This is to be used for all "INFORMATION HANDOUT" cover sheets. Edit as appropriate.

FOR CONTRACT NO.: 03-3E4604

INFORMATION HANDOUT

MATERIALS INFORMATION

FOUNDATION REPORT

ROUTE: 03-ED-50-28.1

State of California
Department of Transportation

Business, Transportation and Housing Agency

Memorandum

Flex your power!
Be energy efficient!

To: MR. SEAN SAMUEL
SENIOR BRIDGE ENGINEER
OFFICE OF TRANSPORTATION
ARCHITECTURE

Attn: MS. DAI LU

Date: December 31, 2008

File: 03-ED-50-PM 28.1
03-3E4601
Camino Sand Storage
Building

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
GEOTECHNICAL SERVICES – MS 5

Subject: Foundation Report

Introduction

Per your request, the Office of Geotechnical Design-North (OGDN) has prepared a Foundation Report in support of the proposed Sand Storage Building to be located on Route 50 at approximate PM 28.1 in El Dorado County. The following report summarizes our subsurface investigation and provides our recommended geotechnical design parameters.

Existing Facilities and Proposed Improvements

Plate No. 1 shows the approximate location of the site. The footprint of the proposed building is approximately 40 by 80 feet as shown in Plate No. 2. The support for structural loading will be obtained from a perimeter strip footing. The building will also have a slab on grade that will support loads from sand and equipment placed inside the building.

Physical Setting

The physical setting of the project site and the surrounding area was reviewed to provide geology, climate, and seismicity characteristics to aid in the project design and construction. The following is a discussion of our review:

Geology

Based upon review of the California Geologic Survey published map, "Geologic Map of the Sacramento, California" (Reference No. 1), the geologic map (Plate No. 3) unit at the project site is shown to be Mehrten Formation. The Mehrten Formation is composed of moderately indurate andesitic conglomerates, sandstone, and breccia.

Climate

According to the Western U.S. Climate Historical Summaries (Reference No. 2) for 1948-2005, the average annual air temperature is approximately 57 (^{0}F) with average monthly extremes of 32 (^{0}F) in January and 92 (^{0}F) in July. Heavy rain occurs in the area typically between the months of November to March. Highest average rainfall is in January (7 in). Highest average snowfall is in January (1.5 in).

Seismicity

The following seismic design parameters are in accordance to the 2007 California Building Code (Reference No. 3):

- Site Class: B
- Mapped spectral acceleration for short periods (S_s): 0.561g
- Mapped spectral acceleration for a 1-section period (S_1): 0.208g
- Surface Displacement from Fault Rupture: None

Subsurface Conditions

In support of the design for the purposed building, we directed a subsurface exploration program on November 25, 2008. Three borings were drilled to the depth of 30 feet below the existing ground surface. Plate No. 2 shows the approximate location of the borings. These borings were accomplished with a CS 2000 drill rig utilizing mud rotary drilling. Samples were collected at various depths by advancing a "Standard Penetration Test" ("SPT", 2.0 inch outer diamcter) sampler with a "safety hammer" that utilizes a standard striking force weight (140 lb) dropped 30 inches. Also, relatively undisturbed samples were obtained by core drilling with a roughly 2.0 inch inner diameter (I.D.) diamond impregnated bit. The borings encountered mainly decomposed igneous rock, this material ranged from loose at the ground surface to dense with depth. More detailed description of the encountered materials is shown on the attached boring logs.

Conclusion and Recommendations

Foundations

The existing ground conditions are suitable for a shallow perimeter strip footing provided that the following recommendations are used for design. Since the footing is designed for the combined forces of bearing as well as overturning due to the storage bunker's containment of sand, project engineer (Ms. Dai Lu) recommended the minimum footing width of 7 feet. Footing will be embedded 20 inches blow the lowest adjacent finish grade, which is greater than the anticipated frost depth of 18 inches. If the following recommendations are met, the foundation may be designed using an allowable bearing capacity of 4000 psf. Based on the Section 1804 of the 2007 California Building Code, we recommend the allowable foundation lateral pressure to be a minimum of 150 psf/f.. Provided that the foundation is designed and constructed in accordance with the criteria presented herein, it is estimated that the total settlement of the strip footing will not exceed 1 inch.

Slope Stability Analysis

We have performed analysis using the geotechnical engineering computer program "Slope W/ 2007". This slope analysis was based on a slope height of 110 feet at 1.4:1 (H:V). Our analysis indicates adequate stability of the slope at this location. Also note that based on the field investigation performed on November 25, 2008, no evidence of slope movement (cracks on the pavement or on the existing salt storage building at the site) was noted at the site.

Corrosivity

The Corrosion Technology Branch considers a site to be corrosive if one or more of the following conditions exist for the representative soil and/or water samples taken at the site: chloride concentration is 500 ppm or greater, sulfate concentration is 2000 ppm or greater, or the pH is 5.5 or less. Based on these criteria this site is considered corrosive. The designer should consider remedial measures to protect against a corrosive environment at foundation location. Samples were collected and tested for corrosion at the following locations (Table No. 2). Note that when soil resistivity is higher than 1000 ohm-cm soil is considered non-corrosive so there is no need to measure the sulfate and chloride content (Sample depth 20~25 feet-Table No. 2).

Ground Water Table

Groundwater was not encountered within the maximum drilled depth of 30 feet below the ground surface at the time of our subsurface investigation.

Table 1 Corrosion Test Summary Report

Sample From Borehole	Sample Depth (ft)	Minimum Resistivity (ohm-cm)	pH	Sulfate Content (ppm)	Chloride Content (ppm)
1	10-15	111	3.69	0	1020
1	20-25	4239	6.02	----	----
2	0-5	298	5.48	0	1670

Moisture Barrier Requirements

A moisture barrier should be used for the proposed structure with the slab-on-grade floor. A vinyl membrane with a minimum thickness of 0.016 inches should be placed over a course not less than 4 inches in thickness that consists of gravel or crushed stone containing not more than 10 percent of material that passes through a No. 4 sieve. The membrane should be covered by 4 inches of sand to aid in uniform curing of the concrete. Care should be taken not to puncture the membrane (References No. 3).

Project Information

Standard Special Provision S5-280, "Project information" discloses to bidders 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 addresses(s) of this report via electronic mail.

Data and information attached with the project plans are:

A. *Log of Test Borings for the 2008 subsurface exploration.*

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

A. *"Foundation Report for Camino Sand Storage Building", 03-ED-50-PM 28.1, dated December 31, 2008.*

Data and information available for inspection at the District office:

A. *None*

Data and information available for inspection at the transportation Laboratory:

A. *None*

If any conceptual changes are made during final project design, the Office of Geotechnical Design North should review those changes to determine if these foundation recommendations are still applicable.

If you have any questions or comments, please call Hamid Akbarzadegan at (916) 227-1091 or Douglas Brittsan at (916) 227-1079.

REGISTERED PROFESSIONAL ENGINEER
DOUGLAS E. BRITTSAN
No. GE2459
Exp. 9/30/10
GEOTECHNICAL
STATE OF CALIFORNIA

HAMID AKBARZADEGAN, M.S.
Transportation Engineer - Civil
Geotechnical Design – North

DOUGLAS E. BRITTSAN, G.E.
Senior Transportation Engineer
Geotechnical Design – North

Attachments:

c: R.E. Pending
Structure OE (E-copy)
PCE (E-copy)
DME (E-copy)
OGDN File
GS File Room

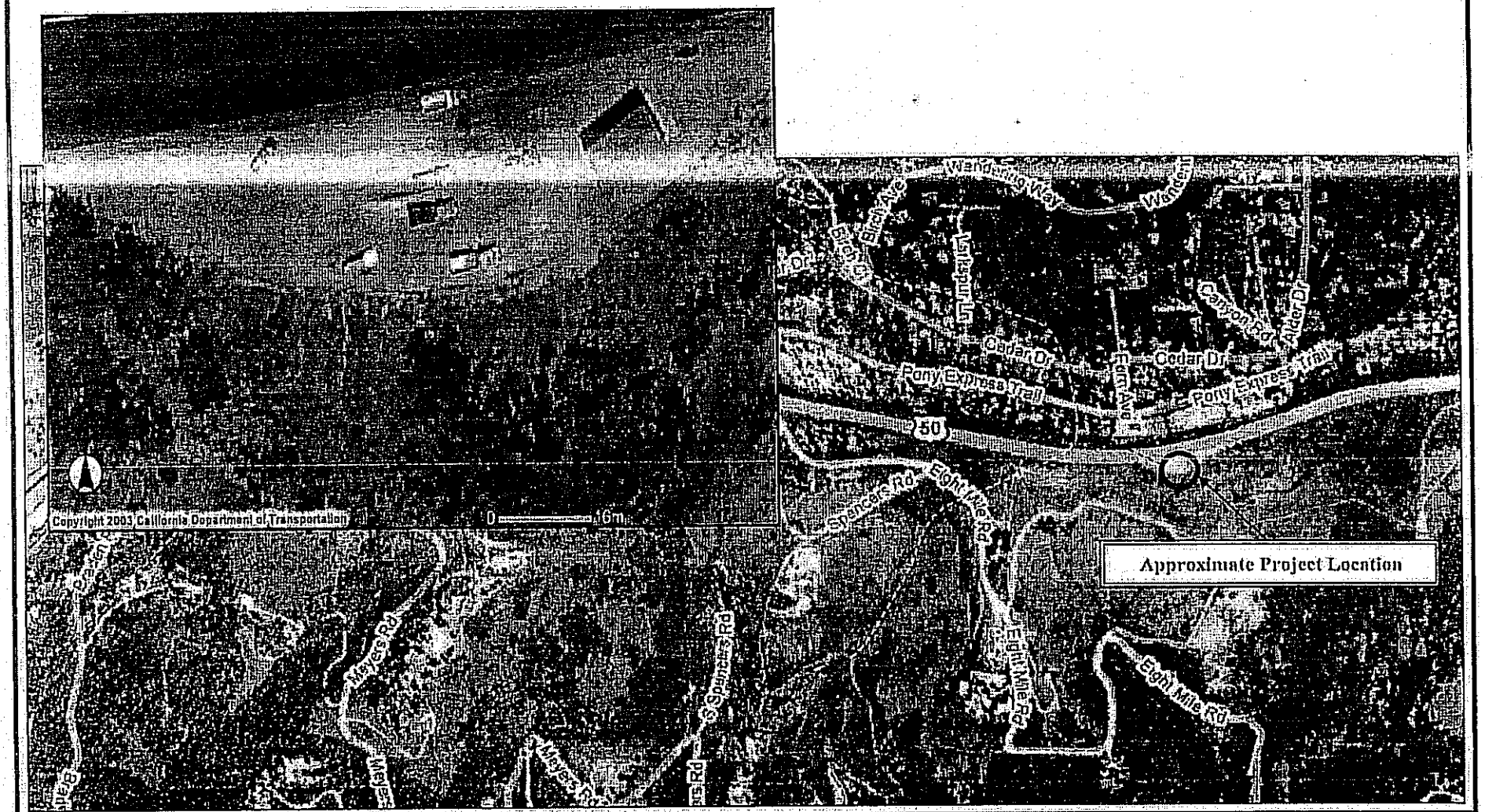
References:

1. *Sacramento Regional Geologic Map (maps are located on USGS's National Geologic Map Database web site).*

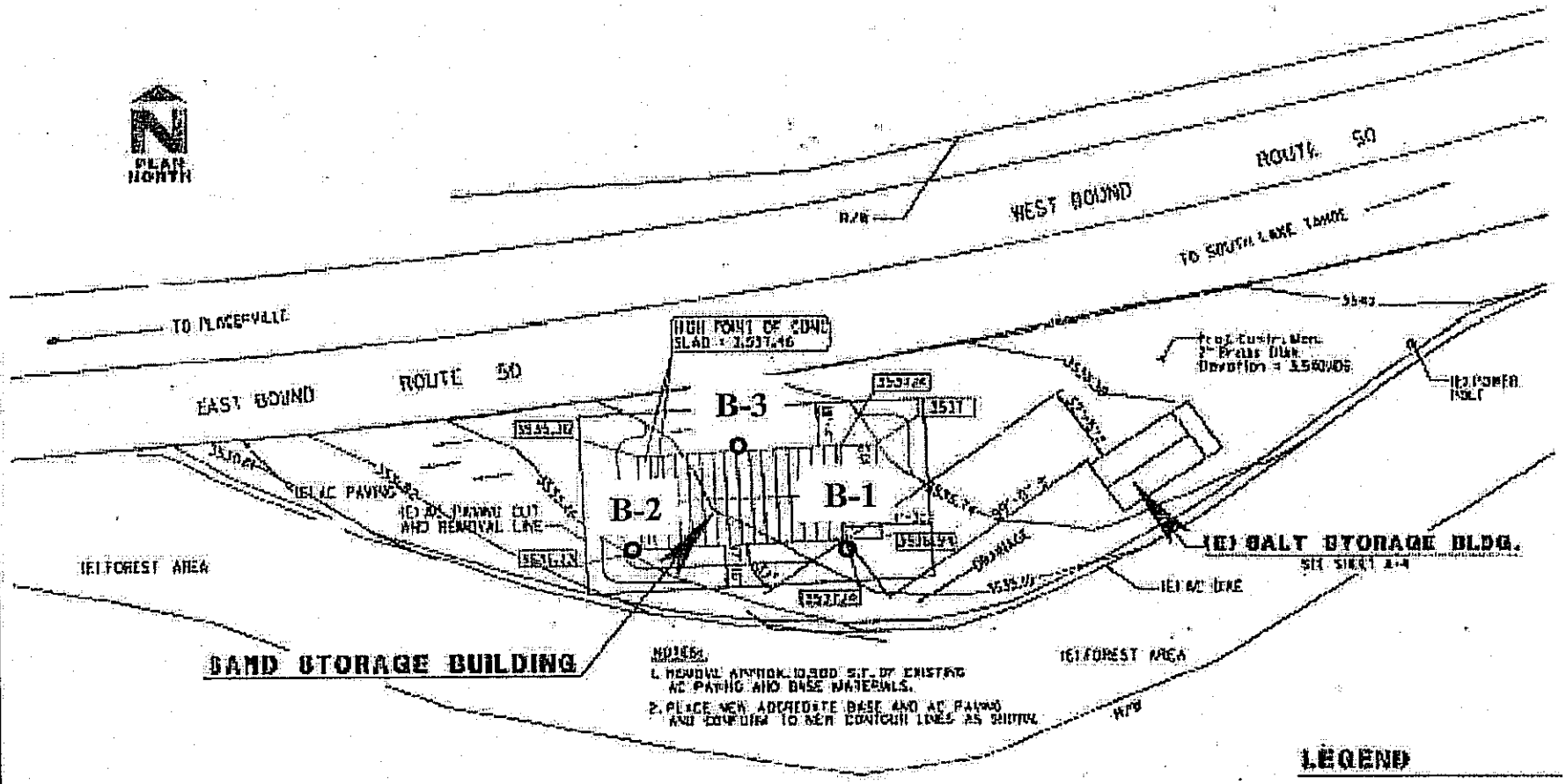
2. *Western U.S. Climate Historical Summaries" www.wrcc.dri.edu/climsum.html".*

3. *2007 California Building Code.*

4. *Soil & Foundations Reference Manual-Volume I, Report No. FHWA-NHI-06-088, Naresh Samtani, Edward Nowatzki.*



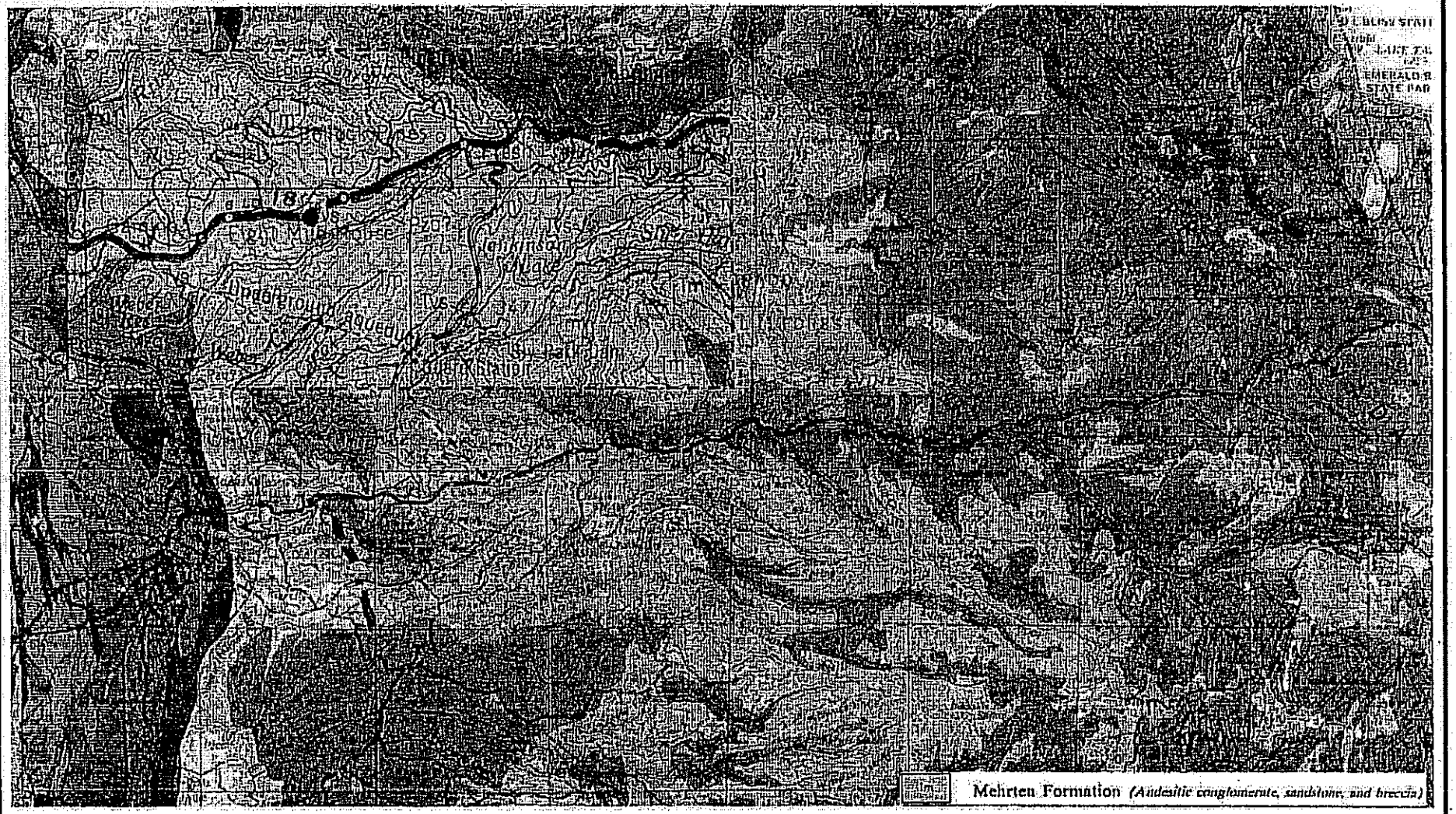
Caltrans	California Department of Transportation Division of Engineering Services Geotechnical Services Office of Geotechnical Design-North	EA: 03-3E460 Date: December, 2008 **Project Location** **Foundation Report** Plate No. 1



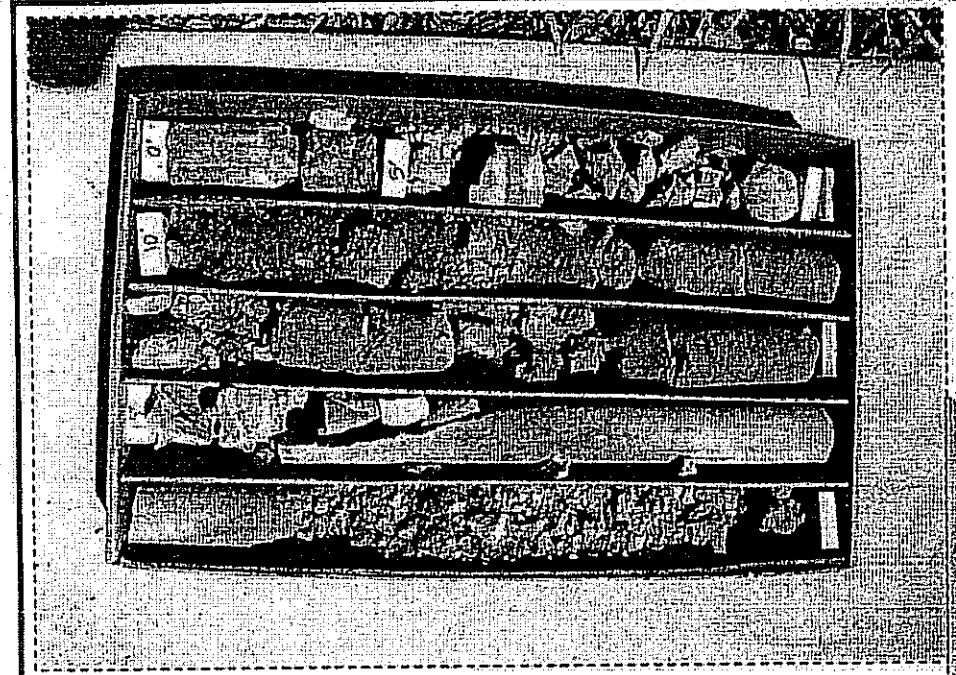
SITE PLAN

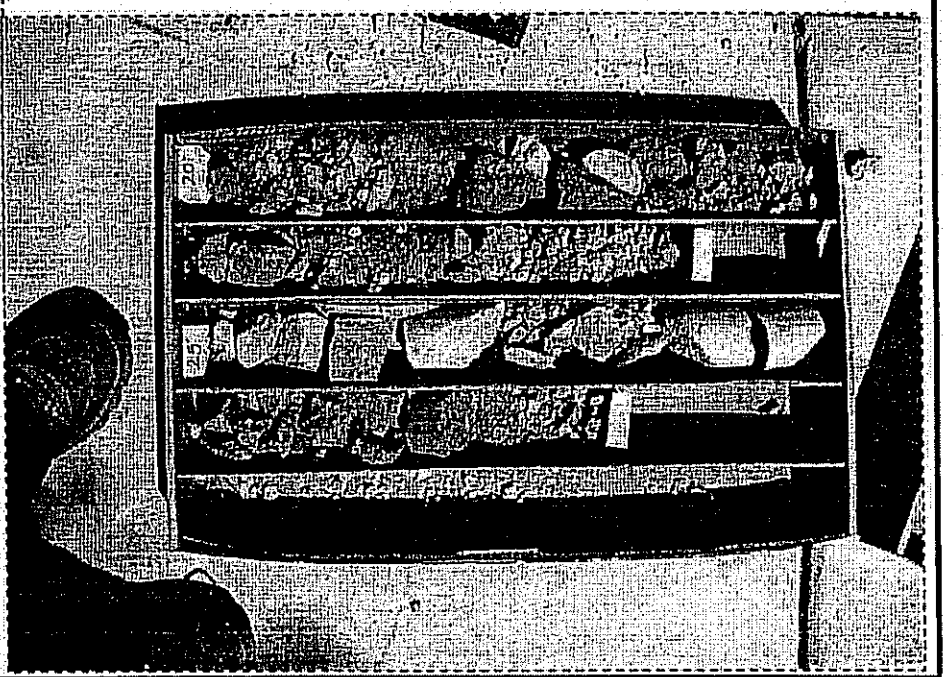
SCALE 1" = 80'-0"

Caltrans	California Department of Transportation Division of Engineering Services Geotechnical Services Office of Geotechnical Design-North	EA: 03-3E460 Date: December, 2008	**Borehole Locations**
		Foundation Report	Plate No. 2

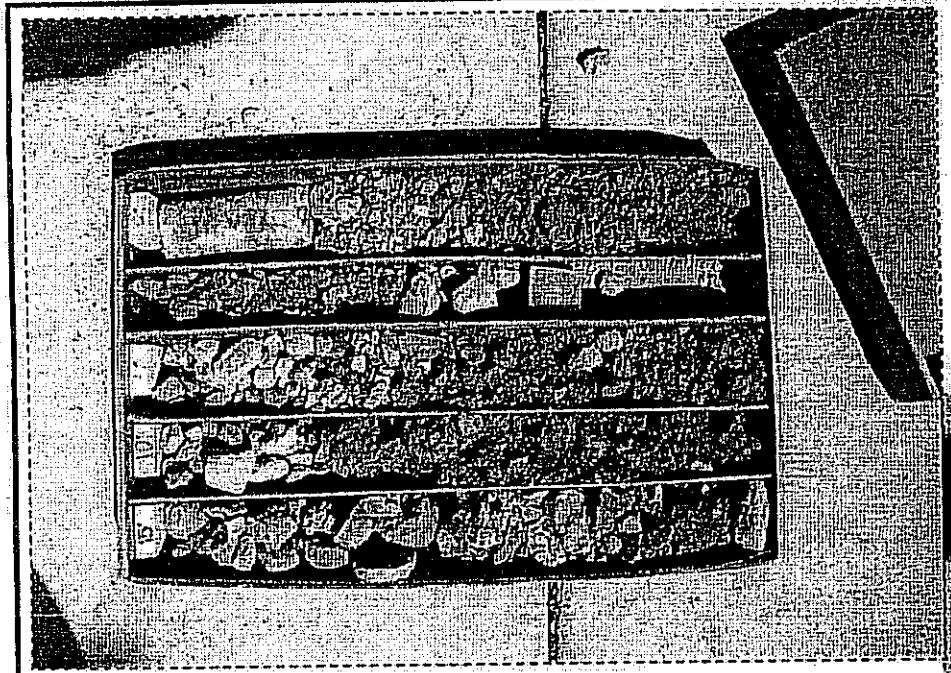


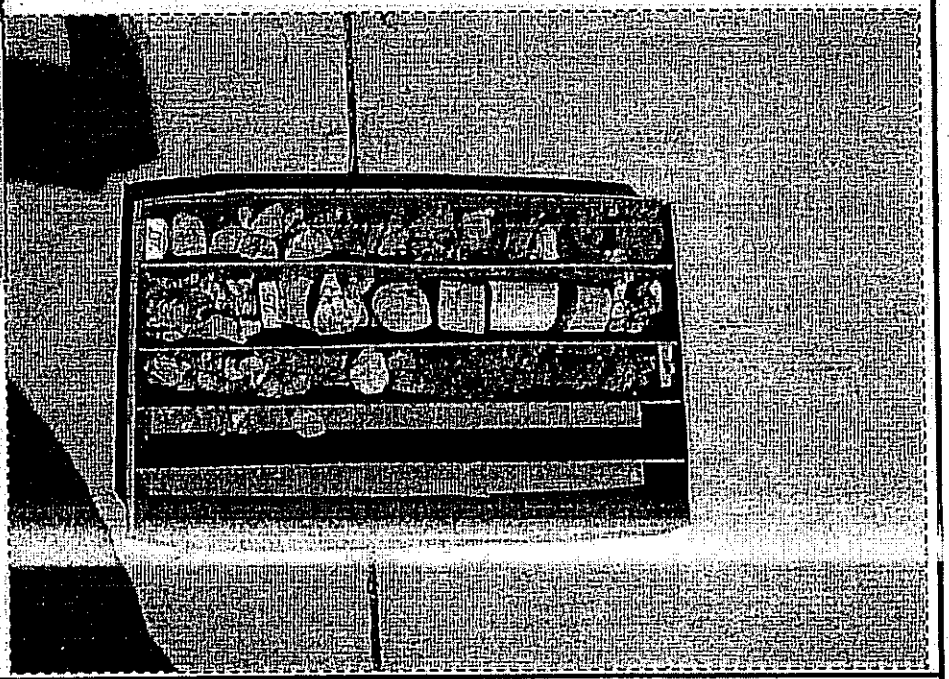
California Department of Transportation Division of Engineering Services Geotechnical Services Office of Geotechnical Design-North	EA: 03-3E460 Date: December, 2008	**Geologic Map**
	Foundation Report	Plate No. 3





California Department of Transportation Division of Engineering Services Geotechnical Services Office of Geotechnical Design-North	EA: 03-3E460 Date: December, 2008	**Bore Hole No. 1**
	Foundation Report	Plate No. 4





California Department of Transportation Division of Engineering Services Geotechnical Services Office of Geotechnical Design-North	EA: 03-3E460 Date: December, 2008	**Bore Hole No. 2**
	Foundation Report	**Plate No. 5**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
AkbarZadegan H.	9-17-08		0.0 ft / 0.0 ft NAD83	R-08-001
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line) 105.6' Rt Sta 146948 146948	SURFACE ELEVATION
DRILLING METHOD Rotary Wash			DRILL RIG CS 2000(truck)	BOREHOLE DIAMETER
SAMPLER TYPE(S) AND SIZE(S) (ID) Punch Core and SPT			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
BOREHOLE BACKFILL AND COMPLETION Borehole Backfilled			GROUNDWATER DURING DRILLING AFTER DRILLING (DATE) READINGS	TOTAL DEPTH OF BORING 30.0 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location, Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
0.00	0		ASPHALT black.											
-2.00	2		SILTY SAND with GRAVEL.; medium dense; dark brown; moderate cementation.				10							
-4.00	4		IGNEOUS ROCK, light gray and light brown, very intensely weathered, moderately hard to hard, very intensely to intensely fractured.		50 R R	R								
-8.00	8						40	0						
-10.00	10		IGNEOUS ROCK, light brown to dusky brown, decomposed, moderately soft to moderately hard, very intensely fractured.		7 5 3	8								
-12.00	12						100	30						
-14.00	14													
-16.00	16		IGNEOUS ROCK, light gray, fresh, moderately hard to hard, slightly fractured.		50 R R	R								
-18.00	18		IGNEOUS ROCK, light brown, very intensely weathered, very soft to soft, very intensely fractured.				96	40						
-20.00	20				8 10 15	25								
-22.00	22		IGNEOUS ROCK, light brown, very intensely weathered, very soft to soft, very intensely fractured.				60	0						
-24.00	24													
	25													

(continued)

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Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE				HOLE ID
BORING RECORD				R-08-001
DIST. 03	COUNTY El Dorado	ROUTE 50	POSTMILE 28.1/28.1	EA 03-3E460
PROJECT OR BRIDGE NAME Camino Sand Storage				
BRIDGE NUMBER	PREPARED BY Hamid AkbarZadegan		DATE	SHEET 1 of 2

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method Casing Depth	Remarks
-26.00	26		IGNEOUS ROCK, light gray, fresh, moderately hard to hard, intensely fractured.		4 5 9	14							
	27		IGNEOUS ROCK, light brown to dusky brown, decomposed, very soft to soft, very intensely fractured.				60	20					
-28.00	28												
	29												
-30.00	30				5 7 10	17							
	31		Bottom of borehole at 31.5 ft										

CALTRANS BORING RECORD MET+ENG FIXED CAMINOSAND.GPJ CALTRANS LIBRARY 040508.GLB 12/26/08

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE: BORING RECORD				HOLE ID: R-08-001
DIST.: 03	COUNTY: El Dorado	ROUTE: 50	POSTMILE: 28.1/28.1	EA: 03-3E460
PROJECT OR BRIDGE NAME: Camino Sand Storage				
BRIDGE NUMBER	PREPARED BY: Hamid AkbarZadegan		DATE	SHEET: 2 of 2

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
AkbarZadegan H.	9-17-08		0.0 ft / -80.0 ft NAD83	R-08-002
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line) 145.6' Rt Sta 147028 147028	SURFACE ELEVATION
DRILLING METHOD Rotary Wash			DRILL RIG CS 2000 (truck)	BOREHOLE DIAMETER
SAMPLER TYPE(S) AND SIZE(S) (ID) Punch Core and SPT			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERI
BOREHOLE BACKFILL AND COMPLETION Borehole Backfilled			GROUNDWATER DURING DRILLING AFTER DRILLING (DATE) READINGS	TOTAL DEPTH OF BORING 30.0 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location, Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method, Casing Depth	Remarks
	0		ASPHALT black.										
	1		SILTY SAND with GRAVEL: medium dense; dark brown coarse to fine GRAVEL: coarse to fine SAND moderate cementation.										
-2.00	2												
	3												
-4.00	4												
	5				12 13 12	25							
-6.00	6												
	7		IGNEOUS ROCK, light gray, intensely to moderately weathered, moderately hard, intensely fractured.				40	0					
-8.00	8												
	9												
-10.00	10				6 7 9	16							
	11												
-12.00	12						40	0					
	13		IGNEOUS ROCK, light brown, decomposed, soft, very intensely fractured.										
-14.00	14												
	15				6 14 14	28							
-16.00	16												
	17						40	0					
-18.00	18												
	19												
-20.00	20		IGNEOUS ROCK, light brown, intensely weathered, moderately hard, intensely fractured.		13 11 5	16							
	21												
-22.00	22						60	0					
	23												
-24.00	24												
	25												

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CALTRANS BORING RECORD MET+ENG FIXED CAMINOSAND.GPJ CALTRANS LIBRARY 040808.GLB 12/19/08

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE				HOLE ID
BORING RECORD				R-08-002
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	El Dorado	50	28.1/28.1	03-3E460
PROJECT OR BRIDGE NAME: Camino Sand Storage				
BRIDGE NUMBER	PREPARED BY: Hamid AkbarZadegan		DATE	SHEET: 1 of 2

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	26		IGNEOUS ROCK, light gray, slightly weathered to fresh, hard, moderately fractured.			35 R R	R								
-26.00	27							76	29						
-28.00	28		IGNEOUS ROCK, dusky brown, intensely to moderately weathered, moderately soft, intensely fractured.												
	29														
-30.00	30					50 R R	R								
	31														

Bottom of borehole at 31.5 ft

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Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE				HOLE ID
BORING RECORD				R-08-002
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	El Dorado	50	28.1/28.1	03-3E460
PROJECT OR BRIDGE NAME: Camino Sand Storage				
BRIDGE NUMBER	PREPARED BY: Hamid AkbarZadegan		DATE	SHEET: 2 of 2

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
AkbarZadegan H.	11-25-08		40.0 ft / -40.0 ft NAD83	R-08-003
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line) 106' Rt Sta 147035 147035	SURFACE ELEVATION
DRILLING METHOD Rotary Wash			DRILL RIG B-47	BOREHOLE DIAMETER
SAMPLER TYPE(S) AND SIZE(S) (ID) Punch Core			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
BOREHOLE BACKFILL AND COMPLETION Borehole Backfilled			GROUNDWATER DURING DRILLING AFTER DRILLING (DATE) READINGS	TOTAL DEPTH OF BORING 30.0 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0														
	1														
-2.00	2		IGNEOUS ROCK, grayish brown, decomposed, very soft, very intensely fractured,					80	0						Down Force (D.F.):1000 psi, Rotation Pressure (R.P.):750 psi
	3														
-4.00	4														
	5														
-6.00	6														
	7		IGNEOUS ROCK, light brown, intensely weathered, soft to moderately soft, very intensely to intensely fractured,					100	0						D.F. : 500 psi R.P. : 1250 psi
-8.00	8														
	9		IGNEOUS ROCK, yellowish gray, fresh, moderately hard to hard, intensely fractured, Rotation Pressure					83	83						D.F. : 750 psi Switched from Finger bit R.P. : 750 psi to Diamond bit.
-10.00	10														
	11														
-12.00	12		IGNEOUS ROCK, grayish brown, intensely weathered, moderately hard to hard, intensely fractured					50	0						D.F. : 750 psi R.P. : 500 psi
	13														
-14.00	14														
	15														
-16.00	16														
	17		IGNEOUS ROCK, yellowish gray, slightly weathered, hard, moderately fractured Decomposed Rock, Silty Clayey Sand like matterials were found on the top.					100	63.3						D.F. : 750 psi R.P. : 750 psi
-18.00	18														
	19														
-20.00	20														
	21														
-22.00	22		IGNEOUS ROCK, yellowish gray, slightly weathered to fresh, hard, moderately fractured, Rotation Pressure					100	87						D.F. : 750 psi R.P. : 750 psi
	23														
-24.00	24														
	25														

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Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE				HOLE ID
BORING RECORD				R-08-003
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	El Dorado	50	28.1/28.1	03-3E460
PROJECT OR BRIDGE NAME Camino Sand Storage				
BRIDGE NUMBER	PREPARED BY Hamid AkbarZadegan		DATE	SHEET 1 of 2

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
-26.00	26		IGNEOUS ROCK, yellowish gray, fresh, moderately hard to hard, moderately fractured, Rotation Pressure												D.F. : 750 psi R.P. : 750 psi
	27														
-28.00	28														
	29														

Bottom of borehole at 31.5 ft

CALTRANS BORING RECORD MET+ENG FIXED CAMINOSAND.GPJ CALTRANS LIBRARY 040606.GLB 12/19/03

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE				HOLE ID
BORING RECORD				R-08-003
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	El Dorado	50	28.1/28.1	03-3E460
PROJECT OR BRIDGE NAME				
Camino Sand Storage				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	Hamid AkbarZadegan			2 of 2