1 of the Final Geotechnical Summary Report, SR-710 Tunnel Technical Study, Los Angeles County, California, dated April, 2010.
799.90	1		SILTY SAND (SM); Loose, yellowish brown, medium to fine SAND [ALLUVIUM].												
797.90	2														
795.90	3														
793.90	4														
791.90	5														
789.90	6														
787.90	7														
785.90	8														
783.90	9														
781.90	10														
779.90	11		Dense, yellowish brown mottled with brown, moist, fine SAND, micaceous, oxidized.	S1	9	27	100								
777.90	12														
	13														
	14														
	15														
	16		Poorly graded SAND with GRAVEL (SP); dense, yellowish brown, moist, subangular GRAVEL, max. 3/4" dia.; coarse SAND, micaceous, granitic source.	D2	28	50/5	100								
	17														
	18														
	19														
	20														
	21														
	22														
	23														
	24														
	25														

(continued)

CALTRANS BORING RECORD MET+ENG FIXED SR710_BORINGLOG_3_13_2010.GPJ CALTRANS LIBRARY 040808.GLB 3/14/10



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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B3
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE D/D	EA 07-187900
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER N/A	PREPARED BY K.T	DATE 6-22-09	SHEET 1 of 10	

CALTRANS BORING RECORD MET+ENG FIXED SR710_BORINGLOG_3_28_2010.GPJ CALTRANS LIBRARY.GLB 3/28/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
775.99	25		Poorly graded SAND with GRAVEL (SP) (continued). Same as above. At EL. 775.99', becomes GRAVEL max. 2 1/4" dia.	D4	20	50/5		100							
773.99	26														
771.99	27														
769.99	28														
767.99	29														
765.99	30				S5	12	55	100							
763.99	31					22									
761.99	32					33									
759.99	33														
757.99	34														
755.99	35			D6	50/6			100							
753.99	36														
751.99	37														
749.99	38														
747.99	39														
	40		SILTY SAND (SM); very dense, yellowish brown and strong brown, moist, fine to very fine SAND, micaceous, oxidized.	S7	18	62	100								
	41				24										
	42				38										
	43														
	44														
	45		Assume Silty SAND as above.	D8	50/6			0							
	46														
	47														
	48														
	49														
	50		No recovery.	D9	24	50/3		0							
	51														
	52														
	53														
	54														
	55														

Note: Sampler Jammed with rock that fell into hole

(continued)



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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B3	
DIST. 7	COUNTY LA	ROUTE 710	POSTMILE D/D	EA 07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER		PREPARED BY K.T		DATE 6-22-09	SHEET 2 of 10

CALTRANS BORING RECORD MET+ENG FIXED SR710_BORINGLOG_3_28_2010.GPJ CALTRANS LIBRARY.GLB 3/28/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
745.99	56		SILT (ML); yellowish brown, moist, nonplastic fines, finely micaceous.	S10	17		100							
	57		GRAVELLY SILT (ML); medium stiff, dark yellowish brown, moist, about 50% GRAVEL, max. 1" dia.; nonplastic fines, GRAVEL consists of diorite, subrounded to subangular, oxidized.		50/1									
743.99	58													
	59													
741.99	60		SILT (ML); yellowish brown, moist, finely micaceous.	D11	50/0.5		100							
	61		Poorly graded SAND with GRAVEL (SP); very dense, dark yellowish brown, moist, about 10% GRAVEL, max. 1" dia.; coarse to fine SAND, GRAVEL consist of diorite, subangular, uncemented, unbedded.											
739.99	62													
	63													
737.99	64													
	65													
735.99	66		SILTY SAND (SM); very dense, yellowish brown to brown, moist, trace fine GRAVEL, coarse to medium SAND.	S12	29		100							
	67													
733.99	68													
	69													
731.99	70		SILTY CLAY (CL-ML); hard, brown to dark yellowish brown, moist, medium plasticity; 0.2" to 0.4" thick beds, horizontal bedding, oxidized, trace of organic material.	D13	19		100							
	71													
729.99	72		SILTY SAND (SM); dense, brown mottled with yellowish brown, moist, fine GRAVEL, coarse to fine SAND, about 20% nonplastic fines, dendritic manganese.											
	73													
727.99	74													
	75													
725.99	76			S14	50/6		100							
	77													
723.99	78													
	79													
721.99	80													
	81			D15	9	45	100							
	82		SILTY SAND with GRAVEL (SM); very stiff, dark brown mottled with dark yellowish brown, about 10% fine GRAVEL, max. 1/2" dia; coarse to fine SAND, GRAVEL consist of diorite, subrounded to subangular, increase in fine towards bottom, unbedded, one 0.08"-thick vein.		18									
719.99	83				27									
	84													
717.99	85													

(continued)



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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B3
DIST. 7	COUNTY LA	ROUTE 710	POSTMILE D/D	EA 07-187900
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY K.T	DATE 6-22-09	SHEET 3 of 10	

CALTRANS BORING RECORD MET+ENG FIXED SR710_BORINGLOG_3_28_2010.GPJ CALTRANS LIBRARY.GLB 3/28/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
715.99	86		Well-graded SAND with GRAVEL (SW); very dense, yellowish brown, moist, about 30% subangular to subrounded GRAVEL, max. 1.5" dia.; coarse to fine SAND, gravel consist of diorite.	S16	50/6			100							
711.99	90		SILTY SAND (SM); very dense, brown to yellowish brown, moist, about 20% fine GRAVEL, medium to fine SAND, sharp contact 20° dip; gravel consist of igneous and metamorphic rocks, more oxidized, more rounded, grading down to bottom.	D17	32 39 41	80		100				PP = 2.75			
705.99	96		Poorly graded SAND with SILT and GRAVEL (SP-SM); very dense, brown to yellowish brown, moist, fine GRAVEL, max. 1/4" dia.; coarse to fine SAND, 2" to 4" thick horizontal bedding.	S18	23 34 50	84		100							
701.99	100		SILTY SAND (SM); very dense, yellowish brown mottled with brown, moist, coarse to fine SAND, micaceous, oxidized.	D19	10 50/5			100							
695.99	106			S20	20 50/6			100							
689.99	112		At EL. 691', trace GRAVEL, max. 1/4" dia.	D21	20 50/6			100							

(continued)



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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B3	
DIST. 7	COUNTY LA	ROUTE 710	POSTMILE D/D	EA 7-07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER		PREPARED BY K.T		DATE 6-22-09	SHEET 4 of 10

CALTRANS BORING RECORD MET+ENG FIXED SR710_BORINGLOG_3_28_2010.GPJ CALTRANS LIBRARY.GLB 3/28/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
115	116		No recovery.	X S22	20	50/6		0							
685.99	117														
683.99	118														
681.99	120		Poorly graded SAND with GRAVEL (SP); very dense, yellowish brown, moist, coarse to fine subangular GRAVEL, max. 1.5" dia.; coarse to fine SAND, gravels consist of feldspar rich granitic rock.	X S23	50/6			100							
679.99	122														
677.99	124														
675.99	125		Well-graded GRAVEL (GW); very dense, gray to dark gray, moist, coarse to fine GRAVEL; gravel consist of diorite and granite, slightly weahtered, hard, slightly fractured, 10% dark minerals, oxidized.	X D24	50/5			100							
673.99	127			C1				55							
671.99	128		SILT (ML); very stiff, nonplastic, slightly micaceous.									PP = 3			
671.99	129		SILTY SAND (SM); medium dense, brown to dark yellowish brown, moist, fine SAND, about 5% low plasticity fines, very stiff, sharp contact.												
671.99	130			C2				100				PP = 3			
669.99	132		Well-graded GRAVEL with SAND (GW); dense, brown to dark yellowish brown, moist, trace COBBLE; coarse GRAVEL; max. 2.5" dia.; coarse to fine SAND; about 5% low plasticity fines; gravel consist of diorite, gabbro and gneiss, hard to decomposed.												
667.99	134		SILTY SAND (SM); dense to medium dense, dark yellow to brown, medium to fine SAND; about 20% nonplastic fines.												
665.99	136		Well-graded GRAVEL with SAND (GW); dense, multi colored, moist, trace BOULDER; about 20% COBBLES; coarse to fine SAND; nonplastic fines; cobbles consist of diorite, quartz diorite, gabbro, granite, gneiss rocks, hard to decomposed, rounded to subrounded.												Lost core at EL. 666.5' to 662'
663.99	138														
661.99	140														Lost core
659.99	141														
659.99	142														
657.99	143														
657.99	144														Lost core
145															

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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B3
DIST. 7	COUNTY LA	ROUTE 710	POSTMILE D/D	EA 07-187900
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY K.T	DATE 6-22-09	SHEET 5 of 10	

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
655.99	146		Well-graded GRAVEL with SAND (GW) (continued).	C7			42							Difficult to drill most likely Pleistocene age soil horizon based on oxidation and density
	147			C8			27							
653.99	148													
	149													
651.99	150													
	151													
649.99	152													
	153		Poorly graded SAND with GRAVEL (SP); dense, reddish brown, moist, about 35% coarse to fine GRAVEL, max. 2.75" dia.; coarse SAND; gravel consist of igneous and metamorphic rocks, hard to decomposed, subrounded to rounded, horizontal bedding. At EL. 648', becomes yellowish brown, moist, wide variety of igneous and metamorphic rocks, hard to decomposed.	C9			75							
647.99	154			C10			100							
	155													
645.99	156													
	157		COBBLES with some well graded SAND with GRAVEL; medium dense to dense, brown and yellowish brown, moist, about 60% COBBLES, medium to coarse SAND; cobbles consist of igneous and metamorphic rocks, well rounded to subrounded, hard to decomposed.											
643.99	158													
	159													
641.99	160			C11			0							
	161													
639.99	162													
	163													
637.99	164													
	165			C12			50							
635.99	166													
	167													
633.99	168													
	169		Poorly graded SAND (SP); dense, yellowish brown, moist, coarse SAND.											
631.99	170		SILT (ML); stiff, yellowish brown, moist, nonplastic, micaceous, no bedding.	C13			60							Lost core at top
	171		Well-graded SAND with GRAVEL (SW); dense, yellowish brown, moist, little GRAVEL, max. 4" dia.; coarse SAND, gravel consist of igneous and metamorphic rocks.											
629.99	172													
	173													
627.99	174			C14			60							
	175													

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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B3	
DIST. 7	COUNTY LA	ROUTE 710	POSTMILE D/D	EA 07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER		PREPARED BY K.T		DATE 6-22-09	SHEET 6 of 10

CALTRANS BORING RECORD MET+ENG FIXED SR710_BORINGLOG_3_28_2010.GPJ CALTRANS LIBRARY.GLB 3/28/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks	
625.99	176		Well-graded SAND with GRAVEL (SW) (continued).	C14			60							See note at end of log regarding RQD.	
623.99	178		At EL. 624.2', gabbro boulder, soft, crumbly.												
621.99	180		COBBLES, BOULDERS, GRAVEL; multi colored, about 50% COBBLES, about 10% BOULDERS, about 30% GRAVEL, about 10% coarse SAND matrix, cobbles consist of igneous and metamorphic rocks, rounded to subrounded, hard to decomposed, some oxidized, some fresh.	C15			70								
619.99	182														
617.99	184			C16					48						
615.99	186		IGNEOUS and METAMORPHIC ROCKS (DIORITE, QUARTZ DIORITE, QUARTZ MONZONITE, foliated DIORITE, GNEISS); intersecting intrusive bodies and dikes; fine-grained to coarse-grained, light gray to bluish green, intensely weathered, soft, (FAULT GOUGE, intensely sheared and altered to SANDY CLAY; stiff, coarse to fine SAND, high plasticity fines) (WILSON QUARTZ DIORITE).	C17			92	0							
611.99	190														
609.99	192			C18					67	0		PP = 3.5 to 4.5			
607.99	194														
605.99	196			C19			87	0			PP = 4.5				
603.99	198														
601.99	200														
599.99	202														
597.99	204		At EL. 597.5', becomes FAULT GOUGE.	C20			79	0					Lost core		

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DIST. 7	COUNTY LA	ROUTE 710	POSTMILE D/D	EA 07-187900
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY K.T		DATE 6-22-09	SHEET 7 of 10

CALTRANS BORING RECORD MET+ENG FIXED SR710_BORINGLOG_3_28_2010.GPJ CALTRANS LIBRARY.GLB 3/28/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
205														
595.99	206			C20			79	0						See note at end of log regarding RQD.
	207													
593.99	208													
	209													
591.99	210													Lost core
	211													
589.99	212		At EL. 593', sheared, altered igneous and metamorphic rocks in SANDY CLAY matrix, dark gray to bluish green, about 50% dark minerals, joints and shears dipping 35° to 45°, clay filling small scale fault, dipping 40°.	C21			75	0			PP = 4.5			
	213													
587.99	214													
	215													
585.99	216													Lost core
	217													
583.99	218			C22			83	0						
	219													
581.99	220													
	221													
579.99	222			C23			40	0						
	223													
577.99	224													Lost core
	225													
575.99	226													
	227													
573.99	228			C24			73	0						
	229													
571.99	230													
	231													
569.99	232		At EL. 569.5', hard zones; highly fractured and sheared igneous and metamorphic rocks, decomposed.	C25			58	0						
	233													
567.99	234													
	235													

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DIST. 7	COUNTY LA	ROUTE 710	POSTMILE D/D	EA 07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER		PREPARED BY K.T		DATE 6-22-09	SHEET 8 of 10

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ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
235	235			C26			10	0						See note at end of log regarding RQD. Very poor recovery
565.99	236													
	237													
563.99	238													
	239													
561.99	240		At EL. 562', sheared DIORITE, soft, decomposed, oxidized, altered.											
	241			C27			0	0						
559.99	242													
	243													
557.99	244													
	245			C28			50	58			PP = 4.5			
555.99	246		At EL. 556.6', hard fragment of sheared diorite, max. 2.25" dia.											
	247													
553.99	248		At EL. 555', fault gouge zone with CLAYEY SAND; about 2% GRAVEL, about 64% coarse to fine SAND, about 34% nonplastic fines; gravel consists of igneous and metamorphic rocks, decomposed, intensely fractured and sheared.								PP = >4.5			PI
	249			C29			100	100						Difficult to drill at EL. 554'
551.99	250													
	251		IGNEOUS and METAMORPHIC ROCKS (DIORITE): fine grained to coarse grained, gray, moderately weathered, hard, intensely fractured, abundant soft zones of sheared and altered rocks.											
549.99	252													
	253		At EL. 549.8', slickensides on fault surface, reddish brown, oxidation, clay filling, dipping 35°.											
547.99	254		At EL. 548', minor scale fault dipping 30°.											
	255			C30			98	45	4					CS & EM, UC
545.99	256		At EL. 546', altered DIORITE, soft to moderately soft, fractured.											
	257													
543.99	258		At EL. 545', wavy fracture with oxidized clay filling, smooth polished surface, dipping 30°.											
	259													
541.99	260		At EL. 543', becomes healed fault, dipping 40°, abundant slickenside. At EL. 542.5', FAULT GOUGE, light gray, very soft, altered to sandy clay.											UC
	261													
539.99	262		At EL. 540.5', recemented igneous rock, moderately hard, altered.											
	263													
537.99	264													
	265			C31			100	0						

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DIST. 7	COUNTY LA	ROUTE 710	POSTMILE D/D	EA 07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER		PREPARED BY K.T		DATE 6-22-09	SHEET 9 of 10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
535.99	266		(continued). At EL. 535.5', shattered zone, moderately hard, 1.25" wide.	C31			100	0						See note at end of log regarding RQD.
533.99	268		At EL. 533', calcite crystals, max. 1/4" dia.											
531.99	270		At EL. 528', becomes intensely fractured.	C32			98	0			PP = 4.5			CS & EM, PTS
529.99	272		IGNEOUS ROCK (altered DIORITE), coarse-grained, light gray, predominantly very soft, locally hard, intensely fractured, small scale faults, dipping 50° to 70°, recrystallization along fault plane, abundant FeO on joint and fault surfaces, hydrothermally altered, Plagioclase 40%, Hornblende 29%, Chlorite 8%, Quartz 8%, biotite 5%, K-feldspar 1%, Calcite 3%, weak directional fabric.											
525.99	276		Bottom of borehole at 275.5 ft bgs Bottom of borehole is at elevation 526.5 ft. Borehole converted to piezometer at the completion of drilling.											



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DIST. 7	COUNTY LA	ROUTE 710	POSTMILE D/D	EA 07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER		PREPARED BY K.T		DATE 6-22-09	SHEET 10 of 10

LOGGED BY D. Jankly	BEGIN DATE 3-2-09	COMPLETION DATE 3-6-09	BOREHOLE LOCATION (Lat/Long or North/East and Datum) 34° 7' 58.7712" / 118° 8' 54.5316" NAD83	HOLE ID R-09-Z3B4
DRILLING CONTRACTOR Cascade Drilling Inc.			BOREHOLE LOCATION (Offset, Station, Line) ' Lt Sta (Fillmore St. e/o S. Raymond Ave.)	SURFACE ELEVATION 768.0 ft NAVD 88
DRILLING METHOD Rotary Wash			DRILL RIG Speedstar 30k	BOREHOLE DIAMETER 6 in
SAMPLER TYPE(S) AND SIZE(S) (ID) SPT(1.4"), Cal (2.4"), PQ core (3.2")			SPT HAMMER TYPE Automatic Hammer 140 lb. 30 inch drop	HAMMER EFFICIENCY, ERI 70%
BOREHOLE BACKFILL AND COMPLETION Bentonite and cement grout backfill			GROUNDWATER DURING DRILLING READINGS NM	AFTER DRILLING (DATE) N/A
				TOTAL DEPTH OF BORING 276.0 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		ASPHALT 4" thick.												<p>This Boring Record was prepared in accordance with the Caltrans Soil & Rock Logging, Classification and Presentation Manual (June, 2007), except as noted in Appendix A.1 of the Final Geotechnical Summary Report, SR-710 Tunnel Technical Study, Los Angeles County, California, dated April, 2010.</p> <p>Hand Auger to 5'</p> <p>VOC = 2.5 ppm</p> <p>PI, PA</p> <p>VOC = 2.6 ppm</p>
	1		Road base material, 4" thick.												
766.00	2		CLAYEY SAND with GRAVEL (SC); yellowish brown; moist [FILL].		D01										
	3														
764.00	4														
	5														
762.00	6														
	7														
760.00	8		SILTY SAND (SM); dense; light reddish brown; moist; coarse to fine SAND; low plasticity fines [OLDER ALLUVIUM].												
	9														
758.00	10				S02	10	40	100							
	11					19									
	12					21									
756.00	13														
	14														
754.00	15														
	16		Medium dense; 2% fine GRAVEL, 60% coarse to fine SAND, 38% fines.		S03	9	35	67		17	107				
752.00	17					16									
	18					19									
750.00	19														
	20														
748.00	21		Poorly graded SAND with GRAVEL (SP); very dense; light reddish brown; moist; fine GRAVEL; coarse to fine SAND; weak cementation.		S04	30	71								
	22					40									
	23					50/5"									
746.00	24														
	25														

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CALTRANS BORING RECORD MET+ENG FIXED SR-710 CH2M HILL BORINGS.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10



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DIST. 07	COUNTY LA	ROUTE 710	POSTMILE D/D	EA 07-187900
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER N/A	PREPARED BY D. Jankly	DATE 5-7-09	SHEET 1 of 10	

CALTRANS BORING RECORD MET+ENG FIXED SR-710 CH2M HILL BORINGS.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
742.00	25		Poorly graded SAND with GRAVEL (SP) (continued).	✕	S05	50/4"		0							
740.00	26														
738.00	27														
736.00	28														
734.00	29														
732.00	30		SILT with SAND (ML); hard; brown; moist; little medium to fine SAND; mostly low plasticity fines.	✕	S06	50/6"		0							VOC = 2.0 ppm
730.00	31														
728.00	32														
726.00	33														
724.00	34														
722.00	35		At EL. 728.0 ft, becomes grayish brown with orange (FeO2) stained zones; 22% medium to fine SAND, 78% fines.	▲	S07		26	83	89						PI, PA
720.00	36														
718.00	37														
716.00	38														
714.00	39														
712.00	40		SILTY SAND (SM); very dense; grayish brown with orange (FeO2) stained zones; moist; 8% coarse to fine GRAVEL, 50% coarse to fine SAND, 42% fines, micaceous.	▲	S08		18		100	24	104				PI, PA
710.00	41														
708.00	42														
706.00	43														
704.00	44														
702.00	45			✕	S09		11	50	100						VOC = 1.7 ppm
700.00	46														
698.00	47														
696.00	48														
694.00	49														
692.00	50			▲	S10		28		100	16	118				PI, PA
690.00	51														
688.00	52														
686.00	53														
684.00	54														
682.00	55														

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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B4	
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE D/D	EA 07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER N/A		PREPARED BY D. Jankly		DATE 5-7-09	SHEET 2 of 10

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ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks						
712.00	56		Poorly graded SAND with GRAVEL (SP); brown; moist; fine GRAVEL; coarse to fine SAND.	✕	S11	50/5"		100							VOC = 2.2 ppm						
708.00	60			✕	S12	50/4"		0													
702.00	66				SILTY SAND (SM); very dense; gray to orange brown; moist; 1% fine GRAVEL, 51% predominantly fine SAND, 48% low plasticity fines.	✕	S13	39	85	100		24							PA VOC = 2.2 ppm		
700.00	68																				
698.00	70					✕	S14	50/4"		0											
692.00	76					✕	S15	19	50	75					21						VOC = 1.7 ppm
688.00	80					✕	S16	26	50/1"		0										
684.00	84																				

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BRIDGE NUMBER N/A		PREPARED BY D. Jankly		DATE 5-7-09	SHEET 3 of 10

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ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
682.00	86		Poorly graded GRAVEL (GP); very dense; light brown and dark gray; moist; cobbles to 3" dia. derived from granite and gneiss (slightly weathered, subangular to subrounded).	S17 C18	50/5"		0	0						
678.00	90		Poorly graded SAND with GRAVEL (SP); brown; moist; few fine GRAVEL; medium to fine SAND; low plasticity fines.	C19			38	0						
674.00	94		SILTY SAND (SM); brown; moist; 2% fine GRAVEL, 65% predominantly medium to fine SAND, 33% low plasticity fines. At EL. 673.0 ft, observed 2" thick, very dark brown silty clay to clayey silt bed, probable paleosol.	C20			50	33	12				PA	
670.00	98		SANDY SILT (ML); soft to medium stiff; brown; moist to wet; fine SAND; homogeneous, micaceous.	C21			20	0						
666.00	102		Poorly graded GRAVEL (GP); light brown and dark gray; moist.	C22			80	60						
662.00	106		SILTY SAND (SM); brown; moist to wet; 1% fine GRAVEL, 55% predominantly fine SAND, 44% low plasticity fines, homogenous.	C22					13				PA	
658.00	110		Poorly graded GRAVEL with SAND (GP); light brown and dark gray; moist; coarse, subangular to subrounded GRAVEL; moderately to slightly weathered, moderately hard to hard, subangular to subrounded; clasts. Clasts composed of granite, diorite, and gneiss.	C23			54	30						VOC = 51.3 ppm

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BRIDGE NUMBER N/A	PREPARED BY D. Jankly	DATE 5-7-09	SHEET 4 of 10	

CALTRANS BORING RECORD MET+ENG FIXED SR-710 CH2M HILL BORINGS.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks	
652.00	115		Poorly graded GRAVEL with SAND (GP) (continued).	C24			30	0							
648.00	120		C25				16	0							
642.00	126		C26	At EL. 643.0 ft, observed 5-inch intersected granitic clast.				40	0						
640.00	127			At EL. 641.4 ft, observed 5-inch intersected granitic clast.											
636.00	132		C27	At EL. 636.3 ft, observed 3-inch intersected granitic clast.				40	0						
632.00	136		C28	At EL. 631.5 ft, observed 5-inch intersected granitic clast. At EL. 630.7 ft, observed 3-inch intersected granitic clast.				50	0						
628.00	140		C29					0	0						
624.00	144														
	145														

(continued)



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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B4
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE D/D	EA 07-187900
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER N/A	PREPARED BY D. Jankly	DATE 5-7-09	SHEET 5 of 10	

CALTRANS BORING RECORD MET+ENG FIXED SR-710 CH2M HILL BORINGS.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
622.00	146			C29			0	0						
	147			C30			25	0						
620.00	148													
	149													
618.00	150			C31			20	0						
	151													
616.00	152		At EL. 616.8 ft, observed 3-inch intersected granitic clast.											
	153													
614.00	154													
	155													
612.00	156		Poorly graded SAND with SILT (SP-SM); moist to wet; 9% fine GRAVEL, 84% coarse to fine SAND, 7% low plasticity fines.	C32			50	20	14					PA
	157		SILTY SAND (SM); moist to wet; trace fine GRAVEL; medium to fine SAND; homogeneous.											VOC = 10.0 ppm
610.00	158		At EL. 610.4 ft, observed SAND with faint subhorizontal laminations.											
	159													
608.00	160		Poorly graded GRAVEL with SAND (GP); and COBBLES, to poorly graded SAND with GRAVEL and COBBLES, dark olive brown, moist to wet. Recovered predominately as gravel and cobble fragments with limited sandy matrix.	C33			6	0						
	161													
606.00	162													
	163													
604.00	164													
	165													
602.00	166			C34			20	0						
	167													
600.00	168													
	169													
598.00	170			C35			40	0						
	171													
596.00	172													
	173													
594.00	174													
	175													

(continued)



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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B4
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE D/D	EA 07-187900
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER N/A	PREPARED BY D. Jankly	DATE 5-7-09	SHEET 6 of 10	

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
592.00	176		Poorly graded GRAVEL with SAND (GP) (continued).	C36				0	0						See note at end of log regarding RQD.
590.00	178														
588.00	180				C37				0	0					
586.00	182														
584.00	184														
582.00	186			Gravel, cobbles and rock fragments in coarse-grained sandy matrix. Clasts are subrounded to well rounded, granitic and metamorphic derived.	C38				40	0					
580.00	188														
578.00	190								40	0					
576.00	192			At EL. 577.2 ft, observed 2 to 4-inch thick intersected diorite and granite clasts.	C39										
574.00	194														
572.00	196			C40				37	0						
570.00	198														
568.00	200		At EL. 568.0 ft, observed decomposed bedrock consisting of Silty Clay.	C41				94	40					VOC = 17.0 ppm	
566.00	202		IGNEOUS ROCK (DIORITE), fine-grained, massive, dark greenish gray mottled with white, intensely to moderately weathered, moderately hard, moderately fractured, some fractures with up to 1/8" thick, soft, moist silty lining. Fractures are undulatory and irregular, tight to slightly open, smooth to moderately rough, no reaction to HCL sol. Becomes locally foliated at depth. [WILSON QUARTZ DIORITE]												VOC = 1.2 ppm
564.00	204		At EL. 567.0 ft, observed joint, dipping 90 to 70°, 0 to 1 mm aperture, smooth to moderately rough.												
205															

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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B4	
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE D/D	EA 07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER N/A		PREPARED BY D. Jankly		DATE 5-7-09	SHEET 7 of 10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
562.00	206		At EL. 565.2 ft, observed joint, dipping 80°, 0 to 1 mm aperture, smooth to moderately rough. At EL. 563.5 ft, observed intensely fractured zone, 3" thick. <i>(continued)</i>		C42			66	20						
560.00	208		At EL. 562.9 ft, becomes moderately weathered. Locally intensely fractured zone, 1.6' thick. At EL. 561.2 ft, observed joint, dipping 40°, 1 to 3 mm aperture, smooth to moderately rough. At EL. 561.1 ft, observed joint, dipping 70°, 1 to 3 mm aperture, smooth to moderately rough. At EL. 561.0 ft, becomes fine-grained to medium-grained, moderately soft.		C43			60	20						VOC = 76.6 ppm
558.00	210		At EL. 560.5 ft, observed joint, dipping 50°, 1 to 3 mm aperture, smooth to moderately rough. At EL. 560.2 ft, observed joint, dipping 20°, 1 to 3 mm aperture, smooth to moderately rough. At EL. 557.5 ft, observed shear, dipping 50 to 5°, undulatory, irregular shear, dusky red, paperthin clay lining, striated along strike, parallels faint foliations 4" above and 4" below.		C44			86	52						VOC = 1.7 ppm
556.00	212		At EL. 557.3 ft, observed joint, dipping 30 to 0°, 2 mm aperture, rough, no infill. At EL. 556.9 ft, observed shear, dipping 40°, tight, moderately rough, 1/8" thick clay lining. At EL. 556.3 ft, observed shear, dipping 45°, tight, moderately rough, 1/8" thick clay lining, intensely fractured below shear.		C45			100	60						PL, UC
555.00	218		At EL. 552.8 ft, observed joint, dipping 35°, 1 to 2 mm aperture, moderately rough. At EL. 552.2 ft, observed shear/fault zone, dipping 30°, 3" thick, highly sheared zone with dusky red clay lining (medium plasticity), along sub parallel shears, polished and striated. At EL. 551.9 ft, becomes coarse-grained, moderately weathered, moderately soft, intensely fractured. At EL. 551.0 ft, becomes intensely to moderately fractured, joint, dipping 60 to 50°, 3 mm aperture, moderately rough.		C46			73	27	1	162				VOC = 2.3 ppm
554.00	214		At EL. 549.5 ft, observed faint clay lined discontinuity, possible shear, irregular and undulatory, dipping 70 degrees to vertical. Clay is greenish gray, soft, wet, low to medium plasticity. Very weak. At EL. 547.0 ft, observed intensely fractured, joint, dipping 60°, smooth. Very weak. At EL. 546.0 ft, observed shear, dipping 60°, polished and striated.		C47			100	30						VOC = 4.7 ppm
552.00	216		At EL. 545.5 ft, observed shear, dipping 90 to 45°, tight, 1/16" to 1/8" thick dusky red clay lining, undulatory. At EL. 545.2 ft, observed joint, dipping 70 to 60°, 1-2mm aperture, moderately rough. At EL. 545.0 ft, becomes intensely to moderately weathered, soft. At EL. 544.0 ft, observed shear, dipping 90 to 60°, 1/8" thick dusky red clay lining, undulatory. At EL. 543.5 ft, observed joint, dipping 65°. At EL. 541.5 ft, becomes moderately weathered, moderately hard.		C47										VOC = 10.5 ppm
550.00	218		At EL. 541.0 ft, observed joint, dipping 80 to 40°, 2-4mm aperture, moderately rough. At EL. 540.5 ft, observed joint, dipping 70°, 2mm aperture, moderately rough. At EL. 540.2 ft, observed joint, dipping 60°, 2mm aperture, moderately rough. At EL. 539.6 ft, observed joint, dipping 60°, 2mm aperture, moderately rough. At EL. 537.5 ft, observed joint, dipping 70°, numerous subparallel joints within 2" thick fractured zone. 2-3mm aperture, slightly rough. At EL. 536.4 ft, observed joint, dipping 60 to 0°, 1-2mm aperture, moderately rough. At EL. 535.7 ft, observed fault, dipping 50°, paperthin clay lining, 1-2mm thick, smooth. Becomes fine grained, very dark gray, slightly weathered, hard, and												

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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B4	
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE D/D	EA 07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER N/A		PREPARED BY D. Jankly		DATE 5-7-09	SHEET 8 of 10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
532.00	236		moderately to intensely fractured below fault. At EL. 534.5 ft, observed shear, dipping 70°, tight, paperthin clay lining.		C48			100	33						PTS
	237		At EL. 534.0 ft, observed shear, dipping 40°, paperthin dusky red clay lining, striated roughly down dip. Vein dipping 70 degrees with 1/8" thick carbonate infill, observed shear, dipping 25°, paperthin dusky red clay lining, striated roughly down dip.												PL VOC = 0.8 ppm
530.00	238		At EL. 530.0 ft, PTS - Quartz Diorite, Plutonic Rock with allotriomorphic-granular texture.		C49			100	0						
	239		At EL. 532.7 ft, becomes moderately to slightly weathered, hard, intensely to moderately fractured.												
528.00	240		At EL. 532.4 ft, observed fault, dipping 70°, 3/8" reverse offset, tight, striated roughly down dip, offsets 1/16" thick carbonate lined vein.												
	241		At EL. 532.1 ft, observed 1/4" thick vein with carbonate infill.												
526.00	242		At EL. 531.6 ft, observed shear, dipping 50 to 45°, two shears with paperthin dusky red clay lining. Unit is medium strong.												VOC = 5.7 ppm
	243		At EL. 530.9 ft, observed shear, dipping 70 to 25°, undulatory, dusky red clay lining, striated roughly parallel to strike.		C50			100	0						
524.00	244		At EL. 530.5 ft, observed shear, dipping 65 to 25°, three shears with paperthin, dusky red clay lining.												
	245		At EL. 529.6 ft, observed joint, dipping 90 to 80°, very intensely fractured, numerous joints with olive yellow staining.		C51			100	0						
522.00	246		At EL. 529.2 ft, becomes very intensely fractured.												
	247		At EL. 528.3 ft, observed shear, dipping 75 to 65°, 3-4mm aperture with dusky red clay film, slightly to moderately rough.												
520.00	248		At EL. 527.3 ft, observed shear, dipping 70°, 2-3mm aperture, striated with paperthin dusky red clay lining.		C52			83	33						VOC = 0.2 ppm
	249		At EL. 526.7 ft, observed shear, dipping 60°, 2-3mm aperture, paperthin dusky red clay lining.												
518.00	250		At EL. 526.0 ft, observed shear, dipping 90 to 70°, 2-3mm aperture, paperthin dusky red clay lining.												PL CAI
	251		At EL. 525.2 ft, observed shear, dipping 90 to 80°, 4mm aperture, 1/8" thick dusky red clay lining.												
516.00	252		At EL. 523.5 ft, observed shear, dipping 40 to 20°, three shears and numerous fractures from 244.2 to 245 ft bgs, with yellowish red and dark red lining.												
	253		At EL. 522.9 ft, contains joint, dipping 30°, moderately rough.												
514.00	254		At EL. 522.0 ft, observed shear, dipping 50 to 40°, three shears from 245.8 to 246.5 ft bgs, clay lined.												VOC = 7.9 ppm
	255		At EL. 521.5 ft, becomes soft to moderately soft from 246.5' to 247.5'.												
512.00	256		At EL. 520.5 ft, observed shear, dipping 65°, 2mm aperture, clay lined, striated down dip.		C53			75	0						
	257		At EL. 520.0 ft, becomes fine-grained, dark greenish gray to light greenish gray, slightly weathered, hard, intensely to moderately fractured.												
510.00	258		At EL. 519.5 ft, observed joint, dipping 30°, unit is weak.												
	259		At EL. 518.8 ft, observed joint, dipping 30 to 20°.												
508.00	260		At EL. 518.1 ft, observed shear, dipping 60 to 40°, 2mm aperture, dusky red clay lining.												VOC = 6.9 ppm
	261		At EL. 516.8 ft, observed shear, dipping 30°, 2mm aperture, clay lined, moderately rough.												
506.00	262		At EL. 515.0 ft, observed joint, dipping 90°, numerous carbonate lined joints up to 1/16" thick.		C54			83	20						
	263		At EL. 511.0 ft, observed joint, dipping 60°, carbonate lined joint or shear, dusky red lining, tight 1/16" thick.												
504.00	264		At EL. 508.5 ft, observed foliation joint, dipping 40°, faint.												
	265		At EL. 508.4 ft, observed joint, dipping 60°, paperthin carbonate lining, tight.												
			At EL. 507.8 ft, observed numerous carbonate lined joint faces, scattered dusky red lined joints and shears.		C55			100	25						VOC = 6.8 ppm
			At EL. 505.7 ft, observed shear/fault zone, dipping 45°, roughly 1' thick gouge zone with highly polished fault plane at 263', striated down dip. Gouge consists of light greenish gray bentonitic clay with abundant diorite gravel to 1/4" dia. Gouge is moist, stiff, highly plastic.												
			At EL. 503.9 ft, becomes moderately fractured, shear,												

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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B4
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE D/D	EA 07-187900
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER N/A	PREPARED BY D. Jankly	DATE 5-7-09	SHEET 9 of 10	

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks	
502.00	266		dipping 40°, clay lined. At EL. 503.7 ft, observed joint, dipping 90°, 2mm aperture.	C55				100	25							
	267		At EL. 503.5 ft, observed fault, dipping 65°, 1/4" thick, soft clay gouge, striated down dip.	C56					88	0						
500.00	268		At EL. 502.9 ft, observed joint, dipping 60°, 2mm aperture, slightly to moderately rough.													VOC = 7.3 ppm
	269		At EL. 502.5 ft, observed faint, undulatory, subhorizontal foliations.													
498.00	270		At EL. 502.0 ft, observed intensely fractured, shear, dipping 60°, 2mm aperture, clay lined, striated down dip.													PL
	271		At EL. 501.8 ft, observed joint, dipping 80°.		C57				100	76						
	272		At EL. 501.0 ft, becomes very intensely fractured, remnant dusky red lined shears.													
496.00	273		At EL. 499.2 ft, observed shear, dipping 50°, dusky red clay and carbonate infill.								1	90				UC
	274		At EL. 497.5 ft, becomes moderately fractured, joint, dipping 50 to 20°, numerous joint to 272 ft bgs, generally 1 mm aperture, slightly to moderately rough. Weak.													
494.00	275		At EL. 497.0 ft, observed foliation joint, dipping 40 to 30°, faint.													VOC = 11.4 ppm
492.00	276	At EL. 496.0 ft, observed shear, dipping 60°, tight, dusky red, 1/16" thick clay lined shear, truncates foliations.														
	277	At EL. 495.5 ft, observed shear, dipping 30°, tight, dusky red, 1/16" thick clay lined shear. Weak.														
	278	At EL. 495.2 ft, becomes locally very intensely fractured.														
490.00	279	At EL. 495.0 ft, observed foliation joint, dipping 40°, faint.														
	280	At EL. 494.6 ft, observed joint, dipping 80°.														
	281	At EL. 494.0 ft, observed shear, dipping 50°, very tight, dusky red, 1/16" thick clay lined shear, truncates foliations.														
488.00	282	At EL. 493.5 ft, contains foliation joint, dipping 45°, faint foliation.														
	283	At EL. 493.0 ft, observed shear, dipping 50°, tight, dusky red, 1/16" thick clay lined shear, truncates foliations above, massive below.														
	284	At EL. 492.7 ft, observed joint, dipping 50°.														
486.00	285		Bottom of borehole at 276.0 ft bgs													
	286		Boring terminated at planned depth.													
484.00	287		Borehole converted to piezometer at the completion of drilling.													
	288															
482.00	289															
	290															
480.00	291															
	292															
478.00	293															
	294															
476.00	295															



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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B4	
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE D/D	EA 07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER N/A		PREPARED BY D. Jankly		DATE 5-7-09	SHEET 10 of 10

LOGGED BY M. Torsiello	BEGIN DATE 2-17-09	COMPLETION DATE 3-11-09	BOREHOLE LOCATION (Lat/Long or North/East and Datum) 34° 7' 31.5588" / 118° 8' 54.6144" NAD83	HOLE ID R-09-Z3B6
DRILLING CONTRACTOR Cascade Drilling Inc.			BOREHOLE LOCATION (Offset, Station, Line) ' Lt Sta (State St. e/o Railroad St. w/o SR-110)	SURFACE ELEVATION 750.0 ft NAVD 88
DRILLING METHOD Rotary Wash			DRILL RIG Ingersoll Rand A400	BOREHOLE DIAMETER 6 in
SAMPLER TYPE(S) AND SIZE(S) (ID) SPT(1.4"), Cal (2.4"), PQ core (3.2")			SPT HAMMER TYPE Automatic Hammer 140 lb. 30 inch drop	HAMMER EFFICIENCY, ERI 75%
BOREHOLE BACKFILL AND COMPLETION Piezometer Installed on Completion			GROUNDWATER DURING DRILLING AFTER DRILLING (DATE) READINGS NM 51.2 ft on 07/01/09	TOTAL DEPTH OF BORING 326.0 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		ASPHALT 6" thick.												This Boring Record was prepared in accordance with the Caltrans Soil & Rock Logging, Classification and Presentation Manual (June, 2007), except as noted in Appendix A.1 of the Final Geotechnical Summary Report, SR-710 Tunnel Technical Study, Los Angeles County, California, dated April, 2008. Hand Auger to 5'
	1		CONCRETE 6" thick.												
748.00	2		Poorly graded SAND (SP); very dark grayish brown; dry to moist; coarse to medium SAND; trace fines [OLDER ALLUVIUM].												
	3														
746.00	4														
	5														
744.00	6		SILTY SAND (SM); medium dense; very dark brown; dry to moist; 4% fine GRAVEL, 61% predominantly fine SAND, 35% low plasticity fines.	S01	4 5 6	11	100			6				PA VOC = 0.0 ppm	
	7														
742.00	8														
	9														
740.00	10														
	11		SILTY SAND with GRAVEL (SM); very dense; very dark brown; 28% coarse to fine GRAVEL, 56% coarse to fine SAND, 16% low plasticity fines.	S02	17 38 50/1"		92			8	128			PA VOC = 0.0 ppm	
	12		SEDIMENTARY ROCK, (SANDSTONE), decomposed (well-graded SAND (SW); very dense, light gray, moist, trace fine gravel, fine to coarse sand) [TOPANGA FORMATION]												
738.00	13														
	14														
736.00	15														
	16														
734.00	17														
	18														
732.00	19														
	20														
730.00	21		Gray.												
	22														
728.00	23														
	24														
726.00	25														

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CALTRANS BORING RECORD MET+ENG FIXED SR-710 CH2M HILL BORINGS.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10



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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B6
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE D/D	EA 07-187900
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER N/A	PREPARED BY D. Janky	DATE 7-13-09	SHEET 1 of 12	

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
724.00	25		No Recovery. (continued).	X	S0560	2.5'		0							See note at end of log regarding RQD.
722.00	26														
	27														
720.00	28														
	29														
720.00	30		No Recovery.	X	S0660	2.5'		0							
	31														
718.00	32														
	33														
716.00	34														
	35		No Recovery.		C07			0	0						
714.00	36														
	37														
712.00	38				C08			0	0						
	39														
710.00	40														
	41														
708.00	42														
	43														
706.00	44		SEDIMENTARY ROCK, (CONGLOMERATE), granule to cobble, fine to coarse sand, light gray, moderately weathered, soft to moderately soft, majority of matrix washed out, predominantly granule to pebble sized clasts observed.		C09			5	0						
	45														
704.00	46														
	47														
702.00	48		At EL. 702.0 ft, observed isolated calcite-cementation, moderately hard zones recovered.		C10			5	0						
	49														
700.00	50														
	51														
698.00	52														
	53														
696.00	54				C11			0	0						
	55														

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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B6	
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE D/D	EA 07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER N/A		PREPARED BY D. Jankly		DATE 7-13-09	SHEET 2 of 12

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
694.00	56				C11			0	0						See note at end of log regarding RQD.
692.00	58		At EL. 692.0 ft, becomes moderately to slightly weathered, soft to moderately hard. Matrix is fine to coarse grained sand. No visible structure. Granule to cobble sized clasts composed of hard to very hard intrusive rock (generally dioritic in nature), subangular to rounded.		C12			30	0						VOC = 0.0 ppm
688.00	62														
686.00	64					C13			7	0					
684.00	66														
682.00	68		At EL. 682.0 ft, becomes slightly weathered.		C14			18	13						
680.00	70														
678.00	72														
676.00	74														
674.00	76														
672.00	78		At EL. 672.0 ft, becomes slightly weathered to fresh, clasts are hard.		C15			15	5						VOC = 0.0 ppm
670.00	80														
668.00	82														
666.00	84														

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 Geotechnical Services
 Office of Geotechnical Design - South 1

REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B6	
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE D/D	EA 07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER N/A		PREPARED BY D. Jankly		DATE 7-13-09	SHEET 3 of 12

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
664.00	86			C15				15	5						See note at end of log regarding RQD.
662.00	88		At EL. 662.0 ft, becomes medium gray.	C16				8	3						VOC = 0.0 ppm
652.00	98			C17				7	0						
642.00	108		At EL. 642.0 ft, with coarse grained sand matrix.	C18				13	0						VOC = 0.0 ppm
636.00	114		At EL. 636.0 ft, observed intersected clasts up to 3".	C19				18	0						

(continued)



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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B6	
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE D/D	EA 07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER N/A		PREPARED BY D. Jankly		DATE 7-13-09	SHEET 4 of 12

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
634.00	116				C19			18	0						See note at end of log regarding RQD.
632.00	118		At EL. 632' to 627' Pressuremeter test.												
626.00	124				C20			0	0						
624.00	126				C21			0	0						
622.00	128		At EL. 622' to 617' Pressuremeter test.												
616.00	134		At EL. 617.0 ft, becomes greenish gray. At EL. 616.4 ft, observed incipient joint, dipping 0°.		C22			20	8						VOC = 0.0 ppm
606.00	144		At EL. 607.0 ft, observed slightly weathered, soft, incipient joint, dipping 70°, very hard clasts up to 8" intersected.		C23			47	13						

(continued)



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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B6	
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE D/D	EA 07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER N/A		PREPARED BY D. Jankly		DATE 7-13-09	SHEET 5 of 12

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
604.00	146				C23			47	13						See note at end of log regarding RQD. VOC = 0.0 ppm
602.00	148		At EL. 602.0 ft, becomes medium gray, slightly weathered to fresh, very soft to soft.		C24			27	0						VOC = 0.0 ppm
596.00	154		At EL. 597.0 ft, observed very soft matrix, clasts are very hard. Intact sand matrix up to 7" thick observed.		C25			45	12						VOC = 0.0 ppm
592.00	158				C26			45	17						VOC = 0.0 ppm
588.00	162		At EL. 590.0 ft, observed intact coarse grained sand matrix up to 5.5" thick, moderately soft. Very hard diorite clasts up to 5" observed.												VOC = 0.0 ppm
586.00	164		At EL. 587.0 ft, becomes fresh, very soft, granule and pebble sized clasts within fine to medium grained sand matrix. At EL. 587' to 580' Pressuremeter test.												VOC = 0.0 ppm
580.00	170				C27			44	0						VOC = 0.0 ppm
578.00	172		At EL. 579.0 ft, observed roughly 6 inches of reddish brown aphanitic igneous rocks.												
576.00	174		At EL. 577.0 ft, observed greenish gray, slightly weathered to fresh, hard granule, pebble and cobble sized clasts within fine to coarse grained very soft sand matrix.		C28			67	7	11					PA VOC = 0.0 ppm

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DIST. 07	COUNTY LA	ROUTE 710	POSTMILE D/D	EA 07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER N/A		PREPARED BY D. Jankly		DATE 7-13-09	SHEET 6 of 12

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
574.00	176		Very weak.		C28			67	7						See note at end of log regarding RQD. PL
572.00	178		At EL. 572.0 ft, becomes light bluish gray to greenish gray, slightly weathered.		C29			30	12						VOC = 0.0 ppm
568.00	182				C30			100	0						VOC = 0.0 ppm
566.00	184		At EL. 566.8 ft, observed joint, dipping 20°. At EL. 566.0 ft, becomes slightly weathered to fresh, intensely fractured, with pebble sized clasts, white, very hard, subangular. At EL. 565.5' to 557' Pressuremeter test.												
562.00	188														
560.00	190		At EL. 560.0 ft, observed abundant pebbles between EL. 560' to 559'.												
558.00	192		At EL. 559.0 ft, observed roughly 4" thick medium to coarse grained sandstone lens, greenish gray.												
556.00	194		At EL. 558.0 ft, observed some polished surfaces, possible gouge zone.												
554.00	196		At EL. 557.0 ft, observed SANDSTONE bed, roughly 1' thick, medium-grained to granule, medium gray, slightly weathered, moderately fractured, bedding plane separation, dipping 30°, seven joints observed between EL. 557' to 555', dips range from 10 to 20 degrees.		C31			98	30						PTS CAI
552.00	198		At EL. 556.0 ft, becomes intensely fractured. At EL. 554.5 ft, observed joint, dipping 60 to 20°, three joints observed between EL. 554.5' to 554'. PTS - Quartz Diorite clast: Plutonic rock with allotriomorphic-granular texture.												VOC = 0.0 ppm
550.00	200		At EL. 554.0 ft, becomes poorly indurated conglomerate.												
548.00	202		At EL. 552.5 ft, observed incipient joint, dipping 60°, 1' thick coarse grained sandstone bed, easily friable. At EL. 552.0 ft, becomes massive, greenish gray, clasts up to 7" intersected. Very weak.		C32			100	29						PL VOC = 0.0 ppm
546.00	204		At EL. 551.0 ft, observed three rough to moderately rough joints observed between EL. 551.3' to 550.7'. At EL. 550.0 ft, observed numerous joints observed between EL. 550' to 548', dipping 0 degrees.		C33			78	0						
	202		At EL. 548.2 ft, observed random fracture, dipping 50°.												VOC = 0.0 ppm
	204		At EL. 547.0 ft, observed shear, dipping 75°, clay lined, slickensided. At EL. 546.9 ft, observed shear, dipping 75°.		C34			90	72						
	205		At EL. 545.5 ft, observed shear, dipping 50°.												

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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B6	
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE D/D	EA 07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER N/A		PREPARED BY D. Jankly		DATE 7-13-09	SHEET 7 of 12

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
544.00	206		At EL. 545.0 ft, becomes very thickly bedded, moderately fractured, bedding joint, dipping 30°.		C34			90	72						See note at end of log regarding RQD. VOC = 0.0 ppm
542.00	208		At EL. 543.7 ft, observed random fracture, dipping 40°. At EL. 543.3 ft, observed joint, dipping 40 to 30°, two joints observed. At EL. 542.5 ft, observed joint, dipping 20°.												
540.00	210		At EL. 541.0 ft, observed bedding joint, dipping 35°, Weak.							4	146				UC, PL
538.00	212		At EL. 540.0 ft, observed joint, dipping 0°. At EL. 539.5 ft, observed incipient joint, dipping 0°. At EL. 539.3 ft, observed incipient joint, dipping 0°. At EL. 538.8 ft, observed joint, dipping 0°.												
536.00	214		At EL. 536.5 ft, observed joint.		C35			98	87						
534.00	216		At EL. 535.9 ft, observed joint, dipping 0°. At EL. 535.6 ft, becomes very thinly bedded, bedding joint, dipping 45°. At EL. 535.5 ft, observed joint, dipping 0°. At EL. 535.0 ft, becomes very thickly bedded, slightly weathered, light gray, coarse angular sand matrix.												VOC = 0.0 ppm PL
532.00	218		At EL. 534.5 ft, observed joint, dipping 0°, Very Weak. At EL. 534.0 ft, observed joint, dipping 0°. At EL. 533.8 ft, observed joint, dipping 0°. At EL. 533.5 ft, observed joint, dipping 0°, Very Weak. At EL. 533.0 ft, observed joint, dipping 0°. At EL. 532.5 ft, observed joint, dipping 0°. At EL. 531.8 ft, observed joint, dipping 0°, Weak. At EL. 531.0 ft, observed 6" thick lens with medium grained sand matrix.							2	149				UC
530.00	220		At EL. 530.5 ft, observed joint, dipping 0°.												
528.00	222		At EL. 529.0 ft, becomes very weak, moderately soft, bedding joint, dipping 40°.							3	142				UC, PL PL
526.00	224		At EL. 528.1 ft, observed joint, dipping 0°. At EL. 527.7 ft, observed joint, dipping 0°, Very Weak. At EL. 527.2 ft, observed joint, dipping 0°. At EL. 527.0 ft, observed granule to cobble sized clasts.		C36			57	13						VOC = 0.0 ppm
524.00	226				C37			67	32						VOC = 0.0 ppm UC, PL
522.00	228		At EL. 523.0 ft, observed bedding joint, dipping 35°, Very weak to weak.							2	152				
520.00	230		At EL. 522.0 ft, observed Sandstone lens, light gray, fine to coarse grained, friable.		C38			83	83						VOC = 0.0 ppm
518.00	232		At EL. 520.5 ft, observed Sandstone lens, gray, fine to medium grained.		C39			63	22						VOC = 0.1 ppm
516.00	234		At EL. 519.5 ft, observed pebble to gravel sized clasts, subangular to angular, local slickensided surfaces.		C40			19	0						VOC = 0.0 ppm
			SEDIMENTARY ROCK, (SANDSTONE), medium to coarse grained, angular, friable, possibly sheared.												

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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B6	
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE D/D	EA 07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER N/A		PREPARED BY D. Jankly		DATE 7-13-09	SHEET 8 of 12

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
514.00	236		(continued).		C40			19	0						See note at end of log regarding RQD.
512.00	238				C41			100	0						VOC = 0.0 ppm
508.00	242		SEDIMENTARY ROCK, (CONGLOMERATE), slightly weathered to fresh, moderately hard, pebble sized clasts within well indurated sandstone matrix.		C42			13	0						VOC = 0.0 ppm
506.00	244		At EL. 506.0 ft, observed random fracture, dipping 70°, dark gray slickensided surfaces.												
504.00	246														
502.00	248														
500.00	250														
498.00	252														
496.00	254		At EL. 497.5 ft, observed joint, dipping 65°, slickensided. At EL. 497.0 ft, observed calcite veins.		C43			59	19						PL VOC = 0.0 ppm
494.00	256		At EL. 495.7 ft, observed joint, dipping 70°, slickensided. Weak.												
492.00	258		At EL. 492.7 ft, observed joint, dipping 0°. Weak to medium strong. At EL. 492.2: PTS - coarse grained arkosic conglomerate with grains cemented by calcite. At EL. 492.0 ft, observed intersected 3" clast. At EL. 491.2 ft, observed joint, dipping 0°.		C44			50	32	3					SD, PL PTS UC VOC = 0.0 ppm
490.00	260									2	154				
488.00	262														
486.00	264														
					C45			0	0						

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DIST. 07	COUNTY LA	ROUTE 710	POSTMILE D/D	EA 07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER N/A		PREPARED BY D. Jankly		DATE 7-13-09	SHEET 9 of 12

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks	
265			(continued).		C45			0	0						See note at end of log regarding RQD.	
484.00	266		At EL. 483.0 ft, becomes slightly weathered, Clasts are 1/2" to 1" dia., diorite pebbles, very hard, some slickensided surfaces. At EL. 482.0 ft, observed joint, dipping 70°, slickensided. At EL. 481.9 ft, observed Intersected 6" clast.		C46			32	10						VOC = 0.0 ppm	
482.00	268				C47			27	0						VOC = 0.0 ppm	
478.00	272			SEDIMENTARY ROCK, (SANDSTONE), dark bluish gray, moderately soft, fine to medium grained, subangular to angular, poorly cemented.		C48			38	0						VOC = 0.2 ppm
476.00	274			At EL. 473.0 ft, observed Sandstone as above with few diorite derived pebbles.		C49			45	19						VOC = 0.0 ppm PL
472.00	278		SEDIMENTARY ROCK, (CONGLOMERATE), pebble sized clasts within sand matrix. At EL. 471.4 ft, observed bedding joint, dipping 35°.		C50			20	0						VOC = 0.0 ppm	
470.00	280		At EL. 468.0 ft, observed joint, dipping 35°. At EL. 467.8 ft, observed joint, dipping 70°, Well cemented, fine grained matrix. At EL. 467.0 ft, observed decreased cementation, moderately soft. At EL. 466.0 ft, observed Intersected 4" clast. Very weak.		C51			15	0						VOC = 0.0 ppm	
468.00	282			SEDIMENTARY ROCK, (SANDSTONE), soft, fine to medium grained, poorly cemented. At EL. 462.3 ft, observed some angular to subangular pebbles.												
466.00	284															
464.00	286															
462.00	288															
460.00	290															
458.00	292		At EL. 458.0 ft, becomes moderately soft, joint, dipping 75°, slickensided.													
456.00	294															
295																

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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B6	
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE D/D	EA 07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER N/A		PREPARED BY D. Jankly		DATE 7-13-09	SHEET 10 of 12

CALTRANS BORING RECORD METH+ENG FIXED SR-710 CH2M HILL BORINGS.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
454.00	296				C51			15	0						See note at end of log regarding RQD.
SHEAR ZONE AT EL. 453' to EL. 424'															
452.00	298		At EL. 452.8 ft, becomes massive, bluish gray, moderately to slightly weathered, extremely weak, very soft to soft, mostly fine to medium sand. Little fine to coarse, angular gravel. Little fines.		C52			46	24						PL
450.00	300		At EL. 450.0 ft, observed sheared and friable bedrock.							6					PA VOC = 0.0 ppm
448.00	302				C53			100	87						VOC = 0.4 ppm
446.00	304		At EL. 446.3 ft, observed bedding joint, dipping 20°, Sandstone, white with black minerals, appears decomposed due to shearing.							12					PA
444.00	306		At EL. 444.0 ft, observed joint, dipping 77°, slickensided.												
442.00	308		At EL. 442.0 ft, observed joint, dipping 80°, Unit is friable, highly sheared, black gouge within joints.		C54			100	48						
440.00	310		At EL. 441.0 ft, observed bedding joint, dipping 25°.												
438.00	312		At EL. 439.0 ft, observed bedding joint, dipping 25°, Unit is sheared, continuing from El. 453'.												
436.00	314		At EL. 438.0 ft, becomes very soft and friable, pebbles within sandstone are decomposed and easily friable, numerous slickensided surfaces.		C55			100	72						VOC = 0.2 ppm
434.00	316		At EL. 437.0 ft, becomes moderately to slightly weathered, soft, sandstone to siltstone, numerous near vertical slickensided surfaces 80 to 90 degree dip.												
432.00	318		At EL. 435.5 ft, observed bedding joint, dipping 25°, Local 3/8" thick beds of sandstone and siltstone.												
430.00	320		At EL. 434.8 ft, observed Possibly decomposed diorite, very dark gray. Numerous gray, clay lined slickensided surfaces which are friable.												VOC = 0.6 ppm
428.00	322		At EL. 433.0 ft, observed joint, dipping 40°, Likely continuation of shear zone from El. 453'.		C56			69	63						
426.00	324		At EL. 432.8 ft, observed joint, dipping 10°.												
			At EL. 432.5 ft, observed joint.												
			At EL. 432.0 ft, observed Sandstone with some pebbles, gray to dark gray, friable, numerous slickensided surfaces.												
			At EL. 431.0 ft, becomes moderately soft.												
			At EL. 429.0 ft, observed bedding joint, dipping 30°, Likely continuation of shear zone from El. 453'.												
			At EL. 428.5 ft, becomes soft.												VOC = 0.9 ppm

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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B6	
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE D/D	EA 07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER N/A		PREPARED BY D. Jankly		DATE 7-13-09	SHEET 11 of 12

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
424.00	326		Bottom of borehole at 326.0 ft bgs Borehole terminated at planned depth.	C56				69	63				X		
422.00	328		Borehole converted to piezometer at the completion of drilling.												
420.00	330		RQD values provided on the boring logs are based on intact core pieces obtained between two natural discontinuities. The majority of core obtained from this boring is typically very weak to weak and does not meet the "sound core" definition provided in the standard test method for RQD (ASTM D 6032). These RQD values should not be used to evaluate rock mass quality.												



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PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER N/A		PREPARED BY D. Jankly		DATE 7-13-09	SHEET 12 of 12

LOGGED BY M. Salisbury	BEGIN DATE 3-11-09	COMPLETION DATE 3-25-09	BOREHOLE LOCATION (Lat/Long or North/East and Datum) 34° 6' 21.59" / 118° 9' 24.5" NAD83	HOLE ID R-09-Z3B8
DRILLING CONTRACTOR Caltrans In-House			BOREHOLE LOCATION (Offset, Station, Line) ' Lt Sta Meridian Ave. n/o Oak St.	SURFACE ELEVATION 594.3 ft NAVD88
DRILLING METHOD Rotary Wire-Line			DRILL RIG CME 85	BOREHOLE DIAMETER 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID) Bulk,SPT (1.4"),Punch Core(2.5"),HQ Core			SPT HAMMER TYPE CME Automatic, 140 lb., 30 inch drop	HAMMER EFFICIENCY, ERI 87%
BOREHOLE BACKFILL AND COMPLETION Piezometer Installed on Completion			GROUNDWATER DURING DRILLING NM	AFTER DRILLING (DATE) Well unaccessible
				TOTAL DEPTH OF BORING 275.0 ft

CALTRANS BORING RECORD MET+ENG FIXED MIKE - 12-7-09SR-710 CALTRANS BORING LOGS W REV Z2B2 Z3B8 Z3B9 Z3B10 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
0	0		ASPHALT (6").												<p>This Boring Record was prepared in accordance with the Caltrans Soil & Rock Logging, Classification and Presentation Manual (June, 2007), except as noted in Appendix A.1 of the Final Geotechnical Summary Report, SR-710 Tunnel Technical Study, Los Angeles County, California, dated April, 2010.</p> <p>Hand Auger from 0.5' - 5' VOC=16.8 ppm</p> <p>UW VOC=15.1 ppm</p> <p>VOC=17.3 ppm</p> <p>UW, PI</p>
592.27	1		SANDY SILTY CLAY (CL-ML); soft to medium stiff; light brown; moist; some SAND; mostly nonplastic fines; weak cementation; [ALLUVIUM]		B1										
588.27	5		SANDY SILTY CLAY (CL-ML); soft to medium stiff; strong brown; moist; some SAND; mostly nonplastic to low plasticity fines; weak to moderate cementation.		S2	3	8	100							
586.27	6					4									
584.27	7					4									
582.27	10		SANDY SILTY CLAY (CL-ML); soft; strong brown; moist to wet; some SAND; mostly nonplastic to low plasticity fines; weak cementation.		C3			78		25					
580.27	11														
578.27	15		SANDY SILT (ML); soft; light brown; moist; some fine SAND; mostly nonplastic to low plasticity fines; weak cementation.		S4	3	5	100							
576.27	16					2									
574.27	17					3									
572.27	20		Fat CLAY (CH); soft; light brown; moist; few fine SAND; mostly nonplastic to low plasticity fines; weak cementation.		C5			78		23	104				
570.27	21		SANDY SILT (ML); medium stiff to stiff; light brown; moist; few fine SAND; mostly nonplastic to low plasticity fines; weak cementation.												
	22														
	23														
	24														
	25														

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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B8
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE T/T	EA 07-07-187900
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY M.Salisbury	DATE	SHEET 1 of 11	

CALTRANS BORING RECORD METH-ENG FIXED MIKE - 12-7-09SR-710 CALTRANS BORING LOGS W REV Z2B2 Z3B8 Z3B9 Z3B10 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
568.27	25		SANDY SILT (ML); medium stiff to stiff; light brown; moist; few fine SAND; mostly nonplastic to low plasticity fines; weak cementation; Siltstone; moderately hard [BEDROCK].		S6	12	28	100							VOC=11.4 ppm
566.27	26					14									See note at the end of log regarding RQD.
566.27	27		SEDIMENTARY ROCK, (MUDSTONE), thinly to moderately bedded, moderate olive brown, moderately weathered, soft, moderately fractured, [TOPANGA FORMATION]		C07			100	43						
564.27	28									25	96				UW, PI
562.27	29		Intensely to moderately fractured, random fracture (CL), with some fine sand.		C08			100	70						VOC=21.4 ppm
560.27	30		Bedding plane separation dipping 35°.												
558.27	31		Bedding joint dipping 25°.												
556.27	32		Bedding joint dipping 15°.												
554.27	33		Bedding joint dipping 52°.												
552.27	34		Bedding joint dipping 62°.												
550.27	35		Very thickly bedded, light brown to grayish orange, moderately soft to moderately hard, intensely fractured, with sand and clay, fine sand.		C09			100	20						VOC=15.2 ppm
548.27	36		Bedding joint (CL), dipping 45°.												
546.27	37		Very thickly bedded, light brown mottled with greenish gray, moderately soft to moderately hard, intensely fractured.												
544.27	38														
542.27	39		SEDIMENTARY ROCK, (CLAYSTONE), thickly bedded, pale yellowish orange, moderately hard, intensely to moderately fractured, sandy, with silt, poorly graded, fine sand.		C10			100	40						VOC=16.3 ppm
540.27	40														
538.27	41		SEDIMENTARY ROCK, (SILTSTONE), very thickly bedded to massive, pale yellowish orange, moderately hard, intensely to moderately fractured, with fine sand, poorly graded.												
536.27	42		Very thickly bedded to massive, bedding plane separation dipping 42°.												
534.27	43		Bedding plane separation dipping 39°.												
532.27	44		Olive gray, intensely to moderately fractured, with fine sand.		C11			100	32						VOC=17.4 ppm
530.27	45		Bedding plane separation dipping 35°.												
528.27	46		Bedding plane separation dipping 32°.												
526.27	47		Bedding joint dipping 67°.												
524.27	48		Bedding plane separation dipping 18°.												
522.27	49		Bedding plane separation dipping 29°.												
520.27	50		Bedding joint (ML), dipping 45°.		C12			100	40						VOC=15.6 ppm
518.27	51		SEDIMENTARY ROCK, (SANDSTONE), thickly bedded, moderate yellowish brown, moderately hard, intensely to moderately fractured, silty, fine sand.												
516.27	52		Bedding plane separation dipping 32°.												
514.27	53		SEDIMENTARY ROCK, (SILTSTONE), thickly bedded, light brown, moderately hard, slightly fractured, with some fine sand.							22	102				UW, PI
512.27	54		Random fracture (ML), dipping 90°.												
510.27	55		SEDIMENTARY ROCK, (CLAYSTONE), moderately to thickly bedded, moderate brown, moderately soft, slightly fractured, shear (CL), dipping 32°.												

(continued)



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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B8	
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE T/T	EA 07-07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER		PREPARED BY M.Salisbury		DATE	SHEET 2 of 11

CALTRANS BORING RECORD METH+ENG FIXED MIKE - 12-7-09SR-710 CALTRANS BORING LOGS W REV Z2B2 Z3B8 Z3B9 Z3B10 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
538.27	56		SEDIMENTARY ROCK, (SILTSTONE), moderately bedded, moderate brown, moderately soft, slightly fractured, bedding plane separation dipping 31°.		C13			100	50						VOC=16.4 ppm See note at the end of log regarding RQD.
536.27	57		SEDIMENTARY ROCK, (CLAYSTONE), thinly to moderately bedded, moderate brown, moderately soft, slightly fractured. Bedding plane separation dipping 31°. (continued).												
534.27	58		SEDIMENTARY ROCK, (SILTSTONE), thinly to moderately bedded, moderate brown, very to extremely hard, slightly fractured.												
532.27	59		SEDIMENTARY ROCK, (CLAYSTONE), thinly to moderately bedded, moderate brown, soft, slightly fractured, shear (CL), dipping 25°.		C14			100	43						VOC=18.3 ppm
530.27	60		SEDIMENTARY ROCK, (SILTSTONE), thinly to moderately bedded, moderate brown, very to extremely hard, slightly fractured, bedding plane separation dipping 15°, laminated silty fine sand lens.												
528.27	61		SEDIMENTARY ROCK, (CLAYSTONE), thinly to moderately bedded, moderate brown, soft, slightly fractured, shear (CL), dipping 25°.		C15			100	40						VOC=18.7 ppm
526.27	62		SEDIMENTARY ROCK, (SANDSTONE), thinly to moderately bedded, moderate yellowish brown, soft, slightly fractured, bedding plane separation dipping 22°, silty, medium sand.												
524.27	63		SEDIMENTARY ROCK, (CLAYSTONE), thinly to moderately bedded, moderate brown, soft, slightly fractured, shear (CL), dipping 25°.												
522.27	64		Thinly to moderately bedded, moderate brown, soft, very slightly fractured to unfractured, shear (CL), dipping 25°.		C16			90	20						VOC=24.6 ppm
520.27	65		SEDIMENTARY ROCK, (SANDSTONE), thinly to moderately bedded, olive gray, moderately soft to moderately hard, very slightly fractured to unfractured, bedding plane separation dipping 22°, silty fine sand.												
518.27	66		SEDIMENTARY ROCK, (CLAYSTONE), thinly to moderately bedded, moderate brown, soft, very slightly fractured to unfractured. Bedding joint (CL), dipping 39°. Bedding joint (CL), dipping 39°.												
516.27	67		Thinly to moderately bedded, moderate brown, soft, very slightly fractured to unfractured, shear dipping 30°.		C17			100	10						VOC=22.4 ppm
514.27	68		SEDIMENTARY ROCK, (SILTSTONE), thinly to moderately bedded, moderate brown, soft, very slightly fractured to unfractured. Shear dipping 30°.												
512.27	69		SEDIMENTARY ROCK, (CLAYSTONE), thinly to moderately bedded, moderate brown, soft, very slightly fractured to unfractured. Shear dipping 15°.												
510.27	70		SEDIMENTARY ROCK, (SILTSTONE), thinly to moderately bedded, moderate brown, hard to very hard, very slightly fractured to unfractured. Moderately hard, shear (clay), dipping 19°.		C18			100	42						VOC=14.1 ppm
	71		Thinly to moderately bedded, moderate brown, very hard, very slightly fractured to unfractured.												
	72		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, olive gray, very hard, very slightly fractured to unfractured, dipping 28°, silty, fine sand.												
	73		Moderate brown, shear (clay), dipping 25°.												
	74		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, very hard, very slightly fractured to unfractured.		C19			71	25						
	75		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, moderately hard, very slightly fractured to unfractured, shear (clay), dipping 22°.												

(continued)



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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B8	
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE T/T	EA 07-07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER		PREPARED BY M.Salisbury		DATE	SHEET 3 of 11

CALTRANS BORING RECORD METH+ENG FIXED MIKE - 12-7-09SR-710 CALTRANS BORING LOGS W REV Z2B2 Z3B8 Z3B9 Z3B10 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
508.27	85		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, very hard, very slightly fractured to unfractured.		C20			93	67						VOC=17.0 ppm See note at the end of log regarding RQD.
	86		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, very hard, very slightly fractured to unfractured.												
	87		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, intensely to moderately fractured, sandy, fine sand.							13	117				UW
506.27	88		Olive gray, dipping 35°. Moderate brown.												
	89		(continued).												
504.27	90		Very intensely to intensely fractured, dipping 15°.		C21			92	0						VOC=16.4 ppm
	91		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, moderately hard, very intensely to intensely fractured, shear.												
502.27	92		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, very intensely to intensely fractured.												
	93		Intensely to moderately fractured, trace fine sand. Dipping 15°.												
500.27	94		Moderate brown to light gray, sandy, fine sand. Moderate brown, slightly fractured.												
	95		Thinly bedded, light gray, dipping 10°. Moderate brown.		C22			100	0						VOC=24.1 ppm
498.27	96		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, soft to moderately soft, slightly fractured, dipping 25°.												
	97		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, soft to moderately soft, slightly fractured.												
496.27	98		Laminated to very thinly bedded, hard, dipping 25°. Moderately hard, shear (clay), dipping 25°.												
	99		SEDIMENTARY ROCK, (SILTSTONE), laminated to very thinly bedded, moderate brown, moderately hard, slightly fractured.												
494.27	100		Bedding joint dipping 25°, with some fine sand. Trace fine sand.		C23			100	0						VOC=21.0 ppm
	101		With some fine sand.												
492.27	102		SEDIMENTARY ROCK, (CLAYSTONE), laminated to very thinly bedded, moderate brown, moderately hard, slightly fractured.												
	103		SEDIMENTARY ROCK, (SILTSTONE), laminated to very thinly bedded, moderate brown, moderately hard, intensely fractured.												
490.27	104		SEDIMENTARY ROCK, (SANDSTONE), laminated to very thinly bedded, moderate brown, very to extremely hard, intensely fractured, dipping 10°, silty, fine sand.		C24			100	89						VOC=22.1 ppm
	105		SEDIMENTARY ROCK, (CLAYSTONE), laminated to very thinly bedded, moderate brown, very to extremely hard, slightly fractured, dipping 10°.												
488.27	106		SEDIMENTARY ROCK, (SILTSTONE), laminated to very thinly bedded, moderate brown, very to extremely hard, slightly fractured.												
	107		Laminated to very thinly bedded, hard, bedding joint dipping 20°.		C25			100	50						
486.27	108		Intensely to moderately fractured. Joint (clay), dipping 48°.												
	109		Dipping 17°. Joint dipping 30°.												
484.27	110		SEDIMENTARY ROCK, (CLAYSTONE), laminated to very thinly bedded, moderate brown, moderately hard, intensely to moderately fractured.		C26			100	0						VOC=23.2 ppm
	111		Joint dipping 30°.												
482.27	112		SEDIMENTARY ROCK, (SILTSTONE), laminated to very thinly bedded, moderate brown, moderately hard, intensely to moderately fractured.												
	113		Moderate brown mottled with light gray, hard, trace fine sand.												
480.27	114		Joint dipping 50°. Bedding joint dipping 25°. With fine sand.		C27			93	18						

(continued)



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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B8	
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE T/T	EA 07-07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER		PREPARED BY M.Salisbury		DATE	SHEET 4 of 11

CALTRANS BORING RECORD METH+ENG FIXED MIKE - 12-7-09SR-710 CALTRANS BORING LOGS W/ REV Z2B2 Z3B8 Z3B9 Z3B10 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
478.27	115		SEDIMENTARY ROCK, (CLAYSTONE), laminated to very thinly bedded, moderate brown, hard, intensely to moderately fractured.		C27			93	18						VOC=15.9 ppm See note at the end of log regarding RQD. UW
	116		SEDIMENTARY ROCK, (SILTSTONE), laminated to very thinly bedded, moderate brown, hard, intensely to moderately fractured.							10	129				
	117		SEDIMENTARY ROCK, (SILTSTONE), laminated to very thinly bedded, moderate brown, hard, intensely to moderately fractured. Dipping 25°.		C28			100	22						
476.27	118		SEDIMENTARY ROCK, (SANDSTONE), laminated to very thinly bedded, moderate brown, hard, intensely to moderately fractured, dipping 24°.												
	119		SEDIMENTARY ROCK, (SILTSTONE), laminated to very thinly bedded, moderate brown, hard, intensely to moderately fractured, dipping 25°, excellent bedding contact.		C29			100	45						VOC=24.2 ppm
474.27	120		SEDIMENTARY ROCK, (CLAYSTONE), laminated to very thinly bedded, moderate brown, hard, intensely to moderately fractured.												
	121		SEDIMENTARY ROCK, (SILTSTONE), laminated to very thinly bedded, moderate brown, hard, intensely to moderately fractured.												
472.27	122		SEDIMENTARY ROCK, (CLAYSTONE), laminated to very thinly bedded, moderate brown, hard, intensely to moderately fractured.												
	123		SEDIMENTARY ROCK, (SILTSTONE), laminated to very thinly bedded, moderate brown, hard, intensely to moderately fractured.												
470.27	124		SEDIMENTARY ROCK, (CLAYSTONE), laminated to very thinly bedded, moderate brown, hard, intensely to moderately fractured, dipping 25°.												
	125		SEDIMENTARY ROCK, (SILTSTONE), laminated to very thinly bedded, moderate brown, hard, intensely to moderately fractured.		C30			98	0						VOC=26.9 ppm
468.27	126		Dipping 18°, trace fine sand. Moderate brown to light gray, hard, intensely to moderately fractured.												
	127		SEDIMENTARY ROCK, (CLAYSTONE), laminated to very thinly bedded, moderate brown, hard, intensely to moderately fractured, random fracture (moderately healed), dipping 90°.												
466.27	128		SEDIMENTARY ROCK, (SILTSTONE), laminated to very thinly bedded, moderate brown, hard, intensely to moderately fractured.												
	129		SEDIMENTARY ROCK, (SILTSTONE), laminated to very thinly bedded, moderate brown, hard, intensely to moderately fractured.												
464.27	130		SEDIMENTARY ROCK, (CLAYSTONE), laminated to very thinly bedded, moderate brown, hard, intensely to moderately fractured.		C31			100	20						VOC=23.5 ppm
	131		SEDIMENTARY ROCK, (SILTSTONE), laminated to very thinly bedded, moderate brown, hard, intensely to moderately fractured.												
462.27	132		SEDIMENTARY ROCK, (SILTSTONE), laminated to very thinly bedded, moderate brown, hard, intensely to moderately fractured. Laminated, moderate brown to light gray, sandy, fine sand. Dipping 16°. Dipping 18°. Thinly bedded, moderate brown.												
	133		SEDIMENTARY ROCK, (CLAYSTONE), thin bedded, moderate brown, hard, intensely to moderately fractured.		C32			100	33						VOC=23.9 ppm
458.27	136		SEDIMENTARY ROCK, (SILTSTONE), laminated, moderate brown, hard, intensely to moderately fractured, dipping 18°, with fine sand.												
	137		SEDIMENTARY ROCK, (CLAYSTONE), laminated, moderate brown, hard, intensely to moderately fractured.												
456.27	138		SEDIMENTARY ROCK, (SILTSTONE), laminated, moderate brown, hard, intensely to moderately fractured, dipping 28°, sandy.												
	139		SEDIMENTARY ROCK, (CLAYSTONE), laminated, moderate brown, hard, intensely to moderately fractured.		C33			77	64						
454.27	140		SEDIMENTARY ROCK, (SILTSTONE), laminated, moderate brown, hard, intensely to moderately fractured.												
	141		SEDIMENTARY ROCK, (CLAYSTONE), laminated, moderate brown, hard, intensely to moderately fractured.							9					UW, SD VOC=19.5ppm
452.27	142		SEDIMENTARY ROCK, (SILTSTONE), laminated, moderate brown, hard, intensely to moderately fractured.												
	143		SEDIMENTARY ROCK, (CLAYSTONE), laminated, moderate brown, hard, intensely to moderately fractured.		C34			100	48						
450.27	144		SEDIMENTARY ROCK, (SILTSTONE), moderately bedded, moderate brown, hard, intensely to moderately fractured, with fine sand, grayish brown mudstone clasts.												

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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B8	
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE T/T	EA 07-07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER		PREPARED BY M.Salisbury		DATE	SHEET 5 of 11

CALTRANS BORING RECORD METH+ENG FIXED MIKE - 12-7-09SR-710 CALTRANS BORING LOGS W/ REV Z2B2 Z3B8 Z3B9 Z3B10 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
448.27	146		Dipping 22°. Bedding joint dipping 17°. SEDIMENTARY ROCK, (SANDSTONE), laminated, olive gray, hard, moderately fractured, dipping 22°, silty, fine sand.		C35			100	58						VOC=18.4 ppm See note at the end of log regarding RQD.
446.27	148		SEDIMENTARY ROCK, (SILTSTONE), moderately bedded, olive gray, hard, moderately fractured, dipping 25°. Moderate brown, dipping 28°. Laminated, olive gray, dipping 17°, sandy. Moderate brown.												
444.27	150		SEDIMENTARY ROCK, (CLAYSTONE), laminated, moderate brown, hard, moderately fractured.												
442.27	152		SEDIMENTARY ROCK, (SILTSTONE), laminated, moderate brown, hard, moderately fractured.		C36			96	18						
440.27	154		SEDIMENTARY ROCK, (CLAYSTONE), laminated, moderate brown, hard, moderately fractured. SEDIMENTARY ROCK, (SILTSTONE), laminated, moderate brown, hard, moderately fractured. Thinly bedded, light olive gray, dipping 28°. Moderately bedded, moderate brown, intensely fractured. (continued). Dipping 25°. Light olive gray, dipping 25°. Moderate brown.												VOC=20.7 ppm
438.27	156		Joint (clay, partially healed), dipping 48°. Bedding joint dipping 20°. Thinly bedded, dipping 14°, sandy. Dipping 10°.		C37			100	21		8				UW, PL
436.27	158		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, moderate brown, hard, intensely fractured. Dipping 39°.		C38			100	0						
434.27	160		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, very intensely fractured, with fine sand. Dipping 29°.												VOC=26.0.6ppm
432.27	162		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, hard, very intensely fractured, shear dipping 25°.		C39			87	0						
430.27	164		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, very intensely fractured. SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, moderate brown, hard, very intensely fractured, dipping 45°.												
428.27	166		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, very intensely fractured. SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, moderate brown, soft, very intensely fractured, dipping 28°.		C40			100	10						
426.27	168		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, moderately fractured, parallel to bedding (shale parting). SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, moderate brown, very hard, moderately fractured, joint dipping 45°.												PL
424.27	170		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, very hard, moderately fractured. Dipping 23°.		C41			100	100						
422.27	172		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, moderate brown, very hard, moderately fractured, dipping 17 to 22°.		C42			100	60						
420.27	174		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, very weak, very hard, moderately fractured, bedding joint (silt, not healed), dipping 32°. Incipient fracture (not healed), dipping 60°.							7	137				UC EM

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Division of Engineering Services
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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B8	
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE T/T	EA 07-07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER		PREPARED BY M.Salisbury		DATE	SHEET 6 of 11

CALTRANS BORING RECORD METH-ENG FIXED MIKE - 12-7-09SR-710 CALTRANS BORING LOGS W REV Z2B2 Z3B8 Z3B9 Z3B10 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
418.27	176		Laminated to very thinly bedded, dipping 22°, sandy, fine sand. (continued).		C43			100	32						See note at the end of log regarding RQD.
416.27	178		SEDIMENTARY ROCK, (CLAYSTONE), laminated to very thinly bedded, moderate brown, very hard, moderately fractured, dipping 15°.												
	179		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, olive gray, very hard, moderately fractured, joint (clay, partially healed), dipping 38°.												
414.27	180		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, moderately hard, moderately fractured.		C44			95	35						
	181		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, moderately hard, intensely fractured.												
412.27	182		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, moderately hard, intensely fractured. No sand.												
	183														
410.27	184		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, moderately hard, intensely fractured, bedding joint.												
	185														
408.27	186		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, moderately hard, intensely fractured, with fine sand.		C45			100	20						
	187		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, moderately hard, intensely fractured.												
406.27	188		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, moderately hard, intensely fractured.												
	189		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, moderately hard, intensely fractured.												
404.27	190		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, moderately hard, intensely fractured.												
	191		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, olive gray, moderately soft, intensely fractured, dipping 15°, silty, fine sand.		C46			100	75						
402.27	192		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, intensely fractured, with fine sand.												
	193		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, moderately soft to moderately hard, intensely fractured.		C47			100	50	11					
400.27	194		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, moderately soft to moderately hard, intensely fractured.												
	195														
398.27	196		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, moderately soft to moderately hard, intensely fractured, dipping 22°.		C48			100	32						
	197		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, moderately soft to moderately hard, intensely fractured.							8	131				
396.27	198		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, olive gray, moderately soft, intensely fractured, dipping 17°, silty, fine sand.												
	199		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, intensely fractured.												
394.27	200		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, olive gray, moderately soft, intensely fractured, dipping 21°.		C49			94	19						
	201		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, moderately soft, moderately												
392.27	202		SEDIMENTARY ROCK, (SANDSTONE), laminated, olive gray, very weak, very hard, slightly fractured, dipping 25°, fine sand.												
	203														
390.27	204		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, moderately soft, moderately		C50			67	50						
	205		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, very hard, moderately fractured.												

(continued)



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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B8	
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE T/T	EA 07-07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER		PREPARED BY M.Salisbury		DATE	SHEET 7 of 11

CALTRANS BORING RECORD METH+ENG FIXED MIKE - 12-7-09SR-710 CALTRANS BORING LOGS W/ REV Z2B2 Z3B8 Z3B9 Z3B10 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
388.27	205		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, very hard, moderately fractured.		C51			100	42	8	133				SD, EM UC See note at the end of log regarding RQD.
	206		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, very hard, moderately fractured.												
	207		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, very hard, moderately fractured.												
386.27	208		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, very hard, moderately fractured.												
	209		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, brownish gray, very hard, intensely fractured, dipping 17°.												
384.27	210		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, very hard, intensely fractured, dipping 17°.		C52			95	33						
	211		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, olive gray, very hard, intensely fractured, dipping 20°, fine sand.												
382.27	212		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, very hard, intensely fractured.												
	213		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, olive gray, very hard, intensely fractured, dipping 19°, fine sand.												
380.27	214		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, weak, hard, intensely to moderately fractured.		C53			100	89						
	215		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, intensely to moderately fractured.												
378.27	216		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, olive gray, moderately hard, intensely to moderately fractured, dipping 19°.		C53			100	42					PTS	
	217		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, intensely to moderately fractured.												
376.27	218		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, hard, intensely to moderately fractured.		C54			100	21						
	219		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, olive gray, moderately soft, intensely to moderately fractured, dipping 21°.												
374.27	220		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, olive gray, moderately soft, intensely to moderately fractured, dipping 21°.		C55			100	50						
	221		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, hard, intensely to moderately fractured.												
372.27	222		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, olive gray, soft, intensely to moderately fractured.		C55			100	75						
	223		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, intensely to moderately fractured.												
370.27	224		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, olive gray, hard, intensely to moderately fractured.												
	225		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, intensely to moderately fractured.		C56			100	83					SD	
368.27	226		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, hard, intensely to moderately fractured.												
	227		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, intensely to moderately fractured, with fine sand.							9					
366.27	228		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, hard, intensely to moderately fractured.		C56			100	100						
	229		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, moderately fractured.												
364.27	230		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, moderately fractured.		C56			100	83						
	231		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, hard, moderately fractured.												
362.27	232		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, moderately fractured.												
	233		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, moderate brown, hard, moderately fractured.												
360.27	234		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, moderately fractured, sandy, fine sand.		C57			100	81						
	235														

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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B8	
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE T/T	EA 07-07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER		PREPARED BY M.Salisbury		DATE	SHEET 8 of 11

CALTRANS BORING RECORD METH+ENG FIXED MIKE - 12-7-09SR-710 CALTRANS BORING LOGS W/ REV Z2B2 Z3B8 Z3B9 Z3B10 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
358.27	236		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, hard, moderately fractured.		C57			100	81						UC See note at the end of log regarding RQD. EM
	237		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, moderately fractured.		C58			100	92	6	135				
	238		Thinly bedded, moderate brown, moderately soft, moderately fractured, dipping 10°.												
356.27	238		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, moderately fractured.												
	239		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, moderately soft, moderately fractured, dipping 10°.												
354.27	240		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, moderately soft, moderately fractured, dipping 10°.		C59			100	94						
	241		Olive gray, sandy, fine sand.												
352.27	242		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, olive gray, moderately soft, moderately fractured, dipping 25°.												
	243		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, moderately fractured, fracture zone dipping 50°.												
350.27	244		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, moderate brown, hard, moderately fractured.		C60			100	83						
	245		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, moderately fractured. Olive gray, hard, intensely fractured.		C60			100	56						
348.27	246		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, hard, intensely fractured.												
	247		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, intensely fractured.												
346.27	248		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, moderately hard to hard, intensely fractured.		C61			100	0						
	249		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, moderately hard to hard, intensely fractured.												
344.27	250		SEDIMENTARY ROCK, (SANDSTONE), very thinly bedded, olive gray, moderately hard to hard, intensely fractured, dipping 22°, silty, fine sand.		C61			100	92						
	251		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, moderately hard to hard, intensely fractured.												
342.27	252		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, moderately hard to hard, intensely fractured.		C62			100	90						
	253		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, moderately hard to hard, intensely fractured.												
340.27	254		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, medium strong, very hard, slightly fractured, bedding joint. Hard, dipping 15°.												
	255		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, medium strong, very hard, slightly fractured, bedding joint. Hard, dipping 15°.												
338.27	256		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, moderate brown, hard, slightly fractured.		C63			100	100						
	257		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, slightly fractured. Dipping 10°.							7	132				
336.27	258		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, moderate brown, hard, slightly fractured.												
	259		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, slightly fractured.												
334.27	260		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, moderate brown, hard, slightly fractured.		C64			100	87						
	261		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, slightly fractured.												
332.27	262		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, moderate brown, very hard, slightly fractured. Dipping 20°.												
	263		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, moderate brown, very hard, slightly fractured. Dipping 15°.												
330.27	264		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, very hard, slightly fractured.												
	265		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, moderate brown, very hard, slightly fractured.												

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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B8	
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE T/T	EA 07-07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER		PREPARED BY M.Salisbury		DATE	SHEET 9 of 11

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
328.27	266		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, weak, hard to very hard, intensely to moderately fractured. Dipping 8°. Incipient fracture (clay, partially healed), dipping 72°.		C65			100	81						PL See note at the end of log regarding RQD.
326.27	268		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, moderate brown, hard to very hard, intensely to moderately fractured, dipping 22°, silty, fine sand.												
	269		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard to very hard, intensely to moderately fractured. Incipient fracture (not healed), dipping 90°. Sandy, fine sand.		C66			100	40						
324.27	270														
	271		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, moderate brown, hard to very hard, intensely to moderately fractured, dipping 18°.												
322.27	272		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, hard to very hard, intensely to moderately fractured.												
	273		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard to very hard, intensely to moderately fractured, bedding joint dipping 18°.												
320.27	274		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, hard to very hard, intensely to moderately fractured, dipping 21°.		C67			100	100						
	275														
318.27	276		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard to very hard, intensely to moderately fractured. Dipping 20°.												
	277														
316.27	278		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, olive gray, hard, intensely to moderately fractured, fine sand.												
	279		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, intensely to moderately fractured. Dipping 25°.												
314.27	280		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, moderate brown, hard, intensely to moderately fractured, dipping 22°.												
	281														
312.27	282		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, intensely to moderately fractured.												
	283		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, hard, intensely to moderately fractured, dipping 20°.												
310.27	284		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, intensely to moderately fractured.												
	285														
308.27	286		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, hard, intensely to moderately fractured.												
	287		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, intensely to moderately fractured, with fine sand.												
306.27	288		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, hard, intensely to moderately fractured.												
	289														
304.27	290		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, intensely to moderately fractured.												
	291		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, moderate brown, hard, intensely to moderately fractured. Incipient fracture (not healed), dipping 90°.												
302.27	292		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, intensely to moderately fractured. Incipient fracture (not healed), dipping 90°.												
	293														
300.27	294		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, olive gray, hard, intensely to moderately fractured, dipping 22°.												
	295														

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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B8	
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE T/T	EA 07-07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER		PREPARED BY M.Salisbury		DATE	SHEET 10 of 11

CALTRANS BORING RECORD MET+ENG FIXED MIKE - 12-7-09SR-710 CALTRANS BORING LOGS W REV Z2B2 Z3B8 Z3B9 Z3B10 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
298.27	296		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, intensely to moderately fractured.												
	297		Bottom of borehole at 275.0 ft bgs Borehole was converted to piezometer at the completion of drilling.												
296.27	298		RQD values provided in the boring logs are based on intact core pieces obtained between two natural discontinuities. Majority of cores obtained in this boring are weak and does not meet the "sound core" definition provided in standard test method for RQD ASTM D 6032. These RQD values should not be used to evaluate the rock mass quality.												
	299														
294.27	300														
	301														
292.27	302														
	303														
290.27	304														
	305														
288.27	306														
	307														
286.27	308														
	309														
284.27	310														
	311														
282.27	312														
	313														
280.27	314														
	315														
278.27	316														
	317														
276.27	318														
	319														
274.27	320														
	321														
272.27	322														
	323														
270.27	324														
	325														



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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B8	
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE T/T	EA 07-07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER		PREPARED BY M.Salisbury		DATE	SHEET 11 of 11

LOGGED BY K. Barker	BEGIN DATE 1-13-09	COMPLETION DATE 1-21-09	BOREHOLE LOCATION (Lat/Long or North/East and Datum) 34° 5' 52" / 118° 8' 47" NAD83	HOLE ID R-09-Z3B11
DRILLING CONTRACTOR Caltrans Drilling Services			BOREHOLE LOCATION (Offset, Station, Line) ' Lt Sta N. Palm Ave. s/o W. Alhambra Rd.	SURFACE ELEVATION 533.1 ft NAVD88
DRILLING METHOD Rotary Wire-Line			DRILL RIG CME 85	BOREHOLE DIAMETER 4 in
SAMPLER TYPE(S) AND SIZE(S) (ID) Bulk,SPT(1.4"),Punch Core(2.5"),HQ Core			SPT HAMMER TYPE CME Automatic, 140 lb., 30 inch drop	HAMMER EFFICIENCY, ERI 87%
BOREHOLE BACKFILL AND COMPLETION Piezometer Installed on Completion			GROUNDWATER DURING DRILLING AFTER DRILLING (DATE) READINGS NM 158.0 ft on 7-1-09	TOTAL DEPTH OF BORING 275.0 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		ASPHALT (6").		D01			100							<p>This Boring Record was prepared in accordance with the Caltrans Soil & Rock Logging, Classification and Presentation Manual (June, 2007), except as noted in Appendix A.1 of the Final Geotechnical Summary Report, SR-710 Tunnel Technical Study, Los Angeles County, California, dated April, 2010.</p> <p>Hand Auger from 0.5' - 5' VOC=2.4 ppm</p> <p>VOC=2.3 ppm</p> <p>UW, PA</p> <p>VOC=2.4 ppm</p> <p>VOC=3.4 ppm</p> <p>UW, PI</p>
531.11	1		SILTY, CLAYEY SAND (SC-SM); medium dense; very dark brown; dry; few fine GRAVEL; medium to fine SAND; [ALLUVIUM]												
529.11	2														
	3														
527.11	4														
	5														
527.11	6		CLAYEY SAND (SC); medium dense; olive brown; moist; medium to fine SAND.		S02	8	29	100							
	7														
525.11	8														
	9														
523.11	10														
	11														
521.11	12		SILTY SAND (SM); medium dense; olive brown; moist; trace fine GRAVEL; mostly medium to fine SAND.		O03			17		13	113				
	13														
519.11	14														
	15														
517.11	16														
	17														
515.11	18		At EL. 516.1 ft, observed 0.5' lens of (Poorly graded SAND) (SP); coarse SAND.		S04	6	26	100							
	19														
513.11	20														
	21														
511.11	22		At EL. 512.1 ft, contains few fine, subangular GRAVEL.		O05			33							
	23														
509.11	24									11	107				
	25														

(continued)

CALTRANS BORING RECORD MET+ENG FIXED KRIS - SR-710 CALTRANS BORING LOGS WITH REV Z1B4 Z1B8 Z2B3 Z2B4 Z2B5 AND Z3B11 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10



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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B11
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE T/T	EA 07-07-187900
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY K. Barker	DATE	SHEET 1 of 10	

CALTRANS BORING RECORD MET+ENG FIXED KRIS - SR-710 CALTRANS BORING LOGS WITH REV Z1B4 Z1B8 Z2B3 Z2B4 Z2B5 AND Z3B11 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
507.11	26		At EL. 508.1 ft, with 0.5' to 1' interbeds of (SANDY SILT) (ML/SM); fine SAND.												VOC=1.7 ppm
	27		SILTY SAND (SM) (continued).		S06	11 15 18	33	100							
505.11	28														
	29														
503.11	30														VOC=1.5 ppm
	31														
501.11	32				O07			33							UW
	33														
499.11	34									14	102				
	35														
497.11	36				S08	6 9 10	19	100							
	37														
495.11	38														
	39														
493.11	40														VOC=3.3 ppm
	41														
491.11	42		Poorly graded SAND with SILT (SP-SM); medium dense; olive brown; moist; mostly medium to fine SAND.		O09			17							UW, PA
	43														
489.11	44									22	98				
	45														
487.11	46				S10	7 7 9	16	100							
	47														
485.11	48														
	49														
483.11	50														VOC=3.1 ppm
	51		SILTY SAND with GRAVEL (SM); medium dense; olive brown; moist; little fine GRAVEL; fine SAND.												
481.11	52				O10A			0							No Recovery
	53														
479.11	54														
	55														

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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B11
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE T/T	EA 07-07-187900
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY K. Barker	DATE	SHEET 2 of 10	

CALTRANS BORING RECORD MET+ENG FIXED KRIS - SR-710 CALTRANS BORING LOGS WITH REV Z1B4 Z1B8 Z2B3 Z2B4 Z2B5 AND Z3B11 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
477.11	55		SILTY SAND with GRAVEL (SM) (continued).		D10A			0							
	56		Well-graded SAND with SILT and GRAVEL (SW-SM); very dense; olive brown; moist; fine GRAVEL; coarse to fine SAND; weak cementation.		S11	23	56	100							
	57					31									
	57					25									
475.11	58														VOC=1.1 ppm
	59														
473.11	60		At EL. 473.1 ft, contains 1' lens of trace coarse GRAVEL; moderate cementation.												
	61		At EL. 472.1 ft, becomes dense; little coarse to fine GRAVEL; mostly coarse to fine SAND; few low plasticity fines.		O12			33							UW, PA
471.11	62														VOC=8.1 ppm
	63														
469.11	64									10	138				
	65														
467.11	66				S13	22	46	100							
	67					19									
	67					27									
465.11	68		SANDY elastic SILT (MH); very stiff; olive brown; moist; some fine SAND; medium plasticity, low dry strength, low toughness fines.												
	69														
463.11	70		SILTY SAND (SM); dense; olive brown; moist; fine GRAVEL; mostly fine SAND; some low plasticity fines; weak cementation.		O14			17							UW, PA
	71														VOC=7.3 ppm
461.11	72														VOC=4.1 ppm
	73														
459.11	74		SANDY elastic SILT (MH); very stiff; olive brown; moist; some fine SAND; medium plasticity, low dry strength, low toughness fines.							21	101				
	75														
457.11	76				S15	11	26	100							
	77					12									
	77					14									
455.11	78														
	79														
453.11	80														
	81														
451.11	82		Poorly graded SAND (SP); medium dense; olive brown; moist; medium to fine SAND; few fines.		O16			50		18	112				UW
	83														VOC=1.4 ppm
449.11	84														
	85														

(continued)



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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B11	
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE T/T	EA 07-07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER		PREPARED BY K. Barker		DATE	SHEET 3 of 10

CALTRANS BORING RECORD MET+ENG FIXED KRIS - SR-710 CALTRANS BORING LOGS WITH REV Z1B4 Z1B5 Z2B3 Z2B4 Z2B5 AND Z3B11 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks		
85			Poorly graded SAND (SP) <i>(continued)</i> .														
447.11	86		SANDY SILT (ML); very stiff; dark yellowish brown; moist; some fine SAND; mostly low to medium plasticity fines.	S17	28	28	100			17				PI			
	14				14												
445.11	88																VOC=1.4 ppm
443.11	90																
441.11	92		CLAYEY SAND (SC); dense; dark yellowish brown; moist; trace fine GRAVEL; some fine SAND; medium plasticity, very high dry strength, high toughness fines.	O18			17			20	101			UW, PA	VOC=1.4 ppm		
439.11	94																
437.11	96						S19	12	35	100							
435.11	98																
433.11	100														VOC=2.1 ppm		
431.11	102		SILTY SAND with GRAVEL (SM); dense to very dense; dark yellowish brown mottled with very pale brown and moderate yellowish brown; moist; some coarse to fine, subangular GRAVEL; weak cementation; gravels are granodiorite, fine to medium grained, dark yellowish brown, intensely weathered, hard.	O20			67			10	101			UW, PI	VOC=20.1 ppm		
429.11	104																VOC=2.5 ppm
427.11	106						C21			10							
425.11	108																
423.11	110																
421.11	112		At EL. 422.1 ft, becomes about 10% COBBLES; about 20 to 30% GRAVEL.												VOC=3.0 ppm		
419.11	114																
115																	

(continued)



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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B11
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE T/T	EA 07-07-187900
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY K. Barker	DATE	SHEET 4 of 10	

CALTRANS BORING RECORD MET+ENG FIXED KRIS - SR-710 CALTRANS BORING LOGS WITH REV Z1B4 Z1B8 Z2B3 Z2B4 Z2B5 AND Z3B11 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
417.11	116		SILTY SAND with GRAVEL (SM) <i>(continued)</i> .		C23			33							
	117		At EL. 417.1 ft, observed little coarse to fine GRAVEL; mostly coarse to fine SAND.		C24			67		12					PI, PA
415.11	118														
413.11	120														
411.11	122		SILTY SAND (SM); dense; yellowish brown; moist; trace fine GRAVEL; mostly medium to fine SAND; little fines; weak cementation.		C25			100							PA
409.11	124		At EL. 409.1 ft, contains trace fine, subangular GRAVEL.												VOC=1.9 ppm
407.11	126		At EL. 407.1 ft, observed no gravel.		C26			95		11					PA
405.11	128														
403.11	130		SANDY lean CLAY (CL); stiff; yellowish brown; moist; trace fine GRAVEL; some medium to fine SAND; mostly medium plasticity fines.		C27			20		26					PI, PA
401.11	132														
399.11	134														
397.11	136		CLAYEY SAND (SC); dense to very dense; dark yellowish brown; moist; trace fine, subangular GRAVEL; coarse to medium SAND.		C28			0							VOC=2.1 ppm
395.11	138														
393.11	140														
391.11	142		Poorly graded SAND with SILT and GRAVEL (SP-SM); dense; dark yellowish brown mottled with yellowish brown and pale orange; moist; few coarse to fine, subangular GRAVEL; fine SAND; few fines.		C29			100							VOC=2.0 ppm
389.11	144														
	145														

(continued)



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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B11	
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE T/T	EA 07-07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER	PREPARED BY K. Barker	DATE	SHEET 5 of 10		

CALTRANS BORING RECORD MET+ENG FIXED KRIS - SR-710 CALTRANS BORING LOGS WITH REV Z1B4 Z1B8 Z2B3 Z2B4 Z2B5 AND Z3B11 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
387.11	146		At EL. 388.1 ft, contains trace fine GRAVEL. Poorly graded SAND with SILT and GRAVEL (SP-SM) <i>(continued)</i> .	C29			100							
	147			C30			100							
385.11	148		At EL. 384.6 ft, observed 6" lens cobbles.											
	149													
383.11	150													
	151		Well-graded SAND with SILT (SW-SM); dense; dark yellowish brown mottled with yellowish brown and pale orange; moist; few fine GRAVEL; mostly medium to fine SAND.	C31			100		14					PA VOC=18.2 ppm
381.11	152		At EL. 380.6 ft, becomes some coarse to fine GRAVEL. At EL. 380.1 ft, becomes trace GRAVEL; coarse SAND. At EL. 379.1 ft, becomes about 10 to 15% coarse to fine GRAVEL. At EL. 378.1 ft, becomes trace GRAVEL.											
	153													
379.11	154													
	155													
377.11	156		Poorly graded SAND with GRAVEL and COBBLES (SP); dense; dark yellowish brown; moist; about 20% COBBLES; coarse SAND; COBBLES consist of.	C32			60							VOC=20.1 ppm
	157													
375.11	158													
	159													
373.11	160		Elastic SILT (MH); very stiff; brown and dark yellowish brown; moist; medium plasticity fines.								PP = 2.5			
	161													
371.11	162		SEDIMENTARY ROCK, (SILTSTONE)/MUDSTONE, laminated, dark yellowish brown, intensely weathered, moderately soft to moderately hard, intensely fractured, shear (silt, moderately healed), dipping 20 to 45°, [TOPANGA FORMATION]	C33			100	35						VOC=0.4 ppm See note at the end of log regarding RQD.
	163													
369.11	164		At EL. 369.6 ft, becomes soft to moderately soft.											
	165													
367.11	166			C34			100	40						VOC=13.4 ppm
	167													
365.11	168		At EL. 365.1 ft, becomes very intensely fractured, moderately healed.											
	169													
363.11	170													
	171													
361.11	172		At EL. 361.1 ft, becomes slightly mottled with greenish gray, extremely weak, moderately soft, slightly fractured, shear, dipping 45°.	C35			100	80	25	101				PI, PA, UU, CR
	173													
359.11	174													
	175		At EL. 358.6 ft, contains fine sandstone lenses.											

(continued)



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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B11	
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE T/T	EA 07-07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER		PREPARED BY K. Barker		DATE	SHEET 6 of 10

CALTRANS BORING RECORD MET+ENG FIXED KRIS - SR-710 CALTRANS BORING LOGS WITH REV Z1B4 Z1B8 Z2B3 Z2B4 Z2B5 AND Z3B11 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
357.11	176		Poorly graded SAND with GRAVEL and COBBLES (SP) (continued). Elastic SILT (MH) (continued). At EL. 357.1 ft, becomes moderately to slightly fractured, dipping 90 to 20°.	C35			100	80						VOC=8.4 ppm See note at the end of log regarding RQD. VOC=3.3 ppm
355.11	178		At EL. 355.1 ft, contains 6" fracture zone.	C36			100	70						
353.11	180			C37			110	100						VOC=20.4 ppm VOC=20.6 ppm
349.11	184		At EL. 352.1 ft, contains 6" fracture zone. SEDIMENTARY ROCK, (SILTSTONE)/MUDSTONE, with fine sandstone lenses, massive, moderate yellowish brown mottled with olive gray, moderately weathered, soft to moderately soft, slightly fractured, fault (moderately healed), dipping 40°. At EL. 349.6 ft, contains 4" fracture zone.	C38			80	70	22	103				UC
347.11	186		SEDIMENTARY ROCK, (SILTSTONE)/MUDSTONE, laminated, moderate yellowish brown, intensely weathered, extremely weak, moderately soft, moderately fractured, (carbonate), dipping 40°. At EL. 348.2 ft, contains 5" fracture zone. At EL. 347.1 ft, becomes moderately soft to moderately hard, incipient joint.	C39			100	95						UW
345.11	188			C40			100	95						VOC=1.8 ppm
343.11	190			C41			100	100						VOC=4.0 ppm
341.11	192		At EL. 342.8 ft, contains 6" shear/fault zone, dipping 55°. At EL. 342.1 ft, becomes soft to moderately soft, slightly fractured, partially healed, dipping 45°.											
339.11	194		At EL. 339.1 ft, contains 4" lens hard.											
337.11	196		At EL. 336.7 ft, contains 4" lens hard.											
335.11	198													
333.11	200		At EL. 334.1 ft, becomes moderately hard, unfractured.											
331.11	202		At EL. 331.3 ft, contains 2" lens hard. At EL. 331.1 ft, becomes dark brown.											VOC=3.6 ppm VOC=2.7 ppm
329.11	204													
205														

(continued)



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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B11	
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE T/T	EA 07-07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER		PREPARED BY K. Barker		DATE	SHEET 7 of 10

CALTRANS BORING RECORD MET-ENG FIXED KRIS - SR-710 CALTRANS BORING LOGS WITH REV Z1B4 Z1B8 Z2B3 Z2B4 Z2B5 AND Z3B11 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks	
	205		(continued).	C41			100	100						See note at the end of log regarding RQD. VOC=1.0 ppm	
327.11	206		At EL. 327.1 ft, becomes slightly fractured, dipping 50 to 45°.	C42			100	100							
	207														
325.11	208														
	209														
323.11	210		At EL. 323.6 ft, contains lenses of fine sandstone, 1-3" thick. Unit is extremely weak. At EL. 323.1 ft, observed shear, dipping 45°.						21	112					PTS, SD, EM, UC
	211		At EL. 322.3 ft, observed shear/fault zone, dipping 50°.												UW
321.11	212		At EL. 322.1 ft, contains 6" slightly weathered, hard, fracture zone, not healed. At EL. 321.6 ft, becomes moderately soft, slightly fractured, dipping 45°.	C43			100	90							
	213														
319.11	214		SEDIMENTARY ROCK, (SANDSTONE), fine-grained, massive, dark reddish brown, intensely weathered, moderately soft, unfractured.												
	215		SEDIMENTARY ROCK, (SILTSTONE)/MUDSTONE, laminated, dark reddish brown, intensely weathered, moderately soft, slightly fractured.												
317.11	216			C44			100	100						UU VOC=0.9 ppm	
	217														
315.11	218		At EL. 316.3 ft, becomes intensely weathered, moderately soft, moderately to slightly fractured, incipient fracture, dipping 60 to 30°, with lenses of fine sandstone.						22	101				PI, UC	
	219		At EL. 314.3 ft, contains 2" slightly weathered, hard, fracture zone, not healed. Unit is extremely weak.												
313.11	220		SEDIMENTARY ROCK, (SILTSTONE)/MUDSTONE, laminated, dusky yellowish brown and dark greenish gray, intensely weathered, moderately hard, very intensely to intensely fractured, (moderately healed), dipping 40 to 80°, swells when excavated.	C45			110	80						VOC=2.8 ppm	
	221														
311.11	222														
	223														
309.11	224														
	225														
307.11	226		At EL. 307.1 ft, becomes totally healed, Unit is extremely weak.	C46			110	50	15	119				EM, UC VOC=4.2 ppm	
	227														
305.11	228														
	229														
303.11	230		At EL. 304.1 ft, becomes fresh, hard, intensely fractured, random fracture, totally healed, dipping 20°. At EL. 303.3 ft, becomes intensely weathered, moderately hard, very intensely fractured, incipient joint.												
	231		At EL. 302.1 ft, becomes intensely fractured, partially healed, with light gray sandstone lenses, 1-2" thick, 1' spacing.	C47			110	80						VOC=5.7 ppm	
301.11	232													PTS	
	233														
299.11	234														
	235														

(continued)



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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B11	
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE T/T	EA 07-07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER		PREPARED BY K. Barker		DATE	SHEET 8 of 10

CALTRANS BORING RECORD MET-ENG FIXED KRIS - SR-710 CALTRANS BORING LOGS WITH REV Z1B4 Z1B8 Z2B3 Z2B4 Z2B5 AND Z3B11 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks	
235	235		At EL. 298.3 ft, contains 3" lens of fresh, very hard. (continued).	C47			110	80						See note at the end of log regarding RQD. VOC=5.5 ppm	
297.11	236			C48			110	60							
	237														
295.11	238														
	239														
293.11	240														
	241			C49			120	90							VOC=1.1 ppm
291.11	242		At EL. 290.8 ft, contains 6" fracture zone, not healed, dipping 45 to 30°.												
	243		At EL. 290.3 ft, becomes moderately soft, intensely fractured, shear, moderately healed.												
289.11	244		Unit is extremely weak.												
	245														
287.11	246			C50			110	80	13	124				SD, EM, PI, UC VOC=2.5 ppm	
	247														
285.11	248														
	249														
283.11	250		At EL. 283.1 ft, observed												
	251		At EL. 282.1 ft, becomes soft, unfractured.	C51			100	60						VOC=1.6, 3.8 ppm	
281.11	252		SEDIMENTARY ROCK, (SANDSTONE), fine-grained, massive, medium gray, intensely weathered, very soft.												
	253		SEDIMENTARY ROCK, (SILTSTONE)/MUDSTONE, thickly to very thickly bedded, dark greenish gray, intensely weathered, moderately soft, unfractured, incipient joint.												
279.11	254		At EL. 278.1 ft, contains 3" lens of fine-grained sandstone.												
	255														
277.11	256			C52			100	90							
	257														
275.11	258		SEDIMENTARY ROCK, (SANDSTONE), fine-grained, massive, light gray, slightly weathered, hard, unfractured.												
	259		SEDIMENTARY ROCK, (SILTSTONE)/MUDSTONE, dark greenish gray, intensely weathered, moderately soft.	C53			100	100						UU, PI	
273.11	260		SEDIMENTARY ROCK, (SANDSTONE), fine-grained, light gray, fresh, very hard.												
	261		SEDIMENTARY ROCK, (SILTSTONE)/MUDSTONE, laminated, dark greenish gray, intensely weathered, extremely weak, moderately soft, very intensely fractured, shear (totally healed), with fine-grained sandstone laminations.	C54			115	80							
271.11	262		At EL. 272.1 ft, contains 3" lens of fracture zone.												
	263		At EL. 271.9 ft, becomes extremely weak, soft, slightly fractured, moderately healed, dipping 45 to 0°.						14	119				SD, EM, UC	
269.11	264														
	265														

(continued)



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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B11	
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE T/T	EA 07-07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER		PREPARED BY K. Barker		DATE	SHEET 9 of 10

CALTRANS BORING RECORD MET+ENG FIXED KRIS - SR-710 CALTRANS BORING LOGS WITH REV Z1B4 Z1B8 Z2B3 Z2B4 Z2B5 AND Z3B11 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
265	265		(continued).												
267.11	266		At EL. 267.1 ft, becomes moderately soft, very intensely fractured, moderately healed, dipping 45°.		C54			115	80						See note at the end of log regarding RQD.
	267				C55			120	75						
265.11	268														
263.11	270		At EL. 262.6 ft, becomes moderately hard.												
261.11	272		At EL. 262.1 ft, becomes very intensely fractured, totally healed.		C56			138	100						
259.11	274														
	275		Bottom of borehole at 275.0 ft bgs												
257.11	276		Borehole was converted to piezometer at the completion of drilling.												
	277														
255.11	278		RQD values provided in the boring logs are based on intact core pieces obtained between two natural discontinuities. Majority of cores obtained in this boring are weak and does not meet the "sound core" definition provided in standard test method for RQD ASTM D 6032. These RQD values should not be used to evaluate the rock mass quality.												
	279														
253.11	280														
	281														
251.11	282														
	283														
249.11	284														
	285														
247.11	286														
	287														
245.11	288														
	289														
243.11	290														
	291														
241.11	292														
	293														
239.11	294														
	295														



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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B11	
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE T/T	EA 07-07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER		PREPARED BY K. Barker		DATE	SHEET 10 of 10

LOGGED BY R. Chavez	BEGIN DATE 1-6-09	COMPLETION DATE 1-13-09	BOREHOLE LOCATION (Lat/Long or North/East and Datum) 34° 5' 32.8014" / 118° 9' 34.1424" NAD83	HOLE ID R-09-Z3B12
DRILLING CONTRACTOR Cascade Drilling Inc.			BOREHOLE LOCATION (Offset, Station, Line) ' Lt Sta (Westmont Dr. s/o Sherwood Ave.)	SURFACE ELEVATION 501.0 ft NAVD 88
DRILLING METHOD Rotary Wash			DRILL RIG Ingersoll Rand A400	BOREHOLE DIAMETER 6 in
SAMPLER TYPE(S) AND SIZE(S) (ID) SPT(1.4"), Cal (2.4"), PQ core (3.2")			SPT HAMMER TYPE Automatic Hammer 140 lb., 30 inch drop	HAMMER EFFICIENCY, ERI 75%
BOREHOLE BACKFILL AND COMPLETION Piezometer Installed on Completion			GROUNDWATER DURING DRILLING READINGS NM	AFTER DRILLING (DATE) 12.8 ft on 7/1/09
				TOTAL DEPTH OF BORING 275.0 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		ASPHALT 6" thick.												<p>This Boring Record was prepared in accordance with the Caltrans Soil & Rock Logging, Classification and Presentation Manual (June, 2007), except as noted in Appendix A.1 of the Final Geotechnical Summary Report, SR-710 Tunnel Technical Study, Los Angeles County, California, dated April, 2010.</p> <p>Hand Auger from 1' - 7.5'</p> <p>VOC = 0.4 ppm</p> <p>VOC = 0.2 ppm</p> <p>VOC = 0.3 ppm</p>
	1		Road base material, 6" thick.												
499.00	2		SANDY lean CLAY (CL); dark yellowish brown to olive brown; moist; fine SAND; medium plasticity fines [OLDER ALLUVIUM].		D1										
	3														
497.00	4														
	5														
495.00	6														
	7														
493.00	8														
	9														
491.00	10		Stiff; brown.		S2	3	7								
	11					3									
	12					4									
489.00	13		SILTY SAND (SM); very dense; light yellowish brown; moist; trace fine GRAVEL; medium to fine SAND; low plasticity fines.												
	14														
487.00	15														
	16				S3	29	67								
485.00	17					26									
	18					41									
483.00	19		SILT (ML); hard; light olive brown; moist; trace fine, rounded GRAVEL; nonplastic fines.												
	20														
481.00	21				S4	10	60								
	22					20									
	23					40									
479.00	24		SILTY SAND (SM); dense; light olive brown; moist; medium to fine SAND; trace mica.												
	25														

(continued)

CALTRANS BORING RECORD MET+ENG FIXED SR-710 CH2M HILL BORINGS.GPJ CALTRANS LIBRARY 040808.GLB 3/11/10



Department of Transportation
 Division of Engineering Services
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 Office of Geotechnical Design - South 1

REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B12
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE D/D	EA 07-187900
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER N/A	PREPARED BY D. Jankly	DATE 3-16-09	SHEET 1 of 10	

CALTRANS BORING RECORD MET+ENG FIXED SR-710 CH2M HILL BORINGS.GPJ CALTRANS LIBRARY 040808.GLB 3/11/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
475.00	25		SILTY SAND (SM) (continued).		S5	15 22 29	51								See note at end of log regarding RQD. VOC = 0.2 ppm
473.00	28		Elastic SILT (MH); very stiff; dark brown; moist; trace mica.												
471.00	30				S6	4 6 14	20								VOC = 0.2 ppm
469.00	32														
467.00	33		SILT with SAND (ML); hard; dark brown; moist; fine SAND.												
465.00	35		25% fine SAND, 75% fines.		S7	7 14 28	42								VOC = 0.3 ppm Other lab tests = PI, PA
463.00	38														
461.00	40		8" Silty Sand layer between 40' and 40.7'.		S8	14 15 19	34								VOC = 0.2 ppm
459.00	42														
457.00	43		SILTY SAND (SM); very dense; olive brown; moist; fine SAND; micaceous.												
455.00	45		78% fine SAND, 22% low plasticity fines.		S9	18 34 41	75								VOC = 0.0 ppm Other Lab tests = PA
453.00	48														
451.00	50		Light olive brown.		S10	12 21 28	49								VOC = 0.0 ppm
449.00	52														
447.00	54														
	55														

(continued)



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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B12
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE D/D	EA 07-187900
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER N/A	PREPARED BY D. Jankly	DATE 3-16-09	SHEET 2 of 10	

CALTRANS BORING RECORD MET+ENG FIXED SR-710 CH2M HILL BORINGS.GPJ CALTRANS LIBRARY 040808.GLB 3/11/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
445.00	55		SILTY SAND (SM) (continued).	S11	17	39	50/4"								See note at end of log regarding RQD.
443.00	58		SILTY CLAY (CL-ML); very stiff, brown to reddish brown; moist; low to medium plasticity fines; trace mica.												
441.00	60		5" thick interbed of silt between 60.4' and 60.8'.	S12	6	9	24								VOC = 0.4 ppm
439.00	62														
437.00	63		Poorly graded SAND (SP); dense; brown; moist; fine SAND.												
435.00	66			S13	16	24	53								VOC = 0.4 ppm
433.00	68														
431.00	69		SEDIMENTARY ROCK: (MUDSTONE/CLAYSTONE), massive, dark olive brown with white specs, intensely weathered, soft, unfractured. (lean CLAY with SAND, hard, moist, medium plasticity fines) [FERNANDO or PUENTE FORMATION]	S14	5	9	24								Driller notes faster rod drop at 68.5' VOC = 1.2 ppm
429.00	72														
427.00	74														
425.00	75		At EL. 426.0 ft, becomes yellowish brown, 1% fine GRAVEL, 16% coarse to fine SAND, 83% fines.	S15	12	20	56								VOC = 1.7 ppm Other lab tests = PI, PA
423.00	78														
421.00	80			S16	8	14	34								VOC = 0.1 ppm
419.00	82		At EL. 419.5 ft, becomes light olive brown and, dark grayish brown, very soft, trace fine gravel, white carbonate stringers with weak reaction to diluted HCL.	C17				100	100						
417.00	84		At EL. 417.0 ft, becomes dark grayish brown, sandy (fine grained).	C18				100	100						

(continued)



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DIST. 07	COUNTY LA	ROUTE 710	POSTMILE D/D	EA 07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER N/A		PREPARED BY D. Jankly		DATE 3-16-09	SHEET 3 of 10

CALTRANS BORING RECORD MET+ENG FIXED SR-710 CH2M HILL BORINGS.GPJ CALTRANS LIBRARY 040808.GLB 3/11/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
415.00	85		SEDIMENTARY ROCK, (CLAYSTONE), massive, light olive brown and, dark grayish brown, intensely weathered, very soft, trace fine gravel, trace sand, white carbonate stringers with weak reaction to diluted HCL. (lean CLAY with trace SAND, hard, moist, mostly low plastic fines). (continued)	C18			100	100						See note at end of log regarding RQD.
413.00	88		At EL. 413.5 ft, grades to thickly bedded, light olive brown and dark yellowish brown, medium plasticity with trace fine to coarse sand.	C19			100	100						VOC = 0.1 ppm
411.00	90		At EL. 411.5 ft, becomes sandy and gravelly 91.5'.											
409.00	92		At EL. 409.5 ft, becomes very dark gray, very thickly bedded.											
407.00	94		At EL. 408.5 ft, becomes moderately weathered, soft.	C20			100	100						
405.00	96		At EL. 406.9 ft, observed approximately 0.4' thick bed with abundant siltstone fragments.											VOC = 0.2 ppm
403.00	98		At EL. 403.5 ft, becomes massive, dark grayish brown with trace angular gravel, no reaction to diluted HCL.	C21			100	100						VOC = 0.2 ppm
401.00	100													VOC = 0.1 ppm
399.00	102			C22			100	100						PI, PA
397.00	104		At EL. 398.5 ft, becomes oxidized, strong brown.											
395.00	106		At EL. 397.5 ft, becomes dark grayish brown and light olive gray, unfractured, low plasticity with trace fine gravel.											
393.00	108		At EL. 394.5 ft, becomes thickly bedded, with occasional olive brown, thin beds of coarse grained sandstone, unfractured.	C23			100	100						VOC = 0.1 ppm
391.00	110		At EL. 392.0 ft, observed bedding joint, dipping 30°, 2" thick coarse grained clayey sandstone bed with some well rounded gravel. Extremely weak.											PI, UU
389.00	112		At EL. 391.0 ft, observed 1" thick, fine to coarse grained, clayey sandstone interbed, dipping 20 to 30 degrees.											
387.00	114		At EL. 390.0 ft, observed 1" thick, fine to coarse grained clayey sandstone bed.	C24			60	60						VOC = 0.2 ppm
			At EL. 389.5 ft, becomes dark grayish brown, lacks sand and gravel, no reaction to diluted HCL.											
			At EL. 387.5 ft, observed 2" thick sandstone bed, brown, fine grained with some gravel.											

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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B12	
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE D/D	EA 07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER N/A		PREPARED BY D. Jankly		DATE 3-16-09	SHEET 4 of 10

CALTRANS BORING RECORD MET+ENG FIXED SR-710 CH2M HILL BORINGS.GPJ CALTRANS LIBRARY 040808.GLB 3/11/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method Casing Depth	Remarks	
385.00	116		At EL. 384.8 ft, becomes slightly weathered, very dark gray with scattered well rounded gravel, highly plastic, unfractured. At EL. 380.5 ft, becomes fresh. Extremely weak. At EL. 374.5 ft, becomes moderately weathered, olive brown, low plasticity, with few elongated gravel. At EL. 370.0 ft, contains white calcareous gravel. Unit is massive.	C24			60	60				See note at end of log regarding RQD. VOC = 0.1 ppm VOC = 0.1 ppm PI, PA UU VOC = 0 ppm VOC = 0.0 ppm PA, UU VOC = 0 ppm		
	117			C25				100	100					
383.00	118													
	119													
381.00	120													
	121													
379.00	122					C26			100	100				
	123													
377.00	124													
	125													
375.00	126			C27			100	100						
	127													
373.00	128													
	129													
371.00	130													
	131			C28			91	91						
369.00	132													
	133													
367.00	134													
	135													
365.00	136													
	137			C29			84	84						
363.00	138													
	139		SEDIMENTARY ROCK, (SILTSTONE), thickly bedded, pale olive mottled with white, moderately weathered, extremely weak, moderately soft, unfractured, mostly non plastic; moderate reaction to diluted HCL. [PUENTE FORMATION] At EL. 362.6 ft, observed bedding joint, dipping 30°, roughly 2" thick calcareous bed with strong reaction to HCL solution.											
361.00	140													
	141													
359.00	142		SEDIMENTARY ROCK, (SHALE) with interbedded SILTSTONE, DIATOMACEOUS SILTSTONE, and CALCAREOUS SILTSTONE, laminated to very thinly bedded, pale olive to olive gray, fresh, very slightly fractured, calcareous interbeds are white and hard. Bedding dipping 40 degrees. At EL. 359.5 ft, observed joint, dipping 80°, tight.	C30			94	94						
	143													
357.00	144													
	145													

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DIST. 07	COUNTY LA	ROUTE 710	POSTMILE D/D	EA 07-187900
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER N/A	PREPARED BY D. Jankly	DATE 3-16-09	SHEET 5 of 10	

CALTRANS BORING RECORD MET+ENG FIXED SR-710 CH2M HILL BORINGS.GPJ CALTRANS LIBRARY 040808.GLB 3/11/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method Casing Depth	Remarks
355.00	146		SHALE with interbedded SILTSTONE, DIATOMACEOUS SILTSTONE, and CALCAREOUS SILTSTONE, laminated to very thinly bedded, pale olive to olive gray, fresh, very slightly fractured, calcareous interbeds are white and hard. (continued) At EL. 354.7 ft, becomes soft with hard SHALE beds.	C30			94	94					See note at end of log regarding RQD.
	147			C31			96	72					VOC = 0.1 ppm
349.00	152		At EL. 349.0 ft, becomes soft, unfractured, bedding joint, dipping 45°, breaks along bedding plane, slightly calcareous.	C32			77	77					VOC = 0.2 ppm
347.00	154												VOC = 0.1 ppm
345.00	156												
343.00	158		At EL. 344.4 ft, becomes very slightly fractured.	C33			91	91					
	159		At EL. 343.0 ft, observed bedding joint, dipping 50°.										VOC = 0.0 ppm
341.00	160												
339.00	162		At EL. 340.4 ft, observed joint, dipping 30°, tight, smooth. At EL. 339.9 ft, observed joint, dipping 40°, tight, smooth.	C34			100	100					
337.00	164		At EL. 337.4 ft, observed bedding joint, dipping 60°.										
335.00	166		SEDIMENTARY ROCK. (SILTSTONE) and DIATOMACEOUS SILTSTONE, joint dipping 60°, tight, smooth.	C35			76	0					CR VOC = 0.0 ppm
	167		At EL. 335.0 ft, becomes soft to hard, with hard, interval with calcareous/dolomitic interbeds, unfractured.										VOC = 0.0 ppm
333.00	168			C36			82	0					VOC = 0.0 ppm
331.00	170												
329.00	172		At EL. 330.2 ft, becomes yellowish brown, oxidized, intensely weathered, soft, very intensely fractured (between 170.8' to 172'). Possible faulted zone. At EL. 329.0 ft, observed bedding joint, dipping 60°, on hard, siliceous interbed.	C37			100	70					VOC = 0 ppm
327.00	174		At EL. 328.5 ft, becomes slightly fractured, joint, dipping 30°, moderately rough.										

(continued)



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DIST. 07	COUNTY LA	ROUTE 710	POSTMILE D/D	EA 07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER N/A		PREPARED BY D. Jankly		DATE 3-16-09	SHEET 6 of 10

CALTRANS BORING RECORD MET+ENG FIXED SR-710 CH2M HILL BORINGS.GPJ CALTRANS LIBRARY 040808.GLB 3/11/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
175			(continued)											
325.00	176		At EL. 325.9 ft, observed joint, dipping 70°, tight, iron oxide stained, slightly rough.	C37			100	70						See note at end of log regarding RQD. VOC = 0 ppm
	177		SEDIMENTARY ROCK, (SHALE), very thinly to thinly bedded, olive gray and light gray, fresh, soft, very slightly fractured, oxidized bedding plane joints, no clay seams.	C38			92	92						
323.00	178		At EL. 323.0 ft, observed bedding joint, dipping 60°.											
	179													
321.00	180		At EL. 321.7 ft, observed color change to very dark gray with gray banding.											
	181		At EL. 321.0 ft, observed syndepositional erosional features to 180.2'.											
319.00	182		At EL. 320.0 ft, becomes laminated to very thinly bedded, black, moderately fractured, low plasticity.	C39			50	0						VOC = 0 ppm
	183													
317.00	184		At EL. 318.0 ft, observed bedding joint, dipping 50°.											
	185													
315.00	186		At EL. 315.2 ft, becomes black and light greenish gray, extremely weak, unfractured, unoxidized, with thin interbeds hard, siliceous material, weak reaction to diluted HCL.	C40			72	50						VOC = 1.1 ppm UC
	187													
313.00	188		At EL. 312.8 ft, observed bedding joint, dipping 70°.											
	189													
311.00	190													
	191		At EL. 310.2 ft, becomes moderately soft, well bedded.	C41			100	100						VOC = 0.4 ppm SD
309.00	192		At EL. 309.5 ft, observed phosphatic nodule, strong brown.											
	193		At EL. 308.5 ft, observed bedding joint, dipping 60°, weak reaction to diluted HCL, breaks along bedding.											
307.00	194			C42			79	79						VOC = 1.3 ppm
	195													
305.00	196		At EL. 305.5 ft, observed bedding joint, dipping 60°, Scattered 1/8" thick phosphate nodules.	C43			83	61						VOC = 2.5 ppm
	197		At EL. 305.2 ft, becomes moderately soft to moderately hard, moderately fractured.											
303.00	198													
	199		At EL. 302.9 ft, observed three joints dipping 10 degrees, tight, stepped.											
301.00	200		At EL. 302.7 ft, observed bedding joint, dipping 60°.	C44			100	100						VOC = 1.1 ppm
	201													
299.00	202		At EL. 299.3 ft, observed bedding joint, dipping 55°, fish scales present. Extremely weak.											UC
	203													
297.00	204		At EL. 297.0 ft, observed bedding joint, dipping 60°, weak reaction to diluted HCL, scattered 1/8" dia.	C45			100	100						VOC = 1.7 ppm
	205													

(continued)



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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B12	
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE D/D	EA 07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER N/A		PREPARED BY D. Jankly		DATE 3-16-09	SHEET 7 of 10

CALTRANS BORING RECORD MET+ENG FIXED SR-710 CH2M HILL BORINGS.GPJ CALTRANS LIBRARY 040808.GLB 3/11/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
205.00	205		phosphatic nodules.	C45			100	100						See note at end of log regarding RQD.
295.00	206		SHALE, laminated to very thinly bedded, black and light greenish gray, fresh, moderately soft to moderately hard, moderately to slightly fractured. (continued).											
	207		At EL. 294.0 ft, observed bedding joint, dipping 60°.											
293.00	208													
	209			C46			100	100						VOC = 0.9 ppm
291.00	210		At EL. 291.5 ft, with scattered 1/8" dia. phosphate nodules.											
	211													
289.00	212		At EL. 288.6 ft, observed bedding joint, dipping 60°, on 1/2" thick CLAY seam, along bedding, highly plastic, smooth, tight.											VOC = 5.8 ppm
	213													
287.00	214		At EL. 286.5 ft, observed bedding joint, dipping 60°, Very weak.	C47			61	61						UC
	215													
285.00	216													
	217		At EL. 284.3 ft, observed bedding joint, dipping 60°.											
283.00	218		At EL. 283.2 ft, observed two joints dipping 30 and 40 degrees, tight, smooth.											
	219			C48			83	37						VOC = 38 ppm
281.00	220		At EL. 280.8 ft, observed bedding joint, dipping 60°.											
	221													
279.00	222			C49			52	52						VOC = 2.5 ppm
	223													
277.00	224		At EL. 277.8 ft, observed bedding joint, dipping 60°.											
	225			C50			80	0						
275.00	226		At EL. 275.8 ft, becomes very slightly fractured to unfractured. At EL. 275.2 ft, observed bedding joint, dipping 65°, tight, smooth.	C51			89	62						VOC = 0.4 ppm
	227													
273.00	228		At EL. 272.7 ft, observed bedding joint, dipping 65°, tight, smooth.											
	229													
271.00	230		At EL. 271.0 ft, becomes olive gray to light olive gray.	C52			68	68						CR VOC = 3.4 ppm
	231													
269.00	232		At EL. 269.0 ft, observed 4" thick siliceous bed, hard, very intensely fractured, no reaction to HCL solution. At EL. 268.3 ft, observed bedding joint, dipping 65°. At EL. 267.8 ft, observed joint, dipping 30°, tight, calcite lined, slightly rough.											
	233													
267.00	234													
	235													

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REPORT TITLE BORING RECORD				HOLE ID R-09-Z3B12	
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE D/D	EA 07-187900	
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER N/A		PREPARED BY D. Jankly		DATE 3-16-09	SHEET 8 of 10

CALTRANS BORING RECORD MET+ENG FIXED SR-710 CH2M HILL BORINGS.GPJ CALTRANS LIBRARY 040808.GLB 3/11/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
265.00	235		SHALE, laminated to very thinly bedded, olive gray and light gray, fresh, moderately soft to moderately hard, very slightly fractured to unfractured.	C53			68	68						VOC = 2.4 ppm See note at end of log regarding RQD.
263.00	236		At EL. 263.8 ft, observed bedding joint, dipping 60°.											
261.00	237		PTS - Fine-grained shale or siltstone, planar bedded at the millimeter scale..											PTS
259.00	238		At EL. 259.5 ft, observed bedding joint, dipping 60°.	C54			100	100						VOC = 2.2 ppm
257.00	239		At EL. 257.0 ft, observed joint, dipping 90°, tight moderately rough, approximately 1' long.	C55			100	100						VOC = 0.4 ppm
255.00	240		At EL. 256.3 ft, observed bedding joint, dipping 60°.											
253.00	241		At EL. 254.7 ft, observed bedding joint, dipping 60°.											
251.00	242		At EL. 252.2 ft, observed bedding joint, dipping 60°, . Very weak.	C56			76	60						VOC = 0.2 ppm
249.00	243		At EL. 250.0 ft, observed bedding joint, dipping 60°.											
247.00	244		At EL. 249.5 ft, observed shear/fault zone, 3" thick, highly plastic, clay infilling, intensely fractured, parallel to bedding.	C57			63	63						VOC = 0.0 ppm
245.00	245		At EL. 243.2 ft, observed bedding joint, dipping 60°.	C58			56	56						
243.00	246		At EL. 241.2 ft, observed bedding joint, dipping 60°.	C59			100	100						VOC = 0.9 ppm
241.00	247		At EL. 240.5 ft, observed bedding joint, dipping 60°.											
239.00	248		At EL. 236.5 ft, observed bedding joint, dipping 60°.	C60			100	90						
237.00	249													
265	250													

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PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER N/A		PREPARED BY D. Jankly		DATE 3-16-09	SHEET 9 of 10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
235.00	266		SHALE, laminated to very thinly bedded, olive gray and light gray, fresh, moderately soft to moderately hard, very slightly fractured to unfractured. At EL. 235.9 ft, observed bedding joint, dipping 60°. At EL. 235.2 ft, observed fault, dipping 80°, 1/8" thick, soft clay lining, rough, 7" offset. At EL. 233.0 ft, observed fine grained sandstone lamination, friable. Very weak.	C60			100	90				X		See note at end of log regarding RQD.
233.00	268			C61			98	98						VOC = 1.3 ppm UC
229.00	272			C62			100	100						VOC = 0.5 ppm SD
227.00	274		At EL. 227.5 ft, observed bedding joint, dipping 70°.											
225.00	276		At EL. 226.7 ft, observed joint, dipping 40°, tight, polished and striated with clay film.											
	275		Bottom of borehole at 275.0 ft bgs Borehole terminated at planned depth.											
	277		Borehole converted to piezometer at the completion of drilling.											
	278		RQD values provided on the boring logs are based on intact core pieces obtained between two natural discontinuities. The majority of core obtained from this boring is typically very weak to weak and does not meet the "sound core" definition provided in the standard test method for RQD (ASTM D 6032). These RQD values should not be used to evaluate rock mass quality.											



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PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY					
BRIDGE NUMBER N/A		PREPARED BY D. Jankly		DATE 3-16-09	SHEET 10 of 10

LOGGED BY D. Jankly	BEGIN DATE 3-10-09	COMPLETION DATE 3-16-09	BOREHOLE LOCATION (Lat/Long or North/East and Datum) 34° 4' 51.5958" / 118° 9' 20.7936" NAD83	HOLE ID R-09-Z4B4
DRILLING CONTRACTOR Cascade Drilling Inc.			BOREHOLE LOCATION (Offset, Station, Line) ' Lt Sta (Westminster Ave. n/o W. Mission Rd.)	SURFACE ELEVATION 454.4 ft NAVD 88
DRILLING METHOD Rotary Wash			DRILL RIG Speedstar 30k	BOREHOLE DIAMETER 6 in
SAMPLER TYPE(S) AND SIZE(S) (ID) SPT(1.4"), Cal (2.4"), PQ core (3.2")			SPT HAMMER TYPE Automatic Hammer 140 lb. 30 inch drop	HAMMER EFFICIENCY, ERI 70%
BOREHOLE BACKFILL AND COMPLETION Piezometer Installed on Completion			GROUNDWATER DURING DRILLING AFTER DRILLING (DATE) READINGS NM 46.3 ft on 7/1/09	TOTAL DEPTH OF BORING 277.0 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
0	0		ASPHALT 4" thick.												<p>This Boring Record was prepared in accordance with the Caltrans Soil & Rock Logging, Classification and Presentation Manual (June, 2007), except as noted in Appendix A.1 of the Final Geotechnical Summary Report, SR-710 Tunnel Technical Study, Los Angeles County, California, dated April, 2010.</p> <p>Hand Auger to 5'</p> <p>PI, PA</p>
	1		Road base material, 6" thick.												
452.40	2		SILTY SAND (SM); reddish brown; dry to moist; few coarse to fine, subangular to subrounded GRAVEL; mostly coarse to fine SAND; some low plasticity fines [FILL].		D01										
450.40	4														
448.40	6		SILTY SAND (SM); dense; light brown; moist; trace coarse to fine, subrounded GRAVEL; mostly coarse to fine SAND; some low plasticity fines [OLDER ALLUVIUM].												
446.40	8														
444.40	10				S02	7 10 20	30	61							
442.40	12														
440.40	14														
438.40	16		SANDY SILTY CLAY (CL-ML); very stiff; dark yellowish brown; moist; 31% medium to fine SAND, 69% fines.		S03	5 18 14	32	100		18	113				
436.40	18														
434.40	20		Hard.		S04	6 12 14	26	100							
432.40	22														
430.40	24														
	25														

(continued)

CALTRANS BORING RECORD MET+ENG FIXED SR-710 CH2M HILL BORINGS.GPJ CALTRANS LIBRARY 040808.GLB 3/11/10



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REPORT TITLE BORING RECORD				HOLE ID R-09-Z4B4
DIST. 07	COUNTY LA	ROUTE 710	POSTMILE D/D	EA 07-187900
PROJECT OR BRIDGE NAME SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER N/A	PREPARED BY D. Jankly	DATE 4-13-09	SHEET 1 of 10	

CALTRANS BORING RECORD MET+ENG FIXED SR-710 CH2M HILL BORINGS.GPJ CALTRANS LIBRARY 040808.GLB 3/11/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
428.40	25		SANDY SILTY CLAY (CL-ML) (continued). Hard.	S05	9 16 25	41	100			21	103				
426.40	28														
424.40	30		Very stiff; brown.	S06	5 8 13	21	100								
422.40	32														
420.40	34														
418.40	35		43% predominantly fine SAND, 57% fines.	S07	6 13 18	31	100			20	110			PI, PA	
416.40	38														
414.40	40			S08	10 18 29	47	72								
412.40	42		Poorly graded SAND (SP); very dense; light yellowish brown; moist; coarse to fine SAND.												
410.40	44														
408.40	46			S09	50/3"		0								
406.40	48														
404.40	50														
402.40	52		SILTY SAND with GRAVEL (SM); very dense; dark yellowish brown; moist; 15% coarse to fine GRAVEL, 69% coarse to fine SAND, 16% low plasticity fines.	S10	33 30 24	54	78			12				PA	
400.40	54														
	55														

(continued)



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BRIDGE NUMBER N/A		PREPARED BY D. Jankly		DATE 4-13-09	SHEET 2 of 10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
398.40	56		At EL. 399.4 ft, with coarse GRAVEL. SILTY SAND with GRAVEL (SM) (continued).	▲	S11	50/5"		40							
394.40	60		SILTY SAND (SM); very dense; reddish brown; moist; mostly coarse to fine SAND; little low plasticity fines.	▲	S12	19 50/5"		80							
388.40	66		1% fine GRAVEL (subangular), 61% predominantly fine SAND, 38% low plasticity fines.	▲	S13	18 31 44	75	100						PA	
384.40	70			▲	S14	18 38 56	94	89							
378.40	76		At EL. 379.4 ft, becomes mostly coarse to fine SAND; little low plasticity fines.	▲	S15	50/6"		33							
374.40	80			▲	S16	24 33 47	80	72							
370.40	84		SEDIMENTARY ROCK, (CLAYSTONE), massive, strong brown, decomposed, soft, moist, oxidized, no reaction to diluted HCL. (fat CLAY (CH), moist, very												

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CALTRANS BORING RECORD METH+ENG FIXED SR-710 CH2M HILL BORINGS.GPJ CALTRANS LIBRARY 040808.GLB 3/11/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
368.40	85		stiff). [FERNANDO FORMATION] (continued).		S17	13 19 23	42	100	100	28					See note at end of log regarding RQD. PI
366.40	87		SEDIMENTARY ROCK, (CLAYSTONE TO SILTSTONE), massive, light greenish gray and dark yellowish brown, moderately weathered, soft, unfractured, iron oxide staining.		C18										
364.40	89				C19			100	100						
360.40	93		At EL. 361.9 ft, observed bedding joint, faint, subhorizontal.												
360.40	94		At EL. 360.5 ft, observed 7" thick Siltstone bed, strong brown with black stained remnant fractures, subhorizontal.												
358.40	96		At EL. 358.6 ft, observed shear, dipping 75°, polished, paperthin clay lining, faint shear surface extended from 95.8 feet to 96.5 feet. At EL. 357.9 ft, observed faint subhorizontal bedding plane. Extremely weak.							27	95				PI, PA, CR, UU
354.40	100		At EL. 355.4 ft, observed bedding joint, dipping 20 to 10°, 3/8" to 1/2" thick Siltstone bed with iron oxide stained halo, undulatory.		C20			100	100						
352.40	101		At EL. 353.4 ft, observed bedding joint, dipping 10°.												VOC = 32.6 ppm
350.40	103		At EL. 351.4 ft, observed joint, dipping 60°, very faint, non-continuous, black lined joint.												
348.40	105		At EL. 350.4 ft, observed undulatory bedding, rolls over, dipping up to 20 degrees in opposite direction, soft sediment deformation present. At EL. 349.4 ft, observed shear, dipping 25 to 20°, four shears observed between 105' to 106.5'. Shears are tight, up to 1/16" thick, black lined, truncate siltstone laminations.		C21			100	100						
346.40	107		At EL. 347.9 ft, observed joint, dipping 30 to 25°, numerous black lined joints, iron oxide stained, some iron oxide stained Siltstone lenses. At EL. 347.4 ft, becomes light brownish gray, very slightly fractured.												
344.40	109		At EL. 346.4 ft, observed shear, dipping 60°, faintly polished shear, bedding is undulatory, subhorizontal. At EL. 345.3 ft, observed shear, dipping 40°, 1mm aperture, moderately rough.												VOC = 51.5 ppm
342.40	111		At EL. 345.0 ft, observed bedding joint, dipping 10°, 3/8" thick iron oxide stained bed with abundant black staining. At EL. 344.4 ft, observed bedding joint, dipping 10 to 5°.		C22			78	78						
340.40	113		At EL. 343.6 ft, observed bedding joint, dipping 25°, bedding is undulatory, locally folded, soft sediment deformation. At EL. 343.5 ft, observed shear, dipping 45°. At EL. 342.0 ft, observed bedding joint, dipping 40°, local faint laminations. At EL. 341.8 ft, observed joint, dipping 70°, tight.												VOC = 49.2 ppm

(continued)



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ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
338.40	116		At EL. 341.6 ft, observed bedding joint, dipping 45°, possible bedding on strong brown and light brown gray contact. At EL. 341.4 ft, becomes greenish black, contact between light greenish gray above and greenish black dipping 60 degree. (continued)		C22			78	78						See note at end of log regarding RQD.
336.40	118		At EL. 338.6 ft, observed shear, dipping 70 to 45°, two very faint shears. At EL. 337.9 ft, observed joint, dipping 60 to 50°, aperture 2mm, moderately rough. At EL. 336.9 ft, observed bedding joint, dipping 25°, bedding on contact between strong brown and light brownish gray beds.		C23			100	80						VOC = 25.6 ppm
334.40	120		At EL. 336.4 ft, observed joint, dipping 50°. At EL. 334.4 ft, grades to unoxidized. Unit is micaceous, no reaction to HCL solution.		C24			100	100						VOC = 26.5 ppm
332.40	122		At EL. 334.0 ft, observed bedding joint, dipping 40°, local iron oxide stained bed. At EL. 333.8 ft, observed shear, dipping 70°. At EL. 332.9 ft, observed irregular gradational contact from 121' to 122.1' dipping 65 degrees to vertical, greenish black above, light gray below.		C25					20	102				PI, UC
330.40	124		At EL. 332.1 ft, observed shear, dipping 70°, iron oxide stained below shear, light brownish gray above. At EL. 331.5 ft, observed bedding joint, dipping 60°, 1" diameter concretionary nodule, beds folded around nodule.		C26			90	83						VOC = 31.7 ppm
328.40	126		SEDIMENTARY ROCK, (SILTSTONE), massive, greenish black to black, slightly weathered to fresh, moderately soft, unfractured, with scattered rip-up clasts, micaceous, unoxidized. At EL. 329.9 ft, observed 8" thick strong brown zone. Very weak.		C27			100	100						UU
326.40	128		At EL. 325.4 ft, observed scattered black rip-up clasts, randomly oriented, bedding unknown.												
324.40	130		At EL. 321.4 ft, observed 1.5' thick zone with very faint black siltstone rip-up clasts and very faint laminations indicating possible subhorizontal bedding (<10 degrees).												VOC = 21.8 ppm
322.40	132		At EL. 319.4 ft, becomes fresh, micaceous.												
320.40	134		At EL. 317.9 ft, observed charcoal fragment, 1/8"x3/8".												
318.40	136		Very weak.							18	102				
316.40	138		At EL. 312.4 ft, observed shear, dipping 70°, polished, tight, faint clay lining. At EL. 311.4 ft, observed shear, dipping 70°, tight shear with 1/16" clay lining, black.												
314.40	140		At EL. 310.2 ft, contains black siltstone rip-up clasts.												
312.40	142														
310.40	144														
	145														

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ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
308.40	146		SILTSTONE, massive, greenish black to black, fresh, moderately soft to moderately hard, unfractured, with scattered rip-up clasts, micaceous, unoxidized. (continued). At EL. 307.9 ft, observed shear, dipping 65°, tight shear with 1/16" clay lining, faint.		C27			100	100						See note at end of log regarding RQD. VOC = 15.4 ppm
306.40	148		At EL. 306.9 ft, observed 2" thick soft zone, no visible shearing observed.												
304.40	150				C28			100	100	17					SD
302.40	152		At EL. 303.4 ft, observed shear, dipping 70 to 50°, two shears, tight, very faint, 1/16" thick clay lining. At EL. 302.4 ft, observed shear, dipping 75 to 70°, tight, 1/16"-1/8" thick, fat clay lining.												
300.40	154														
298.40	156		At EL. 299.9 ft, observed black siltstone rip-up clasts. At EL. 299.6 ft, observed shear, dipping 60°, Aperture 1mm, clay lined, moderately rough.							17	105				UC
296.40	158		Very weak.		C29			100	100						
294.40	160														
292.40	162														VOC = 25.1 ppm
290.40	164														
288.40	166		At EL. 289.1 ft, observed abundant rip-up clasts, randomly oriented.												
286.40	168		At EL. 287.9 ft, observed possible 10 degree bedding on numerous similarly oriented rip-up clasts.		C30			95	95						
284.40	170		At EL. 285.2 ft, observed charcoal fleck 1/8"x3/8".												
282.40	172		At EL. 282.4 ft, observed fine, white lined nodules up to 1/8" thick and 3/8" long. Possible shells/shell fragments.												
280.40	174				C31			100	100						VOC = 15.1 ppm
175															

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ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
278.40	176		SILTSTONE, massive, greenish black to black, fresh, moderately soft to moderately hard, unfractured, with scattered rip-up clasts, micaceous, unoxidized. At EL. 278.9 ft, observed scattered charcoal flecks <1/8" diameter and scattered white lined nodules as El. 282.4 ft.		C31			100	100						See note at end of log regarding RQD.
274.40	180		At EL. 275.4 ft, observed 1/4" x 1-1/2" bluish gray, subhorizontal lens. At EL. 274.8 ft, observed 3/8" x 5" laminated lens dipping 50 degrees, non-continuous around core. At EL. 274.2 ft, observed 3/8" diameter concretionary nodule.		C32			100	100						
272.40	182		At EL. 273.4 ft, observed abundant rip-up clasts, randomly oriented, from 181' to 185'.		C33			100	100						
266.40	188		At EL. 265.9 ft, observed white lined nodules as El. 282.4 ft.		C34			100	100						VOC = 35.8 ppm PI
256.40	198		At EL. 257.4 ft, observed faint white lens, 4" long x 1/8" thick, dipping 60 degrees, non-continuous around core.		C35			100	100						VOC = 15.7 ppm
254.40	200		At EL. 254.9 ft, observed black siltstone rip-up clasts. Very weak.							14	106				SD, UC
252.40	202		PTS - Siltstone with red-brown iron oxide rich matrix (86%). At EL. 253.7 ft, observed 1" long x 1/8" thick white nodule. At EL. 252.4 ft, observed scattered charcoal flecks <1/8" diameter, from 201.3' to 205'. At EL. 251.9 ft, observed 1" x 3/4" stone in center of core, polished, rectangular.												PTS VOC = 28.2 ppm

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ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
205	206		SILTSTONE, massive, greenish black to black, fresh, moderately soft, unfractured, with scattered rip-up clasts, micaceous, unoxidized. At EL. 249.3 ft, observed possible bedding dip of 10 degrees, scarce charcoal flecks <1/8" dia.		C36			100	100						See note at end of log regarding RQD.
248.40	207														
246.40	208														VOC = 48.4 ppm
	209		At EL. 245.9 ft, observed 1" x 1/2" lens of fine to medium grained silty sandstone, dipping 10 degrees.												
244.40	210				C37			100	100						
	211														
242.40	212		At EL. 242.2 ft, observed siltstone rip-up clasts.												VOC = 46.2 ppm
	213														
240.40	214														
	215		At EL. 239.6 ft, observed irregular lenses of bluish gray silt, subhorizontal. At EL. 239.4 ft, observed some fine white lined nodules as El. 282.4 ft.												
238.40	216														
	217														
236.40	218				C38			100	100						
	219														
234.40	220														
	221		At EL. 234.2 ft, observed scarce siltstone rip-up clasts. Scattered charcoal flecks at 220.5 to 222.5'. Very weak.							20	101				CR, UU
232.40	222														
	223														
230.40	224		At EL. 231.4 ft, observed 3/4" x 3/8" bluish gray rip-up clast, internally laminated, subhorizontal.		C39			100	100						VOC = 22.2 ppm
	225														
228.40	226		At EL. 228.3 ft, observed siltstone rip-up clasts.												
	227														
226.40	228														
	229		At EL. 226.4 ft, observed white lined nodules as El. 282.4 ft, generally subhorizontally dipping. At EL. 226.1 ft, observed 3/8" x 1/8" charcoal fleck.												
224.40	230		At EL. 224.8 ft, contains siltstone rip-up clasts.												
	231														
222.40	232		At EL. 223.9 ft, observed faint, 3" x 3/8" sandy lens dipping 20 degrees, dips against faint 10 degree fabric in rock (possible bedding dipping 10 degrees). At EL. 223.4 ft, observed dark greenish gray, hard, 4" thick limestone bed, highly reactive to HCL solution, some very tight internal fractures with possible calcite lining. Upper contact dipping 20 degrees, lower contact is undulatory, subhorizontal. At EL. 221.4 ft, observed bluish gray siltstone rip-up clast. Unit is very weak.		C40			100	100						SD
	233														
220.40	234									14					
	235														

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ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
218.40	236		SILTSTONE, massive, greenish black to black, fresh, moderately soft to moderately hard, unfractured, with scattered rip-up clasts, micaceous, unoxidized. At EL. 218.1 ft, observed 1-1/2" x 3/8" charcoal/remnant wood fragment.		C40			100	100						See note at end of log regarding RQD. VOC = 43.2 ppm
216.40	238		At EL. 216.9 ft, observed scattered charcoal flecks. At EL. 216.4 ft, observed faint siltstone fabric indicates possible subhorizontal bedding.												
210.40	244		At EL. 211.4 ft, observed possible subhorizontal bedding based on siltstone rip-up clast orientation.		C41			100	100						
208.40	246		At EL. 208.9 ft, observed faint siltstone fabric, possible subhorizontal bedding.		C42			97	97						VOC = 3.6 ppm
206.40	248		At EL. 207.4 ft, observed shear, dipping 60°, tight, paperthin clay lining, polished. At EL. 206.4 ft, with scattered fine (<1/16" diameter) white flecks at 248' to 254'.												
202.40	252		At EL. 203.4 ft, observed scarce charcoal flecks up to 1/8" dia.												VOC = 2.4 ppm
200.40	254		At EL. 201.9 ft, observed siltstone rip-up clast.												
198.40	256		At EL. 200.4 ft, observed local fabric dipping 50 degrees, adjacent and parallel to 1/16" to 1/8" thick very fine sand lens, possible soft sediment deformation. As 123.5' with trace fine sand. Siltstone fabric indicates subhorizontal bedding.		C43			100	100						
196.40	258		At EL. 197.9 ft, observed siltstone rip-up clasts. At EL. 197.4 ft, observed scattered charcoal flecks between 257' and 265'.												
190.40	264		Very weak.							21	102				UU

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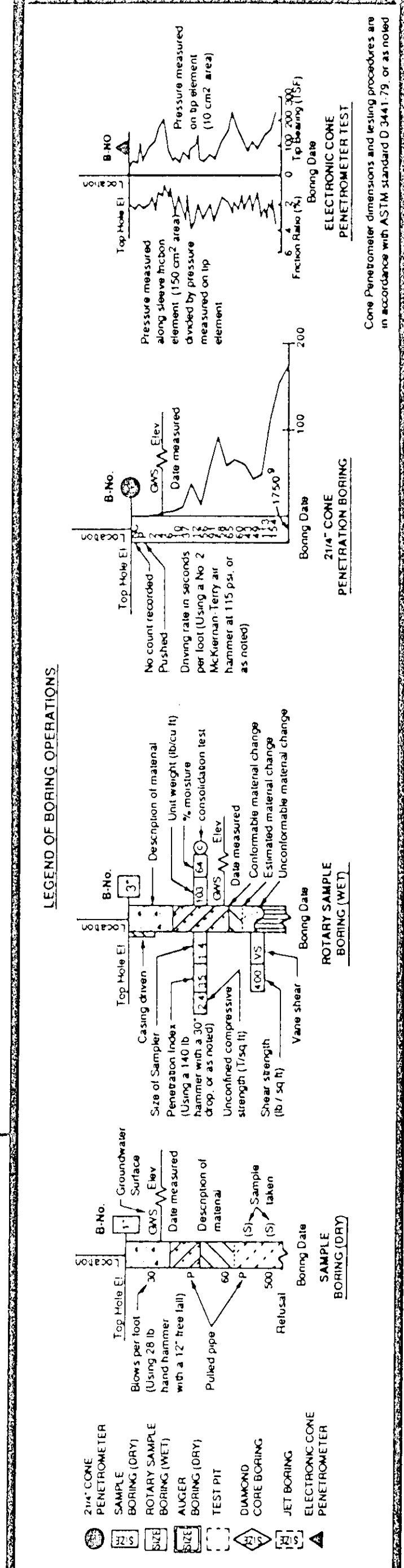
ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
188.40	266		SILTSTONE, massive, greenish black to black, fresh, moderately soft to moderately hard, unfractured, with scattered rip-up clasts, micaceous, unoxidized.		C44			100	100						See note at end of log regarding RQD. VOC = 18.3 ppm
	267		At EL. 187.9 ft, observed 1/8" - 1/4" thick bluish gray silt lens.												
186.40	268														
	269		At EL. 185.6 ft, observed bedding joint, dipping 5 to 0°, 1" thick section with bluish gray, very fine sand lenses, subhorizontal.												
184.40	270														
	271		At EL. 183.4 ft, observed shear, dipping 70°, polished, faint clay lining.												
182.40	272				C45			100	100						
	273														
180.40	274		At EL. 181.1 ft, observed siltstone rip-up clast and bluish gray very fine sand lens.												
	275														
178.40	276		At EL. 178.9 ft, observed shear, dipping 65°, very tight, 1/16" thick clay lining.												
	277														
	278		Bottom of borehole at 277.0 ft bgs Borehole terminated at planned depth.												
	279		Borehole converted to piezometer at the completion of drilling.												
	280		RQD values provided on the boring logs are based on intact core pieces obtained between two natural discontinuities. The majority of core obtained from this boring is typically very weak to weak and does not meet the "sound core" definition provided in the standard test method for RQD (ASTM D 6032). These RQD values should not be used to evaluate rock mass quality.												
	281														
	282														
	283														
	284														
	285														
	286														
	287														
	288														
	289														
	290														
	291														
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Caltrans LOTB



LEGEND OF EARTH MATERIALS

GRAVEL	CLAYEY SILT
SAND	PEAT and/or ORGANIC MATTER
SILT	FILL MATERIAL
CLAY	UNCONSOLIDATED SEDIMENTARY ROCK
SANDY CLAY or CLAYEY SAND	SEDIMENTARY METAMORPHIC ROCK
SANDY SILT or SILTY SAND	CLAYEY SILT or SILTY CLAY

CONSISTENCY CLASSIFICATION FOR SOILS

Penetration (Blows/ft)	Cohesive	
	Granular	Very loose to Very dense
0-4	Very loose	Very soft
5-9	Loose	Soft
10-19	Slightly compact	Stiff
20-29	Medium dense	Very stiff
30-34	Dense	Very hard
35-69		
>70		

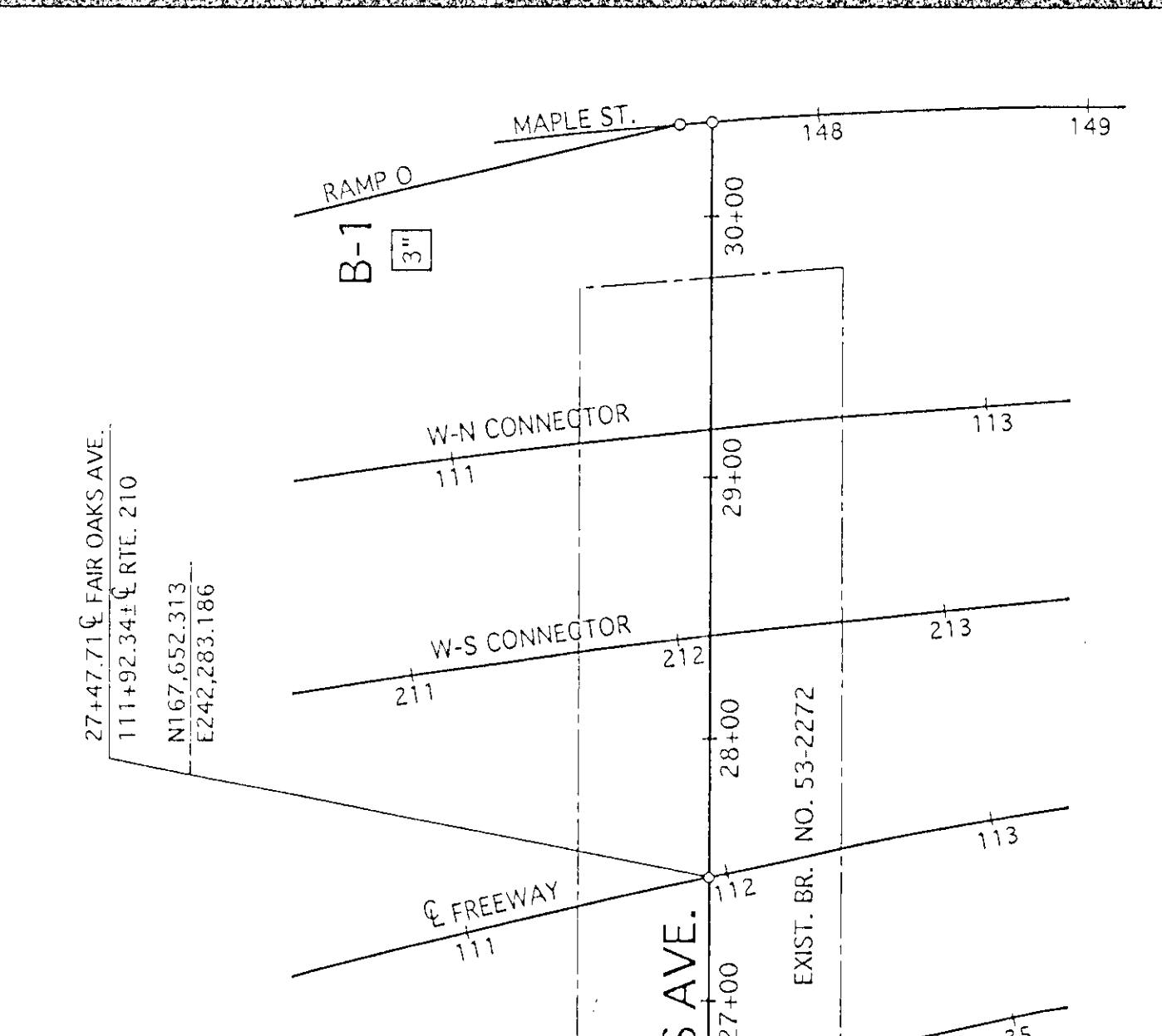
NOTE: Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.

DIVISION OF NEW TECHNOLOGY, MATERIALS AND RESEARCH
 OFFICE OF ENGINEERING GEOLOGY
 FIELD INVESTIGATION BY: F. GERAMI / J. PRATT
 DEPARTMENT OF TRANSPORTATION
 STATE OF CALIFORNIA
 STRUCTURE DESIGN 14
 BRIDGE NO. 53-2272
 POST MILE R25.29

Station	Soil Description	Rotary Sample Boring (WET)	Remarks
888.0	Compact, olive brown and olive gray, SILTY fine to medium SAND with minor GRAVEL and occasional COBBLES; slightly moist.	B-1 26	
870	Dense to very dense, light brown, SILTY medium SAND with scattered GRAVEL and COBBLES; slightly moist.	B-1 28	
860	Dense, brown, SILTY fine to medium SAND with minor GRAVEL; slightly moist.	B-1 33	
850	Very dense, light brown, medium to coarse SAND with scattered GRAVEL and less than 10% fines; slightly moist.	B-1 34	
840	Very dense, brown, SILTY to CLAYEY fine SAND; moist.	B-1 35	
830	Very dense, light brown, slightly SILTY coarse SAND with scattered GRAVEL.	B-1 36	
820	Dense, brown SILT; moist.	B-1 37	
810	Very dense, light brown, slightly SILTY coarse SAND with scattered GRAVEL.	B-1 38	
800	Very dense, light brown, slightly SILTY coarse SAND with scattered GRAVEL.	B-1 39	
790	Dense, brown SILT; moist.	B-1 40	
780	Very dense, light brown, slightly SILTY coarse SAND with scattered GRAVEL.	B-1 41	
770	Very dense, light brown, slightly SILTY coarse SAND with scattered GRAVEL.	B-1 42	
760	Very dense, light brown, coarse SAND with scattered GRAVEL and occasional COBBLES; a 0.5' SILTY fine SAND bed encountered at 130.0' depth; moist.	B-1 43	
750	Very dense, light brown and gray, SANDY GRAVEL with scattered COBBLES.	B-1 44	
740	Very dense, light brown, coarse SAND with scattered GRAVEL and occasional COBBLES.	B-1 45	
730	Very dense, light brown, coarse SAND with scattered GRAVEL and occasional COBBLES.	B-1 46	
720	Very dense, light brown, coarse SAND with scattered GRAVEL and occasional COBBLES.	B-1 47	
710	Very dense, light brown, coarse SAND with scattered GRAVEL and occasional COBBLES.	B-1 48	
700	Very dense, light brown, coarse SAND with scattered GRAVEL and occasional COBBLES.	B-1 49	
690	Very dense, light brown, coarse SAND with scattered GRAVEL and occasional COBBLES.	B-1 50	
680	Very dense, light brown, coarse SAND with scattered GRAVEL and occasional COBBLES.	B-1 51	
670	Very dense, light brown, coarse SAND with scattered GRAVEL and occasional COBBLES.	B-1 52	
660	Very dense, light brown, coarse SAND with scattered GRAVEL and occasional COBBLES.	B-1 53	
650	Very dense, light brown, coarse SAND with scattered GRAVEL and occasional COBBLES.	B-1 54	
640	Very dense, light brown, coarse SAND with scattered GRAVEL and occasional COBBLES.	B-1 55	
630	Very dense, light brown, coarse SAND with scattered GRAVEL and occasional COBBLES.	B-1 56	

**EARTHQUAKE RETROFIT PROJECT SR-156
 FAIR OAKS AVENUE OVERCROSSING
 LOG OF TEST BORINGS 1 OF 2**

DRAWN BY: Irma Gamara 2/95
 CHECKED BY: _____
 ORIGINAL SCALE IN INCHES FOR REDUCED PLANS: 0 1 2 3
 CU 07262
 EA 170901
 REVISION DATES (PRELIMINARY STAGE ONLY): 3-30-95 7 8



PLAN
 1" = 60'
BENCH MARK
 TBM Elev. 881.16 ±
 FD. PAVING NOTCH AT NORTH END OF BRIDGE ON STA. 29+76.72± CENTERLINE FAIR OAKS AVENUE ACCORDING TO GENERAL PLAN (RECEIVED 12-8-94).

NOTES:
 1. REC - % ROCK RECOVERY
 2. ROD - % ROCK QUALITY DESIGNATION
 3. NO GROUND WATER ENCOUNTERED DURING FIELD INVESTIGATION.

DIST. COUNTY ROUTE POST MILES TOTAL PROJECT SHEET NO. TOTAL SHEETS
 07 LA 34,210 710 Var 141 142

R.C. Wilhelms
 CERTIFIED ENGINEERING GEOLOGIST
 No. 5660
 Exp. 5-31-99
 REGISTERED GEOLOGIST
 STATE OF CALIFORNIA

11-11-96
 PLANS APPROVAL DATE

**NO AS BUILT CHANGES
 AS BUILT**
 CORRECTIONS BY *M. JASMINSKI*
 CONTRACT NO. 07-170904
 DATE 01/10/98

PROFILE
 Hor. 1" = 20'
 Ver. 1" = 10'

CALTRANS BORING RECORDS

Table 1
Selected Well Data For The Study Area And Vicinity

Well No.	Year Drilled	Elev. - Top of Well	Elev. - Bottom of Well	Total Depth	Elev. - Base of Alluvium	Thickness of Alluvium	Material at Bottom of Well
C-23a	1907	764	665	99	756	08	Granitic Rock
C-23d	1931	570	435	135	462	108	Granitic Rock
C-23f	1938	643	177	466	446	197	Granitic Rock
C-24a	1931	758	563	195	628	130	Tertiary Rock
C-25a	1916	756	577	180	625	131	Tertiary Rock
C-25b	1927	757	582	175	605	152	Granitic Rock
C-25d	1899	802	-508	1310	502?	300?	Granitic Rock
C-26	1901	756	588	168	588	168	Granitic Rock?
C-27	1911	753	494	259	550	203	Granitic Rock?
C-28	1904	750	456	254	505	245	Granitic Rock?
C-29	1924	754	506	248	508	246	Granite
C-30	1904	756	500	256	500	256	Granitic Rock?
C-30a	1898	746	636	110	---	---	Alluvium?
C-30b	1898	747	649	98	---	---	Alluvium?
C-30e	1910	753	468	285	478	275	Granitic Rock?
C-30L	1891	755	625	130	---	---	Alluvium?
C-30m	1903	756	226	530	498	258	Granitic Rock?
C-30n	1926	758	512	246	525	233	"Decomposed Granite Dyke"
C-31a	1925	772	582	190	589	183	Granite

Table 1. Selected Well Data For The Study Area And Vicinity (contd)

Well No.	Year Drilled	Elev. - Top of Well	Elev. - Bottom of Well	Total Depth	Elev. - Base of Alluvium	Thickness of Alluvium	Material at Bottom of Well
C-31c	1928	763	584	179	560	170	"Granite bed-rock"
C-31e	1931	758	548	210	548	210	Granitic Rock?
C-31f	1931	794	442	352	464	330	Granitic Rock?
C-34b	1908	732	572	160	612?	120?	Tertiary Rock?
C-56	1920	715	478	237	533?	182?	Tertiary Rock?
C-56a	1906	715	505	210	533?	182?	Tertiary Rock?
C-56b	1912	722	521	201	531?	191?	Tertiary Rock?
C-56c	1914	710	505	205	519	191?	Tertiary Rock?
C-56f	1905	746	491	255	492	254	Tertiary Rock?
C-57a	1931	701	- 33	734	391	343?	Decomposed Granite?
C-58	1922	714	229	485	231	483	Tertiary Rock?
C-63	1904	666	306	360	318	348	Tertiary Rock?
C-64b	1911	633	423	210	448	185	"Decomposed Granite"
C-65	1922	602	174	428	174	383	Tertiary Rock?
C-106	1907	754	447	307	454	300	Tertiary Rock?
C-108a	1924	690	490	200	516	174	Tertiary Rock?
C-111	1934	776	161	615	---	---	Alluvium
C-119c	1900?	614	153	461	---	---	Alluvium
C-131	1921	752	452	300	460?	292?	Tertiary Rock?

Table 1. Selected Well Data For The Study Area And Vicinity (contd)

Well No.	Year Drilled	Elev. - Top of Well	Elev. - Bottom of Well	Total Depth	Elev. - Base of Alluvium	Thickness of Alluvium	Material at Bottom of Well
C-202	1923	561	56	505	---	---	Alluvium
C-202a	1921	620	116	504	358	262	"Blue Granite"
C-202c	1921	681	459	222	---	---	Tertiary Rock
C-206	1923	534	- 27	561	---	---	Alluvium

Table 2. Exploratory Test Hole Data, 1973 Seismic Study.

Boring No.	Elev. - Top of Boring	Elev. - Bottom of Boring	Total Depth	Elev. - Base of Alluvium	Thickness of Alluvium	Remarks
ES-1	722	371	351	605	117	Below 137 ft, gray-black claystone with white sandstone fragments: interpreted as fault gouge.
ES-2	743	439	304	626	117	Drilled 187 ft of highly deformed siltstone, sandstone and claystone: interpreted as belonging to the Topanga Formation.
ES-3	698	394	304	457	241	Encountered buff colored decomposed granitics which gradually became bluish-gray with depth: interpreted as basement complex rocks.

DRILL LOG

LA-07 So. Pasadena Monterey Road to Columbia
 102 ft. E. of Meridian
 Location 360 ft. N. Rio 11 Ft., Right, Left _____ Ground Elev. 725 Depth 351
3' W. of R-4 (10-1-71)

Logged by Al Parmer Type of Drill Core _____ Groundwater Depth 30' Date Completed 6/26/73
perched (?)

DEPTH	LOG	DESCRIPTION AND REMARKS
0		Rock bit w/ air to 25'
0'-4'		Alluvium - granitic outwash soil, sandy w/ pebbles.
4'-5'		Gravel - granular to pea gravel, loose, sandy, angular to rounded, few chips of granodiorite pebbles.
5'-17'		Sand w/ few gravelly lenses. Sand is ora-brn., med. gr. w/ silty matrix 20-30% and 10% granules and pebbles. Few gray-green siltstone lenses. Qtz. feldspar predom., ferro-mag. 5%, brn mica 1/2%. Below 12' sand is v. coarse, pebbly (30%), poorly sorted.
17-17.3		Gravel, pebble size, sandy, loose.
17.3-25.5		Sand - med. to v. coarse gr. and pebbly. Silty matrix. Below 20', less pebbles in coarse gr. sand. Grading to med. gr. below 22' w/ random pebbles.
25.5-27.5		Sand - fine gr., silty, soft, med. brn., no visible bedding.
27.5-102		Sand - med. gr., w/ random pebbles & cobbles (cored 6" pebble) blocking recovery. Poorly sorted, silty to coarse gr. w/ lenses of silty, v.f. SS to pebble lenses in 35'-40' run (20% rec.) Color is Lt. grayish brn. except for v.f. SS @ 50-68' and 74-75'. Larger cuttings incl. qtz., gray and pink feldspar, meta. rocks.
50'-55'		Recovered 10" between 50'-55' of slightly plastic, clayey and silty v.f. to fine gr. SS. Some granule size qtz., etc.
60'-63'		Same matl. w/ sand (60'-63') ranging from silty, v.f. gr. to coarse gr. Possible bedding nearly horiz. Only 1 foot of recovery.
		Down-hole T.V. camera showed occasional pebbles. No visible bedding seen before water became too cloudy.

7-LA-07 So. Pasadena Monterey Road to Columbia

102 ft. E. of Meridian

ion 360 ft. W. Rte. 11

3' W. of R-4 (10-1-71)

Ft., Right, Left

Ground Elev. 725

Depth

351

Logged by Al Parmer

Type of Drill Core

Groundwater Depth 30'

Date Completed 6/28/73

perched (?)

DEPTH	LOG	DESCRIPTION AND REMARKS
70	.	Core recovery inc. w/change to Christenson NX
80	.	Very coarse gr. silty and pebbly sandstone. Very soft pebbles hard to very soft, wea. granitic and metamorphic detritus. Orthoclase of 10%.
90	.	Horiz. thin layer of black grains near 90'.
100	.	102-104± Possible gravel lense-mod. consol. as core barrel cut five pebbles in place before blocking. No incr. in bit noise. Cobble size prob. occur in lense. Mod. water loss.
110	.	104±-117.4 Lost most of sample through possible fault material. 104-117.4 SS and distributed silty matl., v. coarse gr., pebbly but w/incr yellow-brn color from both yellow silt and yellow rock detritus. Orthoclase from pebble cuttings.
120	.	117.4-127.0 Poss. fault zone. Good recovery of "squeezed" matl. plastic claystone & siltstone, mottled med. blue-gray to olive-brn. & orange-brn w/ v.f. to med. gr. SS interbeds. Slickensided joints, low to high angle-65°. 6" bed (?) of hard. med. gr. SS, olive-brn 119.4-120.0', 120.0-120.4 highly slickensided claystone. Micaceous SS (120'). Granite (?) pebble 121.7'.
130	.	122.5-124.8 Hard SS fragments (2" dia), not bedded, in irreg. sh. 60° dip at 126.0 appears to be bedded. Core is predom siltstone. 127.0-127.5 Zone of granite pebbles and granular size sandstone. White pebbles in olive brn. matrix.
140	.	128.0-131.8 Tight fault @ 128.0 W/50° dip - truncates bedding 70°-75° dip. Lt. gray SS blue-gray & orange-brn siltstone below fault. 131.8-136.6 Fault zone. Frags. of SS, granitic pebbles in slickensided claystone. Yellow-brown to olive-brown plastic. 136.6- Black claystone W/slicks at 60° @ 137.0. Broken SS frags. (Lt. gray) to 142'. SS is calc., very hard.

DRILL LOG

R-4-07 So. Pasadena Monterey Road to Columbia
 102 ft. E. of Meridian

Location 360 ft. N. Rte. 11 Ft., Right, Left _____ Ground Elev. _____ Depth 351
.3' W. of R-4 (10-1-71)

Logged by Al Parmer Type of Drill Core Groundwater Depth 30' Date Completed 6/26/73
perched (?)

DEPTH	LOG	DESCRIPTION AND REMARKS
140		Same matl. w/bedding visible below 142' - dips 50°-55°
150		Core is predom. dark grayish black claystone and/or siltstone, slightly plastic, possible carbonaceous, w/Lt. to med. gray, hard, limey, micaceous fine gr. SS. Bed of hard SS 1-1/2" thick @ 145'. SS @ 145.2 dips 45° and cut on skew by shear dipping 45°. Slickensided joint 55° at 146'. 147' - Sh/ss dip 57° SS(dry) is dark gray to grayish black w/ lt. gray blebs, silty, v.f. gr., mica., very hard, limey.
160		148' - fault cuts interbedded ss& sh. dips 70°. SS frags in sh 148-148.5. 149.5 - SS bed dips 82°. Fault on skew dips 25°. 150 - dips up to 85°.
		151 - 152 Good exposure in core of sh. w/ lt. gray SS, dip 78°.
		152.5 Apparent fault - broken SS.
		152.5-153.0 SS - Lt. gray, hard, limey, 60' dips, shows 2 healed offsets.
		153-154 Broken zone w/high angle joints.
		154-155 High angle dips appear to be warped. 70° dip @ 155'.
		156-157 Folded bedding. Direction of high angle dip reverses in core
170		158-159.3 Bedding overturns - 70° dip @ 158 to (reversed) 70°, 85°, then 65° @ 159.3 Predom. dark grayish black siltstone w/ med. gray limey SS laminations 1/16 to 1/4" thick to 160.6. Slicks in bl. sh - 80°-85°.
		160.6-164± Sandstone, med. gray w/cogified (?) coatings. Limey joint 75°. Appar. X-bedding. Fine to med. gr. Some horiz. slicks. on shaley, high angle shear.
		164±-172.2 Interbedded carb. sh. & siltstone w/ some thin SS beds and zones of crushed SS. Bedding nearly vertical, warped. Sharp warp at 171 ft. Drag fold?
180		172.2-178.0 SS -Lt. to med. gray, med. to coarse gr., limey, w/ lenticular zones of squeezed, irregular shale partings. 65° dip.
		178.0-192.7 Warped sh&ss. Shale is slickensided, irreg. SS is partly broken and displaced. Moist, plastic gouge (?) black clay (2") @ 183' SS/SH contact nearly vert 183.2 - 184.1. SS fragments 184.1-184.4, 185.3-185.4.
190		Sheared bedding dips 30°, shear 72° @ 186.6'. Low dips 10-30°, 185-186' 188.3-188.8' 60° dip; @ 189.0-189.5, 55° dip w/ab 90° change in bedding strike. 191.0-192.7 Core w/409 SS is chaotic jumble of platy SS frags. in shale.
		192.7-195.5 Shale (claystone), as above except bedding vert., irreg. SS. partings.
		195.5-198.0 Shale, as above, bedding obscured.
		198.0-198.7 Shale, dark grayish black W/SS partings, 65° dips.
200		198.7-206.7 Core distinct by high degree of broken, rehealed beds of shale claystone, siltstone and SS. Dip 60° @ 202.5' on broken bedding. Betw. 203.5 and 205.0, dip reverses almost 180°. 65° dip @ 205'. Betw. 205.5 and 206.7, dips horiz. to 10° in shattered, displaced beds.
210		206.7-218.0 Shale W/SS fragments. Irregular bedding W/dips steep where intact.

DRILL LOG

LA-07 So. Pasadena Monterey Road to Columbia

102 ft. E. $\frac{1}{2}$ Meridian

Location: 360 ft. N. Rte. 11 Ft., Right, Left _____ Ground Elev. 725 Depth 351
3' W. of R-4 (10-1-71)

Logged by Al Parmer Type of Drill Core Groundwater Depth 30' Date Completed 6/28/73
perched (?)

DEPTH	LOG	DESCRIPTION AND REMARKS
210		Same matl. as above. Poss. dip 70° @ 215.0' Irreg. dips up to 90° 217-218'
220		223.0-223.9 Core shows 30° & 35° dips but in opp. dir. Drag folding or faulting (?) 225.0-227 Poss. vert. dips in part.
230		218.0-278 Core dries toohard, tough claystone. Scattered SS. frags. No visible reliable bedding. Claystone is dark, to med. gray, broken, out of place. Pyrite in SS & claystone. Dip 70° (?) @ 235' Dip 60-65° (?) @ 247 (Core is primarily a rehealed section of fault gouge-breccia w/bedding indistinct or destroyed.)
240		Pyrite in SS @ 243.8
250		251.5-256± Core is so near black, appears to contain lignite or oil-stain. No detectable smell. Pyrite
		256-258 Wapred zones 60° - near vertical.
260		260-261.5 Crushed SS & Sh. 261 Good sample of SS/Sh breccia recemented, with later cycles of crushing and rehealing. 263-264 Apparent vertical dip in claystone 265.5-267 Apparent vertical dip in claystone
270		Photographed boxes 25 thru 30 B & W & color. 273.5- Slicks in claystone. 276 Poss. 65° dip.
280		278-351 Core consists largely of SS breccia in steeply dipping claystone. 278 - Iridescent reflections in secondary chalcopryrite (?) in SS. Core sections are firm and strong when dry. 278.5-279.5 Vertical dip.

DRILL LOG

27 So. Pasadena Monterey Road to Columbia
 107 ft. E. of Meridian
 Location: 460 ft. N. Rte. 11 Ft., Right, Left Ground Elev. 725 Depth 351
1/2 W. of R-4 (10-1-71)

Logged by Al Parmer Type of Drill Core Groundwater Depth 30' Date Completed 6/28/73
perched (?)

DEPTH	LOG	DESCRIPTION AND REMARKS
280		Core continues as rehealed fault zone w/at least 2 cycles of squeezing, crushing and rehealing. Approx. 20-30% of matl. is SS fragments that range from v.f. gr. to med. and coarse gr., calc. Some SS has bl. shaley partings, some w/o partings. calcite vein in frag. @ 288.4'.
290		Core lacks any sec. veins - as late stage fracture fillings. 289.3 - Joint in SS-60' - has diagonal (strike-slip) lineations. 297 - Coring cut a SS frag 7" long.
300		301 - SS frag. - crushed and recemented - 5" long. Core is dark, brownish to grayish black w/up to to 40% SS fragments. 302 - Possible dip 70°. 303 - 311.0 - 30%-40% crushed SS (up to 6" pieces). Few open cracks.
310		311.4 Open fractures in SS piece. No clay or other filling. 315.8 SS fragments, fine gr. abut. med. gr. few calcite frags.
320		322.5-324.0 Claystone is softer, poss. moare recent gouge. Poss. 78-90° dip @ 323.
330		332-335 Vertically sheared SS.
340		Core betw. 346-351 - Rehealed fractured SS & SH beds w/numerous offsets.
350		351.0 - Bottom of hole.

DRILL LOG

7-LA-07 So. Pasadena. 117' W. of \angle Fremont, 210' N. of \angle Buena Vista

Location _____ Ft., Right, Left _____ Ground Elev. 745 Depth 304

Logged by A. L. Parmer Type of Drill Core Groundwater Depth _____ Date Completed 7/18/73

DEPTH	LOG	DESCRIPTION AND REMARKS
		Hole was drilled w/ rock bit to 120' except for core runs at 50-55', 75-80, 100-105'. No recovery except for cobble in 100-105' run. Material to 117' prob. pebbly sand.
100		
110		
120		120-125 Tertiary sed. rock, siltstone, SS & claystone, irreg. bedded. med. firm weathered, mottled blue-gray to yell-brn, olive-brn. w/ orange streaks. poss. dip @ 121' at 65°. Core breaks on cross-joints, 50° to 65° dip w/ slick surfaces. Soft wea. SS & plastic clay 121-125'. SS is ora-brn to lt. gray-brn, fine to med. gr., non calc. Poss. lignite (not bedded) @ 125'.
130		125-129.8 Same matl., less wea. Bedding dip & strike change within 1/2 foot. Dip @ 125.3 is 47°, @ 125.9 65° w/ est. 70°-80° change in strike bearing. 126.5'-127' strike change ab. 80° from olive clay st. to silty SS bed w/ poss. lignite.
		129.8-130.0 Warped, broken beds - vert. to 40° SS around blue gray claystone
		130.0-131.8 SS - soft, massive, 25° dip (?) speckled gray & med. brn., silty to coarse gr. w/qtz., some granule-size.
140		131.8-144± Laminated zone of thin interbeds of clayst. siltstone & SS. Distinctive colors - Lt. gray SS, orange SS, olive to dark brn., some carbonaceous mtl. low dips (12°). Bedding warped, squeezed (?) in zones @ 132-133'.
		144.2- Probable fault w/ soft SS above, steep dips below
		142.2- Same laminated matl. as above but dips 65°, healed offset bedding. Slick break 145-143.7 @ 70°, matl. is predom. micaceous siltstone (145-
150		dips ab. 80° @ 149. Broken, offset beds dip 70° @ 152-153
		155-158.2 SS - as above, massive beds. Mod. weak; silty, fine to med. gr., speckled lt. gray to med. brn., olive siltstone & orange partings - 80° dips, Bedding is broken, rehealed.
		157.5-158.2 - bedding plane fault?
160		158.2-160.0± Laminated siltstone and SS as above. Rehealed fault 50° dip @ 159.8' Dip 90° 159.8-160.0'.
		160.0 Prob. a major fault: Rehealed breccia (160.0-160.6) on bedding 65° dip.
		160.0-163.0 Sudden change to unweathered matl. Interbedded dark grayish black siltstone shiny w/ mica(?), carbonaceous, and dark gr. SS, fine gr. Also claystone.

DRILL LOG

7-LA-07 So. Pasadena. 117' W. of \angle Fremont, 210' N. of \angle Buena Vista

Location _____ Ft., Right, Left _____ Ground Elev. 745 Depth 304

Logged by _____ Type of Drill Core Groundwater Depth _____ Date Completed 7/18/73

DEPTH	DESCRIPTION AND REMARKS
160	SS is Lt. gray partings as in ES-1 w/ incr. calcareous cement (w/ ineq. freshness) many small fault offsets (avg. 1/4"). Some coaly fragments (?) 161' carbonaceous clayst. breaks on shiny surfaces 60° @ 162, 50° @ 163
163.0-164.8	SS - v. coarse gr., soft, speckled gray & black. Base is 30-40° contact.
164.8-185.0	Interbedded SS, siltstone & claystone. Fine gr. matl. is carbon., nearly black. First hard, limey. SS. 166.2-166.5'. Soft, v.c. SS (166.5-167.8'). Same as above SS @ 163-164.8. 60° dip at 169.5' & 172' core is not nearly as firm and competent as in ES-1 claystone. Core predominately micaceous siltstone (173-180') w/ lesser amounts of SS & claystone. Dark grayish-black. Dips - 57° @ 174.5', 45° @ 175.5, 30° @ 177', poss. 25° @ 178', 65° ? @ 178.5', 45° @ 179.5'.
180	Bedding is warped, offset by minor faults 180-180.3. Dips 30° to 65° 180-181, then steepen to 75°-80°. Core at 183.5' has tiny vert. to flat-fault offsets, 1/8" to 1/4", normal & reverse types. SS is slightly calc., soft.
185-194.5	SS - predom. w/ partings of bl. carbonaceous siltst. & clayst. Top SS 185-186' is v.c. gr., silty and w/ granules. Mod. gray w/ bl. gr., all SS sl. calc. Bedding steep, irreg. due to squeezing and small folds & faults. Dip 55° on faulted contact @ 187±. Dip @ 191' is 78-80°, SS is predom. silty, med. gr. & med. to dark gray.
194.5-219.8	Interbedded SS & sh., same char. as above. Dips 60-80°, warped, fault offsets. Many small (1/8"-1/4") chunks of lignite 201'-203'. Bedding shows stronger displacements and more breakage below 194'.
200	At 214.8-215.0 SS - hard, calc., med. gr. Lt. gray
210	Dips of 80° at 219.5' overlie fault w/ 30° dip
219.8-245	SS and sandy siltstone. Steep bedding cut by rehealed faults w/ fault dips about 45°. SS is silty, f.g., hard above 224.5', med. to dark gray. Grades into sandy siltstone. Bedding remnants nearly vertical. Core broke up (weak?) 224.5-227.0. Vertical, offset bedding (228-235) in thin beds alternating between lt. gr., v.f. SS; dark gray, silty, med. gr. SS; dark grayish & brownish black sandy siltstone; and claystone. Core varies from hard to soft.
230	

DRILL LOG

hole No. ES-2
 Page 2 of 2
 07204 - 0-4611

7-LA-07 So. Pasadena. 117' W. of ℄ Fremont, 210' N. of ℄ Buena Vista

Location _____ Ft., Right, Left _____ Ground Elev. 745 Depth 304

Logged by _____ Type of Drill Core Groundwater Depth _____ Date Completed 7/18/73

DEPTH	LOG	DESCRIPTION AND REMARKS
230		
240		241.0-241.3 Shattered claystone. All matl. is uniformly fresh appearing, no sec. alteration 242.5-244.0 60° dip truncates 30° dip which in turn is cut by 30° fault (?). Dips ab. 70° below fault. Prob. drag folding.
250		245.0-249.0 Darker than above siltstone & SS. Siltstone is sandy, nearly black. SS is med. to dark gray, fine to med. gr. Dips 60° to 90°. 249.0-250.4 Fault zone (?) Distorted dark claystone w/ (disoriented) SS beds. Major break. 250.4-274.2 Next core run has nearly vertical SS & Siltstone beds w/ only slight warping and breaking. Also claystone, carbon. frags. Core is dark grayish bl. w/ streaks of lt. to med. gray SS.
260		Slight twist in strike 259-259.8 w/ dip change 90° to 75°. Core is predom. SS (260-264) weak to mod. firm. At least 3 zones of bedding displacement. Irreg. dips. 264.8- small fault offset is horiz. 267.5- small fault offset is nearly horiz.
270		At 271.5- 60° dip in warped SS/ siltstone. Warped contacts to 274' w/ SS broken or squeezed.
280		274.2-276 SS, soft, dark gray, silty, fine to med. gr., speckled gray and black grains. Dip 60°. Bedding may be overturned due to eroded (?) structures.
290		276-295.1 Predom. siltstone, w/ lt. gray SS partings. Dips 80°± (277-278) Between 280-289, thin beds of siltstone & SS are squeezed w/ many minor fault offsets. Core is firm.
300		Below 289 dip is ab. 90° w/ small faults ab. 45° dips at 290.6' and 291.1'. Fault w/ 30° dip at 293'.
304		295.1-301.4 Bedding is less distinct w/ white blebs of SS & small, black blebs of carbonaceous matl. 296.3-298.3 Recemented SS fragments. Dip at 298.3 = 45°
		301.4-304.0 Steeply dipping, thin bedded matl. as above. Sandy siltstone (predom.) is dark, grayish black, SS is lt. to dark gray, silty fine to clean, med. gr.

DRILL LOG

Rte 7/11 Interchange, 175' N. of Magnolia, 200' W. of Fairview

Location 50 Ft., Left of Ground Elev. 700 Depth 304.0

Logged by Al Parmer Type of Drill Core _____ Groundwater Depth _____ Date Completed _____

DEPTH	LOG	DESCRIPTION AND REMARKS
0-240±		Pebbly sand. No obvious change in character. Same clay seams. Material is granitic outwash of pebbles, sand & silt. Rock bit cuttings and washed. Orthoclase fragments are prominent in cuttings.
240	ROCK BIT TO 240'	240-244 Cutting change - weathered granodiorite, primarily reduced to clay minerals. 244-259 Granodiorite - coarse gr. core had bluish shade and probably is same as "blue rock" noted in water well C23f, located 2 blocks south at depth of 254 feet. In lab, core is grayish brown. About 60% Lt. gray, 30% yellow and green, 10% greenish black. Core is soft and weak. Uniform grain size. Very little quartz or mica.
260	X	256.1-257± Hard, fresh granodiorite. Light gray w/est. 30% ferro-magnesium minerals. Probably blocked off in run. More weathered to ...
	X	259-303.4 Granodiorite - dark bluish gray, coarse grained. Soft, highly weathered. Slow coring time (up to 7 min/ft) although granodiorite continues to be mushy. Rock bit to 299'. Core is very clayey granodiorite (299-304).
280	X	
	X	
	X	
300	X	303.4-304.0 Quarze vein w/mica @ 303.4'-303.5' purplish gray zone w/450 contact w/Lt. gray clayey rock. Possible fault gouge.
304	X	B.H.



Earth Mechanics, Inc.

Geotechnical and Earthquake Engineering

TECHNICAL DATA REPORT FOR THE PROPOSED 710 FREEWAY TUNNELS FEASIBILITY

TASK 3.1 - SOIL BORING PROGRAM

Prepared For:

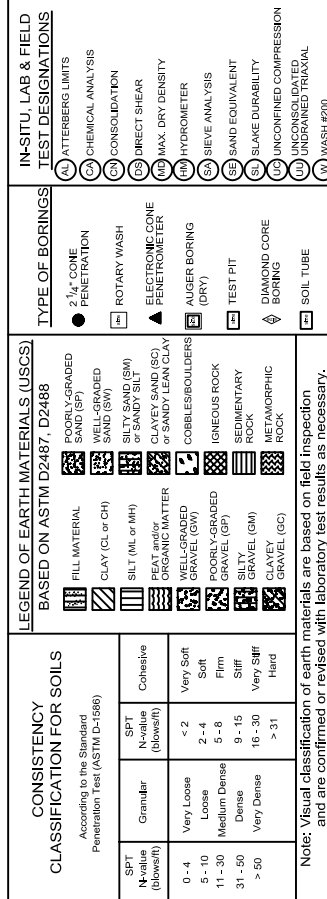
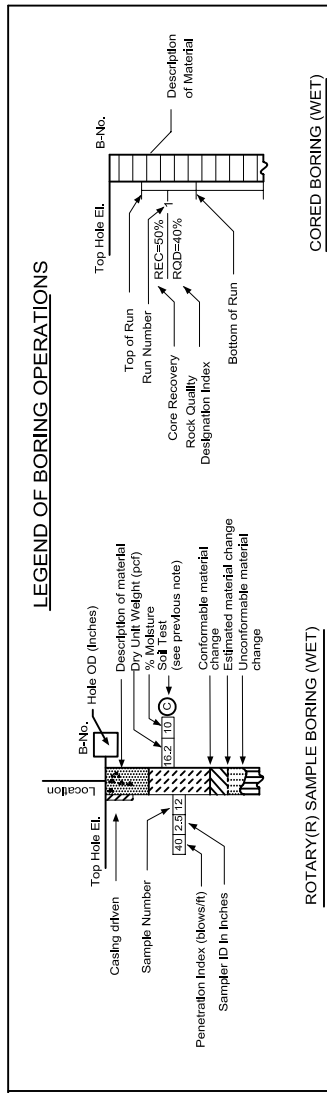
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Prepared By:

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March 20, 2006

EMI Project No. 05-109



WEATHERING DESCRIPTORS

Modified from United States Bureau of Reclamation, Engineering Geology Field Manual.

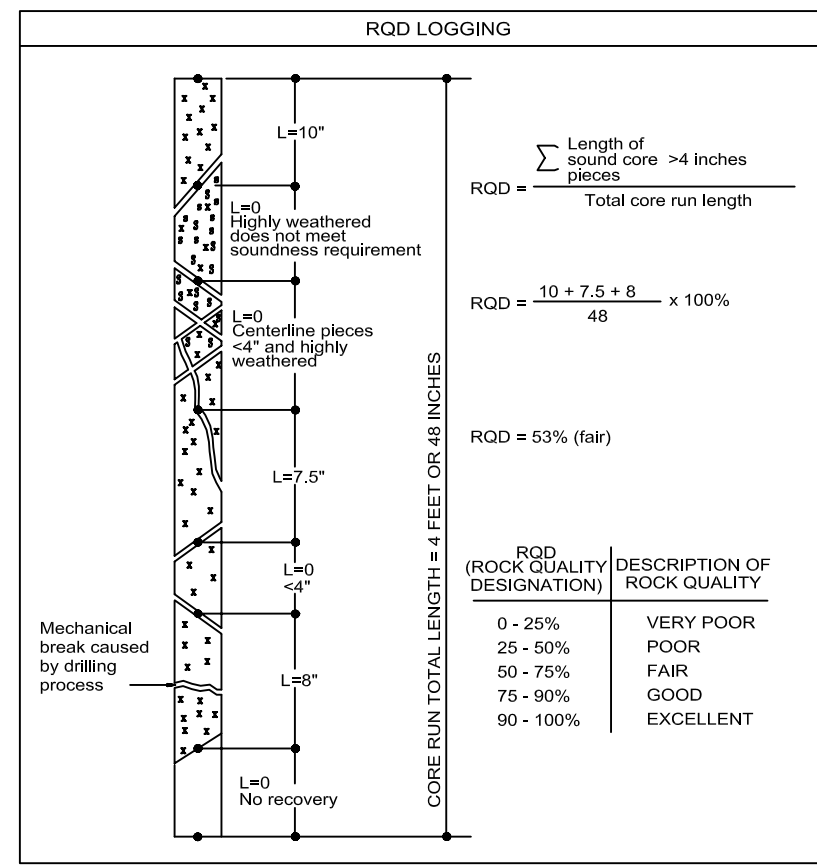
Descriptors	Diagnostic features				General characteristics (strength, excavation, etc.) §	
	Chemical weathering-Discoloration and/or oxidation		Mechanical weathering-Grain boundary conditions (disaggregation) primarily for granitics and some coarse-grained sediments	Texture and solutioning		
Descriptive term	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. Almost always rock excavation except for naturally weak or weakly cemented rocks such as siltstones or shales.
Slightly weathered to fresh ●						
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. With few exceptions, such as siltstones or shales, classified as rock excavation.
Moderately to slightly weathered ○						
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 rings when crystalline rocks are struck. Body of rock is slightly weakened. Depending on fracturing, usually is rock excavation except in naturally weak rocks such as siltstones or shales.
Intensely to moderately weathered ◐						
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 semi-arid 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. Usually common excavation.
Very intensely weathered						
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. Always common excavation. Resistant minerals such as quartz may be present as "stringers" or "dikes."

Note: This chart and its horizontal categories are more readily applied to rocks with feldspars and mafic minerals. Weathering in various sedimentary rocks, particularly limestones and poorly indurated sediments, will not always fit the categories established. This chart and weathering categories may have to be modified for particular site conditions or alteration such as hydrothermal effects; however, the basic framework and similar descriptors are to be used.

● Combination descriptors are permissible where equal distribution of both weathering characteristics are present over significant intervals or where characteristics present are "in between" the diagnostic feature. However, dual descriptors should not be used where significant, identifiable zones can be delineated. When given as a range, only two adjacent terms may be combined. "Decomposed to slightly weathered," or "moderately weathered to fresh" are not acceptable.

† Does not include directional weathering along shears or faults and their associated features. For example, a shear zone that carried weathering to great depths into a fresh rock mass would not require the rock mass to be classified as weathered.

§ These are generalizations and should not be used as diagnostic features for weathering or excavation classification. These characteristics vary to a large extent based on naturally weak materials or cementation and type of excavation.



FRACTURE DENSITY

Modified from United States Bureau of Reclamation, Engineering Geology Field Manual.

FRACTURE DENSITY - Based on the spacing of all natural fractures in an exposure or core recovery lengths in boreholes; excludes mechanical breaks, shears, and shear zones; however, shear-distributed zones (fracturing outside the shear) are included. Descriptors for fracture density apply to all rock exposures such as tunnel walls, dozer trenches, outcrops, or foundation cut slopes and inverts, as well as boreholes. Descriptive criteria presented below are based on borehole cores where lengths are measured along the core axis, for other exposures the criteria is distance measured between fractures (size of blocks).

UNFRACTURED: No fractures.
 VERY SLIGHTLY FRACTURED: Core recovered mostly in lengths greater than 3 ft.
 SLIGHTLY TO VERY SLIGHTLY FRACTURED *
 SLIGHTLY FRACTURED: Core recovered mostly in lengths from 1 to 3 ft. with few scattered lengths less than 1 ft or greater than 3 ft.
 MODERATELY TO SLIGHTLY FRACTURED *
 MODERATELY FRACTURED: Core recovered mostly in 0.3 to 1.0 ft lengths with most lengths about 0.6 ft.
 INTENSELY TO MODERATELY FRACTURED *
 INTENSELY FRACTURED: Lengths average from 0.1 to 0.3 ft with scattered fragmented intervals. Core recovered mostly in lengths less than 0.3 ft.
 VERY INTENSELY TO INTENSELY FRACTURED *
 VERY INTENSELY FRACTURED: Core recovered mostly as chips and fragments with a few scattered short core lengths.

* Combinations of fracture densities (e.g. Very intensely to intensely fractured, or Moderately to slightly fractured) are used where equal distribution of both fracture density characteristics are present over a significant interval or exposure, or where characteristics are "in between" the descriptor definitions.

ROCK HARDNESS/STRENGTH DESCRIPTORS

Descriptor	Criteria
Extremely hard	Core, fragment, or exposure cannot be scratched with knife or sharp pick; can only be chipped with repeated heavy hammer blows.
Very hard	Cannot be scratched with knife on sharp pick. Core on fragment breaks with repeated heavy hammer blows.
Hard	Can be scratched with knife or sharp pick with difficulty (heavy pressure). Heavy hammer blow required to break specimen.
Moderately hard	Can be scratched with knife or sharp pick with light or moderate pressure. Core or fragment breaks with moderate hammer blow.
Moderately soft	Can be grooved 1/16 inch deep by knife or sharp pick with moderate or heavy pressure. Core or fragment breaks with light hammer blow or heavy manual pressure.
Soft	Can be grooved or gouged easily by knife or sharp pick with light pressure, can be scratched with fingernail. Breaks with light to moderate manual pressure.
Very soft	Can be readily indented, grooved or gouged with fingernail, or carved with a knife. Breaks with light manual pressure.

Any bedrock unit softer than "very soft" is to be described using ASTM D-2488 consistency descriptors.

Note: Although "sharp pick" is included in these definitions, descriptions of ability to be scratched, grooved or gouged by a knife is the preferred criteria.

Modified from United States Bureau of Reclamation, Engineering Geology Field Manual.

BEDDING, FOLIATION, OR FLOW TEXTURE DESCRIPTORS

Descriptors	Thickness / Spacing
Massive	Greater than 10 ft
Very thickly (bedded, foliated, or banded)	3 to 10 ft
Thickly	1 to 3 ft
Moderately	0.3 to 1 ft
Thinly	0.1 to 0.3 ft
Very thinly	0.03 (3/8 in) to 0.1 ft
Laminated (intensely foliated or banded)	Less than 0.03 ft (3/8 in)

Modified from United States Bureau of Reclamation, Engineering Geology Field Manual.

- Notes:**
- All elevations refer to datum shown on USGS quadrangle maps for Pasadena and Los Angeles.
 - Discontinuities inclinations are measured with respect to the horizontal.
 - Color designation and numbers are from the Munsell color charts for soils.
 - Laboratory test data are provided in Appendix C of Technical Memorandum for Route 710 Tunnel Feasibility in Cities of Pasadena, South Pasadena, and Alhambra (Earth Mechanics, Inc 2006).
 - Core photos are provided in Appendix B of Technical Memorandum for Route 710 Tunnel Feasibility in Cities of Pasadena, South Pasadena, and Alhambra (Earth Mechanics, Inc 2006).

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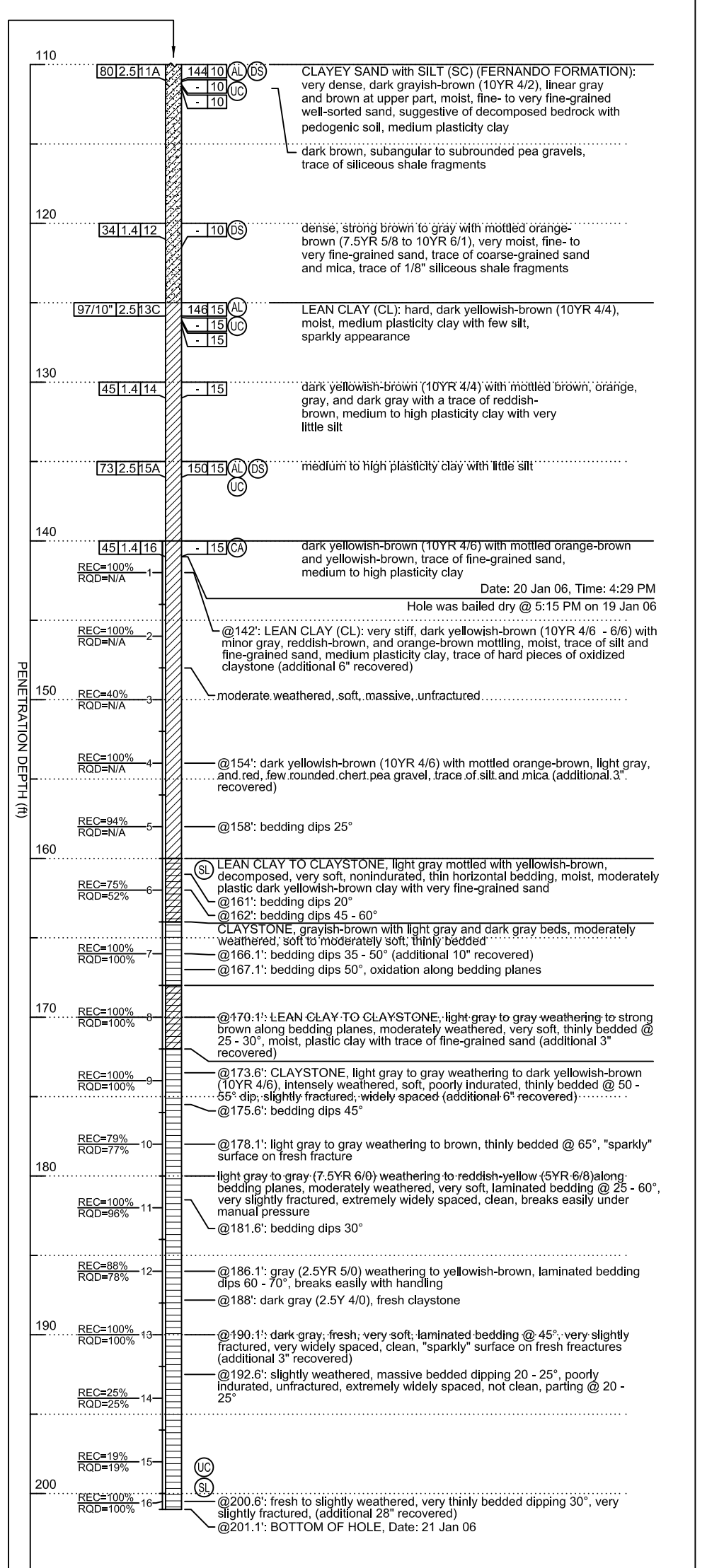
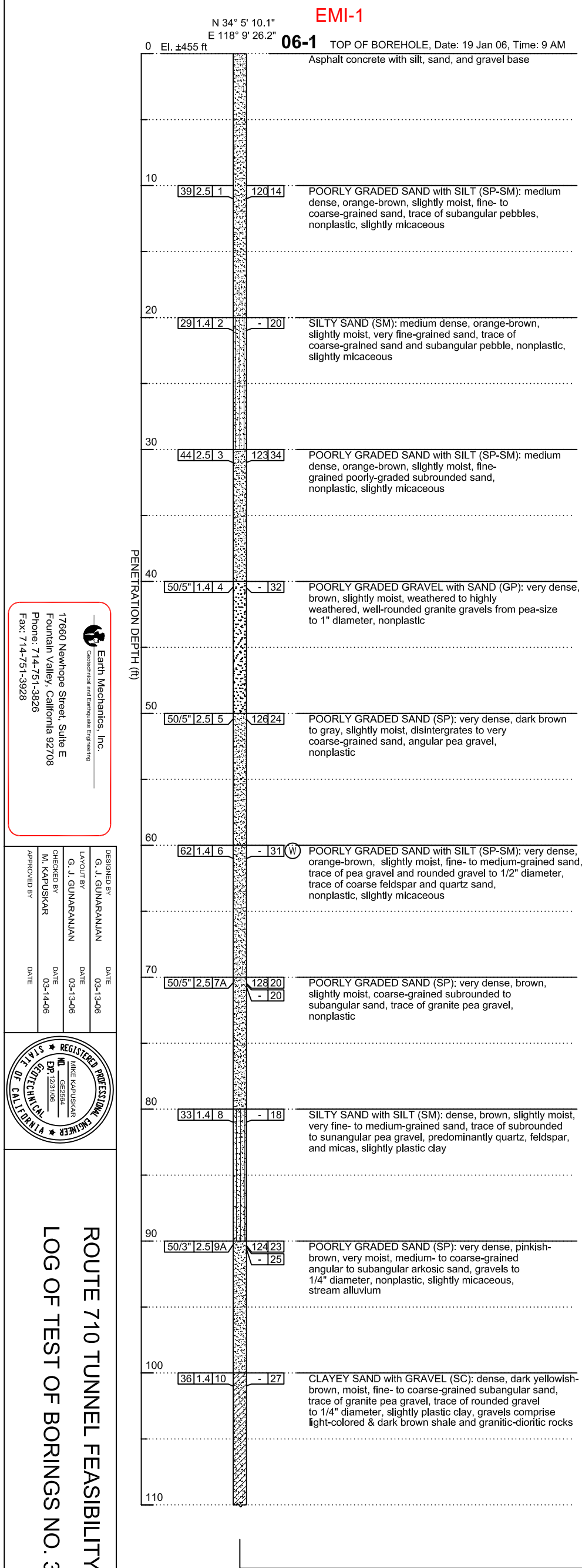
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DESIGNED BY G. J. GUNARANJAN	DATE 03-13-06
LAYOUT BY G. J. GUNARANJAN	DATE 03-13-06
CHECKED BY M. KAPUSKAR	DATE 03-14-06
APPROVED BY	DATE



ROUTE 710 TUNNEL FEASIBILITY LOG OF TEST OF BORINGS NO. 2

CONSISTENCY CLASSIFICATION FOR SOILS				LEGEND OF EARTH MATERIALS (USCS)				TYPE OF BORINGS		IN-SITU, LAB & FIELD TEST DESIGNATIONS		LEGEND OF BORING OPERATIONS	
According to the Standard Penetration Test (ASTM D-1586)				BASED ON ASTM D2487, D2488				● 2 1/4" CONE PENETRATION		⊙ ATTERBERG LIMITS			
SPT N-value (blows/ft)		Cohesive		FILL MATERIAL		POORLY-GRADED SAND (SP)		⊙ ROTARY WASH		⊙ CA CHEMICAL ANALYSIS			
0 - 4		Very Loose		< 2		WELL-GRADED SAND (SW)		⊙ AUGER BORING (DRY)		⊙ CN CONSOLIDATION		Description of material	
5 - 10		Loose		2 - 4		SILTY SAND (SM) or SANDY SILT		⊙ ELECTRONIC CONE PENETROMETER		⊙ CS DIRECT SHEAR		Dry Unit Weight (pcf)	
11 - 30		Medium Dense		5 - 8		CLAYEY SAND (SC) or SANDY LEAN CLAY		⊙ TEST PIT		⊙ MD MAX. DRY DENSITY		% Moisture	
31 - 50		Dense		9 - 15		COBBLES/BOULDERS		⊙ DIAMOND CORE BORING		⊙ HM HYDROMETER		Soil Test (see previous note)	
> 50		Very Dense		> 31		SEDIMENTARY ROCK		⊙ SOIL TUBE		⊙ SA SIEVE ANALYSIS		Conformable material change	
				WELL-GRADED GRAVEL (GW)						⊙ SE SAND EQUIVALENT		Estimated material change	
				POORLY-GRADED GRAVEL (GP)						⊙ SL SLAKE DURABILITY		Unconformable material change	
				SILTY GRAVEL (GM)						⊙ UC UNCONFINED COMPRESSION			
				CLAYEY GRAVEL (GC)						⊙ UU UNCONSOLIDATED UNDRAINED TRIAXIAL			
				METAMORPHIC ROCK						⊙ W WASH #200			



- Notes:**
- Borehole diameter was 3 7/8" between 0 to 140' depth and 5" between 140' to bottom of hole.
 - SPT sampler used was 2" OD and 1.4" ID. California Modified Sampler used was 3" OD and 2.5" ID.
 - An automatic trip hammer system using 140 lb weight and 30" drop was used to obtain blowcounts.
 - 2 3/8" diameter core was obtained using dual-barrel Geobarrel 101mm coring system (2.5" ID, 3 1/8" OD) from 140' depth to bottom of hole.
 - Groundwater level was measured at 66' depth on 20 Jan 06 after waiting time of 14 hours.

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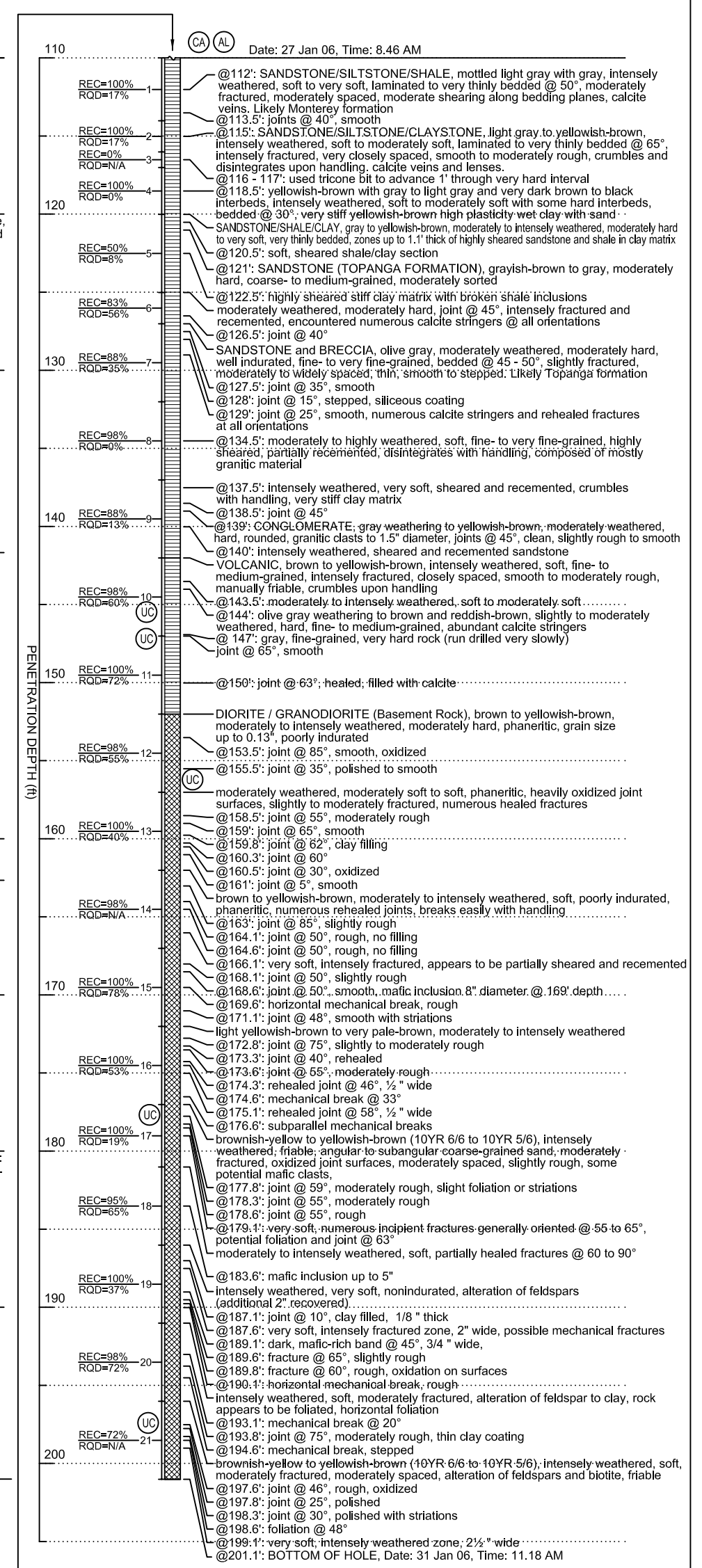
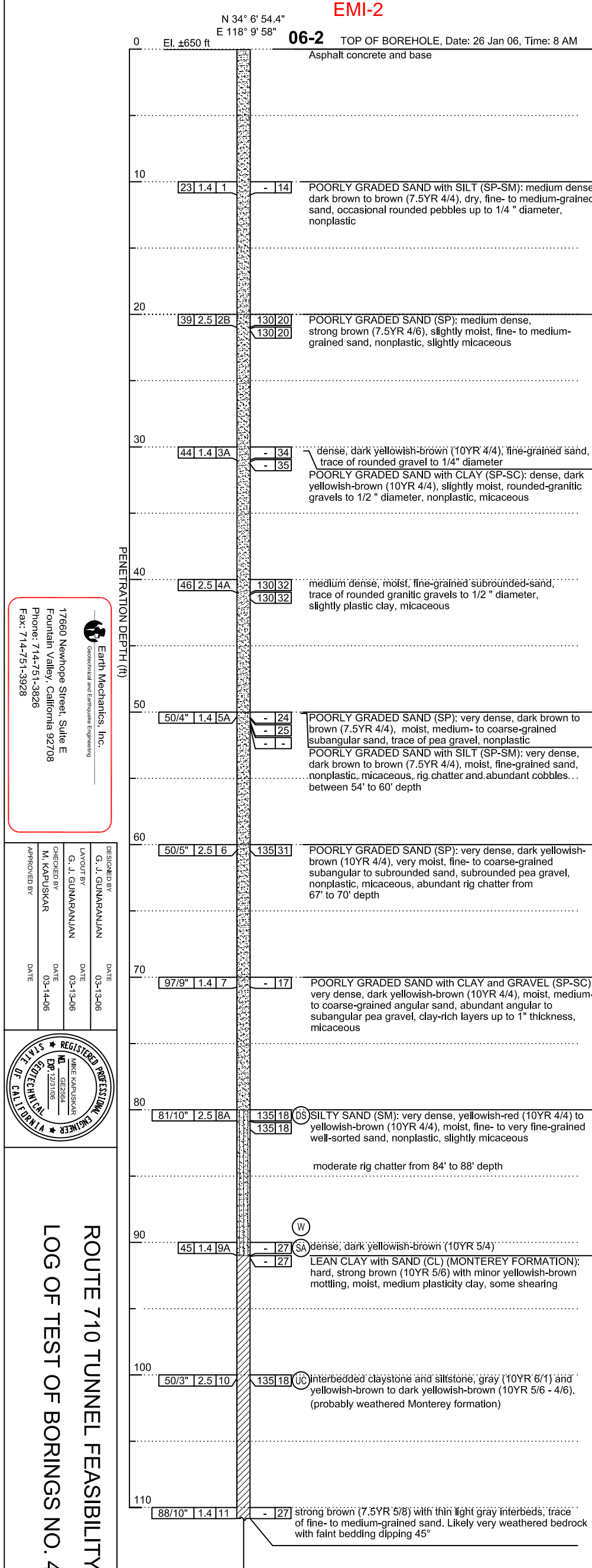
DESIGNED BY	G. J. GUARANANIAN	DATE	03-13-06
LAYOUT BY	G. J. GUARANANIAN	DATE	03-13-06
CHECKED BY	M. KAPUSKAR	DATE	03-14-06
APPROVED BY	M. KAPUSKAR	DATE	



ROUTE 710 TUNNEL FEASIBILITY
LOG OF TEST OF BORINGS NO. 3

CONSISTENCY CLASSIFICATION FOR SOILS				LEGEND OF EARTH MATERIALS (USCS)				TYPE OF BORINGS		IN-SITU, LAB & FIELD TEST DESIGNATIONS				LEGEND OF BORING OPERATIONS				
According to the Standard Penetration Test (ASTM D-1586)				BASED ON ASTM D2487, D2488				● 2 1/4" CONE PENETRATION		(AL) ATTERBERG LIMITS (CA) CHEMICAL ANALYSIS (CN) CONSOLIDATION (CS) DIRECT SHEAR (MD) MAX. DRY DENSITY (HM) HYDROMETER (SA) SIEVE ANALYSIS (SE) SAND EQUIVALENT (SL) SLAKE DURABILITY (UC) UNCONFINED COMPRESSION (UU) UNCONSOLIDATED UNDRAINED TRIAXIAL (W) WASH #200				 				
SPT N-value (blows/ft)	Granular	SPT N-value (blows/ft)	Cohesive	FILL MATERIAL	POORLY-GRADED SAND (SP)	WELL-GRADED SAND (SW)	SILTY SAND (SM) or SANDY SILT	CLAYEY SAND (SC) or SANDY LEAN CLAY	COBBLES/BOULDERS	IGNEOUS ROCK	SEDIMENTARY ROCK	METAMORPHIC ROCK	ROTARY WASH	ELECTRONIC CONE PENETROMETER	AUGER BORING (DRY)	TEST PIT	DIAMOND CORE BORING	SOIL TUBE
0 - 4	Very Loose	< 2	Very Soft	CLAY (CL or CH)	CLAYEY SILT	CLAYEY SAND (SC) or SANDY LEAN CLAY	CLAYEY SILT	CLAYEY SAND (SC) or SANDY LEAN CLAY	COBBLES/BOULDERS	IGNEOUS ROCK	SEDIMENTARY ROCK	METAMORPHIC ROCK						
5 - 10	Loose	2 - 4	Soft	SILT (ML or MH)	CLAYEY SILT	CLAYEY SAND (SC) or SANDY LEAN CLAY	CLAYEY SILT	CLAYEY SAND (SC) or SANDY LEAN CLAY	COBBLES/BOULDERS	IGNEOUS ROCK	SEDIMENTARY ROCK	METAMORPHIC ROCK						
11 - 30	Medium Dense	5 - 8	Firm	PEAT and/or ORGANIC MATTER	CLAYEY SILT	CLAYEY SAND (SC) or SANDY LEAN CLAY	CLAYEY SILT	CLAYEY SAND (SC) or SANDY LEAN CLAY	COBBLES/BOULDERS	IGNEOUS ROCK	SEDIMENTARY ROCK	METAMORPHIC ROCK						
31 - 50	Dense	9 - 15	Stiff	PEAT and/or ORGANIC MATTER	CLAYEY SILT	CLAYEY SAND (SC) or SANDY LEAN CLAY	CLAYEY SILT	CLAYEY SAND (SC) or SANDY LEAN CLAY	COBBLES/BOULDERS	IGNEOUS ROCK	SEDIMENTARY ROCK	METAMORPHIC ROCK						
> 50	Very Dense	16 - 30	Very Stiff	PEAT and/or ORGANIC MATTER	CLAYEY SILT	CLAYEY SAND (SC) or SANDY LEAN CLAY	CLAYEY SILT	CLAYEY SAND (SC) or SANDY LEAN CLAY	COBBLES/BOULDERS	IGNEOUS ROCK	SEDIMENTARY ROCK	METAMORPHIC ROCK						
		> 31	Hard	PEAT and/or ORGANIC MATTER	CLAYEY SILT	CLAYEY SAND (SC) or SANDY LEAN CLAY	CLAYEY SILT	CLAYEY SAND (SC) or SANDY LEAN CLAY	COBBLES/BOULDERS	IGNEOUS ROCK	SEDIMENTARY ROCK	METAMORPHIC ROCK						

Note: Visual classification of earth materials are based on field inspection and are confirmed or revised with laboratory test results as necessary.



Notes:

- Borehole diameter was 3 7/8" between 0 to 110' depth, 5" between 110 to 120' depth, and 3" between 120' to bottom of hole.
- SPT sampler used was 2" OD and 1.4" ID. California Modified Sampler used was 3" OD and 2.5" ID.
- An automatic trip hammer system using 140 lb weight and 30" drop was used to obtain blowcounts.
- 2 3/8" diameter core was obtained using dual-barrel Geobarrel 101mm coring system (2.5" ID, 3 1/8" OD) from 110' to 120' depth and 1.77" diameter core was obtained using dual-barrel NQ coring system (1.969" ID and 2 1/8" OD) from 120' depth to bottom of hole.
- Groundwater level was measured at 82' depth on 27 Jan 06 after waiting time of 14.5 hours.

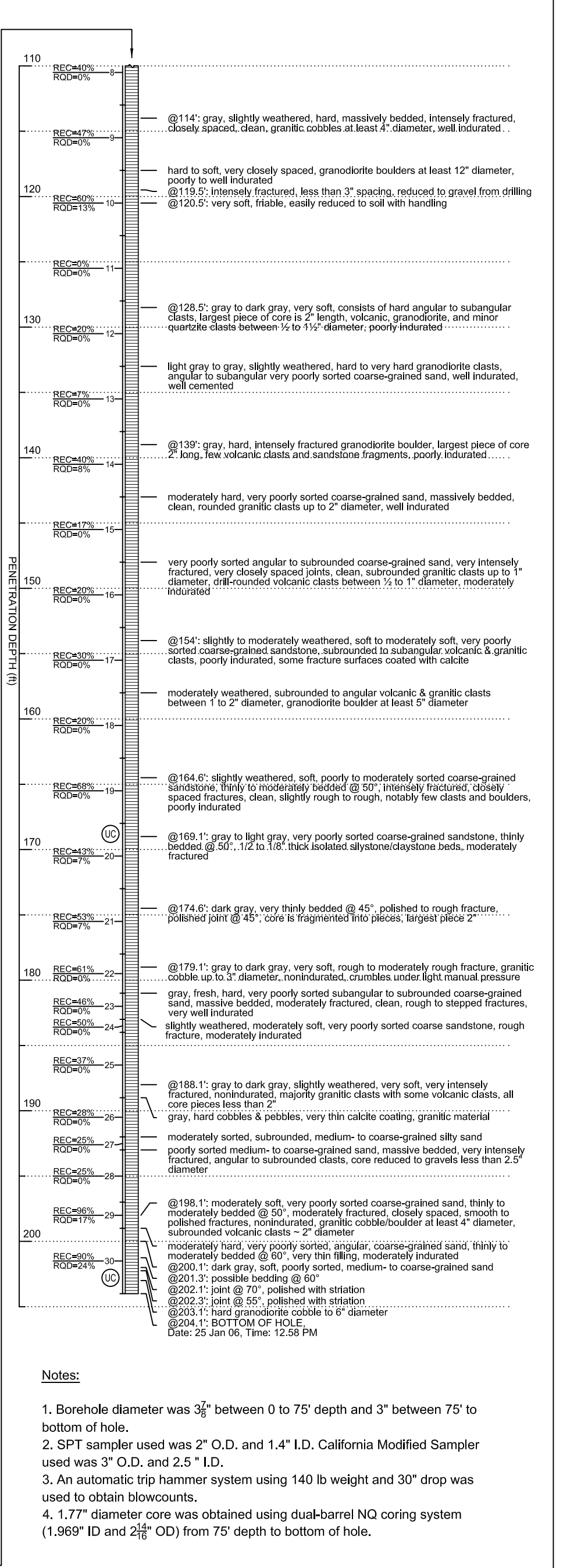
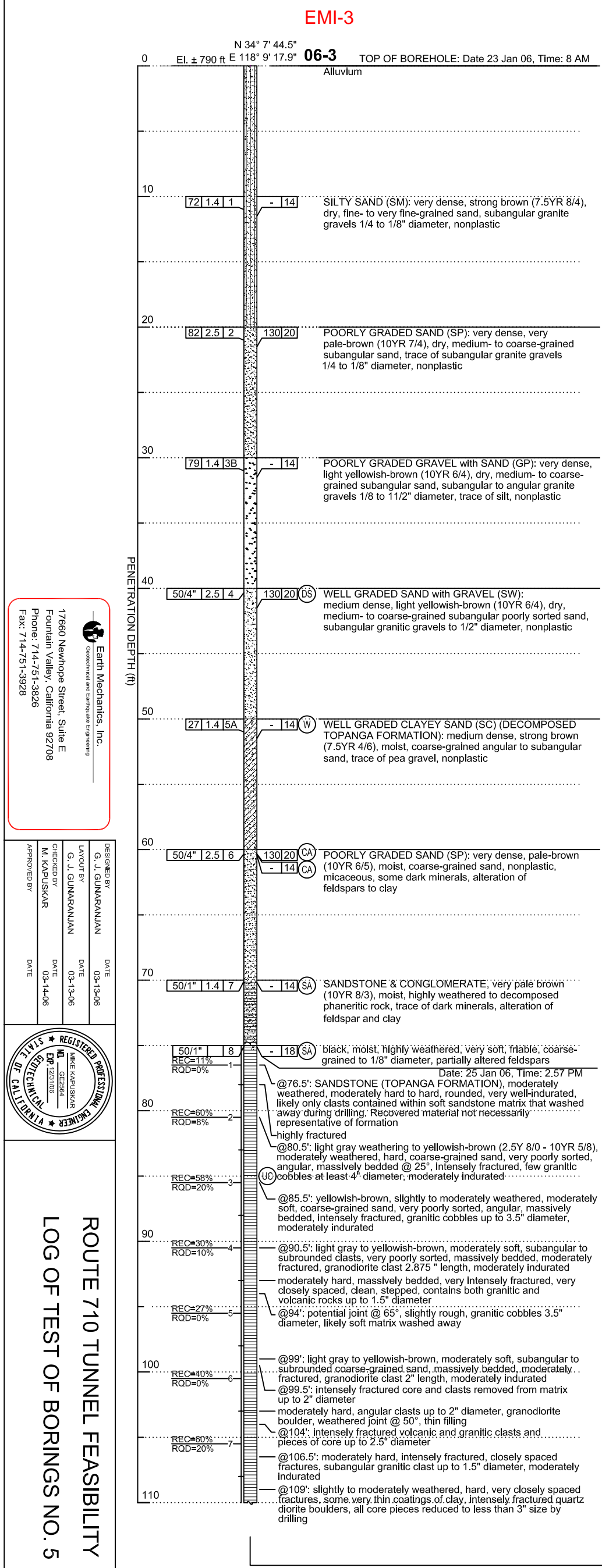
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APPROVED BY: M. KAPUSKAR
DATE: 03-13-06
DATE: 03-13-06
DATE: 03-14-06
DATE:



ROUTE 710 TUNNEL FEASIBILITY
LOG OF TEST OF BORINGS NO. 4

CONSISTENCY CLASSIFICATION FOR SOILS				LEGEND OF EARTH MATERIALS (USCS)				TYPE OF BORINGS		IN-SITU, LAB & FIELD TEST DESIGNATIONS				LEGEND OF BORING OPERATIONS															
According to the Standard Penetration Test (ASTM D-1586)				BASED ON ASTM D2487, D2488				● 2 1/4" CONE PENETRATION		(AL) ATTERBERG LIMITS (CA) CHEMICAL ANALYSIS (CN) CONSOLIDATION (CS) DIRECT SHEAR (MD) MAX. DRY DENSITY (HM) HYDROMETER (SA) SIEVE ANALYSIS (SE) SAND EQUIVALENT (SL) SLAKE DURABILITY (UC) UNCONFINED COMPRESSION (UU) UNCONSOLIDATED UNDRAINED TRIAXIAL (W) WASH #200				 															
SPT N-value (blows/ft)	Granular	SPT N-value (blows/ft)	Cohesive	FILL MATERIAL	POORLY-GRADED SAND (SP)	WELL-GRADED SAND (SW)	SILT (ML or MH)	PEAT and/or ORGANIC MATTER	WELL-GRADED GRAVEL (GW)	POORLY-GRADED GRAVEL (GP)	SILT GRAVEL (GM)	CLAYEY GRAVEL (GC)	ROTARY WASH	AUGER BORING (DRY)	TEST PIT	DIAMOND CORE BORING	SOIL TUBE	Penetration Index (blows/ft)	Sampler ID In Inches	Location	Hole OD (Inches)	B-No.	Top Hole EL	Run Number	Top of Run	Core Recovery	Rock Quality Designation Index	Bottom of Run	Description of Material
0 - 4	Very Loose	< 2	Very Soft	CLAY (CL or CH)	SILTY SAND (SM) or SANDY SILT	CLAYEY SAND (SC) or SANDY LEAN CLAY	CLAYEY SILT	WELL-GRADED GRAVEL (GW)	POORLY-GRADED GRAVEL (GP)	SILT GRAVEL (GM)	CLAYEY GRAVEL (GC)	COBBLES/BOULDERS	ELECTRONIC CONE PENETROMETER	TEST PIT	TEST PIT	TEST PIT	TEST PIT	40	2.5	12	16.2	11.0				REC=50%	RQD=40%		
5 - 10	Loose	2 - 4	Soft	POORLY-GRADED SAND (SP)	WELL-GRADED SAND (SW)	CLAYEY SAND (SC) or SANDY LEAN CLAY	CLAYEY SILT	POORLY-GRADED GRAVEL (GP)	POORLY-GRADED GRAVEL (GP)	SILT GRAVEL (GM)	CLAYEY GRAVEL (GC)	IGNEOUS ROCK	AUGER BORING (DRY)	TEST PIT	TEST PIT	TEST PIT	TEST PIT	40	2.5	12	16.2	11.0				REC=50%	RQD=40%		
11 - 30	Medium Dense	5 - 8	Firm	SEDIMENTARY ROCK	CLAYEY SAND (SC) or SANDY LEAN CLAY	CLAYEY SAND (SC) or SANDY LEAN CLAY	CLAYEY SILT	POORLY-GRADED GRAVEL (GP)	POORLY-GRADED GRAVEL (GP)	SILT GRAVEL (GM)	CLAYEY GRAVEL (GC)	SEDIMENTARY ROCK	TEST PIT	TEST PIT	TEST PIT	TEST PIT	TEST PIT	40	2.5	12	16.2	11.0				REC=50%	RQD=40%		
31 - 50	Dense	9 - 15	Stiff	IGNEOUS ROCK	CLAYEY SAND (SC) or SANDY LEAN CLAY	CLAYEY SAND (SC) or SANDY LEAN CLAY	CLAYEY SILT	POORLY-GRADED GRAVEL (GP)	POORLY-GRADED GRAVEL (GP)	SILT GRAVEL (GM)	CLAYEY GRAVEL (GC)	IGNEOUS ROCK	TEST PIT	TEST PIT	TEST PIT	TEST PIT	TEST PIT	40	2.5	12	16.2	11.0				REC=50%	RQD=40%		
> 50	Very Dense	16 - 30	Very Stiff	SEDIMENTARY ROCK	CLAYEY SAND (SC) or SANDY LEAN CLAY	CLAYEY SAND (SC) or SANDY LEAN CLAY	CLAYEY SILT	POORLY-GRADED GRAVEL (GP)	POORLY-GRADED GRAVEL (GP)	SILT GRAVEL (GM)	CLAYEY GRAVEL (GC)	SEDIMENTARY ROCK	TEST PIT	TEST PIT	TEST PIT	TEST PIT	TEST PIT	40	2.5	12	16.2	11.0				REC=50%	RQD=40%		



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CHECKED BY	M. KAPUSKAR	DATE	02-14-06
APPROVED BY		DATE	





**PHASE II GEOTECHNICAL FEASIBILITY
OF THE PROPOSED
INTERSTATE 710 FREEWAY EXTENSION
THROUGH THE MONTEREY HILLS
LOS ANGELES COUNTY, CALIFORNIA
CONTRACT NO. 07A0406, TASK ORDER NO. 2**

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March 25, 1999
Project No. 201769-01

APPENDIX A

BORING LOGS

Field Procedure for the Collection of Disturbed Samples

Disturbed soil samples were obtained in the field using the following methods.

Bulk Samples

Bulk samples of representative earth materials were obtained from the exploratory excavations. The samples were bagged and transported to the laboratory for testing.

The Standard Penetration Test (SPT) Spoon

Disturbed drive samples of earth materials were obtained by means of a Standard Penetration Test spoon sampler. The sampler is composed of a split barrel with an external diameter of 2 inches and an unlined internal diameter of 1-3/8 inches. The spoon was driven into the ground 12 to 18 inches with a 140-pound hammer free-falling from a height of 30 inches in general accordance with ASTM D 1586-84. The blow counts were recorded for every 6 inches of penetration; the blow counts reported on the logs are those for the last 12 inches of penetration. Soil samples were observed and removed from the spoon, bagged, sealed and transported to the laboratory for testing.

Field Procedure for the Collection of Relatively Undisturbed Samples

Relatively undisturbed soil samples were obtained in the field using the following method.

The Modified Split-Barrel Drive Sampler

The sampler, with an external diameter of 3.0 inches, was lined with 1-inch long, thin brass rings with inside diameters of approximately 2.4 inches. The sample barrel was driven into the ground with the weight of a hammer or the kelly bar of the drill rig in general accordance with ASTM D 3550-84. The driving weight was permitted to fall freely. The approximate length of the fall, the weight of the hammer or bar, and the number of blows per foot of driving are presented on the boring logs as an index to the relative resistance of the materials sampled. The samples were removed from the sample barrel in the brass rings, sealed, and transported to the laboratory for testing.

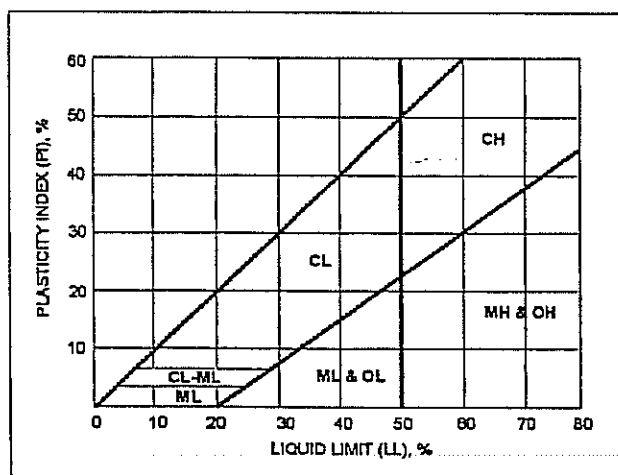
U.S.C.S. METHOD OF SOIL CLASSIFICATION

MAJOR DIVISIONS	SYMBOL	TYPICAL NAMES	
COARSE-GRAINED SOILS (More than 1/2 of soil >No. 200 sieve size)	GRAVELS (More than 1/2 of coarse fraction > No. 4 sieve size)	GW	Well graded gravels or gravel-sand mixtures little or no fines
		GP	Poorly graded gravels or gravel-sand mixtures, little or no fines
		GM	Silty gravels, gravel-sand-silt mixtures
		GC	Clayey gravels, gravel-sand-clay mixtures
	SANDS (More than 1/2 of coarse fraction <No. 4 sieve size)	SW	Well graded sands or gravelly sands, little or no fines
		SP	Poorly graded sands or gravelly sands, little or no fines
		SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS (More than 1/2 of soil <No. 200 sieve size)	SILTS & CLAYS Liquid Limit <50	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
		OL	Organic silts and organic silty clays of low plasticity
	SILTS & CLAYS Liquid Limit >50	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
		CH	Inorganic clays of high plasticity, fat clays
		OH	Organic clays of medium to high plasticity, organic silty clays, organic silts
HIGHLY ORGANIC SOILS	Pt	Peat and other highly organic soils	

CLASSIFICATION CHART (Unified Soil Classification System)

CLASSIFICATION	RANGE OF GRAIN SIZES		
	U.S. Standard Sieve Size	Grain Size in Millimeters	
BOULDERS	Above 12"	Above 305	
COBBLES	12" to 3"	305 to 76.2	
GRAVEL	3" to No.4	76.2 to 4.76	
	Coarse Fine	3" to 3/4" 3/4" to No. 4	76.2 to 19.1 19.1 to 4.76
SAND	No. 4 to No. 200	4.76 to 0.074	
	Coarse	No. 4 to No. 10	4.76 to 2.00
	Medium	No. 10 to No. 40	2.00 to 0.420
	Fine	No. 40 to No. 200	0.420 to 0.074
SILT & CLAY	Below No. 200	Below 0.074	

GRAIN SIZE CHART



PLASTICITY CHART



U.S.C.S. METHOD OF SOIL CLASSIFICATION

DEPTH (feet)	SAMPLES	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DATE DRILLED _____	BORING NO. _____	SAMPLE _____
							GROUND ELEVATION _____	SHEET <u>1</u> OF <u>1</u>	METHOD OF DRILLING _____
							DRIVE WEIGHT _____	DROP _____	
							SAMPLED BY _____	LOGGED BY _____	REVIEWED BY _____
DESCRIPTION/INTERPRETATION									
0							Auger (A)		
							Solid line denotes formation change.		
							Modified split-barrel drive sampler (C)		
							No recovery with modified Split-Barrel Drive Sampler (B)		
							Dutch cone test (D)		
5							Seepage		
							Rock Cores (E)		
							Groundwater encountered during drilling.		
							Groundwater measured after drilling.		
							Piston (I)		
							Dashed line denotes lithologic change		
10							Standard Penetration Test (P)		
							No recovery with a standard penetration test (T)		
							Shelby tube sample (R)		
							Distance pushed in inches/Length of sample recovered in inches.		
							No recovery with Shelby tube sampler (X)		
15							Attitudes: Strike/Dip		
							b: Bedding		
							c: Contact		
							j: Joint		
							f: Fracture		
							F: Fault		
							cs: Clay Seam		
							s: Shear		
							bss: Basal Slide Surface		
							sf: Shear Fracture		
							sz: Shear Zone		
							sbs: Sheared Bedding Surface		
20							The total depth line is a solid line that is drawn at the level of the last entry.		



BORING LOG		
EXPLANATION OF BORING LOG		
PROJECT NO. SAMPLE	DATE Rev.3/95	FIGURE


DEPTH (feet) BORING NO. **NM-B1**
 SAMPLES GROUND ELEVATION 594' ±(MSL) SHEET 1 OF 3
 Driven METHOD OF DRILLING 8" diameter hollow stem auger (Al Roy Drilling)
 BLOWS/FOOT DRIVE WEIGHT 140 lbs. DROP 30 inches
 MOISTURE (%) SAMPLED BY BDF LOGGED BY BDF REVIEWED BY CAP
 DRY DENSITY (PCF) DESCRIPTION/INTERPRETATION
 SYMBOL CLASSIFICATION U.S.C.S.

DEPTH (feet)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0					CL	ASPHALT CONCRETE: Approximately 3 inches thick.
15	15	16.6	78.8			ALLUVIUM: Brown, damp, loose, sandy CLAY.
5	8					Firm; trace gravel; root hairs.
						Moist.
10	76	18.4	102.4			Hard; angular rock fragments up to approximately 1/4 inch in diameter.
15	31					Reddish brown.

	BORING LOG		
	Interstate 710 Extension Los Angeles County, California		
	PROJECT NO. 201769-01	DATE 3/99	FIGURE A-1

DEPTH (feet)	Bulk	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DATE DRILLED	2/3/99	BORING NO.	NM-B1																										
	Driven						SAMPLES	GROUND ELEVATION	594' ±(MSL)	SHEET	2	OF	3																							
							METHOD OF DRILLING					8" diameter hollow stem auger (AI Roy Drilling)																								
							DRIVE WEIGHT					140 lbs.					DROP					30 inches														
							SAMPLED BY					BDF					LOGGED BY					BDF					REVIEWED BY					CAP				

DEPTH (feet)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
20	48	22.7	100.6		CL	ALLUVIUM: (Continued) Reddish brown, moist, hard, sandy CLAY; few gravel; angular and rounded rock fragments up to approximately 1/4 inch in diameter.
25	24					Variable moisture; very stiff. Gradually increasing moisture; fewer rock fragments.
30	35	20.5	105.5			Irregular pockets of finer grained material with higher moisture.
35	21					Light brown.
						TOPANGA FORMATION: Light brown, moist, weakly cemented, sandy SILTSTONE; intensely weathered.

	BORING LOG		
	Interstate 710 Extension Los Angeles County, California		
	PROJECT NO. 201769-01	DATE 3/99	FIGURE A-2

DEPTH (feet)	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DATE DRILLED <u>2/3/99</u>	BORING NO. <u>NM-B1</u>
							GROUND ELEVATION <u>594' ±(MSL)</u>	SHEET <u>3</u> OF <u>3</u>
							METHOD OF DRILLING <u>8" diameter hollow stem auger (AJ Roy Drilling)</u>	
							DRIVE WEIGHT <u>140 lbs.</u>	DROP <u>30 inches</u>
							SAMPLED BY <u>BDF</u> LOGGED BY <u>BDF</u> REVIEWED BY <u>CAP</u>	

DEPTH (feet)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	DESCRIPTION/INTERPRETATION
40	58	23.2	101.2		<p>TOPANGA FORMATION: (Continued) Light brown, moist, weakly cemented, sandy SILTSTONE; intensely weathered; iron oxide stains; manganese stains.</p> <p>Light reddish brown; weakly indurated; clayey SILTSTONE; iron oxide stains along fractures of variable orientation.</p>
45	26				<p>@ 45.0': Groundwater encountered during drilling.</p>
60	60	27.4	98.7		
55					<p>Total Depth = 51.5 feet. Groundwater encountered during drilling at approximately 45 feet. Backfilled and patched on 2/3/99.</p>




BORING LOG		
Interstate 710 Extension Los Angeles County, California		
PROJECT NO. 201769-01	DATE 3/99	FIGURE A-3

DEPTH (feet)	BULK SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DATE DRILLED <u>2/4/99</u>	BORING NO. <u>NM-B2</u>
							GROUND ELEVATION <u>676' ±(MSL)</u>	SHEET <u>1</u> OF <u>2</u>
							METHOD OF DRILLING <u>30" diameter bucket auger (Al Roy Drilling)</u>	
							DRIVE WEIGHT <u>See end of log</u>	DROP <u>12 inches</u>
							SAMPLED BY <u>SMJ</u> LOGGED BY <u>SMJ</u> REVIEWED BY <u>CAP</u>	

DESCRIPTION/INTERPRETATION

0							ASPHALT CONCRETE: Approximately 4 to 5 inches thick.	
						GP		
						ML	AGGREGATE BASE: Gray, moist, dense, sandy GRAVEL; approximately 3 inches thick.	
							FILL: Orange-brown, moist, stiff, clayey SILT; angular rock fragments up to approximately 4 inches in diameter.	
							TOPANGA FORMATION: Orange-brown, moist, weakly to moderately indurated, clayey SILTSTONE to silty CLAYSTONE; highly fractured and jointed; weathered; extensive iron oxide staining; beds up to approximately 4 inches thick; blocky weathering.	
5		10	20.2	101.5			@ 3.0': (B:N89°W/28°N). @ 4.0': Interbeds of dark greenish gray, moist, moderately indurated, siltstone; micaceous; beds range from approximately 1/6 inch to 4 inches thick; (B:N90°W/31°N). @ 4.9': (B:N89°E/35°N). @ 5.1': (J:N56°W/54°S). @ 6.4': (B:N74°E/30°N) (J:N71°E/60°S).	
							@ 8.5': (J:N55°W/75°N). @ 9.0': <u>Clay seam</u> ; dark gray; micaceous; soft; approximately 1/32 to 1/16 inch thick; slickensides; (CS:N85°E/35°N).	
10		11	22.1	97.0			@ 10.5'-13.6': Micaceous silt between bedding surfaces; soft; dark gray. @ 10.6': Gypsum vein; approximately 1/4 inch thick. @ 10.9': (B:N90°W/36°N).	
							@ 13.6': Less weathered; well indurated. @ 13.8': (B:N70°W/35°N); <u>Clay seam</u> ; approximately 1/32 inch thick along bedding. @ 14.5': (J:N52°W/50°S) (B:N68°W/35°N); siliceous beds of siltstone approximately 1/8 inch thick. @ 14.7': (J:N20°E/69°W); gypsum vein approximately 1/16 inch thick; (GV:N60°W/65°S). @ 15.6': (B:N80°W/35°N) (J:N75°W/52°S).	
15		19/10"	19.2	97.9				
							@ 20.0': Groundwater measured after drilling and downhole logging.	

	<h2>BORING LOG</h2>		
	Interstate 710 Extension Los Angeles County, California		
	PROJECT NO. 201769-01	DATE 3/99	FIGURE A-4

DEPTH (feet)	BLOWNS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DATE DRILLED	BORING NO.	
						2/4/99	NM-B2	
						GROUND ELEVATION	SHEET	OF
						676' ±(MSL)	2	2
						METHOD OF DRILLING 30" diameter bucket auger (Al Roy Drilling)		
						DRIVE WEIGHT	DROP	
						See end of log	12 inches	
						SAMPLED BY	LOGGED BY	REVIEWED BY
						SMJ	SMJ	CAP
						DESCRIPTION/INTERPRETATION		
20	9	20.2	98.0			<p>TOPANGA FORMATION: (Continued) Orange-brown, moist, moderately to well indurated, clayey SILTSTONE; highly fractured and jointed; extensive iron oxide staining; beds up to approximately 4 inches thick.</p> <p>@ 24.0': Heavy seepage.</p>		
25	18	24.4	100.3			<p>Total Depth = 26.0 feet. Seepage encountered at approximately 24 feet. Downhole logged to approximately 18 feet. Groundwater measured after downhole logging at 20 feet. Backfilled on 2/4/99.</p> <p><u>Drive Weights:</u> 0-30': 3,350 lbs.</p>		
35								



BORING LOG		
Interstate 710 Extension Los Angeles County, California		
PROJECT NO. 201769-01	DATE 3/99	FIGURE A-5

.PTH (feet)	BULK SAMPLES		BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DATE DRILLED <u>2/10/99</u>	BORING NO. <u>NM-B4</u>
	Bulk	Driven						GROUND ELEVATION <u>545' ±(MSL)</u>	SHEET <u>1</u> OF <u>3</u>
METHOD OF DRILLING <u>8" diameter hollow stem auger (A & R Drilling)</u>								DRIVE WEIGHT <u>140 lbs.</u>	DROP <u>30 inches</u>
SAMPLED BY <u>BDF</u> LOGGED BY <u>BDF</u> REVIEWED BY <u>CAP</u>								DESCRIPTION/INTERPRETATION	

0							GM	ASPHALT CONCRETE: Approximately 4 inches thick.
							CL	AGGREGATE BASE: Gray, damp, dense, sandy GRAVEL with silt; approximately 4 inches thick.
								ALLUVIUM: Brown, damp, very stiff, sandy CLAY; trace gravel.
	39	18.3	74.3					
5								
	35	19.1	70.7					Few gravel.
								Moist.
10								
	58	20.1	91.5					Hard; pinhole voids.
15							SC	Light brown, moist, medium dense, clayey SAND; few gravel.
	43	12.9	111.4					
							SP-SM	Light brown, moist, medium dense, poorly graded SAND with silt.
	68/11"	7.1	116.8					



BORING LOG		
Interstate 710 Extension Los Angeles County, California		
PROJECT NO. 201769-01	DATE 3/99	FIGURE A-10

DATE DRILLED 2/10/99 BORING NO. NM-B4
 GROUND ELEVATION 545' ±(MSL) SHEET 2 OF 3
 METHOD OF DRILLING 8" diameter hollow stem auger (A & R Drilling)
 DRIVE WEIGHT 140 lbs. DROP 30 inches
 SAMPLED BY BDF LOGGED BY BDF REVIEWED BY CAP

DEPTH (feet)	SAMPLE Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
20						SP-SM	<u>ALLUVIUM</u> : (Continued) Light brown, moist, medium dense, poorly graded SAND with silt.
						SC	Light brown, moist, medium dense, clayey SAND.
		105	8.4	103.4		SM	Light brown, moist, dense, silty SAND; gravel up to approximately 2 inches in diameter.
25						SC	Light brown, moist, medium dense to dense, clayey SAND.
		88/11"	6.9	109.4		SW-SM	Reddish brown, moist, dense, well graded SAND with silt; gravel up to approximately 2 inches in diameter.
							@ 33.0': Groundwater encountered during drilling.
		58/6"	15.3	111.1			Saturated.
35						CL	Reddish brown, saturated, hard, silty CLAY.
		71	23.5	102.4			



BORING LOG		
Interstate 710 Extension Los Angeles County, California		
PROJECT NO. 201769-01	DATE 3/99	FIGURE A-11

DEPTH (feet)	Bulk	SAMPLES	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DATE DRILLED <u>2/10/99</u>	BORING NO. <u>NM-B4</u>
	Driven							GROUND ELEVATION <u>545' ±(MSL)</u>	SHEET <u>3</u> OF <u>3</u>
								METHOD OF DRILLING <u>8" diameter hollow stem auger (A & R Drilling)</u>	
								DRIVE WEIGHT <u>140 lbs.</u>	DROP <u>30 inches</u>
								SAMPLED BY <u>BDF</u> LOGGED BY <u>BDF</u> REVIEWED BY <u>CAP</u>	
DESCRIPTION/INTERPRETATION									

40						CL	<p><u>ALLUVIUM: (Continued)</u> Reddish brown, saturated, hard, silty CLAY; grades to light yellowish brown.</p>
45	42	28.4	95.0	95.0	95.0		<p><u>TOPANGA FORMATION:</u> Light yellowish brown, saturated, moderately indurated, clayey SILTSTONE; highly fractured; oxidized along fractures.</p>
50	110	20.7	103.0	103.0	103.0		<p>Thin bedded siltstone and claystone dipping approximately 5-10°; thicker beds of fine-grained sandstone.</p>
55							<p>Total Depth = 50.5 feet. Groundwater encountered during drilling at approximately 33 feet. Backfilled with bentonite slurry and patched on 2/10/99.</p>