FOR CONTRACT NO.: 11-167894

INFORMATION HANDOUT

MATERIALS INFORMATION

FOUNDATION REPORT

AMENDED FOUNDATION REPORT

WATER AVAILABILITY LETTER

MATERIALS INFORMATION BROCHURE

ROUTE: 11-Imp-78, 86-R14.6/R19.5, 38.3/39.1

State of California

Business, Transportation and Housing Agency

Memorandum

Flex your power!
Be energy efficient!

To: MR. MOHAMMAD RAVANIPOUR
Structures Design
Office of Bridge Design-South
Bridge Design Branch 19

Date: May 13, 2009

File: 11-IMP-78-KP 15.61
11-167891
Kalin Rd UC
Br. No. 58-0344 R/L

Attention: Mr. Mamunur Rahman

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
GEOTECHNICAL SERVICES
OFFICE OF GEOTECHNICAL DESIGN – SOUTH 2
DESIGN BRANCH B, MS #5

Subject: Foundation Report

This report presents the foundation recommendations for the proposed new Kalin Rd Undercrossing (UC) (Bridge No. 58-0344 R/L). The following foundation recommendations are based on subsurface information gathered during a foundation investigation performed by Caltrans in June and July 2008. With regards to the current foundation recommendations, all elevations referenced in this report and Log of Test Borings (LOTB) sheets are based on the 1988 North American Vertical Datum (NAVD 1988). Due to the project site being located below mean sea elevation, all elevations have been increased by 100 meters to keep all elevations positive.

Project Description

The proposed bridge site is located in Imperial County approximately 4 km west of the City of Brawley. The proposed left and right bridges are part of the Brawley Bypass project, which will extend the existing Route 78/86 Freeway to connect with Route 111 Freeway. The Kalin Rd UC left and right bridges are proposed to be 2-span, cast-in-place, pre-stressed, box girder structures, supported on seat abutments with the bridges spanning over the Westside Main Canal and Kalin Road.

Site Geology

The proposed bridge site is in an area of relatively flat agriculture ground. The Geologic Map of California San Diego-El Centro sheet (Strand, 1962) reveals the proposed bridge site is underlain by Quaternary lake deposits.

The subsurface investigation performed in June and July 2008 consisted of three mud rotary borings drilled with a CS2000 drill rig and nine Cone Penetration Tests (CPT). Based on the 2008 subsurface investigation, the site is underlain by loose to very dense layers of silt, sandy silts, silt with sand, and silty sand. The layers are interbedded with firm to hard lean and fat

clays with various thicknesses ranging from 0.6 m to 9.1 m (2 to 30 ft). For specific details regarding subsurface conditions, refer to the LOTB sheets.

Groundwater

During the 2008 subsurface investigation, static groundwater levels were measured in boring R-08-001 at Elev. 62.3 m on July 1, 2008 and in boring R-08-003 at Elev. 61.9 m on July 2, 2008. At the proposed Abutment 1 and Abutment 3 locations, existing agriculture irrigation drainage lines are located approximately 1 m below the original ground elevations, which match the measured static groundwater elevations in borings R-08-001 and R-08-003. The Westside Main Canal, which is unlined, flows under the proposed left and right bridges between Abutment 1 and Bent 2 support locations. The water surface in Westside Main Canal is slightly higher (approximately 0.3 m) than the original ground elevations. Boring R-08-002 was backfilled immediately after completion of drilling operations and groundwater was not measured in that boring. The groundwater elevations are subject to seasonal fluctuations and will be encountered at higher or lower elevations depending on conditions at time of construction.

Scour Potential

Scour is not considered to be an issue at the site.

Corrosion

Corrosion test results for soil samples collected from boring R-1-08 of the 2008 field investigation are shown below in Table 1. The site is considered corrosive by current Caltrans standards. Reinforced concrete (including piles) requires corrosion mitigation in accordance with *Bridge Design Specifications, Article 8.22.*

Table 1: Corrosion Test Summary

Boring	SIC Number	Sample Depth (m)	pH	Minimum Resistivity (ohm-cm)	Sulfate Content (PPM)	Chloride Content (PPM)
R-01-08	C640553	0- 10.9	7.79	519	2400	150
R-01-08	C640554	10.9-24.2	7.93	767	220	240

Note: Caltrans currently defines a 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 more than 500 ppm, sulfate concentration is greater than or equal to 2000 ppm, or the pH is 5.5 or less. With the exception of MSE walls, soil and water are not tested for chlorides and sulfates if the minimum resistivity is greater than 1,000 ohm-cm.

Fault and Seismic Data

The structure site may potentially be subject to strong ground motions from nearby earthquake sources during the design life of the new structure. Preliminary Seismic Design Recommendations have been provided by the Office of Geotechnical Design South 2, in a memorandum dated March 25, 2009. The controlling fault for the site is the Brawley-Imperial/W Fault (BIW), located approximately 6.6 km southeast of the site. The Brawley-Imperial/W Fault is capable of generating a Maximum Credible Earthquake moment magnitude (Mw) of 7.0 and the corresponding Peak Bedrock Acceleration is estimated to be 0.5g. The Office of Geotechnical Design-South 2 is in the process of providing Final Seismic Design Recommendations, which will be forwarded to your office when completed.

Liquefaction Potential

The potential for soil liquefaction under strong ground shaking is considered to be low. Refer to the final seismic design recommendations for additional information.

Foundation Recommendations

The following recommendations are for the proposed Kalin Road UC (Bridge No. 58-0344 R/L) as shown on the General Plan dated January 26, 2009. At Abutment 1 and Bent 2 support locations Class 200 Alternative "X" driven concrete piles are recommended for support. At Abutment 3 support location, Class 140 Alternative "X" driven concrete piles are recommended for support. Tables 2 and 3, below, show the foundation design information provided by Structure Design.

Table 2: General Foundation Information Provided by Structure Design

Support Location	Pile Type	Finished Grade Elevation	Pile Cut-off Elevation	Permissible Settlement Under Service Load	Number of Piles per Support
Abutment 1	Class 200 Alt. "X"	66.6 m	64.7 m	25.4 mm (1 in)	16
Bent 2	Class 200 Alt. "X"	63.5 m	61.7 m	25.4 mm (1 in)	12*
Abutment 3	Class 140 Alt. "X"	67.1 m	65.2 m	25.4 mm (1 in)	16

*Two columns per bent support. Each column is supported on an individual footing with 12 piles.

Table 3: Foundation Design Loads Provided by Structure Design

Support Location	Service I Limit State			Strength Limit State (Controlling Group)				Extreme Event Limit State (Controlling Group)			
	Total Loads		Permanent Loads	Compression		Tension		Compression		Tension	
	Per Support	Max Per Pile	Per Support	Per Support	Max Per Pile	Per Support	Max Per Pile	Per Support	Max Per Pile	Per Support	Max Per Pile
Abutment 1	8,211 kN (1846 kips)	654 kN (147 kips)	6,727 kN (1512 kips)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bent 2	8,612 kN (1936 kips)	747 kN (168 kips)	6,730 kN (1513 kips)	13,145 kN (2955 kips)	1,103 kN (248 kips)	0	0	12,500 kN (2810 kips)	1,390 kN (313 kips)	0	0
Abutment 3	5,765 kN (1296 kips)	472 kN (106 kips)	4,495 kN (1011 kips)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

The specified pile tip elevations for Abutments 1 and 3 are shown below in Table 4, and for Bent 2 in Table 5.

Table 4: Abutments 1 and 3 - Pile Data

Location	Pile Type	Cut-Off Elevation	LRFD Service-I Limit State Load per Support		LRFD Service-I Limit State Total Load per Pile (Compression)	Nominal Resistance	Design Tip Elevation	Specified Tip Elevation	Nominal Driving Resistance
			Total	Permanent					
Abutment 1	Class 200 Alt. "X"	64.7 m	8,211 kN (1846 kips)	6,727 kN (1512 kips)	654 kN (147 kips)	1,350 kN (300 kips)	39.95 m (a)	39.95 m	1,350 kN (300 kips)
Abutment 3	Class 140 Alt. "X"	65.2 m	5,765 kN (1296 kips)	4,495 kN (1011 kips)	472 kN (106 kips)	950 kN (220 kips)	39.95 m (a)	39.95 m	950 kN (220 kips)

Note: 1) Design tip elevation is controlled by: (a) Compression

Table 5: Bent 2 Foundation Design Recommendations

Support Location	Pile Type	Cut-Off Elevation	Service-I Limit State Load per Column	Total Permissible Support Settlement	Required Nominal Resistance				Design Tip Elevation	Specified Tip Elevation	Nominal Driving Resistance
					Strength Limit		Extreme Event				
					Comp. (φ=0.7)	Tension (φ=0.7)	Comp. (φ=1)	Tension (φ=1)			
Bent 2	Class 200 Alt. "X"	61.7 m	750 kN (170 kips)	25.4 mm (1 in)	1,600 kN (360 kips)	0	1,400 kN (320 kips)	0	39.95 m (a-1)	39.95 m	1,600 kN (360 kips)

Note: Design tip elevations are controlled by (a-1) Compression (Strength Limit)

The Pile Data Table for Abutments 1 and 3 and Bent 2 is presented in Table 6, below. The ultimate geotechnical pile capacity for the piles will meet or exceed the required nominal resistance in compression shown below in Table 6.

Table 6: Pile Data Table

Location	Pile Type	Nominal Resistance		Design Tip Elevation	Specified Tip Elevation	Nominal Driving Resistance
		Compression	Tension			
Abutment 1	Class 200 Alt. "X"	1,350 kN (300 kips)	0	39.95 m (a)	39.95 m	1,350 kN (300 kips)
Bent 2	Class 200 Alt. "X"	1,600 kN (360 kips)	0	39.95 m (a-1)	39.95 m	1,600 kN (360 kips)
Abutment 3	Class 140 Alt. "X"	950 kN (220 kips)	0	39.95 m (a)	39.95 m	950 kN (220 kips)

Notes: 1) Design tip elevations for Abutments 1 and 3 are controlled by: (a) Compression
2) Design tip elevation for Bent 2 is controlled by: (a-I) Compression (Strength Limit)

General Notes:

1) All support locations are to be plotted in plan view on the LOTB as stated in "Memo to Designers" 4-2. The plotting of support locations should be made prior to requesting a final foundation review.

2) At the Left and Right bridge Bent 2 locations, it is anticipated that the contractor will encounter groundwater while excavating to the bottom of pile cap elevations. Structure Excavation Type "D" is to be shown on the plans at all of the bent support locations.

Construction Considerations:

1) Groundwater was encountered during the 2008 field investigation. The measured static groundwater elevation was Elev. 62.3 m in boring R-08-001 on July 1, 2008 and Elev. 61.9 m in boring R-08-003 on July 2, 2008. At the proposed Abutment 1 and Abutment 3 locations, existing agriculture irrigation drainage lines are located approximately 1 m below the original ground elevations, which match the measured static groundwater elevations in

borings R-08-001 and R-08-003. The groundwater elevations are subject to seasonal fluctuations and will be encountered at higher or lower elevations depending on conditions at time of construction.

2) The calculated geotechnical capacity of the Class 140 and Class 200 Alt "X" piles is based predominantly on end bearing. Due to the piles being predominantly end bearing, and variations in the elevation of the bearing layer, the piles are specified longer than needed, and the contractor should anticipate having to cut-off piles during installation.

3) At the contractor's option, at Abutments 1 and 3, and Bent 2 locations of the Left and Right bridges, drilling to assist driving may be used prior to driving each Alt "X" pile. All drilling to assist driving shall be done in accordance with Standard Specification Section 49-1.05 "Driving Equipment". Drilling to assist driving is not to extend below the elevations shown in Table 7, below.

Table 7: Drilling to Assist Driving Elevations

Location	Drilling to Assist Driving Elevations
Abutment 1	49.7 m
Bent 2	49.7 m
Abutment 3	49.7 m

4) Pile acceptance criteria for the Alt "X" piles is to be in accordance with Standard Specification Section 49-1.08 "Bearing Value and Penetration". Any pile that achieves 1½ times the required nominal resistance in compression, within 1.5 m of the SPTE, may be considered good and cut off with the Engineer's written approval. 1½ times the required nominal resistance in compression is 2025 kN (450 kips) at Abutment 1, 2400 kN (540 kips) at Bent 2, and 1425 kN (330 kips) at Abutment 3.

Wick Drains

1) The 2008 subsurface investigation revealed the proposed bridge site is underlain by compressible soils. The applied loading from the new embankment fills is expected to cause approximately 480 mm of settlement at the Abutment 1 locations, and 680 mm of settlement at the Abutment 3 locations.

2) The contractor shall not begin placing/installing foundation piles at the Abutment 1 and 3 locations until all primary consolidation has ceased.

3) To reduce the contractor's settlement waiting period after the embankments have been constructed, and to eliminate foundation damage due to down drag affects, wick drains (vertical geotextile-encased drains) are recommended to be installed beneath the approach fills at the Abutments 1 and 3 locations. The wick drains are to be placed at a maximum triangular spacing of 1.52 m from each other. Table 8, below, presents the area for wick drains to be placed, as well as the elevation the wick drains are to extend down to.

Table 8: Left and Right Bridges, Wick Drain Placement Locations and Bottom Elevations

Location	Line	Station	Bottom of Wick Drain Elevation
Left and Right Bridge Abutment 1 Approach Fill	"P"	Sta. 166+53.1 Left and Right 45.0 m To Sta. 166+68.4 Left and Right 45.0 m	52.2 m
Left and Right Bridge Abutment 1 Approach Fill	"P"	Sta. 166+68.4 Left and Right 45.0 m To Sta. 166+83.6 Left and Right 45.0 m	46.4 m
Left and Right Bridge Abutment 1 Approach Fill	"P"	Sta. 166+83.6 Left and Right 45.0 m To Sta. 167+38.7 Left and Right 45.0 m	42.1 m
Left and Right Bridge Abutment 3 Approach Fill	"P"	Sta. 168+08.0 Left and Right 45.0 m To Sta. 168+61.6 Left and Right 45.0 m	42.1 m
Left and Right Bridge Abutment 3 Approach Fill	"P"	Sta. 168+61.6 Left and Right 45.0 m To Sta. 168+76.8 Left and Right 45.0 m	46.4 m
Left and Right Bridge Abutment 3 Approach Fill	"P"	Sta. 168+76.8 Left and Right 45.0 m To Sta. 168+92.1 Left and Right 45.0 m	52.2 m

4) After the engineered approach fills at the Abutments 1 and 3 locations have been constructed to final grade, the contractor is to allow a 90-day settlement waiting period prior to beginning installation of the abutment piles.

5) At the Abutments 1 and 3 locations of the Left and Right bridges, settlement of the newly placed fill shall be monitored. Monitoring devices shall consist of settlement platforms or settlement-monitoring devices placed on or beneath the original ground prior to beginning construction of the approach fill embankments. The settlement platforms shall be placed at the locations listed in Table 9, below.

Table 9: Left and Right Bridges, Abutments 1 and 3 Settlement Platform Locations

Location	Platform #	Line	Station	Offset
Left Bridge Abutment 1 Approach Fill	1	"P"	166+69.00	20.0 m Left
Left Bridge Abutment 1 Approach Fill	2	"P"	166+99.00	20.0 m Left
Left Bridge Abutment 1 Approach Fill	3	"P"	167+29.59	20.0 m Left
Left Bridge Abutment 3 Approach Fill	4	"P"	168+15.59	20.0 m Left
Left Bridge Abutment 3 Approach Fill	5	"P"	168+46.00	20.0 m Left
Left Bridge Abutment 3 Approach Fill	6	"P"	168+76.00	20.0 m Left
Right Bridge Abutment 1 Approach Fill	7	"P"	166+69.00	20.0 m Right
Right Bridge Abutment 1 Approach Fill	8	"P"	166+99.00	20.0 m Right
Right Bridge Abutment 1 Approach Fill	9	"P"	167+29.59	20.0 m Right
Right Bridge Abutment 3 Approach Fill	10	"P"	168+15.59	20.0 m Right
Right Bridge Abutment 3 Approach Fill	11	"P"	168+46.00	20.0 m Right
Right Bridge Abutment 3 Approach Fill	12	"P"	168+76.00	20.0 m Right

6) The waiting period may be reduced if the contractor provides evidence that settlement/primary consolidation has ceased. In that case, with the written approval of the Engineer, the waiting period may be terminated at that time. In the opposite case, if settlement/primary consolidation has not ceased by the time the end of the waiting period, monitoring shall continue, extending the settlement time period, until the settlement/primary consolidation ceases.

7) Supplying and installation of the settlement monitoring devices is to be the responsibility of the contractor, and is to be included in the contract as a bid item.

8) At the Abutments 1 and 3 locations of the Left and Right bridges, due to the permeable nature of the alluvial material at the original ground surface, Class 3 Permeable Material (Blanket) and Filter Fabric are not needed beneath the newly placed fill engineered material.

9) The contractor shall construct the embankments at Abutments 1 and 3 locations, of the Left and Right bridges, as if a surcharge has been specified to be placed on top of the fill final grade. Thereby, the embankments shall be constructed up to the final grade/roadway elevations at the beginning of the bridge (BB) and end of the bridge (EB) of the Left and Right bridges.

10) The wick drain recommendations provided within this report are only addressing embankment construction within 76 meters of the BB and EB of the Left and Right bridges. Roadway sections beyond 76 meters from the bridge abutments are outside the scope of this report should be addressed by the Roadway Geotechnical section.

The foundation recommendations contained in this report are based on specific project information regarding structure type, location, and design loads that have been provided by the Office of Bridge Design South. If any conceptual changes are made during final project design, the Office of Geotechnical Design-South 2, Branch B should review those changes to determine if these foundation recommendations are still applicable. Any questions regarding the above recommendations should be directed to the attention of Erich Neupert, (916) 227-4565, or Mark DeSalvatore, (916) 227-5391, at the Office of Geotechnical Design-South 2, Branch B.

Prepared by: Date: 5/13/09

Erich Neupert

Erich Neupert, P.G., #8137
Engineering Geologist
Office of Geotechnical Design-South 2
Design Branch B

Prepared by: Date: 5/13/09

D. Te-Ming Liao, P.E., #59838
Transportation Engineer-Civil
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cc: R.E. Pending File
John Stayton – Specs & Estimates (4)
Kazim Mamdani – District 11 (Project Manager)
Marvin Canton– District 11 (Project Engineer)
Abbas Abghari – OGDS-2
Project File

DISTRICT 11

MATERIALS INFORMATION BROCHURE

MATERIALS ENGINEERING BRANCH

11-IMP-78/86
KP R14.6/R19.5
KP 38.3/39.1
11-167891

CT

CALIFORNIA DEPARTMENT OF TRANSPORTATION

State of California

Business, Transportation and Housing Agency

Memorandum

To : LEON EDMONDS
Office Engineer
District 11

Date: February 23, 2010

File: 11-IMP-78/86
KP R14.6/R19.5
KP 38.3/39.1
EA 167891

From : **DEPARTMENT OF TRANSPORTATION - DISTRICT 11**
Materials Engineering Branch

Subject:: Materials Information Brochure

Attached herewith for your consideration

MATERIALS INFORMATION

FOR PROPOSED PROJECT

IN IMPERIAL COUNTY

STATE ROUTES 78 & 86

For construction of State Highway in Imperial County near Brawley from Route 86 to 0.6 km east of Hovley Road and on Route 86 from 0.1 km north to 0.5 km south of Fredericks Road

Arthur F. Padilla
District Materials Engineer

REGISTERED PROFESSIONAL ENGINEER
ARTHUR F. PADILLA
No. C 49529
Exp. 9-30-10
CIVIL
STATE OF CALIFORNIA

cc: K Mamdani **(333)**
L Edmonds **(332)**
M Deyoe **(33)**
B Hinman **(63)**
Construction Admin. Senior **(72)**
Project File (mib 167891.doc)

MATERIALS INFORMATION

11-IMP-78/86
KP R14.6/R19.5
KP 38.6/39.1
EA 167891

NOTE: Information contained herein has been compiled in accordance with Section 2-1.03 of the Standard Specifications. Additional information is available for review at the District 11, Materials Laboratory, 7177 Opportunity Road, San Diego, California.

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Attachments:

Appendix A - Log of Test Borings 5 Sheets

MATERIALS INFORMATION

GROUND WATER

Perched ground water was not encountered in any of the test pit excavations to the depth of 1.5 m. Fluctuation of perched groundwater throughout the year should be expected due to irrigation practices and precipitation. Geotechnical Roadway South assumes that perched ground water conditions exist at 1.6 meters below existing ground surface.

R-VALUES`

Existing soils within the general limits of the project, R-values were found to be above 10 with the exception of test pit #5 which has an R-value less than 5. See **Appendix A** for further detail.

GRADING FACTORS

The average relative compaction of existing basement soils is 82%. Removal and recompaction of those soils to 90%, as recommended in the Materials Design Report dated June, 2009 and as specified in subsection 19-5.04 of the Standard Specifications, will produce a grading factor of 0.92 or 7.5% shrinkage.

EMBANKMENT RECOMMENDATIONS

As per the Materials Design Report dated June, 2009, basement soils excavated during structural section construction should be placed in embankments. Imported borrow with an R-value of no less than 5 should be used to make up any deficiencies when constructing embankments.

CLASS 4 AGGREGATE SUBBASE

Material for aggregate subbase may be processed from project soils or obtained from commercial sources. Aggregate subbase shall be Class 4 and conform to the provisions in Section 25, "Aggregate Subbase," of the Standard Specifications and Standard Special Provision 25-020, dated 07-30-99.

Class 4 aggregate subbase shall have a minimum R-value of 40 and a Sand Equivalent of 22. The aggregate subbase shall conform to the following grading:

Sieve Sizes	Percentage Passing
100mm	100
4.75mm	30-100
600μm	0-65
75μm	0-20

EARTHWORK QUANTITIES

The following earthwork quantities are from the Engineer's Estimate:

Roadway Excavation	386,400 m^3
Imported Borrow	402,800 m^3
Class 2 Aggregate Base	35,435 m^3
Class 4 Aggregate Subbase	33,950 m^3

CORROSION ANALYSIS

Currently within the project area, sulfate and chloride levels vary due to flood-irrigation practices. When this irrigation process ceases, cycles of evapotranspiration will occur raising the level of soluble salts. Due to this potential change, a conservative design approach was taken for culvert design.

- Soil pH = 8.5
- Soil Minimum Resistivity = 160 Ohms-cm
- Sulfates = 2350 mg/kg
- Chlorides = 1260 mg/kg
- Non-abrasive flow conditions
- Flow Velocities < 5 m/s

RECOMMENDED CULVERT ALTERNATIVES

1. Reinforced Concrete Pipe (RCP) may be used utilizing 6 sacks Cement (Type II modified or Type V) with 1" cover to reinforcing steel and a maximum water/cement ratio of 0.35.

2. Thick wall Plastic Pipes the satisfy design criteria. The pipe should be fabricated from either High Density Polyethylene (HDPE) or Polyvinyl Chloride (PVC).

3. 18 ga (0.52") Polymerized Asphalt Invert.

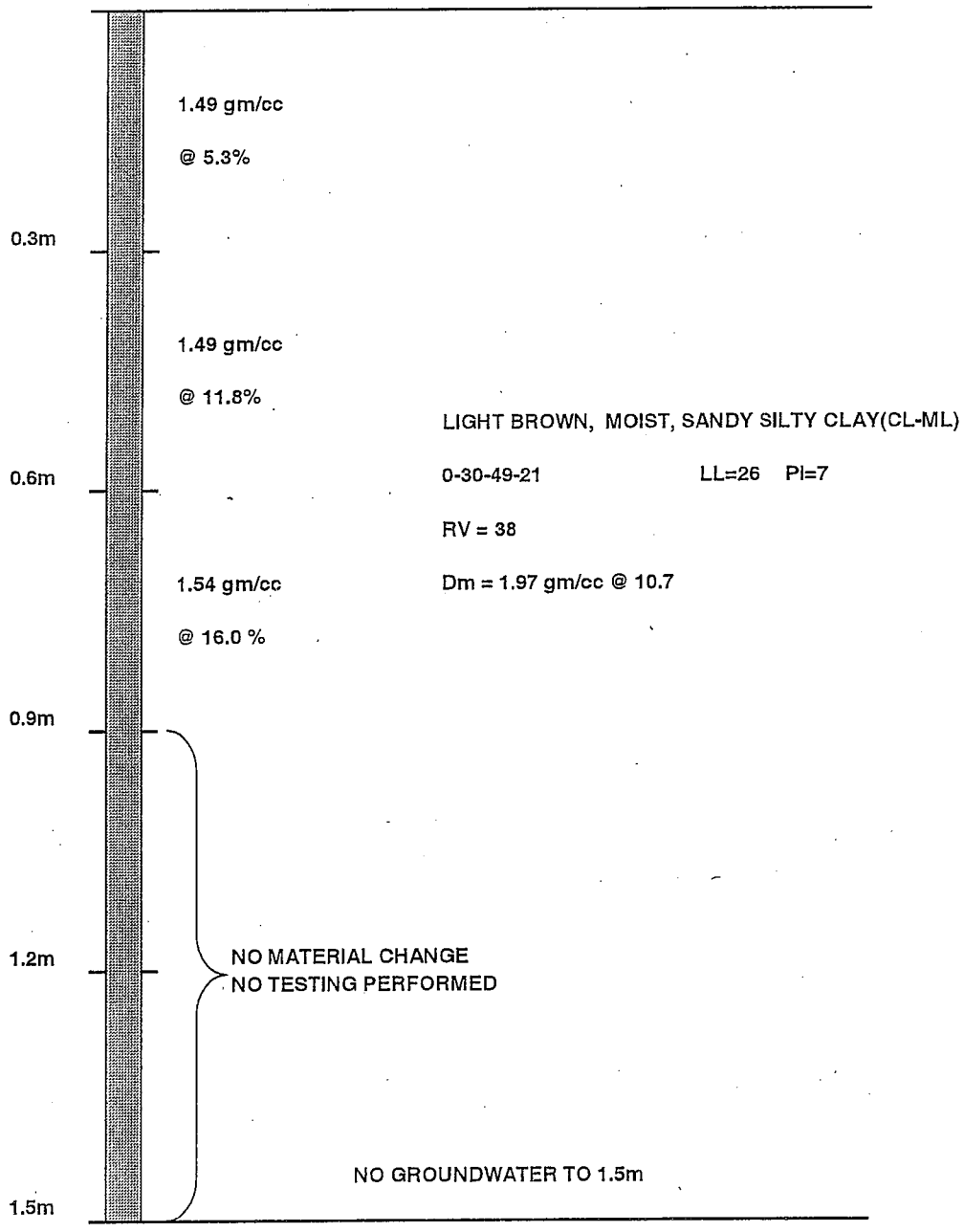
MATERIALS SOURCES

A current list of mining sites, including but not limited to the State owned Ocotillo site, eligible to sell materials such as aggregates to the State of California in Imperial County, can be found at the following California Office of Mine Reclamation website:

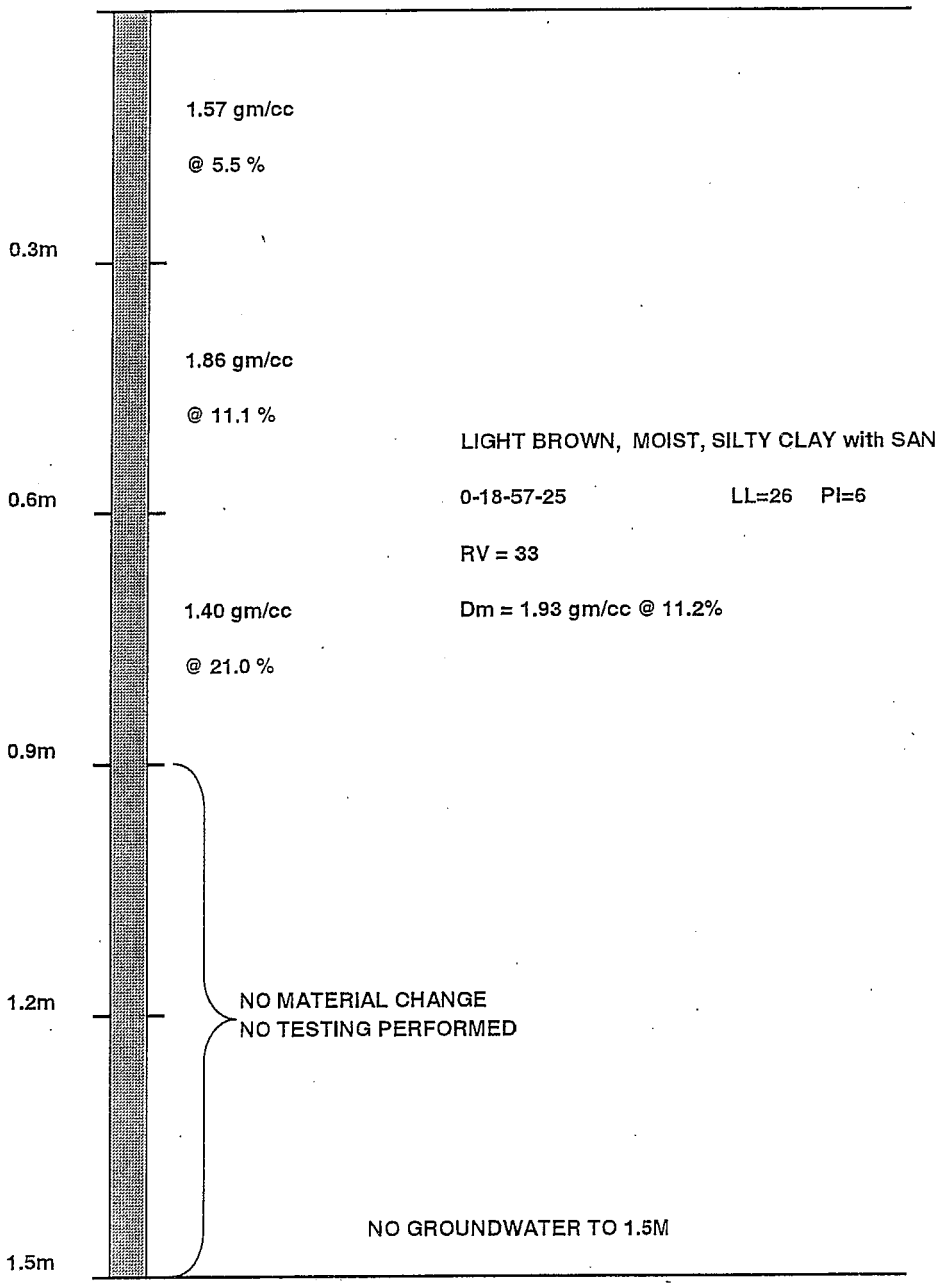
http://www.conservation.ca.gov/omr/ab_3098_list

APPENDIX A

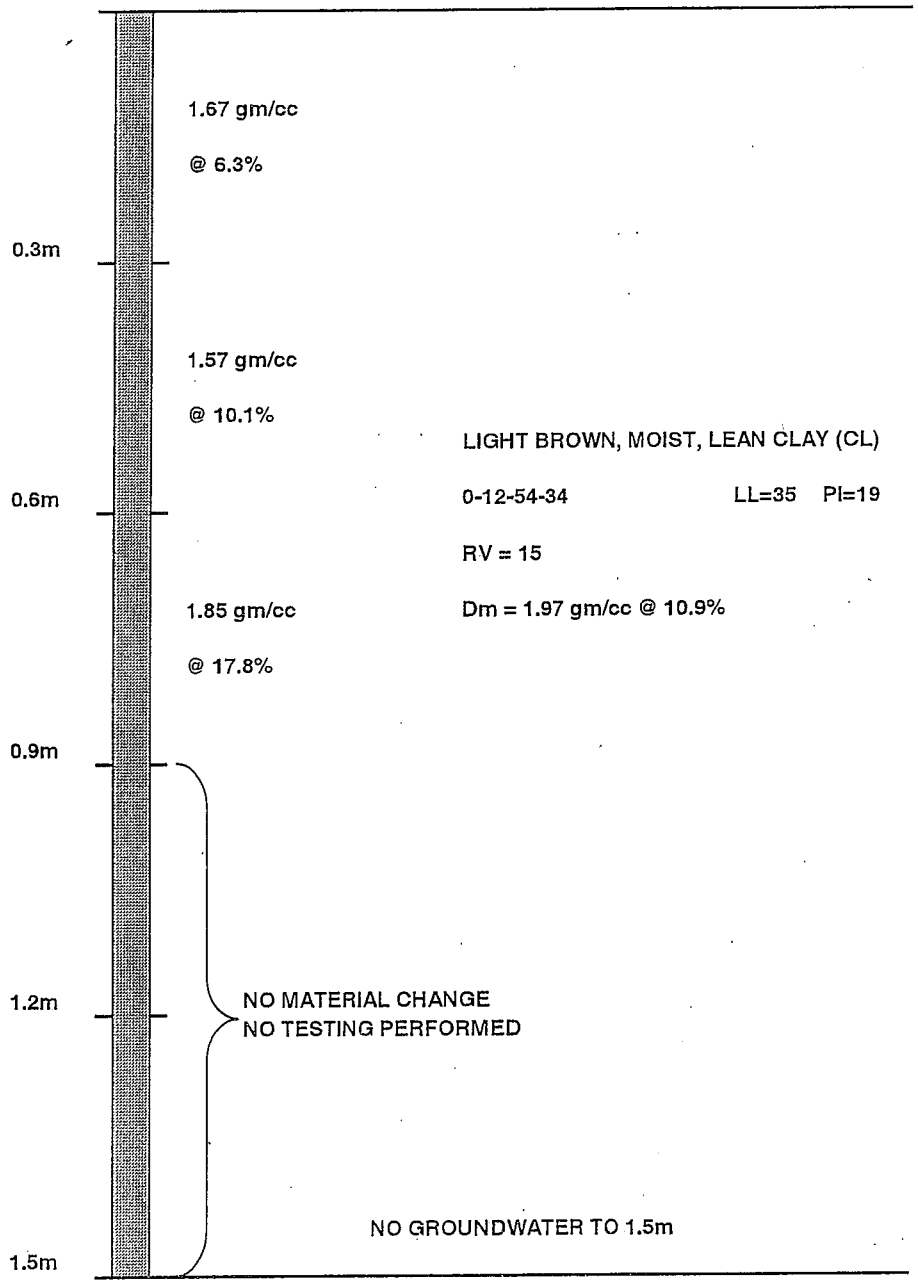
TEST BORING #1 @ STATION 195+35, 35m Lt



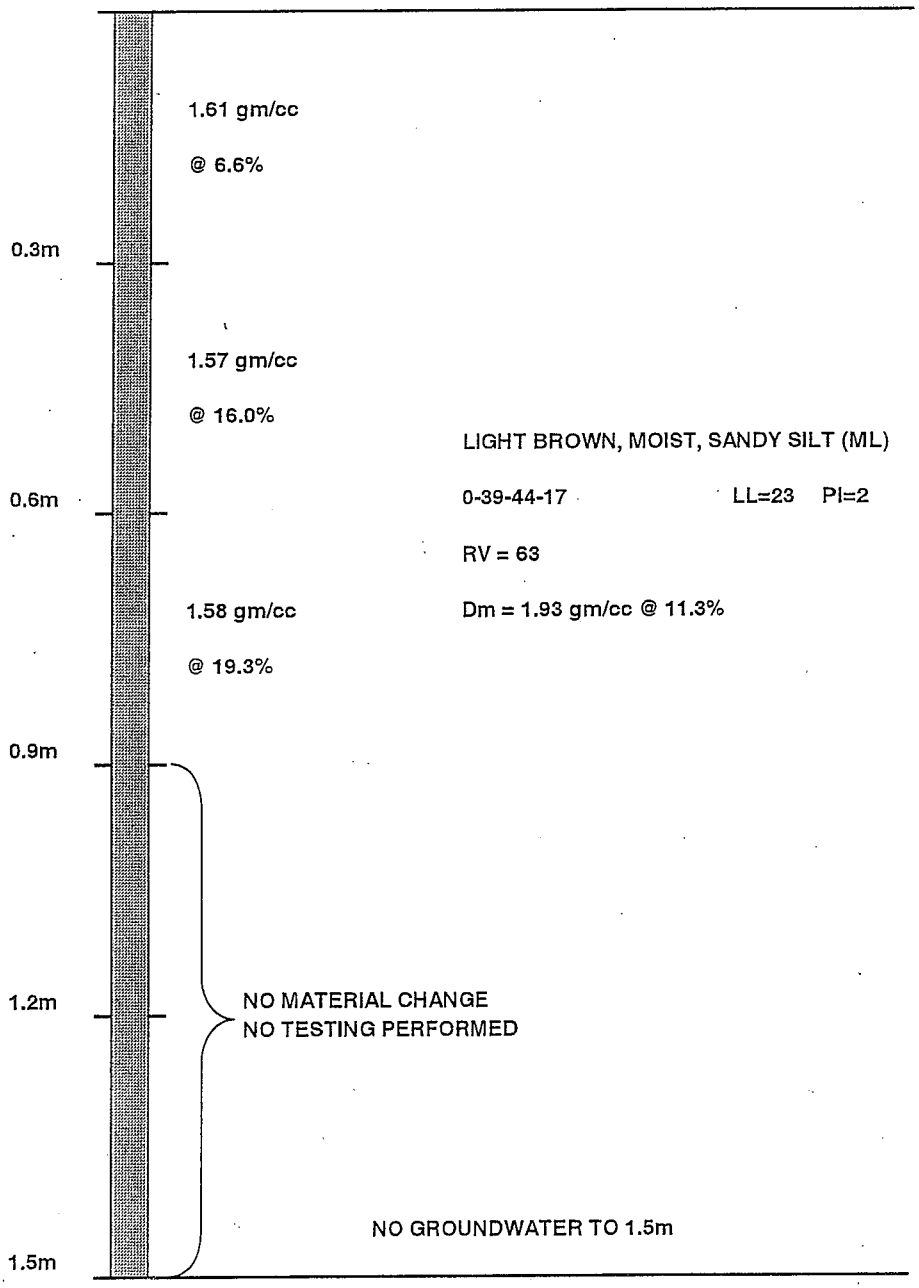
TEST BORING #2 @ STATION 190+35, 35m Lt



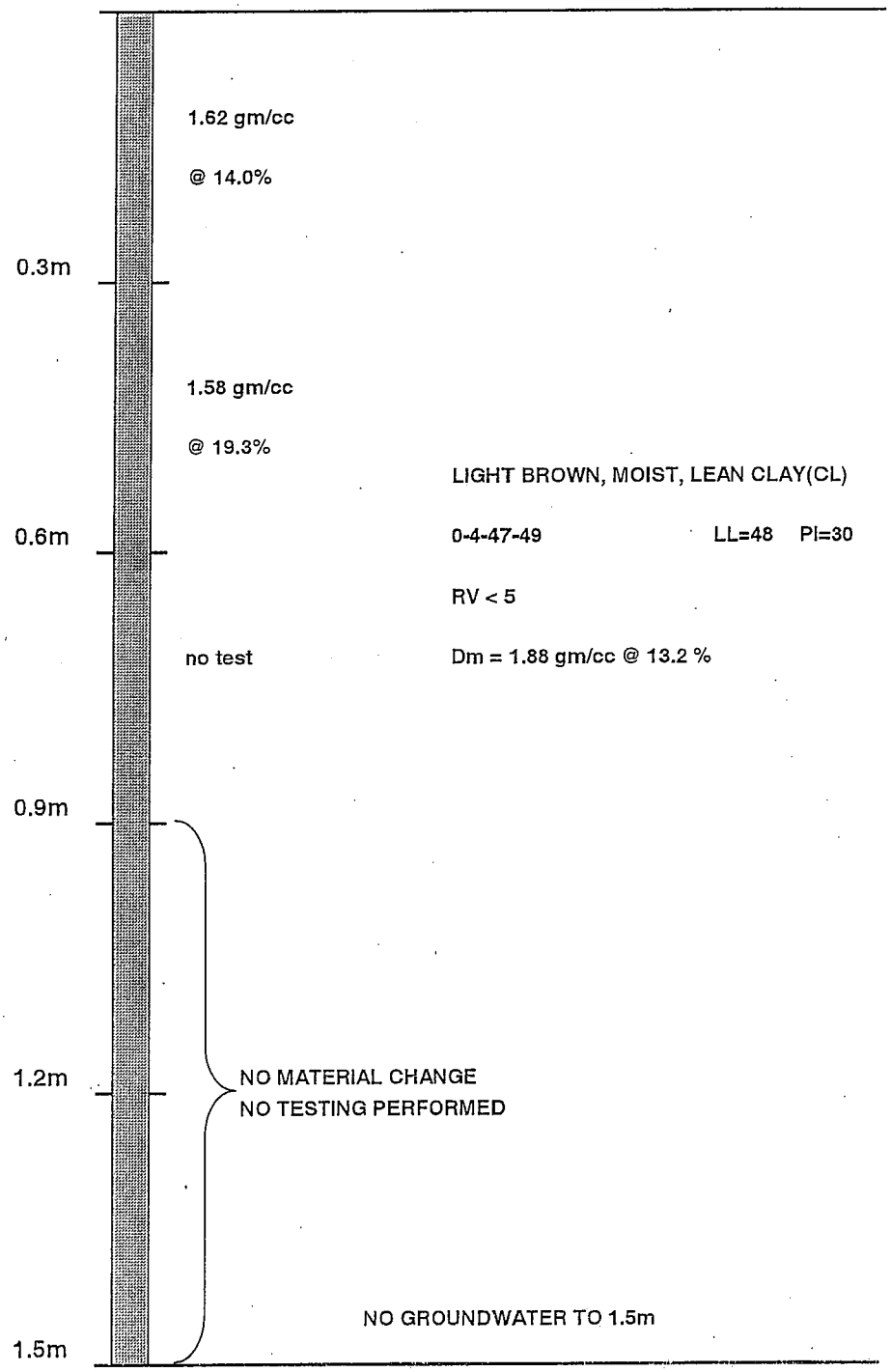
TEST BORING #3 @ STATION 185+35, 35m Lt



TEST BORING #4 @ STATION 169+35, 25m Lt.



TEST BORING #5 @ STATION 160+15, 35m Lt.



IMPERIAL IRRIGATION DISTRICT

OPERATING HEADQUARTERS • P. O. BOX 937 • IMPERIAL, CALIFORNIA 92251

July 8, 2009

Mr. Marvin Canton
Caltrans District 11 – Design
4050 Taylor Street
M.S. 333
San Diego, CA. 92186-5406

Subject: Water Construction Availability for the Imperial 111 Brawley Bypass Project Stage 3

Dear Mr. Canton:

This letter is to confirm that water will be available for the construction of the Imperial 111 Brawley Bypass project Stage 3. Per your letter dated June 18, 2009, an estimated amount of 8,000,000 gallons at an approximate rate of 5 cubic feet per second (cfs) will be required for the construction of the project beginning July 2010 and lasting approximately two years.

The procedure for obtaining water is as follows:

1. The applicant will need to complete an application for temporary water use at the Northend Division office. The temporary water use permit will not be issued until the application is approved and signed by the superintendent.

   Northend Division Office
   5364 Hovley Road
   Westmorland, CA 92281
   (760) 351-2500

2. The application must state the intended locations from where water will be drawn. Please note that due to possible limited capacities and outages water availability cannot be guaranteed at all locations at all times. It will be necessary to plan for multiple locations. Coordination with the Northend Division Office will be warranted.

3. Caltrans will be responsible for pump installation.

4. Meters must be installed on the pumps to allow IID staff to obtain readings and charge accordingly.

5. Caltrans will be charged at the industrial water rate (Schedule No.7).

6. The pumps and all appurtenances must not block access to any IID facility (you must provide enough clearance for IID vehicles to drive through or around).

7. Additionally, IID encroachment permits will be required for all proposed pumps and appurtenances that will encroach upon existing and proposed IID rights-of-way. A copy of the encroachment permit application is included in the attached IID Water Department Developer Project Guide 2008. Please contact IID's Real Estate Section at (760) 339-9239 for additional information regarding encroachment permits.

Once all permits are approved, IID will guarantee that the contractors will have sufficient water for the construction of the Imperial 111 Expressway project. Please contact Mr. Mike Pacheco at (760) 351-2518 if you have any questions.

Sincerely,

OLIVIA I. ALCARAZ
Engineer,
Engineering Services

OA:ga

Attachments: Developer Guide

cc: Supervisor, Real Estate
Superintendent, Northend Water
Project Management, Water
Superintendent General, Construction and Maintenance
Key Customer Coordinator, Water

JJR

State of California

Business, Transportation and Housing Agency

Memorandum

Flex your power!
Be energy efficient!

To: MR. MOHAMMAD RAVANIPOUR
Structures Design.
Office of Bridge Design-South
Bridge Design Branch 19

Date: May 18, 2009

File: 11-IMP-78-KP 15.61
11-167891
Kalin Rd UC
Br. No. 58-0344 R/L

Attention: Mr. Mamunur Rahman

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
GEOTECHNICAL SERVICES
OFFICE OF GEOTECHNICAL DESIGN – SOUTH 2
DESIGN BRANCH B, MS #5

Subject: Amended Foundation Report

The following Amended Foundation Report supercedes the original Foundation Report, dated May 13, 2009, for the proposed new Kalin Rd Undercrossing (UC) (Bridge No. 58-0344 R/L) which was recently sent to your office. The reason for the Amended Foundation Report is to include the metric designation for the concrete piles being recommended at Abutments 1 and 3, and Bent 2 locations. The following foundation recommendations are based on subsurface information gathered during a foundation investigation performed by Caltrans in June and July 2008. With regards to the current foundation recommendations, all elevations referenced in this report and Log of Test Borings (LOTB) sheets are based on the 1988 North American Vertical Datum (NAVD 1988). Due to the project site being located below mean sea elevation, all elevations have been increased by 100 meters to keep all elevations positive.

Project Description

The proposed bridge site is located in Imperial County approximately 4 km west of the City of Brawley. The proposed left and right bridges are part of the Brawley Bypass project, which will extend the existing Route 78/86 Freeway to connect with Route 111 Freeway. The Kalin Rd UC left and right bridges are proposed to be 2-span, cast-in-place, pre-stressed, box girder structures, supported on seat abutments with the bridges spanning over the Westside Main Canal and Kalin Road.

Site Geology

The proposed bridge site is in an area of relatively flat agriculture ground. The Geologic Map of California San Diego-El Centro sheet (Strand, 1962) reveals the proposed bridge site is underlain by Quaternary lake deposits.

The subsurface investigation performed in June and July 2008 consisted of three mud rotary borings drilled with a CS2000 drill rig and nine Cone Penetration Tests (CPT). Based on the

2008 subsurface investigation, the site is underlain by loose to very dense layers of silt, sandy silts, silt with sand, and silty sand. The layers are interbedded with firm to hard lean and fat clays with various thicknesses ranging from 0.6 m to 9.1 m (2 to 30 ft). For specific details regarding subsurface conditions, refer to the LOTB sheets.

Groundwater

During the 2008 subsurface investigation, static groundwater levels were measured in boring R-08-001 at Elev. 62.3 m on July 1, 2008 and in boring R-08-003 at Elev. 61.9 m on July 2, 2008. At the proposed Abutment 1 and Abutment 3 locations, existing agriculture irrigation drainage lines are located approximately 1 m below the original ground elevations, which match the measured static groundwater elevations in borings R-08-001 and R-08-003. The Westside Main Canal, which is unlined, flows under the proposed left and right bridges between Abutment 1 and Bent 2 support locations. The water surface in Westside Main Canal is slightly higher (approximately 0.3 m) than the original ground elevations. Boring R-08-002 was backfilled immediately after completion of drilling operations and groundwater was not measured in that boring. The groundwater elevations are subject to seasonal fluctuations and will be encountered at higher or lower elevations depending on conditions at time of construction.

Scour Potential

Scour is not considered to be an issue at the site.

Corrosion

Corrosion test results for soil samples collected from boring R-1-08 of the 2008 field investigation are shown below in Table 1. The site is considered corrosive by current Caltrans standards. Reinforced concrete (including piles) requires corrosion mitigation in accordance with *Bridge Design Specifications, Article 8.22.*

Table 1: Corrosion Test Summary

Boring	SIC Number	Sample Depth (m)	pH	Minimum Resistivity (ohm-cm)	Sulfate Content (PPM)	Chloride Content (PPM)
R-01-08	C640553	0- 10.9	7.79	519	2400	150
R-01-08	C640554	10.9-24.2	7.93	767	220	240

Note: Caltrans currently defines a 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 more than 500 ppm, sulfate concentration is greater than or equal to 2000 ppm, or the pH is 5.5 or less. With the exception of MSE walls, soil and water are not tested for chlorides and sulfates if the minimum resistivity is greater than 1,000 ohm-cm.

Fault and Seismic Data

The structure site may potentially be subject to strong ground motions from nearby earthquake sources during the design life of the new structure. Preliminary Seismic Design Recommendations have been provided by the Office of Geotechnical Design South 2, in a memorandum dated March 25, 2009. The controlling fault for the site is the Brawley-Imperial/W Fault (BIW), located approximately 6.6 km southeast of the site. The Brawley-Imperial/W Fault is capable of generating a Maximum Credible Earthquake moment magnitude (Mw) of 7.0 and the corresponding Peak Bedrock Acceleration is estimated to be 0.5g. The Office of Geotechnical Design-South 2 is in the process of providing Final Seismic Design Recommendations, which will be forwarded to your office when completed.

Liquefaction Potential

The potential for soil liquefaction under strong ground shaking is considered to be low. Refer to the final seismic design recommendations for additional information.

Foundation Recommendations

The following recommendations are for the proposed Kalin Road UC (Bridge No. 58-0344 R/L) as shown on the General Plan dated January 26, 2009. At Abutment 1 and Bent 2 support locations Class 900 (Class 200 kips) Alternative "X" driven concrete piles are recommended for support. At Abutment 3 support location, Class 625 (Class 140 kips) Alternative "X" driven concrete piles are recommended for support. Tables 2 and 3, below, show the foundation design information provided by Structure Design.

Table 2: General Foundation Information Provided by Structure Design

Support Location	Pile Type	Finished Grade Elevation	Pile Cut-off Elevation	Permissible Settlement Under Service Load	Number of Piles per Support
Abutment 1	Class 900 (Class 200 kips) Alt. "X"	66.6 m	64.7 m	25.4 mm (1 in)	16
Bent 2	Class 900 (Class 200 kips) Alt. "X"	63.5 m	61.7 m	25.4 mm (1 in)	12*
Abutment 3	Class 625 (Class 140 kips) Alt. "X"	67.1 m	65.2 m	25.4 mm (1 in)	16

*Two columns per bent support. Each column is supported on an individual footing with 12 piles.

Table 3: Foundation Design Loads Provided by Structure Design

Support Location	Service 1 Limit State			Strength Limit State (Controlling Group)				Extreme Event Limit State (Controlling Group)			
	Total Loads		Permanent Loads	Compression		Tension		Compression		Tension	
	Per Support	Max Per Pile	Per Support	Per Support	Max Per Pile	Per Support	Max Per Pile	Per Support	Max Per Pile	Per Support	Max Per Pile
Abutment 1	8,211 kN (1846 kips)	654 kN (147 kips)	6,727 kN (1512 kips)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bent 2	8,612 kN (1936 kips)	747 kN (168 kips)	6,730 kN (1513 kips)	13,145 kN (2955 kips)	1,103 kN (248 kips)	0	0	12,500 kN (2810 kips)	1,390 kN (313 kips)	0	0
Abutment 3	5,765 kN (1296 kips)	472 kN (106 kips)	4,495 kN (1011 kips)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

The specified pile tip elevations for Abutments 1 and 3 are shown below in Table 4, and for Bent 2 in Table 5.

Table 4: Abutments 1 and 3 - Pile Data

Location	Pile Type	Cut-Off Elev.	LRFD Service-I Limit State Load per Support		LRFD Service-I Limit State Total Load per Pile (Compression)	Nominal Resistance	Design Tip Elevation	Specified Tip Elevation	Nominal Driving Resistance
			Total	Permanent					
Abutment 1	Class 900 (Class 200 kips) Alt. "X"	64.7 m	8,211 kN (1846 kips)	6,727 kN (1512 kips)	654 kN (147 kips)	1,350 kN (300 kips)	39.95 m (a)	39.95 m	1,350 kN (300 kips)
Abutment 3	Class 625 (Class 140 kips) Alt. "X"	65.2 m	5,765 kN (1296 kips)	4,495 kN (1011 kips)	472 kN (106 kips)	950 kN (220 kips)	39.95 m (a)	39.95 m	950 kN (220 kips)

Note: 1) Design tip elevation is controlled by: (a) Compression

Table 5: Bent 2 Foundation Design Recommendations

Support Location	Pile Type	Cut-Off Elev.	Service-I Limit State Load per Column	Total Permissible Support Settlement	Required Nominal Resistance				Design Tip Elevation	Specified Tip Elevation	Nominal Driving Resistance
					Strength Limit		Extreme Event				
					Comp. (φ=0.7)	Tension (φ=0.7)	Comp. (φ=1)	Tension (φ=1)			
Bent 2	Class 900 (Class 200 kips) Alt. "X"	61.7 m	750 kN (170 kips)	25.4 mm (1 in)	1,600 kN (360 kips)	0	1,400 kN (320 kips)	0	39.95 m (a-1)	39.95 m	1,600 kN (360 kips)

Note: Design tip elevations are controlled by (a-1) Compression (Strength Limit)

The Pile Data Table for Abutments 1 and 3 and Bent 2 is presented in Table 6, below. The ultimate geotechnical pile capacity for the piles will meet or exceed the required nominal resistance in compression shown below in Table 6.

Table 6: Pile Data Table

Location	Pile Type	Nominal Resistance		Design Tip Elevation	Specified Tip Elevation	Nominal Driving Resistance
		Compression	Tension			
Abutment 1	Class 900 (Class 200 kips) Alt. "X"	1,350 kN (300 kips)	0	39.95 m (a)	39.95 m	1,350 kN (300 kips)
Bent 2	Class 900 (Class 200 kips) Alt. "X"	1,600 kN (360 kips)	0	39.95 m (a-1)	39.95 m	1,600 kN (360 kips)
Abutment 3	Class 625 (Class 140 kips) Alt. "X"	950 kN (220 kips)	0	39.95 m (a)	39.95 m	950 kN (220 kips)

Notes: 1) Design tip elevations for Abutments 1 and 3 are controlled by: (a) Compression
2) Design tip elevation for Bent 2 is controlled by: (a-1) Compression (Strength Limit)

General Notes:

1) All support locations are to be plotted in plan view on the LOTB as stated in "Memo to Designers" 4-2. The plotting of support locations should be made prior to requesting a final foundation review.

2) At the Left and Right bridge Bent 2 locations, it is anticipated that the contractor will encounter groundwater while excavating to the bottom of pile cap elevations. Structure Excavation Type "D" is to be shown on the plans at all of the bent support locations.

Construction Considerations:

1) Groundwater was encountered during the 2008 field investigation. The measured static groundwater elevation was Elev. 62.3 m in boring R-08-001 on July 1, 2008 and Elev. 61.9 m in boring R-08-003 on July 2, 2008. At the proposed Abutment 1 and Abutment 3 locations, existing agriculture irrigation drainage lines are located approximately 1 m below the original ground elevations, which match the measured static groundwater elevations in borings R-08-001 and R-08-003. The groundwater elevations are subject to seasonal fluctuations and will be encountered at higher or lower elevations depending on conditions at time of construction.

2) The calculated geotechnical capacity of the Class 625 (Class 140 kips) and Class 900 (200 kips) Alt "X" piles is based predominantly on end bearing. Due to the piles being predominantly end bearing, and variations in the elevation of the bearing layer, the piles are specified longer than needed, and the contractor should anticipate having to cut-off piles during installation.

3) At the contractor's option, at Abutments 1 and 3, and Bent 2 locations of the Left and Right bridges, drilling to assist driving may be used prior to driving each Alt "X" pile. All drilling to assist driving shall be done in accordance with Standard Specification Section 49-1.05 "Driving Equipment". Drilling to assist driving is not to extend below the elevations shown in Table 7, below.

Table 7: Drilling to Assist Driving Elevations

Location	Drilling to Assist Driving Elevations
Abutment 1	49.7 m
Bent 2	49.7 m
Abutment 3	49.7 m

4) Pile acceptance criteria for the Alt "X" piles is to be in accordance with Standard Specification Section 49-1.08 "Bearing Value and Penetration". Any pile that achieves 1½ times the required nominal resistance in compression, within 1.5 m of the SPTE, may be considered good and cut off with the Engineer's written approval. 1½ times the required nominal resistance in compression is 2025 kN (450 kips) at Abutment 1, 2400 kN (540 kips) at Bent 2, and 1425 kN (330 kips) at Abutment 3.

Wick Drains

1) The 2008 subsurface investigation revealed the proposed bridge site is underlain by compressible soils. The applied loading from the new embankment fills is expected to cause approximately 480 mm of settlement at the Abutment 1 locations, and 680 mm of settlement at the Abutment 3 locations.

2) The contractor shall not begin placing/installing foundation piles at the Abutment 1 and 3 locations until all primary consolidation has ceased.

3) To reduce the contractor's settlement waiting period after the embankments have been constructed, and to eliminate foundation damage due to down drag affects, wick drains (vertical geotextile-encased drains) are recommended to be installed beneath the approach fills at the Abutments 1 and 3 locations. The wick drains are to be placed at a maximum triangular spacing of 1.52 m from each other. Table 8, below, presents the area for wick drains to be placed, as well as the elevation the wick drains are to extend down to.

Table 8: Left and Right Bridges, Wick Drain Placement Locations and Bottom Elevations

Location	Line	Station	Bottom of Wick Drain Elevation
Left and Right Bridge Abutment 1 Approach Fill	"P"	Sta. 166+53.1 Left and Right 45.0 m To Sta. 166+68.4 Left and Right 45.0 m	52.2 m
Left and Right Bridge Abutment 1 Approach Fill	"P"	Sta. 166+68.4 Left and Right 45.0 m To Sta. 166+83.6 Left and Right 45.0 m	46.4 m
Left and Right Bridge Abutment 1 Approach Fill	"P"	Sta. 166+83.6 Left and Right 45.0 m To Sta. 167+38.7 Left and Right 45.0 m	42.1 m
Left and Right Bridge Abutment 3 Approach Fill	"P"	Sta. 168+08.0 Left and Right 45.0 m To Sta. 168+61.6 Left and Right 45.0 m	42.1 m
Left and Right Bridge Abutment 3 Approach Fill	"P"	Sta. 168+61.6 Left and Right 45.0 m To Sta. 168+76.8 Left and Right 45.0 m	46.4 m
Left and Right Bridge Abutment 3 Approach Fill	"P"	Sta. 168+76.8 Left and Right 45.0 m To Sta. 168+92.1 Left and Right 45.0 m	52.2 m

4) After the engineered approach fills at the Abutments 1 and 3 locations have been constructed to final grade, the contractor is to allow a 90-day settlement waiting period prior to beginning installation of the abutment piles.

5) At the Abutments 1 and 3 locations of the Left and Right bridges, settlement of the newly placed fill shall be monitored. Monitoring devices shall consist of settlement platforms or settlement-monitoring devices placed on or beneath the original ground prior to beginning construction of the approach fill embankments. The settlement platforms shall be placed at the locations listed in Table 9, below.

Table 9: Left and Right Bridges, Abutments 1 and 3 Settlement Platform Locations

Location	Platform #	Line	Station	Offset
Left Bridge Abutment 1 Approach Fill	1	"P"	166+69.00	20.0 m Left
Left Bridge Abutment 1 Approach Fill	2	"P"	166+99.00	20.0 m Left
Left Bridge Abutment 1 Approach Fill	3	"P"	167+29.59	20.0 m Left
Left Bridge Abutment 3 Approach Fill	4	"P"	168+15.59	20.0 m Left
Left Bridge Abutment 3 Approach Fill	5	"P"	168+46.00	20.0 m Left
Left Bridge Abutment 3 Approach Fill	6	"P"	168+76.00	20.0 m Left
Right Bridge Abutment 1 Approach Fill	7	"P"	166+69.00	20.0 m Right
Right Bridge Abutment 1 Approach Fill	8	"P"	166+99.00	20.0 m Right
Right Bridge Abutment 1 Approach Fill	9	"P"	167+29.59	20.0 m Right
Right Bridge Abutment 3 Approach Fill	10	"P"	168+15.59	20.0 m Right
Right Bridge Abutment 3 Approach Fill	11	"P"	168+46.00	20.0 m Right
Right Bridge Abutment 3 Approach Fill	12	"P"	168+76.00	20.0 m Right

6) The waiting period may be reduced if the contractor provides evidence that settlement/primary consolidation has ceased. In that case, with the written approval of the Engineer, the waiting period may be terminated at that time. In the opposite case, if settlement/primary consolidation has not ceased by the time the end of the waiting period, monitoring shall continue, extending the settlement time period, until the settlement/primary consolidation ceases.

7) Supplying and installation of the settlement monitoring devices is to be the responsibility of the contractor, and is to be included in the contract as a bid item.

8) At the Abutments 1 and 3 locations of the Left and Right bridges, due to the permeable nature of the alluvial material at the original ground surface, Class 3 Permeable Material (Blanket) and Filter Fabric are not needed beneath the newly placed fill engineered material.

9) The contractor shall construct the embankments at Abutments 1 and 3 locations, of the Left and Right bridges, as if a surcharge has been specified to be placed on top of the fill final grade. Thereby, the embankments shall be constructed up to the final grade/roadway elevations at the beginning of the bridge (BB) and end of the bridge (EB) of the Left and Right bridges.

10) The wick drain recommendations provided within this report are only addressing embankment construction within 76 meters of the BB and EB of the Left and Right bridges. Roadway sections beyond 76 meters from the bridge abutments are outside the scope of this report should be addressed by the Roadway Geotechnical section.

The foundation recommendations contained in this report are based on specific project information regarding structure type, location, and design loads that have been provided by the Office of Bridge Design South. If any conceptual changes are made during final project design, the Office of Geotechnical Design-South 2, Branch B should review those changes to determine if these foundation recommendations are still applicable. Any questions regarding the above recommendations should be directed to the attention of Erich Neupert, (916) 227-4565, or Mark DeSalvatore, (916) 227-5391, at the Office of Geotechnical Design-South 2, Branch B.

Prepared by: Date: 5/18/09

Erich Neupert

Erich Neupert, P.G., #8137
Engineering Geologist
Office of Geotechnical Design-South 2
Design Branch B

Prepared by: Date: 5/18/09

D. Te-Ming Liao, P.E., #59838
Transportation Engineer-Civil
Office of Geotechnical Design-South 2
Design Branch B

PROFESSIONAL GEOLOGIST
ERICH NEUPERT
No. 8137
Exp. 2/28/10
STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER
DAVID T-M LIAO
No. C 59838
Exp. 12/31/09
CIVIL
STATE OF CALIFORNIA

Reviewed by: Date: 5/19/09

Mark DeSalvatore, R.C.E., #039499
Senior Materials and Research Engineer
Office of Geotechnical Design-South 2
Design Branch B

REGISTERED PROFESSIONAL ENGINEER
MARK DeSALVATORE
No. CE039499
Exp. 12/31/09
CIVIL
STATE OF CALIFORNIA

cc: R.E. Pending File
John Stayton – Specs & Estimates (4)
Kazim Mamdani – District 11 (Project Manager)
Marvin Canton– District 11 (Project Engineer)
Abbas Abghari – OGDS-2
Project File

IMPERIAL IRRIGATION DISTRICT

OPERATING HEADQUARTERS • P. O. BOX 937 • IMPERIAL, CALIFORNIA 92251

July 8, 2009

Mr. Marvin Canton
Caltrans District 11 – Design
4050 Taylor Street
M.S. 333
San Diego, CA. 92186-5406

Subject: Water Construction Availability for the Imperial 111 Brawley Bypass Project Stage 3

Dear Mr. Canton:

This letter is to confirm that water will be available for the construction of the Imperial 111 Brawley Bypass project Stage 3. Per your letter dated June 18, 2009, an estimated amount of 8,000,000 gallons at an approximate rate of 5 cubic feet per second (cfs) will be required for the construction of the project beginning July 2010 and lasting approximately two years.

The procedure for obtaining water is as follows:

1. The applicant will need to complete an application for temporary water use at the Northend Division office. The temporary water use permit will not be issued until the application is approved and signed by the superintendent.

   Northend Division Office
   5364 Hovley Road
   Westmorland, CA 92281
   (760) 351-2500

2. The application must state the intended locations from where water will be drawn. Please note that due to possible limited capacities and outages water availability cannot be guaranteed at all locations at all times. It will be necessary to plan for multiple locations. Coordination with the Northend Division Office will be warranted.

3. Caltrans will be responsible for pump installation.

4. Meters must be installed on the pumps to allow IID staff to obtain readings and charge accordingly.

5. Caltrans will be charged at the industrial water rate (Schedule No.7).

6. The pumps and all appurtenances must not block access to any IID facility (you must provide enough clearance for IID vehicles to drive through or around).

7. Additionally, IID encroachment permits will be required for all proposed pumps and appurtenances that will encroach upon existing and proposed IID rights-of-way. A copy of the encroachment permit application is included in the attached IID Water Department Developer Project Guide 2008. Please contact IID's Real Estate Section at (760) 339-9239 for additional information regarding encroachment permits.

Once all permits are approved, IID will guarantee that the contractors will have sufficient water for the construction of the Imperial 111 Expressway project. Please contact Mr. Mike Pacheco at (760) 351-2518 if you have any questions.

Sincerely,

OLIVIA I. ALCARAZ
Engineer,
Engineering Services

OA:ga

Attachments: Developer Guide

cc: Supervisor, Real Estate
Superintendent, Northend Water
Project Management, Water
Superintendent General, Construction and Maintenance
Key Customer Coordinator, Water

DISTRICT 11

MATERIALS INFORMATION BROCHURE

MATERIALS ENGINEERING BRANCH

11-IMP-78/86
KP R14.6/R19.5
KP 38.3/39.1
11-167891

CT

CALIFORNIA DEPARTMENT OF TRANSPORTATION

State of California

Business, Transportation and Housing Agency

Memorandum

To : LEON EDMONDS
Office Engineer
District 11

Date: February 23, 2010

File: 11-IMP-78/86
KP R14.6/R19.5
KP 38.3/39.1
EA 167891

From : **DEPARTMENT OF TRANSPORTATION - DISTRICT 11**
Materials Engineering Branch

Subject:: Materials Information Brochure

Attached herewith for your consideration

MATERIALS INFORMATION

FOR PROPOSED PROJECT

IN IMPERIAL COUNTY

STATE ROUTES 78 & 86

For construction of State Highway in Imperial County near Brawley from Route 86 to 0.6 km east of Hovley Road and on Route 86 from 0.1 km north to 0.5 km south of Fredericks Road

Arthur F. Padilla
District Materials Engineer

REGISTERED PROFESSIONAL ENGINEER
ARTHUR F. PADILLA
No. C 49529
Exp. 9-30-10
CIVIL
STATE OF CALIFORNIA

cc: K Mamdani **(333)**
L Edmonds **(332)**
M Deyoe **(33)**
B Hinman **(63)**
Construction Admin. Senior **(72)**
Project File (mib 167891.doc)

MATERIALS INFORMATION

11-IMP-78/86
KP R14.6/R19.5
KP 38.6/39.1
EA 167891

NOTE: Information contained herein has been compiled in accordance with Section 2-1.03 of the Standard Specifications. Additional information is available for review at the District 11, Materials Laboratory, 7177 Opportunity Road, San Diego, California.

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Attachments:

Appendix A - Log of Test Borings 5 Sheets

MATERIALS INFORMATION

GROUND WATER

Perched ground water was not encountered in any of the test pit excavations to the depth of 1.5 m. Fluctuation of perched groundwater throughout the year should be expected due to irrigation practices and precipitation. Geotechnical Roadway South assumes that perched ground water conditions exist at 1.6 meters below existing ground surface.

R-VALUES`

Existing soils within the general limits of the project, R-values were found to be above 10 with the exception of test pit #5 which has an R-value less than 5. See **Appendix A** for further detail.

GRADING FACTORS

The average relative compaction of existing basement soils is 82%. Removal and recompaction of those soils to 90%, as recommended in the Materials Design Report dated June, 2009 and as specified in subsection 19-5.04 of the Standard Specifications, will produce a grading factor of 0.92 or 7.5% shrinkage.

EMBANKMENT RECOMMENDATIONS

As per the Materials Design Report dated June, 2009, basement soils excavated during structural section construction should be placed in embankments. Imported borrow with an R-value of no less than 5 should be used to make up any deficiencies when constructing embankments.

CLASS 4 AGGREGATE SUBBASE

Material for aggregate subbase may be processed from project soils or obtained from commercial sources. Aggregate subbase shall be Class 4 and conform to the provisions in Section 25, "Aggregate Subbase," of the Standard Specifications and Standard Special Provision 25-020, dated 07-30-99.

Class 4 aggregate subbase shall have a minimum R-value of 40 and a Sand Equivalent of 22. The aggregate subbase shall conform to the following grading:

Sieve Sizes	Percentage Passing
100mm	100
4.75mm	30-100
600μm	0-65
75μm	0-20

EARTHWORK QUANTITIES

The following earthwork quantities are from the Engineer's Estimate:

Roadway Excavation	386,400 m^3
Imported Borrow	402,800 m^3
Class 2 Aggregate Base	35,435 m^3
Class 4 Aggregate Subbase	33,950 m^3

CORROSION ANALYSIS

Currently within the project area, sulfate and chloride levels vary due to flood-irrigation practices. When this irrigation process ceases, cycles of evapotranspiration will occur raising the level of soluble salts. Due to this potential change, a conservative design approach was taken for culvert design.

- Soil pH = 8.5
- Soil Minimum Resistivity = 160 Ohms-cm
- Sulfates = 2350 mg/kg
- Chlorides = 1260 mg/kg
- Non-abrasive flow conditions
- Flow Velocities < 5 m/s

RECOMMENDED CULVERT ALTERNATIVES

1. Reinforced Concrete Pipe (RCP) may be used utilizing 6 sacks Cement (Type II modified or Type V) with 1" cover to reinforcing steel and a maximum water/cement ratio of 0.35.

2. Thick wall Plastic Pipes the satisfy design criteria. The pipe should be fabricated from either High Density Polyethylene (HDPE) or Polyvinyl Chloride (PVC).

3. 18 ga (0.52") Polymerized Asphalt Invert.

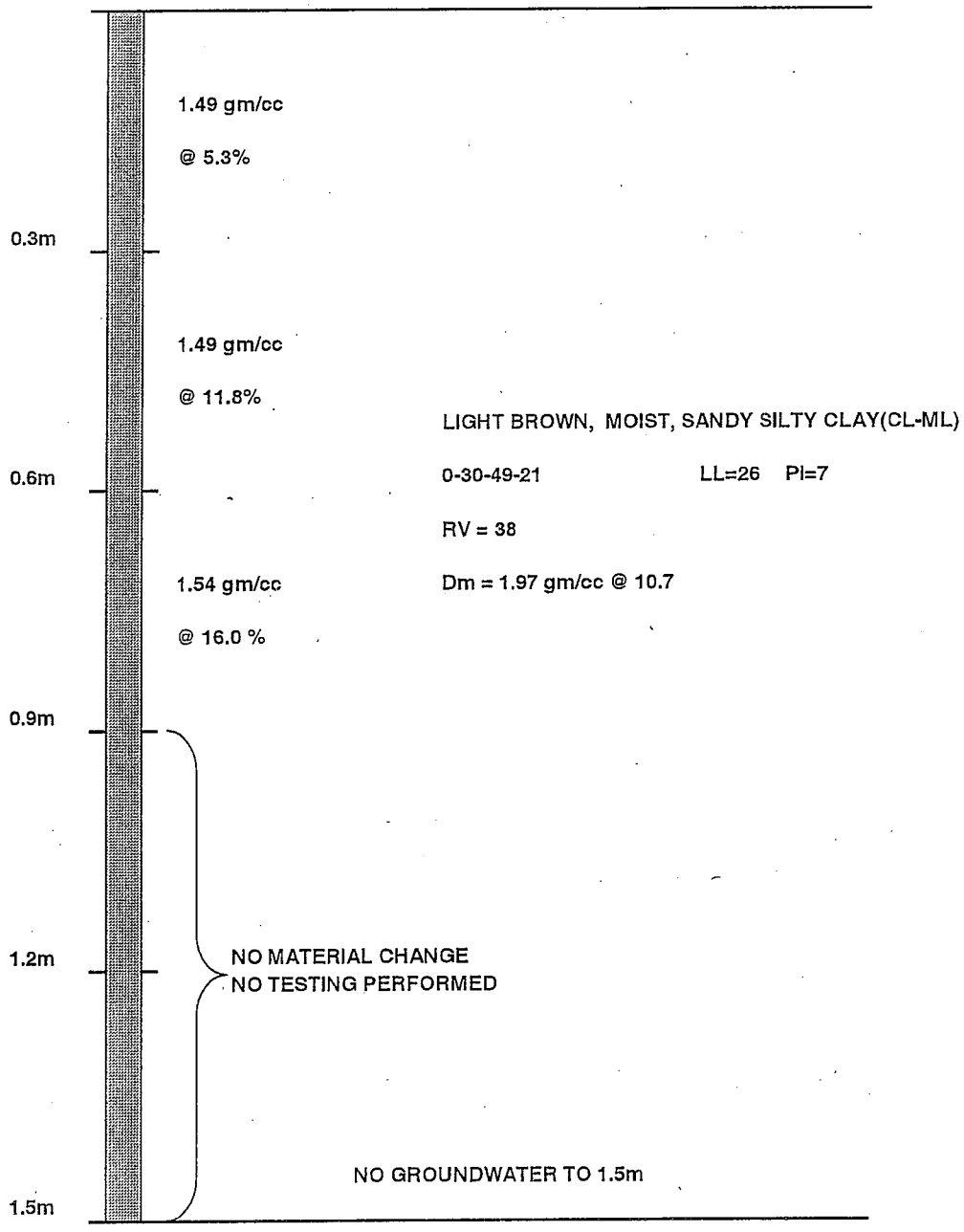
MATERIALS SOURCES

A current list of mining sites, including but not limited to the State owned Ocotillo site, eligible to sell materials such as aggregates to the State of California in Imperial County, can be found at the following California Office of Mine Reclamation website:

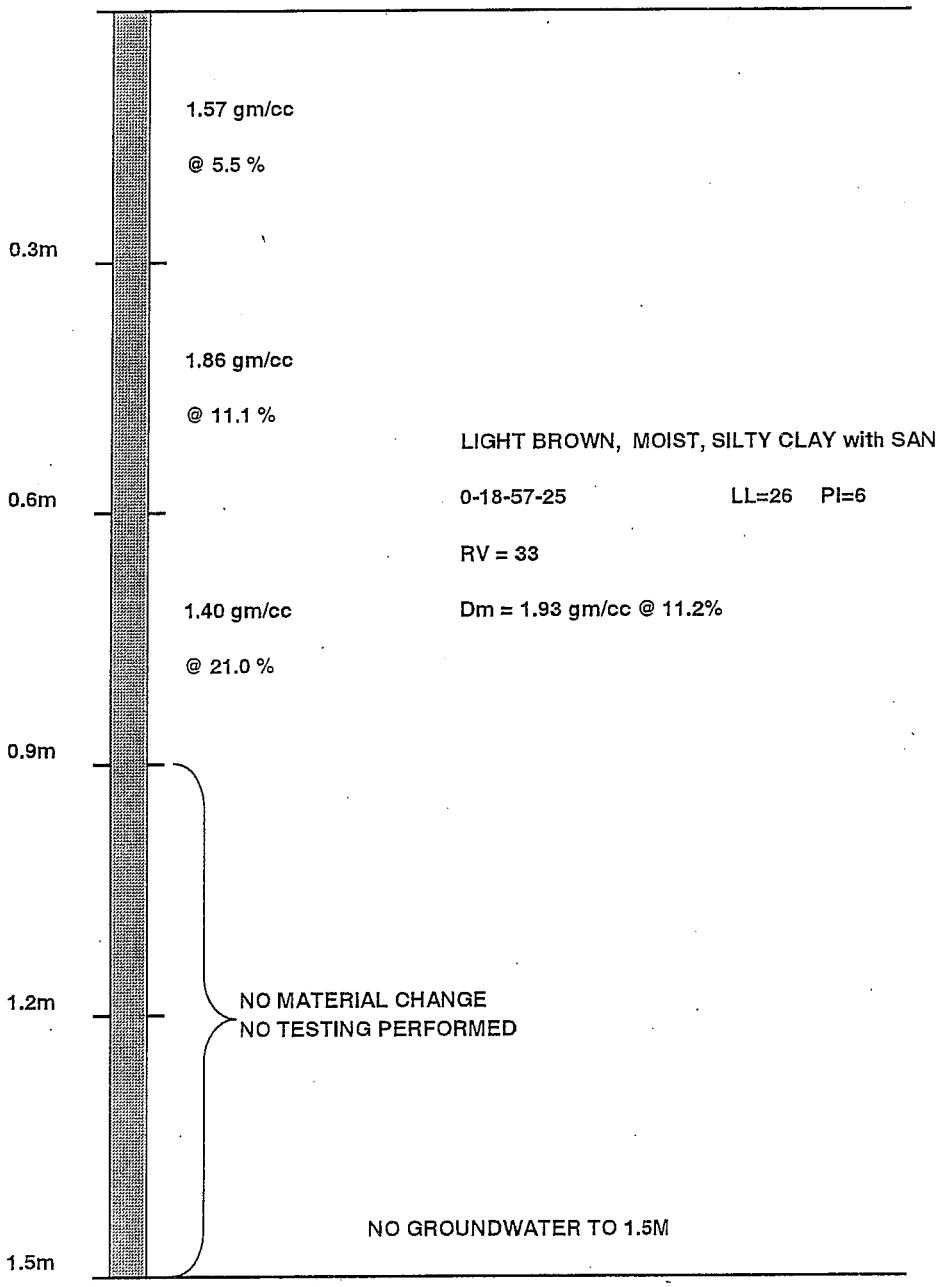
http://www.conservation.ca.gov/omr/ab_3098_list

APPENDIX A

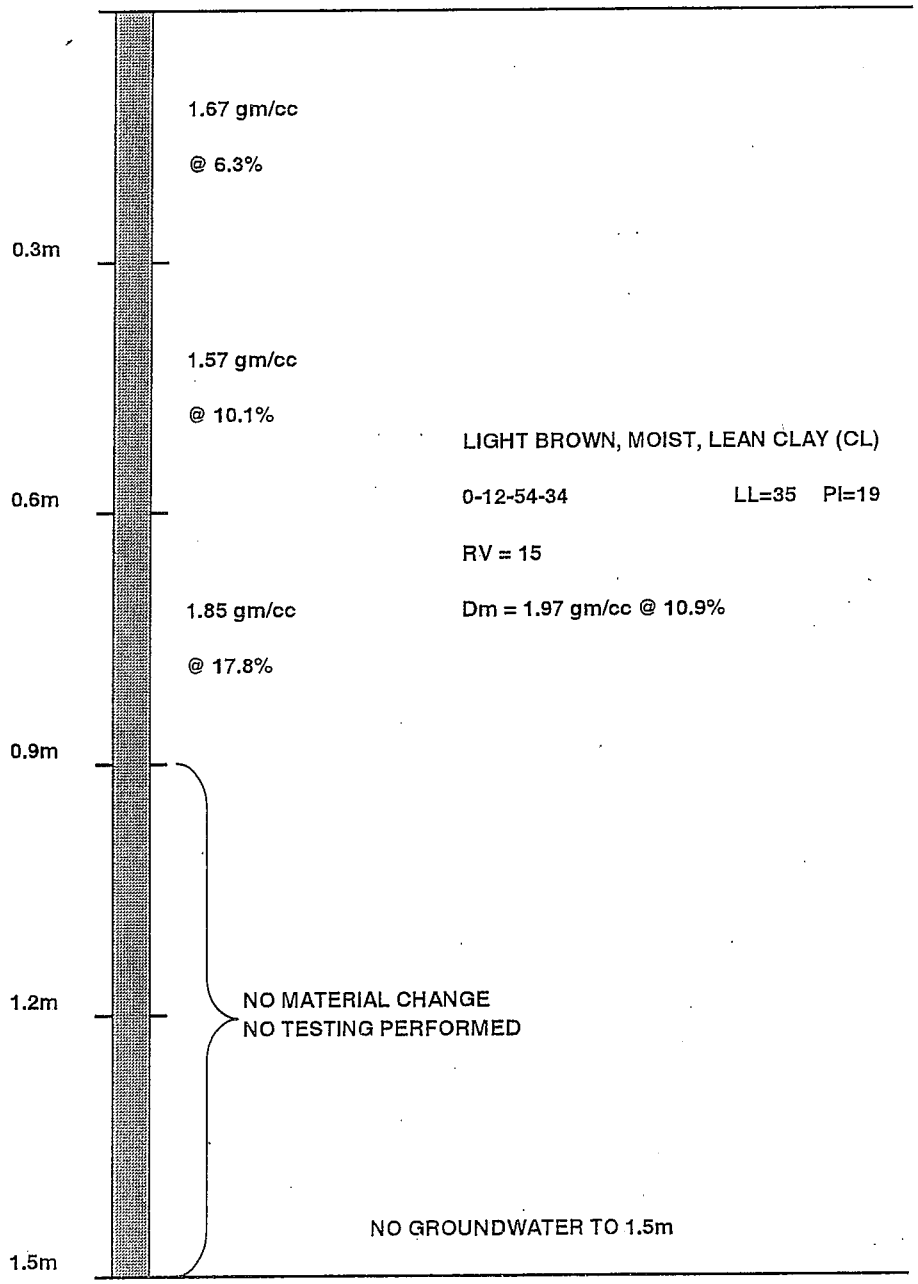
TEST BORING #1 @ STATION 195+35, 35m Lt



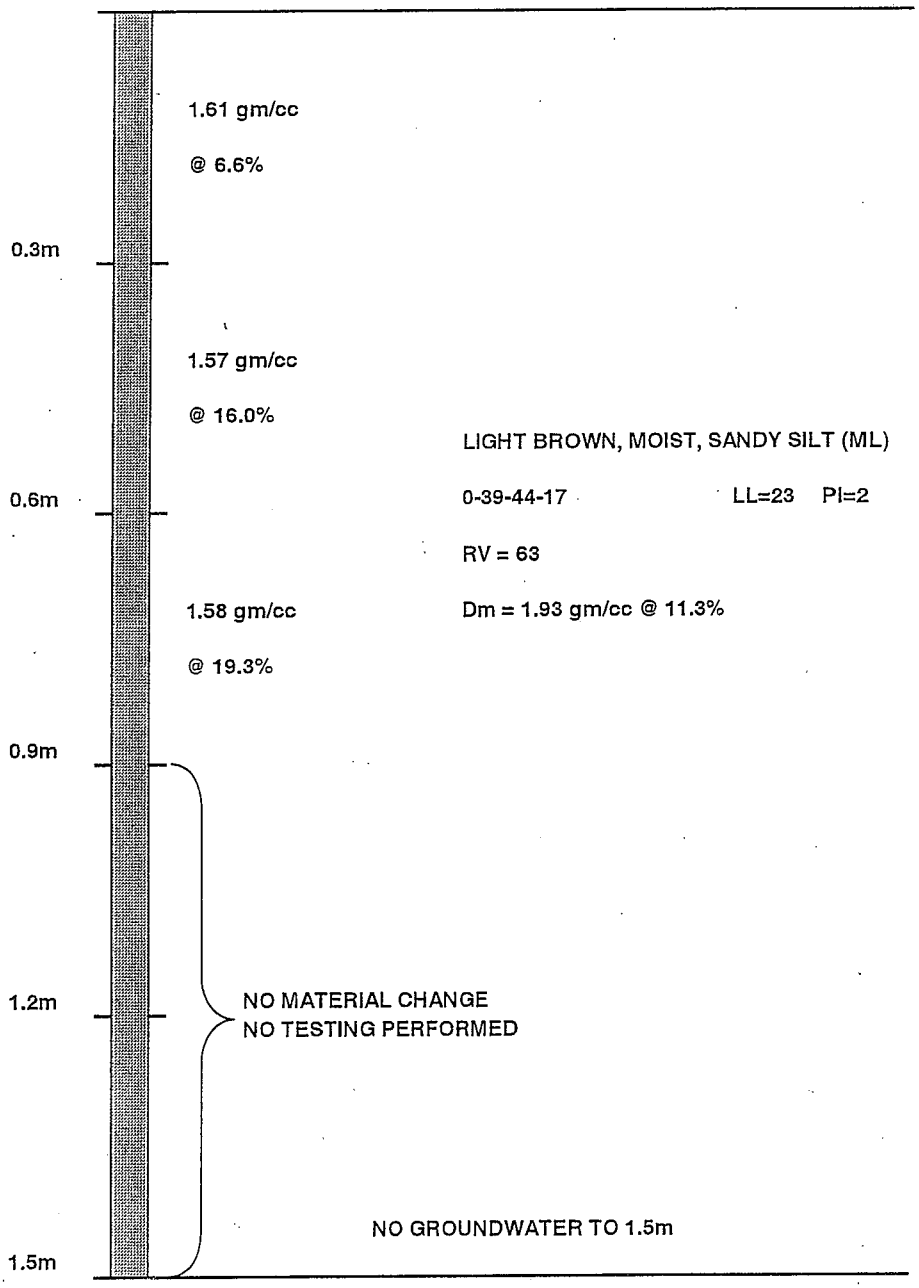
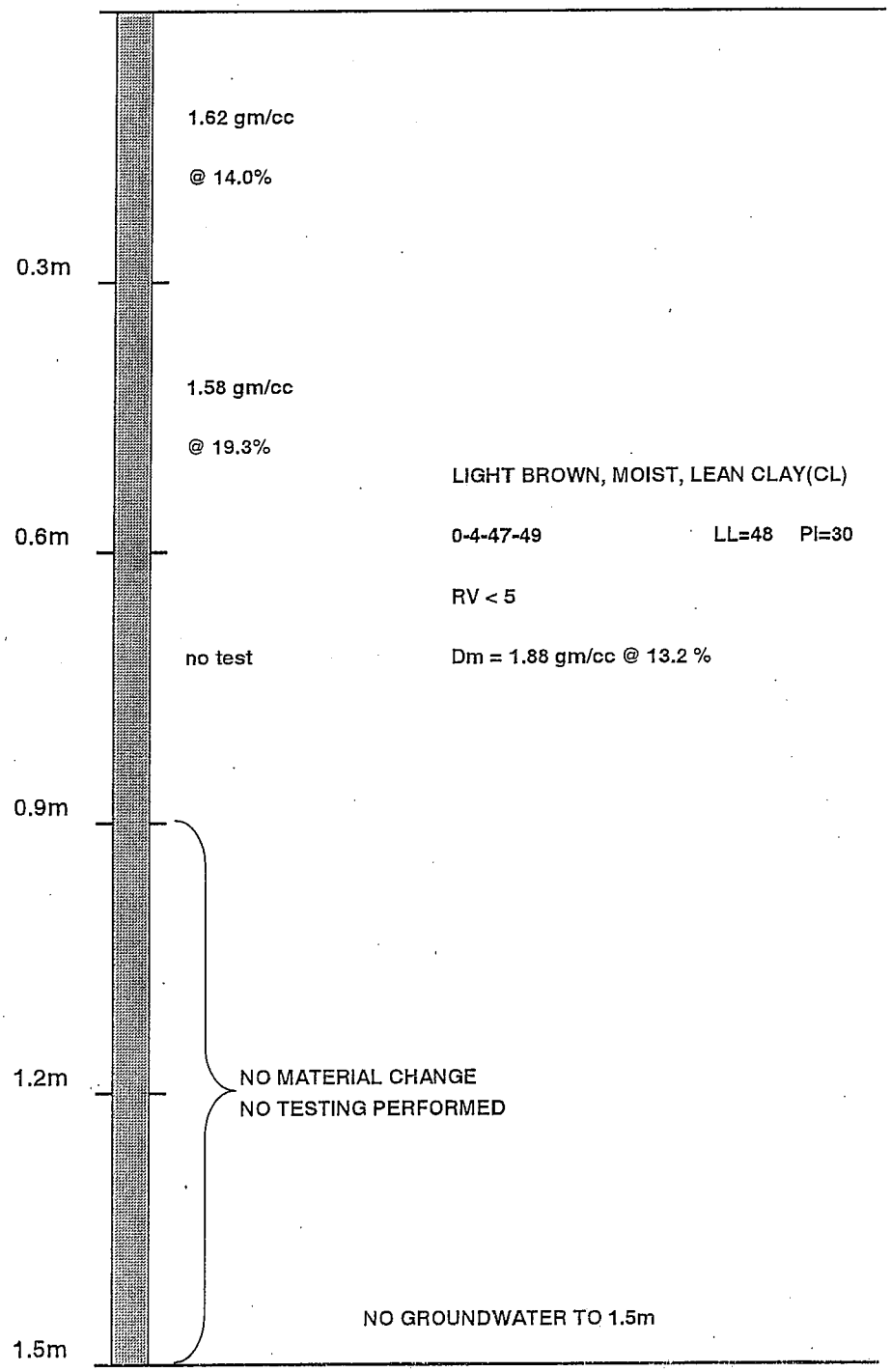
TEST BORING #2 @ STATION 190+35, 35m Lt



TEST BORING #3 @ STATION 185+35, 35m Lt



TEST BORING #4 @ STATION 169+35, 25m Lt.



TEST BORING #5 @ STATION 160+15, 35m Lt.