FOR CONTRACT NO.: 04-294934

INFORMATION HANDOUT

MATERIALS INFORMATION

SITE INVESTIGATION REPORT

GEOTECHNICAL DESIGN REPORTS

FOUNDATION REPORT FOR OVERHEAD SIGNS – CMS, EMS, AND TRAFFIC SIGNAL POLES, PORTALS 1 AND 2

ROUTE: 04-Ala-24-R8.8

State of California
DEPARTMENT OF TRANSPORTATION

Business, Transportation and Housing Agency

Memorandum

Flex your power!
Be energy efficient!

To: MR. VINCE BONNER
District Branch Chief
Design - Contra Costa

Date: July 28, 2008

Attention: Dennis Ocampo

File: 04-ALA-24 PM 5.3/6.2
(KP 8.5/10.0
04-CC-24 PM 0.01/1.3
(KP 0.0/2.1)
04–294901
Caldecott 4th Bore, Signal Poles
CMS & EMS Foundations

From: MAHMOOD MOMENZADEH, PE, GE
Chief, Branch C
Office of Geotechnical Design – West
Geotechnical Services
Division of Engineering Services

Subject : Foundation Report for Overhead Signs-CMS, EMS, and Traffic Signal Poles, Portals 1 and 2

This memorandum presents our geotechnical recommendations for the traffic signal poles, CCTV, and Type 500 CMS foundation design and construction.

1. PROPOSED FACILITIES

Based on the information provided to us by District 4 Design on November 2007, and March 2008 the proposed facilities are located along SR 24 at or near the east portal (Locations 1 through 5) and along Highway 13 off ramp (Location 6) and at the intersection of Broadway and Kay overcrossing, OC, (Location 7) near west portal of the Caldecott Tunnel. The proposed signs at Locations 1 through 5 include one traffic signal pole and one CCTV poles near "2N" Line Station 117+70, one traffic signal near "2M" Line Station 216+80, and four Type 500 CMS or comparable overhead signs including one at the shoulder and one at the median near "A7" Line Station 48+45, one at about A7" Line Station 51+20 and one at about "A7" Line Station 63+90. The CMS at Station 48+45 was changed on April 2008 to an EMS type. For this location, the recommendations are given for both CMS and EMS alternatives.

The Locations 1 through 7 for the proposed CMS/EMS and traffic signal poles are shown on the plans attached to this report.

2. REGIONAL GEOLOGY AND SEISMICITY

The project lies in the Coast Ranges Geomorphic Province of California (see the attached Geological Map). The Caldecott Tunnel is located on the western margin of the East Bay Hills, a transition between the northern and southern Coast Ranges of California. The terrain of the project area is controlled by the interaction of splays of the San Andreas Fault System.

The East Bay Hills consist of faulted and folded strata ranging from Cretaceous to Pliocene in age. This packet or block of strata is bounded on the east by the Calaveras Fault and on the west by the Hayward Fault. Both faults are primary members of the San Andreas Fault System and are primarily right-lateral slip faults. The East Bay Hills are the result of the interaction between the Hayward and the Calaveras Faults as well as the small amount of compressional component typically found within the larger regional system.

The project area lies within the seismically active San Francisco Bay Region and is crossed by mapped traces of the Hayward Fault in at least two locations. The three major active faults in the region, the San Andreas, the Calaveras, and the Hayward, all have the potential for magnitude 7.5 or greater earthquakes.

3. SITE GEOLOGY AND SEISMICITY

Locations #1 and 2

Sign foundation Locations #1 and #2 are proposed near the existing east portal of Caldecott Bore #3 at Line “2N” Station 11+70 and “2M” Station 216+80, respectively. Foundation materials at this location consist of the Orinda Formation. The Orinda Formation consists of non-marine mudstone, sandstone, and conglomerate moderately thickly bedded to massive. The unit is generally weakly cemented and moderately soft; however, it can be locally well cemented and hard.

The table below lists the active faults near the project area and the peak ground accelerations that could be expected from a maximum credible earthquake from each of these faults at Location #1.

FAULT	Distance from project	Maximum Credible Earthquake	Peak Ground Acceleration
San Andreas	31.4 km	8.0	0.31 g
Hayward	2.4 km	7.5	0.65 g
Calaveras	13.6 km	7.5	0.37 g

Location #3

Proposed foundation Location #3 is located east of the Gateway Blvd. overcrossing along westbound Route 24 at about Line "A7" Station 63+90. The foundation material is comprised of Moraga Formation volcanic and interbedded sedimentary rocks as in proposed sign Location #3. However, based on the topography of the proposed sign location, the area is underlain by a relatively thick fill material placed during road construction. The proposed sign location is adjacent to a swale in the south-facing slope that was partially filled, leaving a drainage depression along the highway.

The Table below lists the active faults near the project area and the peak ground accelerations that could be expected from a maximum credible earthquake from each of these faults at Location #4.

FAULT	**Distance from project**	**Maximum Credible Earthquake**	**Peak Ground Acceleration**
San Andreas	34.1 km	8.0	0.28 g
Hayward	5.1 km	7.5	0.56 g
Calaveras	10.9 km	7.5	0.40 g

Location #4

Foundation Location #4 is located at Line "A7" Station 51+20, west of the Gateway Blvd. overcrossing along westbound Route 24. The geology at this location consists of basaltic to andesitic volcanic flows, agglomerates, and tuffs of the Moraga Formation. Beds dip steeply to the east and the formation is moderately weathered and fractured. Thick interbeds of sedimentary rocks within the formation consist of material similar to that of the Orinda Formation to the west.

The table below lists the active faults near the project area and the peak ground accelerations that could be expected from a maximum credible earthquake from each of these faults at Location #3.

FAULT	Distance from project	Maximum Credible Earthquake	Peak Ground Acceleration
San Andreas	32.1 km	8.0	0.30 g
Hayward	3.1 km	7.5	0.63 g
Calaveras	12.9 km	7.5	0.38 g

Location #5

Sign foundation #5 is proposed near the on-ramp from Fish Ranch Road to westbound Route 24 at Line "A7" Station 48+45 and is also in the Orinda Formation (see Location #1 above).

The Table below lists the active faults near the project area and the peak ground accelerations that could be expected from a maximum credible earthquake from each of these faults at Location #2.

FAULT	Distance from project	Maximum Credible Earthquake	Peak Ground Acceleration
San Andreas	31.7 km	8.0	0.31 g
Hayward	2.7 km	7.5	0.67 g
Calaveras	13.3 km	7.5	0.37 g

Location #6

Sign Location #6 is proposed for the shoulder of westbound Route 24 at Sta. 53+40 (A4 line) approximately 920 m west of the west portal of Caldecott Bore #3. Foundation materials at this location consist of fill of unknown thickness overlying Franciscan Greenstone.

A geologic map of the area indicates the site to contain Jurassic Volcanics (quartz keratophyre)(Graymer, *et al,* 1995). The proximity of the Hayward Fault has juxtaposed a variety of rock types in the immediate vicinity of the proposed sign foundation. The small scale of the published geologic map does not accurately reflect the highly disrupted blocks of rock at the project location. The results of the geotechnical investigation, including test borings described in Section 5 of this report, provide a more complete picture of the subsurface conditions.

The table below lists the active faults near the project area and the peak ground accelerations that could be expected from a maximum credible earthquake from each of these faults at Location #1.

FAULT	Distance from project	Maximum Credible Earthquake	Peak Ground Acceleration
San Andreas	28 km	8.0	0.34 g
Hayward	0.5 km	7.5	0.71 g
Calaveras	15 km	7.5	0.34 g

Location #7

Sign Location #7 is at the intersection of Broadway and Kay St. OC located to the south of the eastbound shoulder of Route 24, approximately Station 56+25 on line A4. Four signal poles proposed for this intersection are at close spacing to each others and therefore, they are treated here as a single location.

As-built Log of Test Borings (LOTB's) from the Kay St. Overcrossing taken in 1963 indicate this location to be underlain by 4.5 m of fill, described as compact, tan, silty, clayey, fine to medium sand with sandstone fragments to boulder size. Below this is found bedrock described as tan, weathered, micaceous shale interbedded with fine-grained sandstone. SPT blow counts were 22, 23, and 40 blows per foot to a depth of 4.5 m. Four Boreholes drilled at this location revealed specific soil condition at the location of proposed poles as described in Section 5.

The table below lists the active faults near the project area and the peak ground accelerations that could be expected from a maximum credible earthquake from each of these faults at Location #7.

FAULT	Distance from project	Maximum Credible Earthquake	Peak Ground Acceleration
San Andreas	28.4 km	8.0	0.33 g
Hayward	0.9 km	7.5	0.70 g
Calaveras	14.6 km	7.5	0.35 g

4. FIELD INVESTIGATION

A total of 10 borings including 5 borings on the east and 5 borings on the west side of the tunnel were drilled at/near the proposed signals/CMS/EMS at the accessible locations. Borings on the east side were drilled during November and December 2007 and those on the west side of the tunnel during May 2008 by North Star and Taber Drilling, Inc. retained by Geomatrix Consultants Inc. (Geomatrix). The Office of Geotechnical Design West- Branch A and Geomatrix jointly coordinated the fieldwork and scheduled laboratory testing and reporting. The boring included 6 portable vertical minuteman rotary borings SGN1 (Location 1) and SGN2 (Location 2), SIG 1 through 4 (Location 7) and 4 vertical rotary borings SGN3 (Location 3), SGN4 (Location 4), SGN5 (location 5), and SIGN 6 (Location 6) using a truck or track mounted drilling equipment, depending on the access condition. No drilling was conducted for the CMS sign proposed at median at the

Location 5 due to insufficient space and traffic hazard. The minuteman borings SGN1 and SGN2, SIG1, SIG2, SIG3, and SIG4 were drilled to depths of 3.05, 4.5 m, 4.8, 5.03, 5.03, and 5.03 respectively where refusal to further drilling was encountered. The vertical borings SGN3, SGN5, SGN5, and SGN6 advanced to depths of 8.4 m, 7.6 m, 9.2 m, and 10.8 below the existing ground surface, respectively. Sampling by the Standard Penetration Testing (SPT), Modified California Testing (MCAL) and rock coring were conducted in the borings. The penetration blow counts for the last 0.3-m sampler penetration in soil/rock were recorded at depths where SPT or MCAL testing was conducted. The rock coring was performed using triple barrel tube and wire-line system. Details of the fieldwork are included in the Appendix A. Logs of Test Borings (LOTBs) prepared for the borings drilled for this project are also included in the Appendix A.

5. SUBSURFACE SOIL/ROCK AND GROUNDWATER CONDITIONS

Locations 1 and 2

The boring drilled at Locations 1 and 2 encountered the Orinda Formation overlaid by about 0.3 to 0.5 m thickness of a medium stiff sandy clay soil. The Orinda formation generally consists of interbedded claystone/mudstone, siltstone, sandstone, and conglomerate. Moderately hard, moderately strong to strong, moderately weathered Conglomerate was encountered at the Location 1 and soft, friable to weak, moderately to severely weathered, closely fractured silty/sandy Claystone was encountered at the Location 2. The conglomerate are well indurated and well cemented and more resistant to erosion and slaking when exposed to changes in moisture relative to claystone/mudstone and siltstone. The claystone/mudstone and siltstone within the Orinda formation are known for its erodible potential.

Location 3

The boring drilled at this location encountered medium dense and locally dense clayey sandy gravel which became very clayey from about 1.8 m below the existing ground surface (bgs). This layer extended down to the depth of about 5.8 m where sandstone was encountered. Sandy pocket or zones were encountered within the overburden soil at about 4.5 m depth (bgs).

Below the upper overburden soil and soil like material the sandstone encountered was low hardness, friable to weak and locally moderately strong, and moderately weathered.

Location 4

The boring drilled at this location encountered stiff sandy clay to depth of about 4.9 m bgs where sandstone was encountered. This layer includes clasts of hard to friable sandstone of up to 25 mm.

Below the upper overburden soil and soil like material the sandstone encountered was moderately hard to hard, slightly weathered and fractured.

Location 5

The boring drilled at this location encountered fill material consisting of medium dense clayey sand to about depth of 7.3 m bgs. The recorded SPT values were 48 and 85 blow/0.3 m indicating presence of very dense material mostly where it contained clasts of siltstone, claystone, and shale up to about 25 mm and locally about 50 mm in size. This layer became less clayey and more sandy and medium dense at about depth of 4.5 m bgs.

Below the fill, very dense sand with clay and gravel (residual rock) was encountered extending to depth of about 8.8 m where sandstone was encountered. The sandstone encountered was hard, strong and crushed. This boring was converted to a piezometer to about 9.2 m depth bgs.

Location 6

The boring SGN6 drilled at this location encountered stiff to very stiff moist to wet sandy clay locally with gravel to depth of about 7.5 m bgs. This layer contained pieces of black fibrous wood at about 3 m depth and angular clasts of moderately hard siltstone at about 4.5 m depth. Below about 7.5 m depth the sandy clayey material became very stiff to hard and included clasts of friable sandstone up to depth of 10.8 m where the boring was terminated.

Perched groundwater appeared to be at about 2 m depth.

Location 7

The borings SIG1 through SIG4 drilled at this location encountered soil material (possible Fill) . The fill consisted of medium dense clayey sand with variable amount of gravel (crushed rock fragments) extending to the bottom of all these borings. Available LOTBs for Kay Street Bridge indicated large cobbles and boulder sizes at this area. No groundwater was found at the drill depth at the time of the drilling.

Groundwater Condition

Groundwater was encountered at depth of about 1.2 m at the Location 1, 1.8 m at the Location 2, and 6.5 m at the Location 5 during the drilling of these holes, and about 2 m at Location 6. No groundwater was encountered at Locations 3, 4, and 7 at the time of the drilling. The records of the monitored water table depths below the top of the borehole SGN5 (at Location 5) are shown below:

Table 2-Records of Piezometers Reading

YEAR	Date of Reading	PZ-1 M
2008	January 3rd	6.3
2008	February 6	6.2

The groundwater tables at the sites drilled for this study are anticipated to fluctuate with season and amount of annual precipitation and thus can be higher or lower than the observed groundwater levels.

6. LABORATORY TESTS RESULTS AND ROCK STRENGTH

Index testing such as gradation, Atterberg limits were conducted on representative sample of the overburden soil or soil like material encountered at the drilled holes. Unconfined compressive testing (UCS) were conducted on representative samples of rock which were intact enough to be tested. The measured Unconfined Compressive Strength of the rock encountered ranged generally between 90 KPa to 6.5 MPa. The Actual UCS within the anticipated length of the CIDH piles embedment depth could be higher or lower than the measured range. Laboratory test results are in Appendix A.

7. GEOTECHNICAL DESIGN PARAMETERS

Design of the CIDH pile for these posts is governed by their lateral load carrying capacity and load-deflection behavior. We recommend the following geotechnical recommendations for the CIDH pile design in medium dense clayey sand.

- Use Friction Angle (ϕ) =32 Deg., Cohesion (C)= 25 Kpa, Unit Weight (γ)= 23 KN/m3.
  Ultimate Shaft Compression Resistance: 125/kPa (17.5 psi)
  Ultimate Pullout Resistance: 82 kPa (12 psi)

8. FOUNDATION RECOMMENDATIONS

Based on the subsurface soil/rock and groundwater conditions encountered at boreholes drilled near the proposed facilities, we recommend supporting all of the proposed signal posts and CMS on CIDH pile. Pile diameters in accordance with the Caltrans Standard Specifications are recommended. Below are the standard diameter and minimum pile embedment depth recommended:

Signal Posts: Caltrans Standard CIDH pile diameter and embedment depth are sufficient for the signal posts support at the location drilled in this study. See Standard Plans for the minimum required CIDH Pile diameter and embedment depth for each of the designated type of the signal posts proposed.

CCTV Poles: Use CIDH pile foundation diameter of 610 mm (2ft) and minimum pile embedment depth of 2.7 m below the base plate. See Sheet ES-16A of the Standard Plans for the pole type and foundation details.

CMS Posts: The site of all four CMS is underlain by variable thickness of overburden soil/soil like or fill material, which moderately compressible when subject to additional surcharge loading due to anticipated roadway or adjacent slope remedial treatment. Earthwork. Based on correspondence with the Structure Design Specialist, reduction of the pile less than 1.2 m is not feasible due to the current structural details at the pedestal and the pile reinforcement details need reevaluation if the pile diameter reduced from standard size to 1.2 m. Therefore, we recommend using the standard pile diameter of 1525 mm (5ft). We recommend the following embedment depths to ensure a minimum of 0.6 m rock socket of the CIDH piles. Note that the standard minimum pile embedment depth is 6.7 m.

Location #	Pile Size, mm	Pile Embedment Depth, m
3	1525	6.7
4	1525	6.7
5	1525	7.6
6	1525	7.6

EMS Post:

For EMS sign (with Post Type 10NP) alternative at Location 5, we recommend the standard pile diameter of 914 mm but the pile embedment of 5 m.

9. CORROSION

Based on the Caltrans criteria for corrosive site and the results of tests conducted previously for the adjacent walls, the rock at the sites of the proposed poles are not corrosive, However, the clayey sand soil encountered at most of the drilled hole is known to be corrosive. Therefore, we recommend Caltrans standard design requirements for foundation in corrosive site condition be considered.

10. CONSTRUCTION CONSIDERATIONS

- Casing of the drill hole for Location 5 CIDH at the median is mandatory to prevent the impact of the potential caving of the drilled hole on the adjacent roadway except that the traffic is kept at least 1.5 m away from the closest edge of the pile.

- Drilling difficulties are anticipated for CIDH pile installation due to presence of caving soil, weak/friable rock, and locally hard rock and groundwater. The Contractor should use equipment capable of drilling in these conditions to the specified pile depth. Groundwater is anticipated at the drilled holes especially during the rainy season, so wet method of installation most likely is required. At the option of the Contractor, if no caving of a drill hole occurs and the hole remains in dry condition or the groundwater in the hole is minor which can be pumped out before placing the concrete, dry method of installation may be used.

- Contractor is responsible to select and use suitable equipment for all earthworks including excavation, drilling holes for piles, etc required for this project. Data presented on the strength and fracturing of the rock, LOTBs and other related information should be carefully reviewed and utilized by the Contractor for the above purposes.

- All buried and overhead utilities present at the site should be identified and re-routed and protected during the construction.

- Cast in Drilled Hole (CIDH) piles should be installed generally in accordance with applicable parts of the Section 49 of the Caltrans Standard Specification and any other relevant Standard Provisions. Casing of the drilled holes or use of wet method is anticipated due to potential high groundwater and the sloughing of the holes because of the presence of unstable weak soil and rock at the site. Hardness of the rock at the site is expected to vary, and therefore the Contractor should be aware of such changes in the strength of the rock and utilize suitable drilling/coring equipment, which is capable of drilling in hard rock.

We recommend that a Geotechnical Engineer from Office of GDW-Branch C inspect the pile installation and all earthwork including any excavation and shoring.

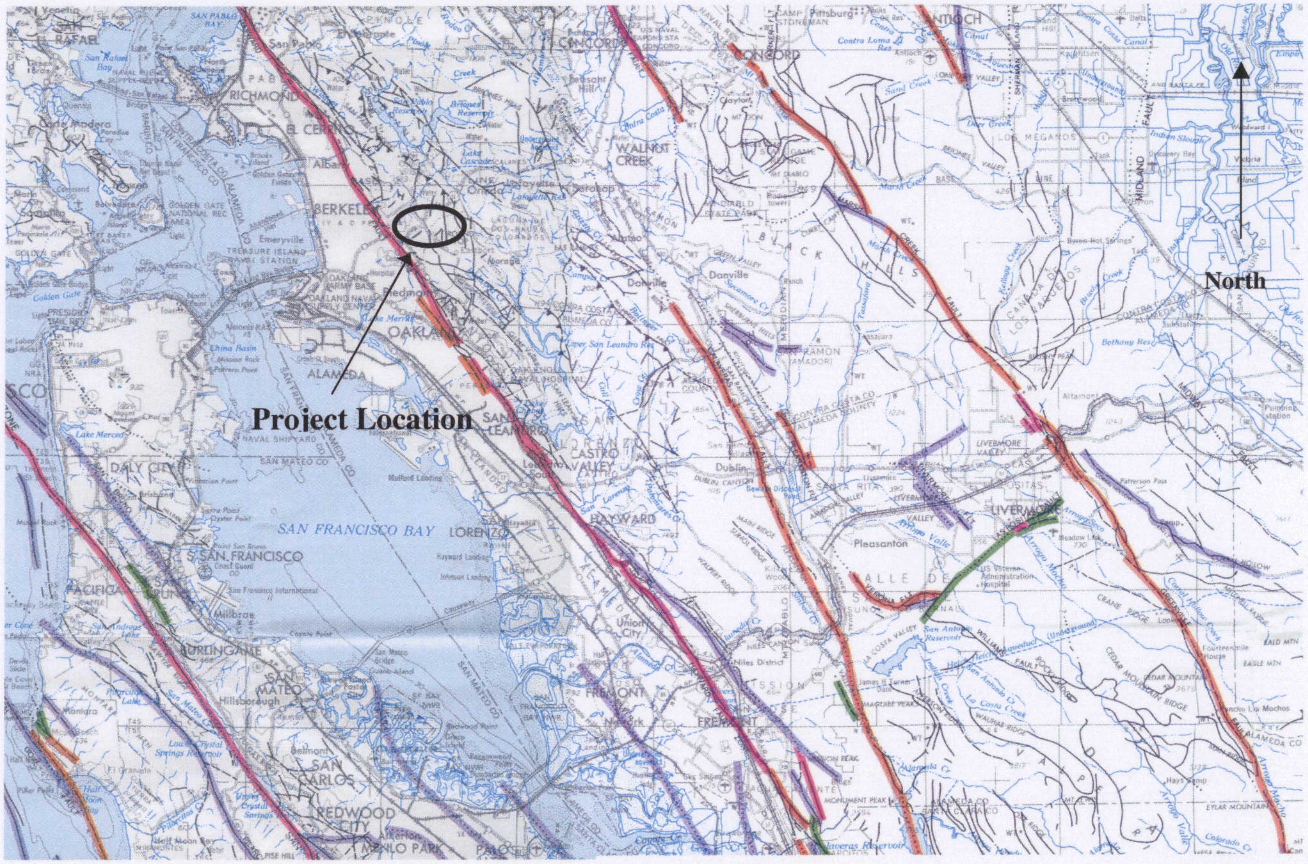
* * * * *

If you have any questions or need additional information, please call Mahmood Momenzadeh at 510-286-5732.

Attachments

c: TPokrywka, , GTomimatsu, HNikoui, MMomenzadeh, Project File

MMomenzadeh/mm



Geologic Time Scale			Years Before Present (Approx.)	Fault Symbol	Recency of Movement on Land Offshore[1]	DESCRIPTION
Quaternary	Late Quaternary	Historic	200			Displacement during historic time (e.g. San Andreas fault 1906). Includes areas of known fault creep.
		Holocene	10,000			Displacement during Holocene time[1]
		Pleistocene	700,000			Faults showing evidence of displacement during late Quaternary time.[3,4]
	Early Quaternary		2,000,000			Quaternary (undifferentiated) faults — most faults in this category show evidence of displacement during the last 2,000,000 years; possible exceptions are faults which displace rocks of undifferentiated Plio-Pleistocene age.
Pre-Quaternary	Pliocene		5,000,000			Fault showing evidence of no displacement during Quaternary time or faults without recognized Quaternary displacement.
	Miocene					

Scale 1:180000

FAULT MAP SYMBOLS

Faults On Land

Solid where well located; dashed where approximately located or inferred; dotted where concealed by younger rocks, lakes, or bays; queried where continuation or existence is uncertain. Barbs indicate thrust fault (barbs on upper plate). Arrows indicate relative or apparent direction of movement. U, upthrown side and D, downthrown side (relative or apparent).

Faults Offshore

Solid where well-defined, dashed where approximately located or inferred. Thrust barbs shown on upper plate. U, upthrown and D, downthrown side (relative or apparent).

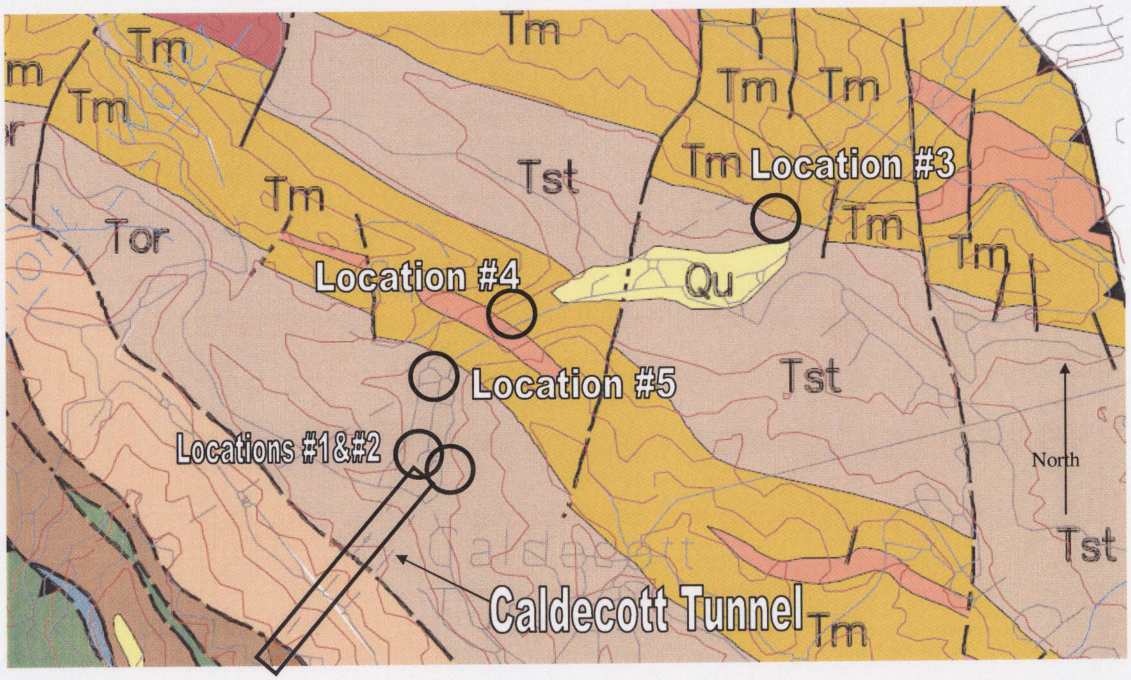
Source: Wagner, D.L., Bortugno, E.J., and McJunkin, R.D., 1991, Geologic Map of the San Francisco-San Jose Quadrangle, CDMG

Caltrans

4th Bore Caldecott Tunnel Fault Map

04-ALA/CC 24 **PM 5.3-6.3/0.0-1.3**

EA 04-294901 **May, 2008**



Scale 1:20000

Map Legend

Surficial Deposits

- Qm – Manmade deposits
- Qls – Landslide deposits
- Qu – Undivided Quaternary deposits
- Qoa – Older alluvial deposits

Pliocene and Pleistocene gravels

- QTi – Irvington gravels
- QTl – Livermore gravels
- QTp – Packwood gravels
- QTs – Undivided gravels
- Tsk – Silver Creek gravels

Tertiary strata

- Tss – Unnamed sandstone and conglomerate
- Tv – Unnamed volcanic rocks
- Tn – Neroly Sandstone
- Tbp – Bald Peak basalt
- Tst – Siesta Formation
- Tm – Moraga basalt
- Tms – Moraga interflow sedimentary rocks
- Tor – Orinda Formation
- Torv – Orinda interbedded dacite
- Tbr – Briones Formation
- Tt – Tice Shale
- To – Oursan Sandstone
- Tcc – Claremont chert and siliceous shale
- Tccs – Claremont interbedded sandstone
- Ts – Sobrante Sandstone
- Tte – Temblor Sandstone
- Tsh – Unnamed early Miocene sandstone and shale
- Tgs – Unnamed glauconite bearing mudstone (Oligocene(?) and Miocene)
- Tgss – Unnamed sandstone (Oligocene(?) and Miocene)
- Ttls – Tolman Formation, limestone member
- Tts – Tolman Formation, glauconitic sandstone member
- Tes – Unnamed mudstone (Eocene)
- Tps – Unnamed siltstone and sandstone (Paleocene)
- Tas – Unnamed glauconitic sandstone (Paleocene)

Great Valley Sequence

- Kp – Pinehurst Shale
- Kr – Redwood Creek Formation
- Ksc – Shephard Canyon Formation
- Kcv – Unnamed sandstone and shale of Castro Valley area
- Kslt – Unnamed siltstone
- Ko – Oakland Sandstone
- Kjm – Joaquin Miller Formation
- Ku – Undivided sandstone and siltstone
- Kc – Undivided conglomerate
- Ksh – Undivided shale
- Knc – Sandstone and shale of Niles Canyon area
- JKk – Knoxville Formation
- JKkc – Knoxville conglomerate beds
- JKkv – Knoxville volcanogenic conglomerate beds

Arc Volcanics

- Jsv – Keratophyre

Coast Range Ophiolite

- Jpb – Pillow basalt and basalt
- Jgb – Gabbro and diabase
- sp – Serpentinite
- sc – Silica carbonate rock

Franciscan Complex

- JKfn – Sandstone of Novato Quarry
- JKfgm – Quartz diorite
- JKfm – Melange
- fc – chert block
- fg – greenstone block
- fs – meta-graywacke
- JKf – Undivided Franciscan complex

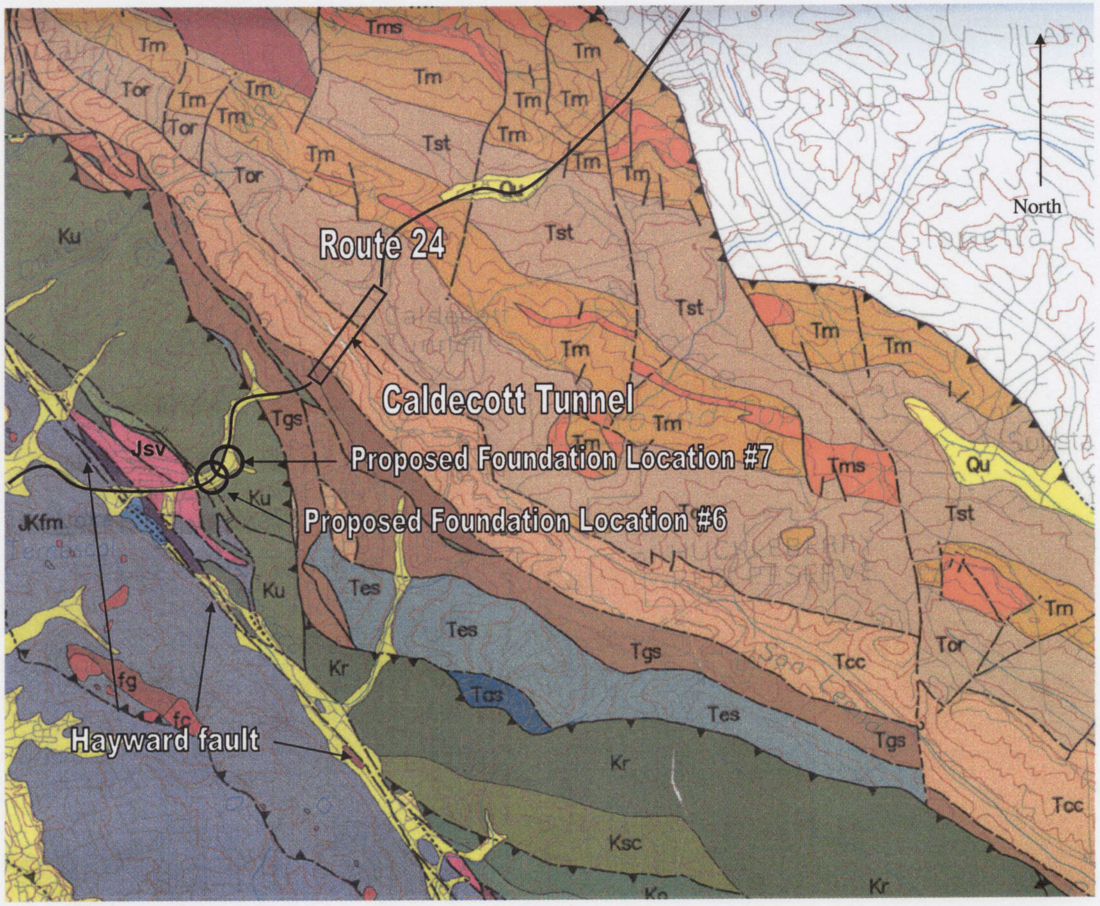
Lines

- Contact
- Contact, approximately located
- Contact, inferred
- Fault
- Fault, approximately located
- Fault, inferred
- Fault, uncertain
- Fault, concealed
- Fault, concealed and uncertain
- Thrust or reverse fault
- Thrust or reverse fault, approximately located
- Thrust or reverse fault, inferred
- Thrust or reverse fault, concealed

Source: Graymer, R.W., Jones, D.L., and Brabb, E.E., 1995, Geologic map of the Hayward fault zone, USGS Open File Report 95-597

Caltrans

Geology Map of the Caldecott Tunnel	
04-CC-24 EA 04-294900	KP 0.0/PM 0.0 February 2008



Scale 1:36000

Map Legend

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- JKk – Knoxville Formation
- JKkc – Knoxville conglomerate beds
- JKkv – Knoxville volcanogenic conglomerate beds

Arc Volcanics

- Jsv – Keratophyre

Coast Range Ophiolite

- Jpb – Pillow basalt and basalt
- Jgb – Gabbro and diabase
- sp – Serpentinite
- sc – Silica carbonate rock

Franciscan Complex

- JKfn – Sandstone of Novato Quarry
- JKfgm – Quartz diorite
- JKfm – Melange
- fc – chert block
- fg – greenstone block
- fs – meta-graywacke
- JKf – Undivided Franciscan complex

Line symbols

- Contact
- Contact, approximately located
- Contact, inferred
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- Fault, approximately located
- Fault, inferred
- Fault, uncertain
- Fault, concealed
- Fault, concealed and uncertain
- Thrust or reverse fault
- Thrust or reverse fault, approximately located
- Thrust or reverse fault, inferred
- Thrust or reverse fault, concealed

Source: Graymer, R.W., Jones, D.L., and Brabb, E.E., 1995, Geologic map of the Hayward fault zone, USGS Open File Report 95-597

Caltrans

Geology Map of the Caldecott Tunnel

Locations 6 and 7, West Portal

04-ALA/CC 24	**PM 5.3-6.3/0.0-1.3**
EA 04-249001	**May, 2008**

APPENDIX A

DETAILS FIELD INVESTIGATION
LOGS OF TEST BORINGS
&
LABORATORY TEST RESULTS

Geomatrix

TO:	Mahmood Momenzadeh	**DATE:**	February 20, 2008
FROM:	Todd Crampton, Geomatrix	**PROJ. NO.:**	7321.002
CC:		**PROJ. NAME:**	Caldecott Tunnel Improvement Project

SUBJECT: **Summary of West Approach Signage ~~and Bioswale~~ Field Exploration by Geomatrix**

This memorandum briefly describes the borings completed by Geomatrix Consultants, Inc. (Geomatrix) for the west approach signage and bioswale investigation in support of the 4th bore for the Caldecott Tunnel Improvement Project. Geomatrix is responsible for preparing logs of test borings (LOTBs) for these borings and field logs have been provided to Caltrans.

Geomatrix's field investigation took place between December 10 through 27, 2007. The following borings were drilled and logged: SGN1, SGN2, SGN3, SGN4, SGN5, BS1 and BS2. The borings with prefix "SGN" were drilled for the west approach signage and the borings with prefix "BS" were drilled for the bioswale.

The drilling for SGN1 and SGN2 was done by Northstar Drilling of Escalon, California using a truck-mounted Mobile B-24 auger drilling rig. These borings were sampled using a 140-pound safety hammer with a 30-inch drop height on a rope-and-cathead system and conventional Standard Penetration and Modified California split-spoon samplers.

The drilling for SGN3 through SGN5, BS1 and BS2 was done by Taber Consultants of West Sacramento, California using a CME 300-55 Crawler (SGN3 and SGN4) and Diedrich D-120 (SGN5) mud-rotary and auger drilling rigs. These borings were sampled using a 140-pound, automatic-trip hammer with a 30-inch drop height and both conventional Standard Penetration and Modified California split-spoon samplers in the upper fill materials and were continuously cored (sampled) using HQ-3 coring techniques in the underlying bedrock materials.

Boring SGN1 was a vertical hole and was logged on December 10, 2007. The boring was drilled to about 10 feet below ground surface (bgs) using an auger drilling method. The boring was located on the north side of Highway 24W, east of the tunnel entrance. The drillers reported difficult and slow drilling beginning at about 2 feet bgs. Water was added to the hole to facilitate drilled; however sample recovery was poor throughout.

Boring SGN2 was a vertical hole and was logged on December 10, 2007. The boring was drilled to about 15.25 feet bgs using an auger drilling method. The boring was located on the south side of Highway 24W, east of the tunnel entrance. The drillers reported very difficult and slow drilling beginning at about 5 feet bgs. Water was added to the hole by the drillers to facilitate drilling; however sample recovery was poor throughout.

Boring SGN3 was a vertical hole and was logged on December 27, 2007. The boring was drilled to about 27.6 feet bgs using mud-rotary and auger drilling methods. The boring was located on the north side of Highway 24W between the Orinda and Gateway Boulevard off ramps. No significant water losses or drilling difficulties were reported by the drillers during the drilling.

Boring SGN4 was a vertical hole and was logged on December 27, 2007. The boring was drilled to about 25 feet bgs using mud-rotary and auger drilling methods. The boring was located on the north side of Highway 24W between the Gateway Boulevard and Fish Ranch Road off ramps. During drilling, about 75% of circulation was lost from Run 8 (20.6-21.2 feet bgs). No other significant water losses or drilling difficulties were reported by the drillers during drilling.

Boring SGN5 was a vertical hole and was logged on December 20, 2007. The boring was drilled to about 23.4 feet bgs using mud-roatary and auger drilling methods. The boring was located on the southwest corner of a triangular median between the on/off ramps of the Fish Ranch Road exit on Highway 24W. No significant drilling difficulties were reported by the drillers during the drilling. Upon completion of drilling, the boring was converted into an open stand-pipe piezometer. The piezometer casing consisted of 2-inch diameter solid and slotted pipe (Schedule 40 PVC) that extended to a depth of about 30 feet bgs. Solid pipe was used from the ground surface to about 17 feet bgs, slotted pipe (0.020-inch machine slots) was used from approximately 17 to 27 feet bgs, and solid pipe was from about 27 feet to 30 feet bgs. Filter sand was placed around the pipe from a depth of about 15 feet bgs to the maximum depth of the hole of about 30.3 feet bgs. Approximately 2 feet of bentonite was placed above the filter sand, and the remaining portion of the piezometer was backfilled with cement grout. A traffic-rated, flush mount, Christy box cover was placed over the piezometer.

Boring BS1 was a vertical hole and was logged on December 19, 2007. The boring was drilled to 31.3 feet bgs using auger drilling methods. The boring was located on the south side of the Highway 24E off ramp to Gateway Boulevard. During drilling, water was added to the hole by the driller at about 23 feet bgs because of difficult drilling. Upon completion of drilling, the boring was converted into an open stand-pipe piezometer. The piezometer casing consisted of 2-inch diameter solid and slotted pipe (Schedule 40 PVC) that extended to a depth of about 31 feet bgs. Solid pipe was used from the ground surface to about 15 feet bgs, slotted pipe (0.020-inch machine slots) was used from about 15 to 30 feet bgs, and solid pipe from about 30 feet to 31 feet bgs. Filter sand was placed around the pipe from a depth of about 12 feet bgs to the maximum depth of the hole of 31.3 feet bgs. Approximately 2 feet of bentonite was placed above the filter sand, and the remaining portion of the piezometer was backfilled with cement grout. A traffic-rated, flush mount, Christy box cover was placed over the piezometer.

Boring BS2 was a vertical hole and was logged on December 19, 2007. The boring was drilled to about 31.5 feet bgs using auger drilling methods. The boring was located on the south side of the Highway 24E off ramp to Gateway Boulevard. During drilling, the drillers reported difficulty drilling at about 16.5 feet and 31 feet bgs. Upon completion of drilling, the boring was converted into an open stand-pipe piezometer. The piezometer casing consisted of 2-inch diameter solid and slotted pipe (Schedule 40 PVC) that extended to a depth of 31.5 feet below ground surface. Solid pipe was used from the ground surface to about 20 feet bgs, slotted pipe (0.020-inch machine slots) was used from about 20 to 30 feet bgs, and solid pipe from about 30 feet to 31.5 feet bgs. Filter sand was placed around the pipe from a depth of about 12.5 feet to the maximum depth of the hole of 31.5 feet bgs. Approximately 2 feet of bentonite was placed above the filter sand, and the remaining portion of the piezometer was backfilled with cement grout. A traffic-rated, flush mount, Christy box cover was placed over the piezometer.

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
04	Ala/CC	24	8.5/10.0 0.0/2.1		

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The Log of Test Boring (LOTB) templates for this project are nonstandard because of the nature of the tunnel project. The same template is consistently used for all LOTB sheets prepared for the entire project.

KEY TO TERMS USED TO DESCRIBE THE PHYSICAL CONDITION OF ROCK CORE[1]

FRACTURE SPACING	SPACING/CORE RECOVERY LENGTHS	FRACTURE DENSITY[2]
(VC) Very closely spaced (crushed)	Less than 30 mm (<0.1 ft)	Very Intensely
(Cl) Closely spaced	30 to 100 mm (0.1 ft to 0.3 ft)	Intensely
(Mo) Moderately spaced	100 to 300 mm (0.3 ft to 1.0 ft)	Moderately
(Wi) Widely spaced	300 mm to 1 m (1.0 ft to 3.0 ft)	Slightly
(VW) Very widely spaced	1 to 3 m (3.0 ft to 10.0 ft)	Very Slightly
(Ex) Extremely wide	Greater than 3 m (>10 ft)	Unfractured

BEDDING OR FLOW TEXTURE	THICKNESS/SPACING
(La) Laminated	Less than 10 mm (<0.03 ft (3/8 in))
(VTn) Very thinly bedded	10 to 30 mm (0.03 (3/8 in) to 0.1 ft)
(Tn) Thinly bedded	30 to 100 mm (0.1 to 0.3 ft)
(Mo) Moderately bedded	100 to 300 mm (0.3 to 1 ft)
(Tk) Thickly bedded	300 mm to 1 m (1.0 to 3.0 ft)
(VTk) Very thickly bedded	1 to 3 m (3.0 to 10.0 ft)
(Ma) Massive	Greater than 3 m (>10 ft)

ROCK HARDNESS	
(So) Soft	can be grooved or gouged easily with a knife, can be scratched with fingernail
(Lo) Low Hardness	can be grooved 1/16 inch (2 mm) deep with a knife with moderate or heavy pressure
(Mo) Moderately Hard	can be scratched with a knife with light or moderate pressure
(Ha) Hard	can be scratched with a knife with difficulty
(VH) Very Hard	cannot be scratched with a knife

ROCK STRENGTH	
(Fr) Friable	breaks with light to moderate manual pressure
(We) Weak	core or fragment breaks with light hammer blow or heavy manual pressure
(Mo) Moderately Strong	core or fragment breaks with moderate hammer blow
(St) Strong	heavy hammer blow required to break specimen
(VS) Very Strong	core or fragment breaks only with repeated heavy hammer blows
(Ex) Extremely Strong	core or fragment can only be chipped with repeated heavy hammer blows

RELATIVE WEATHERING

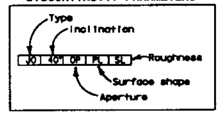
	DECOMPOSITION	DISCOLORATION	FRACTURES
(Fr) Fresh	Unaltered; cleavage surfaces glistening	No discoloration	No stains or coatings
(Sl) Slight	No megascopic alteration of minerals; no grain separations	Slight and localized	Few stains on fracture surfaces
(Mo) Moderate	Slight alternation of minerals; cleavage surfaces lusterless/stained; partial separation of grains visible	Moderate discoloration, usually throughout	Thin coatings or stains
(Se) Severe	Moderate to complete alteration of minerals; feldspars to clay, etc.; rock is friable	Discolored throughout	Extensively coated with oxides, carbonates, or clay

Notes:

1. Based on US Bureau of Reclamation, 1998, Engineering Geology Field Manual, Second Edition, Vol. I.
2. Fracture density refers to the range of core recovery lengths for a given run and excludes mechanical breaks.
3. All elevations shown based on NAVD 88 (Meters).
4. Discontinuity inclinations are measured with respect to the core axis in angled borings. In vertical borings, the inclination is with respect a horizontal plane.
5. Color designation and numbers from Munsell(TM) color charts.
6. Penetration index is the number of blows required to advance sampler 305 mm using a 63.5 Kg hammer falling 762 mm.
7. NR in graphic column = No Recovery.

FRACTURE DENSITY

DISCONTINUITY PARAMETERS



KEY TO TERMS USED TO DESCRIBE DISCONTINUITES[1]

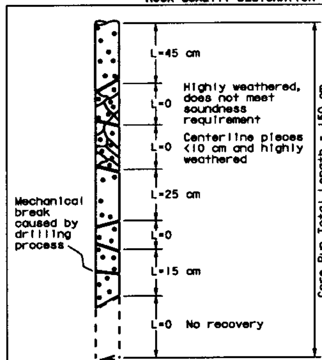
DISCONTINUITY TYPE (and dip inclination)
(Be) Bedding plane
(Fo) Foliation
(Me) Mechanical break (dip angle not recorded)
(Jo) Joint
(Sh) Shear or Fault
(Ve) Vein

SURFACE SHAPE
(Ir) Irregular
(Pl) Planar
(Wa) Wavy or undulating

APERTURE	
(Ti) Tight	No visible separation
(Op) Open	Amount of separation, staining or coatings on fracture surfaces, and fracture surface moisture conditions may be noted
(He) Healed	Degree of healing, (i.e., partial or complete), thickness and mineralogy/hardness may be noted
(Fi) Filled	Degree of filling, (i.e., partial or complete), thickness and type of filling may be noted

ROUGHNESS (note presence of slickensides or striations)	
(St) Stepped	Near normal steps and ridges occur on fracture surface
(Ro) Rough	Large, angular asperities can be seen
(Mo) Moderately rough	Asperities are clearly visible and fracture surface feels abrasive
(Sl) Slightly rough	Small asperities on the fracture surface visible and can be felt
(Sm) Smooth	No asperities, smooth to touch
(Po) Polished	Extremely smooth and shiny

ROCK QUALITY DESIGNATION (RQD) LOGGING



$$RQD = \frac{\sum \text{Length of sound core >10 cm pieces}}{\text{Total core run length}} = \frac{45 + 25 + 15}{150} = 57\% \text{ (Fair)}$$

RQD	Description
0 - 25%	Very Poor
25% - 50%	Poor
50% - 75%	Fair
75% - 90%	Good
90% - 100%	Excellent

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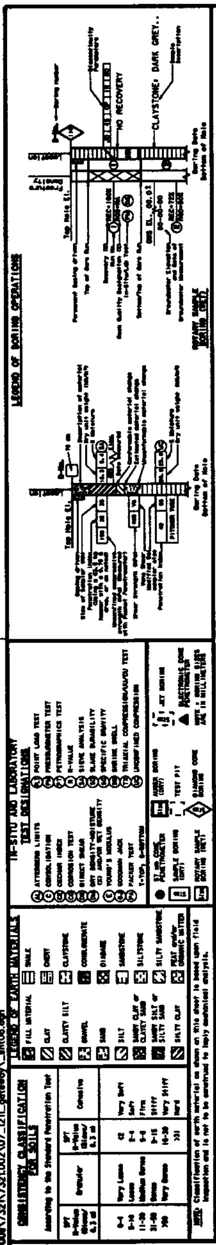

DIVISION OF ENGINEERING SERVICES	FIELD INVESTIGATION BY:
DRAWN BY: S. WESSELS 02/07	GEOMATRIX
CHECKED BY: T. CRAMPTON/A. BEHAN (GEOMATRIX)/M. MOMENZADEH (CALTRANS)	

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CALDECOTT IMPROVEMENT PROJECT
WEST APPROACH SIGNAGE AND BIOSWALE
LOG OF TEST BORINGS - EXPLANATION

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

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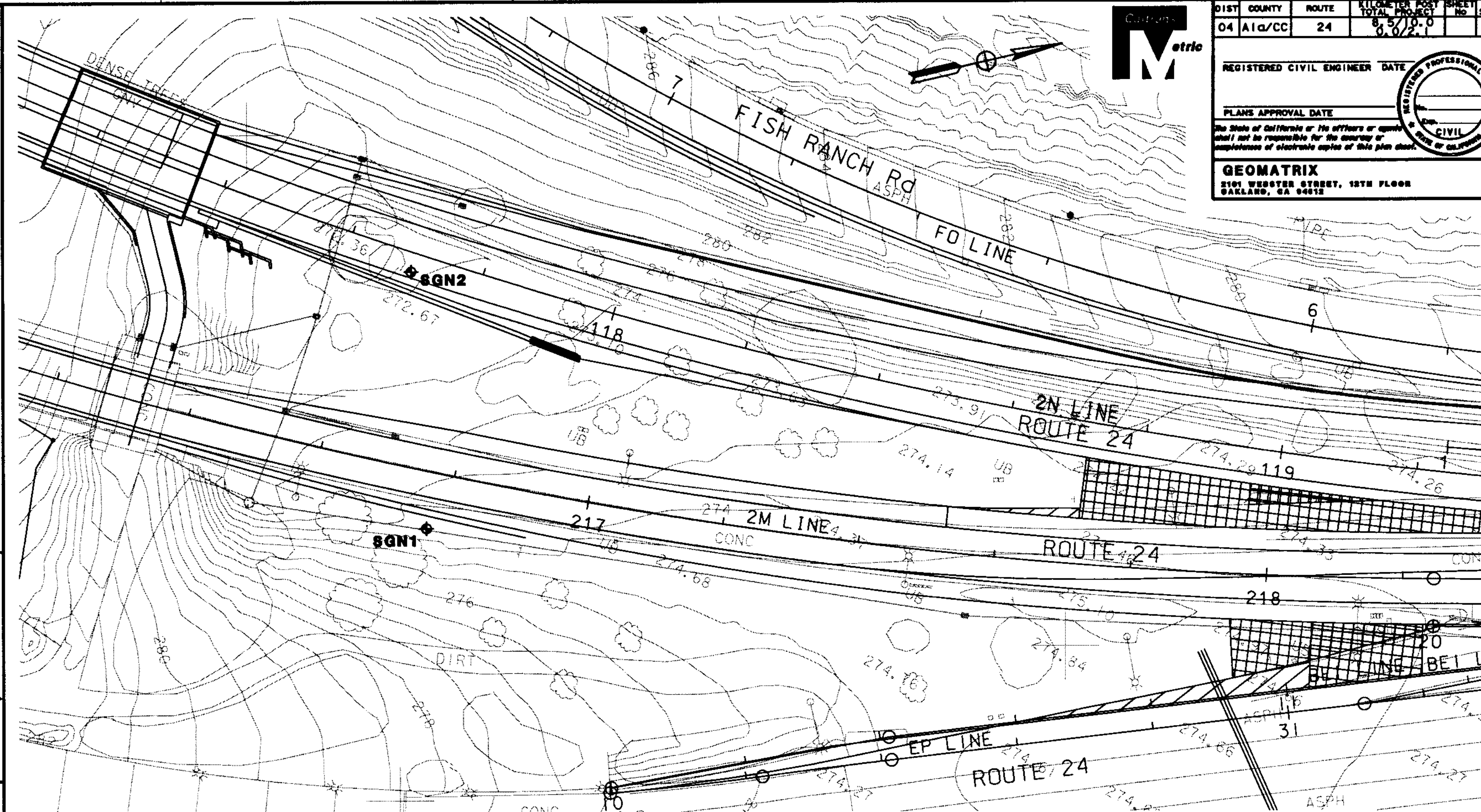

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LEGEND:

⊕ VERTICAL BORING BY GEOMATRIX

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CALDECOTT IMPROVEMENT PROJECT
WEST APPROACH SIGNAGE
LOG OF TEST BORINGS - BORING LOCATIONS

SHEET 1 OF 5

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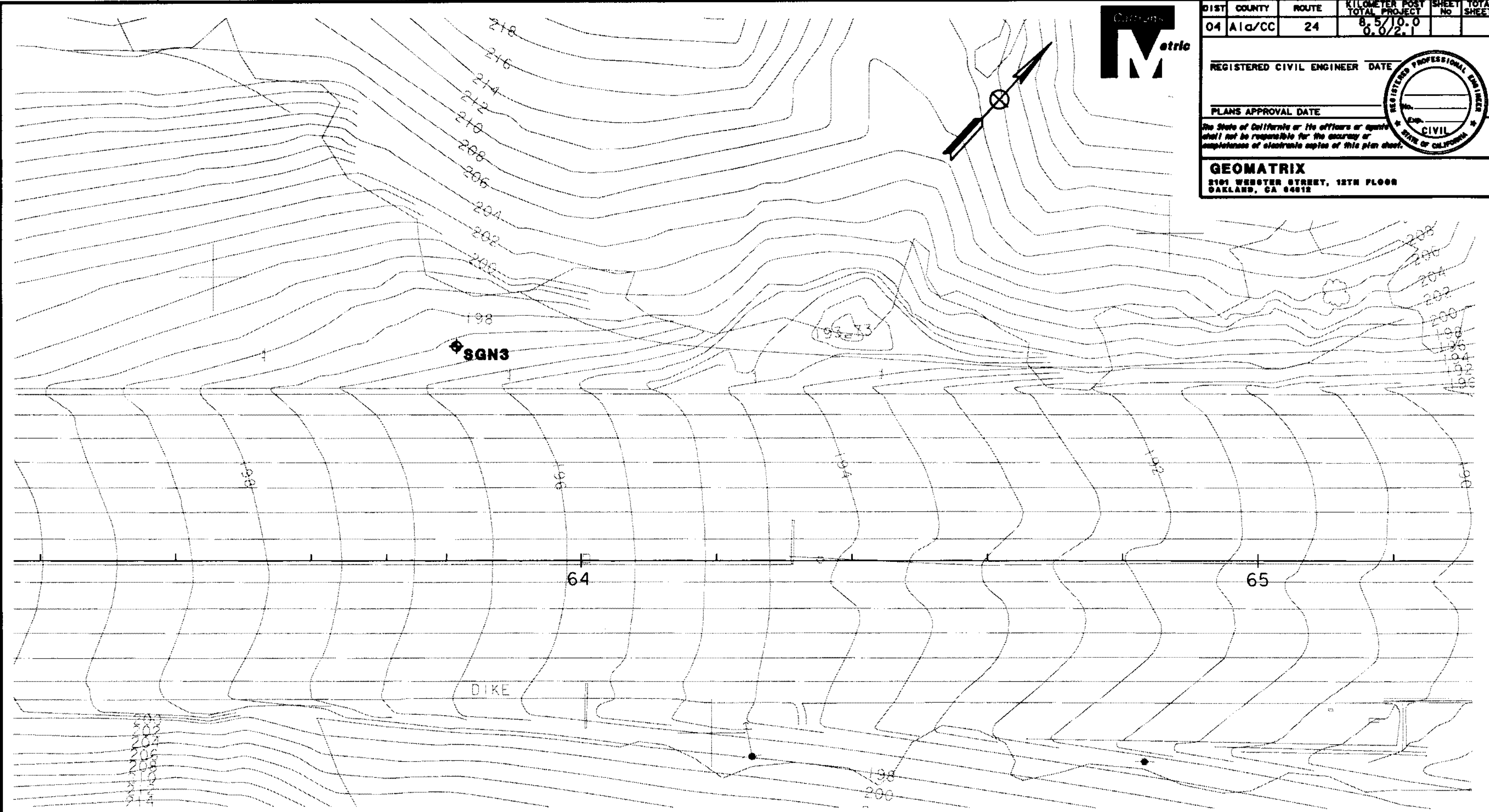

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LEGEND:

◆ VERTICAL BORING BY GEOMATRIX

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CALDECOTT IMPROVEMENT PROJECT
WEST APPROACH SIGNAGE
LOG OF TEST BORINGS - BORING LOCATIONS

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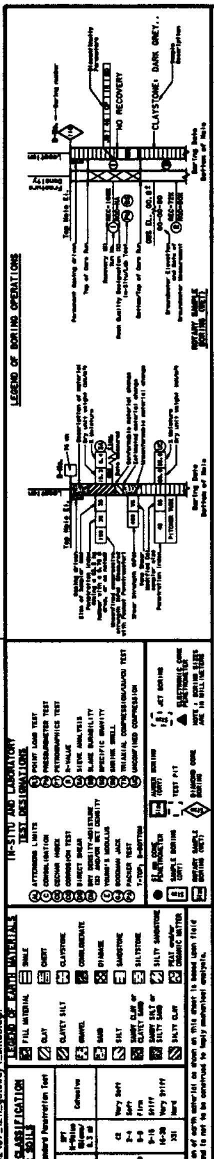

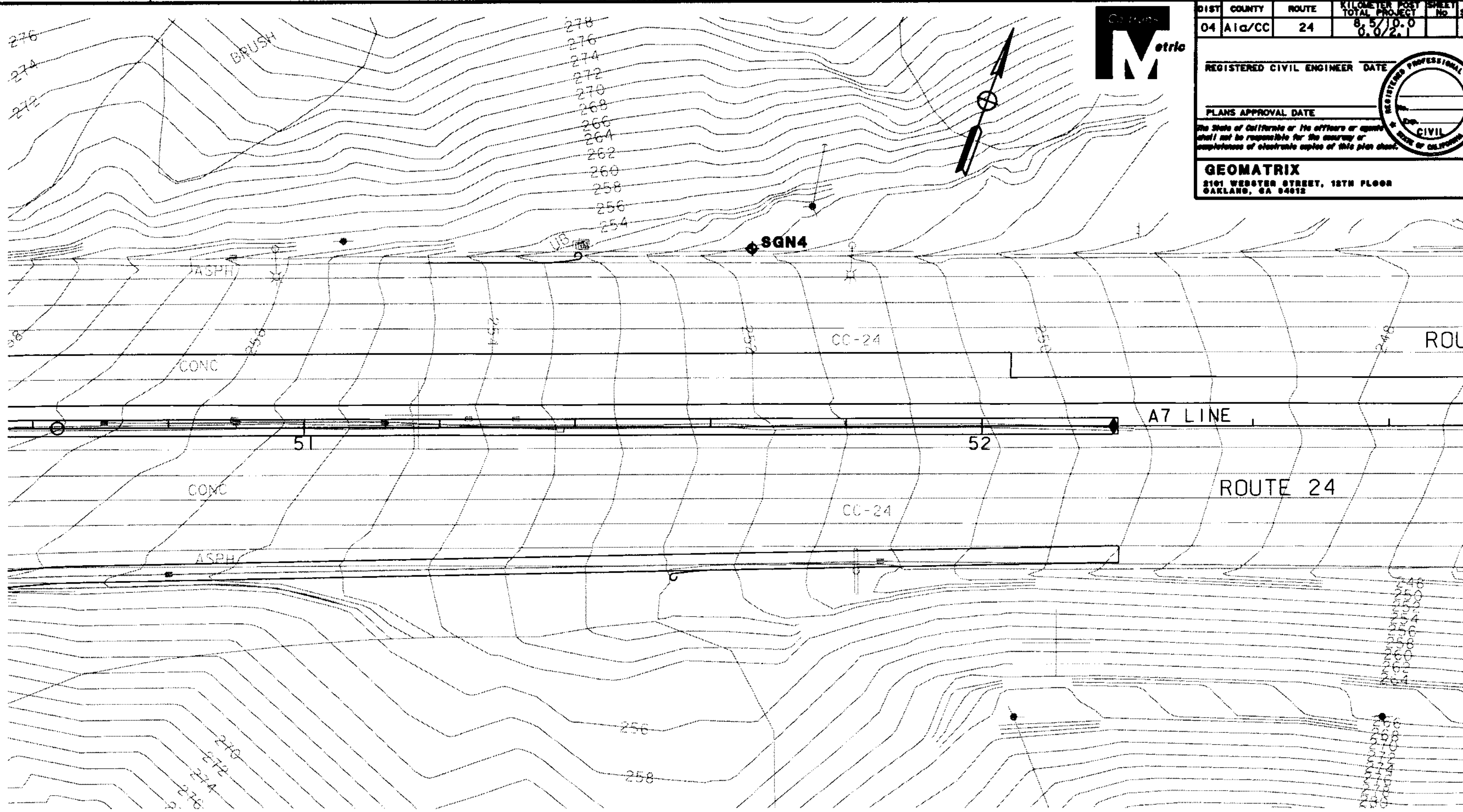

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LEGEND:

◆ VERTICAL BORING BY GEOMATRIX

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WEST APPROACH SIGNAGE

LOG OF TEST BORINGS - BORING LOCATIONS

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SHEET 3 OF 5

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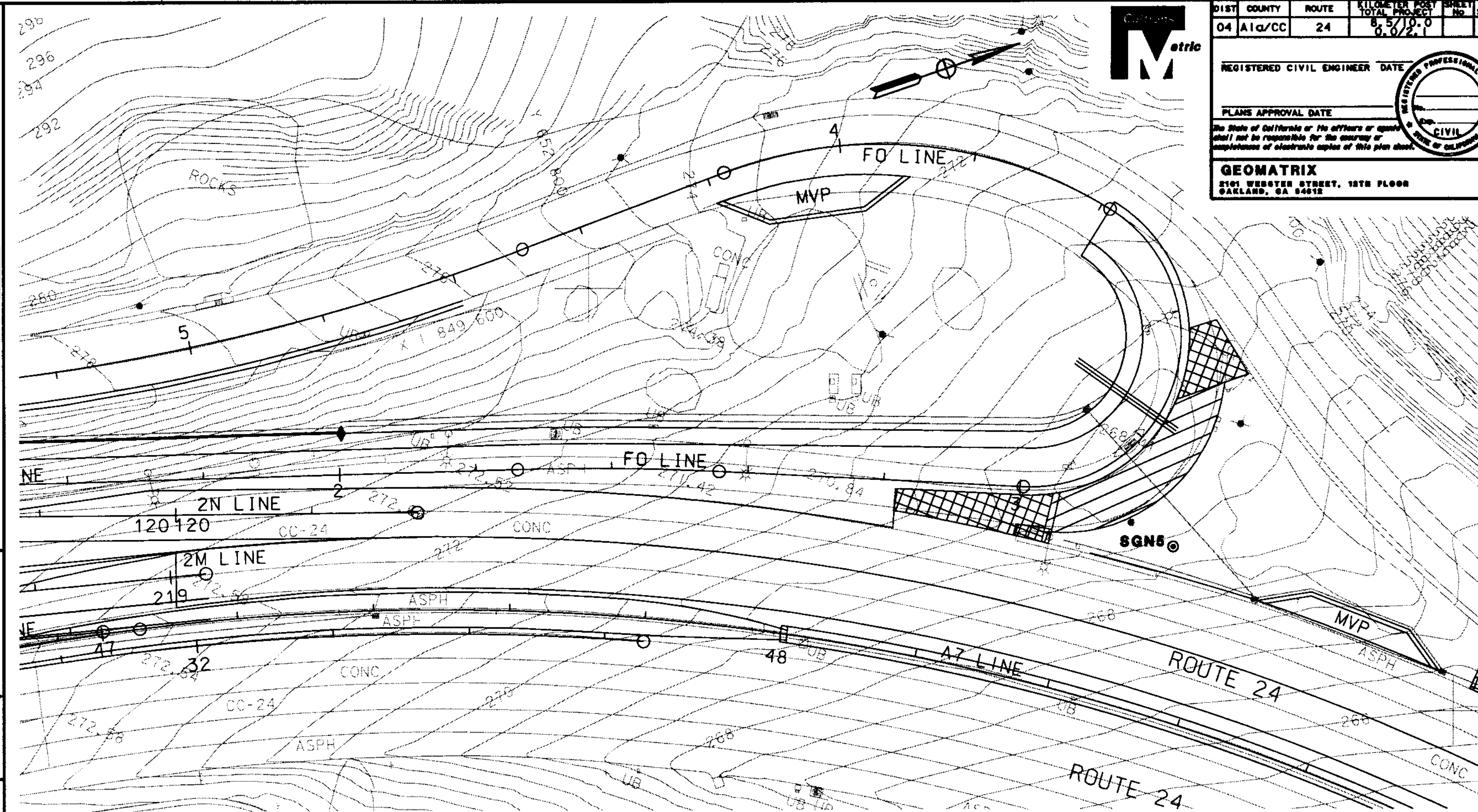

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LOG OF TEST BORINGS - BORING LOCATIONS

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SHEET 2 OF 5

FILE -> @REQUEST

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Caltrans Metric

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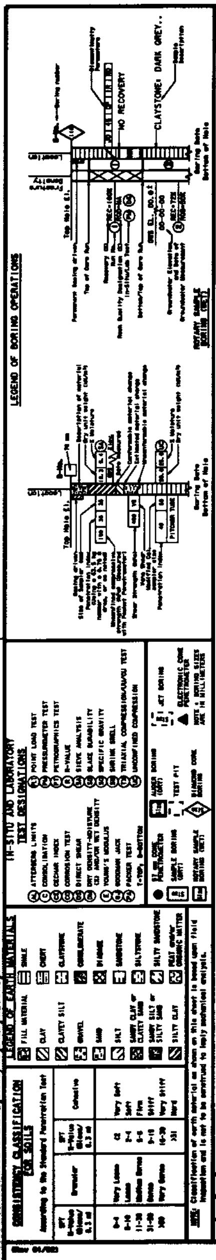

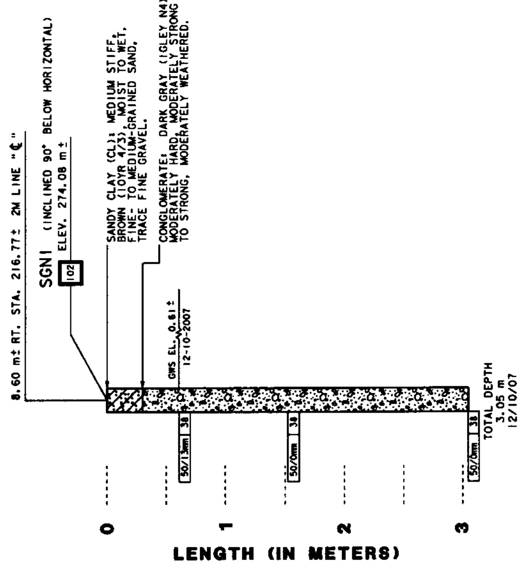

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CALDECOTT IMPROVEMENT PROJECT
WEST APPROACH SIGNAGE
LOG OF TEST BORINGS SGN1

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FIELD INVESTIGATION BY: A. BEHAN (GEOMATRIX)

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BRIDGE NO. 28-0015K
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ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS 0 10 20 30 40 50 60 70 80 90 100

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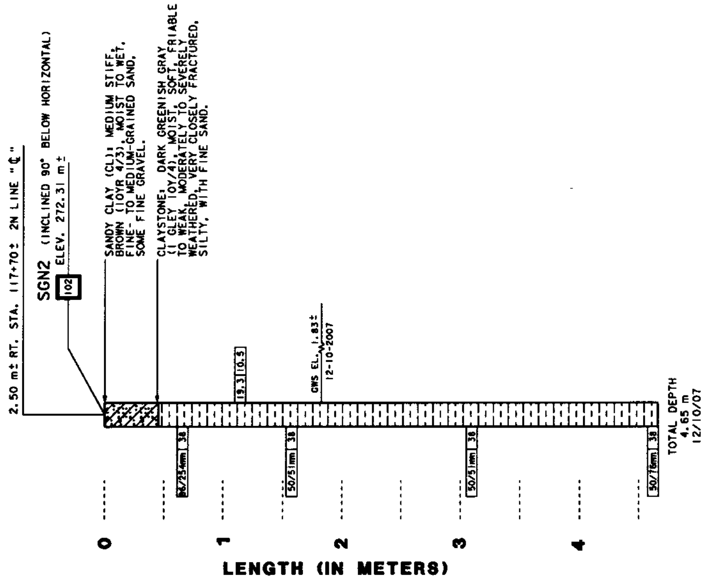

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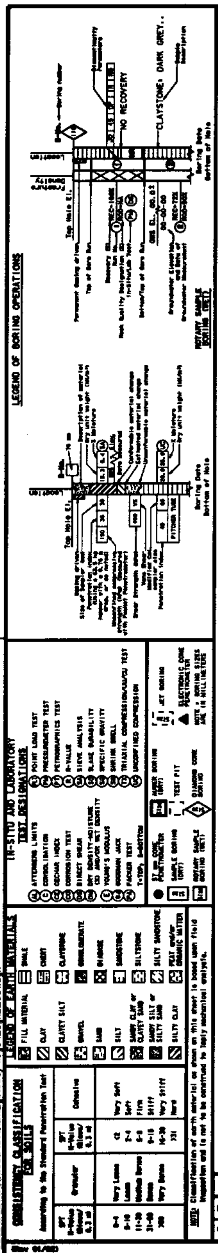

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WEST APPROACH SIGNAGE

LOG OF TEST BORINGS SGN2

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FIELD INVESTIGATION BY: A. BEHAN (GEOMATRIX)

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

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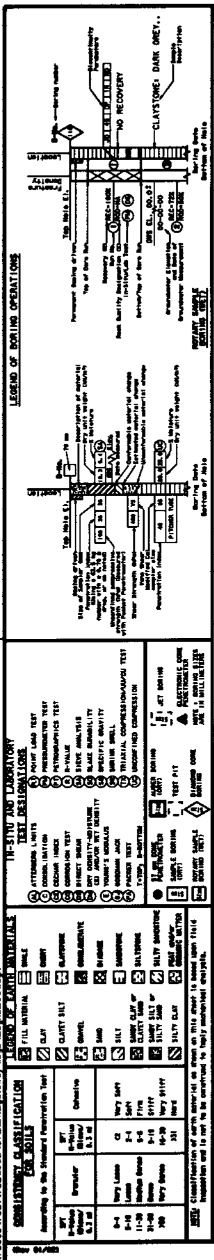

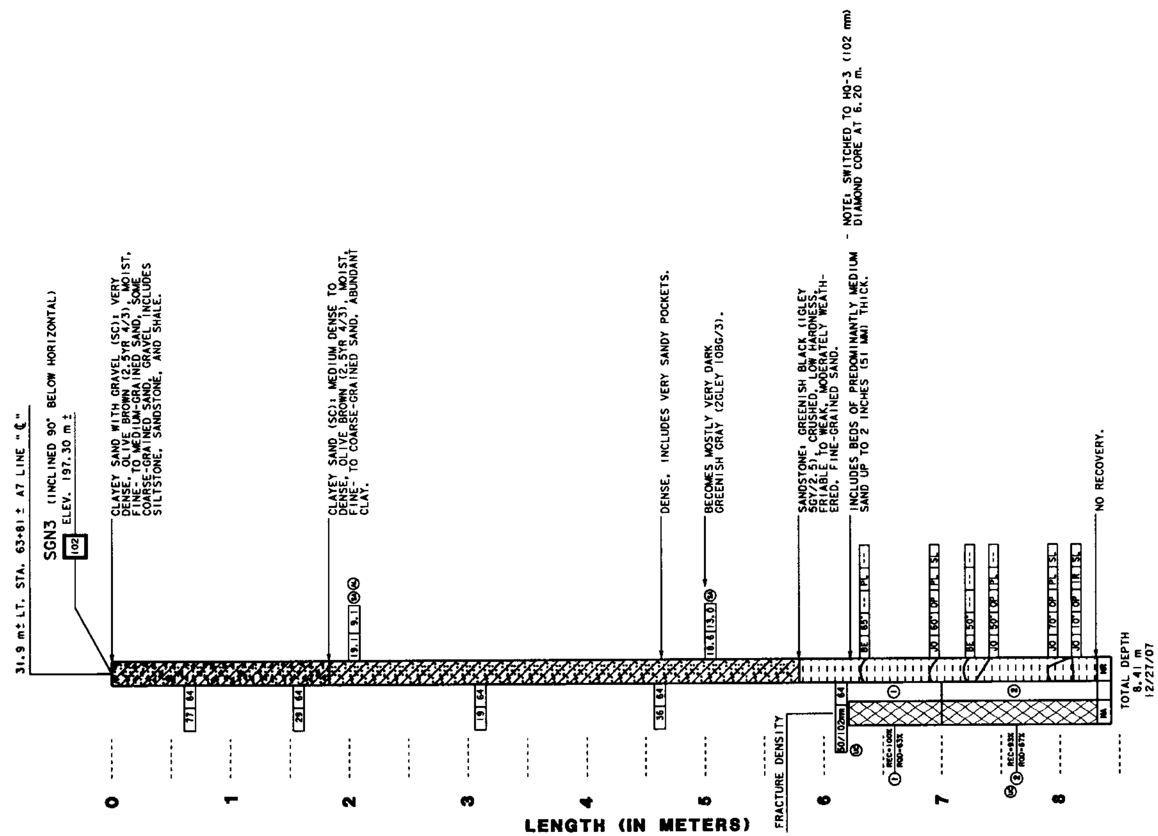

PROFILE
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DIVISION OF ENGINEERING SERVICES		FIELD INVESTIGATION BY:	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	GEOTECHNICAL SERVICES OFFICE OF GEOTECHNICAL DESIGN - WEST	BRIDGE NO. 28-0015K KILOMETER POST	CALDECOTT IMPROVEMENT PROJECT WEST APPROACH SIGNAGE LOG OF TEST BORINGS SGN3
DRAWN BY	S. WESSELS 01/2008	C. JOHNSON (GEOMATRIX)				
CHECKED BY	T. CRAMPTON/A. BEHAN (GEOMATRIX)/M. MOMENZADEH (CALTRANS)					

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

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EA 294911

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY)

SHEET - OF -

FILE => @REQUEST

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

S:\7300\7321\7321.002\07_1211_gateway\logs_sgn3_001.dgn

(Rev 04/08)

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
04	Ala/CC	24	8.5/10.0 0.0/2.1		

Metric

REGISTERED CIVIL ENGINEER DATE

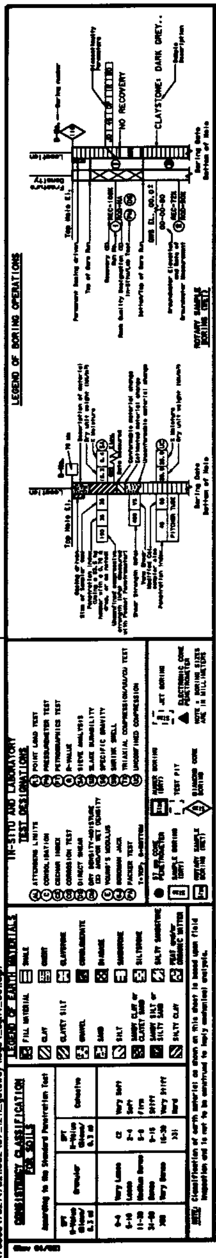
PLANS APPROVAL DATE

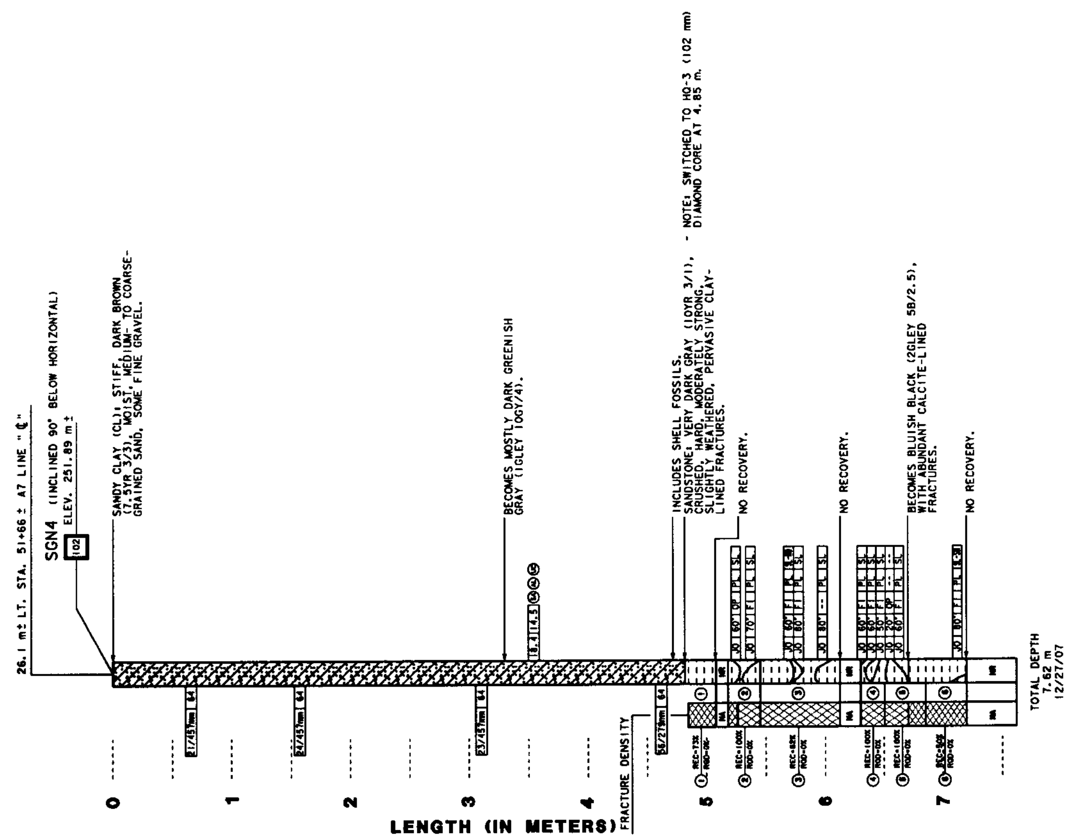
The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

REGISTERED PROFESSIONAL ENGINEER — CIVIL — STATE OF CALIFORNIA

GEOMATRIX
2101 WEBSTER STREET, 12TH FLOOR
OAKLAND, CA 94612

The Log of Test Boring (LOTB) templates for this project are nonstandard because of the nature of the tunnel project. The same template is consistently used for all LOTB sheets prepared for the entire project.





PROFILE
SCALE 1 : 20

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

CALDECOTT IMPROVEMENT PROJECT
WEST APPROACH SIGNAGE
LOG OF TEST BORINGS SGN4

DIVISION OF ENGINEERING SERVICES	
DRAWN BY	S. WESSELS 01/2008
CHECKED BY	T. CRAMPTON/A. BEHAN (GEOMATRIX)/M. MOMENZADEH (CALTRANS)

FIELD INVESTIGATION BY: C. JOHNSON (GEOMATRIX)

PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

GEOTECHNICAL SERVICES
OFFICE OF GEOTECHNICAL DESIGN - WEST

BRIDGE NO. 28-0015K
KILOMETER POST

CU
EA 294911

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

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY)

SHEET - OF -

FILE => $REQUEST

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
04	Ala/CC	24	8.5/10.0 0.0/2.1		

Metric

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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REGISTERED PROFESSIONAL ENGINEER — No. — Exp. — CIVIL — STATE OF CALIFORNIA

GEOMATRIX
2101 WEBSTER STREET, 12TH FLOOR
OAKLAND, CA 94612

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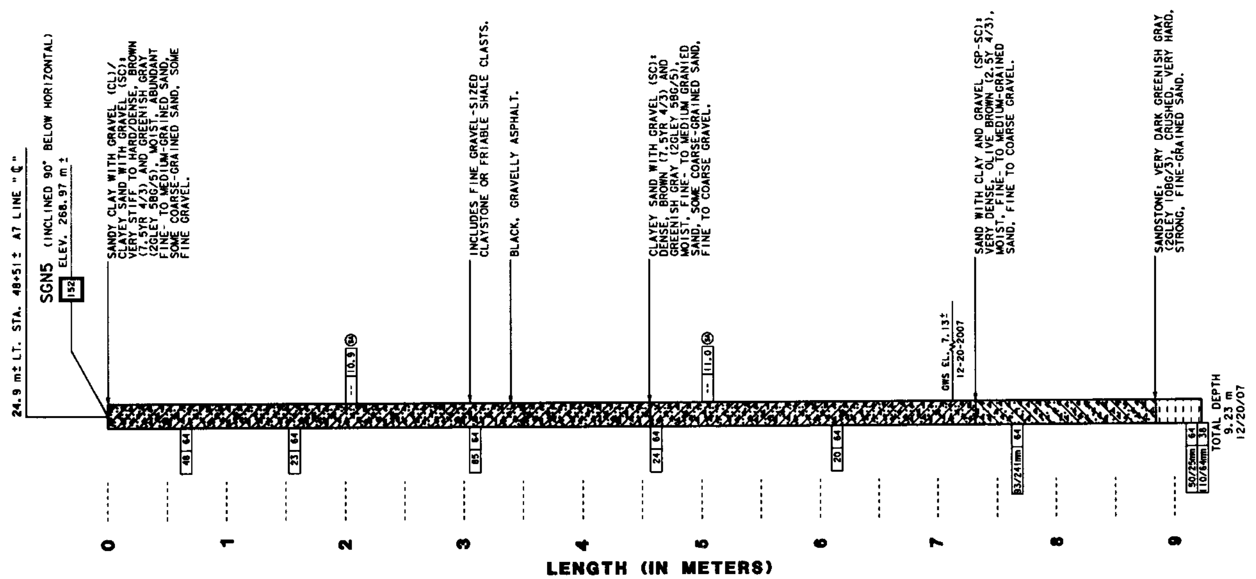

PROFILE
SCALE 1 : 20

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

CALDECOTT IMPROVEMENT PROJECT
WEST APPROACH SIGNAGE
LOG OF TEST BORINGS SGN5

DIVISION OF ENGINEERING SERVICES

DRAWN BY: S. WESSELS 01/2008
CHECKED BY: T. CRAMPTON/A. BEHAN (GEOMATRIX)/M. MOMENZADEH (CALTRANS)

FIELD INVESTIGATION BY: C. JOHNSON (GEOMATRIX)

PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

GEOTECHNICAL SERVICES
OFFICE OF GEOTECHNICAL DESIGN - WEST

BRIDGE NO. 28-0015K
KILOMETER POST

CU
EA 294911

FILE => @REQUEST

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
04	Ala/CC	24			

REGISTERED PROFESSIONAL GEOLOGIST 07-01-08 DATE

PLANS APPROVAL DATE

PROFESSIONAL GEOLOGIST TODD A. CRAMPTON No. 2179 CERTIFIED ENGINEERING GEOLOGIST STATE OF CALIFORNIA

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PARSONS
50 FREMONT STREET, SUITE 1500
SAN FRANCISCO, CA 94105

GEOMATRIX
2101 WEBSTER STREET, 12TH FLOOR
OAKLAND, CA 94612

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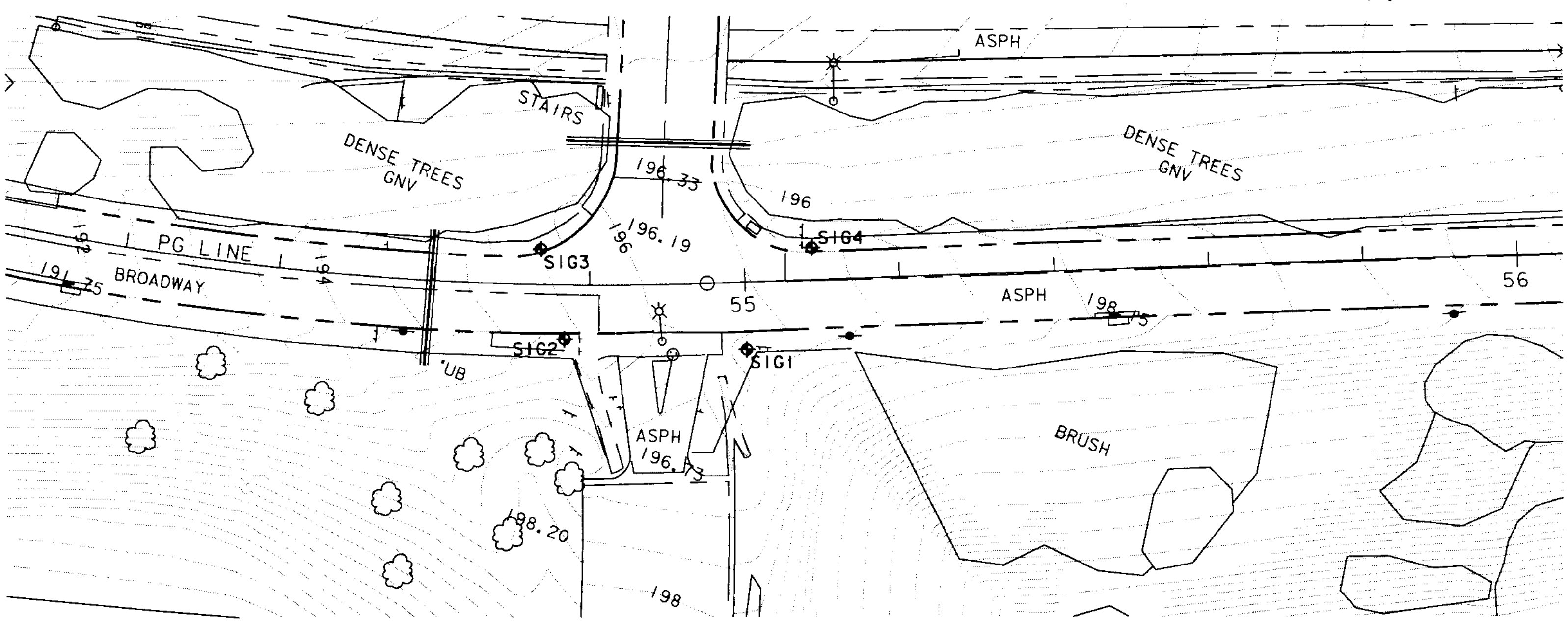

PLAN
SCALE 1 : 300

LEGEND:

VERTICAL BORING BY GEOMATRIX

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

LTB-406

CALDECOTT IMPROVEMENT PROJECT
TUNNEL SIGNAGE
LOG OF TEST BORINGS - BORING LOCATIONS

DIVISION OF ENGINEERING SERVICES		FIELD INVESTIGATION BY:	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	GEOTECHNICAL SERVICES OFFICE OF GEOTECHNICAL DESIGN - WEST	BRIDGE NO. 28-0015K
DRAWN BY	S. WESSELS 06/06				KILOMETER POST 8.2/2.7
CHECKED BY	C. JOHNSON(GEOMATRIX)/M. MOMENZADEH(CALTRANS)	GEOMATRIX CONSULTANTS			

CU 04
EA 294911

FILE => @REQUEST

SHEET 113 OF 130

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
04	Ala/CC	24			

REGISTERED PROFESSIONAL GEOLOGIST 07-01-08 DATE

PROFESSIONAL GEOLOGIST TODD A. CRAMPTON No. 2179 CERTIFIED ENGINEERING GEOLOGIST STATE OF CALIFORNIA

PLANS APPROVAL DATE

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PARSONS
50 FREMONT STREET, SUITE 1500
SAN FRANCISCO, CA 94105

GEOMATRIX
2101 WEBSTER STREET, 12TH FLOOR
OAKLAND, CA 94612

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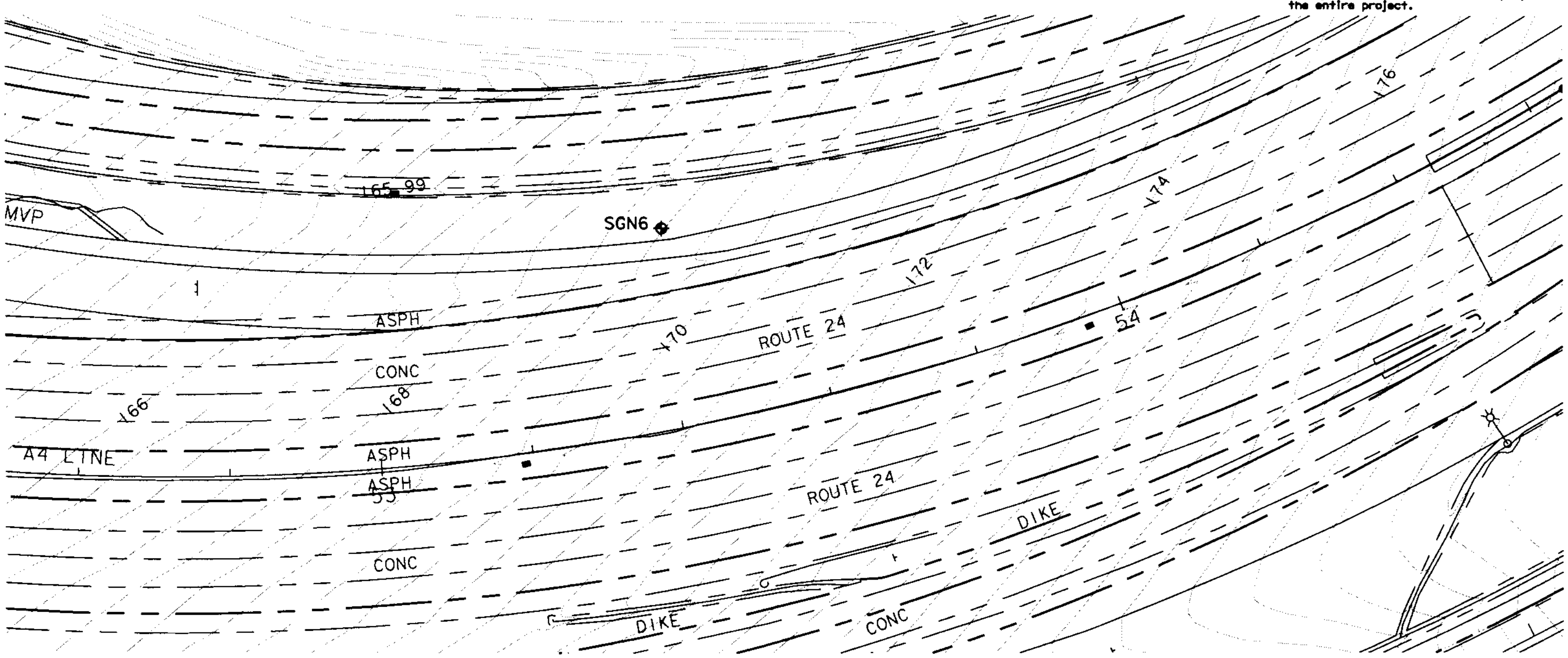

PLAN
SCALE 1 : 300

LEGEND:

VERTICAL BORING BY GEOMATRIX

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

LTB-405

CALDECOTT IMPROVEMENT PROJECT

TRAFFIC SIGNAGE

LOG OF TEST BORINGS - BORING LOCATIONS

DIVISION OF ENGINEERING SERVICES

DRAWN BY: S. WESSELS 06/08

CHECKED BY: C. JOHNSON(GEOMATRIX)/M. MOMENZADEH(CALTRANS)

FIELD INVESTIGATION BY: GEOMATRIX CONSULTANTS

PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

GEOTECHNICAL SERVICES
OFFICE OF GEOTECHNICAL DESIGN - WEST

BRIDGE NO. 28-0015K

KILOMETER POST 8.2/2.7

CU 04
EA 294911

SHEET 112 OF 130

FILE => $REQUEST

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
04	Ala/CC	24			

Todd Crampton (signature) 07-01-08
REGISTERED PROFESSIONAL GEOLOGIST DATE

PLANS APPROVAL DATE

PROFESSIONAL GEOLOGIST TODD A. CRAMPTON No. 2179 CERTIFIED ENGINEERING GEOLOGIST STATE OF CALIFORNIA

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OAKLAND, CA 94612

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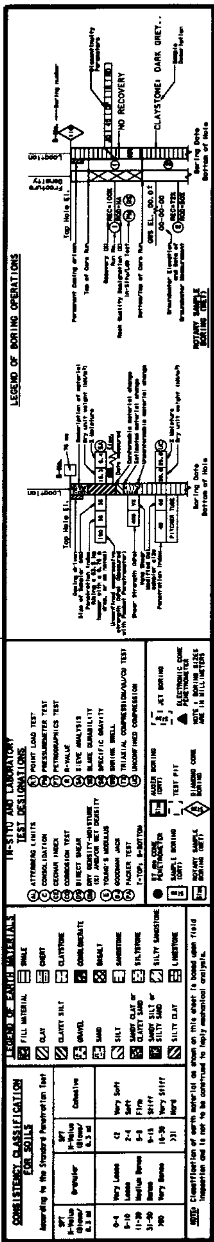

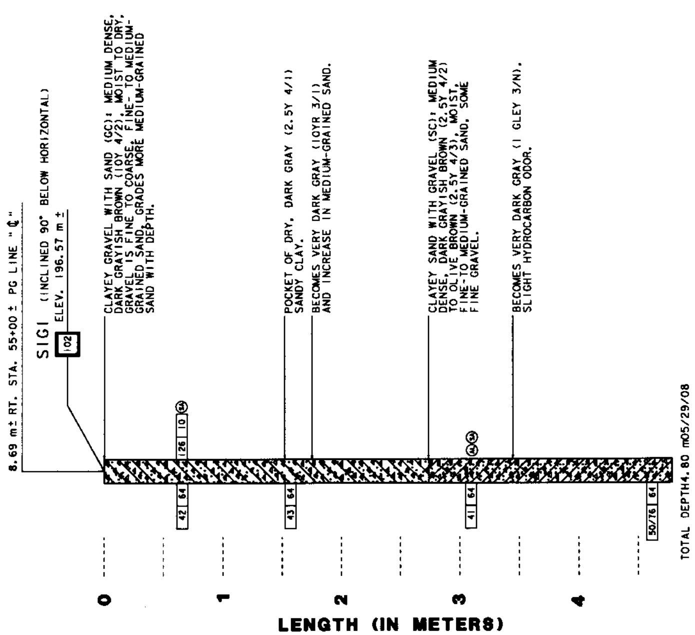

PROFILE
SCALE 1 : 20

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

LTB-414

DIVISION OF ENGINEERING SERVICES		FIELD INVESTIGATION BY:	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	GEOTECHNICAL SERVICES OFFICE OF GEOTECHNICAL DESIGN - WEST	BRIDGE NO. 28-0015K KILOMETER POST 8.2/2.7
DRAWN BY	S. WESSELS 05/08				
CHECKED BY	T. CRAMPTON/A.BEHAN(GEOMATRIX)/M. MOMENZADEH(CALTRANS)	C. JOHNSON (GEOMATRIX)			

CALDECOTT IMPROVEMENT PROJECT
TRAFFIC SIGNAGE
LOG OF TEST BORINGS SIG1

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

CU 04
EA 294911

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY)

SHEET 121 OF 130

FILE => @REQUEST

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
04	Ala/CC	24			

07-01-08
REGISTERED PROFESSIONAL GEOLOGIST DATE

PROFESSIONAL GEOLOGIST TODD A. CRAMPTON No. 2179 CERTIFIED ENGINEERING GEOLOGIST STATE OF CALIFORNIA

PLANS APPROVAL DATE

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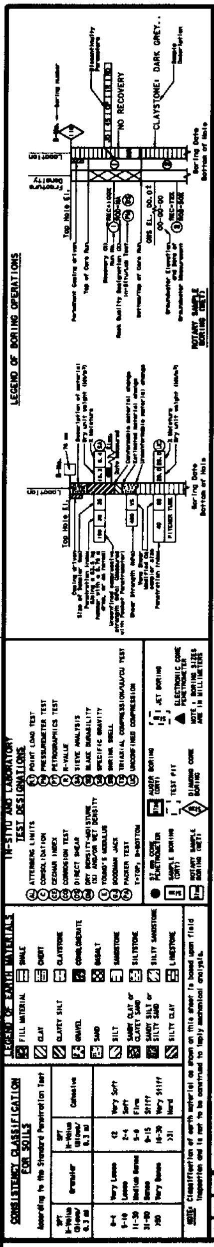
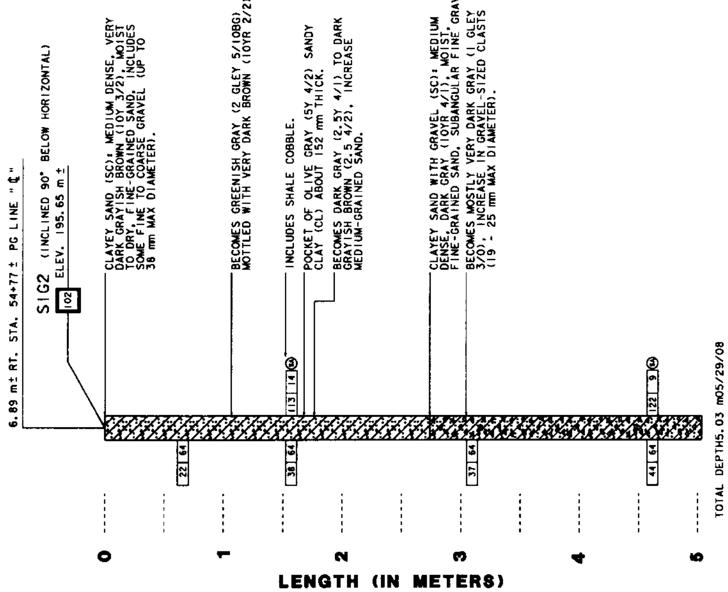


PROFILE
SCALE 1 : 20



ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

LTB-415

CALDECOTT IMPROVEMENT PROJECT
TRAFFIC SIGNAGE
LOG OF TEST BORINGS SIG2

DIVISION OF ENGINEERING SERVICES		FIELD INVESTIGATION BY:	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	GEOTECHNICAL SERVICES OFFICE OF GEOTECHNICAL DESIGN - WEST	BRIDGE NO. 28-0015K
DRAWN BY	S. WESSELS 05/08				KILOMETER POST 8.2/2.7
CHECKED BY	T. CRAMPTON/A.BEHAN(GEOMATRIX)/M. MOMENZADEH(CALTRANS)	C. JOHNSON (GEOMATRIX)			

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

CU 04
EA 294911

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY)

SHEET 122 OF 130

FILE => $REQUEST

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
04	Ala/CC	24			

REGISTERED PROFESSIONAL GEOLOGIST — 07-01-08 DATE

(Seal: PROFESSIONAL GEOLOGIST — TODD A. CRAMPTON — No. 2179 — CERTIFIED ENGINEERING GEOLOGIST — STATE OF CALIFORNIA)

PLANS APPROVAL DATE

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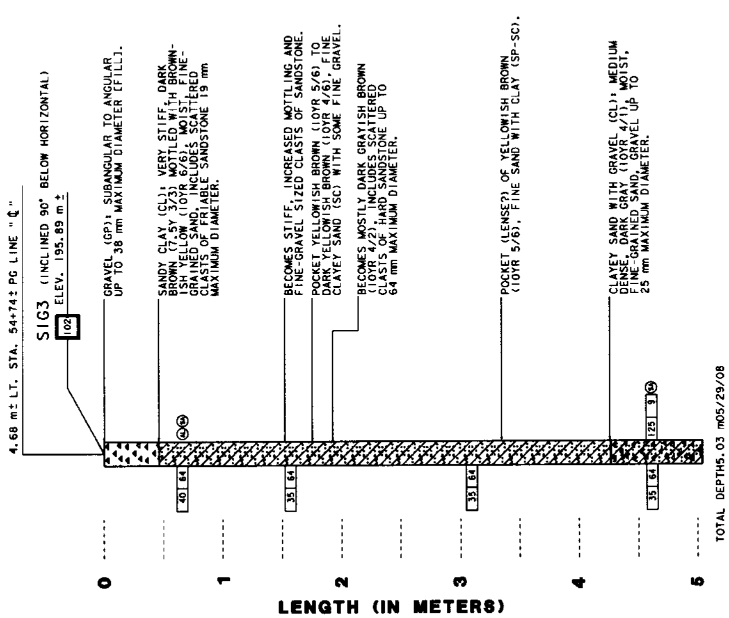
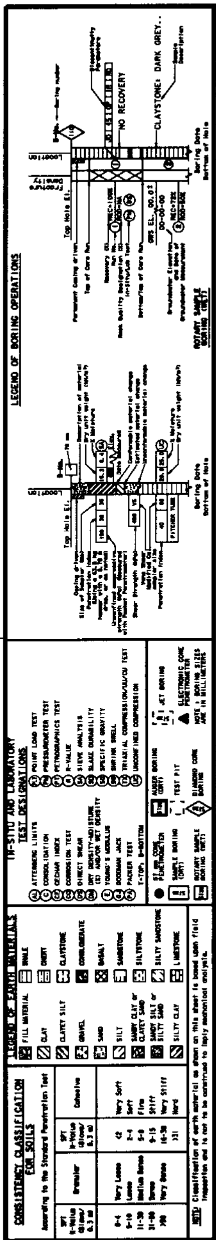
PROFILE
SCALE 1 : 20





ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

LTB-416

CALDECOTT IMPROVEMENT PROJECT

TRAFFIC SIGNAGE

LOG OF TEST BORINGS SIG3

DIVISION OF ENGINEERING SERVICES		FIELD INVESTIGATION BY:
DRAWN BY	S. WESSELS 05/08	C. JOHNSON (GEOMATRIX)
CHECKED BY	T. CRAMPTON/A. BEHAN(GEOMATRIX)/M. MOMENZADEH(CALTRANS)	

PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

GEOTECHNICAL SERVICES
OFFICE OF GEOTECHNICAL DESIGN - WEST

BRIDGE NO. 28-0015K
KILOMETER POST 8.2/2.7

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

CU 04
EA 294911

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY)

SHEET 123 OF 130

FILE => @REQUEST

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
04	Ala/CC	24			

Metric

REGISTERED PROFESSIONAL GEOLOGIST 07-01-08 DATE

PROFESSIONAL GEOLOGIST TODD A. CRAMPTON No. 2179 CERTIFIED ENGINEERING GEOLOGIST STATE OF CALIFORNIA

PLANS APPROVAL DATE

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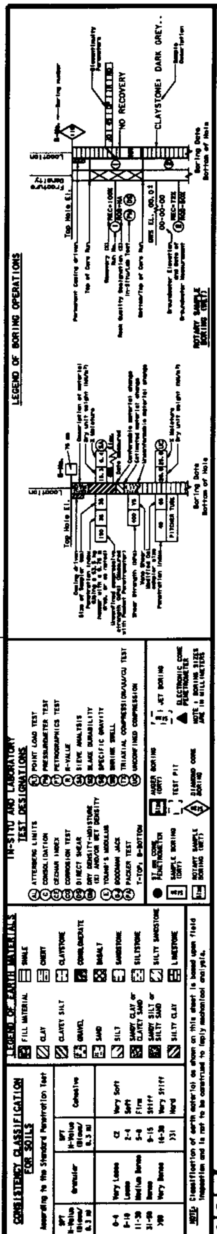

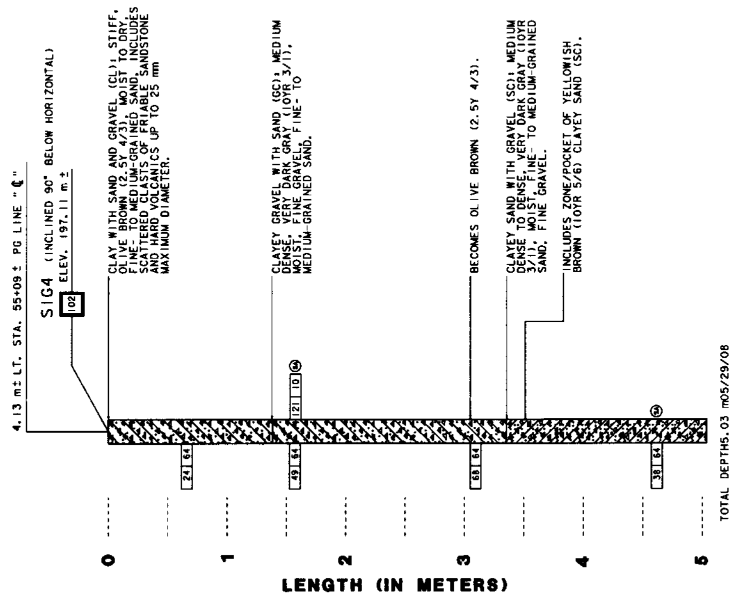

PROFILE
SCALE 1 : 20

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

LTB-417

CALDECOTT IMPROVEMENT PROJECT

TRAFFIC SIGNAGE

LOG OF TEST BORINGS SIG4

DIVISION OF ENGINEERING SERVICES		FIELD INVESTIGATION BY:
DRAWN BY	S. WESSELS 05/08	
CHECKED BY	T. CRAMPTON/A.BEHAN(GEOMATRIX)/M. MOMENZADEH(CALTRANS)	C. JOHNSON (GEOMATRIX)

PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

GEOTECHNICAL SERVICES
OFFICE OF GEOTECHNICAL DESIGN - WEST

BRIDGE NO. 28-0015K
KILOMETER POST 8.2/2.7

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

CU 04
EA 294911
FILE => @REQUEST

DISREGARD PRINTS BEARING EARLIER REVISION DATES —— REVISION DATES (PRELIMINARY STAGE ONLY)

SHEET 124 OF 130

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

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
04	Ala/CC	24			

REGISTERED PROFESSIONAL GEOLOGIST 07-01-08 DATE

PROFESSIONAL GEOLOGIST TODD A. CRAMPTON No. 2179 CERTIFIED ENGINEERING GEOLOGIST STATE OF CALIFORNIA

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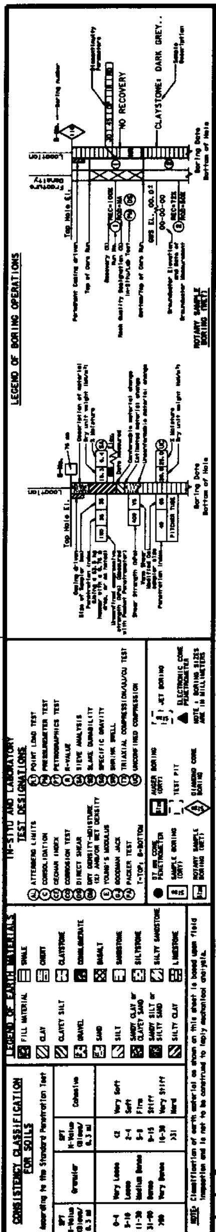
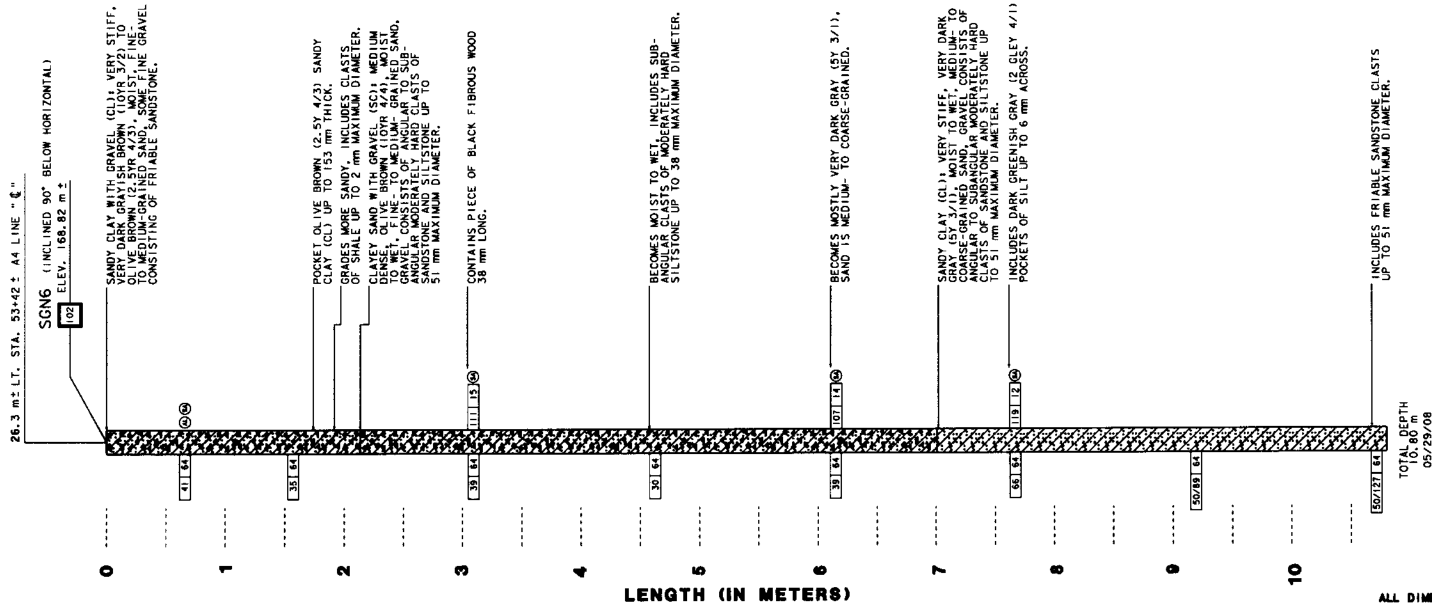


PROFILE
SCALE 1 : 20



ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

LTB-413

CALDECOTT IMPROVEMENT PROJECT
TRAFFIC SIGNAGE
LOG OF TEST BORINGS SGN6

DIVISION OF ENGINEERING SERVICES		FIELD INVESTIGATION BY:	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	GEOTECHNICAL SERVICES OFFICE OF GEOTECHNICAL DESIGN - WEST	BRIDGE NO. 28-0015K KILOMETER POST 8.2/2.7
DRAWN BY	S. WESSELS 05/08	C. JOHNSON (GEOMATRIX)			
CHECKED BY	T. CRAMPTON/A.BEHAN(GEOMATRIX)/M. MOMENZADEH(CALTRANS)				

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

CU 04
EA 294911

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY)

SHEET 120 OF 130

FILE => @REQUEST

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

TABLE 1
SUMMARY OF LABORATORY TEST RESULTS
CALDECOTT TUNNEL IMPROVEMENT PROJECT - WEST APPROACH SIGNAGE AND BIOSWALE
Contra Costa County, CA

						DM			SA			AL			UC	
Boring No.	Core Run/ Sample No.	Depth[1] (m)		Sample Type[2]	Description	Initial			Sieve (% Passing)			Atterberg Limits			UC[3]	
		From	To			Dry Density (kN/m^3)	Wet Density (kN/m^3)	Moisture Content (%)	19 mm	No. 4	No. 200	LL (%)	PL (%)	PI (%)	$\sigma_{1,MAX}$ (kPa)	E[5]$_{ELAST}$ (kPa)
SGN2	2-4	1.1	1.2	SPT	Sandy Clay (CL)	19.3	21.4	10.5								
SGN3	2-4	2.0	2.1	MC	Clayey Gravel with Sand (GC)	19.1	20.8	9.1	73	49	26	40	20	20		
SGN3	4-4	5.0	5.2	MC	Clayey Sand (SC)	18.6	21.1	13.0	100	99	48					
SGN3	Run 1	6.3	6.7	RC	Sandstone	22.4	24.2	7.6							5,010	304,070
SGN3	Run 1	7.5	7.8	RC	Sandstone	22.4	24.1	7.3							6,460	572,970
SGN4	3-4	3.5	3.7	MC	Sandy Clay (CL)	18.4	21.0	14.5	100	97	60	31	14	17	90	3,540
SGN5	2-4	2.0	2.1	MC	Sandy Clay with Gravel (CL)			10.9	84	77	51					
SGN5	4-4	5.0	5.2	MC	Clayey Sand with Gravel (SC)			11.0	75	63	21					
BS1	1-4	1.1	1.2	MC	Clayey Sand with Gravel (SC)	19.0	21.4	12.8	90	68	31					
BS1	4-4	5.0	5.2	MC	Clayey Sand with Gravel (SC)			12.5	84	62	21					
BS1	6-4	8.1	8.2	MC	Clayey Gravel with Sand (GC)			9.4	76	56	26					
BS2	6-4	6.6	6.7	MC	Clayey Sand with Gravel (SC)	20.6	22.7	9.9	90	75	39					

Notes:

1. Depth refers to vertical distance along borehole for borings.
2. Sample types: MC = Modified California drive sampler; SPT = Standard Penetration drive sampler; RC = Rock Core
3. Values reported to nearest 10 kPa.

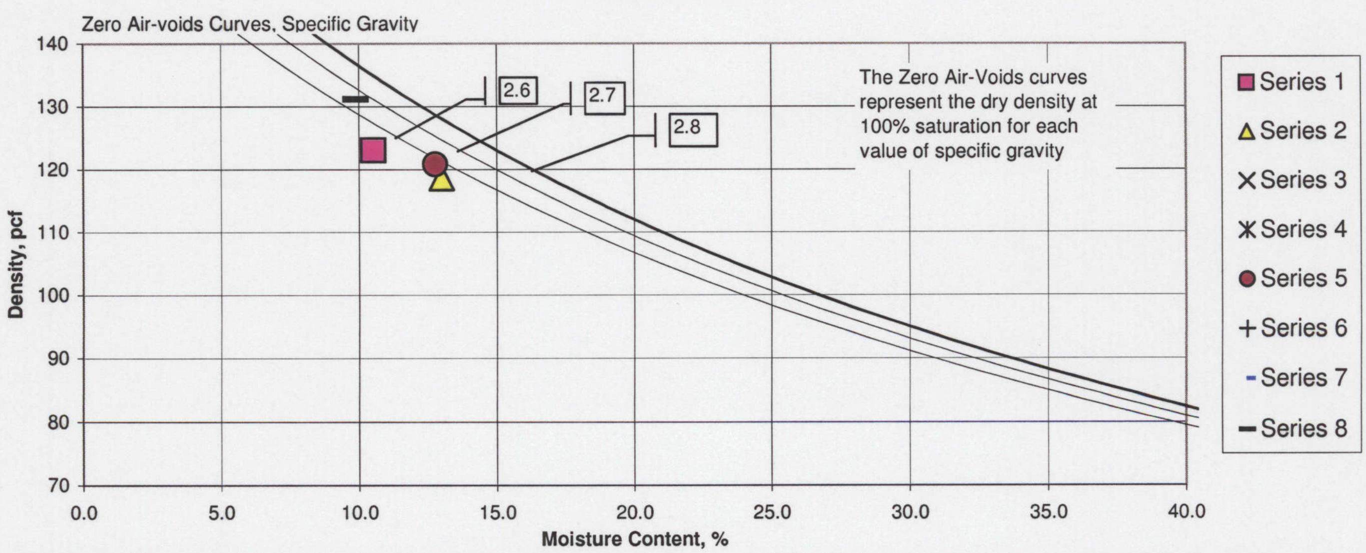
Moisture-Density-Porosity Report

Cooper Testing Labs, Inc.

Job No:	109-594	**Date:**	02/01/08
Client:	Geomatrix Consultants	**By:**	RU
Project:	Caldecott, Signage - 7321.002	**Remarks:**	SGN5;2-4 @6.5' & SGN5;4-4 @16.5' & BS;4-4 @16.5' & BS;6-4 @26.5' - samples disturbed; m/c only

Boring:	SGN2	SGN3	SGN5	SGN5	BS1	BS1	BS1	BS2
Sample:	2-4	4-4	2-4	4-4	1-4	4-4	6-4	6-4
Depth, ft:	3.5	16.5	6.5	16.5	3.5	16.5	26.5	21.5
Visual Description:	Bluish Gray Sandy CLAY	Greenish Brown Clayey SAND	Reddish Brown Sandy CLAY w/ Gravel	Brown Clayey SAND w/ Gravel	Brown Clayey SAND w/ Gravel	Brown Clayey SAND w/ Gravel	Brown Clayey GRAVEL w/ Sand	Bluish Gray Clayey SAND w/ Gravel
Actual G_s								
Assumed G_s	2.70	2.70			2.70			2.70
Total Vol cc	149.4	149.4			149.4			149.4
Vol Solids,cc	109.0	105.0			107.0			116.1
Vol Voids,cc	40.4	44.3			42.4			33.2
Moisture, %	10.5	13.0	10.9	11.0	12.8	12.5	9.4	9.9
Wet Unit wt, pcf	136.0	134.1			136.2			144.1
Dry Unit wt, pcf	123.1	118.6			120.8			131.2
Saturation, %	76.7	83.2			87.0			93.4
Porosity, %	27.0	29.7			28.4			22.2
Air filled Poros.,%	6.3	5.0			3.7			1.5
Water filled Poros.,%	20.7	24.7			24.7			20.8
Void Ratio	0.37	0.42			0.40			0.29
Series	1	2	3	4	5	6	7	8

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



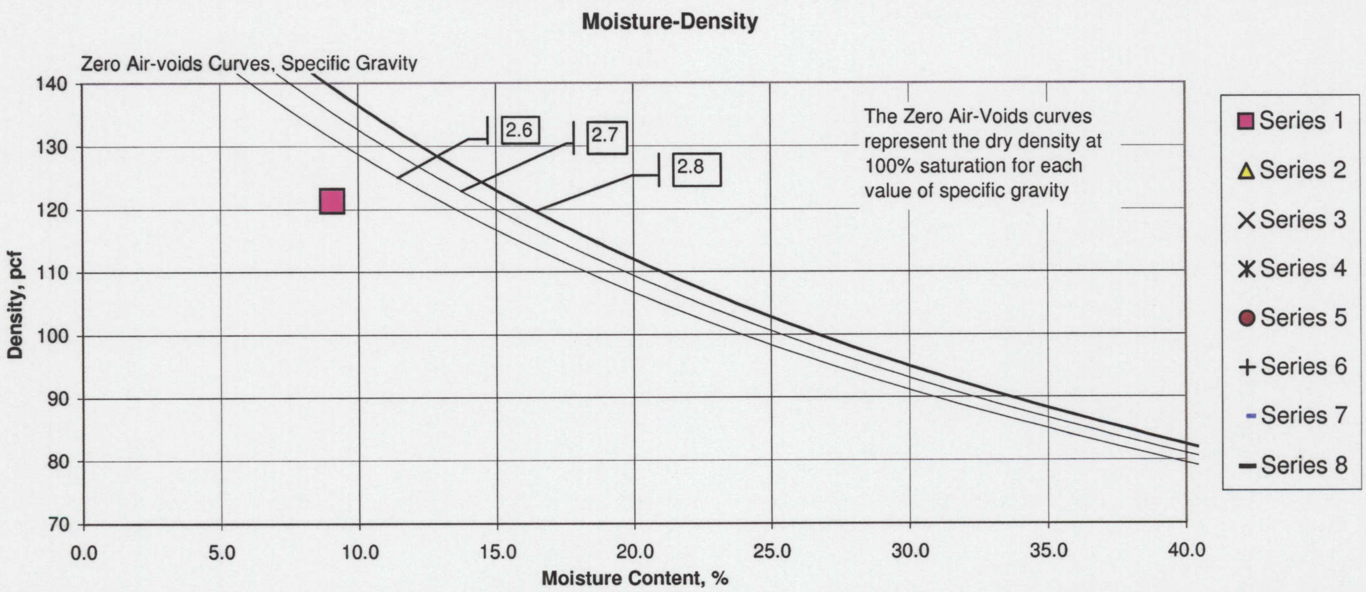
Moisture-Density-Porosity Report

Cooper Testing Labs, Inc.

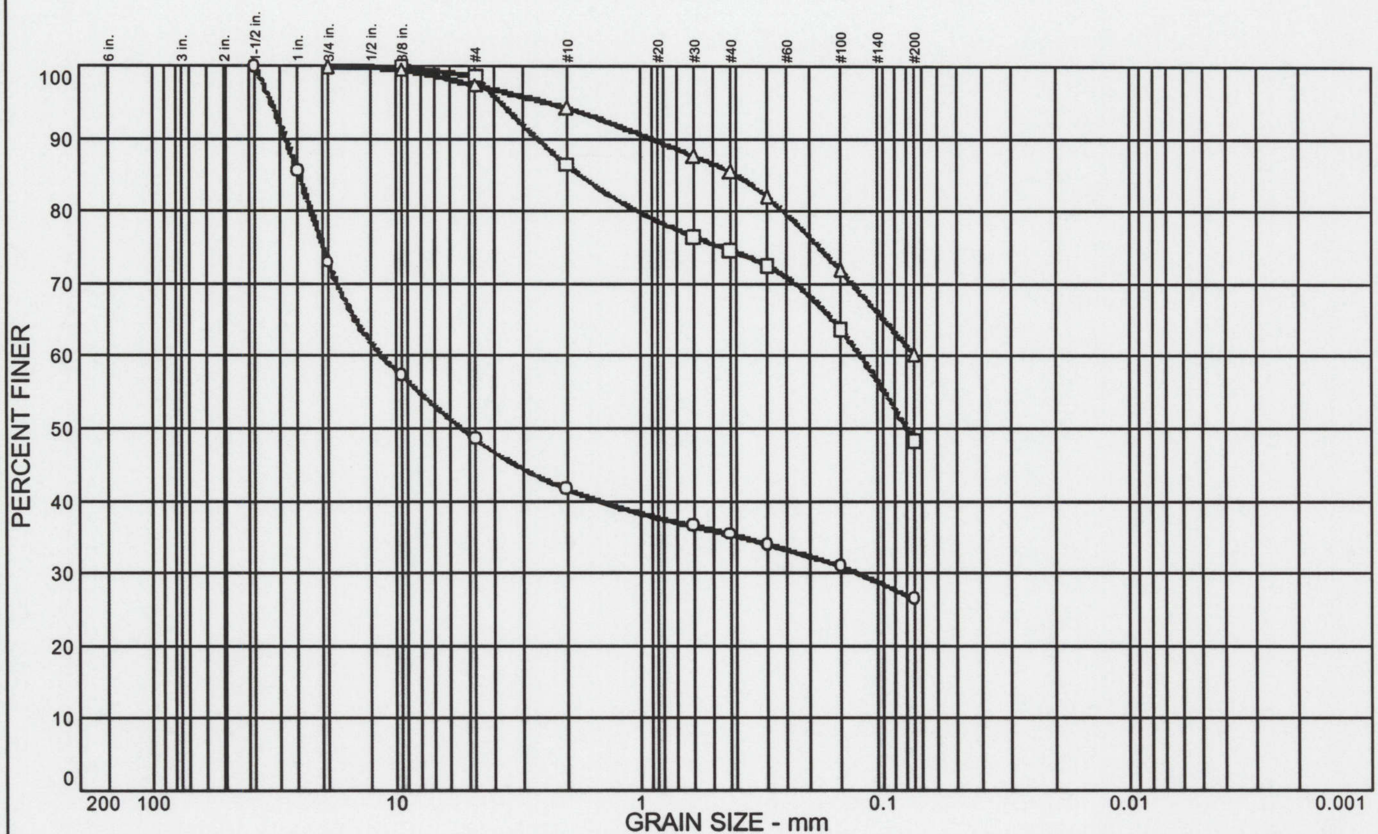
Job No:	109-594a	**Date:**	02/01/08
Client:	Geomatrix Consultants	**By:**	RU
Project:	Caldecott, Signage - 7321.002	**Remarks:**	SGN-3;2-4 @ 6.5' - sample disturbed; m/c only.

Boring:	SGN-3							
Sample:	2-4							
Depth, ft:	6.5							
Visual Description:	Brown Lean Clayey GRAVEL w/ Sand							
Actual G_s								
Assumed G_s	2.70							
Total Vol cc	400.2							
Vol Solids,cc	288.0							
Vol Voids,cc	112.3							
Moisture, %	9.1							
Wet Unit wt, pcf	132.4							
Dry Unit wt, pcf	121.4							
Saturation, %	62.7							
Porosity, %	28.1							
Air filled Poros.,%	10.5							
Water filled Poros.,%	17.6							
Void Ratio	0.39							
Series	1	2	3	4	5	6	7	8

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



Particle Size Distribution Report



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○		51.5	22.1	26.4		GC		20	40
□		1.3	50.4	48.3					
△		2.6	37.1	60.3		CL		14	31

SIEVE inches size	PERCENT FINER ○	□	△
1.5	100.0		
1	85.5		
3/4	72.9		100.0
3/8	57.3	100.0	99.5

	GRAIN SIZE ○	□	△
D_{60}	11.5	0.124	
D_{30}	0.128		
D_{10}			

	COEFFICIENTS ○	□	△
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	48.5	98.7	97.4
#10	41.6	86.5	94.3
#30	36.5	76.6	87.7
#40	35.4	74.7	85.5
#50	34.0	72.6	82.1
#100	30.9	63.8	71.9
#200	26.4	48.3	60.3

SOIL DESCRIPTION

○ Brown Lean Clayey GRAVEL w/ Sand

□ Greenish Brown Clayey SAND

△ Gray Sandy Lean CLAY

REMARKS:

○

□

△

○ Source: SGN3 Sample No.: 2-4 Elev./Depth: 6.5'

□ Source: SGN3 Sample No.: 4-4 Elev./Depth: 16.5'

△ Source: SGN4 Sample No.: 3-4 Elev./Depth: 11.5'

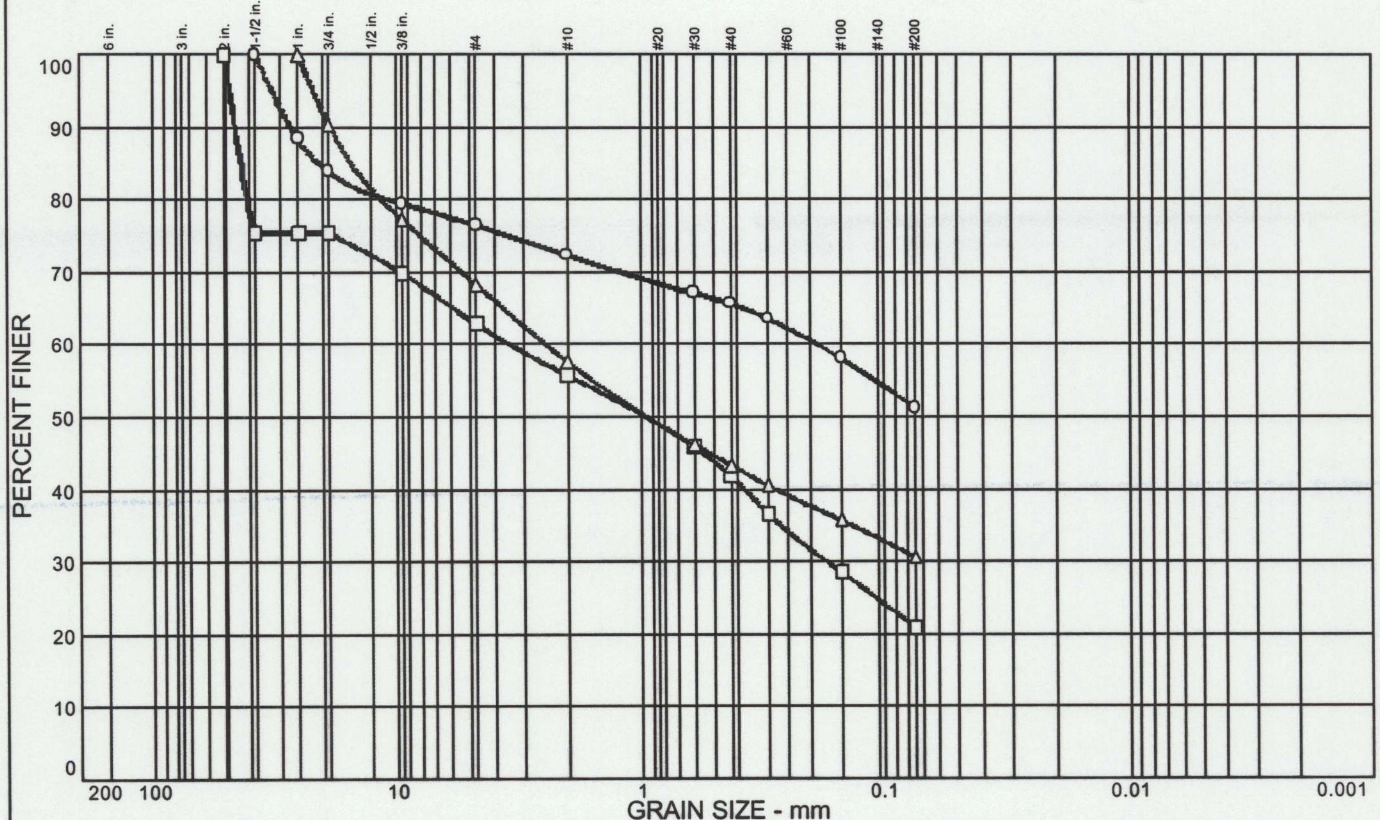
COOPER TESTING LABORATORY

Client: Geomatrix Consultants

Project: Caldecott, Signage - 7321.002

Project No.: 109-594 Figure

Particle Size Distribution Report



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○		23.5	25.2	51.3		ML			
□		37.1	42.0	20.9					
△		31.7	37.7	30.6					

SIEVE inches size	PERCENT FINER ○	□	△
2		100.0	
1.5	100.0	75.4	
1	88.4	75.4	100.0
3/4	83.9	75.4	90.4
3/8	79.5	69.9	77.3
	GRAIN SIZE		
D_{60}	0.187	3.45	2.46
D_{30}		0.173	
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	76.5	62.9	68.3
#10	72.4	55.7	57.6
#30	67.1	45.8	46.1
#40	65.7	41.8	43.3
#50	63.6	36.6	40.5
#100	58.1	28.5	35.7
#200	51.3	20.9	30.6

SOIL DESCRIPTION

○ Reddish Brown Sandy CLAY w/ Gravel

□ Brown Clayey SAND w/ Gravel

△ Brown Clayey SAND w/ Gravel

REMARKS:

○

□

△

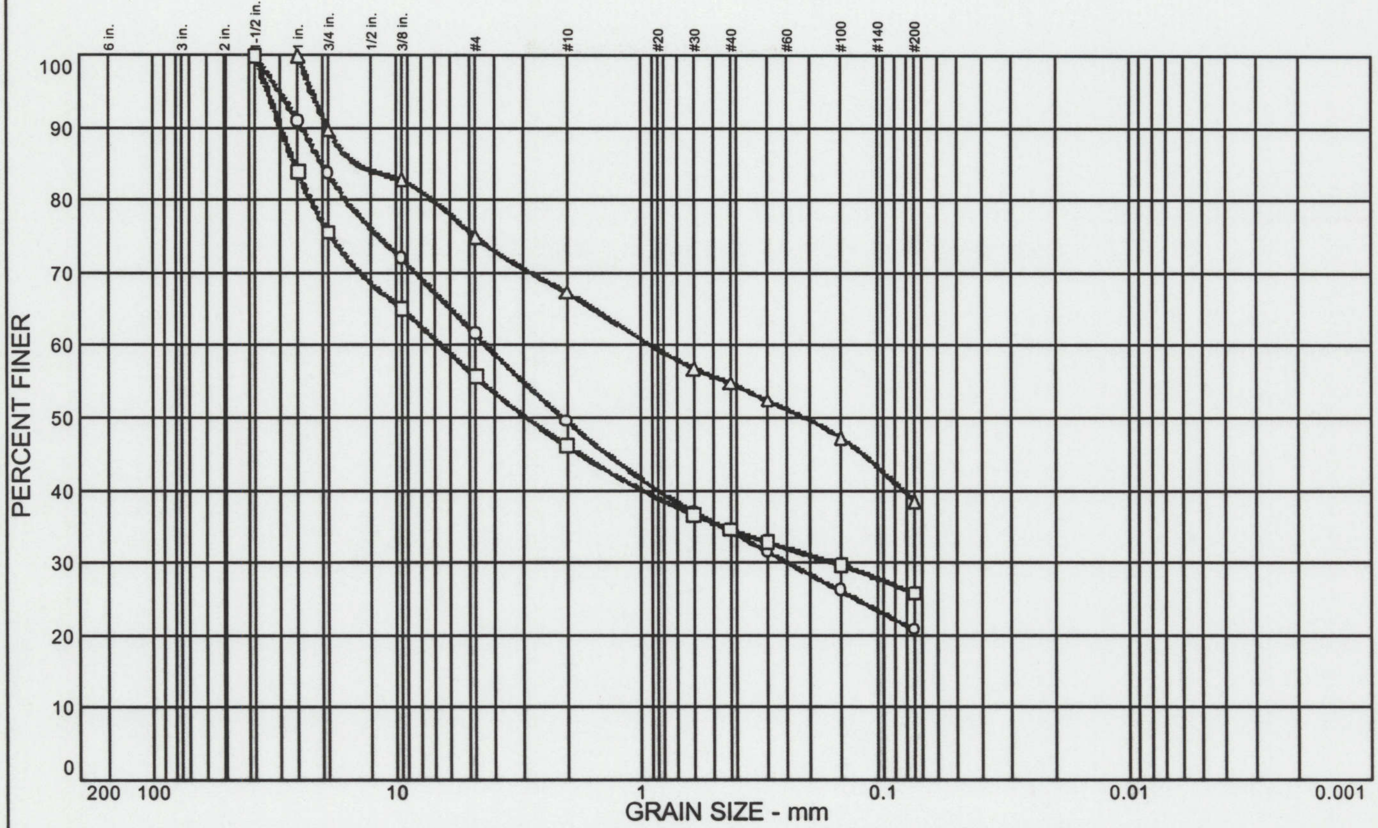
○ Source: SGN5 Sample No.: 2-4 Elev./Depth: 6.5'

□ Source: SGN5 Sample No.: 4-4 Elev./Depth: 16.5'

△ Source: BS1 Sample No.: 1-4 Elev./Depth: 3.5'

COOPER TESTING LABORATORY	Client: Geomatrix Consultants Project: Caldecott, Signage - 7321.002 Project No.: 109-594 Figure

Particle Size Distribution Report



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○		38.5	40.8	20.7					
□		44.3	29.9	25.8					
△		25.0	36.5	38.5					

SIEVE inches size	PERCENT FINER ○	□	△
1.5	100.0	100.0	
1	90.9	83.9	100.0
3/4	83.6	75.6	89.7
3/8	71.9	65.0	82.8
GRAIN SIZE			
D_{60}	4.29	6.53	0.894
D_{30}	0.248	0.160	
D_{10}			
COEFFICIENTS			
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	61.5	55.7	75.0
#10	49.5	46.1	67.3
#30	37.0	36.6	56.9
#40	34.3	34.6	54.8
#50	31.5	32.8	52.4
#100	26.1	29.7	47.3
#200	20.7	25.8	38.5

SOIL DESCRIPTION

○ Brown Clayey SAND w/ Gravel

□ Brown Clayey GRAVEL w/ Sand

△ Bluish Gray Clayey SAND w/ Gravel

REMARKS:

○

□

△

○ Source: BS1 Sample No.: 4-4 Elev./Depth: 16.5'

□ Source: BS1 Sample No.: 6-4 Elev./Depth: 26.5'

△ Source: BS2 Sample No.: 6-4 Elev./Depth: 21.5'

COOPER TESTING LABORATORY

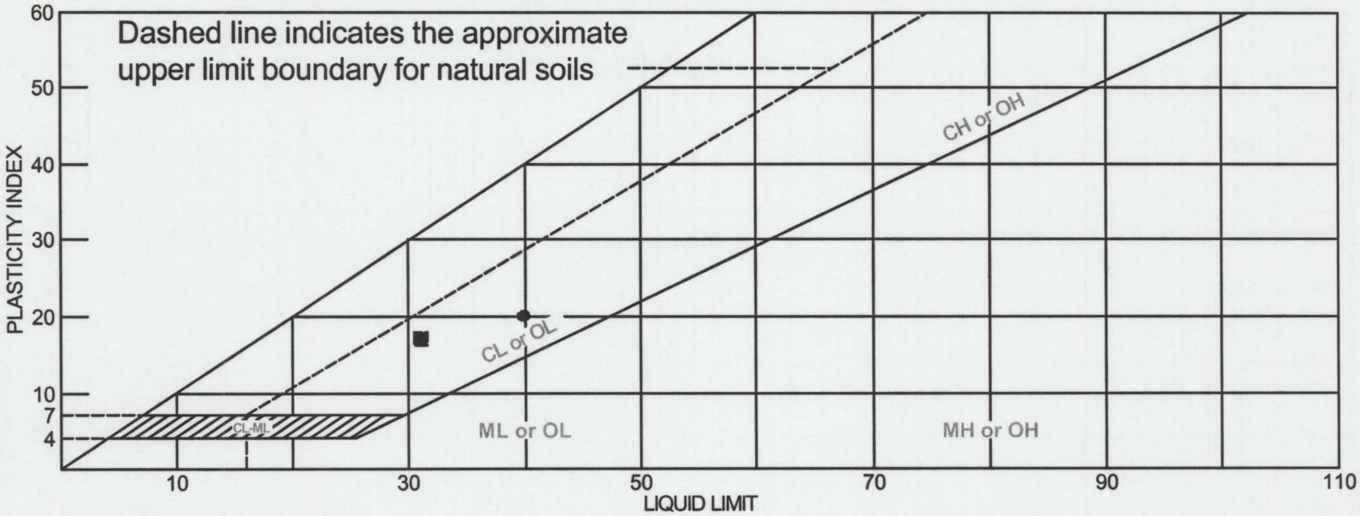
Client: Geomatrix Consultants

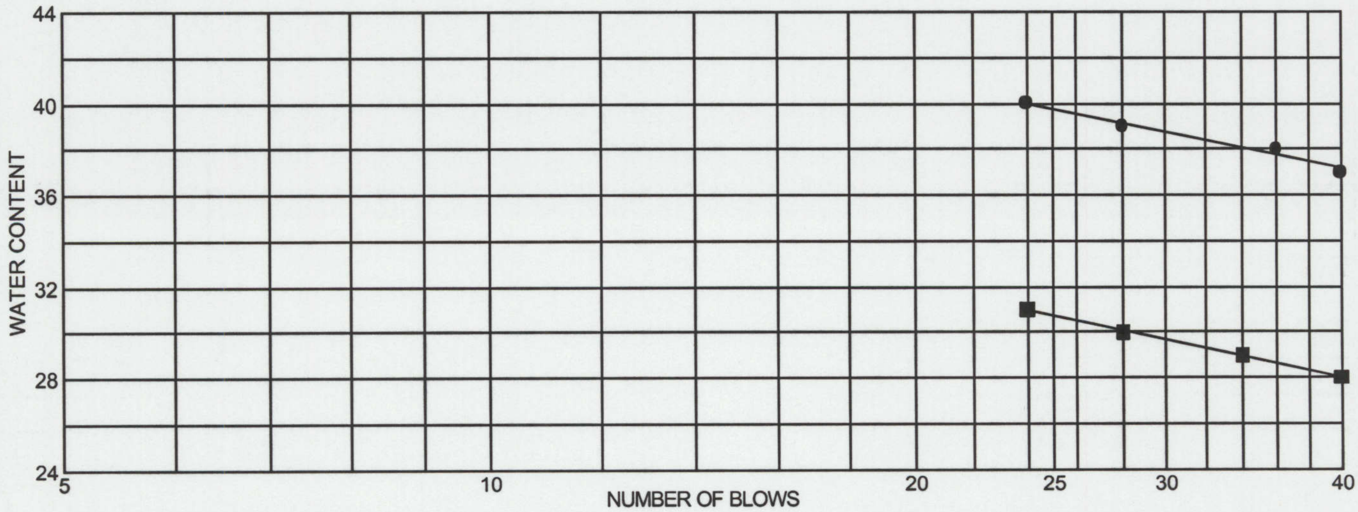
Project: Caldecott, Signage - 7321.002

Project No.: 109-594

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown Lean Clayey GRAVEL w/ Sand	40	20	20	35.4	26.4	GC
■	Gray Sandy Lean CLAY	31	14	17	85.5	60.3	CL

Project No. 109-594 **Client:** Geomatrix Consultants

Project: Caldecott, Signage - 7321.002

● **Source:** SGN3 **Sample No.:** 2-4 **Elev./Depth:** 6.5'

■ **Source:** SGN4 **Sample No.:** 3-4 **Elev./Depth:** 11.5'

Remarks:

●

■

LIQUID AND PLASTIC LIMITS TEST REPORT

COOPER TESTING LABORATORY

Figure

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

COOPER TESTING LABORATORY

CTL Job No.:	109-594	Boring:	SGN3	Date:	1/30/2008
Client:	Geomatrix Consultants	Sample:		By:	PJ
Project Name:	Caldecott, Signage	Depth,ft.:	24.5 - 25.5	Checked:	PJ
Project No.:	7321.002				

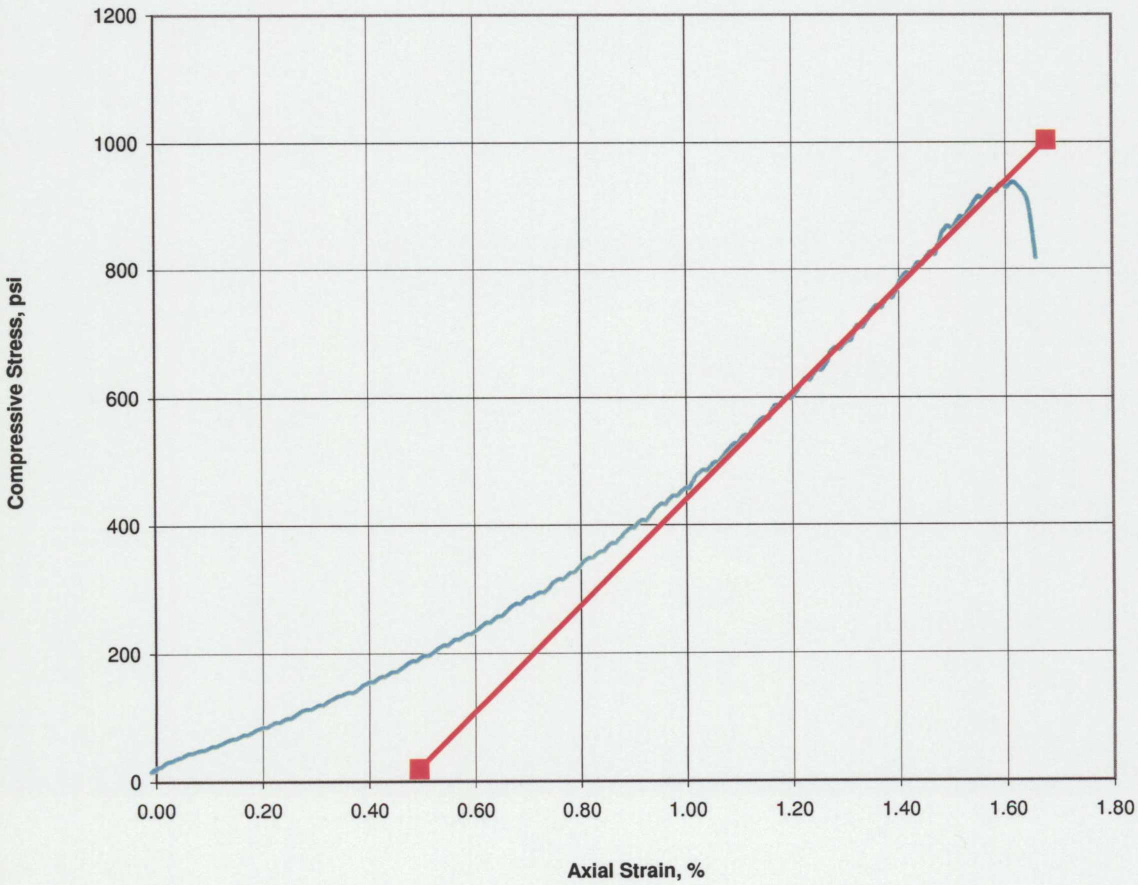
Visual Description: Greenish Gray Rock

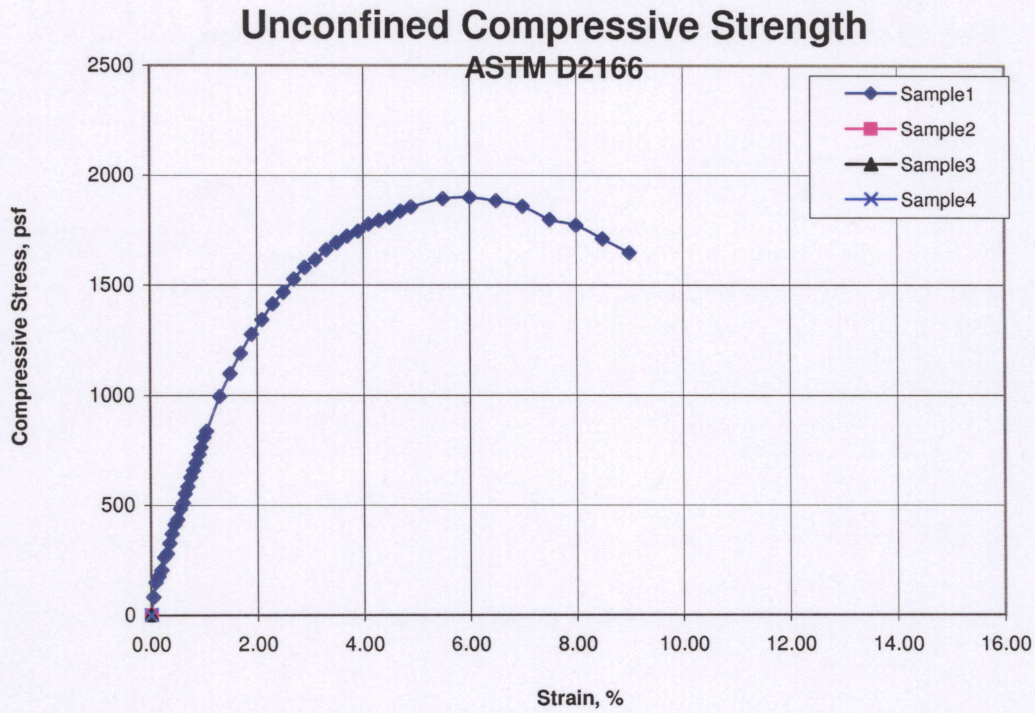
Moisture Condition at Test: Sample was washed and in a moist state.

Test Temperature, (°C): Ambient

Remarks: This material exhibited a tendency to shrink or swell with changes in moisture content. The densities reported are at the time of testing.

Sample Height, in.	4.86	**Unconfined Compressive Strength, psi**	**937**
Sample Diameter, in.	2.38		
Height / Diameter	2.04		
Sample Area, in^2	4.45		
Wet Density, pcf	153.1	**Young's Modulus (E) (psi)**	**83,100**
Dry Density, pcf	142.7		
Moisture Content, %	7.3		
Strain Rate, % / min	0.23		





Sample No.:	1	2	3	4	
Unconfined Compressive Strength, psf	1899				
Unconfined Compressive Strength, psi	13.2				
Undrained Shear Strength, psf	949				
Failure Strain, %	6.0				
Strain Rate, % per minute	1.0				
Strain Rate, inches/minute	0.05				
Moisture Content, %	14.5				
Dry Density, pcf	116.8				
Saturation, %	88.2				
Void Ratio	0.443				
Specimen Diameter, inches	2.420				
Specimen Height, inches	5.00				
Height to Diameter Ratio	2.1				
Assumed Specific Gravity	2.70				

Sample Location				
	Boring	Sample	Depth, ft.	Soil Description
1	SGN-4	3-4	11.5	Gray Sandy Lean CLAY
2				
3				
4				

Job No.:	109-594
Client:	Geomatrix Consultants
Project:	Caldecott, Signage - 7321.002
Date:	2/1/2008 By: MD/RU

Type of Sample: Undisturbed

Remarks:

COOPER TESTING LABORATORY

PREPARED FOR:
CALIFORNIA DEPARTMENT OF TRANSPORTATION
DISTRICT 4
OFFICE OF ENVIRONMENTAL ENGINEERING
111 GRAND AVENUE
OAKLAND, CALIFORNIA

Caltrans

PREPARED BY:
GEOCON CONSULTANTS, INC.
6671 BRISA STREET
LIVERMORE, CALIFORNIA

GEOCON

CALTRANS CONTRACT 04A1862
TASK ORDER NO. 83
EA No. 04-294901

GEOCON PROJECT NO. E8220-06-83

DECEMBER 2007

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SITE INVESTIGATION REPORT

TABLES

FIGURES

APPENDICES

REPORT LIMITATIONS

This report has been prepared exclusively for the State of California Department of Transportation (Caltrans) District 4. The information contained herein is only valid as of the date of the report, and will require an update to reflect additional information obtained.

This report is not a comprehensive site characterization and should not be construed as such. The findings as presented in this report are predicated on the results of the limited sampling and laboratory testing performed. In addition, the information obtained is not intended to address potential impacts related to sources other than those specified herein. Therefore, the report should be deemed conclusive with respect to only the information obtained. We make no warranty, express or implied, with respect to the content of this report or any subsequent reports, correspondence or consultation. Geocon strived to perform the services summarized herein in accordance with the local standard of care in the geographic region at the time the services were rendered.

The contents of this report reflect the views of the author who is responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the State of California or the Federal Highway Administration. This report does not constitute a standard, specification, or regulation.

GEOCON CONSULTANTS, INC

Lauren Wincze
Senior Staff Geologist

Richard Day, CEG, CHG
Regional Manager

PROFESSIONAL GEOLOGIST
RICHARD W. DAY
No. 5479
Exp. 09-30-09
STATE OF CALIFORNIA

CALIFORNIA DEPARTMENT OF TRANSPORTATION – DISTRICT 4
OFFICE OF ENVIRONMENTAL ENGINEERING

Reviewed By:	Recommended By:	Approved By:
Peter Altherr, P.E. Task Order Manager	Chris Wilson, P.E. District Branch Chief	Allen Baradar, P.E., REA District Office Chief

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John McAssey 510.568.7676 510.568.7679 fax jmcassey@vironex.com	Vironex 2110 Adams Avenue San Leandro, CA 94577 (*Geocon Subcontractor*)	Direct-Push Soil Boring
Karli Stroing 916-777-4100	V&W Drilling 100 Fifth Street Isleton, CA 95641 (*Geocon Subcontractor*)	Direct-Push Soil Boring
Diane Galvan 562.989.4045 562.989.4040 fax diane@atlglobal.com	Advanced Technology Laboratories 1510 E. 33rd Street Signal Hill, CA 90807 (*Geocon Subcontractor*)	Laboratory Analysis

EXECUTIVE SUMMARY

We prepared this Site Investigation Report for the State Route 24 Caldecott Tunnel Improvements Project. This report documents the investigation sampling methods, the laboratory analytical data, the statistical analysis of these data, and the recommended waste characterization of surface material generated from within the prescribed areas of excavation. The project consists of State Route (SR) 24 between SR 13 and Gateway Boulevard in Alameda and Contra Costa Counties, California. The Site location is depicted on the Vicinity Map, Figure 1. We understand that Caltrans proposes various freeway and tunnel improvements at the project location.

The primary objectives of our investigation were to 1) evaluate whether impacts due to metals exist in the soil within the project boundaries; and 2) evaluate for the presence of metals, total petroleum hydrocarbons as gasoline, diesel, and motor oil (TPHg, TPHd, and TPHmo), benzene, toluene, ethylbenzene, total xylenes (BTEX), methyl tertiary butyl ether (MTBE), volatile organic compounds (VOCs), and semi-volatile organic compounds (SVOCs) in groundwater within the project boundaries. Caltrans will use the information obtained from this investigation to coordinate improvement activities, determine soil and groundwater disposal costs, determine appropriate abatement/disposal costs, and identify health and safety concerns during improvements.

The field investigation was performed between July 30 and September 28, 2007. The following field activities were performed during sampling efforts.

- Advanced 145 soil borings to depths ranging from the surface to 21 feet below ground surface (bgs) using hand auger and direct-push methods for the purpose of collecting soil and/or groundwater samples. (Copies of the drilling permits from Alameda and Contra Costa Counties are presented as Appendix A.)
- Collected groundwater samples at four locations.
- Collected soil samples in pre-cleaned containers and acetate liners.
- Collected groundwater samples in pre-cleaned, laboratory-supplied glass containers.
- Transported samples under standard chain-of-custody protocol to a California-certified environmental laboratory.

Soil samples were collected from 145 borings as shown on the Site Plans, Figures 2a through 2f. Soil borings B44 through B48 were postponed until the construction phase due to traffic safety concerns. During field activities, soil borings B40 and B52 were determined by the Caltrans Task Order Manager to be unnecessary. Boring locations were surveyed using Differential Global Positioning System (DGPS) equipment. Boring coordinates are presented on Table 1.

We attempted to advance a total of 96 soil borings (B10-B34, B41-B43, B49-B51, B53-B56, B75-B90, B96-B104, and MVP1-MVP36) to a maximum depth of approximately 4 feet bgs. (Three borings were advanced at each of the 12 Maintenance Vehicle Pullout [MVP] locations.) Soil samples were collected at approximate depth intervals of 0 to 0.5 foot, 1 to 1.5 feet, 2.5 to 3 feet, and 3.5 to 4 feet. Refusal was encountered at depths indicated on the chain-of-custody forms. Hand auger boreholes were backfilled to the surface with soil cuttings. Direct-push boreholes were backfilled to surface with the cement grout.

We attempted to advance a total of 25 soil borings (B35-B39, B61-B74, B61A, and B91-B95) to a maximum depth of approximately 6 feet bgs. Soil samples were collected at approximate depth intervals of 0 to 0.5 foot, 1 to 1.5 feet, 2.5 to 3 feet, and 5.5 to 6 feet. Refusal was encountered at depths indicated on the chain-of-custody forms. Hand auger boreholes were backfilled to the surface with soil cuttings. Direct-push boreholes were backfilled to surface with the cement grout.

We attempted to advance a total of 14 soil borings (B1-B9, B57-B60, and B60A) to a maximum depth of approximately 9 feet bgs. Soil samples were collected at approximate depth intervals of 0 to 0.5 foot, 1 to 1.5 feet, 2.5 to 3 feet, and 8.5 to 9 feet. Refusal was encountered at depths indicated on the chain-of-custody forms. Hand auger boreholes were backfilled to the surface with soil cuttings. Direct-push boreholes were backfilled to surface with the cement grout.

We attempted to advance a total of eight soil borings (B105-B108 and B110-B113) to a maximum depth of approximately 16 feet bgs. Soil samples were collected at approximate depth intervals of 0 to 0.5 foot, 1 to 1.5 feet, 3.5 to 4 feet, 9.5 to 10 feet, and 15.5 to 16 feet. Refusal was encountered at depths indicated on the chain-of-custody forms. Hand auger boreholes were backfilled to the surface with soil cuttings. Direct-push boreholes were backfilled to surface with the cement grout.

We attempted to advance a total of two soil borings (B109 and B114) to a maximum depth of approximately 21 feet bgs (in an attempt to encounter groundwater). Soil samples were collected at approximate depth intervals of 0 to 0.5 foot, 1 to 1.5 feet, 3.5 to 4 feet, and 15.5 to 16 feet. Refusal was encountered at depths indicated on the chain-of-custody forms. Hand auger boreholes were backfilled to the surface with soil cuttings. Direct-push boreholes were backfilled to surface with the cement grout.

Groundwater was encountered in only two borings (B59 and B82) during our investigation. We collected grab groundwater samples from the borings. At the direction of the Caltrans Task Order Manager, we collected grab groundwater samples from two monitoring wells (Well A and Well B) located within the Caltrans right-of-way (see Figure 2a).

We provided quality assurance/quality control (QA/QC) procedures during the field activities. These procedures included washing the sampling equipment with a Liqui-Nox® solution followed by a double rinse with deionized water. Decontamination water was disposed to the ground surface within Caltrans right-of-way in a manner not to create runoff, away from drain inlets or potential water bodies.

Sample containers were sealed, labeled, and transported in chilled containers to a Caltrans-approved, certified environmental laboratory using standard chain-of-custody documentation. Laboratory analyses were requested under 48-hour turn-around-times.

The laboratory testing performed is summarized below:

- A total of 358 soil samples were analyzed for total lead using EPA Test Method 6010B.
- A total of 145 soil samples were analyzed for Title 22 (CAM 17) metals using EPA Test Methods 6010B/7471A.
- A total of 56 soil samples were analyzed for pH using EPA Test Method 9045C.
- A total of four groundwater samples were analyzed for CAM 17 metals using EPA Test Methods 6010B/7470A.
- A total of four groundwater samples were analyzed for TPHd, TPHmo, and TPHg using EPA Test Method 8015B.
- A total of four groundwater samples were analyzed for BTEX and MTBE using EPA Test Method 8021B.
- A total of four groundwater samples were analyzed for VOCs using EPA Test Method 8260B.
- A total of four groundwater samples were analyzed for SVOCs using EPA Test Method 8270C.

<u>Soil Results</u>

Summaries of the analytical laboratory test results for soil are presented on Tables 2 and 3. Reproductions of the laboratory reports and chain-of-custody documentation are presented in Appendix B.

The laboratory analyses indicated the following:

- Lead, chromium, and mercury were the only metals detected in soil at total concentrations greater than ten times their Soluble Threshold Limit Concentration (STLC) values of 5.0, 5.0, and 0.2 milligrams per liter (mg/l), respectively. Total lead concentrations ranged from less than the laboratory reporting limit (<) of 1 milligram per kilogram (mg/kg) to 2,000 mg/kg. Total chromium concentrations ranged from <1 mg/kg to 81 mg/kg. Total mercury concentrations ranged from < 0.10 mg/kg to 8.0 mg/kg.
- Soil pH values ranged from 3.8 to 11.
- A total of 93 soil samples that were further analyzed for soluble (WET) lead exhibited concentrations ranging from <1.0 mg/l to 150 mg/l.
- Concentrations for a total of 26 soil samples that were further analyzed for soluble (WET) chromium were <1.0 mg/l.

- A total of nine soil samples that were further analyzed for soluble (WET) mercury exhibited concentrations ranging from <1.0 micrograms per liter (ug/l) to 7.3 ug/l.
- A total of 56 soil samples that were further analyzed for soluble lead using the WET procedure with deionized water as the extractant (WET-DI) exhibited concentrations ranging from <0.25 mg/l to 7.2 mg/l.
- A total of 31 soil samples that were further analyzed for soluble lead using the Toxicity Characteristic Leaching Procedure (TCLP) exhibited concentrations ranging from <1 mg/l to 30 mg/l. (The laboratory reported that samples B49-1 and B51-2 had been consumed during previous analyses and therefore could not be further analyzed using the TCLP.)

The minimum, average, and maximum total CAM 17 metal concentrations are summarized at the end of Table 3 along with the residential and commercial ESLs.

Groundwater Results

Summaries of the analytical laboratory test results for groundwater are presented on Tables 4 and 5. Reproductions of the laboratory reports and chain-of-custody documentation are presented in Appendix B.

The laboratory analyses indicated the following:

- Antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, vanadium, and zinc were detected at or above the laboratory reporting limits in groundwater samples.
- Groundwater samples analyzed for TPHd exhibited concentrations ranging from <0.050 mg/l to 2.3 mg/l.
- Groundwater samples analyzed for TPHmo exhibited concentrations ranging from <0.050 mg/l to 0.58 mg/l.
- TPHg, BTEX, MTBE, VOCs, and SVOCs were not detected in groundwater samples.

Statistical Evaluation of Lead Detected in Soil Samples

The lead data were separated into 24 sample populations for statistical evaluation. Sample populations were separated as follows:

Sample Population	Location	Boring ID's
A	Ramp shoulder, western end of Site	B1-B3, B5-B8, and MVP1-MVP6
B	Ramp shoulder, western portion of Site	B4, and B9-B18
C	Median, western portion of Site	B19-B23
C1	Median, western portion of Site	B27-B32, and B41
D	Ramp shoulder, western-central portion of Site	B35-B39, and MVP13-MVP18
E	Ramp shoulder, western-central portion of Site	B33 and B34
F	Ramp shoulder, western-central portion of Site	B53-B58, B113, B114, and MVP10-MVP12

Sample Population	Location	Boring ID's
F1	Ramp shoulder, western-central portion of Site	B59-B60A
G	Ramp shoulder, western-central portion of Site	B105-B112
H	Ramp shoulder, eastern-central portion of Site.	B61-B74, and B91
I	Ramp shoulder, eastern-central portion of Site.	B75-B77, B80, B92, B93, and MVP25-MVP27
I1	Loop Ramp shoulder, eastern-central portion of Site.	B94 and B95
J	Ramp shoulder, eastern-central portion of Site.	MVP19-MVP24
K	Median, western-central portion of Site	B42 and B43
L	Shoulder, eastern portion of Site	B96-B100
M	Ramp shoulder, eastern portion of Site	MVP28-MVP30
N	Shoulder, eastern portion of Site	B82-B84
N1	Gore Point, eastern portion of Site	B81
O	Median, eastern portion of Site	B85-B90, and B101-B104
P	Shoulder, western portion of Site	B24-B26
Q	Ramp shoulder, eastern end of Site	MVP34-MVP36
R	Ramp shoulder, eastern portion of Site	MVP31-MVP33
S	Ramp shoulder, western portion of Site	MVP7-MVP9
T	Ramp shoulder, western-central portion of Site	B49-B51

Statistical methods were applied to the total lead data to evaluate: 1) the upper confidence limits (UCLs) of the arithmetic means of the total lead concentrations for each sampling depth; and 2) if an acceptable correlation between total and soluble lead concentrations exists that would allow the prediction of soluble lead concentrations based on calculated UCLs.

Based upon the calculated UCLs and statistical results, we drew the following conclusions with respect to soil reuse and disposal at the Site:

- Soil excavated from areas inclusive of Sample Populations A, I1, O, and Q could be reused or disposed as non-hazardous with respect to lead content, as reported total lead concentrations are less than ten times the STLC value of 5 mg/l.

- Soil excavated from areas inclusive of Sample Populations F1 and R could be reused or disposed as non-hazardous with respect to lead content, as reported soluble (WET) lead concentrations are less the STLC value of 5 mg/l

- Soil excavated from areas inclusive of Sample Populations C, E, G, H, J, and S could be reused or disposed as non-hazardous with respect to lead content, since the 90% UCL-predicted soluble (WET) lead concentrations are less than the lead STLC of 5.0 mg/l.

- Soil generated from excavations to a depth of 1 ft from areas inclusive of Sample Populations B, C1, D, F, I, L, M, N, and P would be classified as a California hazardous waste since the 90% UCL-predicted soluble (WET) lead concentration is greater than the lead STLC of 5.0 mg/l. Consequently, the top 1 foot of excavated soil would require offsite disposal as a hazardous waste or onsite reuse under the DTSC variance. Based on the soluble (WET-DI) lead results, the top 1 foot of soil may be reused in accordance with the DTSC variance by placing the lead-impacted soil under a pavement structure or clean fill. Based on the soluble (TCLP) results, the top 1 foot of soil would not be considered a RCRA hazardous waste. Underlying soil (i.e., deeper than 1 foot bgs) could be reused or disposed as non-hazardous with respect to lead content.

- Soil generated from excavations to 2.5 ft from the area inclusive of Sample Populations K and T would be classified as a California hazardous waste since the soluble (TCLP) lead concentrations are greater than the lead TCLP of 5.0 mg/l. Consequently, the top 2.5 feet of excavated soil would require offsite disposal as a RCRA hazardous waste.

- Soil generated from excavations in the area inclusive of Sample Population N1 (Gore Point Boring B81) would be classified as a RCRA hazardous waste based on the soluble (TCLP) concentration of 8.2 mg/l. Consequently, excavated soil would require offsite disposal as a RCRA hazardous waste.

Other CAM17 Metals - Soil

Based on the total and soluble (WET) CAM17 metals concentrations, with the exception of lead, soil excavated from the project site should not be considered a hazardous waste.

Soil sample results were compared to Environmental Screening Levels (ESLs) for shallow and deep soils in areas where Groundwater is a Current or Potential Source of Drinking Water (San Francisco Regional Water Quality Control Board [SFRWQCB], Tables A and C). Reported concentrations of arsenic and zinc exceeded their respective residential and commercial/industrial land use ESLs. Reported concentrations of cadmium, mercury, vanadium exceeded their respective residential land use ESLs. Accordingly, offsite disposal of soil may be restricted depending on proposed use. Additionally, potential associated construction-worker health and safety concerns should be evaluated by an industrial hygienist.

The minimum, average, and maximum total CAM 17 metal concentrations are summarized at the end of Table 3 along with the residential and commercial ESLs.

Groundwater

Grab-groundwater sample results were compared to ESLs for Groundwater that is a Current or Potential Source of Drinking Water (SFRWQCB, Table A).

Organics

Organics were not reported in the grab-groundwater samples above ESLs, with the exception of TPHd and TPHmo, which were detected in the samples collected from Well A and Well B at concentrations exceeding the residential land use ESL of 0.1 mg/l (SFBRWQCB, Table A).

CAM17 Metals

Concentrations of CAM17 metals in the grab-groundwater samples did not exceed their respective ESLs, with the exception of zinc, which was reported at 3.2 mg/l in the sample collected from Well B. This result is greater than the residential land use ESL of 2.0 mg/l for zinc.

Therefore, additional groundwater sampling and analysis may be needed, or treatment of groundwater prior to discharge to the storm sewer system or directly to the San Francisco Bay may be necessary.

Per Caltrans requirements, contractor(s) should prepare a project-specific Health and Safety Plan to prevent or minimize worker exposure to the chemical of concern observed within the soil and groundwater at this project site. The plan should include protocols for environmental and personnel monitoring, requirements for personal protective equipment, and other appropriate health and safety protocols and procedures for the handling of metal-impacted soil.

SITE INVESTIGATION REPORT

1.0 INTRODUCTION

We prepared this Site Investigation Report for the State Route 24 Caldecott Tunnel Improvement project. The project consists of State Route (SR) 24 between SR 13 and Gateway Boulevard in Alameda and Contra Costa Counties, California. The Site location is depicted on the Vicinity Map, Figure 1. We understand that Caltrans proposes various freeway and tunnel improvements at the project location.

The primary objectives of our investigation were to 1) evaluate whether impacts due to metals exist in the soil within the project boundaries; and 2) evaluate for the presence of metals, total petroleum hydrocarbons as gasoline, diesel, and motor oil (TPHg, TPHd, and TPHmo), benzene, toluene, ethylbenzene, total xylenes (BTEX), methyl tertiary butyl ether (MTBE), volatile organic compounds (VOCs), and semi-volatile organic compounds (SVOCs) in groundwater within the project boundaries. Caltrans will use the information obtained from this investigation to coordinate improvement activities, determine soil and groundwater disposal costs, determine appropriate abatement/disposal costs, and identify health and safety concerns during improvements.

The investigation also included an asbestos and deteriorated lead paint survey of the Caldecott Tunnel Office Building. The results of the asbestos and lead paint survey are reported under separate cover in the Geocon report entitled *Asbestos and Deteriorated Lead Paint Survey, Caldecott Tunnel Offices, Alameda County, California*, dated October 9, 2007.

2.0 BACKGROUND

2.1 Potential ADL Impacts

Testing by Caltrans has indicated that aerially deposited lead (ADL) exists along major freeway routes due to past emissions from vehicles powered by leaded gasoline. The ADL is generally limited to the upper 2 feet of soil material within the unpaved median and shoulder areas.

2.2 Hazardous Waste Determination Criteria

Regulatory criteria to classify a waste as California hazardous for handling and disposal purposes are contained in the CCR, Title 22, Division 4.5, Chapter 11, Article 3, §66261.24. Criteria to classify a waste as Resource, Conservation, and Recovery Act (RCRA) hazardous are contained in Chapter 40 of the Code of Federal Regulations (40 CFR), Section 261.

For waste containing metals, the waste is classified as California hazardous when: 1) the total metal content equals or exceeds the respective Total Threshold Limit Concentration (TTLC); or 2) the soluble metal content equals or exceeds the respective Soluble Threshold Limit Concentration (STLC) based on the standard Waste Extraction Test (WET). A waste has the potential of exceeding the STLC when the waste's total metal content is greater than or equal to ten times the respective STLC value since the WET uses a 1:10 dilution ratio. Hence, when a total metal is detected at a concentration greater than or equal to ten times the respective STLC, and assuming that 100 percent of the total metals are soluble, soluble metal analysis is required. A material is classified as RCRA hazardous, or Federal hazardous, when the soluble metal content equals or exceeds the Federal regulatory level based on the Toxicity Characteristic Leaching Procedure (TCLP).

State and Federal regulatory levels have also been established for other compounds such as total petroleum hydrocarbons, chlorinated herbicides, and organochlorine pesticides. Currently, regulatory criteria for the classification of wastes based solely on total petroleum hydrocarbon concentrations have not yet been promulgated.

The above regulatory criteria are based on chemical concentrations. Wastes may also be classified as hazardous based on other criteria such as ignitability and corrosivity; however, for the purposes of this investigation, toxicity (i.e., metal concentration) is the primary factor considered for waste classification since waste generated during the roadway excavation activities would not likely warrant testing for ignitability or other criteria. Waste that is classified as either California hazardous or RCRA hazardous requires management as a hazardous waste.

2.3 DTSC Variance

The California Department of Toxic Substances Control (DTSC) issued Variance No. 00-H-VAR-01 on September 22, 2000 to Caltrans District 4 regarding the disposition of ADL-impacted soils within Caltrans projects. Review of the variance, as modified by DTSC on December 13, 2002, indicates the following conditions regarding reuse and management of ADL-impacted soil as fill material for construction and maintenance operations in Caltrans right-of-way.

Category 1:

Soil exhibiting soluble lead concentrations less than or equal to 0.5 milligrams per liter (mg/l) [based on a modified waste extraction test using deionized water as the extractant (WET-DI)] and total lead concentrations of 1,411 mg/kg or less may be used as fill provided that the lead-impacted soil is placed a minimum of 1.5 meters (5 feet) above the maximum water table elevation and covered with at least 0.3 meter (1 foot) of clean soil.

Category 2:

Soil exhibiting soluble lead concentrations greater than 0.5 mg/l and less than 50 mg/l (based on the WET-DI) and total lead concentrations greater than 1,411 mg/kg and less than 3,397 mg/kg may be used as fill provided that the lead-impacted soil is placed a minimum of 1.5 meters (5 feet) above the maximum water table elevation and protected from infiltration by a pavement structure maintained by Caltrans.

<u>Category 3:</u>
Lead-impacted soil with a pH less than 5.0 shall only be used as fill material under the paved portion of the roadway.

If the excavated soil is not intended to be reused within the Caltrans right-of-way, then hazardous waste determination of the soil is based the criterion summarized in Section 2.2.

DTSC has extended the expiration date of the District 4 variance on an annual basis since September 22, 2005. The current variance extension, and any corresponding soil reuse recommendations provided in this report, may expire on June 30, 2009.

2.4 Environmental Screening Levels

The San Francisco Bay Regional Water Quality Control Board (SFRWQCB) has prepared a technical report entitled *Screening For Environmental Concerns At Sites With Contaminated Soil and Groundwater, Interim Final* (November 2007), which presents Environmental Screening Levels (ESLs) for soil, groundwater, soil gas, and surface water, to assist in evaluating sites impacted by releases of hazardous chemicals The ESLs are conservative values for more than 100 commonly detected contaminants, which may be used to compare with environmental data collected at a site. ESLs are strictly risk assessment tools and "not regulatory clean up standards." The presence of a chemical at concentrations in excess of an ESL does not necessarily indicate that adverse impacts to human health or the environment are occurring; this simply indicates that a potential for adverse risk may exist and that additional evaluation is or "may be" warranted (SFRWQCB, 2007).

The most restrictive ESL table was used for this characterization: Table A – Shallow Soil (≤3 meters below ground surface; bgs) – Groundwater is a Current or Potential Source of Drinking Water. The respective ESLs are listed at the end of Tables 3, 4, and 5 for comparative purposes.

3.0 SCOPE OF SERVICES

The following scope of services was performed:

3.1 Pre-Field Activities

- Prepared the Workplan, dated August 9, 2007, to summarize the scope of services to be performed by Geocon.
- Prepared the Health and Safety Plan, dated August 13, 2007, to provide guidelines on the use of personal protective equipment (PPE) during the field activities. The Health and Safety Plan also provided guidelines on the use of onsite monitoring equipment and action levels for upgrades to higher PPE.
- Retained the services of Vironex and V&W Drilling and Testing, Inc. to provide hollow-stem auger drilling operations.

- Retained the services of Advanced Technology Laboratories (ATL), a California-licensed and Caltrans-approved laboratory, to perform the soil and groundwater analyses.
- Obtained Well Permit No. W2007-0942 from Alameda County Public Works Agency. A copy of the permit is included in Appendix A.
- Obtained Well Permit No. WP0008468 from Contra Costa Environmental Health Division. A copy of the permit is included in Appendix A.

3.2 Field Activities

The field investigation was performed between July 30 and September 28, 2007. The following field activities were performed during sampling efforts.

- Advanced 145 soil borings to depths ranging from the surface to 21 feet below ground surface (bgs) using hand auger and direct-push methods for the purpose of collecting soil and/or groundwater samples.
- Collected groundwater samples at four locations.
- Collected soil samples in pre-cleaned containers and acetate liners.
- Collected groundwater samples in pre-cleaned, laboratory-supplied glass containers.
- Transported samples under standard chain-of-custody protocol to a California-certified environmental laboratory.

4.0 INVESTIGATIVE METHODS

4.1 Sampling Procedures

Soil samples were collected from 145 borings as shown on the Site Plans, Figures 2a through 2f. Soil borings B44 through B48 were not collected due to traffic safety concerns. During field activities, soil borings B40 and B52 were determined by the Caltrans Task Order Manager to be unnecessary. Boring locations were surveyed using Differential Global Positioning System (DGPS) equipment. Boring coordinates are presented on Table 1.

We attempted to advance a total of 96 soil borings (B10-B34, B41-B43, B49-B51, B53-B56, B75-B90, B96-B104, and MVP1-MVP36) to a maximum depth of approximately 4 feet bgs. (Three borings were advanced at each of the 12 Maintenance Vehicle Pullout [MVP] locations.) Soil samples were collected at approximate depth intervals of 0 to 0.5 foot, 1 to 1.5 feet, 2.5 to 3 feet, and 3.5 to 4 feet. Refusal was encountered at depths indicated on the chain-of-custody forms. Hand auger boreholes were backfilled to the surface with soil cuttings. Direct-push boreholes were backfilled to surface with the cement grout.

We attempted to advance a total of 25 soil borings (B35-B39, B61-B74, B61A, and B91-B95) to a maximum depth of approximately 6 feet bgs. Soil samples were collected at approximate depth intervals of 0 to 0.5 foot, 1 to 1.5 feet, 2.5 to 3 feet, and 5.5 to 6 feet. Refusal was encountered at depths indicated on the chain-of-custody forms. Hand auger boreholes were backfilled to the surface with soil cuttings. Direct-push boreholes were backfilled to surface with the cement grout.

We attempted to advance a total of 14 soil borings (B1-B9, B57-B60, and B60A) to a maximum depth of approximately 9 feet bgs. Soil samples were collected at approximate depth intervals of 0 to 0.5 foot, 1 to 1.5 feet, 2.5 to 3 feet, and 8.5 to 9 feet. Refusal was encountered at depths indicated on the chain-of-custody forms. Hand auger boreholes were backfilled to the surface with soil cuttings. Direct-push boreholes were backfilled to surface with the cement grout.

We attempted to advance a total of eight soil borings (B105-B108 and B110-B113) to a maximum depth of approximately 16 feet bgs. Soil samples were collected at approximate depth intervals of 0 to 0.5 foot, 1 to 1.5 feet, 3.5 to 4 feet, 9.5 to 10 feet, and 15.5 to 16 feet. Refusal was encountered at depths indicated on the chain-of-custody forms. Hand auger boreholes were backfilled to the surface with soil cuttings. Direct-push boreholes were backfilled to surface with the cement grout.

We attempted to advance a total of two soil borings (B109 and B114) to a maximum depth of approximately 21 feet bgs (in an attempt to encounter groundwater). Soil samples were collected at approximate depth intervals of 0 to 0.5 foot, 1 to 1.5 feet, 3.5 to 4 feet, and 15.5 to 16 feet. Refusal was encountered at depths indicated on the chain-of-custody forms. Hand auger boreholes were backfilled to the surface with soil cuttings. Direct-push boreholes were backfilled to surface with the cement grout.

Groundwater was encountered in only two borings (B59 and B82) during our investigation. We collected grab groundwater samples from the borings. At the direction of the Caltrans Task Order Manager, we collected grab groundwater samples from two monitoring wells (Well A and Well B) located within the Caltrans right-of-way (see Figure 2a).

We provided quality assurance/quality control (QA/QC) procedures during the field activities. These procedures included washing the sampling equipment with a Liqui-Nox® solution followed by a double rinse with deionized water. Decontamination water was disposed to the ground surface within Caltrans right-of-way in a manner not to create runoff, away from drain inlets or potential water bodies.

Sample containers were sealed, labeled, and transported in chilled containers to a Caltrans-approved, certified environmental laboratory using standard chain-of-custody documentation. Laboratory analyses were requested under 48-hour turn-around-times.

4.2 Laboratory Analyses

The laboratory testing performed is summarized below:

- A total of 358 soil samples were analyzed for total lead using EPA Test Method 6010B.
- A total of 145 soil samples were analyzed for Title 22 (CAM 17) metals using EPA Test Methods 6010B/7471A.
- A total of 56 soil samples were analyzed for pH using EPA Test Method 9045C.
- A total of four groundwater samples were analyzed for CAM 17 metals using EPA Test Methods 6010B/7470A.
- A total of four groundwater samples were analyzed for TPHd, TPHmo, and TPHg using EPA Test Method 8015B.
- A total of four groundwater samples were analyzed for BTEX and MTBE using EPA Test Method 8021B.
- A total of four groundwater samples were analyzed for VOCs using EPA Test Method 8260B.
- A total of four groundwater samples were analyzed for SVOCs using EPA Test Method 8270C.

4.3 Laboratory QA/QC

QA/QC procedures were performed for each method of analysis with specificity for each analyte listed in the test method's QA/QC. The laboratory QA/QC procedures included the following:

- One method blank for every ten samples, batch of samples or type of matrix, whichever was more frequent.
- One sample analyzed in duplicate for every ten samples, batch of samples or type of matrix, whichever was more frequent.
- One spiked sample for every ten samples, batch of samples or type of matrix, whichever was more frequent, with spike made at ten times the detection limit or at the analyte level.

5.0 INVESTIGATIVE RESULTS

<u>Soil Results</u>

Summaries of the analytical laboratory test results for soil are presented on Tables 2 and 3. Reproductions of the laboratory reports and chain-of-custody documentation are presented in Appendix B.

The laboratory analyses indicated the following:

- Lead, chromium, and mercury were the only metals detected in soil at total concentrations greater than ten times their STLC values of 5.0, 5.0, and 0.2 mg/l, respectively. Total lead concentrations ranged from less than the laboratory reporting limit (<) of 1 mg/kg to 2,000 mg/kg. Total chromium concentrations ranged from <1 mg/kg to 81 mg/kg. Total mercury concentrations ranged from < 0.10 mg/kg to 8.0 mg/kg.
- Soil pH values ranged from 3.8 to 11.
- A total of 93 soil samples that were further analyzed for soluble (WET) lead exhibited concentrations ranging from <1.0 mg/l to 150 mg/l.
- Concentrations for a total of 26 soil samples that were further analyzed for soluble (WET) chromium were <1.0 mg/l.
- A total of nine soil samples that were further analyzed for soluble (WET) mercury exhibited concentrations ranging from <1.0 micrograms per liter (ug/l) to 7.3 ug/l.
- A total of 56 soil samples that were further analyzed for soluble lead using the WET-DI exhibited concentrations ranging from <0.25 mg/l to 7.2 mg/l.
- A total of 31 soil samples that were further analyzed for soluble lead using the TCLP exhibited concentrations ranging from <1 mg/l to 30 mg/l. (The laboratory reported that samples B49-1 and B51-2 had been consumed during previous analyses and therefore could not be further analyzed using the TCLP.)

The minimum, average, and maximum total CAM 17 metal concentrations are summarized at the end of Table 3 along with the residential and commercial ESLs.

<u>Groundwater Results</u>

Summaries of the analytical laboratory test results for groundwater are presented on Tables 4 and 5. Reproductions of the laboratory reports and chain-of-custody documentation are presented in Appendix B.

The laboratory analyses indicated the following:

- Antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, vanadium, and zinc were detected at or above the laboratory reporting limits in groundwater samples.
- Groundwater samples analyzed for TPHd exhibited concentrations ranging from <0.050 mg/l to 2.3 mg/l.
- Groundwater samples analyzed for TPHmo exhibited concentrations ranging from <0.050 mg/l to 0.58 mg/l.
- TPHg, BTEX, MTBE, VOCs, and SVOCs were not detected in groundwater samples.

6.0 STATISTICAL EVALUATION FOR LEAD DETECTED IN SOIL SAMPLES

The lead data were separated into 24 sample populations for statistical evaluation. Sample populations were separated as follows:

Sample Population	Location	Boring ID's
A	Ramp shoulder, western end of Site (Caltrans Project No. 04-29492 "Gore Area")	B1-B3, B5-B8, and MVP1-MVP6
B	Ramp shoulder, western portion of Site (Caltrans Project No. 04-29492 "Shoulder")	B4, and B9-B18
C	Median, western portion of Site	B19-B23
C1	Median, western portion of Site	B27-B32, and B41
D	Ramp shoulder, western-central portion of Site	B35-B39, and MVP13-MVP18
E	Ramp shoulder, western-central portion of Site	B33 and B34
F	Ramp shoulder, western-central portion of Site	B49-B51, B53-B58, B113, B114, and MVP10-MVP12
F1	Ramp shoulder, western-central portion of Site	B59-B60A
G	Ramp shoulder, western-central portion of Site	B105-B112
H	Ramp shoulder, eastern-central portion of Site.	B61-B74, and B91
I	Ramp shoulder, eastern-central portion of Site.	B75-B77, B80, B92, B93, and MVP25-MVP27
I1	Loop Ramp shoulder, eastern-central portion of Site.	B94 and B95
J	Ramp shoulder, eastern-central portion of Site.	MVP19-MVP24
K	Median, western-central portion of Site	B42 and B43
L	Shoulder, eastern portion of Site	B96-B100
M	Ramp shoulder, eastern portion of Site	MVP28-MVP30
N	Shoulder, eastern portion of Site	B82-B84
N1	Gore Point, eastern portion of Site	B81
O	Median, eastern portion of Site	B85-B90, and B101-B104
P	Shoulder, western portion of Site (Caltrans Project No. 04-29493 "Turn Pocket")	B24-B26
Q	Ramp shoulder, eastern end of Site	MVP34-MVP36
R	Ramp shoulder, eastern portion of Site	MVP31-MVP33
S	Ramp shoulder, western portion of Site	MVP7-MVP9
T	Ramp shoulder, western-central portion of Site	B49-B51

Statistical methods were applied to the total lead data to evaluate: 1) the upper confidence limits (UCLs) of the arithmetic means of the total lead concentrations for each sampling depth; and 2) if an acceptable correlation between total and soluble lead concentrations exists that would allow the prediction of soluble lead concentrations based on calculated UCLs. The statistical methods used are discussed in a book entitled *Statistical Methods for Environmental Pollution Monitoring,* by Richard Gilbert; in an EPA *Technology Support Center Issue* document entitled, *The Lognormal Distribution in Environmental Applications,* by Ashok Singh et. al., dated December 1997; and in a book entitled *An Introduction to the Bootstrap,* by Bradley Efron and Robert J. Tibshirani.

6.1 Calculating the UCLs for the Arithmetic Mean

The upper one-sided 90% and 95% UCLs of the arithmetic mean are defined as the values that, when calculated repeatedly for randomly drawn subsets of site data, equal or exceed the true mean 90% and 95% of the time, respectively. Statistical confidence limits are the classical tool for addressing uncertainties of a distribution mean. The UCLs of the arithmetic mean concentration are used as the mean concentrations because it is not possible to know the true mean due to the essentially infinite number of soil samples that could be collected from a site. The UCLs therefore account for uncertainties due to limited sampling data. As data become less limited at a site, uncertainties decrease, and the UCLs move closer to the true mean.

Non-parametric bootstrap techniques used to calculate the UCLs are discussed in the previously referenced EPA document and in *An Introduction to the Bootstrap.* For those samples in which total lead was not detected at concentrations exceeding the laboratory MRL, a value equal to one-half of the detection limit was used in the UCL calculation. The bootstrap results are included in Appendix C.

The calculated UCLs and statistical results are summarized in the tables below:

Sample Population A

Shoulder (Borings B1-B3, B5-B8, and MVP1-MVP6)

SAMPLE INTERVAL (feet)	90% TOTAL LEAD UCL (mg/kg)	95% TOTAL LEAD UCL (mg/kg)	TOTAL LEAD MEAN (mg/kg)	MINIMUM VALUE (mg/kg)	MAXIMUM VALUE (mg/kg)
0.0 to 0.5	18.4	18.9	16.6	9.1	26
1.0 to 2.0	18.8	19.9	15.0	2.5	34
2.0 to 3.0	19.0	20.2	14.2	2.5	27
3.5 to 4.0	Not Calculated	Not Calculated	4.4	2.5	8.1

Sample Population B

Shoulder (Borings B4 and B9-B18)

SAMPLE INTERVAL (feet)	90% TOTAL LEAD UCL (mg/kg)	95% TOTAL LEAD UCL (mg/kg)	TOTAL LEAD MEAN (mg/kg)	MINIMUM VALUE (mg/kg)	MAXIMUM VALUE (mg/kg)
0.0 to 0.5	352.2	374.8	266.9	9.9	850
1.0 to 1.5	14.0	14.7	11.5	2.5	22
2.5 to 3.0	13.9	14.7	11.4	7.3	29
3.5 to 4.0	7.9	8.3	6.6	2.5	11

Sample Population C

Median (Borings B19-B23)

SAMPLE INTERVAL (feet)	90% TOTAL LEAD UCL (mg/kg)	95% TOTAL LEAD UCL (mg/kg)	TOTAL LEAD MEAN (mg/kg)	MINIMUM VALUE (mg/kg)	MAXIMUM VALUE (mg/kg)
0.0 to 0.5	54.4	57.2	44.6	20	64
1.0 to 1.5	Not Calculated	Not Calculated	2.5	2.5	2.5
2.5 to 3.0	12.1	12.8	10.0	5.2	15
3.5 to 4.0	11.0	11.2	10.5	9.8	12

Sample Population C1

Median (Borings B27-B32, and B41)

SAMPLE INTERVAL (feet)	90% TOTAL LEAD UCL (mg/kg)	95% TOTAL LEAD UCL (mg/kg)	TOTAL LEAD MEAN (mg/kg)	MINIMUM VALUE (mg/kg)	MAXIMUM VALUE (mg/kg)
0.0 to 0.5	97.9	103.5	76.4	21	160
1.0 to 1.5	Not Calculated	Not Calculated	2.5	2.5	2.5
2.5 to 3.0	7.9	8.3	6.8	2.5	10
3.5 to 4.0	21.4	23.0	14.7	2.5	47

Sample Population D

Shoulder (Borings B35-B39 and MVP13-MVP18)

SAMPLE INTERVAL (feet)	90% TOTAL LEAD UCL (mg/kg)	95% TOTAL LEAD UCL (mg/kg)	TOTAL LEAD MEAN (mg/kg)	MINIMUM VALUE (mg/kg)	MAXIMUM VALUE (mg/kg)
0.0 to 0.5	275.9	296.8	204.8	18	690
1.0 to 1.5	24.3	26.2	15.5	5.7	87
2.5 to 3.0	8.4	8.8	7.4	2.5	10
3.5 to 4.0	8.1	8.5	7.0	2.5	9.9

Sample Population E

Shoulder (Borings B33 and B34)

SAMPLE INTERVAL (feet)	90% TOTAL LEAD UCL (mg/kg)	95% TOTAL LEAD UCL (mg/kg)	TOTAL LEAD MEAN (mg/kg)	MINIMUM VALUE (mg/kg)	MAXIMUM VALUE (mg/kg)
0.0 to 0.5	Not Calculated	Not Calculated	47.5	33	62
1.0 to 1.5	Not Calculated	Not Calculated	17.5	17	18

Sample Population F

Shoulder (Borings B53-B58, B113, B114, and MVP10-MVP12)

SAMPLE INTERVAL (feet)	90% TOTAL LEAD UCL (mg/kg)	95% TOTAL LEAD UCL (mg/kg)	TOTAL LEAD MEAN (mg/kg)	MINIMUM VALUE (mg/kg)	MAXIMUM VALUE (mg/kg)
0.0 to 0.5	88.3	93.9	67.2	9.6	170
1.0 to 2.5	13.2	13.8	11.1	2.5	23
2.5 to 3.0	19.7	21.5	13.7	7.3	54
3.5 to 4.0	13.5	14.7	10.2	2.5	32

Sample Population F1

Shoulder (Borings B59-B60A)

SAMPLE INTERVAL (feet)	90% TOTAL LEAD UCL (mg/kg)	95% TOTAL LEAD UCL (mg/kg)	TOTAL LEAD MEAN (mg/kg)	MINIMUM VALUE (mg/kg)	MAXIMUM VALUE (mg/kg)
0.0 to 0.5	Not Calculated	Not Calculated	105.7	19	220
1.0 to 1.5	Not Calculated	Not Calculated	30.7	6.8	78
2.0 to 3.0	Not Calculated	Not Calculated	2.5	2.5	2.5
3.5 to 4.0	Not Calculated	Not Calculated	2.5	2.5	2.5

Sample Population G

Shoulder (Borings B105-B112)

SAMPLE INTERVAL (feet)	90% TOTAL LEAD UCL (mg/kg)	95% TOTAL LEAD UCL (mg/kg)	TOTAL LEAD MEAN (mg/kg)	MINIMUM VALUE (mg/kg)	MAXIMUM VALUE (mg/kg)
0.0 to 0.5	63.4	65.4	51.5	42	94
1.0 to 2.5	9.0	9.2	8.6	7.5	10
2.5 to 3.0	9.0	9.0	9.0	9.0	9.0
3.5 to 4.0	16.7	18.0	13.2	8.3	34

Sample Population H

Shoulder (Borings B61A, B61-B74, and B91)

SAMPLE INTERVAL (feet)	90% TOTAL LEAD UCL (mg/kg)	95% TOTAL LEAD UCL (mg/kg)	TOTAL LEAD MEAN (mg/kg)	MINIMUM VALUE (mg/kg)	MAXIMUM VALUE (mg/kg)
0.0 to 1.0	56.7	60.7	42.1	0.5	180
1.0 to 1.5	35.2	39.3	17.7	2.5	200
1.5 to 2.5	Not Calculated	Not Calculated	3.1	2.5	5.5
2.5 to 3.0	Not Calculated	Not Calculated	27.2	2.5	69
4.5 to 5..5	Not Calculated	Not Calculated	2.5	2.5	2.5

Sample Population I

Shoulder (Borings B75-B80, B92, B93, and MVP25-MVP27)

SAMPLE INTERVAL (feet)	90% TOTAL LEAD UCL (mg/kg)	95% TOTAL LEAD UCL (mg/kg)	TOTAL LEAD MEAN (mg/kg)	MINIMUM VALUE (mg/kg)	MAXIMUM VALUE (mg/kg)
0.0 to 1.0	660.4	702.4	511.7	22	1,500
1.0 to 2.5	153.9	172	91.8	2.5	470
2.5 to 3.0	Not Calculated	Not Calculated	30.4	7.1	62
3.5 to 4.0	Not Calculated	Not Calculated	22	22	22

Sample Population I1

Loop Ramp Shoulder (Borings B94 and B95)

SAMPLE INTERVAL (feet)	90% TOTAL LEAD UCL (mg/kg)	95% TOTAL LEAD UCL (mg/kg)	TOTAL LEAD MEAN (mg/kg)	MINIMUM VALUE (mg/kg)	MAXIMUM VALUE (mg/kg)
0.0 to 0.5	Not Calculated	Not Calculated	32	26	3838
1.0 to 1.5	Not Calculated	Not Calculated	2.5	2.5	2.5

Sample Population J

Shoulder (Borings MVP19-MVP24)

SAMPLE INTERVAL (feet)	90% TOTAL LEAD UCL (mg/kg)	95% TOTAL LEAD UCL (mg/kg)	TOTAL LEAD MEAN (mg/kg)	MINIMUM VALUE (mg/kg)	MAXIMUM VALUE (mg/kg)
0.0 to 1.0	33.0	35.6	24.7	6.3	59
1.0 to 1.5	5.4	5.7	4.4	2.5	7.1
2.0 to 2.5	Not Calculated	Not Calculated	4.5	2.5	6.4
2.5 to 3.0	Not Calculated	Not Calculated	3.6	2.5	6.7
3.5 to 4.0	Not Calculated	Not Calculated	2.5	2.5	2.5

Sample Population K

Median (Borings B42 and B43)

SAMPLE INTERVAL (feet)	90% TOTAL LEAD UCL (mg/kg)	95% TOTAL LEAD UCL (mg/kg)	TOTAL LEAD MEAN (mg/kg)	MINIMUM VALUE (mg/kg)	MAXIMUM VALUE (mg/kg)
0.0 to 0.5	Not Calculated	Not Calculated	885	170	1600
1.0 to 1.5	Not Calculated	Not Calculated	514	28	1000
2.5 to 3.0	Not Calculated	Not Calculated	4.6	2.5	6.7
3.5 to 4.0	Not Calculated	Not Calculated	6.3	6.3	6.3

Sample Population L

Shoulder (Borings B96-B100)

SAMPLE INTERVAL (feet)	90% TOTAL LEAD UCL (mg/kg)	95% TOTAL LEAD UCL (mg/kg)	TOTAL LEAD MEAN (mg/kg)	MINIMUM VALUE (mg/kg)	MAXIMUM VALUE (mg/kg)
0.0 to 0.5	77.3	84.2	54.6	8.8	110
1.0 to 2.0	20.8	22.7	14.5	2.5	37
2.0 to 3.0	Not Calculated	Not Calculated	3.4	2.5	6.8
3.5 to 4.0	Not Calculated	Not Calculated	2.5	2.5	2.5

Sample Population M

Shoulder (Borings MVP28-MVP30)

SAMPLE INTERVAL (feet)	90% TOTAL LEAD UCL (mg/kg)	95% TOTAL LEAD UCL (mg/kg)	TOTAL LEAD MEAN (mg/kg)	MINIMUM VALUE (mg/kg)	MAXIMUM VALUE (mg/kg)
0.0 to 0.5	Not Calculated	Not Calculated	93.3	57	150
1.0 to 1.5	Not Calculated	Not Calculated	19.8	5.7	48
2.0 to 3.0	Not Calculated	Not Calculated	12.9	6.2	26
3.5 to 4.0	Not Calculated	Not Calculated	5.5	5.5	5.5

Sample Population N

Shoulder (Borings B82-B84)

SAMPLE INTERVAL (feet)	90% TOTAL LEAD UCL (mg/kg)	95% TOTAL LEAD UCL (mg/kg)	TOTAL LEAD MEAN (mg/kg)	MINIMUM VALUE (mg/kg)	MAXIMUM VALUE (mg/kg)
0.0 to 0.5	Not Calculated	Not Calculated	329.3	18	860
1.0 to 1.5	Not Calculated	Not Calculated	4.0	2.5	6.9
2.0 to 3.0	Not Calculated	Not Calculated	4.4	2.5	8.3
3.5 to 4.0	Not Calculated	Not Calculated	2.5	2.5	2.5

Sample Population N1

Gore Point (Boring B81)

SAMPLE INTERVAL (feet)	90% TOTAL LEAD UCL (mg/kg)	95% TOTAL LEAD UCL (mg/kg)	TOTAL LEAD (mg/kg)
0.0 to 0.5	Not Calculated	Not Calculated	2000
1.0 to 1.5	Not Calculated	Not Calculated	83
2.5 to 3.0	Not Calculated	Not Calculated	11

Sample Population O

Median (Borings B85-B90, and B101-B104)

SAMPLE INTERVAL (feet)	90% TOTAL LEAD UCL (mg/kg)	95% TOTAL LEAD UCL (mg/kg)	TOTAL LEAD MEAN (mg/kg)	MINIMUM VALUE (mg/kg)	MAXIMUM VALUE (mg/kg)
0.0 to 0.5	17.0	18.5	12.5	1.1	36
1.0 to 1.5	Not Calculated	Not Calculated	5.5	2.5	24
2.5 to 3.0	8.6	9.3	5.7	2.5	25
3.5 to 4.0	6.4	6.9	4.7	2.5	17

Sample Population P

Shoulder (Borings B24-B26)

SAMPLE INTERVAL (feet)	90% TOTAL LEAD UCL (mg/kg)	95% TOTAL LEAD UCL (mg/kg)	TOTAL LEAD MEAN (mg/kg)	MINIMUM VALUE (mg/kg)	MAXIMUM VALUE (mg/kg)
0.0 to 0.5	Not Calculated	Not Calculated	104.0	15	270
1.0 to 1.5	Not Calculated	Not Calculated	8.5	6.7	11
2.5 to 3.0	Not Calculated	Not Calculated	9.0	8.5	9.6
3.5 to 4.0	Not Calculated	Not Calculated	9.5	6.6	11

Sample Population Q

Shoulder (Borings MVP34-MVP36)

SAMPLE INTERVAL (feet)	90% TOTAL LEAD UCL (mg/kg)	95% TOTAL LEAD UCL (mg/kg)	TOTAL LEAD MEAN (mg/kg)	MINIMUM VALUE (mg/kg)	MAXIMUM VALUE (mg/kg)
0.0 to 0.5	Not Calculated	Not Calculated	23.7	20	28
1.0 to 1.5	Not Calculated	Not Calculated	5.8	2.5	8.2
1.5 to 3.0	Not Calculated	Not Calculated	3.9	2.5	6.7
3.5 to 4.0	Not Calculated	Not Calculated	2.5	2.5	2.5

Sample Population R

Shoulder (Borings MVP31-MVP33)

SAMPLE INTERVAL (feet)	90% TOTAL LEAD UCL (mg/kg)	95% TOTAL LEAD UCL (mg/kg)	TOTAL LEAD MEAN (mg/kg)	MINIMUM VALUE (mg/kg)	MAXIMUM VALUE (mg/kg)
0.0 to 0.5	Not Calculated	Not Calculated	51.9	3.8	84
0..5 to 1.5	Not Calculated	Not Calculated	8.5	2.5	16
2.5 to 3.0	Not Calculated	Not Calculated	9.9	9.9	9.9
3.5 to 4.0	Not Calculated	Not Calculated	11	11	11

Sample Population S

Shoulder (Borings MVP7-MVP9)

SAMPLE INTERVAL (feet)	90% TOTAL LEAD UCL (mg/kg)	95% TOTAL LEAD UCL (mg/kg)	TOTAL LEAD MEAN (mg/kg)	MINIMUM VALUE (mg/kg)	MAXIMUM VALUE (mg/kg)
0.0 to 0.5	Not Calculated	Not Calculated	36.3	13	59
1.0 to 1.5	Not Calculated	Not Calculated	7.8	6.7	9.3
2.5 to 3.0	Not Calculated	Not Calculated	7.3	7.0	7.7
3.5 to 4.0	Not Calculated	Not Calculated	8.2	7.3	9.7

Sample Population T

Shoulder (Borings B49-B51)

SAMPLE INTERVAL (feet)	90% TOTAL LEAD UCL (mg/kg)	95% TOTAL LEAD UCL (mg/kg)	TOTAL LEAD MEAN (mg/kg)	MINIMUM VALUE (mg/kg)	MAXIMUM VALUE (mg/kg)
0.0 to 0.5	Not Calculated	Not Calculated	246.7	100	440
1.0 to 1.5	Not Calculated	Not Calculated	330	100	590
1.5 to 2.0	Not Calculated	Not Calculated	234.3	73	450

6.2 Correlation of Total and Soluble Lead

Total and corresponding soluble (WET) lead concentrations are bivariate data with a linear structure. This linear structure should allow for the prediction of soluble lead (WET) concentrations based on the UCLs calculated in Section 6.1.

To estimate the degree of interrelation between total and corresponding soluble (WET) lead values (x and y, respectively), the *correlation coefficient [r]* is used. The correlation coefficient is a ratio that ranges from +1 to –1. A *correlation coefficient* of +1 indicates a perfect direct relationship between two variables; a *correlation coefficient* of –1 indicates that one variable changes inversely with relation to the other. Between the two extremes is a spectrum of less-than-perfect relationships, including zero, which indicates the lack of any sort of linear relationship at all. The *correlation coefficients* for the entire sample set was calculated for the (x, y) data points (i.e., soil samples analyzed for both total lead [*x*] and soluble [WET] lead [*y*]). A *correlation coefficient* greater than or equal to 0.8 is an acceptable indicator that a correlation exists.

The *correlation coefficient* for the 93 soil samples analyzed for total and soluble (WET) lead equaled 0.901.

For the *correlation coefficient* that indicates a linear relationship between total and soluble (WET) lead concentrations, it is possible to compute the line of dependence or a best-fit line between the two variables. A least squares method was used to find the equation of a best-fit line (regression line) by forcing the y-intercept equal to zero since that is a known point. The equation of the regression line for the data set was determined to be $y = 0.070(x)$, where x represents total lead concentrations and y represents predicted soluble lead (WET) concentrations.

This equation was used to estimate the expected WET soluble lead concentrations for the UCLs calculated in Section 6.1. Regression analysis results and a scatter plot depicting the (x, y) data points along with the regression line are included in Appendix C.

7.0 CONCLUSIONS AND RECOMMENDATIONS

Geocon understands that some of the project areas will be covered with imported fill. Caltrans has confirmed on other projects that impacted soil may be scarified and cut into to develop keys. According to Caltrans, the DTSC allows for this under the "Area of Contamination Policy." Caltrans also confirmed on similar projects that fill material may be placed over impacted soil. If impacted soil will not be reused onsite, the soil may be classified as a California hazardous waste and will require disposal at a Class I landfill.

Waste classifications are evaluated based on the 90% UCL of the lead content for the relevant excavation depths; this has historically been considered sufficient to satisfy a good faith effort by the EPA as discussed in SW-846. Risk assessment characterization is based on the 95% UCL of the lead content in the waste for the relevant depths; this is in accordance with the Risk Assessment Guidance for Superfund (RAGS) Volume 1 Documentation for Exposure Assessment.

Caltrans informed Geocon, after the soil sampling work had been completed, that many of the maintenance vehicle pullout (MVP) locations had to be relocated; therefore, some of the sample data identified by the "MVP" prefix may not be representative of soil conditions at an actual MVP location. The orphaned MVP data were included with adjacent decision units when appropriate.

7.1 Sample Population A - Shoulder (Borings B1-B3, B5-B8, and MVP1-MVP6)

Based on the highest total lead concentration of 34 mg/kg, soil generated from excavations would not be classified as a California hazardous waste (Table 6A). Consequently, excavated soil could be reused or disposed as non-hazardous with respect to lead content.

7.2 Sample Population B - Shoulder (Borings B4, and B9-B18)

The following table summarizes the predicted soluble (WET) lead concentrations and the waste classification for excavated soil based on the calculated total lead UCLs and the relationship between total and soluble (WET) lead. The soluble (WET) lead calculations are summarized in Table 6B.

Excavation Depth	**90% UCL Total Lead (mg/kg)**	**90% UCL Predicted WET Lead (mg/l)**	**95% UCL Total Lead (mg/kg)**	**Waste Classification**
0 to 1 ft	352.2	**24.7**	374.8	**Hazardous**
Underlying soil (1 to 4 ft)	*9.7*	*0.7*	*10.2*	*Non-hazardous*

90% UCL applicable for waste classification; 95% UCL applicable for risk assessment

Based on the above table, soil generated from excavations to 1 ft would be classified as a California hazardous waste since the 90% UCL-predicted soluble (WET) lead concentration is greater than the lead STLC of 5.0 mg/l. Consequently, the top 1 foot of excavated soil would require offsite disposal as a hazardous waste or onsite reuse under the DTSC variance.

Based on the soluble (WET-DI) lead results, the top 1 foot of soil may be reused in accordance with the DTSC variance by placing the lead-impacted soil under a pavement structure.

Based on the soluble (TCLP) results, the top 1 foot of soil would not be considered a RCRA hazardous waste.

Underlying soil (i.e., deeper than 1 foot bgs) could be reused or disposed as non-hazardous with respect to lead content.

7.3 Sample Population C - Median (Borings B19-B23)

The following table summarizes the predicted soluble (WET) lead concentrations and the waste classification for excavated soil based on the calculated total lead UCLs and the relationship between total and soluble (WET) lead. The soluble (WET) lead calculations are summarized in Table 6C.

Excavation Depth	**90% UCL Total Lead (mg/kg)**	**90% UCL Predicted WET Lead (mg/l)**	**95% UCL Total Lead (mg/kg)**	**Waste Classification**
0 to 1 ft	54.4	3.8	57.2	Non-Hazardous
Underlying soil (1 to 4 ft)	*5.3*	*0.4*	*5.5*	*Non-hazardous*

90% UCL applicable for waste classification; 95% UCL applicable for risk assessment

Total lead was detected at concentrations above ten times the applicable STLC value of 5.0 mg/l; however, the predicted soluble (WET) lead concentration is below the STLC. Therefore, soil generated from excavations to 4 ft would be not be classified as a California hazardous waste. Consequently, excavated soil could be reused or disposed as non-hazardous with respect to lead content.

7.4 Sample Population C1 - Median (Borings B27-B32, and B41)

The following table summarizes the predicted soluble (WET) lead concentrations and the waste classification for excavated soil based on the calculated total lead UCLs and the relationship between total and soluble (WET) lead. The soluble (WET) lead calculations are summarized in Table 6C1.

Excavation Depth	90% UCL Total Lead (mg/kg)	90% UCL Predicted WET Lead (mg/l)	95% UCL Total Lead (mg/kg)	Waste Classification
0 to 1 ft	97.9	**6.9**	103.5	**Hazardous**
Underlying soil (1 to 4 ft)	*5.6*	*0.4*	*5.9*	*Non-hazardous*

90% UCL applicable for waste classification; 95% UCL applicable for risk assessment

Based on the above table, soil generated from excavations to 1 ft would be classified as a California hazardous waste since the 90% UCL-predicted soluble (WET) lead concentration is greater than the lead STLC of 5.0 mg/l. Consequently, the top 1 foot of excavated soil would require offsite disposal as a hazardous waste or onsite reuse under the DTSC variance.

Based on the soluble (WET-DI) lead results, the top 1 foot of soil may be reused in accordance with the DTSC variance by placing the lead-impacted soil under a pavement structure or clean fill.

Based on the soluble (TCLP) results, the top 1 foot of soil would not be considered a RCRA hazardous waste.

Underlying soil (i.e., deeper than 1 foot bgs) could be reused or disposed as non-hazardous with respect to lead content.

7.5 Sample Population D - Shoulder (Borings B35-B39, MVP13-MVP18)

The following table summarizes the predicted soluble (WET) lead concentrations and the waste classification for excavated soil based on the calculated total lead UCLs and the relationship between total and soluble (WET) lead. The soluble (WET) lead calculations are summarized in Table 6D.

Excavation Depth	90% UCL Total Lead (mg/kg)	90% UCL Predicted WET Lead (mg/l)	95% UCL Total Lead (mg/kg)	Waste Classification
0 to 1 ft	275.9	**19.3**	296.8	**Hazardous**
Underlying soil (1 to 4 ft)	*12.2*	*0.9*	*13.1*	*Non-hazardous*

90% UCL applicable for waste classification; 95% UCL applicable for risk assessment

Based on the above table, soil generated from excavations to 1 ft would be classified as a California hazardous waste since the 90% UCL-predicted soluble (WET) lead concentration is greater than the lead STLC of 5.0 mg/l. Consequently, the top 1 foot of excavated soil would require offsite disposal as a hazardous waste or onsite reuse under the DTSC variance.

Based on the soluble (WET-DI) lead results, the top 1 foot of soil may be reused in accordance with the DTSC variance by placing the lead-impacted soil under a pavement structure.

Based on the soluble (TCLP) results, the top 1 foot of soil would not be considered a RCRA hazardous waste.

Underlying soil (i.e., deeper than 1 foot bgs) could be reused or disposed as non-hazardous with respect to lead content.

7.6 Sample Population E - Shoulder (Borings B33 and B34)

The following table summarizes the predicted soluble (WET) lead concentrations and the waste classification for excavated soil based on the maximum total lead concentrations and the relationship between total and soluble (WET) lead. The soluble (WET) lead calculations are summarized in Table 6E.

Excavation Depth	**Total Lead (mg/kg) Maximum**	**Predicted WET Lead (mg/l)**	**Waste Classification**
0 to 1 ft	62	4.3	Non-hazardous
Underlying soil (1 to 1.5 ft)	*18*	*1.3*	*Non-hazardous*

Total lead was detected at concentrations above ten times the applicable STLC value of 5.0 mg/l; however, the predicted soluble (WET) lead concentration is below the STLC. Therefore, soil generated from excavations to 1 ft would be not be classified as a California hazardous waste. Consequently, excavated soil could be reused or disposed as non-hazardous with respect to lead content.

7.7 Sample Population F - Shoulder (Borings B53-B58, B113, B114, and MVP10-MVP12)

The following table summarizes the predicted soluble (WET) lead concentrations and the waste classification for excavated soil based on the calculated total lead UCLs and the relationship between total and soluble (WET) lead. The soluble (WET) lead calculations are summarized in Table 6F.

Excavation Depth	**90% UCL Total Lead (mg/kg)**	**90% UCL Predicted WET Lead (mg/l)**	**95% UCL Total Lead (mg/kg)**	**Waste Classification**
0 to 1 ft	88.3	**6.2**	93.9	**Hazardous**
Underlying soil (1 to 4 ft)	*11.6*	*0.8*	*12.4*	*Non-hazardous*

90% UCL applicable for waste classification; 95% UCL applicable for risk assessment

Based on the above table, soil generated from excavations to 1 ft would be classified as a California hazardous waste since the 90% UCL-predicted soluble (WET) lead concentration is greater than the lead STLC of 5.0 mg/l. Consequently, the top 1 foot of excavated soil would require offsite disposal as a hazardous waste or onsite reuse under the DTSC variance.

Based on the soluble (WET-DI) lead results, the top 1 foot of soil may be reused in accordance with the DTSC variance by placing the lead-impacted soil under a pavement structure.

Based on the soluble (TCLP) results, the top 1 foot of soil would not be considered a RCRA hazardous waste.

Underlying soil (i.e., deeper than 1 foot bgs) could be reused or disposed as non-hazardous with respect to lead content.

7.8 Sample Population F1 - Shoulder (Borings B59-B60A)

Based on the highest total lead concentration of 220 mg/kg and the highest soluble (WET) lead concentration of 3.2 mg/l, soil generated from excavations would not be classified as a California hazardous waste (Table 6F1). Consequently, excavated soil could be reused or disposed as non-hazardous with respect to lead content.

7.9 Sample Population G - Shoulder (Borings B105-B112)

The following table summarizes the predicted soluble (WET) lead concentrations and the waste classification for excavated soil based on the calculated total lead UCLs and the relationship between total and soluble (WET) lead. The soluble (WET) lead calculations are summarized in Table 6G.

Excavation Depth	**90% UCL Total Lead (mg/kg)**	**90% UCL Predicted WET Lead (mg/l)**	**95% UCL Total Lead (mg/kg)**	**Waste Classification**
0 to 1 ft	63.4	4.4	65.4	Non-hazardous
Underlying soil (1 to 4 ft)	*7.7*	*0.5*	*8.0*	*Non-hazardous*

90% UCL applicable for waste classification; 95% UCL applicable for risk assessment

Total lead was detected at concentrations above ten times the applicable STLC value of 5.0 mg/l; however, the predicted soluble (WET) lead concentration is below the STLC. Therefore, soil generated from excavations to 1 ft would be not be classified as a California hazardous waste. Consequently, excavated soil could be reused or disposed as non-hazardous with respect to lead content.

7.10 Sample Population H - Shoulder (Borings B61-B74, and B91)

The following table summarizes the predicted soluble (WET) lead concentrations and the waste classification for excavated soil based on the calculated total lead UCLs and the relationship between total and soluble (WET) lead. The soluble (WET) lead calculations are summarized in Table 6H.

Excavation Depth	90% UCL Total Lead (mg/kg)	90% UCL Predicted WET Lead (mg/l)	95% UCL Total Lead (mg/kg)	Waste Classification
0 to 1 ft	56.7	4.0	60.7	Non-hazardous
Underlying soil (1 to 4 ft)	*40.6*	*2.8*	*41.1*	*Non-hazardous*

90% UCL applicable for waste classification; 95% UCL applicable for risk assessment

Total lead was detected at concentrations above ten times the applicable STLC value of 5.0 mg/l; however, the predicted soluble (WET) lead concentration is below the STLC. Therefore, soil generated from excavations to 1 ft would be not be classified as a California hazardous waste. Consequently, excavated soil could be reused or disposed as non-hazardous with respect to lead content.

7.11 Sample Population I - Shoulder (Borings B75-B80, B92, B93, and MVP25-MVP27)

The following table summarizes the predicted soluble (WET) lead concentrations and the waste classification for excavated soil based on the calculated total lead UCLs and the relationship between total and soluble (WET) lead. The soluble (WET) lead calculations are summarized in Table 6I.

Excavation Depth	90% UCL Total Lead (mg/kg)	90% UCL Predicted WET Lead (mg/l)	95% UCL Total Lead (mg/kg)	Waste Classification
0 to 1 ft	660.4	**46.2**	702.4	**Hazardous**
Underlying soil (1 to 4 ft)	*52.8*	*3.7*	*55.8*	*Non-hazardous*

90% UCL applicable for waste classification; 95% UCL applicable for risk assessment

Based on the above table, soil generated from excavations to 1 ft would be classified as a California hazardous waste since the 90% UCL-predicted soluble (WET) lead concentration is greater than the lead STLC of 5.0 mg/l. Consequently, the top 1 foot of excavated soil would require offsite disposal as a hazardous waste or onsite reuse under the DTSC variance.

Based on the soluble (WET-DI) lead results, the top 1 foot of soil may be reused in accordance with the DTSC variance by placing the lead-impacted soil under a pavement structure.

Based on the soluble (TCLP) results, the top 1 foot of soil would not be considered a RCRA hazardous waste.

Underlying soil (i.e., deeper than 1 foot bgs) could be reused or disposed as non-hazardous with respect to lead content.

7.12 Sample Population I1 - Ramp Shoulder (Borings B94 and B95)

Based on the highest total lead concentration of 38 mg/kg, soil generated from excavations would not be classified as a California hazardous waste (Table 6I1). Consequently, excavated soil could be reused or disposed as non-hazardous with respect to lead content.

7.13 Sample Population J - Shoulder (Borings MVP19-MVP24)

Based on the highest total lead 95% UCL of 35.6 mg/kg, soil generated from excavations would not be classified as a California hazardous waste (Table 6J). Consequently, excavated soil could be reused or disposed as non-hazardous with respect to lead content.

7.14 Sample Population K - Median (Borings B42 and B43)

The following table summarizes the predicted soluble (WET) lead concentrations and the waste classification for excavated soil based on the maximum total lead concentrations and the relationship between total and soluble (WET) lead. The soluble (WET) lead calculations are summarized in Table 6K.

Excavation Depth	Total Lead (mg/kg) Maximum	Predicted WET Lead (mg/l)	TCLP Lead (mg/l) Maximum	Waste Classification
0 to 2.5 ft	**1,600**	**112**	**30**	**RCRA Hazardous**
Underlying soil (2.5 to 4 ft)	*6.6*	*0.5*	---	*Non-hazardous*

Based on the above table, soil generated from excavations to 2.5 ft would be classified as a California hazardous waste since the predicted soluble (WET) lead concentration is greater than the lead STLC of 5.0 mg/l. Based on the soluble (TCLP) results, the top 2.5 feet of soil would be considered a RCRA hazardous waste. Consequently, the top 2.5 feet of excavated soil would require offsite disposal as a RCRA hazardous waste.

Underlying soil (i.e., deeper than 2.5 feet bgs) could be reused or disposed as non-hazardous with respect to lead content.

7.15 Sample Population L - Shoulder (Borings B96-B100)

The following table summarizes the predicted soluble (WET) lead concentrations and the waste classification for excavated soil based on the calculated total lead UCLs and the relationship between total and soluble (WET) lead. The soluble (WET) lead calculations are summarized in Table 6L.

Excavation Depth	90% UCL Total Lead (mg/kg)	90% UCL Predicted WET Lead (mg/l)	95% UCL Total Lead (mg/kg)	Waste Classification

0 to 1 ft	77.3	**5.4**	84.2	**Hazardous**
Underlying soil (1 to 4 ft)	*8.1*	*0.6*	*8.5*	*Non-hazardous*

90% UCL applicable for waste classification; 95% UCL applicable for risk assessment

Based on the above table, soil generated from excavations to 1 ft would be classified as a California hazardous waste since the 90% UCL-predicted soluble (WET) lead concentration is greater than the lead STLC of 5.0 mg/l. Consequently, the top 1 foot of excavated soil would require offsite disposal as a hazardous waste or onsite reuse under the DTSC variance.

Based on the soluble (WET-DI) lead results, the top 1 foot of soil may be reused in accordance with the DTSC variance by placing the lead-impacted soil under a pavement structure or clean fill.

Based on the soluble (TCLP) results, the top 1 foot of soil would not be considered a RCRA hazardous waste.

Underlying soil (i.e., deeper than 1 foot bgs) could be reused or disposed as non-hazardous with respect to lead content.

If excavations are at least 2 ft deep and excavated material is managed as a whole, excavated soil might not be classified as a California hazardous waste because the predicted soluble (WET) lead concentration is less than 5 mg/l (see Table 6L).

7.16 Sample Population M - Shoulder (Borings MVP28-MVP30)

The following table summarizes the predicted soluble (WET) lead concentrations and the waste classification for excavated soil based on the maximum total lead concentrations and the relationship between total and soluble (WET) lead. The soluble (WET) lead calculations are summarized in Table 6M.

Excavation Depth	Total Lead (mg/kg) Maximum	Predicted WET Lead (mg/l)	Waste Classification
0 to 1 ft	150	**10.5**	**Hazardous**
Underlying soil (1 to 4 ft)	*22.4*	*1.6*	*Non-hazardous*

Based on the above table, soil generated from excavations to 1 ft would be classified as a California hazardous waste since the predicted soluble (WET) lead concentration is greater than the lead STLC of 5.0 mg/l. Consequently, the top 1 foot of excavated soil would require offsite disposal as a hazardous waste or onsite reuse under the DTSC variance.

Based on the soluble (WET-DI) lead results, the top 1 foot of soil may be reused in accordance with the DTSC variance by placing the lead-impacted soil under a pavement structure.

Based on the soluble (TCLP) results, the top 1.0 foot of soil would not be considered a RCRA hazardous waste.

Underlying soil (i.e., deeper than 1.0 foot bgs) could be reused or disposed as non-hazardous with respect to lead content.

If excavations are at least 3.5 ft deep and excavated material is managed as a whole, excavated soil might not be classified as a California hazardous waste because the predicted soluble (WET) lead concentration is less than 5 mg/l (see Table 6M).

7.17 Sample Population N - Shoulder (Borings B82-B84)

The following table summarizes the predicted soluble (WET) lead concentrations and the waste classification for excavated soil based on the maximum total lead concentrations and the relationship between total and soluble (WET) lead. The soluble (WET) lead calculations are summarized in Table 6N.

Excavation Depth	Total Lead (mg/kg) Maximum	Predicted WET Lead (mg/l)	Waste Classification
0 to 1 ft	860	**60.2**	**Hazardous**
Underlying soil (1 to 4 ft)	*5.2*	*0.4*	*Non-hazardous*

Based on the above table, soil generated from excavations to 1 ft would be classified as a California hazardous waste since the predicted soluble (WET) lead concentration is greater than the lead STLC of 5.0 mg/l. Consequently, the top 1 foot of excavated soil would require offsite disposal as a hazardous waste or onsite reuse under the DTSC variance.

Based on the soluble (WET-DI) lead results, the top 1 foot of soil may be reused in accordance with the DTSC variance by placing the lead-impacted soil under a pavement structure or clean fill.

Based on the soluble (TCLP) results, the top 1.0 foot of soil would not be considered a RCRA hazardous waste.

Underlying soil (i.e., deeper than 1.0 foot bgs) could be reused or disposed as non-hazardous with respect to lead content.

7.18 Sample Population N1 - Gore Point (Boring B81)

Based on the total lead concentration of 2,000 mg/kg, the soluble (WET) lead concentration of 71 mg/l, and the soluble (TCLP) concentration of 8.2 mg/l, soil generated from excavations would be classified as a California and RCRA hazardous waste (Table 6N1). Consequently, excavated soil would require offsite disposal as a RCRA hazardous waste.

7.19 Sample Population O - Median (Borings B85-B90 and B101-B104)

Based on the highest total lead concentration of 36 mg/kg, soil generated from excavations would not be classified as a California hazardous waste (Table 6O). Consequently, excavated soil could be reused or disposed as non-hazardous with respect to lead content.

7.20 Sample Population P - Shoulder (Borings B24-B26)

The following table summarizes the predicted soluble (WET) lead concentrations and the waste classification for excavated soil based on the maximum total lead concentrations and the relationship between total and soluble (WET) lead. The soluble (WET) lead calculations are summarized in Table 6P.

Excavation Depth	**Total Lead (mg/kg) Maximum**	**Predicted WET Lead (mg/l)**	**Waste Classification**
0 to 1 ft	270	**18.9**	**Hazardous**
Underlying soil (1 to 4 ft)	*10.3*	*0.7*	*Non-hazardous*

Based on the above table, soil generated from excavations to 1 ft would be classified as a California hazardous waste since the predicted soluble (WET) lead concentration is greater than the lead STLC of 5.0 mg/l. Consequently, the top 1 foot of excavated soil would require offsite disposal as a hazardous waste or onsite reuse under the DTSC variance.

Based on the soluble (WET-DI) lead results, the top 1 foot of soil may be reused in accordance with the DTSC variance by placing the lead-impacted soil under a pavement structure.

Based on the soluble (TCLP) results, the top 1.0 foot of soil would not be considered a RCRA hazardous waste.

Underlying soil (i.e., deeper than 1.0 foot bgs) could be reused or disposed as non-hazardous with respect to lead content.

7.21 Sample Population Q - Shoulder (Borings MVP34-MVP36)

Based on the highest total lead concentration of 28 mg/kg, soil generated from excavations would not be classified as a California hazardous waste (Table 6Q). Consequently, excavated soil could be reused or disposed as non-hazardous with respect to lead content.

7.22 Sample Population R - Shoulder (Borings MVP31-MVP33)

Based on the highest total lead concentration of 84 mg/kg and the highest soluble (WET) lead concentration of 3.8 mg/l, soil generated from excavations would not be classified as a California hazardous waste (Table 6R). Consequently, excavated soil could be reused or disposed as non-hazardous with respect to lead content.

7.23 Sample Population S - Shoulder (Borings MVP7-MVP9)

Based on the highest total lead concentration of 59 mg/kg and highest predicted soluble (WET) lead concentration of 4.1 mg/l, soil generated from excavations would not be classified as a California hazardous waste (Table 6S). Consequently, excavated soil could be reused or disposed as non-hazardous with respect to lead content.

7.24 Sample Population T - Shoulder (Borings MVP7-MVP9)

The following table summarizes the predicted soluble (WET) lead concentrations and the waste classification for excavated soil based on the maximum total lead concentrations and the relationship between total and soluble (WET) lead. The soluble (WET) lead calculations are summarized in Table 6T.

Excavation Depth	**Total Lead (mg/kg) Maximum**	**Predicted WET Lead (mg/l)**	**Waste Classification**
0 to 2.5 ft	474	**33.2**	**Hazardous**

Based on the above table, soil generated from excavations to 2.5 ft would be classified as a California hazardous waste since the predicted soluble (WET) lead concentration is greater than the lead STLC of 5.0 mg/l. Consequently, the top 2.5 feet of excavated soil would require offsite disposal as a hazardous waste or onsite reuse under the DTSC variance.

Based on the soluble (WET-DI) lead results, the top 2.5 foot of soil may be reused in accordance with the DTSC variance by placing the lead-impacted soil under a pavement structure.

Based on the soluble (TCLP) results, the top 1.0 foot of soil would not be considered a RCRA hazardous waste.

7.25 Other CAM17 Metals - Soil

The total CAM17 metal results for soil samples are summarized in Table 3. Based on the total and soluble (WET) CAM17 metals concentrations, with the exception of lead, soil excavated from the project site should not be considered a hazardous waste.

Soil sample results were compared to ESLs for shallow and deep soils in areas where Groundwater is a Current or Potential Source of Drinking Water (SFRWQCB, Tables A and C). Reported arsenic concentrations were between <1.0 mg/kg and 36 mg/kg, which exceed the residential and commercial/industrial land use ESLs of 0.38 mg/kg and 1.5 mg/kg, respectively. Cadmium was reported at concentrations between <1.0 mg/kg and 2.7 mg/kg, with six sample results above the residential land use ESL of 1.7 mg/kg. In addition, the method reporting limit (MRL) for two of the samples was 2.0 mg/kg. Reported mercury concentrations were between 0.1 mg/kg and 8.0 mg/kg, with 15 samples exceeding the residential land use ESL of 1.0 mg/kg. Reported vanadium concentrations were between 22 mg/kg and 120 mg/kg, exceeding the residential land use ESL of 15 mg/kg. Zinc was reported at concentrations between 23 mg/kg and 2,800 mg/kg, with three samples exceeding the residential and commercial/industrial land use ESLs of 600 mg/kg. Accordingly, offsite disposal of soil may be restricted depending on proposed use.

The minimum, average, and maximum total CAM 17 metal concentrations are summarized at the end of Table 3 along with the residential and commercial ESLs.

7.26 Groundwater

The analytical results for grab-groundwater samples are summarized in Tables 4 and 5 and are discussed below. Grab-groundwater sample results were compared to ESLs for Groundwater that is a Current or Potential Source of Drinking Water (SFRWQCB, Table A).

<u>Organics</u>

Organics were not reported in the grab-groundwater samples above ESLs, with the exception of TPHd and TPHmo, which were detected in the samples collected from Well A and Well B at concentrations exceeding the residential land use ESL of 0.1 mg/l (SFBRWQCB, Table A).

CAM17 Metals

Concentrations of CAM17 metals in the grab-groundwater samples did not exceed their respective ESLs, with the exception of zinc, which was reported at 3.2 mg/l in the sample collected from Well B. This result is greater than the residential land use ESL of 2.0 mg/l for zinc.

Therefore, additional groundwater sampling and analysis may be needed, or treatment of groundwater prior to discharge to the storm sewer system or directly to the San Francisco Bay may be necessary.

7.27 Worker Protection

Per Caltrans requirements, contractor(s) should prepare a project-specific Health and Safety Plan to prevent or minimize worker exposure to the chemical of concern observed within the soil and groundwater at this project site. The plan should include protocols for environmental and personnel monitoring, requirements for personal protective equipment, and other appropriate health and safety protocols and procedures for the handling of metal-impacted soil.

TABLE 1
BORING COORDINATES
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Boring	Easting	Northing
B1	6,062,788.589	2,136,308.240
B2	6,062,905.536	2,136,263.133
B3	6,063,096.973	2,136,219.297
B4	6,063,254.441	2,136,167.156
B5	6,063,127.205	2,136,182.544
B6	6,062,979.589	2,136,205.784
B7	6,062,875.206	2,136,201.447
B8	6,063,035.387	2,136,173.232
B9	6,063,189.915	2,136,157.841
B10	6,063,109.171	2,136,153.067
B11	6,063,239.233	2,136,156.914
B12	6,063,371.750	2,136,175.029
B13	6,063,509.192	2,136,212.863
B14	6,063,660.929	2,136,275.918
B15	6,063,863.750	2,136,419.706
B16	6,063,993.034	2,136,600.330
B17	6,064,076.391	2,136,749.240
B18	6,064,165.614	2,136,937.291
B19	6,064,257.899	2,136,884.206
B20	6,064,201.827	2,136,735.058
B21	6,064,125.790	2,136,599.649
B22	6,064,031.432	2,136,471.914
B23	6,063,881.964	2,136,317.813
B24	6,063,999.567	2,136,776.026
B25	6,064,017.181	2,136,795.239
B26	6,064,029.088	2,136,812.367
B27	6,064,317.394	2,137,070.173
B28	6,064,374.434	2,137,246.164
B29	6,064,451.446	2,137,463.584
B30	6,064,555.967	2,137,656.261
B31	6,064,680.553	2,137,810.320
B32	6,064,804.311	2,137,920.547
B33	6,064,824.821	2,137,649.880
B34	6,064,870.703	2,137,642.626
B35	6,064,880.420	2,137,744.014
B36	6,064,922.545	2,137,843.285
B37	6,065,014.930	2,137,939.548
B38	6,065,091.261	2,137,973.213
B39	6,065,134.497	2,138,008.430
B41	6,064,941.909	2,138,010.523
B42	6,065,067.388	2,138,068.844
B43	6,065,208.956	2,138,119.726

TABLE 1
BORING COORDINATES
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Boring	Easting	Northing
B49	6,065,622.682	2,138,283.317
B50	6,065,632.732	2,138,241.289
B51	6,065,449.891	2,138,211.676
B53	6,064,749.711	2,138,003.926
B54	6,064,912.034	2,138,107.867
B55	6,065,029.386	2,138,164.791
B56	6,065,160.299	2,138,206.560
B57	6,065,265.046	2,138,275.191
B58	6,065,287.300	2,138,262.495
B59	6,065,372.716	2,138,301.578
B60	6,065,449.622	2,138,301.786
B60A	6,065,432.127	2,138,333.807
B61	6,067,737.205	2,140,695.825
B61A	6,067,800.941	2,140,803.950
B62	6,067,879.520	2,140,866.398
B63	6,067,965.435	2,140,955.012
B64	6,068,057.706	2,141,087.137
B65	6,068,158.506	2,141,285.587
B66	6,068,214.772	2,141,500.922
B67	6,067,989.646	2,140,767.919
B68	6,067,970.222	2,140,807.712
B69	6,068,021.730	2,140,838.680
B70	6,068,060.357	2,140,954.948
B71	6,068,089.807	2,141,012.342
B72	6,068,136.662	2,141,069.686
B73	6,068,153.225	2,141,156.873
B74	6,068,184.575	2,141,239.658
B75	6,068,041.481	2,140,754.630
B76	6,068,079.977	2,140,830.645
B77	6,068,144.737	2,140,977.039
B78	6,068,197.775	2,141,191.860
B79	6,068,225.504	2,141,331.086
B80	6,068,252.588	2,141,463.025
B81	6,068,260.338	2,141,248.882
B82	6,068,199.747	2,141,035.393
B83	6,068,127.456	2,140,856.114
B84	6,068,062.919	2,140,721.869
B85	6,068,321.468	2,141,477.226
B86	6,068,376.067	2,141,660.781
B87	6,068,422.686	2,141,770.166
B88	6,068,469.802	2,141,848.216
B89	6,068,529.804	2,141,937.956

TABLE 1
BORING COORDINATES
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Boring	Easting	Northing
B90	6,068,600.112	2,142,021.171
B91	6,068,187.973	2,141,616.782
B92	6,068,279.940	2,141,629.457
B93	6,068,304.312	2,141,733.767
B94	6,068,382.951	2,141,889.554
B95	6,068,336.778	2,141,969.635
B96	6,068,764.962	2,142,051.874
B97	6,068,866.192	2,142,127.651
B98	6,068,949.754	2,142,179.178
B99	6,069,037.115	2,142,220.443
B100	6,069,120.128	2,142,257.626
B101	6,069,068.530	2,142,331.768
B102	6,068,885.517	2,142,249.625
B103	6,068,770.720	2,142,174.801
B104	6,068,677.313	2,142,099.951
B105	6,064,443.906	2,137,865.495
B106	6,064,457.702	2,137,930.623
B107	6,064,553.206	2,138,006.913
B108	6,064,600.682	2,138,067.142
B109	6,064,710.349	2,138,141.705
B110	6,064,841.197	2,138,192.321
B111	6,064,956.078	2,138,231.421
B112	6,065,019.279	2,138,263.679
B113	6,065,211.762	2,138,286.653
B114	6,065,293.335	2,138,306.007
MVP1	6,062,846.195	2,136,232.258
MVP2	6,062,870.456	2,136,203.089
MVP3	6,062,886.412	2,136,221.249
MVP4	6,063,161.795	2,136,197.070
MVP5	6,063,184.642	2,136,191.479
MVP6	6,063,200.879	2,136,184.256
MVP7	6,064,320.853	2,137,414.810
MVP8	6,064,320.234	2,137,457.167
MVP9	6,064,344.141	2,137,491.741
MVP10	6,064,548.455	2,137,852.075
MVP11	6,064,570.970	2,137,876.234
MVP12	6,064,594.320	2,137,888.555
MVP13	6,064,759.804	2,137,765.068
MVP14	6,064,786.841	2,137,778.745
MVP15	6,064,791.913	2,137,803.365
MVP16	6,065,156.168	2,138,020.641
MVP17	6,065,192.787	2,138,030.776

TABLE 1
BORING COORDINATES
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Boring	Easting	Northing
MVP18	6,065,233.120	2,138,044.284
MVP19	6,068,400.985	2,141,337.125
MVP20	6,068,416.020	2,141,334.209
MVP21	6,068,422.933	2,141,359.935
MVP22	6,068,515.563	2,141,581.572
MVP23	6,068,509.771	2,141,609.577
MVP24	6,068,516.681	2,141,623.528
MVP25	6,068,506.058	2,142,015.989
MVP26	6,068,520.353	2,142,073.918
MVP27	6,068,551.066	2,142,092.783
MVP28	6,070,750.434	2,142,933.030
MVP29	6,070,768.769	2,142,934.952
MVP30	6,070,789.178	2,142,939.732
MVP31	6,071,476.921	2,142,588.290
MVP32	6,071,487.098	2,142,570.545
MVP33	6,071,492.963	2,142,575.842
MVP34	6,071,905.863	2,142,608.562
MVP35	6,071,931.193	2,142,638.900
MVP36	6,071,941.559	2,142,631.007
WELL A	6,062,722.809	2,136,308.519
WELL B	6,062,851.312	2,136,345.954

Notes:
Easting and Northing shown in feet, NAD 83 (Zone 3)

TABLE 2
SUMMARY OF LEAD AND pH RESULTS - SOIL
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Sample ID	Sample Depth (ft)	Total Lead (mg/kg)	WET (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B1-0	0.0	11	---	---	---	---
B1-1	1.0	<5.0	---	---	---	---
B2-0	0.0	11	---	---	---	---
B2-1	1.0	12	---	---	---	---
B3-0	0.0	11	---	---	---	---
B3-1	1.0	12	---	---	---	---
B4-0	0.0	46	---	---	---	---
B4-1	1.0	7.7	---	---	---	6.4
B4-2.5	2.5	7.3	---	---	---	---
B4-8.5	8.5	7.4	---	---	---	---
B5-0	0.0	21	---	---	---	---
B5-1	1.0	12	---	---	---	7.8
B5-2.5	2.5	25	---	---	---	---
B5-8.5	8.5	14	---	---	---	---
B6-0	0.0	9.1	---	---	---	---
B7-0	0.0	21	---	---	---	---
B7-1	1.0	19	---	---	---	---
B8-0	0.0	19	---	---	---	---
B9-0	0.0	160	7.0	<0.25	---	---
B9-1	1.0	22	---	---	---	---
B9-2.5	2.5	15	---	---	---	---
B10-0	0.0	190	16	<0.25	---	---
B10-1	1.0	<5.0	---	---	---	---
B10-2.5	2.5	29	---	---	---	---
B10-3.5	3.5	5.5	---	---	---	6.8
B11-0	0.0	850	29	2.5	3.8	---
B11-1	1.0	15	---	---	---	---
B11-2.5	2.5	8.3	---	---	---	---
B11-3.5	3.5	6.8	---	---	---	---

TABLE 2
SUMMARY OF LEAD AND pH RESULTS - SOIL
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Sample ID	Sample Depth (ft)	Total Lead (mg/kg)	WET (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B12-0	0.0	110	8.0	0.27	---	---
B12-1	1.0	9.2	---	---	---	---
B12-2.5	2.5	7.9	---	---	---	---
B12-3.5	3.5	10	---	---	---	---
B13-0	0.0	270	24	3.2	1.0	---
B13-1	1.0	14	---	---	---	---
B13-2.5	2.5	10	---	---	---	---
B13-3.5	3.5	<5.0	---	---	---	---
B14-0	0.0	440	21	<0.25	<1.0	---
B14-1	1.0	9.6	---	---	---	7.5
B14-2.5	2.5	10	---	---	---	---
B14-3.5	3.5	6.8	---	---	---	---
B15-0	0.0	9.9	---	---	---	---
B15-1	1.0	<5.0	---	---	---	---
B15-2.5	2.5	8.8	---	---	---	---
B15-3.5	3.5	<5.0	---	---	---	---
B16-0	0.0	210	14	1.2	<1.0	---
B16-1	1.0	21	---	---	---	---
B16-2.5	2.5	9.9	---	---	---	---
B16-3.5	3.5	11	---	---	---	---
B17-0	0.0	230	16	1.5	<1.0	---
B17-1	1.0	7.4	---	---	---	---
B17-2.5	2.5	8.2	---	---	---	---
B17-3.5	3.5	7.8	---	---	---	---
B18-0	0.0	420	25	0.69	<1.0	---
B18-1	1.0	16	---	---	---	---
B19-0	0.0	48	---	---	---	---
B19-1	1.0	<5.0	---	---	---	---
B19-2.5	2.5	14	---	---	---	---
B19-3.5	3.5	11	---	---	---	---

TABLE 2
SUMMARY OF LEAD AND pH RESULTS - SOIL
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Sample ID	Sample Depth (ft)	Total Lead (mg/kg)	WET (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B20-0	0.0	64	3.3	---	---	---
B20-1	1.0	<5.0	---	---	---	---
B20-2.5	2.5	7.6	---	---	---	7.7
B20-3.5	3.5	9.8	---	---	---	---
B21-0	0.0	20	---	---	---	---
B21-1	1.0	<5.0	---	---	---	---
B21-2.5	2.5	8.0	---	---	---	---
B21-3.5	3.5	12	---	---	---	---
B22-0	0.0	61	4.8	---	---	---
B22-1	1.0	<5.0	---	---	---	---
B22-2.5	2.5	5.2	---	---	---	---
B22-3.5	3.5	10	---	---	---	---
B23-0	0.0	30	---	---	---	---
B23-1	1.0	<5.0	---	---	---	8.1
B23-2.5	2.5	15	---	---	---	---
B23-3.5	3.5	9.9	---	---	---	---
B24-0	0.0	27	---	---	---	7.1
B24-1	1.0	6.7	---	---	---	---
B24-2.5	2.5	8.5	---	---	---	---
B24-3.5	3.5	6.6	---	---	---	---
B25-0	0.0	15	---	---	---	---
B25-1	1.0	11	---	---	---	---
B25-2.5	2.5	9.0	---	---	---	---
B25-3.5	3.5	11	---	---	---	3.8
B26-0	0.0	270	16	2.8	<1.0	---
B26-1	1.0	7.8	---	---	---	---
B26-2.5	2.5	9.6	---	---	---	4.1
B26-3.5	3.5	11	---	---	---	---
B27-0	0.0	21	---	---	---	---
B27-1	1.0	<5.0	---	---	---	---
B27-2.5	2.5	8.7	---	---	---	---
B27-3.5	3.5	47	---	---	---	---

TABLE 2
SUMMARY OF LEAD AND pH RESULTS - SOIL
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Sample ID	Sample Depth (ft)	Total Lead (mg/kg)	WET (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B28-0	0.0	160	4.9	---	---	---
B28-1	1.0	<5.0	---	---	---	---
B28-2.5	2.5	5.4	---	---	---	---
B28-3.5	3.5	9.6	---	---	---	7.7
B29-0	0.0	87	3.0	---	---	8.4
B29-1	1.0	<5.0	---	---	---	---
B29-2.5	2.5	<5.0	---	---	---	---
B29-3.5	3.5	6.1	---	---	---	---
B30-0	0.0	98	5.0	---	---	---
B30-1	1.0	<5.0	---	---	---	---
B30-2.5	2.5	7.9	---	---	---	---
B30-3.5	3.5	9.0	---	---	---	---
B31-0	0.0	76	2.6	---	---	---
B31-1	1.0	<5.0	---	---	---	---
B31-2.5	2.5	5.3	---	---	---	---
B31-3.5	3.5	<5.0	---	---	---	---
B32-0	0.0	68	1.5	---	---	---
B32-1	1.0	<5.0	---	---	---	8.0
B32-2.5	2.5	8.0	---	---	---	---
B32-3.5	3.5	15	---	---	---	---
B33-0	0.0	33	---	---	---	---
B33-1	1.0	17	---	---	---	---
B34-0	0.0	62	3.0	---	---	---
B34-1	1.0	18	---	---	---	---
B35-0	0.0	160	9.6	<0.25	---	---
B35-1	1.0	7.7	---	---	---	---
B35-2.5	2.5	<5.0	---	---	---	---
B36-0	0.0	51	3.5	---	---	---
B36-1	1.0	9.7	---	---	---	---
B36-2.5	2.5	<5.0	---	---	---	---

TABLE 2
SUMMARY OF LEAD AND pH RESULTS - SOIL
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Sample ID	Sample Depth (ft)	Total Lead (mg/kg)	WET (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B37-0	0.0	18	---	---	---	---
B37-1	1.0	9.6	---	---	---	---
B37-2.5	2.5	9.8	---	---	---	---
B38-0	0.0	43	---	---	---	---
B38-1	1.0	5.7	---	---	---	---
B38-2.5	2.5	9.9	---	---	---	6.8
B39-0	0.0	360	27	<0.25	<1.0	---
B39-1	1.0	8.9	---	---	---	---
B39-2.5	2.5	6.9	---	---	---	---
B39-5	5.0	9.4	---	---	---	---
B41-0	0.0	25	---	---	---	---
B41-1	1.0	<5.0	---	---	---	---
B41-2.5	2.5	10	---	---	---	---
B41-3.5	3.5	14	---	---	---	---
B42-0	0.0	170	4.1	---	---	---
B42-1	1.0	28	---	---	---	---
B42-2.5	2.5	<5.0	---	---	---	---
B42-3.5	3.5	6.3	---	---	---	---
B43-0	0.0	1,600	120	<0.25	30	---
B43-1	1.0	1,000	100	<0.25	26	---
B43-2.5	2.5	6.7	---	---	---	8.8
B43-3.5	3.5	6.3	---	---	---	---
B49-0	0.0	440	37	1.3	<1.0	---
B49-1	1.0	590	59	<0.25	---	---
B49-1.5	1.5	450	49	2.9	1.8	---
B50-0	0.0	100	7.3	0.54	---	---
B50-1	1.0	100	3.4	---	---	7.3
B50-1.5	1.5	73	5.2	1.7	---	---

TABLE 2
SUMMARY OF LEAD AND pH RESULTS - SOIL
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Sample ID	Sample Depth (ft)	Total Lead (mg/kg)	WET (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B51-0	0.0	200	9.9	<0.25	<1.0	---
B51-1	1.0	300	30	0.78	1.1	---
B51-2	2.0	180	11	<0.25	---	7.7
B53-0	0.0	16	---	---	---	---
B53-1	1.0	8.5	---	---	---	7.6
B53-2.5	2.5	7.3	---	---	---	---
B53-3.5	3.5	7.4	---	---	---	---
B54-0	0.0	80	5.9	<0.25	---	---
B54-1	1.0	8.9	---	---	---	---
B54-2.5	2.5	54	3.7	---	---	---
B54-3.5	3.5	7.8	---	---	---	---
B55-0	0.0	14	---	---	---	---
B55-1	1.0	23	---	---	---	---
B55-2.5	2.5	8.9	---	---	---	---
B55-3.5	3.5	9.1	---	---	---	---
B56-0	0.0	20	---	---	---	---
B56-1	1.0	20	---	---	---	---
B56-2.5	2.5	9.1	---	---	---	7.9
B56-3.5	3.5	32	---	---	---	---
B57-0	0.0	110	7.8	<0.25	---	---
B57-1	1.0	10	---	---	---	---
B57-2.5	2.5	8.9	---	---	---	---
B57-8.5	8.5	12	---	---	---	---
B58-0	0.0	85	4.7	---	---	---
B58-1	1.0	10	---	---	---	---
B58-2.5	2.5	9.3	---	---	---	---
B58-8.5	8.5	33	---	---	---	6.4
B59-0	0.0	19	---	---	---	---
B59-1	1.0	6.8	---	---	---	---
B59-2.5	2.5	<5.0	---	---	---	---
B59-5.5	5.5	5.8	---	---	---	---
B59-8.5	8.5	<5.0	---	---	---	---

TABLE 2
SUMMARY OF LEAD AND pH RESULTS - SOIL
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Sample ID	Sample Depth (ft)	Total Lead (mg/kg)	WET (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B60-0	0.0	220	3.2	---	---	---
B60-1	1.0	7.2	---	---	---	---
B60-2.5	2.5	<5.0	---	---	---	---
B60-3.5	3.5	<5.0	---	---	---	---
B60A-0	0.0	78	<1.0	---	---	4.6
B60A-1	1.0	78	<1.0	---	---	---
B60A-2.5	2.5	<5.0	---	---	---	4.3
B60A-3.5	3.5	<5.0	---	---	---	---
B61-0	0.0	1.1	---	---	---	---
B61-1	1.0	<5.0	---	---	---	---
B61-2.5	2.0	5.5	---	---	---	---
B61-5.5	2.5	<5.0	---	---	---	---
B61A-0	0.0	1.2	---	---	---	---
B61A-0.5	0.5	<5.0	---	---	---	11
B62-0	0.0	<1.0	---	---	---	---
B62-1	1.0	<5.0	---	---	---	---
B62-2.5	2.5	<5.0	---	---	---	---
B62-4.5	4.5	<5.0	---	---	---	---
B63-0	0.0	27	---	---	---	---
B63-1	1.0	9.1	---	---	---	---
B64-0	0.0	9.8	---	---	---	---
B64-1	1.0	<5.0	---	---	---	---
B65-0	0.0	57	2.4	---	---	---
B65-1	1.0	<5.0	---	---	---	7.8
B65-2.5	2.5	<5.0	---	---	---	---
B65-5.5	5.5	<5.0	---	---	---	---
B66-0	0.0	180	6.4	<0.25	---	6.1
B66-1	1.0	200	8.5	<0.25	<1.0	---
B66-2.5	2.5	69	<1.0	---	---	---

TABLE 2
SUMMARY OF LEAD AND pH RESULTS - SOIL
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Sample ID	Sample Depth (ft)	Total Lead (mg/kg)	WET (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B67-0	0.0	45	---	---	---	7.1
B67-1	1.0	8.5	---	---	---	8.1
B67-1.5	1.5	<5.0	---	---	---	---
B68-0	0.0	16	---	---	---	---
B68-1	1.0	<5.0	---	---	---	---
B68-2.5	2.5	<5.0	---	---	---	---
B68-4.5	4.5	<5.0	---	---	---	---
B69-0	0.0	18	---	---	---	---
B69-1	1.0	<5.0	---	---	---	---
B69-2.5	2.5	<5.0	---	---	---	---
B70-0	0.0	32	---	---	---	---
B70-1	1.0	<5.0	---	---	---	---
B70-2	2.0	<5.0	---	---	---	---
B71-0	0.0	64	2.6	---	---	---
B71-1	1.0	<5.0	---	---	---	---
B72-0	0.0	78	3.6	---	---	---
B72-1	1.0	<5.0	---	---	---	---
B72-1.5	1.5	<5.0	---	---	---	9.1
B73-0	0.0	91	3.7	---	---	---
B73-1	1.0	<5.0	---	---	---	---
B73-1.5	1.5	<5.0	---	---	---	---
B74-0	0.0	120	4.0	---	---	---
B74-1	1.0	5.3	---	---	---	---
B75-0	0.0	22	---	---	---	8.0
B75-1	1.0	6.0	---	---	---	---
B75-1.5	1.5	<5.0	---	---	---	---
B76-0	0.0	130	8.7	<0.25	---	---
B76-1	1.0	<5.0	---	---	---	---

TABLE 2
SUMMARY OF LEAD AND pH RESULTS - SOIL
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Sample ID	Sample Depth (ft)	Total Lead (mg/kg)	WET (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B77-0	0.0	390	33	<0.25	1.4	---
B77-1	1.0	130	14	<0.25	---	---
B77-1.5	1.5	8.3	---	---	---	---
B78-0	0.0	1,100	67	0.26	4.0	---
B78-0.5	0.5	1,500	150	<0.25	3.2	---
B79-0	0.0	650	48	<0.25	<1.0	---
B79-0.5	0.5	760	82	<0.25	2.4	7.4
B80-0	0.0	840	84	<0.25	2.1	---
B80-1	1.0	470	32	<0.25	1.9	---
B81-0	0.0	2,000	71	8.2	8.2	7.4
B81-1	1.0	83	9.2	0.53	---	---
B81-2.5	2.5	11	---	---	---	---
B82-0	0.0	110	6.2	<0.25	---	---
B82-1	1.0	<5.0	---	---	---	---
B82-2.5	2.5	<5.0	---	---	---	---
B82-3.5	3.5	<5.0	---	---	---	---
B83-0	0.0	860	76	3.4	2.8	---
B83-1	1.0	6.9	---	---	---	---
B83-2	2.0	8.3	---	---	---	---
B84-0	0.0	18	---	---	---	---
B84-1	1.0	<5.0	---	---	---	---
B84-2	2.0	<5.0	---	---	---	---
B85-0	0.0	36	---	---	---	---
B85-1	1.0	24	---	---	---	---
B85-2.5	2.5	25	---	---	---	---
B85-3.5	3.5	17	---	---	---	8.2
B86-0	0.0	15	---	---	---	---
B86-1	1.0	11	---	---	---	---
B86-2.5	2.5	11	---	---	---	---
B86-3.5	3.5	<5.0	---	---	---	---

TABLE 2
SUMMARY OF LEAD AND pH RESULTS - SOIL
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Sample ID	Sample Depth (ft)	Total Lead (mg/kg)	WET (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B87-0	0.0	1.6	---	---	---	---
B87-1	1.0	<5.0	---	---	---	---
B87-2.5	2.5	5.1	---	---	---	---
B87-3.5	3.5	<5.0	---	---	---	---
B88-0	0.0	1.1	---	---	---	---
B88-1	1.0	<5.0	---	---	---	---
B88-2.5	2.5	<5.0	---	---	---	8.3
B88-3.5	3.5	5.2	---	---	---	---
B89-0	0.0	3.3	---	---	---	---
B89-1	1.0	<5.0	---	---	---	---
B89-2.5	2.5	<5.0	---	---	---	---
B89-3.5	3.5	7.0	---	---	---	---
B90-0	0.0	3.2	---	---	---	---
B90-1	1.0	<5.0	---	---	---	---
B90-2.5	2.5	<5.0	---	---	---	---
B90-3.5	3.5	<5.0	---	---	---	---
B91-0	0.0	6.8	---	---	---	---
B91-0.5	0.5	7.8	---	---	---	---
B92-0	0.0	340	2.2	---	---	---
B92-1	1.0	17	---	---	---	---
B92-2.5	2.5	22	---	---	---	---
B92-5.5	5.5	47	---	---	---	---
B93-0	0.0	60	13	<0.25	---	---
B93-1	1.0	14	---	---	---	---
B93-2.5	2.5	7.1	---	---	---	---
B93-5.5	5.5	<5.0	---	---	---	---
B94-0	0.0	38	---	---	---	---
B94-1	1.0	<5.0	---	---	---	8.8
B94-2.5	2.5	<5.0	---	---	---	---
B94-5.5	5.5	<5.0	---	---	---	---

TABLE 2
SUMMARY OF LEAD AND pH RESULTS - SOIL
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Sample ID	Sample Depth (ft)	Total Lead (mg/kg)	WET (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B95-0	0.0	26	---	---	---	---
B95-1	1.0	<5.0	---	---	---	---
B96-0	0.0	8.8	---	---	---	---
B96-1	1.0	10	---	---	---	---
B96-1.5	1.5	7.7	---	---	---	---
B97-0	0.0	12	---	---	---	---
B97-1	1.0	5.9	---	---	---	---
B98-0	0.0	110	3.4	---	---	---
B98-1	1.0	37	---	---	---	---
B98-2	2.0	6.8	---	---	---	8.4
B99-0	0.0	61	13	<0.25	---	---
B99-1	1.0	<5.0	---	---	---	---
B99-2.5	2.5	<5.0	---	---	---	---
B99-3.5	3.5	<5.0	---	---	---	7.8
B100-0	0.0	81	2.7	---	---	---
B100-1	1.0	24	---	---	---	---
B100-2.5	2.5	<5.0	---	---	---	---
B100-3.5	3.5	<5.0	---	---	---	---
B101-0	0.0	29	---	---	---	---
B101-1	1.0	<5.0	---	---	---	---
B101-2.5	2.5	<5.0	---	---	---	---
B101-3.5	3.5	<5.0	---	---	---	---
B102-0	0.0	7.6	---	---	---	---
B102-1	1.0	<5.0	---	---	---	---
B102-2.5	2.5	<5.0	---	---	---	---
B102-3.5	3.5	<5.0	---	---	---	---
B103-0	0.0	12	---	---	---	7.7
B103-1	1.0	<5.0	---	---	---	---
B103-2.5	2.5	<5.0	---	---	---	---
B103-3.5	3.5	<5.0	---	---	---	---

TABLE 2
SUMMARY OF LEAD AND pH RESULTS - SOIL
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Sample ID	Sample Depth (ft)	Total Lead (mg/kg)	WET (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B104-0	0.0	16	---	---	---	---
B104-1	1.0	<5.0	---	---	---	11
B104-2.5	2.5	<5.0	---	---	---	---
B104-3.5	3.5	<5.0	---	---	---	---
B105-0	0.0	51	1.9	---	---	6.2
B105-1	1.0	10	---	---	---	---
B105-3.5	3.5	11	---	---	---	---
B105-9.5	9.5	19	---	---	---	---
B105-15.5	15.5	<5.0	---	---	---	7.8
B106-0	0.0	45	---	---	---	---
B106-1	1.0	7.9	---	---	---	---
B106-3.5	3.5	11	---	---	---	---
B106-9.5	9.5	18	---	---	---	---
B106-15.5	15.5	<5.0	---	---	---	---
B107-0	0.0	94	5.5	<0.25	---	---
B107-1	1.0	10	---	---	---	---
B107-3.5	3.5	11	---	---	---	6.8
B107-4	4.0	34	---	---	---	---
B108-0	0.0	52	2.1	---	---	---
B108-1	1.0	8.6	---	---	---	---
B108-3.5	3.5	11	---	---	---	---
B108-9.5	9.5	<5.0	---	---	---	---
B108-12.5	12.5	5.9	---	---	---	---
B109-0	0.0	55	2.2	---	---	---
B109-1	1.0	7.5	---	---	---	---
B109-3.5	3.5	9.2	---	---	---	---
B109-15.5	15.5	<5.0	---	---	---	---
B110-0	0.0	48	---	---	---	---
B110-1	1.0	8.9	---	---	---	---
B110-3.5	3.5	10	---	---	---	---
B110-9.5	9.5	8.4	---	---	---	---
B110-15.5	15.5	11	---	---	---	7.7

TABLE 2
SUMMARY OF LEAD AND pH RESULTS - SOIL
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Sample ID	Sample Depth (ft)	Total Lead (mg/kg)	WET (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B111-0	0.0	42	---	---	---	---
B111-1	1.0	7.6	---	---	---	---
B111-3.5	3.5	8.3	---	---	---	---
B111-9.5	9.5	10	---	---	---	---
B111-14.5	14.5	9.6	---	---	---	7.8
B112-0	0.0	63	2.4	---	---	---
B112-1	1.0	8.5	---	---	---	---
B112-2.5	2.5	9.0	---	---	---	---
B113-0	0.0	130	7.5	<0.25	---	---
B113-1	1.0	9.1	---	---	---	---
B113-3.5	3.5	11	---	---	---	---
B113-8	8.0	13	---	---	---	---
B114-0	0.0	92	4.5	---	---	---
B114-1	1.0	12	---	---	---	---
B114-3.5	3.5	<5.0	---	---	---	7.1
B114-15.5	15.5	5.4	---	---	---	---
MVP1-0	0.0	26	---	---	---	---
MVP1-1	1.0	32	---	---	---	---
MVP1-2.5	2.5	27	---	---	---	---
MVP2-1	1.0	15	---	---	---	---
MVP2-2	2.0	9.2	---	---	---	---
MVP3-0	0.0	18	---	---	---	---
MVP3-1.5	1.0	13	---	---	---	---
MVP3-1.5	1.5	<5.0	---	---	---	5.8
MVP4-0	0.0	18	---	---	---	---
MVP4-1	1.0	24	---	---	---	---
MVP4-2.5	2.5	14	---	---	---	7.9
MVP4-3.5	3.5	8.1	---	---	---	---

TABLE 2
SUMMARY OF LEAD AND pH RESULTS - SOIL
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Sample ID	Sample Depth (ft)	Total Lead (mg/kg)	WET (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
MVP5-0	0.0	16	---	---	---	---
MVP5-1	1.0	<5.0	---	---	---	---
MVP5-2.5	2.5	<5.0	---	---	---	---
MVP5-3.5	3.5	<5.0	---	---	---	---
MVP6-0	0.0	18	---	---	---	---
MVP6-1	1.0	34	---	---	---	---
MVP6-2.5	2.5	7.2	---	---	---	---
MVP6-3.5	3.5	<5.0	---	---	---	---
MVP7-0	0.0	59	3.9	---	---	---
MVP7-1	1.0	9.3	---	---	---	---
MVP7-2.5	2.5	7.7	---	---	---	---
MVP7-3.5	3.5	9.7	---	---	---	7.3
MVP8-0	0.0	13	---	---	---	---
MVP8-1	1.0	7.3	---	---	---	---
MVP8-2.5	2.5	7.0	---	---	---	---
MVP8-3.5	3.5	7.7	---	---	---	---
MVP9-0	0.0	37	---	---	---	---
MVP9-1	1.0	6.7	---	---	---	---
MVP9-2.5	2.5	7.1	---	---	---	---
MVP9-3.5	3.5	7.3	---	---	---	---
MVP10-0	0.0	9.6	---	---	---	---
MVP10-1	1.0	8.6	---	---	---	---
MVP10-2.5	2.5	8.0	---	---	---	---
MVP10-3.5	3.5	7.2	---	---	---	---
MVP11-0	0.0	13	---	---	---	---
MVP11-1	1.0	9.5	---	---	---	---
MVP11-2.5	2.5	9.8	---	---	---	---
MVP11-3.5	3.5	7.5	---	---	---	---
MVP12-0	0.0	170	9.0	<0.25	---	---
MVP12-1	1.0	<5.0	---	---	---	---
MVP12-2.5	2.5	8.2	---	---	---	6.8
MVP12-3.5	3.5	7.1	---	---	---	---

TABLE 2
SUMMARY OF LEAD AND pH RESULTS - SOIL
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Sample ID	Sample Depth (ft)	Total Lead (mg/kg)	WET (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
MVP13-0	0.0	270	14	<0.25	<1.0	---
MVP13-1	1.0	87	6.5	<0.25	---	---
MVP13-2.5	2.5	10	---	---	---	7.5
MVP13-3.5	3.5	9.9	---	---	---	---
MVP14-0	0.0	180	20	<0.25	<1.0	---
MVP14-1	1.0	8.4	---	---	---	---
MVP14-2.5	2.5	10	---	---	---	---
MVP14-3.5	3.5	6.6	---	---	---	---
MVP15-0	0.0	290	25	<0.25	<1.0	7.1
MVP15-1	1.0	8.6	---	---	---	---
MVP15-2.5	2.5	5.0	---	---	---	---
MVP15-3.5	3.5	7.8	---	---	---	---
MVP16-0	0.0	110	5.4	<0.25	---	---
MVP16-1	1.0	9.6	---	---	---	---
MVP16-2.5	2.5	10	---	---	---	---
MVP16-3.5	3.5	7.5	---	---	---	---
MVP17-0	0.0	81	4.5	---	---	---
MVP17-1	1.0	7.5	---	---	---	---
MVP17-2.5	2.5	7.0	---	---	---	---
MVP17-3.5	3.5	<5.0	---	---	---	---
MVP18-0	0.0	690	52	<0.25	<1.0	---
MVP18-1	1.0	7.4	---	---	---	4.2
MVP18-2.5	2.5	7.4	---	---	---	---
MVP18-3.5	3.5	7.5	---	---	---	---
MVP19-0	0.0	59	8.0	<0.25	---	---
MVP19-1	1.0	<5.0	---	---	---	---
MVP19-2.5	2.5	<5.0	---	---	---	---
MVP19-3.5	3.5	<5.0	---	---	---	---
MVP20-0	0.0	21	---	---	---	---
MVP20-1	1.0	<5.0	---	---	---	---
MVP20-2.5	2.5	<5.0	---	---	---	---
MVP20-3.5	3.5	<5.0	---	---	---	---

TABLE 2
SUMMARY OF LEAD AND pH RESULTS - SOIL
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Sample ID	Sample Depth (ft)	Total Lead (mg/kg)	WET (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
MVP21-0	0.0	16	---	---	---	---
MVP21-1	1.0	7.1	---	---	---	---
MVP21-2.5	2.5	6.7	---	---	---	---
MVP21-3.5	3.5	<5.0	---	---	---	---
MVP22-0	0.0	20	---	---	---	---
MVP22-1	1.0	5.7	---	---	---	7.9
MVP22-2	2.0	6.4	---	---	---	---
MVP23-0	0.0	6.3	---	---	---	---
MVP23-1	1.0	<5.0	---	---	---	---
MVP23-2.5	2.5	<5.0	---	---	---	---
MVP23-3.5	3.5	<5.0	---	---	---	---
MVP24-0	0.0	26	---	---	---	---
MVP24-1	1.0	6.2	---	---	---	---
MVP24-2	2.0	<5.0	---	---	---	---
MVP25-0	0.0	280	22	0.37	<1.0	---
MVP25-1	1.0	150	14	1.8	---	---
MVP25-2.5	2.5	62	4.3	---	---	---
MVP25-3.5	3.5	22	---	---	---	---
MVP26-0	0.0	460	36	1.3	<1.0	---
MVP26-1	1.0	14	---	---	---	---
MVP27-0	0.0	120	7.6	0.47	---	---
MVP27-1	1.0	23	---	---	---	---
MVP27-1.5	1.5	5.4	---	---	---	---
MVP28-0	0.0	57	3.8	---	---	---
MVP28-1	1.0	5.7	---	---	---	8.4
MVP28-2.5	2.5	6.2	---	---	---	---
MVP29-0	0.0	73	4.2	---	---	---
MVP29-1	1.0	48	---	---	---	---
MVP29-2.5	2.5	26	---	---	---	---
MVP29-3.5	3.5	5.5	---	---	---	8.4

TABLE 2
SUMMARY OF LEAD AND pH RESULTS - SOIL
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Sample ID	Sample Depth (ft)	Total Lead (mg/kg)	WET (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
MVP30-0	0.0	150	12	0.72	<1.0	---
MVP30-1	1.0	5.7	---	---	---	---
MVP30-2	2.0	6.4	---	---	---	---
MVP31-0	0.0	68	3.2	---	---	6.4
MVP31-0.5	0.5	7.0	---	---	---	---
MVP32-0	0.0	3.8	---	---	---	---
MVP32-1	1.0	<5.0	---	---	---	---
MVP32-2.5	2.5	9.9	---	---	---	---
MVP32-3.5	3.5	11	---	---	---	---
MVP33-0	0.0	84	3.8	---	---	---
MVP33-1	1.0	16	---	---	---	---
MVP34-0	0.0	20	---	---	---	---
MVP34-1	1.0	8.2	---	---	---	---
MVP34-2	2.0	<5.0	---	---	---	---
MVP35-0	0.0	28	---	---	---	---
MVP35-1	1.0	<5.0	---	---	---	---
MVP35-2.5	2.5	<5.0	---	---	---	8.9
MVP35-3.5	3.5	<5.0	---	---	---	---
MVP36-0	0.0	23	---	---	---	---
MVP36-1	1.0	6.6	---	---	---	---
MVP36-1.5	1.5	6.7	---	---	---	8.1

Notes:

WET = Waste Extraction Test using citric acid as the extraction fluid
WET-DI = Waste Extraction Test using deionized water as the extraction fluid
TCLP = Toxicity Characteristic Leaching Procedure
mg/kg = milligrams per kilogram
mg/l = milligrams per liter
--- = Not analyzed
< = Analyte was not detected at or above the stated detection limit

TABLE 3
SUMMARY OF CAM 17 METALS RESULTS - SOIL
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Sample ID	Sample Depth (ft)	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Mercury
B1-0	0	<2.0	**3.0**	30	<1.0	1.2	14	7.9	37	11	<1.0	8.8	<1.0	<1.0	<1.0	**34**	80	**5.3**/*<1.0*
B2-0	0	<2.0	**1.5**	53	<1.0	<1.0	9.6	8.2	28	11	<1.0	12	<1.0	<1.0	<1.0	**38**	84	**1.0**
B3-0	0	<2.0	**5.8**	28	<1.0	<1.0	3.1	5.2	26	11	<1.0	2.8	<1.0	<1.0	<1.0	**22**	140	0.86
B4-0	0	<2.0	**1.8**	54	<1.0	<1.0	31	14	49	46	<1.0	46	<1.0	<1.0	<1.0	**62**	100	**2.8**/*<1.0*
B5-0	0	<2.0	**2.2**	43	<1.0	<1.0	14	11	37	21	<1.0	17	<1.0	<1.0	<1.0	**56**	110	**3.8**/*<1.0*
B6-0	0	<2.0	**1.7**	36	<1.0	<1.0	6.3	6.6	20	9.1	<1.0	7.4	<1.0	<1.0	<1.0	**27**	110	**8.0**/*<1.0*
B7-0	0	<2.0	**36**	27	<1.0	<1.0	<1.0	2.9	63	21	3.2	<1.0	<1.0	<1.0	<1.0	**93**	60	**5.6**/*7.3*
B8-0	0	<2.0	**3.6**	40	<1.0	<1.0	12	10	37	19	<1.0	14	<1.0	<1.0	<1.0	**45**	110	0.69
B9-0	0	<2.0	**2.2**	80	<1.0	1.4	36	10	48	160	1.3	45	<1.0	<1.0	<1.0	**38**	240	0.97
B10-0	0	<2.0	**8.4**	44	<1.0	<1.0	13	9.7	37	190	<1.0	14	<1.0	<1.0	<1.0	**47**	140	**1.5**
B11-0	0	<2.0	**21**	89	<1.0	1.2	22	9.3	60	**850**	1.2	22	<1.0	<1.0	<1.0	**38**	230	0.38
B12-0	0	<2.0	**5.4**	82	<1.0	<1.0	16	8.9	41	110	<1.0	21	<1.0	<1.0	<1.0	**35**	210	0.48
B13-0	0	<2.0	**4.8**	98	<1.0	<1.0	35	13	44	**270**	<1.0	40	<1.0	<1.0	<1.0	**56**	200	0.52
B14-0	0	2.0	**15**	160	<1.0	<1.0	36	13	62	**440**	3.0	30	<1.0	<1.0	<1.0	**49**	360	0.51
B15-0	0	<2.0	**1.9**	20	<1.0	<1.0	9.0	9.0	20	9.9	<1.0	14	<1.0	<1.0	<1.0	**46**	44	**1.1**
B16-0	0	<2.0	**9.9**	120	<1.0	<1.0	46	15	53	**210**	<1.0	52	<1.0	<1.0	<1.0	**50**	170	0.76

TABLE 3
SUMMARY OF CAM 17 METALS RESULTS - SOIL
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Sample ID	Sample Depth (ft)	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Mercury
B17-0	0	<2.0	**6.3**	110	<1.0	<1.0	21	10	39	**230**	<1.0	22	<1.0	<1.0	<1.0	**42**	170	0.48
B18-0	0	<2.0	**6.8**	110	<1.0	<1.0	26	9.5	42	**420**	<1.0	28	<1.0	<1.0	<1.0	**37**	200	0.39
B19-0	0	<2.0	**<1.0**	72	<1.0	<1.0	22	8.8	18	48	<1.0	39	<1.0	<1.0	<1.0	**32**	35	<0.10
B20-0	0	<2.0	**<1.0**	86	<1.0	<1.0	21	7.7	19	64	<1.0	35	<1.0	<1.0	<1.0	**25**	35	<0.10
B21-0	0	<2.0	**<1.0**	110	<1.0	1.0	28	11	23	20	<1.0	48	<1.0	<1.0	<1.0	**41**	38	<0.10
B22-0	0	<2.0	**<1.0**	94	<1.0	<1.0	24	9.4	20	61	<1.0	39	<1.0	<1.0	<1.0	**32**	39	<0.10
B23-0	0	<2.0	**<1.0**	80	<1.0	1.6	25	18	35	30	<1.0	45	<1.0	<1.0	<1.0	**66**	36	0.11
B24-0	0	<2.0	**7.9**	95	<1.0	<1.0	33	12	34	27	<1.0	37	<1.0	<1.0	<1.0	**46**	85	0.14
B25-0	0	<2.0	**6.8**	88	<1.0	<1.0	20	9.0	29	15	<1.0	26	<1.0	<1.0	<1.0	**33**	66	0.13
B26-0	0	<2.0	**7.8**	90	<1.0	<1.0	25	9.5	29	**270**	<1.0	22	<1.0	<1.0	<1.0	**44**	140	<0.10
B27-0	0	<2.0	**<1.0**	54	<1.0	<1.0	20	9.0	16	21	<1.0	29	<1.0	<1.0	<1.0	**34**	28	<0.10
B28-0	0	<2.0	**<1.0**	94	<1.0	1.0	32	11	20	160	<1.0	48	<1.0	<1.0	<1.0	**33**	53	<0.10
B29-0	0	<2.0	**<1.0**	110	<1.0	<1.0	32	10	27	87	<1.0	47	<1.0	<1.0	<1.0	**32**	42	<0.10
B30-0	0	<2.0	**<1.0**	54	<1.0	<1.0	18	6.7	13	98	<1.0	27	<1.0	<1.0	<1.0	**26**	32	<0.10
B31-0	0	<2.0	**<1.0**	110	<1.0	<1.0	26	9.8	18	76	<1.0	45	<1.0	<1.0	<1.0	**32**	46	<0.10
B32-0	0	<2.0	**<1.0**	49	<1.0	1.5	26	17	29	68	<1.0	27	<1.0	<1.0	<1.0	**64**	35	0.17

TABLE 3
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Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Sample ID	Sample Depth (ft)	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Mercury
B33-0	0	<2.0	**<1.0**	28	<1.0	<1.0	28	30	75	33	<1.0	21	<1.0	<1.0	<1.0	**120**	64	0.23
B34-0	0	<2.0	**7.4**	110	<1.0	<1.0	35	12	36	62	<1.0	34	<1.0	<1.0	<1.0	**40**	150	<0.10
B35-0	0	<2.0	**3.8**	110	<1.0	<1.0	22	7.2	39	160	<1.0	24	<1.0	<1.0	<1.0	**31**	210	0.12
B36-0	0	<2.0	**5.1**	74	<1.0	<1.0	19	6.9	21	51	<1.0	22	<1.0	<1.0	<1.0	**29**	56	<0.10
B37-0	0	<2.0	**7.1**	66	<1.0	<1.0	21	9.4	26	18	<1.0	26	<1.0	<1.0	<1.0	**37**	70	<0.10
B38-0	0	<2.0	**7.5**	110	<1.0	<1.0	29	8.1	32	43	<1.0	24	<1.0	<1.0	<1.0	**52**	74	<0.10
B39-0	0	<4.0	**7.4**	100	<2.0	<2.0	23	22	33	**360**	<2.0	81	<2.0	<2.0	<2.0	**33**	130	<0.10
B41-0	0	<2.0	**<1.0**	120	<1.0	1.2	29	16	30	25	<1.0	46	<1.0	<1.0	<1.0	**48**	36	0.11
B42-0	0	<2.0	**<1.0**	52	<1.0	<1.0	25	10	36	170	<1.0	28	<1.0	<1.0	<1.0	**46**	65	0.13
B43-0	0	<2.0	**<1.0**	53	<1.0	**2.2**	27	24	50	**1,600**	<1.0	25	<1.0	<1.0	<1.0	**65**	110	0.18
B49-0	0	<2.0	**3.4**	120	<1.0	<1.0	28	8.3	35	**440**	1.7	37	<1.0	<1.0	<1.0	**32**	220	0.24
B50-0	0	<2.0	**3.4**	97	<1.0	<1.0	24	9.5	26	100	<1.0	28	<1.0	<1.0	<1.0	**35**	110	0.16
B51-0	0	<2.0	**3.0**	130	<1.0	<1.0	37	11	77	**200**	2.3	32	<1.0	<1.0	<1.0	**41**	190	0.22
B53-0	0	<2.0	**7.0**	96	<1.0	<1.0	21	8.9	29	16	<1.0	27	<1.0	<1.0	<1.0	**36**	70	<0.10
B54-0	0	<2.0	**<1.0**	55	<1.0	<1.0	25	12	27	80	<1.0	27	<1.0	<1.0	<1.0	**44**	79	0.11
B55-0	0	<2.0	**<1.0**	30	<1.0	<1.0	22	8.2	26	14	<1.0	28	<1.0	<1.0	<1.0	**24**	27	<0.10

TABLE 3
SUMMARY OF CAM 17 METALS RESULTS - SOIL
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Sample ID	Sample Depth (ft)	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Mercury
B56-0	0	<2.0	**<1.0**	26	<1.0	<1.0	20	16	48	20	<1.0	17	<1.0	<1.0	<1.0	**68**	27	0.25
B57-0	0	<2.0	**2.2**	86	<1.0	1.1	15	7.5	26	110	<1.0	19	<1.0	<1.0	<1.0	**32**	120	<0.50
B58-0	0	<2.0	**6.2**	110	<1.0	1.3	24	9.0	33	85	<1.0	28	<1.0	<1.0	<1.0	**33**	86	0.17
B59-0	0	<2.0	**1.7**	170	<1.0	**2.5**	30	6.1	20	19	3.4	63	<1.0	<1.0	<1.0	**23**	120	<0.10
B60-0	0	<2.0	**4.6**	130	<1.0	1.0	26	12	27	**220**	1.0	34	<1.0	<1.0	<1.0	**22**	74	0.13
B60A-0	0	<2.0	**3.5**	140	<1.0	1.2	27	6.0	23	78	1.5	29	<1.0	<1.0	<1.0	**22**	83	0.17
B61-0	0	<2.0	**<1.0**	10	<1.0	<1.0	30	27	210	1.1	<1.0	27	<1.0	<1.0	<1.0	**99**	30	0.51
B61A-0	0	<2.0	**<1.0**	39	<1.0	<1.0	17	13	19	1.2	<1.0	24	<1.0	<1.0	<1.0	**51**	23	0.10
B62-0	0	<2.0	**<1.0**	18	<1.0	<1.0	22	19	48	**<1.0**	<1.0	20	<1.0	<1.0	<1.0	**78**	26	0.40
B63-0	0	<2.0	**2.6**	150	<1.0	<1.0	52/*<1.0*	12	25	27	<1.0	74	<1.0	<1.0	<1.0	**32**	170	<0.10
B64-0	0	<2.0	**2.7**	220	<1.0	<1.0	81/*<1.0*	19	34	9.8	<1.0	110	<1.0	<1.0	<1.0	**48**	130	<0.10
B65-0	0	<2.0	**3.2**	130	<1.0	<1.0	64/*<1.0*	14	32	57	<1.0	91	<1.0	<1.0	<1.0	**41**	**2,800**	<0.10
B66-0	0	<2.0	**1.2**	120	<1.0	<1.0	48	14	35	180	<1.0	47	<1.0	<1.0	<1.0	**47**	**710**	<0.10
B67-0	0	<2.0	**6.2**	75	<1.0	1.2	43	9.9	21	45	<1.0	62	<1.0	<1.0	<1.0	**26**	59	<0.10
B68-0	0	<2.0	**2.2**	120	<1.0	1.2	55/*<1.0*	12	26	16	<1.0	83	<1.0	<1.0	<1.0	**28**	56	<0.10
B69-0	0	<2.0	**1.8**	110	<1.0	1.3	36	9.4	21	18	<1.0	49	<1.0	<1.0	<1.0	**27**	45	<0.10

TABLE 3
SUMMARY OF CAM 17 METALS RESULTS - SOIL
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Sample ID	Sample Depth (ft)	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Mercury
B70-0	0	<2.0	**4.3**	99	<1.0	1.1	44	11	27	32	<1.0	70	<1.0	<1.0	<1.0	**28**	56	<0.10
B71-0	0	<2.0	**3.9**	73	<1.0	<1.0	39	9.8	19	64	<1.0	61	<1.0	<1.0	<1.0	**24**	58	<0.10
B72-0	0	<2.0	**2.8**	89	<1.0	1.2	42	11	33	78	<1.0	60	<1.0	<1.0	<1.0	**28**	77	<0.10
B73-0	0	<2.0	**2.6**	100	<1.0	1.2	43	10	29	91	1.0	63	<1.0	<1.0	<1.0	**28**	97	<0.10
B74-0	0	<2.0	**6.4**	61	<1.0	<1.0	41	9.7	27	120	<1.0	59	<1.0	<1.0	<1.0	**27**	75	<0.10
B75-0	0	<2.0	**2.5**	100	<1.0	1.0	44	12	25	22	<1.0	70	<1.0	<1.0	<1.0	**29**	58	<0.10
B76-0	0	<2.0	**2.3**	69	<1.0	<1.0	31	9.2	19	130	<1.0	46	<1.0	<1.0	<1.0	**22**	70	<0.10
B77-0	0	<2.0	**<1.0**	58	<1.0	**1.8**	30	17	86	**390**	<1.0	29	<1.0	<1.0	<1.0	**54**	210	0.44
B78-0	0	<2.0	**1.6**	110	<1.0	1.6	31	9.7	46	**1,100**	<1.0	37	<1.0	<1.0	<1.0	**36**	250	0.15
B79-0	0	2.5	**<1.0**	170	<1.0	**2.0**	39	9.9	110	**650**	4.6	38	<1.0	<1.0	<1.0	**30**	**720**	0.19
B80-0	0	<2.0	**3.3**	120	<1.0	**2.0**	47	11	97	**840**	2.5	52	<1.0	<1.0	<1.0	**28**	470	0.16
B81-0	0	<2.0	**2.7**	120	<1.0	**2.7**	44	16	96	**2,000**	1.6	48	<1.0	<1.0	<1.0	**58**	570	0.32
B82-0	0	<2.0	**5.2**	93	<1.0	<1.0	37	9.8	24	110	<1.0	50	<1.0	<1.0	<1.0	**31**	84	**2.0**/*<1.0*
B83-0	0	<2.0	**4.9**	110	<1.0	1.0	49	11	58	**860**	2.0	57	<1.0	<1.0	<1.0	**38**	350	0.11
B84-0	0	<2.0	**5.1**	170	<1.0	<1.0	73/*<1.0*	15	36	18	<1.0	100	<1.0	<1.0	<1.0	**44**	78	<0.10
B85-0	0	<2.0	**<1.0**	53	<1.0	<1.0	22	11	46	36	<1.0	26	<1.0	<1.0	<1.0	**38**	78	0.24

TABLE 3
SUMMARY OF CAM 17 METALS RESULTS - SOIL
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Sample ID	Sample Depth (ft)	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Mercury
B86-0	0	<2.0	**<1.0**	48	<1.0	<1.0	30	19	65	15	<1.0	35	<1.0	<1.0	<1.0	**88**	44	0.39
B87-0	0	<2.0	**<1.0**	19	<1.0	<1.0	23	18	45	1.6	<1.0	20	<1.0	<1.0	<1.0	**83**	38	0.24
B88-0	0	<2.0	**<1.0**	23	<1.0	<1.0	24	16	31	1.1	<1.0	23	<1.0	<1.0	<1.0	**86**	24	0.39
B89-0	0	<2.0	**<1.0**	25	<1.0	<1.0	20	9.2	36	3.3	<1.0	21	<1.0	<1.0	<1.0	**50**	25	0.39
B90-0	0	<2.0	**<1.0**	42	<1.0	<1.0	21	13	34	3.2	<1.0	30	<1.0	<1.0	<1.0	**39**	25	0.28
B91-0	0	<2.0	**2.0**	95	<1.0	<1.0	42	13	27	6.8	<1.0	56	<1.0	<1.0	<1.0	**34**	42	<0.10
B92-0	0	<2.0	**8.0**	140	<1.0	<1.0	56/*<1.0*	16	47	**340**	<1.0	68	<1.0	<1.0	<1.0	**48**	190	<0.10
B93-0	0	<2.0	**3.1**	110	<1.0	<1.0	46	15	45	60	<1.0	57	<1.0	<1.0	<1.0	**39**	110	0.11
B94-0	0	<2.0	**4.7**	150	<1.0	<1.0	57/*<1.0*	16	37	38	<1.0	66	<1.0	<1.0	<1.0	**46**	75	<0.10
B95-0	0	<2.0	**2.1**	94	<1.0	<1.0	37	14	52	26	<1.0	47	<1.0	<1.0	<1.0	**45**	90	0.27
B96-0	0	<2.0	**2.0**	150	<1.0	1.2	42	14	36	8.8	<1.0	55	<1.0	<1.0	<1.0	**33**	62	<0.10
B97-0	0	<2.0	**3.2**	130	<1.0	1.3	53/*<1.0*	15	36	12	<1.0	61	<1.0	<1.0	<1.0	**43**	110	<0.10
B98-0	0	5.4	**2.6**	230	<1.0	1.4	62/*<1.0*	17	44	110	<1.0	80	<1.0	<1.0	<1.0	**46**	88	<0.10
B99-0	0	<2.0	**<1.0**	70	<1.0	1.3	37	12	57	61	<1.0	30	<1.0	<1.0	<1.0	**41**	150	0.16
B100-0	0	<2.0	**<1.0**	64	<1.0	1.3	29	16	61	81	<1.0	35	<1.0	<1.0	<1.0	**45**	100	<0.10
B101-0	0	<2.0	**<1.0**	83	<1.0	<1.0	20	9.8	27	29	<1.0	28	<1.0	<1.0	<1.0	**35**	31	0.16

TABLE 3
SUMMARY OF CAM 17 METALS RESULTS - SOIL
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Sample ID	Sample Depth (ft)	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Mercury
B102-0	0	<2.0	**3.1**	61	<1.0	<1.0	41	12	51	7.6	<1.0	47	<1.0	<1.0	<1.0	**57**	40	0.30
B103-0	0	<2.0	**<1.0**	42	<1.0	<1.0	19	11	43	12	<1.0	28	<1.0	<1.0	<1.0	**46**	35	0.38
B104-0	0	<2.0	**<1.0**	38	<1.0	<1.0	18	11	30	16	<1.0	26	<1.0	<1.0	<1.0	**48**	57	0.30
B105-0	0	<2.0	**5.4**	130	<1.0	<1.0	24	7.4	28	51	<1.0	29	<1.0	<1.0	<1.0	**27**	86	<0.10
B106-0	0	<2.0	**7.5**	86	<1.0	<1.0	19	7.4	27	45	<1.0	21	<1.0	<1.0	<1.0	**31**	86	0.10
B107-0	0	<2.0	**5.1**	110	<1.0	<1.0	20	7.6	30	94	<1.0	26	<1.0	<1.0	<1.0	**30**	110	0.11
B108-0	0	<2.0	**12**	110	<1.0	<1.0	23	9.7	29	52	<1.0	28	<1.0	<1.0	<1.0	**39**	90	<0.10
B109-0	0	<2.0	**5.9**	92	<1.0	<1.0	23	9.6	26	55	<1.0	32	<1.0	<1.0	<1.0	**34**	91	<0.10
B110-0	0	<2.0	**6.4**	110	<1.0	<1.0	29	10	29	48	<1.0	29	<1.0	<1.0	<1.0	**45**	94	<0.10
B111-0	0	<2.0	**6.8**	98	<1.0	<1.0	26	9.9	30	42	<1.0	28	<1.0	<1.0	<1.0	**41**	85	<0.10
B112-0	0	<2.0	**5.6**	95	<1.0	<1.0	22	7.9	26	63	<1.0	25	<1.0	<1.0	<1.0	**32**	92	<0.10
B113-0	0	<2.0	**6.0**	120	<1.0	<1.0	33	10	49	130	<1.0	40	<1.0	<1.0	<1.0	**41**	290	**2.0**/*<1.0*
B114-0	0	<2.0	**6.1**	100	<1.0	<1.0	27	11	33	92	<1.0	32	<1.0	<1.0	<1.0	**38**	100	0.15
MVP1-0	0	<2.0	**19**	42	<1.0	<1.0	6.3	7.6	51	26	<1.0	8.1	<1.0	<1.0	<1.0	**30**	140	0.87
MVP2-0	0	<2.0	**13**	50	<1.0	<1.0	5.6	7.7	38	18	<1.0	8.4	<1.0	<1.0	<1.0	**28**	170	**1.7**
MVP3-0	0	<2.0	**7.3**	49	<1.0	<1.0	6.9	7.7	32	18	<1.0	8.9	<1.0	<1.0	<1.0	**30**	120	0.64

TABLE 3
SUMMARY OF CAM 17 METALS RESULTS - SOIL
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Sample ID	Sample Depth (ft)	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Mercury
MVP4-0	0	<2.0	**5.3**	40	<1.0	<1.0	12	12	37	18	<1.0	14	<1.0	<1.0	<1.0	**63**	120	**1.6**
MVP5-0	0	<2.0	**1.6**	41	<1.0	<1.0	12	13	31	16	<1.0	14	<1.0	<1.0	<1.0	**75**	99	**3.7**/*<1.0*
MVP6-0	0	<2.0	**2.5**	54	<1.0	<1.0	13	14	43	18	<1.0	15	<1.0	<1.0	<1.0	**81**	100	**2.0**/*<1.0*
MVP7-0	0	<2.0	**5.1**	110	<1.0	<1.0	29	14	32	59	<1.0	46	<1.0	<1.0	<1.0	**45**	68	0.18
MVP8-0	0	<2.0	**5.5**	110	<1.0	<1.0	29	14	32	13	<1.0	34	<1.0	<1.0	<1.0	**47**	60	<0.10
MVP9-0	0	<2.0	**2.6**	77	<1.0	<1.0	26	15	32	37	<1.0	29	<1.0	<1.0	<1.0	**60**	50	0.24
MVP10-0	0	<2.0	**6.4**	86	<1.0	<1.0	16	9.2	19	9.6	2.0	24	<1.0	<1.0	<1.0	**30**	57	<0.10
MVP11-0	0	<2.0	**2.9**	92	<1.0	<1.0	17	6.9	19	13	2.4	26	<1.0	<1.0	<1.0	**27**	53	0.11
MVP12-0	0	<2.0	**6.0**	97	<1.0	<1.0	20	7.4	25	170	1.6	22	<1.0	<1.0	<1.0	**33**	80	<0.10
MVP13-0	0	<2.0	**5.3**	130	<1.0	<1.0	46	12	52	**270**	<1.0	49	<1.0	<1.0	<1.0	**42**	140	0.53
MVP14-0	0	<2.0	**1.7**	50	<1.0	<1.0	21	9.7	33	180	<1.0	21	<1.0	<1.0	<1.0	**33**	87	0.38
MVP15-0	0	<2.0	**7.3**	72	<1.0	<1.0	26	11	32	**290**	<1.0	27	<1.0	<1.0	<1.0	**44**	86	0.22
MVP16-0	0	<4.0	**5.2**	81	<2.0	<2.0	23	22	33	110	<2.0	75	<2.0	<2.0	<2.0	**36**	98	0.13
MVP17-0	0	<2.0	**5.6**	140	<1.0	<1.0	24	8.7	26	81	1.2	34	<1.0	<1.0	<1.0	**26**	110	<0.10
MVP18-0	0	<2.0	**6.9**	140	<1.0	<1.0	26	6.2	38	**690**	1.9	36	<1.0	<1.0	<1.0	**23**	240	0.11

TABLE 3
SUMMARY OF CAM 17 METALS RESULTS - SOIL
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Sample ID	Sample Depth (ft)	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Mercury
MVP19-0	0	2.3	**2.8**	150	<1.0	<1.0	66/*<1.0*	14	46	59	<1.0	71	<1.0	<1.0	<1.0	**47**	140	0.11
MVP20-0	0	<2.0	**2.7**	190	<1.0	1.5	62	16	44	21	<1.0	84	<1.0	<1.0	<1.0	**47**	72	<0.10
MVP21-0	0	<2.0	**2.6**	120	<1.0	<1.0	49/*<1.0*	13	34	16	<1.0	61	<1.0	<1.0	<1.0	**44**	60	<0.10
MVP22-0	0	<2.0	**3.0**	120	<1.0	<1.0	61/*<1.0*	16	31	20	<1.0	71	<1.0	<1.0	<1.0	**50**	59	<0.10
MVP23-0	0	<2.0	**1.7**	90	<1.0	<1.0	38	10	25	6.3	<1.0	49	<1.0	<1.0	<1.0	**28**	38	<0.10
MVP24-0	0	<2.0	**3.0**	120	<1.0	<1.0	61/*<1.0*	16	31	26	<1.0	69	<1.0	<1.0	<1.0	**51**	59	0.10
MVP25-0	0	<2.0	**3.7**	120	<1.0	<1.0	51/*<1.0*	13	50	**280**	<1.0	53	<1.0	<1.0	<1.0	**45**	300	0.13
MVP26-0	0	<2.0	**7.5**	110	<1.0	<1.0	52/*<1.0*	13	49	**460**	<1.0	68	<1.0	<1.0	<1.0	**39**	260	0.18
MVP27-0	0	<2.0	**3.2**	93	<1.0	<1.0	51/*<1.0*	16	44	120	<1.0	55	<1.0	<1.0	<1.0	**53**	140	0.46
MVP28-0	0	<2.0	**2.8**	100	<1.0	<1.0	51/*<1.0*	17	55	57	<1.0	53	<1.0	<1.0	<1.0	**55**	120	0.14
MVP29-0	0	<2.0	**2.7**	130	<1.0	<1.0	66/*<1.0*	19	90	73	<1.0	72	<1.0	<1.0	<1.0	**55**	88	0.23
MVP30-0	0	<2.0	**2.8**	99	<1.0	<1.0	54/*<1.0*	16	33	150	<1.0	60	<1.0	<1.0	<1.0	**46**	110	0.11
MVP31-0	0	<2.0	**1.6**	84	<1.0	<1.0	52/*<1.0*	17	69	68	<1.0	49	<1.0	<1.0	<1.0	**55**	69	<0.10
MVP32-0	0	<2.0	**2.7**	130	<1.0	<1.0	42	12	27	3.8	<1.0	54	<1.0	<1.0	<1.0	**35**	41	<0.10
MVP33-0	0	<2.0	**1.6**	84	<1.0	<1.0	57/*<1.0*	17	47	84	<1.0	55	<1.0	<1.0	<1.0	**53**	81	<0.10

TABLE 3
SUMMARY OF CAM 17 METALS RESULTS - SOIL
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Sample ID	Sample Depth (ft)	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Mercury
MVP34-0	0	<2.0	**2.6**	88	<1.0	<1.0	53/*<1.0*	15	28	20	<1.0	58	<1.0	<1.0	<1.0	**52**	60	0.14
MVP35-0	0	<2.0	**3.7**	88	<1.0	<1.0	54/*<1.0*	17	36	28	<1.0	63	<1.0	<1.0	<1.0	**65**	65	<0.10
MVP36-0	0	<2.0	**1.5**	80	<1.0	<1.0	52/*<1.0*	16	29	23	<1.0	57	<1.0	<1.0	<1.0	**55**	71	<0.10
CAM 17 Metals Analyses																		
Number of Samples		145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145
Number of Detections		4	111	145	0	33	144	145	145	144	19	144	0	0	0	145	145	85
Minimum Detection		2.0	**1.2**	10	---	1.0	3.1	2.9	13	1.1	1.0	2.8	---	---	---	**22**	23	0.1
Mean Detection		3.1	**5.0**	90.6	---	1.4	32.1	12.0	38.5	138.5	2.1	40.0	---	---	---	**42.9**	132.1	0.7
Maximum Detection		5.4	**36**	230	---	**2.7**	81	30	210	**2,000**	4.6	110	---	---	---	**120**	**2,800**	**8.0**
ESLs																		
Shallow Soils (≤3 m bgs)																		
Residential Land Use		6.1	0.38	750	4.0	1.7	750*	40	230	200	40	150	10	20	1.2	15	600	1.0
Comm/Indust Land Use		40	1.5	1,500	8.0	7.4	750*	80	230	750	40	150	10	40	15	190	600	100
Deep Soils (≥3 m bgs)																		
Residential Land Use		280	14	2,500	98	39	2,500	94	2,500	750	2,500	260	2,500	2,500	57	710	2,500	33
Comm/Indust Land Use		280	14	2,600	98	39	5,000	94	5,000	750	3,600	260	3,600	3,600	57	710	5,000	33

Notes:

Results are shown in milligrams per kilogram (mg/kg)

Results in italics are soluble metal concentrations in milligrams per liter (mg/l) analyzed using the Waste Extraction Test (WET)

Mercury WET results are reported in micrograms per liter (ug/l)

< Analyte was not detected at or above the stated detection limit

ESLs = Environmental Screening Levels, SFRWQCB, November 2007, Tables A and C.

* = Value is for Chromium III, no standard for total chromium

BOLD = Value exceeds one or more applicable standards

TABLE 4
SUMMARY OF ORGANICS RESULTS - GROUNDWATER
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Sample I.D.	TPHd (mg/l)	TPHmo (mg/l)	TPHg (mg/l)	Benzene (ug/l)	Ethylbenzene (ug/l)	m,p-Xylene (ug/l)	MTBE (ug/l)	o-Xylene (ug/l)	Toluene (ug/l)	VOCs (ug/l)	SVOCs (ug/l)
GRAB GW WELL A	**2.3**	**0.58**	<0.050	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	ND	ND
GRAB GW WELL B	**0.37**	**0.19**	<0.050	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	ND	ND
B59 GRAB GW	<0.050	<0.050	<0.050	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	ND	ND
B82 GRAB GW	0.092	0.091	<0.050	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	ND	ND
ESLs **GW IS Current/Potential Source of Drinking Water**	0.1	0.1	0.1	1.0	30	20	5.0	20	40	NA	NA

Notes:
TPHd = Total Petroleum Hydrocarbons as diesel
TPHmo = Total Petroleum Hydrocarbons as motor oil
TPHg = Total Petroleum Hydrocarbons as gasoline
MTBE = Methyl tertiary-butyl ether
VOCS = Volatile Organic Compounds
SVOCs = Semi-Volatile Organic Compounds
mg/l = milligrams per liter
ug/l = micrograms per liter
< = Analyte was not detected at or above the stated detection limit
ND = No analytes detected at or above the method detection limit
NA = Not Applicable
ESLs = Environmental Screening Levels, SFRWQCB, November 2007, Table A.
ESL values for xylenes are for individual or sum of all isomers.
BOLD = Value exceeds ESL value.

TABLE 5
SUMMARY OF CAM 17 METALS RESULTS - GROUNDWATER
Caldecott Tunnel
Alameda and Contra Costa Counties, California

Sample I.D.	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
GRAB GW WELL A	<0.0050	<0.010	0.028	<0.0030	<0.0030	<0.0030	<0.0030	0.080	<0.0050	<0.20	0.0083	<0.0050	0.053	<0.0030	<0.015	0.0031	1.5
GRAB GW WELL B	<0.0050	<0.010	0.014	<0.0030	<0.0030	0.0073	<0.0030	<0.0050	<0.0050	<0.20	<0.0050	<0.0050	0.022	<0.0030	<0.015	0.0063	**3.2**
B59 GRAB GW	<0.025	<0.050	0.66	<0.015	0.041	0.19	0.21	0.31	0.033	<0.20	<0.025	1.9	0.16	<0.015	<0.075	0.22	1.7
B82 GRAB GW	0.0086	0.042	10	0.015	0.011	0.79	0.62	0.62	0.37	0.0028	<0.0050	1.4	<0.010	<0.0030	<0.015	1.2	1.3
<u>ESLs</u>																	
Table A	6.0	50	1,000	4.0	5.0	50	140	1,000	15	35	100	50	35	2.0	15	5,000	2.0
Table B	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000

<u>Notes:</u>

Results are shown in units of milligrams per liter (mg/l)

< = Analyte was not detected at or above the stated detection limit

ESLs = Environmental Screening Levels, Screening for Environmental Concerns at Contaminated Sites, San Francisco Bay Reqional Water Quality Control Board, November 2007.

Table A: Groundwater Is Current or Potential Source of Drinking Water

Table B: Groundwater Is NOT Current or Potential Source of Drinking Water

TABLE 6A
Summary of Statistical Analysis
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Borings B1-B3, B5-B8, and MVP1-MVP6

TOTAL LEAD UCLs

	Total Lead (mg/kg)	
	90% UCL	**95% UCL**
0 to 0.5 ft	18.4	18.9
1 to 2 ft	18.8	19.9
2 to 3 ft	19.0	20.2

	Maximum
3.5 to 4 ft.	8.1

EXCAVATION SCENARIOS

	90% UCL		**95% UCL**
Excavation Depth	**Total Lead (mg/kg)**	**Soluble (WET) Lead* (mg/l)**	**Total Lead (mg/kg)**
0 to 1 ft.	18.4	1.3	18.9
Underlying Soil (1 to 4 ft.) [1]	*17.1*	*1.2*	*18.1*
0 to 2 ft.	18.6	1.3	19.4
Underlying Soil (2 to 4 ft.) [1]	*16.2*	*1.1*	*17.2*
0 to 3.5 ft.[1]	18.7	1.3	19.7
Underlying Soil (3.5 to 4 ft.) [1]	*8.1*	*0.6*	*8.1*
0 to 4 ft.[1]	17.4	1.2	18.3

UCL = Upper Confidence Limit (90% UCL is applicable for waste classificattion; 95% UCL applicable for risk assessment)
mg/kg = milligrams per kilogram
mg/l = milligrams per liter
* = Soluble (WET) lead concentrations are predicted using slope of regression line, where y = predicted soluble (WET) lead and x = total lead.
[1] = Average Total Lead concentrations were calculated using UCLs and/or maximum values.
Regression Line Slope: $y = 0.07x$

TABLE 6B
Summary of Statistical Analysis
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Borings B4, and B9-B18

TOTAL LEAD UCLs

	Total Lead (mg/kg)	
	90% UCL	95% UCL
0 to 0.5 ft	352.2	374.8
1 to 1.5 ft	14.0	14.7
2.5 to 3 ft	13.9	14.7
3.5 to 4 ft	7.9	8.3

EXCAVATION SCENARIOS

	90% UCL		95% UCL
Excavation Depth	Total Lead (mg/kg)	Soluble (WET) Lead* (mg/l)	Total Lead (mg/kg)
0 to 1 ft.	352.2	24.7	374.8
Underlying Soil (1 to 4 ft.)	*9.7*	*0.7*	*10.2*
0 to 2.5 ft.	149.3	10.5	158.7
Underlying Soil (2.5 to 4 ft.)	*11.9*	*0.8*	12.5
0 to 3.5 ft.	110.6	7.7	117.6
Underlying Soil (3.5 to 4 ft.)	*7.9*	*0.6*	*8.3*
0 to 4 ft.	97.8	6.8	103.9

UCL = Upper Confidence Limit (90% UCL is applicable for waste classificattion; 95% UCL applicable for risk assessment)
mg/kg = milligrams per kilogram
mg/l = milligrams per liter
* = Soluble (WET) lead concentrations are predicted using slope of regression line,
where y = predicted soluble (WET) lead and x = total lead.

Regression Line Slope: $y = 0.07 x$

TABLE 6C
Summary of Statistical Analysis
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Borings B19-B23

TOTAL LEAD UCLs

	Total Lead (mg/kg)	
	90% UCL	**95% UCL**
0 to 0.5 ft	54.4	57.2
1 to 1.5 ft(1)	2.5	2.5
2.5 to 3 ft	12.1	12.8
3.5 to 4 ft	11.0	11.2

EXCAVATION SCENARIOS

	90% UCL		95% UCL
Excavation Depth	**Total Lead (mg/kg)**	**Soluble (WET) Lead* (mg/l)**	**Total Lead (mg/kg)**
0 to 1 ft.	54.4	3.8	57.2
Underlying Soil (1 to 4 ft.)	*5.3*	*0.4*	*5.5*
0 to 2.5 ft.	23.3	1.6	24.4
Underlying Soil (2.5 to 4 ft.)	*11.7*	*0.8*	12.3
0 to 3.5 ft.	20.1	1.4	21.1
Underlying Soil (3.5 to 4 ft.)	*11.0*	*0.8*	*11.2*
0 to 4 ft.	18.9	1.3	19.8

UCL = Upper Confidence Limit (90% UCL is applicable for waste classificattion; 95% UCL applicable for risk assessment)
mg/kg = milligrams per kilogram
mg/l = milligrams per liter
* = Soluble (WET) lead concentrations are predicted using slope of regression line,
where y = predicted soluble (WET) lead and x = total lead.
(1)= Sample results for 1 ft interval were all non-detect, therefore one half the detection limit value was used in calculations
Regression Line Slope: $y = 0.07 x$

TABLE 6C1
Summary of Statistical Analysis
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Borings B27-B32, B41

TOTAL LEAD UCLs

	Total Lead (mg/kg)	
	90% UCL	95% UCL
0 to 0.5 ft	97.9	103.5
1 to 1.5 ft(1)	2.5	2.5
2.5 to 3 ft	7.9	8.3
3.5 to 4 ft	21.4	23.0

EXCAVATION SCENARIOS

	90% UCL		95% UCL
Excavation Depth	Total Lead (mg/kg)	Soluble (WET) Lead* (mg/l)	Total Lead (mg/kg)
0 to 1 ft.	97.9	6.9	103.5
Underlying Soil (1 to 4 ft.)	*5.6*	*0.4*	*5.9*
0 to 2.5 ft.	40.7	2.8	42.9
Underlying Soil (2.5 to 4 ft.)	*12.4*	*0.9*	13.2
0 to 3.5 ft.	31.3	2.2	33.0
Underlying Soil (3.5 to 4 ft.)	*21.4*	*1.5*	*23.0*
0 to 4 ft.	30.1	2.1	31.8

UCL = Upper Confidence Limit (90% UCL is applicable for waste classificattion; 95% UCL applicable for risk assessment)
mg/kg = milligrams per kilogram
mg/l = milligrams per liter
* = Soluble (WET) lead concentrations are predicted using slope of regression line,
where y = predicted soluble (WET) lead and x = total lead.
(1)= Sample results for 1 ft interval were all non-detect, therefore one half the detection limit value was used in calculations
Regression Line Slope: $y = 0.07 x$

TABLE 6D
Summary of Statistical Analysis
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Borings B35-B39 and MVP13-MVP18

TOTAL LEAD UCLs

	Total Lead (mg/kg)	
	90% UCL	**95% UCL**
0 to 0.5 ft	275.9	296.8
1 to 1.5 ft	24.3	26.2
2.5 to 3 ft	8.4	8.8
3.5 to 4 ft	8.1	8.5

EXCAVATION SCENARIOS

	90% UCL		95% UCL
Excavation Depth	**Total Lead (mg/kg)**	**Soluble (WET) Lead* (mg/l)**	**Total Lead (mg/kg)**
0 to 1 ft.	275.9	19.3	296.8
Underlying Soil (1 to 4 ft.)	*12.2*	*0.9*	*13.1*
0 to 2.5 ft.	124.9	8.7	134.4
Underlying Soil (2.5 to 4 ft.)	*8.3*	*0.6*	8.7
0 to 3.5 ft.	91.6	6.4	98.5
Underlying Soil (3.5 to 4 ft.)	*8.1*	*0.6*	*8.5*
0 to 4 ft.	81.2	5.7	87.3

UCL = Upper Confidence Limit (90% UCL is applicable for waste classificattion; 95% UCL applicable for risk assessment)
mg/kg = milligrams per kilogram
mg/l = milligrams per liter
* = Soluble (WET) lead concentrations are predicted using slope of regression line, where y = predicted soluble (WET) lead and x = total lead.

Regression Line Slope: $y = 0.07 x$

TABLE 6E
Summary of Statistical Analysis
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Borings B33 and B34

TOTAL LEAD UCLs

	Total Lead (mg/kg) Maximum
0 to 0.5 ft	62
1 to 1.5 ft	18

EXCAVATION SCENARIOS

Excavation Depth	Total Lead (mg/kg)	Soluble (WET) Lead* (mg/l)
0 to 1 ft.	62	4.3
Underlying Soil (1 to 1.5 ft.) [1]	*18*	*1.3*
0 to 1.5 ft.	47.3	3.3

UCL = Upper Confidence Limit (90% UCL is applicable for waste classificattion; 95% UCL applicable for risk assessment)
mg/kg = milligrams per kilogram
mg/l = milligrams per liter
* = Soluble (WET) lead concentrations are predicted using slope of regression line, where y = predicted soluble (WET) lead and x = total lead.
[1] = Average Total Lead concentrations were calculated using UCLs and/or maximum values.
Regression Line Slope: y = 0.07 x

TABLE 6F
Summary of Statistical Analysis
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Borings B53-B58, B113, B114, MVP10-MVP12

TOTAL LEAD UCLs

	Total Lead (mg/kg) 90% UCL	Total Lead (mg/kg) 95% UCL
0 to 0.5 ft	88.3	93.9
1 to 1.5 ft	13.2	13.8
2.5 to 3 ft	19.7	21.5
3.5 to 4 ft	13.5	14.7

EXCAVATION SCENARIOS

	90% UCL		95% UCL
Excavation Depth	**Total Lead (mg/kg)**	**Soluble (WET) Lead* (mg/l)**	**Total Lead (mg/kg)**
0 to 1 ft.	88.3	6.2	93.9
Underlying Soil (1 to 4 ft.)	*11.6*	*0.8*	*12.4*
0 to 2.5 ft.	43.3	3.0	45.8
Underlying Soil (2.5 to 4 ft.)	*17.6*	*1.2*	19.2
0 to 3.5 ft.	36.5	2.6	38.9
Underlying Soil (3.5 to 4 ft.)	*13.5*	*0.9*	*14.7*
0 to 4 ft.	33.7	2.4	35.8

UCL = Upper Confidence Limit (90% UCL is applicable for waste classificattion; 95% UCL applicable for risk assessment)
mg/kg = milligrams per kilogram
mg/l = milligrams per liter
* = Soluble (WET) lead concentrations are predicted using slope of regression line, where y = predicted soluble (WET) lead and x = total lead.

Regression Line Slope: $y = 0.07\ x$

TABLE 6F1
Summary of Statistical Analysis
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Borings B59-B60A

TOTAL LEAD UCLs

	Total Lead (mg/kg) Maximum	WET Lead (mg/l) Maximum
0 to 0.5 ft	220	3.2
1 to 1.5 ft	78	<1.0
2.5 to 3 ft(1)	2.5	---
3.5 to 4 ft(1)	2.5	---

mg/kg = milligrams per kilogram
mg/l = milligrams per liter
1 = Sample results for 2.5-ft and 3.5-ft intervals were all non-detect, therefore one half the detection limit value was used in calculations
--- = Not analyzed

TABLE 6G
Summary of Statistical Analysis
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Borings B105-B112

TOTAL LEAD UCLs

	Total Lead (mg/kg)	
	90% UCL	**95% UCL**
0 to 0.5 ft	63.4	65.4
1 to 1.5 ft	9.0	9.2
2.5 to 3 ft[(1)]	9.0	9.0
3.5 to 4 ft	16.7	18.0

EXCAVATION SCENARIOS

	90% UCL		95% UCL
Excavation Depth	**Total Lead (mg/kg)**	**Soluble (WET) Lead* (mg/l)**	**Total Lead (mg/kg)**
0 to 1 ft.	63.4	4.4	65.4
Underlying Soil (1 to 4 ft.)	*7.7*	*0.5*	*8.0*
0 to 2.5 ft.	30.8	2.2	31.7
Underlying Soil (2.5 to 4 ft.)	*11.6*	*0.8*	12.0
0 to 3.5 ft.	24.5	1.7	25.2
Underlying Soil (3.5 to 4 ft.)	*16.7*	*1.2*	*18.0*
0 to 4 ft.	23.6	1.6	24.3

UCL = Upper Confidence Limit (90% UCL is applicable for waste classificattion; 95% UCL applicable for risk assessment)
mg/kg = milligrams per kilogram
mg/l = milligrams per liter
* = Soluble (WET) lead concentrations are predicted using slope of regression line, where y = predicted soluble (WET) lead and x = total lead.
(1)= UCL not calculated due to an insufficient number of unique sample results
Regression Line Slope: $y = 0.07 x$

TABLE 6H
Summary of Statistical Analysis
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Borings B61-B74, and B91

TOTAL LEAD UCLs

	Total Lead (mg/kg) 90% UCL	Total Lead (mg/kg) 95% UCL
0 to 1 ft	56.7	60.7
1 to 1.5 ft	35.2	39.3

	Maximum
1.5 to 2.5 ft	5.5
2.5 to 3 ft	69
4.5 to 5.5 ft	2.5

EXCAVATION SCENARIOS

	90% UCL		95% UCL
Excavation Depth	**Total Lead (mg/kg)**	**Soluble (WET) Lead* (mg/l)**	**Total Lead (mg/kg)**
0 to 1 ft.	56.7	4.0	60.7
Underlying Soil (1 to 6 ft.)	*40.6*	*2.8*	*41.1*
0 to 1.5 ft.	49.5	3.5	53.6
Underlying Soil (1.5 to 6 ft.)	*41.4*	*2.9*	*41.4*
0 to 2.5 ft.	31.9	2.2	34.4
Underlying Soil (2.5 to 6 ft.)	*55.7*	*3.9*	55.7
0 to 4.5 ft.	48.4	3.4	49.8
Underlying Soil (4.5 to 5 ft.)	*2.5*	*0.2*	2.5
0 to 5 ft.	43.8	3.1	45.0

UCL = Upper Confidence Limit (90% UCL is applicable for waste classificattion; 95% UCL applicable for risk assessment)
mg/kg = milligrams per kilogram
mg/l = milligrams per liter
* = Soluble (WET) lead concentrations are predicted using slope of regression line,
where y = predicted soluble (WET) lead and x = total lead.

Regression Line Slope: $y = 0.07\ x$

TABLE 6I
Summary of Statistical Analysis
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Borings B75-80, B92-93, and MVP25-27

TOTAL LEAD UCLs

	Total Lead (mg/kg) 90% UCL	95% UCL
0 to 1 ft	660.4	702.4
1 to 1.5 ft	153.9	172.0

	Maximum
1.5 to 2 ft	8.3
2.5 to 3 ft	62
3.5 to 4 ft	22

EXCAVATION SCENARIOS

	90% UCL		95% UCL
Excavation Depth	**Total Lead (mg/kg)**	**Soluble (WET) Lead* (mg/l)**	**Total Lead (mg/kg)**
0 to 1 ft.	660.4	46.2	702.4
Underlying Soil (1 to 4 ft.)	*52.8*	*3.7*	*55.8*
0 to 1.5 ft.	491.6	34.4	525.6
Underlying Soil (1.5 to 4 ft.)	*32.5*	*2.3*	*32.5*
0 to 2.5 ft.	298.3	20.9	318.7
Underlying Soil (2.5 to 4 ft.)	*48.7*	*3.4*	*48.7*
0 to 3.5 ft.	230.8	16.2	245.3
Underlying Soil (3.5 to 4 ft.)	*22*	*1.5*	*22*
0 to 4 ft.	*204.7*	14.3	217.4

UCL = Upper Confidence Limit (90% UCL is applicable for waste classificattion; 95% UCL applicable for risk assessment)
mg/kg = milligrams per kilogram
mg/l = milligrams per liter
* = Soluble (WET) lead concentrations are predicted using slope of regression line,
where y = predicted soluble (WET) lead and x = total lead.

Regression Line Slope: $y = 0.07 x$

TABLE 6I1
Summary of Statistical Analysis
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Borings B94-95

TOTAL LEAD UCLs

	Total Lead (mg/kg) Maximum
0 to 0.5 ft	38
1 to 1.5 ft	2.5
2.5 to 3 ft	2.5

mg/kg = milligrams per kilogram
mg/l = milligrams per liter
(1)= Sample results for 1 ft and 2.5 ft intervals were all non-detect, therefore one half the detection limit value shown

TABLE 6J
Summary of Statistical Analysis
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Borings MVP19-MVP24

TOTAL LEAD UCLs

	Total Lead (mg/kg)	
	90% UCL	95% UCL
0 to 0.5 ft	33.0	35.6
1 to 1.5 ft	5.4	5.7

	Maximum
2 to 2.5 ft	6.4
2.5 to 3 ft	6.7
3.5 to 4 ft	2.5

EXCAVATION SCENARIOS

	90% UCL		95% UCL
Excavation Depth	Total Lead (mg/kg)	Soluble (WET) Lead* (mg/l)	Total Lead (mg/kg)
0 to 1 ft.	33.0	2.3	35.6
Underlying Soil (1 to 4 ft.)	*5.5*	*0.4*	*5.6*
0 to 2 ft.	19.2	1.3	20.7
Underlying Soil (2 to 4 ft.)	*5.7*	*0.4*	*5.7*
0 to 2.5 ft.	12.6	0.9	*13.3*
Underlying Soil (2.5 to 4 ft.)	*5.3*	*0.4*	*5.3*
0 to 3.5 ft.	13.8	1.0	14.6
Underlying Soil (3.5 to 4 ft.)	*2.5*	*0.2*	2.5
0 to 4 ft.	*12.4*	0.9	13.1

UCL = Upper Confidence Limit (90% UCL is applicable for waste classificattion; 95% UCL applicable for risk assessment)
mg/kg = milligrams per kilogram
mg/l = milligrams per liter
* = Soluble (WET) lead concentrations are predicted using slope of regression line, where y = predicted soluble (WET) lead and x = total lead.

Regression Line Slope: $y = 0.07\ x$

TABLE 6K
Summary of Statistical Analysis
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Borings B42 & B43

TOTAL LEAD UCLs

	Total Lead (mg/kg) Maximum
0 to 0.5 ft	1,600
1 to 1.5 ft	1,000
2.5 to 3 ft	6.7
3.5 to 4 ft.	6.3

EXCAVATION SCENARIOS

Excavation Depth	Total Lead (mg/kg)	Soluble (WET) Lead* (mg/l)
0 to 1 ft.	1,600	112
Underlying Soil (1 to 4 ft.) [1]	*503.3*	*35.2*
0 to 2.5 ft.	1,240	86.8
Underlying Soil (2.5 to 4 ft.) [1]	*6.6*	*0.5*
0 to 3.5 ft.[1]	887.6	62.1
Underlying Soil (3.5 to 4 ft.) [1]	*6.3*	*0.4*
0 to 4 ft.[1]	777.5	54.4

UCL = Upper Confidence Limit (90% UCL is applicable for waste classificattion; 95% UCL applicable for risk assessment)
mg/kg = milligrams per kilogram
mg/l = milligrams per liter
* = Soluble (WET) lead concentrations are predicted using slope of regression line, where y = predicted soluble (WET) lead and x = total lead.
[1] = Average Total Lead concentrations were calculated using UCLs and/or maximum values.
Regression Line Slope: $y = 0.07x$

TABLE 6L
Summary of Statistical Analysis
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Borings B96-B100

TOTAL LEAD UCLs

	Total Lead (mg/kg) 90% UCL	95% UCL
0 to 0.5 ft	77.3	84.2
1 to 2 ft	20.8	22.7
	Maximum	
2 to 3 ft	6.8	
3.5 to 4 ft.	2.5	

EXCAVATION SCENARIOS

	90% UCL		95% UCL
Excavation Depth	**Total Lead (mg/kg)**	**Soluble (WET) Lead* (mg/l)**	**Total Lead (mg/kg)**
0 to 1 ft.	77.3	5.4	84.2
Underlying Soil (1 to 4 ft.) [1]	*8.1*	*0.6*	*8.5*
0 to 2 ft.	49.1	3.4	53.4
Underlying Soil (2 to 4 ft.) [1]	*5.7*	*0.4*	*5.7*
0 to 3.5 ft.[1]	30.9	2.2	33.5
Underlying Soil (3.5 to 4 ft.) [1]	*2.5*	*0.2*	*2.5*
0 to 4 ft.[1]	27.4	1.9	29.6

UCL = Upper Confidence Limit (90% UCL is applicable for waste classificattion; 95% UCL applicable for risk assessment)
mg/kg = milligrams per kilogram
mg/l = milligrams per liter
* = Soluble (WET) lead concentrations are predicted using slope of regression line, where y = predicted soluble (WET) lead and x = total lead.
[1] = Average Total Lead concentrations were calculated using UCLs and/or maximum values.
Regression Line Slope: $y = 0.07 x$

TABLE 6M
Summary of Statistical Analysis
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Borings MVP28-MVP30

TOTAL LEAD UCLs

	Total Lead (mg/kg) Maximum
0 to 0.5 ft	150
1 to 1.5 ft	48
2 to 3 ft	26
3.5 to 4 ft.	5.5

EXCAVATION SCENARIOS

Excavation Depth	Total Lead (mg/kg)	Soluble (WET) Lead* (mg/l)
0 to 1 ft.	150	10.5
Underlying Soil (1 to 4 ft.) [1]	*22.4*	*1.6*
0 to 2 ft.	99.0	6.9
Underlying Soil (2 to 4 ft.) [1]	*20.9*	*1.5*
0 to 3.5 ft.[1]	67.7	4.7
Underlying Soil (3.5 to 4 ft.) [1]	*5.5*	*0.4*
0 to 4 ft.[1]	59.9	4.2

UCL = Upper Confidence Limit (90% UCL is applicable for waste classificattion; 95% UCL applicable for risk assessment)
mg/kg = milligrams per kilogram
mg/l = milligrams per liter
* = Soluble (WET) lead concentrations are predicted using slope of regression line, where y = predicted soluble (WET) lead and x = total lead.
[1] = Average Total Lead concentrations were calculated using UCLs and/or maximum values.
Regression Line Slope: $y = 0.07x$

TABLE 6N
Summary of Statistical Analysis
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Borings B82-B84

TOTAL LEAD UCLs

	Total Lead (mg/kg) Maximum
0 to 0.5 ft	860
1 to 1.5 ft	6.9
2 to 3 ft	8.3
3.5 to 4 ft	2.5

EXCAVATION SCENARIOS

Excavation Depth	Total Lead (mg/kg)	Soluble (WET) Lead* (mg/l)
0 to 1 ft.	860	60.2
Underlying Soil (1 to 4 ft.) [1]	*5.2*	*0.4*
0 to 2 ft.	433	30.3
Underlying Soil (2 to 4 ft.) [1]	*6.9*	*0.5*
0 to 3.5 ft.[1]	251.2	17.6
Underlying Soil (3.5 to 4 ft.) [1]	*2.5*	*0.2*
0 to 4 ft.[1]	220.2	15.4

UCL = Upper Confidence Limit (90% UCL is applicable for waste classificattion; 95% UCL applicable for risk assessment)
mg/kg = milligrams per kilogram
mg/l = milligrams per liter
* = Soluble (WET) lead concentrations are predicted using slope of regression line, where y = predicted soluble (WET) lead and x = total lead.
[1] = Average Total Lead concentrations were calculated using UCLs and/or maximum values.
Regression Line Slope: $y = 0.07\ x$

TABLE 6N1
Summary of Statistical Analysis
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Boring B81

TOTAL LEAD UCLs

	Total Lead (mg/kg)	WET Lead (mg/l)	TCLP Lead (mg/l)
0 to 0.5 ft	2,000	71	8.2
1 to 1.5 ft	83	9.2	---
2.5 to 3 ft	11	---	---

mg/kg = milligrams per kilogram
mg/l = milligrams per liter
--- = Not analyzed

TABLE 6O
Summary of Statistical Analysis
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Borings B85-B90, and B101-B104

TOTAL LEAD UCLs

	Total Lead (mg/kg)	
	90% UCL	**95% UCL**
0 to 0.5 ft	17.0	18.5
2.5 to 3 ft	8.6	9.3
3.5 to 4 ft	6.4	6.9

	Maximum
1 to 1.5 ft[(1)]	24

EXCAVATION SCENARIOS

	90% UCL		95% UCL
Excavation Depth	**Total Lead (mg/kg)**	**Soluble (WET) Lead* (mg/l)**	**Total Lead (mg/kg)**
0 to 1 ft.	17.0	*1.2*	18.5
Underlying Soil (1 to 4 ft.)	*11.9*	*0.8*	*12.2*
0 to 2.5 ft.	21.2	*1.5*	21.8
Underlying Soil (2.5 to 4 ft.)	*7.8*	*0.5*	*8.5*
0 to 3.5 ft.	17.6	*1.2*	18.2
Underlying Soil (3.5 to 4 ft.)	*6.4*	*0.4*	*6.9*
0 to 4 ft.	16.2	1.1	16.8

UCL = Upper Confidence Limit (90% UCL is applicable for waste classificattion; 95% UCL applicable for risk assessment)
mg/kg = milligrams per kilogram
mg/l = milligrams per liter
* = Soluble (WET) lead concentrations are predicted using slope of regression line, where y = predicted soluble (WET) lead and x = total lead.
(1)= UCL not calculated due to an insufficient number of unique sample results
Regression Line Slope: $y = 0.07\ x$

TABLE 6P
Summary of Statistical Analysis
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Borings B24-B26

TOTAL LEAD UCLs

	Total Lead (mg/kg) Maximum
0 to 0.5 ft	270
1 to 1.5 ft	11
2 to 3 ft	9.6
3.5 to 4 ft.	11

EXCAVATION SCENARIOS

Excavation Depth	Total Lead (mg/kg)	Soluble (WET) Lead* (mg/l)
0 to 1 ft.	270	18.9
Underlying Soil (1 to 4 ft.) [1]	*10.3*	*0.7*
0 to 2 ft.	140.5	9.8
Underlying Soil (2 to 4 ft.) [1]	*10.0*	*0.7*
0 to 3.5 ft.[1]	84.4	5.9
Underlying Soil (3.5 to 4 ft.) [1]	*11*	*0.8*
0 to 4 ft.[1]	75.2	5.3

UCL = Upper Confidence Limit (90% UCL is applicable for waste classificattion; 95% UCL applicable for risk assessment)
mg/kg = milligrams per kilogram
mg/l = milligrams per liter
* = Soluble (WET) lead concentrations are predicted using slope of regression line, where y = predicted soluble (WET) lead and x = total lead.
[1] = Average Total Lead concentrations were calculated using UCLs and/or maximum values.
Regression Line Slope: $y = 0.07x$

TABLE 6Q
Summary of Statistical Analysis
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Borings MVP34-MVP36

TOTAL LEAD UCLs

	Total Lead (mg/kg) Maximum
0 to 0.5 ft	28
1 to 1.5 ft	8.2
1.5 to 3 ft	6.7
3.5 to 4 ft.	2.5

EXCAVATION SCENARIOS

Excavation Depth	Total Lead (mg/kg)	Soluble (WET) Lead* (mg/l)
0 to 1 ft.	28.0	2.0
Underlying Soil (1 to 4 ft.) [1]	*6.3*	*0.4*
0 to 1.5 ft.	21.4	1.5
Underlying Soil (1.5 to 4 ft.) [1]	*5.9*	*0.4*
0 to 3 ft.[1]	13.0	0.9
Underlying Soil (3 to 4 ft.) [1]	*2.5*	*0.2*
0 to 4 ft.[1]	11.7	0.8

UCL = Upper Confidence Limit (90% UCL is applicable for waste classificattion; 95% UCL applicable for risk assessment)
mg/kg = milligrams per kilogram
mg/l = milligrams per liter
* = Soluble (WET) lead concentrations are predicted using slope of regression line,
where y = predicted soluble (WET) lead and x = total lead.
[1] = Average Total Lead concentrations were calculated using UCLs and/or maximum values.
Regression Line Slope: $y = 0.07 x$

TABLE 6R
Summary of Statistical Analysis
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Borings MVP31-MVP33

TOTAL LEAD UCLs

	Total Lead (mg/kg) Maximum	WET Lead (mg/l) Maximum
0 to 0.5 ft	84	3.8
0.5 to 1.5 ft	16	---
2.5 to 3 ft	9.9	---
3.5 to 4 ft.	11.0	---

UCL = Upper Confidence Limit (90% UCL is applicable for waste classificattion; 95% UCL applicable for risk assessment)
mg/kg = milligrams per kilogram
mg/l = milligrams per liter

TABLE 6S
Summary of Statistical Analysis
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Borings MVP7-MVP9

TOTAL LEAD UCLs

	Total Lead (mg/kg) Maximum
0 to 0.5 ft	59
1 to 1.5 ft	9.3
2.5 to 3 ft	7.7
3.5 to 4 ft.	9.7

EXCAVATION SCENARIOS

Excavation Depth	Total Lead (mg/kg)	Soluble (WET) Lead* (mg/l)
0 to 1 ft.	59	4.1
Underlying Soil (1 to 4 ft.) [1]	*8.8*	*0.6*
0 to 2.5 ft.	29.2	2.0
Underlying Soil (2.5 to 4 ft.) [1]	*8.4*	*0.6*
0 to 3.5 ft.[1]	23.0	1.6
Underlying Soil (3.5 to 4 ft.) [1]	*9.7*	*0.7*
0 to 4 ft.[1]	21.4	1.5

UCL = Upper Confidence Limit (90% UCL is applicable for waste classificattion; 95% UCL applicable for risk assessment)
mg/kg = milligrams per kilogram
mg/l = milligrams per liter
* = Soluble (WET) lead concentrations are predicted using slope of regression line, where y = predicted soluble (WET) lead and x = total lead.
[1] = Average Total Lead concentrations were calculated using UCLs and/or maximum values.
Regression Line Slope: $y = 0.07 x$

TABLE 6T
Summary of Statistical Analysis
Caldecott Tunnel Improvements
Alameda and Contra Costa Counties, California

Borings B49-51

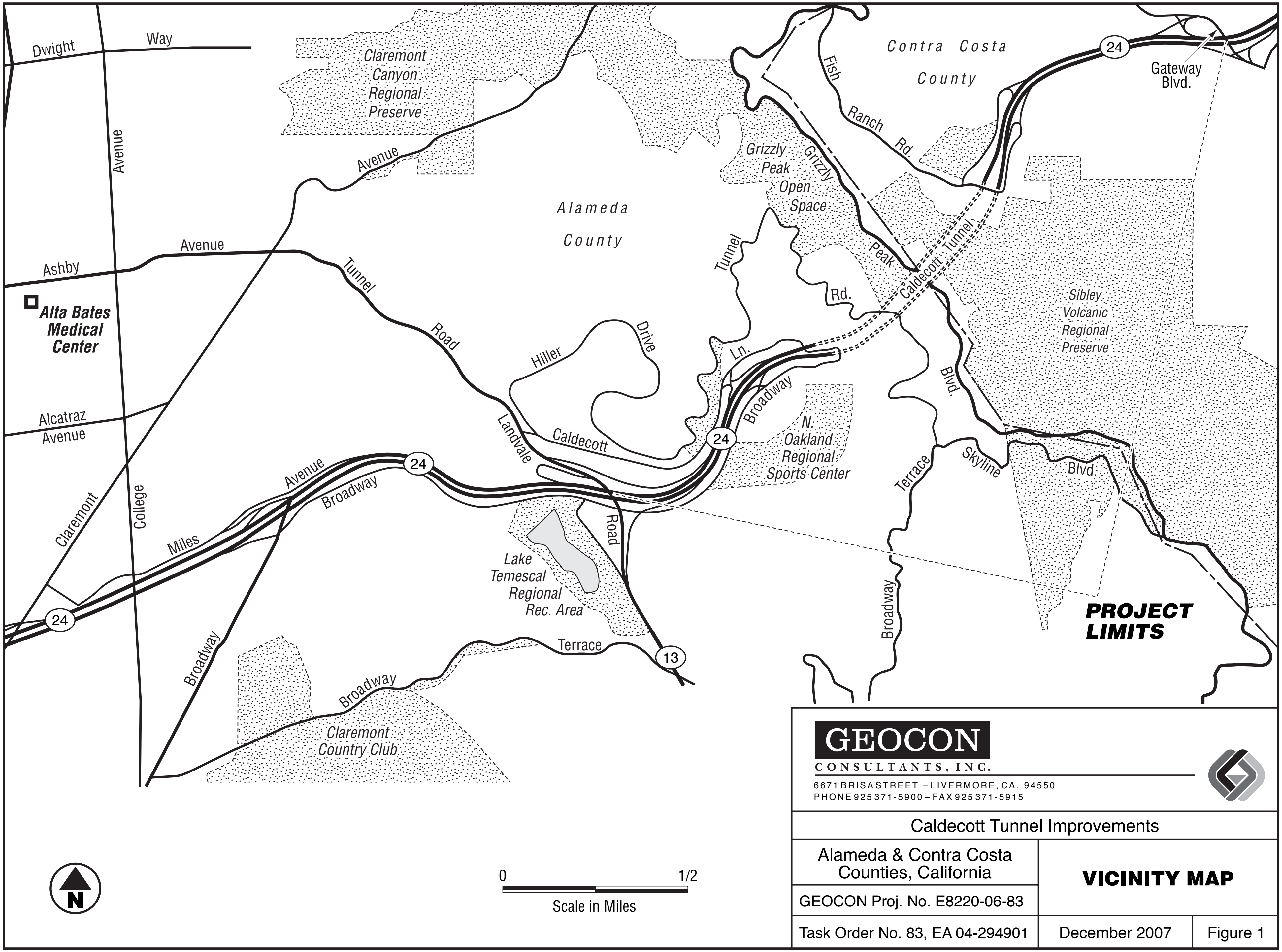
TOTAL LEAD UCLs

	Total Lead (mg/kg) Maximum
0 to 0.5 ft	440
1 to 1.5 ft	590
1.5 to 2.5 ft	450

EXCAVATION SCENARIOS

Excavation Depth	Total Lead (mg/kg)	Soluble (WET) Lead* (mg/l)
0 to 1 ft.	440	30.8
Underlying Soil (1 to 2.5 ft.) [1]	*497*	*34.8*
0 to 2 ft.	490	34.3
Underlying Soil (1.5 to 2.5 ft.) [1]	*450*	*31.5*
0 to 2.5 ft.[1]	474	33.2

UCL = Upper Confidence Limit (90% UCL is applicable for waste classificattion; 95% UCL applicable for risk assessment)
mg/kg = milligrams per kilogram
mg/l = milligrams per liter
* = Soluble (WET) lead concentrations are predicted using slope of regression line, where y = predicted soluble (WET) lead and x = total lead.
[1] = Average Total Lead concentrations were calculated using maximum values.
Regression Line Slope: $y = 0.07\ x$



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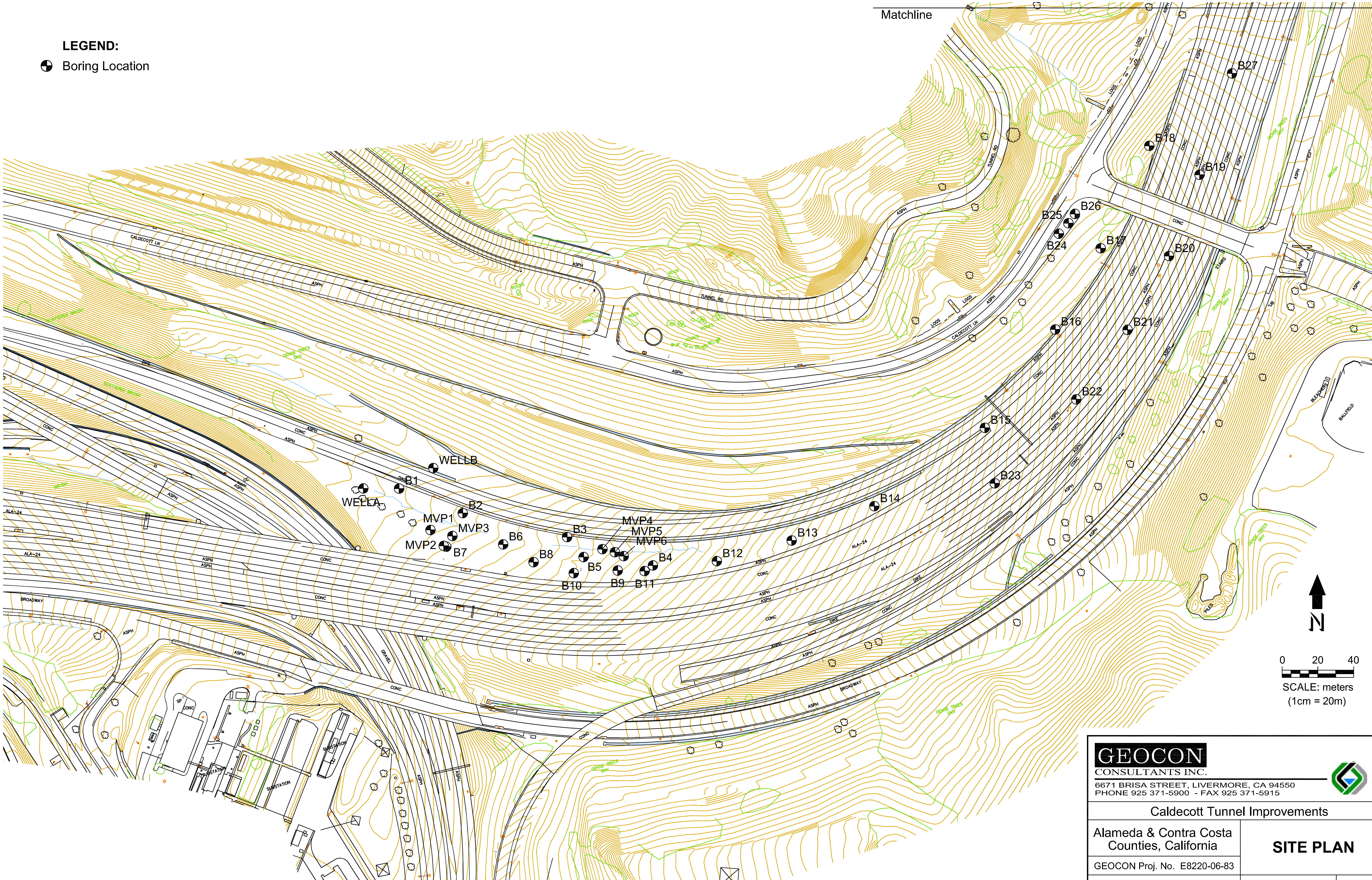
Caldecott Tunnel Improvements

Alameda & Contra Costa Counties, California	**VICINITY MAP**
GEOCON Proj. No. E8220-06-83	
Task Order No. 83, EA 04-294901	December 2007 — Figure 1

LEGEND:

Boring Location



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Caldecott Tunnel Improvements

Alameda & Contra Costa Counties, California

SITE PLAN

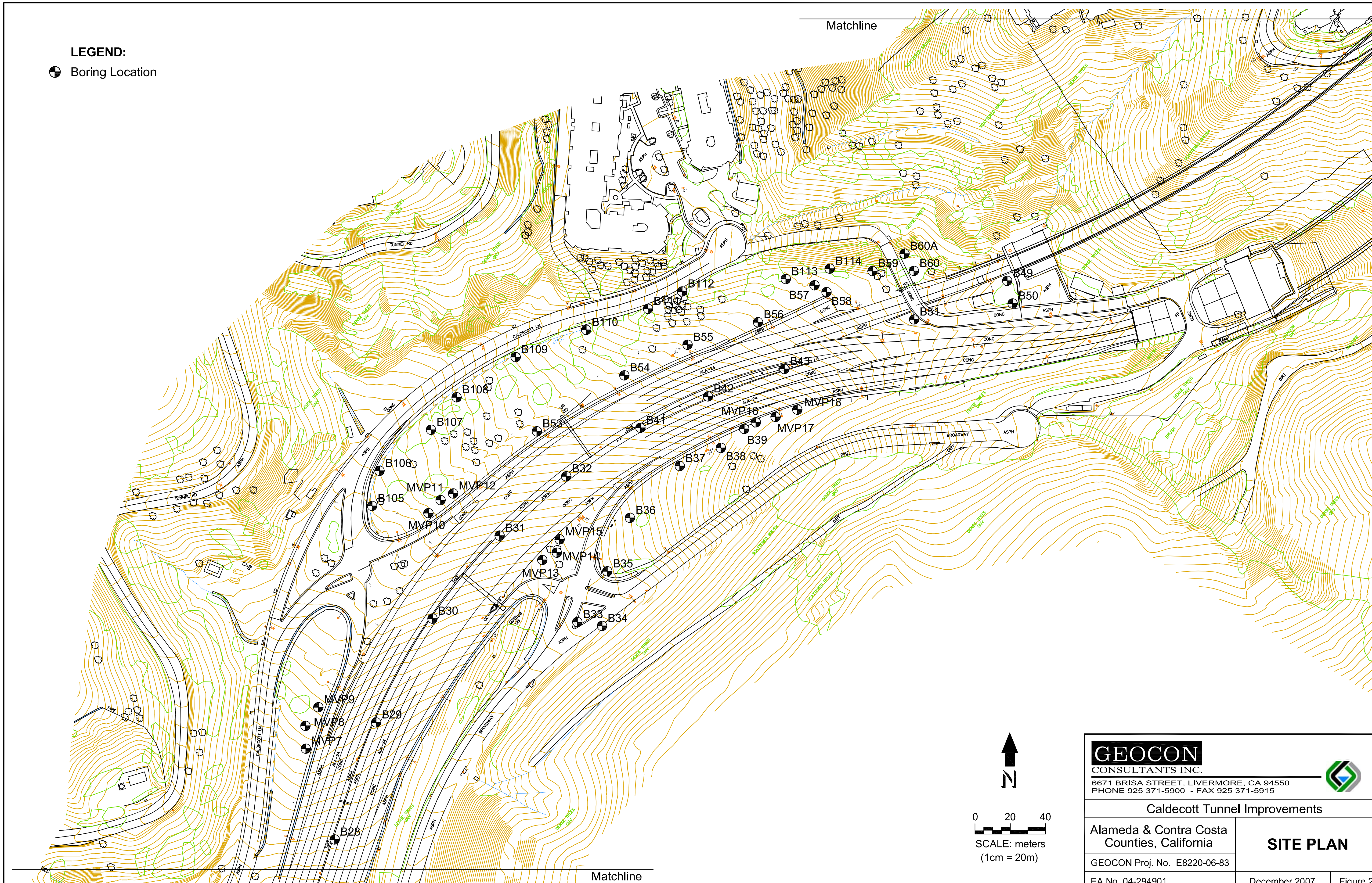
GEOCON Proj. No. E8220-06-83

EA No. 04-294901

December 2007

Figure 2a

SITE1107



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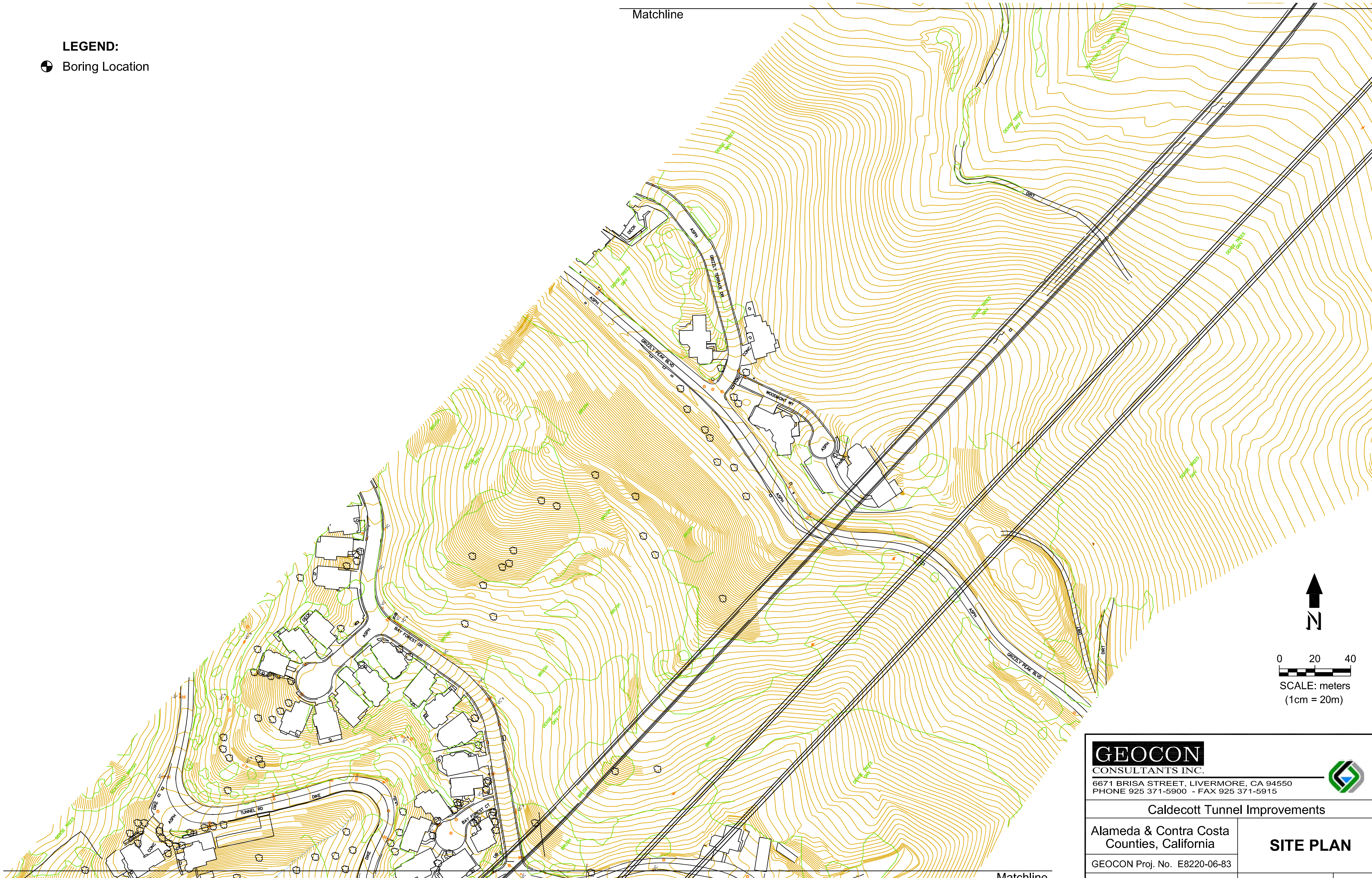
Caldecott Tunnel Improvements	
Alameda & Contra Costa Counties, California	SITE PLAN
GEOCON Proj. No. E8220-06-83	
EA No. 04-294901	December 2007 — Figure 2b

SITE1107

LEGEND:

Boring Location



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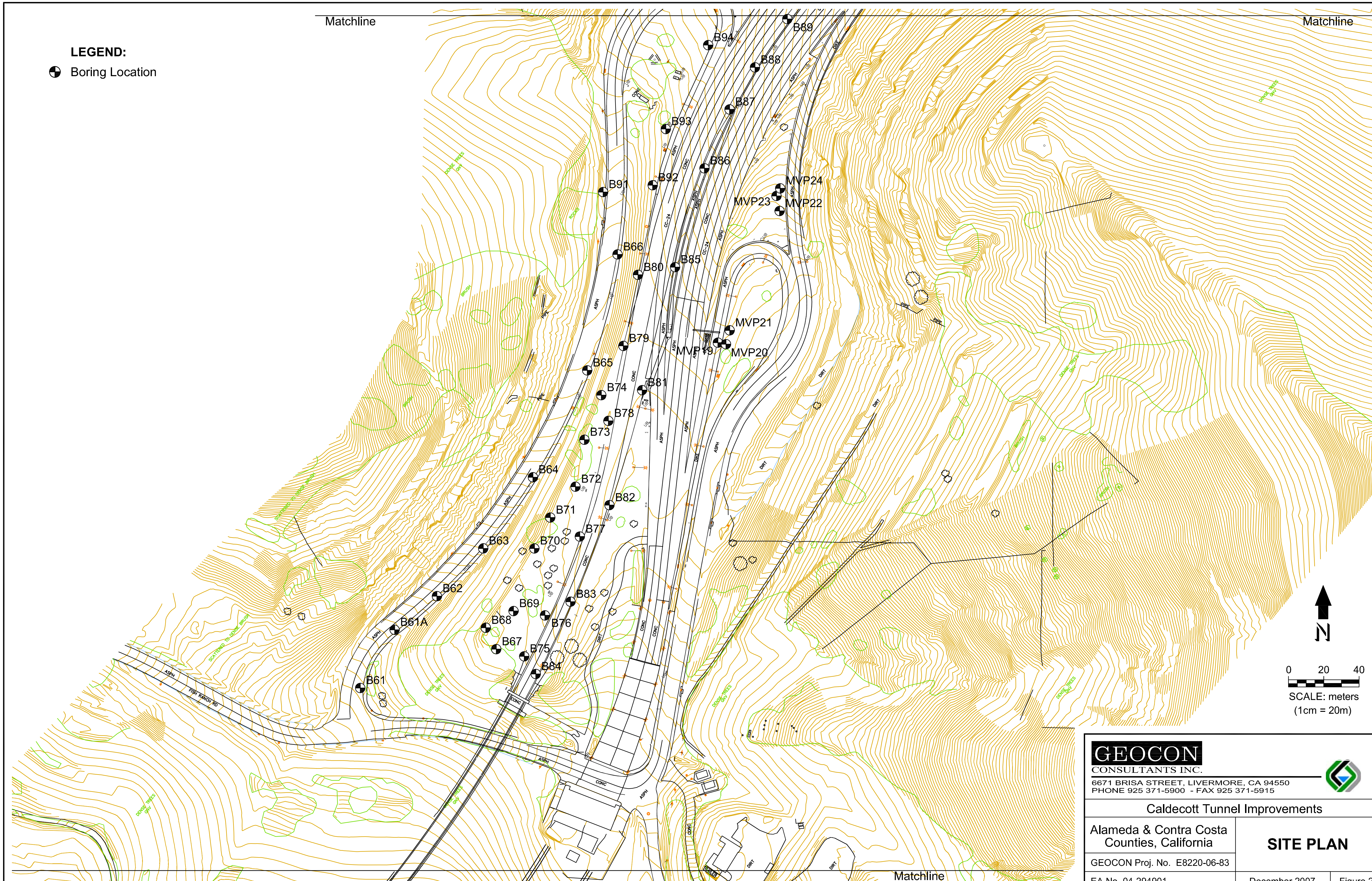
Caldecott Tunnel Improvements

Alameda & Contra Costa Counties, California	**SITE PLAN**
GEOCON Proj. No. E8220-06-83	
EA No. 04-294901	December 2007 / Figure 2c

SITE1107

LEGEND:

Boring Location



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Caldecott Tunnel Improvements

Alameda & Contra Costa Counties, California

SITE PLAN

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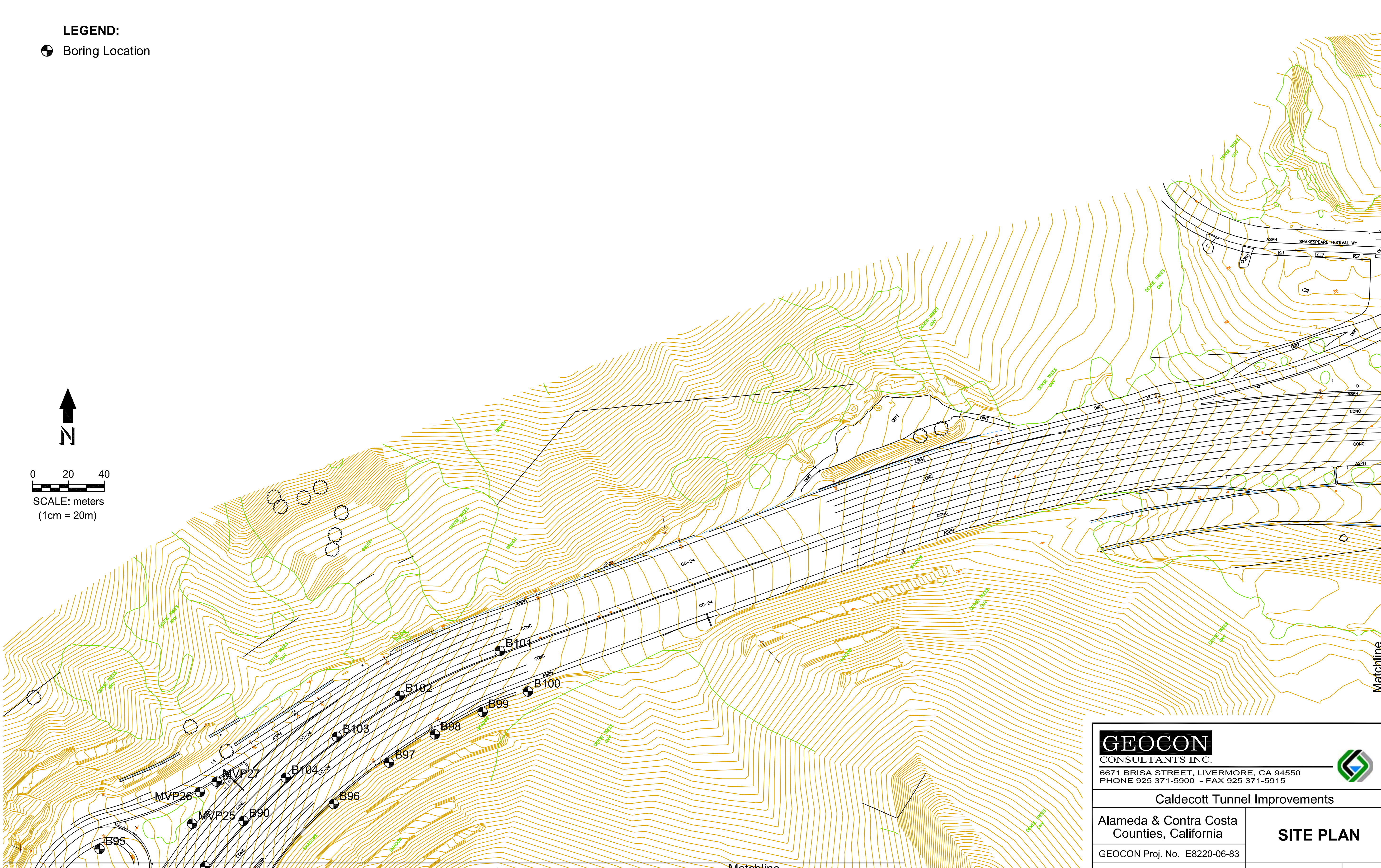
EA No. 04-294901 | December 2007 | Figure 2d

SITE1107



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Caldecott Tunnel Improvements

Alameda & Contra Costa Counties, California

SITE PLAN

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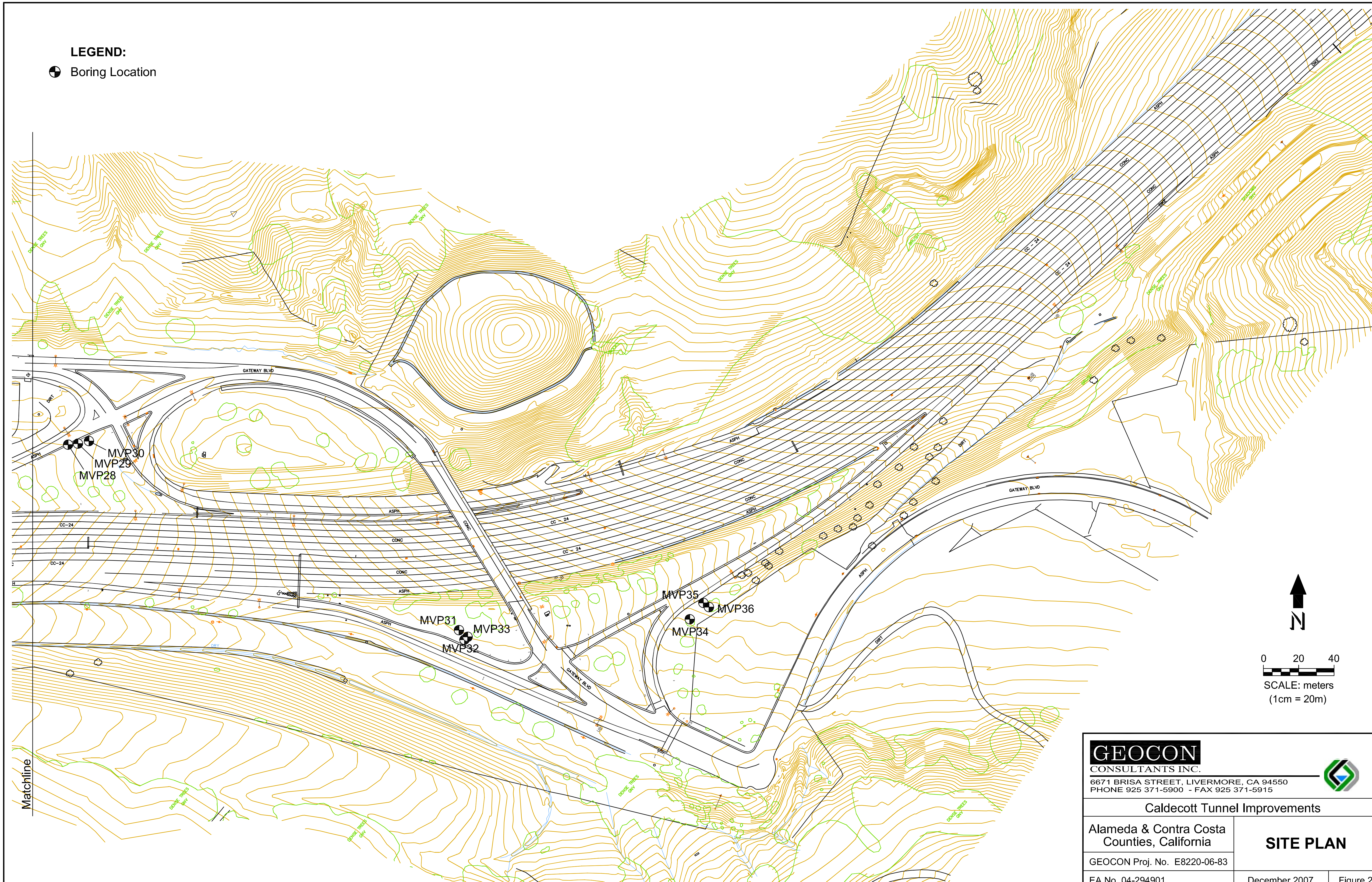
SITE1107



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Caldecott Tunnel Improvements

Alameda & Contra Costa Counties, California

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Figure 2f

SITE1107