PRELIMINARY GEOTECHNICAL RECOMMANDATION

Memorandum

Flex your power!
Be energy efficient!

To: MR. James LEY
Senior Project Development
North Counties

Date: March 4, 2014

Attention: Peter Batio

File: 04-NAP-128 PM 29.7
04-2G9501
Slipout Repair

From: M. DEHGHAN
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Division of Engineering Services

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Division of Engineering Services

Subject : Preliminary Geotechnical Recommendation

1. INTRODUCTION

The slipout is located on the north side of a curve on highway 128. The slipout is approximately 150 feet wide with a six 6 foot scarp that drops into a gorge. The scarp is located within old asphalt 8 feet behind the existing Metal Beam Guard Rail (MBGR), see attached location map, Exhibit A.

In August 1984 this same location had a slipout that encroached into the southbound lane. According to the August 14, 1984 memo *"...the roadway was constructed in 1953-53 by others,"* and *"...fill construction was poorly done. A slipout occurred at this same location during the winter of '71-'72. Four borings drilled in 1972 for the slide investigation indicated that there is approximately 31' of poorly compacted fill."* The slipout was never repaired, but the roadway was realigned on the cut side by one lane. The existing MBGR was installed to separate the traffic lane from the slide area.

Recommendations contained in this report are based on the submitted layout and cross section plans, field survey, subsurface exploration, laboratory test results and engineering analysis and judgment.

2. PROJECT PURPOSE AND NEED

The need for this project is to repair the slide and conform back to the original profile.

3. SCOPE OF WORK

The following tasks were performed for the preparation of this Foundation Report:

- Review of as-built plans and the available geotechnical data;
- Field geotechnical exploration, including drilling 2 borings near the edge of the traveled way;
- Foundation design analysis; and
- Preparation of this Preliminary Geotechnical Report.

4. GEOLOGY AND SEISMICITY

4.1 Regional Geology

The project site is located within the California Coast Ranges geomorphic provinces. This portion of the Coast Range is composed of the accretionary wedge that formed while the Farallon Plate was subducted under the North American Plate thrusting the Great Valley Sequence above the Franciscan Complex. The force left the beds of the Great Valley Sequence dipping in an easterly direction. After the Farllon Plate was completely subducted under the North American Plate, the Pacific Plate and the North American plate were forced together and the San Andreas fault was formed. The San Andreas is the dominant active geologic feature in California. This fault is a right lateral strike slip fault and created new stress on the plates and formed a series of semi-parallel faults: i.e. the Hayward, San Gregorio, Silver Creek faults. Along with the fore mentioned faults, it also created the Wragg Canyon fault, which Caltrans doesn't list on ARS Online database, which may have ruptured in the Holocene epoch.[1] This fault is located half mile to the west of the project site.

As mentioned above the site is located with the Great Valley complex. This complex is composed of *"...Sandstone, shale, and conglomerate (Early Cretaceous and Late Jurassic) distinctly bedded, brown-weathering, dark-gray to white, biotite- and muscovite-lithic wacke and siltstone, dark-gray siltstone and shale, and pebble to boulder conglomerate. Coarse clasts include quartz- and plagioclase-porphyry volcanics, granitic rocks, gray rhyolite tuff, and chert."*[2]

4.2 Site Geology

The site has a top layer of top cast fill which are loose shale fragments. The underlying stratum, is interbedded shale and sandstone. The soil that exists on the slope below the scarp is most

[1] Bulletin of the Seismological Society of America, Vol. 80, No.4, pp. 995-950, August 1990:Seicomtetonics of the Coast Ranges in the Vicinity of Lake Berryessa, Northern California; Wong, I.

[2] CGS 2006; Geologic Map of the Capell Valley 7.5' Quadrangle Napa County, CA; *M. Delattre1 et al*

likely side cast fill. The soil is not engineered in any way, very loose, and dry. No water is at the toe of the subsidance, and the soil on the face of the subsidance is dry.

4.3 Seismicity

The controlling fault for the project is Great Valley fault 4. Fault data is present in Table 1, and fault locations presented on Figure 4. The highest PGA is 0.682. This PGA was calculated with the USGS Probabilistic model, using the USGS Seismic Hazard Map (2008) and a 975 year return period. According to the Alquist-Priolo Earthquake Fault Zone Maps, there are no surface faults within the limits of the project site, so surface rupture should not be an issue, see attached Exhibit B.

Table 1: Fault Data

Fault Name	Distance: Miles	Fault ID:	Fault Type:	Maximum Magnitude (MMax):	Peak Ground Acceleration*
Great Valley fault 4	8.8	23	Thrust	6.6	0.406
Cordelia fault	6.4	212	Right Lateral Strike Slip	6.7	0.237
Green Valley fault	7.8	213	Right Lateral Strike Slip	6.9	0.214
PGA calculated with the USGS Probabilistic model, using the USGS Seismic Hazard Map (2008) and a 975 year return period					0.682

* Caltrans ARS tool gives a maximum PGA at a period of 0.01.

4.4 Liquefaction

Liquefaction in this area is considered to be moderate to very low.

4.5 SUBSURFACE INVESTIGATION

The subsurface exploration was performed by the Office of Geotechnical Design West (OGDW) in December of 2012. It consists of 2 mud-rotary borings with Standard Penetration Tests (SPT). Soil samples were taken every 5 feet from the Standard Penetration Test (SPT) sampling. All foundation soil classifications were based on Caltrans "Soil and Rock Logging, Classification, and Presentation Manual".

The borings show about 50 feet of loose sandy lean clay with shale fragments and the underlying stratum, is interbedded shale and sandstone. The subsurface conditions can vary from very soft to very hard, with no lateral continuity. The Field Log of Test Borings (LOTBs) are attached, see (Exhibit B).

5. FOUNDATION RECOMMENDATIONS

The slipout at this location appears to be the same slipout that occurred at this location during the winter of 1971-1972, at that time the road was realigned and the slipout (subsidence) was never repaired. During our investigations and analysis, we considered a variety of options for repairing the affected slope. Since the slipout has not migrated towards the realigned roadway, we do not see a need for a retaining wall; however, we recommend reducing the driving force of the slope and reconstructing the slope back to the original grade with lightweight fill. We have determined that the use of Expanded Polystyrene (EPS) Geofoam blocks is the most effective lightweight fill option due to its extreme low unit weight (1.5 lbs/cu. ft) which minimizes the amount of required excavation. Please refer to the attached Typical Cross Section (Exhibit C).

We recommend the following contraction steps for re-building the slope to its original grade:

- Excavate 8 feet of the soil mass below the surface of subsidence area within the limits shown on the attached plan. The limits of excavation are approximate and will be finalized during PS&E phase;
- Scarify to a depth of 6", moisture conditioned and re-compact to 90% relative compaction;
- Place Subgrade Enhancement Fabric over the compacted excavated area;
- Place the Expanded Polystyrene (EPS) Geofoam blocks in accordance to The Standard Special Provisions;
- Geosynthetic Enhancement Fabric (Geogrid) shall be installed in front of each EPS layer as shown on the typical cross section to within 6" of the reconstructed slope face;
- Place native excavated material on top of the EPS blocks up to finish grade.

6. CONSTRUCTION CONSIDERATIONS AND REQUIREMENTS

The following construction considerations and requirements should be included in the design and construction specifications for the proposed EPS:

- A representative of the Geotechnical Design West shall be notified in advance to be present during all phases of the construction.
- The Geofoam blocks shall be installed in a brick format (the Geofoam block joint shall not be in one line).

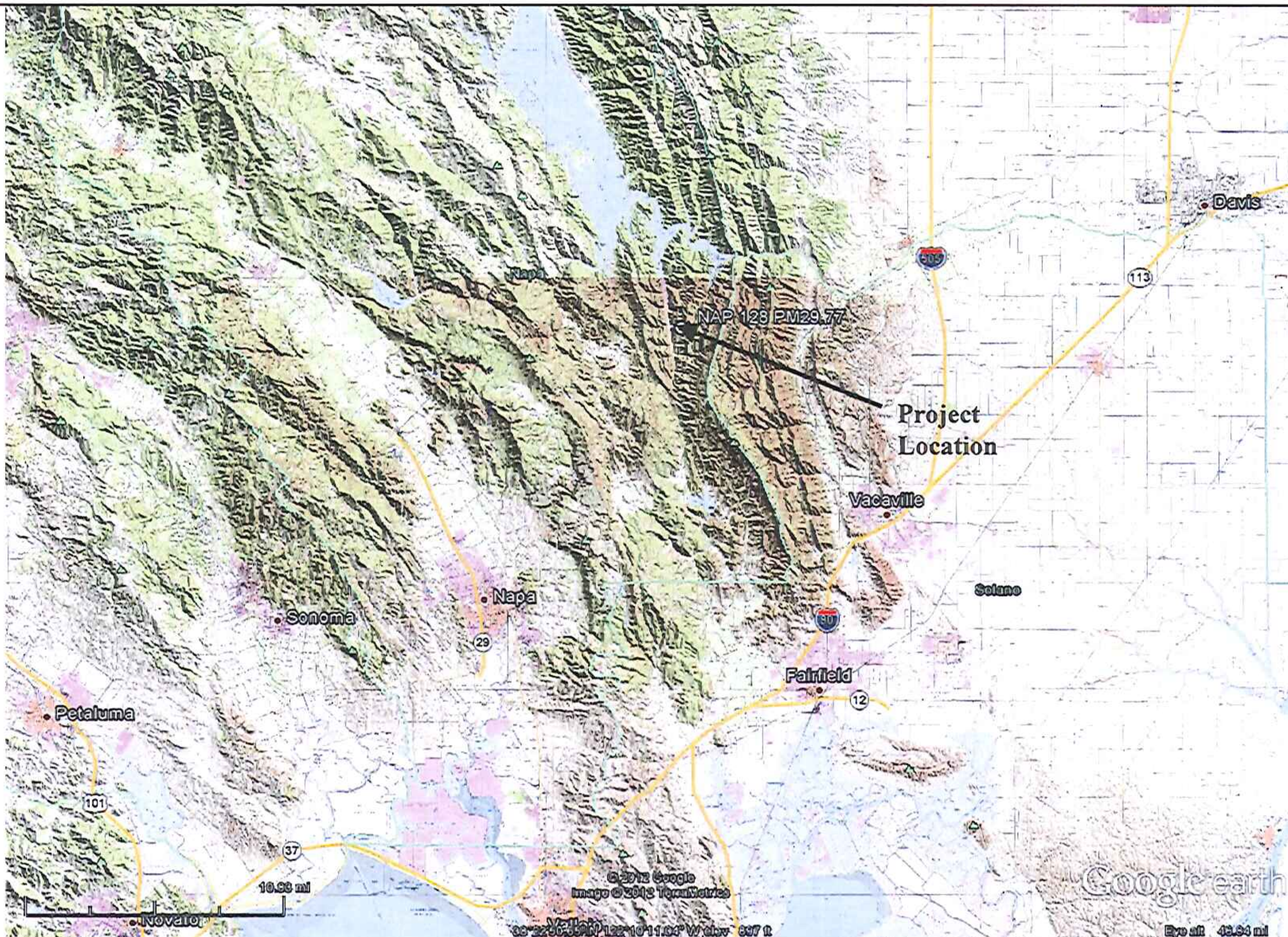
* * * * *

Should you have any questions, please call me at (510) 286-4717 or Hooshmand Nikoui, Brach Chief at (510)286-4811.

c: TPokrywka, HNikoui, MDehghan, Dily File, Project File

MDehghan/mm

EXHIBIT A



MAP TAKEN FROM:
GOOGLE EARTH

SCALE

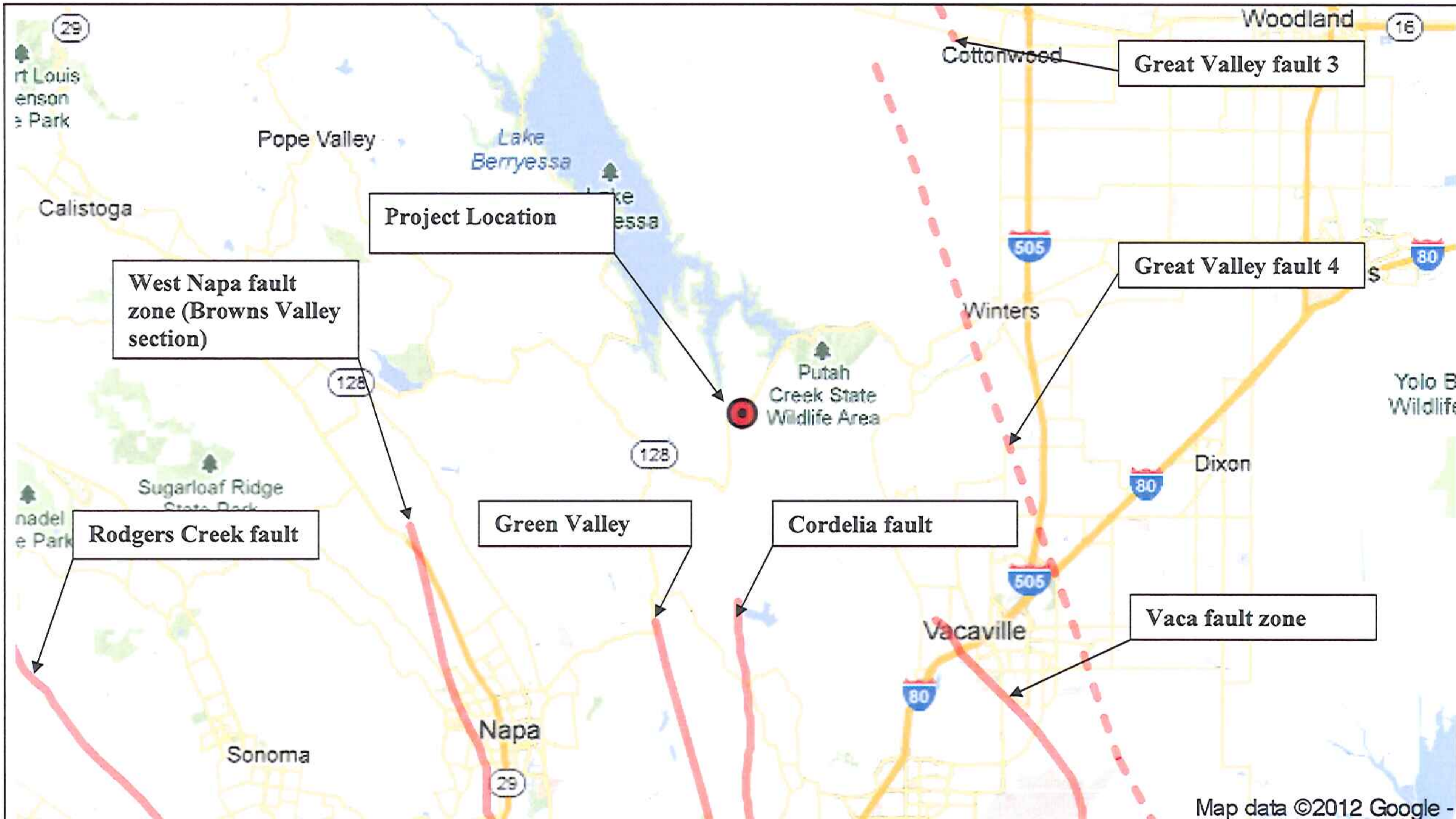
Not to Scale

Caltrans

Engineering Service Center
DIVISION OF ENGINEERING SERVICES
OFFICE OF GEOTECHNICAL SERVICES
GEOTECHNICAL DESIGN BRANCH (WEST) – BRANCH B

LOCATION MAP	
04NAP-128	EFIS 0400021255
PM 29.77	NOVEMBER 2012
FIGURE 1	

EXHIBIT B



MAP TAKEN FROM: Caltrans ARS Online Tool (v1.0.4) SCALE Not to Scale	Caltrans	**Engineering Service Center** DIVISION OF ENGINEERING SERVICES OFFICE OF GEOTECHNICAL SERVICES GEOTECHNICAL DESIGN BRANCH (WEST) – BRANCH B	FAULT MAP 04NAP-128 EFIS 0400021255 PM 29.77 NOVEMBER 2012 FIGURE 4

EXHIBIT C

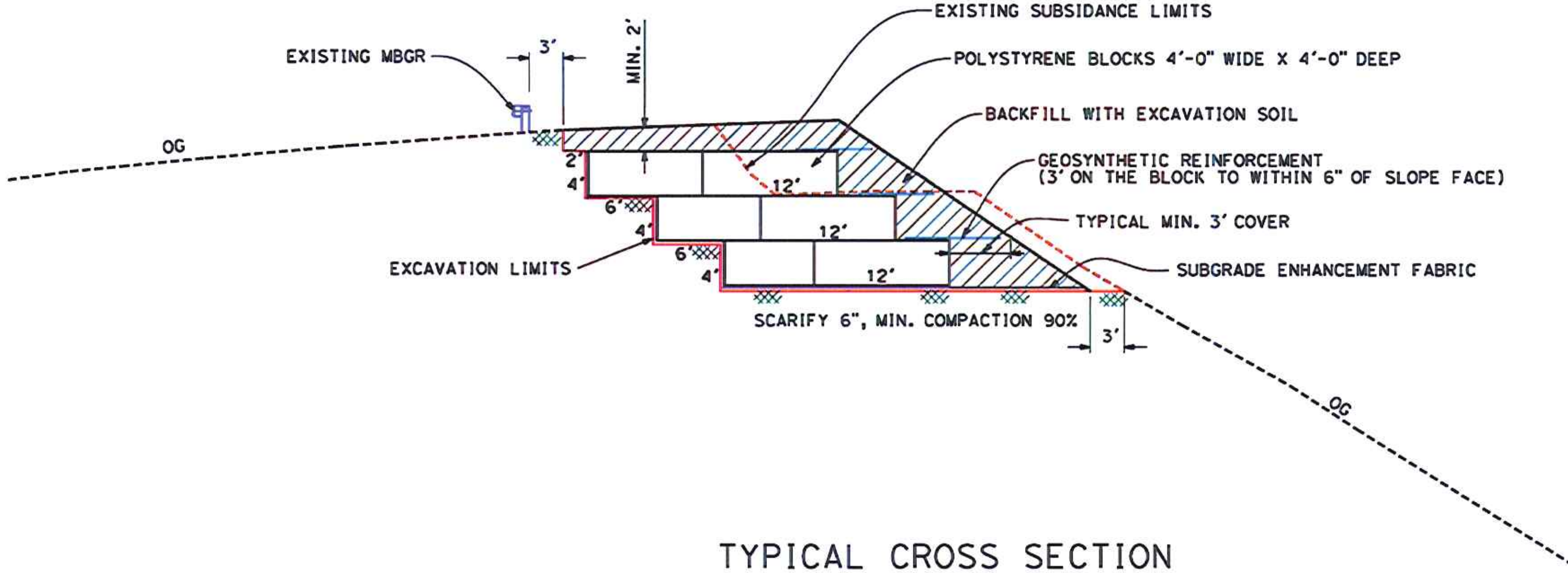
Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA



TYPICAL CROSS SECTION

EA 2G9501

REVISED BY	DATE REVISED	CALCULATED-DESIGNED BY	CHECKED BY	FUNCTIONAL SUPERVISOR

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION Caltrans

BORDER LAST REVISED 7/2/2010 | USERNAME => $USER DGN FILE => $REQUEST | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | UNIT 0000 | PROJECT NUMBER & PHASE 00000000001

LAST REVISION 00-00-00 DATE PLOTTED => $DATE TIME PLOTTED => $TIME

EXHIBIT D

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Nap	128	29.0/30.1		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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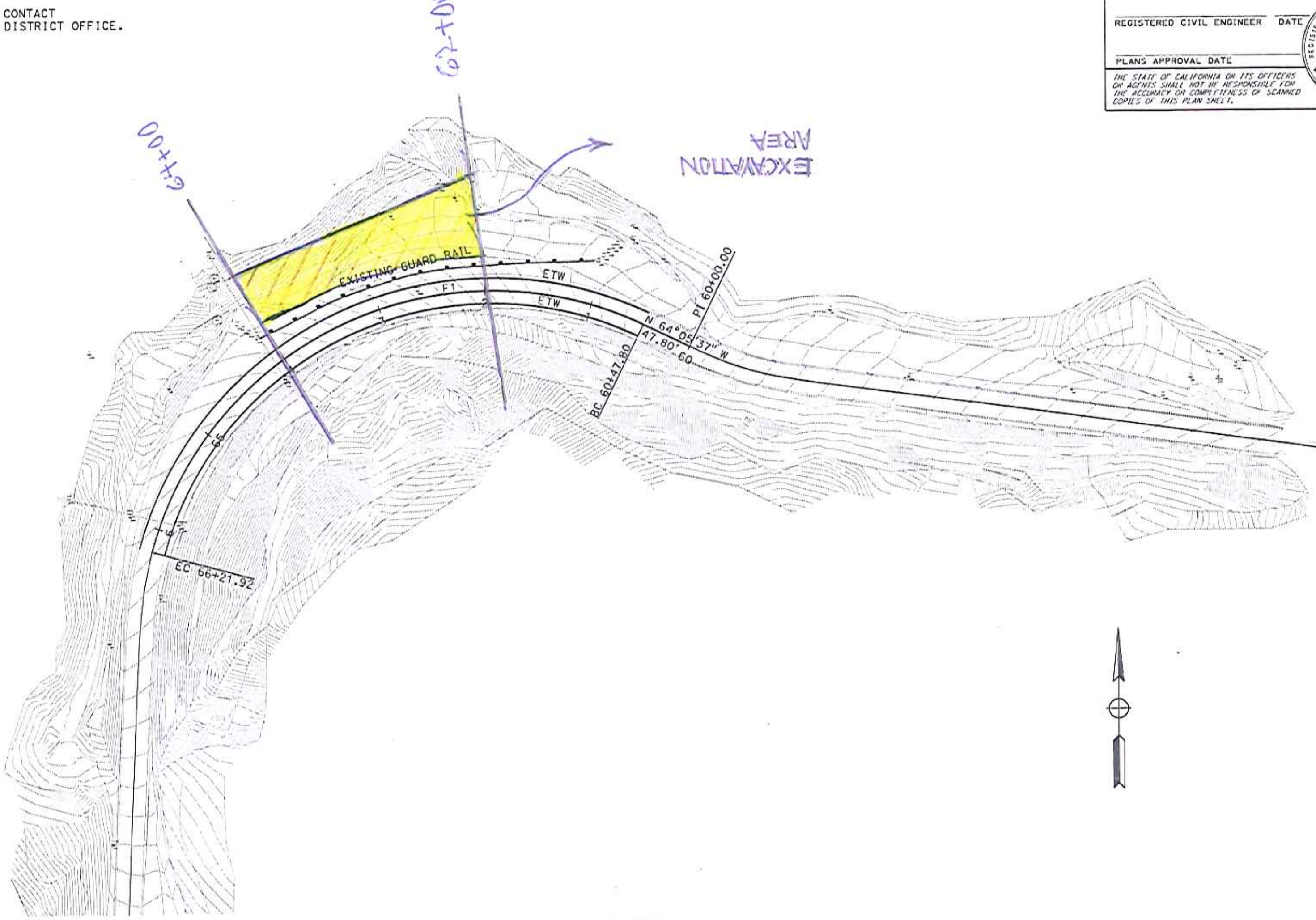
NOTE:

FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.



CURVE DATA

No.	R	Δ	T	L	N-COORDINATE	E-COORDINATE
1	326.252'	100°49' 34'	394.55'	574.12'	xxxxxxx.xxx	xxxxxxx.xxx

FOR NOTES, ABBREVIATIONS AND LEGEND, SEE SHEET L-1

LAYOUT
SCALE: 1" = 50'

L-1

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

DESIGN

FUNCTIONAL SUPERVISOR	CALCULATED-DESIGNED BY	PETER BATIO	REVISED BY
JAMES LEY	CHECKED BY	PETER BATIO	DATE REVISED

LAST REVISION 10-07-13 DATE PLOTTED => 10-MAR-2014 TIME PLOTTED => 15:08

USERNAME => s120911 RELATIVE BORDER SCALE 0 1 2 3 UNIT 0753 PROJECT NUMBER & PHASE 0400021255