FOR CONTRACT NO.: 10-0H04U1

INFORMATION HANDOUT

MATERIALS INFORMATION

GEOTECHNICAL DESIGN REPORT
SUPPLEMENTAL RECOMMENDATIONS TO GEOTECHNICAL DESIGN REPORT

ROUTE: 10-SJ-4-8.7/R11.1

ADDED PER ADDENDUM NO. 2 DATED AUGUST 20, 2009

Memorandum

Flex your power!
Be energy efficient!

To: **NICHOLAS CHAN**
Senior
Office of Design IV-Design Branch P

Attention: Eric Karlson

Date: May 25, 2006

File: 10-SJ-04
KP 8.85/13.19
EA: 10-0H04U1
(Previously 10-0H0400
and 10-0H5700)

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

Subject: Geotechnical Design Report

Introduction

Per your request, we are providing this Geotechnical Design Report (GDR) for State Highway 4 from KP 8.85 to KP 13.19 (PM 5.5/8.2), located approximately 17 km west of the city of Stockton in San Joaquin County, California. At this location, a project is proposed to improve the nonstandard horizontal curves on Highway 4 and widen the shoulders to standard width. A vicinity map (Plate No. 1) showing the project location is attached.

The Office of Geotechnical Design-North (GDN) has prepared this GDR based upon a literature review, a site reconnaissance and sampling program, and information extracted from the Preliminary Geotechnical Report (PGR) dated April 30, 2004. Extensive laboratory sampling was performed to assess the existing soils properties.

This report defines the geotechnical conditions as evaluated from field and laboratory test data, as well as previously developed works. This report provides recommendations for design and construction of the realigned embankment and evaluates alternatives and post-construction conditions.

Pertinent Reports and Investigations

In preparing this report, we have reviewed the following documents:

1. Microsoft Expedia Streets 98, 1988-1997
2. Topographic map, found at http://topozone.com/
3. Western Regional Climate Center for 1931-2003 (www.wrcc.dri.edu)
4. "Air Resources Board Map of California Showing Principal Asbestos Deposits",

prepared by the State of California

5. "California Seismic Hazard Map", prepared by Caltrans, dated 1996, rev. 1997
6. Geologic Map of California – San Francisco-San Jose Sheet , 1991
7. USDA Soil Survey-San Joaquin County, 1992
8. Foundation Investigation of Old River and Middle River Bridges, Caltrans, 1969
9. Preliminary Geotechnical Reports for EA's 0H5700 and 0H0400, Caltrans, 4/30/04

Existing Facilities and Proposed Improvements

Currently, Highway 4 is an elevated levee road consisting of a 2-lane asphalt highway with 3.6-meter lanes and 0 to 0.3-meter shoulders. Several buildings, along with above and below ground electrical and telephone utilities, were observed within the project area. In general, the condition of the existing road within the project limits showed signs of differential settlement. Undulations are common and severe road surface cracking was observed along the levee in areas where road resurfacing has not been performed recently.

The proposed project involves straightening the highway alignment and widening the shoulders to a standard width of 2.4 meters. The proposed alignment will consist of an import fill embankment with a maximum height of about 5 meters from the existing ground surface that will utilize the existing embankment in some areas and stand-alone in others.

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 characteristics to aid in preliminary project design and construction planning. The following is a discussion of our review:

Climate

Information regarding the climate in the project area is provided by the Western Regional Climate Center period of record from 1955 to 2003. The weather station closest to the site is located approximately 15 km to the south, at the Tracy Pumping Plant. The average annual precipitation is 310 mm (12.19 in). The majority of this precipitation (over 88 percent) falls between November and April. The average daily minimum air temperature ranges from 3.3° C (38.0° F) in January to 15.7° C (60.2° F) in July while the average daily maximum temperature ranges from 12.6° C (54.7° F) in January to 33.6.0° C (92.5° F). Freezing temperatures and snowfall are not common at the project site. Yearly updates

are available at the Western Regional Climate Center's web site.

Topography & Drainage

The site is located within the Sacramento Delta region. The terrain is flat with an elevation at about sea level. The localized drainage is generally channeled into irrigation ditches throughout the area. Plate No. 2 illustrates the sight topography.

Man-made and Natural Features of Engineering and Construction Significance

Man-made features that will be considered during geotechnical design include utility lines, existing embankments (Trapper Slough levee), and existing drainage ditches and conduits that may require extension. Natural features that will be considered during design are the existing soil types and ground water levels.

Regional Geology and Seismicity

The California Department of Conservation, Division of Mines and Geology Geologic Map of California, San Francisco-San Jose Sheet, 1991, was used to help determine the geologic formations at the project location. The existing material within the project location is classified as Dos Palos Alluvium of Holocene age. Bedrock is expected to be deep (>10m). Refer to Plate 3.

The State of California, Air Resources Board Map of California Showing Principal Asbestos Deposits was reviewed to determine whether asbestos deposits might be encountered in the project area. According to this map, the project site is not located in an area of naturally occurring asbestos.

The Department's California Seismic Hazard Map, 1997 revision, was also reviewed. The map indicates that the controlling fault is the Coast Ranges-Sierran Block fault. The fault is located approximately 24 km west of the project location and is expected to be capable of producing a Maximum Credible Earthquake (MCE) of magnitude 7.0. The MCE from this source is expected to produce peak bedrock acceleration on the order of 0.3 g at the project location.

Site Investigation and Local Geology

Information regarding the local soil conditions is derived from a soil sampling program performed by GDN between 1/24/06 and 1/31/06. This investigation involved the drilling

of eight boreholes ranging in depth of 9.6-m to 15.7-m. In order to maintain the most undisturbed soil samples, the hollow-stem auger method was used for drilling and the sampling was performed using Standard Penetration Tests (SPT) and Shelby tubes. Based on the results of the drilling and sampling program, the foundation soil in general consists of an upper layer of soft, saturated organic clay and peat to various depths ranging from 2.4-m to 4.9-m. Below the organic layer is a soft clay layer ranging in thickness from 0-m to 7.6-m. Below the clay is a fine sand containing traces of silt and clay. The water table was measured to be within 1 to 2-m of the ground surface. Locations of the boreholes are illustrated on Plate 4 and the boring logs are provided in Appendix A. Plate 5 illustrates the soils encountered during a shallow soil survey by the United States Department of Agriculture.

Laboratory Testing

As mentioned above, Shelby tube samples were retrieved from the boreholes at various depths. Shelby tube sampling was chosen since it offers the most undisturbed method of sampling at depth. The soil samples were tested to determine soil properties such as unit weight, moisture content, grain-size, Atterburg Limits, void ratios, and specific gravities. In addition, the engineering properties were obtained using consolidation and triaxial tests. These tests were performed to provide properties utilized in design for settlement and slope stability. A summary of the laboratory test results is included as Plate 6.

Geotechnical Recommendations

Settlement

As mentioned above, the foundation soils in the project area consist of varying thicknesses of peat and clay layers above a sand layer. These soil types exhibit significant settlement potential and low initial shear strength, especially since they are of a soft consistency. Table 1 summarizes the settlement magnitudes at various locations throughout the project based upon laboratory results, published and internal reports, and settlement calculations using the FHWA computer program FoSSA 1.0 using values shown in Plate 7.

TABLE 1 - Summary of Calculated Results

Stations	Estimated Settlement (m) Elastic (immediate)	Ultimate (primary)	Creep (secondary)	Time needed for 90% ultimate consolidation (days) no surcharge	with 1.5 m surcharge	% time saved with surcharge
12+30	0.10	1.37	0.10	180	100	44
15+00	0.10	1.58	0.21	600	450	25
17+00	0.09	1.10	0.17	2100	1000	52
18+40	0.10	1.62	0.11	100	90	10
21+60	0.12	1.28	0.25	250	150	40
25+20	0.12	1.16	0.22	350	200	43
34+90	0.11	1.89	0.30	1400	900	36
48+60	0.13	1.71	0.21	670	520	22

As shown in Table 1, settlement will be significant throughout the project length. The elastic settlement is expected to occur during the loading process, the ultimate settlement will occur during the loading and waiting period, and creep is expected to occur for many years after construction is complete. This Office recommends the following:

- Provide a drainage blanket layer under the new embankment footprint. Place a filter fabric on the existing ground, followed by a 760 mm layer of Class 1 permeable material. The construction should take place so that equipment does not disturb the existing ground by applying the permeable material ahead of the equipment and not compacting this layer. This will allow for excess pore water to escape from the foundation during loading and maintain the strength of the original ground. Since a trench is incorporated into the design along the south edge of the embankment, no additional drainage pipes will be necessary to aid in draining the foundation.

- Restrict the loading of the embankment to 305 mm per week after the drainage blanket is applied. This will allow time for dissipation of pore pressures, thereby increasing the shear strength of the foundation soil and reducing any chance of bearing capacity failure.

- Above the drainage blanket, place a layer of geosynthetic reinforcing fabric. The geotextile will lessen the chance of circular slip failures and hold the fill together as the foundation consolidates, reducing cracking at the surface.

- Apply 2.0 meters of fill as a surcharge to accelerate the ultimate settlement. According to the calculations, the surcharge will reduce the waiting period by about 35% on average. As shown in Table 1, the calculated time required to achieve 90% ultimate consolidation varies significantly from 90 to 1000 days. These variances are dependant upon the thickness of soft soil layers, their properties, fill heights, and relation to previously consolidated soil under the existing embankment. Based on past experiences in the Delta region, settlement occurs more rapidly than calculated due to sand lenses and organic fibers within the clay. The waiting period is therefore estimated to be approximately 24 months from the time the surcharge is fully applied to removal and final grading. The settlement must be monitored to assure that primary consolidation is 90% complete before any surcharge is removed. Geotechnical Design-North should be contacted to evaluate the instrumentation data and determine additional surcharging and may impart additional studies utilizing drilling or Cone Penetration Testing. Compaction of the surcharge is recommended, as some to most of the surcharge will remain after the settlement period has taken place as part of the final embankment.

- Since the thickness of the various compressible layers vary throughout the project, as well as the fill being applied adjacent to and on existing embankments that have already experienced consolidation, differential settlement will take place. It will be of importance to instrument the embankment and monitor settlement and pore pressures throughout the construction and waiting period and adjust estimated settlements and waiting periods as the job progresses. It is recommended to install settlement platforms, piezometers and slope inclinometers every 500 meters. The information from these measuring devices should be collected weekly to assure pore pressures are dissipating and refine settlements and waiting periods. In addition, the elevation of survey alignment stakes should be checked weekly for bulging at the toe. It is advised that the instrumentation and monitoring be part of the construction contract and that the contractor is responsible to report the results within 24 hours of taking measurements. The Geotechnical Instrumentation Branch should be contacted to establish a testing program. The figure on Plate 8 illustrates the above recommendations.

Wick drains are not expected to be beneficial to this project and are therefore not recommended. According to calculations, wick drains will only slightly reduce the consolidation time of the lower clay layer and have no effect on the upper organic layer.

Lightweight Fill Alternative

Lightweight fill is not recommended at this time, but is discussed here to address why it is not recommended. In areas where the new embankment is in complete contact with the existing, lightweight fill may be used to reduce stresses imparted on the existing embankment. The benefit of this alternative is that the existing road will be in service and require less maintenance as the construction takes place and placement requires less effort. The areas considered for lightweight fill are from Station 10+00 to 11+40, 13+20 to 19+40, 27+00 to 35+20, and 51+00 to 52+40. In these areas, wood fiber can be used in lieu of traditional fill to lessen the impact of settlement on the existing embankment. The moist density of this fill ranges from 45 to 60 pounds per cubic foot, about half of traditional fill. The vertical subgrade reaction is approximately 9 to 10 MPa, with a CBR value of about 1. According to FHWA research, wood fiber fills have a very long design life when kept free from repeated wetting and drying cycles. Therefore, a minimum soil cover of 0.6 meters is required to protect the wood fibers and reduce the resiliency of the fill. Based on settlement calculations, use of this lightweight fill will reduce overall settlement by approximately 30 to 50% depending on the height of the embankment. However, using this lightweight fill is not recommended at this time due to the limits of the benefits and possibility of degradation due to wetting and drying. Also, the impact on a wood fiber embankment due to flooding from irrigation or levee failure must be studied further. The use of shredded tires as lightweight fill was also researched but is not permitted in this area due to exothermic reaction and leachate concerns. A letter explaining this condition is attached in the Appendix.

Slope Stability

As mentioned above, the existing foundation soils have inherent low shear strength. For this reason, controlled loading at a rate of 305 mm per week is recommended in order to allow pore pressures to dissipate. Piezometers should be installed at various depths throughout the project at 500 meter horizontal spacing to monitor the pressures. We recommend using automated data collectors at each of these locations wired to piezometers spaced every 1.5 meters vertically and terminate near the bottom of the lower clay layer as shown on the boring logs.

Creep Settlement

Secondary settlement, or creep, is expected to occur on the order of 100 to 300 mm over a period of about 50 years. This type of settlement has been observed along the current

alignment and poses maintenance challenges throughout the life of the road. The pavement design section should be made aware of this post-construction movement to incorporate flexible asphalt, thicker structural sections, and/or geosynthetics into the design.

Ground Improvement Alternatives

Improving the existing foundation soils to reduce long-term settlements and increase strength can be accomplished by installing stone columns, installing piles, jet grouting, or deep soil mixing. These improvements are typically cost prohibitive for projects of this extent, but may be considered to reduce overall settlement amounts and consolidation time, thereby reducing the cost of additional fill. Assuming that fill material will be reduced by 1 meter over the project length at $20/cubic meter, the savings in imported fill will be approximately $3 million. These ground improvements can also reduce post-construction creep movement that will impact future maintenance costs. Note that the costs displayed in Table 2 below are from a 2001 FWHA manual and costs may be significantly different depending upon local experience and availability of materials. If one of these techniques is desirable, this Office should be contacted for a more detailed design.

Table 2

Improvement Method	Unit cost*	Preliminary quantity	Estimated cost
Stone Columns	$600/column	1700 to 3800	$10 to $23 million
Vibro Concrete Columns	$750/column	1700 to 3800	$13 to $29 million
Deep Soil Mixing (lime columns)	$60/cubic m	1.5 million cubic m	$91 million
Jet Grouting	$200/cubic m treated	760000 cubic m	$152 million

*Cost estimates from FHWA-SA-98-086R, Ground Improvement Technical Summaries, 2001
Assume project footprint of 35mx4340m with a treated depth of 10 m.
Assumed spacing of reinforcing columns is 2 to 3 m.

Project Information

Standard Special Provision 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. None

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

A. *Geotechnical Design Report for EA: 10-0H04U1 dated 5/25/2006*

Data and Information available for inspection at the District Office:

A. *None*

Data and Information available for inspection at the Transportation Laboratory are:

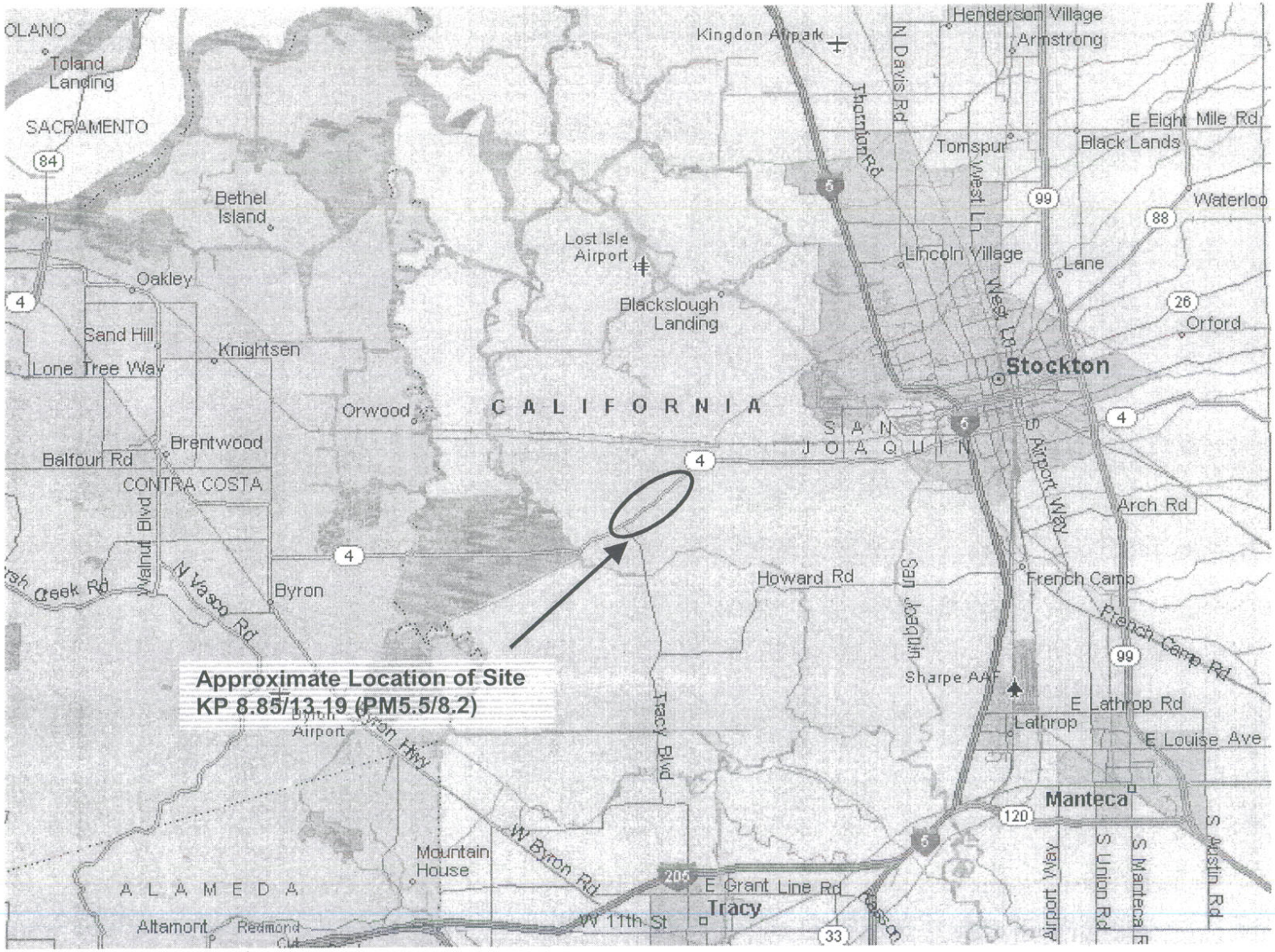
A. None

The recommendations contained in this report are based on specific project information regarding embankment dimensions and locations that have been provided by your Office. If any conceptual changes are made during final design, the Office of Geotechnical Design-North should review those changes to determine if these foundation recommendations still apply. If you have any questions regarding this report, please contact John Huang at 916-227-7237.

ERIC MCGRATH, P.E.
Transportation Engineer – Civil
Geotechnical Design – North

Attachments:
Plate 1: Vicinity Map
Plate 2: Topographic Map
Plate 3: Geologic Map
Plate 4: Boring Locations
Plate 5: Soil Map
Plate 6: Laboratory Test Summary
Plate 7: Idealized Sections Used for Settlement Analysis
Plate 8: Typical Instrumented Cross-section
Appendix A: Boring Logs
Appendix B: Letter to California Waste Management Board pertaining to use of shredded tires

c:QiangHuang,RonSekhon(ecopy),GDNFile



CALTRANS
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

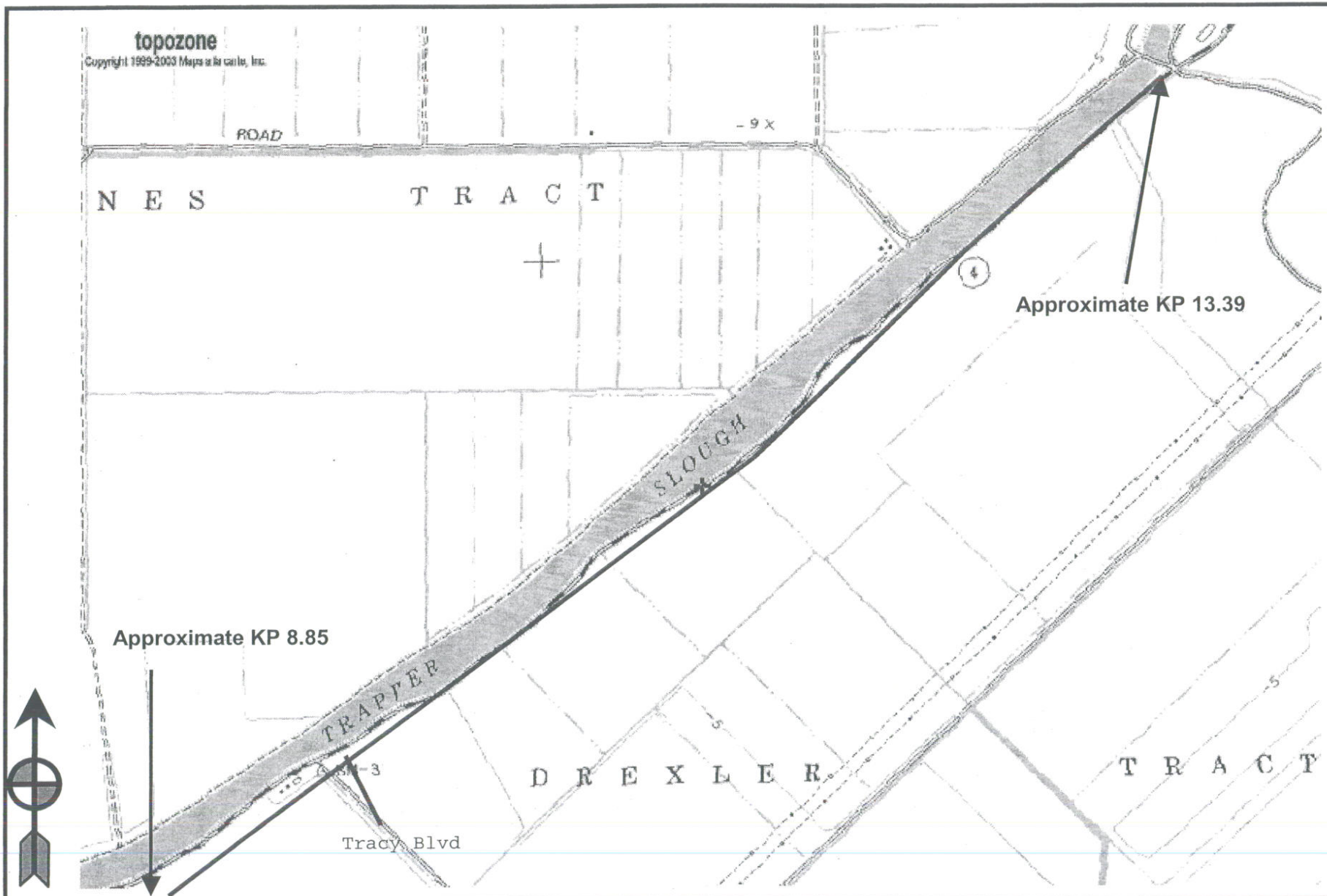
EA: 10-0H04U1

Date: May 2006

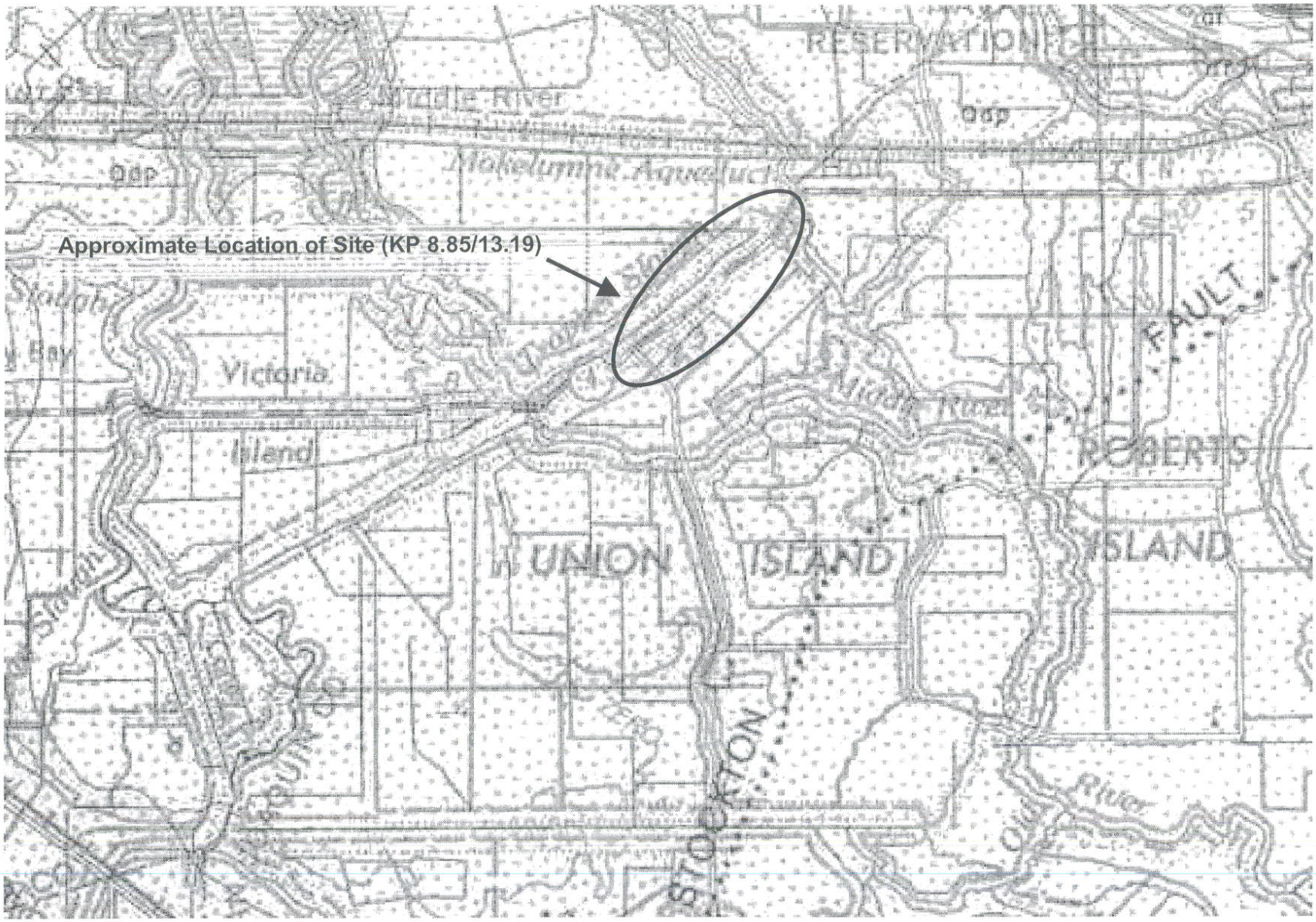
VICINITY MAP

Plate No. 1

10-SJ-4 KP 8.85/13.19 (PM 5.5/8.2)
GEOTECHNICAL DESIGN REPORT



CALTRANS Division of Engineering Services Geotechnical Services Office of Geotechnical Design - North	EA: 10-0H04U1 Date: May 2006	**TOPOGRAPHIC MAP**	Plate No. 2
		10-SJ-4 KP 8.85/13.39 (PM 5.5/8.2) GEOTECHNICAL DESIGN REPORT	



CALTRANS
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

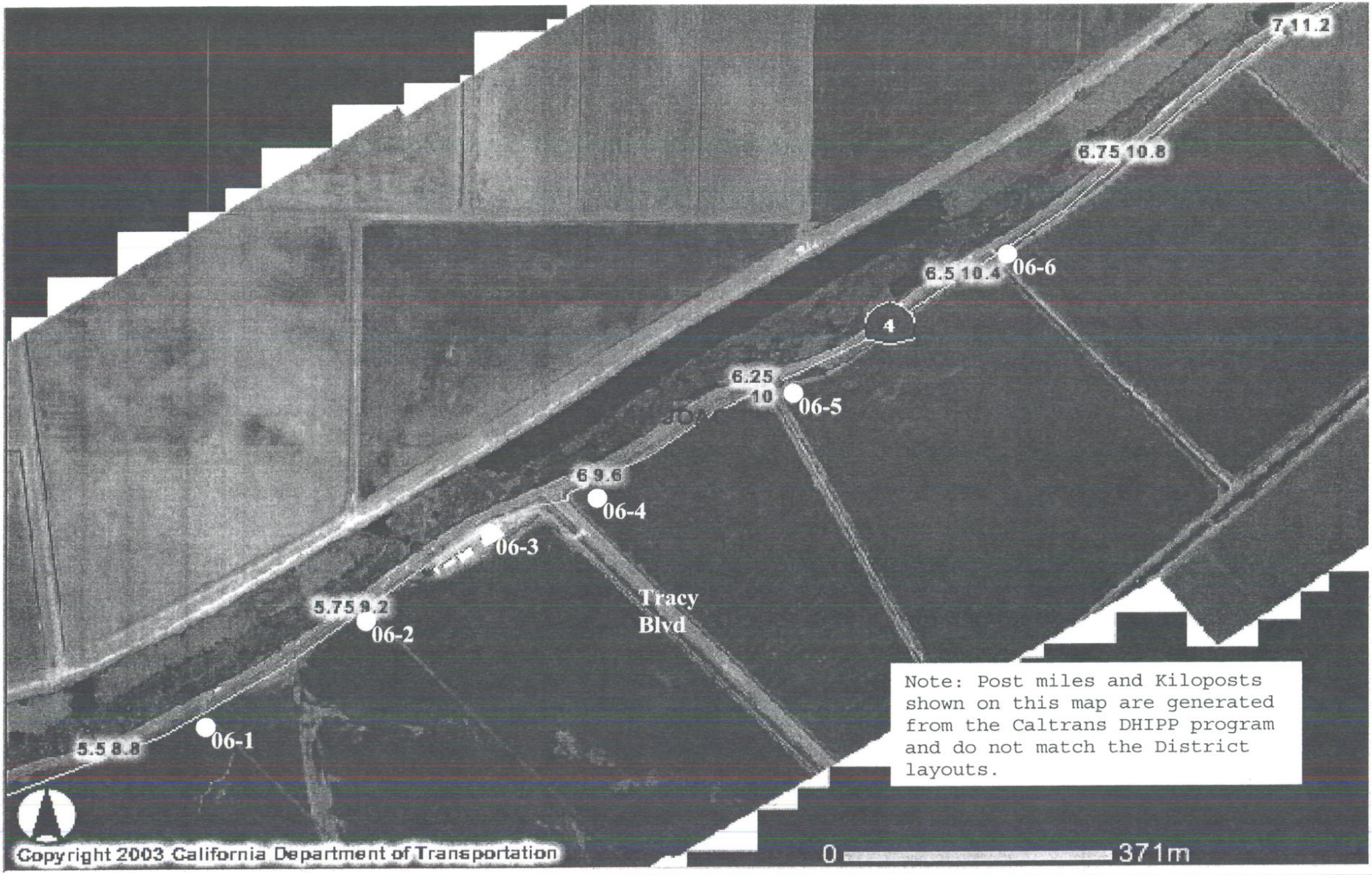
EA: 10-0H04U1

Date: May 2006

Geologic Map

Plate No. 3

10-SJ-4 KP8.85/13.19 (PM 5.5/8.2)
GEOTECHNICAL DESIGN REPORT



CALTRANS
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

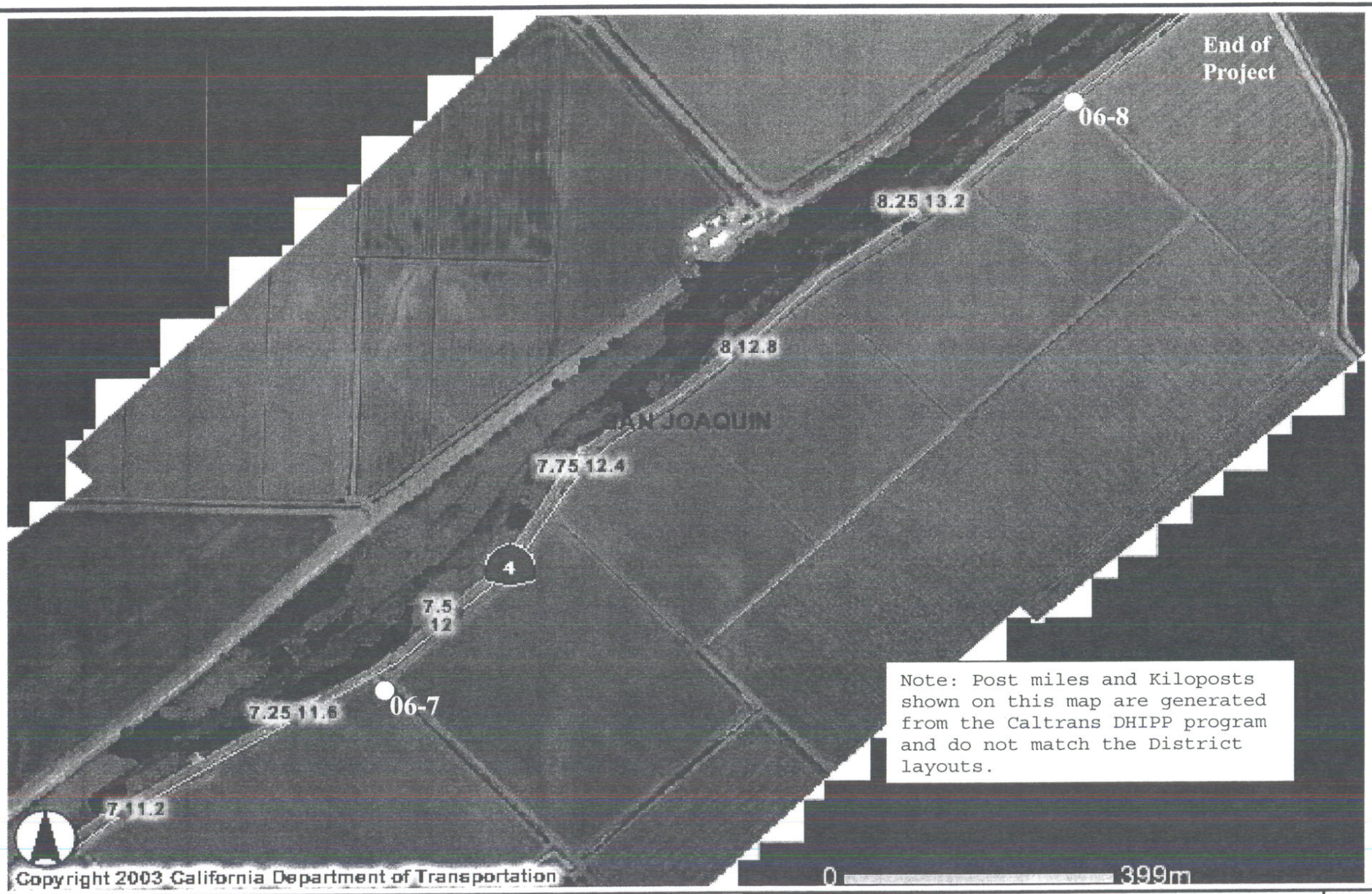
EA: 10-0H04U1

Date: May 2006

Soil Boring Location Map

Plate No. 4A

10-SJ-4 KP8.85/13.19 (PM 5.5/8.2)
GEOTECHNICAL DESIGN REPORT



CALTRANS
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

EA: 10-0H04U1

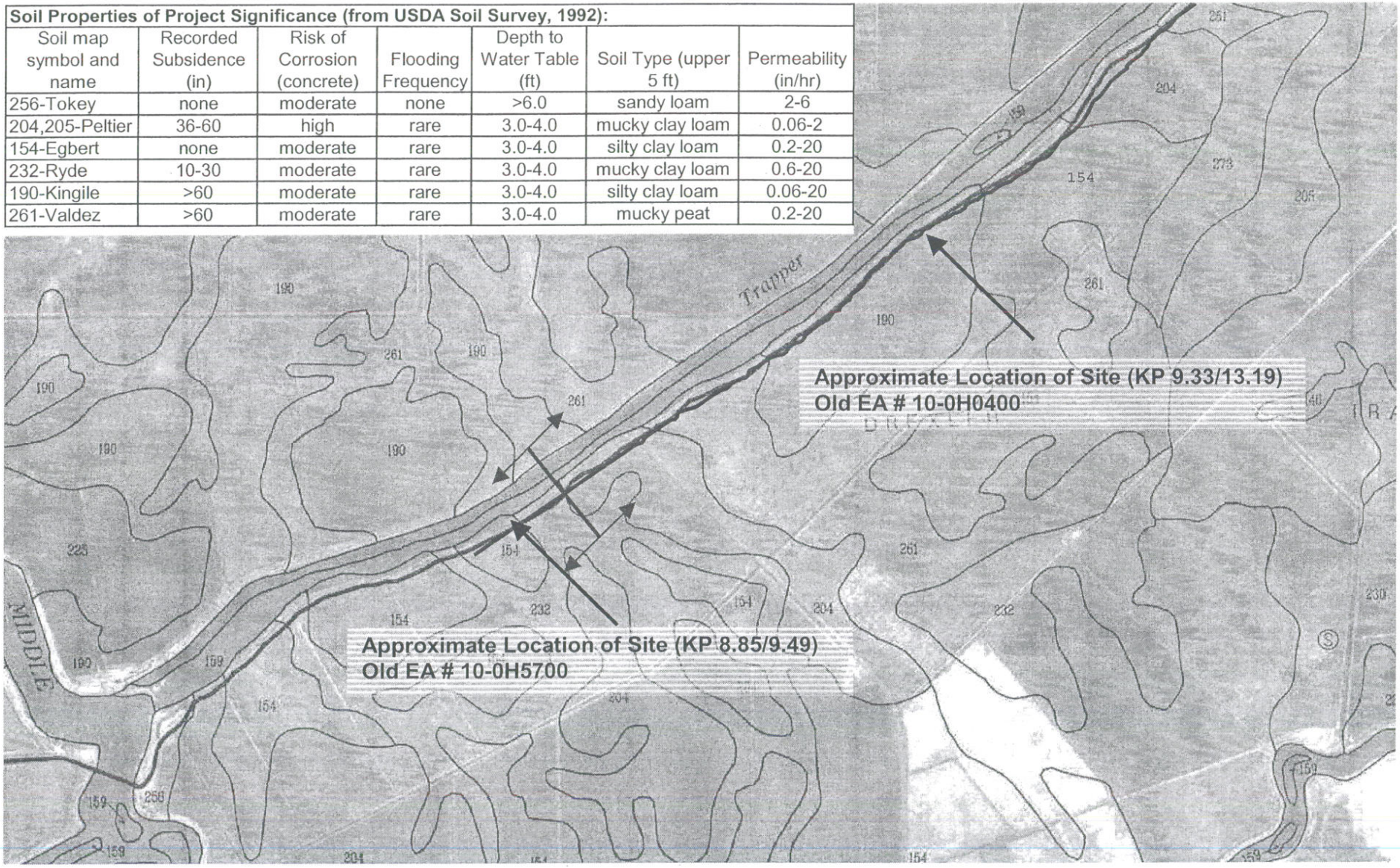
Date: May 2006

Soil Boring Location Map

Plate No. 4B

10-SJ-4 KP8.85/13.19 (PM 5.5/8.2)
GEOTECHNICAL DESIGN REPORT

Soil Properties of Project Significance (from USDA Soil Survey, 1992):						
Soil map symbol and name	Recorded Subsidence (in)	Risk of Corrosion (concrete)	Flooding Frequency	Depth to Water Table (ft)	Soil Type (upper 5 ft)	Permeability (in/hr)
256-Tokey	none	moderate	none	>6.0	sandy loam	2-6
204,205-Peltier	36-60	high	rare	3.0-4.0	mucky clay loam	0.06-2
154-Egbert	none	moderate	rare	3.0-4.0	silty clay loam	0.2-20
232-Ryde	10-30	moderate	rare	3.0-4.0	mucky clay loam	0.6-20
190-Kingile	>60	moderate	rare	3.0-4.0	silty clay loam	0.06-20
261-Valdez	>60	moderate	rare	3.0-4.0	mucky peat	0.2-20



CALTRANS
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

EA: 10-0H04U1

Date: May 2006

SOIL MAP

Plate No. 5

10-SJ-4 KP 8.85/13.19 (PM 5.5/8.2)
GEOTECHNICAL DESIGN REPORT

SOIL LABORATORY TEST SUMMARY

Boring	Depth (ft)	Test	Lab Description	%m	Dry Unit Weight (lb/cuft)	Wet Unit Weight (lb/cuft)	Initial Void Ratio	LL	Gs	Cohesion Cu (kPa)	phi angle	Avg. Cv (in/s)
06-1-1	5	Density	black peaty clay	60	61	97.6	1.6		2.53			
06-2-1	5	UU	gray organic silty clay	50.7	70.4	106.1	1.4			51		2.80E-03
06-5-1	5	consol	dark gray organic clay	31.9	81.7	107.8	1.01		2.62			2.00E-03
06-6-1	5	consol	black silt w/ peat	26.1	79	99.6	0.94		2.46			1.14E-03
06-7-1	5	consol	dark brown silt w/ peat	73.9	49.4	85.9	2.02		2.39			1.00E-03
06-8-1	5	consol	brown organic clay	44.6	68.6	99.2	1.28		2.51			3.00E-03
06-3-1	10A	consol	black peaty clay	171.5	28.4	77.0	3.5				25	3.90E-05
06-3-1	10B	consol	black peaty clay	251.9	20.0	70.5	5.4	NP				7.89E-05
06-4-2	10	MA	gray sand	32.3	91.4	120.9			2.72			
06-5-2	10	UU	gray organic silty clay	38.6	82.8	114.8	1.07		2.75	29.7		
06-6-2	10	AL	black peaty clay	30.5				28				
06-8-2	10	AL	silty clay	55.8				45				
06-1-3	15	consol	clayey sand	18.4	109.1	129.2	0.55		2.7			6.00E-04
06-2-2	15	Density	gray organic clay	58.3	62.3	98.6			2.57			
06-3-3	15	Density	sandy clay	25.2								
06-6-3	15	UU	dark gray silty clay w/ sand	35.3	86.2	116.6	0.99			27	28	
06-5-3	15	consol	gray lean clay with sand	34.9	86.9	117.1	0.97					1.21E-05
06-7-3	15	MA	clayey sand	23.0								
06-8-3	15	consol	silt w/clay & organics	32.8	89.6	119.0	0.91		2.75			2.00E-03
06-1-4	20	Density	gray clayey sand	27.0	96.9	123.1						
06-2-3	20	MA	sandy clay	25.2	96.4	120.7			2.67			
06-5-4	20	consol	silt w/ peat	19.0	105.8	125.9	0.61		2.73			9.00E-03
06-6-4	20	CU/AL	gray clay with silt	24.7	100.5	125.3	0.71	31		64	36	
06-7-4	20	consol	gray silt w/ clay	27.2	97.8	124.4	0.76		2.76			2.50E-04
06-2-4	20	consol	blue gray sandy lean clay	24.4	101.3	126.0	0.7					1.30E-05
06-8-4	20	consol	gray silt w/ clay	32.0	90.6	119.6	0.89		2.74			2.50E-04
06-7-5	25	consol	lean clay	32.0	90.6	119.5	0.88					1.36E-04
06-5-5	25	consol	gray lean clay	26.9	97.9	124.2	0.74		2.72			9.50E-03
06-6-5	25	consol	gray silt w/ clay	24.0	102.7	127.3	0.66		2.73			6.00E-04
06-5-6	30	consol	gray lean clay	27.6	96.7	123.4	0.77					9.53E-04
06-7-6	30	UU	reddish brown lean clay	24.9	100.2	125.1	0.71			38		
06-5-7	35	consol	olive brown clay w/silt	29.3	94.2	121.8	0.81		2.74			
06-2-6	35	MA	gray sand	26	99.4	125.2			2.74			

consol=consolidation test
UU=unconsolidated undrained triaxial test
CU=consolidated undrained triaxial test

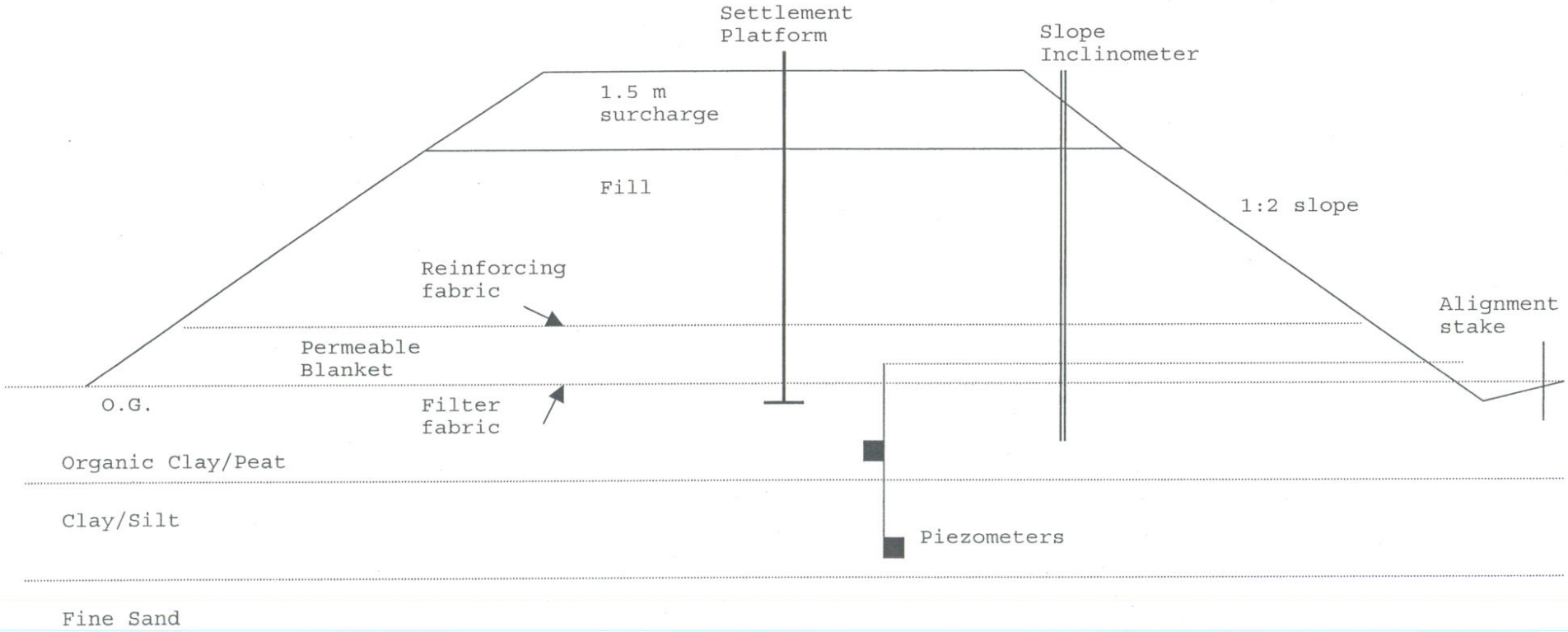
MA=mechanical analysis
Density=unit weight and moisture test
AL=Atterburg Limits

LL=Liquid Limit
Gs=Specific Gravity
Cv=Coefficient of Consolidation

	Boring #	06-1	06-2	06-3	06-4	06-5	06-6	06-7	06-8
	Station	12+30	15+00	17+00	18+40	21+60	25+20	34+90	48+60
1. Organic Clay/Peat/Silt	Layer 1 Thickness (ft)	11	15	16	8	13	15	11	9
	C (lb/sqft)	50	50	50	50	50	50	50	50
	Phi	20	20	21	21	22	22	23	23
	in-situ unit weight (lb/cuft)	98	100	80	100	108	100	90	99
	Cc	.71	.80	1.3	0.7	.45	0.49	1.2	0.75
	Cr	0.06	0.06	0.10	0.06	0.04	0.04	0.12	0.075
	Eo	1.6	1.4	3.5	1.1	1.0	1.0	2.0	1.3
	Cv	0.6	0.6	0.1	0.6	0.6	0.6	0.6	0.6
2. Clay/Silt	Layer 2 thickness	0	7.5	5	6	25	16	25	16
	C	0	300	300	300	300	300	300	300
	Phi	0	29	29	29	29	29	29	29
	unit weight	0	124	125	125	123	125	125	119
	Cc	0	0.47	0.3	0.35	0.4	0.38	0.42	0.48
	Cr	0	0.047	0.03	0.035	0.04	0.038	0.042	0.048
	Eo	0	0.7	0.8	0.8	0.9	0.7	0.8	0.9
3. Sand	Cv	0	.08	.08	.08	.6	.3	.1	.08
	Layer 3 thickness	30	30	30	30	30	30	30	30
	c	0	0	0	0	0	0	0	0
	phi	34	34	34	34	34	34	34	34
	unit weight	125	125	125	125	125	125	125	125

Note: Values are in English units

No Scale



CALTRANS
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

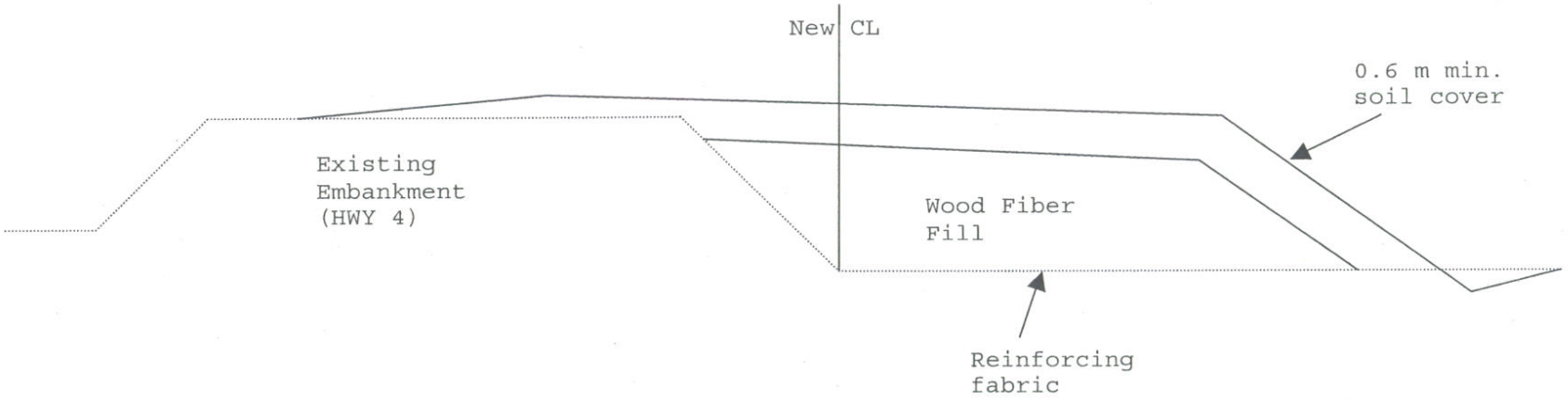
EA: 10-0H04U1

Date: May 2006

Typical Instrumented Cross Section

Plate
No. 8

10-SJ-4 KP 8.85/13.19 (PM 5.5/8.2)
GEOTECHNICAL DESIGN REPORT



CALTRANS
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

EA: 10-0H04U1

Date: May 2006

Lightweight Fill Cross Section

Plate No. 9

10-SJ-4 KP 8.85/13.19 (PM 5.5/8.2)
GEOTECHNICAL DESIGN REPORT

GRAPHIC SYMBOLS


Bulk Sample


Rock Core


Modified California Sampler


Standard Penetration Sampler


Shelby Tube


Vane Shear


Auger


Diamond Core


Rotary


California Sampler


Water Level - 1st Reading

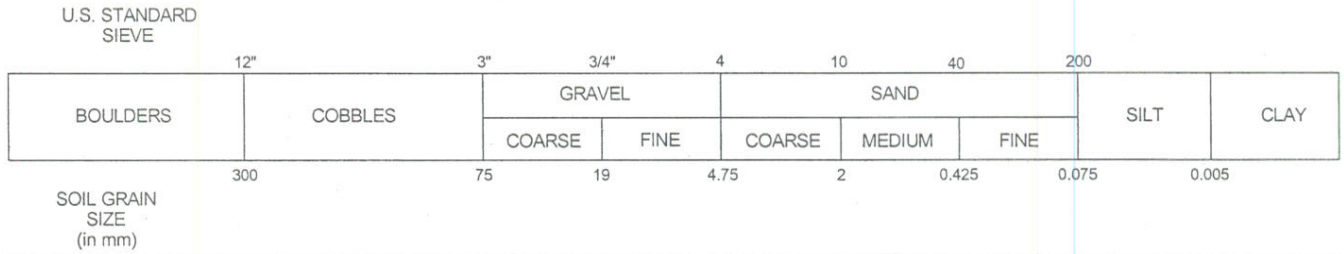

Water Level - 2nd Reading


Water Level - 3rd Reading

TESTING

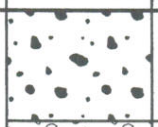
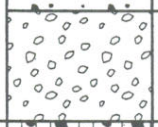
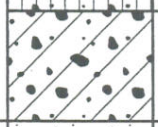
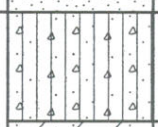
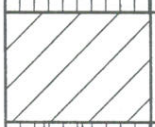
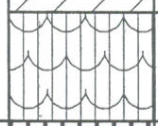
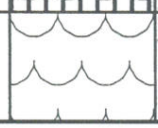
CONS	Consolidation (Cal Test 219)	RQD	Rock Quality Designation (ASTM D6032)
UU	Unconsolidated Undrained Triaxial (Cal Test 230)	CP	Compaction Test (Cal Test 216)
CU	Consolidated Undrained Triaxial (Cal Test 230)	PERM	Permeability (Cal Test 220)
DS	Direct Shear (ASTM D3080)	COR	Corrosivity Testing (Cal Test 532/643)
UC	Unconfined Compression (Cal Test 221)	GRAD	Gradation Analysis (Cal Tests 202/203)
LL	Liquid Limit-% (Cal Test 204)	EP	Expansion Pressure (Cal Test 354)
PI	Plasticity Index-% (Cal Test 204)	OC	Organic Content-% (ASTM D2974)
PP	Pocket Penetrometer	SE	Sand Equivalent (Cal Test 217)
TV	Pocket Torvane		

SOIL GRAIN SIZE



GENERAL NOTES

1. Logs represent general subsurface conditions observed at the point of exploration on the date indicated.
2. In general, USCS designations presented on logs were established by visual methods only; therefore, actual designations (based on laboratory tests) may vary.
3. No warranty is provided as to the continuity of soil conditions between individual sample locations.
4. Lines separating strata on the logs represent approximate boundaries only; actual transitions may be different or gradual.
5. Pocket penetrometer values reported on the logs under shear strength are actual values as recorded in the field. (To be used in analysis, the pocket penetrometer value should be divided by two)

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				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
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

Equipment:	Station/KP:	Boring ID.:
CS 2000 (track)	~12+30	06-1
Hammer:	**Offset Distance/Line:**	**Date Completed:**
Safety semi-automatic drop (140#/ 30")	~0/CL	1-31-06
Drilling Method:	**North/East:**	**Hole Diameter:**
6-inch hollow stem auger	0.0m / 0.0m	
Sampling Method:	**Ground Surface Elevation:**	**Total Depth:**
Shelby, SPT	~0.0m	9.6m
Notes:	**~Depth to GW/date measured:**	**Logged By:**
		Eric McGrath

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	Graphic Log	Description	Sample Type	Sample Number	Sample Blows	Blows per Foot	Recovery (%)	RQD (%)	w/c (%)	Dry Density (kN/m³)	Shear Strength (kPa)	Drilling Method/ Casing	Remarks
				PEAT (OL): black, wet, low plasticity.											
-0.30	0.30	1													
-0.61	0.61	2													
-0.91	0.91	3													
-1.22	1.22	4													
-1.52	1.52	5													
						1			100		60.0	9.6			14.9% organic content
-1.83	1.83	6													
-2.13	2.13	7													
-2.44	2.44	8													
-2.74	2.74	9													
-3.05	3.05	10													
						2			0						
-3.35	3.35	11		CLAYEY SAND (SC): very loose, bluish gray, wet, nonplastic.											
-3.66	3.66	12													
-3.96	3.96	13													
-4.27	4.27	14													
-4.57	4.57	15													
						3			100		18.4	17.1			
-4.88	4.88	16													
-5.18	5.18	17													
-5.49	5.49	18													
-5.79	5.79	19													
-6.10	6.10	20													

(continued)

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	Graphic Log	Description	Sample Type	Sample Number	Sample Blows	Blows per Foot	Recovery (%)	RQD (%)	w/c (%)	Dry Density (kN/m³)	Shear Strength (kPa)	Drilling Method/ Casing	Remarks
				CLAYEY SAND (SC): very loose, bluish gray, wet, nonplastic. *(continued)*		4	0 2 5	7	100		27.0	15.2			
-6.40	6.40	21		becomes loose.											
-6.71	6.71	22													
-7.01	7.01	23													
-7.32	7.32	24													
-7.62	7.62	25													
				becomes v. loose.		5	0 0 0	0	0						
-7.92	7.92	26													
-8.23	8.23	27													
-8.53	8.53	28													
-8.84	8.84	29													
-9.14	9.14	30													
				becomes m. dense.		6	3 6 10	16	100						
-9.45	9.45	31													
-9.75	9.75	32		Bottom of Hole at 9.60 m (31.5 ft) on 1-31-06											
-10.06	10.06	33													
-10.36	10.36	34													
-10.67	10.67	35													
-10.97	10.97	36													
-11.28	11.28	37													
-11.58	11.58	38													
-11.89	11.89	39													
-12.19	12.19	40													
-12.50	12.50	41													
-12.80	12.80	42													
-13.11	13.11	43													
-13.41	13.41	44													

Equipment:	Station/KP:	Boring ID.:
CS 2000 (track)	~15+00	06-2
Hammer:	**Offset Distance/Line:**	**Date Completed:**
Safety semi-automatic drop (140#/ 30")	~12Rt./CL	1-24-06
Drilling Method:	**North/East:**	**Hole Diameter:**
6-inch hollow stem auger	0.0m / 30.5m	
Sampling Method:	**Ground Surface Elevation:**	**Total Depth:**
Shelby, SPT	~0.0m	14.2m
Notes:	**~Depth to GW/date measured:**	**Logged By:**
	1.8m on 1-24-06	Eric McGrath

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	Graphic Log	Description	Sample Type	Sample Number	Sample Blows	Blows per Foot	Recovery (%)	RQD (%)	w/c (%)	Dry Density (kN/m³)	Shear Strength (kPa)	Drilling Method/ Casing	Remarks
0.00	0.00	0		ORGANIC CLAY (OL): very soft, dark gray, wet, low plasticity.											
-0.30	0.30	1													
-0.61	0.61	2													
-0.91	0.91	3													
-1.22	1.22	4													
-1.52	1.52	5													
-1.83	1.83	6				1			100		50.7	11.1			
-2.13	2.13	7													
-2.44	2.44	8													
-2.74	2.74	9													
-3.05	3.05	10													
-3.35	3.35	11				2			100		58.3	9.8			7% Organic content
-3.66	3.66	12													
-3.96	3.96	13													
-4.27	4.27	14													
-4.57	4.57	15													
-4.88	4.88	16		SANDY lean CLAY (CL): soft, bluish gray, wet, low plasticity.		3			100		25.2	15.2			
-5.18	5.18	17													
-5.49	5.49	18													
-5.79	5.79	19													
-6.10	6.10	20													

(continued)

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	Graphic Log	Description	Sample Type	Sample Number	Sample Blows	Blows per Foot	Recovery (%)	RQD (%)	w/c (%)	Dry Density (kN/m^3)	Shear Strength (kPa)	Drilling Method/ Casing	Remarks
				SANDY lean CLAY (CL): soft, bluish gray, wet, low plasticity. *(continued)*		4			100		24.4	15.9			
-6.40	6.40	21													
-6.71	6.71	22													
-7.01	7.01	23		Poorly graded SAND (SP): medium dense, bluish gray, wet, fine sand, trace of clay.											
-7.32	7.32	24													
-7.62	7.62	25				5			100						
-7.92	7.92	26													
-8.23	8.23	27													
-8.53	8.53	28													
-8.84	8.84	29													
-9.14	9.14	30				6	4 5 8	13	100		26.0	15.6			
-9.45	9.45	31													
-9.75	9.75	32													
-10.06	10.06	33													
-10.36	10.36	34													
-10.67	10.67	35				7	4 10 16	26	100						
-10.97	10.97	36													
-11.28	11.28	37													
-11.58	11.58	38													
-11.89	11.89	39													
-12.19	12.19	40				8	5 11 18	29	100						
-12.50	12.50	41													
-12.80	12.80	42													
-13.11	13.11	43													
-13.41	13.41	44													

(continued)

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	Graphic Log	Description	Sample Type	Sample Number	Sample Blows	Blows per Foot	Recovery (%)	RQD (%)	w/c (%)	Dry Density (kN/m³)	Shear Strength (kPa)	Drilling Method/ Casing	Remarks
-13.72	13.72	45		Poorly graded SAND (SP): medium dense, bluish gray, wet, fine sand, trace of clay. *(continued)*											
						9	8	37	100						
-14.02	14.02	46					13								
							24								
-14.33	14.33	47		Bottom of Hole at 14.17 m (46.5 ft) on 1-24-06											
-14.63	14.63	48													
-14.94	14.94	49													
-15.24	15.24	50													
-15.54	15.54	51													
-15.85	15.85	52													
-16.15	16.15	53													
-16.46	16.46	54													
-16.76	16.76	55													
-17.07	17.07	56													
-17.37	17.37	57													
-17.68	17.68	58													
-17.98	17.98	59													
-18.29	18.29	60													
-18.59	18.59	61													
-18.90	18.90	62													
-19.20	19.20	63													
-19.51	19.51	64													
-19.81	19.81	65													
-20.12	20.12	66													
-20.42	20.42	67													
-20.73	20.73	68													
-21.03	21.03	69													

Equipment:	Station/KP:	Boring ID.:
CS 2000 (track)	~17+00	06-3
Hammer:	**Offset Distance/Line:**	**Date Completed:**
Safety semi-automatic drop (140#/ 30")	~10Rt./CL	1-31-06
Drilling Method:	**North/East:**	**Hole Diameter:**
6-inch hollow stem auger	0.0m / 61.0m	
Sampling Method:	**Ground Surface Elevation:**	**Total Depth:**
Shelby, SPT	~0.0m	11.1m
Notes:	**~Depth to GW/date measured:**	**Logged By:**
		Eric McGrath

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	Graphic Log	Description	Sample Type	Sample Number	Sample Blows	Blows per Foot	Recovery (%)	RQD (%)	w/c (%)	Dry Density (kN/m³)	Shear Strength (kPa)	Drilling Method/ Casing	Remarks
				ASPHALT CONCRETE											
-0.30	0.30	1		PEAT (OL): very soft, black, wet, nonplastic, trace of fine sand.											
-0.61	0.61	2													
-0.91	0.91	3													
-1.22	1.22	4													
-1.52	1.52	5													
-1.83	1.83	6													
-2.13	2.13	7													
-2.44	2.44	8													
-2.74	2.74	9													
-3.05	3.05	10													
-3.35	3.35	11				1			100		228.2	3.4			
-3.66	3.66	12													
-3.96	3.96	13													
-4.27	4.27	14													
-4.57	4.57	15													
-4.88	4.88	16				2	0 0 0	0	100						
-5.18	5.18	17		Lean CLAY (CL): very soft, bluish gray, moist, medium plasticity.											
-5.49	5.49	18													
-5.79	5.79	19													
-6.10	6.10	20													

(continued)

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	Graphic Log	Description	Sample Type	Sample Number	Sample Blows	Blows per Foot	Recovery (%)	RQD (%)	w/c (%)	Dry Density (kN/m³)	Shear Strength (kPa)	Drilling Method/ Casing	Remarks
				Lean CLAY (CL): very soft, bluish gray, moist, medium plasticity. *(continued)*		3			100		25.2				
-6.40	6.40	21		Poorly graded SAND (SP): loose, bluish gray, moist, fine to medium sand.											
-6.71	6.71	22													
-7.01	7.01	23													
-7.32	7.32	24													
-7.62	7.62	25													
-7.92	7.92	26				4	1 3 7	10	100						
-8.23	8.23	27													
-8.53	8.53	28													
-8.84	8.84	29													
-9.14	9.14	30													
-9.45	9.45	31				5	0 0 3	3	0						
-9.75	9.75	32													
-10.06	10.06	33													
-10.36	10.36	34													
-10.67	10.67	35													
-10.97	10.97	36				6	1 4 8	12	100						
-11.28	11.28	37		Bottom of Hole at 11.13 m (36.5 ft) on 1-31-06											
-11.58	11.58	38													
-11.89	11.89	39													
-12.19	12.19	40													
-12.50	12.50	41													
-12.80	12.80	42													
-13.11	13.11	43													
-13.41	13.41	44													

Equipment:	Station/KP:	Boring ID.:
CS 2000 (track)	~18+40	06-4
Hammer:	**Offset Distance/Line:**	**Date Completed:**
Safety semi-automatic drop (140#/ 30")	~12Rt./CL	1-30-06
Drilling Method:	**North/East:**	**Hole Diameter:**
6-inch hollow stem auger	0.0m / 91.4m	
Sampling Method:	**Ground Surface Elevation:**	**Total Depth:**
Shelby, SPT	~0.0m	11.1m
Notes:	**~Depth to GW/date measured:**	**Logged By:**
	1.8m on 1-30-06	Eric McGrath

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	Graphic Log	Description	Sample Type	Sample Number	Sample Blows	Blows per Foot	Recovery (%)	RQD (%)	w/c (%)	Dry Density (kN/m³)	Shear Strength (kPa)	Drilling Method/ Casing	Remarks
				ORGANIC CLAY (OL): very soft, dark gray, wet.											
-0.30	0.30	1													
-0.61	0.61	2													
-0.91	0.91	3													
-1.22	1.22	4													
-1.52	1.52	5													
						1	0 0 0	0	0						4.98% organic content
-1.83	1.83	6													
-2.13	2.13	7													
-2.44	2.44	8													
				Poorly graded SAND (SP): loose, bluish gray, moist, trace of clay.											
-2.74	2.74	9													
-3.05	3.05	10													
						2			100		32.3	14.4			
-3.35	3.35	11													
-3.66	3.66	12													
-3.96	3.96	13													
				Lean CLAY (CL): soft, bluish gray, moist, medium plasticity.											
-4.27	4.27	14													
-4.57	4.57	15													
						3	0 1 3	4	100						
-4.88	4.88	16													
-5.18	5.18	17													
-5.49	5.49	18													
-5.79	5.79	19													
				CLAYEY SAND (SC): loose, bluish gray, wet, fine to medium sand.											
-6.10	6.10	20													

(continued)

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	Graphic Log	Description	Sample Type	Sample Number	Sample Blows	Blows per Foot	Recovery (%)	RQD (%)	w/c (%)	Dry Density (kN/m³)	Shear Strength (kPa)	Drilling Method/ Casing	Remarks
				CLAYEY SAND (SC): loose, bluish gray, wet, fine to medium sand. *(continued)*		4			100						
-6.40	6.40	21													
-6.71	6.71	22		Poorly graded SAND (SP): medium dense, bluish gray, moist.											
-7.01	7.01	23													
-7.32	7.32	24													
-7.62	7.62	25													
-7.92	7.92	26				5	2 6 8	14	100						
-8.23	8.23	27													
-8.53	8.53	28													
-8.84	8.84	29													
-9.14	9.14	30													
-9.45	9.45	31				6			100						
-9.75	9.75	32													
-10.06	10.06	33													
-10.36	10.36	34													
-10.67	10.67	35													
-10.97	10.97	36				7	2 2 4	6	100						
-11.28	11.28	37		Bottom of Hole at 11.13 m (36.5 ft) on 1-30-06											
-11.58	11.58	38													
-11.89	11.89	39													
-12.19	12.19	40													
-12.50	12.50	41													
-12.80	12.80	42													
-13.11	13.11	43													
-13.41	13.41	44													

Equipment:	Station/KP:	Boring ID.:
CS 2000 (track)	~21+60	06-5
Hammer:	**Offset Distance/Line:**	**Date Completed:**
Safety semi-automatic drop (140#/ 30")	~0/CL	1-30-06
Drilling Method:	**North/East:**	**Hole Diameter:**
6-inch hollow stem auger	0.0m / 121.9m	
Sampling Method:	**Ground Surface Elevation:**	**Total Depth:**
Shelby, SPT	~0.0m	15.7m
Notes:	**~Depth to GW/date measured:**	**Logged By:**
	2.1m on 1-30-06	Eric McGrath

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	Graphic Log	Description	Sample Type	Sample Number	Sample Blows	Blows per Foot	Recovery (%)	RQD (%)	w/c (%)	Dry Density (kN/m³)	Shear Strength (kPa)	Drilling Method/ Casing	Remarks
-0.30	0.30	1		**FILL** ORGANIC SOIL (OL): firm, dark gray, moist.											
-0.61	0.61	2													
-0.91	0.91	3													
-1.22	1.22	4													
-1.52	1.52	5		ORGANIC CLAY (OL): soft, dark gray, moist, medium plasticity.											
-1.83	1.83	6				1			100		31.9	12.8			
-2.13	2.13	7		▼											
-2.44	2.44	8													
-2.74	2.74	9													
-3.05	3.05	10													
-3.35	3.35	11				2			50		38.6	13.0			
-3.66	3.66	12													
-3.96	3.96	13													
-4.27	4.27	14		Lean CLAY with SAND (CL): soft, gray, wet, fine sand, medium plasticity.											
-4.57	4.57	15				3			100		34.9	13.6			
-4.88	4.88	16													
-5.18	5.18	17													
-5.49	5.49	18		SANDY lean CLAY (CL): firm, gray, wet, fine sand, medium plasticity.											
-5.79	5.79	19													
-6.10	6.10	20													

(continued)

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	Graphic Log	Description	Sample Type	Sample Number	Sample Blows	Blows per Foot	Recovery (%)	RQD (%)	w/c (%)	Dry Density (kN/m³)	Shear Strength (kPa)	Drilling Method/ Casing	Remarks
				SANDY lean CLAY (CL): firm, gray, wet, fine sand, medium plasticity. *(continued)*		4			100		19.0	16.6			
-6.40	6.40	21													
-6.71	6.71	22													
-7.01	7.01	23													
-7.32	7.32	24													
				Lean CLAY (CL): firm, gray, moist, trace of fine sand.											
-7.62	7.62	25				5			100		26.9	15.4			
-7.92	7.92	26													
-8.23	8.23	27													
-8.53	8.53	28													
-8.84	8.84	29													
-9.14	9.14	30				6			78		27.6	15.2			
-9.45	9.45	31													
-9.75	9.75	32													
-10.06	10.06	33													
-10.36	10.36	34													
-10.67	10.67	35				7			56		29.3	14.8			
-10.97	10.97	36													
-11.28	11.28	37													
-11.58	11.58	38													
				Poorly graded SAND (SP): medium dense, gray, moist, fine sand, trace of clay.											
-11.89	11.89	39													
-12.19	12.19	40				8			100						
-12.50	12.50	41													
-12.80	12.80	42													
-13.11	13.11	43													
-13.41	13.41	44													

(continued)

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	Graphic Log	Description	Sample Type	Sample Number	Sample Blows	Blows per Foot	Recovery (%)	RQD (%)	w/c (%)	Dry Density (kN/m³)	Shear Strength (kPa)	Drilling Method/ Casing	Remarks
-13.72	13.72	45		Poorly graded SAND (SP): medium dense, gray, moist, fine sand, trace of clay. *(continued)*											
-14.02	14.02	46			X	9	16 36 40	76	100						
-14.33	14.33	47													
-14.63	14.63	48													
-14.94	14.94	49													
-15.24	15.24	50													
-15.54	15.54	51			X	10	6 9 23	32	100						
-15.85	15.85	52		Bottom of Hole at 15.70 m (51.5 ft) on 1-30-06											
-16.15	16.15	53													
-16.46	16.46	54													
-16.76	16.76	55													
-17.07	17.07	56													
-17.37	17.37	57													
-17.68	17.68	58													
-17.98	17.98	59													
-18.29	18.29	60													
-18.59	18.59	61													
-18.90	18.90	62													
-19.20	19.20	63													
-19.51	19.51	64													
-19.81	19.81	65													
-20.12	20.12	66													
-20.42	20.42	67													
-20.73	20.73	68													
-21.03	21.03	69													

Equipment:	Station/KP:	Boring ID.:
CS 2000 (track)	~25+20	06-6
Hammer:	**Offset Distance/Line:**	**Date Completed:**
Safety semi-automatic drop (140#/ 30")	~0/CL	1-25-06
Drilling Method:	**North/East:**	**Hole Diameter:**
6-inch hollow stem auger	0.0m / 152.4m	
Sampling Method:	**Ground Surface Elevation:**	**Total Depth:**
Shelby, SPT	~0.0m	12.6m
Notes:	**~Depth to GW/date measured:**	**Logged By:**
	2.7m on 1-25-06	Myo Naing

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	Graphic Log	Description	Sample Type	Sample Number	Sample Blows	Blows per Foot	Recovery (%)	RQD (%)	w/c (%)	Dry Density (kN/m³)	Shear Strength (kPa)	Drilling Method/ Casing	Remarks
				FILL SILT (ML): soft, dark gray, moist.											
-0.30	0.30	1													
-0.61	0.61	2													
-0.91	0.91	3													
-1.22	1.22	4													
-1.52	1.52	5													
				ORGANIC CLAY (OL): soft, dark brown, moist, low plasticity.		1			100		26.1	12.4			
-1.83	1.83	6													
-2.13	2.13	7													
-2.44	2.44	8													
-2.74	2.74	9		▼											
-3.05	3.05	10													
-3.35	3.35	11													
						2			100		30.5				
-3.66	3.66	12													
-3.96	3.96	13													
-4.27	4.27	14													
-4.57	4.57	15													
				Lean CLAY with Silt (CL): soft, bluish gray, wet, medium plasticity.		3			100		35.3	13.5			
-4.88	4.88	16													
-5.18	5.18	17													
-5.49	5.49	18													
-5.79	5.79	19													
-6.10	6.10	20													

(continued)

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	Graphic Log	Description	Sample Type	Sample Number	Sample Blows	Blows per Foot	Recovery (%)	RQD (%)	w/c (%)	Dry Density (kN/m³)	Shear Strength (kPa)	Drilling Method/ Casing	Remarks
				Lean CLAY with Silt (CL): soft, bluish gray, wet, medium plasticity. *(continued)*		4			100		24.7	15.8			
-6.40	6.40	21													
-6.71	6.71	22													
-7.01	7.01	23													
-7.32	7.32	24													
-7.62	7.62	25													
-7.92	7.92	26				5			100		24.0	16.1			
-8.23	8.23	27													
-8.53	8.53	28													
-8.84	8.84	29													
-9.14	9.14	30													
-9.45	9.45	31				6			100						
-9.75	9.75	32		SILTY SAND (SM): medium dense, bluish gray, wet.		7	5 7 16	23	100						
-10.06	10.06	33													
-10.36	10.36	34													
-10.67	10.67	35													
-10.97	10.97	36				8	6 9 12	21	100						
-11.28	11.28	37													
-11.58	11.58	38													
-11.89	11.89	39													
-12.19	12.19	40													
-12.50	12.50	41				9	6 7 12	19	100						
-12.80	12.80	42		Bottom of Hole at 12.65 m (41.5 ft) on 1-25-06											
-13.11	13.11	43													
-13.41	13.41	44													

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

EA: 10-0H04U1
Date: 2-28-06
Drafted By: E.McGrath

06-6

10-SJ-4 / KP 8.85/13.20 (PM 5.5/8.2)
Geotechnical Design Report

Equipment:	Station/KP:	Boring ID.:
CS 2000 (track)	~34+90	06-7
Hammer:	**Offset Distance/Line:**	**Date Completed:**
Safety semi-automatic drop (140#/ 30")	~15Rt./CL	1-26-06
Drilling Method:	**North/East:**	**Hole Diameter:**
6-inch hollow stem auger	0.0m / 182.9m	
Sampling Method:	**Ground Surface Elevation:**	**Total Depth:**
Shelby, SPT	~0.0m	12.2m
Notes:	**~Depth to GW/date measured:**	**Logged By:**
		Eric McGrath

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	Graphic Log	Description	Sample Type	Sample Number	Sample Blows	Blows per Foot	Recovery (%)	RQD (%)	w/c (%)	Dry Density (kN/m³)	Shear Strength (kPa)	Drilling Method/ Casing	Remarks
-0.30	0.30	1		ORGANIC CLAY (OL): soft, brown and black, moist.											
-0.61	0.61	2													
-0.91	0.91	3													
-1.22	1.22	4													
-1.52	1.52	5													
-1.83	1.83	6				1			100		73.9	7.8			
-2.13	2.13	7													
-2.44	2.44	8													
-2.74	2.74	9													
-3.05	3.05	10													
-3.35	3.35	11				2			100						
-3.66	3.66	12		CLAYEY SAND (SC): medium dense, bluish gray, moist.											
-3.96	3.96	13													
-4.27	4.27	14													
-4.57	4.57	15													
-4.88	4.88	16				3			100		23.0				
-5.18	5.18	17													
-5.49	5.49	18													
-5.79	5.79	19													
-6.10	6.10	20													

(continued)

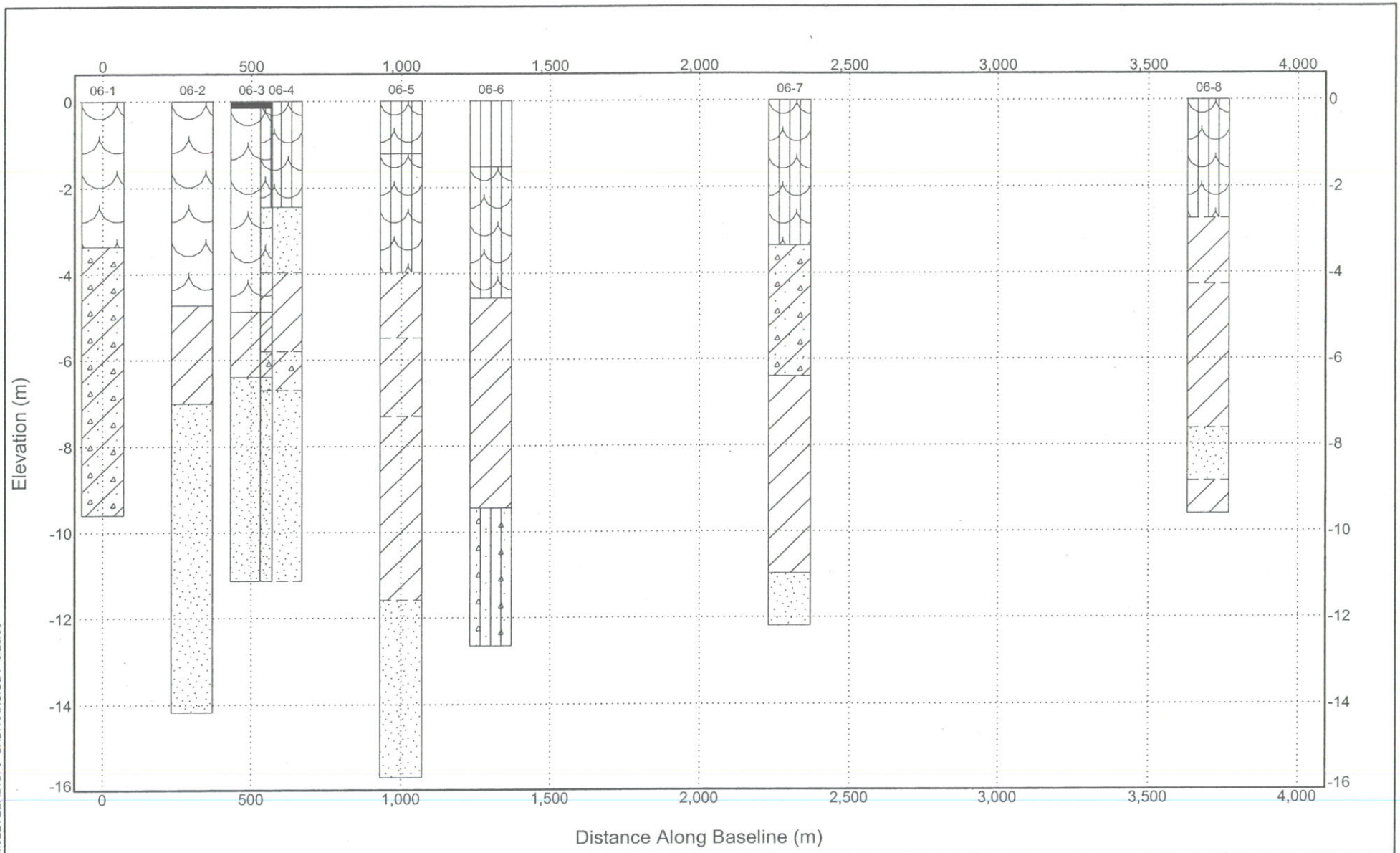
ELEVATION (m)	DEPTH (m)	DEPTH (ft)	Graphic Log	Description	Sample Type	Sample Number	Sample Blows	Blows per Foot	Recovery (%)	RQD (%)	w/c (%)	Dry Density (kN/m³)	Shear Strength (kPa)	Drilling Method/ Casing	Remarks
				CLAYEY SAND (SC): medium dense, bluish gray, moist. *(continued)*		4			100		27.2	15.3	P = 431		
-6.40	6.40	21		Lean CLAY (CL): very stiff, reddish brown, moist, low plasticity.											
-6.71	6.71	22													
-7.01	7.01	23													
-7.32	7.32	24													
-7.62	7.62	25				5			100		32.0	14.2			
-7.92	7.92	26													
-8.23	8.23	27													
-8.53	8.53	28													
-8.84	8.84	29													
-9.14	9.14	30				6			100		24.9	15.8	P = 96		
-9.45	9.45	31													
-9.75	9.75	32													
-10.06	10.06	33													
-10.36	10.36	34													
-10.67	10.67	35				7			100						
-10.97	10.97	36		Poorly graded SAND (SP): medium dense, brown, wet.											
-11.28	11.28	37													
-11.58	11.58	38													
-11.89	11.89	39													
-12.19	12.19	40		Bottom of Hole at 12.19 m (40.0 ft) on 1-26-06											
-12.50	12.50	41													
-12.80	12.80	42													
-13.11	13.11	43													
-13.41	13.41	44													

Equipment:	Station/KP:	Boring ID.:
CS 2000 (track)	~48+60	06-8
Hammer:	**Offset Distance/Line:**	**Date Completed:**
Safety semi-automatic drop (140#/ 30")	~0/CL	1-26-06
Drilling Method:	**North/East:**	**Hole Diameter:**
6-inch hollow stem auger	0.0m / 213.4m	
Sampling Method:	**Ground Surface Elevation:**	**Total Depth:**
Shelby, SPT	~0.0m	9.6m
Notes:	**~Depth to GW/date measured:**	**Logged By:**
	2.4m on 1-26-06	Eric McGrath

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	Graphic Log	Description	Sample Type	Sample Number	Sample Blows	Blows per Foot	Recovery (%)	RQD (%)	w/c (%)	Dry Density (kN/m³)	Shear Strength (kPa)	Drilling Method/ Casing	Remarks
-0.30	0.30	1		ORGANIC CLAY (OL): very soft, dark brown, moist, trace of fine sand.											
-0.61	0.61	2													
-0.91	0.91	3													
-1.22	1.22	4													
-1.52	1.52	5													
						1			33		44.6	10.8	P = 0		
-1.83	1.83	6													
-2.13	2.13	7													
-2.44	2.44	8		▼											
-2.74	2.74	9													
				Lean CLAY with SAND (CL): very soft, brown, wet, medium plasticity.											
-3.05	3.05	10													
						2			33		55.8		P = 0		
-3.35	3.35	11													
-3.66	3.66	12													
-3.96	3.96	13													
-4.27	4.27	14													
				SANDY lean CLAY (CL): firm, gray, moist.											
-4.57	4.57	15													
						3			33		32.8	14.1	P = 168		
-4.88	4.88	16													
-5.18	5.18	17													
-5.49	5.49	18													
-5.79	5.79	19													
-6.10	6.10	20													

(continued)

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	Graphic Log	Description	Sample Type	Sample Number	Sample Blows	Blows per Foot	Recovery (%)	RQD (%)	w/c (%)	Dry Density (kN/m³)	Shear Strength (kPa)	Drilling Method/ Casing	Remarks
				SANDY lean CLAY (CL): firm, gray, moist. *(continued)*		4			33		32.0	14.2	P = 0		
-6.40	6.40	21													
-6.71	6.71	22													
-7.01	7.01	23													
-7.32	7.32	24													
-7.62	7.62	25													
				Poorly graded SAND (SP): medium dense, gray, wet.		5	2 5 9	14	100						
-7.92	7.92	26													
-8.23	8.23	27													
-8.53	8.53	28													
-8.84	8.84	29													
				Lean CLAY (CL): stiff, brown, moist.											
-9.14	9.14	30				6	2 6 6	12	100						
-9.45	9.45	31													
-9.75	9.75	32		Bottom of Hole at 9.60 m (31.5 ft) on 1-26-06											
-10.06	10.06	33													
-10.36	10.36	34													
-10.67	10.67	35													
-10.97	10.97	36													
-11.28	11.28	37													
-11.58	11.58	38													
-11.89	11.89	39													
-12.19	12.19	40													
-12.50	12.50	41													
-12.80	12.80	42													
-13.11	13.11	43													
-13.41	13.41	44													



STRATIGRAPHY 10-SJ-4PM5LEVEERD.GPJ CALTRANS.GDT 5/23/06

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

EA:	10-0H04U1
Date:	2-28-06
Drafted By:	E.McGrath

BORING LOG FENCE DIAGRAM

10-SJ-4 / KP 8.85/13.20 (PM 5.5/8.2)
Geotechnical Design Report

A-11

DEPARTMENT OF TRANSPORTATION
P.O. BOX 2048 STOCKTON, CA 95201
(1976 E. CHARTER WAY/1976 E. DR. MARTIN
LUTHER KING JR. BLVD. 95205)
TTY: California Relay Service (800) 735-2929
PHONE (209) 948-7889
FAX (209) 948-7666

Flex your power!
Be energy efficient!

September 22, 2004

Stacey Petenaude
California Integrated Waste Management Board
Special Waste Division
1001 I Street
P O Box 4025
Sacramento CA 95812

Dear Ms. Patenaude,

Thank you for your time and help, working with us, as we have considered using tire shreds as lightweight fill in a curve correction project on State Route 4 in San Joaquin County. Unfortunately, after careful consideration, the project development team has determined that it would be to high of a risk to use the material for this project.

Our hydraulics engineers have recommended that we not use the shredded tire material in this project because the use of the material poses too high a risk for an exothermic reaction to occur, that could cause the structural failure of the roadway and the dispersal of shredded tire material by flood waters over a wide area of the San Joaquin delta region.

Our investigations have revealed that an exothermic reaction can occur where there is free access to water, air, and microorganisms in the soil. The project area, located in the delta region, presents these "ideal" conditions. Research material described how two roadways in the state of Washington, having the same risk factors, were required to remove the tire shreds after spontaneous heating occurred.

The proposed project area is in a floodplain and subject to seven feet of flood water in a 100 year storm event. If an exothermic reaction were to damage the geotech fiber used to contain the three miles of tire material proposed in this project, there is a high risk that the material could fail under flooding conditions, causing shredded tire material to be dispersed over a large area within the environmentally sensitive delta region.

In addition, several Caltrans environmental specialists have reviewed the *Tire Shred Leachate Study: Chemical Composition and Aquatic Toxicity for Above and Below-Water-Table Applications* and found that the study results were not sufficient to support using the material in

this project. The consensus of the review is that the study is too small in scope, with too few sample points and samples taken over a short period of time (2 years). Specialists reported that the study results are inconsistent, along with a notable variation in the presence and levels of constituents between samples and sample events. Also, results show levels of some constituents to be notably higher than the CA EPA drinking water standards used in the study. For example, iron and manganese levels, are reported to be well over the regulatory standards. The regulatory guidelines for manganese are set at 50 ppb (lifetime health advisory or MCL), with levels found at the study sites to be at 880 ppb. Similarly, iron guidelines are 300 ppb, while the study recorded levels at 10,000 ppb. And finally, the study report did not contain important background information regarding the study parameters and how they were established or the regulatory standards required to support the findings that the material is *"inert"*.

We do feel that the use of tire shreds has high merit, and so we are pursuing the idea of a test site through our Office of Research and Innovation. We will gladly pass on your name to them as a resource.

Again, thank you for your time, and that of Dr. Humphrey. Please feel free to call me if you have any questions.

Include addressee's name and the date of this letter as page 2's header if there is a page 2.

Leave only one line-space between the end of the text and the closing.

Sincerely,

CHRISTINA HIBBARD
Senior Environmental Planner/Project Manager

c: Raychel Skeen
Claudia Espino

CH/ch