Interstate 15 Express Lanes Project Southern Extension (ELPSE)

RIVERSIDE COUNTY, CALIFORNIA
DISTRICT 8 – RIV – 15 (PM 20.3 to 40.1)
EA: 08-0J0820, Project I.D. 08-18000063

District Preliminary Geotechnical Report

Prepared for the
State of California Department of Transportation
in coordination with the Riverside County Transportation Commission

January 20, 2023

Traffic capacity and operational improvements would be constructed on Interstate 15 (I-15) between post miles (PM) 21.2 near Main Street in Lake Elsinore to PM 38.1 near El Cerrito Road in Corona. This area is referred to as the lane improvement limits. These lane improvements are located within Riverside County, California and run through the cities of Lake Elsinore, Corona and portions of unincorporated Riverside County including the Temescal Valley. Limits for the express lanes advance signage extend from PM 20.3 to PM 40.1 in Riverside County; these post miles constitute the overall project limits.

District Preliminary Geotechnical Report

Submitted Pursuant to: (State) Division 13, California Public Resources Code
(Federal) 42 USC 4332(2) (C) and 49 USC 303

THE STATE OF CALIFORNIA
Department of Transportation
In cooperation with
THE RIVERSIDE COUNTY TRANSPORTATION COMMISSION

02/14/2023
Date of Approval

Daniel Ciacchella, PE
District 8, Caltrans Consultant Project Manager
California Department of Transportation

2/14/2023
Date of Approval

David Thomas, PE
Toll Project Delivery Director
Riverside County Transportation Commission

Leighton Consulting, Inc.
A Leighton Group Company

Friday, January 20, 2023

Project No. 12421.017

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Senior Highway Project Manager

Subject: District Preliminary Geotechnical Report
Riverside County Transportation Commission
Interstate-15 Express Lanes Project Southern Extension (ELPSE)
Project Approval and Environmental Document (PA&ED) Phase
Lake Elsinore to Corona, Riverside County, California
Caltrans EA: 08-0J0820
08-Riv-15 PM 20.3 to 40.1

In accordance with our June 4, 2019, *Master Subconsultant Agreement* and June 5, 2019 *Task Order*, Leighton Consulting, Inc. is pleased to present this *District Preliminary Geotechnical Report* (DPGR), as Work Breakdown Structure (WBS) Task 160.10.80, to summarize relevant preliminary geotechnical information for the proposed Interstate 15 (I-15) Express Lanes Project Southern Extension (ELPSE), extending from post mile (PM) 20.3 in Lake Elsinore north to PM 40.1 in Corona, Riverside County, California. This DPGR incorporates requirements of Caltrans February 2021 *Geotechnical Design Reports* manual.

This alignment does not traverse any currently-designated active surface fault rupture zone; but some of this alignment, particularly in and adjacent to Temescal Wash, is within a liquefaction hazard zones (as designated by Riverside County), requiring design-specific studies (see Plate 5). Small segments of this alignment in Lake Elsinore and Corona will also traverse sections of hard granitic rock (see Plate 2).

Information provided in this report should only be used for preliminary evaluation and type selection analysis and may require revisions or modifications after completion of updated geotechnical exploration during development of Plans, Specifications and Estimates (PS&Es). Separate *Structure Preliminary Geotechnical Reports* (SPGRs) have also been submitted and reviewed by Caltrans for 15 bridges that are proposed to be widened as

part of this project. A separate *Preliminary Materials Report* (PMR) has been submitted and reviewed by Caltrans, presenting preliminary pavement recommendations.

We appreciate the opportunity to be of additional service. If you have any questions regarding our preliminary findings and recommendations, or require additional information, please do not hesitate to contact us at **(866) *LEIGHTON***, directly as noted below.

Respectfully submitted,

LEIGHTON CONSULTING, INC.

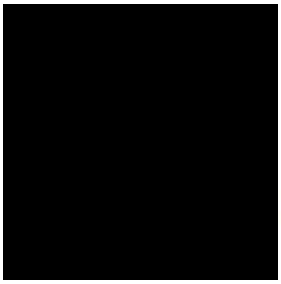

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TABLE OF CONTENTS

Figures

Appendices

Tables **Page**

1.0 INTRODUCTION

1.1 Project Description

The Riverside County Transportation Commission (RCTC), in cooperation with the California Department of Transportation (Caltrans) District 8, proposes to develop a tolled express lane network to improve and manage traffic operations, congestion, travel times and expand travel mode options with a reliable and cost-effective mobility solution on Interstate 15 (I-15) in Riverside County. Delineated as the **red** highlighted segment of I-15 on Plate 1, *Project Alignment Map* (in pocket), this proposed project would extend existing I-15 Express Lanes (in both directions) south an additional 15.8 miles from post miles (PM) 22.3 near Central Avenue (SR-74) in Lake Elsinore to PM 38.1 near El Cerrito Road in Corona. Associated improvements, including advance signage and transition striping, would extend from each end of the project limits, two miles, overall from PM 20.3 at the south end to PM 40.1 at the north end. Primary components of this I-15 Express Lanes Project Southern Extension (I-15 ELPSE) would be:

- **Tolled Express Lanes**: Two tolled express lanes would be constructed in both the northbound and southbound directions within the median of I-15 from State Route 74 (SR-74, PM 22.3, Central Avenue) in the City of Lake Elsinore, through the unincorporated Riverside County community of Temescal Valley, north to El Cerrito Road (PM 38.1) in the City of Corona for a distance of approximately 15.8 miles.
- **Auxiliary Lanes**: Southbound auxiliary lanes would also be added between both the Main Street (PM 21.2) Off-Ramp and SR-74 (Central Avenue) On-Ramp (PM 21.95) for approximately 0.75 mile, and SR-74 (Central Avenue) Off-Ramp (PM 22.6) and Nichols Road On-Ramp (PM 23.6) for approximately one mile.
- **Weirick Road (Dos Lagos) On and Off-Ramps**: Also, due to southbound express lanes access between the Cajalco Road and Weirick Road interchanges, the southbound I-15 Weirick Road Off-Ramp would be configured as a dual lane exit. Between the Weirick Road (Dos Lagos) and Cajalco Road interchanges, the I-15 centerline will be shifted east to avoid modification of existing retaining walls along the west edge of I-15 between Weirick and Cajalco Roads. This centerline shift will result in widening to the east between the Weirick Road (Dos Lagos) On-Ramp and the Cajalco Road Off-Ramp to accommodate additional pavement for Express Lane access.

In addition to adding lanes, which extend from PM 21.2 to 38.1, this proposed project would include widening of up to 15 bridges, retaining walls, cantilever

overhead signs, drainage and stormwater infiltration improvements; and potential construction of sound walls. Tolled Express Lanes and supporting infrastructure are expected to be constructed primarily within the existing I-15 (Caltrans) right of way.

This project is included in the 2019 Federal Transportation Improvement Program (FTIP) as Project ID RIV170901. It is also included in the Southern California Association of Government's (SCAG) Connect SoCal Plan 2020-2045 Regional Transportation Plan (RTP)/Sustainable Communities Strategy (SCS) as Project ID 3160001. This "Project" is subject to both state and federal environmental review requirements because federal funds from the Federal Highway Administration (FHWA) are anticipated to be used to fund this project. Project documentation has been prepared in compliance with both the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA). Caltrans is the lead agency under both CEQA and NEPA.

1.1.1 Existing I-15 ELPSE Alignment Conditions: Delineated as the **red** highlighted segment of I-15 on Plate 1 (in pocket), this I-15 ELPSE alignment is located within western Riverside County, where this existing I-15 alignment extends from State Route 74 (Central Avenue) in Lake Elsinore, north through the unincorporated Riverside County community of Temescal Valley, to Cajalco Road in Corona.

This alignment is located within a suburban setting with commercial, commercial/industrial, open space and some residential land uses adjacent to project limits. Terrain along this alignment is characterized as rolling with sustained upward grades towards the Saddleback Mountains west of this alignment. Much of this alignment is a fill embankment at bridges, for grade separations, typically raising the I-15 vertical alignment above adjacent native grade. However, there are two retaining walls cut into slopes ascending to the west (along the southbound outer shoulder) between Weirick Road and Bedford Wash, where southbound lanes are clearly in a cut zone. This existing interstate freeway can be summarized as follows:

- **Roadways**: The existing I-15 corridor within the project limits is a six-lane highway with three mixed flow lanes in each direction and paved shoulders. Northbound and southbound travel lanes are separated predominantly by an unpaved median, with separate northbound and southbound (R/L) parallel bridges.
- **Structures**: As listed in Table 1 (below), 15 existing bridges are located within this ELPSE alignment. The I-15 ELPSE will require widening the Bedford Wash Bridge (56-0540 R/L), which is also a component of the I-15

Corridor Operations Project (I-15 COP, EA 08-0J830) that may be constructed in advance of the I-15 ELPSE. Longest structure along this alignment is the four-span Temescal Wash Bridge constructed in 1980. Existing structures along this alignment are as follows:

Table 1. Existing I-15 Facilities

Type	Post Mile	Bridge Number	Structure Name
Bridge	25.55	56-0726 R/L	Gavilan Wash Bridge
	26.69	56-0682 R/L	Lake Street UC
	27.78	56-0681 R/L	Temescal Canyon Road OH
	28.04	56-0680 R/L	Temescal Wash Bridge
	28.87	56-0679 R/L	Horsethief Canyon Road UC
	29.13	56-0678 R/L	Horsethief Canyon Wash Bridge
	30.09	56-0677 R/L	Indian Wash Bridge
	30.40	56-0676 R/L	Indian Truck Trail UC
	31.90	56-0675 R/L	Temescal Canyon Road UC
	31.97	56-0674 R/L	Mayhew Wash Bridge
	32.96	56-0543 R/L	Coldwater Wash Bridge
	33.25	56-0542 R/L	Temescal Canyon Road UC
	34.72	56-0559 R/L	Brown Canyon Wash Bridge
	35.64	56-0541 R/L	Weirick Road UC
	36.58	56-0540 R/L	Bedford Wash Bridge
Retaining Wall	35.92 to 36.12		Retaining Wall A
	36.58 to 36.63		Retaining Wall B

Abbreviations: UC – Undercrossing, OH – Overhead (abandoned railway)

1.1.2 **I-15 ELPSE Purpose:** Purpose of this proposed project is to improve operational characteristics by adding two tolled express lanes in both directions within the I-15 median to accommodate increasing traffic volumes in western Riverside County. Specifically, this project is to provide the following benefits:

- Improve and manage traffic operations, congestion and travel times along this corridor,
- Expand travel mode choice along this corridor,
- Provide an option for travel time reliability,
- Provide a cost-effective mobility solution, and
- Expand and maintain compatibility with the express lane network in the region.

1.1.3 I-15 ELPSE Need: Existing traffic volumes often exceed current highway capacity along several segments of I-15 between SR-74 (Central Avenue) and El Cerrito Road. Due to forecasted population growth and continued development to support projected growth in the region, the I-15 corridor is expected to continue to experience increased congestion and longer commute times that are projected to negatively affect traffic operations along the freeway mainline.

The adopted Southern California Association of Governments (SCAG) 2016 Regional Transportation Plan (RTP) Growth Forecast estimates a 36.7-percent increase in population in Riverside County between 2015 and 2040. SCAG's recently adopted Connect SoCal (2020–2045 RTP/SCS) Growth Forecast estimates a 38.3-percent increase in population in Riverside County between 2020 and 2045, with the number of households and employment increasing by approximately 30.5 percent and 34.02 percent, respectively. In the City of Corona, the 2020–2045 RTP/SCS Growth Forecast estimates an 11.6-percent increase in population from 2016 to 2045 and an 11.7-percent increase in households. The 2020–2045 RTP/SCS also found, of the top three counties where Los Angeles residents migrate, Riverside County places third. In 2017, the number of Los Angeles migrants to Riverside County was approximately 11,000. Additionally, based on the 2016–2040 RTP/SCS Final Growth Forecast by Jurisdiction, the City of Corona is estimated to experience a 3.7-percent increase in population between 2020 and 2045. According to the same source, the City of Lake Elsinore is projected to see a 76.8-percent increase in population. This projected growth is expected to place a high demand on existing transportation facilities and services.

Existing regional transit in Riverside County includes the Riverside Transit Agency (RTA) and Metrolink, which connects to various local transit services offered by municipalities (i.e., Corona Cruisers). RTA operates a weekday commuter bus service (Route 205/206) along I-15 and State Route 91 (SR-91) for passengers traveling between the City of Temecula in Riverside County and the City of Orange in Orange County. Within the proposed Project limits, this route offers stops at Dos Lagos, Temescal Canyon Road (Tom's Farms) and Nichols Road. Metrolink and Amtrak also operate within the northwestern portion of Riverside County but do not currently offer rail transit options that would serve the populations traveling through Temescal Valley between Corona and Lake Elsinore. Overall, regional transit options are limited for travelers south of Corona's city limits.

The Express Lanes Network in both Riverside and San Bernardino Counties has been growing rapidly in response to the increased inter-county travel demand. Development of an extensive regional express lanes network is a key strategy in the 2020–2045 RTP/SCS that aims to improve travel time reliability, provide travel choices, and ensure existing freeway capacity is optimized within

the SCAG region. In 2017, RCTC completed construction of the SR-91 Express Lanes in the City of Corona as first Express Lanes constructed in Riverside County. RCTC's I-15 Express Lanes Project (ELP), which extends the SR-91 Express Lanes Network north and south of SR-91 along I-15 through the Cities of Jurupa Valley, Eastvale, Norco, and Corona was just opened in 2021. North of the I-15 ELP, in 2023 San Bernardino County Transportation Authority (SBCTA) will break ground on the I-15 Corridor Project, which will construct Express Lanes in both directions along I-15 between Cantu-Galleano Ranch Road in the City of Jurupa Valley and Duncan Canyon Road in the City of Fontana. In addition to providing continuity of Express Lanes north of the I-15 ELP, the I-15 Corridor Project will connect to the I-10 Corridor Project (Phase 1), which is currently under construction and will add Express Lanes in each direction on I-10 between the Cities of Montclair and Upland. Currently (February 2022), the southern terminus of the Express Lanes Network in the Inland Empire terminates at Cajalco Road on I-15.

As federal, state, and local funding becomes constrained and additional projects are developed to maintain the condition of existing roadways, it has become increasingly challenging for transportation agencies to develop, construct, operate, and maintain new projects that improve mobility in heavily congested corridors. Based on this situation, alternative funding streams like federal loans and revenue bonds can be utilized to fill funding gaps. In some cases, if financial obligations are met on Express Lane projects, excess toll revenue can provide additional funding to invest in other improvements within the corridor.

Currently, north-south mobility options for motorists are limited through this portion of Riverside County. Besides local streets, the only parallel route for motorists is Interstate 215, which is over 10 miles east of I-15 and generally serves a different region within Riverside County. Under Existing Conditions (2019) during the morning peak hour, northbound I-15 experiences heavy congestion at the Cajalco Road interchange due to commuter traffic along the corridor. This heavy congestion during the morning peak hour results in a bottleneck at the Cajalco Road on-ramp that extends to the Indian Truck Trail off-ramp. Through the project limits, during the afternoon peak hour, the southbound direction experiences heavy congestion due to commuter traffic. The southbound I-15 bottleneck at the Cajalco Road on-ramp extends to the Magnolia Avenue on-ramp during the afternoon peak.

1.1.4 Proposed I-15 ELPSE: The proposed project includes construction of two tolled express lanes in each direction on I-15 in Riverside County between PM 22.3 and PM 38.1. The proposed project would be constructed within existing I-15 right of way. Advanced signage is required to be posted prior to the start of the tolled express lanes. Signage will be located within the project limits between PM 20.3 and PM 40.1. This Build Alternative would not add any new

I-15 connections. However, due to southbound express lanes access between Cajalco Road and Weirick Road interchanges, the southbound I-15 Weirick Road off-ramp will be configured as a dual-lane exit. Proposed improvements as the *Build Alternative* would include the following components:

- **New Tolled Express Lanes:** New median tolled express lanes will include:
  - **Central Avenue to Nichols Road**: One tolled express lane is proposed in each direction from Central Avenue to approximately 0.4 miles north of Nichols Road by constructing a new lane (in each direction) within the unpaved median.
  - **Nichols Road to Weirick Road**: Two tolled express lanes are proposed in each direction from approximately 0.4 miles north of Nichols Road to Weirick Road by constructing new lanes within the unpaved median.
  - **Weirick Road to Bedford Wash**: Two tolled express lanes are proposed in the northbound direction from Weirick Road to Bedford Wash by constructing new lanes within the unpaved median. Note that portions of this segment of the I-15 ELPSE may be constructed in advance as part of the I-15 COP (EA 08-0J0830). To avoid existing retaining walls along the western edge of the southbound outside shoulder, pavement will be added on the northbound outside (easterly) shoulder to accommodate express lane access and the I-15 centerline will be shifted easterly.
- **Bridge Widening**: Widening in the median of 15 bridges listed in Table 1 (previously in this report) is proposed, such that two parallel bridges nearly abut with a small gap between them, which were addressed in separate *Structure Preliminary Geotechnical Reports* (SPGRs).
- **Median Barrier**: A new concrete barrier will be constructed in the median between express lanes.
- **Median Shoulders**: Remaining median width (NB/SB) will be paved to establish inside shoulders.
- **Exterior Shoulders**: Paving to widen exterior shoulders is proposed at the following locations:

Table 2. Proposed I-15 Exterior Shoulder Widening

Location	Begin		End	
	Station (Centerline*)	Post Mile	Station (Centerline*)	Post Mile
SB Shoulder	1121+47	21.25	1185+14	22.49
SB Shoulder	1205+45	22.84	1243+71	23.56
SB Shoulder	1268+69	24.03	1290+62	24.45
NB Shoulder	"C1" 883+50	35.68	"C1" 930+25	36.56
SB Shoulder			"C1" 894+75	35.89
NB Shoulder	"C1" 931+85	36.59	"C1" 955+05	37.03
SB Shoulder			"C1" 943+25	36.81

*All stations referenced are mainline centerline ("C" Line) unless noted otherwise.

- **Median Retaining Walls**: The following retaining walls are planned to be constructed along the centerline between the proposed northbound and southbound express lanes:

Table 3. Proposed I-15 Retaining Walls at Median

Wall Number	Begin		End		Wall Height (feet)	
	Station (Centerline*)	Post Mile	Station (Centerline*)	Post Mile	Maximum	Minimum
1273M	1196+30	22.67	1350+90	25.60	10	6
1626M	1623+60	30.76	1627+90	30.84	6	
1668M	1665+80	31.56	1668+40	31.61	6	
1737M	1732+80	32.83	1741+60	33.00	6	
1786M	1783+50	33.79	1790+00	33.91	6	
1918M	"C1" 905+80	36.10	"C1" 944+00	36.82	6	

*All stations referenced are mainline centerline ("C" Line) unless noted otherwise.

- **Exterior Shoulder Retaining Walls**: The following retaining walls are planned to be constructed to accommodate outside widening along the southbound SR-74 (Central Avenue) On-Ramp (Wall 1165) and northbound outside widening (shifting easterly) I-15 between Weirick and Cajalco Roads interchanges (Walls 1886, 1888 and 1914):

Table 4. Proposed I-15 Retaining Walls at Exterior Shoulders

Wall Number	Begin		End		Wall Height (feet)	
	Station (Centerline**)	Post Mile	Station (Centerline**)	Post Mile	Maximum	Minimum
1165	1160+50	21.98	1168+00	22.13	18	4
1886*	"C1" 883+50	35.68	"C1" 891+00	35.82	8	
1888*	"C1" 886+50	35.73	"C1" 890+50	35.81	12	
1914*	"C1" 908+50	36.15	"C1" 921+00	36.39	14	

*Walls 1886, 1888 and 1914 are at the northbound exterior shoulder (easterly edge of right-of-way) where embankment fill slopes down easterly, between Weirick Road (Dos Lagos) NB On-Ramp and Cajalco Road NB Off- and On-Ramps.

**All stations referenced are mainline centerline ("C" Line) unless noted otherwise.

- **Sound Walls**: Sound walls may be constructed for this project. However, need, location and/or configuration of sound walls has not been determined at this time (PA&ED stage).
- **Overhead Signs**: The following cantilever monopole overhead signs are proposed with 55 located at the express lanes median barrier plus nine at outside shoulders:

Table 5. Proposed I-15 Cantilever Overhead Signs

Center Median Overhead Sign	Direction*	Station**	Post Mile
EXPRESS LANES ENTRANCE - 2 MILES	NB	1074+00	20.35
Full CMS Sign	NB	1099+00	20.82
EXPRESS LANES ENTRANCE - 1 MILE	NB	1127+00	21.35
VTMS (Indian Truck Trail / 91)	NB	1142+00	21.63
EXPRESS LANES ENTRANCE – ½ MILE	NB	1153+50	21.85
EXPRESS LANES ENTRANCE	NB	1179+40	22.34
FasTrak ONLY	NB	1200+00	22.73
TOLL GANTRY W/CHP	NB	1225+00	23.21
EXPRESS LANES ENTRANCE - 1 MILE	NB	1252+00	23.72
EXPRESS LANES ENTRANCE – ½ MILE	NB	1278+00	24.21
TOLL GANTRY W/ CHP	SB	1293+00	24.49
VTMS (Indian Truck Trail / 91)	NB	1293+10	24.50
EXPRESS LANES ENTRANCE	NB	1308+00	24.78
FasTrak ONLY / FasTrak ONLY	NB	1314+50	24.90
VTMS (Main)	SB	1333+00	25.25
TOLL GANTRY -NO CHP	NB	1339+00	25.37
EXPRESS LANES ENTRANCE - 1 MILE	NB	1393+00	26.39
EXPRESS LANES ENTRANCE – ½ MILE	NB	1419+00	26.88
TOLL GANTRY W/CHP	SB	1436+05	27.20
VTMS (Temescal Canyon / 91)	NB	1436+15	27.21
FasTrak ONLY / FasTrak ONLY	SB	1446+00	27.39

Center Median Overhead Sign	Direction*	Station**	Post Mile
EXPRESS LANES ENTRANCE	NB	1456+00	27.58
	SB		
FasTrak ONLY / FasTrak ONLY	NB	1474+00	27.92
VTMS (Nichols / Main)	SB		
EXPRESS LANES ENTRANCE – ½ MILE	SB	1485+00	28.13
TOLL GANTRY W/ CHP	NB	1501+20	28.44
EXPRESS LANES ENTRANCE - 1 MILE	SB	1518+00	28.76
TOLL GANTRY W/CHP	SB	1649+60	31.25
EXPRESS LANES ENTRANCE - 1 MILE	NB	1652+50	31.30
EXPRESS LANES ENTRANCE - ½ MILE	NB	1679+00	31.80
VTMS (Ontario Ave/ 91)	NB	1689+00	31.99
FasTrak ONLY / FasTrak ONLY	SB	1709+00	32.37
EXPRESS LANES ENTRANCE	NB	1717+00	32.52
	SB		
FasTrak ONLY / FasTrak ONLY	NB	1725+33	32.68
TOLL GANTRY - NO CHP	NB	1743+00	33.02
VTMS (Lake / Main)	SB		
EXPRESS LANES ENTRANCE - ½ MILE	SB	1753+50	33.22
EXPRESS LANES ENTRANCE - 1 MILE	SB	1782+30	33.76
EXPRESS LANES ENTRANCE - 1 MILE	NB	1864+00	35.31
TOLL GANTRY W/CHP	SB	1875+45	35.53
EXPRESS LANES ENTRANCE - ½ MILE	NB	“C1” 892+00	35.84
VTMS (Magnolia Ave / 91)	NB	“C1” 905+00	36.08
FasTrak ONLY / FasTrak ONLY	SB	“C1” 911+00	36.20
EXPRESS LANES ENTRANCE	NB	“C1” 921+00	36.39
	SB		
FasTrak ONLY / FasTrak ONLY	NB	“C1” 930+00	36.56
VTMS (Indian Truck Trail / Main)	SB	“C1” 936+00	36.67
EXPRESS LANES ENTRANCE - 1 MILE	NB	“C1” 943+44	36.81
EXPRESS LANES ENTRANCE - ½ MILE	SB	1952+00	36.98
TOLL GANTRY W/ CHP	NB	1959+00	37.11
	SB		
EXPRESS LANES ENTRANCE - ½ MILE	NB	1965+00	37.22
Full CMS Sign	SB		
VTMS (Magnolia / 91)	NB	1972+00	37.35
EXPRESS LANES ENTRANCE - 1 MILE	SB	1980+20	37.51
FasTrak ONLY / FasTrak ONLY	SB	1988+20	37.66
EXPRESS LANES ENTRANCE	NB	1998+50	37.86
	SB		
FasTrak ONLY / FasTrak ONLY	NB	2009+00	38.05
VTMS (Weirick/Dos Lagos / Main)	SB	2022+00	38.30
EXPRESS LANES ENTRANCE - ½ MILE	SB	2036+99	38.58

Outside Shoulder Overhead Sign	Direction*	Station**	Post Mile
MAIN STREET EXIT	SB	1122+00	21.26
MAIN STREET EXIT ONLY	SB	1138+00	21.56
MAIN STREET EXIT ONLY – 1 MILE	SB	1160+00	21.98
CENTRAL AVENUE (SR-74) EXIT ONLY – 1 MILE	SB	1241+50	23.52
NICHOLS ROAD EXIT	SB	1275+00	24.15
NICHOLS ROAD EXIT ONLY	SB	1301+00	24.65
NICHOLS ROAD EXIT ONLY – 1 MILE	SB	1327+50	25.15
WEIRICK ROAD EXIT	SB	"C1" 896+00	35.91
CAJALCO ROAD EXIT	NB	"C1" 919+00	36.35

Updated by HDR, October 19, 2022. *NB=signs for northbound lanes, SB=signs for southbound lanes.
**All stations referenced are mainline centerline ("C" Line) unless noted otherwise.

- **Drainage**: Upgrading existing drainage facilities and developing stormwater treatment areas is proposed. Proposed stormwater facilities are as follows:

Table 6. Proposed I-15 Stormwater Infiltration Locations

BMP ID	BMP Type	Location		
		Station (Centerline*)		Post Mile
BST_S-1176A	bio-strip	L	1183+00	22.41
BSW_S-1202	bio-swale	L	1202+00	22.77
BSW_S-1211	bio-swale	L	1211+00	22.94
BSW_BSW-N-1211	bio-swale	R	1211+00	22.94
BSW_N-1217	bio-swale	R	1218+00	23.07
BSW_S-1221	bio-swale	L	1222+00	23.15
BSW_N-1224	bio-swale	R	1224+00	23.19
BSW_N-1239	bio-swale	R	1239+00	23.47
BSW_S-1286	bio-swale	L	1285+00	24.34
BST_N-1252	bio-strip	R	1258+00	23.83
BST_S-1252B	bio-strip	L	1252+00	23.72
BST_N-1259	bio-strip	R	1262+00	23.91
BST_S-1291	bio-strip	L	1289+00	24.42
BST_S-1296	bio-strip	L	1296+00	24.55
BST_S-1299	bio-strip	L	1300+00	24.63
BSW_S-1306	bio-swale	L	1306+00	24.74
BSW_S-1324	bio-swale	L	1324+00	25.08
BSW_S-1330	bio-swale	L	1330+00	25.19
BSW_S-1335	bio-swale	L	1335+00	25.29
BST_S-1343	bio-strip	L	1340+00	25.38
BST_S-1347	bio-strip	L	1345+00	25.48

BMP ID	BMP Type	Location		
		Station (Centerline*)		Post Mile
BSW_S-1355	bio-swale	L	1355+00	25.67
BSW_S-1364	bio-swale	L	1364+00	25.84
BSW_N-1364	bio-swale	R	1364+00	25.84
BSW_N-1372	bio-swale	R	1372+00	25.99
BSW_S-1373	bio-swale	L	1373+00	26.01
BSW_S-1377	bio-swale	L	1377+00	26.08
BST_S-1383	bio-strip	L	1383+00	26.20
BST_N-1383	bio-strip	R	1383+00	26.20
BST_S-1408	bio-strip	L	1404+00	26.60
BST_N-OFF-1409	bio-strip	R	1407+00	26.65
BST_N-ON-1410	bio-strip	R	1415+00	26.80
BSW_S-1440B(1)	bio-swale	L	1440+00	27.28
BSW_S-1440B(2)	bio-swale	L	1440+00	27.28
BSW_S-1448	bio-swale	L	1488+00	28.19
BSW_S-1467	bio-swale	L	1464+00	27.73
BSW_S-1479	bio-swale	L	1479+00	28.02
BSW_N-1467	bio-swale	R	1467+00	27.79
BSW_N-1480	bio-swale	R	1480+00	28.04
BSW_N-1484	bio-swale	R	1485+00	28.13
BSW_N-1493	bio-swale	R	1493+00	28.28
BSW_N-1498	bio-swale	R	1499+00	28.40
BSW_S-1498	bio-swale	L	1499+00	28.40
BSW_S-1507	bio-swale	L	1507+00	28.55
BSW_N-1508	bio-swale	R	1508+00	28.57
BSW_S-1514	bio-swale	L	1515+00	28.70
BSW_S-1536	bio-swale	L	1536+00	29.10
BSW_S-1554	bio-swale	L	1554+00	29.44
BSW_N-1554	bio-swale	R	1554+00	29.44
BSW_N-1562	bio-swale	R	1562+00	29.59
BSW_N-1571	bio-swale	R	1571+00	29.76
BSW_N-1579	bio-swale	R	1579+00	29.91
BSW_S-1579	bio-swale	L	1579+00	29.91
BSW_S-1586	bio-swale	L	1586+00	30.04
BSW_N-1587	bio-swale	R	1586+00	30.04
BST_S-1596B	bio-strip	L	1594+00	30.19
BST_N-1603	bio-strip	R	1599+00	30.29
BST_N-1604	bio-strip	R	1603+00	30.37

BMP ID	BMP Type	Location		
		Station (Centerline*)		Post Mile
BST_S-1603B	bio-strip	L	1596+00	30.23
BST_N-1606B	bio-strip	R	1609+00	30.48
BST_S-OFF-1606	bio-strip	L	1608+00	30.46
BSW_S-1627	bio-swale	L	1627+00	30.82
BSW_S-1636	bio-swale	L	1635+00	30.97
BSW_S-1642	bio-swale	L	1642+00	31.10
BSW_S-1650	bio-swale	L	1650+00	31.26
BSW_N-1650	bio-swale	R	1650+00	31.26
BSW_N-1656	bio-swale	R	1656+00	31.37
BSW_S-1656	bio-swale	L	1656+00	31.37
BSW_S-1660	bio-swale	L	1660+00	31.44
BSW_S-1668	bio-swale	L	1667+00	31.58
BSW_S-1675	bio-swale	L	1675+00	31.73
BSW_N-1675	bio-swale	R	1675+00	31.73
BSW_N-1678	bio-swale	R	1678+00	31.79
BSW_N-1682	bio-swale	R	1682+00	31.86
BST_N-1689B	bio-strip	R	1692+00	32.05
BST_N-1696	bio-strip	R	1697+00	32.15
BSW_S-1696	bio-swale	L	1702+00	32.24
BSW_S-1706	bio-swale	L	1706+00	32.32
BSW_S-1720	bio-swale	L	1720+00	32.58
BST_S-ON-1754	bio-strip	L	1754+00	33.23
BST_N-1755	bio-strip	R	1755+00	33.24
BST_S-OFF-1755	bio-strip	L	1756+00	33.26
BST_N-1758	bio-strip	R	1758+00	33.30
BST_N-1760	bio-strip	R	1761+00	33.36
BST_S-1764A	bio-strip	L	1762+00	33.38
BSW_S-1775	bio-swale	L	1775+00	33.62
BSW_S-1784	bio-swale	L	1784+00	33.79
BSW_S-1810	bio-swale	L	1809+00	34.27
BSW_S-1822	bio-swale	L	1823+00	34.53
BST_S-1846	bio-strip	L	1839+00	34.83
DPPIA_N-1942	DPPIA	R	“C1” 939+00	36.73
DPPIA_S-1949	DPPIA	L	1949+00	36.92

*All stations referenced are mainline centerline (“C” Line) unless noted otherwise.

1.2 Exception to Policy

No geotechnical exceptions to Caltrans policies and procedures have been identified at this time for this proposed I-15 ELPSE and/or specifically this *District Preliminary Geotechnical Report* (DPGR).

2.0 GEOTECHNICAL INVESTIGATION

Purpose of this *District Preliminary Geotechnical Report* (DPGR) is to summarize relevant preliminary geotechnical (engineering and geology) information for proposed I-15 ELPSE improvements, located in Riverside County, California, to support this Project Approval and Environmental Document (PA&ED) phase of project delivery. Information provided in this report should only be used for preliminary evaluation and type selection analysis (e.g. slope gradients, ERSs type selection, etc.) for preliminary cost estimates, and may require revisions or modifications after completion of updated geotechnical exploration during the next phase of design development. Future designers will be responsible for performing design-specific geotechnical exploration, testing and preparation of reports including a *Geotechnical Design Report* (GDR), *Materials Report* (MR) and structure-specific *Foundation Reports* (FRs) for 15 proposed bridge widenings, as required by Caltrans.

As summarized on the following Table 7, other reports previously prepared by Leighton Consulting, Inc. for this project include 15 *Structure Preliminary Geotechnical Reports* (SPGRs) for bridge widenings, a *Preliminary Materials Report* (PMR), an Initial Site Assessment (ISA) to research hazardous materials that may exist in soil and/or groundwater along this alignment, and an Aerially Deposited Lead (ADL) survey. These reports have been previously reviewed, revised and approved by Caltrans, as summarized below:

Table 7. I-15 ELPSE Completed Geotechnical and Geoenvironmental Reports

Type	Post Mile	Bridge Number	Structure Name	Date
Bridge	25.55	56-0726 R/L	Gavilan Wash Bridge	May 2021
	26.69	56-0682 R/L	Lake Street UC	May 2021
	27.78	56-0681 R/L	Temescal Canyon Road OH	May 2021
	28.04	56-0680 R/L	Temescal Wash Bridge	May 2021
	28.87	56-0679 R/L	Horsethief Canyon Road UC	May 2021
	29.13	56-0678 R/L	Horsethief Canyon Wash Bridge	March 2021
	30.09	56-0677 R/L	Indian Wash Bridge	March 2021
	30.40	56-0676 R/L	Indian Truck Trail UC	April 2021
	31.90	56-0675 R/L	Temescal Canyon Road UC	April 2021
	31.97	56-0674 R/L	Mayhew Wash Bridge	April 2021
	32.96	56-0543 R/L	Coldwater Wash Bridge	July 2021
	33.25	56-0542 R/L	Temescal Canyon Road UC	July 2021
	34.72	56-0559 R/L	Brown Canyon Wash Bridge	July 2021
	35.64	56-0541 R/L	Weirick Road UC	July 2021
	36.58	56-0540 R/L	Bedford Wash Bridge (ELPSE V2)	October 2022
Road	20.3 to 40.1		Preliminary Materials Report (PMR)	August 2022
	8.74 to 52.28		Initial Site Assessment (ISA)	June 2011
	20.3 to 38.8		Aerially Deposited Lead (ADL)	January 2020

Abbreviations: UC – Undercrossing, OH – Overhead (abandoned railway)

Neither current subsurface exploration nor testing was performed along this alignment. In accordance with HDR's June 4, 2019, *Master Subconsultant Agreement* and June 5, 2019 *Task Order*, Leighton Consulting, Inc.'s scope of work included the following tasks:

2.1 Research and Review

We reviewed relevant geotechnical literature and aerial photographs of this alignment available from our in-house library, provided by HDR and available as public record (e.g. GeoDOG, etc.). Pertinent documents we reviewed are referenced at the end of this report. We also obtained and reviewed Caltrans as-built information for this alignment, including as-built Log of Test Borings (LOTBs). Caltrans as-built LOTBs for this alignment are reproduced in Appendix A, *Caltrans As-Built LOTB Sheets* (38 sheets).

2.2 Reconnaissance

Although we have driven this alignment many times, **no** geotechnical subsurface exploration was performed for this PA&ED phase of the project (as is customary for WBS 160.10.80, see the February 2021 *Caltrans Geotechnical Design Manual, Geotechnical Design Reports*, page 1). A California licensed Geotechnical Engineer (GE) drove this alignment (in March 2021) and noted pertinent surface conditions.

2.3 Analyses and Report Preparation

Site-specific Acceleration Response Spectra (ARS) curves were calculated for 15 bridges to be widened along this alignment, and results of ARS output for Gavilan Wash at the south end and Bedford Wash at the north end of the I-15 ELPSE alignment are presented in Appendix B, *Calculations*. We prepared this *District Preliminary Geotechnical Report* (DPGR) to document reported subsurface conditions, and present preliminary geotechnical analyses results, conclusions and design recommendations for this proposed I-15 ELPSE.

3.0 GEOTECHNICAL CONDITIONS

3.1 Regional Geology

Alignment geology is depicted on Plate 2, *Regional Geologic Map* (in pocket). From a geologic perspective, this alignment is predominantly located within Temescal Valley, all within the Peninsular Ranges Geomorphic Province of California. The Peninsular Ranges are characterized by extensive pre-cretaceous intrusive igneous rocks ranging in composition and age from gabbro to granodiorite with tonalite being most common. I-15 along the ELPSE segment runs basically parallel and east of the Elsinore Fault, east of the Santa Ana Mountains.

3.2 Topsoil – Soil Survey Review

Based on a review of mapping prepared by the United States Department of Agriculture's (USDA) Web Soil Survey (WSS) web-based application, this 15.8 mile I-15 ELPSE alignment encompasses numerous agricultural soil classifications, predominantly consisting of sandy loam, often with gravel and/or cobbles. There were 88 map unit descriptions along this alignment ranging from clay pits (Alberhill) to gravel pits and quarries (throughout Temescal Canyon). USDA's 126-page "*Custom Soil Resource Report*" including a D-size map is included at the end of Appendix B.

3.3 Surface Conditions

As can be seen on Plate 1 (in pocket), this I-15 alignment segment extends from the Elsinore Trough along Temescal Canyon to Temescal Valley, just south of the Chino Basin. The Temescal Canyon and Elsinore Trough are bounded on the west by the Santa Ana Mountains and on the east by the Perris Block. Topography and I-15 vertical alignment generally slopes downs to the north. Temescal Wash generally runs parallel to the alignment, crosses the alignment at several locations, and drains into the Santa Ana River to the north, which, in turn, flows east-northeast to west-southwest towards the Prado Basin and Prado Dam. Temescal Wash is connected as a spillway to Lake Elsinore on the southern end of the alignment. Topography along the alignment is relatively rugged with bedrock hills and outcrops. Alignment elevations range from 1,314 feet at the south end near SR-74 to 892 feet (NAVD 88) near Cajalco Road.

3.4 Subsurface Conditions

As mapped regionally on Plate 2 (in pocket), this alignment traverses igneous (primarily granitic) rock south of the Santa Ana River, with intervening coarse to fine alluvium within transecting drainages. Present local topography along this

alignment has been formed by erosion, tectonic forces and, in more recent times, human activity. Undocumented artificial fill related to past construction of the highway (1988 and earlier in Corona) is present at various bridge approaches.

Earth materials anticipated to be encountered during lane construction primarily in the median, are expected to consist of undocumented artificial fill (Afu), overlying Quaternary-aged alluvium (Qal) and possibly (at depth) igneous rock described as follows:

- **Undocumented Artificial Fill (Afu):** Undocumented fill soils consisting of cobbles, gravel, sand, silty sands and silt are primarily expected along this existing I-15 median, due to past highway grading including drainage facility construction. Embankment fills on-the-order of 20- to 30-feet deep were placed during past highway grading throughout the various bridges along the alignment.
- **Alluvium (Qal):** Young and old alluvial fan deposits consisting primarily of loose to dense well-graded sands with gravel (SW), silty sands (SM), and sandy silt (ML) are primarily expected to underlie majority of this alignment. Cobbles were noted in various LOTBs. Additionally, clayey sand (SC) and sandy lean clay (CL) were reported at select locations.
- **Wash Deposits (Qya):** Wash deposits consisting primarily of loose to dense poorly-graded sand with gravel (SP) and silty sand (SM) are expected to be encountered at the various wash areas that cross the project alignment. A large area of wash deposits associated with the Temescal Wash is mapped towards the southern portion of the alignment. Veneers of rip-rap are located in the side slopes beneath bridges crossing wash areas.
- **Igneous and Sedimentary Bedrock:** Igneous bedrock consisting of Santiago Peak Volcanics and Estelle Mountain Volcanics (Cretaceous) are regionally mapped on the mountains and hills directly west and east of this I-15 segment. Sedimentary rock consisting of Silverado formation sandstone is mapped towards the northern and southern portions of the project alignment. Outcrops and cut exposures of the bedrock formation are encountered at various locations along the alignment.

3.5 Groundwater

Groundwater was reportedly encountered in borings drilled between 1964 and 2012, as depicted on Caltrans LOTB sheets included in Appendix A. Encountered groundwater depths and commensurate boring locations are summarized in the following table:

Table 8. Summary of Initial Groundwater Data

Location	Bridge PM	Boring Local Label	Ground Surface Elevation (feet)*	Groundwater at (feet)		Date Measured
				Depth	Elevation*	
Gavilan Wash Bridge	25.55	No groundwater down to elevation 1225 feet				9/20/1977
Lake Street UC	26.69	B-3	1212.3	21.3	1191	3/14/1974
		B-4	1212.1	21.1	1191	3/14/1974
Temescal Canyon Road UC	27.79	B-1	1189.3	21	1168.3	10/19/1973
		B-2	1190.7	19.8	1170.9	2/5/1974
		B-3	1190.4	19	1171.4	2/19/1974
		B-4	1189.0	19	1170	3/4/1974
		B-7	1189.6	20	1169.6	2/21/1974
		B-8	1190.1	19	1171.1	2/21/1974
		B-9	1190.3	19	1171.3	2/22/1974
		B-10	1188.3	19.7	1168.6	3/1/1974
		B-11	1188.2	18.5	1169.7	3/1/1974
		B-12	1188.0	18.5	1169.5	3/1/1974
		B-14	1189.1	20	1169.1	3/4/1974
		B-16	1191.6	22	1169.6	3/1/1974
Temescal Wash Bridge	28.04	B-1	1174.1	6.5	1167.6	2/19/1974
		B-2	1176.4	9.7	1166.7	12/11/1973
		B-3	1175.5	9	1166.5	12/11/1973
		B-4	1177.0	10.1	1166.9	2/19/1974
		B-6	1175.3	8.3	1167.0	12/13/1973
		B-10	1176.5	7.8	1168.7	2/19/1974
		B-11	1175.9	7.4	1168.5	2/19/1974
		B-12	1174.9	5.5	1169.4	2/19/1974
Horsethief Canyon Road UC	28.87	B-2	1232.5	44.3	1188.2	1/17/1974
		B-3	1229.5	44	1185.5	1/17/1974
		B-4	1235.3	57	1178.3	1/23/1974
Horsethief Wash Bridge	29.13	B-3	1214.1	19.6	1194.5	11/19/1973
Indian Wash Bridge	30.09	B-2	1166.6	35.8	1130.8	12/19/1973
Indian Truck Trail UC	30.4	B-1	1150.6	15.7	1134.9	5/16/1972
		05-4	1759.5	25.6	1133.9	7/18/2005
		05-6	1174.2	46.5	1127.7	7/20/2005
		05-8	1173.3	62	1111.4	7/20/2005
		05-9	1149.6	34	1115.5	7/18/2005

Location	Bridge PM	Boring Local Label	Ground Surface Elevation (feet)*	Groundwater at (feet)		Date Measured
				Depth	Elevation*	
Temescal Canyon Road UC (Mayhew Wash)	31.90	No groundwater down to elevation 991 feet				2/23/1972
Mayhew Wash Bridge	31.97	No groundwater down to elevation 994 feet				2/29/1972
Coldwater Wash Bridge	32.96	B-2	1011.4	8.9	1002.5	6/8/1972
Temescal Canyon Road UC (Glen Ivy)	33.25	B-4	999.4	25.4	974	4/1/1964
Brown Canyon Wash	34.72	No groundwater down to elevation 853 feet				4/20/1964
Weirick Road UC	35.64	No groundwater down to elevation 873 feet				12/26/1973
Bedford Wash Bridge	36.58	A-1-003	878.0	63	815	12/8/2012

* Groundwater and ground surface elevations for borings older than 1988 were presumably based on the NGVD29 elevation datum. NAVD88 elevations are roughly 2.7 feet higher than the NGVD29 elevations.

For the most part, sustained shallow groundwater is not expected along this alignment. However, significant seasonal groundwater fluctuations can occur particularly near existing creeks/washes following heavy and persistent rain. Groundwater levels along this alignment will fluctuate due to rainfall, seasonal variation, upstream flood control management, upstream development, nearby construction, irrigation, and numerous other artificial and natural influences. Groundwater seepage may appear in cut and fill slopes and within excavations along earth materials of contrasting permeabilities, particularly immediately after heavy rain.

This I-15 alignment is through the Santa Ana Mountains foothills and Temescal Valley with undulatory topography and variable depths to bedrock. Therefore, linear interpolation and extrapolation of groundwater elevations encountered in nearby wells can be misleading. As a basic depth to groundwater "model," groundwater is predominantly relatively shallow in Temescal Wash and also to a lesser extent within the dendritic washes draining from the Santa Ana Mountains to Temescal Wash. Shallow groundwater predominantly does not exist in the well-drained hillsides. So groundwater conditions vary considerable along this alignment commensurate with the topography.

3.6 Seismic Hazards

Principal seismic hazard that could affect this I-15 ELPSE alignment is ground shaking resulting from an earthquake occurring along several major active or potentially active faults in southern California; some of which are shown on Plate

3, *Regional Fault Map* (in pocket). Specific seismic hazards are discussed in the following subsections:

3.6.1 Fault Rupture: As a basis for establishing alignment-specific seismic design parameters, faulting needs to be modeled first. Ground shaking along this alignment has and will occur from earthquakes occurring along major active or potentially active faults in southern California, but particularly and deterministically, the Elsinore Fault. Both the San Jacinto and Elsinore fault zones are considered to be two of the most active strike-slip faults in southern California, accommodating strike-slip movement west of the San Andreas Fault, resulting from the Peninsular Ranges Geomorphic Province relative movement to the north. Both faults are considered capable of inducing surface rupture. But these faults do not traverse this alignment. As depicted on Plate 3, there is no known historic surface fault rupture through or in the vicinity (within 1,000 feet) of this alignment. However, the Elsinore Fault is mapped as having had Holocene (<11,700 years) rupture (**orange** fault traces on Plate 3) through Corona generally to the southwest of this alignment along the northeastern edge of the Santa Ana (Saddleback) Mountains and the Cleveland National Forest. Therefore, the Elsinore Fault is considered "active" as defined in California (by CGS). So too the San Jacinto and San Andreas faults, with historical movement further away from this alignment.

To protect structures from ground surface-rupture hazards along a fault, the California Geological Survey (CGS), under the State-mandated Alquist-Priolo Act of 1972, has delineated "Earthquake Fault Zones" along active or potentially active faults. As mapped on the May 1, 2003 *Corona North Quadrangle*, Special Studies Zones, *Official Map*, and the *Corona South Quadrangle Revised Official Map*, known active fault traces do **not** cross this I-15 ELPSE alignment. In addition, Riverside County has not mapped fault zones within the bounds of this alignment **except** a segment from roughly I-15 PM 29.4 to 29.7, south of Corona (Lee) Lake between Horsethief Canyon Wash and Indian Wash. County **zones** for fault traces running roughly parallel to I-15 encompass I-15 within this segment, but postulated traces (**red lines**) do not cross I-15, as shown recently in the following two excerpts (on the next page) from the Riverside County, Map My County website (2022); and as similarly mapped countywide on Plate 5, *Regional Geologic Hazards Map* (by Riverside County, excerpt), also shown as **turquoise zones** on the attached Plate 5:

Note suggested faults as red lines below (zones as red <u>area</u> above).

This alignment is 14.6-miles long, so distance to faults is variable. However, none of the 15 bridges for which we prepared SPGRs were within 1,000 feet of a known active surface fault. Therefore, in accordance with Caltrans MTD 20-10, a surface fault rupture displacement hazard analysis is not required for the 15 existing bridges to be widened as part of this I-15 ELPSE. Nearby active

fault distances from the Gavilan Wash Bridge at the south end and Bedford Wash Bridge at the north end of the I-15 ELPSE are listed below:

Table 9. Closest Caltrans-Identified Faults (I-15 ELPSE South and North Ends)

Fault Name	Distance (miles)*		Moment Magnitude
	Gavilan Wash*	Bedford Wash*	
Elsinore (Glen Ivy, FID 365)	3.6	2.5	7.7
Elsinore (Temescal, FID 378)	6.7	6.5	7.7
San Jacinto (Anza, FID 362)	30.2	20.4	7.7

*Distance between fault and Gavilan Wash on the south and Bedford Wash on the north of I-15 ELPSE.

3.6.2 Alignment Seismic Parameters: Plate 4, *Historical Seismicity Map*, shows locations of recent regional earthquakes with respect to this alignment. As reported in our 15 bridge-specific *Structure Preliminary Geotechnical Reports* (SPGR), we previously performed seismic analysis for 15 bridge widenings proposed along this alignment; using Caltrans' *ARS Online* Version 3.0.2 (which is based on SDC 2.0, adopted September 1, 2019). In general, higher magnitude ground accelerations are expected at the northern end of this alignment, slightly closer to the active Elsinore Fault. Our calculations were based on shear wave velocities shown on ARS output in Appendix B. Based on a Soil Profile Type D for well-graded older Quaternary alluvium with some gravel and cobbles, and considering relatively shallow granitic rock, an average shear (S) wave velocity of 300- to 330-meters-per-second (m/s) was used to model ground response in the upper 100 feet (30 meters, V_{s30}). These shear wave velocities were validated using the California Geological Survey's (CGS's) *Map Sheet 48: Shear-wave Velocity in Upper 30m of Surficial Geology (V_s30),* accessed on the California "Geoportal" webpage.

3.6.3 Alignment Ground Motion Parameters: Based on Caltrans seismic design criteria (SDC 2.0), design-level ground motion parameters are summarized below for the south end (Gavilan Wash), closest to fault (Horsethief Wash) and north end (Bedford Wash) of this I-15 ELPSE alignment:

Table 10. Recommended Ground Motion Parameters for Geotechnical Design

Site Parameters			Design Ground Motion Parameters*		
Latitude	Longitude	V_{s30} (m/s)	PHGA (g)*	Mean M_o	Mean R (km)
33.7266°	-117.3741°	300	0.76	6.61	7.9
33.7412°	-117.4323°	330	0.92	6.56	3.9
34.6749°	-118.1577°	330	0.87	6.57	5.4

*For 975-year return period. From Caltrans web tool ARS online V3.0.2, 5% damping (see Appendix B).

Seismic design calculations, including backup for V_s30, are presented in Appendix B, *Calculations*. Numerical spectral acceleration values are tabulated below (and in Appendix B):

Table 11. Recommended Caltrans ARS Curves (Ends and Closest Approach)

Period (seconds)	Spectral Acceleration (g) for Bridge (PM)		
	Gavilan Wash (25.55)	Horsethief Wash (29.13)	Bedford Wash (36.58)
PGA	0.76	0.92	0.87
0.1	1.29	1.55	1.5
0.2	1.73	2.07	1.99
0.3	1.91	2.27	2.18
0.5	1.75	2.05	1.94
0.75	1.54	1.79	1.7
1	1.35	1.55	1.45
2	0.63	0.68	0.65
3	0.38	0.41	0.39
4	0.26	0.26	0.26
5	0.19	0.19	0.18

3.6.4 Parameters for Seismic Slope Stability Analyses: New cut slopes are not proposed for this I-15 ELPSE. Some fill slope contouring may be required east of northbound I-15 between the Dos Lagos Drive/Weirick Road northbound on-ramp and the Cajalco Road northbound off-ramp, with slope gradients ranging from 2:1 to 4:1 (horizontal:vertical). Therefore, slope stability analyses are not expected to be required for this project. However, pseudo-static analyses for this seismically-active alignment adjacent to the Elsinore Fault will not likely provide realistic results. Therefore, Newmark sliding block analyses will be required for the next phase of design ***if*** significant cut or fill slopes are envisioned.

3.6.5 Liquefaction: When loose to medium dense, saturated granular deposits are subjected to seismic shaking of significant duration without substantial dissipation of excess pore water pressure, soil deposits may liquefy (i.e., behave like a liquid) and lose shear strength. Liquefaction is associated primarily with loose (low density), saturated, fine- to medium-grained, cohesionless soils. For liquefaction to occur, the following three conditions must occur simultaneously at a site:

1) Shallow groundwater (typically assumed to be within 50 feet of the ground surface),
2) Loose to medium dense cohesionless soils (primarily clean sands), and

3) Sustained ground shaking.

If one of these three conditions does not exist simultaneously, then liquefaction will not occur at the site.

The California Geological Survey (CGS) has not yet mapped liquefaction hazard zones for this alignment. However, as depicted on Plate 5, *Regional Geologic Hazards Map*, Riverside County has mapped liquefaction hazard zones for the County. Based on historic depth to groundwater and regionally mapped alluvial soils, Riverside County regionally maps portions of the I-15 ELPSE in lower-lying areas adjacent to Lake Elsinore and Temescal Creek/Wash as susceptible to liquefaction (although we note in some cases that Riverside County's regional mapping was more conservative than CGS would map – SP 117A).

Liquefaction is expected to primarily be a concern at wash bridges, where potential for lateral spreading must also be considered. Groundwater and wash channel water is expected predominantly at and above existing grade at bridge piers. Liquefaction will need to be addressed with subsurface exploration, geotechnical laboratory testing and numerical analyses in future *Foundation Report*s (FRs) for these wash bridges. Liquefaction is commonly mitigated with pile foundations extending below potentially liquefiable young stream deposits.

3.6.6 Liquefaction-Induced Lateral Spreading: Liquefaction and lateral spreading will need to be addressed with subsurface exploration, geotechnical laboratory testing and numerical analyses in future *Foundation Report*s (FRs) for these wash bridges. Liquefaction and lateral spreading is commonly mitigated with stiff (large EI) pile foundations extending below potentially liquefiable young stream deposits.

3.6.7 Other Geologic Hazards: A qualitative assessment of alignment-specific geologic hazards is summarized below, excluding secondary seismic hazards (e.g. liquefaction and lateral spreading), which are discussed later in this report:

Table 12. Alignment-Specific Geologic Hazards

Geologic Hazard	Site-Specific Conditions	Qualitative Risk Level
landslides	engineered cut slopes	low (old alluvium & granite)
seismically-induced flooding	dams far upstream	low
seiche	no adjacent higher water bodies	nil
tsunami	inland	nil
volcanoes	no nearby volcanoes	nil

Generally speaking, these hazards tabulated above are considered "nil" or low.

4.0 GEOTECHNICAL DESIGN EVALUATION

4.1 Mitigation of Landslides, Rockfall or Other Slope Instability

This portion of I-15 was predominantly constructed in the late 1980s, with engineered cut slopes predominantly in hard granitic rock. Almost all new construction will be within the relatively flat I-15 median between existing northbound and southbound lanes. No new cut slopes are proposed, and we are unaware of any existing landslides along the I-15 ELPSE alignment. Approach embankment erosion has been common along this alignment, and has been addressed by Caltrans maintenance. However, erosion protection must be implemented in future design of the I-15 ELPSE project, in accordance with Caltrans standards and special provisions.

4.2 Geotechnical Options for New Slopes and/or Retaining Walls (ERSs)

A recent design-development shifts the I-15 centerline east to avoid modification of existing retaining walls along the west edge of I-15 between Weirick (Dos Lagos) and Cajalco Roads. This includes adding a northbound lane between the Weirick Road on-ramp and the Cajalco Road off-ramp. Depending on how new ERS foundations are constructed, there may be some impact on northbound traffic, particularly at the Dos Lagos northbound on-ramp south of the Cajalco Road northbound off-ramp. New construction will be constrained by the limits of the existing Caltrans right-of-way.

Caltrans standard plan reinforced concrete retaining walls have been initially considered for this segment where embankment widening is required. Standard plan footings will have to extend into the embankment (westerly). However, this might be a good location for a mechanically-stabilized earth (MSE) wall, since this will be a fill embankment rather than cut. Over-steepened slopes (steeper than 2:1 horizontal:vertical) are not proposed and were not considered.

4.3 Environmental (CEQA/NEPA) Constraints

We are unaware of any environmental (CEQA/NEPA) issues that would impact geotechnical design for the I-15 ELPSE. We are unaware of the need for soundwalls, although soundwalls atop retaining walls at the Dos Lagos northbound on-ramp may be required, adding additional load to the ERSs along that segment of the alignment, making an MSE wall less desirable. We are unaware of any wildlife crossings being proposed as part of the I-15 ELPSE.

5.0 RECOMMENDATIONS

5.1 Recommended Geotechnical Exploration (PS&E)

For the PS&E phase of design, for 15 *Foundation Reports* (FRs), we recommend that a combination of hollow-stem-auger borings be drilled at abutments and rotary-wash borings be drilled at piers in washes (e.g. Temescal Wash) for bridge pile foundation design, with borings drilled well below anticipated scour elevations for pile design, considering pile type and required capacity. Hollow-stem-borings are necessary to detect groundwater elevations and rotary-wash borings are necessary to drill below groundwater to advance the boring deep enough and obtain accurate N-values. For driven piles, borings are generally expected to be drilled from the ground surface down to at least 10-feet into granitic rock or a maximum depth of 80 feet, whichever is shallower, at bridges. However, deeper borings may be required for large-capacity cast-in-drilled-hole (CIDH) piles or in areas where significantly-thick zones of liquefaction are predicted. Standard Penetration Test (SPT) blow counts (N-values) should be obtained from these borings.

Geotechnical laboratory testing of recovered soil samples should be performed as necessary for earthwork bulking/shrinkage estimates, liquefaction and lateral spreading analyses, to refine pile design, evaluate moisture sensitivity and compressibility for shallow foundations, and to evaluate corrosion. This would include drive sample (in-situ) moisture and density, sieve analyses, compaction curves (CTM 216 or modified Proctor), direct-shear testing, consolidation testing and a suite of corrosivity tests.

Hollow-stem-auger borings will also need to be drilled for the next design phase *Geotechnical Design Report* (GDR) as follows:

- **Cantilever Overhead Signs**: Borings are typically drilled to depths of 35 feet for cantilever overhead signs. We count 64 overhead sign locations (eight locations have “butterfly” cantilever signs – two signs with one foundation). These median borings can also be used to obtain R-values to reduce the pavement test-pit/boring count to 30.
- **Conventional Retaining Walls**: Deeper borings will need to be drilled for three retaining walls along the northbound easterly edge of I-15 between Weirick and Cajalco Roads, approximately 300 feet on center to on-the-order-of 50-feet deep for gross slope stability analyses and conventional retaining wall spread footing foundation design.

- **Stormwater Infiltration**: In-situ infiltration tests should be performed at proposed stormwater infiltration basins, bioswales and/or similar stormwater infiltration improvements.

Corrosivity testing should also be performed at structures and particularly where new culverts are proposed. As always, conventional geotechnical classification tests (e.g. sieve analyses and possibly Atterberg Limits if clay is encountered) should also be performed.

5.2 Preliminary Seismic Design Considerations

5.2.1 Ground Surface Rupture and Deformation Potential: Our review of available in-house literature indicates that there are no known active or potentially active faults that traverse this alignment, and this alignment is **not** located within a State of California designated Alquist-Priolo Earthquake Fault Zone (CGS, 2007). Based on our understanding of the current geologic framework in the general site vicinity, and in accordance with current State of California standards (Bryant and Hart, 2007), the potential for surface rupture through this segment of I-15 is considered low. Known faults in the region are regionally mapped on Plate 3 (in pocket).

5.2.2 Liquefaction and Lateral Spreading Potential: As discussed previously in Section 3.5.2, during final design (PS&E phase), liquefaction and lateral spreading potential for 15 bridges will be required. Pile foundations likely mitigated liquefaction hazards, but lateral spreading needs to be considered for these areas where there are steep embankments and potential large lateral spreading forces that could overcome conventional pile foundations lateral load capacities.

5.2.3 Seismically Induced Settlements: Seismically induced settlement consists of dry dynamic settlement (above groundwater) and liquefaction-related settlement (below groundwater). This settlement occurs primarily within loose to moderately dense, dry or saturated granular soil. Settlement caused by ground shaking is often non-uniformly distributed, which can result in differential settlement. During the PS&E phase of this project, dynamically-induced total and differential settlement should be evaluated for fill embankments predominantly in the vicinity of 15 bridges.

5.3 Earthwork

Proposed grading is expected to consist of filling the I-15 median for crowned Portland cement concrete (PCC) pavements, with enhanced drainage required due to increased surface runoff from larger paved surfaces. For the most part, cuts are not anticipated except to accommodate Portland cement concrete (PCC)

pavement sections and as generated to install new storm drain catch basins and conduits. As a result, mostly existing fill soils are expected to be encountered during this grading, although granitic rock may be encountered during deeper storm drain trenching at some segments.

All grading should be performed in accordance with Caltrans *Standard Specifications* except as indicated in the Special Provisions prepared for this project. For example, fill placed on sloping ground should be properly keyed and benched into existing ground and placed as specified in Section 19-6 of the Caltrans *Standard Specifications*. Earthwork for this project is expected to consist of (1) stripping organic soils to expose new pavement subgrades, (2) minor cuts and fills to achieve roadway grades, (3) embankment widening and retaining wall backfill, and (4) placement and compaction of pavement subgrades and aggregate base. Additional earthwork recommendations are presented in the following subsections:

5.3.1 Fill Placement: Encountered granular fill and alluvium are generally suitable for reuse as compacted structural fill, provided these soils are free of debris, organic material, and oversize material (i.e., greater-than 6-inches in largest dimension). Any soils to be placed as fill, whether onsite or imported material, should be reviewed and approved by the Geotechnical Engineer of Record (GEOR). All fill soil should be placed in thin (≤12-inches-thick, typically 8-inches-thick as a function of soil type and compaction equipment used) loose lifts, moisture-conditioned, as necessary, to near-optimum moisture content, and, where placed as structural fill, compacted to a minimum 95 percent relative compaction (either Caltrans CTM 216 or ASTM D 1557, as specified by Caltrans at that time).

New fill should be placed as specified in Sections 19-5.03B and 19-5.03C of Caltrans *Standard Specifications*. When away from new structures or bridge approach fills, fills should be compacted to a minimum 90 percent relative compaction (either Caltrans CTM 216 or ASTM D1557 modified Proctor, as specified by Caltrans at that time). However, in accordance with Section 19-5.03B of Caltrans *Standard Specifications*, earthwork should be compacted to a relative compaction of at least 95 percent for at least a depth of:

- **Shoulders**: 0.5 foot below the grading plane for the width between the outer edges of shoulders, or
- **Ramp Lanes**: 2.5 feet below the finished grade for the width of the “traveled way” (ramp lanes) plus 3 feet on each side.

In any event, aggregate base should always be compacted to a minimum of 95 percent relative compaction.

In areas to be landscaped and only in areas to be landscaped with planting, the Caltrans District Landscape Architect has requested that the upper 12-inches of fill placed be ripped or tilled to create a healthy medium for planting. This is not recommended for any other area to be paved or covered with anything other than vegetation.

5.3.2 Surface Drainage: Inadequate control of runoff water and/or poorly controlled irrigation can cause loose soils to collapse, resulting in settlement of pavements and/or other improvements, and increasing soil creep on and immediately adjacent to, slopes. Maintaining adequate surface drainage, proper disposal of runoff water and control of irrigation should help reduce the potential for future soil moisture related problems.

Positive surface drainage should be provided to direct surface water away from pavements and slopes and towards suitable drainage facilities. Water should be transported off site in approved drainage devices such as gutters, paved drainage swales, or watertight area drains and collector pipes. Unpaved drainage swales should have a gradient of at least two-percent.

5.3.3 Cut Slopes: New cut slopes are not expected at this time. However, any finish cut slopes in alluvium and/or existing fill soils should be graded no-steeper-than 2:1 (horizontal:vertical). Existing cuts in granitic and other igneous rock will not likely have to be cut back, but should be geotechnically evaluated where changes in cut slope geometry are proposed. However, note that the Caltrans *Highway Design Manual* (HDM) Section 304.1 calls for graded slopes adjacent to highways to be no steeper than 4:1 (horizontal:vertical).

5.3.4 Fill Slopes: New fill slopes will be required where the I-15 embankment is to be widened in Corona south of Cajalco Road. Fill slopes should be graded no-steeper-than 2:1 (horizontal:vertical) based solely on geotechnical issues. However, note that the Caltrans *Highway Design Manual* (HDM) Section 304.1 calls for graded slopes adjacent to highways to be no steeper than 4:1 (horizontal:vertical) primarily for errant vehicle recovery and maintenance considerations. For sufficient stability of augmented embankments, it is important that new fills be properly benched into existing fill in accordance with Section 19 of the Caltrans *Standard Specifications*.

5.3.5 Erosion Protection: Proposed slopes should be protected from erosion in accordance with Section 20 of the Caltrans *Standard Specifications*. Landscaping can help reduce slope surface erosion. However, excessive irrigation of slopes should be avoided and appropriate drainage devices should be placed at the top of all slopes such that water does not flow over slope faces in an uncontrolled manner.

Inadequate control of runoff water and/or poorly controlled irrigation can cause site soils to creep on, and immediately adjacent to slopes. Maintaining adequate surface drainage, proper disposal of runoff water and control of irrigation should help reduce the potential for future soil moisture related problems. Unpaved drainage swales should have a gradient of at least two-percent.

5.3.6 Shrinkage and Subsidence: The change in volume of excavated and recompacted soil varies according to soil type and location. This volume change is represented as a percentage increase (bulking) or decrease (shrinkage) in volume of fill after excavation and recompaction. Subsidence occurs as natural ground is moisture-conditioned and densified to receive fill. To calculate bulking and shrinkage, in-situ soil density and optimum moisture/maximum density compactions curves are required. Insufficient in-situ density data currently exists, and this data is expected to be highly variable along this 14.6-mile-long alignment. Reliable estimates at this time are not possible without this data, but based on local experience, we estimate the following soil volume changes (**excluding** granitic rock) will occur during proper recompaction:

- **Shrinkage**: Shrinkage due to recompaction of soils in the upper three feet will vary with depth, with shrinkage decreasing with depth. We suggest an estimated shrinkage ranging from 5 to 15 percent.
- **Subsidence**: Subsidence due solely to scarification, moisture conditioning and recompaction of the exposed bottom of overexcavation, is expected to be on the order of 0.10 foot. This should be added to the above shrinkage value for the recompacted fill zone, to calculate overall recompaction subsidence.

The level of fill compaction, variations in in-situ density of the existing soils and other factors influence the amount of volume change. Some adjustments to earthwork volume should be anticipated during grading of the alignment median, and should be addressed in more detail during the PS&E phase.

5.4 Corrosivity

Neither field nor laboratory corrosivity testing of soils along this alignment has been performed during this PA&ED stage. However, we reviewed an April 2006 *Materials Report* prepared by Twining, Inc. for State Route 74 (SR-74) from PM R16.16 to PM 17.57, which is generally located towards the southern end of this project alignment. Their soil samples were located near the intersection of the southbound I-15 Central Avenue (SR-74) exit, in areas outside of bridge embankment fill. Also, as presented in Earth Mechanics, Inc.'s November 4, 2013 "*Final Foundation Report*" (EMI, 2013) for Bridge 56-0864S over Bedford Wash at

the northbound off-ramp to Cajalco Road, they found a clay sample to test. Corrosion testing performed by Twining (south end of I-15 ELPSE) and Earth Mechanics (north end of I-15 ELPSE) on near-surface samples are summarized below:

Table 13. Soil Corrosivity Test Results Summary

Consultant	Boring Number	Soil Type	Sample Depth (feet)	Sulfate Content (ppm)	Chloride Content (ppm)	pH	Resistivity (ohm-cm)
Twining	B-1	"sand silty"	1 – 3	ND	ND	7.3	4,800
	B-5		0 – 3	ND	ND	7.0	8,300
Earth Mechanics		CLAY(CL)	5	50	256	8.0	1,400

* ND = Not Detected

Caltrans Corrosion Guidelines (Version 3.2, May 2021, page 6-1) indicate a site to be corrosive (a corrosive environment) if one or more of the following conditions exist for representative soil and/or water samples taken at the site:

- Chloride concentration is (≥) 500 parts-per-million (ppm) or greater,
- Sulfate concentration is (≥) 1,500 ppm or greater, and/or
- pH is (≤) 5.5 or less.

None of these were measured in these samples tabulated above. Resistivity results listed in Table 12 (above) indicate mild to severe ferrous corrosivity. However, corrosivity testing should be performed during the PS&E phase for further evaluation.

Based on the Caltrans Highway Design Manual Table 855.4A, Guide for the Protection of Cast-In-Place and Precast Reinforced and Unreinforced Concrete Structures Against Acid and Sulfate Exposure Conditions (July 1, 2020 version), soil with a pH ranging between 7.1 to 14 shall follow the cementitious material requirements of Standard Specifications Section 90 without any other restriction, and soil with a pH ranging between 5.6 to 7.0 shall follow the cementitious material requirements of Standard Specifications Section 90 with a maximum water-to-cementitious material ratio of 0.45. In accordance with Table 855.4B, 1½-inches of concrete cover over reinforcing steel should be sufficient.

See Section 5.1, stating the need for additional design-phase corrosivity testing.

5.5 Retaining Walls (Earth Retaining Systems - ERSs)

Retaining walls (Earth Retaining Systems -ERSs) are proposed for this project as summarized in Tables 3 (median) and 4 (northbound exterior shoulders) of this report, described in the following subsections:

5.5.1 Median Barrier Retaining Walls: Median barrier retaining walls will be located intermittently along this I-15 alignment as listed in Table 3 (previously in this report), integrated with the proposed I-15 median barrier (centerline) adjacent express lanes pavements where there are grade differences up to 10-feet between northbound and southbound lanes.

Standard Caltrans reinforced-concrete retaining walls are proposed, which will need to be evaluated and perhaps modified to accommodate peak horizontal ground acceleration greater-than (>) 0.6g to be addressed in subsequent design phases. We have assumed that these mainline walls will consist of Caltrans Retaining Wall Type 5 (Case 1) as shown on Caltrans Standard Plans. Shallow foundations for proposed median retaining walls are primarily anticipated to encounter artificial fill and alluvial soils. Mitigating differential settlement in fill and loose shallow native alluvium will need to be addressed in subsequent design phases. We recommend that retaining walls be backfilled with sands or imported non-expansive soil, and constructed with a backdrain in accordance Caltrans standard plans and specifications. Using expansive soil as retaining wall backfill will result in higher lateral earth pressures exerted on retaining walls.

5.5.2 Exterior Shoulder Retaining Walls: As listed in Table 4 (previously in this report), a retaining wall is required to widen the southbound I-15 on-ramp from Central Avenue (SR-74) at the westerly edge, with a height up to 18 feet, where the on-ramp embankment slopes down to the west towards Lake Elsinore (commercial property). Also proposed are three retaining walls for the I-15 northbound (easterly edge) mainline lane addition between the Weirick Road (Dos Logos) On-Ramp and Cajalco Road Off-Ramp, where these retaining walls are proposed to have maximum wall heights of 14 feet, supporting I-15 mainlines atop a descending slope down to the east (multi-family residential properties).

Caltrans standard retaining walls founded on alluvium are envisioned, although global descending slope analyses will be required (final design phase), which may demonstrate the need for deeper retaining wall foundation embedment, but will likely require an inward-facing (towards the centerline) “L” shaped footing with a key, as Caltrans Standard Plan B3-1A, or similar. Site-specific structural engineering analyses will be required considering a peak horizontal ground acceleration exceeding 0.6g, and backfill must be sand and/or gavel, possibly with some silt (specified $\phi \geq 34°$).

MSE walls should also be considered for this location.

5.6 Sound Walls

Sound walls are anticipated for this project; however the determined-need, location and/or configuration of these walls will be identified in the forthcoming *Noise Abatement Decision Report* (NADR), which was not available at the time we wrote this DPGR. A *Materials Report* (MR) will be prepared in the final design phase to address identified specific retaining wall locations (alignments). Geotechnical recommendations will need to be site (alignment) specific, since hillside walls may encounter hard rock, while valley and wash alignments may encounter loose and compressible soils. Sound walls founded atop fill embankments, utility crossings and/or loose native soils will likely need to be founded on piles.

5.7 Overhead Sign Foundations

Multi-pole overhead signs over freeway mainlines are not proposed. However, 64 single-pole cantilever (and butterfly) overhead signs currently planned to be located at the proposed tolled express lanes median barrier and outside shoulders, are summarized in Table 5.

In most cases, for enhanced wind and seismic lateral load resistance, and for a smaller foundation footprint, it is initially suggested that overhead signposts be supported on cast-in-drilled-hole (CIDH) piles. But standard plans will need to be reviewed and possibly modified to accommodate peak horizontal ground acceleration greater-than (>) 0.6g; which is to be addressed in subsequent design phases.

5.8 Drainage Facilities.

5.8.1 Culverts: Existing drainage facilities (culverts) along the existing I-15 (ELPSE segment) alignment are tabulated below for design consideration:

Table 14. Summary of As-Built I-15 Drainage Facilities

Start		End Station*	Direction	Owner	Diameter** (inches)	Conduit Material
Station*	Post Mile					
1135+50	21.51	1140+46	Longitudinal	Caltrans	11.8	PVC
1146+00	21.71	--	Transverse	Caltrans	24	CMP
1149+71	21.78	--	Transverse	Caltrans	24	CMP
1159+90	21.97	--	Transverse	Caltrans	8 by 6*	RCB (*feet)
1162+00	22.01	--	Transverse	Caltrans	8	CSP

Start		End Station*	Direction	Owner	Diameter** (inches)	Conduit Material
Station*	Post Mile					
1162+00	22.01	--	Transverse	Caltrans	8	CSP
1164+20	22.05	--	Transverse	Caltrans	54	APC
1168+00	22.13	--	Transverse	Caltrans	36	RCP
1171+05	22.18	--	Transverse	Caltrans	30	RCP
1172+00	22.20	--	Transverse	Caltrans	8	CSP
1172+64	22.21	--	Transverse	Caltrans	12	CSP (downdrain)
1173+00	22.22	--	Transverse	Caltrans	8	CSP
1174+35	22.25	--	Transverse	Caltrans	24	APC
1174+35	22.25	1174+58	Longitudinal	Caltrans	18	APC
1174+67	22.25	1175+66	Longitudinal	Caltrans	8	CSP
1174+94	22.26	--	Transverse	Caltrans	18	APC
1175+00	22.26	1176+14	Longitudinal	Caltrans	8	CSP
1175+90	22.28	--	Transverse	Caltrans	3 by 2*	RCB (*feet)
1180+00	22.35	--	Transverse	Caltrans	8	CSP
1180+45	22.36	--	Transverse	Caltrans	8	CSP
1181+45	22.38	--	Transverse	Caltrans	18	APC
1186+87	22.48	--	Transverse	Caltrans	24	RCP
1188+76	22.52	--	Transverse	Caltrans	24	RCP
1188+78	22.52	--	Transverse	Caltrans	24	RCP
1188+76	22.52	1198+37	Longitudinal	Caltrans	24	RCP
1190+76	22.56	--	Transverse	Caltrans	30	RCP
1191+74	22.58	--	Transverse	Caltrans	30	RCP
1192+74	22.60	--	Transverse	Caltrans	36	RCP
1192+93	22.60	--	Transverse	Caltrans	36	RCP
1193+10	22.60	--	Transverse	Caltrans	36	RCP
1193+29	22.61	--	Transverse	Caltrans	36	RCP
1193+45	22.61	--	Transverse	Caltrans	36	RCP
1193+64	22.61	--	Transverse	Caltrans	36	RCP
1193+82	22.62	--	Transverse	Caltrans	36	RCP
1194+00	22.62	--	Transverse	Caltrans	36	RCP
1194+19	22.62	--	Transverse	Caltrans	36	RCP
1194+36	22.63	--	Transverse	Caltrans	36	RCP
1195+34	22.64	--	Transverse	Caltrans	48	RCP
1195+50	22.65	--	Transverse	Caltrans	48	RCP
1195+66	22.65	--	Transverse	Caltrans	48	RCP
1195+83	22.65	--	Transverse	Caltrans	48	RCP

Start		End Station*	Direction	Owner	Diameter** (inches)	Conduit Material
Station*	Post Mile					
1196+00	22.66	--	Transverse	Caltrans	48	RCP
1199+00	22.71	--	Transverse	Caltrans	8	CSP
1202+19	22.77	--	Transverse	Caltrans	30	APC
1204+74	22.82	1205+16	Longitudinal	Caltrans	12	APC
1204+74	22.82	1205+16	Longitudinal	Caltrans	12	APC
1204+96	22.83	1205+20	Longitudinal	Caltrans	18	APC
1205+00	22.83	--	Transverse	Caltrans	18	APC
1205+00	22.83	--	Transverse	Caltrans	24	APC
1205+12	22.83	1205+30	Longitudinal	Caltrans	12	APC
1205+20	22.83	1205+46	Longitudinal	Caltrans	12	APC
1209+01	22.90	--	Transverse	Caltrans	8	CSP
1209+47	22.91	--	Transverse	Caltrans	54	RCP
1209+52	22.91	--	Transverse	Caltrans	54	RCP
1211+16	22.94	--	Transverse	Caltrans	36	CSP
1216+12	23.04	--	Transverse	Caltrans	24	APC
1217+20	23.06	--	Transverse	Caltrans	24	APC
1221+65	23.14	--	Transverse	Caltrans	30	APC
1223+92	23.19	--	Transverse	Caltrans	30	APC
1229+00	23.28	--	Transverse	Caltrans	8	CSP
1229+40	23.29	--	Transverse	Caltrans	24	APC
1232+47	23.35	--	Transverse	Caltrans	24	APC
1239+00	23.47	--	Transverse	Caltrans	8	CSP
1239+00	23.47	--	Transverse	Caltrans	8	CSP
1239+26	23.48	--	Transverse	Caltrans	18	APC
1239+58	23.48	--	Transverse	Caltrans	18	APC
1239+59	23.48	--	Transverse	Caltrans	14 by 6*	RCB (*feet)
1239+95	23.49	--	Transverse	Caltrans	18	APC
1240+95	23.51	1241+44	Longitudinal	Caltrans	12	APC
1247+02	23.62	1247+81	Longitudinal	Caltrans	18	APC
1247+03	23.62	--	Transverse	Caltrans	8	CSP
1247+61	23.63	--	Transverse	Caltrans	30	APC
1252+61	23.73	--	Transverse	Caltrans	24	APC
1252+64	23.73	1253+60	Longitudinal	Caltrans	24	APC
1252+87	23.73	--	Transverse	Caltrans	30	APC
1253+61	23.75	1254+44	Longitudinal	Caltrans	18	APC
1254+85	23.77	--	Transverse	Caltrans	8	CSP

Start		End Station*	Direction	Owner	Diameter** (inches)	Conduit Material
Station*	Post Mile					
1258+90	23.85	--	Transverse	Caltrans	18	APC
1260+00	23.87	--	Transverse	Caltrans	24	RCP
1260+54	23.88	1264+15	Longitudinal	Caltrans	24	APC
1261+96	23.91	--	Transverse	Caltrans	8	CSP
1263+58	23.94	--	Transverse	Caltrans	54	APC
1263+58	23.94	--	Transverse	Caltrans	54	APC
1263+62	23.94	--	Transverse	Caltrans	12	CSP
1265+90	23.98	--	Transverse	Caltrans	12	CSP
1266+77	24.00	--	Transverse	Caltrans	18	APC
1267+46	24.01	--	Transverse	Caltrans	48	RCP
1270+34	24.06	--	Transverse	Caltrans	24	APC
1271+97	24.10	--	Transverse	Caltrans	8	CSP
1279+95	24.25	--	Transverse	Caltrans	18	APC
1279+95	24.25	--	Transverse	Caltrans	24	APC
1282+09	24.29	--	Transverse	Caltrans	8	CSP
1284+98	24.34	--	Transverse	LLWD	24	CSP
1285+94	24.36	--	Transverse	Caltrans	54	CSP
1291+06	24.46	--	Transverse	Caltrans	24	APC
1296+56	24.56	1297+06	Longitudinal	Caltrans	12	APC
1296+56	24.56	1297+06	Longitudinal	Caltrans	12	APC
1296+57	24.56	1297+07	Longitudinal	Caltrans	12	APC
1296+81	24.57	--	Transverse	Caltrans	18	APC
1296+81	24.57	--	Transverse	Caltrans	18	APC
1299+14	24.61	--	Transverse	Caltrans	54	APC
1306+45	24.75	--	Transverse	Caltrans	42	APC
1306+45	24.75	1309+06	Longitudinal	Caltrans	24	APC
1309+08	24.80	--	Transverse	Caltrans	18	APC
1316+47	24.94	--	Transverse	Caltrans	30	CSP
1324+29	25.09	--	Transverse	Caltrans	84	CSP
1327+60	25.15	--	Transverse	Caltrans	18	CSP
1327+82	25.15	--	Transverse	Caltrans	24	CSP
1330+21	25.20	--	Transverse	Caltrans	18	APC
1335+52	25.30	--	Transverse	Caltrans	7 by 5*	RCB (*feet)
1338+43	25.35	--	Transverse	Caltrans	66	APC
1343+92	25.46	--	Transverse	Caltrans	30	RCP
1346+97	25.52	1347+80	Longitudinal	Caltrans	18	APC

Start		End Station*	Direction	Owner	Diameter** (inches)	Conduit Material
Station*	Post Mile					
1347+00	25.52	--	Transverse	Caltrans	12	APC
1347+93	25.53	1348+36	Longitudinal	Caltrans	12	APC
1353+56	25.64	--	Transverse	Caltrans	7 by 5*	RCB (*feet)
1364+11	25.84	--	Transverse	Caltrans	42	APC
1373+22	26.01	--	Transverse	Caltrans	42	APC
1377+42	26.09	--	Transverse	Caltrans	42	RCP
1377+42	26.09	--	Transverse	Caltrans	48	APC
1382+52	26.19	1384+46	Longitudinal	Caltrans	18*	APC
1382+53	26.19	1384+48	Longitudinal	Caltrans	18	APC
1382+54	26.19	1384+47	Longitudinal	Caltrans	18	APC
1383+44	26.21	--	Transverse	Caltrans	36	APC
1383+44	26.21	--	Transverse	Caltrans	30	CSP
1393+25	26.39	--	Transverse	Caltrans	42	RCP
1399+20	26.51	--	Transverse	Caltrans	36	APC
1400+70	26.53	--	Transverse	Caltrans	24	APC
1404+52	26.61	--	Transverse	Caltrans	8	CSP
1404+54	26.61	--	Transverse	Caltrans	8	CSP
1408+40	26.68	1408+97	Longitudinal	Caltrans	8	CSP
1408+54	26.68	--	Transverse	Caltrans	36	RCP
1408+78	26.69	--	Transverse	Caltrans	12 by 9*	RCB (*feet)
1408+90	26.69	1409+76	Longitudinal	Caltrans	12	APC
1409+09	26.69	--	Transverse	Caltrans	42	APC
1412+48	26.76	--	Transverse	Caltrans	8	CSP
1412+49	26.76	--	Transverse	Caltrans	8	CSP
1417+35	26.85	--	Transverse	Caltrans	8	CSP
1417+70	26.86	--	Transverse	Caltrans	8	CSP
1421+07	26.92	--	Transverse	Caltrans	24	APC
1428+05	27.05	--	Transverse	Caltrans	30	CSP
1432+76	27.14	--	Transverse	Caltrans	10 by 6*	RCB (*feet)
1432+76	27.14	--	Transverse	Caltrans	Two 8 by 6*	Two RCB (*feet)
1439+11	27.26	1441+07	Longitudinal	Caltrans	18	APC
1439+17	27.26	1441+04	Longitudinal	Caltrans	18	APC
1439+29	27.26	1441+05	Longitudinal	Caltrans	18	APC
1440+01	27.28	--	Transverse	Caltrans	42	CSP
1440+01	27.28	--	Transverse	Caltrans	36	CSP
1448+37	27.44	--	Transverse	Caltrans	18	APC

Start		End Station*	Direction	Owner	Diameter** (inches)	Conduit Material
Station*	Post Mile					
1448+86	27.45	1449+36	Longitudinal	Caltrans	18	APC
1451+17	27.49	--	Transverse	Caltrans	10 by 6*	RCB (*feet)
1451+27	27.49	--	Transverse	Caltrans	10 by 6*	RCB (*feet)
1451+37	27.49	--	Transverse	Caltrans	10 by 6*	RCB (*feet)
1460+94	27.67	1461+42	Longitudinal	Caltrans	30	APC
1466+13	27.77	--	Transverse	Caltrans	24	RCP
1467+76	27.80	--	Transverse	Caltrans	24	CSP
1478+92	28.02	--	Transverse	LLWD	18	APC
1479+33	28.02	--	Transverse	LLWD	18	APC
1480+11	28.04	1480+74	Longitudinal	LLWD	18	APC
1483+90	28.11	--	Transverse	LLWD	18	APC
1484+50	28.12	--	Transverse	LLWD	18	APC
1486+90	28.17	--	Transverse	Caltrans	42	CSP
1493+69	28.29	--	Transverse	Caltrans	30	CSP
1498+36	28.38	--	Transverse	Caltrans	48	CSP
1502+33	28.46	--	Transverse	Caltrans	72	CSP
1507+86	28.56	--	Transverse	Caltrans	36	CSP
1512+40	28.65	--	Transverse	Caltrans	30	CSP
1514+30	28.69	--	Transverse	Caltrans	42	CSP
1522+83	28.85	--	Transverse	Caltrans	18	APC
1524+52	28.88	1524+74	Longitudinal	Caltrans	12	APC
1524+65	28.88	--	Transverse	Caltrans	18	APC
1527+69	28.94	--	Transverse	LLWD	78	CSP
1536+32	29.10	1536+85	Longitudinal	Caltrans	18	APC
1536+70	29.11	1537+35	Longitudinal	Caltrans	18	APC
1537+21	29.12	1537+76	Longitudinal	Caltrans	18	APC
1543+43	29.24	--	Transverse	Caltrans	36	Culvert Pipe
1544+11	29.25	--	Transverse	Caltrans	18	APC
1554+64	29.45	--	Transverse	LLWD	66	CSP
1562+72	29.60	--	Transverse	LLWD	72	CSP
1571+33	29.77	--	Transverse	Caltrans	54	CSP
1579+48	29.92	--	Transverse	Caltrans	24	APC
1587+08	30.06	--	Transverse	Caltrans	18	APC
1587+53	30.07	--	Transverse	Caltrans	18	APC
1587+99	30.08	1588+67	Longitudinal	Caltrans	18	APC
1595+20	30.22	--	Transverse	Caltrans	60	CSP

Start		End Station*	Direction	Owner	Diameter** (inches)	Conduit Material
Station*	Post Mile					
1602+95	30.36	--	Transverse	Caltrans	36	CSP
1603+37	30.37	--	Transverse	Caltrans	18	CSP
1604+87	30.40	--	Transverse	Caltrans	18	CSP
1605+12	30.41	--	Transverse	Caltrans	24	CSP
1605+39	30.41	--	Transverse	Caltrans	18	CSP
1605+79	30.42	--	Transverse	Caltrans	18	CSP
1605+80	30.42	1605+96	Longitudinal	Caltrans	18	CSP
1606+61	30.43	--	Transverse	Caltrans	8 by 6*	RCB (*feet)
1606+76	30.44	1608+52	Longitudinal	Caltrans	24	CSP
1606+84	30.44	--	Transverse	Caltrans	24	CSP
1613+11	30.56	--	Transverse	Caltrans	30	CSP
1615+95	30.61	--	Transverse	Caltrans	24	CSP
1621+85	30.72	--	Transverse	Caltrans	18	CSP
1627+78	30.83	--	Transverse	Caltrans	18	CSP
1630+49	30.89	--	Transverse	Caltrans	48	CSP
1636+55	31.00	--	Transverse	Caltrans	36	CSP
1642+17	31.11	--	Transverse	Caltrans	18	CSP
1643+00	31.12	--	Transverse	Caltrans	48	CSP
1643+00	31.12	--	Transverse	Caltrans	24	CSP
1646+06	31.18	--	Transverse	Caltrans	12	CSP
1647+54	31.21	--	Transverse	Caltrans	12	CSP
1650+00	31.26	--	Transverse	Caltrans	18	CSP
1650+13	31.26	--	Transverse	Caltrans	36	CSP
1656+22	31.37	--	Transverse	Caltrans	36	CSP
1660+14	31.45	--	Transverse	Caltrans	18	CSP
1660+57	31.46	--	Transverse	Caltrans	36	CSP
1668+36	31.60	--	Transverse	Caltrans	24	CSP
1669+10	31.62	--	Transverse	Caltrans	12	CSP
1671+37	31.66	--	Transverse	Caltrans	24	CSP
1674+94	31.73	--	Transverse	Caltrans	36	CSP
1678+74	31.80	--	Transverse	Caltrans	36	CSP
1682+32	31.87	--	Transverse	Caltrans	18	CSP
1683+01	31.88	--	Transverse	Caltrans	18	CSP
1683+90	31.90	--	Transverse	Caltrans	12	CSP
1684+42	31.91	--	Transverse	LLWD	24	CSP
1684+72	31.91	--	Transverse	Caltrans	12	CSP

Start		End Station*	Direction	Owner	Diameter** (inches)	Conduit Material
Station*	Post Mile					
1685+96	31.94	--	Transverse	Caltrans	12	CSP
1686+40	31.94	--	Transverse	Caltrans	12	CSP
1687+82	31.97	1688+50	Longitudinal	Caltrans	12	CSP
1688+03	31.98	1688+84	Longitudinal	Caltrans	12	CSP
1688+50	31.98	1689+09	Longitudinal	Caltrans	12	CSP
1696+52	32.14	--	Transverse	Caltrans	42	CSP
1706+36	32.32	--	Transverse	Caltrans	24	CSP
1708+35	32.36	--	Transverse	Caltrans	36	CSP
1720+59	32.59	--	Transverse	Caltrans	36	APC
1721+60	32.61	--	Transverse	Caltrans	30	APC
1727+06	32.71	--	Transverse	Caltrans	18	CSP
1727+10	32.72	1734+93	Longitudinal	Caltrans	24	CSP
1731+09	32.79	--	Transverse	Caltrans	18	CSP
1734+95	32.86	--	Transverse	Caltrans	18	CSP
1734+98	32.86	1740+19	Longitudinal	Caltrans	30	CSP
1737+93	32.92	--	Transverse	Caltrans	12	CSP
1749+74	33.14	--	Transverse	Caltrans	48	CSP
1753+25	33.21	--	Transverse	Caltrans	48	CMP
1754+17	33.23	--	Transverse	Caltrans	18	CSP
1754+47	33.23	1755+19	Longitudinal	Caltrans	18	CSP
1755+22	33.25	--	Transverse	LLWD	24	CSP
1754+50	33.23	1755+21	Longitudinal	LLWD	24	CSP
1755+22	33.25	--	Transverse	LLWD	24	CSP
1756+01	33.26	1759+25	Longitudinal	Caltrans	54	CSP
1759+71	33.33	--	Transverse	Caltrans	54	CSP
1759+66	33.33	1764+41	Longitudinal	Caltrans	24	CSP
1770+25	33.53	--	Transverse	Caltrans	36	CSP
1775+00	33.62	--	Transverse	Caltrans	12	CSP
1775+14	33.63	--	Transverse	Caltrans	36	CSP
1778+42	33.69	--	Transverse	Caltrans	5 by 4	RCB (*feet)
1781+95	33.75	--	Transverse	Caltrans	12	CSP
1784+99	33.81	--	Transverse	Caltrans	12	CSP
1787+06	33.85	--	Transverse	Caltrans	8	Two CMP
1788+13	33.87	--	Transverse	Caltrans	7 by 6	RCB (*feet)
1790+01	33.91	--	Transverse	Caltrans	42	CSP
1796+95	34.04	--	Transverse	Caltrans	30	CSP

Start		End Station*	Direction	Owner	Diameter** (inches)	Conduit Material
Station*	Post Mile					
1807+20	34.23	--	Transverse	Caltrans	12 by 12*	RCB (*feet)
1813+86	34.36	--	Transverse	Caltrans	24	CMP
1826+38	34.60	--	Transverse	Caltrans	30	CSP
1833+00	34.72	--	Transverse	LLWD	20 by 11*	RCB (*feet)
1832+83	34.72	1837+17	Longitudinal	RCFC	6	
1846+47	34.98	--	Transverse	Caltrans	36	CSP
1850+03	35.04	--	Transverse	Caltrans	8 by 5	RCB (*feet)
1856+36	35.16	--	Transverse	Caltrans	8 by 5	RCB (*feet)
1856+51	35.17	--	Transverse	Caltrans	8	CMP
1859+19	35.22	--	Transverse	Caltrans	24	CSP
1865+81	35.34	--	Transverse	Caltrans	54	CSP
1870+18	35.43	--	Transverse	Caltrans	24	CSP
1873+32	35.48	--	Transverse	Caltrans	18	RCP
1874+91	35.52	1876+74	Longitudinal	Caltrans	18	CSP
1877+20	35.56	--	Transverse	Caltrans	54	CSP
1879+46	35.60	1883+26	Longitudinal	Caltrans	24	CSP
1880+71	35.62	1882+17	Longitudinal	Caltrans	18	ALTP
1881+10	35.63	1883+45	Longitudinal	Caltrans	24	CSP
1883+00	35.67	--	Transverse	Caltrans	36	CSP
“C1” 887+57	35.75	--	Transverse	Caltrans	24	CSP
“C1” 888+08	35.76	--	Transverse	Caltrans	54	CSP
“C1” 891+26	35.82	“C1” 892+39	Longitudinal	Caltrans	24	ALTP
“C1” 891+70	35.83	“C1” 892+26	Longitudinal	Caltrans	25	ALTP
“C1” 891+78	35.83	--	Transverse	Caltrans	24	CSP
“C1” 899+16	35.97	--	Transverse	Caltrans	12	CSP
“C1” 899+16	35.97	“C1” 902+00	Longitudinal	RCFC	24	ALTP
“C1” 902+00	36.03	“C1” 907+51	Longitudinal	Caltrans	30	ALTP
“C1” 904+44	36.07	“C1” 908+53	Longitudinal	Caltrans	24	CSP
“C1” 908+57	36.15	--	Transverse	Caltrans	54	CSP
“C1” 913+58	36.25	--	Transverse	Caltrans	48	CSP
“C1” 915+36	36.28	--	Transverse	Caltrans	24	CSP
“C1” 916+02	36.29	--	Transverse	Caltrans	24	CSP
“C1” 929+00	36.54	“C1” 930+87	Longitudinal	Caltrans	24	CMP
“C1” 930+07	36.56	“C1” 930+54	Longitudinal	Caltrans	12	CMP
“C1” 930+40	36.57	“C1” 930+75	Longitudinal	Caltrans	12	CMP
“C1” 939+00	36.73	--	Transverse	Caltrans	24	CSP

Start		End Station*	Direction	Owner	Diameter** (inches)	Conduit Material
Station*	Post Mile					
1948+39	36.91	1949+03	Longitudinal	Caltrans	24	APC
1948+51	36.91	--	Transverse	Caltrans	24	CMP
1949+11	36.92	--	Transverse	Caltrans	18	APC
1951+48	36.97	1953+23	Longitudinal	Caltrans	24	APC
1955+89	37.05	--	Transverse	Caltrans	8	CSP
1959+26	37.11	1959+90	Longitudinal	Caltrans	12	CMP
1959+93	37.13	--	Transverse	Caltrans	25	CMP
1963+50	37.19	1963+80	Longitudinal	Caltrans	24	CMP
1963+80	37.20	--	Transverse	RCFC	12 by 10*	RCB (*feet)

*All stations referenced are mainline centerline (“C” Line) unless noted otherwise.
**Conduit diameters in inches, except reinforced-concrete-box (RCB) culvert rectangular dimensions in feet.
Abbreviations: AP=Alternative Pipe, APC=Alternative Pipe Culvert, RCB=Reinforced Concrete Box (dimensions in feet), CMP=Corrugated Metal Pipe (dimensions in inches), CSP=Corrugated Steel Pipe (dimensions in inches), RCP=Reinforced Concrete Pipe (dimensions in inches),
RCFC=Riverside County Flood Control, LLWD=Lee Lake Water District (currently Temescal Valley Water District).

Condition of existing culverts should be evaluated during the next design phase. Existing culverts may need to be replaced or repaired if corroded or flow capacity needs to be increased. However, we understand that Caltrans District 8 is proposing a drainage maintenance project along I-15 between Temescal Canyon Road and Indian Truck Trail (EA 08-1L820), which may include repairs or replacement of culverts prior to I-15 ELPSE construction.

- **Transverse Drainage**: For the most part, modification of transverse drainage facilities is not expected and the overall drainage scheme outside of the median for I-15 should remain the same. Existing transverse drainage facilities will need new junction boxes and other connection improvements where new longitudinal drainage facilities in the median intersect existing transverse drainage facilities. We also understand that this is a “high trash” corridor, so trash capture devices may need to be added.
- **Longitudinal Drainage**: Proposed pavements predominantly in the median will require capping of existing median drainage facilities (inlets), and redirecting stormwater runoff to the shoulders with a combined freeway transverse section. Existing shoulder inlets and edge drains should be protected when possible and enhanced. Where there is superelevation of mainlines such that sheet flow to the shoulders is not possible, existing inlets will be replaced by grated line-drains and new conventional inlets where space permits.

Existing culverts and pipes to be abandoned should be abandoned in accordance with Section 71-6.03 of the Caltrans *Standard Special Provisions*

and any encountered corroded culverts (12- to 36-inches in diameter) should be repaired in accordance with Section 71-3.10 of the *Standard Special Provisions*. New culverts and drainpipes should be embedded in sand in accordance with Section 19-3.02F(2), soil cement in accordance with Section 19-3.02F(3) or in Controlled Low Strength Material (CLSM) where space is limited, and subgrade drainage is not intended, in accordance with Section 19-3.02G of the Caltrans *Standard Specifications*.

5.8.2 Stormwater Infiltration: Stormwater and surface runoff requirements will be accommodated by earthen swale (bio-strip or bio-swale) areas as a Design Pollution Prevention Infiltration Area (DPPIA) within the project alignment as listed in Table 6. Additional infiltration areas may be identified in the next design phase. As described in Section 7.1 (later in this report), infiltration testing should be performed for the final Materials Report (MR) during the final design stage, to evaluate infiltration characteristics at proposed stormwater infiltration improvement areas.

5.9 Rippability

Hard rock is not expected to be encountered in the near-surface median pavement areas nor in fill embankments along the easterly (northbound) edge of I-15 between Weirick and Cajalco Roads. In our opinion, most earth materials expected to be excavated in the median and fill embankments can be excavated using conventional earth moving equipment in good working condition, with light to moderate effort.

5.10 Material Sources

5.10.1 Alignment Borrow Soils: Limited borrow soils may be available from areas of the alignment within planned cuts (mostly cuts for new pavement sections). However, depending on earthwork contractor's sequencing, additional fill soils might be imported from off-site, to reach final design grades with limited haul distance, particularly to construct a roadway transverse chevron section that peaks at the centerline of I-15.

5.10.2 Recycling Shoulder Pavement Materials: This project is intended to add new lanes within the median but is not intended to improve existing mainlines. Inside (median) asphalt shoulders will be demolished. Some isolated sections of concrete removal will also be required. Therefore, pulverized median-shoulder pavements can be recycled for use in subgrades when Caltrans Standard Specifications requirements are met for lower class (e.g. Class 3) aggregate base material (e.g. gradation, durability, etc.). In-place pavement recycling is not feasible for this project due to the thickness of proposed new lanes pavement sections.

5.10.3 Off-Site Borrow Sources: As can be seen on Plate 6, *Borrow and Disposal Sites* (in pocket), there are numerous gravel pits, materials sources and disposal/recycling sites throughout the Temescal Valley. Material suppliers can be found on-line in The Blue Book (amongst other sources):

http://www.thebluebook.com/search.html?region=7&searchsrc=thebluebook&searchTerm=Aggregate&regionLabel=Corona%2C+CA

A list of mining operations eligible to sell materials to the State of California can also be found here:

http://www.conservation.ca.gov/dmr/SMARA%20Mines/ab_3098_list

5.11 Underground Utilities

Underground utilities, including fiber optic lines, storm drains and other buried utilities are reported to be crossing under I-15 at several locations along this alignment. The contractor should perform their own utility research to confirm precise locations of these and other utilities and take necessary measures to protect in place or relocate these buried utilities as appropriate, prior to proposed grading and construction.

5.12 Temporary Excavations

All temporary excavations, including utility trenches and other excavations should be performed in accordance with project plans, specifications, all OSHA and Cal-OSHA requirements, and the current edition of the California Construction Safety Orders (see: http://www.dir.ca.gov/title8/sb4a6.html). Contractors should be advised that sandy soils (such as fills generated from onsite alluvium) will primarily be encountered along the alignment. Fill and cohesionless alluvium should be classified as Type C soils (see California Construction Safety Orders Article 6, Section 1541.1, Appendix A).

Site safety is the responsibility of the construction (earthwork) Contractor. Leighton Consulting, Inc. does not consult in the area of safety engineering. The contractor must be responsible for providing a "competent person" as defined in Article 6 of the California Construction Safety Orders. During construction, exposed soil conditions should be regularly evaluated to verify that conditions are as anticipated. Close coordination between their competent person and the Geotechnical Engineer of Record should be maintained to facilitate construction while providing safe excavations.

Spoil piles from the excavation(s) and construction equipment should be kept away from the sides of the trenches. Surcharge loads should not be permitted within a

horizontal distance equal to the height of cut or 5 feet, whichever is greater, measured from the top of the cut, unless the cut is shored appropriately. Excavations that extend below an imaginary plane inclined at 45 degrees below the edge of any adjacent existing foundation should be properly shored to maintain support of the adjacent structure(s).

5.13 Stormwater Infiltration Basins

Stormwater infiltration basins and other infiltration devices should be designed as promulgated by Caltrans' April 2019 *Stormwater Quality Handbooks Project Planning and Design Guide*:

https://dot.ca.gov/-/media/dot-media/programs/design/documents/f0005755-final-ppdgjuly-2017-rev4292019a11y2.pdf

Table B-2 and Checklist T-1 Part 2 included in Caltrans' *Design Guide* provide a synopsis of infiltration device design and siting criteria. Infiltration testing and evaluation should be performed during the final-design-stage.

5.14 Observation and Testing During Construction

This preliminary report was based, in part, upon data obtained from a limited number of past observations, site visits, soil excavations, samples and tests. Such information is, by necessity, incomplete. The nature of many alignments is such that differing soil or geologic conditions can be experienced within small distances and under varying climatic conditions. Changes in subsurface conditions can and do occur over time. Findings, conclusions and recommendations presented in this report should be revised, refined and/or augmented based on complete PS&E-phase geotechnical (engineering and geology) studies. In addition, the Geotechnical Engineer of Record (GEOR) must be provided opportunities to observe subsurface conditions during construction to confirm that Caltrans preliminary data is representative for this alignment. Geotechnical engineering recommendations are subject to change based on weather at the time of construction, means and methods of construction implemented, and possibly unanticipated subsurface conditions exposed between and/or beyond past exploratory borings.

6.0 REPORT LIMITATIONS

This report was prepared solely for HDR, for their use in preliminary design of the proposed Interstate 15 (I-15) Express Lanes Project Southern Extension (ELPSE), extending from post mile (PM) 20.3 in Lake Elsinore to PM 40.1 in Corona, Riverside County, California, on behalf of the Riverside County Transportation Commission (RCTC), in cooperation with the California Department of Transportation (Caltrans) District 8. This report may not contain sufficient information for other uses, or for purposes of other parties. This report does **not** address the potential for encountering hazardous materials in soil and/or groundwater. This report has been prepared in accordance with the care and skill generally exercised by professionals in the field of geotechnical engineering and engineering geology, under similar circumstances in California at the present time. No other representation, either express or implied, is made, and no warranty or guarantee is included or intended.

In the event that any substantial change in nature, design and/or location of the proposed improvements occur, conclusions and recommendations of this report should not be considered valid unless such changes are reviewed, and conclusions and recommendations are either verified or modified by Leighton Consulting, Inc. to adapt to a revised design. Leighton Consulting, Inc. is not responsible for any claims, damages or liability associated with reinterpretation or reuse by others of Caltrans' subsurface data contained in this report.

R E F E R E N C E S

A-Tech Consulting, Inc., May 4, 2020, Limited Asbestos and Lead Chip Assessment, Interstate 15 Express Lanes Project Southern Extension (ELPSE), 08-RIV-15 PM 20.3 to 38.8, Lake Elsinore to Corona, County of Riverside, State of California, EA 08-0J0820, Prepared for HDR Engineering, Inc., Atch-192661.

Caltrans, May 1996, *Memos To Designers 5-1*: http://www.dot.ca.gov/hq/esc/techpubs/manual/bridgemanuals/bridge-memo-to-designer/page/Section%205/5-1m.pdf

_____, 2004, Bridge Design Specifications, Section 5 – Retaining Walls: http://www.dot.ca.gov/hq/esc/techpubs/manual/bridgemanuals/bridge-design-specifications/page/section5.pdf

_____, October 5, 2005, *Pavement Climate Regions* map: https://dot.ca.gov/-/media/dot-media/programs/maintenance/documents/office-of-concrete-pavement/climate/pavement-climateregions-100505-a11y.pdf

_____, June 2008, *Memos to Designers 1-35*: http://www.dot.ca.gov/hq/esc/techpubs/manual/bridgemanuals/bridge-memo-to-designer/page/Section_1/1-35.pdf

_____, January 2013, *Memos to Designers 20-10, Fault Rupture*: https://dot.ca.gov/-/media/dot-media/programs/engineering/documents/memotodesigner/20-10.pdf

_____, July 2017 (updated April 2019), *Stormwater Quality Handbook: Project Planning and Design Guide*, by HQ Office of Hydraulics and Stormwater Design: https://dot.ca.gov/-/media/dot-media/programs/design/documents/f0005755-final-ppdgjuly-2017-rev4292019a11y2.pdf

_____, 2018 *Standard Plans and Specifications*: https://dot.ca.gov/programs/design/ccs-standard-plans-and-standard-specifications

_____, 2018 Standard Special Provisions: https://dot.ca.gov/programs/traffic-operations/ep/specifications

_____, April 2019, *Seismic Design Criteria*, Version 2.0: https://dot.ca.gov/-/media/dot-media/programs/engineering/documents/seismicdesigncriteria-sdc/201904-seismicdesigncriteria-v2-a11y.pdf

_____, February 2021, *Caltrans Geotechnical Design Manual, Geotechnical Design Reports*: https://dot.ca.gov/-/media/dot-media/programs/engineering/documents/geotechnical-services/202102-gm-geotechnicaldesignreports-a11y.pdf

_____, May 2021, *Corrosion Guidelines* Version 3.2: https://dot.ca.gov/-/media/dot-media/programs/engineering/documents/mets/corrosion-guidelines-a11y.pdf

_____, May 20, 2022 Highway Design Manual, 7th Edition, https://dot.ca.gov/programs/design/manual-highway-design-manual-hdm

_____, September 16, 2022, *ARS Online*, Version 3.0.2, https://arsonline.dot.ca.gov/

California Department of Water Resources (CDWR), 2021, Groundwater Level Data Tool: https://wdl.water.ca.gov/WaterDataLibrary; accessed December, 2021

California Geological Survey (CGS), May 1, 2003, *State of California Special Study Zone, Corona South Quadrangle, Revised Official Map*.

_____, May 1, 2003, *State of California Special Study Zone, Corona North Quadrangle, Official Map*.

_____, 2018, *Earthquake Fault Zones, A Guide for Government Agencies, Property Owners/Developers, and Geoscience Practitioners for Assessing Fault Rupture Hazards in California*, Department of Conservation, Division of Mines and Geology, Special Publication 42, Revised 2018.

_____, 2022, *CGS Map Sheet 48: Shear-wave Velocity in Upper 30m of Surficial Geology (V_s30)*, California "Geoportal" webpage accessed December 14, 2022: https://gis.data.ca.gov/maps/edit?content=cadoc%3A%3Acgs-map-sheet-48-shear-wave-velocity-in-upper-30m-of-surficial-geology-vs30

Earth Mechanics, Inc. (EMI), 2013, *Final Foundation Report, Interstate 15/Cajalco Road Interchange Project, City of Corona, Riverside County, California*, 08-RIV-15, PM 36.10/37.64 Caltrans Project No. 08000003081 (EA 08-0J6104), dated November 4, 2013.

Federal Emergency Management Agency (FEMA) 2021, Flood Map Service Center Data Tool: https://msc.fema.gov/poRal/home ; Accessed December 2021.

Geo-Advantec, Inc., August 28, 2020, Preliminary Geotechnical Design Report, Interstate 15/State Route 74 (Central Avenue) Interchange Improvement Project (Post Miles 21.6/23.5), Caltrans Project No. 08-00000124 Caltrans District 8, EA 0F310, prepared for The State of California: Department of Transportation in Coordination with The City of Lake Elsinore, Project No. 17-1220.

Group Delta Consultants, Inc., February 10, 2022, *Materials Report, I-15 Interim Corridor Operations Project (ICOP), Riverside County, CA, 08-RIV-15-PM-35.7-37.0, EA 08-1M750, Project Number 08-22000037*, Prepared for Parsons, Group Delta Project No. IR633E.

HDR Engineering, Inc., January 4, 2021, Preliminary Materials Report, Interstate 15/State Route 74 Interchange, Riverside County, California, EA Riv 08-0F310, prepared for City of Lake Elsinore.

_____, July 2021, Conceptual Geometric Approval Drawing, I-15 Express Lanes Project Southern Extension (ELPSE), EA 0J0820, 24 sheets.

_____, August 2021, Initial Site Assessment, Interstate 15 Express Lanes Project Southern Extension (ELPSE), Riverside County, California, District 8-RIV-15 PM 20.3 to PM 40.1, EA 08-0J0820, Prepared for the State of California Department of Transportation in coordination with the Riverside County Transportation Commission.

Jennings, C.W., and Bryant, W.A., 2010, *Fault Activity Map of California*, California Geological Survey Geologic Data Map No. 6, map scale 1:750,000.

Kleinfelder, Inc., August 23, 2018, Materials Report I-15/Railroad Canyon Road, Interchange Improvement Project, Lake Elsinore, California 08-RIV-15-PM 17.6/19.6, Caltrans EA No. 0A4401, EFIS 0800000016, Prepared for WKE, Inc., Kleinfelder Project No. 20182322.001A.

Leighton Consulting, Inc., January 12, 2010, Initial Site Assessment (ISA) and Aerially Deposited Lead (ADL) Request for Budget Increase for Supplemental Services, Riverside County Transportation Commission, Interstate-15 Corridor Improvement Project (PA & ED) Riverside County, California, Leighton Project No. 603007-001.

_____, July 23, 2010, Aerially Deposited Lead Survey, Interstate 15 Corridor Improvement Project, District 8-RIV-15 (PM 8.74/52.25) EA 0J0800, Riverside County, California, prepared by the State of California Department of Transportation in Coordination with the Riverside County Transportation Commission, Leighton Project No. 603008-001.

_____, June 15, 2011, Revised Initial Site Assessment Report, Interstate 15 Corridor Improvement Project, District 8-RIV-15 (PM8.74/52.28) EA 0J0800, Riverside County, California, prepared by the State of California Department of Transportation in Coordination with the Riverside County Transportation Commission, Leighton Project No. 603007-001.

_____, June 17, 2015, District Preliminary Geotechnical Report, Interstate 15 Corridor Improvement Project (CIP) Toll Express Lanes (TEL), District 8-RIV-15 (PM RIV-15 PM 34.7 to SBD-15 PM 1.3) EA 0J0800, Riverside County, California, Prepared for the State of California Department of Transportation in Coordination with the Riverside County Transportation Commission, Leighton Project No. 10433.001.

_____, July 9, 2015, Preliminary Materials Report, Interstate 15 Express Lanes Project, District 8-RIV-15 (PM RIV-15 PM 34.7 to SBD-15 PM 1.3) EA 0J0800, Riverside County, California, Prepared for the State of California Department of Transportation in Coordination with the Riverside County Transportation Commission, Leighton Project No. 10433.001.

_____, January 2020, Aerially Deposited Lead Analysis, Interstate 15 Express Lanes Project Southern Extension (ELPSE), Riverside County, California, District 8-RIV-15 PM 20.3 to 38.8, EA 08-0J0820, Prepared for the State of California Department of Transportation in coordination with the Riverside County Transportation Commission, Leighton Project No. 12421.018.

_____, March 1, 2021, Structure Preliminary Geotechnical Report, Bedford Wash Bridge (Widen), Caltrans Bridge No. 56-0540 R/L (08-Riv-15 PM 36.58), Interstate 15 Corridor Operations Project (I-15 COP), District 8-RIV-15 (PM 35.6 to 37.1) EA 08-

0J0830, Project I.D. 08-21000050, Riverside County, California, Prepared for the State of California Department of Transportation in Coordination with the Riverside County Transportation Commission, Leighton Project No. 12421.015.

_____, March 25, 2021, Structure Preliminary Geotechnical Report, Horsethief Canyon Wash Bridge (Widen), Caltrans Bridge No. 56-0678 R/L (08-Riv-15 PM 29.13), Interstate 15 Express Lanes Project Southern Extension (ELPSE), District 8-RIV-15 (PM 20.3 to 40.1) EA 08-0J0820, Project I.D. 08-18000063, Riverside County, California, Prepared for the State of California Department of Transportation in Coordination with the Riverside County Transportation Commission, Leighton Project No. 12421.006.

_____, March 25, 2021, Structure Preliminary Geotechnical Report, Indian Wash Bridge (Widen), Caltrans Bridge No. 56-0677 R/L (08-Riv-15 PM 30.09), Interstate 15 Express Lanes Project Southern Extension (ELPSE), District 8-RIV-15 (PM 20.3 to 40.1) EA 08-0J0820, Project I.D. 08-18000063, Riverside County, California, Prepared for the State of California Department of Transportation in Coordination with the Riverside County Transportation Commission, Leighton Project No. 12421.007.

_____, April 7, 2021, Structure Preliminary Geotechnical Report, Indian Truck Trail UC (Widen), Caltrans Bridge No. 56-0676 R/L (08-Riv-15 PM 30.4), Interstate 15 Express Lanes Project Southern Extension (ELPSE), District 8-RIV-15 (PM 20.3 to 40.1) EA 08-0J0820, Project I.D. 08-18000063, Riverside County, California, Prepared for the State of California Department of Transportation in Coordination with the Riverside County Transportation Commission, Leighton Project No. 12421.008.

_____, April 7, 2021, Structure Preliminary Geotechnical Report, Temescal Canyon Road UC (Widen), Caltrans Bridge No. 56-0675 R/L (08-Riv-15 PM 31.9), Interstate 15 Express Lanes Project Southern Extension (ELPSE), District 8-RIV-15 (PM 20.3 to 40.1) EA 08-0J0820, Project I.D. 08-18000063, Riverside County, California, Prepared for the State of California Department of Transportation in Coordination with the Riverside County Transportation Commission, Leighton Project No. 12421.009.

_____, April 7, 2021, Structure Preliminary Geotechnical Report, Mayhew Wash Bridge (Widen), Caltrans Bridge No. 56-0674 R/L (08-Riv-15 PM 31.97), Interstate 15 Express Lanes Project Southern Extension (ELPSE), District 8-RIV-15 (PM 20.3 to 40.1) EA 08-0J0820, Project I.D. 08-18000063, Riverside County, California, Prepared for the State of California Department of Transportation in Coordination with the Riverside County Transportation Commission, Leighton Project No. 12421.010.

_____, May 12, 2021, Structure Preliminary Geotechnical Report, Gavilan Wash Bridge (Widen), Caltrans Bridge No. 56-0726 R/L (08-Riv-15 PM 25.55), District 8-RIV-15

(PM 20.3 to 40.1) EA 08-0J0820, Project I.D. 08-18000063, Riverside County, California, Prepared for the State of California Department of Transportation in Coordination with the Riverside County Transportation Commission, Leighton Project No. 12421.001.

_____, May 12, 2021, Structure Preliminary Geotechnical Report, Lake Street UC (Widen), Caltrans Bridge No. 56-0682 R/L (08-Riv-15 PM 26.69), Interstate 15 Express Lanes Project Southern Extension (ELPSE), District 8-RIV-15 (PM 20.3 to 40.1) EA 08-0J0820, Project I.D. 08-18000063, Riverside County, California, Prepared for the State of California Department of Transportation in Coordination with the Riverside County Transportation Commission, Leighton Project No. 12421.002.

_____, May 13, 2021, Structure Preliminary Geotechnical Report, Temescal Canyon Road OH (Widen), Caltrans Bridge No. 56-0681 R/L (08-Riv-15 PM 27.78), Interstate 15 Express Lanes Project Southern Extension (ELPSE), District 8-RIV-15 (PM 20.3 to 40.1) EA 08-0J0820, Project I.D. 08-18000063, Riverside County, California, Prepared for the State of California Department of Transportation in Coordination with the Riverside County Transportation Commission, Leighton Project No. 12421.003.

_____, May 14, 2021, Structure Preliminary Geotechnical Report, Temescal Wash Bridge (Widen), Caltrans Bridge No. 56-0680 R/L (08-Riv-15 PM 28.04), Interstate 15 Express Lanes Project Southern Extension (ELPSE), District 8-RIV-15 (PM 20.3 to 40.1) EA 08-0J0820, Project I.D. 08-18000063, Riverside County, California, Prepared for the State of California Department of Transportation in Coordination with the Riverside County Transportation Commission, Leighton Project No. 12421.004.

_____, May 14, 2021, Structure Preliminary Geotechnical Report, Horsethief Canyon Road UC (Widen), Caltrans Bridge No. 56-0679 R/L (08-Riv-15 PM 28.87), Interstate 15 Express Lanes Project Southern Extension (ELPSE), District 8-RIV-15 (PM 20.3 to 40.1) EA 08-0J0820, Project I.D. 08-18000063, Riverside County, California, Prepared for the State of California Department of Transportation in Coordination with the Riverside County Transportation Commission, Leighton Project No. 12421.005.

_____, July 8, 2021, Structure Preliminary Geotechnical Report, Coldwater Wash Bridge (Widen), Caltrans Bridge No. 56-0543 R/L (08-Riv-15 PM 32.96), Interstate 15 Express Lanes Project Southern Extension (ELPSE), District 8-RIV-15 (PM 20.3 to 40.1) EA 08-0J0820, Project I.D. 08-18000063, Riverside County, California, Prepared for the State of California Department of Transportation in Coordination with the Riverside County Transportation Commission, Leighton Project No. 12421.011.

_____, July 14, 2021, Structure Preliminary Geotechnical Report, Temescal Canyon Road UC (Widen), Caltrans Bridge No. 56-0542 R/L (08-Riv-15 PM 33.25), Interstate 15 Express Lanes Project Southern Extension (ELPSE), District 8-RIV-15 (PM 20.3 to 40.1) EA 08-0J0820, Project I.D. 08-18000063, Riverside County, California, Prepared for the State of California Department of Transportation in Coordination with the Riverside County Transportation Commission, Leighton Project No. 12421.012.

_____, July 15, 2021, Structure Preliminary Geotechnical Report, Brown Canyon Wash Bridge (Widen), Caltrans Bridge No. 56-0559 R/L (08-Riv-15 PM 34.72), Interstate 15 Express Lanes Project Southern Extension (ELPSE), District 8-RIV-15 (PM 20.3 to 40.1) EA 08-0J0820, Project I.D. 08-18000063, Riverside County, California, Prepared for the State of California Department of Transportation in Coordination with the Riverside County Transportation Commission, Leighton Project No. 12421.013.

_____, July 15, 2021, Structure Preliminary Geotechnical Report, Weirick Road UC (Widen), Caltrans Bridge No. 56-0541 R/L (08-Riv-15 PM 35.64), Interstate 15 Express Lanes Project Southern Extension (ELPSE), District 8-RIV-15 (PM 20.3 to 40.1) EA 08-0J0820, Project I.D. 08-18000063, Riverside County, California, Prepared for the State of California Department of Transportation in Coordination with the Riverside County Transportation Commission, Leighton Project No. 12421.014.

_____, August 5, 2022, Preliminary Materials Report, Interstate 15 Express Lanes Project Southern Extension (ELPSE), District 8-RIV-15 (PM 20.3 to 40.1) EA 08-0J0820, Project I.D. 08-18000063, Riverside County, California, Prepared for the State of California Department of Transportation in Coordination with the Riverside County Transportation Commission, Leighton Project No. 12421.016.

Michael Baker International (MBI), December 2021, *Preliminary Hydraulics Report (PHR), 1-15 Express Lanes Project Southern Extension, Bedford Wash (Bridge No. 56-0540 R/L*, MBI Project No. 174273, EA RIV 08-0J0820, in association with HDR for RCTC and Caltrans.

Riverside County, 2004, General Plan Safety Element and Appendix H - Geotechnical Report (Technical Background Document), Adopted October 7, 2003, Geologic Hazards Map of Riverside County, printed May 17, 2004

Riverside County Information Technology, 2022, Map My County (website), http://mmc.rivcoit.org/MMC_Public/Viewer.html?Viewer=MMC_Public

Seed, H.B. and Whitman, R.V. 1970, “Design of Earth Retaining Structures for Dynamic Loads,” ASCE Specialty Conference-Lateral Stresses in the Ground and Earth Retaining Structures.

Tokimatsu, K. and Seed, H. B., 1987, "Evaluation of Settlements in Sands Due to Earthquake Shaking," Journal of the Geotechnical Engineering Division, American Society of Civil Engineers, Vol. 113, No. 8, pp. 861-878.

Twining Laboratories, Inc., April 19, 2006, Materials Report Roadway Widening California State Route 74, Post Mile R16.160 to Post Mile 17.570 Lake Elsinore California, Caltrans District 8, Riverside County, CA, Bridge Number 56-723 R/L Twining Project No. D050C4.06-02.

United States Department of Agriculture, 2022, *Web Soil Survey*, accessed on October 4, 2022: https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm

United States Geological Survey (USGS), Geologic Map of the San Bernardino and Santa Ana 30' x 60' Quadrangles, California, Open File Report 2006-1217, compiled by Douglas M. Morton and Fred K. Miller, Scale 1:100,000, 2006.

Table R-1. Reviewed Aerial Photos

Date	Flight Number	Frame	Scale	Source
1938	Riv-38	A-5-18	1:12,000	Fairchild
09/23/1953	AXM-6K	6K-115 & 6K-114	1:20,000	RCFCD
11/09/1956	R11956	3-14,3-15,&3-16	1:12,000	RCFCD
1/30/1962	RCFC 62	3-513 &3-514	1:24,000	RCFCD
5/24/1974	RCFC 74	5	1:24,000	RCFCD
1/23/1980	RCFC 80	4-5	1:12,000	RCFCD

RCFCD=Riverside County Flood Control District

Project: 12421.017	Eng/Geol: TCB/RFR
Scale: 1 " = 3,000 '	Date: September 2022
Base Map: USGS 1:24,000 Topographic Map Quadrangles served by ESRI ArcGIS Online 2022	

PROJECT ALIGNMENT MAP

Interstate 15
Express Lanes Project, Southern Extension
Riverside County, California

PLATE 1

Leighton

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REGIONAL GEOLOGIC MAP

Interstate 15
Express Lanes Project, Southern Extension
Riverside County, California

PLATE 2

Leighton

Approximate Project Alignment

RIVERSIDE

ORANGE

ELSINORE

Legend

- af, Artificial Fill
- Qyls, Landslide Deposits
- Qyf, Young Alluvial Fan Deposits
- Qya, Young Alluvial Valley Deposits
- Qyw, Young Alluvial Wash Deposits
- Qf, Alluvial Fan Deposits
- Qw, Alluvial Wash Deposits
- Qof, Old Alluvial Fan Deposits
- Qoa, Old Alluvial Valley Deposits
- Qvof, Very Old Alluvial Fan Deposits
- Qvoa, Very Old Alluvial Valley Deposits
- Qow, Old Alluvial Wash Deposits
- Ql, Lacustrine, Playa and Estuarine (Paralic) Deposits
- Qpf, Coarse-grained formations of Pleistocene age and younger
- Kgt, Granitic and other intrusive crystalline rocks of all ages
- Kp, Fine-grained Cretaceous age formations of sedimentary origin
- Kss, Coarse-grained Cretaceous age formations of sedimentary origin
- Kvem, Cretaceous age formations of volcanic origin
- Jbc, Cretaceous and Pre-Cretaceous metamorphic formations of sedimentary and volcanic origin
- Tlm, Fine-grained Tertiary age formations of sedimentary origin
- Tvs, Coarse-grained Tertiary age formations of sedimentary origin

N

0 4,000 8,000
Feet

Project: 12421.016	Eng/Geol: TCB/RFR
Scale: 1 " = 4,000 '	Date: December 2021

Base Map: USGS 1:24,000 Topographic Map Quadrangles serverd by ESRI ArcGIS Online 2021

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SAN BERNARDINO
RIVERSIDE

Approximate Project Alignment

Glen Ivy North fault

Glen Ivy South fault

Wildomar fault

Willard fault

RIVERSIDE
ORANGE

N

0 3,000 6,000
Feet

Project: 12421.017	Eng/Geol: TCB/RFR
Scale: 1 " = 3,000 '	Date: September 2022

Reference: Fault Activity Map GIS Service from maps.conservation.ca.gov
Basemap: USGS 1:24,000 Topographic Map Quadrangles served by ESRI ArcGIS Online 2022

REGIONAL FAULT MAP

Interstate 15
Express Lanes Project, Southern Extension
Riverside County, California

PLATE 3

Leighton

Legend

Fault activity

Recency of Movement

- Historic (<200 years)
- Holocene (<11,700 years)
- Late Quaternary (last 700,000 years)
- Quaternary (<1.6M years)

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Approximate
I-15 ELPSE Alignment

N

0 5 10
Miles

Legend

Historical Earthquakes Magnitude (≥M3.5)
1769 through 2022

- 3.5 - 3.99
- 4.0 - 4.99
- 5.0 - 5.99
- 6.0 - 6.99

Project: 12421.017	Eng/Geol: TCB/RFR
Scale: 1 " = 5 miles	Date: September 2022

Reference: Historic Seismicity GIS Service from maps.conservation.ca.gov
Basemap: USGS 1:24,000 Topographic Map Quadrangles serverd by ESRI ArcGIS Online 2022

HISTORICAL SEISMICITY MAP

Interstate 15
Express Lanes Project, Southern Extension
Riverside County, California

PLATE 4

Leighton

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Approximate Project Alignment

Orange County

RIVERSIDE

NORCO

CORONA

LAKE ELSINORE

CANYON

LAKE MATHEWS

IRONWOOD AVE

COTTONWOOD AV

CACTUS AV

VAN BUREN BLV

EL SOBRANTE RD

CAJALCO RD

WOOD RD

TRAUTWEIN RD

SANTA ROSA MINE RD

ETIWANAC RD

TEMESCAL CANYON RD

LAKESHORE DR

SH-74

GRAND AVE

BUNDY CANYON RD

PALOMAR ST

JURUPA RD

LIMONITE AVE

HAMNER AVE

ARCHIBALD AVE

MAGNOLIA AVE

56TH ST

6TH ST

FIFTH ST

T.2S.R.6W.

T.2S.R.5W.

T.2S.R.4W.

T.3S.R.6W.

T.3S.R.5W.

T.3S.R.4W.

T.4S.R.6W.

T.4S.R.5W.

T.4S.R.4W.

T.5S.R.7W.

T.5S.R.6W.

T.5S.R.5W.

T.5S.R.4W.

T.6S.R.6W.

T.6S.R.5W.

T.6S.R.4W.

T.7S.R.6W.

T.7S.R.5W.

T.7S.R.4W.

Legend

- Groundwater Wells
- HHGWT Contour
- Major Roads
- Highways
- County Faults
- Alquist Priolo Fault Zones
- County Fault Zones
- Existing Mapped Landslides

Liquefaction Hazard Zones

- Study Required
- Discretionary
- Sections
- Townships
- Cities
- Waterbodies
- County Boundary
- Surrounding Counties

N

0 3,000 6,000 Feet

Project: 12421.017	Eng/Geol: TCB/RFR
Scale: 1 " = 3,000 '	Date: September 2022

Reference: County of Riverside Geologic Hazards Map, 2004
Basemap: USGS 1:24,000 Topographic Map Quadrangles served by ESRI ArcGIS Online 2022

REGIONAL GEOLOGIC HAZARDS MAP
Interstate 15
Express Lanes Project, Southern Extension
Riverside County, California

PLATE 5

Leighton

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FST North Plant Aggregate

Eagle Valley Aggregates

El Sobrante Landfill

Chandler Aggregates (Corona)

Approximate Project Alignment

Pacific Aggregates

Chandler Aggregates

N

0 2,000 4,000 Feet

Legend

POSSIBLE DISPOSAL AND/OR BORROW SITE

Project: 12421.017	Eng/Geol: TCB/RFR
Scale: 1 " = 2,000 '	Date: September 2022

Basemap: USGS 1:24,000 Topographic Map Quadrangles served by ESRI ArcGIS Online 2022

BORROW AND DISPOSAL SITES

Interstate 15
Express Lanes Project, Southern Extension
Riverside County, California

PLATE 6

Leighton

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APPENDIX A

CALTRANS AS-BUILT LOTB SHEETS

Copies of available *Log Of Test Borings* (LOTBs) from along this alignment are included in this appendix (38 sheets). **No** current geotechnical subsurface exploration or geotechnical laboratory testing was performed for this current (PA&ED) phase of this project.

Any new plans will be based on the NAVD88 vertical datum while older Log of Test Borings (LOTB) sheets (older than 1988) were presumably based on the NGVD29 elevation datum. As-built plans for original construction are based on the Sea Level 1929 datum which was renamed NGVD29 in 1973. NOAA reports that the NAVD88 elevations are roughly 2.7 feet higher than the NGVD29 elevations at this location; see:

http://www.ngs.noaa.gov/cgi-bin/VERCON/veR_con.prl

These attached subsurface exploration logs and related information depict subsurface conditions only at the approximate locations indicated and at the particular date designated on these logs. Subsurface conditions at other locations may differ from conditions occurring at these locations. Passage of time may result in altered subsurface conditions due to possible environmental changes. In addition, any stratification lines on these logs represent an approximate boundary between soil types and transitions may be gradual.

DIST.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	RIV	15	21.8/26.1	198	198

Robert O. Reynolds #155
ENGINEERING GEOLOGIST — CIVIL ENGINEERING GEOLOGIST NO.
DATE APPROVED: January 29 1979

DIVISION OF ENGINEERING SERVICES - GEOTECHNICAL SERVICES

As-Built Log of Test Borings sheet is considered an informational document only. As such, the State of California registration seal with signature, license number and registration certificate expiration date confirm that this is a true and accurate copy of the original document. This drawing is available and presented only for the convenience of any bidder, contractor or other interested party.

DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets
08	Riv	15	20.3/40.1	1	38

CERTIFIED ENGINEERING GEOLOGIST — DATE 12/17/2021

I-15 EXPRESS LANES PROJECT SOUTHERN EXTENSION

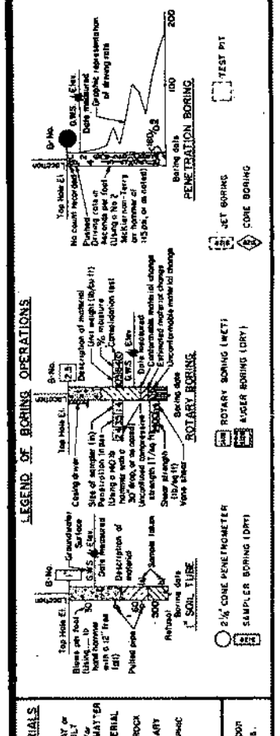
LOG OF TEST BORING 1 OF 38

NOTE: A COPY OF THIS LOG OF TEST BORINGS IS AVAILABLE AT OFFICE OF STRUCTURE MAINTENANCE AND INVESTIGATIONS, SACRAMENTO, CALIFORNIA — UNIT: EA: 08-0J0820

REGISTERED PROFESSIONAL ENGINEER — THOMAS C. BENSON JR. — No. 2091 — Exp. 03/31/2023 — GEOTECHNICAL — STATE OF CALIFORNIA

REDUCED PLAN USE SCALE BELOW — 3 INCHES ON ORIGINAL PLAN

LEGEND OF BORING OPERATIONS



LEGEND OF EARTH MATERIALS

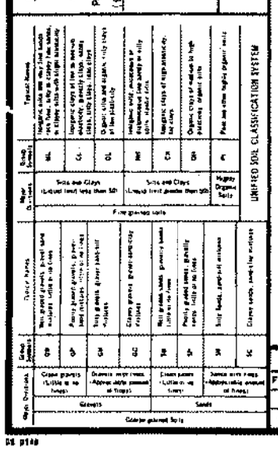
GRAVEL; SAND; SILT; CLAY; SILTY CLAY or CLAYEY SILT; PEAT and/or ORGANIC MATTER; FILL MATERIAL; IGNEOUS ROCK; SEDIMENTARY ROCK; METAMORPHIC ROCK; SANDY CLAY or CLAYEY SAND; SANDY SILT or SILTY SAND

CONSISTENCY CLASSIFICATION FOR SOILS

According to the Standard Penetration Test

Penetration Index (Blows/Ft.)	Granular	Cohesive
0 - 4	Very loose	Very soft
5 - 10	Loose	Soft
10 - 30	Slightly compact	Stiff
30 - 50	Compact	Very stiff
50 - 70	Dense	Hard
70	Very dense	Very hard

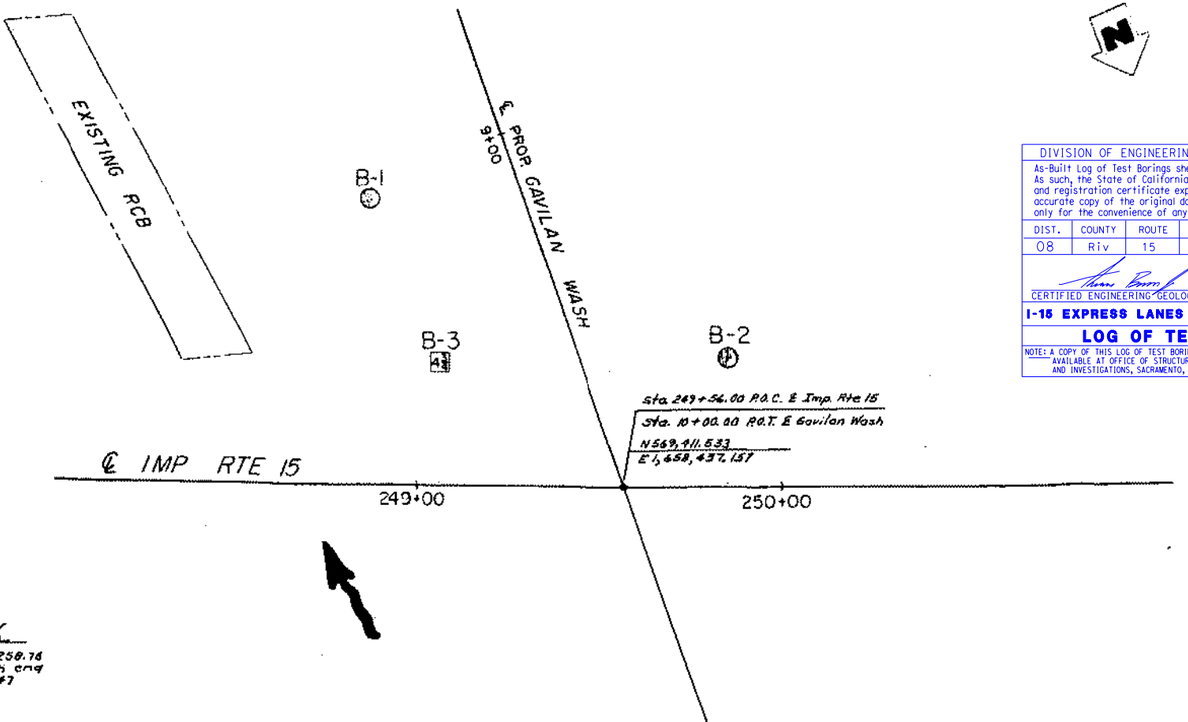
NOTE: Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.



BENCH MARK

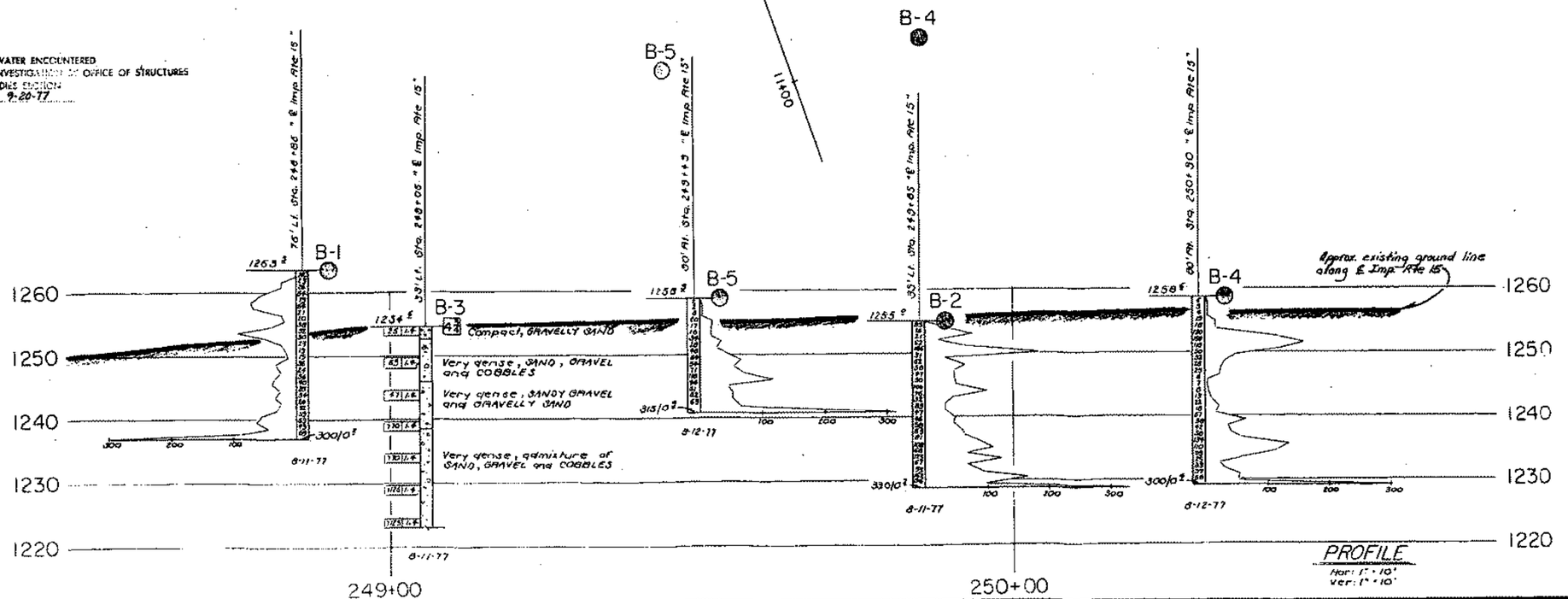
BM No. 22-A-71 Elev. 1258.76
Chiseled square on north end headwall 30' Lt. Sta. 248+97 ℄ Imp.

NO GROUND WATER ENCOUNTERED DURING THIS INVESTIGATION
OFFICE OF STRUCTURES GEOLOGIC STUDIES SECTION
DATE 9-20-77



PLAN

1" = 10'



PROFILE

Hor: 1" = 10'
Ver: 1" = 10'

ENGINEERING GEOLOGY BRANCH			
FIELD STUDY	By L.E. Price	9/77	Approval Recommended By: ENGINEERING GEOLOGIST
DRAWN	By E.D. Kung	12/77	CERTIFIED ENGINEERING GEOLOGIST NUMBER
CHECKED	By L.E. Price	1-9-78	

Corrections by D.B. Crawford 1-9-78

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES — DESIGN SECTION 5
PROJECT ENGINEER

BRIDGE NO. 56-726R/L
POST MILE 25.5

CU 08203
WO 170401

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

Disregard prints bearing earlier revision dates →

REVISION DATES (PRELIMINARY STAGE ONLY)

GAVILAN WASH BRIDGE

LOG OF TEST BORINGS

SHEET 7 OF 7

98

DS p148

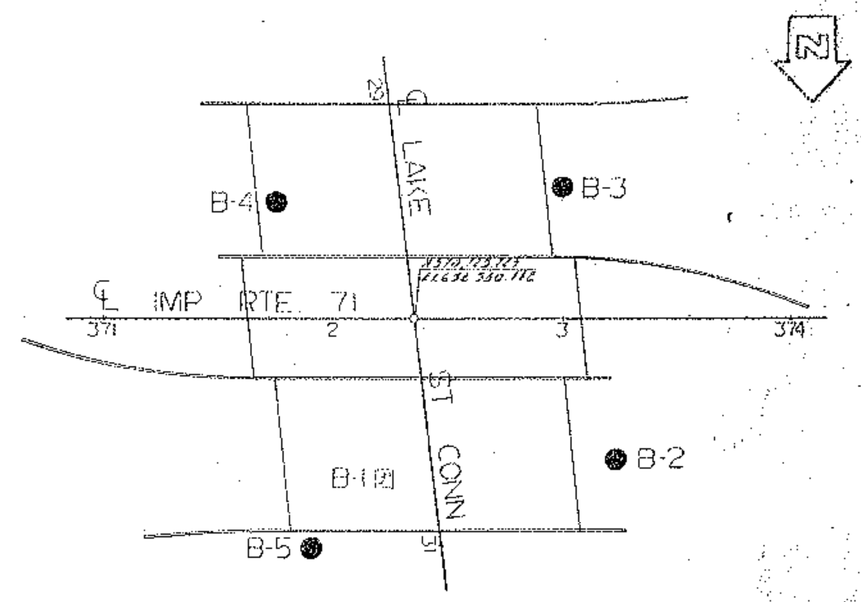
DIST.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET No.	TOTAL SHEETS
08	RIV	71			

BENCH MARK

B.M. #38-B-11 Elev. 1212.48
Brass disk in conc. buried 1.0' 172.6' Rt. 373+
14.7 E Imp. Rte. 71.

PLAN

Scale 1" = 40'



NOTE: Abutment and Bent locations obtained from General Plan. Aug. 27 1973

DIVISION OF ENGINEERING SERVICES - GEOTECHNICAL SERVICES

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DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets
08	Riv	15	20.3/40.1	2	38

CERTIFIED ENGINEERING GEOLOGIST — DATE 12/17/2021

I-15 EXPRESS LANES PROJECT SOUTHERN EXTENSION

LOG OF TEST BORING 2 OF 38

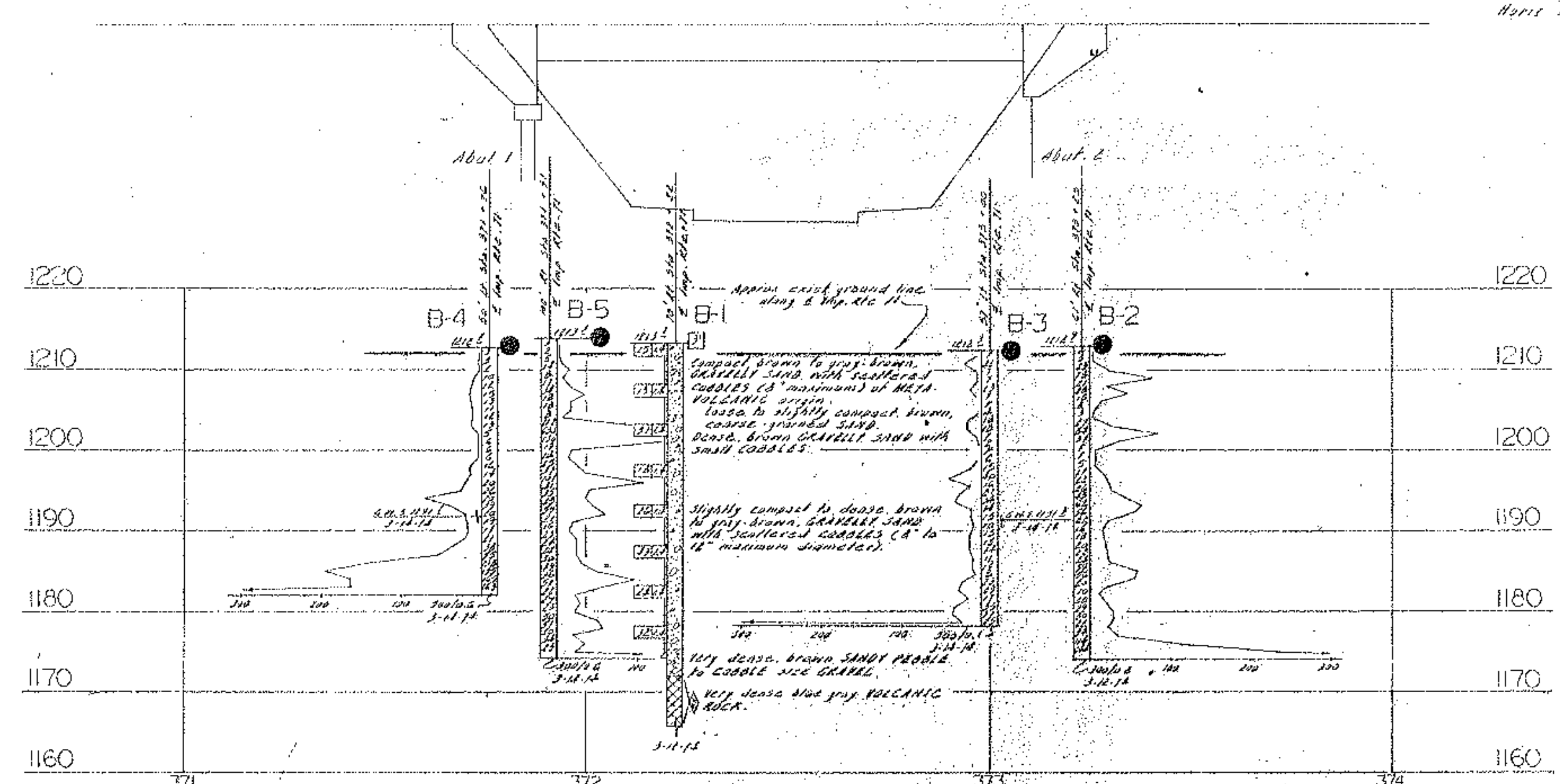
NOTE: A COPY OF THIS LOG OF TEST BORINGS IS AVAILABLE AT OFFICE OF STRUCTURE MAINTENANCE AND INVESTIGATIONS, SACRAMENTO, CALIFORNIA

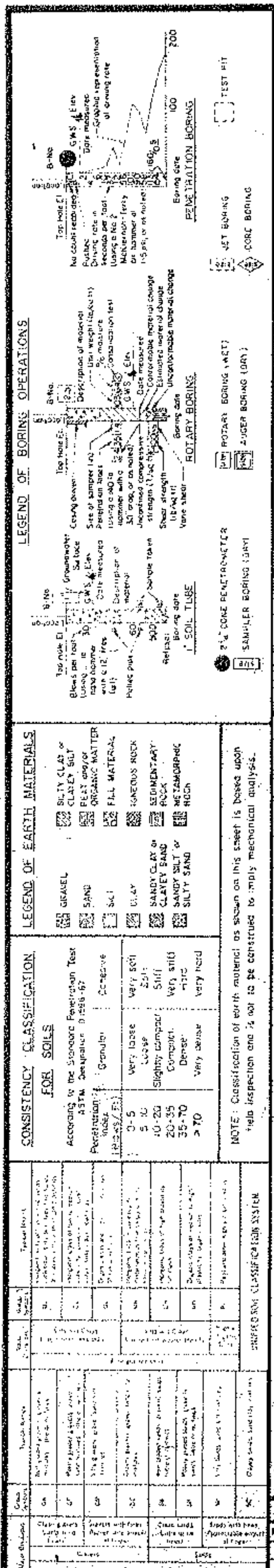
UNIT:
EA: 08-0J0820

REGISTERED PROFESSIONAL ENGINEER — THOMAS C. BENSON JR. — No. 2091 — Exp. 03/31/2023 — GEOTECHNICAL — STATE OF CALIFORNIA

PROFILE

Scale Vert 1" = 10' Horiz 1" = 20'





MAY 6 1974

ENGINEERING GEOLOGY SECTION		
FIELD STUDY	E.B. Crawford 3-15-74	
DRAWN		
CHECKED	D. Crawford 4-29-74	CERTIFIED ENGINEERING GEOLOGIST NUMBER 40

State of CALIFORNIA
DEPARTMENT OF TRANSPORTATION

BRIDGE DEPARTMENT
DESIGN SECTION
PROJECT ENGINEER

BRIDGE NO. 56-0682-RL
POST MILE 18.7

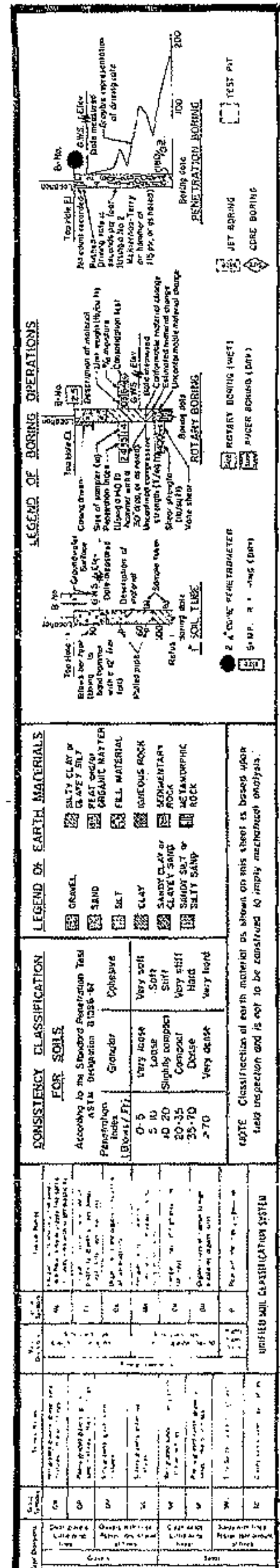
LAKE STREET UNDERCROSSING
LOG OF TEST BORINGS

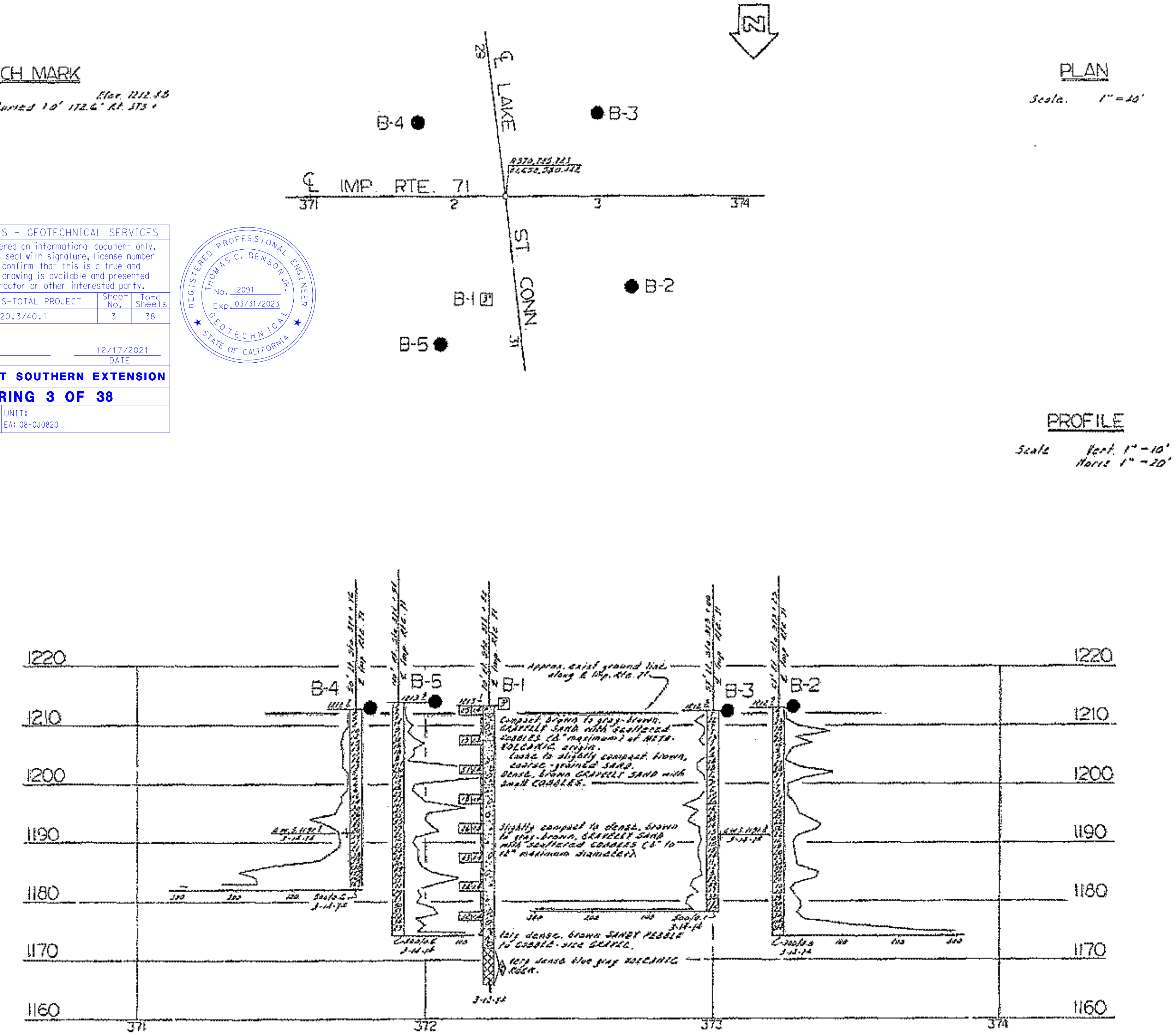
ORIGINAL SCALE IN INCHES FOR REDUCED PLANS

CU 08203

Disregard prints bearing earlier revision dates

REVISION DATES (PRELIMINARY STAGE ONLY) — SHEET — OF





DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets
08	RIV	15	26.1/30.4	148	220

CERTIFIED ENGINEERING GEOLOGIST 271

DATE APPROVED February 21, 1978

DIVISION OF ENGINEERING SERVICES - GEOTECHNICAL SERVICES

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DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets
08	Riv	15	20.3/40.1	3	38

CERTIFIED ENGINEERING GEOLOGIST — 12/17/2021 DATE

I-15 EXPRESS LANES PROJECT SOUTHERN EXTENSION

LOG OF TEST BORING 3 OF 38

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

UNIT:
EA: 08-0J0820

REGISTERED PROFESSIONAL ENGINEER — THOMAS C. BENSON JR. — No. 2091 — Exp. 03/31/2023 — GEOTECHNICAL — STATE OF CALIFORNIA

No Changes
AS BUILT
XL Wheeler nd 6-80
170504
4-7-80

ENGINEERING GEOLOGY SECTION
FIELD STUDY By D.B. Crawford 3-15-74
DRAWN By J. Lan 4-12-74
CHECKED By D. Crawford 4-29-74
ENGINEERING GEOLOGIST — CERTIFIED ENGINEERING GEOLOGIST NUMBER 40

State of
CALIFORNIA
DEPARTMENT OF TRANSPORTATION

BRIDGE DEPARTMENT
DESIGN SECTION
PROJECT ENGINEER

BRIDGE NO. 56-0682-R/L
POST MILE R 26.7

LAKE STREET UNDERCROSSING

LOG OF TEST BORINGS

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

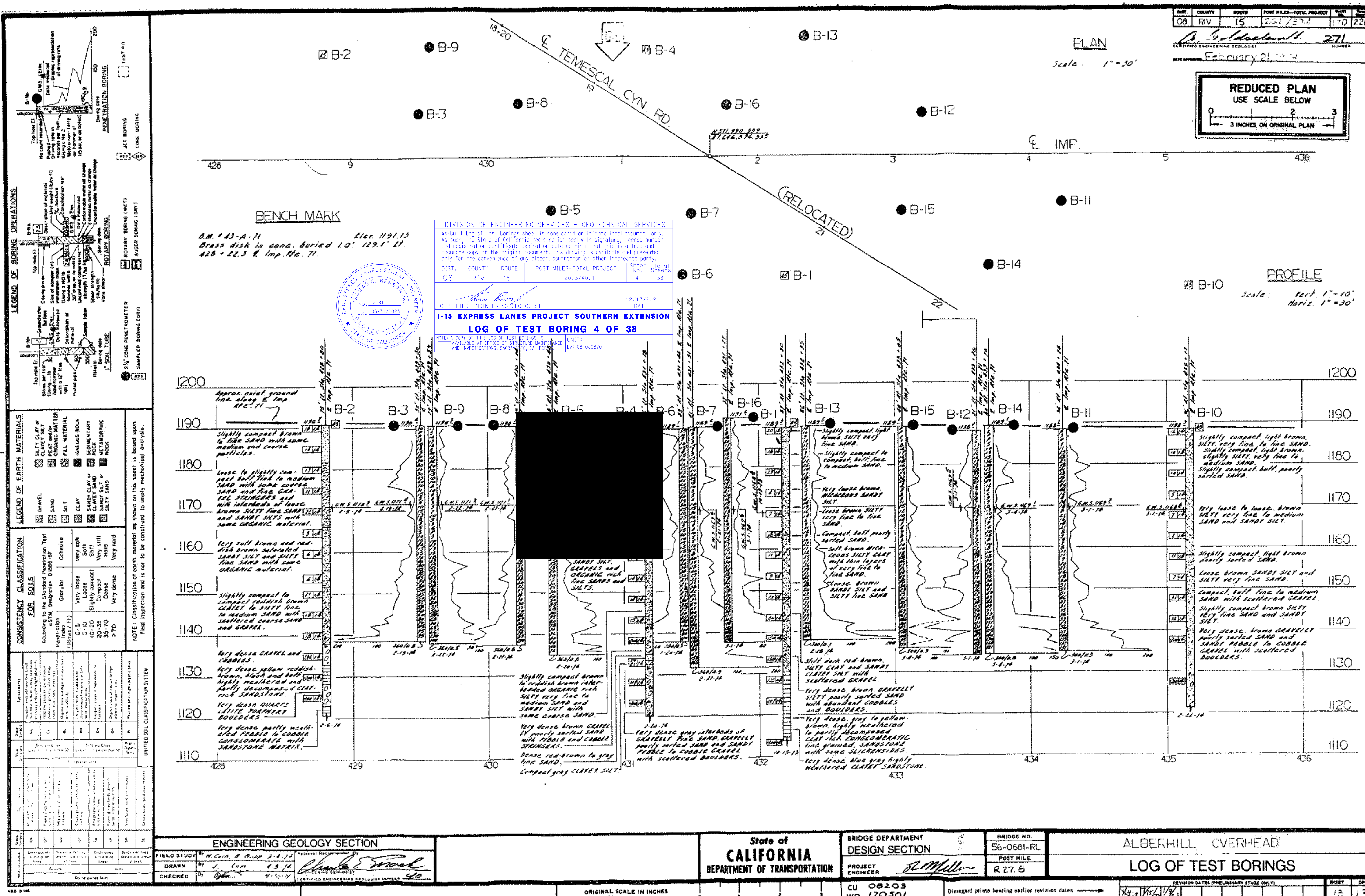
CU 08203
WO 170501

Disregard prints bearing earlier revision dates

SHEET 6 OF 6

AS BUILT PLANS
Contract No. 08-170504
Date Completed 4-7-80
Document No.

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THE DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF TRANSPORTATION.
7-16-80 — SUPERVISOR OF MICROFILM SERVICES



DIVISION OF ENGINEERING SERVICES - GEOTECHNICAL SERVICES

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DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets
08	Riv	15	20.3/40.1	4	38

CERTIFIED ENGINEERING GEOLOGIST — DATE 12/17/2021

I-15 EXPRESS LANES PROJECT SOUTHERN EXTENSION

LOG OF TEST BORING 4 OF 38

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

UNIT:
EA: 08-0J0820

ENGINEERING GEOLOGY SECTION

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

BRIDGE DEPARTMENT DESIGN SECTION

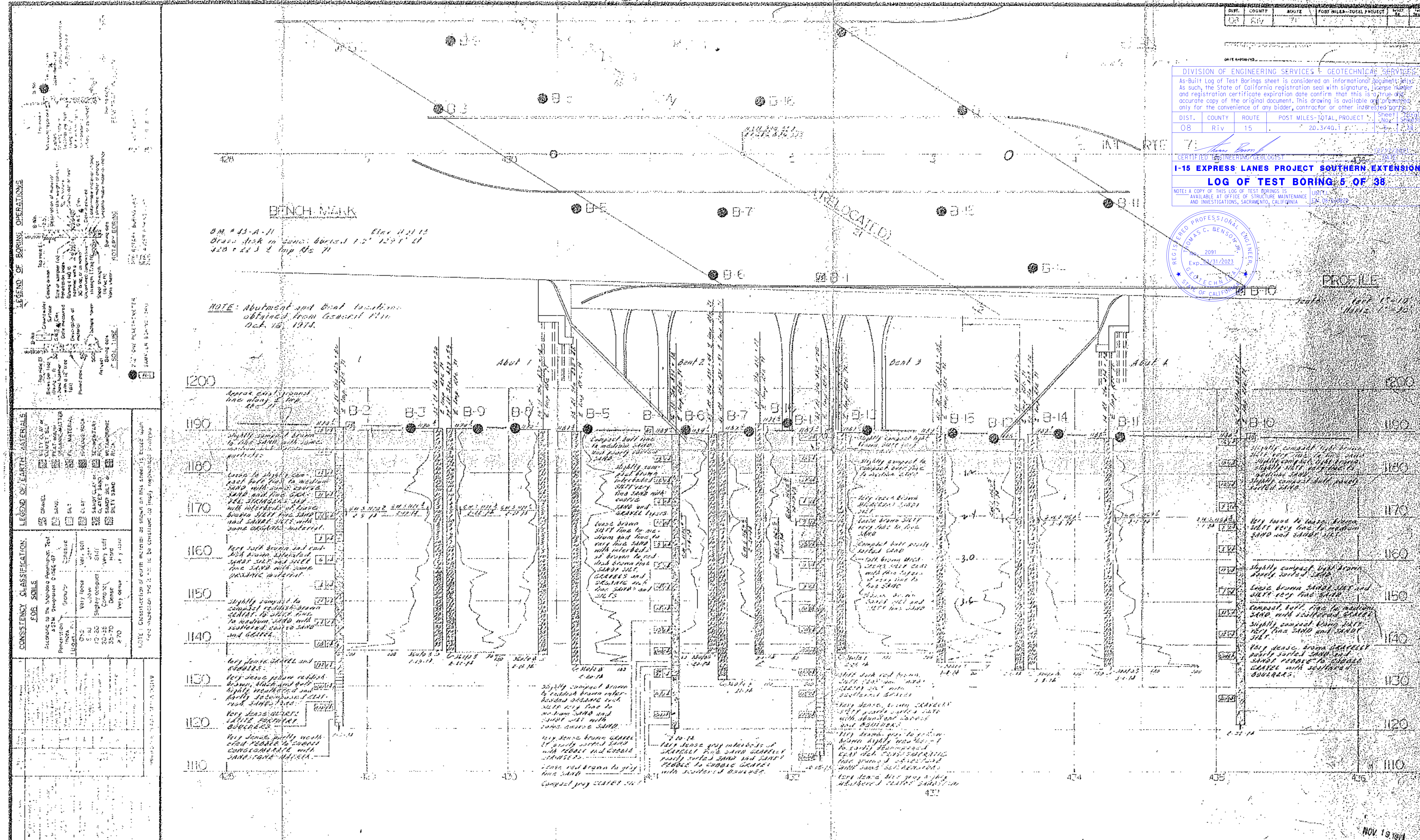
BRIDGE NO. 56-0681-RL

POST MILE R 27.8

ALBERHILL OVERHEAD

LOG OF TEST BORINGS

CU 08203
WO 170501



DIVISION OF ENGINEERING SERVICES - GEOTECHNICAL SERVICES

As-Built Log of Test Borings sheet is considered an informational document only. As such, the State of California registration seal with signature, license number and registration certificate expiration date confirm that this is a true and accurate copy of the original document. This drawing is available and presented only for the convenience of any bidder, contractor or other interested party.

DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets
08	Riv	15	20.3/40.1	5	38

CERTIFIED ENGINEERING GEOLOGIST — DATE 12/17/2021

REGISTERED PROFESSIONAL ENGINEER — THOMAS C. BENSON JR. — No. 2091 — Exp. 03/31/2023 — GEOTECHNICAL — STATE OF CALIFORNIA

I-15 EXPRESS LANES PROJECT SOUTHERN EXTENSION

LOG OF TEST BORING 5 OF 38

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

UNIT:
EA: 08-0J0820

ENGINEERING GEOLOGY SECTION

FIELD STUDY / DRAWN / CHECKED

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

BRIDGE DEPARTMENT DESIGN SECTION

PROJECT ENGINEER

BRIDGE NO. 56-0681 R/L

POST MILE

ALBERHILL OVERHEAD

LOG OF TEST BORINGS

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS

CU 08203
WO 170507

DIST.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
08	RIV	15	26.1/30.4	170	220

CERTIFIED ENGINEERING GEOLOGIST 271

DATE APPROVED February 21, 1978

DIVISION OF ENGINEERING SERVICES - GEOTECHNICAL SERVICES

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DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets
08	Riv	15	20.3/40.1	6	38

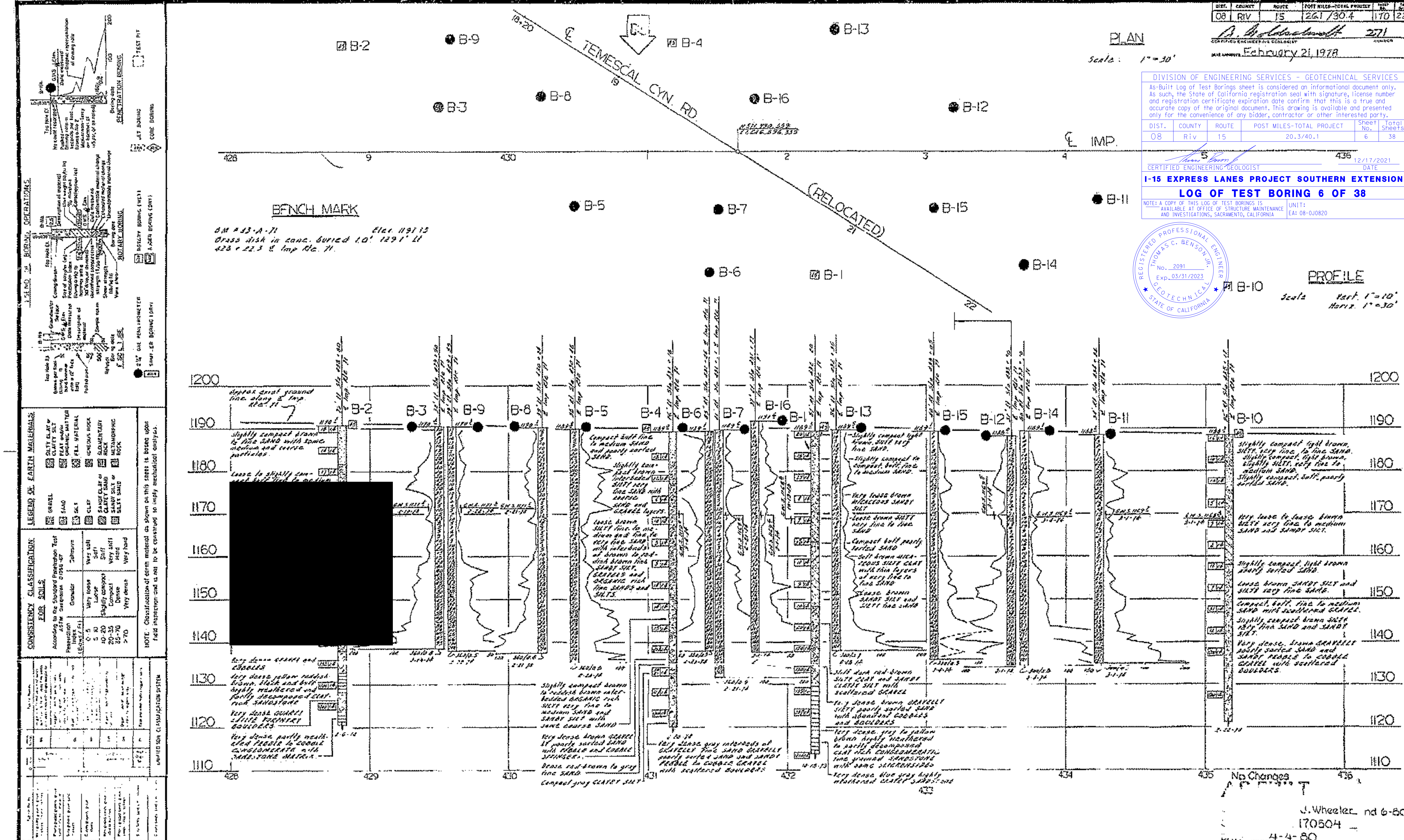
CERTIFIED ENGINEERING GEOLOGIST 12/17/2021 DATE

I-15 EXPRESS LANES PROJECT SOUTHERN EXTENSION

LOG OF TEST BORING 6 OF 38

NOTE: A COPY OF THIS LOG OF TEST BORINGS IS AVAILABLE AT OFFICE OF STRUCTURE MAINTENANCE AND INVESTIGATIONS, SACRAMENTO, CALIFORNIA. UNIT: EA: 08-0J0820

REGISTERED PROFESSIONAL ENGINEER THOMAS C. BENSON JR. No. 2091 Exp. 03/31/2023 GEOTECHNICAL STATE OF CALIFORNIA



ENGINEERING GEOLOGY SECTION

FIELD STUDY	R. Cork, R. Bopp	5-8-73
DRAWN	J. Low	5-8-74
CHECKED		4-30-74

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

BRIDGE DEPARTMENT DESIGN SECTION

PROJECT ENGINEER

BRIDGE NO. 56-0681-RL

POST MILE R27.8

ALBERHILL OVERHEAD

LOG OF TEST BORINGS

CU 08209 WO 170501

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS

SHEET 13 OF 13

AS BUILT PLANS
Contract No. 08-170504
Date Completed 4-7-80
Document No.

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

DATE 7-16-80 TITLE SUPERVISOR OF MICROFILM SERVICES

DIST.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
08	RIV	15 (71)	26.1/30.4	193	220

R.W Reynolds (sam) 165
CERTIFIED ENGINEERING GEOLOGIST — NUMBER
DATE APPROVED February 21, 1978

DIVISION OF ENGINEERING SERVICES - GEOTECHNICAL SERVICES

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DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets
08	Riv	15	20.3/40.1	7	38

CERTIFIED ENGINEERING GEOLOGIST — DATE 12/17/2021

I-15 EXPRESS LANES PROJECT SOUTHERN EXTENSION

LOG OF TEST BORING 7 OF 38

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

UNIT:
EA: 08-0J0820

REGISTERED PROFESSIONAL ENGINEER — THOMAS C. BENSON JR. — No. 2091 — Exp. 03/31/2023 — GEOTECHNICAL — STATE OF CALIFORNIA

LEGEND OF BORING OPERATIONS

PENETRATION BORING · ROTARY BORING · 1" SOIL TUBE · TEST PIT · JET BORING · CORE BORING · ROTARY BORING (WET) · AUGER BORING (DRY) · 2 1/2" CONE PENETROMETER · SAMPLER BORING (DRY)

LEGEND OF EARTH MATERIALS

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

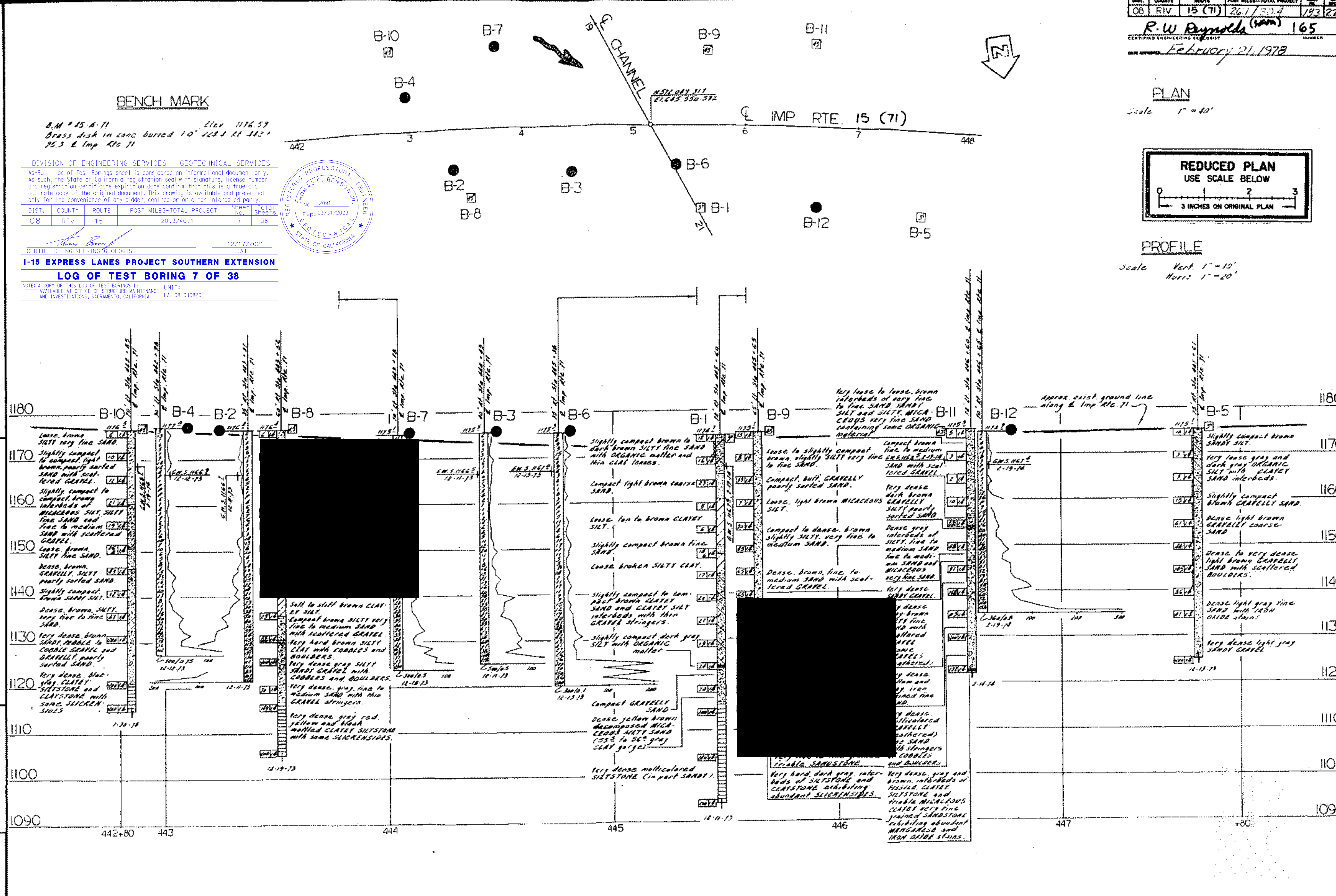
CONSISTENCY CLASSIFICATION FOR SOILS

According to the Standard Penetration Test ASTM Designation D1586-67

Penetration Index (Blows/Ft)	Granular	Cohesive
0-5	Very loose	Very soft
5-10	Loose	Soft
10-20	Slightly compact	Stiff
20-35	Compact	Very stiff
35-70	Dense	Hard
>70	Very dense	Very hard

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

UNIFIED SOIL CLASSIFICATION SYSTEM



ENGINEERING GEOLOGY SECTION		
FIELD STUDY	By W. Cam / Mike ... 2-19-74	Approval Recommended By J. L. Champlin
DRAWN	By J. Lam 3-1-74	ENGINEERING GEOLOGIST
CHECKED	By A. C. A.	CERTIFIED ENGINEERING GEOLOGIST NUMBER 368

State of **CALIFORNIA** DEPARTMENT OF TRANSPORTATION

BRIDGE DEPARTMENT
DESIGN SECTION
PROJECT ENGINEER

BRIDGE NO.	56-0680RL
POST MILE	R28.1

TEMESCAL WASH BRIDGE

LOG OF TEST BORINGS

CU 08203
WO 170501

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

Disregard prints bearing earlier revision dates →

REVISION DATES (PRELIMINARY STAGE ONLY)

SHEET 11 OF 13

183

DIVISION OF ENGINEERING SERVICES - GEOTECHNICAL SERVICES					
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DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets
08	Riv	15	20.3/40.1	8	38

CERTIFIED ENGINEERING GEOLOGIST — DATE 12/17/2021

I-15 EXPRESS LANES PROJECT SOUTHERN EXTENSION

LOG OF TEST BORING 8 OF 38

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

UNIT:
EA: 08-0J0820

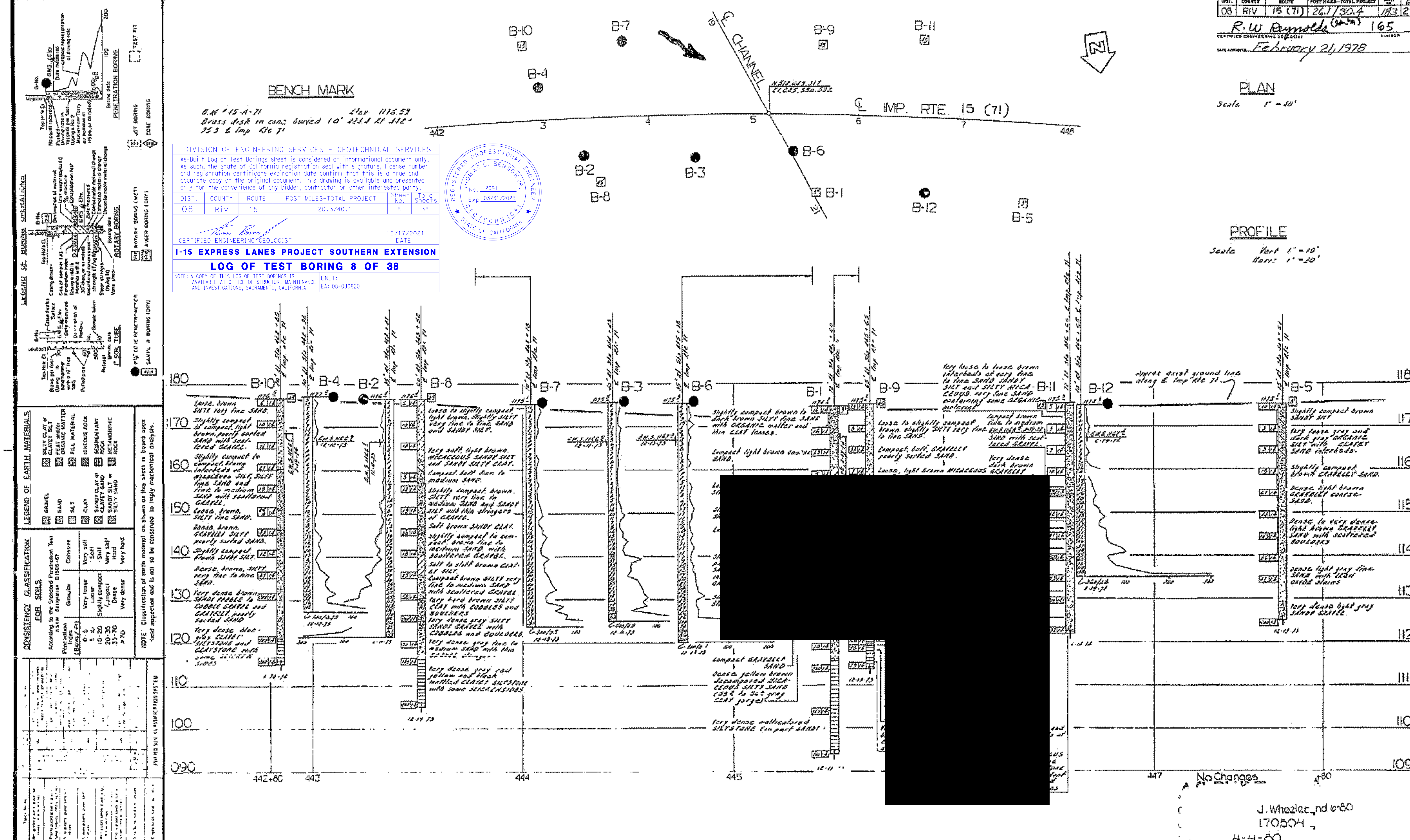
REGISTERED PROFESSIONAL ENGINEER — THOMAS C. BENSON JR. — No. 2091 — Exp. 03/31/2023 — GEOTECHNICAL — STATE OF CALIFORNIA

DIST.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
08	RIV	15 (71)	26.1/30.4	183	220

R.W. Reynolds 165
CERTIFIED ENGINEERING GEOLOGIST — NUMBER
DATE APPROVED February 21, 1978

BENCH MARK

B.M. # 15-A-71 Elev. 1116.59
Brass disk in conc. buried 10' 222.1 Rt 442+253 ℄ Imp Rte 71



ENGINEERING GEOLOGY SECTION		
FIELD STUDY	By W Cain G Hikes	2-19-74
DRAWN	By J Lam	3-21-74
CHECKED	By W Cain	3-29-74

Approval Recommended By: J. L. Champlin — ENGINEERING GEOLOGIST — CERTIFIED ENGINEERING GEOLOGIST NUMBER 365

State of **CALIFORNIA** DEPARTMENT OF TRANSPORTATION

BRIDGE DEPARTMENT — DESIGN SECTION — PROJECT ENGINEER

BRIDGE NO.	POST MILE
56-0680RL	R28.1

TEMESCAL WASH BRIDGE

LOG OF TEST BORINGS

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 08203
WO 170501

Disregard prints bearing earlier revision dates →

REVISION DATES (PRELIMINARY STAGE ONLY) 9/5/81

SHEET 13 OF 13

AS BUILT PLANS
Contract No. 08-170504
Date Completed 4-7-80
Document No. ______

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF TRANSPORTATION.
DATE 7-16-80 SIGNATURE Joseph M. Costa TITLE SUPERVISOR OF MICROFILM SERVICES

DIST.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
08	Riv	15	20.3/30.4	192	220

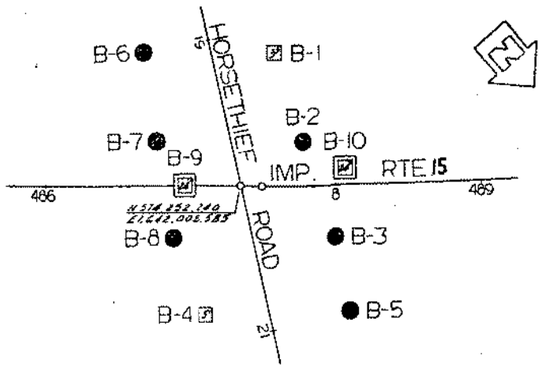
Robert L. Reynolds #165
BRIDGE ENGINEERING GEOLOGIST — CERT. ENGINEERING GEOLOGIST NO.
DATE APPROVED: February 21, 1978

BENCH MARK

B.M. P168 (PI-G) Elev. 1236.66
Standard brass disc 1 foot below ground, located approx. 100' Lt. Sta. 892 + 00 ℄ Improv. Rte. 71.

DIVISION OF ENGINEERING SERVICES - GEOTECHNICAL SERVICES					
As-Built Log of Test Borings sheet is considered an informational document only. As such, the State of California registration seal with signature, license number and registration certificate expiration date confirm that this is a true and accurate copy of the original document. This drawing is available and presented only for the convenience of any bidder, contractor or other interested party.					
DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets
08	Riv	15	20.3/40.1	9	38
CERTIFIED ENGINEERING GEOLOGIST			12/17/2021 DATE		
I-15 EXPRESS LANES PROJECT SOUTHERN EXTENSION					
LOG OF TEST BORING 9 OF 38					
NOTE: A COPY OF THIS LOG OF TEST BORINGS IS AVAILABLE AT OFFICE OF STRUCTURE MAINTENANCE AND INVESTIGATIONS, SACRAMENTO, CALIFORNIA			UNIT: EA: 08-0J0820		

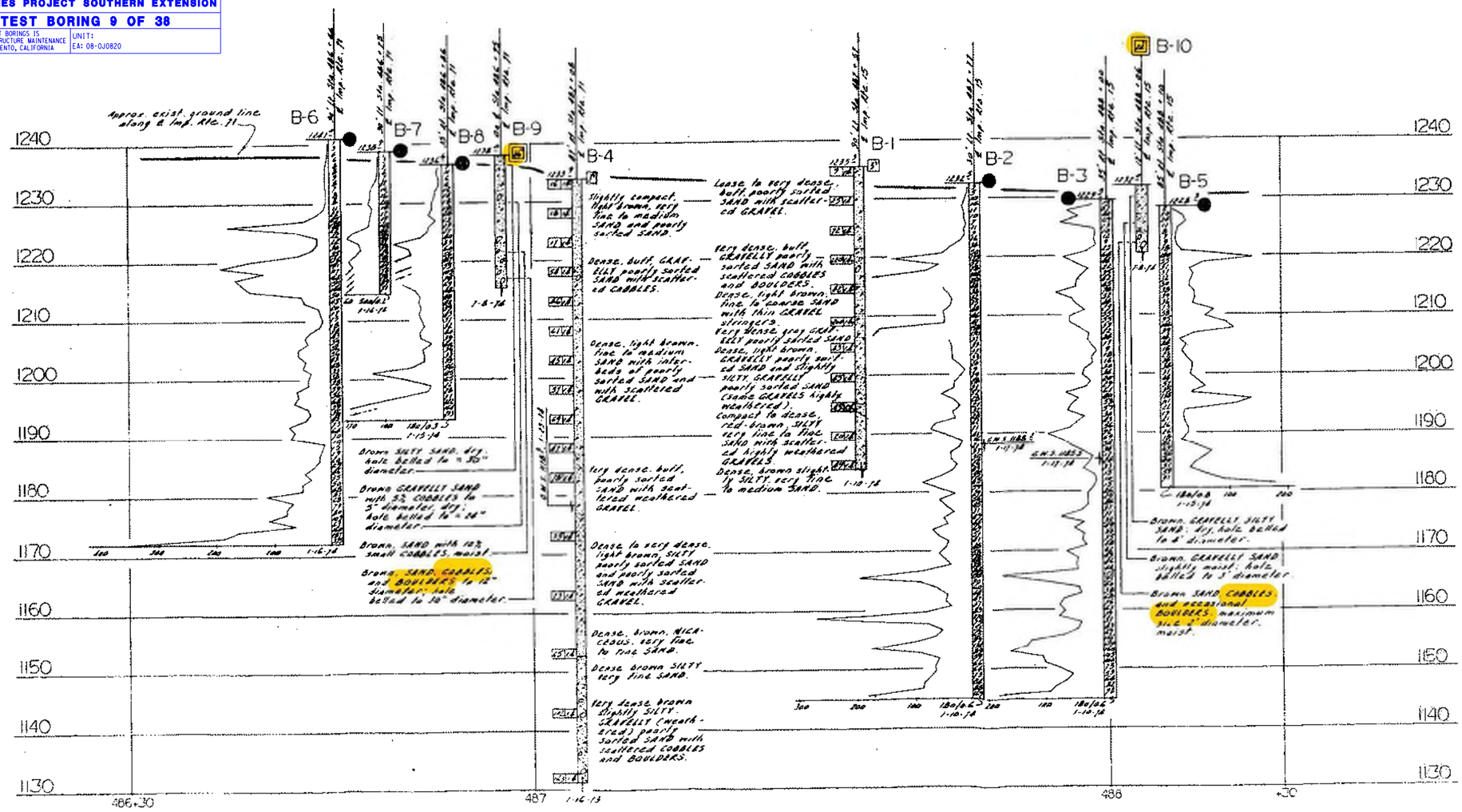
REGISTERED PROFESSIONAL ENGINEER — THOMAS C. BENSON JR. — No. 2091 — Exp. 03/31/2023 — GEOTECHNICAL — STATE OF CALIFORNIA



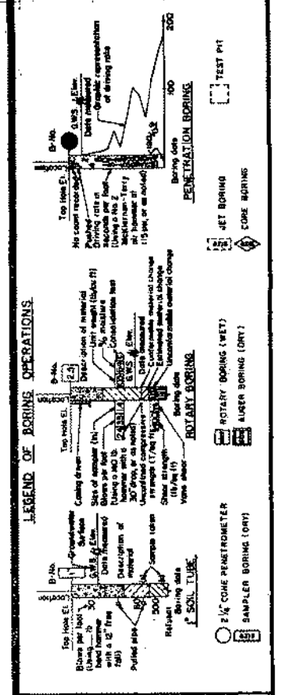
PLAN
Scale: 1" = 50'

PROFILE
Scale Vert. 1" = 10'
Horiz. 1" = 10'

REDUCED PLAN
USE SCALE BELOW
0 1 2 3
3 INCHES ON ORIGINAL PLAN



LEGEND OF BORING OPERATIONS



LEGEND OF EARTH MATERIALS

GRAVEL; SAND; SILT; CLAY; SANDY CLAY or CLAYEY SAND; SANDY SILT or SILTY SAND; SILTY CLAY or CLAYEY SILT; PEAT and/or HIGHLY ORGANIC SOILS; FILL MATERIAL; IGNEOUS ROCK; SEDIMENTARY ROCK; METAMORPHIC ROCK

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

CONSISTENCY CLASSIFICATION FOR SOILS

According to the Standard Penetration Test

Penetration (blows/ft)	Granular	Cohesive
0-5	Very loose	Very soft
5-10	Loose	Soft
10-20	Slightly compact	Stiff
20-35	Compact	Very stiff
35-70	Dense	Hard
70	Very dense	Very hard

UNIFIED SOIL CLASSIFICATION SYSTEM

Major Divisions	Letter	Typical Names	Information required for describing soils	Laboratory Classification Criteria
Coarse Grained Soils: More than half of material is larger than No. 200 sieve size	GW	Well-graded gravels, gravel-sand mixtures, little or no fines	Give typical name; indicate approximate percentages of sand and gravel; maximum size; angularity, surface condition, and hardness of the coarse grains; local or geologic name and other pertinent descriptive information; and symbol in parentheses	For undisturbed soils add information on stratification, degree of compactness, cementation, moisture conditions and drainage characteristics
	GP	Poorly graded gravels, gravel-sand mixtures, little or no fines		
	GM	Silty gravels, gravel-sand-silt mixtures		Atterberg limits below "A" line or P.I. less than 4
	GC	Clayey gravels, gravel-sand-clay mixtures		Atterberg limits above "A" line with P.I. greater than 7
	SW	Well-graded sands, gravelly sands, little or no fines		
	SP	Poorly graded sands, gravelly sands, little or no fines		
	SM	Silty sands, sand-silt mixtures		Atterberg limits below "A" line or P.I. less than 4
	SC	Clayey sands, sand-clay mixtures		Atterberg limits above "A" line with P.I. greater than 7
Fine Grained Soils: More than half of material is smaller than No. 200 sieve size	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity	Give typical name; indicate degree and character of plasticity, amount and maximum size of coarse grains; color in wet condition, odor if any, local or geologic name and other pertinent descriptive information; and symbol in parentheses	For undisturbed soils add information on structure, stratification, consistency in undisturbed and remolded states, moisture and drainage conditions
	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays		
	OL	Organic silts and organic silty clays of low plasticity		
	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts		
	CH	Inorganic clays of high plasticity, fat clays		
	OH	Organic clays of medium to high plasticity, organic silts		
Highly Organic Soils	Pt	Peat and other highly organic soils		

ENGINEERING GEOLOGY SECTION
FIELD STUDY By M. Cain, L. Rand 7-5-78
DRAWN By J. Lam 9-6-78
CHECKED By L.E. RAND 9-11-78
Approved Recommended By J. L. Champlin
ENGINEERING GEOLOGIST
CERTIFIED ENGINEERING GEOLOGIST NUMBER 368

State of CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OFFICE OF STRUCTURES
DESIGN GROUP
PROJECT ENGINEER B.C. Mellon

BRIDGE NO. 56-0679-RL
POST MILE R 28.9

HORSETHIEF ROAD UNDERCROSSING
LOG OF TEST BORINGS

CU 08203
WO 170501

Disregard prints bearing earlier revision dates →

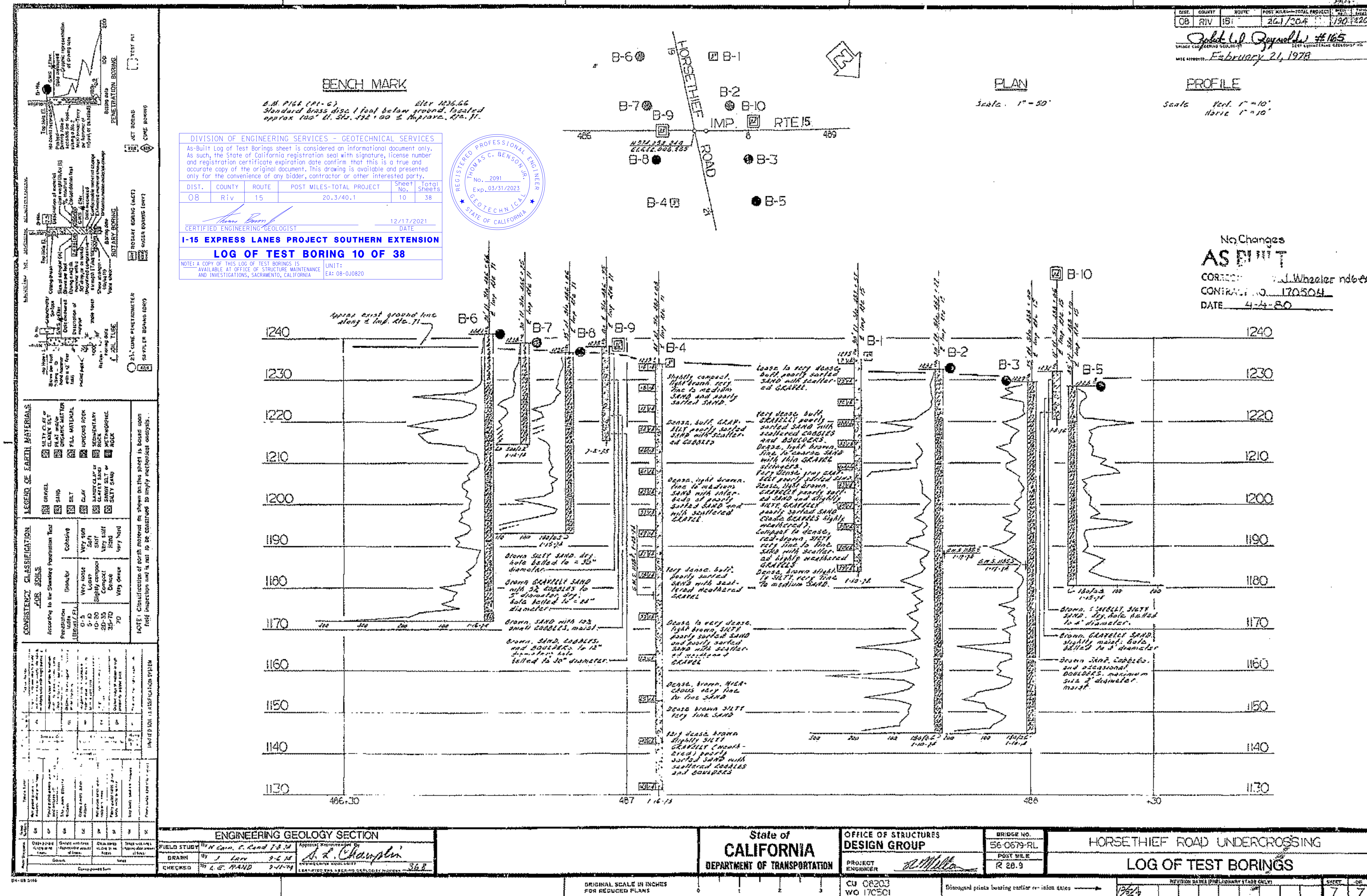
REVISION DATES (PRELIMINARY STAGE ONLY)

SHEET 7 OF 7

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

190

08-08 0146

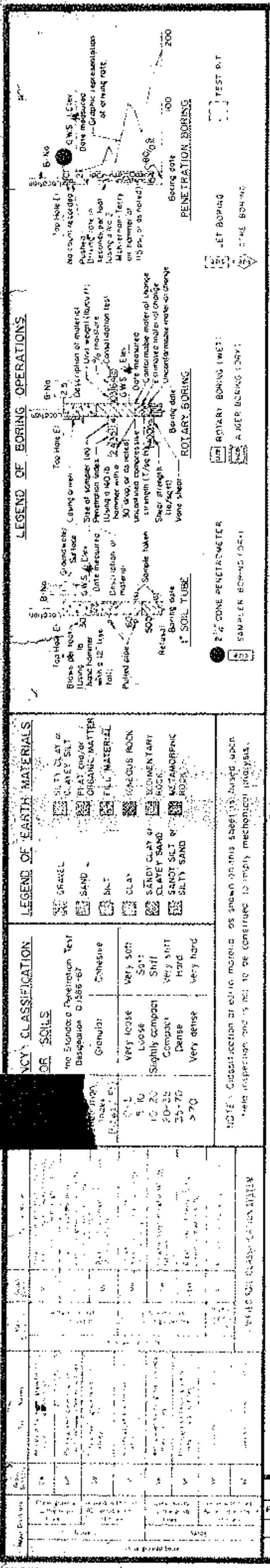


DIST. COUNTY ROUTE POST MILES—TOTAL PROJECT SHEET NO. TOTAL SHEETS
08 RIV 15 26.1/20.4 190 220
February 21, 1978
BENCH MARK
B.M. P166 (P1-G) Elev 1236.66
Standard brass disc 1 foot below ground, located approx 100' Lt. Sta. 492+00 ± Improve. Rte. 71
DIVISION OF ENGINEERING SERVICES - GEOTECHNICAL SERVICES
As-Built Log of Test Borings sheet is considered an informational document only. As such, the State of California registration seal with signature, license number and registration certificate expiration date confirm that this is a true and accurate copy of the original document. This drawing is available and presented only for the convenience of any bidder, contractor or other interested party.
DIST. COUNTY ROUTE POST MILES-TOTAL PROJECT Sheet No. Total Sheets
08 Riv 15 20.3/40.1 10 38
CERTIFIED ENGINEERING GEOLOGIST
12/17/2021
DATE
I-15 EXPRESS LANES PROJECT SOUTHERN EXTENSION
LOG OF TEST BORING 10 OF 38
NOTE: A COPY OF THIS LOG OF TEST BORINGS IS AVAILABLE AT OFFICE OF STRUCTURE MAINTENANCE AND INVESTIGATIONS, SACRAMENTO, CALIFORNIA
UNIT:
EA: 08-0J0820
REGISTERED PROFESSIONAL ENGINEER
THOMAS C. BENSON JR.
No. 2091
Exp. 03/31/2023
GEOTECHNICAL
STATE OF CALIFORNIA
HORSETHIEF ROAD
IMP. RTE 15
B-1 B-2 B-3 B-4 B-5 B-6 B-7 B-8 B-9 B-10
PLAN
Scale 1" = 50'
PROFILE
Scale Vert. 1" = 10' Horiz. 1" = 10'
No Changes
AS BUILT
CONTRACT NO. 170504
DATE 4-4-80
Approx exist ground line along ℄ Imp. Rte. 71
1240 1230 1220 1210 1200 1190 1180 1170 1160 1150 1140 1130
486+30 487 488 +30
LEGEND OF EARTH MATERIALS
CONSISTENCY CLASSIFICATION FOR SOILS
ENGINEERING GEOLOGY SECTION
State of CALIFORNIA DEPARTMENT OF TRANSPORTATION
OFFICE OF STRUCTURES DESIGN GROUP
PROJECT ENGINEER
BRIDGE NO. 56-0679-RL
POST MILE R 28.9
HORSETHIEF ROAD UNDERCROSSING
LOG OF TEST BORINGS
CU 08203
WO 170501
SHEET 7 OF 7

AS BUILT PLANS
Contract No. 08-170504
Date Completed 4-7-80
Document No.

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

DATE 7-16-80 SIGNATURE [signature] TITLE SUPERVISOR OF MICROFILM SERVICES



BENCH MARK

B.M. #53-A.11 Elev 1219.51'
Brass disk in conc buried 1' 164 C' Lt. 501 +13 ℄ Imp Rte. 11

DIVISION OF ENGINEERING SERVICES - GEOTECHNICAL SERVICES					
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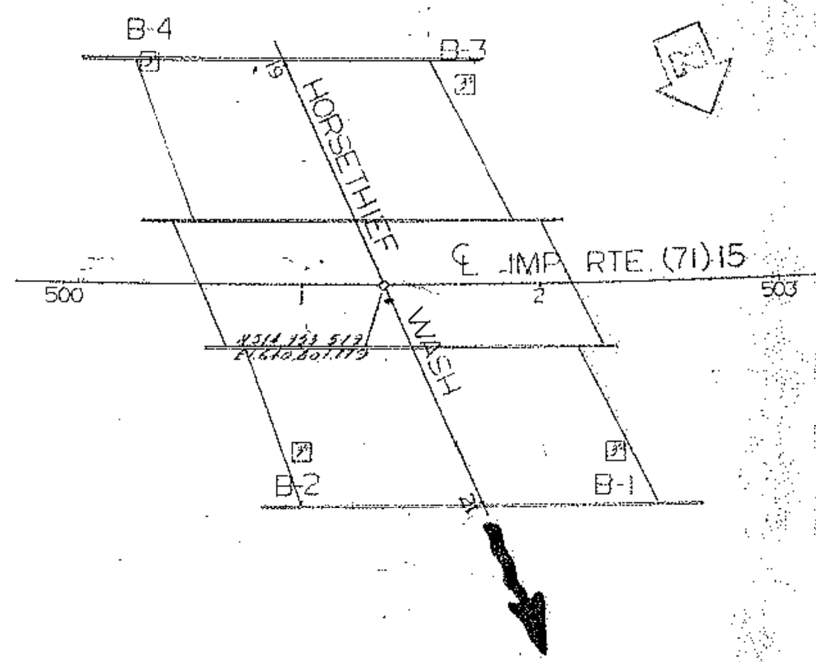
DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets
08	Riv	15	20.3/40.1	11	38
CERTIFIED ENGINEERING GEOLOGIST			DATE 12/17/2021		
I-15 EXPRESS LANES PROJECT SOUTHERN EXTENSION					
LOG OF TEST BORING 11 OF 38					
NOTE: A COPY OF THIS LOG OF TEST BORINGS IS AVAILABLE AT OFFICE OF STRUCTURE MAINTENANCE AND INVESTIGATIONS, SACRAMENTO, CALIFORNIA			UNIT: EA: 08-0J0820		

REGISTERED PROFESSIONAL ENGINEER · THOMAS C. BENSON JR. · No. 2091 · Exp. 03/31/2023 · GEOTECHNICAL · STATE OF CALIFORNIA

NOTE: Abutment and bent locations obtained from General Plan.

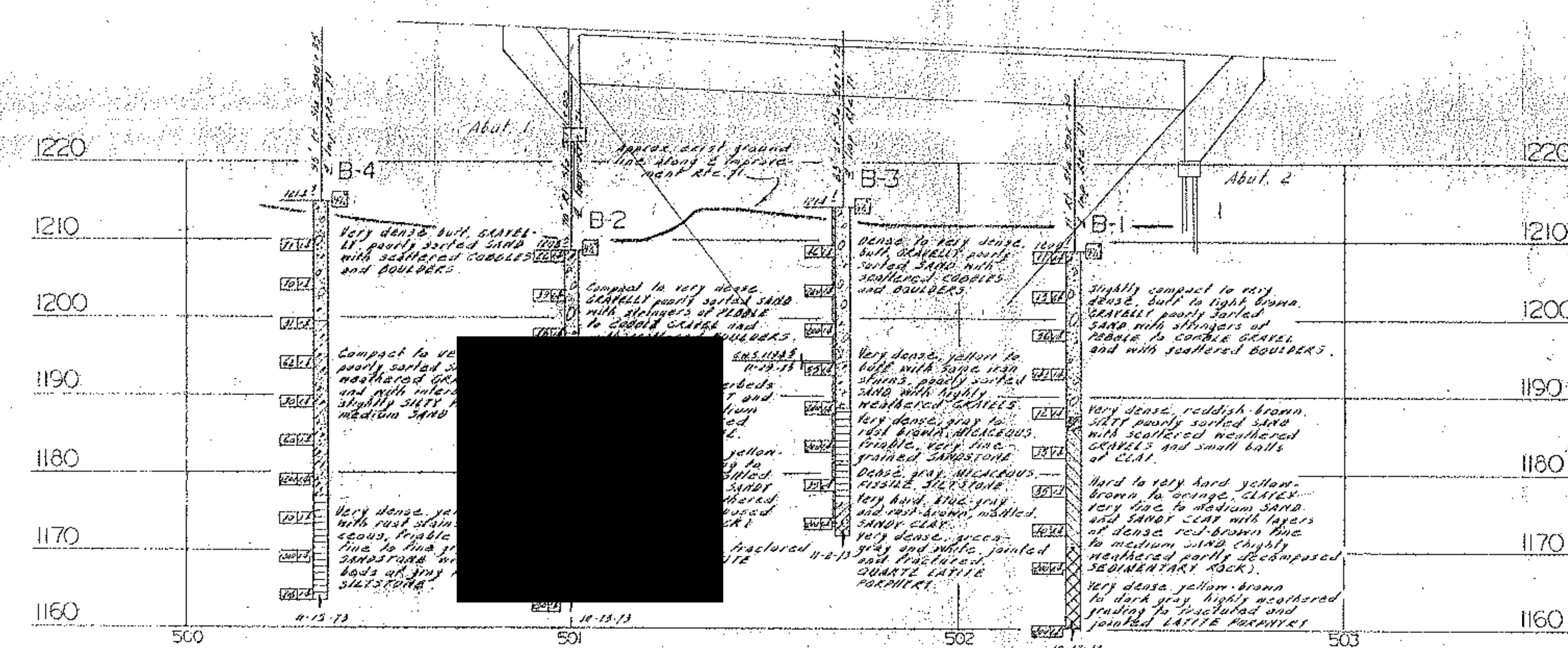
PLAN

Scale 1" = 40'



PROFILE

Scale Vert. 1" = 10'
Horiz. 1" = 20'



ENGINEERING GEOLOGY SECTION

FIELD STUDY		
DRAWN		
CHECKED		

CERTIFIED ENGINEERING GEOLOGIST

NOV 19 1974

State of CALIFORNIA
DEPARTMENT OF TRANSPORTATION

BRIDGE DEPARTMENT
DESIGN SECTION
PROJECT ENGINEER

BRIDGE NO. 56-0678-RL
POST MILE 16.3 29.1

HORSETHIEF WASH BRIDGE
LOG OF TEST BORINGS

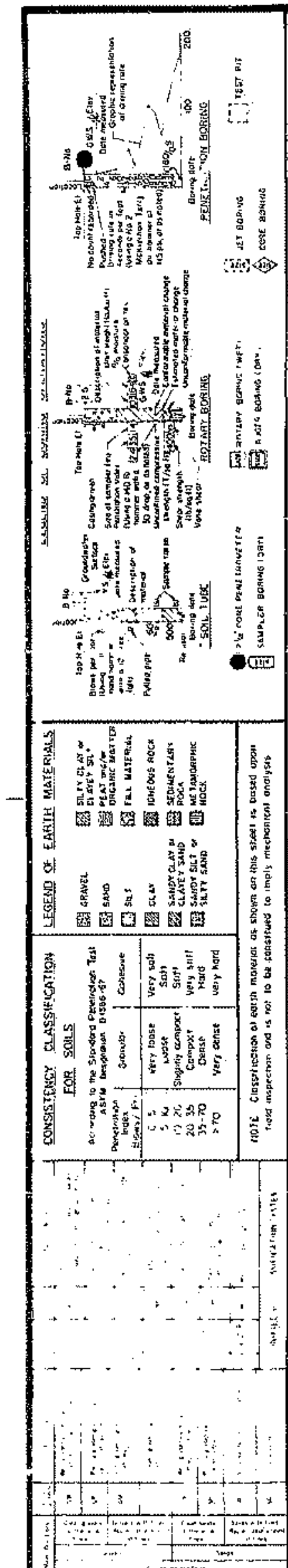
ORIGINAL SCALE IN INCHES FOR REDUCED PLANS

CU 08203
WO 170501

Disregard prints bearing earlier revision dates

DIST.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET No.	TOTAL SHEETS
08	RIV	15	26.1/30.4	197	220

Robert L. Reynolds #165
CERTIFIED ENGINEERING GEOLOGIST
DATE APPROVED February 21, 1978



BENCH MARK

B.M. #50-A-71 Elev 1219.51'
Brass disk in conc buried 1± 164.6' Lt 501 +13 ℄ Imp Rte 71

DIVISION OF ENGINEERING SERVICES - GEOTECHNICAL SERVICES

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DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets
08	Riv	15	20.3/40.1	12	38

CERTIFIED ENGINEERING GEOLOGIST — DATE 12/17/2021

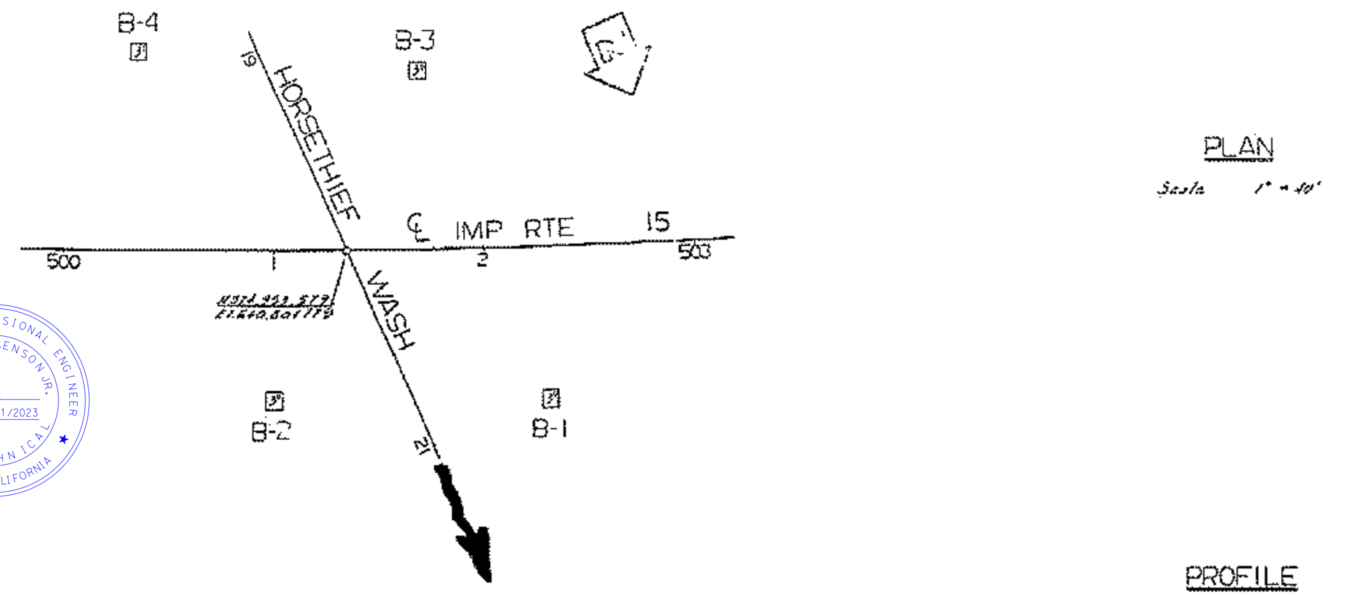
I-15 EXPRESS LANES PROJECT SOUTHERN EXTENSION

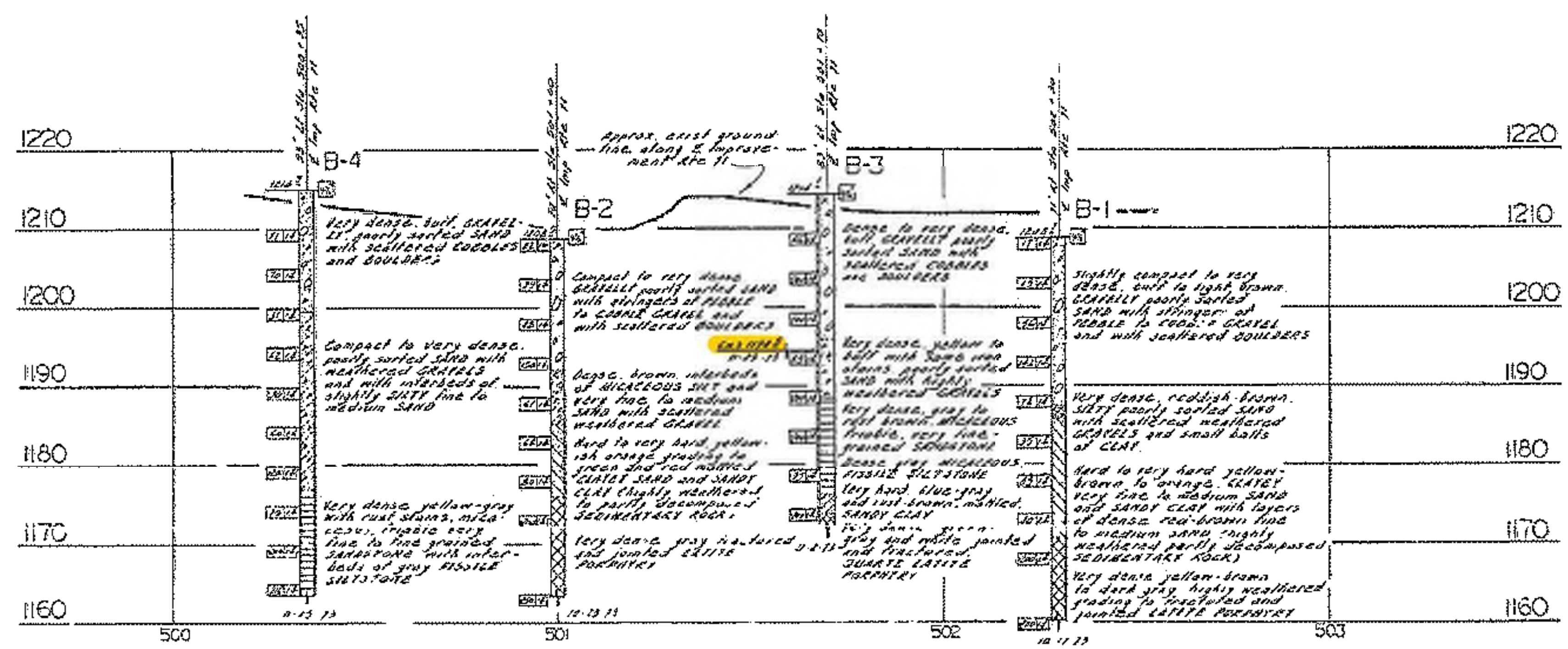
LOG OF TEST BORING 12 OF 38

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

UNIT:
EA: 08-0J0820

REGISTERED PROFESSIONAL ENGINEER — THOMAS C. BENSON, JR. — No. 2091 — Exp. 03/31/2023 — GEOTECHNICAL — STATE OF CALIFORNIA





No Changes
AS BUILT
J. Wheeler
170504
4-4-80

ENGINEERING GEOLOGY SECTION			
FIELD STUDY	W. C. Carr	4-29-77	
DRAWN	J. Carr	2-2-78	
CHECKED			

State of
CALIFORNIA
DEPARTMENT OF TRANSPORTATION

BRIDGE DEPARTMENT
DESIGN SECTION
PROJECT ENGINEER

BRIDGE NO. 56-0678-F
POST MILE R29.1

HORSETHIEF WASH BRIDGE

LOG OF TEST BORINGS

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 08203
WO 170501

Disregard prints bearing earlier revision dates →

SHEET 7 OF 7

AS BUILT PLANS
Contract No. 08-170504
Date Completed 4-7-80

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF TRANSPORTATION.
DATE 7-16-80 SIGNATURE TITLE SUPERVISOR OF MICROFILM SERVICES

DIST.	COUNTY	ROUTE
08	RIV	15(71)

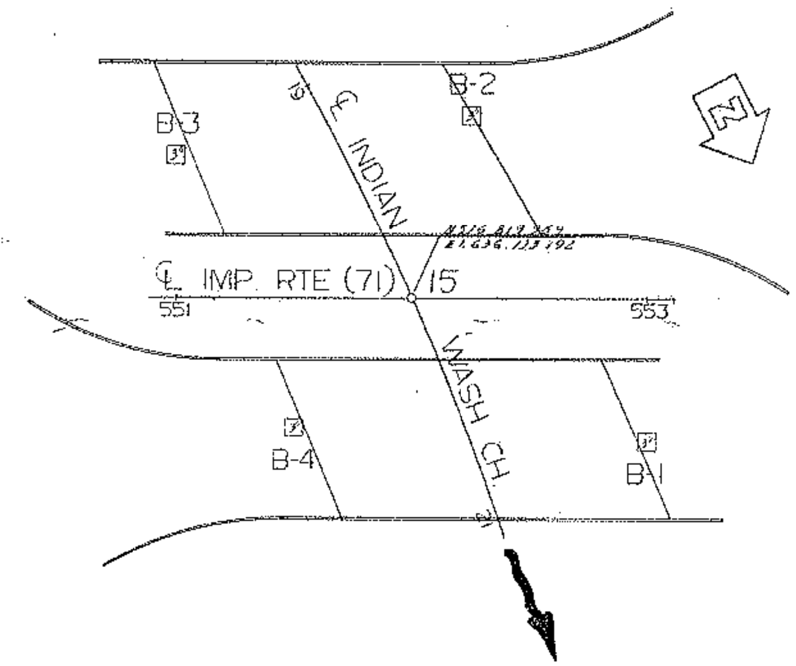
BENCH MARK

B.M. #56-A-71 Elev. 1166.62
Brass disk in conc. buried 1.0' 188.2' Rt.
Sta 550+64.9 ± Imp Rte 71.

NOTE: Abutment and Bent locations obtained from General Plan Dec. 2 1971.

PLAN

Scale 1" = 40'



DIVISION OF ENGINEERING SERVICES - GEOTECHNICAL SERVICES					
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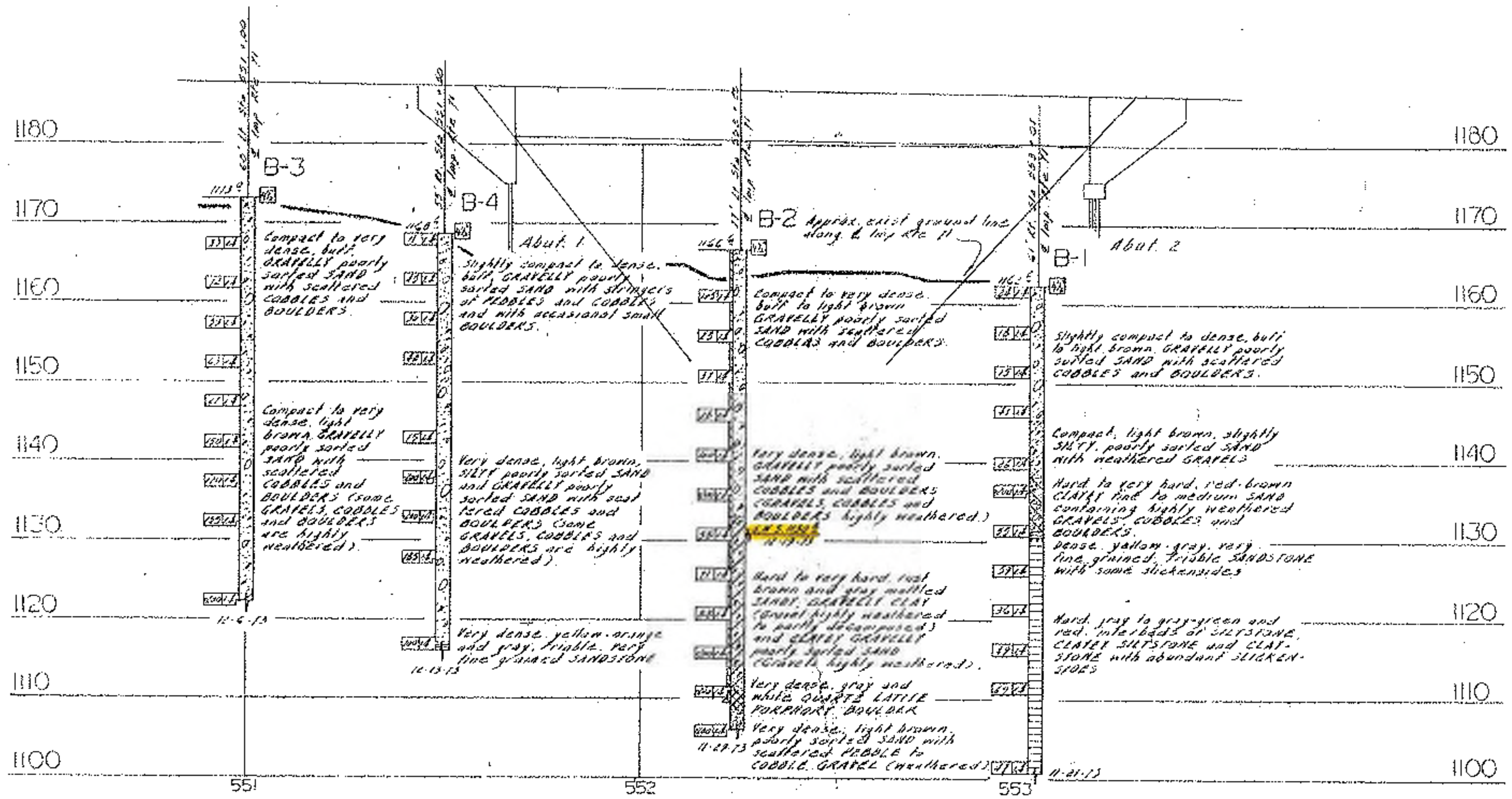
DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets
08	Riv	15	20.3/40.1	13	38
CERTIFIED ENGINEERING GEOLOGIST				DATE 12/17/2021	
I-15 EXPRESS LANES PROJECT SOUTHERN EXTENSION					
LOG OF TEST BORING 13 OF 38					
NOTE: A COPY OF THIS LOG OF TEST BORINGS IS AVAILABLE AT OFFICE OF STRUCTURE MAINTENANCE AND INVESTIGATIONS, SACRAMENTO, CALIFORNIA			UNIT: EA: 08-0J0820		

REGISTERED PROFESSIONAL ENGINEER THOMAS C. BENSON JR. No. 2091 Exp. 03/31/2023 GEOTECHNICAL STATE OF CALIFORNIA

PROFILE

Scale Vert 1" = 10' Horiz 1" = 20'



LEGEND OF BORING OPERATIONS

LEGEND OF EARTH MATERIALS

CONSISTENCY CLASSIFICATION FOR SOILS

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

ENGINEERING GEOLOGY SECTION			
FIELD STUDY	H. C. Cunn	12-19-73	Approval Recommended By
DRAWN	J. Carr	2-13-74	ENGINEERING GEOLOGIST
CHECKED		2-14-74	

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

BRIDGE DEPARTMENT DESIGN SECTION

PROJECT ENGINEER

BRIDGE NO.	56-0677-RL
POST MILE	15.4-30.1

INDIAN WASH BRIDGE

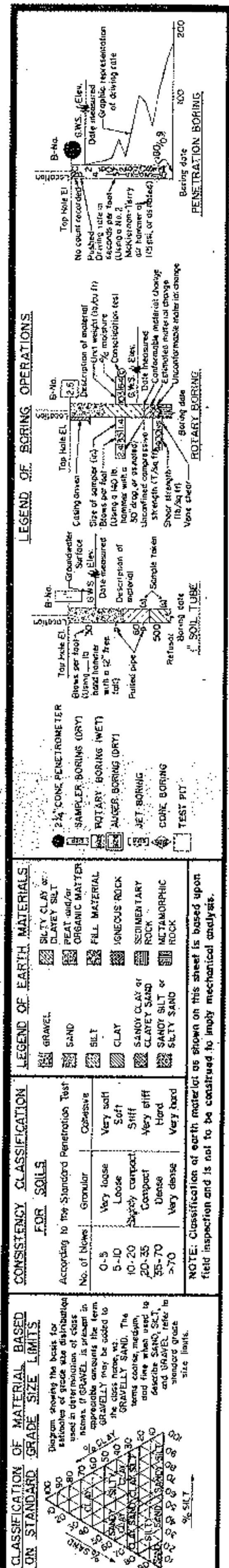
LOG OF TEST BORINGS

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 08203
WO 170501

Disregard prints bearing earlier revision dates

REVISION DATES (PRELIMINARY STAGE ONLY)



DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
08	RIV.	71			

BENCH MARK

B.M. # 57-A-71 Elev. 1149.36
Brass disk in conc. buried 10' 206.4' Rt 567+21
℄ Rte 71

DIVISION OF ENGINEERING SERVICES - GEOTECHNICAL SERVICES

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DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets
08	Riv	15	20.3/40.1	14	38

CERTIFIED ENGINEERING GEOLOGIST — DATE 12/17/2021

I-15 EXPRESS LANES PROJECT SOUTHERN EXTENSION

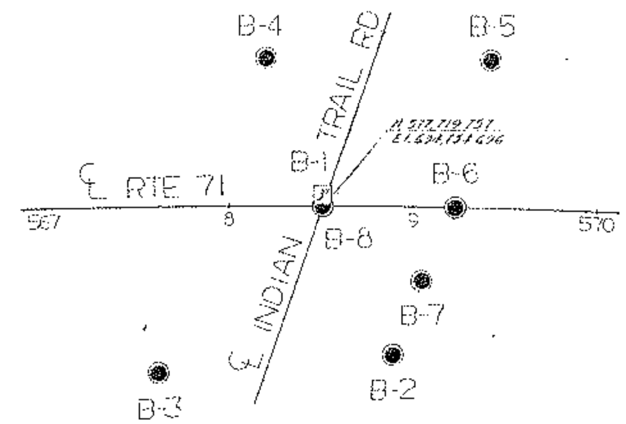
LOG OF TEST BORING 14 OF 38

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

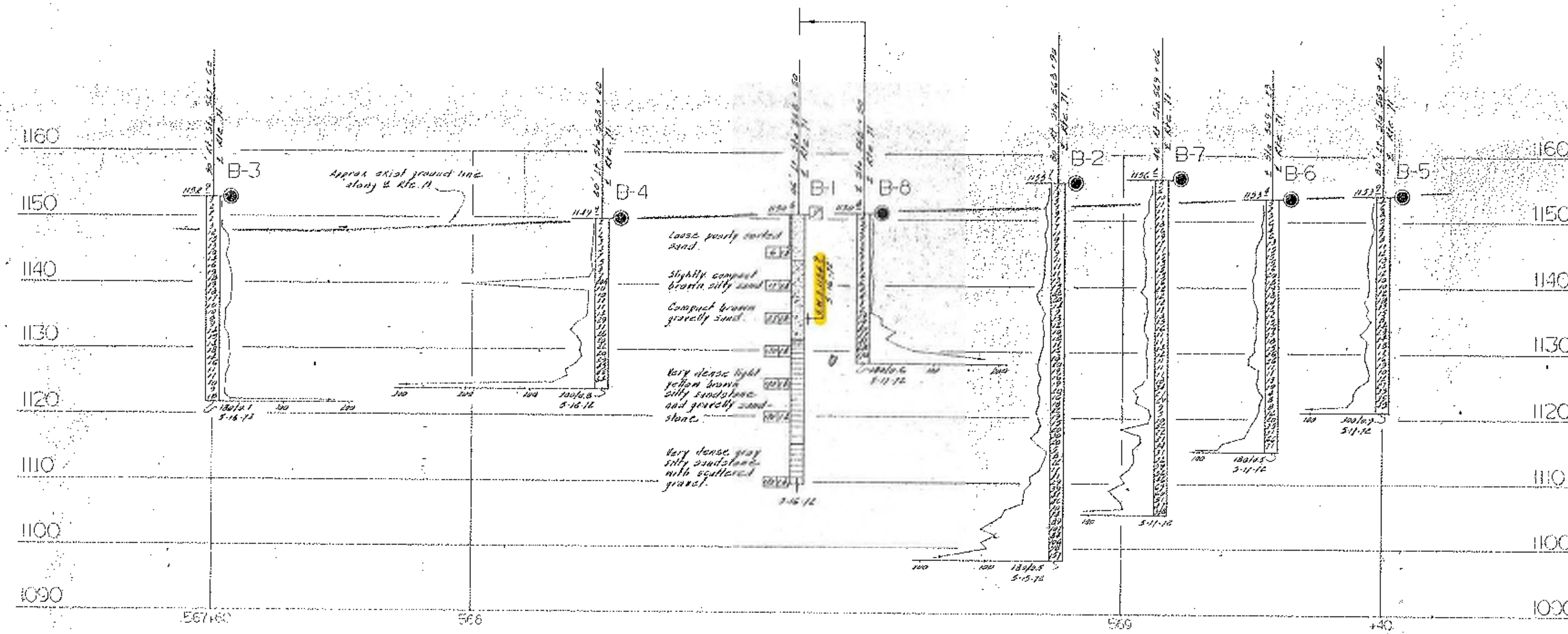
UNIT:
EA: 08-0J0820

REGISTERED PROFESSIONAL ENGINEER
THOMAS C. BENSON JR.
No. 2091
Exp. 03/31/2023
GEOTECHNICAL
STATE OF CALIFORNIA

PLAN
Scale 1" = 50'



PROFILE
Scale Vert. 1" = 10'
Horiz. 1" = 10'



BRIDGE DEPARTMENT
ENGINEERING GEOLOGY SECTION

FIELD STUDY	by	R E Corbaley	5-17-72
DRAWN	by	J. Lum	6-2-72
CHECKED	by	D. Crawford	8-10-72

Approval Recommended by ______ Engineering Geologist
Certified Engineering Geologist No. 42

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

GEOLOGY

INDIAN TRAIL UNDERCROSSING

LOG OF TEST BORINGS

BRIDGE NO.	POST MILE	DRAWING NO.	SHEET	OF
56-676 R/L	15.0			

REVISION DATES (PRELIMINARY STAGE ONLY)

Disregard prints bearing earlier revision dates

WO 170601

NOTES:

(1) 61 mm samples were taken using a California split-barrel sampler with an inside diameter (I.D) of 61 mm and an outside diameter (O.D) of 83 mm.

(2) An automatic trip hammer system consisting of a hammer weight of 62.5 kg falling a distance of 762 mm was used to advance the drive samplers.

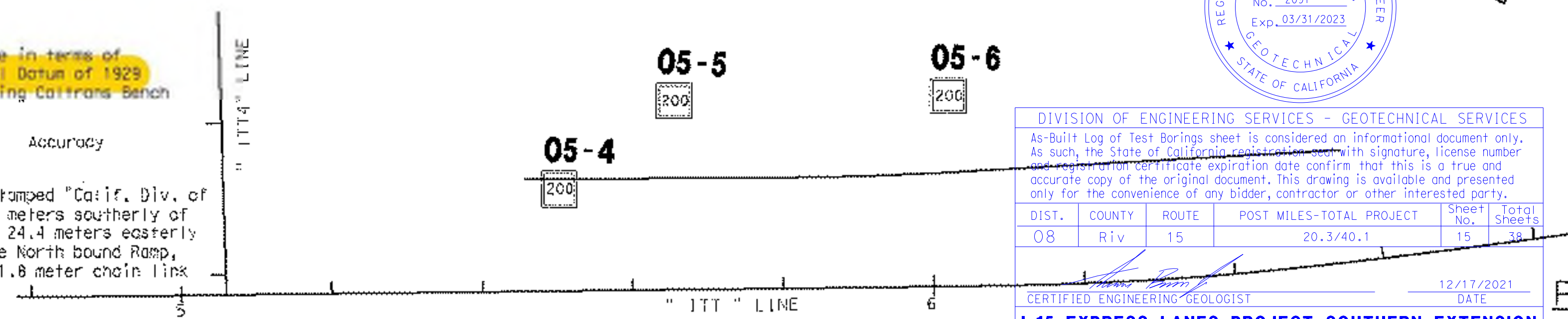
(3) This LOTB sheet (Boring Record) was prepared in accordance with the Caltrans Soil and Rock Logging, Classification Manual, Field Guide (August 1996).

BENCH MARK 58-B-77

Elevations as shown hereon are in terms of the National Geodetic Vertical Datum of 1929 based locally upon the following Caltrans Bench marks:

Name	Elev. (m)	Accuracy
NGVD 29	356.736	

Found 0.05 meter Brass Cap, Stamped "Calif. Div. of Hwys. 58-B-77", located 167.6 meters southerly of the Northbound Gore point and 24.4 meters easterly of the edge of pavement of the North bound Ramp, next to the angle point of a 1.8 meter chain link fence, down 0.2 meters.



DIVISION OF ENGINEERING SERVICES - GEOTECHNICAL SERVICES

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DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets
08	Riv	15	20.3/40.1	15	38

CERTIFIED ENGINEERING GEOLOGIST 12/17/2021 DATE

I-15 EXPRESS LANES PROJECT SOUTHERN EXTENSION

LOG OF TEST BORING 15 OF 38

NOTE: A COPY OF THIS LOG OF TEST BORINGS IS AVAILABLE AT OFFICE OF STRUCTURE MAINTENANCE AND INVESTIGATIONS, SACRAMENTO, CALIFORNIA. UNIT: EA: 08-0J0820

REGISTERED PROFESSIONAL ENGINEER THOMAS C. BENSON, JR. No. 2091 Exp. 03/31/2023 GEOTECHNICAL STATE OF CALIFORNIA

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
08	RIV	15	48.6/49.3	177	178

REGISTERED ENGINEER 08/06/09

PLANS APPROVAL DATE

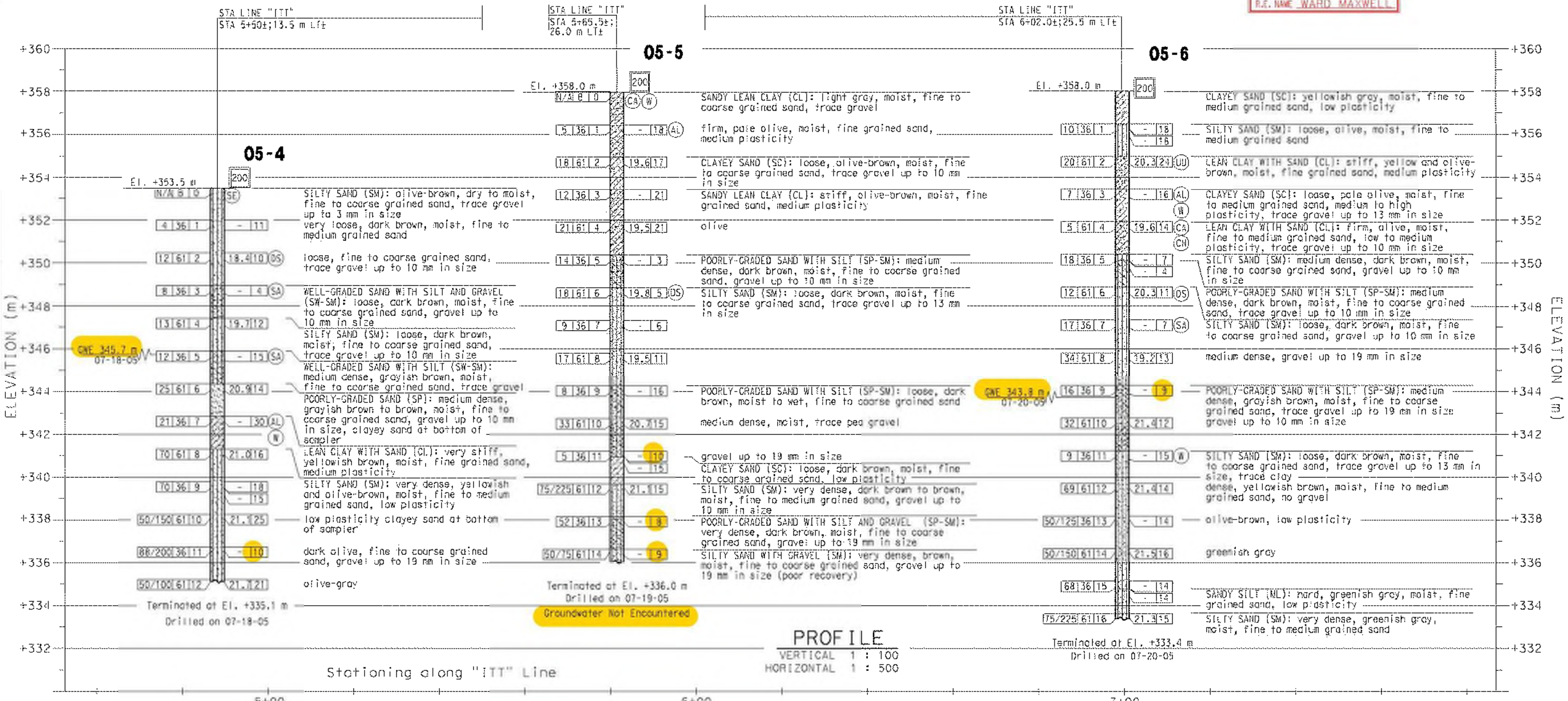
REGISTERED PROFESSIONAL ENGINEER A. KORKOS No. GE 2357 Exp. 3-31-12 GEOTECHNICAL STATE OF CALIFORNIA

RBF
14725 ALTON PARKWAY
IRVINE, CA 92618

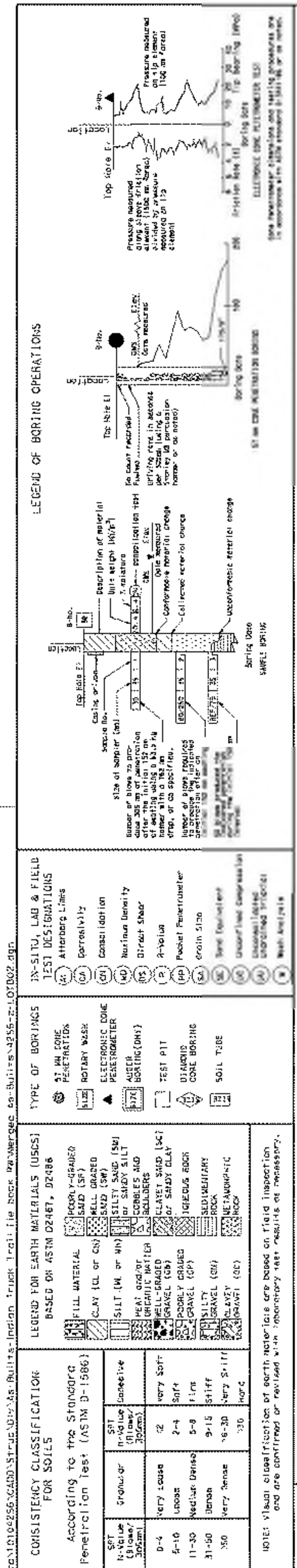
EARTH MECHANICS, INC.
17660 Newhope Street, Suite E
Fountain Valley, California 92708

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.

AS BUILT
CONTRACT No. 08-0E4504
C.C.A. DATE 10-31-13
R.E. NAME WARD MAXWELL



STA LINE "ITT" STA 5+50±;13.5 m Lt
STA LINE "ITT" STA 5+65.5±; 26.0 m Lt
STA LINE "ITT" STA 6+02.0±;25.5 m Lt
05-4
05-5
05-6
El. +353.5 m
El. +358.0 m
El. +358.0 m
ELEVATION (m)
GWE 345.7 m 07-18-05
GWE 343.8 m 07-20-05
05-4:
SILTY SAND (SM): olive-brown, dry to moist, fine to coarse grained sand, trace gravel up to 3 mm in size
very loose, dark brown, moist, fine to medium grained sand
loose, fine to coarse grained sand, trace gravel up to 10 mm in size
WELL-GRADED SAND WITH SILT AND GRAVEL (SW-SM): loose, dark brown, moist, fine to coarse grained sand, gravel up to 10 mm in size
SILTY SAND (SM): loose, dark brown, moist, fine to coarse grained sand, trace gravel up to 10 mm in size
WELL-GRADED SAND WITH SILT (SW-SM): medium dense, grayish brown, moist, fine to coarse grained sand, trace gravel
POORLY-GRADED SAND (SP): medium dense, grayish brown to brown, moist, fine to coarse gravel up to 10 mm in size, clayey sand at bottom of sampler
LEAN CLAY WITH SAND (CL): very stiff, yellowish brown, moist, fine grained sand, medium plasticity
SILTY SAND (SM): very dense, yellowish and olive-brown, moist, fine to medium grained sand, low plasticity clayey sand at bottom of sampler
dark olive, fine to coarse grained sand, gravel up to 19 mm in size
olive-gray
Terminated at El. +335.1 m
Drilled on 07-18-05
05-5:
SANDY LEAN CLAY (CL): light gray, moist, fine to coarse grained sand, trace gravel
firm, pale olive, moist, fine grained sand, medium plasticity
CLAYEY SAND (SC): loose, olive-brown, moist, fine to coarse grained sand, trace gravel up to 10 mm in size
SANDY LEAN CLAY (CL): stiff, olive-brown, moist, fine grained sand, medium plasticity
olive
POORLY-GRADED SAND WITH SILT (SP-SM): medium dense, dark brown, moist, fine to coarse grained sand, gravel up to 10 mm in size
SILTY SAND (SM): loose, dark brown, moist, fine to coarse grained sand, trace gravel up to 13 mm in size
POORLY-GRADED SAND WITH SILT (SP-SM): loose, dark brown, moist to wet, fine to coarse grained sand
medium dense, moist, trace pea gravel
gravel up to 19 mm in size
CLAYEY SAND (SC): loose, dark brown, moist, fine to coarse grained sand, low plasticity
SILTY SAND (SM): very dense, dark brown to brown, moist, fine to medium grained sand, gravel up to 10 mm in size
POORLY-GRADED SAND WITH SILT AND GRAVEL (SP-SM): very dense, dark brown, moist, fine to coarse grained sand, gravel up to 19 mm in size
SILTY SAND WITH GRAVEL (SM): very dense, brown, moist, fine to coarse grained sand, gravel up to 19 mm in size (poor recovery)
Terminated at El. +336.0 m
Drilled on 07-19-05
Groundwater Not Encountered
05-6:
CLAYEY SAND (SC): yellowish gray, moist, fine to medium grained sand, low plasticity
SILTY SAND (SM): loose, olive, moist, fine to medium grained sand
LEAN CLAY WITH SAND (CL): stiff, yellow and olive-brown, moist, fine grained sand, medium plasticity
CLAYEY SAND (SC): loose, pale olive, moist, fine to medium grained sand, medium to high plasticity, trace gravel up to 13 mm in size
LEAN CLAY WITH SAND (CL): firm, olive, moist, fine to medium grained sand, low to medium plasticity, trace gravel up to 10 mm in size
SILTY SAND (SM): medium dense, dark brown, moist, fine to coarse grained sand, gravel up to 10 mm in size
POORLY-GRADED SAND WITH SILT (SP-SM): medium dense, dark brown, moist, fine to coarse grained sand, trace gravel up to 10 mm in size
SILTY SAND (SM): loose, dark brown, moist, fine to coarse grained sand, gravel up to 10 mm in size
medium dense, gravel up to 19 mm in size
POORLY-GRADED SAND WITH SILT (SP-SM): medium dense, grayish brown, moist, fine to coarse grained sand, trace gravel up to 19 mm in size gravel up to 10 mm in size
SILTY SAND (SM): loose, dark brown, moist, fine to coarse grained sand, trace gravel up to 13 mm in size, trace clay
dense, yellowish brown, moist, fine to medium grained sand, no gravel
olive-brown, low plasticity
greenish gray
SANDY SILT (ML): hard, greenish gray, moist, fine grained sand, low plasticity
SILTY SAND (SM): very dense, greenish gray, moist, fine to medium grained sand
Terminated at El. +333.4 m
Drilled on 07-20-05
PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500
Stationing along "ITT" Line
5+00
6+00
7+00



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

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

DESIGN OVERSIGHT	Robert Zozoff	DRAWN BY M. THAN 05/23/07	FIELD INVESTIGATION BY: M.Than
SIGN OFF DATE		CHECKED BY A. KORKOS 05/23/07	DATE: July 18 to 20, 05

PREPARED FOR THE **STATE OF CALIFORNIA** DEPARTMENT OF TRANSPORTATION

A. KORKOS PROJECT ENGINEER

BRIDGE NO. 00-0000

KILOMETER POST 00.00

I-15/INDIAN TRUCK TRAIL UNDERCROSSING

LOG OF TEST BORINGS NO.2

CU 08224
EA 0E4501

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

DISREGARD PRINTS BEARING EARLIER REVISION DATES

SHEET 18 OF 19

GEOTECHNICAL LOG OF TEST BORINGS SHEET (METRIC) (REV 2/1/00)

NOTES:

(1) 61 mm samples were taken using a California split-barrel sampler with an inside diameter (I.D) of 61 mm and an outside diameter (O.D) of 83 mm.

(2) An automatic trip hammer system consisting of a hammer weight of 62.5 kg falling a distance of 762 mm was used to advance the drive samplers.

(3) This LOTB sheet (Boring Record) was prepared in accordance with the Caltrans Soil and Rock Logging, Classification Manual, Field Guide (August 1996).

BENCH MARK

Elevations as shown hereon are in terms of the National Geodetic Vertical Datum of 1929 based locally upon the following Caltrans Bench marks:

Name	NGVD 29 Elv. (m)	Accuracy
58-B-77	356.736	

Found 0.05 meter Brass Cap, Stamped "Calif. Div. of Hwys. 58-B-77", located 167.6 meters southerly of the Northbound Gore point and 24.4 meters easterly of the edge of pavement of the North bound Ramp, next to the angle point of a 1.8 meter chain link fence, down 0.2 meters.

DIVISION OF ENGINEERING SERVICES - GEOTECHNICAL SERVICES

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DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets
08	Riv	15	20.3/40.1	16	38

CERTIFIED ENGINEERING GEOLOGIST — DATE 12/17/2021

I-15 EXPRESS LANES PROJECT SOUTHERN EXTENSION

LOG OF TEST BORING 16 OF 38

NOTE: A COPY OF THIS LOG OF TEST BORINGS IS AVAILABLE AT OFFICE OF STRUCTURE MAINTENANCE AND INVESTIGATIONS, SACRAMENTO, CALIFORNIA — UNIT: — EA: 08-0J0820

REGISTERED PROFESSIONAL ENGINEER — THOMAS C. BENSON, JR. — No. 2091 — Exp. 03/31/2023 — GEOTECHNICAL — STATE OF CALIFORNIA

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
08	RIV	15	48.6/49.3	178	178

REGISTERED ENGINEER — 08/06/09

PLANS APPROVAL DATE

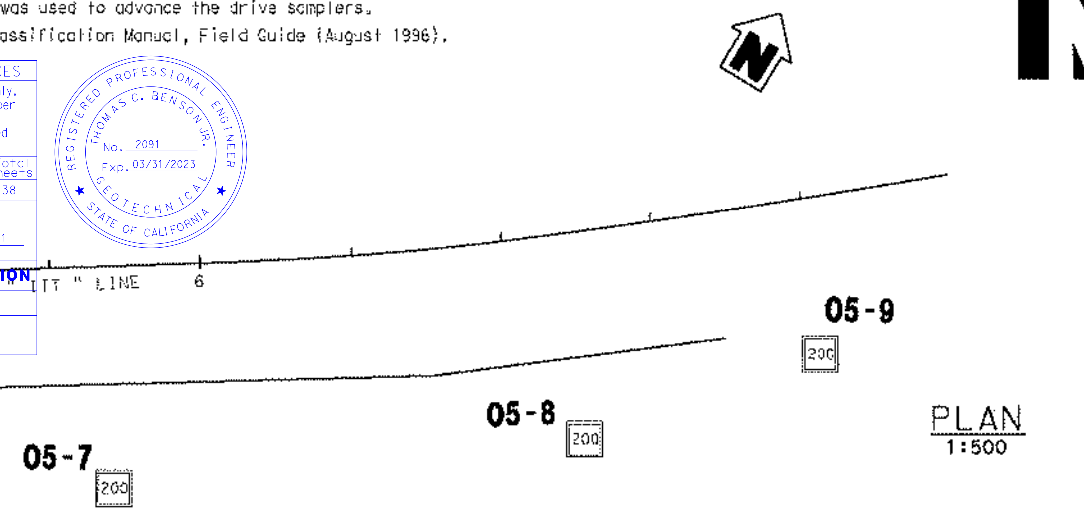
REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — No. GE 2357 — Exp. 3-31-12 — GEOTECHNICAL — STATE OF CALIFORNIA

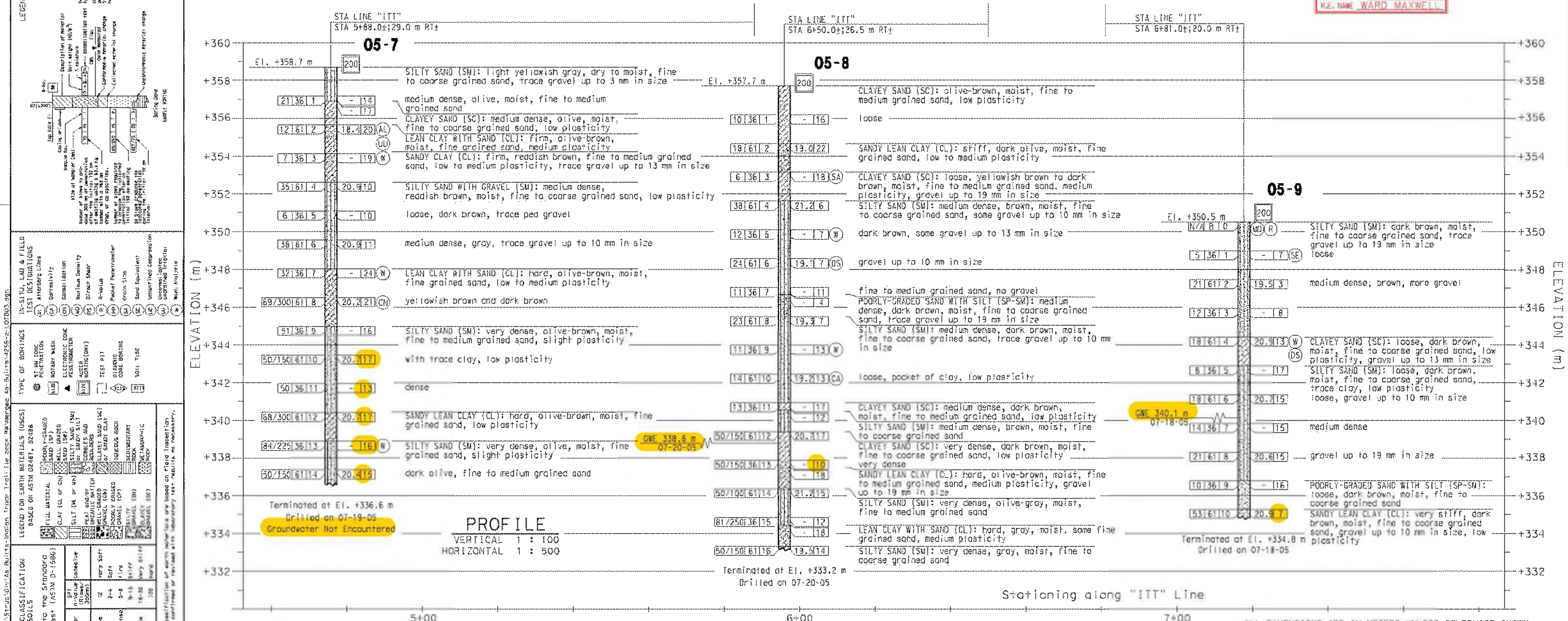
RBF
14725 ALTON PARKWAY
IRVINE, CA 92618

EARTH MECHANICS, INC.
17660 Newhope Street, Suite E
Fountain Valley, California 92708

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.

AS BUILT
CONTRACT No. 08-0E4504
C.C.A. DATE 10-31-13
R.E. NAME WARD MAXWELL





STA LINE "ITT"
STA 5+88.0±;29.0 m RT±
05-7
El. +356.7 m
SILTY SAND (SM): light yellowish gray, dry to moist, fine to coarse grained sand, trace gravel up to 3 mm in size
medium dense, olive, moist, fine to medium grained sand
CLAYEY SAND (SC): medium dense, olive, moist, fine to coarse grained sand, low plasticity
LEAN CLAY WITH SAND (CL): firm, olive-brown, moist, fine grained sand, medium plasticity
SANDY CLAY (CL): firm, reddish brown, fine to medium grained sand, low to medium plasticity, trace gravel up to 13 mm in size
SILTY SAND WITH GRAVEL (SM): medium dense, reddish brown, moist, fine to coarse grained sand, low plasticity
loose, dark brown, trace pea gravel
medium dense, gray, trace gravel up to 10 mm in size
LEAN CLAY WITH SAND (CL): hard, olive-brown, moist, fine grained sand, low to medium plasticity
yellowish brown and dark brown
SILTY SAND (SM): very dense, olive-brown, moist, fine to medium grained sand, slight plasticity
with trace clay, low plasticity
dense
SANDY LEAN CLAY (CL): hard, olive-brown, moist, fine grained sand, low plasticity
SILTY SAND (SM): very dense, olive, moist, fine grained sand, slight plasticity
GWE 338.8 m 07-20-05
dark olive, fine to medium grained sand
Terminated at El. +336.6 m
Drilled on 07-19-05
Groundwater Not Encountered
STA LINE "ITT"
STA 6+50.0±;26.5 m RT±
05-8
El. +357.7 m
CLAYEY SAND (SC): olive-brown, moist, fine to medium grained sand, low plasticity
loose
SANDY LEAN CLAY (CL): stiff, dark olive, moist, fine grained sand, low to medium plasticity
CLAYEY SAND (SC): loose, yellowish brown to dark brown, moist, fine to medium grained sand, medium plasticity, gravel up to 19 mm in size
SILTY SAND (SM): medium dense, brown, moist, fine to coarse grained sand, some gravel up to 10 mm in size
dark brown, some gravel up to 13 mm in size
gravel up to 10 mm in size
fine to medium grained sand, no gravel
POORLY-GRADED SAND WITH SILT (SP-SM): medium dense, dark brown, moist, fine to coarse grained sand, trace gravel up to 19 mm in size
SILTY SAND (SM): medium dense, dark brown, moist, fine to coarse grained sand, trace gravel up to 10 mm in size
loose, pocket of clay, low plasticity
CLAYEY SAND (SC): medium dense, dark brown, moist, fine to medium grained sand, low plasticity
SILTY SAND (SM): medium dense, brown, moist, fine to coarse grained sand
CLAYEY SAND (SC): very dense, dark brown, moist, fine to coarse grained sand, low plasticity
very dense
SANDY LEAN CLAY (CL): hard, olive-brown, moist, fine to medium grained sand, medium plasticity, gravel up to 19 mm in size
SILTY SAND (SM): very dense, olive-gray, moist, fine to medium grained sand
LEAN CLAY WITH SAND (CL): hard, gray, moist, some fine grained sand, medium plasticity
SILTY SAND (SM): very dense, gray, moist, fine to coarse grained sand
Terminated at El. +333.2 m
Drilled on 07-20-05
STA LINE "ITT"
STA 6+81.0±;20.0 m RT±
05-9
El. +350.5 m
SILTY SAND (SM): dark brown, moist, fine to coarse grained sand, trace gravel up to 19 mm in size
loose
medium dense, brown, more gravel
CLAYEY SAND (SC): loose, dark brown, moist, fine to coarse grained sand, low plasticity, gravel up to 13 mm in size
SILTY SAND (SM): loose, dark brown, moist, fine to coarse grained sand, trace clay, low plasticity
loose, gravel up to 10 mm in size
GWE 340.1 m 07-18-05
medium dense
gravel up to 19 mm in size
POORLY-GRADED SAND WITH SILT (SP-SM): loose, dark brown, moist, fine to coarse grained sand
SANDY LEAN CLAY (CL): very stiff, dark brown, moist, fine to coarse grained sand, gravel up to 10 mm in size, low plasticity
Terminated at El. +334.8 m
Drilled on 07-18-05
PROFILE
VERTICAL 1 : 100
HORIZONTAL 1 : 500
ELEVATION (m)
Stationing along "ITT" Line
5+00
6+00
7+00

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

DESIGN OVERSIGHT	Robert Zezoff	DRAWN BY	M. THAN 05/23/07
SIGN OFF DATE		CHECKED BY	A. KORKOS 05/23/07

M. Than — FIELD INVESTIGATION BY: — DATE: July 18 to 20, 05

PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

A. KORKOS — PROJECT ENGINEER

BRIDGE NO. 00-0000 — KILOMETER POST 00.00

I-15/INDIAN TRUCK TRAIL UNDERCROSSING

LOG OF TEST BORINGS NO.3

GEOTECHNICAL LOG OF TEST BORINGS SHEET (METRIC) (REV 2/1/00)

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

CU 08224 — EA 0E4501

DISREGARD PRINTS BEARING EARLIER REVISION DATES — REVISION DATES (PRELIMINARY STAGE ONLY) — SHEET 19 OF 19

DIST.	COUNTY	ROUTE	POST MILES--TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
08	RIV.	71			

BRIDGE ENGINEER ____ REGISTERED CIVIL ENGINEER NO. 5588

DATE APPROVED ____

BENCH MARKS

B.M. #66-A-71 Elev. 1047.98'
Brass Disk in Conc. Buried 1'
216.3 Lt. 650+35.0 ℄ Imp.
Rte. 71.

DIVISION OF ENGINEERING SERVICES - GEOTECHNICAL SERVICES					
As-Built Log of Test Borings sheet is considered an informational document only. As such, the State of California registration seal with signature, license number and registration certificate expiration date confirm that this is a true and accurate copy of the original document. This drawing is available and presented only for the convenience of any bidder, contractor or other interested party.					
DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets
08	Riv	15	20.3/40.1	17	38

CERTIFIED ENGINEERING GEOLOGIST — 12/17/2021 DATE

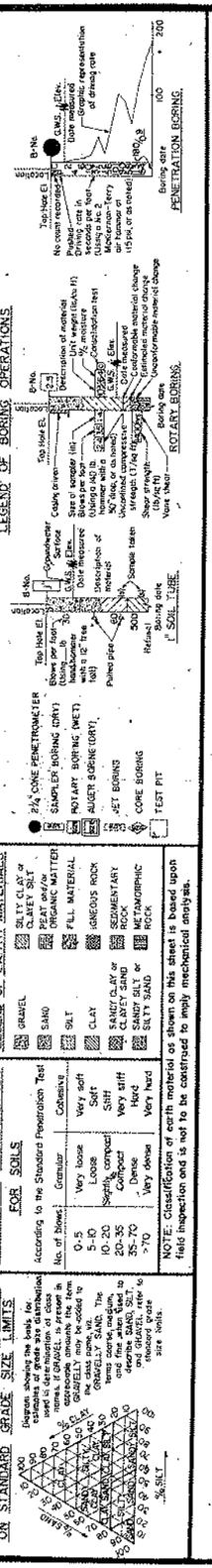
REGISTERED PROFESSIONAL ENGINEER — THOMAS C. BENSON, JR. — No. 2091 — Exp. 03/31/2023 — GEOTECHNICAL — STATE OF CALIFORNIA

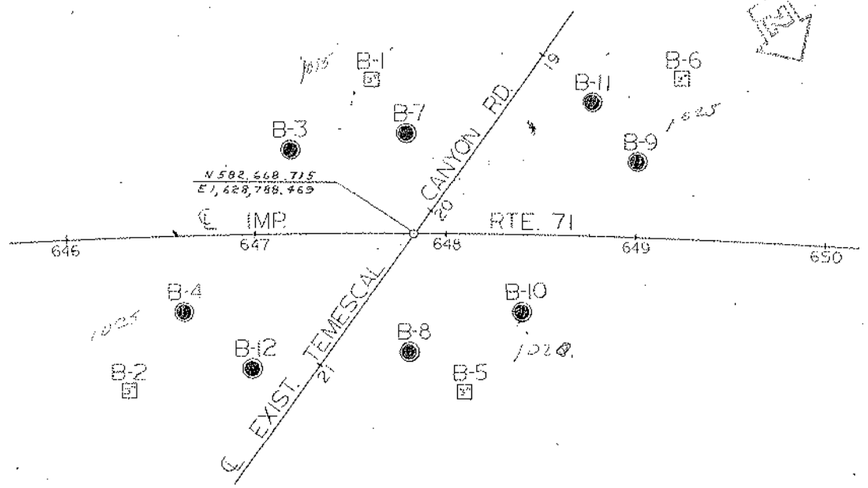
I-15 EXPRESS LANES PROJECT SOUTHERN EXTENSION

LOG OF TEST BORING 17 OF 38

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

UNIT: EA: 08-0J0820





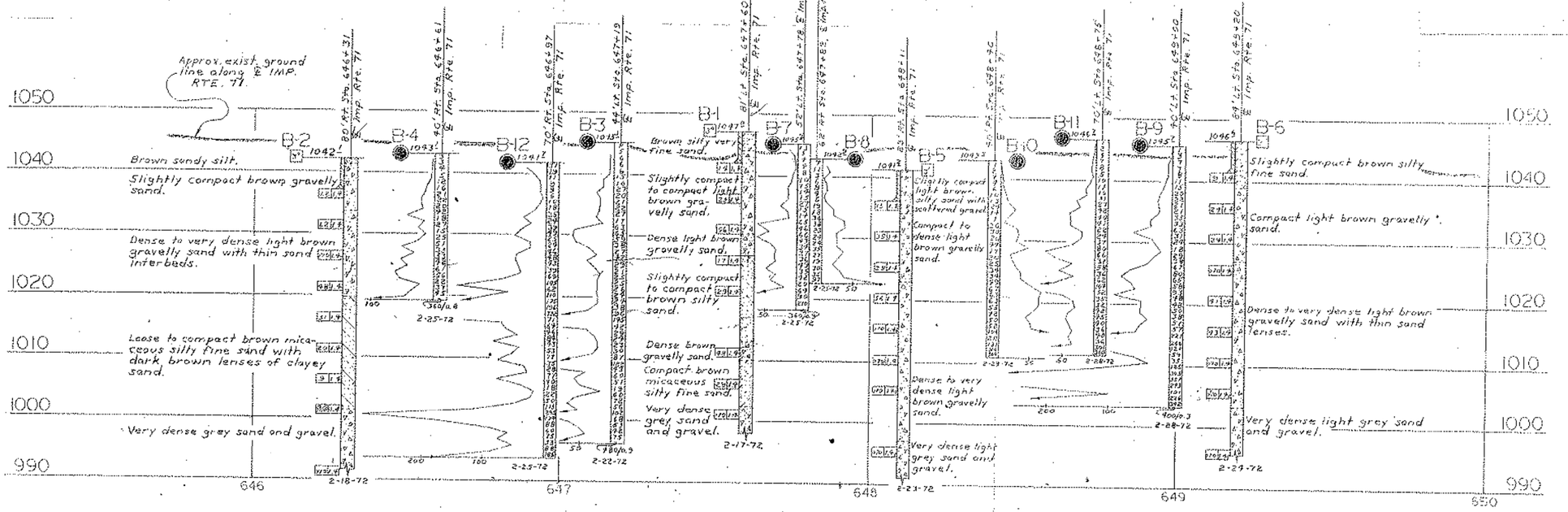
PLAN

Scale: 1" = 40'

NO GROUND WATER ENCOUNTERED DURING THIS INVESTIGATION BY BRIDGE DEPT. GEOLOGIST DATE FEBRUARY, 1972

PROFILE

Scale: Vert 1" = 10'
Horiz. 1" = 20'



BRIDGE DEPARTMENT
ENGINEERING GEOLOGY SECTION

FIELD STUDY	by O. MIKES, 2-28-72
DRAWN	by E. S. JIMENEZ, 3-14-72
CHECKED	by O. MIKES 4-24-72

Approval Recommended by ____ Engineering Geologist

Certified Engineering Geologist No. 542

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

TEMESCAL CANYON ROAD UNDERCROSSING

LOG OF TEST BORINGS

BRIDGE NO.	POST MILE	DRAWING NO.	SHEET	OF
56-675 R/L	13.5			

REVISION DATES (PRELIMINARY STAGE ONLY)

WO 170600
CU 08203

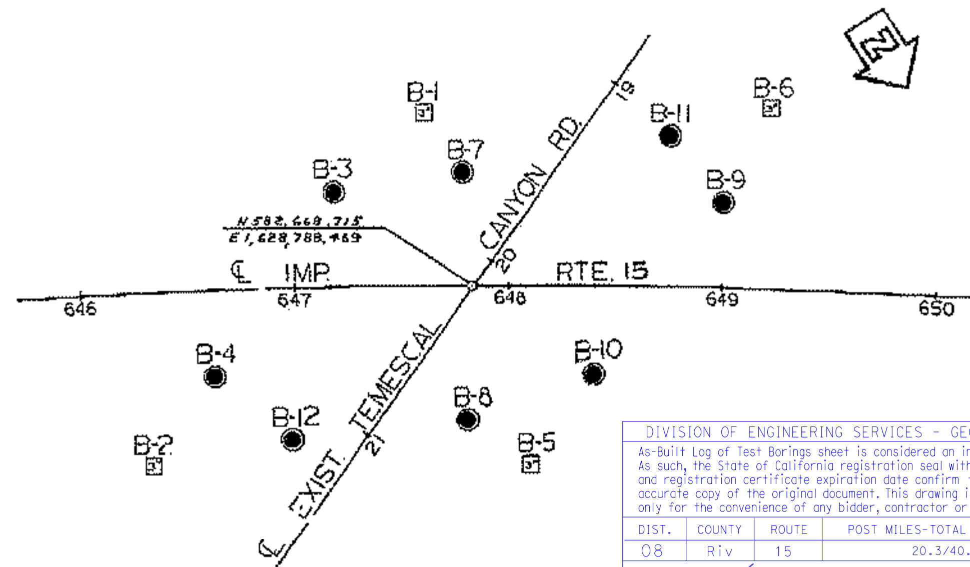
Disregard prints bearing earlier revision dates →

DIST.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
08	RIV.	15	30.4/33.9	143	175

Robert W. Reynolds #165 — CERTIFIED ENGINEERING GEOLOGIST
March 28, 1977

BENCH MARKS

B.M. #66-A-71 Elev. 1097.98'
Brass Disk in Conc. Buried 1'±
216.3 Lt. 650+35.0 ℄ Imp.
Rte. 71.



PLAN
Scale: 1" = 40'

AS BUILT PLANS
Contract No. 08-170604
Date Completed
Document No. 3999

DIVISION OF ENGINEERING SERVICES - GEOTECHNICAL SERVICES

As-Built Log of Test Borings sheet is considered an informational document only. As such, the State of California registration seal with signature, license number and registration certificate expiration date confirm that this is a true and accurate copy of the original document. This drawing is available and presented only for the convenience of any bidder, contractor or other interested party.

DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets
08	Riv	15	20.3/40.1	18	38

CERTIFIED ENGINEERING GEOLOGIST — DATE 12/17/2021

I-15 EXPRESS LANES PROJECT SOUTHERN EXTENSION

LOG OF TEST BORING 18 OF 38

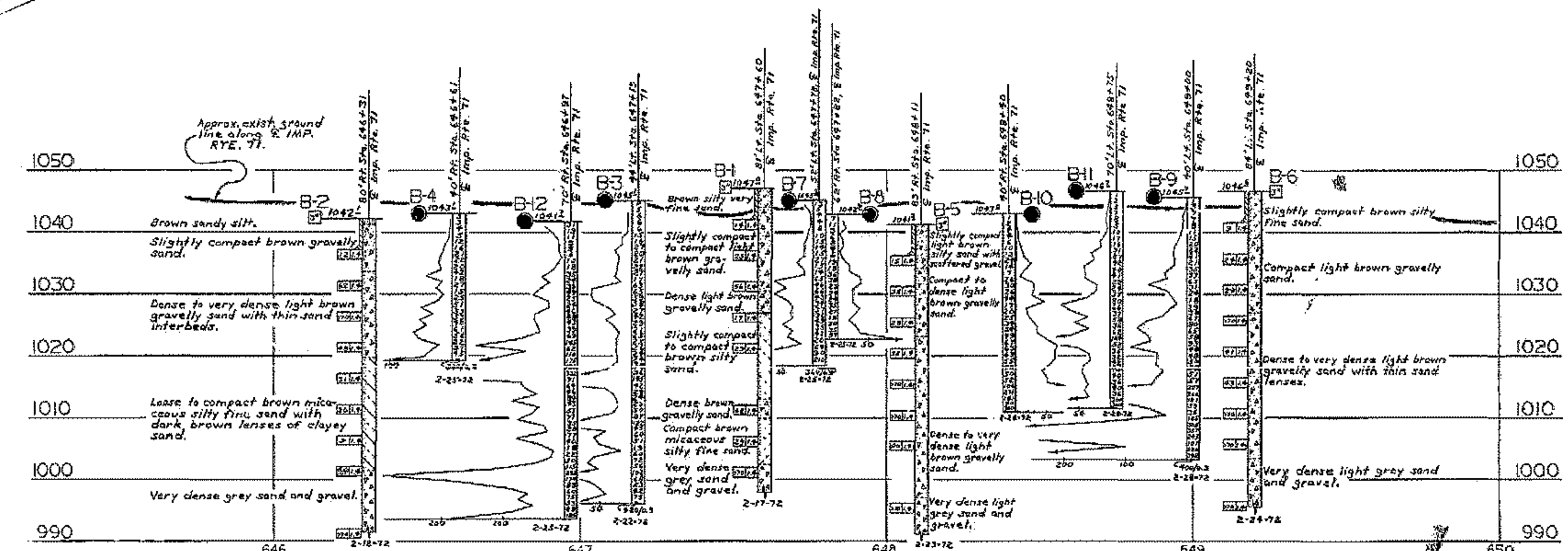
NOTE: A COPY OF THIS LOG OF TEST BORINGS IS AVAILABLE AT OFFICE OF STRUCTURE MAINTENANCE AND INVESTIGATIONS, SACRAMENTO, CALIFORNIA

UNIT:
EA: 08-0J0820

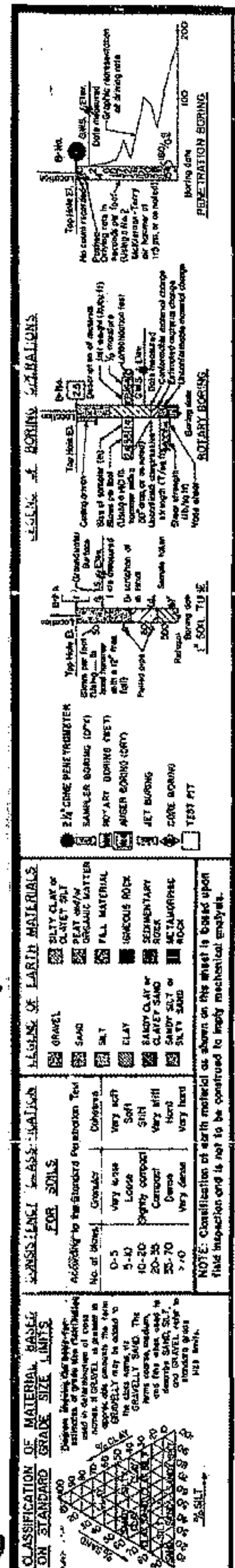
REGISTERED PROFESSIONAL ENGINEER — THOMAS C. BENSON JR. — No. 2091 — Exp. 03/31/2023 — GEOTECHNICAL — STATE OF CALIFORNIA

NO GROUND WATER ENCOUNTERED DURING THIS INVESTIGATION BY BRIDGE DEPT. GEOLOGY SECTION
DATE FEBRUARY, 1972

PROFILE
Scale: Vert. 1" = 10'
Horiz. 1" = 20'



Approx. exist. ground line along ℄ IMP. RTE. 71.
1050
1040
1030
1020
1010
1000
990
Brown sandy silt.
Slightly compact brown gravelly sand.
Dense to very dense light brown gravelly sand with thin sand interbeds.
Loose to compact brown micaceous silty fine sand with dark brown lenses of clayey sand.
Very dense grey sand and gravel.
Brown silty very fine sand.
Slightly compact to compact brown gravelly sand.
Dense light brown gravelly sand.
Slightly compact to compact brown silty sand.
Dense brown gravelly sand.
Compact brown micaceous silty fine sand.
Very dense grey sand and gravel.
Slightly compact light brown silty sand with scattered gravel.
Compact to dense light brown gravelly sand.
Dense to very dense light brown gravelly sand.
Very dense light grey sand and gravel.
Slightly compact brown silty fine sand.
Compact light brown gravelly sand.
Dense to very dense light brown gravelly sand with thin sand lenses.
Very dense light grey sand and gravel.
646
647
648
649
650



No Changes
AS BUILT
CORRECTIONS BY W. Lohse FHE
CONTRACT NO. 08-170604
[illegible] 10-9-79 3-10-80

BRIDGE DEPARTMENT — ENGINEERING GEOLOGY SECTION		
FIELD STUDY	by D. MIKES	2-28-72
DRAWN	by E.S. JIMENEZ	3-14-72
CHECKED	by D. MIKES	4-24-72

Approval Recommended by [signature] Engineering Geologist
Certified Engineering Geologist No. 40

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

TEMESCAL CANYON ROAD UNDERCROSSING

LOG OF TEST BORINGS

BRIDGE NO. 56-67_ R/L | POST MILE 31.9 | DRAWING NO. | SHEET 8 OF 8

WO 170601
CU 08203

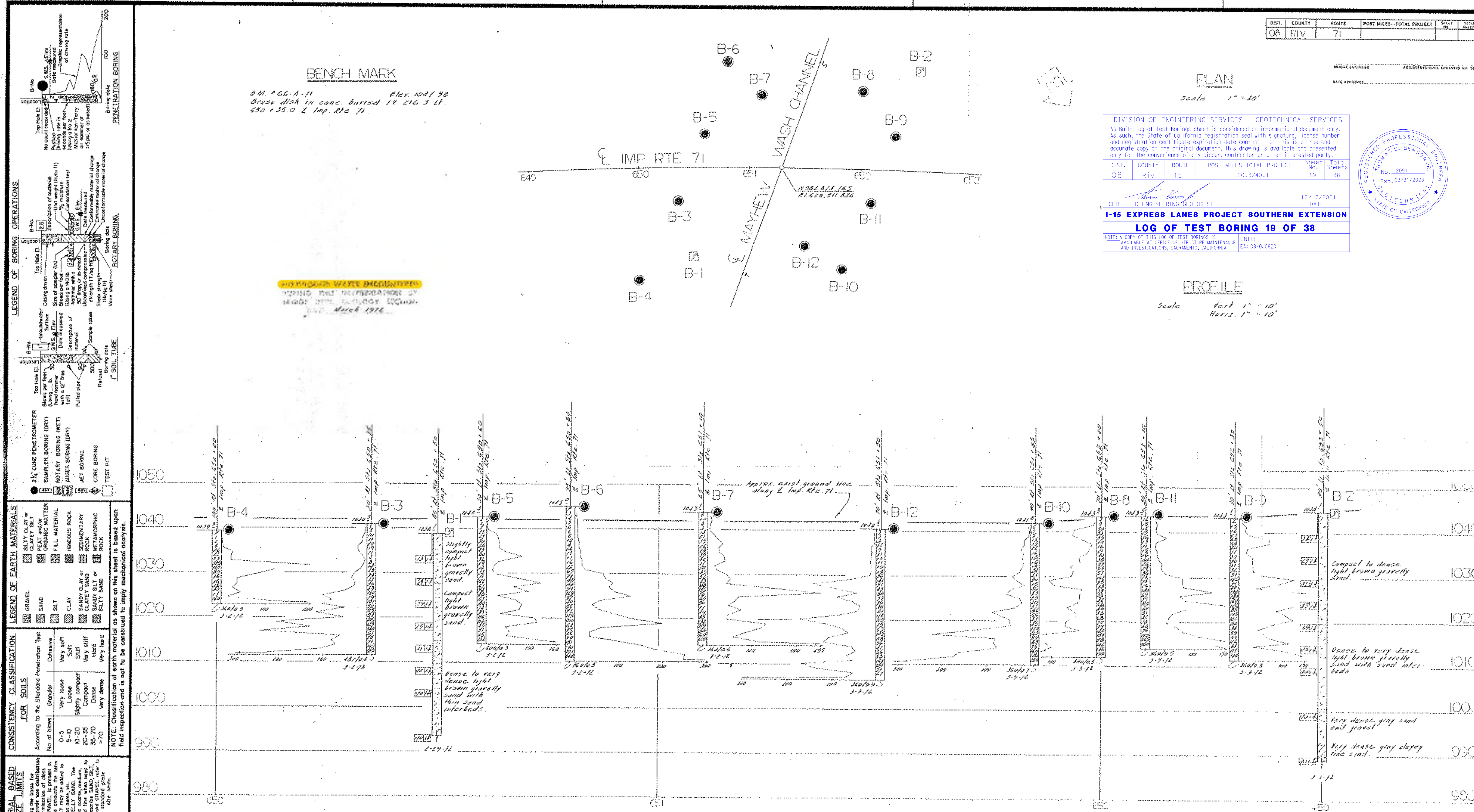
Disregard prints bearing earlier revision dates

REVISION DATES (PRELIMINARY STAGE ONLY)

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF TRANSPORTATION.
DATE 3-28-80 Joseph M. Cota TITLE SUPERVISOR OF [illegible] SERVICES

143

DIST.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET No.	TOTAL SHEETS
08	RIV	71			



DIVISION OF ENGINEERING SERVICES - GEOTECHNICAL SERVICES

As-Built Log of Test Borings sheet is considered an informational document only. As such, the State of California registration seal with signature, license number and registration certificate expiration date confirm that this is a true and accurate copy of the original document. This drawing is available and presented only for the convenience of any bidder, contractor or other interested party.

DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets
08	Riv	15	20.3/40.1	19	38

CERTIFIED ENGINEERING GEOLOGIST — DATE 12/17/2021

REGISTERED PROFESSIONAL ENGINEER — THOMAS C. BENSON JR. — No. 2091 — Exp. 03/31/2023 — GEOTECHNICAL — STATE OF CALIFORNIA

I-15 EXPRESS LANES PROJECT SOUTHERN EXTENSION

LOG OF TEST BORING 19 OF 38

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

UNIT:
EA: 08-0J0820

BRIDGE DEPARTMENT
ENGINEERING GEOLOGY SECTION

FIELD STUDY	by O. Mikes	3-9-72
DRAWN	by J. Law	3-30-72
CHECKED	by O. Mikes	6-7-72

Approval Recommended by ______ Engineering Geologist

Certified Engineering Geologist No. 48

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

GEOLOGY

MAYHEW WASH

LOG OF TEST BORINGS

BRIDGE NO. 56-674 R/L — POST MILE 134 — DRAWING NO. — SHEET — OF

REVISION DATES (PRELIMINARY STAGE ONLY)

Disregard prints bearing earlier revision dates

WO 170501
CU 08203

DIST.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
08	RIV	15	30.4/33.9	151	175

Robert O. Reynolds #165
REGISTERED ENGINEERING GEOLOGIST — REGISTERED
DATE SIGNED March 28, 1977

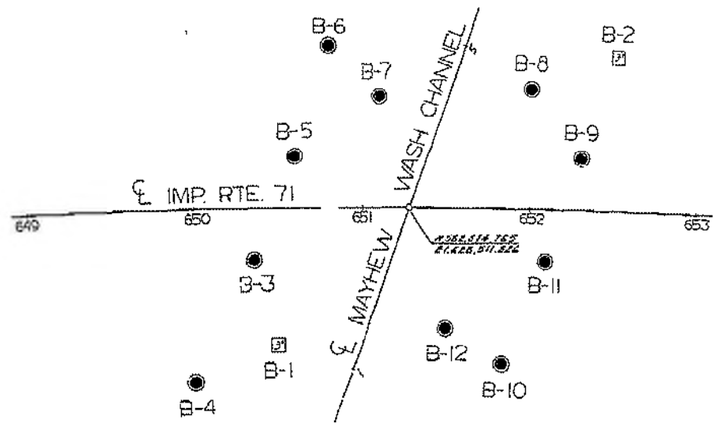
BENCH MARK

B.M. "66-A-11" Elev. 1047.98
Brass disk in conc. buried 1ft 216.3 Lt.
650 +35.0 ℄ Imp. Rte. 71.

NO GROUND WATER ENCOUNTERED DURING THIS INVESTIGATION BY BRIDGE DEPT. GEOLOGY SECTION
DATE March 1978

PLAN

Scale 1" = 40'



DIVISION OF ENGINEERING SERVICES - GEOTECHNICAL SERVICES

As-Built Log of Test Borings sheet is considered an informational document only. As such, the State of California registration seal with signature, license number and registration certificate expiration date confirm that this is a true and accurate copy of the original document. This drawing is available and presented only for the convenience of any bidder, contractor or other interested party.

DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets
08	Riv	15	20.3/40.1	20	38

CERTIFIED ENGINEERING GEOLOGIST — 12/17/2021 DATE

REGISTERED PROFESSIONAL ENGINEER — THOMAS C. BENSON JR. — No. 2091 — Exp. 03/31/2023 — GEOTECHNICAL — STATE OF CALIFORNIA

I-15 EXPRESS LANES PROJECT SOUTHERN EXTENSION

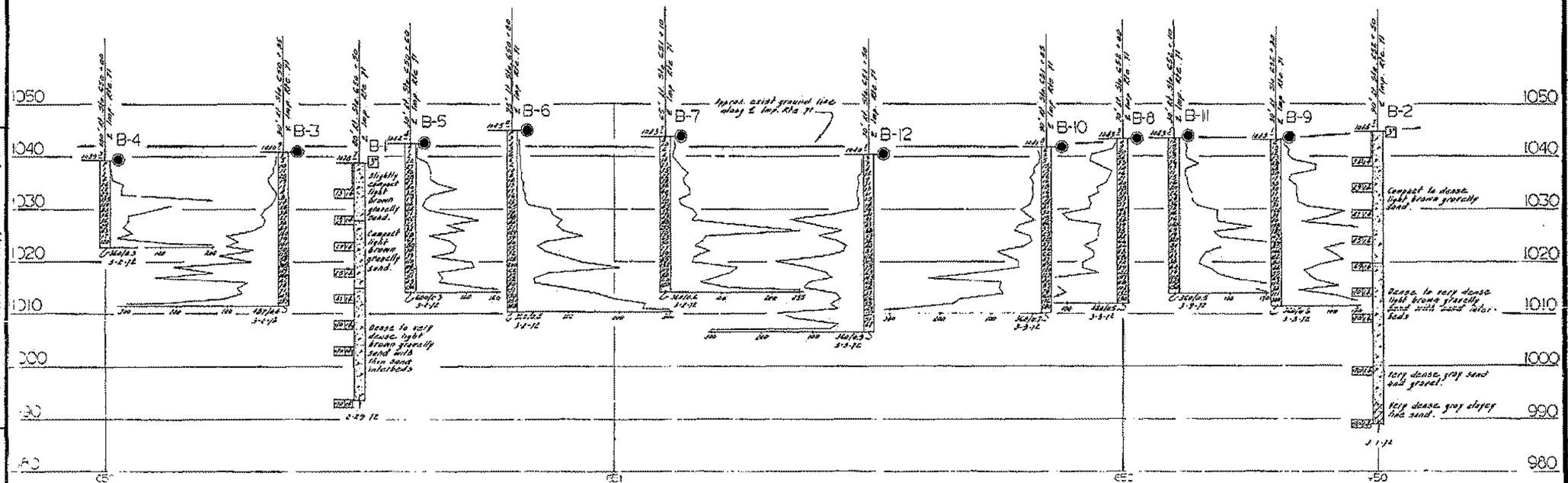
LOG OF TEST BORING 20 OF 38

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

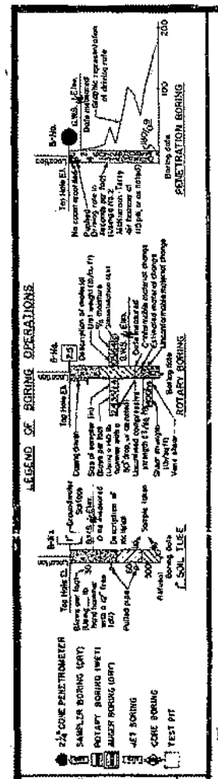
UNIT: EA: 08-0J0820

PROFILE

Scale: Vert 1" = 10'
Horiz 1" = 10'



LEGEND OF BORING OPERATIONS



LEGEND OF EARTH MATERIALS

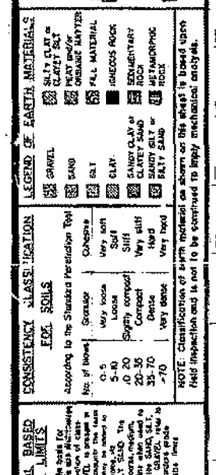
GRAVEL · SAND · SILT · CLAY · SANDY CLAY or CLAYEY SAND · SILT, CLAY or SANDY CLAY · PEAT and/or ORGANIC MATTER · FILL MATERIAL · IGNEOUS ROCK · SEDIMENTARY ROCK · METAMORPHIC ROCK

CONSISTENCY CLASSIFICATION FOR SOILS according to the Standard Penetration Test

No. of blows	Granular	Cohesive
0-5	Very loose	Very soft
6-10	Loose	Soft
11-30	Slightly compact	Stiff
31-50	Compact	Very stiff
51-70	Dense	Hard
>70	Very dense	Very hard

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

CLASSIFICATION OF MATERIAL BASED ON ST. MIHARD GRADE SIZE LIMITS



AS BUILT PLANS
Contract No. 08-170604
Date Completed
Document No. See 3899

No Changes
AS BUILT
SIGNATURES BY W. Lohse FHE
CONTRACT NO. 08-170604
DATE 10-10-79 3-11-80

WO 17061
CU 08203

BRIDGE DEPARTMENT
ENGINEERING GEOLOGY SECTION

FIELD STUDY	by O. Mikes	3-3-12
DRAWN	by J. Com	3-30-12
CHECKED	by O. MIKES	6-7-12

Approval Recommended by Charles E. Sowers, Engineering Geologist
Certified Engineering Geolo. No. 40

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

MAYHEW WASH

LOG OF TEST BORINGS

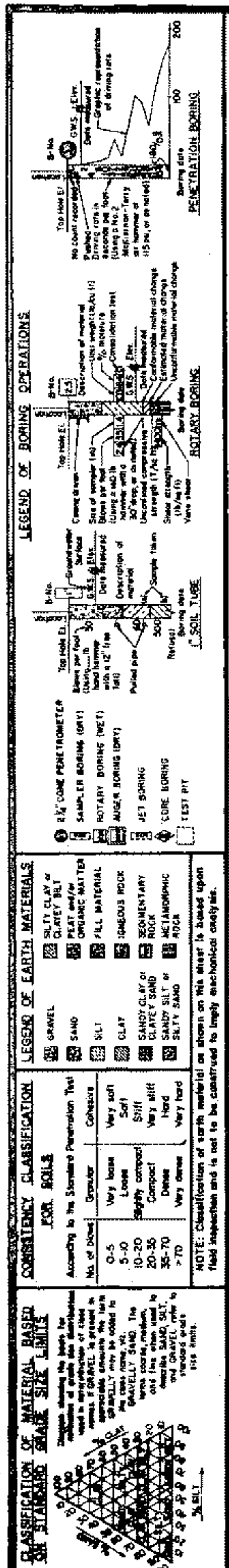
BRIDGE NO. 56-674 R/L — POST MILE 980 — DRAWING NO. — SHEET 8 OF 8

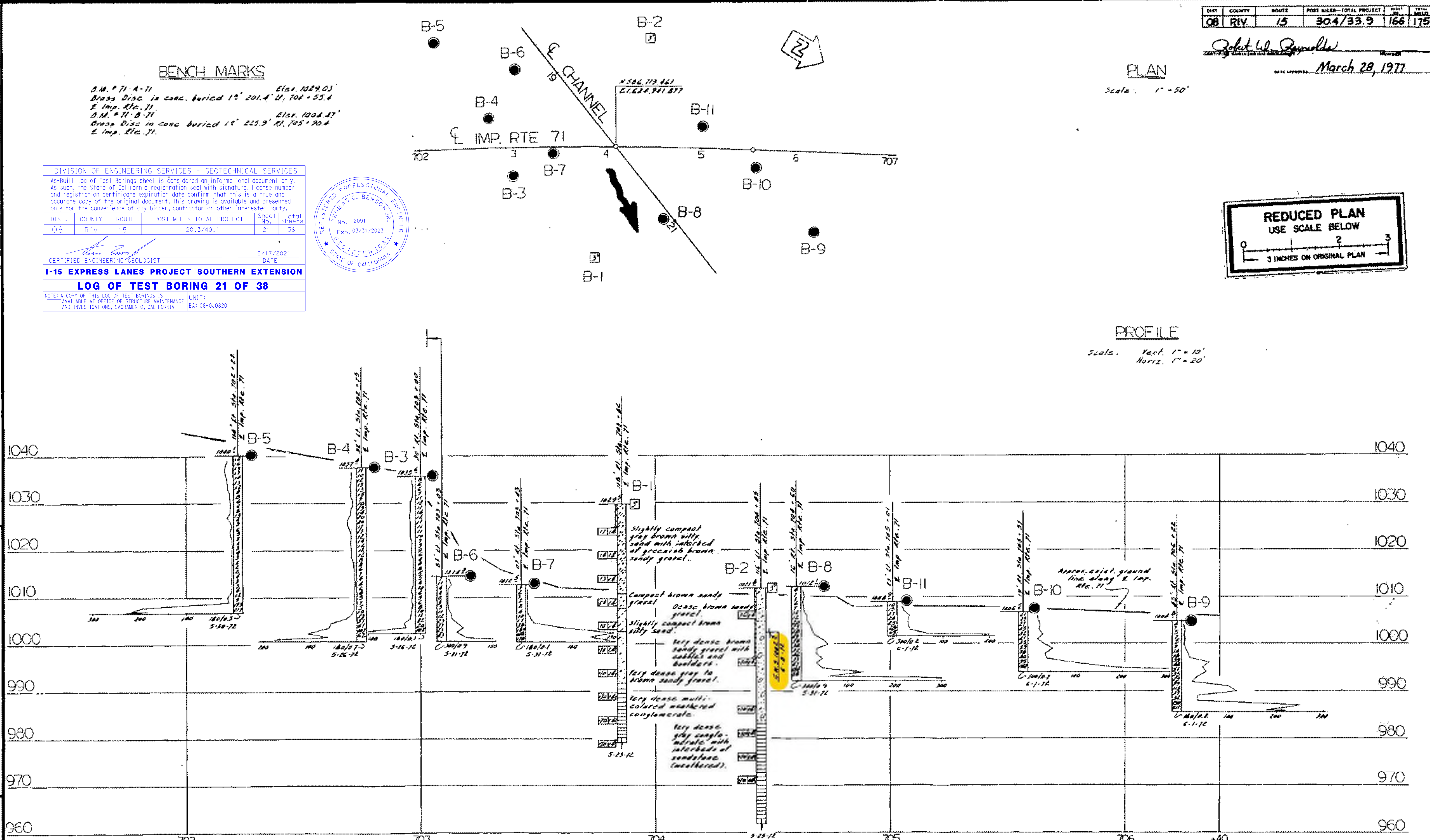
REVISION DATES (PRELIMINARY STAGE ONLY)

Disregard prints bearing earlier certified dates

I HEREBY CERTIFY THAT THE [redacted] UNDER MY DIRECTION AND [redacted] AUTHORIZATION BY THE DIR[redacted]
DATE 3-28-80 SIGNATURE [redacted]

[redacted] MENT TAKEN [redacted] SUBJECT TO [redacted] VISOR OF [redacted] SERVICES





DIST	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
08	RIV	15	30.4/33.9	166	175

March 28, 1977

DIVISION OF ENGINEERING SERVICES - GEOTECHNICAL SERVICES					
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DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets
08	Riv	15	20.3/40.1	21	38
CERTIFIED ENGINEERING GEOLOGIST				DATE 12/17/2021	
I-15 EXPRESS LANES PROJECT SOUTHERN EXTENSION					
LOG OF TEST BORING 21 OF 38					
NOTE: A COPY OF THIS LOG OF TEST BORINGS IS AVAILABLE AT OFFICE OF STRUCTURE MAINTENANCE AND INVESTIGATIONS, SACRAMENTO, CALIFORNIA			UNIT: EA: 08-0J0820		

REGISTERED PROFESSIONAL ENGINEER
THOMAS C. BENSON JR.
No. 2091
Exp. 03/31/2023
GEOTECHNICAL
STATE OF CALIFORNIA

BRIDGE DEPARTMENT
ENGINEERING GEOLOGY SECTION

FIELD STUDY	by R. E. Corbaley 6-8-72
DRAWN	by J. Lam 6-22-72
CHECKED	by D. Crawford 8-2-72

Approval Recommended by _______ Engineering Geologist

Certified Engineering Geologist No. 40

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

COLDWATER WASH

LOG OF TEST BORINGS

BRIDGE NO.	POST MILE	DRAWING NO.	SHEET	OF
56-543RL	33.0		15	15

WO 170601
CU 08203

Disregard prints bearing earlier revision dates →

REVISION DATES (PRELIMINARY STAGE ONLY)

DIST.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
08	RIV.	15	30.4/39.9	166	175

Robert W. Reynolds
March 28, 1977

BENCH MARKS

B.M. # 71-A-71 Elev. 1063.03'
Brass Disc in conc. buried 12' 201.4' Lt. 704+55.4
℄ Imp. Rte. 71.
B.M. # 71-B-71 Elev. 1004.47'
Brass Disc in conc. buried 12' 225.9' Rt. 705+30.2
℄ Imp. Rte. 71.

DIVISION OF ENGINEERING SERVICES - GEOTECHNICAL SERVICES

As-Built Log of Test Borings sheet is considered an informational document only. As such, the State of California registration seal with signature, license number and registration certificate expiration date confirm that this is a true and accurate copy of the original document. This drawing is available and presented only for the convenience of any bidder, contractor or other interested party.

DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets
08	Riv	15	20.3/40.1	22	38

CERTIFIED ENGINEERING GEOLOGIST 12/17/2021 DATE

I-15 EXPRESS LANES PROJECT SOUTHERN EXTENSION

LOG OF TEST BORING 22 OF 38

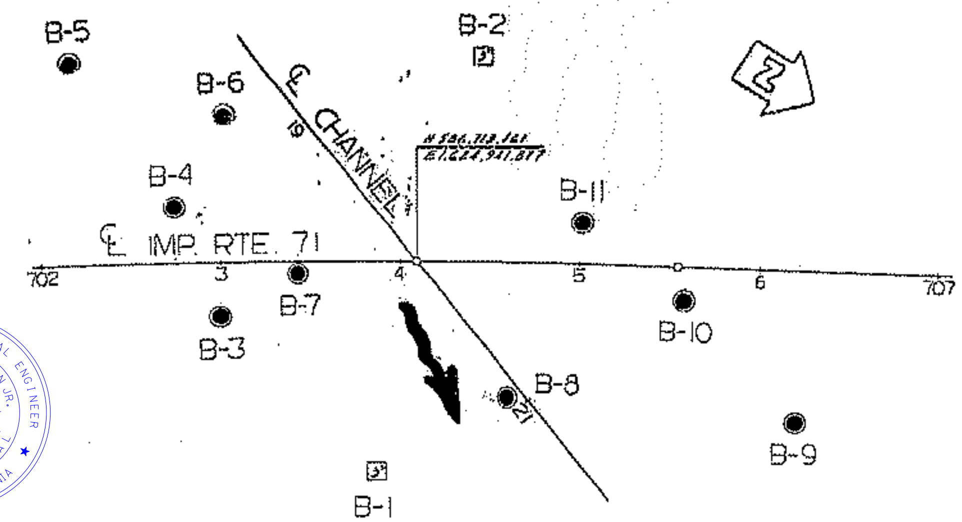
NOTE: A COPY OF THIS LOG OF TEST BORINGS IS AVAILABLE AT OFFICE OF STRUCTURE MAINTENANCE AND INVESTIGATIONS, SACRAMENTO, CALIFORNIA

UNIT:
EA: 08-0J0820

REGISTERED PROFESSIONAL ENGINEER
THOMAS C. BENSON JR.
No. 2091
Exp. 03/31/2023
GEOTECHNICAL
STATE OF CALIFORNIA

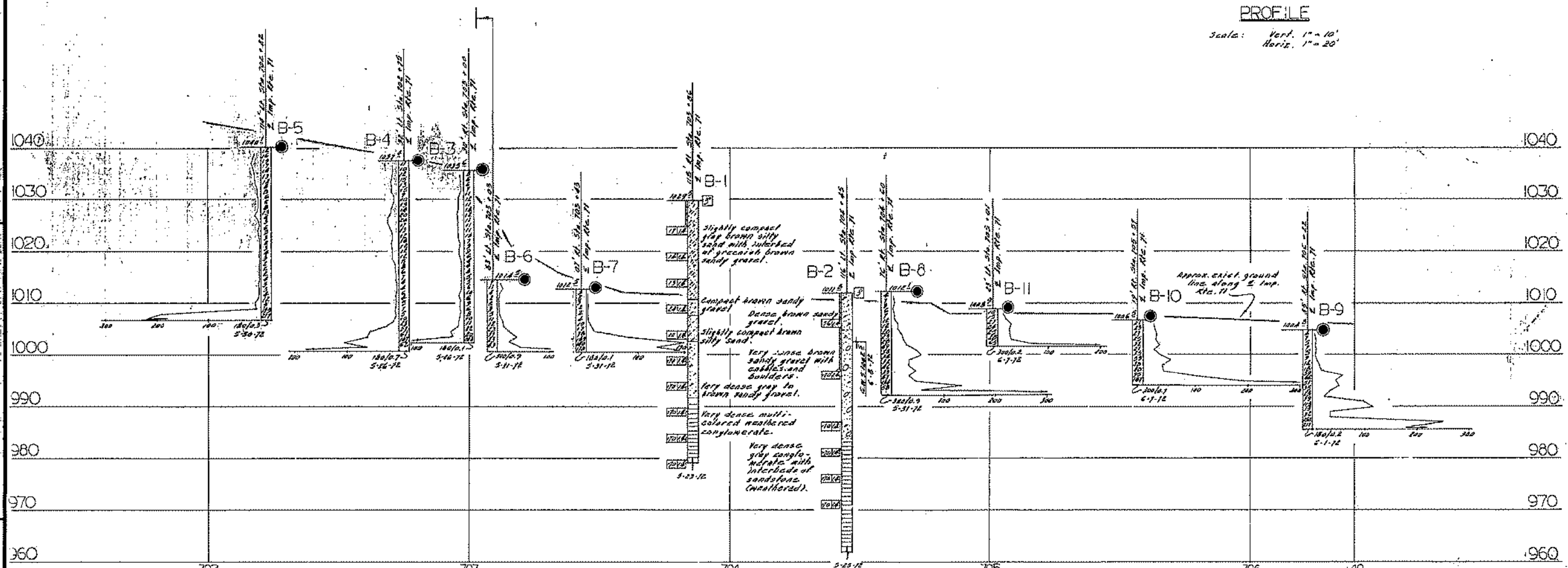
PLAN

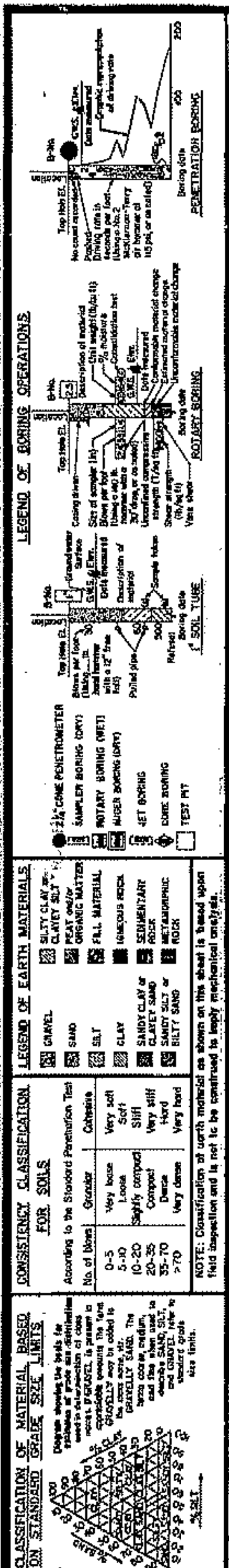
Scale: 1" = 50'



PROFILE

Scale: Vert. 1" = 10'
Horiz. 1" = 20'





AS BUILT PLANS
Contract No. 08-170604
Date Completed ______
Document No. 8000 3899

No Changes
AS BUILT
CORRECTIONS BY W. Lohse FME
CONTRACT NO. 08-170604
DATE 10-10-79 3-11-80

BRIDGE DEPARTMENT		
ENGINEERING GEOLOGY SECTION		
FIELD STUDY	by R. E. Carbalay	6-8-72
DRAWN	by J. Lam	6-22-72
CHECKED	by D. Crawford	8-8-72

Approval Recommended by ______ Engineering Geologist
Certified Engineering Geologist No. 40

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

COLDWATER WASH

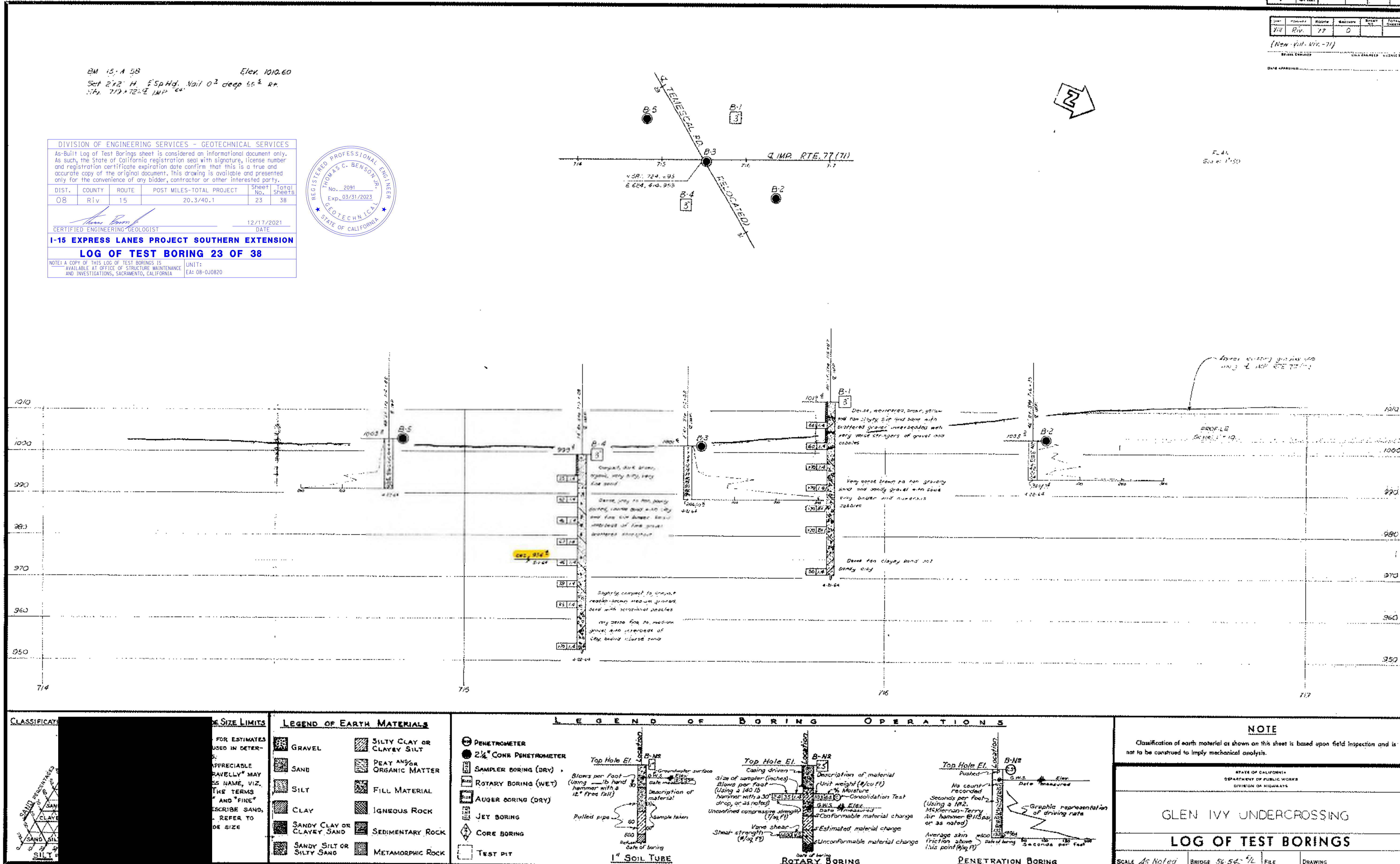
LOG OF TEST BORINGS

BRIDGE NO.	POST MILE	DRAWING NO.	SHEET	OF
56-543R L	33.0		15	15

WO 170601
CU 08203

Disregard prints bearing earlier revision dates → 7/7/76 1/11/77

I HEREBY CERTIFY THAT TH[redacted]OCUMENT TAKEN UNDER MY DIRECTION AND C[redacted] PURSUANT TO AUTHORIZATION BY THE DI[redacted]PERVISOR OF
DATE 3-28-80


DIVISION OF ENGINEERING SERVICES - GEOTECHNICAL SERVICES
As-Built Log of Test Borings sheet is considered an informational document only. As such, the State of California registration seal with signature, license number and registration certificate expiration date confirm that this is a true and accurate copy of the original document. This drawing is available and presented only for the convenience of any bidder, contractor or other interested party.
DIST. 08 | COUNTY Riv | ROUTE 15 | POST MILES-TOTAL PROJECT 20.3/40.1 | Sheet No. 23 | Total Sheets 38
CERTIFIED ENGINEERING GEOLOGIST
12/17/2021
DATE
I-15 EXPRESS LANES PROJECT SOUTHERN EXTENSION
LOG OF TEST BORING 23 OF 38
NOTE: A COPY OF THIS LOG OF TEST BORINGS IS AVAILABLE AT OFFICE OF STRUCTURE MAINTENANCE AND INVESTIGATIONS, SACRAMENTO, CALIFORNIA
UNIT:
EA: 08-0J0820
REGISTERED PROFESSIONAL ENGINEER
THOMAS C. BENSON JR.
No. 2091
Exp. 03/31/2023
GEOTECHNICAL
STATE OF CALIFORNIA
BM 15-A 58
Elev. 1010.60
B-5
B-1
B-3
B-4
B-2
RELOCATED
IMP. RTE. 77 (71)
BRIDGE DEPARTMENT
1010
1000
990
980
970
960
950
714
715
716
717
PROFILE
Dense, weathered, brown, yellow and tan silty sand with scattered gravel interbedded with very thin stringers of gravel and cobbles
Very dense brown to tan gravelly sand and sandy gravel with some clay binder and numerous cobbles
Dense tan clayey sand and sandy clay
Compact, dark brown, organic, very silty, very fine sand
Slightly compact to compact reddish-brown medium grained sand with occasional pebbles
Very dense fine to medium gravel with interbeds of clay bearing coarse sand
FIELD STUDY
DRAWN
CHECKED
CLASSIFICATI[redacted]E SIZE LIMITS
LEGEND OF EARTH MATERIALS
GRAVEL
SAND
SILT
CLAY
SANDY CLAY OR CLAYEY SAND
SANDY SILT OR SILTY SAND
SILTY CLAY OR CLAYEY SILT
PEAT AND/OR ORGANIC MATTER
FILL MATERIAL
IGNEOUS ROCK
SEDIMENTARY ROCK
METAMORPHIC ROCK
LEGEND OF BORING OPERATIONS
PENETROMETER
2¼" CONE PENETROMETER
SAMPLER BORING (DRY)
ROTARY BORING (WET)
AUGER BORING (DRY)
JET BORING
CORE BORING
TEST PIT
1" SOIL TUBE
ROTARY BORING
PENETRATION BORING
NOTE
Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS
GLEN IVY UNDERCROSSING
LOG OF TEST BORINGS
SCALE As Noted
BRIDGE 56-54

BENCH MARKS

B.M. 72-B-71 Elev. 1003.50
Brass disk in conc. buried 0.8' 201.0' Rt.
717+66.4 ℄ IMP. RTE. 71.

DIVISION OF ENGINEERING SERVICES - GEOTECHNICAL SERVICES

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DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets
08	Riv	15	20.3/40.1	24	38

CERTIFIED ENGINEERING GEOLOGIST — DATE 12/17/2021

I-15 EXPRESS LANES PROJECT SOUTHERN EXTENSION

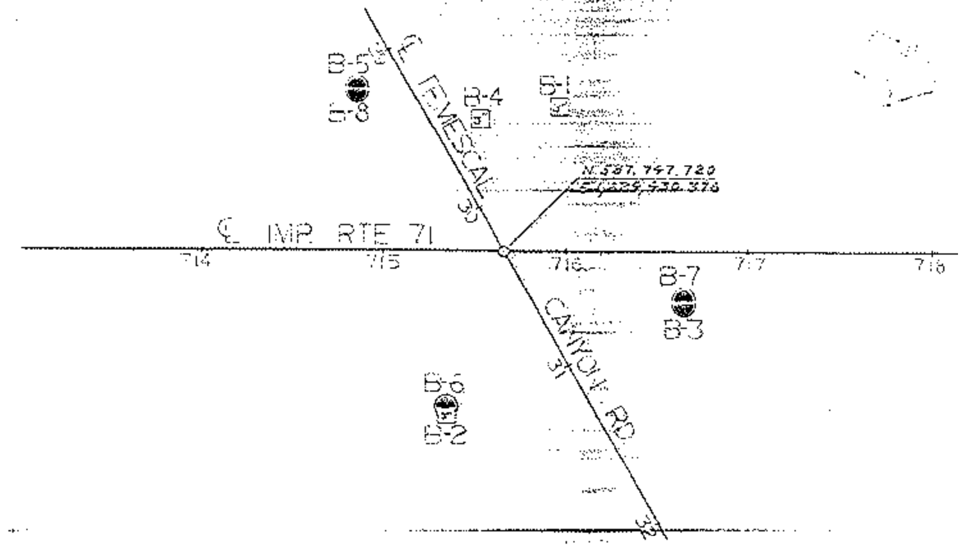
LOG OF TEST BORING 24 OF 38

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

UNIT: EA: 08-0J0820

REGISTERED PROFESSIONAL ENGINEER — THOMAS C. BENSON JR. — No. 2091 — Exp. 03/31/2023 — GEOTECHNICAL — STATE OF CALIFORNIA

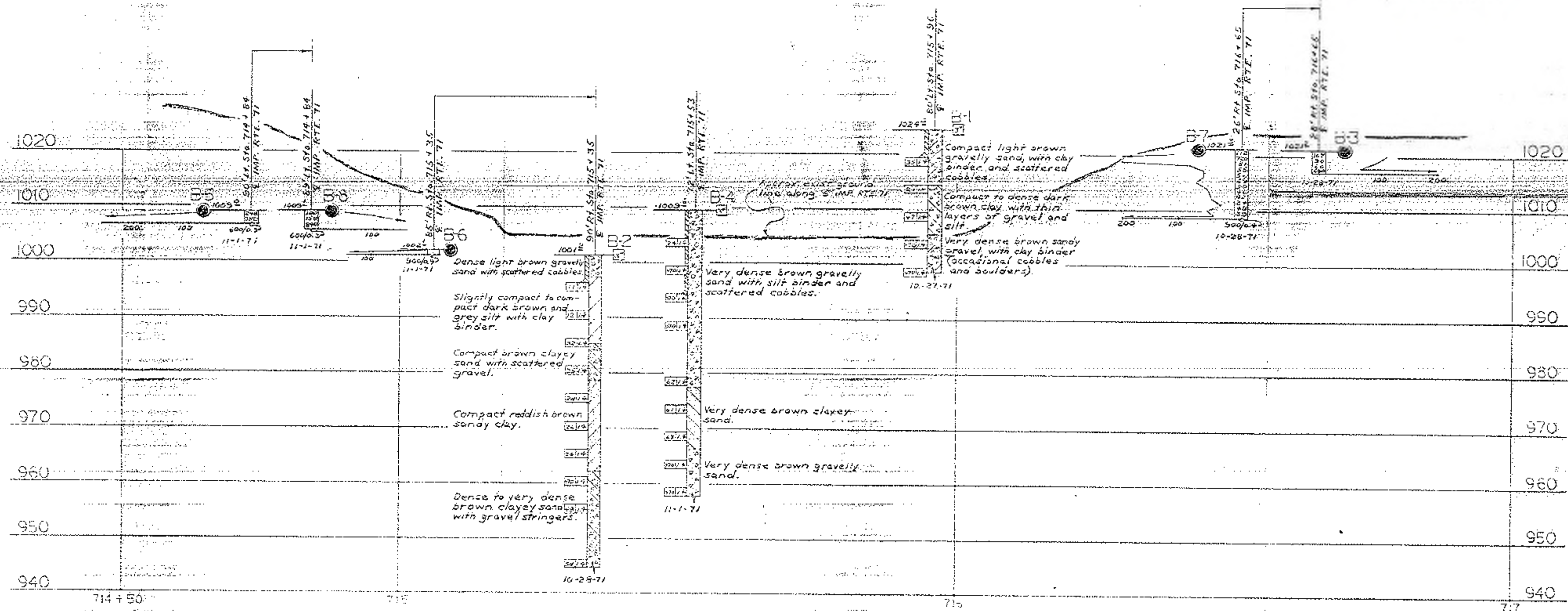
DIST.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET No.	TOTAL SHEETS
08	RIV	71			



PLAN
Scale: 1"=50'

PROFILE
Scale: Vert. 1"=10'
Horiz. 1"=10'

NO GROUND WATER ENCOUNTERED DURING THIS INVESTIGATION BY BRIDGE DEPT. GEOLOGY SECTION IN NOVEMBER, 1971



LEGEND OF BORING OPERATIONS: Penetration Boring, Rotary Boring, 2" Soil Tube

LEGEND OF EARTH MATERIALS: Gravel, Sand, Silt, Clay, Sandy Clay or Clayey Sand, Sandy Silt or Silty Sand, Silty Clay or Clayey Silt, Peat and Organic Matter, Fill Material, Igneous Rock, Sedimentary Rock, Metamorphic Rock

CLASSIFICATION OF MATERIAL BASED ON STANDARD GRADE SIZE LIMITS

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

FIELD STUDY	
DRAWN	
CHECKED	

BRIDGE DEPARTMENT
ENGINEERING GEOLOGY SECTION

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

GEOLOGY

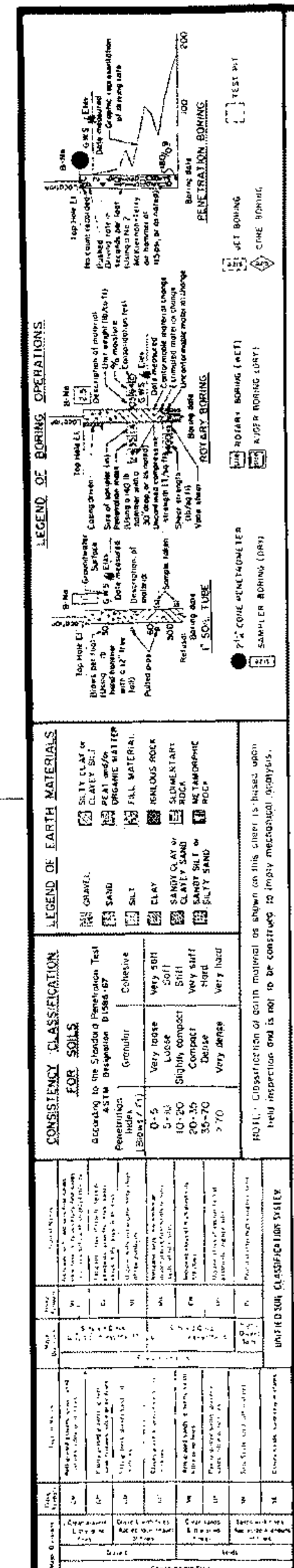
GLEN IVY ROAD UNDERCROSSING

LOG OF TEST BORINGS

BRIDGE NO. 56-542 R/L — POST MILE 12.2 — DRAWING NO.

WO
CU 08203

Disregard prints bearing earlier revision dates



DIST.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
08	RIV	15	30.4/33.9	175	175

Robert W. Reynolds #165
CERTIFIED ENGINEERING GEOLOGIST
March 28, 1977

BENCH MARKS

B.M. 72-8-71 Elev. 1003.50
Brass disk in conc. buried 0.9' 201.0' Rt.
717+66.4 ℄ IMP. PTE. 71.

DIVISION OF ENGINEERING SERVICES - GEOTECHNICAL SERVICES

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DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets
08	Riv	15	20.3/40.1	25	38

CERTIFIED ENGINEERING GEOLOGIST 12/17/2021 DATE

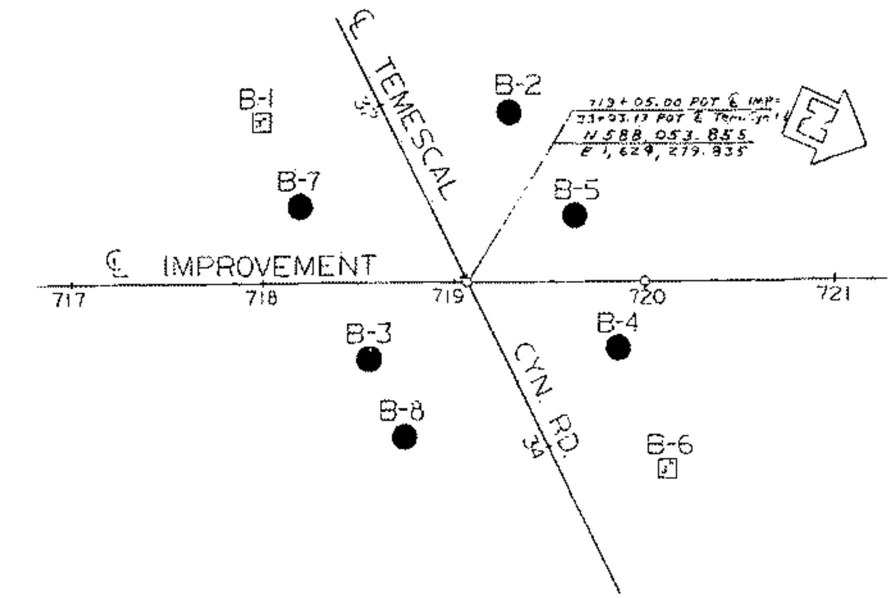
I-15 EXPRESS LANES PROJECT SOUTHERN EXTENSION

LOG OF TEST BORING 25 OF 38

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

UNIT:
EA: 08-0J0820

REGISTERED PROFESSIONAL ENGINEER THOMAS C. BENSON JR. No. 2091 Exp. 03/31/2023 GEOTECHNICAL STATE OF CALIFORNIA

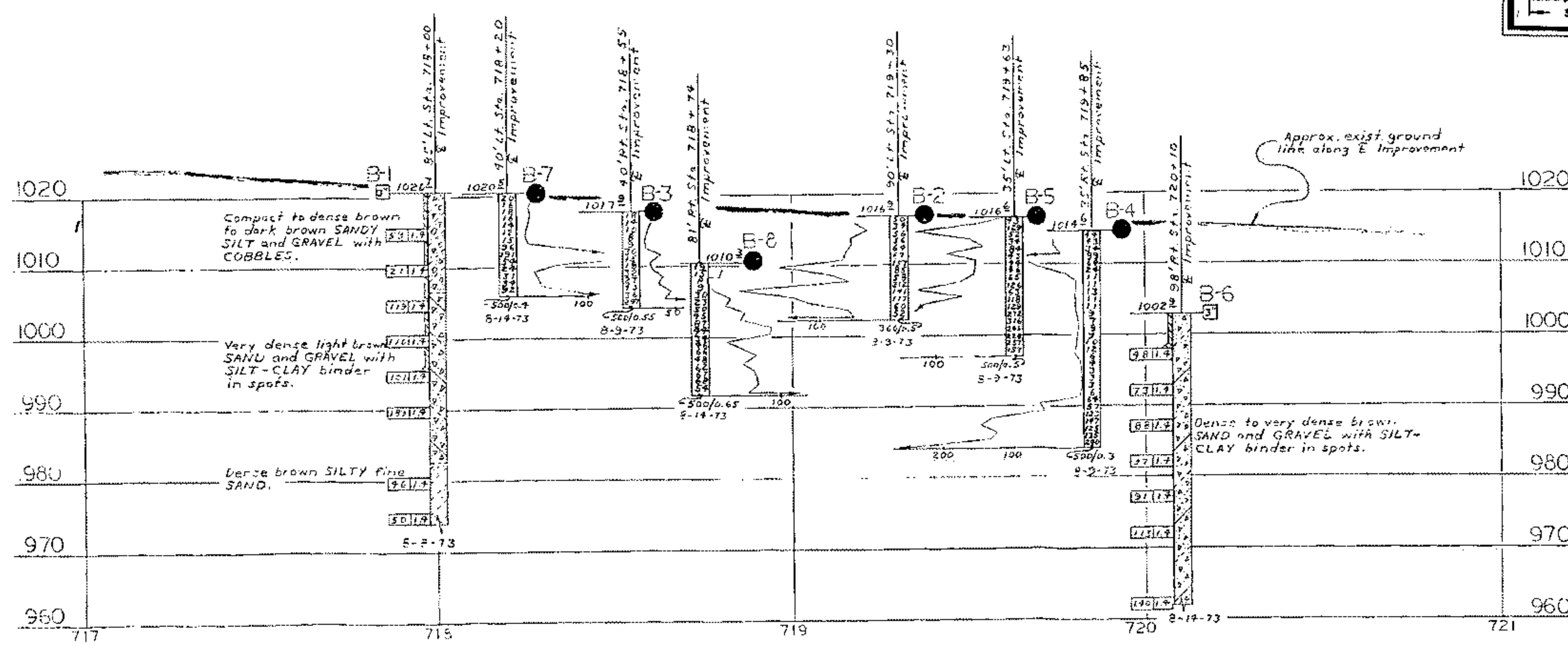


PLAN
Scale: 1" = 50'

NO GROUND WATER ENCOUNTERED DURING THIS INVESTIGATION BY BRIDGE DEPT. GEOLOGY SECTION DATE AUGUST, 1973

PROFILE
Scale: Vert. 1" = 10'
Horiz. 1" = 20'

REDUCED PLAN
USE SCALE BELOW
0 1 2 3
3 INCHES ON ORIGINAL PLAN



ENGINEERING GEOLOGY SECTION	
FIELD STUDY	By O. MIKES, 8-14-73
DRAWN	By E.S. JIMENEZ, 10-3-73
CHECKED	By

State of **CALIFORNIA**
DEPARTMENT OF TRANSPORTATION

BRIDGE DEPARTMENT
DESIGN SECTION
PROJECT ENGINEER

BRIDGE NO. 56-542 R/L
POST MILE

GLEN IVY ROAD UNDERCROSSING

LOG OF TEST BORINGS

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 08203
WO 170601

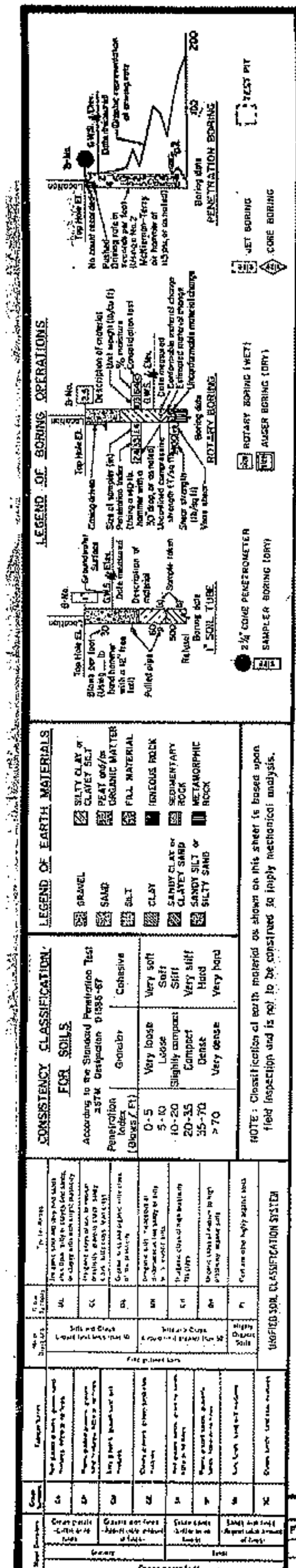
Disregard prints bearing earlier revision dates.

REVISION DATES (PRELIMINARY STAGE ONLY) 10/3/73

SHEET 9 OF 9

DIST.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
08	RIV	15	30.4/33.9	175	175

March 28, 1977



BENCH MARKS

B.M. 72-B-71 Elev. 1003.50
Brass disk in conc. buried 0.8' 201.0' Rt.
717+66.4 ℄ IMP. RTE. 71.

DIVISION OF ENGINEERING SERVICES - GEOTECHNICAL SERVICES					
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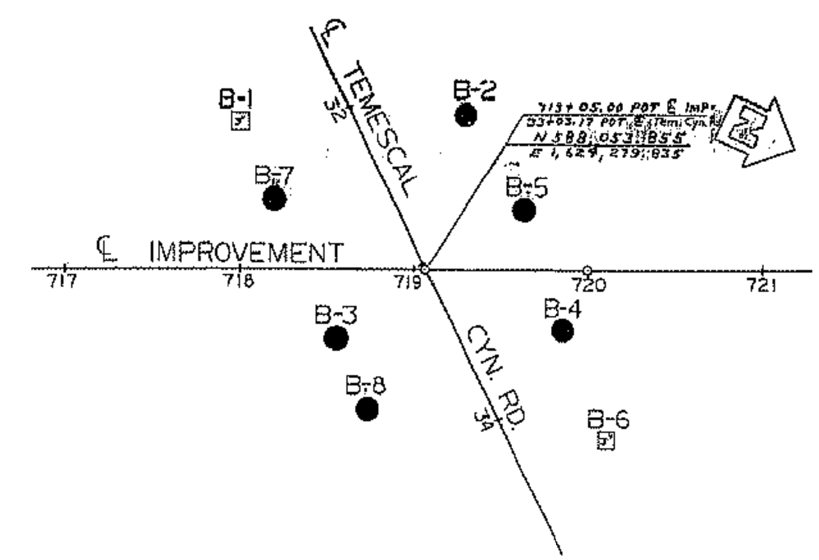
DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets
08	Riv	15	20.3/40.1	26	38
CERTIFIED ENGINEERING GEOLOGIST			DATE 12/17/2021		
I-15 EXPRESS LANES PROJECT SOUTHERN EXTENSION					
LOG OF TEST BORING 26 OF 38					
NOTE: A COPY OF THIS LOG OF TEST BORINGS IS AVAILABLE AT OFFICE OF STRUCTURE MAINTENANCE AND INVESTIGATIONS, SACRAMENTO, CALIFORNIA			UNIT: EA: 08-0J0820		

REGISTERED PROFESSIONAL ENGINEER — THOMAS C. BENSON JR. — No. 2091 — Exp. 03/31/2023 — GEOTECHNICAL — STATE OF CALIFORNIA

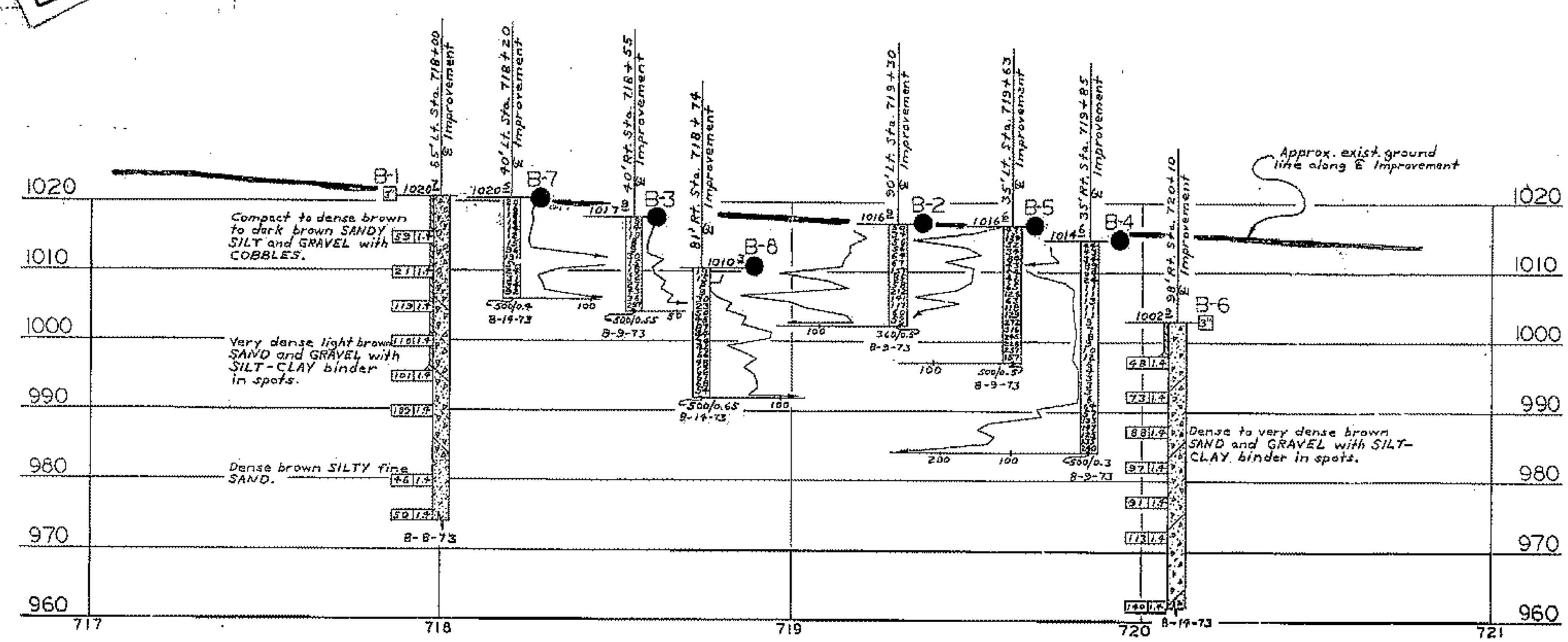
AS BUILT PLANS
Contract No. 08-170604
Date Completed
Document No. 3899



PLAN
Scale: 1" = 50'

NO GROUND WATER ENCOUNTERED DURING THIS INVESTIGATION BY BRIDGE DEPT. GEOLOGY SECTION
DATE AUGUST, 1973

PROFILE
Scale: Vert. 1" = 10'
Horiz. 1" = 20'



No Changes
AS BUILT
CORRECTIONS BY W. Lohse
CONTRACT NO. 08-170604
DATE 10-10-79 3-12-80

ENGINEERING GEOLOGY SECTION	
FIELD STUDY	By G. MIKES, 8-14-73
DRAWN	By E. S. JIMENEZ, 10-3-73
CHECKED	By Crawford 10-12-73

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

BRIDGE DEPARTMENT DESIGN SECTION 8
PROJECT ENGINEER

BRIDGE NO. 56-542 R/L
POST MILE

GLEN IVY ROAD UNDERCROSSING
LOG OF TEST BORINGS

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS
CU 08203
WO 170601
Disregard prints bearing earlier revision dates
SHEET 9 OF 9

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF TRANSPORTATION.
DATE 3-28-80 SUPERVISOR OF MICROFILM SERVICES

BM #13 Elev. 934.24
1" iron pipe & tag 1.2' deep 123.5'
Rt. Sta 794+53 ℄ IMP "64"

TBM Elev. 936.23
Set by Preliminary design @ 796 + 40 ℄ IMP "64" & Sta. 30.00 Brown Wash top of stake.

DIVISION OF ENGINEERING SERVICES - GEOTECHNICAL SERVICES

As-Built Log of Test Borings sheet is considered an informational document only. As such, the State of California registration seal with signature, license number and registration certificate expiration date confirm that this is a true and accurate copy of the original document. This drawing is available and presented only for the convenience of any bidder, contractor or other interested party.

DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets
08	Riv	15	20.3/40.1	27	38

CERTIFIED ENGINEERING GEOLOGIST — DATE 12/17/2021

REGISTERED PROFESSIONAL ENGINEER — THOMAS C. BENSON JR. — No. 2091 — Exp. 03/31/2023 — GEOTECHNICAL — STATE OF CALIFORNIA

I-15 EXPRESS LANES PROJECT SOUTHERN EXTENSION

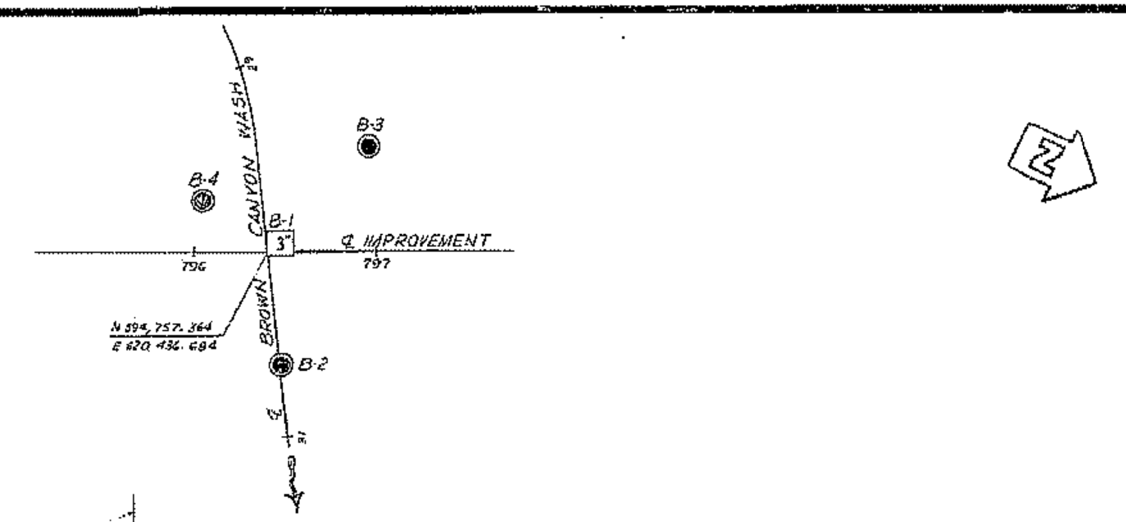
LOG OF TEST BORING 27 OF 38

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

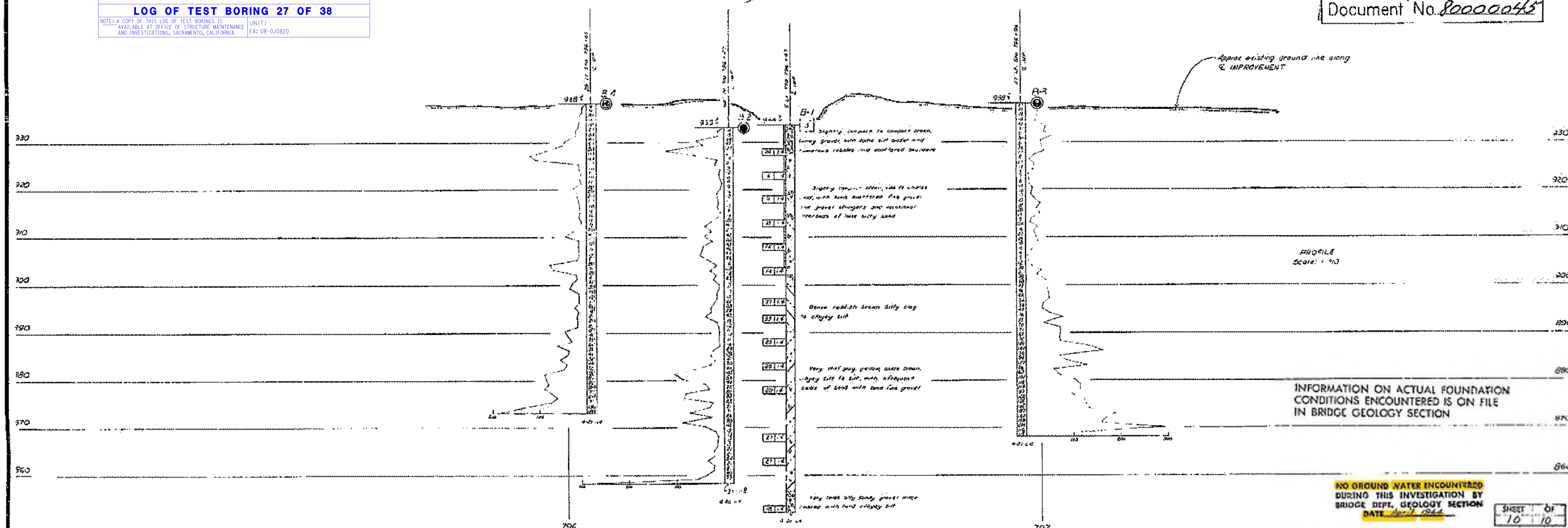
UNIT:
EA: 08-0J0820

DIST	COUNTY	ROUTE	SECTION	SHEET NO.	TOTAL SHEETS
08	Riv.	71	12.5/13.7	102	133

DATE APPROVED February 1, 1965



AS BUILT PLANS
Contract No. 08-074214
Date Completed 8-24-66
Document No. 80000045



INFORMATION ON ACTUAL FOUNDATION CONDITIONS ENCOUNTERED IS ON FILE IN BRIDGE GEOLOGY SECTION

NO GROUND WATER ENCOUNTERED DURING THIS INVESTIGATION BY BRIDGE DEPT. GEOLOGY SECTION DATE April 1964

SHEET	OF
10	10

BRIDGE DEPARTMENT

CLASSIFICATION OF MATERIAL BASED ON STANDARD GRADE SIZE LIMITS

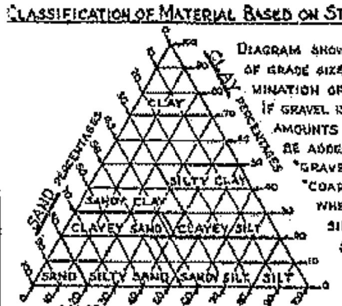


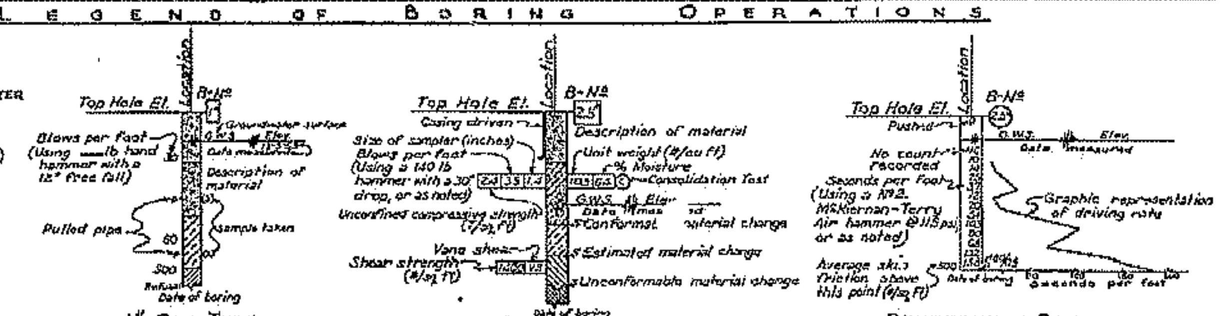
DIAGRAM SHOWING THE BASIS FOR ESTIMATES OF GRADE SIZE DISTRIBUTION USED IN DETERMINATION OF CLASS NAMES. IF GRAVEL IS PRESENT IN APPREC IABLE AMOUNTS THE TERM "GRAVELLY" MAY BE ADDED TO THE CLASS NAME, VIZ. "GRAVELLY SAND". THE TERMS "COARSE", "MEDIUM" AND "FINE" WHEN USED TO DESCRIBE SAND, SILT AND GRAVEL REFER TO STANDARD GRADE SIZE LIMITS.

LEGEND OF EARTH MATERIALS

- Gravel
- Sand
- Silt
- Clay
- Sandy Clay or Clayey Sand
- Sandy Silt or Silty Sand
- Silty Clay or Clayey Silt
- Peat and/or Organic Matter
- Fill Material
- Igneous Rock
- Sedimentary Rock
- Metamorphic Rock

LEGEND OF BORING OPERATIONS

- Penetrometer
- 2½" Cone Penetrometer
- Sampler boring (dry)
- Rotary boring (wet)
- Auger boring (dry)
- Jet boring
- Core boring
- Test pit



NOTE

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

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

BROWN CANYON WASH BRIDGE

LOG OF TEST BORINGS

SCALE	BRIDGE	FILE	DRAWING
As Noted	56-559 R/L		56559-10

FREL. DRAWING NO. P-

102

DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets
08	Riv	15	20.3/40.1	28	38

DIST.	COUNTY	ROUTE	PROJECT NO.	TOTAL SHEETS
08	Riv.	71	102	139

BM #13 Elev. 934.24
Iron pipe & tag 12' deep 123.5' Rt Sta 792+58 ℄ IMP "64"

TBM Elev. 936.23
Set by Preliminary design @ 796+ Rt ℄ IMP "64" ℄ Sta 30.00 Brass Wash top of Stake.

DIVISION OF ENGINEERING SERVICES - GEOTECHNICAL SERVICES

As-Built Log of Test Borings sheet is considered an informational document only. As such, the State of California registration seal with signature, license number and registration certificate expiration date confirm that this is a true and accurate copy of the original document. This drawing is available and presented only for the convenience of any bidder, contractor or other interested party.

CERTIFIED ENGINEERING GEOLOGIST — DATE 12/17/2021

REGISTERED PROFESSIONAL ENGINEER — THOMAS C. BENSON JR. — No. 2091 — Exp. 03/31/2023 — GEOTECHNICAL — STATE OF CALIFORNIA

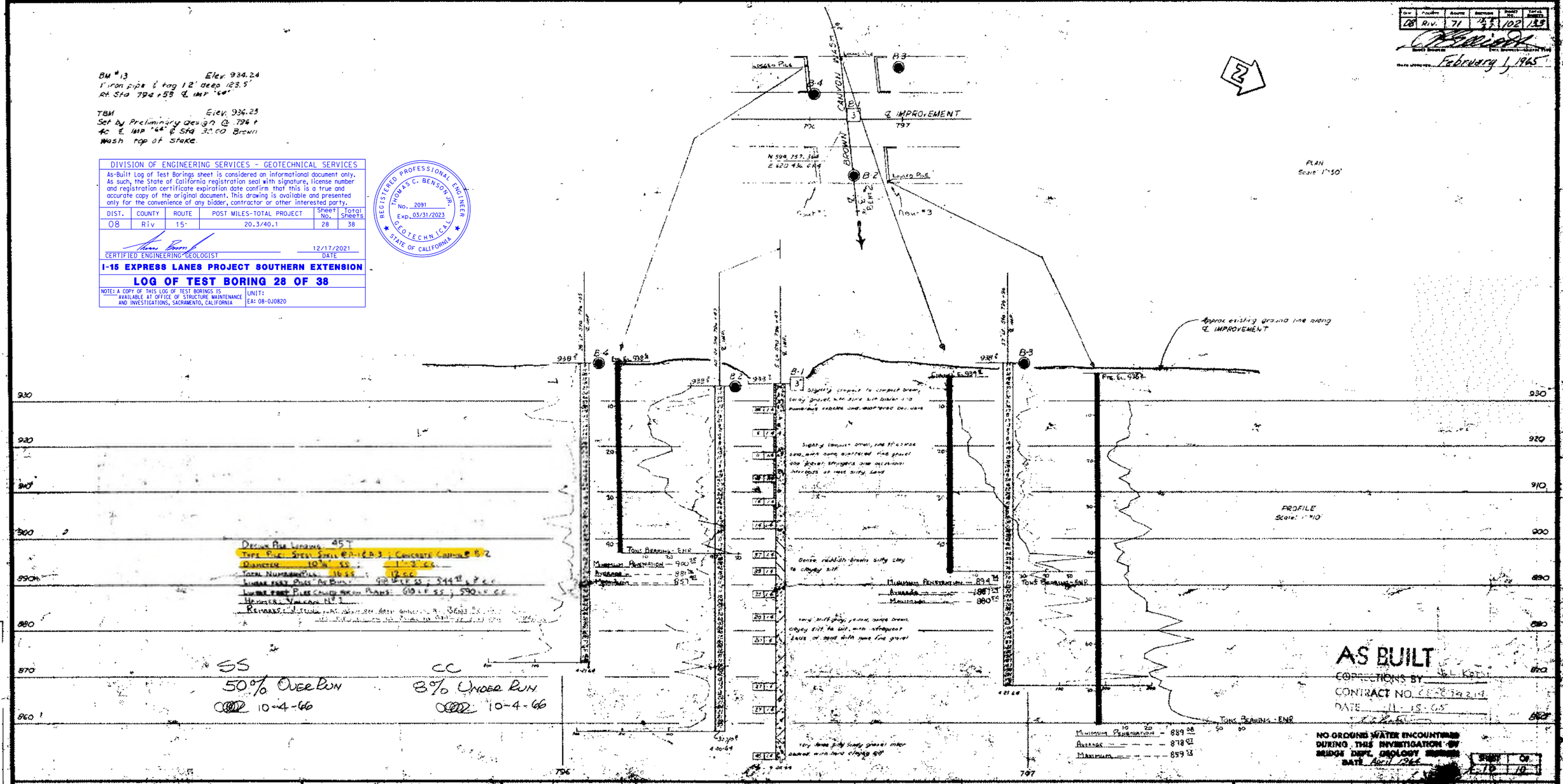
I-15 EXPRESS LANES PROJECT SOUTHERN EXTENSION

LOG OF TEST BORING 28 OF 38

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

UNIT: EA: 08-0J0820

BRIDGE DEPARTMENT



CLASSIFICATION OF MATERIAL BASED ON STANDARD GRADE SIZE LIMITS

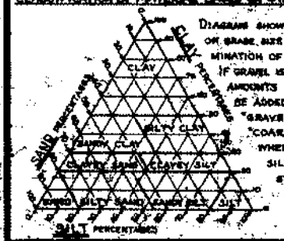


DIAGRAM SHOWING THE BASIS FOR ESTIMATES OF GRADE SIZE DISTRIBUTION USED IN DETERMINATION OF CLASS NAMES.

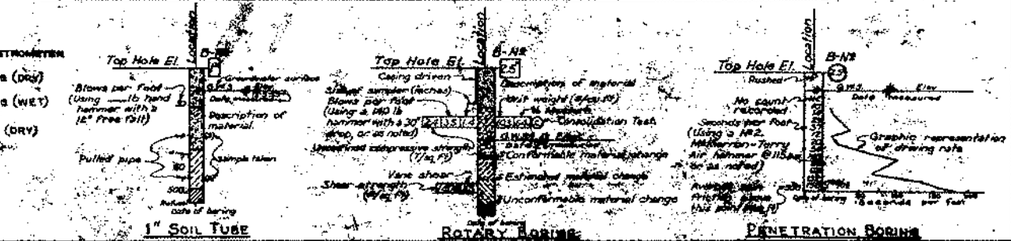
IF GRAVEL IS PRESENT IN APPRECIABLE AMOUNTS THE TERM "GRAVELLY" MAY BE ADDED TO THE CLASS NAME, VIZ. "GRAVELLY SAND." THE TERMS "COARSE," "MEDIUM" AND "FINE" WHEN USED TO DESCRIBE SAND, SILT AND GRAVEL REFER TO STANDARD GRADE SIZE LIMITS.

LEGEND OF EARTH MATERIALS

- GRAVEL
- SAND
- SILT
- CLAY
- SANDY CLAY OR CLAYEY SAND
- SANDY SILT OR SILTY SAND
- SILTY CLAY OR CLAYEY SILT
- PEAT AND/OR ORGANIC MATTER
- FILL MATERIAL
- IGNEOUS ROCK
- SEDIMENTARY ROCK
- METAMORPHIC ROCK

LEGEND OF BORING OPERATIONS

- PENETROMETER
- 2½" CONE PENETROMETER
- SAMPLER BORING (DRY)
- ROTARY BORING (WET)
- AUGER BORING (DRY)
- JET BORING
- CORE BORING
- TEST PIT



NOTE

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

STATE OF CALIFORNIA — DEPARTMENT OF PUBLIC WORKS — DIVISION OF HIGHWAYS

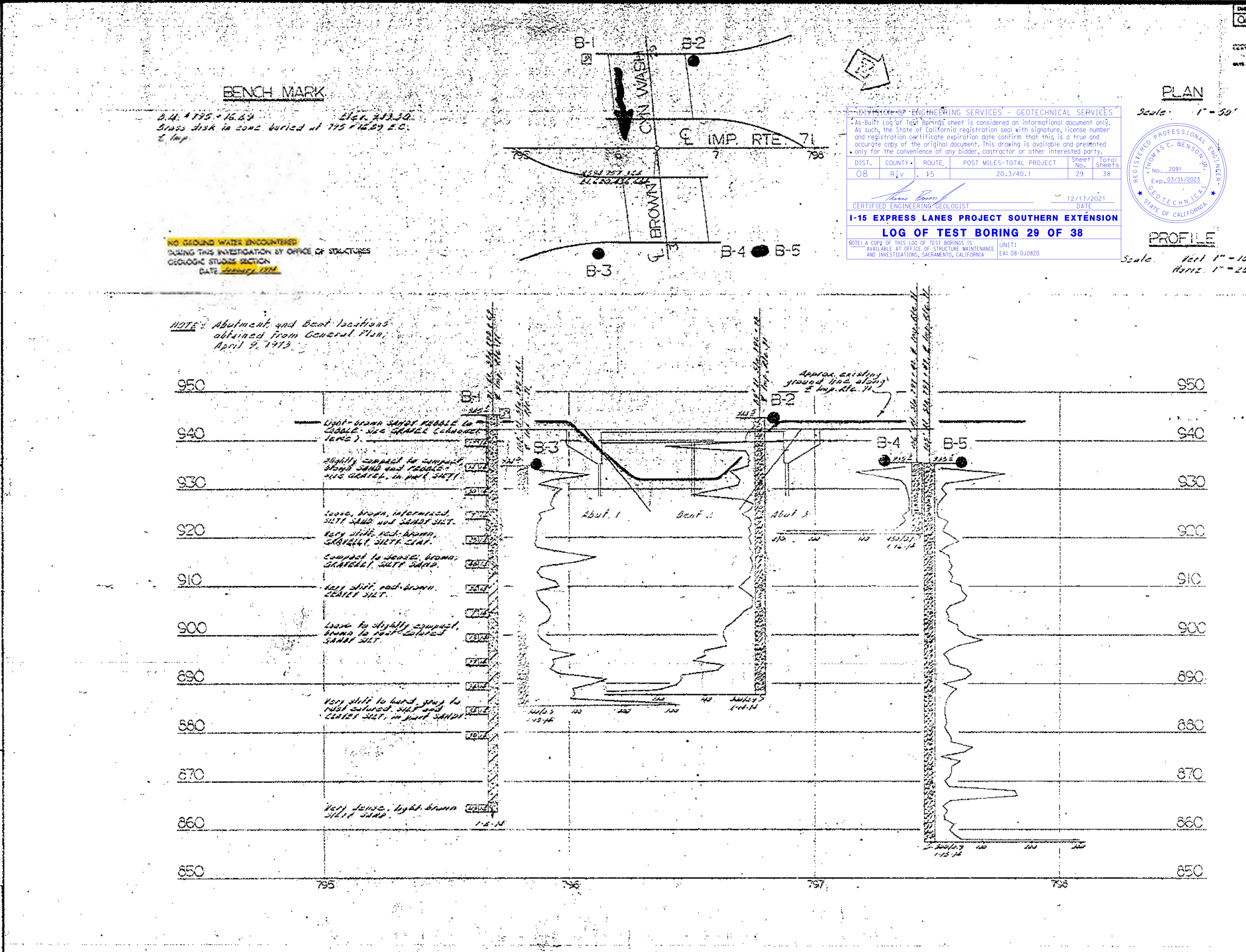
BROWN CANYON, WASH BRIDGE

LOG OF TEST BORINGS

SCALE As Noted | BRIDGE 56-559¾ | FILE | DRAWING 56559-10

FED. DRAWING NO. P.

102



DIVISION OF ENGINEERING SERVICES - GEOTECHNICAL SERVICES

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DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets
08	Riv	15	20.3/40.1	29	38

CERTIFIED ENGINEERING GEOLOGIST — DATE 12/17/2021

REGISTERED PROFESSIONAL ENGINEER — THOMAS C. BENSON JR. — No. 2091 — Exp. 03/31/2023 — GEOTECHNICAL — STATE OF CALIFORNIA

I-15 EXPRESS LANES PROJECT SOUTHERN EXTENSION

LOG OF TEST BORING 29 OF 38

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

UNIT:
EA: 08-0J0820

ENGINEERING GEOLOGY SECTION

State of CALIFORNIA
DEPARTMENT OF TRANSPORTATION

BRIDGE DEPARTMENT
DESIGN SECTION

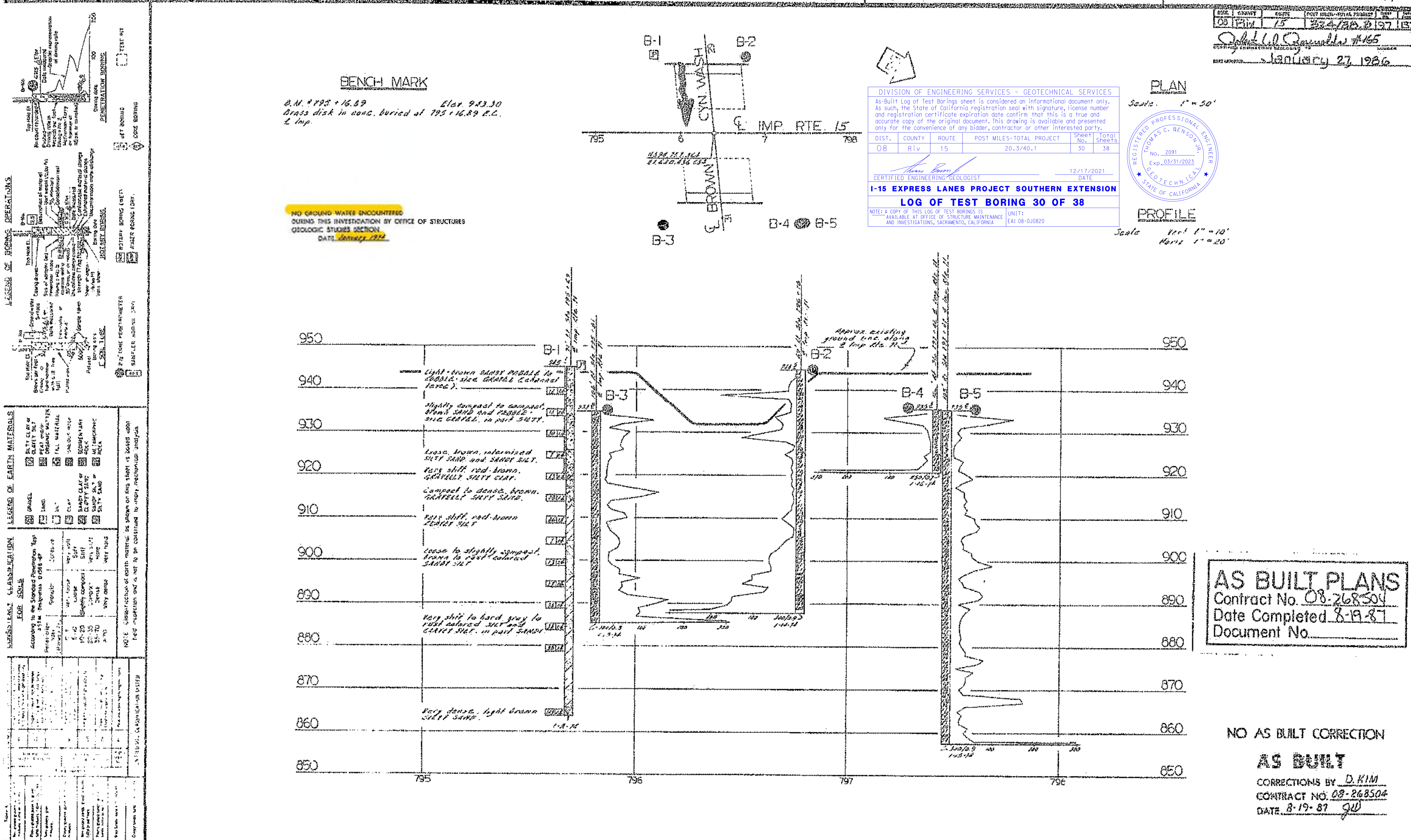
BRIDGE NO. 56-0555RL
POST MILE 10.71

BROWN CANYON WASH

LOG OF TEST BORINGS

CU 08203
WO 170701

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS



DIVISION OF ENGINEERING SERVICES - GEOTECHNICAL SERVICES

As-Built Log of Test Borings sheet is considered an informational document only. As such, the State of California registration seal with signature, license number and registration certificate expiration date confirm that this is a true and accurate copy of the original document. This drawing is available and presented only for the convenience of any bidder, contractor or other interested party.

DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets
08	Riv	15	20.3/40.1	30	38

CERTIFIED ENGINEERING GEOLOGIST — DATE 12/17/2021

I-15 EXPRESS LANES PROJECT SOUTHERN EXTENSION

LOG OF TEST BORING 30 OF 38

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

UNIT:
EA: 08-0J0820

REGISTERED PROFESSIONAL ENGINEER — THOMAS C. BENSON JR. — No. 2091 — Exp. 03/31/2023 — GEOTECHNICAL — STATE OF CALIFORNIA

ENGINEERING GEOLOGY SECTION

FIELD STUDY	D.B. Crawford	1-15-74	Approval Recommended By: A. L. Champlin, ENGINEERING GEOLOGIST
DRAWN	J. Lau	1-25-74	CERTIFIED ENGINEERING GEOLOGIST NUMBER 348
CHECKED		2-11-74	

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

BRIDGE DEPARTMENT — DESIGN SECTION 1 — PROJECT ENGINEER

BRIDGE NO. 56-559R/L — POST MILE 34.72

BROWN CANYON WASH BRIDGE (WIDEN)

LOG OF TEST BORINGS

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 08201
WO 268501

Disregard prints bearing earlier revision dates

SHEET 6 OF 6

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

DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets
7	CAL.				

Dist.	County	Route	Section	Sheet No.	Total Sheets
08	Riv	71	33	111	133

February 1, 1965

BM #27-A 58 Elev. 908.44
Set 2"x2" H & Sp.Hd. Nail 1' deep, 125' Lt. Sta. 843+38± ℄ IMP '64

DIVISION OF ENGINEERING SERVICES - GEOTECHNICAL SERVICES

As-Built Log of Test Borings sheet is considered an informational document only. As such, the State of California registration seal with signature, license number and registration certificate expiration date confirm that this is a true and accurate copy of the original document. This drawing is available and presented only for the convenience of any bidder, contractor or other interested party.

DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets
08	Riv	15	20.3/40.1	31	38

CERTIFIED ENGINEERING GEOLOGIST DATE 12/17/2021

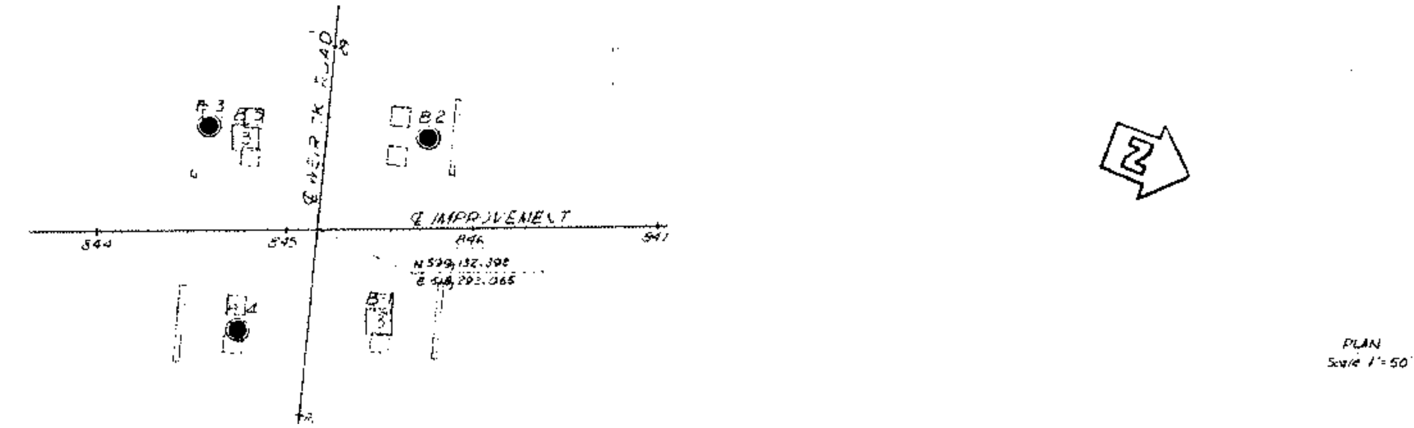
REGISTERED PROFESSIONAL ENGINEER THOMAS C. BENSON JR. No. 2091 Exp. 03/31/2023 GEOTECHNICAL STATE OF CALIFORNIA

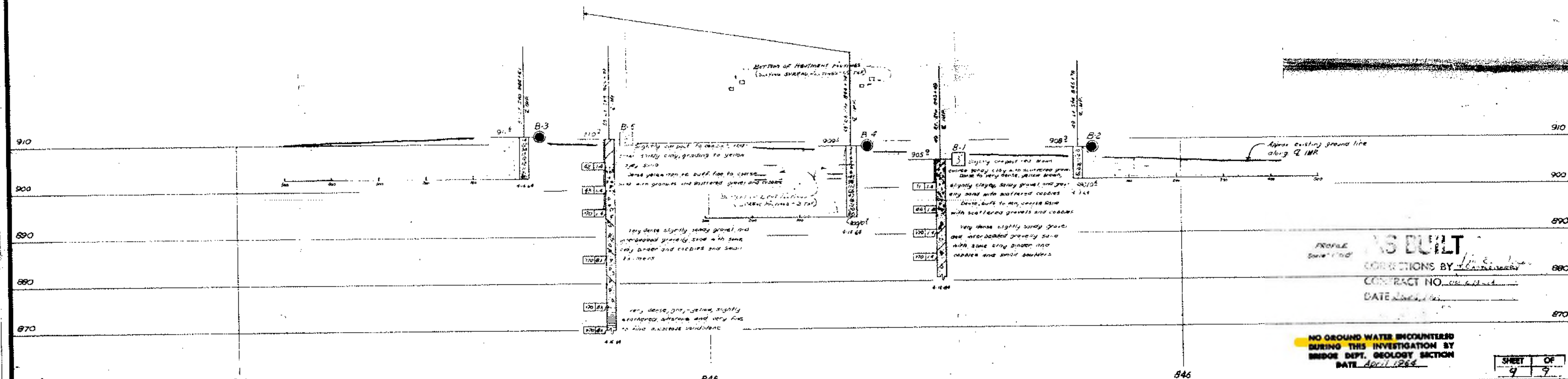
I-15 EXPRESS LANES PROJECT SOUTHERN EXTENSION

LOG OF TEST BORING 31 OF 38

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

UNIT:
EA: 08-0J0820





AS BUILT
CORRECTIONS BY
CONTRACT NO.
DATE

NO GROUND WATER ENCOUNTERED DURING THIS INVESTIGATION BY BRIDGE DEPT. GEOLOGY SECTION
DATE April 1964

SHEET	OF
9	9

BRIDGE DEPARTMENT

FIELD STUDY / DRAWN / CHECKED

Classification of Material Based on Standard Grade Size Limits

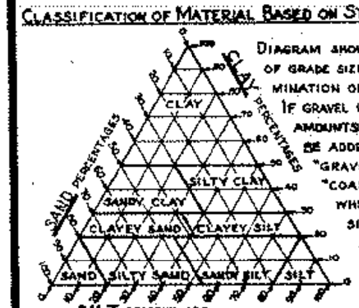


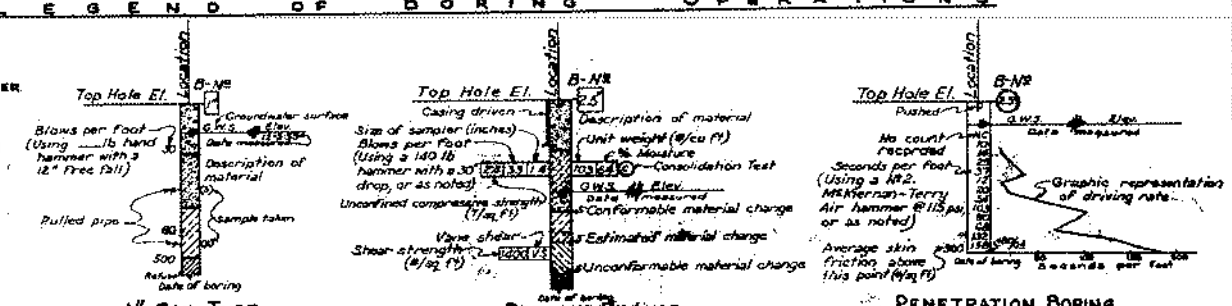
Diagram showing the basis for estimates of grade size distribution used in determination of class names. If gravel is present in appreciable amounts the term "gravelly" may be added to the class name, viz. "gravelly sand". The terms "coarse", "medium" and "fine" when used to describe sand, silt and gravel refer to standard grade size limits.

Legend of Earth Materials

- Gravel
- Sand
- Silt
- Clay
- Sandy Clay or Clayey Sand
- Sandy Silt or Silty Sand
- Silty Clay or Clayey Silt
- Peat and/or Organic Matter
- Fill Material
- Igneous Rock
- Sedimentary Rock
- Metamorphic Rock

Legend of Boring Operations

- Penetrometer
- 2½" Cone Penetrometer
- Sampler boring (dry)
- Rotary boring (wet)
- Auger boring (dry)
- Jet boring
- Core boring
- Test pit



NOTE

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

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

TEMESCAL UNDERCROSSING

LOG OF TEST BORINGS

SCALE	BRIDGE	FILE	DRAWING
As Noted	56-541 R/L		5654/-9

PREL. DRAWING NO. P-

FED. ROAD DIV. NO.	STATE	...	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
7	CAL.				

DIST.	COUNTY	ROUTE	SECTION	SHEET NO.	TOTAL SHEETS
08	Riv	71		111	133

DATE APPROVED February 1, 1965

BM # 27-A-58 Elev. 908.44
Set 2"x2" H & Sp.Hd. Nail 1' deep, 135' Lt. Sta. 843 + 38 ± ℄ IMP "64"

DIVISION OF ENGINEERING SERVICES - GEOTECHNICAL SERVICES

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DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets
08	Riv	15	20.3/40.1	32	38

CERTIFIED ENGINEERING GEOLOGIST — DATE 12/17/2021

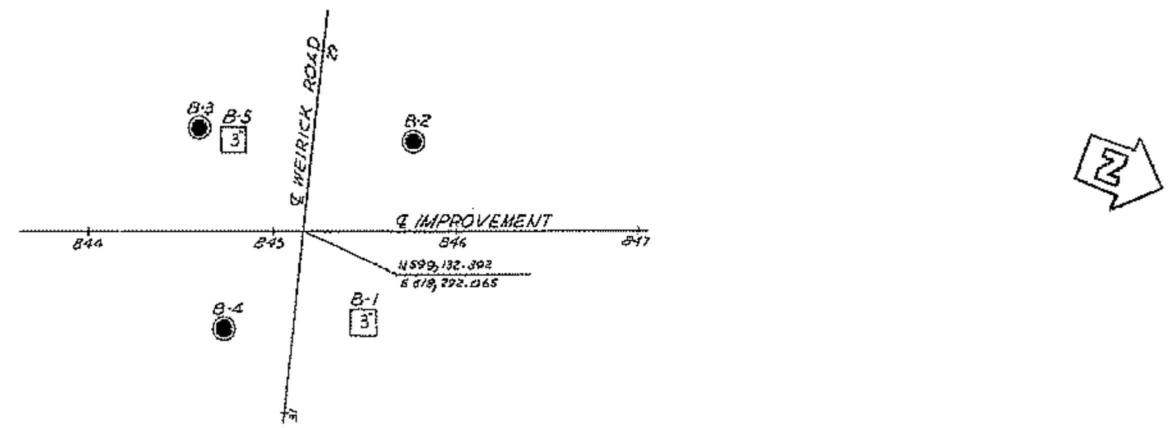
REGISTERED PROFESSIONAL ENGINEER — THOMAS C. BENSON JR. — No. 2091 — Exp. 03/31/2023 — GEOTECHNICAL — STATE OF CALIFORNIA

I-15 EXPRESS LANES PROJECT SOUTHERN EXTENSION

LOG OF TEST BORING 32 OF 38

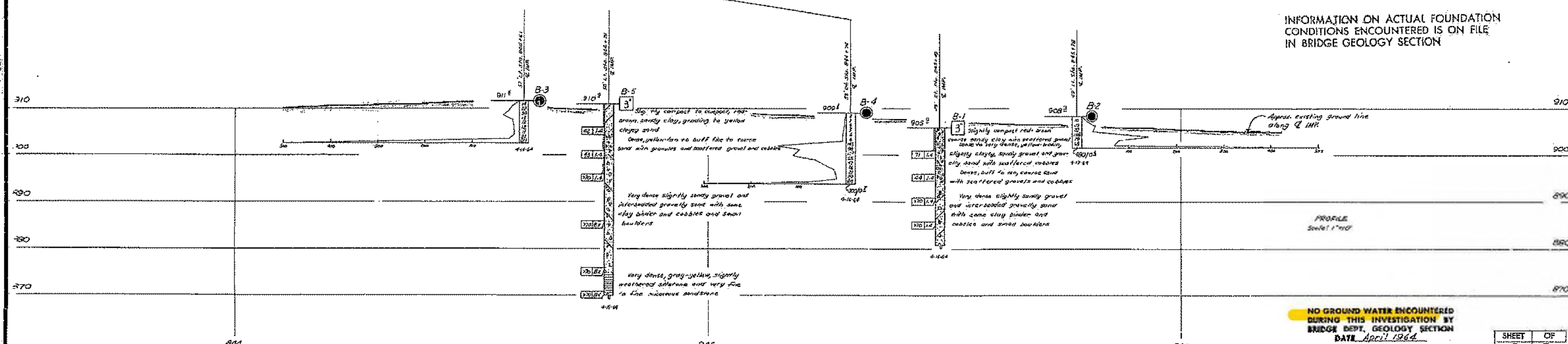
NOTE: A COPY OF THIS LOG OF TEST BORINGS IS AVAILABLE AT OFFICE OF STRUCTURE MAINTENANCE AND INVESTIGATIONS, SACRAMENTO, CALIFORNIA

UNIT:
EA: 08-0J0820



AS BUILT PLANS
Contract No. 08-074214
Date Completed 8-24-66
Document No. 80000045

INFORMATION ON ACTUAL FOUNDATION CONDITIONS ENCOUNTERED IS ON FILE IN BRIDGE GEOLOGY SECTION



NO GROUND WATER ENCOUNTERED DURING THIS INVESTIGATION BY BRIDGE DEPT. GEOLOGY SECTION
DATE April 1964

SHEET	OF
9	9

BRIDGE DEPARTMENT

FIELD STUDY	by S. L. Champlin 4-15-64
DRAWN	by P. Ryan
CHECKED	by R. Robinson
Approval Recommended by	

Classification of Material Based on Standard Grade Size Limits

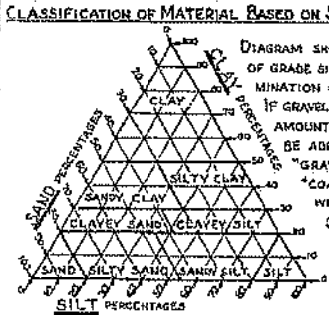


Diagram showing the basis for estimates of grade size distribution used in determination of class names.
If gravel is present in appreciable amounts the term "gravelly" may be added to the class name, viz. "gravelly sand." The terms "coarse", "medium" and "fine" when used to describe sand, silt and gravel, refer to standard grade size limits.

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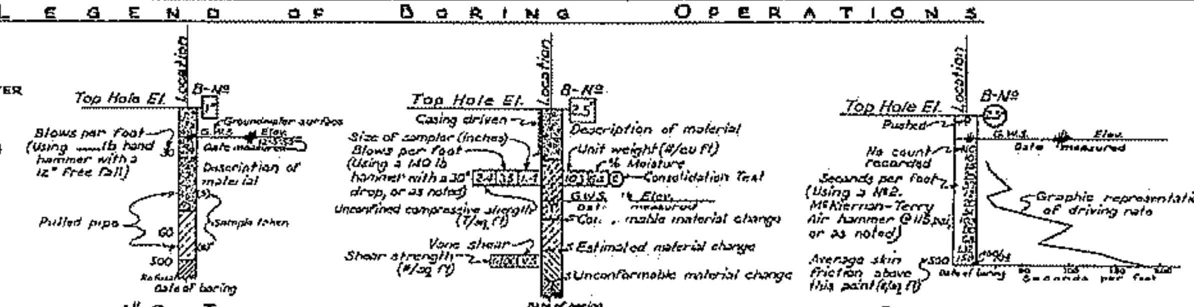
- Penetrometer
- 2¼" Cone Penetrometer
- Sampler boring (dry)
- Rotary boring (wet)
- Auger boring (dry)
- Jet boring
- Core boring
- Test pit



NOTE

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

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

TEMESCAL UNDERCROSSING

LOG OF TEST BORINGS

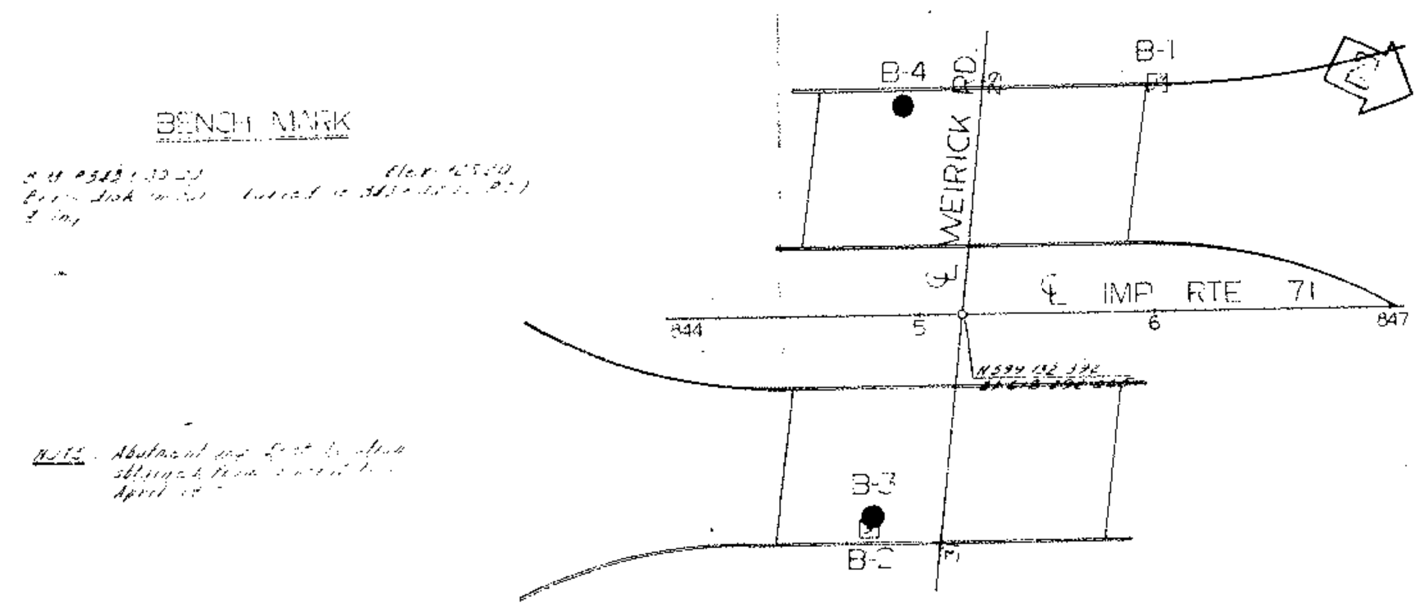
SCALE As Noted	BRIDGE 56-541 R/L	FILE	DRAWING 56541-9

PREL. DRAWING NO. P- 3/5/64

DIST.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT
08	RIV	71	

PLAN

Scale 1" = 40'



DIVISION OF ENGINEERING SERVICES - GEOTECHNICAL SERVICES

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DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets
08	Riv	15	20.3/40.1	33	38

CERTIFIED ENGINEERING GEOLOGIST — DATE 12/17/2021

REGISTERED PROFESSIONAL ENGINEER — THOMAS C. BENSON JR. — No. 2091 — Exp. 03/31/2023 — GEOTECHNICAL — STATE OF CALIFORNIA

I-15 EXPRESS LANES PROJECT SOUTHERN EXTENSION

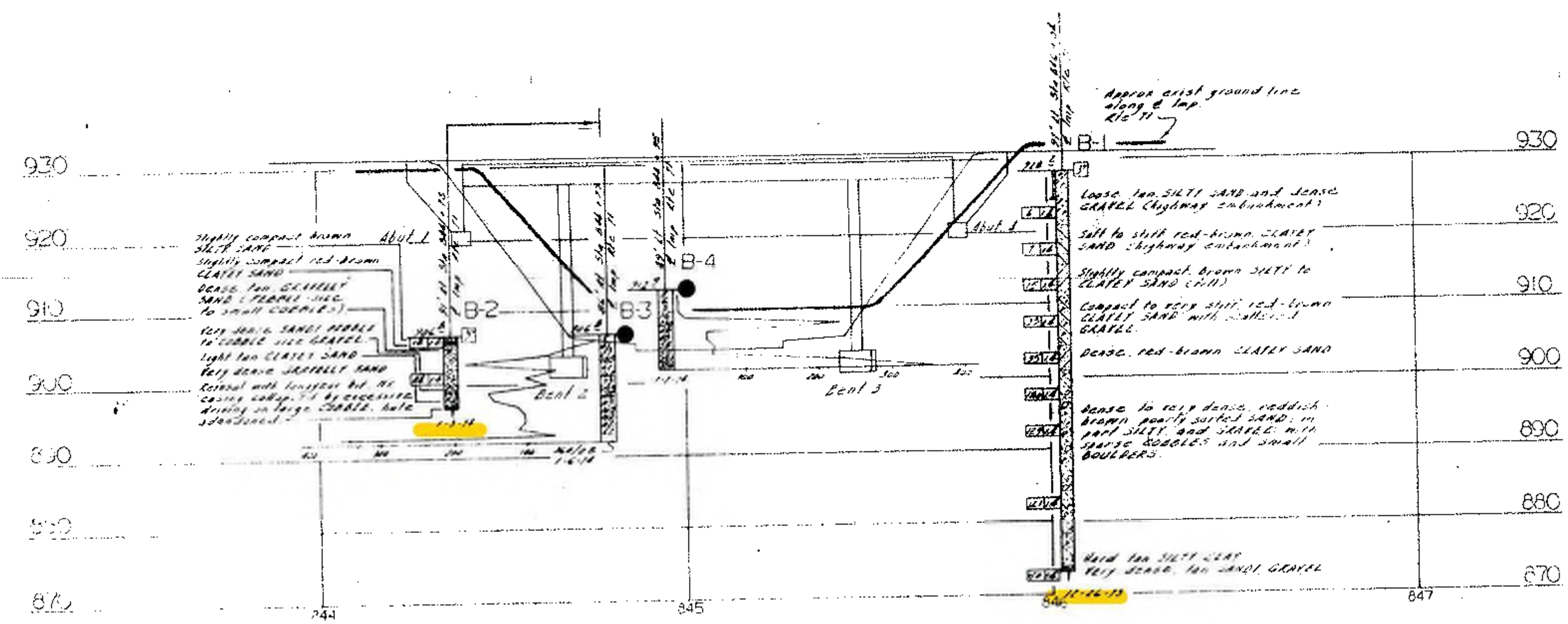
LOG OF TEST BORING 33 OF 38

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

UNIT:
EA: 08-0J0820

PROFILE

Scale Vert 1" = 10'
Horiz 1" = 20'



ENGINEERING GEOLOGY SECTION

FIELD STUDY	
DRAWN	
CHECKED	

State of CALIFORNIA
DEPARTMENT OF TRANSPORTATION

BRIDGE DEPARTMENT
DESIGN SECTION
PROJECT ENGINEER

BRIDGE NO.	POST MILE
56-0541RL	9.77

WEIRICK ROAD UNDERCROSSING (WIDEN)

LOG OF TEST BORINGS

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS

CU 08203
WO

DIST.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET	TOTAL SHEETS
08	Riv	15	32.4/38.8	105	133

Robert W. Reynolds #165
CERTIFIED ENGINEERING GEOLOGIST
January 27, 1986

BENCH MARK

B.M. #613 + 03.00 Elev 925.20.
Brass disk in conc. buried at 613 + 30.00 POT
℄ Imp

DIVISION OF ENGINEERING SERVICES - GEOTECHNICAL SERVICES					
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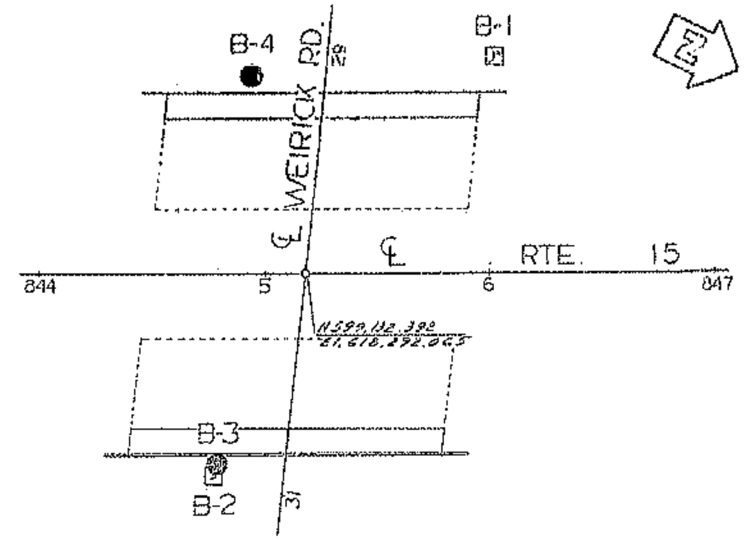
DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets
08	Riv	15	20.3/40.1	34	38
CERTIFIED ENGINEERING GEOLOGIST				DATE 12/17/2021	
I-15 EXPRESS LANES PROJECT SOUTHERN EXTENSION					
LOG OF TEST BORING 34 OF 38					
NOTE: A COPY OF THIS LOG OF TEST BORINGS IS AVAILABLE AT OFFICE OF STRUCTURE MAINTENANCE AND INVESTIGATIONS, SACRAMENTO, CALIFORNIA			UNIT: EA: 08-0J0820		

REGISTERED PROFESSIONAL ENGINEER
THOMAS C. BENSON JR.
No. 2091
Exp. 03/31/2023
GEOTECHNICAL
STATE OF CALIFORNIA

PLAN

Scale 1" = 10'

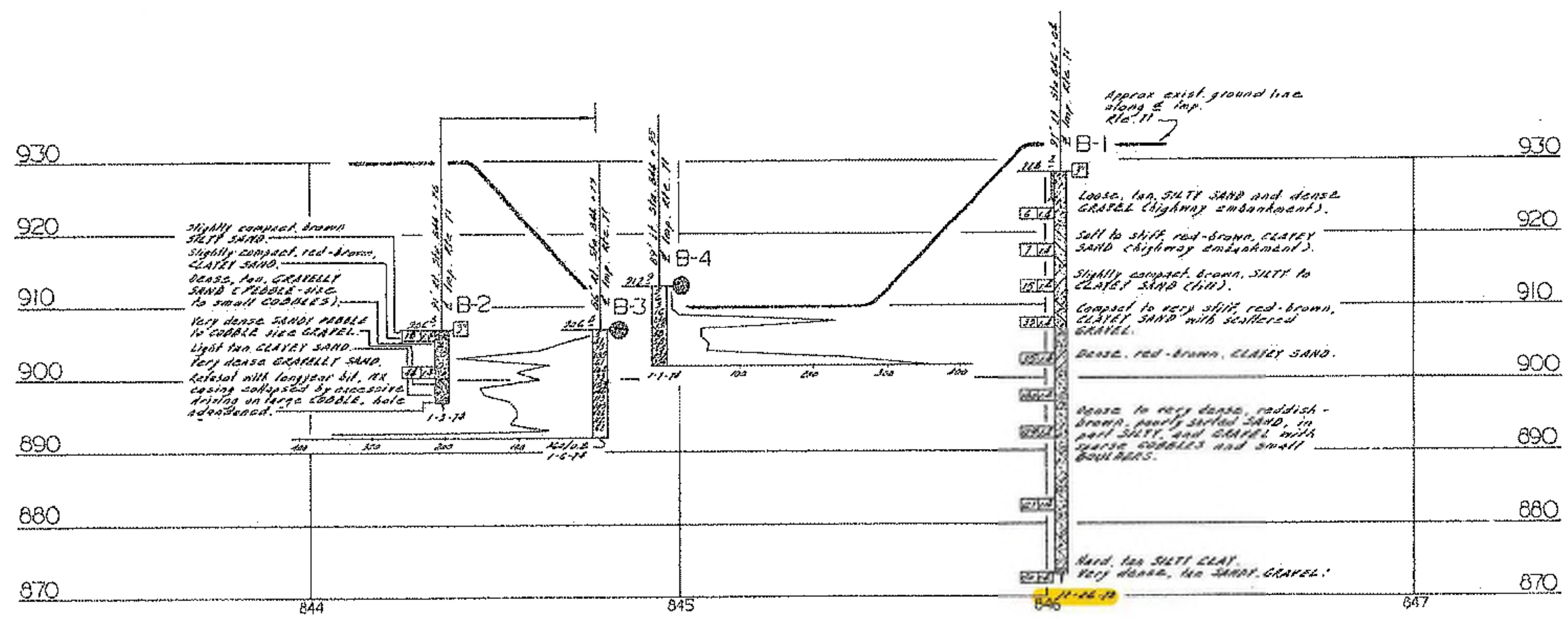


AS BUILT PLANS
Contract No. 08-268504
Date Completed 8-19-87
Document No.

NO GROUND WATER ENCOUNTERED
DURING THIS INVESTIGATION BY OFFICE OF STRUCTURES
GEOLOGIC STUDIES SECTION
DATE January 1986

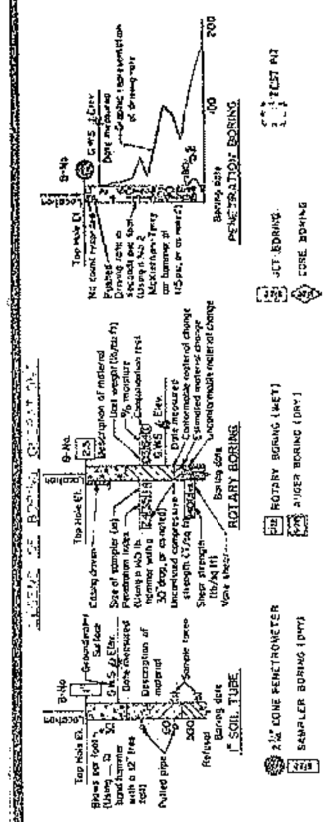
PROFILE

Scale. Vert. 1" = 10'
Horiz. 1" = 20'



930
920
910
900
890
880
870
844
845
846
847
B-1
B-2
B-3
B-4
Approx exist. ground line along ℄ Imp. Rte. 11
Slightly compact, brown SILTY SAND.
Slightly compact, red-brown, CLAYEY SAND.
Dense, tan, GRAVELLY SAND (PEBBLE-size to small COBBLES).
Very dense SANDY PEBBLE to COBBLE size GRAVEL.
Light tan CLAYEY SAND.
Very dense GRAVELLY SAND.
Refusal with longyear bit, NX casing collapsed by excessive driving on large COBBLE, hole abandoned.
1-3-78
Loose, tan, SILTY SAND and dense GRAVEL (highway embankment).
Soft to stiff, red-brown, CLAYEY SAND (highway embankment).
Slightly compact, brown, SILTY to CLAYEY SAND (fill).
Compact to very stiff, red-brown, CLAYEY SAND with scattered GRAVEL.
Dense, red-brown, CLAYEY SAND.
Dense to very dense, reddish-brown, poorly sorted SAND, in part SILTY, and GRAVEL with sparse COBBLES and small BOULDERS.
Hard, tan SILTY CLAY.
Very dense, tan SANDY GRAVEL.

NO AS BUILT CORRECTION
AS BUILT
CORRECTIONS BY D. KIM
CONTRACT NO. 08-268504
DATE 8-19-87



LEGEND OF EARTH MATERIALS

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

CONSISTENCY CLASSIFICATION FOR SOILS

According to the Standard Penetration Test ASTM Designation D1586-67

Penetration Index (Blows/Ft)	Granular	Cohesive
0-5	Very loose	Very soft
5-10	Loose	Soft
10-20	Slightly compact	Stiff
20-35	Compact	Very stiff
35-70	Dense	Hard
>70	Very dense	Very hard

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

UNIFIED SOIL CLASSIFICATION SYSTEM

ENGINEERING GEOLOGY SECTION			
FIELD STUDY	By D.A. Crawford	1-5-78	Approval Recommended by
DRAWN	By J. Lew	1-18-78	S.L. Champion
CHECKED	By	2-14-78	ENGINEERING GEOLOGIST 368

State of CALIFORNIA
DEPARTMENT OF TRANSPORTATION

BRIDGE DEPARTMENT DESIGN SECTION	BRIDGE NO. 56-0541RL	WEIRICK ROAD UNDERCROSSING (WIDEN)
PROJECT ENGINEER 36617	POST MILE 35.6	LOG OF TEST BORINGS

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2

CU 06201
WO 268501

Disregard prints bearing earlier revision dates 6/28/85

SHEET 8 OF 8

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF TRANSPORTATION.
DATE 1/22/88 SUPERVISOR OF MICROFILM SERVICES

DIVISION OF ENGINEERING SERVICES - GEOTECHNICAL SERVICES

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DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets
08	Riv	15	20.3/40.1	35	38

CERTIFIED ENGINEERING GEOLOGIST — DATE 12/14/2022

REGISTERED PROFESSIONAL ENGINEER
THOMAS C. BENSON JR.
No. 2091
Exp. 03/31/2023
GEOTECHNICAL
STATE OF CALIFORNIA

I-15 EXPRESS LANES PROJECT SOUTHERN EXTENSION

LOG OF TEST BORING 35 OF 38

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

UNIT:
EA: 08-0J0820

PLAN 1"=100'

PROFILE HOR. 1"=40' VERT. 1"=10'

B-1 B-2 B-3

RTE 15 "℄"

BENCH MARK

BM TOP PT. #1 FOUND 2 1/2" B.T. FLUSH PER F.B. 261/67, P. 19 ELEV. 1079.86 FT.

AS BUILT PLANS
Contract No. 08-268504
Date Completed 8-19-87
Document No.

NO AS BUILT CORRECTION

AS BUILT
CORRECTIONS BY D. KIM
CONTRACT NO. 08-268504
DATE 8-20-87

[redacted]

GEOTECHNICAL BRANCH - TRANSPORTATION LABORATORY
DRAWN BY Leony L. Lopez 5/85
CHECKED BY K.O. Oshuna 5/85
K.O. Oshuna 10/13

State of CALIFORNIA
DEPARTMENT OF TRANSPORTATION

RETAINING WALL A
LOG OF TEST BORINGS

SHEET 4 OF 4

33

I HEREBY CERTIFY THAT THIS IS A TRUE A... UNDER MY DIRECTION AND CONTROL ON TH... AUTHORIZATION BY THE DIRECTOR OF TR...
1/23/88

DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets
08	Riv	71	13.5/27	118	133

February 1, 1965

BM 35-A-5B Elev. 885.22
Set 2"x2" H & Sp. Hd. Nail 0.5 deep. 130'
Lt. 913+86± ℄ IMP. "64"

TBM set by Preliminary Elev. 881.67
2"x2" stake at Sta. 895+20 POT ℄ IMP.

DIVISION OF ENGINEERING SERVICES - GEOTECHNICAL SERVICES

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DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets
08	Riv	15	20.3/40.1	36	38

CERTIFIED ENGINEERING GEOLOGIST — DATE 12/17/2021

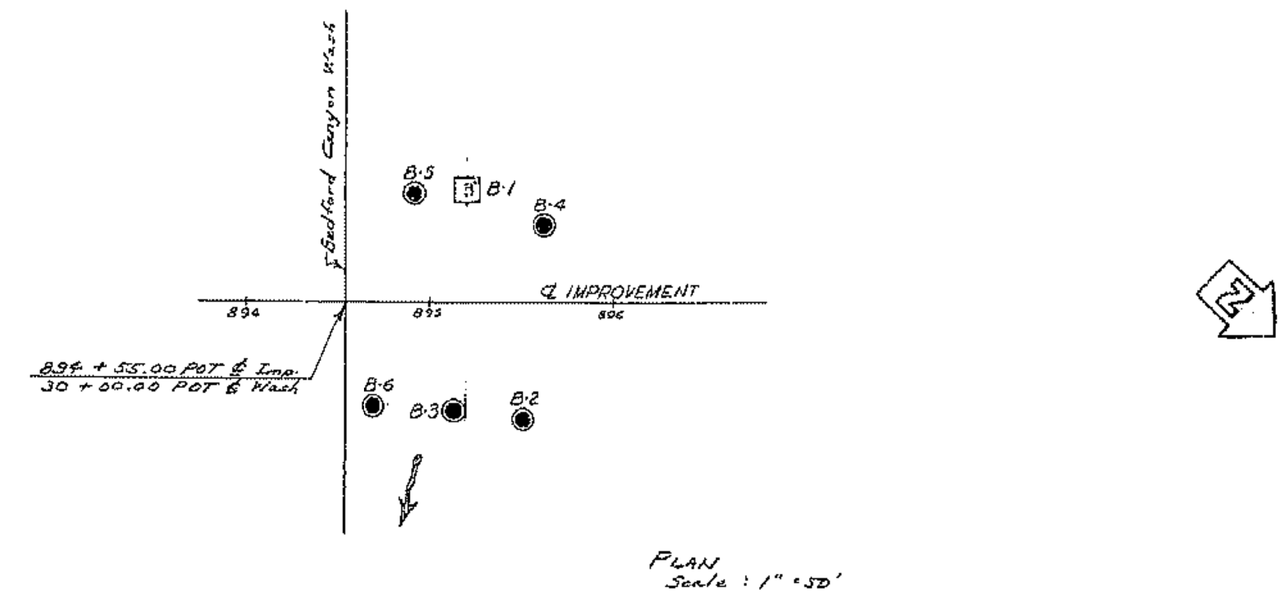
I-15 EXPRESS LANES PROJECT SOUTHERN EXTENSION

LOG OF TEST BORING 36 OF 38

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

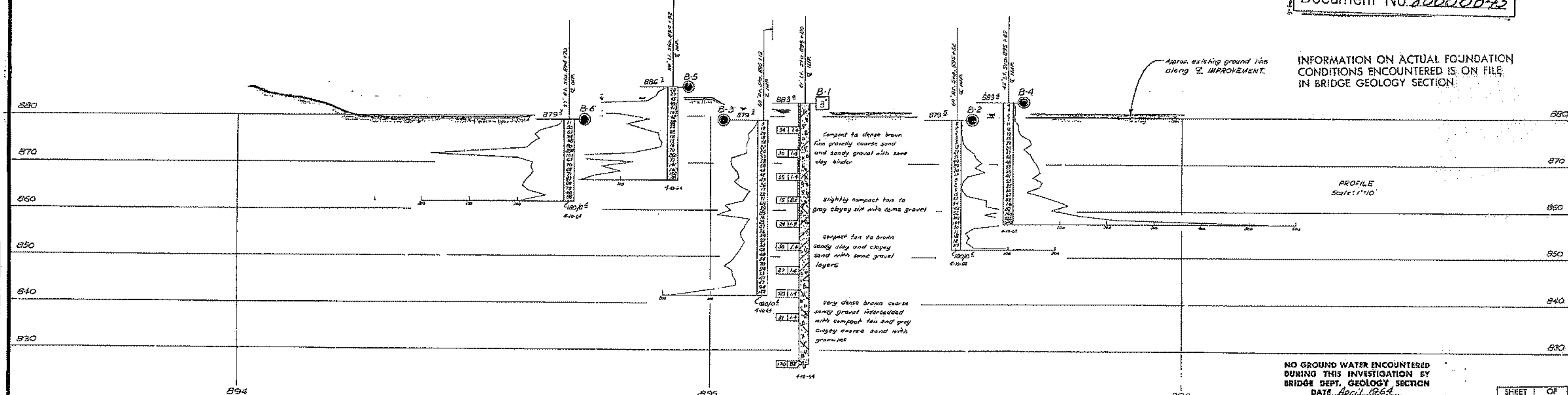
UNIT:
EA: 08-0J0820

REGISTERED PROFESSIONAL ENGINEER — THOMAS C. BENSON JR. — No. 2091 — Exp. 03/31/2023 — GEOTECHNICAL — STATE OF CALIFORNIA



AS BUILT PLANS
Contract No. 08-074214
Date Completed 8-24-66
Document No. 80000045

INFORMATION ON ACTUAL FOUNDATION CONDITIONS ENCOUNTERED IS ON FILE IN BRIDGE GEOLOGY SECTION



NO GROUND WATER ENCOUNTERED DURING THIS INVESTIGATION BY BRIDGE DEPT. GEOLOGY SECTION
DATE April 1964

SHEET	OF
7	7

BRIDGE DEPARTMENT

Alinement Revised

FIELD STUDY S.L. Champlin 4-10-64
DRAWN
CHECKED

Classification of Material Based on Standard Grade Size Limits

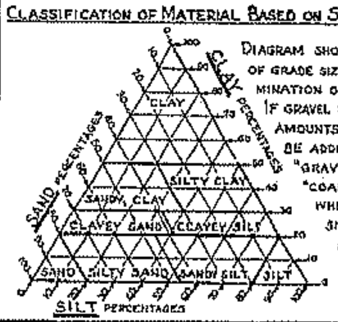


Diagram showing the basis for estimates of grade size distribution used in determination of class names.
If gravel is present in appreciable amounts the term "gravelly" may be added to the class name, viz. "gravelly sand". The terms "coarse", "medium" and "fine" when used to describe sand, silt and gravel, refer to standard grade size limits.

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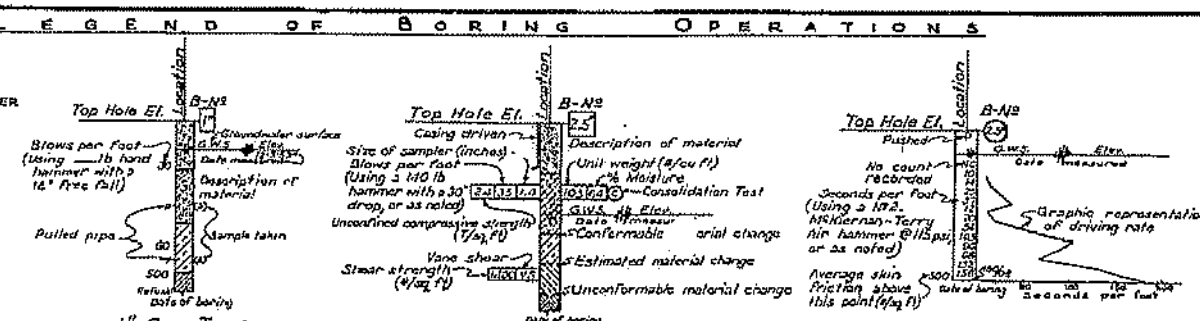
Gravel; Sand; Silt; Clay; Sandy Clay or Clayey Sand; Sandy Silt or Silty Sand; Silty Clay or Clayey Silt; Peat and/or Organic Matter; Fill Material; Igneous Rock; Sedimentary Rock; Metamorphic Rock

Legend of Boring Operations

Penetrometer; 2¼" Cone Penetrometer; Sampler boring (dry); Rotary boring (wet); Auger boring (dry); Jet boring; Core boring; Test pit



NOTE

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STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

BEDFORD WASH

LOG OF TEST BORINGS

SCALE AS Noted | BRIDGE 56-540 R/L | FILE | DRAWING 56540-7

PREL. DRAWING NO. P-

DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
08	Riv	15	32.4/38.3	111	133

January 27, 1986

AS BUILT PLANS

Contract No. 08-268504
Date Completed 8-19-87
Document No.

DIVISION OF ENGINEERING SERVICES - GEOTECHNICAL SERVICES

As-Built Log of Test Borings sheet is considered an informational document only. As such, the State of California registration seal with signature, license number and registration certificate expiration date confirm that this is a true and accurate copy of the original document. This drawing is available and presented only for the convenience of any bidder, contractor or other interested party.

DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets
08	Riv	15	20.3/40.1	37	38

CERTIFIED ENGINEERING GEOLOGIST — DATE 12/17/2021

I-15 EXPRESS LANES PROJECT SOUTHERN EXTENSION

LOG OF TEST BORING 37 OF 38

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

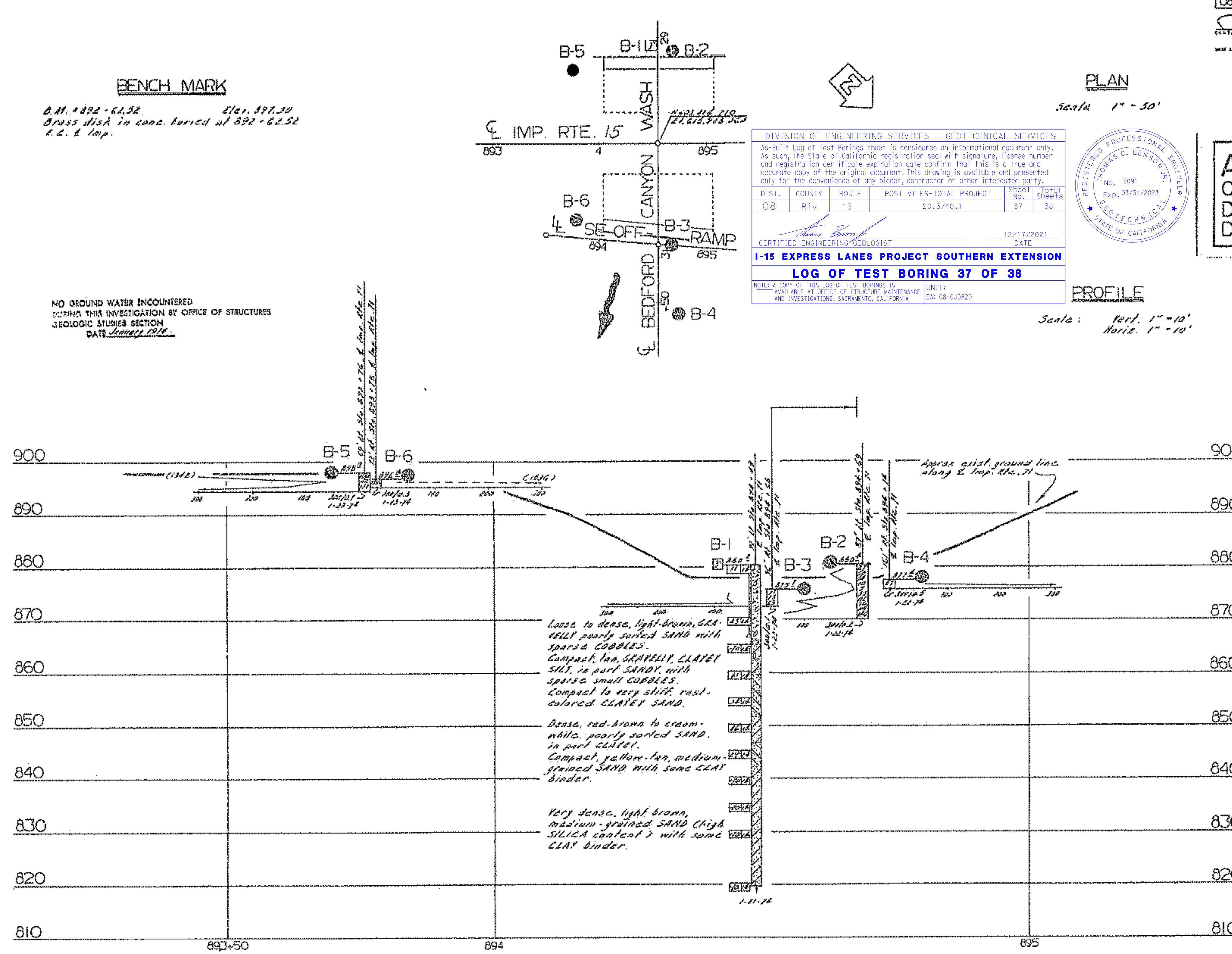
UNIT:
EA: 08-0J0820

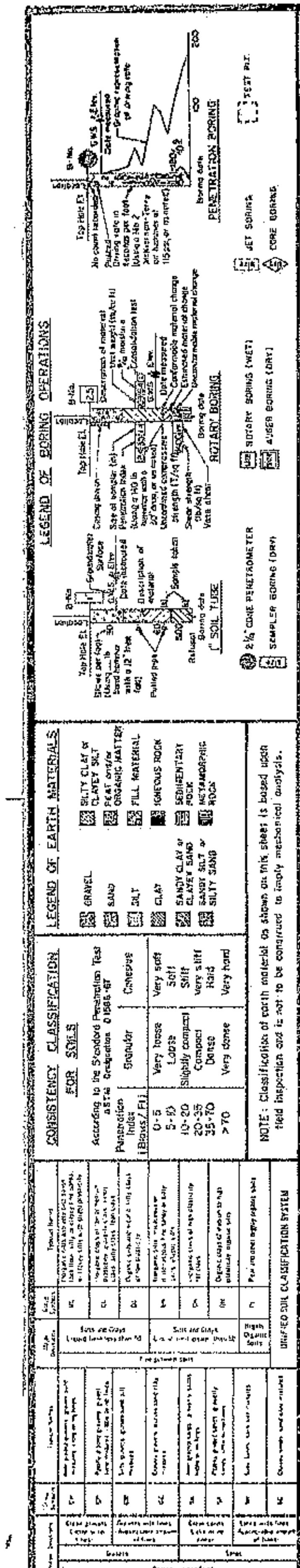
REGISTERED PROFESSIONAL ENGINEER — THOMAS C. BENSON JR. — No. 2091 — Exp. 03/31/2023 — GEOTECHNICAL — STATE OF CALIFORNIA

BENCH MARK

B.M. #892+62.52 Elev. 897.30
Brass disk in conc. buried at 892+62.52 ℄ Imp.

NO GROUND WATER ENCOUNTERED DURING THIS INVESTIGATION BY OFFICE OF STRUCTURES GEOLOGIC STUDIES SECTION DATE January 1974





NO AS BUILT CORRECTION

AS BUILT

CORRECTIONS BY D. KIM
CONTRACT NO. 08-268504
DATE 8-20-87

ENGINEERING GEOLOGY SECTION	
FIELD STUDY	By A. A. Crawford 1-23-74
DRAWN	By J. Lam 1-30-74
CHECKED	By 2-11-74

State of CALIFORNIA
DEPARTMENT OF TRANSPORTATION

BRIDGE DEPARTMENT
DESIGN SECTION 1
PROJECT ENGINEER

BRIDGE NO. 56-0540-R/L
POST MILE 36.58

BEDFORD WASH BRIDGE (WIDEN)
LOG OF TEST BORINGS

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS

CU 08201
WO 2CA501

SHEET 6 OF 6

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF TRANSPORTATION.
1/22/88 — SUPERVISOR OF MICROFILM SERVICES

BENCH MARKS:

POINT 1001 ELEVATION = 892.783
2 1/4" Brass Disk stamped "Calif. Dept. of Transportation D8-SCN RIV-15 PM 36.7"
3' offset from northbound edge of shoulder in a 10" concrete collar at gore area NB I-15 off-ramp to Cajalco rd. per Survey Control Map: 08-RIV-15-35.8-43.2 sheets 1-4 RTE 15 from Cajalco Rd. to Hidden Valley Pkwy.

POINT 1002 ELEVATION = 911.844
2 1/2" Brass Disk stamped "Calif. Dept. of Transportation D-8-SCN RIV-15 PM 37.12 12-31-08"
2.5' offset from the northbound edge of shoulder, 2.5' north of metal beam guard rail at the end of the northbound on ramp to I-15 from Cajalco Rd.

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
08	Riv	15	36.4/37.6		

GEOTECHNICAL PROFESSIONAL DATE

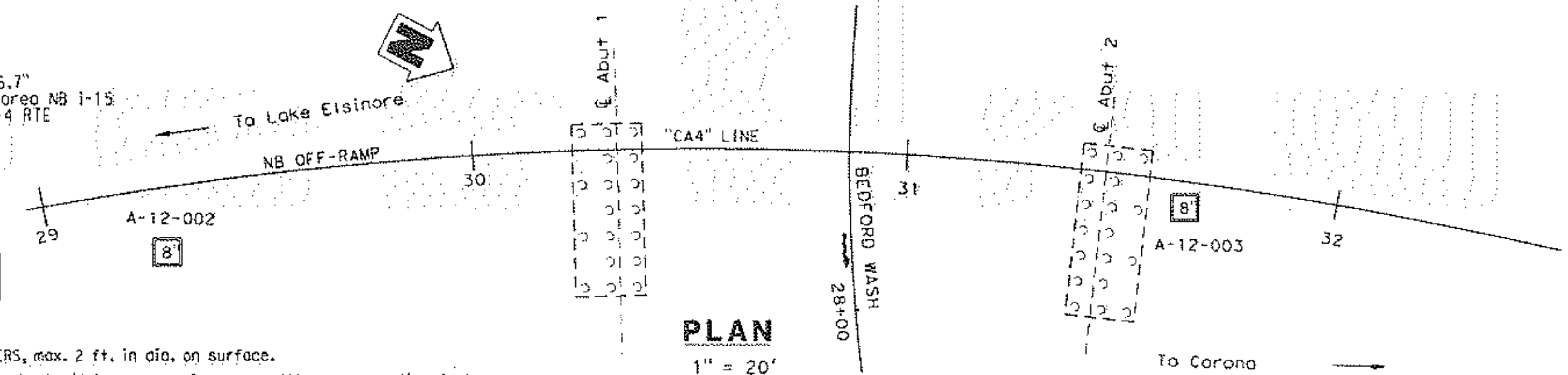
PLANS APPROVAL DATE

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 S. PIRATHIVIRAJ No. C71662 EXP. 12/31/13 CIVIL STATE OF CALIFORNIA

CITY OF CORONA
400 S. VICENTIA AVE
CORONA, CA 92882

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



DIVISION OF ENGINEERING SERVICES - GEOTECHNICAL SERVICES

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DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets
08	Riv	15	20.3/40.1	38	38

CERTIFIED ENGINEERING GEOLOGIST — DATE 12/17/2021

REGISTERED PROFESSIONAL ENGINEER THOMAS C. BENSON, JR. No. 2091 Exp. 03/31/2023 GEOTECHNICAL STATE OF CALIFORNIA

I-15 EXPRESS LANES PROJECT SOUTHERN EXTENSION

LOG OF TEST BORING 38 OF 38

NOTE: A COPY OF THIS LOG OF TEST BORINGS IS AVAILABLE AT OFFICE OF STRUCTURE MAINTENANCE AND INVESTIGATIONS, SACRAMENTO, CALIFORNIA — UNIT: EA: 08-0J0820

A-12-002

"CA4" Line — STA. 29+26; 15' Rt — El. +924.0 ft — 8"

Sample	Tests	Description
Bulk	CP, R, PA	Observed BOULDERS, max. 2 ft. in dia. on surface. SILTY SAND with GRAVEL (SM); brown; moist; about 42% coarse to fine SAND; about 32% coarse to fine GRAVEL, max. 1 in. dia.; about 26% nonplastic fines.
50 / 1.4 / 1	M, CR, PA	SANDY lean CLAY (CL); hard; brown; moist; about 57% medium plasticity fines; about 29% coarse to fine SAND; about 14% coarse to fine GRAVEL.
REF / 2.4 / 2	M, UW	CLAYEY SAND with GRAVEL (SC); very dense; brown; moist; mostly coarse to fine SAND; little coarse to fine GRAVEL, max. 1 in. dia.; little medium plasticity fines.
21 / 1.4 / 3	M	SILTY SAND with GRAVEL (SM); medium dense; brown; moist; mostly coarse to fine SAND; little coarse to fine GRAVEL, max. 1 in. dia.; little nonplastic fines.
REF / 2.4 / 4	M, UW	Very dense.
28 / 1.4 / 5	M	Dense.
73 / 2.4 / 6	M, UW, DS, PA	Encountered GRAVEL, COBBLES and possibly BOULDERS. CLAYEY SAND (SC); dense; yellowish brown; moist; about 69% coarse to fine SAND; about 30% medium plasticity fines; about 1% coarse to fine GRAVEL, max. 2 in. dia.
26 / 1.4 / 7	M	SILTY SAND (SM); dense; brown; moist; coarse to fine SAND; few fine GRAVEL; some nonplastic fines.
50/4" / 2.4 / 8	M, UW, DS, PP	SILT with SAND (ML); hard; olive; moist; low plasticity fines; little fine SAND. PP>4.5 tsf.
50/4" / 1.4 / 9	M	SILTY SAND (SM); very dense; brown; moist; coarse to fine SAND; some nonplastic fines.
REF / 2.4 / 10	M, UW	Poorly graded SAND with SILT (SP-SM); very dense; light gray; moist; coarse to fine SAND; few nonplastic fines.
REF / 1.4 / 11	M, PA	SILTY SAND (SM); very dense; olive; moist; about 80% coarse to fine SAND; about 19% nonplastic fines; about 1% fine GRAVEL.
REF / 2.4 / 12	M, UW	Poorly graded SAND with SILT (SP-SM); very dense; pale olive; moist; coarse to fine SAND; few nonplastic fines.
REF / 1.4 / 13	M	
REF / 2.4 / 14	M, UW	
REF / 1.4 / 15	M, PA	SILTY SAND (SM); very dense; olive gray; moist; about 71% coarse to fine SAND; about 29% nonplastic fines.
REF / 2.4 / 16	M, UW	Poorly graded SAND with SILT (SP-SM); very dense; gray to olive gray; moist; coarse to fine SAND; few nonplastic fines.
50/4" / 1.4 / 17	M	
REF / 2.4 / 18	M	CLAYEY SAND (SC); very dense; brown mottled with olive gray; moist; coarse to fine SAND; little low plasticity fines.

12-17-2012
Terminated at Elev + 833.5 ft
ERi = 80%

A-12-003

"CA4" Line — STA. 31+65; 6' Rt — El. +878.0 ft — 8"

Sample	Tests	Description
		Observed BOULDERS, max. 2 ft. in dia. on surface. SILTY SAND (SM); medium dark brown; moist; coarse to fine SAND; few coarse to fine GRAVEL; little nonplastic fines.
41 / 2.4 / 1	M, UW	
29 / 1.4 / 2	M	Dense.
26 / 2.4 / 3	M, UW, DS, PA	Poorly graded SAND with SILT and GRAVEL (SP-SM); medium dense; yellowish brown; moist; about 47% coarse to fine SAND; about 43% coarse to fine GRAVEL, max. 1 in. dia.; about 10% nonplastic fines.
42 / 1.4 / 4	M	SILTY SAND (SM); medium dense; dark brown; moist; coarse to fine SAND; few fine GRAVEL; little nonplastic fines.
50/5" / 2.4 / 5	M, UW	Poorly graded SAND (SP); very dense; olive brown; moist; coarse to fine SAND; few fine GRAVEL; trace nonplastic fines; with 1" SANDY lean CLAY layer at top.
50/5" / 1.4 / 6	M	Poorly graded SAND with SILT (SP-SM); very dense; pale olive; moist; coarse to fine SAND; few nonplastic fines.
REF / 2.4 / 7	M, UW	
50/3" / 1.4 / 8	M, PA	SILTY SAND (SM); very dense; pale olive; moist; about 75% coarse to fine SAND; about 23% nonplastic fines; about 2% fine GRAVEL.
REF / 2.4 / 9	M, UW	Poorly graded SAND with SILT (SP-SM); very dense; light gray; moist; coarse to fine SAND; few nonplastic fines.
REF / 1.4 / 10	M	
50/2" / 2.4 / 11	M, UW	CLAYEY SAND (SC); very dense; pale olive; moist; coarse to fine SAND; little low plasticity fines.
50/3" / 1.4 / 12	M	GWS Elev + 815.0 ft 12-18-2012
REF / 2.4 / 13	M, UW, DS, PA	SILTY SAND (SM); very dense; light gray; moist; about 79% coarse to fine SAND; about 18% nonplastic fines; about 3% fine GRAVEL.
REF / 1.4 / 14	M	CLAYEY SAND (SC); very dense; grayish brown; moist; coarse to fine SAND; low plasticity fines.
REF / 2.4 / 15	M, UW	
REF / 1.4 / 16	M	Poorly graded SAND with SILT (SP-SM); very dense; pale olive; moist; coarse to fine SAND; few nonplastic fines.
REF / 2.4 / 17	M, UW, PA	CLAYEY SAND (SC); very dense; olive gray; moist; coarse to fine SAND; little low plasticity fines.
50/4" / 1.4 / 18	M	

12-18-2012
Terminated at Elev + 787.2 ft
ERi = 80%

ELEVATION (ft): +930, +920, +910, +900, +890, +880, +870, +860, +850, +840, +830, +820, +810, +800, +790, +780

Stationing along "CA4" Line: 28+00, 29+00, 30+00, 31+00, 32+00, 33+00

NOTES:

(1) This LOTB sheet was prepared in accordance with the Caltrans Soil and Rock Logging, Classification and Presentation Manual (June 2010).
(2) 2.4" samples were taken using a California Modified Sampler.
(3) An automatic trip hammer system consisting of a hammer weight of 140 lbs falling a distance of 30" was used to advance the drive sampler.
(4) Conversion factor from 2.4" Modified California Ring Sampler blowcounts to Standard Penetration Test (SPT) blowcounts is 0.5.

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

DESIGN OVERSIGHT	DRAWN BY: J. FANG	C. PONGSAKORNPATARA — FIELD INVESTIGATION BY	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	S. PIRATHIVIRAJ — PROJECT ENGINEER	BRIDGE NO. 56-0864S	I-15 NB/CAJALCO OFF-RAMP
SIGN OFF DATE	CHECKED BY: S. PIRATHIVIRAJ	DATE: 12/2012			POST MILES 36.58	LOG OF TEST BORINGS 1 OF 3

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10) — ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3 — UNIT: 0000 — PROJECT NUMBER & PHASE: 08000003081 — CONTRACT NO.: 08-0J6101 — DISREGARD PRINTS BEARING EARLIER REVISION DATES — SHEET 15 OF 17

APPENDIX B

CALCULATIONS

ARS Online V3.0.2

Using the tool: Specify latitude and longitude in decimal degrees in the input boxes below. Alternatively, **Google Maps** can be used to find the site location. Specify the time-averaged shear-wave velocity in the upper 30m (Vs30) in the input box. After submitting the data, the USGS 2014 hazard data for a 975-year return period will be reported along with adjustment factors required by Caltrans Seismic Design Criteria (SDC) V2.0.

Latitude: 33.726600 **Longitude:** -117.374100 **Vs30 (m/s):** 300 Submit

Caltrans Design Spectrum (5% damping)

Period(s)	Sa_{2008}(g)	Sa_{2014}(g)	$Basin_{2008}$	$Basin_{2014}$	Near Fault Amp	Design Sa_{2008}(g)	Design Sa_{2014}(g)
PGA	0.66	0.76	1	1	1	0.66	0.76
0.10	1.14	1.29	1	1	1	1.14	1.29
0.20	1.42	1.73	1	1	1	1.42	1.73
0.30	1.43	1.91	1	1	1	1.43	1.91
0.50	1.29	1.75	1	1	1	1.29	1.75
0.75	1.08	1.4	1	1	1.1	1.19	1.54
1.0	0.88	1.12	1	1	1.2	1.05	1.35
2.0	0.47	0.52	1	1	1.2	0.56	0.63
3.0	0.3	0.32	1	1	1.2	0.36	0.38
4.0	0.22	0.21	1	1	1.2	0.26	0.26
5.0	0.17	0.16	1	1	1.2	0.21	0.19

Copy table

Deaggregation (based on 2014 hazard)

mean magnitude (for PGA)	6.61
mean site-source distance (km, for Sa at 1s)	7.9

Option: recalculate Near Fault amplification with user specified distance

Site-source distance (km): 7.9 Update

ARS Online V3.0.2

Using the tool: Specify latitude and longitude in decimal degrees in the input boxes below. Alternatively, **Google Maps** can be used to find the site location. Specify the time-averaged shear-wave velocity in the upper 30m (Vs30) in the input box. After submitting the data, the USGS 2014 hazard data for a 975-year return period will be reported along with adjustment factors required by Caltrans Seismic Design Criteria (SDC) V2.0.

Latitude: 33.741248 **Longitude:** -117.432283 **Vs30 (m/s):** 330 Submit

Caltrans Design Spectrum (5% damping)

Period(s)	Sa_{2008}(g)	Sa_{2014}(g)	$Basin_{2008}$	$Basin_{2014}$	Near Fault Amp	Design Sa_{2008}(g)	Design Sa_{2014}(g)
PGA	0.7	0.92	1	1	1	0.7	0.92
0.10	1.22	1.55	1	1	1	1.22	1.55
0.20	1.53	2.07	1	1	1	1.53	2.07
0.30	1.54	2.27	1	1	1	1.54	2.27
0.50	1.36	2.05	1	1	1	1.36	2.05
0.75	1.12	1.63	1	1	1.1	1.23	1.79
1.0	0.89	1.29	1	1	1.2	1.07	1.55
2.0	0.45	0.57	1	1	1.2	0.54	0.68
3.0	0.29	0.34	1	1	1.2	0.35	0.41
4.0	0.21	0.22	1	1	1.2	0.25	0.26
5.0	0.17	0.16	1	1	1.2	0.2	0.19

Copy table

Deaggregation (based on 2014 hazard)

mean magnitude (for PGA)	6.56
mean site-source distance (km, for Sa at 1s)	3.9

Option: recalculate Near Fault amplification with user specified distance

Site-source distance (km): 3.9 Update

ARS Online V3.0.2

Using the tool: Specify latitude and longitude in decimal degrees in the input boxes below. Alternatively, **Google Maps** can be used to find the site location. Specify the time-averaged shear-wave velocity in the upper 30m (Vs30) in the input box. After submitting the data, the USGS 2014 hazard data for a 975-year return period will be reported along with adjustment factors required by Caltrans Seismic Design Criteria (SDC) V2.0.

Latitude: 33.818664 **Longitude:** -117.515282 **Vs30 (m/s):** 330 Submit

Caltrans Design Spectrum (5% damping)

Period(s)	Sa_{2008}(g)	Sa_{2014}(g)	$Basin_{2008}$	$Basin_{2014}$	Near Fault Amp	Design Sa_{2008}(g)	Design Sa_{2014}(g)
PGA	0.7	0.87	1	1	1	0.7	0.87
0.10	1.24	1.5	1	1	1	1.24	1.5
0.20	1.56	1.99	1	1	1	1.56	1.99
0.30	1.56	2.18	1	1	1	1.56	2.18
0.50	1.37	1.94	1	1	1	1.37	1.94
0.75	1.12	1.54	1	1	1.1	1.23	1.7
1.0	0.89	1.21	1	1	1.2	1.07	1.45
2.0	0.45	0.54	1	1	1.2	0.54	0.65
3.0	0.29	0.32	1	1	1.2	0.34	0.39
4.0	0.2	0.21	1	1	1.2	0.24	0.26
5.0	0.16	0.15	1	1	1.2	0.2	0.18

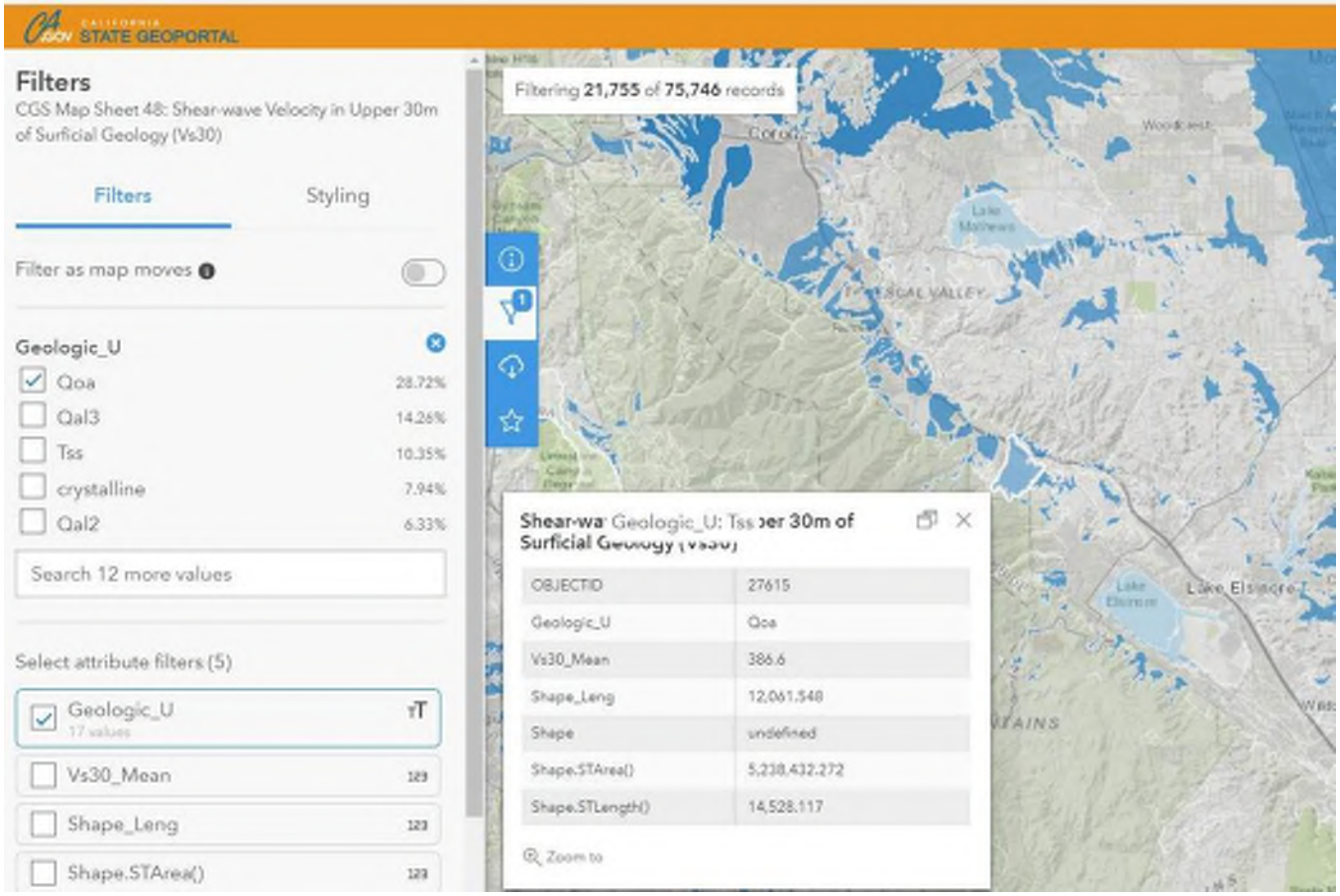
Copy table

Deaggregation (based on 2014 hazard)

mean magnitude (for PGA)	6.57
mean site-source distance (km, for Sa at 1s)	5.4

Option: recalculate Near Fault amplification with user specified distance

Site-source distance (km): 5.4 Update


CALIFORNIA STATE GEOPORTAL
Filters
CGS Map Sheet 48: Shear-wave Velocity in Upper 30m of Surficial Geology (Vs30)
Filters
Styling
Filter as map moves
Geologic_U
Qoa 28.72%
Qal3 14.26%
Tss 10.35%
crystalline 7.94%
Qal2 6.33%
Search 12 more values
Select attribute filters (5)
Geologic_U
17 values
Vs30_Mean
Shape_Leng
Shape.STArea()
Filtering 21,755 of 75,746 records
Shear-wa Geologic_U: Tss er 30m of Surficial Geology (Vs30)
OBJECTID 27615
Geologic_U Qoa
Vs30_Mean 386.6
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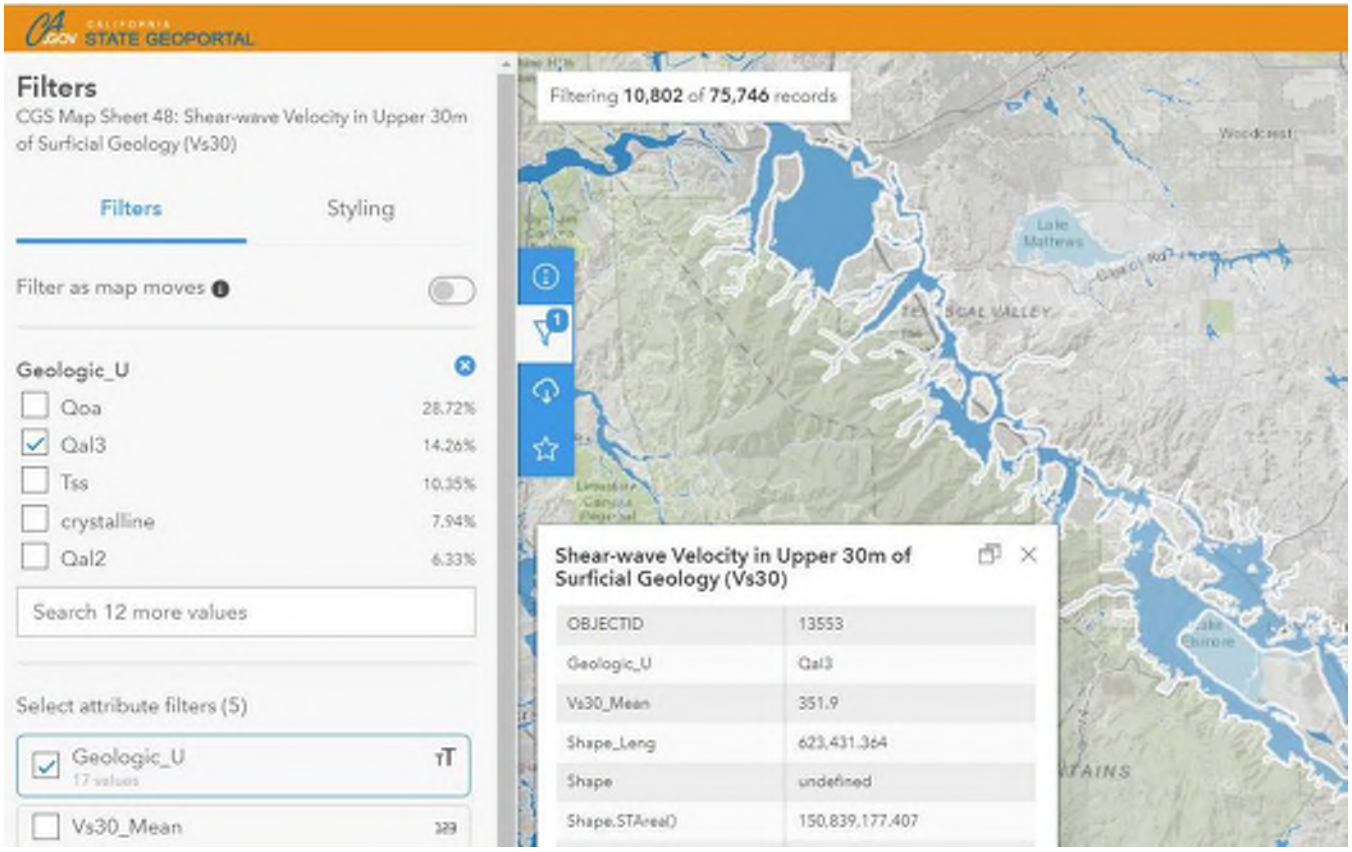
Shape.STArea() 5,238,432.272
Shape.STLength() 14,528.117
Zoom to
Lake Mathews
Lake Elsinore


CALIFORNIA STATE GEOPORTAL
Filters
CGS Map Sheet 48: Shear-wave Velocity in Upper 30m of Surficial Geology (Vs30)
Filters
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Filter as map moves
Geologic_U
Qoa 28.72%
Qal3 14.26%
Tss 10.35%
crystalline 7.94%
Qal2 6.33%
Search 12 more values
Select attribute filters (5)
Geologic_U
17 values
Vs30_Mean
Filtering 10,802 of 75,746 records
Shear-wave Velocity in Upper 30m of Surficial Geology (Vs30)
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Lake Mathews

United States Department of Agriculture

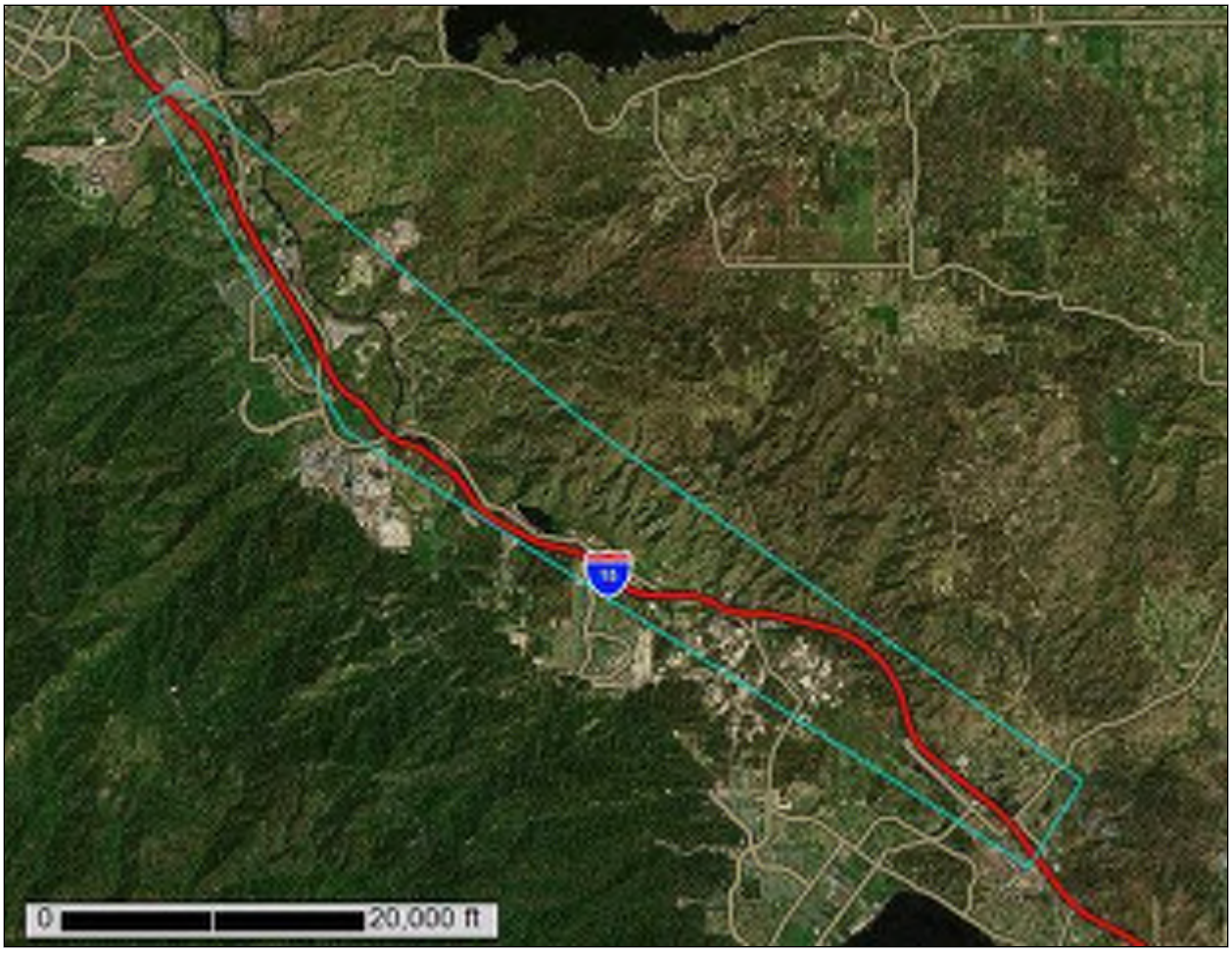
NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Orange County and Part of Riverside County, California, and Western Riverside Area, California

I-15



October 5, 2022

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Map Scale: 1:39,000 if printed on D landscape (34" x 22") sheet.

Meters: 0 500 1000 2000 3000

Feet: 0 1500 3000 6000 9000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at scales ranging from 1:15,800 to 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County and Part of Riverside County, California
Survey Area Data: Version 16, Sep 6, 2022

Soil Survey Area: Western Riverside Area, California
Survey Area Data: Version 15, Sep 6, 2022

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 14, 2022—Mar 17, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

MAP LEGEND

MAP INFORMATION

imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
153	Friant fine sandy loam, 30 to 75 percent slopes	0.0	0.0%
155	Garretson gravelly very fine sandy loam, 2 to 9 percent slopes	22.8	0.2%
169	Modjeska gravelly loam, 2 to 9 percent slopes	10.6	0.1%
170	Modjeska gravelly loam, 9 to 15 percent slopes	11.8	0.1%
175	Myford sandy loam, 9 to 15 percent slopes	2.2	0.0%
198	Soboba cobbly loamy sand, 0 to 15 percent slopes	0.1	0.0%
221	Yorba gravelly sandy loam, 2 to 9 percent slopes	3.9	0.0%
226	Yorba cobbly sandy loam, 30 to 50 percent slopes	20.4	0.2%
Subtotals for Soil Survey Area		**71.8**	**0.5%**
Totals for Area of Interest		**13,485.2**	**100.0%**

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
155	Garretson gravelly very fine sandy loam, 2 to 9 percent slopes	17.2	0.1%
169	Modjeska gravelly loam, 2 to 9 percent slopes	9.4	0.1%
175	Myford sandy loam, 9 to 15 percent slopes	1.9	0.0%
197	Soboba gravelly loamy sand, 0 to 5 percent slopes	17.7	0.1%
198	Soboba cobbly loamy sand, 0 to 15 percent slopes	1.8	0.0%
221	Yorba gravelly sandy loam, 2 to 9 percent slopes	14.2	0.1%
AaD	Altamont clay, 5 to 15 percent slopes	47.3	0.4%
AaE2	Altamont clay, 15 to 25 percent slopes, eroded	65.8	0.5%
AaF	Altamont clay, 25 to 50 percent slopes	5.4	0.0%
AbF	Altamont cobbly clay, 8 to 35 percent slopes	421.8	3.1%
AkC	Arbuckle loam, 2 to 8 percent slopes	146.1	1.1%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
AkD	Arbuckle loam, 8 to 15 percent slopes	86.9	0.6%
AlC	Arbuckle gravelly loam, 2 to 9 percent slopes, dry, MLRA 19	660.9	4.9%
AlD	Arbuckle gravelly loam, 8 to 15 percent slopes	198.2	1.5%
AlE	Arbuckle gravelly loam, 15 to 25 percent slopes	97.8	0.7%
BaG	Badland	15.4	0.1%
CaD2	Cajalco fine sandy loam, 8 to 15 percent slopes, eroded	69.4	0.5%
ChC	Cieneba sandy loam, 5 to 8 percent slopes	6.1	0.0%
CkF2	Cieneba rocky sandy loam, 15 to 50 percent slopes, eroded	413.1	3.1%
ClC	Cortina gravelly loamy sand, 2 to 8 percent slopes	225.5	1.7%
CmC	Cortina cobbly loamy sand, 2 to 8 percent slopes	283.6	2.1%
CnC	Cortina gravelly coarse sandy loam, 2 to 8 percent slopes	280.1	2.1%
CP	Clay Pits	647.6	4.8%
CrD	Cortina cobbly sandy loam, 2 to 12 percent slopes	10.8	0.1%
EcD2	Escondido fine sandy loam, 8 to 15 percent slopes, eroded	10.3	0.1%
GaA	Garretson very fine sandy loam, 0 to 2 percent slopes	106.8	0.8%
GaC	Garretson very fine sandy loam, 2 to 8 percent slopes	71.6	0.5%
GdA	Garretson gravelly very fine sandy loam, 0 to 2 percent slopes	22.7	0.2%
GdC	Garretson gravelly very fine sandy loam, 2 to 8 percent slopes	522.9	3.9%
GhC	Gorgonio loamy sand, 0 to 8 percent slopes	450.4	3.3%
GhD	Gorgonio loamy sand, 8 to 15 percent slopes	26.5	0.2%
GkD	Gorgonio loamy sand, channeled, 2 to 15 percent slopes	59.5	0.4%
GP	Gravel pits	6.8	0.1%
GyE2	Greenfield sandy loam, 15 to 25 percent slopes, eroded	1.6	0.0%
GzG	Gullied land	84.2	0.6%
HaC	Hanford loamy fine sand, 0 to 8 percent slopes	11.2	0.1%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
HcC	Hanford coarse sandy loam, 2 to 8 percent slopes	116.9	0.9%
HcD2	Hanford coarse sandy loam, 8 to 15 percent slopes, eroded	9.5	0.1%
HdD2	Hanford cobbly coarse sandy loam, 2 to 15 percent slopes, eroded	57.3	0.4%
HnC	Honcut sandy loam, 2 to 8 percent slopes	121.1	0.9%
HnD2	Honcut sandy loam, 8 to 15 percent slopes, eroded	35.1	0.3%
HoE	Honcut cobbly sandy loam, 2 to 25 percent slopes	126.2	0.9%
HuC2	Honcut loam, 2 to 8 percent slopes, eroded	47.7	0.4%
LpE2	Lodo rocky loam, 8 to 25 percent slopes, eroded	3.7	0.0%
LpF2	Lodo rocky loam, 25 to 50 percent slopes, eroded	1,498.0	11.1%
PaA	Pachappa fine sandy loam, 0 to 2 percent slopes	28.7	0.2%
PlB	Placentia fine sandy loam, 0 to 5 percent slopes	8.5	0.1%
PlD	Placentia fine sandy loam, 5 to 15 percent slopes	471.1	3.5%
PmE	Placentia cobbly fine sandy loam, 8 to 25 percent slope s	127.2	0.9%
PoC	Porterville clay, 0 to 8 percent slopes	11.8	0.1%
QU	Quarries	121.8	0.9%
RaB2	Ramona sandy loam, 2 to 5 percent slopes, eroded	5.9	0.0%
RaB3	Ramona sandy loam, 0 to 5 percent slopes, severely eroded	85.8	0.6%
RaC2	Ramona sandy loam, 5 to 8 percent slopes, eroded	1.4	0.0%
RaC3	Ramona sandy loam, 5 to 8 percent slopes, severely eroded	36.4	0.3%
RaD2	Ramona sandy loam, 8 to 15 percent slopes, eroded	4.9	0.0%
RaD3	Ramona sandy loam, 8 to 15 percent slopes, severely eroded	77.2	0.6%
RaE3	Ramona sandy loam, 15 to 25 percent slopes, severely eroded	37.3	0.3%
RsC	Riverwash	132.0	1.0%
RuF	Rough broken land	102.2	0.8%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
SeC2	San Emigdio fine sandy loam, 2 to 8 percent slopes, eroded	29.4	0.2%
SgC	San Emigdio loam, 2 to 8 percent slopes	33.6	0.2%
SsD	Soboba stony loamy sand, 2 to 15 percent slopes	19.4	0.1%
StF2	Soper loam, 15 to 35 percent slopes, eroded	12.8	0.1%
SuF2	Soper cobbly loam, 25 to 50 percent slopes, eroded	179.7	1.3%
TbF2	Temescal rocky loam, 15 to 50 percent slopes, eroded	3,706.2	27.5%
TeG	Terrace escarpments	532.1	3.9%
Tp2	Traver loamy fine sand, eroded	10.8	0.1%
Tr2	Traver loamy fine sand, saline-alkali, eroded	10.5	0.1%
Ts	Traver fine sandy loam, saline-alkali	0.5	0.0%
TvC	Tujunga loamy sand, channeled, 0 to 8 percent slopes	83.9	0.6%
TwC	Tujunga gravelly loamy sand, 0 to 8 percent slopes	29.8	0.2%
VaE3	Vallecitos loam, 8 to 25 percent slopes, severely eroded	20.5	0.2%
VdF2	Vallecitos rocky loam, 8 to 50 percent slopes, eroded	42.1	0.3%
VeD2	Vallecitos loam, thick solum variant, 8 to 15 percent slopes, eroded	1.4	0.0%
VsD2	Vista coarse sandy loam, 8 to 15 percent slopes, eroded	11.1	0.1%
W	Water	55.8	0.4%
Wg	Willows silty clay, saline-alkali	166.6	1.2%
YbD2	Yokohl loam, 8 to 15 percent slopes, eroded	29.2	0.2%
YbE3	Yokohl loam, 8 to 25 percent slopes, severely eroded	45.0	0.3%
Subtotals for Soil Survey Area		**13,406.5**	**99.4%**
Totals for Area of Interest		**13,485.2**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps.

The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Orange County and Part of Riverside County, California

153—Friant fine sandy loam, 30 to 75 percent slopes

Map Unit Setting

National map unit symbol: hcmy
Elevation: 500 to 5,800 feet
Mean annual precipitation: 10 to 25 inches
Mean annual air temperature: 59 to 64 degrees F
Frost-free period: 210 to 280 days
Farmland classification: Not prime farmland

Map Unit Composition

Friant and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Friant

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Residuum weathered from metasedimentary rock

Typical profile

H1 - 0 to 17 inches: gravelly fine sandy loam
H2 - 17 to 21 inches: unweathered bedrock

Properties and qualities

Slope: 30 to 75 percent
Depth to restrictive feature: 8 to 20 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 1.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: R019XD060CA - SHALLOW LOAMY
Hydric soil rating: No

Minor Components

Unnamed, steeper or less sloping soils

Percent of map unit: 4 percent
Hydric soil rating: No

Cieneba
Percent of map unit: 4 percent
Hydric soil rating: No

Rock outcrop
Percent of map unit: 4 percent
Hydric soil rating: No

Escondido, fine sandy loam
Percent of map unit: 4 percent
Hydric soil rating: No

Exchequer
Percent of map unit: 4 percent
Hydric soil rating: No

155—Garretson gravelly very fine sandy loam, 2 to 9 percent slopes

Map Unit Setting
National map unit symbol: hcn0
Elevation: 50 to 3,000 feet
Mean annual precipitation: 12 to 25 inches
Mean annual air temperature: 61 to 64 degrees F
Frost-free period: 250 to 350 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition
Garretson and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Garretson

Setting
Landform: Alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Riser, flat
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Alluvium derived from metasedimentary rock

Typical profile
H1 - 0 to 30 inches: gravelly very fine sandy loam
H2 - 30 to 60 inches: gravelly loam

Properties and qualities
Slope: 2 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.5 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Corralitos, loamy sand

Percent of map unit: 5 percent
Hydric soil rating: No

Hanford, sandy loam

Percent of map unit: 5 percent
Hydric soil rating: No

Soboba, gravelly loamy sand

Percent of map unit: 5 percent
Hydric soil rating: No

Unnamed, less sloping or steeper soils

Percent of map unit: 5 percent
Hydric soil rating: No

169—Modjeska gravelly loam, 2 to 9 percent slopes

Map Unit Setting

National map unit symbol: hcng
Elevation: 200 to 1,500 feet
Mean annual precipitation: 12 to 20 inches
Mean annual air temperature: 59 to 63 degrees F
Frost-free period: 280 to 330 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Modjeska and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Modjeska

Setting

Landform: Terraces
Landform position (two-dimensional): Summit

Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from mixed

Typical profile

H1 - 0 to 14 inches: gravelly loam
H2 - 14 to 63 inches: very cobbly loam
H3 - 63 to 71 inches: very gravelly loamy sand

Properties and qualities

Slope: 2 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.7 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: A
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Myford, sandy loam noneroded

Percent of map unit: 5 percent
Hydric soil rating: No

Yorba, gravelly sandy loam

Percent of map unit: 5 percent
Hydric soil rating: No

Myford, sandy loam, eroded

Percent of map unit: 5 percent
Hydric soil rating: No

170—Modjeska gravelly loam, 9 to 15 percent slopes

Map Unit Setting

National map unit symbol: hcnh
Elevation: 200 to 1,500 feet
Mean annual precipitation: 12 to 20 inches
Mean annual air temperature: 59 to 63 degrees F
Frost-free period: 280 to 330 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Modjeska and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Modjeska

Setting

Landform: Terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Riser
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Alluvium derived from mixed

Typical profile

H1 - 0 to 14 inches: gravelly loam
H2 - 14 to 63 inches: very cobbly loam
H3 - 63 to 71 inches: very gravelly loamy sand

Properties and qualities

Slope: 9 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.7 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: A
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Yorba, gravelly sandy loam

Percent of map unit: 5 percent
Hydric soil rating: No

Myford, sandy loam

Percent of map unit: 5 percent
Hydric soil rating: No

175—Myford sandy loam, 9 to 15 percent slopes

Map Unit Setting

National map unit symbol: hcnn
Elevation: 1,500 feet
Mean annual precipitation: 12 to 20 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 270 to 350 days
Farmland classification: Not prime farmland

Map Unit Composition

Myford and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Myford

Setting

Landform: Terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Riser
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Alluvium derived from mixed

Typical profile

H1 - 0 to 12 inches: sandy loam
H2 - 12 to 18 inches: sandy clay
H3 - 18 to 28 inches: sandy clay loam
H4 - 28 to 71 inches: sandy clay loam
H5 - 71 to 79 inches: sandy loam

Properties and qualities

Slope: 9 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 1.4 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D

Ecological site: R019XD061CA - CLAYPAN
Hydric soil rating: No

Minor Components

Capistrano, sandy loam
Percent of map unit: 5 percent
Hydric soil rating: No

Myford, sandy loam, eroded
Percent of map unit: 5 percent
Hydric soil rating: No

Yorba, gravelly sandy loam
Percent of map unit: 3 percent
Hydric soil rating: No

San andreas, sandy loam
Percent of map unit: 2 percent
Hydric soil rating: No

198—Soboba cobbly loamy sand, 0 to 15 percent slopes

Map Unit Setting
National map unit symbol: hcpd
Elevation: 30 to 4,200 feet
Mean annual precipitation: 10 to 20 inches
Mean annual air temperature: 61 degrees F
Frost-free period: 210 to 330 days
Farmland classification: Not prime farmland

Map Unit Composition
Soboba and similar soils: 65 percent
Minor components: 35 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Soboba

Setting
Landform: Alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Riser, flat
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Sandy and gravelly alluvium derived from mixed

Typical profile
H1 - 0 to 10 inches: very cobbly loamy sand
H2 - 10 to 60 inches: very gravelly sand

Properties and qualities
Slope: 0 to 15 percent

Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Very high (19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 1.8 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: R019XD035CA - SANDY
Hydric soil rating: No

Minor Components

Unnamed

Percent of map unit: 10 percent
Hydric soil rating: No

Soboba, stony surface

Percent of map unit: 10 percent
Hydric soil rating: No

Corralitos, loamy sand

Percent of map unit: 5 percent
Hydric soil rating: No

Soboba, steeper

Percent of map unit: 5 percent
Hydric soil rating: No

Riverwash

Percent of map unit: 5 percent
Landform: Fans
Hydric soil rating: Yes

221—Yorba gravelly sandy loam, 2 to 9 percent slopes

Map Unit Setting

National map unit symbol: hcq4
Elevation: 100 to 2,500 feet
Mean annual precipitation: 12 to 20 inches
Mean annual air temperature: 61 to 63 degrees F
Frost-free period: 300 to 350 days
Farmland classification: Not prime farmland

Map Unit Composition

Yorba and similar soils: 85 percent
Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Yorba

Setting

Landform: Terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Riser
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Sandy and gravelly alluvium derived from mixed

Typical profile

H1 - 0 to 11 inches: gravelly sandy loam
H2 - 11 to 40 inches: very gravelly sandy clay loam
H3 - 40 to 63 inches: very gravelly sandy loam

Properties and qualities

Slope: 2 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: R019XD061CA - CLAYPAN
Hydric soil rating: No

Minor Components

Myford, sandy loam

Percent of map unit: 5 percent
Hydric soil rating: No

Gabino, gravelly clay loam

Percent of map unit: 5 percent
Hydric soil rating: No

Soper, gravelly clay loam

Percent of map unit: 3 percent
Hydric soil rating: No

Modjeska, gravelly sandy loam

Percent of map unit: 2 percent
Hydric soil rating: No

226—Yorba cobbly sandy loam, 30 to 50 percent slopes

Map Unit Setting

National map unit symbol: hcq9
Elevation: 100 to 2,500 feet
Mean annual precipitation: 12 to 20 inches
Mean annual air temperature: 61 to 63 degrees F
Frost-free period: 300 to 350 days
Farmland classification: Not prime farmland

Map Unit Composition

Yorba and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Yorba

Setting

Landform: Terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Riser
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Sandy and gravelly alluvium derived from mixed

Typical profile

H1 - 0 to 11 inches: very cobbly sandy loam
H2 - 11 to 40 inches: very gravelly sandy clay loam
H3 - 40 to 63 inches: very gravelly sandy loam

Properties and qualities

Slope: 30 to 50 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: R019XD061CA - CLAYPAN
Hydric soil rating: No

Minor Components

Gabino, gravelly clay loam
Percent of map unit: 5 percent
Hydric soil rating: No

Myford, sandy loam
Percent of map unit: 5 percent
Hydric soil rating: No

Soper, cobbly loam
Percent of map unit: 3 percent
Hydric soil rating: No

Modjeska, gravelly loam
Percent of map unit: 2 percent
Hydric soil rating: No

Western Riverside Area, California

155—Garretson gravelly very fine sandy loam, 2 to 9 percent slopes

Map Unit Setting

National map unit symbol: sgp5
Elevation: 50 to 3,000 feet
Mean annual precipitation: 12 to 25 inches
Mean annual air temperature: 61 to 64 degrees F
Frost-free period: 250 to 350 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Garretson and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Garretson

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Riser, flat
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Alluvium derived from metasedimentary rock

Typical profile

H1 - 0 to 30 inches: gravelly very fine sandy loam
H2 - 30 to 60 inches: gravelly loam

Properties and qualities

Slope: 2 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.5 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Corralitos, loamy sand

Percent of map unit: 5 percent
Hydric soil rating: No

Hanford, sandy loam
Percent of map unit: 5 percent
Hydric soil rating: No

Soboba, gravelly loamy sand
Percent of map unit: 5 percent
Hydric soil rating: No

Unnamed, less sloping or steeper soils
Percent of map unit: 5 percent
Hydric soil rating: No

169—Modjeska gravelly loam, 2 to 9 percent slopes

Map Unit Setting
National map unit symbol: sgpd
Elevation: 200 to 1,500 feet
Mean annual precipitation: 12 to 20 inches
Mean annual air temperature: 59 to 63 degrees F
Frost-free period: 280 to 330 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition
Modjeska and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Modjeska

Setting
Landform: Terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from mixed

Typical profile
H1 - 0 to 14 inches: gravelly loam
H2 - 14 to 63 inches: very cobbly loam
H3 - 63 to 71 inches: very gravelly loamy sand

Properties and qualities
Slope: 2 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None

Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.7 inches)

Interpretive groups
Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: A
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Myford, sandy loam noneroded
Percent of map unit: 5 percent
Hydric soil rating: No

Myford, sandy loam, eroded
Percent of map unit: 5 percent
Hydric soil rating: No

Yorba, gravelly sandy loam
Percent of map unit: 5 percent
Hydric soil rating: No

175—Myford sandy loam, 9 to 15 percent slopes

Map Unit Setting
National map unit symbol: sgpf
Elevation: 1,500 feet
Mean annual precipitation: 12 to 20 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 270 to 350 days
Farmland classification: Not prime farmland

Map Unit Composition
Myford and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Myford

Setting
Landform: Terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Riser
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Alluvium derived from mixed

Typical profile
H1 - 0 to 12 inches: sandy loam
H2 - 12 to 18 inches: sandy clay

H3 - 18 to 28 inches: sandy clay loam
H4 - 28 to 71 inches: sandy clay loam
H5 - 71 to 79 inches: sandy loam

Properties and qualities

Slope: 9 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 1.4 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Ecological site: R019XD061CA - CLAYPAN
Hydric soil rating: No

Minor Components

Myford, sandy loam, eroded

Percent of map unit: 5 percent
Hydric soil rating: No

Capistrano, sandy loam

Percent of map unit: 5 percent
Hydric soil rating: No

Yorba, gravelly sandy loam

Percent of map unit: 3 percent
Hydric soil rating: No

San andreas, sandy loam

Percent of map unit: 2 percent
Hydric soil rating: No

197—Soboba gravelly loamy sand, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: sgp2
Elevation: 30 to 4,200 feet
Mean annual precipitation: 10 to 20 inches
Mean annual air temperature: 61 to 63 degrees F
Frost-free period: 175 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition

Soboba and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Soboba

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Riser, flat
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy and gravelly alluvium derived from mixed

Typical profile

H1 - 0 to 10 inches: gravelly loamy sand
H2 - 10 to 60 inches: very gravelly sand

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Very high (19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 1.8 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: R019XD035CA - SANDY
Hydric soil rating: No

Minor Components

Unnamed

Percent of map unit: 10 percent
Hydric soil rating: No

Corralitos, loamy sand

Percent of map unit: 5 percent
Hydric soil rating: No

Riverwash

Percent of map unit: 5 percent
Landform: Fans
Hydric soil rating: Yes

Soboba, gravelly loamy sand

Percent of map unit: 5 percent
Hydric soil rating: No

198—Soboba cobbly loamy sand, 0 to 15 percent slopes

Map Unit Setting

National map unit symbol: sgp6
Elevation: 30 to 4,200 feet
Mean annual precipitation: 10 to 20 inches
Mean annual air temperature: 61 degrees F
Frost-free period: 210 to 330 days
Farmland classification: Not prime farmland

Map Unit Composition

Soboba and similar soils: 65 percent
Minor components: 35 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Soboba

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Riser, flat
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Sandy and gravelly alluvium derived from mixed

Typical profile

H1 - 0 to 10 inches: very cobbly loamy sand
H2 - 10 to 60 inches: very gravelly sand

Properties and qualities

Slope: 0 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Very high (19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 1.8 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: R019XD035CA - SANDY
Hydric soil rating: No

Minor Components

Soboba, stony surface
Percent of map unit: 10 percent
Hydric soil rating: No

Unnamed
Percent of map unit: 10 percent
Hydric soil rating: No

Corralitos, loamy sand
Percent of map unit: 5 percent
Hydric soil rating: No

Soboba, steeper
Percent of map unit: 5 percent
Hydric soil rating: No

Riverwash
Percent of map unit: 5 percent
Landform: Fans
Hydric soil rating: Yes

221—Yorba gravelly sandy loam, 2 to 9 percent slopes

Map Unit Setting
National map unit symbol: sgpc
Elevation: 100 to 2,500 feet
Mean annual precipitation: 12 to 20 inches
Mean annual air temperature: 61 to 63 degrees F
Frost-free period: 300 to 350 days
Farmland classification: Not prime farmland

Map Unit Composition
Yorba and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Yorba

Setting
Landform: Terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Riser
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Sandy and gravelly alluvium derived from mixed

Typical profile
H1 - 0 to 11 inches: gravelly sandy loam
H2 - 11 to 40 inches: very gravelly sandy clay loam

H3 - 40 to 63 inches: very gravelly sandy loam

Properties and qualities

Slope: 2 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: R019XD061CA - CLAYPAN
Hydric soil rating: No

Minor Components

Gabino, gravelly clay loam

Percent of map unit: 5 percent
Hydric soil rating: No

Myford, sandy loam

Percent of map unit: 5 percent
Hydric soil rating: No

Soper, gravelly clay loam

Percent of map unit: 3 percent
Hydric soil rating: No

Modjeska, gravelly sandy loam

Percent of map unit: 2 percent
Hydric soil rating: No

AaD—Altamont clay, 5 to 15 percent slopes

Map Unit Setting

National map unit symbol: hcqg
Elevation: 200 to 3,250 feet
Mean annual precipitation: 9 to 25 inches
Mean annual air temperature: 59 to 63 degrees F
Frost-free period: 200 to 310 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Altamont and similar soils: 85 percent
Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Altamont

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Residuum weathered from sedimentary rock

Typical profile

H1 - 0 to 18 inches: clay
H2 - 18 to 23 inches: silty clay
H3 - 23 to 27 inches: bedrock

Properties and qualities

Slope: 5 to 15 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.5 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: D
Ecological site: R019XD001CA - CLAYEY
Hydric soil rating: No

Minor Components

Soper

Percent of map unit: 5 percent
Hydric soil rating: No

Gaviota

Percent of map unit: 5 percent
Hydric soil rating: No

Vallecitos

Percent of map unit: 2 percent
Hydric soil rating: No

Altamont

Percent of map unit: 2 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 1 percent
Hydric soil rating: No

AaE2—Altamont clay, 15 to 25 percent slopes, eroded

Map Unit Setting

National map unit symbol: hcqh
Elevation: 200 to 3,250 feet
Mean annual precipitation: 9 to 25 inches
Mean annual air temperature: 59 to 63 degrees F
Frost-free period: 200 to 310 days
Farmland classification: Not prime farmland

Map Unit Composition

Altamont and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Altamont

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Residuum weathered from sedimentary rock

Typical profile

H1 - 0 to 18 inches: clay
H2 - 18 to 23 inches: silty clay
H3 - 23 to 27 inches: bedrock

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.5 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Ecological site: R019XD001CA - CLAYEY
Hydric soil rating: No

Minor Components

Vallecitos
Percent of map unit: 5 percent
Hydric soil rating: No

Soper
Percent of map unit: 5 percent
Hydric soil rating: No

Gaviota
Percent of map unit: 5 percent
Hydric soil rating: No

AaF—Altamont clay, 25 to 50 percent slopes

Map Unit Setting
National map unit symbol: hcqj
Elevation: 200 to 3,250 feet
Mean annual precipitation: 9 to 25 inches
Mean annual air temperature: 59 to 63 degrees F
Frost-free period: 200 to 310 days
Farmland classification: Not prime farmland

Map Unit Composition
Altamont and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Altamont

Setting
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Residuum weathered from sedimentary rock

Typical profile
H1 - 0 to 18 inches: clay
H2 - 18 to 23 inches: silty clay
H3 - 23 to 27 inches: bedrock

Properties and qualities
Slope: 25 to 50 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: R019XD001CA - CLAYEY
Hydric soil rating: No

Minor Components

Gaviota

Percent of map unit: 5 percent
Hydric soil rating: No

Vallecitos

Percent of map unit: 5 percent
Hydric soil rating: No

Soper

Percent of map unit: 5 percent
Hydric soil rating: No

AbF—Altamont cobbly clay, 8 to 35 percent slopes

Map Unit Setting

National map unit symbol: hcqk
Elevation: 200 to 3,000 feet
Mean annual precipitation: 12 to 25 inches
Mean annual air temperature: 59 to 63 degrees F
Frost-free period: 250 to 310 days
Farmland classification: Not prime farmland

Map Unit Composition

Altamont and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Altamont

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Convex

Parent material: Residuum weathered from sedimentary rock

Typical profile

H1 - 0 to 18 inches: cobbly clay
H2 - 18 to 23 inches: silty clay
H3 - 23 to 27 inches: bedrock

Properties and qualities

Slope: 8 to 35 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: R019XD001CA - CLAYEY
Hydric soil rating: No

Minor Components

Gaviota

Percent of map unit: 5 percent

Soper

Percent of map unit: 5 percent

Unnamed

Percent of map unit: 3 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 2 percent
Hydric soil rating: No

AkC—Arbuckle loam, 2 to 8 percent slopes

Map Unit Setting

National map unit symbol: hcqp
Elevation: 100 to 1,600 feet
Mean annual precipitation: 12 to 35 inches
Mean annual air temperature: 57 to 64 degrees F
Frost-free period: 200 to 280 days

Farmland classification: Prime farmland if irrigated

Map Unit Composition

Arbuckle and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Arbuckle

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from metasedimentary rock

Typical profile

H1 - 0 to 12 inches: loam
H2 - 12 to 26 inches: loam
H3 - 26 to 45 inches: gravelly loam
H4 - 45 to 68 inches: stratified sandy loam to very gravelly sandy clay loam

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.5 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Garretson

Percent of map unit: 5 percent
Hydric soil rating: No

Perkins

Percent of map unit: 5 percent
Hydric soil rating: No

Cortina

Percent of map unit: 5 percent
Hydric soil rating: No

AkD—Arbuckle loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: hcqq
Elevation: 100 to 1,600 feet
Mean annual precipitation: 12 to 35 inches
Mean annual air temperature: 57 to 64 degrees F
Frost-free period: 200 to 280 days
Farmland classification: Not prime farmland

Map Unit Composition

Arbuckle and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Arbuckle

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Alluvium derived from metasedimentary rock

Typical profile

H1 - 0 to 12 inches: loam
H2 - 12 to 26 inches: loam
H3 - 26 to 45 inches: gravelly loam
H4 - 45 to 68 inches: stratified sandy loam to very gravelly sandy clay loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.5 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Garretson
Percent of map unit: 5 percent
Hydric soil rating: No

Perkins
Percent of map unit: 5 percent
Hydric soil rating: No

Cortina
Percent of map unit: 5 percent

AIC—Arbuckle gravelly loam, 2 to 9 percent slopes, dry, MLRA 19

Map Unit Setting
National map unit symbol: 2w8cx
Elevation: 690 to 1,470 feet
Mean annual precipitation: 11 to 18 inches
Mean annual air temperature: 64 to 65 degrees F
Frost-free period: 325 to 359 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition
Arbuckle and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Arbuckle

Setting
Landform: Fan remnants
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from igneous, metamorphic and sedimentary rock

Typical profile
Ap - 0 to 6 inches: gravelly loam
A - 6 to 12 inches: gravelly very fine sandy loam
Bw - 12 to 26 inches: gravelly loam
Bt1 - 26 to 30 inches: gravelly clay loam
Bt2 - 30 to 45 inches: gravelly clay loam
C - 45 to 68 inches: very gravelly sandy loam

Properties and qualities
Slope: 2 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained

Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.2 to 0.5 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 6.7 inches)

Interpretive groups
Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Perkins
Percent of map unit: 5 percent
Hydric soil rating: No

Garretson
Percent of map unit: 5 percent
Hydric soil rating: No

Cortina
Percent of map unit: 5 percent
Hydric soil rating: No

AlD—Arbuckle gravelly loam, 8 to 15 percent slopes

Map Unit Setting
National map unit symbol: hcqs
Elevation: 100 to 1,600 feet
Mean annual precipitation: 12 to 35 inches
Mean annual air temperature: 57 to 64 degrees F
Frost-free period: 200 to 280 days
Farmland classification: Not prime farmland

Map Unit Composition
Arbuckle and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Arbuckle

Setting
Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Concave

Across-slope shape: Linear
Parent material: Alluvium derived from metasedimentary rock

Typical profile

H1 - 0 to 26 inches: gravelly loam
H2 - 26 to 45 inches: gravelly clay loam
H3 - 45 to 68 inches: stratified very gravelly sandy loam to very gravelly sandy clay loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 6.5 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Perkins

Percent of map unit: 5 percent
Hydric soil rating: No

Cortina

Percent of map unit: 5 percent
Hydric soil rating: No

Garretson

Percent of map unit: 5 percent
Hydric soil rating: No

AlE—Arbuckle gravelly loam, 15 to 25 percent slopes

Map Unit Setting

National map unit symbol: hcqt
Elevation: 100 to 1,600 feet
Mean annual precipitation: 12 to 35 inches
Mean annual air temperature: 57 to 64 degrees F
Frost-free period: 200 to 280 days
Farmland classification: Not prime farmland

Map Unit Composition

Arbuckle and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Arbuckle

Setting

Landform: Alluvial fans
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Alluvium derived from metasedimentary rock

Typical profile

H1 - 0 to 26 inches: gravelly loam
H2 - 26 to 45 inches: gravelly clay loam
H3 - 45 to 68 inches: stratified very gravelly sandy loam to very gravelly sandy clay loam

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water supply, 0 to 60 inches: Moderate (about 6.5 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Perkins

Percent of map unit: 5 percent
Hydric soil rating: No

Garretson

Percent of map unit: 5 percent
Hydric soil rating: No

Cortina

Percent of map unit: 5 percent
Hydric soil rating: No

BaG—Badland

Map Unit Composition

Badland: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Badland

Setting

Down-slope shape: Concave
Across-slope shape: Concave

Typical profile

H1 - 0 to 60 inches: unweathered bedrock

Properties and qualities

Slope: 30 to 70 percent
Depth to restrictive feature: 0 to 3 inches to paralithic bedrock
Runoff class: Very high

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: No

Minor Components

Unnamed

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

CaD2—Cajalco fine sandy loam, 8 to 15 percent slopes, eroded

Map Unit Setting

National map unit symbol: hcrz
Elevation: 900 to 3,500 feet
Mean annual precipitation: 12 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 230 to 300 days
Farmland classification: Not prime farmland

Map Unit Composition

Cajalco and similar soils: 85 percent
Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cajalco

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Residuum weathered from gabbro

Typical profile

H1 - 0 to 13 inches: fine sandy loam
H2 - 13 to 22 inches: loam
H3 - 22 to 62 inches: weathered bedrock

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Honcut

Percent of map unit: 5 percent
Hydric soil rating: No

Cajalco

Percent of map unit: 5 percent
Hydric soil rating: No

Las posas

Percent of map unit: 2 percent
Hydric soil rating: No

Temescal

Percent of map unit: 2 percent
Hydric soil rating: No

Wyman

Percent of map unit: 1 percent
Hydric soil rating: No

ChC—Cieneba sandy loam, 5 to 8 percent slopes

Map Unit Setting

National map unit symbol: hcs9
Elevation: 500 to 4,000 feet
Mean annual precipitation: 12 to 35 inches
Mean annual air temperature: 57 to 64 degrees F
Frost-free period: 200 to 300 days
Farmland classification: Not prime farmland

Map Unit Composition

Cieneba and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cieneba

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from igneous rock

Typical profile

H1 - 0 to 14 inches: sandy loam
H2 - 14 to 22 inches: weathered bedrock

Properties and qualities

Slope: 5 to 8 percent
Depth to restrictive feature: 10 to 20 inches to paralithic bedrock
Drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 1.4 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Ecological site: R019XD060CA - SHALLOW LOAMY
Hydric soil rating: No

Minor Components

Vista
Percent of map unit: 5 percent
Hydric soil rating: No

Friant
Percent of map unit: 5 percent
Hydric soil rating: No

Fallbrook
Percent of map unit: 5 percent
Hydric soil rating: No

CkF2—Cieneba rocky sandy loam, 15 to 50 percent slopes, eroded

Map Unit Setting
National map unit symbol: hcsf
Elevation: 500 to 4,000 feet
Mean annual precipitation: 12 to 35 inches
Mean annual air temperature: 57 to 64 degrees F
Frost-free period: 200 to 300 days
Farmland classification: Not prime farmland

Map Unit Composition
Cieneba and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cieneba

Setting
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Residuum weathered from igneous rock

Typical profile
H1 - 0 to 14 inches: sandy loam
H2 - 14 to 22 inches: weathered bedrock

Properties and qualities
Slope: 15 to 50 percent
Depth to restrictive feature: 14 to 22 inches to paralithic bedrock
Drainage class: Somewhat excessively drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches

Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 1.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: R019XD060CA - SHALLOW LOAMY
Hydric soil rating: No

Minor Components

Rock outcrop

Percent of map unit: 10 percent
Hydric soil rating: No

Friant

Percent of map unit: 3 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 3 percent
Hydric soil rating: No

Escondido

Percent of map unit: 3 percent
Hydric soil rating: No

Vista

Percent of map unit: 3 percent
Hydric soil rating: No

Fallbrook

Percent of map unit: 3 percent
Hydric soil rating: No

CIC—Cortina gravelly loamy sand, 2 to 8 percent slopes

Map Unit Setting

National map unit symbol: hcsg
Elevation: 30 to 2,400 feet
Mean annual precipitation: 8 to 20 inches
Mean annual air temperature: 61 to 63 degrees F
Frost-free period: 240 to 270 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Cortina and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cortina

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Alluvium derived from metasedimentary rock

Typical profile

H1 - 0 to 23 inches: gravelly loamy sand
H2 - 23 to 38 inches: stratified very gravelly loamy sand to very gravelly loam
H3 - 38 to 60 inches: stratified very gravelly sand to very gravelly loamy sand

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7w
Hydrologic Soil Group: A
Ecological site: R019XD069CA - SANDY ALLUVIAL
Hydric soil rating: No

Minor Components

Riverwash

Percent of map unit: 10 percent
Landform: Channels
Hydric soil rating: Yes

Garretson

Percent of map unit: 5 percent
Hydric soil rating: No

CmC—Cortina cobbly loamy sand, 2 to 8 percent slopes

Map Unit Setting

National map unit symbol: hcsh
Elevation: 30 to 2,400 feet
Mean annual precipitation: 12 to 40 inches
Mean annual air temperature: 61 to 63 degrees F

Frost-free period: 240 to 270 days
Farmland classification: Not prime farmland

Map Unit Composition

Cortina and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cortina

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from metasedimentary rock

Typical profile

H1 - 0 to 23 inches: cobbly loamy sand
H2 - 23 to 38 inches: stratified very cobbly loamy sand to very cobbly loam
H3 - 38 to 60 inches: stratified very gravelly sand to very gravelly loamy sand

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7w
Hydrologic Soil Group: A
Ecological site: R019XD069CA - SANDY ALLUVIAL
Hydric soil rating: No

Minor Components

Riverwash

Percent of map unit: 10 percent
Landform: Channels
Hydric soil rating: Yes

Garretson

Percent of map unit: 5 percent
Hydric soil rating: No

CnC—Cortina gravelly coarse sandy loam, 2 to 8 percent slopes

Map Unit Setting

National map unit symbol: hcsj
Elevation: 30 to 2,400 feet
Mean annual precipitation: 8 to 20 inches
Mean annual air temperature: 61 to 63 degrees F
Frost-free period: 240 to 270 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Cortina and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cortina

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from metasedimentary rock

Typical profile

H1 - 0 to 23 inches: gravelly sandy loam
H2 - 23 to 38 inches: stratified very gravelly loamy sand to very gravelly loam
H3 - 38 to 60 inches: stratified very gravelly sand to very gravelly loamy sand

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): 3s
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: A
Ecological site: R019XD035CA - SANDY
Hydric soil rating: No

Minor Components

Arbuckle
Percent of map unit: 10 percent
Hydric soil rating: No

Garretson
Percent of map unit: 5 percent
Hydric soil rating: No

CP—Clay Pits

Map Unit Composition
Clay pits: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Clay Pits

Setting
Down-slope shape: Concave
Across-slope shape: Convex

CrD—Cortina cobbly sandy loam, 2 to 12 percent slopes

Map Unit Setting
National map unit symbol: hcsm
Elevation: 30 to 2,400 feet
Mean annual precipitation: 12 to 40 inches
Mean annual air temperature: 61 to 63 degrees F
Frost-free period: 240 to 270 days
Farmland classification: Not prime farmland

Map Unit Composition
Cortina and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cortina

Setting
Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from metasedimentary rock

Typical profile
H1 - 0 to 23 inches: cobbly sandy loam

H2 - 23 to 38 inches: stratified very cobbly loamy sand to very cobbly loam
H3 - 38 to 60 inches: stratified very gravelly sand to very gravelly loamy sand

Properties and qualities

Slope: 2 to 12 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: R019XD035CA - SANDY
Hydric soil rating: No

Minor Components

Garretson

Percent of map unit: 10 percent
Hydric soil rating: No

Arbuckle

Percent of map unit: 5 percent
Hydric soil rating: No

EcD2—Escondido fine sandy loam, 8 to 15 percent slopes, eroded

Map Unit Setting

National map unit symbol: hctc
Elevation: 400 to 2,800 feet
Mean annual precipitation: 10 to 20 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 230 to 280 days
Farmland classification: Not prime farmland

Map Unit Composition

Escondido and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Escondido

Setting

Landform: Hills

Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Residuum weathered from metamorphic rock

Typical profile

H1 - 0 to 5 inches: fine sandy loam
H2 - 5 to 34 inches: silt loam
H3 - 34 to 38 inches: unweathered bedrock

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.0 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Vista

Percent of map unit: 3 percent
Hydric soil rating: No

Fallbrook

Percent of map unit: 3 percent
Hydric soil rating: No

Friant

Percent of map unit: 3 percent
Hydric soil rating: No

Vallecitos

Percent of map unit: 3 percent
Hydric soil rating: No

Lodo

Percent of map unit: 3 percent
Hydric soil rating: No

GaA—Garretson very fine sandy loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: hcv1
Elevation: 490 to 1,480 feet
Mean annual precipitation: 12 to 25 inches
Mean annual air temperature: 61 to 64 degrees F
Frost-free period: 220 to 280 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Garretson and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Garretson

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from metasedimentary rock

Typical profile

H1 - 0 to 10 inches: very fine sandy loam
H2 - 10 to 60 inches: loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 9.0 inches)

Interpretive groups

Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: B
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Perkins
Percent of map unit: 5 percent
Hydric soil rating: No

Arbuckle
Percent of map unit: 5 percent
Hydric soil rating: No

Cortina
Percent of map unit: 5 percent
Hydric soil rating: No

GaC—Garretson very fine sandy loam, 2 to 8 percent slopes

Map Unit Setting
National map unit symbol: hcv2
Elevation: 430 to 1,740 feet
Mean annual precipitation: 12 to 25 inches
Mean annual air temperature: 61 to 64 degrees F
Frost-free period: 220 to 280 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition
Garretson and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Garretson

Setting
Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from metasedimentary rock

Typical profile
H1 - 0 to 10 inches: very fine sandy loam
H2 - 10 to 60 inches: loam

Properties and qualities
Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None

Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 9.0 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Cortina

Percent of map unit: 5 percent
Hydric soil rating: No

Arbuckle

Percent of map unit: 5 percent
Hydric soil rating: No

Perkins

Percent of map unit: 5 percent
Hydric soil rating: No

GdA—Garretson gravelly very fine sandy loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: hcv4
Elevation: 50 to 3,000 feet
Mean annual precipitation: 12 to 25 inches
Mean annual air temperature: 61 to 64 degrees F
Frost-free period: 250 to 350 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Garretson and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Garretson

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from metasedimentary rock

Typical profile

H1 - 0 to 10 inches: gravelly very fine sandy loam
H2 - 10 to 53 inches: gravelly loam
H3 - 53 to 72 inches: loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.4 inches)

Interpretive groups

Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Cortina

Percent of map unit: 5 percent
Hydric soil rating: No

Perkins

Percent of map unit: 5 percent
Hydric soil rating: No

Arbuckle

Percent of map unit: 5 percent
Hydric soil rating: No

GdC—Garretson gravelly very fine sandy loam, 2 to 8 percent slopes

Map Unit Setting

National map unit symbol: hcv5
Elevation: 50 to 3,000 feet
Mean annual precipitation: 12 to 25 inches
Mean annual air temperature: 61 to 64 degrees F
Frost-free period: 250 to 350 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Garretson and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Garretson

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from metasedimentary rock

Typical profile

H1 - 0 to 10 inches: gravelly very fine sandy loam
H2 - 10 to 53 inches: gravelly loam
H3 - 53 to 72 inches: loam

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.4 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Perkins

Percent of map unit: 5 percent
Hydric soil rating: No

Arbuckle

Percent of map unit: 5 percent
Hydric soil rating: No

Cortina

Percent of map unit: 5 percent
Hydric soil rating: No

GhC—Gorgonio loamy sand, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: hcvb

Elevation: 20 to 3,000 feet
Mean annual precipitation: 10 to 25 inches
Mean annual air temperature: 57 to 63 degrees F
Frost-free period: 250 to 310 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Gorgonio and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Gorgonio

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile

H1 - 0 to 15 inches: loamy sand
H2 - 15 to 60 inches: stratified gravelly loamy sand to gravelly loamy fine sand

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): 3s
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: R019XD035CA - SANDY
Hydric soil rating: No

Minor Components

Soboba

Percent of map unit: 5 percent
Hydric soil rating: No

Hanford

Percent of map unit: 5 percent
Hydric soil rating: No

Tujunga

Percent of map unit: 5 percent
Hydric soil rating: No

GhD—Gorgonio loamy sand, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: hcvc
Elevation: 20 to 3,000 feet
Mean annual precipitation: 10 to 25 inches
Mean annual air temperature: 57 to 63 degrees F
Frost-free period: 250 to 310 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Gorgonio and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Gorgonio

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile

H1 - 0 to 15 inches: loamy sand
H2 - 15 to 60 inches: stratified gravelly loamy sand to gravelly loamy fine sand

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): 4s
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: R019XD035CA - SANDY
Hydric soil rating: No

Minor Components

Tujunga
Percent of map unit: 5 percent
Hydric soil rating: No

Soboba
Percent of map unit: 5 percent
Hydric soil rating: No

Hanford
Percent of map unit: 5 percent
Hydric soil rating: No

GkD—Gorgonio loamy sand, channeled, 2 to 15 percent slopes

Map Unit Setting
National map unit symbol: hcvd
Elevation: 20 to 3,000 feet
Mean annual precipitation: 8 to 25 inches
Mean annual air temperature: 46 to 63 degrees F
Frost-free period: 110 to 310 days
Farmland classification: Not prime farmland

Map Unit Composition
Gorgonio and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Gorgonio

Setting
Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile
H1 - 0 to 15 inches: loamy sand
H2 - 15 to 60 inches: stratified gravelly loamy sand to gravelly loamy fine sand

Properties and qualities
Slope: 2 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare

Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7w
Hydrologic Soil Group: A
Ecological site: R019XD069CA - SANDY ALLUVIAL
Hydric soil rating: No

Minor Components

Riverwash

Percent of map unit: 10 percent
Landform: Drainageways
Hydric soil rating: Yes

Riverwash

Percent of map unit: 4 percent
Landform: Channels
Hydric soil rating: Yes

Tujunga

Percent of map unit: 3 percent
Hydric soil rating: No

Soboba

Percent of map unit: 3 percent
Hydric soil rating: No

GP—Gravel pits

Map Unit Composition

Gravel pits: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Gravel Pits

Setting

Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy and gravelly alluvium

GyE2—Greenfield sandy loam, 15 to 25 percent slopes, eroded

Map Unit Setting

National map unit symbol: hcvy

Elevation: 100 to 3,500 feet
Mean annual precipitation: 9 to 20 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 200 to 300 days
Farmland classification: Not prime farmland

Map Unit Composition

Greenfield and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Greenfield

Setting

Landform: Terraces, alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear, concave
Across-slope shape: Linear, convex
Parent material: Alluvium derived from granite

Typical profile

H1 - 0 to 26 inches: sandy loam
H2 - 26 to 43 inches: fine sandy loam
H3 - 43 to 60 inches: loam

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 8.3 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Hanford

Percent of map unit: 6 percent
Hydric soil rating: No

Pachappa

Percent of map unit: 5 percent
Hydric soil rating: No

Arlington

Percent of map unit: 2 percent
Hydric soil rating: No

San timoteo, badlands
Percent of map unit: 2 percent
Hydric soil rating: No

GzG—Gullied land

Map Unit Composition
Gullied land: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Gullied Land

Setting
Landform: Terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Riser
Down-slope shape: Concave
Across-slope shape: Concave

Typical profile
H1 - 0 to 60 inches: variable

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Ecological site: R019XG909CA - Terrace
Hydric soil rating: No

HaC—Hanford loamy fine sand, 0 to 8 percent slopes

Map Unit Setting
National map unit symbol: 2y8tt
Elevation: 840 to 2,490 feet
Mean annual precipitation: 10 to 16 inches
Mean annual air temperature: 63 to 65 degrees F
Frost-free period: 280 to 365 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition
Hanford and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hanford

Setting
Landform: Alluvial fans
Landform position (three-dimensional): Tread

Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile

A - 0 to 8 inches: loamy fine sand
C1 - 8 to 40 inches: fine sandy loam
C2 - 40 to 60 inches: stratified loamy sand to coarse sandy loam

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 6.6 inches)

Interpretive groups

Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: R019XD012CA - SANDY
Hydric soil rating: No

Minor Components

Ramona

Percent of map unit: 5 percent
Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Tujunga

Percent of map unit: 5 percent
Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Greenfield

Percent of map unit: 5 percent
Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

HcC—Hanford coarse sandy loam, 2 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2y8tk
Elevation: 680 to 2,930 feet
Mean annual precipitation: 9 to 17 inches
Mean annual air temperature: 63 to 65 degrees F
Frost-free period: 290 to 365 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Hanford and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hanford

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile

A - 0 to 8 inches: coarse sandy loam
C1 - 8 to 40 inches: fine sandy loam
C2 - 40 to 60 inches: stratified loamy sand to coarse sandy loam

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 7.0 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: A
Ecological site: R019XD012CA - SANDY
Hydric soil rating: No

Minor Components

Greenfield
Percent of map unit: 5 percent
Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Ramona
Percent of map unit: 5 percent
Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Unnamed
Percent of map unit: 2 percent
Hydric soil rating: No

Tujunga
Percent of map unit: 2 percent
Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Unnamed
Percent of map unit: 1 percent
Hydric soil rating: No

HcD2—Hanford coarse sandy loam, 8 to 15 percent slopes, eroded

Map Unit Setting
National map unit symbol: 2y8tm
Elevation: 790 to 3,440 feet
Mean annual precipitation: 9 to 18 inches
Mean annual air temperature: 62 to 65 degrees F
Frost-free period: 250 to 365 days
Farmland classification: Farmland of statewide importance

Map Unit Composition
Hanford and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hanford

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile

A - 0 to 8 inches: coarse sandy loam
C1 - 8 to 40 inches: fine sandy loam
C2 - 40 to 60 inches: stratified loamy sand to coarse sandy loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 7.0 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: R019XD012CA - SANDY
Hydric soil rating: No

Minor Components

Tujunga

Percent of map unit: 5 percent
Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Ramona

Percent of map unit: 5 percent
Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Greenfield

Percent of map unit: 5 percent
Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Concave

Across-slope shape: Linear
Hydric soil rating: No

HdD2—Hanford cobbly coarse sandy loam, 2 to 15 percent slopes, eroded

Map Unit Setting

National map unit symbol: 2y8tq
Elevation: 1,260 to 3,030 feet
Mean annual precipitation: 9 to 17 inches
Mean annual air temperature: 63 to 65 degrees F
Frost-free period: 250 to 365 days
Farmland classification: Not prime farmland

Map Unit Composition

Hanford and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hanford

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile

A - 0 to 18 inches: cobbly coarse sandy loam
C1 - 18 to 30 inches: gravelly fine sandy loam
C2 - 30 to 60 inches: stratified loamy sand to gravelly coarse sandy loam

Properties and qualities

Slope: 2 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: R019XD035CA - SANDY

Hydric soil rating: No

Minor Components

Riverwash

Percent of map unit: 10 percent
Landform: Channels
Hydric soil rating: Yes

Tujunga

Percent of map unit: 5 percent
Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

HnC—Honcut sandy loam, 2 to 8 percent slopes

Map Unit Setting

National map unit symbol: hcwc
Elevation: 2,000 feet
Mean annual precipitation: 12 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 200 to 280 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Honcut and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Honcut

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Alluvium derived from igneous rock

Typical profile

H1 - 0 to 22 inches: sandy loam
H2 - 22 to 60 inches: coarse sandy loam

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 6.6 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: A
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Buren

Percent of map unit: 5 percent
Hydric soil rating: No

Wyman

Percent of map unit: 5 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 5 percent
Hydric soil rating: No

HnD2—Honcut sandy loam, 8 to 15 percent slopes, eroded

Map Unit Setting

National map unit symbol: hcwd
Elevation: 2,000 feet
Mean annual precipitation: 12 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 200 to 280 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Honcut and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Honcut

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Linear

Parent material: Alluvium derived from igneous rock

Typical profile

H1 - 0 to 22 inches: sandy loam
H2 - 22 to 60 inches: coarse sandy loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 6.6 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Buren

Percent of map unit: 5 percent
Hydric soil rating: No

Wyman

Percent of map unit: 5 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 5 percent
Hydric soil rating: No

HoE—Honcut cobbly sandy loam, 2 to 25 percent slopes

Map Unit Setting

National map unit symbol: hcwf
Elevation: 150 to 900 feet
Mean annual precipitation: 10 to 20 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 250 to 280 days
Farmland classification: Not prime farmland

Map Unit Composition

Honcut and similar soils: 85 percent

Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Honcut

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Alluvium derived from igneous rock

Typical profile

H1 - 0 to 22 inches: cobbly coarse sandy loam
H2 - 22 to 60 inches: gravelly fine sandy loam

Properties and qualities

Slope: 2 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7w
Hydrologic Soil Group: A
Ecological site: R019XD069CA - SANDY ALLUVIAL
Hydric soil rating: No

Minor Components

Riverwash

Percent of map unit: 5 percent
Landform: Channels
Hydric soil rating: Yes

Wyman

Percent of map unit: 5 percent
Hydric soil rating: No

Buren

Percent of map unit: 5 percent
Hydric soil rating: No

HuC2—Honcut loam, 2 to 8 percent slopes, eroded

Map Unit Setting

National map unit symbol: hcwg
Elevation: 2,000 feet
Mean annual precipitation: 12 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 200 to 280 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Honcut and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Honcut

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from igneous rock

Typical profile

H1 - 0 to 22 inches: loam
H2 - 22 to 60 inches: loam

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 8.6 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: A
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Unnamed
Percent of map unit: 5 percent
Hydric soil rating: No

Unnamed
Percent of map unit: 5 percent
Hydric soil rating: No

Unnamed
Percent of map unit: 5 percent
Hydric soil rating: No

LpE2—Lodo rocky loam, 8 to 25 percent slopes, eroded

Map Unit Setting
National map unit symbol: hcwr
Elevation: 300 to 4,000 feet
Mean annual precipitation: 8 to 35 inches
Mean annual air temperature: 45 to 64 degrees F
Frost-free period: 110 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition
Lodo and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lodo

Setting
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Metamorphosed residuum weathered from sandstone

Typical profile
H1 - 0 to 8 inches: gravelly loam
H2 - 8 to 19 inches: unweathered bedrock

Properties and qualities
Slope: 8 to 25 percent
Depth to restrictive feature: 8 to 20 inches to lithic bedrock
Drainage class: Somewhat excessively drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches

Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 1.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: R019XD060CA - SHALLOW LOAMY
Hydric soil rating: No

Minor Components

Rock outcrop

Percent of map unit: 10 percent
Hydric soil rating: No

Vallecitos

Percent of map unit: 3 percent
Hydric soil rating: No

Escondido

Percent of map unit: 3 percent
Hydric soil rating: No

Temescal

Percent of map unit: 3 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 3 percent
Hydric soil rating: No

Cajalco

Percent of map unit: 3 percent
Hydric soil rating: No

LpF2—Lodo rocky loam, 25 to 50 percent slopes, eroded

Map Unit Setting

National map unit symbol: hcws
Elevation: 300 to 3,500 feet
Mean annual precipitation: 12 to 35 inches
Mean annual air temperature: 59 to 64 degrees F
Frost-free period: 230 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition

Lodo and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lodo

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Metamorphosed residuum weathered from sandstone

Typical profile

H1 - 0 to 8 inches: gravelly loam
H2 - 8 to 19 inches: unweathered bedrock

Properties and qualities

Slope: 25 to 50 percent
Depth to restrictive feature: 8 to 20 inches to lithic bedrock
Drainage class: Somewhat excessively drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 1.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: R019XD060CA - SHALLOW LOAMY
Hydric soil rating: No

Minor Components

Tumescal

Percent of map unit: 5 percent
Hydric soil rating: No

Vallecitos

Percent of map unit: 5 percent
Hydric soil rating: No

Escondido

Percent of map unit: 5 percent
Hydric soil rating: No

PaA—Pachappa fine sandy loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: hcxn

Elevation: 1,000 feet
Mean annual precipitation: 14 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 270 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Pachappa and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pachappa

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile

H1 - 0 to 20 inches: fine sandy loam
H2 - 20 to 63 inches: loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 9.0 inches)

Interpretive groups

Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: B
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Hanford

Percent of map unit: 5 percent
Hydric soil rating: No

Greenfield

Percent of map unit: 5 percent
Hydric soil rating: No

San emigdio

Percent of map unit: 5 percent
Hydric soil rating: No

PlB—Placentia fine sandy loam, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: hcxv
Elevation: 50 to 2,500 feet
Mean annual precipitation: 12 to 18 inches
Mean annual air temperature: 61 to 64 degrees F
Frost-free period: 200 to 300 days
Farmland classification: Not prime farmland

Map Unit Composition

Placentia and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Placentia

Setting

Landform: Terraces, alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile

H1 - 0 to 18 inches: fine sandy loam
H2 - 18 to 39 inches: clay
H3 - 39 to 57 inches: clay loam
H4 - 57 to 60 inches: gravelly sandy loam

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Very slightly saline to moderately saline (2.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum: 50.0
Available water supply, 0 to 60 inches: Low (about 4.8 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Ecological site: R019XD061CA - CLAYPAN

Hydric soil rating: No

Minor Components

Greenfield
Percent of map unit: 5 percent
Hydric soil rating: No

Hanford
Percent of map unit: 5 percent
Hydric soil rating: No

Ramona
Percent of map unit: 4 percent
Hydric soil rating: No

Unnamed, ponded
Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: Yes

PID—Placentia fine sandy loam, 5 to 15 percent slopes

Map Unit Setting
National map unit symbol: hcxw
Elevation: 50 to 2,500 feet
Mean annual precipitation: 12 to 18 inches
Mean annual air temperature: 61 to 64 degrees F
Frost-free period: 200 to 300 days
Farmland classification: Not prime farmland

Map Unit Composition
Placentia and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Placentia

Setting
Landform: Terraces, alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile
H1 - 0 to 18 inches: fine sandy loam
H2 - 18 to 39 inches: clay
H3 - 39 to 57 inches: clay loam
H4 - 57 to 60 inches: gravelly sandy loam

Properties and qualities

Slope: 5 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Very slightly saline to moderately saline (2.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum: 50.0
Available water supply, 0 to 60 inches: Low (about 4.8 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Ecological site: R019XD061CA - CLAYPAN
Hydric soil rating: No

Minor Components

Greenfield

Percent of map unit: 5 percent
Hydric soil rating: No

Hanford

Percent of map unit: 5 percent
Hydric soil rating: No

Ramona

Percent of map unit: 4 percent
Hydric soil rating: No

Unnamed, ponded

Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: Yes

PmE—Placentia cobbly fine sandy loam, 8 to 25 percent slope s

Map Unit Setting

National map unit symbol: hcxx
Elevation: 50 to 2,500 feet
Mean annual precipitation: 12 to 18 inches
Mean annual air temperature: 61 to 64 degrees F
Frost-free period: 200 to 300 days
Farmland classification: Not prime farmland

Map Unit Composition

Placentia and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Placentia

Setting

Landform: Terraces, alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear, concave
Across-slope shape: Linear, convex
Parent material: Alluvium derived from granite

Typical profile

H1 - 0 to 18 inches: cobbly fine sandy loam
H2 - 18 to 39 inches: clay
H3 - 39 to 57 inches: clay loam
H4 - 57 to 60 inches: gravelly sandy loam

Properties and qualities

Slope: 8 to 25 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Very slightly saline to moderately saline (2.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum: 50.0
Available water supply, 0 to 60 inches: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: R019XD061CA - CLAYPAN
Hydric soil rating: No

Minor Components

Greenfield

Percent of map unit: 5 percent
Hydric soil rating: No

Hanford

Percent of map unit: 5 percent
Hydric soil rating: No

Ramona

Percent of map unit: 4 percent
Hydric soil rating: No

Unnamed, ponded

Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: Yes

PoC—Porterville clay, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: hcxy
Elevation: 50 to 300 feet
Mean annual precipitation: 9 to 20 inches
Mean annual air temperature: 57 to 63 degrees F
Frost-free period: 150 to 300 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Porterville and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Porterville

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from igneous rock

Typical profile

H1 - 0 to 15 inches: clay
H2 - 15 to 66 inches: clay

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 8.2 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e

Hydrologic Soil Group: C
Ecological site: R019XD001CA - CLAYEY
Hydric soil rating: No

Minor Components

Cajalco
Percent of map unit: 5 percent
Hydric soil rating: No

Yokohl
Percent of map unit: 5 percent
Hydric soil rating: No

Las posas
Percent of map unit: 5 percent
Hydric soil rating: No

QU—Quarries

Map Unit Composition
Quarries: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Quarries

Setting
Down-slope shape: Concave
Across-slope shape: Convex

RaB2—Ramona sandy loam, 2 to 5 percent slopes, eroded

Map Unit Setting
National map unit symbol: hcy5
Elevation: 250 to 3,500 feet
Mean annual precipitation: 10 to 20 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 230 to 320 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition
Ramona and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ramona

Setting
Landform: Terraces, alluvial fans

Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile

H1 - 0 to 14 inches: sandy loam
H2 - 14 to 23 inches: fine sandy loam
H3 - 23 to 68 inches: sandy clay loam
H4 - 68 to 74 inches: gravelly sandy loam

Properties and qualities

Slope: 2 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Available water supply, 0 to 60 inches: Moderate (about 8.1 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Hanford

Percent of map unit: 4 percent
Hydric soil rating: No

Arlington

Percent of map unit: 4 percent
Hydric soil rating: No

Greenfield

Percent of map unit: 4 percent
Hydric soil rating: No

Tujunga

Percent of map unit: 3 percent
Hydric soil rating: No

RaB3—Ramona sandy loam, 0 to 5 percent slopes, severely eroded

Map Unit Setting

National map unit symbol: hcy6
Elevation: 250 to 3,500 feet
Mean annual precipitation: 10 to 20 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 230 to 320 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Ramona and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ramona

Setting

Landform: Terraces, alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile

H1 - 0 to 8 inches: sandy loam
H2 - 8 to 17 inches: fine sandy loam
H3 - 17 to 68 inches: sandy clay loam
H4 - 68 to 74 inches: gravelly sandy loam

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Available water supply, 0 to 60 inches: Moderate (about 8.4 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Tujunga
Percent of map unit: 5 percent
Hydric soil rating: No

Hanford
Percent of map unit: 5 percent
Hydric soil rating: No

Greenfield
Percent of map unit: 5 percent
Hydric soil rating: No

RaC2—Ramona sandy loam, 5 to 8 percent slopes, eroded

Map Unit Setting
National map unit symbol: hcy7
Elevation: 250 to 3,500 feet
Mean annual precipitation: 10 to 20 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 230 to 320 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition
Ramona and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ramona

Setting
Landform: Terraces, alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile
H1 - 0 to 14 inches: sandy loam
H2 - 14 to 23 inches: fine sandy loam
H3 - 23 to 68 inches: sandy clay loam
H4 - 68 to 74 inches: gravelly sandy loam

Properties and qualities
Slope: 5 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Available water supply, 0 to 60 inches: Moderate (about 8.1 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Hanford

Percent of map unit: 5 percent
Hydric soil rating: No

Tujunga

Percent of map unit: 5 percent
Hydric soil rating: No

Greenfield

Percent of map unit: 5 percent
Hydric soil rating: No

RaC3—Ramona sandy loam, 5 to 8 percent slopes, severely eroded

Map Unit Setting

National map unit symbol: hcy8
Elevation: 250 to 3,500 feet
Mean annual precipitation: 10 to 20 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 230 to 320 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Ramona and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ramona

Setting

Landform: Terraces, alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile

H1 - 0 to 8 inches: sandy loam
H2 - 8 to 11 inches: fine sandy loam
H3 - 11 to 68 inches: sandy clay loam
H4 - 68 to 74 inches: gravelly sandy loam

Properties and qualities

Slope: 5 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Available water supply, 0 to 60 inches: Moderate (about 8.5 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Hanford

Percent of map unit: 5 percent
Hydric soil rating: No

Greenfield

Percent of map unit: 5 percent
Hydric soil rating: No

Tujunga

Percent of map unit: 5 percent
Hydric soil rating: No

RaD2—Ramona sandy loam, 8 to 15 percent slopes, eroded

Map Unit Setting

National map unit symbol: hcy9
Elevation: 250 to 3,500 feet
Mean annual precipitation: 10 to 20 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 230 to 320 days
Farmland classification: Not prime farmland

Map Unit Composition

Ramona and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ramona

Setting

Landform: Terraces, alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear, concave
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile

H1 - 0 to 14 inches: sandy loam
H2 - 14 to 23 inches: fine sandy loam
H3 - 23 to 68 inches: sandy clay loam
H4 - 68 to 74 inches: gravelly sandy loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Available water supply, 0 to 60 inches: Moderate (about 8.1 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Hanford

Percent of map unit: 5 percent
Hydric soil rating: No

Greenfield

Percent of map unit: 5 percent
Hydric soil rating: No

Tujunga

Percent of map unit: 5 percent
Hydric soil rating: No

RaD3—Ramona sandy loam, 8 to 15 percent slopes, severely eroded

Map Unit Setting

National map unit symbol: hcyb
Elevation: 250 to 3,500 feet
Mean annual precipitation: 10 to 20 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 230 to 320 days
Farmland classification: Not prime farmland

Map Unit Composition

Ramona and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ramona

Setting

Landform: Terraces, alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear, concave
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile

H1 - 0 to 8 inches: sandy loam
H2 - 8 to 17 inches: fine sandy loam
H3 - 17 to 68 inches: sandy clay loam
H4 - 68 to 74 inches: gravelly sandy loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Available water supply, 0 to 60 inches: Moderate (about 8.4 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Greenfield
Percent of map unit: 5 percent
Hydric soil rating: No

Hanford
Percent of map unit: 5 percent
Hydric soil rating: No

Tujunga
Percent of map unit: 5 percent
Hydric soil rating: No

RaE3—Ramona sandy loam, 15 to 25 percent slopes, severely eroded

Map Unit Setting
National map unit symbol: hcyc
Elevation: 250 to 3,500 feet
Mean annual precipitation: 10 to 20 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 230 to 320 days
Farmland classification: Not prime farmland

Map Unit Composition
Ramona and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ramona

Setting
Landform: Terraces, alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear, concave
Across-slope shape: Linear, convex
Parent material: Alluvium derived from granite

Typical profile
H1 - 0 to 8 inches: sandy loam
H2 - 8 to 17 inches: fine sandy loam
H3 - 17 to 68 inches: sandy clay loam
H4 - 68 to 74 inches: gravelly sandy loam

Properties and qualities
Slope: 15 to 25 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Available water supply, 0 to 60 inches: Moderate (about 8.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Hanford

Percent of map unit: 5 percent
Hydric soil rating: No

Greenfield

Percent of map unit: 5 percent
Hydric soil rating: No

Tujunga

Percent of map unit: 5 percent
Hydric soil rating: No

RsC—Riverwash

Map Unit Setting

National map unit symbol: hcym
Elevation: 700 to 2,900 feet
Mean annual precipitation: 8 to 15 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 110 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Riverwash: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Riverwash

Setting

Landform: Channels
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy and gravelly alluvium derived from mixed sources

Typical profile

H1 - 0 to 6 inches: gravelly coarse sand
H2 - 6 to 60 inches: stratified extremely gravelly coarse sand to gravelly sand

Properties and qualities

Slope: 0 to 8 percent
Drainage class: Excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: FrequentNone
Available water supply, 0 to 60 inches: Very low (about 1.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Ecological site: R019XG905CA - Riparian
Hydric soil rating: Yes

RuF—Rough broken land

Map Unit Composition

Rough broken land: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rough Broken Land

Setting

Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Residuum derived from mixed sources

Typical profile

H1 - 0 to 60 inches: unweathered bedrock

Properties and qualities

Slope: 30 to 50 percent
Depth to restrictive feature: 0 to 3 inches to paralithic bedrock
Runoff class: Very high

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: No

SeC2—San Emigdio fine sandy loam, 2 to 8 percent slopes, eroded

Map Unit Setting

National map unit symbol: hcys
Elevation: 600 to 1,800 feet
Mean annual precipitation: 12 to 18 inches
Mean annual air temperature: 61 to 64 degrees F

Frost-free period: 220 to 280 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

San emigdio and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of San Emigdio

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from sedimentary rock

Typical profile

H1 - 0 to 8 inches: fine sandy loam
H2 - 8 to 40 inches: fine sandy loam
H3 - 40 to 60 inches: stratified sandy loam to silt loam

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 8.5 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: A
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Metz

Percent of map unit: 10 percent
Hydric soil rating: No

San timoteo

Percent of map unit: 5 percent
Hydric soil rating: No

SgC—San Emigdio loam, 2 to 8 percent slopes

Map Unit Setting

National map unit symbol: hcyx
Elevation: 600 to 1,800 feet
Mean annual precipitation: 12 to 18 inches
Mean annual air temperature: 61 to 64 degrees F
Frost-free period: 220 to 280 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

San emigdio and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of San Emigdio

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from sedimentary rock

Typical profile

H1 - 0 to 8 inches: loam
H2 - 8 to 40 inches: fine sandy loam
H3 - 40 to 60 inches: stratified sandy loam to silt loam

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 8.5 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: A
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Metz

Percent of map unit: 10 percent
Hydric soil rating: No

San timoteo

Percent of map unit: 5 percent
Hydric soil rating: No

SsD—Soboba stony loamy sand, 2 to 15 percent slopes

Map Unit Setting

National map unit symbol: hcz4
Elevation: 30 to 4,200 feet
Mean annual precipitation: 10 to 20 inches
Mean annual air temperature: 61 degrees F
Frost-free period: 210 to 330 days
Farmland classification: Not prime farmland

Map Unit Composition

Soboba and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Soboba

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy and gravelly alluvium derived from granite

Typical profile

H1 - 0 to 11 inches: very stony loamy sand
H2 - 11 to 60 inches: stratified very cobbly sand to very gravelly loamy sand

Properties and qualities

Slope: 2 to 15 percent
Surface area covered with cobbles, stones or boulders: 0.1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Very high (19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 1.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7w
Hydrologic Soil Group: A
Ecological site: R019XD069CA - SANDY ALLUVIAL
Hydric soil rating: No

Minor Components

Riverwash

Percent of map unit: 10 percent
Landform: Channels
Hydric soil rating: Yes

Tujunga

Percent of map unit: 2 percent
Hydric soil rating: No

Hanford

Percent of map unit: 2 percent
Hydric soil rating: No

Soboba

Percent of map unit: 1 percent
Hydric soil rating: No

StF2—Soper loam, 15 to 35 percent slopes, eroded

Map Unit Setting

National map unit symbol: hcz5
Elevation: 100 to 2,500 feet
Mean annual precipitation: 12 to 25 inches
Mean annual air temperature: 61 to 63 degrees F
Frost-free period: 250 to 350 days
Farmland classification: Not prime farmland

Map Unit Composition

Soper and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Soper

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Residuum weathered from sandstone

Typical profile

H1 - 0 to 10 inches: loam
H2 - 10 to 26 inches: gravelly clay loam
H3 - 26 to 30 inches: weathered bedrock

Properties and qualities

Slope: 15 to 35 percent
Depth to restrictive feature: 24 to 40 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Altamont

Percent of map unit: 10 percent
Hydric soil rating: No

Gaviota

Percent of map unit: 5 percent
Hydric soil rating: No

SuF2—Soper cobbly loam, 25 to 50 percent slopes, eroded

Map Unit Setting

National map unit symbol: hcz6
Elevation: 100 to 2,500 feet
Mean annual precipitation: 12 to 25 inches
Mean annual air temperature: 61 to 63 degrees F
Frost-free period: 250 to 350 days
Farmland classification: Not prime farmland

Map Unit Composition

Soper and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Soper

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Residuum weathered from sandstone

Typical profile

H1 - 0 to 10 inches: cobbly loam
H2 - 10 to 26 inches: gravelly clay loam
H3 - 26 to 30 inches: weathered bedrock

Properties and qualities

Slope: 25 to 50 percent
Depth to restrictive feature: 24 to 40 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Altamont

Percent of map unit: 10 percent
Hydric soil rating: No

Gaviota

Percent of map unit: 5 percent
Hydric soil rating: No

TbF2—Temescal rocky loam, 15 to 50 percent slopes, eroded

Map Unit Setting

National map unit symbol: hcz8
Elevation: 1,000 to 3,500 feet
Mean annual precipitation: 15 inches
Mean annual air temperature: 61 degrees F

Frost-free period: 210 to 280 days
Farmland classification: Not prime farmland

Map Unit Composition

Temescal and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Temescal

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Residuum weathered from gabbro

Typical profile

H1 - 0 to 17 inches: loam
H2 - 17 to 21 inches: unweathered bedrock

Properties and qualities

Slope: 15 to 50 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: R019XD060CA - SHALLOW LOAMY
Hydric soil rating: No

Minor Components

Cajalco

Percent of map unit: 10 percent
Hydric soil rating: No

Las posas

Percent of map unit: 5 percent
Hydric soil rating: No

TeG—Terrace escarpments

Map Unit Composition

Terrace escarpments: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Terrace Escarpments

Setting

Landform: Terraces
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Alluvium derived from mixed sources

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Ecological site: R019XD060CA - SHALLOW LOAMY
Hydric soil rating: No

Tp2—Traver loamy fine sand, eroded

Map Unit Setting

National map unit symbol: hczf
Elevation: 1,000 feet
Mean annual precipitation: 10 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 250 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Traver and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Traver

Setting

Landform: Valley floors
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile

H1 - 0 to 13 inches: loamy fine sand
H2 - 13 to 38 inches: fine sandy loam

H3 - 38 to 60 inches: stratified fine sandy loam to silty clay loam

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Slightly saline to strongly saline (4.0 to 16.0 mmhos/cm)
Sodium adsorption ratio, maximum: 2.0
Available water supply, 0 to 60 inches: Moderate (about 6.2 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: R019XD070CA - SANDY BASIN
Hydric soil rating: No

Minor Components

Waukena

Percent of map unit: 5 percent
Hydric soil rating: No

Grangeville

Percent of map unit: 5 percent
Hydric soil rating: No

Dello

Percent of map unit: 5 percent
Hydric soil rating: No

Tr2—Traver loamy fine sand, saline-alkali, eroded

Map Unit Setting

National map unit symbol: hczg
Elevation: 1,000 feet
Mean annual precipitation: 10 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 250 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Traver and similar soils: 85 percent
Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Traver

Setting

Landform: Valley floors
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile

H1 - 0 to 13 inches: loamy fine sand
H2 - 13 to 38 inches: fine sandy loam
H3 - 38 to 60 inches: stratified fine sandy loam to silty clay loam

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Slightly saline to strongly saline (4.0 to 16.0 mmhos/cm)
Sodium adsorption ratio, maximum: 2.0
Available water supply, 0 to 60 inches: Moderate (about 6.2 inches)

Interpretive groups

Land capability classification (irrigated): 3s
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: B
Ecological site: R019XD070CA - SANDY BASIN
Hydric soil rating: No

Minor Components

Dello

Percent of map unit: 5 percent
Hydric soil rating: No

Grangeville

Percent of map unit: 5 percent
Hydric soil rating: No

Waukena

Percent of map unit: 5 percent
Hydric soil rating: No

Ts—Traver fine sandy loam, saline-alkali

Map Unit Setting

National map unit symbol: hczh
Elevation: 1,000 feet
Mean annual precipitation: 10 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 250 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Traver and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Traver

Setting

Landform: Valley floors
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile

H1 - 0 to 20 inches: fine sandy loam
H2 - 20 to 60 inches: stratified fine sandy loam to silty clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Slightly saline to strongly saline (4.0 to 16.0 mmhos/cm)
Sodium adsorption ratio, maximum: 2.0
Available water supply, 0 to 60 inches: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): 3s
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: B
Ecological site: R019XD070CA - SANDY BASIN
Hydric soil rating: No

Minor Components

Grangeville
Percent of map unit: 5 percent
Hydric soil rating: No

Waukena
Percent of map unit: 5 percent
Hydric soil rating: No

Dello
Percent of map unit: 5 percent
Hydric soil rating: No

TvC—Tujunga loamy sand, channeled, 0 to 8 percent slopes

Map Unit Setting
National map unit symbol: hczl
Elevation: 10 to 2,900 feet
Mean annual precipitation: 8 to 25 inches
Mean annual air temperature: 46 to 64 degrees F
Frost-free period: 110 to 350 days
Farmland classification: Not prime farmland

Map Unit Composition
Tujunga and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tujunga

Setting
Landform: Alluvial fans, flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy alluvium derived from granite

Typical profile
H1 - 0 to 10 inches: loamy sand
H2 - 10 to 60 inches: loamy sand

Properties and qualities
Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: OccasionalNone

Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7w
Hydrologic Soil Group: A
Ecological site: R019XD069CA - SANDY ALLUVIAL
Hydric soil rating: No

Minor Components

Riverwash

Percent of map unit: 10 percent
Landform: Drainageways
Hydric soil rating: Yes

Delhi

Percent of map unit: 10 percent
Hydric soil rating: No

Soboba

Percent of map unit: 5 percent
Hydric soil rating: No

TwC—Tujunga gravelly loamy sand, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: hczm
Elevation: 10 to 1,500 feet
Mean annual precipitation: 10 to 25 inches
Mean annual air temperature: 59 to 64 degrees F
Frost-free period: 250 to 350 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Tujunga and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tujunga

Setting

Landform: Alluvial fans, flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy alluvium derived from granite

Typical profile

H1 - 0 to 10 inches: gravelly loamy sand
H2 - 10 to 60 inches: loamy sand

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: OccasionalNone
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): 4s
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: R019XD035CA - SANDY
Hydric soil rating: No

Minor Components

Delhi

Percent of map unit: 10 percent
Hydric soil rating: No

Soboba

Percent of map unit: 5 percent
Hydric soil rating: No

VaE3—Vallecitos loam, 8 to 25 percent slopes, severely eroded

Map Unit Setting

National map unit symbol: hczn
Elevation: 100 to 3,000 feet
Mean annual precipitation: 12 to 25 inches
Mean annual air temperature: 57 to 64 degrees F
Frost-free period: 220 to 300 days
Farmland classification: Not prime farmland

Map Unit Composition

Vallecitos and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Vallecitos

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope

Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Residuum weathered from metamorphosed sedimentary rock

Typical profile

H1 - 0 to 12 inches: loam
H2 - 12 to 20 inches: clay loam
H3 - 20 to 24 inches: unweathered bedrock

Properties and qualities

Slope: 9 to 25 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: R019XD060CA - SHALLOW LOAMY
Hydric soil rating: No

Minor Components

Friant

Percent of map unit: 5 percent
Hydric soil rating: No

Lodo

Percent of map unit: 5 percent
Hydric soil rating: No

Fallbrook

Percent of map unit: 5 percent
Hydric soil rating: No

VdF2—Vallecitos rocky loam, 8 to 50 percent slopes, eroded

Map Unit Setting

National map unit symbol: hczp
Elevation: 100 to 3,000 feet
Mean annual precipitation: 12 to 25 inches
Mean annual air temperature: 57 to 64 degrees F
Frost-free period: 220 to 300 days
Farmland classification: Not prime farmland

Map Unit Composition

Vallecitos and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Vallecitos

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Residuum weathered from metamorphosed sedimentary rock

Typical profile

H1 - 0 to 12 inches: loam
H2 - 12 to 20 inches: clay loam
H3 - 20 to 24 inches: unweathered bedrock

Properties and qualities

Slope: 9 to 50 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: R019XD060CA - SHALLOW LOAMY
Hydric soil rating: No

Minor Components

Rock outcrop

Percent of map unit: 10 percent
Hydric soil rating: No

Friant

Percent of map unit: 5 percent
Hydric soil rating: No

Fallbrook

Percent of map unit: 5 percent
Hydric soil rating: No

Lodo

Percent of map unit: 5 percent
Hydric soil rating: No

VeD2—Vallecitos loam, thick solum variant, 8 to 15 percent slopes, eroded

Map Unit Setting

National map unit symbol: hczr
Elevation: 600 to 2,500 feet
Mean annual precipitation: 12 inches
Mean annual air temperature: 63 to 64 degrees F
Frost-free period: 250 days
Farmland classification: Not prime farmland

Map Unit Composition

Vallecitos and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Vallecitos

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Residuum weathered from metamorphosed sedimentary rock

Typical profile

H1 - 0 to 8 inches: loam
H2 - 8 to 27 inches: clay loam
H3 - 27 to 48 inches: loam
H4 - 48 to 52 inches: unweathered bedrock

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 40 to 60 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: R019XD029CA - LOAMY

Hydric soil rating: No

Minor Components

Fallbrook

Percent of map unit: 5 percent
Hydric soil rating: No

Lodo

Percent of map unit: 5 percent
Hydric soil rating: No

Friant

Percent of map unit: 5 percent
Hydric soil rating: No

VsD2—Vista coarse sandy loam, 8 to 15 percent slopes, eroded

Map Unit Setting

National map unit symbol: hczy
Elevation: 400 to 3,900 feet
Mean annual precipitation: 10 to 18 inches
Mean annual air temperature: 59 to 64 degrees F
Frost-free period: 210 to 300 days
Farmland classification: Not prime farmland

Map Unit Composition

Vista and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Vista

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Residuum weathered from granite and/or residuum weathered from granodiorite

Typical profile

H1 - 0 to 15 inches: coarse sandy loam
H2 - 15 to 24 inches: coarse sandy loam
H3 - 24 to 28 inches: weathered bedrock

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.4 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Bonsall

Percent of map unit: 5 percent
Hydric soil rating: No

Cieneba

Percent of map unit: 5 percent
Hydric soil rating: No

Fallbrook

Percent of map unit: 5 percent
Hydric soil rating: No

W—Water

Map Unit Composition

Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Wg—Willows silty clay, saline-alkali

Map Unit Setting

National map unit symbol: hd08
Elevation: 0 to 1,700 feet
Mean annual precipitation: 19 inches
Mean annual air temperature: 61 degrees F
Frost-free period: 210 to 250 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Willows and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Willows

Setting

Landform: Basin floors
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from mixed sources

Typical profile

H1 - 0 to 10 inches: silty clay
H2 - 10 to 60 inches: clay

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Slightly saline to strongly saline (4.0 to 16.0 mmhos/cm)
Sodium adsorption ratio, maximum: 2.0
Available water supply, 0 to 60 inches: Low (about 5.1 inches)

Interpretive groups

Land capability classification (irrigated): 3w
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: D
Ecological site: R019XD068CA - SILTY BASIN
Hydric soil rating: No

Minor Components

Madera

Percent of map unit: 5 percent
Hydric soil rating: No

Chino

Percent of map unit: 5 percent
Hydric soil rating: No

Domino

Percent of map unit: 5 percent
Hydric soil rating: No

YbD2—Yokohl loam, 8 to 15 percent slopes, eroded

Map Unit Setting

National map unit symbol: hd0h
Elevation: 500 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 61 to 64 degrees F
Frost-free period: 260 days
Farmland classification: Not prime farmland

Map Unit Composition

Yokohl and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Yokohl

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Alluvium derived from igneous rock

Typical profile

H1 - 0 to 10 inches: loam
H2 - 10 to 26 inches: clay loam
H3 - 26 to 30 inches: indurated
H4 - 30 to 60 inches: stratified sandy loam to gravelly loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 20 to 39 inches to duripan
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 2.3 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: R019XD061CA - CLAYPAN
Hydric soil rating: No

Minor Components

Wyman
Percent of map unit: 5 percent
Hydric soil rating: No

Porterville
Percent of map unit: 5 percent
Hydric soil rating: No

Buren
Percent of map unit: 4 percent
Hydric soil rating: No

Unnamed
Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: Yes

YbE3—Yokohl loam, 8 to 25 percent slopes, severely eroded

Map Unit Setting
National map unit symbol: hd0j
Elevation: 500 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 61 to 64 degrees F
Frost-free period: 260 days
Farmland classification: Not prime farmland

Map Unit Composition
Yokohl and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Yokohl

Setting
Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Alluvium derived from igneous rock

Typical profile
H1 - 0 to 6 inches: loam
H2 - 6 to 20 inches: clay loam
H3 - 20 to 24 inches: indurated
H4 - 24 to 60 inches: stratified sandy loam to gravelly loam

Properties and qualities
Slope: 8 to 25 percent

Depth to restrictive feature: 10 to 20 inches to duripan
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 1.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: R019XD061CA - CLAYPAN
Hydric soil rating: No

Minor Components

Porterville

Percent of map unit: 5 percent
Hydric soil rating: No

Wyman

Percent of map unit: 5 percent
Hydric soil rating: No

Buren

Percent of map unit: 4 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: Yes

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf