FOR CONTRACT NO.: 02-2E2004

INFORMATION HANDOUT

MATERIALS INFORMATION

FOUNDATION REPORT

SOIL NAIL WALL @ PM 19.4
WALL # 05E007

State of California

Business, Transportation and Housing Agency

Memorandum

Flex your power!
Be energy efficient!

To: MR. JOSEPH DOWNING, CHIEF
Office of Bridge Design North
Structure Design
Division of Engineering Services MS9-4/8I

Date: March 15, 2011
File: 02-TRI-299-PM 19.4
02-2E2001
0200000204
Swede Cr. Superelevation
Retaining Wall @ PM 19.4
Wall # 05E0007

Attention: Mr. Joey Aquino

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
Geotechnical Services – MS 5
Office of Geotechnical Design – North

Subject: Revised Foundation Report for Retaining Wall #05E0007

Introduction/Scope of Work

Per your request, we are providing Revised Foundation Recommendations report for State Highway 299 in southwestern Trinity County, California. This report supersedes the recommendations provided in the original Foundation Report prepared by our Office for this project dated October 5, 2010 for Soil Nail Retaining Wall (Wall# 05E0007). The proposed wall is to be constructed as a portion of the Swede Creek roadway widening project. This update is needed due to changes in the wall length and location to accommodate changes in design of the project. Changes in wall location and length were provided to us by the Office of Bridge Design North (OBDR). The Office of Geotechnical Design North, Branch C completed a subsurface investigation for this project during March and April 2010.

The following foundation recommendations are based on the subsurface information gathered during the subsurface investigation, and a review of the available Revised General Plan dated March 10, 2011 and subsequent e-mail correspondence. A copy of the Revised General Plan is attached.

Project Description

The proposed new soil nail wall will be incorporated as part of the Swede Creek Roadway Widening Project located between Post Miles 19.2 to 19.6 along State Highway 299 in south western Trinity County, California. At the time of our investigation, Highway 299 consists of a two-lane roadway paved with asphalt concrete (AC). Highway 299 has two 11 foot wide travel ways with approximately 0 to 1 feet of paved shoulders in this region. Within the project area the highway is roughly aligned

east/west. The Trinity River parallels the south side of the highway. Overhead utility lines were not observed in the project limits and it is unknown if underground utilities are located within the project limits.

At the onset of this project District 3 Design originally planned to complete the proposed widening by completing cuts on the north side of the existing highway and placement of a Standard Plan Type 1 retaining wall between approximate project stationing 61+50 to 62+20. Due to the exposure of bedrock in the highway cut just west of the wall location, the District assumed that shallow bedrock would be encountered in the vicinity of the proposed wall location, therefore limiting the proposed height of the wall needed to complete the widening. During our Office's subsurface investigation for the proposed Standard Plan wall it was determined that the subsurface rock was significantly deeper than District Designs original assumptions which would significantly increase the height and cost of the proposed wall. At this time our Office recommended that since the District was already considering doing a minor cut for the proposed widening directly across from the proposed Standard Plan wall location that they may want to re-evaluate the alignment and complete all the necessary widening by cutting on the north side of the highway. At this time our Office also indicated that the existing cut slope on the north side of the highway between approximate project stationing 61+50 to 63+50 would likely not support a slope ratio steeper than 1:1 and should the District wish to utilize a steeper slope ratio that they consider use of a soil nail wall within these limits. Based on our recommendations, the District re-evaluation of the proposed alignment and the General Plan submitted to our Office by the Office of Structure Design, it is our understanding that District Design proposes to utilize the recommended soil nail wall that will be located on the north shoulder of the existing highway. In this report, the Stations are referenced from the "A1" Line shown on the General and Foundation Plans dated August 16, 2010. Table 1 summarizes the beginning and ending stations of the proposed soil nail wall with corresponding heights.

Table 1. Proposed Soil Nail Retaining Wall

Retaining Wall Number	Station "LOL1" Line ("A1" Line)		Offset to wall face from "A1" Line		Length (ft)	Height (ft)
	Begin (ft)	End (ft)	Begin (ft)	End (ft)		
N/A	10+00 (60+60)	12+69 (63+30)	22.9	22.9	269	0.0-16.0

Physical Setting

The physical setting of the project site and the surrounding area was reviewed to provide climate, topography and drainage, man-made and natural features, geology and seismicity, and soil survey characteristics to aid in project design and construction. The site itself is

located approximately 6.0 miles. northwest of the town of Big Bar, California along State Highway 299. The following is a discussion of the above review:

Climate

According to the National Weather Service, California Climate Normals for 1943-2009, the average annual precipitation in Big Bar area, which is located approximately 6 miles. southeast of the site, is about 37 inches. The average annual air temperature is approximately 56°F with average monthly extremes of 33°F in January and 97°F in July. Occasional snowfall has been known to occur within this area but usually does not stick to the ground.

Topography and Drainage

According to United States Geological Survey (USGS) 7.5 minute Topographic Map "Del Loma, Quadrangle" dated 1982 and observations in the field, the site is located in the gently to moderately rolling west trending Trinity River drainage valley with steep hill slopes bounding the north and south sides of the valley. The existing highway elevation in the project area is approximately 450 feet above mean sea level. The existing highway generally slopes down to the west. The east-west trending Trinity River is located on the south side of the existing highway and an unnamed drainage channel (Big Swede Creek) and Swede Creek are depicted on the map on the northern side of the highway in the approximate middle of the project limits.

Man-made and Natural Features of Engineering and Construction Significance

The current highway was constructed with both cuts and fills, and it is anticipated that the new alignment and widening will be constructed by cutting into the existing hillside on the northern side of the highway and the addition of minor fills on the south side to widen the highway. Cuts in the general vicinity of the project vary from approximately 1:1 to vertical. Fills in the general vicinity and on the south side of the project are variable from 1:1 to 2:1 (H:V).

Natural features at the site include the Trinity River, which is approximately east/west aligned. The area surrounding the highway consists of steeply sloping hillside topography. Vegetation in the general area consists of native grasses, weeds and poison oak, with moderate brush and conifer trees. The existing cuts are not vegetated and the vegetation on the fill slopes consists of grasses and small to large deciduous and conifer trees.

Regional Geology and Seismicity

According to the USGS geologic map "Geologic Map of the Klamath Mountains, California and Oregon", 1:500,000, W.P. Irwin, 1982, the site is approximately located on the boundary between Jurassic age, meta-andesite of the Hayfork Bally and Jurassic age mélange. The mélange contains volcaiclastic rocks, chert, tuff altered sandstone and limestone. Rock outcrops observed in the field compare favorably with those described on the map. More detailed mapping will be completed for the Geotechnical Design Report for this project.

We have reviewed the State of California, Air Resources Board (ARB) Map of California Showing Principal Asbestos Deposits, 2000 and the Caltrans DOT "Asbestos Location Map, District 2", 2001. According to both maps, the site is not in an area of naturally occurring asbestos. In addition, during our site reconnaissance the presence of serpentine was not observed in the bedrock exposed at the site.

We utilized Caltrans ARS Online v 1.0.2 to determine the closest active fault to the project site. The program indicated the Mad River Fault Zone is located approximately 25 miles. west of the site. The Mad River fault zone is considered to be made up of northeast dipping reverse faults and could produce a maximum credible earthquake of magnitude 7.2. The ARS results indicated that the maximum credible earthquake from this fault zone would result in a peak horizontal bedrock acceleration of approximately 0.3g at the site. Bedrock at the site is at or near the surface based on the field review.

Field Exploration

The Office of Geotechnical Design-North conducted a subsurface investigation between March and April 2010. The subsurface investigation consisted of advancing three mud rotary borings (Nos. R-10-101, R-10-102, and R-10-103) through the existing roadway section adjacent to the proposed wall location. The mud rotary borings were advanced using a self-casing wireline-diamond coring method extending to a maximum depth of 50 feet below ground surface. Sampling was achieved by retrieval of continuous core samples and Standard Penetration Tests.

The subsurface investigation revealed the site materials at the location of the proposed soil nail wall (Wall No. 05E0007) generally consist of approximately 20 to 40 feet of medium dense to dense, silty-sand/sandy-silts with gravel, cobbles and boulders underlain by moderately hard to hard, very intensely to closely fractured metamorphic rock (Granulite).

For subsurface data and boring locations, please refer to the Log of Test Borings. Log of Test Borings for site-specific information and conditions will be forwarded once completed.

Laboratory Testing

No laboratory tests were completed for this report.

Seismic Data and Evaluation

The project site is not located within any Alquist-Priolo Earthquake Fault Zones (EFZs) as established by the California Geological Survey. Based on the Department of Transportation (Caltrans) ARS Online v 1.0.2, the controlling fault for the site is the Mad River fault zone, located approximately 25 miles west of the site. This fault zone could produce a maximum credible earthquake of magnitude 7.2 and is made up of northeast dipping reverse faults. ARS analysis indicated that the maximum credible earthquake from this fault would result in a peak horizontal bedrock acceleration of approximately 0.3g at the site. Depth to bedrock should be considered near surface in the area of the proposed retaining wall for this project.

The potential for ground rupture hazard due to fault movement is considered low since no known active fault crosses the project site. The potential for liquefaction to occur is considered to be minimal at the project site.

Groundwater

At the time of our site investigation no seeps or wet locations were observed in the existing cut where the proposed wall will be located. A groundwater monitoring well was installed in Boring R-10-001 during our subsurface investigation. Groundwater was not encountered when measured on 10/5/10. Results of future groundwater measurements taken between now and the project RTL will be reported to the RE Pending File. Groundwater traveling through cracks and voids in the rock or at the soil/bedrock interface maybe encountered during the drilling process of the soil nails. It should be anticipated that chances of encountering groundwater during construction will increase if wall construction occurs during the wetter time of year, typically October through May in the area.

Corrosion

The Department considers the site to be corrosive to foundation elements if one or more of the following conditions exist for the representative soil and/or water samples taken at the site: Chloride concentration is greater than or equal to 500 ppm, sulfate concentration

is greater than or equal to 2000 ppm, or pH is 5.5 or less.

Our Office has reviewed corrosion test results completed by the District for this project. Soil samples were obtained for corrosion analyses at Post Mile 19.27 and tested in June 2009 for pH and Resistivity. Based on the result of the corrosion analyses, pH = 6.96, the site is considered non-corrosive.

Soil Nail Wall Recommendations

The following soil nail wall recommendations are based on the subsurface conditions encountered during our site exploration, existing site surface conditions, proposed District improvements, the project plans and cross-sections provided to our Office by District 2 Design, as indicated on the Revised General Plan dated March 14, 2011, provided by Mr. Joey Aquino with the Office of Bridge Design North (OBDN) and per e-mail correspondence dated March 14, 2011. A copy of the Revised General Plan provided to our Office is attached. Based on the Revised General Plan provided, the proposed soil nail wall will have a maximum vertical height of 16.0 feet.

The following design parameters were used for the wall analyses, using the SNAILWin 5.01 program. The minimum factor of safety is 1.5 with pullout controlling. Due to the lack of recovered subsurface material during the drilling operations, Slope W was utilized to obtain an equivalent phi and cohesion for the subsurface materials to be utilized in the SNAIL program. Phi and cohesion were obtained by modeling the existing slope and back calculating the subsurface soil properties for slope stability with a Factor of Safety of 1.1.

Design Parameters:

Phi = 40^{o}
C = 50 psf
Gamma = 120 pcf

Soil Nail Design Recommendations:

Due to the length and varied height of the proposed wall, our Office recommends that the wall be divided into 3 zones rather than 2 zones as identified in the original Foundation Report for this project. Zone 1 should begin at LOL1 line Sta: 10+00 (A1 Line Sta: 60+60) and extend to LOL1 line Sta: 10+50 (A1 line Sta: 61+10). Zone 2 should begin at LOL1 line 10+50 (A1 line Sta: 61+10) and extend to LOL1 line 11+50 (A1 Sta: 62+10). Zone 3 should begin at LOL1 line Sta: 11+50 (A1 line Sta: 62+10) and extend to LOL1 line Sta: 12+69 (A1 line Sta: 63+30).

Between LOL1 line Sta: 10+00 to 10+07 and Sta: 12+52 to 12+69 our Office recommends one level of nails
Length of Nail = 18 feet
Inclination = 15^0
Vertical Distance from top of cut to first level = 3 feet

Between LOL1 Line Sta: 10+07 to 10+17 and Sta: 11+92 to 12+52 our Office recommends two levels of nails
Length of Nail = 18 feet
Inclination = 15^0
Vertical Distance from top of cut to first level = 2 feet
Vertical Distance from first level to second level = 3 feet

Between LOL1 Line Sta: 10+17 to 10+27 and Sta: 11+02 to 11+92 our Office recommends three levels of nails
Length of Nail = 18 feet
Inclination = 15^0
Vertical Distance from top of cut to first level = 2 feet
Vertical Distance from first level to second level and vertical distance between each successive level = 3 feet

Between LOL1 Line Sta: 10+27 to 10+52 and Sta: 10+82 to 11+02 our Office recommends four levels of nails
Length of Nail = 18 feet
Inclination = 15^0
Vertical Distance from top of cut to first level = 2 feet
Vertical Distance from first level to second level and vertical distance between each successive level = 3 feet

Between LOL1 Line Sta: 10+52 to Sta: 10+82 our Office recommends five levels of nails
Length of Nail = 18 feet
Inclination = 15^0
Vertical Distance from top of cut to first level = 2 feet
Vertical Distance from first level to second level and vertical distance between each successive level = 3 feet

Horizontal Spacing = 5 feet maximum between all nails in each row

Q_d = design pullout resistance = 1660 lbs/linear ft.

Reinforcing: #8 bars, 60 ksi
Punching Shear = 36 kips

Test Nail Assemblies:

Our Office recommends that the majority of the test nail locations be selected by the engineer in the field, as best suited locations are better identified during the excavation for the wall. Maximum Total Allowable movement for test nails shall conform to the recommended tolerances identified in the Standard Special Provision.

General Notes to Designer and Resident Engineer

1. The analysis for this wall assumed that the material behind the wall is free draining. Strip drains behind the wall are required to alleviate pore water pressure from surface/groundwater water that will likely migrate through fractures and voids within the rock/soil material behind the wall.

2. Our Office recommends that one verification nail for Zone 1 be placed between LOL1 line Stations 10+00 and 10+25 and the second verification nail be placed between Stations 10+25 to 10+50. For Zone 2 we recommend a verification nail be placed between LOL1 line Stations 10+50 to 10+80 and the second verification nail be placed between Stations 10+80 to 11+50. The verification nails for Zone 3 maybe placed anywhere with the Zone.

Construction Considerations

1. Depth to groundwater was not determined during the subsurface investigation. It should be anticipated that ground water will migrate in the fractures and voids within the native material during the wet season.

2. Difficult drilling conditions should be anticipated due to the presence of cobbles and boulders encountered within the subsurface materials at the site.

3. Caving hole conditions were encountered during our subsurface investigation, and should be anticipated during drilling of the soil nails due to predominately cohesionless soils encountered at the site.

Project Information

Standard special Provisions S5-280, "Project Information," discloses to bidders and contractors a list of pertinent information available for their inspection prior to bid opening. The following is an excerpt from SSP S5-280 disclosing information originating from Geotechnical Services. Items listed to be included in the information handout will be provided in Acrobat (.pdf) format to the addressee(s) of this report via electronic mail.

Data and information attached with the project plans are:

A. *Log of Test Borings for Soil Nail Wall @ PM 19.4, Wall No. 05E0007.*

Data and Information included in the Information Handout provided to the bidders and Contractors are:

A. *"Foundation Report Update #1 for Retaining Wall #05E0007" 02-TRI-299 PM 19.4, dated March 15, 2011*

Data and information available for inspection at the District Office:

A. *None*

Data and information available for inspection at the Transportation Laboratory:

A. *12 boxes of Soil/Rock Cores*

The recommendations contained in this report are based on specific project information regarding structure location and dimensions that has been provided by the OBDN, Branch 3. If any conceptual changes are made during final project design, the Office of Geotechnical Design - North, Branch C should review those changes to determine if the foundation recommendations provided in this report are still applicable. Any questions regarding the above recommendations should be directed to Bill Webster at (916) 227-1041, or Douglas Brittsan (916) 227-1079.

PROFESSIONAL GEOLOGIST
W.P. WEBSTER
No. 2485
CERTIFIED
ENGINEERING
GEOLOGIST
Exp. 2-28-13
STATE OF CALIFORNIA

William Webster, CEG
Engineering Geologist
Office of Geotechnical Design-North

Douglas E. Brittsan, GE
Senior Transportation Engineer
Office of Geotechnical Design-North

Attachments

cc: OGDN
Mark_Willian@dot.ca.gov
Douglas Brittsan
RE Pending File/HQ/Caltrans/CAGov
Structure OE/HQ/Caltrans/CAGov
Chris Harvey/D02/Caltrans/CAGov - PM
Byron Berger/D02/Caltrans/CAGov - D2 DME

REGISTERED PROFESSIONAL E
DOUGLAS E. BRITTSAN
No. GE2459
Exp. 9/30/12
GEOTECHNICAL
STATE OF CALIFO

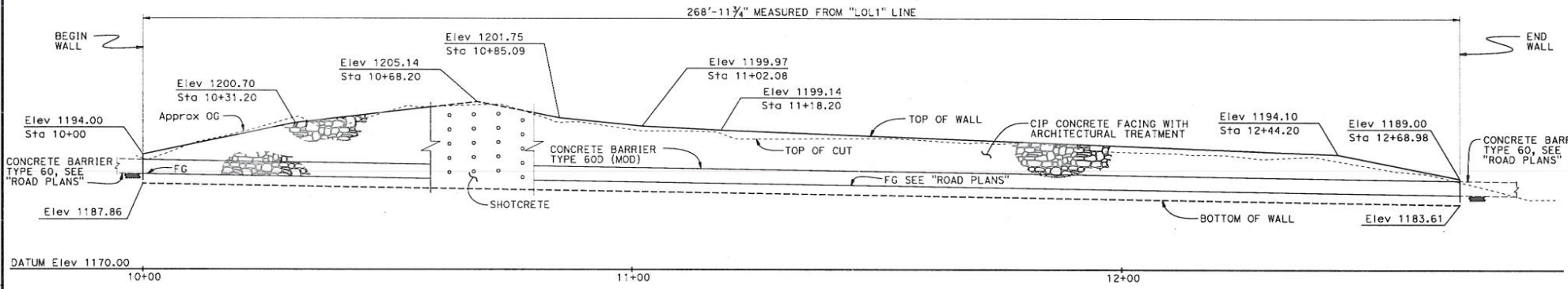
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
02	Tri	299			

REGISTERED CIVIL ENGINEER X DATE

PLANS APPROVAL DATE

Jose W Aquino III
No. 58386
Exp. 12-31-12
CIVIL
REGISTERED PROFESSIONAL ENGINEER
STATE OF CALIFORNIA

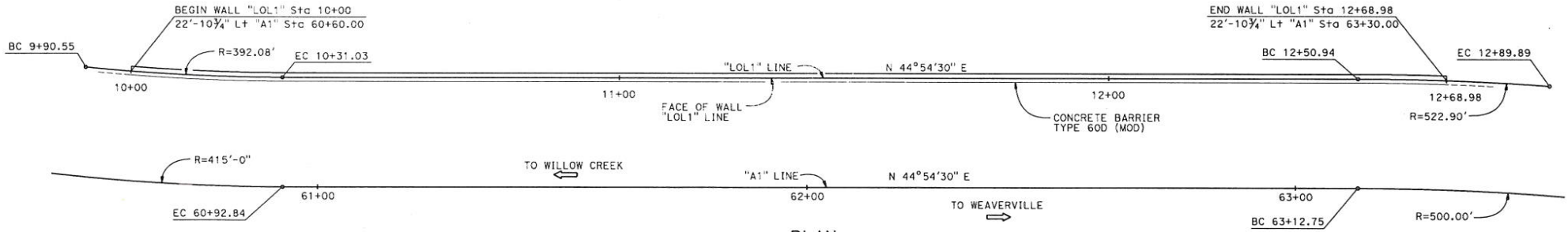
The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.



ELEVATION
1" = 10'

NOTES:
- Indicates Soil Nail

"LOL1" Line	"A1" Line
R = 392.08'	R = 415.00'
Δ = 2°27'47"	Δ = 70°15'15"
T = 8.45'	T = 291.96'
L = 16.90'	L = 508.86''



PLAN
1" = 10'

NOTE:
THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.

"LOL1" Line	"A1" Line
R = 522.90'	R = 500.00'
Δ = 10°57'26"	Δ = 50°44'86"
T = 19.48'	T = 237.09'
L = 38.95'	L = 442.78''

Joseph E Downing
DESIGN ENGINEER

	BY	CHECKED
DESIGN	Art V Herrera	Joey Aquino
DETAILS	Jay Reid	Joey Aquino
QUANTITIES	Joey Aquino	Art V Herrera

LOAD FACTOR DESIGN — LIVE LOADING:

	BY	CHECKED
LAYOUT	Art V Herrera	Joey Aquino
SPECIFICATIONS	Xiahong Li	PLANS AND SPECS COMPARED Xiahong Li

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DIVISION OF ENGINEERING SERVICES
STRUCTURE DESIGN
DESIGN BRANCH 3

CU 03-242
EA 2E2001
FILE => 02-2e2001-a-gp01.dgn

BRIDGE NO. 05E0007
POST MILE 19.2/19.6

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES: 5-25-10 | 7-22-10 | 8-16-10 | 9-29-10 | 9-30-10 | 10-4-10 | 10-1-10 | 3-2-11 | 3-10-11

RETAINING WALL @ PM 19.4
GENERAL PLAN NO. 1

SHEET 1 OF 18

STRUCTURES DESIGN GENERAL PLAN SHEET (ENGLISH) (REV.07-24-06)