Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

TECHNICAL MEMORANDUM

EMI PROJECT NO: 10-113

DATE: September 23, 2011

PREPARED FOR: Vinh Trinh / WKE, Inc.

PREPARED BY: S. "Raja" Pirathiviraj and Andrew Lee / Earth Mechanics, Inc. (EMI)

SUBJECT: **Structure Preliminary Geotechnical Report (SPGR)** for
Non-Standard Retaining Walls 40, 244B, 250, 258A, 258B, 260, 280, 287, 288, 294D and 352
SR-57/SR-60 Confluence Project
07-LA-60, PM R24.45
EA 07-279100

1.0 Introduction

This memorandum has been prepared to provide the necessary geotechnical information to assist the structural designers in the Advanced Planning Study (APS) process for the non-standard retaining walls 40, 244B, 250, 258A, 258B, 260, 280, 287, 288, 294D and 352 of the SR-57/SR-60 Confluence project. The content of this memorandum follows Caltrans Foundation Report Preparation for Bridge Foundations (Caltrans, 2009b). It includes preliminary geotechnical, seismic, and foundation recommendations for the subject earth retaining structures. The preliminary recommendations provided in this memorandum are based on a recent field investigation performed by EMI for Phase 1 design of retaining wall 287, which is under a separate contract of this project, and subsurface information contained on the following as-built Log-of-Test-Boring (LOTB) sheets:

- Golden Spring Drive Undercrossing (UC) (Bridge No. 53-2149R)
- Grand Avenue Overcrossing (OC) (Bridge No. 53-1864)
- E60/N57 Connector OC (Bridge No. 53-1873G)
- Diamond Bar Blvd UC (Bridge No. 53-1899)
- Retaining Walls 386, 390 and 392

In Phase 1 design of retaining wall 287, the wall heights will range between 6.0 and 23.5 feet. This SPGR includes the Phase 2 design of the same wall, in which wall heights greater than 14.5 feet in Phase 1 will be increased by approximately 6 to 7 feet.

The LOTB sheets for the recent field investigation and the referenced as-built LOTB sheets are included in Appendix A and B, respectively. Additional site-specific geotechnical investigations will be performed for the retaining walls during the PS&E phase; therefore, the following

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preliminary recommendations may be amended when additional site-specific information becomes available.

2.0 Project Description

The subject non-standard retaining walls are located along the State Route (SR) SR-57/SR-60 Confluence in the Cities of Industry and Diamond Bar. The SR-57/SR-60 Confluence is a section of freeway where the SR-57 and SR-60 mainlines meet and co-exist as one mainline. SR-57 is a major north-south freeway that originates in central Orange County and extends northerly to the boundaries of the Cities of Pomona and San Dimas in Los Angeles County. SR-60 serves as a major east-west freeway that originates in the Los Angeles metropolitan area and extends through Los Angeles County into Riverside County. A Site Location Map is presented in Figure 1.

The project consists of improving approximately 2½ miles of the SR-57/SR-60 Confluence, which includes the addition of auxiliary lanes and associated on-ramp/off-ramp reconfigurations. Because of the improvements, eleven non-standard retaining walls are proposed along the mainline and ramps of the confluence as shown in Figure 2. Pertinent data of each retaining wall, as provided by WKE, is summarized in Table 1.

Table 1. Retaining Wall Pertinent Data

Wall No	Wall Type	Approximate Locations (referenced to each wall LOL)	Approximate Length (ft)	Proposed Retaining Heights (ft)	Approximate Bottom of Footing Elevations (ft)
40	Tieback	39+41.86 to 45+8.65	567	5 to 20	+624.1 to +633.9
244B	CIP	30+86.44 to 31+58.44	72	14 to 18	+637.8 to +641.8
250	MSE	252+00 to 254+40	240	15 to 30	+608.3 to +623.3
258A	SW on CIP	31+58.44 to 33+2.74	144	15 to 20	+630.2 to +633.8
258B	SW on MSE	33+2.74 to 38+18.44	516	15 to 20	+630.2 to +633.8
260	CIP	258+50 to 266+18	768	8 to 12	+636.2
280	MSE	17+00 to 39+20	2,220	18 to 28	+659.5 to +685.5
287	MSE	86+39 to 91+54	515	10 to 33	+673.3 to +683.3
288	MSE	15+63.38 to29+93.38	1,430	15 to 23	+680.4 to +697.9

294D	SW on MSE	64+36.64 to 69+34.77	498	13 to 20	+687.5 to +729.0
352	MSE	10+00 to 12+70	270	13 to 22	+727.6

3.0 Existing Subsurface Data

The as-built boring information included in Appendix B is gathered for each subject non-standard retaining wall and the boring data is summarized in Table 2.

Table 2. Summary of As-Built Borings Used for the Proposed Retaining Walls

As-Built LOTB	As-Built Borings	Top of Boring El. (feet)	Approx. Bottom of Boring El. (feet)	Groundwater El. (feet)	Drilling Method	Applicable Retaining Walls
Golden Spring Drive UC	B-1	+685.8	+605.5	+609.6	Rotary Boring	40 and 250
	B-2	+626.0	+615.0	NE	Penetration Boring	
	B-3	+647.0	+624.0	NE		
	B-4	+651.5	+625.0	NE		
	B-5	+633.1	+628.0	NE		
	B-6	+623.9	+619.0	NE		
RW 386	B1	+624.3	+602.0	NE	Rotary Boring	244B, 250, 258A, 258B and 260
	B2	+633.9	+608.5	NE		
	CPT1	+624.0	+602.6	NE	Cone Penetration Test	
	CPT2	+630.2	+595.3	NE		
	CPT3	+637.5	+606.4	NE		
	CPT4	+647.0	+599.3	NE		
RW 390 and RW 392	B1	+692.7	+626.7	NE	Rotary Boring	280
	B2	+672.6	+631.9	+667.3		
	B3	+689.0	+642.4	ntl		
Grand Avenue OC	B-1	+671.0	+605.0	+658.2	Rotary Boring	288
	B-2	+671.6	+610.0	+658.1		
	B-3	+672.6	▯ 栖 1.6	+658.2		
E60/N57 Conn. OC	B-1	+709.3	+663.7	NE	Rotary Boring	294D
	B-2	+710.1	+664.5	+681.1		
Diamond Bar Blvd UC	B-1	+720.0	+630.0	+679.3	Rotary Boring	352
	B-2	+718.0	+641.5	+678.2		
	B-3	+716.2	+635.7	+682.2		
	B-4	+719.5	+648.5	+680.1		
	B-5	+719.2	+646.0	NE	Penetration Boring	

In addition to the above soil borings, four hollow-stem auger borings and two cone-penetration tests (CPT) were completed between April 26 and 27, 2010 under the supervision of EMI for the proposed Phase 1 design of retaining wall 287, which is a part of the on-going Grand Avenue WB On-ramp project. The top-of-borehole elevations range from +676.0 to +690.0 feet, and the boreholes were advanced to elevations ranging from +609.5 to +627.8 feet. The LOTB sheets are presented in Appendix A.

4.0 Site Geology

The site is located in the northern part of the Puente Hills, a northwesterly trending range of low-elevation, rounded hills at the northern edge of the Peninsular Ranges. The site is in valley of Diamond Bar Creek between the Los Angeles basin to the west and the Upper Santa Ana River Valley on the east, and the San Gabriel Valley and Mountains on the north. Diamond Bar Valley is a small narrow valley with a flat floor ranging from about 550 feet on the west to 700 feet in elevation in the northeast. The valley is bounded by a ridge on the north that rises to about 800 feet elevation, and hills on the south that rise to about 1000 feet before descending into Tonner Canyon on the south. The project facilities are basically on the valley floor and the creek bed along the north side of the valley.

The valley floor is underlain by late- to middle-Holocene-age stream channel, alluvial basin, and alluvial fan sediments (Division of Mines and Geology, 1998; Morton and Miller, 2003). These young deposits are about 45 to 50 feet thick and overlie Miocene-age (~15 million years old) rocks of the Puente Formation.

The Puente formation consists of siltstone, sandstone, and conglomerate. Depending largely on the relative amounts of these sedimentary rock types, the unit is divided into members called the Sycamore Canyon, Yorba, Soquel, and La Vida members. The slopes of the adjacent ridge just north of the site are predominantly Yorba and Soquel members and the slopes on the south are predominantly La Vida member. In the site area, these members are predominantly siltstone and sandstone that range from soft to very hard rock where cemented by calcium carbonate.

5.0 Subsurface Conditions

The idealized soil profiles as shown in Table 3 are used for the preliminary design of the walls.

Table 3. Idealized Soil Profile

Approximate Top Elevation (ft)	Approximate Bottom Elevation (ft)	Predominant Soil Type	Observed Groundwater Elevation (ft)
Wall 40			
+650	+625	Stiff to very stiff lean Clay	+609.6
+625	+605	Weathered sandstone and siltstone	
Wall 244B, 258A, 258B and 260			
+642	+615	Stiff to very stiff lean Clay	+609.6

615	+599	Interbedded stiff lean clay and loose to dense silty sand	
Wall 250			
+624	+607	Interbedded loose to dense silty sand to clayey sand and stiff clayey silt	+609.6
+607	+595	Very soft to soft clayey silt and lean clay	
Wall 280			
+690	+630	Inerbedded loose to medium dense silty sand and very soft to medium stiff sandy silt and lean clay	+667.3
+630	+626	Weathered sandstone and shale	
Wall 287			
+690	+625	Interbedded loose to medium dense silty sand and very soft to medium stiff sandy silt and lean clay	+671
+625	+610	Weathered claystone	
Wall 288			
+689	+622	Interbedded loose to medium dense silty sand and very soft to medium stiff sandy silt and lean clay	+658.1
+622	+610	Weathered sandstone and shale	
Wall 294D			
+709	+685	Medium dense to dense silty sand	+681.1
+685	+664	Weathered sandstone and very hard shale	
Wall 352			
+720	+650	Interbedded loose to dense silty sand and soft to very stiff sandy silt and clayey silt	+680.1
+650	+648	Weathered siltstone and shale	

The depth to historically highest groundwater beneath the project site ranges between 15 feet and 20 feet below natural ground surface (CGS (previously CDMG), 1998).

6.0 Geologic Hazards

6.1 Landsliding

The Puente Formation typically has abundant landslides (Tan, 1998; Morton and Miller, 2003), generally a result of low-angle, out-of-slope bedding orientation. The seismic hazard map of the San Dimas quadrangle (Division of Mines and Geology, 1998) does not identify the site as having a potential for landsliding during an earthquake. However, the materials at the site underlain by late- to middle-Holocene-age stream channel, alluvial basin, and alluvial fan sediments which may be susceptible to running or caving in temporary excavations.

6.2 Flooding

There are three dams located in the surroundings of the project area; Puddingstone dam is located about 8.5 miles to the north, Santa Fe Basin is located about 11 miles to the northwest, and Whittier Narrows Dam is located about 15 miles to the west. However, the Los Angeles County General Plan (1990) indicates that the site is not located within a potential inundation area from an earthquake-induced failure; therefore, the potential for flooding due to earthquake-induced dam failure is very low.

7.0 Corrosion

A site-specific soil corrosion study was performed for the retaining wall 287. Based on the test results and the Caltrans criteria, the on-site soils are non-corrosive to bare metals and concrete. The corrosion test results will be presented in the foundation report for the walls during the final design phase.

There is no corrosion test result included with the as-built plans for the remaining walls. Site-specific soil corrosivity must be investigated during PS&E phase in accordance with Caltrans requirements.

8.0 Scour

Scour is not a design issue because the retaining wall foundations are not located within a channel or creek.

9.0 Preliminary Seismic Recommendations

9.1 Seismic Design Parameters

Retaining walls are not designed using a response spectrum approach. Preliminary design ARS curves were developed near both ends of the project at Golden Spring Drive Undercrossing (Bridge No. 53-2149R) and Diamond Bar Blvd. Undercrossing (Bridge No. 53-1899) in accordance with the Caltrans 2010 Seismic Design Criteria (SDC) procedures just to obtain the preliminary design Peak Ground Acceleration (PGA), which is the zero-period spectral acceleration on the ARS curves These ARS curves were generated based on estimated small strain shear wave velocity (V_{s30}) of 1,312 ft/s and 1,083 ft/s for the upper 100 ft of subsurface material at Golden Spring Drive Undercrossing and Diamond Bar Blvd. Undercrossing, respectively, in accordance with subsurface information contained in the referenced LOTB sheets.

Our preliminary recommendations are to use a Peak Ground Acceleration (PGA) of 0.59g for retaining wall RW 352 and 0.61g for the rest of the walls. These preliminary design recommendations will be updated during the PS&E phase.

9.2 Ground Rupture

The valley of Diamond Bar Creek may be controlled by a fault under the axis of the valley (Tan, 1998; Morton and Miller, 2003). The northeast-southwest linearity of the valley may be due to erosion along the fractured rocks along the fault. However, this fault is only inferred and not exposed. If there is a fault, it is not known to be active. No Alquist-Priolo Earthquake Fault Zones requiring special studies are designated by the California Geological Survey (formerly the Division of Mines and Geology). Therefore, the risk for ground surface rupture is low. Potential for lateral spreading at the bridge site is very low.

9.3 Liquefaction

The depths of exploration for most of the as-built borings are not adequate for the purpose of fully evaluating potential of liquefaction. However, based on the Seismic Hazard Map for the San Dimas Quadrangles (CGS (previously CDMG), 1999) as shown in Figure 3, all proposed locations of the non-standard retaining walls, except at retaining wall 40 where shallow bedrock is anticipated, are located within an area considered at great risk of liquefaction-related ground failure during a seismic event. As a result, potential of liquefaction should be assumed at all retaining wall sites, except at retaining wall 40, in preliminary planning. We will evaluate soil liquefaction after site-specific borings are drilled during the PS&E phase.

9.4 Seismic Settlement

Since the liquefaction potential may be high, seismic settlement of onsite soils is anticipated. We will evaluate seismic settlement once site-specific borings are drilled during the PS&E phase.

9.5 Seismic Slope Stability

We will evaluate seismic slope stability with appropriate shear strength parameters based on laboratory testing results and common correlations to shear strength during PS&E phase when layout and profile sheets are available. Caltrans Guidelines for Structures Foundation Reports (Caltrans, 2009b) recommends using a horizontal seismic coefficient equal to one-third of the peak ground acceleration but not exceeding 0.2 for a pseudo-static slope stability analysis. Based on the preliminary design PGA, a horizontal ground acceleration of 0.2 g is appropriate for the pseudo-static analysis.

9.6 Lateral Spreading

The risk associated with lateral spreading is considered low due to the fact that the potentially liquefiable layers are below any free face of slopes.

10.0 Preliminary Foundation Recommendations

10.1 Retaining Wall 40

Retaining wall 40 is proposed to be a tieback wall. Tieback walls are usually designed by contractors on performance specifications. It should be designed to resist all lateral pressures against the tieback wall, including pressure from surcharge loading, in accordance with Section 11.9 of the Caltrans LRFD Bridge Design Specifications.

The unbonded length of the anchor is a portion of the anchor which is not grouted. The unbonded length should fall outside the Rankine active wedge, which is defined by the ground surface, the tieback wall, and an assumed failure plane. For preliminary design, the unbonded length should not be less than 15 feet. The angle of inclination of the anchors should be at least 10 degrees to facilitate tendon installation and grouting.

The bonded length of tieback anchors is anticipated to be installed into bedrock. Rippability of bedrock will be evaluated during the PS&E phase. However, we do not anticipate constructability problem with a proper choice of equipment. For preliminary design, the bonded length of the anchors should not be less than 15 feet. Tieback anchors should not be spaced closer than three times the diameter of the bonded zone or 5 feet, whichever is greater.

No fill will be placed for construction of the tieback wall; therefore, settlement will not be a design issue. Global stability will be evaluated for static and seismic loading conditions after site-specific borings are drilled during the PS&E phase.

10.2 Retaining Walls 244B, 258A and 260

Retaining walls 244B and 260 are pile-supported cast-in-place retaining walls. Retaining wall 258A is a pile-supported cast-in-place retaining wall with a 14 feet high masonry soundwall supported at the top of the wall.

Cast-in-Drilled-Hole (CIDH) concrete piles may appear to be feasible since a large majority of the foundation type of nearby bridges is CIDH piles. However, Caltrans current design criteria negate the use of end bearing for CIDH pile with diameters less than 24 inches, and limited end-bearing resistance is allowed for CIDH pile diameters greater than 24 inches. As such, there is likelihood that groundwater will be encountered during CIDH pile construction, and CIDH piles using a wet method of construction would not be the preferred foundation type.

Based on the review of the as-built subsurface information, driven piles appear to be a better pile type than CIDH piles due to the following reasons:

1. reliability of pile end bearing without cleanout effort;
2. high potential of encountering groundwater and caving soils during drilling of cast-in-CIDH piles;
3. no disposal of soil cuttings and groundwater is necessary; and
4. pile capacity can be verified by blowcounts and/or pile driving analyzer (PDA).

After evaluating various viable options, we recommend HP10x42 piles with a nominal compressive resistance of 180 kips for preliminary planning purpose, as steel piles can sustain higher stresses in a potentially liquefiable environment. However, the limited depth of subsurface information available makes the determination of pile length highly inaccurate. We can only estimate a preliminary pile length of 45 feet based on our past project experience with similar subsurface conditions in the vicinity of the project site.

Due to the limited surface information, we will further evaluate suitable pile type and pile length in the PS&E phase after site-specific borings are drilled.

10.3 Retaining Walls 250, 258, 280, 287 and 288

Retaining walls 250, 258, 280, 287 and 288 are proposed MSE walls. The methodologies outlined in Section 11.10 of Caltrans LRFD Bridge Design Specifications (Caltrans, 2007) should be followed for MSE wall designs. For preliminary design, details as shown in Caltrans Bridge Design Aids Interim Section 3-8 (Caltrans, 2009a) can be used.

A preliminary allowable bearing capacity of 2.5 ksf may be assumed for the subject MSE wall, provided that at least 3 feet of overexcavation is performed for soils below the wall base. The MSE wall should be embedded at least 2 feet or 10% of the design wall height, whichever is larger below the lowest adjacent grade. The overexcavation should be backfilled with Caltrans Structure Backfill. The horizontal limits of the overexcavation should begin one foot from each edge of the wall base and extending downward at a 45-degree imaginary plane until the plane intersects the recommended minimum excavation depth. Prior to backfilling, the excavation bottom should be proof-rolled and after that the excavation bottom should be inspected by a qualified geotechnical engineer or technician to confirm the presence of an unyielding and competent surface. The backfilling should be compacted to a minimum relative compaction of 95% of maximum density as determined by Caltrans Test Method 216.

The total settlement under the recommended bearing pressure is expected to be less than 4 inches. The differential settlement is not expected to exceed 1%. For higher allowable bearing pressures, mitigation measures such as surcharging, or ground improvements may be necessary, particularly near the eastern end of the wall where soft lean clay was encountered.

Fine-grained materials were encountered below the ground water table. Therefore, a settlement period and settlement monitoring are proposed. Mitigation measures such as surcharge and vertical drains may be necessary to reduce settlement and corresponding waiting period. For the MSE wall, the uppermost level of wall facing, coping, roadway pavement, hardscape, and any other improvements should not be constructed until remaining settlement is within acceptable limits. We will evaluate settlement and corresponding settlement period as well as global stability of the subject MSE wall under static and pseudo-static loading conditions when site-specific boring information and laboratory test results are available during the PS&E phase.

10.4 Retaining Wall RW 294D and 352

Retaining walls 294D and 352 are proposed MSE walls. The methodologies outlined in Section 11.10 of Caltrans LRFD Bridge Design Specifications (Caltrans, 2007) should be followed for design. For preliminary design, details as shown in Caltrans Bridge Design Aids Interim Section 3-8 (Caltrans, 2009a) can be used.

A preliminary allowable bearing capacity of 4.5 ksf may be assumed for the subject MSE wall. The MSE wall should be embedded at least 2 feet or 10% of the design wall height, whichever is larger below the lowest adjacent grade. The total settlement under the recommended bearing pressure is expected to be less than 3 inches. The differential settlement is not expected to exceed 1%.

Fine-grained materials were encountered below the ground water table. Therefore, a settlement period and settlement monitoring are proposed. Mitigation measures such as surcharge and vertical drains may be necessary to reduce settlement and corresponding waiting period. For the MSE wall, the uppermost level of wall facing, coping, roadway pavement, hardscape, and any other improvements should not be constructed until remaining settlement is within acceptable limits. We will evaluate settlement and corresponding settlement period as well as global stability of the subject MSE wall under static and pseudo-static loading conditions when site-specific boring information and laboratory test results are available during the PS&E phase.

11.0 Additional Field Work and Laboratory Testing

Additional geotechnical investigation will be performed for each wall. Due to the presence of shallow groundwater condition, we recommend using a mud-rotary drill rig for the proposed geotechnical borings. The maximum boring depth is expected to be near 60 feet.

Samples recovered during the field investigation will be transported to the laboratory for testing. All of the soil samples will be visually classified and moisture content/density tests will be performed. Additional samples will be selected for sieve analysis, #200 wash, Atterberg, corrosion, consolidation, unconsolidated-undrained (UU) tests and direct shear tests. Other laboratory tests may be required depending upon the nature of the soils and bedrock encountered during the investigation.

12.0 References

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U.S. Geological Survey (USGS), 2008a, Documentation for the 2008 Update of the United States National Seismic Hazard Maps: USGS Open-File Report 2008-1128, 61p.

U.S. Geological Survey (USGS), 2008b, USGS Probabilistic Seismic Hazard Analysis, http://eqint.cr.usgs.gov/deaggint/2008/index.php.

FIGURES

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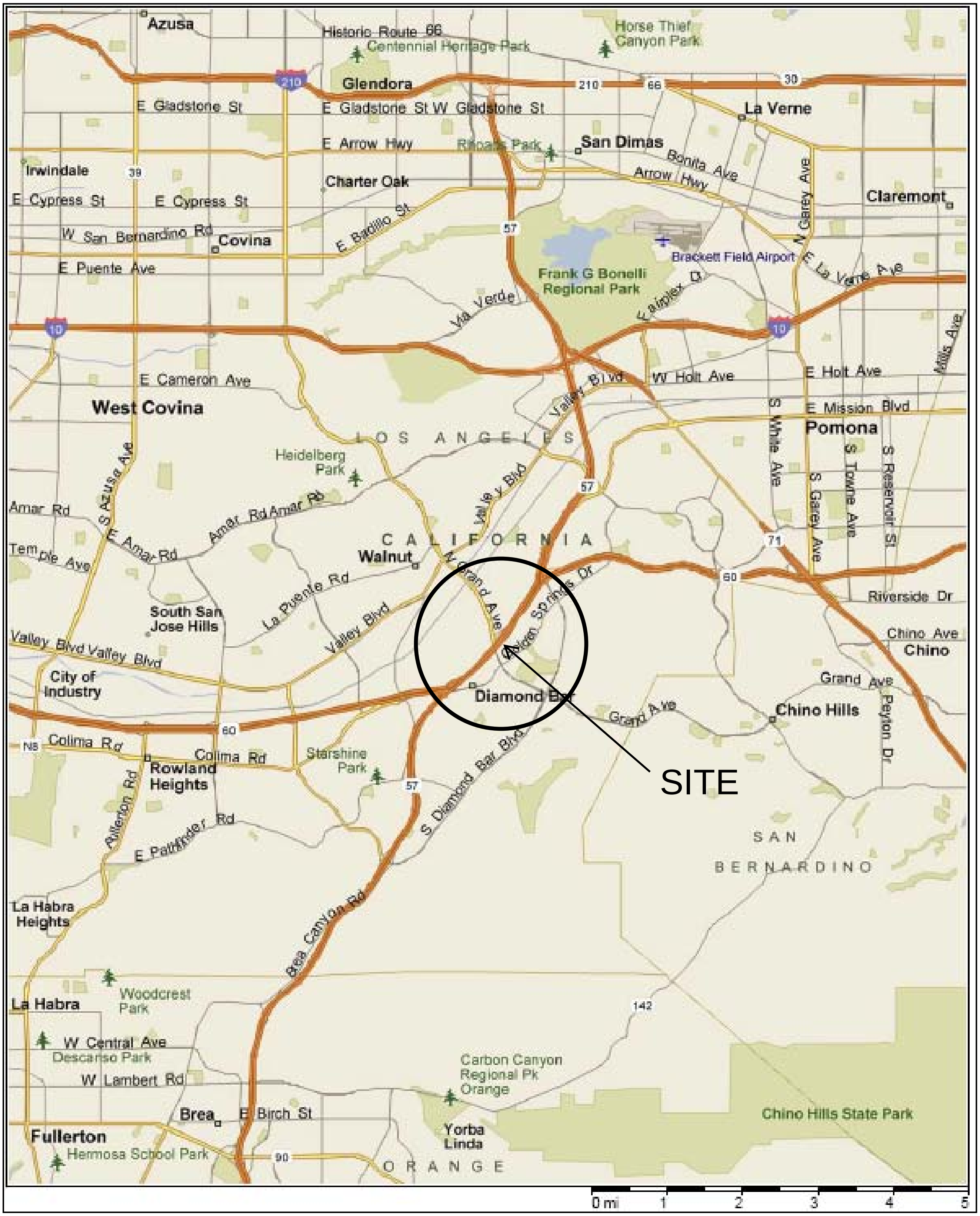
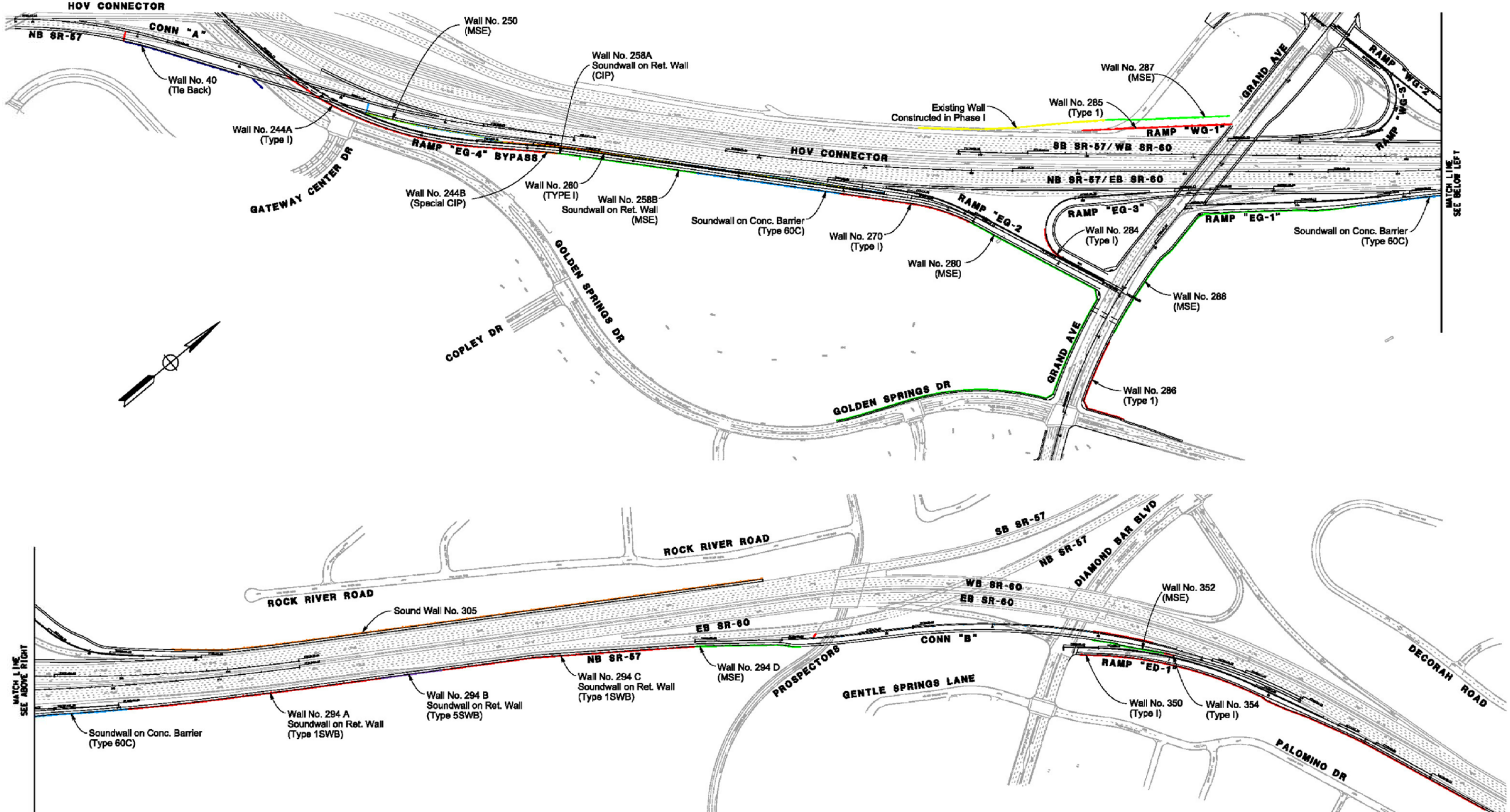
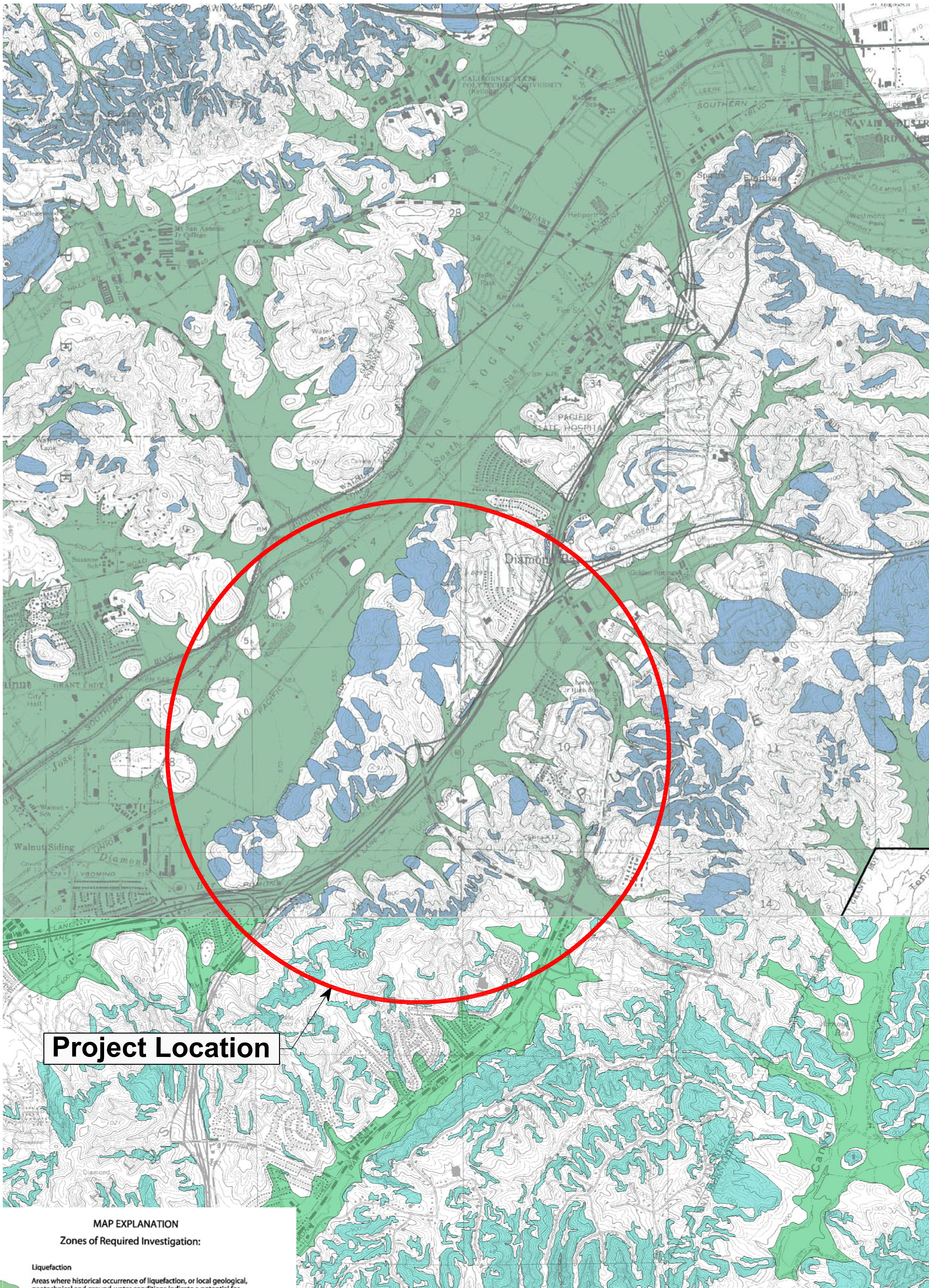


SR-57/SR-60 Confluence Project	**SITE LOCATION MAP**
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	Figure 1
	Project No. 10-113 / Date: 09-21-11

ALTERNATIVE 3



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	SR-57/SR-60 Confluence Project	Retaining Wall Plan
	Project No. 10-113 / Date: September 2011	Figure 2



MAP EXPLANATION

Zones of Required Investigation:

Liquefaction

Areas where historical occurrence of liquefaction, or local geological, geotechnical and ground-water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

Earthquake-Induced Landslides

Areas where previous occurrence of landslide movement, or local topographic, geological, geotechnical and subsurface water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

NOTE: Seismic Hazard Zones identified on this map may include developed land where delineated hazards have already been mitigated to city or county standards. Check with your local building/planning department for information regarding the location of such mitigated areas.

0 2500 5000 FEET

SCALE 1" = 2500'

N

Earth Mechanics, Inc.

Geotechnical and Earthquake Engineering

SR-57/SR-60 Confluence Project

Project No. 10-113

Date: September 2011

SEISMIC HAZARD ZONE MAP

REFERENCE: California Geological Survey, Seismic Hazard Zone Map, San Dimas Quadrangle (1999) and Yorba Linda Quadrangle (2005)

Figure 3

APPENDIX A

Log-Of-Test-Boring (LOTB) Sheets

RETAINING WALL 287

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
07	LA	60	R23.87-R24.48		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER - NO. - EXP. - CIVIL STATE OF CALIFORNIA

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

CITY OF INDUSTRY
15625 EAST STAFFORD STREET
INDUSTRY, CA 91744

EARTH MECHANICS, INC.
17660, NEWHOPE STREET, SUITE E
FOUNTAIN VALLEY, CA 92708

BENCH MARK

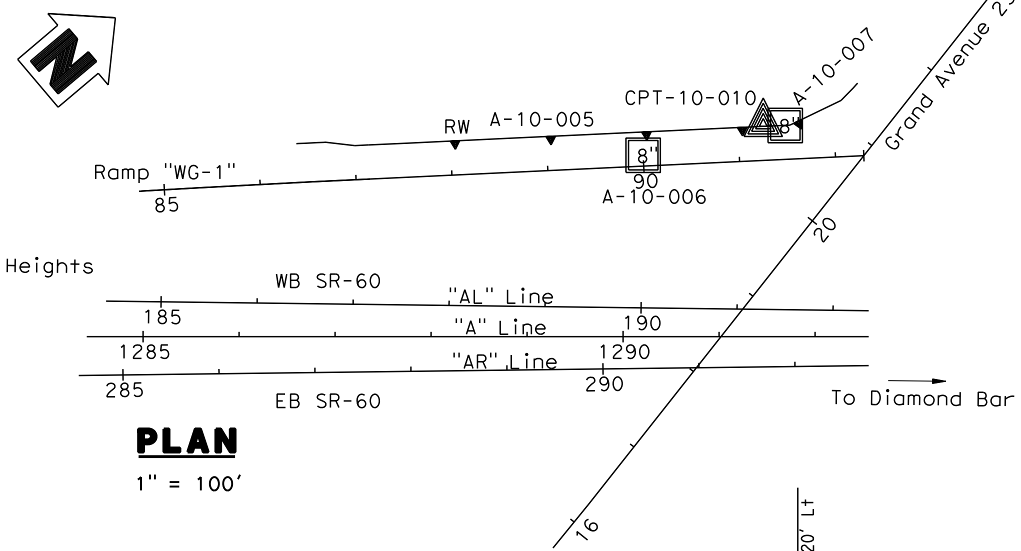
Horizontal control is based on Caltrans GPS points 1001 and 1002 from TLI Control project done Jan 2000.

Coordinates shown are based on the California Coordinate System (CCS83) Zone 5, 1983 NAD (1992.88 EPOCH).

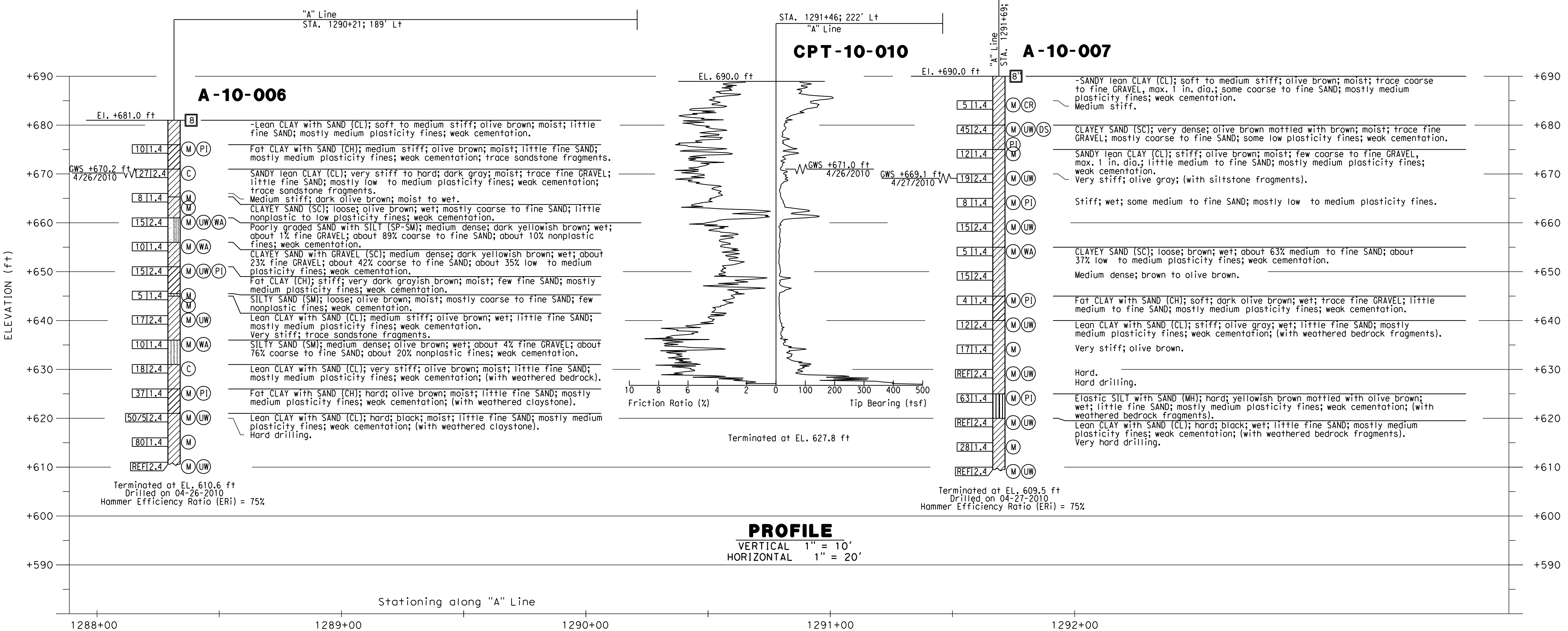
Vertical control is based on Caltrans Benchmark 38-C-74, a standard disk, down 1.2', 63' left of Centerline Baseline relocated 374+85.00. Elev = 1298.37 feet 1929 NGVD, 1978 Adjustment, dated Dec 1990.

NOTES:

(1) This LOTB sheet was prepared in accordance with the Caltrans Soil and Rock Logging, Classification and Presentation Manual (June 2007).
(2) 2.4" samples were taken using a California Modified Sampler.
(3) An automatic trip hammer system consisting of a hammer weight of 140 lbs falling a distance of 30" was used to advance the drive sampler.
(4) Conversion factor from 2.4" Modified California Ring Sampler blowcounts to Standard Penetration Test (SPT) blowcounts is 0.5.



PLAN
1" = 100'



PROFILE
VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

X DESIGN OVERSIGHT	DRAWN BY	J.Fang	R.Jie FIELD INVESTIGATION BY:
X SIGN OFF DATE	CHECKED BY	L. Cheang	DATE: 4/26/2010 and 4/27/2010

PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

S. Pirathiviraj
PROJECT ENGINEER

BRIDGE NO. -
POST MILES R23.87-R24.48

GRAND AVENUE WB ON-RAMP RETAINING WALL
LOG OF TEST BORINGS NO. 2 OF 2

OGS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 06-01-09)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 07
EA 255100

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES

SHEET X OF X

FILE => $REQUEST

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

BENCH MARK

Horizontal control is based on Caltrans GPS points 1001 and 1002 from TLI Control project done Jan 2000.

Coordinates shown are based on the California Coordinate System (CCS83) Zone 5, 1983 NAD (1992.88 EPOCH).

Vertical control is based on Caltrans Benchmark 38-C-74, a standard disk, down 1.2', 63' left of Centerline Baseline relocated 374+85.00. Elev = 1298.37 feet 1929 NGVD, 1978 Adjustment, dated Dec 1990.

NOTES:

(1) This LOTB sheet was prepared in accordance with the Caltrans Soil and Rock Logging, Classification and Presentation Manual (June 2007).
(2) 2.4" samples were taken using a California Modified Sampler.
(3) An automatic trip hammer system consisting of a hammer weight of 140 lbs falling a distance of 30" was used to advance the drive sampler.
(4) Conversion factor from 2.4" Modified California Ring Sampler blowcounts to Standard Penetration Test (SPT) blowcounts is 0.5.

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO	TOTAL SHEETS
07	LA	60	R23.87-R24.48		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER NO. - EXP. - CIVIL STATE OF CALIFORNIA

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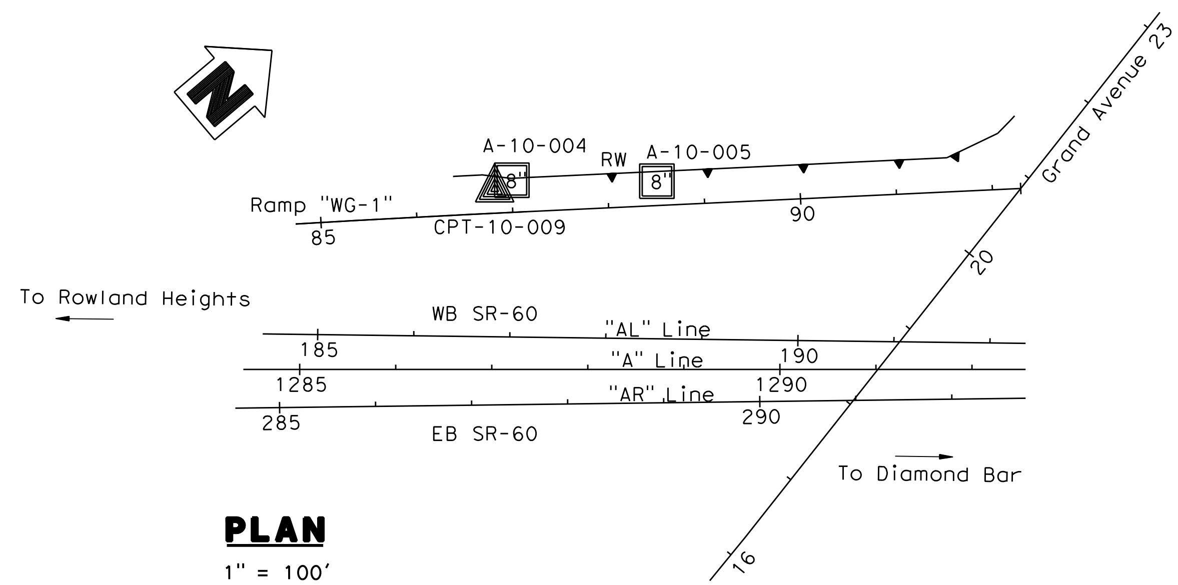
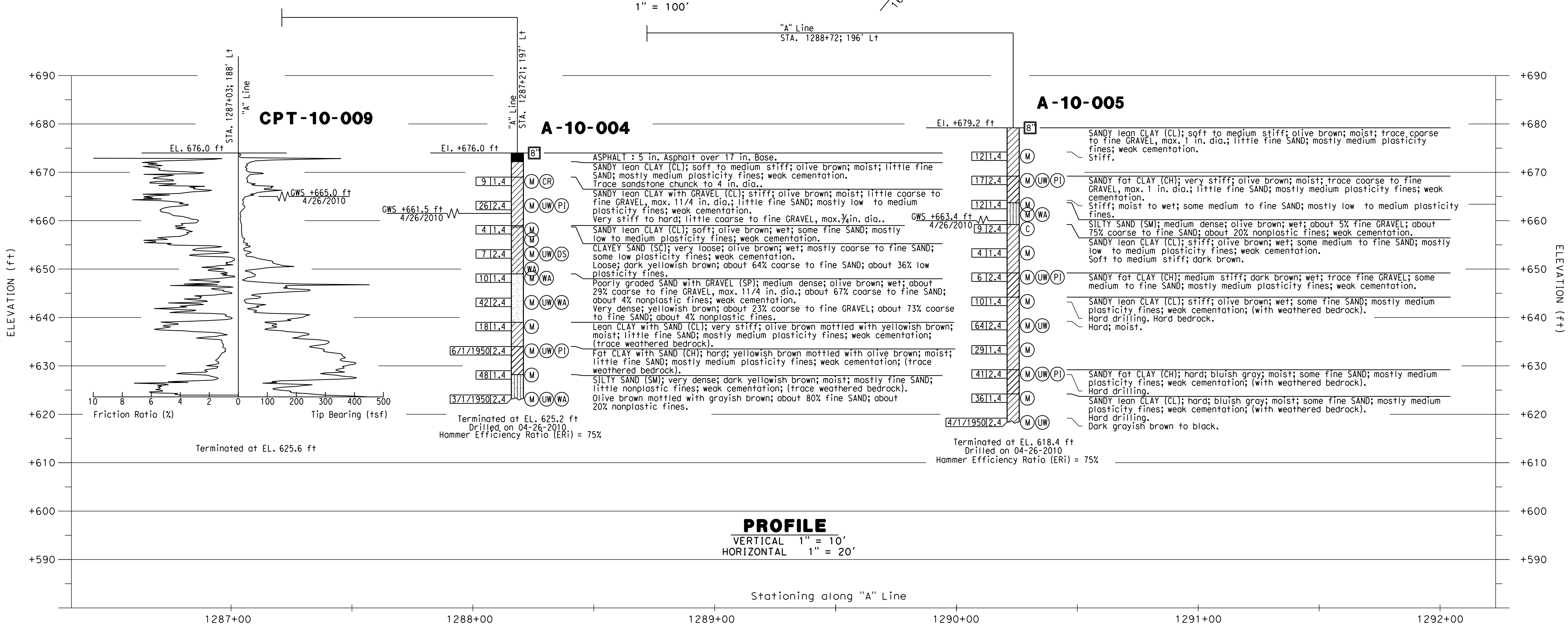
CITY OF INDUSTRY
15625 EAST STAFFORD STREET
INDUSTRY, CA 91744

EARTH MECHANICS, INC.
17800, NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708



PLAN

1" = 100'



PROFILE

VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

X DESIGN OVERSIGHT	DRAWN BY	J.Fang	R.Jie FIELD INVESTIGATION BY:	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	S. Pirathiviraj PROJECT ENGINEER	BRIDGE NO. -	GRAND AVENUE WB ON-RAMP RETAINING WALL
X SIGN OFF DATE	CHECKED BY	L. Cheang	DATE: 2/19/2010 and 3/2/2010			POST MILES R23.87-R24.48	LOG OF TEST BORINGS NO. 1 OF 2

OGS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 06-01-09)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 07
EA 255100

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES

SHEET X OF X

FILE => $REQUEST

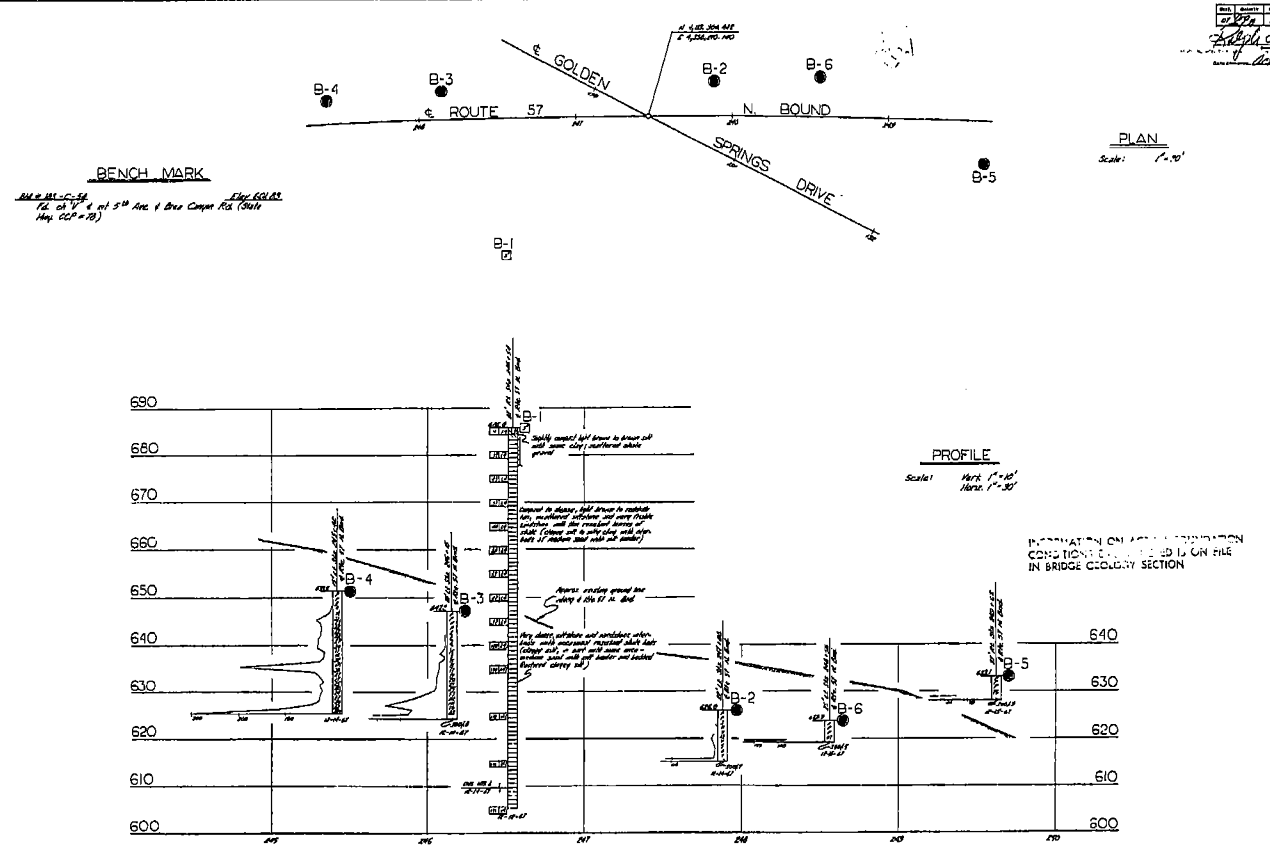
USERNAME => $USER DATE PLOTTED => $DATE TIME PLOTTED => $TIME

APPENDIX B

As-Built Log-Of-Test-Boring (LOTB) Sheets

GOLDEN SPRING DRIVE UNDECROSSING

(Bridge No. 53-2149R)



AS BUILT PLANS
Contract No. 07-036204
Date Completed 10-72
Document No. 6046

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

GOLDEN SPRINGS DRIVE
UNDERCROSSING

LOG OF TEST BORINGS

Sheet 11 of 11

BRIDGE DEPARTMENT
ENGINEERING GEOLOGY SECTION

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

LEGEND OF EARTH MATERIALS

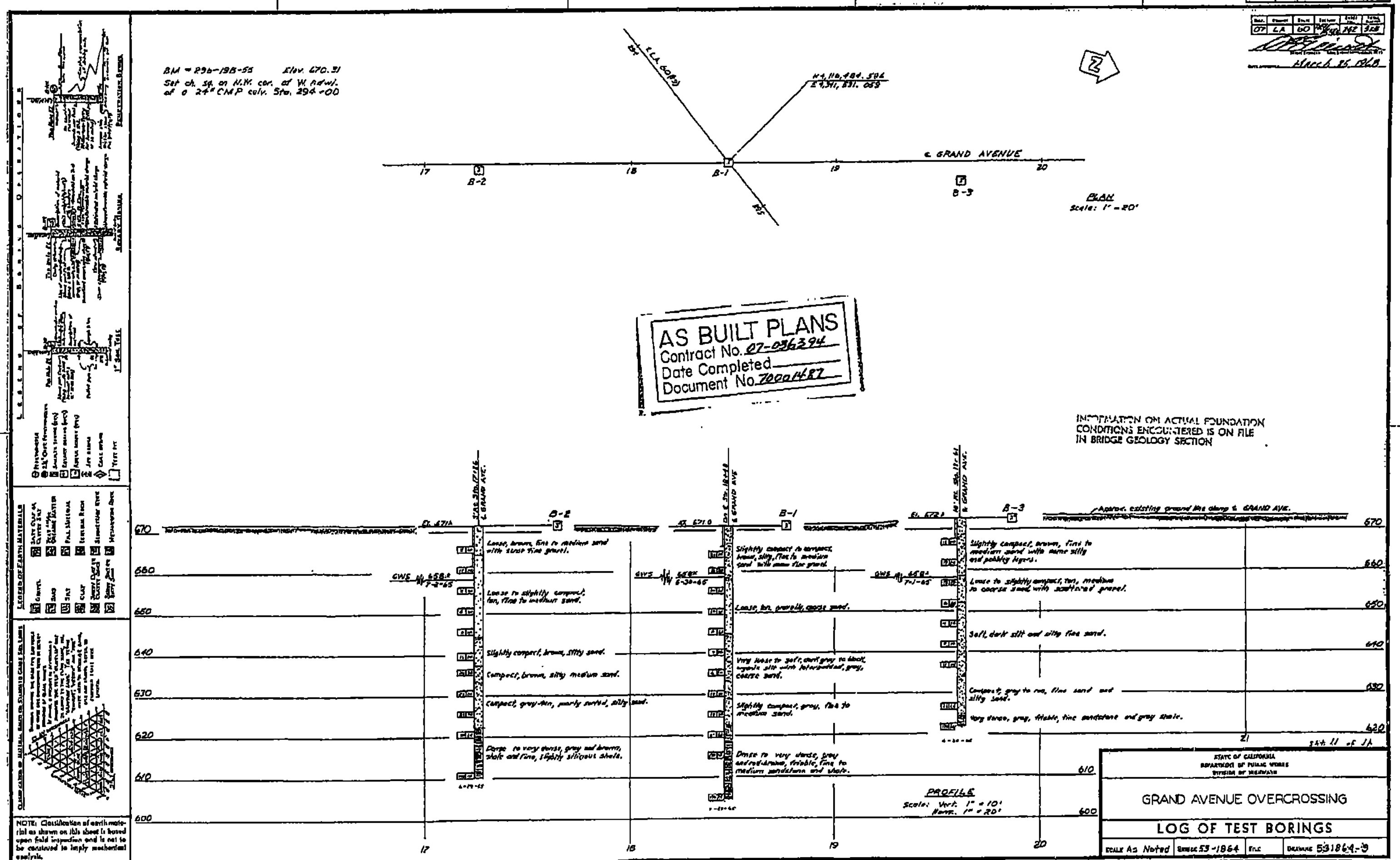
LEGEND OF BORING OPERATIONS

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

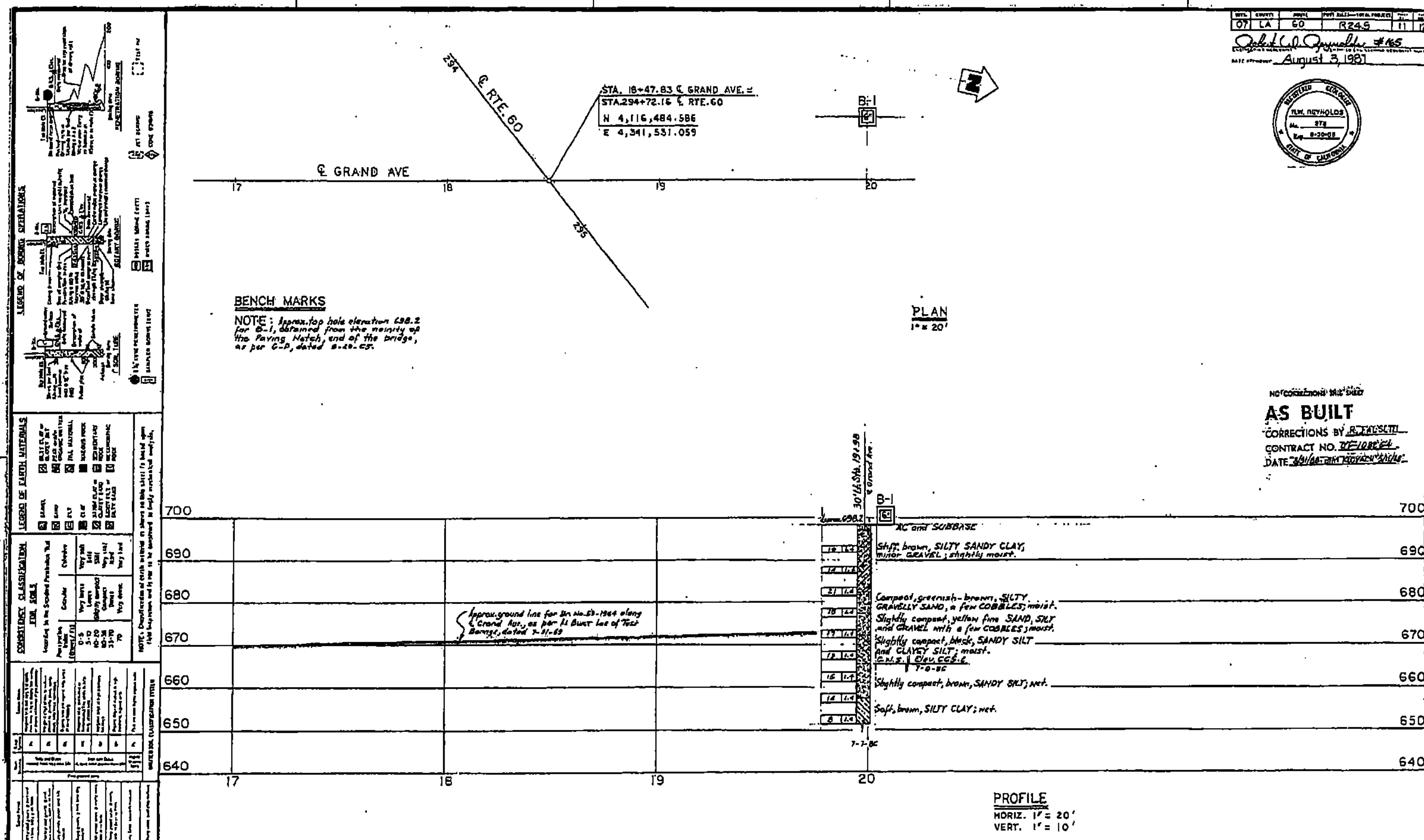
273

GRAND AVENUE OVERCROSSING

(Bridge No. 53-1864)



BM = 296-198-55 Elev. 670.31
Set ch. sq. on N.W. cor. of W. hdwl. of a 24" CMP culv. Sta. 294+00
GRAND AVENUE
PLAN
Scale: 1" = 20'
AS BUILT PLANS
Contract No. 07-036394
Date Completed
Document No. 70001487
INFORMATION ON ACTUAL FOUNDATION CONDITIONS ENCOUNTERED IS ON FILE IN BRIDGE GEOLOGY SECTION
B-1
B-2
B-3
PROFILE
Scale: Vert. 1" = 10'
Horiz. 1" = 20'
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS
GRAND AVENUE OVERCROSSING
LOG OF TEST BORINGS
SCALE As Noted
BRIDGE DEPARTMENT
ENGINEERING GEOLOGY SECTION
LEGEND OF EARTH MATERIALS
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.
252



GEOTECHNICAL BRANCH - TRANSPORTATION LABORATORY

DRAWN BY: VICTOR SESTORAS, 10-22-86

CHECKED BY: CHRIS BRACE 11-10-86

State of CALIFORNIA
DEPARTMENT OF TRANSPORTATION

STRUCTURES - DESIGN

BRIDGE NO. 53-1864

POST MILE 24.5

CU 07207
WO 108261

GRAND AVENUE OVERCROSSING/WINGWALL REPAIR

LOG OF TEST BORINGS 1

SHEET 5 OF 6

AS BUILT PLANS
Contract No. 07-108264
Date Completed: 3-31-88
Document No.

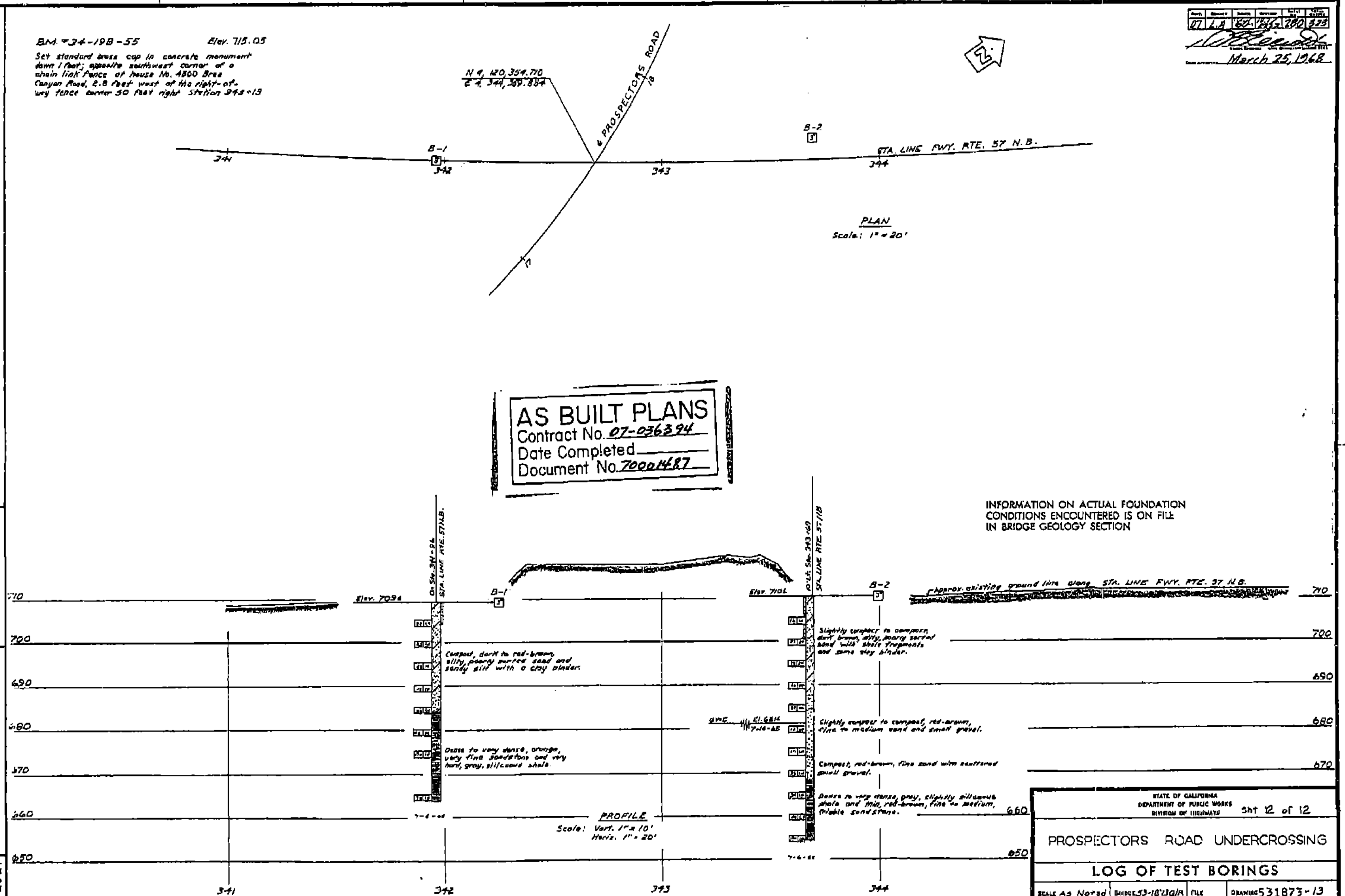
29X

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

9-29-88

E60/N57 CONNECTOR OVERCROSSING

(Bridge No. 53-1873G)



STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

Sht 12 of 12

PROSPECTORS ROAD UNDERCROSSING

LOG OF TEST BORINGS

SCALE As Noted | BRIDGE 53-1873 G/R | FILE | DRAWING 531873-13

PREL. DRAWING No. PR-

Charge: 0721E
W.A.: 044301

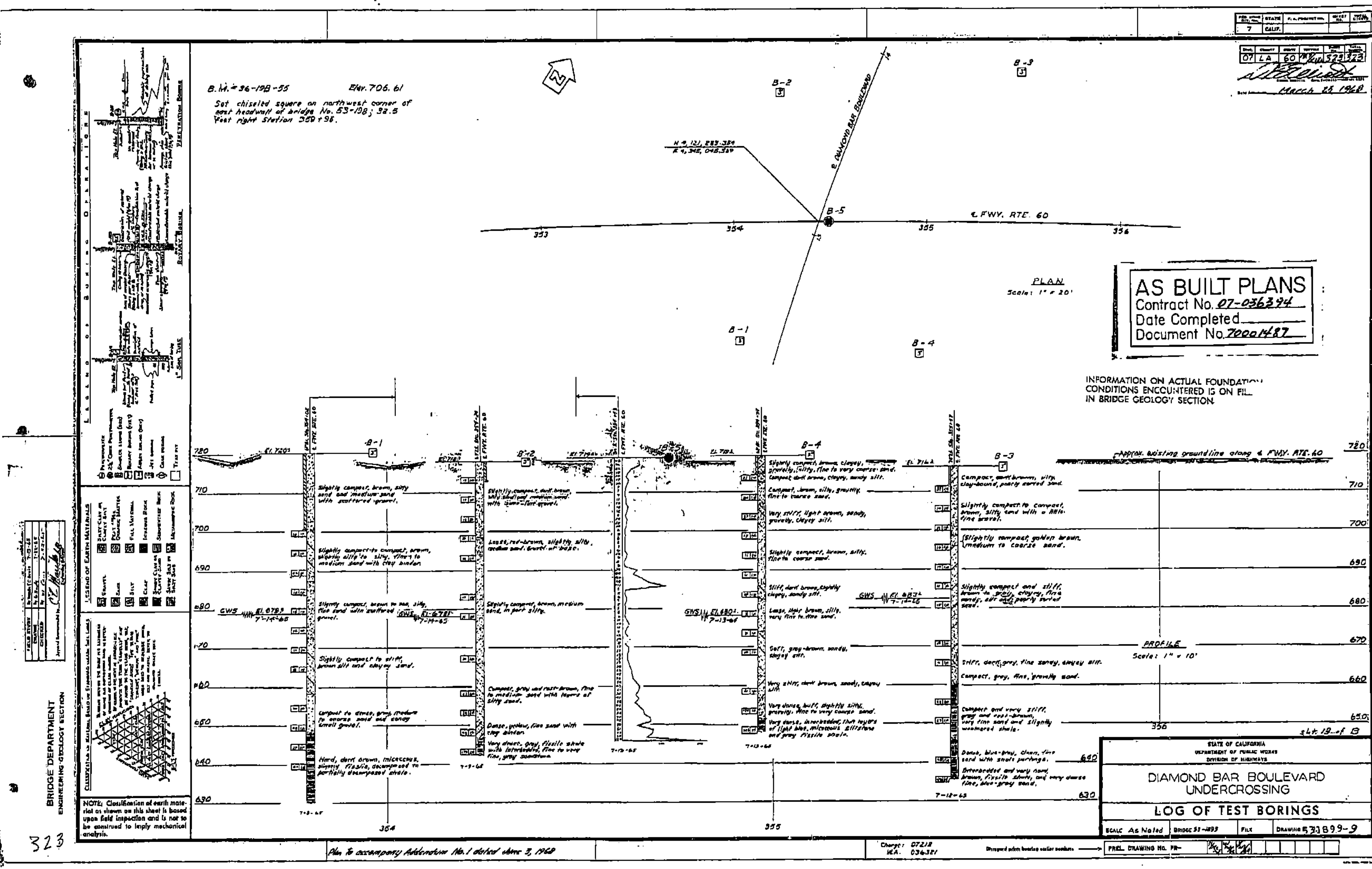
BRIDGE DEPARTMENT
ENGINEERING GEOLOGY SECTION

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

280

DIAMOND BAR BOULEVARD UNDERCROSSING

(Bridge No. 53-1899)


B.M. # 36-19B-55 Elev. 706.61
Set chiseled square on northwest corner of east headwall of bridge No. 53-19B; 32.5 feet right Station 359+96.
B-1
B-2
B-3
B-4
B-5
℄ FWY. RTE. 60
℄ DIAMOND BAR BOULEVARD
353
354
355
356
PLAN
Scale: 1" = 20'
AS BUILT PLANS
Contract No. 07-036394
Date Completed
Document No. 70001487
INFORMATION ON ACTUAL FOUNDATION CONDITIONS ENCOUNTERED IS ON FILE IN BRIDGE GEOLOGY SECTION.
Approx. existing groundline along ℄ FWY. RTE. 60
PROFILE
Scale: 1" = 10'
720
710
700
690
680
670
660
650
640
630
GWS
March 28, 1968
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS
DIAMOND BAR BOULEVARD UNDERCROSSING
LOG OF TEST BORINGS
SCALE As Noted
BRIDGE 53-1893
DRAWING 53B899-9
BRIDGE DEPARTMENT
ENGINEERING GEOLOGY SECTION
LEGEND OF EARTH MATERIALS
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.
Plan to accompany Addendum No. 1 dated June 3, 1968
Charge: 07218
W.A. 036321
PREL. DRAWING No. PR-
323

RETAING WALL 386, 390 AND 392

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
07	LA	57,60	R5.2/R7.3, R36.1/R40.0	464	863

REGISTERED CIVIL ENGINEER 4-11-02 DATE

12-2-02
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER Javad Ehsan No. 47251 Exp. 12-31-03 CIVIL STATE OF CALIFORNIA

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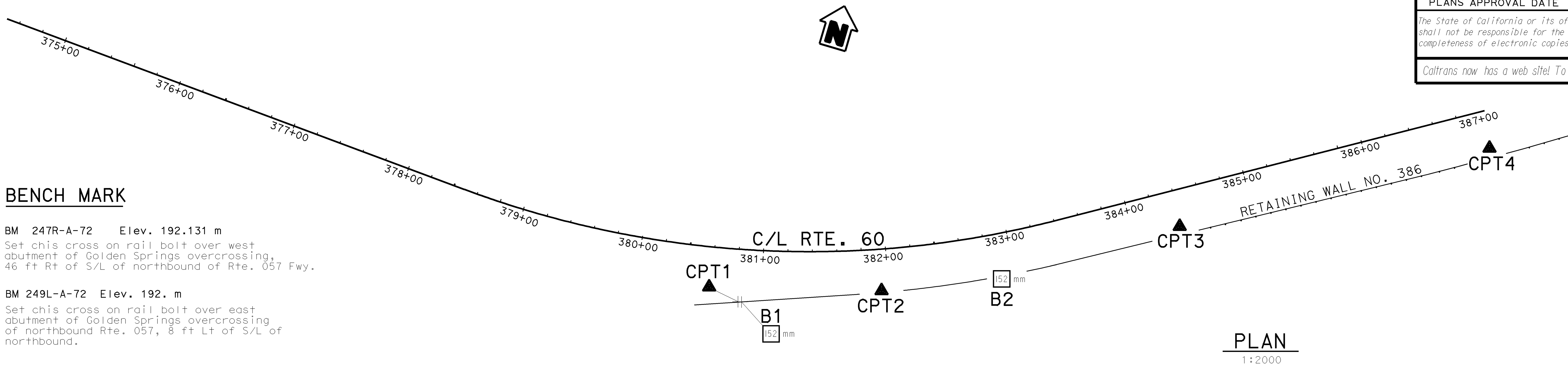


PLAN
1:2000

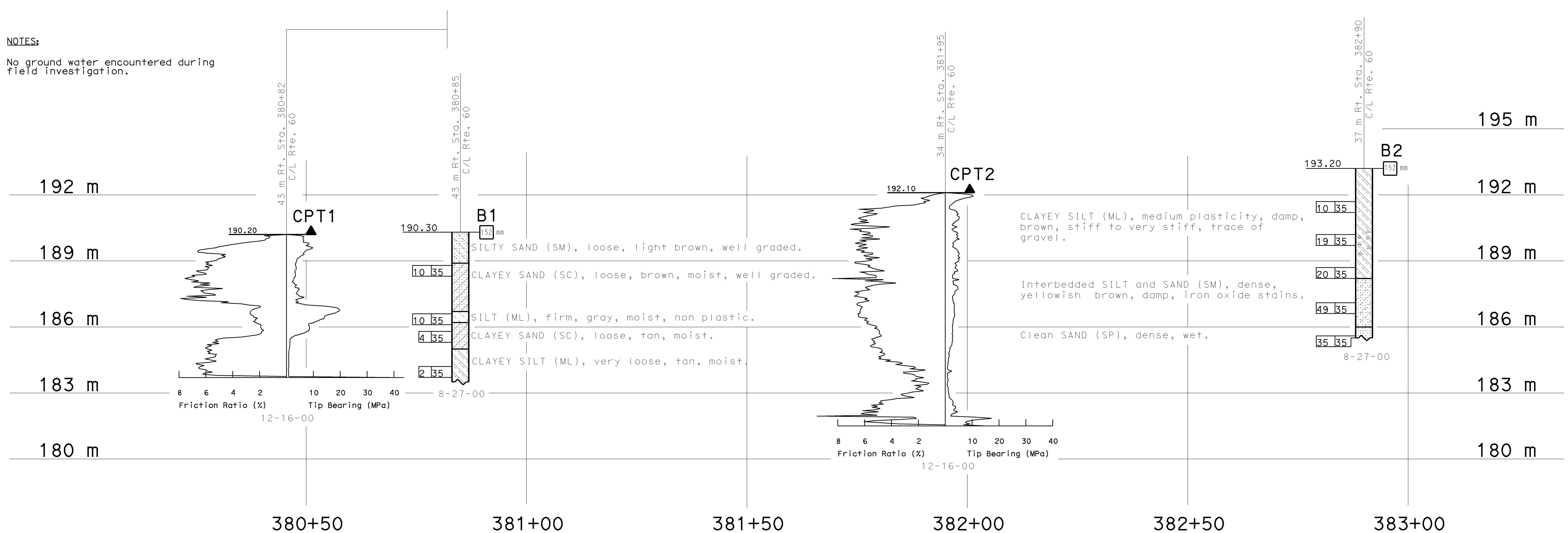
BENCH MARK

BM 247R-A-72 Elev. 192.131 m
Set chis cross on rail bolt over west abutment of Golden Springs overcrossing, 46 ft Rt of S/L of northbound of Rte. 057 Fwy.

BM 249L-A-72 Elev. 192. m
Set chis cross on rail bolt over east abutment of Golden Springs overcrossing of northbound Rte. 057, 8 ft Lt of S/L of northbound.

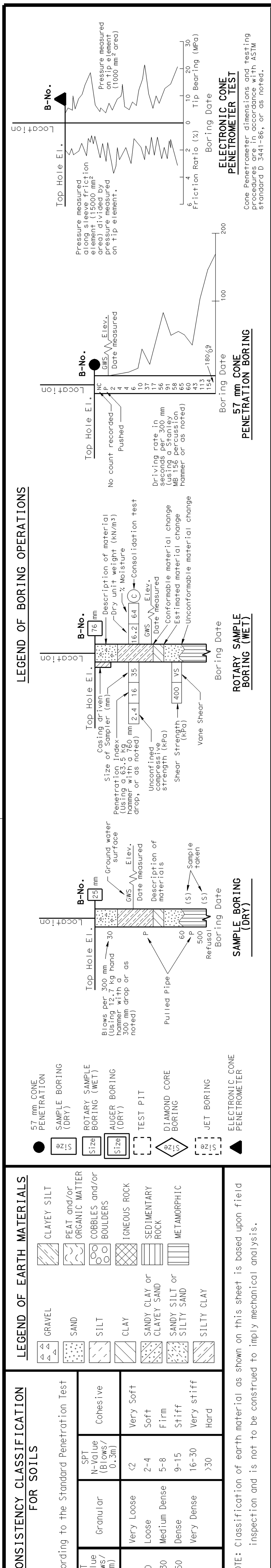
NOTES:

No ground water encountered during field investigation.



R-27

PROFILE
HOR. 1:500
VER. 1:100



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.

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	FIELD INVESTIGATION BY:	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF STRUCTURES STRUCTURE DESIGN	BRIDGE NO.	RETAINING WALL 386
DRAWN BY	W.Tang 5/01		V. Khotan			KILOMETER POST	LOG OF TEST BORINGS 1 OF 2
CHECKED BY	V. Khotan 6/01						

OGS CIVIL LOG OF TEST BORINGS SHEET (METRIC) (REV. 328/01)

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

CU 07226
EA 1257U1

DISREGARD PRINTS BEARING EARLIER REVISION DATES 6-18-01

REVISION DATES (PRELIMINARY STAGE ONLY) SHEET OF

FILE => 71257uq027.dgn

USERNAME => trmartin DATE PLOTTED => 04-DEC-2002 TIME PLOTTED => 16:04

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
07	LA	57,60	R5.2/R7.3, R36.1/R40.0	465	863

Caltrans Metric

REGISTERED CIVIL ENGINEER 4-11-02 DATE

12-2-02
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER Javad Ehsan No. 47251 Exp. 12-31-03 CIVIL STATE OF CALIFORNIA

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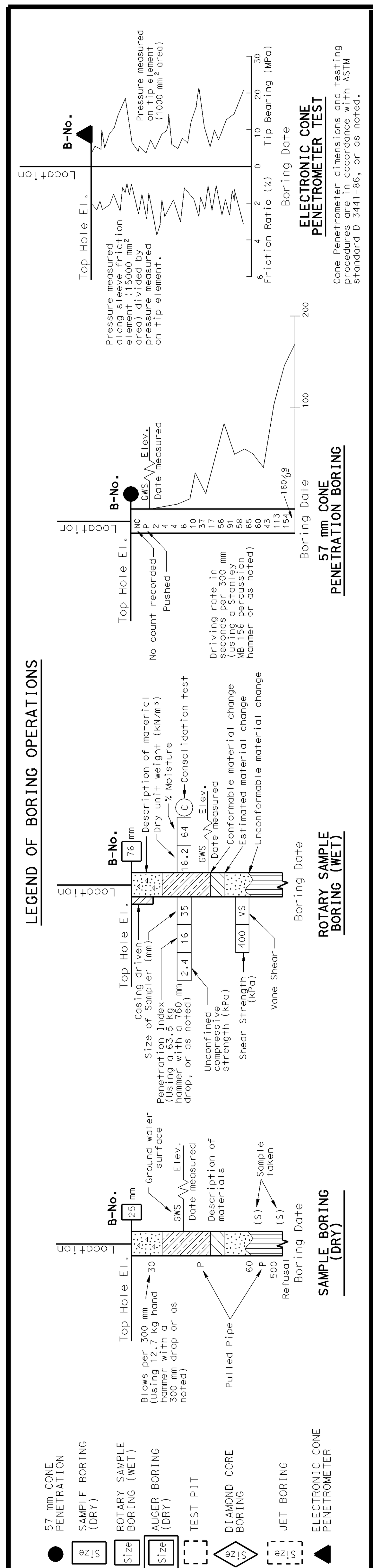
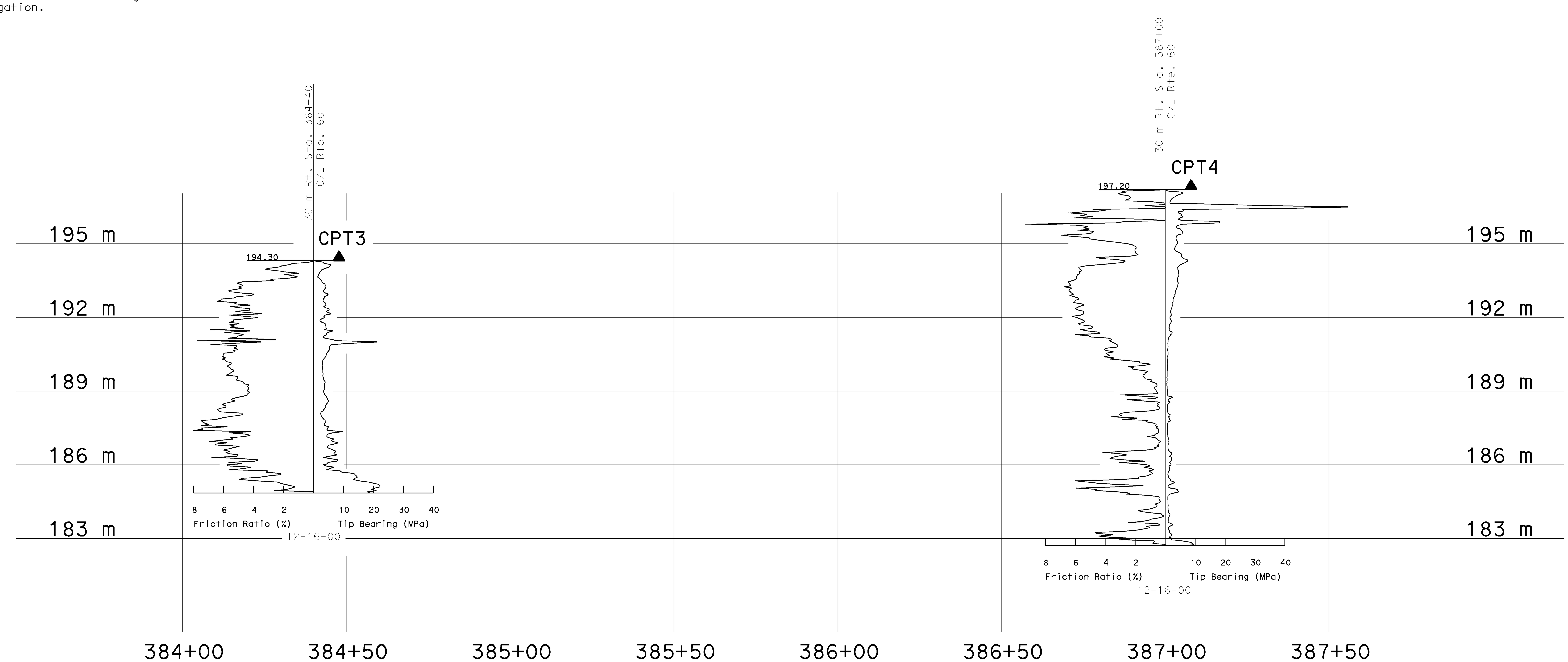


NOTE: Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.

FOR PLAN VIEW, SEE
"LOG OF TEST BORINGS" 1 OF 2

Note:
No ground water encountered during field investigation.



R-28

PROFILE
HOR. 1:750
VER. 1:100

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	FIELD INVESTIGATION BY:	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF STRUCTURES STRUCTURE DESIGN	BRIDGE NO.	RETAINING WALL 386
DRAWN BY W.Tang 5/01		V. Khotan			KILOMETER POST	LOG OF TEST BORINGS 2 OF 2
CHECKED BY V. Khotan 6/01						

OGS CIVIL LOG OF TEST BORINGS SHEET (METRIC) (REV. 328/01)

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

CU 07226
EA 1257U1

DISREGARD PRINTS BEARING EARLIER REVISION DATES 6-18-01

REVISION DATES (PRELIMINARY STAGE ONLY) SHEET OF

FILE => 71257uq028.dgn

USERNAME => trmartin DATE PLOTTED => 04-DEC-2002 TIME PLOTTED => 16:05

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
07	LA	57,60	R5.2/R7.3, R36.1/R40.0	469	863

REGISTERED CIVIL ENGINEER 4-11-02 DATE

12-2-02
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER Javad Ehsan No. 47251 Exp. 12-31-03 CIVIL STATE OF CALIFORNIA

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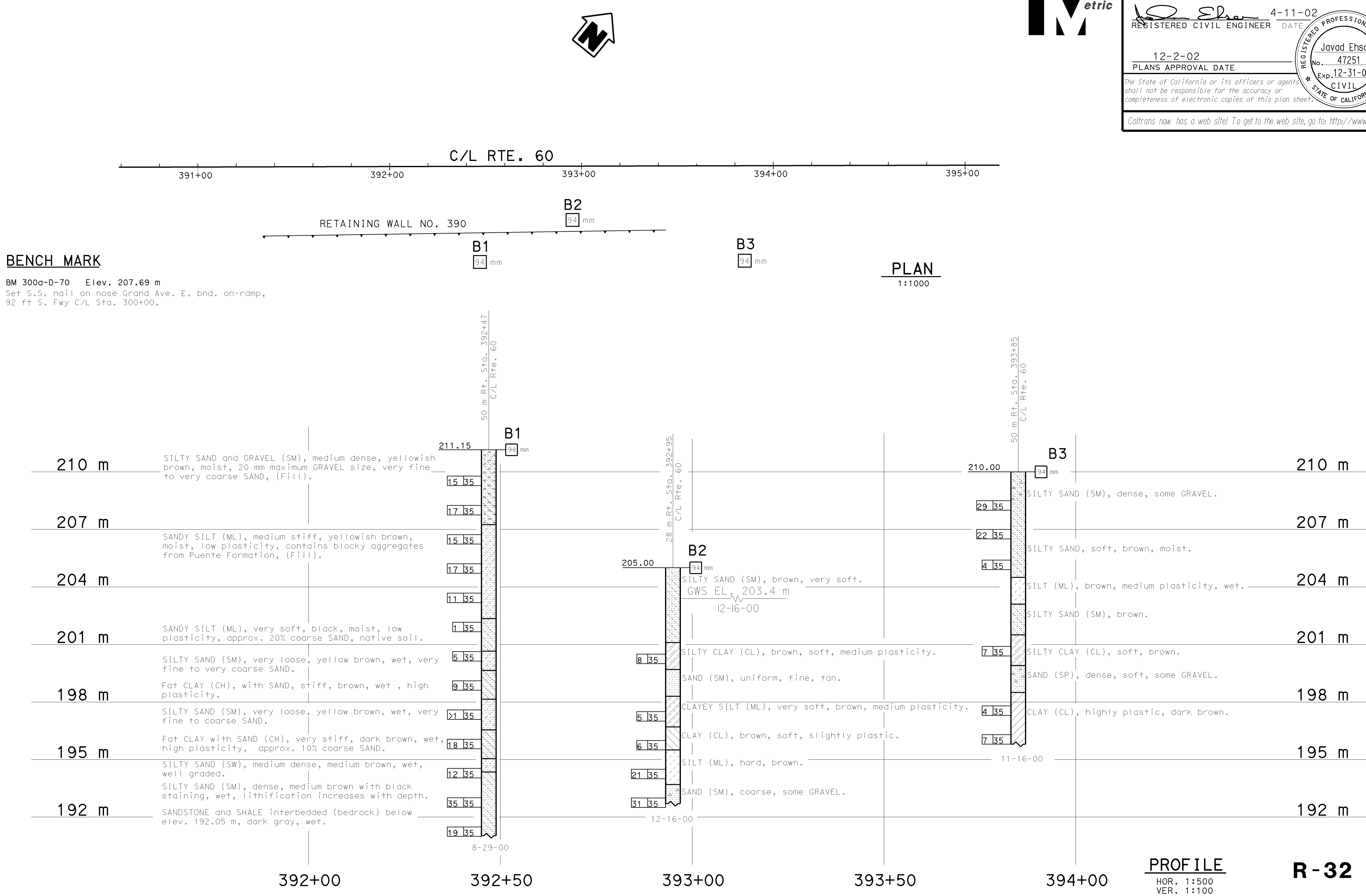
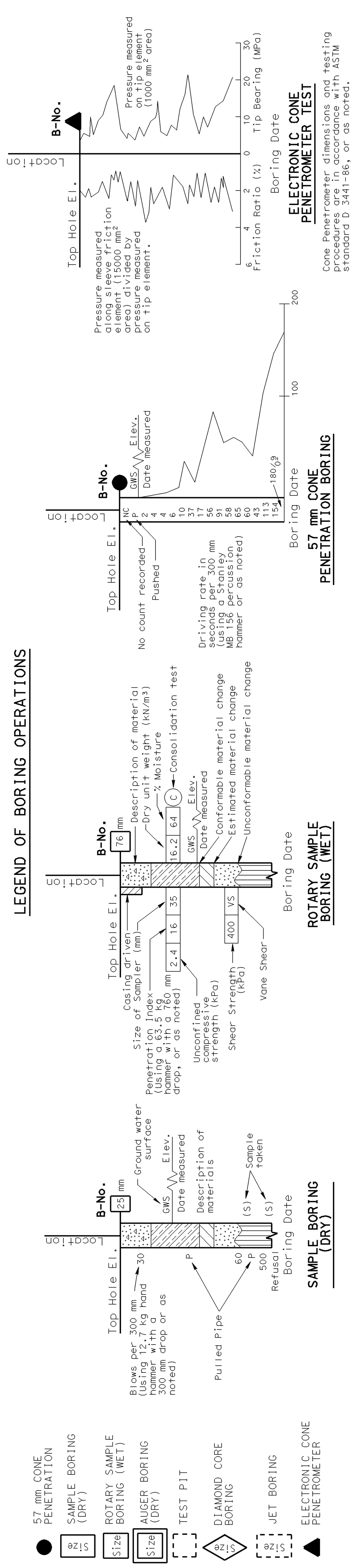


R-32



LEGEND OF EARTH MATERIALS

GRAVEL, SAND, SILT, CLAY, SANDY CLAY or CLAYEY SAND, SANDY SILT or SILTY SAND, SILTY CLAY, CLAYEY SILT, PEAT and/or ORGANIC MATTER, COBBLES and/or BOULDERS, IGNEOUS ROCK, SEDIMENTARY ROCK, METAMORPHIC

CONSISTENCY CLASSIFICATION FOR SOILS

According to the Standard Penetration Test

Granular: SPT N-Value (Blows/0.3m)	Granular	Cohesive: SPT N-Value (Blows/0.3m)	Cohesive
0-4	Very Loose	<2	Very Soft
5-10	Loose	2-4	Soft
11-30	Medium Dense	5-8	Firm
31-50	Dense	9-15	Stiff
>50	Very Dense	16-30	Very Stiff
		>30	Hard

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.

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	FIELD INVESTIGATION BY:	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF STRUCTURES STRUCTURE DESIGN	BRIDGE NO. / KILOMETER POST	RETAINING WALL 390 LOG OF TEST BORINGS
DRAWN BY	W.Tang 6/01	V. Khotan				
CHECKED BY	V. Khotan 6/01					

OGS CIVIL LOG OF TEST BORINGS SHEET (METRIC) (REV. 328/01)

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

CU 07226
EA 1257U1

DISREGARD PRINTS BEARING EARLIER REVISION DATES → 6-18-01

REVISION DATES (PRELIMINARY STAGE ONLY) SHEET OF

FILE => 71257uq032.dgn

USERNAME => trmartin DATE PLOTTED => 04-DEC-2002 TIME PLOTTED => 16:06

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
07	LA	57,60	R5.2/R7.3, R36.1/R40.0	471	863

4-11-02
REGISTERED CIVIL ENGINEER DATE

12-2-02
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER Javad Ehsan No. 47251 Exp. 12-31-03 CIVIL STATE OF CALIFORNIA

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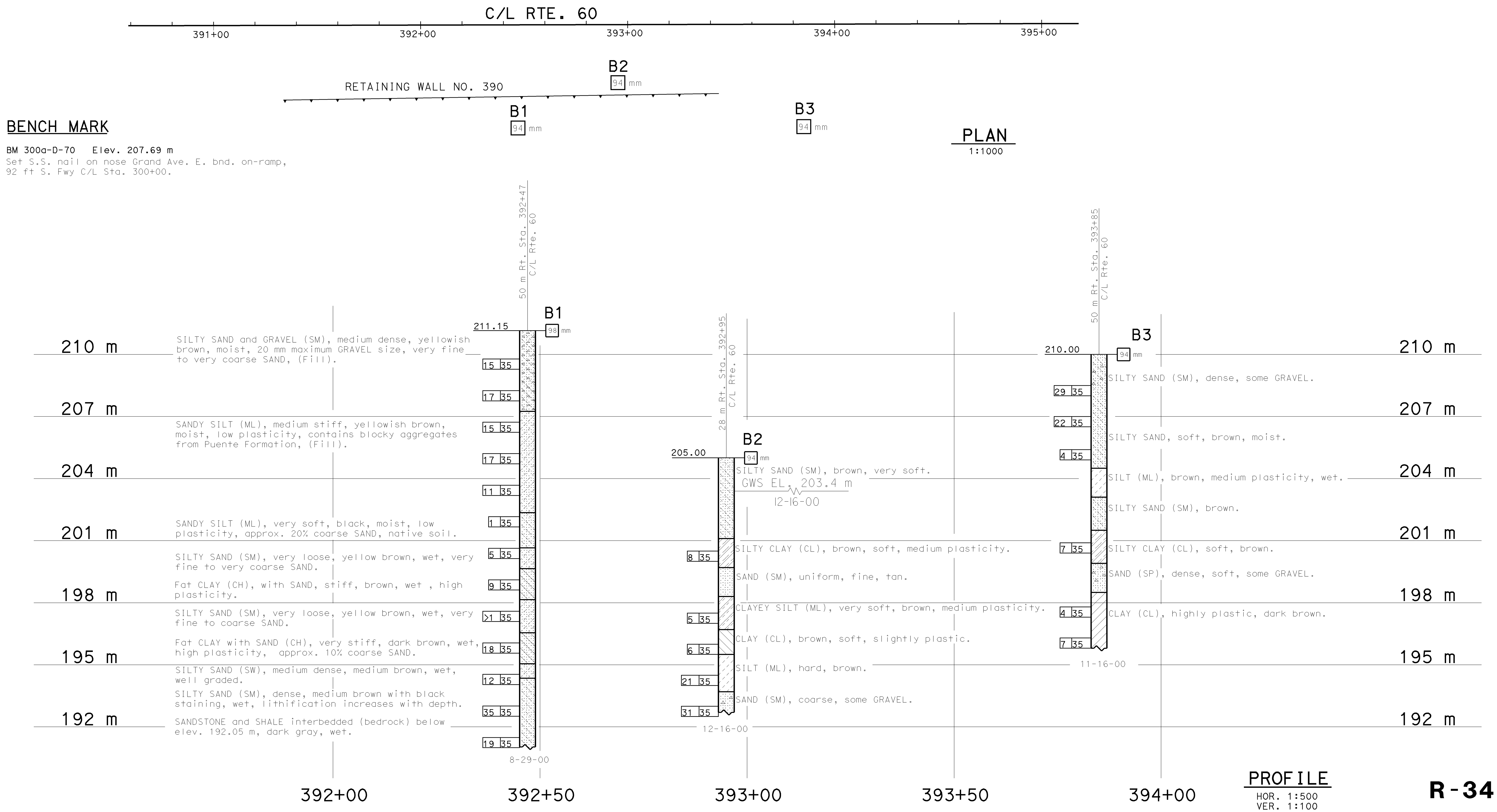
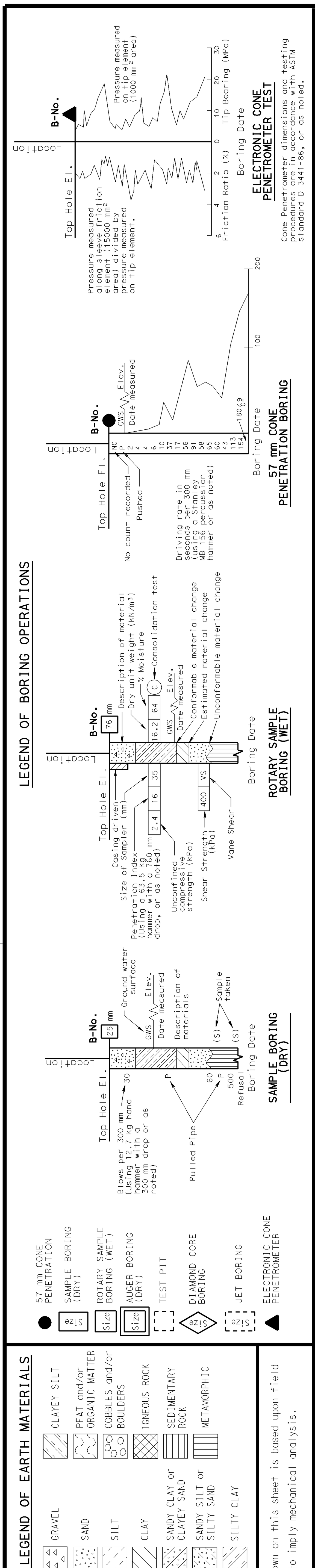
Caltrans Metric



R-34



CONSISTENCY CLASSIFICATION FOR SOILS
According to the Standard Penetration Test

Granular	SPT N-Value (Blows/0.3m)	Cohesive	SPT N-Value (Blows/0.3m)
Very Loose	0-4	Very Soft	<2
Loose	5-10	Soft	2-4
Medium Dense	11-30	Firm	5-8
Dense	31-50	Stiff	9-15
Very Dense	>50	Very Stiff	16-30
		Hard	>30

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.

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	FIELD INVESTIGATION BY:	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF STRUCTURES STRUCTURE DESIGN	BRIDGE NO.	RETAINING WALL 392
DRAWN BY W.Tang 6/01		V. Khotan			KILOMETER POST	LOG OF TEST BORINGS
CHECKED BY V. Khotan 6/01						

OGS CIVIL LOG OF TEST BORINGS SHEET (METRIC) (REV. 328/01)

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

CU 07226
EA 1257U1

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY) 6-18-01 SHEET OF

FILE => 71257uq034.dgn

USERNAME => trmartin DATE PLOTTED => 04-DEC-2002 TIME PLOTTED => 16:03