State of California
DEPARTMENT OF TRANSPORTATION

California State Transportation Agency

Memorandum

Serious drought
Help save water!

To: OLIVER IBERIAN
Senior Environmental Planner
Office of Environmental Analysis

Date: March 2, 2015

Attention: Zachary Gifford

File: 04- SOL-84 PM 12.1
04-0G660
Efis 0400000343
DPGR

From: MATTHEW GAFFNEY MJG
Engineering Geologist
Office of Geotechnical Design – West
Geotechnical Services
Division of Engineering Services

SUNNY YANG S, YS
Transportation Engineer
Office of Geotechnical Design – West
Geotechnical Services
Division of Engineering Services

CHRISTOPHER RISDEN
Chief, Branch B
Office of Geotechnical Design – West
Geotechnical Services
Division of Engineering Services

Subject: DISTRICT PRELIMINARY GEOTECHNICAL REPORT FOR MINER SLOUGH BRIDGE

1. Executive Summary

This memorandum is in response to your request for technical studies developing the EIR/Categorical Exclusion for the Miner Slough Bridge (Br. #23-0035) Replacement Project, State Route (SR) 84, Post Mile (PM) 11.8 - 12.5 (Figure 1). The scope of work is to construct a new bridge with control house, for the draw bridges operation, to be built on the levee, after which the existing bridge will be demolished. It is our conclusion that there are no significant geotechnical conditions and the project can be constructed as proposed. However, there are some significant geologic constraints that may require special considerations, specifically ground shaking.

2. Introduction

The project site is located in Solano County on SR-84, PM 11.8 – 12.5. This memorandum has been requested to determine site conditions and geology.

3. Pertinent Reports and Investigations

- Caltrans; October 2010; Miner Slough Bridge Deck Replacement Structure Preliminary Geotechnical Report (Geology & Subsurface Conditions)
- Caltrans; *1953; Bridge Across Miner Slough Log of Test Borings; Bridge Number 23-0035.*

4. Description of Project Alternatives and Existing Facilities

SR 84 runs roughly north-south through the project on a man-made levee. The route is a two lane road, with non-standard shoulders. This project proposes to build a new swing bridge about 100 ft west of existing alignment. The new bridge will have standard features with 12 ft travel way and 8 ft shoulder in each direction. The vertical clearance of the proposed structure will be approximately 15 ft above the slough. The project would require construction of a temporary trestle bridge, a control-house structure on the levee, and a viaduct on the levee to accommodate maintenance parking for the control house.

5. Physical Settings

5.1 Climate

The climate of the job site is characterized by warm summers and cold winters. The average temperature in Rio Vista, 10 miles south of the project, is 60.8°. July is the warmest month at 74.4°, and December and January are the coldest at 45.7°. In the summer, little rainfall occurs. The rainy season begins about October and ends around April. The average rainfall is 13.33 inches, with the highest rainfall in January at 27.2 inches.[1]

5.2 Topography and Drainage

The project site is located in the eastern part of Solano County, which is on the floor of the Sacramento Valley. The valley areas of Solano County are level or gently sloping alluvial plains and marshes. They are near sea level along the eastern and southern borders and rise to an elevation of about 100 feet at the foot of the Montezuma Hills (USDA, 1977)[2]. The bridge spans across Miner Slough at the northern tip of Ryer Island. The levees site approximately 15 feet above the slough. Drainage from the roadway is typically sheet flow into the low-laying areas.

[1] http://www.idcide.com/weather/ca/san-mateo.htm
[2] United States Department of Agriculture, 1977, Soil Survey of Solano County, California

5.3 Prior Land Use

Most of Ryer Island has been owned by the same farming families for 4 or 5 generations. Over the last 150 years, Ryer Island was the site of a school district, a railroad, a fish canning operation, many types of farming, recreational resorts, housing communities, stores and restaurants, and a small RV resort.[3]

5.4 Manmade and Natural Features of Engineering and Construction Significance

The Rivers and Harbors Act of 1937 authorized construction of the initial features of the Central Valley Project, including improvement to specific Delta islands, including Ryer.[4]

6. Geology

6.1 Regional Geology

The project area is located in Solano County in the northern portion of the Sacramento – San Joaquin Delta.

"The Delta is located along the western edge of California's Central Valley. The Delta began to take its present form during the end of the last glacial period about 11,000 years ago as the sea began to rise, filling the alluvial valley of the Sacramento River. River and streams draining into the area formed a complex of network of channels, islands and sloughs. Alluvial materials accumulated along the banks of channels forming natural levees around islands."[5]

6.2 Site Geology

The project site is entirely covered by Holocene alluvial fan levee deposits (see the Geology Map Figure 2).

"The alluvial fan levee deposits are natural levee deposits of alluvial fans and formed by streams that overtop their banks and deposit sediment adjacent to the channel. They contain coarser material than the adjoining interlevee areas, especially adjacent to creek banks where the coarsest material is deposited during floods. Levee deposits are loose, moderately to poorly grained sand, silt and clay."[6]

---

[3] http://ryerisland.com/Ryer_history.htm
[4] ibid
[5] Us Army Corps of Engineers and Departement of Water Resources, 2001, Prospect Island Ecosystem Restoration Project, Solano County, CA.
[6] California Department of Conservation; California Geological Survey. 2009, Dawson, T. Preliminary Geologic Map Of The Lodi 30' X 60' Quadrangle, California.

As mentioned above, many of the islands that form the farmlands in the delta regions have been protected by Central Valley Project and the 1937 Rivers and Harbors Act. Therefore, many of the islands are ringed by a natural levee topped by a manmade levee.

6.3 Subsurface Condition

On August 1951, six boreholes (B1, B2, B3, No. 1, No. 2 & No.3) were drilled at the project site. According to the LOTBs, the foundation material encountered at the site is 1-2 ft fine sand, underlain by 18 ft soft gray and blue clay, and 30 ft of stiff to very stiff clayey silt, followed by loose to medium dense fine sand with little gravel.

6.4 Soils

The project area is entirely covered by Colombia fine sandy loam. The Colombia fine sandy loam consists of nearly level, somewhat poorly drained soils on flood plains. These soils formed from mixed alluvium. This soil is pale-brown and gray, distinctly mottled, stratified sand, loam, and silty clay loam. Included with this soil in mapping are small areas of Valdez silt loam, Egbert silty clay loam, and Ryde clay loam. Permeability is moderately rapid. Surface runoff is slow, erosion is not a hazard, Shrink-swell potential is low, and corrosivity is moderate.[7] (The USDA, Soil Resource Report for Solano County, California; 2012, can be supplied upon request.)

6.5 Seismicity

The dominant geologic structure in the area is the Great Valley fault system (Figure 3 presents the Regional Fault Map). These are northwest-striking, reverse faults. The closest portions of the Great Valley fault system are Midland fault is 8.1 miles south of the project and the Gordon Valley and Pittsburg Kirby Hills portion which are 17 miles west of the site. Fault data is listed in Table 1.

Table 1: Fault Data

Fault Name	Distance: Miles	Fault ID:	Fault Type:	Maximum Magnitude (MMax):
Great Valley 06 (Midland)	8.9	116	Reverse	6.8
Great Valley 05 Pittsburg Kirby Hills	17.8	111	Reverse	6.6
Great Valley 04b Gordon Valley	17.3	104	Reverse	6.7

[7] The USDA, NRCS, Custom Soil Resource Report for Solano County, California; 2012

The probabilistic acceleration based on a 975 Year Return Period with a shear wave velocity of 260m/s has a calculated acceleration is 0.34g.

7. Geotechnical Conditions

7.1 Groundwater

Due to the lack of groundwater information at the project site, the surface water elevation at Miner Slough can be considered the groundwater level throughout the project site. The water elevation at the slough is 5.2 feet measured in August 31, 1951.

7.1.1 Groundwater Regime

Miner Slough is the drainage for the area surrounding the project, and the amount of water removed, if any, will not affect its flow. Seepage rate through the subsurface silts and clays would be slow.

7.2 Erosion

The soil around the site is Colombia fine sandy loam surface runoff is slow, erosion is not a hazard.

7.3 Seismic Hazards

7.3.1 Primary Seismic Hazards

As discussed in the Seismicity Section (see above), Northern California is within the most tectonically active area of the North American continent. The project lies within the delta, which is on the western edge of the San Joaquin/Sacramento Valley. This side of the valley has "complex system of branching and anatomizing normal faults" that accommodated extension and subsidence in the western side of the valley.[8] According to the Alquist-Priolo Earthquake Fault Zone Maps, the project is not located within a special studies zone.

[8] Krug, E.H., Cherven, V.B., Hatten, C.W., and Roth, J.C., 1992, Subsurface structure in the Montezuma Hills, southwestern Sacramento basin, in Cherven, V.B., and Edmondson, W.F., eds., Structural Geology of the Sacramento Basin: Volume MP-41, Annual Meeting, Pacific Section, Society of Economic Paleontologists and Mineralogists, p. 41-60.

7.3.2 Secondary Seismic Hazards

7.3.2.1 Liquefaction Susceptibility

Liquefaction Susceptibility is very high at the stream banks and moderate approximately 100 feet inland.[9] (Figure 4)

7.4 Slope Stability

Solano County in this area is relatively flat, with the exception of the river banks, slope stability is not an issue.

7.5 Excavation Characteristics

The excavation of the subsurface material is soft to very stiff silts and clays. Excavation is rippable using standard excavation equipment. Some swelling of the material is to be expected, so shafts or narrow excavation has the potential to close with time.

7.6 Embankments

There are no embankments planned for this project.

7.7 Volumetric Stability of Embankment and Subgrade Materials

7.8 Other Potential Geologic Hazards

7.8.1 Settlement

There is no sign of settlement on the levees.

7.8.2 Lateral Spreading

Where streams are incised, the Holocene alluvial fan deposits that form the levee and cover the project area may be susceptible to lateral spreading.

[9] USGS Open File Report 2006-1037

7.8.3 Scour

In 2010, the scour potential of this bridge was evaluated, and the bridge appears to have a fairly low scour potential due to the channel being a slough (i.e. low flow velocity), and no evidence of scour.

8. Hazardous Waste Potential

To our knowledge, there is no hazardous waste within the project site

9. Preliminary Recommendations and Conclusions

9.1 Future Exploration and Investigations

Additional field investigation and laboratory testing are necessary, if new approach spans are to be constructed. The field investigation will include geotechnical borings at the abutment locations of the new structure. It may be deemed necessary to conduct drilling in the riverbed through the use of a barge. Standard Penetration Tests will be performed at 5-foot intervals throughout soil layers. Soil samples will be collected for laboratory testing. Laboratory testing of soil samples may include, but not limited to:

- Index tests (unit weight, water content, gradation, Atterberg limits)
- Consolidation tests
- Strength tests (unconfined compression)
- Corrosion tests

9.2 Embankments

There are no embankments planned for this project.

9.3 Excavations

There are no excavations planned for this project.

9.4 Retaining Wall Alternatives

There are no walls planned for this project.

9.5 Groundwater Control

Groundwater is approximately close to the slough surface. If needed, groundwater may have to be pumped out, treated and taken offsite, depending on the pile design.

9.6 Other Considerations

Paleontology

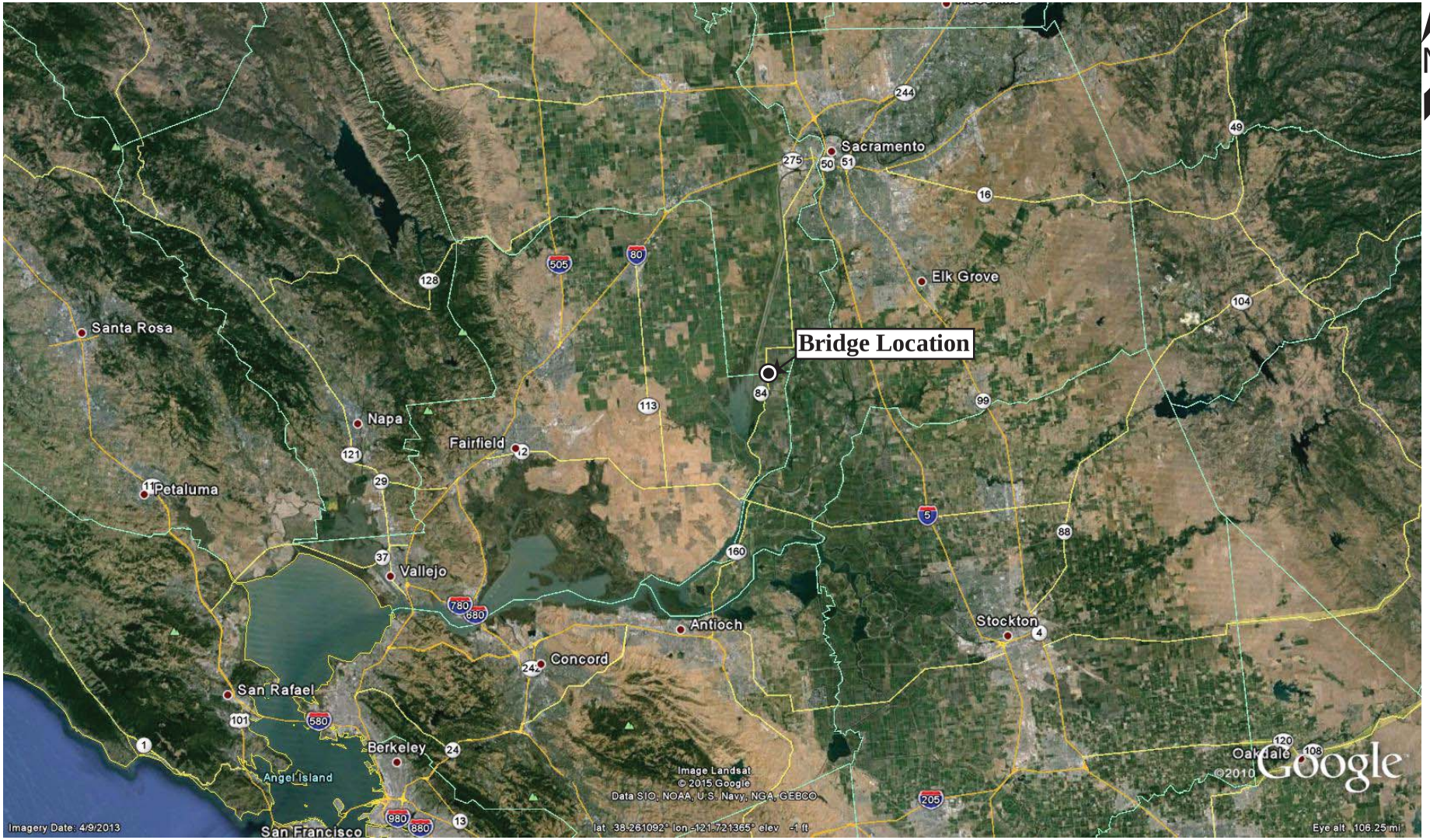
According to University of California Museum of Paleontology many fossils have been found within Solano County. Even though this is true, none of these fossils have been found within the Holocene epoch, and even there were fossils found they would not be considered scientifically significant. Therefore, no further paleontological reports are warranted.

Attachment: LOTB for Minor Slough Bridge OH, Bridge No. 23-0035.

If you have any questions or require further information, please contact Matthew Gaffney at (510) 622-1777 or Chris Risden at (510) 622-8757.

c: TPokrywka, CRisden, MGaffney, Daily File

MGaffney/mm



SCALE

0 20 miles

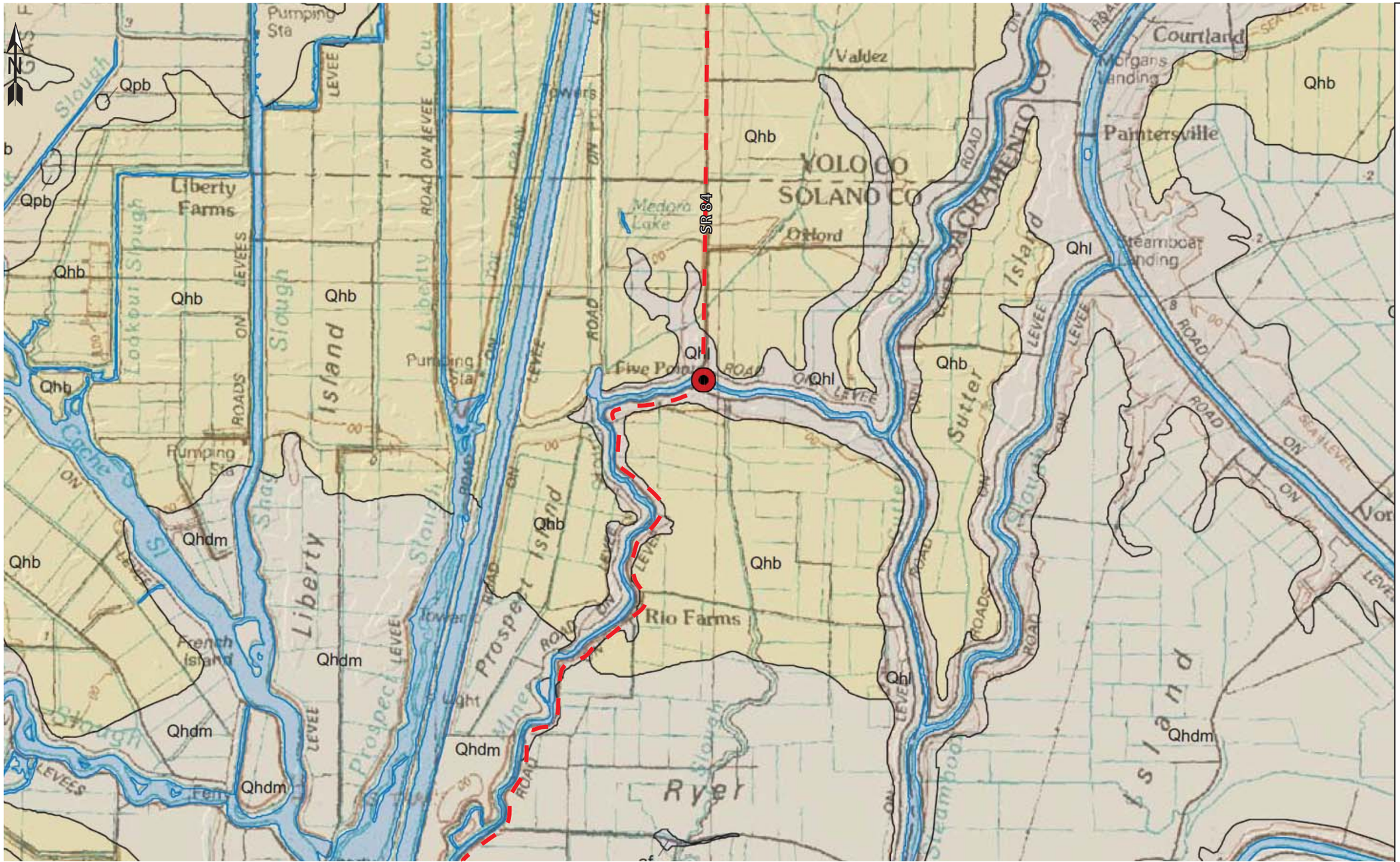
Caltrans

DIVISION OF
ENGINEERING SERVICES
GEOTECHNICAL SERVICES
GEOTECHNICAL DESIGN - WEST – BRANCH B

LOCATION MAP

04-SOL-84	**04000000343**
PM. 12.1	**March 2015**

FIGURE 1



Explanation

Qhl	Holocene fan levee deposits
Qhdm	Holocene Delta mud
Qhb	Holocene basin deposits
Qpb	Latest Pleistocene basin deposits

Map Symbols

- Project Locations
- State Route 84

Reference:
California Department of Conservation;
California Geological Survey.
PRELIMINARY GEOLOGIC MAP OF
THE LODI 30' x 60' QUADRANGLE,
CALIFORNIA
Compiled by Timothy E. Dawson

SCALE
0 1 mile

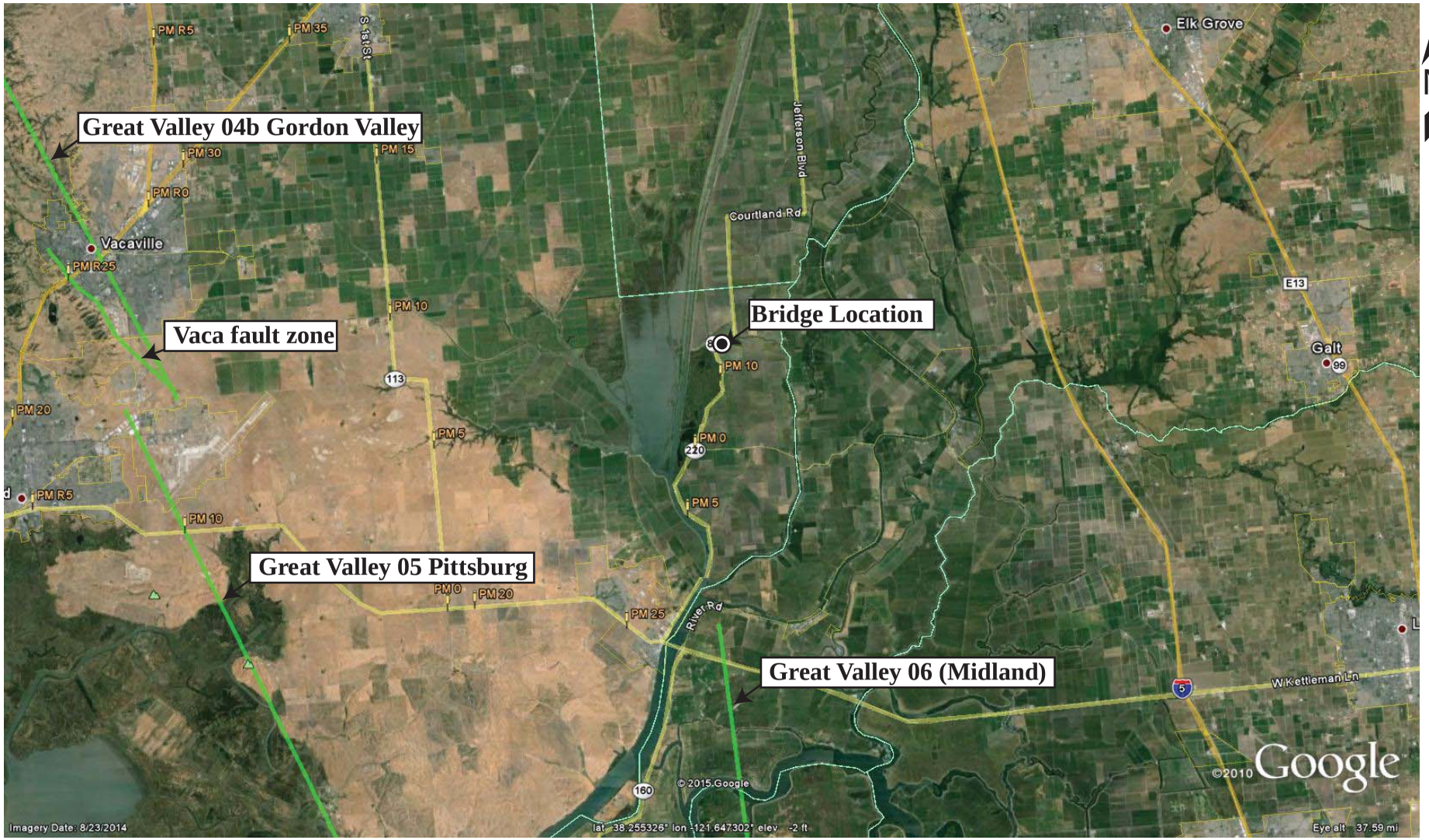
Caltrans

DIVISION OF
ENGINEERING SERVICES
GEOTECHNICAL SERVICES
GEOTECHNICAL DESIGN - WEST – BRANCH B

GEOLOGY

04-SOL-84	04000000343
PM. 12.1	March 2015

FIGURE 2

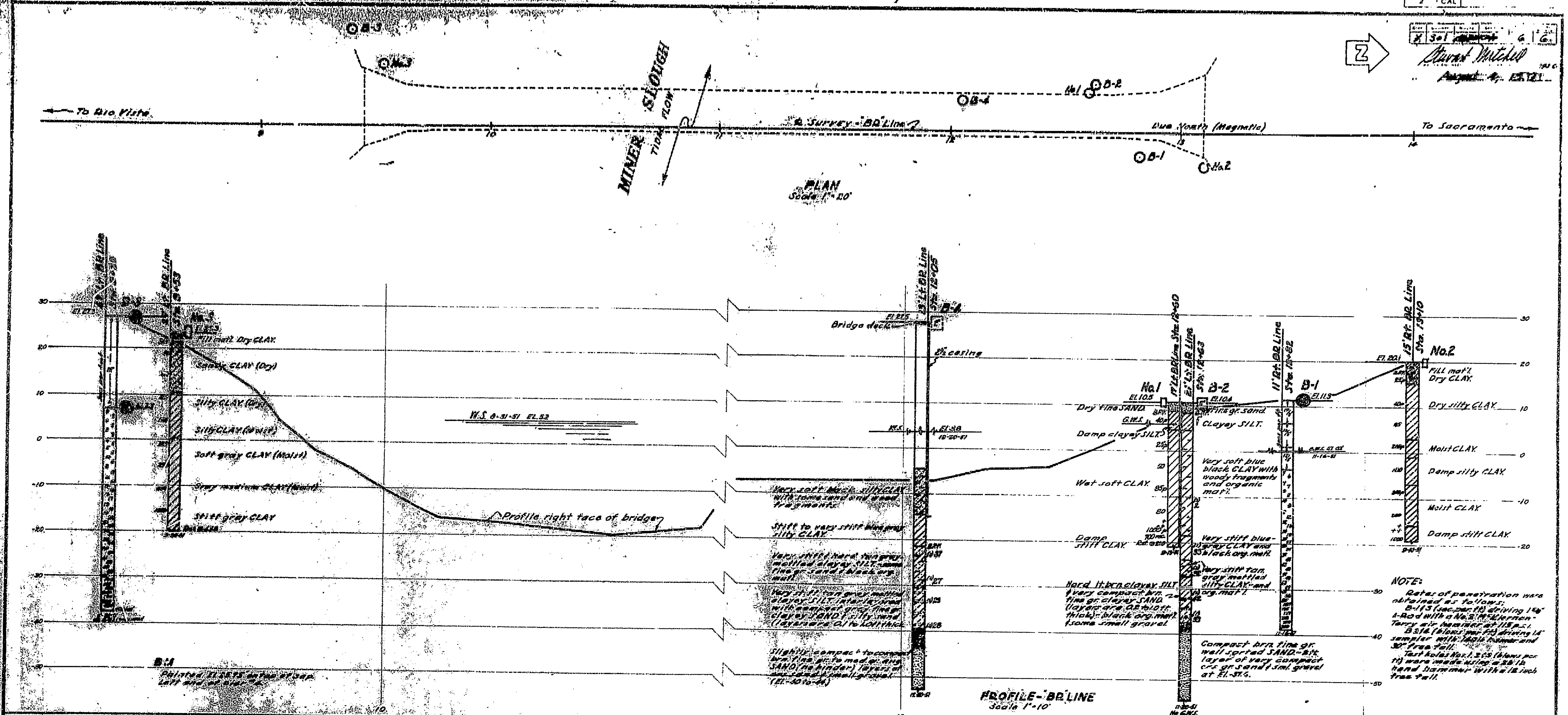


SCALE 0 — 15 miles	Caltrans	**DIVISION OF ENGINEERING SERVICES** GEOTECHNICAL SERVICES GEOTECHNICAL DESIGN - WEST – BRANCH B	**REGIONAL FAULT MAP** **04-SOL-84** **04000000343** **PM. 12.1** **March 2015** **FIGURE 3**

http://earthquake.usgs.gov/regional/nca/bayarea/liquefaction.php

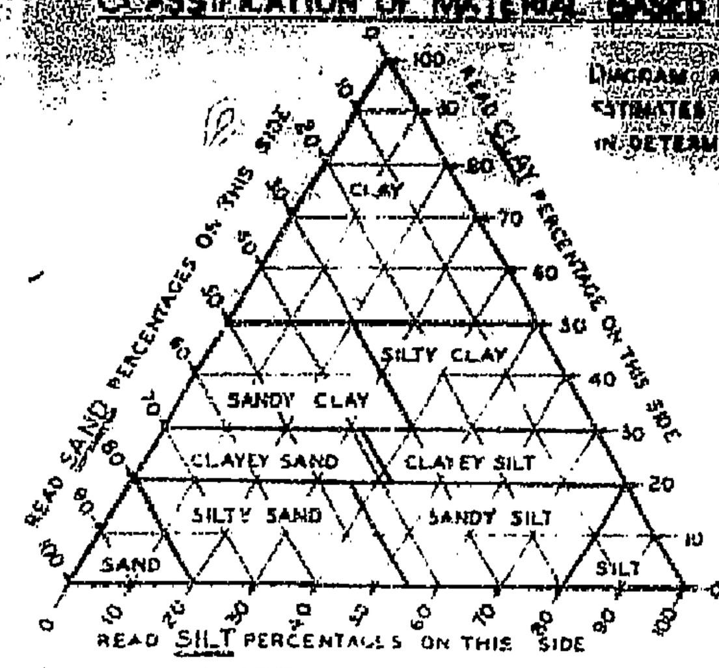
	Caltrans	**DIVISION OF ENGINEERING SERVICES** GEOTECHNICAL SERVICES GEOTECHNICAL DESIGN - WEST – BRANCH B	**LIQUEFACTION SUSCEPTIBILITY** **04-SOL-84** **04000000343** **PM. 12.1** **March 2015** **FIGURE 4**

ATTACHMENTS



CLASSIFICATION OF MATERIAL BASED ON STANDARD GRADE SIZE LIMITS

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



GROUPING USED IN TRIANGULAR CLASSIFICATION

CLASS NAME	SAND	SILT	CLAY
SAND	80-100	0-20	0-20
SILTY SAND	45-80	0-55	0-20
SANDY SILT	0-45	35-80	0-20
SILT	0-20	80-100	0-20
CLAYEY SAND	35-80	0-42	20-30
CLAYEY SILT	0-38	32-80	20-30
SANDY CLAY	30-70	0-40	30-50
SILTY CLAY	0-30	20-70	30-50
CLAY	0-50	0-50	30-100

(Column heading: PERCENTAGE OF SIZES PRESENT)

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

LEGEND OF BORING OPERATIONS

- PLAN OF ANY BORING
- 1" SAMPLER BORING
- ROTARY WASH BORING
- 1" CLOSED SAMPLER DRIVEN
- CORE BORING
- 2½" PENETROMETER DRIVEN
- 1⅜" SAMPLER BORING
- 2" TO 5" AUGER BORING
- 6" TO 20" AUGER BORING
- CASING DRIVEN
- JET BORING
- SAMPLE TAKEN
- 1⅝" A-ROD DRIVEN

THE APPROPRIATE BORING SYMBOLS DESIGNATING THE METHOD OF OPERATION ARE SHOWN AT THE UPPER RIGHT-HAND CORNER OF THE RESPECTIVE BORING. WHERE TOOL CHANGES WERE MADE DURING THE BORING OPERATION SYMBOLS ARE SHOWN AT THE POINT OF CHANGE.

LEGEND OF EARTH MATERIALS

- GRAVEL — G
- SAND — S
- SILT — Si
- CLAY — C
- SILTY SAND — Si S
- CLAYEY SAND — C S
- SANDY SILT — S Si
- CLAYEY SILT — C Si
- SANDY CLAY — S C
- SILTY CLAY — Si C
- PEAT and/or ORGANIC CLAY — O
- SANDSTONE — SS
- SHALE — SH
- BROKEN ROCK FRAGMENTS — Br
- ROCK — R
- FILL MATERIAL

ABBREVIATIONS

EL. 69.4	ELEVATION OF GROUND AT TEST HOLE
bpf	BLOWS PER FOOT — (SEE NOTE ABOVE)
P	PULLED PIPE
M	MOISTURE AS % DRY WEIGHT
EL. 64.3 6-12-49	ELEVATION OF GROUND WATER AND DATE

NOTES

THE CONTRACTOR'S ATTENTION IS DIRECTED TO SECTION 2, ARTICLE (c) OF THE STANDARD SPECIFICATIONS AND TO THE SPECIAL PROVISIONS ACCOMPANYING THIS SET OF PLANS.

CLASSIFICATION OF EARTH MATERIAL AS SHOWN ON THIS SHEET IS BASED UPON FIELD INSPECTION AND IS NOT TO BE CONSTRUED TO IMPLY MECHANICAL ANALYSIS.

AS BUILT
53-14TC29
6-2-53 AJC
NO CORRECTIONS

BRIDGE ACROSS MINER SLOUGH

LOG OF TEST BORINGS

As Shown

23-35

DRAWING No. C-1599-16

PRFL. DRAWING NO. P. 1599

CONTRACT PLANS
Contract No. 53-14TC29
Document No. 0001252

AS BUILT PLANS
Contract No. 53-14TC29
Date Completed
Document No. 0000 1085

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 PUBLIC WORKS.

DATE 4/17/72 SIGNATURE [illegible] TITLE [illegible]

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.

Joseph m Costa

BRIDGE DEPARTMENT