FOR CONTRACT NO.: 12-0E3104

INFORMATION HANDOUT

WATER QUALITY

STORM WATER INFORMATION HANDOUT

PERMITS

UNITED STATES ARMY CORPS OF ENGINEERS NATIONWIDE 404 PERMIT

MATERIALS INFORMATION

AERIALLY DEPOSITED LEAD SITE INVESTIGATION
FOUNDATION REPORTS FOR SIGN 205 & SIGNAL POLE OF ROUTE 5-74 SEPARATION
GEOTECH DESIGN REPORT FOR RETAINING WALLS 67, 80, 533B, 533C, 914, 930, and 954
MATERIAL REPORT-DRIVEWAY
MATERIAL REPORT-EPS DATED 08-09-11
MATERIAL REPORT REVISED THICKNESS DATED 03-17-11
MATERIAL REPORT SR 74 & I-5 DATED 02-01-11
FOUNDATION REPORT FOR ROUTE 74/5 SEPERATION (REPLACE)
FOUNDATION REPORT FOR RETAINING WALLS NOS. 10, 83 AND 533A
FOUNDATION REPORT FOR RETAINING WALLS NO. 96
FOUNDATION REPORT FOR RETAINING WALL 513
BATTERY BACKUP SYSTEM
CHEVRON STATION WELL INFORMATION AND MEDIATION SYSTEM INFORMATION

ROUTE: 12-Ora-5, 74-9.3/10.0, 0.0/0.2

State of California Business Transportation and Housing Agency

M e m o r a n d u m

To: Mr. Matthew Cugini
DISTRICT 12
Branch Chief, Design Branch C

Date: October 6, 2011

Attn: Mr. David Lam

From: GRACE PINA-GARRETT
DEPARTMENT OF TRANSPORTATION

DISTRICT 12
Branch Chief, NPDES/ Storm Water Unit

File: 12-0E3101
12-ORA-5/74
9.4/9.9, 0.0/0.2

Subject: **Storm Water Information Handout**

Please include the following information into Supplemental Project Information:

1. Groundwater Elevations: According to Geo-technical Design Report for Retaining Walls dated September 9, 2011, groundwater elevation in this project site is approximately 10 feet below ground surface on the west side of the I-5 and is approximately 10 to 37 feet below ground surface on the existing freeway and on the east side of the I-5. Comprehensive Site Assessment Report for Chevron Service Station (west of I-5, 26988 Ortega Highway) dated December 20, 2010 indicates that groundwater elevations range from 20.4 ft to 35.5 ft below top of well casing. Site Investigation Report for Chevron Service Station (east of I-5, 27112 Ortega Highway) dated June 30, 2011 indicates that groundwater elevations range from 20.9 ft to 21.0 ft below ground surface. Site Conceptual Model for 76 Service Station (east of I-5m 27164 Ortega Highway) dated September 3, 2009 indicates that groundwater elevation range from13.3 ft to 36.45 ft below top of well casing. Therefore, dewatering will be expected during the drilling process for the CIDH sign foundations, retaining wall installation, culvert box extensions/drainage system modifications, pile driving for bridge abutment foundations etc.
2. Groundwater Contamination: Groundwater on the western side of I-5, under the Chevron gasoline station (26988 Ortega Highway) and the adjacent Burger King restaurant was found to contain elevated MTBE concentrations, as well as concentrations of TPH as gasoline, and benzene (Delta Group, 2000, Comprehensive Site Assessment Report 2010 and Quarterly Monitoring Report 2011). Groundwater on the eastern side of I-5 under the Chevron gasoline station (27112 Ortega Highway) was also found to contain MTBE concentrations and TPH as gasoline concentrations. (Site Investigation Report, 2011). Therefore, the extracted groundwater during construction activities within the project limit is likely to be contaminated.
3. Discharge Extracted Groundwater: Any discharges of extracted groundwater must meet San Diego RWQCB General Waste Discharge Requirements (NPDES No. CAG919002, Order No. R9-2008-0002) (Attachment 1) and Enrollment Letter (Attachment 2). If the

concentrations of extracted groundwater exceed the Permit requirements, it must be disposed of appropriately as directed per non-standard SSP prepared by Environmental Engineering Unit.

4. The following critical Construction Site BMPs should be implemented during the construction:

   a. Temporary Gravel Bag Berm
   b. Temporary Fiber Rolls
   c. Temporary Silt Fence
   d. Temporary Hydraulic Mulch (Bonded Fiber Matrix)
   e. Temporary Concrete Washout Bin
   f. Temporary Drainage Inlet Protection
   g. Temporary Construction Entrance
   h. Street Sweeping

You may contact Grace Pina-Garrett at (949) 724-2189 with any questions you may have regarding this information handout.

Attachment 1: Order No. R9-2008-0002, NPDES No. CAG919002: General Waste Discharge Requirements for Discharges from Groundwater Extraction and Similar Discharges to Surface Waters within the San Diego Region Except for San Diego Bay (WDR).

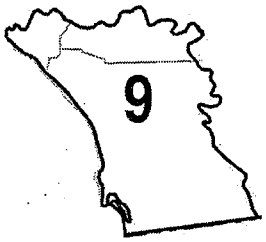
Attachment 2: Enrollment Letter.

California Regional Water Quality Control Board

San Diego Region
9174 Sky Park Court, San Diego, CA 92123-4340
(916) 341-5455 • FAX (916) 341-5463
www.waterboards.ca.gov/sandiego

Linda S. Adams
Secretary for
Environmental Protection

Arnold Schwarzenegger
Governor



GENERAL WASTE DISCHARGE REQUIREMENTS
FOR DISCHARGES
FROM GROUNDWATER EXTRACTION AND SIMILAR DISCHARGES
TO SURFACE WATERS WITHIN THE SAN DIEGO REGION
EXCEPT FOR SAN DIEGO BAY (WDR)

ORDER NO. R9-2008-0002
NPDES NO. CAG919002

A Discharger, as described in the following table that has complied with the requirements for coverage under this General "Waste Discharge Requirements" (WDR), is subject to waste discharge requirements, once permit coverage is effective, as set forth in this WDR.

Dischargers	Any person with discharges from ground water extraction activities to surface waters within the San Diego Region, except for San Diego Bay that do not cause, have the reasonable potential to cause, or contribute to an instream excursion above any applicable State or federal water quality objectives/criteria or cause acute or chronic toxicity in the receiving water.

This WDR was adopted by the Regional Board on:	March 12, 2008
This WDR shall become effective on:	March 12, 2008
This WDR shall expire on:	March 12, 2013
The U.S. Environmental Protection Agency and the California Regional Water Quality Control Board, San Diego Region have classified these discharges as minor discharges.	

IT IS HEREBY ORDERED that Order No. 2001-96 is rescinded upon the effective date of this WDR except for enforcement purposes, as specified elsewhere in this Order, and; in order to meet the provisions contained in Division 7 of the California Water Code and regulations adopted therein, and the provisions of the federal Clean Water Act, and regulations and guidelines adopted therein, Dischargers shall comply with the requirements in this WDR.

I, John H. Robertus, Executive Officer, do hereby certify the following is a full, true, and correct copy of an Order adopted by the California Regional Water Quality Control Board, San Diego Region on March 12, 2008.

for John H. Robertus, Executive Officer

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I. DISCHARGE INFORMATION

A. Groundwater Extraction

Existing and proposed discharges of groundwater extraction waste to surface waters within the San Diego Region from construction groundwater extraction, foundation groundwater extraction and groundwater extraction related to groundwater remediation cleanup projects (collectively groundwater extraction):

1. Result from similar operations (all involve extraction and discharge of groundwater);
2. Are the same type of wastes (all are groundwater containing or potentially containing petroleum hydrocarbons, solvents, or other pollutants);
3. Require similar effluent limitations for the protection of the beneficial uses of similar receiving waters;
4. Require similar monitoring; and
5. Are more appropriately regulated under a general permit rather than individual permits.

II. PERMIT INFORMATION

A. Application

To obtain coverage under this WDR a Discharger must submit the following to the California Regional Water Quality Control Board, San Diego Region (Regional Board):

1. A Notice of Intent (NOI), including the following information:
   a. Owner and Operator name;
   b. Owner and Operator address;
   c. Owner and Operator telephone number;
   d. Site name
   e. Site address
   f. Type of discharges;
   g. Name of receiving waterbody and conveyance(s);
2. An initial sampling and monitoring report;
3. A project map(s) that shows the essential features of the groundwater extraction system within the Regional Board boundary, and the corresponding surface water or storm drain to which water will be discharged; and
4. Payment of the application fee, equal to the first annual fee, made payable to "SWRCB."

The NOI form is included within this WDR package as Attachment B.

The WDR NOI, including, map(s), the application fee, and other attachments, must be submitted to the following address:

CRWQCB – San Diego Region
9174 Sky Park Court, Suite 100
San Diego, CA 92123

Attn: Groundwater Extraction to San Diego Region
Core Regulatory Unit
NOTICE OF INTENT

B. Coverage

Permit coverage will be effective when all of the following have occurred:

1. The Discharger has submitted a complete NOI application (including initial sampling and monitoring report), as determined by the Regional Board; and
2. The Regional Board issues the Discharger's a Notice of Enrollment, which includes the discharge flow limit, any additional or increase in monitoring due to specific circumstances of the discharge, and any other additional requirements.
3. Current dischargers enrolled in Order No. 2001-96 shall re-enroll no later than 365 days after adoption of this WDR, each discharger currently enrolled in Order No. 2001-96 shall continue to comply with Order No. 2001-96 until obtaining permit coverage under this WDR.

C. Eligibility Criteria

This WDR is intended to cover all discharges of groundwater extraction wastes to surface waters within the San Diego Region Except San Diego Bay, from groundwater extraction due to construction and other groundwater extraction activities regardless of volume, including discharges less than 100,000 gallons per day. Dischargers must meet the following criteria to be subject to waste discharge requirements by this WDR:

1. The discharge of extracted groundwater due to groundwater extraction activities is discharged to surface waters within San Diego Region except San Diego Bay;

2. Pollutant concentrations in the discharge comply with the Discharge Specifications of this WDR.

This WDR does <u>not</u> cover:

STORM WATER - Storm water runoff due to construction activities. These activities may be covered under the statewide general NPDES permit for storm water discharges associated with construction activities (CAS000002), the statewide general NPDES permit for storm water runoff associated with small linear underground/overhead construction projects (CAS000005), and/or Clean Water Act (CWA) Section 401 Water Quality Certifications.

SANITARY SEWER - Discharges to a sanitary sewer. These discharges do not need coverage under the NPDES Program. Contact the agency controlling the sanitary sewer for approval prior to discharging to its conveyance system.

UTILITY VAULTS - Discharges from utility vaults and underground structures. These activities may be covered under the statewide general NPDES permit for discharges from utility vaults and underground structures to surface water Order No. 2006-0008-DWQ (CAG990002).

HYDROSTATIC/ POTABLE WATER – Discharges from drinking water well development. These discharges are covered under Order No. R9-2002-0020 (CAG679001).

D. Discharge to a Municipal Separate Storm Sewer System (MS4)

Prior to discharging into an MS4, the Discharger shall demonstrate alternatives to discharging extracted groundwater waste into an MS4 and why it is technically or economically infeasible to implement these alternatives.

Without prior approval from the appropriate local agency with jurisdiction over the MS4, the discharger shall not discharge extracted groundwater waste under this WDR into an MS4.

Local agencies responsible for operating the MS4s may not passively receive and discharge pollutants from third parties. By providing free and open access to an MS4 that conveys discharges to waters of the U.S., the MS4 operator essentially accepts responsibility for discharges into the MS4 that it does not prohibit or control. These discharges may cause or contribute to a condition of contamination or a violation of water quality standards.

Therefore, at least 30 days prior to initiating an extracted groundwater discharge to an MS4, the Discharger shall notify and receive authorization from the appropriate local agency with jurisdiction over the MS4. This requirement encourages communication between Dischargers enrolled under this WDR and local agencies responsible for MS4s in an effort to reduce misunderstandings and concerns over the types of discharges covered by this WDR.

E. Termination of Discharges

Dischargers shall submit a written request referred to as a "Notice of Termination (NOT)" to this Regional Board when coverage under this WDR is no longer required. The NOT letter constitutes a notice that the owner (and his/her agent) of the site has ceased the discharge of ground water associated with the groundwater extraction activities at the site under this WDR.

The NOT should include "Notice of Termination (NOT)" in the subject line, the Waste Discharge Identification Number (WDID) assigned to the project by the Regional Board when enrolled in the WDR, the name and address of the owner, and be signed and dated by the owner in accordance with the signatory requirements of the WDR. The Discharger shall continue to comply with the

requirements of the WDR until the Regional Board approves the NOT. Submittal of a NOT letter does not guarantee termination. Approval of the NOT does not relieve the Discharger's responsibility for paying any applicable outstanding invoices of annual fees as a result of enrollment under this WDR, nor does it relieve the Discharger from enforcement from existing violations.

F. Re-Enrollment of Renewed Permit

Dischargers enrolled under previous General Permit Order No. 2001-96 that plan on continuing their discharge, must re-enroll by submitting an NOI to obtain coverage under this WDR. Re-enrollees shall re-enroll no later than 365 days after the date of adoption of this WDR to achieve compliance with the new effluent limitations and criteria established by this WDR.

G. Transferring Ownership

Enrollment under the WDR for a specific project is not transferable. In the event of any change in ownership of land or waste discharge facilities presently owned by the enrolled Discharger, the Discharger must notify the new succeeding owner of the existence of this WDR by letter 120 days prior to property transfer, a copy of which must be immediately forwarded to the Regional Board office. Additionally, the Discharger must submit a NOT to the Regional Board. The new succeeding owner must submit a new NOI in application of enrollment under this WDR.

III. Findings

The Regional Board finds:

A. Background

This WDR supersedes Order No. 2001-96. The NPDES No. CAG919002 remains the same. Dischargers enrolled under previous Order No. 2001-96 must obtain coverage under this new WDR to continue their discharge subject to waste discharge requirements in this WDR.

B. Discharge Subject to Waste Discharge Requirements

To be subject to waste discharge requirements in this WDR for continued and future discharge to waters of the United States, Dischargers must submit an NOI and obtain coverage in order to be regulated under this WDR as provided in 40 CFR section 122.28 (b)(2).

C. Discharge Description

Existing and proposed discharges of groundwater extraction waste to surface waters within the San Diego Region except San Diego Bay from construction groundwater extraction, foundation groundwater extraction and groundwater extraction related to groundwater remediation (collectively referred to as Groundwater Extraction).

D. Legal Authorities

These waste discharge requirements are issued pursuant to Sections 13263 and 13377 of the California Water Code (CWC). The Regional Board shall prescribe requirements as to the nature of any proposed discharge and shall issue waste discharge requirements which apply and ensure compliance with all applicable provisions of the Federal Water Pollution Control Act, also referred as the Clean Water Act (CWA).

These waste discharge requirements issued by the Regional Board shall also serve as an NPDES permit for point source discharges from groundwater extraction waste to surface waters within the San Diego Region except San Diego Bay.

States may request authority to issue general NPDES permits pursuant to 40 CFR section 122.28. On June 8, 1989, the California State Water Resources Control Board (State Board) submitted an application to USEPA requesting revisions to its NPDES Program in accordance with 40 CFR sections 122.28, 123.62, and 403.10. The application included a request to add general permit authority to its approved NPDES Program. On September 22, 1989, USEPA, Region 9, approved the State Board's request and granted authorization for the State of California to issue general NPDES permits.

E. Background and Rationale for Requirements

The Regional Board developed the requirements in this WDR based on information submitted as part of the applications for several like agencies, individuals, and entities, through monitoring and reporting programs, and through special studies. Attachments A through F, which contain background information and rationale for WDR requirements, are hereby incorporated into this WDR and constitute part of the Findings for this WDR.

F. California Environmental Quality Act (CEQA)

This action to adopt a NPDES permit is exempt from the provisions of CEQA (Public Resources Code section 21100, et seq.) in accordance with CWC section 13389.

G. Technology-Based Effluent Limitations (TBELs)

Permits shall include applicable TBELs and standards. (40 CFR § 122.44(a)). This WDR does not include numeric-TBELs because USEPA has not promulgated effluent limitation guidelines for groundwater extraction.

H. Water Quality-Based Effluent Limitations (WQBELs)

Permits shall include WQBELs to attain and maintain applicable numeric and narrative water quality criteria to protect the beneficial uses of the receiving water. (40 CFR § 122.44(d)). Where numeric water quality criteria have not been established, WQBELs may be established using USEPA CWA section 304(a)criteria guidance, proposed State criteria or a State policy interpreting

narrative criteria supplemented with other relevant information, or an indicator parameter. (40 CFR § 122.44(d)).

I. Water Quality Control Plan

The Regional Board's Water Quality Control Plan for the San Diego Basin (hereinafter Basin Plan) designates beneficial uses, establishes water quality objectives, and contains implementation programs and policies to achieve those objectives for all waters addressed through the Basin Plan. The Basin Plan was adopted by the Regional Board on September 8, 1994, and was subsequently approved by the State Board on December 13, 1994. Subsequent revisions to the Basin Plan have also been adopted by the Regional Board and the State Board.

In addition, State Board Resolution No. 88-63 establishes state policy that all waters, with certain exceptions, should be considered suitable or potentially suitable for municipal and domestic supplies. Requirements of this WDR specifically implement the applicable provisions of the Basin Plan and State Board policy.

J. National Toxics Rule (NTR) and California Toxics Rule (CTR)

The USEPA adopted the NTR on December 22, 1992, which was amended on May 4, 1995, and November 9, 1999. The CTR was adopted by USEPA on May 18, 2000, and amended on February 13, 2001. These rules include water quality criteria for priority pollutants and are applicable to these discharges.

K. State Implementation Policy

On March 2, 2000, the State Board adopted the Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (State Implementation Policy or SIP). The SIP became effective on April 28, 2000, with respect to the priority pollutant criteria promulgated for California by USEPA through the NTR and to the priority pollutant objectives established by the Regional Boards in their Basin Plans, with the exception of the provision on alternate test procedures for individual discharges that have been approved by the USEPA Regional Administrator. The alternate test procedures provision became effective on May 22, 2000. The SIP became effective on May 18, 2000. The SIP includes procedures for determining the need for WQBELs and for calculating WQBELs. The SIP also requires Dischargers to submit sufficient data to make the determination, and if necessary to calculate the WQBELs. The State Board adopted amendments to the SIP on February 24, 2005, that became effective on July 13, 2005. The SIP establishes implementation provisions for priority pollutant criteria and objectives, and provisions for chronic toxicity control. Requirements of this WDR implement the SIP.

L. Compliance Schedules and Interim Requirements

Current dischargers enrolled in Order No. 2001-96 shall re-enroll no later than 365 days after adoption of this WDR, each discharger currently enrolled in Order

No. 2001-96 shall continue to comply with Order No. 2001-96 until obtaining permit coverage under this WDR.

M. Antidegradation Policy

Section 131.12 of 40 CFR requires that State water quality standards include an antidegradation policy consistent with the federal policy. The State Board established California's antidegradation policy in State Board Resolution No. 68-16. Resolution No. 68-16 incorporates the federal antidegradation policy where the federal policy applies under federal law. Resolution No. 68-16 requires that existing quality of waters be maintained unless degradation is justified based on specific findings. The Regional Boards' Basin Plans implement, and incorporate by reference, both the State and federal antidegradation policies. As discussed in detail in the Fact Sheet, the permitted discharges are consistent with the antidegradation provision of 40 CFR section 131.12 and State Board Resolution No. 68-16.

N. Anti-Backsliding Requirements

Sections 402(o)(2) and 303(d)(4) of the CWA and federal regulations of 40 CFR section 122.44(l) prohibit backsliding in NPDES permits. These anti-backsliding provisions require effluent limitations in a reissued permit to be as stringent as those in the previous permit, with some exceptions where limitations may be relaxed. All effluent limitations in this WDR are at least as stringent as the effluent limitations in the previous Order.

O. Monitoring and Reporting

Section 122.48 of 40 CFR requires that all NPDES permits specify requirements for recording and reporting monitoring results. Sections 13267 and 13383 of the CWC authorize the Regional Boards to require technical and monitoring reports. The Monitoring and Reporting Program (MRP) establishes monitoring and reporting requirements to implement federal and State requirements. This MRP is provided in Attachment E.

P. Standard and Special Provisions

Standard Provisions, which in accordance with 40 CFR sections 122.41 and 122.42 apply to all NPDES discharges and must be included in every NPDES permit, are provided in Attachment D. The Regional Board has also included in this WDR special provisions applicable to the enrolled Dischargers. A rationale for the special provisions contained in this WDR is provided in the attached Fact Sheet (Attachment F).

Q. Notification of Interested Parties

The Regional Board has notified the Dischargers, interested agencies and persons of its intent to prescribe WDRs for these discharges, and has provided them with an opportunity to submit their written comments and recommendations. Notification details are provided in the Fact Sheet (Attachment F) of this WDR.

R. Consideration of Public Comment

The Regional Board, in a public meeting, heard and considered all comments pertaining to the discharges. Details of the Public Hearing are provided in the Fact Sheet of this WDR.

S. Alaska Rule

On March 30, 2000, USEPA revised its regulation that specifies when new and revised State and Tribal water quality standards (WQS) become effective for CWA purposes (40 CFR section 131.21, 65 FR 24641, April 27, 2000). Under the revised regulation (also known as the Alaska rule), USEPA must approve new and revised standards submitted to USEPA after May 30, 2000, before being used for CWA purposes. The final rule also provides that standards already in effect and submitted to USEPA by May 30, 2000, may be used for CWA purposes, whether or not approved by USEPA.

T. Ocean Plan

In order to protect the beneficial uses of receiving waters from excessive concentrations of pollutants as a result of groundwater extraction waste discharges, this Order does not provide for a mixing zone or a zone of initial dilution except when the discharge is to the surf zone. This Order allows initial dilution of 3 in a surf zone.

IV. Discharge Prohibitions

A. The discharge of wastewater at a location, or in a manner different from that described in the Findings, NOI, or Notice of Enrollment letter from the Regional Board is prohibited.

B. The discharge of wastewater shall not create or cause conditions of nuisance or pollution.

C. The discharge shall not cause, have a reasonable potential to cause, or contribute to an in-stream excursion above any applicable criterion promulgated by USEPA pursuant to section 303 of the CWA, or water quality objective adopted by the State or Regional Boards.

D. The discharge of waste to areas designated by the State Board as being of special (ASBS) biological significance is prohibited. Discharges shall be located a sufficient distance from such designated areas to assure maintenance of natural water quality conditions in these areas.

E. The discharge of groundwater extraction wastes from a specific site in excess of the flowrate specified in the Notice of Enrollment from the Regional Board is prohibited, unless the enrollee obtains a revised discharge Notice of Enrollment authorizing an increased flowrate.

F. The addition of pollutants to extracted groundwater to be discharged to surface waters within the San Diego Region except San Diego Bay is prohibited. The

only exception to this prohibition is that chemicals may be added to extracted groundwater to control biofouling in treatment systems, provided that extracted groundwater discharged meets the effluent limitations for such chemicals established by this WDR and in the discharge Notice of Enrollment issued by the Regional Board.

G. The discharge of groundwater extraction wastes to surface waters within the San Diego Region except San Diego Bay is prohibited unless an NOI has been submitted, and the Regional Board has provided the Discharger with a written Notice of Enrollment identifying the discharge subject to waste discharge requirements.

H. The discharge of groundwater extraction wastes from a groundwater remediation operation after the date groundwater has been remediated to the satisfaction of the Regional Board is prohibited.

I. Compliance with Discharge Prohibitions contained in the Basin Plan is also required as a condition of this WDR.

J. Discharges of wastes in a manner, or to a location which have not been specifically regulated by waste discharge requirements of this WDR are prohibited.

K. The discharge of any radiological, chemical, or biological warfare agent, or high level radiological waste is prohibited.

L. The dumping or deposition, from shore, of oil, garbage, trash, or other solid municipal, industrial, or agricultural waste directly into waters subject to tidal action or adjacent to waters subject to tidal action in any manner which may permit it to be washed into waters subject to tidal action is prohibited.

M. The dumping or deposition of chemical agents or explosives into waters subject to tidal action is prohibited.

V. Effluent Limitations and Discharge Specifications

A. Effluent Limitations

Summary of Water Quality-Based Effluent Limitations
Discharge Point
Summary of Water Quality-based Effluent Limitations Table

1. DISCHARGES TO BAYS AND HARBORS

The discharge of groundwater extraction waste to Mission Bay, Oceanside Harbor, Del Mar Boat Basin, or Dana Point Harbor shall not contain pollutants in excess of the following effluent limitations:

General / Inorganic / Biological

Parameter	Units	Effluent Limitations				
		AMEL	AWEL	MDEL	Instantaneous Maximum	6-Month Median
Settleable Solids	ml/L	1.0 [OP]	1.5 [OP]	-	3.0 [OP]	-
Total Suspended Solids	mg/L	30 [AB]	-	-	50 [AB]	-
Hydrogen Sulfide	µg/L	2 [AB]	-	4 [AB]	10 [AB]	-
Total Residual Chlorine	µg/L	-	-	8 [OP]	60 [OP]	2 [OP]
Acute Toxicity	Tua			0.3 [OP]		
Chronic Toxicity	Tuc			1.0 [OP]		
Total Coliform	MPN/ 100 ml				1000.0 [AB]	
Fecal Coliform	MPN/ 100 ml				200.0 [AB]	
pH	Units	Within limit of 6.0 to 9.0 at all times [OP]				

Parameter	Units	Effluent Limitations				
		AMEL	AWEL	MDEL	Instantaneous Minimum	6-Month Median
Dissolved Oxygen (DO)	mg/L				> 5.0 [AB]	

Petroleum

Parameter	Units	Effluent Limitations				
		AMEL	AWEL	MDEL	Instantaneous Maximum	6-Month Median
MTBE	µg/L				5 [DHS]	
Benzene	µg/L	-	-	-	5 [AB]	-
Ethylbenzene	µg/L	-	-	-	5 [AB]	-
Toluene	µg/L	-	-	-	5 [AB]	-
Xylene	µg/L	-	-	-	5 [AB]	-
Total Petroleum Hydrocarbons	mg/L	-	-	-	0.5 [AB]	-

Metals

Parameter	Units	Effluent Limitations			
		AMEL	MDEL	Instantaneous Maximum	6-Month Median
Tributyltin (TBT)	µg/L	0.0014 [OP]			

Organics

Parameter	Units	Effluent Limitations			
		AMEL	MDEL	Instantaneous Maximum	6-Month Median
Phenolic Compounds (non-chlorinated)	µg/L	-	120 [OP]	300 [OP]	30 [OP]
Chlorinated Phenolics	µg/L	0.025 [CTR]	0.049 [CTR]	10 [OP]	1 [OP]
1,1,2,2-tetrachlorethane (PCA)	µg/L	2.3 [OP]	-	-	-
1,1,1-trichloroethane (TCA)	µg/L	5.4E5 [OP]	-	-	-
1,1,2-trichloroethane (TCA)	µg/L	9.4 [OP]	-	-	-
1,2-dichloroethane	µg/L	28 [OP]	-	-	-
Tetrachloroethylene (PCE)	µg/L	2.0 [OP]	-	-	-
Trichloroethylene (TCE)	µg/L	27 [OP]	-	-	-
Vinyl chloride	µg/L	36 [OP]	-	-	-
Carbon tetrachloride	µg/L	0.90 [OP]	-	-	-
Base/Neutral Organic Compounds	µg/L			10 [AB]	

Parameter	Units	Effluent Limitations			
		AMEL	MDEL	Instantaneous Maximum	6-Month Median
Ammonia (as N)	µg/L		2400 [OP]	6000 [OP]	600 [OP]
Endosulfan	ng/L	-	18 [OP]	27 [OP]	9 [OP]
HCH	ng/L	-	8 [OP]	12 [OP]	4 [OP]
Dichloromethane	µg/L	450 [OP]	-	5 [AB]	-
Halomethanes	µg/L	-	-	5 [AB]	-
PAHs	ng/L	8.8 [OP]	-	-	-
TCDD Equivalents	pg/L	0.0039 [OP]	-	-	-

Parameter	Units	Effluent Limitations			
		AMEL	MDEL	Instantaneous Maximum	6-Month Median
Turbidity	µg/L	75 [OP]	2.2 [CTR]	225	-

Parameter	Units	Effluent Limitations			
		AMEL	AWEL	Instantaneous Minimum	6-Month Median
Turbidity	NTU	75 [OP]	100 [OP]	225 [OP]	-
Turbidity	NTU	Shall not exceed the turbidity of the receiving water. [AB]			
126 Priority Pollutants from "Inland Surface Waters"					

2. DISCHARGES TO LAGOONS/ESTUARIES

The discharge of groundwater extraction waste discharges to saline lagoons (only Buena Vista Lagoon is fresh water) and estuaries of the region shall not contain pollutants in excess of the following effluent limitations:

Includes limits to the Bays and Harbors Limitations

Parameter	Units	Effluent Limitations			
		AMEL	MDEL	Instantaneous Maximum	6-Month Median
Total Nitrogen	mg/L	-	-	2.0 [AB]	1.0 [AB]
Total Phosphorus	mg/L	-	-	.0.2 [AB]	0.1 [AB]
pH	Units	Within limit of 7.0 to 8.5 at all times [AB]			
All Parameters and Effluent Limitations from "Bays and Harbors"					

3. DISCHARGES TO THE SURF ZONE

The discharge of groundwater extraction waste to the surf zone (3:1 dilution factor) shall not contain pollutants in excess of the following effluent limitations:

Discharges to the Surf Zone Calculation

The formula used to calculate effluent limits for consituents discharged to the surf zone is from Table B in the Ocean Plan except for Toxicity and Radioactivity.

$Ce=Co+Dm(Co-Cs)$

Ce = the effluent concentration limit, ug/L
Co = the concentration (water quality objective) to be met at the completion of initial dilution, ug/L
Dm = minimum probable initial dilution expressed as parts seawater per part wastewater

Dm = 3 from findings from the 2001-96 Order.
Cs = background seawater concentration (see Table C), ug/L

Table C
BACKGROUND SEAWATER CONCENTRATIONS (Cs)

Waste Consitituent	Cs (ug/L)
Arsenic	3
Copper	2
Mercury	0.0005
Silver	0.16
Zinc	8
For all other Table B parameters	0

DISCHARGES TO THE SURF ZONE

(3:1 DILUTION FACTOR) [AB]

Parameter	Units	Effluent Limitations			
		AMEL	MDEL	Instantaneous Maximum	6-Month Median
TCR	µg/L		32 [OP]	240 [OP]	8 [OP]
Ammonia (as Nitrogen)	µg/L		9600 [OP]	24,000 [OP]	2400 [OP]
Arsenic	µg/L		119 [OP]	311 [OP]	23 [OP]
Cadmium	µg/L		16 [OP]	40 [OP]	4 [OP]
Chromium (hexavalent)	µg/L		32 [OP]	80 [OP]	8 [OP]
Copper	µg/L		42 [OP]	114 [OP]	6 [OP]
Lead	µg/L		32 [OP]	80 [OP]	8 [OP]
Mercury	µg/L		0.64 [OP]	1.60 [OP]	0.16 [OP]
Nickel	µg/L		80 [OP]	200 [OP]	20 [OP]
Silver	µg/L		10.7 [OP]	27.5 [OP]	2.32 [OP]
Zinc	µg/L		296 [OP]	776 [OP]	56 [OP]
Cyanide	µg/L		16 [OP]	40 [OP]	4 [OP]
Phenolic Compounds (Non-chlorinated)	µg/L		480 [OP]	1200 [OP]	120 [OP]
1,1,2,2-tetrachloroethane	µg/L		9.2 [OP]		
Tributyltin (TBT)	µg/L		0.0056 [OP]		
1,1,-trichoroethane	µg/L		2,160,000 [OP]		

Parameter	Units	Effluent Limitations			
		AMEL	MDEL	Instantaneous Maximum	6-Month Median
1,1,2-trichloroethane	µg/L		37.6 OP		
Carbon tetrachloride	µg/L		3.6 OP		
PCBs	µg/L		0.000076 OP		
Tetrachloroethylene	µg/L		8 OP		
Trichloroethylene	µg/L		108 OP		
Vinyl chloride	µg/L		144 OP		
Selenium	µg/L		240 OP	600 OP	60 OP
Endosulfan	µg/L		0.072 OP	0.108 OP	0.036 OP
Endrin	µg/L		0.016 OP	0.024 OP	0.008 OP
HCH	µg/L		0.032 OP	0.048 OP	0.016 OP
Acrolein	µg/L	880 OP			
Antimony	µg/L	4800 OP			
bis(2-chloroethoxy) methane	µg/L	17.6 OP			
bis(2-chloroisopropyl) ether	µg/L	4800 OP			
Chlorobenzene	µg/L	2280 OP			
di-n-butyl phthalate	µg/L	14,000 OP			
Dichlorobenzenes	µg/L	20,400 OP			
1,1-dichloroethylene	µg/L	3.6 OP			
Diethyl phthalate	µg/L	132,000 OP			
Dimethyl phthalate	µg/L	3,280,000 OP			
4,6-dinitro-2-methylphenol	µg/L	880 OP			
2,4-dinitrophenol	µg/L	16 OP			
Ethylbenzene	µg/L	16,400 OP			
Fluoranthene	µg/L	60 OP			
Hexachlorocyclopentadiene	µg/L	232 OP			

Parameter	Units	Effluent Limitations			
		AMEL	MDEL	Instantaneous Maximum	6-Month Median
Nitrobenzene	µg/L	19.6 OP			
Thallium	µg/L	8 OP			
Acrylonitrile	µg/L	0.4 OP			
Aldrin	µg/L	0.000088 OP			
Benzene	µg/L	23.6 OP			
Benzidine	µg/L	0.000276 OP			
Beryllium	µg/L	0.132 OP			
Bis(2-chloroethyl) ether	µg/L	0.18 OP			
Bis(2-ethylhexyl) phthalate	µg/L	14 OP			
Chlordane	µg/L	0.000092 OP			
Chloroform	µg/L	520 OP			
DDT	µg/L	0.00068 OP			
3,3-dichlorobenzidine	µg/L	0.0324 OP			
1,2-dichloroethane	µg/L	112 OP			
Dichloromethane	µg/L	1,800 OP			
1,3-dichloropropene	µg/L	35.6 OP			
Dieldrin	µg/L	0.00016 OP			
2,4-dinitrotoluene	µg/L	10.4 OP			
1,2-diphenylhydrazine	µg/L	0.64 OP			
Halomethanes	µg/L	520 OP			
Heptachlor	µg/L	0.0002 OP			
Hexachlorobenzene	µg/L	0.00084 OP			
Hexachlorobutadine	µg/L	56 OP			
Hexachloroethane	µg/L	10 OP			

Parameter	Units	Effluent Limitations			
		AMEL	MDEL	Instantaneous Maximum	6-Month Median
N-nitrosodimethylamine	µg/L	29.2 [OP]			
N-nitrosodiphenylamine	µg/L	10 [OP]			
PAHs	µg/L	0.0352 [OP]			
TCDD equivalents	µg/L	1.56E-08 [OP]			
Toxaphene	µg/L	0.00084 [OP]			
2,4,6-trichlorophenol	µg/L	1.16 [OP]			

Parameter	Units	Effluent Limitations			
		AMEL	AWEL	Instantaneous Maximum	MDEL
Settleable Solids	ml/L	1 [OP]	1.5 [OP]	3 [OP]	
Suspended Solids		75% [OP] *			
		*Suspended Solids AMEL is 75% removal unless the average monthly influent is 80 mg/L or less, then the effluent limit shall be 60 mg/L. [OP]			
pH		Within limit of 6.0 and 9.0 at all times. [OP]			
Toluene		340,000 [OP]			
Xylene				5 [AB]	
Total Petroleum Hydrocarbons				500 [AB]	
Aute Toxicity	TUa				0.3 [OP]
Chronic Toxicity	TUc				1 [OP]
Turbidity	NTU	75 [OP]	100 [OP]	225 [OP]	

Parameter	Units	Effluent Limitations			
		AMEL	AWEL	Instantaneous Maximum	Shellfish Harvesting
Total Coliform	MPN/100 mL	1,000 [OP]		10,000 [OP]	
Total Coliform	MPN/100 mL			1,000 [OP] *	
		*Total coliform density shall not exceed 1,000 per 100 mL when the ratio of fecal/total coliform exceeds 0.1 [OP]			
Total Coliform					70 [OP] **

Parameter	Units	Effluent Limitations			
		AMEL	AWEL	Instantaneous Maximum	Shellfish Harvesting
Total Coliform					230 [OP] **
		**The median total coliform density shall not exceed 70 per 100 mL, and not more than 10 percent of the samples shall exceed 230 per 100 mL. [OP]			
Fecal Coliform	MPN/100 mL	200 [OP]		400 [OP]	
Enterococcus	MPN/100 mL	35 [OP]		104 [OP]	

Parameter	Units	Effluent Limitations				
		AMEL	AWEL	MDEL	Instantaneous Minimum	6-Month Median
Dissolved Oxygen (DO)	mg/L				5.0 [AB]	

[OP] Basis – Ocean Plan 2005
[AB] Basis – Anti-Backsliding, values from the previous permit
[DHS] Basis – Department of Health Services
[CTR] Basis – California Toxics Rule/ State Implementation Plan 2005

4. DISCHARGES TO INLAND SURFACE WATERS

The discharge of groundwater extraction waste to inland surface waters (including Buena Vista Lagoon) shall not contain pollutants in excess of the following effluent limitations:

GENERAL CONSTITUENTS

Constituent	Unit	AMEL	Daily Maximum	Instantaneous Maximum	Basis
Settleable Solids	ml/L	0.1	---	0.2	AB
Total Suspended Solids	mg/L	30	---	50	
Percent Sodium	%	---	---	60	AB
Total Nitrogen	mg/L	1.0		2.0	"
Total Phosphorus	mg/L	0.1		0.2	"
Methylene Blue Active Substances	mg/L	---	---	0.5	"
Turbidity	NTU	Shall not exceed the ambient turbidity of the surface water at any time.			"
Fluoride	mg/L	---	---	1.0	"
Hydrogen Sulfide	µg/L	2	4	10	AB
Total Residual Chlorine (TRC)	µg/L	2	8	10	AB
pH	Units	Within the limits of 6.5 and 8.5 at all times.			AB
Acute Toxicity	TUa	---	---	0.59	AB
Chronic Toxicity	TUc	---	1	---	AB

Constituent	Unit	AMEL	Daily Maximum	Instantaneous Maximum	Basis
Dissolved Oxygen	mg/L	Shall not be less than 5.0 at any time in waters with designated warm fresh-water habitat beneficial uses or less than 6.0 in waters with cold fresh water habitat beneficial uses.			AB
Total Coliform	MPN/100mL	---	---	1000	"
Fecal Coliform	MPN/100mL	---	---	200	"

VOLATILES, METALS, PRIORITY POLLUTANTS:

Beneficial Use:	Municipal/Potable Supply			Non-municipal/Non-potable		
		Instantaneous			Instantaneous	
Constituent	Unit	Maximum	Basis	Unit	Maximum	Basis
Dibromochloropropane	µg/L	0.2	DOHS	µg/L	0.2	AB
Ethylene Dibromide	µg/L	0.02	DOHS	µg/L	0.02	AB
Xylene	µg/L	5	AB	µg/L	5	AB
Chlorinated Phenolics	µg/L	1	DOHS	µg/L	10	AB
Remaining Base/Neutral Compounds	µg/L	10	AB	µg/L	10	AB
Total Petroleum Hydrocarbons	mg/L	0.5	"	mg/L	0.5	AB
Iron**	mg/L	0.3	"	mg/L	0.3	AB
Manganese	mg/L	0.05	"	mg/L	0.05	AB
MTBE	µg/L	5	DOHS			
126 Priority Pollutants (Including metals)	40 CFR 131.38 - Water Quality Standards; Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California.					See Below

126 Priority Pollutants - 40 CFR 131.38 - Water Quality Standards; Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California.

The effluent limits for eight priority pollutants will be developed on a case-by-case basis because the freshwater criteria are based on site-specific water quality data.

Seven metals are dependent on water hardness, Cadmium, Copper, Chromium (III), Lead, Nickel, Silver, and Zinc [See Table 1 to 40 CFR 131.38(b)(2)], and the "Conversion Factors" for Cadmium and Lead are also water hardness dependent. [See Table 3 of 40 CFR 131.38(b)(2)]

In order to calculate the effluent limits for these seven metals the following equations from 40 CFR 131.38(b)(2) will be needed:

Cd CFa=1.136672-((LN(hardness))*0.041838)
Cd CFc = 1.101672-((LN(hardness))*0.041838)
Pb CFa&c = 1.46203-((LN(hardness))*0.145712)
Criterion=WER*CFx*(exp(mA*LN(hardness)+bA

Pentachlorophenol is dependent on the pH value. [See Footnote "f" to Table in 40 CFR 131.38(b)(1)]

To calculate the effluent limit for Pentachlorophenol use this equation:
CMC = exp(1.005(pH)−4.869). CCC = exp(1.005(pH)−5.134)

The remainder of the criteria is not water quality dependent and the effluent limits can be calculated. However, not all the effluent limits will apply to all sites because of the Beneficial use designation for "Municipal" may not apply to all sites.

Effluent Limits for Human Health Municipal and Non-Municipal

		Human Health			
		MUN		NON-MUN	
		AMEL	MDEL	AMEL	MDEL
		(µg/L)	(µg/L)	(µg/L)	(µg/L)
A					
1	Antimony	14	28	4300	8600
2	Arsenic				
3	Beryllium				
4	Cadmium				
5a	Chromium (III)				
5b	Chromium (IV)				
6	Copper	1300	2600		
7	Lead				
8	Mercury	0.05	0.1	0.051	0.1
9	Nickel				
10	Selenium				
11	Silver				
12	Thallium				
13	Zinc	700	1400	220000	440000
14	Cyanide	7000000	14000000		
15	Asbestos	1.3E-08	2.6E-08	1.4E-08	2.8E-08
16	2,3,7,8-TCDD (Dioxin)	320	640	780	1600
17	Acrolein	0.059	0.12	0.66	1.3
18	Acrylonitrile	1.2	2.4	71	140
19	Benzene	4.3	8.6	360	720
20	Bromoform	0.25	0.5	4.4	8.8
21	Carbon Tetrachloride	680	1400	21000	42000
22	Chlorobenzene	0.41	0.82	34	68
23	Chlorodibromomethane				

		Human Health			
		MUN		NON-MUN	
		AMEL (µg/L)	MDEL (µg/L)	AMEL (µg/L)	MDEL (µg/L)
24	Chloroethane				
25	2-Chloroethylvinyl Ether				
26	Chloroform				
27	Dichlorobromomethane	0.56	1.1	46	92
28	1,1-Dichloroethane				
29	1,2-Dichloroethane	0.38	0.76	99	200
30	1,1-Dichloroethylene	0.057	0.11	3.2	6.4
31	1,2-Dichloropropane	0.52	1	39	78
32	1,3-Dichloropropylene	10	20	1700	3400
33	Ethylbenzene	3100	6200	29000	58000
34	Methyl Bromide	48	96	4000	8000
35	Methyl Chloride				
36	Methylene Chloride	4.7	9.4	1600	3200
37	1,1,2,2-Tetrachloroethane	0.17	0.34	11	22
38	Tetrachloroethylene	0.8	1.6	8.9	18
39	Toluene	6800	14000	200000	400000
40	1,2-Trans-Dichloroethylene	700	1400	140000	280000
41	1,1,1-Trichloroethane				
42	1,1,2-Trichloroethane	0.6	1.2	40	80
43	Trichloroethylene	2.7	5.4	81	160
44	Vinyl Chloride	2	4	530	1100
45	2-Chlorophenol	120	240	400	800
46	2,4-Dichlorophenol	93	190	790	1600
47	2,4-Dimethylphenol	540	1100	2300	4600
48	2-Methyl-4,6-Dinitrophenol	13	27	770	1500
49	2,4-Dinitrophenol	70	140	14000	28000
50	2-Nitrophenol				
51	4-Nitrophenol				
52	3-Methyl-4-Chlorophenol				
53	Pentachlorophenol	0.28	0.56	8.2	16
54	Phenol	21000	42000	4500000	9000000
55	2,4,6-Trichlorophenol	2.1	4.2	6.5	13
56	Acenaphthene	1200	2400	2700	5400

		Human Health			
		MUN		NON-MUN	
		AMEL (µg/L)	MDEL (µg/L)	AMEL (µg/L)	MDEL (µg/L)
57	Acenaphthylene				
58	Anthracene	9600	19000	110000	220000
59	Benzidine	0.00012	0.00024	0.00054	0.0011
60	Benzo(a)Anthracene	0.0044	0.0088	0.049	0.098
61	Benzo(a)Pyrene	0.0044	0.0088	0.049	0.098
62	Benzo(b)Fluoranthene	0.0044	0.0088	0.049	0.098
63	Benzo(ghi)Perylene				
64	Benzo(k)Fluoranthene	0.0044	0.0088	0.049	0.098
65	Bis(2-Chloroethoxy)Methane				
66	Bis(2-Chloroethyl)Ether	0.031	0.062	1.4	2.8
67	Bis(2-Chloroisopropyl)Ether	1400	2800	170000	340000
68	Bis(2-Ethylhexyl)Phthalate	1.8	3.6	5.9	12
69	4-Bromophenyl Phenyl Ether				
70	Butylbenzyl Phthalate	3000	6000	5200	10000
71	2-Chloronaphthalene	1700	3400	4300	8600
72	4-Chlorophenyl Phenyl Ether				
73	Chrysene	0.0044	0.0088	0.049	0.098
74	Dibenzo(a,h)Anthracene	0.0044	0.0088	0.049	0.098
75	1,2 Dichlorobenzene	2700	5400	17000	34000
76	1,3 Dichlorobenzene	400	800	2600	5200
77	1,4 Dichlorobenzene	400	800	2600	5200
78	3,3'-Dichlorobenzidine	0.04	0.08	0.077	0.15
79	Diethyl Phthalate	23000	46000	120000	240000
80	Dimethyl Phthalate	310000	630000	2900000	5800000
81	Di-n-Butyl Phthalate	2700	5400	12000	24000
82	2,4-Dinitrotoluene	0.11	0.22	9.1	18
83	2,6-Dinitrotoluene				
84	Di-nOctyl Phthalate				
85	1,2-Diphenylhydrazine	0.04	0.08	0.54	1.1
86	Fluoranthene	300	600	370	740
87	Fluorene	1300	2600	14000	28000
88	Hexachlorobenzene	0.00075	0.0015	0.00077	0.0015
89	Hexachlorobutadiene	0.44	0.88	50	100

		Human Health			
		MUN		NON-MUN	
		AMEL (µg/L)	MDEL (µg/L)	AMEL (µg/L)	MDEL (µg/L)
90	Hexachlorocyclopentadiene	240	480	17000	34000
91	Hexachloroethane	1.9	3.8	8.9	18
92	Inden(1,2,3-cd) Pyrene	0.0044	0.0088	0.049	0.098
93	Isophorone	8.4	17	600	1200
94	Naphthalene				
95	Nitrobenzene	17	34	1900	3800
96	N-Nitrosodimethylamine	0.00059	0.0012	8.1	16
97	N-Nitrosodi-n-Propylamine	0.005	0.01	1.4	2.8
98	N-Nitrosodiphenylamine	5	10	16	32
99	Phenanthrene				
100	Pyrene	960	1900	11000	22000
101	1,2,4-Trichlorobenzene				
102	Aldrin	0.00013	0.00026	0.00014	0.00028
103	alpha-BHC	0.0039	0.0078	0.013	0.026
104	beta-BHC	0.014	0.028	0.046	0.092
105	gamma-BHC	0.019	0.038	0.063	0.13
106	delta-BHC				
107	Chlordane	0.00057	0.0011	0.00059	0.0012
108	4,4'-DDT	0.00059	0.0012	0.00059	0.0012
109	4,4'-DDE	0.00059	0.0012	0.00059	0.0012
110	4,4'-DDD	0.00083	0.0017	0.00084	0.0017
111	Dieldrin	0.00014	0.00028	0.00014	0.00028
112	alpha-Endosulfan	110	220	240	480
113	beta-Endosulfan	110	220	240	480
114	Endosulfan Sulfate	110	220	240	480
115	Endrin	0.76	1.5	0.81	1.6
116	Endrin Aldehyde	0.76	1.5	0.81	1.6
117	Heptachlor	0.00021	0.00042	0.00021	0.00042
118	Heptachlor Epoxide	0.0001	0.0002	0.00011	0.00022
119	Polychlorinated biphenyls (PCBs)	0.00017	0.00034	0.00017	0.00034
120	"				
121	"				

		Human Health			
		MUN		NON-MUN	
		AMEL (µg/L)	MDEL (µg/L)	AMEL (µg/L)	MDEL (µg/L)
122	"				
123	"				
124	"				
125	"				
126	Toxaphene	0.00073	0.0015	0.00075	0.0015

Effluent Limits for Freshwater and Saltwater

		Freshwater		Saltwater	
		MDEL (µg/L)	AMEL (µg/L)	MDEL (µg/L)	AMEL (µg/L)
A					
1	Antimony				
2	Arsenic	250	120	59	29
3	Beryllium				
4	Cadmium	*	*	16	8
5a	Chromium (III)	*	*		
5b	Chromium (IV)	16	8.1	83	41
6	Copper	*	*	5.8	2.9
7	Lead	*	*	14	7
8	Mercury				
9	Nickel	*	*	14	6.8
10	Selenium	8.2	4.1	120	58
11	Silver	*	*	2.2	1.1
12	Thallium				
13	Zinc	*	*	95	47
14	Cyanide	8.5	4.2	1	0.5
15	Asbestos				
16	2,3,7,8-TCDD (Dioxin)				
17	Acrolein				
18	Acrylonitrile				
19	Benzene				
20	Bromoform				
21	Carbon Tetrachloride				

		Freshwater		Saltwater	
		MDEL (µg/L)	AMEL (µg/L)	MDEL (µg/L)	AMEL (µg/L)
22	Chlorobenzene				
23	Chlorodibromomethane				
24	Chloroethane				
25	2-Chloroethylvinyl Ether				
26	Chloroform				
27	Dichlorobromomethane				
28	1,1-Dichloroethane				
29	1,2-Dichloroethane				
30	1,1-Dichloroethylene				
31	1,2-Dichloropropane				
32	1,3-Dichloropropylene				
33	Ethylbenzene				
34	Methyl Bromide				
35	Methyl Chloride				
36	Methylene Chloride				
37	1,1,2,2-Tetrachloroethane				
38	Tetrachloroethylene				
39	Toluene				
40	1,2-Trans-Dichloroethylene				
41	1,1,1-Trichloroethane				
42	1,1,2-Trichloroethane				
43	Trichloroethylene				
44	Vinyl Chloride				
45	2-Chlorophenol				
46	2,4-Dichlorophenol				
47	2,4-Dimethylphenol				
48	2-Methyl-4,6-Dinitrophenol				
49	2,4-Dinitrophenol				
50	2-Nitrophenol				
51	4-Nitrophenol				
52	3-Methyl-4-Chlorophenol				
53	Pentachlorophenol	**	**	13	6.5
54	Phenol				
55	2,4,6-Trichlorophenol				

		Freshwater		Saltwater	
		MDEL (µg/L)	AMEL (µg/L)	MDEL (µg/L)	AMEL (µg/L)
56	Acenaphthene				
57	Acenaphthylene				
58	Anthracene				
59	Benzidine				
60	Benzo(a)Anthracene				
61	Benzo(a)Pyrene				
62	Benzo(b)Fluoranthene				
63	Benzo(ghi)Perylene				
64	Benzo(k)Fluoranthene				
65	Bis(2-Chloroethoxy)Methane				
66	Bis(2-Chloroethyl)Ether				
67	Bis(2-Chloroisopropyl)Ether				
68	Bis(2-Ethylhexyl)Phthalate				
69	4-Bromophenyl Phenyl Ether				
70	Butylbenzyl Phthalate				
71	2-Chloronaphthalene				
72	4-Chlorophenyl Phenyl Ether				
73	Chrysene				
74	Dibenzo(a,h)Anthracene				
75	1,2 Dichlorobenzene				
76	1,3 Dichlorobenzene				
77	1,4 Dichlorobenzene				
78	3,3'-Dichlorobenzidine				
79	Diethyl Phthalate				
80	Dimethyl Phthalate				
81	Di-n-Butyl Phthalate				
82	2,4-Dinitrotoluene				
83	2,6-Dinitrotoluene				
84	Di-nOctyl Phthalate				
85	1,2-Diphenylhydrazine				
86	Fluoranthene				
87	Fluorene				
88	Hexachlorobenzene				
89	Hexachlorobutadiene				

		Freshwater		Saltwater	
		MDEL (µg/L)	AMEL (µg/L)	MDEL (µg/L)	AMEL (µg/L)
90	Hexachlorocyclopentadiene				
91	Hexachloroethane				
92	Inden(1,2,3-cd) Pyrene				
93	Isophorone				
94	Naphthalene				
95	Nitrobenzene				
96	N-Nitrosodimethylamine				
97	N-Nitrosodi-n-Propylamine				
98	N-Nitrosodiphenylamine				
99	Phenanthrene				
100	Pyrene				
101	1,2,4-Trichlorobenzene				
102	Aldrin	3	1.5	1.3	0.65
103	alpha-BHC				
104	beta-BHC				
105	gamma-BHC	0.95	0.47	0.16	0.08
106	delta-BHC				
107	Chlordane	0.007	0.0035	0.0066	0.0033
108	4,4'-DDT	0.0016	0.00082	0.0016	0.00082
109	4,4'-DDE				
110	4,4'-DDD				
111	Dieldrin	0.092	0.046	0.0031	0.0016
112	alpha-Endosulfan	0.092	0.046	0.014	0.0071
113	beta-Endosulfan	0.092	0.046	0.014	0.0071
114	Endosulfan Sulfate				
115	Endrin	0.059	0.029	0.0038	0.0019
116	Endrin Aldehyde				
117	Heptachlor	0.0062	0.0031	0.0059	0.0029
118	Heptachlor Epoxide	0.0062	0.0031	0.0059	0.0029
119	Polychlorinated biphenyls (PCBs)	0.023	0.011	0.049	0.025
120	"				
121	"				
122	"				

		Freshwater		Saltwater	
		MDEL (µg/L)	AMEL (µg/L)	MDEL (µg/L)	AMEL (µg/L)
123	"				
124	"				
125	"				
126	Toxaphene	0.00033	0.00016	0.00033	0.00016

* Use equations from 40 CFR 131.38(b)(2)
** Use equations from 40 CFR 131.38(b)(1) footnote "f"

Mass Limits

All permit limitations, standards or prohibitions shall be expressed in terms of mass except for pH, or other pollutants which cannot appropriately be expressed by mass or under certain circumstances including "when applicable standards and limitations are expressed in terms of other units of measurement." (40 CFR § 122.45(f)(1)). Therefore, all concentration limits stated above except for Settleable Solids, Acute Toxicity, Chronic Toxicity, Total Coliform, Fecal Coliform, pH, and Dissolved Oxygen shall also have a mass limit based on its concentration limit times the discharge flow limit in the Notice of Enrollment expressed in pounds per day (lbs/d) as shown in the equations below:

Concentration Limit * Flow Limit * Conversion Factor = Mass Limit
(mg/l) * (MGD) * 8.34 [lb*L/(Million Gallons*mg)] = lbs/day
(µg/l) * (MGD) * 0.00834 [lb*L/(Million Gallons*µg)] = lbs/day
(mg/l) * (gpd) * 0.00000834 [lb*L/(Gallons*mg)] = lbs/day
(µg/l) * (gpd) * 0.00000000834 [lb*L/(Million Gallons*µg)] = lbs/day

5. Interim Effluent Limitations (Not Applicable)

6. Land Discharge Specifications (Not Applicable)

7. Reclamation Specifications (Not Applicable)

B. Land Discharge Specifications (Not Applicable)

C. Reclamation Specifications (Not Applicable)

VI. Receiving Water Limitations

A. Surface Water Limitations

Receiving water limitations are based on water quality objectives contained in the Basin Plan and are a required part of this WDR. The discharge of groundwater extraction waste from any site shall not, separately or jointly with any other discharge, cause violations of the following water quality objectives. These

limitations apply unless more stringent provisions exist in either the Basin Plan, or an applicable State plan. The more stringent limitation shall apply.

1. Bacterial Characteristics

   a. Water-Contact Standards
   Within a zone bounded by the shoreline and a distance of 1,000 feet from the shoreline or the 30-foot depth contour, whichever is further from the shoreline, and in areas outside this zone used for water-contact sports, as determined by the Regional Board, the following bacterial objectives shall be maintained throughout the water column:

   (1) Samples of water from each sampling station shall have a density of total coliform organisms less than 1,000 per 100 ml (10 per ml); provided that not more than 20 percent of the samples at any sampling station, in any 30-day period, may exceed 1,000 per 100 ml (10 per ml), and provided further that no single sample when verified by a repeat sample taken within 48 hours shall exceed 10,000 per 100 ml (100 per ml).

   (2) The fecal coliform density based on a minimum of not less than five samples for any 30-day period shall not exceed a geometric mean of 200 per 100 ml nor shall more than 10 percent of the total samples during any 60-day period exceed 400 per 100 ml.

   b. Shellfish Harvesting Standards
   At all areas where shellfish may be harvested for human consumption, as determined by the Regional Board, the following bacterial objectives shall be maintained throughout the water column:

   The median total coliform density shall not exceed 70 per 100 ml, and not more than 10 percent of the samples shall exceed 230 per 100 ml.

2. Physical Characteristics
   a. Floating particulates and grease and oil shall not be visible.
   b. The discharge of waste shall not cause aesthetically undesirable discoloration of the surface waters.
   c. Natural light shall not be significantly reduced.
   The rate of deposition of solids and the characteristics of inert solids in the sediments shall not be changed such that benthic communities are degraded.

3. Chemical Characteristics
   a. The dissolved oxygen concentration shall not at any time be depressed more than 10 percent from that which occurs naturally, as a result of the discharge of oxygen demanding waste materials.
   b. The pH shall not be changed at any time more than 0.2 units from that which occurs naturally.

c. The dissolved sulfide concentration of waters in and near sediments shall not be significantly increased above that present under natural conditions.
d. The concentration of substances set forth in the Discharge Specifications in marine sediments shall not be increased to levels which would degrade indigenous biota.
e. The concentration of organic materials in the sediments shall not be increased to levels which would degrade marine life.
f. Nutrient materials shall not cause objectionable aquatic growth or degrade indigenous biota.

4. Biological Characteristics
   a. Marine communities, including vertebrate, invertebrate, and plant species, shall not be degraded.
   b. The natural taste, odor, and color of fish, shellfish, or other aquatic resources used for human consumption shall not be altered.
   c. The concentration of organic materials in fish, shellfish or other aquatic resources used for human consumption shall not bioaccumulate to levels that are harmful to human health.

5. Radioactivity
   Discharge of radioactive waste shall not degrade marine life.

6. Toxic Materials Limitations for Marine Waters (Surf Zone) Ocean Plan, 2005

OBJECTIVES FOR PROTECTION OF MARINE AQUATIC LIFE

Chemical	Units of Measurement	6-Month Median	Daily Maximum	Instantaneous Maximum
Arsenic	µg/L	8	32	80
Cadmium	µg/L	1	4	10
Chromium (Hexavalent)	µg/L	2	8	20
Copper	µg/L	3	12	30
Lead	µg/L	2	8	20
Mercury	µg/L	0.04	0.16	0.4
Nickel	µg/L	5	20	50
Selenium	µg/L	15	60	150
Silver	µg/L	0.7	2.8	7
Zinc	µg/L	20	80	200
Cyanide	µg/L	1	4	10
Total Chlorine Residual	µg/L	2	8	60
Ammonia (as nitrogen)	µg/L	600	2400	6000
Chronic Toxicity	TUc		1	
Phenolic Compounds (Non-chlorinated)	µg/L	30	120	300
Chlorinated Phenolics	µg/L	1	4	10
Endosulfan	ng/L	9	18	27
Endrin	ng/L	2	4	6

Chemical	Units of Measurement	6-Month Median	Daily Maximum	Instantaneous Maximum
HCH	ng/L	4	8	12
Radioactivity	Not to exceed limits specified in Title 17, Chapter 15, Subchapter 4, Group 3, Article 3, Section 30269 of the California Code of Regulations.			

OBJECTIVES FOR PROTECTION OF HUMAN HEALTH -- NONCARCINOGENS

Chemical	Units of Measurement	30-day Averages
Acrolein	µg/L	220
Antimony	mg/L	1.2
bis(2-chloroethoxy) methane	µg/L	4.4
bis(2-chloroisopropyl) ether	mg/L	1.2
Chlorobenzene	µg/L	570
Chromium (III)	mg/L	190
Di-n-butyl phthalate	mg/L	3.5
Dichlorobenzenes	mg/L	5.1
1,1-dichloroethylene	mg/L	7.1
Diethyl phthalate	mg/L	33
Dimethyl phthalate	mg/L	820
4,6-dinitro-2-methylphenol	µg/L	220
2,4-dinitrophenol	µg/L	4.0
Ethylbenzene	mg/L	4.1
Fluoranthene	µg/L	15
Hexachlorocyclopentadiene	µg/L	58
Isophorone	mg/L	150
Nitrobenzene	µg/L	4.9
Thallium	µg/L	14
Toluene	mg/L	85
1,1,2,2-tetrachloroethane	mg/L	1.2
Tributyltin	ng/L	1.4
1,1,1-trichloroethane	mg/L	540
1,1,2-trichloroethane	mg/L	43

OBJECTIVES FOR PROTECTION OF HUMAN HEALTH -- CARCINOGENS

Chemical	Units of Measurement	30-day Average
Acrylonitrile	µg/L	0.1
Aldrin	ng/L	0.022
Benzene	µg/L	5.9
Benzidine	ng/L	0.069
Beryllium	ng/L	33
bis(2-chloroethyl) ether	µg/L	0.045
bis(2-ethylhexyl) phthalate	µg/L	3.5
Carbon tetrachloride	µg/L	0.9
Chlordane	ng/L	0.023
Chloroform	mg/L	0.13
DDT	ng/L	0.17

Chemical	Units of Measurement	30-day Average
1,4-dichlorobenzene	µg/L	18
3,3-dichlorobenzidine	ng/L	8.1
1,2-dichloroethane	mg/L	0.13
Dichloromethane	mg/L	0.45
1,3-dichloropropene	µg/L	8.9
Dieldrin	ng/L	0.04
2,4-dinitrotoluene	µg/L	2.6
1,2-diphenylhydrazine	µg/L	0.16
Halomethanes	mg/L	0.13
Heptachlor	ng/L	0.72
Hexachlorobenzene	ng/L	0.21
Hexachlorobutadiene	µg/L	14
Hexachloroethane	µg/L	2.5
N-nitrosodimethylamine	µg/L	7.3
N-nitrosodiphenylamine	µg/L	2.5
PAHs	ng/L	8.8
PCBs	ng/L	0.019
TCDD equivalents	pg/L	0.0039
Tetrachloroethylene	µg/L	99
Toxaphene	ng/L	0.21
Trichloroethylene	µg/L	27
2,4,6-trichlorophenol	µg/L	0.29
Vinyl chloride	µg/L	36

7. Toxic Materials Limitations and Objectives for Inland Surface Waters (Fresh)

(a) Discharges of extracted groundwater shall not cause violations of surface water quality objectives presented by hydrographic subunit and subarea in Table 3-2 of the Comprehensive Water Quality Control Plan Report, San Diego Basin (9), as amended.

(b) Discharges of extracted groundwater shall not cause violations of the following objectives in inland surface waters:

1. No individual pesticide or combination of pesticides shall be present in concentrations that adversely affect beneficial uses. There shall be no increase in pesticide concentrations found in bottom sediments or aquatic life.

2. For the protection of public health and aquatic species, waters designated for use as domestic or municipal supply (MUN) shall not contain concentrations of toxics in excess of the maximum contaminant levels for contaminants set forth in the California Code of Regulations, Title 22, as amended, or water quality objectives listed in 40 CFR 131.38 (Attachment D), for the protection of aquatic species and protection of human health, whichever concentration for a specific chemical is less. Current maximum

contaminant levels for the protection of human health from the ingestion of water are as follows:

	Constituent	Title22 Maximum Contaminant Level (mg/L)
a. Inorganic	Aluminum	1
	Arsenic	0.05
	Barium	1
	Cadmium	0.01
	Chromium	0.05
	Lead	0.05
	Mercury	0.002
	Nitrate	45
	Selenium	0.01
	Silver	0.05

	Constituent	Title22 Maximum Contaminant Level (mg/L)
b. Organic	Atrazine	0.003
	Bentazon	0.018
	Benzene	0.001
	Carbon Tetrachloride	0.0005
	2,4-D	0.1
	Dibromochloropropane	0.0002
	1,4-Dichlorobenzene	0.005
	1,2-Dichloroethane	0.0005
	1,1-Dichloroethylene	0.006
	1,3-Dichloropropene	0.0005
	Endrin	0.0002
	Ethyl Benzene	0.68
	Ethylene Dibromide	0.00002
	Lindane	0.004
	Methoxychlor	0.1
	Molinate	0.02
	Monochlorobenzene	0.03
	Simazine	0.01
	1,1,2,2-Tetrachloroethane	0.001
	Tetrachloroethylene	0.005
	Thiobencarb	0.07
	Toxaphene	0.005
	2,4,5-TP Silvex	0.01
	1,1,1-Trichloroethane	0.2
	1,1,2-Trichloroethane	0.032
	Trichloroethylene	0.005
	Vinyl Chloride	0.0005
	Xylenes (Single or sum of isomers)	1.75

8. Mineral Objectives for Inland Surface Waters (fresh):

Hydrographic Unit	**Objective (mg/L)**			
	TDS	**Chloride**	**Sulfate**	**Boron**
San Juan Unit				
1.10	1000	400	500	0.75
1.20,1.30,1.40,1.50	500	250	250	0.75
Santa Margarita Unit				
2.20,2.40,2.50,2.60	500	250	250	0.75
2.70,2.80,2.90,2.10,2.30	750	300	300	0.75
San Luis Rey Unit				
3.10,3.20,3.30	500	250	250	0.75
Carlsbad Unit				
4.10,4.40				
4.20,4.30,4.50,4.60	500	250	250	0.75
San Dieguito Unit				
5.10,5.20,5.30,5.40, 5.50	500	250	250	0.75
Penasquitos Unit				
6.10,6.20,6.40	500	250	250	0.75
6.30,6.50	---	---	---	---
San Diego Unit				
7.10	1000	400	500	1.0
7.11	1500	400	500	1.0
7.12c/d,	1000/1500	400	500	1.0
7.20,7.30,7.40	300	50	65	1.0
Coronado Unit				
10.10	NA	NA	NA	NA
Sweetwater River Unit				
9.10	1500	500	500	0.75
9.20,9.30	500	250	250	0.75
Otay Unit				
10.20	1000	400	500	0.75
10.30	500	250	250	0.75
Tijuana Unit				
11.11	2100	NA	NA	NA
11.20,11.30,11.40,11.50				
11.60,11.70,11.80	500	250	250	1.0

9. Waters designated for use as agricultural supply (AGR) shall not contain concentrations of chemical constituents in amounts that adversely affect such beneficial use.

10. Radioactivity: Discharges of radioactive waste shall not degrade marine life.

B. Groundwater Limitations (Not Applicable)

VII. Provisions

A. Standard Provisions

1. The Discharger shall comply with all Standard Provisions included in Attachment D of this WDR.

2. Regional Board Standard Provisions. The Discharger shall comply with the following provisions:

   a. The Discharger shall comply with all requirements and conditions of this WDR. Any permit non-compliance constitutes a violation of the CWA and/or of the CWC and is grounds for enforcement action, permit termination, revocation and reissuance, or modification, or for denial of an application for permit renewal, modification, or reissuance.

   b. The Discharger shall comply with all applicable federal, state, and local laws and regulations for handling, transport, treatment, or disposal of waste or the discharge of waste to waters of the state in a manner which causes or threatens to cause a condition of pollution, contamination or nuisance as those terms are defined in CWC 13050.

   c. The Porter-Cologne Water Quality Control Act provides for civil and criminal penalties comparable to, and in some cases greater than, those provided for under the CWA.

   d. Any noncompliance with this WDR is a violation of the CWC and/or the CWA and is grounds for denial of an application for Order renewal or modification.

   e. No discharge of waste into waters of the state, whether or not the discharge is made pursuant to WDRs, shall create a vested right to continue the discharge. All discharges of waste into waters of the state are privileges, not rights.

   f. For the purposes of this WDR, the term "permittee" used in parts of 40 CFR incorporated into this WDR by reference and/or applicable to this WDR shall have the same meaning as the term "Discharger" used elsewhere in this WDR.

g. This WDR expires on March 12, 2013, after which, the terms and conditions of this permit are automatically continued pending issuance of a new WDR, provided that all requirements of USEPA's NPDES regulations at 40 CFR 122.6 and the State's regulations at CCR Title 23, Section 2235.4 regarding the continuation of expired Orders and waste discharge requirements are met.

h. Except as provided for in 40 CFR 122.7, no information or documents submitted in accordance with or in application for this permit will be considered confidential, and all such information and documents shall be available for review by the public at the office of the Regional Water Board.

i. A copy of this WDR shall be maintained on-site at the Facility, and shall be available to Regional Water Board, State Water Board, and EPA personnel and/or their authorized representatives at all times.

j. The Discharger shall comply with any interim limitations established by addendum, enforcement action, or revised waste discharge requirements that have been or may be adopted by the Regional Water Board.

k. Failure to comply with provisions or requirements of this WDR, or violation of other applicable laws or regulations governing discharges from this facility, may subject the Discharger to administrative or civil liabilities, criminal penalties, and/or other enforcement remedies to ensure compliance. Additionally, certain violations may subject the Discharger to civil or criminal enforcement from appropriate local, state, or federal law enforcement entities.

l. In the event the Discharger does not comply or will be unable to comply for any reason, with any prohibition, effluent limitation, discharge specification, or receiving water limitation of this WDR, the Discharger shall notify the Regional Water Board by telephone (858) 467-2952 within 24 hours of having knowledge of such noncompliance, and shall confirm this notification in writing within five days, unless the Regional Water Board waives confirmation. The written notification shall state the nature, time, duration, and cause of noncompliance, and shall describe the measures being taken to remedy the current noncompliance and prevent recurrence including, where applicable, a schedule of implementation. Other noncompliance requires written notification as above at the time of the normal monitoring report.

m. The Discharger is required to retain records, including all monitoring information and copies of all reports required by this WDR, for five years unless directed otherwise by the Regional Board.

n. This WDR may be modified, revoked and reissued, or terminated for cause due to promulgation of amended regulations, receipt of USEPA

guidance concerning regulated activities, judicial decision, or in accordance with 40 Code of Federal Regulations (CFR) 122.62, 122.63, 122.64, and 124.5.

o. Dischargers enrolled in this WDR planning to discharge extracted groundwater waste after the expiration date of March 12, 2013 may be subject to new prohibitions or requirements based on the re-issuance of this WDR after March 12, 2013.

p. The enrollee shall take all reasonable steps to minimize or correct any adverse impact on the environment resulting from noncompliance with this WDR and the Notice of Enrollment from the Regional Board, including such accelerated or additional monitoring as may be necessary to determine the nature, and effect of the noncomplying discharge.

q. This WDR or the Notice of Enrollment from the Regional Board, may be modified, revoked and reissued, or terminated for cause including, but not limited to, the following:

(1) Violation of any terms or conditions of this WDR or the Notice of Enrollment from the Regional Board;

(2) Obtaining enrollment in this WDR, or a Notice of Enrollment from the Regional Board, by misrepresentation or failure to disclose fully all relevant facts;

(3) A change in any condition that requires either a temporary or permanent reduction or elimination of the discharge subject to waste discharge requirements; or

(4) A finding that monitoring "indicator" pollutants listed in this WDR do not ensure compliance with water quality criteria or objectives for the pollutants expected to be represented by the "indicator" pollutants.

r. The filing of a request by the enrollee for modification, revocation and reissuance, or termination of this WDR or an associated discharge Notice of Enrollment from the Regional Board, or a notification of planned change in or anticipated noncompliance with this WDR or discharge Notice of Enrollment does not stay any condition of this WDR or the Notice of Enrollment from the Regional Board.

s. Notwithstanding Provision 2.e above, if any applicable toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is promulgated under Section 307(a) of the CWA for a toxic pollutant and that standard or prohibition is more stringent than any limitation on the pollutant in this WDR, the Regional Board may institute proceedings under these regulations to modify or revoke and reissue this WDR to conform to the toxic effluent standard or prohibition.

t. In addition to any other grounds specified herein, this WDR or a Notice of Enrollment from the Regional Board shall be modified or revoked at any time if, on the basis of any data, the Regional Board determines that continued discharges may cause unreasonable degradation of the aquatic environment.

u. The Regional Board or the Director of the USEPA may require any person requesting enrollment under this WDR or subject to waste discharge requirements under this WDR to apply for and obtain an individual NPDES permit. Cases where an individual NPDES permit may be required include but are not limited to those described in 40 CFR 122.28 (b)(3)(i) and (b)(3)(ii), and where the volume of a discharge exceeds 10 million gallons per year, or the duration of a discharge exceeds 3 years.

v. It shall not be a defense for the enrollee in an enforcement action that effluent limitation violations are a result of analytical variability rendering the results inaccurate. The validity of the testing results, whether or not the enrollee has monitored or sampled more frequently than required by this WDR, shall not be a defense to an enforcement action.

w. A copy of this WDR, and the Notice of Enrollment from the Regional Board shall be posted at a prominent location at or near the enrollee's facility, and shall be available to operating personnel at all times.

x. The enrollee shall take all reasonable steps to minimize or prevent any discharge in violation of this WDR which has a reasonable likelihood of adversely affecting human health or the environment.

y. For the purposes of this WDR, the term permit, general permit, and order, shall have the same meaning as the term WDR used elsewhere in this WDR.

z. For the purpose of this WDR, the term Discharger and enrollee shall have the same meaning as the term discharger used elsewhere in this WDR.

B. Monitoring and Reporting Program Requirements

The Discharger shall comply with the MRP, and future revisions thereto, in Attachment E of this WDR.

C. Special Provisions

1. Reopener Provisions (Not Applicable)

2. Special Studies, Technical Reports and Additional Monitoring Requirements (Not Applicable)

3. Best Management Practices and Pollution Prevention Plan (Not Applicable)

4. Compliance Schedules (Not Applicable)

5. Construction, Operation and Maintenance Specifications (Not Applicable)

6. Special Provisions for Municipal Facilities (POTWs Only) (Not Applicable)

7. Other Special Provisions

   The Dischargers shall dispose of solids removed from liquid wastes in a manner that is consistent with Title 27 of the CCR and approved by the Regional Board.

8. Order No. R9-2008-0002 may be modified by the Regional Board and EPA to enable the discharger to participate in comprehensive regional monitoring activities conducted in the Southern California Bight during the term of this permit. The intent of regional monitoring activities is to maximize the efforts of all monitoring partners using a more cost-effective monitoring design and to best utilize the pooled scientific resources of the region. During these coordinated sampling efforts, the discharger's sampling and analytical effort may be reallocated to provide a regional assessment of the impact of the discharge of municipal wastewater to the Southern California Bight. Anticipated modifications to the monitoring program will be coordinated so as to provide a more comprehensive picture of the ecological and statistical significance of monitoring results and to determine cumulative impacts of various pollution sources. If predictable relationships among the biological, water quality and effluent monitoring variables can be demonstrated, it may be appropriate to decrease the discharger's sampling effort. Conversely, the monitoring program may be intensified if it appears that the objectives cannot be achieved through the discharger's existing monitoring program. These changes will improve the overall effectiveness of monitoring in the Southern California Bight. Minor changes may be made without further public notice.

VIII. Compliance Determination

Compliance with the effluent limitations contained in Section IV of this WDR will be determined as specified below:

A. Average Monthly Effluent Limitation (AMEL)

If the average of daily discharges over a calendar month exceeds the AMEL for a given parameter, an alleged violation will be flagged and the Discharger will be considered out of compliance for each day of that month for that parameter (e.g., resulting in 31 days of non-compliance in a 31-day month). The average of daily discharges over the calendar month that exceeds the AMEL for a parameter will be considered out of compliance for that month only. If only a single sample is taken during the calendar month and the analytical result for that sample exceeds the AMEL, the Discharger will be considered out of compliance for that calendar month. For any one calendar month during which no sample (daily discharge) is taken, no compliance determination can be made for that calendar month.

B. Average Weekly Effluent Limitation (AWEL)

If the average of daily discharges over a calendar week exceeds the AWEL for a given parameter, an alleged violation will be flagged and the Discharger will be considered out of compliance for each day of that week for that parameter, resulting in seven days of non-compliance. The average of daily discharges over the calendar week that exceeds the AWEL for a parameter will be considered out of compliance for that week only. If only a single sample is taken during the calendar week and the analytical result for that sample exceeds the AWEL, the Discharger will be considered out of compliance for that calendar week. For any one calendar week during which no sample (daily discharge) is taken, no compliance determination can be made for that calendar week.

C. Maximum Daily Effluent Limitation (MDEL)

If a daily discharge exceeds the MDEL for a given parameter, an alleged violation will be flagged and the Discharger will be considered out of compliance for that parameter for that one day only within the reporting period. For any one day during which no sample is taken, no compliance determination can be made for that day.

D. Instantaneous Minimum Effluent Limitation

If the analytical result of a single grab sample is lower than the instantaneous minimum effluent limitation for a parameter, a violation will be flagged and the Discharger will be considered out of compliance for that parameter for that single sample. Non-compliance for each sample will be considered separately (e.g., the results of two grab samples taken within a calendar day that both are lower than the instantaneous minimum effluent limitation would result in two instances of non-compliance with the instantaneous minimum effluent limitation).

E. Instantaneous Maximum Effluent Limitation

If the analytical result of a single grab sample is higher than the instantaneous maximum effluent limitation for a parameter, a violation will be flagged and the Discharger will be considered out of compliance for that parameter for that single sample. Non-compliance for each sample will be considered separately

(e.g., the results of two grab samples taken within a calendar day that both exceed the instantaneous maximum effluent limitation would result in two instances of non-compliance with the instantaneous maximum effluent limitation).

F. Six-Month Median Effluent Limitation

The Discharger shall determine the six-month median effluent value (SMEV) for a given parameter by calculating the statistical median of all daily effluent values (DEVs) for each parameter within each six-month calendar period (January-June and July-December). The SMEV determination for a given six-month calendar period shall not include DEVs from any other six-month calendar period. If only a single DEV is obtained for a parameter during a six-month calendar period, that DEV shall be considered the SMEV for that parameter for that given six-month calendar period. The SMEV shall be attributed to each day of the six-month calendar period for determination of compliance with the six-month median effluent limitation (SMEL) for a given parameter for each day of that given six-month calendar period, resulting in approximately 180 days of non-compliance depending on the number of days in the six-month calendar period. If the SMEV exceeds the six-month median, the Discharger will be considered out of compliance for each day for the six-month period. The SMEV cannot be determined for any six month calendar period during which no DEV is obtained.

Attachment A – Definitions

Arithmetic Mean (μ), also called the average: the sum of measured values divided by the number of samples. For ambient water concentrations, the arithmetic mean is calculated as follows:

Arithmetic mean = $\mu = \Sigma x / n$ where: Σx is the sum of the measured ambient water concentrations, and n is the number of samples.

Average Monthly Effluent Limitation (AMEL): the highest allowable average of daily discharges over a calendar month, calculated as the sum of all daily discharges measured during a calendar month divided by the number of daily discharges measured during that month.

Average Weekly Effluent Limitation (AWEL): the highest allowable average of daily discharges over a calendar week (Sunday through Saturday), calculated as the sum of all daily discharges measured during a calendar week divided by the number of daily discharges measured during that week.

Bioaccumulative Pollutants: those substances taken up by an organism from its surrounding medium through gill membranes, epithelial tissue, or from food and subsequently concentrated and retained in the body of the organism.

Carcinogenic Pollutants: substances that are known to cause cancer in living organisms.

Coefficient of Variation (*CV*): a measure of the data variability and is calculated as the estimated standard deviation divided by the arithmetic mean of the observed values.

Cone of Depression: A depression in the water table that develops around a pumped well.

Cone of Influence: The depression, roughly conical in shape, produced in a water table by the pumping of water from a well.

Contamination Site: A site that is currently under investigation or cleanup for any medium (air, soil, water), or is provided oversight by any local, state, or federal environmental regulatory agency, such as the County of San Diego, Air Pollution Control District, and Department of Toxics Substance Control, or the quality of surface water or groundwater at a site has been altered by wastes to a degree which unreasonably affects either the waters for beneficial uses or facilities which serve these beneficial uses.

Daily Discharge: Daily Discharge is defined as either: (1) the total mass of the constituent discharged over the calendar day (12 a.m. through 11:59 p.m.) or any 24-hour period that reasonably represents a calendar day for purposes of sampling (as specified in the permit), for a constituent with limitations expressed in units of mass or;

(2) the unweighted arithmetic mean measurement of the constituent over the day for a constituent with limitations expressed in other units of measurement (e.g., concentration).

The daily discharge may be determined by the analytical results of a composite sample taken over the course of one day (a calendar day, or other 24-hour period defined as a day), or by the arithmetic mean of analytical results from one or more grab samples taken over the course of the day.

For composite sampling, if one day is defined as a 24-hour period other than a calendar day, the analytical result for the 24-hour period will be considered as the result for the calendar day in which the 24-hour period ends.

Detected, but Not Quantified (DNQ): those sample results less than the Reporting Level (RL), but greater than or equal to the laboratory's Method Detection Limit (MDL).

Dilution Credit: the amount of dilution granted to a Discharger in the calculation of a water quality-based effluent limitation, based on the allowance of a specified mixing zone. It is calculated from the dilution ratio, or determined through conducting a mixing zone study, or modeling of the discharge and receiving water.

Effluent Concentration Allowance (ECA): a value derived from the water quality criterion/objective, dilution credit, and ambient background concentration that is used, in conjunction with the coefficient of variation for the effluent monitoring data, to calculate a long-term average (LTA) discharge concentration. The ECA has the same meaning as waste load allocation (WLA) as used in USEPA guidance (Technical Support Document For Water Quality-based Toxics Control, March 1991, second printing, EPA/505/2-90-001).

Enclosed Bays: indentations along the coast that enclose an area of oceanic water within distinct headlands or harbor works. Enclosed bays include all bays where the narrowest distance between the headlands or outermost harbor works is less than 75 percent of the greatest dimension of the enclosed portion of the bay. Enclosed bays include, but are not limited to, Humboldt Bay, Bodega Harbor, Tomales Bay, Drake's Estero, San Francisco Bay, Morro Bay, Los Angeles-Long Beach Harbor, Upper and Lower Newport Bay, Mission Bay, and San Diego Bay. Enclosed bays do not include inland surface waters or ocean waters.

Notice of Enrollment: A notice from the Regional Board to the discharger that the NOI application has been accepted and the project is enrolled in this WDR. The Notice of Enrollment will specify the discharge flow limit, any additional or increase in monitoring due to specific circumstances of the discharge, or other requirements.

Estimated Chemical Concentration: the estimated chemical concentration that results from the confirmed detection of the substance by the analytical method below the Minimum Level value.

Estuaries: waters, including coastal lagoons, located at the mouths of streams that serve as areas of mixing for fresh and ocean waters. Coastal lagoons and mouths of streams that are temporarily separated from the ocean by sandbars shall be considered estuaries. Estuarine waters shall be considered to extend from a bay or the open ocean to a point upstream where there is no significant mixing of fresh water and seawater. Estuarine waters include~~d~~, but are not limited to, the Sacramento-San Joaquin Delta, as defined in Water Code section 12220, Suisun Bay, Carquinez Strait downstream to the Carquinez Bridge, and appropriate areas of the Smith, Mad, Eel, Noyo, Russian, Klamath, San Diego, and Otay rivers. Estuaries do not include inland surface waters or ocean waters.

Inland Surface Waters: all surface waters of the State that do not include the ocean, enclosed bays, or estuaries. Inland surface water consist of freshwater and do not have any measurable salinity.

Instantaneous Maximum Effluent Limitation: the highest allowable value for any single grab sample or aliquot (i.e., each grab sample or aliquot is independently compared to the instantaneous maximum limitation).

Instantaneous Minimum Effluent Limitation: the lowest allowable value for any single grab sample or aliquot (i.e., each grab sample or aliquot is independently compared to the instantaneous minimum limitation).

Maximum Daily Effluent Limitation (MDEL): the highest allowable daily discharge of a pollutant, over a calendar day (or 24-hour period). For pollutants with limitations expressed in units of mass, the daily discharge is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurement, the daily discharge is calculated as the arithmetic mean measurement of the pollutant over the day.

Median: the middle measurement in a set of data. The median of a set of data is found by first arranging the measurements in order of magnitude (either increasing or decreasing order). If the number of measurements (n) is odd, then the median = $X_{(n+1)/2}$. If n is even, then the median = $(X_{n/2} + X_{(n/2)+1})/2$ (i.e., the midpoint between the $n/2$ and $n/2+1$).

Method Detection Limit (MDL): the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero, as defined in title 40 of the Code of Federal Regulations, Part 136, Attachment B, revised as of July 3, 1999.

Minimum Level (ML): the concentration at which the entire analytical system must give a recognizable signal and acceptable calibration point. The ML is the concentration in a sample that is equivalent to the concentration of the lowest calibration standard analyzed by a specific analytical procedure, assuming that all the method specified sample weights, volumes, and processing steps have been followed.

Mixing Zone: a limited volume of receiving water that is allocated for mixing with a wastewater discharge where water quality criteria can be exceeded without causing adverse effects to the overall water body.

Not Detected (ND): those sample results less than the laboratory's MDL.

Notice of Intent (NOI): A form completed and signed by a Discharger notifying the Regional Board that the Discharger is applying for enrollment under the terms and conditions of the WDR and will comply with the WDR for a groundwater extraction activity at a specific site.

Notice of Termination (NOT): A letter completed and signed by a Discharger notifying the Regional Board that the Discharger no longer wishes to discharge under the WDR. Submission of a NOT constitutes notice that the owner (and his/her agent) of the site identified on the letter has ceased discharge groundwater associated with groundwater extraction activities at the site under this WDR.

Ocean Waters: the territorial marine waters of the State as defined by California law to the extent these waters are outside of enclosed bays, estuaries, and coastal lagoons. Discharges to ocean waters are regulated in accordance with the State Board's California Ocean Plan.

Permanent groundwater extraction activities: Groundwater extraction operations for structures which 1) are not designed or constructed to withstand hydrostatic pressure or do not preclude infiltration of groundwater, and 2) require removal of groundwater to prevent water infiltration to the structure(s).

Persistent pollutants: substances for which degradation or decomposition in the environment is nonexistent or very slow.

Radius of Influence: The radial distance from the center of a wellbore to the point where there is no lowering of the water table or potentiometric surface (the edge of the cone of depression).

Reporting Level (RL): the ML (and its associated analytical method) chosen by the Discharger for reporting and compliance determination from the MLs included in this WDR. The MLs included in this WDR correspond to approved analytical methods for reporting a sample result that are selected by the Regional Board either from Appendix 4 of the SIP in accordance with section 2.4.2 of the SIP, or established in accordance with section 2.4.3 of the SIP. The ML is based on the proper application of method-based analytical procedures for sample preparation and the absence of any matrix interferences. Other factors may be applied to the ML depending on the specific sample preparation steps employed. For example, the treatment typically applied in cases where there are matrix-effects is to dilute the sample or sample aliquot by a factor of ten. In such cases, this additional factor must be applied to the ML in the computation of the RL.

Satellite Collection System: the portion, if any, of a sanitary sewer system owned or operated by a different public agency than the agency that owns and operates the wastewater treatment facility that a sanitary sewer system is tributary to.

Six-Month Median Effluent Limitation: the highest allowable median of all daily discharges, based on 24-hour flow-weighted composite samples, for any 180-day period.

Source of Drinking Water: any water designated as municipal or domestic supply (MUN) in a Regional Board Basin Plan.

Standard Deviation (σ): a measure of variability that is calculated as follows:

$$\sigma = (\sum[(x - \mu)^2]/(n - 1))^{0.5}$$

where:

x is the observed value;

μ is the arithmetic mean of the observed values; and

n is the number of samples.

Temporary Discharge: Discharge of extracted groundwater waste from groundwater cleanup with a projected cleanup date and subsurface excavation that requires groundwater extraction that is not a permanent groundwater extraction activity.

Discharges of groundwater for the purpose of protecting subterranean structures from groundwater infiltration are not considered groundwater cleanup projects, whether or not such discharges cleanup or remove pollutants from the groundwater. These activities may be covered under the statewide general NPDES permit for discharges from utility vaults and underground structures to surface water (CAG990002).

Toxicity Reduction Evaluation (TRE): a study conducted in a step-wise process designed to identify the causative agents of effluent or ambient toxicity, isolate the sources of toxicity, evaluate the effectiveness of toxicity control options, and then confirm the reduction in toxicity. The first steps of the TRE consist of the collection of data relevant to the toxicity, including additional toxicity testing, and an evaluation of facility operations and maintenance practices, and best management practices. A Toxicity Identification Evaluation (TIE) may be required as part of the TRE, if appropriate. (A TIE is a set of procedures to identify the specific chemical[s] responsible for toxicity. These procedures are performed in three phases [characterization, identification, and confirmation] using aquatic organism toxicity tests.)

Waters of the United States or waters of the U.S.: (40 e-CFR 122.2, March 20, 2007) (a) All waters which are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide; (b) All interstate waters, including interstate "wetlands;" (c) All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, "wetlands," sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds the use, degradation, or destruction of which would affect or could affect interstate or foreign commerce including any such waters:

(1) Which are or could be used by interstate or foreign travelers for recreational or other purposes; (2) From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or (3) Which are used or could be used for industrial purposes by industries in interstate commerce; (d) All impoundments of waters otherwise defined as waters of the United States under this definition; (e) Tributaries of waters identified in paragraphs (a) through (d) of this definition; (f) The territorial sea; and (g) "Wetlands" adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (a) through (f) of this definition. Waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of CWA (other than cooling ponds as defined in 40 CFR 423.11(m) which also meet the criteria of this definition) are not waters of the United States. This exclusion applies only to manmade bodies of water which neither were originally created in waters of the United States (such as disposal area in wetlands) nor resulted from the impoundment of waters of the United States. Waters of the United States do not include prior converted cropland. Notwithstanding the determination of an area's status as prior converted cropland by any other federal agency, for the purposes of the Clean Water Act, the final authority regarding Clean Water Act jurisdiction remains with EPA.

Attachment B1 – Notice of Intent Form

NOTICE OF INTENT

TO DISCHARGE GROUNDWATER EXTRACTION WASTE TO SURFACE WATERS WITHIN THE SAN DIEGO REGION

EXCEPT FOR SAN DIEGO BAY

SUBJECT TO GENERAL WASTE DISCHARGE REQUIREMENTS IN ORDER NO. R9-2008-0002 (NPDES NO. CAG919002)

GENERAL WASTE DISCHARGE REQUIREMENTS FOR DISCHARGES FROM GROUNDWATER EXTRACTION AND SIMILAR WASTE DISCHARGES TO SURFACE WATERS WITHIN THE SAN DIEGO REGION EXCEPT FOR SAN DIEGO BAY (WDR)

Attach Form 200 (completed and signed) and additional sheets as necessary to provide complete information requested in this Notice of Intent (NOI).

I. STIPULATION OF APPLICABILITY AND CERTIFICATION

☐ I have determined that the groundwater extracted waste discharge will be to navigable waters of the United States within the San Diego Region and that any violation of effluent limits will be subject to Mandatory Minimum Penalties under California Water Code section 13385(h) and (i).

☐ I have determined that this discharge is eligible for enrollment in this General "Waste Discharge Requirements" (WDR) because the discharge will comply with the Discharge Specifications of this WDR.

☐ I have read this WDR Order No. R9-2008-0002 and hereby certify that:

1. I understand the requirements of Order No. R9-2008-0002.
2. The enclosed information describing my proposed groundwater extraction waste discharge is accurate and describes a discharge that meets the requirements of Order No. R9-2008-0002, which is the applicable general groundwater extraction waste discharge permit.
3. I will comply with all terms, conditions, and requirements of WDR Order No. R9-2008-0002.

I. STIPULATION OF APPLICABILITY AND CERTIFICATION

I certify under penalty of law that this document, Form 200, and all attachments were prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those directly responsible for gathering the information, the information submitted is true, accurate, and complete to the best of my knowledge and belief. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. In addition, I certify that the provisions of the permit, including the criteria for eligibility will be complied with.

A. Printed Name:	
B. Signature*:	C. Date:
D. Title:	

*The appropriate person must sign the application form.
Acceptable signatures are:
1. for a corporation, a principal executive officer of at least the level of senior vice-president;
2. for a partnership or individual (sole proprietorship), a general partner or the proprietor;
3. for a governmental or public agency, either a principal executive officer or ranking elected/appointed official.

II. ITEMS REQUIRED FOR DETERMINING ELIGIBILITY

☐ A. Identify and discuss technical and economic feasibility of alternative disposal options.

☐ B. If discharging to an MS4, obtain authorization from the appropriate municipality and submit proof.

☐ C. Submit scale appropriate vicinity map(s).

☐ D. Submit a completed and signed Form 200 (*Application/Report of Waste Discharge, General Information for Waste Discharge Requirements or NPDES Permit*).

III. NOTICE OF INTENT STATUS

A. Is this a renewal of an expiring WDR? 1. ☐ No 2.☐ Yes, Order No.: _____

IV. GROUNDWATER EXTRACTION INFORMATION

A. Nature of Groundwater Extraction Activity:
1. ☐ Subsurface Excavation
   a.☐ Foundation b. ☐ Tunneling c.☐ Construction d.☐ Footing e.☐ Other _____
2. ☐ Remediation Project
3. ☐ Other _____

B. ☐ This project is associated with a project that requires Regional Board license, permit, or oversight?
Explain: Construction storm water, 401 Certifications, WDR, UST or cleanup project, etc.

C. Duration and Start Date
1. Proposed Start Date of Groundwater Extraction Discharge: _____

2. Estimated Duration of Groundwater Extraction Discharge: _____

D. 1.☐ Describe the historical use of the land within the cone/radius of influence.

2. ☐ Identify all known contamination sites and ground water plumes within half mile of each groundwater extraction point to be used in the project.
Attach a source of contamination description and list of constituents.
Attach site assessment (If one has been done)

E. For each discharge point identify the location of discharge according to the following: (show in vicinity map)
1. ☐ Storm Drain, ☐ Attach proof of authorization from the appropriate municipality for the discharge into the storm drain or conveyance used to convey the discharge.
2. ☐ Directly into surface water, ☐ submerged or ☐ on the surface

3. Salinity of the Tributary at the discharge point _____

F. Will treatment be required to meet the Discharge Specifications of this WDR?
1.☐ Yes 2.☐ No
If Yes, attach the following:
a. ☐ A report certifying the adequacy of each component of the treatment facilities or other type of contingency plan. The report shall also certify that:
(1) ☐ all treatment facility startup and operation instruction manuals are adequate and available to operating personnel,
(2) ☐ adequate treatment facility maintenance and testing (if treatment facilities are on "standby") schedules are included in the treatment facility operations manual,
(3) ☐ treatment facilities and appurtenances can be fully operational, as designed, within 24 hours, and
(4) ☐ influent and effluent sampling locations or ports are located in areas where samples representative of the waste stream to be monitored can be obtained.
b. ☐ The design engineer shall affix his/her signature and engineering license number to this certification report.

IV. GROUNDWATER EXTRACTION INFORMATION

G. Additional Attachments
1. ☐ Describe best management practices (bmp) and contingency plan.
2. ☐ Provide the results of the analysis of the groundwater to be extracted for all of those constituents, as determined by the sampling requirement criteria described in this WDR, for the proposed receiving water type.

V. RECEIVING WATER INFORMATION

A. Name of receiving water(s): (San Diego River, Rainbow Creek, Pacific Ocean, etc.)

B. Describe the types of receiving waters affected: (bay, creek, river, etc.)

C. Receiving water flows seasonally 1.☐ Yes 2.☐ No

D. More than one discharge point is proposed?

1.☐ Yes 2.☐ No If Yes, how many? _____

And distance between points _____
Include in Vicinity Map
3. Location of Discharge Points: (attach)
Example: Outfall 001 (Latitude and Longitude)

E. Proposed Flow (MGD or gpd) of the discharge:
1. Maximum Discharge: _____
2. Average Daily Flowrate: _____
3. Basis for flow rate estimates (if necessary attach):

F. Hydrologic Subarea Number(s) at the point of discharge:

VI. APPLICATION FEE

The initial fee and annual fee are based upon the type of pollutants to be discharged or potentially discharged.

Make checks payable to "SWRCB" and include the project's name in the "memo" field.

☐ **Category 3 Lowest Threat to Water Quality**
The discharge will not require any treatment.
Current fee is $1,000 plus $185 surcharge = $1,185

☐ **Category 2 Moderate Threat to Water Quality**
The discharge will be from a well that has a contaminated site within the radius of influence.
Current fee is $2,900 plus $537 surcharge = $3,437

☐ **Category 1 Highest Threat to Water Quality**
The discharge will require treatment to meet effluent limitations.
Current fee is $4,800 plus $888 surcharge = $5,688

VII. ANTIDEGREDATION POLICIES

A. ☐ Statement of compliance with 40 CFR 131.12 and State Water Resources Control Board Resolution No. 68-16 (attach) (collectively antidegredation policies)

40 CFR 131.12 Antidegradation policy.
(a) The State shall develop and adopt a statewide antidegradation policy and identify the methods for implementing such policy pursuant to this subpart. The antidegradation policy and implementation methods shall, at a minimum, be consistent with the following:
(1) Existing instream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected.
(2) Where the quality of the waters exceed levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water, that quality shall be maintained and protected unless the State finds, after full satisfaction of the intergovernmental coordination and public participation provisions of the State's continuing planning process, that allowing lower water quality is necessary to accommodate important economic or social development in the area in which the waters are located. In allowing such degradation or lower water quality, the State shall assure water quality adequate to protect existing uses fully. Further, the State shall assure that there shall be achieved the highest statutory and regulatory requirements for all new and existing point sources and all cost-effective and reasonable best management practices for nonpoint source control.
(3) Where high quality waters constitute an outstanding National resource, such as waters of National and State parks and wildlife refuges, and waters of exceptional recreational or ecological significance, that water quality shall be maintained and protected.
(4) In those cases where potential water quality impairment associated with a thermal discharge is involved, the antidegradation policy and implementing method shall be consistent with section 316 of the Act.

RESOLUTION NO, 68-16
STATEMENT OF POLICY WITH RESPECT TO MAINTAINING HIGH QUALITY OF WATERS IN CALIFORNIA
WHEREAS the California Legislature has declared that it is the policy of the State that the granting of permits and licenses for unappropriated water and the disposal of wastes into the waters of the State shall be so regulated as to achieve highest water quality consistent with maximum benefit to the people of the State and shall be controlled so as to promote the peace, health, safety and welfare of the people of the State; and
WHEREAS water quality control policies have been and are being adopted for waters of the State; and
WHEREAS the quality of some waters of the State is higher than that established by the adopted policies and it is the intent and purpose of this Board that such higher quality shall be maintained to the maximum extent possible consistent with the declaration of the Legislature;

NOW, THEREFORE, BE IT RESOLVED:
1. Whenever the existing quality of water is better than the quality established in policies as of the date on which such policies become effective, such existing high quality will be maintained until it has been demonstrated to the State that any change will be consistent with maximum benefit to the people of the State, will not unreasonably affect present and anticipated beneficial use of such water and will not result in water quality less than that prescribed in the policies.
2. Any activity which produces or may produce a waste or increased volume or concentration of waste and which discharges or proposes to discharge to existing high quality waters will be required to meet waste discharge requirements which will result in the best practicable treatment or control of the discharge necessary to assure that (a) a pollution or nuisance will not occur, and (b) the highest water quality consistent with maximum benefit to the people of the State will be maintained.
3. In implementing this policy, the Secretary of the Interior will be kept advised and will be provided with such information as he will need to discharge his responsibilities under the Federal Water Pollution Control Act.

BE IT FURTHER RESOLVED that a copy of this resolution be forwarded to the Secretary of the Interior as part of California's water quality control policy submission.
CERTIFICATION
The undersigned, Executive Officer of the State Water Resources Control Board, does hereby certify that the foregoing is a full, true, and correct copy of a resolution duly and regularly adopted at a meeting of the State Water Resources Control Board held on October 24, 1968.
Dated: October 28, 1968
Kerry W. Mulligan, Executive Officer
State Water Resources Control Board

VIII. CALIFORNIA CONSTITUTION COMPLIANCE

A. ☐ Discuss the potential uses of the extracted groundwaters, efforts made to ensure use to the fullest extent possible and compliance with Article 10, Section 2 of the California Constitution (attach)

CALIFORNIA CONSTITUTION
ARTICLE 10 WATER
SEC. 2. It is hereby declared that because of the conditions prevailing in this State the general welfare requires that the water resources of the State be put to beneficial use to the fullest extent of which they are capable, and that the waste or unreasonable use or unreasonable method of use of water be prevented, and that the conservation of such waters is to be exercised with a view to the reasonable and beneficial use thereof in the interest of the people and for the public welfare. The right to water or to the use or flow of water in or from any natural stream or water course in this State is and shall be limited to such water as shall be reasonably required for the beneficial use to be served, and such right does not and shall not extend to the waste or unreasonable use or unreasonable method of use or unreasonable method of diversion of water. Riparian rights in a stream or water course attach to, but to no more than so much of the flow thereof as may be required or used consistently with this section, for the purposes for which such lands are, or may be made adaptable, in view of such reasonable and beneficial uses; provided, however, that nothing herein contained shall be construed as depriving any riparian owner of the reasonable use of water of the stream to which the owner's land is riparian under reasonable methods of diversion and use, or as depriving any appropriator of water to which the appropriator is lawfully entitled.

This section shall be self-executing, and the Legislature may also enact laws in the furtherance of the policy in this section contained.

Submit the NOI, first annual fee, map, and other attachments to the following address:

CRWQCB – San Diego Region
9174 Sky Park Court, Suite 100
San Diego, CA 92123

Attn: Groundwater Extraction to San Diego Region
Core Regulatory Unit
NOTICE OF INTENT

IX. STATE USE ONLY

WDID:	Staff Initials:	Status: ☐ Complete ☐ Incomplete ☐ Withdrawn ☐ Pending Additional Information
Date NOI Received:	Check #:	
Date NOI Processed:	Fee Amount Received: $	
CIWQS Place # :	CIWQS Reg. Meas. # :	
Comments:		

Attachment B2 – Priority Toxic Pollutants
Source: [65 FR 31711, May 18, 2000, as amended at 66 FR 9961, Feb. 13, 2001; 68 FR 62747, Nov. 6, 2003]

Table in Paragraph (b)(1) of 40 CFR 131.38 —126 PRIORITY POLLUTANTS
Numeric criteria for priority toxic pollutants for the State of California

A		B Freshwater		C Saltwater		D Human Health (10^{-6} risk for carcinogens) For consumption of:	
# Compound	CAS Number	Criterion Maximum Conc. [c] B1	Criterion Continuous Conc. [d] B2	Criterion Maximum Conc. [d] C1	Criterion Continuous Conc. [d] C2	Water & Organisms (µg/L) D1	Organisms Only (µg/L) D2
1. Antimony	7440360					14 a,s	4300 a,t
2. Arsenic [b]	7440382	340 i,m,w	150 i,m,w	69 i,m	36 i,m		
3. Beryllium	7440417					n	n
4. Cadmium [b]	7440439	4.3 e,i,m,w,x	2.2 e,i,m,w	42 i,m	9.3 i,m	n	n
5a. Chromium (III)	16065831	550 e,i,m,o	180 e,i,m,o			n	n
5b. Chromium (VI) [b]	18540299	16 i,m,w	11 i,m,w	1100 i,m	50 i,m	n	n
6. Copper [b]	7440508	13 e,i,m,w,x	9.0 e,i,m,w	4.8 i,m	3.1 i,m	1300	
7. Lead [b]	7439921	65 e,i,m	2.5 e,i,m	210 i,m	8.1 i,m	n	n
8. Mercury [b]	7439976	[Reserved]	[Reserved]	[Reserved]	[Reserved]	0.050 a	0.051 a
9. Nickel [b]	7440020	470 e,i,m,w	52 e,i,m,w	74 i,m	8.2 i,m	610 a	4600 a
10. Selenium [b]	7782492	[Reserved] p	5.0 q	290 i,m	71 i,m	n	n
11. Silver [b]	7440224	3.4 e,i,m		1.9 i,m			
12. Thallium	7440280					1.7 a,s	6.3 a,t
13. Zinc [b]	7440666	120 e,i,m,w,x	120 e,i,m,w	90 i,m	81 i,m		
14. Cyanide [b]	57125	22 o	5.2 o	1 r	1 r	700 a	220,000 a,j
15. Asbestos	1332214					7,000,000 fibers/L k,s	
16. 2,3,7,8-TCDD (Dioxin)	1746016					0.000000013 c	0.000000014 c
17. Acrolein	107028					320 s	780 t
18. Acrylonitrile	107131					0.059 a,c,s	0.66 a,c,t
19. Benzene	71432					1.2 a,c	71 a,c
20. Bromoform	75252					4.3 a,c	360 a,c
21. Carbon Tetrachloride	56235					0.25 a,c,s	4.4 a,c,t
22. Chlorobenzene	108907					680 a,s	21,000 a,j,t
23. Chlorodibromomethane	124481					0.401 a,c	34 a,c
24. Chloroethane	75003						
25. 2-Chloroethylvinyl Ether	110758						

Table in Paragraph (b)(1) of 40 CFR 131.38 —126 PRIORITY POLLUTANTS

Numeric criteria for priority toxic pollutants for the State of California

A		B Freshwater		C Saltwater		D Human Health (10^{-6} risk for carcinogens) For consumption of:	
# Compound	CAS Number	Criterion Maximum Conc. [e] B1	Criterion Continuous Conc. [d] B2	Criterion Maximum Conc. [d] C1	Criterion Continuous Conc. [d] C2	Water & Organisms (µg/L) D1	Organisms Only (µg/L) D2
26. Chloroform	67663					[Reserved]	[Reserved]
27. Dichlorobromomethane	75274					0.56 a,c	46 a,c
28. 1,1-Dichloroethane	75343						
29. 1,2-Dichloroethane	107062					0.38 a,c,s	99 a,c,t
30. 1,1-Dichloroethylene	75354					0.057 a,c,s	3.2 a,c,t
31. 1,2-Dichloropropane	78875					0.52 a	39 a
32. 1,3-Dichloropropylene	542756					10 a,s	1,700 a,t
33. Ethylbenzene	100414					3,100 a,s	29,000 a,t
34. Methyl Bromide	74839					48 a	4,000 a
35. Methyl Chloride	74873					n	n
36. Methylene Chloride	75092					4.7 a,c	1,600 a,c
37. 1,1,2,2-Tetrachloroethane	79345					0.17 a,c,s	11 a,c,t
38. Tetrachloroethylene	127184					0.8 c,s	8.85 c,t
39. Toluene	108883					6,800 a	200,000 a
40. 1,2-Trans-Dichloroethylene	156605					700 a	140,000 a
41. 1,1,1-Trichloroethane	71556					n	n
42. 1,1,2-Trichloroethane	79005					0.60 a,c,s	42 a,c,t
43. Trichloroethylene	79016					2.7 c,s	81 c,t
44. Vinyl Chloride	75014					2 c,s	525 c,t
45. 2-Chlorophenol	95578					120 a	400 a
46. 2,4-Dichlorophenol	120832					93 a,s	790 a,t
47. 2,4-Dimethylphenol	105679					540 a	2,300 a
48. 2-Methyl-4,6-Dinitrophenol	534521					13.4 s	765 t
49. 2,4-Dinitrophenol	51285					70 a,s	14,000 a,t
50. 2-Nitrophenol	88755						
51. 4-Nitrophenol	100027						
52. 3-Methyl-4-Chlorophenol	59507						
53. Pentachlorophenol	87865	19 f,w	15 f,w	13	7.9	0.28 a,c	8.2 a,c,j
54. Phenol	108952					21,000 a	4,600,000 a,j,t
55. 2,4,6-Trichlorophenol	88062					2.1 a,c	6.5 a,c
56. Acenaphthene	83329					1,200 a	2,700 a
57. Acenaphthylene	208968						
58. Anthracene	120127					9,600 a	110,000 a

Table in Paragraph (b)(1) of 40 CFR 131.38 —126 PRIORITY POLLUTANTS

Numeric criteria for priority toxic pollutants for the State of California

A		B Freshwater		C Saltwater		D Human Health (10^{-6} risk for carcinogens) For consumption of:	
# Compound	CAS Number	Criterion Maximum Conc. [d] B1	Criterion Continuous Conc. [d] B2	Criterion Maximum Conc. [d] C1	Criterion Continuous Conc. [d] C2	Water & Organisms (µg/L) D1	Organisms Only (µg/L) D2
59. Benzidine	92875					0.00012 a,c,s	0.00054 a,c,t
60. Benzo(a)Anthracene	56553					0.0044 a,c	0.049 a,c
61. Benzo(a)Pyrene	50328					0.0044 a,c	0.049 a,c
62. Benzo(b)Fluoranthene	205992					0.0044 a,c	0.049 a,c
63. Benzo(ghi)Perylene	191242						
64. Benzo(k)Fluoranthene	207089					0.0044 a,c	0.049 a,c
65. Bis(2-Chloroethoxy)Methane	111911						
66. Bis(2-Chloroethyl)Ether	111444					0.031 a,c,s	1.4 a,c,t
67. Bis(2-Chloroisopropyl)Ether	39638329					1,400 a	170,000 a,t
68. Bis(2-Ethylhexyl)Phthalate	117817					1.8 a,c,s	5.9 a,c,t
69. 4-Bromophenyl Phenyl Ether	101553						
70. Butylbenzyl Phthalate	85687					3,000 a	5,200 a
71. 2-Chloronaphthalene	91587					1,700 a	4,300 a
72. 4-Chlorophenyl Phenyl Ether	7005723						
73. Chrysene	218019					0.0044 a,c	0.049 a,c
74. Dibenzo(a,h)Anthracene	53703					0.0044 a,c	0.049 a,c
75. 1,2 Dichlorobenzene	95501					2,700 a	17,000 a
76. 1,3 Dichlorobenzene	541731					400	2,600
77. 1,4 Dichlorobenzene	106467					400	2,600
78. 3,3'-Dichlorobenzidine	91941					0.04 a,c,s	0.077 a,c,t
79. Diethyl Phthalate	84662					23,000 a,s	120,000 a,t
80. Dimethyl Phthalate	131113					313,000 s	2,900,000 t
81. Di-n-Butyl Phthalate	84742					2,700 a,s	12,000 a,t
82. 2,4-Dinitrotoluene	121142					0.11 c,s	9.1 c,t
83. 2,6-Dinitrotoluene	606202						
84 Di-n-Octyl Phthalate	117840						
85. 1,2-Diphenylhydrazine	122667					0.040 a,c,s	0.54 a,c,t
86. Fluoranthene	206440					300 a	370 a
87. Fluorene	86737					1,300 a	14,000 a
88. Hexachlorobenzene	118741					0.00075 a,c	0.00077 a,c
89. Hexachlorobutadiene	87683					0.44 a,c,s	50 a,c,t
90. Hexachlorocyclopentadiene	77474					240 a,s	17,000 a,j,t
91. Hexachloroethane	67721					1.9 a,c,s	8.9 a,c,t

Table in Paragraph (b)(1) of 40 CFR 131.38 —126 PRIORITY POLLUTANTS

Numeric criteria for priority toxic pollutants for the State of California

A		B Freshwater		C Saltwater		D Human Health (10^{-6} risk for carcinogens) For consumption of:	
# Compound	CAS Number	Criterion Maximum Conc. [e] B1	Criterion Continuous Conc. [e] B2	Criterion Maximum Conc. [e] C1	Criterion Continuous Conc. [e] C2	Water & Organisms (µg/L) D1	Organisms Only (µg/L) D2
92. Indeno(1,2,3-cd) Pyrene	193395					0.0044 a,c	0.049 a,c
93. Isophorone	78591					8.4 c,s	600 c,t
94. Naphthalene	91203						
95. Nitrobenzene	98953					17 a,s	1,900 a,j,t
96. N-Nitrosodimethylamine	62759					0.00069 a,c,s	8.1 a,c,t
97. N-Nitrosodi-n-Propylamine	621647					0.005 a	1.4 a
98. N-Nitrosodiphenylamine	86306					5.0 a,c,s	16 a,c,t
99. Phenanthrene	85018						
100. Pyrene	129000					960 a	11,000 a
101. 1,2,4-Trichlorobenzene	120821						
102. Aldrin	309002	3 g		1.3 g		0.00013 a,c	0.00014 a,c
103. alpha-BHC	319846					0.0039 a,c	0.013 a,c
104. beta-BHC	319857					0.014 a,c	0.046 a,c
105. gamma-BHC	58899	0.95 w		0.16 g		0.019 c	0.063 c
106. delta-BHC	319868						
107. Chlordane	57749	2.4 g	0.0043 g	0.09 g	0.004 g	0.00057 a,c	0.00059 a,c
108. 4,4'-DDT	50293	1.1 g	0.001 g	0.13 g	0.001 g	0.00059 a,c	0.00059 a,c
109. 4,4'-DDE	72559					0.00059 a,c	0.00059 a,c
110. 4,4'-DDD	72548					0.00083 a,c	0.00084 a,c
111. Dieldrin	60571	0.24 w	0.056 w	0.71 g	0.0019 g	0.00014 a,c	0.00014 a,c
112. alpha-Endosulfan	959988	0.22 g	0.056 g	0.034 g	0.0087 g	110 a	240 a
113. beta-Endosulfan	33213659	0.22 g	0.056 g	0.034 g	0.0087 g	110 a	240 a
114. Endosulfan Sulfate	1031078					110 a	240 a
115. Endrin	72208	0.086 w	0.036 w	0.037 g	0.0023 g	0.76 a	0.81 a,j
116. Endrin Aldehyde	7421934					0.76 a	0.81 a,j
117. Heptachlor	76448	0.52 g	0.0038 g	0.053 g	0.0036 g	0.00021 a,c	0.00021 a,c
118. Heptachlor Epoxide	1024573	0.52 g	0.0038 g	0.053 g	0.0036 g	0.00010 a,c	0.00011 a,c
119-125. Polychlorinated biphenyls (PCBs)			0.014 u		0.03 u	0.00017 c,v	0.00017 c,v
126. Toxaphene	8001352	0.73	0.0002	0.21	0.0002	0.00073 a,c	0.00075 a,c
Total Number of Criteria [h]		22	21	22	20	92	90

Footnotes to
Table in paragraph(b)(1) of 40 CFR 131.38 —126 PRIORITY POLLUTANTS:

a. Criteria revised to reflect the Agency q1* or RfD, as contained in the Integrated Risk Information System (IRIS) as of October 1, 1996. The fish tissue bioconcentration factor (BCF) from the 1980 documents was retained in each case.

b. Criteria apply to California waters except for those waters subject to objectives in Tables III–2A and III–2B of the San Francisco Regional Water Quality Control Board's (SFRWQCB) 1986 Basin Plan that were adopted by the SFRWQCB and the State Water Resources Control Board, approved by EPA, and which continue to apply. For copper and nickel, criteria apply to California waters except for waters south of Dumbarton Bridge in San Francisco Bay that are subject to the objectives in the SFRWQCB's Basin Plan as amended by SFRWQCB Resolution R2–2002–0061, dated May 22, 2002, and approved by the State Water Resources Control Board. EPA approved the aquatic life site-specific objectives on January 21, 2003. The copper and nickel aquatic life site-specific objectives contained in the amended Basin Plan apply instead.

c. Criteria are based on carcinogenicity of 10 (-6) risk.

d. Criteria Maximum Concentration (CMC) equals the highest concentration of a pollutant to which aquatic life can be exposed for a short period of time without deleterious effects. Criteria Continuous Concentration (CCC) equals the highest concentration of a pollutant to which aquatic life can be exposed for an extended period of time (4 days) without deleterious effects. ug/L equals micrograms per liter.

e. Freshwater aquatic life criteria for metals are expressed as a function of total hardness (mg/L) in the water body. The equations are provided in matrix at paragraph (b)(2) of this section. Values displayed above in the matrix correspond to a total hardness of 100 mg/l.

f. Freshwater aquatic life criteria for pentachlorophenol are expressed as a function of pH, and are calculated as follows: Values displayed above in the matrix correspond to a pH of 7.8. CMC = exp(1.005(pH)−4.869). CCC = exp(1.005(pH)−5.134).

g. This criterion is based on 304(a) aquatic life criterion issued in 1980, and was issued in one of the following documents: Aldrin/Dieldrin (EPA 440/5–80–019), Chlordane (EPA 440/5–80–027), DDT (EPA 440/5–80–038), Endosulfan (EPA 440/5–80–046), Endrin (EPA 440/5–80–047), Heptachlor (440/5–80–052), Hexachlorocyclohexane (EPA 440/5–80–054), Silver (EPA 440/5–80–071). The Minimum Data Requirements and derivation procedures were different in the 1980 Guidelines than in the 1985 Guidelines. For example, a "CMC" derived using the 1980 Guidelines was derived to be used as an instantaneous maximum. If assessment is to be done using an averaging period, the values given should be divided by 2 to obtain a value that is more comparable to a CMC derived using the 1985 Guidelines.

h. These totals simply sum the criteria in each column. For aquatic life, there are 23 priority toxic pollutants with some type of freshwater or saltwater, acute or chronic criteria. For human health, there are 92 priority toxic pollutants with either "water + organism" or "organism only" criteria. Note that these totals count chromium as one pollutant even though EPA has developed criteria based on two valence states. In the matrix, EPA has assigned numbers 5a and 5b to the criteria for chromium to reflect the fact that the list of 126 priority pollutants includes only a single listing for chromium.

i. Criteria for these metals are expressed as a function of the water-effect ratio, WER, as defined in paragraph (c) of this section. CMC = column B1 or C1 value×WER; CCC = column B2 or C2 value×WER.

j. No criterion for protection of human health from consumption of aquatic organisms (excluding water) was presented in the 1980 criteria document or in the 1986 Quality Criteria for Water. Nevertheless, sufficient information was presented in the 1980 document to allow a calculation of a criterion, even though the results of such a calculation were not shown in the document.

k. The CWA 304(a) criterion for asbestos is the MCL.

l. [Reserved]

m. These freshwater and saltwater criteria for metals are expressed in terms of the dissolved fraction of the metal in the water column. Criterion values were calculated by using EPA's Clean Water Act 304(a) guidance values (described in the total recoverable fraction) and then applying the conversion factors in §131.36(b)(1) and (2).

n. EPA is not promulgating human health criteria for these contaminants. However, permit authorities should address these contaminants in NPDES permit actions using the State's existing narrative criteria for toxics.

o. These criteria were promulgated for specific waters in California in the National Toxics Rule ("NTR"), at §131.36. The specific waters to which the NTR criteria apply include: Waters of the State defined as bays or estuaries and waters of the State defined as inland, i.e., all surface waters of the State not ocean waters. These waters specifically include the San Francisco Bay upstream to and including Suisun Bay and the Sacramento-San Joaquin Delta. This section does not apply instead of the NTR for this criterion.

p. A criterion of 20 ug/l was promulgated for specific waters in California in the NTR and was promulgated in the total recoverable form. The specific waters to which the NTR criterion applies include: Waters of the San Francisco Bay upstream to and including Suisun Bay and the Sacramento-San Joaquin Delta; and waters of Salt Slough, Mud Slough (north) and the San Joaquin River, Sack Dam to the mouth of the Merced River. This section does not apply instead of the NTR for this criterion. The State of California adopted and EPA approved a site specific criterion for the San Joaquin River, mouth of Merced to Vernalis; therefore, this section does not apply to these waters.

q. This criterion is expressed in the total recoverable form. This criterion was promulgated for specific waters in California in the NTR and was promulgated in the total recoverable form. The specific waters to which the NTR criterion applies include: Waters of the San Francisco Bay upstream to and including Suisun Bay and the Sacramento-San Joaquin Delta; and waters of Salt Slough, Mud Slough (north) and the San Joaquin River, Sack Dam to Vernalis. This criterion does not apply instead of the NTR for these waters. This criterion applies to additional waters of the United States in the State of California pursuant to 40 CFR 131.38(c). The State of California adopted and EPA approved a site-specific criterion for the Grassland Water District, San Luis National Wildlife Refuge, and the Los Banos State Wildlife Refuge; therefore, this criterion does not apply to these waters.

r. These criteria were promulgated for specific waters in California in the NTR. The specific waters to which the NTR criteria apply include: Waters of the State defined as bays or estuaries including the San Francisco Bay upstream to and including Suisun Bay and the Sacramento-San Joaquin Delta. This section does not apply instead of the NTR for these criteria.

s. These criteria were promulgated for specific waters in California in the NTR. The specific waters to which the NTR criteria apply include: Waters of the Sacramento-San Joaquin Delta and waters of the State defined as inland (i.e., all surface waters of the State not bays or estuaries or ocean) that include a MUN use designation. This section does not apply instead of the NTR for these criteria.

t. These criteria were promulgated for specific waters in California in the NTR. The specific waters to which the NTR criteria apply include: Waters of the State defined as bays and estuaries including San Francisco Bay upstream to and including Suisun Bay and the Sacramento-San Joaquin Delta; and waters of the State defined as inland (i.e., all surface waters of the State not bays or estuaries or ocean) without a MUN use designation. This section does not apply instead of the NTR for these criteria.

u. PCBs are a class of chemicals which include aroclors 1242, 1254, 1221, 1232, 1248, 1260, and 1016, CAS numbers 53469219, 11097691, 11104282, 11141165, 12672296, 11096825, and 12674112, respectively. The aquatic life criteria apply to the sum of this set of seven aroclors.

v. This criterion applies to total PCBs, e.g., the sum of all congener or isomer or homolog or aroclor analyses.

w. This criterion has been recalculated pursuant to the 1995 Updates: Water Quality Criteria Documents for the Protection of Aquatic Life in Ambient Water, Office of Water, EPA–820-B–96–001, September 1996. See also Great Lakes Water Quality Initiative Criteria Documents for the Protection of Aquatic Life in Ambient Water, Office of Water, EPA–80–B–95–004, March 1995.

x. The State of California has adopted and EPA has approved site specific criteria for the Sacramento River (and tributaries) above Hamilton City; therefore, these criteria do not apply to these waters.

40 CFR 131.38 Editorial Note: At 66 FR 9961, Feb. 13, 2001, §131.38 was amended in the table to paragraph (b)(1) under the column heading for "B Freshwater" by revising the column headings for "Criterion Maximum Concentration" and "Criterion Continuous Concentration"; under the column heading for "C Saltwater" by revising the column headings for "Criterion Maximum Concentration" and "Criterion Continuous Concentration"; and by revising entries "23." and "67.", effective Feb. 13, 2001. However, this is a photographed table and the amendments could not be incorporated into the text. For the convenience of the user, the amended text is set forth as follows:

1) § 131.38 Establishment of Numeric Criteria for priority toxic pollutants for the State of California.

(b)(1) * * *

A		B Freshwater		C Saltwater		D Human Health (10^{-6} risk for carcinogens) For consumption of:	
# Compound	CAS number	Criterion maximum conc. (µg/L)[d] B1	Criterion continous conc. (µg/L)[d] B2	Criterion maximum conc. (µg/L)[d] C1	Criterion continious conc. (µg/L)[d] C2	Water & organisms (µg/L) D1	Organisms only (µg/L) D2
*	*	*	*	*	*	*	
23. Chlorodibromomethane	124481					[a,c]0.41	[a,c]34
*	*	*	*	*	*	*	
67. Bis(2-Chloroisopropyl)Ether	108601					[a]1,400	[a,t]170,000
*	*	*	*	*	*	*	

Attachment C – (Not applicable)

Attachment D – Standard Provisions

I. Standard Provisions – Permit Compliance

A. Duty to Comply

1. The Discharger must comply with all of the conditions of this WDR. Any noncompliance constitutes a violation of the Clean Water Act (CWA) and the California Water Code (CWC) and is grounds for enforcement action, for permit termination, revocation and reissuance, or denial of a permit renewal application [40 CFR §122.41(a)].

2. The Discharger shall comply with effluent standards or prohibitions established under section 307(a) of the CWA for toxic pollutants and with standards for sewage sludge use or disposal established under section 405(d) of the CWA within the time provided in the regulations that establish these standards or prohibitions, even if this WDR has not been modified to incorporate the requirement [40 CFR §122.41(a)(1)].

B. Need to Halt or Reduce Activity Not a Defense

It shall not be a defense for a Discharger in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this WDR [*40 CFR §122.41(c)*].

C. Duty to Mitigate

The Discharger shall take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this WDR that has a reasonable likelihood of adversely affecting human health or the environment [*40 CFR §122.41(d)*].

D. Proper Operation and Maintenance

The Discharger shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the Discharger to achieve compliance with the conditions of this WDR. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of backup or auxiliary facilities or similar systems that are installed by a Discharger only when necessary to achieve compliance with the conditions of this WDR [*40 CFR §122.41(e)*].

E. Property Rights

1. This WDR does not convey any property rights of any sort or any exclusive privileges [40 CFR §122.41(g)].

2. The issuance of this WDR does not authorize any injury to persons or property or invasion of other private rights, or any infringement of State or local law or regulations [40 CFR §122.5(c)].

F. Inspection and Entry

The Discharger shall allow the Regional Water Quality Control Board (Regional Board), California State Water Resources Control Board (State Board), United States Environmental Protection Agency (USEPA), and/or their authorized representatives (including an authorized contractor acting as their representative), upon the presentation of credentials and other documents, as may be required by law, to [*40 CFR §122.41(i)*] [*CWC 13383(c)*]:

1. Enter upon the Discharger's premises where a regulated facility or activity is located or conducted, or where records are kept under the conditions of this WDR [40 CFR §122.41(i)(1)];

2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this WDR [40 CFR §122.41(i)(2)];

3. Inspect and photograph, at reasonable times, any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this WDR [40 CFR §122.41(i)(3)];

4. Sample or monitor, at reasonable times, for the purposes of assuring WDR compliance or as otherwise authorized by the CWA or the CWC, any substances or parameters at any location [40 CFR §122.41(i)(4)].

G. Bypass

1. Definitions

   a. "Bypass" means the intentional diversion of waste streams from any portion of a treatment facility [40 CFR §122.41(m)(1)(i)].

   b. "Severe property damage" means substantial physical damage to property, damage to the treatment facilities, which causes them to become inoperable, or substantial and permanent loss of natural resources that can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production [40 CFR §122.41(m)(1)(ii)].

2. Bypass not exceeding limitations – The Discharger may allow any bypass to occur which does not cause exceedances of effluent limitations, but only if it is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions listed in Standard Provisions – Permit Compliance I.G.3 and I.G.5 below [40 CFR §122.41(m)(2)].

3. Prohibition of bypass – Bypass is prohibited, and the Regional Board may take enforcement action against a Discharger for bypass, unless [40 CFR §122.41(m)(4)(i)]:

   a. Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage [40 CFR §122.41(m)(4)(A)];

   b. There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass that occurred during normal periods of equipment downtime or preventive maintenance [40 CFR §122.41(m)(4)(B)]; and

   c. The Discharger submitted notice to the Regional Board as required under Standard Provision – Permit Compliance I.G.5 below [40 CFR §122.41(m)(4)(C)].

4. The Regional Board may approve an anticipated bypass, after considering its adverse effects, if the Regional Board determines that it will meet the three conditions listed in Standard Provisions – Permit Compliance I.G.3 above [40 CFR §122.41(m)(4)(ii)].

5. Notice

   a. Anticipated bypass. If the Discharger knows in advance of the need for a bypass, it shall submit a notice, if possible at least 10 days before the date of the bypass [40 CFR §122.41(m)(3)(i)].

   b. Unanticipated bypass. The Discharger shall submit notice of an unanticipated bypass as required in Standard Provisions - Reporting V.E below [40 CFR §122.41(m)(3)(ii)].

H. Upset

Upset means an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond the reasonable control of the Discharger. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation [*40 CFR §122.41(n)(1)*].

1. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology based permit effluent limitations if the requirements of paragraph H.2 of this section are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for

noncompliance, is final administrative action subject to judicial review [40 CFR §122.41(n)(2)].

2. Conditions necessary for a demonstration of upset. A Discharger who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs or other relevant evidence that [40 CFR §122.41(n)(3)]:

   a. An upset occurred and that the Discharger can identify the cause(s) of the upset [40 CFR §122.41(n)(3)(i)];

   b. The permitted facility was, at the time, being properly operated [40 CFR §122.41(n)(3)(i)];

   c. The Discharger submitted notice of the upset as required in Standard Provisions – Reporting V.E.2.b [40 CFR §122.41(n)(3)(iii)]; and

   d. The Discharger complied with any remedial measures required under Standard Provisions – Permit Compliance I.C above [40 CFR §122.41(n)(3)(iv)].

3. Burden of proof. In any enforcement proceeding, the Discharger seeking to establish the occurrence of an upset has the burden of proof [40 CFR §122.41(n)(4)].

II. Standard Provisions – Permit Action

A. General

This WDR may be modified, revoked and reissued, or terminated for cause. The filing of a request by the Discharger for modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any WDR condition [*40 CFR §122.41(f)*].

If any toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is promulgated under section 307(a) of the CWA for a toxic pollutant which is present in the discharge, and that standard or prohibition is more stringent than any limitation on the pollutant in this WDR, this WDR shall be modified or revoked and reissued to conform to the toxic effluent standard or prohibition and the Discharger so notified.

B. Duty to Reapply

If the Discharger wishes to continue an activity regulated by this WDR after the expiration date of this WDR, the Discharger must apply for and obtain a new permit [*40 CFR §122.41(b)*] or submit a new NOI for re-enrollment.

C. Transfers

This Order is not transferable to any person because the Regional Board is required to modify or revoke and reissue this Order to change the name of the Discharger and incorporate such other requirements as may be necessary under the CWA and the CWC [*40 CFR §122.41(l)(3)*] [*40 CFR §122.61*]. A new owner or operator shall submit an NOI application to enroll in this WDR and the previous owner or operator shall submit a NOT.

D. Severability

The provisions of this WDR are severable and if any provisions of this WDR or the application of any provisions of this WDR to any circumstance is held invalid, the applications of such provision to other circumstances and the remainder of this WDR shall not be affected thereby.

E. Pollution, Contamination, or Nuisance [CWC §13050]

Neither the treatment nor the discharge shall create a condition of pollution, contamination or nuisance.

III. Standard Provisions – Monitoring

A. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity [40 CFR §122.41(j)(1)].

B. Monitoring results must be conducted according to test procedures under 40 CFR section 136 or, in the case of sludge use or disposal, approved under 40 CFR section 136 unless otherwise specified in 40 CFR section 503 unless other test procedures have been specified in this WDR [40 CFR §122.41(j)(4)] [40 CFR §122.44(i)(1)(iv)].

IV. Standard Provisions – Records

A. Except for records of monitoring information required by this WDR related to the Discharger's sewage sludge use and disposal activities, which shall be retained for a period of at least five years (or longer as required by 40 CFR section 503), the Discharger shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this WDR, and records of all data used to complete the application for this WDR, for a period of at least three (3) years from the date of the sample, measurement, report or application. This period may be extended by request of the Regional Board Executive Officer at any time [40 CFR §122.41(j)(2)].

B. Records of monitoring information shall include:

1. The date, exact place, and time of sampling or measurements [40 CFR §122.41(j)(3)(i)];

2. The individual(s) who performed the sampling or measurements [40 CFR §122.41(j)(3)(ii)];

3. The date(s) analyses were performed [40 CFR §122.41(j)(3)(iii)];

4. The individual(s) who performed the analyses [40 CFR §122.41(j)(3)(iv)];

5. The analytical techniques or methods used [40 CFR §122.41(j)(3)(v)]; and

6. The results of such analyses [40 CFR §122.41(j)(3)(vi)].

C. Claims of confidentiality for the following information will be denied [40 CFR §122.7(b)]:

1. The name and address of any permit applicant or Discharger [40 CFR §122.7(b)(1)]; and

2. Permit applications and attachments, permits and effluent data [40 CFR §122.7(b)(2)].

V. Standard Provisions – Reporting

A. Duty to Provide Information

The Discharger shall furnish to the Regional Board, State Board, or USEPA within a reasonable time, any information which the Regional Board, State Board, or USEPA may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this WDR or to determine compliance with this WDR. Upon request, the Discharger shall also furnish to the Regional Board, State Board, or USEPA copies of records required to be kept by this WDR [*40 CFR §122.41(h)*] [*CWC 13267*].

B. Signatory and Certification Requirements

1. All applications, reports, or information submitted to the Regional Board, State Board, and/or USEPA shall be signed and certified in accordance with paragraph (B.2) and (B.3) of this provision [40 CFR §122.41(k)].

2. All permit applications shall be signed as follows:

a. For a corporation: By a responsible corporate officer. For the purpose of this section, a responsible corporate officer means: (i) A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision making functions for the corporation, or (ii) the manager of one or more manufacturing, production, or operating facilities, provided the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures [40 CFR §122.22(a)(1)];

b. For a partnership or sole proprietorship: by a general partner or the proprietor, respectively [40 CFR §122.22(a)(2)]; or

c. For a municipality, State, federal, or other public agency: by either a principal executive officer or ranking elected official. For purposes of this provision, a principal executive officer of a federal agency includes: (i) the chief executive officer of the agency, or (ii) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrators of USEPA) [40 CFR §122.22(a)(3)].

3. All reports required by this WDR and other information requested by the Regional Board, State Board, or USEPA shall be signed by a person described in paragraph (B.2) of this provision, or by a duly authorized representative of that person. A person is a duly authorized representative only if:

a. The authorization is made in writing by a person described in paragraph (B.2) of this provision [40 CFR §122.22(b)(1)];

b. The authorization specified either an individual or a position having responsibility for the overall operation of the regulated facility or activity such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company (a duly authorized representative may thus be either a named individual or any individual occupying a named position) [40 CFR §122.22(b)(2)]; and

c. The written authorization is submitted to the Regional Board, State Board, or USEPA [40 CFR §122.22(b)(3)].

4. If an authorization under paragraph (B.3) of this provision is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of paragraph (B.3) of this provision must be submitted to the Regional Board, State Board or USEPA prior to or together with any reports, information, or applications, to be signed by an authorized representative [40 CFR §122.22(c)].

5. Any person signing a document under paragraph (B.2) or (B.3) of this provision shall make the following certification:

   "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations" [*40 CFR §122.22(d)*].

C. Monitoring Reports

1. Monitoring results shall be reported at the intervals specified in the MRP in this WDR [40 CFR §122.41(l)(4)].

2. Monitoring results must be reported on a Self-Monitoring Report (SMR) form or forms provided or specified by the Regional Board or State Board for reporting results of monitoring of sludge use or disposal practices [40 CFR §122.41(l)(4)(i)].

3. If the Discharger monitors any pollutant more frequently than required by this WDR using test procedures approved under 40 CFR section 136 or, in the case of sludge use or disposal, approved under 40 CFR section 136 unless otherwise specified in 40 CFR section 503, or as specified in this WDR, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the SMR or sludge reporting form specified by the Regional Board [40 CFR §122.41(l)(4)(ii)].

4. Calculations for all limitations, which require averaging of measurements, shall utilize an arithmetic mean unless otherwise specified in this WDR [40 CFR §122.41(l)(4)(iii)].

D. Compliance Schedules

Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this WDR, shall be submitted no later than 14 days following each schedule date [*40 CFR §122.41(l)(5)*].

E. Twenty-Four Hour Reporting

1. The Discharger shall report any noncompliance that may endanger health or the environment. Any information shall be provided orally within 24 hours from the time the Discharger becomes aware of the circumstances. A written submission shall also be provided within five (5) days of the time the Discharger becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance [40 CFR §122.41(l)(6)(i)].

2. The following shall be included as information that must be reported within 24 hours under this paragraph [40 CFR §122.41(l)(6)(ii)]:

   a. Any unanticipated bypass that exceeds any effluent limitation in this WDR [40 CFR §122.41(l)(6)(ii)(A)].

   b. Any upset that exceeds any effluent limitation in this WDR [40 CFR §122.41(l)(6)(ii)(B)].

   c. Violation of a maximum daily discharge limitation for any of the pollutants listed in this WDR to be reported within 24 hours [40 CFR §122.41(l)(6)(ii)(C)].

3. The Regional Board may waive the above-required written report under this provision on a case-by-case basis if an oral report has been received within 24 hours [40 CFR §122.41(l)(6)(iii)].

F. Planned Changes

The Discharger shall give notice to the Regional Board as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required under this provision only when [*40 CFR §122.41(l)(1)*]:

1. The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source in 40 CFR §122.29(b) [40 CFR §122.41(l)(1)(i)]; or

2. The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants which

are subject neither to effluent limitations in this WDR nor to notification requirements under 40 CFR section 122.42(a)(1) (see Additional Provisions—Notification Levels VII.A.1) [40 CFR §122.41(l)(1)(ii)]; or

3. The alteration or addition results in a significant change in the Discharger's sludge use or disposal practices, and such alteration, addition, or change may justify the application of permit conditions that are different from or absent in the existing permit, including notification of additional use or disposal sites not reported during the permit application process or not reported pursuant to an approved land application plan [40 CFR §122.41(l)(1)(iii)].

G. Anticipated Noncompliance

The Discharger shall give advance notice to the Regional Board or State Board of any planned changes in the permitted facility or activity that may result in noncompliance with the requirements of this WDR [*40 CFR §122.41(l)(2)]*.

H. Other Noncompliance

The Discharger shall report all instances of noncompliance not reported under Standard Provisions – Reporting E.3, E.4, and E.5 at the time monitoring reports are submitted. The reports shall contain the information listed in Standard Provision – Reporting V.E [*40 CFR §122.41(l)(7)*].

I. Discharge Monitoring Quality Assurance (DMQA) Program [STATE WATER BOARD/USEPA 106 MOA]

The Discharger shall conduct appropriate analyses on any sample provided by USEPA as part of the DMQA program. The results of such analyses shall be submitted to USEPA's DMQA manager.

J. Other Information

When the Discharger becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Regional Board, State Board, or USEPA, the Discharger shall promptly submit such facts or information [*40 CFR §122.41(l)(8)*].

VI. Standard Provisions – Enforcement

A. The CWA provides that any person who violates section 301, 302, 306, 307, 308, 318 or 405 of the Act, or any permit condition or limitation implementing any such sections in a permit issued under section 402, or any requirement imposed in a pretreatment program approved under sections 402(a)(3) or 402(b)(8) of the Act, is subject to a civil penalty not to exceed $25,000 per day for each violation. The CWA provides that any person who negligently violates sections 301, 302, 306, 307, 308, 318, or 405 of the Act, or any condition or limitation implementing any of such sections in a permit issued under section 402 of the Act, or any requirement imposed in a pretreatment program approved

under section 402(a)(3) or 402(b)(8) of the Act, is subject to criminal penalties of $2,500 to $25,000 per day of violation, or imprisonment of not more than one (1) year, or both. In the case of a second or subsequent conviction for a negligent violation, a person shall be subject to criminal penalties of not more than $50,000 per day of violation, or by imprisonment of not more than two (2) years, or both. Any person who knowingly violates such sections, or such conditions or limitations is subject to criminal penalties of $5,000 to $50,000 per day of violation, or imprisonment for not more than three (3) years, or both. In the case of a second or subsequent conviction for a knowing violation, a person shall be subject to criminal penalties of not more than $100,000 per day of violation, or imprisonment of not more than six (6) years, or both. Any person who knowingly violates section 301, 302, 303, 306, 307, 308, 318 or 405 of the Act, or any permit condition or limitation implementing any of such sections in a permit issued under section 402 of the Act, and who knows at that time that he thereby places another person in imminent danger of death or serious bodily injury, shall, upon conviction, be subject to a fine of not more than $250,000 or imprisonment of not more than 15 years, or both. In the case of a second or subsequent conviction for a knowing endangerment violation, a person shall be subject to a fine of not more than $500,000 or by imprisonment of not more than 30 years, or both. An organization, as defined in section 309(c)(3)(B)(iii) of the CWA, shall, upon conviction of violating the imminent danger provision, be subject to a fine of not more than $1,000,000 and can be fined up to $2,000,000 for second or subsequent convictions [40 CFR §122.41(a)(2)] [CWC 13385 and 13387].

B. Any person may be assessed an administrative penalty by the Regional Board for violating CWA section 301, 302, 306, 307, 308, 318 or 405, or any permit condition or limitation implementing any of such sections in a permit issued under CWA section 402. Administrative penalties for Class I violations are not to exceed $10,000 per violation, with the maximum amount of any Class I penalty assessed not to exceed $25,000. Penalties for Class II violations are not to exceed $10,000 per day for each day, during which the violation continues, with the maximum amount of any Class II penalty not to exceed $125,000 [40 CFR §122.41(a)(3)].

C. The CWA provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $10,000, or by imprisonment for not more than two years, or both. If a conviction of a person is for a violation committed after a first conviction of such person under this paragraph, punishment is a fine of not more than $20,000 per day of violation, or by imprisonment of not more than four years, or both [40 CFR §122.41(j)(5)].

D. The CWA provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this WDR, including monitoring reports or reports of compliance or noncompliance shall, upon conviction, be punished by

a fine of not more than $10,000 per violation, or by imprisonment for not more than six months per violation, or by both [40 CFR §122.41(k)(2)].

VII. Additional Provisions – Notification Levels

A. Non-Municipal Facilities

Dischargers of existing manufacturing, commercial, mining, and silvicultural wastes shall notify the Regional Board as soon as they know or have reason to believe [*40 CFR §122.42(a)*]:

1. That any activity has occurred or will occur that would result in the discharge, on a routine or frequent basis, of any toxic pollutant that is not limited in this WDR, if that discharge will exceed the highest of the following "notification levels" [40 CFR §122.42(a)(1)]:

    a. 100 micrograms per liter (µg/L) [40 CFR §122.42(a)(1)(i)];

    b. 200 µg/L for acrolein and acrylonitrile; 500 µg/L for 2,4-dinitrophenol and 2-methyl-4,6-dinitrophenol; and 1 milligram per liter (mg/L) for antimony [40 CFR §122.42(a)(1)(ii)];

    c. Five (5) times the maximum concentration value reported for that pollutant in the Report of Waste Discharge [40 CFR §122.42(a)(1)(iii)]; or

    d. The level established by the Regional Board in accordance with 40 CFR section 122.44(f) [40 CFR §122.42(a)(1)(iv)].

2. That any activity has occurred or will occur that would result in the discharge, on a non-routine or infrequent basis, of any toxic pollutant that is not limited in this WDR, if that discharge will exceed the highest of the following "notification levels" [40 CFR §122.42(a)(2)]:

    a. 500 micrograms per liter (µg/L) [40 CFR §122.42(a)(2)(i)];

    b. 1 milligram per liter (mg/L) for antimony [40 CFR §122.42(a)(2)(ii)];

    c. Ten (10) times the maximum concentration value reported for that pollutant in the Report of Waste Discharge [40 CFR §122.42(a)(2)(iii)]; or

    d. The level established by the Regional Board in accordance with 40 CFR §122.44(f) [40 CFR §122.42(a)(2)(iv)].

B. Publicly-Owned Treatment Works (POTWs) (Not Applicable)

Attachment E – Monitoring and Reporting Program (MRP)

Title 40 of the Code of Federal Regulations (CFR) section 122.48 requires that all National Pollutant Discharge Elimination System (NPDES) permits specify monitoring and reporting requirements. California Water Code sections 13267 and 13383 also authorize the California Regional Water Quality Control Board (Regional Board) to require technical and monitoring reports. This MRP establishes monitoring and reporting requirements, which implement the federal and California regulations.

I. General Monitoring Provisions

A. Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge. All samples shall be taken at the monitoring location identified in the representative sampling and analysis program. Another waste stream, body of water, or substance shall not dilute the monitored discharge. Monitoring points shall not be changed without notification to and the approval of the appropriate Regional Board.

B. Monitoring must be conducted according to USEPA test procedures approved under 40 CFR section 136, Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act as amended, unless other test procedures are specified in this WDR and/or by the appropriate Regional Board.

C. If the Discharger monitors any pollutant more frequently than required by this WDR using test procedures approved under 40 CFR section 136, or as specified in this WDR or by the appropriate Regional Board, the results of the monitoring shall be included in the calculation and reporting of the data submitted in the Discharger's Annual Report. The increased frequency of monitoring shall also be reported.

D. Calculations for all limitations, which require averaging of measurements, shall utilize an arithmetic mean unless otherwise specified in this WDR.

E. All analyses shall be performed in a laboratory certified to perform such analyses by the California Department of Health Services or a laboratory approved by the appropriate Regional Board.

F. All monitoring instruments and devices used by the Discharger to fulfill the monitoring program shall be properly maintained and calibrated to ensure accuracy. All flow measurement devices shall be calibrated at least once per year to ensure accuracy of the devices.

G. Order No. R9-2008-0002 may be modified by the Regional Board and EPA to enable the discharger to participate in comprehensive regional monitoring activities conducted in the Southern California Bight during the term of this permit. The intent of regional monitoring activities is to maximize the efforts of all monitoring partners using a more cost-effective monitoring design and to best utilize the pooled scientific resources of the region. During these coordinated sampling efforts, the discharger's sampling and analytical effort may be reallocated to provide a regional assessment of the impact of the discharge of municipal wastewater to the

Southern California Bight. Anticipated modifications to the monitoring program will be coordinated so as to provide a more comprehensive picture of the ecological and statistical significance of monitoring results and to determine cumulative impacts of various pollution sources. If predictable relationships among the biological, water quality and effluent monitoring variables can be demonstrated, it may be appropriate to decrease the discharger's sampling effort. Conversely, the monitoring program may be intensified if it appears that the objectives cannot be achieved through the discharger's existing monitoring program. These changes will improve the overall effectiveness of monitoring in the Southern California Bight. Minor changes may be made without further public notice.

II. Monitoring Locations

A. Dischargers enrolling for the first time under this WDR shall develop a representative sampling and analysis program to be used as case studies to represent the typical types of discharges occurring within their service areas. This study, to be submitted as the first annual report, will include the monitoring locations and rationale for choosing those locations.

B. Re-enrollees must submit a new case study defining monitoring locations and rationale for these locations, if there are new types of discharges.

III. Influent Monitoring Requirements (Not Applicable)

IV. Effluent Monitoring Requirements

A. Dischargers who are enrolling for the first time under this WDR shall develop a representative sampling and analysis program based on the discharge anticipated from the extracted groundwater activity as compared to the Effluent Limitations and Discharge Specifications established in this Permit to ensure the discharge will not violate Regional Board Discharge Prohibitions.

B. The Regional Board may increase monitoring requirements on a case-by-case basis. Additional monitoring for individual discharges may be required, where necessary, to show that during the term of the discharge, applicable water quality objectives will be maintained.

C. For certain metals, the hardness of the receiving water is required to calculate the effluent limit, therefore the Discharger shall measure the hardness of the receiving water at the same frequency as metals analysis.

D. Treatment System Status
The daily status (e.g., onsite, in operation/on standby, etc.) of any treatment systems used to achieve compliance with this WDR or the Notice of Enrollment from the Regional Board shall be reported monthly.

E. GROUNDWATER DISCHARGE MONITORING

1. For discharges associated with gasoline or diesel underground or above ground storage tanks (Remediation Projects) (as determined by the Regional Board), the discharge monitoring shall be conducted as listed below. For remediation of groundwaters containing individual solvents (e.g. trichloroethylene, tetrachloroethane, etc.) not associated with fuel products, or other substances with effluent concentration limitations in Order No. R9-2008-0002 , the monitoring requirements may be modified in the Notice of Enrollment to include a sampling frequency of once every two weeks for the individual compound(s) present in lieu of benzene, ethylbenzene, toluene, and xylene (collectively BTEX) monitoring requirements, provided that BTEX are not present, and the results reported monthly:

(a) Constituent	Units	Sample Type	Analysis Frequency	Reporting Frequency
Flowrate	gpd	NA	daily	monthly
Total Nitrogen	mg/L	grab	quarterly	quarterly
	lb/d	"	"	"
Total Phosphorus	mg/L	"	"	"
	lb/d	"	"	"
Settleable Solids	ml/L	"	"	"
	lb/d	"	"	"
Total Suspended Solids	mg/L	"	quarterly	quarterly
	lb/d	"	"	"

(b) Constituent	Units	Sample Type	Analysis Frequency	Reporting Frequency
Hydrogen Sulfide	µg/L	grab	semiannually	semiannually
	lb/d	"	"	"
Total Residual Chloride (TRC)	µg/L	"	daily if chlorinating	monthly
	lb/d	"		"
pH	Units	"	monthly	monthly
Benzene	µg/L	"	every 2 weeks	monthly
	lb/d	"		"
Ethylbenzene	µg/L	"	"	"
	lb/d	"	"	"
Toluene	µg/L	"	"	"
	lb/d	"	"	"
Xylene	µg/L	"	"	"
	lb/d	"	"	"
MTBE	µg/L	"	"	"

Constituent	Units	Sample Type	Analysis Frequency	Reporting Frequency
Total Petroleum Hydrocarbons	µg/L	grab	monthly	monthly
	lb/d	"	"	"
Tributyltin	µg/L	"	semiannually	semiannually
	lb/d	"	"	"
Arsenic	µg/L	"	"	"
	lb/d	"	"	"
Cadmium	µg/L	"	"	"
	lb/d	"	"	"
Chromium (hexavalent)	µg/L	"	"	"
	lb/d	"	"	"
Copper CTR	µg/L	"	"	"
	lb/d	"	"	"
Lead	µg/L	"	quarterly	quarterly
	lb/d	"	"	"
Mercury	µg/L	"	semiannually	semiannually
	lb/d	"	"	"
Nickel	µg/L	"	"	"
	lb/d	"	"	"
Silver	µg/L	"	"	"
	lb/d	"	"	"
Zinc	µg/L	"	"	"
	lb/d	"	"	"
Cyanide	µg/L	"	"	"
	lb/d	"	"	"
Phenolic Compounds (non-chlorinated)	µg/L	"	"	"
	lb/d	"	"	"

(c) Constituent	Units	Sample Type	Analysis Frequency	Reporting Frequency
Chlorinated Phenolics	µg/L	grab	semiannually	semiannually
	lb/d	"	"	"
Acute Toxicity	TUa	"	quarterly	quarterly
Chronic Toxicity	TUc	"	"	"
1,1,2,2-Tetrachloroethane (PCA)	µg/L	"	semiannually	semiannually
1,1,1-Trichloroethane (TCA)	mg/L	"	"	"
1,1,2-Trichloroethane (TCA)	mg/L	"	"	"
1,2-Dichloroethane	µg/L	"	"	"
Tetrachloroethylene (PCE)	µg/L	"	"	"

Constituent	Units	Sample Type	Analysis Frequency	Reporting Frequency
Trichloroethylene (TCE)	µg/L	"	"	"
Vinyl Chloride[6]	µg/L	"	"	"
Carbon Tetrachloride	µg/L	"	"	"
Base/Neutrals	µg/L	"	"	"
	lb/d	"	"	"
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2. For discharges which are not associated with gasoline or diesel underground or above ground storage tanks (as determined by the Regional Board), discharge monitoring shall be conducted as follows:

(d) Constituent	Units	Sample Type	Analysis Frequency	Reporting Frequency
Flowrate	gpd	na	daily	quarterly
Total Nitrogen	mg/L	grab	quarterly	quarterly
Total Phosphorus	mg/L	"	"	"
Settleable Solids	ml/L	"	"	"
	lb/d	"	"	"
Total Suspended Solids	mg/L	"	"	"
	lb/d	"	"	"
Hydrogen Sulfide	mg/L	"	semiannually	semiannually
	lb/d	"	"	"
Total Residual Chlorine (TRC)	µg/L	"	daily if chlorinating	monthly
	lb/d	"		"
pH	Units	"	monthly	quarterly

(e) Constituent	Units	Sample Type	Analysis Frequency	Reporting Frequency
Total Petroleum Hydrocarbons	µg/L	grab	quarterly	quarterly
	lb/d	"	"	"
MTBE	µg/L	"	"	"
Tributyltin	µg/L	"	semiannually	semiannually
	lb/d	"	"	"
Arsenic	µg/L	"	"	"
	lb/d	"	"	"
Cadmium	µg/L	"	"	"
	lb/d	"	"	"
Chromium (hexavalent)	µg/L	"	"	"
	lb/d	"	"	"
Copper	µg/L	"	"	"
	lb/d	"	"	"

Constituent	Units	Sample Type	Analysis Frequency	Reporting Frequency
Lead	µg/L	"	"	"
	lb/d	"	"	"
Mercury	µg/L	"	"	"
	lb/d	"	"	"
Nickel	µg/L	"	"	"
	lb/d	"	"	"
Silver	µg/L	"	"	"
	lb/d	"	"	"
Zinc	µg/L	"	"	"
	lb/d	"	"	"
Cyanide	µg/L	"	"	"
	lb/d	"	"	"
Phenolic Compounds	µg/L	"	"	"
(non-chlorinated)	lb/d	"	"	"
Chlorinated Phenolics	µg/L	"	"	"
	lb/d	"	"	"
Acute Toxicity	TUa	"	quarterly	quarterly
Chronic Toxicity	TUc	"	"	"
Base/Neutrals	µg/L	"	semiannually	semiannually
	lb/d	"	"	"
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3. For long term discharges (greater than 6 months) in RURAL AREAS (as determined by the Regional Board), discharge monitoring shall be conducted as follows:

(f) Constituent	Units	Sample Type	Analysis Frequency	Reporting Frequency
Flowrate	gpd	na	daily	monthly
Total Nitrogen	mg/L	grab	quarterly	quarterly
Total Phosphorus	mg/L	"	"	"
	lb/d	"	"	"
Settleable Solids	ml/L	"	"	"
	lb/d	"	"	"
Total Suspended Solids	mg/L	"	"	"
Hydrogen Sulfide	µg/L	"	"	"
Total Petroleum Hydrocarbons	µg/L	"	"	"
Total Residual Chlorine	µg/L	"	daily if	monthly
(TRC)	lb/d	"	chlorinating	"
pH	Units	"	monthly	quarterly
MTBE	µg/L	"	quarterly	quarterly
Acute Toxicity	TUa	"	semiannually	semiannually
Chronic Toxicity	TUc	"	"	"
Base/Neutrals	µg/L	"	"	"
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4. For short term (duration of 6 months or less at a particular groundwater extraction site) discharges in RURAL AREAS, monitoring shall be conducted as follows:

(g) Constituent	Units	Sample Type	Analysis Frequency	Reporting Frequency
Flowrate	gpd	na	daily	monthly
Total Nitrogen	mg/L	grab	every two weeks	monthly
Total Phosphorus	mg/L	"	"	"
	lb/d	"	"	"
Settleable Solids	ml/L	"	"	"
	lb/d	"	"	"
Total Suspended Solids	mg/L	"	"	"
Hydrogen Sulfide	µg/L	"	"	"
Total Petroleum Hydrocarbons	µg/L	"	every two weeks	monthly
Total Residual Chlorine	µg/L	"	daily if	"
(TRC)	lb/d	"	chlorinating	"
pH	Units	"	monthly	quarterly
MTBE	µg/L	"	quarterly	"
			Analysis	**Reporting**

(h) Constituent	Units	Sample Type	Frequency	Frequency
Acute Toxicity	TUa	grab	semiannually	semiannually
Chronic Toxicity[5]	TUc	"	"	"
Base/Neutrals[7]	µg/L	"	"	"
126 Priority Pollutants – Attachment B2		"	"	"

5. For short term (duration of 6 months or less at a particular groundwater extraction site) discharges in URBAN AREAS, discharge monitoring shall be conducted as follows:

(i) Constituent	Units	Sample Type	Analysis Frequency	Reporting Frequency
Flowrate	gpd	NA	daily	monthly
Total Nitrogen	mg/L	grab	every other week	"
Total Phosphorus	mg/L	"	"	"
Settleable Solids	ml/L	"	"	"
	lb/d	"	"	"
Total Suspended	mg/L	"	"	"
Solids	lb/d	"	"	"
Hydrogen Sulfide	mg/L	"	"	"
	lb/d	"	"	"
Total Residual	µg/L	"	daily if	"
Chlorine (TRC)	lb/d	"	chlorinating	"
pH	Units	"	every other week	"
Total Petroleum	µg/L	"	"	"
Hydrocarbons	lb/d	"	"	"
MTBE	µg/L	"	"	"
Tributyltin	µg/L	"	semiannually	semiannually
	lb/d	"	"	"
Arsenic	µg/L	"	"	"
	lb/d	"	"	"
Cadmium	µg/L	"	"	"
	lb/d	"	"	"
Chromium	µg/L	"	"	"
(hexavalent)	lb/d	"	"	"
Copper	µg/L	"	"	"
	lb/d	"	"	"
Lead	µg/L	"	"	"
	lb/d	"	"	"
Mercury	µg/L	"	"	"
	lb/d	"	"	"
Nickel	µg/L	grab	"	"
	lb/d	"	"	"

(j) Constituent	Units	Sample Type	Analysis Frequency	Reporting Frequency
Silver	µg/L	"	semiannually	semiannually
	lb/d	"	"	"
Zinc	µg/L	"	"	"
	lb/d	"	"	"
Cyanide	µg/L	"	"	"
	lb/d	"	"	"
Phenolic Compounds	µg/L	"	"	"
(non-chlorinated)	lb/d	"	"	"
Chlorinated Phenolics	µg/L	"	"	"
	lb/d	"	"	"
Chronic Toxicity	TUc	"	quarterly	quarterly
Base/Neutrals	µg/L	"	"	"
	lb/d	"	"	"
126 Priority Pollutants – Attachment B2 (Excluding Above Marked Pollutants)	"		semiannually	semiannually

6. For discharges associated with Sewer System Replacement, or Wastewater Treatment Plant Construction or Expansion Projects, in addition to monitoring for those Constituents listed in Monitoring Provision E, discharge monitoring shall be conducted for the following:

Constituent	Units	Sample Type	Minimum Frequency Of Analysis	Reporting Frequency
Total Coliform	MPN100/ml	grab	weekly	Monthly
Fecal Coliform	"	"	"	"
Dissolved Oxygen	mg/L	"	"	"
126 Priority Pollutants – Attachment B2	---	"	semiannually	Semiannually

E. RECEIVING WATER MONITORING

The discharger shall obtain a monthly upstream sample of the receiving water if the discharge is to a river or stream; or from an area unaffected by the discharge for other receiving waters, and analyze the sample for turbidity and report the results monthly. The turbidity of the receiving water is necessary to determine compliance of the effluent turbidity. The discharger shall also submit a monthly report discussing any turbidity plumes created by the discharge including a description (e.g., color, extent, duration, etc.) of any turbidity plumes.

For discharges to surf zones, in lieu of obtaining turbidity samples in unaffected areas, the discharger shall submit a monthly report describing (e.g., color, extent, duration, etc.) any turbidity plumes caused by the discharge.

The Regional Board may increase receiving water monitoring requirements on a case-by-case basis. Additional receiving water monitoring for individual discharges may be required, where necessary, to show that during the term of the discharge, applicable surface water quality objectives will be maintained.

For certain metals, the hardness of the receiving water is required to calculate the effluent limit, therefore the discharger shall measure the hardness of the receiving water at the same frequency as metals analysis.

F. ANNUAL SUMMARY OF MONITORING DATA

A summary of monitoring data for the previous year shall be submitted to the Regional Board previous to March 1st of each year. The report shall contain both tabular and graphical summaries of the previous year's data. If the duration of the discharge is six months or less, an annual summary is not required.

G. REPORT OF DISCHARGE TERMINATION

Within thirty days of the termination of the discharge, the discharger shall submit a letter to the Regional Board specifying the date the groundwater extraction waste discharge was terminated.

H. REPORTING FREQUENCY

Monitoring reports shall be submitted to the Regional Board in accordance with the following schedule:

REPORTING FREQUENCY	REPORT PERIOD	REPORT DUE
Monthly	January, February March, April, May June, July, August September, October November, December	By the 30th day of the following month*.

* The monthly report for January is due no later than February 28th

Quarterly	January - March	April 30
	April - June	July 30
	July - September	October 30
	October - December	January 30
Semiannually	January - June	July 30
	July - December	January 30
Annual	January - December	March 1

Laboratories analyzing monitoring samples shall be certified by the Department of Health Services, in accordance with the provision of Water Code Section 13176, and must include quality assurance/quality control data with their reports.

The results of such analysis shall be reported in the annual report. Grab samples shall be collected at the applicable point of discharge (either at the storm drain or the receiving water). If a Discharger monitors the above constituents more frequently than required by this WDR, then the results of such monitoring shall be included in the calculation and reporting of the data submitted in the annual report. Separate annual reports are required for each region.

I. The Discharger shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this WDR, and records of all data used to complete the application for this WDR, for a period of at least five years from the date of the sample, measurement, report, or application. This period may be extended by request of this Regional Board. These records shall include:

1. The date, place, and time of site inspections, sampling, visual observation, and/or measurement;
2. The individual(s) who performed the site inspections, sampling, visual observations, and/or measurements;
3. The dimension, size and/or volume of vault;
4. Flow measurements (if required) and duration of discharge;
5. The estimated volume of discharge;
6. The date and time of analyses;
7. The laboratory, staff, or wholesaler who performed the analyses; and
8. Analytical results.

J. Toxicity Reduction Evaluation (TRE)

The enrollee shall develop a Toxicity Reduction Evaluation (TRE) workplan. The workplan shall be subject to the approval of the Regional Board and shall be modified as directed by the Regional Board. Enrollees shall submit the TRE workplan to the Regional Board upon request of the Regional Board. The TRE

workplan shall be developed no later than six months after adoption of this WDR in accordance with the following manuals:

1. Generalized Methodology for Conducting Industrial Toxicity Reduction Evaluations (EPA/600/2-88/070).

2. Toxicity Identification Evaluation (TIE), Phase I (EPA/600/6-91/005F).

3. Methods for Aquatic Toxicity Identification Evaluations, Phase II (EPA/600/R-92/080).

4. Methods for Aquatic Toxicity Identification Evaluations, Phase III (EPA/600/R-92/081).

K. If toxicity-testing results show a violation of any acute toxicity limitation identified in Discharge Specifications of this WDR, the enrollee shall:

1. Take all reasonable measures necessary to immediately minimize toxicity; and

2. Increase the frequency of the toxicity test(s), which showed a violation, to at least two times per month until the results of at least two consecutive toxicity tests do not show violations.

L. If the Regional Board determines that toxicity testing shows consistent violation of any acute toxicity limitation identified in Discharge Specifications of this WDR, the enrollee shall conduct a TRE that includes all reasonable steps to identify the source of toxicity. Once the source of toxicity is identified, the enrollee shall take all reasonable steps to reduce the toxicity to meet the toxicity limitations identified in Discharge Specifications of this WDR.

M. Within 14 days of completion of the TRE, the enrollee shall submit the results of the TRE, including a summary of the findings, data generated, a list of corrective actions necessary to achieve consistent compliance with all the toxicity limitations of this WDR and to prevent recurrence of violations of those limitations, and a time schedule for implementation of such corrective actions. The corrective actions and time schedule shall be modified at the direction of the Regional Board.

V. Whole Effluent Toxicity Testing Requirements

Whole effluent toxicity (WET) tests measure the aggregate toxic effect of a mixture of pollutants that may be present in a waste stream and provides information on potential toxic impacts to receiving waters from the discharge of wastes. WET tests measure the degree of response of exposed aquatic test organisms to an effluent. The WET approach provides a means of assessing compliance with the narrative toxicity water quality objective for aquatic life protection of the Basin Plan while implementing numeric criteria for toxicity.

There are two types of WET tests: acute and chronic. An acute toxicity test is conducted over a short time period and measures mortality. A chronic toxicity test is conducted over a longer period of time and may measure mortality, reproduction, and development.

This order requires that a Toxicity Reduction Evaluation (TRE) be conducted if a discharge causes or contributes to chronic toxicity in a receiving water body. This WDR requires the Discharger to periodically monitor the toxicity of its discharge and to develop a TRE Workplan if the toxicity effluent limitations are exceeded.

VI. Land Discharge Monitoring Requirements (Not Applicable)

VII. Reclamation Monitoring Requirements (Not Applicable)

VIII. Receiving Water Monitoring Requirements – SURFACE WATER AND GROUNDWATER (Not Applicable)

IX. Other Monitoring Requirements (Not Applicable)

X. Reporting Requirements

A. General Monitoring and Reporting Requirements

All reports submitted in response to this WDR shall comply with signatory requirements set forth in the Standard Provisions.

B. Self Monitoring Reports (SMRs) to State and Regional Board

1. At any time during the term of this permit, the State or Regional Board may notify the Discharger to electronically submit Self-Monitoring Reports (SMRs) using the State Board's California Integrated Water Quality System (CIWQS) Program Web site (http://www.waterboards.ca.gov/ciwqs/index.html). Until such notification is given, the Discharger shall submit hard copy SMRs. The CIWQS Web site will provide additional directions for SMR submittal in the event there will be service interruption for electronic submittal.

2. The Discharger shall submit annual monitoring results to the Regional Board by the 20th day of March for the preceding calendar year. The Discharger shall report in the SMR the results for all monitoring specified in this MRP. The Discharger shall submit annual SMRs including the results of all required monitoring using USEPA-approved test methods or other test methods specified in this WDR. If the Discharger monitors any pollutant more frequently than required by this WDR, the results of this monitoring shall be included in the calculations and reporting of the data submitted in the SMR.

3. The Discharger shall submit SMRs in accordance with the following requirements:

   a. The Discharger shall arrange all reported data in a tabular format. The data shall be summarized to clearly illustrate whether the facility is operating in compliance with interim and/or final effluent limitations. The Discharger is not required to duplicate the submittal of data that are entered in a tabular format within CIWQS. When electronic submittal of data is required and CIWQS does not provide for entry into a tabular format within the system, the Discharger shall electronically submit the data in a tabular format as an attachment.

   b. The Discharger shall attach a cover letter to the SMR. The information contained in the cover letter shall clearly identify violations of this WDR; discuss corrective actions taken or planned; and the proposed time schedule for corrective actions. Identified violations must include a description of the requirement that was violated and a description of the violation.

   c. SMRs must be submitted to the appropriate Regional Board, signed and certified as required by the Standard Provisions (Attachment D).

C. Discharge Monitoring Reports (DMRs) to EPA

When requested by USEPA, the Discharger shall also complete and submit Discharge Monitoring Reports to USEPA. The submittal date shall be specified in the request.

D. OTHER REPORTS (NOT APPLICABLE)

Attachment F – Fact Sheet

As described in section III of this WDR, this Fact Sheet includes the legal requirements and technical rationale that serve as the basis for the requirements of this WDR.

I. Permit Information

A. INTRODUCTION

This Order establishes a WDR regulating the discharge of groundwater extraction waste discharges to surface waters in the San Diego Region except San Diego Bay from all construction groundwater extraction, and similar waste discharges.

B. BACKGROUND

In 1972, the Federal Water Pollution Control Act, currently referred to as the Federal Clean Water Act (CWA), was amended to provide that the discharge of pollutants to waters of the United States from any point source is prohibited, unless the discharge is in compliance with a National Pollutant Discharge Elimination System (NPDES) permit. The federal regulations allow authorized states to issue either general permits or individual permits to regulate discharges of pollutants to waters of the United States. On January 28, 1991, the California Regional Water Quality Control Board, San Diego Region (Regional Board) issued a General Waste Discharge Requirement for Groundwater Remediation and Dewatering Wastes Discharges to Surface Waters within the San Diego Region except for San Diego Bay (Order No. 91-10). The permit was reissued two more times on June 13, 1996 (Order No. 96-41) and October 10, 2001 (Order No. 2001-96).

In accordance with Title 40, Code of Federal Regulations (CFR), the Regional Board must meet general program requirements prior to the re-issuance and adoption of a general NPDES permit. General program requirements include preparing a draft WDR, public noticing, allowing a public comment period, and conducting a public hearing. To meet these requirements, the Regional Board prepared a draft WDR. The tentative WDR was made available to interested parties and posted on the Regional Board's website on February 5, 2008 for comments. A public hearing to receive testimony from interested parties was scheduled for March 12, 2008. A public hearing notice was posted in the San Diego Union-Tribune, The Riverside Press-Enterprise, and The Orange County Register, major newspapers in the San Diego Region, on February 8, 2008. The public written comment period ended March 5, 2008 and the public oral comment period ended March 12, 2008 at the Regional Board meeting.

C. GENERAL CRITERIA

Extracted groundwater may contain pollutants which may be found in groundwaters as a result of decomposition of organic materials (e.g., hydrogen

sulfide), leaking underground storage tanks and fuel lines, surface spills, sewage, past use of liquid waste impoundments, or the potential presence of nutrients (phosphorus and nitrogen compounds).

The San Diego Regional Water Quality Control Board (hereinafter Regional Board) is aware that petroleum pollutant plumes exist in groundwaters in areas subject to construction groundwater extraction. In addition to construction groundwater extraction discharges, groundwater remediation projects required by cleanup and abatement orders issued by the Regional Board may require the discharge of treated groundwater. In addition to petroleum products and solvents, groundwaters may contain elevated concentrations of other pollutants that could degrade surface waters. These other pollutants may include metals, nutrients (nitrogen and phosphorus), hydrogen sulfide, solids, and other inorganic and organic compounds.

Existing and proposed discharges of groundwater extraction waste from construction groundwater extraction, foundation groundwater extraction, and groundwater cleanup projects:

a) Result from similar operations (all involve extraction and discharge of groundwater);

b) Are the same type of waste (all are groundwater);

c) Require similar effluent limitations for the protection of the beneficial uses of the receiving waters;

d) Require similar monitoring; and

e) Are more appropriately regulated under a general permit rather than individual permits.

Order No. 2001-96, applied to all groundwater extraction waste discharges of greater than 100,000 gpd. For purposes of renewing NPDES permit No. 2001-96 (Tentative Order No. R9-2008-0002), historical monitoring data has been reviewed. Based on the data review results, lack of complaints of adverse impacts to water quality and/or beneficial uses of the receiving waters, and lack of documentation of adverse impacts to water quality and/or beneficial uses of the receiving waters, discharges of groundwater to all receiving waters within the region except discharges to San Diego Bay less than 100,000 gallons per day and where no known contamination exists, probably will not have an adverse effect on the receiving water/environment.

This WDR does <u>not</u> cover:

STORM WATER - Storm water runoff due to construction activities. These activities may be covered under the statewide general NPDES permit for storm water discharges associated with construction activities (CAS000002), the

statewide general NPDES permit for Storm Water Runoff Associated With Small Linear Underground/Overhead Construction Projects (CAS000005), and/or Clean Water Act (CWA) Section 401 Water Quality Certifications.

SANITARY SEWER - Discharges to a sanitary sewer. These discharges do not need coverage under the NPDES Program, although the agency controlling the sanitary sewer must approve discharges to its conveyance system.

UTILITY VAULTS - Discharges from utility vaults and underground structures. These activities may be covered under the statewide general NPDES permit for discharges from utility vaults and underground structures to surface water Order No. 2006-0008-DWQ (CAG990002).

HYDROSTATIC/ POTABLE WATER – Discharges from drinking water well development. These discharges are covered in Order No. R9-2002-0020 (CAG679001).

Notification Requirements

The purpose of this WDR is to facilitate regulation of discharges from groundwater extraction activities. To obtain coverage under this WDR, the Discharger must submit a Notice of Intent (NOI), a project map(s), an initial Monitoring Report, and first annual fee. Signing the certification on the NOI signifies that the Discharger intends to comply with the provisions and requirements of this WDR. AN NOI must be signed to be valid.

D. DISCHARGE TO A MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4)

Prior to discharging into an MS4, the Discharger shall demonstrate alternatives to discharging extracted groundwater waste into an MS4 and why it is technically or economically infeasible to implement these alternatives.

Without prior approval from the appropriate local agency with jurisdiction over the MS4, the discharger shall not discharge extracted groundwater waste under this WDR into an MS4.

Local agencies responsible for operating the MS4s may not passively receive and discharge pollutants from third parties. By providing free and open access to an MS4 that conveys discharges to waters of the U.S., the MS4 operator essentially accepts responsibility for discharges into the MS4 that it does not prohibit or control. These discharges may cause or contribute to a condition of contamination or a violation of water quality standards.

Therefore, at least 30 days prior to initiating an extracted groundwater discharge to an MS4, the Discharger shall notify and receive authorization from the appropriate local agency with jurisdiction over the MS4. This requirement encourages communication between Dischargers enrolled under this WDR and

local agencies responsible for MS4s in an effort to reduce misunderstandings and concerns over the types of discharges covered by this WDR.

E. DISCHARGE DESCRIPTION

Groundwaters in some urban areas are known to be contaminated with petroleum products and solvents due to underground storage tank leaks and pipeline leaks. Discharges of groundwater to receiving waters within the region will be required to comply with the effluent limitations contained in this Order and protect the beneficial uses of the receiving waters.

Regional Board staff expects that a number of the groundwater project proponents will propose discharges to surface waters which will require National Pollutant Discharge Elimination System (NPDES) permits.

Any discharge of untreated groundwater to a surface water may cause or contribute to excursions above narrative water quality objectives contained in the Ocean Plan and/or Basin Plan as a result of the potential discharge of petroleum related compounds, solvents, and metals.

Enrollees under this WDR that are in close proximity of the ocean, a bay, harbor, lagoon or estuary, may encounter saline groundwater, in which case the use of EPA Method 1638, and EPA Method 1640 (Clean Technologies) would be appropriate for the analysis of metals in saline samples.

FACILITY DESCRIPTIONS - TREATMENT FACILITIES AND OUTFALLS

This general NPDES permit contains effluent limitations which may require the application of 'best available treatment economically achievable' for the removal of petroleum products and organic compounds from each groundwater project proponent's discharge. The general NPDES permit will require each Enrollee to certify the adequacy of each component of treatment facilities or a contingency plan prior to initiating a discharge. Each Enrollee's certification report shall contain a requirement-by-requirement analysis, based on accepted engineering practice, of how the contingency plan or process and physical design of the facilities will ensure compliance with this Order.

Groundwater may be discharged to a variety of receiving waters, storm drains, or other conveyance systems tributary to receiving waters within the region. Because outfalls are not designed to achieve maximum initial dilution and dispersion of discharges, initial dilution factors for discharges to inland surface waters, bays, estuaries, and lagoons are conservatively assumed to equal zero.

An initial dilution factor of three is assumed for discharges to the surf zone. The initial dilution factor is based on a preliminary dilution model submitted by Professor Gerhard H. Jirka, School of Civil and Environmental Engineering, Cornell University, for a dewatering project for the international treatment facility ocean outfall near Tijuana. This particular model assumes that:

a) Mixing of the dewatering discharge is primarily controlled by wave-induced turbulence and longshore conditions;

b) 0.55 meter wave height with a 15 second period occurring with a 95 percent exceedance probability;

c) A longshore velocity of 5 to 10 centimeters per second; and

d) A near-shore beach slope of 3 percent.

The model results in an initial dilution ratio of six. Since the model does not represent topographic and wave conditions throughout the region, the initial dilution factor for discharges to surf zones was halved.

F. DESCRIPTION OF WASTEWATER AND BIOSOLIDS TREATMENT OR CONTROLS (NOT APPLICABLE)

G. DISCHARGE POINTS AND RECEIVING WATERS

Under the WDR, there may be multiple discharge points. Additional information regarding the receiving waters can be found in the completed NOI which describes the discharge and identifies the points of discharge.

The Comprehensive Water Quality Control Plan Report, San Diego Basin (9), (Basin Plan) was adopted by this Regional Board on September 8, 1994, and subsequently approved by the State Water Resource Control Board (hereinafter SWRCB) on December 13, 1994. Subsequent revisions to the Basin Plan have also been adopted by the Regional Board and approved by the SWRCB. The Basin Plan designates beneficial uses, narrative and numerical water quality objectives, and prohibitions which are applicable to the groundwater extraction waste discharges regulated under this Order.

The Basin Plan identifies the following beneficial uses of the surface waters in the San Diego Region to be protected (not all surface waters have all of the beneficial uses listed below):

- Municipal and domestic supply;
- Agricultural supply;
- Industrial service supply;
- Industrial process supply;
- Groundwater recharge;
- Freshwater replenishment;
- Navigation;
- Hydropower generation;

- Contact water recreation;
- Non-contact water recreation;
- Commercial and sport fishing;
- Warm freshwater habitat;
- Cold freshwater habitat;
- Preservation of Biological Habitats of Special Significance;
- Inland saline water habitat;
- Wildlife habitat;
- Rare, threatened, or endangered species;
- Marine habitat;
- Migration of aquatic organisms;
- Spawning, reproduction, and/or early development;
- Shellfish harvesting;
- Estuarine habitat; and
- Aquaculture

In order to protect these beneficial uses, the Basin Plan establishes water quality objectives (for bacterial, physical, chemical, and biological characteristics, and for radioactivity), general requirements for management of waste discharge to the bays/harbors, quality requirements for waste discharges (effluent water quality requirements), discharge prohibitions, and general provisions.

The SWRCB adopted a revised Water Quality Control Plan for Ocean Waters of California (Ocean Plan) on April 21, 2005. The Ocean Plan identifies the following beneficial uses of state ocean waters to be protected:

- Industrial water supply;
- Navigation;
- Aesthetic enjoyment;
- Water contact recreation;
- Non-contact water recreation;
- Fish migration;
- Mariculture;
- Marine habitat;
- Preservation and enhancement of areas of special biological significance;
- Preservation and enhancement of rare and endangered species;
- Fish spawning;
- Shellfish harvesting
- Ocean commercial and sport fishing;

The Ocean Plan establishes water quality objectives (for bacterial, physical, chemical, and biological characteristics, and for radioactivity), general requirements for management of waste discharge to the ocean, quality requirements for waste discharges (effluent water quality requirements), discharge prohibitions, and general provisions.

Beneficial uses of the bays and estuaries in the San Diego Region are similar to those of the Ocean Waters of the State. In order to protect the beneficial uses of the bays and estuaries, discharge specifications and receiving water quality limitations for some parameters, derived from the Ocean Plan, have been included in this Order for discharges to bays and estuaries (when open to the ocean and consisting of marine waters). If a lagoon or estuary is not open to the Pacific Ocean and consists of fresh water, discharges shall comply with the requirements established in this Order for discharges to inland surface waters.

This region has continuous and ephemeral rivers and streams, bays, estuaries, lagoons, and approximately 85 miles of coastline. No receiving waters covered under the terms and conditions of this Order have been designated an outstanding national resource water by the SWRCB. However, Heisler Park Ecological Reserve, located in coastal waters near the City of Laguna Beach, the San Diego-La Jolla Ecological Reserve, and the San Diego Marine Life Refuge, located in coastal waters near La Jolla, a community of the City of San Diego, have been designated an Area of Special Biological Significance (ASBS) by the SWRCB. The Water Quality Control Plan for Ocean Waters of California (Ocean Plan) contains the following prohibitions applicable to ASBSs:

"Waste shall not be discharged to areas designated as being of special biological significance. Discharges shall be located a sufficient distance from such designated areas to assure maintenance of natural water quality conditions in these areas."

Order No. R9-2008-0002 prohibits the discharge of extraction waste to the above ASBSs

H. SUMMARY OF EXISTING REQUIREMENTS AND SELF-MONITORING REPORT DATA

Order No. 2001-96, which this WDR replaces, requires the Discharger not to exceed the Effluent Limitations for a number of constituents, and to monitor and report the concentration and mass of the constituents in their discharge. Significant changes occurred in the Effluent Limitation requirements for some constituents. Effluent Limitations under Order No. 2001-96 were developed using the CTR, while the SIP was used for this WDR.

I. Compliance Summary (Not Applicable)

J. Planned Changes (Not Applicable)

II. Applicable Plans, Policies, and Regulations

The requirements contained in this WDR are based on the requirements and authorities described in this section.

A. Legal Authorities

This WDR is issued pursuant to CWA section 402 and implementing regulations adopted by the USEPA and Chapter 5.5, Division 7 of the California Water Code (CWC). It shall serve as an NPDES permit for point source discharges from groundwater extraction waste discharges to surface waters. This WDR also serves as Waste Discharge Requirements (WDRs) pursuant to Article 4, Chapter 4 of the CWC for discharges that are not subject to regulation under CWA section 402.

States may request authority to issue general NPDES permits pursuant to 40 CFR section 122.28. On June 8, 1989, the State Board submitted an application to the USEPA requesting revisions to its NPDES Program in accordance with 40 CFR 122.28, 123.62, and 403.10. The application included a request to add general permit authority to its approved NPDES Program. On September 22, 1989, the USEPA, Region 9, approved the State Board's request and granted authorization for the State to issue general NPDES permits.

B. California Environmental Quality Act (CEQA)

This action to adopt a NPDES permit is exempt from the provisions of CEQA (Public Resources Code section 21100, et seq.) in accordance with CWC section 13389 for the following reasons: 1) A Discharger cannot obtain coverage under this WDR if pollutants in the discharge, cause, contribute, or have the reasonable potential to cause or contribute to a water quality standards violation; 2) The permit requires Dischargers to monitor and report the discharge to ensure the Dischargers will not cause a violation; and 3) The Regional Board's granting of the exceptions does not have the potential for causing significant adverse environmental effects. See California Code of Regulations, Title 14, section 15061(b)(3).

C. State and Federal Regulations, Policies, and Plans

1. **Water Quality Control Plan**
   On September 8, 1994, the Regional Board adopted a Water Quality Control Plan for the San Diego Region (hereinafter Basin Plan), that designates beneficial uses, establishes water quality objectives, and contains implementation programs and policies to achieve those objectives for all waters addressed through the plan. In addition, State Board Resolution No. 88-63 requires that, with certain exceptions, the Regional Board assigns the municipal and domestic supply use to water bodies that do not have beneficial uses listed in the Basin Plans.

2. **National Toxics Rule (NTR) and California Toxics Rule (CTR)**
   USEPA adopted the NTR on December 22, 1992, which was amended on May 4, 1995, and November 9, 1999, and the CTR on May 18, 2000, which was amended on February 13, 2001. These rules include water quality criteria for priority pollutants and are applicable to this discharge.

3. **State Implementation Policy (SIP)**
On March 2, 2000, the State Board adopted the SIP, which became effective on April 28, 2000, with respect to the priority pollutant criteria promulgated for California by the USEPA through the NTR and to the priority pollutant objectives established by the Regional Boards in their basin plans, with the exception of the provision on alternate test procedures for individual discharges that have been approved by USEPA Regional Administrator. The alternate test procedures provision was effective on May 22, 2000. The SIP became effective on May 18, 2000, with respect to the priority pollutant criteria promulgated by the USEPA through the CTR. The State Board adopted amendments to the SIP on February 24, 2005, that became effective on July 13, 2005. The SIP includes procedures for determining the need for and calculating Water Quality-Based Effluent Limitations (WQBELs), and requires Dischargers to submit data sufficient to do so. The State Board adopted amendments to the SIP on February 24, 2005, that became effective on July 13, 2005. The SIP establishes implementation provisions for priority pollutant criteria and objectives and provisions for chronic toxicity control. Requirements of this WDR implement the SIP.

4. **Antidegradation Policy**
Section 131.12 of 40 CFR requires that State water quality standards include an antidegradation policy consistent with the federal policy. The State Board established California's antidegradation policy in State Board Resolution No. 68-16, which incorporates the requirements of the federal antidegradation policy where applicable. Resolution No. 68-16 requires that existing water quality be maintained unless degradation is justified based on specific findings. As discussed in detail in this Fact Sheet, the permitted discharge shall be consistent with the antidegradation provision of 40 CFR section 131.12 and State Board Resolution No. 68-16.

5. **Anti-Backsliding Requirements**
Sections 402(o)(2) and 303(d)(4) of the CWA and 40 CFR section 122.44(l) prohibit backsliding in NPDES permits. These anti-backsliding provisions require that effluent limitations in a reissued permit must be as stringent as those in the previous permit, with some exceptions in which limitations may be relaxed. All effluent limitations in the WDR are at least as stringent as the effluent limitations in the previous Order unless specified.

6. **Monitoring and Reporting Requirements**
Section 122.48 of 40 CFR requires that all NPDES permits specify requirements for recording and reporting monitoring results. Sections 13267 and 13383 of the CWC authorize the Regional Boards to require technical and monitoring reports. The MRP establishes monitoring and reporting requirements to implement Federal and State requirements. This MRP is provided in Attachment E.

D. Impaired Water Bodies on CWA 303(d) List

The federal Clean Water Act requires States to identify and make a list of surface water bodies that are polluted. These water bodies, referred to in law as "water quality limited segments," do not meet water quality standards even after discharges of wastes from point sources have been treated by the minimum required levels of pollution control technology. Wastewater treatment plants, a city's storm drain system, or a boat yard, are a few examples of point sources that discharge wastes to surface waters. States are required to compile the water bodies into a list, referred to as the "Clean Water Act Section 303(d) List of Water Quality Limited Segments" (303(d) List). States must also prioritize the water bodies on the list and develop action plans, called total maximum daily loads (TMDLs) to improve the water quality.

The State Board updated the 2004-2006 303(d) List for California on October 25, 2006, and EPA approved it on November 30, 2006.

There are approximately 100 impaired water bodies on the 303(d) List in the San Diego Region. Most TMDLs for water bodies within the San Diego Region are under development or have not been started. However, four TMDLs for the San Diego Region need only State Board approval to be complete, and three are already complete. Of the three completed TMDLs, two impact the water quality of San Diego Bay and the third impacts the water quality of Rainbow Creek.

E. Other Plans, Polices and Regulations

Ocean Plan
The State Board adopted the Water Quality Control Plan for Ocean Waters of California (Ocean Plan) in 2005, it was approved by USEPA, and became effective on February 14, 2006. The Ocean Plan identifies the following beneficial uses of state ocean waters to be protected:

a. Industrial water supply;
b. Navigation;
c. Aesthetic enjoyment;
d. Water contact recreation;
e. Non-contact water recreation;
f. Ocean commercial and sport fishing;
g. Mariculture;
h. Preservation and enhancement of Areas of Special Biological Significance;
i. Preservation and enhancement of rare and endangered species;
j. Marine habitat;
k. Fish migration;
l. Fish spawning; and
m. Shellfish harvesting.

In order to protect the above beneficial uses, the Ocean Plan establishes water quality objectives (for bacteriological, physical, chemical, and biological characteristics, and for radioactivity), general requirements for management of waste discharged to the ocean, quality requirements for waste discharges (effluent quality requirements), discharge prohibitions, and general provisions.

Limits derived from the Ocean Plan have been included in this WDR to protect beneficial uses of enclosed bays and estuaries because their beneficial uses are similar to those of the ocean waters of the State.

F. BASIS FOR WASTE DISCHARGE REQUIREMENTS

Section 402 of the federal Clean Water Act (CWA) gives the U.S. EPA the authority to issue NPDES permits for discharges into navigable waters and to prescribe conditions for such permits necessary to carry out the provisions of the CWA. In California, EPA has delegated this authority to the State of California.

The discharge of extracted groundwater threatens to cause or contribute to excursions above narrative water quality objectives as a result of the discharge of petroleum related compounds, metals, and organics. On May 26, 1989, the U.S. EPA enacted revisions to 40 CFR 122 (NPDES regulations). When a proposed discharged of a compound or chemical threatens to cause or contribute to an excursion above a State narrative water quality standard and a numeric water quality standard for the specific chemical has not been established, the NPDES revisions require the Regional Board to:

a) Establish an effluent limitation using a proposed State water quality objective or standard or an explicit State policy or regulation interpreting its narrative water quality objective which will protect and maintain water quality and designated beneficial uses of the receiving water;

b) Establish effluent limitations on a case-by-case basis, using EPA's water quality criteria published under 307(a) of the Federal Clean Water Act; or

c) Establish effluent limitations on an indicator parameter for the pollutants of concern (State Board memorandum dated November 3, 1989).

Groundwater pollutant plumes are often complex mixtures of hundreds of petroleum related compounds (e.g. gasoline contains over 200 chemical compounds) which makes complete chemical analyses very expensive and sometimes impracticable or impossible due to sample matrix interferences, constituent masking, or the lack of standard analytical techniques. Since water quality criteria for many of the petroleum hydrocarbon compounds have not been proposed or established by the State or EPA, the permit will require monitoring groundwater discharged using "indicator constituents" for the detection and evaluation of complex mixtures of petroleum related compounds such as gasoline and solvents. The indicator constituents used for evaluating compliance with the narrative water quality criteria in the permit for discharges of gasoline related products are benzene, ethylbenzene, toluene, xylene, and total petroleum

hydrocarbons, since it is believed that fuels have been adequately studied to justify limiting the analysis to these compounds.

On June 8, 1989, the SWRCB submitted an application to the U.S. EPA requesting revisions to its NPDES program in accordance with 40 CFR 123.62 and 403.10. The application included a request to add general permit authority to its approved NPDES program. States may request authority to issue general permits pursuant to 40 CFR 122.28. On September 22, 1989, the EPA, Region IX, approved the SWRCB's request and granted authorization for the State's issuance of general NPDES permits.

40 CFR 122.28 provides for the issuance of general permits to regulate discharges of waste which result from similar operations, are the same type of waste, require the same effluent limitations, require similar monitoring, and are more appropriately regulated under a general permit rather than individual permits.

In order to protect the beneficial uses of groundwaters and receiving waters in the region as a result of escalating numbers of groundwater extraction waste discharges, new permanent groundwater extraction waste discharges will be considered for enrollment on a case-by-case basis. The regulation of discharges from new permanent groundwater extraction operations to receiving waters will reduce the waste of groundwater as intended by Article X of the California Constitution and Section 275 of the California Water Code, and may reduce the potential number of new permanent discharges as intended by the federal Clean Water Act (Section 101(a)(1)) and the Water Quality Control Policy for Enclosed Bays and Estuaries of California.

The practice of permanent groundwater extraction for the purpose of protecting underground parking or other structures and the subsequent discharge of the groundwaters, without using the groundwaters to the "fullest extent to which they are capable, "as required by the California Constitution, is an unreasonable use of such waters, if the waters have designated beneficial uses. Article X, Section 2, of the California Constitution requires that "water resources of the State be put to beneficial use to the fullest extent of which they are capable and that the waste or unreasonable use or unreasonable method of use of water be prevented, and that the conservation of such waters is to be exercised with a view to the reasonable and beneficial use thereof in the interest of the people and for the public welfare." Water Code Section 275 states, "The department and board shall take all appropriate proceedings or actions before executive, legislative, or judicial agencies to prevent waste, unreasonable use, unreasonable method of use, or unreasonable method of diversion of water in this state."

On March 2, 2000, the SWRCB, in Resolution No. 2000-15, adopted a Policy for Implementation of Toxic Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (Policy). The Policy implements the provisions promulgated by the U.S. Environmental Protection Agency (U.S. EPA) in the California Toxics Rule (CTR). Criteria for 126 priority pollutants are established by the CTR.

U.S. EPA promulgated this rule to fill a gap in California water quality standards that was created in 1994 when a State court overturned the State's water quality control plans containing water quality criteria for priority toxic pollutants. The Federal criteria are legally applicable in the State of California for inland surface waters, enclosed bays and estuaries for all purposes and programs under the Clean Water Act.

The Policy was effective on April 28, 2000, with respect to the priority pollutant criteria promulgated for California by the U.S. EPA through the National Toxics Rule (NTR) and to the priority pollutant objectives established by Regional Boards in their water quality control plans (basin plans).

The U.S. EPA promulgated the final California Toxic Rule (CTR) on May 18, 2000, as required by Section 303(c)(2)(B) of the federal Clean Water Act. The CTR regulations, codified in 40 CFR 131.38, establish numeric criteria for water quality standards for priority toxic pollutants for the State of California.

The Policy establishes:

a) implementation provisions for priority pollutant criteria promulgated by the U.S. EPA through the National Toxic Rule (NTR) and the CTR, and for priority pollutant objectives established in the Basin Plan;

b) monitoring requirements for 2,3,7,8-TCDD (tetrachlorodibenzo-p-dioxin) equivalents; and

c) Chronic toxicity control provisions.

Pursuant to Section 5.3 of the Policy, the Regional Board may, after compliance with the California Environmental Quality Act (CEQA), allow short-term or seasonal exceptions from meeting the priority pollutant criteria/objectives if determined to be necessary to implement control measures either:

a) For resource or pest management (i.e., vector or weed control, pest eradication, or fishery management) conducted by public entities to fulfill statutory requirements, including, but not limited for, those in the California Fish and Game, Food and Agriculture, Health and Safety, and Harbors and Navigation codes; or

b) Regarding drinking water conducted to fulfill statutory requirements under the federal Safe Drinking Water Act or the California Health and Safety Code. Such categorical exceptions may also be granted for draining municipal storm water conveyances for cleaning or maintenance, or for draining water treatment facilities for cleaning or maintenance.

Section 5.3 of the Policy states that, where site-specific conditions in individual water bodies or watersheds differ sufficiently from statewide conditions and those differences cannot be addressed through other provisions of this policy the SWRCB

may, in compliance with the California Environmental Quality Act (CEQA), subsequent to a public hearing, and with the concurrence of the U.S. Environmental Protection Agency, grant an exception to meeting a priority pollutant criterion/objective or any other provision of this Policy where the State Board determines:

a) The exception will not compromise protection of enclosed bay, estuarine, and inland surface waters for beneficial uses; and

b) The public interest will be served.

Section 402(a)(1) of the Clean Water Act authorizes the issuance of best available technology effluent limitations in NPDES permits using best professional judgement. Using best professional judgement, best available technology economically achievable for the removal of volatile and semi-volatile organic compounds, and analytical practical quantitation levels is the basis for effluent limitations, for these compounds, in the Discharge Specifications of the Order. Thus, best available technology economically achievable for the removal of organic compounds is the basis for effluent limitations for xylene and other volatile hydrocarbons, and base/neutral compounds (not included in 40 CFR 131.38).

Water Quality Based Effluent Discharge Specifications (limits) were established for this groundwater extraction waste discharge permit, using 40 CFR 131.38 (Water Quality Standards; Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California), and the State's Implementation Policy. Water Quality Based Effluent Discharge Limits do not apply to discharges of extracted groundwater to the surf zone.

In general, there are two accepted technologies in use for the removal of synthetic organic compounds from water: aeration and adsorption. Removal efficiencies of volatile organic compounds through aeration processes can be estimated based on each compound's Henry's Law Coefficient (increasing coefficients indicate increasing volatility). Benzene is relatively soluble in water when compared to other fuel constituents and solvents. Any compound which has a Henry's Law coefficient greater than that of benzene will theoretically volatilize faster than benzene (assuming molecular or chemical interactions are nonexistent or minimized). Most of the compounds associated with fuel products and solvents commonly found in contaminated groundwater have Henry's Law Coefficients greater than that of benzene and will be efficiently removed through aeration if benzene is removed. The general consensus in the literature is that a 99 percent removal efficiency of volatile compounds with similar concentrations may be achieved through aeration processes. Based on best professional judgement, if benzene is removed from groundwater to levels approaching detection limits (practical quantitation level), other volatile organic compounds of concern (e.g., tetrachloroethylene, trichloroethylene, carbon tetrachloride, etc.) will be removed from the discharged groundwater as well.

Organic compounds which are not removed from groundwaters through aeration processes may be removed through adsorption processes (e.g., granular activated carbon). When properly designed and operated, most granular activated carbon systems can lower the concentration of synthetic organic contaminants to below detection limits.

In general, most synthetic organic contaminants can be removed from groundwaters using the aeration of adsorption processes or a combination thereof. Establishing effluent limitations in the practical quantitation limit range (1 to 5 □g/L) and monitoring requirements for BTEX as indicators of fuels, 40 CFR 136 listed volatile compounds as indicators of solvents, and base/neutral compounds as indicators of diesel product, will, based on best professional judgement, ensure that compounds of concern are not discharged in levels which will cause excursions from narrative water quality criteria or objectives.

On January 1, 1998, Senate Bill (SB) 521 was passed. SB521 adds language, applicable to leaking underground storage tanks, to the Health & Safety Code as follows: "Section 25299.37.1. No closure letter pursuant to this chapter shall be issued unless the soil or groundwater, or both, where applicable, at the site have been tested for Methyl Tertiary Butyl Ether (MTBE) and the results of that testing are known to the Regional Board." Subsequently, on February 20, 1998, the San Diego Regional Board, Site Mitigation & Cleanup Unit, issued written notification to interested parties of Mandatory MTBE Sampling For Underground Storage Tank (UST) Site Closures-Senate Bill (SB) 521. The February 20, 1998, notification specifies that "For ground water impacted sites or soil sites that may threaten ground water, both soil and ground water sampling and analysis for MTBE will be required."

The Porter-Cologne Water Quality Control Act (January 1, 2000), Section 13272.1 and Section 13285, address discharges of MTBE. The California Department of Health Services (DHS) last update (March 9, 2000) of California's Maximum Contaminant Levels (MCLs) for MTBE states the following:

As established by the DHS, the primary MCL is 13 µg/L for MTBE and the secondary MCL is 5 µg/L.

The Order requires that groundwater discharged to bays and estuaries must not contain pollutants in excess of applicable receiving water quality objectives contained in 40 CFR 131.38 (Water Quality Standards; Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California), or effluent limitations based on achievable concentrations using best available technology (BAT), whichever results in a lower effluent concentration. Effluent limitations based on BAT are equal to or less than the practical quantitation level. Since the assumed initial dilution factor for the discharge is zero, a discharge could not cause an excursion from numeric receiving water quality objectives for Tables 1 and 2 (Groundwater Extraction Discharges to Bays and Harbors, and Groundwater Extraction Waste Discharges to Lagoons/Estuaries), if the discharge is in compliance with the effluent limitations contained in the Order. Likewise,

discharges to the surf zone cannot cause excursions from water quality objectives based on the preceding, and assuming that the dilution factor will always be greater than three.

For discharges to inland surface waters, effluent limitations are based on the EPA water quality criteria for the protection of aquatic species, the EPA water quality criteria for the protection of human health, effluent concentrations achievable using best available technology, 40 CFR 131.38 (Water Quality Standards; Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California), or, in the cases where the receiving water is designated potable or municipal supply waters, maximum contaminant levels for municipal waters established by the California Department of Health Services. Since the assumed initial dilution factor for the discharge is zero and a mixing zone is not allowed, a discharge could not cause an excursion from numeric receiving water quality objectives if the discharge is in compliance with the effluent limitations contained in the Order.

No evidence that groundwaters in the region contain biocides, dioxins, or radiation has been found to date. However, discharges of pesticides in detectable concentrations to inland surface waters are prohibited by the Comprehensive Water Quality Control Plan Report, San Diego Basin (9) (Basin Plan), and by the Order.

In the adoption of waste discharge requirements and effluent limitations to protect the beneficial uses of waters of the State, Section 1300 et seq., of the California Water Code, authorizes the use of relevant water quality objectives or other criteria in the absence of numerical effluent concentration limitations in the Bays and Estuaries Policy.

Compliance with effluent limitations shall be determined as follows (pursuant to 40 CFR – 131.38):

a) Dischargers shall be deemed out of compliance with an effluent limitation if the concentration of the priority pollutant in the monitoring sample is greater than the effluent limitation and greater than or equal to the reported Minimum Level (ML).

b) Dischargers shall be required to conduct a Pollutant Minimization Program (PMP) when there is evidence (e.g., sample results reported as "Detected, but Not Quantified" (DNQ) when the effluent limitation is less than the Method Detection Limit (MDL), sample results from analytical methods more sensitive than those methods included in the permit, presence of whole effluent toxicity, health advisories for fish consumption, results of benthic or aquatic organism tissue sampling) that the priority pollutant is present in the effluent above an effluent limitation and either:

   1) A sample result is reported as DNQ and the effluent limitation is less than the reported ML; or

2) A sample result is reported as Non-Detect (ND) and the effluent limitation is less than the MDL.

When determining compliance with an Average Monthly Effluent Limitation (AMEL) and more than one sample result is available in a month, the discharger shall compute the arithmetic mean unless the data set contains one or more reported determinations of DNQ or ND. In those cases, the discharger shall compute the median in place of the arithmetic mean in accordance with the following procedure:

a) The data set shall be ranked from low to high, reported ND determinations lowest, DNQ determinations next, followed by quantified values (if any). The order of the individual ND or DNQ determinations is unimportant.

b) The median value of the data set shall be determined. If the data set has an odd number of data points, then the median is the middle value. If the data set has an even number of data points, then the median is the average of the two values around the middle unless one or both of the points are ND or DNQ, in which case the median value shall be the lower of the two data points where DNQ is lower than a value and ND is lower than DNQ.

If a sample result, or the arithmetic mean or median of multiple sample results, is below the reported ML, and there is evidence that the priority pollutant is present in the effluent above an effluent limitation and the discharger conducts a PMP, the discharger shall not be deemed out of compliance.

III. Rationale For Effluent Limitations and Discharge Specifications

The CWA requires point source dischargers to control the amount of conventional, non-conventional, and toxic pollutants that are discharged into the waters of the United States. The control of pollutants discharged is established through effluent limitations and other requirements in NPDES permits. Effluent limitations are based on the following principles:

A. 40 CFR section 122.44(a) requires that permits include applicable technology-based limitations and standards;

B. 40 CFR section 122.44(d) requires that permits include water quality-based effluent limitations to attain and maintain applicable numeric and narrative water quality criteria to protect the beneficial uses of the receiving water. Where numeric water quality criteria have not been established, three options exist to protect water quality: 1) 40 CFR section 122.44(d) specifies that WQBELs may be established using USEPA criteria guidance under CWA section 304(a); 2) proposed state criteria or a state policy interpreting narrative criteria supplemented with other relevant information may be used; or 3) an indicator parameter may be established;

C. Any discharge of untreated groundwater to surface water in the San Diego Reigon threatens to cause or contribute to excursions above narrative water quality objectives contained in the Basin Plan as a result of the potential discharge of petroleum related compounds, solvents, and metals.

On May 26, 1989, USEPA enacted revisions to NPDES program regulations (40 CFR 122). When a proposed discharge of a compound or chemical threatens to cause or contribute to an excursion above a State narrative water quality standard and a numeric water quality standard for the specific chemical has not been established, the NPDES program regulations require the Regional Board to do the following: 1) Establish effluent limitations using a proposed State water quality objective or standard, or an explicit State policy or regulation interpreting its narrative water quality objective which will protect and maintain water quality and designated beneficial uses of the receiving water; 2) Establish effluent limitations on a case-by-case basis, using USEPA's water quality criteria published under CWA section 307(a); or 3) Establish effluent limitations on an indicator parameter for the pollutants of concern; and

D. 40 CFR section 122.44(l) requires that when a permit is renewed or reissued, effluent limitations must be at least as stringent as the effluent limitations in the previous permit. Since this permit is a renewal of a previous permit, anti-backsliding is applicable and the following pollutants are included:

Settleable Solids
Total Suspended Solids
Hydrogen Sulfide
Total Residual Chlorine
pH
Benzene
Ethylbenzene
Toluene
Xylene
Total Petroleum Hydrocarbons
Arsenic
Cadmium
Chromium (hexavalent)
Copper
Lead
Mercury
Nickel
Silver
Zinc
Cyanide
Phenolic Compounds (non-chlorinated)
Chlorinated Phenolics
1,1,2,2-tetrachlorethane (PCA)
1,1,1-trichloroethane (TCA)
1,1,2-trichloroethane (TCA)
1,2-dichloroethane
Tetrachloroethylene (PCE)
Trichloroethylene (TCE)
Vinyl chloride
Carbon tetrachloride
Base/Neutral Organic Compounds
Acute Toxicity
Chronic Toxicity
Tributyltin (TBT)
Total Coliform
Fecal Coliform
Dissolved Oxygen (DO)

E. Methyl Tertiary-Butyl Ether (MTBE), is a chemical compound that is manufactured by the chemical reaction of methanol and isobutylene.

MTBE is produced in very large quantities (over 200,000 barrels per day in the U.S. in 1999) and is almost exclusively used as a fuel additive in motor gasoline. It is one of a group of chemicals commonly known as "oxygenates" because they raise the oxygen content of gasoline. At room temperature, MTBE is a volatile, flammable and colorless liquid that dissolves rather easily in water.

Because MTBE dissolves easily in water and does not "cling" to soil very well, it migrates faster and farther in the ground than other gasoline components, thus making it more likely to migrate to groundwater extraction wells. MTBE does not degrade (breakdown) easily and is difficult and costly to remove from groundwater.

On January 1, 1998, Senate Bill (SB) 521 was passed. SB521 adds language to the Health & Safety Code which is applicable to leaking underground storage tanks as follows: "Section 25299.37.1. No closure letter pursuant to this chapter shall be issued unless the soil or groundwater, or both, where applicable, at the site have been tested for Methyl Tertiary Butyl Ether (MTBE) and the results of that testing are known to the Regional Board." Subsequently, on February 20, 1998, the Regional Board, Site Mitigation & Cleanup Unit, issued written notification to interested parties of Mandatory MTBE Sampling For Underground Storage Tank (UST) Site Closures-Senate Bill (SB) 521. The February 20, 1998, notification specifies that "For ground water impacted sites or soil sites that may threaten ground water, both soil and ground water sampling and analysis for MTBE will be required."

Sections 13272.1 and Section 13285 of the CWC address discharges of MTBE. The California Department of Health Services (DHS) adopted limits for Maximum Contaminant Levels for MTBE. The Primary MCL of 13 µg/L was adopted by DHS on May 17, 2000. The Secondary MCL (for taste and odor not health affects) of 5 µg/L was adopted on January 7, 1999. The UST program uses the more conservative secondary MCL of 5 µg/L.

F. Discharge Prohibitions

Discharges under this WDR are required to be nontoxic. Toxicity is the adverse response of organisms to chemicals or physical agents. This prohibition is based on the Basin Plan, which require that all waters be maintained free of toxic substances in concentrations that are lethal or produce other detrimental responses in aquatic organisms. Detrimental responses include, but are not limited to, decreased growth rate and decreased reproductive success of resident or indicator species. The Basin Plan also requires waters to be free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, or animal life. This objective applies regardless of whether

the toxicity is caused by a single substance or the interactive effect of multiple substances.

Mass emission rate limitations will be determined using the discharge flowrate and effluent concentration limitations specified in this WDR; therefore, the daily maximum discharge flowrate limitation for each discharge will be specified in the discharge Notice of Enrollment from the Regional Board. The discharge flowrate will be designated as the maximum discharge flowrate and the Discharger shall be prohibited from discharging in excess of the maximum discharge flowrate.

1. The discharge of groundwater to surface waters is prohibited unless authorized, exempted, or issued an individual NPDES permit by the Regional Board.

2. The discharge of wastes to areas designated by the SWRCB, and recommended by the Regional Board, as areas of special biological significance is prohibited. Discharges shall be located a sufficient distance from such designated areas to assure maintenance of natural water quality conditions in these areas.

3. The discharge of groundwater extraction waste to surface waters from permanent groundwater extraction operations in basins with designated beneficial uses of industrial, agricultural, or municipal and domestic supply are prohibited unless such extracted groundwater (not used beneficially) is used beneficially (Application Requirements, Section F.17, and F.18). If the Enrollee of such extracted groundwater wishes to discharge to surface waters, it shall be the responsibility of the Enrollee to obtain an individual NPDES Permit for the discharge.

4. The discharge of groundwater extraction waste to enclosed bays, harbors, lagoons, and estuaries, or tributaries thereto, is prohibited unless the Enrollee demonstrates to the satisfaction of the Regional Board that alternative disposal sites (e.g., surf zone) are not practicable as required in Application Requirements, Sections F.17, and F.18.

5. The discharge of groundwater extraction waste to any surface water from a groundwater extraction project after the date of completion of construction of structures requiring groundwater extraction, or from a groundwater remediation operation after the date the groundwater has been remediated to the satisfaction of the Regional Board, is prohibited.

6. The discharge of groundwater in excess of the flowrate specified in each Enrollee's Notice of Enrollment is prohibited unless the

Enrollee obtains a revised discharge Notice of Enrollment authorizing an increased flowrate.

7. No individual pesticide or combination of pesticides shall be present in the water column, sediments, or biota at concentration(s) that adversely affect beneficial uses. Pesticides shall not be present at levels which will bioaccumulate in aquatic organisms to levels which are harmful to human health, wildlife or aquatic organisms.

   Water designated for use as domestic or municipal supply (MUN) (drinking water) shall not contain concentrations of pesticides in excess of the maximum contaminant levels specified in California Code of Regulations, Title 22, Table 64444-A of Section 64444 (Organic Chemicals). (See Basin Plan Chapter 3-13).

8. Compliance with the waste discharge prohibitions contained in the Basin Plan is a condition of this Order.

9. The discharge of groundwater extraction waste to a storm water conveyance system without notifying and receiving authorization from the agency having jurisdiction over the storm water conveyance system is prohibited.

10. The discharge of wastes tributary or directly to areas designated as being of special biological significance by the SWRCB is prohibited. Discharges shall be located a sufficient distance from such designated areas to assure maintenance of natural water quality conditions in these areas.

G. Technology-Based Effluent Limitations (TBELs)

1. Scope and Authority

The CWA requires that TBELs be established based on several levels of controls:

Best Practicable Treatment Control Technology (BPT) represents the average of the best performance by plants within an industrial category or subcategory. The BPT standards apply to toxic, conventional, and nonconventional pollutants.

Best Available Technology Economically Achievable (BAT) represents the best existing performance of treatment technologies that are economically achievable within an industrial point source category. The BAT standards apply to toxic and nonconventional pollutants.

Best Conventional Pollutant Control Technology (BCT) represents the control from existing industrial point sources of conventional pollutants including BOD, TSS, fecal coliform, pH, and oil and grease. The BCT standard is established after considering the "cost reasonableness" of the relationship between the cost of attaining a reduction in effluent discharge and the benefits that would result, and also the cost effectiveness of additional industrial treatment beyond BPT.

New Source Performance Standards (NSPS) represent the best available demonstrated control technology standards. The intent of NSPS guidelines is to set limitations that represent state-of-the-art treatment technology for new sources.

The CWA requires USEPA to develop Effluent Limitations, Guidelines and Standards (ELGs) representing application of BPT, BAT, BCT, and NSPS. Section 402(a)(1) of the CWA and 40 CFR section 125.3 of the NPDES regulations authorize the use of Best Professional Judgment (BPJ) to derive technology-based effluent limitations on a case-by-case basis where ELGs are not available for certain industrial categories and/or pollutants of concern. Where BPJ is used, the permit writer must consider specific factors outlined in 40 CFR section 125.3.

2. Applicable Technology-Based Effluent Limitations

The USEPA has not developed numeric Technology-Based effluent limitations for pollutants in discharges from groundwater extraction.

H. Water Quality-Based Effluent Limitations (WQBELs)

1. Scope and Authority

As specified in 40 CFR section 122.44(d)(1)(i), permits are required to include WQBELs for pollutants (including toxicity) that are or may be discharged at levels that cause, have reasonable potential to cause, or contribute to an excursion above any state water quality standard. The process for determining reasonable potential and calculating WQBELs when necessary is intended to protect the designated uses of the receiving water as specified in the Basin Plan, achieve applicable water quality objectives and criteria contained in state plans and policies, and meet water quality criteria in the CTR and NTR.

2. Applicable Beneficial Uses and Water Quality Criteria and Objectives

The designated beneficial uses of surface waters throughout the State may include municipal, domestic, industrial, and agricultural supply; water contact and non-contact recreation; navigation; groundwater recharge and freshwater replenishment; hydropower generation; wildlife habitat; cold

freshwater and warm freshwater habitat; fish migration and fish spawning; marine habitat; estuarine habitat; shellfish harvesting; ocean commercial and sport fishing; areas of special biological significance; and preservation of rare and endangered species. To the extent that the Basin Plan designates additional or different beneficial uses, the Basin Plan shall apply.

3. Determining the Need for WQBELs

All applicable provisions of sections 301 and 402 of the CWA must be met for NPDES permits for discharges to surface waters. These provisions require controls of pollutant discharges that utilize BAT and BCT to reduce pollutant and any more stringent controls necessary to meet water quality standards.

As specified in the SIP, the Regional Board shall conduct an analysis for each priority pollutant with applicable criterion or objective to determine if a water quality-based effluent limitation is required.

Data are unavailable to conduct an analysis because a WDR as a General Permit, does not require a Report of Waste Discharge. Therefore, the discharger shall conduct an initial sample based on flow to determine the requirements.

Reasonable Potential Analysis (RPA)

In order to determine what to sample for and what frequency, an initial set of data is required.

If the discharger proposes to discharge less than 100,000 gallons per day, then the discharger shall initially conduct Monitoring Program A (sample for the entire constituents listed in III.D. and MTBE).

However it the discharger proposes to discharge 100,000 gallons per day or more, then the discharger shall initially conduct Monitoring Program B (sample the entire constituents listed in III.D., MTBE, and all 126 priority pollutants).

Based on the initial monitoring program if the discharge does not require treatment to meet the discharge specifications of this WDR, then the discharger will only need to conduct Monitoring Program A (if discharging less than 100,000 gallons per day) or Monitoring Program B (if discharging 100,000 gallons per day or more) once per year. This will provide data to identify reasonable potential for future effluent limits.

If the discharge will require treatment prior to discharge, then in addition to the once per year monitoring required listed above, the discharger will also monitor for all the constituents listed in the discharge specification with

effluent limits at the frequency required in the Monitoring and Reporting Program stated in Attachment E because of the reasonable potential of exceeding the effluent limits in the discharge specifications of this WDR.

If there are any contaminated sites within the radius of influence of the groundwater extraction activities, then the constituent of concern will be monitored at the frequency required in the Monitoring and Reporting Program stated in Attachment E because of the reasonable potential of exceeding the effluent limits in the discharge specifications of this WDR. If the constituent of concern is not listed in the Monitoring and Reporting Program stated in Attachment E then a monitoring and reporting frequency will be stated in the Notice of Enrollment.

Table summarizing effluent limits and monitoring

DISCHARGE	EFFLUENT LIMITS	MONITORING PROGRAM
< 100,000		• Program A Annual
>= 100,000		• Program B Annual
Treatment	Yes	• Monitoring and Reporting Program in Attachment E
Contaminated Site in Radius of Influence		• Monitor and Report constituent(s) of concern as stated in the Notice of Enrollment

4. WQBEL Calculations

The Average Monthly Effluent and Maximum Daily Effluent WQBELs were calculated using a statistical approach with the following considerations and assumptions:

No dilution credit is considered for the discharge. Therefore, the discharge must comply with the Water Quality Objective at the point of discharge.

The WQBEL based on the CTR were implemented using the procedure list in the SIP. The procedure is listed below with copper as the example.

CTR/SIP calculations - Copper Example:

Criteria for Priority Toxic Pollutant in the State of California is described in the CTR table listed in 40 CFR 131.38.

§ 131.38 40 CFR Ch. I (7–1–00 Edition)

A		B Freshwater		C Saltwater		D Human Health (10^{-6} risk for carcinogens) For consumption of:	
# Compound	CAS Number	Criterion Maximum Conc. [d] B1	Criterion Continuous Conc. [d] B2	Criterion Maximum Conc. [d] C1	Criterion Continuous Conc. [d] C2	Water & Organisms (µg/L) D1	Organisms Only (µg/L) D2
1. Antimony	7440360					14 a,s	4300 a,t
2. Arsenic [b]	7440382	340 i,m,w	150 i,m,w	69 i,m	36 i,m		
3. Beryllium	7440417					n	n
4. Cadmium [b]	7440439	4.3 e,i,m,w,x	2.2 e,i,m,w	42 i,m	9.3 i,m	n	n
5a. Chromium (III)	16065831	550 e,i,m,o	180 e,i,m,o			n	n
5b. Chromium (VI) [b]	18540299	16 i,m,w	11 i,m,w	1100 i,m	50 i,m	n	n
6. Copper [b]	7440508	13 e,i,m,w,x	9.0 e,i,m,w	4.8 i,m	3.1 i,m	1300	

Saltwater criterion maximum concentration (CMC) = 4.8 µg/L
Saltwater criterion continuous concentration (CCC) = 3.1 µg/L

These criteria are expressed in terms of the dissolved fraction of the metal in the water column. [See footnote "m" to Table in paragraph (b)(1) of 40 CFR 131.38]

40 CFR 122.45(c) requires that this WDR include effluent limitations as a total recoverable concentration.

The SIP requires that if it is necessary to express a dissolved metal or selenium value as total recoverable and a site-specific translator has not yet been developed, the Regional Board shall use the applicable conversion factor from 40 CFR 131.38.

The term "Conversion Factor" (CF) represents the recommended conversion factor for converting a metal criterion expressed as the total recoverable fraction in the water column to a criterion expressed as the dissolved fraction in the water column [See note to Table 2 of Paragraph (b)(2) to 40 CFR 131.38]

Total recoverable concentration * CF = Dissolved concentration criterion

or

Total recoverable concentration = Dissolved concentration criterion / CF

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(iv) Table 2 to paragraph (b)(2) of this section:

Metal	Conversion factor (CF) for freshwater acute criteria	CF for freshwater chronic criteria	CF for saltwater acute criteria	CF[a] for saltwater chronic criteria
Antimony	(d)	(d)	(d)	(d)
Arsenic	1.000	1.000	1.000	1.000
Beryllium	(d)	(d)	(d)	(d)
Cadmium	[b] 0.944	[b] 0.909	0.994	0.994
Chromium (III)	0.316	0.860	(d)	(d)
Chromium (VI)	0.982	0.962	0.993	0.993
Copper	0.960	0.960	0.83	0.83

CF for copper = 0.83

Total recoverable concentrations for copper:
4.8 µg/L dissolved (CMC) / 0.83 (CF) = 5.8 µg/L total recoveralbe for CMC
3.1 µg/L dissolved (CCC) / 0.83 (CF) = 3.7 µg/L total recoveralbe for CCC

Effluent variability multiplier and Coefficient of Variation (CV)
For each concentration based on an aquatic life criterion, the long-term average (LTA) is calculated by multiplying the concentration with a factor that adjusts for effluent variability. The multiplier can be found in Table 1 of the SIP. Since this is a WDR without existing data points, the number of effluent data points is less than ten; the CV shall be set equal to 0.6 per the SIP.

Table 1. Effluent Concentration Allowance (ECA) Multipliers for Calculating Long-Term Averages (LTAs)

Coefficient Of Variation (CV)	Acute Multiplier	Chronic Multiplier
	99th Percentile Occurrence Probability	99th Percentile Occurrence Probability
0.1	0.797	0.891
0.2	0.643	0.797
0.3	0.527	0.715
0.4	0.440	0.643
0.5	0.373	0.581
0.6	0.321	0.527

Therefore, from Table 1 of the SIP, the effluent variability multiplier will be as follows:
Acute Multiplier = 0.321
Chronic Multiplier = 0.527

The long-term average (LTA) is calculated by multiplying the total recoverable concentrations for copper with the acute and chronic multipliers:

LTA acute = 5.8 µg/L * 0.321 = 1.9 µg/L
LTA chronic = 3.7 µg/L * 0.527 = 2.0 µg/L

The MDEL and AMEL will be based on the most limiting of the acute and chronic LTA, in the case for copper it will be LTA acute of 1.9 µg/L.

Water quality-based effluent limits are calculated by multiplying the most limiting LTA with a factor (multiplier) that adjusts for the averaging periods and exceedance frequencies of the criteria and the effluent limitations. The multiplier can be found in Table 2 of the SIP. Since this is a WDR without existing data points, the CV will be set equal to 0.6 and since sampling frequency is four times a month or less, n shall be set equal to 4 per SIP (n=4).

Table 2. Long-Term Average (LTA) Multipliers for Calculating Effluent Limitations

Coefficient of Variation	MDEL Multiplier	AMEL Multiplier			MDEL/AMEL Multiplier		
	99th Percentile Occurrence Probability	95th Percentile Occurrence Probability			MDEL = 99th Percentile AMEL = 95th Percentile Occurrence Probability		
(CV)		n = 4	n = 8	n = 30	n = 4	n = 8	n = 30
0.1	1.25	1.08	1.06	1.03	1.16	1.18	1.22
0.2	1.55	1.17	1.12	1.06	1.33	1.39	1.46
0.3	1.90	1.26	1.18	1.09	1.50	1.60	1.74
0.4	2.27	1.36	1.25	1.12	1.67	1.82	2.02
0.5	2.68	1.45	1.31	1.16	1.84	2.04	2.32
0.6	3.11	1.55	1.38	1.19	2.01	2.25	2.62

Therefore, from Table 2 of the SIP, the LTA multipliers will be as follows:
MDEL Multiplier = 3.11
AMEL Multiplier = 1.55

The MDEL and AMEL limits are calculated by multiplying the LTA with an LTA multiplier for each limit:
Maximum Daily Effluent Limit (MDEL) = 1.9 µg/L * 3.11 = 5.8 µg/L
Average Monthly Effluent Limit (AMEL) = 1.9 µg/L * 1.55 = 2.9 µg/L

I. Whole Effluent Toxicity (WET)

Whole effluent toxicity (WET) tests measure the aggregate toxic effect of a mixture of pollutants that may be present in a waste stream and provides information on potential toxic impacts to receiving waters from the

discharge of wastes. WET tests measure the degree of response of exposed aquatic test organisms to an effluent. The WET approach provides a means of assessing compliance with the narrative toxicity water quality objective for aquatic life protection of the Basin Plan while implementing numeric criteria for toxicity. There are two types of WET tests: acute and chronic. An acute toxicity test is conducted over a short time period and measures mortality. A chronic toxicity test is conducted over a longer period of time and may measure mortality, reproduction, and development.

The SIP requires that a Toxicity Reduction Evaluation (TRE) be conducted if a discharge causes or contributes to chronic toxicity in a receiving water body. This WDR requires the Discharger to periodically monitor the toxicity of its discharge and to develop a TRE Workplan if the toxicity effluent limitations are exceeded.

J. Anti-Backsliding Effluent Limitations

Sections 402(o)(2) and 303(d)(4) of the CWA and 40 CFR section 122.44(l) prohibit backsliding in NPDES permits. The following limits designated with AB in the Final Effluent Limitations table below have the same limit as the previous permit.

K. Final Effluent Limitations

Summary of Water Quality-Based Effluent Limitations
Discharge Point
Summary of Water Quality-based Effluent Limitations Table

Mass Limits
All permit limitations, standards or prohibitions shall be expressed in terms of mass except for pH, or other pollutants which cannot appropriately be expressed by mass or under certain circumstances including "when applicable standards and limitations are expressed in terms of other units of measurement." (40 CFR § 122.45(f)(1)). Therefore, all concentration limits stated above except for Settleable Solids, Acute Toxicity, Chronic Toxicity, Total Coliform, Fecal Coliform, pH, and Dissolved Oxygen shall also have a mass limit based on its concentration limit times the discharge flow limit in the Notice of Enrollment expressed in pounds per day (lbs/d) as shown in the equations below:

Concentration Limit * Flow Limit * Conversion Factor = Mass Limit
(mg/l) * (MGD) * 8.34 [lb*L/(Million Gallons*mg)] = lbs/day
(µg/l) * (MGD) * 0.00834 [lb*L/(Million Gallons*µg)] = lbs/day
(mg/l) * (gpd) * 0.00000834 [lb*L/(Gallons*mg)] = lbs/day
(µg/l) * (gpd) * 0.00000000834 [lb*L/(Million Gallons*µg)] = lbs/day

B. DISCHARGE SPECIFICATIONS

1. DISCHARGES TO BAYS AND HARBORS

The discharge of groundwater extraction waste to Mission Bay, Oceanside Harbor, Del Mar Boat Basin, or Dana Point Harbor shall not contain pollutants in excess of the following effluent limitations:

General / Inorganic / Biological

Parameter	Units	Effluent Limitations				
		AMEL	AWEL	MDEL	Instantaneous Maximum	6-Month Median
Settleable Solids	ml/L	1.0 [OP]	1.5 [OP]	-	3.0 [OP]	-
Total Suspended Solids	mg/L	30 [AB]	-	-	50 [AB]	-
Hydrogen Sulfide	µg/L	2 [AB]	-	4 [AB]	10 [AB]	-
Total Residual Chlorine	µg/L	-	-	8 [OP]	60 [OP]	2 [OP]
Acute Toxicity	Tua			0.3 [OP]		
Chronic Toxicity	Tuc			1.0 [OP]		
Total Coliform	MPN/ 100 ml				1000.0 [AB]	
Fecal Coliform	MPN/ 100 ml				200.0 [AB]	
pH	Units	Within limit of 6.0 to 9.0 at all times [OP]				

Parameter	Units	Effluent Limitations				
		AMEL	AWEL	MDEL	Instantaneous Minimum	6-Month Median
Dissolved Oxygen (DO)	mg/L				> 5.0 [AB]	

Petroleum

Parameter	Units	Effluent Limitations				
		AMEL	AWEL	MDEL	Instantaneous Maximum	6-Month Median
MTBE	µg/L				5 [DHS]	
Benzene	µg/L	-	-	-	5 [AB]	-
Ethylbenzene	µg/L	-	-	-	5 [AB]	-
Toluene	µg/L	-	-	-	5 [AB]	-
Xylene	µg/L	-	-	-	5 [AB]	-

Parameter	Units	Effluent Limitations				
		AMEL	AWEL	MDEL	Instantaneous Maximum	6-Month Median
Total Petroleum Hydrocarbons	mg/L	-	-	-	0.5 [AB]	-

Metals

Parameter	Units	Effluent Limitations			
		AMEL	MDEL	Instantaneous Maximum	6-Month Median
Tributyltin (TBT)	µg/L	0.0014 [OP]			

Organics

Parameter	Units	Effluent Limitations			
		AMEL	MDEL	Instantaneous Maximum	6-Month Median
Phenolic Compounds (non-chlorinated)	µg/L	-	120 [OP]	300 [OP]	30 [OP]
Chlorinated Phenolics	µg/L	0.025 [CTR]	0.049 [CTR]	10 [OP]	1 [OP]
1,1,2,2-tetrachlorethane (PCA)	µg/L	2.3 [OP]	-	-	-
1,1,1-trichloroethane (TCA)	µg/L	5.4E5 [OP]	-	-	-
1,1,2-trichloroethane (TCA)	µg/L	9.4 [OP]	-	-	-
1,2-dichloroethane	µg/L	28 [OP]	-	-	-
Tetrachloroethylene (PCE)	µg/L	2.0 [OP]	-	-	-
Trichloroethylene (TCE)	µg/L	27 [OP]	-	-	-
Vinyl chloride	µg/L	36 [OP]	-	-	-
Carbon tetrachloride	µg/L	0.90 [OP]	-	-	-
Base/Neutral Organic Compounds	µg/L			10 [AB]	

Parameter	Units	Effluent Limitations			
		AMEL	MDEL	Instantaneous Maximum	6-Month Median
Ammonia (as N)	µg/L		2400 [OP]	6000 [OP]	600 [OP]

Parameter	Units	Effluent Limitations			
		AMEL	MDEL	Instantaneous Maximum	6-Month Median
Endosulfan	ng/L	-	18 [OP]	27 [OP]	9 [OP]
HCH	ng/L	-	8 [OP]	12 [OP]	4 [OP]
Dichloromethane	µg/L	450 [OP]	-	5 [AB]	-
Halomethanes	µg/L	-	-	5 [AB]	-
PAHs	ng/L	8.8 [OP]	-	-	-
TCDD Equivalents	pg/L	0.0039 [OP]	-	-	-
Turbidity	µg/L	75 [OP]	2.2 [CTR]	225	-

Parameter	Units	Effluent Limitations			
		AMEL	AWEL	Instantaneous Minimum	6-Month Median
Turbidity	NTU	75 [OP]	100 [OP]	225 [OP]	-
Turbidity	NTU	Shall not exceed the turbidity of the receiving water. [AB]			
126 Priority Pollutants from "Inland Surface Waters"					

2. DISCHARGES TO LAGOONS/ESTUARIES

The discharge of groundwater extraction waste discharges to saline lagoons (only Buena Vista Lagoon is fresh water) and estuaries of the region shall not contain pollutants in excess of the following effluent limitations:

Includes limits to the Bays and Harbors Limitations

Parameter	Units	Effluent Limitations			
		AMEL	MDEL	Instantaneous Maximum	6-Month Median
Total Nitrogen	mg/L	-	-	2.0 [AB]	1.0 [AB]
Total Phosphorus	mg/L	-	-	.0.2 [AB]	0.1 [AB]
pH	Units	Within limit of 7.0 to 8.5 at all times [AB]			
All Parameters and Effluent Limitations from "Bays and Harbors"					

3. DISCHARGES TO THE SURF ZONE

The discharge of groundwater extraction waste to the surf zone (3:1 dilution factor) shall not contain pollutants in excess of the following effluent limitations:

Discharges to the Surf Zone Calculation

The formula used to calculate effluent limits for consituents discharged to the surf zone is from Table B in the Ocean Plan except for Toxicity and Radioactivity.

Ce=Co+Dm(Co-Cs)

Ce = the effluent concentration limit, ug/L
Co = the concentration (water quality objective) to be met at the completion of initial dilution, ug/L
Dm = minimum probable initial dilution expressed as parts seawater per part wastewater Dm = 3 from findings from the 2001-96 Order.
Cs = background seawater concentration (see Table C), ug/L

Table C
BACKGROUND SEAWATER CONCENTRATIONS (Cs)

Waste Consitituent	Cs (ug/L)
Arsenic	3
Copper	2
Mercury	0.0005
Silver	0.16
Zinc	8
For all other Table B parameters	0

DISCHARGES TO THE SURF ZONE

(3:1 DILUTION FACTOR) [AB]

Parameter	Units	Effluent Limitations			
		AMEL	MDEL	Instantaneous Maximum	6-Month Median
TCR	µg/L		32 [OP]	240 [OP]	8 [OP]
Ammonia (as Nitrogen)	µg/L		9600 [OP]	24,000 [OP]	2400 [OP]
Arsenic	µg/L		119 [OP]	311 [OP]	23 [OP]
Cadmium	µg/L		16 [OP]	40 [OP]	4 [OP]
Chromium (hexavalent)	µg/L		32 [OP]	80 [OP]	8 [OP]
Copper	µg/L		42 [OP]	114 [OP]	6 [OP]
Lead	µg/L		32 [OP]	80 [OP]	8 [OP]

Parameter	Units	Effluent Limitations			
		AMEL	MDEL	Instantaneous Maximum	6-Month Median
Mercury	µg/L		0.64 OP	1.60 OP	0.16 OP
Nickel	µg/L		80 OP	200 OP	20 OP
Silver	µg/L		10.7 OP	27.5 OP	2.32 OP
Zinc	µg/L		296 OP	776 OP	56 OP
Cyanide	µg/L		16 OP	40 OP	4 OP
Phenolic Compounds (Non-chlorinated)	µg/L		480 OP	1200 OP	120 OP
1,1,2,2-tetrachloroethane	µg/L		9.2 OP		
Tributyltin (TBT)	µg/L		0.0056 OP		
1,1,-trichoroethane	µg/L		2,160,000 OP		
1,1,2-trichloroethane	µg/L		37.6 OP		
Carbon tetrachloride	µg/L		3.6 OP		
PCBs	µg/L		0.000076 OP		
Tetrachloroethylene	µg/L		8 OP		
Trichloroethylene	µg/L		108 OP		
Vinyl chloride	µg/L		144 OP		
Selenium	µg/L		240 OP	600 OP	60 OP
Endosulfan	µg/L		0.072 OP	0.108 OP	0.036 OP
Endrin	µg/L		0.016 OP	0.024 OP	0.008 OP
HCH	µg/L		0.032 OP	0.048 OP	0.016 OP
Acrolein	µg/L	880 OP			
Antimony	µg/L	4800 OP			
bis(2-chloroethoxy) methane	µg/L	17.6 OP			
bis(2-chloroisopropyl) ether	µg/L	4800 OP			
Chlorobenzene	µg/L	2280 OP			
di-n-butyl phthalate	µg/L	14,000 OP			

Parameter	Units	Effluent Limitations			
		AMEL	MDEL	Instantaneous Maximum	6-Month Median
Dichlorobenzenes	µg/L	20,400 OP			
1,1-dichloroethylene	µg/L	3.6 OP			
Diethyl phthalate	µg/L	132,000 OP			
Dimethyl phthalate	µg/L	3,280,000 OP			
4,6-dinitro-2-methylphenol	µg/L	880 OP			
2,4-dinitrophenol	µg/L	16 OP			
Ethylbenzene	µg/L	16,400 OP			
Fluoranthene	µg/L	60 OP			
Hexachlorocyclopentadiene	µg/L	232 OP			
Nitrobenzene	µg/L	19.6 OP			
Thallium	µg/L	8 OP			
Acrylonitrile	µg/L	0.4 OP			
Aldrin	µg/L	0.000088 OP			
Benzene	µg/L	23.6 OP			
Benzidine	µg/L	0.000276 OP			
Beryllium	µg/L	0.132 OP			
Bis(2-chloroethyl) ether	µg/L	0.18 OP			
Bis(2-ethylhexyl) phthalate	µg/L	14 OP			
Chlordane	µg/L	0.000092 OP			
Chloroform	µg/L	520 OP			
DDT	µg/L	0.00068 OP			
3,3-dichlorobenzidine	µg/L	0.0324 OP			
1,2-dichloroethane	µg/L	112 OP			
Dichloromethane	µg/L	1,800 OP			
1,3-dichloropropene	µg/L	35.6 OP			

Parameter	Units	Effluent Limitations			
		AMEL	MDEL	Instantaneous Maximum	6-Month Median
Dieldrin	µg/L	0.00016 OP			
2,4-dinitrotoluene	µg/L	10.4 OP			
1,2-diphenylhydrazine	µg/L	0.64 OP			
Halomethanes	µg/L	520 OP			
Heptachlor	µg/L	0.0002 OP			
Hexachlorobenzene	µg/L	0.00084 OP			
Hexachlorobutadine	µg/L	56 OP			
Hexachloroethane	µg/L	10 OP			
N-nitrosodimethylamine	µg/L	29.2 OP			
N-nitrosodiphenylamine	µg/L	10 OP			
PAHs	µg/L	0.0352 OP			
TCDD equivalents	µg/L	1.56E-08 OP			
Toxaphene	µg/L	0.00084 OP			
2,4,6-trichlorophenol	µg/L	1.16 OP			

Parameter	Units	Effluent Limitations			
		AMEL	AWEL	Instantaneous Maximum	MDEL
Settleable Solids	ml/L	1 OP	1.5 OP	3 OP	
Suspended Solids		75% OP *			
		*Suspended Solids AMEL is 75% removal unless the average monthly influent is 80 mg/L or less, then the effluent limit shall be 60 mg/L. OP			
pH		Within limit of 6.0 and 9.0 at all times. OP			
Toluene		340,000 OP			
Xylene				5 AB	
Total Petroleum Hydrocarbons				500 AB	
Aute Toxicity	TUa				0.3 OP

Parameter	Units	Effluent Limitations			
		AMEL	AWEL	Instantaneous Maximum	MDEL
Chronic Toxicity	TUc				1 [OP]
Turbidity	NTU	75 [OP]	100 [OP]	225 [OP]	

Parameter	Units	Effluent Limitations			
		AMEL	AWEL	Instantaneous Maximum	Shellfish Harvesting
Total Coliform	MPN/ 100 mL	1,000 [OP]		10,000 [OP]	
Total Coliform	MPN/ 100 mL			1,000 [OP] *	
		*Total coliform density shall not exceed 1,000 per 100 mL when the ratio of fecal/total coliform exceeds 0.1 [OP]			
Total Coliform					70 [OP] **
Total Coliform					230 [OP] **
		**The median total coliform density shall not exceed 70 per 100 mL, and not more than 10 percent of the samples shall exceed 230 per 100 mL. [OP]			
Fecal Coliform	MPN/ 100 mL	200 [OP]		400 [OP]	
Enterococcus	MPN/ 100 mL	35 [OP]		104 [OP]	

Parameter	Units	Effluent Limitations				
		AMEL	AWEL	MDEL	Instantaneous Minimum	6-Month Median
Dissolved Oxygen (DO)	mg/L				5.0 [AB]	

[OP] Basis – Ocean Plan 2005
[AB] Basis – Anti-Backsliding, values from the previous permit
[DHS] Basis – Department of Health Services
[CTR] Basis – California Toxics Rule/ State Implementation Plan 2005

4. DISCHARGES TO INLAND SURFACE WATERS

The discharge of groundwater extraction waste to inland surface waters (including Buena Vista Lagoon) shall not contain pollutants in excess of the following effluent limitations:

GENERAL CONSTITUENTS

Constituent	Unit	AMEL	Daily Maximum	Instantaneous Maximum	Basis
Settleable Solids	ml/L	0.1	---	0.2	AB
Total Suspended Solids	mg/L	30	---	50	
Percent Sodium	%	---	---	60	AB
Total Nitrogen	mg/L	1.0		2.0	"
Total Phosphorus	mg/L	0.1		0.2	"
Methylene Blue Active Substances	mg/L	---	---	0.5	"
Turbidity	NTU	Shall not exceed the ambient turbidity of the surface water at any time.			"
Fluoride	mg/L	---	---	1.0	"
Hydrogen Sulfide	µg/L	2	4	10	AB
Total Residual Chlorine (TRC)	µg/L	2	8	10	AB
pH	Units	Within the limits of 6.5 and 8.5 at all times.			AB
Acute Toxicity	TUa	---	---	0.59	AB
Chronic Toxicity	TUc	---	1	---	AB
Dissolved Oxygen	mg/L	Shall not be less than 5.0 at any time in waters with designated warm fresh-water habitat beneficial uses or less than 6.0 in waters with cold fresh water habitat beneficial uses.			AB
Total Coliform	MPN/100mL	---	---	1000	"
Fecal Coliform	MPN/100mL	---	---	200	"

VOLATILES, METALS, PRIORITY POLLUTANTS:

Beneficial Use:	Municipal/Potable Supply			Non-municipal/Non-potable		
		Instantaneous			Instantaneous	
Constituent	Unit	Maximum	Basis	Unit	Maximum	Basis
Dibromochloropropane	µg/L	0.2	DOHS	µg/L	0.2	AB
Ethylene Dibromide	µg/L	0.02	DOHS	µg/L	0.02	AB
Xylene	µg/L	5	AB	µg/L	5	AB
Chlorinated Phenolics	µg/L	1	DOHS	µg/L	10	AB
Remaining Base/Neutral Compounds	µg/L	10	AB	µg/L	10	AB
Total Petroleum Hydrocarbons	mg/L	0.5	"	mg/L	0.5	AB
Iron	mg/L	0.3	"	mg/L	0.3	AB
Manganese	mg/L	0.05	"	mg/L	0.05	AB
MTBE	µg/L	5	DOHS			
126 Priority Pollutants (Including metals)	40 CFR 131.38 - Water Quality Standards; Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California.					See Below

126 Priority Pollutants - 40 CFR 131.38 - Water Quality Standards; Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California.

The effluent limits for eight priority pollutants will be developed on a case-by-case basis because the freshwater criteria are based on site-specific water quality data.

Seven metals are dependent on water hardness, Cadmium, Copper, Chromium (III), Lead, Nickel, Silver, and Zinc [See Table 1 to 40 CFR 131.38(b)(2)], and the "Conversion Factors" for Cadmium and Lead are also water hardness dependent. [See Table 3 of 40 CFR 131.38(b)(2)]

In order to calculate the effluent limits for these seven metals the following equations from 40 CFR 131.38(b)(2) will be needed:

Cd CFa=1.136672-((LN(hardness))*0.041838)
Cd CFc = 1.101672-((LN(hardness))*0.041838)
Pb CFa&c = 1.46203-((LN(hardness))*0.145712)
Criterion=WER*CFx*(exp(mA*LN(hardness)+bA

Pentachlorophenol is dependent on the pH value. [See Footnote "f" to Table in 40 CFR 131.38(b)(1)]

To calculate the effluent limit for Pentachlorophenol use this equation:
CMC = exp(1.005(pH)−4.869). CCC = exp(1.005(pH)−5.134)

The remainder of the criteria is not water quality dependent and the effluent limits can be calculated. However, not all the effluent limits will apply to all sites because of the Beneficial use designation for "Municipal" may not apply to all sites.

These priority pollutant effluent limits were calculated the same way as the effluent limits for the bays and harbors.

Effluent Limitations calculated from CTR and SIP

Effluent Limits for Human Health Municipal and Non-Municipal

		Human Health			
		MUN		NON-MUN	
		AMEL (µg/L)	MDEL (µg/L)	AMEL (µg/L)	MDEL (µg/L)
A					
1	Antimony	14	28	4300	8600
2	Arsenic				
3	Beryllium				
4	Cadmium				
5a	Chromium (III)				

		Human Health			
		MUN		NON-MUN	
		AMEL	MDEL	AMEL	MDEL
		(µg/L)	(µg/L)	(µg/L)	(µg/L)
5b	Chromium (IV)				
6	Copper	1300	2600		
7	Lead				
8	Mercury	0.05	0.1	0.051	0.1
9	Nickel				
10	Selenium				
11	Silver				
12	Thallium				
13	Zinc	700	1400	220000	440000
14	Cyanide	7000000	14000000		
15	Asbestos	1.3E-08	2.6E-08	1.4E-08	2.8E-08
16	2,3,7,8-TCDD (Dioxin)	320	640	780	1600
17	Acrolein	0.059	0.12	0.66	1.3
18	Acrylonitrile	1.2	2.4	71	140
19	Benzene	4.3	8.6	360	720
20	Bromoform	0.25	0.5	4.4	8.8
21	Carbon Tetrachloride	680	1400	21000	42000
22	Chlorobenzene	0.41	0.82	34	68
23	Chlorodibromomethane				
24	Chloroethane				
25	2-Chloroethylvinyl Ether				
26	Chloroform				
27	Dichlorobromomethane	0.56	1.1	46	92
28	1,1-Dichloroethane				
29	1,2-Dichloroethane	0.38	0.76	99	200
30	1,1-Dichloroethylene	0.057	0.11	3.2	6.4
31	1,2-Dichloropropane	0.52	1	39	78
32	1,3-Dichloropropylene	10	20	1700	3400
33	Ethylbenzene	3100	6200	29000	58000
34	Methyl Bromide	48	96	4000	8000
35	Methyl Chloride				
36	Methylene Chloride	4.7	9.4	1600	3200
37	1,1,2,2-Tetrachloroethane	0.17	0.34	11	22

		Human Health			
		MUN		NON-MUN	
		AMEL	MDEL	AMEL	MDEL
		(µg/L)	(µg/L)	(µg/L)	(µg/L)
38	Tetrachloroethylene	0.8	1.6	8.9	18
39	Toluene	6800	14000	200000	400000
40	1,2-Trans-Dichloroethylene	700	1400	140000	280000
41	1,1,1-Trichloroethane				
42	1,1,2-Trichloroethane	0.6	1.2	40	80
43	Trichloroethylene	2.7	5.4	81	160
44	Vinyl Chloride	2	4	530	1100
45	2-Chlorophenol	120	240	400	800
46	2,4-Dichlorophenol	93	190	790	1600
47	2,4-Dimethylphenol	540	1100	2300	4600
48	2-Methyl-4,6-Dinitrophenol	13	27	770	1500
49	2,4-Dinitrophenol	70	140	14000	28000
50	2-Nitrophenol				
51	4-Nitrophenol				
52	3-Methyl-4-Chlorophenol				
53	Pentachlorophenol	0.28	0.56	8.2	16
54	Phenol	21000	42000	4500000	9000000
55	2,4,6-Trichlorophenol	2.1	4.2	6.5	13
56	Acenaphthene	1200	2400	2700	5400
57	Acenaphthylene				
58	Anthracene	9600	19000	110000	220000
59	Benzidine	0.00012	0.00024	0.00054	0.0011
60	Benzo(a)Anthracene	0.0044	0.0088	0.049	0.098
61	Benzo(a)Pyrene	0.0044	0.0088	0.049	0.098
62	Benzo(b)Fluoranthene	0.0044	0.0088	0.049	0.098
63	Benzo(ghi)Perylene				
64	Benzo(k)Fluoranthene	0.0044	0.0088	0.049	0.098
65	Bis(2-Chloroethoxy)Methane				
66	Bis(2-Chloroethyl)Ether	0.031	0.062	1.4	2.8
67	Bis(2-Chloroisopropyl)Ether	1400	2800	170000	340000
68	Bis(2-Ethylhexyl)Phthalate	1.8	3.6	5.9	12
69	4-Bromophenyl Phenyl Ether				
70	Butylbenzyl Phthalate	3000	6000	5200	10000

		Human Health			
		MUN		NON-MUN	
		AMEL	MDEL	AMEL	MDEL
		(µg/L)	(µg/L)	(µg/L)	(µg/L)
71	2-Chloronaphthalene	1700	3400	4300	8600
72	4-Chlorophenyl Phenyl Ether				
73	Chrysene	0.0044	0.0088	0.049	0.098
74	Dibenzo(a,h)Anthracene	0.0044	0.0088	0.049	0.098
75	1,2 Dichlorobenzene	2700	5400	17000	34000
76	1,3 Dichlorobenzene	400	800	2600	5200
77	1,4 Dichlorobenzene	400	800	2600	5200
78	3,3'-Dichlorobenzidine	0.04	0.08	0.077	0.15
79	Diethyl Phthalate	23000	46000	120000	240000
80	Dimethyl Phthalate	310000	630000	2900000	5800000
81	Di-n-Butyl Phthalate	2700	5400	12000	24000
82	2,4-Dinitrotoluene	0.11	0.22	9.1	18
83	2,6-Dinitrotoluene				
84	Di-nOctyl Phthalate				
85	1,2-Diphenylhydrazine	0.04	0.08	0.54	1.1
86	Fluoranthene	300	600	370	740
87	Fluorene	1300	2600	14000	28000
88	Hexachlorobenzene	0.00075	0.0015	0.00077	0.0015
89	Hexachlorobutadiene	0.44	0.88	50	100
90	Hexachlorocyclopentadiene	240	480	17000	34000
91	Hexachloroethane	1.9	3.8	8.9	18
92	Inden(1,2,3-cd) Pyrene	0.0044	0.0088	0.049	0.098
93	Isophorone	8.4	17	600	1200
94	Naphthalene				
95	Nitrobenzene	17	34	1900	3800
96	N-Nitrosodimethylamine	0.00059	0.0012	8.1	16
97	N-Nitrosodi-n-Propylamine	0.005	0.01	1.4	2.8
98	N-Nitrosodiphenylamine	5	10	16	32
99	Phenanthrene				
100	Pyrene	960	1900	11000	22000
101	1,2,4-Trichlorobenzene				
102	Aldrin	0.00013	0.00026	0.00014	0.00028
103	alpha-BHC	0.0039	0.0078	0.013	0.026

		Human Health			
		MUN		NON-MUN	
		AMEL (µg/L)	MDEL (µg/L)	AMEL (µg/L)	MDEL (µg/L)
104	beta-BHC	0.014	0.028	0.046	0.092
105	gamma-BHC	0.019	0.038	0.063	0.13
106	delta-BHC				
107	Chlordane	0.00057	0.0011	0.00059	0.0012
108	4,4'-DDT	0.00059	0.0012	0.00059	0.0012
109	4,4'-DDE	0.00059	0.0012	0.00059	0.0012
110	4,4'-DDD	0.00083	0.0017	0.00084	0.0017
111	Dieldrin	0.00014	0.00028	0.00014	0.00028
112	alpha-Endosulfan	110	220	240	480
113	beta-Endosulfan	110	220	240	480
114	Endosulfan Sulfate	110	220	240	480
115	Endrin	0.76	1.5	0.81	1.6
116	Endrin Aldehyde	0.76	1.5	0.81	1.6
117	Heptachlor	0.00021	0.00042	0.00021	0.00042
118	Heptachlor Epoxide	0.0001	0.0002	0.00011	0.00022
119	Polychlorinated biphenyls (PCBs)	0.00017	0.00034	0.00017	0.00034
120	"				
121	"				
122	"				
123	"				
124	"				
125	"				
126	Toxaphene	0.00073	0.0015	0.00075	0.0015

Effluent Limits for Freshwater and Saltwater

		Freshwater		Saltwater	
		MDEL (µg/L)	AMEL (µg/L)	MDEL (µg/L)	AMEL (µg/L)
A					
1	Antimony				
2	Arsenic	250	120	59	29
3	Beryllium				
4	Cadmium	*	*	16	8
5a	Chromium (III)	*	*		
5b	Chromium (IV)	16	8.1	83	41
6	Copper	*	*	5.8	2.9
7	Lead	*	*	14	7
8	Mercury				
9	Nickel	*	*	14	6.8
10	Selenium	8.2	4.1	120	58
11	Silver	*	*	2.2	1.1
12	Thallium				
13	Zinc	*	*	95	47
14	Cyanide	8.5	4.2	1	0.5
15	Asbestos				
16	2,3,7,8-TCDD (Dioxin)				
17	Acrolein				
18	Acrylonitrile				
19	Benzene				
20	Bromoform				
21	Carbon Tetrachloride				
22	Chlorobenzene				
23	Chlorodibromomethane				
24	Chloroethane				
25	2-Chloroethylvinyl Ether				
26	Chloroform				
27	Dichlorobromomethane				
28	1,1-Dichloroethane				
29	1,2-Dichloroethane				
30	1,1-Dichloroethylene				

		Freshwater		Saltwater	
		MDEL (µg/L)	AMEL (µg/L)	MDEL (µg/L)	AMEL (µg/L)
31	1,2-Dichloropropane				
32	1,3-Dichloropropylene				
33	Ethylbenzene				
34	Methyl Bromide				
35	Methyl Chloride				
36	Methylene Chloride				
37	1,1,2,2-Tetrachloroethane				
38	Tetrachloroethylene				
39	Toluene				
40	1,2-Trans-Dichloroethylene				
41	1,1,1-Trichloroethane				
42	1,1,2-Trichloroethane				
43	Trichloroethylene				
44	Vinyl Chloride				
45	2-Chlorophenol				
46	2,4-Dichlorophenol				
47	2,4-Dimethylphenol				
48	2-Methyl-4,6-Dinitrophenol				
49	2,4-Dinitrophenol				
50	2-Nitrophenol				
51	4-Nitrophenol				
52	3-Methyl-4-Chlorophenol				
53	Pentachlorophenol	**	**	13	6.5
54	Phenol				
55	2,4,6-Trichlorophenol				
56	Acenaphthene				
57	Acenaphthylene				
58	Anthracene				
59	Benzidine				
60	Benzo(a)Anthracene				
61	Benzo(a)Pyrene				
62	Benzo(b)Fluoranthene				
63	Benzo(ghi)Perylene				
64	Benzo(k)Fluoranthene				

		Freshwater		Saltwater	
		MDEL (µg/L)	AMEL (µg/L)	MDEL (µg/L)	AMEL (µg/L)
65	Bis(2-Chloroethoxy)Methane				
66	Bis(2-Chloroethyl)Ether				
67	Bis(2-Chloroisopropyl)Ether				
68	Bis(2-Ethylhexyl)Phthalate				
69	4-Bromophenyl Phenyl Ether				
70	Butylbenzyl Phthalate				
71	2-Chloronaphthalene				
72	4-Chlorophenyl Phenyl Ether				
73	Chrysene				
74	Dibenzo(a,h)Anthracene				
75	1,2 Dichlorobenzene				
76	1,3 Dichlorobenzene				
77	1,4 Dichlorobenzene				
78	3,3'-Dichlorobenzidine				
79	Diethyl Phthalate				
80	Dimethyl Phthalate				
81	Di-n-Butyl Phthalate				
82	2,4-Dinitrotoluene				
83	2,6-Dinitrotoluene				
84	Di-nOctyl Phthalate				
85	1,2-Diphenylhydrazine				
86	Fluoranthene				
87	Fluorene				
88	Hexachlorobenzene				
89	Hexachlorobutadiene				
90	Hexachlorocyclopentadiene				
91	Hexachloroethane				
92	Inden(1,2,3-cd) Pyrene				
93	Isophorone				
94	Naphthalene				
95	Nitrobenzene				
96	N-Nitrosodimethylamine				
97	N-Nitrosodi-n-Propylamine				
98	N-Nitrosodiphenylamine				

		Freshwater		Saltwater	
		MDEL (µg/L)	AMEL (µg/L)	MDEL (µg/L)	AMEL (µg/L)
99	Phenanthrene				
100	Pyrene				
101	1,2,4-Trichlorobenzene				
102	Aldrin	3	1.5	1.3	0.65
103	alpha-BHC				
104	beta-BHC				
105	gamma-BHC	0.95	0.47	0.16	0.08
106	delta-BHC				
107	Chlordane	0.007	0.0035	0.0066	0.0033
108	4,4'-DDT	0.0016	0.00082	0.0016	0.00082
109	4,4'-DDE				
110	4,4'-DDD				
111	Dieldrin	0.092	0.046	0.0031	0.0016
112	alpha-Endosulfan	0.092	0.046	0.014	0.0071
113	beta-Endosulfan	0.092	0.046	0.014	0.0071
114	Endosulfan Sulfate				
115	Endrin	0.059	0.029	0.0038	0.0019
116	Endrin Aldehyde				
117	Heptachlor	0.0062	0.0031	0.0059	0.0029
118	Heptachlor Epoxide	0.0062	0.0031	0.0059	0.0029
119	Polychlorinated biphenyls (PCBs)	0.023	0.011	0.049	0.025
120	"				
121	"				
122	"				
123	"				
124	"				
125	"				
126	Toxaphene	0.00033	0.00016	0.00033	0.00016

* Use equations from 40 CFR 131.38(b)(2)
** Use equations from 40 CFR 131.38(b)(1) footnote "f"

5. Groundwater extraction waste discharged to surface waters must be essentially free of:

   a. Material that is floatable or will become floatable upon discharge.

   b. Settleable material or substances that form sediments which degrade[23] benthic communities or other aquatic life.

   c. Substances which will accumulate to toxic levels in aquatic sediments or biota.

   d. Substances that significantly[24] decrease the natural light to benthic communities and other aquatic life.

   e. Materials that result in aesthetically undesirable discoloration of surface waters.

6. Groundwater extraction waste discharged to surface waters shall not cause natural water quality conditions to be altered in areas designated as being of special biological significance or areas that existing marine laboratories use as a source of seawater.

7. Groundwater extraction waste discharged to surface waters shall be discharged in such a manner as to provide maximum protection to aquatic environments.

8. Groundwater extraction waste that contains pathogenic organisms or viruses shall be discharged a sufficient distance from shellfishing and water-contact sports areas to maintain applicable bacterial standards without disinfection. Where conditions are such that an adequate distance cannot be attained, reliable disinfection in conjunction with a reasonable separation of the discharge point from the area must be provided. Disinfection procedures that do not increase effluent toxicity and that constitute the least environmental and human hazard shall be used.

9. The Enrollee shall comply with all items of the " 40 CFR Standard Provisions References" that are part of this Order (Attachment B).

IV. Rationale for Receiving Water Limitations

A. Surface Water

Receiving Water Limitations are based upon water quality objectives contained in the Basin Plan. The discharge of groundwater extraction waste from any site shall not, separately or jointly with any other discharge, cause violations of the following water quality objectives in the surface waters of the San Diego Region.

1. Bacterial Characteristics

a. Water-Contact Standards

Within a zone bounded by the shoreline and a distance of 1,000 feet from the shoreline or the 30-foot depth contour, whichever is further from the shoreline, and in areas outside this zone used for water-contact sports, as determined by the Regional Board, the following bacterial objectives shall be maintained throughout the water column:

(1) Samples of water from each sampling station shall have a density of total coliform organisms less than 1,000 per 100 ml (10 per ml); provided that not more than 20 percent of the samples at any sampling station, in any 30-day period, may exceed 1,000 per 100 ml (10 per ml), and provided further that no single sample when verified by a repeat sample taken within 48 hours shall exceed 10,000 per 100 ml (100 per ml).

(2) The fecal coliform density based on a minimum of not less than five samples for any 30-day period shall not exceed a geometric mean of 200 per 100 ml nor shall more than 10 percent of the total samples during any 60-day period exceed 400 per 100 ml.

b. Shellfish Harvesting Standards

At all areas where shellfish may be harvested for human consumption, as determined by the Regional Board, the following bacterial objectives shall be maintained throughout the water column:

1) The median total coliform density shall not exceed 70 per 100 ml; and

2) Not more than 10 percent of the samples shall exceed 230 per 100 ml.

2. Physical Characteristics

a. Floating particulates and grease and oil shall not be visible.

b. The discharge of waste shall not cause aesthetically undesirable discoloration of the surface waters.

c. Natural light shall not be significantly reduced.

d. The rate of deposition of solids and the characteristics of inert solids in the sediments shall not be changed such that benthic communities are degraded.

3. Chemical Characteristics

a. The dissolved oxygen concentration shall not at any time be depressed more than 10 percent from that which occurs naturally, as a result of the discharge of oxygen demanding waste materials.

b. The pH shall not be changed at any time more than 0.2 units from that which occurs naturally.

c. The dissolved sulfide concentration of waters in and near sediments shall not be significantly increased above that present under natural conditions.
d. The concentration of substances set forth in the Discharge Specifications in marine sediments shall not be increased to levels which would degrade indigenous biota.
e. The concentration of organic materials in the sediments shall not be increased to levels which would degrade marine life.
f. Nutrient materials shall not cause objectionable aquatic growth or degrade indigenous biota.

4. Biological Characteristics

a. Marine communities, including vertebrate, invertebrate, and plant species, shall not be degraded.
b. The natural taste, odor, and color of fish, shellfish, or other aquatic resources used for human consumption shall not be altered.
c. The concentration of organic materials in fish, shellfish or other aquatic resources used for human consumption shall not bioaccumulate to levels that are harmful to human health.

5. Radioactivity

Discharge of radioactive waste shall not degrade marine life.

6. Toxic Materials Limitations

Since there is no dilution, toxic materials limits are the same as the effluent limits.

V. Rationale for Monitoring and Reporting Requirements

Section 122.48 of 40 CFR requires all NPDES permits to specify recording and reporting of monitoring results. Sections 13267 and 13383 of the CWC authorize the Regional Board to require technical and monitoring reports. The MRP, Attachment E of this WDR, establishes monitoring and reporting requirements to implement federal and state requirements. The following provides the rationale for the monitoring and reporting requirements contained in the MRP for this permit.

A. Influent Monitoring (Not applicable)

B. Effluent Monitoring

In reviewing the monitoring reports, the State Board found that although Dischargers were reporting Total Petroleum Hydorcarbons (TPH), a distinction between diesel and gasoline was not always made. Results for TPH should be reported as total TPH, TPH diesel (TPH-d), and TPH gasoline (TPH-g). Also, for detections of TPH-g, the amount of benzene, ethylbenzene, toluene, and xylene

should be reported. Benzene, ethylbenzene, and toluene are priority pollutants. (40 CFR § 131).

C. Whole Effluent Toxicity (WET) Testing Requirements

A WET Limit is required if a discharge causes, has a reasonable potential to cause, or contributes to an exceedance of applicable water quality standards, including numeric and narrative. Since these types of discharges are prohibited under this WDR, WET limits are not applicable.

D. Receiving Water Monitoring

States are required to adopt numeric criteria where they are necessary to protect designated uses. (CWA §§ 303(a) – 303(c)). The Regional Board adopted numeric criteria in the Basin Plan. The Basin Plan is a regulatory reference for meeting the State and Federal requirements for water quality control. (40 CFR 131.20). State Board Resolution 68-16, the Antidegradation Policy, does not allow changes in water quality less than that prescribed in Water Quality Control Plans (Basin Plans). The Basin Plan states that; "The numerical and narrative water quality objectives define the least stringent standards that the Regional Water Board will apply to regional waters in order to protect the beneficial uses." This WDR contains Receiving Water Limitations based on the Basin Plan numerical and narrative water quality objectives for Biostimulatory Substances, Chemical Constituents, Color, Dissolved Oxygen, Floating Material, Oil and Grease, pH, Pesticides, Radioactivity, Salinity, Sediment, Settleable Material, Suspended Material, Tastes and Odors, Temperature, Toxicity and Turbidity.

Section 13267 of the California Water Code states, in part,

> (a) A regional board, in establishing … waste discharge requirements … may investigate the quality of any waters of the state within its region" and "(b) (1) In conducting an investigation … the regional board may require that any person who … discharges … waste … that could affect the quality of waters within its region shall furnish, under penalty of perjury, technical or monitoring program reports which the regional board requires. The burden, including costs, of these reports shall bear a reasonable relationship to the need for the report and the benefits to be obtained from the reports.

The attached Monitoring and Reporting Program is issued pursuant to CWC section 13267. The groundwater extraction waste discharge monitoring and reporting program required by this WDR and the attached Monitoring and Reporting Program are necessary to determine compliance with these waste discharge requirements. The Discharger is responsible for the discharges of waste at the facility subject to this WDR.

E. Other Monitoring Requirements (Not Applicable)

VI. Rationale for Provisions

A. Standard Provisions

Standard Provisions, which in accordance with 40 CFR sections 122.41and 122.42, apply to all NPDES discharges and must be included in every NPDES permit, are provided in Attachment D.

B. Special Provisions

1. Reopener Provisions (Not Applicable)

2. Special Studies and Additional Monitoring Requirements (Not Applicable)

3. Best Management Practices and Pollution Prevention Plan (Not Applicable)

4. Compliance Schedules (Not Applicable)

5. Construction, Operation, and Maintenance Specifications (Not Applicable)

6. Special Provisions for Municipal Facilities (POTWs Only) (Not Applicable)

7. Other Special Provisions

The Dischargers shall dispose of solids removed from liquid wastes in a manner that is consistent with Title 27 of the CCR and approved by the Regional Board.

VII. Public Participation

In considering the re-issuance and adoption of this WDR the Regional Board has developed a draft WDR. The Regional Board encouraged public participation in the WDR adoption process.

A. Notification of Interested Parties

The Regional Board notified interested agencies and persons of its intent to prescribe waste discharge requirements in this WDR and provided them with an opportunity to submit their written comments and recommendations. Notification was posted on the Regional Board's webpage on February 5, 2008, and published in the San Diego Union Tribune, The Riverside Press-Enterprise, and The Orange County Register newspapers on February 8, 2008. On March 12, 2008, the Regional Board sent out notification through the Regional Board Agenda by an electronic mail list.

B. Written Comments

Interested persons were invited to submit written comments concerning the tentative WDR. Comments were to be submitted in person, by fax, email, or mail to the Executive Officer at the Regional Board at the address on the cover page of this Permit.

To be fully addressed and considered by the Regional Board, written comments must have been received at the Regional Board office by 5 p.m. on March 5, 2008.

C. Public Hearing

The Regional Board held a public hearing on the tentative WDR during its regular meeting on the following date and at the following location:

Date: **March 12, 2008**
Location: **California Regional Water Quality Control Board**
San Diego Region
Regional Board Meeting Room
9174 Sky Park Court, Suite 100
San Diego, California 92123

Interested persons were invited to attend. At the public hearing, the Regional Board heard testimony pertinent to the discharge and WDR.

D. Information and Copying

WDR-related documents, tentative effluent limitations and special provisions, comments received, and other information are on file and may be inspected at the address above at any time between 8:30 a.m. and 4:45 p.m., Monday through Friday. A partial list of these items are on the Regional Board's web site at: www.waterboards.ca.gov/sandiego

Copying of documents may be arranged through the Regional Board by calling (858) 467-2952.

E. Register of Interested Persons

Any person interested in being placed on the mailing list for information regarding the WDR was invited to contact the Regional Board, reference this WDR, and provide a name, address, and telephone number.

F. Additional Information

Requests for additional information or questions regarding this WDR may be directed to Vicente Rodriguez at (858) 627-3940 or at: VRodriguez@waterboards.ca.gov

This WDR will expire on March 12, 2012. Enrollees covered under this WDR at the time of expiration will be required to re-enroll under the reissued permit.

California Regional Water Quality Control Board

San Diego Region

Over 50 Years Serving San Diego, Orange, and Riverside Counties

Recipient of the 2004 Environmental Award for Outstanding Achievement from USEPA

Linda S. Adams
Secretary for Environmental Protection

Arnold Schwarzenegger
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http:// www.waterboards.ca.gov/sandiego

April 6, 2010

CERTIFIED MAIL – RETURN RECEIPT REQUESTED
7009 1410 0002 2347 4206

Ms. Grace Pina-Garrett, NPDES Stormwater Coordinator
California Dept. of Transportation (CALTRANS)
District 12
3347 Michelson Drive, Suite 100
Irvine, CA 92612-1692

In reply refer to:
CIWQS Place No. 750987: WGhoram
WDID No. 9 00000 2047

Dear Ms. Pina-Garrett:

SUBJECT: ENROLLMENT UNDER ORDER NO. R9-2008-0002; NPDES NO. CAG919002; GENERAL WASTE DISCHARGE REQUIREMENTS FOR DISCHARGES FROM GROUNDWATER EXTRACTION AND SIMILAR DISCHARGES TO SURFACE WATERS WITHIN THE SAN DIEGO REGION EXCEPT FOR SAN DIEGO BAY (WDR)

FACILITY: VARIOUS CALTRANS DISTRICT 12 CONSTRUCTION GROUNDWATER DEWATERING PROJECTS WITHIN THE SAN DIEGO REGION, TO SURFACE WATERS WITHIN THE SAN DIEGO REGION EXCEPT FOR SAN DIEGO BAY

This letter acknowledges receipt of your permit application (Form 200 and attachments) dated September 15, 2009, and subsequent submittals, submitted pursuant to Order No. R9-2008-0002 (NPDES Permit No. CAG919002), and received on September 21, 2009 and March 23, 2010 respectively.

Caltrans District 12 proposes multiple discharges of groundwater to surface waters throughout the San Diego Region as part of its ongoing construction project schedule (list attached). Some of these projects will include the need to pump (extract) groundwater and discharge the groundwater to surface waters where the extracted groundwater cannot be used for dust control or compaction due to excess volume or during the rainy season.

This letter specifies the general pre-discharge and discharge requirements for future proposed temporary discharges of extracted and/or treated groundwater of less than 100,000 gallons per day (GPD) to surface waters located within the San Diego Region. It is our understanding that the expected duration of groundwater discharges will vary from project to project.

Discharges of extracted groundwater of greater than 100,000 GPD are not covered under this enrollment, and for those larger flows, a separate individual application (NOI and Form 200) for enrollment shall be submitted for individual enrollment under Order NO. R9-2008-0002.

This general notice of enrollment to discharge under the terms and conditions of Order No. R9-2008-0002, NPDES Permit No. CAG0919002, is based on the following information that has been submitted by Caltrans:

1. Application (Form 200 and attachments)
2. List of proposed projects, planned start dates and completion dates, through December 31, 2012. (Attached)
3. Names of surface waters for projects anticipated to encounter groundwater. (List Attached)

PRE-DISCHARGE INFORMATION SUBMITTAL REQUIREMENTS

At least 30 days prior to the initiation of each discharge, submit the following in writing along with a completed and signed Notice of Intent (NOI):

1. Name and address of the construction project that may require groundwater extraction and discharge.
2. Map(s) depicting the location of the construction project and all of the groundwater extraction points.
3. Name of receiving water for the construction project.
4. Updated scheduled start date for the construction project.
5. Estimated duration of the construction project.
6. Estimated maximum groundwater discharge flow rate for the construction project.
7. Number of extraction/pumping points at the construction project.
8. Distance between each extraction/pumping point at the construction project.
9. A copy of a general agreement with local municipalities allowing discharge to their storm drain system.

PRE-DISCHARGE TESTING AND CERTIFICATION REQUIREMENTS

Pumped groundwater shall be placed in a tank and tested for certain constituents listed in Order No. R9-2008-0002 (General constituents, volatiles, metals and acute toxicity). 126 Priority Pollutants do not need to be tested.

Chronic Toxicity is also exempt from testing if pumping occurs for less than 30 days.

Projects encountering groundwater may proceed as long as no discharge to surface waters occurs until after groundwater is tested and Caltrans certifies that the discharge meets all effluent limitations, and will not cause water quality objectives to be exceeded.

Your enrollment is based on your signed certification and the application for waste discharge requirements.

The maximum permitted volume of groundwater (in gallons per day) will be the volume that is specified in the Notice of Intent (NOI) that is submitted 30 days prior to the project start, unless the Executive Officer specifies otherwise, and shall not exceed 100,000 gallons per day.

The groundwater quality monitoring will vary from project to project but will be required to meet the Effluent Limitation/Discharge Specifications in Order No. R9-2008-0002 (*Discharge Specification V.A.1, V.A.2, V.A.3, or V.A.4)* depending on the type of surface water. It is our understanding that in cases where the extracted groundwater does not meet the effluent limitations, treatment system(s) will be installed in order to reduce the concentration of the constituents of concern and to meet the permit requirements. A detailed description of the treatment system and certification that the treated effluent will comply with the effluent limitations specified in Order No. R9-2008-0002, for each project proposing treatment, is required in accordance with Order No. R9-2008-0002.

DISCHARGE MONITORING REQUIREMENTS

You are required to monitor the discharge and submit monitoring reports as specified in Monitoring and Reporting Program R9-2008-0002, Sections IV.E.4. Groundwater Discharge Monitoring for short term (duration of 6 months or less at a particular groundwater extraction site) discharges in Rural Areas, or, IV. E.5. Groundwater Discharge Monitoring for short term (duration of 6 months or less at a particular groundwater extraction site) discharges in Urban Areas, whichever is applicable. The reporting frequency includes monthly, quarterly, and semi-annual monitoring reports. In addition, add monthly monitoring and reporting for any constituents present that are not listed in the Monitoring and Reporting Program.

Receiving water monitoring for turbidity and pH shall be conducted 100 feet upstream and 100 feet downstream of the discharge point on a daily basis and begin within 24 hours of commencement of discharge.

All reports must be signed and certified pursuant to Attachment D - *V. Standard Provisions – Reporting, B. Signatory and Certification Requirements* of Order No. R9-2008-0002.

All extracted groundwater that does not meet any one or more of the numerical limitations contained in *Discharge Specifications* of the Order will require additional treatment to remove contaminants prior to discharge to a surface water. Alternatively, effluent containing constituents in excess of the effluent limitations established in Order No. R9-2008-0002 may be discharged to the sanitary sewer system (with the local municipality's permission) or hauled away for proper disposal by a certified waste-hauler.

The California Water Code includes provisions for a variety of enforcement actions for violations of the terms and conditions of Order No. R9-2008-0002, the California Water Code, and the Clean Water Act. Violations of Order No. R9-2008-0002 may subject you to further enforcement including Cleanup and Abatement Orders, Cease and Desist Orders, Administrative Assessment of Liability, and/or termination of your enrollment under Order No. R9-2008-0002. Liability could be administratively imposed to a maximum of $10,000 per violation plus $10 per gallon of waste discharged. After an initial violation of the terms and conditions of the Order is discovered, prevention of further violations is necessary to prevent further enforcement actions.

Pursuant to the California Water Code (CWC) Sections 13385 (h) and (I), violations of effluent limitations, contained in NPDES permits are subject to Mandatory Minimum Penalties (MMP) of $3,000 for each serious violation or for the 4th and each subsequent non-serious violation in a six month period.

The applicable annual fee for Caltrans' enrollment shall be based on Category 2 NPDES General Permit Enrollees: $ 4,210.80 per year ($ 3,480. + $ 730.80. surcharge).

When the groundwater extraction discharge at a specific project is terminated, you are required to submit a letter notifying this office of the completion of the project, and the termination date of the discharge.

Due to the potential for changes (additions and subtractions) of planned projects, updated project lists will be required. Update the list of planned projects for the next

Fiscal Year on an annual basis, and submit the updated list by March 30th of each year. The first updated list covering projects planned for Fiscal Year July 2011 through June 2012 shall be submitted by March 30, 2011.

The heading portion of this letter includes a San Diego Water Board code number noted after "In reply refer to:" In order to assist us in the processing of your correspondence please include this code number in the heading or subject line portion of all correspondence and reports to the San Diego Water Board pertaining to this matter.

If you have any questions regarding this letter or the discharge requirements, please contact Ms. Whitney Ghoram by e-mail at *WGhoram@waterboards.ca.gov* or by phone at (858) 467-2967.

Respectfully,

DAVID W. GIBSON
Executive Officer

Attachment: Caltrans District 12 List of Construction Projects

Order No. R9-2008-0002
NPDES No. CAG919002
WDID No. 9 00000 2047
File No. 14- 2047.01
CIWQS Place: 750987
Party: 7578
Regulatory Measure: 373549

Cc: Mr. Ken Greenberg, CWA, Compliance Office (WTR-7), USEPA, Region IX, 75 Hawthorne Street, San Francisco, CA 94105

County of San Diego, Storm Water Compliance and Enforcement, Department of Public Works, 5555 Overland Avenue, San Diego, CA 92123

Mr. Grant C. Sharp, County Storm Water Program Manager, Orange County Public Works, 2301 N. Glassell Street, Orange, CA 92865-2773

Mr. Roger L. Miller, Senior Environmental Compliance Inspector, County of Riverside, 4080 Lemon Street, 12th Floor, Riverside, CA 92501

File: 14-2047.01 & 02
DWG: dtb:bdk:wjg
S\CoreRegulatoryUnit\Ghoram\EnrollmentLetter-CaltransDist-12-VariousGW-DewateringPrjts-April 6-2010

	Project Location					Project Description[1],[2]	Water Bodies Within or Adjacent to Project	Dredge and Fill Activities (Y/N/	Disturbed Land Area (acres)	Treatment Control Status Type,	Anticipated Project Delivery Schedule		Construction Period	
EA	Co	Route	Begin PM	End PM	Regional Board						PA&ED Date	PS&E Date	Start Date	End Date
"04322"	ORA	74	13.3	16.6	San Diego	Plant establishment/ environmental mitigation	San Juan Creek	N	< 1.0 Acres	E	02/14/2006	06/01/2009	05/01/2010	02/01/2016
"08691"	ORA	74	1.9	3	San Diego	Widen from 2 lanes to 4 lanes	San Juan Creek	Y	> 1.0 Acres	BS	04/01/2008	06/01/2008	01/30/2009	01/01/2011
"08692"	ORA	74	1	1.9	San Diego	Widen from 2 lanes to 4 lanes	San Juan Creek	Y	> 1.0 Acres	BS	11/30/2009	05/01/2012	02/01/2013	02/01/2015
"0E070"	ORA	5	15.1	16.4	San Diego	Widen freeway and overhead	Oso Creek	N	> 1.0 Acres	BS	07/25/2005	08/01/2007	07/29/2008	05/01/2012
0A040	ORA	133	3.4	4	San Diego	Roadway widening	Laguna Canyon Channel	N	> 1.0 Acres	C	02/23/2007		11/01/2010	07/01/2011
0E310	ORA	74	0	1.6	San Diego	Reconstruct IC at SR-74	San Juan Creek	Y	> 1.0 Acres	BS	06/01/2009	12/01/2011	09/01/2012	11/01/2014
0E570	ORA	5	8.5	9.4	San Diego	Construct aux lane and widen SB off-ramp, ramp intersection and Camino Capistrano Frontage Road	San Juan Creek	Y	> 1.0 Acres	C	04/17/2006	07/02/2009	08/01/2010	01/01/2014
0F060	ORA	5	5.6	6.6	San Diego	Widen S/B off-ramp and bridge OC @ Camino De Estrella	San Juan Creek	N	2.6 Acres	C	01/29/2008	08/01/2010	05/01/2011	05/01/2013
0G013	ORA	73	15	23	San Diego	SJH NB widening. adds a fourth NB lane	Sand Canyon Channel, San Diego Creek	Y	35 Acres	C	07/02/2008	07/01/2008	10/01/2008	02/01/2010
0G930	ORA	5	5.1	5.4	San Diego	Construct two sound walls (1,805 LF)	Prima Deshecha, San Juan Creek	N	> 1.0 Acres	E	12/15/2004	03/11/2009	10/01/2010	12/01/2012
0G940	ORA	5	1.2	1.7	San Diego	Construct two sound walls (660 LF)	Segunda Deshecha channel	N	> 1.0 Acres	E	08/05/2004	01/22/2009	10/01/2010	04/01/2012
0H021	ORA	5	16.5	16.7	San Diego	Modify ramp/IC	Aliso Creek	N	> 1.0 Acres	E	04/02/2008		07/01/2010	07/01/2011
0H232	ORA	5	6.1	0	San Diego	Install CMS at various freeway IC	Prima Deshecha, Segunda Deshecha	N	> 1.0 Acres	E	08/29/2007	03/01/2010	01/01/2011	03/01/2012
0H440	ORA	73	10	24.5	San Diego	Stormwater mitigation and slope stability	Aliso Creek, Laguna Canyon Channel, Sand Canyon Channel, San Diego	N	> 1.0 Acres	E	02/01/2009	09/01/2011	10/01/2012	10/01/2016
0H860	ORA	5	13.7	13.7	San Diego	Modify ramps/ICs	Oso Creek	N	> 1.0 Acres	E	07/02/2008		11/01/2010	11/01/2011
0L280	ORA	5	8.8	0	San Diego	Widening of San Juan Creek Rd.	San Juan Creek	N	> 1.0 Acres	E	12/01/2010		10/01/2012	10/01/2013

MEMORANDUM

To: Scott Shelley, Associate Enviro. Planner
Environmental Planning Branch A

Date: March 28, 2012

From: Arianne Preite, District Biologist
Environmental Planning Branch C

File: 12-ORA-5/74
Interchange Improvements

Subject: Memo to File

The existing Preliminary Jurisdictional Determination regarding presence of geographic jurisdiction (Department of the Army, December 5, 2011) is valid for the 5/74 interchange improvement project. The permit does not have to be re-authorized by the Army Corps since the project is currently under contract for hazardous waste investigation. This was verified by Stephanie J Hall, US Army Corps of Engineers Regulatory and Caltrans HQ Rebecca Loeffler (3/5/12). In addition, this was verified by Stephanie J Hall via email on 3/28/12. To summarize, the permit issued to our district on December 5, 2011, may be "grandfathered" due to the on-going hazardous waste investigation (currently under task order), which qualifies as "under contract", with this extending the existing nationwide permit (issued December 5, 2011) for one year.

Nationwide Permit Summary

U S Army Corps of Engineers
Sacramento District

33 CFR Part 330; Issuance of Nationwide Permits – March 19, 2007 includes corrections of May 8, 2007 and addition of regional conditions December 2007

14. Linear Transportation Projects. Activities required for the construction, expansion, modification, or improvement of linear transportation projects (e.g., roads, highways, railways, trails, airport runways, and taxiways) in waters of the United States. For linear transportation projects in non-tidal waters, the discharge cannot cause the loss of greater than 1/2-acre of waters of the United States. For linear transportation projects in tidal waters, the discharge cannot cause the loss of greater than 1/3-acre of waters of the United States. Any stream channel modification, including bank stabilization, is limited to the minimum necessary to construct or protect the linear transportation project; such modifications must be in the immediate vicinity of the project.

This NWP also authorizes temporary structures, fills, and work necessary to construct the linear transportation project. Appropriate measures must be taken to maintain normal downstream flows and minimize flooding to the maximum extent practicable, when temporary structures, work, and discharges, including cofferdams, are necessary for construction activities, access fills, or dewatering of construction sites. Temporary fills must consist of materials, and be placed in a manner, that will not be eroded by expected high flows. Temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The areas affected by temporary fills must be revegetated, as appropriate.

This NWP cannot be used to authorize non-linear features commonly associated with transportation projects, such as vehicle maintenance or storage buildings, parking lots, train stations, or aircraft hangars.

Notification: The permittee must submit a pre-construction notification to the district engineer prior to commencing the activity if: (1) the loss of waters of the United States exceeds 1/10 acre; or (2) there is a discharge in a special aquatic site, including wetlands. (See general condition 27.) (Sections 10 and 404)

Note: Some discharges for the construction of farm roads or forest roads, or temporary roads for moving mining equipment, may qualify for an exemption under Section 404(f) of the Clean Water Act (see 33 CFR 323.4)

A. Nationwide Permit General Conditions

Note: To qualify for NWP authorization, the prospective permittee must comply with the following general conditions, as appropriate, in addition to any regional or case-specific conditions imposed by the division engineer or district engineer. Prospective permittees should contact the appropriate Corps district office to determine if regional conditions have been imposed on an NWP. Prospective permittees should also contact the appropriate Corps district office to determine the status of Clean Water Act Section 401 water quality certification and/or Coastal Zone Management Act consistency for an NWP.

☒ **1. Navigation.**

☒ (a) No activity may cause more than a minimal adverse effect on navigation.

☒ (b) Any safety lights and signals prescribed by the U.S. Coast Guard, through regulations or otherwise, must be installed and maintained at the permittee's expense on authorized facilities in navigable waters of the United States.

☒ (c) The permittee understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from the Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.

☒ **2. Aquatic Life Movements.** No activity may substantially disrupt the necessary life cycle movements of those species of aquatic life indigenous to the waterbody, including those species that normally migrate through the area, unless the activity's primary purpose is to impound water. Culverts placed in streams must be installed to maintain low flow conditions.

☒ **3 Spawning Areas.** Activities in spawning areas during spawning seasons must be avoided to the maximum extent practicable. Activities that result in the physical destruction (e.g., through excavation, fill, or downstream smothering by substantial turbidity) of an important spawning area are not authorized.

☒ **4. Migratory Bird Breeding Areas.** Activities in waters of the United States that serve as breeding areas for migratory birds must be avoided to the maximum extent practicable.

☒ **5. Shellfish Beds.** No activity may occur in areas of concentrated shellfish populations, unless the activity is directly related to a shellfish harvesting activity authorized by NWPs 4 and 48.

☒ **6. Suitable Material.** No activity may use unsuitable material (e.g., trash, debris, car bodies, asphalt, etc.). Material used for construction or discharged must be free from toxic pollutants in toxic amounts (see Section 307 of the Clean Water Act).

☒ **7. Water Supply Intakes.** No activity may occur in the proximity of a public water supply intake, except where the activity is for the repair or improvement of public water supply intake structures or adjacent bank stabilization.

☒ **8. Adverse Effects From Impoundments.** If the activity creates an impoundment of water, adverse effects to the aquatic system due to accelerating the passage of water, and/or

☒ (b) Federal permittees should follow their own procedures for complying with the requirements of Section 106 of the National Historic Preservation Act. Federal permittees must provide the district engineer with the appropriate documentation to demonstrate compliance with those requirements.

☒ (c) Non-federal permittees must submit a pre-construction notification to the district engineer if the authorized activity may have the potential to cause effects to any historic properties listed, determined to be eligible for listing on, or potentially eligible for listing on the National Register of Historic Places, including previously unidentified properties. For such activities, the pre-construction notification must state which historic properties may be affected by the proposed work or include a vicinity map indicating the location of the historic properties or the potential for the presence of historic properties. Assistance regarding information on the location of or potential for the presence of historic resources can be sought from the State Historic Preservation Officer or Tribal Historic Preservation Officer, as appropriate, and the National Register of Historic Places (see 33 CFR 330.4(g)). The district engineer shall make a reasonable and good faith effort to carry out appropriate identification efforts, which may include background research, consultation, oral history interviews, sample field investigation, and field survey. Based on the information submitted and these efforts, the district engineer shall determine whether the proposed activity has the potential to cause an effect on the historic properties. Where the non-Federal applicant has identified historic properties which the activity may have the potential to cause effects and so notified the Corps, the non-Federal applicant shall not begin the activity until notified by the district engineer either that the activity has no potential to cause effects or that consultation under Section 106 of the NHPA has been completed.

☒ (d) The district engineer will notify the prospective permittee within 45 days of receipt of a complete pre-construction notification whether NHPA Section 106 consultation is required. Section 106 consultation is not required when the Corps determines that the activity does not have the potential to cause effects on historic properties (see 36 CFR §800.3(a)). If NHPA section 106 consultation is required and will occur, the district engineer will notify the non-Federal applicant that he or she cannot begin work until Section 106 consultation is completed.

☒ (e) Prospective permittees should be aware that section 110k of the NHPA (16 U.S.C. 470h-2(k)) prevents the Corps from granting a permit or other assistance to an applicant who, with intent to avoid the requirements of Section 106 of the NHPA, has intentionally significantly adversely affected a historic property to which the permit would relate, or having legal power to prevent it, allowed such significant adverse effect to occur, unless the Corps, after consultation with the Advisory Council on Historic Preservation (ACHP), determines that circumstances justify granting such assistance despite the adverse effect created or permitted by the applicant. If circumstances justify granting the assistance, the Corps is required to notify the ACHP and provide documentation specifying the circumstances, explaining the degree of damage to the integrity of any historic properties affected, and proposed mitigation. This documentation must include any views obtained from the applicant, SHPO/THPO, appropriate Indian tribes if the undertaking occurs on or affects historic properties on tribal lands or affects properties of interest to those tribes, and other parties known to have a legitimate interest in the impacts to the permitted activity on historic properties.

☒ **19. Designated Critical Resource Waters.** Critical resource waters include, NOAA-designated marine sanctuaries, National Estuarine Research Reserves, state natural heritage sites, and outstanding national resource waters or other waters officially designated by a state as having particular environmental or ecological significance and identified by the district engineer after notice and opportunity for public comment. The district engineer may also designate additional critical resource waters after notice and opportunity for comment.

☒ (a) Discharges of dredged or fill material into waters of the United States are not authorized by NWPs 7, 12, 14, 16, 17, 21, 29, 31, 35, 39, 40, 42, 43, 44, 49, and 50 for any activity within, or directly affecting, critical resource waters, including wetlands adjacent to such waters.

☒ (b) For NWPs 3, 8, 10, 13, 15, 18, 19, 22, 23, 25, 27, 28, 30, 33, 34, 36, 37, and 38, notification is required in accordance with general condition 27, for any activity proposed in the designated critical resource waters including wetlands adjacent to those waters. The district engineer may authorize activities under these NWPs only after it is determined that the impacts to the critical resource waters will be no more than minimal.

☒ **20 Mitigation.** The district engineer will consider the following factors when determining appropriate and practicable mitigation necessary to ensure that adverse effects on the aquatic environment are minimal:

☒ (a) The activity must be designed and constructed to avoid and minimize adverse effects, both temporary and permanent, to waters of the United States to the maximum extent practicable at the project site (i.e., on site).

☒ (b) Mitigation in all its forms (avoiding, minimizing, rectifying, reducing, or compensating) will be required to the extent necessary to ensure that the adverse effects to the aquatic environment are minimal.

☒ (c) Compensatory mitigation at a minimum one-for-one ratio will be required for all wetland losses that exceed 1/10 acre and require pre-construction notification, unless the district engineer determines in writing that some other form of mitigation would be more environmentally appropriate and provides a project-specific waiver of this requirement. For wetland losses of 1/10 acre or less that require pre-construction notification, the district engineer may determine on a case-by-case basis that compensatory mitigation is required to ensure that the activity results in minimal adverse effects on the

☒ (a) A statement that the authorized work was done in accordance with the NWP authorization, including any general or specific conditions;

☒ (b) A statement that any required mitigation was completed in accordance with the permit conditions; and

☒ (c) The signature of the permittee certifying the completion of the work and mitigation.

☒ **27. Pre-Construction Notification.**

☒ (a) **Timing.**. Where required by the terms of the NWP, the prospective permittee must notify the district engineer by submitting a pre-construction notification (PCN) as early as possible. The district engineer must determine if the PCN is complete within 30 calendar days of the date of receipt and, as a general rule, will request additional information necessary to make the PCN complete only once. However, if the prospective permittee does not provide all of the requested information, then the district engineer will notify the prospective permittee that the PCN is still incomplete and the PCN review process will not commence until all of the requested information has been received by the district engineer. The prospective permittee shall not begin the activity until either:

☒ (1) He or she is notified in writing by the district engineer that the activity may proceed under the NWP with any special conditions imposed by the district or division engineer; or

☒ (2) Forty-five calendar days have passed from the district engineer's receipt of the complete PCN and the prospective permittee has not received written notice from the district or division engineer. However, if the permittee was required to notify the Corps pursuant to general condition 17 that listed species or critical habitat might affected or in the vicinity of the project, or to notify the Corps pursuant to general condition 18 that the activity may have the potential to cause effects to historic properties, the permittee cannot begin the activity until receiving written notification from the Corps that is "no effect" on listed species or "no potential to cause effects" on historic properties, or that any consultation required under Section 7 of the Endangered Species Act (see 33 CFR 330.4(f)) and/or Section 106 of the National Historic Preservation (see 33 CFR 330.4(g)) is completed. Also, work cannot begin under NWPs 21, 49, or 50 until the permittee has received written approval from the Corps. If the proposed activity requires a written waiver to exceed specified limits of an NWP, the permittee cannot begin the activity until the district engineer issues the waiver. If the district or division engineer notifies the permittee in writing that an individual permit is required within 45 calendar days of receipt of a complete PCN, the permittee cannot begin the activity until an individual permit has been obtained. Subsequently, the permittee's right to proceed under the NWP may be modified, suspended, or revoked only in accordance with the procedure set forth in 33 CFR 330.5(d)(2).

☒ (b) Contents of Pre-Construction Notification: The PCN must be in writing and include the following information:

☒ (1) Name, address and telephone numbers of the prospective permittee;

☒ (2) Location of the proposed project;

☒ (3) A description of the proposed project; the project's purpose; direct and indirect adverse environmental effects the project would cause; any other NWP(s), regional general permit(s), or individual permit(s) used or intended to be used to authorize any part of the proposed project or any related activity. The description should be sufficiently detailed to allow the district engineer to determine that the adverse effects of the project will be minimal and to determine the need for compensatory mitigation. Sketches should be provided when necessary to show that the activity complies with the terms of the NWP. (Sketches usually clarify the project and when provided result in a quicker decision.);

☒ (4) The PCN must include a delineation of special aquatic sites and other waters of the United States on the project site. Wetland delineations must be prepared in accordance with the current method required by the Corps. The permittee may ask the Corps to delineate the special aquatic sites and other waters of the United States, but there may be a delay if the Corps does the delineation, especially if the project site is large or contains many waters of the United States. Furthermore, the 45 day period will not start until the delineation has been submitted to or completed by the Corps, where appropriate;

☒ (5) If the proposed activity will result in the loss of greater than 1/10 acre of wetlands and a PCN is required, the prospective permittee must submit a statement describing how the mitigation requirement will be satisfied. As an alternative, the prospective permittee may submit a conceptual or detailed mitigation plan.

☒ (6) If any listed species or designated critical habitat might be affected or is in the vicinity of the project, or if the project is located in designated critical habitat, for non-Federal applicants the PCN must include the name(s) of those endangered or threatened species that might be affected by the proposed work or utilize the designated critical habitat that may be affected by the proposed work. Federal applicants must provide documentation demonstrating compliance with the Endangered Species Act; and

☒ (7) For an activity that may affect a historic property listed on, determined to be eligible for listing on, or potentially eligible for listing on, the National Register of Historic Places, for non-Federal applicants the PCN must state which historic property may be affected by the proposed work or include a vicinity map indicating the location of the historic

submit a mitigation plan that would reduce the adverse effects on the aquatic environment to the minimal level. When mitigation is required, no work in waters of the United States may occur until the district engineer has approved a specific mitigation plan.

☒ **(a) 28. Single and Complete Project.** The activity must be a single and complete project. The same NWP cannot be used more than once for the same single and complete project.

B. Regional Conditions:

I. Sacramento District (All States, except Colorado)

1. When pre-construction notification (PCN) is required, the prospective permittee shall notify the Sacramento District in accordance with General Condition 27 using either the South Pacific Division Preconstruction Notification (PCN) Checklist or a completed application form (ENG Form 4345). In addition, the PCN shall include:

a. A written statement explaining how the activity has been designed to avoid and minimize adverse effects, both temporary and permanent, to waters of the United States;

b. Drawings, including plan and cross-section views, clearly depicting the location, size and dimensions of the proposed activity. The drawings shall contain a title block, legend and scale, amount (in cubic yards) and size (in acreage) of fill in Corps jurisdiction, including both permanent and temporary fills/structures. The ordinary high water mark or, if tidal waters, the high tide line should be shown (in feet), based on National Geodetic Vertical Datum (NGVD) or other appropriate referenced elevation; and

c. Pre-project color photographs of the project site taken from designatedlocations documented on the plan drawing.

2. The permittee shall complete compensatory mitigation required by special conditions of the NWP verification before or concurrent with construction of the authorized activity, except when specifically determined to be impracticable by the Sacramento District. When project mitigation involves use of a mitigation bank or in-lieu fee program, payment shall be made before commencing construction.

3. The permittee shall record the NWP verification with the Registrar of Deeds or other appropriate official charged with the responsibility for maintaining records of title to or interest in real property against areas (1) designated to be preserved as part of mitigation for authorized impacts, including any associated covenants or restrictions, or (2) where structures such as boat ramps or docks, marinas, piers, and permanently moored vessels will be constructed in or adjacent to navigable waters (Section 10 and Section 404). The recordation shall also include a map showing the surveyed location of the authorized structure and any associated areas preserved to minimize or compensate for project impacts.

4. The permittee shall place wetlands, other aquatic areas, and any vegetative buffers preserved as part of mitigation for impacts into a separate "preserve" parcel prior to discharging dredged or fill material into waters of the United States, except where specifically determined to be impracticable by the Sacramento District. Permanent legal protection shall be established for all preserve parcels, following Sacramento District approval of the legal instrument.

5. The permittee shall allow Corps representatives to inspect the authorized activity and any mitigation areas at any time deemed necessary to determine compliance with the terms and conditions of the NWP verification. The permittee will be notified in advance of an inspection.

6. For NWPs 29, 39, 40, 42, 43, 44, and 46, requests to waive the 300 linear foot limitation for intermittent or ephemeral waters of the U.S. shall include an evaluation of functions and services provided by the waterbody taking into account the watershed, measures to be implemented to avoid and minimize impacts, other measures to avoid and minimize that were found to be impracticable, and a mitigation plan for offsetting impacts.

7. Road crossings shall be designed to ensure fish passage, especially for anadromous fisheries. Permittees shall employ bridge designs that span the stream or river, utilize pier or pile supported structures, or involve large bottomless culverts with a natural streambed, where the substrate and streamflow conditions approximate existing channel conditions. Approach fills in waters of the United States below the ordinary high water mark are not authorized under the NWPs, except where avoidance has specifically been determined to be impracticable by the Sacramento District.

8. For NWP 12, clay blocks, bentonite, or other suitable material shall be used to seal the trench to prevent the utility line from draining waters of the United States, including wetlands.

9. For NWP 13, bank stabilization shall include the use of vegetation or other biotechnical design to the maximum extent practicable. Activities involving hard-armoring of the bank toe or slope requires submission of a PCN per General Condition 27.

10. For NWP 23, the PCN shall include a copy of the signed Categorical Exclusion document and final agency determinations regarding compliance with Section 7 of the Endangered Species Act, Essential Fish Habitat under the Magnussen-Stevens Act, and Section 106 of the National Historic Preservation Act.

11. For NWP 44, the discharge shall not cause the loss of more than 300 linear feet of streambed. For intermittent and ephemeral streams, the 300 linear foot limit may be waived in writing by the Sacramento District. This NWP does not authorize discharges in waters of the United States supporting anadromous fisheries.

12. For NWPs 29 and 39, channelization or relocation of intermittent or perennial drainage, is not authorized, except when, as determined by the Sacramento District, the relocation would result in a net increase in functions of the aquatic ecosystem within the watershed.

13. For NWP 33, temporary fills for construction access in waters of the United States supporting fisheries shall be accomplished with clean, washed spawning quality gravels where practicable as determined by the Sacramento District, in consultation with appropriate federal and state wildlife agencies.

building structures is not authorized by this nationwide permit.

(4) The construction of water parks (i.e., kayak courses) and flood control projects are not authorized by this nationwide permit.

d. Nationwide Permits Nos. 29 and 39; Residential Developments and Commercial and Institutional Developments. A copy of the existing FEMA/locally-approved floodplain map must be submitted with the Pre-Construction Notification. When reviewing proposed developments, the Corps will utilize the most accurate and reliable FEMA/locally-approved pre-project floodplain mapping, not post-project floodplain mapping based on a CLOMR or LOMR. However, the Corps will accept revisions to existing floodplain mapping if the revisions resolve inaccuracies in the original floodplain mapping and if the revisions accurately reflect pre-project conditions.

2. Final Regional Conditions Applicable to All Nationwide Permits within Colorado

e. Removal of Temporary Fills. General Condition 13 (Removal of Temporary Fills) is amended by adding the following: When temporary fills are placed in wetlands in Colorado, a horizontal marker (i.e. fabric, certified weed-free straw, etc.) must be used to delineate the existing ground elevation of wetlands that will be temporarily filled during construction.

f. Spawning Areas. General Condition 3 (Spawning Areas) is amended by adding the following: In Colorado, all Designated Critical Resource Waters (see enclosure 1) are considered important spawning areas. Therefore, In accordance with General Condition 19 (Designated Critical Resource Waters), the discharge of dredged or fill material in not authorized by the following nationwide permits in these waters: NWPs 7, 12, 14, 16, 17, 21, 29, 31, 35, 39, 40, 42, 43, 44, 49, and 50. In addition, in accordance with General Condition 27 (Pre-Construction Notification), notification to the District Engineer is required for use of the following nationwide permits in these waters: NWPs 3, 8, 10, 13, 15, 18, 19, 22, 23, 25, 27, 28, 30, 33, 34, 36, 37 and 38".

g. Suitable Fill. In Colorado, use of broken concrete as fill material requires notification to the District Engineer in accordance with General Condition 27 (Pre-Construction Notification). Permittees must demonstrate that soft engineering methods utilizing native or non-manmade materials are not practicable (with respect to cost, existing technology, and logistics), before broken concrete is allowed as suitable fill. Use of broken concrete with exposed rebar is prohibited in perennial waters and special aquatic sites.

h. Invasive Aquatic Species. General Condition 11 is amended by adding the following condition for work in perennial or intermittent waters of the United States: If heavy equipment is used for the subject project that was previously working in another stream, river, lake, pond, or wetland within 10 days of initiating work, one the following procedures is necessary to prevent the spread of New Zealand Mud Snails and other aquatic hitchhikers:

(1) Remove all mud and debris from equipment (tracks, turrets, buckets, drags, teeth, etc.) and keep the equipment dry for 10 days. OR

(2) Remove all mud and debris from Equipment (tracks, turrets, buckets, drags, teeth, etc.) and spray/soak equipment with either a 1:1 solution of Formula 409 Household Cleaner and water, or a solution of Sparquat 256 (5 ounces Sparquat per gallon of water). Treated equipment must be kept moist for at least 10 minutes. OR

(3) Remove all mud and debris from equipment (tracks, turrets, buckets, drags, teeth, etc.) and spray/soak equipment with water greater than 120 degrees F for at least 10 minutes.

3. Final Regional Conditions for Revocation/Special Notification Specific to Certain Geographic Areas

i. Fens: All Nationwide permits, except permit Nos. 3, 6, 20, 27, 32, 38 and 47, are revoked in fens and wetlands adjacent to fens. Use of nationwide permit Nos. 3, 20, 27 and 38, requires notification to the District Engineer, in accordance with General Condition 27 (Pre-Construction Notification), and the permittee may not begin the activity until the Corps determines the adverse environmental effects are minimal. The following defines a fen:

Fen soils (histosols) are normally saturated throughout the growing season, although they may not be during drought conditions. The primary source of hydrology for fens is groundwater. Histosols are defined in accordance with the U.S. Department of Agriculture, Natural Resources Conservation Service publications on Keys to Soil Taxonomy and Field Indicators of Hydric Soils in the United States (http://soils.usda.gov/technical/classification/taxonomy).

j. Springs: Within the state of Colorado, all NWPs, except permit 47 (original 'C'), require preconstruction notification pursuant to General Condition 27 for discharges of dredged or fill material within 100 feet of the point of groundwater discharge of natural springs. A spring source is defined as any location where groundwater emanates from a point in the ground. For purposes of this regional condition, springs do not include seeps or other discharges which do not have a defined channel.

4. Additional Information

The following provides additional information regarding minimization of impacts and compliance with existing general Conditions:

a. Permittees are reminded of the existing General Condition No. 6 which prohibits the use of unsuitable material. Organic debris, building waste, asphalt, car bodies, and trash are not suitable material. Also, General Condition 12 requires appropriate erosion and sediment controls (i.e. all fills must be permanently stabilized to

contiguous to tidal waters are located landward of the high tide line (i.e., spring high tide line).

Open water: For purposes of the NWPs, an open water is any area that in a year with normal patterns of precipitation has water flowing or standing above ground to the extent that an ordinary high water mark can be determined. Aquatic vegetation within the area of standing or flowing water is either non-emergent, sparse, or absent. Vegetated shallows are considered to be open waters. Examples of "open waters" include rivers, streams, lakes, and ponds.

Ordinary High Water Mark: An ordinary high water mark is a line on the shore established by the fluctuations of water and indicated by physical characteristics, or by other appropriate means that consider the characteristics of the surrounding areas (see 33 CFR 328.3(e)).

Perennial stream: A perennial stream has flowing water year-round during a typical year. The water table is located above the stream bed for most of the year. Groundwater is the primary source of water for stream flow. Runoff from rainfall is a supplemental source of water for stream flow.

Practicable: Available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes.

Pre-construction notification: A request submitted by the project proponent to the Corps for confirmation that a particular activity is authorized by nationwide permit. The request may be a permit application, letter, or similar document that includes information about the proposed work and its anticipated environmental effects. Pre-construction notification may be required by the terms and conditions of a nationwide permit, or by regional conditions. A pre-construction notification may be voluntarily submitted in cases where pre-construction notification is not required and the project proponent wants confirmation that the activity is authorized by nationwide permit.

Preservation: The removal of a threat to, or preventing the decline of, aquatic resources by an action in or near those aquatic resources. This term includes activities commonly associated with the protection and maintenance of aquatic resources through the implementation of appropriate legal and physical mechanisms. Preservation does not result in a gain of aquatic resource area or functions.

Re-establishment: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former aquatic resource. Re-establishment results in rebuilding a former aquatic resource and results in a gain in aquatic resource area.

Rehabilitation: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of repairing natural/historic functions to a degraded aquatic resource. Rehabilitation results in a gain in aquatic resource function, but does not result in a gain in aquatic resource area.

Restoration: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former or degraded aquatic resource. For the purpose of tracking net gains in aquatic resource area, restoration is divided into two categories: re-establishment and rehabilitation.

Riffle and pool complex: Riffle and pool complexes are special aquatic sites under the 404(b)(1) Guidelines. Riffle and pool complexes sometimes characterize steep gradient sections of streams. Such stream sections are recognizable by their hydraulic characteristics. The rapid movement of water over a course substrate in riffles results in a rough flow, a turbulent surface, and high dissolved oxygen levels in the water. Pools are deeper areas associated with riffles. A slower stream velocity, a streaming flow, a smooth surface, and a finer substrate characterize pools.

Riparian areas: Riparian areas are lands adjacent to streams, lakes, and estuarine-marine shorelines. Riparian areas are transitional between terrestrial and aquatic ecosystems, through which surface and subsurface hydrology connects waterbodies with their adjacent uplands. Riparian areas provide a variety of ecological functions and services and help improve or maintain local water quality. (See general condition 20.)

Shellfish seeding: The placement of shellfish seed and/or suitable substrate to increase shellfish production. Shellfish seed consists of immature individual shellfish or individual shellfish attached to shells or shell fragments (i.e., spat on shell). Suitable substrate may consist of shellfish shells, shell fragments, or other appropriate materials placed into waters for shellfish habitat.

Single and complete project: The term "single and complete project" is defined at 33 CFR 330.2(i) as the total project proposed or accomplished by one owner/developer or partnership or other association of owners/developers. A single and complete project must have independent utility (see definition). For linear projects, a "single and complete project" is all crossings of a single water of the United States (i.e., a single waterbody) at a specific location. For linear projects crossing a single waterbody several times at separate and distant locations, each crossing is considered a single and complete project. However, individual channels in a braided stream or river, or individual arms of a large, irregularly shaped wetland or lake, etc., are not separate waterbodies, and crossings of such features cannot be considered separately.

Stormwater management: Stormwater management is the mechanism for controlling stormwater runoff for the purposes of reducing downstream erosion, water quality degradation, and flooding and mitigating the adverse effects of changes in land use on the aquatic environment.

Stormwater management facilities: Stormwater management facilities are those facilities, including but not limited to, stormwater retention and detention ponds and best management practices, which retain water for a period of time to control runoff and/or improve the quality (i.e., by reducing the concentration of nutrients, sediments, hazardous substances and other pollutants) of stormwater runoff.

Stream bed: The substrate of the stream channel between the ordinary high water marks. The substrate may be bedrock or inorganic particles that range in size from clay to boulders. Wetlands contiguous to the stream bed, but outside of the ordinary high water marks, are not considered part of the stream bed.

Stream channelization: The manipulation of a stream's course, condition, capacity, or location that causes more than minimal

March 15, 2011
Project No. 207384045

Mr. Wayne Chiou
State of California Department of Transportation
District 12, Environmental Engineering
3347 Michelson Drive, Suite 100
Irvine, California 92612-1692

Subject: Aerially Deposited Lead Site Investigation
SR-74/I-5 Interchange
San Juan Capistrano, California
Task Order No. 12-0E3101-45
EA No. 0E3101
Contract No. 12A1139

Dear Mr. Chiou:

In accordance with the State of California Department of Transportation Contract No. 12A1139, Task Order No. 12-0E3101-45, Ninyo & Moore has conducted an aerially deposited lead investigation at selected locations of the existing State Route 74 (SR-74) and Interstate 5 (I-5) interchange in the city of San Juan Capistrano, California.

The following report documents our methodologies, findings, conclusions, and recommendations.

We appreciate the opportunity to be of service to you on this project.

Sincerely,
NINYO & MOORE

Michael S. Cushner
Senior Staff Environmental Scientist

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AERIALLY DEPOSITED LEAD SITE INVESTIGATION
SR-74/I-5 INTERCHANGE
SAN JUAN CAPISTRANO, CALIFORNIA
TASK ORDER NO. 12-0E3101-45
EA NO. 0E3101, CONTRACT NO. 12A1139

PREPARED FOR:
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March 15, 2011
Project No. 207384045

AERIALLY DEPOSITED LEAD INVESTIGATION REPORT
Task Order No. 12-0E3101-45
E.A. 0E3101

This report was prepared by the staff of Ninyo & Moore Geotechnical and Environmental Sciences Consultants under the supervision of the Engineer and/or Geologist whose signature appears hereon.

The findings, recommendations, specifications, or professional opinions are presented within the limits described by the client, after being prepared in accordance with generally accepted professional engineering and geologic practice. No warranty is expressed or implied.

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EXECUTIVE SUMMARY

The State of California Department of Transportation (Department) authorized Ninyo & Moore to conduct an aerially deposited lead (ADL) site investigation (SI) at the State Route 74 (SR-74) and Interstate 5 (I-5) interchange in the city of San Juan Capistrano. (site). Work was conducted in general accordance with the Department Contract No. 12A1139, Task Order No. 12-0E3101-45 (TO 45), dated December 16, 2010. It is our understanding that the Department is planning construction of a new traffic interchange to replace the existing SR-74 and I-5 interchange by widening three ramps, adding a northbound loop on ramp, and reconfiguring the northbound off ramp and the Del Obispo Street intersection.

An ADL site investigation was performed under Ninyo & Moore's Contract Number 12A1139 in association with the Department.

This investigation was performed to evaluate the presence of lead in soil resulting from the combustion of leaded fuel from freeway traffic. Data collected during this investigation were used to develop recommendations for the potential reuse or disposal of soil excavated from the site and to inform the Department of potential health and safety issues concerning the presence of lead in soil for workers at the site during construction activities.

Ninyo & Moore collected 91 soil samples from twenty-six borings at the site. Eleven of the 91 samples contained a total lead concentration greater than or equal to 50 milligrams per kilogram (mg/kg) and less than 1,000 mg/kg and were subsequently analyzed for soluble lead in accordance with the Waste Extraction Test (WET) using citric acid as the extractant. Five of the results were above 5.0 milligrams per liter (mg/l) and the five samples were subsequently analyzed for soluble lead by the WET using deionized water as the extractant and in accordance with the Toxicity Characteristic Leaching Procedure (TCLP). The results of the soluble lead analyses using deionized water as the extractant were below 1.5 mg/l and the TCLP results were below 5.0 mg/l. Ten samples were analyzed for pH. The pH levels ranged from 4.4 to 9.0. One sample (B20-0.5) collected at the surface level had a pH level of 4.4. This soil will be classified as hazardous as it is greater than the California Environmental Protection Agency (Cal-EPA) Department of Toxic Substances Control (DTSC) lower limit of 5.0.

Our recommendations for soil reuse on site are based on the guidelines set forth by the DTSC Lead Variance issued to the Department on June 30, 2009 (DTSC Variance). Laboratory analytical results for lead were compared to the guidelines of the DTSC Variance for potential reuse of the soil as fill within the Department right-of-way (ROW).

Our recommendations for off-site disposal were based on the comparison of lead concentrations in soil samples to the California Health and Safety Code thresholds and Title 40 Code of Federal Regulations (CFR) 261.24 thresholds.

Based on the analytical results, the on-site reuse and the off-site disposal recommendations are summarized below.

Recommendations for Soil for Reuse by the Department

Soil at the site can be reused on site with the following restrictions:

- Scenario A: Soil associated with boring B20 in the surface layer (from surface to 0.5 feet below ground surface[bgs]) between station numbers 512+45.00 and 513+19.35, including the entire width of the excavation should be classified as hazardous and disposed at a Class 1 disposal site in accordance with Title 22 California Code of Regulations requirements. This soil cannot be re-used. The remaining soil in the surface layer (surface to 0.5 feet bgs) may be reused on site if it is placed a minimum of 5 feet above the maximum water table elevation and covered with at least 1 foot of non-hazardous soil. The remaining soil from the 1.5 to 4-foot layers combined (0.5 to 4 feet bgs) has no restrictions based on total and soluble lead concentrations.

- Scenario B: Soil in the surface and 1.5-foot layers combined (surface to 1.5 feet bgs) has no restrictions based on total and soluble lead concentrations. The remaining soil from the 3 and 4-foot layers combined (1.5 to 4 feet bgs) also has no restrictions based on total and soluble lead concentrations.

- Scenario C: Soil in the surface to 3-foot layers combined (surface to 3 feet bgs) has no restrictions based on total and soluble lead concentrations. The remaining soil from the 4 foot layer (3 to 4 feet bgs) also has no restrictions based on total and soluble lead concentrations.

- Scenario D: Soil in the layers combined (surface to 4 feet bgs) has no restrictions based on total and soluble lead concentrations.

Recommendations for Soil to be Disposed Off Site

If the Department elects to dispose the soil off site, the following restrictions apply:

- Scenario A: The soil in the surface layer (surface to 0.5 feet bgs) is classified as hazardous and should be disposed at a Class 1 disposal site in accordance with Title 22 California Code of Regulations (CCR) requirements. The remaining soil from the 1.5 to 4-foot layers combined (0.5 to 4 feet bgs) is classified as non-hazardous and may be disposed off site with no restrictions based on total and soluble lead.

- Scenario B: Soil in the surface and 1.5-foot layer combined (surface to 1.5 feet bgs) is classified as non-hazardous and may be disposed off site with no restrictions based on total and soluble lead. The remaining soil from the 3-foot and 4-foot layers combined (1.5 to 4 feet bgs) is also classified as non-hazardous and may be disposed off site with no restrictions based on total and soluble lead.

- Scenario C: Soil in the surface to 3-foot layers combined (surface to 3 feet bgs) is classified as non-hazardous and may be disposed off site with no restrictions based on total and soluble lead. The remaining soil from the 4-foot layer (3 to 4-feet bgs) is also classified as non-hazardous and may be disposed off site with no restrictions based on total and soluble lead.

- Scenario D: Soil in the layers combined (surface to 4-feet bgs) is classified as non-hazardous and may be disposed off site with no restrictions based on total and soluble lead.

The Department should notify the contractors performing the construction activities that hazardous concentrations of lead are present in on-site soil. Appropriate health and safety measures should be taken to minimize the potential exposure to lead.

1. INTRODUCTION

The State of California Department of Transportation (Department) authorized Ninyo & Moore to conduct an aerially deposited lead (ADL) site investigation (SI) at the State Route 74 (SR-74) and Interstate 5 (I-5) interchange in the city of San Juan Capistrano, California (site; Figure 1). Work was conducted in general accordance with the Department Contract No. 12A1139, Task Order No. 12-0E3101-45 (TO 45), dated December 16, 2010.

1.1. Project Description and Objective

It is our understanding that the Department is planning to construct a new traffic interchange to replace the existing SR-74/I-5 interchange in the city of San Juan Capistrano, widening three ramps, adding a northbound loop on ramp, and reconfiguring the northbound off ramp and the Del Obispo Street intersection. This report has been prepared by Ninyo & Moore to document the results of a study to evaluate the potential presence of ADL along the unpaved shoulder and slope in the areas of the site. Twenty-six borings were hand augered at the site (Figure 2).

1.2. Scope of Work

Ninyo & Moore performed the tasks described in the following sections.

1.2.1. Prefield Activities

Prefield activities included:

- Preparing a site specific health and safety plan (HSP).
- Marking boring locations at the site.
- Notifying Underground Service Alert (USA) that Ninyo & Moore would be advancing soil borings in the area (USA ticket number A10140349).
- Preparing a project schedule, and coordinating work with subcontractors.

1.2.2. Soil Sampling

Soil sampling was conducted on January 20 and 21, 2011. Twenty-six sampling locations (B1 to B26) were chosen, as shown on Figure 2. One boring at each sampling location was advanced and sampled using a hand auger. Four soil samples were attempted for collection from depths of surface to ½ foot, 1½ to 2, 2½ to 3, and 3½ to 4 feet below ground surface (bgs) at each boring location.

1.2.3. Laboratory Analysis

Ninyo & Moore submitted the soil samples under chain-of-custody protocol to Advanced Technology Laboratories (ATL) of Signal Hill, California; a laboratory certified by the State of California Department of Health Services Environmental Laboratory Accreditation Program.

1.2.4. Global Positioning System (GPS) Surveying

Approximate latitude and longitude (North American Datum 83) of sampling locations were recorded with a handheld GPS unit (GeoXT, Trimble). The latitude and longitude data for each boring are presented on Table 1.

1.2.5. Report Preparation

This report was prepared in general accordance with Department Contract No. 12A1139 and TO 45, dated December 16, 2010.

1.3. Previous Site Investigations

Ninyo & Moore has not performed previous subsurface investigations at this site. In addition, the Department has not notified Ninyo & Moore of previous investigations performed at the site.

2. BACKGROUND

The Department obtained a variance (V09 HQSCD006) from the California Environmental Protection Agency (Cal-EPA), Department of Toxic Substances Control (DTSC), on June 30, 2009 (DTSC Variance). The DTSC Variance allows for conditional reuse of lead-impacted soil within the Department right-of-way (ROW). Background information regarding the source of ADL and the reuse or disposal of lead-impacted soil is discussed in the following sections.

2.1. Aerially Deposited Lead in Soil

Analyses for lead in soil along highways throughout the state of California have revealed that lead is commonly present along the shoulders of the highways as a result of automobile exhaust containing lead from the combustion of leaded gasoline. Elevated concentrations of lead are commonly found in the upper 2 feet of soil. Lead concentrations in soil are dependent on many variables; but in general, are a function of the age of the highway and the volume of traffic using the highway (DTSC, 2009).

2.2. Hazardous Waste Classification Criteria

Soil that exceeds the following limitations may be classified as hazardous waste with respect to lead concentrations:

- The soil contains more than 1,000 milligrams per kilogram (mg/kg) total lead, exceeding the Total Threshold Limit Concentration (TTLC) for California hazardous waste (Title 22 California Code of Regulations [CCR], Section 66261.24);
- The soil contains more than 5.0 milligrams per liter (mg/l) citric acid-extractable lead, exceeding the Soluble Threshold Limit Concentration (STLC) for California hazardous waste (Title 22 CCR, Section 66261.24);
- The soil contains more than 5.0 mg/l leachable lead using the Toxicity Characteristic Leaching Procedure (TCLP), exceeding the maximum concentration for the toxicity characteristic of the Resource, Conservation, and Recovery Act (RCRA; Title 40 Code of Federal Regulations [CFR] 261.24); or
- The soil pH is less than or equal to 2.0 or greater than or equal to 12.5, which exceeds the limits for the corrosivity characteristic of RCRA hazardous waste (40CFR 261.22) and California hazardous waste (Title 22 CCR, Section 66261.22).

2.3. DTSC Variance

In accordance with the DTSC Variance, soil that is subject to the guidelines presented below may be reused within the Department ROW. A chart presenting the different ADL soil type classifications is included in Appendix A.

2.3.1. Reuse – Condition 1

Soil containing less than 1.5 mg/l extractable lead by the Waste Extraction Test (WET) using de-ionized water as the extractant (WET-DI) and less than or equal to 1,411 mg/kg total lead (United States Environmental Protection Agency [EPA] Method 6010B) may be used as fill in the Department ROW provided the soil is placed a minimum of 5 feet above the maximum level of the water table and covered with at least 1 foot of non-hazardous soil.

2.3.2. Reuse – Condition 2

Soil containing greater than or equal to 1.5 mg/l but less than 150 mg/l, extractable lead by WET-DI method, or more than 1,411 mg/kg total lead but less than 3,397 mg/kg total lead, may be used as fill in the Department ROW provided the soil is placed a minimum of 5 feet above the maximum level of the water table and protected from infiltration by a paved structure that will be maintained by the Department.

2.3.3. Reuse – Condition 3

Lead-contaminated soil with a pH less than 5.5 but greater than 5.0 shall only be used as fill material under the paved portion of the roadway. Lead-contaminated soil with a pH at or less than 5.0 shall be managed as a hazardous waste.

2.4. Criteria for Disposal of Soil Not Intended for Reuse On Site

If the Department elects to reuse soil within the Department ROW that has been excavated during construction activities, the soil may be classified either as hazardous waste or non-hazardous waste. The distinction is based on the total and soluble lead concentrations compared to the TTLC and STLC criteria. As mentioned in Section 2.2, the TTLC for total lead

is 1,000 mg/kg and the STLC for citric acid extractable lead is 5.0 mg/l. Waste containing lead concentrations in excess of or equal to those listed must be disposed at a Class I hazardous waste disposal facility pursuant to State of California regulations.

3. INVESTIGATION METHODS

The investigation activities are described in the following subsections and were conducted in general accordance with the TO that was approved by the Department prior to beginning the field activities.

3.1. Health and Safety Plan (HSP)

A site-specific HSP dated January 11, 2011, was prepared by Ninyo & Moore and submitted to the Department for approval prior to commencing field work.

3.2. Utility Clearance

The boring locations were described to USA during the notification at least 2 working days prior to conducting the soil sampling. USA marked the member utilities known to be in the vicinity of the boring locations.

3.3. Hand-Auger Sampling

The field work was conducted on January 20 and 21, 2011. The boring locations were approved by the Department Task Order Manager and are shown on the attached Figure 2. Four samples were attempted for collection from each of the twenty-six boreholes at depths of 0 to ½ foot, 1½ to 2, 2½ to 3, and 3½ to 4 feet bgs unless refusal was encountered. The depths reached for each boring are presented on Table 1.

Samples were placed into new, 4-ounce, glass jars; capped with Teflon-coated plastic lids; labeled; placed in a resealable plastic bag; and stored in a cooler. The sampling equipment was decontaminated between each boring. Soil samples were transferred under chain-of-

custody (COC) protocol to ATL within 24 hours of collection. In accordance with the TO, soil sample homogenization was performed in the laboratory.

Hand augering was conducted by Ninyo & Moore personnel.

3.4. Investigative-Derived Wastes

Soil cuttings generated by hand-auger drilling were returned to their corresponding bore-holes after collection of soil samples. Decontamination water was transported to Ninyo & Moore's Irvine office and placed in a drum pending chemical characterization. Based on the analytical result of the decontamination water sample (non-detect), the decontamination water was subsequently disposed in the sanitary sewer.

3.5. Laboratory Analyses

Once the samples were received by ATL, the samples were homogenized and analyzed for the following:

- Ninety-one soil samples were analyzed for total lead using EPA Method 6010B;
- Eleven of the soil samples contained a total lead concentration greater than or equal to 50 mg/kg and less than 1,000 mg/kg and were subsequently analyzed for soluble lead by the WET using citric acid for comparison to the STLC;
- Five of the soil samples contained a soluble lead concentration greater than or equal to 5.0 mg/l and were therefore analyzed for soluble lead by the WET using de-ionized water for comparison to the STLC and soluble lead by TCLP.
- Approximately 10 percent of the soil samples (10 samples) were analyzed for pH using EPA Method 9045.
- One sample of the decontamination water was analyzed for total lead using EPA Method 6010B.

4. ANALYTICAL RESULTS

The results of this investigation are described in the following subsections. The analytical results of lead and pH are summarized in Table 1, and the sampling locations with their corresponding

data are shown on Figures 3 through 7. Laboratory reports and COC records are included in Appendix B.

4.1. Total Lead

Ninety-one samples were analyzed for total lead. The maximum total lead concentration was 580 mg/kg. The minimum total lead concentration was less than the laboratory practical quantitation limit of 5.0 mg/kg (Table 1).

The decontamination water sample did not contain a reportable concentration of lead.

4.2. Soluble Lead – Citric Acid

Eleven of the ninety-one samples contained total lead at a concentration greater than or equal to 50 mg/kg and less than 1,000 mg/kg and were subsequently analyzed for soluble lead using a citric acid extraction. The maximum reported concentration was 24 mg/l. The minimum reported concentration was 0.72 mg/l.

4.3. Soluble Lead – Deionized Water

Five of the eleven samples analyzed using the WET contained soluble lead at a concentration greater than or equal to 5.0 mg/l and were subsequently analyzed for soluble lead using deionized water extraction. Concentrations were less than the laboratory practical quantitation limit of 0.25 mg/l.

4.4. Soluble Lead – TCLP

Five of the eleven samples analyzed using the WET contained soluble lead at a concentration greater than or equal to 5.0 mg/l or contained a total lead concentration greater than 1,000 mg/kg and were subsequently analyzed for soluble lead by the TCLP Method. The maximum reported concentration was 0.72 mg/l. The minimum reported concentration was less than the laboratory practical quantitation limit of 0.25 mg/l.

4.5. pH

Approximately 10 percent of the samples collected (10 samples) were analyzed for pH. The maximum pH level was 9.0 and the minimum pH level was 4.4. The surface soil sample from boring B20 has a pH value of 4.4 which is below the lower limit of 5.0 specified in the DTSC Variance.

5. STATISTICAL EVALUATION

The following subsections describe the statistical methods used to evaluate the lead data set for the site.

Because sample B20-0.5 contained a pH value of 4.4, the soil associated with this sample will be removed as hazardous and disposed at a Class 1 disposal site in accordance with Title 22 California Code of Regulations requirements. This soil cannot be re-used. Therefore, the data associated with this sample was removed from the data set prior to statistical evaluation. Recommendations for soil associated with sample B20-0.5 are provided separately.

5.1. Statistical Evaluation Methods

The analytical results were evaluated statistically to recommend the appropriate method of on-site reuse or off-site disposal of excavated soil. Prior to performing statistical calculations, concentrations below the laboratory reporting limit were assigned values equal to half the reporting limit. Statistical methods were applied to the data set to evaluate:

- The total lead data population distribution;
- The one-sided upper confidence limits (UCLs) of the means of the total lead concentrations; and
- If there is an acceptable correlation between total and soluble lead concentrations that would allow prediction of soluble lead concentrations based on calculated UCLs.

5.2. Population Distribution

A test for population distribution is necessary in order to apply the appropriate evaluation methods when estimating the UCLs on the total lead means. When evaluating the distribu-

tion of total lead concentrations, total lead data are treated as one data set. Distribution was evaluated in accordance with EPA SW-846, Chapter Nine (1986) by comparing the mean to the variance of the total lead data sets. If the mean is greater than the variance, the data set is normally distributed and no transformation is performed. If the mean is less than the variance, the data set is transformed using an arcsine conversion. If the mean is approximately equal to the variance, the data set is transformed using a square-root conversion. A histogram of the data is presented in Appendix D.

5.3. Upper Confidence Limits

The UCLs are used to address the uncertainty associated with estimating the true mean concentration of a population. As more data become available for a given site, the uncertainty of the estimate of a true statistical mean decreases and the UCLs move closer to the true mean of the population.

For this project, a 90 percent UCL is calculated for soil to be reused on site, while a 95 percent UCL is calculated for soil to be disposed off site. As described in Section 2.3.2, the maximum 90 percent UCL allowed for soil reuse on site is 3,397 mg/kg. A total lead concentration above 1,000 mg/kg is classified as hazardous for soil not reused on site, corresponding to a 95 percent UCL greater than or equal to 1,000 mg/kg.

One-sided 90 and 95 percent UCLs of the true mean are defined as values that, when calculated repeated for randomly drawn subsets of data, equal or exceed the true mean 90 and 95 percent of the time, respectively. The following equation (EPA, 1986) was used to calculate the UCLs:

$$UCL = x + t_p \frac{S}{sqrt(n)}$$

Where:

x = sample mean
t_p = student's t for a one-tailed confidence interval and a probability of p
S = standard deviation

N = number of samples

The samples in this study were collected using a systematic random sampling approach. SW-846 Chapter Nine indicates that statistical transformation should be used if the data set is not normally distributed and that statistical evaluations should be performed on the transformed scale. The data for this project are not normally distributed and therefore must be transformed using the arcsine function.

Transformation using the arcsine function is accomplished by calculating the arcsine of the concentration normalized to the maximum concentration in the population. That is:

$$y_i = \text{arcsine} \frac{x_i}{x_{max}}$$

Where:

y_i = transformed value sample mean
x_i = reported concentration
x_{max} = maximum concentration reported for the data set

The final result is transformed back to a concentration by multiplying the sine of the transformed number by the maximum concentration:

$$z_i = x_{max} \sin y_i$$

In order to evaluate four of the possible soil excavation depth scenarios, several different UCLs for total lead concentrations were calculated:

- **Scenario A** – surface soil (0 to ½ foot) and underlying subsurface soil (½ foot to 4 feet bgs)
- **Scenario B** – the upper 1½ feet (0 to 1½ feet) and the underlying subsurface soil (1½ to 4 feet)
- **Scenario C** – the upper 3 feet (0 to 3 feet) and the underlying subsurface soil (3 to 4 feet)
- **Scenario D** – the entire 4-foot soil column

Results of this exercise are presented in Appendix C and are shown graphically on the block diagrams presented in Appendix F.

5.4. Regression Analysis

A linear regression analysis is used to create a soluble lead prediction model for use with the 90 and 95 percent UCLs. A line fit to the data using the equation:

$y = mx + b$

Where:

y = soluble lead by WET-citric acid, mg/l
x = total lead concentration, mg/kg
b = y-intercept
m = slope

$$\text{slope} = \frac{r \times s_t}{s_s}$$

Where:

r = correlation coefficient
s_t = standard deviation of the total lead concentrations
s_s = standard deviation of the soluble lead concentrations

The linear equation from the regression is used to predict soluble lead concentrations for the statistical total lead UCLs. The integrity of the equation is directly related to 'r,' the correlation coefficient, which should be greater than or equal to 0.8.

A regression analysis was performed for this data set and the correlation coefficient was 0.93. The regression analysis is included as Appendix E.

6. CONCLUSIONS

The analyses of the data indicate that the surface layer tends to have the highest concentrations of total lead, followed by the 1½-foot layer, then the 3-foot layer, and then the 4-foot layer. Assum-

ing the soil has not been disturbed since construction of the routes in the site vicinities, concentrations of total lead would be expected to decrease with depth.

7. RECOMMENDATIONS

Based on the findings of this study, recommendations are summarized on block diagrams in Appendix F and discussed below.

7.1. Recommendations for Soil for Reuse by the Department

Soil at the site can be reused on site with the following restrictions:

- Scenario A: Soil associated with boring B20 in the surface layer between station numbers 512+45.00 and 513+19.35, including the entire width of the excavation should be classified as hazardous and disposed at a Class 1 disposal site in accordance with Title 22 California Code of Regulations requirements. This soil cannot be re-used. The remaining soil in the surface layer may be reused on site if it is placed a minimum of 5 feet above the maximum water table elevation and covered with at least 1 foot of non-hazardous soil. The remaining soil from the 1.5 to 4-foot layers combined has no restrictions based on total and soluble lead concentrations.

- Scenario B: Soil in the surface and 1.5-foot layers combined has no restrictions based on total and soluble lead concentrations. The remaining soil from the 3 and 4-foot layers combined also has no restrictions based on total and soluble lead concentrations.

- Scenario C: Soil in the surface to 3-foot layers combined has no restrictions based on total and soluble lead concentrations. The remaining soil from the 4 foot layer also has no restrictions based on total and soluble lead concentrations.

- Scenario D: Soil in the layers combined has no restrictions based on total and soluble lead concentrations.

7.2. Recommendations for Soil to be Disposed Off Site

If the Department elects to dispose the soil off site, the following restrictions apply:

- Scenario A: The soil in the surface layer is classified as hazardous and should be disposed at a Class 1 disposal site in accordance with Title 22 CCR requirements. The remaining soil from the 1.5 to 4-foot layers combined is classified as non-hazardous and may be disposed off site with no restrictions based on total and soluble lead.

- Scenario B: Soil in the surface and 1.5-foot layer combined is classified as non-hazardous and may be disposed off site with no restrictions based on total and soluble lead. The remaining soil from the 3-foot and 4-foot layers combined is also classified as non-hazardous and may be disposed off site with no restrictions based on total and soluble lead.

- Scenario C: Soil in the surface to 3-foot layers combined is classified as non-hazardous and may be disposed off site with no restrictions based on total and soluble lead. The remaining soil from the 4-foot layer is also classified as non-hazardous and may be disposed off site with no restrictions based on total and soluble lead.

- Scenario D: Soil in the layers combined is classified as non-hazardous and may be disposed off site with no restrictions based on total and soluble lead.

The Department should notify the contractors performing the construction activities that hazardous concentrations of lead are present in on-site soil. Appropriate health and safety measures should be taken to minimize the potential exposure to lead.

8. HEALTH EFFECTS OF LEAD

Concentrations of lead in soil at the site represent a potential threat to the health of site workers performing earthwork activities.

Lead in its element form is a heavy, ductile, soft, gray metal. The permissible exposure limit for lead is 0.05 milligrams per cubic meter in air based on an eight-hour time-weighted average. The immediately dangerous to life and health exposure limit is 100 mg/m^3 as established by the National Institute of Occupational Safety and Health. Exposure may produce several symptoms including weakness, eye irritation, facial pallor, pale eyes, lassitude, insomnia, anemia, tremors, malnutrition, constipation, paralysis of the wrists and ankles, abdominal pain, colic, nephropathy, encephalopathy, gingival lead line, hypertension, anorexia, and weight loss. Target organs are the central nervous system, kidneys, eyes, blood, gingival tissue, and the gastrointestinal tract.

Because of the potential hazard from exposure to lead-contaminated soil, a lead HSP should be prepared by a Certified Industrial Hygienist (CIH). In addition, all site workers (earthwork) should have completed a training program meeting the requirements of 29 CFR/910.120 and 8 CCR 1532.1. The plan developed by the CIH should include a hazard analysis, dust control

measures, air monitoring, signage, work practices, emergency response plans, personal protective equipment, decontamination, and documentation.

9. LIMITATIONS

The services outlined in this report have been conducted in a manner generally consistent with current regulatory guidelines. No warranty, expressed or implied, is made regarding the professional opinions presented in this report. Ninyo & Moore's opinions are based on an analysis of observed conditions and on information obtained from third parties. It is likely that variations in soil conditions may exist.

The samples collected and chemically analyzed and the observations made are believed to be representative of the general area evaluated; however, conditions can vary significantly between sampling locations. The interpretations and opinions contained in this report are based on the results of laboratory tests and analyses intended to detect the presence and measure the concentration of selected chemical or physical constituents in samples collected from the site. The analyses have been conducted by an independent laboratory certified by the State of California to conduct such analyses. Ninyo & Moore has no involvement in, or control over, such analyses and has no means of confirming the accuracy of laboratory results. Ninyo & Moore, therefore, disclaims any responsibility for inaccuracy in such laboratory results.

This document is intended to be used only in its entirety. No portion of the document, by itself, is designed to completely represent any aspect of the project described herein. Ninyo & Moore should be contacted if the reader wants any additional information, or has questions regarding content, interpretations presented, or completeness of this document. Opinions and judgments expressed herein, which are based on our understanding and interpretation of current regulatory standards, should not be construed as legal opinions.

For individuals with sensory disabilities, this document is available in alternate formats upon request. For any questions regarding this document, please call or write Wayne Chiou,

Environmental Engineering, 3347 Michelson Drive, Suite 100, Irvine, California 92612-1692. Phone Number (949) 724-2221.

10. REFERENCES

Department of Toxic Substance Control (DTSC), 2009, Variance (V69HQSCD006), dated June 30.

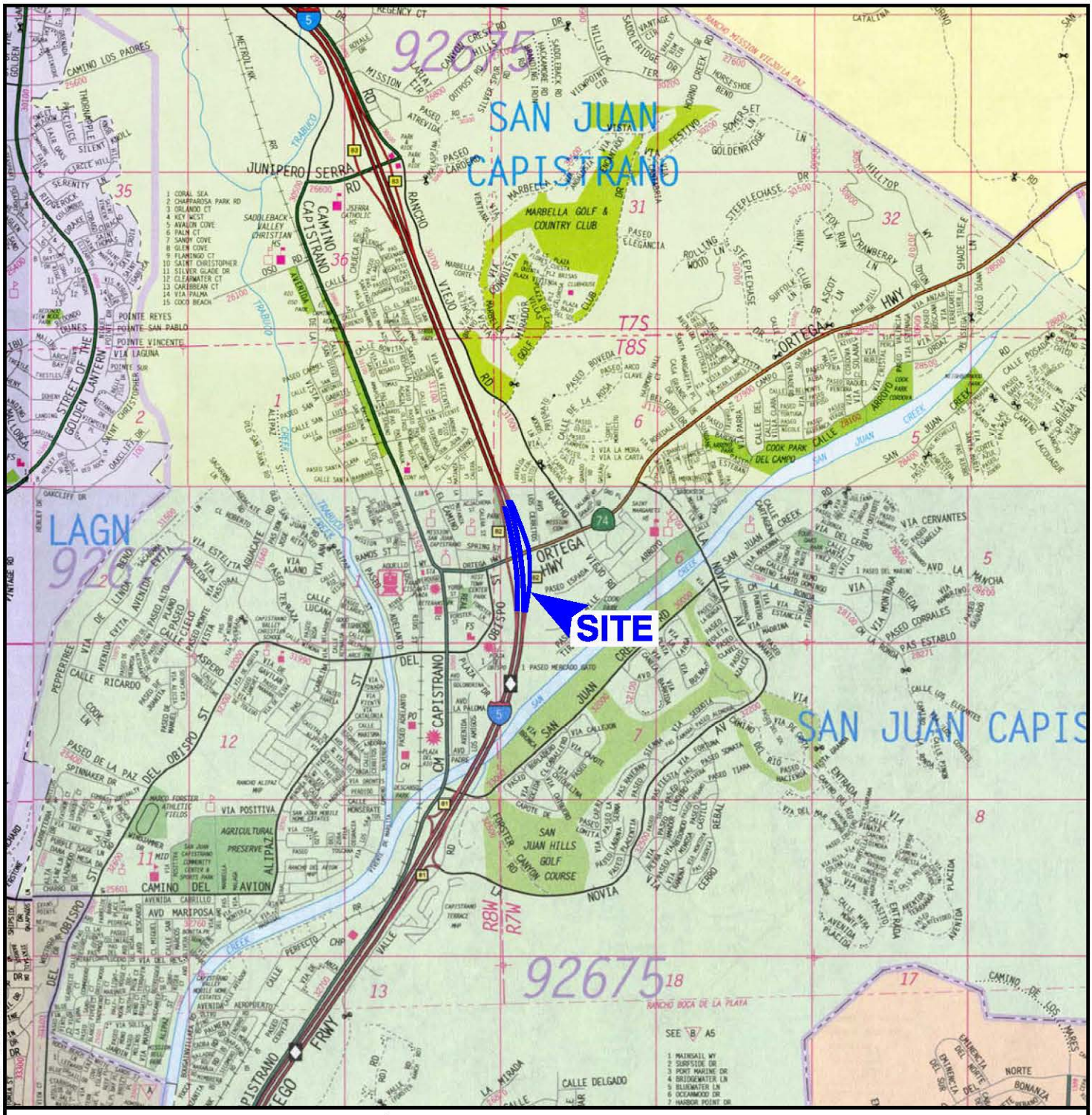
TABLE 1 – SOIL ANALYTICAL RESULTS – AERIALLY DEPOSITED LEAD, pH, AND GPS COORDINATES

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH	Latitude	Longitude
B1-0.5	0.5	1/20/2011	21				9.0	6132434.77459	2129796.25011
B1-1.5	1.5	1/20/2011	10						
B1-3	3	1/20/2011	ND <5.0						
B1-4	4	1/20/2011	ND <5.0						
B2-0.5	0.5	1/20/2011	25					6132386.62508	2129938.63354
B2-1.5	1.5	1/20/2011	22						
B2-3	3	1/20/2011	8.2						
B2-4	4	1/20/2011	25						
B3-0.5	0.5	1/20/2011	16					6132334.82943	2130089.20882
B3-1.5	1.5	1/20/2011	8.5						
B3-3	3	1/20/2011	11				8.2		
B4-0.5	0.5	1/20/2011	10					6132281.77095	2130263.70619
B4-1.5	1.5	1/20/2011	42						
B5-0.5	0.5	1/20/2011	120	4.0				6132209.00129	2130421.96249
B5-1.5	1.5	1/20/2011	5.3						
B5-3	3	1/20/2011	ND <5.0						
B5-4	4	1/20/2011	9.1						
B6-0.5	0.5	1/20/2011	78	3.4				6132155.82110	2130576.00425
B6-1.5	1.5	1/20/2011	190	6.6	ND<0.25	0.27			
B6-3	3	1/20/2011	84	1.8					
B7-0.5	0.5	1/20/2011	51	0.72				6132084.82075	213078.46831
B7-1.5	1.5	1/20/2011	ND <5.0						
B7-3	3	1/20/2011	ND <5.0						
B7-4	4	1/20/2011	ND <5.0						
B8-0.5	0.5	1/20/2011	50	1.5				6132333.18272	2129886.94952
B8-1.5	1.5	1/20/2011	ND <5.0				5.0		
B8-3	3	1/20/2011	ND <5.0						
B8-4	4	1/20/2011	ND <5.0						
B9-0.5	0.5	1/20/2011	39					6132367.85337	2129699.71985
B9-1.5	1.5	1/20/2011	12						
B10-0.5	0.5	1/20/2011	580	24	ND<0.25	0.72		6132400.76289	2129445.85295
B10-1.5	1.5	1/20/2011	7.1						
B11-0.5	0.5	1/20/2011	33				7.6	613425.92892	2129230.91623
B11-1.5	1.5	1/20/2011	ND <5.0						
B11-3	3	1/20/2011	ND <5.0						
B11-4	4	1/20/2011	ND <5.0						
B12-0.5	0.5	1/20/2011	29					6132436.61551	2129072.19650
B12-1.5	1.5	1/20/2011	ND <5.0						
B12-3	3	1/20/2011	ND <5.0						
B12-4	4	1/20/2011	ND <5.0						
B13-0.5	0.5	1/20/2011	ND <5.0					6132442.85868	2128911.45036
B13-1.5	1.5	1/20/2011	7.4						
B13-3	3	1/20/2011	ND <5.0						
B13-4	4	1/20/2011	ND <5.0						
B14-0.5	0.5	1/20/2011	42					6132444.83765	2128687.43158
B14-1.5	1.5	1/20/2011	ND <5.0						
B14-3	3	1/20/2011	ND <5.0						
B14-4	4	1/20/2011	ND <5.0				7.6		
B15-0.5	0.5	1/21/2011	380	14	ND<0.25	0.39		6132467.05862	2128685.97426
B15-1.5	1.5	1/21/2011	ND <5.0						
B15-3	3	1/21/2011	5.5						
B15-4	4	1/21/2011	7.5						
B16-0.5	0.5	1/21/2011	110	12	ND<0.25	0.28		6132496.46312	2128676.36554
B16-1.5	1.5	1/21/2011	ND <5.0						
B16-3	3	1/21/2011	7.6				6.9		
B16-4	4	1/21/2011	12						
B17-0.5	0.5	1/21/2011	10					6132491.04139	2128876.98309
B17-1.5	1.5	1/21/2011	24						
B17-3	3	1/21/2011	20						
B17-4	4	1/21/2011	40						

TABLE 1 – SOIL ANALYTICAL RESULTS – AERIALLY DEPOSITED LEAD, pH, AND GPS COORDINATES

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH	Latitude	Longitude
B18-0.5	0.5	1/21/2011	40					6132526.83566	2128865.95566
B18-1.5	1.5	1/21/2011	5.4						
B18-3	3	1/21/2011	ND <5.0						
B18-4	4	1/20/2011	ND <5.0						
B19-0.5	0.5	1/21/2011	15				6.8	6132509.95586	2129204.28376
B19-1.5	1.5	1/21/2011	15						
B19-3	3	1/21/2011	ND <5.0						
B19-4	4	1/21/2011	ND <5.0						
B20-0.5*	0.5	1/21/2011	ND <5.0				4.4	6132544.57780	2129114.42134
B20-1.5	1.5	1/21/2011	5.2						
B20-3	3	1/21/2011	ND <5.0						
B20-4	4	1/21/2011	ND <5.0						
B21-0.5	0.5	1/21/2011	19					6132259.59780	2128925.89785
B21-1.5	1.5	1/21/2011	ND <5.0				7.4		
B21-3	3	1/21/2011	ND <5.0						
B21-4	4	1/21/2011	ND <5.0						
B22-0.5	0.5	1/21/2011	25					6132264.09364	2129096.01458
B22-1.5	1.5	1/21/2011	ND <5.0						
B22-3	3	1/21/2011	17						
B23-0.5	0.5	1/21/2011	6.6					6132245.87860	2129267.66667
B23-1.5	1.5	1/21/2011	ND <5.0						
B23-3	3	1/21/2011	ND <5.0						
B23-4	4	1/21/2011	ND <5.0						
B24-0.5	0.5	1/21/2011	310	17	ND<0.25	0.28		6132226.79885	2129447.00136
B24-1.5	1.5	1/21/2011	7.8						
B25-0.5	0.5	1/21/2011	9.5					6132216.96785	2129531.23155
B25-1.5	1.5	1/21/2011	5.5						
B25-3	3	1/21/2011	ND <5.0						
B25-4	4	1/21/2011	19				6.4		
B26-0.5	0.5	1/21/2011	75	4.0				6132197.99002	2129681.40291
B26-1.5	1.5	1/21/2011	26						
Maximum			580	24	ND<0.25	0.72	9.0		
Average			31.6	8.1	ND<0.25	0.390	6.9		
Minimum			ND<5.0	0.72	ND<0.25	ND<0.25	4.4		
Regulatory Limits			1411(1)	5(2)	1.5(3)	5(4)	5(5)		
Decontamination Water (mg/l)									
W-1		1/21/2011	ND<0.25						

Notes:
mg/kg – milligrams per kilogram
mg/l – milligrams per liter
TTLC – total lead for comparison to the Total Threshold Limit Concentration
WET – Waste Extraction Test
WET-citric – soluble lead by WET using citric acid for comparison to the Soluble Threshold Limit Concentration
WET-DI – soluble lead by WET using deionized water for comparison to the Soluble Threshold Limit Concentration
TCLP – soluble lead by the Toxicity Characteristic Leaching Procedure
ND − not detected above reporting limits presented in Appendix B
1 − Limit specified in addendum to Variance issued by the Department of Toxic Substance Control to Caltrans (DTSC) Variance, September 22, 2000; Addendum, December 2002; Addendum June 2008)
2 − Soluble Threshold Limit Concentration for California Hazardous Waste (California Code of Regulations [CCR] Title 22, Section 66261.24)
3 − Limit Specified by DTSC Variance
4 − Maximum concentration for the TCLP of Resource, Conservation, and Recovery Act (RCRA) hazardous waste (CCR Title 22, Section 66216.24)
5 − Minimum value specified by DTSC variance
* Data removed as hot spot and not used in statistics.



207384-A3.DWG..G.K.

REFERENCE: 2008 THOMAS GUIDE FOR LOS ANGELES/ORANGE COUNTIES, STREET GUIDE AND DIRECTORY

SCALE IN FEET

0 2400 4800

N

NOTE: DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE

Ninyo & Moore		SITE LOCATION	FIGURE
PROJECT NO.	DATE	SR-74/I-5 INTERCHANGE SAN JUAN CAPISTRANO, CALIFORNIA	1
207384045	3/11		

REFERENCE: GOOGLE EARTH AERIAL PHOTO, 2010.

LEGEND

BORING

SCALE IN FEET

0 350 700

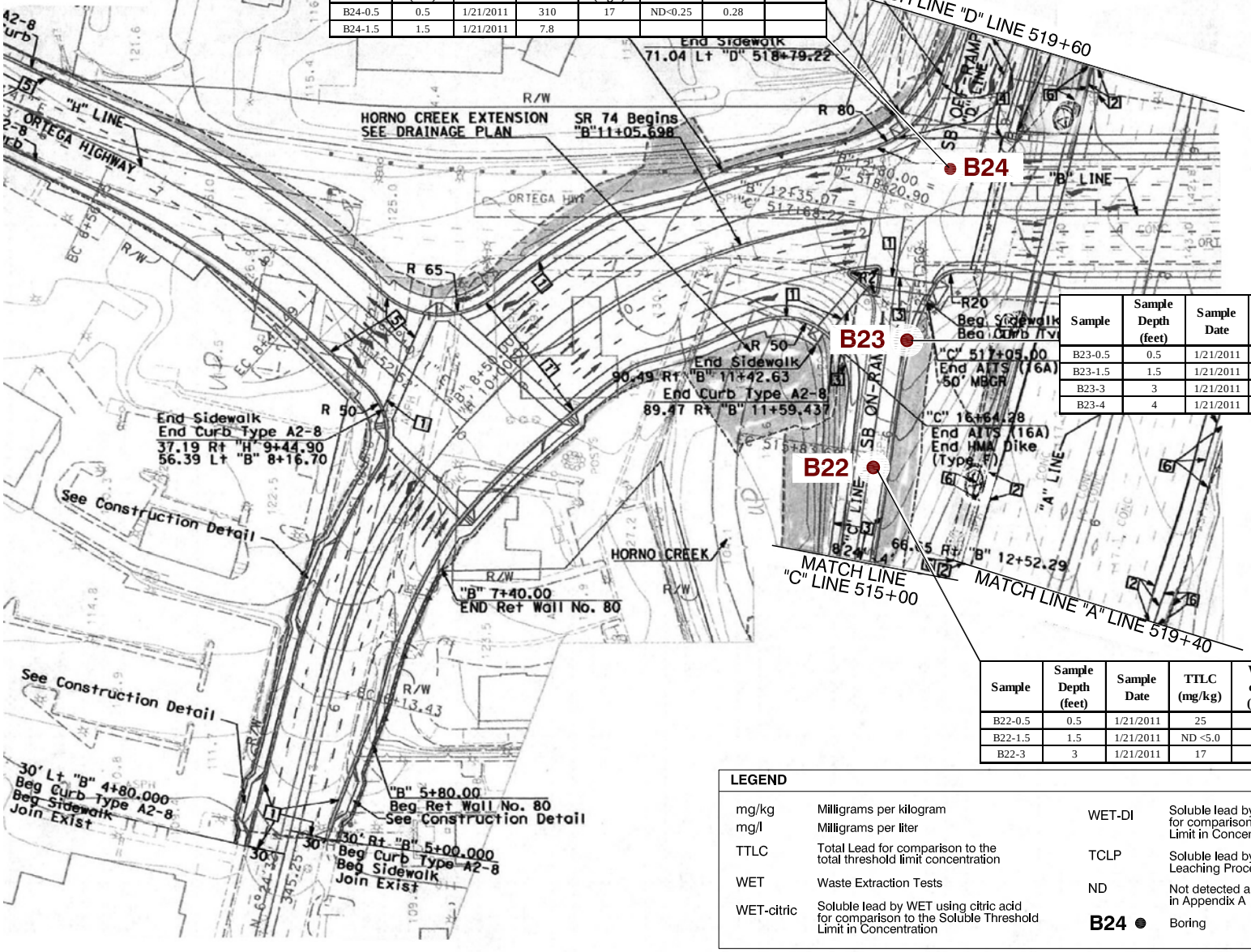
N

NOTE: DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

Ninyo & Moore		BORING LOCATIONS	FIGURE
PROJECT NO.	DATE	SR-74/I-5 INTERCHANGE SAN JUAN CAPISTRANO, CALIFORNIA	2
207384045	3/11		

207384_A4.DWG.....—M.T.

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B24-0.5	0.5	1/21/2011	310	17	ND<0.25	0.28	
B24-1.5	1.5	1/21/2011	7.8				



Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B23-0.5	0.5	1/21/2011	6.6				
B23-1.5	1.5	1/21/2011	ND <5.0				
B23-3	3	1/21/2011	ND <5.0				
B23-4	4	1/21/2011	ND <5.0				

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B22-0.5	0.5	1/21/2011	25				
B22-1.5	1.5	1/21/2011	ND <5.0				
B22-3	3	1/21/2011	17				

LEGEND

mg/kg	Milligrams per kilogram	WET-DI	Soluble lead by WET using deionized water for comparison to the Soluble Threshold Limit in Concentration
mg/l	Milligrams per liter	TCLP	Soluble lead by Toxicity Characteristic Leaching Procedure
TTLC	Total Lead for comparison to the total threshold limit concentration	ND	Not detected above reporting limits presented in Appendix A
WET	Waste Extraction Tests	B24 ●	Boring
WET-citric	Soluble lead by WET using citric acid for comparison to the Soluble Threshold Limit in Concentration		

REFERENCE: BORING LOCATION MAP PROVIDED BY CALTRANS, 07/07/10.

SCALE IN FEET

0 120 240

NOTE: DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

207384_A8.DWG.....GK

Ninyo & Moore

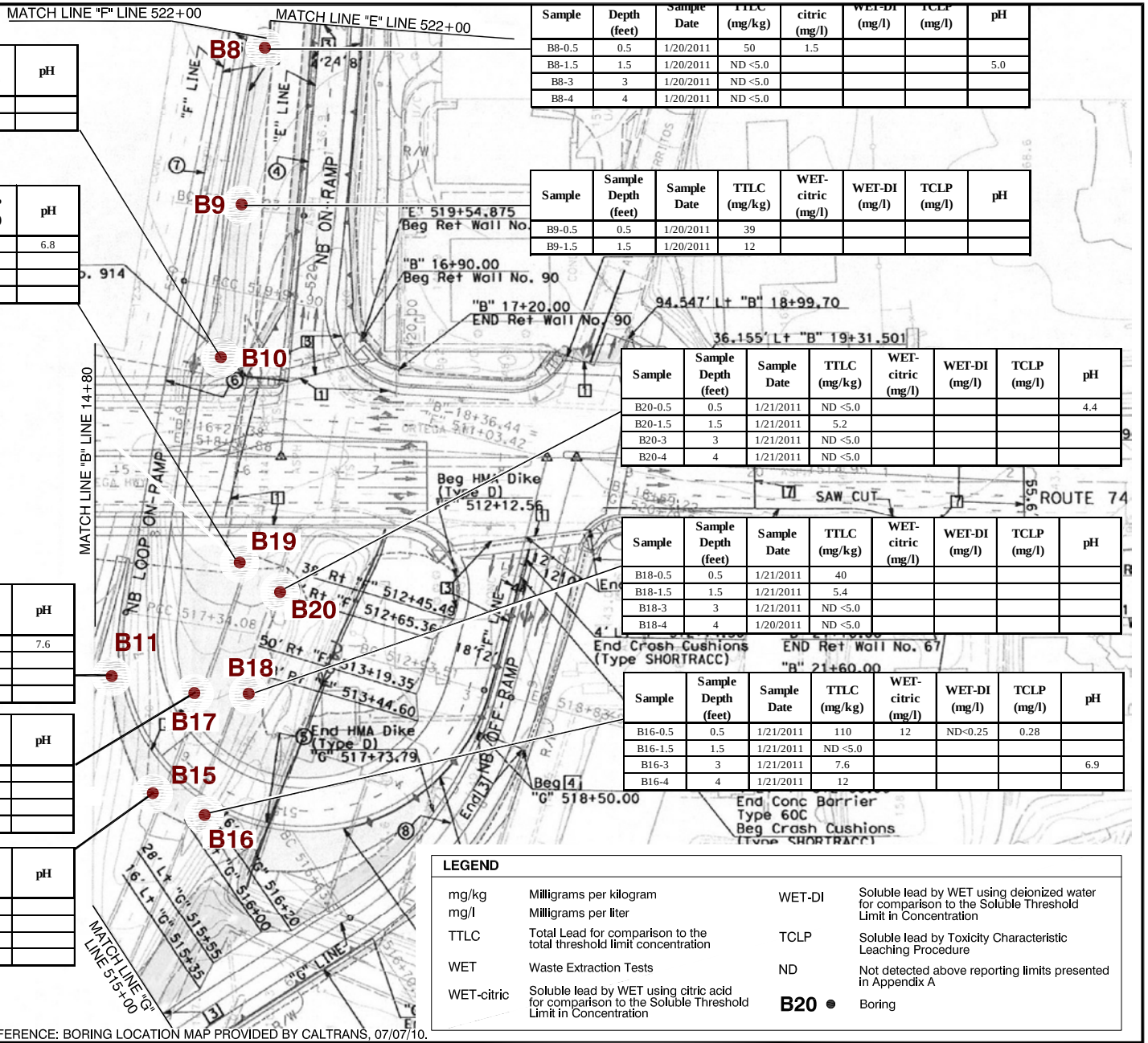
PROJECT NO.	DATE
207384045	3/11

BORING DATA

SR-74/I-5 INTERCHANGE
SAN JUAN CAPISTRANO, CALIFORNIA

FIGURE

3



Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B10-0.5	0.5	1/20/2011	580	24	ND<0.25	0.72	
B10-1.5	1.5	1/20/2011	7.1				

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B19-0.5	0.5	1/21/2011	15				6.8
B19-1.5	1.5	1/21/2011	15				
B19-3	3	1/21/2011	ND <5.0				
B19-4	4	1/21/2011	ND <5.0				

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B11-0.5	0.5	1/20/2011	33				7.6
B11-1.5	1.5	1/20/2011	ND <5.0				
B11-3	3	1/20/2011	ND <5.0				
B11-4	4	1/20/2011	ND <5.0				

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B17-0.5	0.5	1/21/2011	10				
B17-1.5	1.5	1/21/2011	24				
B17-3	3	1/21/2011	20				
B17-4	4	1/21/2011	40				

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B15-0.5	0.5	1/21/2011	380	14	ND<0.25	0.39	
B15-1.5	1.5	1/21/2011	ND <5.0				
B15-3	3	1/21/2011	5.5				
B15-4	4	1/21/2011	7.5				

Sample	Depth (feet)	Sample Date	TTLC (mg/kg)	citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B8-0.5	0.5	1/20/2011	50	1.5			
B8-1.5	1.5	1/20/2011	ND <5.0				5.0
B8-3	3	1/20/2011	ND <5.0				
B8-4	4	1/20/2011	ND <5.0				

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B9-0.5	0.5	1/20/2011	39				
B9-1.5	1.5	1/20/2011	12				

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B20-0.5	0.5	1/21/2011	ND <5.0				4.4
B20-1.5	1.5	1/21/2011	5.2				
B20-3	3	1/21/2011	ND <5.0				
B20-4	4	1/21/2011	ND <5.0				

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B18-0.5	0.5	1/21/2011	40				
B18-1.5	1.5	1/21/2011	5.4				
B18-3	3	1/21/2011	ND <5.0				
B18-4	4	1/20/2011	ND <5.0				

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B16-0.5	0.5	1/21/2011	110	12	ND<0.25	0.28	
B16-1.5	1.5	1/21/2011	ND <5.0				
B16-3	3	1/21/2011	7.6				6.9
B16-4	4	1/21/2011	12				

LEGEND

mg/kg	Milligrams per kilogram	WET-DI	Soluble lead by WET using deionized water for comparison to the Soluble Threshold Limit in Concentration
mg/l	Milligrams per liter		
TTLC	Total Lead for comparison to the total threshold limit concentration	TCLP	Soluble lead by Toxicity Characteristic Leaching Procedure
WET	Waste Extraction Tests	ND	Not detected above reporting limits presented in Appendix A
WET-citric	Soluble lead by WET using citric acid for comparison to the Soluble Threshold Limit in Concentration	B20 ●	Boring

N

SCALE IN FEET

0 120 240

NOTE: DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

REFERENCE: BORING LOCATION MAP PROVIDED BY CALTRANS, 07/07/10.

207384_A9.DWG.....GK

Ninyo & Moore

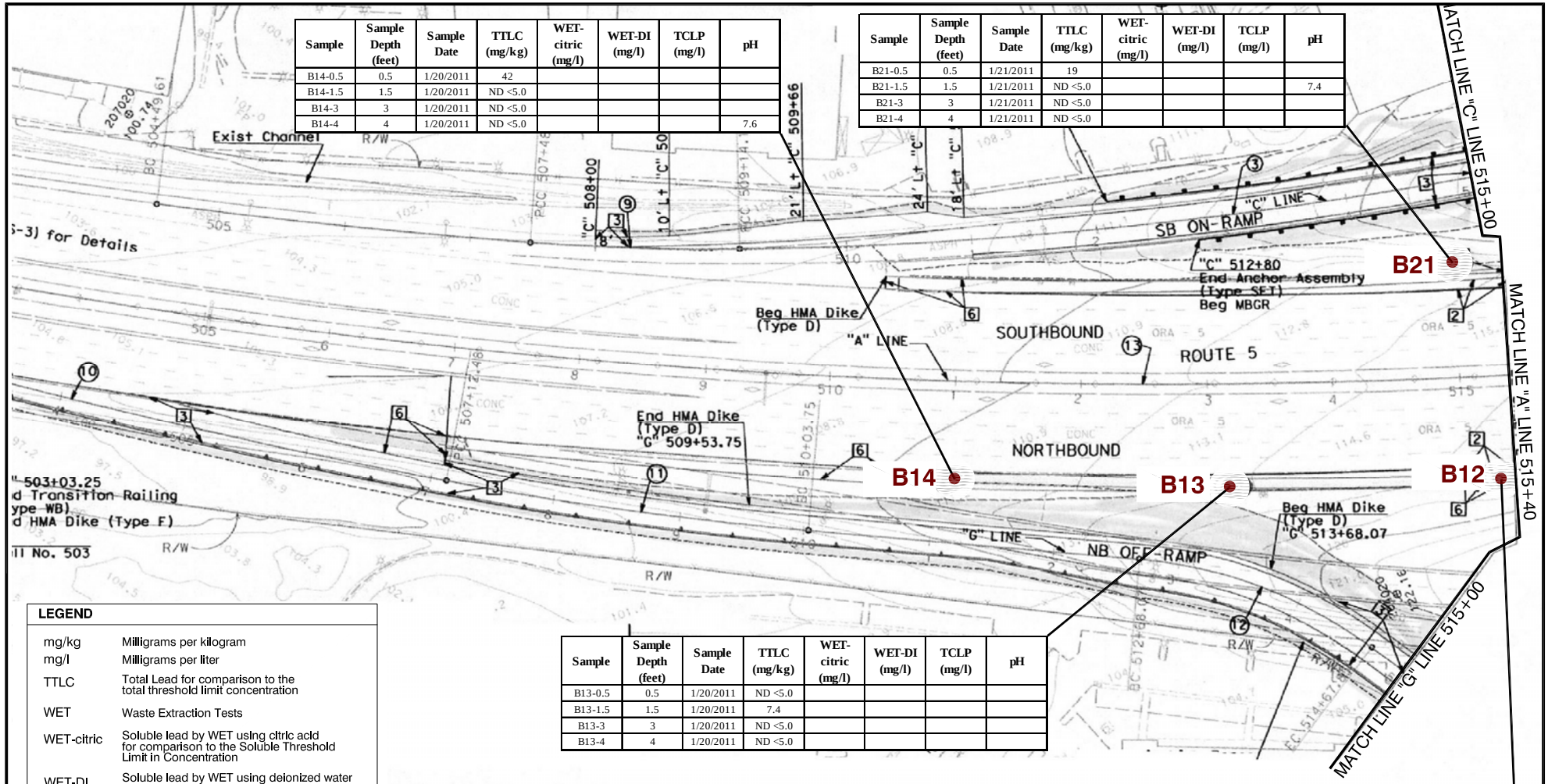
PROJECT NO.	DATE
207384045	3/11

BORING DATA

SR-74/I-5 INTERCHANGE
SAN JUAN CAPISTRANO, CALIFORNIA

FIGURE

4



Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B14-0.5	0.5	1/20/2011	42				
B14-1.5	1.5	1/20/2011	ND <5.0				
B14-3	3	1/20/2011	ND <5.0				
B14-4	4	1/20/2011	ND <5.0				7.6

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B21-0.5	0.5	1/21/2011	19				
B21-1.5	1.5	1/21/2011	ND <5.0				7.4
B21-3	3	1/21/2011	ND <5.0				
B21-4	4	1/21/2011	ND <5.0				

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B13-0.5	0.5	1/20/2011	ND <5.0				
B13-1.5	1.5	1/20/2011	7.4				
B13-3	3	1/20/2011	ND <5.0				
B13-4	4	1/20/2011	ND <5.0				

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B12-0.5	0.5	1/20/2011	29				
B12-1.5	1.5	1/20/2011	ND <5.0				
B12-3	3	1/20/2011	ND <5.0				
B12-4	4	1/20/2011	ND <5.0				

LEGEND

mg/kg	Milligrams per kilogram
mg/l	Milligrams per liter
TTLC	Total Lead for comparison to the total threshold limit concentration
WET	Waste Extraction Tests
WET-citric	Soluble lead by WET using citric acid for comparison to the Soluble Threshold Limit in Concentration
WET-DI	Soluble lead by WET using deionized water for comparison to the Soluble Threshold Limit in Concentration
TCLP	Soluble lead by Toxicity Characteristic Leaching Procedure
ND	Not detected above reporting limits presented in Appendix A
B21 ●	Boring

SCALE IN FEET

0 120 240

NOTE: DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

REFERENCE: BORING LOCATION MAP PROVIDED BY CALTRANS, 07/07/10.

Ninyo & Moore

PROJECT NO.	DATE
207384045	3/11

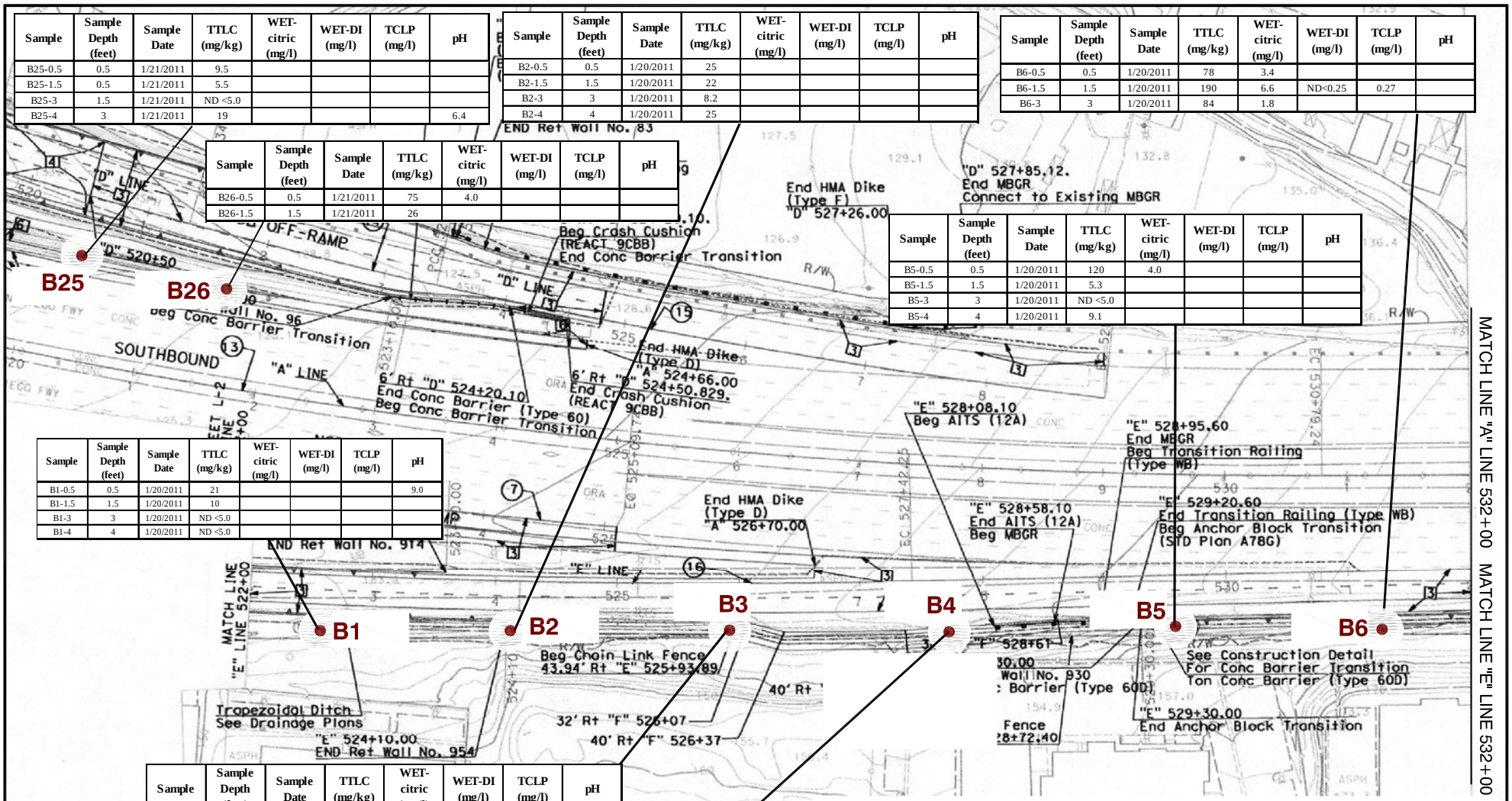
BORING DATA

SR-74/I-5 INTERCHANGE
SAN JUAN CAPISTRANO, CALIFORNIA

FIGURE

5

207384_A10.DWG....GK



Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B25-0.5	0.5	1/21/2011	9.5				
B25-1.5	0.5	1/21/2011	5.5				
B25-3	1.5	1/21/2011	ND <5.0				
B25-4	3	1/21/2011	19				6.4

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B2-0.5	0.5	1/20/2011	25				
B2-1.5	1.5	1/20/2011	22				
B2-3	3	1/20/2011	8.2				
B2-4	4	1/20/2011	25				

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B6-0.5	0.5	1/20/2011	78	3.4			
B6-1.5	1.5	1/20/2011	190	6.6	ND<0.25	0.27	
B6-3	3	1/20/2011	84	1.8			

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B26-0.5	0.5	1/21/2011	75	4.0			
B26-1.5	1.5	1/21/2011	26				

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B5-0.5	0.5	1/20/2011	120	4.0			
B5-1.5	1.5	1/20/2011	5.3				
B5-3	3	1/20/2011	ND <5.0				
B5-4	4	1/20/2011	9.1				

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B1-0.5	0.5	1/20/2011	21				9.0
B1-1.5	1.5	1/20/2011	10				
B1-3	3	1/20/2011	ND <5.0				
B1-4	4	1/20/2011	ND <5.0				

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B3-0.5	0.5	1/20/2011	16				
B3-1.5	1.5	1/20/2011	8.5				
B3-3	3	1/20/2011	11				8.2

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B4-0.5	0.5	1/20/2011	10				
B4-1.5	1.5	1/20/2011	42				

LEGEND

mg/kg	Milligrams per kilogram	WET-DI	Soluble lead by WET using deionized water for comparison to the Soluble Threshold Limit in Concentration
mg/l	Milligrams per liter		
TTLC	Total Lead for comparison to the total threshold limit concentration	TCLP	Soluble lead by Toxicity Characteristic Leaching Procedure
WET	Waste Extraction Tests	ND	Not detected above reporting limits presented in Appendix A
WET-citric	Soluble lead by WET using citric acid for comparison to the Soluble Threshold Limit in Concentration	B26 ●	Boring

N

SCALE IN FEET

0 120 240

NOTE: DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

REFERENCE: BORING LOCATION MAP PROVIDED BY CALTRANS, 07/07/10.

Ninyo & Moore

PROJECT NO.	DATE
207384045	3/11

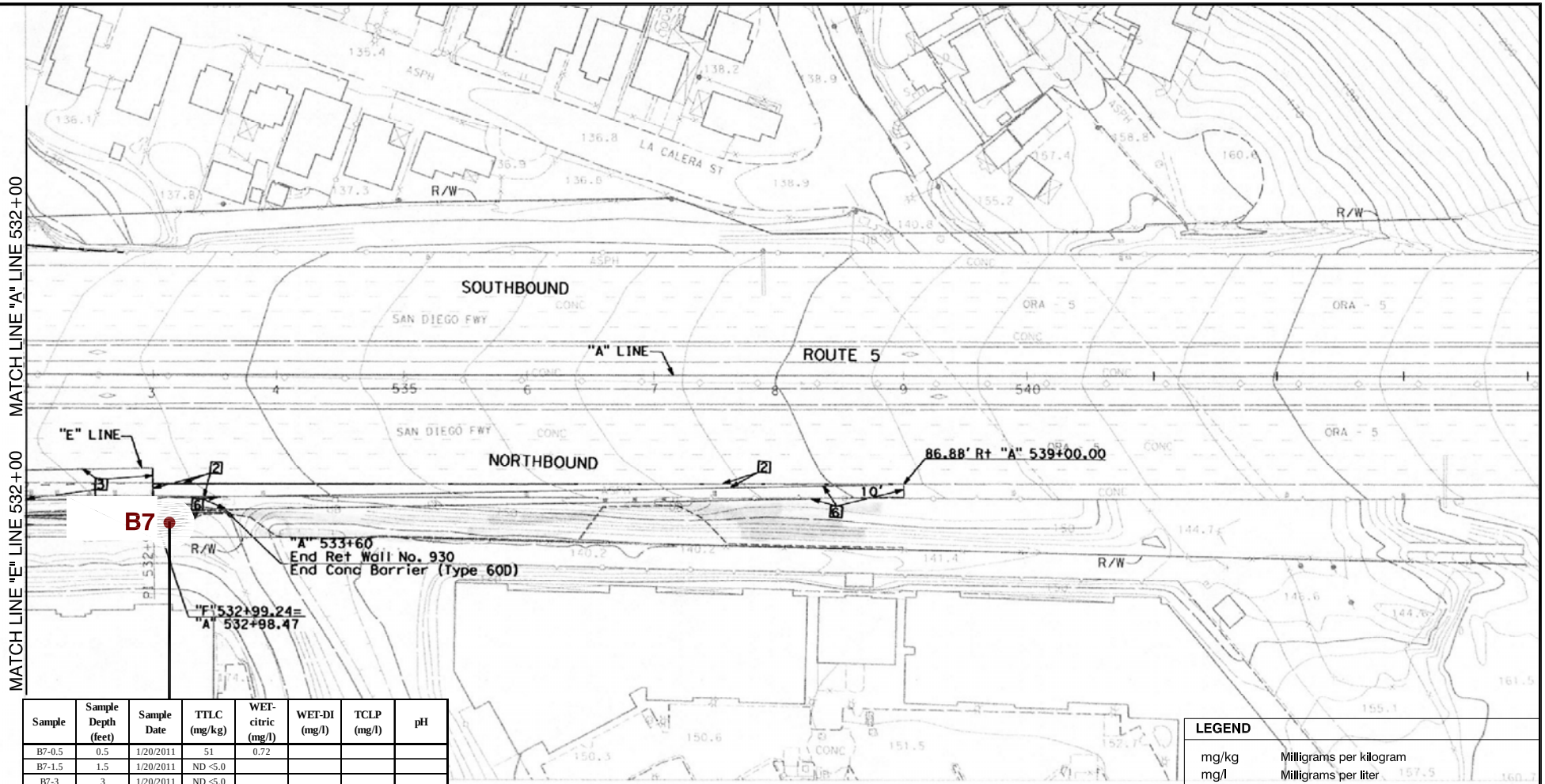
BORING DATA

SR-74/I-5 INTERCHANGE
SAN JUAN CAPISTRANO, CALIFORNIA

FIGURE

6

207384_A11.DWG.....GK



Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B7-0.5	0.5	1/20/2011	51	0.72			
B7-1.5	1.5	1/20/2011	ND <5.0				
B7-3	3	1/20/2011	ND <5.0				
B7-4	4	1/20/2011	ND <5.0				

LEGEND

mg/kg	Milligrams per kilogram
mg/l	Milligrams per liter
TTLC	Total Lead for comparison to the total threshold limit concentration
WET	Waste Extraction Tests
WET-citric	Soluble lead by WET using citric acid for comparison to the Soluble Threshold Limit in Concentration
WET-DI	Soluble lead by WET using deionized water for comparison to the Soluble Threshold Limit in Concentration
TCLP	Soluble lead by Toxicity Characteristic Leaching Procedure
ND	Not detected above reporting limits presented in Appendix A
B7 ●	Boring

SCALE IN FEET

0 120 240

NOTE: DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

REFERENCE: BORING LOCATION MAP PROVIDED BY CALTRANS, 07/07/10.

Ninyo & Moore

PROJECT NO.	DATE
207384045	3/11

BORING DATA

SR-74/I-5 INTERCHANGE
SAN JUAN CAPISTRANO, CALIFORNIA

FIGURE

7

207384_A12.DWG.....GK

APPENDIX A

AERIALLY DEPOSITED LEAD SOIL MANAGEMENT CHART

AERIALLY DEPOSITED LEAD SOIL MANAGEMENT			
SOLUBLE LEAD (mg/l)	**TOTAL LEAD** (mg/kg)	**SOIL TYPE**	**HANDLING**
CALIFORNIA TESTING			
STLC <5.0	TTLC <1000	X	**Non-hazardous Waste**. Notify and require Lead Compliance Plan for worker safety.
	1000 – 1411 and DI WET < 1.5 mg/l	Y1	**Hazardous Waste. Variance applies** – cover with minimum 1 foot of clean soil.*
	1411 – 3397 and DI WET < 150 mg/l	Y2	**Hazardous Waste. Variance applies** – cover with pavement structure. *
	1000 – 3397 but Surplus	Z2	**Hazardous Waste** - Surplus. Dispose at Class 1 disposal site.
	> 3397 or 1000 – 3397 & DI WET > 150 mg/l	Z2	**Hazardous Waste** – not reusable under Variance. Dispose at Class 1 disposal site.
STLC >5.0	TTLC < 1411 and DI WET < 1.5 mg/l	Y1	**Hazardous Waste. Variance applies** – cover with minimum of 1 foot of clean soil.*
	1411 – 3397 and DI WET < 150 mg/l	Y2	**Hazardous Waste. Variance applies** – cover with pavement structure.*
	< 3397 and DI WET < 150 mg/l but Surplus	Z2	**Hazardous Waste** - Surplus. Dispose at Class 1 disposal site.
	> 3397 or DI WET > 150 mg/l	Z2	**Hazardous Waste** – not reusable under Variance. Dispose at Class 1 disposal site.
FEDERAL TESTING			
TCLP > 5.0 mg/l	N/A	Z3	**RCRA Hazardous Waste** Dispose at Class 1 disposal site as a RCRA waste regardless of TTLC and STLC results.

*Note: For hazardous waste levels of lead - if pH is less than 5.5 soil must be placed under a pavement structure. If pH is less than 5.0 variance can not be used and the soil must be disposed as Z-2 material.

APPENDIX B

LABORATORY REPORTS AND CHAIN-OF-CUSTODY DOCUMENTATION

February 11, 2011

Beth Padgett
Ninyo & Moore
475 Goddard Suite 200
Irvine, CA 92618

TEL: (949) 678-0842
FAX: (949) 753-7071

ELAP No.: 1838
NELAP No.: 02107CA
CSDLAC No.: 10196
ORELAP No.: CA300003

Workorder No.: 115904

RE: EA 0E3101, 207384045

Attention: Beth Padgett

Enclosed are the results for sample(s) received on January 20, 2011 by Advanced Technology Laboratories . The sample(s) are tested for the parameters as indicated in the enclosed chain of custody in accordance with the applicable laboratory certifications.

Thank you for the opportunity to service the needs of your company.

Please feel free to call me at (562)989-4045 if I can be of further assistance to your company.

Sincerely,

Eddie F. Rodriguez
Laboratory Director

The cover letter and the case narrative are an integral part of this analytical report and cannot be reproduced in part or in its entirety without written permission from the client and Advanced Technology Laboratories.

Advanced Technology Laboratories
3275 Walnut Avenue Signal Hill, CA 90755 Tel: 562 989-4045 Fax: 562 989-4040

Advanced Technology Laboratories

Date: *11-Feb-11*

CLIENT: Ninyo & Moore
Project: EA 0E3101, 207384045
Lab Order: 115904
Contract No:

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Matrix	Collection Date	Date Received	Date Reported
115904-001A	B1-0.5	Soil	1/20/2011 10:10:00 AM	1/20/2011	2/11/2011
115904-002A	B1-1.5	Soil	1/20/2011 10:15:00 AM	1/20/2011	2/11/2011
115904-003A	B1-3	Soil	1/20/2011 10:18:00 AM	1/20/2011	2/11/2011
115904-004A	B1-4	Soil	1/20/2011 10:23:00 AM	1/20/2011	2/11/2011
115904-005A	B2-0.5	Soil	1/20/2011 10:30:00 AM	1/20/2011	2/11/2011
115904-006A	B2-1.5	Soil	1/20/2011 10:34:00 AM	1/20/2011	2/11/2011
115904-007A	B2-3	Soil	1/20/2011 10:35:00 AM	1/20/2011	2/11/2011
115904-008A	B2-4	Soil	1/20/2011 10:37:00 AM	1/20/2011	2/11/2011
115904-009A	B3-0.5	Soil	1/20/2011 10:42:00 AM	1/20/2011	2/11/2011
115904-010A	B3-1.5	Soil	1/20/2011 10:44:00 AM	1/20/2011	2/11/2011
115904-011A	B3-3	Soil	1/20/2011 10:47:00 AM	1/20/2011	2/11/2011
115904-012A	B4-0.5	Soil	1/20/2011 11:04:00 AM	1/20/2011	2/11/2011
115904-013A	B4-1.5	Soil	1/20/2011 11:08:00 AM	1/20/2011	2/11/2011
115904-014A	B5-0.5	Soil	1/20/2011 11:18:00 AM	1/20/2011	2/11/2011
115904-015A	B5-1.5	Soil	1/20/2011 11:21:00 AM	1/20/2011	2/11/2011
115904-016A	B5-3	Soil	1/20/2011 11:25:00 AM	1/20/2011	2/11/2011
115904-017A	B5-4	Soil	1/20/2011 11:28:00 AM	1/20/2011	2/11/2011
115904-018A	B6-0.5	Soil	1/20/2011 11:33:00 AM	1/20/2011	2/11/2011
115904-019A	B6-1.5	Soil	1/20/2011 11:37:00 AM	1/20/2011	2/11/2011
115904-020A	B6-3	Soil	1/20/2011 11:45:00 AM	1/20/2011	2/11/2011
115904-021A	B7-0.5	Soil	1/20/2011 11:55:00 AM	1/20/2011	2/11/2011
115904-022A	B7-1.5	Soil	1/20/2011 11:59:00 AM	1/20/2011	2/11/2011
115904-023A	B7-3	Soil	1/20/2011 12:04:00 PM	1/20/2011	2/11/2011
115904-024A	B7-4	Soil	1/20/2011 12:08:00 PM	1/20/2011	2/11/2011
115904-025A	B14-0.5	Soil	1/20/2011 1:33:00 PM	1/20/2011	2/11/2011
115904-026A	B14-1.5	Soil	1/20/2011 1:36:00 PM	1/20/2011	2/11/2011
115904-027A	B14-3	Soil	1/20/2011 1:40:00 PM	1/20/2011	2/11/2011
115904-028A	B14-4	Soil	1/20/2011 1:44:00 PM	1/20/2011	2/11/2011
115904-029A	B13-0.5	Soil	1/20/2011 1:52:00 PM	1/20/2011	2/11/2011

Advanced Technology Laboratories
3275 Walnut Avenue, Signal Hill, CA 90755 Tel: 562. 989.4045 Fax: 562.989.4040

CLIENT: Ninyo & Moore
Project: EA 0E3101, 207384045
Lab Order: 115904
Contract No:

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Matrix	Collection Date	Date Received	Date Reported
115904-030A	B13-1.5	Soil	1/20/2011 1:56:00 PM	1/20/2011	2/11/2011
115904-031A	B13-3	Soil	1/20/2011 1:59:00 PM	1/20/2011	2/11/2011
115904-032A	B13-4	Soil	1/20/2011 2:05:00 PM	1/20/2011	2/11/2011
115904-033A	B12-0.5	Soil	1/20/2011 2:15:00 PM	1/20/2011	2/11/2011
115904-034A	B12-1.5	Soil	1/20/2011 2:20:00 PM	1/20/2011	2/11/2011
115904-035A	B12-3	Soil	1/20/2011 2:25:00 PM	1/20/2011	2/11/2011
115904-036A	B12-4	Soil	1/20/2011 2:30:00 PM	1/20/2011	2/11/2011
115904-037A	B11-0.5	Soil	1/20/2011 2:36:00 PM	1/20/2011	2/11/2011
115904-038A	B11-1.5	Soil	1/20/2011 2:40:00 PM	1/20/2011	2/11/2011
115904-039A	B11-3	Soil	1/20/2011 2:48:00 PM	1/20/2011	2/11/2011
115904-040A	B11-4	Soil	1/20/2011 2:51:00 PM	1/20/2011	2/11/2011
115904-041A	B10-0.5	Soil	1/20/2011 2:55:00 PM	1/20/2011	2/11/2011
115904-042A	B10-1.5	Soil	1/20/2011 2:58:00 PM	1/20/2011	2/11/2011
115904-043A	B9-0.5	Soil	1/20/2011 3:08:00 PM	1/20/2011	2/11/2011
115904-044A	B9-1.5	Soil	1/20/2011 3:12:00 PM	1/20/2011	2/11/2011
115904-045A	B8-0.5	Soil	1/20/2011 3:20:00 PM	1/20/2011	2/11/2011
115904-046A	B8-1.5	Soil	1/20/2011 3:24:00 PM	1/20/2011	2/11/2011
115904-047A	B8-3	Soil	1/20/2011 3:28:00 PM	1/20/2011	2/11/2011
115904-048A	B8-4	Soil	1/20/2011 3:31:00 PM	1/20/2011	2/11/2011

Advanced Technology Laboratories
3275 Walnut Avenue, Signal Hill, CA 90755 Tel: 562. 989.4045 Fax: 562.989.4040

CASE NARRATIVE

Analytical Comments for EPA 6010B

Samples 115904-002A-DUP, 115904-012A-DUP, 115904-042A-DUP and 115934-004A-DUP, RPD for Sample Duplicate (DUP) is outside criteria; however, the Laboratory Control Sample (LCS) validated the analytical batch.

Advanced Technology Laboratories
3275 Walnut Avenue, Signal Hill, CA 90755 Tel: 562. 989.4045 Fax: 562.989.4040

Advanced Technology Laboratories

ANALYTICAL RESULTS

Print Date: *11-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B1-0.5
Lab Order:	115904	**Collection Date:**	1/20/2011 10:10:00 AM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115904-001A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M			**EPA 6010B**			
RunID: **ICP6_110126A**	QC Batch: **69974**				PrepDate: **1/25/2011**		Analyst: **JSD**
Lead	21	0.11	5.0		mg/Kg	1	1/26/2011 12:26 PM
PH							
				EPA 9045C			
RunID: **WETCHEM_110126A**	QC Batch: **R129193**				PrepDate:		Analyst: **CBB**
pH	9.0	0.10	0.10		pH Units	1	1/26/2011

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

Advanced Technology Laboratories

3275 Walnut Avenue, Signal Hill, CA 90755 Tel: 562. 989.4045 Fax: 562.989.4040

Advanced Technology Laboratories

ANALYTICAL RESULTS

Print Date: *11-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B1-1.5
Lab Order:	115904	**Collection Date:**	1/20/2011 10:15:00 AM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115904-002A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126A**	QC Batch: **69974**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	10	0.11	5.0		mg/Kg	1	1/26/2011 12:27 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

Advanced Technology Laboratories

3275 Walnut Avenue, Signal Hill, CA 90755 Tel: 562. 989.4045 Fax: 562.989.4040

Advanced Technology Laboratories

ANALYTICAL RESULTS

Print Date: *11-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B1-3
Lab Order:	115904	**Collection Date:**	1/20/2011 10:18:00 AM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115904-003A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126A**	QC Batch: **69974**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	ND	0.11	5.0		mg/Kg	1	1/26/2011 12:30 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

Advanced Technology Laboratories

ANALYTICAL RESULTS

Print Date: *11-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B1-4
Lab Order:	115904	**Collection Date:**	1/20/2011 10:23:00 AM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115904-004A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126A**	QC Batch: **69974**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	ND	0.11	5.0		mg/Kg	1	1/26/2011 12:31 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *11-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B2-0.5
Lab Order:	115904	**Collection Date:**	1/20/2011 10:30:00 AM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115904-005A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126A**	QC Batch: **69974**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	25	0.11	5.0		mg/Kg	1	1/26/2011 12:31 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *11-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B2-1.5
Lab Order:	115904	**Collection Date:**	1/20/2011 10:34:00 AM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115904-006A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126A**	QC Batch: **69974**				PrepDate: **1/25/2011**	Analyst: **JSD**	
Lead	22	0.11	5.0		mg/Kg	1	1/26/2011 12:32 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *11-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B2-3
Lab Order:	115904	**Collection Date:**	1/20/2011 10:35:00 AM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115904-007A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126A**	QC Batch: **69974**				PrepDate: **1/25/2011**	Analyst: **JSD**	
Lead	8.2	0.11	5.0		mg/Kg	1	1/26/2011 12:33 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *11-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B2-4
Lab Order:	115904	**Collection Date:**	1/20/2011 10:37:00 AM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115904-008A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126A**	QC Batch: **69974**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	25	0.11	5.0		mg/Kg	1	1/26/2011 12:35 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *11-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B3-0.5
Lab Order:	115904	**Collection Date:**	1/20/2011 10:42:00 AM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115904-009A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126A**	QC Batch: **69974**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	16	0.11	5.0		mg/Kg	1	1/26/2011 12:36 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *11-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B3-1.5
Lab Order:	115904	**Collection Date:**	1/20/2011 10:44:00 AM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115904-010A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126A**	QC Batch: **69974**				PrepDate: **1/25/2011**	Analyst: **JSD**	
Lead	8.5	0.11	5.0		mg/Kg	1	1/26/2011 12:37 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *11-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B3-3
Lab Order:	115904	**Collection Date:**	1/20/2011 10:47:00 AM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115904-011A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M			**EPA 6010B**			
RunID: **ICP6_110126A**	QC Batch: **69974**				PrepDate: **1/25/2011**		Analyst: **JSD**
Lead	11	0.11	5.0		mg/Kg	1	1/26/2011 12:37 PM
PH							
				EPA 9045C			
RunID: **WETCHEM_110126A**	QC Batch: **R129193**				PrepDate:		Analyst: **CBB**
pH	8.2	0.10	0.10		pH Units	1	1/26/2011

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *11-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B4-0.5
Lab Order:	115904	**Collection Date:**	1/20/2011 11:04:00 AM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115904-012A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126A**	QC Batch: **69974**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	10	0.11	5.0		mg/Kg	1	1/26/2011 12:38 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *11-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B4-1.5
Lab Order:	115904	**Collection Date:**	1/20/2011 11:08:00 AM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115904-013A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126B**	QC Batch: **69975**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	42	0.11	5.0		mg/Kg	1	1/26/2011 12:44 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *11-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B5-0.5
Lab Order:	115904	**Collection Date:**	1/20/2011 11:18:00 AM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115904-014A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
EPA 3050M			**EPA 6010B**				
RunID: **ICP6_110126B**	QC Batch: **69975**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	120	0.11	5.0		mg/Kg	1	1/26/2011 12:45 PM
LEAD BY ATOMIC ABSORPTION (STLC)							
WET			**WET/ EPA 7420**				
RunID: **AA2_110203A**	QC Batch: **70118**				PrepDate:	**1/29/2011**	Analyst: **IL**
Lead	4.0	0.21	0.25		mg/L	1	2/3/2011 12:17 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *11-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B5-1.5
Lab Order:	115904	**Collection Date:**	1/20/2011 11:21:00 AM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115904-015A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126B**	QC Batch: **69975**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	5.3	0.11	5.0		mg/Kg	1	1/26/2011 12:46 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *11-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B5-3
Lab Order:	115904	**Collection Date:**	1/20/2011 11:25:00 AM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115904-016A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126B**	QC Batch: **69975**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	ND	0.11	5.0		mg/Kg	1	1/26/2011 12:47 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *11-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B5-4
Lab Order:	115904	**Collection Date:**	1/20/2011 11:28:00 AM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115904-017A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126B**	QC Batch: **69975**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	9.1	0.11	5.0		mg/Kg	1	1/26/2011 12:47 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *11-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B6-0.5
Lab Order:	115904	**Collection Date:**	1/20/2011 11:33:00 AM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115904-018A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
EPA 3050M			**EPA 6010B**				
RunID: **ICP6_110126B**	QC Batch: **69975**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	78	0.11	5.0		mg/Kg	1	1/26/2011 12:48 PM
LEAD BY ATOMIC ABSORPTION (STLC)							
WET			**WET/ EPA 7420**				
RunID: **AA2_110203A**	QC Batch: **70118**				PrepDate:	**1/29/2011**	Analyst: **IL**
Lead	3.4	0.21	0.25		mg/L	1	2/3/2011 12:17 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *11-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B6-1.5
Lab Order:	115904	**Collection Date:**	1/20/2011 11:37:00 AM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115904-019A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126B**	QC Batch: **69975**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	190	0.11	5.0		mg/Kg	1	1/26/2011 12:49 PM
LEAD BY ATOMIC ABSORPTION							
			WET DI/ EPA 7420				
RunID: **AA2_110210A**	QC Batch: **R129813**				PrepDate:		Analyst: **VV**
Lead	ND	0.21	0.25		mg/L	1	2/10/2011 10:24 AM
LEAD BY ATOMIC ABSORPTION (STLC)							
	WET		**WET/ EPA 7420**				
RunID: **AA2_110203A**	QC Batch: **70118**				PrepDate:	**1/29/2011**	Analyst: **IL**
Lead	6.6	0.21	0.25		mg/L	1	2/3/2011 12:17 PM
LEAD BY ATOMIC ABSORPTION (TCLP)							
	EPA3010A		**EPA 1311/ 7420**				
RunID: **AA2_110208E**	QC Batch: **70456**				PrepDate:	**2/7/2011**	Analyst: **VV**
Lead	0.27	0.21	0.25		mg/L	1	2/8/2011 04:28 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *11-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B6-3
Lab Order:	115904	**Collection Date:**	1/20/2011 11:45:00 AM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115904-020A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126B**	QC Batch: **69975**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	84	0.11	5.0		mg/Kg	1	1/26/2011 12:49 PM
LEAD BY ATOMIC ABSORPTION (STLC)							
	WET		**WET/ EPA 7420**				
RunID: **AA2_110203A**	QC Batch: **70118**				PrepDate:	**1/29/2011**	Analyst: **IL**
Lead	1.8	0.21	0.25		mg/L	1	2/3/2011 12:18 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *11-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B7-0.5
Lab Order:	115904	**Collection Date:**	1/20/2011 11:55:00 AM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115904-021A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126B**	QC Batch: **69975**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	51	0.11	5.0		mg/Kg	1	1/26/2011 12:50 PM
LEAD BY ATOMIC ABSORPTION (STLC)							
	WET		**WET/ EPA 7420**				
RunID: **AA2_110203A**	QC Batch: **70118**				PrepDate:	**1/29/2011**	Analyst: **IL**
Lead	0.72	0.21	0.25		mg/L	1	2/3/2011 12:18 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *11-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B7-1.5
Lab Order:	115904	**Collection Date:**	1/20/2011 11:59:00 AM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115904-022A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126B**	QC Batch: **69975**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	ND	0.11	5.0		mg/Kg	1	1/26/2011 12:51 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *11-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B7-3
Lab Order:	115904	**Collection Date:**	1/20/2011 12:04:00 PM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115904-023A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126B**	QC Batch: **69975**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	ND	0.11	5.0		mg/Kg	1	1/26/2011 12:56 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *11-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B7-4
Lab Order:	115904	**Collection Date:**	1/20/2011 12:08:00 PM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115904-024A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126B**	QC Batch: **69975**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	ND	0.11	5.0		mg/Kg	1	1/26/2011 12:56 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *11-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B14-0.5
Lab Order:	115904	**Collection Date:**	1/20/2011 1:33:00 PM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115904-025A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126B**	QC Batch: **69975**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	42	0.11	5.0		mg/Kg	1	1/26/2011 12:57 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *11-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B14-1.5
Lab Order:	115904	**Collection Date:**	1/20/2011 1:36:00 PM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115904-026A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126B**	QC Batch: **69975**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	ND	0.11	5.0		mg/Kg	1	1/26/2011 12:58 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *11-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B14-3
Lab Order:	115904	**Collection Date:**	1/20/2011 1:40:00 PM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115904-027A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126B**	QC Batch: **69975**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	ND	0.11	5.0		mg/Kg	1	1/26/2011 12:58 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *11-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B14-4
Lab Order:	115904	**Collection Date:**	1/20/2011 1:44:00 PM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115904-028A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M			**EPA 6010B**			
RunID: **ICP6_110126B**	QC Batch: **69975**				PrepDate: **1/25/2011**		Analyst: **JSD**
Lead	ND	0.11	5.0		mg/Kg	1	1/26/2011 12:59 PM
PH							
				EPA 9045C			
RunID: **WETCHEM_110126A**	QC Batch: **R129193**				PrepDate:		Analyst: **CBB**
pH	7.6	0.10	0.10		pH Units	1	1/26/2011

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *11-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B13-0.5
Lab Order:	115904	**Collection Date:**	1/20/2011 1:52:00 PM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115904-029A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126B**	QC Batch: **69975**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	ND	0.11	5.0		mg/Kg	1	1/26/2011 01:00 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *11-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B13-1.5
Lab Order:	115904	**Collection Date:**	1/20/2011 1:56:00 PM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115904-030A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126B**	QC Batch: **69975**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	7.4	0.11	5.0		mg/Kg	1	1/26/2011 01:02 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *11-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B13-3
Lab Order:	115904	**Collection Date:**	1/20/2011 1:59:00 PM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115904-031A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126B**	QC Batch: **69975**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	ND	0.11	5.0		mg/Kg	1	1/26/2011 01:03 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *11-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B13-4
Lab Order:	115904	**Collection Date:**	1/20/2011 2:05:00 PM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115904-032A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126B**	QC Batch: **69975**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	ND	0.11	5.0		mg/Kg	1	1/26/2011 01:04 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *11-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B12-0.5
Lab Order:	115904	**Collection Date:**	1/20/2011 2:15:00 PM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115904-033A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126C**	QC Batch: **69976**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	29	0.11	5.0		mg/Kg	1	1/26/2011 01:08 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *11-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B12-1.5
Lab Order:	115904	**Collection Date:**	1/20/2011 2:20:00 PM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115904-034A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126C**	QC Batch: **69976**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	ND	0.11	5.0		mg/Kg	1	1/26/2011 01:09 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *11-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B12-3
Lab Order:	115904	**Collection Date:**	1/20/2011 2:25:00 PM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115904-035A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126C**	QC Batch: **69976**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	ND	0.11	5.0		mg/Kg	1	1/26/2011 01:12 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *11-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B12-4
Lab Order:	115904	**Collection Date:**	1/20/2011 2:30:00 PM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115904-036A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126C**	QC Batch: **69976**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	ND	0.11	5.0		mg/Kg	1	1/26/2011 01:12 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *11-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B11-0.5
Lab Order:	115904	**Collection Date:**	1/20/2011 2:36:00 PM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115904-037A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M			**EPA 6010B**			
RunID: **ICP6_110126C**	QC Batch: **69976**				PrepDate: **1/25/2011**		Analyst: **JSD**
Lead	33	0.11	5.0		mg/Kg	1	1/26/2011 01:13 PM
PH							
				EPA 9045C			
RunID: **WETCHEM_110126A**	QC Batch: **R129193**				PrepDate:		Analyst: **CBB**
pH	7.6	0.10	0.10		pH Units	1	1/26/2011

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *11-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B11-1.5
Lab Order:	115904	**Collection Date:**	1/20/2011 2:40:00 PM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115904-038A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126C**	QC Batch: **69976**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	ND	0.11	5.0		mg/Kg	1	1/26/2011 01:14 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *11-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B11-3
Lab Order:	115904	**Collection Date:**	1/20/2011 2:48:00 PM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115904-039A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126C**	QC Batch: **69976**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	ND	0.11	5.0		mg/Kg	1	1/26/2011 01:14 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *11-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B11-4
Lab Order:	115904	**Collection Date:**	1/20/2011 2:51:00 PM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115904-040A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126C**	QC Batch: **69976**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	ND	0.11	5.0		mg/Kg	1	1/26/2011 01:15 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *11-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B10-0.5
Lab Order:	115904	**Collection Date:**	1/20/2011 2:55:00 PM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115904-041A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126C**	QC Batch: **69976**				PrepDate: **1/25/2011**		Analyst: **JSD**
Lead	580	0.11	5.0		mg/Kg	1	1/26/2011 01:16 PM
LEAD BY ATOMIC ABSORPTION							
			WET DI/ EPA 7420				
RunID: **AA2_110210A**	QC Batch: **R129813**				PrepDate:		Analyst: **VV**
Lead	ND	0.21	0.25		mg/L	1	2/10/2011 10:24 AM
LEAD BY ATOMIC ABSORPTION (STLC)							
	WET		**WET/ EPA 7420**				
RunID: **AA2_110203A**	QC Batch: **70118**				PrepDate: **1/29/2011**		Analyst: **IL**
Lead	24	2.1	2.5		mg/L	10	2/3/2011 12:19 PM
LEAD BY ATOMIC ABSORPTION (TCLP)							
	EPA3010A		**EPA 1311/ 7420**				
RunID: **AA2_110208E**	QC Batch: **70456**				PrepDate: **2/7/2011**		Analyst: **VV**
Lead	0.72	0.21	0.25		mg/L	1	2/8/2011 04:29 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *11-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B10-1.5
Lab Order:	115904	**Collection Date:**	1/20/2011 2:58:00 PM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115904-042A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126C**	QC Batch: **69976**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	7.1	0.11	5.0		mg/Kg	1	1/26/2011 01:16 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *11-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B9-0.5
Lab Order:	115904	**Collection Date:**	1/20/2011 3:08:00 PM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115904-043A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126C**	QC Batch: **69976**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	39	0.11	5.0		mg/Kg	1	1/26/2011 01:21 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *11-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B9-1.5
Lab Order:	115904	**Collection Date:**	1/20/2011 3:12:00 PM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115904-044A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126C**	QC Batch: **69976**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	12	0.11	5.0		mg/Kg	1	1/26/2011 01:22 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *11-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B8-0.5
Lab Order:	115904	**Collection Date:**	1/20/2011 3:20:00 PM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115904-045A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126C**	QC Batch: **69976**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	50	0.11	5.0		mg/Kg	1	1/26/2011 01:23 PM
LEAD BY ATOMIC ABSORPTION (STLC)							
	WET		**WET/ EPA 7420**				
RunID: **AA2_110203A**	QC Batch: **70118**				PrepDate:	**1/29/2011**	Analyst: **IL**
Lead	1.5	0.21	0.25		mg/L	1	2/3/2011 12:20 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *11-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B8-1.5
Lab Order:	115904	**Collection Date:**	1/20/2011 3:24:00 PM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115904-046A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
EPA 3050M			**EPA 6010B**				
RunID: **ICP6_110126C**	QC Batch: **69976**				PrepDate: **1/25/2011**		Analyst: **JSD**
Lead	ND	0.11	5.0		mg/Kg	1	1/26/2011 01:24 PM
PH							
			EPA 9045C				
RunID: **WETCHEM_110126A**	QC Batch: **R129193**				PrepDate:		Analyst: **CBB**
pH	5.0	0.10	0.10		pH Units	1	1/26/2011

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *11-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B8-3
Lab Order:	115904	**Collection Date:**	1/20/2011 3:28:00 PM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115904-047A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126C**	QC Batch: **69976**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	ND	0.11	5.0		mg/Kg	1	1/26/2011 01:24 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *11-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B8-4
Lab Order:	115904	**Collection Date:**	1/20/2011 3:31:00 PM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115904-048A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126C**	QC Batch: **69976**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	ND	0.11	5.0		mg/Kg	1	1/26/2011 01:25 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

CLIENT: Ninyo & Moore
Work Order: 115904
Project: EA 0E3101, 207384045

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_SPB

Sample ID: **MB-69974A** SampType: **MBLK** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **1/25/2011** RunNo: **129188**
Client ID: **PBS** Batch ID: **69974** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **1/26/2011** SeqNo: **2094490**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	0.198	5.0									

Sample ID: **LCS-69974** SampType: **LCS** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **1/25/2011** RunNo: **129188**
Client ID: **LCSS** Batch ID: **69974** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **1/26/2011** SeqNo: **2094491**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	238.846	5.0	250.0	0.1976	95.5	80	120				

Sample ID: **115904-002A-DUP** SampType: **DUP** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **1/25/2011** RunNo: **129188**
Client ID: **B1-1.5** Batch ID: **69974** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **1/26/2011** SeqNo: **2094501**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	44.310	5.0						10.32	124	20	R

Sample ID: **115904-002A-MS** SampType: **MS** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **1/25/2011** RunNo: **129188**
Client ID: **B1-1.5** Batch ID: **69974** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **1/26/2011** SeqNo: **2094502**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	239.800	5.0	250.0	10.32	91.8	34	126				

Sample ID: **MB-69974B** SampType: **MBLK** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **1/25/2011** RunNo: **129188**
Client ID: **PBS** Batch ID: **69974** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **1/26/2011** SeqNo: **2094503**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	ND	5.0									

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Ninyo & Moore
Work Order: 115904
Project: EA 0E3101, 207384045

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_SPB

Sample ID: **115904-012A-DUP** SampType: **DUP** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **1/25/2011** RunNo: **129188**
Client ID: **B4-0.5** Batch ID: **69974** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **1/26/2011** SeqNo: **2094514**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	8.277	5.0						10.30	21.8	20	R

Sample ID: **115904-012A-MS** SampType: **MS** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **1/25/2011** RunNo: **129188**
Client ID: **B4-0.5** Batch ID: **69974** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **1/26/2011** SeqNo: **2094515**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	289.277	5.0	250.0	10.30	112	34	126				

Sample ID: **115904-012A-MSD** SampType: **MSD** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **1/25/2011** RunNo: **129188**
Client ID: **B4-0.5** Batch ID: **69974** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **1/26/2011** SeqNo: **2094516**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	267.431	5.0	250.0	10.30	103	34	126	289.3	7.85	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Ninyo & Moore
Work Order: 115904
Project: EA 0E3101, 207384045

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_SPB

Sample ID: **MB-69975A** SampType: **MBLK** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **1/25/2011** RunNo: **129189**
Client ID: **PBS** Batch ID: **69975** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **1/26/2011** SeqNo: **2094544**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	ND	5.0									

Sample ID: **LCS-69975** SampType: **LCS** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **1/25/2011** RunNo: **129189**
Client ID: **LCSS** Batch ID: **69975** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **1/26/2011** SeqNo: **2094545**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	276.036	5.0	250.0	0	110	80	120				

Sample ID: **115904-022A-DUP** SampType: **DUP** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **1/25/2011** RunNo: **129189**
Client ID: **B7-1.5** Batch ID: **69975** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **1/26/2011** SeqNo: **2094556**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	2.503	5.0						2.247	0	20	

Sample ID: **115904-022A-MS** SampType: **MS** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **1/25/2011** RunNo: **129189**
Client ID: **B7-1.5** Batch ID: **69975** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **1/26/2011** SeqNo: **2094557**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	222.229	5.0	250.0	2.247	88.0	34	126				

Sample ID: **MB-69975B** SampType: **MBLK** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **1/25/2011** RunNo: **129189**
Client ID: **PBS** Batch ID: **69975** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **1/26/2011** SeqNo: **2094558**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	ND	5.0									

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

Advanced Technology Laboratories
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CLIENT: Ninyo & Moore
Work Order: 115904
Project: EA 0E3101, 207384045

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_SPB

Sample ID: **115904-032A-DUP** SampType: **DUP** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **1/25/2011** RunNo: **129189**
Client ID: **B13-4** Batch ID: **69975** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **1/26/2011** SeqNo: **2094569**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	2.011	5.0						1.991	0	20	

Sample ID: **115904-032A-MS** SampType: **MS** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **1/25/2011** RunNo: **129189**
Client ID: **B13-4** Batch ID: **69975** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **1/26/2011** SeqNo: **2094570**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	209.398	5.0	250.0	1.991	83.0	34	126				

Sample ID: **115904-032A-MSD** SampType: **MSD** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **1/25/2011** RunNo: **129189**
Client ID: **B13-4** Batch ID: **69975** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **1/26/2011** SeqNo: **2094571**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	198.145	5.0	250.0	1.991	78.5	34	126	209.4	5.52	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

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Work Order: 115904
Project: EA 0E3101, 207384045

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_SPB

Sample ID: **MB-69976A** SampType: **MBLK** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **1/25/2011** RunNo: **129190**
Client ID: **PBS** Batch ID: **69976** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **1/26/2011** SeqNo: **2094572**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	ND	5.0									

Sample ID: **LCS-69976** SampType: **LCS** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **1/25/2011** RunNo: **129190**
Client ID: **LCSS** Batch ID: **69976** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **1/26/2011** SeqNo: **2094573**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	227.276	5.0	250.0	0	90.9	80	120				

Sample ID: **115904-042A-DUP** SampType: **DUP** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **1/25/2011** RunNo: **129190**
Client ID: **B10-1.5** Batch ID: **69976** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **1/26/2011** SeqNo: **2094584**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	25.775	5.0						7.103	114	20	R

Sample ID: **115904-042A-MS** SampType: **MS** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **1/25/2011** RunNo: **129190**
Client ID: **B10-1.5** Batch ID: **69976** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **1/26/2011** SeqNo: **2094585**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	240.472	5.0	250.0	7.103	93.3	34	126				

Sample ID: **MB-69976B** SampType: **MBLK** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **1/25/2011** RunNo: **129190**
Client ID: **PBS** Batch ID: **69976** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **1/26/2011** SeqNo: **2094586**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	ND	5.0									

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

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CLIENT: Ninyo & Moore
Work Order: 115904
Project: EA 0E3101, 207384045

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_SPB

Sample ID: **115934-004A-DUP** SampType: **DUP** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **1/25/2011** RunNo: **129190**
Client ID: **ZZZZZZ** Batch ID: **69976** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **1/26/2011** SeqNo: **2094597**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	7.675	5.0						5.529	32.5	20	R

Sample ID: **115934-004A-MS** SampType: **MS** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **1/25/2011** RunNo: **129190**
Client ID: **ZZZZZZ** Batch ID: **69976** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **1/26/2011** SeqNo: **2094598**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	215.039	5.0	250.0	5.529	83.8	34	126				

Sample ID: **115934-004A-MSD** SampType: **MSD** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **1/25/2011** RunNo: **129190**
Client ID: **ZZZZZZ** Batch ID: **69976** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **1/26/2011** SeqNo: **2094599**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	189.366	5.0	250.0	5.529	73.5	34	126	215.0	12.7	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

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CLIENT: Ninyo & Moore
Work Order: 115904
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ANALYTICAL QC SUMMARY REPORT

TestCode: 7420_DI

Sample ID: **MB-70503A** SampType: **MBLK** TestCode: **7420_DI** Units: **mg/L** Prep Date: RunNo: **129813**
Client ID: **PBS** Batch ID: **R129813** TestNo: **WET DI/ EPA** Analysis Date: **2/10/2011** SeqNo: **2107803**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	ND	0.25									

Sample ID: **LCS-70503** SampType: **LCS** TestCode: **7420_DI** Units: **mg/L** Prep Date: RunNo: **129813**
Client ID: **LCSS** Batch ID: **R129813** TestNo: **WET DI/ EPA** Analysis Date: **2/10/2011** SeqNo: **2107804**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	4.943	0.25	5.000	0	98.9	80	120				

Sample ID: **115975-011A-DUP** SampType: **DUP** TestCode: **7420_DI** Units: **mg/L** Prep Date: RunNo: **129813**
Client ID: **ZZZZZZ** Batch ID: **R129813** TestNo: **WET DI/ EPA** Analysis Date: **2/10/2011** SeqNo: **2107810**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	0.454	0.25						0.4641	2.21	20	

Sample ID: **115975-011A-MS** SampType: **MS** TestCode: **7420_DI** Units: **mg/L** Prep Date: RunNo: **129813**
Client ID: **ZZZZZZ** Batch ID: **R129813** TestNo: **WET DI/ EPA** Analysis Date: **2/10/2011** SeqNo: **2107811**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	5.135	0.25	5.000	0.4641	93.4	70	130				

Sample ID: **115975-011A-MSD** SampType: **MSD** TestCode: **7420_DI** Units: **mg/L** Prep Date: RunNo: **129813**
Client ID: **ZZZZZZ** Batch ID: **R129813** TestNo: **WET DI/ EPA** Analysis Date: **2/10/2011** SeqNo: **2107812**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	5.565	0.25	5.000	0.4641	102	70	130	5.135	8.05	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

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CLIENT: Ninyo & Moore
Work Order: 115904
Project: EA 0E3101, 207384045

ANALYTICAL QC SUMMARY REPORT

TestCode: 7420_ST

Sample ID: **MB-70118A** SampType: **MBLK** TestCode: **7420_ST** Units: **mg/L** Prep Date: **1/29/2011** RunNo: **129523**
Client ID: **PBS** Batch ID: **70118** TestNo: **WET/ EPA 74 WET** Analysis Date: **2/3/2011** SeqNo: **2101758**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	ND	0.25									

Sample ID: **LCS-70118** SampType: **LCS** TestCode: **7420_ST** Units: **mg/L** Prep Date: **1/29/2011** RunNo: **129523**
Client ID: **LCSS** Batch ID: **70118** TestNo: **WET/ EPA 74 WET** Analysis Date: **2/3/2011** SeqNo: **2101759**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	5.085	0.25	5.000	0	102	80	120				

Sample ID: **115998-001A-DUP** SampType: **DUP** TestCode: **7420_ST** Units: **mg/L** Prep Date: **1/29/2011** RunNo: **129523**
Client ID: **ZZZZZZ** Batch ID: **70118** TestNo: **WET/ EPA 74 WET** Analysis Date: **2/3/2011** SeqNo: **2101771**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	0.470	0.25						0.4861	3.44	20	

Sample ID: **115998-001A-MS** SampType: **MS** TestCode: **7420_ST** Units: **mg/L** Prep Date: **1/29/2011** RunNo: **129523**
Client ID: **ZZZZZZ** Batch ID: **70118** TestNo: **WET/ EPA 74 WET** Analysis Date: **2/3/2011** SeqNo: **2101772**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	5.265	0.25	5.000	0.4861	95.6	80	120				

Sample ID: **115998-001A-MSD** SampType: **MSD** TestCode: **7420_ST** Units: **mg/L** Prep Date: **1/29/2011** RunNo: **129523**
Client ID: **ZZZZZZ** Batch ID: **70118** TestNo: **WET/ EPA 74 WET** Analysis Date: **2/3/2011** SeqNo: **2101773**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	5.379	0.25	5.000	0.4861	97.9	80	120	5.265	2.15	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

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CLIENT: Ninyo & Moore
Work Order: 115904
Project: EA 0E3101, 207384045

ANALYTICAL QC SUMMARY REPORT

TestCode: 7420_TC

Sample ID: **MB-70456** SampType: **MBLK** TestCode: **7420_TC** Units: **mg/L** Prep Date: **2/7/2011** RunNo: **129742**
Client ID: **PBS** Batch ID: **70456** TestNo: **EPA 1311/ 74 EPA3010A** Analysis Date: **2/8/2011** SeqNo: **2106428**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	ND	0.25									

Sample ID: **MB-70406A TCLP** SampType: **MBLK** TestCode: **7420_TC** Units: **mg/L** Prep Date: **2/7/2011** RunNo: **129742**
Client ID: **PBS** Batch ID: **70456** TestNo: **EPA 1311/ 74 EPA3010A** Analysis Date: **2/8/2011** SeqNo: **2106429**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	ND	0.25									

Sample ID: **LCS-70456** SampType: **LCS** TestCode: **7420_TC** Units: **mg/L** Prep Date: **2/7/2011** RunNo: **129742**
Client ID: **LCSS** Batch ID: **70456** TestNo: **EPA 1311/ 74 EPA3010A** Analysis Date: **2/8/2011** SeqNo: **2106430**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	0.930	0.25	1.000	0	93.0	80	120				

Sample ID: **116111-001A-DUP** SampType: **DUP** TestCode: **7420_TC** Units: **mg/L** Prep Date: **2/7/2011** RunNo: **129742**
Client ID: **ZZZZZZ** Batch ID: **70456** TestNo: **EPA 1311/ 74 EPA3010A** Analysis Date: **2/8/2011** SeqNo: **2106434**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	0.269	0.25						0.2363	13.0	20	

Sample ID: **116111-001A-MS** SampType: **MS** TestCode: **7420_TC** Units: **mg/L** Prep Date: **2/7/2011** RunNo: **129742**
Client ID: **ZZZZZZ** Batch ID: **70456** TestNo: **EPA 1311/ 74 EPA3010A** Analysis Date: **2/8/2011** SeqNo: **2106435**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	2.760	0.25	2.500	0.2363	101	70	130				

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Ninyo & Moore
Work Order: 115904
Project: EA 0E3101, 207384045

ANALYTICAL QC SUMMARY REPORT

TestCode: 7420_TC

Sample ID: **116111-001A-MSD** SampType: **MSD** TestCode: **7420_TC** Units: **mg/L** Prep Date: **2/7/2011** RunNo: **129742**
Client ID: **ZZZZZZ** Batch ID: **70456** TestNo: **EPA 1311/ 74 EPA3010A** Analysis Date: **2/8/2011** SeqNo: **2106436**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	2.762	0.25	2.500	0.2363	101	70	130	2.760	0.0789	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

Advanced Technology Laboratories
3275 Walnut Avenue, Signal Hill, CA 90755 Tel: 562. 989.4045 Fax: 562.989.4040

CLIENT: Ninyo & Moore
Work Order: 115904
Project: EA 0E3101, 207384045

ANALYTICAL QC SUMMARY REPORT

TestCode: 9045_S

Sample ID: **115934-022A-DUP** SampType: **DUP** TestCode: **9045_S** Units: **pH Units** Prep Date: RunNo: **129193**
Client ID: **ZZZZZZ** Batch ID: **R129193** TestNo: **EPA 9045C** Analysis Date: **1/26/2011** SeqNo: **2094681**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
pH	7.320	0.10						6.880	6.20	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

Advanced Technology Laboratories
3275 Walnut Avenue, Signal Hill, CA 90755 Tel: 562. 989.4045 Fax: 562.989.4040

LABORATORY:	SITE:	CONSULTANT:
Advanced Technology Laboratories 3275 Walnut Avenue Signal Hill, CA 90807 (562) 989-4045 / fax (562) 989-4040	SR-74 and I-5 Interchange San Juan Capistrano, California EA 0E3101 Project Number 207384045	Ninyo & Moore 475 Goddard, Suite 200 Irvine, CA 92618 (949) 753-7070/fax (949) 753-7071

Special Instructions:

Homogonize the samples

If total lead is <1,000 mg/kg, but >/= 50 mg/kg, run STLC WET test (citric acid extraction EPA Method 7000 series)

If STLC WET >/= 5 mg/l, run STLC-DI (DI extraction EPA Method 7000 series)

If total lead is >/=1,000 mg/kg or STLC WET >/=5 mg/l, run TCLP (EPA Method 7000 series for leachable lead)

Sampler name = Michael Cushner, Thomas Mulfer

Relinquished by (name/date and time):	Received by (name/date and time):
Michael Cushner 1-20-11 5:25 PM.	1/20/11 ~~1775~~ 17:25
Relinquished by (name/date and time):	Received by (name/date and time):
Relinquished by (name/date and time):	Received by (name/date and time):
Relinquished by (name/date and time):	Received by (name/date and time):

TB-45

Lab No.	Sample I. D.	Date	Time	Total Lead EPA Method 6010	pH EPA Method 9045	Sample Type	Turn-Around Time	Container Type	HOLD
	B1-0.5	1-20-11	10:10	X	X	Soil	Normal	Glass Jar	
	B1-1.5		10:15	X		Soil	Normal	Glass Jar	
	B1-3		10:18	X		Soil	Normal	Glass Jar	
	B1-4		10:23	X		Soil	Normal	Glass Jar	
	B2-0.5		10:30	X		Soil	Normal	Glass Jar	
	B2-1.5		10:34	X		Soil	Normal	Glass Jar	
	B2-3		10:35	X		Soil	Normal	Glass Jar	
	B2-4		10:37	X		Soil	Normal	Glass Jar	
	B3-0.5		10:42	X		Soil	Normal	Glass Jar	
	B3-1.5		10:44	X		Soil	Normal	Glass Jar	
	B3-3		10:47	X	X	Soil	Normal	Glass Jar	
	B4-0.5		11:04	X		Soil	Normal	Glass Jar	
	B4-1.5		11:03	X		Soil	Normal	Glass Jar	
	B5-0.5		11:18	X		Soil	Normal	Glass Jar	
	B5-1.5		11:21	X		Soil	Normal	Glass Jar	
	B5-3		11:25	X		Soil	Normal	Glass Jar	
	B5-4		11:28	X		Soil	Normal	Glass Jar	
	B6-0.5		11:33	X		Soil	Normal	Glass Jar	
	B6-1.5		11:37	X		Soil	Normal	Glass Jar	
	B6-3		11:45	X		Soil	Normal	Glass Jar	
	B7-0.5		11:55	X		Soil	Normal	Glass Jar	
	B7-1.5		11:59	X		Soil	Normal	Glass Jar	
	B7-3		1204	X		Soil	Normal	Glass Jar	
	B7-4		1208	X		Soil	Normal	Glass Jar	
	B14-0.5		1333	X		Soil	Normal	Glass Jar	
	B14-1.5		1336	X		Soil	Normal	Glass Jar	
	B14-3		1340	X		Soil	Normal	Glass Jar	
	B14-4		1344	X	X	Soil	Normal	Glass Jar	
	B13-0.5		1352	X		Soil	Normal	Glass Jar	
	B13-1.5		1356	X		Soil	Normal	Glass Jar	
	B13-3		13:59	X		Soil	Normal	Glass Jar	
	B13-4		14:05	X		Soil	Normal	Glass Jar	
	B12-0.5		14:15	X		Soil	Normal	Glass Jar	
	B12-1.5		14:20	X		Soil	Normal	Glass Jar	
	B12-3		14:25	X		Soil	Normal	Glass Jar	
	B12-4		14:30	X		Soil	Normal	Glass Jar	
	B11-0.5		1436	X	X	Soil	Normal	Glass Jar	
	B11-1.5		1440	X		Soil	Normal	Glass Jar	
	B11-3		1448	X		Soil	Normal	Glass Jar	
	B11-4		1451	X		Soil	Normal	Glass Jar	
	B10-0.5		1455	X		Soil	Normal	Glass Jar	
	B10-1.5		1458	X		Soil	Normal	Glass Jar	
	B9-0.5		1503	X		Soil	Normal	Glass Jar	
	B9-1.5		1512	X		Soil	Normal	Glass Jar	
	B8-0.5		1520	X		Soil	Normal	Glass Jar	
	B8-1.5		1524	X	X	Soil	Normal	Glass Jar	

5.0 c

TO-45

LABORATORY:	SITE:	CONSULTANT:
Advanced Technology Laboratories 3275 Walnut Avenue Signal Hill, CA 90807 (562) 989-4045 / fax (562) 989-4040	[redacted] Project Number 20738404 5 TO-45	Ninyo & Moore 475 Goddard, Suite 200 Irvine, CA 92618 (949) 753-7070/fax (949) 753-7071

TO-45

Special Instructions:

Homogonize the samples

If total lead is <1,000 mg/kg, but >/= 50 mg/kg, run STLC WET test (citric acid extraction EPA Method 7000 series)

If STLC WET >/= 5 mg/l, run STLC-DI (DI extraction EPA Method 7000 series)

If total lead is >/=1,000 mg/kg or STLC WET >/=5 mg/l, run TCLP (EPA Method 7000 series for leachable lead)

Relinquished by (name/date and time):	Received by (name/date and time):
Michael Cushner 1-20-11 5:25 p.m.	1/20/11 ~~1735~~ 1725
Relinquished by (name/date and time):	Received by (name/date and time):
Relinquished by (name/date and time):	Received by (name/date and time):
Relinquished by (name/date and time):	Received by (name/date and time):

Lab No.	Sample I. D.	Date	Time	Total Lead EPA Method 6010	pH EPA Method 9045	Sample Type	Turn-Around Time	Container Type	HOLD
	[redacted]					Soil	Normal	Glass Jar	
						Soil	Normal	Glass Jar	
						Soil	Normal	Glass Jar	
						Soil	Normal	Glass Jar	
						Soil	Normal	Glass Jar	
						Soil	Normal	Glass Jar	
						Soil	Normal	Glass Jar	
						Soil	Normal	Glass Jar	
						Soil	Normal	Glass Jar	
						Soil	Normal	Glass Jar	
	B8-3	1-20-11	15:28	X		Soil	Normal	Glass Jar	
	B8-4	↓	15:31	X		Soil	Normal	Glass Jar	
						Soil	Normal	Glass Jar	
						Soil	Normal	Glass Jar	
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						Soil	Normal	Glass Jar	
						Soil	Normal	Glass Jar	
	[redacted]					water	Normal	Plastic	

February 17, 2011

Beth Padgett
Ninyo & Moore
475 Goddard Suite 200
Irvine, CA 92618

TEL: (949) 678-0842
FAX: (949) 753-7071

ELAP No.: 1838
NELAP No.: 02107CA
CSDLAC No.: 10196
ORELAP No.: CA300003

Workorder No.: 115934

RE: EA 0E3101, 207384045

Attention: Beth Padgett

Enclosed are the results for sample(s) received on January 22, 2011 by Advanced Technology Laboratories . The sample(s) are tested for the parameters as indicated in the enclosed chain of custody in accordance with the applicable laboratory certifications.

Thank you for the opportunity to service the needs of your company.

Please feel free to call me at (562)989-4045 if I can be of further assistance to your company.

Sincerely,

Eddie F. Rodriguez
Laboratory Director

The cover letter and the case narrative are an integral part of this analytical report and cannot be reproduced in part or in its entirety without written permission from the client and Advanced Technology Laboratories.

Advanced Technology Laboratories
3275 Walnut Avenue Signal Hill, CA 90755 Tel: 562 989-4045 Fax: 562 989-4040

Advanced Technology Laboratories

Date: *17-Feb-11*

CLIENT: Ninyo & Moore
Project: EA 0E3101, 207384045
Lab Order: 115934
Contract No:

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Matrix	Collection Date	Date Received	Date Reported
115934-001A	B26-0.5	Soil	1/21/2011 9:10:00 AM	1/22/2011	2/17/2011
115934-002A	B26-1.5	Soil	1/21/2011 9:15:00 AM	1/22/2011	2/17/2011
115934-003A	B25-0.5	Soil	1/21/2011 9:20:00 AM	1/22/2011	2/17/2011
115934-004A	B25-1.5	Soil	1/21/2011 9:25:00 AM	1/22/2011	2/17/2011
115934-005A	B25-3	Soil	1/21/2011 9:28:00 AM	1/22/2011	2/17/2011
115934-006A	B25-4	Soil	1/21/2011 9:33:00 AM	1/22/2011	2/17/2011
115934-007A	B24-0.5	Soil	1/21/2011 9:40:00 AM	1/22/2011	2/17/2011
115934-008A	B24-1.5	Soil	1/21/2011 9:44:00 AM	1/22/2011	2/17/2011
115934-009A	B23-0.5	Soil	1/21/2011 9:53:00 AM	1/22/2011	2/17/2011
115934-010A	B23-1.5	Soil	1/21/2011 9:57:00 AM	1/22/2011	2/17/2011
115934-011A	B23-3	Soil	1/21/2011 10:02:00 AM	1/22/2011	2/17/2011
115934-012A	B23-4	Soil	1/21/2011 10:05:00 AM	1/22/2011	2/17/2011
115934-013A	B22-0.5	Soil	1/21/2011 10:13:00 AM	1/22/2011	2/17/2011
115934-014A	B22-1.5	Soil	1/21/2011 10:17:00 AM	1/22/2011	2/17/2011
115934-015A	B22-3	Soil	1/21/2011 10:21:00 AM	1/22/2011	2/17/2011
115934-016A	B21-0.5	Soil	1/21/2011 10:35:00 AM	1/22/2011	2/17/2011
115934-017A	B21-1.5	Soil	1/21/2011 10:39:00 AM	1/22/2011	2/17/2011
115934-018A	B21-3	Soil	1/21/2011 10:45:00 AM	1/22/2011	2/17/2011
115934-019A	B21-4	Soil	1/21/2011 10:49:00 AM	1/22/2011	2/17/2011
115934-020A	B16-0.5	Soil	1/21/2011 11:45:00 AM	1/22/2011	2/17/2011
115934-021A	B16-1.5	Soil	1/21/2011 11:49:00 AM	1/22/2011	2/17/2011
115934-022A	B16-3	Soil	1/21/2011 11:53:00 AM	1/22/2011	2/17/2011
115934-023A	B16-4	Soil	1/21/2011 11:57:00 AM	1/22/2011	2/17/2011
115934-024A	B18-0.5	Soil	1/21/2011 12:05:00 PM	1/22/2011	2/17/2011
115934-025A	B18-1.5	Soil	1/21/2011 12:10:00 PM	1/22/2011	2/17/2011
115934-026A	B18-3	Soil	1/21/2011 12:18:00 PM	1/22/2011	2/17/2011
115934-027A	B18-4	Soil	1/21/2011 12:26:00 PM	1/22/2011	2/17/2011
115934-028A	B20-0.5	Soil	1/21/2011 12:36:00 PM	1/22/2011	2/17/2011
115934-029A	B20-1.5	Soil	1/21/2011 12:40:00 PM	1/22/2011	2/17/2011

Advanced Technology Laboratories
3275 Walnut Avenue, Signal Hill, CA 90755 Tel: 562. 989.4045 Fax: 562.989.4040

CLIENT: Ninyo & Moore
Project: EA 0E3101, 207384045
Lab Order: 115934
Contract No:

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Matrix	Collection Date	Date Received	Date Reported
115934-030A	B20-3	Soil	1/21/2011 12:44:00 PM	1/22/2011	2/17/2011
115934-031A	B20-4	Soil	1/21/2011 12:48:00 PM	1/22/2011	2/17/2011
115934-032A	B15-0.5	Soil	1/21/2011 12:58:00 PM	1/22/2011	2/17/2011
115934-033A	B15-1.5	Soil	1/21/2011 1:07:00 PM	1/22/2011	2/17/2011
115934-034A	B15-3	Soil	1/21/2011 1:11:00 PM	1/22/2011	2/17/2011
115934-035A	B15-4	Soil	1/21/2011 1:12:00 PM	1/22/2011	2/17/2011
115934-036A	B17-0.5	Soil	1/21/2011 1:20:00 PM	1/22/2011	2/17/2011
115934-037A	B17-1.5	Soil	1/21/2011 1:24:00 PM	1/22/2011	2/17/2011
115934-038A	B17-3	Soil	1/21/2011 1:29:00 PM	1/22/2011	2/17/2011
115934-039A	B17-4	Soil	1/21/2011 1:33:00 PM	1/22/2011	2/17/2011
115934-040A	B19-0.5	Soil	1/21/2011 1:45:00 PM	1/22/2011	2/17/2011
115934-041A	B19-1.5	Soil	1/21/2011 1:48:00 PM	1/22/2011	2/17/2011
115934-042A	B19-3	Soil	1/21/2011 1:52:00 PM	1/22/2011	2/17/2011
115934-043A	B19-4	Soil	1/21/2011 1:56:00 PM	1/22/2011	2/17/2011
115934-044A	W-1	Water	1/21/2011 3:30:00 PM	1/22/2011	2/17/2011

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CASE NARRATIVE

Analytical Comments for EPA 6010B

Samples 115904-042A-DUP, 115934-004A-DUP, 115934-014A-DUP, 115934-024A-DUP, 115934-034A-DUP and 115934-043A-DUP, RPD for Sample Duplicate (DUP) is outside criteria; however, the Laboratory Control Sample (LCS) validated the analytical batch.

Advanced Technology Laboratories
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Advanced Technology Laboratories

ANALYTICAL RESULTS

Print Date: *17-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B26-0.5
Lab Order:	115934	**Collection Date:**	1/21/2011 9:10:00 AM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115934-001A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
EPA 3050M			**EPA 6010B**				
RunID: **ICP6_110126C**	QC Batch: **69976**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	75	0.11	5.0		mg/Kg	1	1/26/2011 01:26 PM
LEAD BY ATOMIC ABSORPTION (STLC)							
WET			**WET/ EPA 7420**				
RunID: **AA2_110204A**	QC Batch: **70237**				PrepDate:	**2/2/2011**	Analyst: **IL**
Lead	4.0	0.21	0.25		mg/L	1	2/4/2011 02:54 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

Advanced Technology Laboratories

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Advanced Technology Laboratories

ANALYTICAL RESULTS

Print Date: *17-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B26-1.5
Lab Order:	115934	**Collection Date:**	1/21/2011 9:15:00 AM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115934-002A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126C**	QC Batch: **69976**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	26	0.11	5.0		mg/Kg	1	1/26/2011 01:26 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

Advanced Technology Laboratories

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Advanced Technology Laboratories

ANALYTICAL RESULTS

Print Date: *17-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B25-0.5
Lab Order:	115934	**Collection Date:**	1/21/2011 9:20:00 AM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115934-003A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126C**	QC Batch: **69976**				PrepDate: **1/25/2011**	Analyst: **JSD**	
Lead	9.5	0.11	5.0		mg/Kg	1	1/26/2011 01:27 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

Advanced Technology Laboratories

3275 Walnut Avenue, Signal Hill, CA 90755 Tel: 562. 989.4045 Fax: 562.989.4040

Advanced Technology Laboratories

ANALYTICAL RESULTS

Print Date: *17-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B25-1.5
Lab Order:	115934	**Collection Date:**	1/21/2011 9:25:00 AM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115934-004A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126C**	QC Batch: **69976**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	5.5	0.11	5.0		mg/Kg	1	1/26/2011 01:30 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

Advanced Technology Laboratories

3275 Walnut Avenue, Signal Hill, CA 90755 Tel: 562. 989.4045 Fax: 562.989.4040

Advanced Technology Laboratories

ANALYTICAL RESULTS

Print Date: *17-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B25-3
Lab Order:	115934	**Collection Date:**	1/21/2011 9:28:00 AM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115934-005A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126D**	QC Batch: **69977**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	ND	0.11	5.0		mg/Kg	1	1/26/2011 01:34 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *17-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B25-4
Lab Order:	115934	**Collection Date:**	1/21/2011 9:33:00 AM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115934-006A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M			**EPA 6010B**			
RunID: **ICP6_110126D**	QC Batch: **69977**				PrepDate: **1/25/2011**		Analyst: **JSD**
Lead	19	0.11	5.0		mg/Kg	1	1/26/2011 01:35 PM
PH							
				EPA 9045C			
RunID: **WETCHEM_110126A**	QC Batch: **R129193**				PrepDate:		Analyst: **CBB**
pH	6.4	0.10	0.10		pH Units	1	1/26/2011

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *17-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B24-0.5
Lab Order:	115934	**Collection Date:**	1/21/2011 9:40:00 AM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115934-007A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126D**	QC Batch: **69977**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	310	0.11	5.0		mg/Kg	1	1/26/2011 01:36 PM
LEAD BY ATOMIC ABSORPTION							
	WET		**WET DI/ EPA 7420**				
RunID: **AA2_110211A**	QC Batch: **70561**				PrepDate:	**2/9/2011**	Analyst: **VV**
Lead	ND	0.21	0.25		mg/L	1	2/11/2011 12:04 PM
LEAD BY ATOMIC ABSORPTION (STLC)							
	WET		**WET/ EPA 7420**				
RunID: **AA2_110204A**	QC Batch: **70237**				PrepDate:	**2/2/2011**	Analyst: **IL**
Lead	17	0.41	0.50		mg/L	2	2/4/2011 02:55 PM
LEAD BY ATOMIC ABSORPTION (TCLP)							
	EPA3010A		**EPA 1311/ 7420**				
RunID: **AA2_110216B**	QC Batch: **70598**				PrepDate:	**2/10/2011**	Analyst: **VV**
Lead	0.28	0.21	0.25		mg/L	1	2/16/2011 10:14 AM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *17-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B24-1.5
Lab Order:	115934	**Collection Date:**	1/21/2011 9:44:00 AM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115934-008A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126D**	QC Batch: **69977**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	7.8	0.11	5.0		mg/Kg	1	1/26/2011 01:36 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *17-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B23-0.5
Lab Order:	115934	**Collection Date:**	1/21/2011 9:53:00 AM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115934-009A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126D**	QC Batch: **69977**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	6.6	0.11	5.0		mg/Kg	1	1/26/2011 01:39 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *17-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B23-1.5
Lab Order:	115934	**Collection Date:**	1/21/2011 9:57:00 AM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115934-010A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126D**	QC Batch: **69977**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	ND	0.11	5.0		mg/Kg	1	1/26/2011 01:40 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *17-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B23-3
Lab Order:	115934	**Collection Date:**	1/21/2011 10:02:00 AM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115934-011A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126D**	QC Batch: **69977**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	ND	0.11	5.0		mg/Kg	1	1/26/2011 01:40 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *17-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B23-4
Lab Order:	115934	**Collection Date:**	1/21/2011 10:05:00 AM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115934-012A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126D**	QC Batch: **69977**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	ND	0.11	5.0		mg/Kg	1	1/26/2011 01:41 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *17-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B22-0.5
Lab Order:	115934	**Collection Date:**	1/21/2011 10:13:00 AM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115934-013A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126D**	QC Batch: **69977**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	25	0.11	5.0		mg/Kg	1	1/26/2011 01:42 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *17-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B22-1.5
Lab Order:	115934	**Collection Date:**	1/21/2011 10:17:00 AM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115934-014A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126D**	QC Batch: **69977**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	ND	0.11	5.0		mg/Kg	1	1/26/2011 01:42 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *17-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B22-3
Lab Order:	115934	**Collection Date:**	1/21/2011 10:21:00 AM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115934-015A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126D**	QC Batch: **69977**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	17	0.11	5.0		mg/Kg	1	1/26/2011 01:46 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *17-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B21-0.5
Lab Order:	115934	**Collection Date:**	1/21/2011 10:35:00 AM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115934-016A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126D**	QC Batch: **69977**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	19	0.11	5.0		mg/Kg	1	1/26/2011 01:48 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *17-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B21-1.5
Lab Order:	115934	**Collection Date:**	1/21/2011 10:39:00 AM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115934-017A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M			**EPA 6010B**			
RunID: **ICP6_110126D**	QC Batch: **69977**				PrepDate: **1/25/2011**		Analyst: **JSD**
Lead	ND	0.11	5.0		mg/Kg	1	1/26/2011 01:49 PM
PH							
				EPA 9045C			
RunID: **WETCHEM_110126A**	QC Batch: **R129193**				PrepDate:		Analyst: **CBB**
pH	7.4	0.10	0.10		pH Units	1	1/26/2011

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *17-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B21-3
Lab Order:	115934	**Collection Date:**	1/21/2011 10:45:00 AM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115934-018A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126D**	QC Batch: **69977**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	ND	0.11	5.0		mg/Kg	1	1/26/2011 01:50 PM

Qualifiers:	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *17-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B21-4
Lab Order:	115934	**Collection Date:**	1/21/2011 10:49:00 AM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115934-019A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126D**	QC Batch: **69977**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	ND	0.11	5.0		mg/Kg	1	1/26/2011 01:50 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *17-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B16-0.5
Lab Order:	115934	**Collection Date:**	1/21/2011 11:45:00 AM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115934-020A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
EPA 3050M			**EPA 6010B**				
RunID: **ICP6_110126D**	QC Batch: **69977**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	110	0.11	5.0		mg/Kg	1	1/26/2011 01:51 PM
LEAD BY ATOMIC ABSORPTION							
WET			**WET DI/ EPA 7420**				
RunID: **AA2_110211A**	QC Batch: **70561**				PrepDate:	**2/9/2011**	Analyst: **VV**
Lead	ND	0.21	0.25		mg/L	1	2/11/2011 12:05 PM
LEAD BY ATOMIC ABSORPTION (STLC)							
WET			**WET/ EPA 7420**				
RunID: **AA2_110204A**	QC Batch: **70237**				PrepDate:	**2/2/2011**	Analyst: **IL**
Lead	12	0.41	0.50		mg/L	2	2/4/2011 02:56 PM
LEAD BY ATOMIC ABSORPTION (TCLP)							
EPA3010A			**EPA 1311/ 7420**				
RunID: **AA2_110216B**	QC Batch: **70598**				PrepDate:	**2/10/2011**	Analyst: **VV**
Lead	0.28	0.21	0.25		mg/L	1	2/16/2011 10:14 AM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *17-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B16-1.5
Lab Order:	115934	**Collection Date:**	1/21/2011 11:49:00 AM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115934-021A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126D**	QC Batch: **69977**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	ND	0.11	5.0		mg/Kg	1	1/26/2011 01:52 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *17-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B16-3
Lab Order:	115934	**Collection Date:**	1/21/2011 11:53:00 AM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115934-022A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M			**EPA 6010B**			
RunID: **ICP6_110126D**	QC Batch: **69977**				PrepDate: **1/25/2011**		Analyst: **JSD**
Lead	7.6	0.11	5.0		mg/Kg	1	1/26/2011 01:52 PM
PH							
				EPA 9045C			
RunID: **WETCHEM_110126A**	QC Batch: **R129193**				PrepDate:		Analyst: **CBB**
pH	6.9	0.10	0.10		pH Units	1	1/26/2011

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *17-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B16-4
Lab Order:	115934	**Collection Date:**	1/21/2011 11:57:00 AM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115934-023A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126D**	QC Batch: **69977**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	12	0.11	5.0		mg/Kg	1	1/26/2011 01:53 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *17-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B18-0.5
Lab Order:	115934	**Collection Date:**	1/21/2011 12:05:00 PM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115934-024A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126D**	QC Batch: **69977**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	40	0.11	5.0		mg/Kg	1	1/26/2011 01:54 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *17-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B18-1.5
Lab Order:	115934	**Collection Date:**	1/21/2011 12:10:00 PM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115934-025A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126E**	QC Batch: **69978**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	5.4	0.11	5.0		mg/Kg	1	1/26/2011 02:00 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *17-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B18-3
Lab Order:	115934	**Collection Date:**	1/21/2011 12:18:00 PM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115934-026A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126E**	QC Batch: **69978**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	ND	0.11	5.0		mg/Kg	1	1/26/2011 02:01 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *17-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B18-4
Lab Order:	115934	**Collection Date:**	1/21/2011 12:26:00 PM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115934-027A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126E**	QC Batch: **69978**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	ND	0.11	5.0		mg/Kg	1	1/26/2011 02:02 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *17-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B20-0.5
Lab Order:	115934	**Collection Date:**	1/21/2011 12:36:00 PM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115934-028A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M			**EPA 6010B**			
RunID: **ICP6_110126E**	QC Batch: **69978**				PrepDate: **1/25/2011**		Analyst: **JSD**
Lead	ND	0.11	5.0		mg/Kg	1	1/26/2011 02:03 PM
PH							
				EPA 9045C			
RunID: **WETCHEM_110126B**	QC Batch: **R129195**				PrepDate:		Analyst: **CBB**
pH	4.4	0.10	0.10		pH Units	1	1/26/2011

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *17-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B20-1.5
Lab Order:	115934	**Collection Date:**	1/21/2011 12:40:00 PM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115934-029A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126E**	QC Batch: **69978**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	5.2	0.11	5.0		mg/Kg	1	1/26/2011 02:03 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *17-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B20-3
Lab Order:	115934	**Collection Date:**	1/21/2011 12:44:00 PM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115934-030A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126E**	QC Batch: **69978**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	ND	0.11	5.0		mg/Kg	1	1/26/2011 02:04 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *17-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B20-4
Lab Order:	115934	**Collection Date:**	1/21/2011 12:48:00 PM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115934-031A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126E**	QC Batch: **69978**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	ND	0.11	5.0		mg/Kg	1	1/26/2011 02:06 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *17-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B15-0.5
Lab Order:	115934	**Collection Date:**	1/21/2011 12:58:00 PM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115934-032A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
EPA 3050M			**EPA 6010B**				
RunID: **ICP6_110126E**	QC Batch: **69978**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	380	0.11	5.0		mg/Kg	1	1/26/2011 02:07 PM
LEAD BY ATOMIC ABSORPTION							
WET			**WET DI/ EPA 7420**				
RunID: **AA2_110211A**	QC Batch: **70561**				PrepDate:	**2/9/2011**	Analyst: **VV**
Lead	ND	0.21	0.25		mg/L	1	2/11/2011 12:06 PM
LEAD BY ATOMIC ABSORPTION (STLC)							
WET			**WET/ EPA 7420**				
RunID: **AA2_110204A**	QC Batch: **70237**				PrepDate:	**2/2/2011**	Analyst: **IL**
Lead	14	0.41	0.50		mg/L	2	2/4/2011 02:58 PM
LEAD BY ATOMIC ABSORPTION (TCLP)							
EPA3010A			**EPA 1311/ 7420**				
RunID: **AA2_110216B**	QC Batch: **70598**				PrepDate:	**2/10/2011**	Analyst: **VV**
Lead	0.39	0.21	0.25		mg/L	1	2/16/2011 10:15 AM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *17-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B15-1.5
Lab Order:	115934	**Collection Date:**	1/21/2011 1:07:00 PM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115934-033A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126E**	QC Batch: **69978**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	ND	0.11	5.0		mg/Kg	1	1/26/2011 02:08 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *17-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B15-3
Lab Order:	115934	**Collection Date:**	1/21/2011 1:11:00 PM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115934-034A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126E**	QC Batch: **69978**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	5.5	0.11	5.0		mg/Kg	1	1/26/2011 02:09 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *17-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B15-4
Lab Order:	115934	**Collection Date:**	1/21/2011 1:12:00 PM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115934-035A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126E**	QC Batch: **69978**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	7.5	0.11	5.0		mg/Kg	1	1/26/2011 02:12 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *17-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B17-0.5
Lab Order:	115934	**Collection Date:**	1/21/2011 1:20:00 PM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115934-036A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126E**	QC Batch: **69978**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	10	0.11	5.0		mg/Kg	1	1/26/2011 02:12 PM

Qualifiers:	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *17-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B17-1.5
Lab Order:	115934	**Collection Date:**	1/21/2011 1:24:00 PM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115934-037A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126E**	QC Batch: **69978**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	24	0.11	5.0		mg/Kg	1	1/26/2011 02:13 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *17-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B17-3
Lab Order:	115934	**Collection Date:**	1/21/2011 1:29:00 PM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115934-038A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126E**	QC Batch: **69978**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	20	0.11	5.0		mg/Kg	1	1/26/2011 02:16 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *17-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B17-4
Lab Order:	115934	**Collection Date:**	1/21/2011 1:33:00 PM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115934-039A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126E**	QC Batch: **69978**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	40	0.11	5.0		mg/Kg	1	1/26/2011 02:16 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *17-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B19-0.5
Lab Order:	115934	**Collection Date:**	1/21/2011 1:45:00 PM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115934-040A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M			**EPA 6010B**			
RunID: **ICP6_110126E**	QC Batch: **69978**				PrepDate: **1/25/2011**		Analyst: **JSD**
Lead	15	0.11	5.0		mg/Kg	1	1/26/2011 02:17 PM
PH							
				EPA 9045C			
RunID: **WETCHEM_110126B**	QC Batch: **R129195**				PrepDate:		Analyst: **CBB**
pH	6.8	0.10	0.10		pH Units	1	1/26/2011

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *17-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B19-1.5
Lab Order:	115934	**Collection Date:**	1/21/2011 1:48:00 PM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115934-041A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126E**	QC Batch: **69978**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	15	0.11	5.0		mg/Kg	1	1/26/2011 02:18 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *17-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B19-3
Lab Order:	115934	**Collection Date:**	1/21/2011 1:52:00 PM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115934-042A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126E**	QC Batch: **69978**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	ND	0.11	5.0		mg/Kg	1	1/26/2011 02:18 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *17-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	B19-4
Lab Order:	115934	**Collection Date:**	1/21/2011 1:56:00 PM
Project:	EA 0E3101, 207384045	**Matrix:**	SOIL
Lab ID:	115934-043A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3050M		**EPA 6010B**				
RunID: **ICP6_110126E**	QC Batch: **69978**				PrepDate:	**1/25/2011**	Analyst: **JSD**
Lead	ND	0.11	5.0		mg/Kg	1	1/26/2011 02:19 PM

Qualifiers:	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *17-Feb-11*

CLIENT:	Ninyo & Moore	**Client Sample ID:**	W-1
Lab Order:	115934	**Collection Date:**	1/21/2011 3:30:00 PM
Project:	EA 0E3101, 207384045	**Matrix:**	WATER
Lab ID:	115934-044A		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ICP							
	EPA 3010A		**EPA 6010B**				
RunID: **ICP10_110126A**	QC Batch: **69982**				PrepDate:	**1/25/2011**	Analyst: **SRB**
Lead	ND	0.0046	0.25		mg/L	1	1/26/2011 12:22 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT: Ninyo & Moore
Work Order: 115934
Project: EA 0E3101, 207384045

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_SPB

Sample ID: **MB-69976A** SampType: **MBLK** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **1/25/2011** RunNo: **129190**
Client ID: **PBS** Batch ID: **69976** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **1/26/2011** SeqNo: **2094572**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	ND	5.0									

Sample ID: **LCS-69976** SampType: **LCS** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **1/25/2011** RunNo: **129190**
Client ID: **LCSS** Batch ID: **69976** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **1/26/2011** SeqNo: **2094573**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	227.276	5.0	250.0	0	90.9	80	120				

Sample ID: **115904-042A-DUP** SampType: **DUP** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **1/25/2011** RunNo: **129190**
Client ID: **ZZZZZZ** Batch ID: **69976** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **1/26/2011** SeqNo: **2094584**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	25.775	5.0						7.103	114	20	R

Sample ID: **115904-042A-MS** SampType: **MS** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **1/25/2011** RunNo: **129190**
Client ID: **ZZZZZZ** Batch ID: **69976** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **1/26/2011** SeqNo: **2094585**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	240.472	5.0	250.0	7.103	93.3	34	126				

Sample ID: **MB-69976B** SampType: **MBLK** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **1/25/2011** RunNo: **129190**
Client ID: **PBS** Batch ID: **69976** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **1/26/2011** SeqNo: **2094586**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	ND	5.0									

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Ninyo & Moore
Work Order: 115934
Project: EA 0E3101, 207384045

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_SPB

Sample ID: **115934-004A-DUP** SampType: **DUP** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **1/25/2011** RunNo: **129190**
Client ID: **B25-1.5** Batch ID: **69976** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **1/26/2011** SeqNo: **2094597**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	7.675	5.0						5.529	32.5	20	R

Sample ID: **115934-004A-MS** SampType: **MS** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **1/25/2011** RunNo: **129190**
Client ID: **B25-1.5** Batch ID: **69976** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **1/26/2011** SeqNo: **2094598**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	215.039	5.0	250.0	5.529	83.8	34	126				

Sample ID: **115934-004A-MSD** SampType: **MSD** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **1/25/2011** RunNo: **129190**
Client ID: **B25-1.5** Batch ID: **69976** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **1/26/2011** SeqNo: **2094599**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	189.366	5.0	250.0	5.529	73.5	34	126	215.0	12.7	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

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CLIENT: Ninyo & Moore
Work Order: 115934
Project: EA 0E3101, 207384045

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_SPB

Sample ID: **MB-69977A** SampType: **MBLK** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **1/25/2011** RunNo: **129191**
Client ID: **PBS** Batch ID: **69977** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **1/26/2011** SeqNo: **2094600**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	ND	5.0									

Sample ID: **LCS-69977** SampType: **LCS** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **1/25/2011** RunNo: **129191**
Client ID: **LCSS** Batch ID: **69977** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **1/26/2011** SeqNo: **2094601**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	254.595	5.0	250.0	0	102	80	120				

Sample ID: **115934-014A-DUP** SampType: **DUP** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **1/25/2011** RunNo: **129191**
Client ID: **B22-1.5** Batch ID: **69977** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **1/26/2011** SeqNo: **2094612**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	10.552	5.0						4.157	86.9	20	R

Sample ID: **115934-014A-MS** SampType: **MS** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **1/25/2011** RunNo: **129191**
Client ID: **B22-1.5** Batch ID: **69977** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **1/26/2011** SeqNo: **2094613**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	203.381	5.0	250.0	4.157	79.7	34	126				

Sample ID: **MB-69977B** SampType: **MBLK** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **1/25/2011** RunNo: **129191**
Client ID: **PBS** Batch ID: **69977** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **1/26/2011** SeqNo: **2094614**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	ND	5.0									

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Ninyo & Moore
Work Order: 115934
Project: EA 0E3101, 207384045

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_SPB

Sample ID: **115934-024A-DUP**	SampType: **DUP**	TestCode: **6010_SPB**	Units: **mg/Kg**	Prep Date: **1/25/2011**	RunNo: **129191**
Client ID: **B18-0.5**	Batch ID: **69977**	TestNo: **EPA 6010B**	**EPA 3050M**	Analysis Date: **1/26/2011**	SeqNo: **2094625**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	56.083	5.0						40.08	33.3	20	R

Sample ID: **115934-024A-MS**	SampType: **MS**	TestCode: **6010_SPB**	Units: **mg/Kg**	Prep Date: **1/25/2011**	RunNo: **129191**
Client ID: **B18-0.5**	Batch ID: **69977**	TestNo: **EPA 6010B**	**EPA 3050M**	Analysis Date: **1/26/2011**	SeqNo: **2094626**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	223.689	5.0	250.0	40.08	73.4	34	126				

Sample ID: **115934-024A-MSD**	SampType: **MSD**	TestCode: **6010_SPB**	Units: **mg/Kg**	Prep Date: **1/25/2011**	RunNo: **129191**
Client ID: **B18-0.5**	Batch ID: **69977**	TestNo: **EPA 6010B**	**EPA 3050M**	Analysis Date: **1/26/2011**	SeqNo: **2094627**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	268.583	5.0	250.0	40.08	91.4	34	126	223.7	18.2	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Ninyo & Moore
Work Order: 115934
Project: EA 0E3101, 207384045

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_SPB

Sample ID: **MB-69978A** SampType: **MBLK** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **1/25/2011** RunNo: **129192**
Client ID: **PBS** Batch ID: **69978** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **1/26/2011** SeqNo: **2094628**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	0.113	5.0									

Sample ID: **LCS-69978** SampType: **LCS** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **1/25/2011** RunNo: **129192**
Client ID: **LCSS** Batch ID: **69978** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **1/26/2011** SeqNo: **2094629**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	254.579	5.0	250.0	0.1127	102	80	120				

Sample ID: **115934-034A-DUP** SampType: **DUP** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **1/25/2011** RunNo: **129192**
Client ID: **B15-3** Batch ID: **69978** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **1/26/2011** SeqNo: **2094640**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	8.564	5.0						5.497	43.6	20	R

Sample ID: **115934-034A-MS** SampType: **MS** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **1/25/2011** RunNo: **129192**
Client ID: **B15-3** Batch ID: **69978** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **1/26/2011** SeqNo: **2094641**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	231.306	5.0	250.0	5.497	90.3	34	126				

Sample ID: **MB-69978B** SampType: **MBLK** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **1/25/2011** RunNo: **129192**
Client ID: **PBS** Batch ID: **69978** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **1/26/2011** SeqNo: **2094642**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	ND	5.0									

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Ninyo & Moore
Work Order: 115934
Project: EA 0E3101, 207384045

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_SPB

Sample ID: **115934-043A-DUP** SampType: **DUP** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **1/25/2011** RunNo: **129192**
Client ID: **B19-4** Batch ID: **69978** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **1/26/2011** SeqNo: **2094652**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	8.982	5.0						3.362	91.1	20	R

Sample ID: **115934-043A-MS** SampType: **MS** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **1/25/2011** RunNo: **129192**
Client ID: **B19-4** Batch ID: **69978** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **1/26/2011** SeqNo: **2094653**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	211.526	5.0	250.0	3.362	83.3	34	126				

Sample ID: **115934-043A-MSD** SampType: **MSD** TestCode: **6010_SPB** Units: **mg/Kg** Prep Date: **1/25/2011** RunNo: **129192**
Client ID: **B19-4** Batch ID: **69978** TestNo: **EPA 6010B** **EPA 3050M** Analysis Date: **1/26/2011** SeqNo: **2094654**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	223.538	5.0	250.0	3.362	88.1	34	126	211.5	5.52	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

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CLIENT: Ninyo & Moore
Work Order: 115934
Project: EA 0E3101, 207384045

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_WPB

Sample ID: **MB-69982** SampType: **MBLK** TestCode: **6010_WPB** Units: **mg/L** Prep Date: **1/25/2011** RunNo: **129173**
Client ID: **PBW** Batch ID: **69982** TestNo: **EPA 6010B** **EPA 3010A** Analysis Date: **1/26/2011** SeqNo: **2094239**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	ND	0.25									

Sample ID: **LCS-69982** SampType: **LCS** TestCode: **6010_WPB** Units: **mg/L** Prep Date: **1/25/2011** RunNo: **129173**
Client ID: **LCSW** Batch ID: **69982** TestNo: **EPA 6010B** **EPA 3010A** Analysis Date: **1/26/2011** SeqNo: **2094240**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	0.919	0.25	1.000	0	91.9	85	115				

Sample ID: **115903-009A-DUP** SampType: **DUP** TestCode: **6010_WPB** Units: **mg/L** Prep Date: **1/25/2011** RunNo: **129173**
Client ID: **ZZZZZZ** Batch ID: **69982** TestNo: **EPA 6010B** **EPA 3010A** Analysis Date: **1/26/2011** SeqNo: **2094242**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	0.079	0.25						0.07839	0	20	

Sample ID: **115903-009A-MS** SampType: **MS** TestCode: **6010_WPB** Units: **mg/L** Prep Date: **1/25/2011** RunNo: **129173**
Client ID: **ZZZZZZ** Batch ID: **69982** TestNo: **EPA 6010B** **EPA 3010A** Analysis Date: **1/26/2011** SeqNo: **2094243**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	2.256	0.25	2.500	0.07839	87.1	80	118				

Sample ID: **115903-009A-MSD** SampType: **MSD** TestCode: **6010_WPB** Units: **mg/L** Prep Date: **1/25/2011** RunNo: **129173**
Client ID: **ZZZZZZ** Batch ID: **69982** TestNo: **EPA 6010B** **EPA 3010A** Analysis Date: **1/26/2011** SeqNo: **2094244**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	2.354	0.25	2.500	0.07839	91.0	80	118	2.256	4.27	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

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CLIENT: Ninyo & Moore
Work Order: 115934
Project: EA 0E3101, 207384045

ANALYTICAL QC SUMMARY REPORT

TestCode: 7420_DI

Sample ID: **MB-70561A** SampType: **MBLK** TestCode: **7420_DI** Units: **mg/L** Prep Date: **2/9/2011** RunNo: **129866**
Client ID: **PBS** Batch ID: **70561** TestNo: **WET DI/ EPA WET** Analysis Date: **2/11/2011** SeqNo: **2108887**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	ND	0.25									

Sample ID: **LCS-70561** SampType: **LCS** TestCode: **7420_DI** Units: **mg/L** Prep Date: **2/9/2011** RunNo: **129866**
Client ID: **LCSS** Batch ID: **70561** TestNo: **WET DI/ EPA WET** Analysis Date: **2/11/2011** SeqNo: **2108888**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	5.000	0.25	5.000	0	100	80	120				

Sample ID: **116042-024A-DUP** SampType: **DUP** TestCode: **7420_DI** Units: **mg/L** Prep Date: **2/9/2011** RunNo: **129866**
Client ID: **ZZZZZZ** Batch ID: **70561** TestNo: **WET DI/ EPA WET** Analysis Date: **2/11/2011** SeqNo: **2108893**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	ND	0.25						0	0	20	

Sample ID: **116042-024A-MS** SampType: **MS** TestCode: **7420_DI** Units: **mg/L** Prep Date: **2/9/2011** RunNo: **129866**
Client ID: **ZZZZZZ** Batch ID: **70561** TestNo: **WET DI/ EPA WET** Analysis Date: **2/11/2011** SeqNo: **2108894**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	4.982	0.25	5.000	0	99.6	70	130				

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Ninyo & Moore
Work Order: 115934
Project: EA 0E3101, 207384045

ANALYTICAL QC SUMMARY REPORT

TestCode: 7420_ST

Sample ID: **MB-70237A** SampType: **MBLK** TestCode: **7420_ST** Units: **mg/L** Prep Date: **2/2/2011** RunNo: **129591**
Client ID: **PBS** Batch ID: **70237** TestNo: **WET/ EPA 74 WET** Analysis Date: **2/4/2011** SeqNo: **2103152**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	ND	0.25									

Sample ID: **LCS-70237** SampType: **LCS** TestCode: **7420_ST** Units: **mg/L** Prep Date: **2/2/2011** RunNo: **129591**
Client ID: **LCSS** Batch ID: **70237** TestNo: **WET/ EPA 74 WET** Analysis Date: **2/4/2011** SeqNo: **2103153**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	5.128	0.25	5.000	0	103	80	120				

Sample ID: **115934-020A-DUP** SampType: **DUP** TestCode: **7420_ST** Units: **mg/L** Prep Date: **2/2/2011** RunNo: **129591**
Client ID: **B16-0.5** Batch ID: **70237** TestNo: **WET/ EPA 74 WET** Analysis Date: **2/4/2011** SeqNo: **2103157**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	11.847	0.50						11.73	1.01	20	

Sample ID: **115934-020A-MS** SampType: **MS** TestCode: **7420_ST** Units: **mg/L** Prep Date: **2/2/2011** RunNo: **129591**
Client ID: **B16-0.5** Batch ID: **70237** TestNo: **WET/ EPA 74 WET** Analysis Date: **2/4/2011** SeqNo: **2103158**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	16.575	0.50	5.000	11.73	96.9	80	120				

Sample ID: **MB-70237B** SampType: **MBLK** TestCode: **7420_ST** Units: **mg/L** Prep Date: **2/2/2011** RunNo: **129591**
Client ID: **PBS** Batch ID: **70237** TestNo: **WET/ EPA 74 WET** Analysis Date: **2/4/2011** SeqNo: **2103159**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	ND	0.25									

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

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CLIENT: Ninyo & Moore
Work Order: 115934
Project: EA 0E3101, 207384045

ANALYTICAL QC SUMMARY REPORT

TestCode: 7420_ST

Sample ID: **115975-030A-DUP** SampType: **DUP** TestCode: **7420_ST** Units: **mg/L** Prep Date: **2/2/2011** RunNo: **129591**
Client ID: **ZZZZZZ** Batch ID: **70237** TestNo: **WET/ EPA 74 WET** Analysis Date: **2/4/2011** SeqNo: **2103166**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	2.937	0.25						2.955	0.617	20	

Sample ID: **115975-030A-MS** SampType: **MS** TestCode: **7420_ST** Units: **mg/L** Prep Date: **2/2/2011** RunNo: **129591**
Client ID: **ZZZZZZ** Batch ID: **70237** TestNo: **WET/ EPA 74 WET** Analysis Date: **2/4/2011** SeqNo: **2103167**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	7.593	0.25	5.000	2.955	92.8	80	120				

Sample ID: **115975-030A-MSD** SampType: **MSD** TestCode: **7420_ST** Units: **mg/L** Prep Date: **2/2/2011** RunNo: **129591**
Client ID: **ZZZZZZ** Batch ID: **70237** TestNo: **WET/ EPA 74 WET** Analysis Date: **2/4/2011** SeqNo: **2103168**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	7.701	0.25	5.000	2.955	94.9	80	120	7.593	1.41	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

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CLIENT: Ninyo & Moore
Work Order: 115934
Project: EA 0E3101, 207384045

ANALYTICAL QC SUMMARY REPORT

TestCode: 7420_TC

Sample ID: **MB70598A** SampType: **MBLK** TestCode: **7420_TC** Units: **mg/L** Prep Date: **2/10/2011** RunNo: **130010**
Client ID: **PBS** Batch ID: **70598** TestNo: **EPA 1311/ 74 EPA3010A** Analysis Date: **2/16/2011** SeqNo: **2112257**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	ND	0.25									

Sample ID: **MB-70585A TCLP** SampType: **MBLK** TestCode: **7420_TC** Units: **mg/L** Prep Date: **2/10/2011** RunNo: **130010**
Client ID: **PBS** Batch ID: **70598** TestNo: **EPA 1311/ 74 EPA3010A** Analysis Date: **2/16/2011** SeqNo: **2112258**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	ND	0.25									

Sample ID: **LCS-70598** SampType: **LCS** TestCode: **7420_TC** Units: **mg/L** Prep Date: **2/10/2011** RunNo: **130010**
Client ID: **LCSS** Batch ID: **70598** TestNo: **EPA 1311/ 74 EPA3010A** Analysis Date: **2/16/2011** SeqNo: **2112259**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	1.145	0.25	1.000	0	114	80	120				

Sample ID: **115934-032A-DUP** SampType: **DUP** TestCode: **7420_TC** Units: **mg/L** Prep Date: **2/10/2011** RunNo: **130010**
Client ID: **B15-0.5** Batch ID: **70598** TestNo: **EPA 1311/ 74 EPA3010A** Analysis Date: **2/16/2011** SeqNo: **2112263**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	0.363	0.25						0.3890	7.03	20	

Sample ID: **115934-032A-MS** SampType: **MS** TestCode: **7420_TC** Units: **mg/L** Prep Date: **2/10/2011** RunNo: **130010**
Client ID: **B15-0.5** Batch ID: **70598** TestNo: **EPA 1311/ 74 EPA3010A** Analysis Date: **2/16/2011** SeqNo: **2112264**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	2.794	0.25	2.500	0.3890	96.2	70	130				

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

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CLIENT: Ninyo & Moore
Work Order: 115934
Project: EA 0E3101, 207384045

ANALYTICAL QC SUMMARY REPORT

TestCode: 7420_TC

Sample ID: **115934-032A-MSD** SampType: **MSD** TestCode: **7420_TC** Units: **mg/L** Prep Date: **2/10/2011** RunNo: **130010**
Client ID: **B15-0.5** Batch ID: **70598** TestNo: **EPA 1311/ 74 EPA3010A** Analysis Date: **2/16/2011** SeqNo: **2112265**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	2.811	0.25	2.500	0.3890	96.9	70	130	2.794	0.626	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

Advanced Technology Laboratories
3275 Walnut Avenue, Signal Hill, CA 90755 Tel: 562. 989.4045 Fax: 562.989.4040

CLIENT: Ninyo & Moore
Work Order: 115934
Project: EA 0E3101, 207384045

ANALYTICAL QC SUMMARY REPORT

TestCode: 9045_S

Sample ID: **115934-022A-DUP** SampType: **DUP** TestCode: **9045_S** Units: **pH Units** Prep Date: RunNo: **129193**
Client ID: **B16-3** Batch ID: **R129193** TestNo: **EPA 9045C** Analysis Date: **1/26/2011** SeqNo: **2094681**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
pH	7.320	0.10						6.880	6.20	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

Advanced Technology Laboratories
3275 Walnut Avenue, Signal Hill, CA 90755 Tel: 562. 989.4045 Fax: 562.989.4040

CLIENT: Ninyo & Moore
Work Order: 115934
Project: EA 0E3101, 207384045

ANALYTICAL QC SUMMARY REPORT

TestCode: 9045_S

Sample ID: **115934-040ADUP** SampType: **DUP** TestCode: **9045_S** Units: **pH Units** Prep Date: RunNo: **129195**
Client ID: **B19-0.5** Batch ID: **R129195** TestNo: **EPA 9045C** Analysis Date: **1/26/2011** SeqNo: **2094687**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
pH	6.870	0.10						6.830	0.584	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

Advanced Technology Laboratories
3275 Walnut Avenue, Signal Hill, CA 90755 Tel: 562. 989.4045 Fax: 562.989.4040

LABORATORY:	SITE:	CONSULTANT:
Advanced Technology Laboratories 3275 Walnut Avenue Signal Hill, CA 90807 (562) 989-4045 / fax (562) 989-4040	SR-74 and I-5 Interchange San Juan Capistrano, California EA 0E3101 Project Number 207384045	Ninyo & Moore 475 Goddard, Suite 200 Irvine, CA 92618 (949) 753-7070/fax (949) 753-7071

SR-74 - 01

Special Instructions:

Homogonize the samples

If total lead is <1,000 mg/kg, but >/= 50 mg/kg, run STLC WET test (citric acid extraction EPA Method 7000 series)

If STLC WET >/= 5 mg/l, run STLC-DI (DI extraction EPA Method 7000 series)

If total lead is >/=1,000 mg/kg or STLC WET >/=5 mg/l, run TCLP (EPA Method 7000 series for leachable lead)

Sampled by: Michael Cushner / Thomas Mutten.

Relinquished by (name/date and time):	Received by (name/date and time):
Michael Cushner 1-22-11 9:00 A.M.	1/22/11 9:00
Relinquished by (name/date and time):	Received by (name/date and time):
Relinquished by (name/date and time):	Received by (name/date and time):
Relinquished by (name/date and time):	Received by (name/date and time):

Lab No.	Sample I. D.	Date	Time	Total Lead EPA Method 6010	pH EPA Method 9045	Sample Type	Turn-Around Time	Container Type	HOLD
	B26-0.5	1-21-11	9:10	X		Soil	Normal	Glass Jar	
	B26-1.5		9:15			Soil	Normal	Glass Jar	
	B25-0.5		9:20			Soil	Normal	Glass Jar	
	B25-1.5		9:25			Soil	Normal	Glass Jar	
	B25-3		9:28			Soil	Normal	Glass Jar	
	B25-4		9:33		X	Soil	Normal	Glass Jar	
	B24-0.5		940			Soil	Normal	Glass Jar	
	B24-1.5		944			Soil	Normal	Glass Jar	
	B23-0.5		953			Soil	Normal	Glass Jar	
	B23-1.5		957			Soil	Normal	Glass Jar	
	B23-3		1002			Soil	Normal	Glass Jar	
	B23-4		1005			Soil	Normal	Glass Jar	
	B22-0.5		1013			Soil	Normal	Glass Jar	
	B22-1.5		1017			Soil	Normal	Glass Jar	
	B22-3		10:21			Soil	Normal	Glass Jar	
	B21-0.5		10:35			Soil	Normal	Glass Jar	
	B21-1.5		10:39		X	Soil	Normal	Glass Jar	
	B21-3		10:45			Soil	Normal	Glass Jar	
	B21-4		10:49			Soil	Normal	Glass Jar	
	B16-0.5		11:45			Soil	Normal	Glass Jar	
	B16-1.5		11:49			Soil	Normal	Glass Jar	
	B16-3		11:53		X	Soil	Normal	Glass Jar	
	B16-4		11:57			Soil	Normal	Glass Jar	
	B18-0.5		12:06			Soil	Normal	Glass Jar	
	B18-1.5		12:10			Soil	Normal	Glass Jar	
	B18-3		12:18			Soil	Normal	Glass Jar	
	B18-4		12:26			Soil	Normal	Glass Jar	
	B20-0.5		1236			Soil	Normal	Glass Jar	
	B20-1.5		1240			Soil	Normal	Glass Jar	
	B20-3		1244			Soil	Normal	Glass Jar	
	B20-4		1248			Soil	Normal	Glass Jar	
	B15-0.5		1258			Soil	Normal	Glass Jar	
	B15-1.5		13:07			Soil	Normal	Glass Jar	
	B15-3		13:11			Soil	Normal	Glass Jar	
	B15-4		13:12			Soil	Normal	Glass Jar	
	B17-0.5		13:20			Soil	Normal	Glass Jar	
	B17-1.5		1324			Soil	Normal	Glass Jar	
	B17-3		1329			Soil	Normal	Glass Jar	
	B17-4		1333			Soil	Normal	Glass Jar	
	B19-0.5		1345		X	Soil	Normal	Glass Jar	
	B19-1.5		1348			Soil	Normal	Glass Jar	
	B19-3		1352			Soil	Normal	Glass Jar	
	B19-4		13:56			Soil	Normal	Glass Jar	
						Soil	Normal	Glass Jar	
						Soil	Normal	Glass Jar	
	W-1	1-21-11	15:30	X		water	Normal	Plastic	

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APPENDIX C

STATISTICAL ANALYSES

TABLE C-1
LEAD ANALYSES – SURFACE LAYER

Sample ID	Depth (feet bgs)	Total Lead (mg/kg)	Total Lead % of Maximum	Transformed Data Arcsine
B1-0.5	0.5	21	0.0362	0.036214812
B2-0.5	0.5	25	0.0431	0.043116806
B3-0.5	0.5	16	0.0276	0.027589707
B4-0.5	0.5	10	0.0172	0.017242234
B5-0.5	0.5	120	0.2069	0.208401807
B6-0.5	0.5	78	0.1345	0.134891461
B7-0.5	0.5	51	0.0879	0.088044742
B8-0.5	0.5	50	0.0862	0.086314032
B9-0.5	0.5	39	0.0672	0.067292154
B10-0.5	0.5	580	1.0000	1.570796327
B11-0.5	0.5	33	0.0569	0.056927294
B12-0.5	0.5	29	0.0500	0.050020857
B13-0.5	0.5	2.5	0.0043	0.004310358
B14-0.5	0.5	42	0.0724	0.072477230
B15-0.5	0.5	380	0.6552	0.714410816
B16-0.5	0.5	110	0.1897	0.190810933
B17-0.5	0.5	10	0.0172	0.017242234
B18-0.5	0.5	40	0.0690	0.069020304
B19-0.5	0.5	15	0.0259	0.025864953
B21-0.5	0.5	19	0.0328	0.032764483
B22-0.5	0.5	25	0.0431	0.043116806
B23-0.5	0.5	6.6	0.0114	0.011379556
B24-0.5	0.5	310	0.5345	0.563895639
B25-0.5	0.5	9.5	0.0164	0.016380043
B26-0.5	0.5	75	0.1293	0.129673454

Total Lead	Max TTLC:	580	**Transformed Data**		**Soluble Data**	
Number of Samples:	25		25			
Sample Mean:	84		0.171			
Delta = RT - mean	916					
Appropriate Number of Samples:	0.04					
Standard Deviation of Sample:	138		0.337			
Standard Deviation of Mean:	28		0.067			
Sample Variance:	18920		0.113			
t-value for 90%:	1.318	Need to Transform Data	1.318			
Upper Confidence Limit for 90%:			0.260			
Reverse Transformation for 90%			149	mg/kg	6.6	mg/l
t-value for 95%:	1.711		1.711			
Upper Confidence Limit for 95%:			0.286			
Reverse Transformation for 95%			164	mg/kg	7.2	mg/l

TABLE C-2
LEAD ANALYSES – 1½ TO 4 FOOT LAYER

Sample ID	Depth (feet bgs)	Total Lead (mg/kg)	Total Lead % of Maximum	Transformed Data Arcsine
B1-1.5	1.5	10	0.0526	0.052655908
B1-3	3	2.5	0.0132	0.013158274
B1-4	4	2.5	0.0132	0.013158274
B2-1.5	1.5	22	0.1158	0.116049783
B2-3	3	8.2	0.0432	0.043171304
B2-4	4	25	0.1316	0.131961608
B3-1.5	1.5	8.5	0.0447	0.044751778
B3-3	3	11	0.0579	0.057927128
B4-1.5	1.5	42	0.2211	0.222893671
B5-1.5	1.5	5.3	0.0279	0.027898356
B5-3	3	2.5	0.0132	0.013158274
B5-4	4	9.1	0.0479	0.047913067
B5-1.5	1.5	5.5	0.0289	0.028951413
B6-1.5	1.5	190	1.0000	1.570796327
B6-3	3	84	0.4421	0.457944420
B7-1.5	1.5	2.5	0.0132	0.013158274
B7-3	3	2.5	0.0132	0.013158274
B7-4	4	2.5	0.0132	0.013158274
B8-1.5	1.5	2.5	0.0132	0.013158274
B8-3	3	2.5	0.0132	0.013158274
B8-4	4	2.5	0.0132	0.013158274
B9-1.5	1.5	12	0.0632	0.063199959
B10-1.5	1.5	7.1	0.0374	0.037377123
B11-1.5	1.5	2.5	0.0132	0.013158274
B11-3	3	2.5	0.0132	0.013158274
B11-4	4	2.5	0.0132	0.013158274
B12-1.5	1.5	2.5	0.0132	0.013158274
B12-3	3	2.5	0.0132	0.013158274
B12-4	4	2.5	0.0132	0.013158274
B13-1.5	1.5	7.4	0.0389	0.038957222
B13-3	3	2.5	0.0132	0.013158274
B13-4	4	2.5	0.0132	0.013158274
B14-1.5	1.5	2.5	0.0132	0.013158274
B14-3	3	2.5	0.0132	0.013158274
B14-4	4	2.5	0.0132	0.013158274
B15-1.5	1.5	2.5	0.0132	0.013158274
B15-3	3	5.5	0.0289	0.028951413
B15-4	4	7.5	0.0395	0.039483943
B16-1.5	1.5	2.5	0.0132	0.013158274
B16-3	3	7.6	0.0400	0.040010674
B16-4	4	12	0.0632	0.063199959
B17-1.5	1.5	24	0.1263	0.126654134
B17-3	3	20	0.1053	0.105458525
B17-4	4	40	0.2105	0.212113310
B18-1.5	1.5	5.4	0.0284	0.028424880
B18-3	3	2.5	0.0132	0.013158274
B18-4	4	2.5	0.0132	0.013158274
B19-1.5	1.5	15	0.0789	0.079029608
B19-3	3	2.5	0.0132	0.013158274

TABLE C-2
LEAD ANALYSES – 1½ TO 4 FOOT LAYER

Sample ID	Depth (feet bgs)	Total Lead (mg/kg)	Total Lead % of Maximum	Transformed Data Arcsine
B19-4	4	2.5	0.0132	0.013158274
B20-1.5	1.5	5.2	0.0274	0.027371839
B20-3	3	2.5	0.0132	0.013158274
B20-4	4	2.5	0.0132	0.013158274
B21-1.5	1.5	2.5	0.0132	0.013158274
B21-3	3	2.5	0.0132	0.013158274
B21-4	4	2.5	0.0132	0.013158274
B22-1.5	1.5	2.5	0.0132	0.013158274
B22-3	3	17	0.0895	0.089593497
B23-1.5	1.5	2.5	0.0132	0.013158274
B23-3	3	2.5	0.0132	0.013158274
B23-4	4	2.5	0.0132	0.013158274
B24-1.5	1.5	7.8	0.0411	0.041064171
B25-1.5	1.5	5.5	0.0289	0.028951413
B25-3	1.5	2.5	0.0132	0.013158274
B25-4	3	19	0.1000	0.100167421
B26-1.5	1.5	26	0.1368	0.137272823

Total Lead	Max TTLC:	190	**Transformed Data**		**Soluble Data**
Number of Samples:	66		66		
Sample Mean:	11		0.069		
Delta = RT - mean	989				
Appropriate Number of Samples:	0.00				
Standard Deviation of Sample:	26		0.200		
Standard Deviation of Mean:	3		0.025		
Sample Variance:	661		0.040		
t-value for 90%:	1.295	Need to Transform Data	1.295		
Upper Confidence Limit for 90%:			0.101		
Reverse Transformation for 90%			19	mg/kg	1.3 mg/l
t-value for 95%:	1.670		1.670		
Upper Confidence Limit for 95%:			0.110		
Reverse Transformation for 95%			21	mg/kg	1.3 mg/l

TABLE C-3
LEAD ANALYSES – SURFACE TO $1^1/_2$ FOOT LAYER

Sample ID	Depth (feet bgs)	Total Lead (mg/kg)	Total Lead % of Maximum	Transformed Data Arcsine
B1-0.5	0.5	21	0.0362	0.036214812
B1-1.5	1.5	10	0.0172	0.017242234
B2-0.5	0.5	25	0.0431	0.043116806
B2-1.5	1.5	22	0.0379	0.037940136
B3-0.5	0.5	16	0.0276	0.027589707
B3-1.5	1.5	8.5	0.0147	0.014655697
B4-0.5	0.5	10	0.0172	0.017242234
B4-1.5	1.5	42	0.0724	0.072477230
B5-0.5	0.5	120	0.2069	0.208401807
B5-1.5	1.5	5.3	0.0091	0.009138058
B6-0.5	0.5	78	0.1345	0.134891461
B6-1.5	1.5	190	0.3276	0.333747678
B7-0.5	0.5	51	0.0879	0.088044742
B7-1.5	1.5	2.5	0.0043	0.004310358
B8-0.5	0.5	50	0.0862	0.086314032
B8-1.5	1.5	2.5	0.0043	0.004310358
B9-0.5	0.5	39	0.0672	0.067292154
B9-1.5	1.5	12.0	0.0207	0.020691132
B10-0.5	0.5	580	1.0000	1.570796327
B10-1.5	1.5	7.1	0.0122	0.012241685
B11-0.5	0.5	33	0.0569	0.056927294
B11-1.5	1.5	2.5	0.0043	0.004310358
B12-0.5	0.5	29	0.0500	0.050020857
B12-1.5	1.5	2.5	0.0043	0.004310358
B13-0.5	0.5	2.5	0.0043	0.004310358
B13-1.5	1.5	7.4	0.0128	0.012758967
B14-0.5	0.5	42	0.0724	0.072477230
B14-1.5	1.5	2.5	0.0043	0.004310358
B15-0.5	0.5	380	0.6552	0.714410816
B15-1.5	1.5	2.5	0.0043	0.004310358
B16-0.5	0.5	110	0.1897	0.190810933
B16-1.5	1.5	2.5	0.0043	0.004310358
B17-0.5	0.5	10	0.0172	0.017242234
B17-1.5	1.5	24	0.0414	0.041391128
B18-0.5	0.5	40	0.0690	0.069020304
B18-1.5	1.5	5.4	0.0093	0.009310479
B19-0.5	0.5	15	0.0259	0.025864953
B19-1.5	1.5	15	0.0259	0.025864953
B20-1.5	1.5	5.2	0.0090	0.008965637
B21-0.5	0.5	19	0.0328	0.032764483
B21-1.5	1.5	2.5	0.0043	0.004310358
B22-0.5	0.5	25	0.0431	0.043116806
B22-1.5	1.5	2.5	0.0043	0.004310358
B23-0.5	0.5	6.6	0.0114	0.011379556
B23-1.5	1.5	2.5	0.0043	0.004310358
B24-0.5	0.5	310	0.5345	0.563895639
B24-1.5	1.5	7.8	0.0134	0.013448681
B25-0.5	0.5	9.5	0.0164	0.016380043
B25-1.5	1.5	5.5	0.0095	0.009482901
B26-0.5	0.5	75	0.1293	0.129673454
B26-1.5	1.5	26	0.0448	0.044842613

TABLE C-3
LEAD ANALYSES – SURFACE TO $1^1/_2$ FOOT LAYER

Sample ID	Depth (feet bgs)	Total Lead (mg/kg)	Total Lead % of Maximum	Transformed Data Arcsine	
Total Lead	Max TTLC:	580	**Transformed Data**		**Soluble Data**
Number of Samples:	51		51		
Sample Mean:	49		0.098		
Delta = RT - mean	951				
Appropriate Number of Samples:	0.02				
Standard Deviation of Sample:	105		0.249		
Standard Deviation of Mean:	15		0.035		
Sample Variance:	10928		0.062		
t-value for 90%:	1.300	Need to Transform Data	1.300		
Upper Confidence Limit for 90%:			0.143		
Reverse Transformation for 90%			83	mg/kg	3.9 mg/l
t-value for 95%:	1.678		1.678		
Upper Confidence Limit for 95%:			0.157		
Reverse Transformation for 95%			90	mg/kg	4.2 mg/l

TABLE C-4
LEAD ANALYSES – 3 TO 4 FOOT LAYER

Sample ID	Depth (feet bgs)	Total Lead (mg/kg)	Total Lead % of Maximum	Transformed Data Arcsine
B1-3	3	2.5	0.0298	0.029766300
B1-4	4	2.5	0.0298	0.029766300
B2-3	3	8.2	0.0976	0.097774759
B2-4	4	25	0.2976	0.302197714
B3-3	3	11	0.1310	0.131329572
B5-3	3	2.5	0.0298	0.029766300
B5-4	4	9.1	0.1083	0.108546362
B6-3	3	84	1.0000	1.570796327
B7-3	3	2.5	0.0298	0.029766300
B7-4	4	2.5	0.0298	0.029766300
B8-3	3	2.5	0.0298	0.029766300
B8-4	4	2.5	0.0298	0.029766300
B11-3	3	2.5	0.0298	0.029766300
B11-4	4	2.5	0.0298	0.029766300
B12-3	3	2.5	0.0298	0.029766300
B12-4	4	2.5	0.0298	0.029766300
B13-3	3	2.5	0.0298	0.029766300
B13-4	4	2.5	0.0298	0.029766300
B14-3	3	2.5	0.0298	0.029766300
B14-4	4	2.5	0.0298	0.029766300
B15-3	3	5.5	0.0655	0.065523065
B15-4	4	7.5	0.0893	0.089404772
B16-3	3	7.6	0.0905	0.090600086
B16-4	4	12	0.1429	0.143347569
B17-3	3	20	0.2381	0.240404217
B17-4	4	40	0.4762	0.496317362
B18-3	3	2.5	0.0298	0.029766300
B18-4	4	2.5	0.0298	0.029766300
B19-3	3	2.5	0.0298	0.029766300
B19-4	4	2.5	0.0298	0.029766300
B20-3	3	2.5	0.0298	0.029766300
B20-4	4	2.5	0.0298	0.029766300
B21-3	3	2.5	0.0298	0.029766300
B21-4	4	2.5	0.0298	0.029766300
B22-3	3	17	0.2024	0.203788576
B23-3	3	2.5	0.0298	0.029766300
B23-4	4	2.5	0.0298	0.029766300
B25-3	3	2.5	0.0298	0.029766300
B25-4	4	19	0.2262	0.228165014

TABLE C-4
LEAD ANALYSES – 3 TO 4 FOOT LAYER

Sample ID	Depth (feet bgs)	Total Lead (mg/kg)	Total Lead % of Maximum	Transformed Data Arcsine	
Total Lead	Max TTLC:	84	**Transformed Data**		**Soluble Data**
Number of Samples:	39		39		
Sample Mean:	8		0.116		
Delta = RT - mean	992				
Appropriate Number of Samples:	0.00				
Standard Deviation of Sample:	15		0.258		
Standard Deviation of Mean:	2		0.041		
Sample Variance:	217		0.067		
t-value for 90%:	1.304	Need to Transform Data	1.304		
Upper Confidence Limit for 90%:			0.170		
Reverse Transformation for 90%			14	mg/kg	1.1 mg/l
t-value for 95%:	1.687		1.687		
Upper Confidence Limit for 95%:			0.186		
Reverse Transformation for 95%			16	mg/kg	1.1 mg/l

TABLE C-5
LEAD ANALYSES – SURFACE TO 3 FOOT LAYER

Sample ID	Depth (feet bgs)	Total Lead (mg/kg)	Total Lead % of Maximum	Transformed Data Arcsine
B1-0.5	0.5	21	0.0362	0.036214812
B1-1.5	1.5	10	0.0172	0.017242234
B1-3	3	2.5	0.0043	0.004310358
B2-0.5	0.5	25	0.0431	0.043116806
B2-1.5	1.5	22	0.0379	0.037940136
B2-3	3	8.2	0.0141	0.014138402
B3-0.5	0.5	16	0.0276	0.027589707
B3-1.5	1.5	8.5	0.0147	0.014655697
B3-3	3	11	0.0190	0.018966654
B4-0.5	0.5	10	0.0172	0.017242234
B4-1.5	1.5	42	0.0724	0.072477230
B5-0.5	0.5	120	0.2069	0.208401807
B5-1.5	1.5	5.3	0.0091	0.009138058
B5-3	3	2.5	0.0043	0.004310358
B6-0.5	0.5	78	0.1345	0.134891461
B6-1.5	1.5	190	0.3276	0.333747678
B6-3	3	84	0.1448	0.145338719
B7-0.5	0.5	51	0.0879	0.088044742
B7-1.5	1.5	2.5	0.0043	0.004310358
B7-3	3	2.5	0.0043	0.004310358
B8-0.5	0.5	50	0.0862	0.086314032
B8-1.5	1.5	2.5	0.0043	0.004310358
B8-3	3	2.5	0.0043	0.004310358
B9-0.5	0.5	39	0.0672	0.067292154
B9-1.5	1.5	12.0	0.0207	0.020691132
B10-0.5	0.5	580	1.0000	1.570796327
B10-1.5	1.5	7.1	0.0122	0.012241685
B11-0.5	0.5	33	0.0569	0.056927294
B11-1.5	1.5	2.5	0.0043	0.004310358
B11-3	3	2.5	0.0043	0.004310358
B12-0.5	0.5	29	0.0500	0.050020857
B12-1.5	1.5	2.5	0.0043	0.004310358
B12-3	3	2.5	0.0043	0.004310358
B13-0.5	0.5	2.5	0.0043	0.004310358
B13-1.5	1.5	7.4	0.0128	0.012758967
B13-3	3	2.5	0.0043	0.004310358
B14-0.5	0.5	42	0.0724	0.072477230
B14-1.5	1.5	2.5	0.0043	0.004310358
B14-3	3	2.5	0.0043	0.004310358
B15-0.5	0.5	380	0.6552	0.714410816
B15-1.5	1.5	2.5	0.0043	0.004310358
B15-3	3	5.5	0.0095	0.009482901
B16-0.5	0.5	110	0.1897	0.190810933
B16-1.5	1.5	2.5	0.0043	0.004310358
B16-3	3	7.6	0.0131	0.013103823
B17-0.5	0.5	10	0.0172	0.017242234
B17-1.5	1.5	24	0.0414	0.041391128
B17-3	3	20	0.0345	0.034489596
B18-0.5	0.5	40	0.0690	0.069020304

TABLE C-5
LEAD ANALYSES – SURFACE TO 3 FOOT LAYER

Sample ID	Depth (feet bgs)	Total Lead (mg/kg)	Total Lead % of Maximum	Transformed Data Arcsine
B18-1.5	1.5	5.4	0.0093	0.009310479
B18-3	3	2.5	0.0043	0.004310358
B19-0.5	0.5	15	0.0259	0.025864953
B19-1.5	1.5	15	0.0259	0.025864953
B19-3	3	2.5	0.0043	0.004310358
B20-1.5	1.5	5.2	0.0090	0.008965637
B20-3	3	2.5	0.0043	0.004310358
B21-0.5	0.5	19	0.0328	0.032764483
B21-1.5	1.5	2.5	0.0043	0.004310358
B21-3	3	2.5	0.0043	0.004310358
B22-0.5	0.5	25	0.0431	0.043116806
B22-1.5	1.5	2.5	0.0043	0.004310358
B22-3	3	17	0.0293	0.029314543
B23-0.5	0.5	6.6	0.0114	0.011379556
B23-1.5	1.5	2.5	0.0043	0.004310358
B23-3	3	2.5	0.0043	0.004310358
B24-0.5	0.5	310	0.5345	0.563895639
B24-1.5	1.5	7.8	0.0134	0.013448681
B25-0.5	3	9.5	0.0164	0.016380043
B25-1.5	1.5	5.5	0.0095	0.009482901
B25-3	3	2.5	0.0043	0.004310358
B26-0.5	0.5	75	0.1293	0.129673454
B26-1.5	1.5	26	0.0448	0.044842613

Total Lead	Max TTLC:	580	**Transformed Data**		**Soluble Data**
Number of Samples:	72		72		
Sample Mean:	38		0.074		
Delta = RT - mean	962				
Appropriate Number of Samples:	0.01				
Standard Deviation of Sample:	90		0.213		
Standard Deviation of Mean:	11		0.025		
Sample Variance:	8127		0.045		
t-value for 90%:	1.295	Need to Transform Data	1.295		
Upper Confidence Limit for 90%:			0.106		
Reverse Transformation for 90%			62	mg/kg	3.0 mg/l
t-value for 95%:	1.669		1.669		
Upper Confidence Limit for 95%:			0.116		
Reverse Transformation for 95%			67	mg/kg	3.2 mg/l

TABLE C-6
LEAD ANALYSES – 4 FOOT LAYER

Sample ID	Depth (feet bgs)	Total Lead (mg/kg)	Total Lead % of Maximum	Transformed Data Arcsine
B1-4	4	2.5	0.0625	0.062540762
B2-4	4	25	0.6250	0.675131533
B5-4	4	9.1	0.2275	0.229509590
B7-4	4	2.5	0.0625	0.062540762
B8-4	4	2.5	0.0625	0.062540762
B11-4	4	2.5	0.0625	0.062540762
B12-4	4	2.5	0.0625	0.062540762
B13-4	4	2.5	0.0625	0.062540762
B14-4	4	2.5	0.0625	0.062540762
B15-4	4	7.5	0.1875	0.188616386
B16-4	4	12	0.3000	0.304692654
B17-4	4	40	1.0000	1.570796327
B18-4	4	2.5	0.0625	0.062540762
B19-4	4	2.5	0.0625	0.062540762
B20-4	4	2.5	0.0625	0.062540762
B21-4	4	2.5	0.0625	0.062540762
B23-4	4	2.5	0.0625	0.062540762
B25-4	4	19	0.4750	0.494964032

Total Lead	Max TTLC:	40	**Transformed Data**		**Soluble Data**
Number of Samples:	18		18		
Sample Mean:	8		0.234		
Delta = RT - mean	992				
Appropriate Number of Samples:	0.00				
Standard Deviation of Sample:	10		0.376		
Standard Deviation of Mean:	2		0.089		
Sample Variance:	107		0.142		
t-value for 90%:	1.333	Need to Transform Data	1.333		
Upper Confidence Limit for 90%:			0.352		
Reverse Transformation for 90%			14	mg/kg	1.0 mg/l
t-value for 95%:	1.740		1.740		
Upper Confidence Limit for 95%:			0.389		
Reverse Transformation for 95%			15	mg/kg	1.1 mg/l

TABLE C-7
LEAD ANALYSES – SURFACE TO 4 FOOT LAYER

Sample ID	Depth (feet bgs)	Total Lead (mg/kg)	Total Lead % of Maximum	Transformed Data Arcsine
B1-0.5	0.5	21	0.0362	0.036214812
B1-1.5	1.5	10	0.0172	0.017242234
B1-3	3	2.5	0.0043	0.004310358
B1-4	4	2.5	0.0043	0.004310358
B2-0.5	0.5	25	0.0431	0.043116806
B2-1.5	1.5	22	0.0379	0.037940136
B2-3	3	8.2	0.0141	0.014138402
B2-4	4	25	0.0431	0.043116806
B3-0.5	0.5	16	0.0276	0.027589707
B3-1.5	1.5	8.5	0.0147	0.014655697
B3-3	3	11	0.0190	0.018966654
B4-0.5	0.5	10	0.0172	0.017242234
B4-1.5	1.5	42	0.0724	0.072477230
B5-0.5	0.5	120	0.2069	0.208401807
B5-1.5	1.5	5.3	0.0091	0.009138058
B5-3	3	2.5	0.0043	0.004310358
B5-4	4	9.1	0.0157	0.015690299
B6-0.5	0.5	78	0.1345	0.134891461
B6-1.5	1.5	190	0.3276	0.333747678
B6-3	3	84	0.1448	0.145338719
B7-0.5	0.5	51	0.0879	0.088044742
B7-1.5	1.5	2.5	0.0043	0.004310358
B7-3	3	2.5	0.0043	0.004310358
B7-4	4	2.5	0.0043	0.004310358
B8-0.5	0.5	50	0.0862	0.086314032
B8-1.5	1.5	2.5	0.0043	0.004310358
B8-3	3	2.5	0.0043	0.004310358
B8-4	4	2.5	0.0043	0.004310358
B9-0.5	0.5	39	0.0672	0.067292154
B9-1.5	1.5	12	0.0207	0.020691132
B10-0.5	0.5	580	1.0000	1.570796327
B10-1.5	1.5	7.1	0.0122	0.012241685
B11-0.5	0.5	33	0.0569	0.056927294
B11-1.5	1.5	2.5	0.0043	0.004310358
B11-3	3	2.5	0.0043	0.004310358
B11-4	4	2.5	0.0043	0.004310358
B12-0.5	0.5	29	0.0500	0.050020857
B12-1.5	1.5	2.5	0.0043	0.004310358
B12-3	3	2.5	0.0043	0.004310358
B12-4	4	2.5	0.0043	0.004310358
B13-0.5	0.5	2.5	0.0043	0.004310358
B13-1.5	1.5	7.4	0.0128	0.012758967
B13-3	3	2.5	0.0043	0.004310358
B13-4	4	2.5	0.0043	0.004310358
B14-0.5	0.5	42	0.0724	0.072477230
B14-1.5	1.5	2.5	0.0043	0.004310358
B14-3	3	2.5	0.0043	0.004310358
B14-4	4	2.5	0.0043	0.004310358
B15-0.5	0.5	380	0.6552	0.714410816
B15-1.5	1.5	2.5	0.0043	0.004310358
B15-3	3	5.5	0.0095	0.009482901
B15-4	4	7.5	0.0129	0.012931395
B16-0.5	0.5	110	0.1897	0.190810933
B16-1.5	1.5	2.5	0.0043	0.004310358
B16-3	3	7.6	0.0131	0.013103823

TABLE C-7
LEAD ANALYSES – SURFACE TO 4 FOOT LAYER

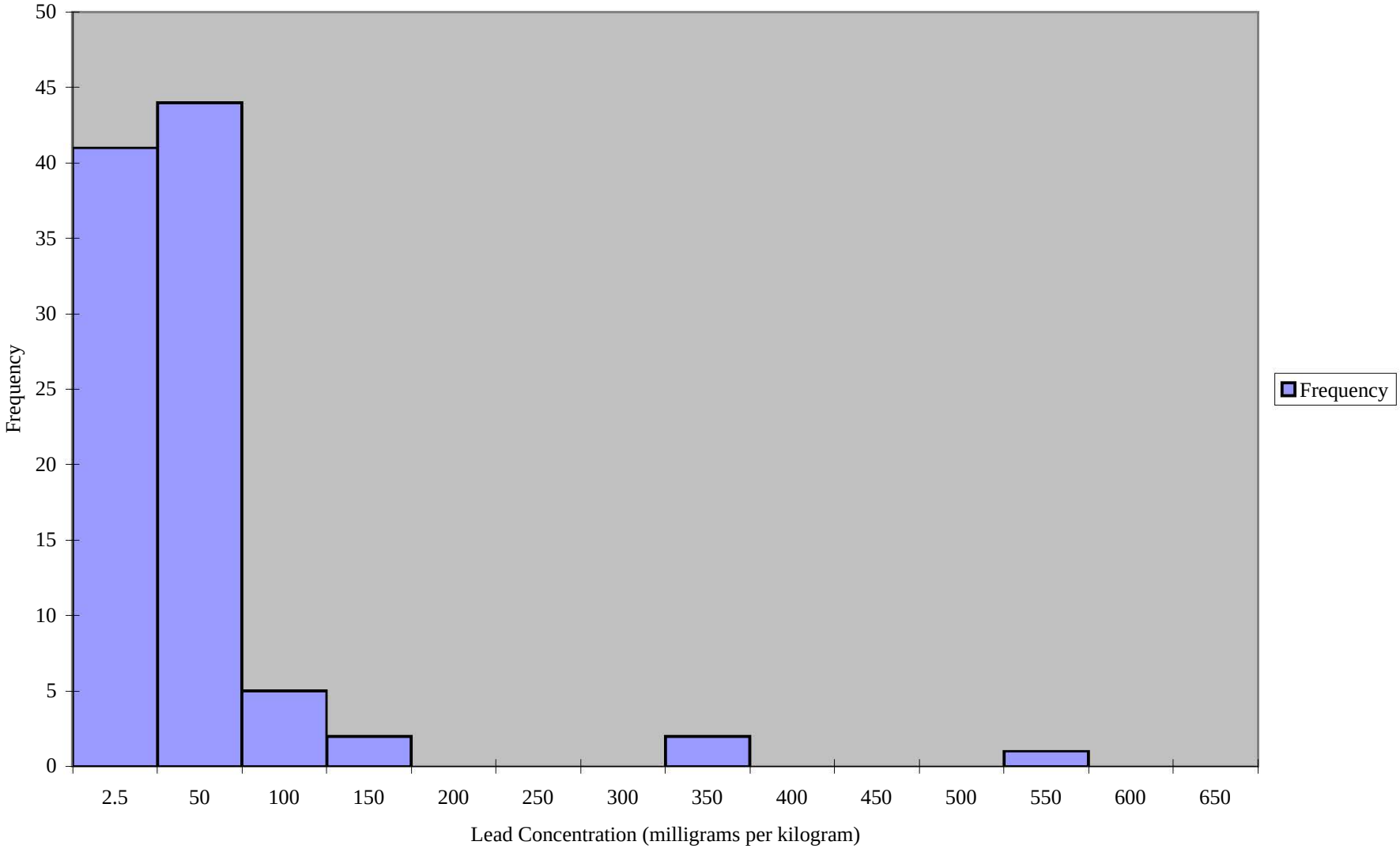
Sample ID	Depth (feet bgs)	Total Lead (mg/kg)	Total Lead % of Maximum	Transformed Data Arcsine
B16-4	4	12	0.0207	0.020691132
B17-0.5	0.5	10	0.0172	0.017242234
B17-1.5	1.5	24	0.0414	0.041391128
B17-3	3	20	0.0345	0.034489596
B17-4	4	40	0.0690	0.069020304
B18-0.5	0.5	40	0.0690	0.069020304
B18-1.5	1.5	5.4	0.0093	0.009310479
B18-3	3	2.5	0.0043	0.004310358
B18-4	4	2.5	0.0043	0.004310358
B19-0.5	0.5	15	0.0259	0.025864953
B19-1.5	1.5	15	0.0259	0.025864953
B19-3	3	2.5	0.0043	0.004310358
B19-4	4	2.5	0.0043	0.004310358
B20-1.5	1.5	5.2	0.0090	0.008965637
B20-3	3	2.5	0.0043	0.004310358
B20-4	4	2.5	0.0043	0.004310358
B21-0.5	0.5	19	0.0328	0.032764483
B21-1.5	1.5	2.5	0.0043	0.004310358
B21-3	3	2.5	0.0043	0.004310358
B21-4	4	2.5	0.0043	0.004310358
B22-0.5	0.5	25	0.0431	0.043116806
B22-1.5	1.5	2.5	0.0043	0.004310358
B22-3	3	17	0.0293	0.029314543
B23-0.5	0.5	6.6	0.0114	0.011379556
B23-1.5	1.5	2.5	0.0043	0.004310358
B23-3	3	2.5	0.0043	0.004310358
B23-4	4	2.5	0.0043	0.004310358
B24-0.5	0.5	310	0.5345	0.563895639
B24-1.5	1.5	7.8	0.0134	0.013448681
B25-0.5	0.5	9.5	0.0164	0.016380043
B25-1.5	0.5	5.5	0.0095	0.009482901
B25-3	1.5	2.5	0.0043	0.004310358
B25-4	3	19	0.0328	0.032764483
B26-0.5	0.5	75	0.1293	0.129673454
B26-1.5	1.5	26	0.0448	0.044842613

Total Lead	Max TTLC:	580	**Transformed Data**		**Soluble Data**
Number of Samples:	90		90		
Sample Mean:	32		0.062		
Delta = RT - mean	968				
Appropriate Number of Samples:	0.01				
Standard Deviation of Sample:	82		0.192		
Standard Deviation of Mean:	9		0.020		
Sample Variance:	6646		0.037		
t-value for 90%:	1.293	Need to Transform Data	1.293		
Upper Confidence Limit for 90%:			0.088		
Reverse Transformation for 90%			51	mg/kg	2.6 mg/l
t-value for 95%:	1.665		1.665		
Upper Confidence Limit for 95%:			0.096		
Reverse Transformation for 95%			55	mg/kg	2.8 mg/l

APPENDIX D

HISTOGRAM

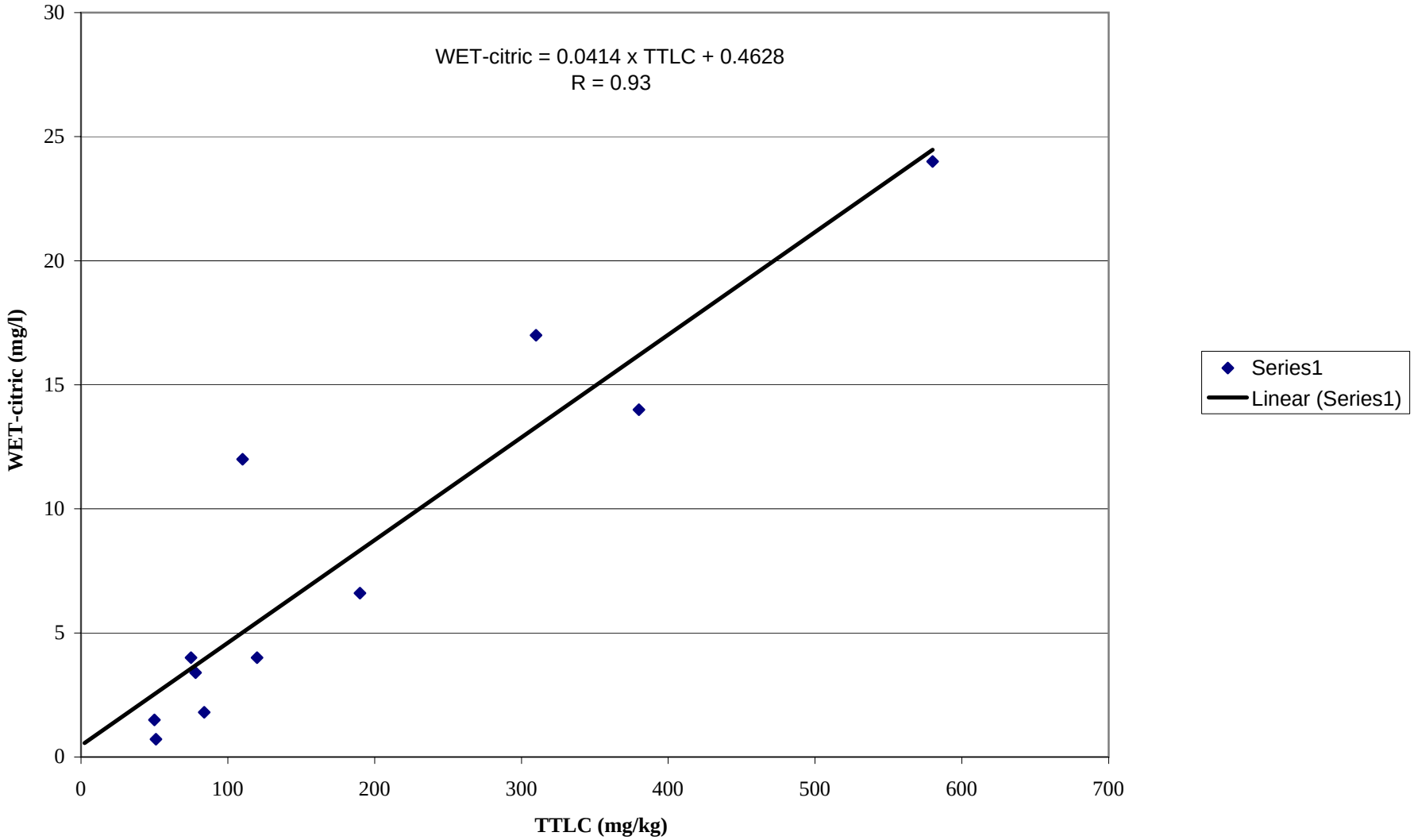
HISTOGRAM OF TOTAL LEAD



APPENDIX E

CORRELATION OF TOTAL LEAD TO SOLUBLE LEAD

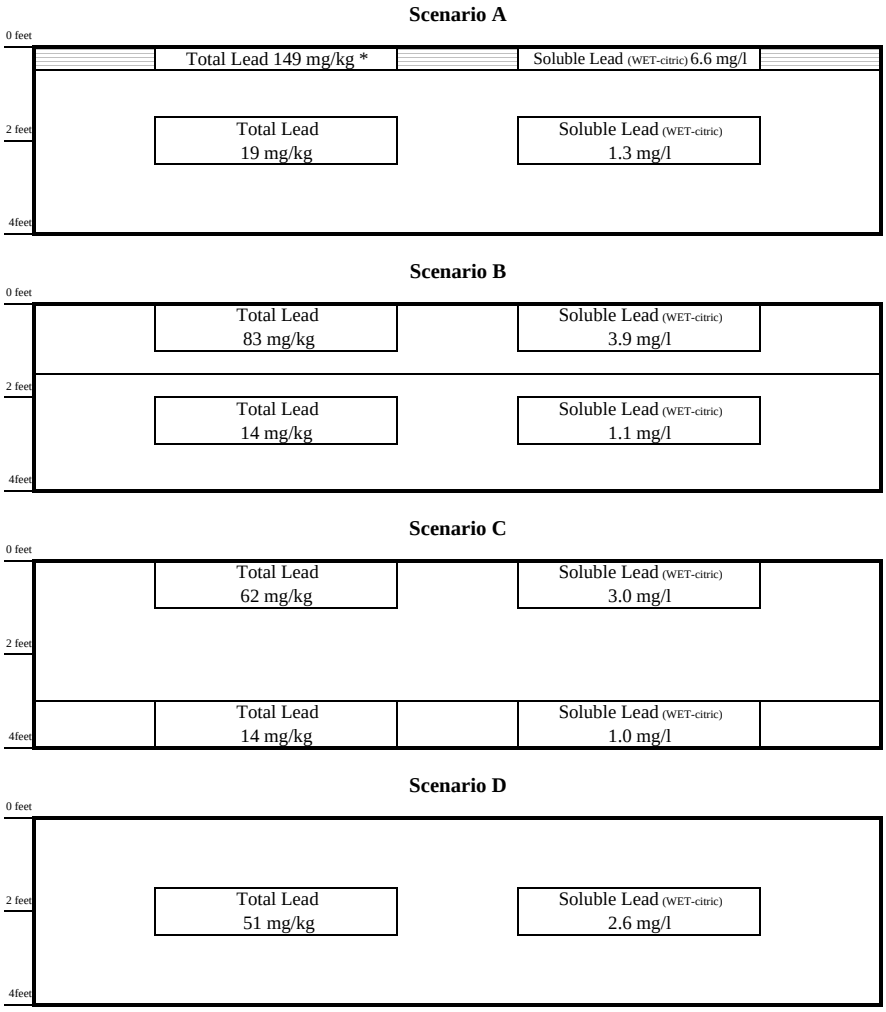
CORRELATION OF TOTAL LEAD TO SOLUBLE LEAD



APPENDIX F

BLOCK DIAGRAMS

FIGURE F1 – BLOCK DIAGRAM FOR POTENTIAL DEPARTMENT RIGHT-OF-WAY RE-USE ONE-TAILED 90 PERCENT UCLs FOR ARCSINE TRANSFORMATION



– Non-hazardous soil with respect to total and soluble lead

– Reuse Condition 1 [Hazardous. Variance applies. Use material on job site. Place a minimum of 5 feet above maximum water table elevation and cover with at least 1 foot of non-hazardous soil]

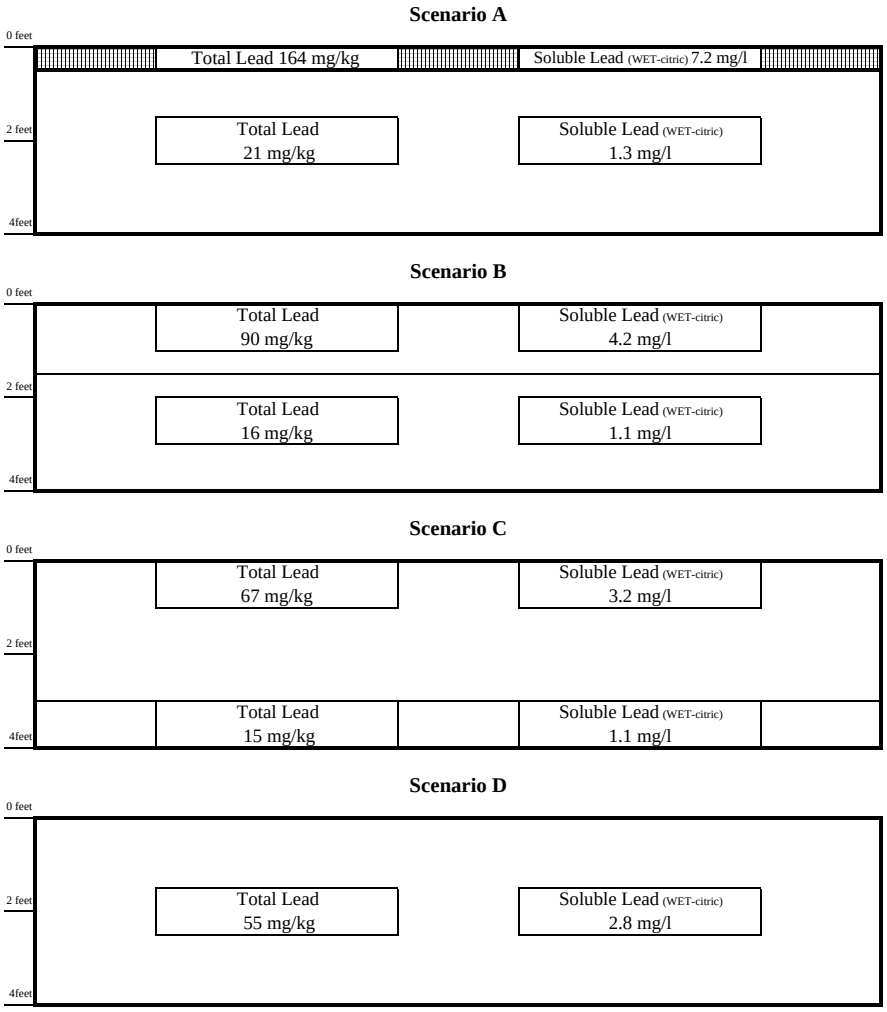
– Reuse Condition 2 [Hazardous. Variance applies. Use material on job site. Place a minimum of 5 feet above maximum water table elevation and protect from infiltration with a pavement structure which will be maintained by the Department]

– Hazardous. Class 1 disposal site, all other Title 22 CCR requirements apply

– Hazardous. Class 1 disposal site RCRA based on the layer having a TCLP value≥ 5 mg/l

UCL – upper confidence limit
WET-DI – soluble lead using the Waste Extraction Test with deionized water
WET-citric acid – soluble lead using the Waste Extraction Test with citric acid
TCLP – Toxicity Characteristic Leaching Procedure
mg/kg – milligrams per kilogram
mg/l – milligrams per liter
CCR – California Code of Regulations
RCRA – Resource, Conservation, and Recovery Act
* – Soil in the vicinity of boring B20 in the surface layer must be managed as Hazardous, Class 1 disposal site due to a pH value less than 5.0. Soil should be removed from station numbers 512+45.00 and 513-19.35, including the entire width of the excavation to a depth of 6-inches, and disposed at a Class 1 disposal site in accordance with Title 22 CCR requirements.

FIGURE F2 – BLOCK DIAGRAM FOR POTENTIAL DEPARTMENT OFF SITE DISPOSAL ONE-TAILED 95 PERCENT UCLs FOR ARCSINE TRANSFORMATION



– Non-hazardous soil with respect to total and soluble lead

– Reuse Condition 1 [Hazardous. Variance applies. Use material on job site. Place a minimum of 5 feet above maximum water table elevation and cover with at least 1 foot of non-hazardous soil]

– Reuse Condition 2 [Hazardous. Variance applies. Use material on job site. Place a minimum of 5 feet above maximum water table elevation and protect from infiltration with a pavement structure which will be maintained by the Department]

– Hazardous. Class 1 disposal site, all other Title 22 CCR requirements apply

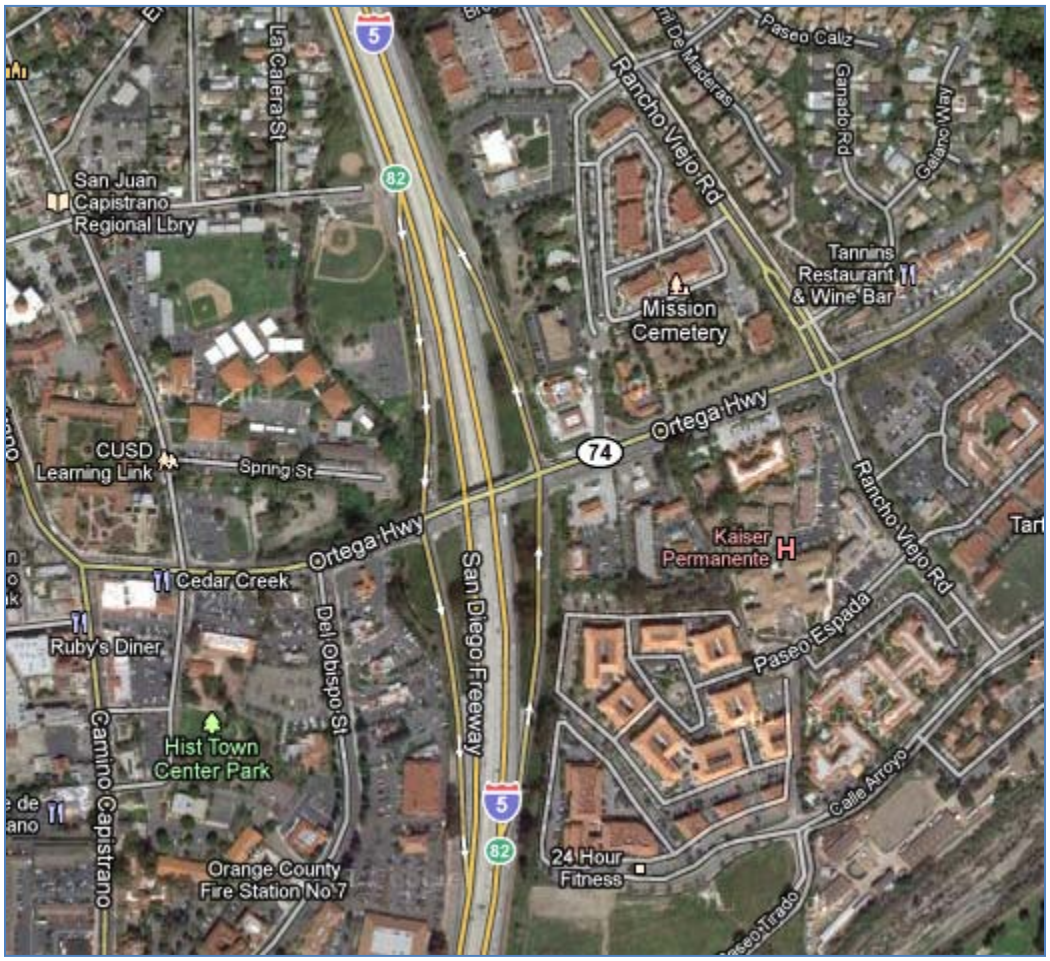
– Hazardous. Class 1 disposal site RCRA based on the layer having a TCLP value≥ 5 mg/l

UCL – upper confidence limit
WET-DI – soluble lead using the Waste Extraction Test with deionized water
WET-citric acid – soluble lead using the Waste Extraction Test with citric acid
TCLP – Toxicity Characteristic Leaching Procedure
mg/kg – milligrams per kilogram
mg/l – milligrams per liter
CCR – California Code of Regulations
RCRA – Resource, Conservation, and Recovery Act

FOUNDATION REPORTS

for the replacement of the existing SR-74/I-5 interchange in the City of San Juan Capistrano

12-ORA-5/74 PM 0.01 PROJECT ID-1200000102 (EA 0E3101)



November 14, 2011

State of California

Business, Transportation and Housing Agency

Memorandum

Flex your power!
Be energy efficient!

To: **MR. JEFF WOODY**
Branch chief
Special Designs, Branch A
Office of Design and Technical Services
1801 30th street, FMP I
Sacramento, CA 95816

Date: November 14, 2011

File: 12-ORA-5/74- PM 0.01
Project ID 1200000102
EA 12-0E3101
Geotechnical Foundation
Recommendation Reports

Attn.: Andrew Bui
Vanessa Truong

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
Geotechnical Services
Office of Geotechnical Design – South 1

Subject: **Geotechnical Foundation Recommendations Reports for the replacement of the existing SR-74/I-5 interchange**

Attached please find signed copies of the following geotechnical Foundation Recommendations Reports prepared for above-referenced project.

Report	Applicable Structures
Foundation Report for Sign 205	Sign no. 205
Foundation Report for Signal/Lighting Poles	Signal and Lighting poles: Type 1A, 26A-4-100, 29A-5-100, 31, 15TS

If you have any questions or need for additional information, please contact Mohammed Islam at (916) 227- 0993.

Distribution:

OGDS-1
Nooshin Yoosefi, D12 Project Manager
Mark Williams, GS Corporate
David Lam, District PE.
Farhad Hadjibabaie, D12 Material Engineer
Structure Construction R.E. Pending file

State of California | Business, Transportation and Housing Agency

M e m o r a n d u m

Flex your power!
Be energy efficient!

To: MR. JEFF WOODY, CHIEF
BRANCH A
OFFICE OF DESIGN AND TECHNICAL SERVICES

Date: Nov. 8th, 2011

File: 12-ORA-5,74-PM9.4/10.0,0.0/0.2
EA 12-0E310
I-5/ SR74 Separation Signs 205

Attn: Andrew A Bui

Project No. 1200000102

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
Geotechnical Services – MS5
Office of Geotechnical Design – South 1

Subject: **Foundation Report for Sign 205**

Per your request, the following is the foundation report for the sign 205 proposed at south-bound off-ramp from I-5 to SR74.

PROJECT DESCRIPTION

The proposed Sign 205 is a part of general improvement to replace the existing Route 75/ I-5 interchange for the alleviation of traffic congestion along SR74 in the city of San Juan Capistrano, Orange County. The information regarding the sign type, location, ground geometry, and adjacent structures are summarized in following table.

Table 1 General Information for Sign 205

Sign Type	Standard Plans Plate Number	Location	Ground Geometry	Base Plate/Top of Wall Elevation (ft)	Ground Elevation At Sign Location (ft)	Adjacent Structures	Bottom of Sign Pedestal / RW Footing Elevations (ft)	Adjacent Structure / Foundation Type
Lightweight Type A2	S43	I-5 SB Offramp (widening)	1(V):4(H) Downslope outside Both Posts	139.16 (Left)	132.13 (Left)	RW96 (Left)	127.93 (Left)	Type 1 Wall with Spread Footing
				137.86 (Right)	129.35 (Right)	RW83 (Right)	123.25 (Right)	Type 1 Wall with Driven Steel Pipe Pile

FIELD INVESTIGATION

Subsurface investigation was completed by URS to obtain geotechnical information for the replacement of Route 74/I5 Interchange and the associated earth retaining structures. Two rotary wash borings and one cone penetrometer test boring adjacent to the future sign structure were selected to obtain the soil parameters for the foundation recommendations. The general information for those borings is summarized in following table:

Table 2 Summary of Field Investigation for the Signs 205

Sign Number (STA Number)	Reference Boring Number	Station	Reference Line	Offset	Top of Hole Elevation (ft)	Borehole Depth (ft)
Sign 205 (STA520+50)	CPT-10-026	STA519+52.0	A	175.7L	133.53	54.5
	R-10-09	STA518+95.6	A	9.5L	120.86	56
	R-10-10	STA519+40.2	A	173.2L	134.16	17

SITE GEOLOGY

The project is located within the alluvial valleys of the Trabuco Creek and San Juan Creek and their tributaries. These alluvial valleys are covered by Quaternary age alluvium and terrace deposits. The alluvium consists of clay, clayey sand, sandy clay, and sandy clay with gravel. The terrace deposits consist of sandy silt, clayey sand and conglomeratic coarse-grained sand. The alluvium and terrace deposits are underlain by the Capistrano Formation (Tertiary age), which primarily consists of marine-derived siltstone with interbedded fine-grained sandstone, thin pebble sand beds, and thin hard calcareous beds. There are fill slopes associated primarily with the existing southbound on and off ramps and with Route 74 west of I-5. Consists mostly of sandy clay and clayey sand, the fill thickness is estimated to be up to 25 feet.

SUBSURFACE CONDITIONS

From existing grade to approximately five feet below, embankment materials are mostly dense clayey sand with gravel. Continuing down 14 feet, the subsurface materials become very stiff sandy lean clay with Gravel. From 19 feet to 45 feet below the ground surface, foundation soils are mostly lean clay with its consistency ranging from medium stiff at the top to very stiff near the bottom of this clay layer.

For foundation design purpose, the idealized soil profiles are presented in Table 3 below.

Table 3. Idealized Soil Profile and Strength Parameters

Approximate Elevation (ft)	Predominant Soil Type, USCS	Average Blowcount, N_{60}	Total Unit Weight (pcf)	Friction Angle (degree)	Cohesion /Undrained Shear Strength (psf)
+134' to +126'	SC	36	125	40	N/A
+126' to +112'	CL	N/A	125	N/A	2500
+112' to +99'	CL	N/A	120	N/A	1000
+99' to +86'	CL	N/A	125	N/A	3000
+86' to +76'	GP-GC	50	125	35	N/A

* Shaded area indicates materials submerged in groundwater

GROUNDWATER

Groundwater was measured to be 11 feet below ground surface at rotary wash boring site (R-10-009), and 25 feet below the top of hole at CPT sounding (CPT-10-026) location. Based on groundwater information obtained from field investigations, the design ground water table can be assumed as 112 ft above mean sea level at Sign 205 location.

CORROSION EVALUATION

Corrosion samples were obtained during recent subsurface explorations. The bulk samples were collected from the adjacent soil borings and tested for corrosion potential following the guidelines from Caltrans' Corrosion Technology Branch. The test results are presented in Table 4 below. Based on those test results, the subsurface materials are considered as non-corrosive to the sign foundations.

Table 4 Corrosion test Results

Sign Number	Location of Sampling	Depth of Sample (ft)	pH	Soluble Sulfates	Soluble Chlorides	Minimum Resistivity
205	R-10-009	5-55 Composite	7.3	930	150	600
Caltrans Criteria for Non-corrosive Area			> 5.5	< 2000 PPM	< 500 PPM	> 1000 Ohm-cm

SEISMICITY

The proposed overhead sign is located within a seismically active region of Southern California, and close to a number of faults that are considered to be active or potentially active. More detailed seismic information regarding faults, peak ground acceleration, and acceleration response spectrum will be available in geotechnical design report for the retaining walls and foundation report for the bridge replacement of the same project.

Based on the communication with Office of Design and Technical Services, the lateral demand will be controlled by wind load under service condition, instead of seismic loading for extreme event.

LIQUEFACTION

Although groundwater table is relatively shallow at the project site, the subsurface materials are predominantly cohesive with relatively high consistency/density. Therefore, liquefaction potential is considered to be low.

GEOTECHNICAL RECOMMENDATIONS

Three-foot diameter CIDH piles were proposed as the foundations for Sign 205. For aesthetic reason, concrete pedestals with trapezoid shaped cross-section will be used above the bottom of retaining wall footings and CIDH piles, creating visual effect of integrated retaining walls/sign system. The sign pedestals and foundations will be structurally separated from adjacent walls (RWs #83 and #96) and their footings by expansion joints, which can filled with compressible polystyrene to isolate movement and eliminate future interaction between two different structures. Special design has to be conducted for the proposed sign pedestals and shaft foundations.

Foundation Analysis

Since the design of sign post foundation is primarily governed by lateral demand of pile, only lateral pile response was evaluated. The pile lateral analysis was performed using LPILE PLUS 5.0. The loading information was provided by Office of Design and Technical Services/DES, reflecting combined load vector from both longitudinal and transverse directions, which are created by maximum wind pressure under service condition. Due to higher magnitude of design load on the base plate and adjacent wall height, CIDH pile foundation for the right post (near RW 83) was selected for the analysis, creating more critical results for deep foundation design. Detailed information for the lateral analysis is presented below.

- The wind load in longitudinal direction will be concurrent with 20% of that load in perpendicular (transverse) direction to approximate the worst loading condition for overhead sign, following the recommendation from Office of Design and Technical Services.

- For the evaluation of pile top deflection, nonlinear EI is considered for the bending stiffness reduction on piles, where concrete crack may exist due to advanced bending moment. The concrete and reinforcement information for CIDH piles are provided by Office of Structure Design (Foundation Details).

- Lateral pile analysis was conducted in combined loading direction. To reflect the influence of sloping ground (1V:4H) to the east of Sign 205, a five-degree down slope from horizontal was assumed in that direction.

- The cross-section of sign pedestal is conservatively assumed to be the same size as the shaft portion below the bottom of the retaining wall footing (El. +123.25', RW83). From the bottom of footing and above, the 14.61 feet high pedestal section is assumed to be free-standing without lateral support from footing, wall stem, and surrounding soils, representing the absence of interaction with the adjacent facilities.

- Cyclic loading condition was used in pile lateral analysis with number of loading cycles assumed to be 100 under major loading event (conservative).

The results of lateral analysis are summarized on the Table 5 below.

Table 5 Summary of Lateral Analysis for Sign 205 Foundation

CIDH Pile Diameter (ft)	Pile Length below the Bottom of RW Footing (ft)	Combined Service Load on Base Plate (Top of Concrete Pedestal)			Maximum Pile Response		
		Axial Load (kips)	Lateral Load (kips)	Bending Moment (kip-ft)	Bending Moment (kip-ft)	Shear (kips)	Pedestal Top Deflection (in)
3	22	4.7	6.1	148	239*	27.2*	0.7

* Maximum moment and shear are loacted at 15 ft and 21 ft below the top of pedestal, respectively.
Moment capacity is approximately 980 kips-ft, with concrete crack mement at approximately 200 kips-ft

Based on the results from LPILE analysis, under service condition, lateral deflection on top of the sign pedestal supported by 3-foot diameter shaft that extends to 22-foot below

the bottom of wall footings will be less than the acceptable limit (one inch) mandated by Office of Design and Technical Services/DES for overhead sign structure.

CONSTRUCTION CONSIDERATION

Groundwater was encountered at the elevation that is above the bottom of CIDH pile foundations during field investigations. It is recommended that wet (drilling slurry) method be used to stabilize the drilled hole during CIDH pile installation. In addition, the contractor should have temporary casing on-site, and readily available other equipment and techniques to remedy caving compatible with Section 49-4.03 of Standard Specifications (May 2006).

Should you have any question or comment, please contact Haitao Liu at (916)-227-0992.

Prepared by: Date: Nov. 8th, 2011

REGISTERED PROFESSIONAL ENGINEER
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Structure Construction R.E. Pending File

FOUNDATION REPORT
for
Signal/Lighting Poles
Type 1A, 26A-4-100, 29A-5-100, 31, 15TS

Memorandum

To : **MR. JEFF WOODY**
Branch chief
Special Designs, Branch A
Office of Design and Technical Services
1801 30th street, FMP I
Sacramento, CA 95816

Date: November 9, 2011

File: 12-ORA-5/74
PM 0.01
Project ID 00000102
EA 12-0E3101
Signal and Lighting Pole Foundation

Attn. : Andrew Bui, P.E.
Vanessa Truong

From : **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
METS-Geotechnical Services
Office of Geotechnical Design – South 1

Subject : Foundation Report for Signal and Lighting Pole Foundation

As requested per foundation report for signal and lighting poles through email from Vanessa Truong on 08/18/2011, OGDS-1 prepared for this foundation report on signal and lighting poles at I-5 southbound on / off ramp of the cross areas of I-5 and Rte 74.

SUBSURFACE CONDITIONS

The areas of the proposed signal and lighting poles consist of various thickness of fill over alluvium, which in turn is underlain by Capistrano Formation bedrock.

The depth of the artificial fill soils at the location of the borings ranges from about 12 to 18 feet. The fill soils at the site are comprised mainly of medium to stiff lean clay (CL) and clayey sand (SC) with gravel, and medium dense clayey gravel (GC).

The alluvium at the site generally consists of medium to stiff lean clay (CL) and fat clay (CH) stiff clay/sandy clay (CL). Occasional layers of silty sand (SM) and clayed sand (SC) were encountered at borings locations drilled.

GROUNDWATER CONDITIONS

Depths to groundwater at the end of drilling were measured within the Boring R-11-001, R-11-002, RC-10-008R. Based on these data, depths to groundwater varied from about 22 to 50 feet below existing ground surface at the exploration locations.

The results of these investigations indicate that groundwater elevation is likely to range from about

110 feet. During construction, some variations in the depths to the static groundwater should be expected due to the clayey nature of the soil, topography, seasonal variations, and adjacent construction or other water recharge/discharge activities. Perched water may be encountered at isolated locations.

DESIGN SOIL PARAMETERS

Relevant soil parameters were evaluated for use in the design of the subject pole foundations. Table 1 presents the general subsurface properties used for the geotechnical analyses.

TABLE 1 – SUMMARY OF ENGINEERING SOIL PROPERTIES

Ref. Boring Nos.	Approx. Boring Surface Elev. (ft)	Boring depth (ft)	Soil description	Groundwater Elev. (ft)	Effective Friction angle, ϕ	Undrained shear strength, C (psf)
R-10-008, RC-10-008R, R-11-001, R-11-002, CPT-10-026 CPT-10-012	136.1 136.1 130.0 119.0 133.53 122.27	90.5 141.0 51.5 41.5 54.5 44.1	Silty Clay (CL)	110.0	N/A	1000

FOUNDATION DESIGN RECOMMENDATIONS

The geofoam location above the signal and lighting pole foundation were found out from the cross-sections given by David Lam (D12) on 09/15/2011. Based on the cross sections, geofoam at location B, E, and west corner of the I-5 SB on-ramp would be installed for the roadway fill. The approximate distance from the bottom of the goefoam and finish ground surface at the pole location would be a 7 ft, 17 ft, 18 ft respectively. Permanent casings shall be required wherever signal and lighting poles would be installed over the proposed geofoam areas. Table 2 presents summary of signal and lighting pole foundation recommendations.

TABLE 2 - FOUNDATION DESIGN RECOMMENDATIONS

Location No*	Signal or Lighting Type	Foundation Type	Diameter (in)	Standard Plan (2010)		Minimum required pile length (ft)	Casing need / Length (ft)
				Page	Use		
A	Type 1A	2x3	N/A	ES-7B, 438	Yes	N/A	N/A
B	Type 26A-4-100	CIDH	36	ES-7F, 442	No	13	Yes / 7
D/F	Type 29A-5-100	CIDH	36	ES-7G, 443	No	13	No
E	Type 31	CIDH	30	ES-6E, 430	No	10	Yes / 17
G	Type 15 TS	CIDH	30	ES-7A, 437	No	10	No
West Corner area of I-5 SB On-ramp	Type 1A	CIDH	30	ES-7B, 438	No	10	Yes / 18

*from the sheet no: E-19 of Signal and Lighting (Location 1)

CONSTRUCTION CONSIDERATIONS

1. The foundation of signal and lighting shall be completed prior to any geofoam construction.
2. The above CIDH pile shall be installed from the existing ground surface.
3. Permanent casings for the distance between proposed the bottom of the geofoam and finish ground surface at the pole location shall be needed wherever signal or lighting pole would be installed over the geofoam (EPS).
4. The inside diameter of the casing shall not be less than 6 inch greater of pole diameter, and be installed to the top of CIDH piles.
5. Groundwater is present at the site at relatively shallow depths. Due to seasonal rainfall and fluctuating groundwater elevations, there is the high potential for perched groundwater and groundwater to be encountered in excavations and/or pile holes. The Contractor should anticipate this condition.
6. Care must be exercised not to damage geofoam during transport, storing and installation.

If you have any questions or comments, please call Jongkoo Jeon at (916) 227-5389, or Mohammed Islam at (916) 227-0993.

Prepared by: Date: 11/09/2011

Jongkoo Jeon, Ph.D., P.E.
Transportation Engineer
Office of Geotechnical Design – South 1

State of California **Business, Transportation and Housing Agency**

M e m o r a n d u m

Flex your power!
Be energy efficient!

To: MR. MATTHEW CUGINI
Senior Transportation Engineer
District 12, Office of Design - Branch C

Date: September 9, 2011
File: 12-ORA-5/74
PM 9.4/9.9, 0.0/0.2
1200000102 (EA12-0E3101)
Retaining Wall Nos. 67, 80, 533B, 533C, 914, 930, and 954

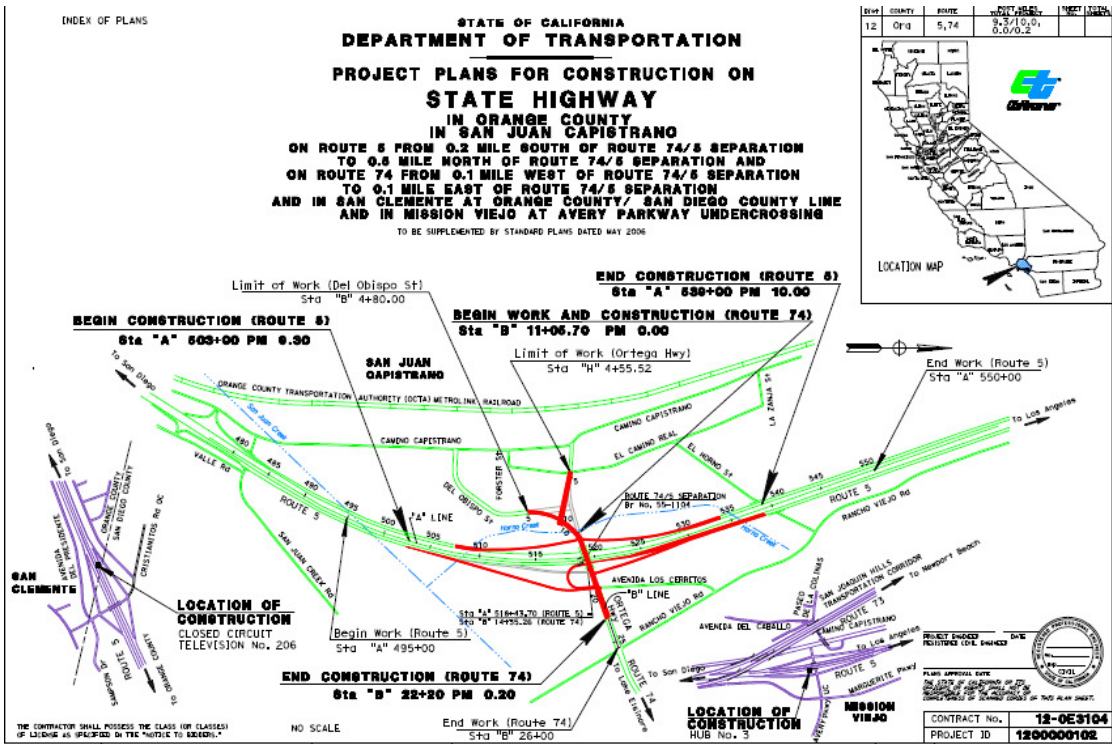
From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
Geotechnical Services
Office of Geotechnical Design – South 1
Branch C

Subject: Geotechnical Design Report for Retaining Wall Nos. 67, 80, 533B, 533C, 914, 930, and 954

INTRODUCTION

Per your request dated January 20, 2010, Office of Geotechnical Design-South 1 (OGDS1) has prepared this Geotechnical Design Report (GDR) for seven retaining walls (Nos. 67, 80, 533B, 533C, 914, 930, and 954) proposed by above referenced project. The project proposes to construct a new traffic interchange to replace the existing SR-74/I-5 interchange in the City of San Juan Capistrano. The proposed project includes widening of three ramps, adding northbound loop on-ramp, reconfigured northbound off-ramp and Del Obispo Street intersection. Figure 1 depicts the location map of the project.

Figure No. 1 – Project Location Map



EXISTING FACILITIES AND PROPOSED IMPROVEMENTS

In order to improve the interchange, this project proposes to construct seven (7) Standard Plan Type 1 retaining walls on spread footings, five (5) non-standard retaining walls. Twelve retaining walls will be constructed as shown in Table No. 1 below:

Table 1 – Retaining Walls Information

RW No.	Location	Reference Plan No.	Stations						Max. Height (ft)	Length (ft)	Standard Plan Design
			From			To					
			Reference Line	Stationing	Offset	Reference Line	Stationing	Offset			
10	WB Rte. 74 (west of 5/74 Interchange) at Horno Creek	L-2, RW10	B	11+08.240	59.82' LT	B	12+30.100	78.424' LT	22.00	141.00	No
83	1-5 SB Off-Ramp (west side)	L-2, L-4, RW83	D	518+79.750	73.86' LT	D	523+50.000	42.27' LT	22.00	473.30	No
96	1-5 SB Off-Ramp (east side)	L-2, L-4, RW96	D	518+98.430	25'Rt	D	523+10.000	17.10' RT	16.00	416.34	No
533A	1-5 SB On-Ramp at Horno Creek (east side)	L-5, RW533A	A	533+80.000	108.78' RT	A	534+45.000	107.48' RT	6.00	65.60	No
513	I-5 NB Off-Ramp (east side)	L-2, L-3, RW513	G	513+10.000	23.76' RT	G	516+70.220	23.76' RT	31.75	370.00	No
67	EB Rte. 74 (east of 5/74 Interchange)	L-2, R-3	B	20+54.060	130.02'Rt	B	20+86.900	59.06'Rt	12.00	89.53	Yes
80	NB Del Obispo Street	L-1, R-1	B	5+69.50	45.08'Rt	B	7+67.87	50.24'Rt	10.00	182.46	Yes
914	1-5 SB On-Ramp (west side)	L-2, L-4, R-4	E	519+17.640	34.14' LT	E	520+50.000	5.67' LT	16.00	138.85	Yes
930	1-5 SB On-Ramp (east side)	L-4, R-6	E	529+30.000	35'Rt	A	533+60.000	107.86' RT	10.00	428.65	Yes
954	1-5 SB On-Ramp (east side)	L-2,L-4, R-5	E	519+36.310	85.71'Rt	E	524+10.000	33.48'Rt	16.00	497.02	Yes
533B	1-5 SB On-Ramp at Horno Creek (east side)	L-4, L-5, R-7	A	534+45.000	107.48' RT	A	536+59.930	103.18'Rt	8.00	215.06	Yes
533C	1-5 SB On-Ramp at Horno Creek (east side)	L-5, R-7	A	537+19.450	101.99' RT	A	538+40.000	99.58' RT	12.00	120.44	Yes

Foundation reports for non-standard retaining wall nos. 10, 83, 96, 533A, and 513 will be prepared separately for Structure Design Branch 19.

The existing crib wall at the west side of Dennys restaurant will be removed for the construction of northbound I-5 off-ramp. An existing loose block wall is found at the south side of Dennys parking lot and this will also be removed for construction.

There is an existing soundwall along the school property and State R/W line by the southbound I-5 off-ramp.

An existing block retaining wall is located along the east side of Chevron gas station and restaurant areas in the west of I-5 and SR-74 interchange. A portion of the block wall is located within the proposed roadway limits.

The existing Route 74/5 Separation overcrossing (Bridge No. 55-0229) will be replaced to allow additional lanes and full width standards, as well as a longer span length to provide additional space underneath to accommodate the proposed east on-ramp and for the future widening of the I-

5 freeway. The depth of bridge section will be increased and it requires the bridge profile to be raised to maintain the minimum required vertical clearance.

The El Horno Creek continues from northeast corner of SR-74/I-5 Interchange, where it flows southwest beneath freeway I-5 (near proposed Retaining Wall No. 533A). The creek is channelized just south of the San Juan Elementary School playground, where it flows into an existing box culvert under Ortega Highway (proposed Retaining Wall No. 10) and connects to an existing concrete channel. Then, the creek flows into an existing box culvert across Route 5.

West of I-5/SR-74 Interchange

- Fill embankment is required for Ortega Highway at the west of Del Obispo Street (Sta. "H" 5+00.00 to "H" 9+40.00),
- Cut slope for NB Del Obispo Street (Sta. "B" 5+10.00 to "B" 9+00.00),
- Fill to be placed near bridge approach areas due to bridge profile to be raised (Sta. "B" 9+00.00 to "B" 12+97.01; Sta. "B" 15+95.59 to 20+00.00),
- Fill embankment for southbound I-5 on-ramp (Sta. "C" 510+38.00 to "C" 517+20.42),
- Fill embankment for southbound I-5 off-ramp (Sta. "D" 518+60.00 to "D" 528+98.59),

East of I-5/SR-74 Interchange

- Fill embankment for northbound I-5 (Sta. "A" 533+80.00 to 538+40.10).
- Cut slope for northbound I-5 on-ramp (Sta. "E" 529+19.60 to "E" 532+99.24; Sta. "A" 533+00.00 to "A" 533+60.00),
- Fill embankment for northbound I-5 on-ramp (Sta. "E" 519+14.92 to "E" 529+19.60),
- Cut slope for WB Ortega Highway (Sta. "B" 18+88.00 to "B" 19+31.58),
- Cut slope for new northbound I-5 loop on-ramp (Sta. "F" 511+58.00 to "F" 525+09.74),
- Fill embankment for northbound I-5 off-ramp (Sta. "G" 502+97.90 to "G" 520+26.00),

PERTINENT REPORTS AND INVESTIGATIONS

The following documents have been reviewed for the preparation of this GDR:

- Foundation Investigation for Bridge 55-229, Route 64/2 Separation, June 1956.
- Log of Test Borings for Bridge 55-229, Route 64/2 Separation, May 1956.
- Foundation Recommendations for Bridge 55-229, Route 74/5 Separation, July 1965.
- Log of Test Borings and General Plan for Bridge 55-229, Route 74/5 Separation, February 1967
- Project Report for I-5/Ortega Highway Interchange Improvement Project, May 2009.
- Second Quarter 2009 Groundwater Monitoring Progress Report Chevron Service Station 26988 Ortega Highway, *Holguin, Fahan & Associates, Inc.,* June 29, 2009.
- Site Conceptual Model 76 Service Station 27164 Ortega Highway, *Delta Consultants,* September 3, 2009.
- 95% PS&E Project Plans for SR-74/I-5 Interchange Improvements Project, July 8, 2011.

- "Data Submittal for the Interstate 5 at State Route 74 Interchange, Orange County, California", prepared by URS Corporation, July 7, 2011.

The preparation of the GDR follows guidelines established in the Guidelines for Geotechnical Design Reports (December 2006).

FIELD EXPLORATION PROGRAM

In order to obtain subsurface conditions and engineering properties at the location of retaining walls and other structures proposed by this project, site-specific field exploration was performed between June 2010 and February 2011 under the supervision of a URS Corporation representative. The exploratory locations for the project were planned and provided by Caltrans and marked in the field by URS Corporation staff. A field exploration and laboratory test data report submittal by URS Corporation in Appendix A presents boring logs and laboratory data for the geotechnical subsurface investigations performed by URS Corporation for the Interstate 5 at State Route 74 Interchange Project in Orange County, California. Right of Entry permits were obtained for three geotechnical explorations.

Subsurface exploration included 15 Cone Penetration Tests (CPT), 2 hollow stem auger borings, 8 rotary wash borings and 3 rotary core borings along the I-5 at SR-74 Interchange areas. The exploratory locations were typically planned with a spacing of approximately 300 ft and borings were done as close as possible to the proposed wall alignment to provide site-specific information. CPT soundings were performed by Kehoe Testing and Engineering, Inc., hollow stem auger borings were performed by Tri-County Drilling, Inc., and Jet Drilling, Inc., rotary wash borings were performed by C&L Drilling and Crux Subsurface, Inc., and core borings were performed by Crux Subsurface, Inc. and Caltrans Drilling Services. To avoid possible interference with the unmarked underground utilities the upper five feet was hand augured. Summary of field exploration locations and elevation is presented in Table 2.

URS Corporation geotechnical staff maintained field boring logs and visually classified the soil and bedrock according to the Caltrans Soil and Rock Logging, Classification, and Presentation Manual (April 2010). When subsurface conditions permitted, relatively undisturbed samples were obtained using both the Shelby Tube Sampler [with 2.875-inch I.D and 3-inch O.D.] and the California Modified Sampler. Standard Penetration Testing (SPT) was performed in the subsurface soils using a 140-pound automatic-trip hammer or a manual safety hammer with a 30-inch drop. The number of blows required to drive the sampler was recorded at 6-inch intervals for each sample taken. SPT was performed in accordance with ASTM D1586 procedures. The total number of blows required to drive the sampler the last 12 inches is recorded on the log of borings.

Geotechnical samples obtained in the field were carefully sealed and packaged to reduce moisture loss and disturbance and were transported to our laboratory for further testing. After completion of drilling and sampling operations, borings were backfilled with grout to the ground surface. The cuttings generated by drilling were drummed and disposed of off-site.

The blow count for the final 12 inches of sampler penetration is commonly referred to as the "N-value". This value generally reflects the resistance to penetration of the soil at the sample depth. The degree of relative density of granular soils and the degree of consistency of cohesive soils are generally described on the Boring Records according to the conventional correlation presented in key of the log of boring.

The relative density and consistency descriptions for coarse-grained soils on the attached log of boring are based on corrected Standard Penetration Test (SPT) N_{60} value as described below.

$$N_{60} = N_{measured} \times (ER_i/60)$$

where,

$$ER_i = \text{Hammer energy ratio}$$

Hammer energy ratios of rotary wash and hollow stem borings range between 71 to 87 percent depending on the drilling subcontractor used and the drill rig specific calibration report. The relative density and consistency descriptions on the log may deviate from the correlation for a number of reasons, including reliance on other test results or the engineer's judgment based on manual manipulation of the sample.

It is widely accepted that the above-listed SPT blow count correlation is overly simplistic. For most applications in non-gravelly soils, the blow count is usually adjusted for the effective vertical pressure at the sampling depth and for other sampling system parameters such as the efficiency of the sampling system and/or sampling techniques used. In gravelly soils, it is recognized that the blow counts are higher than would be expected in non-gravelly soils of similar density or consistency. This occurs because the sampler tends to push larger gravel clasts ahead of it. The area of the gravel clasts may be significantly greater than that of the sampler, causing increased resistance and higher blow counts.

Wire-line core borings (hole diameter of 3.0 inches (NQ) to 3.8 inches (HQ) and core diameter of 1.9 inches (NQ) to 2.4 inches (HQ)) were drilled to characterize the subsurface rock conditions. The recovered core was logged for rock name and type, grain size, bedding spacing, color, degree of weathering, hardness, fracture density, percent recovery, and Rock Quality Designation (RQD) in accordance with the Caltrans Soil and Rock Logging, Classification, and Presentation Manual (April 2010). Samples of core obtained in the field were carefully packaged to reduce moisture loss and disturbance and were transported to our laboratory for further evaluation and testing. After completion of coring operations, borings were backfilled with grout to the ground surface. The cuttings generated by drilling were drummed and disposed of off-site.

CPT soundings were accomplished in general accordance with ASTM Method D3441. A 15-cm^2 cone penetrometer was deployed using a truck mounted CPT. Parameters measured nearly continuously during the CPT are soil bearing resistance at the cone tip (q_c), soil frictional resistance along the cylindrical friction sleeve (f_s), and pore water pressure directly behind the cone tip (U). These measured values are then used to estimate the type of soil being penetrated

using correlation established through experience and research. The correlations have been established by Robertson and Campanella (1986). The CPT logs include measured soil parameters and interpreted soil types. The stratigraphic interpretation is based on relationships between q_c, f_s, and U (Robertson, 1990). The CPT data interpretation is presented in Appendix A.

CPT soundings do not include soil sampling; as such laboratory tests were not conducted. The CPT sounding location was backfilled with Bentonite chips, and patched with "cold patch" asphalt.

LOTBs (Log of Test Borings) have been prepared by the URS Corporation and will be submitted to your office.

Table 2 - Summary of Field Exploration Locations and Elevations

Boring No.	Depth (feet)	Station (-L/+R) (feet)	Offset (feet, NAVD88)	Elevation	Location	
					Northing	Easting
R-11-001	51.5	517+25.50	-445.3	127.838	2129186.761	6131886.446
R-11-002	41.5	518+22.29	-345.41	116.495	2129285.312	6131977.715
CPT-10-003	103.02	512+18.57	-507.62	114.14	2128722.112	6131841.051
CPT-10-004	41.02	516+68.45	-765.62	124.416	2129111.398	6131571.012
CPT-10-005	60.04	515+53.07	-532.85	125.915	2129024.226	6131809.594
CPT-10-006	50.36	515+95.45	-367.03	129.526	2129072.183	6131973.029
R-10-007	46.5	514+1.59	-209.22	102.5	2128895.178	6132138.238
R-10-008	141	517+32.88	-162.19	136.129	2129216.743	6132168.039
RC-10-008	90.5	517+32.88	-157.19	136.129	2129217.674	6132172.977
R-10-009	56	518+95.59	-9.51	120.861	2129391.686	6132304.121
R-10-010	17	519+40.15	-173.19	134.159	2129415.978	6132136.425
CPT-10-011	46.59	521+17.52	-127.71	130.619	2129593.083	6132157.744
CPT-10-012	44.13	523+22.14	-127	127.267	2129790.082	6132124.076
CPT-10-014	27.23	519+53.98	489.46	144.205	2129511.423	6132792.315
CPT-10-015	30.18	519+56.30	696.06	143.736	2129539.630	6132996.998
CPT-10-016	25.43	521+18.30	186.7	137.812	2129642.156	6132468.308
CPT-10-017	33.14	523+24.04	154.51	133.47	2129845.579	6132400.074
CPT-10-018	16.08	533+42.97	92.34	147.94	2130824.638	6132055.865
CPT-10-019	22.97	516+34.42	173.47	132.496	2129144.109	6132510.081
A-11-020	31.5	516+22.42	362.5	139.58	2129143.813	6132699.523
RC-10-021	140.4	518+19.41	142.79	143.541	2129331.239	6132463.760
R-11-022	42	514+98.99	285.7	107.853	2129009.239	6132629.709
CPT-10-023	45.11	512+53.55	148.26	114.404	2128751.540	6132497.142
R-10-024	31.5	509+44.32	99.27	108.592	2128437.085	6132438.163
CPT-10-025	34.94	505+09.14	77.84	106.323	2127999.316	6132372.879
CPT-10-026	54.46	519+52.02	-175.74	133.527	2129427.072	6132132.490
A-10-028	51.5	517+79.34	-9.83	119.103	2129276.228	6132315.736
RC-10-028A	141.5	517+74.09	-10.31	119.091	2129270.962	6132315.740

LABORATORY TESTING

Geotechnical soil samples obtained by the URS Corporation staff from the borings were carefully sealed and packaged in the field to reduce moisture loss and disturbance. The samples were subsequently delivered to URS Corporation laboratory where they were further examined and classified. Selected representative samples were tested to evaluate moisture content, in-situ dry density, fines content, Atterberg limits, shear strength, compressibility, and corrosivity of the soils. All tests listed in Table 3 were performed in accordance with the latest American Society of Testing and Materials (ASTM) and California Test Method (CTM) guidelines.

Table No. 3 – Laboratory Test Methods

Test	Standard
Moisture Content and Dry Density Tests	ASTM D2937
Atterberg Limits Tests	ASTM D4318, CTM 204
Mechanical Analysis of Soils	CTM 203
Wash Analysis	ASTM D1140
Sieve and Hydrometer	ASTM D422
Consolidation Tests	ASTM D2435, D4546, D5333
Direct Shear Tests	ASTM D3080
Unconfined Compression Test	ASTM D2166
Unconsolidated-Undrained Triaxial Compression Tests	ASTM D2850
Corrosion – Resistivity, pH	CTM 643
Corrosion – Chloride content	CTM 422
Corrosion – Sulfate content	CTM 417

GEOLOGY

Regional Geology

The subject site is located within the Peninsular Range Geomorphic Province. The Peninsular Ranges are characterized by northerly and northwesterly trending mountain ranges and associated valleys. The site is located along the southwest foothills of the Santa Ana Mountains in Orange County, which are comprised of Tertiary marine sediments overlain by Quaternary (younger) alluvium and terrace deposits along stream terraces and valleys (Morton, P. K., CDMG 1974). The southwest foothills of the Santa Ana Mountains are bounded by the Santa Ana Mountains to the north, east and southeast and bounded by the San Joaquin Hills to the west and bounded by the Pacific Ocean to the south. Northwest-southeast trending strike-slip faults are present bordering the Santa Ana Mountains and the San Joaquin Hills (Newport-Inglewood-Rose Canyon Fault (offshore) and San Joaquin Hills Thrust Fault). The active faults nearby the site are discussed later in the Seismicity section of this report.

Site Geology

The project is located within the alluvial valleys of the Trabuco Creek and San Juan Creek and their tributaries. The lower parts of the valleys are covered with Quaternary age and older alluvium (also Quaternary age). The upper or higher elevation portions of the valleys are comprised of terrace deposits (Quaternary age) which are older alluvial surfaces deposited by streams then uplifted and down-cut into by younger streams. The alluvium and older alluvium was deposited primarily by floods emanating from the Trabuco and San Juan Creeks and their tributaries from the mountains and hills to the northeast of the project location. The alluvium and the terrace deposits are underlain by the Capistrano Formation (Tertiary age).

The area east of the 5 Freeway and north of "A" Line Station 515+50 consists of terrace deposits over Capistrano formation bedrock. The terrace deposits consist of sandy silt, clayey sand and conglomeratic coarse-grained sand, and clayey soil horizons. The Capistrano Formation consists of marine derived siltstone with interbedded fine grained sandstone, thin pebble sand beds, and thin hard calcareous beds, and also can be locally diatomaceous and tuffaceous.

The remaining areas of the project consist of clayey alluvium over Capistrano formation bedrock.

There are also fills placed in the areas of the on and off ramps and for the Highway 74. The fill encountered ranges in thickness from a few feet to approximately 20 feet. Except for the NB on-ramp these fills consist of clay and clayey sand fill material. The material used for the NB on-ramp consists of sand, silty sand, sandy silt, silty clay and clay.

The closest fault to the site is the Newport-Inglewood-Rose Canyon Fault oriented as a vertical right-lateral strike slip fault approximately 5.9 miles south-southwest of the site (Caltrans, 2007).

Subsurface Conditions

The subsurface conditions are based on information from this investigation that include borings and CPTs completed in the subject area. The alluvium consists of primarily soft clay, soft to medium stiff sandy silty clay, soft to medium stiff sandy clayey silt. The terrace deposits consist of medium dense to dense sand, silty sand, sandy silt, medium stiff to stiff clay, and medium dense to dense clayey sand with gravel. The Capistrano Formation consists of weathered siltstone and siltstone with shale becoming less weathered with depth. The artificial fill encountered ranges in thickness from a few feet to approximately 20 feet. Except for the NB on-ramp these fills consist of clay and clayey sand fill material. The material used for the NB on-ramp consists of sand, silty sand, sandy silt, silty clay and clay. Based on subsurface investigations we interpret the subsurface on the east side of I-5 north of "A" Line Station 515+50 to consist of terrace deposits overlying Capistrano Formation siltstone. The subsurface under the existing freeway and on the west side of the I-5 (and south of "A" Line Station 515+50 east of the freeway) consists of clayey alluvium overlying Capistrano Formation siltstone. The clayey alluvium ranges in thickness from 22 feet in boring A-10-028 under the median of the 5 Freeway to 38 feet in boring R-11-022 in the office building complex near "G" Line Station 515+50 to 53 feet in boring R-10-008 at the junction of the 74 with the southbound on ramp to 56 feet in CPT-10-005 at the existing junction of Del Obispo with the 74 to greater than 92 feet in CPT-10-003 at "H" line Station 5+00. In the areas of the existing fill embankments the fill material is overlying alluvium overlying Capistrano Formation siltstone.

Groundwater

Groundwater was encountered in several of the CPT sounding locations during this investigation. The groundwater encountered under the freeway and west of the freeway in the vicinity of the interchange ranges from elevation 110.7 to 112.5 feet (approximately 10 feet below the existing freeway elevation). To the south end of the project around "A" Line Station 507+00 the groundwater was found at elevation 77.8 feet (approximately 28 feet below existing freeway level.

Groundwater was encountered during the borings for the 1956 foundation investigation. During the 1956 investigation groundwater was encountered and ranges between elevations 108.2 to elevation 111.2 feet above mean sea level. Groundwater was also encountered during the investigations for the Chevron gas station (west side of I-5) and 76 gas station (east side of I-5) as reported in 2009 reports prepared for these property owners by their consultants. Groundwater elevations reported for the 76 gas station 2009 report range from 107.64 to 130.96 feet above mean sea level. Groundwater elevations reported for the Chevron gas station 2009 report range from 82.0 to 94.0 feet above mean sea level.

The results of these investigations indicate that groundwater in this project site is approximately 10 feet below ground surface on the west side of the I-5 and is approximately 10-37 feet below ground surface on the under the existing freeway and on the east side of the I-5. The most likely groundwater model indicates the groundwater is within the alluvium and/or the terrace deposits and is sitting on top of the less permeable Capistrano bedrock formation.

SEISMICITY

The project site is not located within any established Alquist-Priolo Earthquake Fault Zone. Based on the California Geological Survey 2007 Fault Database, the Newport Inglewood-Rose Canyon Fault is the nearest active seismic source to the proposed project site. Another seismic source is the San Joaquin Hills Thrust Fault. Both of these sources are nearby causative faults that should be considered in the design of the proposed project.

Table No. 4 summarizes the Maximum Moment Magnitude (MMax) of the faults, type of faulting, distance, direction from site to the fault, and Peak Ground Acceleration (PGA) of the faults mentioned above. The PGA is based on the Caltrans 2007 Caltrans Deterministic PGA Map and 2009 ARS Online Report.

Table No. 4 - Summary of Seismic Parameters

Fault	Type of Faulting	MMax	Distance (miles)	Direction to fault	PGA
San Joaquin Hills Thrust	Reverse	6.6	6.6	NW	0.37
Newport Inglewood-Rose Canyon	RLSS	7.5	5.9	SSW	0.33

Liquefaction Potential

Liquefaction is a phenomenon in which loose, saturated, fine grained granular soils behave like a fluid when subjected to high intensity ground shaking. Liquefaction occurs when three general conditions exist: (1) shallow ground water (2) low-density, fine, sandy soils and (3) high-intensity ground motion. Saturated, loose and medium dense, near surface cohesionless soils exhibit the liquefaction potential, while dense cohesionless soil and cohesive soil exhibit the lowest, negligible liquefaction potential. Effects of liquefaction on ground surface include sand boils, settlement and lateral spreading.

The groundwater in this project site is approximately 10-37 feet below ground surface. The most likely groundwater model indicates the groundwater is within the alluvium and/or the terrace deposits and is sitting on top of the less permeable Capistrano bedrock formation. The alluvium consists of primarily soft clay, soft to medium stiff sandy silty clay, soft to medium stiff sandy clayey silt. The terrace deposits consist of medium dense to dense sand, silty sand, sandy silt, medium stiff to stiff clay, and medium dense to dense clayey sand with gravel. The liquefaction potential for this project is considered relatively low based on the existing subsurface information.

GEOTECHNICAL ANALYSIS AND DESIGN

Cuts and Excavations

The proposed cut/fill embankment that will be placed on the project includes:
West of I-5/SR-74 Interchange

- Fill embankment for Ortega Highway west of Del Obispo Street (Sta. "H" 5+00.00 to "H" 9+40.00),
- Cut slope for NB Del Obispo Street (Sta. "B" 5+10.00 to "B" 9+00.00),
- Fill to be placed near bridge approach areas due to bridge profile to be raised (Sta. "B" 9+00.00 to "B" 12+97.01; Sta. "B" 15+95.59 to 20+00.00),
- Fill embankment for southbound I-5 on-ramp (Sta. "C" 510+38.00 to "C" 517+20.42),
- Fill embankment for southbound I-5 off-ramp (Sta. "D" 518+60.00 to "D" 528+98.59),

East of I-5/SR-74 Interchange

- Fill embankment for northbound I-5 (Sta. "A" 533+80.00 to 538+40.10).
- Cut slope for northbound I-5 on-ramp (Sta. "E" 529+19.60 to "E" 532+99.24; Sta. "A" 533+00.00 to "A" 533+60.00),
- Fill embankment for northbound I-5 on-ramp (Sta. "E" 519+14.92 to "E" 529+19.60),
- Cut slope for EB Ortega Highway (Sta. "B" 18+88.00 to "B" 19+31.58),
- Cut slope for new northbound I-5 loop on-ramp (Sta. "F" 511+58.00 to "F" 525+09.74),
- Fill embankment for northbound I-5 off-ramp (Sta. "G" 502+97.90 to "G" 520+26.00),

<u>Stability</u>
Global stability analyses were conducted using the computer program Geo Studio SlopeW for both static and pseudostatic conditions. The critical (highest) sections along the retaining following walls were analyzed:

- RW 67: 12-foot-high Type 1 retaining wall,
- RW 80: 10-foot-high Type 1 retaining wall,
- RW 914: 16-foot-high Type 1 retaining wall,
- RW 930: 10-foot-high Type 1 retaining wall,
- RW 954: 16-foot-high Type 1 retaining wall,
- RW 533B: 8-foot-high Type 1 retaining wall,
- RW 533C: 12-foot-high Type 1 retaining wall,

The factor of safety for a deep-seated failure is greater than 1.5 under static condition with a 3-foot soil surcharge to represent traffic loading. Slope stability analysis under pseudostatic condition was performed using a seismic coefficient equal to 0.2g (which is the smaller of either one-third the horizontal peak ground acceleration or 0.2g). Analysis indicates that the factor of safety is greater than 1.1 under pseudostatic condition.

Based on a review of the proposed grading, the proposed cuts and excavations with 2(H) to 1(V) or flatter slopes are expected to be grossly stable. The temporary cuts and excavations with 1½(H) to 1(V) or flatter slopes are expected to be grossly stable.

Grading Factors

Earthwork will be required as part of the proposed improvements. Preliminary estimates of shrinkage and bulking grading factors are provided for earthwork quantity calculations. Shrinkage occurs when soil is excavated and replaced at a density substantially different from its original density. For preliminary planning and estimating purposes, shrinkage factors of 10 to 15 percent for sandy soil and 20 to 30 percent for clayey soil should be used from truck-soil volume to compacted-in-place volume. Bulking occurs when an in-place material is removed for hauling purposes. Excavated materials could be assumed to bulk 10 to 15 percent for sandy soil and 20 to 40 percent for clayey soils for hauling purposes.

Embankments

The fill embankments within the following areas which contain clayey alluvium over Capistrano formation bedrock:

1. **West of I-5/SR-74 Interchange**
   - Fill embankment for Ortega Highway at the west of Del Obispo Street (Sta. "H" 5+00.00 to "H" 9+40.00),
   - Fill to be placed near bridge approach areas due to bridge profile to be raised (Sta. "B" 9+00.00 to "B" 12+97.01; Sta. "B" 15+95.59 to 20+00.00),
   - Fill embankment for southbound I-5 on-ramp (Sta. "C" 510+38.00 to "C" 517+20.42),
   - Fill embankment for southbound I-5 off-ramp (Sta. "D" 518+60.00 to "D" 528+98.59),
2. **East of I-5/SR-74 Interchange**
   - Fill embankment for northbound I-5 off-ramp (Sta. "G" 502+97.90 to "G" 520+26.00),

Settlements of the proposed embankment fills within these areas were analyzed. Standard consolidation and elastic procedures were used to evaluate both immediate and consolidated settlements (long-term settlement). Based on our analysis, the long-term settlement from compressible clay layers below the proposed embankment fill (embankment height 30' maximum) will reach up to 14 inches with an average 30 years of 90% consolidation. The waiting period for preloading with vertical drains at 6' spacing below the proposed embankment fills will take about 180 days to reach 90% consolidation.

The long-term settlement for the proposed embankment fill height less than 5' is within 2" with an average 30 years of 90% consolidation. No preloading is needed for placement of less than 5' of embankment fill.

The pre-consolidation process may be required to construct fill embankments (prior to construction of adjacent retaining walls) over compressible soft to medium silty clay and clay. Site-specific subsurface exploration at this project site indicated that a waiting period and pre-consolidation process (install wick drain) be recommended for the following areas:

1. Fill placed at the west side of I-5/SR-74 Interchange (Roadway, SB off-ramp, and SB on-ramp) includes retaining wall nos. 10, 83, and 96.
2. Fill placed at the east side of I-5/SR-74 Interchange (NB off-ramp and SB off-ramp) includes retaining wall no. 513.

Foundation Recommendations for Type 1 Retaining Walls on spread footing

It is recommended that retaining wall nos. 67, 80, 533B, 533C, 914, 930, and 954 be founded on spread footings. The Standard design details for these type 1 retaining walls are given in the Caltrans Standard Plans (May 2006) no. B3-1 (loading case I). Subsurface soil conditions at the proposed retaining wall locations were determined based on the borings performed for this project. Table No. 5 presents the general subsurface profile and soil properties used for the geotechnical analyses. Log of Test Borings (LOTB) should be referred for detailed information.

Based on our analysis, the foundation soil under the wall will have sufficient capacity to support the wall with the footing size proportioned according to the Caltrans Standard Plans, and expected settlement is about 1 inch, which will mostly occur during wall construction.

To provide uniform support and to reduce the effect of differential settlement, it is recommended that the foundation soil within 6" below the bottom of the retaining wall footing should be excavated and recompacted to 95 percent relative compaction (based on ASTM D1557), at or near its optimum moisture content.

Table No. 5 – General Subsurface Profile

Wall No.	Beg. STA		End STA		Ref. Boring No.	Top of Boring Elev. (ft)	Top of Footing Elev. (ft)	Soil Type		Groundwater Elev. (ft)	ϕ (deg.)	Su (psf)
								Boring Elev. (ft)	Description			
RW 67	B	20+71.27	B	21+10.00	CPT-10-014	144.21	141.14	144.21-113.9	sand, silty sand, sandy silt	110 (Estimated)	>35	
RW 80	B	5+80.00	B	7+40.00	CPT-10-003	114.14	112.55-116.55	114.14-11.04	clay, silty clay	85 (Estimated)		1000.0
RW 533B RW 533C	A	534+45.60	A	538+40.00	CPT-10-018	147.94	149.7-153.55	148-132	sand, silty sand, sandy silt	130 (Estimated)	>35	
RW 914	E	519+16.759	E	522+80.00	CPT-10-016	137.81	132.56-138.56	137.81-127.5	sand, silty sand, sandy silt	125 (Estimated)	>35	
								127.5-112.3	clay, silty clay	125 (Estimated)		2000.0
		522+80.00		523+60.00	CPT-10-017	133.47	130.56	133.43-100.3	sand, silty sand, sandy silt	125 (Estimated)	>35	
RW 930	E	529+30.00	E	533+60.00	CPT-10-018	147.94	139.34-143.34	148-132	sand, silty sand, sandy silt	130-140 (Estimated)	>35	
RW 954	E	519+34.00	E	522+80.00	CPT-10-016	137.81	136.37-130.37	137.81-127.5	sand, silty sand, sandy silt	125 (Estimated)	>35	
								127.5-112.3	clay, silty clay	125 (Estimated)		2000.0
		522+80.00		524+10.00	CPT-10-017	133.47	128.37	133.43-100.3	sand, silty sand, sandy silt	125 (Estimated)	>35	

Expansion Potential

Expansive and collapsing soils are characterized by their ability to undergo significant volume changes (shrink or sweI1) due to variations in moisture content even without an increase in external loads. Changes in soil moisture content can result from precipitation, landscape irrigation, utility leakage, roof drainage, perched groundwater, drought, or other factors, and may result in unacceptable settlement or heave of structures or concrete slabs supported on grade.

Expansion potential of the soil at the project site was evaluated using the laboratory testing results of materials collected from various locations along the project alignment. Results of the index properties and the expansion index (EI) testing are summarized in Appendix B. The laboratory test results indicate that the expansion potential of the soil samples from A-11-020 @15' is very high and from A-11-020 @6.5' is low.

Corrosion

Eight soil samples collected at the project site were tested for minimum soil resistivity, soil pH, water-soluble sulfate content, and chloride content using the procedures described in California Test Methods (CTM) 417 (2006), 422 (2006), and 643 (2007). Soil samples were obtained within the existing compacted roadway fill. The results of those laboratory tests are presented in Table 6.

Table No. 6 - Corrosion Test Results

Boring	Sample Depth (ft)	pH	Minimum Resistivity* (ohm-cm)	Sulfate Content (PPM)	Chloride Content (PPM)
R-11-001	5.0-5.5	7.3	430	396	165
R-11-002	5.0-40.0	7.2	350	471	330
R-10-007	5.0-45.0	7.4	430	1349	345
R-10-009	6.0-55.0	7.3	600	930	150
A-11-020	5.0-8.0	7.6	580	0	600
R-11-022	5.0-30.0	7.5	515	0	120
R-10-024	5.0-60.0	7.5	445	1692	90
R-10-028	5.0-50.0	6.5	640	606	105

Note: * The Corrosion Technology Branch policy states that if the minimum resistivity is greater than 1000 ohm-cm the area is considered to be non-corrosive and sulfate and chloride contents are not tested

Based on Caltrans Corrosion Guidelines, Version 1.0 (2003), the Department considers 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:

- minimum electrochemical resistivity of less than 1,000 ohm-cm,
- chloride concentration is greater than or equal to 500 ppm,
- sulfate concentration is greater than or equal to 2000 ppm, or
- the pH is 5.5 or less.

Comparison between the current laboratory test results in Table 6 and the Caltrans corrosion criteria indicates that the onsite soils are considered to be corrosive to steel and concrete structures.

The chloride concentration for Boring no. A-11-020 at the Denny's parking lot is 600 ppm which is greater than 500 ppm. Based on the results of the corrosion analyses, the site at Denny's parking lot is considered corrosive. The Corrosion Technology Branch shall be consulted.

MATERIAL SOURCES

This section identifies sources within the current project limits that will produce materials that can be put to a higher use than common borrow. The debris from structures demolished for the project improvements can be considered to be such a source. Demolished structures include the existing pavement that is to be removed prior to roadway widening. That debris may be recycled as aggregate or roadway base. The debris should be tested to ensure that it meets all applicable Caltrans criteria for processed miscellaneous base before being used for these purposes. For use as embankment fill, all excavated sandy material is considered suitable, but excavated clayey material is not considered suitable. Any import fill materials, either for structural backfills or roadway embankment fills, shall be tested and approved prior to import per Caltrans Standard Specifications (Caltrans, 2006c).

The area for proposed cut above the right shoulder of the existing northbound 5 Freeway between approximate Stations 515+50 to 523+00 including the proposed northbound loop on ramp consists primarily of medium dense to dense sand, silty sand, sandy silt, medium stiff to stiff clay, and medium dense to dense clayey sand with gravel. Approximately 9.0 feet of clay was encountered in boring R-11-20 in the Denny's parking lot, however the other borings and CPT's (CPT-10-019, CPT-10-016, CPT-10-017) in the area of this proposed cut encountered more granular material. The material excavated from this area should be suitable for use as backfill for other areas of fill on this project.

MATERIAL DISPOSAL

Based on the grading presented in the roadway plans, it appears that the project will require import of soil. Most of the excavated material in NB loop on-ramp area will be used as embankment fill within the project area.

The remaining material, including unsuitable materials for embankment fill, will be either disposed of by the Contractor, or temporarily stockpiled outside the project limits. The stockpiled material will be available for other project usage. If the Contractor elects to dispose of any material outside the project limits, the Contractor will be required to obtain any necessary permits for this activity.

No hazardous waste consideration and aerially deposited lead (ADL) was provided in this report.

RECOMMENDATIONS AND SPECIFICATIONS

Corrosion

Caltrans considers 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: Chloride concentration is greater than or equal to 500 ppm, sulfate concentration is greater than or equal to 2000 ppm, or the pH is 5.5 or less (Corrosion Guidelines, 2003). Based on the test results summarized in Table No. 4 of this report, the site is corrosive.

Type 1 Retaining Walls (nos. 67, 80, 533B, 533C, 914, 930, and 954) on Spread Footings

The maximum heights of each wall vary from 8 to 16 feet. The subsurface condition along the wall alignment is suitable for the proposed type 1 retaining walls on spread footings as per Caltrans Standard Plans (2006) sheet B3-1. It's recommended that Design Load Case 1, level backfilling plus 240 pound per square feet (psf) surcharge, be applied to all of the walls.

To provide uniform support and to reduce the effect of differential settlement, it is recommended that the foundation soil within 6" below the bottom of the retaining wall footing should be excavated and recompacted to 95 percent relative compaction (based on ASTM D1557), at or near its optimum moisture content.

Embankment

The proposed cut/fill embankment that will be placed on the project includes:

West of I-5/SR-74 Interchange

- Fill embankment for Ortega Highway at the west of Del Obispo Street (Sta. "H" 5+00.00 to "H" 9+40.00),
- Cut slope for NB Del Obispo Street (Sta. "B" 5+10.00 to "B" 9+00.00),
- Fill to be placed near bridge approach areas due to bridge profile to be raised (Sta. "B" 9+00.00 to "B" 12+97.01; Sta. "B" 15+95.59 to 20+00.00),
- Fill embankment for southbound I-5 on-ramp (Sta. "C" 510+38.00 to "C" 517+20.42),
- Fill embankment for southbound I-5 off-ramp (Sta. "D" 518+60.00 to "D" 528+98.59),

East of I-5/SR-74 Interchange

- Fill embankment for northbound I-5 (Sta. "A" 533+80.00 to 538+40.10).
- Cut slope for northbound I-5 on-ramp (Sta. "E" 529+19.60 to "E" 532+99.24; Sta. "A" 533+00.00 to "A" 533+60.00),
- Fill embankment for northbound I-5 on-ramp (Sta. "E" 519+14.92 to "E" 529+19.60),
- Cut slope for EB Ortega Highway (Sta. "B" 18+88.00 to "B" 19+31.58),
- Cut slope for new northbound I-5 loop on-ramp (Sta. "F" 511+58.00 to "F" 525+09.74),
- Fill embankment for northbound I-5 off-ramp (Sta. "G" 502+97.90 to "G" 520+26.00),

Subsurface soil conditions at the proposed retaining wall locations were determined based on the borings performed for this project.

The alluvium consists of primarily soft clay, soft to medium stiff sandy silty clay, soft to medium stiff sandy clayey silt. The terrace deposits consist of medium dense to dense sand, silty sand, sandy silt, medium stiff to stiff clay, and medium dense to dense clayey sand with gravel. The placement of embankment fill may cause settlement within the underlying compressible soils in alluvium. This settlement may consist of elastic and consolidation settlement. It is most likely that the elastic settlement will be completed during construction, but completion of consolidation settlement will take substantial time.

The existing subsurface material at the west Chevron parking lot is suitable. The top two feet of the existing block wall at the east side of parking lot shall be removed prior to placement of fill at this location. The remaining portions of the wall shall be left in place.

Lightweight fill - EPS (expanded polystyrene material) block

For the proposed embankment fill more than 5' in height, over-excavation of the existing grade is required. The amount of over-excavation is equal to the fill height minus 5'. Lightweight fill - EPS (expanded polystyrene material) block is recommended. District Material Engineer needs to evaluate minimum thickness of compacted soil backfill between the pavement structure section and EPS block in order to reduce load demand on EPS block. A compacted soil backfill layer can be placed above the EPS block for the roadway geometry design purpose to maintain super-elevations or sliver fill. In general, EPS block is used whenever the thickness of the new fill exceeds 5 feet.

Lightweight fill (EPS block) shall be fabricated as blocks measuring approximately 2ft x 4ft x 8ft. Manufacturer's standard size blocks will be acceptable. Special-size blocks will be required at the edges of the lightweight fill section to fill the volume shown on the contract plans.

Lightweigth fill(EPS block) shall have the following properties:

Physical Property	ASTM Designation	Acceptance Value
Density	C303	1.5 lb/ft3 Minimum 2 lb/ft3 Maximum
Compressive Strength (at 5% deformation)	D1621	14.5 psi Minimum
Flexural Strength	C203	43.5 psi Minimum
Tensile Strength	D1623	20 psi Minimum
Water Absorption	C 272	2.0% Maximum by Volume

The EPS blocks shall not be exposed to hydrocarbons contamination during the life of the contract. Between stages, the lightweight embankment fill (EPS block) shall be protected with temporary geomembrane (Type A-gasoline resistant) and weighted down with sufficient sand bags to keep it in place.

Geomembrane (gasoline resistant) shall consist of reinforced or unreinforced tri-polymer membrane consisting of polyvinyl chloride (PVC), ethylene interpolymer alloy, and polyurethane or a comparable polymer combination. The geomembrane shall be suitable for the containment of spilled liquid hydrocarbons, including gasoline, diesel fuel, kerosene, hydraulic fluid, methanol,

ethanol, mineral spirits, and naptha. The geomembrane shall be sufficiently flexible to cover and closely conform to 90 degree edges and corners of lightweight fill (EPS block) subgrade material at ambient temperatures as low as 45°F without application of heat.

Existing Box Culvert

In order to reduce the load from the embankment fill over existing box culvert under Ortega Highway, the over-excavation from the existing grade to the top of the box culvert is recommended. Lightweight fill - EPS (expanded polystyrene material) block is recommended for the proposed embankment fill.

CONSTRUCTION CONSIDERATIONS

The recommendations contained in this report are based on specific project information that has been provided by the Office of Design, Branch C. If any conceptual changes are made during final project design, the office of Geotechnical Design South-1 should review those changes to determine if these foundation recommendations are still applicable.

Construction Advisories

All work should be performed in accordance with the Caltrans Standard Specifications (Caltrans, 2006c) except as indicated in Special Provisions prepared for this project.

Earthwork should be performed in accordance with Section 19 of the latest Caltrans Standard Specifications.

Proposed additional fills and EPS blocks for pavement widening should be keyed into the existing embankments and placed as specified in Section 19-3 of the Caltrans Standard Specifications (Caltrans, 2006c).

Construction advisories for other components of the other retaining walls and bridge replacement are provided in a separate foundation report.

Construction Considerations that Influence Design

The existing fill embankment material may contain cobbles and construction debris from nearby roadway projects constructed in the past. Although these oversized materials were not encountered within borings performed within the existing fill embankments for this project, it is anticipated that they could potentially be encountered within localized areas. If such oversized material are encountered during construction, our office should be contacted.

No other construction considerations significantly influence the design of the items included in the scope of this report.

Construction Considerations that Influence Specifications

The proposed retaining walls should be founded on the existing competent soils or properly compacted fill. To provide uniform support and to reduce the effect of differential settlement, it is

recommended that the foundation soil within 2 feet below the bottom of the retaining wall foundations be excavated and recompacted to 95 percent relative compaction (based on ASTM D1557) at or near its optimum moisture content.

No other construction considerations significantly influence the specifications of the items included in the scope of this report.

Construction Monitoring and Instrumentation

As discussed in previous sections, soil fills and EPS blocks are proposed for the construction of the type 1 retaining walls. The fill-induced settlement is anticipated to occur during construction, and to be less than 1 inch. Therefore, no monitoring instrumentation is recommended.

Hazardous Waste Considerations

Evaluating the presence and level of hazardous materials is beyond our scope of work and therefore is not addressed in this report. District Hazardous Waste Branch shall be consulted. Storage, transport, and disposal of hazardous materials should be performed in accordance with all applicable federal, state, and local requirements.

Differing Site Conditions

The analyses and recommendations contained in this report are based on the data obtained from the review of available geologic references, as-built logs, our site reconnaissance, soil borings, and laboratory testing. The soil boring logs indicate subsurface conditions only at specific locations and times drilled, and only to the depths penetrated. The logs do not necessarily reflect subsurface variations that could exist between such locations. If variations in subsurface conditions from those described in this report are noted during construction, our office shall be consulted. Therefore, upon encountering any site conditions that are perceived to differ materially from those conditions anticipated in this report, the resident engineer should contact our Engineering Geologist immediately.

Coarse gravel, cobbles, boulders, and hard rock should be expected during excavation of the footings and piles. Coring bits for CIDH pile holes may be needed to core through Boulders of hard rock. Construction difficulties may be expected.

Groundwater may be expected. Due to seasonal rainfall and fluctuating groundwater elevations, there is the high potential for perched groundwater to be encountered in excavations and/or pile holes. The Contractor should anticipate this condition.

REFERENCES

- California Department of Conservation, Digital Images of Official Maps of Alquist-Priolo Earthquake Fault Zones of California, Southern Region, 2000.

- California Department of Transportation, Caltrans Deterministic PGA Map, 2007.

- California Department of Transportation, Caltrans Fault Database, 2007.

- California Division of Mines and Geology, Geology and Engineering Geologic Aspects of the San Juan Capistrano Quadrangle Orange County California, 1974.

- Delta Consultants, Site Conceptual Model 76 Service Station 27164 Ortega Highway, *September* 3, 2009.

- Federal Highway Administration, Earth Retaining Structures, Publication No. FHWA NHI-07-071, 2007.

- Holguin, Fahan & Associates, Second Quarter 2009 Groundwater Monitoring Progress Report Chevron Service Station 26988 Ortega Highway, June 29, 2009.

- "Guidelines for Preparing Geotechnical Design Reports", Version 1.3, dated December 2006, by Division of Engineering Services, Geotechnical Services.

- "Project Report for I-5/Ortega Highway Interchange Improvement Project", prepared by Parsons for City of San Juan Capistrano, May 2009.

- "Data Submittal for the Interstate 5 at State Route 74 Interchange, Orange County, California", prepared by URS Corporation, July 7, 2011.

If you have any questions or comments, please call Chris Harris at (213) 620-2149, or Ted Liu at (213) 620-2136.

Prepared by: Date: 9/9/2011

Christopher R. Harris, C.E.G.
Engineering Geologist
Office of Geotechnical Design – South 1
Branch C

Prepared by: Date: 9/9/2011

Chi-Tseng Ted Liu, Ph.D., P.E., G.E.
Senior Transportation Engineer
Office of Geotechnical Design – South 1
Branch C

c: GS Corporate – Mark Willian (Electronic File)
District Design Engineer – David Lam (Electronic File)
District Project Manager – Nooshin Yoosefi (Electronic File)
District Construction R.E. Pending File (Electronic File)
District Materials Engineer– Behdad Baseghi (Electronic File)

APPENDIX A

URS

July 7, 2011

Mr. Christopher Harris
Caltrans
Division of Engineering Services MS 18
100 South Main Street, 11th Floor
Los Angeles, CA 90012

Subject: Data Submittal for the Interstate 5 at State Route 74 Interchange, Orange County, California

Dear Mr. Harris:

This data submittal presents draft boring logs and laboratory data for the geotechnical subsurface investigations performed by URS Corporation for the Interstate 5 at State Route 74 Interchange Project in Orange County, California. Field exploration consisting of 15 Cone Penetration Tests (CPT), 2 hollow stem auger borings, 8 rotary wash borings and 3 core borings was performed along the I-5 at SR-74 Interchange as listed in Table 1 in Attachment A. Boring Records with a key explaining the descriptions and symbols are included as Attachment A. CPT soundings are also included in Attachment A and laboratory test data are included as Attachment B.

Please review these boring logs, CPT soundings, and laboratory test data and provide us with your review comments.

We appreciate the opportunity to have been of service to you. If you have any questions or require additional information, please call us at your convenience.

Respectfully submitted,
URS Corporation

Mike Smith, P.E., G.E.
Principal Geotechnical Engineer

Daniel Orris, P.G.
Senior Staff Engineering Geologist

Attachment A: Boring Logs & CPT Soundings
Attachment B: Laboratory Test Data

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ATTACHMENT A
BORING LOGS AND CONE PENETRATION TEST SOUNDINGS

ATTACHMENT A

FIELD EXPLORATION

The field investigation was performed between June 2010 and February 2011 under the supervision of a URS representative. The exploratory locations for the project were planned and provided by Caltrans and marked in the field by URS. URS notified Underground Service Alert (USA) so that they could coordinate with various utility companies to locate and clear existing underground lines in the vicinity of the planned exploration.

Subsurface exploration included 15 Cone Penetration Tests (CPT), 2 hollow stem auger borings, 8 rotary wash borings and 3 core borings along the I-5 at SR-74 Interchange in areas proposed by Caltrans. CPT soundings were performed by Kehoe Testing and Engineering, Inc., hollow stem auger borings were performed by Tri-County Drilling, Inc., and Jet Drilling, Inc., rotary wash borings were performed by C&L Drilling and Crux Subsurface, Inc., and core borings were performed by Crux Subsurface, Inc. and Caltrans. To avoid possible interference with the unmarked underground utilities the upper five feet was hand augered. Summary of field exploration locations and elevation is presented in Table 1.

Table 1 Summary of Exploration Locations and Elevations

Boring No.	Depth (feet)	Station	Offset	Elevation	Location	
			(-L/+R) (feet)	(feet, NAVD88)	Northing	Easting
R-11-001	51.5	517+25.50	-445.3	127.838	2129186.761	6131886.446
R-11-002	41.5	518+22.29	-345.41	116.495	2129285.312	6131977.715
CPT-10-003	103.02	512+18.57	-507.62	114.14	2128722.112	6131841.051
CPT-10-004	41.02	516+68.45	-765.62	124.416	2129111.398	6131571.012
CPT-10-005	60.04	515+53.07	-532.85	125.915	2129024.226	6131809.594
CPT-10-006	50.36	515+95.45	-367.03	129.526	2129072.183	6131973.029
R-10-007	46.5	514+1.59	-209.22	102.5	2128895.178	6132138.238
R-10-008	141	517+32.88	-162.19	136.129	2129216.743	6132168.039
RC-10-008	90.5	517+32.88	-157.19	136.129	2129217.674	6132172.977
R-10-009	56	518+95.59	-9.51	120.861	2129391.686	6132304.121
R-10-010	17	519+40.15	-173.19	134.159	2129415.978	6132136.425
CPT-10-011	46.59	521+17.52	-127.71	130.619	2129593.083	6132157.744
CPT-10-012	44.13	523+22.14	-127	127.267	2129790.082	6132124.076
CPT-10-014	27.23	519+53.98	489.46	144.205	2129511.423	6132792.315
CPT-10-015	30.18	519+56.30	696.06	143.736	2129539.63	6132996.998
CPT-10-016	25.43	521+18.30	186.7	137.812	2129642.156	6132468.308
CPT-10-017	33.14	523+24.04	154.51	133.47	2129845.579	6132400.074
CPT-10-018	16.08	533+42.97	92.34	147.94	2130824.638	6132055.865

Boring No.	Depth (feet)	Station	Offset	Elevation	Location	
			(-L/+R) (feet)	(feet, NAVD88)	Northing	Easting
CPT-10-019	22.97	516+34.42	173.47	132.496	2129144.109	6132510.081
A-11-020	31.5	516+22.42	362.5	139.58	2129143.813	6132699.523
RC-10-021	140.4	518+19.41	142.79	143.541	2129331.239	6132463.76
R-11-022	42	514+98.99	285.7	107.853	2129009.239	6132629.709
CPT-10-023	45.11	512+53.55	148.26	114.404	2128751.54	6132497.142
R-10-024	31.5	509+44.32	99.27	108.592	2128437.085	6132438.163
CPT-10-025	34.94	505+09.14	77.84	106.323	2127999.316	6132372.879
CPT-10-026	54.46	519+52.02	-175.74	133.527	2129427.072	6132132.49
A-10-028	51.5	517+79.34	-9.83	119.103	2129276.228	6132315.736
RC-10-028A	141.5	517+74.09	-10.31	119.091	2129270.962	6132315.74

URS geotechnical representative maintained field boring logs and visually classified the soil and bedrock according to the Caltrans *Soil and Rock Logging, Classification, and Presentation Manual* (April 2010). When subsurface conditions permitted, relatively undisturbed samples were obtained using both the Shelby Tube Sampler [with 2.875-inch I.D and 3-inch O.D.] and the California Sampler [with 2.4-inch I.D. and 2.5-inch O.D.]. Standard Penetration Testing (SPT) was performed in the subsurface soils using a 140-pound automatic-tripped hammer or a manual safety hammer with a 30-inch drop. The number of blows required to drive the sampler was recorded at 6-inch intervals for each sample taken. SPT was performed in accordance with ASTM D1586 procedures. The total number of blows required to drive the sampler the last 12 inches is recorded on the log of borings.

Geotechnical samples obtained in the field were carefully sealed and packaged to reduce moisture loss and disturbance and were transported to our laboratory for further testing. After completion of drilling and sampling operations, borings were backfilled with grout to the ground surface. The cuttings generated by drilling were drummed and disposed of off-site.

The blow count for the final 12 inches of sampler penetration is commonly referred to as the "N-value". This value generally reflects the resistance to penetration of the soil at the sample depth. The degree of relative density of granular soils and the degree of consistency of cohesive soils are generally described on the Boring Records according to the conventional correlation presented in key of the log of boring.

The relative density and consistency descriptions for coarse-grained soils on the attached log of boring are based on corrected Standard Penetration Test (SPT) N_{60} value as described below.

$$N_{60} = N_{measured} \text{ x } (ER_i/60)$$

where,

ER_i = Hammer energy ratio

Hammer energy ratios of rotary wash and hollow stem borings range between 71 to 87 percent depending on the drilling subcontractor used and the drill rig specific calibration report. The relative density and consistency descriptions on the log may deviate from the correlation for a number of reasons, including reliance on other test results or the engineer's judgment based on manual manipulation of the sample.

It is widely accepted that the above-listed SPT blow count correlation is overly simplistic. For most applications in non-gravelly soils, the blow count is usually adjusted for the effective vertical pressure at the sampling depth and for other sampling system parameters such as the efficiency of the sampling system and/or sampling techniques used. In gravelly soils, it is recognized that the blow counts are higher than would be expected in non-gravelly soils of similar density or consistency. This occurs because the sampler tends to push larger gravel clasts ahead of it. The area of the gravel clast may be significantly greater than that of the sampler, causing increased resistance and higher blow counts.

Wire-line core borings (hole diameter of 3.0 inches (NQ) to 3.8 inches (HQ) and core diameter of 1.9 inches (NQ) to 2.4 inches (HQ)) were drilled to characterize the subsurface rock conditions. The recovered core was logged for rock name and type, grain size, bedding spacing, color, degree of weathering, hardness, fracture density, percent recovery, and Rock Quality Designation (RQD) in accordance with the Caltrans *Soil and Rock Logging, Classification, and Presentation Manual* (April 2010). Samples of core obtained in the field were carefully packaged to reduce moisture loss and disturbance and were transported to our laboratory for further evaluation and testing. After completion of coring operations, borings were backfilled with grout to the ground surface. The cuttings generated by drilling were drummed and disposed of off-site.

CPT soundings were accomplished in general accordance with ASTM Method D3441. A 15-cm^2 cone penetrometer was deployed using a truck mounted CPT. Parameters measured nearly continuously during the CPT are soil bearing resistance at the cone tip (q_c), soil frictional resistance along the cylindrical friction sleeve (f_s), and pore water pressure directly behind the cone tip (U). These measured values are then used to estimate the type of soil being penetrated using correlation established through experience and research. The correlations have been established by Robertson and Campanella (1986). The CPT logs include measured soil parameters and interpreted soil types. The stratigraphic interpretation is based on relationships between q_c, f_s, and U (Robertson, 1990). The CPT data interpretation is presented in Attachment A.

CPT soundings do not include soil sampling; as such laboratory tests were not conducted. The CPT sounding location was backfilled with Bentonite chips, and patched with "cold patch" asphalt.

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
EJ. Jeon	1-13-11	1-14-11	2129186.8 ft / 6131886.4 ft NAD83	R-11-001
DRILLING CONTRACTOR: C&L Drilling			BOREHOLE LOCATION (Offset, Station, Line): ~445.30' Lt Sta ~517+25.50"A" Line	SURFACE ELEVATION: ~127.8 ft MLLW
DRILLING METHOD: Rotary Wash			DRILL RIG: Mayhew 1000 with 4-7/8-in. tricone bit	BOREHOLE DIAMETER: 4-7/8
SAMPLER TYPE(S) AND SIZE(S) (ID): Std Cal (2.5"), SPT (1.4")			SPT HAMMER TYPE: Automatic; 140 lb, 30-inch drop	HAMMER EFFICIENCY, ERi: 71%
BOREHOLE BACKFILL AND COMPLETION: Backfilled with cement grout			GROUNDWATER READINGS: DURING DRILLING; AFTER DRILLING (DATE): 22.0 ft on 1-14-11	TOTAL DEPTH OF BORING: 51.5 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		ASPHALT.												
	1		Lean CLAY (CL); medium stiff; olive; moist; few SAND; mostly fines; weak cementation.												Hand auger to 5 ft
125.84	2														
	3														
123.84	4														
	5		- stiff; olive mottled with black; PP=1.5 tsf.		S01	3 5 9	14					PP = 1.5			CR
121.84	6														
	7		- very stiff; no cementation; PP=2.5 tsf.		S02					31	92	PP = 2.5 UC = 3.5			WA: 91%<#200 sieve C
119.84	8														
	9														
117.84	10				S03	12 12 12	24	0							
	11														
115.84	12														
	13		CLAYEY GRAVEL (GC); medium dense; olive brown; moist; mostly fine GRAVEL; little SAND; some fines.												
113.84	14														
	15				S04	6 7 8	15								WA: 34%<#200 sieve
111.84	16														
	17														
109.84	18		SANDY lean CLAY (CL); stiff; dark olive gray; moist; few fine GRAVEL; some SAND; mostly fines; PP=1.2 tsf.												
	19														
	20														

(continued)

URS

REPORT TITLE			HOLE ID
BORING RECORD			R-11-001
DIST. 12	COUNTY ORA	ROUTE I-5	PROJECT NO. 0E3101
PROJECT OR BRIDGE NAME: I-5 and SR-74 Interchange			
BRIDGE NUMBER 55-1104	PREPARED BY EJ. Jeon	DATE 6-10-11	SHEET 1 of 3

BR - STANDARD - URSLOGO I5SR74SJ_BR.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/30/11

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	20		SANDY lean CLAY (CL) *(continued)*.		S05			0							
	21														
105.84	22				S06	3 3 5	8					PP = 1.2			
	23														
103.84	24														
	25		- few SAND.		S07					26	96	PP = 1.3 UC = 0.9			LL=43, PI=27 C, PI WA: 87%<#200 sieve
101.84	26														
	27														
99.84	28														
	29														
97.84	30				S08	3 6 6	12					PP = 1.5			
	31														
95.84	32														
	33														
93.84	34														
	35				S09					29	94	PP = 1.5 UC = 1.4			LL=49, PI=39 PI
91.84	36														
	37														
89.84	38														
	39														
87.84	40				S10	P 5 6	11					PP = 1.3			
	41														
85.84	42														
	43														
	44														

(continued)

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REPORT TITLE			HOLE ID
BORING RECORD			**R-11-001**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	PROJECT NO. **0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**			
BRIDGE NUMBER **55-1104**	PREPARED BY **EJ. Jeon**	DATE **6-10-11**	SHEET **2 of 3**

BR - STANDARD - URSLOGO I5SR74SJ_BR.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/30/11

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	44														
	45				S11										
81.84	46														
	47														
79.84	48														
	49														
77.84	50				S12	P 3 5	8					PP = 1.5			
	51														
			Bottom of borehole at 51.5 ft bgs												
75.84	52														
	53														
73.84	54														
	55														
71.84	56														
	57														
69.84	58														
	59														
67.84	60														
	61														
65.84	62														
	63														
63.84	64														
	65														
61.84	66														
	67														
	68														

URS

REPORT TITLE			HOLE ID
BORING RECORD			**R-11-001**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	PROJECT NO. **0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**			
BRIDGE NUMBER **55-1104**	PREPARED BY **EJ. Jeon**	DATE **6-10-11**	SHEET **3 of 3**

BR - STANDARD - URSLOGO I5SR74SJ_BR.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/30/11

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
D. Orris	1-13-11	1-13-11	2129285.3 ft / 6131977.7 ft NAD83	R-11-002
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Crux Subsurface, Inc.			~345.41' Lt Sta ~518+22.29"A" Line	~116.5 ft MLLW
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			Burley 4000 with HWT Chevron Advancer	4.5 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Std Cal (2.5"), SPT (1.4")			Manual; 140 lb, 30-inch drop	74%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS: DURING DRILLING / AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Backfilled with cement grout			22.0 ft on 1-14-11	41.5 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		Lean CLAY (CL); stiff; olive and very dark gray; moist; trace white mineralization; (FILL).												Hand auger to 5 ft
	1														
114.50	2														
	3														
112.50	4														
	5		- dark grayish brown; few SAND; PP=1.25 tsf.		S01	2 2 2	4					PP = 1.25			CR
110.50	6														
	7				S02										
108.50	8														
	9														
106.50	10		- medium stiff to stiff; PP=0.5-1.5 tsf.		S03	2 3 4	7					PP = 0.5-1.5			
	11														
104.50	12		- stiff; very dark grayish brown; PP=1.75 tsf; (ALLUVIUM).		S04					27	97	PP = 1.75 UC = 0.8			LL=47, PI=30 C, PI WA: 86%<#200 sieve
	13														
102.50	14														
	15		- trace roots, trace white mineralization; PP=1.25 tsf.		S05	2 4 4	8					PP = 1.25			WA: 86%<#200 sieve
100.50	16														
	17				S06					26	98	UC = 1.2			LL=37, PI=21 C, PI WA: 69%<#200 sieve
98.50	18														
	19														
	20														

(continued)

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REPORT TITLE			HOLE ID
BORING RECORD			R-11-002
DIST. 12	COUNTY ORA	ROUTE I-5	PROJECT NO. 0E3101
PROJECT OR BRIDGE NAME: I-5 and SR-74 Interchange			
BRIDGE NUMBER 55-1104	PREPARED BY EJ. Jeon	DATE 6-10-11	SHEET 1 of 2

BR - STANDARD - URSLOGO I5SR74SJ_BR.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/30/11

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	20		- medium stiff; PP=0.75 tsf. Lean CLAY (CL) *(continued)*.		S07	1 2 3	5					PP = 0.75			
	21														
94.50	22														
	23		Fat CLAY (CH); stiff; dark grayish brown; moist.												
92.50	24														
	25				S08					32	90	PP = 1.25			LL=56, PI=36 PI
90.50	26														
	27														
88.50	28														
	29														
86.50	30		- medium stiff; olive gray.		S09	2 3 3	6					PP = 0.75			
	31														
84.50	32														
	33		Lean CLAY (CL); medium stiff; olive gray; moist.												
82.50	34														
	35				S10							PP = 0.75			LL=47, PI=28 PI
80.50	36														
	37														
78.50	38														
	39														
76.50	40				S11	2 2 3	5	22							
	41														
74.50	42		Bottom of borehole at 41.5 ft bgs												
	43														
	44														

URS

REPORT TITLE			HOLE ID
BORING RECORD			**R-11-002**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	PROJECT NO. **0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**			
BRIDGE NUMBER **55-1104**	PREPARED BY **EJ. Jeon**	DATE **6-10-11**	SHEET **2 of 2**

BR - STANDARD - URSLOGO I5SR74SJ_BR.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/30/11

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
P. McDonald	7-2-10	7-2-10	2128895.2 ft / 6132138.2 ft NAD83	R-10-007
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Crux Subsurface, Inc.			~209.22' Lt Sta ~514+1.59"A" Line	~102.5 ft MLLW
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			Crux Custom	5 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Std Cal (2.5"), SPT (1.4")			140 lb, 30-inch drop	74%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING / AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Backfilled with cuttings			Not measured	46.5 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		Lean CLAY (CL); hard; dark brown; moist; rootlets; pinhole voids; trace calcium stringers; (ALLUVIUM).												
	1														
100.50	2														
	3														
98.50	4														
	5		- PP=4.5 tsf.		S01	3 5 5	10					PP = 4.5			CR (CR on composite sample 5-46 ft)
96.50	6														
	7														
94.50	8														
	9														
92.50	10		- PP=4.5 tsf.		S02	6 7 10	17			20	104	PP = 4.5 UC = 2.54			LL=47, PI=31 PI
	11														
90.50	12														
	13														
88.50	14														
	15		- very stiff; PP=2.5 tsf.		S03	5 5 6	11					PP = 2.5			
86.50	16														
	17														
84.50	18														
	19														
	20														

(continued)

URS

REPORT TITLE			HOLE ID
BORING RECORD			R-10-007
DIST. 12	COUNTY ORA	ROUTE I-5	PROJECT NO. 0E3101
PROJECT OR BRIDGE NAME I-5 and SR-74 Interchange			
BRIDGE NUMBER 55-1104	PREPARED BY D. Nelson	DATE 10-14-10	SHEET 1 of 3

BR - STANDARD - URSLOGO I5SR74SJ_LOTB.GPJ CALTRANS LIBRARY DOT 2011.GLB 7/6/11

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	20		Lean CLAY (CL) *(continued)*.		S04	2 4 5	9								No sample recovery.
	21														
80.50	22														
	23		Fat CLAY (CH); stiff; dark brown; moist; high plasticity fines; PP=2.0 tsf.												
78.50	24														
	25				S05	2 3 4	7			29		PP = 2.0			LL=56, PI=36 PI
76.50	26														
	27														
74.50	28														
	29														
72.50	30				S06	3 3 5	8								No sample recovery.
	31														
70.50	32														
	33														
68.50	34														
	35		- soft; dark grayish brown; PP=0.5 tsf.		S07	2 2 2	4					PP = 0.5			
66.50	36														
	37														
64.50	38														
	39														
62.50	40		- very dark gray; trace fine SAND; PP=0.25 tsf.		S08	2 4 5	9			32	85	PP = 0.25			LL=58, PI=32 C, PI
	41														
60.50	42														Rig chatter 41.5-43 ft.
	43														
	44														

(continued)

URS

REPORT TITLE			HOLE ID
BORING RECORD			**R-10-007**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	PROJECT NO. **0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**			
BRIDGE NUMBER **55-1104**	PREPARED BY **D. Nelson**	DATE **10-14-10**	SHEET **2 of 3**

BR - STANDARD - URSLOGO I5SR74SJ_LOTB.GPJ CALTRANS LIBRARY DOT 2011.GLB 7/6/11

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	44		Fat CLAY (CH) *(continued)*.												
	45				S09	2	4								
56.50	46					2 2									
			Bottom of borehole at 46.5 ft bgs												
	47														
54.50	48														
	49														
52.50	50														
	51														
50.50	52														
	53														
48.50	54														
	55														
46.50	56														
	57														
44.50	58														
	59														
42.50	60														
	61														
40.50	62														
	63														
38.50	64														
	65														
36.50	66														
	67														
	68														

URS

REPORT TITLE			HOLE ID
BORING RECORD			**R-10-007**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	PROJECT NO. **0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**			
BRIDGE NUMBER **55-1104**	PREPARED BY **D. Nelson**	DATE **10-14-10**	SHEET **3 of 3**

BR - STANDARD - URSLOGO I5SR74SJ_LOTB.GPJ CALTRANS LIBRARY DOT 2011.GLB 7/6/11

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
EJ Jeon	6-22-10	6-23-10	2129217.7 ft / 6132173.0 ft NAD83	R-10-008
DRILLING CONTRACTOR: C&L Drilling			BOREHOLE LOCATION (Offset, Station, Line): ~157.19' Lt Sta ~517+32.88"A" Line	SURFACE ELEVATION: ~136.1 ft MLLW
DRILLING METHOD: Rotary Wash			DRILL RIG: Mayhew 1000 with 4-7/8-in. tricone bit	BOREHOLE DIAMETER: 4-7/8
SAMPLER TYPE(S) AND SIZE(S) (ID): Std Cal (2.5"), SPT (1.4")			SPT HAMMER TYPE: Automatic; 140 lb, 30-inch drop	HAMMER EFFICIENCY, ERi: 71%
BOREHOLE BACKFILL AND COMPLETION: Backfilled with cuttings			GROUNDWATER READINGS: DURING DRILLING Not measured; AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING: 90.5 ft

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0	CLAYEY SAND (SC); loose to medium dense; light yellowish brown; moist; few fine, subrounded GRAVEL; little fines.												Grass at surface. Hand auger to 5 ft.
134.13	2													
	3	SANDY lean CLAY (CL); hard; olive with black and reddish yellow; moist; some fine SAND; weak cementation; PP=4.5 tsf.												
132.13	4													
	5			S01					20	100	PP = 4.5			CR (CR on composite sample 5-60 ft)
130.13	6													
	7													
128.13	8													Encounter asphalt layer at 8 ft; abandon hole, drill second hole and continue sampling at 10 ft.
	9	Lean CLAY with SAND (CL); stiff; olive with black and reddish yellow; moist; little fine SAND; weak cementation; PP=1.75 tsf.												
126.13	10			S02	2 2 3	5					PP = 1.75			
	11													
124.13	12													
	13													
122.13	14	Fat CLAY (CH); stiff; olive; moist; few fine SAND; mostly fines; weak cementation.												
	15			S03					29	93	UC = 1.35			C, PI LL=57, PI=40
120.13	16													
	17													Hit obstruction (storm drain?); move 6 ft and drill new hole.
118.13	18													
	19													
	20													

(continued)

URS

REPORT TITLE			HOLE ID
BORING RECORD			R-10-008
DIST. 12	COUNTY ORA	ROUTE I-5	PROJECT NO. 0E3101
PROJECT OR BRIDGE NAME: I-5 and SR-74 Interchange			
BRIDGE NUMBER 55-1104	PREPARED BY D. Nelson	DATE 10-14-10	SHEET 1 of 4

BR - STANDARD - URSLOGO I5SR74SJ_LOTB.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/28/11

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	20		Fat CLAY (CH) *(continued)*.		S04	3	14					PP =			
			- very stiff; mottled olive and black; no cementation;			6						2.0-3.0			
	21		PP=2.0-3.0 tsf.			8									
114.13	22														
	23														
112.13	24														
	25		- stiff; dark olive gray; trace fine, subrounded GRAVEL;		S05					32	90	PP =			C
			few coarse to fine SAND; PP=1.5-2.0 tsf.									1.5-2.0			WA: 92%<#200 sieve
110.13	26											UC =			
												2.17			
	27														
108.13	28														
	29														
106.13	30				S06	9	15								No sample recovery. Soil appears
						7									to be same as above.
	31					8									
104.13	32														
	33														
102.13	34														
	35				S07										No recovery. Soil appears to be
															same as above.
100.13	36														
	37														
98.13	38														
	39		SANDY lean CLAY (CL); medium stiff; olive gray; moist; some fine SAND; mostly fines; weak cementation; PP=0.5-1.0 tsf.												
96.13	40				S08	1	2			24		PP =			PI
						1						0.5-1.0			LL=37, PI=22
	41					1									WA: 66%<#200 sieve
94.13	42														
	43														
	44														

(continued)

URS

REPORT TITLE			HOLE ID
BORING RECORD			**R-10-008**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	PROJECT NO. **0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**			
BRIDGE NUMBER **55-1104**	PREPARED BY **D. Nelson**	DATE **10-14-10**	SHEET **2 of 4**

BR - STANDARD - URSLOGO I5SR74SJ_LOTB.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/28/11

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	44	SANDY lean CLAY (CL) *(continued)*.												
	45			S09										No recovery. Soil appears to be same as above.
90.13	46													
	47													
88.13	48													
	49													
86.13	50			S10	6	15								No sample recovery. Soil appears to be same as above.
	51				7 8									
84.13	52													
	53													
82.13	54													
	55			S11	8	45								WA: 26%<#200 sieve
80.13	56	CLAYEY SAND with GRAVEL (SC); dense; olive brown; moist; little coarse, subangular GRAVEL; little fines.			17 28				14					
	57													End for 6-22-10 at 1340 hrs. Resume drilling at 0830 hrs on 6-23-10.
78.13	58													
	59	CLAYEY GRAVEL (GC); dense; black and olive brown; moist; mostly coarse to fine, subangular GRAVEL, max. 1 in. dia.; trace SAND; some fines; black GRAVEL in olive brown CLAY matrix.												
76.13	60			S12	13	38			10					PA Disturbed; retained in ziplock bag. Encounter bedrock at 60.5 ft.
	61	SEDIMENTARY ROCK (SILTSTONE); fine-grained; massive; light olive brown; intensely weathered; very soft; very slightly fractured to unfractured.			16 22									
74.13	62													
	63													
72.13	64													
	65	- olive gray mottled with moderate yellowish brown; moderately weathered; soft; very slightly fractured; oxide staining; PP=1.5-2.5 tsf.		S13	9	29					PP = 1.5-2.5			
70.13	66				13 16									
	67													
	68													

(continued)

URS

REPORT TITLE			HOLE ID
BORING RECORD			**R-10-008**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	PROJECT NO. **0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**			
BRIDGE NUMBER **55-1104**	PREPARED BY **D. Nelson**	DATE **10-14-10**	SHEET **3 of 4**

BR - STANDARD - URSLOGO I5SR74SJ_LOTB.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/28/11

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	68		SEDIMENTARY ROCK (Siltstone) *(continued)*.												
	69														
66.13	70		- PP=4.0-4.5 tsf.		S14	15 24 25	49					PP = 4.25			
	71														
64.13	72														
	73														
62.13	74														
	75		- very dark gray; slightly weathered; PP>4.5 tsf.		S15	16 24 31	55					PP = 4.5			
60.13	76														
	77														
58.13	78														
	79														
56.13	80		- PP>4.5 tsf.		S16	36 50/4"	50/4					PP = 4.5			
	81														
54.13	82														
	83														
52.13	84														
	85		- PP>4.5 tsf.		S17	18 23 28	51					PP = 4.5			
50.13	86														
	87				C01			0							Start rock coring at 86.5 ft. No core recovery.
48.13	88														
	89														
46.13	90														
	91		Bottom of borehole at 90.5 ft bgs												
	92														

URS

REPORT TITLE			HOLE ID
BORING RECORD			**R-10-008**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	PROJECT NO. **0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**			
BRIDGE NUMBER **55-1104**	PREPARED BY **D. Nelson**	DATE **10-14-10**	SHEET **4 of 4**

BR - STANDARD - URSLOGO I5SR74SJ_LOTB.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/28/11

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
P. McDonald	6-28-10	6-29-10	2129217.7 ft / 6132173.0 ft NAD83	RC-10-008R
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Crux Subsurface, Inc.			~157.19' Lt Sta ~517+32.88"A" Line	~136.1 ft MLLW
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wire-Line Core			Crux Custom	3.8 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Continuous Core (HQ, NQ)			Not applicable	Not applicable
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS: DURING DRILLING	AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Backfilled with cement grout			Not measured	50.0 ft on 6-29-10	141.0 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		No sampling until 16 ft bgs; (FILL).												Hand auger to 5 ft on 6-28-10.
	1														
134.13	2														
	3														
132.13	4														
	5														Start coring using HQ core bit.
130.13	6														
	7														
128.13	8														
	9														
126.13	10														
	11														
124.13	12														
	13														
122.13	14														
	15														
120.13	16		Lean to fat CLAY (CL/CH); stiff; black mottled with light brown; moist; PP=1.5 tsf.		C04			10	0						No core recovery 16.8-21.0 ft.
	17														
118.13	18														
	19														
	20														

(continued)

URS

REPORT TITLE			HOLE ID
BORING RECORD			RC-10-008R
DIST. 12	COUNTY ORA	ROUTE I-5	PROJECT NO. 0E3101
PROJECT OR BRIDGE NAME: I-5 and SR-74 Interchange			
BRIDGE NUMBER 55-1104	PREPARED BY D. Nelson	DATE 10-14-10	SHEET 1 of 7

BR - STANDARD - URSLOGO I5SR74SJ_LOTB.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/28/11

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	20		Lean to fat CLAY (CL/CH) *(continued)*.		C04			10	0						
	21				C05			42	0						
114.13	22		Lean to fat CLAY (CL/CH); stiff; black mottled with dark greenish gray; moist; trace calcite stringers; PP=2.0 tsf; (ALLUVIUM).												
	23														No core recovery 23.1-26.0 ft.
112.13	24														
	25														
110.13	26				C06			0	0						No core recovery 26.0-31.0 ft.
	27														
108.13	28														
	29														
106.13	30														
	31				C07			0	0						No core recovery 31.0-36.0 ft.
104.13	32														
	33														
102.13	34														
	35														
100.13	36		- very dark gray; pinhole voids visible; PP=1.5 tsf.		C08			5	0						No core recovery 36.3-41.0 ft.
	37														
98.13	38														
	39														
96.13	40														
	41				C09			0	0						No core recovery 41.0-46.0 ft.
94.13	42														
	43														
	44														

(continued)

URS

REPORT TITLE			HOLE ID
BORING RECORD			**RC-10-008R**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	PROJECT NO. **0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**			
BRIDGE NUMBER **55-1104**	PREPARED BY **D. Nelson**	DATE **10-14-10**	SHEET **2 of 7**

BR - STANDARD - URSLOGO I5SR74SJ_LOTB.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/28/11

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Number	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Remarks
	44	Lean to fat CLAY (CL/CH) *(continued)*.	C09	0	0				
	45								
90.13	46		C10	0	0				No core recovery 46.0-51.0 ft.
	47								
88.13	48								
	49								Hard drilling.
86.13	50								
	51		C11	25	0				No core recovery 51.0-54.75 ft.
84.13	52								
	53								
82.13	54	- hard drilling through cobble.							Hard to drill through 54.0-55.0 ft; possible cobble.
	55	- olive brown; few coarse to fine, rounded GRAVEL.							
80.13	56		C12	8	0				Trip out to change bit. No core recovery 56.4-61.0 ft.
	57								
78.13	58								
	59								
76.13	60								
	61	SEDIMENTARY ROCK (SILTSTONE); laminated; medium gray; intensely weathered; very soft; intensely fractured; fractures healed with iron oxidation [CAPISTRANO FORMATION].	C13	57	0				No core recovery 61.5-61.8 ft.
74.13	62		C14	100	100	29	94	UC = 4.59	
	63								
72.13	64	- dark bluish gray; moderately weathered; soft.							
	65								
70.13	66	- dark greenish gray; intensely weathered; very soft; (Fat CLAY (CH), moist).	C15	80	0				Attempt to switch to NQ core, but none on site. Stop for 6-28-10. Resume coring with NQ bit on 6-29-10. No core recovery 67.0-71.0 ft.
	67								
	68								

(continued)

URS

REPORT TITLE			HOLE ID
BORING RECORD			**RC-10-008R**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	PROJECT NO. **0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**			
BRIDGE NUMBER **55-1104**	PREPARED BY **D. Nelson**	DATE **10-14-10**	SHEET **3 of 7**

BR - STANDARD - URSLOGO I5SR74SJ_LOTB.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/28/11

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	68		SEDIMENTARY ROCK (Siltstone) *(continued)*.		C15			80	0						
	69														
66.13	70														
	71		- laminated; dark bluish gray; moderately weathered; soft.		C16			100	100						
64.13	72														
	73		- massive; greenish black; unfractured.												
62.13	74														
	75									23	99	UC = 22.0			
60.13	76				C17			100	100						
	77														
58.13	78														
	79														
56.13	80														
	81				C18			100	100	23	100	UC = 18.0			
54.13	82														
	83														
52.13	84														
	85														
50.13	86				C19			100	100						
	87														
48.13	88														
	89														
46.13	90														
	91				C20			100	100						
	92														

(continued)

URS

REPORT TITLE			HOLE ID
BORING RECORD			**RC-10-008R**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	PROJECT NO. **0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**			
BRIDGE NUMBER **55-1104**	PREPARED BY **D. Nelson**	DATE **10-14-10**	SHEET **4 of 7**

BR - STANDARD - URSLOGO I5SR74SJ_LOTB.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/28/11

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	92		SEDIMENTARY ROCK (Siltstone) *(continued)*.		C20			100	100						
	93		- slightly weathered; moderately soft.							29	93	UC = 3.98			
42.13	94														
	95														
40.13	96				C21			36	36						Difficult to get wireline down rods.
	97														
38.13	98														No core recovery 97.8-101.0 ft.
	99														
36.13	100														
	101		- trace shell fragments.		C22			100	100						Difficult to get wireline down hole.
34.13	102														
	103														
32.13	104														
	105														
30.13	106				C23			88	88						
	107														
28.13	108														
	109														
26.13	110														No core recovery 110.4-111.0 ft.
	111		- dark greenish gray.		C24			100	100						
24.13	112														
	113														
22.13	114														
	115														
	116														

(continued)

URS

REPORT TITLE			HOLE ID
BORING RECORD			**RC-10-008R**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	PROJECT NO. **0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**			
BRIDGE NUMBER **55-1104**	PREPARED BY **D. Nelson**	DATE **10-14-10**	SHEET **5 of 7**

BR - STANDARD - URSLOGO I5SR74SJ_LOTB.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/28/11

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	116		SEDIMENTARY ROCK (Siltstone) *(continued)*.		C25			100	100						
	117														
18.13	118														
	119														
16.13	120														
	121				C26			100	100						
14.13	122														
	123														
12.13	124														
	125														
10.13	126				C27			90	90						
	127														
8.13	128														
	129														
6.13	130														No core recovery 130.5-131.0 ft.
	131				C28			100	100						
4.13	132														
	133														
2.13	134														
	135														
0.13	136				C29			100	100						
	137														
-1.87	138														
	139														
	140														

(continued)

URS

REPORT TITLE			HOLE ID
BORING RECORD			**RC-10-008R**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	PROJECT NO. **0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**			
BRIDGE NUMBER **55-1104**	PREPARED BY **D. Nelson**	DATE **10-14-10**	SHEET **6 of 7**

BR - STANDARD - URSLOGO I5SR74SJ_LOTB.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/28/11

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	140		SEDIMENTARY ROCK (Siltstone) *(continued)*.		C29			100	100						
	141		Bottom of borehole at 141.0 ft bgs												End drilling at 1559 hrs on 6-29-10.
-5.87	142														
	143														
-7.87	144														
	145														
-9.87	146														
	147														
-11.87	148														
	149														
-13.87	150														
	151														
-15.87	152														
	153														
-17.87	154														
	155														
-19.87	156														
	157														
-21.87	158														
	159														
-23.87	160														
	161														
-25.87	162														
	163														
	164														

URS

REPORT TITLE			HOLE ID
BORING RECORD			**RC-10-008R**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	PROJECT NO. **0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**			
BRIDGE NUMBER **55-1104**	PREPARED BY **D. Nelson**	DATE **10-14-10**	SHEET **7 of 7**

BR - STANDARD - URSLOGO I5SR74SJ_LOTB.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/28/11

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
P. McDonald	8-23-10	8-24-10	2129391.7 ft / 6132304.1 ft NAD83	R-10-009
DRILLING CONTRACTOR: C&L Drilling			BOREHOLE LOCATION (Offset, Station, Line): ~9.51' Lt Sta ~518+95.59"A" Line	SURFACE ELEVATION: ~120.9 ft MLLW
DRILLING METHOD: Rotary Wash			DRILL RIG: Mayhew 1000 with 4-7/8-in. tricone bit	BOREHOLE DIAMETER: 4-7/8
SAMPLER TYPE(S) AND SIZE(S) (ID): Std Cal (2.5"), SPT (1.4")			SPT HAMMER TYPE: Automatic; 140 lb, 30-inch drop	HAMMER EFFICIENCY, ERi: 71%
BOREHOLE BACKFILL AND COMPLETION: Backfilled with grout			GROUNDWATER READINGS: DURING DRILLING: Not measured; AFTER DRILLING (DATE): 11.0 ft on 8-25-10	TOTAL DEPTH OF BORING: 56.0 ft

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0	CONCRETE pavement section consisting of concrete (16 in.) over base and old concrete (11 in.) [FILL].												Core through concrete on 8-23-10.
	1													PID=0.3 ppm; moderate odor. Hand auger to 5 ft.
118.86	2													PID=4.1 ppm. PID=N.D. below 2.5 ft.
	3	SILTY CLAY (CL-ML) [ALLUVIUM].												
116.86	4	Lean CLAY with SAND (CL); very stiff; olive gray; moist; little fine SAND; PP=3.0 tsf.												
	5													
114.86	6			S01							PP = 3.0			CR (CR on composite sample 6-55 ft)
	7													
112.86	8													
	9	Lean CLAY (CL); stiff; olive gray; moist; PP=1.75 tsf.												
110.86	10			S02	0 0 4	4					PP = 1.75			
	11													
108.86	12													
	13													
106.86	14	Lean CLAY with SAND (CL); medium stiff; olive gray; moist; little fine SAND; medium plasticity fines; PP=1.0 tsf.												
	15			S03					23	101	PP = 1.0 UC = 0.67			PI
104.86	16													
	17													
102.86	18													
	19													
	20													

(continued)

URS

REPORT TITLE			HOLE ID
BORING RECORD			R-10-009
DIST. 12	COUNTY ORA	ROUTE I-5	PROJECT NO. 0E3101
PROJECT OR BRIDGE NAME: I-5 and SR-74 Interchange			
BRIDGE NUMBER 55-1104	PREPARED BY D. Nelson	DATE 10-14-10	SHEET 1 of 3

BR - STANDARD - URSLOGO I5SR74SJ_LOTB.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/30/11

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	20	Lean CLAY with SAND (CL) *(continued)*. - dark greenish gray; trace fine, subangular GRAVEL; PP=1.0 tsf.		S04	0 3 4	7					PP = 1.0 & 4.0			
	21	- hard; PP=4.0 tsf.												
98.86	22													
	23													
96.86	24													
	25	- very dark gray; low plasticity fines; PP=2.5 tsf.		S05					18 19	112 112	PP = 2.5			C DS, PI
94.86	26													
	27													
92.86	28	Lean CLAY (CL); hard; olive brown; moist; few fine SAND; PP=4.0 tsf.												
	29													
90.86	30			S06	5 9 10	19					PP = 4.0			
	31													
88.86	32													
	33													
86.86	34													
	35	CLAYEY SAND (SC); very loose; olive brown grades to yellowish brown; wet; trace fine, subrounded GRAVEL; medium to fine SAND; little fines; grades medium dense with depth.		S07	0* 3 19	22			21	110	UC = 0.08			*S07 was pushed 8 in. with rig; driven 4 in. with 3 blows, 6 in. with 19 blows.
84.86	36													
	37													
82.86	38													
	39													
80.86	40	Poorly graded GRAVEL with SILTY CLAY and COBBLES (GP-GC); very dense; olive brown; wet; about 30% COBBLES; mostly coarse to fine GRAVEL; little fines; COBBLES consist of Siltstone.		S08	9 44 18	62								
	41													
78.86	42													
	43													
	44													

(continued)

URS

REPORT TITLE			HOLE ID
BORING RECORD			**R-10-009**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	PROJECT NO. **0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**			
BRIDGE NUMBER **55-1104**	PREPARED BY **D. Nelson**	DATE **10-14-10**	SHEET **2 of 3**

BR - STANDARD - URSLOGO I5SR74SJ_LOTB.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/30/11

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	44		Poorly graded GRAVEL with SILTY CLAY and COBBLES (GP-GC) *(continued)*.												
	45		SEDIMENTARY ROCK (SILTSTONE/CLAYSTONE); fine-grained; laminated; very dark gray; moderately weathered; very soft; unfractured [CAPISTRANO FORMATION].		S09	8	27								
74.86	46					11									
						16									
	47														
72.86	48														
	49														
70.86	50		- slightly weathered; soft.		S10	15	66			26	98	UC = 0.72			
	51					30									
						36									
68.86	52														
	53														
66.86	54														
	55				S11	14									
						23									
64.86	56		Bottom of borehole at 56.0 ft bgs												Hammer breaks after 12-in. drive. Bail hole after last sample on 8-24-10. Backfill hole on 8-25-10.
	57														
62.86	58														
	59														
60.86	60														
	61														
58.86	62														
	63														
56.86	64														
	65														
54.86	66														
	67														
	68														

URS

REPORT TITLE			HOLE ID
BORING RECORD			**R-10-009**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	PROJECT NO. **0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**			
BRIDGE NUMBER **55-1104**	PREPARED BY **D. Nelson**	DATE **10-14-10**	SHEET **3 of 3**

BR - STANDARD - URSLOGO I5SR74SJ_LOTB.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/30/11

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
EJ. Jeon	6-17-10	6-17-10	2129416.0 ft / 6132136.4 ft NAD83	R-10-010
DRILLING CONTRACTOR: C&L Drilling			BOREHOLE LOCATION (Offset, Station, Line): ~173.19' Lt Sta ~519+40.15"A" Line	SURFACE ELEVATION: ~134.2 ft MLLW
DRILLING METHOD: Rotary Wash			DRILL RIG: Mayhew 1000 with 4-7/8-in. tricone bit	BOREHOLE DIAMETER: 4-7/8
SAMPLER TYPE(S) AND SIZE(S) (ID): Std Cal (2.5"), SPT (1.4")			SPT HAMMER TYPE: Automatic; 140 lb, 30-inch drop	HAMMER EFFICIENCY, ERi: 71%
BOREHOLE BACKFILL AND COMPLETION: Backfilled with grout			GROUNDWATER READINGS: DURING DRILLING Not measured; AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING: 17.0 ft

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0	ASPHALT (10 in.) [FILL].												Hand auger only to 4.5 ft due to asphalt and gravel.
	1	CLAYEY SAND with GRAVEL (SC); GRAVEL consists of asphalt and rock fragments.												
132.16	2													
	3													
130.16	4													
	5			S01	15 16 13/3"	29/9								
128.16	6													
	7													
126.16	8													
	9	SANDY lean CLAY with GRAVEL (CL); very stiff; olive; moist; few coarse to fine GRAVEL; little fine SAND; moderate cementation; GRAVEL consists of asphalt fragments; PP=3.0 tsf.												
124.16	10			S02							PP = 3.0			S02 was pushed with rig.
	11													
122.16	12													
	13													
120.16	14													
	15			S03	9 15 18	33								
118.16	16													
	17	Bottom of borehole at 17.0 ft bgs												Encounter and break concrete storm drain (Caltrans error on drainage map). Lose circulation. Abandon hole.
116.16	18													
	19													
	20													

URS

REPORT TITLE			HOLE ID
BORING RECORD			R-10-010
DIST. 12	COUNTY ORA	ROUTE I-5	PROJECT NO. 0E3101
PROJECT OR BRIDGE NAME: I-5 and SR-74 Interchange			
BRIDGE NUMBER 55-1104	PREPARED BY D. Nelson	DATE 10-14-10	SHEET 1 of 1

BR - STANDARD - URSLOGO I5SR74SJ_LOTB.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/30/11

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
D. Orris	2-28-11	2-28-11	2129143.8 ft / 6132699.5 ft NAD83	A-11-020
DRILLING CONTRACTOR: Tri-County Drilling, Inc.			BOREHOLE LOCATION (Offset, Station, Line): ~362.50' Rt Sta ~516+22.42"A" Line	SURFACE ELEVATION: ~139.6 ft MLLW
DRILLING METHOD: Hollow-Stem Auger			DRILL RIG: Diedrich 120	BOREHOLE DIAMETER: 8 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Std Cal (2.5"), SPT (1.4")			SPT HAMMER TYPE: 140 lb, 30-inch drop	HAMMER EFFICIENCY, ERi: 87%
BOREHOLE BACKFILL AND COMPLETION: Backfilled with cement grout			GROUNDWATER READINGS: DURING DRILLING / AFTER DRILLING (DATE): Not Encountered	TOTAL DEPTH OF BORING: 31.5 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		SANDY lean CLAY (CL); medium stiff; mottled very dark gray to black; moist; few GRAVEL; some medium to fine SAND [FILL].												
	1														
137.58	2														
	3														
135.58	4														
	5		- stiff; mottled olive brown to dark grayish brown; PP=1.0 tsf.		S01	3 4 5	9					PP = 1			CR
133.58	6														
	7		Fat CLAY with SAND (CH); very stiff; mottled dark gray to dark olive gray; moist; little medium to fine SAND; PP=2.5 tsf.		S02					25	95	PP = 2.5			C WA: 83%<#200 sieve
131.58	8														
	9		SEDIMENTARY ROCK (CLAYSTONE); moderately to thickly bedded; olive gray; intensely to moderately weathered; soft; moderately to slightly fractured.												
129.58	10				S03	3 6 7	13			32					LL=75, PI=48 PI WA: 99%<#200 sieve
	11														
127.58	12														
	13														
125.58	14														
	15				S04	3 5 8	13					PP = 3.5			
123.58	16														
	17														
121.58	18														
	19														
	20														

(continued)

URS

REPORT TITLE			HOLE ID
BORING RECORD			A-11-020
DIST. 12	COUNTY ORA	ROUTE I-5	PROJECT NO. 0E3101
PROJECT OR BRIDGE NAME: I-5 and SR-74 Interchange			
BRIDGE NUMBER 55-1104	PREPARED BY EJ. Jeon	DATE 6-10-11	SHEET 1 of 2

BR - STANDARD - URSLOGO I5SR74SJ_LOTB.GPJ CALTRANS LIBRARY DOT 2011.GLB 7/6/11

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	20		- moderately weathered. SEDIMENTARY ROCK (Claystone) *(continued)*.		S05	3 5 7	12			28		PP = 3.75			LL=63, PI=37 PI WA: 98%<#200 sieve
	21														
117.58	22														
	23														
115.58	24														
	25		- moderately soft.		S06	6 8 13	21					PP = 4.25			
113.58	26														
	27														
111.58	28														
	29														
109.58	30				S07	6 10 14	24					PP = 24			
	31														
			Bottom of borehole at 31.5 ft bgs												
107.58	32														
	33														
105.58	34														
	35														
103.58	36														
	37														
101.58	38														
	39														
99.58	40														
	41														
97.58	42														
	43														
	44														

URS

REPORT TITLE			HOLE ID
BORING RECORD			**A-11-020**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	PROJECT NO. **0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**			
BRIDGE NUMBER **55-1104**	PREPARED BY **EJ. Jeon**	DATE **6-10-11**	SHEET **2 of 2**

BR - STANDARD - URSLOGO I5SR74SJ_LOTB.GPJ CALTRANS LIBRARY DOT 2011.GLB 7/6/11

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
P. McDonald	6-30-10	7-1-10	2129331.2 ft / 6132463.8 ft NAD83	RC-10-021
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Crux Subsurface, Inc.			~142.79' Rt Sta ~518+19.41"A" Line	~143.5 ft MLLW
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wire-Line Core			Crux Custom	3.8 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Continuous Core (HQ, NQ), SPT (1.4")			Not applicable	Not applicable
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING / AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Backfilled with cement grout			Not measured	140.4 ft

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0	SILTY CLAY with GRAVEL (CL-ML); light brown; dry; flat and elongated GRAVEL [FILL].		C01			32	0						Hand auger to 3.9 ft on 6-30-10, then core from surface using HQ bit. No core recovery to 3.9 ft.
	1													
141.54	2													
	3	- increase in GRAVEL content, subangular clasts.												
139.54	4	SILTY SAND (SM); olive brown; moist; trace fine GRAVEL; about 65% coarse to fine SAND.												
	5	Lean CLAY (CL); hard; olive brown mottled with light yellowish brown; moist; sand stringers; PP=4.5 tsf.												
137.54	6	- mottled yellow, light brownish gray, olive brown, and black; PP=4.5+ tsf.		C02			77	0						
	7													
135.54	8	- black zone 4 in. thick; PP=4.0 tsf.												
	9	- very stiff; PP=2.5 tsf.												
133.54	10													No core recovery 9.55-10.7 ft.
	11	- interbeds of sand 2-3 in. thick.		C03			46	0						
131.54	12	- PP=2.5 tsf.												
	13													No core recovery 13.0-15.7 ft.
129.54	14													
	15													
127.54	16			C04			100	0						
	17	SILTY SAND (SM); dark grayish brown to light yellowish brown; moist; locally mottled with yellowish brown [ALLUVIUM].												
125.54	18													
	19	- olive yellow.												
	20													

(continued)

URS

REPORT TITLE			HOLE ID
BORING RECORD			RC-10-021
DIST.	COUNTY	ROUTE	PROJECT NO.
12	ORA	I-5	0E3101
PROJECT OR BRIDGE NAME			
I-5 and SR-74 Interchange			
BRIDGE NUMBER	PREPARED BY	DATE	SHEET
55-1104	D. Nelson	10-14-10	1 of 7

BR - STANDARD - URSLOGO I5SR74SJ_BR.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/30/11

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Remarks
	20	SILTY SAND (SM) *(continued)*.	C04			100	0	
	21		C05			86	0	
121.54	22							
	23							
119.54	24							
	25							No core recovery 25.0-25.7 ft.
117.54	26		C06			55	0	Recover only gravel and/or cobbles in core barrel.
	27							
115.54	28							No core recovery 27.5-29.0 ft.
	29		C07			0	0	
113.54	30							
	31	CLAYEY SAND (SC); dense; olive brown; moist; medium to fine SAND; PP=2.0 tsf.	S01	8 10 34	44			Interrupt coring to sample with SPT.
111.54	32							
	33	Poorly graded GRAVEL (GP); granitic GRAVEL and COBBLES; trace clayey sand matrix.	C08			100	0	
109.54	34		C09			42	0	No core recovery 33.7-34.1 ft.
	35		C10			100	0	
107.54	36	CLAYEY SAND with GRAVEL (SC); very dense; olive brown; moist; coarse to fine GRAVEL; coarse to fine SAND; possible COBBLES.	S02	31 19 34	53			Interrupt coring to sample with SPT.
	37		C11			7	0	No core recovery 37.45-40.7 ft.
105.54	38							
	39							
103.54	40							
	41		C12			34	0	
101.54	42							
	43							No core recovery 42.4-45.7 ft.
	44							

Sample Location | Material Graphics | Moisture Content (%) | Dry Unit Weight (pcf) | Shear Strength (tsf) | Drilling Method | Casing Depth

(continued)

URS

REPORT TITLE			HOLE ID
BORING RECORD			**RC-10-021**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	PROJECT NO. **0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**			
BRIDGE NUMBER **55-1104**	PREPARED BY **D. Nelson**	DATE **10-14-10**	SHEET **2 of 7**

BR - STANDARD - URSLOGO I5SR74SJ_BR.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/30/11

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	44	CLAYEY SAND with GRAVEL (SC) *(continued)*.		C12			34	0						
	45													
97.54	46	SEDIMENTARY ROCK (SILTSTONE/CLAYSTONE); grayish brown; very intensely weathered; very soft; (Lean CLAY (CL); very stiff; mottled brownish yellow; moist, PP=2.75 tsf; very soft organic layer, PP=0.0 tsf) [CAPISTRANO FORMATION].		S03	1 2 8	10								Interrupt coring to sample with SPT.
	47	- massive; very dark grayish brown; moderately weathered; soft; unfractured.		C13			100	100						
95.54	48													
	49													
93.54	50													
	51			S04	4 8 13	21								Interrupt coring to sample with SPT.
91.54	52			C14			100	0						
	53													
89.54	54	- very hard; cemented below clay-filled fracture dipping 70°.												
	55			C15			100	0						
87.54	56			C16			0	0						Trip rods end switch to NQ core. No core recovery 55.7-60.4 ft due to rock in shoe.
	57													
85.54	58													
	59													
83.54	60													
	61	- very dark gray; soft; no cementation.		C17			28	0						
81.54	62													No core recovery 61.8-65.4 ft.
	63													
79.54	64													
	65													
77.54	66			C18			100	100						
	67													
	68													

(continued)

URS

REPORT TITLE			HOLE ID
BORING RECORD			**RC-10-021**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	PROJECT NO. **0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**			
BRIDGE NUMBER **55-1104**	PREPARED BY **D. Nelson**	DATE **10-14-10**	SHEET **3 of 7**

BR - STANDARD - URSLOGO I5SR74SJ_BR.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/30/11

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	68		SEDIMENTARY ROCK (Siltstone/Claystone) *(continued)*.		C18			100	100						
	69														
73.54	70														
					C19			100	100						
	71														
71.54	72														
	73														
69.54	74														
	75														
					C20			100	100						
67.54	76														
	77		SEDIMENTARY ROCK (SILTSTONE); massive; very dark gray; moderately weathered; moderately soft; unfractured.												
65.54	78														
	79														
63.54	80														
					C21			100	100						
	81														
61.54	82														
	83														
59.54	84														
	85														
					C22			100	100						
57.54	86														
	87														
55.54	88														
	89														
53.54	90														
					C23			100	100						
	91														
	92														

(continued)

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REPORT TITLE			HOLE ID
BORING RECORD			**RC-10-021**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	PROJECT NO. **0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**			
BRIDGE NUMBER **55-1104**	PREPARED BY **D. Nelson**	DATE **10-14-10**	SHEET **4 of 7**

BR - STANDARD - URSLOGO I5SR74SJ_BR.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/30/11

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	92		SEDIMENTARY ROCK (Siltstone) *(continued)*.		C23			100	100						
	93														
49.54	94														
	95														
					C24			100	100						
47.54	96														
	97														
45.54	98														
	99														
43.54	100														
					C25			100	100						
	101														
41.54	102														
	103														
			- Claystone layer 1/4 in. thick, greenish gray, dips 15°.												
39.54	104														
	105														
					C26			95	95						
37.54	106														
	107														
35.54	108														
	109		- moderately to slightly weathered; very slightly fractured to unfractured.												
33.54	110														No core recovery 110.15-110.4 ft.
					C27			84	84						
	111														
31.54	112		- 70° joint, planar, 1/8-in. fine sand infilling.												
	113		- 15° bedding break, wavy.												
29.54	114														No core recovery 114.6-115.4 ft.
	115														
					C28			68	68						
	116														

(continued)

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REPORT TITLE			HOLE ID
BORING RECORD			**RC-10-021**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	PROJECT NO. **0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**			
BRIDGE NUMBER **55-1104**	PREPARED BY **D. Nelson**	DATE **10-14-10**	SHEET **5 of 7**

BR - STANDARD - URSLOGO I5SR74SJ_BR.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/30/11

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	116		SEDIMENTARY ROCK (Siltstone) *(continued).*		C28			68	68						
	117		- 80° joint, wavy, fine sand infilling.												
25.54	118														
	119														No core recovery 118.8-120.4 ft.
23.54	120														End for 6-30-10.
			- very dark gray to dark gray; slightly weathered.		C29			100	100						Resume coring on 7-1-10.
	121														
21.54	122														
	123														
19.54	124														
	125														
			- Claystone interbeds 1/8 in. thick to 126.8 ft.		C30			100	100						
17.54	126														
	127														
15.54	128														
	129														
13.54	130														
					C31			97	97						
	131														
11.54	132		- faint bedding dipping approx. 15°.												
	133														
9.54	134														
	135														No core recovery 135.25-135.4 ft.
					C32			97	97						
7.54	136		- two joints, 45° and 35°, 1/8 in. clay infilling.												
	137		- hard, cemented zone 1.8 ft thick.												
5.54	138														
	139														
	140														

(continued)

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REPORT TITLE			HOLE ID
BORING RECORD			**RC-10-021**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	PROJECT NO. **0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**			
BRIDGE NUMBER **55-1104**	PREPARED BY **D. Nelson**	DATE **10-14-10**	SHEET **6 of 7**

BR - STANDARD - URSLOGO I5SR74SJ_BR.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/30/11

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	140		SEDIMENTARY ROCK (Siltstone) *(continued)*.												No core recovery 140.25-140.4 ft.
			Bottom of borehole at 140.4 ft bgs												
	141														
1.54	142														
	143														
-0.46	144														
	145														
-2.46	146														
	147														
-4.46	148														
	149														
-6.46	150														
	151														
-8.46	152														
	153														
-10.46	154														
	155														
-12.46	156														
	157														
-14.46	158														
	159														
-16.46	160														
	161														
-18.46	162														
	163														
	164														

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REPORT TITLE			HOLE ID
BORING RECORD			**RC-10-021**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	PROJECT NO. **0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**			
BRIDGE NUMBER **55-1104**	PREPARED BY **D. Nelson**	DATE **10-14-10**	SHEET **7 of 7**

BR - STANDARD - URSLOGO I5SR74SJ_BR.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/30/11

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
D. Orris	1-14-11	1-14-11	2129009.2 ft / 6132629.7 ft NAD83	R-11-022
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Crux Subsurface, Inc.			~285.70' Rt Sta ~514+98.99"A" Line	~107.9 ft MLLW
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			Burley 4000 with HWT Chevron Advancer	4.5 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Std Cal (2.5"), SPT (1.4")			Manual; 140 lb, 30-inch drop	74%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING / AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Backfilled with cement grout			Not measured	42.0 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		ASPHALT.												
	1		SANDY lean CLAY (CL); stiff; grayish brown; moist; some medium to fine SAND.												
105.85	2														
	3														
103.85	4														
	5		- dark grayish brown; few GRAVEL; few SAND; PP=1.0 tsf.		S01	2 2 3	5					PP = 1			CR
101.85	6														
	7		Fat CLAY (CH); very stiff; dark olive gray to black; moist; trace mineralization nodules; trace roots; PP=2.5 tsf.		S02					24	101	PP = 2.5 UU = 2.1			C
99.85	8														
	9														
97.85	10		- dark grayish brown; PP=2.25 tsf.		S03	4 4 6	10					PP = 2.25			
	11														
95.85	12				S04					29	92	UU = 1.7			LL=58, PI=36 C, PI
	13														
93.85	14														
	15		- stiff; PP=1.0 tsf.		S05	2 3 3	6					PP = 1			
91.85	16														
	17														
89.85	18														
	19														
	20														

(continued)

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REPORT TITLE			HOLE ID
BORING RECORD			R-11-022
DIST. 12	COUNTY ORA	ROUTE I-5	PROJECT NO. 0E3101
PROJECT OR BRIDGE NAME I-5 and SR-74 Interchange			
BRIDGE NUMBER 55-1104	PREPARED BY EJ. Jeon	DATE 6-10-11	SHEET 1 of 2

BR - STANDARD - URSLOGO I5SR74SJ_LOTB.GPJ CALTRANS LIBRARY DOT 2011.GLB 7/6/11

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	20	- very stiff; PP=2.0 tsf. Fat CLAY (CH) *(continued)*.		S06					26	99	PP = 2 UU = 1.8			LL=50, PI=32 C, PI
	21													
85.85	22													
	23	SANDY lean CLAY (CL); stiff; dark grayish brown; moist; trace GRAVEL; some SAND; PP=1.0 tsf.												
83.85	24													
	25			S07	4 3 3	6					PP = 1			WA: 67%<#200 sieve
81.85	26													
	27													
79.85	28													
	29													
77.85	30	- few coarse to fine GRAVEL; few SAND; PP=1.0 tsf.		S08					20	109				LL=39, PI=24 C, PI
	31													
75.85	32													
	33													
73.85	34													
	35			S09	3 5 6	11								No Recovery
71.85	36													
	37													
69.85	38													
	39	SEDIMENTARY ROCK (CLAYSTONE); moderately to thickly bedded; olive gray; intensely to moderately weathered; soft; intensely to moderately fractured.		S10	5 7 10	17								
67.85	40													
	41			S11	5 7 9	16								
65.85	42	Bottom of borehole at 42.0 ft bgs												
	43													
	44													

URS

REPORT TITLE			HOLE ID
BORING RECORD			**R-11-022**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	PROJECT NO. **0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**			
BRIDGE NUMBER **55-1104**	PREPARED BY **EJ. Jeon**	DATE **6-10-11**	SHEET **2 of 2**

BR - STANDARD - URSLOGO I5SR74SJ_LOTB.GPJ CALTRANS LIBRARY DOT 2011.GLB 7/6/11

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
EJ. Jeon	6-16-10	6-16-10	2128437.1 ft / 6132438.2 ft NAD83	R-10-024
DRILLING CONTRACTOR: C&L Drilling			BOREHOLE LOCATION (Offset, Station, Line): ~99.27' Rt Sta ~509+44.32"A" Line	SURFACE ELEVATION: ~108.6 ft MLLW
DRILLING METHOD: Rotary Wash			DRILL RIG: Mayhew 1000 with 4-7/8-in. tricone bit	BOREHOLE DIAMETER: 4-7/8
SAMPLER TYPE(S) AND SIZE(S) (ID): Std Cal (2.5"), SPT (1.4")			SPT HAMMER TYPE: Automatic; 140 lb, 30-inch drop	HAMMER EFFICIENCY, ERi: 71%
BOREHOLE BACKFILL AND COMPLETION: Grout mix of cement and bentonite chips, AC cap			GROUNDWATER READINGS: DURING DRILLING: Not measured; AFTER DRILLING (DATE): 28.0 ft on 6-16-10	TOTAL DEPTH OF BORING: 31.5 ft

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0	ASPHALT pavement section consisting of asphalt concrete (7 in.) over CT base (5 in.) and aggregate base (6 in.) [FILL].												
	1													
106.59	2	CLAYEY SAND (SC).												Hand auger to 5 ft.
		SANDY lean CLAY (CL); medium stiff; olive brown; moist.												
	3													
104.59	4	Lean CLAY with SAND (CL); stiff; olive; moist; little fine SAND; weak cementation; PP=1.1 tsf.												
	5			S01					28	94	PP = 2.5 & 1.1			CR (CR on composite sample 5-30 ft)
102.59	6	- very stiff; very dark gray; PP=2.5 tsf.												
	7													
100.59	8													
	9													
98.59	10	- stiff; olive gray; no cementation; PP=1.25 tsf.		S02	2 2 3	5					PP = 1.25			
	11													
96.59	12													
	13													
94.59	14	Lean CLAY (CL); stiff; olive to dark gray; moist; few fine SAND; medium plasticity fines; PP=1.1 tsf.												
	15			S03					24	79	PP = 1.1 UC = 1.02			LL=47, PI=33 PI
92.59	16													
	17													
90.59	18													
	19													
	20													

(continued)

URS

REPORT TITLE			HOLE ID
BORING RECORD			R-10-024
DIST. 12	COUNTY ORA	ROUTE I-5	PROJECT NO. 0E3101
PROJECT OR BRIDGE NAME: I-5 and SR-74 Interchange			
BRIDGE NUMBER 55-1104	PREPARED BY D. Nelson	DATE 10-14-10	SHEET 1 of 2

BR - STANDARD - URSLOGO I5SR74SJ_BR.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/30/11

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	20		Lean CLAY with SAND (CL); stiff; dark olive gray; moist; about 15% fine SAND; about 85% fines; PP=1.5 tsf.		S04	2 3 4	7			29		PP = 1.5			
	21														
86.59	22														
	23														
84.59	24		Fat CLAY with SAND (CH); stiff; olive; moist; about 25% fine SAND; about 75% high plasticity fines; PP=1.5 tsf.												
	25				S05					32	90	PP = 1.5			LL=61, PI=45
82.59	26									27	96	UC = 1.67			PI C
	27														
80.59	28		SILTY SAND (SM); medium dense; light olive brown; moist to wet; about 75 to 80% mostly fine SAND; about 15 to 20% fines.												
	29														
78.59	30				S06	9 8 10	18			27					
	31														
76.59	32		Bottom of borehole at 31.5 ft bgs												
	33														
74.59	34														
	35														
72.59	36														
	37														
70.59	38														
	39														
68.59	40														
	41														
66.59	42														
	43														
	44														

URS

REPORT TITLE			HOLE ID
BORING RECORD			**R-10-024**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	PROJECT NO. **0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**			
BRIDGE NUMBER **55-1104**	PREPARED BY **D. Nelson**	DATE **10-14-10**	SHEET **2 of 2**

BR - STANDARD - URSLOGO I5SR74SJ_BR.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/30/11

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
Luke Roebuck	8-23-10	8-24-10	2129276.2 ft / 6132315.7 ft NAD83	A-10-028
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
JET Drilling Inc.			~9.83' Lt Sta ~517+79.34"A" Line	~119.1 ft MLLW
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hollow-Stem Auger			Mobile B61 with 8-in. rock bit	8 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Std Cal (2.5"), Shelby (2.87"), SPT (1.4")			140 lb, 30-inch drop	72%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS: DURING DRILLING	AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Hole open with temporary steel cap			19.0 ft	20.0 ft on 8-25-10	51.5 ft

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0	CONCRETE (12 in.) over CAP (8 in.) and aggregate base (12 in.).												Start on 8/23/10. Hand auger to 5 ft to clear for utilities. PID background and headspace measured 0.0 ppm to total depth.
117.10	2													
	3	GRAVELLY CLAYEY SILT (ML/CL). CLAYEY SILT with SAND (ML/CL); stiff; olive brown; moist; little fine SAND.												
115.10	4													
	5	SILT (ML); stiff; olive brown; moist; trace fine GRAVEL; trace fine SAND; weak cementation; PP=1.5 tsf.		S01	5 6 9	15					PP = 1.5			CR (CR on composite sample 5-50 ft)
113.10	6													
	7													
111.10	8													
	9	SANDY lean CLAY (CL); medium stiff to stiff; very dark gray; moist; about 35% medium to fine SAND; about 65% fines; weak cementation; PP=0.5-1.5 tsf.												
109.10	10			S02	5 6 9	15					PP = 0.5-1.5			No sample recovery.
	11													
107.10	12													
	13													
105.10	14													
	15	- dark grayish brown; PP=1.5 tsf.		S03							PP = 1.5			LL=39, PI=26
103.10	16								18	112	UC = 1.37			PI
	17								17	108				C
101.10	18													
	19	Fat CLAY (CH); very stiff; dark grayish brown; wet; weak cementation; few silt; PP=2.0 tsf.												First groundwater encountered at ~19 ft.
	20													

(continued)

URS

REPORT TITLE			HOLE ID
BORING RECORD			A-10-028
DIST. 12	COUNTY ORA	ROUTE I-5	PROJECT NO. 0E3101
PROJECT OR BRIDGE NAME: I-5 and SR-74 Interchange			
BRIDGE NUMBER 55-1104	PREPARED BY D. Nelson	DATE 10-14-10	SHEET 1 of 3

BR - STANDARD - URSLOGO ISSR74SJ_BR.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/30/11

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	20	Fat CLAY (CH) *(continued)*.		S04	3 5 7	12					PP = 2.0			Water running out of SPT sleeve.
	21													
97.10	22													
	23													
95.10	24	SILTY SAND with GRAVEL (SM); very dense; olive brown; wet; little coarse to fine, subangular GRAVEL; coarse to fine SAND; GRAVEL consists of reworked lithified black shale clasts; mostly fine SAND.												
	25			S05	10 21 43	64								Sampler wet.
93.10	26													
	27													
91.10	28													
	29	Fat CLAY (CH); stiff; dark grayish brown; moist; trace silt; PP=1.5-2.0.												
89.10	30			S06	5 6 7	13			38		PP = 1.5-2.0			LL=65, PI=35 PI
	31	SEDIMENTARY ROCK (SILTSTONE); fine-grained; massive; moderately weathered; very soft; slightly fractured; (Clayey SILT (ML); low plasticity; evidence of lamination; fractures at 1-in. spacing with brown oxidation on surfaces).												
87.10	32													
	33													
85.10	34													
	35	- (Fat CLAY (CH); very stiff; moist; medium to high plasticity; weak cementation; little silt; evidence of angular lamination, close uncemented fractures; PP=2.25 tsf).		S07	7 18 23	41					PP = 2.25			
83.10	36													
	37													
81.10	38													
	39													
79.10	40	- (very stiff; trace SAND; PP=3.5 tsf).		S08	7 12 15	27					PP = 3.5			
	41													
77.10	42													
	43													
	44													

(continued)

URS

REPORT TITLE			HOLE ID
BORING RECORD			**A-10-028**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	PROJECT NO. **0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**			
BRIDGE NUMBER **55-1104**	PREPARED BY **D. Nelson**	DATE **10-14-10**	SHEET **2 of 3**

BR - STANDARD - URSLOGO I5SR74SJ_BR.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/30/11

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	44		SEDIMENTARY ROCK (Siltstone) *(continued)*.												
	45				S09					33	87				Shelby met refusal; partially crushed.
73.10	46														
	47														
71.10	48														
	49														
69.10	50		- (Lean CLAY (CL); very stiff; black; moist; medium plasticity; weak cementation; little silt; evidence of angular lamination; PP=2.0 tsf).		S10	6 10 13	23					PP = 2.0			
	51														
67.10	52		Bottom of borehole at 51.5 ft bgs												
	53														
65.10	54														
	55														
63.10	56														
	57														
61.10	58														
	59														
59.10	60														
	61														
57.10	62														
	63														
55.10	64														
	65														
53.10	66														
	67														
	68														

URS

REPORT TITLE			HOLE ID
BORING RECORD			**A-10-028**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	PROJECT NO. **0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**			
BRIDGE NUMBER **55-1104**	PREPARED BY **D. Nelson**	DATE **10-14-10**	SHEET **3 of 3**

BR - STANDARD - URSLOGO I5SR74SJ_BR.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/30/11

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
P. McDonald	10-26-10	10-27-10	2129271.0 ft / 6132315.7 ft NAD83	RC-10-028A
DRILLING CONTRACTOR: Caltrans			BOREHOLE LOCATION (Offset, Station, Line): ~10.31' Lt Sta ~517+74.09"A" Line	SURFACE ELEVATION: ~119.1 ft MLLW
DRILLING METHOD: Rotary Wire-Line Core			DRILL RIG: CME 85	BOREHOLE DIAMETER: 3.8 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Continuous Core (HQ, NQ), SPT (1.4")			SPT HAMMER TYPE: Not applicable	HAMMER EFFICIENCY, ERi: Not applicable
BOREHOLE BACKFILL AND COMPLETION: Backfilled with cement grout			GROUNDWATER READINGS: DURING DRILLING Not measured; AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING: 141.5 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		Drill to 50 ft with no samples..												
	1														
117.09	2														
	3														
115.09	4														
	5														
113.09	6														
	7														
111.09	8														
	9														
109.09	10														
	11														
107.09	12														
	13														
105.09	14														
	15														
103.09	16														
	17														
101.09	18														
	19														
	20														

(continued)

URS

REPORT TITLE			HOLE ID
BORING RECORD			RC-10-028A
DIST. 12	COUNTY ORA	ROUTE I-5	PROJECT NO. 0E3101
PROJECT OR BRIDGE NAME: I-5 and SR-74 Interchange			
BRIDGE NUMBER 55-1104	PREPARED BY EJ. Jeon	DATE 6-10-11	SHEET 1 of 7

BR - STANDARD - URSLOGO I5SR74SJ_BR.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/30/11

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	20		*(continued).*												
	21														
97.09	22														
	23														
95.09	24														
	25														
93.09	26														
	27														
91.09	28														
	29														
89.09	30														
	31														
87.09	32														
	33														
85.09	34														
	35														
83.09	36														
	37														
81.09	38														
	39														
79.09	40														
	41														
77.09	42														
	43														
	44														

(continued)

URS

REPORT TITLE			HOLE ID
BORING RECORD			**RC-10-028A**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	PROJECT NO. **0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**			
BRIDGE NUMBER **55-1104**	PREPARED BY **EJ. Jeon**	DATE **6-10-11**	SHEET **2 of 7**

BR - STANDARD - URSLOGO I5SR74SJ_BR.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/30/11

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	44														
	45														
73.09	46														
	47														
71.09	48														
	49														
69.09	50		SEDIMENTARY ROCK (SILTSTONE); massive; very dark gray; fresh; moderately soft; unfractured.		c01	9 17 23	40	50	50						
	51														
67.09	52														
	53														
65.09	54														
	55				c02			100	100						
63.09	56									26	98	UC = 22.8			
	57														
61.09	58														
	59														
59.09	60				c03			88	88						
	61														
57.09	62														
	63														
55.09	64									25	99	UC = 30.2			
	65				c04			100	100						
53.09	66														
	67														
	68														

(continued)

URS

REPORT TITLE			HOLE ID
BORING RECORD			**RC-10-028A**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	PROJECT NO. **0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**			
BRIDGE NUMBER **55-1104**	PREPARED BY **EJ. Jeon**	DATE **6-10-11**	SHEET **3 of 7**

BR - STANDARD - URSLOGO I5SR74SJ_BR.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/30/11

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	68		Strong cementation zone 6 in. thick.. SEDIMENTARY ROCK (Siltstone) *(continued)*.		c04			100	100						
	69				c05			100	100						
49.09	70														
	71														
47.09	72														
	73				c06			90	90	28	94	UC = 28.9			
45.09	74														
	75		Strong cementation zone 1.2 ft thick..		c07			25	17						
43.09	76														
	77														
41.09	78														
	79														
39.09	80				c08			100	100	23	102	UC = 17.5			
	81														
37.09	82														
	83														
35.09	84														
	85				c09	9 20 28	48	100	100						
33.09	86														
	87														
31.09	88														
	89														
29.09	90				c10			100	100						
	91														
	92														

(continued)

URS

REPORT TITLE			HOLE ID
BORING RECORD			**RC-10-028A**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	PROJECT NO. **0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**			
BRIDGE NUMBER **55-1104**	PREPARED BY **EJ. Jeon**	DATE **6-10-11**	SHEET **4 of 7**

BR - STANDARD - URSLOGO I5SR74SJ_BR.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/30/11

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	92				c10			100	100						
	93									20	103	UC = 43.7			
25.09	94														
	95				c11			100	100						
23.09	96														
	97									23	102	UC = 28.9			
21.09	98														
	99														
19.09	100				c12			100	100						
	101														
17.09	102														
	103														
15.09	104														
	105				c13			95	90						
13.09	106														
	107														
11.09	108														
	109														
9.09	110				c14	13 24 28	52	100	100						
	111														
7.09	112														
	113														
5.09	114														
	115				c15			100	100						
	116														

(continued)

URS

REPORT TITLE			HOLE ID
BORING RECORD			**RC-10-028A**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	PROJECT NO. **0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**			
BRIDGE NUMBER **55-1104**	PREPARED BY **EJ. Jeon**	DATE **6-10-11**	SHEET **5 of 7**

BR - STANDARD - URSLOGO I5SR74SJ_BR.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/30/11

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	116				c15			100	100						
	117									23	101	UC = 30.3			
1.09	118														
	119														
-0.91	120				c16			100	100						
	121														
-2.91	122														
	123														
-4.91	124														
	125				c17			100	100	24	101	UC = 36.9			
-6.91	126														
	127														
-8.91	128														
	129														
-10.91	130				c18			100	100						
	131														
-12.91	132														
	133									24	100	UC = 35.4			
-14.91	134														
	135				c19			62	62						
-16.91	136														
	137														
-18.91	138														
	139														
	140														

(continued)

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REPORT TITLE			HOLE ID
BORING RECORD			**RC-10-028A**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	PROJECT NO. **0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**			
BRIDGE NUMBER **55-1104**	PREPARED BY **EJ. Jeon**	DATE **6-10-11**	SHEET **6 of 7**

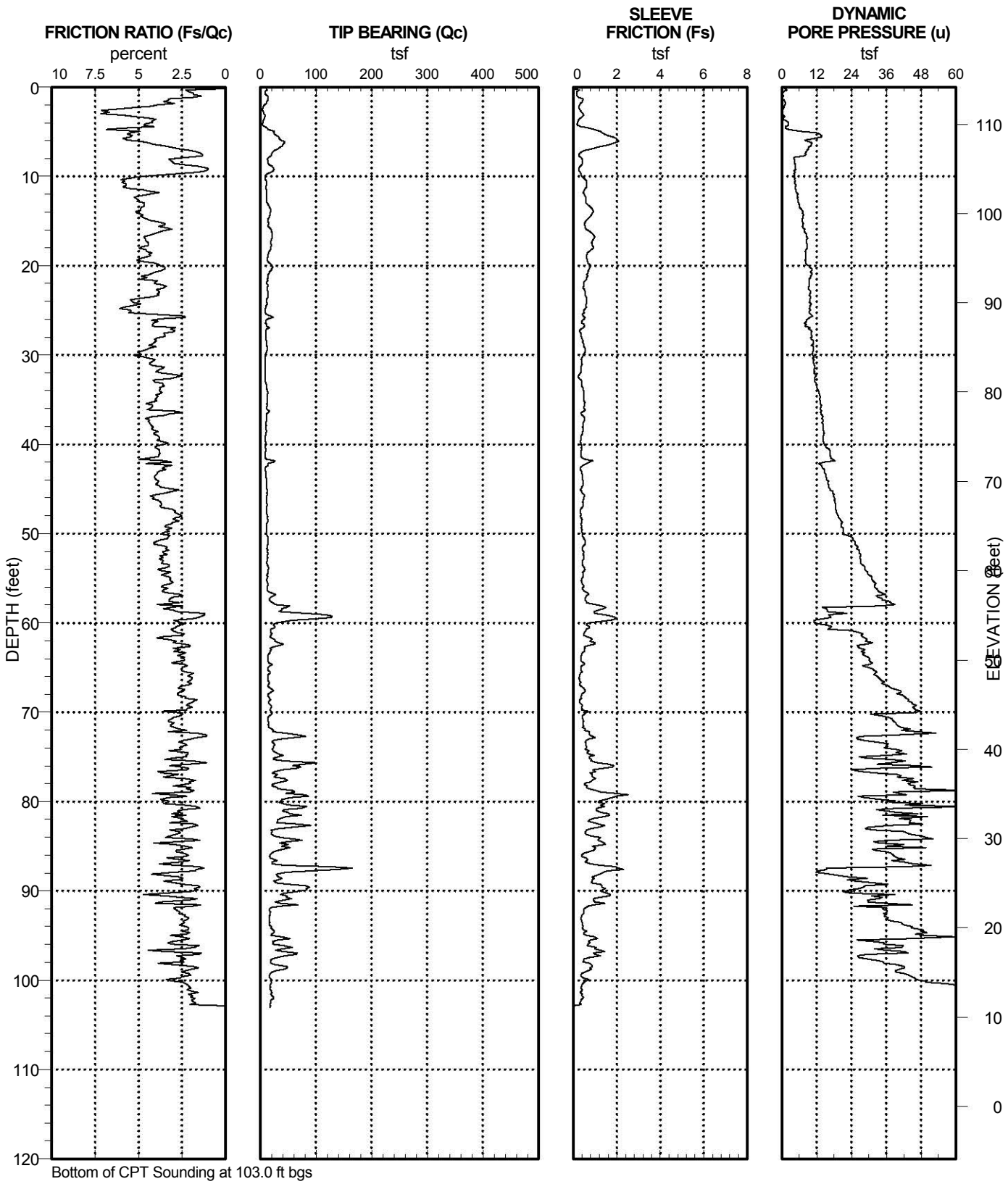
BR - STANDARD - URSLOGO I5SR74SJ_BR.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/30/11

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	140					16	73								
						29									
	141					44									
			Bottom of borehole at 141.5 ft bgs												
-22.91	142														
	143														
-24.91	144														
	145														
-26.91	146														
	147														
-28.91	148														
	149														
-30.91	150														
	151														
-32.91	152														
	153														
-34.91	154														
	155														
-36.91	156														
	157														
-38.91	158														
	159														
-40.91	160														
	161														
-42.91	162														
	163														
	164														

URS

REPORT TITLE			HOLE ID
BORING RECORD			**RC-10-028A**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	PROJECT NO. **0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**			
BRIDGE NUMBER **55-1104**	PREPARED BY **EJ. Jeon**	DATE **6-10-11**	SHEET **7 of 7**

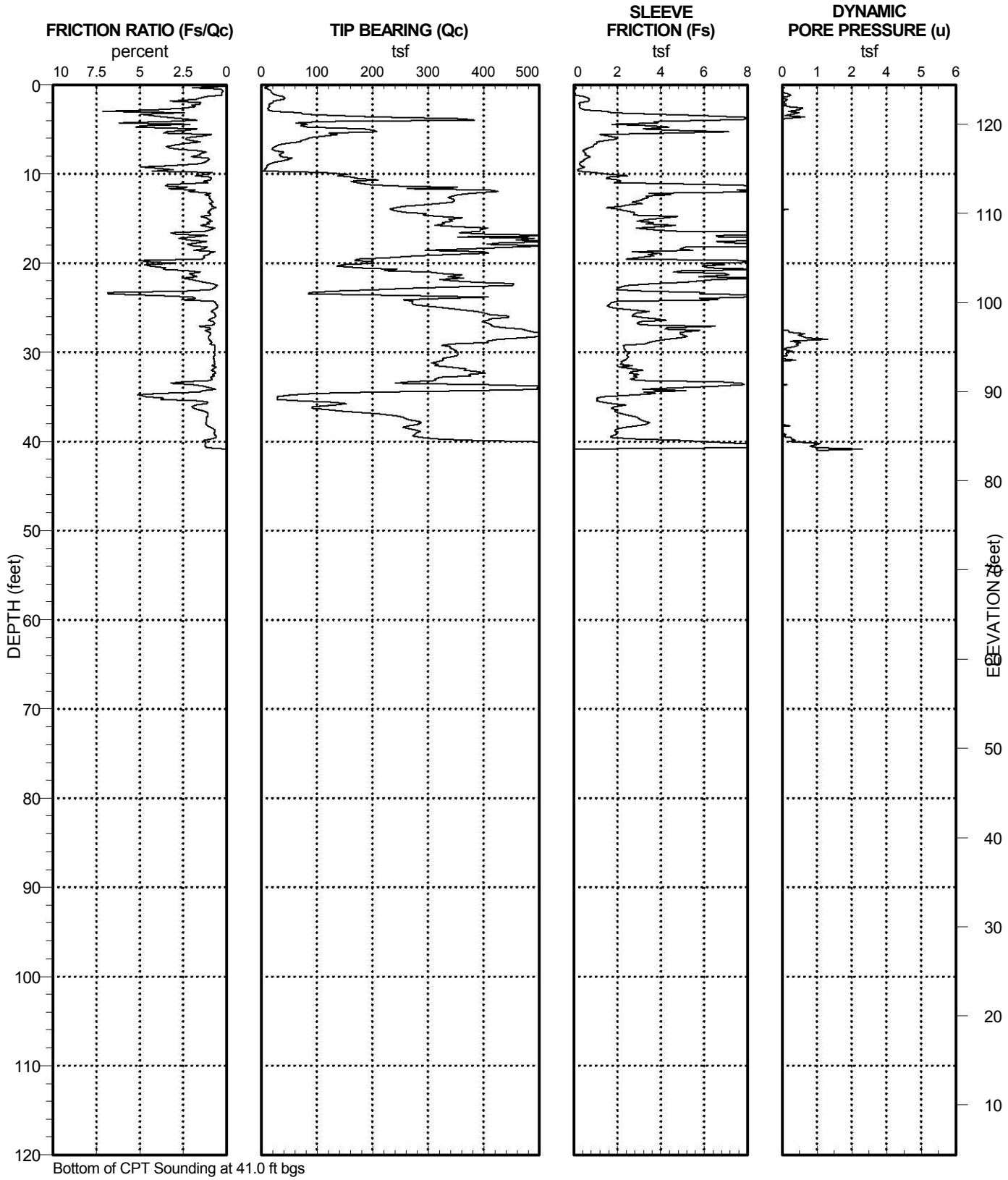
BR - STANDARD - URSLOGO I5SR74SJ_BR.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/30/11



Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**CPT-10-003**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	POSTMILE **D0.0/D**	EA **12-0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**				
BRIDGE NUMBER **55-1104**	PREPARED BY	DATE		SHEET **1 of 1**

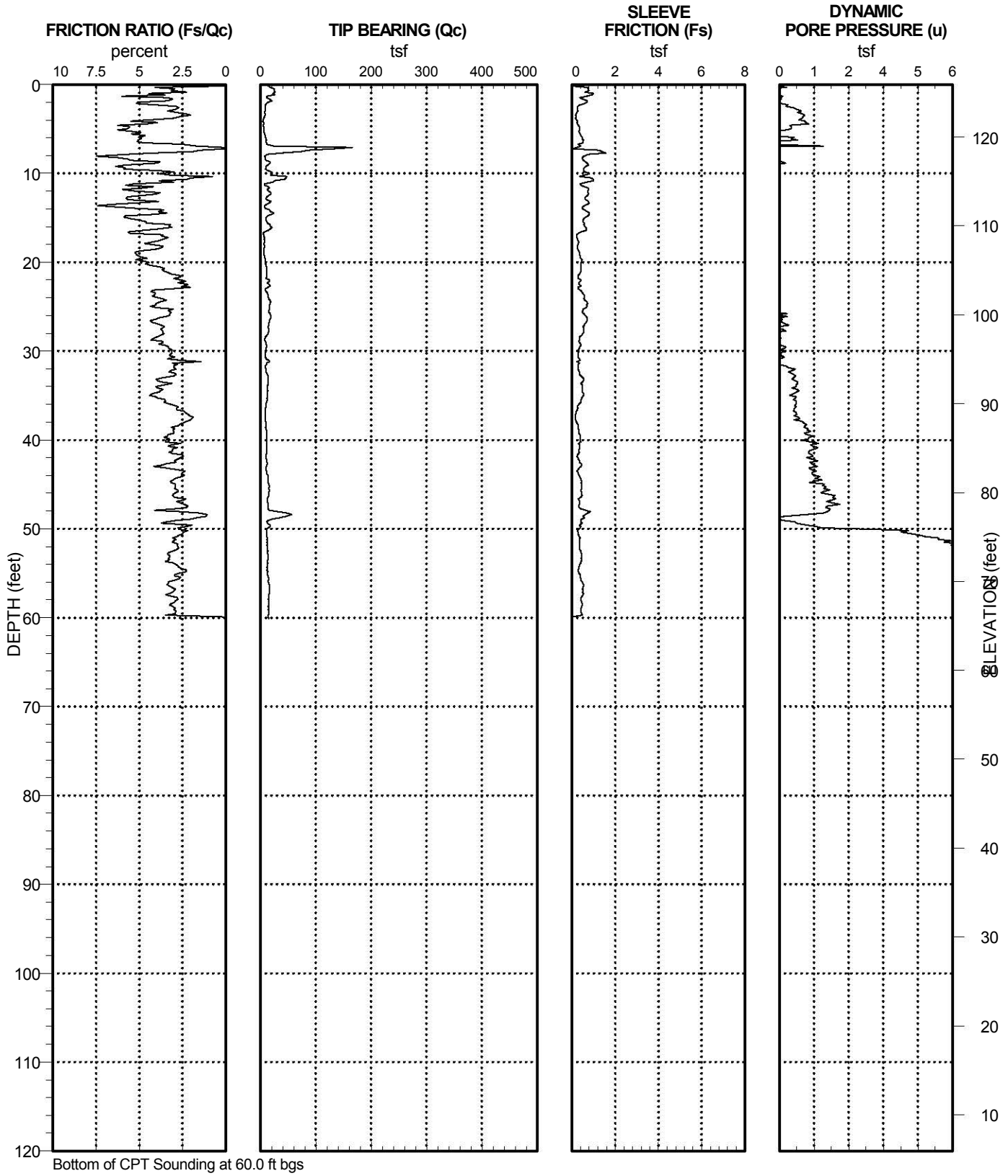
6 BR - CPT I5SR74SJ_LOTB.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/23/11



Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**CPT-10-004**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	POSTMILE **D0.0/D**	EA **12-0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**				
BRIDGE NUMBER **55-1104**	PREPARED BY	DATE		SHEET **1 of 1**

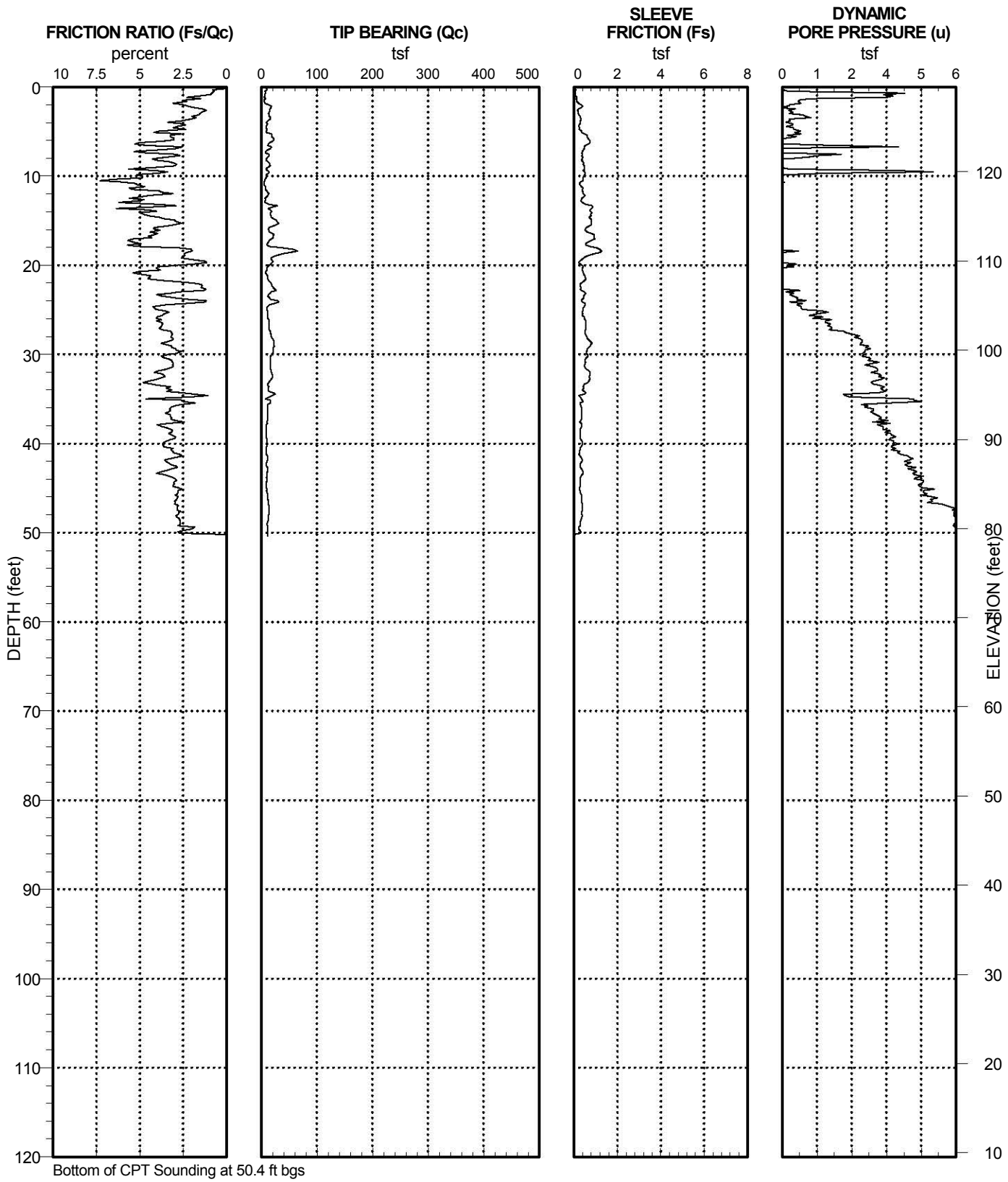
6 BR - CPT I5SR74SJ_LOTB.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/23/11



Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**CPT-10-005**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	POSTMILE **D0.0/D**	EA **12-0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**				
BRIDGE NUMBER **55-1104**	PREPARED BY	DATE		SHEET **1 of 1**

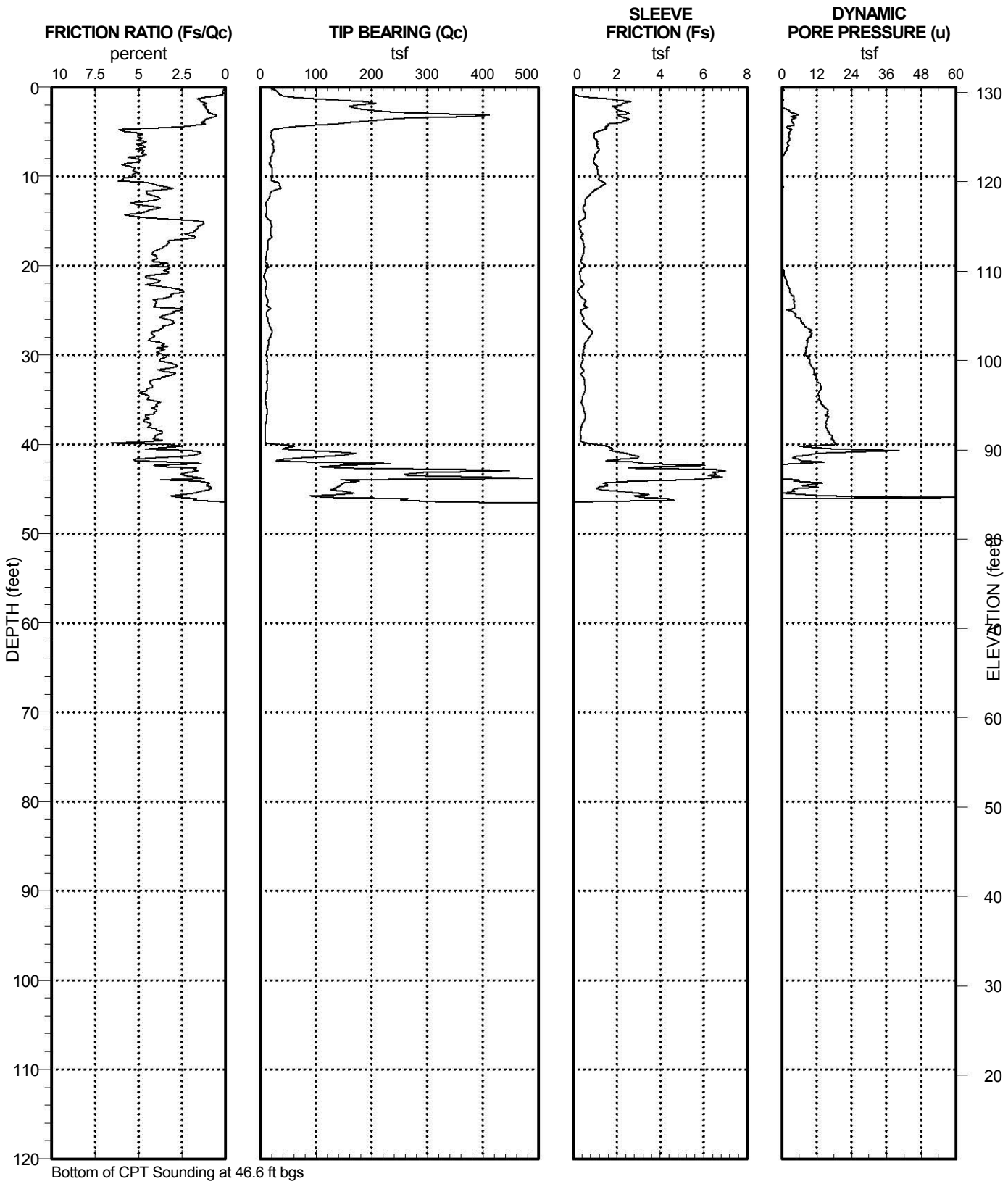
6 BR - CPT I5SR74SJ_LOTB.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/23/11



Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**CPT-10-006**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	POSTMILE **D0.0/D**	EA **12-0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**				
BRIDGE NUMBER **55-1104**	PREPARED BY	DATE		SHEET **1 of 1**

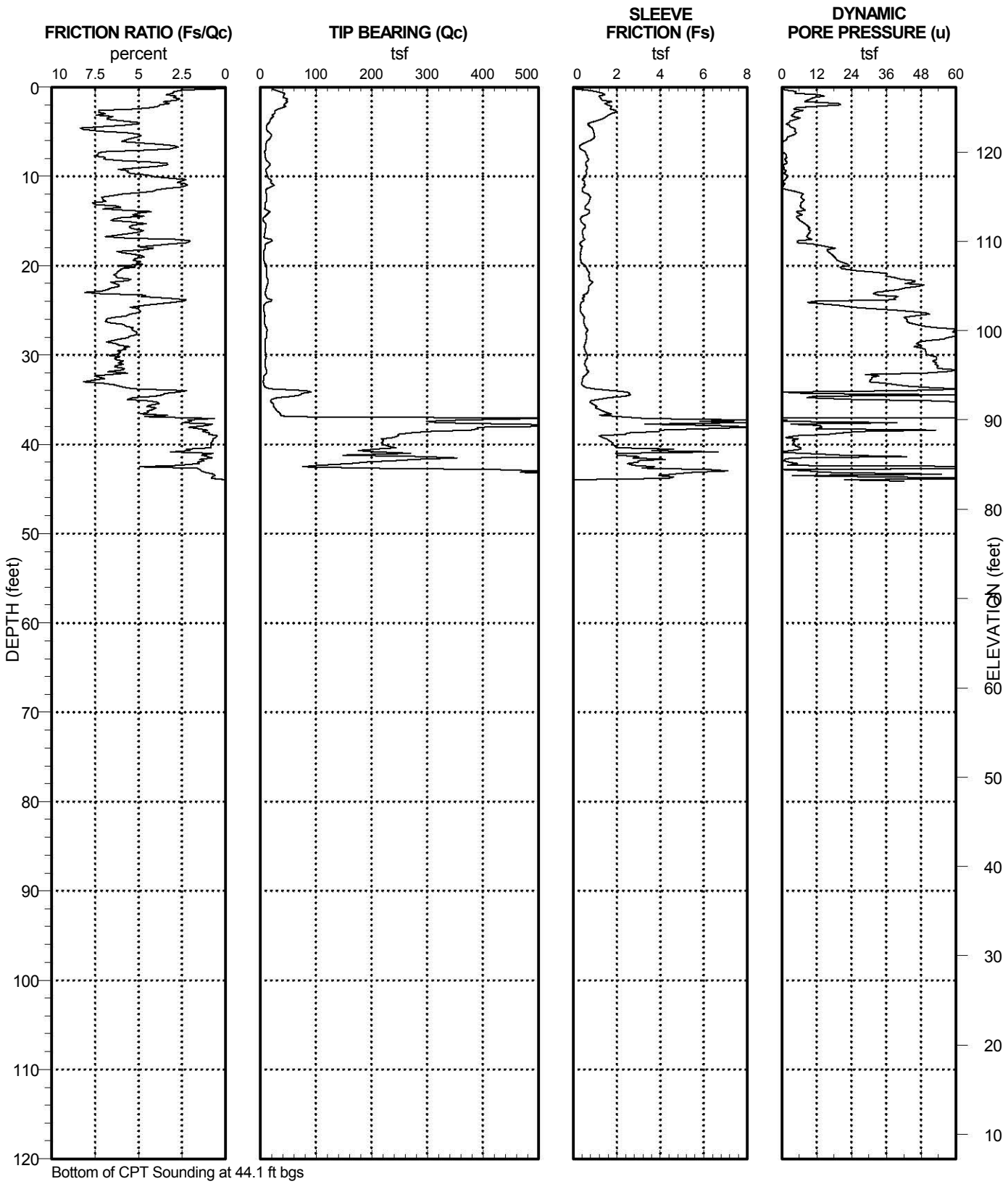
6 BR - CPT I5SR74SJ_LOTB.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/23/11



Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**CPT-10-011**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	POSTMILE **D0.0/D**	EA **12-0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**				
BRIDGE NUMBER **55-1104**	PREPARED BY	DATE		SHEET **1 of 1**

6 BR - CPT I5SR74SJ_LOTB.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/23/11

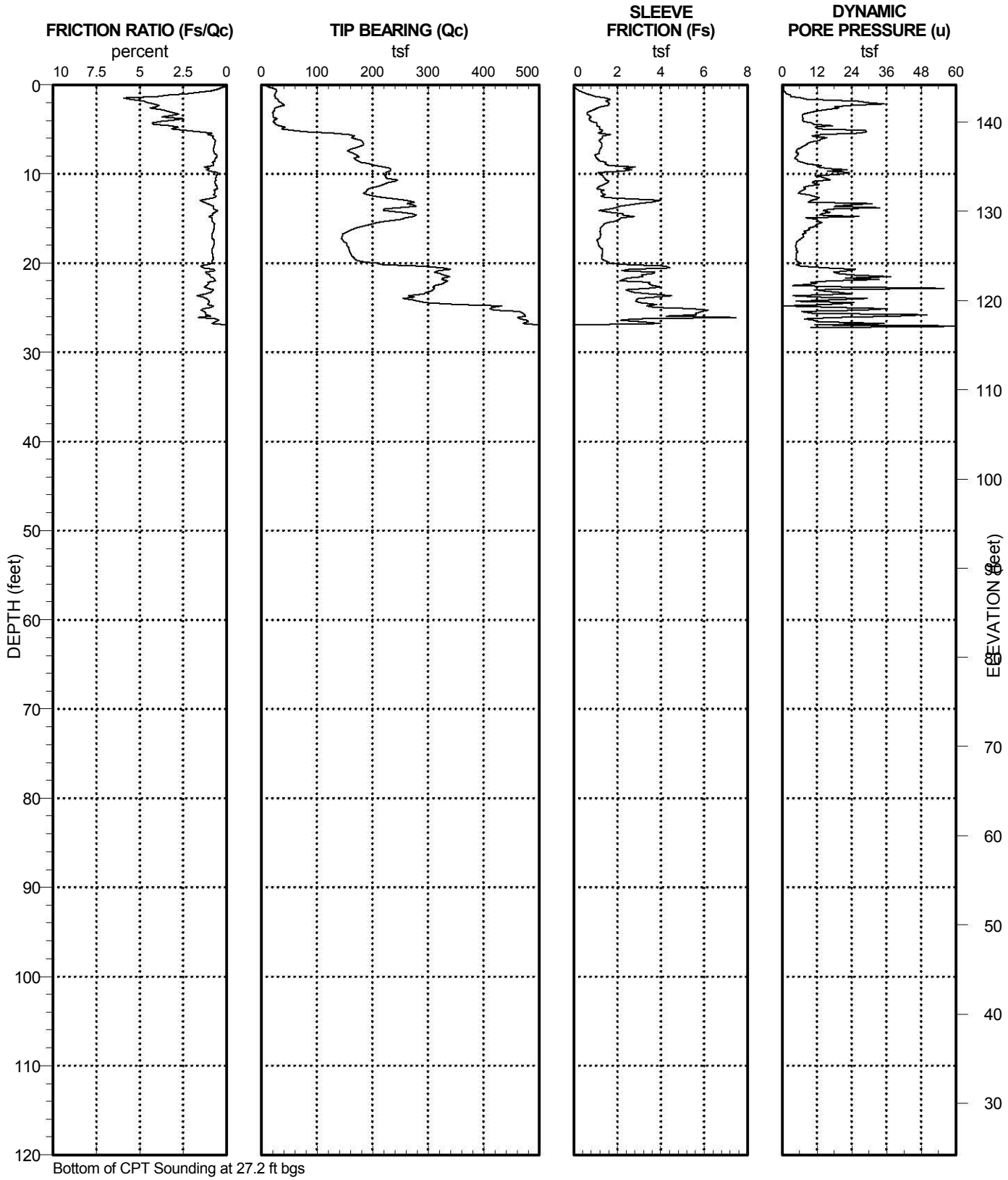


Bottom of CPT Sounding at 44.1 ft bgs

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**CPT-10-012**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	POSTMILE **D0.0/D**	EA **12-0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**				
BRIDGE NUMBER **55-1104**	PREPARED BY	DATE		SHEET **1 of 1**

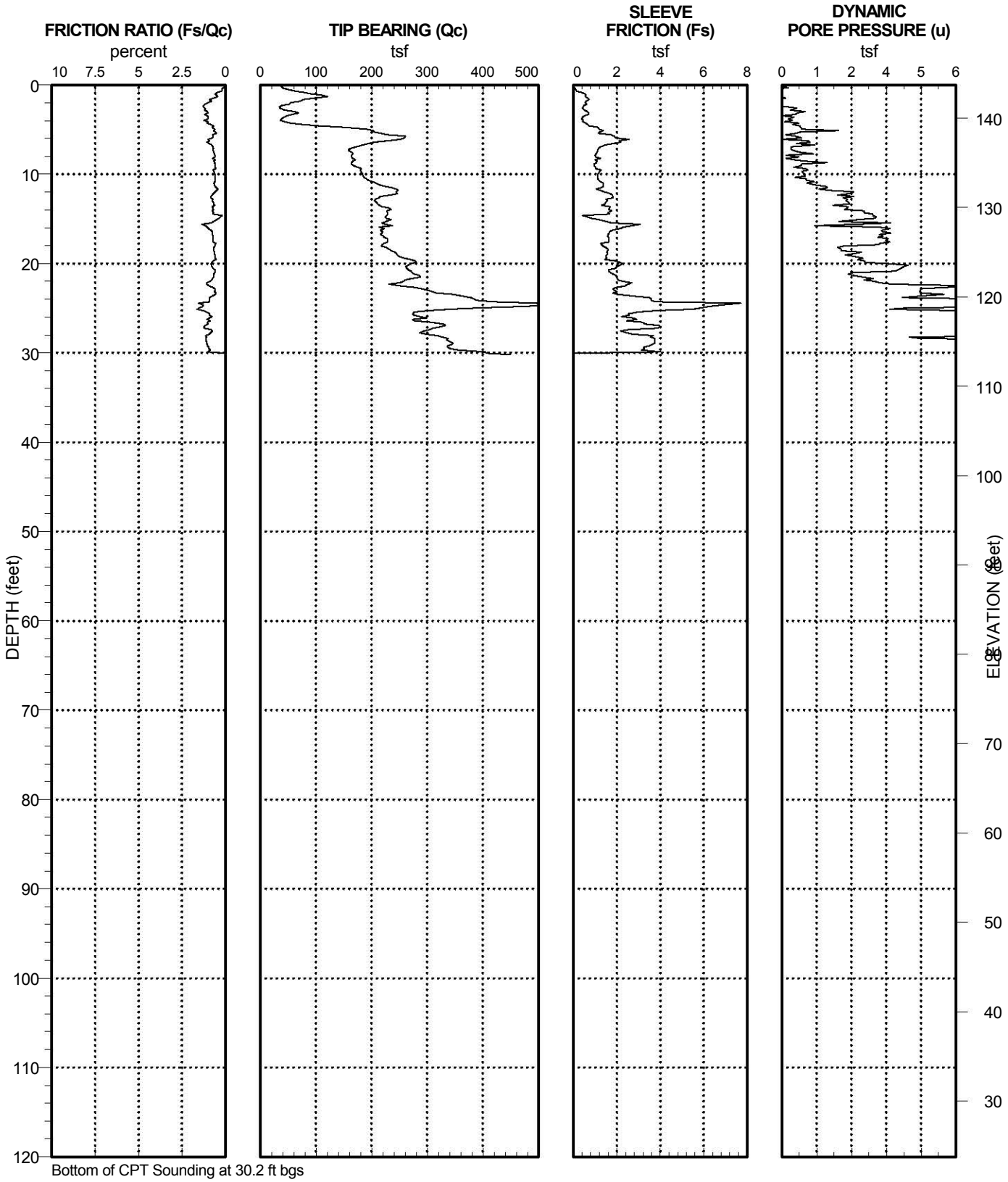
6 BR - CPT I5SR74SJ_LOTB.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/23/11



Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**CPT-10-014**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	POSTMILE **D0.0/D**	EA **12-0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**				
BRIDGE NUMBER **55-1104**	PREPARED BY	DATE		SHEET **1 of 1**

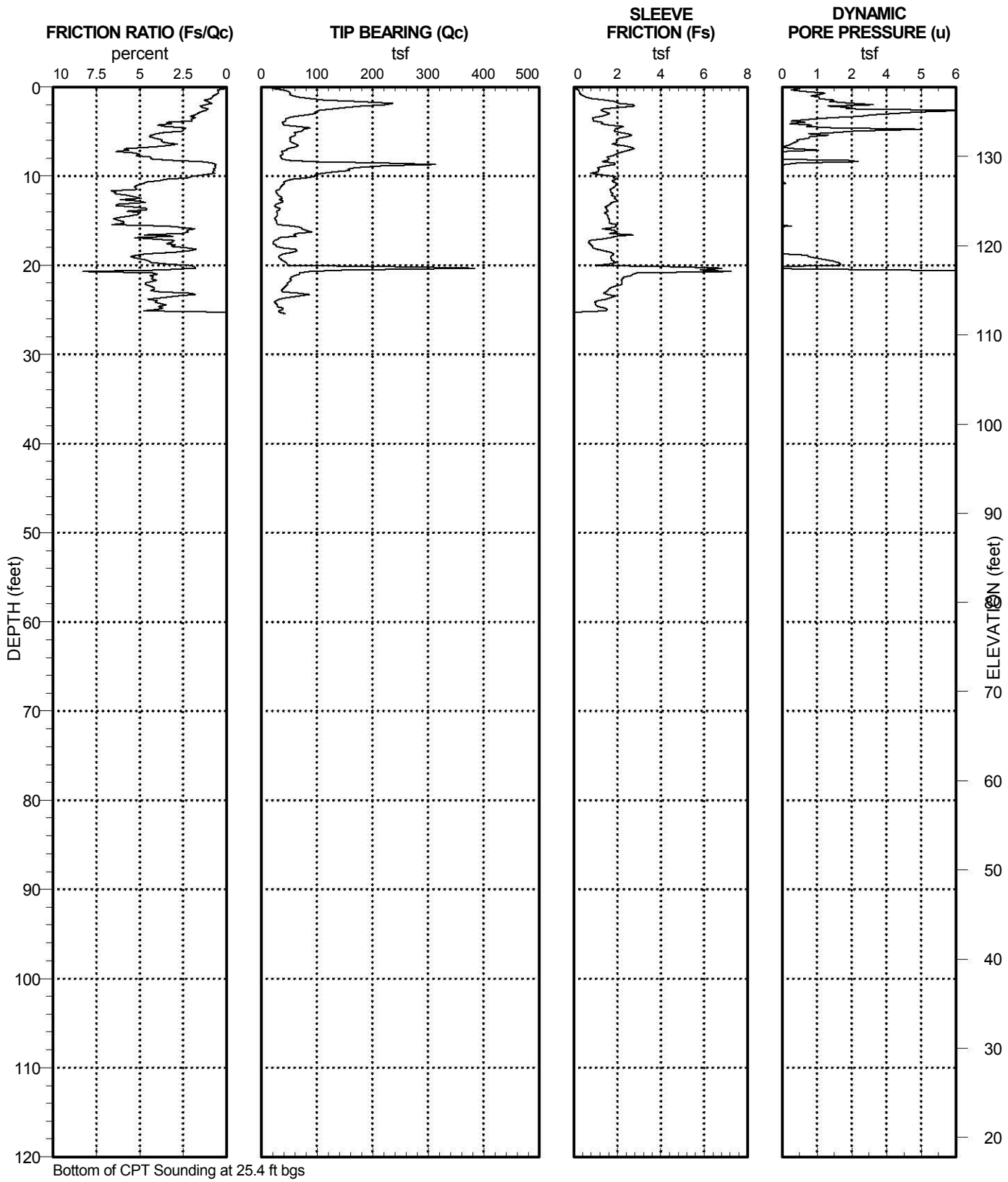
6 BR - CPT I5SR74SJ_LOTB.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/23/11



Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**CPT-10-015**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	POSTMILE **D0.0/D**	EA **12-0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**				
BRIDGE NUMBER **55-1104**	PREPARED BY	DATE		SHEET **1 of 1**

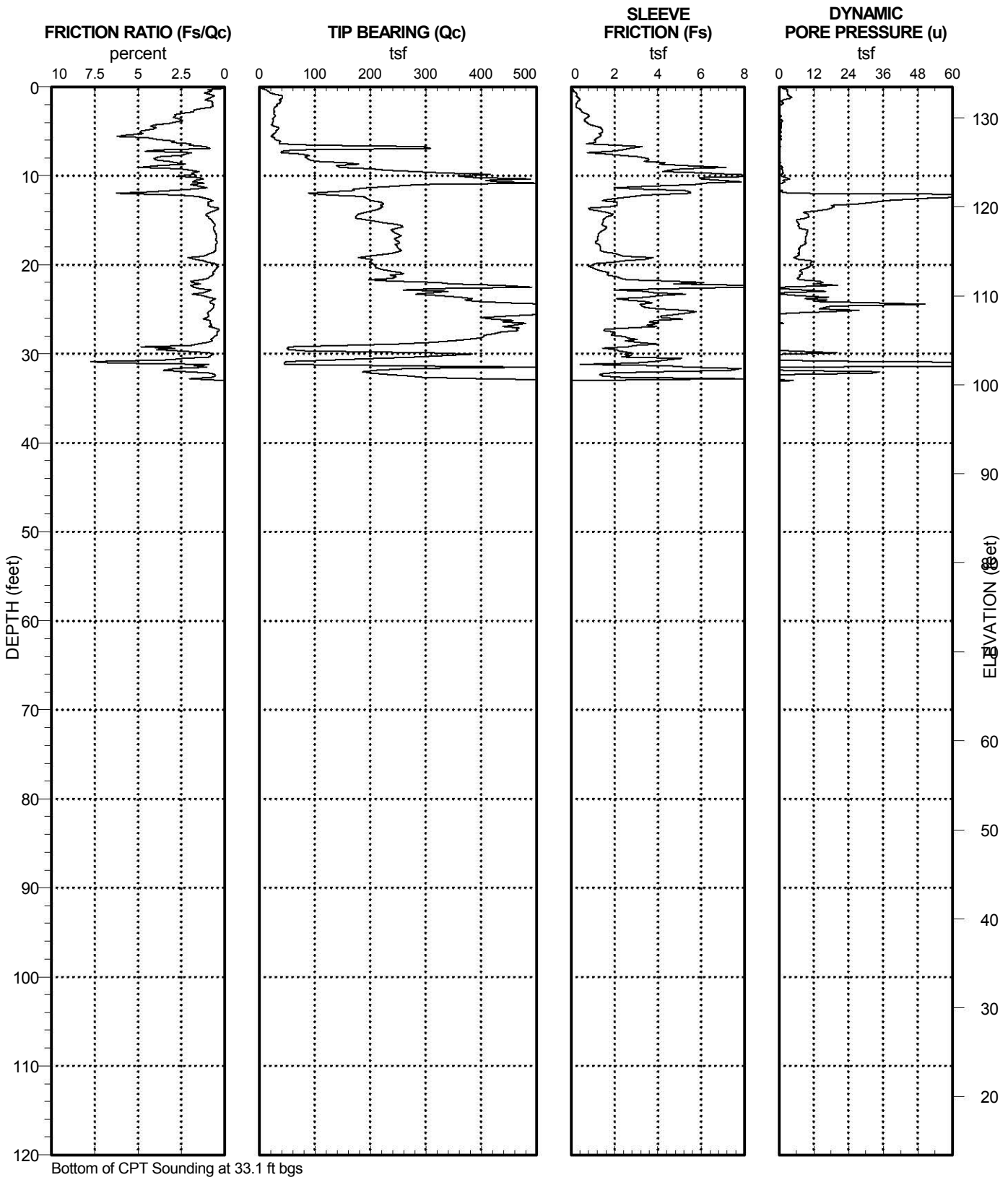
6 BR - CPT I5SR74SJ_LOTB.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/23/11



Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**CPT-10-016**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	POSTMILE **D0.0/D**	EA **12-0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**				
BRIDGE NUMBER **55-1104**	PREPARED BY	DATE		SHEET **1 of 1**

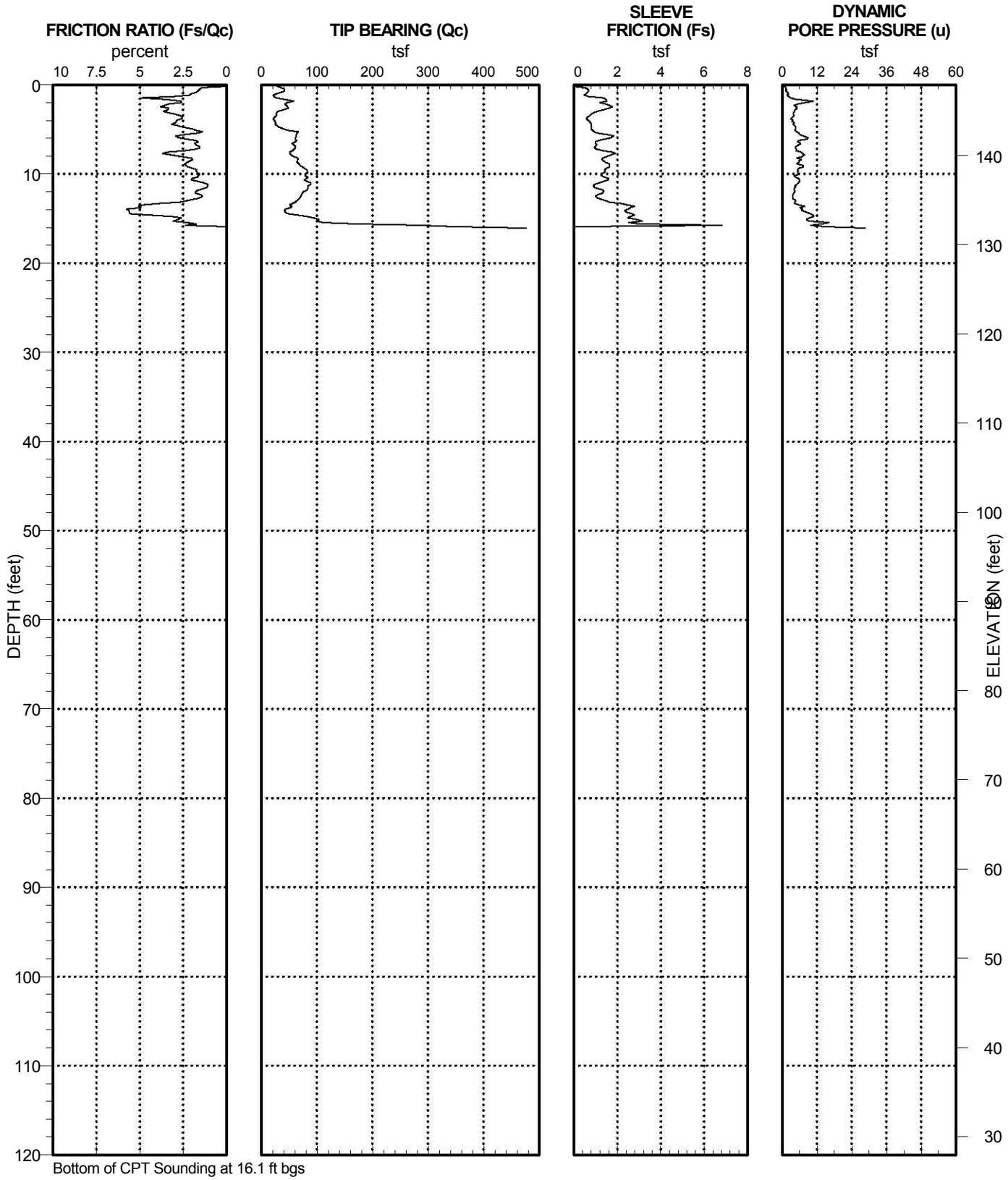
6 BR - CPT I5SR74SJ_LOTB.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/23/11



Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**CPT-10-017**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	POSTMILE **D0.0/D**	EA **12-0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**				
BRIDGE NUMBER **55-1104**	PREPARED BY	DATE		SHEET **1 of 1**

6 BR - CPT I5SR74SJ_LOTB.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/23/11

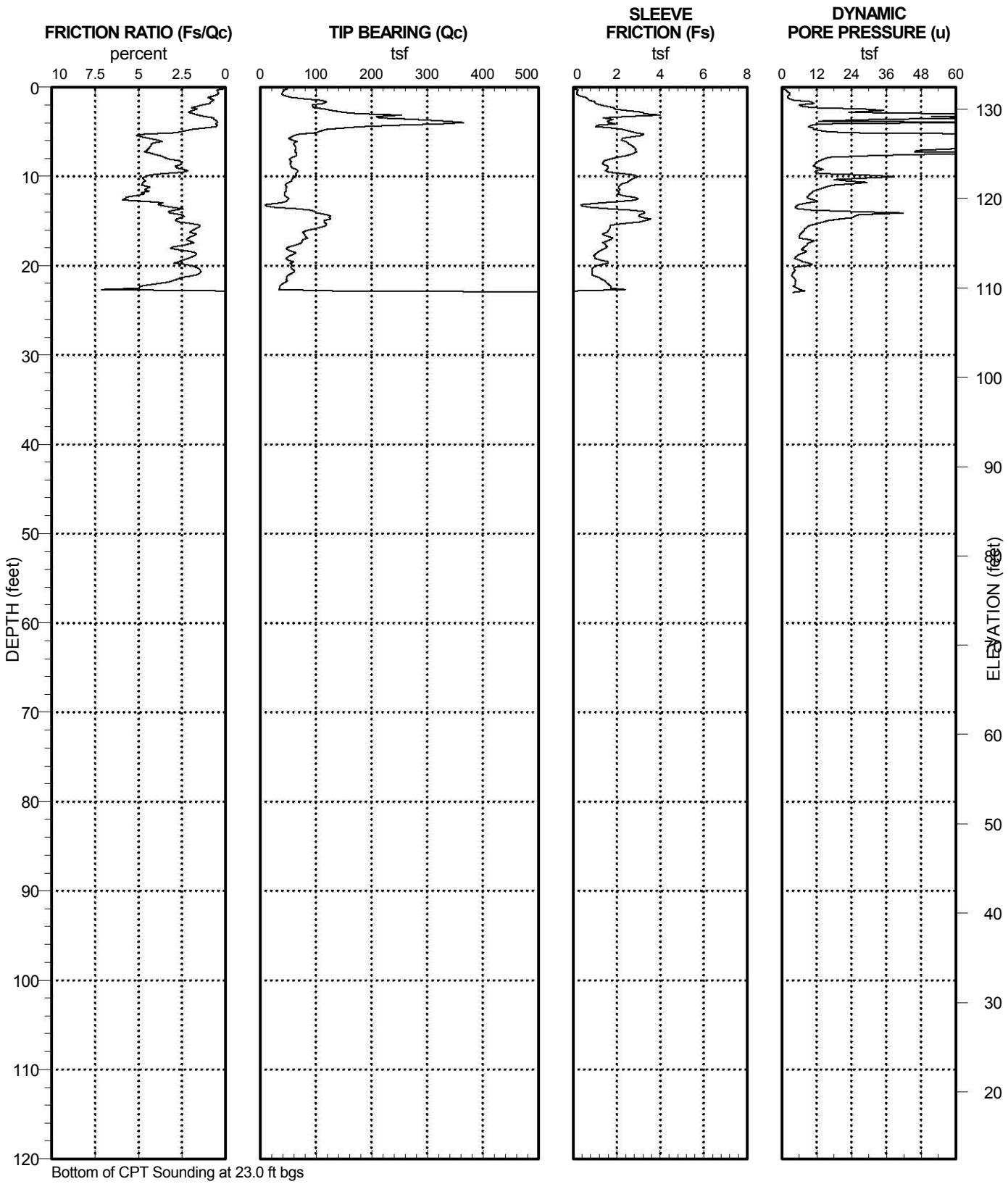


Bottom of CPT Sounding at 16.1 ft bgs

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**CPT-10-018**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	POSTMILE **D0.0/D**	EA **12-0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**				
BRIDGE NUMBER **55-1104**	PREPARED BY	DATE		SHEET **1 of 1**

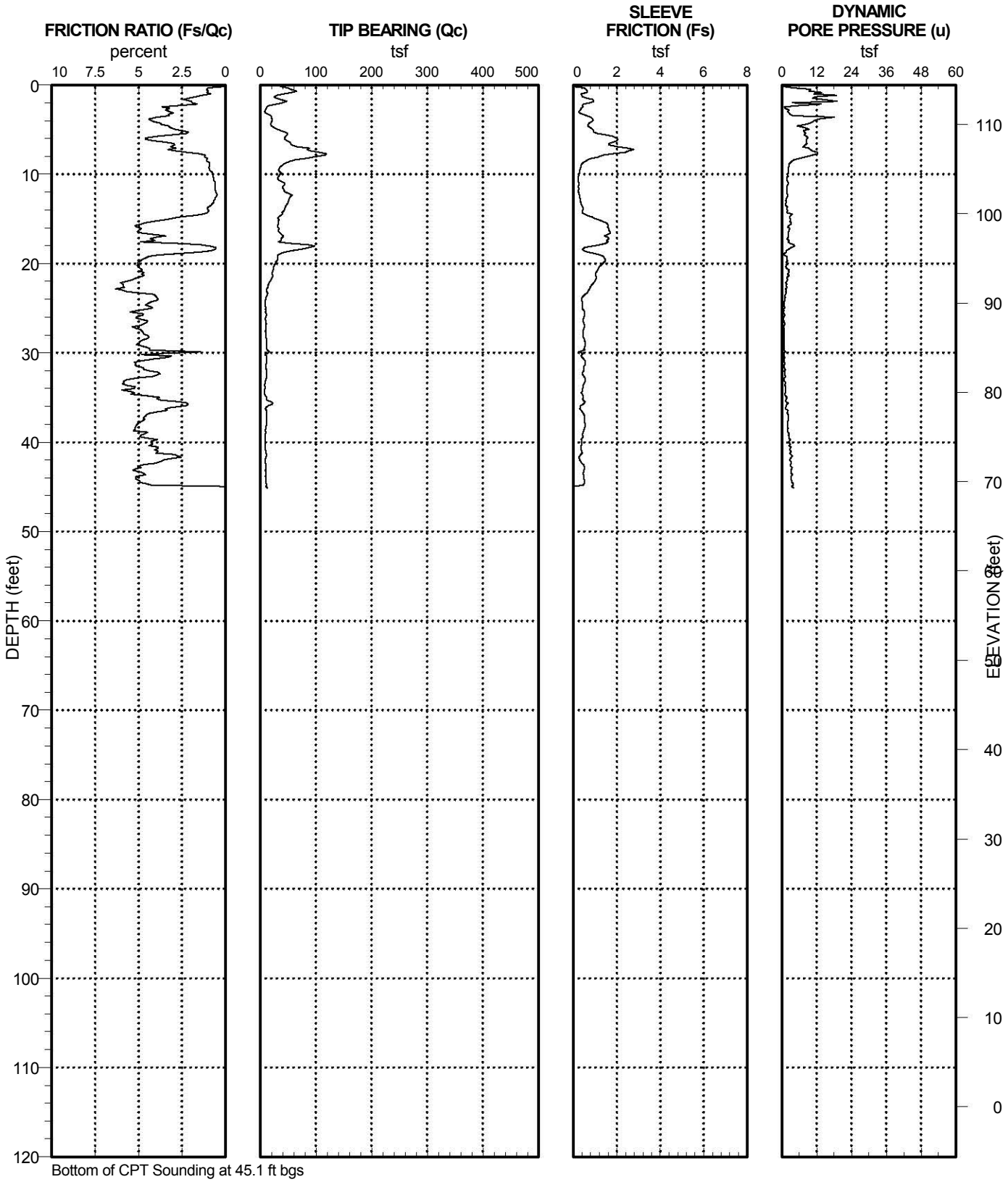
6 BR - CPT I5SR74SJ_LOTB.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/23/11



Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**CPT-10-019**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	POSTMILE **D0.0/D**	EA **12-0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**				
BRIDGE NUMBER **55-1104**	PREPARED BY	DATE		SHEET **1 of 1**

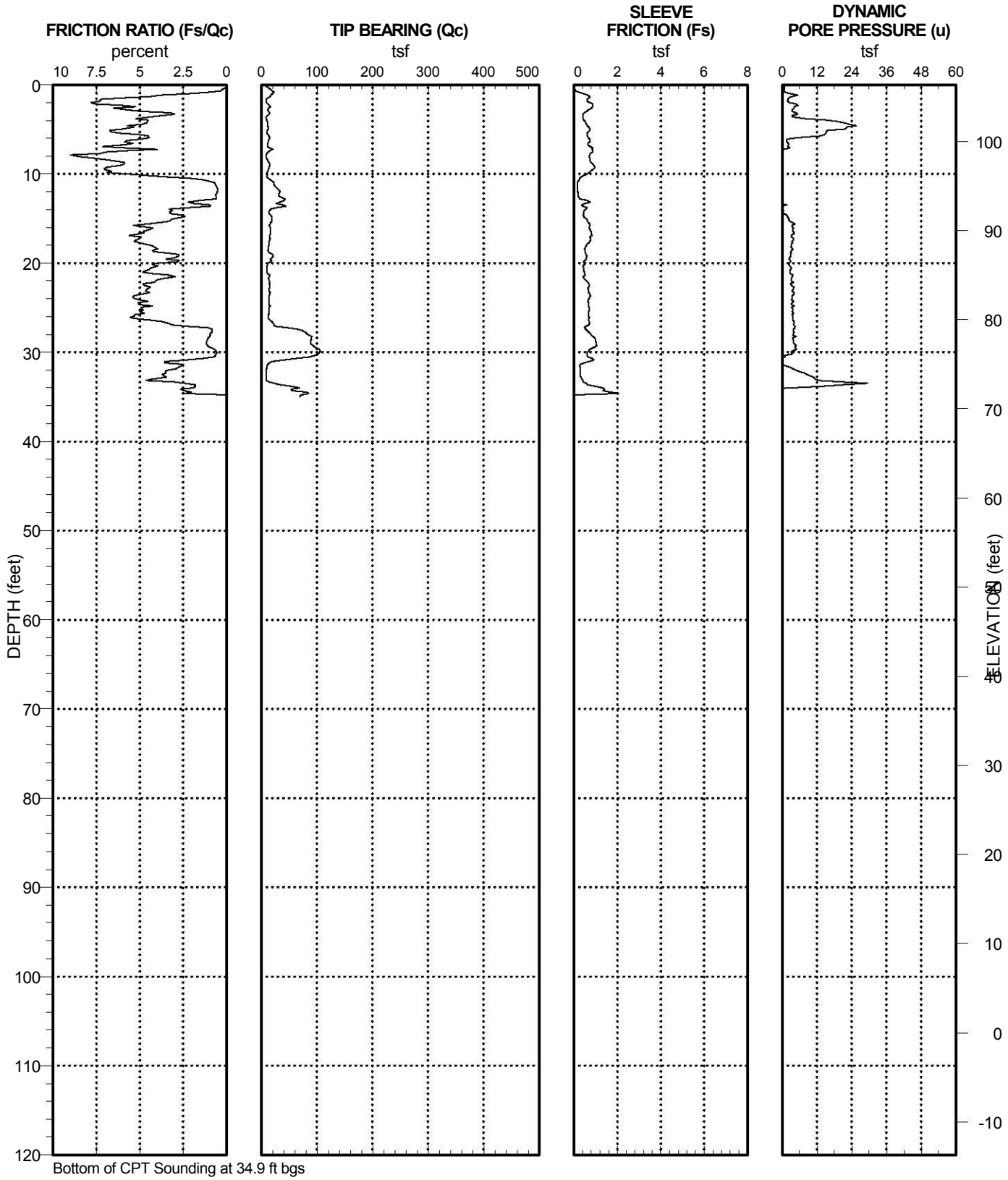
6 BR - CPT I5SR74SJ_LOTB.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/23/11



Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**CPT-10-023**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	POSTMILE **D0.0/D**	EA **12-0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**				
BRIDGE NUMBER **55-1104**	PREPARED BY	DATE		SHEET **1 of 1**

6 BR - CPT I5SR74SJ_LOTB.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/23/11



Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**CPT-10-025**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	POSTMILE **D0.0/D**	EA **12-0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**				
BRIDGE NUMBER **55-1104**	PREPARED BY	DATE		SHEET **1 of 1**

6 BR - CPT I5SR74SJ_LOTB.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/23/11

GROUP SYMBOLS AND NAMES

Graphic / Symbol	Group Names
GW	Well-graded GRAVEL Well-graded GRAVEL with SAND
GP	Poorly graded GRAVEL Poorly graded GRAVEL with SAND
GW-GM	Well-graded GRAVEL with SILT Well-graded GRAVEL with SILT and SAND
GW-GC	Well-graded GRAVEL with CLAY (or SILTY CLAY) Well-graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)
GP-GM	Poorly graded GRAVEL with SILT Poorly graded GRAVEL with SILT and SAND
GP-GC	Poorly graded GRAVEL with CLAY (or SILTY CLAY) Poorly graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)
GM	SILTY GRAVEL SILTY GRAVEL with SAND
GC	CLAYEY GRAVEL CLAYEY GRAVEL with SAND
GC-GM	SILTY, CLAYEY GRAVEL SILTY, CLAYEY GRAVEL with SAND
SW	Well-graded SAND Well-graded SAND with GRAVEL
SP	Poorly graded SAND Poorly graded SAND with GRAVEL
SW-SM	Well-graded SAND with SILT Well-graded SAND with SILT and GRAVEL
SW-SC	Well-graded SAND with CLAY (or SILTY CLAY) Well-graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)
SP-SM	Poorly graded SAND with SILT Poorly graded SAND with SILT and GRAVEL
SP-SC	Poorly graded SAND with CLAY (or SILTY CLAY) Poorly graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)
SM	SILTY SAND SILTY SAND with GRAVEL
SC	CLAYEY SAND CLAYEY SAND with GRAVEL
SC-SM	SILTY, CLAYEY SAND SILTY, CLAYEY SAND with GRAVEL
PT	PEAT
	COBBLES COBBLES and BOULDERS BOULDERS

Graphic / Symbol	Group Names
CL	Lean CLAY Lean CLAY with SAND Lean CLAY with GRAVEL SANDY lean CLAY SANDY lean CLAY with GRAVEL GRAVELLY lean CLAY GRAVELLY lean CLAY with SAND
CL-ML	SILTY CLAY SILTY CLAY with SAND SILTY CLAY with GRAVEL SANDY SILTY CLAY SANDY SILTY CLAY with GRAVEL GRAVELLY SILTY CLAY GRAVELLY SILTY CLAY with SAND
ML	SILT SILT with SAND SILT with GRAVEL SANDY SILT SANDY SILT with GRAVEL GRAVELLY SILT GRAVELLY SILT with SAND
OL	ORGANIC lean CLAY ORGANIC lean CLAY with SAND ORGANIC lean CLAY with GRAVEL SANDY ORGANIC lean CLAY SANDY ORGANIC lean CLAY with GRAVEL GRAVELLY ORGANIC lean CLAY GRAVELLY ORGANIC lean CLAY with SAND
OL	ORGANIC SILT ORGANIC SILT with SAND ORGANIC SILT with GRAVEL SANDY ORGANIC SILT SANDY ORGANIC SILT with GRAVEL GRAVELLY ORGANIC SILT GRAVELLY ORGANIC SILT with SAND
CH	Fat CLAY Fat CLAY with SAND Fat CLAY with GRAVEL SANDY fat CLAY SANDY fat CLAY with GRAVEL GRAVELLY fat CLAY GRAVELLY fat CLAY with SAND
MH	Elastic SILT Elastic SILT with SAND Elastic SILT with GRAVEL SANDY elastic SILT SANDY elastic SILT with GRAVEL GRAVELLY elastic SILT GRAVELLY elastic SILT with SAND
OH	ORGANIC fat CLAY ORGANIC fat CLAY with SAND ORGANIC fat CLAY with GRAVEL SANDY ORGANIC fat CLAY SANDY ORGANIC fat CLAY with GRAVEL GRAVELLY ORGANIC fat CLAY GRAVELLY ORGANIC fat CLAY with SAND
OH	ORGANIC elastic SILT ORGANIC elastic SILT with SAND ORGANIC elastic SILT with GRAVEL SANDY elastic ELASTIC SILT SANDY ORGANIC elastic SILT with GRAVEL GRAVELLY ORGANIC elastic SILT GRAVELLY ORGANIC elastic SILT with SAND
OL/OH	ORGANIC SOIL ORGANIC SOIL with SAND ORGANIC SOIL with GRAVEL SANDY ORGANIC SOIL SANDY ORGANIC SOIL with GRAVEL GRAVELLY ORGANIC SOIL GRAVELLY ORGANIC SOIL with SAND

FIELD AND LABORATORY TESTS

C	Consolidation (ASTM D 2435-04)
CL	Collapse Potential (ASTM D 5333-03)
CP	Compaction Curve (CTM 216 - 06)
CR	Corrosion, Sulfates, Chlorides (CTM 643 - 99; CTM 417 - 06; CTM 422 - 06)
CU	Consolidated Undrained Triaxial (ASTM D 4767-02)
DS	Direct Shear (ASTM D 3080-04)
EI	Expansion Index (ASTM D 4829-03)
M	Moisture Content (ASTM D 2216-05)
OC	Organic Content (ASTM D 2974-07)
P	Permeability (CTM 220 - 05)
PA	Particle Size Analysis (ASTM D 422-63 [2002])
PI	Liquid Limit, Plastic Limit, Plasticity Index (AASHTO T 89-02, AASHTO T 90-00)
PL	Point Load Index (ASTM D 5731-05)
PM	Pressure Meter
PP	Pocket Penetrometer
R	R-Value (CTM 301 - 00)
SE	Sand Equivalent (CTM 217 - 99)
SG	Specific Gravity (AASHTO T 100-06)
SL	Shrinkage Limit (ASTM D 427-04)
SW	Swell Potential (ASTM D 4546-03)
TV	Pocket Torvane
UC	Unconfined Compression - Soil (ASTM D 2166-06) Unconfined Compression - Rock (ASTM D 2938-95)
UU	Unconsolidated Undrained Triaxial (ASTM D 2850-03)
UW	Unit Weight (ASTM D 4767-04)
VS	Vane Shear (AASHTO T 223-96 [2004])

SAMPLER GRAPHIC SYMBOLS

- Standard Penetration Test (SPT)
- Standard California Sampler
- Modified California Sampler
- Shelby Tube
- Piston Sampler
- NX Rock Core
- HQ Rock Core
- Bulk Sample
- Other (see remarks)

DRILLING METHOD SYMBOLS

- Auger Drilling
- Rotary Drilling
- Dynamic Cone or Hand Driven
- Diamond Core

WATER LEVEL SYMBOLS

- First Water Level Reading (during drilling)
- Static Water Level Reading (short-term)
- Static Water Level Reading (long-term)

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE
BORING RECORD LEGEND

DIST.	COUNTY	ROUTE	POSTMILE	EA
12	Orange	I-5	D0.0/D	12-0E3101

PROJECT OR BRIDGE NAME
I-5 and SR-74 Interchange

BRIDGE NUMBER	PREPARED BY	DATE	SHEET
55-1104			1 of 3

CONSISTENCY OF COHESIVE SOILS

Descriptor	Unconfined Compressive Strength (tsf)	Pocket Penetrometer (tsf)	Torvane (tsf)	Field Approximation
Very Soft	< 0.25	< 0.25	< 0.12	Easily penetrated several inches by fist
Soft	0.25 - 0.50	0.25 - 0.50	0.12 - 0.25	Easily penetrated several inches by thumb
Medium Stiff	0.50 - 1.0	0.50 - 1.0	0.25 - 0.50	Can be penetrated several inches by thumb with moderate effort
Stiff	1.0 - 2.0	1.0 - 2.0	0.50 - 1.0	Readily indented by thumb but penetrated only with great effort
Very Stiff	2.0 - 4.0	2.0 - 4.0	1.0 - 2.0	Readily indented by thumbnail
Hard	> 4.0	> 4.0	> 2.0	Indented by thumbnail with difficulty

APPARENT DENSITY OF COHESIONLESS SOILS

Descriptor	SPT N_{60} - Value (blows / foot)
Very Loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE

Descriptor	Criteria
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

PERCENT OR PROPORTION OF SOILS

Descriptor	Criteria
Trace	Particles are present but estimated to be less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

SOIL PARTICLE SIZE

Descriptor		Size
Boulder		> 12 inches
Cobble		3 to 12 inches
Gravel	Coarse	3/4 inch to 3 inches
	Fine	No. 4 Sieve to 3/4 inch
Sand	Coarse	No. 10 Sieve to No. 4 Sieve
	Medium	No. 40 Sieve to No. 10 Sieve
	Fine	No. 200 Sieve to No. 40 Sieve
Silt and Clay		Passing No. 200 Sieve

PLASTICITY OF FINE-GRAINED SOILS

Descriptor	Criteria
Nonplastic	A 1/8-inch thread cannot be rolled at any water content.
Low	The thread can barely be rolled, and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll, and not much time is required to reach the plastic limit; it cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.

CEMENTATION

Descriptor	Criteria
Weak	Crumbles or breaks with handling or little finger pressure.
Moderate	Crumbles or breaks with considerable finger pressure.
Strong	Will not crumble or break with finger pressure.

NOTE: This legend sheet provides descriptors and associated criteria for required soil description components only. Refer to Caltrans Soil and Rock Logging, Classification, and Presentation Manual (July 2007), Section 2, for tables of additional soil description components and discussion of soil description and identification.

ROCK GRAPHIC SYMBOLS

IGNEOUS ROCK

SEDIMENTARY ROCK

METAMORPHIC ROCK

BEDDING SPACING

Descriptor	Thickness or Spacing
Massive	> 10 ft
Very thickly bedded	3 to 10 ft
Thickly bedded	1 to 3 ft
Moderately bedded	3-5/8 inches to 1 ft
Thinly bedded	1-1/4 to 3-5/8 inches
Very thinly bedded	3/8 inch to 1-1/4 inches
Laminated	< 3/8 inch

WEATHERING DESCRIPTORS FOR INTACT ROCK

	Diagnostic Features					
	Chemical Weathering-Discoloration-Oxidation		Mechanical Weathering and Grain Boundary Conditions	Texture and Solutioning		
Descriptor	Body of Rock	Fracture Surfaces		Texture	Solutioning	General Characteristics
Fresh	No discoloration, not oxidized	No discoloration or oxidation	No separation, intact (tight)	No change	No solutioning	Hammer rings when crystalline rocks are struck.
Slightly Weathered	Discoloration or oxidation is limited to surface of, or short distance from, fractures; some feldspar crystals are dull	Minor to complete discoloration or oxidation of most surfaces	No visible separation, intact (tight)	Preserved	Minor leaching of some soluble minerals may be noted	Hammer rings when crystalline rocks are struck. Body of rock not weakened.
Moderately Weathered	Discoloration or oxidation extends from fractures usually throughout; Fe-Mg minerals are "rusty"; feldspar crystals are "cloudy"	All fracture surfaces are discolored or oxidized	Partial separation of boundaries visible	Generally preserved	Soluble minerals may be mostly leached	Hammer does not ring when rock is struck. Body of rock is slightly weakened.
Intensely Weathered	Discoloration or oxidation throughout; all feldspars and Fe-Mg minerals are altered to clay to some extent; or chemical alteration produces in situ disaggregation (refer to grain boundary conditions)	All fracture surfaces are discolored or oxidized; surfaces are friable	Partial separation, rock is friable; in semi-arid conditions, granitics are disaggregated	Altered by chemical disintegration such as via hydration or argillation	Leaching of soluble minerals may be complete	Dull sound when struck with hammer; usually can be broken with moderate to heavy manual pressure or by light hammer blow without reference to planes of weakness such as incipient or hairline fractures or veinlets. Rock is significantly weakened.
Decomposed	Discolored of oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe-Mg minerals are completely altered to clay		Complete separation of grain boundaries (disaggregated)	Resembles a soil; partial or complete remnant rock structure may be preserved; leaching of soluble minerals usually complete		Can be granulated by hand. Resistant minerals such as quartz may be present as "stringers" or "dikes".

Note: Combination descriptors (such as "slightly weathered to fresh") are used where equal distribution of both weathering characteristics is present over significant intervals or where characteristics present are "in between" the diagnostic feature. However, combination descriptors should not be used where significant identifiable zones can be delineated. Only two adjacent descriptors shall be combined. "Very intensely weathered" is the combination descriptor for "decomposed to intensely weathered".

RELATIVE STRENGTH OF INTACT ROCK

Descriptor	Uniaxial Compressive Strength (psi)
Extremely Strong	> 30,000
Very Strong	14,500 - 30,000
Strong	7,000 - 14,500
Medium Strong	3,500 - 7,000
Weak	700 - 3,500
Very Weak	150 - 700
Extremely Weak	< 150

ROCK HARDNESS

Descriptor	Criteria
Extremely Hard	Specimen cannot be scratched with pocket knife or sharp pick; can only be chipped with repeated heavy hammer blows
Very hard	Specimen cannot be scratched with pocket knife or sharp pick; breaks with repeated heavy hammer blows
Hard	Specimen can be scratched with pocket knife or sharp pick with heavy pressure; heavy hammer blows required to break specimen
Moderately Hard	Specimen can be scratched with pocket knife or sharp pick with light or moderate pressure; breaks with moderate hammer blows
Moderately Soft	Specimen can be grooved 1/6 in. with pocket knife or sharp pick with moderate or heavy pressure; breaks with light hammer blow or heavy hand pressure
Soft	Specimen can be grooved or gouged with pocket knife or sharp pick with light pressure, breaks with light to moderate hand pressure
Very Soft	Specimen can be readily indented, grooved, or gouged with fingernail, or carved with pocket knife; breaks with light hand pressure

CORE RECOVERY CALCULATION (%)

$$\frac{\Sigma \text{ Length of the recovered core pieces (in.)}}{\text{Total length of core run (in.)}} \times 100$$

RQD CALCULATION (%)

$$\frac{\Sigma \text{ Length of intact core pieces > 4 in.}}{\text{Total length of core run (in.)}} \times 100$$

FRACTURE DENSITY

Descriptor	Criteria
Unfractured	No fractures
Very Slightly Fractured	Lengths greater 3 ft
Slightly Fractured	Lengths from 1 to 3 ft, few lengths outside that range
Moderately Fractured	Lengths mostly in range of 4 in. to 1 ft, with most lengths about 8 in.
Intensely Fractured	Lengths average from 1 in. to 4 in. with scattered fragmented intervals with lengths less than 4 in.
Very Intensely Fractured	Mostly chips and fragments with few scattered short core lengths

ATTACHMENT B
GEOTECHNICAL LABORATORY TESTS

ATTACHMENT B

LABORATORY TESTING

Geotechnical soil samples obtained from the borings were carefully sealed and packaged in the field to reduce moisture loss and disturbance. The samples were subsequently delivered to our laboratory where they were further examined and classified. Selected representative samples were tested to evaluate moisture content, in-situ dry density, fines content, Atterberg limits, shear strength, compressibility, and corrosivity of the soils. All tests discussed below were performed in accordance with the latest American Society of Testing and Materials (ASTM) and California Test Method (CTM) guidelines.

Moisture Content and Dry Density (ASTM D2937) Tests

The moisture content and density tests were performed on selected soil samples obtained from the borings. The moisture content and dry density tests were performed in accordance with ASTM Test Methods D 2216 and 2937, respectively. The results of these tests are presented in Attachment B on the summary sheet labeled "Santa Ana Geotechnical Laboratory Testing Summary" and are also presented on the Boring Logs.

Atterberg Limits Tests (ASTM D4318)

Atterberg Limits tests were performed to aid in classification and to evaluate the plasticity characteristics of fine-grained materials encountered in the borings. The test was performed in accordance with ASTM Test Method D 4318. The results of these tests are presented in Attachment B both numerically and graphically on the "Plasticity Chart", as well as on the summary sheet labeled "Santa Ana Geotechnical Laboratory Testing Summary" and on the Boring Logs (denoted by "LL" and "PI").

Wash Analysis (ASTM D1140)

Analyses were performed to determine the percentage of materials finer than a Standard No. 200 sieve. The percentages of fines content based on the results of wash sieve analyses are presented in Attachment B on the summary sheet labeled "Santa Ana Geotechnical Laboratory Testing Summary" and are also presented on the Boring Logs at the corresponding sample depth (denoted by "WA").

Sieve Analysis (ASTM D422)

Tests were performed to determine the particle size distribution of selected soil samples. These tests were performed in accordance with ASTM Test Method D 422. Test results are presented in Attachment B both numerically and graphically on the "Particle-Size Distribution Curves", as well as on the summary sheet labeled "Santa Ana Geotechnical Laboratory Testing Summary".

Corrosivity Tests (CTM 417, 422, 532 and 643)

Corrosivity testing was conduced on selected bulk samples obtained from the borings. Determination of the soluble sulfate and water-soluble chloride content of on-site soils were performed in accordance with CTM Test Method 417 and 422. Minimum resistivity and pH testing were conducted in accordance with CTM Test Method 532 and 643. The results of the corrosion tests are presented in Attachment B on the summary sheet labeled "Santa Ana Geotechnical Laboratory Testing Summary".

Consolidation Tests (ASTM D2435, D4546, D5333)

Consolidation tests were performed on select, representative, relatively undisturbed samples in accordance with ASTM Test Methods D2435, D4546 and D5333. This test method covers procedures for determining the magnitude of consolidation of soil, when it is restrained laterally and drained axially while subjected to incrementally applied controlled-stress loading. The results of the consolidation tests are presented in Attachment B on the detailed worksheets.

Direct Shear Tests (ASTM D3080)

Consolidated-drained (saturated) direct shear tests were performed on selected undisturbed samples to evaluate shear strength parameters of the on-site soils. The direct shear tests were performed in accordance with ASTM Test Method D 3080. The results of the direct shear tests are presented in Attachment B on the detailed worksheets.

Unconfined Compression Tests (ASTM D2166)

Tests were performed to determine the unconfined compressive strength of cohesive soil in the intact using strain-controlled application of the axial load was performed in accordance with ASTM D2166. The results of the unconfined compression tests are presented in Attachment B on the figures labeled "Unconfined Compression Test".

Unconsolidated-Undrained Triaxial Compression Tests (ASTM D2850)

Unconsolidated-undrained triaxial compression tests were performed on relatively undisturbed samples obtained from the borings. Determination of strength and stress-strain relationships of a cylindrical specimen of cohesive soil was conducted in accordance with ASTM D2850. The results of the unconsolidated-undrained triaxial compression tests are presented in Attachment B on the figures labeled "Unconsolidated-Undrained Triaxial Compression Test".

Santa Ana Geotechnical Laboratory Testing Summary

Project Name: I-5 / SR-74 Interchange
Project Number: 30989830, TO 59030
Project Engineer: FM

LOCATION				INITIAL CONDITION			INDEX																
							Limits			Gradation				SG	C	CU	UU	DS	UC	CORROSIVITY			
Exploration Number	Sample/ Specimen Number	Depth (ft)	USCS Symbol	Water Content (%)	Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Liquid Limit (%)	Plasticity Index (%)	Liquidity Index	Gravel (%)	Sand (%)	Fines (%)	Clay Fraction, finer than 5mm (%)	Specific Gravity	Consolidation	Consolidated Undrained Triaxial	Unconsolidated Undrained peak dev. (ks	Direct Shear, Peak Friction Angle (deg)	Unconfined Compression peak (ksf)	pH	Minimum Resistivity (ohm - cm)	Sulfate Content (ppm)	Chloride Content (ppm)
R-11-001		5~50																		7.3	430	396	165
R-11-001	1	6.0	CL	30.7	119.8	91.7						90.7			done				6.9				
R-11-001	4	15.0	GC									33.9											
R-11-001	7	25.0	CL	26.4	121.6	96.2	43	27	0.39			87.1			done				1.79				
R-11-001	9	35.0	CL	29.3	121.4	93.9	49	30	0.34										2.95				
R-11-002		5~40																		7.2	350	471	330
R-11-002	4	11.5	CL	26.6	123.2	97.3	47	30	0.32			85.9			done				1.63				
R-11-002	5	15.0	CL									86.4											
R-11-002	6	16.5	CL	26.2	123.5	97.9	37	21	0.49			69.3			done				2.47				
R-11-002	8	25.0	CH	32.3	119.3	90.2	56	36	0.34														
R-11-002	10	35.0	CL				47	28															
R-10-007		5~45																		7.4	430	1349	345

Santa Ana Geotechnical Laboratory Testing Summary

Project Name: I-5 / SR-74 Interchange
Project Number: 30989830, TO 59030
Project Engineer: FM

LOCATION				INITIAL CONDITION			INDEX																
							Limits			Gradation				SG	C	CU	UU	DS	UC	CORROSIVITY			
Exploration Number	Sample/ Specimen Number	Depth (ft)	USCS Symbol	Water Content (%)	Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Liquid Limit (%)	Plasticity Index (%)	Liquidity Index	Gravel (%)	Sand (%)	Fines (%)	Clay Fraction, finer than 5mm (%)	Specific Gravity	Consolidation	Consolidated Undrained Triaxial	Unconsolidated Undrained peak dev. (ks	Direct Shear, Peak Friction Angle (deg)	Unconfined Compression peak (ksf)	pH	Minimum Resistivity (ohm - cm)	Sulfate Content (ppm)	Chloride Content (ppm)
R-10-007	2	10.0	CL	20.1	124.3	103.5	47	31	0.13										5.07				
R-10-007	5	25.0	CH	28.5			53	36	0.32														
R-10-007	8	40.0	CH	31.5			58	32	0.17						done								
R-10-008		5~60																		7.3	285	1572	270
R-10-008	1	5.0	CL	20.4	120.8	100.3																	
R-10-008	3	15.0	CH	29.2	120.7	93.4	57	40	0.31						done				2.69				
R-10-008	5	25.0	CH	32.1	118.4	89.6						92.2			done				4.34				
R-10-008	8	40.0	CL	24.0			37	22	0.41			65.6											
R-10-008	11	55.0	SC	14.2								25.9											
R-10-008	12	60.0	GC	9.7						65.4	1.8	32.8											
R-10-008		62.0	ROCK	28.8	120.9	93.9													9.17				
R-10-008		75.0	ROCK	23.2	121.4	98.5													44.03				

Santa Ana Geotechnical Laboratory Testing Summary

Project Name: I-5 / SR-74 Interchange
Project Number: 30989830, TO 59030
Project Engineer: FM

LOCATION				INITIAL CONDITION			INDEX																
							Limits			Gradation				SG	C	CU	UU	DS	UC	CORROSIVITY			
Exploration Number	Sample/ Specimen Number	Depth (ft)	USCS Symbol	Water Content (%)	Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Liquid Limit (%)	Plasticity Index (%)	Liquidity Index	Gravel (%)	Sand (%)	Fines (%)	Clay Fraction, finer than 5mm (%)	Specific Gravity	Consolidation	Consolidated Undrained Triaxial	Unconsolidated Undrained peak dev. (ks	Direct Shear, Peak Friction Angle (deg)	Unconfined Compression peak (ksf)	pH	Minimum Resistivity (ohm - cm)	Sulfate Content (ppm)	Chloride Content (ppm)
R-10-008		81.0	ROCK	23.0	123.3	100.2													36.02				
R-10-008		93.0	ROCK	28.8	119.3	92.6													7.95				
R-10-009		6~55																		7.3	600	930	150
R-10-009	3	15.0	CL	22.8	124.4	101.3	39	24	0.33										1.34				
R-10-009	5	25.0	CL	18.5	132.6	111.9	26	10	0.25			74.0			done			27					
R-10-009	7	35.0	SC	20.7	133.1	110.3													0.15				
R-10-009	10	50.0	CH	25.7	122.9	97.8													1.43				
A-11-020	1,2	5~8	CH																	7.6	580	0	600
A-11-020	2	6.5	CH	25.1	119.0	95.1						83.1			done								
A-11-020	3	10.0	CH	31.5			75	48	0.09			98.6											
A-11-020	5	20.0	CH	28.1			63	37	0.06			97.9											
R-11-022		5~30																		7.5	515	0	120

Santa Ana Geotechnical Laboratory Testing Summary

Project Name: I-5 / SR-74 Interchange
Project Number: 30989830, TO 59030
Project Engineer: FM

LOCATION				INITIAL CONDITION			INDEX																
							Limits			Gradation				SG	C	CU	UU	DS	UC	CORROSIVITY			
Exploration Number	Sample/ Specimen Number	Depth (ft)	USCS Symbol	Water Content (%)	Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Liquid Limit (%)	Plasticity Index (%)	Liquidity Index	Gravel (%)	Sand (%)	Fines (%)	Clay Fraction, finer than 5mm (%)	Specific Gravity	Consolidation	Consolidated Undrained Triaxial	Unconsolidated Undrained peak dev. (ks	Direct Shear, Peak Friction Angle (deg)	Unconfined Compression peak (ksf)	pH	Minimum Resistivity (ohm - cm)	Sulfate Content (ppm)	Chloride Content (ppm)
R-11-022	2	6.5	CH	23.5	124.2	100.6									done		4.13						
R-11-022	4	11.5	CH	29.4	119.6	92.4	58	36	0.21						done		3.48						
R-11-022	6	20.0	CH	25.7	124.4	99.0	50	32	0.24						done		3.5						
R-11-022	7	25.0	CL									66.8											
R-11-022	8	30.0	CL	19.5	130.0	108.8	39	24	0.19						done								
R-10-024		5~60																		7.5	445	1692	90
R-10-024	1	5.0	CL	27.6	119.6	93.8																	
R-10-024	3	15.0	CL	23.6	97.3	78.7	47	33	0.29										2.04				
R-10-024	4	20.0	CL	28.7								82.7											
R-10-024	5	25.0	CH	31.7	117.9	89.5	61	45	0.35						done				3.34				
R-10-024	6	30.0	SM	27.3								17.9											
R-10-028		5~50																		6.5	640	606	105

Santa Ana Geotechnical Laboratory Testing Summary

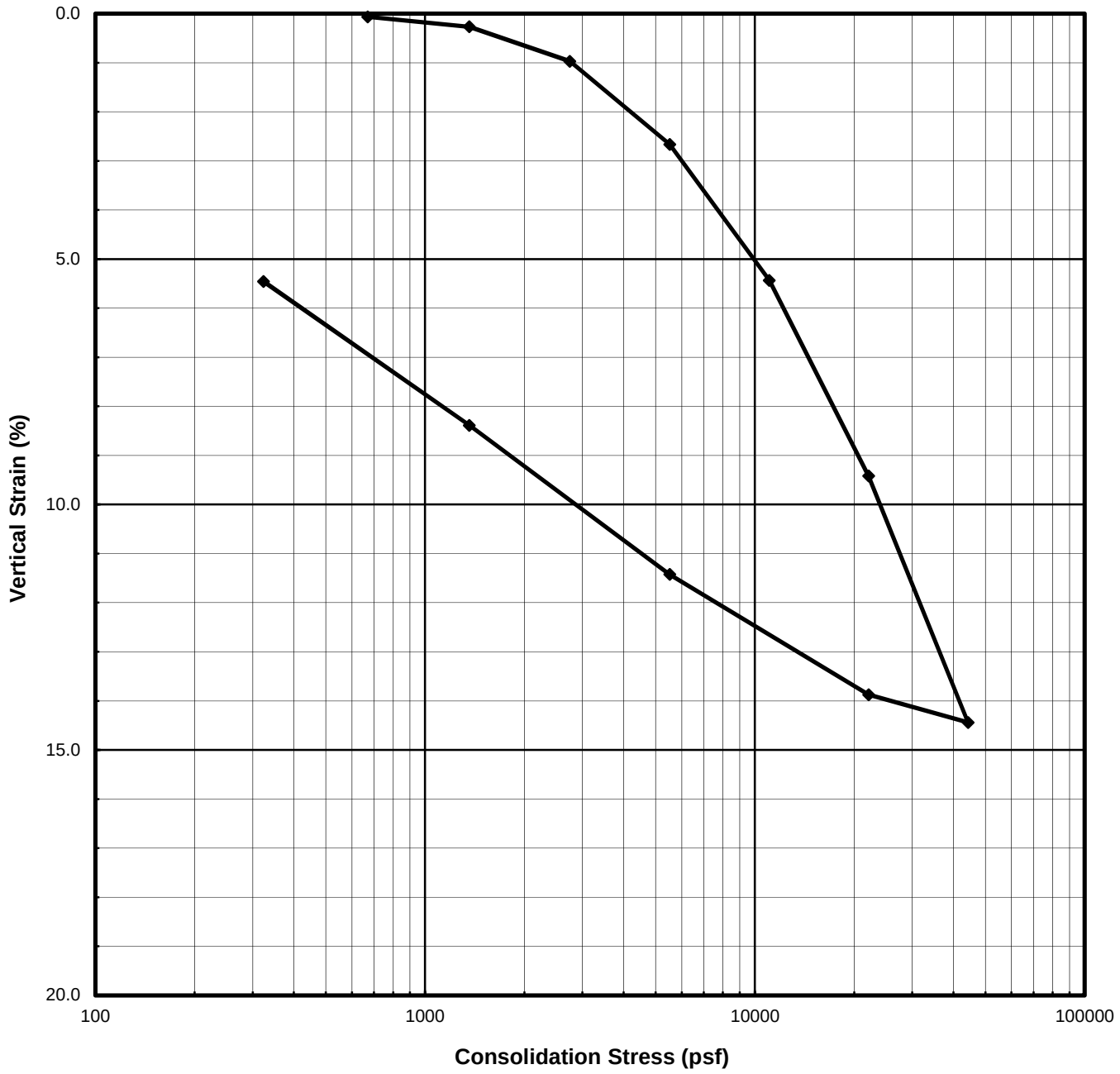
Project Name: I-5 / SR-74 Interchange
Project Number: 30989830, TO 59030
Project Engineer: FM

LOCATION				INITIAL CONDITION			INDEX																
							Limits			Gradation				SG	C	CU	UU	DS	UC	CORROSIVITY			
Exploration Number	Sample/ Specimen Number	Depth (ft)	USCS Symbol	Water Content (%)	Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Liquid Limit (%)	Plasticity Index (%)	Liquidity Index	Gravel (%)	Sand (%)	Fines (%)	Clay Fraction, finer than 5mm (%)	Specific Gravity	Consolidation	Consolidated Undrained Triaxial	Unconsolidated Undrained peak dev. (ks	Direct Shear, Peak Friction Angle (deg)	Unconfined Compression peak (ksf)	pH	Minimum Resistivity (ohm - cm)	Sulfate Content (ppm)	Chloride Content (ppm)
R-10-028	3	16.0	CL	17.6	131.7	112.0	39	26	0.18			64.5			done				2.75				
R-10-028	5	25.0	SC									16.2											
R-10-028	6	30.0	CH	38.1			65	35															
R-10-028	9	45.0	CH	33.23	115.8	86.9																	
R-10-028		56.0	ROCK	26.0	123.7	98.2													22.8				
R-10-028		63.5	ROCK	25.0	123.7	99.0													30.2				
R-10-028		73.0	ROCK	27.6	120.5	94.4													28.9				
R-10-028		80.0	ROCK	22.8	125.1	101.9													17.5				
R-10-028		93.0	ROCK	20.4	123.7	102.7													43.7				
R-10-028		97.0	ROCK	23.1	125.1	101.6													28.9				
R-10-028		117.0	ROCK	23.4	124.1	100.6													30.3				
R-10-028		125.0	ROCK	23.7	124.7	100.8													36.9				

Santa Ana Geotechnical Laboratory Testing Summary

Project Name: I-5 / SR-74 Interchange
Project Number: 30989830, TO 59030
Project Engineer: FM

LOCATION				INITIAL CONDITION			INDEX																
							Limits			Gradation				SG	C	CU	UU	DS	UC	CORROSIVITY			
Exploration Number	Sample/ Specimen Number	Depth (ft)	USCS Symbol	Water Content (%)	Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Liquid Limit (%)	Plasticity Index (%)	Liquidity Index	Gravel (%)	Sand (%)	Fines (%)	Clay Fraction, finer than 5mm (%)	Specific Gravity	Consolidation	Consolidated Undrained Triaxial	Unconsolidated Undrained peak dev. (ks	Direct Shear, Peak Friction Angle (deg)	Unconfined Compression peak (ksf)	pH	Minimum Resistivity (ohm - cm)	Sulfate Content (ppm)	Chloride Content (ppm)
R-10-028		133.0	ROCK	24.3	124.9	100.5													35.4				



Description:	**Light olive brown Clay (CL)**							
Boring No.:	R-11-001		Liquid Limit		%	Specific Gravity	2.75	assumed
Sample No.:	2		Plasticity Index		%	Strain for Saturation	0.42	%
Depth (ft | m)	6.5	1.98	Fines Content	90.7	%	Water added at	67	psf

	Water Content (%)	Total Unit Weight		Dry Unit Weight		Saturation (%)	Void Ratio	Height		Diameter	
		(pcf)	(kN/m^3)	(pcf)	(kN/m^3)			(inches)	(cm)	(inches)	(cm)
Initial	30.7	119.8	18.82	91.7	14.40	97.1	0.87	0.938	2.38	2.416	6.137
Final	30.5	122.6	19.27	94.0	14.76	101.9	0.82	0.915	2.32		

URS

I-5 & SR-74 IC

Project Number: 30989830
Test Start Date: 2/9/2011

CONSOLIDATION TEST
ASTM D2435

SUBMITTED BY: Thomas J. O'Meara

Con I5 SR74 R11001 006.xls

One-Dimensional Oedometer Testing
Set-up / Take down Worksheet
ASTM D2435

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM

Boring No.: R-11-001
Sample No.: 2
Depth (ft): 6.5

Apparatus No.: C-6

Specimen Description : Light olive brown Clay (CL)
Duration: end of increment

Ring Number: R21
Weight of Wet Spec. and Ring: 352.25 g
Weight of Ring: 216.96 g
Initial Weight of Wet Spec.: 135.29 g

Take Down Weight with Ring: 351.85 g

Excess Oven-dried Cont. No.: cp5
Weight of Cont. and Dry Spec.: 163.51 g
Weight of Container: 163.37 g
Weight of Excess Dried Soil: 0.14 g
Weight of Excess Wet Soil 0.18 g
Final Weight of Wet Specimen: 135.07 g

Height of Specimen (in)

	Initial	Final
1	0.941	0.917
2	0.942	0.910
3	0.936	0.919
4	0.938	0.913
5	0.935	0.917
Ave:	0.938	0.915

Initial Height - Final Height = 0.023 in
Change in Dial (Dd) = 0.031 in
Initial Height - Dd = 0.907 in
Final Height + Dd = 0.946 in
Weight of Top Cap = 370.52 g

Specimen Analysis					Initial Trim	Initial Spec.	Final
				Container Number:	c33	**XXXXX**	s29
				Mass of Container and Wet Specimen M1 (g)	447.84	135.29	260.01
				Mass of Container and Dry Specimen, M2 (g)	378.94	103.50	228.69
				Mass of Container, M3 (g)	139.33	**XXXXX**	126.02
				Water Content, w (%)	28.76	30.72	30.51
				Mass of Wet Specimen, M4 (g)	135.29	135.29	135.07
				Mass of Dry Specimen, M5 (g)	103.50	103.50	103.50
Nominal		Measured	**x**	Specimen Height, H (in)	0.938	0.938	0.915
Nominal	**x**	Measured		Specimen Diameter, D (in)	2.416	2.416	2.416
				Area of Specimen, A (in^2)	4.584	4.584	4.584
				Volume of Specimen, V (cc)	70.50	70.50	68.75
Assumed	**x**	Measured		Specific Gravity, Gs	2.75	2.75	2.75
				Wet Unit Weight, WUW (pcf)	**119.8**	**119.8**	**122.6**
				Dry Unit Weight, DUW (pcf)	**93.0**	**91.7**	**94.0**
				Void Ratio	**0.842**	**0.870**	**0.824**
				Degree of Saturation, S (%)	**93.9**	**97.1**	**101.9**

Set-up by: TJO
Date: 2/9/11

Calculated by: TJO
Checked by: TJO

Strain for Saturation (%) = **0.420**

One-Dimensional Oedometer Testing

Loading Worksheet

ASTM D2435

Project Number: 30989830 Boring No.: R-11-001

Project Name: I-5 & SR-74 IC Sample No.: 2

Project Engineer: FM Apparatus No.: C-6 Depth (ft): 6.5

Initial Dial Reading: 0.3489 inch Initial Specimen Height: 0.938 inch

Stage No.	Normal Stress (psf)	Dial Reading (in)		Compressibility Correction (in)	Vertical Strain (%)	
		End of Duration	End of Increment		End of Duration	End of Increment
Seat	67		0.3489	0.0000		0.00
1	150	0.3488	0.3489	0.0003	-0.02	-0.03
2	323	0.3479	0.3480	0.0011	-0.01	-0.02
3	670	0.3459	0.3460	0.0024	0.06	0.05
4	1362	0.3426	0.3426	0.0038	0.27	0.27
5	2747	0.3344	0.3338	0.0054	0.97	1.03
6	5517	0.3160	0.3153	0.0079	2.66	2.74
7	11057	0.2880	0.2855	0.0099	5.43	5.70
8	22137	0.2475	0.2435	0.0130	9.42	9.85
9	44296	0.1970	0.1974	0.0164	14.44	14.40
10	22137		0.2043	0.0144		13.87
11	5517		0.2314	0.0103		11.42
12	1362		0.2623	0.0079		8.39
13	323		0.2914	0.0063		5.46
14	67		0.3179	0.0053		2.74
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						
33						

Final dial reading prior to take down (inch): 0.3179 Take down by: TJO Date: 3/2/11

One-Dimensional Oedometer Testing
ASTM D2435
Table of Incremental Values

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM
Apparatus No.: C-6

Boring No.: R-11-001
Sample No.: 2
Depth (ft): 6.5
Inundation at stage: Seat

10 **20** Hanger Ratios

Stage Number	Incremental Weight Applied (kg) Back	Front	Vertical Stress (psf)	Specimen Hieght (in)	Deflections (in) $d_{initial}$	d_o	d_{50}	d_{100}	d_{final}	Porous Stone (in)	t_{50} (min)	cv (in^2/min)	cv (ft^2/day)
Top Cap			26	0.938	0.3489	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
Seat	0.06		67	0.938	0.3489	XXXXX	XXXXX	XXXXX	0.3489	0.0000	XXXXX	XXXXX	XXXXX
1		0.06	150	0.939	0.3489	0.3488	0.3488	0.3488	0.3489	0.0003	XXXXX	XXXXX	XXXXX
2	0.25		323	0.939	0.3489	0.3484	0.3482	0.3479	0.3480	0.0011	XXXXX	XXXXX	XXXXX
3	0.50		670	0.939	0.3480	0.3467	0.3463	0.3459	0.3460	0.0024	XXXXX	XXXXX	XXXXX
4	1.0		1362	0.940	0.3460	0.3446	0.3436	0.3426	0.3426	0.0038	XXXXX	XXXXX	XXXXX
5		1.0	2747	0.936	0.3426	0.3411	0.3378	0.3344	0.3338	0.0054	6.00	0.007	0.072
6	4.0		5517	0.926	0.3338	0.3318	0.3239	0.3160	0.3153	0.0079	12.00	0.004	0.035
7		4.0	11057	0.906	0.3153	0.3128	0.3004	0.2880	0.2855	0.0099	16.00	0.003	0.025
8		8.0	22137	0.877	0.2855	0.2831	0.2653	0.2475	0.2435	0.0130	22.00	0.002	0.017
9		16.0	44296	0.847	0.2435	0.2408	0.2189	0.1970	0.1974	0.0164	25.00	0.001	0.014
10		-16.0	22137	0.868	0.1974	0.1994	XXXXX	XXXXX	0.2043	0.0144	XXXXX	XXXXX	XXXXX
11		-12.0	5517	0.906	0.2043	0.2081	XXXXX	XXXXX	0.2314	0.0103	XXXXX	XXXXX	XXXXX
12	-4.0	-1.0	1362	0.945	0.2314	0.2328	XXXXX	XXXXX	0.2623	0.0079	XXXXX	XXXXX	XXXXX
13	-1.50		323	0.980	0.2623	0.2629	XXXXX	XXXXX	0.2914	0.0063	XXXXX	XXXXX	XXXXX
14	-0.250	-0.060	67	1.012	0.2914	XXXXX	XXXXX	XXXXX	0.3179	0.0053	XXXXX	XXXXX	XXXXX
15			67	XXXXX	0.3179	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
16			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
17			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
18			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
19			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
20			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
21			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
22			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
23			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
24			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
25			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX

One-Dimensional Oedometer Testing Increment

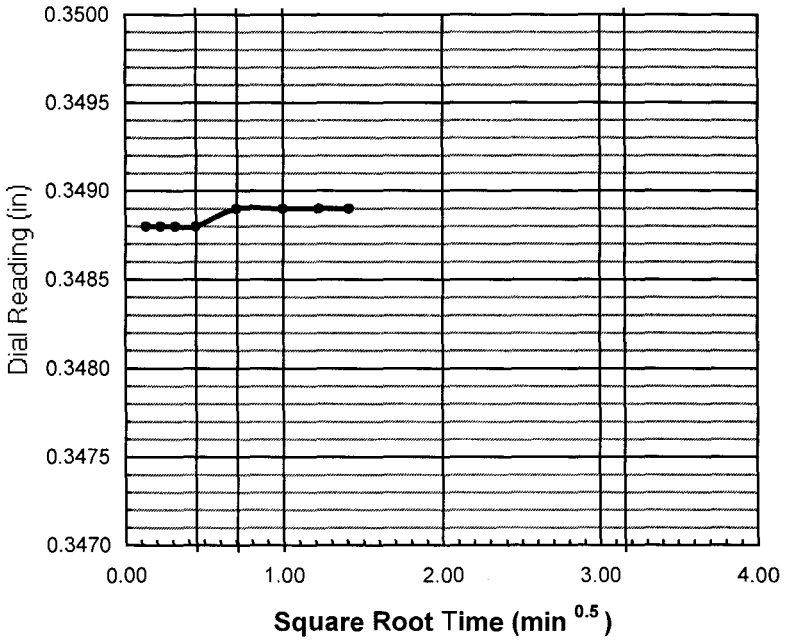
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C-6 | Stage Number: 1 | Curves by: TJO

Boring No.: R-11-001 | Sample No.: 2 | Depth (ft.) 6.5

Date: 9-Feb-11 | Load (psf): 150 | Zero Reading: 0.3489

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:24:52	0	0.00	0.3489
	0.02	0.13	0.3488
	0.05	0.22	0.3488
	0.10	0.32	0.3488
	0.20	0.45	0.3488
	0.50	0.71	0.3489
	1.00	1.00	0.3489
	1.50	1.22	0.3489
swelling	2.00	1.41	0.3489



do = 0.3488

d90 = _____ t90 = _____ min

d100 = 0.3488

df = 0.3489

square root

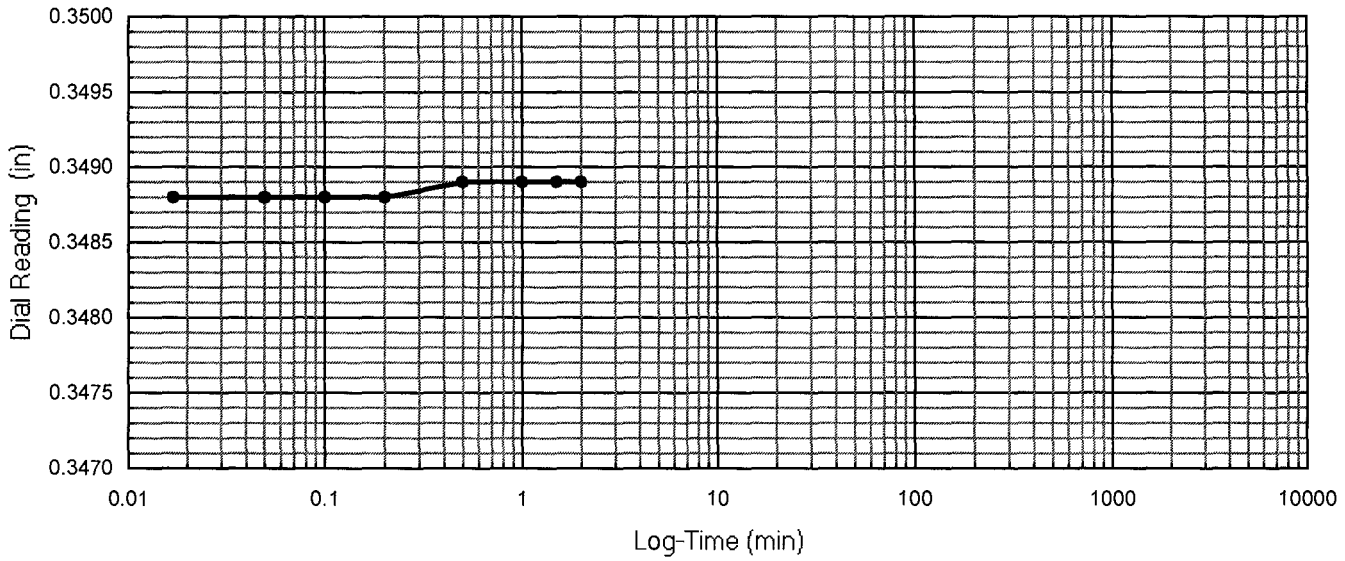
d50 = _____

t50 = _____ min

log time

d50 = 0.3488

t50 = _____ min



One-Dimensional Oedometer Testing Increment

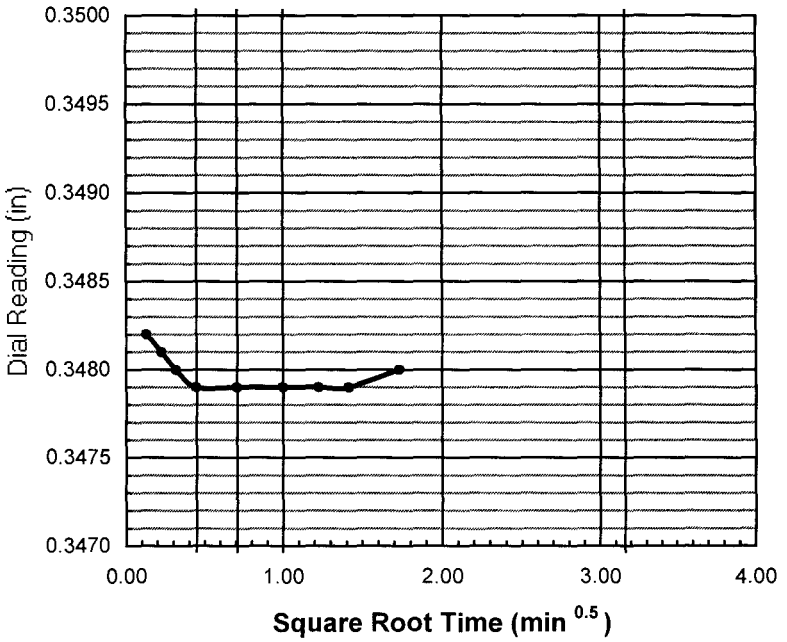
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C-6 | Stage Number: 2 | Curves by: TJO

Boring No.: R-11-001 | Sample No.: 2 | Depth (ft.) 6.5

Date: 9-Feb-11 | Load (psf): 323 | Zero Reading: 0.3489

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:25:31	0	0.00	0.3489
	0.02	0.13	0.3482
	0.05	0.22	0.3481
	0.10	0.32	0.3480
	0.20	0.45	0.3479
	0.50	0.71	0.3479
	1.00	1.00	0.3479
	1.50	1.22	0.3479
	2.00	1.41	0.3479
swelling	3.0	1.73	0.3480



do = 0.3484

d90 = _____ t90 = _____ min

d100 = 0.3479

df = 0.3480

square root

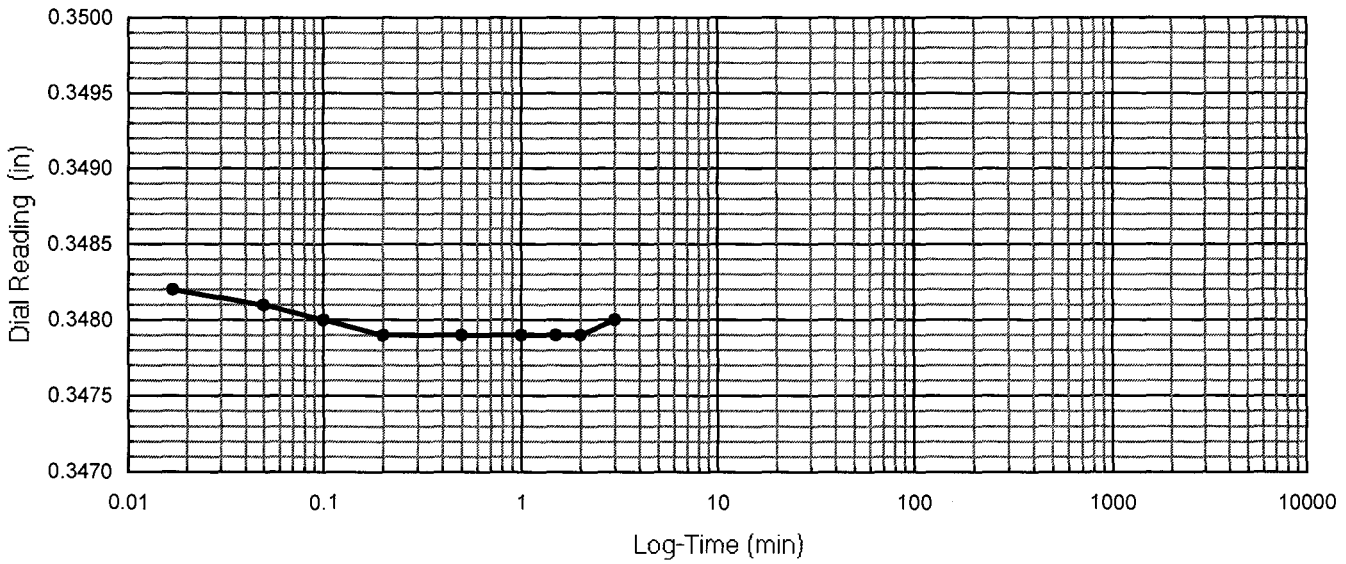
d50 = _____

t50 = _____ min

log time

d50 = 0.3481

t50 = _____ min



One-Dimensional Oedometer Testing Increment

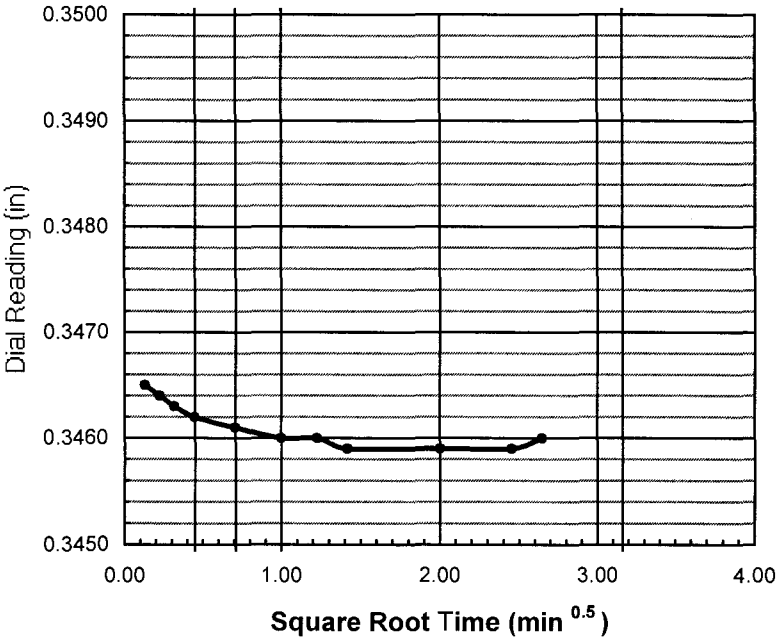
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C-6 | Stage Number: 3 | Curves by: TJO

Boring No.: R-11-001 | Sample No.: 2 | Depth (ft.) 6.5

Date: 9-Feb-11 | Load (psf): 670 | Zero Reading: 0.3489

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:28:17	0	0.00	0.3480
	0.02	0.13	0.3465
	0.05	0.22	0.3464
	0.10	0.32	0.3463
	0.20	0.45	0.3462
	0.50	0.71	0.3461
	1.00	1.00	0.3460
	1.50	1.22	0.3460
	2.00	1.41	0.3459
	4.0	2.00	0.3459
	6.0	2.45	0.3459
swelling	7.0	2.65	0.3460



do = 0.3467

d90 = _____ t90 = _____ min

d100 = 0.3459

df = 0.3460

square root

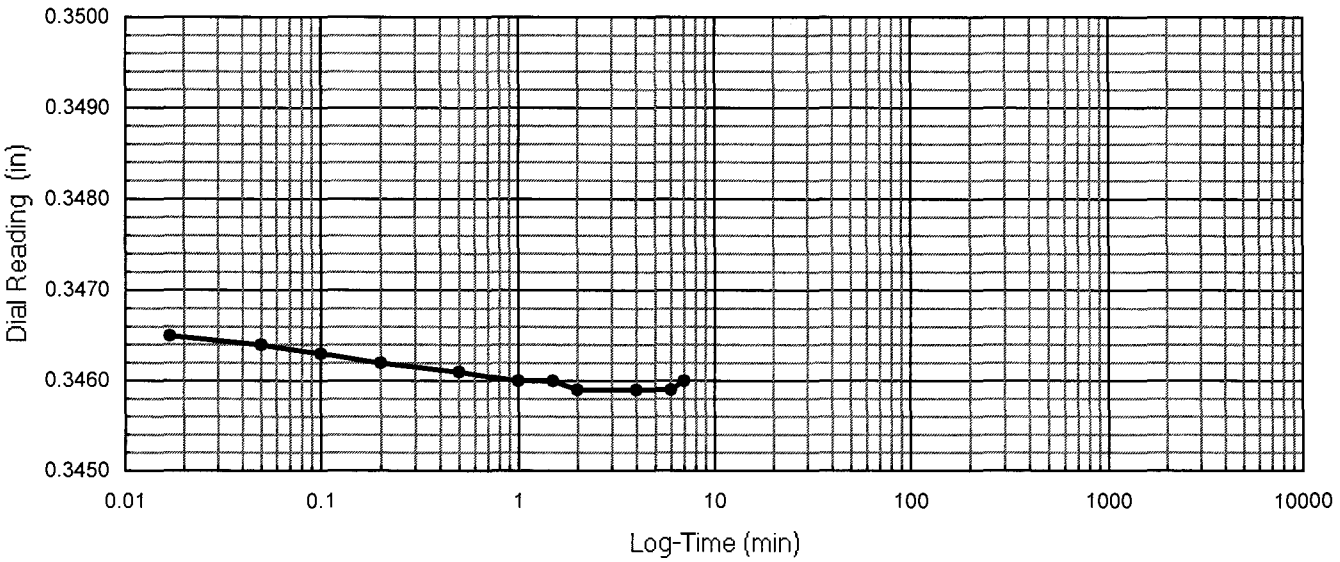
d50 = _____

t50 = _____ min

log time

d50 = 0.3463

t50 = _____ min



One-Dimensional Oedometer Testing Increment

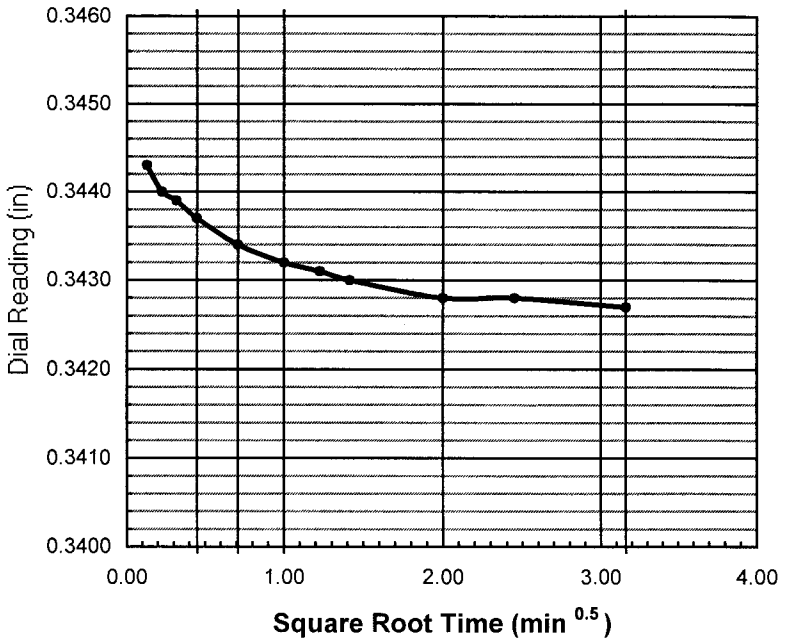
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C-6 | Stage Number: 4 | Curves by: TJO

Boring No.: R-11-001 | Sample No.: 2 | Depth (ft.) 6.5

Date: 9-Feb-11 | Load (psf): 1362 | Zero Reading: 0.3489

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:35:30	0	0.00	0.3460
	0.02	0.13	0.3443
	0.05	0.22	0.3440
	0.10	0.32	0.3439
	0.20	0.45	0.3437
	0.50	0.71	0.3434
	1.00	1.00	0.3432
	1.50	1.22	0.3431
	2.00	1.41	0.3430
	4.0	2.00	0.3428
	6.0	2.45	0.3428
	10.0	3.16	0.3427
	16.0		0.3426
	30		0.3426
	60		0.3426
	91		0.3426



do = 0.3446

d90 = _____ t90 = _____ min

d100 = 0.3426

df = 0.3426

square root

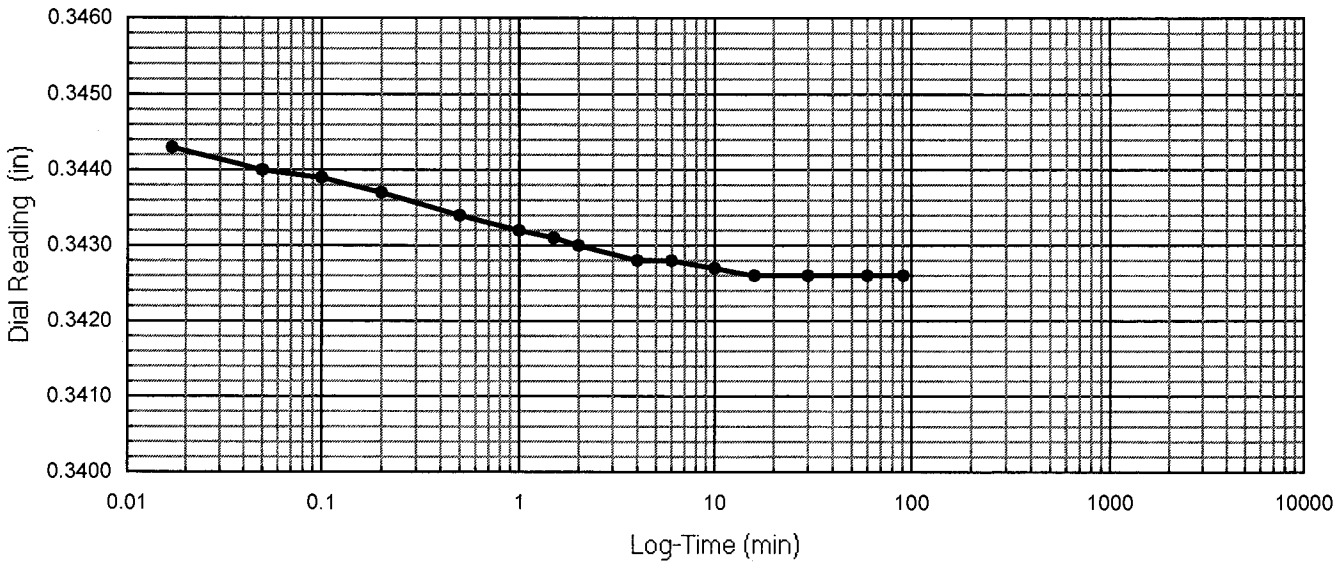
d50 = _____

t50 = _____ min

log time

d50 = 0.3436

t50 = _____ min



One-Dimensional Oedometer Testing Increment

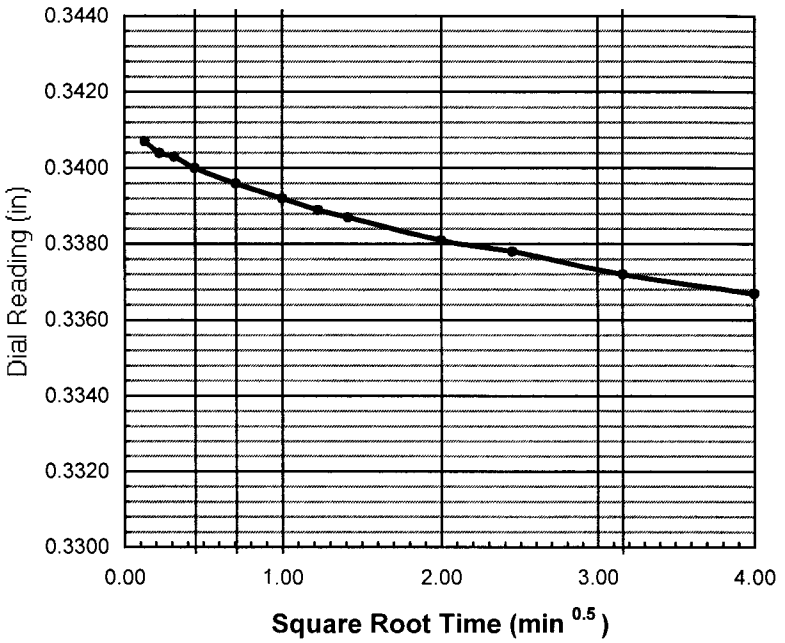
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C-6 | Stage Number: 5 | Curves by: TJO

Boring No.: R-11-001 | Sample No.: 2 | Depth (ft.) 6.5

Date: 9-Feb-11 | Load (psf): 2747 | Zero Reading: 0.3489

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
12:06:59	0	0.00	0.3426
	0.02	0.13	0.3407
	0.05	0.22	0.3404
	0.10	0.32	0.3403
	0.20	0.45	0.3400
	0.50	0.71	0.3396
	1.00	1.00	0.3392
	1.50	1.22	0.3389
	2.00	1.41	0.3387
	4.0	2.00	0.3381
	6.0	2.45	0.3378
	10.0	3.16	0.3372
	16.0	4.00	0.3367
	30		0.3360
	60		0.3353
	120		0.3348
	240		0.3344
	480		0.3341
	1260		0.3338



do = 0.3411

d90 = _____ t90 = _____ min

d100 = 0.3344

df = 0.3338

square root

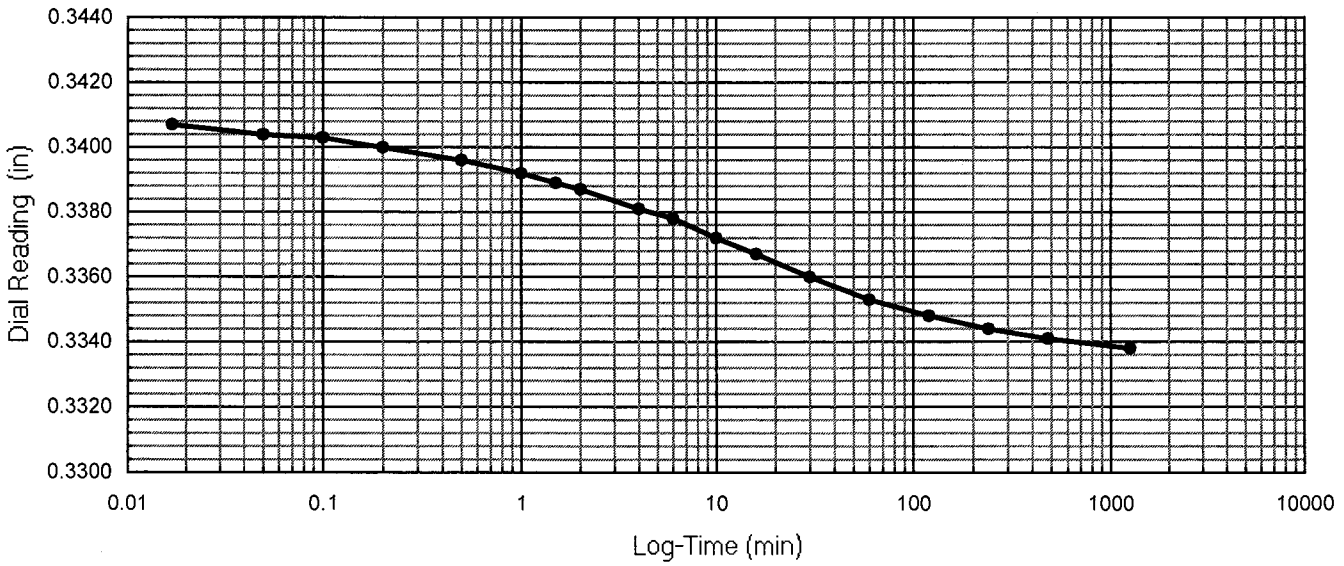
d50 = _____

t50 = _____ min

log time

d50 = 0.3377

t50 = 6.0 min



One-Dimensional Oedometer Testing Increment

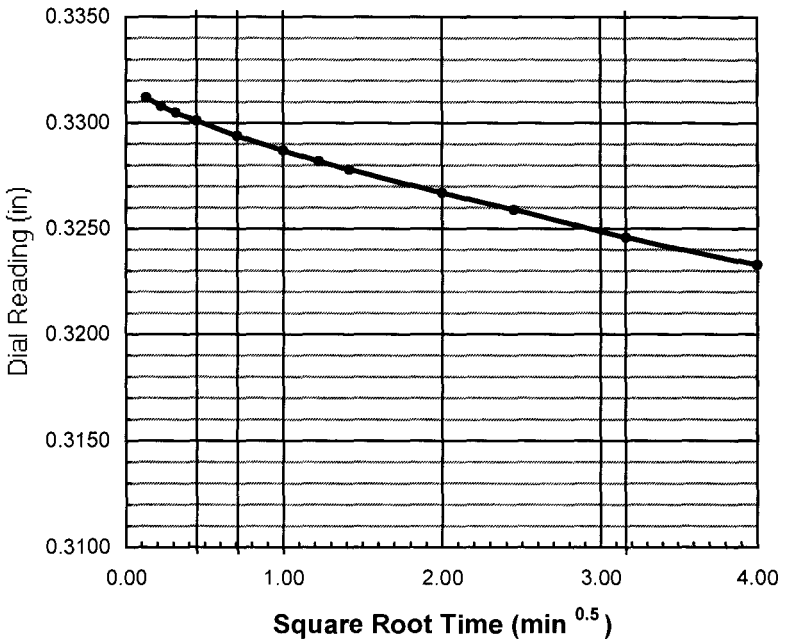
for ASTM D2435, method B

Project Number: 30989830 Apparatus No.: C-6 Stage Number: 6 Curves by: TJO

Boring No.: R-11-001 Sample No.: 2 Depth (ft.) 6.5

Date: 10-Feb-11 Load (psf): 5517 Zero Reading: 0.3489

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:08:16	0	0.00	0.3338
	0.02	0.13	0.3312
	0.05	0.22	0.3308
	0.10	0.32	0.3305
	0.20	0.45	0.3301
	0.50	0.71	0.3294
	1.00	1.00	0.3287
	1.50	1.22	0.3282
	2.00	1.41	0.3278
	4.0	2.00	0.3267
	6.0	2.45	0.3259
	10.0	3.16	0.3246
	16.0	4.00	0.3233
	30		0.3213
	60		0.3193
	120		0.3178
	240		0.3169
	480		0.3161
	960		0.3155
	1456		0.3153



do = 0.3318

d90 = t90 = min

d100 = 0.3160

df = 0.3153

square root

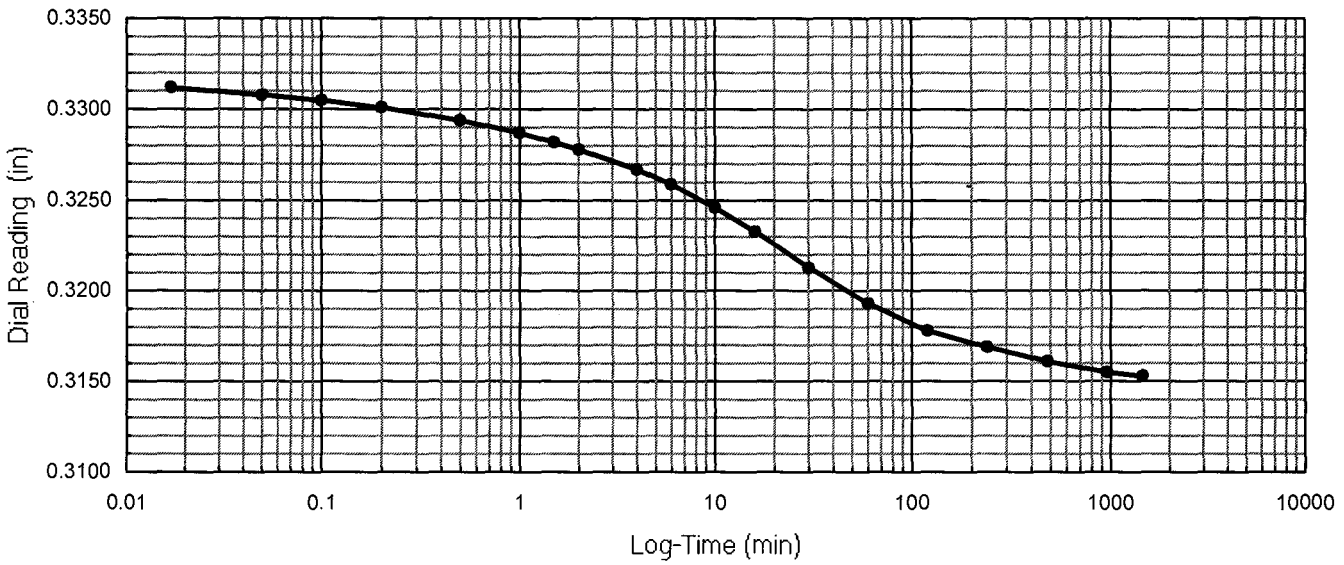
d50 =

t50 = min

log time

d50 = 0.3239

t50 = 12.0 min



One-Dimensional Oedometer Testing Increment

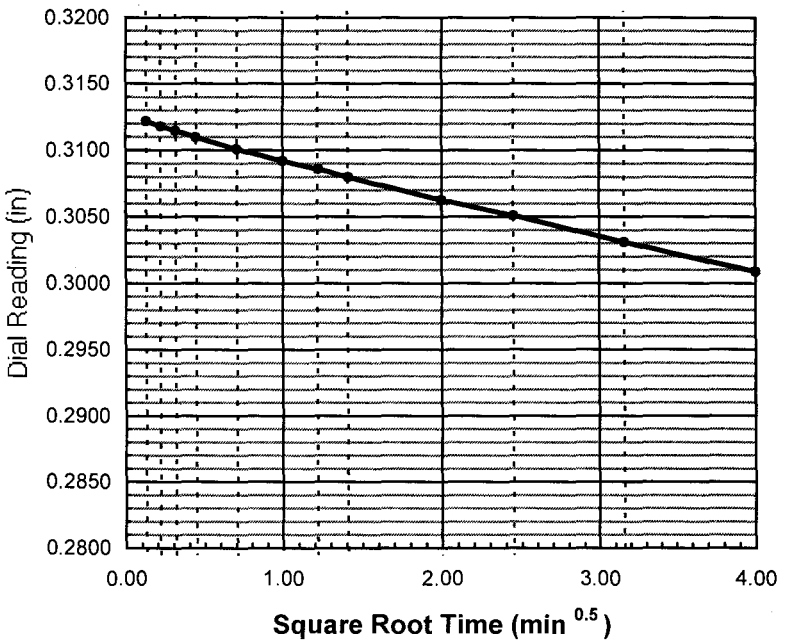
for ASTM D2435, method B

Project Number: 30989830 Apparatus No.: C-6 Stage Number: 7 Curves by: TJO

Boring No.: R-11-001 Sample No.: 2 Depth (ft.) 6.5

Date: 11-Feb-11 Load (psf): 11057 Zero Reading: 0.3489

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:24:37	0	0.00	0.3153
	0.02	0.13	0.3122
	0.05	0.22	0.3118
	0.10	0.32	0.3115
	0.20	0.45	0.3110
	0.50	0.71	0.3101
	1.00	1.00	0.3092
	1.50	1.22	0.3086
	2.00	1.41	0.3080
	4.0	2.00	0.3063
	6.0	2.45	0.3051
	10.0	3.16	0.3031
	16.0	4.00	0.3009
	30		0.2973
	60		0.2933
	120		0.2902
	240		0.2881
	480		0.2868
	960		0.2859
	1520		0.2855



do = 0.3128

d90 = t90 = min

d100 = 0.2880

df = 0.2855

square root

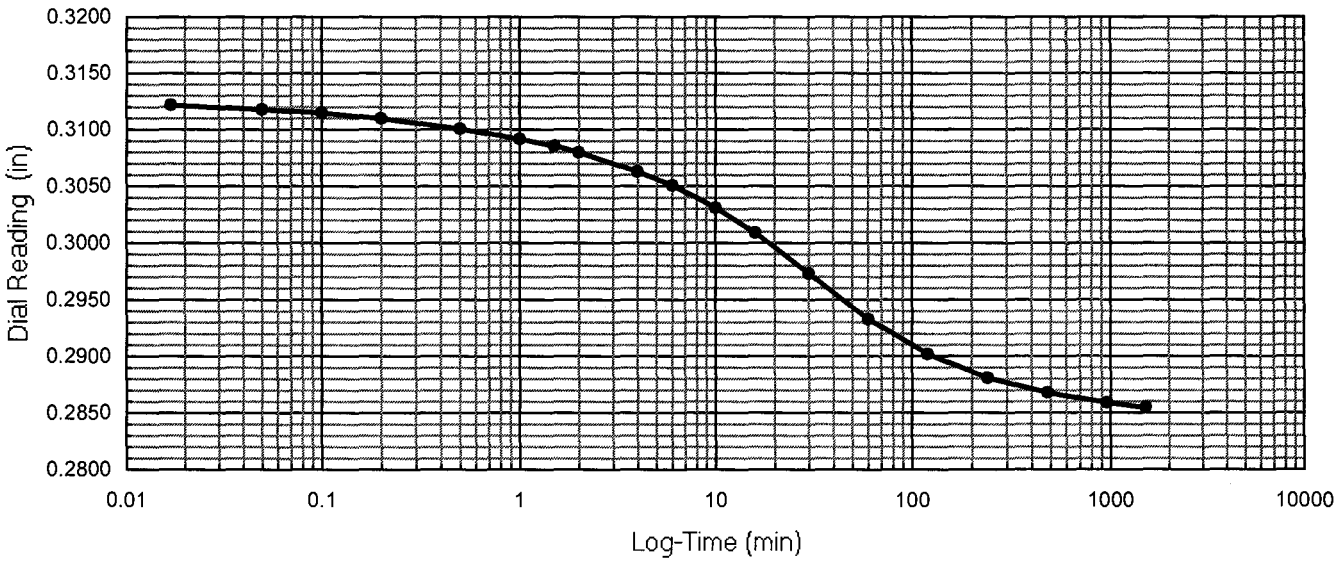
d50 =

t50 = min

log time

d50 = 0.3004

t50 = 16.0 min



One-Dimensional Oedometer Testing Increment

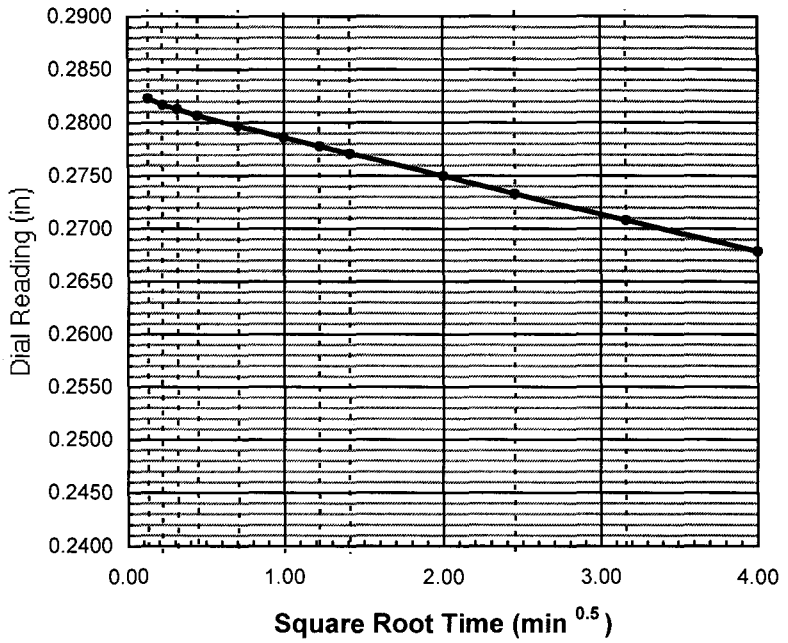
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C-6 | Stage Number: 8 | Curves by: TJO

Boring No.: R-11-001 | Sample No.: 2 | Depth (ft.) 6.5

Date: 12-Feb-11 | Load (psf): 22137 | Zero Reading: 0.3489

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:45:24	0	0.00	0.2855
	0.02	0.13	0.2823
	0.05	0.22	0.2817
	0.10	0.32	0.2813
	0.20	0.45	0.2807
	0.50	0.71	0.2797
	1.00	1.00	0.2786
	1.50	1.22	0.2778
	2.00	1.41	0.2771
	4.0	2.00	0.2750
	6.0	2.45	0.2733
	10.0	3.16	0.2708
	16.0	4.00	0.2679
	30		0.2631
	60		0.2570
	120		0.2517
	240		0.2483
	480		0.2462
	960		0.2449
	1440		0.2444
	2792		0.2435



do = 0.2831

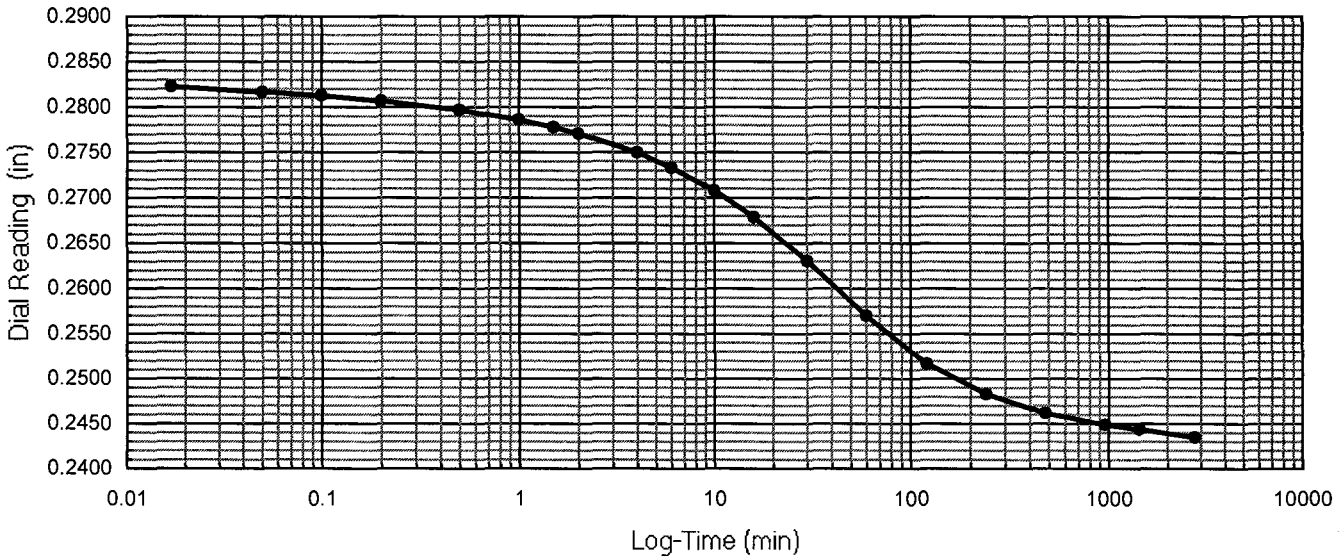
d90 = _____ t90 = _____ min

d100 = 0.2475

df = 0.2435

square root: d50 = _____ t50 = _____ min

log time: d50 = 0.2653 t50 = 22.0 min



One-Dimensional Oedometer Testing Increment

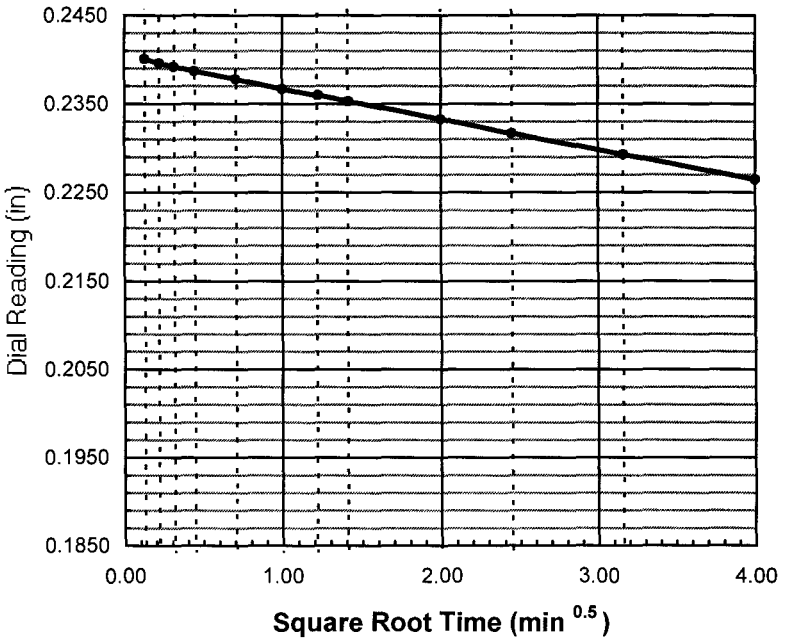
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C-6 | Stage Number: 9 | Curves by: TJO

Boring No.: R-11-001 | Sample No.: 2 | Depth (ft.) 6.5

Date: 14-Feb-11 | Load (psf): 44296 | Zero Reading: 0.3489

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:17:42	0	0.00	0.2435
	0.02	0.13	0.2401
	0.05	0.22	0.2396
	0.10	0.32	0.2392
	0.20	0.45	0.2387
	0.50	0.71	0.2378
	1.00	1.00	0.2367
	1.50	1.22	0.2360
	2.00	1.41	0.2353
	4.0	2.00	0.2333
	6.0	2.45	0.2317
	10.0	3.16	0.2293
	16.0	4.00	0.2265
	30		0.2217
	60		0.2152
	120		0.2084
	240		0.2031
	480		0.1998
	960		0.1980
	1402		0.1974



do = 0.2408

d90 = _____ t90 = _____ min

d100 = 0.1970

df = 0.1974

square root

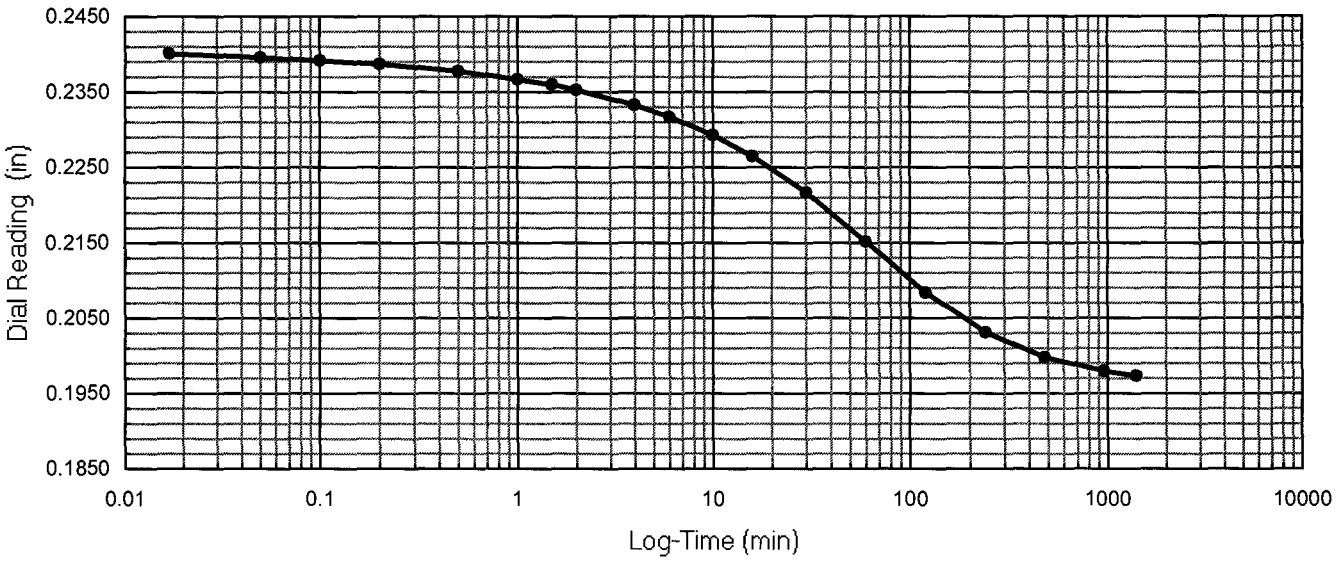
d50 = _____

t50 = _____ min

log time

d50 = 0.2189

t50 = 25.0 min



One-Dimensional Oedometer Testing Increment

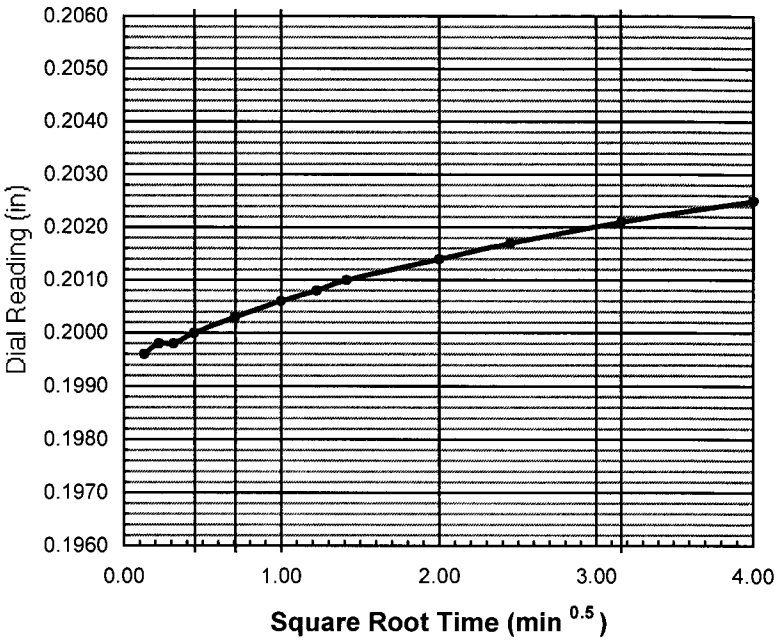
for ASTM D2435, method B

Project Number: 30989830 Apparatus No.: C-6 Stage Number: 10 Curves by: TJO

Boring No.: R-11-001 Sample No.: 2 Depth (ft.) 6.5

Date: 15-Feb-11 Load (psf): 22137 Zero Reading: 0.3489

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:40:33	0	0.00	0.1974
	0.02	0.13	0.1996
	0.05	0.22	0.1998
	0.10	0.32	0.1998
	0.20	0.45	0.2000
	0.50	0.71	0.2003
	1.00	1.00	0.2006
	1.50	1.22	0.2008
	2.00	1.41	0.2010
	4.0	2.00	0.2014
	6.0	2.45	0.2017
	10.0	3.16	0.2021
	16.0	4.00	0.2025
	30		0.2031
	60		0.2036
	120		0.2040
	240		0.2042
	529		0.2043



do = 0.1994

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2043

square root

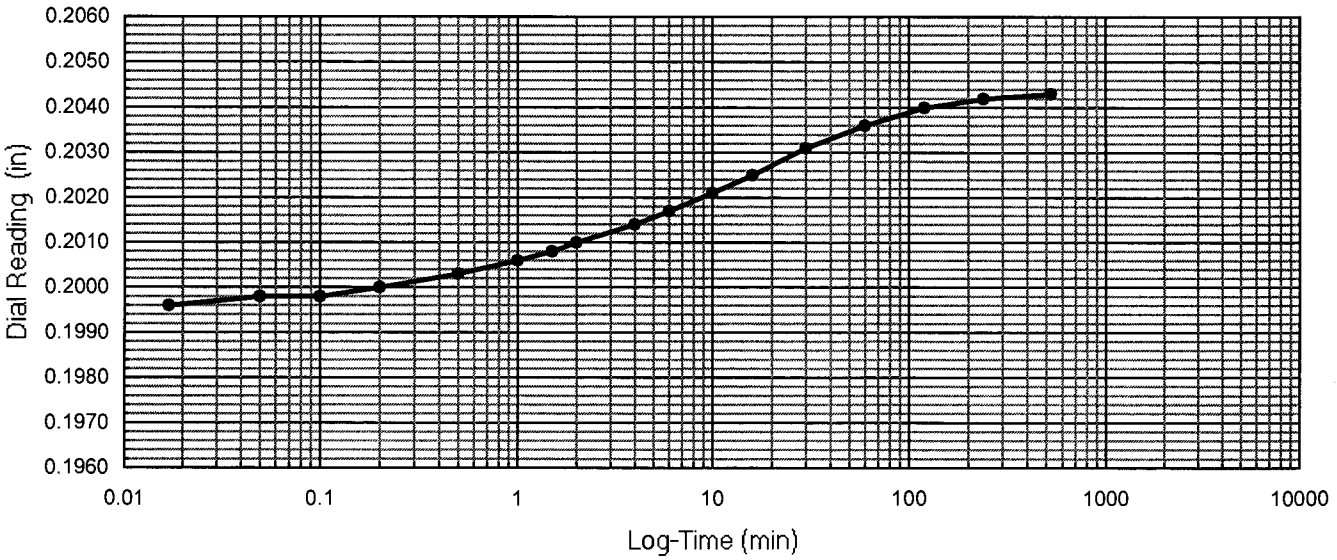
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

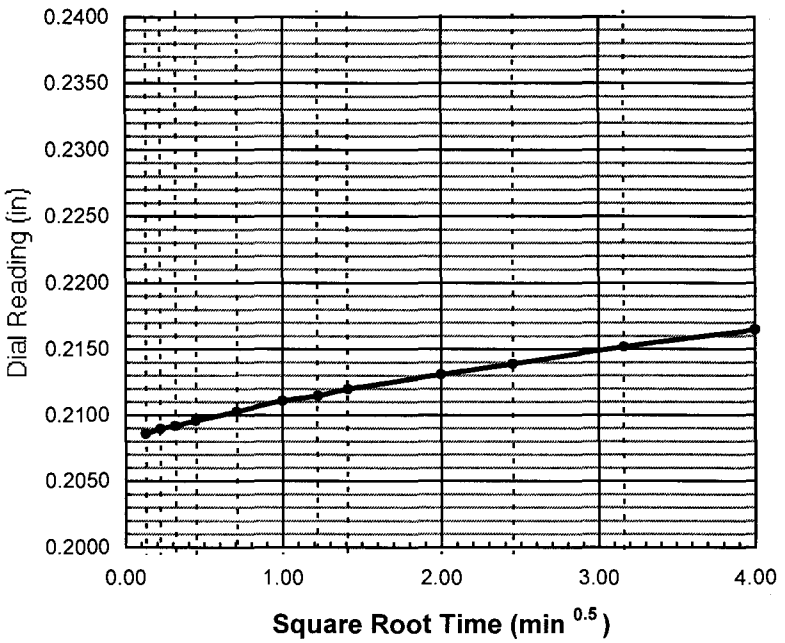
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C-6 | Stage Number: 11 | Curves by: TJO

Boring No.: R-11-001 | Sample No.: 2 | Depth (ft.) 6.5

Date: 15-Feb-11 | Load (psf): 5517 | Zero Reading: 0.3489

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
17:30:34	0	0.00	0.2043
	0.02	0.13	0.2086
	0.05	0.22	0.2090
	0.10	0.32	0.2092
	0.20	0.45	0.2096
	0.50	0.71	0.2103
	1.00	1.00	0.2111
	1.50	1.22	0.2115
	2.00	1.41	0.2120
	4.0	2.00	0.2131
	6.0	2.45	0.2139
	10.0	3.16	0.2152
	16.0	4.00	0.2165
	30		0.2189
	60		0.2222
	120		0.2257
	240		0.2287
	480		0.2306
	866		0.2314



do = 0.2081

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2314

square root

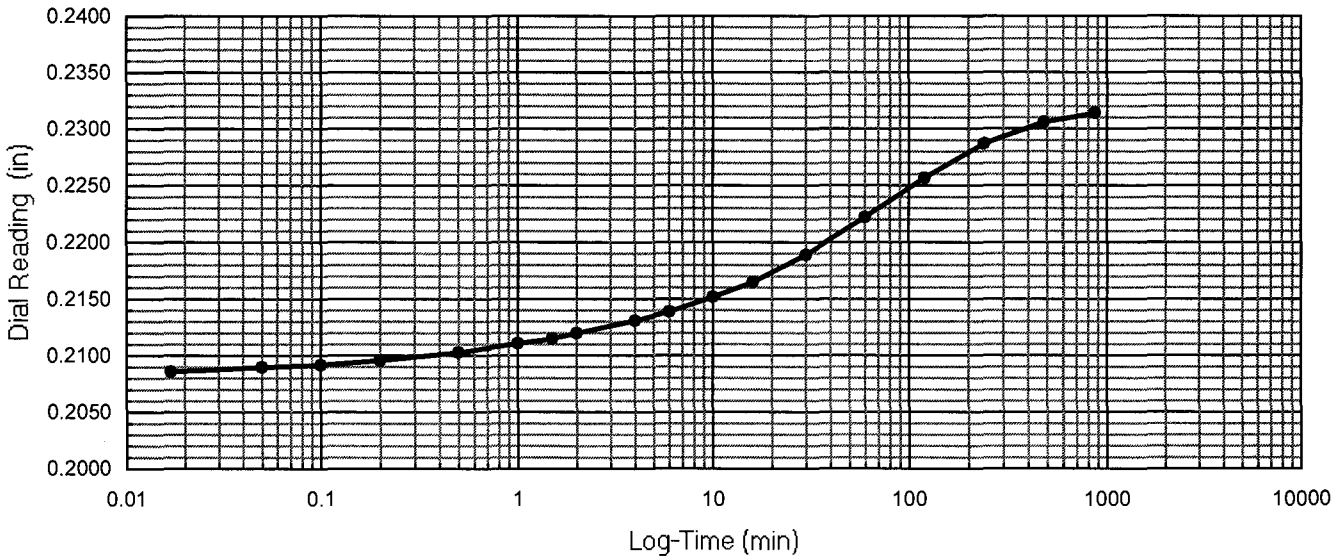
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

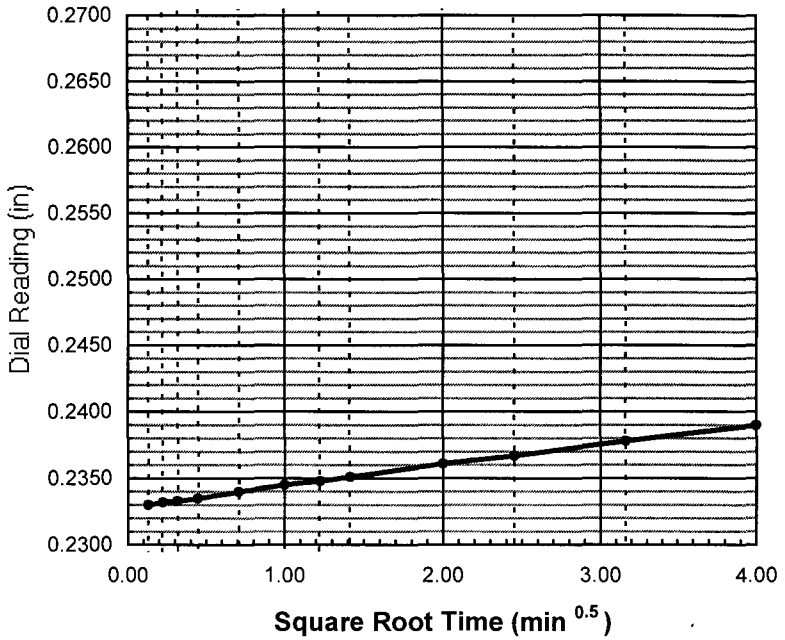
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C-6 | Stage Number: 12 | Curves by: TJO

Boring No.: R-11-001 | Sample No.: 2 | Depth (ft.) 6.5

Date: 16-Feb-11 | Load (psf): 1362 | Zero Reading: 0.3489

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
7:56:54	0	0.00	0.2314
	0.02	0.13	0.2330
	0.05	0.22	0.2332
	0.10	0.32	0.2333
	0.20	0.45	0.2335
	0.50	0.71	0.2340
	1.00	1.00	0.2345
	1.50	1.22	0.2348
	2.00	1.41	0.2351
	4.0	2.00	0.2361
	6.0	2.45	0.2367
	10.0	3.16	0.2378
	16.0	4.00	0.2390
	30		0.2411
	60		0.2443
	120		0.2486
	240		0.2538
	480		0.2584
	960		0.2613
	1511		0.2623



do = 0.2328

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2623

square root

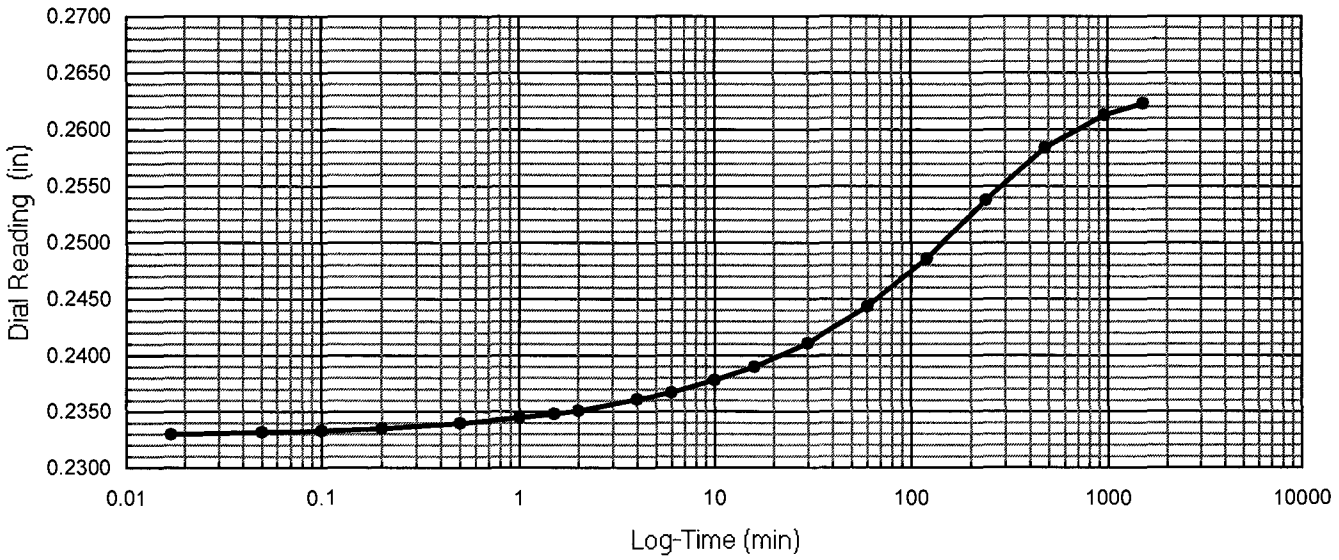
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

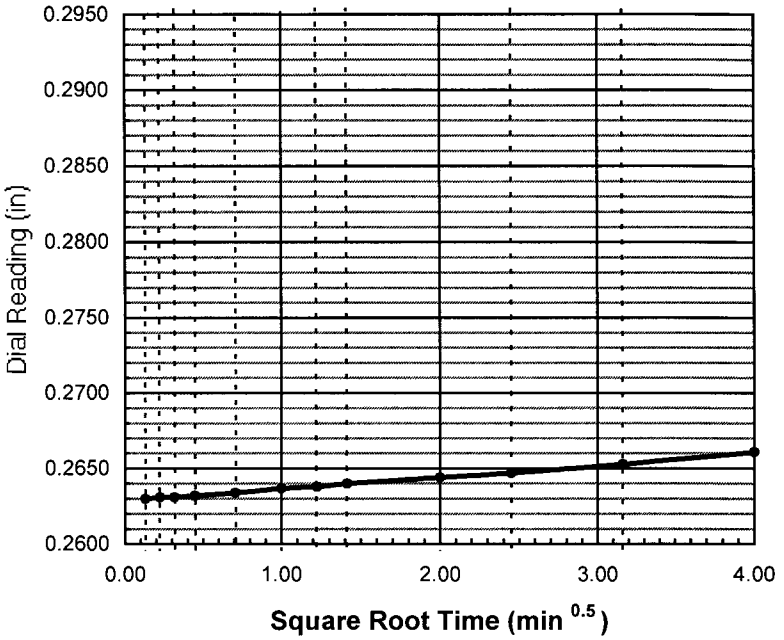
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C-6 | Stage Number: 13 | Curves by: TJO

Boring No.: R-11-001 | Sample No.: 2 | Depth (ft.) 6.5

Date: 17-Feb-11 | Load (psf): 323 | Zero Reading: 0.3489

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:07:57	0	0.00	0.2623
	0.02	0.13	0.2630
	0.05	0.22	0.2631
	0.10	0.32	0.2631
	0.20	0.45	0.2632
	0.50	0.71	0.2634
	1.00	1.00	0.2637
	1.50	1.22	0.2638
	2.00	1.41	0.2640
	4.0	2.00	0.2644
	6.0	2.45	0.2647
	10.0	3.16	0.2653
	16.0	4.00	0.2661
	30		0.2674
	60		0.2696
	120		0.2728
	240		0.2770
	480		0.2821
	960		0.2865
	1980		0.2895
	2930		0.2905
	4395		0.2914



do = 0.2629

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2914

square root

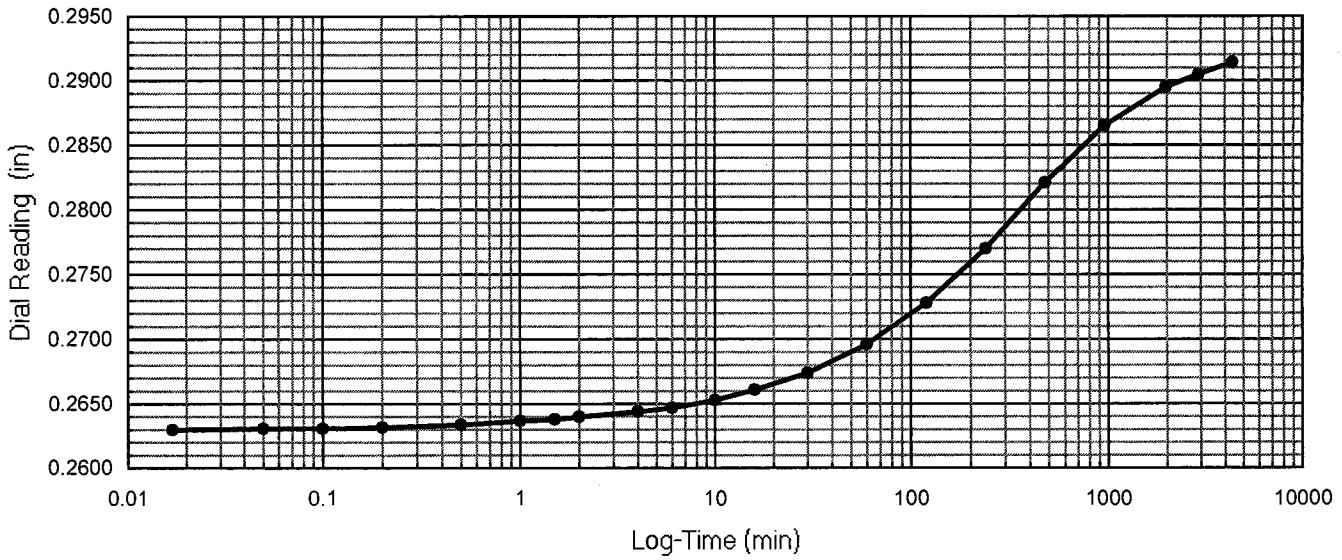
d50 = _____

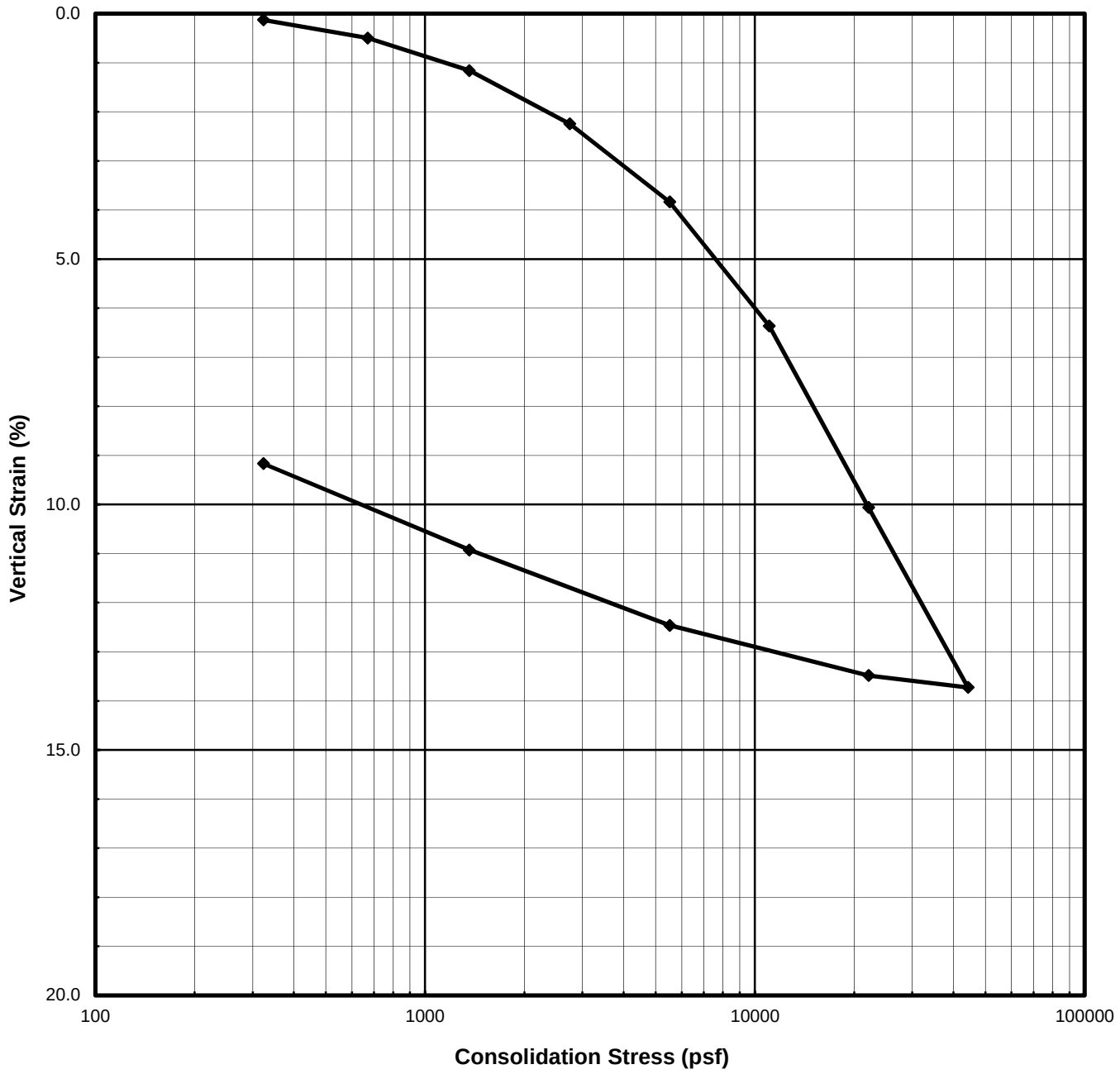
t50 = _____ min

log time

d50 = _____

t50 = _____ min





Description:	**Dark gray Clay (CL)**							
Boring No.:	R-11-001		Liquid Limit	43	%	Specific Gravity	2.75	assumed
Sample No.:	7		Plasticity Index	27	%	Strain for Saturation	3.56	%
Depth (ft | m)	25.0	7.62	Fines Content	87.1	%	Water added at	150	psf

	Water Content (%)	Total Unit Weight		Dry Unit Weight		Saturation (%)	Void Ratio	Height		Diameter	
		(pcf)	(kN/m^3)	(pcf)	(kN/m^3)			(inches)	(cm)	(inches)	(cm)
Initial	24.1	122.4	19.22	98.6	15.49	89.8	0.74	0.949	2.41	2.416	6.137
Final	21.5	130.1	20.43	107.0	16.81	98.5	0.60	0.875	2.22		

URS

I-5 & SR-74 IC

Project Number: 30989830
Test Start Date: 2/9/2011

CONSOLIDATION TEST
ASTM D2435

SUBMITTED BY: Thomas J. O'Meara

Con I5 SR74 R11001 025.xls

One-Dimensional Oedometer Testing
Set-up / Take down Worksheet
ASTM D2435

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM
Apparatus No.: C8

Boring No.: R-11-001
Sample No.: 7
Depth (ft): 25.0

Specimen Description : Dark gray Clay (CL)
Duration: end of increment
Ring Number: R24

Weight of Wet Spec. and Ring:	357.83	g
Weight of Ring:	218.06	g
Initial Weight of Wet Spec.:	139.77	g
Take Down Weight with Ring:	354.77	g
Excess Oven-dried Cont. No.:	cp12	
Weight of Cont. and Dry Spec.:	164.48	g
Weight of Container:	164.34	g
Weight of Excess Dried Soil:	0.14	g
Weight of Excess Wet Soil	0.17	g
Final Weight of Wet Specimen:	136.88	g

Height of Specimen (in)

	Initial	Final
1	0.950	0.877
2	0.952	0.877
3	0.949	0.874
4	0.950	0.872
5	0.945	0.873
Ave:	0.949	0.875

Initial Height - Final Height =	0.075	in
Change in Dial (Dd) =	0.081	in
Initial Height - Dd =	0.868	in
Final Height + Dd =	0.956	in
Weight of Top Cap =	369.47	g

Specimen Analysis					Initial Trim	Initial Spec.	Final
				Container Number:	x17	**XXXXX**	s15
				Mass of Container and Wet Specimen M1 (g)	400.33	139.77	194.84
				Mass of Container and Dry Specimen, M2 (g)	346.01	112.63	174.44
				Mass of Container, M3 (g)	139.31	**XXXXX**	79.68
				Water Content, w (%)	26.28	24.09	21.53
				Mass of Wet Specimen, M4 (g)	139.77	139.77	136.88
				Mass of Dry Specimen, M5 (g)	112.63	112.63	112.63
Nominal		Measured	x	Specimen Height, H (in)	0.949	0.949	0.875
Nominal	x	Measured		Specimen Diameter, D (in)	2.416	2.416	2.416
				Area of Specimen, A (in^2)	4.584	4.584	4.584
				Volume of Specimen, V (cc)	71.31	71.31	65.70
Assumed	x	Measured		Specific Gravity, Gs	2.75	2.75	2.75
				Wet Unit Weight, WUW (pcf)	**122.4**	**122.4**	**130.1**
				Dry Unit Weight, DUW (pcf)	**96.9**	**98.6**	**107.0**
				Void Ratio	**0.769**	**0.738**	**0.601**
				Degree of Saturation, S (%)	**94.0**	**89.8**	**98.5**

Set-up by: TJO
Date: 2/9/11
Calculated by: TJO
Checked by: TJO
Strain for Saturation (%) = **3.557**

One-Dimensional Oedometer Testing

Loading Worksheet

ASTM D2435

Project Number: 30989830 Boring No.: R-11-001

Project Name: I-5 & SR-74 IC Sample No.: 7

Project Engineer: FM Apparatus No.: C8 Depth (ft): 25.0

Initial Dial Reading: 0.3662 inch Initial Specimen Height: 0.949 inch

Stage No.	Normal Stress (psf)	Dial Reading (in)		Compressibility Correction (in)	Vertical Strain (%)	
		End of Duration	End of Increment		End of Duration	End of Increment
Seat	150		0.3600	0.0000		0.65
1	323	0.3647	0.3649	0.0003	0.13	0.11
2	670	0.3610	0.3600	0.0015	0.39	0.50
3	1362	0.3524	0.3521	0.0031	1.13	1.16
4	2747	0.3412	0.3400	0.0049	2.12	2.24
5	5517	0.3250	0.3230	0.0068	3.62	3.83
6	11057	0.3010	0.2967	0.0091	5.91	6.36
7	22137	0.2640	0.2593	0.0114	9.57	10.06
8	44296	0.2250	0.2221	0.0138	13.42	13.73
9	22137		0.2254	0.0128		13.49
10	5517		0.2380	0.0099		12.46
11	1362		0.2550	0.0075		10.92
12	323		0.2735	0.0057		9.17
13	67		0.2853	0.0044		8.06
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						
33						

Final dial reading prior to take down (inch): 0.2853 Take down by: TJO Date: 3/2/11

One-Dimensional Oedometer Testing
ASTM D2435
Table of Incremental Values

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM
Apparatus No.: C8

Boring No.: R-11-001
Sample No.: 7
Depth (ft): 25.0
Inundation at stage: Seat

10 **20** Hanger Ratios

Stage Number	Incremental Weight Applied (kg) Back	Front	Vertical Stress (psf)	Specimen Hieght (in)	Deflections (in) $d_{initial}$	d_o	d_{50}	d_{100}	d_{final}	Porous Stone (in)	t_{50} (min)	cv (in^2/min)	cv (ft^2/day)
Top Cap			26	0.949	0.3662	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
Seat	0.06	0.06	150	0.943	0.3662	XXXXX	XXXXX	XXXXX	0.3600	0.0000	XXXXX	XXXXX	XXXXX
1	0.25		323	0.948	0.3600	0.3654	0.3651	0.3647	0.3649	0.0003	XXXXX	XXXXX	XXXXX
2	0.50		670	0.945	0.3649	0.3632	0.3621	0.3610	0.3600	0.0015	0.50	0.088	0.879
3	1.00		1362	0.940	0.3600	0.3580	0.3552	0.3524	0.3521	0.0031	2.00	0.022	0.218
4		1.0	2747	0.933	0.3521	0.3495	0.3454	0.3412	0.3400	0.0049	1.00	0.043	0.429
5	4.0		5517	0.923	0.3400	0.3367	0.3309	0.3250	0.3230	0.0068	1.00	0.042	0.419
6		4.0	11057	0.905	0.3230	0.3177	0.3094	0.3010	0.2967	0.0091	1.00	0.040	0.404
7		8.0	22137	0.879	0.2967	0.2898	0.2769	0.2640	0.2593	0.0114	1.50	0.025	0.254
8		16.0	44296	0.856	0.2593	0.2531	0.2391	0.2250	0.2221	0.0138	2.50	0.014	0.144
9		-16.0	22137	0.872	0.2221	0.2240	XXXXX	XXXXX	0.2254	0.0128	XXXXX	XXXXX	XXXXX
10		-12.0	5517	0.895	0.2254	0.2296	XXXXX	XXXXX	0.2380	0.0099	XXXXX	XXXXX	XXXXX
11	-4.0	-1.0	1362	0.919	0.2380	0.2400	XXXXX	XXXXX	0.2550	0.0075	XXXXX	XXXXX	XXXXX
12	-1.5		323	0.943	0.2550	0.2559	XXXXX	XXXXX	0.2735	0.0057	XXXXX	XXXXX	XXXXX
13	-0.25	-0.06	67	0.960	0.2735	XXXXX	XXXXX	XXXXX	0.2853	0.0044	XXXXX	XXXXX	XXXXX
14			67	XXXXX	0.2853	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
15			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
16			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
17			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
18			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
19			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
20			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
21			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
22			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
23			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
24			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
25			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX

One-Dimensional Oedometer Testing Increment

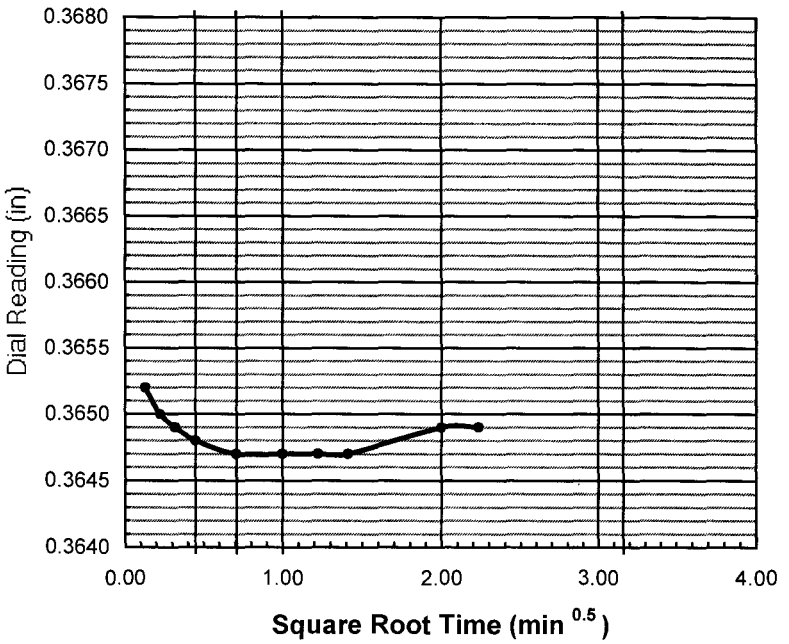
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 1 | Curves by: TJO

Boring No.: R-11-001 | Sample No.: 7 | Depth (ft.) 25.0

Date: 9-Feb-11 | Load (psf): 323 | Zero Reading: 0.3662

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:44:54	0	0.00	0.3662
	0.02	0.13	0.3652
	0.05	0.22	0.3650
	0.10	0.32	0.3649
	0.20	0.45	0.3648
	0.50	0.71	0.3647
	1.00	1.00	0.3647
	1.50	1.22	0.3647
	2.00	1.41	0.3647
	4.0	2.00	0.3649
swelling	5.0	2.24	0.3649



do = 0.3654

d90 = _____ t90 = _____ min

d100 = 0.3647

df = 0.3649

square root

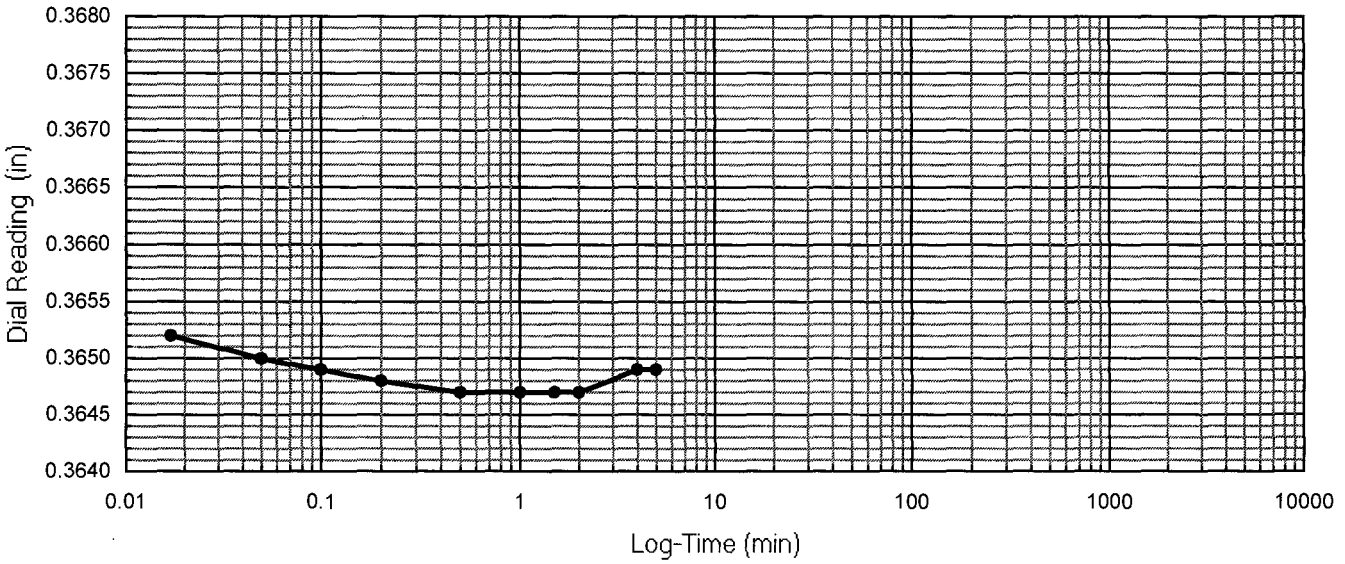
d50 = _____

t50 = _____ min

log time

d50 = 0.3651

t50 = _____ min



One-Dimensional Oedometer Testing Increment

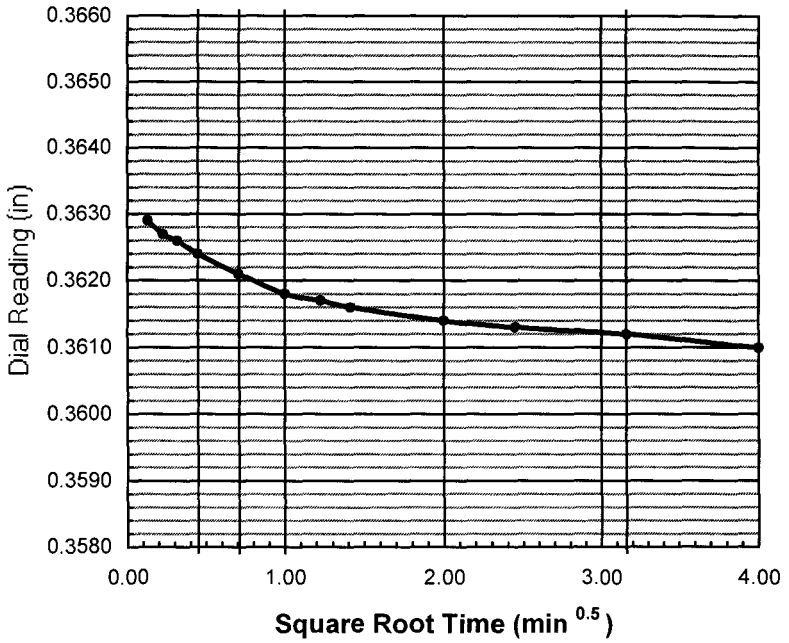
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 2 | Curves by: TJO

Boring No.: R-11-001 | Sample No.: 7 | Depth (ft.) 25.0

Date: 9-Feb-11 | Load (psf): 670 | Zero Reading: 0.3662

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:49:39	0	0.00	0.3649
	0.02	0.13	0.3629
	0.05	0.22	0.3627
	0.10	0.32	0.3626
	0.20	0.45	0.3624
	0.50	0.71	0.3621
	1.00	1.00	0.3618
	1.50	1.22	0.3617
	2.00	1.41	0.3616
	4.0	2.00	0.3614
	6.0	2.45	0.3613
	10.0	3.16	0.3612
	16.0	4.00	0.3610
	30		0.3609
	60		0.3607
	120		0.3605
	240		0.3604
	480		0.3602
	1340		0.3600



do = 0.3632

d90 = ____ t90 = ____ min

d100 = 0.3610

df = 0.3600

square root

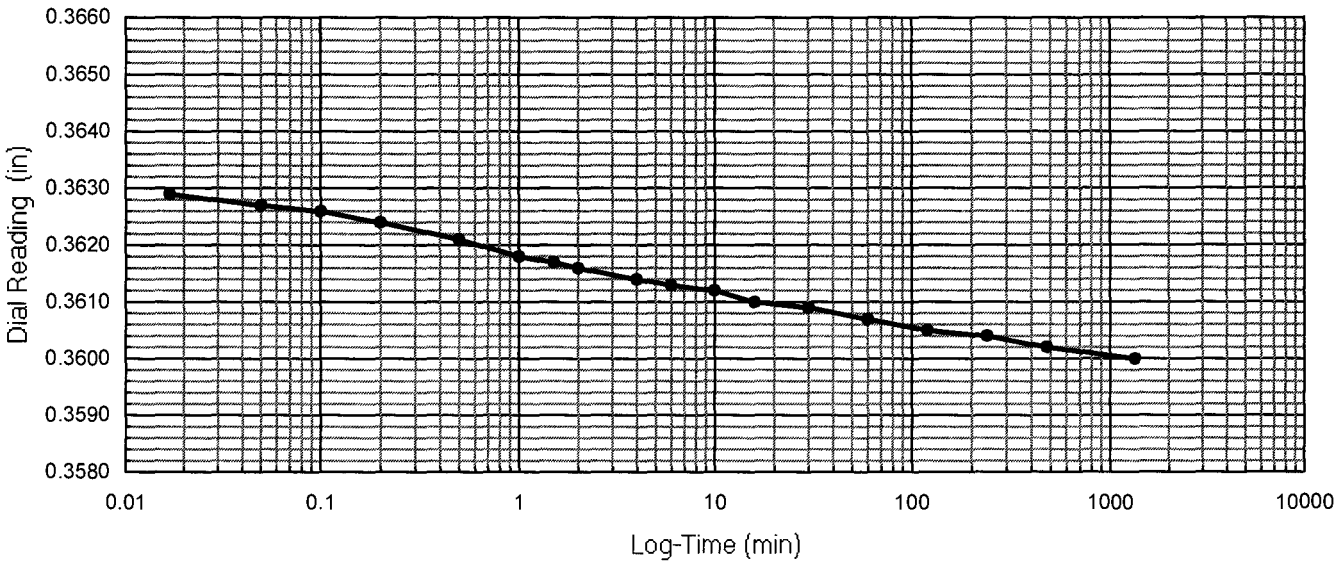
d50 = ____

t50 = ____ min

log time

d50 = 0.3621

t50 = 0.5 min



One-Dimensional Oedometer Testing Increment

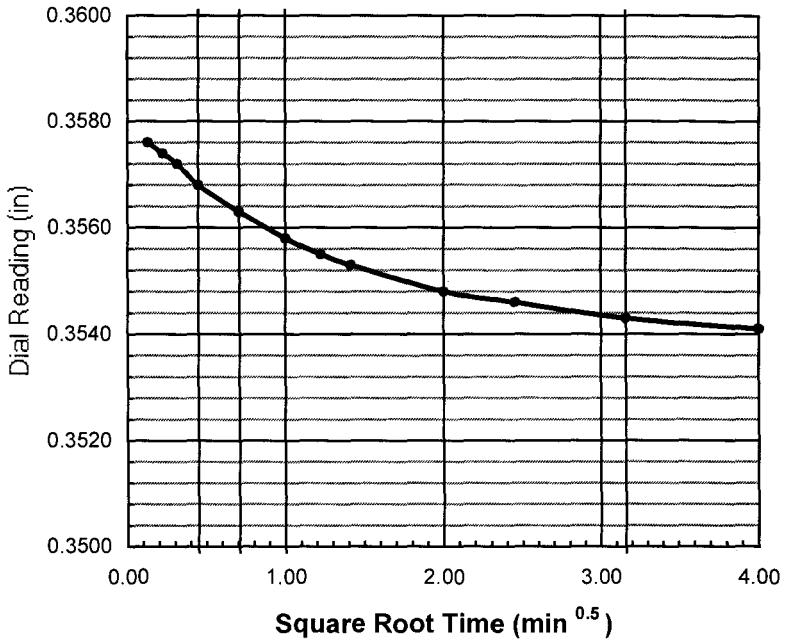
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 3 | Curves by: TJO

Boring No.: R-11-001 | Sample No.: 7 | Depth (ft.) 25.0

Date: 10-Feb-11 | Load (psf): 1362 | Zero Reading: 0.3662

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:10:22	0	0.00	0.3600
	0.02	0.13	0.3576
	0.05	0.22	0.3574
	0.10	0.32	0.3572
	0.20	0.45	0.3568
	0.50	0.71	0.3563
	1.00	1.00	0.3558
	1.50	1.22	0.3555
	2.00	1.41	0.3553
	4.0	2.00	0.3548
	6.0	2.45	0.3546
	10.0	3.16	0.3543
	16.0	4.00	0.3541
	30		0.3538
	60		0.3535
	120		0.3532
	240		0.3528
	480		0.3525
	960		0.3522
	1456		0.3521



do = 0.3580

d90 = ____ t90 = ____ min

d100 = 0.3524

df = 0.3521

square root

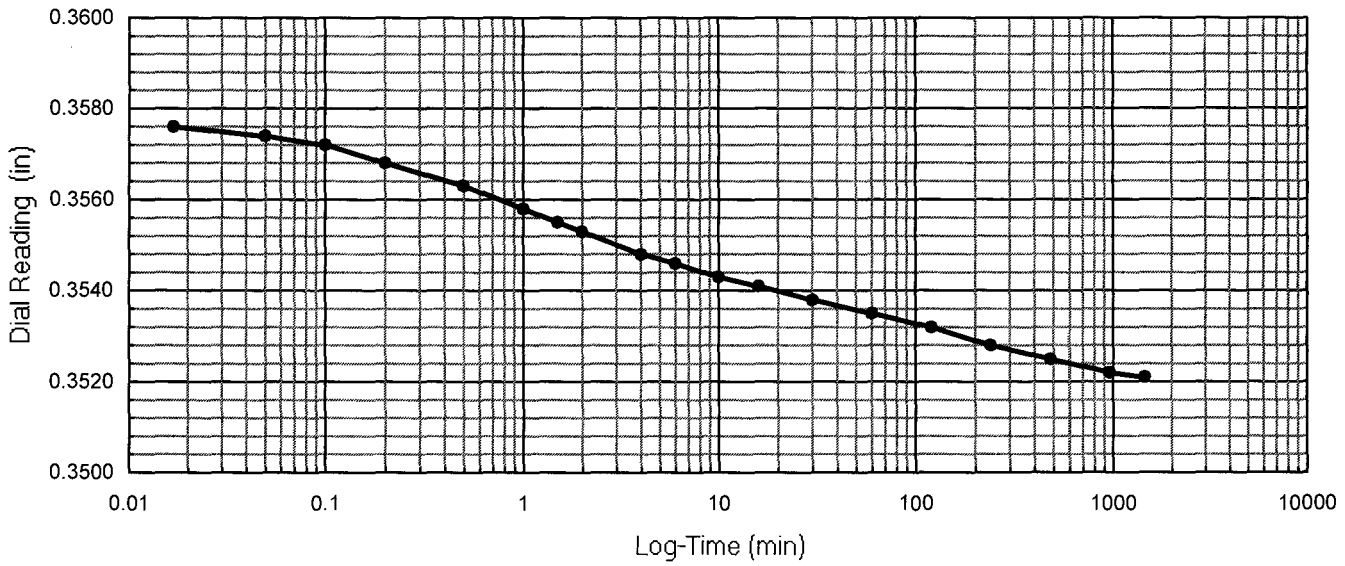
d50 = ____

t50 = ____ min

log time

d50 = 0.3552

t50 = 2.0 min



One-Dimensional Oedometer Testing Increment

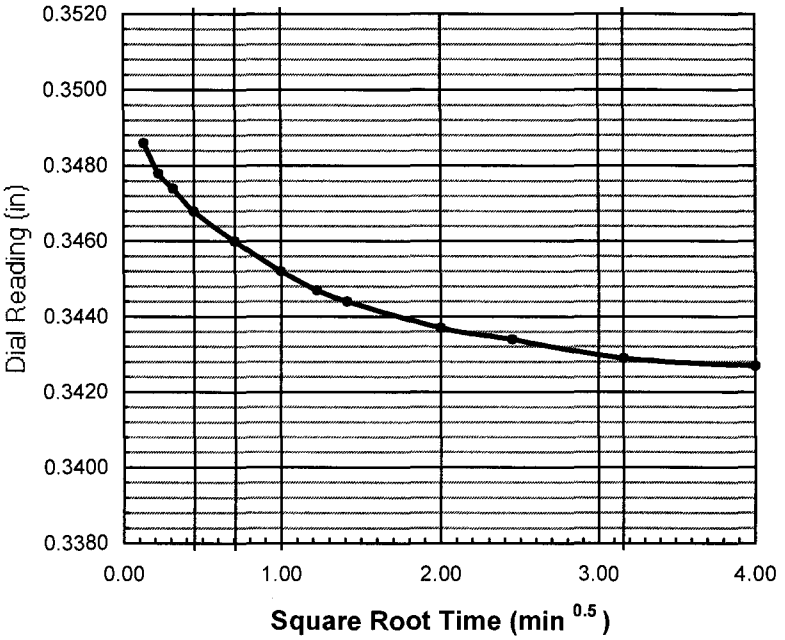
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 4 | Curves by: TJO

Boring No.: R-11-001 | Sample No.: 7 | Depth (ft.) 25.0

Date: 11-Feb-11 | Load (psf): 2747 | Zero Reading: 0.3662

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:26:42	0	0.00	0.3521
	0.02	0.13	0.3486
	0.05	0.22	0.3478
	0.10	0.32	0.3474
	0.20	0.45	0.3468
	0.50	0.71	0.3460
	1.00	1.00	0.3452
	1.50	1.22	0.3447
	2.00	1.41	0.3444
	4.0	2.00	0.3437
	6.0	2.45	0.3434
	10.0	3.16	0.3429
	16.0	4.00	0.3427
	30		0.3423
	60		0.3419
	120		0.3417
	240		0.3410
	480		0.3406
	960		0.3402
	1520		0.3400



do = 0.3495

d90 = _____ t90 = _____ min

d100 = 0.3412

df = 0.3400

square root

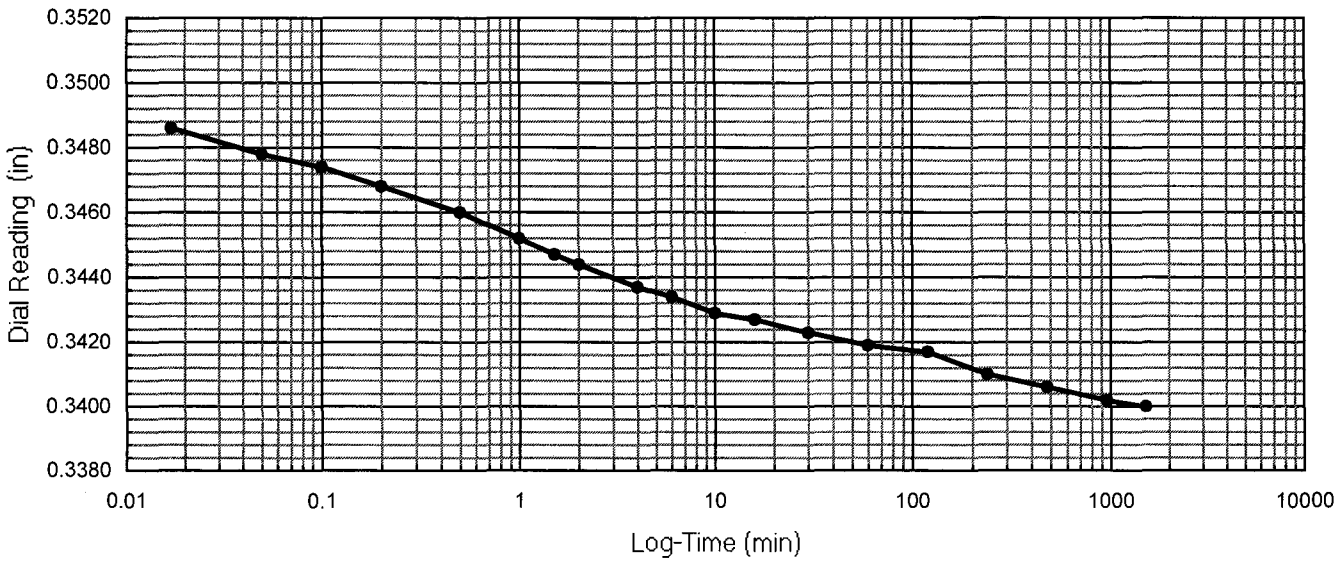
d50 = _____

t50 = _____ min

log time

d50 = 0.3454

t50 = 1.0 min



One-Dimensional Oedometer Testing Increment

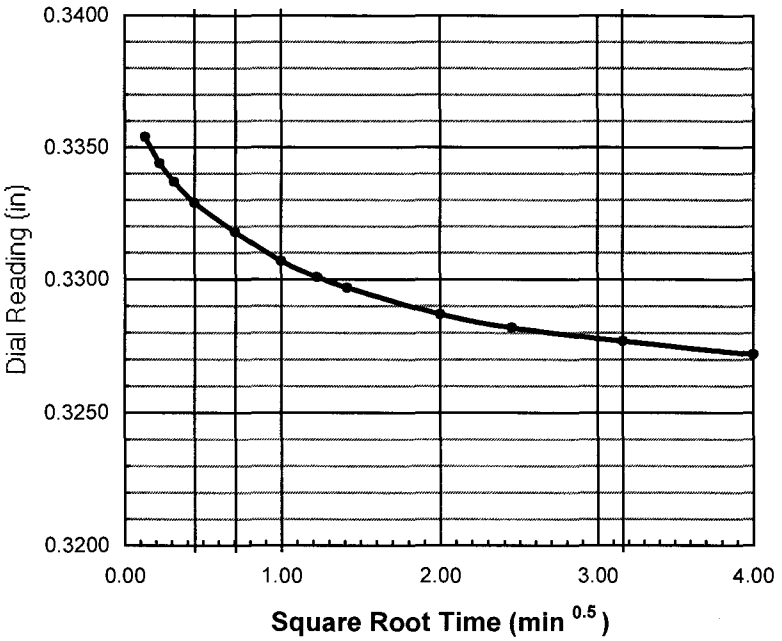
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 5 | Curves by: TJO

Boring No.: R-11-001 | Sample No.: 7 | Depth (ft.) 25.0

Date: 12-Feb-11 | Load (psf): 5517 | Zero Reading: 0.3662

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:47:34	0	0.00	0.3400
	0.02	0.13	0.3354
	0.05	0.22	0.3344
	0.10	0.32	0.3337
	0.20	0.45	0.3329
	0.50	0.71	0.3318
	1.00	1.00	0.3307
	1.50	1.22	0.3301
	2.00	1.41	0.3297
	4.0	2.00	0.3287
	6.0	2.45	0.3282
	10.0	3.16	0.3277
	16.0	4.00	0.3272
	30		0.3266
	60		0.3261
	120		0.3255
	240		0.3249
	480		0.3243
	960		0.3238
	1440		0.3235
	2792		0.3230



do = 0.3367

d90 = _____ t90 = _____ min

d100 = 0.3250

df = 0.3230

square root

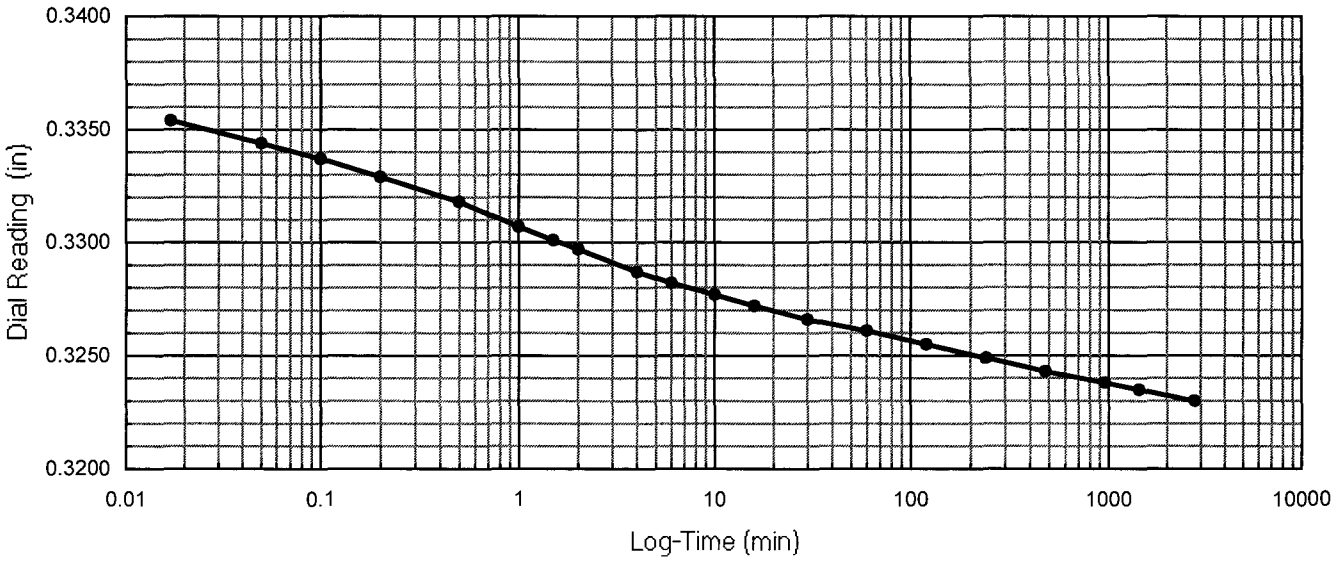
d50 = _____

t50 = _____ min

log time

d50 = 0.3308

t50 = 1.0 min



One-Dimensional Oedometer Testing Increment

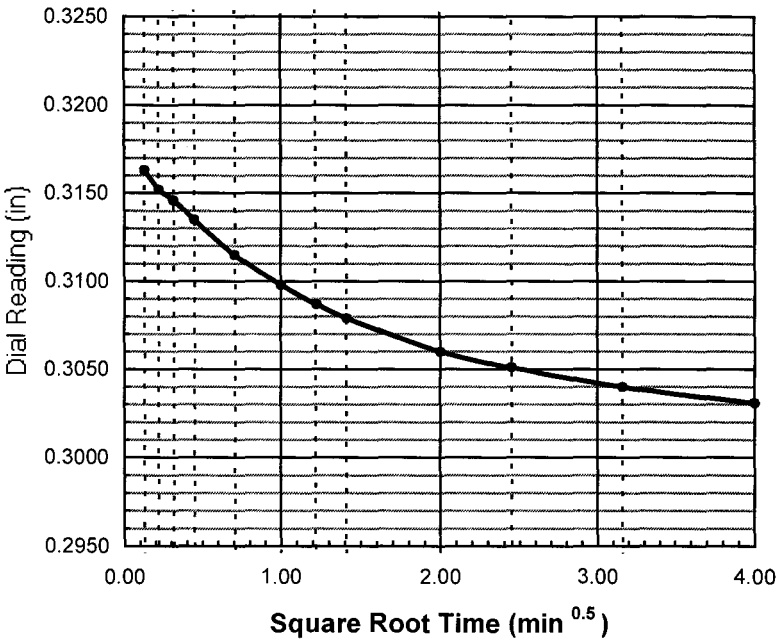
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 6 | Curves by: TJO

Boring No.: R-11-001 | Sample No.: 7 | Depth (ft.) 25.0

Date: 14-Feb-11 | Load (psf): 11057 | Zero Reading: 0.3662

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:19:49	0	0.00	0.3230
	0.02	0.13	0.3163
	0.05	0.22	0.3152
	0.10	0.32	0.3146
	0.20	0.45	0.3135
	0.50	0.71	0.3115
	1.00	1.00	0.3098
	1.50	1.22	0.3087
	2.00	1.41	0.3079
	4.0	2.00	0.3060
	6.0	2.45	0.3051
	10.0	3.16	0.3040
	16.0	4.00	0.3031
	30		0.3020
	60		0.3009
	120		0.2999
	240		0.2989
	480		0.2980
	960		0.2972
	1402		0.2967



do = 0.3177

d90 = _____ t90 = _____ min

d100 = 0.3010

df = 0.2967

square root

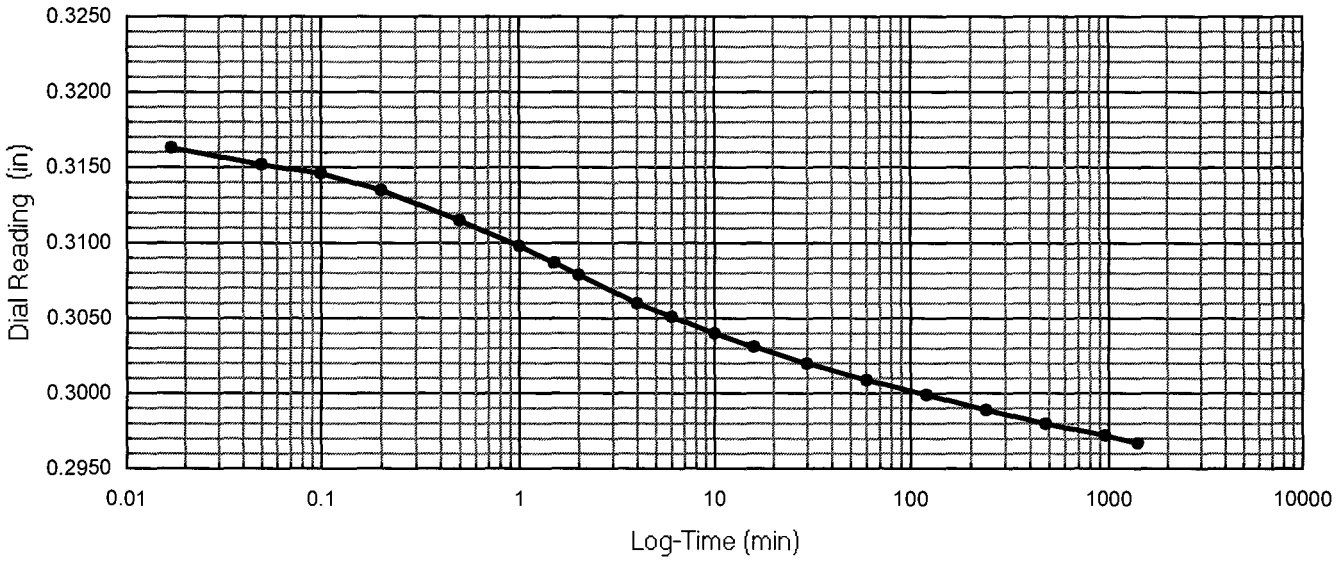
d50 = _____

t50 = _____ min

log time

d50 = 0.3094

t50 = 1.5 min



One-Dimensional Oedometer Testing Increment

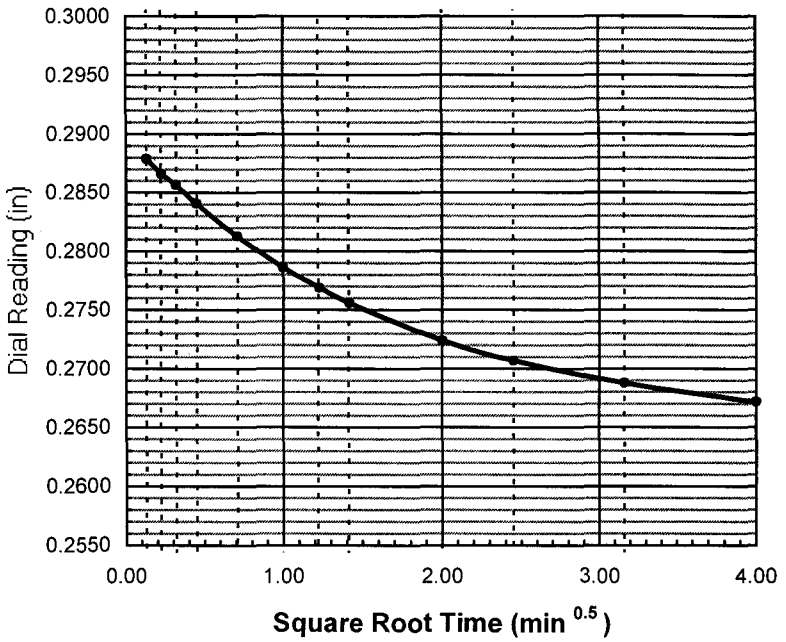
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 7 | Curves by: TJO

Boring No.: R-11-001 | Sample No.: 7 | Depth (ft.) 25.0

Date: 15-Feb-11 | Load (psf): 22137 | Zero Reading: 0.3662

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:42:40	0	0.00	0.2967
	0.02	0.13	0.2879
	0.05	0.22	0.2866
	0.10	0.32	0.2857
	0.20	0.45	0.2841
	0.50	0.71	0.2813
	1.00	1.00	0.2786
	1.50	1.22	0.2769
	2.00	1.41	0.2756
	4.0	2.00	0.2724
	6.0	2.45	0.2707
	10.0	3.16	0.2688
	16.0	4.00	0.2672
	30		0.2656
	60		0.2641
	120		0.2629
	240		0.2617
	480		0.2607
	960		0.2597
	1395		0.2593



do = 0.2898

d90 = _____ t90 = _____ min

d100 = 0.2640

df = 0.2593

square root

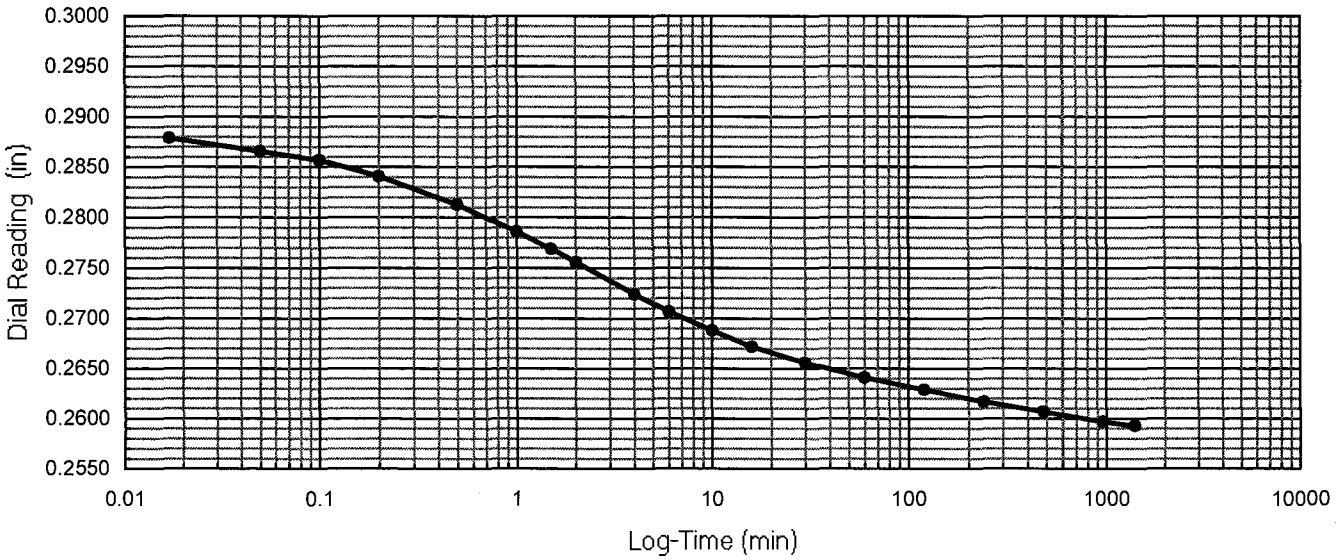
d50 = _____

t50 = _____ min

log time

d50 = 0.2769

t50 = 1.5 min



One-Dimensional Oedometer Testing Increment

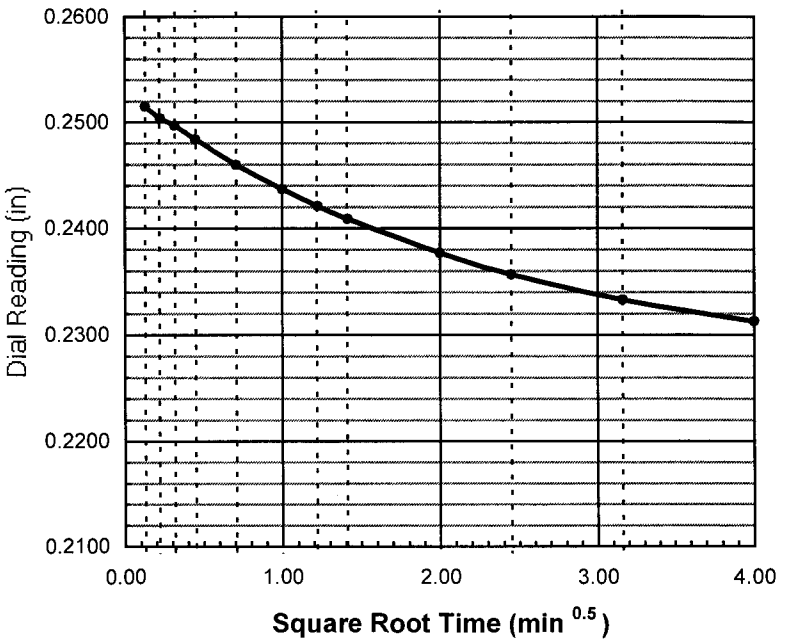
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 8 | Curves by: TJO

Boring No.: R-11-001 | Sample No.: 7 | Depth (ft.) 25.0

Date: 16-Feb-11 | Load (psf): 44296 | Zero Reading: 0.3662

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
7:59:00	0	0.00	0.2592
	0.02	0.13	0.2515
	0.05	0.22	0.2504
	0.10	0.32	0.2497
	0.20	0.45	0.2484
	0.50	0.71	0.2460
	1.00	1.00	0.2437
	1.50	1.22	0.2421
	2.00	1.41	0.2409
	4.0	2.00	0.2377
	6.0	2.45	0.2357
	10.0	3.16	0.2333
	16.0	4.00	0.2313
	30		0.2290
	60		0.2271
	120		0.2256
	240		0.2244
	480		0.2234
	960		0.2226
	15010		0.2221



do = 0.2531

d90 = _____ t90 = _____ min

d100 = 0.2250

df = 0.2221

square root

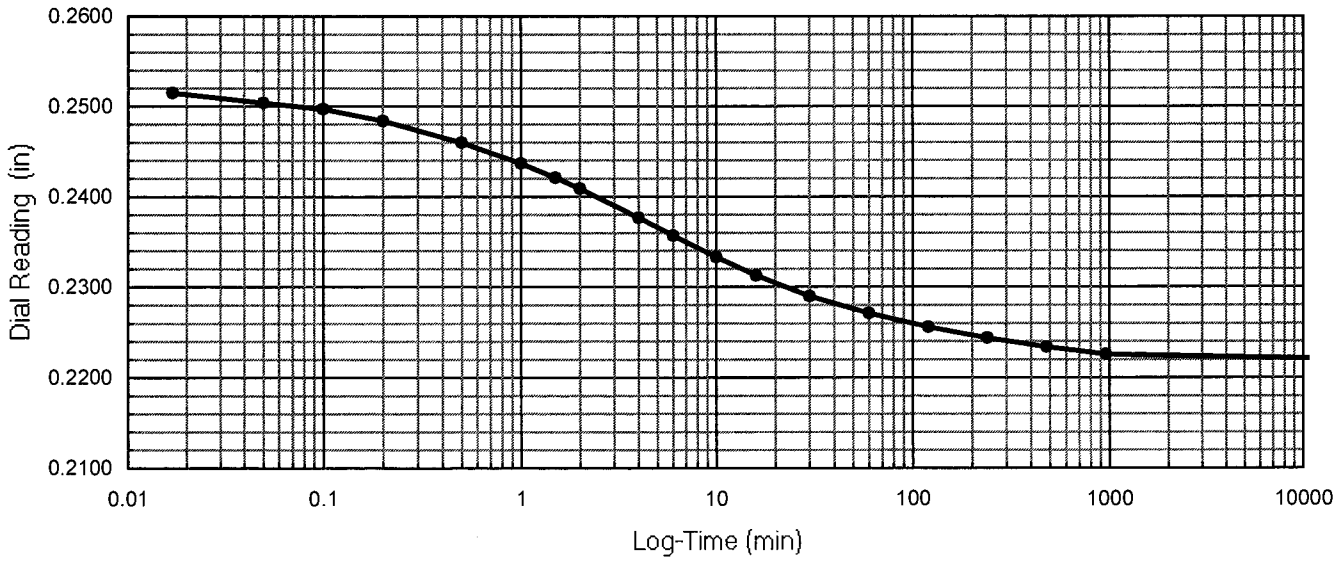
d50 = _____

t50 = _____ min

log time

d50 = 0.2390

t50 = 2.5 min



One-Dimensional Oedometer Testing Increment

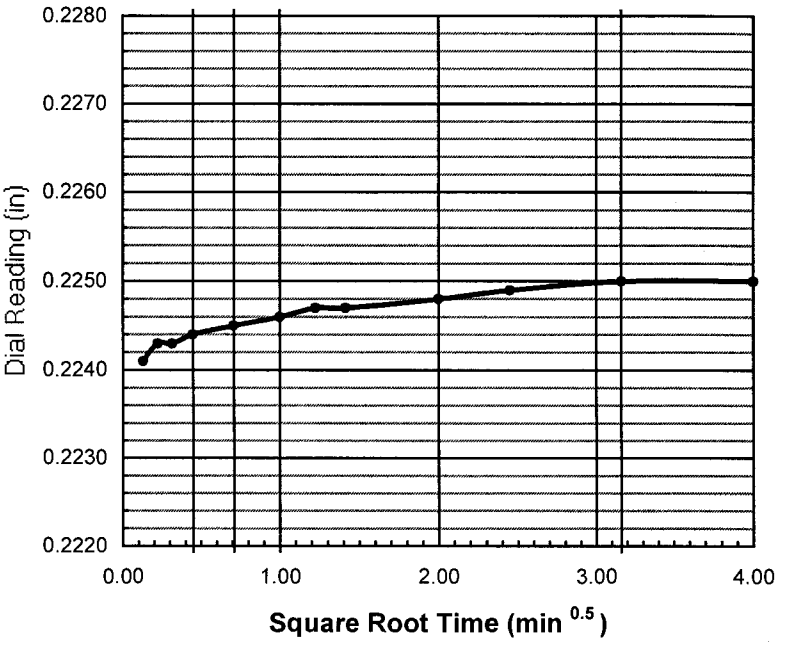
for ASTM D2435, method B

Project Number: 30989830 Apparatus No.: C8 Stage Number: 9 Curves by: TJO

Boring No.: R-11-001 Sample No.: 7 Depth (ft.) 25.0

Date: 17-Feb-11 Load (psf): 22137 Zero Reading: 0.3662

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:10:00	0	0.00	0.2221
	0.02	0.13	0.2241
	0.05	0.22	0.2243
	0.10	0.32	0.2243
	0.20	0.45	0.2244
	0.50	0.71	0.2245
	1.00	1.00	0.2246
	1.50	1.22	0.2247
	2.00	1.41	0.2247
	4.0	2.00	0.2248
	6.0	2.45	0.2249
	10.0	3.16	0.2250
	16.0	4.00	0.2250
	30		0.2251
	60		0.2252
	120		0.2252
	240		0.2253
	566		0.2254



do = 0.2240

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2254

square root

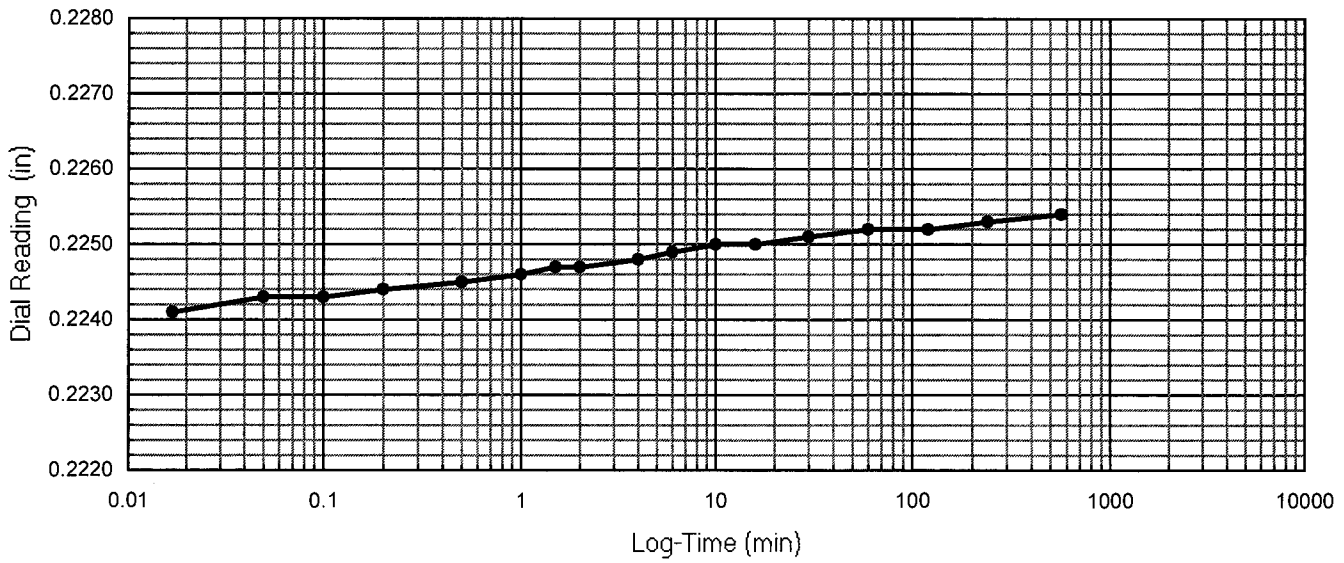
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

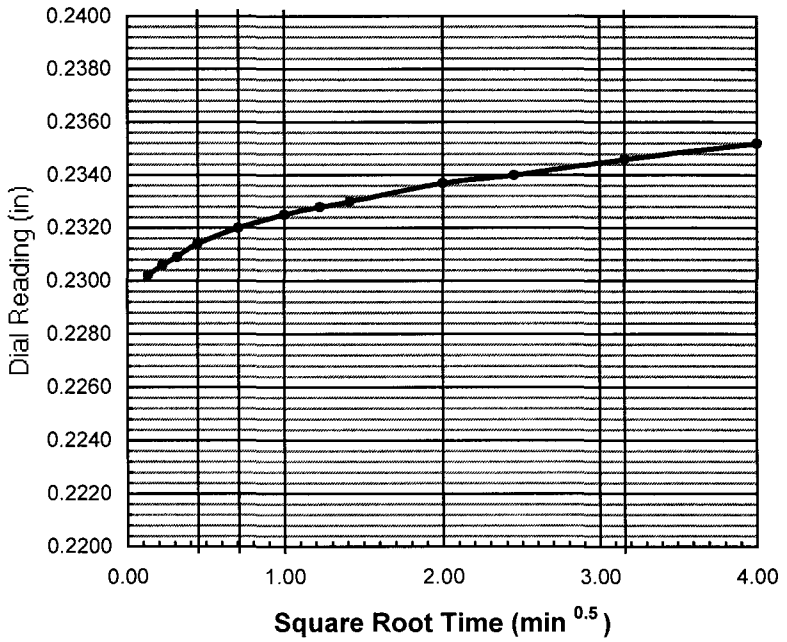
for ASTM D2435, method B

Project Number: 30989830 Apparatus No.: C8 Stage Number: 10 Curves by: TJO

Boring No.: R-11-001 Sample No.: 7 Depth (ft.) 25.0

Date: 17-Feb-11 Load (psf): 5517 Zero Reading: 0.3662

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
18:36:54	0	0.00	0.2254
	0.02	0.13	0.2302
	0.05	0.22	0.2306
	0.10	0.32	0.2309
	0.20	0.45	0.2314
	0.50	0.71	0.2320
	1.00	1.00	0.2325
	1.50	1.22	0.2328
	2.00	1.41	0.2330
	4.0	2.00	0.2337
	6.0	2.45	0.2340
	10.0	3.16	0.2346
	16.0	4.00	0.2352
	30		0.2359
	60		0.2366
	120		0.2372
	240		0.2376
	480		0.2378
	841		0.2380



do = 0.2296

d90 = t90 = min

d100 =

df = 0.2380

square root

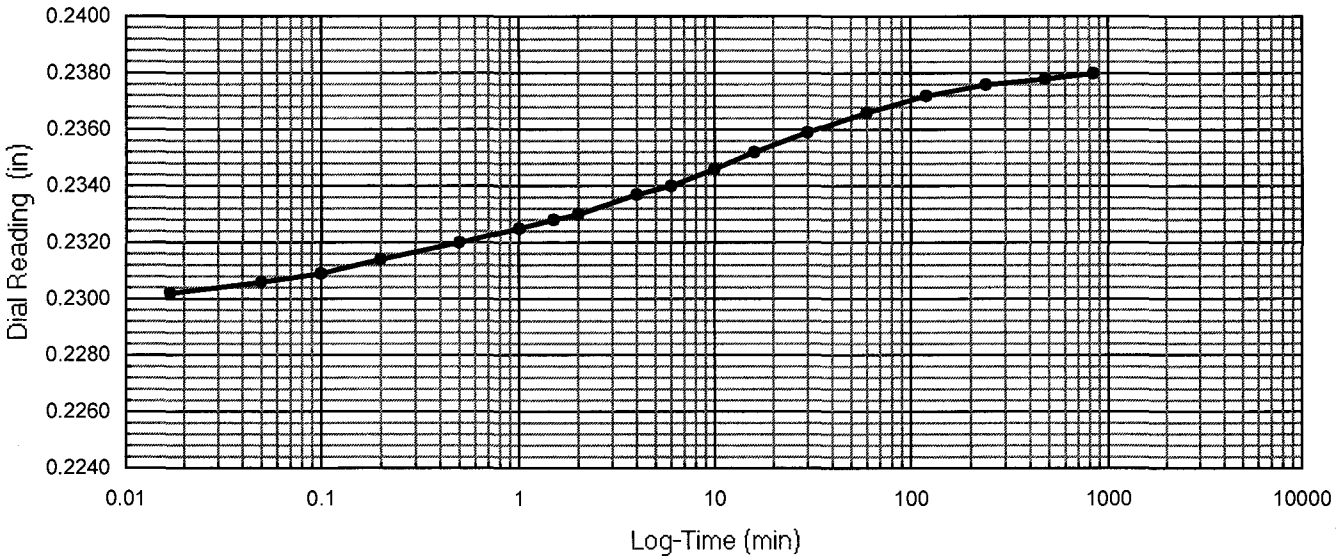
d50 =

t50 = min

log time

d50 =

t50 = min



One-Dimensional Oedometer Testing Increment

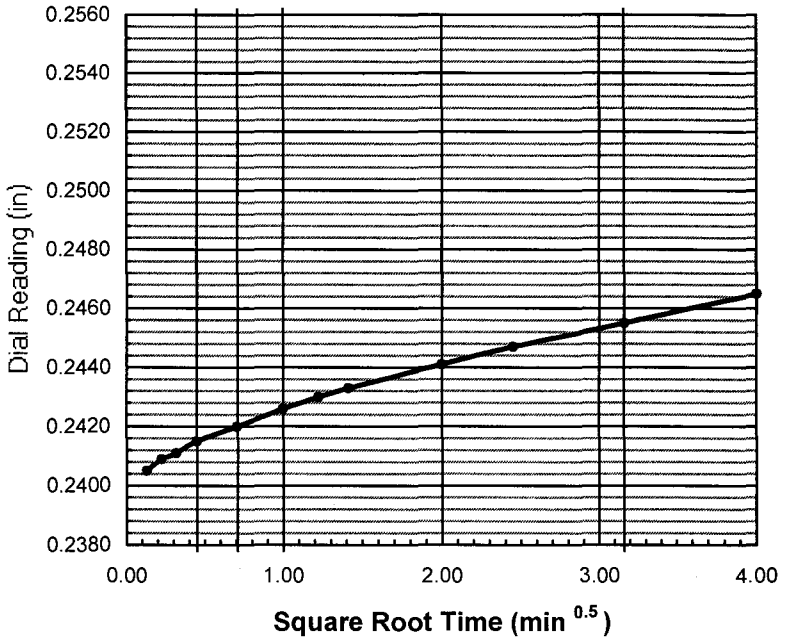
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 11 | Curves by: TJO

Boring No.: R-11-001 | Sample No.: 7 | Depth (ft.) 25.0

Date: 18-Feb-11 | Load (psf): 1362 | Zero Reading: 0.3662

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:39:03	0	0.00	0.2380
	0.02	0.13	0.2405
	0.05	0.22	0.2409
	0.10	0.32	0.2411
	0.20	0.45	0.2415
	0.50	0.71	0.2420
	1.00	1.00	0.2426
	1.50	1.22	0.2430
	2.00	1.41	0.2433
	4.0	2.00	0.2441
	6.0	2.45	0.2447
	10.0	3.16	0.2455
	16.0	4.00	0.2465
	30		0.2480
	60		0.2498
	120		0.2516
	240		0.2531
	480		0.2540
	960		0.2546
	1530		0.2550



do = 0.2400

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2550

square root

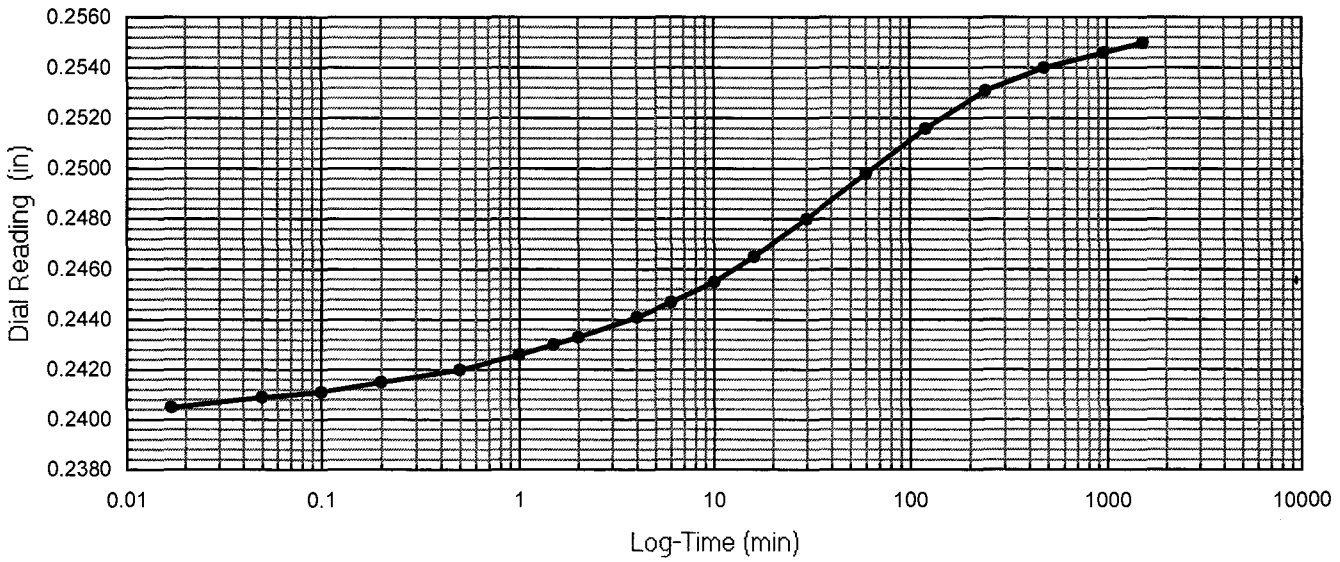
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

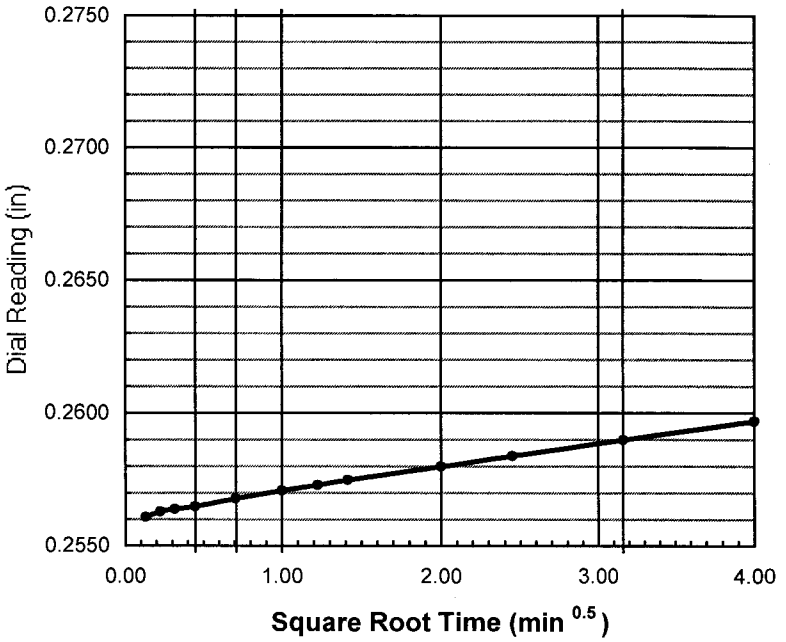
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 12 | Curves by: TJO

Boring No.: R-11-001 | Sample No.: 7 | Depth (ft.) 25.0

Date: 19-Feb-11 | Load (psf): 323 | Zero Reading: 0.3662

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:10:24	0	0.00	0.2550
	0.02	0.13	0.2561
	0.05	0.22	0.2563
	0.10	0.32	0.2564
	0.20	0.45	0.2565
	0.50	0.71	0.2568
	1.00	1.00	0.2571
	1.50	1.22	0.2573
	2.00	1.41	0.2575
	4.0	2.00	0.2580
	6.0	2.45	0.2584
	10.0	3.16	0.2590
	16.0	4.00	0.2597
	30		0.2609
	60		0.2628
	120		0.2649
	240		0.2671
	480		0.2690
	960		0.2703
	2080		0.2715
	6900		0.2732
	8537		0.2735



do = 0.2559

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2735

square root

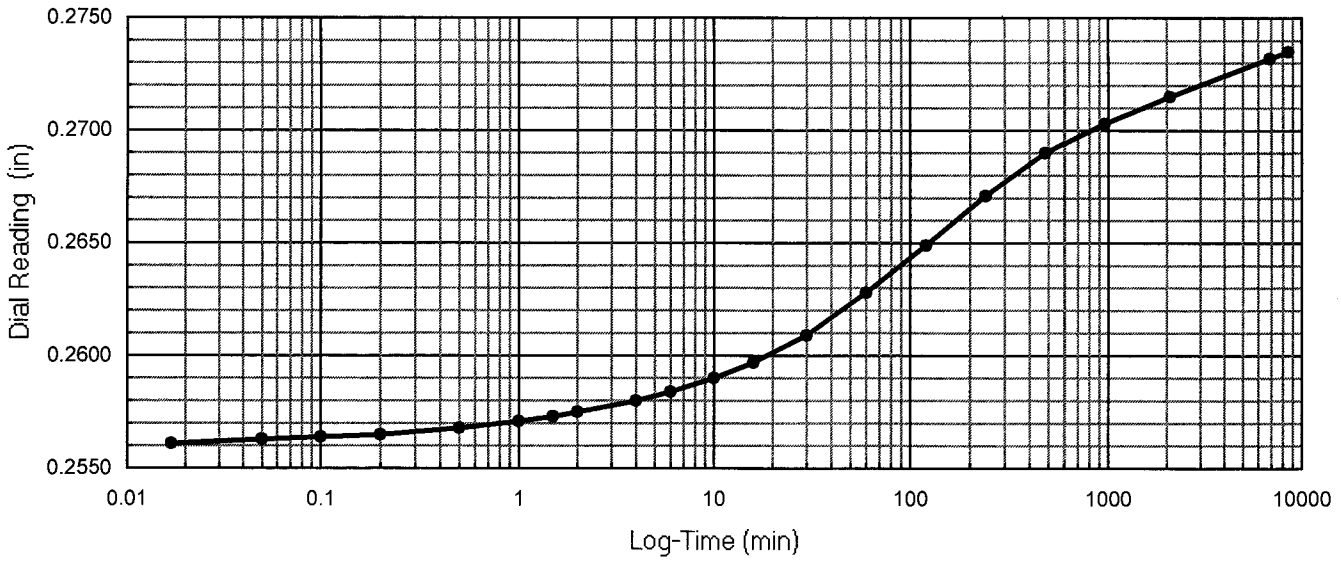
d50 = _____

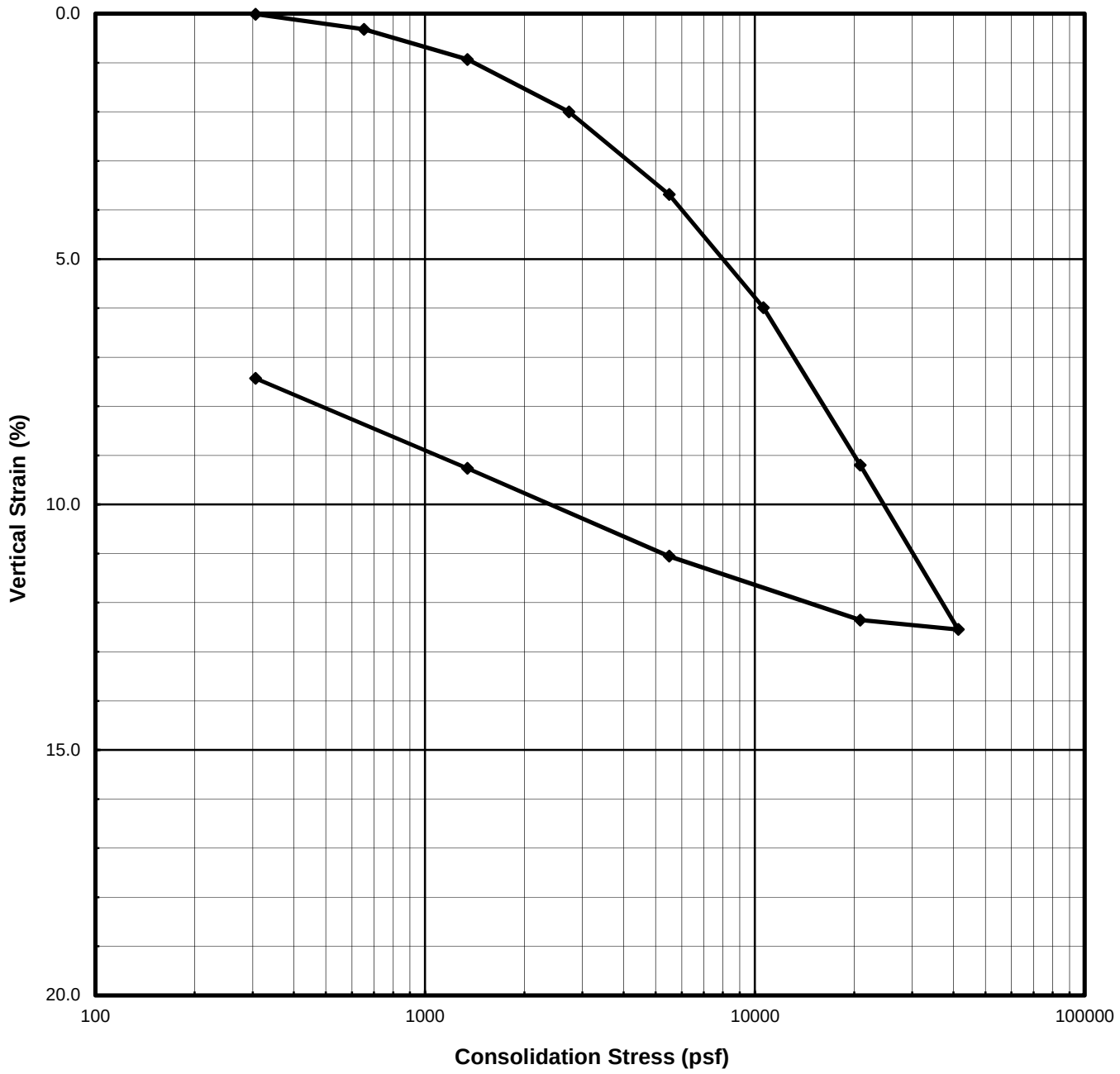
t50 = _____ min

log time

d50 = _____

t50 = _____ min





Description:	**Very dark grayish brown Clay (CL)**							
Boring No.:	R-11-002		Liquid Limit	47	%	Specific Gravity	2.75	assumed
Sample No.:	4		Plasticity Index	30	%	Strain for Saturation	1.75	%
Depth (ft | m)	11.5	3.51	Fines Content	85.9	%	Water added at	46	psf

	Water Content (%)	Total Unit Weight		Dry Unit Weight		Saturation (%)	Void Ratio	Height		Diameter	
		(pcf)	(kN/m^3)	(pcf)	(kN/m^3)			(inches)	(cm)	(inches)	(cm)
Initial	24.4	124.3	19.53	100.0	15.70	93.9	0.71	0.945	2.40	2.416	6.137
Final	22.6	129.3	20.31	105.5	16.57	99.4	0.62	0.895	2.27		

URS

I-5 & SR-74 IC

Project Number: 30989830
Test Start Date: 2/9/2011

CONSOLIDATION TEST
ASTM D2435

SUBMITTED BY: Thomas J. O'Meara

Con I5 SR74 R11002 011.xls

One-Dimensional Oedometer Testing
Set-up / Take down Worksheet
ASTM D2435

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM

Boring No.: R-11-002
Sample No.: 4
Depth (ft): 11.5

Apparatus No.: C12

Specimen Description : Very dark grayish brown Clay (CL)
Duration: end of increment

Ring Number: R20
Weight of Wet Spec. and Ring: 360.49 g
Weight of Ring: 219.15 g
Initial Weight of Wet Spec.: 141.34 g

Take Down Weight with Ring: 358.18 g

Excess Oven-dried Cont. No.: cp10
Weight of Cont. and Dry Spec.: 84.49 g
Weight of Container: 84.28 g
Weight of Excess Dried Soil: 0.21 g
Weight of Excess Wet Soil 0.26 g
Final Weight of Wet Specimen: 139.29 g

Height of Specimen (in)

	Initial	Final
1	0.945	0.898
2	0.944	0.902
3	0.946	0.888
4	0.944	0.890
5	0.944	0.898
Ave:	0.945	0.895

Initial Height - Final Height = 0.049 in
Change in Dial (Dd) = 0.059 in
Initial Height - Dd = 0.886 in
Final Height + Dd = 0.954 in
Weight of Top Cap = 371.41 g

Specimen Analysis					Initial Trim	Initial Spec.	Final
				Container Number:	sf4	**XXXXX**	s19
				Mass of Container and Wet Specimen M1 (g)	344.33	141.34	240.61
				Mass of Container and Dry Specimen, M2 (g)	301.21	113.63	215.18
				Mass of Container, M3 (g)	130.58	**XXXXX**	102.57
				Water Content, w (%)	25.27	24.39	22.58
				Mass of Wet Specimen, M4 (g)	141.34	141.34	139.29
				Mass of Dry Specimen, M5 (g)	113.63	113.63	113.63
Nominal		Measured	x	Specimen Height, H (in)	0.945	0.945	0.895
Nominal	x	Measured		Specimen Diameter, D (in)	2.416	2.416	2.416
				Area of Specimen, A (in^2)	4.584	4.584	4.584
				Volume of Specimen, V (cc)	70.96	70.96	67.25
Assumed	x	Measured		Specific Gravity, Gs	2.75	2.75	2.75
				Wet Unit Weight, WUW (pcf)	**124.3**	**124.3**	**129.3**
				Dry Unit Weight, DUW (pcf)	**99.3**	**100.0**	**105.5**
				Void Ratio	**0.727**	**0.714**	**0.625**
				Degree of Saturation, S (%)	**95.7**	**93.9**	**99.4**

Set-up by: TJO
Date: 2/9/11
Calculated by: TJO
Checked by: TJO
Strain for Saturation (%) = **1.749**

One-Dimensional Oedometer Testing

Loading Worksheet

ASTM D2435

Project Number: 30989830 Boring No.: R-11-002

Project Name: I-5 & SR-74 IC Sample No.: 4

Project Engineer: FM Apparatus No.: C12 Depth (ft): 11.5

Initial Dial Reading: 0.3257 inch Initial Specimen Height: 0.945 inch

Stage No.	Normal Stress (psf)	Dial Reading (in)		Compressibility Correction (in)	Vertical Strain (%)	
		End of Duration	End of Increment		End of Duration	End of Increment
Seat	46		0.3255	0.0000		0.02
1	133	0.3252	0.3254	0.0005	0.00	-0.02
2	306	0.3240	0.3240	0.0016	0.01	0.01
3	652	0.3196	0.3196	0.0031	0.32	0.32
4	1345	0.3121	0.3121	0.0048	0.93	0.93
5	2730	0.3005	0.3001	0.0067	1.96	2.00
6	5500	0.2830	0.2819	0.0090	3.57	3.68
7	10624	0.2595	0.2570	0.0121	5.73	5.99
8	20873	0.2260	0.2229	0.0159	8.87	9.20
9	41371	0.1900	0.1872	0.0200	12.25	12.54
10	20873		0.1913	0.0177		12.35
11	5500		0.2096	0.0117		11.05
12	1345		0.2295	0.0087		9.26
13	306		0.2490	0.0065		7.43
14	46		0.2667	0.0053		5.68
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						
33						

Final dial reading prior to take down (inch): 0.2667 Take down by: TJO Date: 3/2/11

One-Dimensional Oedometer Testing
ASTM D2435
Table of Incremental Values

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM
Apparatus No.: C12

Boring No.: R-11-002
Sample No.: 4
Depth (ft): 11.5
Inundation at stage: Seat

5 **10** Hanger Ratios

Stage Number	Incremental Weight Applied (kg) Back	Front	Vertical Stress (psf)	Specimen Hieght (in)	Deflections (in) $d_{initial}$	d_o	d_{50}	d_{100}	d_{final}	Porous Stone (in)	t_{50} (min)	cv (in^2/min)	cv (ft^2/day)
Top Cap			26	0.945	0.3257	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
Seat	0.06		46	0.944	0.3257	XXXXX	XXXXX	XXXXX	0.3255	0.0000	XXXXX	XXXXX	XXXXX
1	0.25		133	0.945	0.3255	0.3254	0.3253	0.3252	0.3254	0.0005	XXXXX	XXXXX	XXXXX
2	0.50		306	0.945	0.3254	0.3247	0.3244	0.3240	0.3240	0.0016	XXXXX	XXXXX	XXXXX
3	1.00		652	0.944	0.3240	0.3228	0.3212	0.3196	0.3196	0.0031	6.00	0.007	0.073
4		1.0	1345	0.941	0.3196	0.3179	0.3150	0.3121	0.3121	0.0048	6.00	0.007	0.073
5	4.0		2730	0.936	0.3121	0.3096	0.3051	0.3005	0.3001	0.0067	6.00	0.007	0.072
6		4.0	5500	0.927	0.3001	0.2976	0.2903	0.2830	0.2819	0.0090	6.00	0.007	0.070
7		7.4	10624	0.914	0.2819	0.2787	0.2691	0.2595	0.2570	0.0121	6.00	0.007	0.069
8		14.8	20873	0.896	0.2570	0.2531	0.2396	0.2260	0.2229	0.0159	10.00	0.004	0.039
9		29.6	41371	0.880	0.2229	0.2195	0.2048	0.1900	0.1872	0.0200	20.00	0.002	0.019
10		-29.6	20873	0.902	0.1872	0.1893	XXXXX	XXXXX	0.1913	0.0177	XXXXX	XXXXX	XXXXX
11		-22.2	5500	0.932	0.1913	0.1969	XXXXX	XXXXX	0.2096	0.0117	XXXXX	XXXXX	XXXXX
12	-4.0	-4.0	1345	0.960	0.2096	0.2113	XXXXX	XXXXX	0.2295	0.0087	XXXXX	XXXXX	XXXXX
13	-1.00	-1.00	306	0.986	0.2295	0.2303	XXXXX	XXXXX	0.2490	0.0065	XXXXX	XXXXX	XXXXX
14	-0.750		46	1.009	0.2490	XXXXX	XXXXX	XXXXX	0.2667	0.0053	XXXXX	XXXXX	XXXXX
15			46	XXXXX	0.2667	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
16			46	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
17			46	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
18			46	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
19			46	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
20			46	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
21			46	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
22			46	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
23			46	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
24			46	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
25			46	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX

One-Dimensional Oedometer Testing Increment

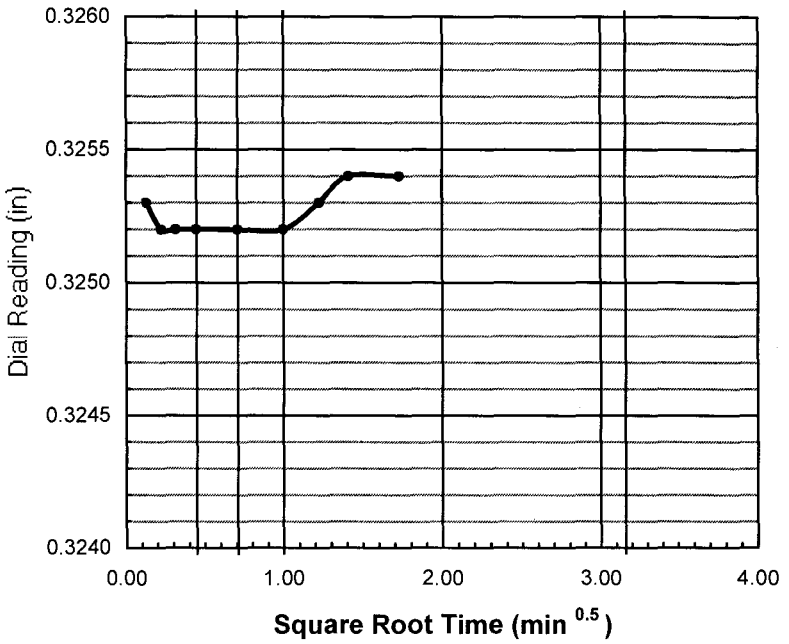
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C12 | Stage Number: 1 | Curves by: TJO

Boring No.: R-11-002 | Sample No.: 4 | Depth (ft.) 11.5

Date: 9-Feb-11 | Load (psf): 133 | Zero Reading: 0.3257

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
11:26:20	0	0.00	0.3255
	0.02	0.13	0.3253
	0.05	0.22	0.3252
	0.10	0.32	0.3252
	0.20	0.45	0.3252
	0.50	0.71	0.3252
	1.00	1.00	0.3252
	1.50	1.22	0.3253
	2.00	1.41	0.3254
swelling	3.0	1.73	0.3254



do = 0.3254

d90 = _____ t90 = _____ min

d100 = _____

df = 0.3254

square root

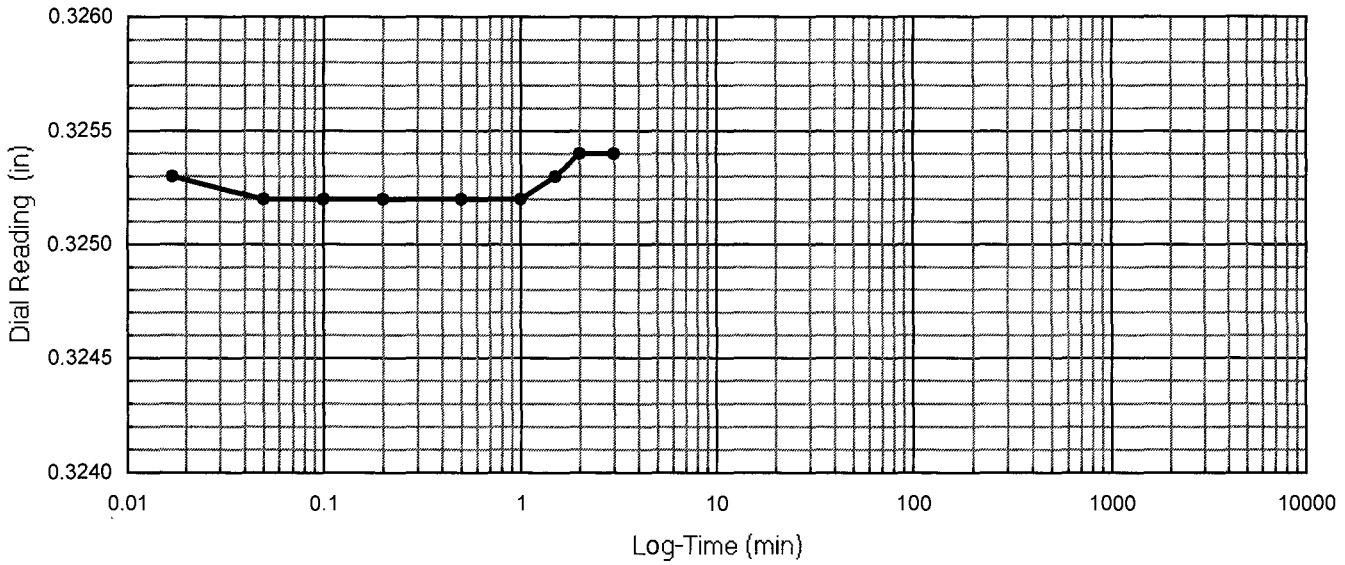
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

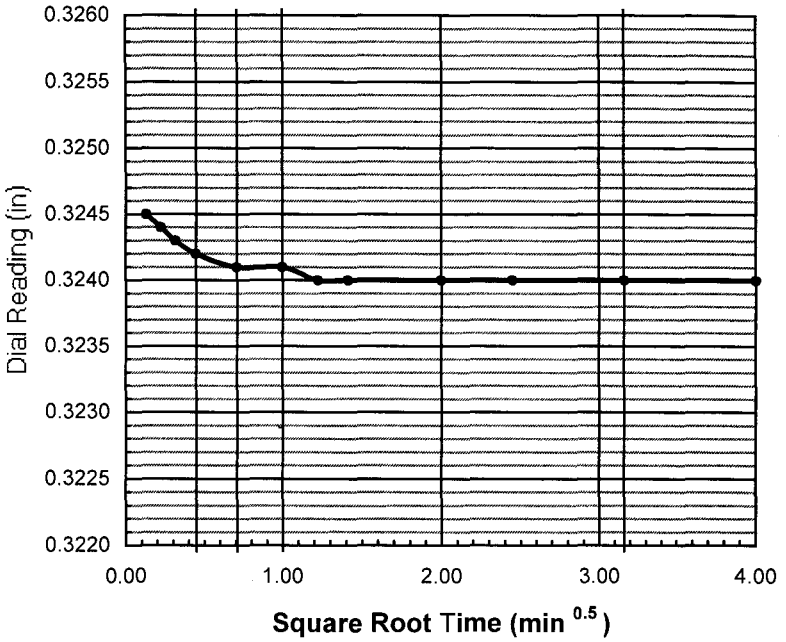
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C12 | Stage Number: 2 | Curves by: TJO

Boring No.: R-11-002 | Sample No.: 4 | Depth (ft.) 11.5

Date: 9-Feb-11 | Load (psf): 306 | Zero Reading: 0.3257

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
11:28:27	0	0.00	0.3254
	0.02	0.13	0.3245
	0.05	0.22	0.3244
	0.10	0.32	0.3243
	0.20	0.45	0.3242
	0.50	0.71	0.3241
	1.00	1.00	0.3241
	1.50	1.22	0.3240
	2.00	1.41	0.3240
	4.0	2.00	0.3240
	6.0	2.45	0.3240
	10.0	3.16	0.3240
	16.0	4.00	0.3240
	30		0.3240



do = 0.3247

d90 = _____ t90 = _____ min

d100 = 0.3240

df = 0.3240

square root

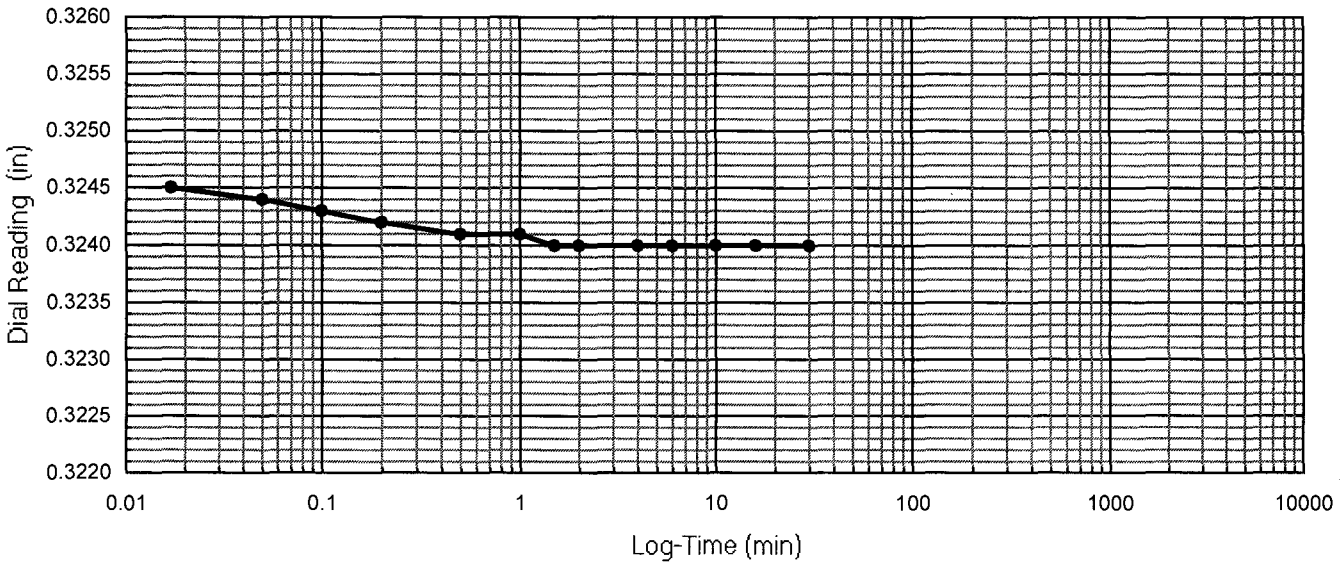
d50 = _____

t50 = _____ min

log time

d50 = 0.3243

t50 = _____ min



One-Dimensional Oedometer Testing Increment

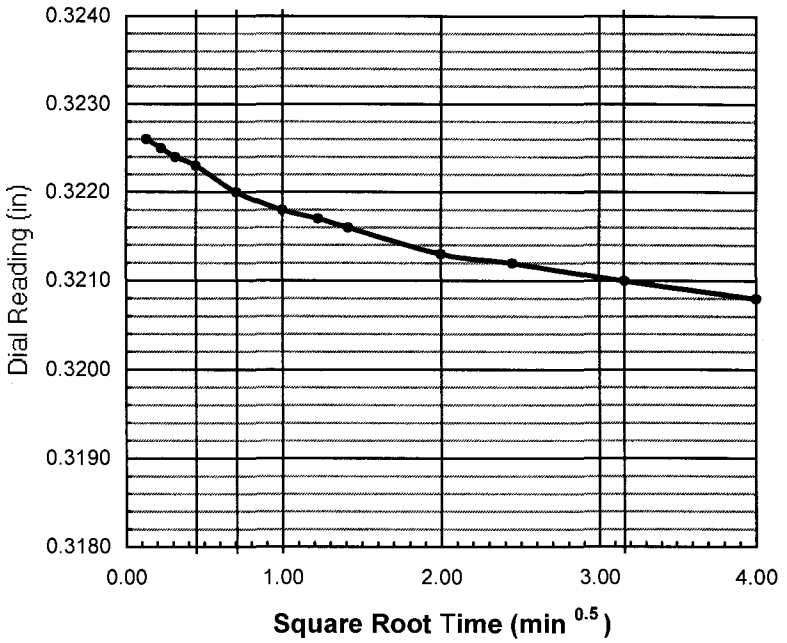
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C12 | Stage Number: 3 | Curves by: TJO

Boring No.: R-11-002 | Sample No.: 4 | Depth (ft.) 11.5

Date: 9-Feb-11 | Load (psf): 652 | Zero Reading: 0.3257

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
12:09:10	0	0.00	0.3240
	0.02	0.13	0.3226
	0.05	0.22	0.3225
	0.10	0.32	0.3224
	0.20	0.45	0.3223
	0.50	0.71	0.3220
	1.00	1.00	0.3218
	1.50	1.22	0.3217
	2.00	1.41	0.3216
	4.0	2.00	0.3213
	6.0	2.45	0.3212
	10.0	3.16	0.3210
	16.0	4.00	0.3208
	30		0.3206
	60		0.3203
	120		0.3201
	240		0.3198
	480		0.3197
	960		0.3196
	1262		0.3196



do = 0.3228

d90 = _____ t90 = _____ min

d100 = 0.3196

df = 0.3196

square root

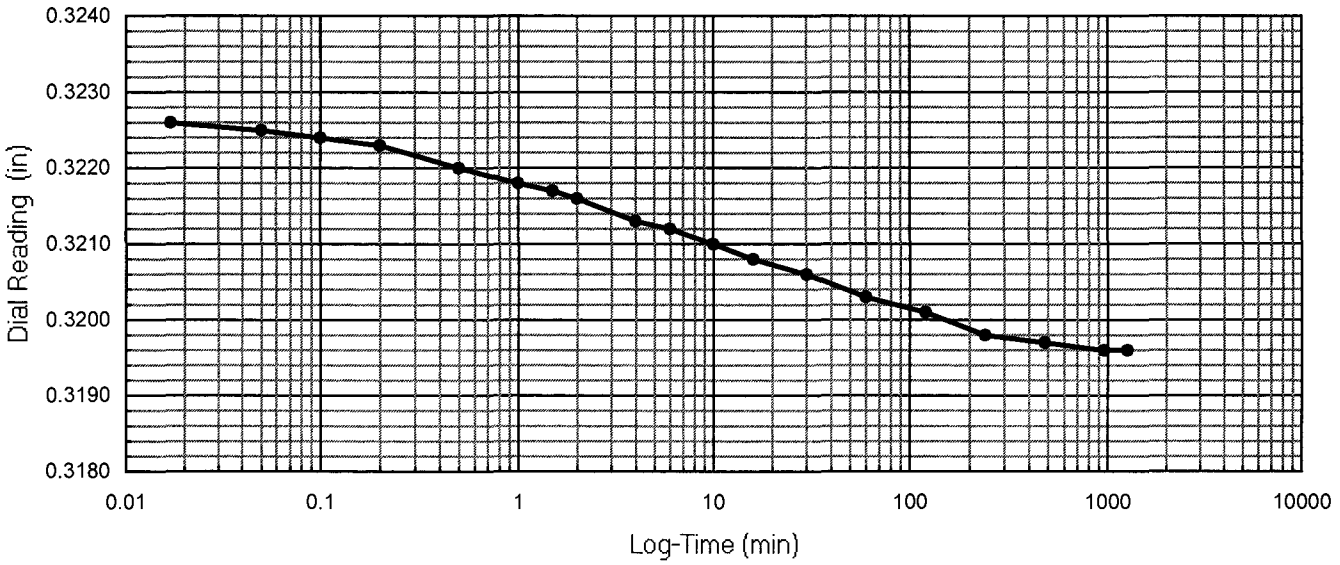
d50 = _____

t50 = _____ min

log time

d50 = 0.3212

t50 = 6.0 min



One-Dimensional Oedometer Testing Increment

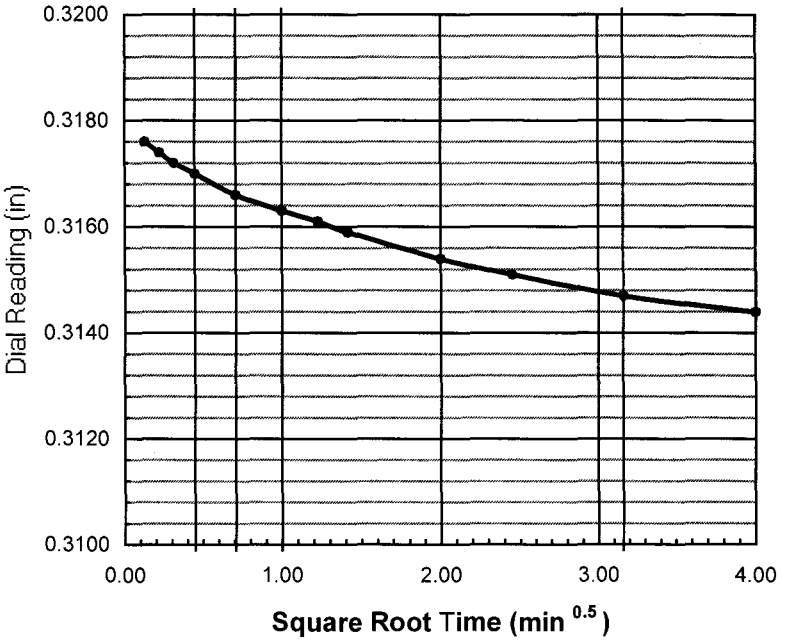
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C12 | Stage Number: 4 | Curves by: TJO

Boring No.: R-11-002 | Sample No.: 4 | Depth (ft.) 11.5

Date: 10-Feb-11 | Load (psf): 1345 | Zero Reading: 0.3257

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:12:28	0	0.00	0.3196
	0.02	0.13	0.3176
	0.05	0.22	0.3174
	0.10	0.32	0.3172
	0.20	0.45	0.3170
	0.50	0.71	0.3166
	1.00	1.00	0.3163
	1.50	1.22	0.3161
	2.00	1.41	0.3159
	4.0	2.00	0.3154
	6.0	2.45	0.3151
	10.0	3.16	0.3147
	16.0	4.00	0.3144
	30		0.3140
	60		0.3136
	120		0.3133
	240		0.3128
	480		0.3123
	960		0.3121
	1456		0.3121



do = 0.3179

d90 = _____ t90 = _____ min

d100 = 0.3121

df = 0.3121

square root

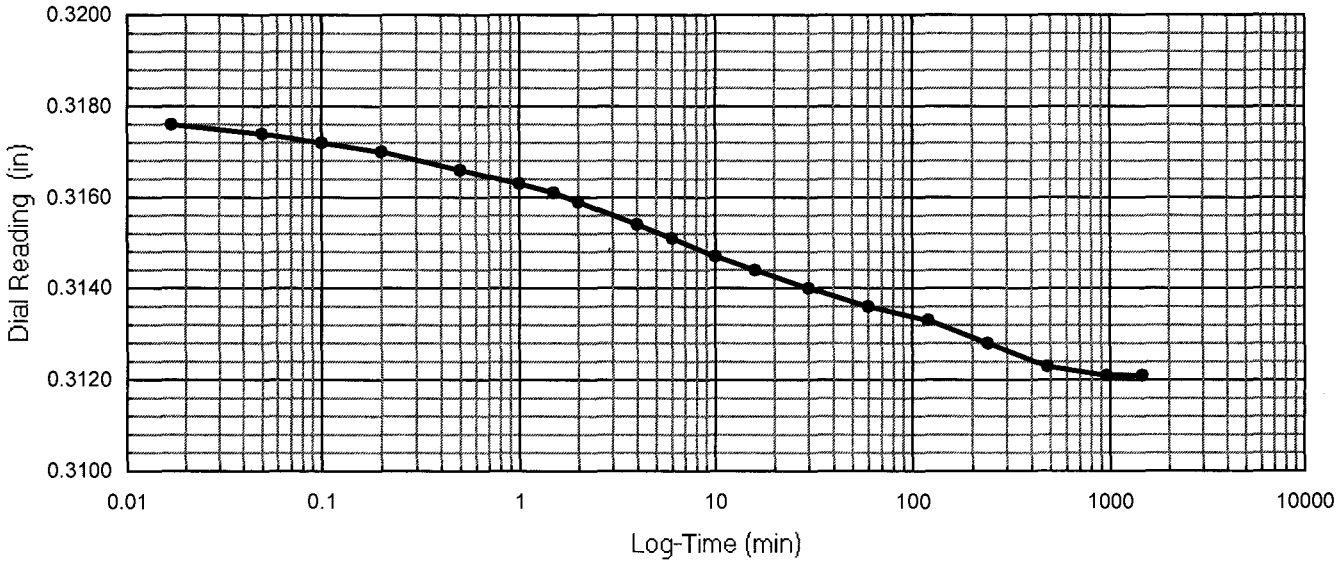
d50 = _____

t50 = _____ min

log time

d50 = 0.3150

t50 = 6.0 min



One-Dimensional Oedometer Testing Increment

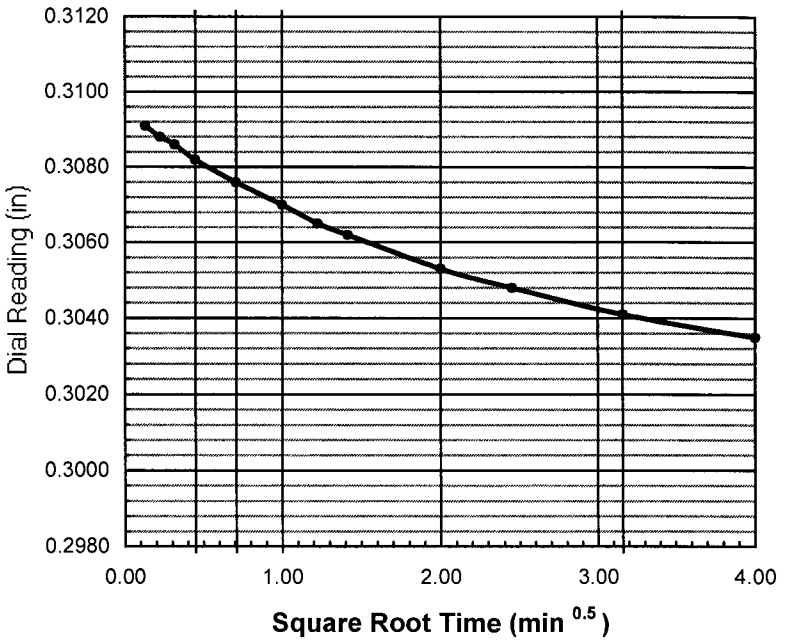
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C12 | Stage Number: 5 | Curves by: TJO

Boring No.: R-11-002 | Sample No.: 4 | Depth (ft.) 11.5

Date: 11-Feb-11 | Load (psf): 2730 | Zero Reading: 0.3257

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:28:51	0	0.00	0.3121
	0.02	0.13	0.3091
	0.05	0.22	0.3088
	0.10	0.32	0.3086
	0.20	0.45	0.3082
	0.50	0.71	0.3076
	1.00	1.00	0.3070
	1.50	1.22	0.3065
	2.00	1.41	0.3062
	4.0	2.00	0.3053
	6.0	2.45	0.3048
	10.0	3.16	0.3041
	16.0	4.00	0.3035
	30		0.3028
	60		0.3022
	120		0.3017
	240		0.3011
	480		0.3005
	960		0.3002
	1520		0.3001



do = 0.3096

d90 = ____ t90 = ____ min

d100 = 0.3005

df = 0.3001

square root

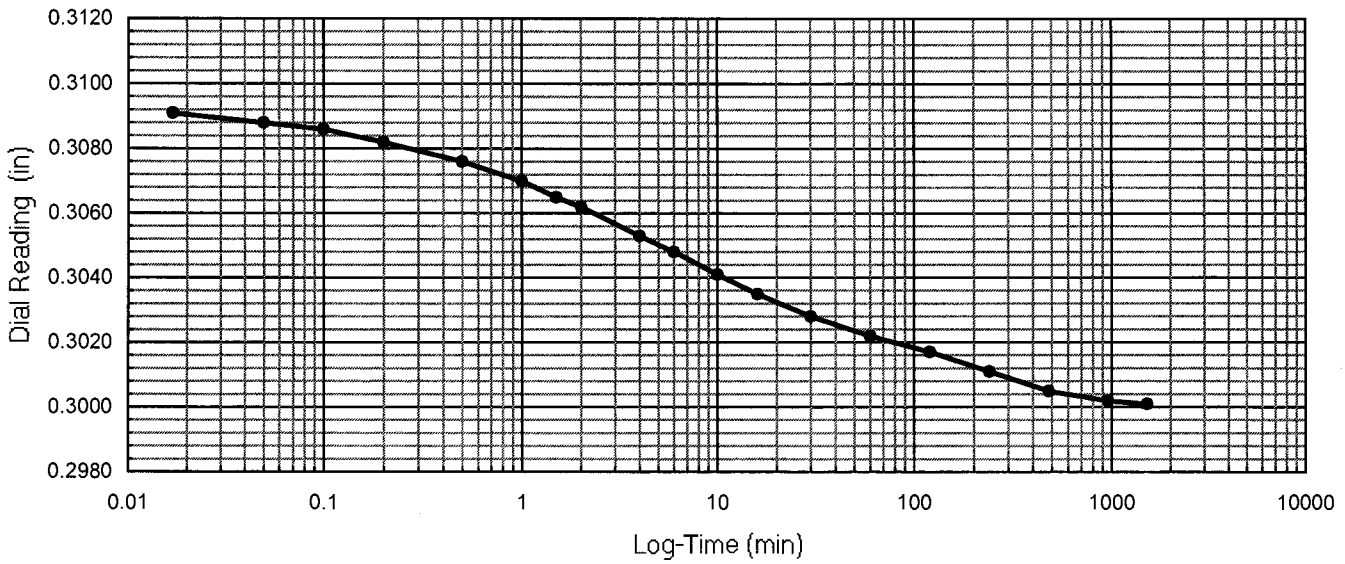
d50 = ____

t50 = ____ min

log time

d50 = 0.3050

t50 = 6.0 min



One-Dimensional Oedometer Testing Increment

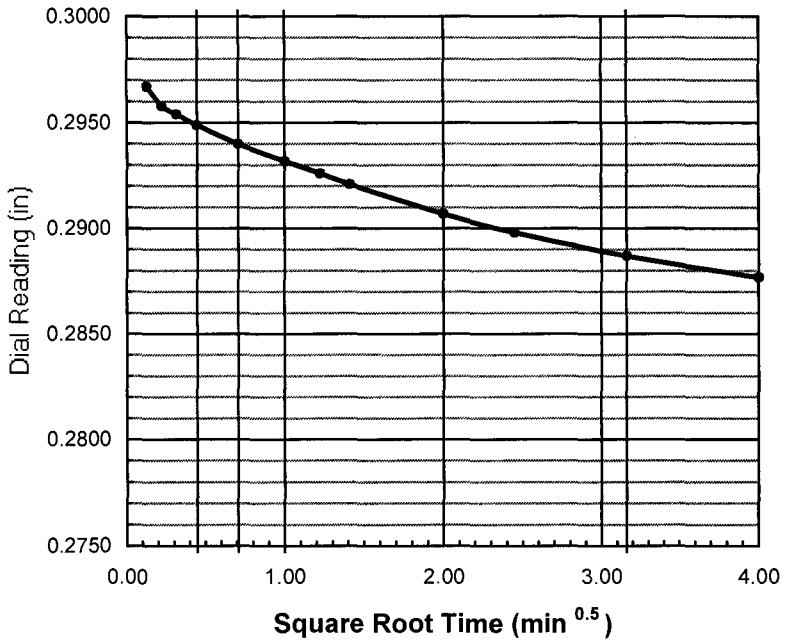
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C12 | Stage Number: 6 | Curves by: TJO

Boring No.: R-11-002 | Sample No.: 4 | Depth (ft.) 11.5

Date: 12-Feb-11 | Load (psf): 5500 | Zero Reading: 0.3257

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:49:41	0	0.00	0.3001
	0.02	0.13	0.2967
	0.05	0.22	0.2958
	0.10	0.32	0.2954
	0.20	0.45	0.2949
	0.50	0.71	0.2940
	1.00	1.00	0.2932
	1.50	1.22	0.2926
	2.00	1.41	0.2921
	4.0	2.00	0.2907
	6.0	2.45	0.2898
	10.0	3.16	0.2887
	16.0	4.00	0.2877
	30		0.2865
	60		0.2854
	120		0.2846
	240		0.2837
	480		0.2830
	960		0.2825
	1440		0.2824
	2792		0.2819



do = 0.2976

d90 = ____ t90 = ____ min

d100 = 0.2830

df = 0.2819

square root

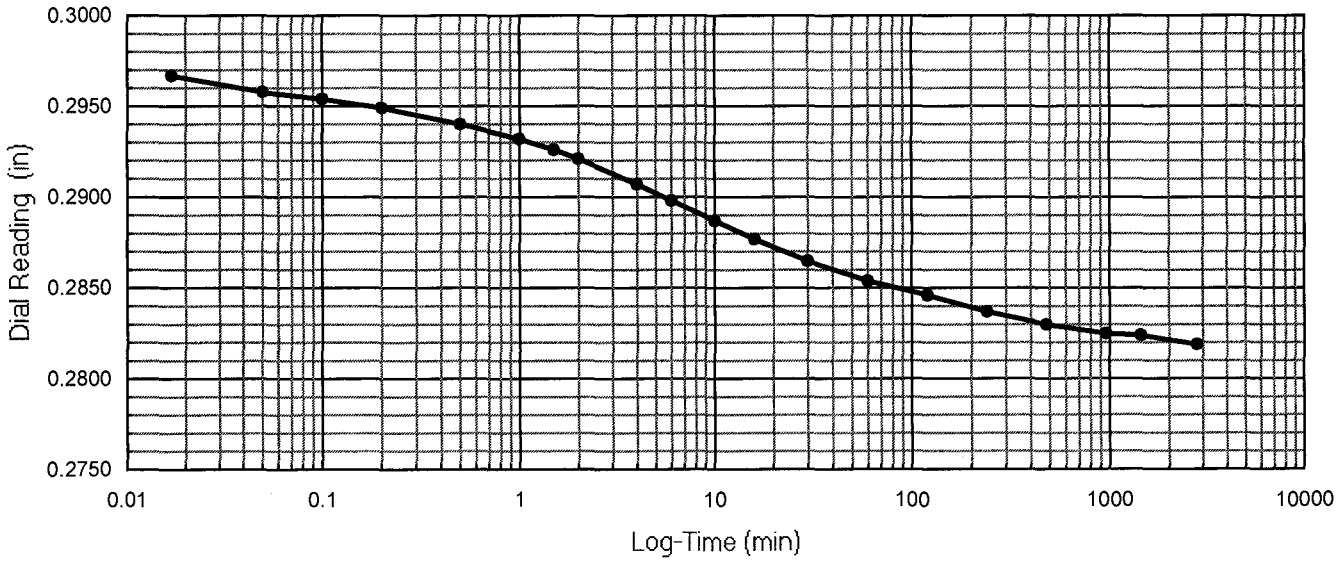
d50 = ____

t50 = ____ min

log time

d50 = 0.2903

t50 = 5.0 min



One-Dimensional Oedometer Testing Increment

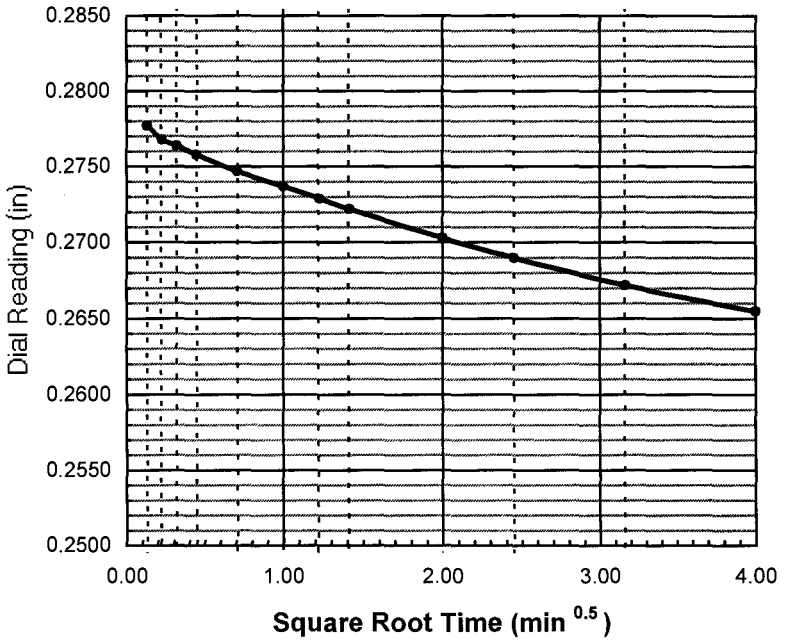
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C12 | Stage Number: 7 | Curves by: TJO

Boring No.: R-11-002 | Sample No.: 4 | Depth (ft.) 11.5

Date: 14-Feb-11 | Load (psf): 10624 | Zero Reading: 0.3257

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:22:07	0	0.00	0.2819
	0.02	0.13	0.2777
	0.05	0.22	0.2768
	0.10	0.32	0.2764
	0.20	0.45	0.2758
	0.50	0.71	0.2747
	1.00	1.00	0.2737
	1.50	1.22	0.2729
	2.00	1.41	0.2722
	4.0	2.00	0.2703
	6.0	2.45	0.2690
	10.0	3.16	0.2672
	16.0	4.00	0.2655
	30		0.2635
	60		0.2617
	120		0.2603
	240		0.2591
	480		0.2581
	960		0.2573
	1402		0.2570



do = 0.2787

d90 = ____ t90 = ____ min

d100 = 0.2595

df = 0.2570

square root

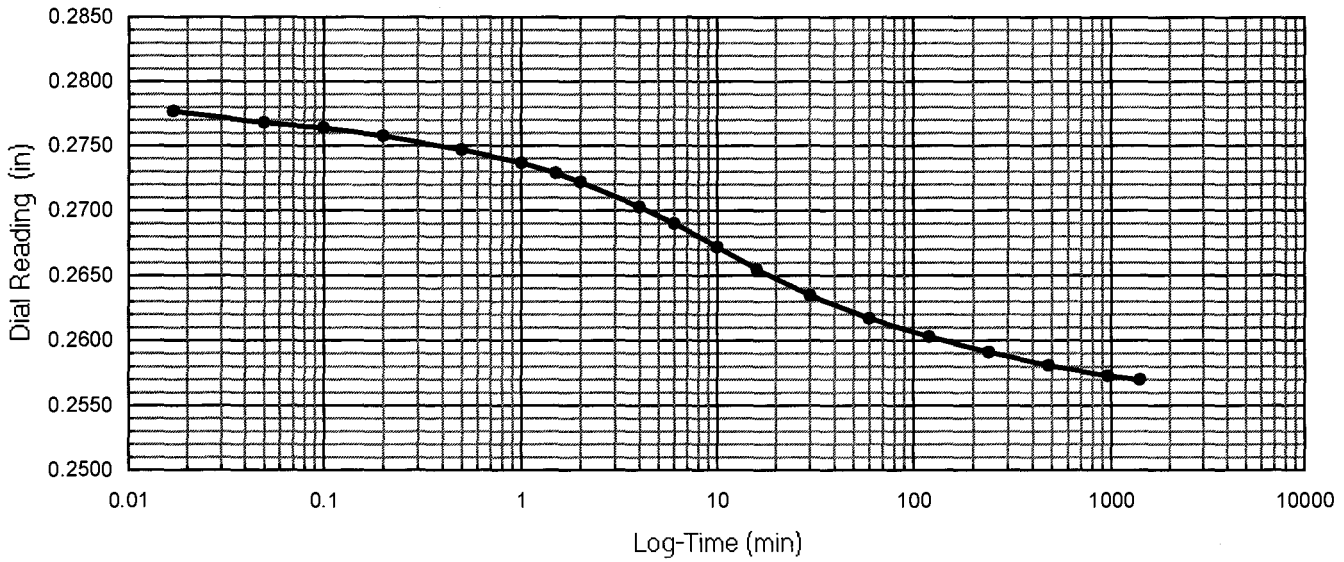
d50 = ____

t50 = ____ min

log time

d50 = 0.2691

t50 = 6.0 min



One-Dimensional Oedometer Testing Increment

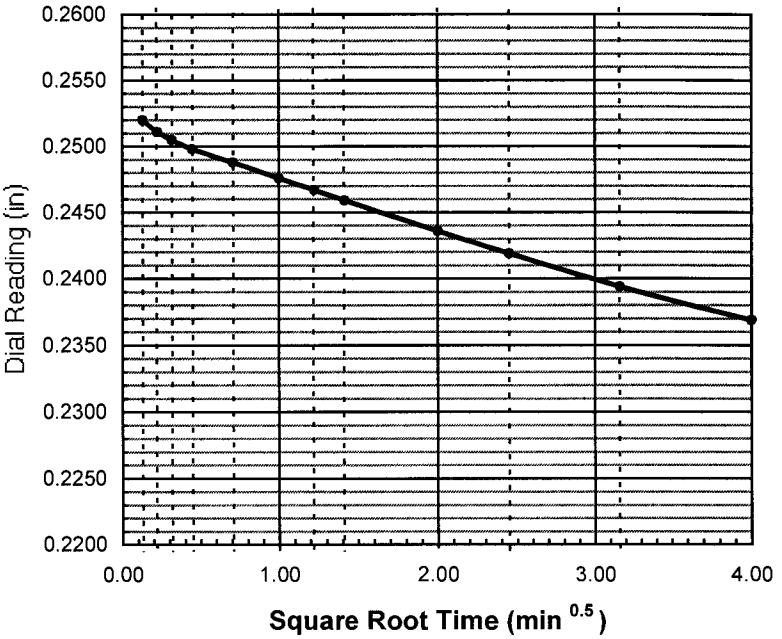
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C12 | Stage Number: 8 | Curves by: TJO

Boring No.: R-11-002 | Sample No.: 4 | Depth (ft.) 11.5

Date: 15-Feb-11 | Load (psf): 20873 | Zero Reading: 0.3257

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:44:53	0	0.00	0.2570
	0.02	0.13	0.2520
	0.05	0.22	0.2511
	0.10	0.32	0.2505
	0.20	0.45	0.2498
	0.50	0.71	0.2488
	1.00	1.00	0.2476
	1.50	1.22	0.2467
	2.00	1.41	0.2459
	4.0	2.00	0.2436
	6.0	2.45	0.2419
	10.0	3.16	0.2394
	16.0	4.00	0.2369
	30		0.2334
	60		0.2301
	120		0.2276
	240		0.2258
	480		0.2244
	960		0.2234
	1395		0.2229



do = 0.2531

d90 = ____ t90 = ____ min

d100 = 0.2260

df = 0.2229

square root

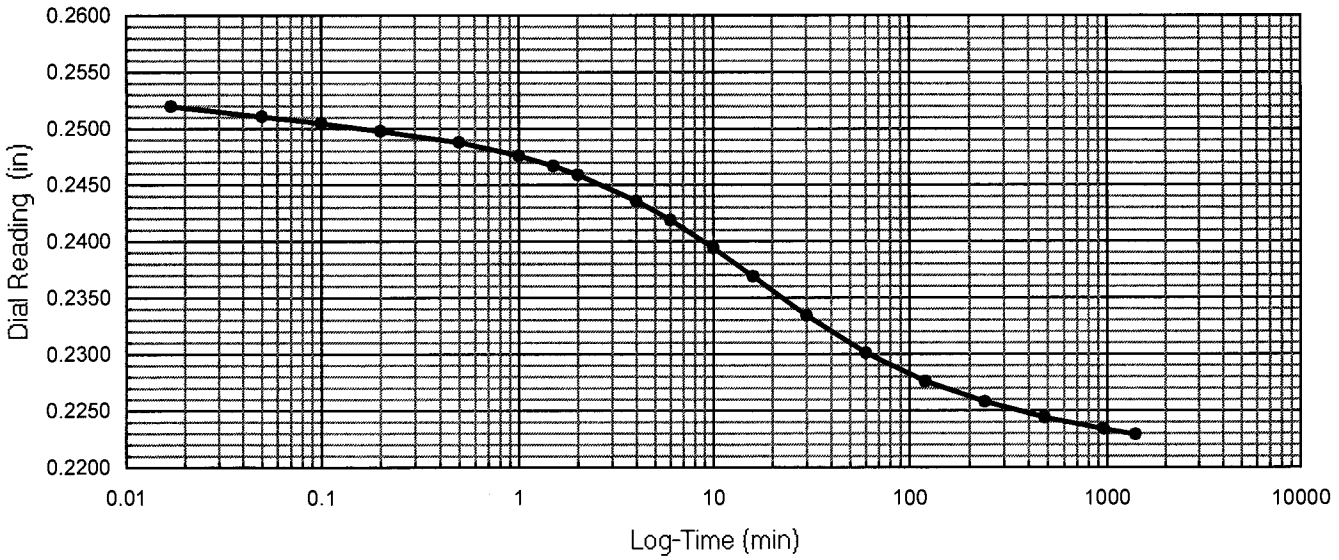
d50 = ____

t50 = ____ min

log time

d50 = 0.2396

t50 = 10.0 min



One-Dimensional Oedometer Testing Increment

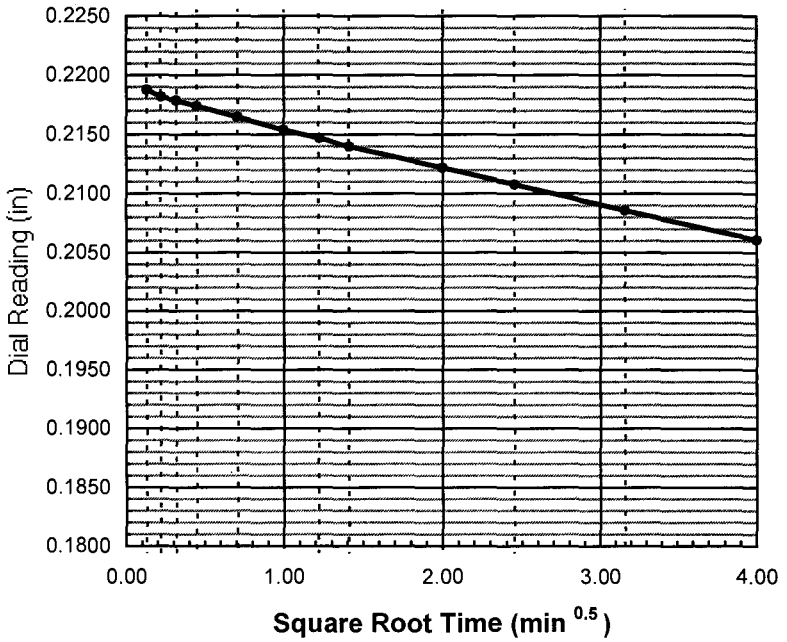
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C12 | Stage Number: 9 | Curves by: TJO

Boring No.: R-11-002 | Sample No.: 4 | Depth (ft.) 11.5

Date: 16-Feb-11 | Load (psf): 41371 | Zero Reading: 0.3257

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:01:09	0	0.00	0.2229
	0.02	0.13	0.2188
	0.05	0.22	0.2182
	0.10	0.32	0.2179
	0.20	0.45	0.2174
	0.50	0.71	0.2165
	1.00	1.00	0.2154
	1.50	1.22	0.2147
	2.00	1.41	0.2140
	4.0	2.00	0.2122
	6.0	2.45	0.2108
	10.0	3.16	0.2086
	16.0	4.00	0.2061
	30		0.2021
	60		0.1974
	120		0.1933
	240		0.1904
	480		0.1886
	960		0.1875
	1510		0.1872



do = 0.2195

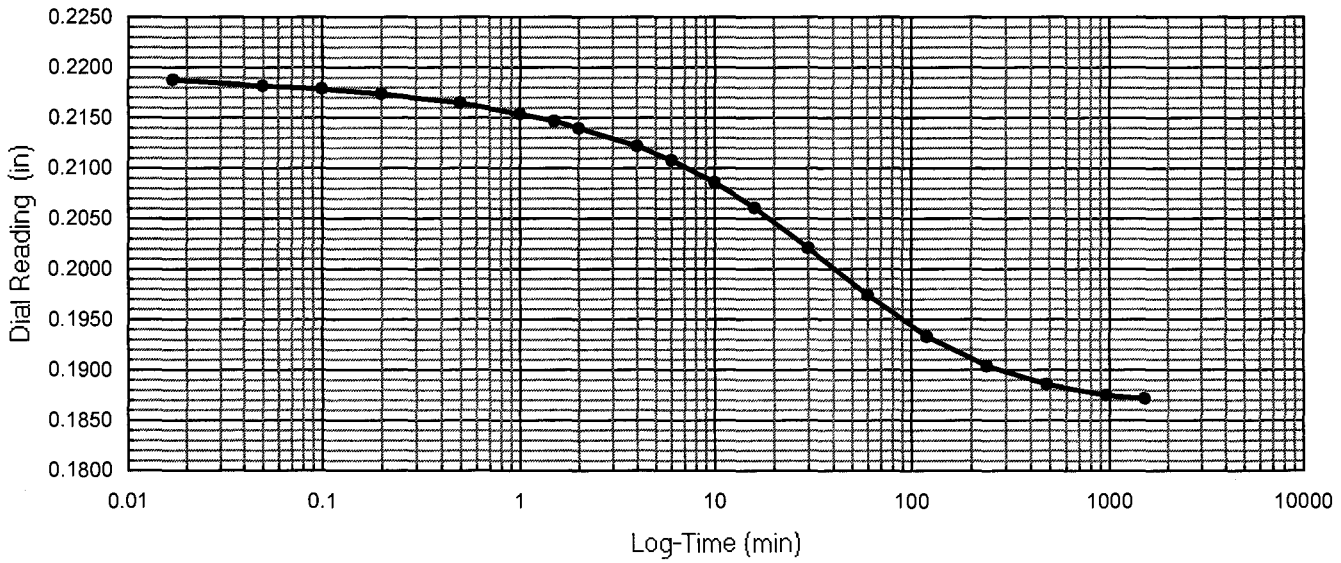
d90 = ____ t90 = ____ min

d100 = 0.1900

df = 0.1872

square root: d50 = ____ t50 = ____ min

log time: d50 = 0.2048 t50 = 20.0 min



One-Dimensional Oedometer Testing Increment

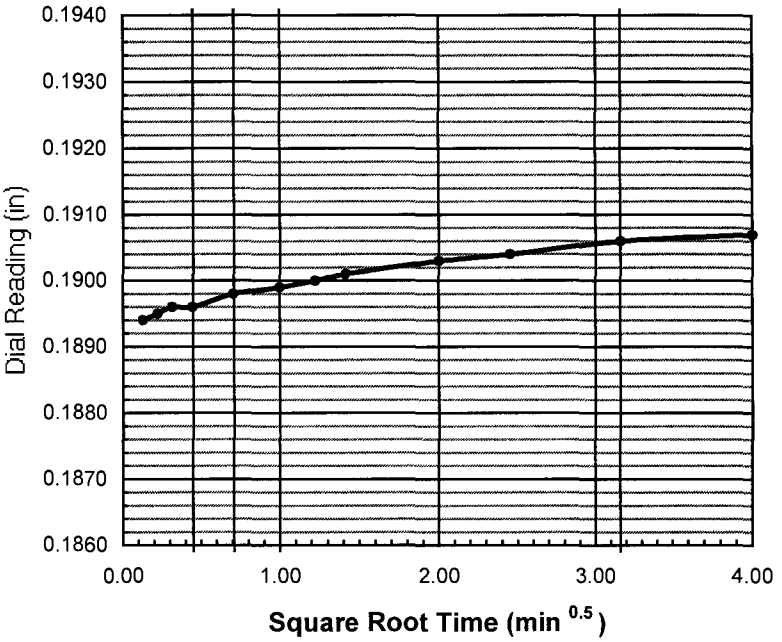
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C12 | Stage Number: 10 | Curves by: TJO

Boring No.: R-11-002 | Sample No.: 4 | Depth (ft.) 11.5

Date: 17-Feb-11 | Load (psf): 20873 | Zero Reading: 0.3257

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:12:05	0	0.00	0.1872
	0.02	0.13	0.1894
	0.05	0.22	0.1895
	0.10	0.32	0.1896
	0.20	0.45	0.1896
	0.50	0.71	0.1898
	1.00	1.00	0.1899
	1.50	1.22	0.1900
	2.00	1.41	0.1901
	4.0	2.00	0.1903
	6.0	2.45	0.1904
	10.0	3.16	0.1906
	16.0	4.00	0.1907
	30		0.1909
	60		0.1911
	120		0.1912
	240		0.1912
	566		0.1913



do = 0.1893

d90 = _____ t90 = _____ min

d100 = _____

df = 0.1913

square root

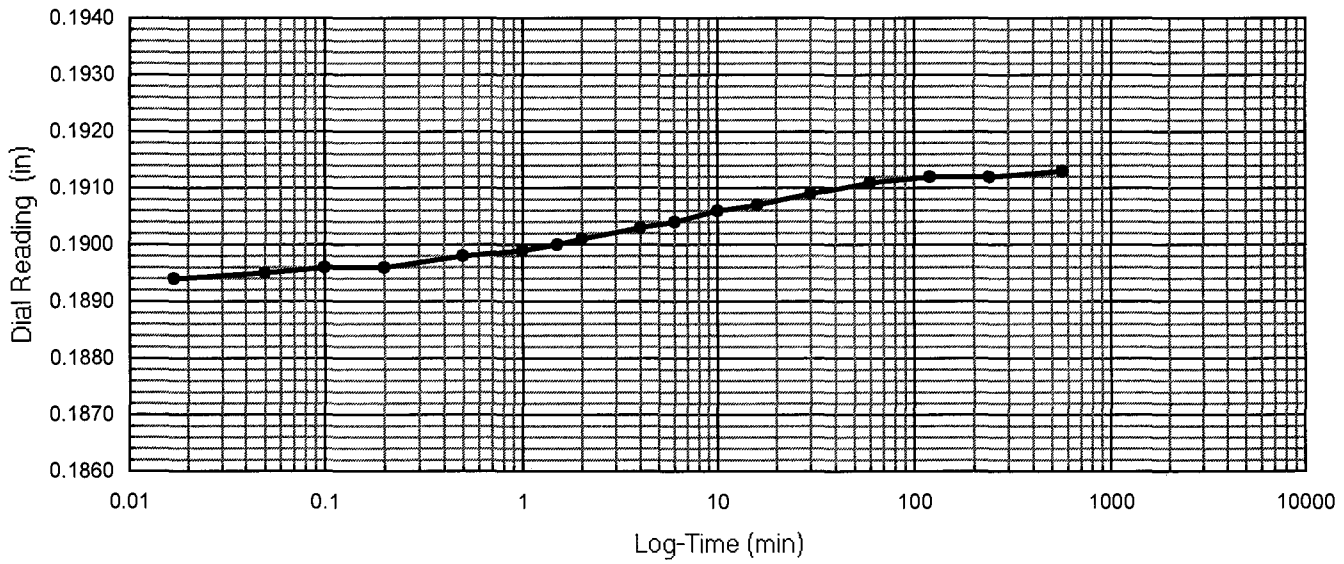
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

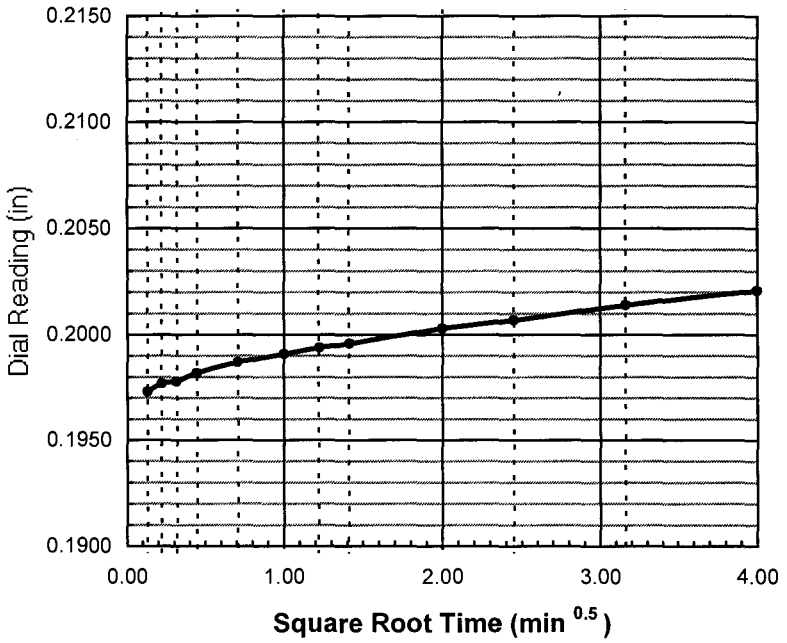
for ASTM D2435, method B

Project Number: 30989830 Apparatus No.: C12 Stage Number: 11 Curves by: TJO

Boring No.: R-11-002 Sample No.: 4 Depth (ft.) 11.5

Date: 17-Feb-11 Load (psf): 5500 Zero Reading: 0.3257

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
18:38:58	0	0.00	0.1913
	0.02	0.13	0.1973
	0.05	0.22	0.1977
	0.10	0.32	0.1978
	0.20	0.45	0.1982
	0.50	0.71	0.1987
	1.00	1.00	0.1991
	1.50	1.22	0.1994
	2.00	1.41	0.1996
	4.0	2.00	0.2003
	6.0	2.45	0.2007
	10.0	3.16	0.2014
	16.0	4.00	0.2021
	30		0.2034
	60		0.2051
	120		0.2068
	240		0.2083
	480		0.2091
	841		0.2096



do = 0.1969

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2096

square root

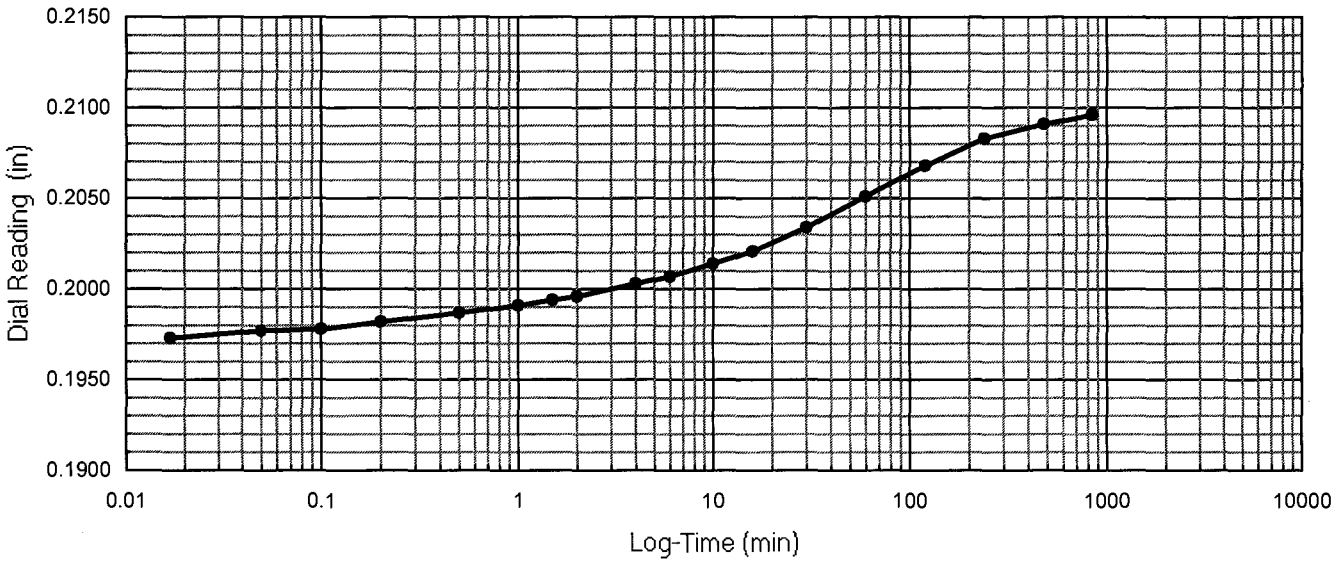
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

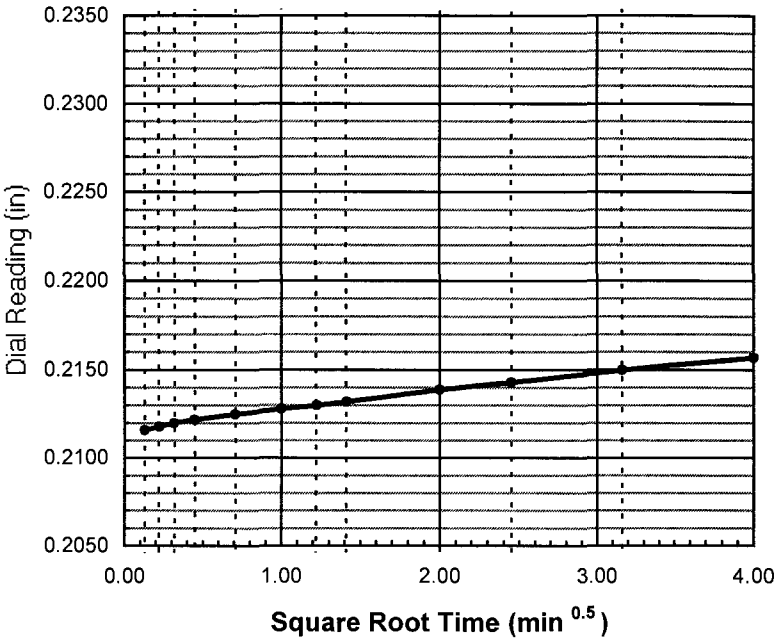
for ASTM D2435, method B

Project Number: 30989830 Apparatus No.: C12 Stage Number: 12 Curves by: TJO

Boring No.: R-11-002 Sample No.: 4 Depth (ft.) 11.5

Date: 18-Feb-11 Load (psf): 1345 Zero Reading: 0.3257

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:41:09	0	0.00	0.2096
	0.02	0.13	0.2116
	0.05	0.22	0.2118
	0.10	0.32	0.2120
	0.20	0.45	0.2122
	0.50	0.71	0.2125
	1.00	1.00	0.2128
	1.50	1.22	0.2130
	2.00	1.41	0.2132
	4.0	2.00	0.2139
	6.0	2.45	0.2143
	10.0	3.16	0.2150
	16.0	4.00	0.2157
	30		0.2170
	60		0.2191
	120		0.2217
	240		0.2246
	480		0.2272
	960		0.2288
	1530		0.2295



do = 0.2113

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2295

square root

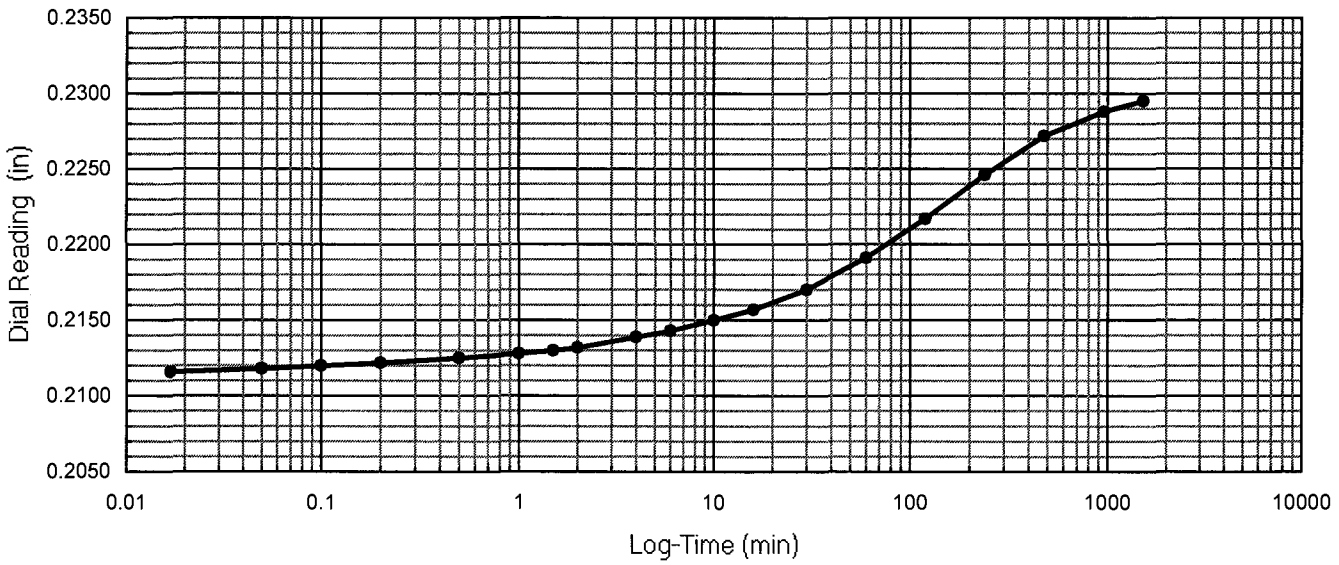
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

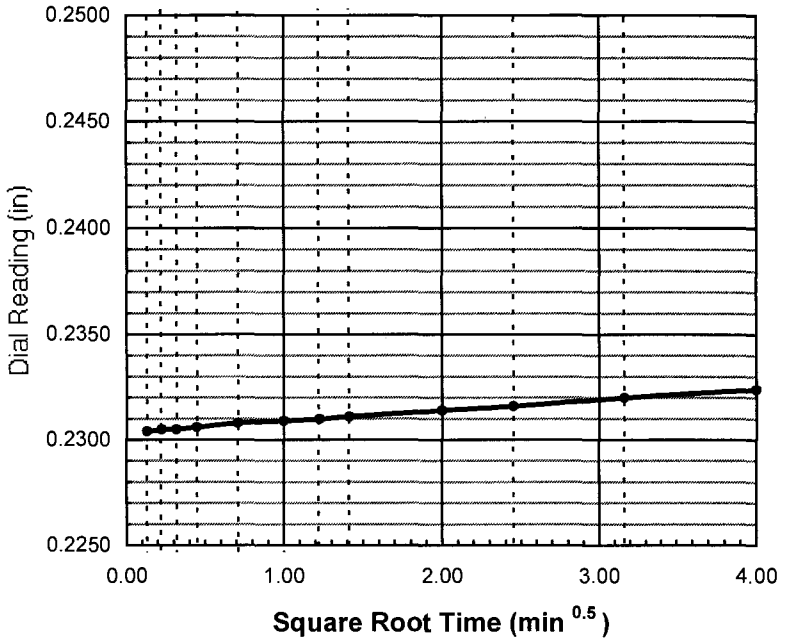
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C12 | Stage Number: 13 | Curves by: TJO

Boring No.: R-11-002 | Sample No.: 4 | Depth (ft.) 11.5

Date: 19-Feb-11 | Load (psf): 306 | Zero Reading: 0.3257

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:12:28	0	0.00	0.2295
	0.02	0.13	0.2304
	0.05	0.22	0.2305
	0.10	0.32	0.2305
	0.20	0.45	0.2306
	0.50	0.71	0.2308
	1.00	1.00	0.2309
	1.50	1.22	0.2310
	2.00	1.41	0.2311
	4.0	2.00	0.2314
	6.0	2.45	0.2316
	10.0	3.16	0.2320
	16.0	4.00	0.2324
	30		0.2332
	60		0.2346
	120		0.2365
	240		0.2392
	480		0.2419
	960		0.2445
	2080		0.2464
	4500		0.2479
	8536		0.2490



do = 0.2303

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2490

square root

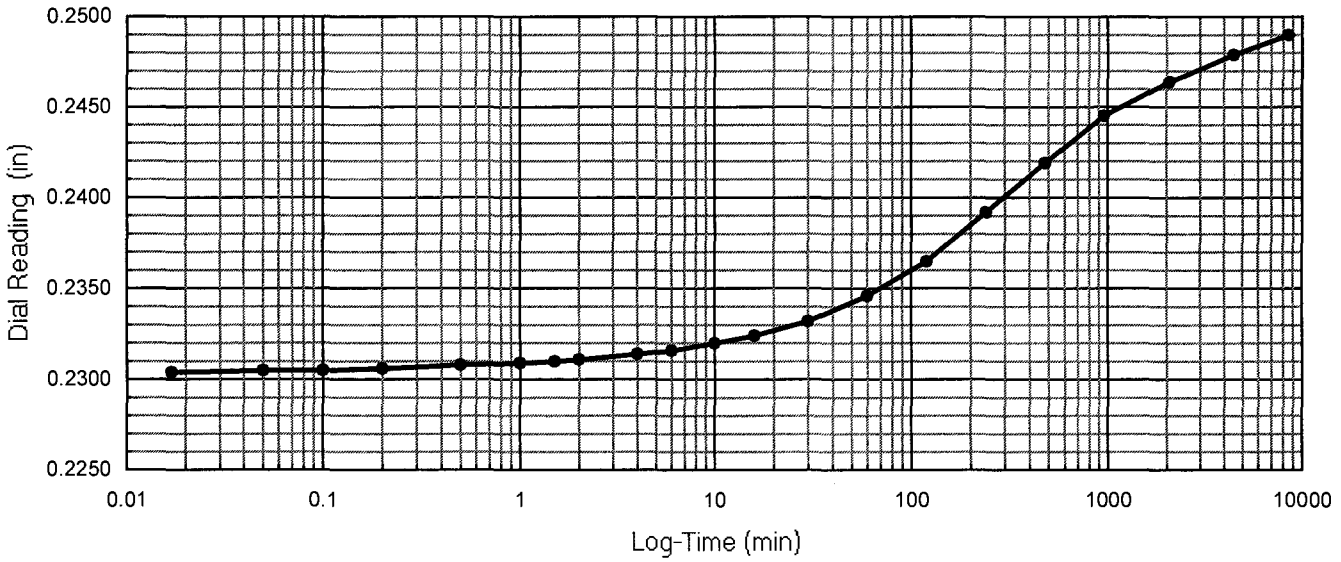
d50 = _____

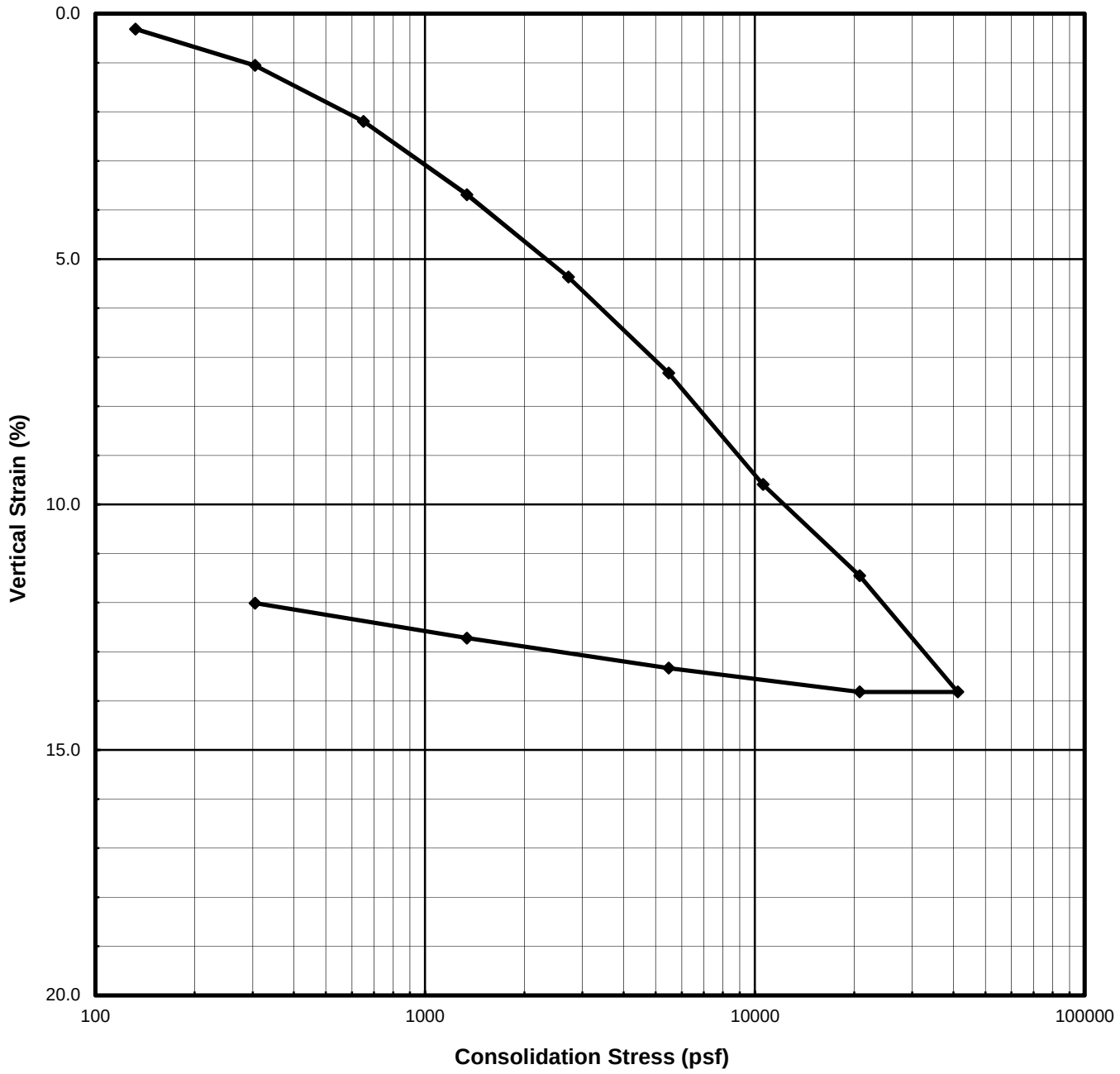
t50 = _____ min

log time

d50 = _____

t50 = _____ min





Description:	**Olive brown sandy Clay (CL)**							
Boring No.:	R-11-002		Liquid Limit	37	%	Specific Gravity	2.75	assumed
Sample No.:	6		Plasticity Index	21	%	Strain for Saturation	0.95	%
Depth (ft | m)	16.5	5.03	Fines Content	69.3	%	Water added at	46	psf

	Water Content (%)	Total Unit Weight		Dry Unit Weight		Saturation (%)	Void Ratio	Height		Diameter	
		(pcf)	(kN/m^3)	(pcf)	(kN/m^3)			(inches)	(cm)	(inches)	(cm)
Initial	26.2	123.5	19.40	97.9	15.38	95.8	0.75	0.930	2.36	2.420	6.147
Final	20.0	131.8	20.70	109.8	17.25	98.2	0.56	0.829	2.11		

URS

I-5 & SR-74 IC

Project Number: 30989830
Test Start Date: 2/9/2011

CONSOLIDATION TEST
ASTM D2435

SUBMITTED BY: Thomas J. O'Meara

Con I5 SR74 R11002 016.xls

One-Dimensional Oedometer Testing
Set-up / Take down Worksheet
ASTM D2435

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM
Boring No.: R-11-002
Sample No.: 6
Depth (ft): 16.5
Apparatus No.: C10

Specimen Description : Olive brown sandy Clay (CL)
Duration: end of increment
Ring Number: R22
Weight of Wet Spec. and Ring: 356.36 g
Weight of Ring: 217.69 g
Initial Weight of Wet Spec.: 138.67 g
Take Down Weight with Ring: 349.55 g
Excess Oven-dried Cont. No.: cp7
Weight of Cont. and Dry Spec.: 172.16 g
Weight of Container: 172.12 g
Weight of Excess Dried Soil: 0.04 g
Weight of Excess Wet Soil 0.05 g
Final Weight of Wet Specimen: 131.91 g

Height of Specimen (in)

	Initial	Final
1	0.928	0.829
2	0.930	0.827
3	0.930	0.832
4	0.930	0.824
5	0.932	0.833
Ave:	0.930	0.829

Initial Height - Final Height = 0.101 in
Change in Dial (Dd) = 0.111 in
Initial Height - Dd = 0.819 in
Final Height + Dd = 0.940 in
Weight of Top Cap = 366.47 g

Specimen Analysis					Initial Trim	Initial Spec.	Final
				Container Number:	x34	**XXXXX**	s24
				Mass of Container and Wet Specimen M1 (g)	379.00	138.67	202.32
				Mass of Container and Dry Specimen, M2 (g)	328.60	109.92	182.21
				Mass of Container, M3 (g)	136.95	**XXXXX**	81.69
				Water Content, w (%)	26.30	26.16	20.01
				Mass of Wet Specimen, M4 (g)	138.67	138.67	131.91
				Mass of Dry Specimen, M5 (g)	109.92	109.92	109.92
Nominal		Measured	x	Specimen Height, H (in)	0.930	0.930	0.829
Nominal	x	Measured		Specimen Diameter, D (in)	2.420	2.420	2.420
				Area of Specimen, A (in^2)	4.600	4.600	4.600
				Volume of Specimen, V (cc)	70.10	70.10	62.49
Assumed	x	Measured		Specific Gravity, Gs	2.75	2.75	2.75
				Wet Unit Weight, WUW (pcf)	**123.5**	**123.5**	**131.8**
				Dry Unit Weight, DUW (pcf)	**97.8**	**97.9**	**109.8**
				Void Ratio	**0.753**	**0.751**	**0.560**
				Degree of Saturation, S (%)	**96.1**	**95.8**	**98.2**

Set-up by: TJO
Date: 2/9/11
Calculated by: TJO
Checked by: TJO
Strain for Saturation (%) = **0.948**

One-Dimensional Oedometer Testing

Loading Worksheet

ASTM D2435

Project Number: 30989830 Boring No.: R-11-002

Project Name: I-5 & SR-74 IC Sample No.: 6

Project Engineer: FM Apparatus No.: C10 Depth (ft): 16.5

Initial Dial Reading: 0.3701 inch Initial Specimen Height: 0.930 inch

Stage No.	Normal Stress (psf)	Dial Reading (in)		Compressibility Correction (in)	Vertical Strain (%)	
		End of Duration	End of Increment		End of Duration	End of Increment
Seat	46		0.3697	0.0000		0.04
1	132	0.3666	0.3665	0.0006	0.31	0.32
2	305	0.3584	0.3584	0.0019	1.05	1.05
3	650	0.3460	0.3458	0.0037	2.19	2.22
4	1340	0.3305	0.3292	0.0053	3.69	3.83
5	2721	0.3130	0.3120	0.0072	5.37	5.47
6	5481	0.2930	0.2928	0.0090	7.32	7.34
7	10589	0.2700	0.2728	0.0109	9.59	9.29
8	20804	0.2505	0.2499	0.0131	11.45	11.52
9	41234	0.2260	0.2250	0.0156	13.82	13.92
10	20804		0.2270	0.0146		13.82
11	5481		0.2340	0.0121		13.33
12	1340		0.2421	0.0097		12.72
13	305		0.2504	0.0080		12.01
14	46		0.2592	0.0065		11.23
15						
16						
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31						
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33						

Final dial reading prior to take down (inch): 0.2592 Take down by: TJO Date: 3/2/11

One-Dimensional Oedometer Testing
ASTM D2435
Table of Incremental Values

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM
Apparatus No.: C10

Boring No.: R-11-002
Sample No.: 6
Depth (ft): 16.5
Inundation at stage: Seat

5 **10** Hanger Ratios

Stage Number	Incremental Weight Applied (kg) Back	Front	Vertical Stress (psf)	Specimen Hieght (in)	Deflections (in) $d_{initial}$	d_o	d_{50}	d_{100}	d_{final}	Porous Stone (in)	t_{50} (min)	cv (in^2/min)	cv (ft^2/day)
Top Cap			25	0.930	0.3701	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
Seat	0.06		46	0.930	0.3701	XXXXX	XXXXX	XXXXX	0.3697	0.0000	XXXXX	XXXXX	XXXXX
1	0.25		132	0.927	0.3697	0.3691	0.3679	0.3666	0.3665	0.0006	XXXXX	XXXXX	XXXXX
2	0.50		305	0.921	0.3665	0.3656	0.3620	0.3584	0.3584	0.0019	1.50	0.028	0.278
3	1.00		650	0.912	0.3584	0.3572	0.3516	0.3460	0.3458	0.0037	1.00	0.041	0.410
4		1.0	1340	0.901	0.3458	0.3438	0.3372	0.3305	0.3292	0.0053	1.00	0.040	0.399
5	4.0		2721	0.891	0.3292	0.3277	0.3204	0.3130	0.3120	0.0072	1.00	0.039	0.391
6		4.0	5481	0.880	0.3120	0.3109	0.3020	0.2930	0.2928	0.0090	0.50	0.076	0.763
7		7.4	10589	0.871	0.2928	0.2908	0.2804	0.2700	0.2728	0.0109	0.50	0.075	0.748
8		14.8	20804	0.862	0.2728	0.2712	0.2609	0.2505	0.2499	0.0131	0.50	0.073	0.731
9		29.6	41234	0.852	0.2499	0.2467	0.2364	0.2260	0.2250	0.0156	0.50	0.072	0.715
10		-29.6	20804	0.869	0.2250	0.2268	XXXXX	XXXXX	0.2270	0.0146	XXXXX	XXXXX	XXXXX
11		-22.2	5481	0.888	0.2270	0.2312	XXXXX	XXXXX	0.2340	0.0121	XXXXX	XXXXX	XXXXX
12	-4.0	-4.0	1340	0.906	0.2340	0.2359	XXXXX	XXXXX	0.2421	0.0097	XXXXX	XXXXX	XXXXX
13	-1.00	-1.00	305	0.922	0.2421	0.2423	XXXXX	XXXXX	0.2504	0.0080	XXXXX	XXXXX	XXXXX
14	-0.750		46	0.937	0.2504	XXXXX	XXXXX	XXXXX	0.2592	0.0065	XXXXX	XXXXX	XXXXX
15			46	XXXXX	0.2592	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
16			46	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
17			46	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
18			46	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
19			46	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
20			46	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
21			46	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
22			46	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
23			46	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
24			46	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
25			46	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX

One-Dimensional Oedometer Testing Increment

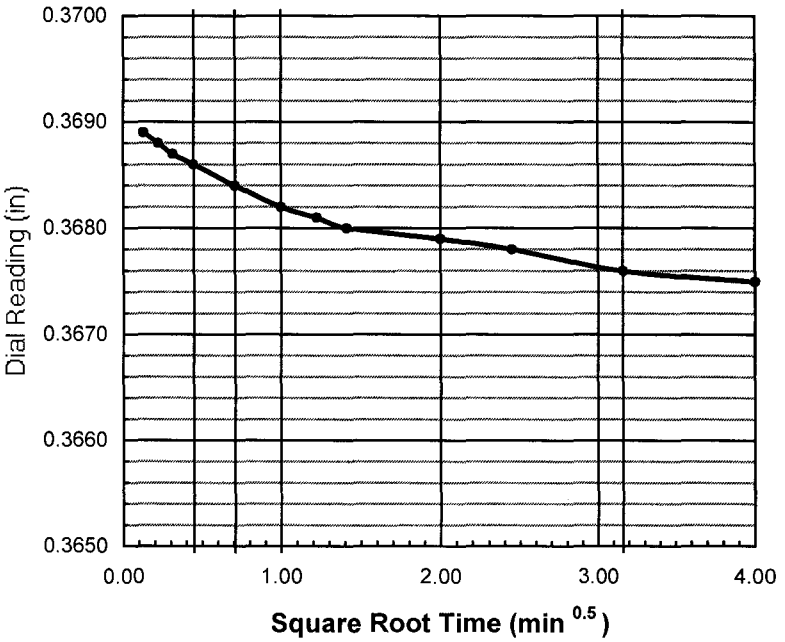
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C10 | Stage Number: 1 | Curves by: TJO

Boring No.: R-11-002 | Sample No.: 6 | Depth (ft.) 16.5

Date: 9-Feb-11 | Load (psf): 132 | Zero Reading: 0.3701

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
11:45:27	0	0.00	0.3697
	0.02	0.13	0.3689
	0.05	0.22	0.3688
	0.10	0.32	0.3687
	0.20	0.45	0.3686
	0.50	0.71	0.3684
	1.00	1.00	0.3682
	1.50	1.22	0.3681
	2.00	1.41	0.3680
	4.0	2.00	0.3679
	6.0	2.45	0.3678
	10.0	3.16	0.3676
	16.0	4.00	0.3675
	30		0.3674
	60		0.3672
	120		0.3670
	240		0.3667
	480		0.3666
	1288		0.3665



do = 0.3691

d90 = _____ t90 = _____ min

d100 = 0.3666

df = 0.3665

square root

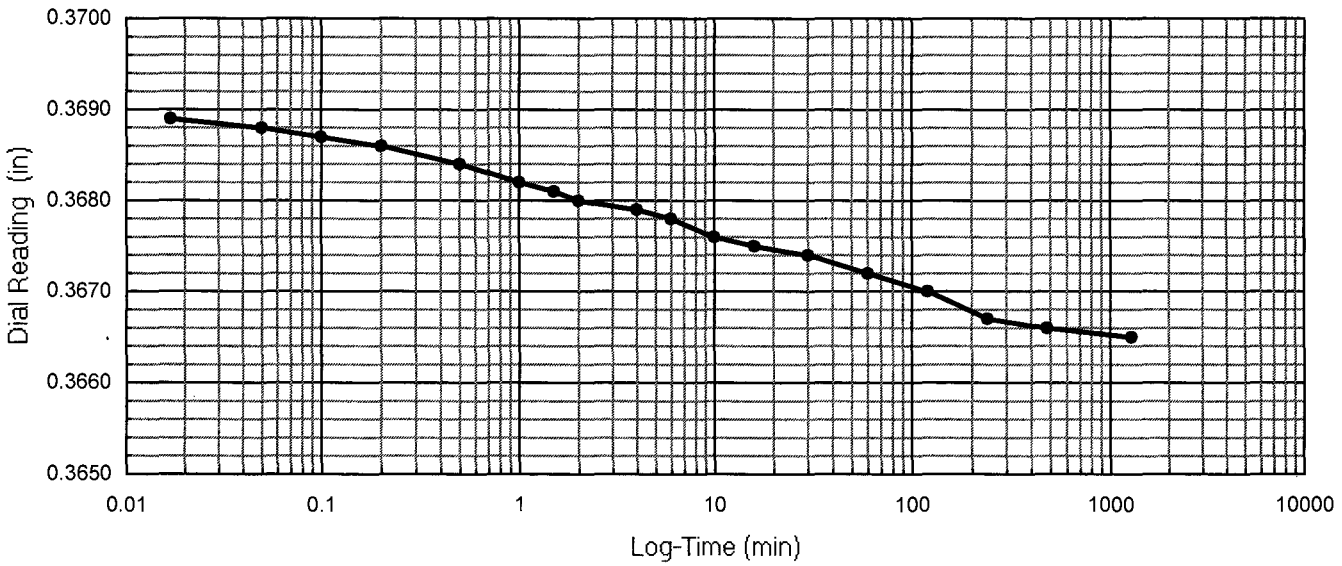
d50 = _____

t50 = _____ min

log time

d50 = 0.3678

t50 = 6.0 min



One-Dimensional Oedometer Testing Increment

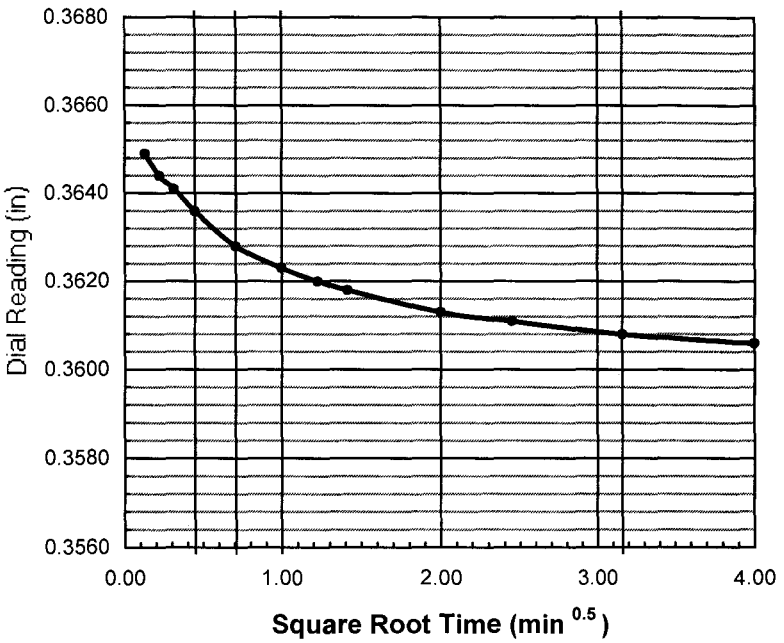
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C10 | Stage Number: 2 | Curves by: TJO

Boring No.: R-11-002 | Sample No.: 6 | Depth (ft.) 16.5

Date: 10-Feb-11 | Load (psf): 305 | Zero Reading: 0.3701

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:15:10	0	0.00	0.3665
	0.02	0.13	0.3649
	0.05	0.22	0.3644
	0.10	0.32	0.3641
	0.20	0.45	0.3636
	0.50	0.71	0.3628
	1.00	1.00	0.3623
	1.50	1.22	0.3620
	2.00	1.41	0.3618
	4.0	2.00	0.3613
	6.0	2.45	0.3611
	10.0	3.16	0.3608
	16.0	4.00	0.3606
	30		0.3603
	60		0.3599
	120		0.3595
	240		0.3591
	480		0.3586
	960		0.3584
	1456		0.3584



do = 0.3656

d90 = _____ t90 = _____ min

d100 = 0.3584

df = 0.3584

square root

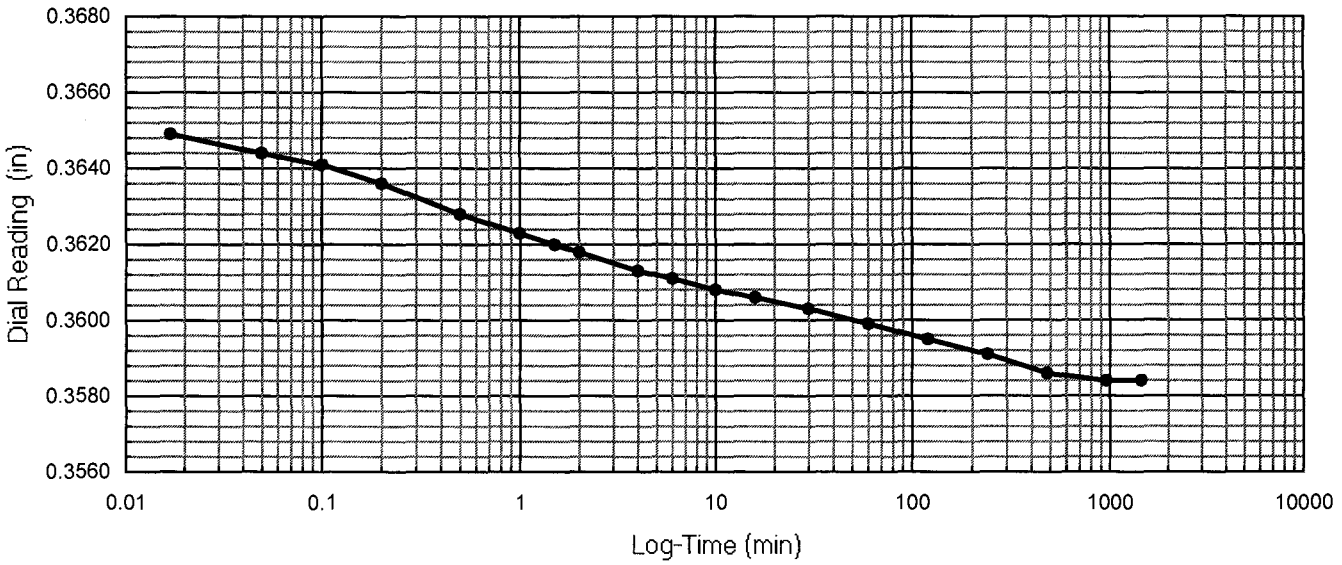
d50 = _____

t50 = _____ min

log time

d50 = 0.3620

t50 = 1.5 min



One-Dimensional Oedometer Testing Increment

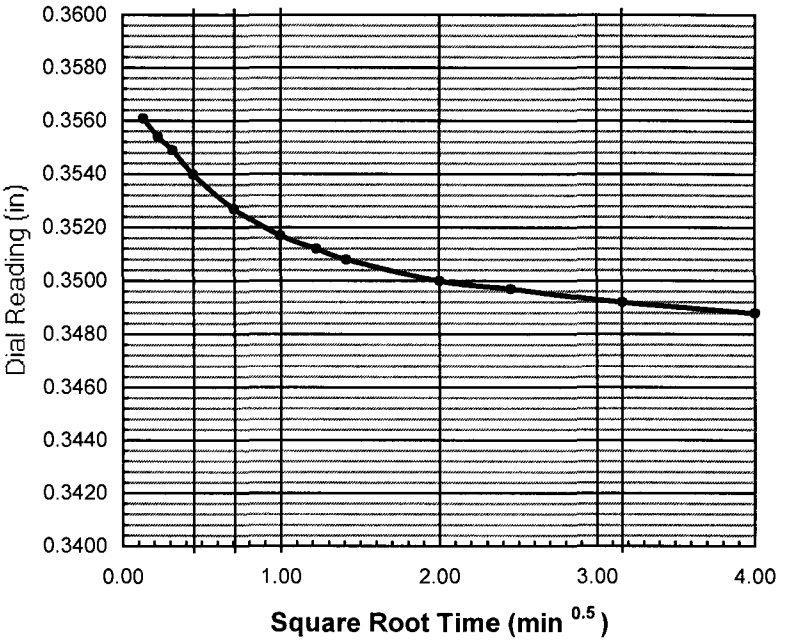
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C10 | Stage Number: 3 | Curves by: TJO

Boring No.: R-11-002 | Sample No.: 6 | Depth (ft.) 16.5

Date: 11-Feb-11 | Load (psf): 650 | Zero Reading: 0.3701

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:30:57	0	0.00	0.3584
	0.02	0.13	0.3561
	0.05	0.22	0.3554
	0.10	0.32	0.3549
	0.20	0.45	0.3540
	0.50	0.71	0.3527
	1.00	1.00	0.3517
	1.50	1.22	0.3512
	2.00	1.41	0.3508
	4.0	2.00	0.3500
	6.0	2.45	0.3497
	10.0	3.16	0.3492
	16.0	4.00	0.3488
	30		0.3484
	60		0.3479
	120		0.3474
	240		0.3467
	480		0.3462
	960		0.3459
	1520		0.3458



do = 0.3572

d90 = _____ t90 = _____ min

d100 = 0.3460

df = 0.3458

square root

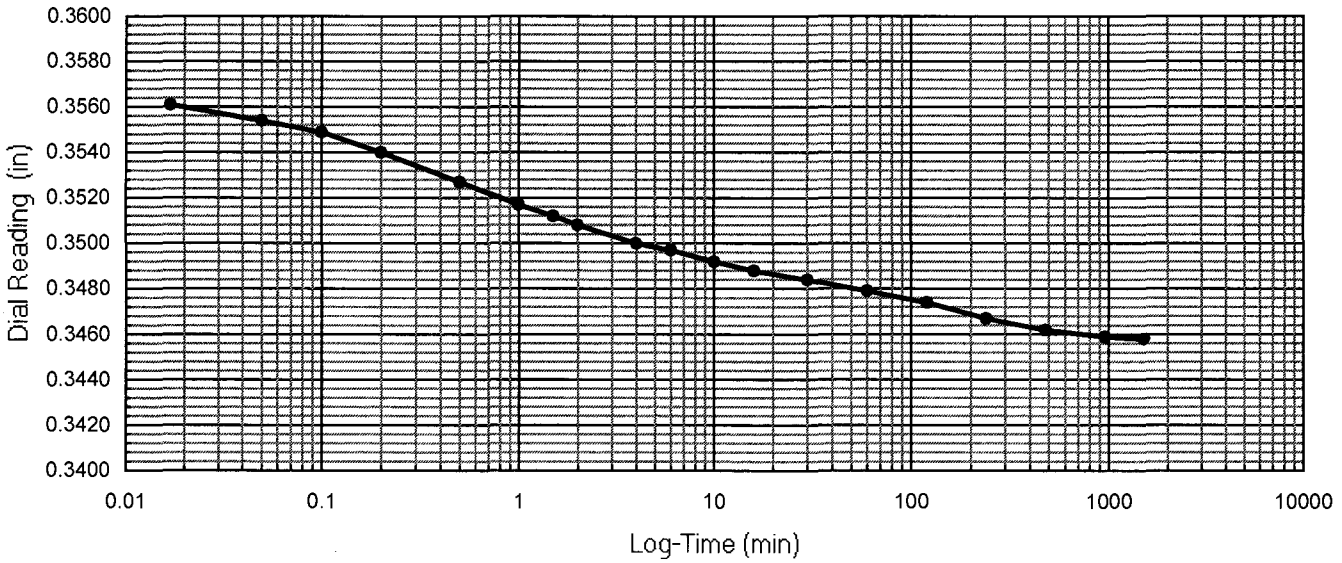
d50 = _____

t50 = _____ min

log time

d50 = 0.3516

t50 = 1.0 min



One-Dimensional Oedometer Testing Increment

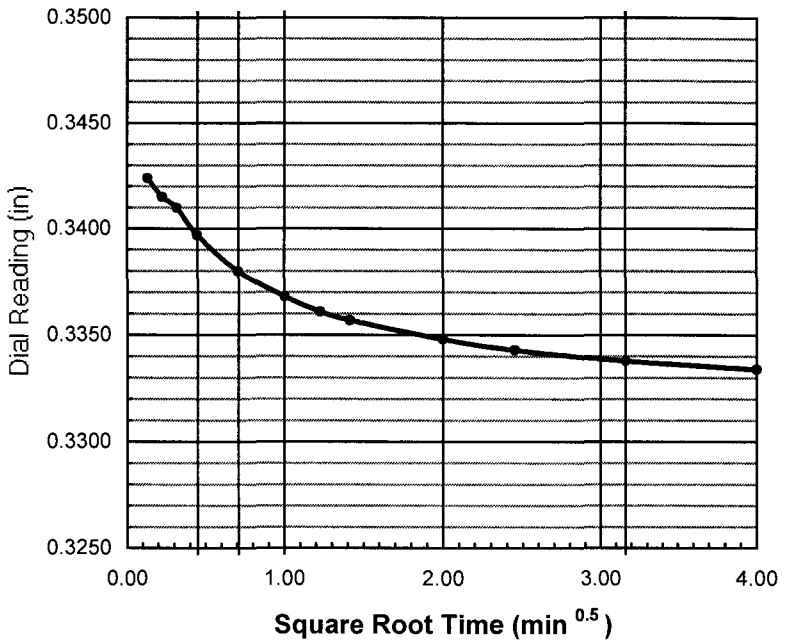
for ASTM D2435, method B

Project Number: 30989830 Apparatus No.: C10 Stage Number: 4 Curves by: TJO

Boring No.: R-11-002 Sample No.: 6 Depth (ft.) 16.5

Date: 12-Feb-11 Load (psf): 1340 Zero Reading: 0.3701

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:51:48	0	0.00	0.3458
	0.02	0.13	0.3424
	0.05	0.22	0.3415
	0.10	0.32	0.3410
	0.20	0.45	0.3397
	0.50	0.71	0.3380
	1.00	1.00	0.3368
	1.50	1.22	0.3361
	2.00	1.41	0.3357
	4.0	2.00	0.3348
	6.0	2.45	0.3343
	10.0	3.16	0.3338
	16.0	4.00	0.3334
	30		0.3328
	60		0.3322
	120		0.3315
	240		0.3308
	480		0.3302
	960		0.3299
	1440		0.3297
	2792		0.3292



do = 0.3438

d90 = ____ t90 = ____ min

d100 = 0.3305

df = 0.3292

square root

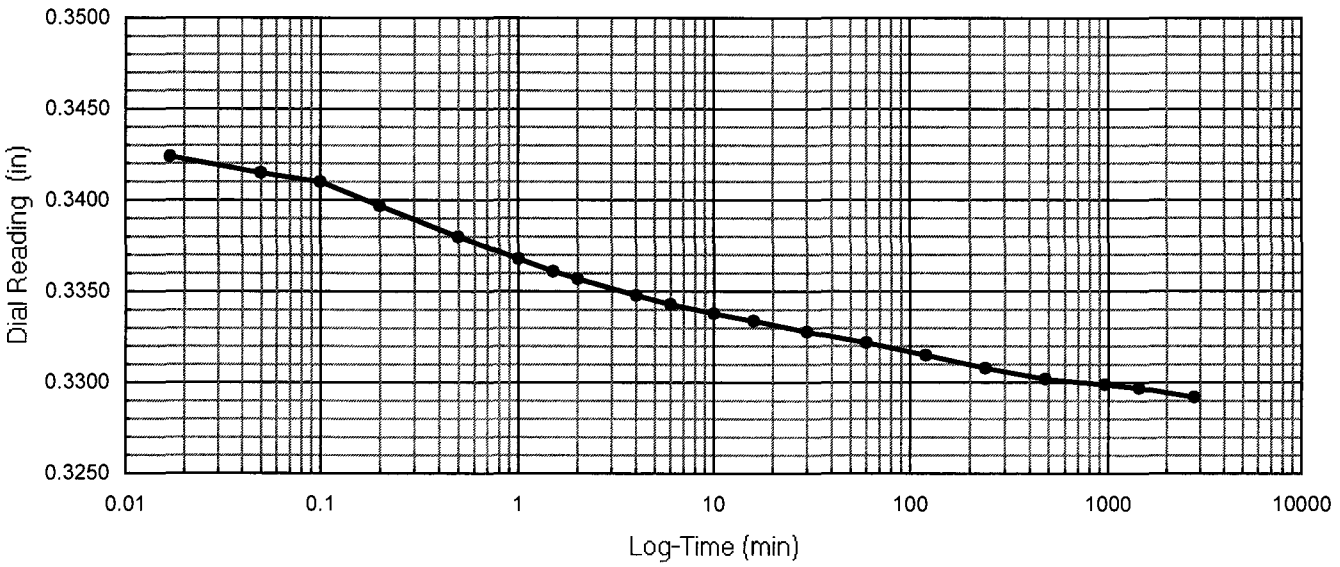
d50 = ____

t50 = ____ min

log time

d50 = 0.3371

t50 = 1.0 min



One-Dimensional Oedometer Testing Increment

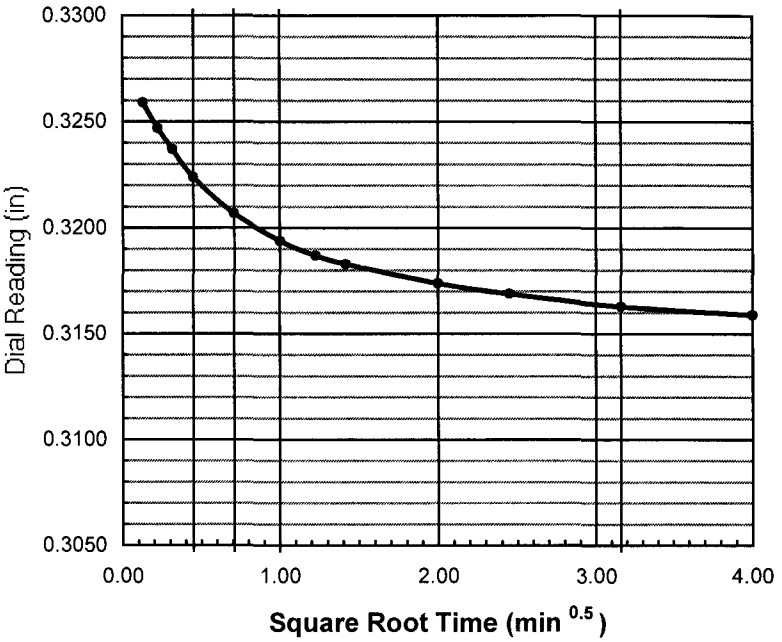
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C10 | Stage Number: 5 | Curves by: TJO

Boring No.: R-11-002 | Sample No.: 6 | Depth (ft.) 16.5

Date: 14-Feb-11 | Load (psf): 2721 | Zero Reading: 0.3701

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:24:17	0	0.00	0.3292
	0.02	0.13	0.3259
	0.05	0.22	0.3247
	0.10	0.32	0.3237
	0.20	0.45	0.3224
	0.50	0.71	0.3207
	1.00	1.00	0.3194
	1.50	1.22	0.3187
	2.00	1.41	0.3183
	4.0	2.00	0.3174
	6.0	2.45	0.3169
	10.0	3.16	0.3163
	16.0	4.00	0.3159
	30		0.3152
	60		0.3146
	120		0.3139
	240		0.3133
	480		0.3126
	960		0.3122
	1402		0.3120



do = 0.3277

d90 = ____ t90 = ____ min

d100 = 0.3130

df = 0.3120

square root

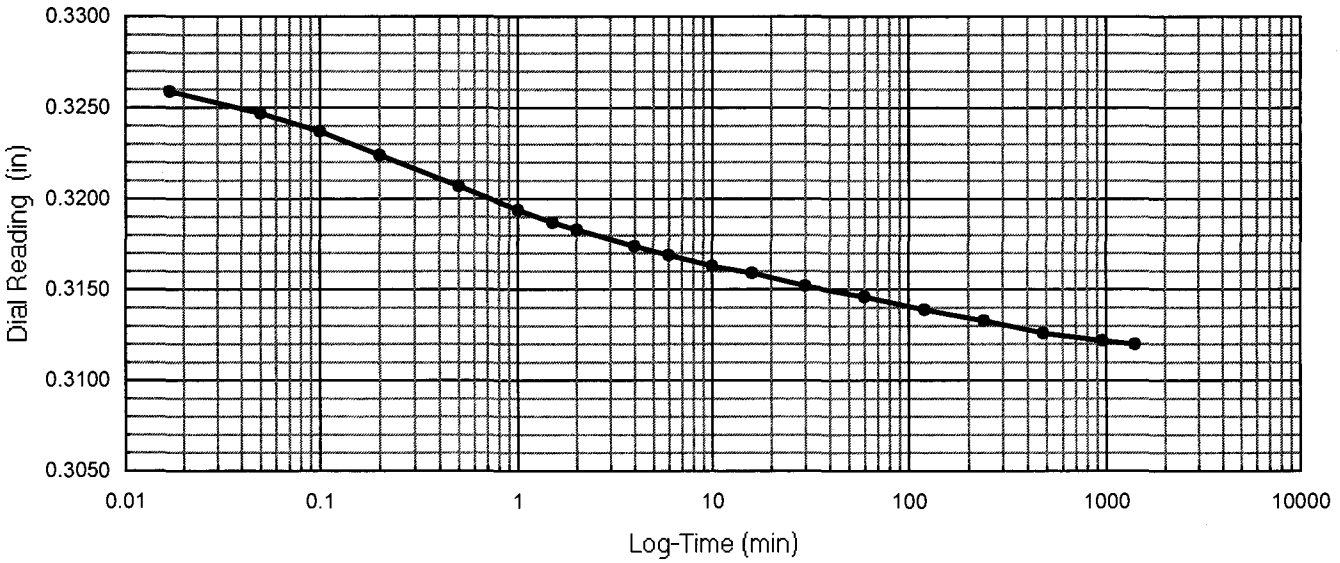
d50 = ____

t50 = ____ min

log time

d50 = 0.3203

t50 = 1.0 min



One-Dimensional Oedometer Testing Increment

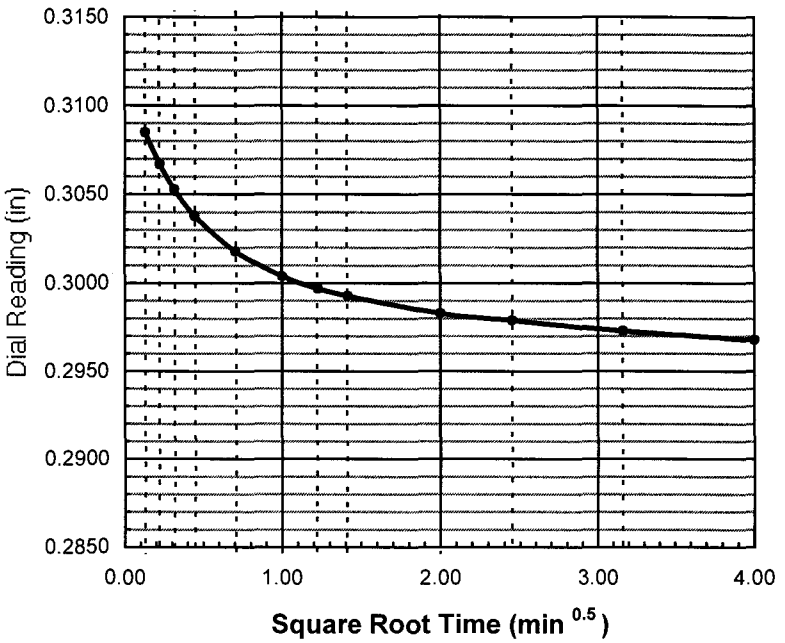
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C10 | Stage Number: 6 | Curves by: TJO

Boring No.: R-11-002 | Sample No.: 6 | Depth (ft.) 16.5

Date: 15-Feb-11 | Load (psf): 5481 | Zero Reading: 0.3701

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:47:01	0	0.00	0.3119
	0.02	0.13	0.3085
	0.05	0.22	0.3067
	0.10	0.32	0.3053
	0.20	0.45	0.3038
	0.50	0.71	0.3018
	1.00	1.00	0.3004
	1.50	1.22	0.2997
	2.00	1.41	0.2993
	4.0	2.00	0.2983
	6.0	2.45	0.2979
	10.0	3.16	0.2973
	16.0	4.00	0.2968
	30		0.2962
	60		0.2956
	120		0.2949
	240		0.2942
	480		0.2936
	960		0.2930
	1395		0.2928



do = 0.3109

d90 = _____ t90 = _____ min

d100 = 0.2930

df = 0.2928

square root

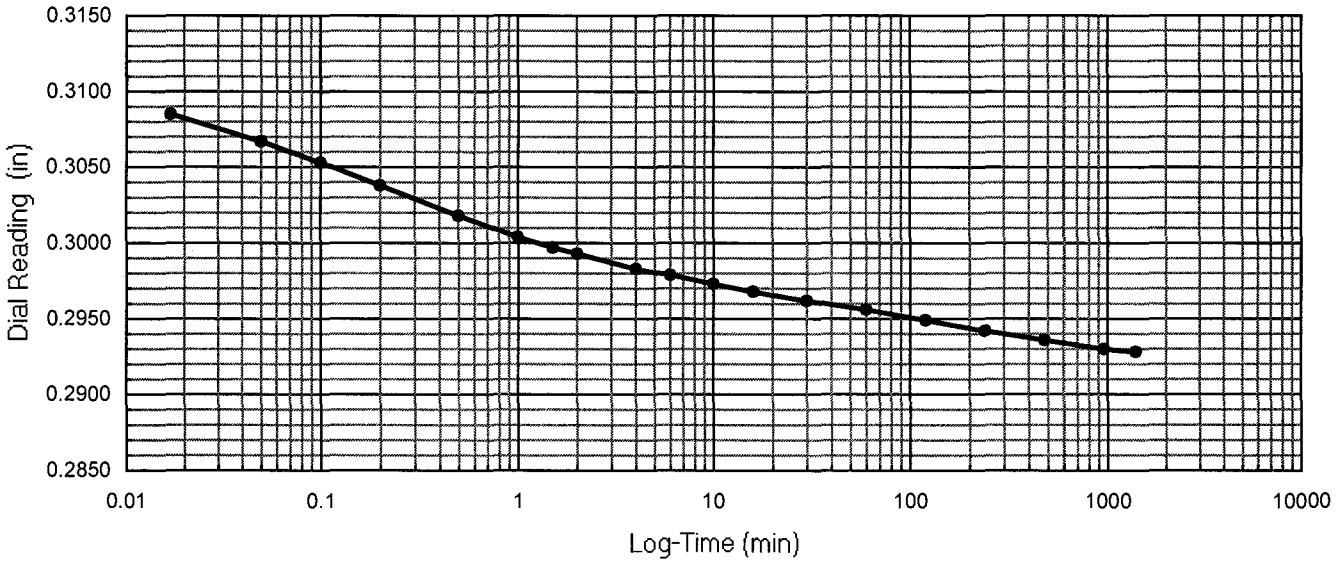
d50 = _____

t50 = _____ min

log time

d50 = 0.3019

t50 = 0.5 min



One-Dimensional Oedometer Testing Increment

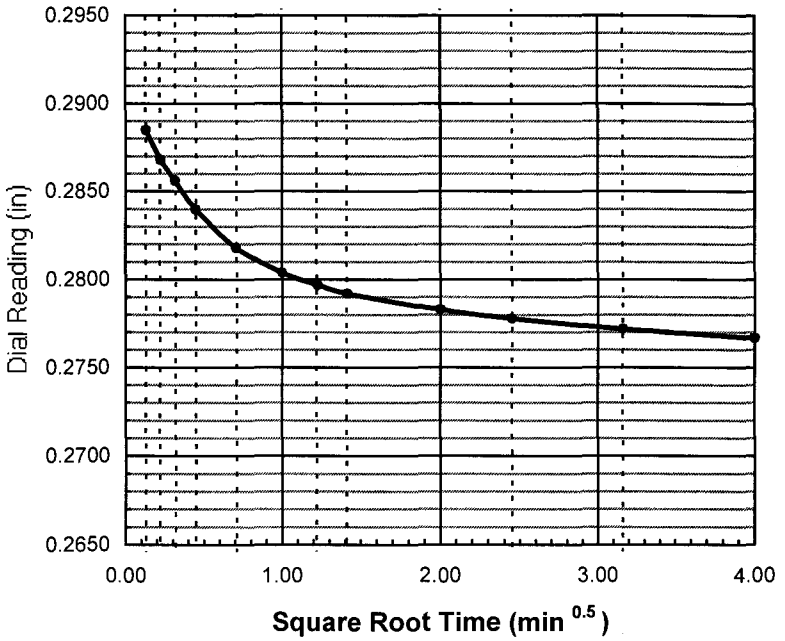
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C10 | Stage Number: 7 | Curves by: TJO

Boring No.: R-11-002 | Sample No.: 6 | Depth (ft.) 16.5

Date: 16-Feb-11 | Load (psf): 10589 | Zero Reading: 0.3701

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:03:16	0	0.00	0.2928
	0.02	0.13	0.2885
	0.05	0.22	0.2868
	0.10	0.32	0.2856
	0.20	0.45	0.2840
	0.50	0.71	0.2818
	1.00	1.00	0.2804
	1.50	1.22	0.2797
	2.00	1.41	0.2792
	4.0	2.00	0.2783
	6.0	2.45	0.2778
	10.0	3.16	0.2772
	16.0	4.00	0.2767
	30		0.2761
	60		0.2754
	120		0.2748
	240		0.2741
	480		0.2735
	960		0.2731
	1510		0.2728



do = 0.2908

d90 = _____ t90 = _____ min

d100 = 0.2740

df = 0.2728

square root

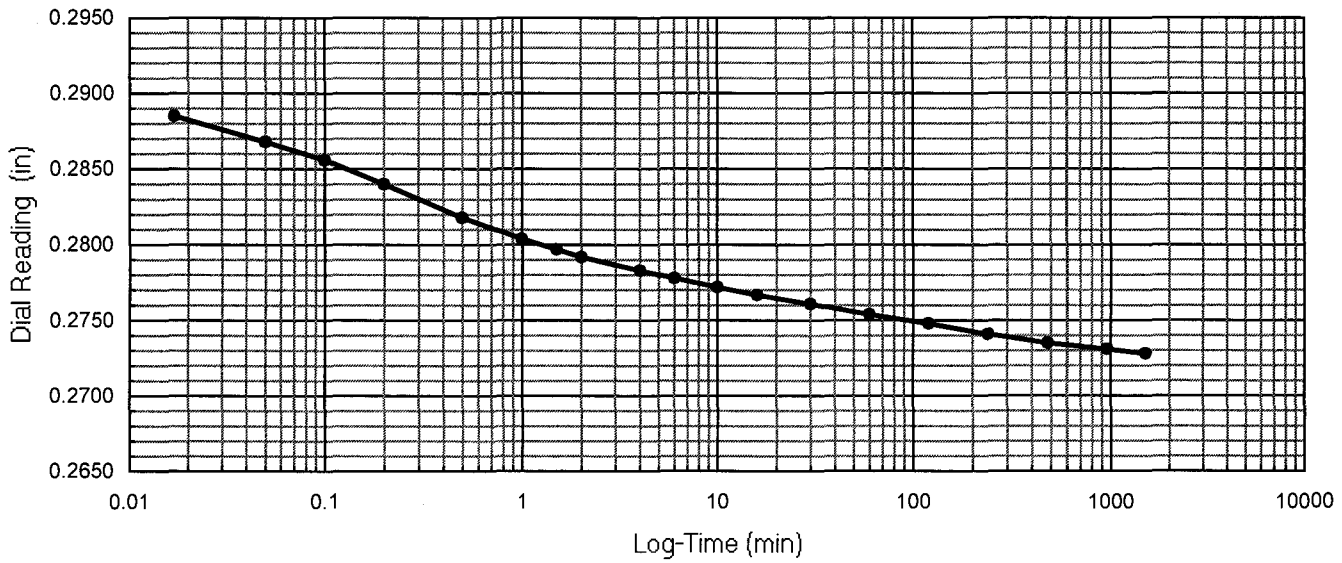
d50 = _____

t50 = _____ min

log time

d50 = 0.2824

t50 = 0.5 min



One-Dimensional Oedometer Testing Increment

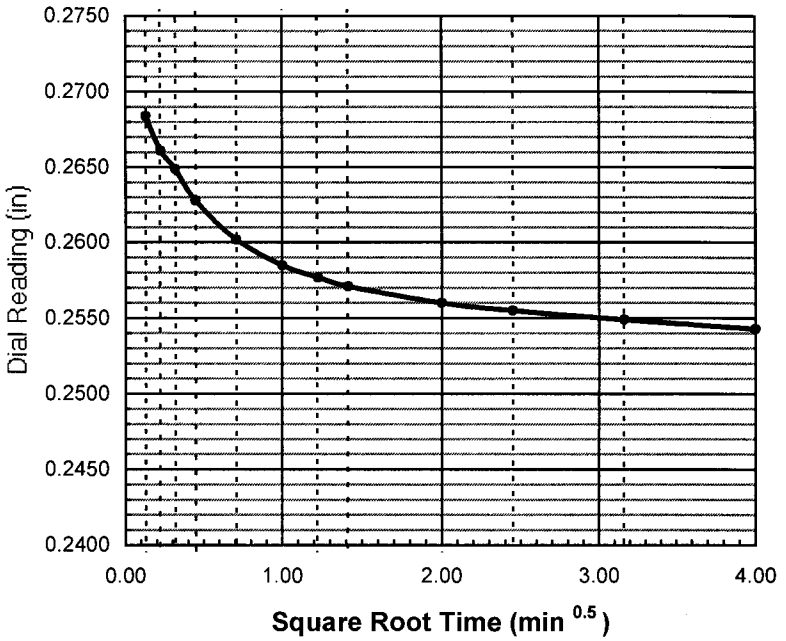
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C10 | Stage Number: 8 | Curves by: TJO

Boring No.: R-11-002 | Sample No.: 6 | Depth (ft.) 16.5

Date: 17-Feb-11 | Load (psf): 20804 | Zero Reading: 0.3701

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:14:12	0	0.00	0.2728
	0.02	0.13	0.2684
	0.05	0.22	0.2661
	0.10	0.32	0.2649
	0.20	0.45	0.2628
	0.50	0.71	0.2602
	1.00	1.00	0.2585
	1.50	1.22	0.2577
	2.00	1.41	0.2571
	4.0	2.00	0.2560
	6.0	2.45	0.2555
	10.0	3.16	0.2549
	16.0	4.00	0.2543
	30		0.2537
	60		0.2530
	120		0.2523
	240		0.2516
	480		0.2508
	960		0.2502
	1408		0.2499



do = 0.2712

d90 = ____ t90 = ____ min

d100 = 0.2505

df = 0.2499

square root

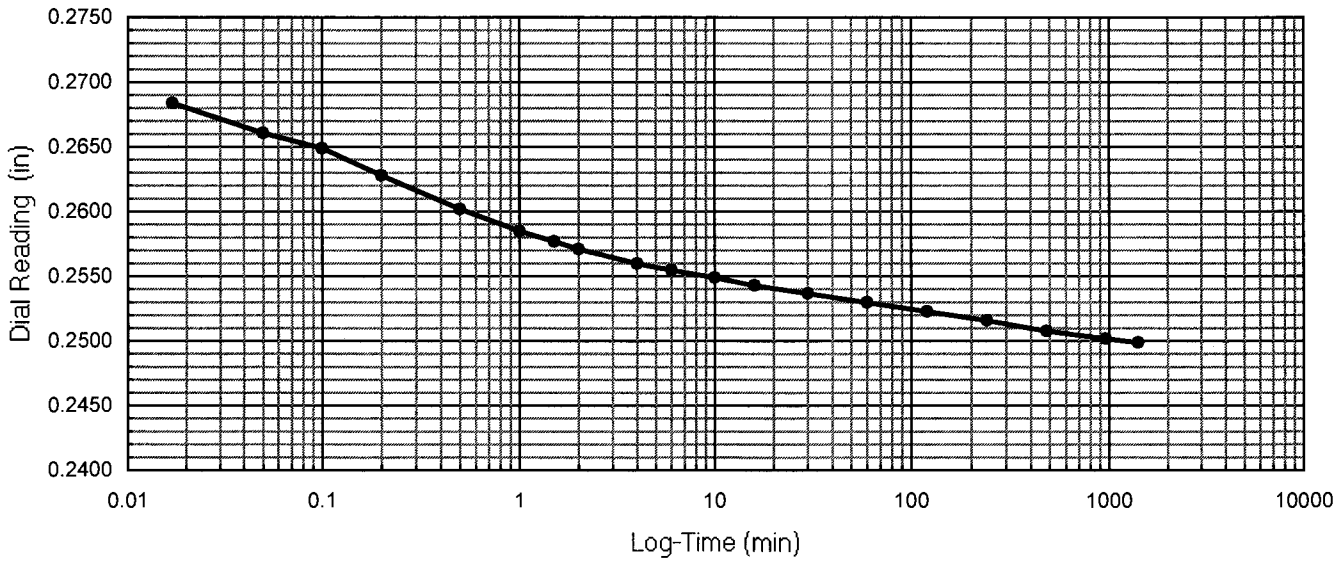
d50 = ____

t50 = ____ min

log time

d50 = 0.2609

t50 = 0.5 min



One-Dimensional Oedometer Testing Increment

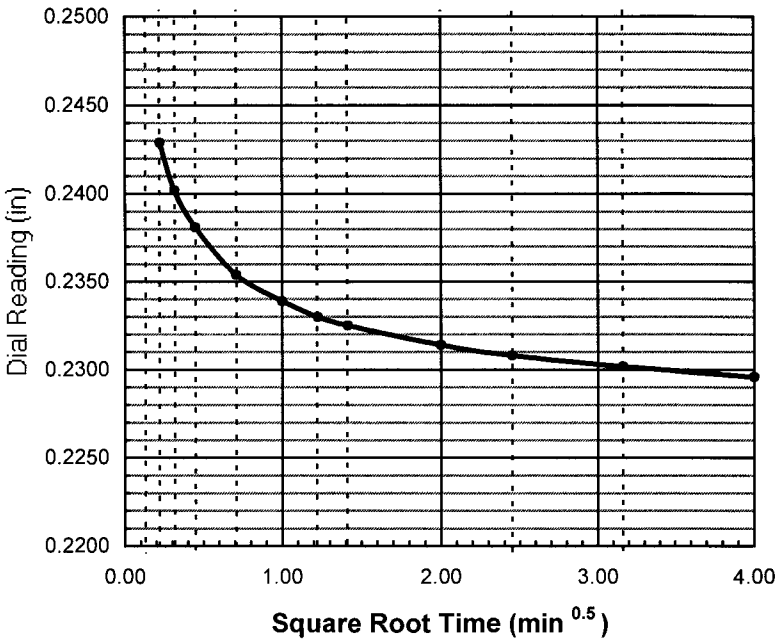
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C10 | Stage Number: 9 | Curves by: TJO

Boring No.: R-11-002 | Sample No.: 6 | Depth (ft.) 16.5

Date: 18-Feb-11 | Load (psf): 41234 | Zero Reading: 0.3701

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:43:22	0	0.00	0.2499
	0.05	0.22	0.2429
	0.05	0.22	0.2429
	0.10	0.32	0.2402
	0.20	0.45	0.2381
	0.50	0.71	0.2354
	1.00	1.00	0.2339
	1.50	1.22	0.2330
	2.00	1.41	0.2325
	4.0	2.00	0.2314
	6.0	2.45	0.2308
	10.0	3.16	0.2302
	16.0	4.00	0.2296
	30		0.2289
	60		0.2282
	120		0.2275
	240		0.2266
	480		0.2260
	960		0.2253
	1530		0.2250



do = 0.2467

d90 = ____ t90 = ____ min

d100 = 0.2260

df = 0.2250

square root

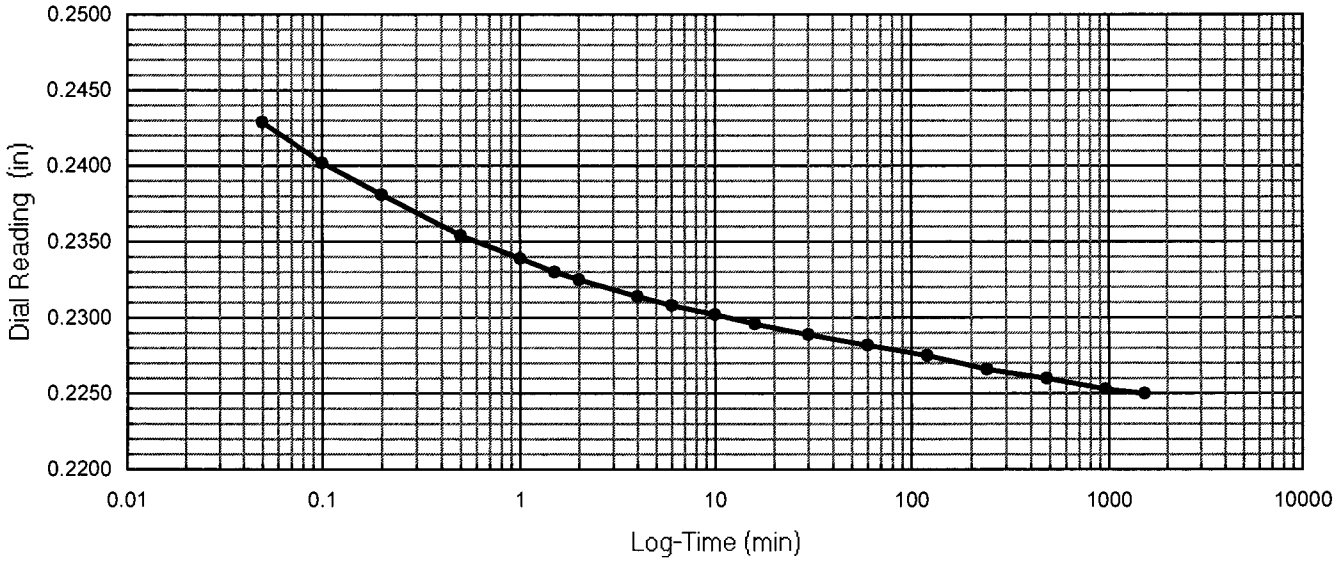
d50 = ____

t50 = ____ min

log time

d50 = 0.2363

t50 = 0.5 min



One-Dimensional Oedometer Testing Increment

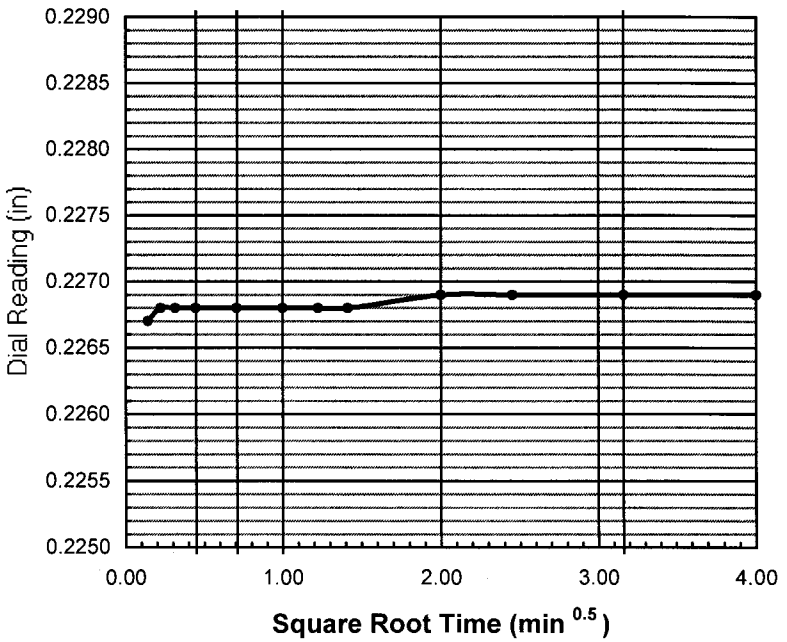
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C10 | Stage Number: 10 | Curves by: TJO

Boring No.: R-11-002 | Sample No.: 6 | Depth (ft.) 16.5

Date: 19-Feb-11 | Load (psf): 20804 | Zero Reading: 0.3701

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:14:34	0	0.00	0.2250
	0.02	0.14	0.2267
	0.05	0.22	0.2268
	0.10	0.32	0.2268
	0.20	0.45	0.2268
	0.50	0.71	0.2268
	1.00	1.00	0.2268
	1.50	1.22	0.2268
	2.00	1.41	0.2268
	4.0	2.00	0.2269
	6.0	2.45	0.2269
	10.0	3.16	0.2269
	16.0	4.00	0.2269
	30		0.2269
	60		0.2269
	120		0.2269
	240		0.2270
	400		0.2270



do = 0.2267

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2270

square root

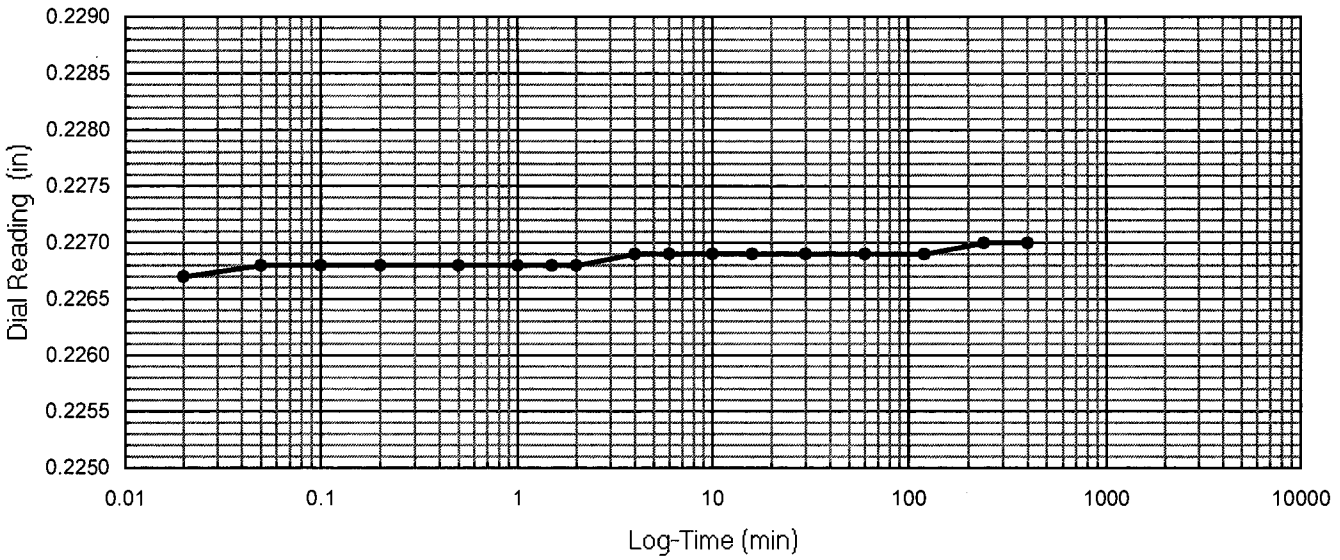
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

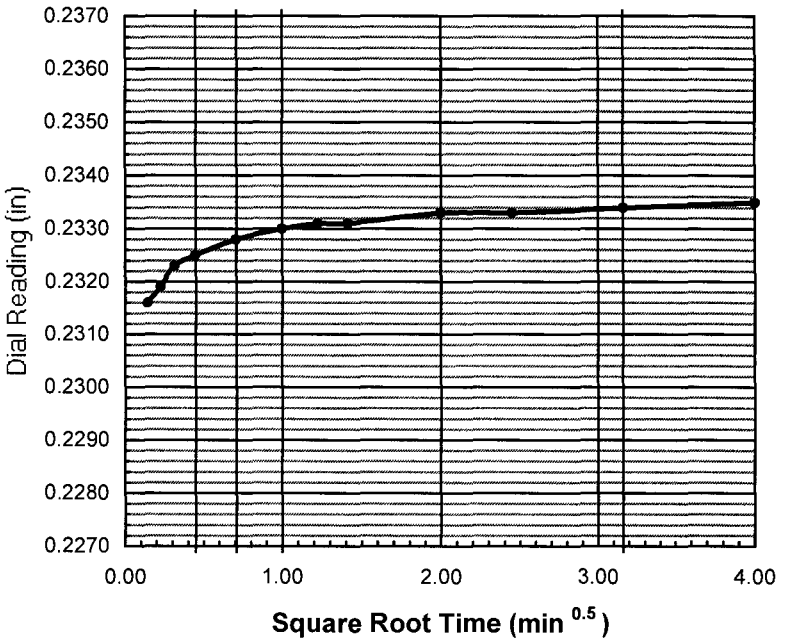
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C10 | Stage Number: 11 | Curves by: TJO

Boring No.: R-11-002 | Sample No.: 6 | Depth (ft.) 16.5

Date: 19-Feb-11 | Load (psf): 5481 | Zero Reading: 0.3701

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
16:55:28	0	0.00	0.2270
	0.02	0.14	0.2316
	0.05	0.22	0.2319
	0.10	0.32	0.2323
	0.20	0.45	0.2325
	0.50	0.71	0.2328
	1.00	1.00	0.2330
	1.50	1.22	0.2331
	2.00	1.41	0.2331
	4.0	2.00	0.2333
	6.0	2.45	0.2333
	10.0	3.16	0.2334
	16.0	4.00	0.2335
	30		0.2336
	60		0.2336
	120		0.2337
	240		0.2338
	480		0.2339
	1060		0.2340



do = 0.2312

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2340

square root

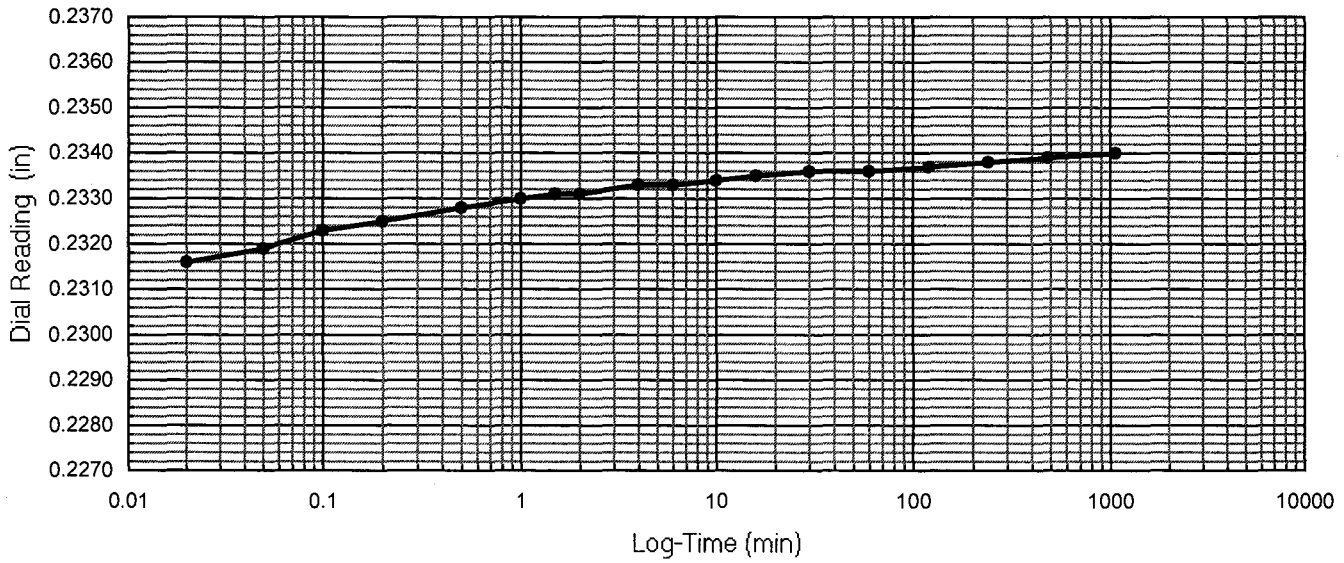
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

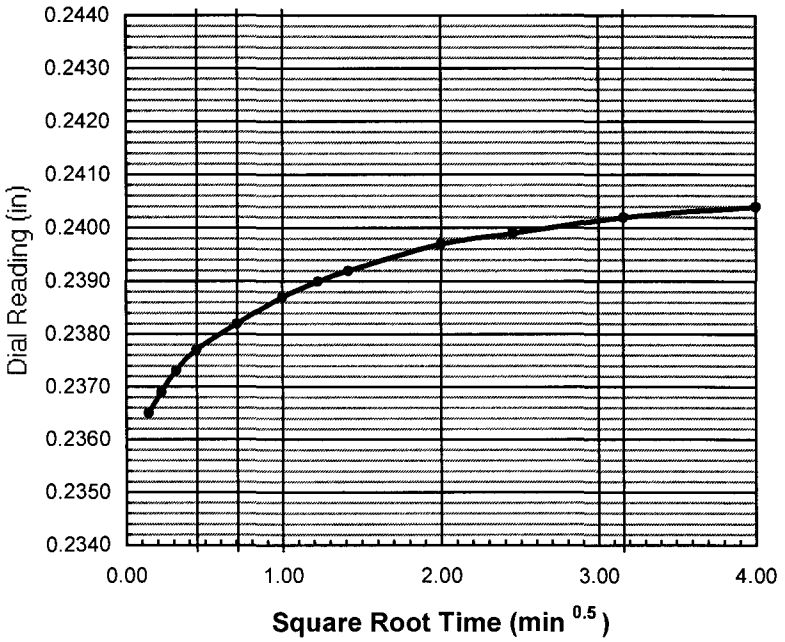
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C10 | Stage Number: 12 | Curves by: TJO

Boring No.: R-11-002 | Sample No.: 6 | Depth (ft.) 16.5

Date: 20-Feb-11 | Load (psf): 1340 | Zero Reading: 0.3701

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:37:13	0	0.00	0.2340
	0.02	0.14	0.2365
	0.05	0.22	0.2369
	0.10	0.32	0.2373
	0.20	0.45	0.2377
	0.50	0.71	0.2382
	1.00	1.00	0.2387
	1.50	1.22	0.2390
	2.00	1.41	0.2392
	4.0	2.00	0.2397
	6.0	2.45	0.2399
	10.0	3.16	0.2402
	16.0	4.00	0.2404
	30		0.2406
	60		0.2409
	120		0.2411
	240		0.2413
	480		0.2414
	980		0.2417
	1440		0.2419
	2740		0.2421



do = 0.2359

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2421

square root

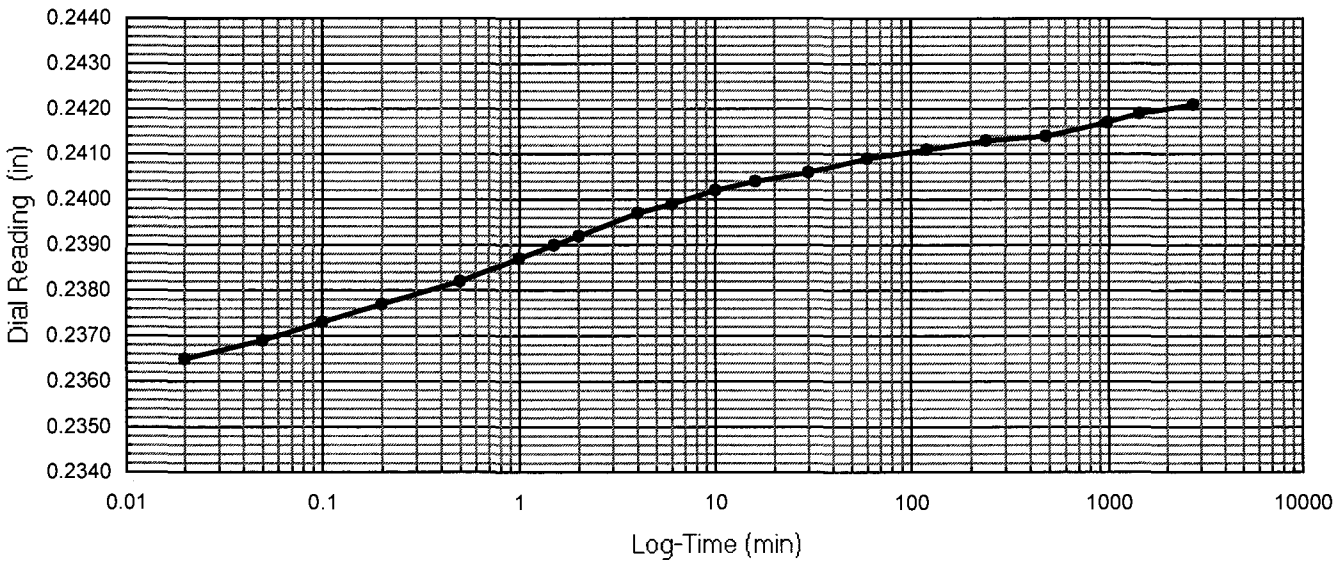
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

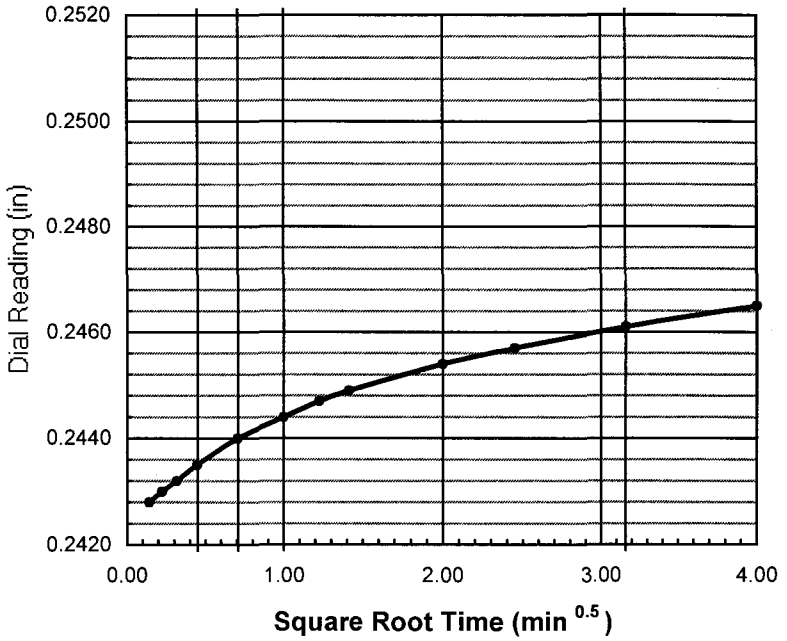
for ASTM D2435, method B

Project Number: 30989830 Apparatus No.: C10 Stage Number: 13 Curves by: TJO

Boring No.: R-11-002 Sample No.: 6 Depth (ft.) 16.5

Date: 22-Feb-11 Load (psf): 305 Zero Reading: 0.3701

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:17:50	0	0.00	0.2421
	0.02	0.14	0.2428
	0.05	0.22	0.2430
	0.10	0.32	0.2432
	0.20	0.45	0.2435
	0.50	0.71	0.2440
	1.00	1.00	0.2444
	1.50	1.22	0.2447
	2.00	1.41	0.2449
	4.0	2.00	0.2454
	6.0	2.45	0.2457
	10.0	3.16	0.2461
	16.0	4.00	0.2465
	30		0.2469
	60		0.2475
	120		0.2479
	240		0.2485
	480		0.2489
	980		0.2494
	1800		0.2499
	3467		0.2503
	4332		0.2504



do = 0.2423

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2504

square root

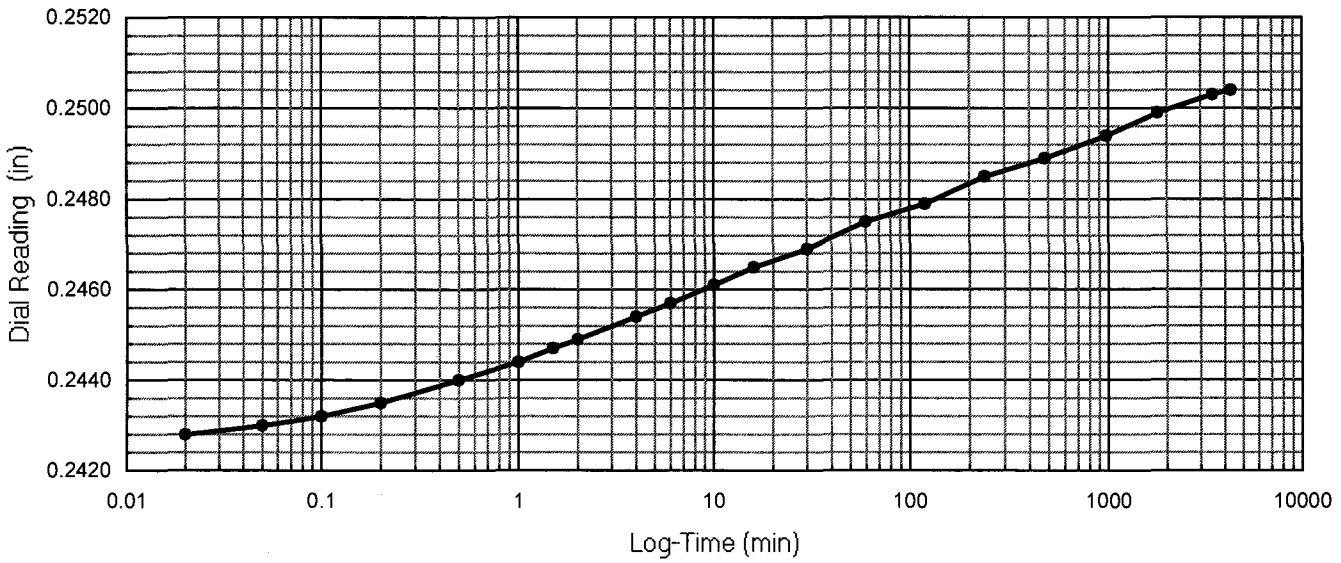
d50 = _____

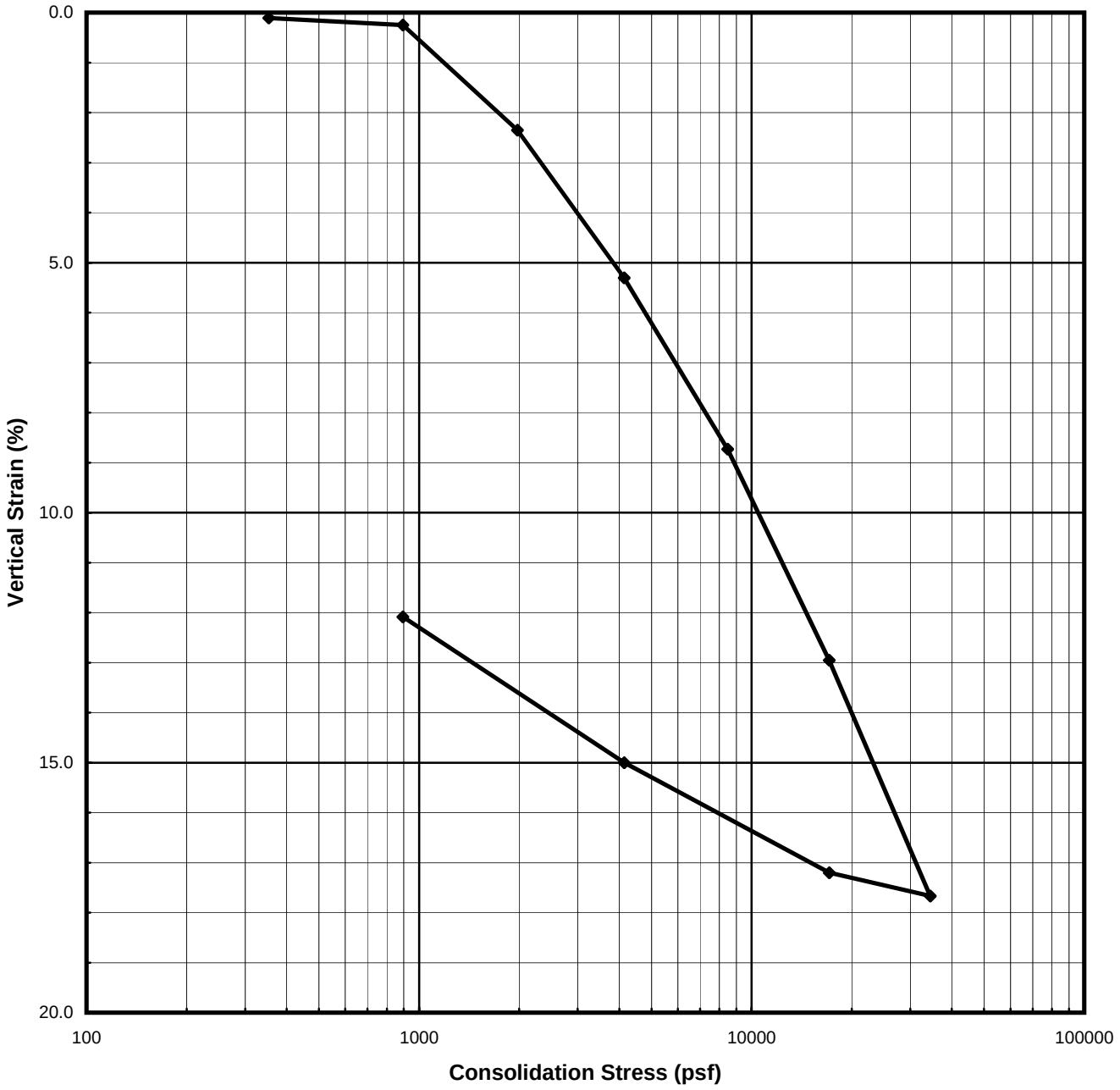
t50 = _____ min

log time

d50 = _____

t50 = _____ min





Description:	**Very dark gray Clay (CH)**							
Boring No.:	R-10-007		Liquid Limit	58	%	Specific Gravity	2.75	assumed
Sample No.:	S8		Plasticity Index	32	%	Strain for Saturation	0.80	%
Depth (ft | m)	40.0	12.19	Fines Content	92.8	%	Water added at	83.0	psf

	Water Content (%)	Total Unit Weight		Dry Unit Weight		Saturation (%)	Void Ratio	Height		Diameter	
		(pcf)	(kN/m^3)	(pcf)	(kN/m^3)			(inches)	(cm)	(inches)	(cm)
Initial	35.9	115.1	18.08	84.7	13.31	96.5	1.02	0.727	1.85	1.933	4.910
Final	31.5	121.1	19.03	92.1	14.47	100.7	0.86	0.669	1.70		

URS

I5 & SR74 IC

Project Number: 30989830
Test Start Date: 8/17/2010

CONSOLIDATION TEST
ASTM D2435

SUBMITTED BY: Thomas J. O'Meara

Con I5 R10007040.xls

One-Dimensional Oedometer Testing
Set-up / Take down Worksheet
ASTM D2435

Project Number: 30989830
Project Name: I5 & SR74 IC
Project Engineer: FM
Apparatus No.: C8

Boring No.: R-10-007
Sample No.: S8
Depth (ft): 40.0

Specimen Description : Very dark gray Clay (CH)
Duration: end of primary

Ring Number: R35
Weight of Wet Spec. and Ring: 194.49 g
Weight of Ring: 130.01 g
Initial Weight of Wet Spec.: 64.48 g

Take Down Weight with Ring: 192.38 g

Excess Oven-dried Cont. No.: rp5
Weight of Cont. and Dry Spec.: 115.65 g
Weight of Container: 115.62 g
Weight of Excess Dried Soil: 0.03 g
Weight of Excess Wet Soil 0.04 g
Final Weight of Wet Specimen: 62.41 g

Height of Specimen (in)

	Initial	Final
1	0.730	0.670
2	0.727	0.671
3	0.731	0.667
4	0.720	0.674
5	0.728	0.662
Ave:	0.727	0.669

Initial Height - Final Height = 0.058 in
Change in Dial (Dd) = 0.064 in
Initial Height - Dd = 0.663 in
Final Height + Dd = 0.733 in
Weight of Top Cap = 165.74 g

Specimen Analysis					Initial Trim	Initial Spec.	Final
				Container Number:	M69	**XXXXX**	x8
				Mass of Container and Wet Specimen M1 (g)	129.12	64.48	201.65
				Mass of Container and Dry Specimen, M2 (g)	121.73	47.45	186.83
				Mass of Container, M3 (g)	100.45	**XXXXX**	139.81
				Water Content, w (%)	34.73	35.88	31.52
				Mass of Wet Specimen, M4 (g)	64.48	64.48	62.41
				Mass of Dry Specimen, M5 (g)	47.45	47.45	47.45
Nominal		Measured	x	Specimen Height, H (in)	0.727	0.727	0.669
Nominal	x	Measured		Specimen Diameter, D (in)	1.933	1.933	1.933
				Area of Specimen, A (in^2)	2.935	2.935	2.935
				Volume of Specimen, V (cc)	34.97	34.97	32.16
Assumed	x	Measured		Specific Gravity, Gs	2.75	2.75	2.75
				Wet Unit Weight, WUW (pcf)	**115.1**	**115.1**	**121.1**
				Dry Unit Weight, DUW (pcf)	**85.4**	**84.7**	**92.1**
				Void Ratio	**1.006**	**1.023**	**0.861**
				Degree of Saturation, S (%)	**94.9**	**96.5**	**100.7**

Set-up by: YS
Date: 8/17/10
Calculated by: TJO
Reviewed by: YS
Strain for Saturation (%) = **0.797**

One-Dimensional Oedometer Testing

Loading Worksheet

ASTM D2435

Project Number: 30989830 Boring No.: R-10-007

Project Name: I5 & SR74 IC Sample No.: S8

Project Engineer: FM Apparatus No.: C8 Depth (ft): 40.0

Initial Dial Reading: 0.3404 inch Initial Specimen Height: 0.727 inch

Stage No.	Normal Stress (psf)	Dial Reading (in)		Compressibility Correction (in)	Vertical Strain (%)	
		End of Duration	End of Increment		End of Duration	End of Increment
Seat	83		0.3404	0.0000		0.00
1	353		0.3388	0.0008		0.11
2	894	0.3352	0.3367	0.0019	0.45	0.25
3	1976	0.3220	0.3201	0.0032	2.09	2.35
4	4140	0.3005	0.2969	0.0049	4.81	5.31
5	8467	0.2730	0.2700	0.0069	8.32	8.73
6	17121	0.2405	0.2368	0.0094	12.44	12.95
7	34430	0.2030	0.2000	0.0119	17.26	17.67
8	17121		0.2046	0.0107		17.20
9	4140		0.2236	0.0077		15.00
10	894		0.2472	0.0053		12.09
11	83		0.2764	0.0032		8.36
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						
33						

Final dial reading prior to take down (inch): 0.2764 Take down by: YS Date: 9/2/10

One-Dimensional Oedometer Testing
ASTM D2435
Table of Incremental Values

Project Number: 30989830
Project Name: I5 & SR74 IC
Project Engineer: FM
Apparatus No.: C8

Boring No.: R-10-007
Sample No.: S8
Depth (ft): 40.0
Inundation at stage: Seat

10 **20** Hanger Ratios

Stage Number	Incremental Weight Applied (kg) Back	Front	Vertical Stress (psf)	Specimen Hieght (in)	Deflections (in) $d_{initial}$	d_o	d_{50}	d_{100}	d_{final}	Porous Stone (in)	t_{50} (min)	cv (in^2/min)	cv (ft^2/day)
Top Cap			18	0.727	0.3404	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
Seat	0.06		83	0.727	0.3404	XXXXX	XXXXX	XXXXX	0.3404	0.0000	XXXXX	XXXXX	XXXXX
1	0.25		353	0.726	0.3404	0.3396	XXXXX	XXXXX	0.3388	0.0008	XXXXX	XXXXX	XXXXX
2	0.50		894	0.726	0.3388	0.3384	0.3368	0.3352	0.3367	0.0019	5.00	0.005	0.052
3	1.00		1976	0.713	0.3367	0.3328	0.3274	0.3220	0.3201	0.0032	7.00	0.004	0.036
4		1.0	4140	0.695	0.3201	0.3188	0.3097	0.3005	0.2969	0.0049	8.00	0.003	0.030
5	4.0		8467	0.675	0.2969	0.2959	0.2845	0.2730	0.2700	0.0069	11.00	0.002	0.020
6		4.0	17121	0.651	0.2700	0.2681	0.2543	0.2405	0.2368	0.0094	13.00	0.002	0.016
7		8.0	34430	0.626	0.2368	0.2344	0.2187	0.2030	0.2000	0.0119	20.00	0.001	0.010
8		-8.0	17121	0.641	0.2000	0.2010	XXXXX	XXXXX	0.2046	0.0107	XXXXX	XXXXX	XXXXX
9	-4.0	-4.0	4140	0.668	0.2046	0.2069	XXXXX	XXXXX	0.2236	0.0077	XXXXX	XXXXX	XXXXX
10	-1.0	-1.0	894	0.697	0.2236	0.2248	XXXXX	XXXXX	0.2472	0.0053	XXXXX	XXXXX	XXXXX
11	-0.75		83	0.729	0.2472	0.2472	XXXXX	XXXXX	0.2764	0.0032	XXXXX	XXXXX	XXXXX
12			83	XXXXX	0.2764	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
13			83	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
14			83	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
15			83	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
16			83	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
17			83	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
18			83	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
19			83	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
20			83	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
21			83	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
22			83	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
23			83	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
24			83	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
25			83	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX

One-Dimensional Oedometer Testing Increment

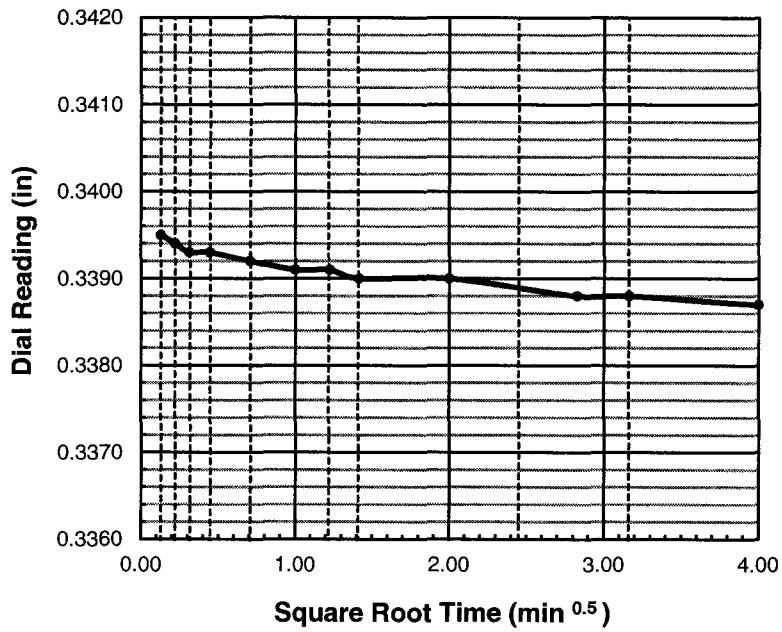
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 1 | Curves by: TJO

Boring No.: R-10-007 | Sample No.: S8 | Depth (ft.) 40.0

Date: 17-Aug-10 | Load (psf): 353 | Zero Reading: 0.3404

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
18:26:02	0	0.00	0.3404
	0.02	0.13	0.3395
	0.05	0.22	0.3394
	0.10	0.32	0.3393
	0.20	0.45	0.3393
	0.50	0.71	0.3392
	1.00	1.00	0.3391
	1.50	1.22	0.3391
	2.00	1.41	0.3390
	4.0	2.00	0.3390
	8.0	2.83	0.3388
	10.0	3.16	0.3388
	16.0	4.00	0.3387
	30		0.3387
	60		0.3387
	120		0.3387
	240		0.3387
	480		0.3388
	877		0.3388



do = 0.3396

d90 = _____ t90 = _____ min

d100 = _____

df = 0.3380

square root

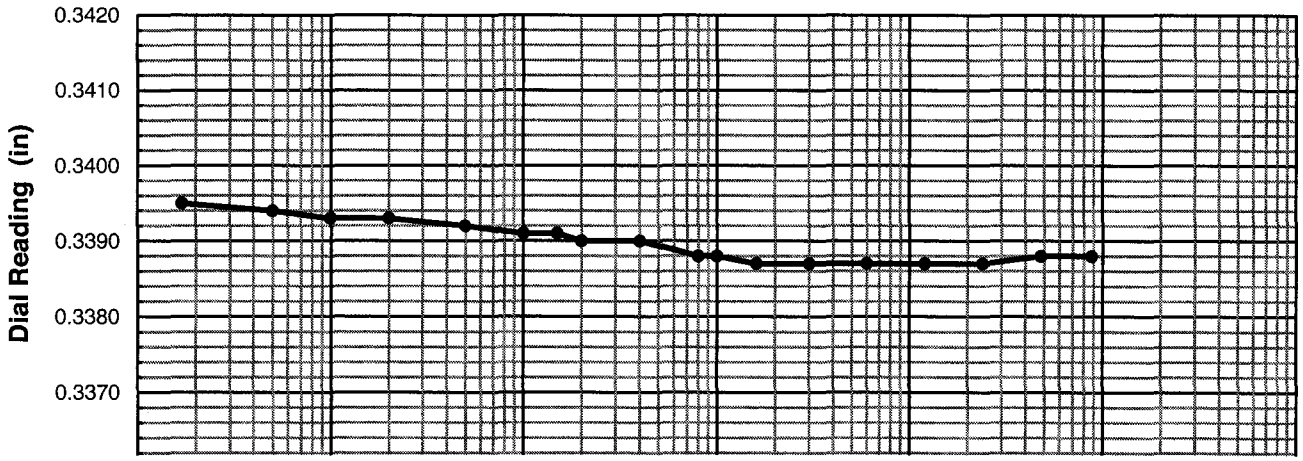
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

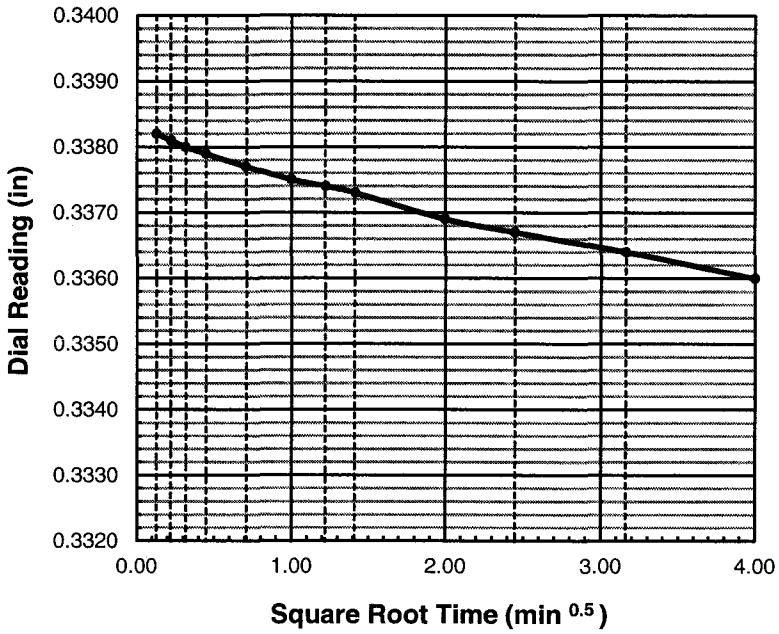
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 2 | Curves by: TJO

Boring No.: R-10-007 | Sample No.: S8 | Depth (ft.) 40.0

Date: 18-Aug-10 | Load (psf): 894 | Zero Reading: 0.3404

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:03:10	0	0.00	0.3388
	0.02	0.13	0.3382
	0.05	0.22	0.3381
	0.10	0.32	0.3380
	0.20	0.45	0.3379
	0.50	0.71	0.3377
	1.00	1.00	0.3375
	1.50	1.22	0.3374
	2.00	1.41	0.3373
	4.0	2.00	0.3369
	6.0	2.45	0.3367
	10.0	3.16	0.3364
	16.0	4.00	0.3360
	30		0.3356
	60		0.3352
	120		0.3349
	240		0.3345
	480		0.3342
	960		0.3340
	1440		0.3338
	1885		0.3337



do = 0.3384

d90 = _____ t90 = _____ min

d100 = 0.3352

df = 0.3337

square root

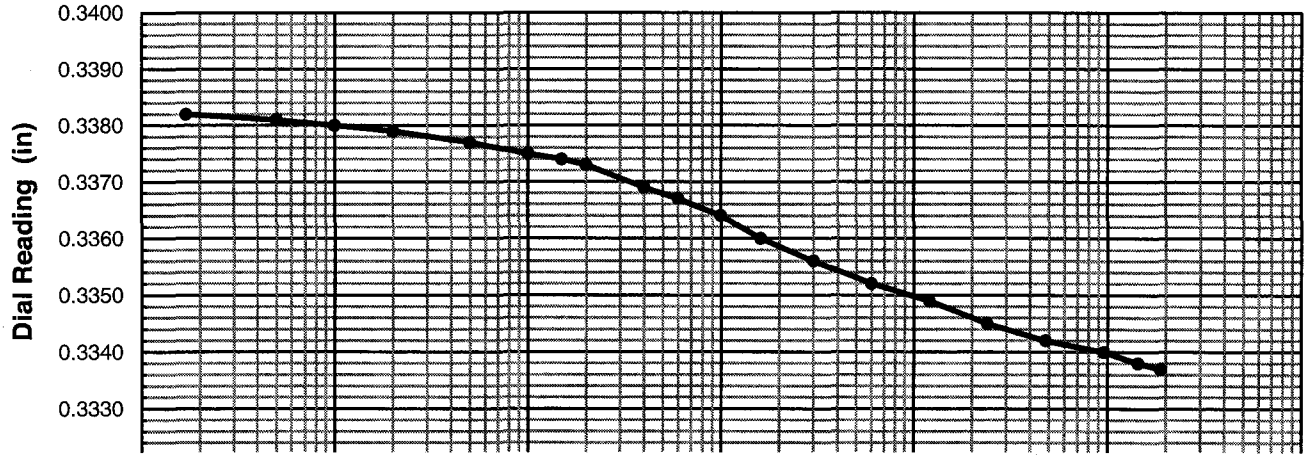
d50 = _____

t50 = _____ min

log time

d50 = 0.3368

t50 = _____ min



One-Dimensional Oedometer Testing Increment

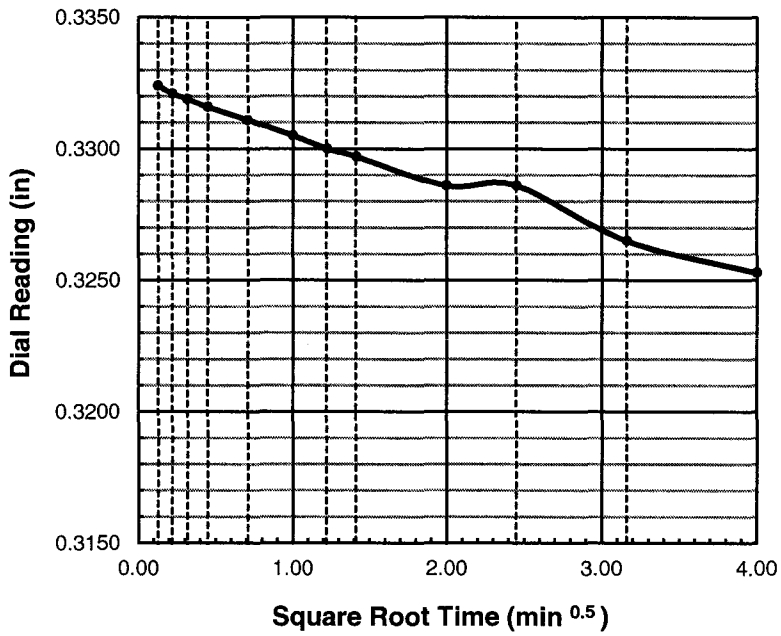
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 3 | Curves by: TJO

Boring No.: R-10-007 | Sample No.: S8 | Depth (ft.) 40.0

Date: 19-Aug-10 | Load (psf): 1976 | Zero Reading: 0.3404

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
16:28:59	0	0.00	0.3337
	0.02	0.13	0.3324
	0.05	0.22	0.3321
	0.10	0.32	0.3319
	0.20	0.45	0.3316
	0.50	0.71	0.3311
	1.00	1.00	0.3305
	1.50	1.22	0.3300
	2.00	1.41	0.3297
	4.0	2.00	0.3286
	6.0	2.45	0.3286
	10.0	3.16	0.3265
	16.0	4.00	0.3253
	30		0.3238
	60		0.3225
	120		0.3217
	240		0.3211
	480		0.3206
	1027		0.3201



do = 0.3328

d90 = _____ t90 = _____ min

d100 = 0.3220

df = 0.3201

square root

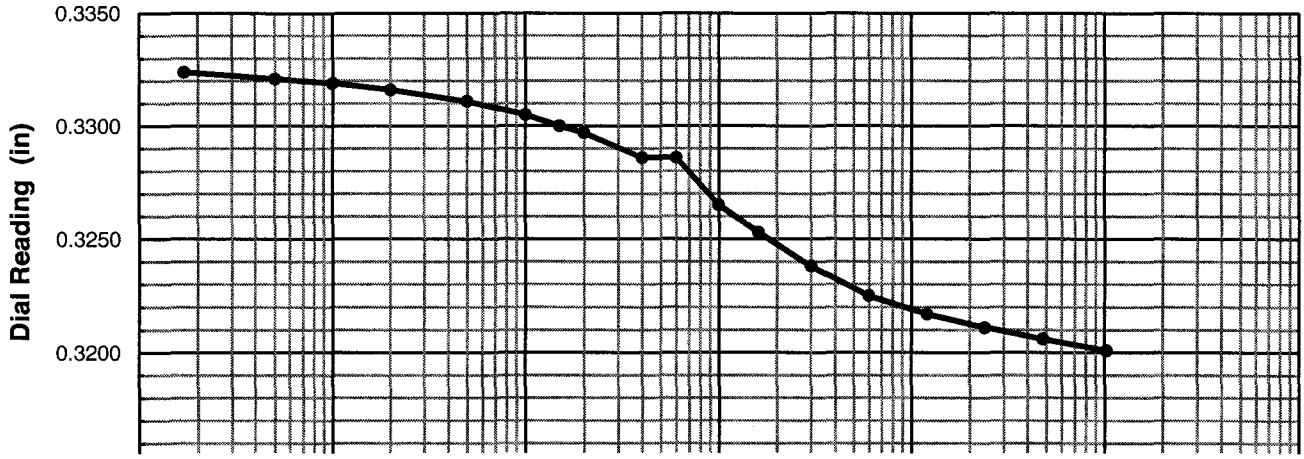
d50 = _____

t50 = _____ min

log time

d50 = 0.3274

t50 = _____ min



One-Dimensional Oedometer Testing Increment

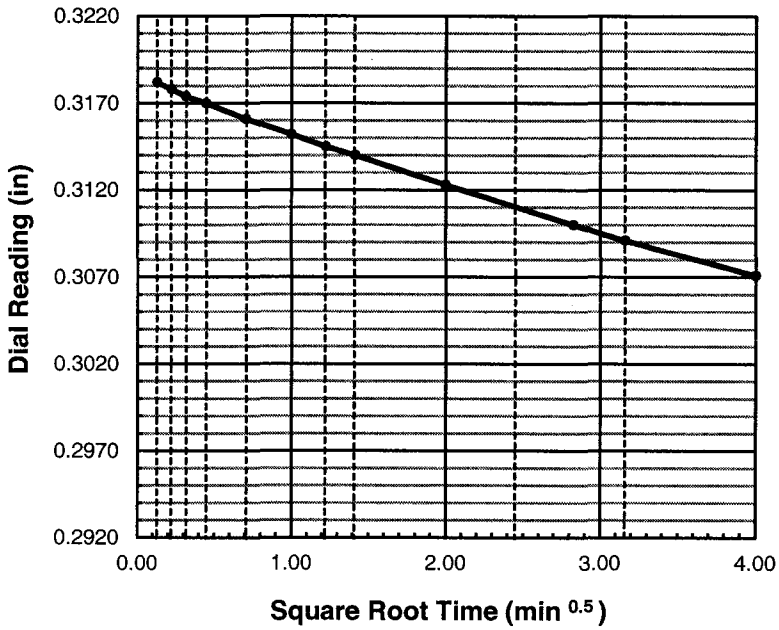
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 4 | Curves by: TJO

Boring No.: R-10-007 | Sample No.: S8 | Depth (ft.) 40.0

Date: 20-Aug-10 | Load (psf): 4140 | Zero Reading: 0.3404

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:36:17	0	0.00	0.3201
	0.02	0.13	0.3182
	0.05	0.22	0.3178
	0.10	0.32	0.3174
	0.20	0.45	0.3170
	0.50	0.71	0.3161
	1.00	1.00	0.3152
	1.50	1.22	0.3145
	2.00	1.41	0.3140
	4.0	2.00	0.3123
	8.0	2.83	0.3100
	10.0	3.16	0.3091
	16.0	4.00	0.3071
	30		0.3045
	60		0.3021
	120		0.3006
	240		0.2995
	480		0.2987
	960		0.2981
	1440		0.2978
	2880		0.2973
	4353		0.2969



do = 0.3188

d90 = _____ t90 = _____ min

d100 = 0.3005

df = 0.2969

square root

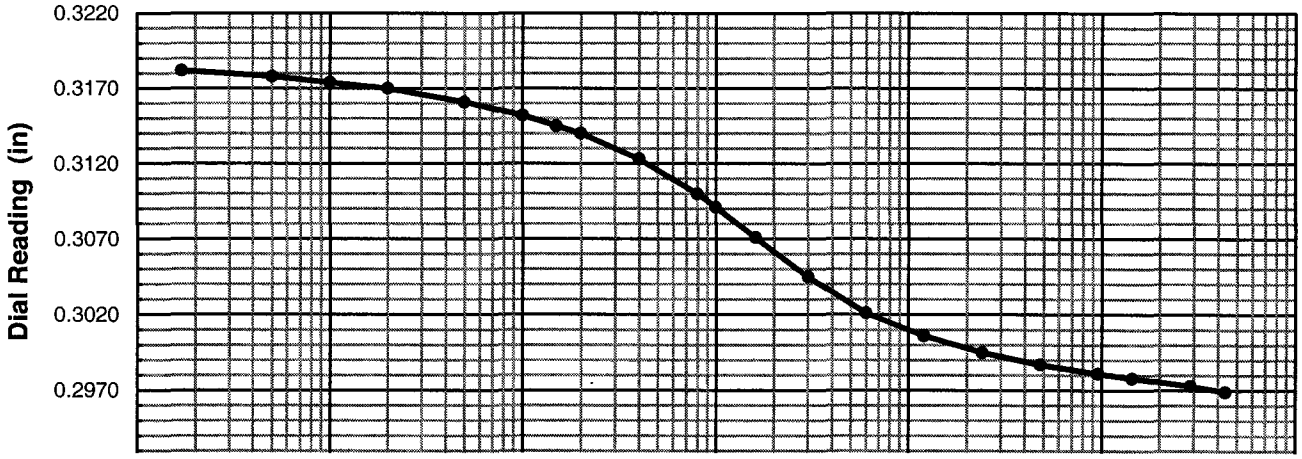
d50 = _____

t50 = _____ min

log time

d50 = 0.3097

t50 = _____ min



One-Dimensional Oedometer Testing Increment

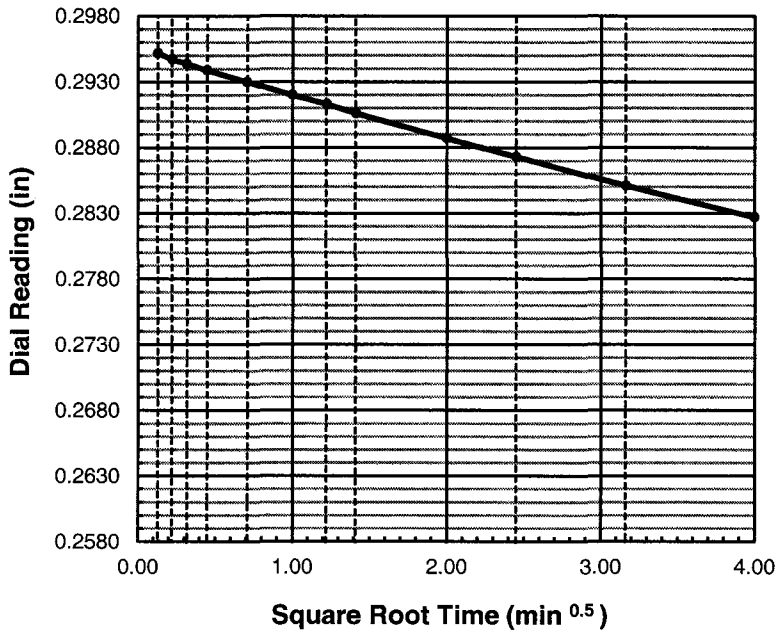
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 5 | Curves by: TJO

Boring No.: R-10-007 | Sample No.: S8 | Depth (ft.) 40.0

Date: 23-Aug-10 | Load (psf): 8467 | Zero Reading: 0.3404

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:10:07	0	0.00	0.2969
	0.02	0.13	0.2952
	0.05	0.22	0.2947
	0.10	0.32	0.2944
	0.20	0.45	0.2939
	0.50	0.71	0.2930
	1.00	1.00	0.2920
	1.50	1.22	0.2913
	2.00	1.41	0.2906
	4.0	2.00	0.2887
	6.0	2.45	0.2873
	10.0	3.16	0.2851
	16.0	4.00	0.2827
	30		0.2793
	60		0.2759
	120		0.2737
	240		0.2722
	480		0.2711
	960		0.2703
	1383		0.2700



do = 0.2959

d90 = _____ t90 = _____ min

d100 = 0.2730

df = 0.2700

square root

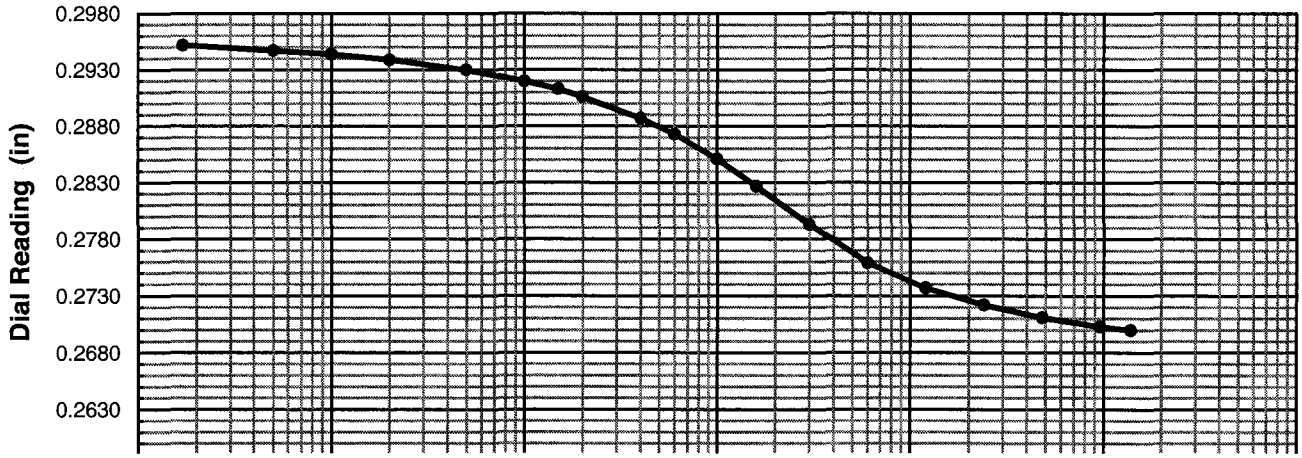
d50 = _____

t50 = _____ min

log time

d50 = 0.2844

t50 = _____ min



One-Dimensional Oedometer Testing Increment

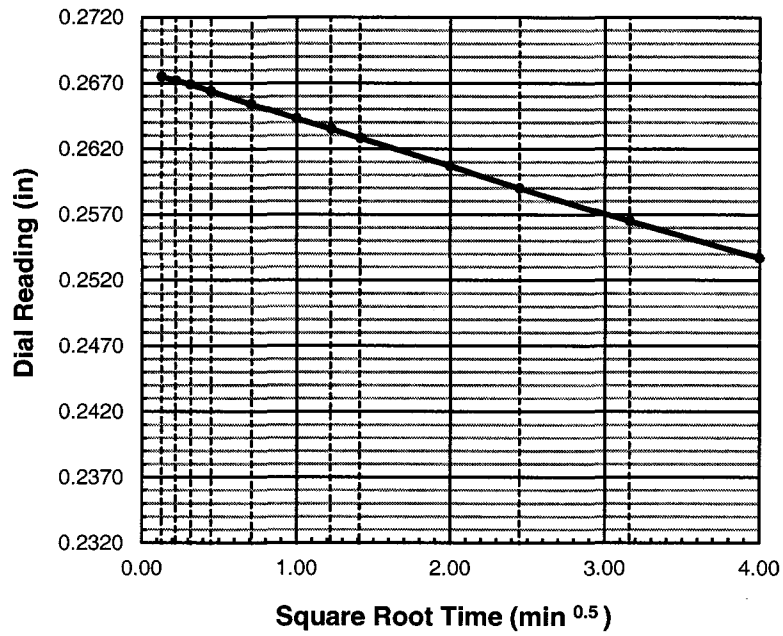
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 6 | Curves by: TJO

Boring No.: R-10-007 | Sample No.: S8 | Depth (ft.) 40.0

Date: 24-Aug-10 | Load (psf): 17121 | Zero Reading: 0.3404

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:14:01	0	0.00	0.2700
	0.02	0.13	0.2675
	0.05	0.22	0.2672
	0.10	0.32	0.2669
	0.20	0.45	0.2664
	0.50	0.71	0.2654
	1.00	1.00	0.2643
	1.50	1.22	0.2635
	2.00	1.41	0.2628
	4.0	2.00	0.2607
	6.0	2.45	0.2590
	10.0	3.16	0.2565
	16.0	4.00	0.2537
	30		0.2494
	60		0.2448
	120		0.2415
	240		0.2396
	480		0.2382
	960		0.2373
	1463		0.2368



do = 0.2681

d90 = _____ t90 = _____ min

d100 = 0.2405

df = 0.2368

square root

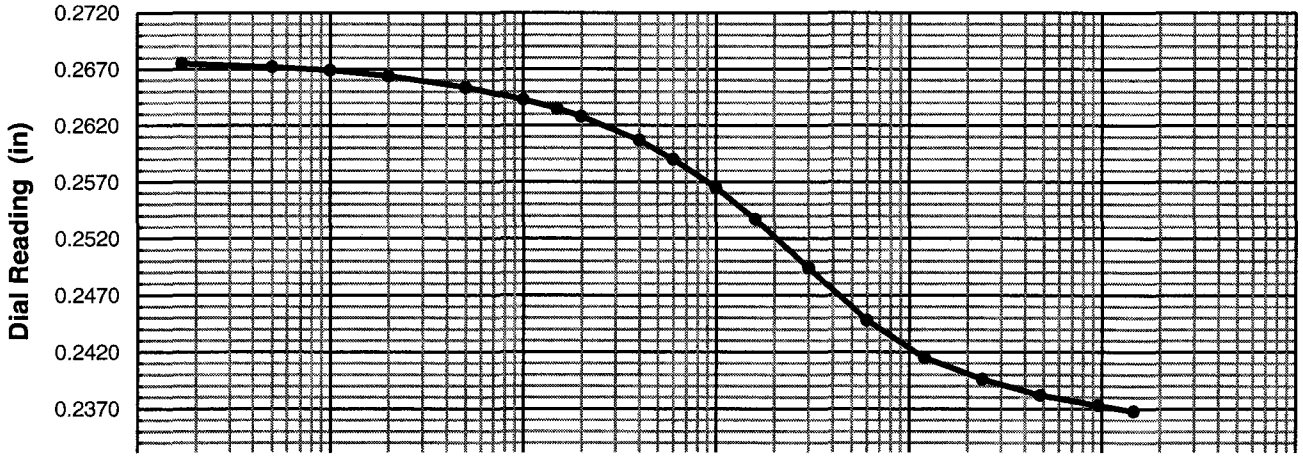
d50 = _____

t50 = _____ min

log time

d50 = 0.2543

t50 = _____ min



One-Dimensional Oedometer Testing Increment

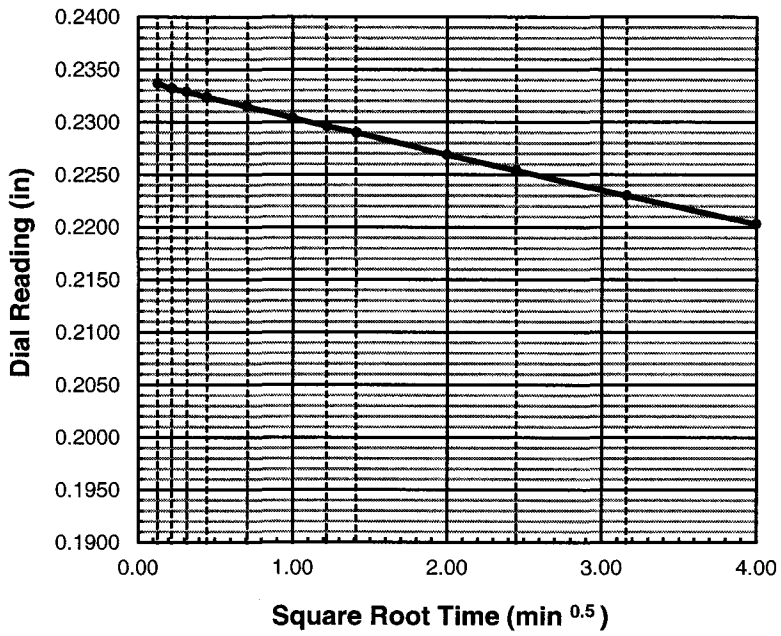
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 7 | Curves by: TJO

Boring No.: R-10-007 | Sample No.: S8 | Depth (ft.) 40.0

Date: 25-Aug-10 | Load (psf): 34430 | Zero Reading: 0.3404

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:38:27	0	0.00	0.2365
	0.02	0.13	0.2337
	0.05	0.22	0.2332
	0.10	0.32	0.2329
	0.20	0.45	0.2324
	0.50	0.71	0.2315
	1.00	1.00	0.2304
	1.50	1.22	0.2296
	2.00	1.41	0.2290
	4.0	2.00	0.2269
	6.0	2.45	0.2254
	10.0	3.16	0.2230
	16.0	4.00	0.2203
	30		0.2160
	60		0.2107
	120		0.2063
	240		0.2036
	480		0.2017
	960		0.2006
	1473		0.2000



do = 0.2344

d90 = _____ t90 = _____ min

d100 = 0.2030

df = 0.2000

square root

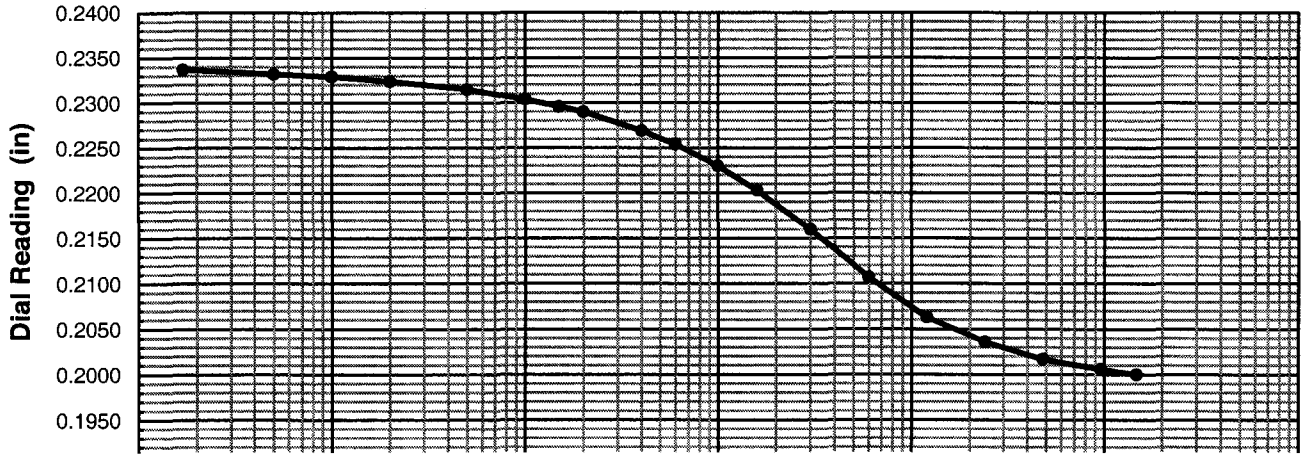
d50 = _____

t50 = _____ min

log time

d50 = 0.2187

t50 = _____ min



One-Dimensional Oedometer Testing Increment

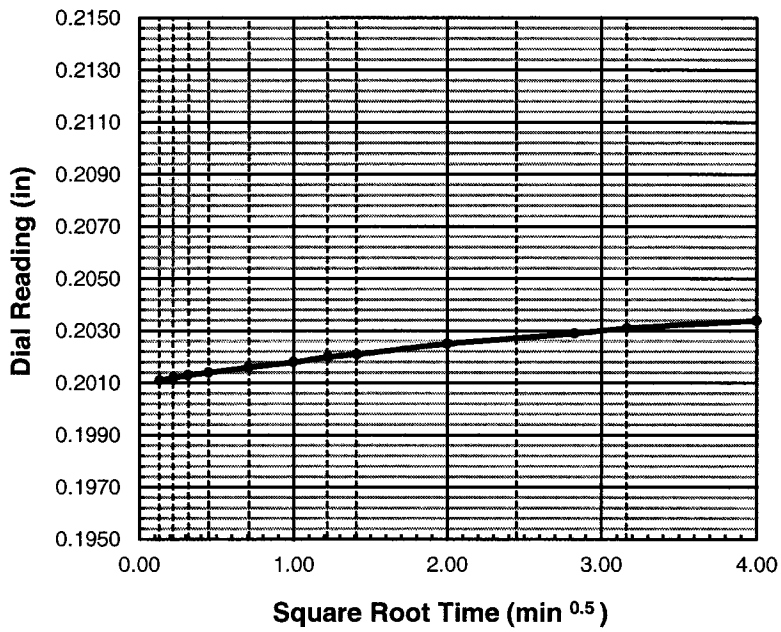
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 8 | Curves by: TJO

Boring No.: R-10-007 | Sample No.: S8 | Depth (ft.) 40.0

Date: 26-Aug-10 | Load (psf): 17121 | Zero Reading: 0.3404

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:12:17	0	0.00	0.2000
	0.02	0.13	0.2011
	0.05	0.22	0.2012
	0.10	0.32	0.2013
	0.20	0.45	0.2014
	0.50	0.71	0.2016
	1.00	1.00	0.2018
	1.50	1.22	0.2020
	2.00	1.41	0.2021
	4.0	2.00	0.2025
	8.0	2.83	0.2029
	10.0	3.16	0.2031
	16.0	4.00	0.2034
	30		0.2038
	60		0.2041
	120		0.2043
	247		0.2046



do = 0.2010

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2046

square root

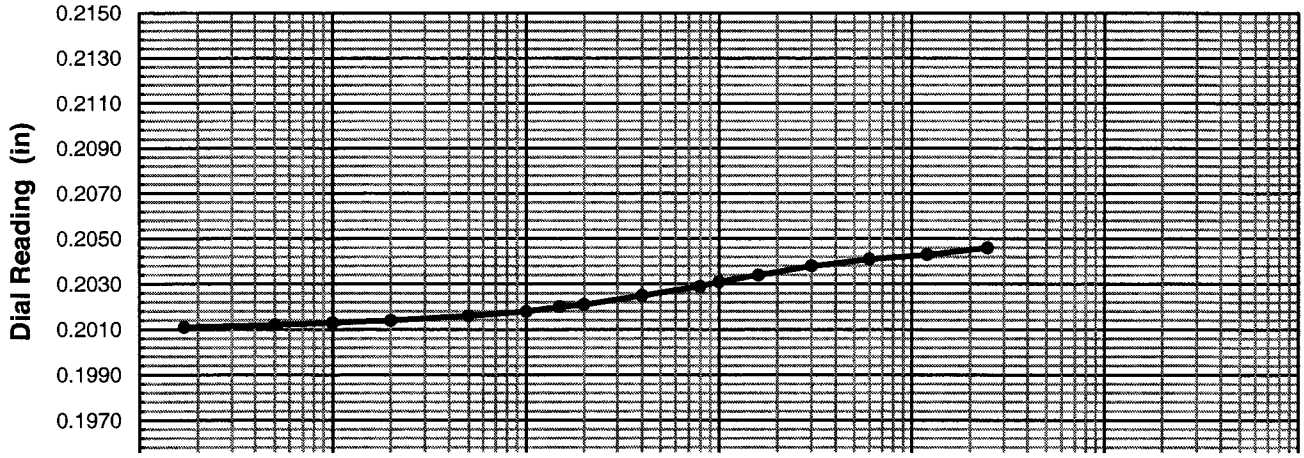
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

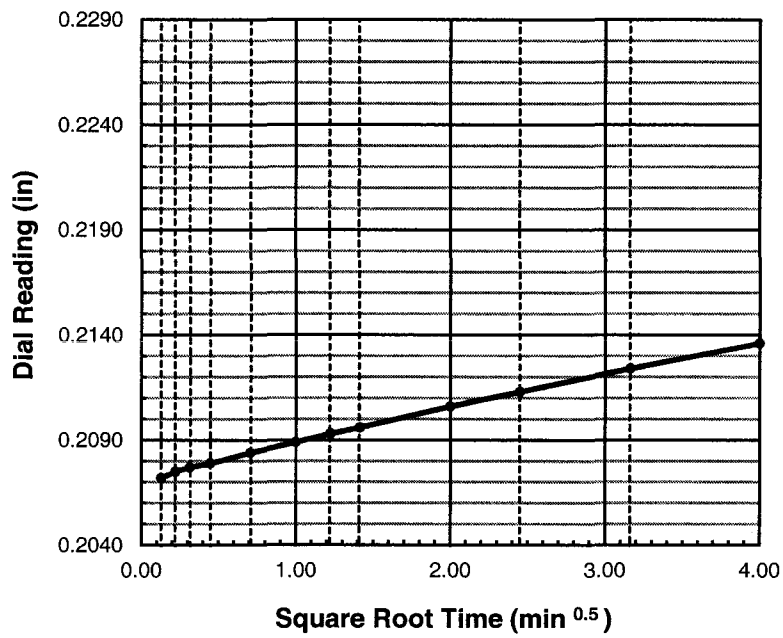
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 9 | Curves by: TJO

Boring No.: R-10-007 | Sample No.: S8 | Depth (ft.) 40.0

Date: 26-Aug-10 | Load (psf): 4140 | Zero Reading: 0.3404

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
14:19:52	0	0.00	0.2046
	0.02	0.13	0.2072
	0.05	0.22	0.2075
	0.10	0.32	0.2077
	0.20	0.45	0.2079
	0.50	0.71	0.2084
	1.00	1.00	0.2089
	1.50	1.22	0.2093
	2.00	1.41	0.2096
	4.0	2.00	0.2106
	6.0	2.45	0.2113
	10.0	3.16	0.2124
	16.0	4.00	0.2136
	30		0.2156
	60		0.2181
	120		0.2206
	240		0.2223
	480		0.2231
	1163		0.2236



do = 0.2069

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2236

square root

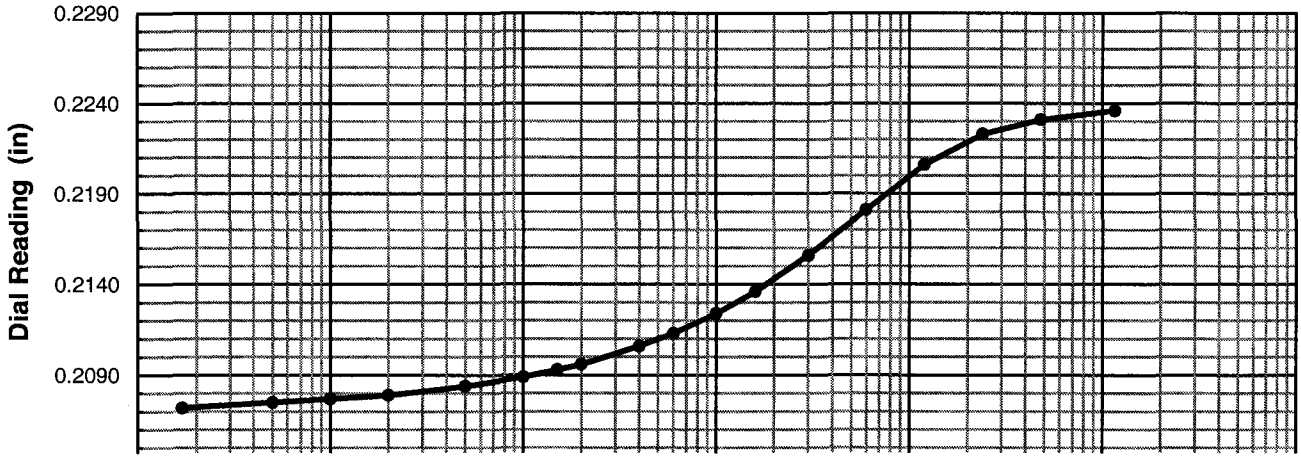
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

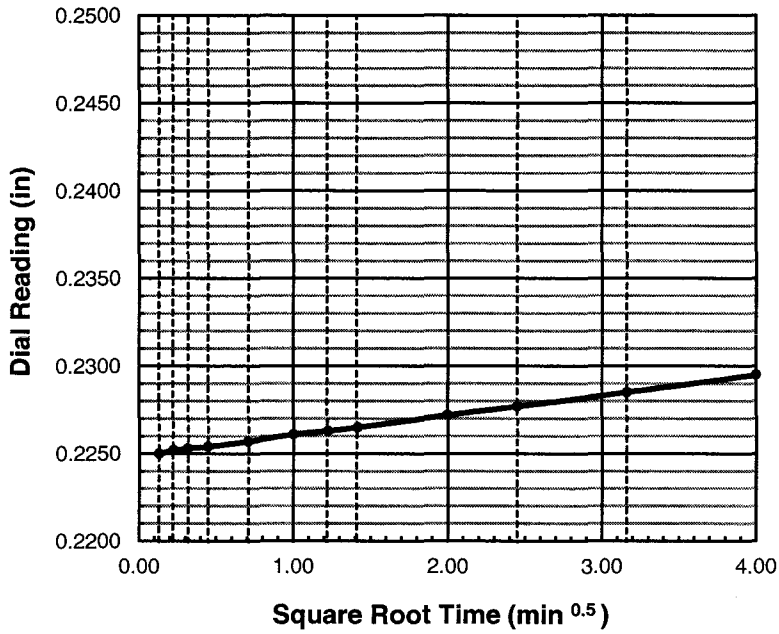
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 10 | Curves by: TJO

Boring No.: R-10-007 | Sample No.: S8 | Depth (ft.) 40.0

Date: 27-Aug-10 | Load (psf): 894 | Zero Reading: 0.3404

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:43:55	0	0.00	0.2238
	0.02	0.13	0.2250
	0.05	0.22	0.2252
	0.10	0.32	0.2253
	0.20	0.45	0.2254
	0.50	0.71	0.2257
	1.00	1.00	0.2261
	1.50	1.22	0.2263
	2.00	1.41	0.2265
	4.0	2.00	0.2272
	6.0	2.45	0.2277
	10.0	3.16	0.2285
	16.0	4.00	0.2295
	30		0.2312
	60		0.2338
	120		0.2371
	240		0.2409
	480		0.2439
	960		0.2455
	1440		0.2462
	2880		0.2469
	4292		0.2472



do = 0.2248

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2472

square root

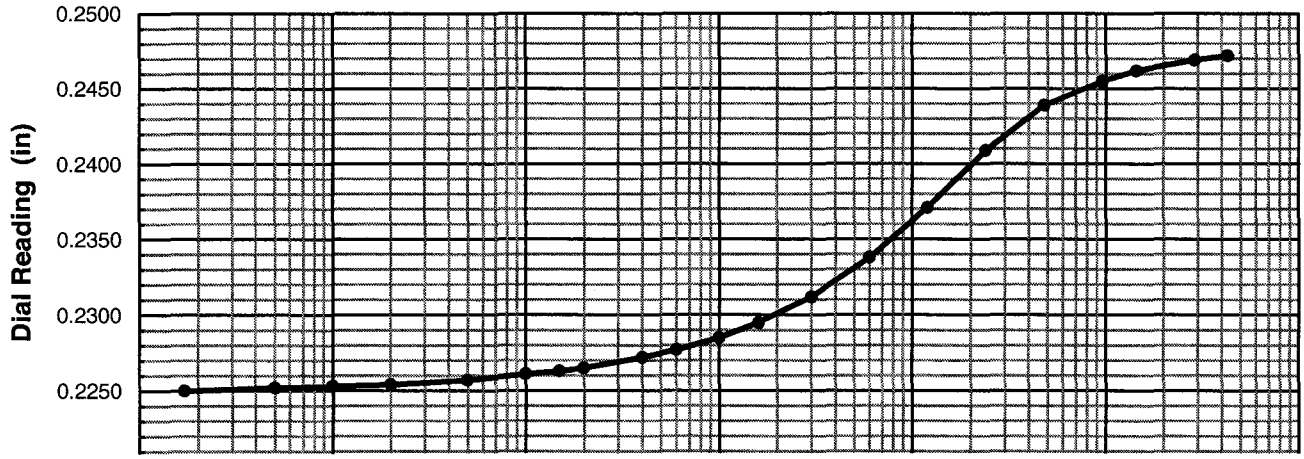
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

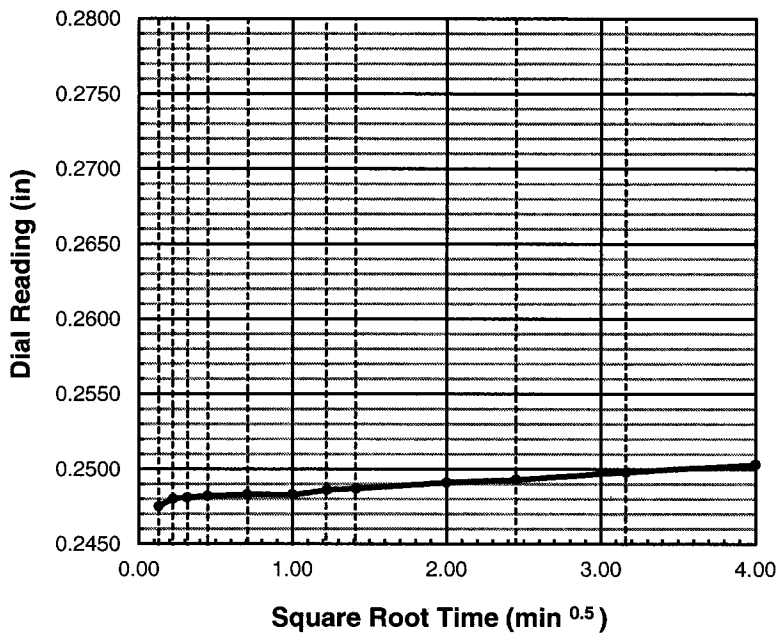
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 11 | Curves by: TJO

Boring No.: R-10-007 | Sample No.: S8 | Depth (ft.) 40.0

Date: 30-Aug-10 | Load (psf): 83 | Zero Reading: 0.3404

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:17:47	0	0.00	0.2472
	0.02	0.13	0.2475
	0.05	0.22	0.2480
	0.10	0.32	0.2481
	0.20	0.45	0.2482
	0.50	0.71	0.2483
	1.00	1.00	0.2483
	1.50	1.22	0.2486
	2.00	1.41	0.2487
	4.0	2.00	0.2491
	6.0	2.45	0.2493
	10.0	3.16	0.2498
	16.0	4.00	0.2503
	30		0.2514
	60		0.2530
	120		0.2556
	240		0.2591
	480		0.2636
	1440		0.2717
	2220		0.2740
	3234		0.2754
	4420		0.2764



do = 0.2472

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2764

square root

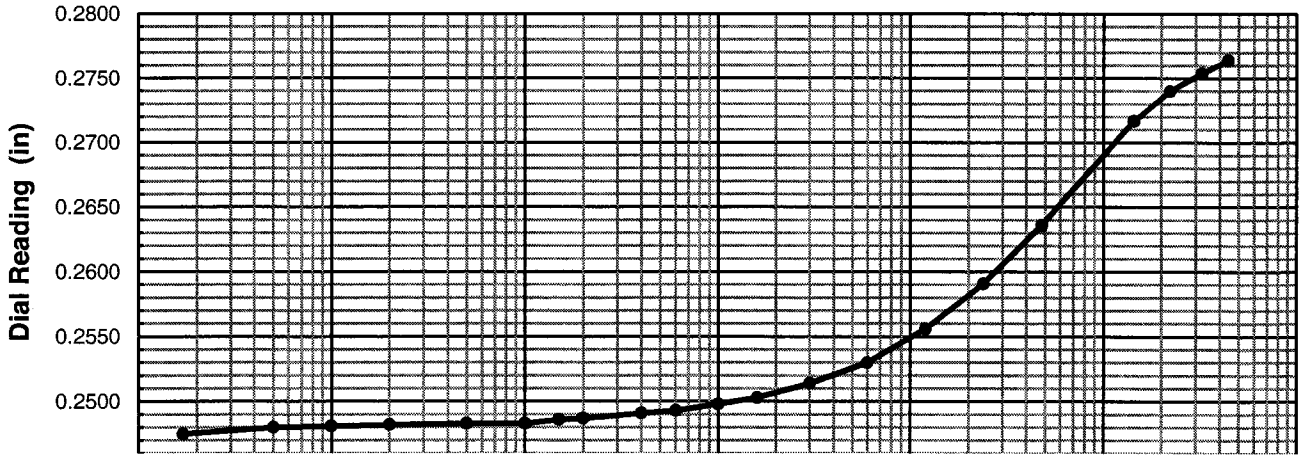
d50 = _____

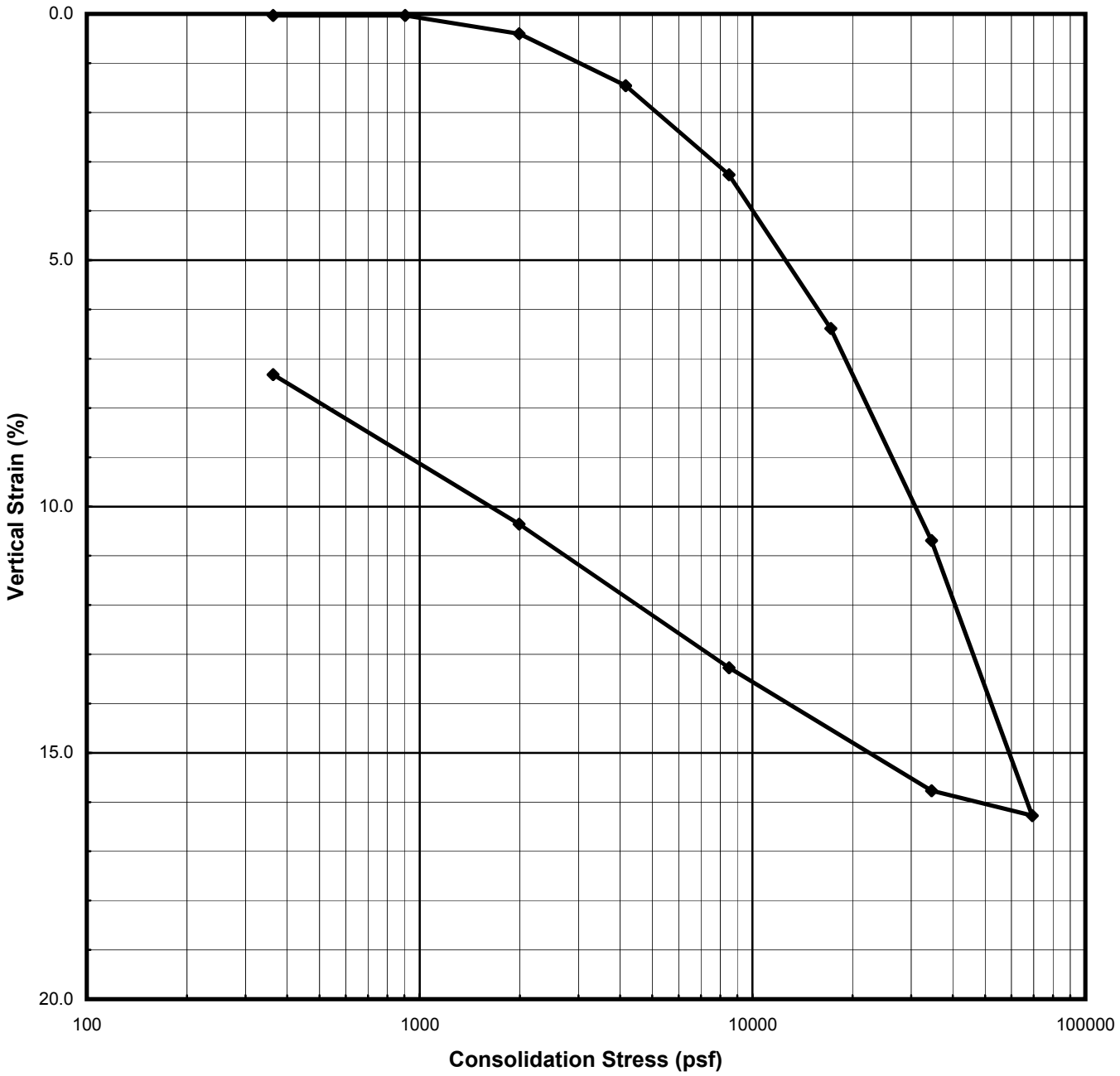
t50 = _____ min

log time

d50 = _____

t50 = _____ min





Description:	**Olive Clay (CH)**							
Boring No.:	R-10-008		Liquid Limit	57	%	Specific Gravity	2.75	assumed
Sample No.:	S3		Plasticity Index	40	%	Strain for Saturation	3.61	%
Depth (ft | m)	15.0	4.57	Fines Content	89.0	%	Water added at	91.0	psf

	Water Content (%)	Total Unit Weight		Dry Unit Weight		Saturation (%)	Void Ratio	Height		Diameter	
		(pcf)	(kN/m^3)	(pcf)	(kN/m^3)			(inches)	(cm)	(inches)	(cm)
Initial	29.6	117.0	18.37	90.3	14.18	90.5	0.90	0.597	1.52	1.930	4.902
Final	28.5	122.8	19.29	95.6	15.02	98.7	0.79	0.563	1.43		

URS

I5 & SR74 IC

Project Number: 30989830
Test Start Date: 8/17/2010

CONSOLIDATION TEST
ASTM D2435

SUBMITTED BY: Thomas J. O'Mear

@BCL@0C0C17E0.xls

One-Dimensional Oedometer Testing
Set-up / Take down Worksheet
ASTM D2435

Project Number: 30989830
Project Name: I5 & SR74 IC
Project Engineer: FM
Apparatus No.: C7

Boring No.: R-10-008
Sample No.: S3
Depth (ft): 15.0

Specimen Description : Olive Clay (CH)
Duration: end of primary

Ring Number: R16
Weight of Wet Spec. and Ring: 439.93 g
Weight of Ring: 386.34 g
Initial Weight of Wet Spec.: 53.59 g

Take Down Weight with Ring: 439.30 g

Excess Oven-dried Cont. No.: rp1
Weight of Cont. and Dry Spec.: 116.27 g
Weight of Container: 116.14 g
Weight of Excess Dried Soil: 0.13 g
Weight of Excess Wet Soil 0.17 g
Final Weight of Wet Specimen: 53.13 g

Height of Specimen (in)

	Initial	Final
1	0.596	0.564
2	0.596	0.569
3	0.597	0.560
4	0.599	0.561
5	0.595	0.563
Ave:	0.597	0.563

Initial Height - Final Height = 0.033 in
Change in Dial (Dd) = 0.046 in
Initial Height - Dd = 0.551 in
Final Height + Dd = 0.610 in
Weight of Top Cap = 242.53 g

Specimen Analysis					Initial Trim	Initial Spec.	Final
				Container Number:	M65	**XXXXX**	s38
				Mass of Container and Wet Specimen M1 (g)	328.01	53.59	176.42
				Mass of Container and Dry Specimen, M2 (g)	281.82	41.36	164.77
				Mass of Container, M3 (g)	117.15	**XXXXX**	123.83
				Water Content, w (%)	28.05	29.58	28.46
				Mass of Wet Specimen, M4 (g)	53.59	53.59	53.13
				Mass of Dry Specimen, M5 (g)	41.36	41.36	41.36
Nominal		Measured	x	Specimen Height, H (in)	0.597	0.597	0.563
Nominal	x	Measured		Specimen Diameter, D (in)	1.930	1.930	1.930
				Area of Specimen, A (in^2)	2.926	2.926	2.926
				Volume of Specimen, V (cc)	28.60	28.60	27.01
Assumed	x	Measured		Specific Gravity, Gs	2.75	2.75	2.75
				Wet Unit Weight, WUW (pcf)	**117.0**	**117.0**	**122.8**
				Dry Unit Weight, DUW (pcf)	**91.3**	**90.3**	**95.6**
				Void Ratio	**0.876**	**0.898**	**0.793**
				Degree of Saturation, S (%)	**88.1**	**90.5**	**98.7**

Set-up by: YS
Date: 8/17/10
Calculated by: TJO
Reviewed by: YS
Strain for Saturation (%) = **3.605**

One-Dimensional Oedometer Testing

Loading Worksheet

ASTM D2435

Project Number: 30989830 Boring No.: R-10-008

Project Name: I5 & SR74 IC Sample No.: S3

Project Engineer: FM Apparatus No.: C7 Depth (ft): 15.0

Initial Dial Reading: 0.3347 inch Initial Specimen Height: 0.597 inch

Stage No.	Normal Stress (psf)	Dial Reading (in)		Compressibility Correction (in)	Vertical Strain (%)	
		End of Duration	End of Increment		End of Duration	End of Increment
Seat	91		0.3347	0.0000		0.00
1	363		0.3343	0.0002		0.03
2	905		0.3337	0.0008		0.03
3	1990		0.3306	0.0017		0.40
4	4161	0.3240	0.3229	0.0031	1.27	1.46
5	8501	0.3126	0.3111	0.0041	3.02	3.27
6	17183	0.2935	0.2908	0.0058	5.93	6.39
7	34545	0.2670	0.2629	0.0080	10.01	10.69
8	69270	0.2315	0.2277	0.0099	15.64	16.28
9	34545		0.2318	0.0088		15.77
10	8501	0.2490	0.2499	0.0056	13.43	13.28
11	1990		0.2691	0.0038		10.36
12	363		0.2886	0.0024		7.32
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						
33						

Final dial reading prior to take down (inch): 0.2886 Take down by: TJO Date: 8/31/10

One-Dimensional Oedometer Testing
ASTM D2435
Table of Incremental Values

Project Number: 30989830
Project Name: I5 & SR74 IC
Project Engineer: FM
Apparatus No.: C7

Boring No.: R-10-008
Sample No.: S3
Depth (ft): 15.0
Inundation at stage: Seat

10 **20** Hanger Ratios

Stage Number	Incremental Weight Applied (kg) Back	Front	Vertical Stress (psf)	Specimen Hieght (in)	Deflections (in) $d_{initial}$	d_o	d_{50}	d_{100}	d_{final}	Porous Stone (in)	t_{50} (min)	cv (in^2/min)	cv (ft^2/day)
Top Cap			26	0.597	0.3347	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
Seat	0.06		91	0.597	0.3347	XXXXX	XXXXX	XXXXX	0.3347	0.0000	XXXXX	XXXXX	XXXXX
1	0.25		363	0.596	0.3347	0.3340	XXXXX	XXXXX	0.3343	0.0002	XXXXX	XXXXX	XXXXX
2	0.50		905	0.597	0.3343	0.3334	XXXXX	XXXXX	0.3337	0.0008	XXXXX	XXXXX	XXXXX
3	1.00		1990	0.595	0.3337	0.3324	XXXXX	XXXXX	0.3306	0.0017	XXXXX	XXXXX	XXXXX
4		1.0	4161	0.591	0.3306	0.3282	0.3261	0.3240	0.3229	0.0031	0.50	0.034	0.344
5	4.0		8501	0.583	0.3229	0.3194	0.3160	0.3126	0.3111	0.0041	0.75	0.022	0.223
6		4.0	17183	0.568	0.3111	0.3067	0.3001	0.2935	0.2908	0.0058	4.00	0.004	0.040
7		8.0	34545	0.549	0.2908	0.2862	0.2766	0.2670	0.2629	0.0080	4.00	0.004	0.037
8		16.0	69270	0.523	0.2629	0.2596	0.2456	0.2315	0.2277	0.0099	9.00	0.001	0.015
9		-16.0	34545	0.536	0.2277	0.2295	XXXXX	XXXXX	0.2318	0.0088	XXXXX	XXXXX	XXXXX
10		-12.0	8501	0.560	0.2318	0.2369	0.2430	0.2490	0.2499	0.0056	13.00	0.001	0.012
11	-4.0	-1.0	1990	0.583	0.2499	0.2520	XXXXX	XXXXX	0.2691	0.0038	XXXXX	XXXXX	XXXXX
12	-1.5		363	0.605	0.2691	0.2700	XXXXX	XXXXX	0.2886	0.0024	XXXXX	XXXXX	XXXXX
13			363	XXXXX	0.2886	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
14			363	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
15			363	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
16			363	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
17			363	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
18			363	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
19			363	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
20			363	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
21			363	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
22			363	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
23			363	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
24			363	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
25			363	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX

One-Dimensional Oedometer Testing Increment

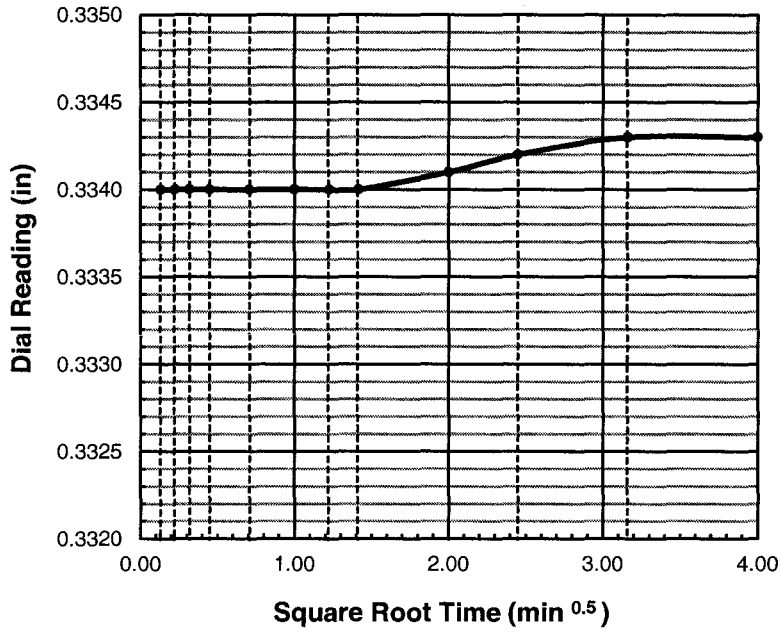
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C7 | Stage Number: 1 | Curves by: TJO

Boring No.: R-10-008 | Sample No.: S3 | Depth (ft.) 15.0

Date: 17-Aug-10 | Load (psf): 363 | Zero Reading: 0.3347

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
17:52:58	0	0.00	0.3347
	0.02	0.13	0.3340
	0.05	0.22	0.3340
	0.10	0.32	0.3340
	0.20	0.45	0.3340
	0.50	0.71	0.3340
	1.00	1.00	0.3340
	1.50	1.22	0.3340
	2.00	1.41	0.3340
	4.0	2.00	0.3341
	6.0	2.45	0.3342
	10.0	3.16	0.3343
	16.0	4.00	0.3343



do = 0.3340

d90 = _____ t90 = _____ min

d100 = _____

df = _____

square root

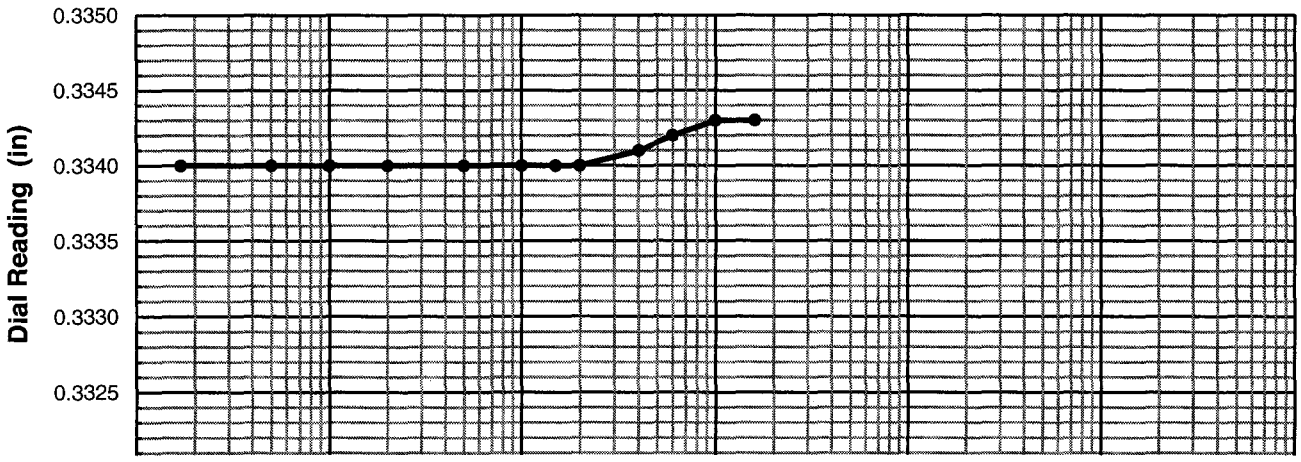
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

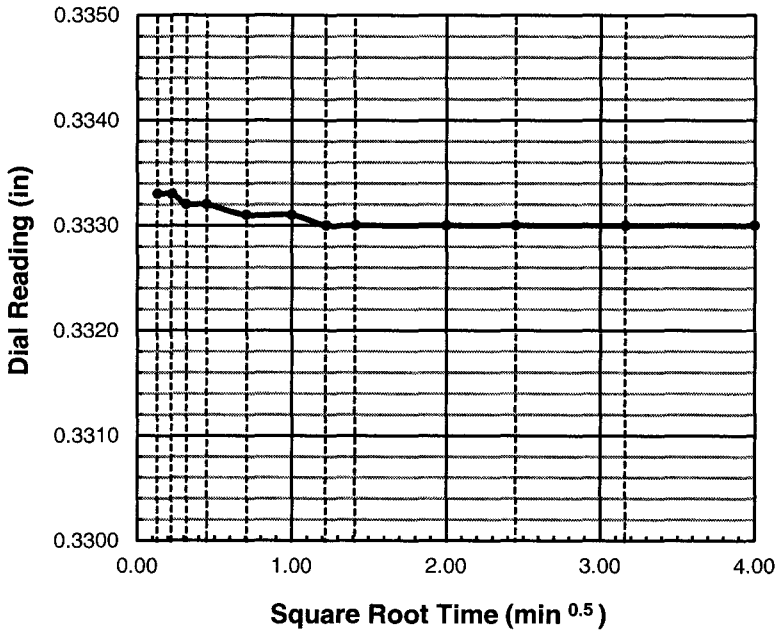
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C7 | Stage Number: 2 | Curves by: TJO

Boring No.: R-10-008 | Sample No.: S3 | Depth (ft.) 15.0

Date: 17-Aug-10 | Load (psf): 905 | Zero Reading: 0.3347

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
18:01:09	0	0.00	0.3343
	0.02	0.13	0.3333
	0.05	0.22	0.3333
	0.10	0.32	0.3332
	0.20	0.45	0.3332
	0.50	0.71	0.3331
	1.00	1.00	0.3331
	1.50	1.22	0.3330
	2.00	1.41	0.3330
	4.0	2.00	0.3330
	6.0	2.45	0.3330
	10.0	3.16	0.3330
	16.0	4.00	0.3330
	30		0.3329
	60		0.3331
	120		0.3334
	240		0.3335
	480		0.3336
	896		0.3337



do = 0.3334

d90 = _____ t90 = _____ min

d100 = _____

df = 0.3337

square root

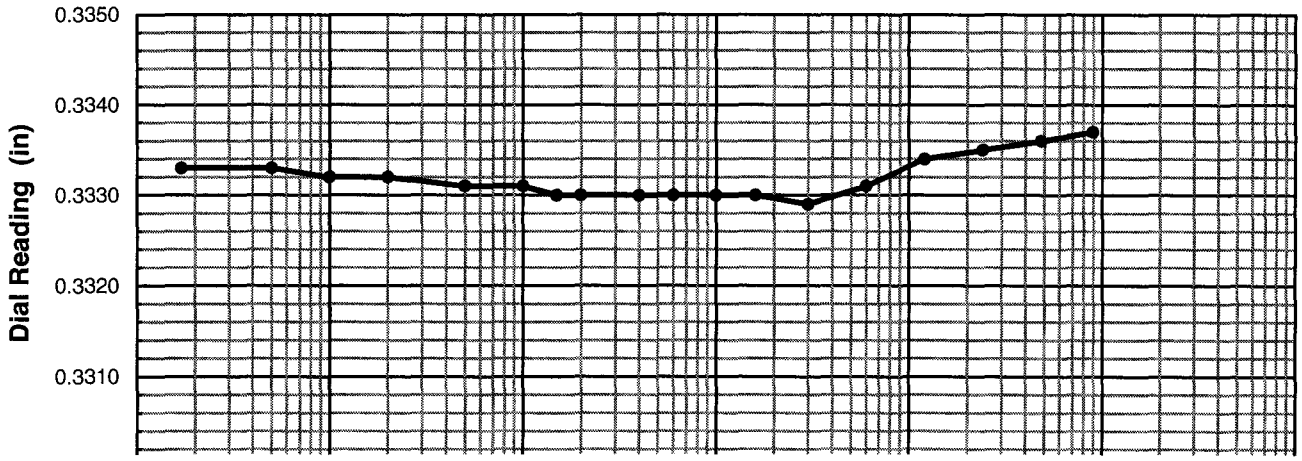
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

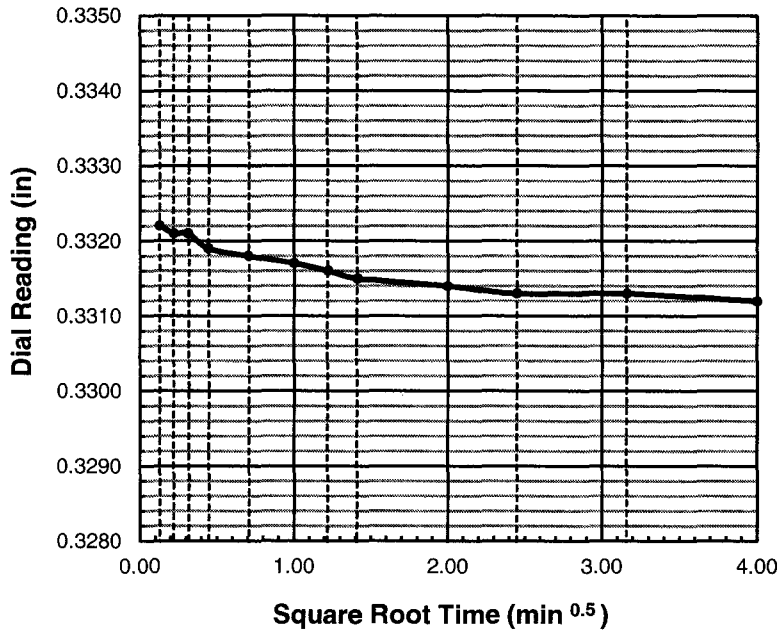
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C7 | Stage Number: 3 | Curves by: TJO

Boring No.: R-10-008 | Sample No.: S3 | Depth (ft.) 15.0

Date: 18-Aug-10 | Load (psf): 1990 | Zero Reading: 0.3347

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:58:21	0	0.00	0.3337
	0.02	0.13	0.3322
	0.05	0.22	0.3321
	0.10	0.32	0.3321
	0.20	0.45	0.3319
	0.50	0.71	0.3318
	1.00	1.00	0.3317
	1.50	1.22	0.3316
	2.00	1.41	0.3315
	4.0	2.00	0.3314
	6.0	2.45	0.3313
	10.0	3.16	0.3313
	16.0	4.00	0.3312
	30		0.3311
	60		0.3310
	120		0.3309
	240		0.3309
	480		0.3307
	960		0.3306
	1432		0.3306



do = 0.3324

d90 = _____ t90 = _____ min

d100 = _____

df = 0.3306

square root

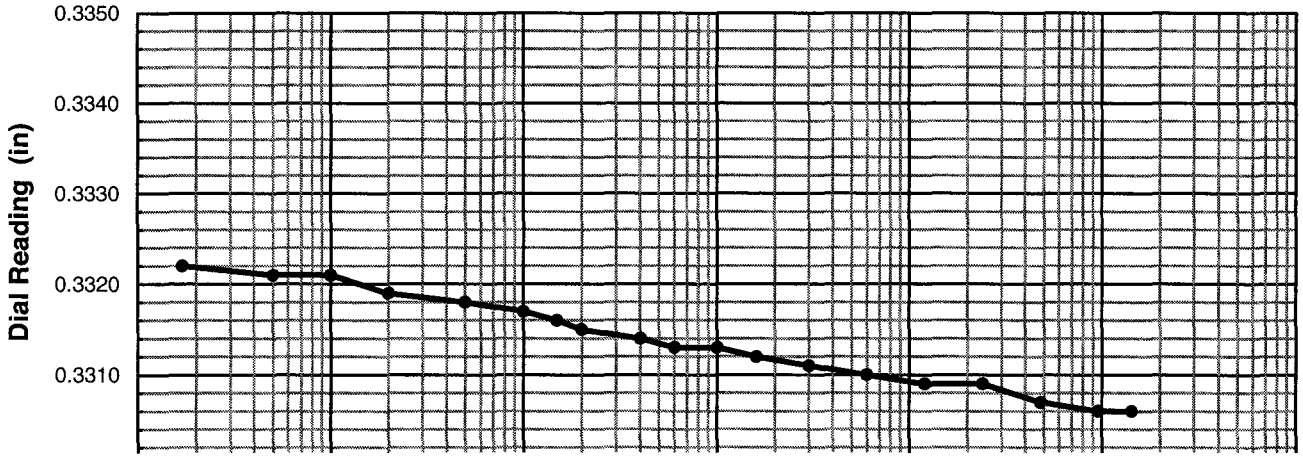
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

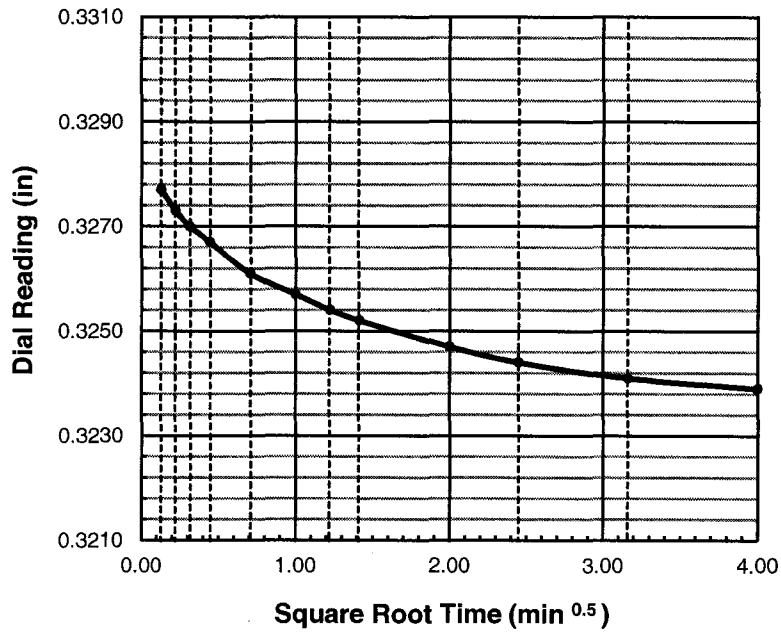
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C7 | Stage Number: 4 | Curves by: TJO

Boring No.: R-10-008 | Sample No.: S3 | Depth (ft.) 15.0

Date: 19-Aug-10 | Load (psf): 4161 | Zero Reading: 0.3347

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:51:16	0	0.00	0.3306
	0.02	0.13	0.3277
	0.05	0.22	0.3273
	0.10	0.32	0.3270
	0.20	0.45	0.3267
	0.50	0.71	0.3261
	1.00	1.00	0.3257
	1.50	1.22	0.3254
	2.00	1.41	0.3252
	4.0	2.00	0.3247
	6.0	2.45	0.3244
	10.0	3.16	0.3241
	16.0	4.00	0.3239
	30		0.3237
	60		0.3235
	120		0.3233
	240		0.3231
	509		0.3229



do = 0.3282

d90 = _____ t90 = _____ min

d100 = 0.3240

df = 0.3229

square root

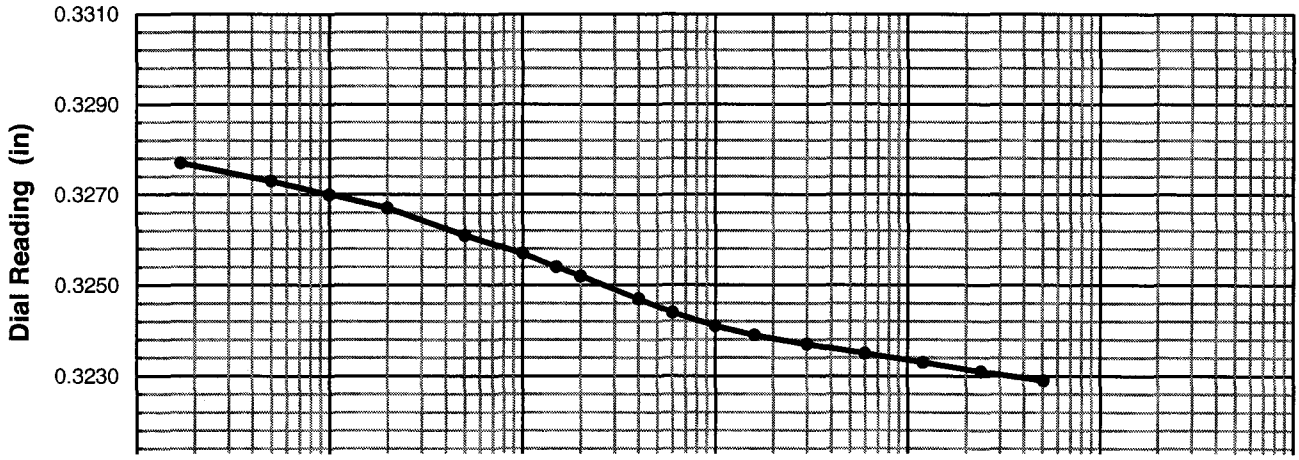
d50 = _____

t50 = _____ min

log time

d50 = 0.3261

t50 = _____ min



One-Dimensional Oedometer Testing Increment

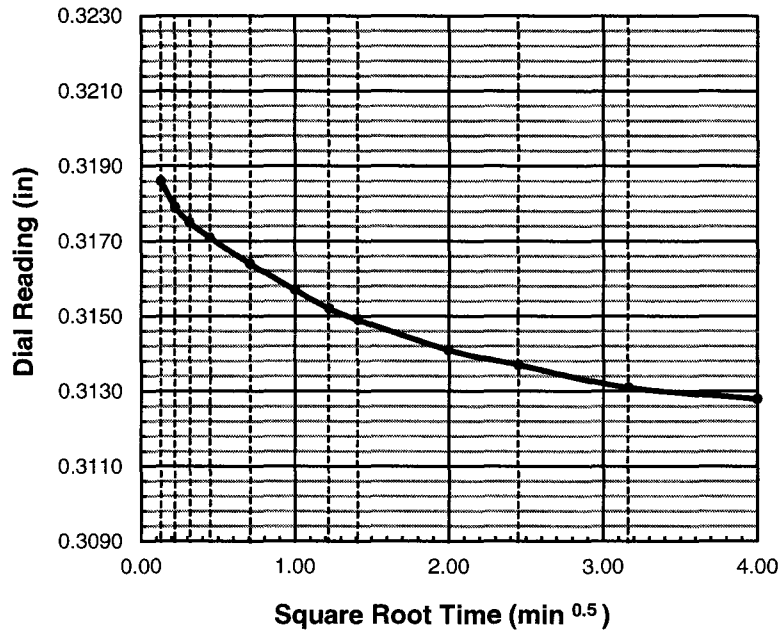
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C7 | Stage Number: 5 | Curves by: TJO

Boring No.: R-10-008 | Sample No.: S3 | Depth (ft.) 15.0

Date: 19-Aug-10 | Load (psf): 8501 | Zero Reading: 0.3347

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
17:20:55	0	0.00	0.3229
	0.02	0.13	0.3186
	0.05	0.22	0.3179
	0.10	0.32	0.3175
	0.20	0.45	0.3171
	0.50	0.71	0.3164
	1.00	1.00	0.3157
	1.50	1.22	0.3152
	2.00	1.41	0.3149
	4.0	2.00	0.3141
	6.0	2.45	0.3137
	10.0	3.16	0.3131
	16.0	4.00	0.3128
	30		0.3124
	60		0.3121
	120		0.3118
	240		0.3116
	480		0.3114
	966		0.3111



do = 0.3194

d90 = _____ t90 = _____ min

d100 = 0.3126

df = 0.3111

square root

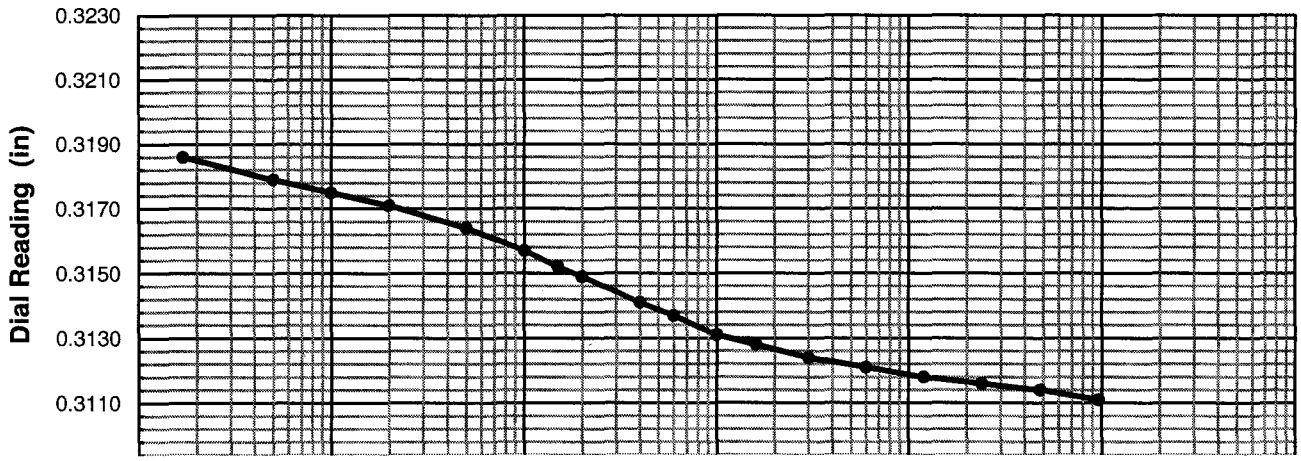
d50 = _____

t50 = _____ min

log time

d50 = 0.3160

t50 = _____ min



One-Dimensional Oedometer Testing Increment

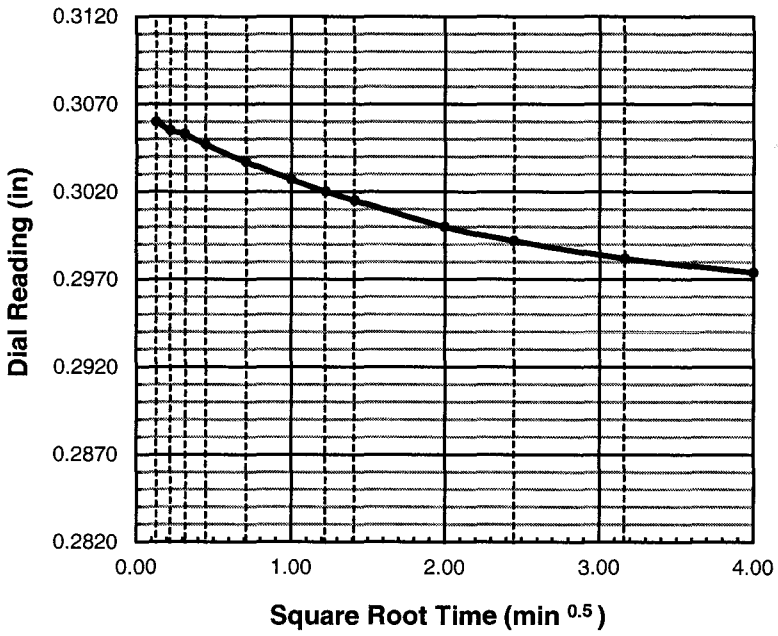
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C7 | Stage Number: 6 | Curves by: TJO

Boring No.: R-10-008 | Sample No.: S3 | Depth (ft.) 15.0

Date: 20-Aug-10 | Load (psf): 17183 | Zero Reading: 0.3347

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:27:11	0	0.00	0.3111
	0.02	0.13	0.3060
	0.05	0.22	0.3055
	0.10	0.32	0.3053
	0.20	0.45	0.3047
	0.50	0.71	0.3037
	1.00	1.00	0.3027
	1.50	1.22	0.3020
	2.00	1.41	0.3015
	4.0	2.00	0.3000
	6.0	2.45	0.2992
	10.0	3.16	0.2982
	16.0	4.00	0.2974
	30		0.2947
	60		0.2936
	120		0.2930
	240		0.2925
	480		0.2920
	960		0.2916
	1440		0.2914
	2880		0.2911
	4356		0.2908



do = 0.3067

d90 = _____ t90 = _____ min

d100 = 0.2935

df = 0.2908

square root

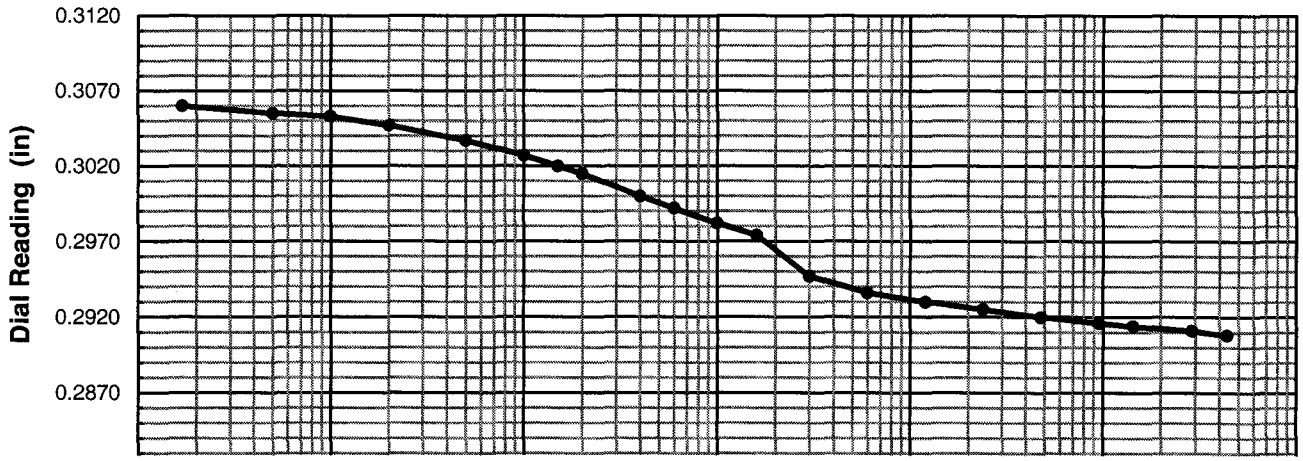
d50 = _____

t50 = _____ min

log time

d50 = 0.3001

t50 = _____ min



One-Dimensional Oedometer Testing Increment

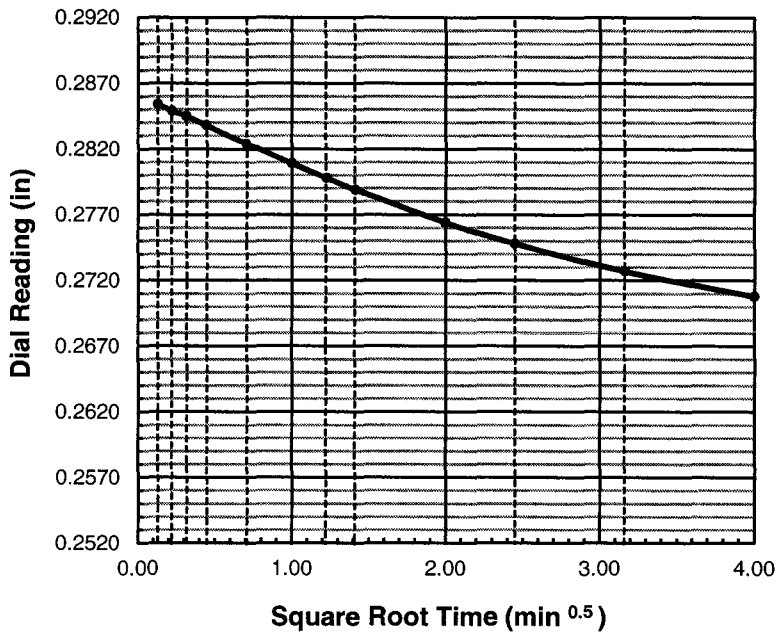
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C7 | Stage Number: 7 | Curves by: TJO

Boring No.: R-10-008 | Sample No.: S3 | Depth (ft.) 15.0

Date: 23-Aug-10 | Load (psf): 34545 | Zero Reading: 0.3347

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:04:16	0	0.00	0.2908
	0.02	0.13	0.2854
	0.05	0.22	0.2849
	0.10	0.32	0.2845
	0.20	0.45	0.2838
	0.50	0.71	0.2824
	1.00	1.00	0.2809
	1.50	1.22	0.2798
	2.00	1.41	0.2789
	4.0	2.00	0.2764
	6.0	2.45	0.2748
	10.0	3.16	0.2727
	16.0	4.00	0.2708
	30		0.2688
	60		0.2671
	120		0.2658
	240		0.2648
	480		0.2639
	960		0.2632
	1383		0.2629



do = 0.2862

d90 = _____ t90 = _____ min

d100 = 0.2670

df = 0.2629

square root

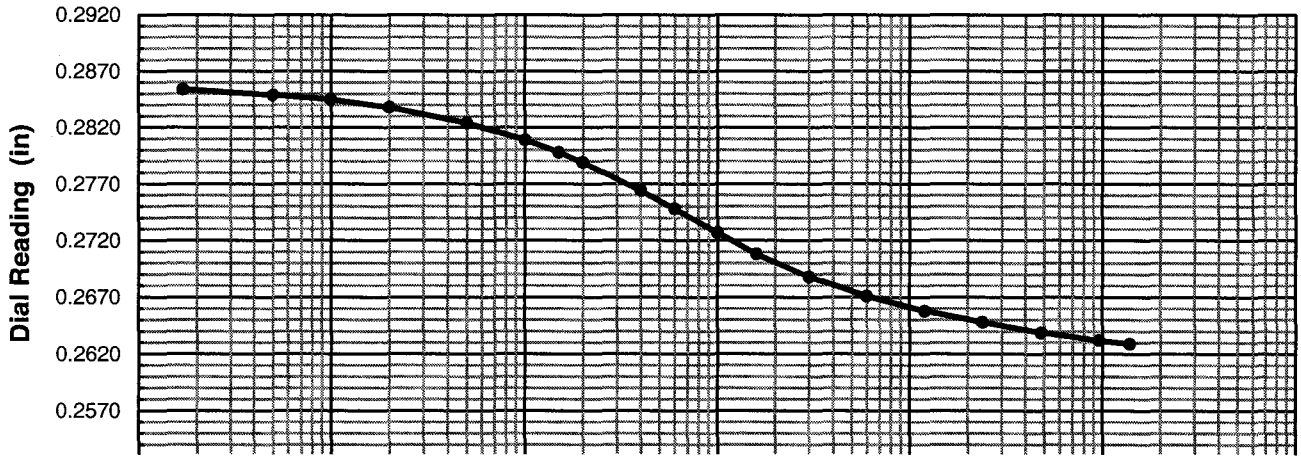
d50 = _____

t50 = _____ min

log time

d50 = 0.2766

t50 = _____ min



One-Dimensional Oedometer Testing Increment

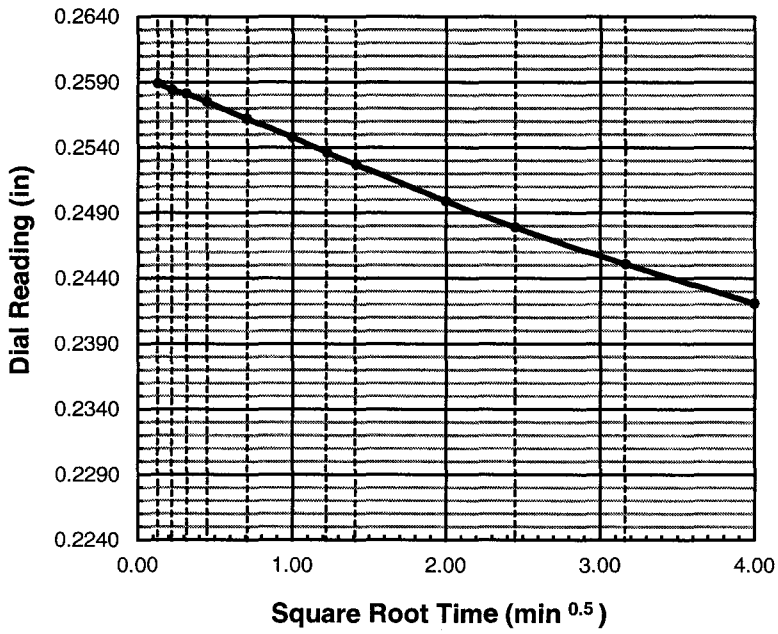
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C7 | Stage Number: 8 | Curves by: TJO

Boring No.: R-10-008 | Sample No.: S3 | Depth (ft.) 15.0

Date: 24-Aug-10 | Load (psf): 69270 | Zero Reading: 0.3347

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:07:52	0	0.00	0.2629
	0.02	0.13	0.2589
	0.05	0.22	0.2584
	0.10	0.32	0.2581
	0.20	0.45	0.2575
	0.50	0.71	0.2562
	1.00	1.00	0.2548
	1.50	1.22	0.2536
	2.00	1.41	0.2527
	4.0	2.00	0.2499
	6.0	2.45	0.2479
	10.0	3.16	0.2451
	16.0	4.00	0.2421
	30		0.2382
	60		0.2347
	120		0.2322
	240		0.2304
	480		0.2292
	960		0.2282
	1461		0.2277



do = 0.2596

d90 = _____ t90 = _____ min

d100 = 0.2315

df = 0.2277

square root

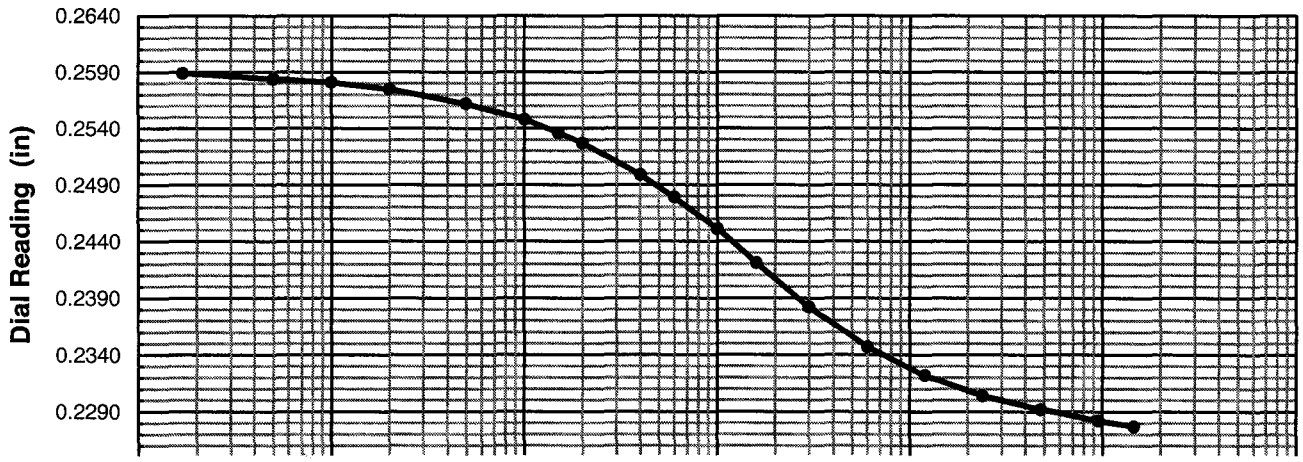
d50 = _____

t50 = _____ min

log time

d50 = 0.2456

t50 = _____ min



One-Dimensional Oedometer Testing Increment

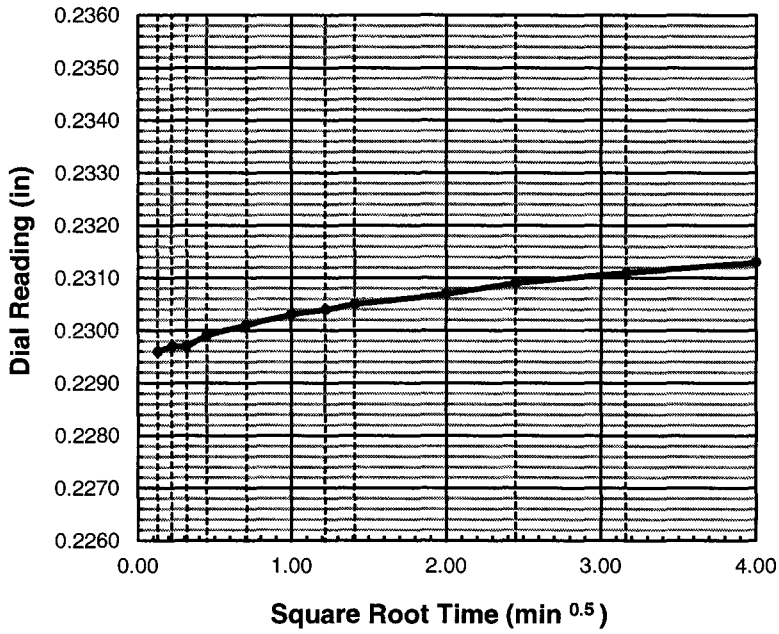
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C7 | Stage Number: 9 | Curves by: TJO

Boring No.: R-10-008 | Sample No.: S3 | Depth (ft.) 15.0

Date: 25-Aug-10 | Load (psf): 34545 | Zero Reading: 0.3347

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:29:49	0	0.00	0.2275
	0.02	0.13	0.2296
	0.05	0.22	0.2297
	0.10	0.32	0.2297
	0.20	0.45	0.2299
	0.50	0.71	0.2301
	1.00	1.00	0.2303
	1.50	1.22	0.2304
	2.00	1.41	0.2305
	4.0	2.00	0.2307
	6.0	2.45	0.2309
	10.0	3.16	0.2311
	16.0	4.00	0.2313
	30		0.2315
	60		0.2316
	120		0.2317
	312		0.2318



do = 0.2295

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2318

square root

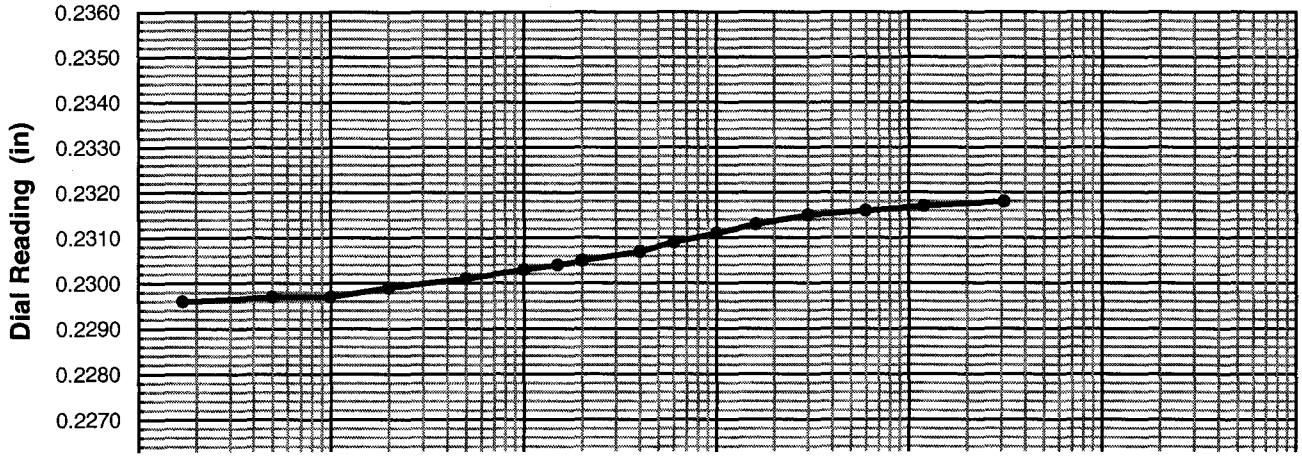
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

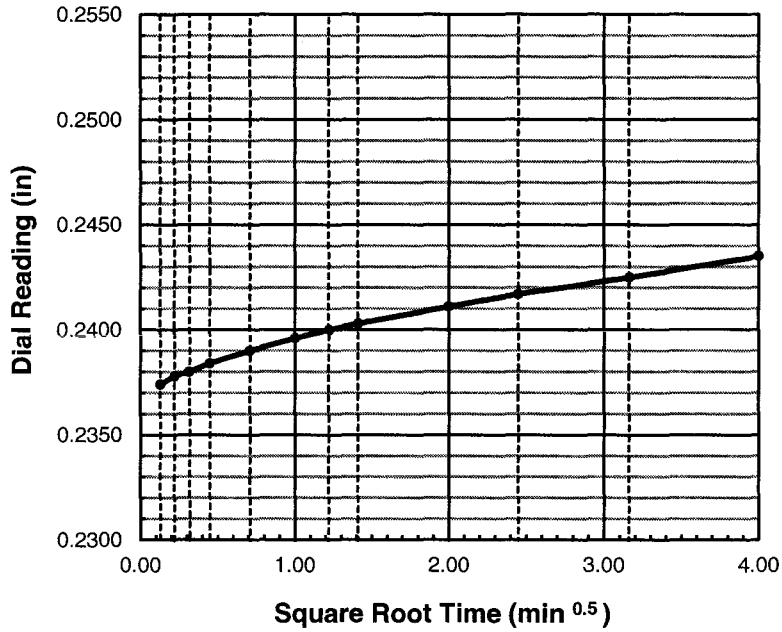
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C7 | Stage Number: 10 | Curves by: TJO

Boring No.: R-10-008 | Sample No.: S3 | Depth (ft.) 15.0

Date: 25-Aug-10 | Load (psf): 8501 | Zero Reading: 0.3347

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
14:41:55	0	0.00	0.2318
	0.02	0.13	0.2374
	0.05	0.22	0.2378
	0.10	0.32	0.2380
	0.20	0.45	0.2384
	0.50	0.71	0.2390
	1.00	1.00	0.2396
	1.50	1.22	0.2400
	2.00	1.41	0.2403
	4.0	2.00	0.2411
	6.0	2.45	0.2417
	10.0	3.16	0.2425
	16.0	4.00	0.2435
	30		0.2450
	60		0.2467
	120		0.2482
	240		0.2492
	480		0.2496
	1102		0.2499



do = 0.2369

d90 = _____ t90 = _____ min

d100 = 0.2490

df = 0.2499

square root

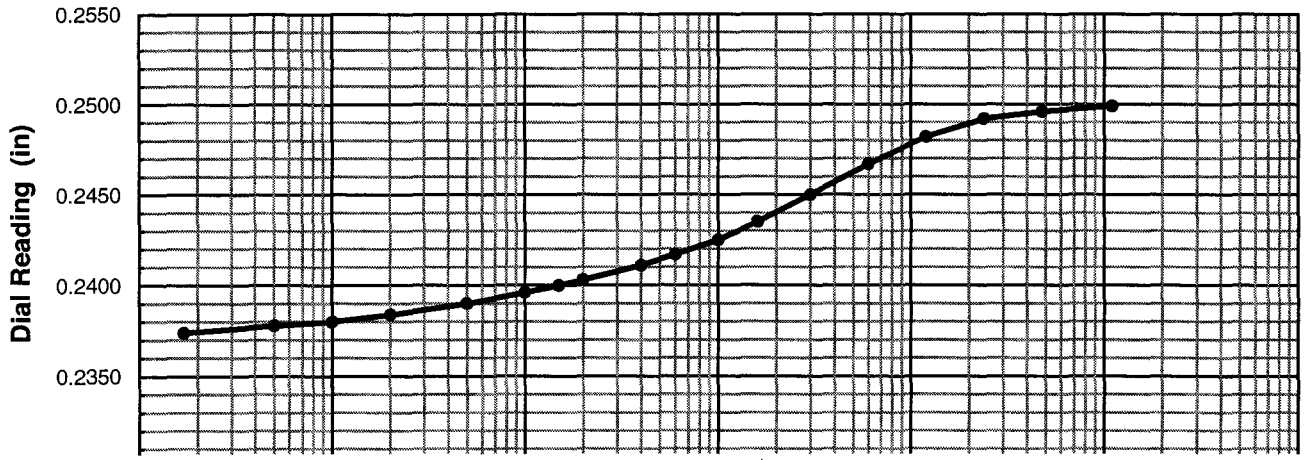
d50 = _____

t50 = _____ min

log time

d50 = 0.2430

t50 = 13.0 min



One-Dimensional Oedometer Testing Increment

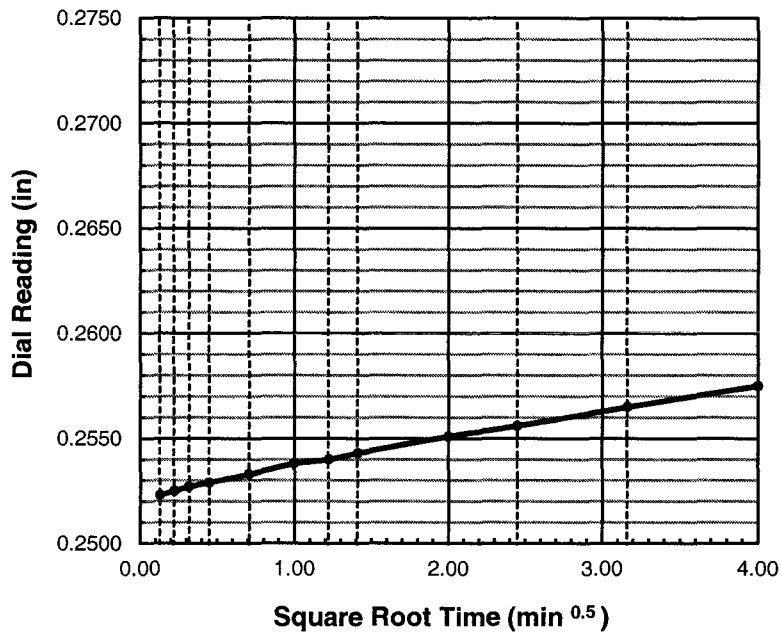
for ASTM D2435, method B

Project Number: 30989830 Apparatus No.: C7 Stage Number: 11 Curves by: TJO

Boring No.: R-10-008 Sample No.: S3 Depth (ft.) 15.0

Date: 26-Aug-10 Load (psf): 1990 Zero Reading: 0.3347

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:04:32	0	0.00	0.2500
	0.02	0.13	0.2523
	0.05	0.22	0.2525
	0.10	0.32	0.2527
	0.20	0.45	0.2529
	0.50	0.71	0.2533
	1.00	1.00	0.2538
	1.50	1.22	0.2540
	2.00	1.41	0.2543
	4.0	2.00	0.2551
	6.0	2.45	0.2556
	10.0	3.16	0.2565
	16.0	4.00	0.2575
	30		0.2592
	60		0.2617
	120		0.2642
	240		0.2666
	480		0.2680
	960		0.2687
	1521		0.2691



do = 0.2520

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2691

square root

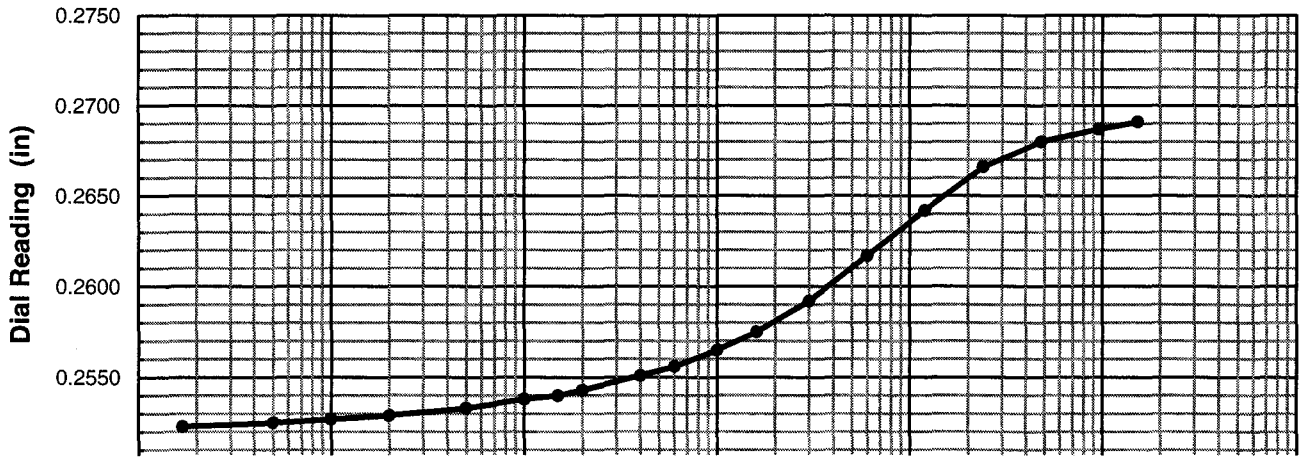
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

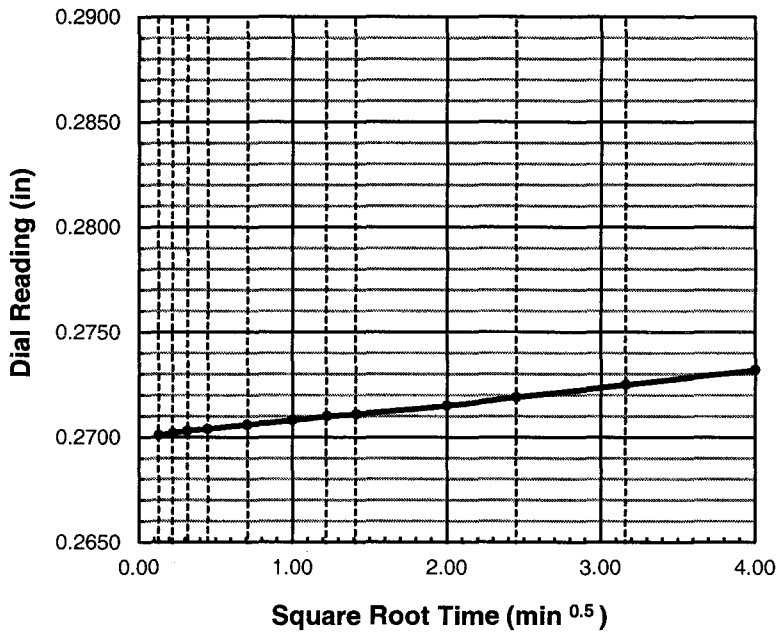
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C7 | Stage Number: 12 | Curves by: TJO

Boring No.: R-10-008 | Sample No.: S3 | Depth (ft.) 15.0

Date: 27-Aug-10 | Load (psf): 363 | Zero Reading: 0.3347

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:25:57	0	0.00	0.2691
	0.02	0.13	0.2701
	0.05	0.22	0.2702
	0.10	0.32	0.2703
	0.20	0.45	0.2704
	0.50	0.71	0.2706
	1.00	1.00	0.2708
	1.50	1.22	0.2710
	2.00	1.41	0.2711
	4.0	2.00	0.2715
	6.0	2.45	0.2719
	10.0	3.16	0.2725
	16.0	4.00	0.2732
	30		0.2745
	60		0.2766
	120		0.2794
	240		0.2824
	480		0.2848
	1440		0.2870
	2880		0.2878
	4320		0.2882
	6134		0.2886



do = 0.2700

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2886

square root

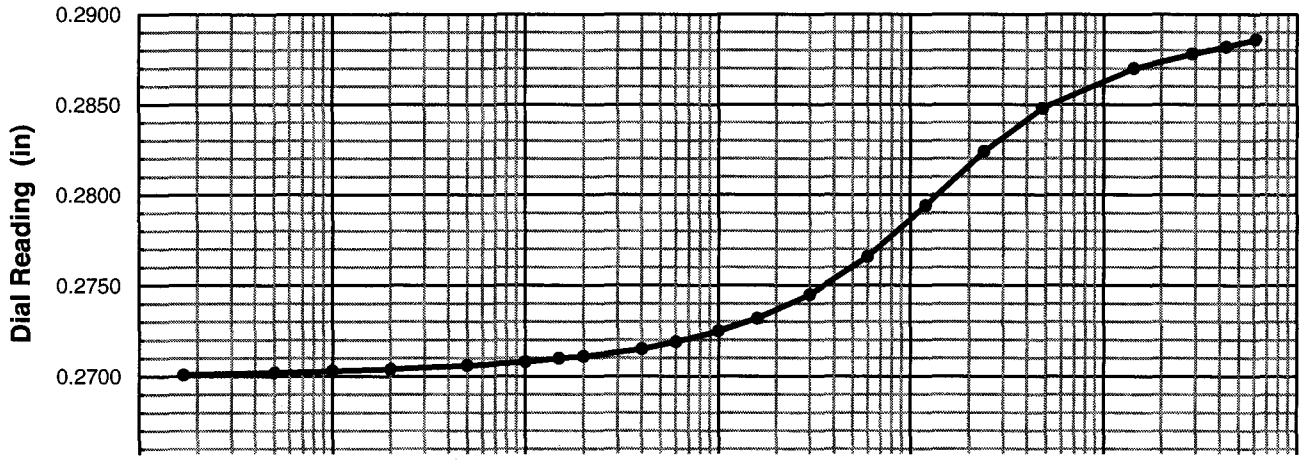
d50 = _____

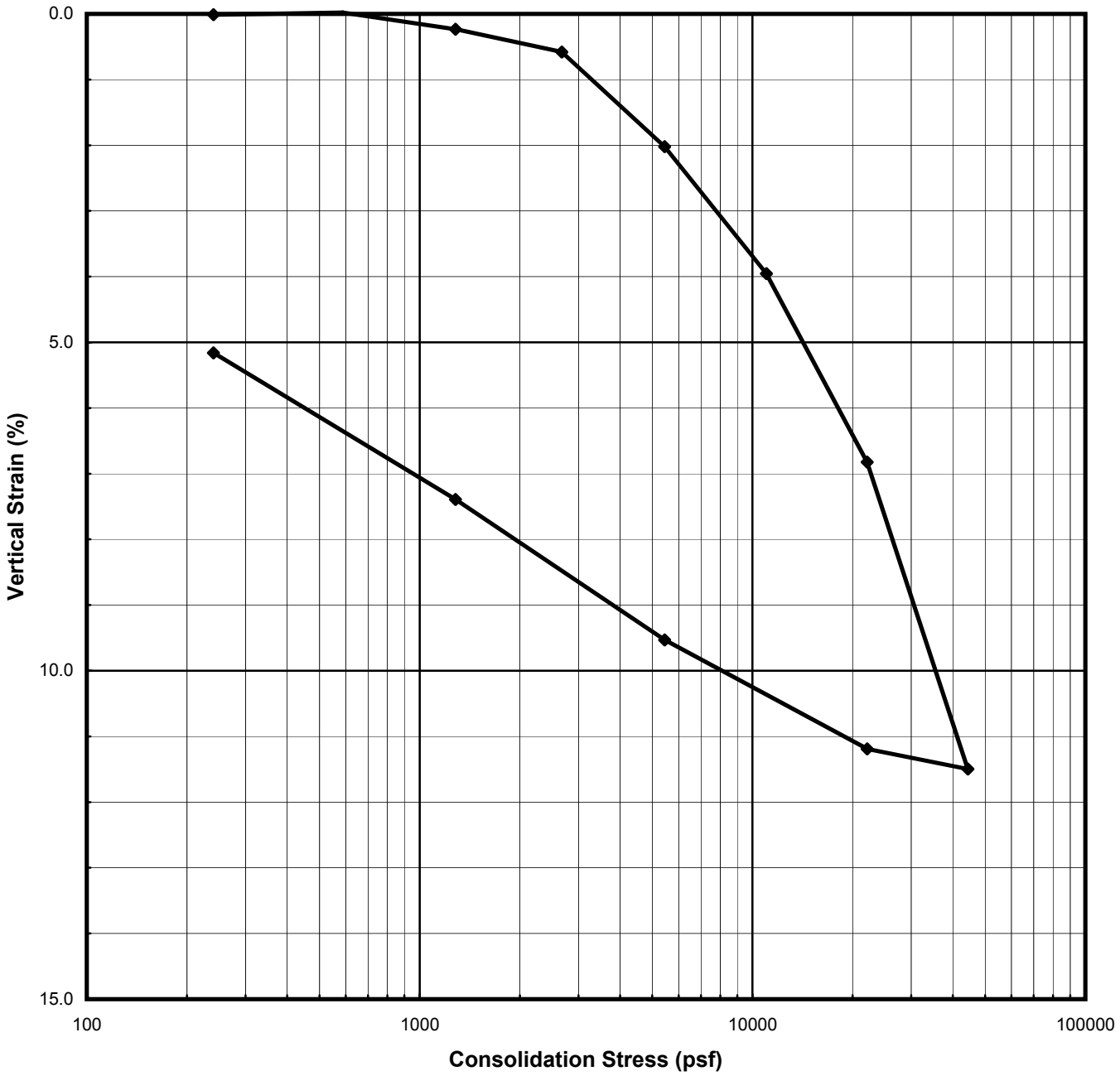
t50 = _____ min

log time

d50 = _____

t50 = _____ min





Description:	**Dark olive gray sandy Clay (CH)**							
Boring No.:	R-10-008		Liquid Limit	NA		Specific Gravity	2.75	assumed
Sample No.:	S5		Plasticity Index	NA		Strain for Saturation	2.51	%
Depth (ft | m)	25.0	7.62	Fines Content	63.7	%	Water added at	67.0	psf

	Water Content (%)	Total Unit Weight (pcf)	Total Unit Weight (kN/m^3)	Dry Unit Weight (pcf)	Dry Unit Weight (kN/m^3)	Saturation (%)	Void Ratio	Height (inches)	Height (cm)	Diameter (inches)	Diameter (cm)
Initial	29.3	118.5	18.62	91.6	14.39	92.7	0.87	0.945	2.40	2.412	6.126
Final	28.3	123.6	19.41	96.4	15.14	99.8	0.78	0.893	2.27		

URS

I5&SR74 IC

Project Number: 30989830
Test Start Date: 8/17/2010

CONSOLIDATION TEST
ASTM D2435

SUBMITTED BY: Thomas J. O'Mear

@BCL@0C0C38C3.xls

One-Dimensional Oedometer Testing
Set-up / Take down Worksheet
ASTM D2435

Project Number: 30989830
Project Name: I5&SR74 IC
Project Engineer: FM

Boring No.: R-10-008
Sample No.: S5
Depth (ft): 25.0

Apparatus No.: C6

Specimen Description : Dark olive gray sandy Clay (CH)
Duration: end of primary

Ring Number: R25
Weight of Wet Spec. and Ring: 353.10 g
Weight of Ring: 218.72 g
Initial Weight of Wet Spec.: 134.38 g

Take Down Weight with Ring: 351.84 g

Excess Oven-dried Cont. No.: rp10
Weight of Cont. and Dry Spec.: 116.16 g
Weight of Container: 116.06 g
Weight of Excess Dried Soil: 0.10 g
Weight of Excess Wet Soil 0.13 g
Final Weight of Wet Specimen: 133.25 g

Height of Specimen (in)

	Initial	Final
1	0.945	0.893
2	0.946	0.892
3	0.945	0.894
4	0.941	0.891
5	0.950	0.895
Ave:	0.945	0.893

Initial Height - Final Height = 0.052 in
Change in Dial (Dd) = 0.055 in
Initial Height - Dd = 0.891 in
Final Height + Dd = 0.948 in
Weight of Top Cap = 357.15 g

Specimen Analysis					Initial Trim	Initial Spec.	Final
				Container Number:	N34	**XXXXX**	s39
				Mass of Container and Wet Specimen M1 (g)	302.37	134.38	245.82
				Mass of Container and Dry Specimen, M2 (g)	266.94	103.89	216.66
				Mass of Container, M3 (g)	113.66	**XXXXX**	113.47
				Water Content, w (%)	23.11	29.35	28.26
				Mass of Wet Specimen, M4 (g)	134.38	134.38	133.25
				Mass of Dry Specimen, M5 (g)	103.89	103.89	103.89
Nominal		Measured	x	Specimen Height, H (in)	0.945	0.945	0.893
Nominal	x	Measured		Specimen Diameter, D (in)	2.412	2.412	2.420
				Area of Specimen, A (in^2)	4.569	4.600	4.600
				Volume of Specimen, V (cc)	70.79	70.79	67.31
Assumed	x	Measured		Specific Gravity, Gs	2.75	2.75	2.75
				Wet Unit Weight, WUW (pcf)	**118.5**	**118.5**	**123.6**
				Dry Unit Weight, DUW (pcf)	**96.3**	**91.6**	**96.4**
				Void Ratio	**0.780**	**0.870**	**0.778**
				Degree of Saturation, S (%)	**81.5**	**92.7**	**99.8**

Set-up by: YS
Date: 8/17/10
Calculated by: TJO
Reviewed by: YS
Strain for Saturation (%) = **2.506**

One-Dimensional Oedometer Testing

Loading Worksheet

ASTM D2435

Project Number: 30989830 Boring No.: R-10-008

Project Name: I5&SR74 IC Sample No.: S5

Project Engineer: FM Apparatus No.: C6 Depth (ft): 25.0

Initial Dial Reading: 0.3256 inch Initial Specimen Height: 0.945 inch

Stage No.	Normal Stress (psf)	Dial Reading (in)		Compressibility Correction (in)	Vertical Strain (%)	
		End of Duration	End of Increment		End of Duration	End of Increment
Seat	67		0.3256	0.0000		0.00
1	240	0.3255	0.3277	0.0000	0.01	-0.22
2	588	0.3258	0.3260	0.0000	-0.02	-0.04
3	1282	0.3223	0.3219	0.0011	0.23	0.28
4	2672	0.3140	0.3125	0.0061	0.58	0.74
5	5451	0.2985	0.2962	0.0080	2.02	2.26
6	11009	0.2780	0.2734	0.0102	3.96	4.44
7	22126	0.2480	0.2427	0.0131	6.82	7.38
8	44359	0.2090	0.2006	0.0163	10.61	11.50
9	22126		0.2055	0.0143		11.19
10	5451		0.2249	0.0106		9.53
11	1282		0.2476	0.0081		7.39
12	240		0.2708	0.0060		5.16
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						
33						

Final dial reading prior to take down (inch): 0.2708 Take down by: TJO Date: 8/31/10

One-Dimensional Oedometer Testing
ASTM D2435
Table of Incremental Values

Project Number: 30989830
Project Name: I5&SR74 IC
Project Engineer: FM
Apparatus No.: C6

Boring No.: R-10-008
Sample No.: S5
Depth (ft): 25.0
Inundation at stage: Seat

10 **20** Hanger Ratios

Stage Number	Incremental Weight Applied (kg) Back	Front	Vertical Stress (psf)	Specimen Hieght (in)	Deflections (in) $d_{initial}$	d_o	d_{50}	d_{100}	d_{final}	Porous Stone (in)	t_{50} (min)	cv (in^2/min)	cv (ft^2/day)
Top Cap			25	0.945	0.3256	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
Seat	0.06		67	0.945	0.3256	XXXXX	XXXXX	XXXXX	0.3256	0.0000	XXXXX	XXXXX	XXXXX
1	0.25		240	0.948	0.3256	0.3264	0.3260	0.3255	0.3277	0.0000	XXXXX	XXXXX	XXXXX
2	0.50		588	0.946	0.3277	0.3267	0.3263	0.3258	0.3260	0.0000	XXXXX	XXXXX	XXXXX
3	1.00		1282	0.943	0.3260	0.3247	0.3235	0.3223	0.3219	0.0011	1.00	0.044	0.438
4		1.0	2672	0.940	0.3219	0.3196	0.3168	0.3140	0.3125	0.0061	1.80	0.024	0.242
5	4.0		5451	0.931	0.3125	0.3088	0.3037	0.2985	0.2962	0.0080	2.00	0.021	0.214
6		4.0	11009	0.919	0.2962	0.2913	0.2847	0.2780	0.2734	0.0102	2.00	0.021	0.208
7		8.0	22126	0.901	0.2734	0.2677	0.2579	0.2480	0.2427	0.0131	3.00	0.013	0.133
8		16.0	44359	0.875	0.2427	0.2378	0.2234	0.2090	0.2006	0.0163	3.50	0.011	0.108
9		-16.0	22126	0.894	0.2006	0.2030	XXXXX	XXXXX	0.2055	0.0143	XXXXX	XXXXX	XXXXX
10		-12.0	5451	0.924	0.2055	0.2098	XXXXX	XXXXX	0.2249	0.0106	5.00	0.008	0.084
11	-4.0	-1.0	1282	0.955	0.2249	0.2267	XXXXX	XXXXX	0.2476	0.0081	XXXXX	XXXXX	XXXXX
12	-1.5		240	0.984	0.2476	0.2483	XXXXX	XXXXX	0.2708	0.0060	XXXXX	XXXXX	XXXXX
13			240	XXXXX	0.2708	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
14			240	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
15			240	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
16			240	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
17			240	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
18			240	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
19			240	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
20			240	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
21			240	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
22			240	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
23			240	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
24			240	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
25			240	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX

One-Dimensional Oedometer Testing Increment

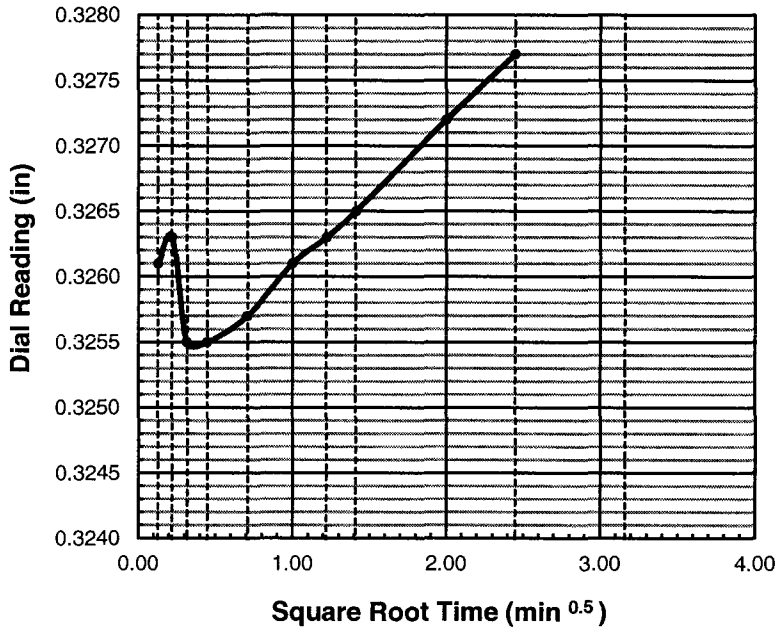
for ASTM D2435, method B

Project Number: 30989830 Apparatus No.: C6 Stage Number: 1 Curves by: TJO

Boring No.: R-10-008 Sample No.: S5 Depth (ft.) 25.0

Date: 17-Aug-10 Load (psf): 240 Zero Reading: 0.3256

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
17:16:39	0	0.00	0.3256
	0.02	0.13	0.3261
	0.05	0.22	0.3263
	0.10	0.32	0.3255
	0.20	0.45	0.3255
	0.50	0.71	0.3257
	1.00	1.00	0.3261
	1.50	1.22	0.3263
	2.00	1.41	0.3265
	4.0	2.00	0.3272
	6.0	2.45	0.3277



do = 0.3264

d90 = _____ t90 = _____ min

d100 = _____

df = _____

square root

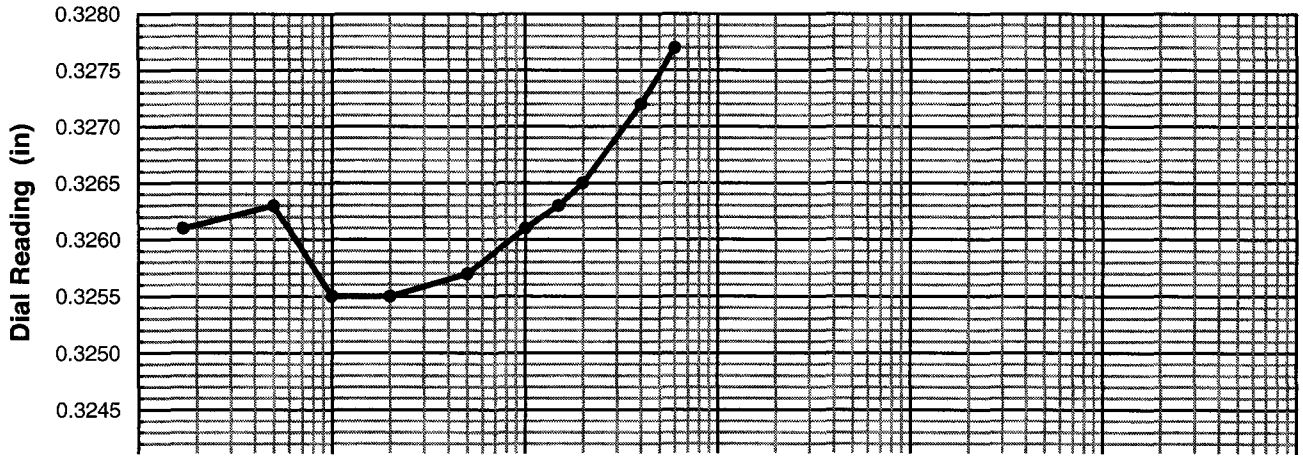
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

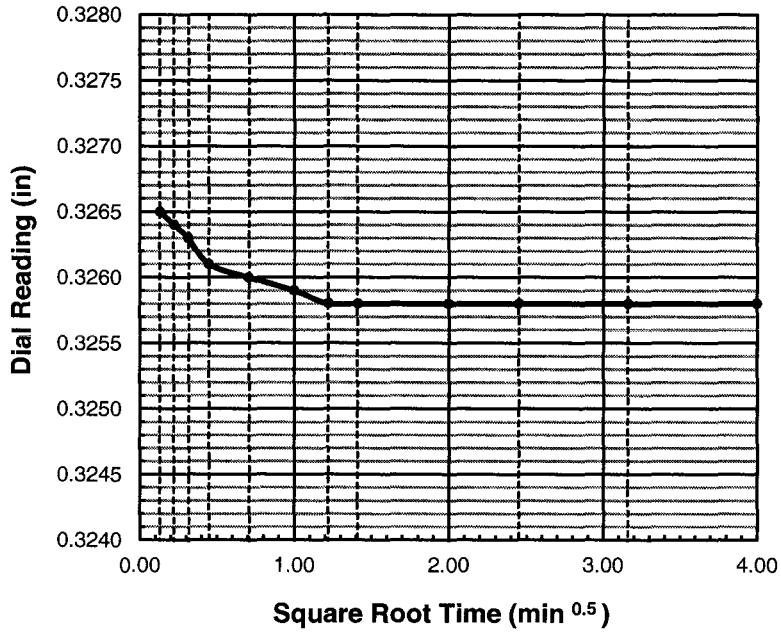
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C6 | Stage Number: 2 | Curves by: TJO

Boring No.: R-10-008 | Sample No.: S5 | Depth (ft.) 25.0

Date: 17-Aug-10 | Load (psf): 588 | Zero Reading: 0.3256

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
17:23:24	0	0.00	0.3278
	0.02	0.13	0.3265
	0.05	0.22	0.3264
	0.10	0.32	0.3263
	0.20	0.45	0.3261
	0.50	0.71	0.3260
	1.00	1.00	0.3259
	1.50	1.22	0.3258
	2.00	1.41	0.3258
	4.0	2.00	0.3258
	6.0	2.45	0.3258
	10.0	3.16	0.3258
	16.0	4.00	0.3258
	30		0.3259
	79		0.3259



do = 0.3267

d90 = _____ t90 = _____ min

d100 = _____

df = 0.3260

square root

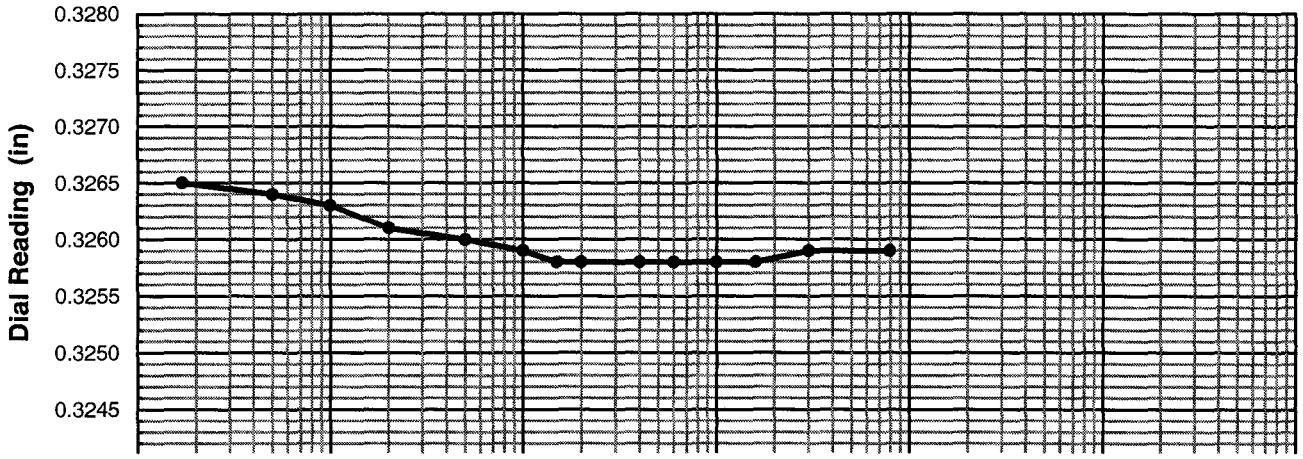
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

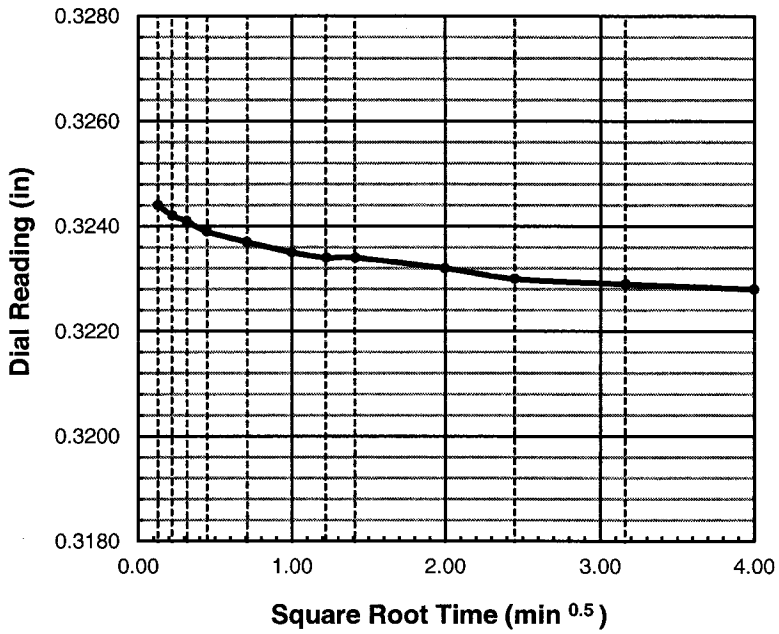
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C6 | Stage Number: 3 | Curves by: TJO

Boring No.: R-10-008 | Sample No.: S5 | Depth (ft.) 25.0

Date: 17-Aug-10 | Load (psf): 1282 | Zero Reading: 0.3256

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
18:42:32	0	0.00	0.3260
	0.02	0.13	0.3244
	0.05	0.22	0.3242
	0.10	0.32	0.3241
	0.20	0.45	0.3239
	0.50	0.71	0.3237
	1.00	1.00	0.3235
	1.50	1.22	0.3234
	2.00	1.41	0.3234
	4.0	2.00	0.3232
	6.0	2.45	0.3230
	10.0	3.16	0.3229
	16.0	4.00	0.3228
	30		0.3226
	60		0.3225
	120		0.3223
	240		0.3222
	480		0.3221
	960		0.3219
	1331		0.3219



do = 0.3247

d90 = _____ t90 = _____ min

d100 = 0.3223

df = 0.3219

square root

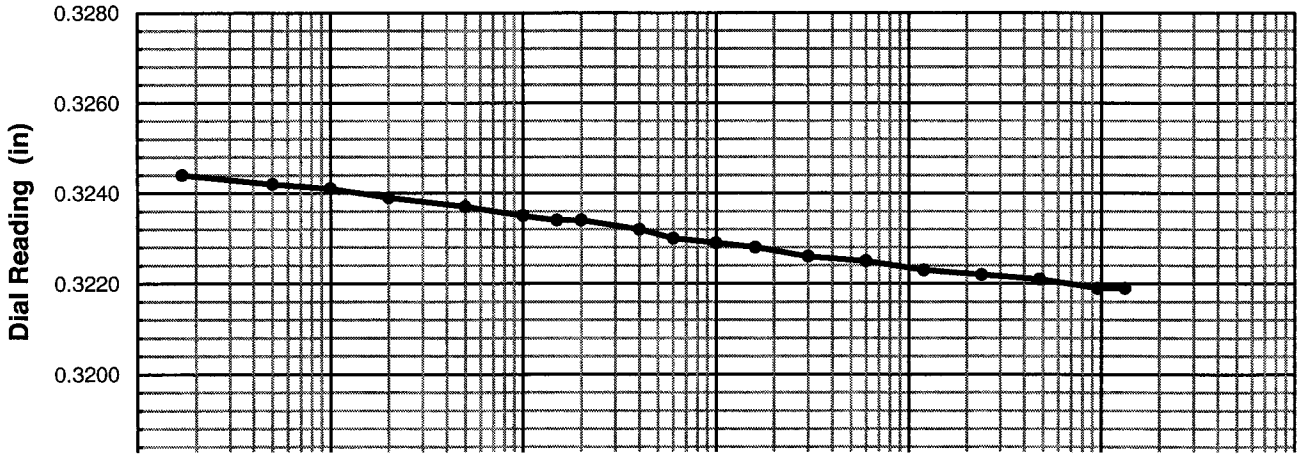
d50 = _____

t50 = _____ min

log time

d50 = 0.3235

t50 = _____ min



One-Dimensional Oedometer Testing Increment

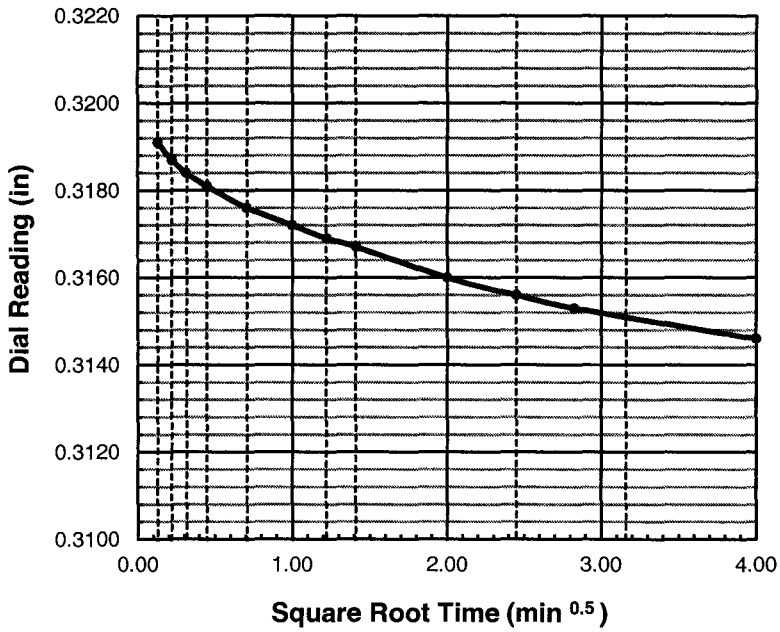
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C6 | Stage Number: 4 | Curves by: TJO

Boring No.: R-10-008 | Sample No.: S5 | Depth (ft.) 25.0

Date: 18-Aug-10 | Load (psf): 2672 | Zero Reading: 0.3256

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
16:54:53	0	0.00	0.3219
	0.02	0.13	0.3191
	0.05	0.22	0.3187
	0.10	0.32	0.3184
	0.20	0.45	0.3181
	0.50	0.71	0.3176
	1.00	1.00	0.3172
	1.50	1.22	0.3169
	2.00	1.41	0.3167
	4.0	2.00	0.3160
	6.0	2.45	0.3156
	8.0	2.83	0.3153
	16.0	4.00	0.3146
	30		0.3141
	60		0.3137
	120		0.3133
	240		0.3130
	480		0.3128
	990		0.3125



do = 0.3196

d90 = _____ t90 = _____ min

d100 = 0.3140

df = 0.3125

square root

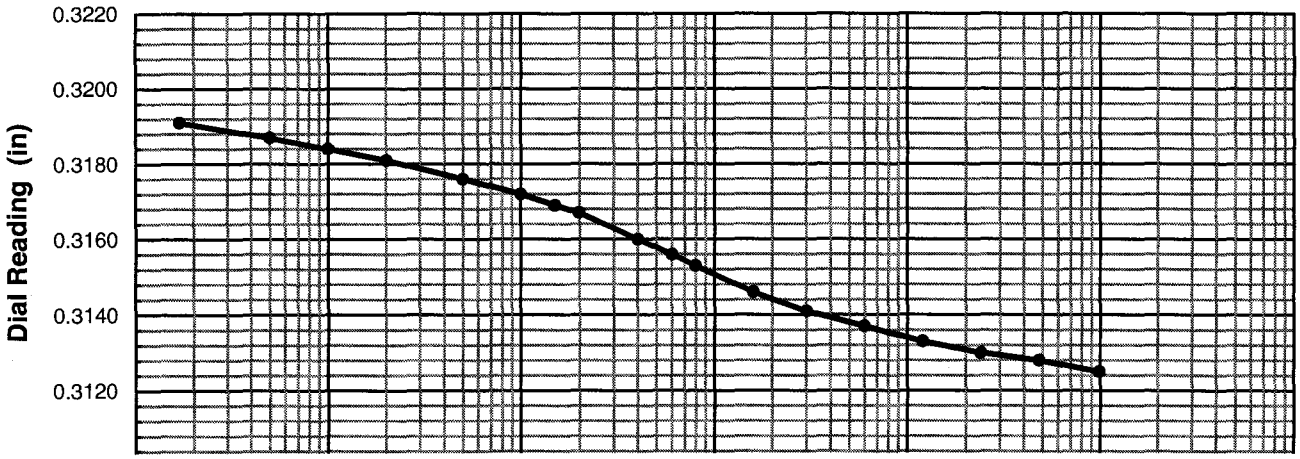
d50 = _____

t50 = _____ min

log time

d50 = 0.3168

t50 = _____ min



One-Dimensional Oedometer Testing Increment

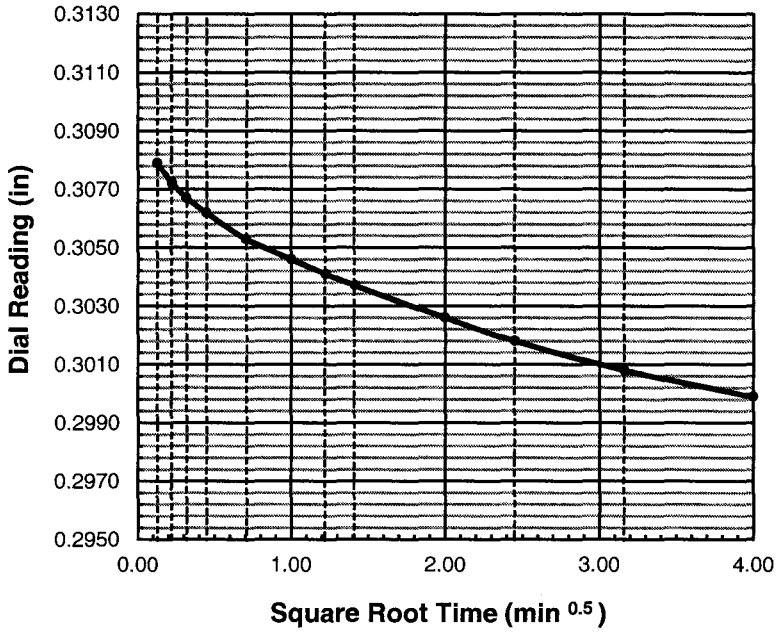
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C6 | Stage Number: 5 | Curves by: TJO

Boring No.: R-10-008 | Sample No.: S5 | Depth (ft.) 25.0

Date: 19-Aug-10 | Load (psf): 5451 | Zero Reading: 0.3256

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:26:10	0	0.00	0.3125
	0.02	0.13	0.3079
	0.05	0.22	0.3072
	0.10	0.32	0.3067
	0.20	0.45	0.3062
	0.50	0.71	0.3053
	1.00	1.00	0.3046
	1.50	1.22	0.3041
	2.00	1.41	0.3037
	4.0	2.00	0.3026
	6.0	2.45	0.3018
	10.0	3.16	0.3008
	16.0	4.00	0.2999
	30		0.2990
	60		0.2983
	120		0.2977
	240		0.2972
	480		0.2967
	960		0.2964
	1429		0.2962



do = 0.3088

d90 = _____ t90 = _____ min

d100 = 0.2985

df = 0.2962

square root

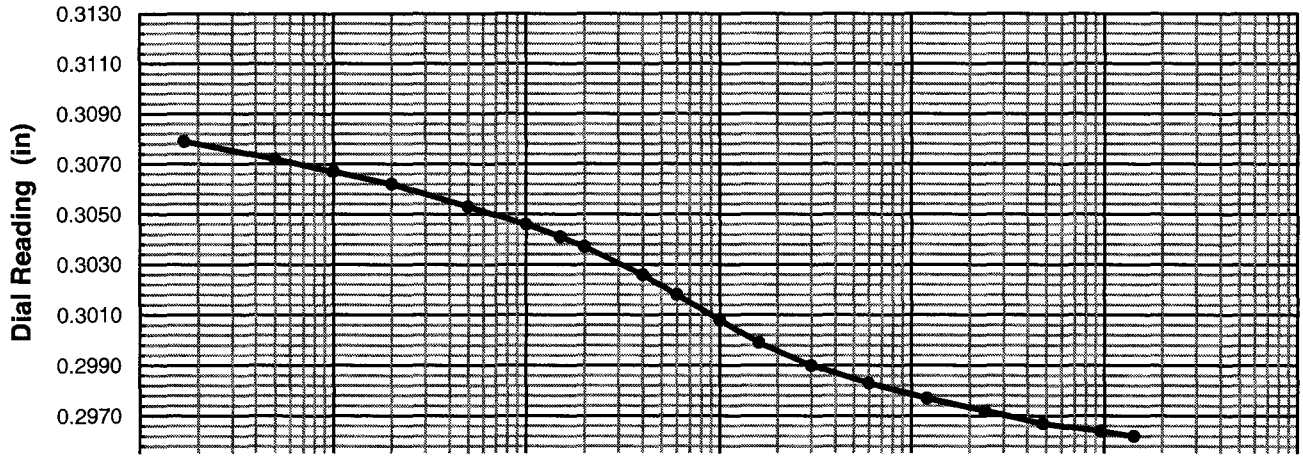
d50 = _____

t50 = _____ min

log time

d50 = 0.3036

t50 = _____ min



One-Dimensional Oedometer Testing Increment

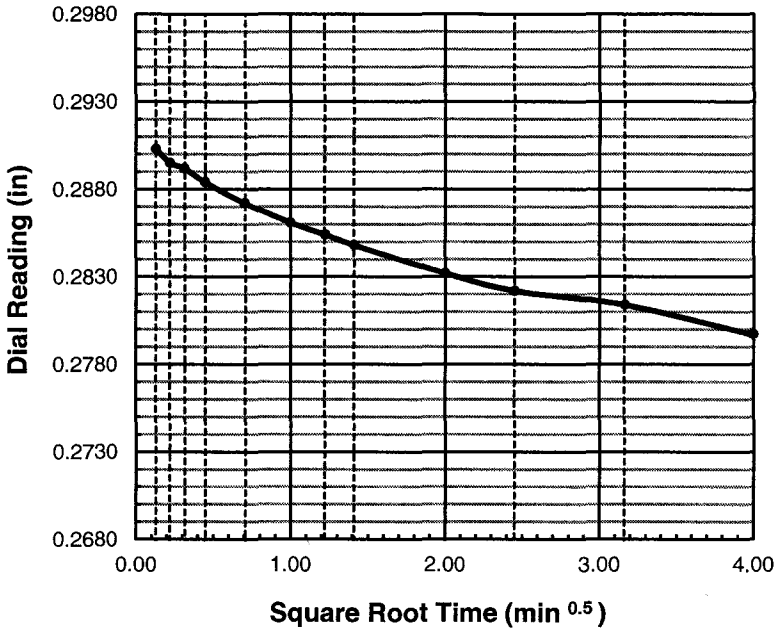
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C6 | Stage Number: 6 | Curves by: TJO

Boring No.: R-10-008 | Sample No.: S5 | Depth (ft.) 25.0

Date: 20-Aug-10 | Load (psf): 11009 | Zero Reading: 0.3256

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:15:59	0	0.00	0.2962
	0.02	0.13	0.2903
	0.05	0.22	0.2895
	0.10	0.32	0.2892
	0.20	0.45	0.2884
	0.50	0.71	0.2872
	1.00	1.00	0.2861
	1.50	1.22	0.2854
	2.00	1.41	0.2848
	4.0	2.00	0.2832
	6.0	2.45	0.2822
	10.0	3.16	0.2814
	16.0	4.00	0.2797
	30		0.2785
	60		0.2775
	120		0.2767
	240		0.2759
	480		0.2753
	960		0.2747
	1440		0.2744
	2880		0.2738
	4356		0.2734



do = 0.2913

d90 = _____ t90 = _____ min

d100 = 0.2780

df = 0.2734

square root

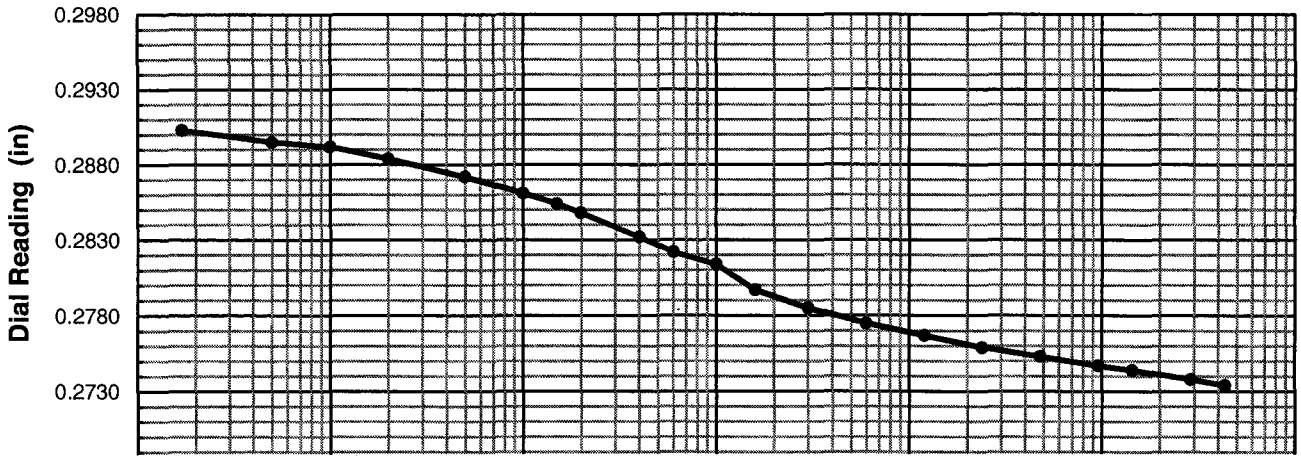
d50 = _____

t50 = _____ min

log time

d50 = 0.2846

t50 = _____ min



One-Dimensional Oedometer Testing Increment

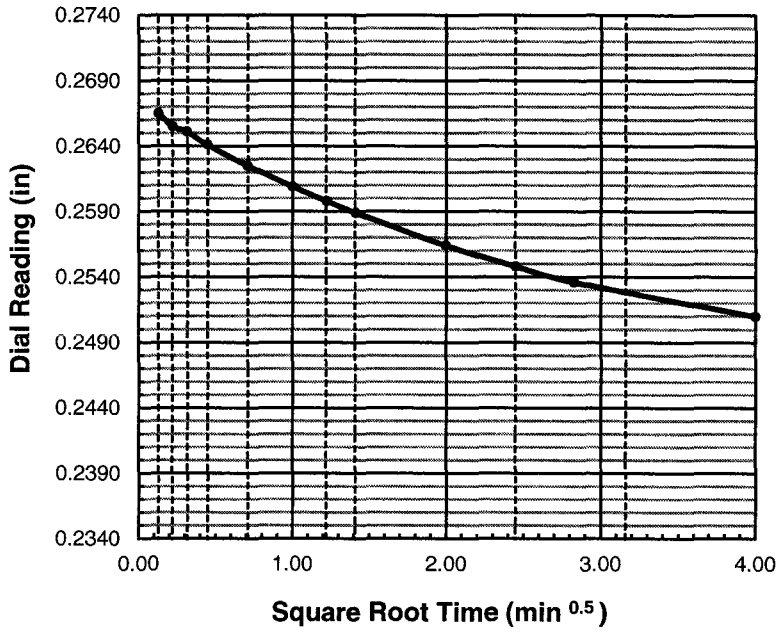
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C6 | Stage Number: 7 | Curves by: TJO

Boring No.: R-10-008 | Sample No.: S5 | Depth (ft.) 25.0

Date: 23-Aug-10 | Load (psf): 22126 | Zero Reading: 0.3256

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:52:52	0	0.00	0.2733
	0.02	0.13	0.2665
	0.05	0.22	0.2655
	0.10	0.32	0.2651
	0.20	0.45	0.2641
	0.50	0.71	0.2625
	1.00	1.00	0.2609
	1.50	1.22	0.2598
	2.00	1.41	0.2589
	4.0	2.00	0.2564
	6.0	2.45	0.2548
	8.0	2.83	0.2536
	16.0	4.00	0.2510
	30		0.2492
	60		0.2476
	120		0.2464
	240		0.2452
	480		0.2441
	960		0.2432
	1383		0.2427



do = 0.2677

d90 = _____ t90 = _____ min

d100 = 0.2480

df = 0.2427

square root

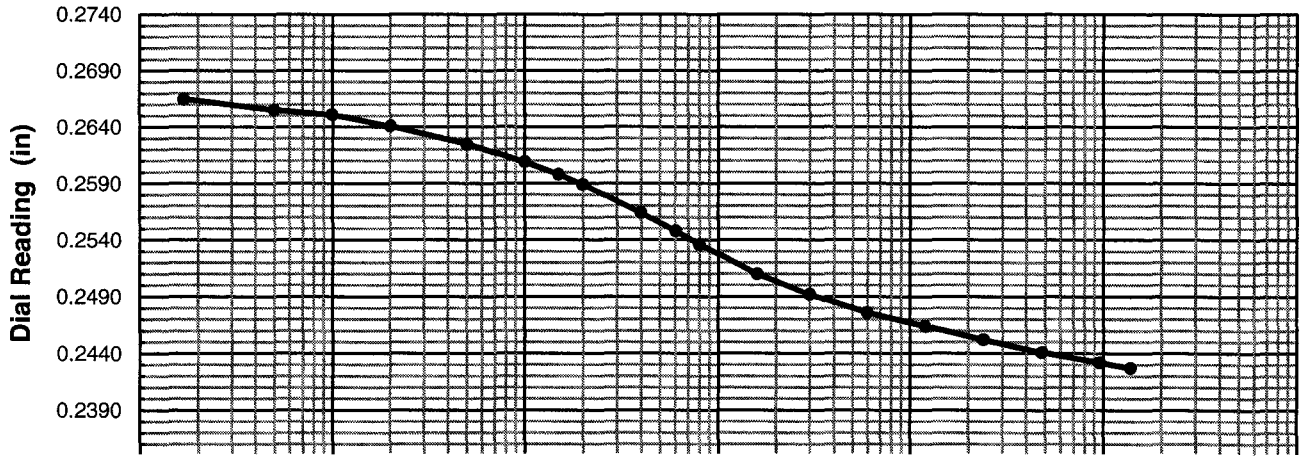
d50 = _____

t50 = _____ min

log time

d50 = 0.2579

t50 = _____ min



One-Dimensional Oedometer Testing Increment

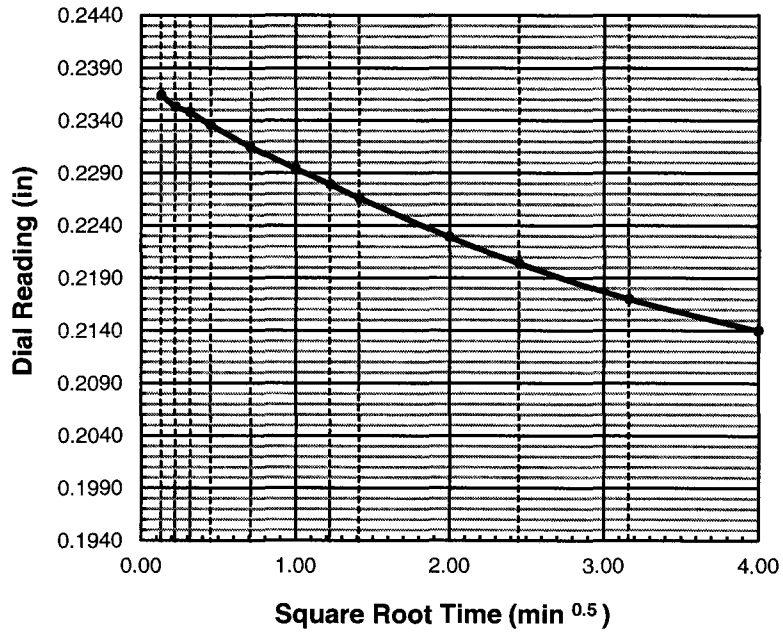
for ASTM D2435, method B

Project Number: 30989830 Apparatus No.: C6 Stage Number: 8 Curves by: TJO

Boring No.: R-10-008 Sample No.: S5 Depth (ft.) 25.0

Date: 24-Aug-10 Load (psf): 44359 Zero Reading: 0.3256

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:56:05	0	0.00	0.2427
	0.02	0.13	0.2364
	0.05	0.22	0.2353
	0.10	0.32	0.2348
	0.20	0.45	0.2336
	0.50	0.71	0.2315
	1.00	1.00	0.2294
	1.50	1.22	0.2279
	2.00	1.41	0.2266
	4.0	2.00	0.2229
	6.0	2.45	0.2204
	10.0	3.16	0.2170
	16.0	4.00	0.2140
	30		0.2107
	60		0.2080
	120		0.2061
	240		0.2043
	480		0.2027
	960		0.2013
	1466		0.2006



do = 0.2378

d90 = _____ t90 = _____ min

d100 = 0.2090

df = 0.2006

square root

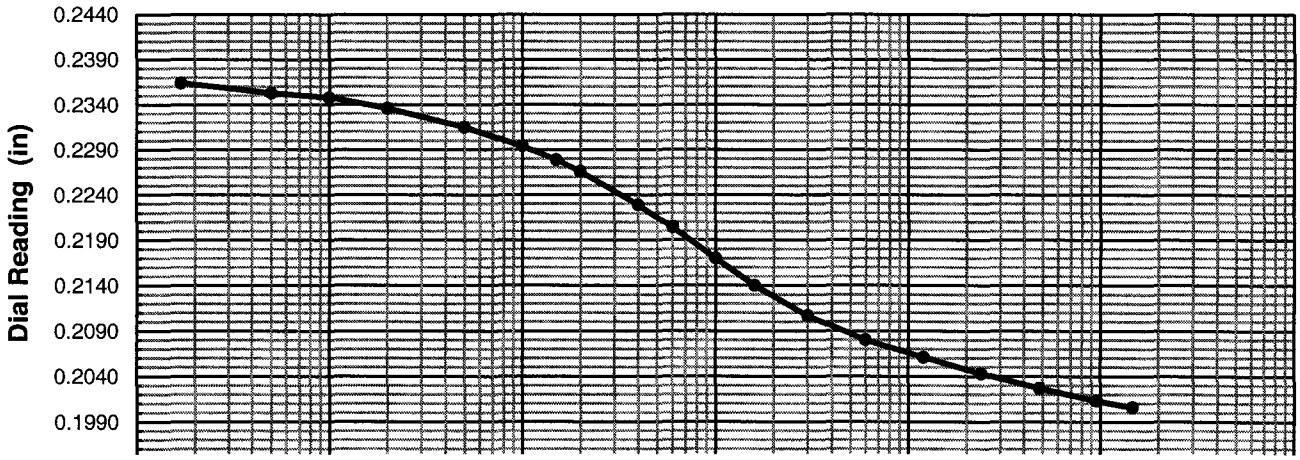
d50 = _____

t50 = _____ min

log time

d50 = 0.2234

t50 = _____ min



One-Dimensional Oedometer Testing Increment

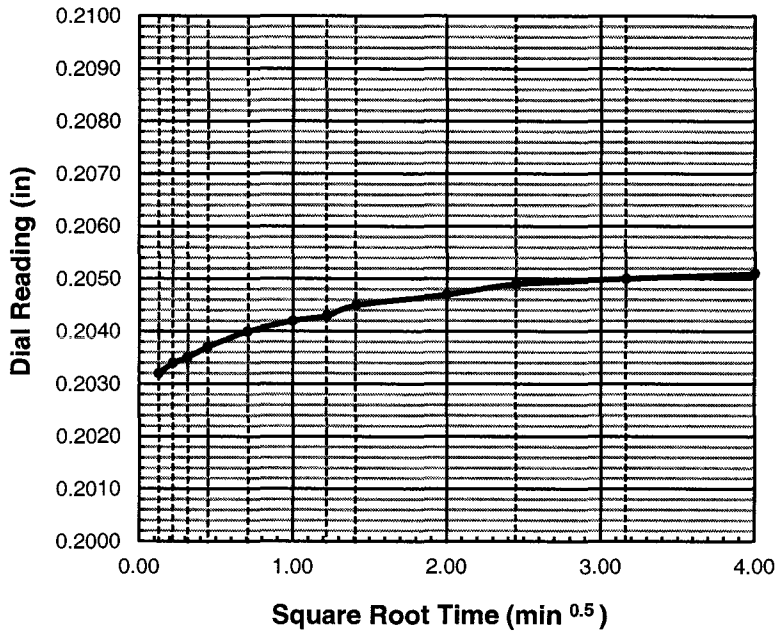
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C6 | Stage Number: 9 | Curves by: TJO

Boring No.: R-10-008 | Sample No.: S5 | Depth (ft.) 25.0

Date: 25-Aug-10 | Load (psf): 22126 | Zero Reading: 0.3256

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:23:05	0	0.00	0.2006
	0.02	0.13	0.2032
	0.05	0.22	0.2034
	0.10	0.32	0.2035
	0.20	0.45	0.2037
	0.50	0.71	0.2040
	1.00	1.00	0.2042
	1.50	1.22	0.2043
	2.00	1.41	0.2045
	4.0	2.00	0.2047
	6.0	2.45	0.2049
	10.0	3.16	0.2050
	16.0	4.00	0.2051
	30		0.2052
	60		0.2053
	120		0.2054
	240		0.2055
	300		0.2055



do = 0.2030

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2055

square root

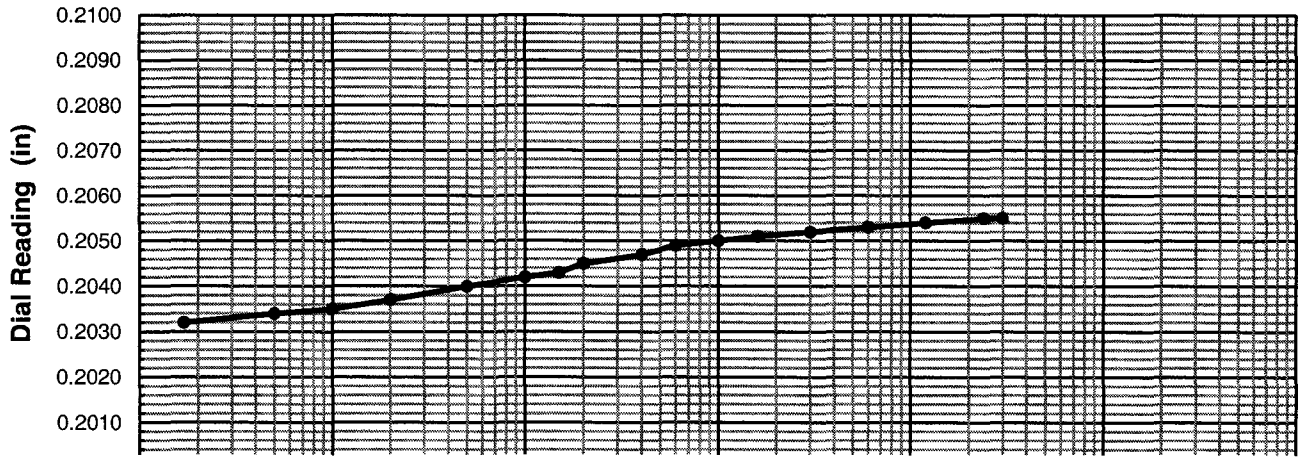
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

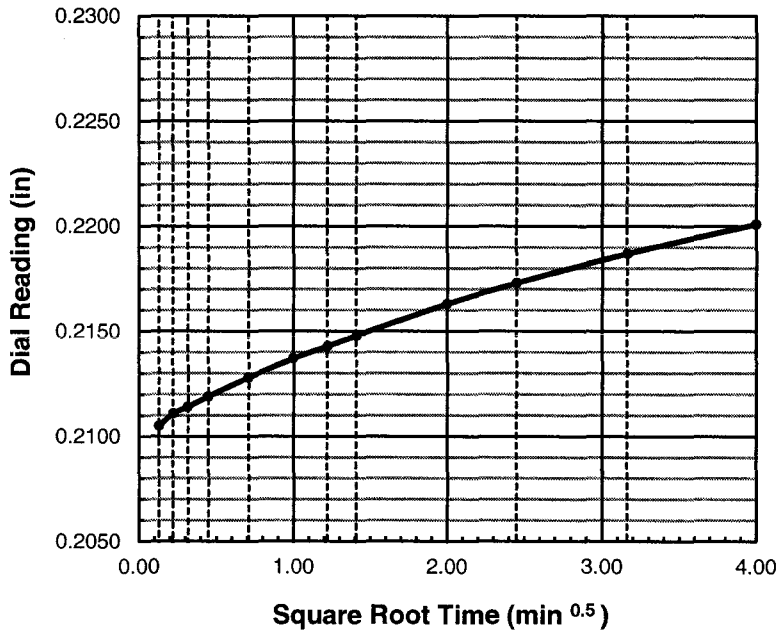
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C6 | Stage Number: 10 | Curves by: TJO

Boring No.: R-10-008 | Sample No.: S5 | Depth (ft.) 25.0

Date: 25-Aug-10 | Load (psf): 5451 | Zero Reading: 0.3256

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
14:22:56	0	0.00	0.2055
	0.02	0.13	0.2105
	0.05	0.22	0.2111
	0.10	0.32	0.2114
	0.20	0.45	0.2119
	0.50	0.71	0.2128
	1.00	1.00	0.2137
	1.50	1.22	0.2143
	2.00	1.41	0.2148
	4.0	2.00	0.2163
	6.0	2.45	0.2173
	10.0	3.16	0.2187
	16.0	4.00	0.2201
	30		0.2217
	60		0.2230
	120		0.2238
	240		0.2242
	480		0.2245
	1115		0.2249



do = 0.2098

d90 = _____ t90 = _____ min

d100 = 0.2235

df = 0.2249

square root

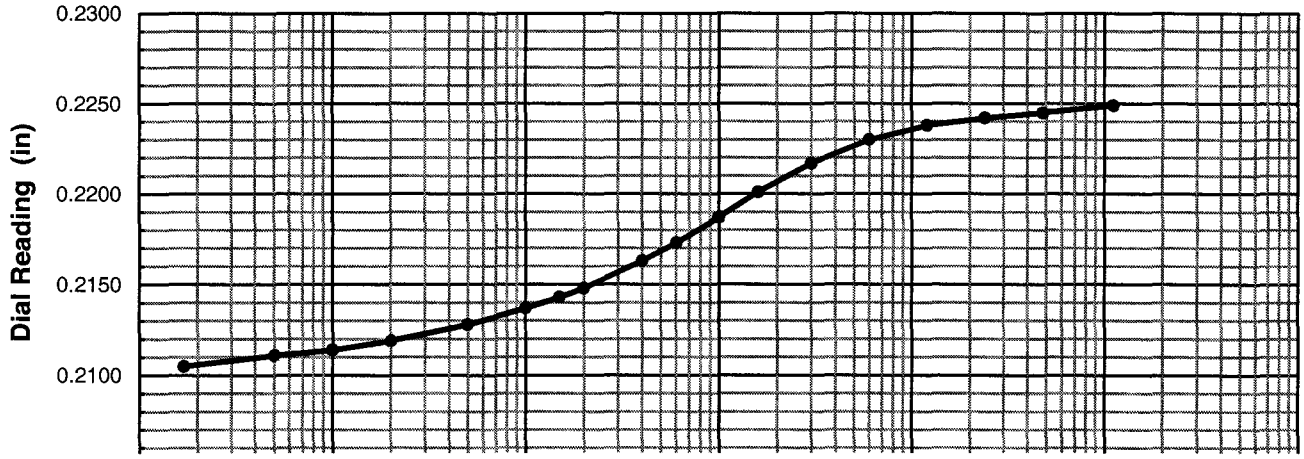
d50 = _____

t50 = _____ min

log time

d50 = 0.2167

t50 = _____ min



One-Dimensional Oedometer Testing Increment

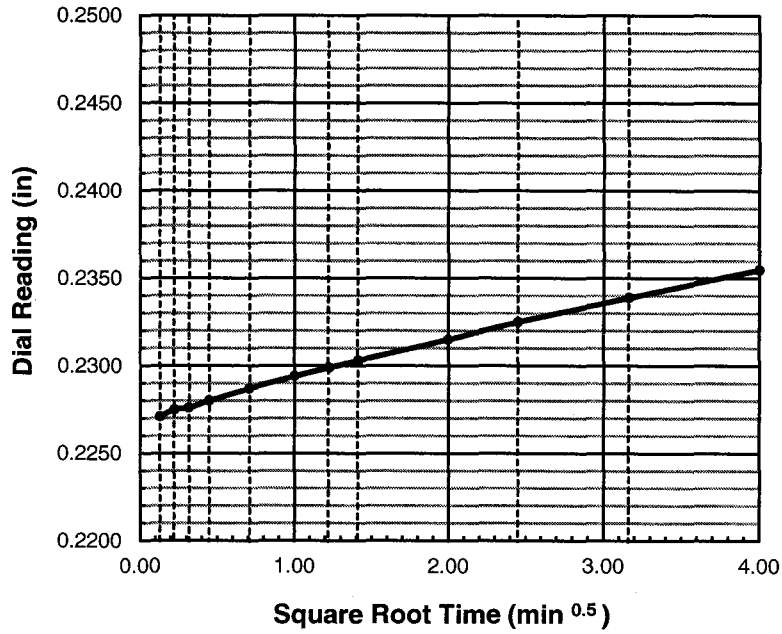
for ASTM D2435, method B

Project Number: 30989830 Apparatus No.: C6 Stage Number: 11 Curves by: TJO

Boring No.: R-10-008 Sample No.: S5 Depth (ft.) 25.0

Date: 26-Aug-10 Load (psf): 1282 Zero Reading: 0.3256

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:58:53	0	0.00	0.2249
	0.02	0.13	0.2271
	0.05	0.22	0.2275
	0.10	0.32	0.2276
	0.20	0.45	0.2280
	0.50	0.71	0.2287
	1.00	1.00	0.2294
	1.50	1.22	0.2299
	2.00	1.41	0.2303
	4.0	2.00	0.2315
	6.0	2.45	0.2325
	10.0	3.16	0.2339
	16.0	4.00	0.2355
	30		0.2380
	60		0.2411
	120		0.2437
	240		0.2453
	480		0.2464
	960		0.2471
	1542		0.2476



do = 0.2267

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2476

square root

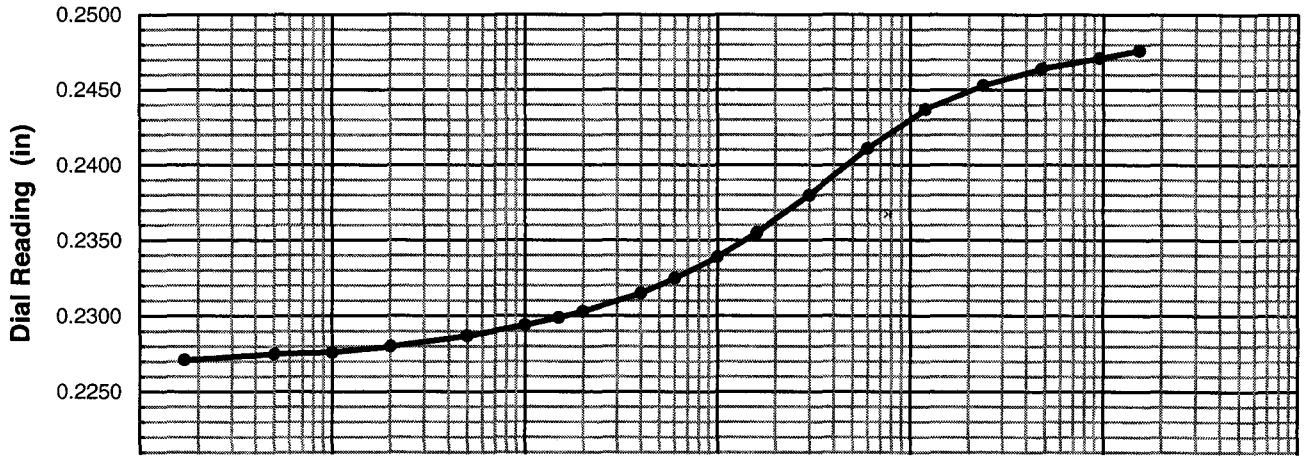
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

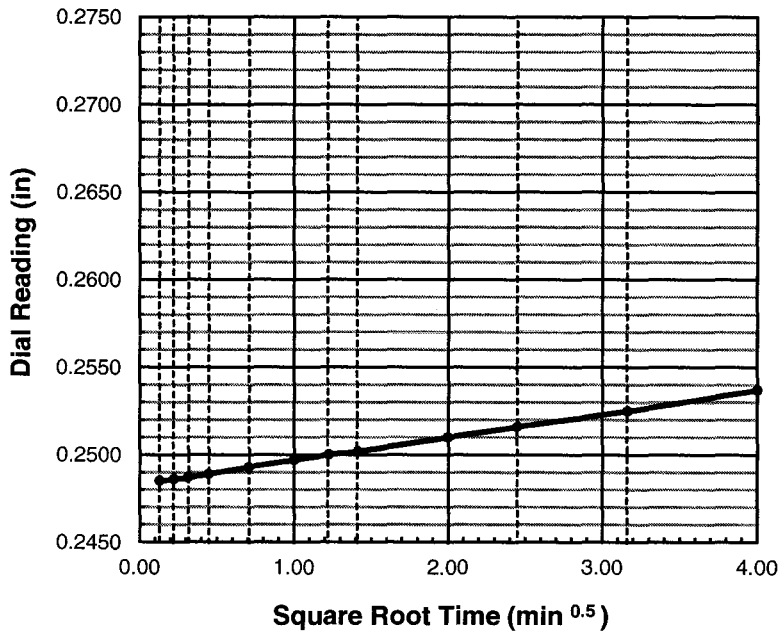
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C6 | Stage Number: 12 | Curves by: TJO

Boring No.: R-10-008 | Sample No.: S5 | Depth (ft.) 25.0

Date: 27-Aug-10 | Load (psf): 240 | Zero Reading: 0.3256

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:41:48	0	0.00	0.2476
	0.02	0.13	0.2485
	0.05	0.22	0.2486
	0.10	0.32	0.2487
	0.20	0.45	0.2489
	0.50	0.71	0.2493
	1.00	1.00	0.2497
	1.50	1.22	0.2500
	2.00	1.41	0.2502
	4.0	2.00	0.2510
	6.0	2.45	0.2516
	10.0	3.16	0.2525
	16.0	4.00	0.2537
	30		0.2555
	60		0.2582
	120		0.2612
	240		0.2641
	480		0.2664
	1440		0.2688
	2880		0.2698
	4320		0.2704
	6126		0.2708



do = 0.2483

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2708

square root

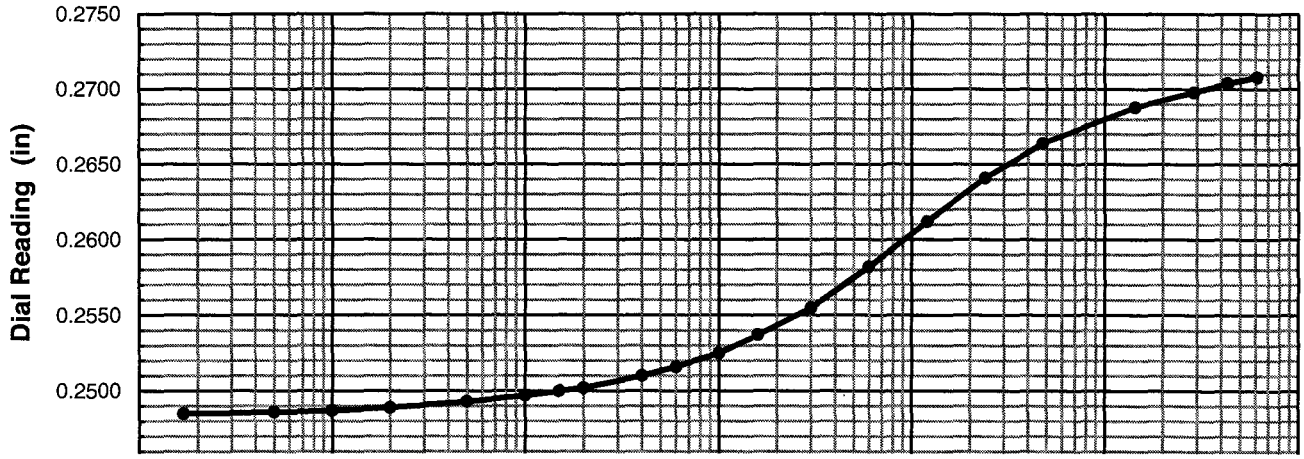
d50 = _____

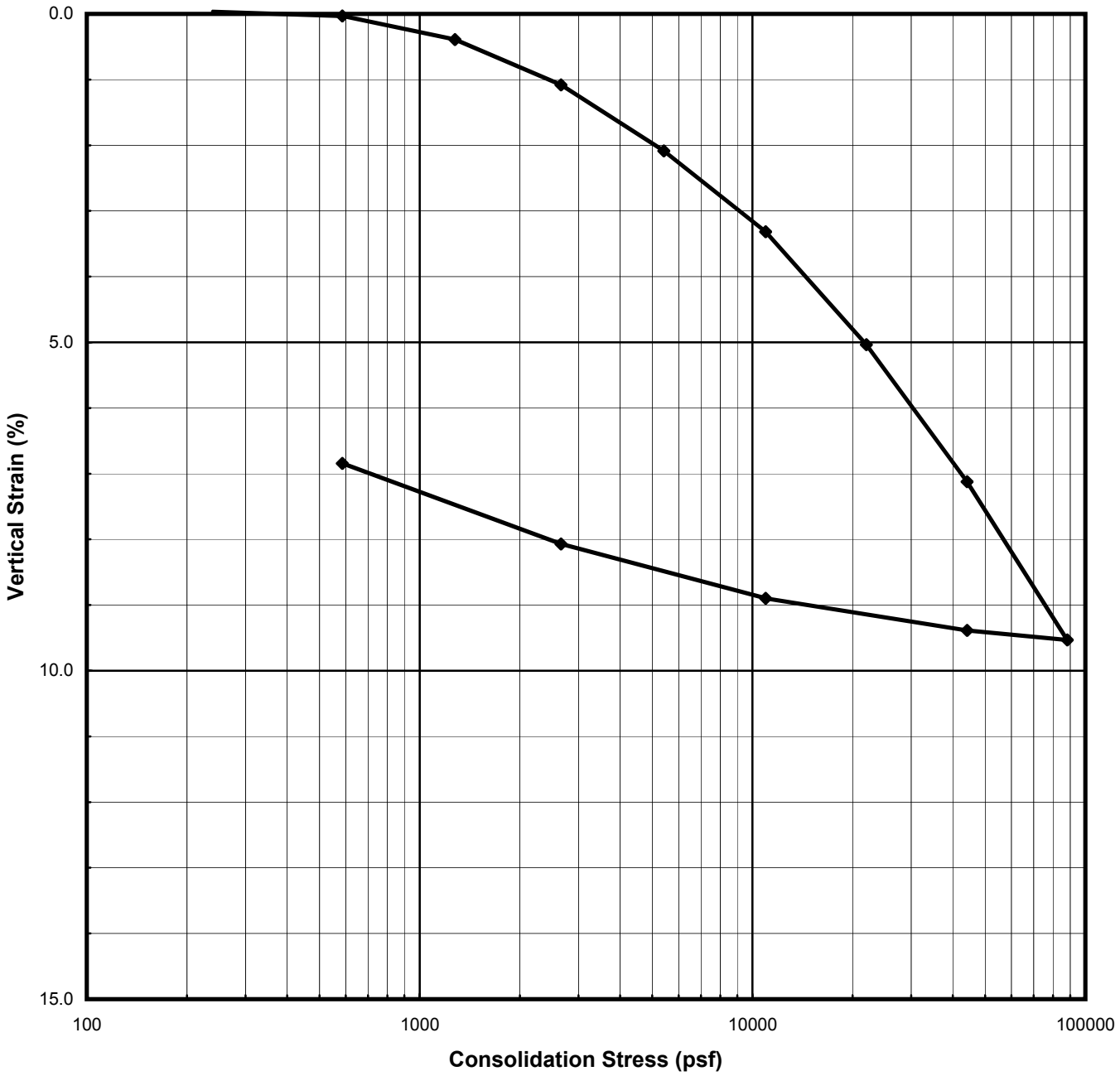
t50 = _____ min

log time

d50 = _____

t50 = _____ min





Description:	**Very dark gray Clay with sand (CL)**							
Boring No.:	R-10-009		Liquid Limit	26	%	Specific Gravity	2.75	assumed
Sample No.:	5		Plasticity Index	10	%	Strain for Saturation	1.33	%
Depth (ft | m)	25.0	7.62	Fines Content	74.0	%	Water added at	67.0	psf

	Water Content (%)	Total Unit Weight		Dry Unit Weight		Saturation (%)	Void Ratio	Height		Diameter	
		(pcf)	(kN/m^3)	(pcf)	(kN/m^3)			(inches)	(cm)	(inches)	(cm)
Initial	18.1	132.4	20.80	112.1	17.60	94.2	0.53	0.896	2.28	2.419	6.144
Final	16.1	136.4	21.43	117.5	18.45	96.6	0.46	0.855	2.17		

URS

I5 & SR74 IC

Project Number: 30989830
Test Start Date: 9/7/2010

CONSOLIDATION TEST
ASTM D2435

SUBMITTED BY: Thomas J. O'Mear

@BCL@B40414DF.xls

One-Dimensional Oedometer Testing
Set-up / Take down Worksheet
ASTM D2435

Project Number: 30989830
Project Name: I5 & SR74 IC
Project Engineer: FM
Apparatus No.: C7

Boring No.: R-10-009
Sample No.: 5
Depth (ft): 25.0

Specimen Description : Very dark gray Clay with sand (CL)
Duration: end of increment

Ring Number: R20
Weight of Wet Spec. and Ring: 362.20 g
Weight of Ring: 219.14 g
Initial Weight of Wet Spec.: 143.06 g

Take Down Weight with Ring: 359.55 g

Excess Oven-dried Cont. No.: rp4
Weight of Cont. and Dry Spec.: 115.39 g
Weight of Container: 115.21 g
Weight of Excess Dried Soil: 0.18 g
Weight of Excess Wet Soil 0.21 g
Final Weight of Wet Specimen: 140.62 g

Height of Specimen (in)

	Initial	Final
1	0.895	0.856
2	0.897	0.851
3	0.898	0.857
4	0.894	0.850
5	0.895	0.859
Ave:	0.896	0.855

Initial Height - Final Height = 0.041 in
Change in Dial (Dd) = 0.053 in
Initial Height - Dd = 0.843 in
Final Height + Dd = 0.907 in
Weight of Top Cap = 373.7 g

Specimen Analysis					Initial Trim	Initial Spec.	Final
				Container Number:	X35	**XXXXX**	s43
				Mass of Container and Wet Specimen M1 (g)	390.00	143.06	197.26
				Mass of Container and Dry Specimen, M2 (g)	351.86	121.09	181.12
				Mass of Container, M3 (g)	138.17	**XXXXX**	81.03
				Water Content, w (%)	17.85	18.14	16.13
				Mass of Wet Specimen, M4 (g)	143.06	143.06	140.62
				Mass of Dry Specimen, M5 (g)	121.09	121.09	121.09
Nominal		Measured	x	Specimen Height, H (in)	0.896	0.896	0.855
Nominal	x	Measured		Specimen Diameter, D (in)	2.419	2.419	2.419
				Area of Specimen, A (in^2)	4.596	4.596	4.596
				Volume of Specimen, V (cc)	67.46	67.46	64.36
Assumed	x	Measured		Specific Gravity, Gs	2.75	2.75	2.75
				Wet Unit Weight, WUW (pcf)	**132.4**	**132.4**	**136.4**
				Dry Unit Weight, DUW (pcf)	**112.3**	**112.1**	**117.5**
				Void Ratio	**0.526**	**0.529**	**0.459**
				Degree of Saturation, S (%)	**93.4**	**94.2**	**96.6**

Set-up by: YS
Date: 9/7/10
Calculated by: TJO
Reviewed by: YS
Strain for Saturation (%) = **1.327**

One-Dimensional Oedometer Testing

Loading Worksheet

ASTM D2435

Project Number: 30989830 Boring No.: R-10-009

Project Name: I5 & SR74 IC Sample No.: 5

Project Engineer: FM Apparatus No.: C7 Depth (ft): 25.0

Initial Dial Reading: 0.3667 inch Initial Specimen Height: 0.896 inch

Stage No.	Normal Stress (psf)	Dial Reading (in)		Compressibility Correction (in)	Vertical Strain (%)	
		End of Duration	End of Increment		End of Duration	End of Increment
Seat	67		0.3667	0.0000		0.00
1	240		0.3663	0.0007		-0.03
2	585		0.3639	0.0025		0.03
3	1276	0.3600	0.3587	0.0045	0.25	0.39
4	2658	0.3520	0.3505	0.0065	0.92	1.08
5	5421	0.3412	0.3394	0.0086	1.89	2.09
6	10947	0.3280	0.3260	0.0110	3.09	3.32
7	21999	0.3100	0.3082	0.0134	4.83	5.03
8	44104	0.2910	0.2874	0.0155	6.72	7.12
9	88313	0.2690	0.2636	0.0177	8.93	9.53
10	44104		0.2659	0.0167		9.39
11	10947		0.2737	0.0133		8.90
12	2658		0.2846	0.0098		8.07
13	585		0.2981	0.0073		6.84
14	67		0.3142	0.0053		5.27
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						
33						

Final dial reading prior to take down (inch): 0.3142 Take down by: TJO Date: 9/30/10

One-Dimensional Oedometer Testing
ASTM D2435
Table of Incremental Values

Project Number: 30989830
Project Name: I5 & SR74 IC
Project Engineer: FM
Apparatus No.: C7

Boring No.: R-10-009
Sample No.: 5
Depth (ft): 25.0
Inundation at stage: Seat

10 **20** Hanger Ratios

Stage Number	Incremental Weight Applied (kg) Back	Front	Vertical Stress (psf)	Specimen Hieght (in)	Deflections (in) $d_{initial}$	d_o	d_{50}	d_{100}	d_{final}	Porous Stone (in)	t_{50} (min)	cv (in^2/min)	cv (ft^2/day)
Top Cap			26	0.896	0.3667	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
Seat	0.06		67	0.896	0.3667	XXXXX	XXXXX	XXXXX	0.3667	0.0000	XXXXX	XXXXX	XXXXX
1	0.25		240	0.896	0.3667	0.3662	XXXXX	XXXXX	0.3663	0.0007	XXXXX	XXXXX	XXXXX
2	0.50		585	0.896	0.3663	0.3689	XXXXX	XXXXX	0.3639	0.0025	XXXXX	XXXXX	XXXXX
3	1.00		1276	0.896	0.3639	0.3632	0.3616	0.3600	0.3587	0.0045	1.50	0.026	0.263
4		1.0	2658	0.894	0.3587	0.3574	0.3547	0.3520	0.3505	0.0065	1.50	0.026	0.262
5	4.0		5421	0.891	0.3505	0.3489	0.3451	0.3412	0.3394	0.0086	1.00	0.039	0.391
6		4.0	10947	0.889	0.3394	0.3369	0.3325	0.3280	0.3260	0.0110	1.00	0.039	0.389
7		8.0	21999	0.885	0.3260	0.3245	0.3173	0.3100	0.3082	0.0134	1.00	0.039	0.385
8		16.0	44104	0.879	0.3082	0.3065	0.2988	0.2910	0.2874	0.0155	1.00	0.038	0.381
9		32.0	88313	0.873	0.2874	0.2852	0.2771	0.2690	0.2636	0.0177	1.00	0.038	0.375
10		-32.0	44104	0.892	0.2636	0.2653	XXXXX	XXXXX	0.2659	0.0167	XXXXX	XXXXX	XXXXX
11		-24.0	10947	0.913	0.2659	0.2706	XXXXX	XXXXX	0.2737	0.0133	XXXXX	XXXXX	XXXXX
12	-4.0	-4.0	2658	0.934	0.2737	0.2718	XXXXX	XXXXX	0.2846	0.0098	XXXXX	XXXXX	XXXXX
13	-1.00	-1.00	585	0.955	0.2846	0.2858	XXXXX	XXXXX	0.2981	0.0073	XXXXX	XXXXX	XXXXX
14	-0.750		67	0.976	0.2981	0.2982	XXXXX	XXXXX	0.3142	0.0053	XXXXX	XXXXX	XXXXX
15			67	XXXXX	0.3142	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
16			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
17			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
18			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
19			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
20			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
21			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
22			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
23			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
24			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
25			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX

One-Dimensional Oedometer Testing Increment

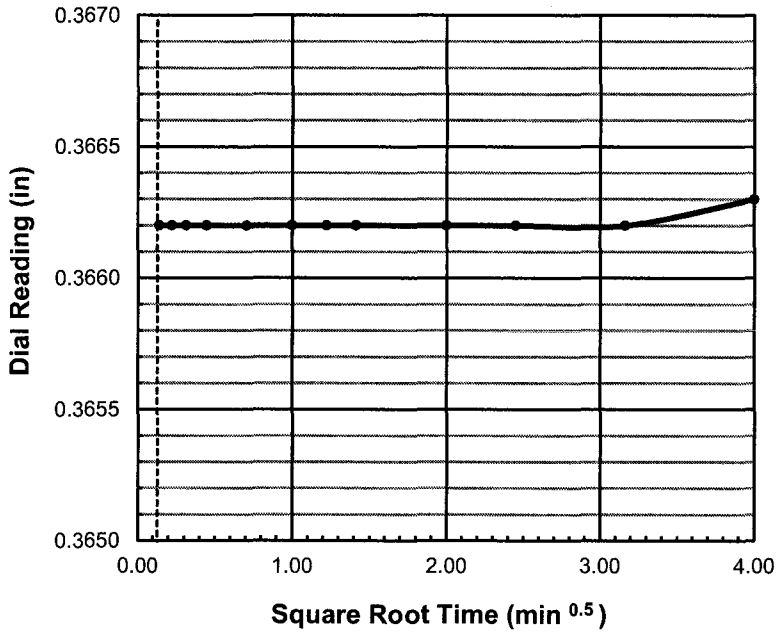
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C7 | Stage Number: 1 | Curves by: TJO

Boring No.: R-10-009 | Sample No.: 5 | Depth (ft.) 25.0

Date: 7-Sep-10 | Load (psf): 240 | Zero Reading: 0.3667

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
16:55:06	0	0.00	0.3667
	0.02	0.14	0.3662
	0.05	0.22	0.3662
	0.10	0.32	0.3662
	0.20	0.45	0.3662
	0.50	0.71	0.3662
	1.00	1.00	0.3662
	1.50	1.22	0.3662
	2.00	1.41	0.3662
	4.0	2.00	0.3662
	6.0	2.45	0.3662
	10.0	3.16	0.3662
	16.0	4.00	0.3663
swelling	21		0.3663



do = 0.3662

d90 = _____ t90 = _____ min

d100 = _____

df = 0.3663

square root

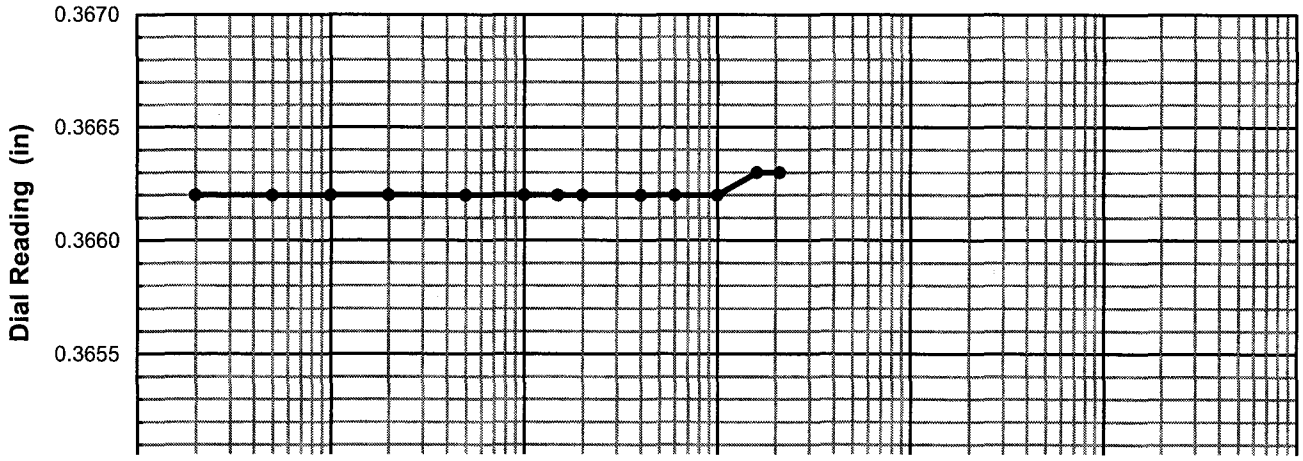
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

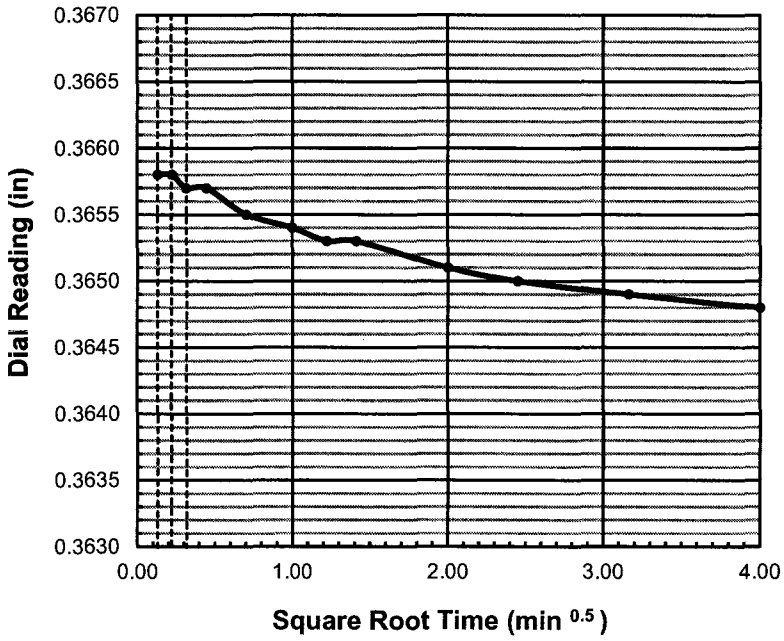
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C7 | Stage Number: 2 | Curves by: TJO

Boring No.: R-10-009 | Sample No.: 5 | Depth (ft.) 25.0

Date: 7-Sep-10 | Load (psf): 585 | Zero Reading: 0.3667

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
17:16:38	0	0.00	0.3663
	0.02	0.13	0.3658
	0.05	0.22	0.3658
	0.10	0.32	0.3657
	0.20	0.45	0.3657
	0.50	0.71	0.3655
	1.00	1.00	0.3654
	1.50	1.22	0.3653
	2.00	1.41	0.3653
	4.0	2.00	0.3651
	6.0	2.45	0.3650
	10.0	3.16	0.3649
	16.0	4.00	0.3648
	30		0.3647
	60		0.3646
	120		0.3645
	240		0.3644
	480		0.3643
	1140		0.3641
	2595		0.3639



do = 0.3659

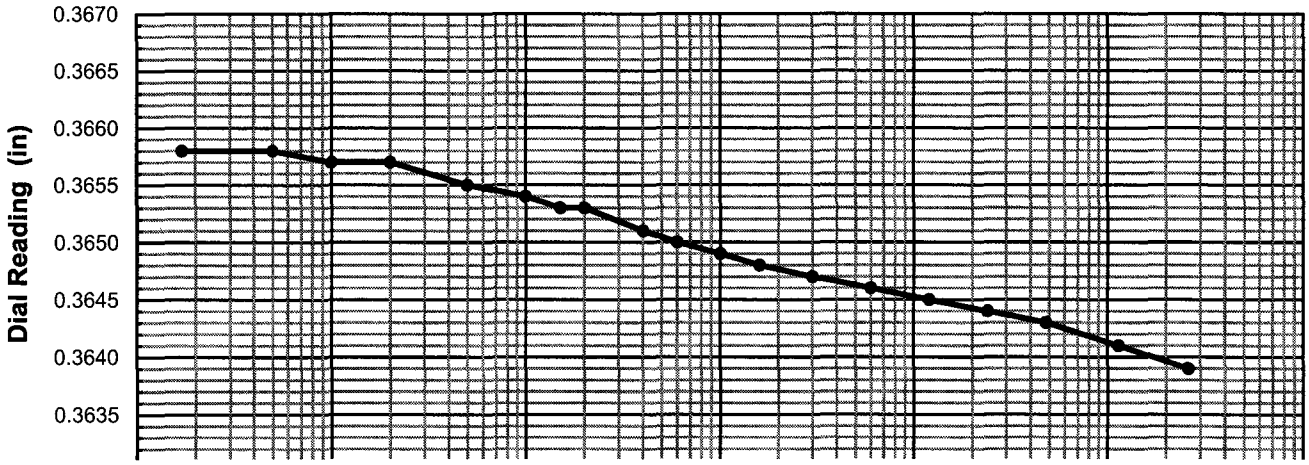
d90 = _____ t90 = _____ min

d100 = _____

df = 0.3639

square root: d50 = _____ t50 = _____ min

log time: d50 = _____ t50 = _____ min



One-Dimensional Oedometer Testing Increment

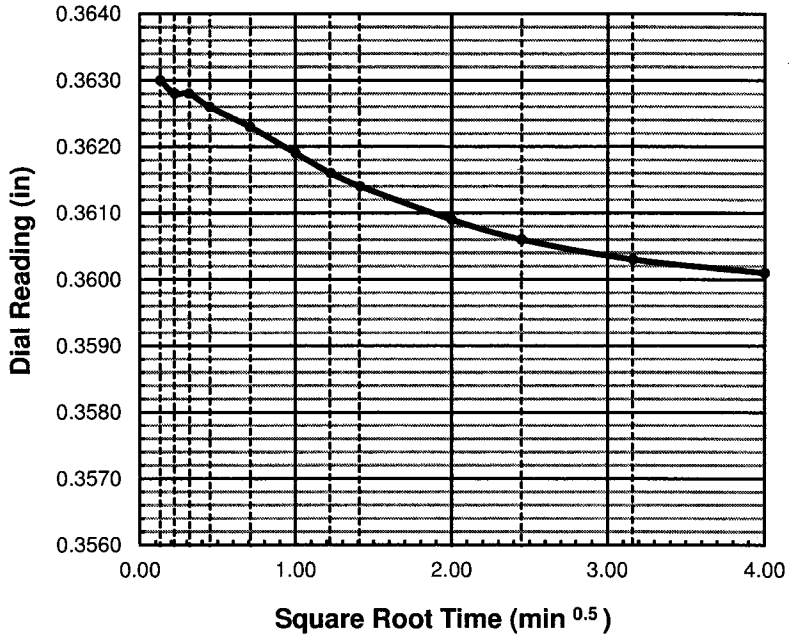
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C7 | Stage Number: 3 | Curves by: TJO

Boring No.: R-10-009 | Sample No.: 5 | Depth (ft.) 25.0

Date: 9-Sep-10 | Load (psf): 1276 | Zero Reading: 0.3667

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
12:32:13	0	0.00	0.3639
	0.02	0.13	0.3630
	0.05	0.22	0.3628
	0.10	0.32	0.3628
	0.20	0.45	0.3626
	0.50	0.71	0.3623
	1.00	1.00	0.3619
	1.50	1.22	0.3616
	2.00	1.41	0.3614
	4.0	2.00	0.3609
	6.0	2.45	0.3606
	10.0	3.16	0.3603
	16.0	4.00	0.3601
	30		0.3599
	60		0.3597
	120		0.3595
	240		0.3593
	480		0.3591
	960		0.3589
	1320		0.3587



do = 0.3632

d90 = _____ t90 = _____ min

d100 = 0.3600

df = 0.3587

square root

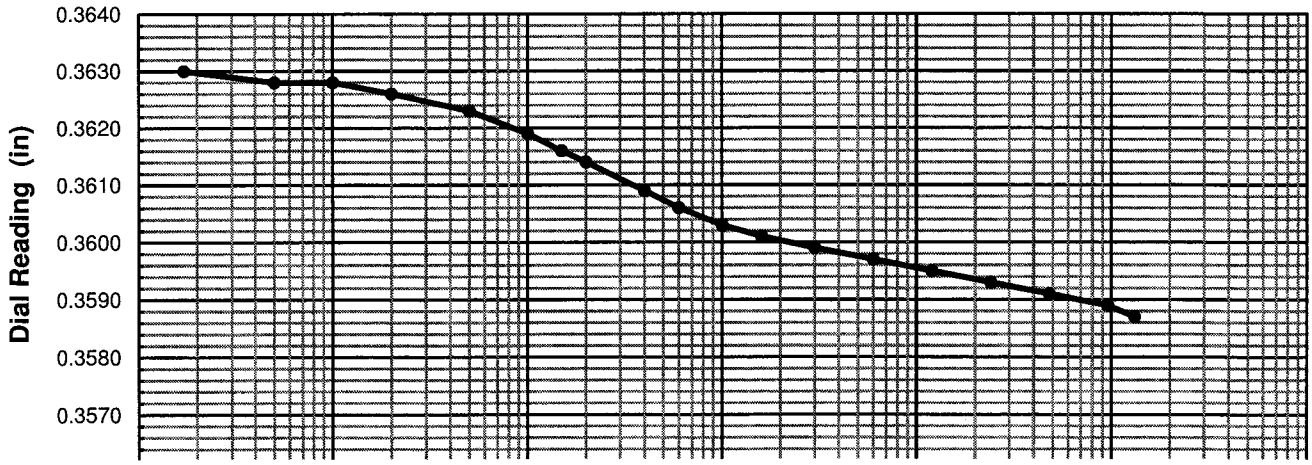
d50 = _____

t50 = _____ min

log time

d50 = 0.3616

t50 = 1.5 min



One-Dimensional Oedometer Testing Increment

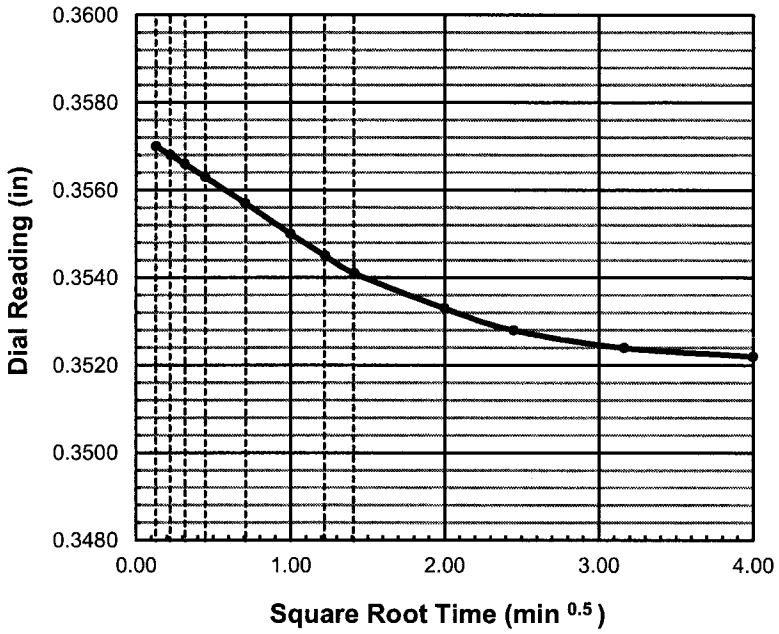
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C7 | Stage Number: 4 | Curves by: TJO

Boring No.: R-10-009 | Sample No.: 5 | Depth (ft.) 25.0

Date: 10-Sep-10 | Load (psf): 2658 | Zero Reading: 0.3667

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:33:02	0	0.00	0.3587
	0.02	0.13	0.3570
	0.05	0.22	0.3568
	0.10	0.32	0.3566
	0.20	0.45	0.3563
	0.50	0.71	0.3557
	1.00	1.00	0.3550
	1.50	1.22	0.3545
	2.00	1.41	0.3541
	4.0	2.00	0.3533
	6.0	2.45	0.3528
	10.0	3.16	0.3524
	16.0	4.00	0.3522
	30		0.3519
	92		0.3514
	153		0.3512
	242		0.3510
	482		0.3508
	962		0.3506
	1497		0.3505



do = 0.3574

d90 = _____ t90 = _____ min

d100 = 0.3520

df = 0.3505

square root

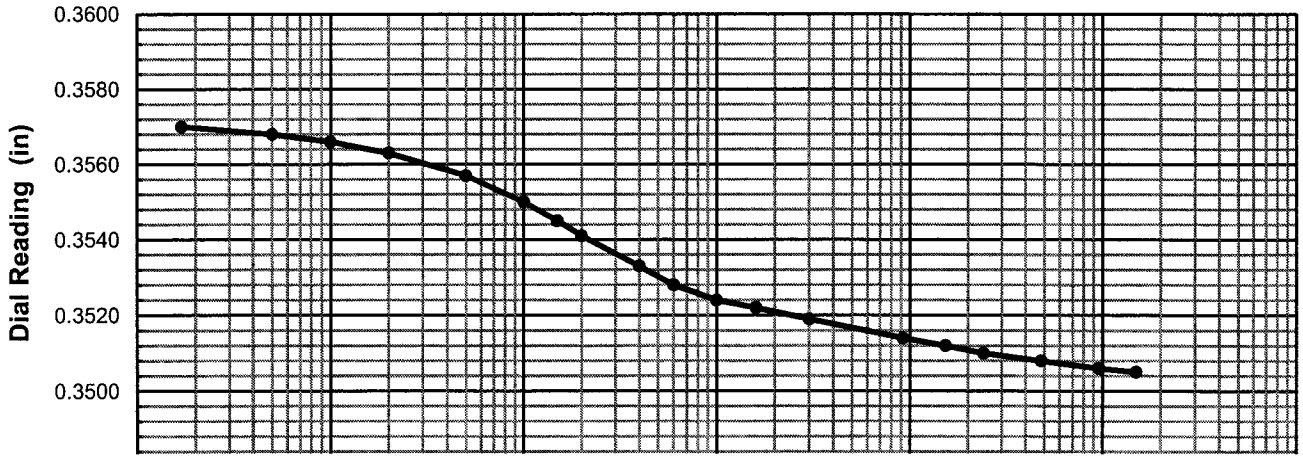
d50 = _____

t50 = _____ min

log time

d50 = 0.3547

t50 = 1.5 min



One-Dimensional Oedometer Testing Increment

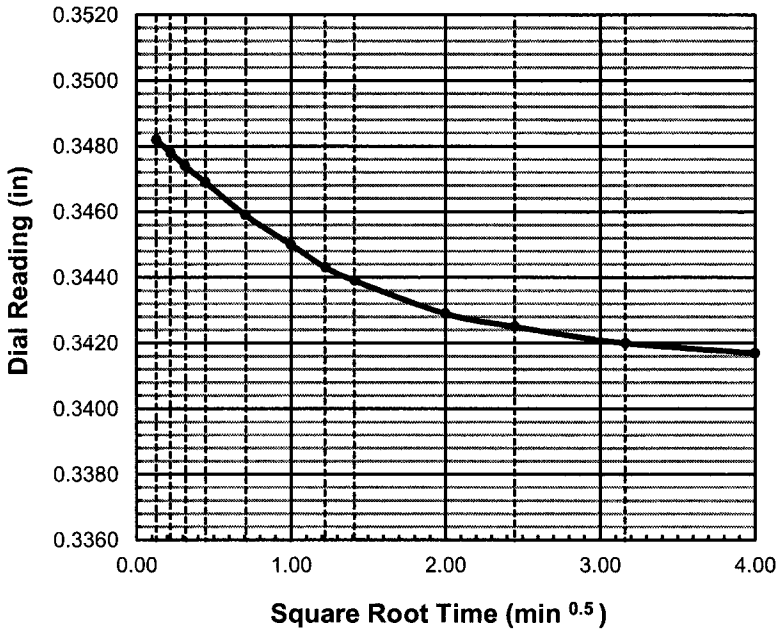
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C7 | Stage Number: 5 | Curves by: TJO

Boring No.: R-10-009 | Sample No.: 5 | Depth (ft.) 25.0

Date: 11-Sep-10 | Load (psf): 5421 | Zero Reading: 0.3667

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
11:33:55	0	0.00	0.3505
	0.02	0.13	0.3482
	0.05	0.22	0.3478
	0.10	0.32	0.3474
	0.20	0.45	0.3469
	0.50	0.71	0.3459
	1.00	1.00	0.3450
	1.50	1.22	0.3443
	2.00	1.41	0.3439
	4.0	2.00	0.3429
	6.0	2.45	0.3425
	10.0	3.16	0.3420
	16.0	4.00	0.3417
	30		0.3414
	60		0.3410
	120		0.3407
	240		0.3404
	480		0.3401
	960		0.3398
	1440		0.3397
	2731		0.3394



do = 0.3489

d90 = _____ t90 = _____ min

d100 = 0.3412

df = 0.3394

square root

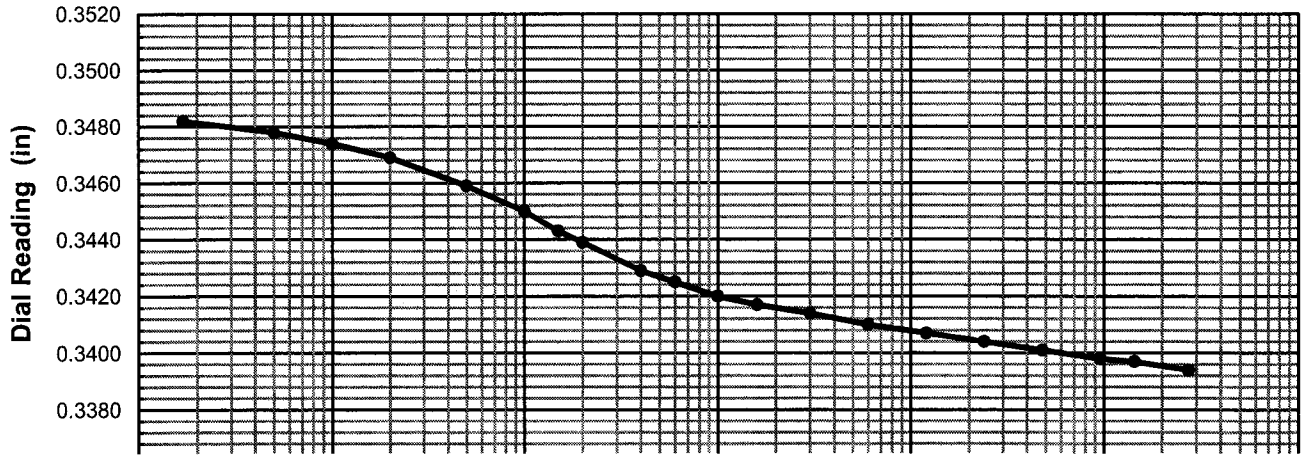
d50 = _____

t50 = _____ min

log time

d50 = 0.3450

t50 = 1.0 min



One-Dimensional Oedometer Testing Increment

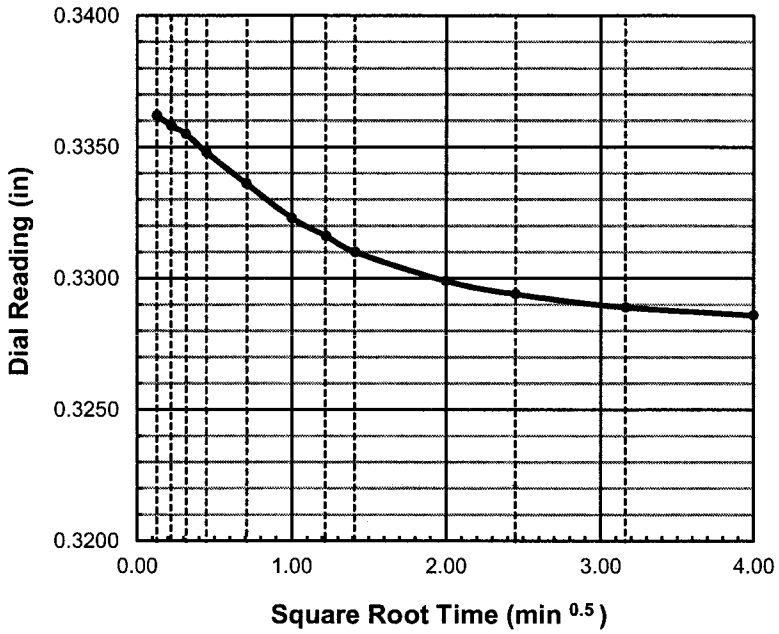
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C7 | Stage Number: 6 | Curves by: TJO

Boring No.: R-10-009 | Sample No.: 5 | Depth (ft.) 25.0

Date: 13-Sep-10 | Load (psf): 10947 | Zero Reading: 0.3667

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:10:04	0	0.00	0.3394
	0.02	0.13	0.3362
	0.05	0.22	0.3358
	0.10	0.32	0.3355
	0.20	0.45	0.3348
	0.50	0.71	0.3336
	1.00	1.00	0.3323
	1.50	1.22	0.3316
	2.00	1.41	0.3310
	4.0	2.00	0.3299
	6.0	2.45	0.3294
	10.0	3.16	0.3289
	16.0	4.00	0.3286
	30		0.3281
	60		0.3277
	120		0.3273
	240		0.3269
	480		0.3266
	960		0.3262
	1474		0.3260



do = 0.3369

d90 = _____ t90 = _____ min

d100 = 0.3280

df = 0.3260

square root

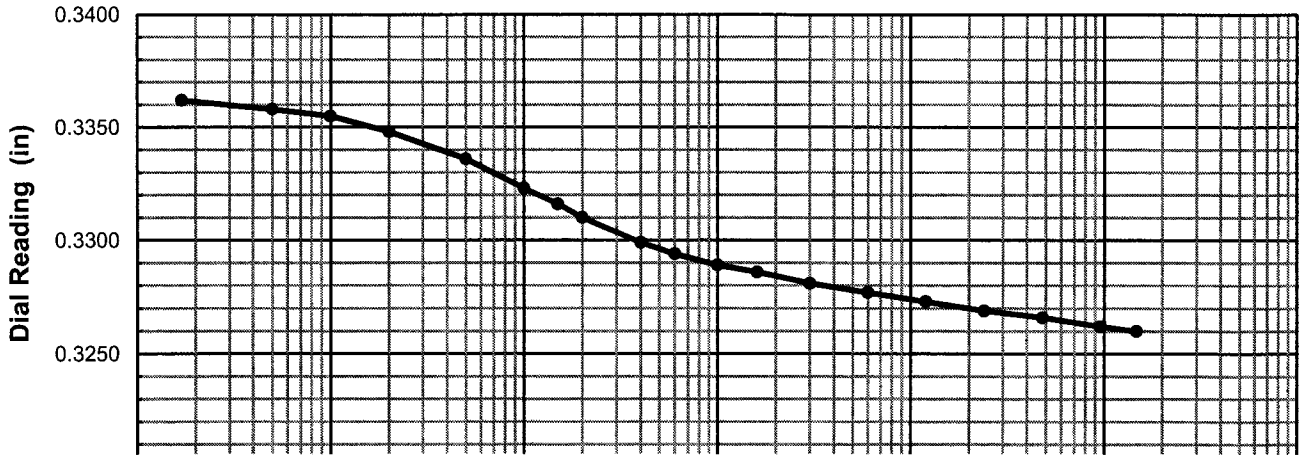
d50 = _____

t50 = _____ min

log time

d50 = 0.3325

t50 = 1.0 min



One-Dimensional Oedometer Testing Increment

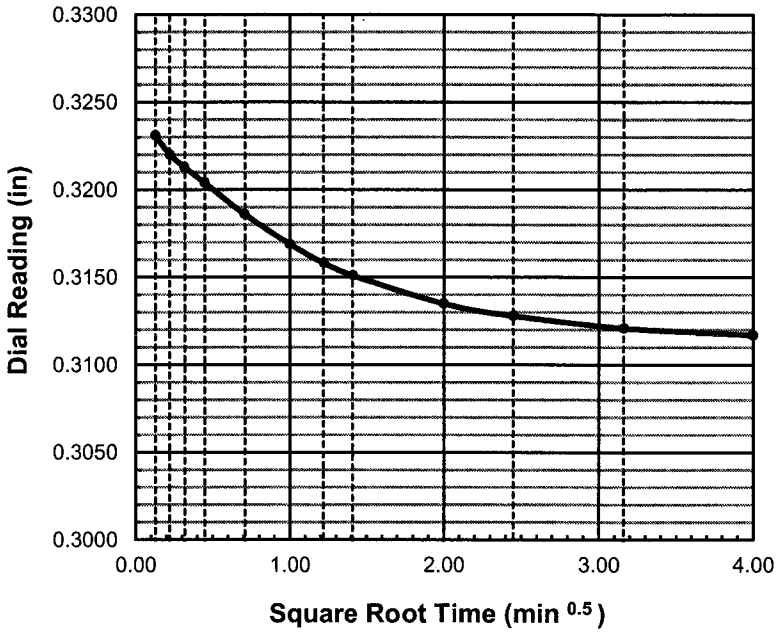
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C7 | Stage Number: 7 | Curves by: TJO

Boring No.: R-10-009 | Sample No.: 5 | Depth (ft.) 25.0

Date: 14-Sep-10 | Load (psf): 21999 | Zero Reading: 0.3667

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:45:27	0	0.00	0.3260
	0.02	0.13	0.3231
	0.05	0.22	0.3220
	0.10	0.32	0.3213
	0.20	0.45	0.3204
	0.50	0.71	0.3186
	1.00	1.00	0.3169
	1.50	1.22	0.3158
	2.00	1.41	0.3151
	4.0	2.00	0.3135
	6.0	2.45	0.3128
	10.0	3.16	0.3121
	16.0	4.00	0.3117
	30		0.3111
	60		0.3105
	120		0.3100
	240		0.3095
	480		0.3090
	960		0.3086
	1366		0.3082



do = 0.3245

d90 = _____ t90 = _____ min

d100 = 0.3100

df = 0.3082

square root

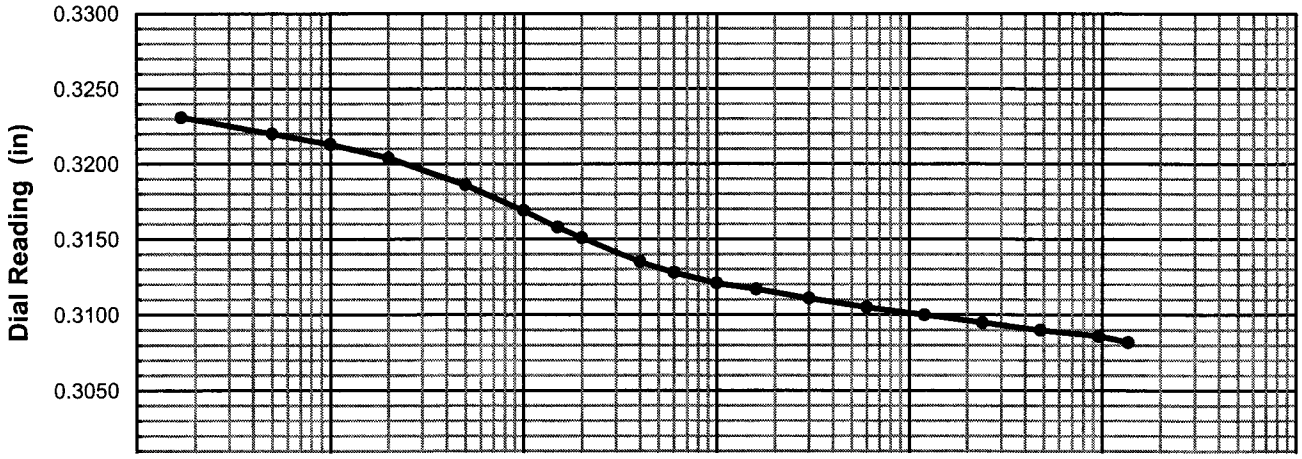
d50 = _____

t50 = _____ min

log time

d50 = 0.3172

t50 = 1.0 min



One-Dimensional Oedometer Testing Increment

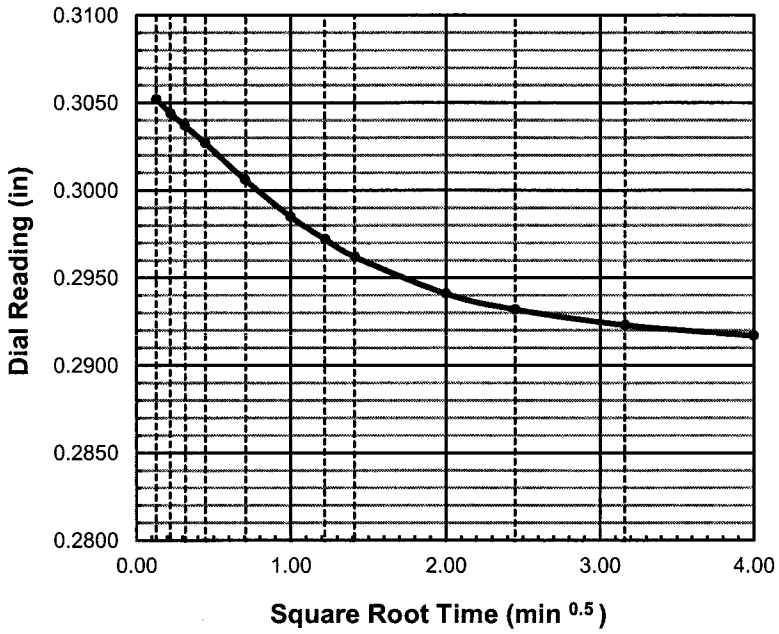
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C7 | Stage Number: 8 | Curves by: TJO

Boring No.: R-10-009 | Sample No.: 5 | Depth (ft.) 25.0

Date: 15-Sep-10 | Load (psf): 44104 | Zero Reading: 0.3667

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:31:35	0	0.00	0.3082
	0.02	0.13	0.3052
	0.05	0.22	0.3044
	0.10	0.32	0.3037
	0.20	0.45	0.3027
	0.50	0.71	0.3006
	1.00	1.00	0.2985
	1.50	1.22	0.2972
	2.00	1.41	0.2962
	4.0	2.00	0.2941
	6.0	2.45	0.2932
	10.0	3.16	0.2923
	16.0	4.00	0.2917
	30		0.2910
	60		0.2903
	120		0.2894
	240		0.2888
	480		0.2882
	960		0.2877
	1488		0.2874



do = 0.3065

d90 = _____ t90 = _____ min

d100 = 0.2910

df = 0.2874

square root

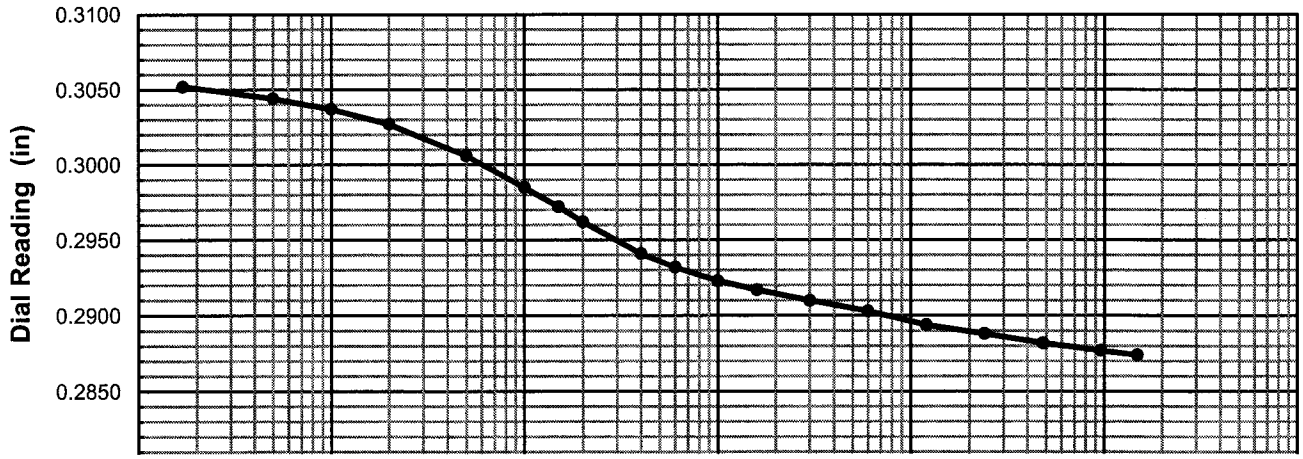
d50 = _____

t50 = _____ min

log time

d50 = 0.2987

t50 = 1.0 min



One-Dimensional Oedometer Testing Increment

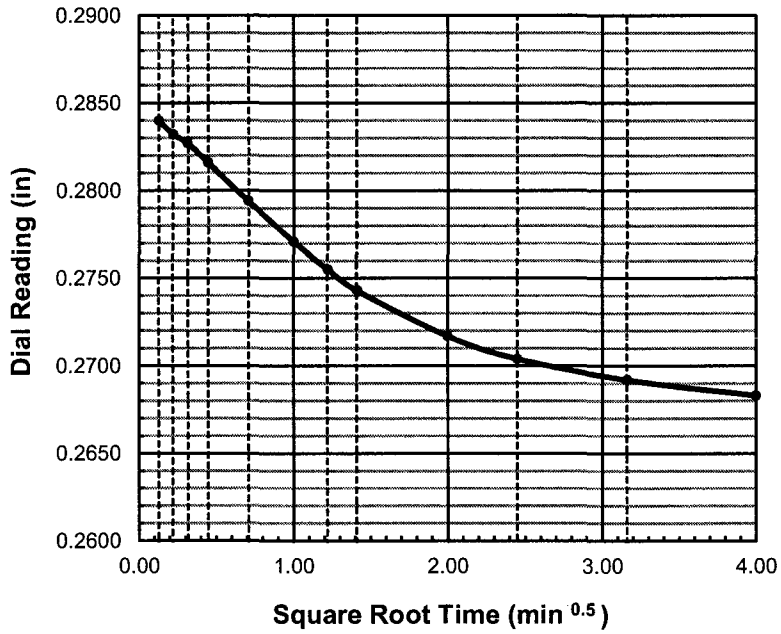
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C7 | Stage Number: 9 | Curves by: TJO

Boring No.: R-10-009 | Sample No.: 5 | Depth (ft.) 25.0

Date: 16-Sep-10 | Load (psf): 88313 | Zero Reading: 0.3667

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:21:00	0	0.00	0.2873
	0.02	0.13	0.2840
	0.05	0.22	0.2832
	0.10	0.32	0.2827
	0.20	0.45	0.2816
	0.50	0.71	0.2794
	1.00	1.00	0.2771
	1.50	1.22	0.2755
	2.00	1.41	0.2743
	4.0	2.00	0.2717
	6.0	2.45	0.2704
	10.0	3.16	0.2692
	16.0	4.00	0.2683
	30		0.2675
	60		0.2666
	120		0.2659
	240		0.2652
	480		0.2645
	960		0.2639
	1388		0.2636



do = 0.2852

d90 = _____ t90 = _____ min

d100 = 0.2690

df = 0.2636

square root

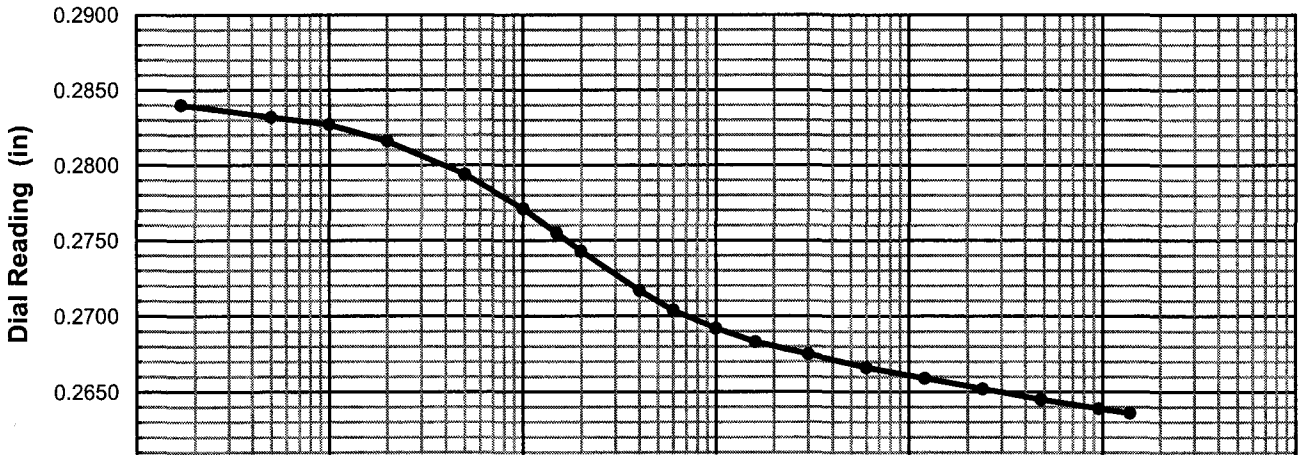
d50 = _____

t50 = _____ min

log time

d50 = 0.2771

t50 = 1.0 min



One-Dimensional Oedometer Testing Increment

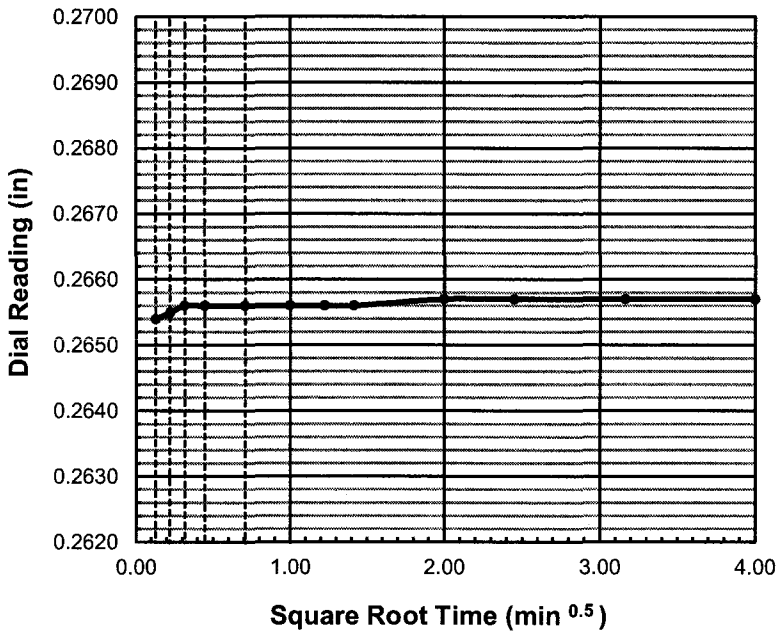
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C7 | Stage Number: 10 | Curves by: TJO

Boring No.: R-10-009 | Sample No.: 5 | Depth (ft.) 25.0

Date: 17-Sep-10 | Load (psf): 44104 | Zero Reading: 0.3667

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:29:53	0	0.00	0.2634
	0.02	0.13	0.2654
	0.05	0.22	0.2655
	0.10	0.32	0.2656
	0.20	0.45	0.2656
	0.50	0.71	0.2656
	1.00	1.00	0.2656
	1.50	1.22	0.2656
	2.00	1.41	0.2656
	4.0	2.00	0.2657
	6.0	2.45	0.2657
	10.0	3.16	0.2657
	16.0	4.00	0.2657
	30		0.2658
	60		0.2658
	120		0.2658
	310		0.2659



do = 0.2653

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2659

square root

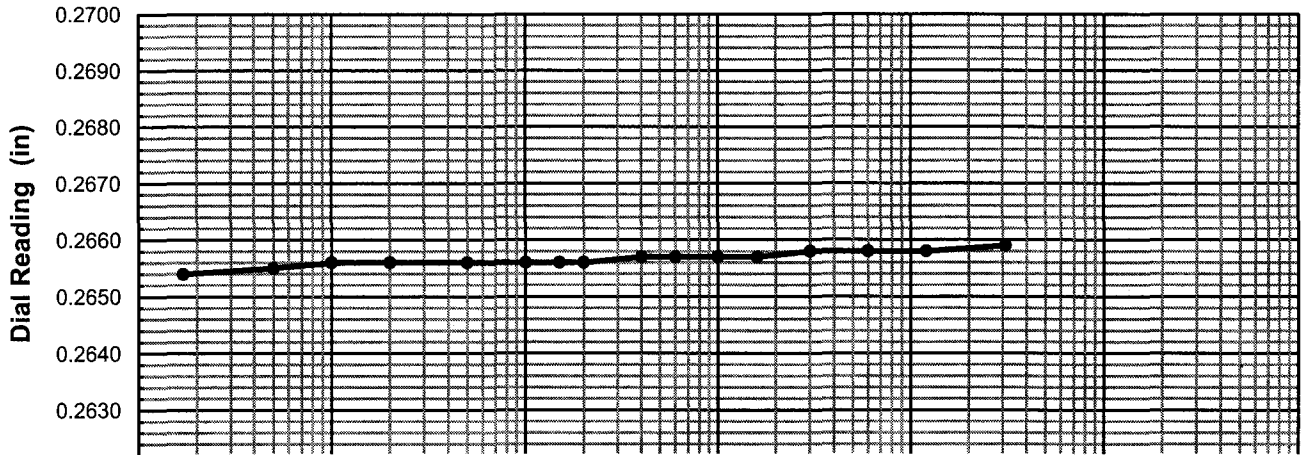
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

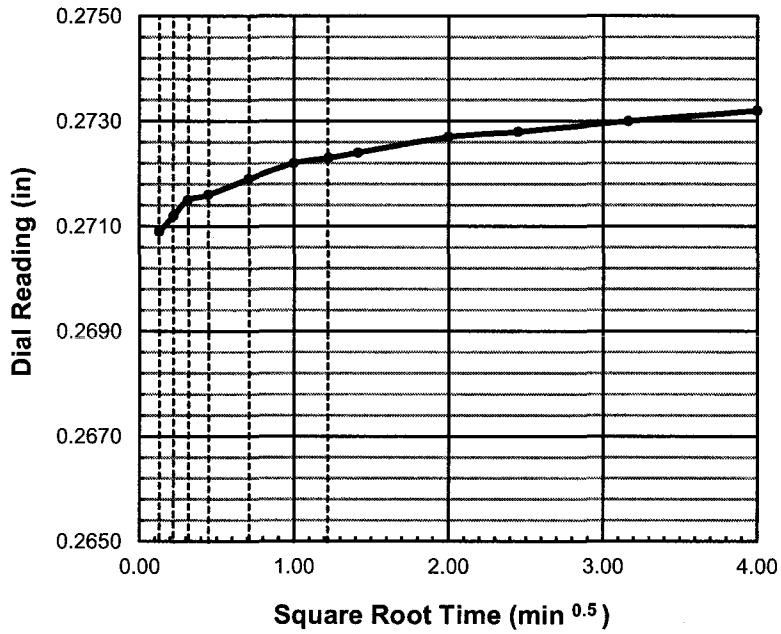
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C7 | Stage Number: 11 | Curves by: TJO

Boring No.: R-10-009 | Sample No.: 5 | Depth (ft.) 25.0

Date: 17-Sep-10 | Load (psf): 10947 | Zero Reading: 0.3667

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
13:40:51	0	0.00	0.2658
	0.02	0.13	0.2709
	0.05	0.22	0.2712
	0.10	0.32	0.2715
	0.20	0.45	0.2716
	0.50	0.71	0.2719
	1.00	1.00	0.2722
	1.50	1.22	0.2723
	2.00	1.41	0.2724
	4.0	2.00	0.2727
	6.0	2.45	0.2728
	10.0	3.16	0.2730
	16.0	4.00	0.2732
	30		0.2734
	60		0.2735
	120		0.2736
	272		0.2737



do = 0.2706

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2737

square root

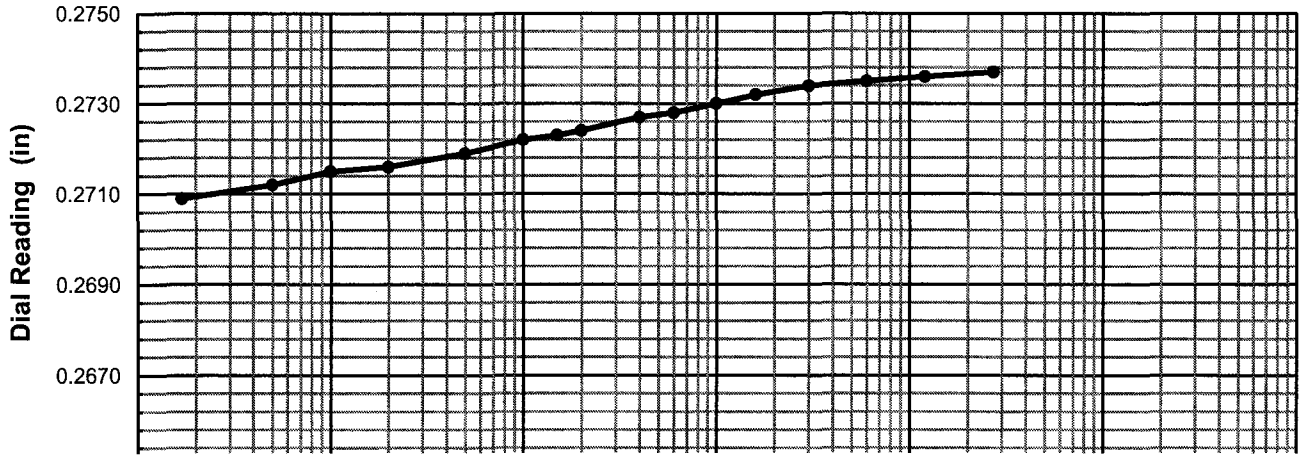
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

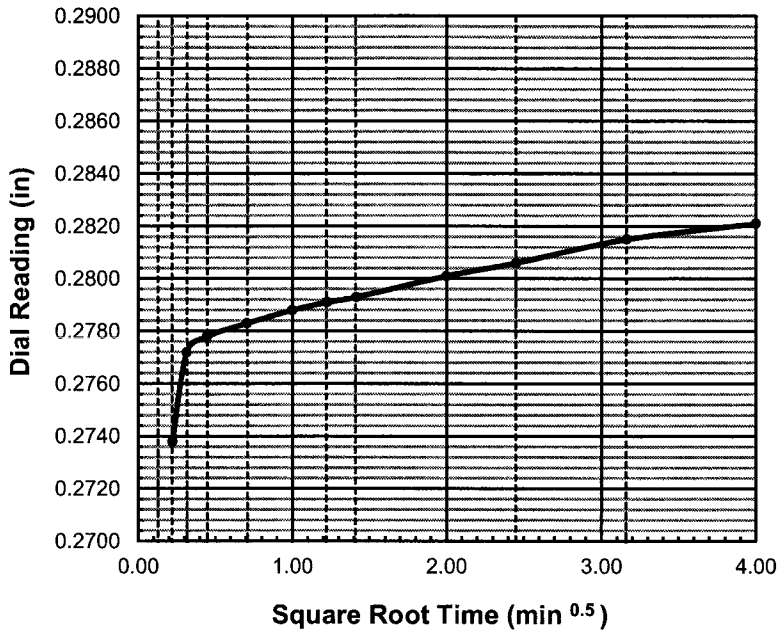
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C7 | Stage Number: 12 | Curves by: TJO

Boring No.: R-10-009 | Sample No.: 5 | Depth (ft.) 25.0

Date: 17-Sep-10 | Load (psf): 2658 | Zero Reading: 0.3667

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
18:13:31	0	0.00	0.2737
	0.05	0.22	0.2738
	0.05	0.22	0.2738
	0.10	0.32	0.2772
	0.20	0.45	0.2778
	0.50	0.71	0.2783
	1.00	1.00	0.2788
	1.50	1.22	0.2791
	2.00	1.41	0.2793
	4.0	2.00	0.2801
	6.0	2.45	0.2806
	10.0	3.16	0.2815
	16.0	4.00	0.2821
	30		0.2829
	60		0.2835
	120		0.2840
	240		0.2842
	480		0.2844
	993		0.2846



do = 0.2718

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2846

square root

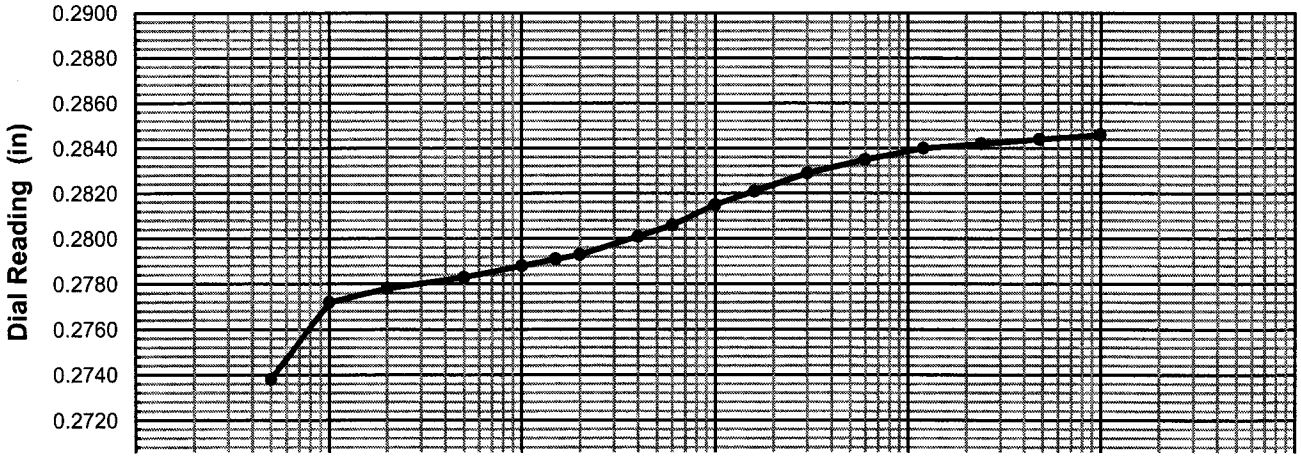
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

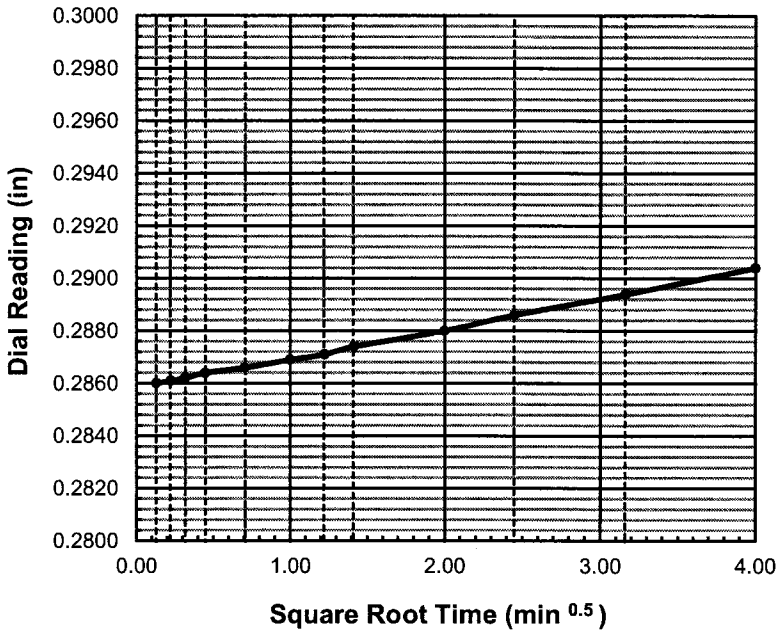
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C7 | Stage Number: 13 | Curves by: TJO

Boring No.: R-10-009 | Sample No.: 5 | Depth (ft.) 25.0

Date: 18-Sep-10 | Load (psf): 585 | Zero Reading: 0.3667

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:48:21	0	0.00	0.2847
	0.02	0.13	0.2860
	0.05	0.22	0.2861
	0.10	0.32	0.2862
	0.20	0.45	0.2864
	0.50	0.71	0.2866
	1.00	1.00	0.2869
	1.50	1.22	0.2871
	2.00	1.41	0.2874
	4.0	2.00	0.2880
	6.0	2.45	0.2886
	10.0	3.16	0.2894
	16.0	4.00	0.2904
	30		0.2920
	60		0.2937
	120		0.2952
	240		0.2962
	480		0.2969
	960		0.2975
	1440		0.2977
	2776		0.2981



do = 0.2858

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2981

square root

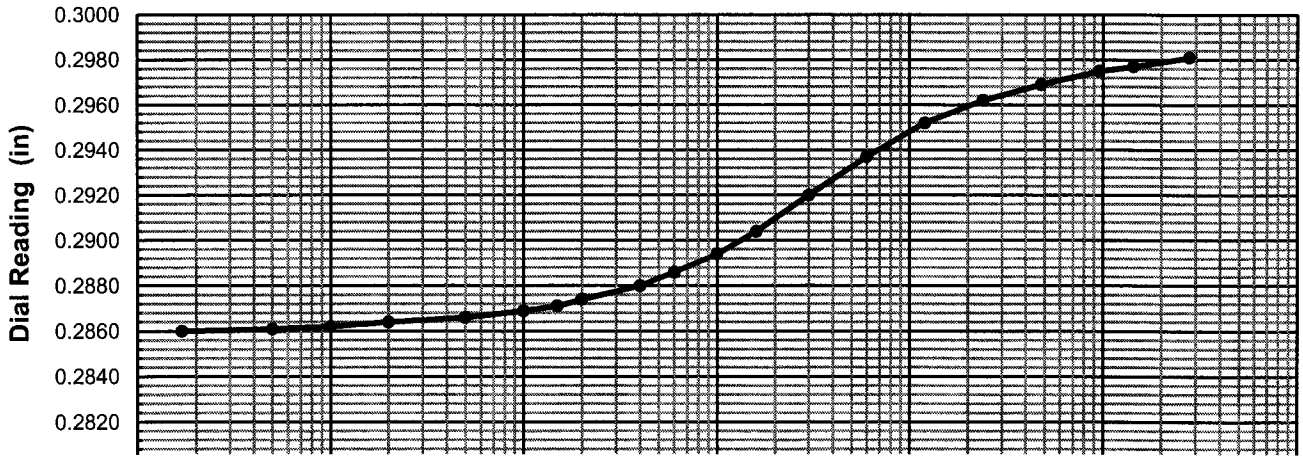
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

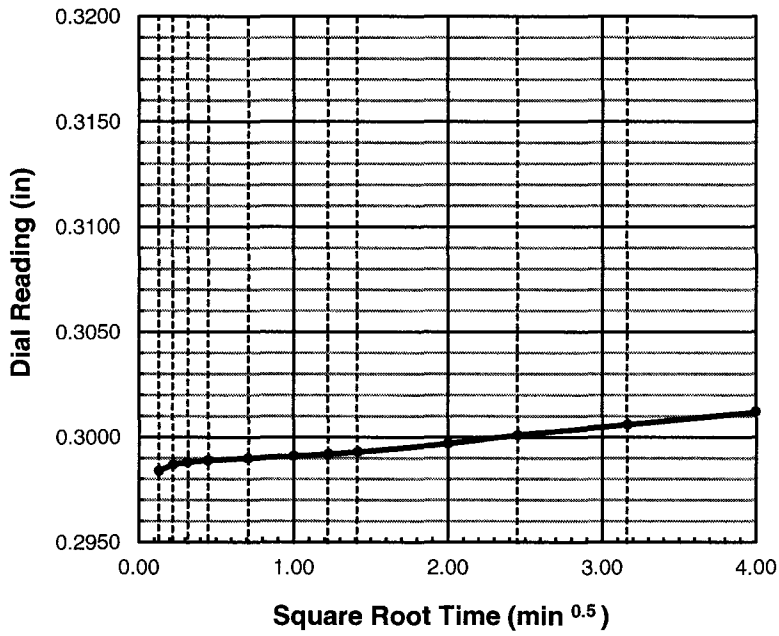
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C7 | Stage Number: 14 | Curves by: TJO

Boring No.: R-10-009 | Sample No.: 5 | Depth (ft.) 25.0

Date: 20-Sep-10 | Load (psf): 1276 | Zero Reading: 0.3667

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:06:10	0	0.00	0.2981
	0.02	0.13	0.2984
	0.05	0.22	0.2987
	0.10	0.32	0.2988
	0.20	0.45	0.2989
	0.50	0.71	0.2990
	1.00	1.00	0.2991
	1.50	1.22	0.2992
	2.00	1.41	0.2993
	4.0	2.00	0.2997
	6.0	2.45	0.3001
	10.0	3.16	0.3006
	16.0	4.00	0.3012
	30		0.3024
	60		0.3041
	120		0.3063
	240		0.3086
	480		0.3106
	960		0.3120
	1440		0.3128
	2880		0.3137
	4260		0.3142



do = 0.2982

d90 = _____ t90 = _____ min

d100 = _____

df = 0.3142

square root

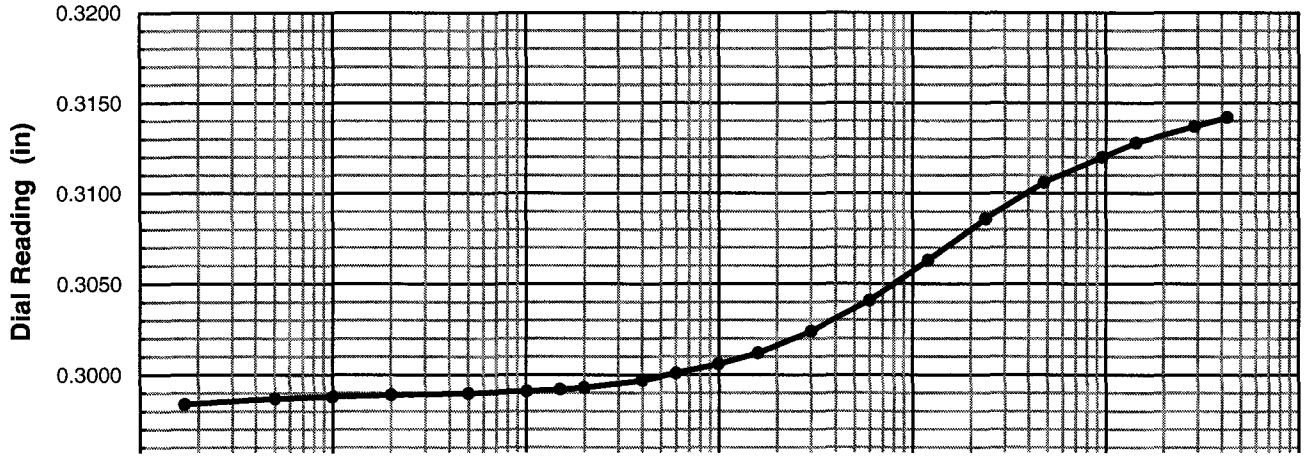
d50 = _____

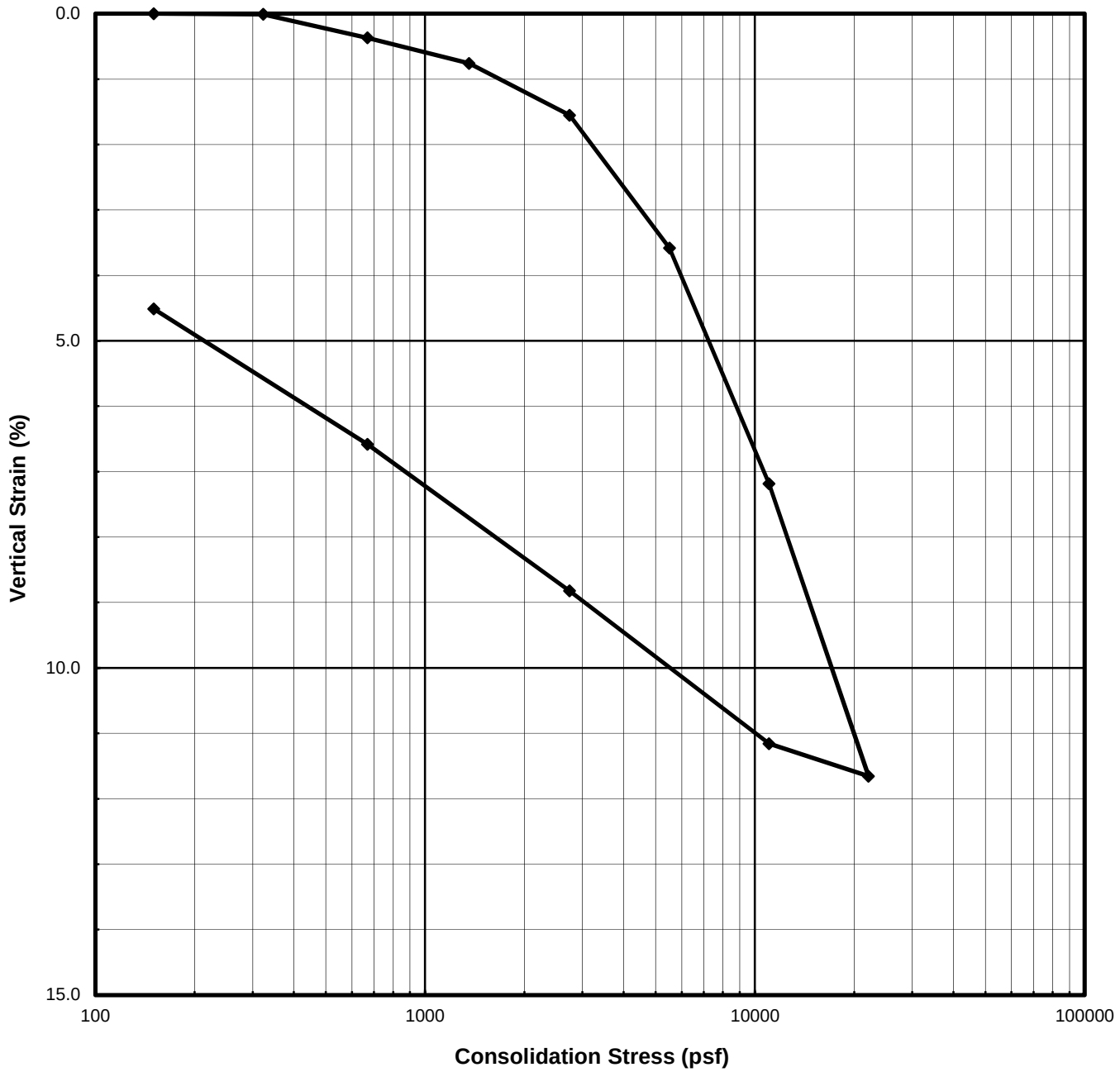
t50 = _____ min

log time

d50 = _____

t50 = _____ min





Description:	**Very dark greenish gray Clay with sand (CH)**							
Boring No.:	A-11-020		Liquid Limit		%	Specific Gravity	2.70	assumed
Sample No.:	2		Plasticity Index		%	Strain for Saturation	4.37	%
Depth (ft | m)	6.5	1.98	Fines Content	83.1	%	Water added at	67	psf

	Water Content (%)	Total Unit Weight		Dry Unit Weight		Saturation (%)	Void Ratio	Height		Diameter	
		(pcf)	(kN/m^3)	(pcf)	(kN/m^3)			(inches)	(cm)	(inches)	(cm)
Initial	25.1	119.0	18.70	95.2	14.95	88.1	0.77	0.946	2.40	2.418	6.142
Final	26.2	125.2	19.67	99.2	15.58	101.8	0.70	0.908	2.31		

URS

I-5 & SR-74 IC

Project Number: 30989830
Test Start Date: 5/10/2011

CONSOLIDATION TEST
ASTM D2435

SUBMITTED BY: Thomas J O'Meara

Con SR 74 A11020 006.xls

One-Dimensional Oedometer Testing
Set-up / Take down Worksheet
ASTM D2435

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM

Boring No.: A-11-020
Sample No.: 2
Depth (ft): 6.5

Apparatus No.: C-8

Specimen Description : Very dark greenish gray Clay with sand (CH)
Duration: end of increment

Ring Number: R25
Weight of Wet Spec. and Ring: 354.50 g
Weight of Ring: 218.71 g
Initial Weight of Wet Spec.: 135.79 g

Take Down Weight with Ring: 355.50 g

Excess Oven-dried Cont. No.: rp1
Weight of Cont. and Dry Spec.: 116.31 g
Weight of Container: 116.09 g
Weight of Excess Dried Soil: 0.22 g
Weight of Excess Wet Soil 0.28 g
Final Weight of Wet Specimen: 137.07 g

Height of Specimen (in)

	Initial	Final
1	0.943	0.909
2	0.954	0.911
3	0.941	0.906
4	0.943	0.919
5	0.951	0.895
Ave:	0.946	0.908

Initial Height - Final Height = 0.038 in
Change in Dial (Dd) = 0.047 in
Initial Height - Dd = 0.900 in
Final Height + Dd = 0.955 in
Weight of Top Cap = 373.48 g

Specimen Analysis					Initial Trim	Initial Spec.	Final
				Container Number:	sx6	**XXXXX**	s7
				Mass of Container and Wet Specimen M1 (g)	300.49	135.79	213.14
				Mass of Container and Dry Specimen, M2 (g)	261.47	108.58	185.52
				Mass of Container, M3 (g)	108.79	**XXXXX**	80.25
				Water Content, w (%)	25.56	25.06	26.24
				Mass of Wet Specimen, M4 (g)	135.79	135.79	137.07
				Mass of Dry Specimen, M5 (g)	108.58	108.58	108.58
Nominal		Measured	x	Specimen Height, H (in)	0.946	0.946	0.908
Nominal	x	Measured		Specimen Diameter, D (in)	2.418	2.418	2.418
				Area of Specimen, A (in^2)	4.592	4.592	4.592
				Volume of Specimen, V (cc)	71.22	71.22	68.33
Assumed	x	Measured		Specific Gravity, Gs	2.70	2.70	2.70
				Wet Unit Weight, WUW (pcf)	**119.0**	**119.0**	**125.2**
				Dry Unit Weight, DUW (pcf)	**94.8**	**95.2**	**99.2**
				Void Ratio	**0.775**	**0.768**	**0.696**
				Degree of Saturation, S (%)	**89.1**	**88.1**	**101.8**

Set-up by: TJO
Date: 5/10/11
Calculated by: TJO
Checked by: TJO
Strain for Saturation (%) = **4.372**

One-Dimensional Oedometer Testing

Loading Worksheet

ASTM D2435

Project Number: 30989830 Boring No.: A-11-020

Project Name: I-5 & SR-74 IC Sample No.: 2

Project Engineer: FM Apparatus No.: C-8 Depth (ft): 6.5

Initial Dial Reading: 0.3791 inch Initial Specimen Height: 0.946 inch

	Stage No.	Normal Stress (psf)	Dial Reading (in)		Compressibility Correction (in)	Vertical Strain (%)	
			End of Duration	End of Increment		End of Duration	End of Increment
w	Seat	67		0.3791	0.0000		0.00
	1	150		0.3791	0.0004		-0.04
	2	323	0.3780	0.3781	0.0009	0.02	0.01
	3	669	0.3736	0.3736	0.0020	0.37	0.37
	4	1360	0.3684	0.3684	0.0035	0.76	0.76
	5	2743	0.3596	0.3593	0.0051	1.52	1.55
	6	5508	0.3384	0.3382	0.0070	3.56	3.58
	7	11039	0.3020	0.3017	0.0094	7.15	7.19
	8	22100	0.2590	0.2568	0.0120	11.42	11.65
	9	11039		0.2628	0.0107		11.16
	10	2743		0.2880	0.0076		8.82
	11	669		0.3114	0.0054		6.58
	12	150		0.3324	0.0040		4.51
	13						
	14						
	15						
	16						
	17						
	18						
	19						
	20						
	21						
	22						
	23						
	24						
	25						
	26						
	27						
	28						
	29						
	30						
	31						
	32						
	33						

Final dial reading prior to take down (inch): 0.3324 Take down by: TJO Date: 5/31/11

One-Dimensional Oedometer Testing
ASTM D2435
Table of Incremental Values

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM
Apparatus No.: C-8

Boring No.: A-11-020
Sample No.: 2
Depth (ft): 6.5
Inundation at stage: Seat

10 **20** Hanger Ratios

Stage Number	Incremental Weight Applied (kg) Back	Front	Vertical Stress (psf)	Specimen Hieght (in)	Deflections (in) $d_{initial}$	d_o	d_{50}	d_{100}	d_{final}	Porous Stone (in)	t_{50} (min)	cv (in^2/min)	cv (ft^2/day)
Top Cap			26	0.946	0.3791	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
Seat	0.06		67	0.946	0.3791	XXXXX	XXXXX	XXXXX	0.3791	0.0000	XXXXX	XXXXX	XXXXX
1		0.06	150	0.946	0.3791	0.3791	XXXXX	XXXXX	0.3791	0.0004	XXXXX	XXXXX	XXXXX
2	0.25		323	0.944	0.3791	0.3784	0.3782	0.3780	0.3781	0.0009	XXXXX	XXXXX	XXXXX
3	0.50		669	0.938	0.3781	0.3762	0.3749	0.3736	0.3736	0.0020	XXXXX	XXXXX	XXXXX
4	1.0		1360	0.929	0.3736	0.3713	0.3699	0.3684	0.3684	0.0035	0.60	0.071	0.708
5		1.0	2743	0.915	0.3684	0.3665	0.3631	0.3596	0.3593	0.0051	6.00	0.007	0.069
6	4.0		5508	0.887	0.3593	0.3548	0.3466	0.3384	0.3382	0.0070	7.00	0.006	0.055
7		4.0	11039	0.841	0.3382	0.3311	0.3166	0.3020	0.3017	0.0094	38.00	0.001	0.009
8		8.0	22100	0.784	0.3017	0.2957	0.2774	0.2590	0.2568	0.0120	60.00	0.001	0.005
9		-8.0	11039	0.779	0.2568	0.2584	XXXXX	XXXXX	0.2628	0.0107	XXXXX	XXXXX	XXXXX
10	-4.0	-4.0	2743	0.797	0.2628	0.2657	XXXXX	XXXXX	0.2880	0.0076	0.50	0.063	0.625
11	-1.0	-1.0	669	0.815	0.2880	0.2890	XXXXX	XXXXX	0.3114	0.0054	XXXXX	XXXXX	XXXXX
12	-0.8		150	0.832	0.3114	0.3119	XXXXX	XXXXX	0.3324	0.0040	XXXXX	XXXXX	XXXXX
13			150	XXXXX	0.3324	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
14			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
15			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
16			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
17			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
18			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
19			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
20			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
21			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
22			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
23			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
24			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
25			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX

One-Dimensional Oedometer Testing Increment

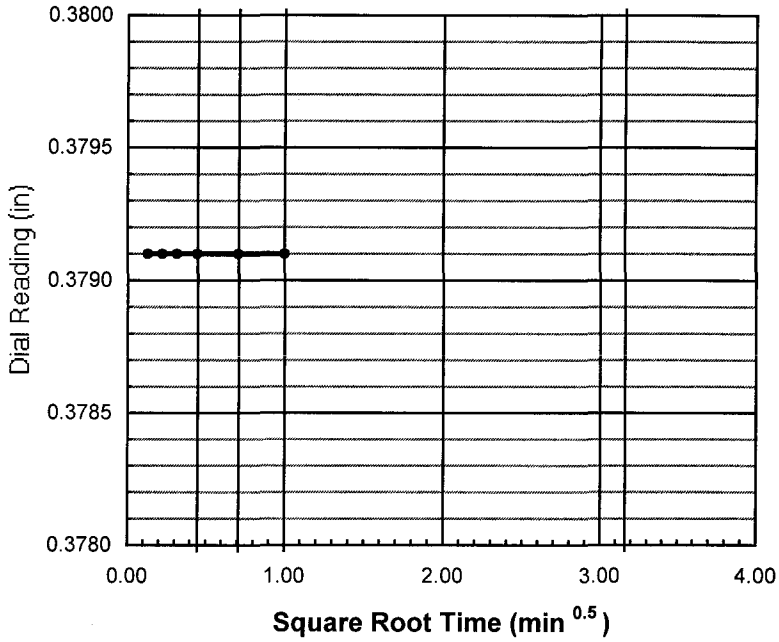
for ASTM D2435, method B

Project Number: 30989830 Apparatus No.: C-8 Stage Number: 1 Curves by: TJO

Boring No.: A-11-020 Sample No.: 2 Depth (ft.) 6.5

Date: 10-May-11 Load (psf): 150 Zero Reading: 0.3791

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
17:01:18	0	0.00	0.3791
	0.02	0.13	0.3791
	0.05	0.22	0.3791
	0.10	0.32	0.3791
	0.20	0.45	0.3791
	0.50	0.71	0.3791
	1.00	1.00	0.3791



do = 0.3791

d90 = _____ t90 = _____ min

d100 = _____

df = 0.3791

square root

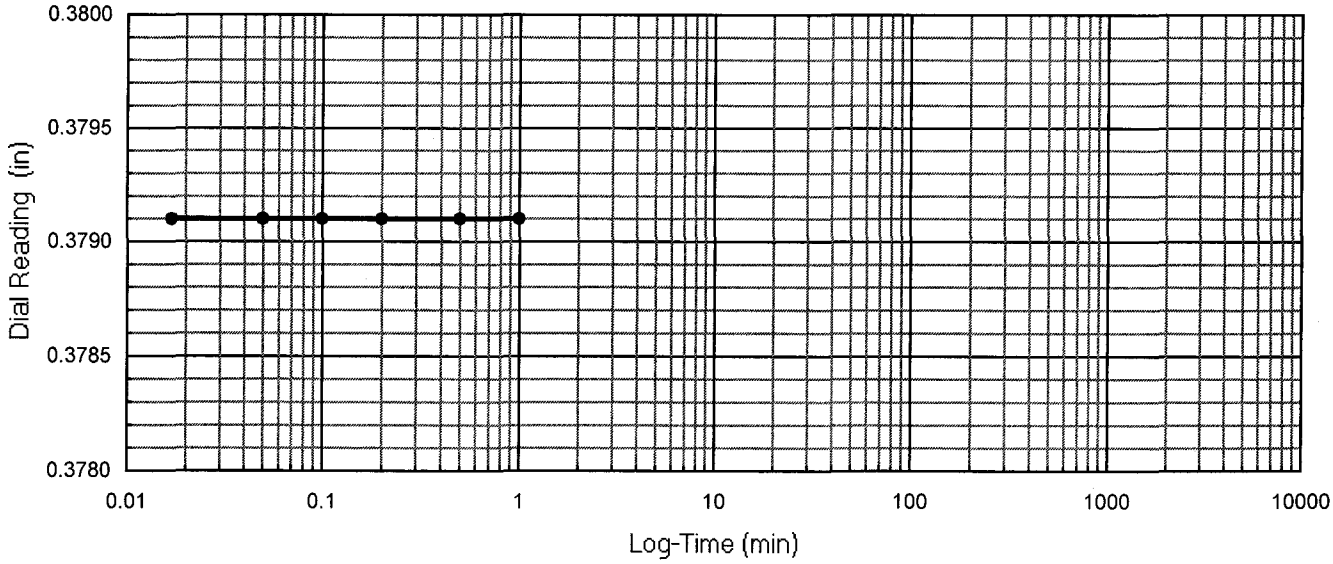
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

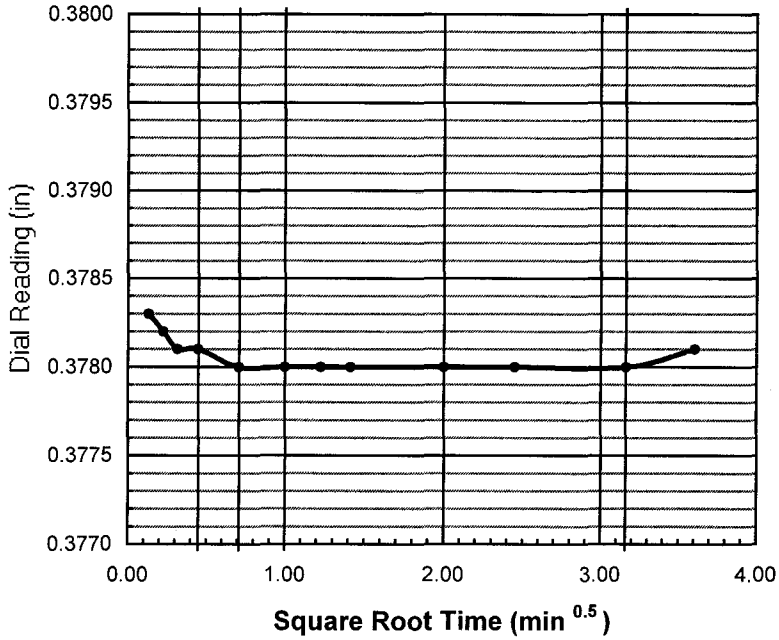
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C-8 | Stage Number: 2 | Curves by: TJO

Boring No.: A-11-020 | Sample No.: 2 | Depth (ft.) 6.5

Date: 10-May-11 | Load (psf): 323 | Zero Reading: 0.3791

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
17:02:17	0	0.00	0.3790
	0.02	0.13	0.3783
	0.05	0.22	0.3782
	0.10	0.32	0.3781
	0.20	0.45	0.3781
	0.50	0.71	0.3780
	1.00	1.00	0.3780
	1.50	1.22	0.3780
	2.00	1.41	0.3780
	4.0	2.00	0.3780
	6.0	2.45	0.3780
	10.0	3.16	0.3780
swelling	13.0	3.61	0.3781



do = 0.3784

d90 = _____ t90 = _____ min

d100 = 0.3780

df = 0.3781

square root

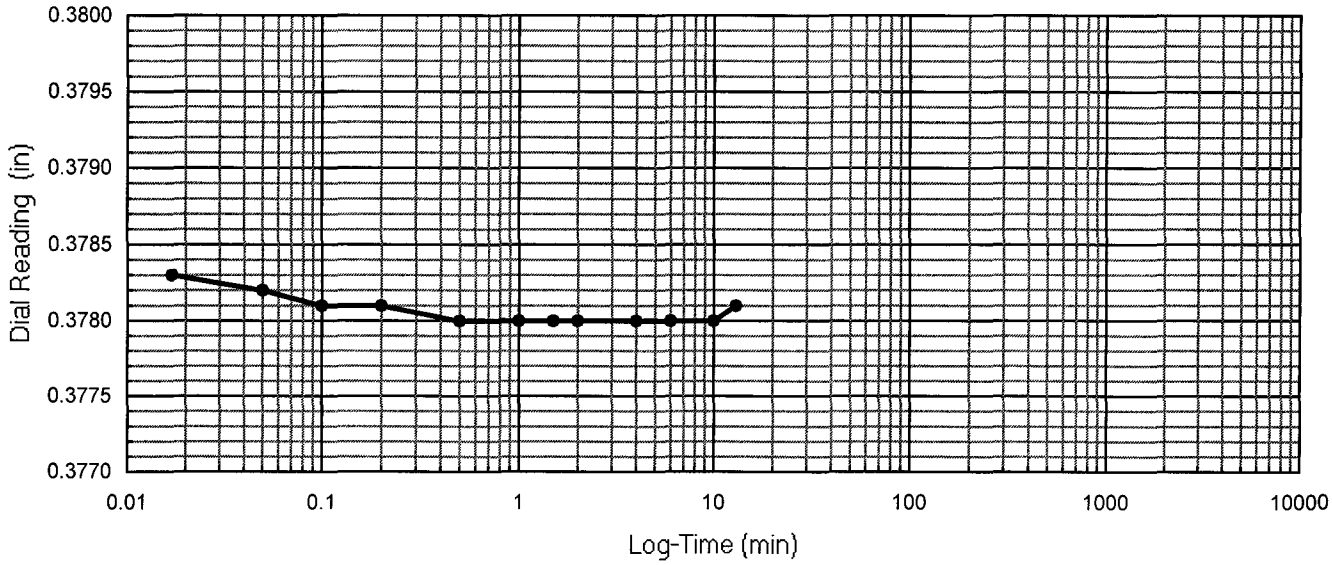
d50 = _____

t50 = _____ min

log time

d50 = 0.3782

t50 = _____ min



One-Dimensional Oedometer Testing Increment

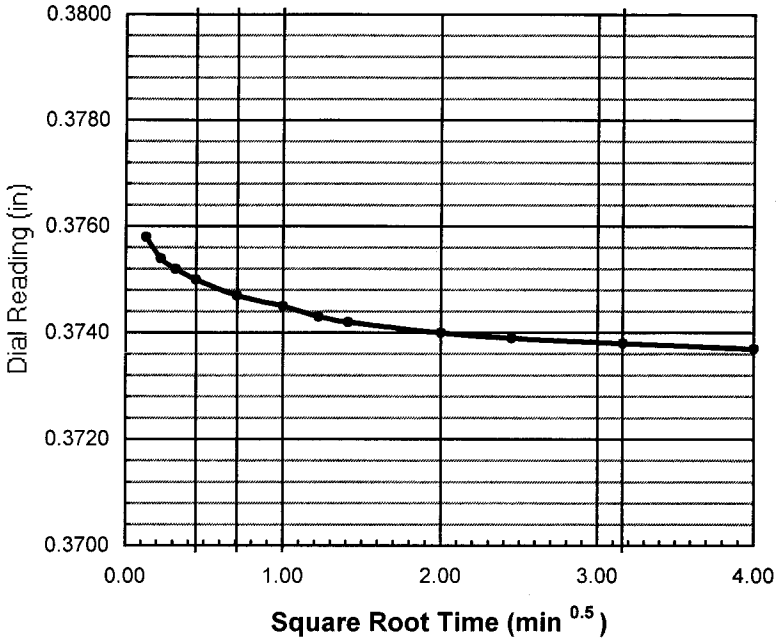
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C-8 | Stage Number: 3 | Curves by: TJO

Boring No.: A-11-020 | Sample No.: 2 | Depth (ft.) 6.5

Date: 10-May-11 | Load (psf): 669 | Zero Reading: 0.3791

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
17:15:24	0	0.00	0.3781
	0.02	0.13	0.3758
	0.05	0.22	0.3754
	0.10	0.32	0.3752
	0.20	0.45	0.3750
	0.50	0.71	0.3747
	1.00	1.00	0.3745
	1.50	1.22	0.3743
	2.00	1.41	0.3742
	4.0	2.00	0.3740
	6.0	2.45	0.3739
	10.0	3.16	0.3738
	16.0	4.00	0.3737
	30		0.3737
	60		0.3736
	90		0.3736



do = 0.3762

d90 = _____ t90 = _____ min

d100 = 0.3736

df = 0.3736

square root

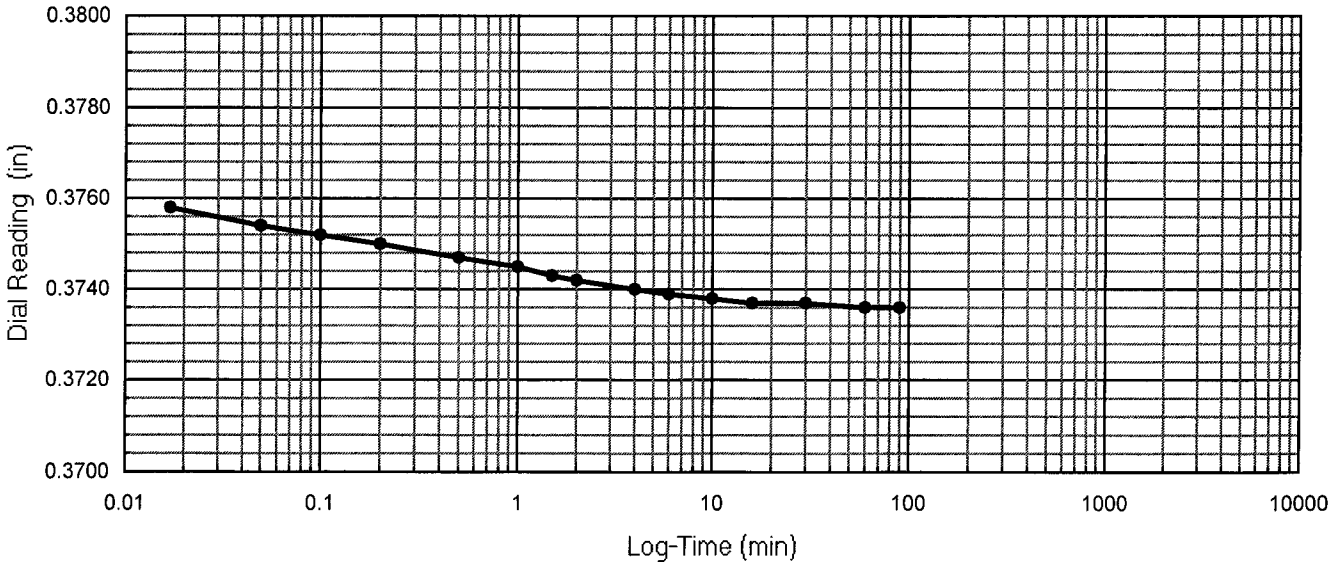
d50 = _____

t50 = _____ min

log time

d50 = 0.3749

t50 = _____ min



One-Dimensional Oedometer Testing Increment

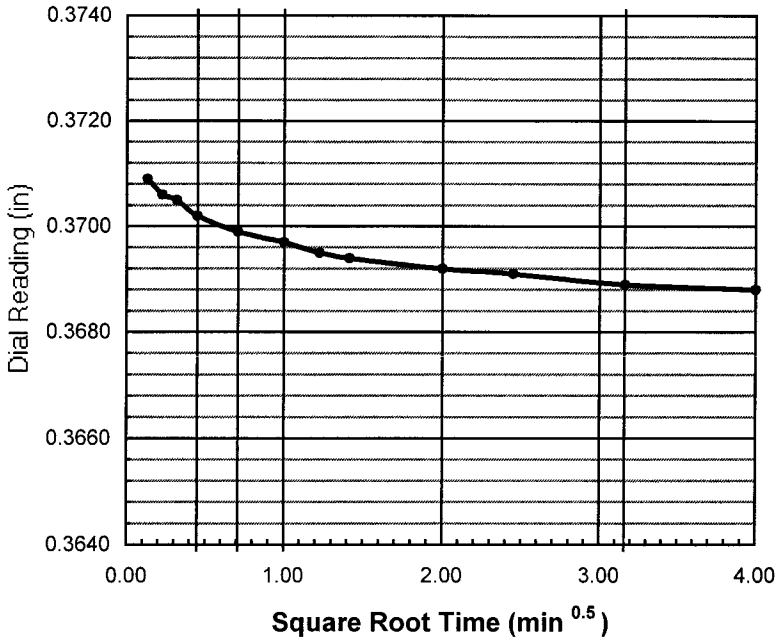
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C-8 | Stage Number: 4 | Curves by: TJO

Boring No.: A-11-020 | Sample No.: 2 | Depth (ft.) 6.5

Date: 10-May-11 | Load (psf): 1360 | Zero Reading: 0.3791

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
18:46:26	0	0.00	0.3736
	0.02	0.13	0.3709
	0.05	0.22	0.3706
	0.10	0.32	0.3705
	0.20	0.45	0.3702
	0.50	0.71	0.3699
	1.00	1.00	0.3697
	1.50	1.22	0.3695
	2.00	1.41	0.3694
	4.0	2.00	0.3692
	6.0	2.45	0.3691
	10.0	3.16	0.3689
	16.0	4.00	0.3688
	30		0.3686
	60		0.3685
	120		0.3685
	240		0.3684
	480		0.3684
	878		0.3684



do = 0.3713

d90 = _____ t90 = _____ min

d100 = 0.3684

df = 0.3684

square root

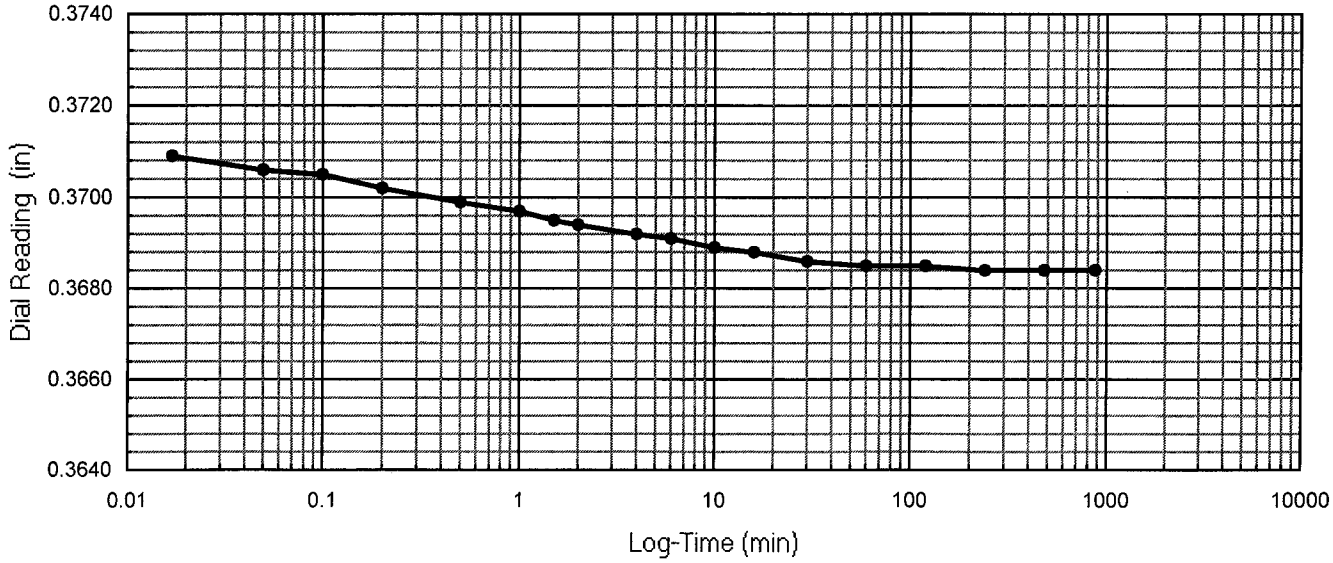
d50 = _____

t50 = _____ min

log time

d50 = 0.3698

t50 = 0.6 min



One-Dimensional Oedometer Testing Increment

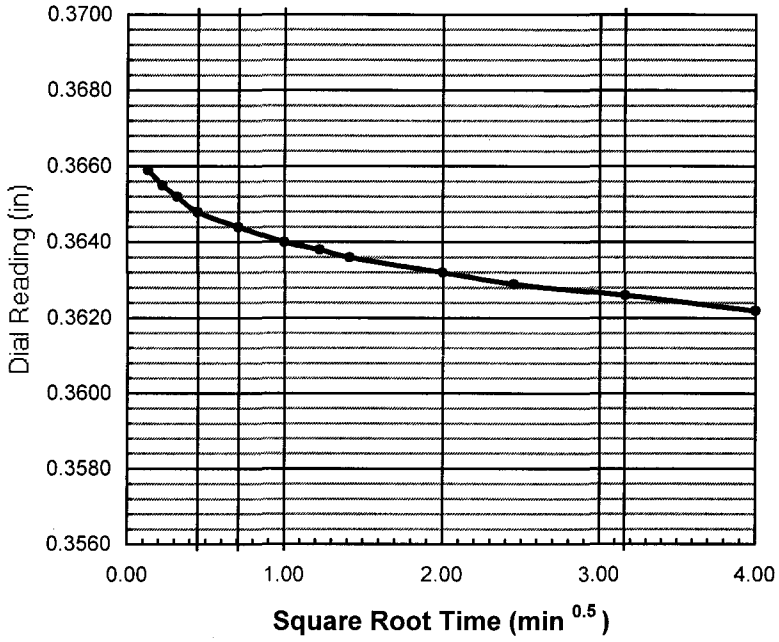
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C-8 | Stage Number: 5 | Curves by: TJO

Boring No.: A-11-020 | Sample No.: 2 | Depth (ft.) 6.5

Date: 11-May-11 | Load (psf): 2743 | Zero Reading: 0.3791

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:25:11	0	0.00	0.3684
	0.02	0.13	0.3659
	0.05	0.22	0.3655
	0.10	0.32	0.3652
	0.20	0.45	0.3648
	0.50	0.71	0.3644
	1.00	1.00	0.3640
	1.50	1.22	0.3638
	2.00	1.41	0.3636
	4.0	2.00	0.3632
	6.0	2.45	0.3629
	10.0	3.16	0.3626
	16.0	4.00	0.3622
	30		0.3617
	60		0.3612
	120		0.3607
	240		0.3603
	480		0.3599
	1440		0.3594
	1984		0.3593



do = 0.3665

d90 = _____ t90 = _____ min

d100 = 0.3596

df = 0.3593

square root

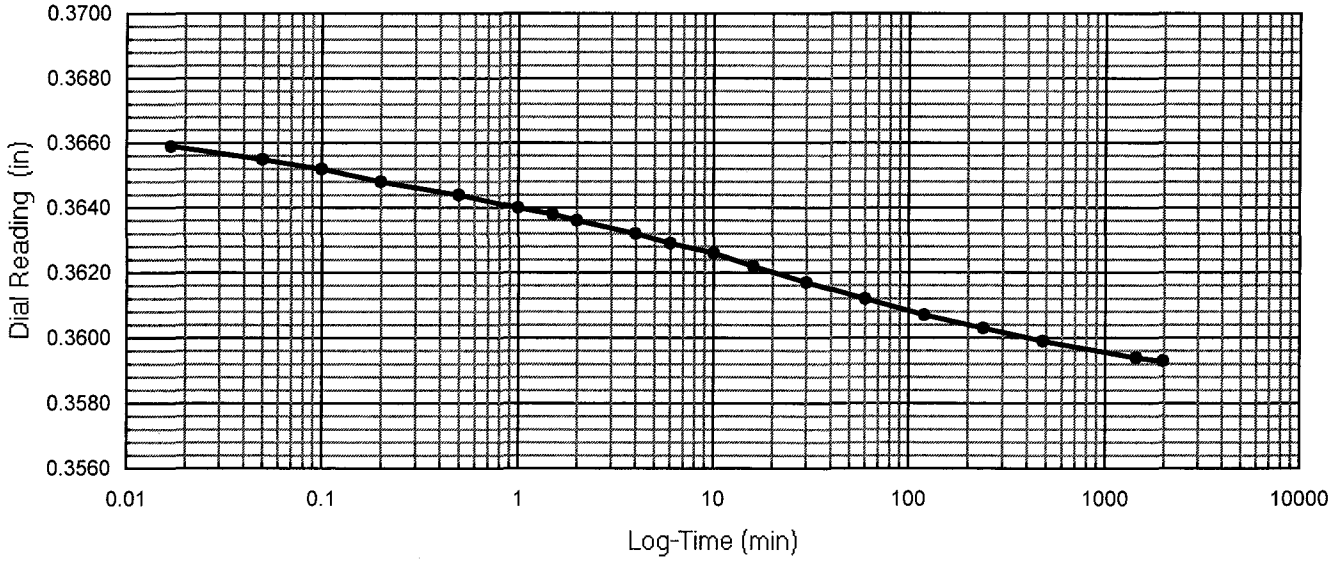
d50 = _____

t50 = _____ min

log time

d50 = 0.3630

t50 = 6.0 min



One-Dimensional Oedometer Testing Increment

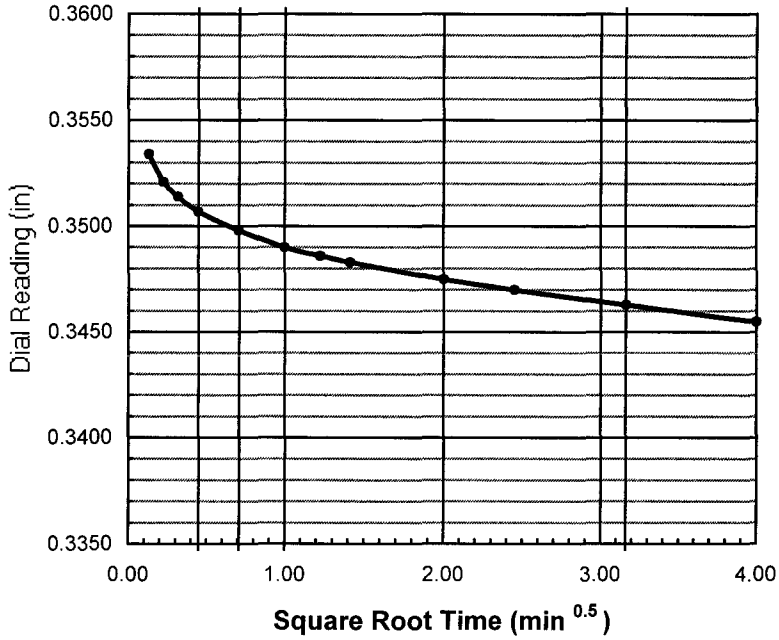
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C-8 | Stage Number: 6 | Curves by: TJO

Boring No.: A-11-020 | Sample No.: 2 | Depth (ft.) 6.5

Date: 12-May-11 | Load (psf): 5508 | Zero Reading: 0.3791

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
18:30:20	0	0.00	0.3593
	0.02	0.13	0.3534
	0.05	0.22	0.3521
	0.10	0.32	0.3514
	0.20	0.45	0.3507
	0.50	0.71	0.3498
	1.00	1.00	0.3490
	1.50	1.22	0.3486
	2.00	1.41	0.3483
	4.0	2.00	0.3475
	6.0	2.45	0.3470
	10.0	3.16	0.3463
	16.0	4.00	0.3455
	30		0.3442
	60		0.3426
	120		0.3410
	240		0.3398
	480		0.3389
	878		0.3382



do = 0.3548

d90 = ____ t90 = ____ min

d100 = 0.3384

df = 0.3382

square root

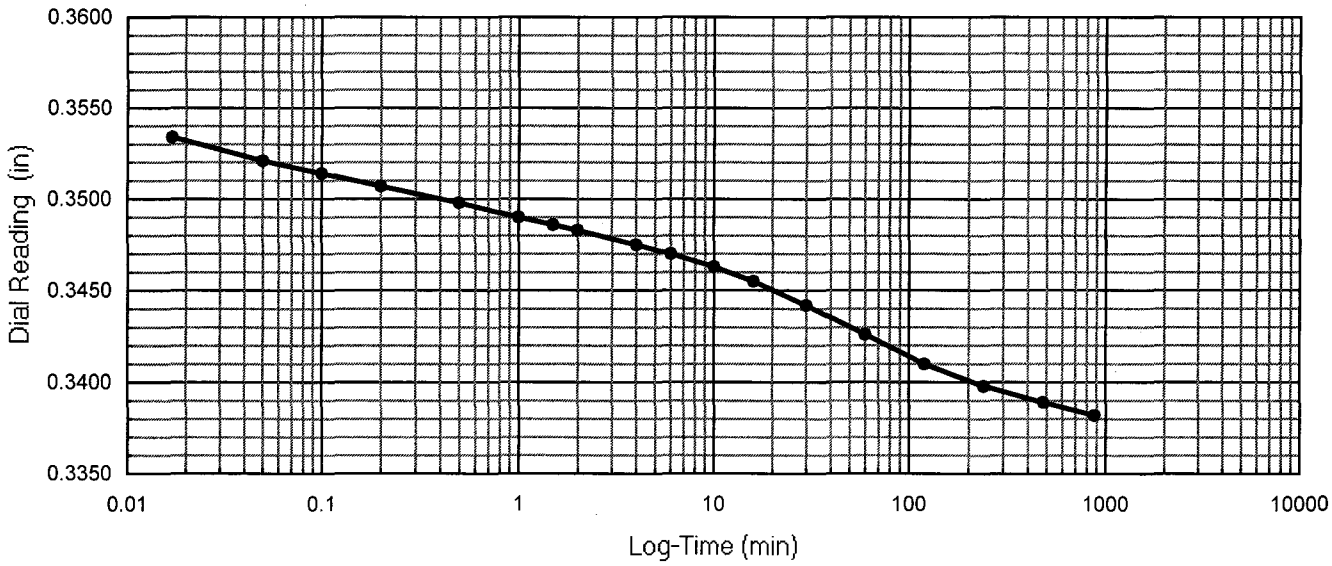
d50 = ____

t50 = ____ min

log time

d50 = 0.3466

t50 = 7.0 min



One-Dimensional Oedometer Testing Increment

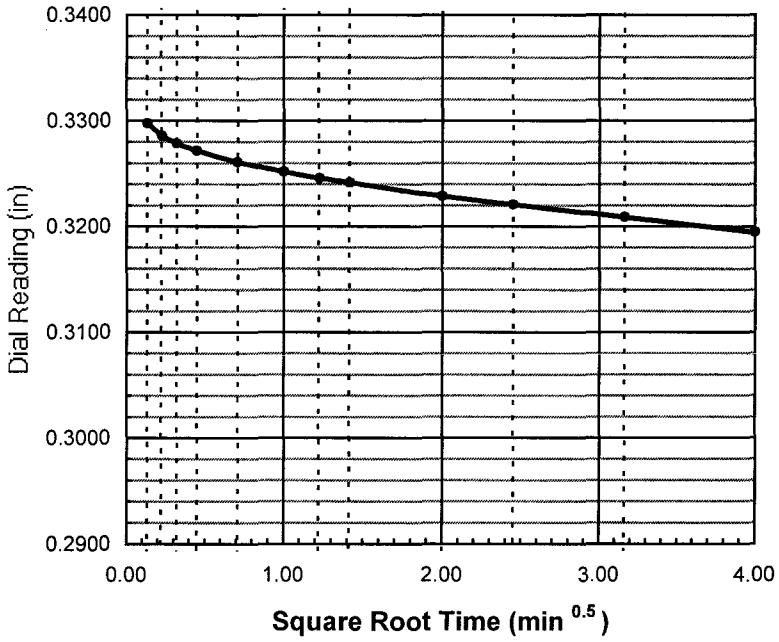
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C-8 | Stage Number: 7 | Curves by: TJO

Boring No.: A-11-020 | Sample No.: 2 | Depth (ft.) 6.5

Date: 13-May-11 | Load (psf): 11039 | Zero Reading: 0.3791

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:09:42	0	0.00	0.3382
	0.02	0.13	0.3298
	0.05	0.22	0.3286
	0.10	0.32	0.3279
	0.20	0.45	0.3272
	0.50	0.71	0.3261
	1.00	1.00	0.3252
	1.50	1.22	0.3246
	2.00	1.41	0.3242
	4.0	2.00	0.3229
	6.0	2.45	0.3221
	10.0	3.16	0.3209
	16.0	4.00	0.3195
	30		0.3172
	60		0.3140
	120		0.3101
	240		0.3065
	480		0.3039
	960		0.3025
	1584		0.3017



do = 0.3311

d90 = _____ t90 = _____ min

d100 = 0.3020

df = 0.3017

square root

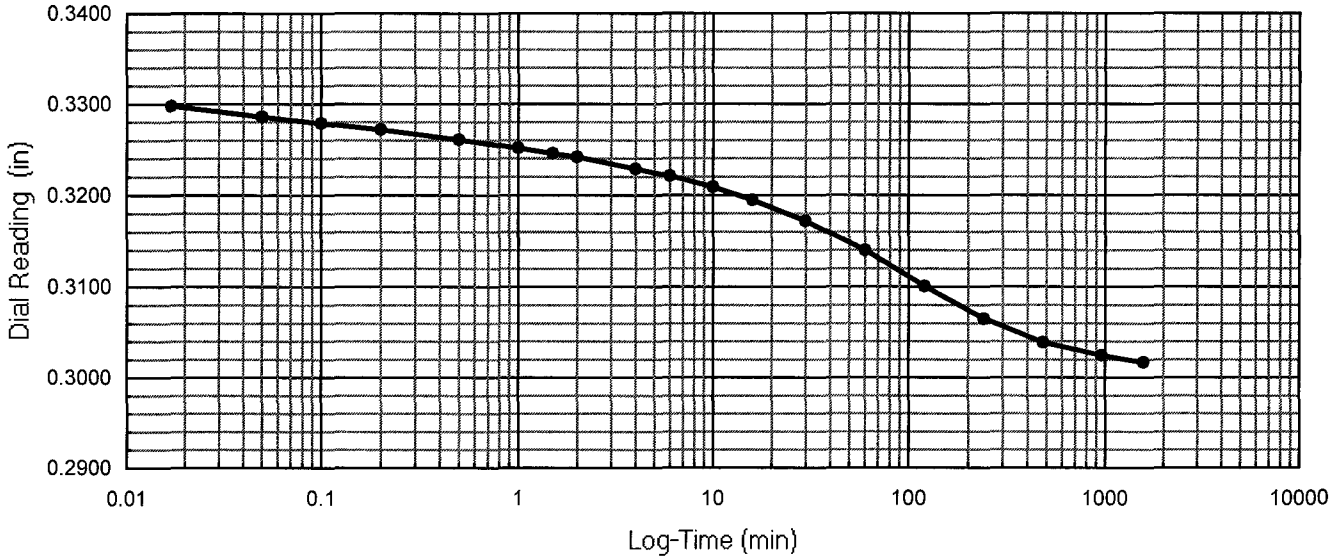
d50 = _____

t50 = _____ min

log time

d50 = 0.3166

t50 = 38.0 min



One-Dimensional Oedometer Testing Increment

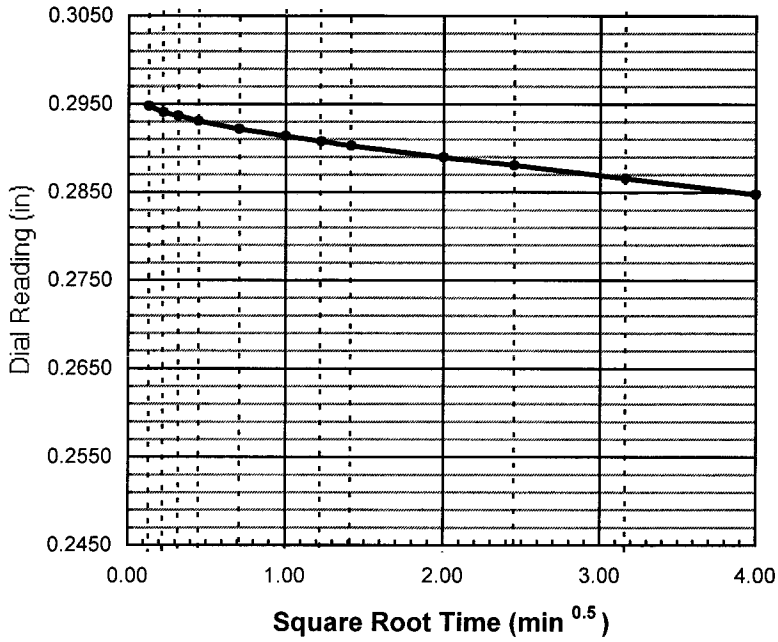
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C-8 | Stage Number: 8 | Curves by: TJO

Boring No.: A-11-020 | Sample No.: 2 | Depth (ft.) 6.5

Date: 14-May-11 | Load (psf): 22100 | Zero Reading: 0.3791

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
11:35:40	0	0.00	0.3017
	0.02	0.13	0.2948
	0.05	0.22	0.2941
	0.10	0.32	0.2937
	0.20	0.45	0.2931
	0.50	0.71	0.2922
	1.00	1.00	0.2914
	1.50	1.22	0.2908
	2.00	1.41	0.2903
	4.0	2.00	0.2890
	6.0	2.45	0.2881
	10.0	3.16	0.2866
	16.0	4.00	0.2848
	30		0.2818
	60		0.2772
	120		0.2714
	240		0.2652
	480		0.2604
	960		0.2578
	1476		0.2568



do = 0.2957

d90 = _____ t90 = _____ min

d100 = 0.2590

df = 0.2568

square root

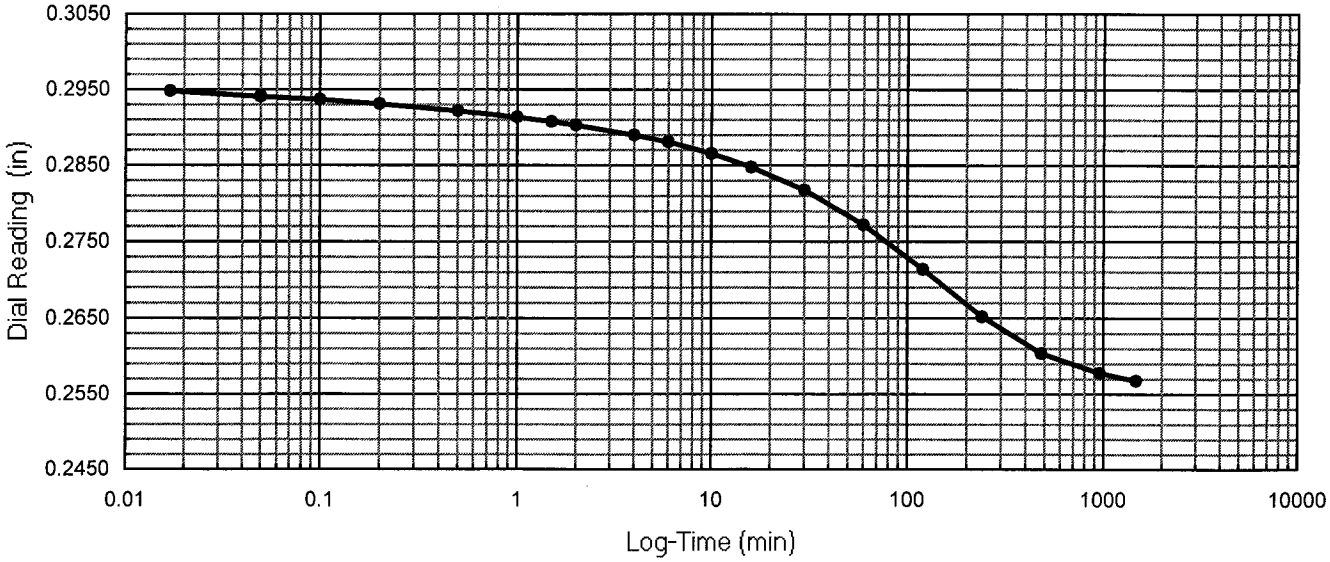
d50 = _____

t50 = _____ min

log time

d50 = 0.2773

t50 = 60.0 min



One-Dimensional Oedometer Testing Increment

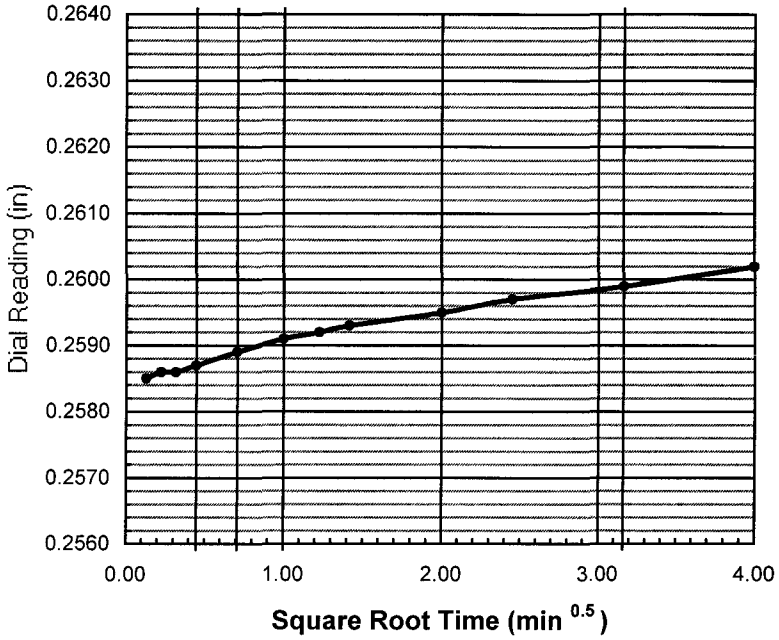
for ASTM D2435, method B

Project Number: 30989830 Apparatus No.: C-8 Stage Number: 9 Curves by: TJO

Boring No.: A-11-020 Sample No.: 2 Depth (ft.) 6.5

Date: 15-May-11 Load (psf): 11039 Zero Reading: 0.3791

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
12:12:49	0	0.00	0.2569
	0.02	0.13	0.2585
	0.05	0.22	0.2586
	0.10	0.32	0.2586
	0.20	0.45	0.2587
	0.50	0.71	0.2589
	1.00	1.00	0.2591
	1.50	1.22	0.2592
	2.00	1.41	0.2593
	4.0	2.00	0.2595
	6.0	2.45	0.2597
	10.0	3.16	0.2599
	16.0	4.00	0.2602
	30		0.2606
	60		0.2613
	120		0.2619
	240		0.2623
	480		0.2626
	960		0.2627
	1350		0.2628



do = 0.2584

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2628

square root

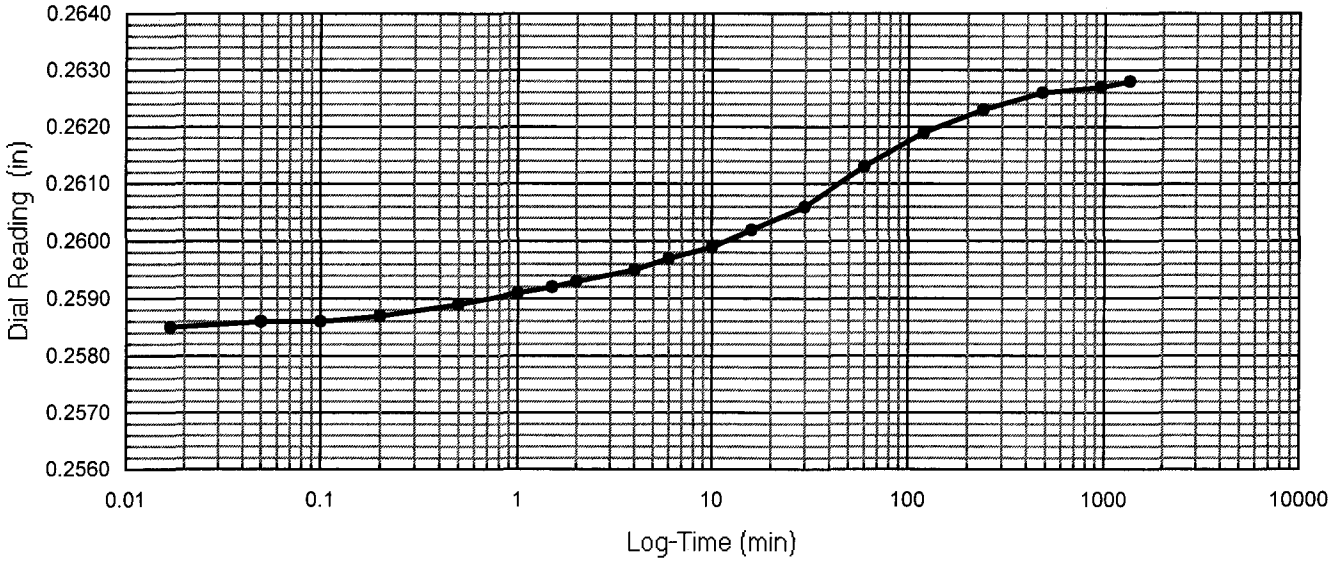
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

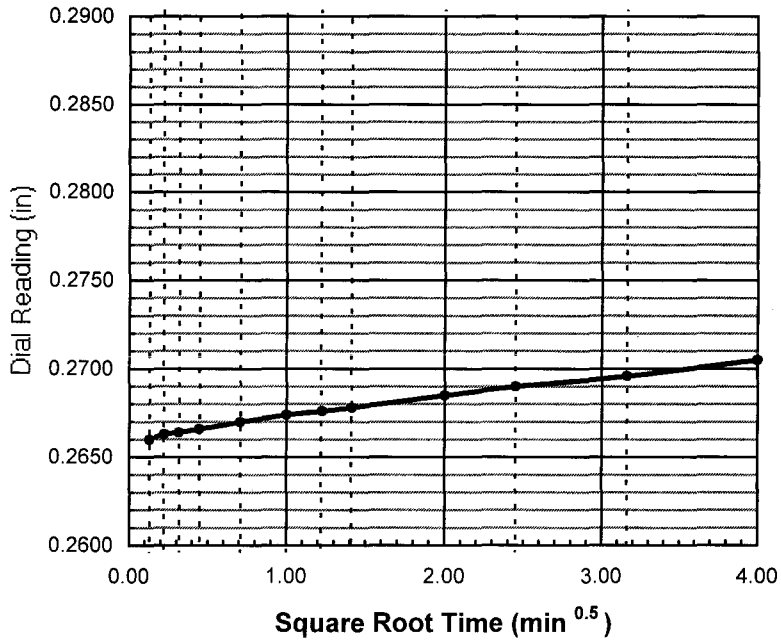
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C-8 | Stage Number: 10 | Curves by: TJO

Boring No.: A-11-020 | Sample No.: 2 | Depth (ft.) 6.5

Date: 16-May-11 | Load (psf): 2743 | Zero Reading: 0.3791

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:44:37	0	0.00	0.2631
	0.02	0.13	0.2660
	0.05	0.22	0.2663
	0.10	0.32	0.2664
	0.20	0.45	0.2666
	0.50	0.71	0.2670
	1.00	1.00	0.2674
	1.50	1.22	0.2676
	2.00	1.41	0.2678
	4.0	2.00	0.2685
	6.0	2.45	0.2690
	10.0	3.16	0.2696
	16.0	4.00	0.2705
	30		0.2719
	60		0.2741
	120		0.2771
	240		0.2806
	480		0.2839
	1440		0.2869
	2880		0.2879
	4188		0.2880



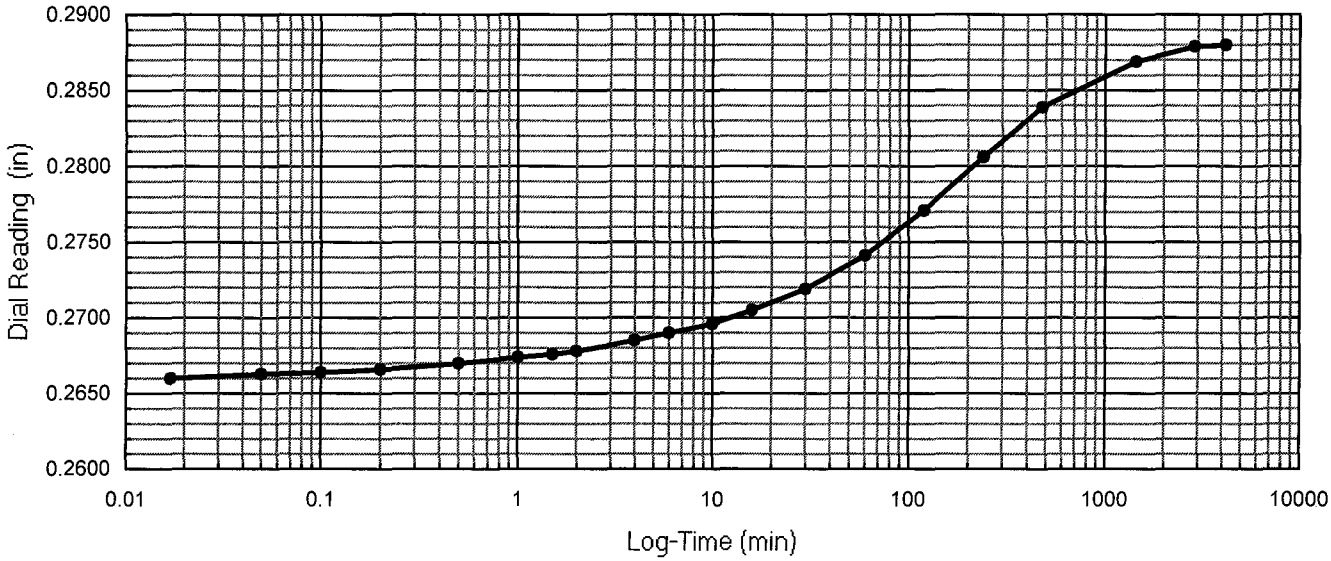
do = 0.2657

d90 = _____ t90 = _____ min

d100 = 0.2680

df = 0.2880

square root	log time
d50 = _____	d50 = 0.2669
t50 = _____ min	t50 = 0.5 min



One-Dimensional Oedometer Testing Increment

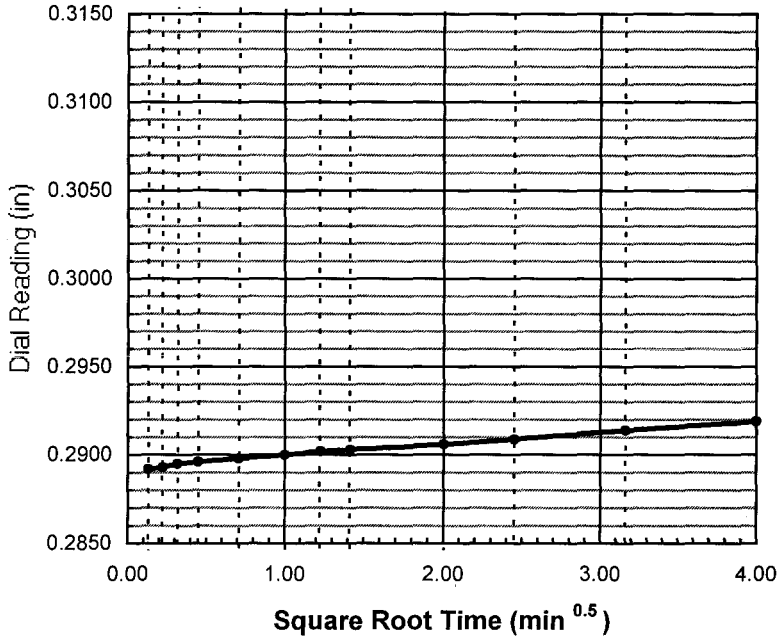
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C-8 | Stage Number: 11 | Curves by: TJO

Boring No.: A-11-020 | Sample No.: 2 | Depth (ft.) 6.5

Date: 19-May-11 | Load (psf): 669 | Zero Reading: 0.3791

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:32:56	0	0.00	0.2880
	0.02	0.13	0.2892
	0.05	0.22	0.2893
	0.10	0.32	0.2895
	0.20	0.45	0.2896
	0.50	0.71	0.2898
	1.00	1.00	0.2900
	1.50	1.22	0.2902
	2.00	1.41	0.2903
	4.0	2.00	0.2906
	6.0	2.45	0.2909
	10.0	3.16	0.2914
	16.0	4.00	0.2919
	30		0.2928
	60		0.2943
	120		0.2963
	240		0.2993
	480		0.3031
	1440		0.3084
	2880		0.3099
	4188		0.3105
	7270		0.3114



do = 0.2890

d90 = _____ t90 = _____ min

d100 = _____

df = 0.3114

square root

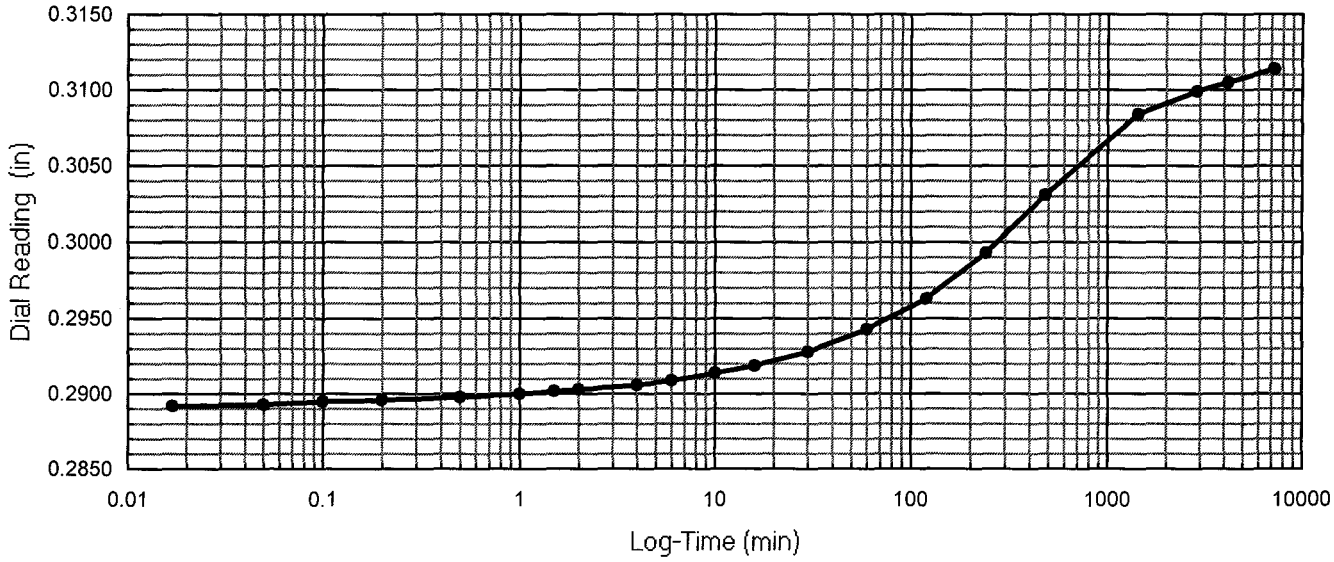
d50 = _____

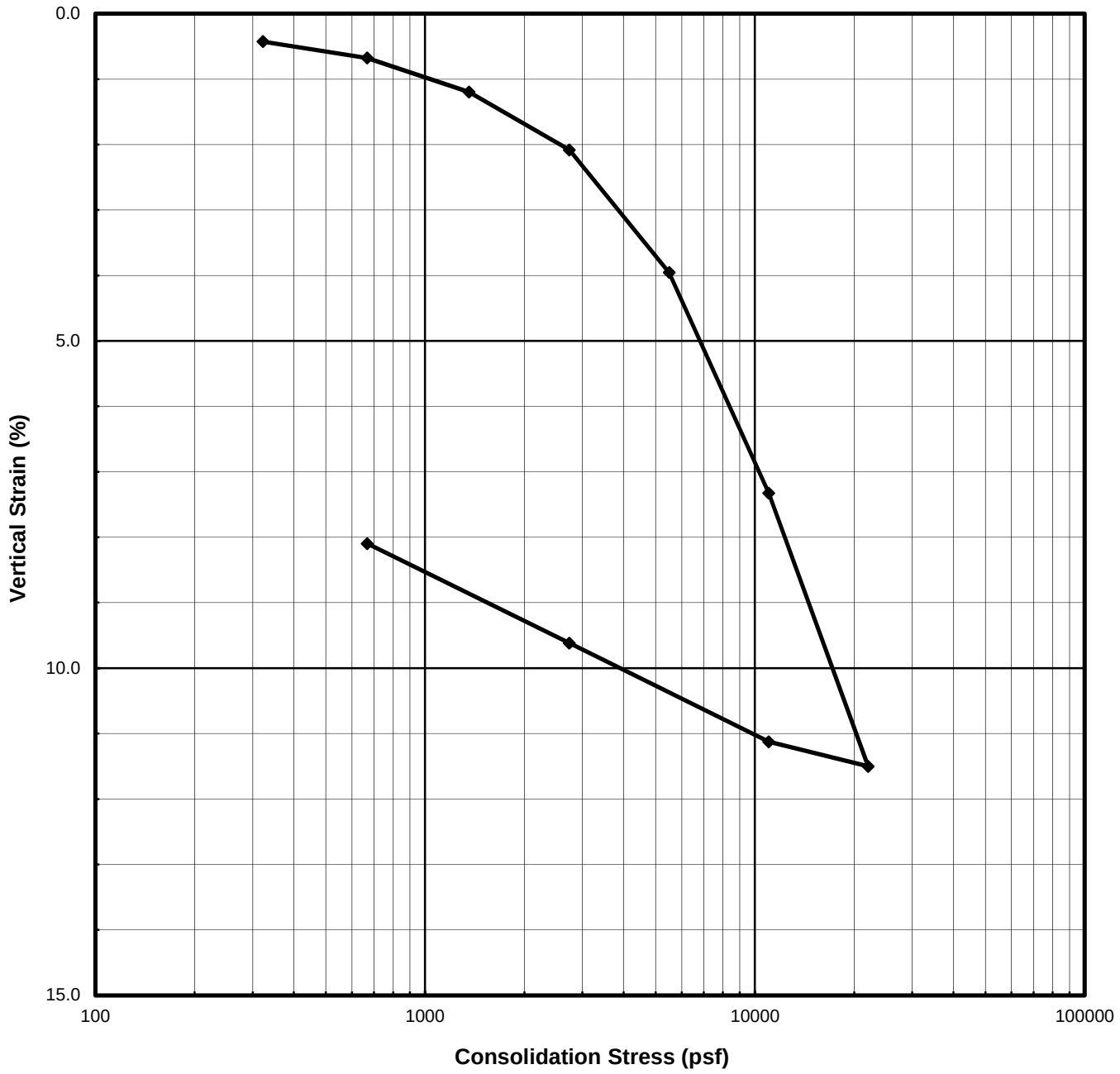
t50 = _____ min

log time

d50 = _____

t50 = _____ min





Description:	**Very dark gray Clay (CH)**							
Boring No.:	R-11-022		Liquid Limit		%	Specific Gravity	2.75	assumed
Sample No.:	2		Plasticity Index		%	Strain for Saturation	6.41	%
Depth (ft | m)	6.5	1.98	Fines Content	85.3	%	Water added at	150	psf

	Water Content (%)	Total Unit Weight		Dry Unit Weight		Saturation (%)	Void Ratio	Height		Diameter	
		(pcf)	(kN/m^3)	(pcf)	(kN/m^3)			(inches)	(cm)	(inches)	(cm)
Initial	23.8	119.1	18.70	96.2	15.11	83.7	0.78	0.961	2.44	2.420	6.147
Final	22.5	126.9	19.94	103.6	16.27	94.7	0.65	0.892	2.27		

URS

I-5 & SR-74 IC

Project Number: 30989830
Test Start Date: 3/4/2011

CONSOLIDATION TEST
ASTM D2435

SUBMITTED BY: Thomas J. O'Meara

Con I5 SR74 R11022 006.xls

One-Dimensional Oedometer Testing
Set-up / Take down Worksheet
ASTM D2435

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM
Apparatus No.: C6

Boring No.: R-11-022
Sample No.: 2
Depth (ft): 6.5

Specimen Description : Very dark gray Clay (CH)
Duration: end of primary

Ring Number: R22
Weight of Wet Spec. and Ring: 355.82 g
Weight of Ring: 217.71 g
Initial Weight of Wet Spec.: 138.11 g

Take Down Weight with Ring: 354.34 g

Excess Oven-dried Cont. No.: rp12
Weight of Cont. and Dry Spec.: 115.05 g
Weight of Container: 114.99 g
Weight of Excess Dried Soil: 0.06 g
Weight of Excess Wet Soil 0.07 g
Final Weight of Wet Specimen: 136.70 g

Height of Specimen (in)

	Initial	Final
1	0.960	0.892
2	0.959	0.892
3	0.962	0.894
4	0.966	0.892
5	0.957	0.891
Ave:	0.961	0.892

Initial Height - Final Height = 0.069 in
Change in Dial (Dd) = 0.075 in
Initial Height - Dd = 0.886 in
Final Height + Dd = 0.967 in
Weight of Top Cap = 374.01 g

Specimen Analysis					Initial Trim	Initial Spec.	Final
				Container Number:	m4	**XXXXX**	s44
				Mass of Container and Wet Specimen M1 (g)	474.59	138.11	253.12
				Mass of Container and Dry Specimen, M2 (g)	400.05	111.56	228.06
				Mass of Container, M3 (g)	91.90	**XXXXX**	116.87
				Water Content, w (%)	24.19	23.80	22.54
				Mass of Wet Specimen, M4 (g)	138.11	138.11	136.70
				Mass of Dry Specimen, M5 (g)	111.56	111.56	111.56
Nominal		Measured	x	Specimen Height, H (in)	0.961	0.961	0.892
Nominal	x	Measured		Specimen Diameter, D (in)	2.420	2.420	2.420
				Area of Specimen, A (in^2)	4.600	4.600	4.600
				Volume of Specimen, V (cc)	72.42	72.42	67.25
Assumed	x	Measured		Specific Gravity, Gs	2.75	2.75	2.75
				Wet Unit Weight, WUW (pcf)	**119.1**	**119.1**	**126.9**
				Dry Unit Weight, DUW (pcf)	**95.9**	**96.2**	**103.6**
				Void Ratio	**0.788**	**0.782**	**0.655**
				Degree of Saturation, S (%)	**84.5**	**83.7**	**94.7**

Set-up by: TJO
Date: 3/4/11
Calculated by: TJO
Checked by: YS
Strain for Saturation (%) = **6.405**

One-Dimensional Oedometer Testing

Loading Worksheet

ASTM D2435

Project Number: 30989830 Boring No.: R-11-022

Project Name: I-5 & SR-74 IC Sample No.: 2

Project Engineer: FM Apparatus No.: C6 Depth (ft): 6.5

Initial Dial Reading: 0.3725 inch Initial Specimen Height: 0.961 inch

Stage No.	Normal Stress (psf)	Dial Reading (in)		Compressibility Correction (in)	Vertical Strain (%)	
		End of Duration	End of Increment		End of Duration	End of Increment
Seat	150		0.3713	0.0000		0.12
1	323		0.3676	0.0008		0.43
2	668		0.3638	0.0022		0.68
3	1358	0.3574	0.3570	0.0040	1.16	1.20
4	2738	0.3466	0.3465	0.0060	2.07	2.08
5	5499	0.3263	0.3263	0.0082	3.96	3.96
6	11021	0.2930	0.2914	0.0107	7.16	7.33
7	22064	0.2510	0.2483	0.0137	11.22	11.50
8	11021		0.2536	0.0120		11.13
9	2738		0.2711	0.0090		9.62
10	668		0.2878	0.0069		8.10
11	150		0.2975	0.0053		7.25
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						
33						

Final dial reading prior to take down (inch): 0.2975 Take down by: TJO Date: 3/16/11

One-Dimensional Oedometer Testing
ASTM D2435
Table of Incremental Values

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM
Apparatus No.: C6

Boring No.: R-11-022
Sample No.: 2
Depth (ft): 6.5
Inundation at stage: Seat

10 **20** Hanger Ratios

Stage Number	Incremental Weight Applied (kg) Back	Front	Vertical Stress (psf)	Specimen Hieght (in)	Deflections (in) $d_{initial}$	d_o	d_{50}	d_{100}	d_{final}	Porous Stone (in)	t_{50} (min)	cv (in^2/min)	cv (ft^2/day)
Top Cap			26	0.961	0.3725	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
Seat	0.06	0.06	150	0.960	0.3725	XXXXX	XXXXX	XXXXX	0.3713	0.0000	XXXXX	XXXXX	XXXXX
1	0.25		323	0.957	0.3713	0.3695	XXXXX	XXXXX	0.3676	0.0008	XXXXX	XXXXX	XXXXX
2	0.50		668	0.955	0.3676	0.3665	XXXXX	XXXXX	0.3638	0.0022	XXXXX	XXXXX	XXXXX
3	1.00		1358	0.952	0.3638	0.3620	0.3597	0.3574	0.3570	0.0040	2.00	0.022	0.223
4		1.0	2738	0.948	0.3570	0.3541	0.3504	0.3466	0.3465	0.0060	2.00	0.022	0.221
5	4.0		5499	0.936	0.3465	0.3430	0.3347	0.3263	0.3263	0.0082	3.00	0.014	0.144
6		4.0	11021	0.912	0.3263	0.3193	0.3062	0.2930	0.2914	0.0107	3.00	0.014	0.136
7		8.0	22064	0.882	0.2914	0.2823	0.2667	0.2510	0.2483	0.0137	10.00	0.004	0.038
8		-8.0	11021	0.900	0.2483	0.2508	XXXXX	XXXXX	0.2536	0.0120	XXXXX	XXXXX	XXXXX
9	-4.0	-4.0	2738	0.926	0.2536	0.2569	XXXXX	XXXXX	0.2711	0.0090	XXXXX	XXXXX	XXXXX
10	-1.0	-1.0	668	0.950	0.2711	0.2727	XXXXX	XXXXX	0.2878	0.0069	XXXXX	XXXXX	XXXXX
11	-0.75		150	0.965	0.2878	0.2878	XXXXX	XXXXX	0.2975	0.0053	XXXXX	XXXXX	XXXXX
12			150	XXXXX	0.2975	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
13			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
14			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
15			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
16			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
17			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
18			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
19			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
20			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
21			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
22			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
23			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
24			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
25			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX

One-Dimensional Oedometer Testing Increment

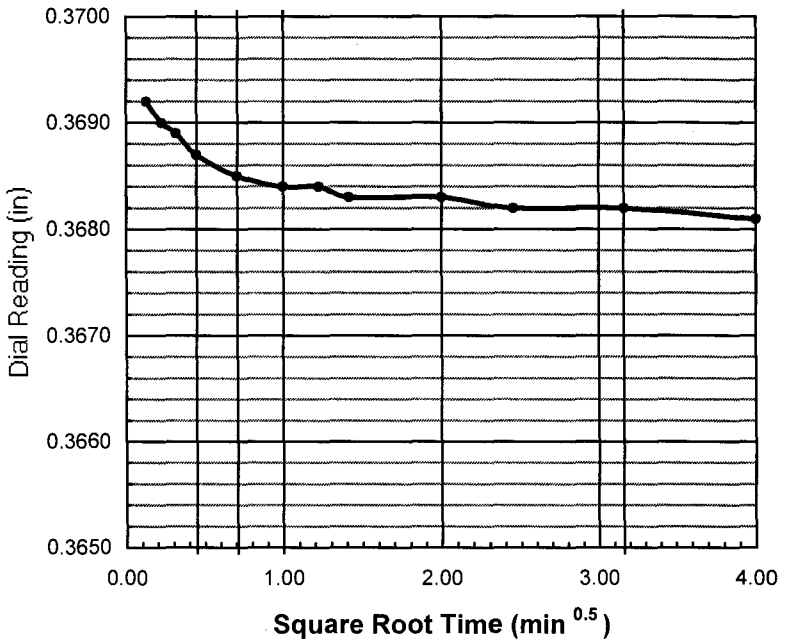
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C6 | Stage Number: 1 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 2 | Depth (ft.) 6.5

Date: 4-Mar-11 | Load (psf): 323 | Zero Reading: 0.3725

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:50:06	0	0.00	0.3713
	0.02	0.13	0.3692
	0.05	0.22	0.3690
	0.10	0.32	0.3689
	0.20	0.45	0.3687
	0.50	0.71	0.3685
	1.00	1.00	0.3684
	1.50	1.22	0.3684
	2.00	1.41	0.3683
	4.0	2.00	0.3683
	6.0	2.45	0.3682
	10.0	3.16	0.3682
	16.0	4.00	0.3681
	30		0.3680
	60		0.3679
	120		0.3678
	240		0.3677
	480		0.3676
	960		0.3676
	1306		0.3676



do = 0.3695

d90 = _____ t90 = _____ min

d100 = _____

df = 0.3676

square root

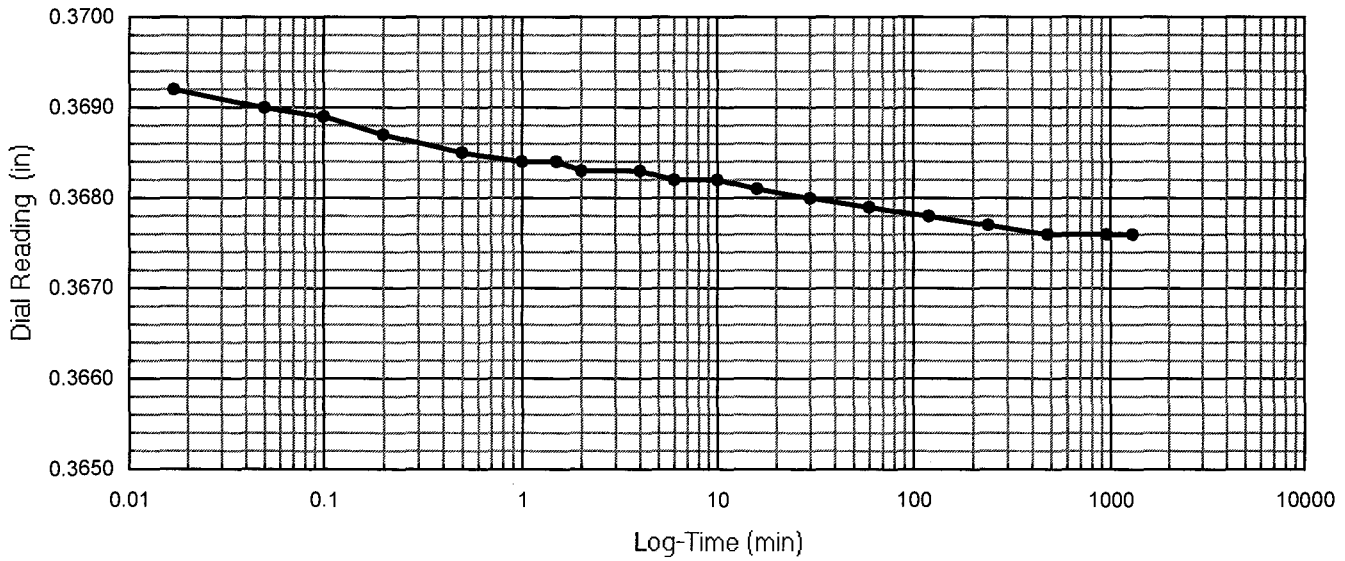
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

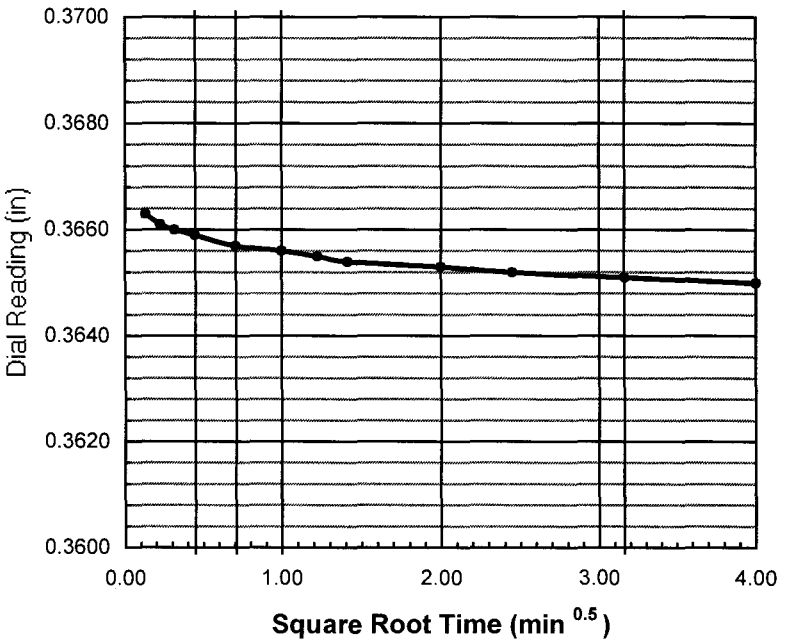
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C6 | Stage Number: 2 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 2 | Depth (ft.) 6.5

Date: 5-Mar-11 | Load (psf): 668 | Zero Reading: 0.3725

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:36:17	0	0.00	0.3676
	0.02	0.13	0.3663
	0.05	0.22	0.3661
	0.10	0.32	0.3660
	0.20	0.45	0.3659
	0.50	0.71	0.3657
	1.00	1.00	0.3656
	1.50	1.22	0.3655
	2.00	1.41	0.3654
	4.0	2.00	0.3653
	6.0	2.45	0.3652
	10.0	3.16	0.3651
	16.0	4.00	0.3650
	30		0.3649
	60		0.3647
	120		0.3646
	240		0.3644
	480		0.3641
	960		0.3639
	1691		0.3638



do = 0.3665

d90 = _____ t90 = _____ min

d100 = _____

df = 0.3638

square root

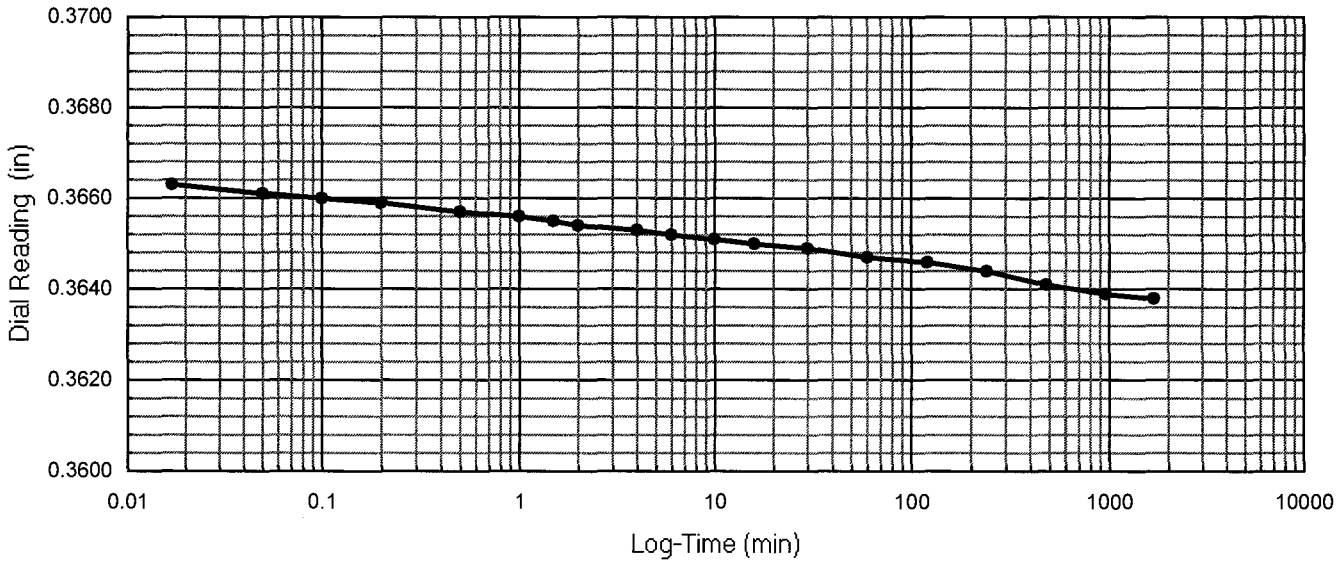
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

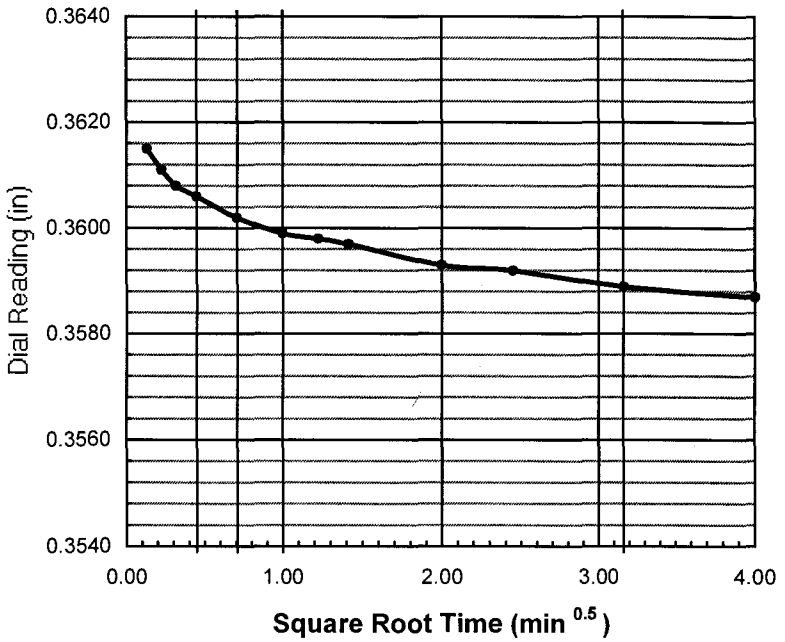
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C6 | Stage Number: 3 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 2 | Depth (ft.) 6.5

Date: 6-Mar-11 | Load (psf): 1358 | Zero Reading: 0.3725

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
12:47:44	0	0.00	0.3638
	0.02	0.13	0.3615
	0.05	0.22	0.3611
	0.10	0.32	0.3608
	0.20	0.45	0.3606
	0.50	0.71	0.3602
	1.00	1.00	0.3599
	1.50	1.22	0.3598
	2.00	1.41	0.3597
	4.0	2.00	0.3593
	6.0	2.45	0.3592
	10.0	3.16	0.3589
	16.0	4.00	0.3587
	30		0.3585
	60		0.3582
	120		0.3579
	240		0.3576
	480		0.3573
	1184		0.3570



do = 0.3620

d90 = _____ t90 = _____ min

d100 = 0.3574

df = 0.3570

square root

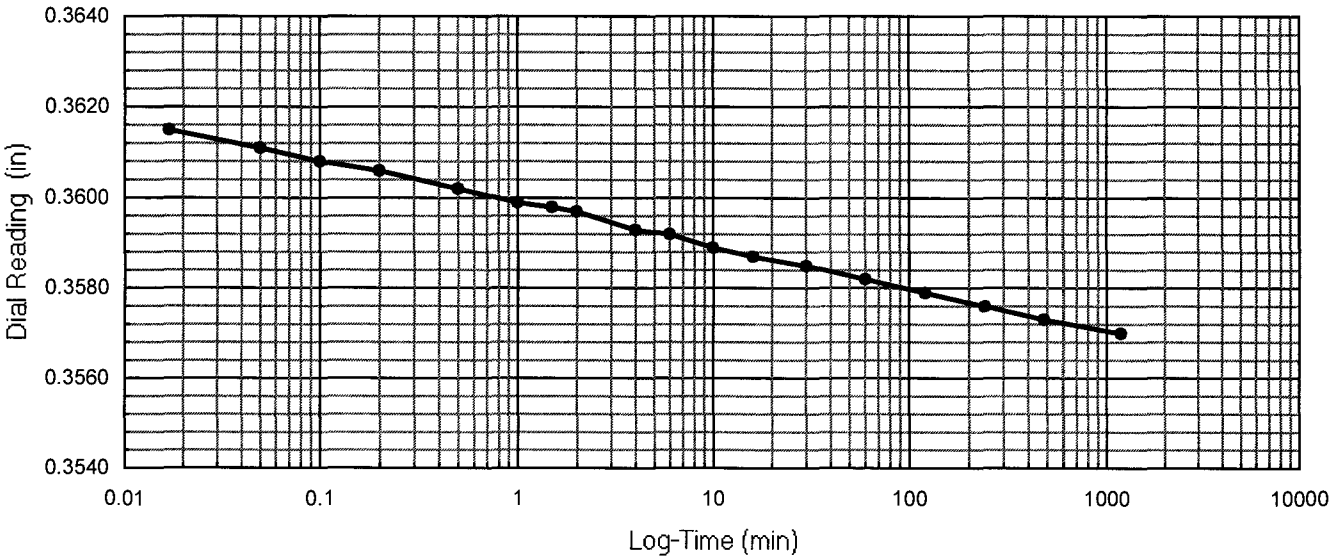
d50 = _____

t50 = _____ min

log time

d50 = 0.3597

t50 = 2.0 min



One-Dimensional Oedometer Testing Increment

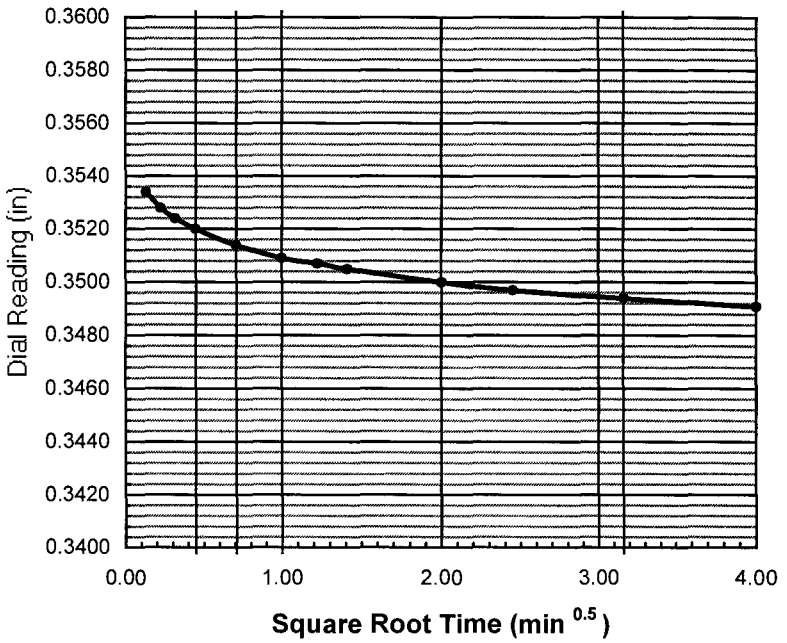
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C6 | Stage Number: 4 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 2 | Depth (ft.) 6.5

Date: 7-Mar-11 | Load (psf): 2738 | Zero Reading: 0.3725

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:32:20	0	0.00	0.3570
	0.02	0.13	0.3534
	0.05	0.22	0.3528
	0.10	0.32	0.3524
	0.20	0.45	0.3520
	0.50	0.71	0.3514
	1.00	1.00	0.3509
	1.50	1.22	0.3507
	2.00	1.41	0.3505
	4.0	2.00	0.3500
	6.0	2.45	0.3497
	10.0	3.16	0.3494
	16.0	4.00	0.3491
	30		0.3487
	60		0.3483
	120		0.3479
	240		0.3475
	480		0.3470
	960		0.3466
	1443		0.3465



do = 0.3541

d90 = ____ t90 = ____ min

d100 = 0.3466

df = 0.3465

square root

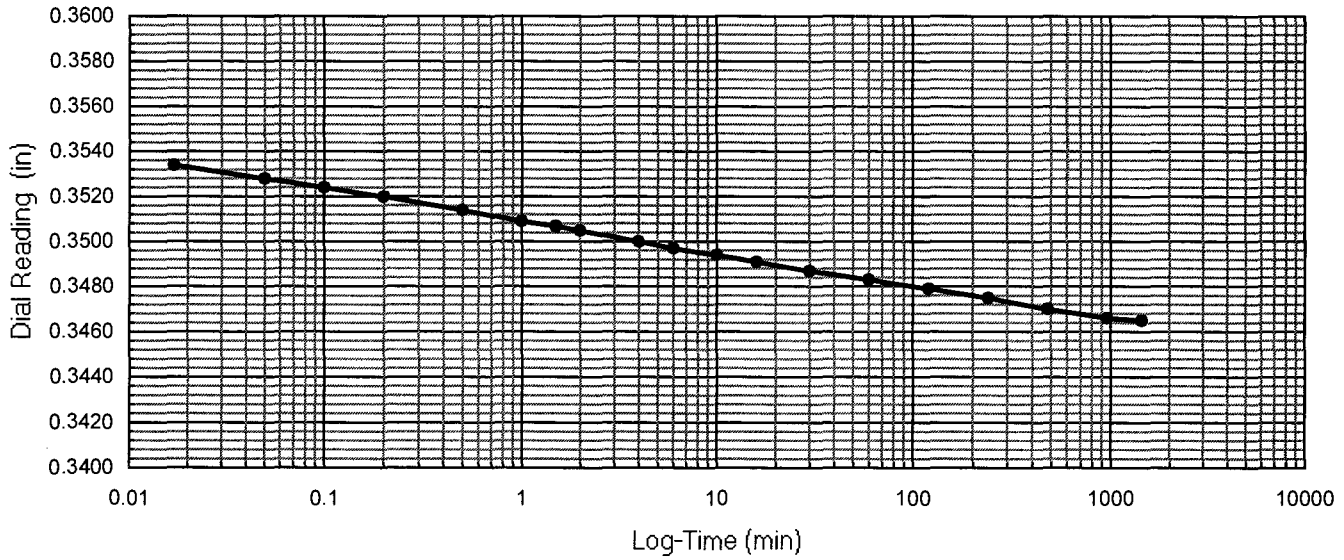
d50 = ____

t50 = ____ min

log time

d50 = 0.3504

t50 = 2.0 min



One-Dimensional Oedometer Testing Increment

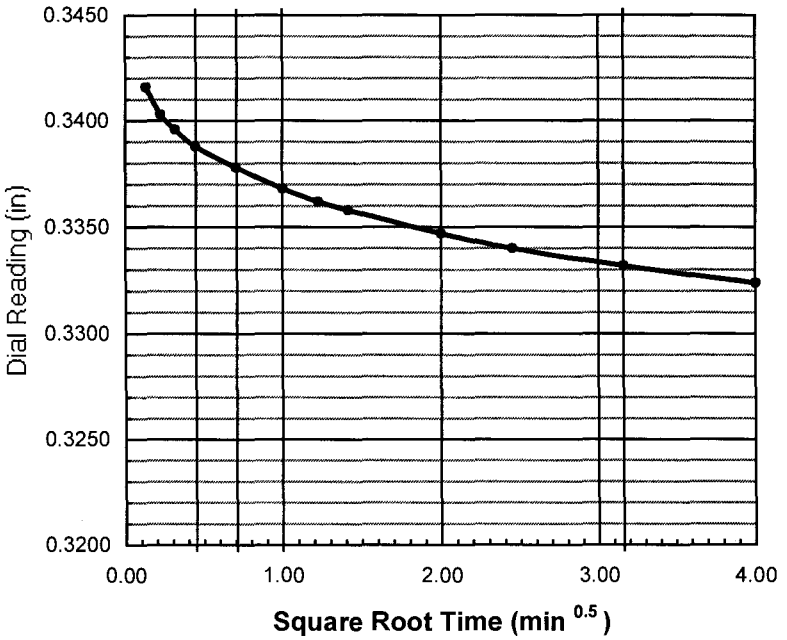
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C6 | Stage Number: 5 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 2 | Depth (ft.) 6.5

Date: 8-Mar-11 | Load (psf): 5499 | Zero Reading: 0.3725

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:36:44	0	0.00	0.3465
	0.02	0.13	0.3416
	0.05	0.22	0.3403
	0.10	0.32	0.3396
	0.20	0.45	0.3388
	0.50	0.71	0.3378
	1.00	1.00	0.3368
	1.50	1.22	0.3362
	2.00	1.41	0.3358
	4.0	2.00	0.3347
	6.0	2.45	0.3340
	10.0	3.16	0.3332
	16.0	4.00	0.3324
	30		0.3315
	60		0.3304
	120		0.3295
	240		0.3285
	480		0.3275
	960		0.3266
	1430		0.3263



do = 0.3430

d90 = _____ t90 = _____ min

d100 = 0.3263

df = 0.3263

square root

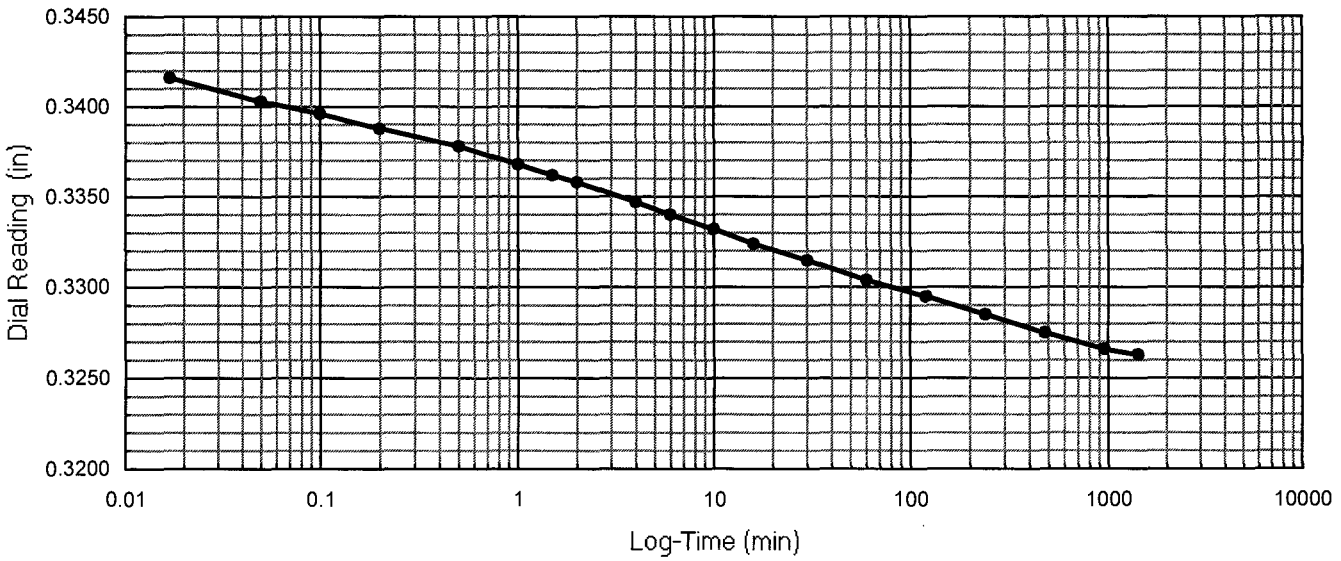
d50 = _____

t50 = _____ min

log time

d50 = 0.3347

t50 = 4.0 min



One-Dimensional Oedometer Testing Increment

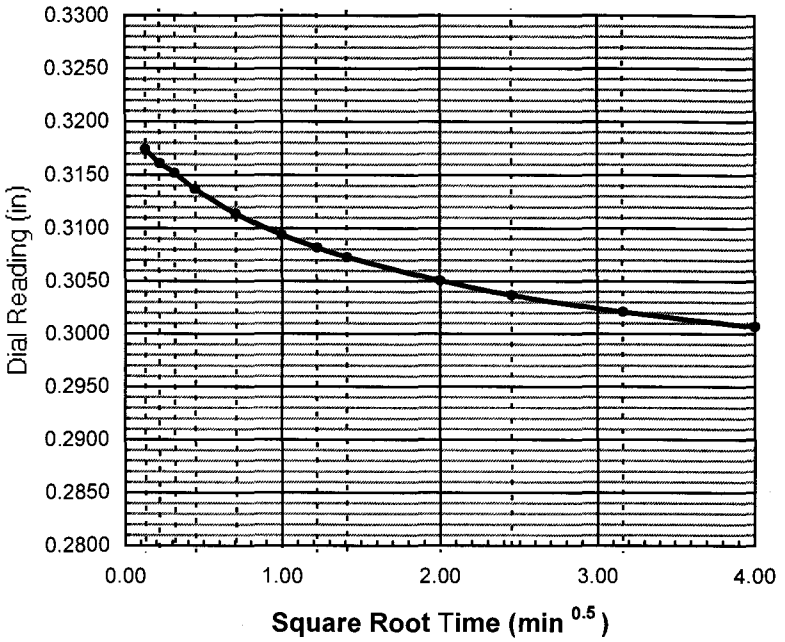
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C6 | Stage Number: 6 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 2 | Depth (ft.) 6.5

Date: 9-Mar-11 | Load (psf): 11021 | Zero Reading: 0.3725

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:27:58	0	0.00	0.3263
	0.02	0.13	0.3174
	0.05	0.22	0.3161
	0.10	0.32	0.3152
	0.20	0.45	0.3137
	0.50	0.71	0.3114
	1.00	1.00	0.3094
	1.50	1.22	0.3082
	2.00	1.41	0.3073
	4.0	2.00	0.3051
	6.0	2.45	0.3037
	10.0	3.16	0.3021
	16.0	4.00	0.3007
	30		0.2990
	60		0.2973
	120		0.2958
	240		0.2945
	480		0.2932
	960		0.2920
	1480		0.2914



do = 0.3193

d90 = _____ t90 = _____ min

d100 = 0.2930

df = 0.2914

square root

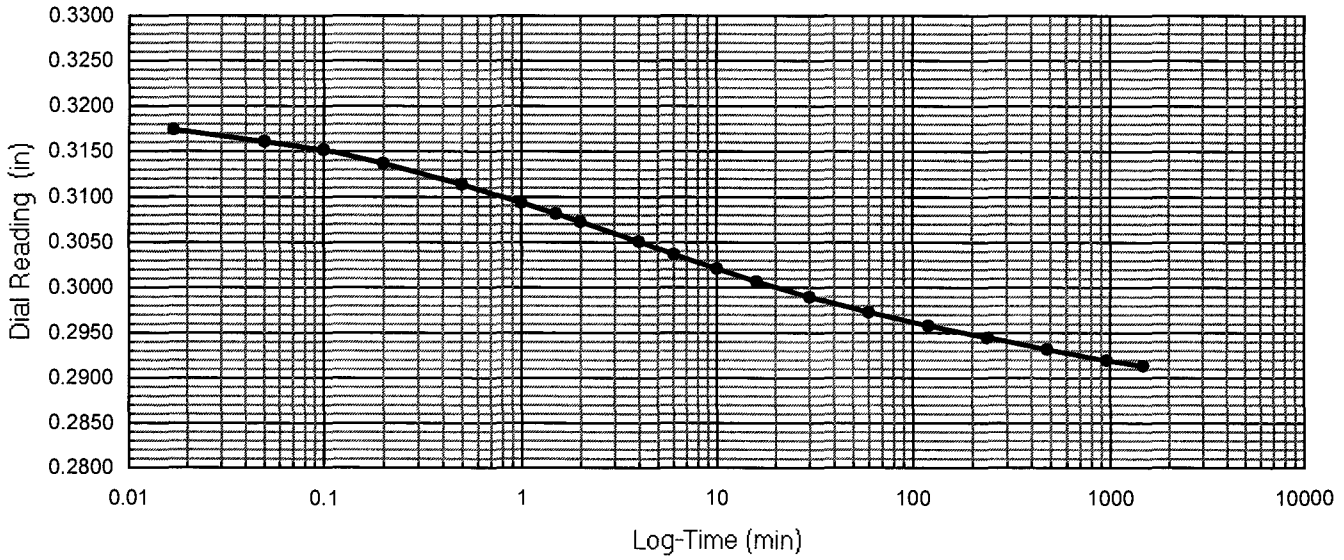
d50 = _____

t50 = _____ min

log time

d50 = 0.3061

t50 = 3.0 min



One-Dimensional Oedometer Testing Increment

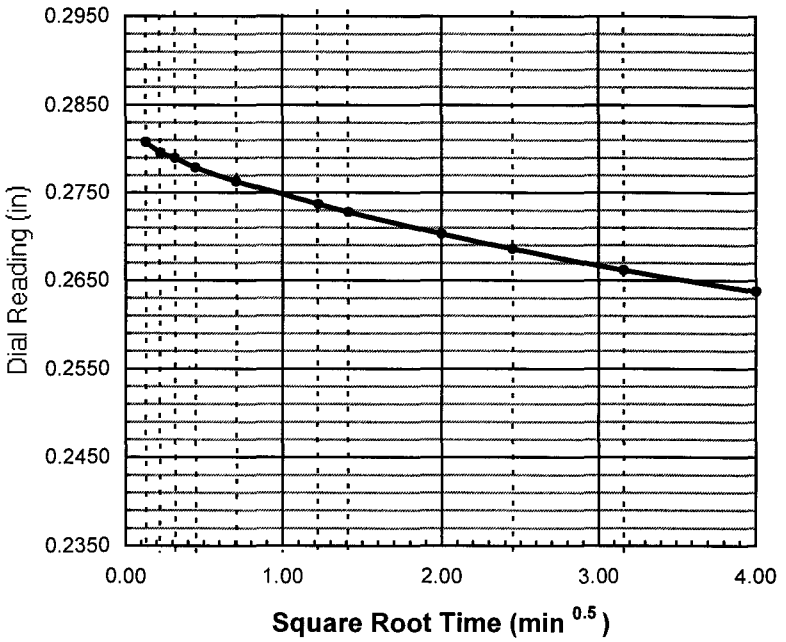
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C6 | Stage Number: 7 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 2 | Depth (ft.) 6.5

Date: 10-Mar-11 | Load (psf): 22064 | Zero Reading: 0.3725

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:10:02	0	0.00	0.2914
	0.02	0.13	0.2808
	0.05	0.22	0.2796
	0.10	0.32	0.2790
	0.20	0.45	0.2779
	0.50	0.71	0.2763
	0.50	0.71	0.2763
	1.50	1.22	0.2737
	2.00	1.41	0.2728
	4.0	2.00	0.2703
	6.0	2.45	0.2686
	10.0	3.16	0.2662
	16.0	4.00	0.2638
	30		0.2605
	60		0.2570
	120		0.2541
	240		0.2518
	480		0.2501
	960		0.2489
	1494		0.2483



do = 0.2823

d90 = ____ t90 = ____ min

d100 = 0.2510

df = 0.2483

square root

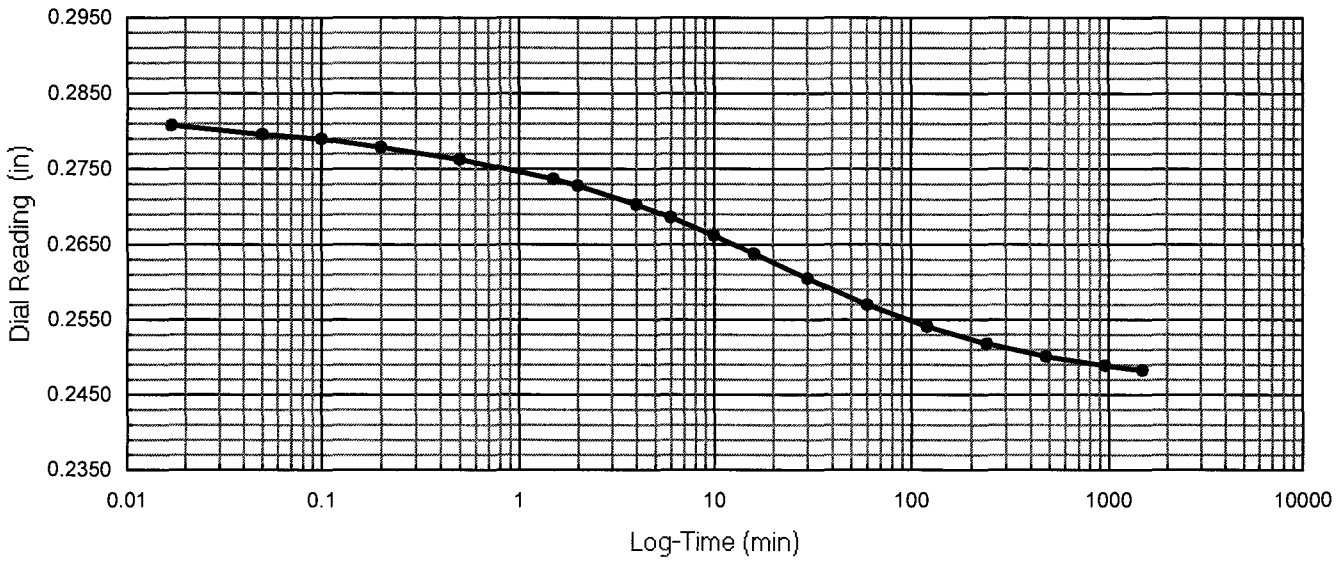
d50 = ____

t50 = ____ min

log time

d50 = 0.2666

t50 = 10.0 min



One-Dimensional Oedometer Testing Increment

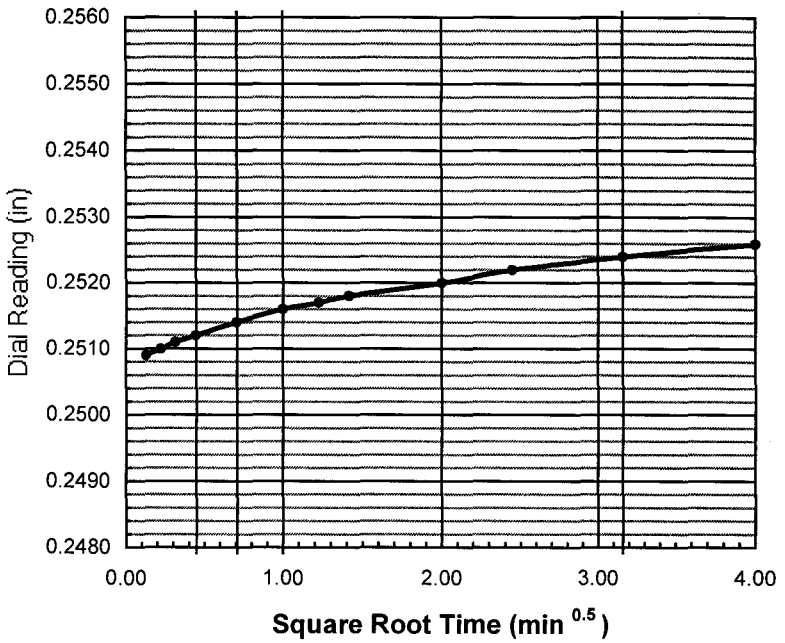
for ASTM D2435, method B

Project Number: 30989830 Apparatus No.: C6 Stage Number: 8 Curves by: TJO

Boring No.: R-11-022 Sample No.: 2 Depth (ft.) 6.5

Date: 11-Mar-11 Load (psf): 11021 Zero Reading: 0.3725

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:04:43	0	0.00	0.2483
	0.02	0.13	0.2509
	0.05	0.22	0.2510
	0.10	0.32	0.2511
	0.20	0.45	0.2512
	0.50	0.71	0.2514
	1.00	1.00	0.2516
	1.50	1.22	0.2517
	2.00	1.41	0.2518
	4.0	2.00	0.2520
	6.0	2.45	0.2522
	10.0	3.16	0.2524
	16.0	4.00	0.2526
	30		0.2529
	60		0.2532
	120		0.2534
	240		0.2535
	480		0.2536



do = 0.2508

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2536

square root

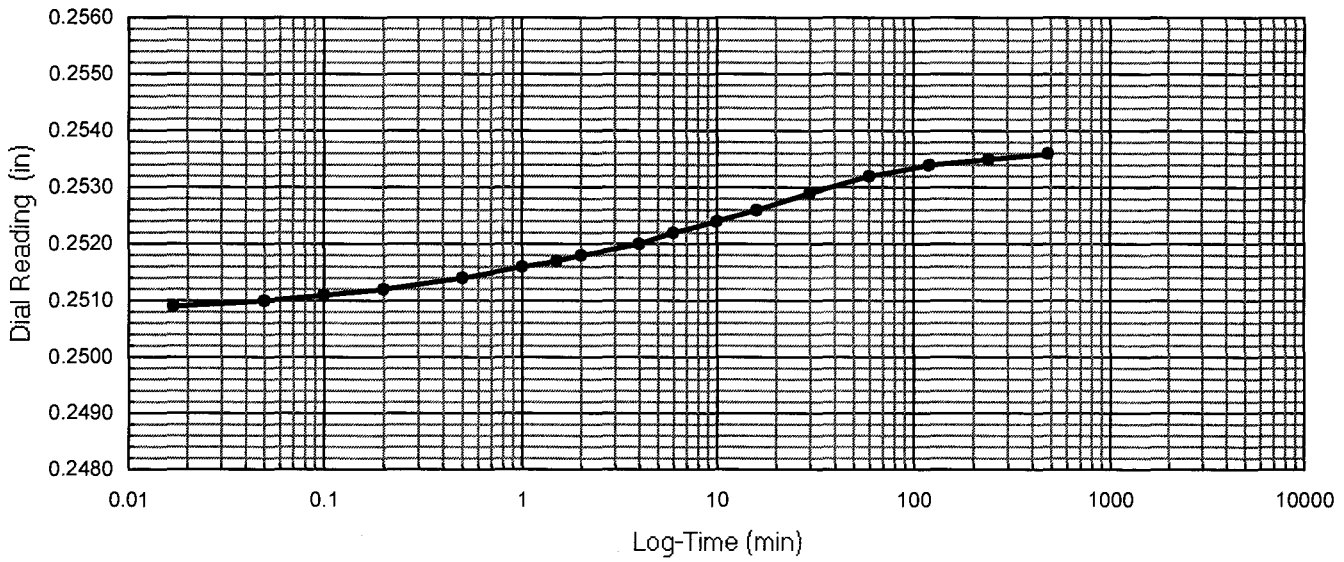
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

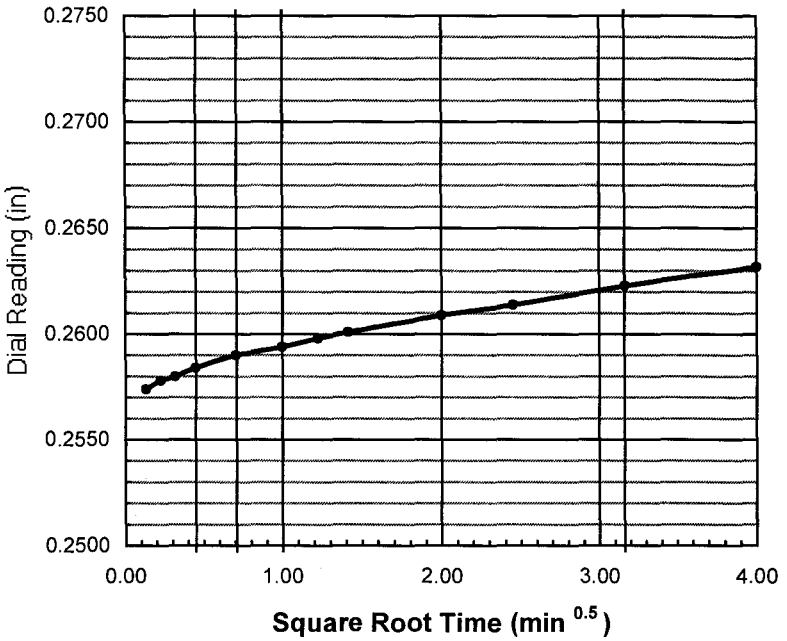
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C6 | Stage Number: 9 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 2 | Depth (ft.) 6.5

Date: 11-Mar-11 | Load (psf): 2738 | Zero Reading: 0.3725

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
18:07:01	0	0.00	0.2536
	0.02	0.13	0.2574
	0.05	0.22	0.2578
	0.10	0.32	0.2580
	0.20	0.45	0.2584
	0.50	0.71	0.2590
	1.00	1.00	0.2594
	1.50	1.22	0.2598
	2.00	1.41	0.2601
	4.0	2.00	0.2609
	6.0	2.45	0.2614
	10.0	3.16	0.2623
	16.0	4.00	0.2632
	30		0.2647
	60		0.2667
	120		0.2685
	240		0.2699
	480		0.2706
	974		0.2711



do = 0.2569

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2711

square root

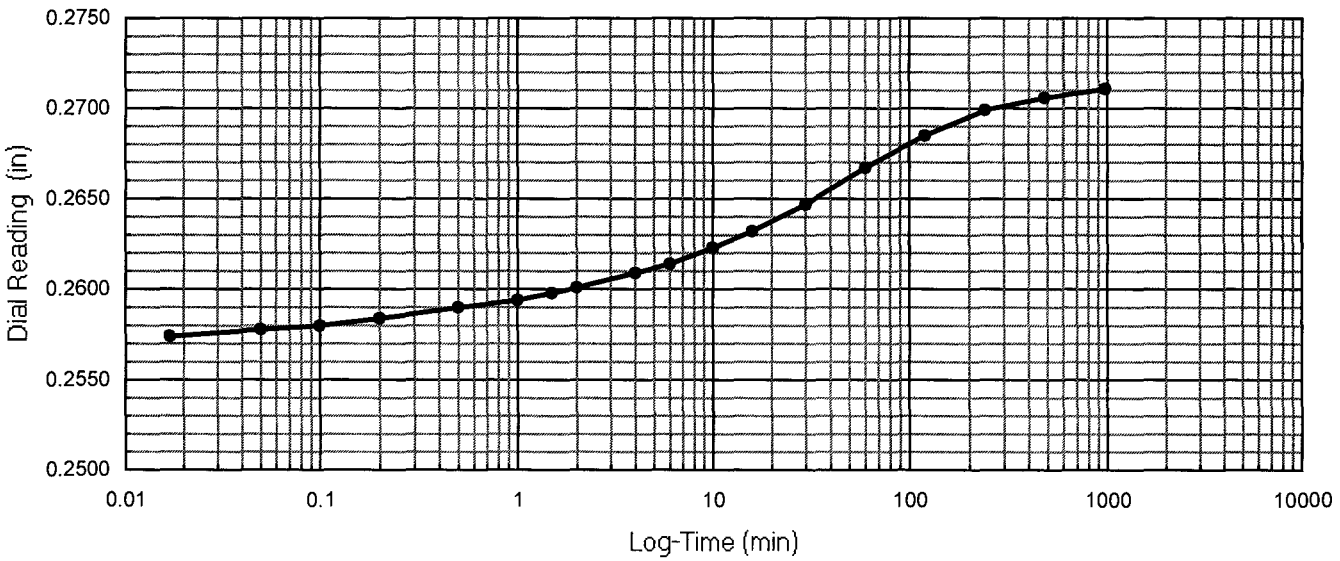
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

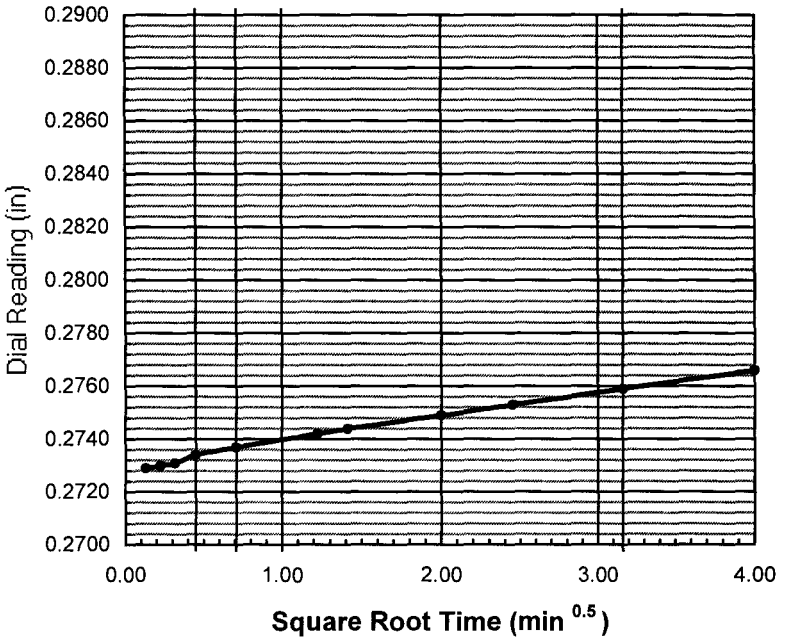
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C6 | Stage Number: 10 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 2 | Depth (ft.) 6.5

Date: 12-Mar-11 | Load (psf): 668 | Zero Reading: 0.3725

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:21:14	0	0.00	0.2711
	0.02	0.13	0.2729
	0.05	0.22	0.2730
	0.10	0.32	0.2731
	0.20	0.45	0.2734
	0.50	0.71	0.2737
	1.50	1.22	0.2742
	1.50	1.22	0.2742
	2.00	1.41	0.2744
	4.0	2.00	0.2749
	6.0	2.45	0.2753
	10.0	3.16	0.2759
	16.0	4.00	0.2766
	30		0.2779
	60		0.2797
	120		0.2819
	240		0.2841
	480		0.2856
	974		0.2866
	1440		0.2871
	2880		0.2877
	3488		0.2878



do = 0.2727

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2878

square root

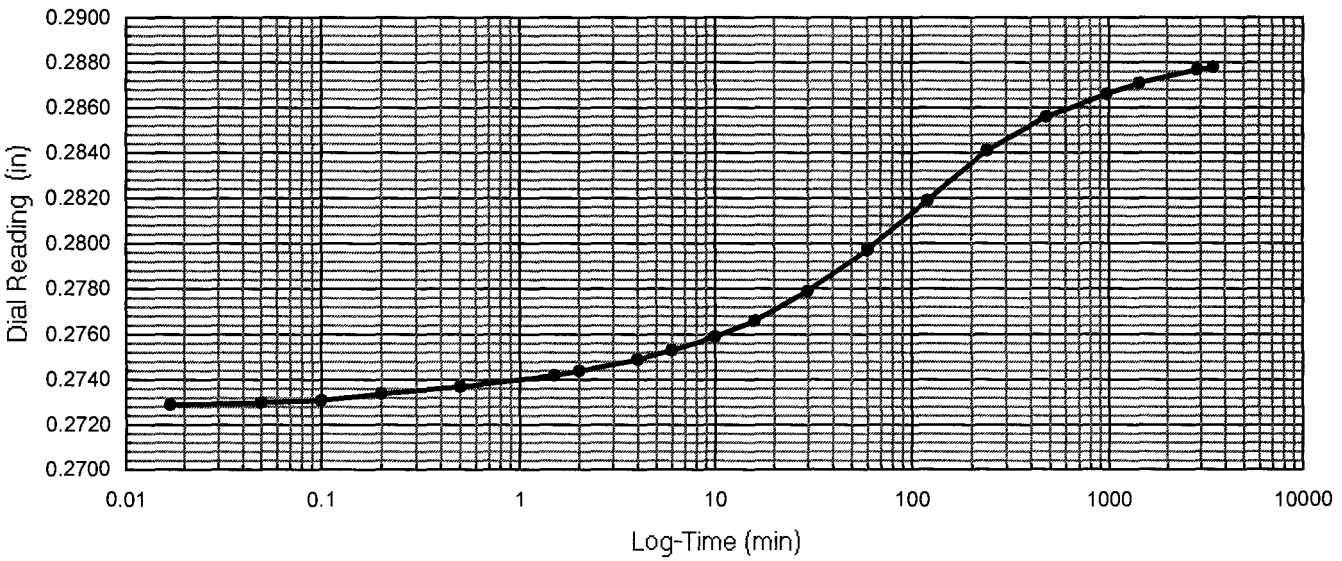
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

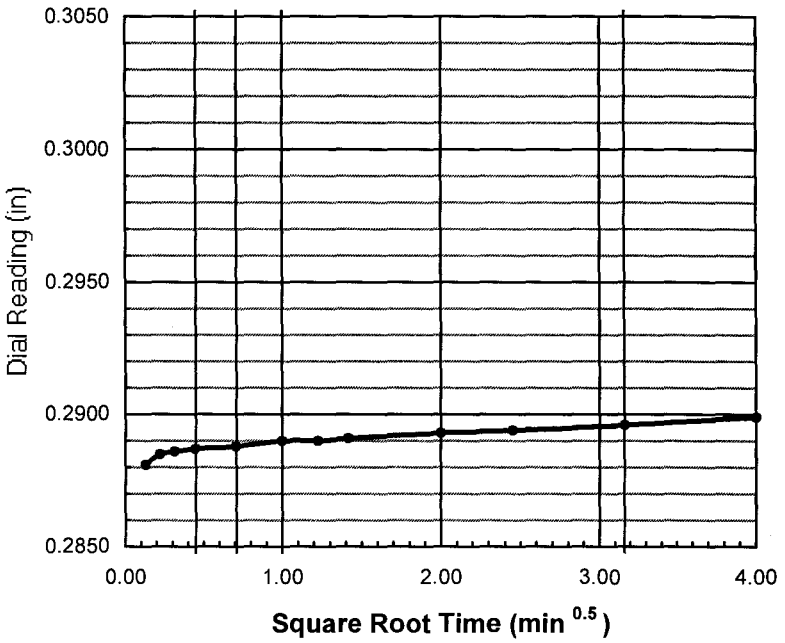
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C6 | Stage Number: 11 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 2 | Depth (ft.) 6.5

Date: 14-Mar-11 | Load (psf): 150 | Zero Reading: 0.3725

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
20:30:16	0	0.00	0.2878
	0.02	0.13	0.2881
	0.05	0.22	0.2885
	0.10	0.32	0.2886
	0.20	0.45	0.2887
	0.50	0.71	0.2888
	1.00	1.00	0.2890
	1.50	1.22	0.2890
	2.00	1.41	0.2891
	4.0	2.00	0.2893
	6.0	2.45	0.2894
	10.0	3.16	0.2896
	16.0	4.00	0.2899
	30		0.2903
	60		0.2911
	120		0.2921
	240		0.2933
	480		0.2946
	960		0.2958
	1440		0.2965
	2109		0.2970
	2835		0.2975



do = 0.2878

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2975

square root

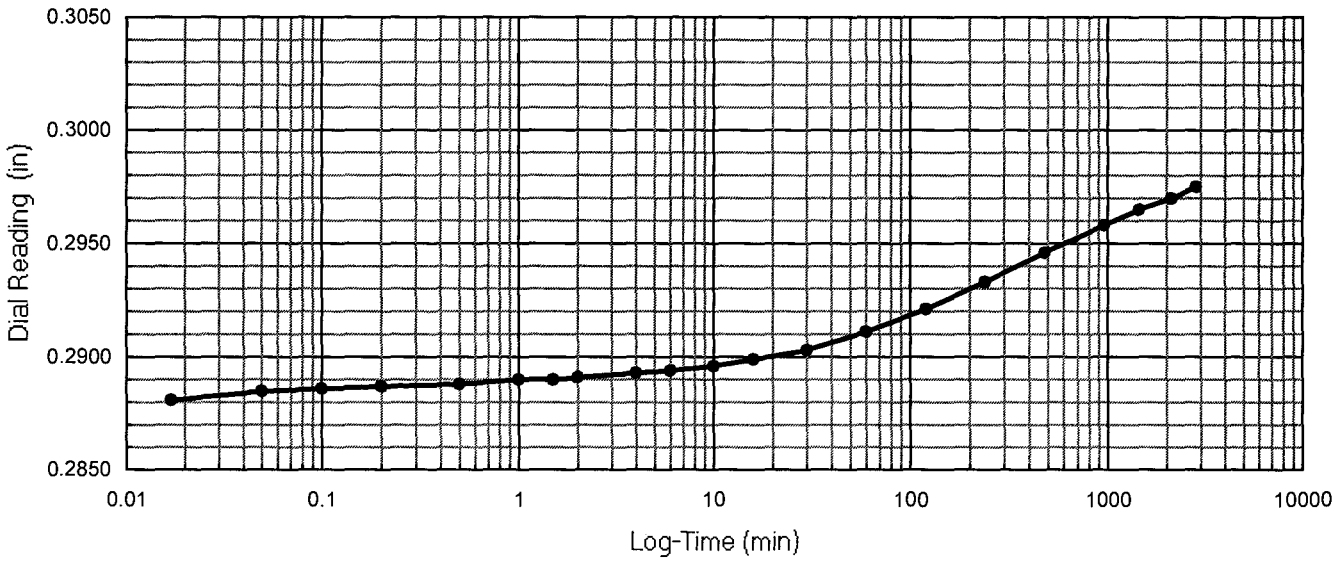
d50 = _____

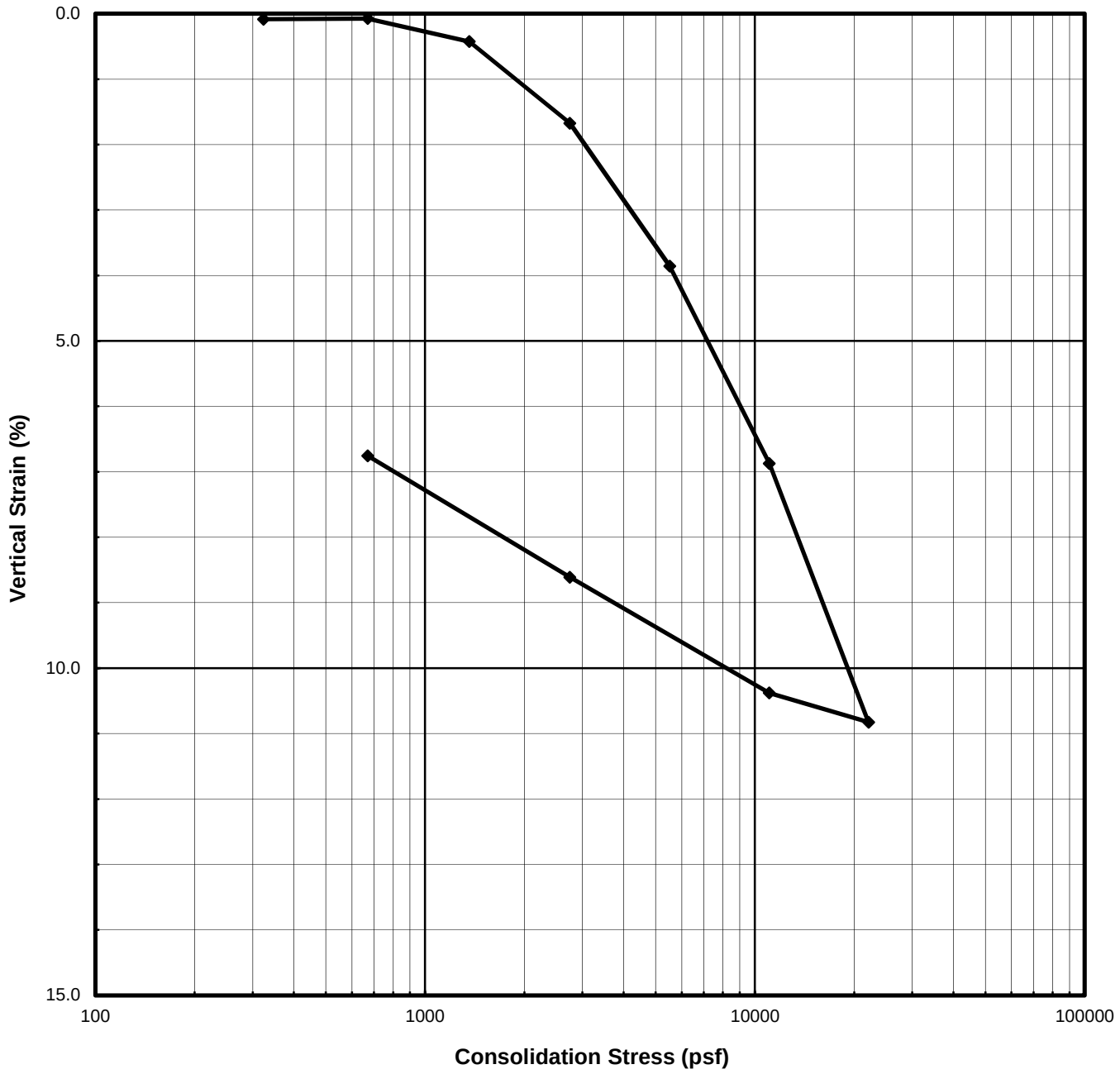
t50 = _____ min

log time

d50 = _____

t50 = _____ min





Description:	**Dark olive gray Clay (CH)**							
Boring No.:	R-11-022		Liquid Limit		%	Specific Gravity	2.75	assumed
Sample No.:	4		Plasticity Index		%	Strain for Saturation	3.57	%
Depth (ft | m)	11.5	3.51	Fines Content	94.5	%	Water added at	150	psf

	Water Content (%)	Total Unit Weight		Dry Unit Weight		Saturation (%)	Void Ratio	Height		Diameter	
		(pcf)	(kN/m^3)	(pcf)	(kN/m^3)			(inches)	(cm)	(inches)	(cm)
Initial	28.3	118.2	18.57	92.2	14.48	90.4	0.86	0.938	2.38	2.416	6.137
Final	26.5	123.2	19.36	97.4	15.30	96.0	0.76	0.888	2.26		

URS

I-5 & SR-74 IC

Project Number: 30989830
Test Start Date: 3/4/2011

CONSOLIDATION TEST
ASTM D2435

SUBMITTED BY: Thomas J. O'Meara

Con I5 SR74 R11022 011.xls

One-Dimensional Oedometer Testing
Set-up / Take down Worksheet
ASTM D2435

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM

Boring No.: R-11-022
Sample No.: 4
Depth (ft): 11.5

Apparatus No.: C8

Specimen Description : Dark olive gray Clay (CH)
Duration: end of primary
Ring Number: R24

Weight of Wet Spec. and Ring: 351.56 g
Weight of Ring: 218.07 g
Initial Weight of Wet Spec.: 133.49 g

Take Down Weight with Ring: 349.55 g

Excess Oven-dried Cont. No.: rp00
Weight of Cont. and Dry Spec.: 117.17 g
Weight of Container: 117.03 g
Weight of Excess Dried Soil: 0.14 g
Weight of Excess Wet Soil 0.18 g
Final Weight of Wet Specimen: 131.66 g

Height of Specimen (in)

	Initial	Final
1	0.941	0.889
2	0.939	0.892
3	0.936	0.885
4	0.939	0.886
5	0.937	0.887
Ave:	0.938	0.888

Initial Height - Final Height = 0.051 in
Change in Dial (Dd) = 0.059 in
Initial Height - Dd = 0.880 in
Final Height + Dd = 0.947 in
Weight of Top Cap = 371.22 g

Specimen Analysis					Initial Trim	Initial Spec.	Final
				Container Number:	m5	**XXXXX**	s2
				Mass of Container and Wet Specimen M1 (g)	374.32	133.49	231.04
				Mass of Container and Dry Specimen, M2 (g)	311.26	104.08	203.62
				Mass of Container, M3 (g)	91.31	**XXXXX**	100.13
				Water Content, w (%)	28.67	28.26	26.50
				Mass of Wet Specimen, M4 (g)	133.49	133.49	131.66
				Mass of Dry Specimen, M5 (g)	104.08	104.08	104.08
Nominal		Measured	x	Specimen Height, H (in)	0.938	0.938	0.888
Nominal	x	Measured		Specimen Diameter, D (in)	2.416	2.416	2.416
				Area of Specimen, A (in^2)	4.584	4.584	4.584
				Volume of Specimen, V (cc)	70.50	70.50	66.70
Assumed	x	Measured		Specific Gravity, Gs	2.75	2.75	2.75
				Wet Unit Weight, WUW (pcf)	**118.2**	**118.2**	**123.2**
				Dry Unit Weight, DUW (pcf)	**91.9**	**92.2**	**97.4**
				Void Ratio	**0.865**	**0.859**	**0.759**
				Degree of Saturation, S (%)	**91.1**	**90.4**	**96.0**

Set-up by: TJO
Date: 3/4/11
Calculated by: TJO
Checked by: TJO
Strain for Saturation (%) = **3.572**

One-Dimensional Oedometer Testing

Loading Worksheet

ASTM D2435

Project Number: 30989830 Boring No.: R-11-022

Project Name: I-5 & SR-74 IC Sample No.: 4

Project Engineer: FM Apparatus No.: C8 Depth (ft): 11.5

Initial Dial Reading: 0.3780 inch Initial Specimen Height: 0.938 inch

Stage No.	Normal Stress (psf)	Dial Reading (in)		Compressibility Correction (in)	Vertical Strain (%)	
		End of Duration	End of Increment		End of Duration	End of Increment
Seat	150		0.3776	0.0000		0.04
1	323	0.3765	0.3774	0.0007	0.09	-0.01
2	670		0.3755	0.0018		0.07
3	1362	0.3708	0.3706	0.0034	0.40	0.43
4	2747	0.3580	0.3574	0.0049	1.61	1.67
5	5517	0.3360	0.3350	0.0068	3.75	3.86
6	11057	0.3090	0.3043	0.0092	6.37	6.87
7	22137	0.2670	0.2642	0.0122	10.53	10.83
8	11057		0.2698	0.0108		10.38
9	2747		0.2897	0.0075		8.61
10	670		0.3090	0.0056		6.76
11	150		0.3191	0.0041		5.84
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						
33						

Final dial reading prior to take down (inch): 0.3191 Take down by: TJO Date: 3/16/11

One-Dimensional Oedometer Testing
ASTM D2435
Table of Incremental Values

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM
Apparatus No.: C8

Boring No.: R-11-022
Sample No.: 4
Depth (ft): 11.5
Inundation at stage: Seat

10 **20** Hanger Ratios

Stage Number	Incremental Weight Applied (kg) Back	Front	Vertical Stress (psf)	Specimen Hieght (in)	Deflections (in) $d_{initial}$	d_o	d_{50}	d_{100}	d_{final}	Porous Stone (in)	t_{50} (min)	cv (in^2/min)	cv (ft^2/day)
Top Cap			26	0.938	0.3780	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
Seat	0.06	0.06	150	0.938	0.3780	XXXXX	XXXXX	XXXXX	0.3776	0.0000	XXXXX	XXXXX	XXXXX
1	0.25		323	0.939	0.3776	0.3768	0.3767	0.3765	0.3774	0.0007	XXXXX	XXXXX	XXXXX
2	0.50		670	0.938	0.3774	0.3766	XXXXX	XXXXX	0.3755	0.0018	XXXXX	XXXXX	XXXXX
3	1.00		1362	0.937	0.3755	0.3748	0.3728	0.3708	0.3706	0.0034	6.00	0.007	0.072
4		1.0	2747	0.929	0.3706	0.3688	0.3634	0.3580	0.3574	0.0049	5.00	0.008	0.085
5	4.0		5517	0.913	0.3574	0.3554	0.3457	0.3360	0.3350	0.0068	5.00	0.008	0.082
6		4.0	11057	0.892	0.3350	0.3327	0.3209	0.3090	0.3043	0.0092	6.00	0.007	0.065
7		8.0	22137	0.864	0.3043	0.3011	0.2841	0.2670	0.2642	0.0122	16.00	0.002	0.023
8		-8.0	11057	0.880	0.2642	0.2656	XXXXX	XXXXX	0.2698	0.0108	XXXXX	XXXXX	XXXXX
9	-4.0	-4.0	2747	0.907	0.2698	0.2723	XXXXX	XXXXX	0.2897	0.0075	XXXXX	XXXXX	XXXXX
10	-1.0	-1.0	670	0.932	0.2897	0.2907	XXXXX	XXXXX	0.3090	0.0056	XXXXX	XXXXX	XXXXX
11	-0.8		150	0.947	0.3090	XXXXX	XXXXX	XXXXX	0.3191	0.0041	XXXXX	XXXXX	XXXXX
12			150	XXXXX	0.3191	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
13			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
14			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
15			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
16			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
17			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
18			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
19			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
20			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
21			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
22			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
23			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
24			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
25			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX

One-Dimensional Oedometer Testing Increment

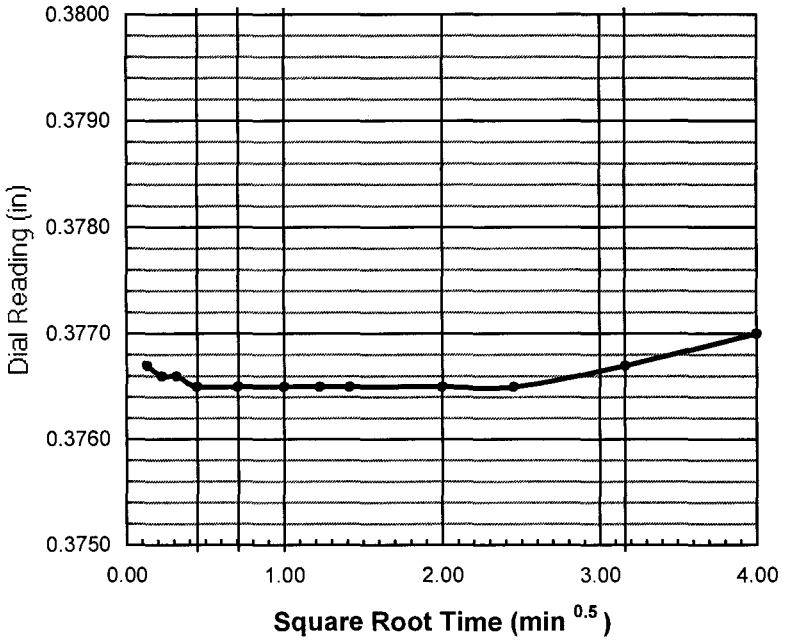
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 1 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 4 | Depth (ft.) 11.5

Date: 4-Mar-11 | Load (psf): 323 | Zero Reading: 0.3780

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
11:08:41	0	0.00	0.3776
	0.02	0.13	0.3767
	0.05	0.22	0.3766
	0.10	0.32	0.3766
	0.20	0.45	0.3765
	0.50	0.71	0.3765
	1.00	1.00	0.3765
	1.50	1.22	0.3765
	2.00	1.41	0.3765
	4.0	2.00	0.3765
	6.0	2.45	0.3765
	10.0	3.16	0.3767
	16.0	4.00	0.3770
swelling	26		0.3774



do = 0.3768

d90 = _____ t90 = _____ min

d100 = 0.3765

df = 0.3774

square root

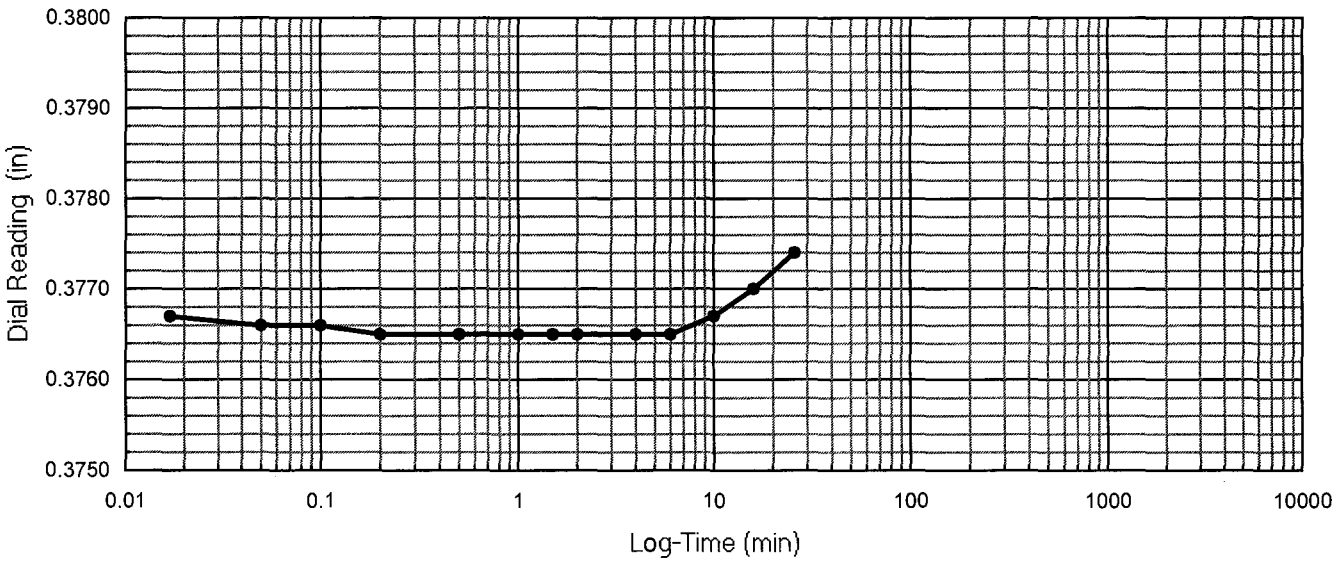
d50 = _____

t50 = _____ min

log time

d50 = 0.3767

t50 = _____ min



One-Dimensional Oedometer Testing Increment

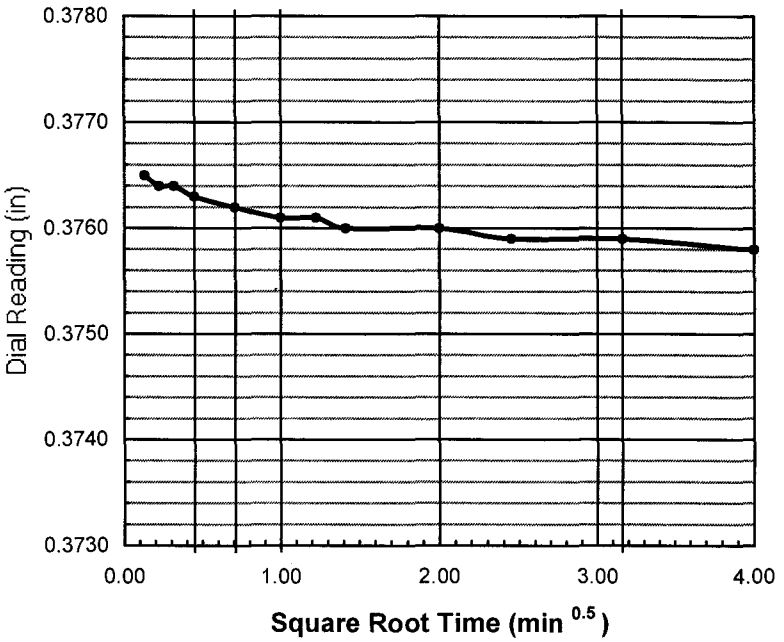
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 2 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 4 | Depth (ft.) 11.5

Date: 4-Mar-11 | Load (psf): 670 | Zero Reading: 0.3780

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
11:34:58	0	0.00	0.3774
	0.02	0.13	0.3765
	0.05	0.22	0.3764
	0.10	0.32	0.3764
	0.20	0.45	0.3763
	0.50	0.71	0.3762
	1.00	1.00	0.3761
	1.50	1.22	0.3761
	2.00	1.41	0.3760
	4.0	2.00	0.3760
	6.0	2.45	0.3759
	10.0	3.16	0.3759
	16.0	4.00	0.3758
	30		0.3758
	60		0.3757
	120		0.3757
	240		0.3756
	480		0.3756
	960		0.3756
	1263		0.3755



do = 0.3766

d90 = _____ t90 = _____ min

d100 = _____

df = 0.3755

square root

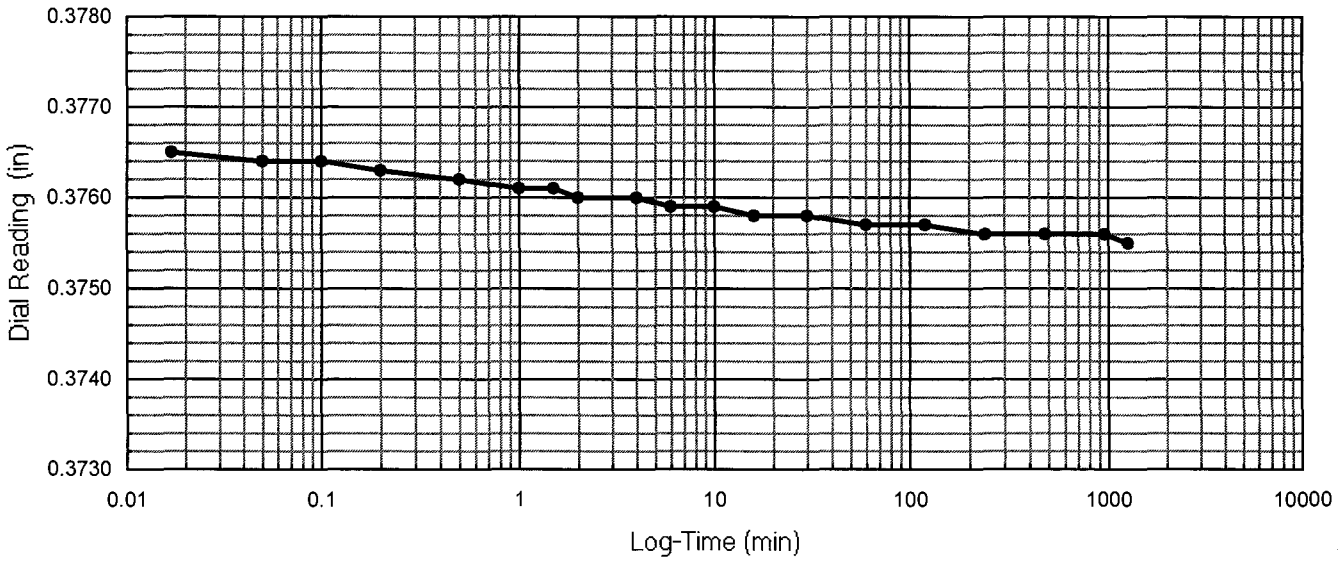
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

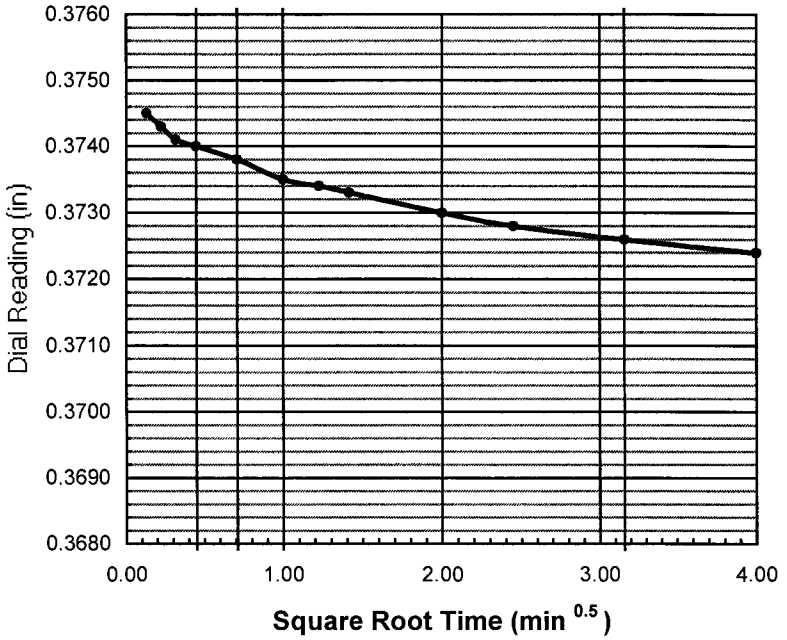
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 3 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 4 | Depth (ft.) 11.5

Date: 5-Mar-11 | Load (psf): 1362 | Zero Reading: 0.3780

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:38:31	0	0.00	0.3755
	0.02	0.13	0.3745
	0.05	0.22	0.3743
	0.10	0.32	0.3741
	0.20	0.45	0.3740
	0.50	0.71	0.3738
	1.00	1.00	0.3735
	1.50	1.22	0.3734
	2.00	1.41	0.3733
	4.0	2.00	0.3730
	6.0	2.45	0.3728
	10.0	3.16	0.3726
	16.0	4.00	0.3724
	30		0.3722
	60		0.3719
	120		0.3717
	240		0.3714
	480		0.3712
	960		0.3709
	1440		0.3708
	2874		0.3706



do = 0.3748

d90 = ____ t90 = ____ min

d100 = 0.3708

df = 0.3706

square root

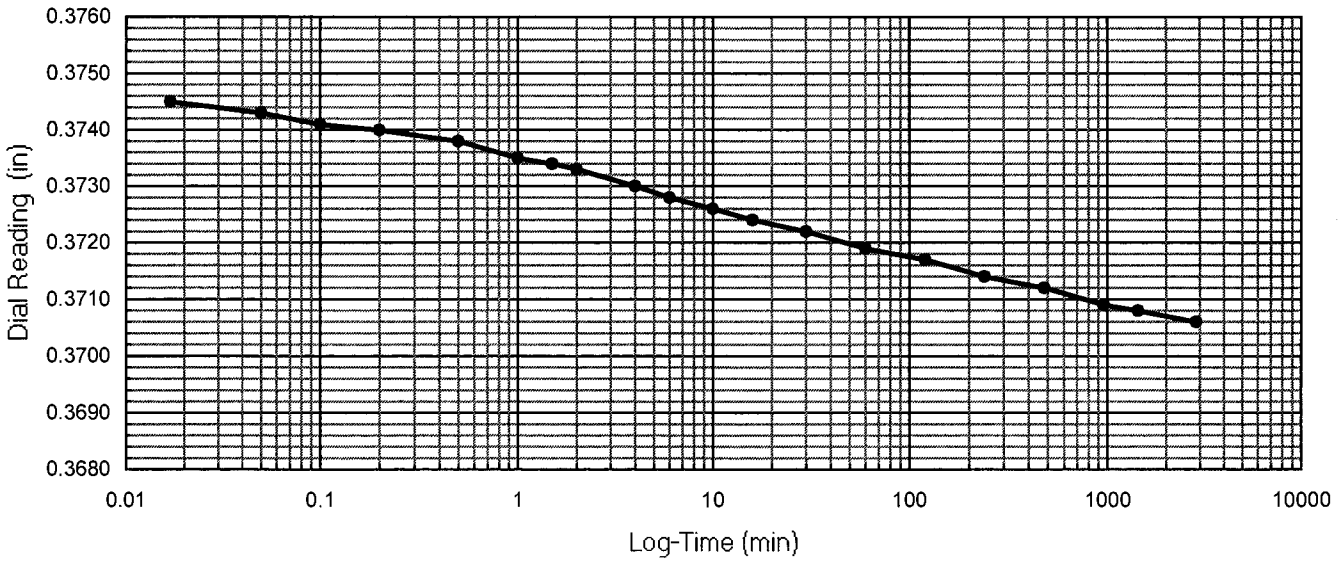
d50 = ____

t50 = ____ min

log time

d50 = 0.3728

t50 = 6.0 min



One-Dimensional Oedometer Testing Increment

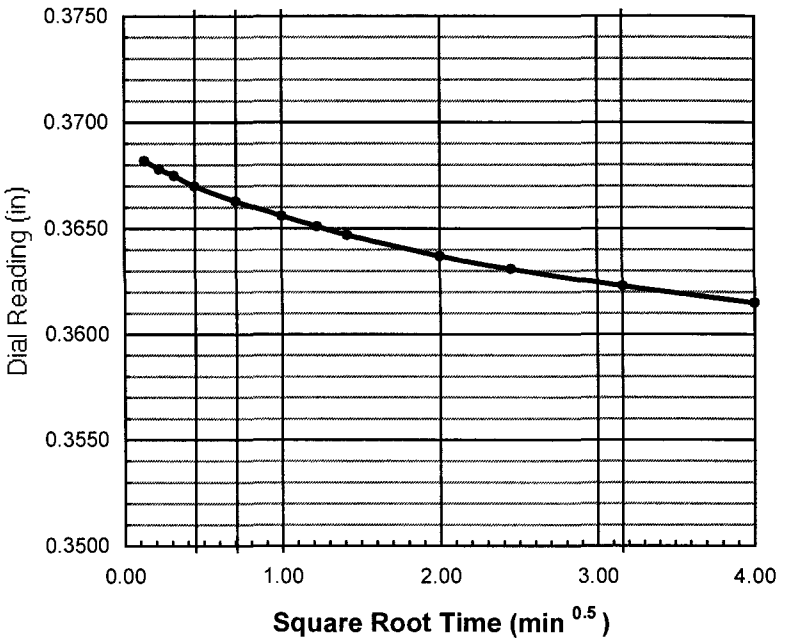
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 4 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 4 | Depth (ft.) 11.5

Date: 7-Mar-11 | Load (psf): 2747 | Zero Reading: 0.3780

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:34:26	0	0.00	0.3706
	0.02	0.13	0.3682
	0.05	0.22	0.3678
	0.10	0.32	0.3675
	0.20	0.45	0.3670
	0.50	0.71	0.3663
	1.00	1.00	0.3656
	1.50	1.22	0.3651
	2.00	1.41	0.3647
	4.0	2.00	0.3637
	6.0	2.45	0.3631
	10.0	3.16	0.3623
	16.0	4.00	0.3615
	30		0.3607
	60		0.3600
	120		0.3593
	240		0.3587
	480		0.3582
	960		0.3577
	1443		0.3574



do = 0.3688

d90 = ____ t90 = ____ min

d100 = 0.3580

df = 0.3574

square root

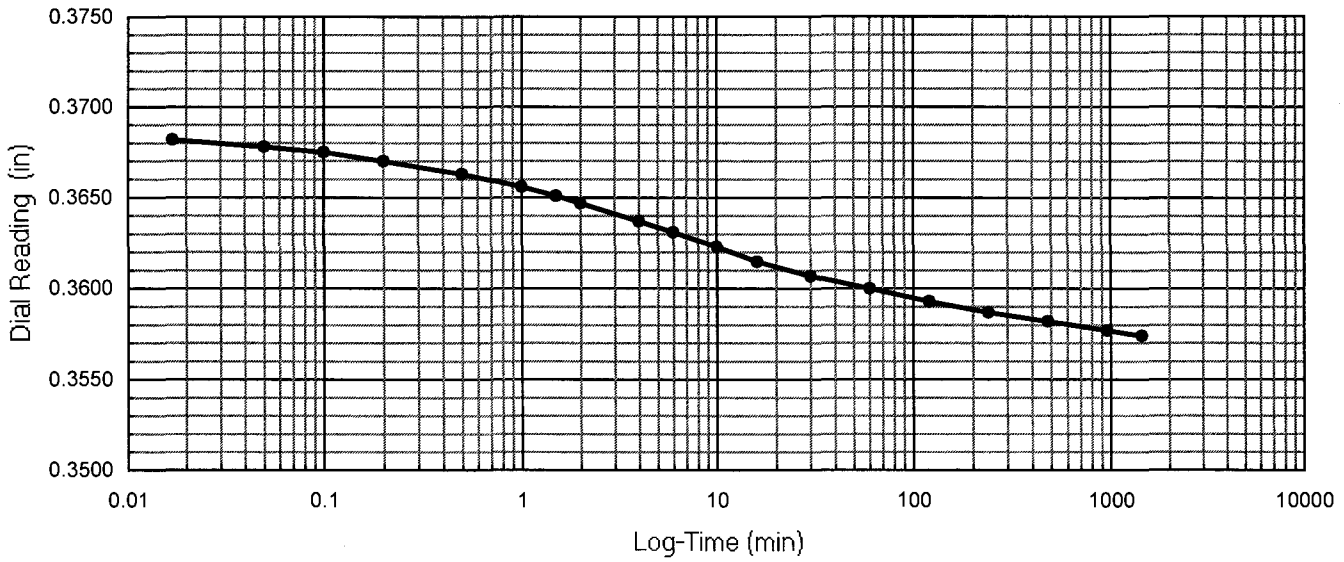
d50 = ____

t50 = ____ min

log time

d50 = 0.3634

t50 = 5.0 min



One-Dimensional Oedometer Testing Increment

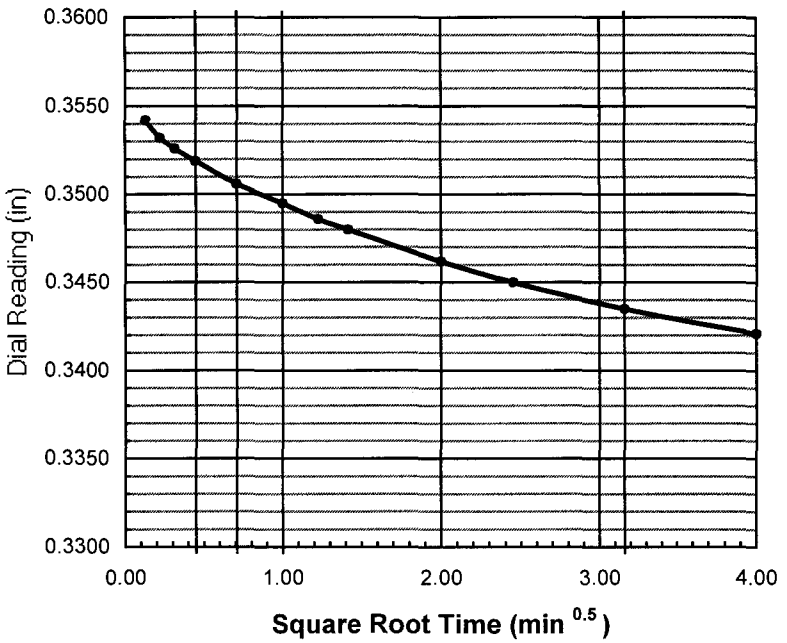
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 5 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 4 | Depth (ft.) 11.5

Date: 8-Mar-11 | Load (psf): 5517 | Zero Reading: 0.3780

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:38:55	0	0.00	0.3574
	0.02	0.13	0.3542
	0.05	0.22	0.3532
	0.10	0.32	0.3526
	0.20	0.45	0.3519
	0.50	0.71	0.3506
	1.00	1.00	0.3495
	1.50	1.22	0.3486
	2.00	1.41	0.3480
	4.0	2.00	0.3462
	6.0	2.45	0.3450
	10.0	3.16	0.3435
	16.0	4.00	0.3421
	30		0.3404
	60		0.3390
	120		0.3379
	240		0.3370
	480		0.3361
	960		0.3353
	1430		0.3350



do = 0.3554

d90 = ____ t90 = ____ min

d100 = 0.3360

df = 0.3350

square root

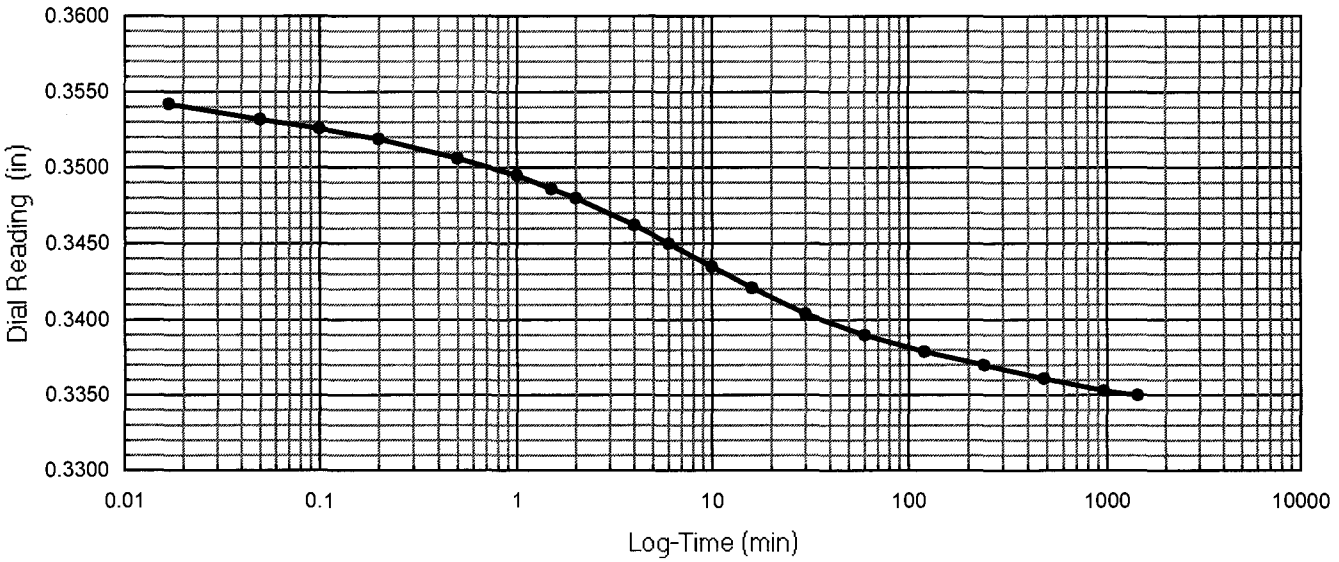
d50 = ____

t50 = ____ min

log time

d50 = 0.3457

t50 = 5.0 min



One-Dimensional Oedometer Testing Increment

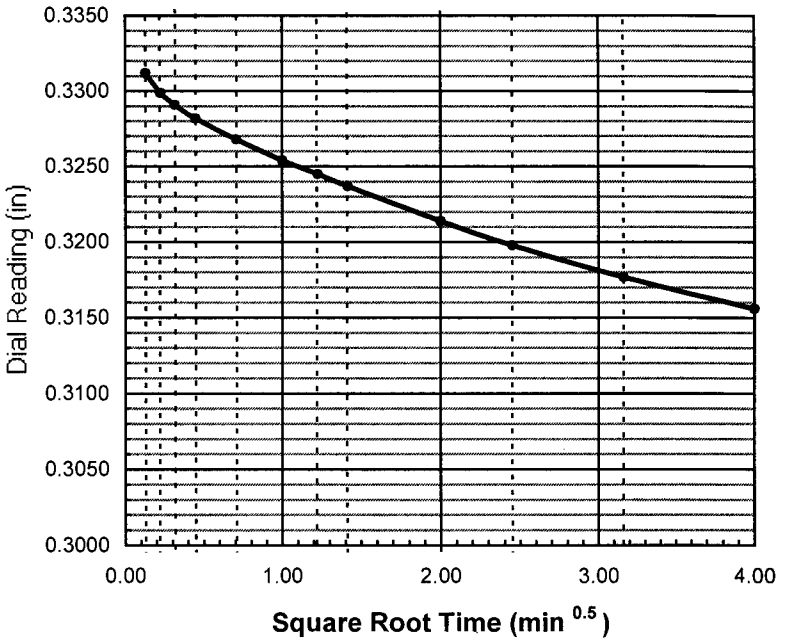
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 6 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 4 | Depth (ft.) 11.5

Date: 9-Mar-11 | Load (psf): 11057 | Zero Reading: 0.3780

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:30:03	0	0.00	0.3350
	0.02	0.13	0.3312
	0.05	0.22	0.3299
	0.10	0.32	0.3291
	0.20	0.45	0.3282
	0.50	0.71	0.3268
	1.00	1.00	0.3254
	1.50	1.22	0.3245
	2.00	1.41	0.3237
	4.0	2.00	0.3214
	6.0	2.45	0.3198
	10.0	3.16	0.3177
	16.0	4.00	0.3156
	30		0.3129
	60		0.3105
	120		0.3086
	240		0.3072
	480		0.3060
	960		0.3048
	1481		0.3043



do = 0.3327

d90 = ____ t90 = ____ min

d100 = 0.3090

df = 0.3043

square root

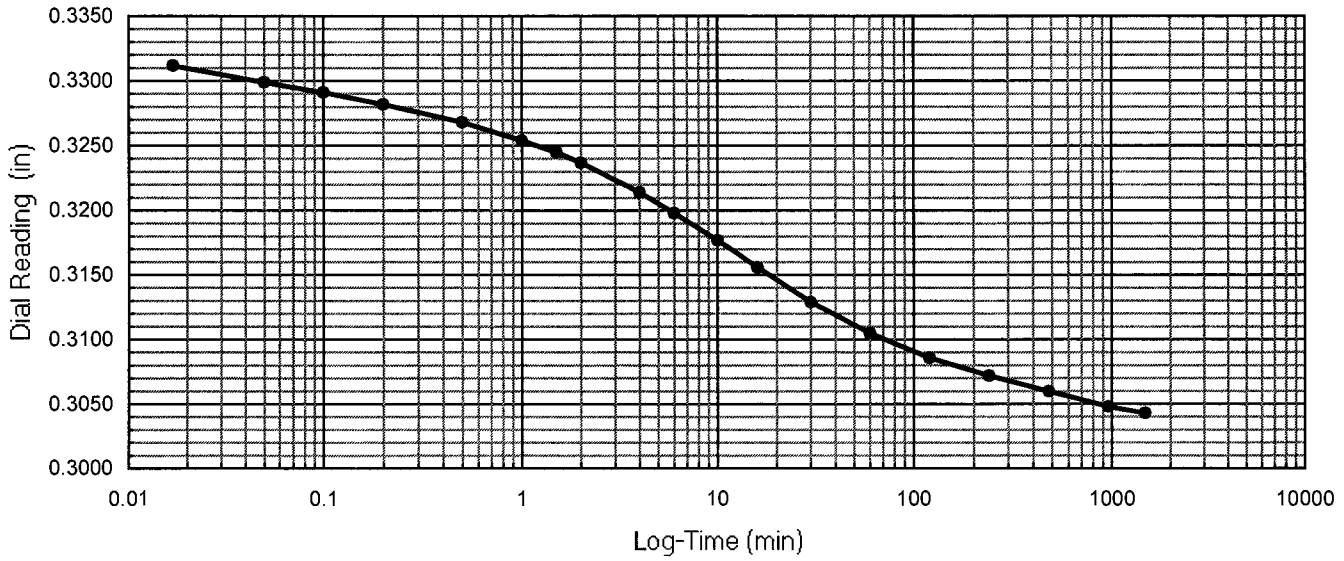
d50 = ____

t50 = ____ min

log time

d50 = 0.3209

t50 = 6.0 min



One-Dimensional Oedometer Testing Increment

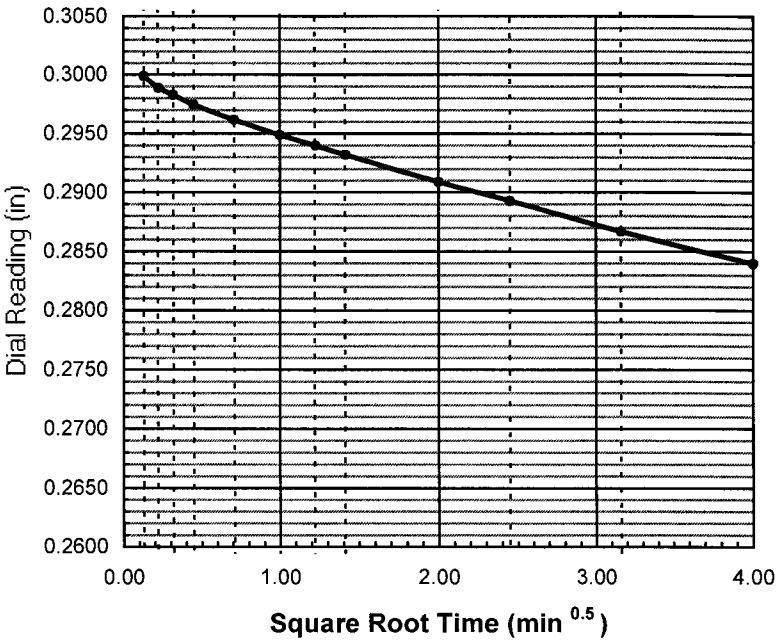
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 7 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 4 | Depth (ft.) 11.5

Date: 10-Mar-11 | Load (psf): 22137 | Zero Reading: 0.3780

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:12:07	0	0.00	0.3043
	0.02	0.13	0.2999
	0.05	0.22	0.2989
	0.10	0.32	0.2983
	0.20	0.45	0.2975
	0.50	0.71	0.2962
	1.00	1.00	0.2949
	1.50	1.22	0.2940
	2.00	1.41	0.2932
	4.0	2.00	0.2909
	6.0	2.45	0.2893
	10.0	3.16	0.2867
	16.0	4.00	0.2840
	30		0.2798
	60		0.2751
	120		0.2711
	240		0.2682
	480		0.2663
	960		0.2649
	1493		0.2642



do = 0.3011

d90 = ____ t90 = ____ min

d100 = 0.2670

df = 0.2642

square root

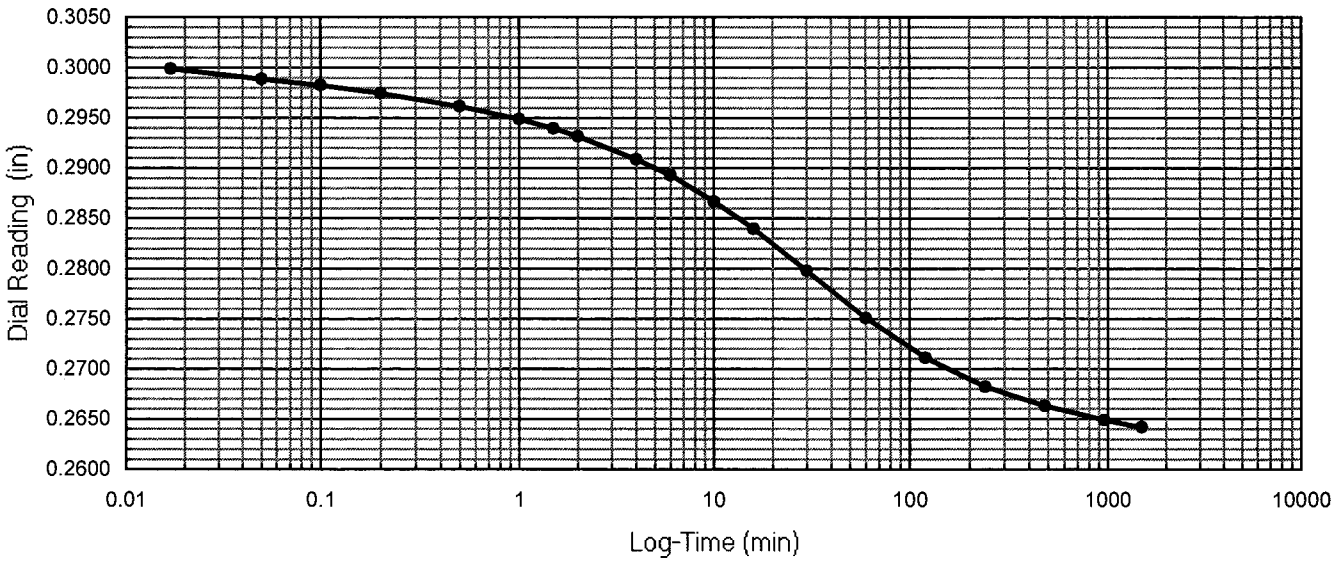
d50 = ____

t50 = ____ min

log time

d50 = 0.2841

t50 = 16.0 min



One-Dimensional Oedometer Testing Increment

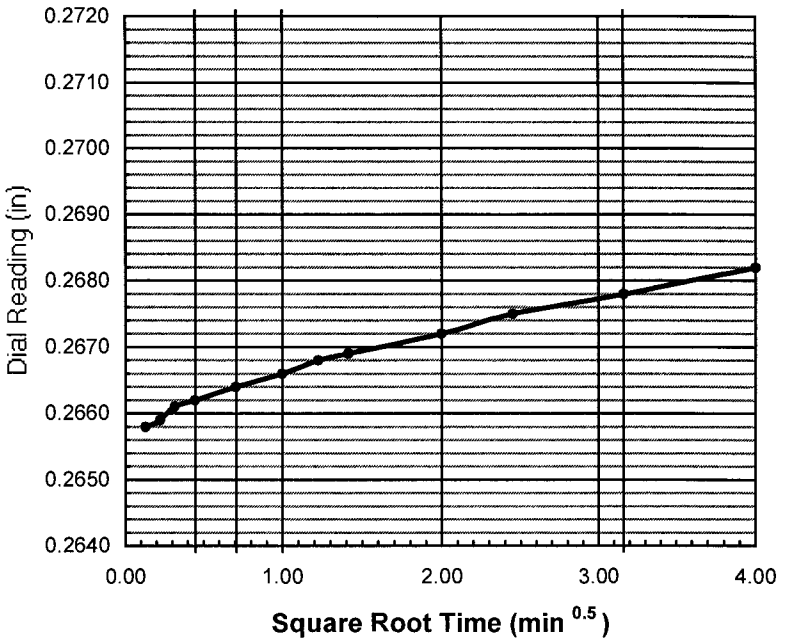
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 8 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 4 | Depth (ft.) 11.5

Date: 11-Mar-11 | Load (psf): 11057 | Zero Reading: 0.3780

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:06:46	0	0.00	0.2642
	0.02	0.13	0.2658
	0.05	0.22	0.2659
	0.10	0.32	0.2661
	0.20	0.45	0.2662
	0.50	0.71	0.2664
	1.00	1.00	0.2666
	1.50	1.22	0.2668
	2.00	1.41	0.2669
	4.0	2.00	0.2672
	6.0	2.45	0.2675
	10.0	3.16	0.2678
	16.0	4.00	0.2682
	30		0.2687
	60		0.2691
	120		0.2693
	240		0.2695
	480		0.2697
	960		0.2698
	1455		0.2698



do = 0.2656

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2698

square root

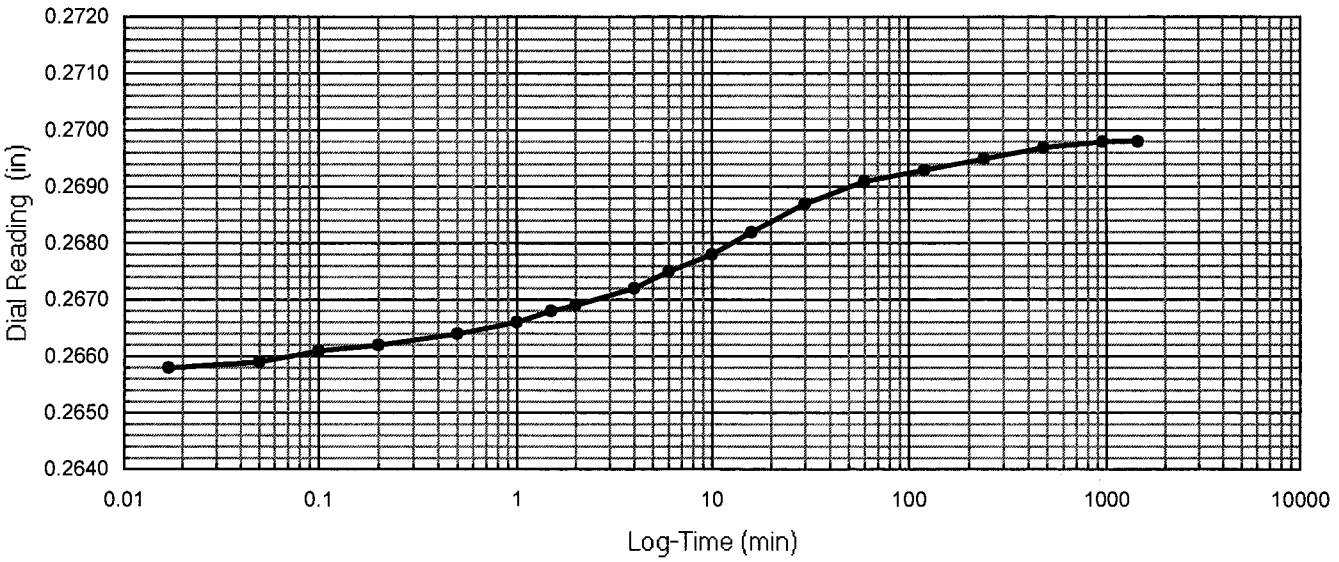
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

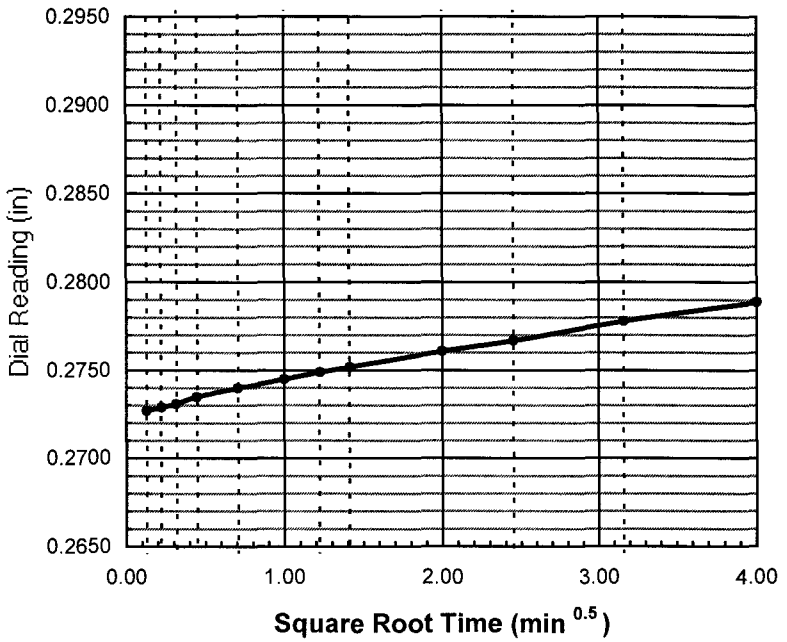
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 9 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 4 | Depth (ft.) 11.5

Date: 12-Mar-11 | Load (psf): 2747 | Zero Reading: 0.3780

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:23:19	0	0.00	0.2698
	0.02	0.13	0.2727
	0.05	0.22	0.2729
	0.10	0.32	0.2731
	0.20	0.45	0.2735
	0.50	0.71	0.2740
	1.00	1.00	0.2745
	1.50	1.22	0.2749
	2.00	1.41	0.2752
	4.0	2.00	0.2761
	6.0	2.45	0.2767
	10.0	3.16	0.2778
	16.0	4.00	0.2789
	30		0.2808
	60		0.2834
	120		0.2859
	240		0.2878
	480		0.2888
	960		0.2894
	1541		0.2897



do = 0.2723

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2897

square root

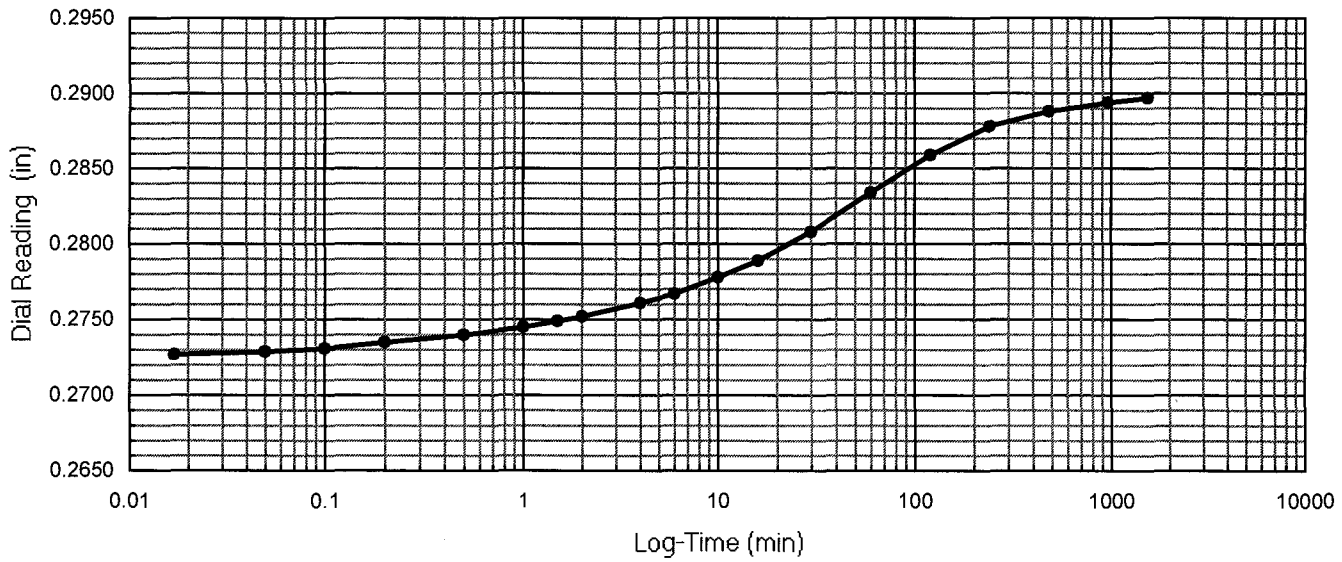
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

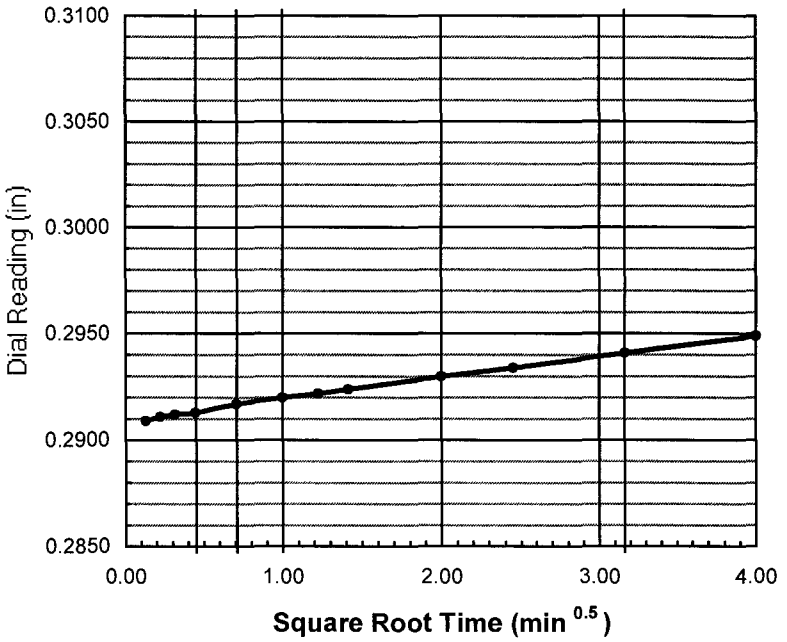
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 10 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 4 | Depth (ft.) 11.5

Date: 13-Mar-11 | Load (psf): 670 | Zero Reading: 0.3780

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
12:04:44	0	0.00	0.2897
	0.02	0.13	0.2909
	0.05	0.22	0.2911
	0.10	0.32	0.2912
	0.20	0.45	0.2913
	0.50	0.71	0.2917
	1.00	1.00	0.2920
	1.50	1.22	0.2922
	2.00	1.41	0.2924
	4.0	2.00	0.2930
	6.0	2.45	0.2934
	10.0	3.16	0.2941
	16.0	4.00	0.2949
	30		0.2964
	60		0.2984
	120		0.3010
	240		0.3038
	480		0.3059
	960		0.3072
	1440		0.3078
	2880		0.3087
	4054		0.3090



do = 0.2907

d90 = _____ t90 = _____ min

d100 = _____

df = 0.3090

square root

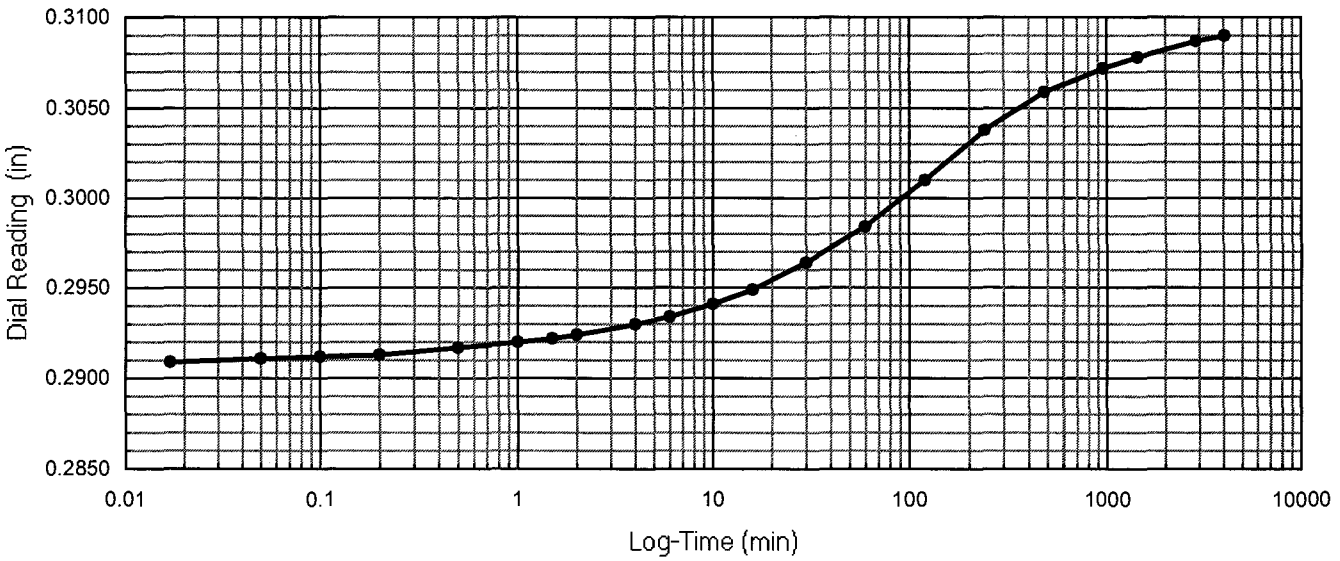
d50 = _____

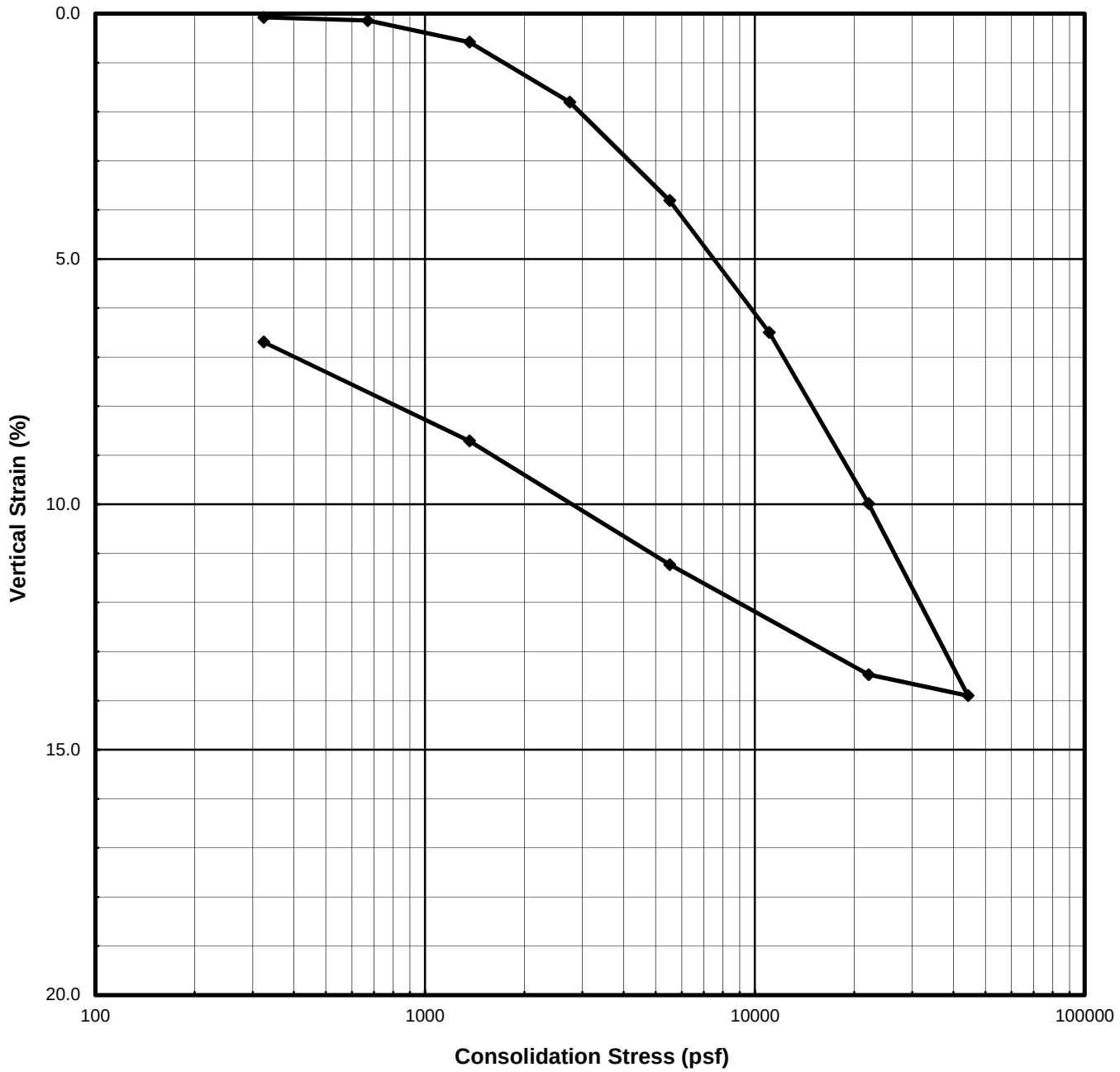
t50 = _____ min

log time

d50 = _____

t50 = _____ min





Description:	**Dark olive gray Clay (CH)**							
Boring No.:	R-11-022		Liquid Limit	50	%	Specific Gravity	2.75	assumed
Sample No.:	6		Plasticity Index	32	%	Strain for Saturation	1.64	%
Depth (ft | m)	20.0	6.10	Fines Content	87.0	%	Water added at	151	psf

	Water Content (%)	Total Unit Weight		Dry Unit Weight		Saturation (%)	Void Ratio	Height		Diameter	
		(pcf)	(kN/m^3)	(pcf)	(kN/m^3)			(inches)	(cm)	(inches)	(cm)
Initial	25.6	123.2	19.35	98.1	15.41	94.2	0.75	0.932	2.37	2.416	6.137
Final	24.6	126.8	19.92	101.8	16.00	98.9	0.68	0.898	2.28		

URS

I-5 & SR-74 IC

Project Number: 30989830
Test Start Date: 2/18/2011

CONSOLIDATION TEST
ASTM D2435

SUBMITTED BY: Thomas J. O'Meara

Con I5 SR74 R11022 020.xls

One-Dimensional Oedometer Testing
Set-up / Take down Worksheet
ASTM D2435

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM
Apparatus No.: C5

Boring No.: R-11-022
Sample No.: 6
Depth (ft): 20.0

Specimen Description : Dark olive gray Clay (CH)
Duration: end of increment
Ring Number: R23

Weight of Wet Spec. and Ring:	355.68	g
Weight of Ring:	217.46	g
Initial Weight of Wet Spec.:	138.22	g
Take Down Weight with Ring:	354.27	g
Excess Oven-dried Cont. No.:	rp10	
Weight of Cont. and Dry Spec.:	116.20	g
Weight of Container:	116.00	g
Weight of Excess Dried Soil:	0.20	g
Weight of Excess Wet Soil	0.25	g
Final Weight of Wet Specimen:	137.06	g

Height of Specimen (in)

	Initial	Final
1	0.932	0.899
2	0.931	0.899
3	0.932	0.898
4	0.932	0.894
5	0.935	0.900
Ave:	0.932	0.898

Initial Height - Final Height =	0.034	in
Change in Dial (Dd) =	0.041	in
Initial Height - Dd =	0.891	in
Final Height + Dd =	0.939	in
Weight of Top Cap =	378.97	g

Specimen Analysis					Initial Trim	Initial Spec.	Final
				Container Number:	m13	**XXXXX**	s20
				Mass of Container and Wet Specimen M1 (g)	337.78	138.22	212.23
				Mass of Container and Dry Specimen, M2 (g)	286.50	110.04	185.43
				Mass of Container, M3 (g)	89.82	**XXXXX**	76.30
				Water Content, w (%)	26.07	25.61	24.56
				Mass of Wet Specimen, M4 (g)	138.22	138.22	137.06
				Mass of Dry Specimen, M5 (g)	110.04	110.04	110.04
Nominal		Measured	x	Specimen Height, H (in)	0.932	0.932	0.898
Nominal	x	Measured		Specimen Diameter, D (in)	2.416	2.416	2.416
				Area of Specimen, A (in^2)	4.584	4.584	4.584
				Volume of Specimen, V (cc)	70.05	70.05	67.46
Assumed	x	Measured		Specific Gravity, Gs	2.75	2.75	2.75
				Wet Unit Weight, WUW (pcf)	**123.2**	**123.2**	**126.8**
				Dry Unit Weight, DUW (pcf)	**97.7**	**98.1**	**101.8**
				Void Ratio	**0.754**	**0.747**	**0.683**
				Degree of Saturation, S (%)	**95.1**	**94.2**	**98.9**

Set-up by: TJO
Date: 2/18/11
Calculated by: TJO
Checked by: TJO
Strain for Saturation (%) = **1.643**

One-Dimensional Oedometer Testing

Loading Worksheet

ASTM D2435

Project Number: 30989830 Boring No.: R-11-022

Project Name: I-5 & SR-74 IC Sample No.: 6

Project Engineer: FM Apparatus No.: C5 Depth (ft): 20.0

Initial Dial Reading: 0.3580 inch Initial Specimen Height: 0.932 inch

Stage No.	Normal Stress (psf)	Dial Reading (in)		Compressibility Correction (in)	Vertical Strain (%)	
		End of Duration	End of Increment		End of Duration	End of Increment
Seat	151		0.3579	0.0000		0.01
1	324	0.3562	0.3564	0.0009	0.10	0.08
2	670	0.3544	0.3545	0.0022	0.15	0.14
3	1363	0.3490	0.3488	0.0038	0.56	0.58
4	2748	0.3370	0.3357	0.0055	1.66	1.80
5	5518	0.3170	0.3147	0.0078	3.56	3.81
6	11058	0.2900	0.2867	0.0107	6.15	6.50
7	22137	0.2520	0.2501	0.0148	9.78	9.98
8	44297	0.2140	0.2106	0.0178	13.53	13.90
9	22137		0.2162	0.0162		13.47
10	5518		0.2429	0.0104		11.23
11	1363		0.2695	0.0073		8.71
12	324		0.2904	0.0052		6.69
13	68		0.3167	0.0043		3.97
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						
33						

Final dial reading prior to take down (inch): 0.3167 Take down by: TJO Date: 3/16/11

One-Dimensional Oedometer Testing
ASTM D2435
Table of Incremental Values

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM
Apparatus No.: C5

Boring No.: R-11-022
Sample No.: 6
Depth (ft): 20.0
Inundation at stage: Seat

10 **20** Hanger Ratios

Stage Number	Incremental Weight Applied (kg) Back	Front	Vertical Stress (psf)	Specimen Hieght (in)	Deflections (in) $d_{initial}$	d_o	d_{50}	d_{100}	d_{final}	Porous Stone (in)	t_{50} (min)	cv (in^2/min)	cv (ft^2/day)
Top Cap			26	0.932	0.3580	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
Seat	0.06	0.06	151	0.932	0.3580	XXXXX	XXXXX	XXXXX	0.3579	0.0000	XXXXX	XXXXX	XXXXX
1	0.25		324	0.932	0.3579	0.3570	0.3566	0.3562	0.3564	0.0009	XXXXX	XXXXX	XXXXX
2	0.50		670	0.932	0.3564	0.3550	0.3547	0.3544	0.3545	0.0022	XXXXX	XXXXX	XXXXX
3	1.00		1363	0.930	0.3545	0.3530	0.3510	0.3490	0.3488	0.0038	1.50	0.028	0.284
4		1.0	2748	0.923	0.3488	0.3475	0.3423	0.3370	0.3357	0.0055	10.00	0.004	0.042
5	4.0		5518	0.909	0.3357	0.3341	0.3256	0.3170	0.3147	0.0078	15.00	0.003	0.027
6		4.0	11058	0.892	0.3147	0.3125	0.3013	0.2900	0.2867	0.0107	18.00	0.002	0.022
7		8.0	22137	0.870	0.2867	0.2835	0.2678	0.2520	0.2501	0.0148	35.00	0.001	0.011
8		16.0	44297	0.849	0.2501	0.2477	0.2309	0.2140	0.2106	0.0178	70.00	0.001	0.005
9		-16.0	22137	0.870	0.2106	0.2122	XXXXX	XXXXX	0.2162	0.0162	XXXXX	XXXXX	XXXXX
10		-12.0	5518	0.907	0.2162	0.2207	XXXXX	XXXXX	0.2429	0.0104	XXXXX	XXXXX	XXXXX
11	-4.0	-1.0	1363	0.941	0.2429	0.2447	XXXXX	XXXXX	0.2695	0.0073	XXXXX	XXXXX	XXXXX
12	-1.5		324	0.967	0.2695	0.2703	XXXXX	XXXXX	0.2904	0.0052	XXXXX	XXXXX	XXXXX
13	-0.25	-0.06	68	0.998	0.2904	XXXXX	XXXXX	XXXXX	0.3167	0.0043	XXXXX	XXXXX	XXXXX
14			68	XXXXX	0.3167	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
15			68	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
16			68	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
17			68	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
18			68	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
19			68	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
20			68	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
21			68	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
22			68	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
23			68	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
24			68	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
25			68	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX

One-Dimensional Oedometer Testing Increment

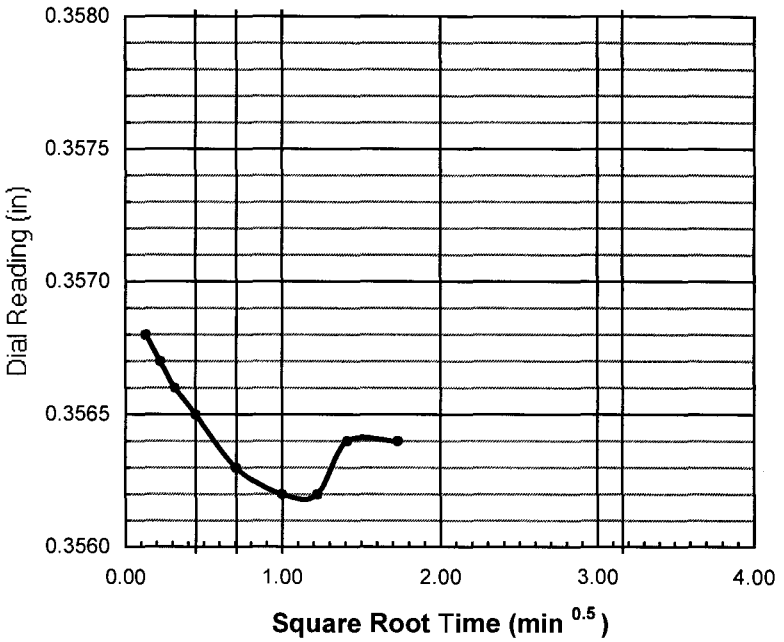
for ASTM D2435, method B

Project Number: 30989830 Apparatus No.: C5 Stage Number: 1 Curves by: TJO

Boring No.: R-11-022 Sample No.: 6 Depth (ft.) 20.0

Date: 18-Feb-11 Load (psf): 324 Zero Reading: 0.3580

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
12:14:05	0	0.00	0.3579
	0.02	0.13	0.3568
	0.05	0.22	0.3567
	0.10	0.32	0.3566
	0.20	0.45	0.3565
	0.50	0.71	0.3563
	1.00	1.00	0.3562
	1.50	1.22	0.3562
	2.00	1.41	0.3564
swelling	3.0	1.73	0.3564



do = 0.3570

d90 = _____ t90 = _____ min

d100 = _____

df = 0.3564

square root

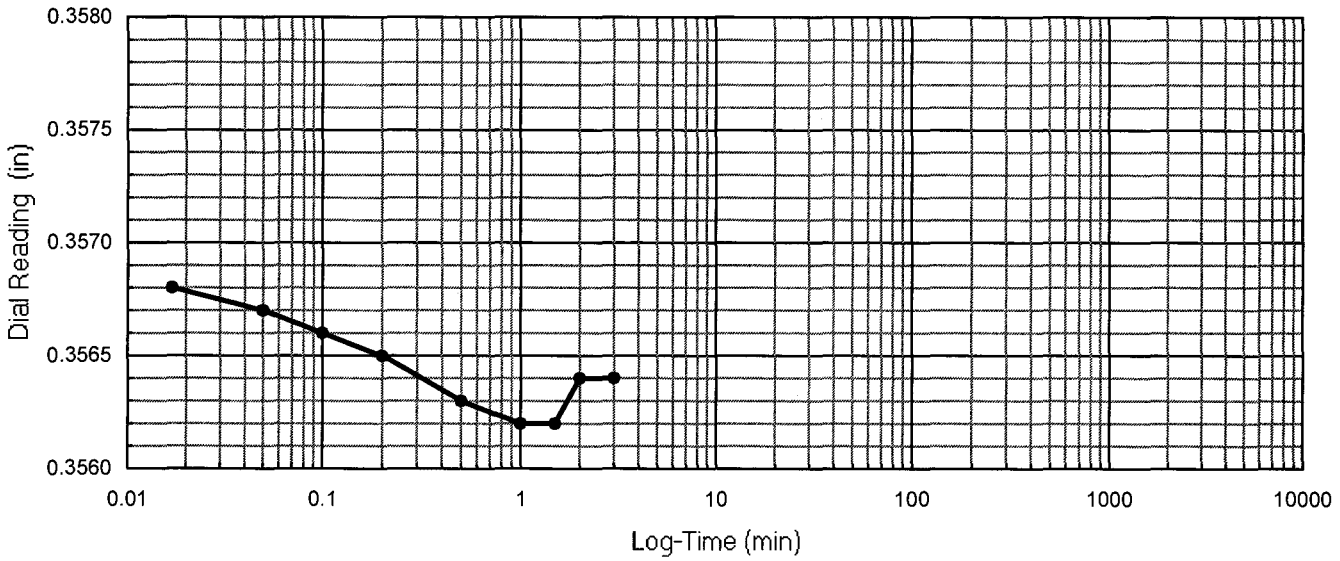
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

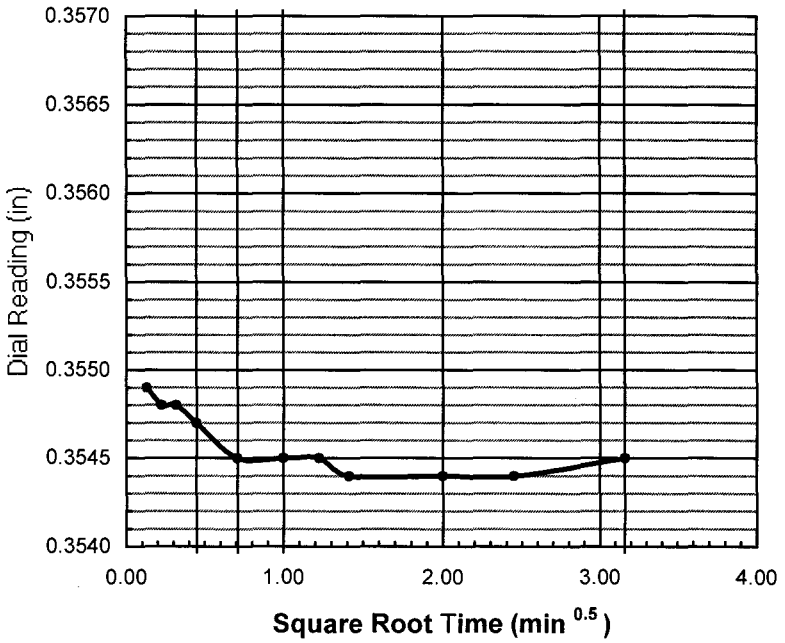
for ASTM D2435, method B

Project Number: 30989830 Apparatus No.: C5 Stage Number: 2 Curves by: TJO

Boring No.: R-11-022 Sample No.: 6 Depth (ft.) 20.0

Date: 18-Feb-11 Load (psf): 670 Zero Reading: 0.3580

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
12:16:27	0	0.00	0.3564
	0.02	0.13	0.3549
	0.05	0.22	0.3548
	0.10	0.32	0.3548
	0.20	0.45	0.3547
	0.50	0.71	0.3545
	1.00	1.00	0.3545
	1.50	1.22	0.3545
	2.00	1.41	0.3544
	4.0	2.00	0.3544
	6.0	2.45	0.3544
swelling	10.0	3.16	0.3545



do = 0.3550

d90 = _____ t90 = _____ min

d100 = _____

df = 0.3545

square root

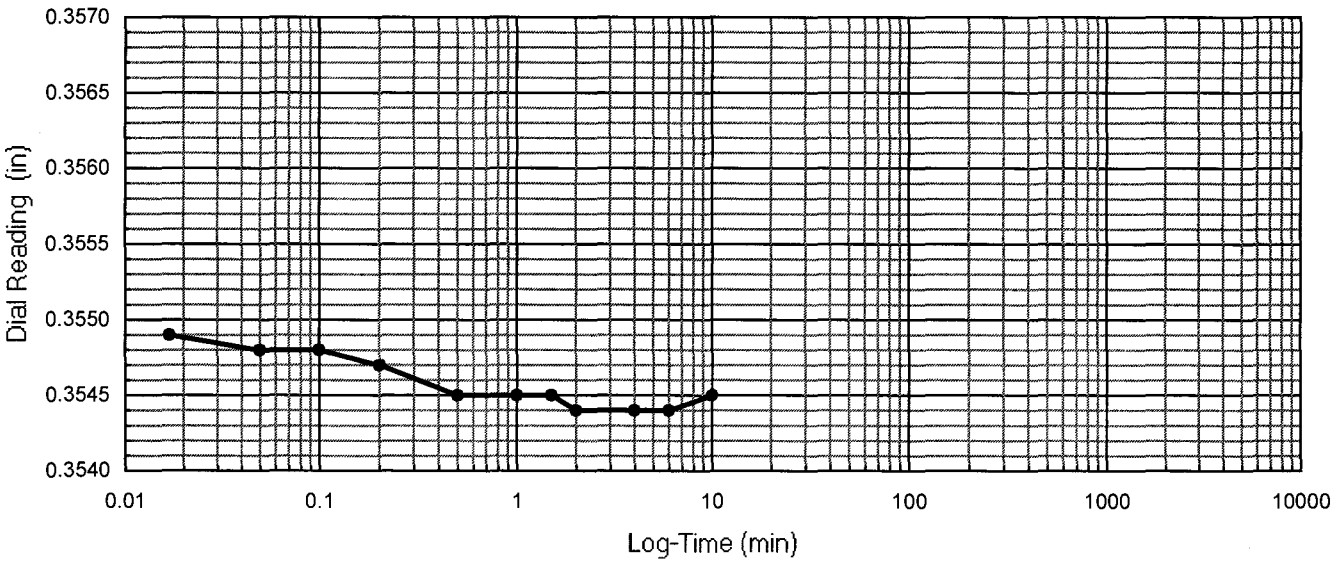
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

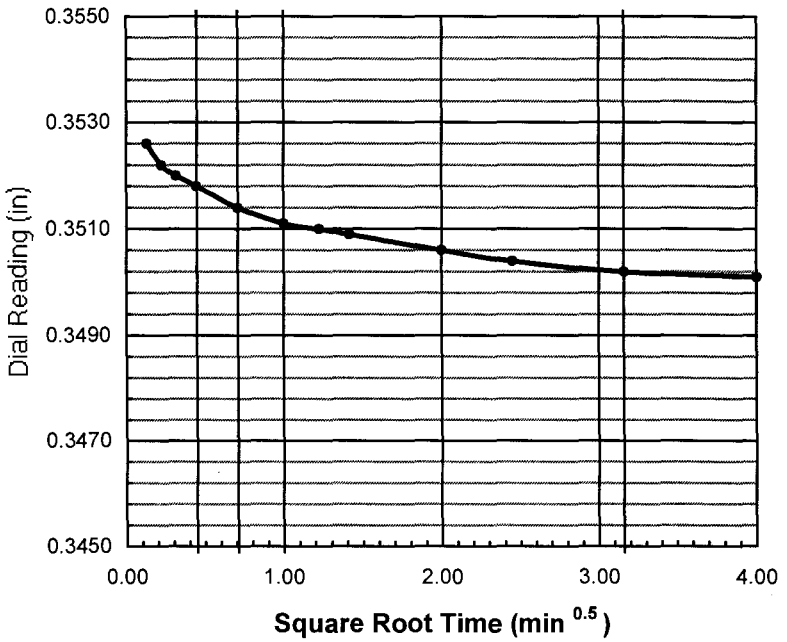
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C5 | Stage Number: 3 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 6 | Depth (ft.) 20.0

Date: 18-Feb-11 | Load (psf): 1363 | Zero Reading: 0.3580

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
12:26:50	0	0.00	0.3545
	0.02	0.13	0.3526
	0.05	0.22	0.3522
	0.10	0.32	0.3520
	0.20	0.45	0.3518
	0.50	0.71	0.3514
	1.00	1.00	0.3511
	1.50	1.22	0.3510
	2.00	1.41	0.3509
	4.0	2.00	0.3506
	6.0	2.45	0.3504
	10.0	3.16	0.3502
	16.0	4.00	0.3501
	30		0.3499
	60		0.3497
	120		0.3494
	240		0.3492
	480		0.3490
	960		0.3488
	1300		0.3488



do = 0.3530

d90 = _____ t90 = _____ min

d100 = 0.3490

df = 0.3488

square root

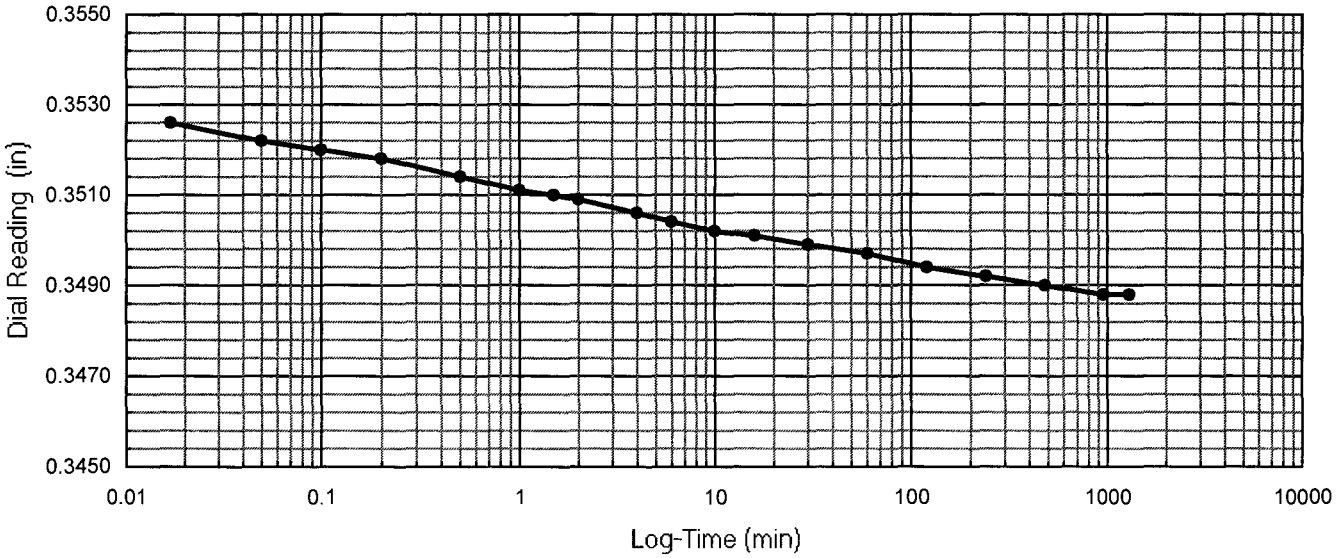
d50 = _____

t50 = _____ min

log time

d50 = 0.3510

t50 = 1.5 min



One-Dimensional Oedometer Testing Increment

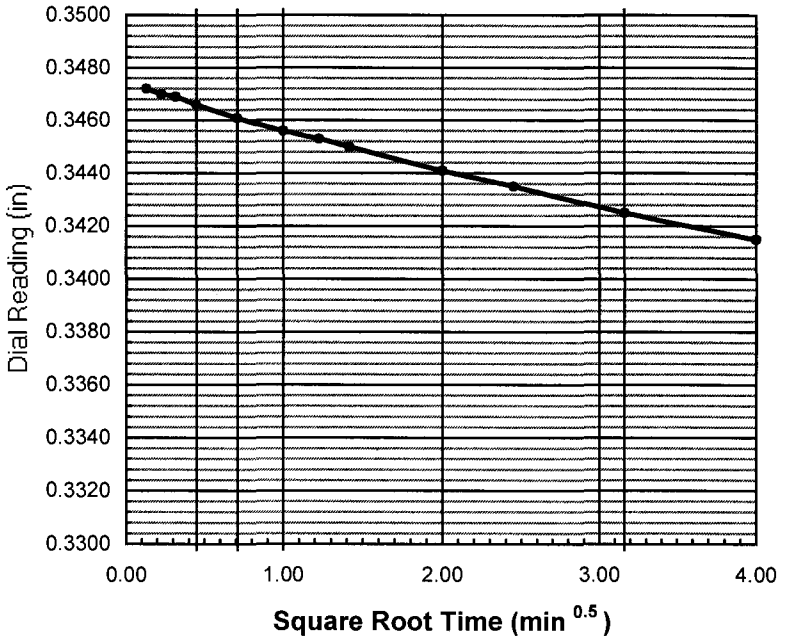
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C5 | Stage Number: 4 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 6 | Depth (ft.) 20.0

Date: 19-Feb-11 | Load (psf): 2748 | Zero Reading: 0.3580

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:06:15	0	0.00	0.3488
	0.02	0.13	0.3472
	0.05	0.22	0.3470
	0.10	0.32	0.3469
	0.20	0.45	0.3466
	0.50	0.71	0.3461
	1.00	1.00	0.3456
	1.50	1.22	0.3453
	2.00	1.41	0.3450
	4.0	2.00	0.3441
	6.0	2.45	0.3435
	10.0	3.16	0.3425
	16.0	4.00	0.3415
	30		0.3401
	60		0.3387
	120		0.3377
	240		0.3370
	480		0.3364
	960		0.3360
	1466		0.3357



do = 0.3475

d90 = _____ t90 = _____ min

d100 = 0.3370

df = 0.3357

square root

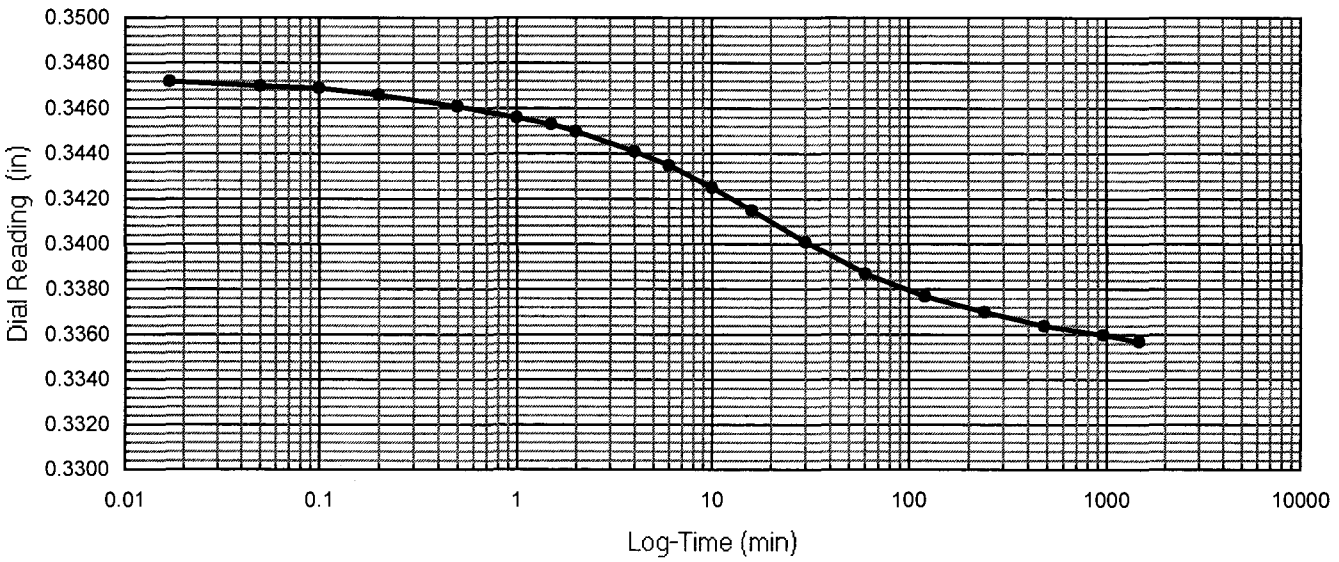
d50 = _____

t50 = _____ min

log time

d50 = 0.3423

t50 = 10.0 min



One-Dimensional Oedometer Testing Increment

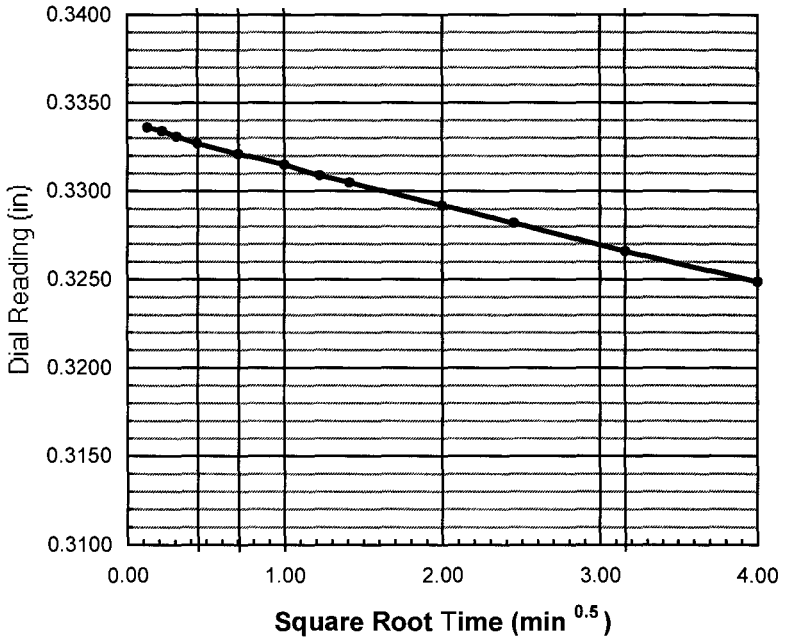
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C5 | Stage Number: 5 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 6 | Depth (ft.) 20.0

Date: 20-Feb-11 | Load (psf): 5518 | Zero Reading: 0.3580

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:33:03	0	0.00	0.3357
	0.02	0.13	0.3336
	0.05	0.22	0.3334
	0.10	0.32	0.3331
	0.20	0.45	0.3327
	0.50	0.71	0.3321
	1.00	1.00	0.3315
	1.50	1.22	0.3309
	2.00	1.41	0.3305
	4.0	2.00	0.3292
	6.0	2.45	0.3282
	10.0	3.16	0.3266
	16.0	4.00	0.3249
	30		0.3223
	60		0.3196
	120		0.3177
	240		0.3165
	480		0.3156
	960		0.3149
	1276		0.3147



do = 0.3341

d90 = _____ t90 = _____ min

d100 = 0.3170

df = 0.3147

square root

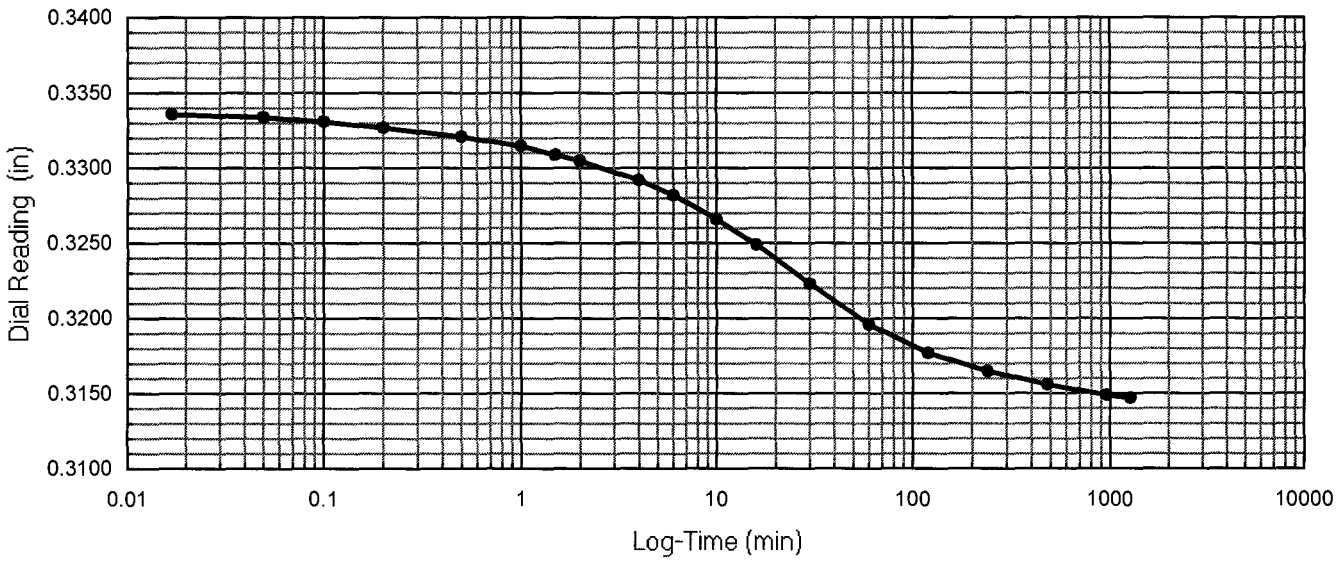
d50 = _____

t50 = _____ min

log time

d50 = 0.3255

t50 = 15.0 min



One-Dimensional Oedometer Testing Increment

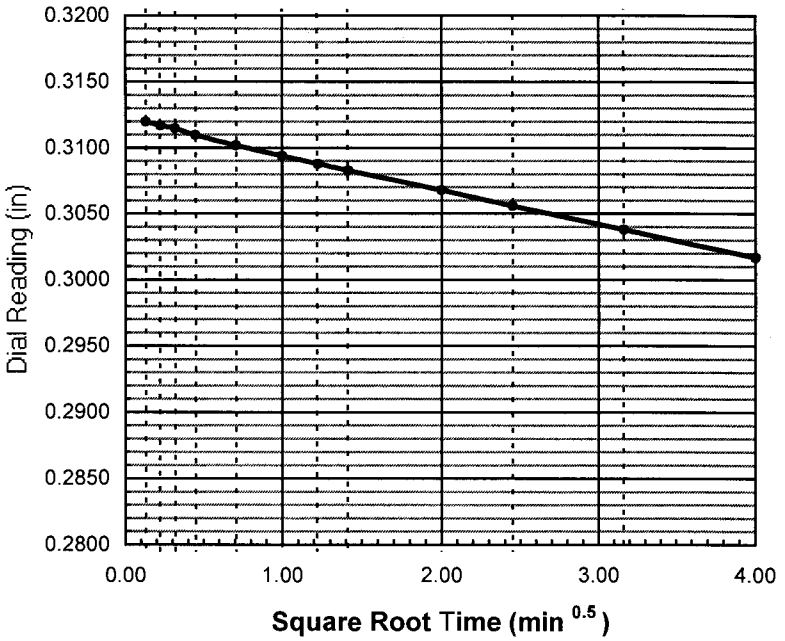
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C5 | Stage Number: 6 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 6 | Depth (ft.) 20.0

Date: 21-Feb-11 | Load (psf): 11058 | Zero Reading: 0.3580

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
7:50:04	0	0.00	0.3147
	0.02	0.13	0.3120
	0.05	0.22	0.3117
	0.10	0.32	0.3115
	0.20	0.45	0.3110
	0.50	0.71	0.3102
	1.00	1.00	0.3094
	1.50	1.22	0.3088
	2.00	1.41	0.3083
	4.0	2.00	0.3068
	6.0	2.45	0.3056
	10.0	3.16	0.3038
	16.0	4.00	0.3017
	30		0.2985
	60		0.2948
	120		0.2918
	240		0.2898
	480		0.2883
	960		0.2872
	1463		0.2867



do = 0.3125

d90 = ____ t90 = ____ min

d100 = 0.2900

df = 0.2867

square root

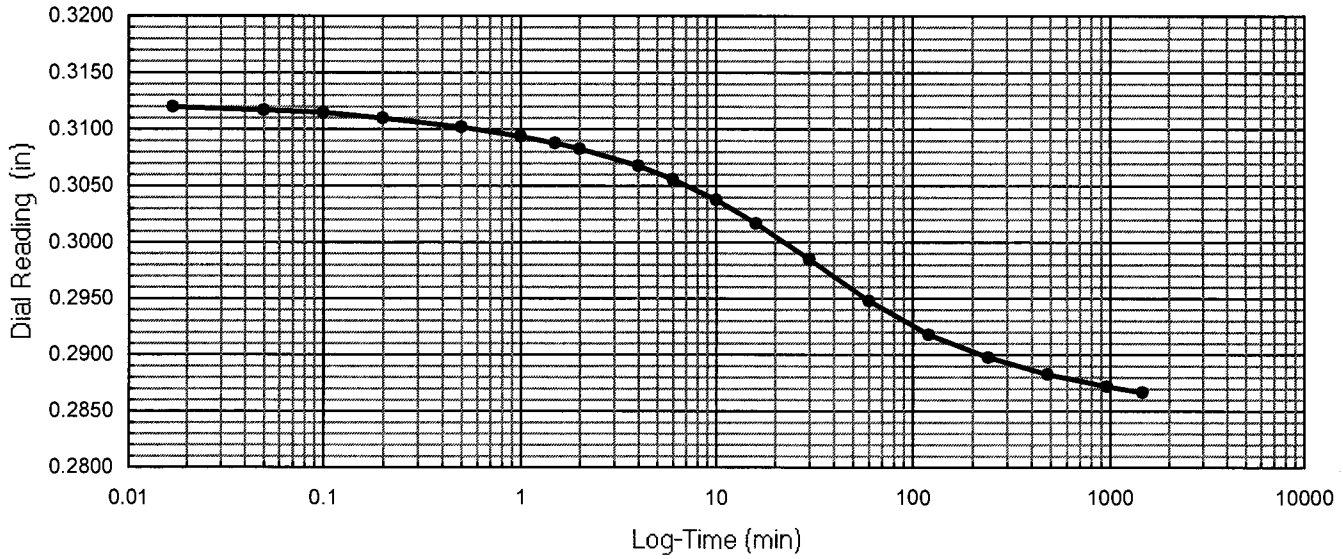
d50 = ____

t50 = ____ min

log time

d50 = 0.3013

t50 = 18.0 min



One-Dimensional Oedometer Testing Increment

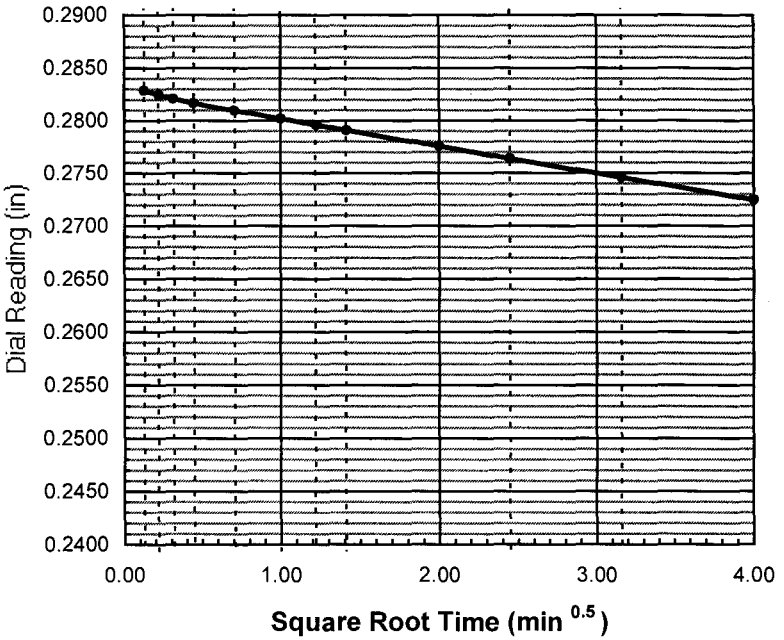
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C5 | Stage Number: 7 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 6 | Depth (ft.) 20.0

Date: 22-Feb-11 | Load (psf): 22137 | Zero Reading: 0.3580

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:13:38	0	0.00	0.2867
	0.02	0.13	0.2829
	0.05	0.22	0.2825
	0.10	0.32	0.2821
	0.20	0.45	0.2817
	0.50	0.71	0.2810
	1.00	1.00	0.2802
	1.50	1.22	0.2796
	2.00	1.41	0.2791
	4.0	2.00	0.2776
	6.0	2.45	0.2764
	10.0	3.16	0.2746
	16.0	4.00	0.2725
	30		0.2691
	60		0.2643
	120		0.2593
	240		0.2552
	480		0.2523
	960		0.2506
	1451		0.2501



do = 0.2835

d90 = _____ t90 = _____ min

d100 = 0.2520

df = 0.2501

square root

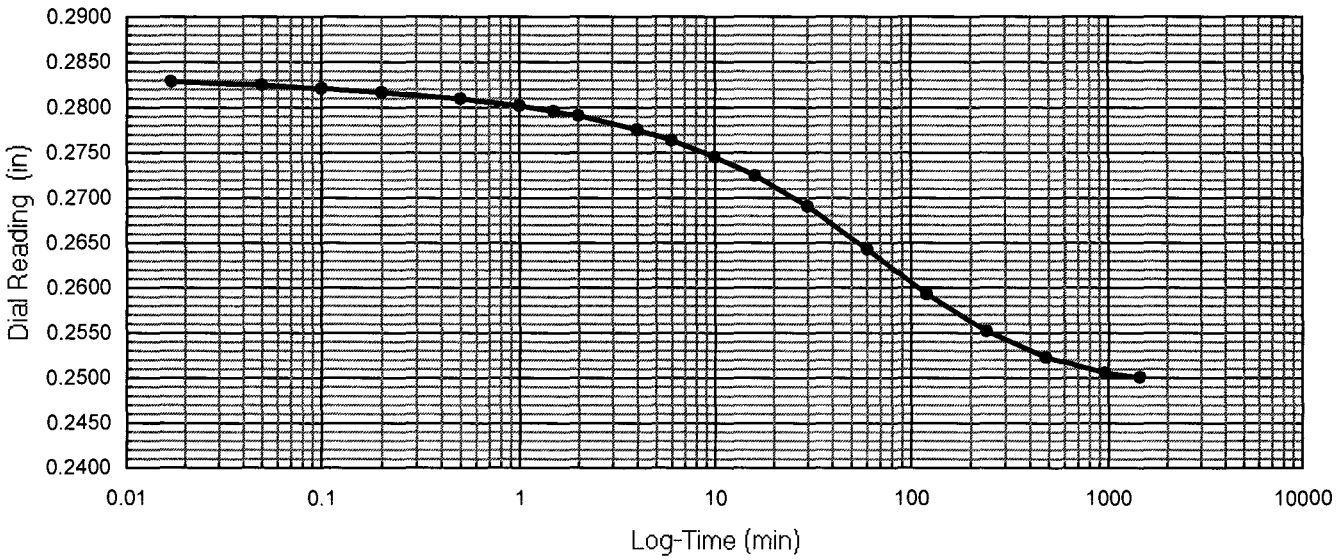
d50 = _____

t50 = _____ min

log time

d50 = 0.2678

t50 = 35.0 min



One-Dimensional Oedometer Testing Increment

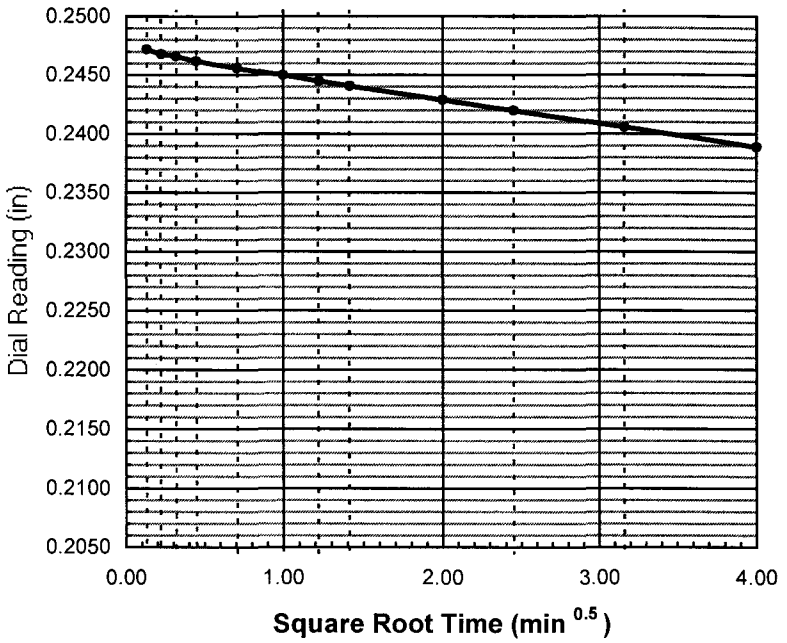
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C5 | Stage Number: 8 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 6 | Depth (ft.) 20.0

Date: 23-Feb-11 | Load (psf): 44297 | Zero Reading: 0.3580

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:24:51	0	0.00	0.2501
	0.02	0.13	0.2472
	0.05	0.22	0.2468
	0.10	0.32	0.2466
	0.20	0.45	0.2462
	0.50	0.71	0.2456
	1.00	1.00	0.2450
	1.50	1.22	0.2445
	2.00	1.41	0.2441
	4.0	2.00	0.2429
	6.0	2.45	0.2420
	10.0	3.16	0.2406
	16.0	4.00	0.2389
	30		0.2361
	60		0.2318
	120		0.2264
	240		0.2206
	480		0.2158
	960		0.2128
	1440		0.2118
	2889		0.2106



do = 0.2477

d90 = ____ t90 = ____ min

d100 = 0.2140

df = 0.2106

square root

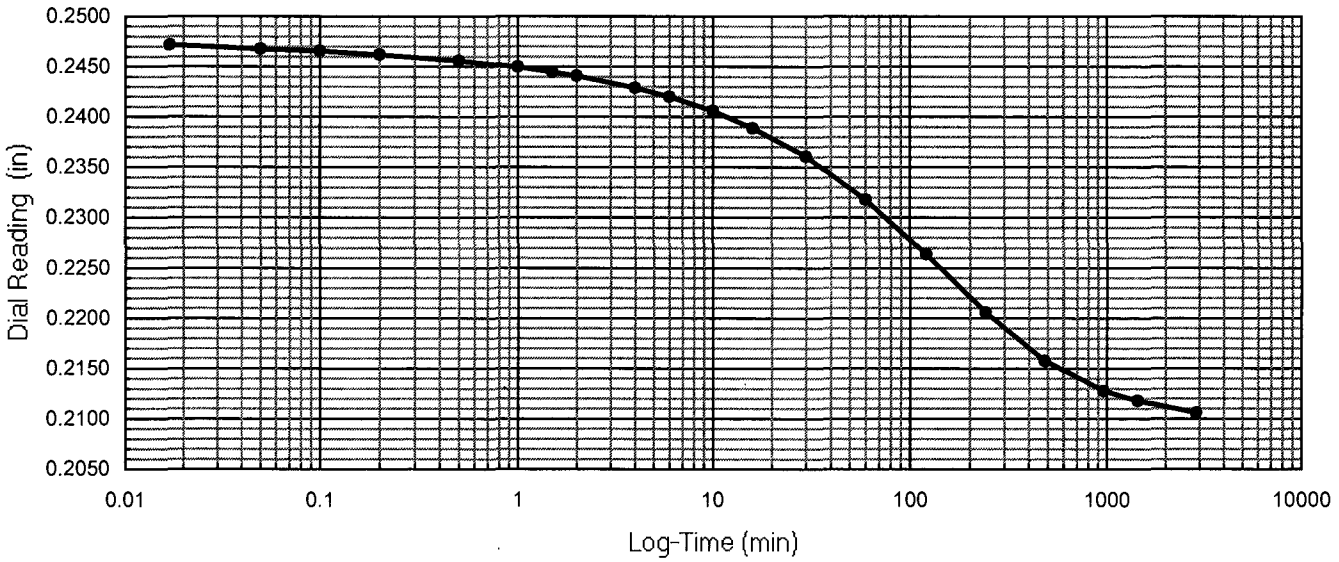
d50 = ____

t50 = ____ min

log time

d50 = 0.2309

t50 = 70.0 min



One-Dimensional Oedometer Testing Increment

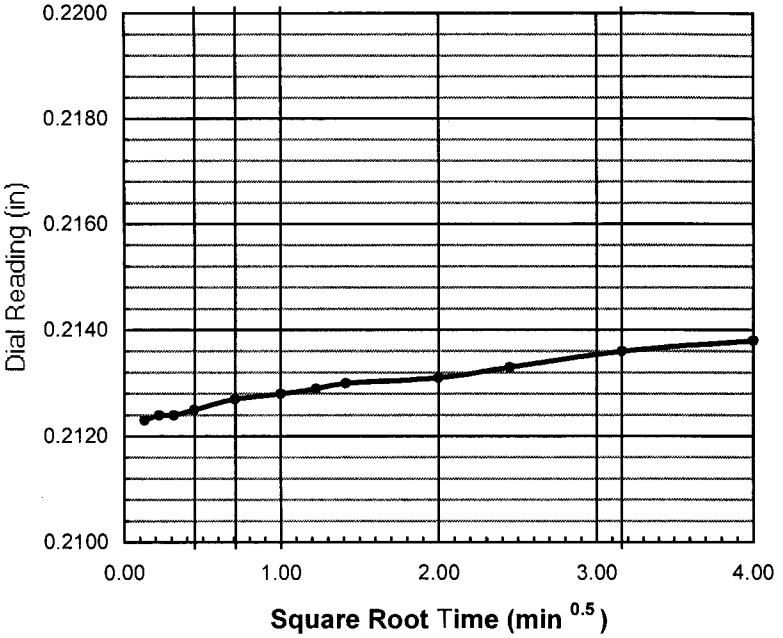
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C5 | Stage Number: 9 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 6 | Depth (ft.) 20.0

Date: 25-Feb-11 | Load (psf): 22137 | Zero Reading: 0.3580

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:34:44	0	0.00	0.2106
	0.02	0.13	0.2123
	0.05	0.22	0.2124
	0.10	0.32	0.2124
	0.20	0.45	0.2125
	0.50	0.71	0.2127
	1.00	1.00	0.2128
	1.50	1.22	0.2129
	2.00	1.41	0.2130
	4.0	2.00	0.2131
	6.0	2.45	0.2133
	10.0	3.16	0.2136
	16.0	4.00	0.2138
	30		0.2143
	60		0.2149
	120		0.2154
	240		0.2159
	560		0.2162



do = 0.2122

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2162

square root

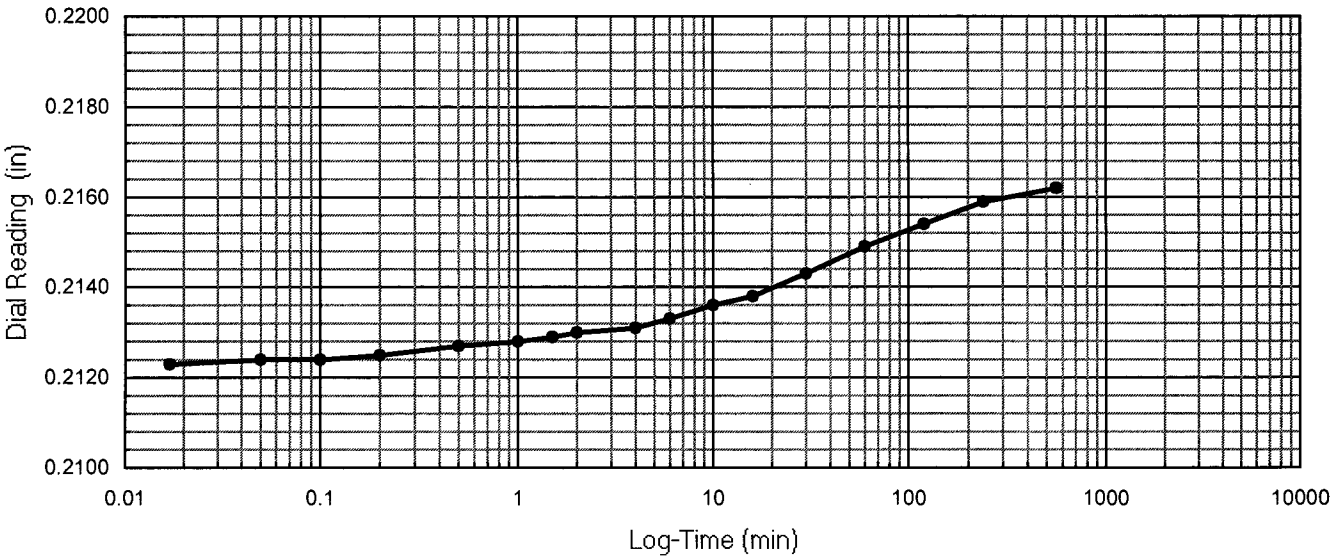
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

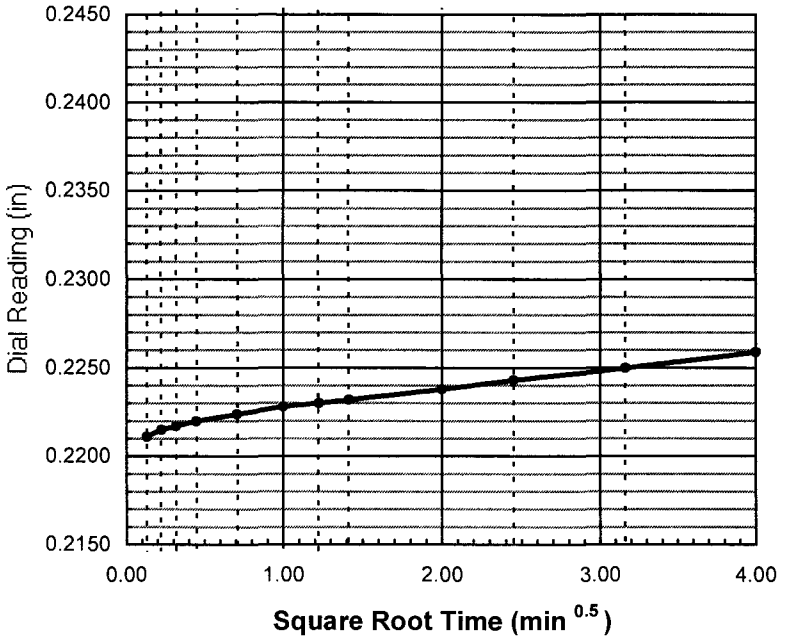
for ASTM D2435, method B

Project Number: 30989830 Apparatus No.: C5 Stage Number: 10 Curves by: TJO

Boring No.: R-11-022 Sample No.: 6 Depth (ft.) 20.0

Date: 25-Feb-11 Load (psf): 5518 Zero Reading: 0.3580

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
17:54:16	0	0.00	0.2162
	0.02	0.13	0.2211
	0.05	0.22	0.2215
	0.10	0.32	0.2217
	0.20	0.45	0.2220
	0.50	0.71	0.2224
	1.00	1.00	0.2228
	1.50	1.22	0.2230
	2.00	1.41	0.2232
	4.0	2.00	0.2238
	6.0	2.45	0.2243
	10.0	3.16	0.2250
	16.0	4.00	0.2259
	30		0.2273
	60		0.2295
	120		0.2325
	240		0.2360
	480		0.2393
	960		0.2416
	1440		0.2423
	2410		0.2429



do = 0.2207

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2429

square root

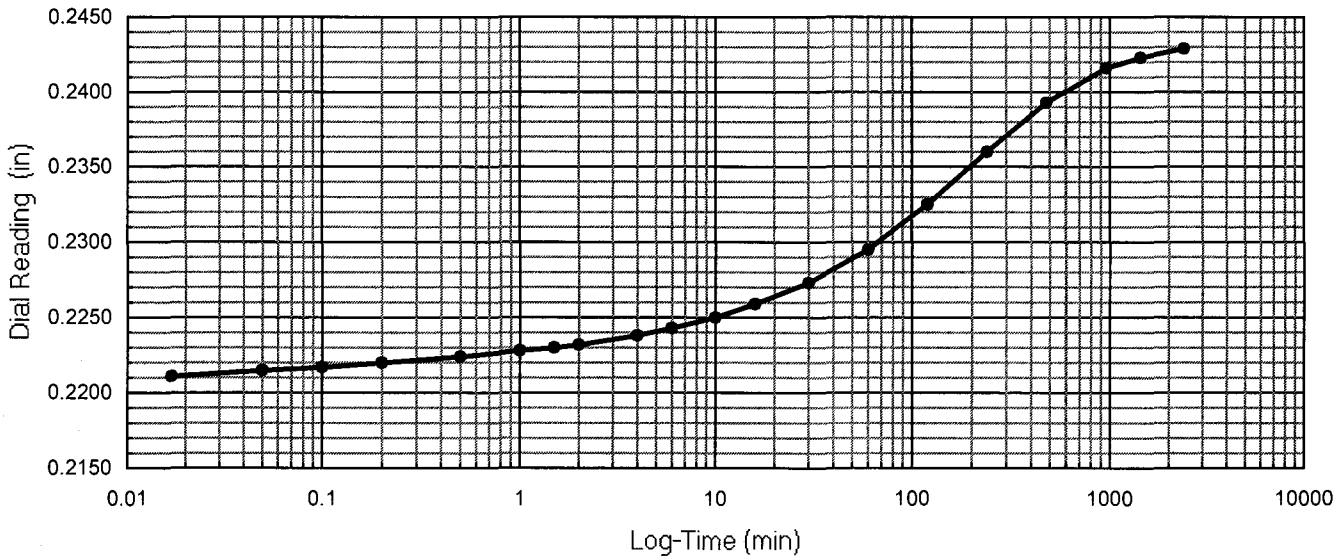
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

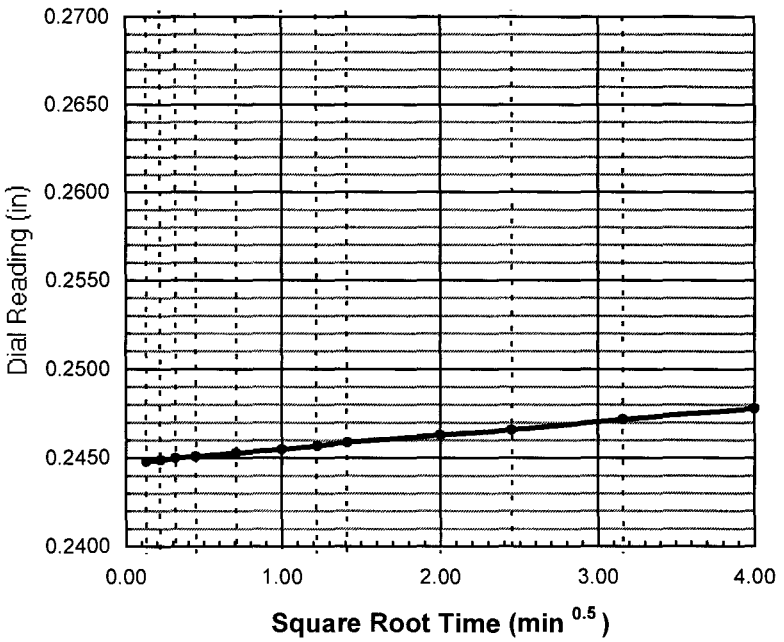
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C5 | Stage Number: 11 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 6 | Depth (ft.) 20.0

Date: 27-Feb-11 | Load (psf): 1363 | Zero Reading: 0.3580

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:04:29	0	0.00	0.2429
	0.02	0.13	0.2448
	0.05	0.22	0.2449
	0.10	0.32	0.2450
	0.20	0.45	0.2451
	0.50	0.71	0.2453
	1.00	1.00	0.2455
	1.50	1.22	0.2457
	2.00	1.41	0.2459
	4.0	2.00	0.2463
	6.0	2.45	0.2466
	10.0	3.16	0.2472
	16.0	4.00	0.2478
	30		0.2489
	60		0.2506
	120		0.2529
	240		0.2562
	480		0.2604
	960		0.2645
	1440		0.2665
	2786		0.2684
	5886		0.2695



do = 0.2447

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2695

square root

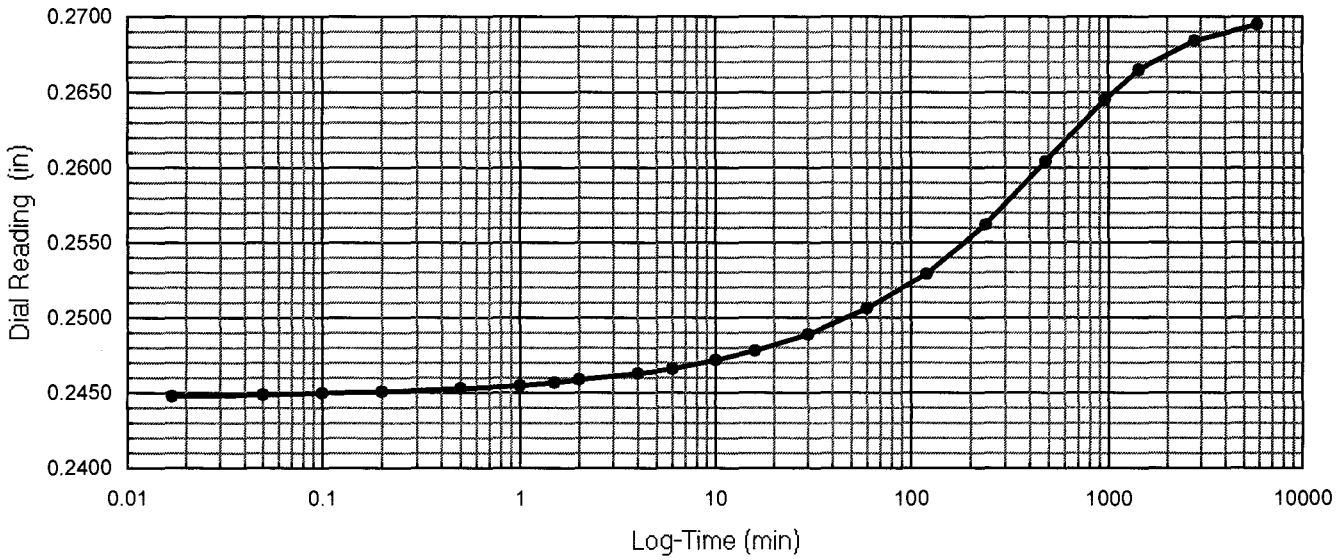
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

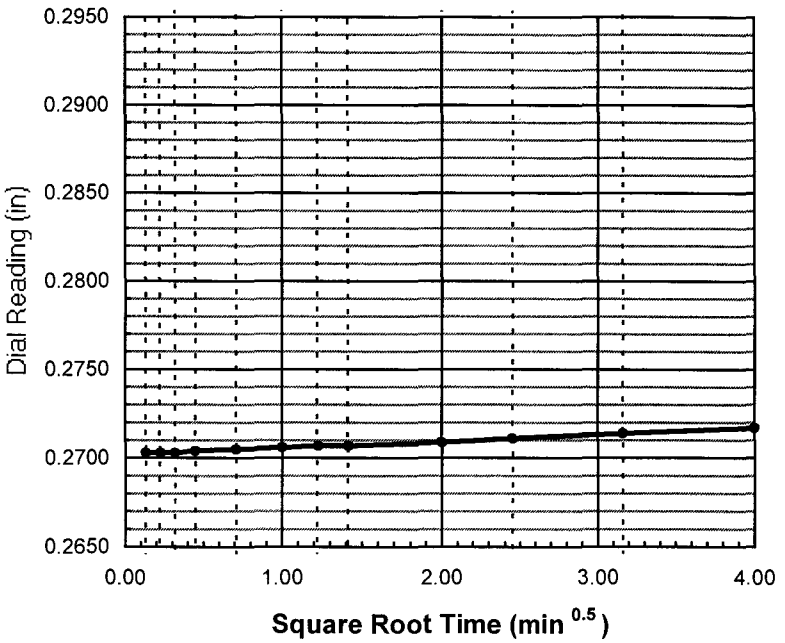
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C5 | Stage Number: 12 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 6 | Depth (ft.) 20.0

Date: 3-Mar-11 | Load (psf): 324 | Zero Reading: 0.3580

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
12:11:26	0	0.00	0.2695
	0.02	0.13	0.2703
	0.05	0.22	0.2703
	0.10	0.32	0.2703
	0.20	0.45	0.2704
	0.50	0.71	0.2705
	1.00	1.00	0.2706
	1.50	1.22	0.2707
	2.00	1.41	0.2707
	4.0	2.00	0.2709
	6.0	2.45	0.2711
	10.0	3.16	0.2714
	16.0	4.00	0.2717
	30		0.2723
	60		0.2732
	120		0.2746
	240		0.2767
	480		0.2795
	960		0.2829
	2100		0.2866
	4020		0.2887
	8405		0.2904



do = 0.2703

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2904

square root

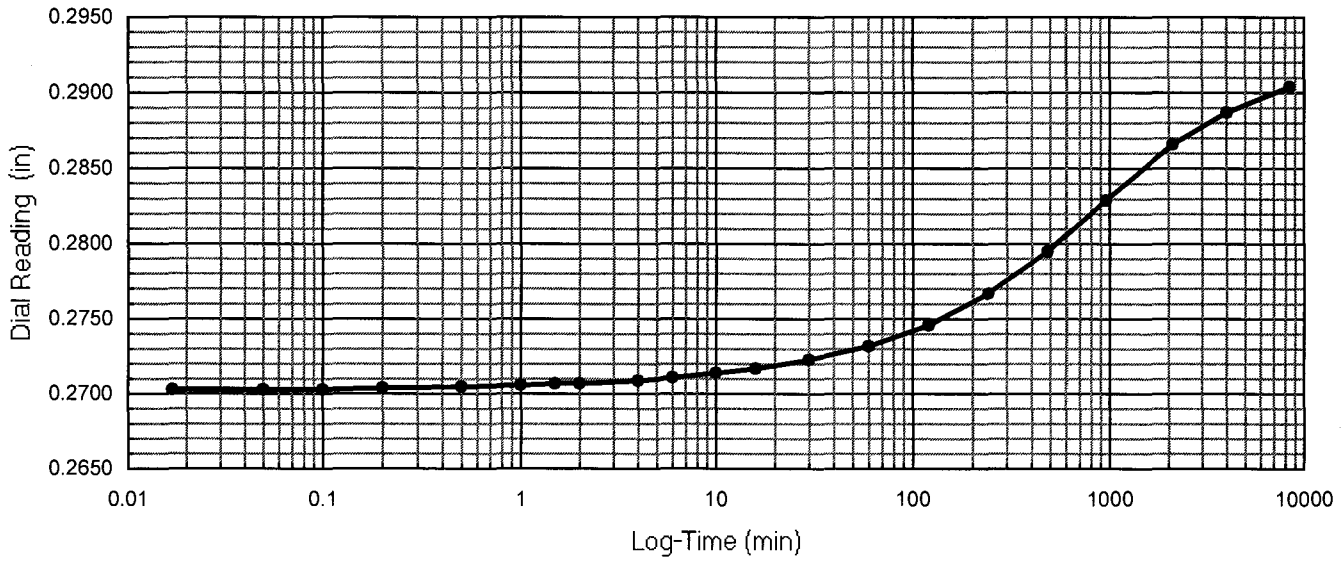
d50 = _____

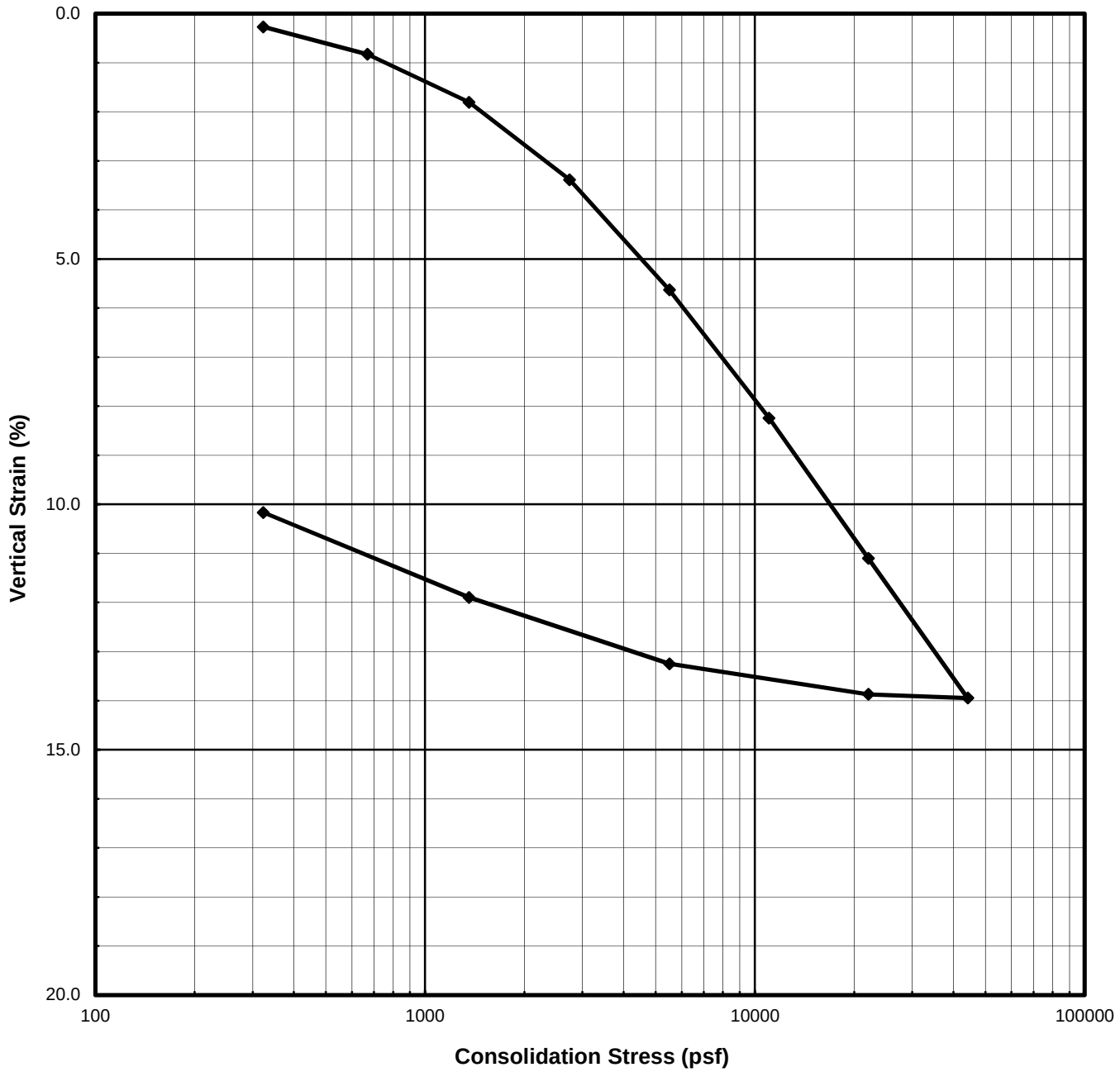
t50 = _____ min

log time

d50 = _____

t50 = _____ min





Description:	**Dark olive brown sandy Clay (CL)**							
Boring No.:	R-11-022		Liquid Limit	39	%	Specific Gravity	2.75	assumed
Sample No.:	8		Plasticity Index	24	%	Strain for Saturation	1.76	%
Depth (ft | m)	30.0	9.14	Fines Content	57.4	%	Water added at	150	psf

	Water Content (%)	Total Unit Weight		Dry Unit Weight		Saturation (%)	Void Ratio	Height		Diameter	
		(pcf)	(kN/m^3)	(pcf)	(kN/m^3)			(inches)	(cm)	(inches)	(cm)
Initial	19.5	130.0	20.42	108.8	17.09	93.3	0.58	0.931	2.36	2.418	6.142
Final	16.2	136.3	21.41	117.3	18.42	96.6	0.46	0.863	2.19		

URS

I-5 & SR-74 IC

Project Number: 30989830
Test Start Date: 2/18/2011

CONSOLIDATION TEST
ASTM D2435

SUBMITTED BY: Thomas J. O'Meara

Con I5 SR74 R11022 030.xls

One-Dimensional Oedometer Testing
Set-up / Take down Worksheet
ASTM D2435

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM

Boring No.: R-11-022
Sample No.: 8
Depth (ft): 30.0

Apparatus No.: C7

Specimen Description : Dark olive brown sandy Clay (CL)
Duration: end of increment

Ring Number: R25
Weight of Wet Spec. and Ring: 364.56 g
Weight of Ring: 218.72 g
Initial Weight of Wet Spec.: 145.84 g

Take Down Weight with Ring: 360.37 g

Excess Oven-dried Cont. No.: rp5
Weight of Cont. and Dry Spec.: 115.72 g
Weight of Container: 115.58 g
Weight of Excess Dried Soil: 0.14 g
Weight of Excess Wet Soil 0.16 g
Final Weight of Wet Specimen: 141.81 g

Height of Specimen (in)

	Initial	Final
1	0.927	0.864
2	0.932	0.866
3	0.935	0.861
4	0.932	0.863
5	0.927	0.863
Ave:	0.931	0.863

Initial Height - Final Height = 0.067 in
Change in Dial (Dd) = 0.082 in
Initial Height - Dd = 0.848 in
Final Height + Dd = 0.946 in
Weight of Top Cap = 373.52 g

Specimen Analysis					Initial Trim	Initial Spec.	Final
				Container Number:	m60	**XXXXX**	s5
				Mass of Container and Wet Specimen M1 (g)	353.32	145.84	253.36
				Mass of Container and Dry Specimen, M2 (g)	309.51	122.03	233.68
				Mass of Container, M3 (g)	91.46	**XXXXX**	112.28
				Water Content, w (%)	20.09	19.51	16.21
				Mass of Wet Specimen, M4 (g)	145.84	145.84	141.81
				Mass of Dry Specimen, M5 (g)	122.03	122.03	122.03
Nominal		Measured	x	Specimen Height, H (in)	0.931	0.931	0.863
Nominal	x	Measured		Specimen Diameter, D (in)	2.418	2.418	2.418
				Area of Specimen, A (in^2)	4.592	4.592	4.592
				Volume of Specimen, V (cc)	70.03	70.03	64.97
Assumed	x	Measured		Specific Gravity, Gs	2.75	2.75	2.75
				Wet Unit Weight, WUW (pcf)	**130.0**	**130.0**	**136.3**
				Dry Unit Weight, DUW (pcf)	**108.3**	**108.8**	**117.3**
				Void Ratio	**0.583**	**0.575**	**0.462**
				Degree of Saturation, S (%)	**94.8**	**93.3**	**96.6**

Set-up by: TJO
Date: 2/18/11
Calculated by: TJO
Checked by: TJO
Strain for Saturation (%) = **1.762**

One-Dimensional Oedometer Testing

Loading Worksheet

ASTM D2435

Project Number: 30989830 Boring No.: R-11-022

Project Name: I-5 & SR-74 IC Sample No.: 8

Project Engineer: FM Apparatus No.: C7 Depth (ft): 30.0

Initial Dial Reading: 0.3502 inch Initial Specimen Height: 0.931 inch

Stage No.	Normal Stress (psf)	Dial Reading (in)		Compressibility Correction (in)	Vertical Strain (%)	
		End of Duration	End of Increment		End of Duration	End of Increment
Seat	150		0.3502	0.0000		0.00
1	323		0.3470	0.0007		0.27
2	669		0.3407	0.0018		0.83
3	1360	0.3316	0.3301	0.0033	1.64	1.81
4	2743	0.3155	0.3137	0.0050	3.19	3.38
5	5508	0.2940	0.2908	0.0070	5.29	5.63
6	11039	0.2660	0.2641	0.0094	8.04	8.24
7	22100	0.2370	0.2346	0.0123	10.84	11.10
8	44223	0.2070	0.2055	0.0149	13.79	13.95
9	22100		0.2074	0.0137		13.87
10	5508		0.2174	0.0095		13.25
11	1360		0.2326	0.0069		11.90
12	323		0.2506	0.0050		10.17
13	67		0.2680	0.0037		8.44
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						
33						

Final dial reading prior to take down (inch): 0.2680 Take down by: TJO Date: 3/16/11

One-Dimensional Oedometer Testing
ASTM D2435
Table of Incremental Values

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM
Apparatus No.: C7

Boring No.: R-11-022
Sample No.: 8
Depth (ft): 30.0
Inundation at stage: Seat

10 **20** Hanger Ratios

Stage Number	Incremental Weight Applied (kg) Back	Front	Vertical Stress (psf)	Specimen Hieght (in)	Deflections (in) $d_{initial}$	d_o	d_{50}	d_{100}	d_{final}	Porous Stone (in)	t_{50} (min)	cv (in^2/min)	cv (ft^2/day)
Top Cap			26	0.931	0.3502	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
Seat	0.06	0.06	150	0.931	0.3502	XXXXX	XXXXX	XXXXX	0.3502	0.0000	XXXXX	XXXXX	XXXXX
1	0.25		323	0.928	0.3502	0.3488	XXXXX	XXXXX	0.3470	0.0007	XXXXX	XXXXX	XXXXX
2	0.50		669	0.924	0.3470	0.3454	XXXXX	XXXXX	0.3407	0.0018	XXXXX	XXXXX	XXXXX
3	1.00		1360	0.916	0.3407	0.3392	0.3354	0.3316	0.3301	0.0033	4.00	0.010	0.103
4		1.0	2743	0.905	0.3301	0.3283	0.3219	0.3155	0.3137	0.0050	6.00	0.007	0.067
5	4.0		5508	0.889	0.3137	0.3110	0.3025	0.2940	0.2908	0.0070	7.00	0.006	0.056
6		4.0	11039	0.872	0.2908	0.2880	0.2770	0.2660	0.2641	0.0094	10.00	0.004	0.037
7		8.0	22100	0.855	0.2641	0.2619	0.2495	0.2370	0.2346	0.0123	12.00	0.003	0.030
8		16.0	44223	0.840	0.2346	0.2064	0.2067	0.2070	0.2055	0.0149	120.00	0.000	0.003
9		-16.0	22100	0.856	0.2055	0.2068	XXXXX	XXXXX	0.2074	0.0137	XXXXX	XXXXX	XXXXX
10		-12.0	5508	0.875	0.2074	0.2110	XXXXX	XXXXX	0.2174	0.0095	XXXXX	XXXXX	XXXXX
11	-4.0	-1.0	1360	0.898	0.2174	0.2192	XXXXX	XXXXX	0.2326	0.0069	XXXXX	XXXXX	XXXXX
12	-1.5		323	0.921	0.2326	0.2335	XXXXX	XXXXX	0.2506	0.0050	XXXXX	XXXXX	XXXXX
13	-0.25	-0.06	67	0.942	0.2506	XXXXX	XXXXX	XXXXX	0.2680	0.0037	XXXXX	XXXXX	XXXXX
14			67	XXXXX	0.2680	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
15			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
16			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
17			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
18			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
19			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
20			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
21			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
22			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
23			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
24			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
25			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX

One-Dimensional Oedometer Testing Increment

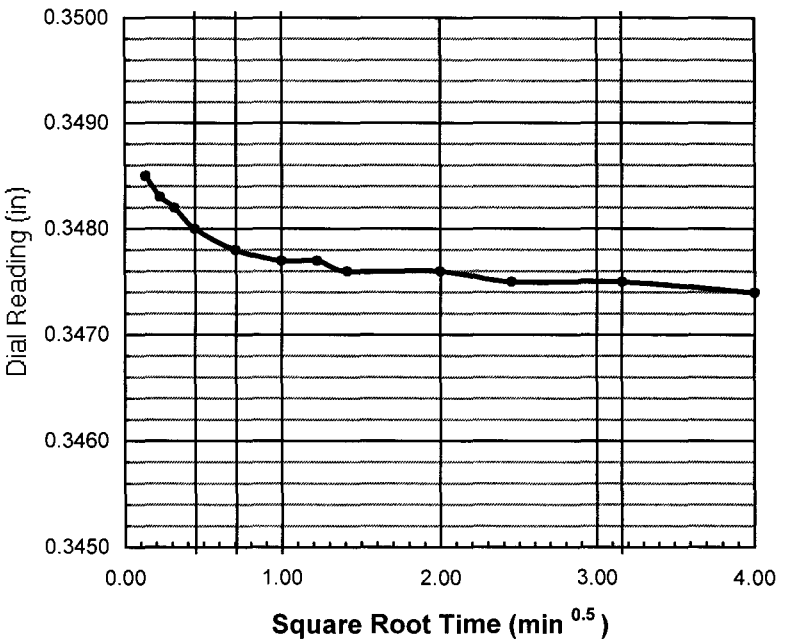
for ASTM D2435, method B

Project Number: 30989830 Apparatus No.: C7 Stage Number: 1 Curves by: TJO

Boring No.: R-11-022 Sample No.: 8 Depth (ft.) 30.0

Date: 18-Feb-11 Load (psf): 323 Zero Reading: 0.3502

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
12:37:09	0	0.00	0.3502
	0.02	0.13	0.3485
	0.05	0.22	0.3483
	0.10	0.32	0.3482
	0.20	0.45	0.3480
	0.50	0.71	0.3478
	1.00	1.00	0.3477
	1.50	1.22	0.3477
	2.00	1.41	0.3476
	4.0	2.00	0.3476
	6.0	2.45	0.3475
	10.0	3.16	0.3475
	16.0	4.00	0.3474
	30		0.3474
	60		0.3473
	120		0.3471
	240		0.3470
	312		0.3470



do = 0.3488

d90 = _____ t90 = _____ min

d100 = _____

df = 0.3470

square root

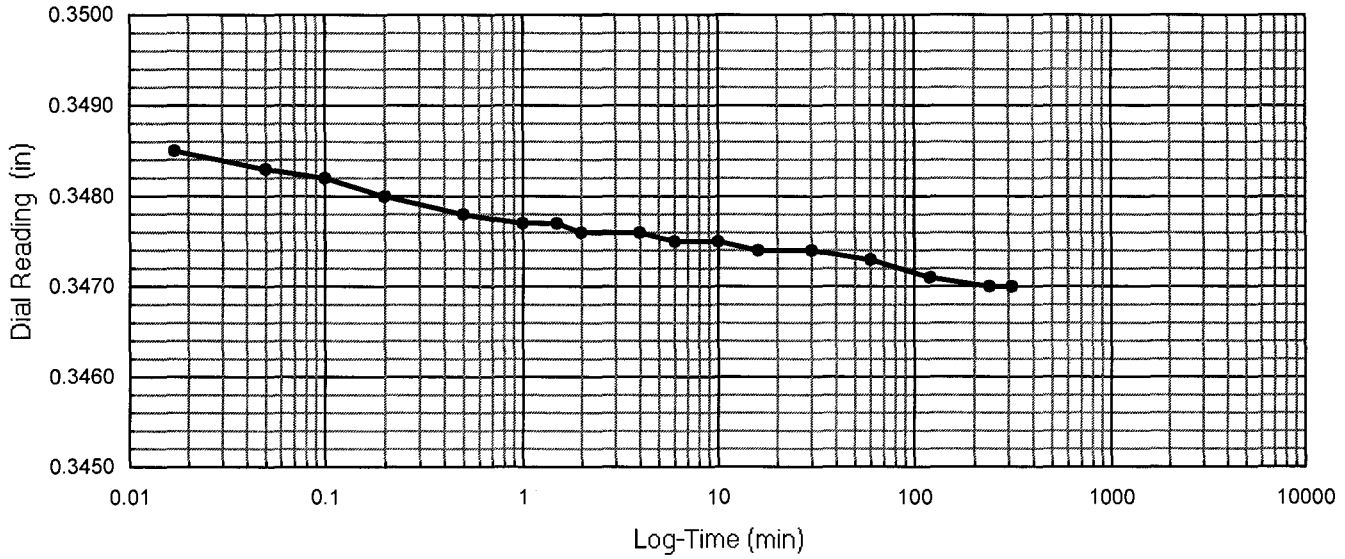
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

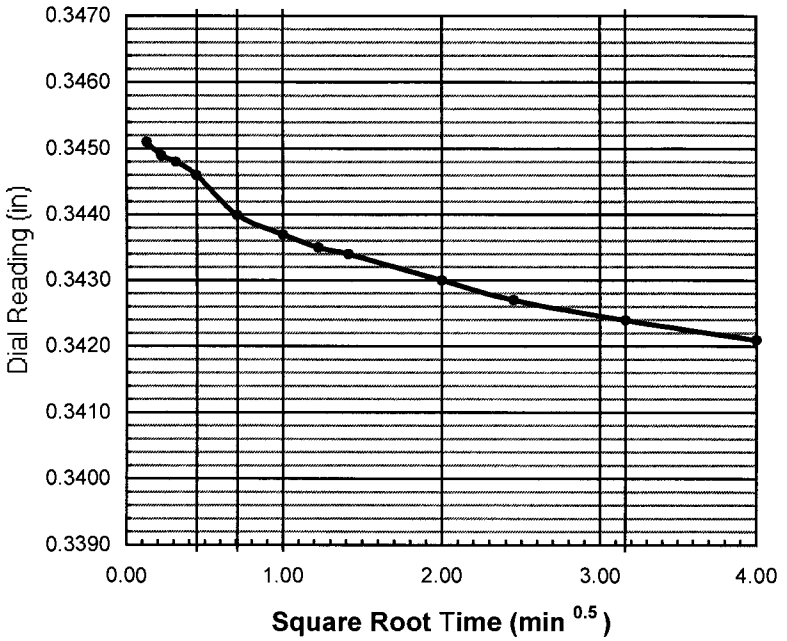
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C7 | Stage Number: 2 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 8 | Depth (ft.) 30.0

Date: 18-Feb-11 | Load (psf): 669 | Zero Reading: 0.3502

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
17:49:58	0	0.00	0.3470
	0.02	0.13	0.3451
	0.05	0.22	0.3449
	0.10	0.32	0.3448
	0.20	0.45	0.3446
	0.50	0.71	0.3440
	1.00	1.00	0.3437
	1.50	1.22	0.3435
	2.00	1.41	0.3434
	4.0	2.00	0.3430
	6.0	2.45	0.3427
	10.0	3.16	0.3424
	16.0	4.00	0.3421
	30		0.3417
	60		0.3414
	120		0.3412
	240		0.3410
	480		0.3408
	978		0.3407



do = 0.3454

d90 = ____ t90 = ____ min

d100 = 0.3414

df = 0.3407

square root

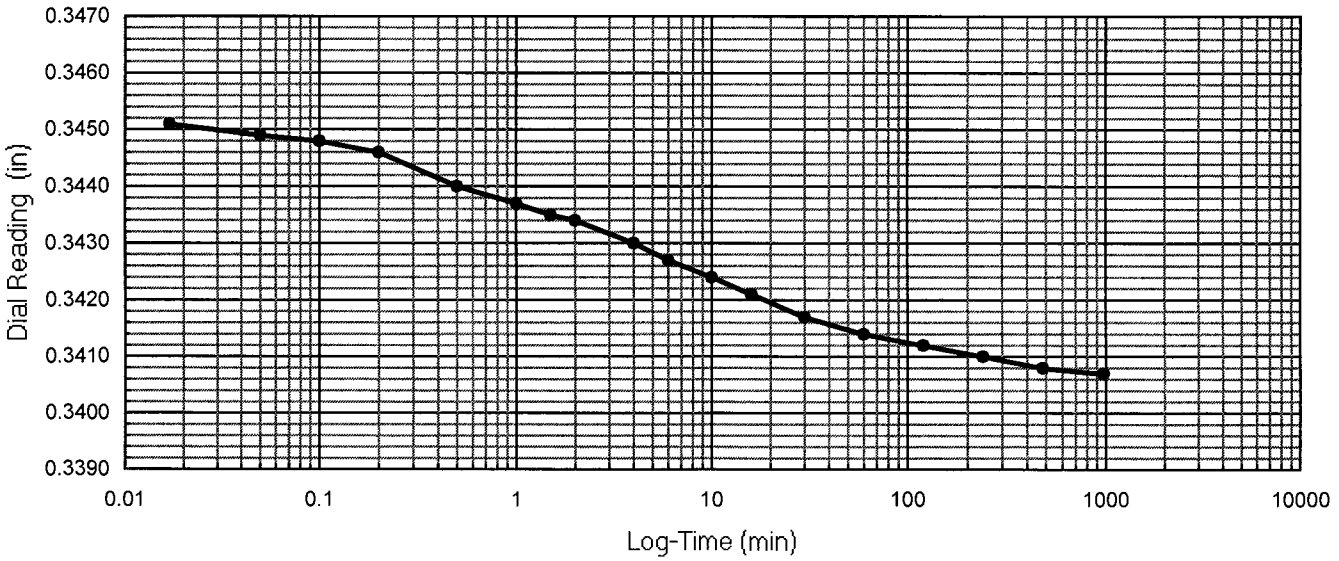
d50 = ____

t50 = ____ min

log time

d50 = 0.3434

t50 = 2.0 min



One-Dimensional Oedometer Testing Increment

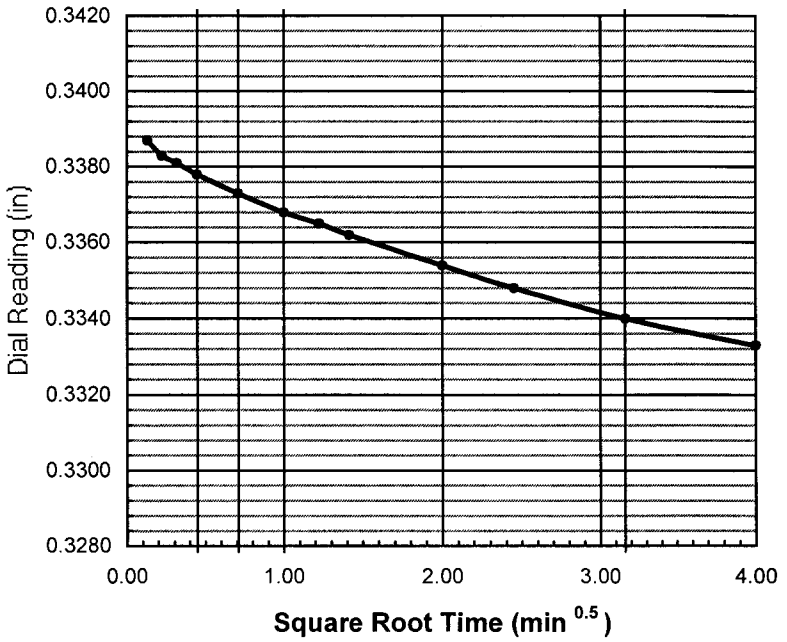
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C7 | Stage Number: 3 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 8 | Depth (ft.) 30.0

Date: 19-Feb-11 | Load (psf): 1360 | Zero Reading: 0.3502

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:08:19	0	0.00	0.3407
	0.02	0.13	0.3387
	0.05	0.22	0.3383
	0.10	0.32	0.3381
	0.20	0.45	0.3378
	0.50	0.71	0.3373
	1.00	1.00	0.3368
	1.50	1.22	0.3365
	2.00	1.41	0.3362
	4.0	2.00	0.3354
	6.0	2.45	0.3348
	10.0	3.16	0.3340
	16.0	4.00	0.3333
	30		0.3325
	60		0.3319
	120		0.3314
	240		0.3310
	480		0.3305
	980		0.3303
	1465		0.3301



do = 0.3392

d90 = ____ t90 = ____ min

d100 = 0.3316

df = 0.3301

square root

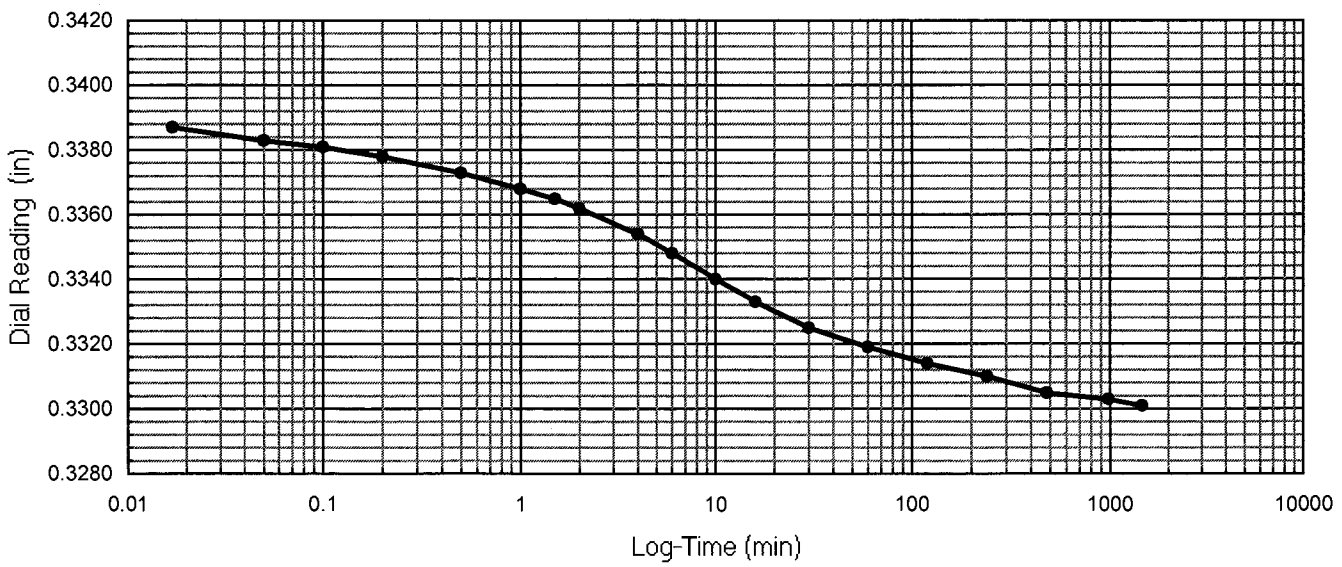
d50 = ____

t50 = ____ min

log time

d50 = 0.3354

t50 = 4.0 min



One-Dimensional Oedometer Testing Increment

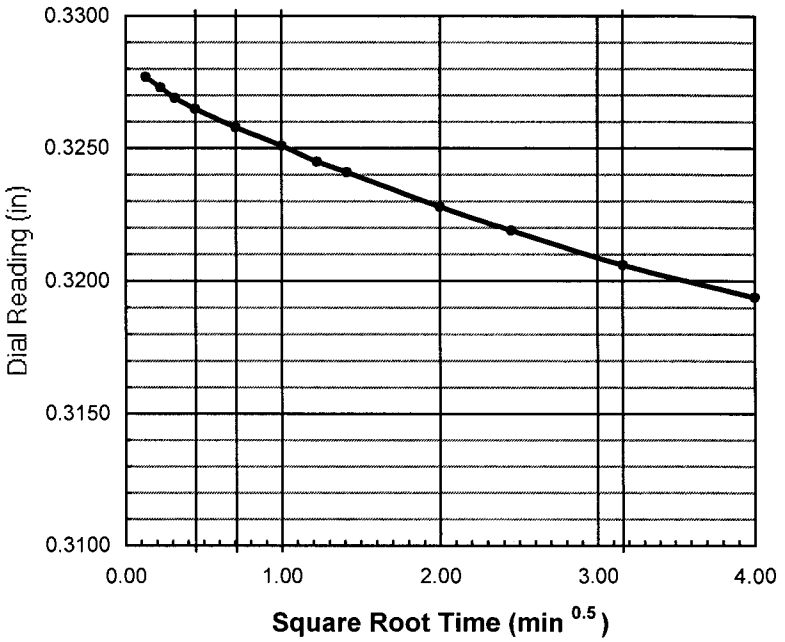
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C7 | Stage Number: 4 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 8 | Depth (ft.) 30.0

Date: 20-Feb-11 | Load (psf): 2743 | Zero Reading: 0.3502

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:35:08	0	0.00	0.3301
	0.02	0.13	0.3277
	0.05	0.22	0.3273
	0.10	0.32	0.3269
	0.20	0.45	0.3265
	0.50	0.71	0.3258
	1.00	1.00	0.3251
	1.50	1.22	0.3245
	2.00	1.41	0.3241
	4.0	2.00	0.3228
	6.0	2.45	0.3219
	10.0	3.16	0.3206
	16.0	4.00	0.3194
	30		0.3178
	60		0.3165
	120		0.3156
	240		0.3149
	480		0.3144
	980		0.3139
	1276		0.3137



do = 0.3283

d90 = _____ t90 = _____ min

d100 = 0.3155

df = 0.3137

square root

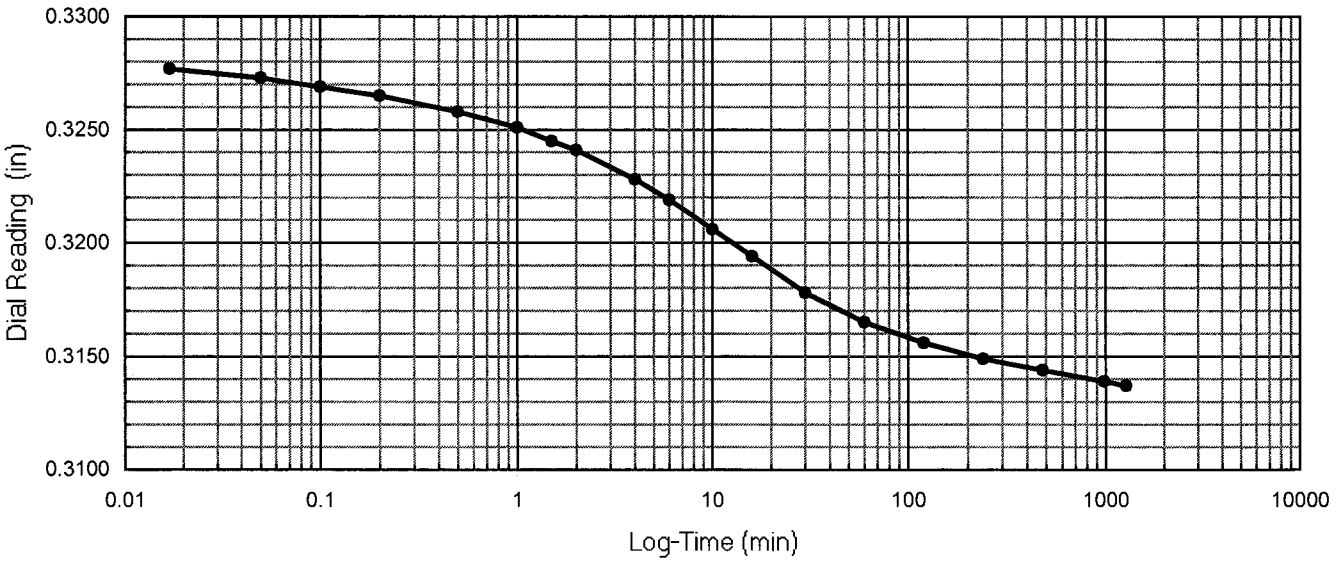
d50 = _____

t50 = _____ min

log time

d50 = 0.3219

t50 = 6.0 min



One-Dimensional Oedometer Testing Increment

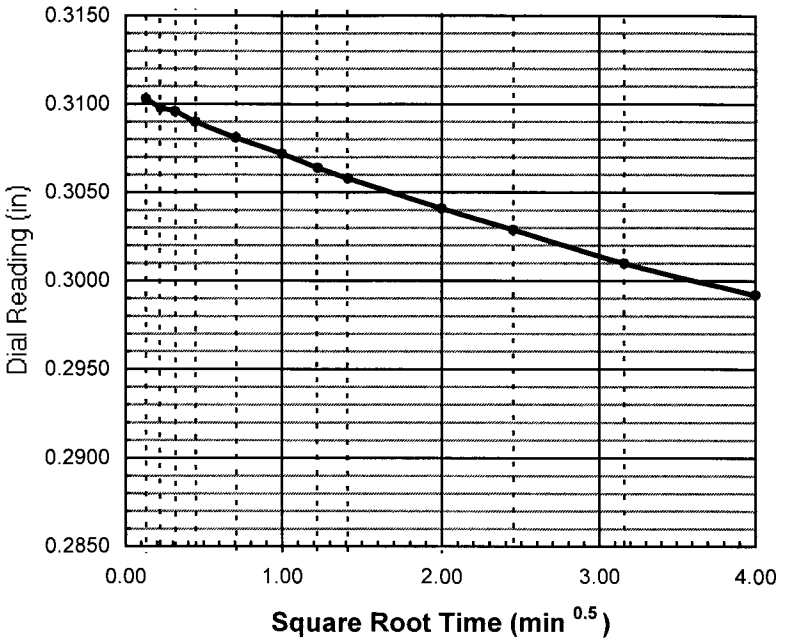
for ASTM D2435, method B

Project Number: 30989830 Apparatus No.: C7 Stage Number: 5 Curves by: TJO

Boring No.: R-11-022 Sample No.: 8 Depth (ft.) 30.0

Date: 21-Feb-11 Load (psf): 5508 Zero Reading: 0.3502

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
7:52:12	0	0.00	0.3137
	0.02	0.13	0.3103
	0.05	0.22	0.3098
	0.10	0.32	0.3096
	0.20	0.45	0.3090
	0.50	0.71	0.3081
	1.00	1.00	0.3072
	1.50	1.22	0.3064
	2.00	1.41	0.3058
	4.0	2.00	0.3041
	6.0	2.45	0.3029
	10.0	3.16	0.3010
	16.0	4.00	0.2992
	30		0.2968
	60		0.2948
	120		0.2935
	240		0.2926
	480		0.2919
	980		0.2912
	1463		0.2908



do = 0.3110

d90 = t90 = min

d100 = 0.2940

df = 0.2908

square root

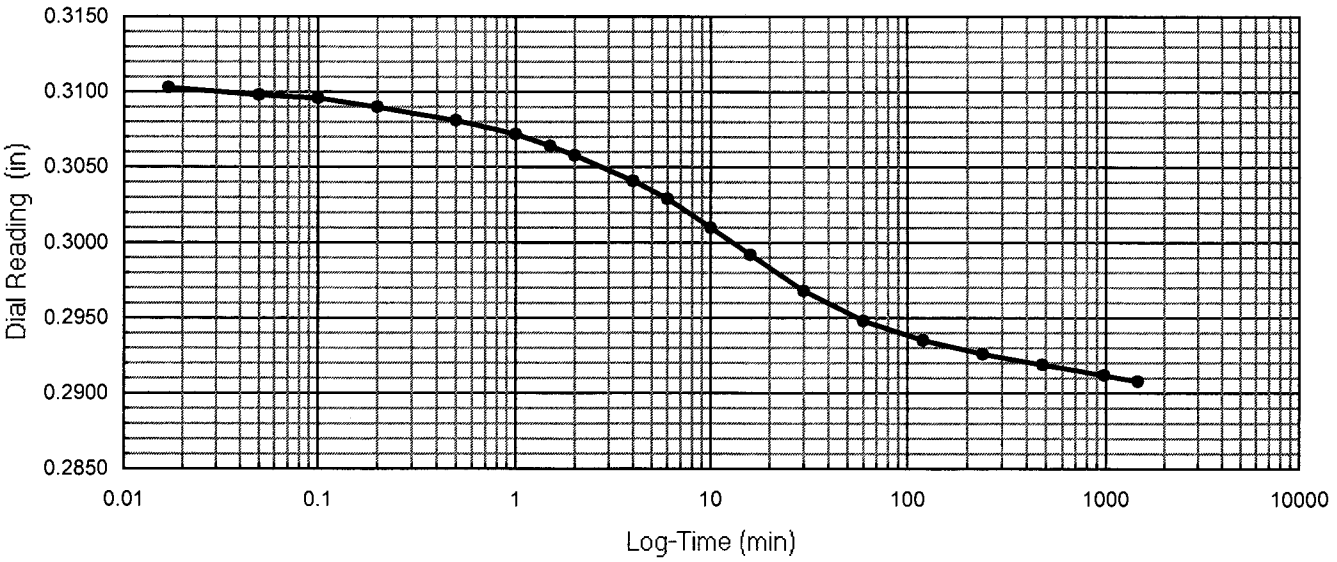
d50 =

t50 = min

log time

d50 = 0.3025

t50 = 7.0 min



One-Dimensional Oedometer Testing Increment

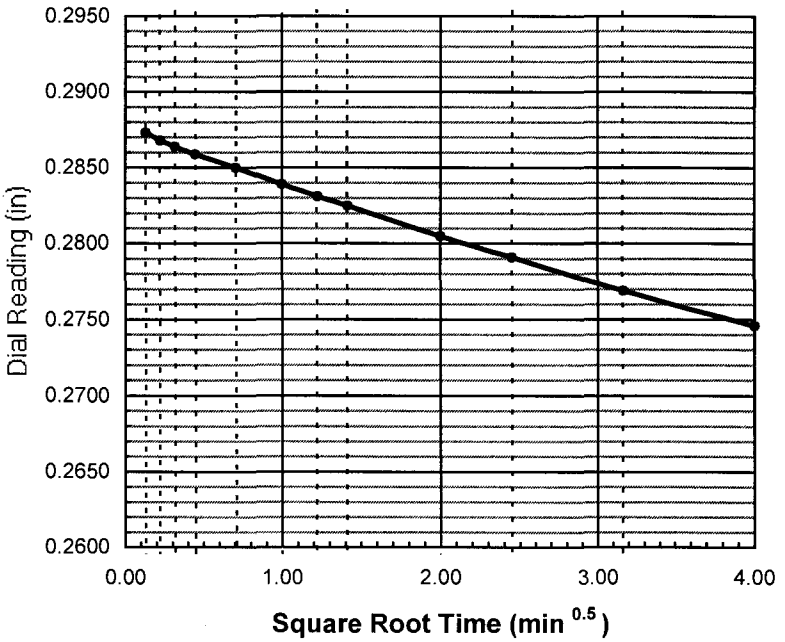
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C7 | Stage Number: 6 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 8 | Depth (ft.) 30.0

Date: 22-Feb-11 | Load (psf): 11039 | Zero Reading: 0.3502

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:15:45	0	0.00	0.2908
	0.02	0.13	0.2873
	0.05	0.22	0.2868
	0.10	0.32	0.2864
	0.20	0.45	0.2859
	0.50	0.71	0.2850
	1.00	1.00	0.2839
	1.50	1.22	0.2831
	2.00	1.41	0.2825
	4.0	2.00	0.2805
	6.0	2.45	0.2791
	10.0	3.16	0.2769
	16.0	4.00	0.2746
	30		0.2715
	60		0.2687
	120		0.2669
	240		0.2658
	480		0.2650
	980		0.2643
	1450		0.2641



do = 0.2880

d90 = ____ t90 = ____ min

d100 = 0.2660

df = 0.2641

square root

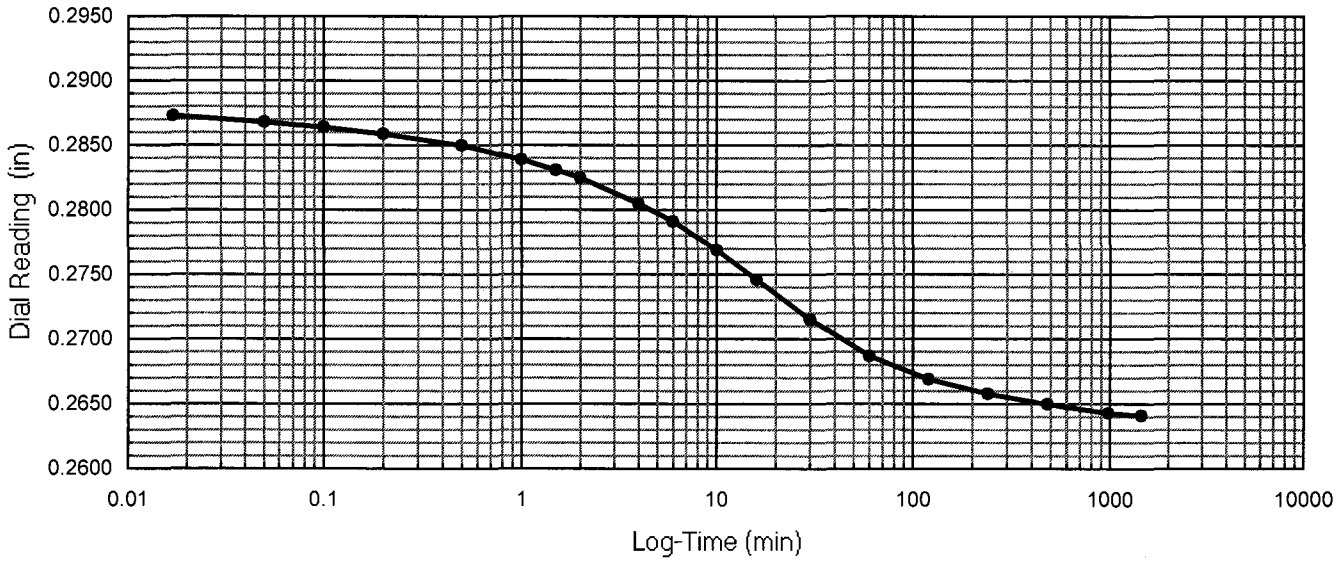
d50 = ____

t50 = ____ min

log time

d50 = 0.2770

t50 = 10.0 min



One-Dimensional Oedometer Testing Increment

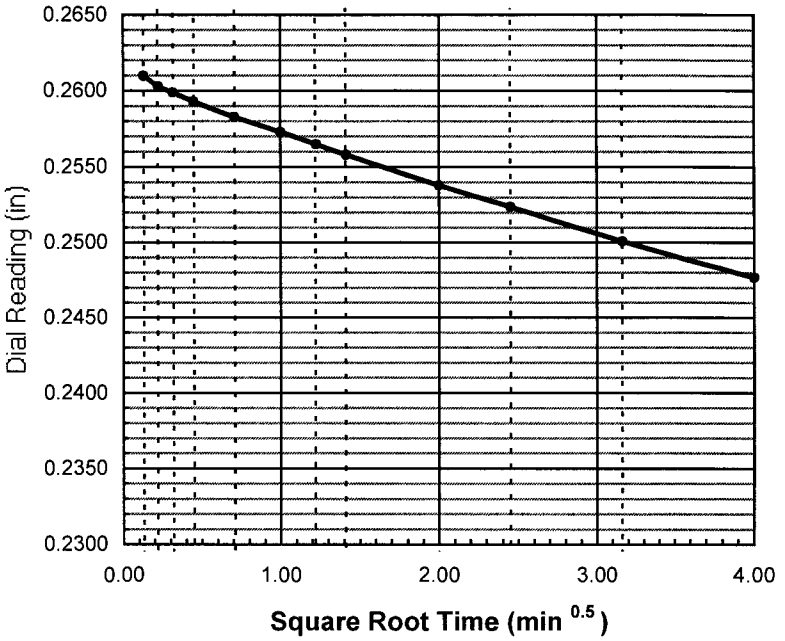
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C7 | Stage Number: 7 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 8 | Depth (ft.) 30.0

Date: 23-Feb-11 | Load (psf): 22100 | Zero Reading: 0.3502

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:26:58	0	0.00	0.2640
	0.02	0.13	0.2610
	0.05	0.22	0.2603
	0.10	0.32	0.2599
	0.20	0.45	0.2593
	0.50	0.71	0.2583
	1.00	1.00	0.2573
	1.50	1.22	0.2565
	2.00	1.41	0.2558
	4.0	2.00	0.2538
	6.0	2.45	0.2524
	10.0	3.16	0.2501
	16.0	4.00	0.2477
	30		0.2440
	60		0.2404
	120		0.2380
	240		0.2367
	480		0.2357
	980		0.2349
	1456		0.2346



do = 0.2619

d90 = _____ t90 = _____ min

d100 = 0.2370

df = 0.2346

square root

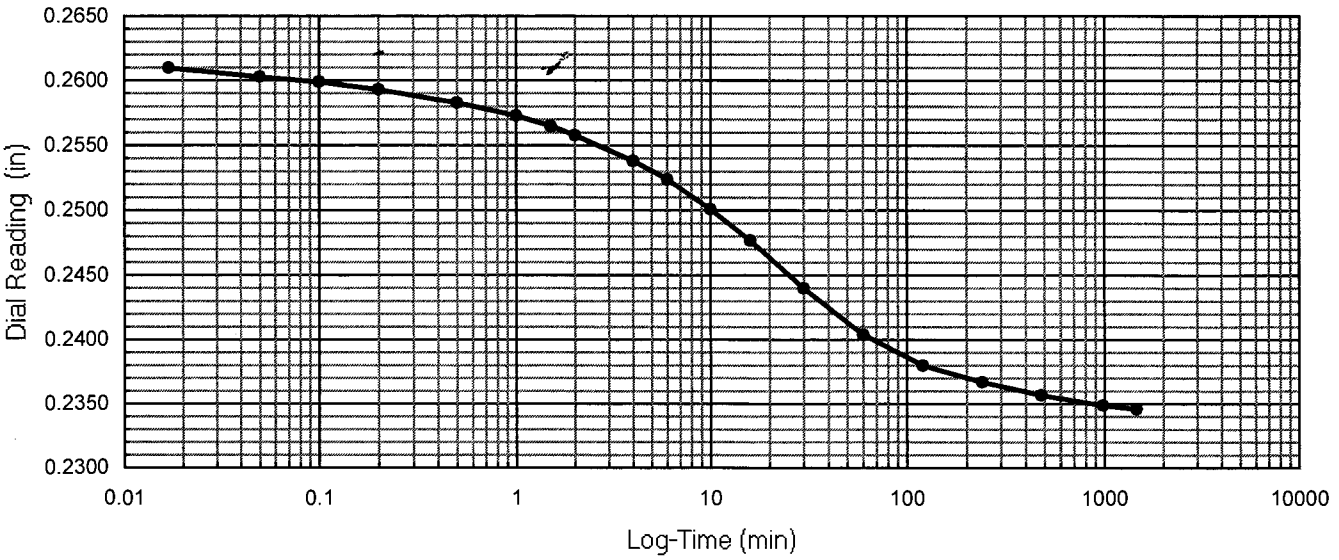
d50 = _____

t50 = _____ min

log time

d50 = 0.2494

t50 = 12.0 min



One-Dimensional Oedometer Testing Increment

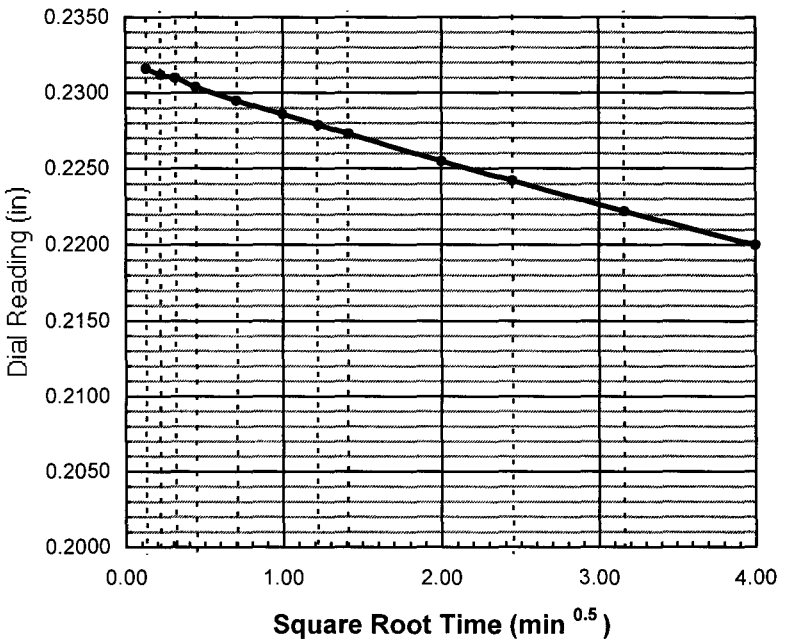
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C7 | Stage Number: 8 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 8 | Depth (ft.) 30.0

Date: 24-Feb-11 | Load (psf): 44223 | Zero Reading: 0.3502

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:43:22	0	0.00	0.2346
	0.02	0.13	0.2316
	0.05	0.22	0.2312
	0.10	0.32	0.2310
	0.20	0.45	0.2304
	0.50	0.71	0.2295
	1.00	1.00	0.2286
	1.50	1.22	0.2279
	2.00	1.41	0.2273
	4.0	2.00	0.2255
	6.0	2.45	0.2242
	10.0	3.16	0.2222
	16.0	4.00	0.2200
	30		0.2165
	60		0.2125
	120		0.2095
	240		0.2077
	480		0.2066
	980		0.2058
	1434		0.2055



do = 0.2322

d90 = ____ t90 = ____ min

d100 = 0.2070

df = 0.2055

square root

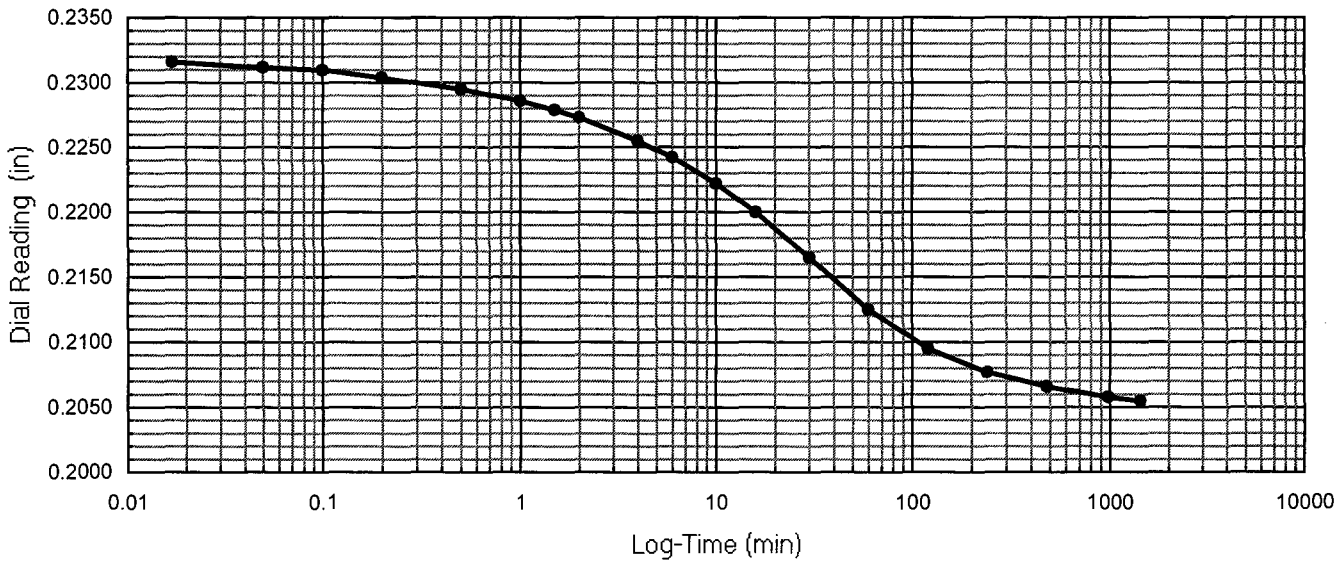
d50 = ____

t50 = ____ min

log time

d50 = 0.2196

t50 = 120.0 min



One-Dimensional Oedometer Testing Increment

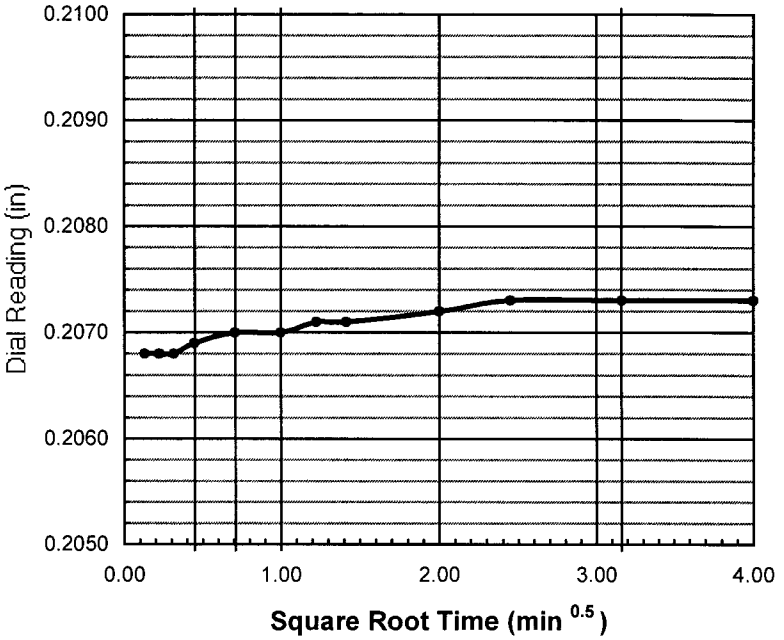
for ASTM D2435, method B

Project Number: 30989830 Apparatus No.: C7 Stage Number: 9 Curves by: TJO

Boring No.: R-11-022 Sample No.: 8 Depth (ft.) 30.0

Date: 25-Feb-11 Load (psf): 22100 Zero Reading: 0.3502

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:37:48	0	0.00	0.2054
	0.02	0.13	0.2068
	0.05	0.22	0.2068
	0.10	0.32	0.2068
	0.20	0.45	0.2069
	0.50	0.71	0.2070
	1.00	1.00	0.2070
	1.50	1.22	0.2071
	2.00	1.41	0.2071
	4.0	2.00	0.2072
	6.0	2.45	0.2073
	10.0	3.16	0.2073
	16.0	4.00	0.2073
	30		0.2074
	60		0.2074
	120		0.2074
	240		0.2074
	558		0.2074



do = 0.2068

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2074

square root

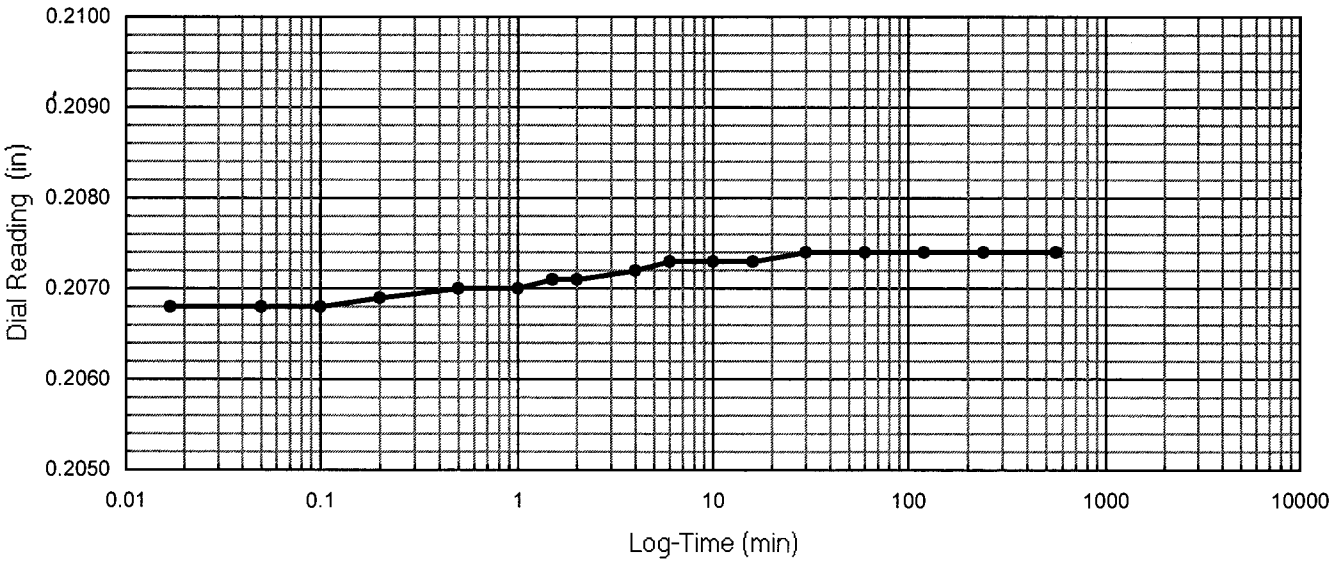
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

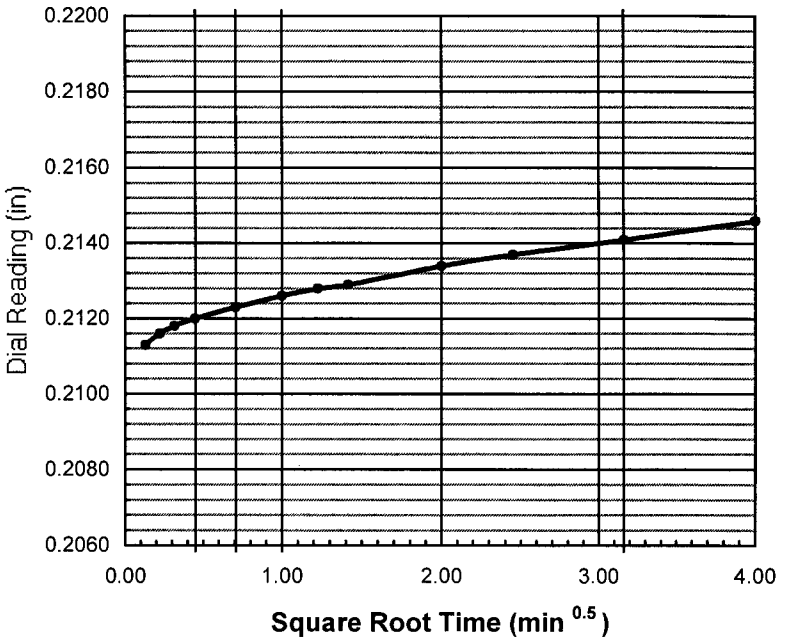
for ASTM D2435, method B

Project Number: 30989830 Apparatus No.: C7 Stage Number: 10 Curves by: TJO

Boring No.: R-11-022 Sample No.: 8 Depth (ft.) 30.0

Date: 25-Feb-11 Load (psf): 5508 Zero Reading: 0.3502

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
17:56:20	0	0.00	0.2074
	0.02	0.13	0.2113
	0.05	0.22	0.2116
	0.10	0.32	0.2118
	0.20	0.45	0.2120
	0.50	0.71	0.2123
	1.00	1.00	0.2126
	1.50	1.22	0.2128
	2.00	1.41	0.2129
	4.0	2.00	0.2134
	6.0	2.45	0.2137
	10.0	3.16	0.2141
	16.0	4.00	0.2146
	30		0.2153
	60		0.2160
	120		0.2166
	240		0.2170
	480		0.2173
	1021		0.2174



do = 0.2110

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2174

square root

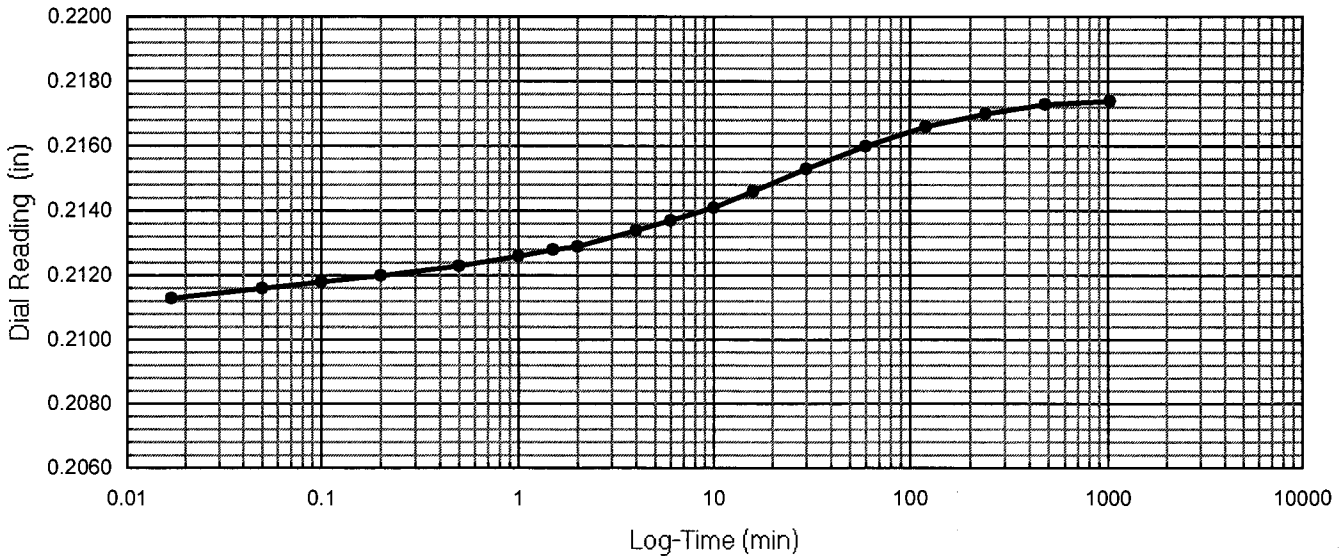
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

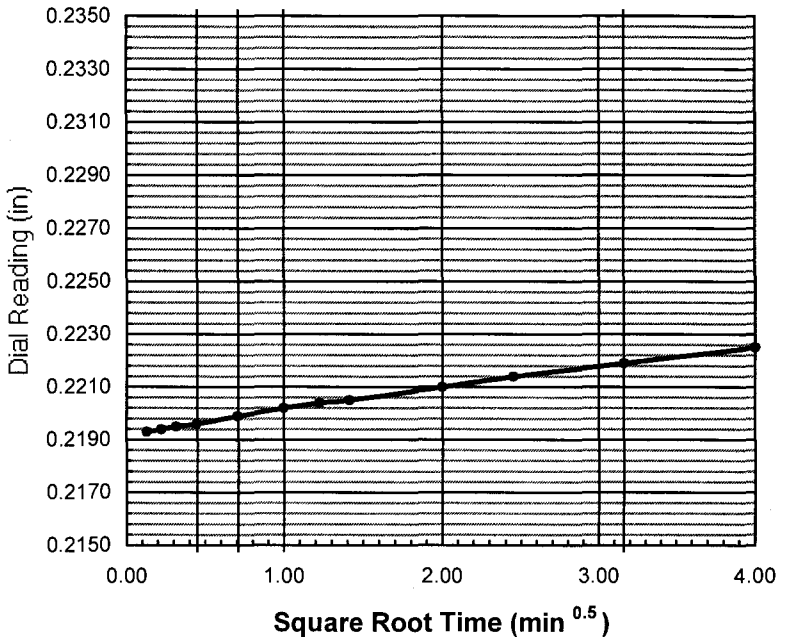
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C7 | Stage Number: 11 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 8 | Depth (ft.) 30.0

Date: 26-Feb-11 | Load (psf): 1360 | Zero Reading: 0.3502

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:57:34	0	0.00	0.2174
	0.02	0.13	0.2193
	0.05	0.22	0.2194
	0.10	0.32	0.2195
	0.20	0.45	0.2196
	0.50	0.71	0.2199
	1.00	1.00	0.2202
	1.50	1.22	0.2204
	2.00	1.41	0.2205
	4.0	2.00	0.2210
	6.0	2.45	0.2214
	10.0	3.16	0.2219
	16.0	4.00	0.2225
	30		0.2236
	60		0.2251
	120		0.2270
	240		0.2290
	480		0.2307
	960		0.2318
	1440		0.2322
	2772		0.2326



do = 0.2192

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2326

square root

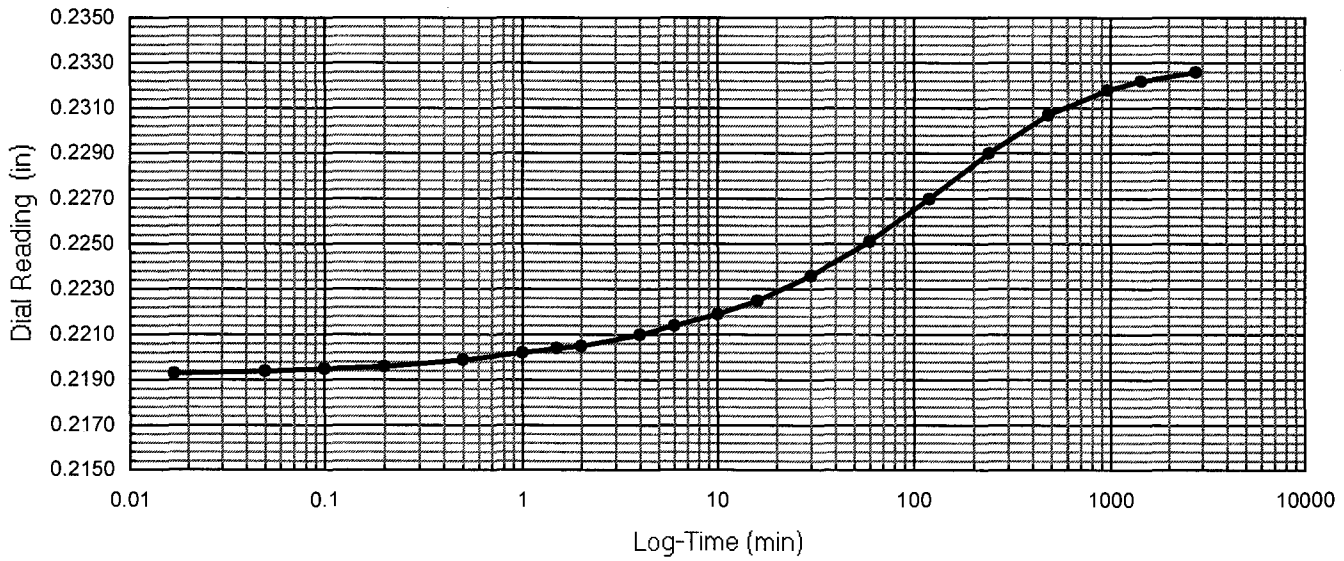
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

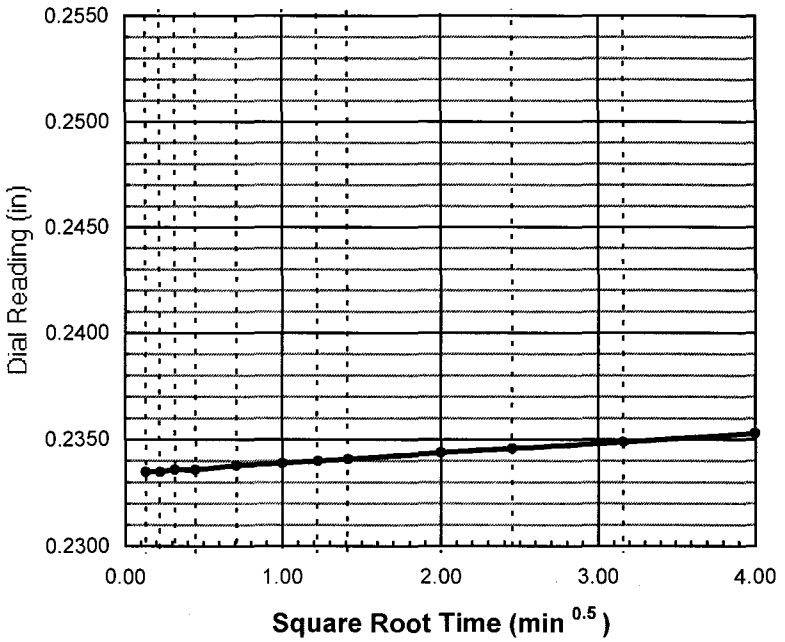
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C7 | Stage Number: 12 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 8 | Depth (ft.) 30.0

Date: 28-Feb-11 | Load (psf): 323 | Zero Reading: 0.3502

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:10:01	0	0.00	0.2326
	0.02	0.13	0.2335
	0.05	0.22	0.2335
	0.10	0.32	0.2336
	0.20	0.45	0.2336
	0.50	0.71	0.2338
	1.00	1.00	0.2339
	1.50	1.22	0.2340
	2.00	1.41	0.2341
	4.0	2.00	0.2344
	6.0	2.45	0.2346
	10.0	3.16	0.2349
	16.0	4.00	0.2353
	30		0.2361
	60		0.2372
	120		0.2390
	240		0.2414
	480		0.2444
	960		0.2471
	2040		0.2488
	4500		0.2501
	7160		0.2506



do = 0.2335

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2506

square root

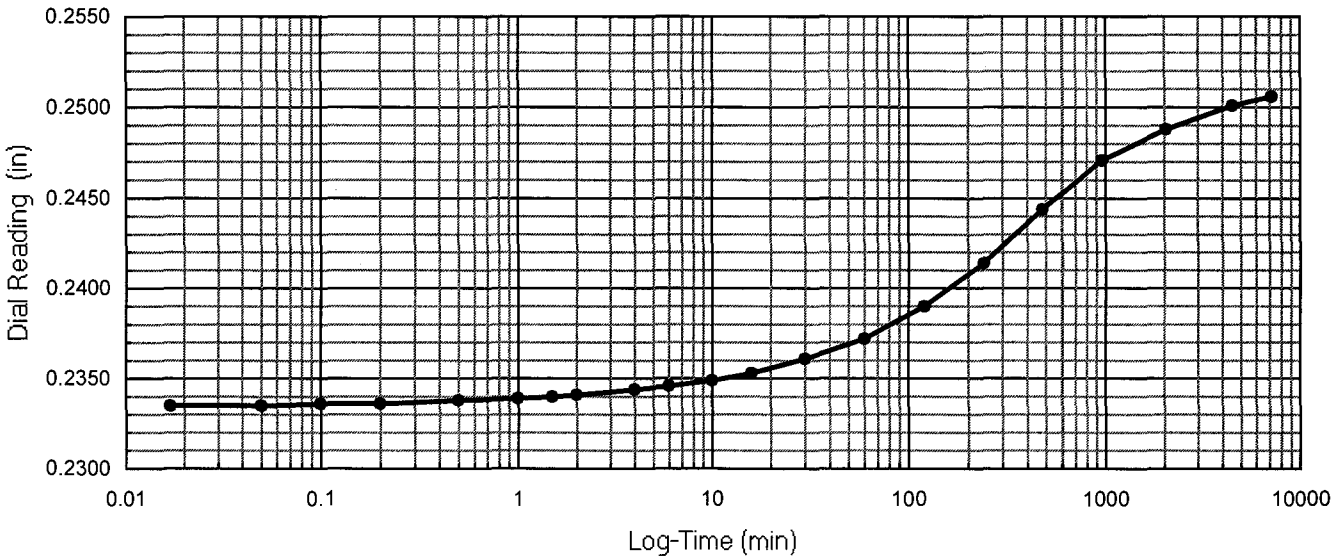
d50 = _____

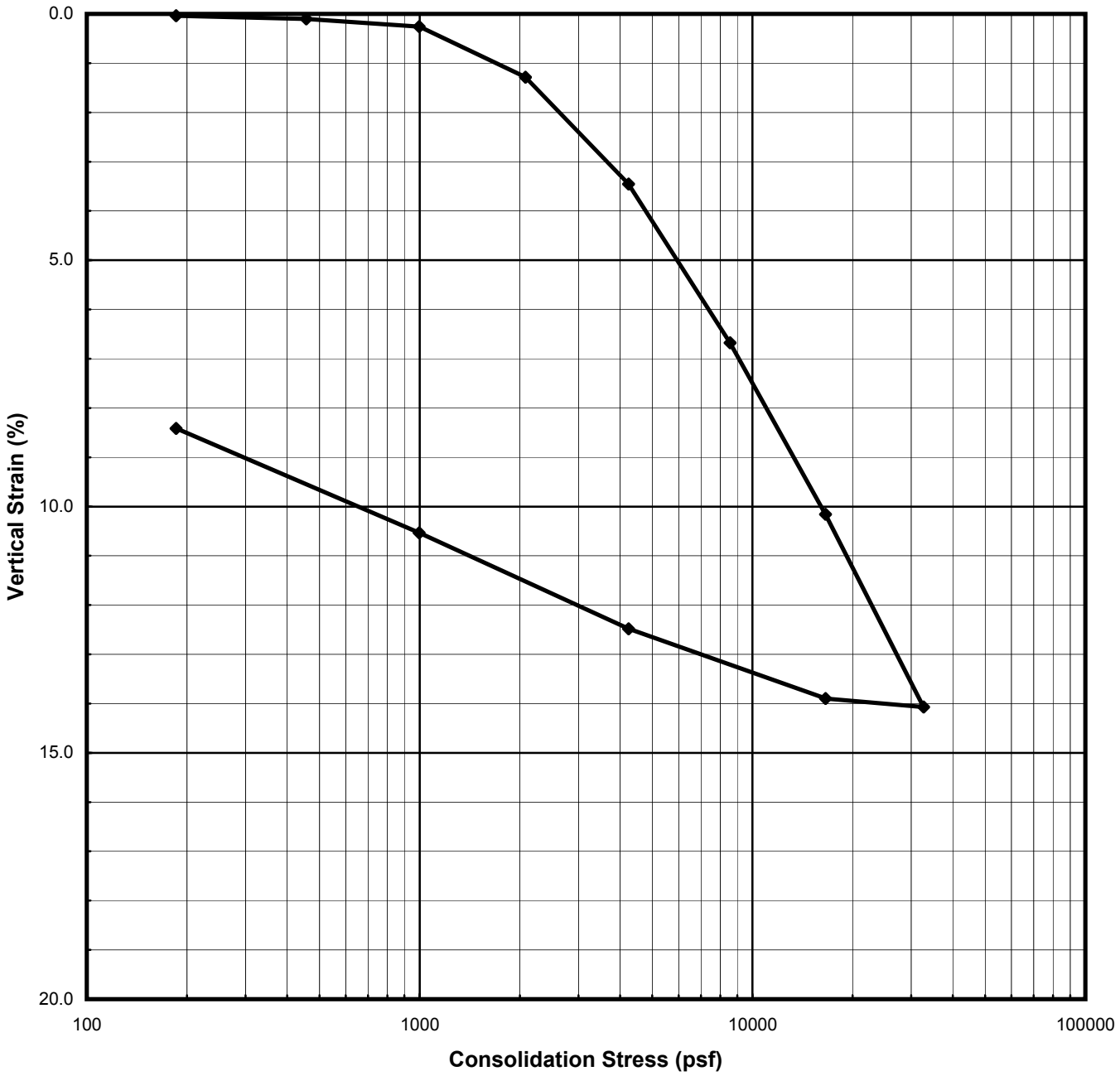
t50 = _____ min

log time

d50 = _____

t50 = _____ min





Description:	**Olive Clay with sand (CH)**							
Boring No.:	R-10-024		Liquid Limit	61	%	Specific Gravity	2.75	assumed
Sample No.:	S5		Plasticity Index	45	%	Strain for Saturation	2.30	%
Depth (ft | m)	25.0	7.62	Fines Content	75.8	%	Water added at	50.0	psf

	Water Content (%)	Total Unit Weight		Dry Unit Weight		Saturation (%)	Void Ratio	Height		Diameter	
		(pcf)	(kN/m^3)	(pcf)	(kN/m^3)			(inches)	(cm)	(inches)	(cm)
Initial	26.6	121.4	19.07	95.9	15.06	92.9	0.79	0.770	1.96	1.933	4.910
Final	22.6	127.9	20.08	104.3	16.38	96.6	0.64	0.708	1.80		

URS

I5 & SR74 IC

Project Number: 30989830
Test Start Date: 8/17/2010

CONSOLIDATION TEST
ASTM D2435

SUBMITTED BY: Thomas J. O'Mear

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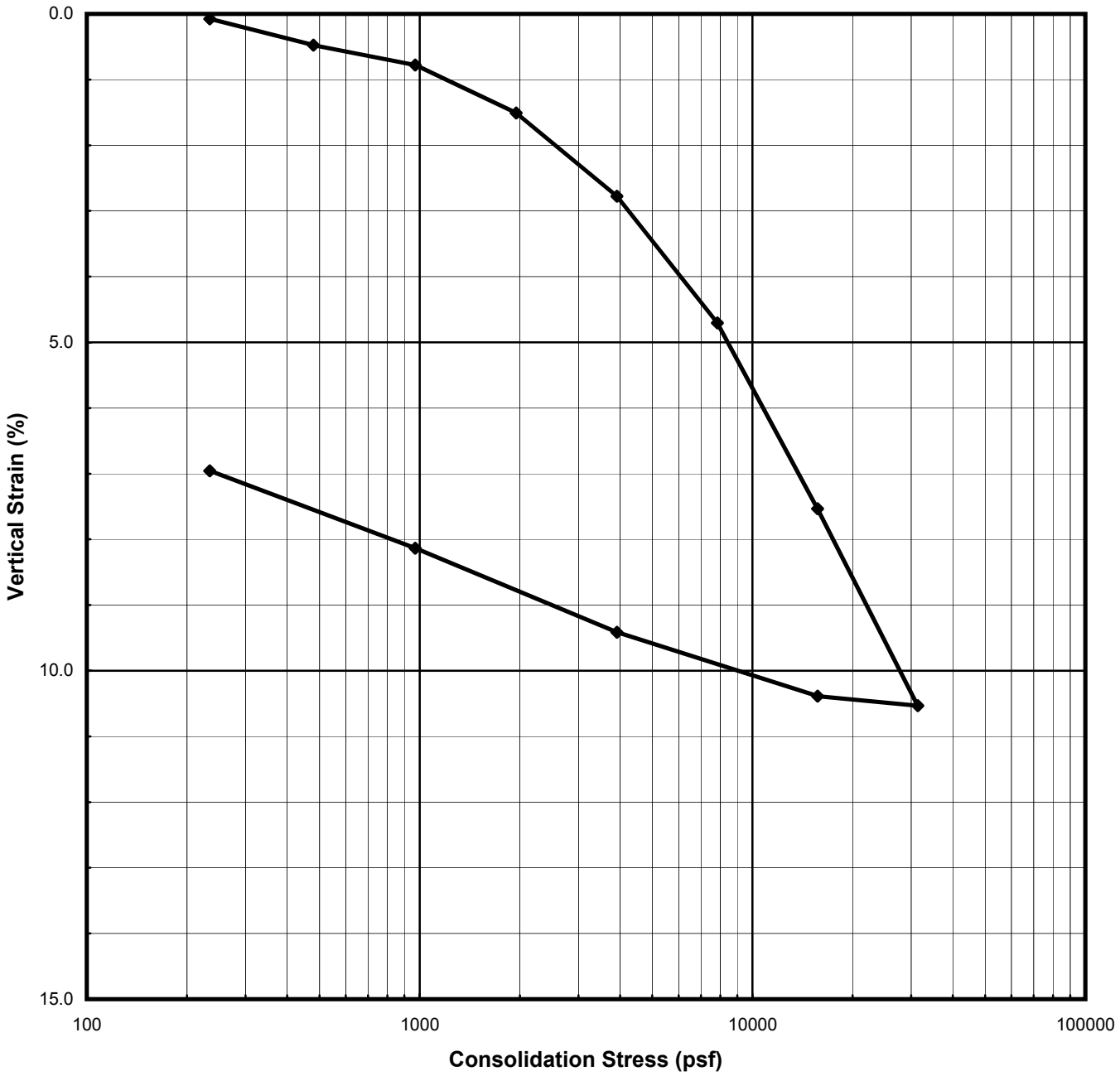

Description:	**Dark grayish brown sandy Clay (CH)**							
Boring No.:	R-10-028		Liquid Limit	39	%	Specific Gravity	2.75	assumed
Sample No.:	3		Plasticity Index	26	%	Strain for Saturation	6.01	%
Depth (ft | m)	17.0	5.18	Fines Content	64.5	%	Water added at	112.0	psf

	Water Content (%)	Total Unit Weight		Dry Unit Weight		Saturation (%)	Void Ratio	Height		Diameter	
		(pcf)	(kN/m^3)	(pcf)	(kN/m^3)			(inches)	(cm)	(inches)	(cm)
Initial	17.5	126.9	19.94	108.0	16.97	82.1	0.59	1.026	2.61	2.870	7.290
Final	17.2	136.0	21.36	116.0	18.22	99.1	0.48	0.956	2.43		

URS

I-5 & SR-74 IC

Project Number: 30989830
Test Start Date: 9/10/2010

CONSOLIDATION TEST
ASTM D2435

SUBMITTED BY: Thomas J. O'Meara

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One-Dimensional Oedometer Testing
Set-up / Take down Worksheet
ASTM D2435

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM
Apparatus No.: C6

Boring No.: R-10-028
Sample No.: 3
Depth (ft): 17.0

Specimen Description : Dark grayish brown sandy Clay (CH)
Duration: end of increment

Ring Number: R15
Weight of Wet Spec. and Ring: 439.96 g
Weight of Ring: 218.76 g
Initial Weight of Wet Spec.: 221.20 g

Take Down Weight with Ring: 438.88 g

Excess Oven-dried Cont. No.: rp10
Weight of Cont. and Dry Spec.: 116.48 g
Weight of Container: 116.02 g
Weight of Excess Dried Soil: 0.46 g
Weight of Excess Wet Soil 0.54 g
Final Weight of Wet Specimen: 220.66 g

Height of Specimen (in)

	Initial	Final
1	1.030	0.957
2	1.025	0.958
3	1.034	0.953
4	1.017	0.947
5	1.025	0.964
Ave:	1.026	0.956

Initial Height - Final Height = 0.070 in
Change in Dial (Dd) = 0.080 in
Initial Height - Dd = 0.946 in
Final Height + Dd = 1.036 in
Weight of Top Cap = 474.26 g

Specimen Analysis					Initial Trim	Initial Spec.	Final
				Container Number:	f110	**XXXXX**	s23
				Mass of Container and Wet Specimen M1 (g)	336.35	221.20	302.04
				Mass of Container and Dry Specimen, M2 (g)	302.49	188.26	269.94
				Mass of Container, M3 (g)	109.57	**XXXXX**	83.43
				Water Content, w (%)	17.55	17.50	17.21
				Mass of Wet Specimen, M4 (g)	221.20	221.20	220.66
				Mass of Dry Specimen, M5 (g)	188.26	188.26	188.26
Nominal		Measured	x	Specimen Height, H (in)	1.026	1.026	0.956
Nominal	x	Measured		Specimen Diameter, D (in)	2.870	2.870	2.870
				Area of Specimen, A (in^2)	6.469	6.469	6.469
				Volume of Specimen, V (cc)	108.79	108.79	101.33
Assumed	x	Measured		Specific Gravity, Gs	2.75	2.75	2.75
				Wet Unit Weight, WUW (pcf)	**126.9**	**126.9**	**136.0**
				Dry Unit Weight, DUW (pcf)	**108.0**	**108.0**	**116.0**
				Void Ratio	**0.587**	**0.586**	**0.477**
				Degree of Saturation, S (%)	**82.2**	**82.1**	**99.1**

Set-up by: TJO
Date: 9/10/10
Calculated by: TJO
Reviewed by: YS
Strain for Saturation (%) = **6.007**

One-Dimensional Oedometer Testing

Loading Worksheet

ASTM D2435

Project Number: 30989830 Boring No.: R-10-028

Project Name: I-5 & SR-74 IC Sample No.: 3

Project Engineer: FM Apparatus No.: C6 Depth (ft): 17.0

Initial Dial Reading: 0.3289 inch Initial Specimen Height: 1.026 inch

Stage No.	Normal Stress (psf)	Dial Reading (in)		Compressibility Correction (in)	Vertical Strain (%)	
		End of Duration	End of Increment		End of Duration	End of Increment
Seat	112		0.3287	0.0000		0.02
1	234		0.3265	0.0016		0.08
2	480		0.3211	0.0029		0.48
3	970	0.3156	0.3155	0.0054	0.77	0.78
4	1952	0.3064	0.3055	0.0079	1.42	1.51
5	3915	0.2905	0.2894	0.0110	2.67	2.78
6	7841	0.2680	0.2666	0.0140	4.57	4.71
7	15692	0.2370	0.2341	0.0175	7.25	7.53
8	31396	0.2020	0.1993	0.0215	10.27	10.53
9	15692		0.2028	0.0195		10.39
10	3915		0.2172	0.0151		9.41
11	970		0.2344	0.0110		8.14
12	234		0.2489	0.0086		6.96
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						
33						

Final dial reading prior to take down (inch): 0.2489 Take down by: TJO Date: 9/30/10

One-Dimensional Oedometer Testing
ASTM D2435
Table of Incremental Values

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM
Apparatus No.: C6

Boring No.: R-10-028
Sample No.: 3
Depth (ft): 17.0
Inundation at stage: Seat

10 **20** Hanger Ratios

Stage Number	Incremental Weight Applied (kg) Back	Front	Vertical Stress (psf)	Specimen Hieght (in)	Deflections (in) $d_{initial}$	d_o	d_{50}	d_{100}	d_{final}	Porous Stone (in)	t_{50} (min)	cv (in^2/min)	cv (ft^2/day)
Top Cap			23	1.026	0.3289	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
Seat	0.06	0.06	112	1.026	0.3289	XXXXX	XXXXX	XXXXX	0.3287	0.0000	XXXXX	XXXXX	XXXXX
1	0.25		234	1.025	0.3287	0.3276	XXXXX	XXXXX	0.3265	0.0016	XXXXX	XXXXX	XXXXX
2	0.50		480	1.023	0.3265	0.3220	XXXXX	XXXXX	0.3211	0.0029	XXXXX	XXXXX	XXXXX
3	1.00		970	1.023	0.3211	0.3192	0.3174	0.3156	0.3155	0.0054	1.00	0.052	0.515
4		1.0	1952	1.021	0.3155	0.3134	0.3099	0.3064	0.3055	0.0079	1.00	0.051	0.513
5	4.0		3915	1.016	0.3055	0.3018	0.2962	0.2905	0.2894	0.0110	1.00	0.051	0.508
6		4.0	7841	1.007	0.2894	0.2842	0.2761	0.2680	0.2666	0.0140	1.50	0.033	0.333
7		8.0	15692	0.992	0.2666	0.2605	0.2488	0.2370	0.2341	0.0175	3.00	0.016	0.161
8		16.0	31396	0.978	0.2341	0.2292	0.2156	0.2020	0.1993	0.0215	10.00	0.005	0.047
9		-16.0	15692	1.001	0.1993	0.2012	XXXXX	XXXXX	0.2028	0.0195	XXXXX	XXXXX	XXXXX
10		-12.0	3915	1.031	0.2028	0.2064	XXXXX	XXXXX	0.2172	0.0151	XXXXX	XXXXX	XXXXX
11	-4.0	-1.0	970	1.059	0.2172	0.2187	XXXXX	XXXXX	0.2344	0.0110	XXXXX	XXXXX	XXXXX
12	-1.5		234	1.082	0.2344	0.2351	XXXXX	XXXXX	0.2489	0.0086	XXXXX	XXXXX	XXXXX
13			234	XXXXX	0.2489	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
14			234	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
15			234	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
16			234	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
17			234	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
18			234	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
19			234	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
20			234	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
21			234	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
22			234	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
23			234	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
24			234	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
25			234	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX

One-Dimensional Oedometer Testing Increment

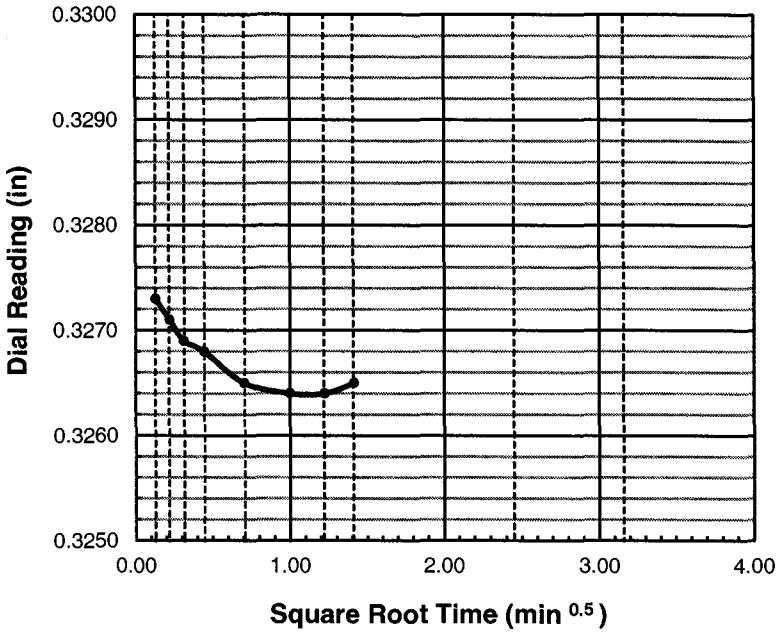
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C6 | Stage Number: 1 | Curves by: TJO

Boring No.: R-10-028 | Sample No.: 3 | Depth (ft.) 17.0

Date: 10-Sep-10 | Load (psf): 234 | Zero Reading: 0.3289

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
13:51:39	0	0.00	0.3287
	0.02	0.13	0.3273
	0.05	0.22	0.3271
	0.10	0.32	0.3269
	0.20	0.45	0.3268
	0.50	0.71	0.3265
	1.00	1.00	0.3264
	1.50	1.22	0.3264
swelling	2.00	1.41	0.3265



do = 0.3276

d90 = _____ t90 = _____ min

d100 = _____

df = 0.3265

square root

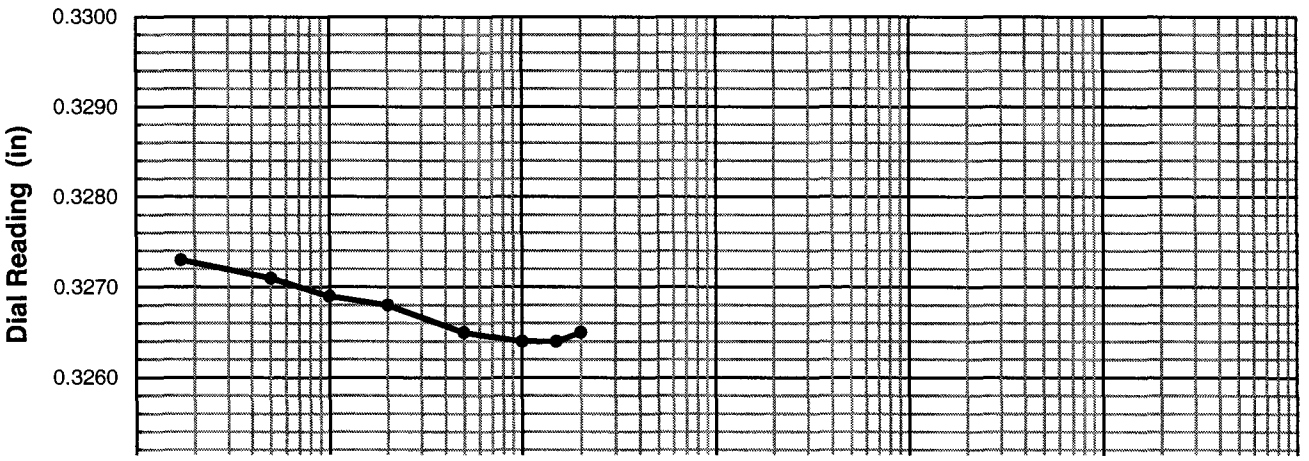
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

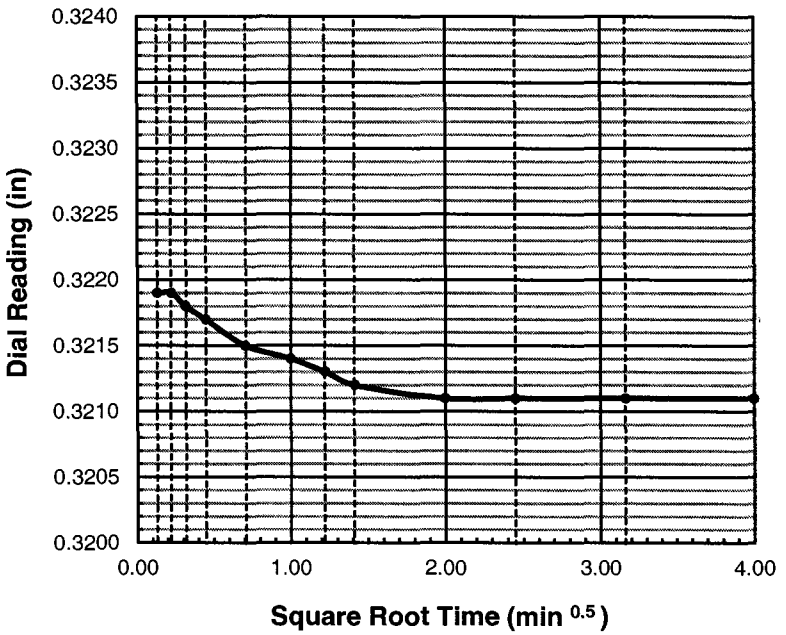
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C6 | Stage Number: 2 | Curves by: TJO

Boring No.: R-10-028 | Sample No.: 3 | Depth (ft.) 17.0

Date: 10-Sep-10 | Load (psf): 480 | Zero Reading: 0.3289

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
13:54:10	0	0.00	0.3221
	0.02	0.13	0.3219
	0.05	0.22	0.3219
	0.10	0.32	0.3218
	0.20	0.45	0.3217
	0.50	0.71	0.3215
	1.00	1.00	0.3214
	1.50	1.22	0.3213
	2.00	1.41	0.3212
	4.0	2.00	0.3211
	6.0	2.45	0.3211
	10.0	3.16	0.3211
	16.0	4.00	0.3211
	30		0.3211
	60		0.3211



do = 0.3220

d90 = _____ t90 = _____ min

d100 = _____

df = 0.3211

square root

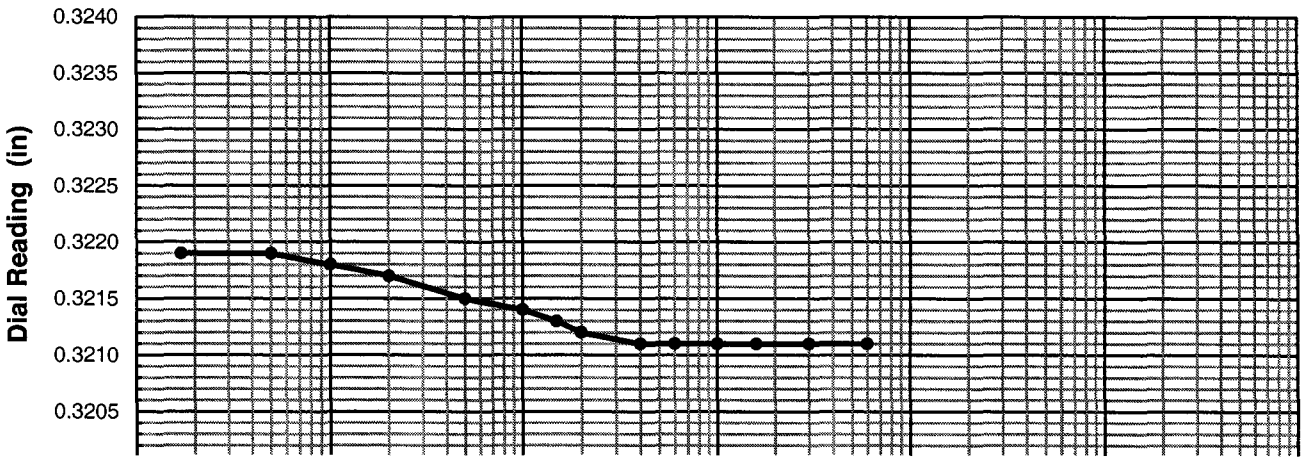
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

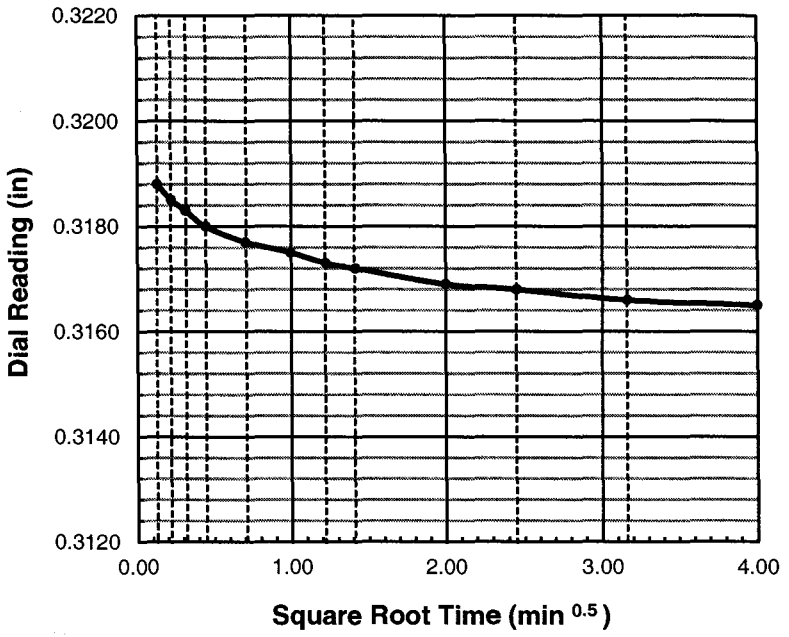
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C6 | Stage Number: 3 | Curves by: TJO

Boring No.: R-10-028 | Sample No.: 3 | Depth (ft.) 17.0

Date: 10-Sep-10 | Load (psf): 970 | Zero Reading: 0.3289

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
14:55:06	0	0.00	0.3211
	0.02	0.13	0.3188
	0.05	0.22	0.3185
	0.10	0.32	0.3183
	0.20	0.45	0.3180
	0.50	0.71	0.3177
	1.00	1.00	0.3175
	1.50	1.22	0.3173
	2.00	1.41	0.3172
	4.0	2.00	0.3169
	6.0	2.45	0.3168
	10.0	3.16	0.3166
	16.0	4.00	0.3165
	30		0.3163
	60		0.3161
	120		0.3159
	240		0.3158
	480		0.3156
	1236		0.3155



do = 0.3192

d90 = _____ t90 = _____ min

d100 = 0.3156

df = 0.3155

square root

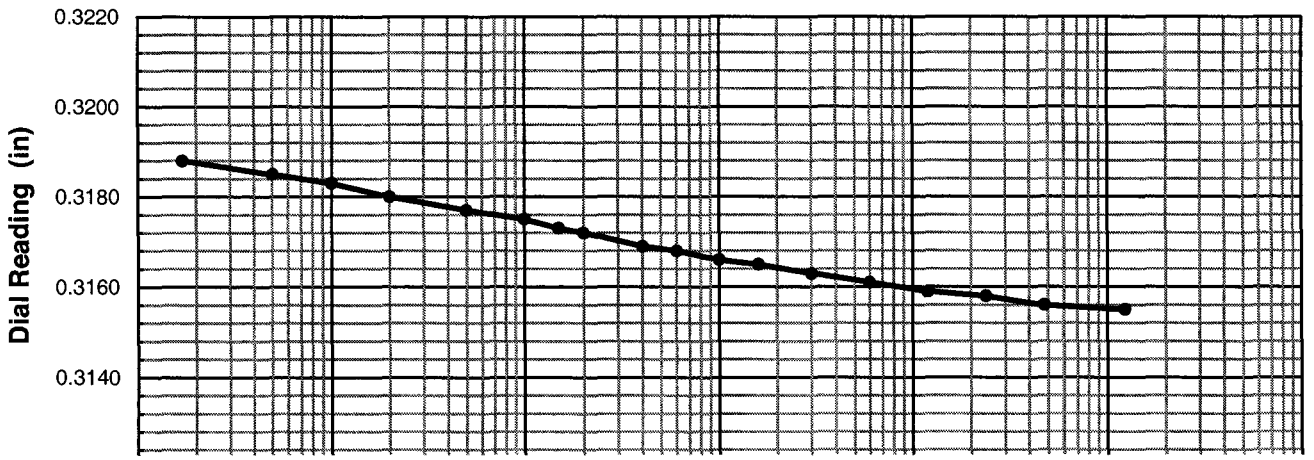
d50 = _____

t50 = _____ min

log time

d50 = 0.3174

t50 = 1.0 min



One-Dimensional Oedometer Testing Increment

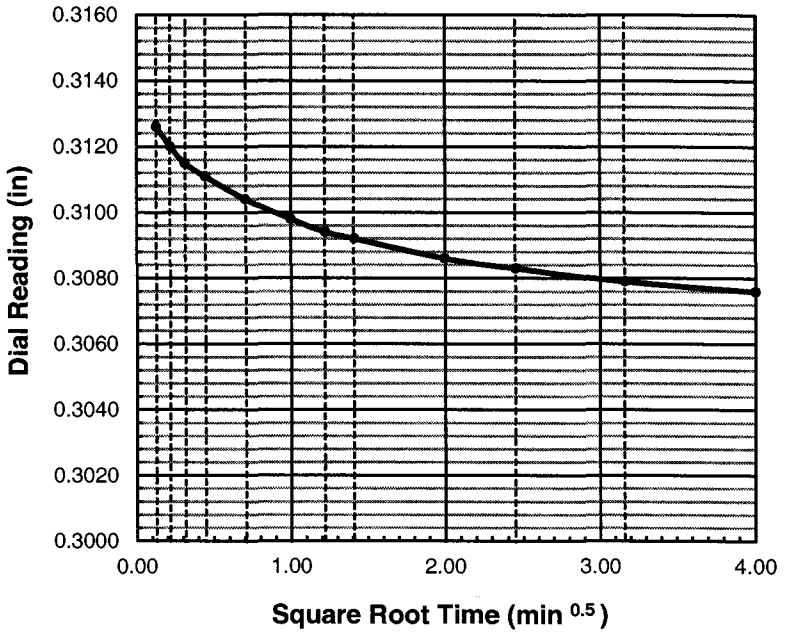
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C6 | Stage Number: 4 | Curves by: TJO

Boring No.: R-10-028 | Sample No.: 3 | Depth (ft.) 17.0

Date: 11-Sep-10 | Load (psf): 1952 | Zero Reading: 0.3289

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
11:31:47	0	0.00	0.3154
	0.02	0.13	0.3126
	0.05	0.22	0.3120
	0.10	0.32	0.3115
	0.20	0.45	0.3111
	0.50	0.71	0.3104
	1.00	1.00	0.3098
	1.50	1.22	0.3094
	2.00	1.41	0.3092
	4.0	2.00	0.3086
	6.0	2.45	0.3083
	10.0	3.16	0.3079
	16.0	4.00	0.3076
	30		0.3073
	60		0.3070
	120		0.3067
	240		0.3064
	480		0.3061
	960		0.3058
	1440		0.3057
	2735		0.3055



do = 0.3134

d90 = _____ t90 = _____ min

d100 = 0.3064

df = 0.3055

square root

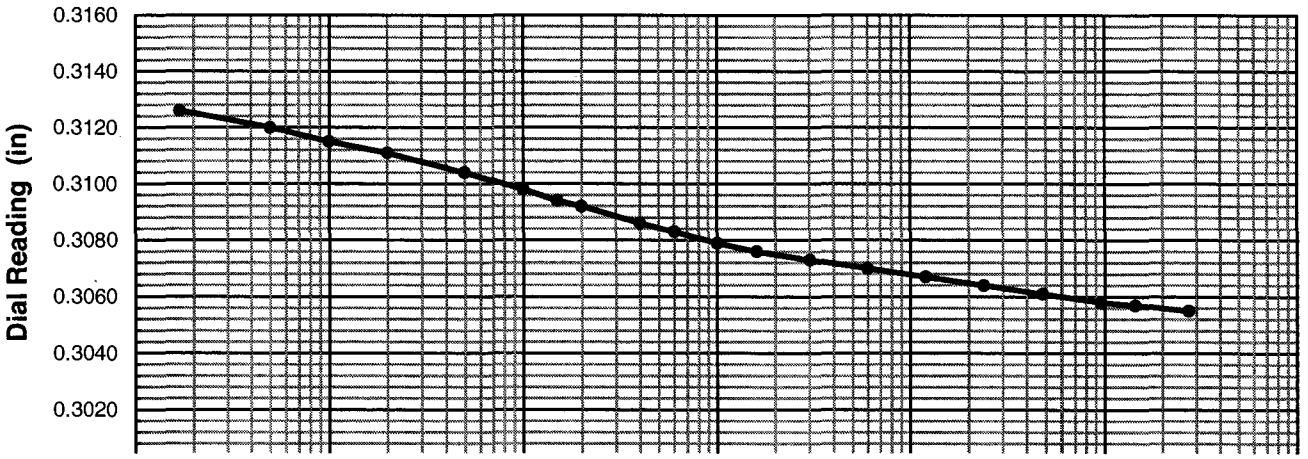
d50 = _____

t50 = _____ min

log time

d50 = 0.3099

t50 = 1.0 min



One-Dimensional Oedometer Testing Increment

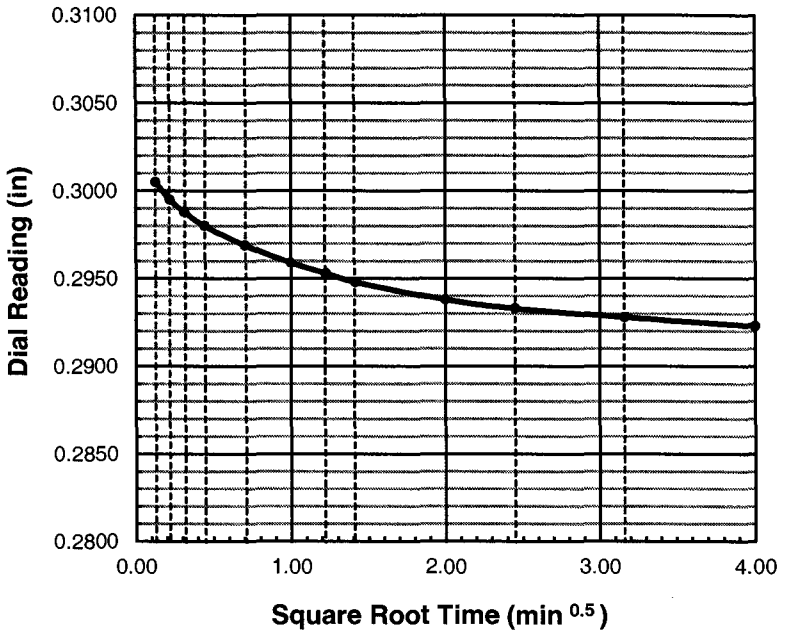
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C6 | Stage Number: 5 | Curves by: TJO

Boring No.: R-10-028 | Sample No.: 3 | Depth (ft.) 17.0

Date: 13-Sep-10 | Load (psf): 3915 | Zero Reading: 0.3289

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:07:56	0	0.00	0.3055
	0.02	0.13	0.3005
	0.05	0.22	0.2995
	0.10	0.32	0.2988
	0.20	0.45	0.2980
	0.50	0.71	0.2969
	1.00	1.00	0.2959
	1.50	1.22	0.2953
	2.00	1.41	0.2948
	4.0	2.00	0.2938
	6.0	2.45	0.2933
	10.0	3.16	0.2928
	16.0	4.00	0.2923
	30		0.2918
	60		0.2913
	120		0.2909
	240		0.2904
	480		0.2900
	960		0.2896
	1475		0.2894



do = 0.3018

d90 = _____ t90 = _____ min

d100 = 0.2905

df = 0.2894

square root

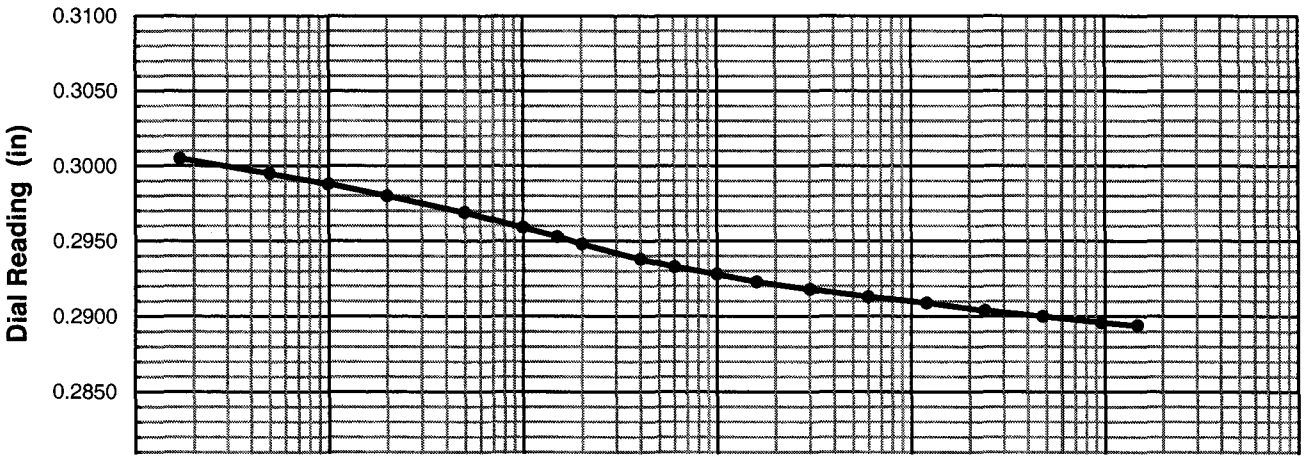
d50 = _____

t50 = _____ min

log time

d50 = 0.2961

t50 = 1.0 min



One-Dimensional Oedometer Testing Increment

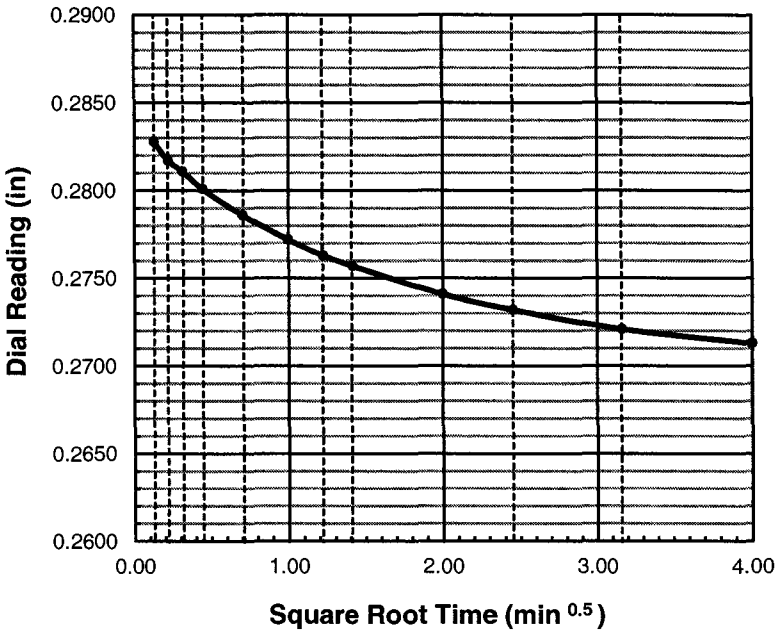
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C6 | Stage Number: 6 | Curves by: TJO

Boring No.: R-10-028 | Sample No.: 3 | Depth (ft.) 17.0

Date: 14-Sep-10 | Load (psf): 7841 | Zero Reading: 0.3289

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:43:21	0	0.00	0.2894
	0.02	0.13	0.2828
	0.05	0.22	0.2817
	0.10	0.32	0.2811
	0.20	0.45	0.2801
	0.50	0.71	0.2786
	1.00	1.00	0.2772
	1.50	1.22	0.2763
	2.00	1.41	0.2757
	4.0	2.00	0.2741
	6.0	2.45	0.2732
	10.0	3.16	0.2721
	16.0	4.00	0.2713
	30		0.2703
	60		0.2695
	120		0.2688
	240		0.2681
	480		0.2675
	960		0.2669
	1366		0.2666



do = 0.2842

d90 = ____ t90 = ____ min

d100 = 0.2680

df = 0.2666

square root

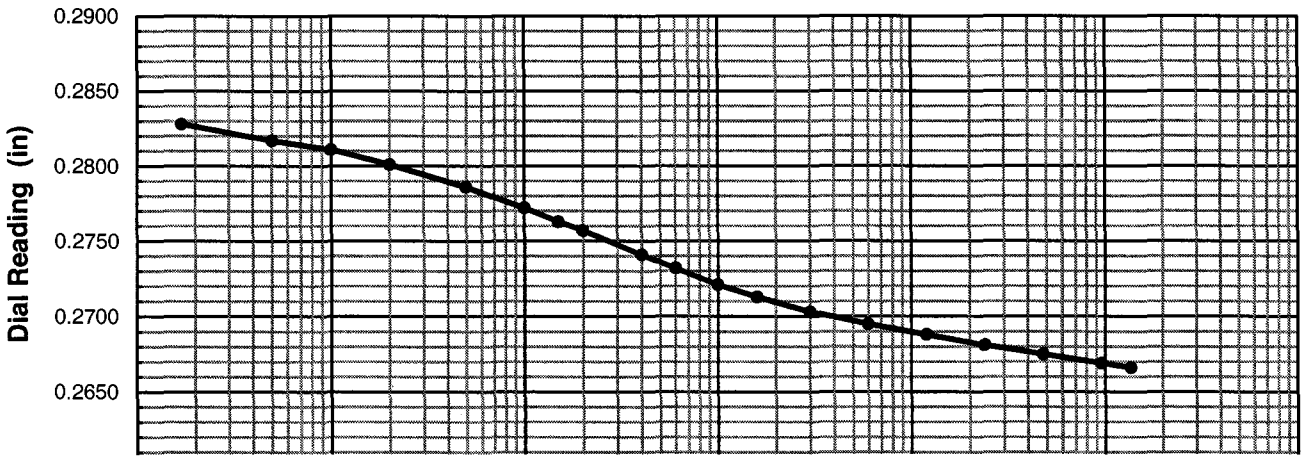
d50 = ____

t50 = ____ min

log time

d50 = 0.2761

t50 = 1.5 min



One-Dimensional Oedometer Testing Increment

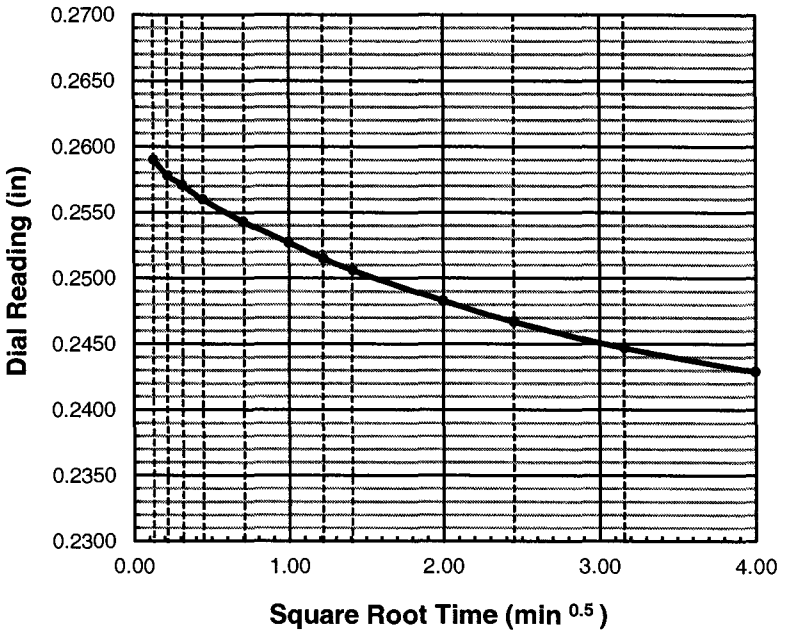
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C6 | Stage Number: 7 | Curves by: TJO

Boring No.: R-10-028 | Sample No.: 3 | Depth (ft.) 17.0

Date: 15-Sep-10 | Load (psf): 15692 | Zero Reading: 0.3289

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:29:28	0	0.00	0.2666
	0.02	0.13	0.2590
	0.05	0.22	0.2578
	0.10	0.32	0.2571
	0.20	0.45	0.2560
	0.50	0.71	0.2543
	1.00	1.00	0.2527
	1.50	1.22	0.2515
	2.00	1.41	0.2506
	4.0	2.00	0.2483
	6.0	2.45	0.2467
	10.0	3.16	0.2447
	16.0	4.00	0.2429
	30		0.2406
	60		0.2387
	120		0.2372
	240		0.2361
	480		0.2352
	960		0.2345
	1443		0.2341



do = 0.2605

d90 = ____ t90 = ____ min

d100 = 0.2370

df = 0.2341

square root

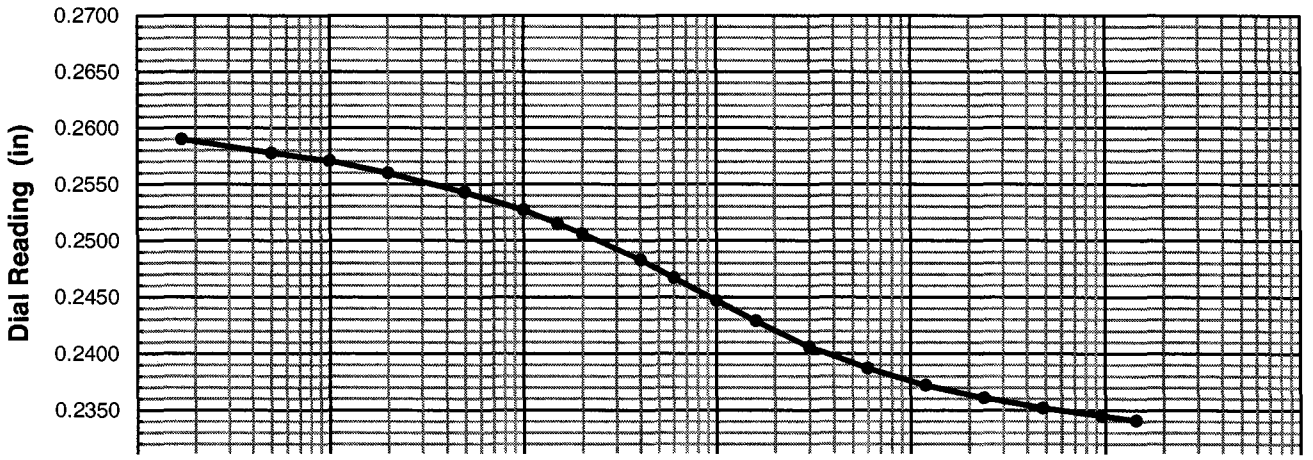
d50 = ____

t50 = ____ min

log time

d50 = 0.2488

t50 = 3.0 min



One-Dimensional Oedometer Testing Increment

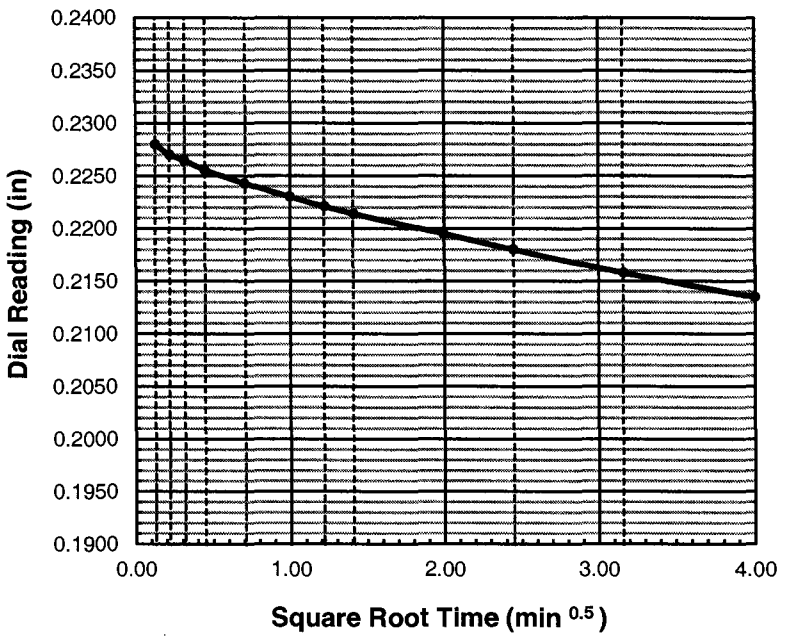
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C6 | Stage Number: 8 | Curves by: TJO

Boring No.: R-10-028 | Sample No.: 3 | Depth (ft.) 17.0

Date: 16-Sep-10 | Load (psf): 31396 | Zero Reading: 0.3289

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:18:49	0	0.00	0.2341
	0.02	0.13	0.2280
	0.05	0.22	0.2270
	0.10	0.32	0.2265
	0.20	0.45	0.2256
	0.50	0.71	0.2243
	1.00	1.00	0.2230
	1.50	1.22	0.2221
	2.00	1.41	0.2214
	4.0	2.00	0.2195
	6.0	2.45	0.2180
	10.0	3.16	0.2158
	16.0	4.00	0.2135
	30		0.2102
	60		0.2067
	120		0.2038
	240		0.2019
	480		0.2005
	960		0.1996
	1388		0.1993



do = 0.2292

d90 = _____ t90 = _____ min

d100 = 0.2020

df = 0.1993

square root

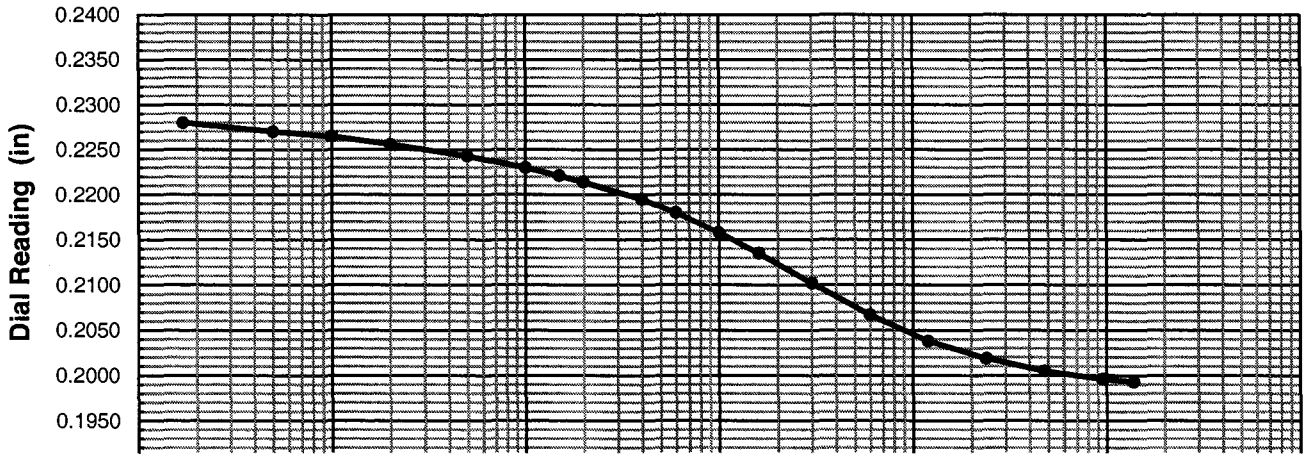
d50 = _____

t50 = _____ min

log time

d50 = 0.2156

t50 = 10.0 min



One-Dimensional Oedometer Testing Increment

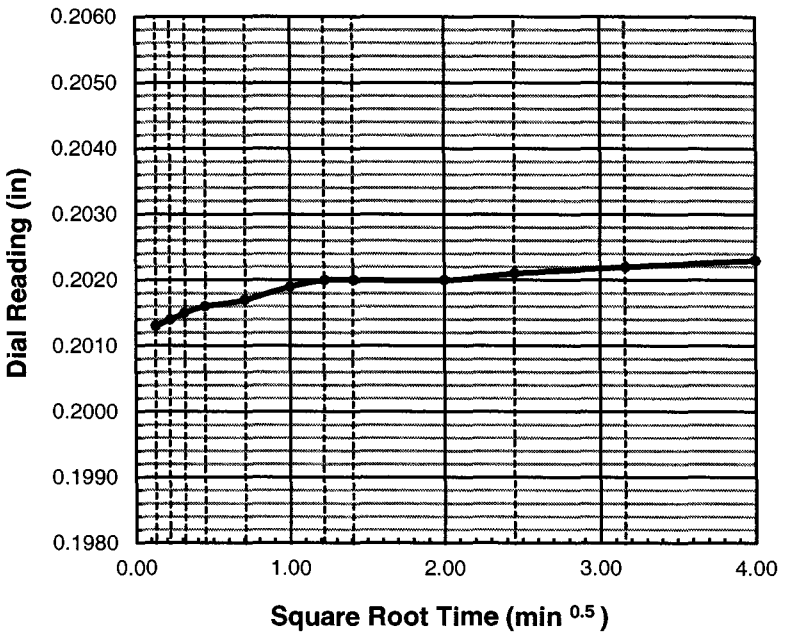
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C6 | Stage Number: 9 | Curves by: TJO

Boring No.: R-10-028 | Sample No.: 3 | Depth (ft.) 17.0

Date: 17-Sep-10 | Load (psf): 15692 | Zero Reading: 0.3289

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:27:49	0	0.00	0.1993
	0.02	0.13	0.2013
	0.05	0.22	0.2014
	0.10	0.32	0.2015
	0.20	0.45	0.2016
	0.50	0.71	0.2017
	1.00	1.00	0.2019
	1.50	1.22	0.2020
	2.00	1.41	0.2020
	4.0	2.00	0.2020
	6.0	2.45	0.2021
	10.0	3.16	0.2022
	16.0	4.00	0.2023
	30		0.2024
	60		0.2026
	120		0.2027
	310		0.2028



do = 0.2012

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2028

square root

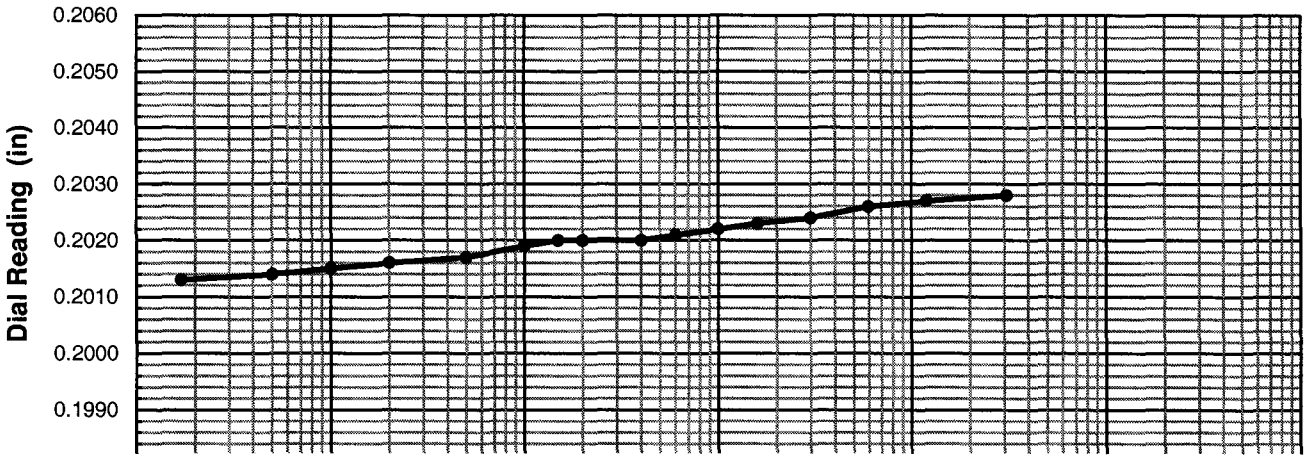
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

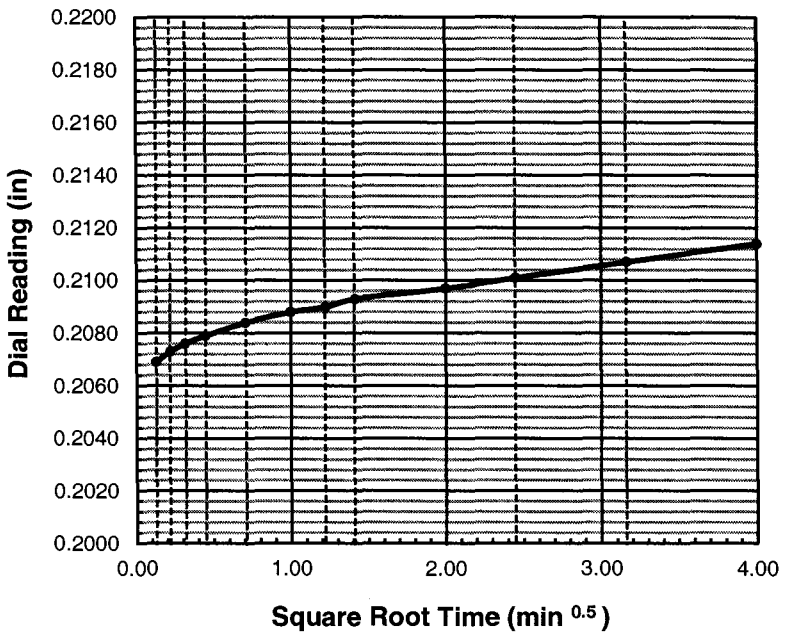
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C6 | Stage Number: 10 | Curves by: TJO

Boring No.: R-10-028 | Sample No.: 3 | Depth (ft.) 17.0

Date: 17-Sep-10 | Load (psf): 970 | Zero Reading: 0.3289

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
13:38:46	0	0.00	0.2028
	0.02	0.13	0.2069
	0.05	0.22	0.2073
	0.10	0.32	0.2076
	0.20	0.45	0.2079
	0.50	0.71	0.2084
	1.00	1.00	0.2088
	1.50	1.22	0.2090
	2.00	1.41	0.2093
	4.0	2.00	0.2097
	6.0	2.45	0.2101
	10.0	3.16	0.2107
	16.0	4.00	0.2114
	30		0.2125
	60		0.2138
	120		0.2151
	240		0.2162
	480		0.2167
	960		0.2171
	1266		0.2172



do = 0.2064

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2172

square root

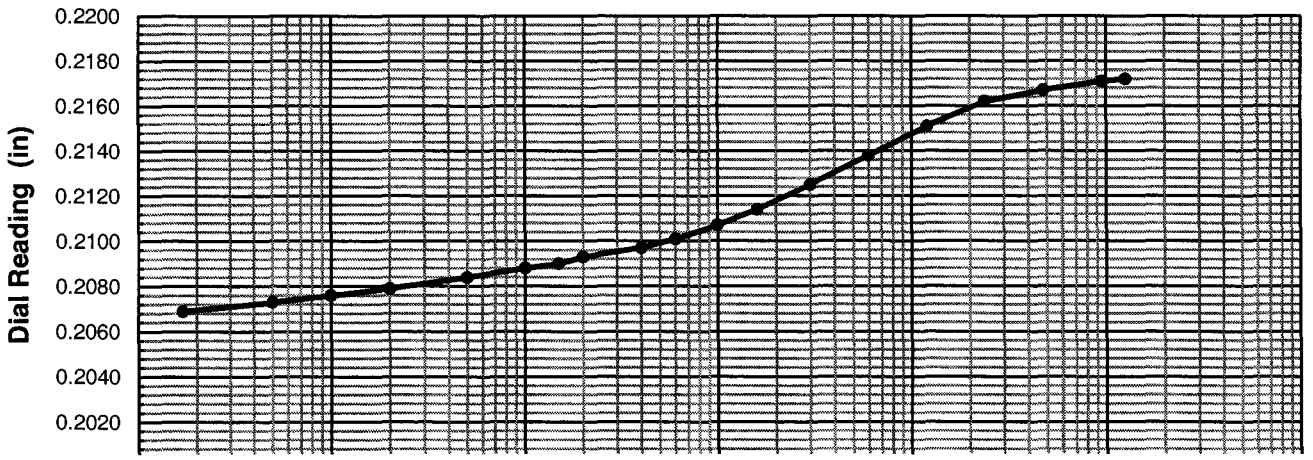
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

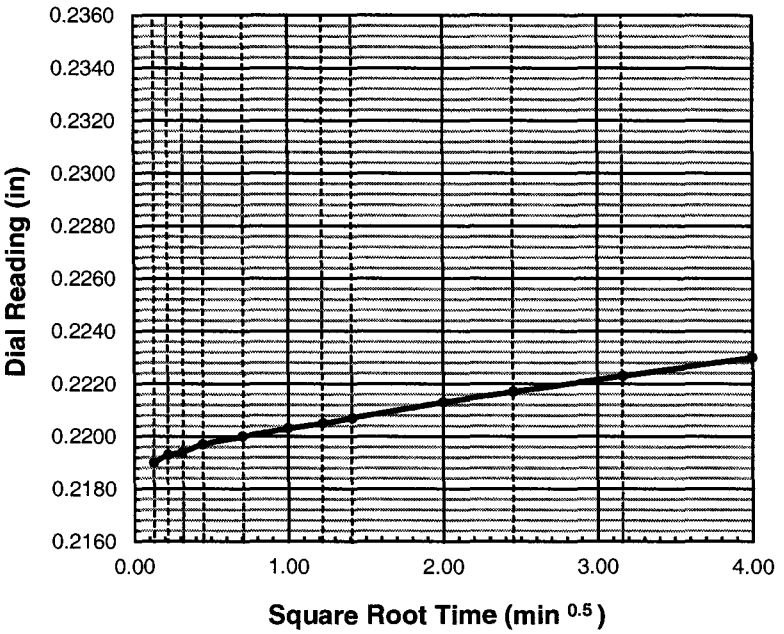
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C6 | Stage Number: 11 | Curves by: TJO

Boring No.: R-10-028 | Sample No.: 3 | Depth (ft.) 17.0

Date: 18-Sep-10 | Load (psf): 970 | Zero Reading: 0.3289

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:46:17	0	0.00	0.2172
	0.02	0.13	0.2190
	0.05	0.22	0.2193
	0.10	0.32	0.2194
	0.20	0.45	0.2197
	0.50	0.71	0.2200
	1.00	1.00	0.2203
	1.50	1.22	0.2205
	2.00	1.41	0.2207
	4.0	2.00	0.2213
	6.0	2.45	0.2217
	10.0	3.16	0.2223
	16.0	4.00	0.2230
	30		0.2241
	60		0.2259
	120		0.2280
	240		0.2304
	480		0.2324
	960		0.2335
	1440		0.2340
	2777		0.2344



do = 0.2187

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2344

square root

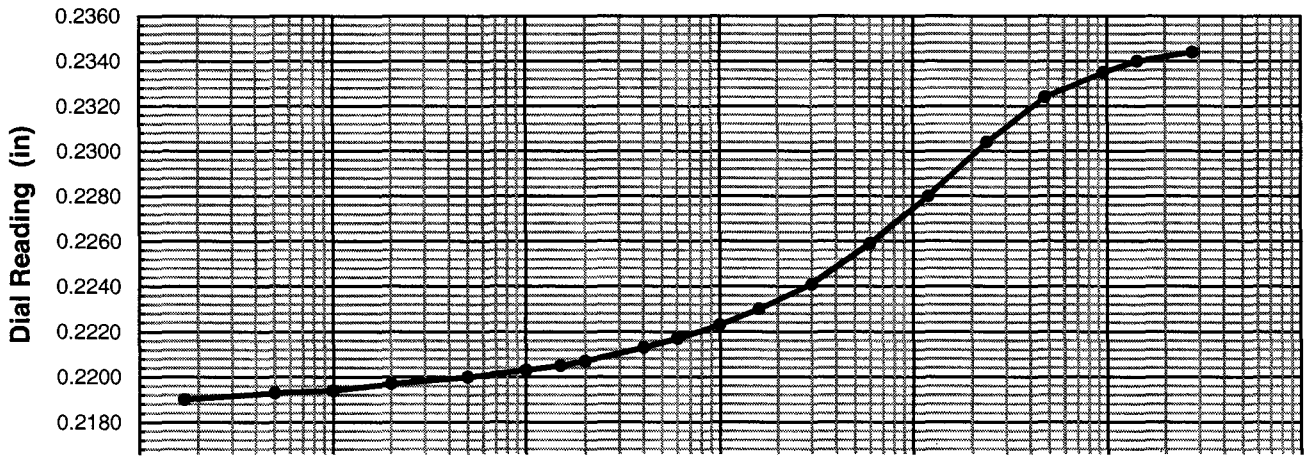
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

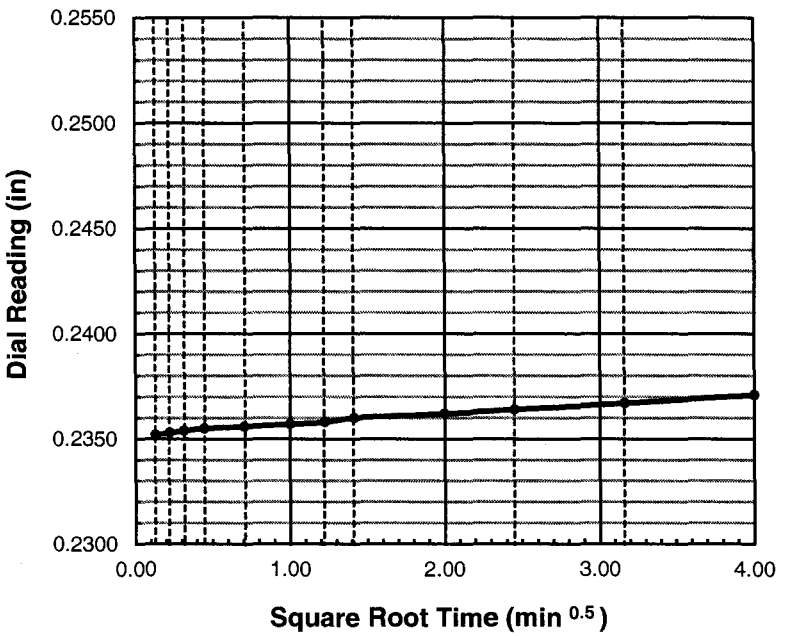
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C6 | Stage Number: 12 | Curves by: TJO

Boring No.: R-10-028 | Sample No.: 3 | Depth (ft.) 17.0

Date: 20-Sep-10 | Load (psf): 234 | Zero Reading: 0.3289

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:04:02	0	0.00	0.2345
	0.02	0.13	0.2352
	0.05	0.22	0.2353
	0.10	0.32	0.2354
	0.20	0.45	0.2355
	0.50	0.71	0.2356
	1.00	1.00	0.2357
	1.50	1.22	0.2358
	2.00	1.41	0.2360
	4.0	2.00	0.2362
	6.0	2.45	0.2364
	10.0	3.16	0.2367
	16.0	4.00	0.2371
	30		0.2378
	60		0.2390
	120		0.2405
	240		0.2426
	480		0.2447
	1440		0.2473
	2880		0.2483
	5506		0.2489
	10088		0.2489



do = 0.2351

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2489

square root

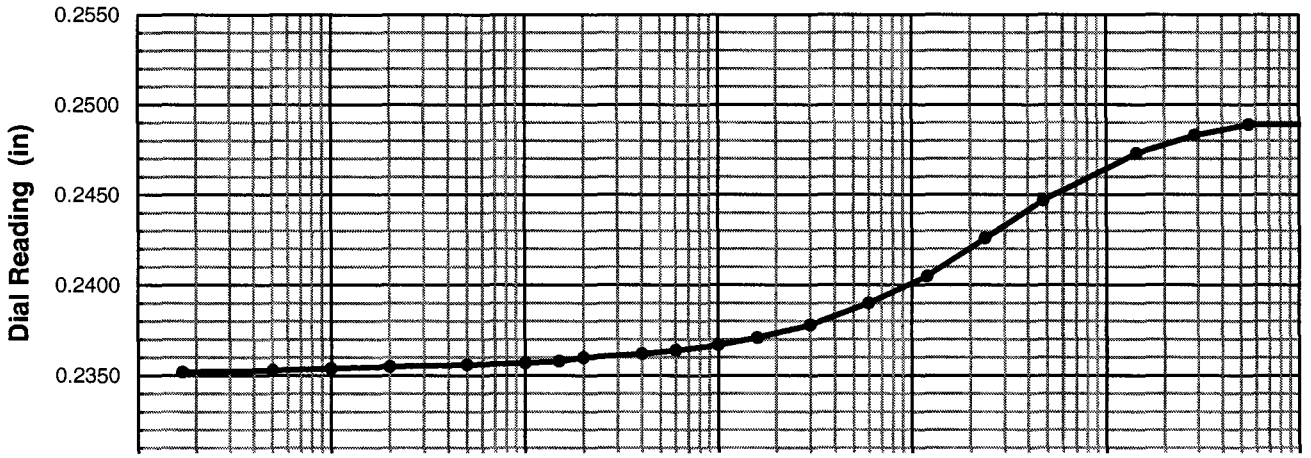
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



CORROSIVITY TEST ANALYSIS

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM

Exploration No.: R-10-007
Sample No.:
Depth (ft): 5 ~ 45

Initial Visual Classification Symbol: CH

State of Specimen before Processing

X	Passing soil through #8 sieve
X	Moist State
	Air Dried
	Oven Dried at 60 C

Set-Up Water Content	Minus No. 8 or ( )
Container No.	x12
Mass Container + Wet Soil (g), M1	255.65
Mass Container + Dry Soil (g), M2	250.25
Mass Container (g), M3	154.97
Water Content, w (%)	5.67

Resistivity Test: California Test Method 643

Mininum Resistence value: 430 ohm-cm

	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5
Weight of Soil in bowl (g):	458.78	487.86	511.32	539.29	567.05
Weight of mixing bowl (g):	130.02	130.02	130.02	130.02	130.02
Wet weight of Soil (g):	328.76	357.84	381.3	409.27	437.03
Amount of water added (ml):	0	30	25	30	30
Soil Box + Wet Soil (g), M5	219.70	223.63	230.39	250.78	249.26
Weight of Soil Box (g), M6	126.60	126.60	126.60	126.60	126.60
Wt. of Wet Soil for test (g), M7	93.097	97.03	103.79	124.18	122.66
Volume of Soil Box (cm^3)	79.2	79.2	79.2	79.2	79.2
Est. Saturation (%)	10.8	38.2	49.0	77.9	83.9
Resistivity Reading (ohm)	185,000	2,400	985	430	445
Resistence (ohm-cm)	185,000	2,400	985	430	445

Resistence = Soil Box Constant x Reading

pH Test : California Test Method 532

50g wet weight of soil mixed with 50 mL of de-ionized water.

pH of slurry: 7.40

Temperature : 23.2 Celsius

Sulfate Content: California Test Method 417

100g of soil mixed with 300 mL of de-ionized water.

SO_4 (ppm) : 1349

recorded mg of SO_4 in sample, x, = 79 mg

soil / water ratio, r, = 3

number of dilutions to obtain above value, d, = 2.5 = 1349.16 mg/ L = ppm

Dilution Equation, d > 0; $SO_4 = ((x / 80) * (r\ 80 * 2^{d} - r\ 80 * 2^{(d-1)})) + r\ 80 * 2^{(d-1)}$

Chloride Content: California Test Method 422

100g of soil mixed with 300 mL of de-ionized water.

Cl^- (ppm) : 345

mg/L of Cl^- = ((A-B) x N x 35453) x 3

A = mL of $AgNO_3$ A= 23

B = 23 mL of the blank

N = 0.0493 N, normality of the titrant

Cl^- (mg/L) = A * 5 * 3

Tested By: YS Date: 8/11/2010 Checked By: TJO

CORROSIVITY TEST ANALYSIS

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM

Boring No.: R-11-001
Sample No.: composite
Depth (ft): 5 ~ 50

Initial Visual Classification Symbol: CL

State of Specimen before Processing

X	Passing soil through #8 sieve
X	Moist State
	Air Dried
	Oven Dried at 60 C

Set-Up Water Content	Minus No. 8 or ( )
Container No.	s39
Mass Container + Wet Soil (g), M1	219.78
Mass Container + Dry Soil (g), M2	198.1
Mass Container (g), M3	113.5
Water Content, w (%)	25.63

Resistivity Test: California Test Method 643

Mininum Resistence value: 430 ohm-cm

	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5
Weight of Soil in bowl (g):	359.16	368.17	381.85	399.28	
Weight of mixing bowl (g):	151.03	151.03	151.03	151.03	
Wet weight of Soil (g):	208.13	217.14	230.82	248.25	
Amount of water added (ml):	0	10	15	15	
Soil Box + Wet Soil (g), M5	254.86	260.04	253.29	247.58	
Weight of Soil Box (g), M6	124.73	124.73	124.73	124.73	
Wt. of Wet Soil for test (g), M7	130.13	135.31	128.56	122.85	
Volume of Soil Box (cm^3)	79.2	79.2	79.2	79.2	79.2
Est. Saturation (%)	65.2	86.1	89.2	90.3	
Resistivity Reading (ohm)	560	440	430	455	
Resistence (ohm-cm)	560	440	430	455	

Resistence = Soil Box Constant x Reading

pH Test : California Test Method 532

50g wet weight of soil mixed with 50 mL of de-ionized water.

pH of slurry: 7.30

Temperature : 21.2 Celsius

Sulfate Content:

100g of soil mixed with 300 mL of de-ionized water.

SO_4 (ppm) : 396

recorded mg of SO_4 in sample, x, = 52 mg

soil / water ratio, r, = 3

number of dilutions to obtain above value, d, = 1 = 396 mg/ L = ppm

Dilution Equation, d > 0; $SO_4 = ((x / 80) * (r\ 80 * 2^{d} - r\ 80 * 2^{(d-1)})) + r\ 80 * 2^{(d-1)}$

Chloride Content:

100g of soil mixed with 300 mL of de-ionized water.

Cl^- (ppm) : 165

mg/L of Cl^- = ((A-B) x N x 35453) x 3

A = mL of $AgNO_3$ A= 11

B = 23 mL of the blank

N = 0.0493 N, normality of the titrant

Cl^- (mg/L) = A * 5 * 3

Tested By: YS Date: 2/15/2011 Checked By: TJO

CORROSIVITY TEST ANALYSIS

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM

Boring No.: R-11-002
Sample No.: composite
Depth (ft): 5 ~ 40

Initial Visual Classification Symbol: CL

State of Specimen before Processing

X	Passing soil through #8 sieve
X	Moist State
	Air Dried
	Oven Dried at 60 C

Set-Up Water Content	Minus No. 8 or ( )
Container No.	s10
Mass Container + Wet Soil (g), M1	200.91
Mass Container + Dry Soil (g), M2	175.65
Mass Container (g), M3	84.04
Water Content, w (%)	27.57

Resistivity Test: California Test Method 643

Mininum Resistence value: 350 ohm-cm

	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5
Weight of Soil in bowl (g):	540.32	550.23	563.94	576.26	
Weight of mixing bowl (g):	155.75	155.75	155.75	155.75	
Wet weight of Soil (g):	384.57	394.48	408.19	420.51	
Amount of water added (ml):	0	10	15	15	
Soil Box + Wet Soil (g), M5	277.77	274.03	269.97	269.81	
Weight of Soil Box (g), M6	130.40	130.40	130.40	130.40	
Wt. of Wet Soil for test (g), M7	147.37	143.63	139.57	139.41	
Volume of Soil Box (cm^3)	79.2	79.2	79.2	79.2	79.2
Est. Saturation (%)	87.8	92.8	95.1	99.1	
Resistivity Reading (ohm)	350	350	360	365	
Resistence (ohm-cm)	350	350	360	365	

Resistence = Soil Box Constant x Reading

pH Test : California Test Method 532

50g wet weight of soil mixed with 50 mL of de-ionized water.

pH of slurry: 7.20

Temperature : 21.2 Celsius

Sulfate Content:

100g of soil mixed with 300 mL of de-ionized water.

SO_4 (ppm) : 471

recorded mg of SO_4 in sample, x, = 77 mg

soil / water ratio, r, = 3

number of dilutions to obtain above value, d, = 1 = 471 mg/ L = ppm

Dilution Equation, d > 0; $SO_4 = ((x / 80) * (r\ 80 * 2^{d} - r\ 80 * 2^{(d-1)})) + r\ 80 * 2^{(d-1)}$

Chloride Content:

100g of soil mixed with 300 mL of de-ionized water.

Cl^- (ppm) : 330

mg/L of Cl^- = ((A-B) x N x 35453) x 3

A = mL of $AgNO_3$ A= 22

B = 23 mL of the blank

N = 0.0493 N, normality of the titrant

Cl^- (mg/L) = A * 5 * 3

Tested By: YS Date: 2/15/2011 Checked By: TJO

CORROSIVITY TEST ANALYSIS

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM

Exploration No.: R-10-008
Sample No.:
Depth (ft): 5 ~ 60

Initial Visual Classification Symbol: CH

State of Specimen before Processing

X	Passing soil through #8 sieve
X	Moist State
	Air Dried
	Oven Dried at 60 C

Set-Up Water Content	Minus No. 8 or ( )
Container No.	x29
Mass Container + Wet Soil (g), M1	247.19
Mass Container + Dry Soil (g), M2	239.98
Mass Container (g), M3	149.48
Water Content, w (%)	7.97

Resistivity Test: California Test Method 643

Mininum Resistence value: 285 ohm-cm

	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5
Weight of Soil in bowl (g):	410.71	433.99	470.92	493.37	513.49
Weight of mixing bowl (g):	151.03	151.03	151.03	151.03	151.03
Wet weight of Soil (g):	259.68	282.96	319.89	342.34	362.46
Amount of water added (ml):	0	25	40	25	25
Soil Box + Wet Soil (g), M5	217.09	222.09	239.83	246.11	245.08
Weight of Soil Box (g), M6	126.43	126.43	126.43	126.43	126.43
Wt. of Wet Soil for test (g), M7	90.66	95.66	113.4	119.68	118.65
Volume of Soil Box (cm^3)	79.2	79.2	79.2	79.2	79.2
Est. Saturation (%)	13.9	40.8	73.8	82.6	86.9
Resistivity Reading (ohm)	38,000	2,500	435	315	285
Resistence (ohm-cm)	38,000	2,500	435	315	285

Resistence = Soil Box Constant x Reading

pH Test : California Test Method 532

50g wet weight of soil mixed with 50 mL of de-ionized water.

pH of slurry: 7.30

Temperature : 23.1 Celsius

Sulfate Content: California Test Method 417

100g of soil mixed with 300 mL of de-ionized water.

SO_4 (ppm) : 1572

recorded mg of SO_4 in sample, x, = 51 mg

soil / water ratio, r, = 3

number of dilutions to obtain above value, d, = 3 = 1572 mg/ L = ppm

Dilution Equation, d > 0; $SO_4 = ((x / 80) * (r\ 80 * 2^{d} - r\ 80 * 2^{(d-1)})) + r\ 80 * 2^{(d-1)}$

Chloride Content: California Test Method 422

100g of soil mixed with 300 mL of de-ionized water.

Cl^- (ppm) : 270

mg/L of Cl^- = ((A-B) x N x 35453) x 3

A = mL of $AgNO_3$ A= 18

B = 23 mL of the blank

N = 0.0493 N, normality of the titrant

Cl^- (mg/L) = A * 5 * 3

Tested By: YS Date: 8/11/2010 Checked By: TJO

CORROSIVITY TEST ANALYSIS

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM

Boring No.: R-10-009
Sample No.: composite
Depth (ft): 6 ~ 55

Initial Visual Classification Symbol: CL

State of Specimen before Processing

X	Passing soil through #8 sieve
X	Moist State
	Air Dried
	Oven Dried at 60 C

Set-Up Water Content	Minus No. 8 or ( )
Container No.	s40
Mass Container + Wet Soil (g), M1	320.9
Mass Container + Dry Soil (g), M2	309.78
Mass Container (g), M3	81.38
Water Content, w (%)	4.87

Resistivity Test: California Test Method 643

Mininum Resistence value: 600 ohm-cm

	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5
Weight of Soil in bowl (g):	609.37	657.4	716.32	765.37	794.05
Weight of mixing bowl (g):	134.86	134.86	134.86	134.86	134.86
Wet weight of Soil (g):	474.51	522.54	581.46	630.51	659.19
Amount of water added (ml):	0	50	60	50	30
Soil Box + Wet Soil (g), M5	228.01	240.29	267.05	268.37	261.59
Weight of Soil Box (g), M6	130.53	130.53	130.53	130.53	130.53
Wt. of Wet Soil for test (g), M7	97.48	109.76	136.52	137.84	131.06
Volume of Soil Box (cm^3)	79.2	79.2	79.2	79.2	79.2
Est. Saturation (%)	10.0	48.4	91.3	101.0	94.2
Resistivity Reading (ohm)	450,000	2,800	635	600	620
Resistence (ohm-cm)	450,000	2,800	635	600	620

Resistence = Soil Box Constant x Reading

pH Test : California Test Method 532

50g wet weight of soil mixed with 50 mL of de-ionized water.

pH of slurry: 7.30

Temperature : 23.3 Celsius

Sulfate Content: California Test Method 417

100g of soil mixed with 300 mL of de-ionized water.

SO_4 (ppm) : 930

recorded mg of SO_4 in sample, x, = 75 mg

soil / water ratio, r, = 3

number of dilutions to obtain above value, d, = 2 = 930 mg/ L = ppm

Dilution Equation, d > 0; $SO_4 = ((x / 80) * (r\ 80 * 2^{d} - r\ 80 * 2^{(d-1)})) + r\ 80 * 2^{(d-1)}$

Chloride Content: California Test Method 422

100g of soil mixed with 300 mL of de-ionized water.

Cl^- (ppm) : 150

mg/L of Cl^- = ((A-B) x N x 35453) x 3

A = mL of $AgNO_3$ A= 10

B = 23 mL of the blank

N = 0.0493 N, normality of the titrant

Cl^- (mg/L) = A * 5 * 3

Tested By: YS Date: 9/10/2010 Checked By: TJO

CORROSIVITY TEST ANALYSIS

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM

Boring No.: A-11-020
Sample No.: 1, 2
Depth (ft): 5 ~ 6.5

Initial Visual Classification Symbol: CH

State of Specimen before Processing

X	Passing soil through #8 sieve
X	Moist State
	Air Dried
	Oven Dried at 60 C

Set-Up Water Content	Minus No. 8 or ( )
Container No.	s1
Mass Container + Wet Soil (g), M1	137.2
Mass Container + Dry Soil (g), M2	134.9
Mass Container (g), M3	85.24
Water Content, w (%)	4.63

Resistivity Test: California Test Method 643

Mininum Resistence value: 580 ohm-cm

	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5
Weight of Soil in bowl (g):	407.55	426.4	464.57	493.03	509.52
Weight of mixing bowl (g):	132.75	132.75	132.75	132.75	132.75
Wet weight of Soil (g):	274.8	293.65	331.82	360.28	376.77
Amount of water added (ml):	0	20	41	30	20
Soil Box + Wet Soil (g), M5	220.83	227.20	246.95	252.20	251.66
Weight of Soil Box (g), M6	124.67	124.67	124.67	124.67	124.67
Wt. of Wet Soil for test (g), M7	96.16	102.53	122.28	127.53	126.99
Volume of Soil Box (cm^3)	79.2	79.2	79.2	79.2	79.2
Est. Saturation (%)	9.5	35.3	76.6	88.2	89.6
Resistivity Reading (ohm)	10,000	3,600	695	580	640
Resistence (ohm-cm)	10,000	3,600	695	580	640

Resistence = Soil Box Constant x Reading

pH Test : California Test Method 532

50g wet weight of soil mixed with 50 mL of de-ionized water.

pH of slurry: 7.60

Temperature : 21.7 Celsius

Sulfate Content:

100g of soil mixed with 300 mL of de-ionized water.

SO_4 (ppm) : not detected

recorded mg of SO_4 in sample, x, = 0 mg

soil / water ratio, r, = 3

number of dilutions to obtain above value, d, = _____ = _____ mg/ L = ppm

Dilution Equation, d > 0; $SO_4 = ((x / 80) * (r\ 80 * 2^{d} - r\ 80 * 2^{(d-1)})) + r\ 80 * 2^{(d-1)}$

Chloride Content:

100g of soil mixed with 300 mL of de-ionized water.

Cl^- (ppm) : 600

mg/L of Cl^- = ((A-B) x N x 35453) x 3

A = mL of $AgNO_3$ A= 40

B = 23 mL of the blank

N = 0.0493 N, normality of the titrant

Cl^- (mg/L) = A * 5 * 3

Tested By: YS Date: 5/15/2011 Checked By: TJO

CORROSIVITY TEST ANALYSIS

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM

Boring No.: R-11-022
Sample No.: composite
Depth (ft): 5 ~ 30

Initial Visual Classification Symbol: CL

State of Specimen before Processing

X	Passing soil through #8 sieve
X	Moist State
	Air Dried
	Oven Dried at 60 C

Set-Up Water Content	Minus No. 8 or ( )
Container No.	c4
Mass Container + Wet Soil (g), M1	115.87
Mass Container + Dry Soil (g), M2	106.7
Mass Container (g), M3	71.92
Water Content, w (%)	26.37

Resistivity Test: California Test Method 643

Mininum Resistence value: 515 ohm-cm

	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5
Weight of Soil in bowl (g):	403.98	413.67	423.36		
Weight of mixing bowl (g):	134.86	134.86	134.86		
Wet weight of Soil (g):	269.12	278.81	288.5		
Amount of water added (ml):	0	10	10		
Soil Box + Wet Soil (g), M5	245.27	254.08	255.16		
Weight of Soil Box (g), M6	126.47	126.47	126.47		
Wt. of Wet Soil for test (g), M7	118.8	127.61	128.69		
Volume of Soil Box (cm^3)	79.2	79.2	79.2	79.2	79.2
Est. Saturation (%)	56.0	75.8	81.8		
Resistivity Reading (ohm)	695	515	525		
Resistence (ohm-cm)	695	515	525		

Resistence = Soil Box Constant x Reading

pH Test : California Test Method 532

50g wet weight of soil mixed with 50 mL of de-ionized water.

pH of slurry: 7.50

Temperature : 21.2 Celsius

Sulfate Content:

100g of soil mixed with 300 mL of de-ionized water.

SO_4 (ppm) : not detected

recorded mg of SO_4 in sample, x, = 0 mg

soil / water ratio, r, = 3

number of dilutions to obtain above value, d, = _____ = _____ mg/ L = ppm

Dilution Equation, d > 0; $SO_4 = ((x / 80)* (r\ 80 * 2^{d} - r\ 80 * 2^{(d-1)})) + r\ 80 * 2^{(d-1)}$

Chloride Content:

100g of soil mixed with 300 mL of de-ionized water.

Cl^- (ppm) : 120

mg/L of Cl^- = ((A-B) x N x 35453) x 3

A = mL of $AgNO_3$ A= 8

B = 23 mL of the blank

N = 0.0493 N, normality of the titrant

Cl^- (mg/L) = A * 5 * 3

Tested By: YS Date: 2/15/2011 Checked By: TJO

CORROSIVITY TEST ANALYSIS

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM

Exploration No.: R-10-024
Sample No.:
Depth (ft): 5 ~ 60

Initial Visual Classification Symbol: CH

State of Specimen before Processing

X	Passing soil through #8 sieve
X	Moist State
	Air Dried
	Oven Dried at 60 C

Set-Up Water Content	Minus No. 8 or ( )
Container No.	x7
Mass Container + Wet Soil (g), M1	242.05
Mass Container + Dry Soil (g), M2	237.64
Mass Container (g), M3	156.68
Water Content, w (%)	5.45

Resistivity Test: California Test Method 643

Mininum Resistence value: 445 ohm-cm

	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5
Weight of Soil in bowl (g):	393.25	412.28	459.28	487.68	504.57
Weight of mixing bowl (g):	140.76	140.76	140.76	140.76	140.76
Wet weight of Soil (g):	252.49	271.52	318.52	346.92	363.81
Amount of water added (ml):	0	20	50	30	20
Soil Box + Wet Soil (g), M5	233.44	237.25	266.79	263.41	259.11
Weight of Soil Box (g), M6	130.82	130.82	130.82	130.82	130.82
Wt. of Wet Soil for test (g), M7	102.62	106.43	135.97	132.59	128.29
Volume of Soil Box (cm^3)	79.2	79.2	79.2	79.2	79.2
Est. Saturation (%)	12.3	40.7	102.8	101.0	97.6
Resistivity Reading (ohm)	18,000	3,550	495	445	450
Resistence (ohm-cm)	18,000	3,550	495	445	450

Resistence = Soil Box Constant x Reading

pH Test : California Test Method 532

50g wet weight of soil mixed with 50 mL of de-ionized water.

pH of slurry: 7.50

Temperature : 23.2 Celsius

Sulfate Content: California Test Method 417

100g of soil mixed with 300 mL of de-ionized water.

SO_4 (ppm) : 1692

recorded mg of SO_4 in sample, x, = 61 mg

soil / water ratio, r, = 3

number of dilutions to obtain above value, d, = 3 = 1692 mg/ L = ppm

Dilution Equation, d > 0; $SO_4 = ((x / 80)* (r\ 80 * 2^{d} - r\ 80 * 2^{(d-1)})) + r\ 80 * 2^{(d-1)}$

Chloride Content: California Test Method 422

100g of soil mixed with 300 mL of de-ionized water.

Cl^- (ppm) : 90

mg/L of Cl^- = ((A-B) x N x 35453) x 3

A = mL of $AgNO_3$ A= 6

B = 23 mL of the blank

N = 0.0493 N, normality of the titrant

Cl^- (mg/L) = A * 5 * 3

Tested By: YS Date: 8/11/2010 Checked By: TJO

CORROSIVITY TEST ANALYSIS

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM

Boring No.: R-10-028
Sample No.: composite
Depth (ft): 5 ~ 50

Initial Visual Classification Symbol: CL

State of Specimen before Processing

X	Passing soil through #8 sieve
X	Moist State
	Air Dried
	Oven Dried at 60 C

Set-Up Water Content	Minus No. 8 or ( )
Container No.	s19
Mass Container + Wet Soil (g), M1	297.8
Mass Container + Dry Soil (g), M2	289.11
Mass Container (g), M3	102.58
Water Content, w (%)	4.66

Resistivity Test: California Test Method 643

Mininum Resistence value: 640 ohm-cm

	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5
Weight of Soil in bowl (g):	700.21	748.43	805.2	853.7	899.98
Weight of mixing bowl (g):	151.08	151.08	151.08	151.08	151.08
Wet weight of Soil (g):	549.13	597.35	654.12	702.62	748.9
Amount of water added (ml):	0	50	60	50	50
Soil Box + Wet Soil (g), M5	216.85	225.40	239.01	250.81	245.93
Weight of Soil Box (g), M6	126.39	126.39	126.39	126.39	126.39
Wt. of Wet Soil for test (g), M7	90.46	99.01	112.62	124.42	119.54
Volume of Soil Box (cm^3)	79.2	79.2	79.2	79.2	79.2
Est. Saturation (%)	8.5	37.6	61.0	79.3	81.2
Resistivity Reading (ohm)	740,000	4,950	1,050	645	640
Resistence (ohm-cm)	740,000	4,950	1,050	645	640

Resistence = Soil Box Constant x Reading

pH Test : California Test Method 532

50g wet weight of soil mixed with 50 mL of de-ionized water.

pH of slurry: 6.50
Temperature : 23.1 Celsius

Sulfate Content: California Test Method 417

100g of soil mixed with 300 mL of de-ionized water.

SO_4 (ppm) : 606

recorded mg of SO_4 in sample, x, = 21 mg

soil / water ratio, r, = 3

number of dilutions to obtain above value, d, = 2 = 606 mg/ L = ppm

Dilution Equation, d > 0; $SO_4 = ((x / 80) * (r\ 80 * 2^{d} - r\ 80 * 2^{(d-1)})) + r\ 80 * 2^{(d-1)}$

Chloride Content: California Test Method 422

100g of soil mixed with 300 mL of de-ionized water.

Cl^- (ppm) : 105

mg/L of Cl^- = ((A-B) x N x 35453) x 3

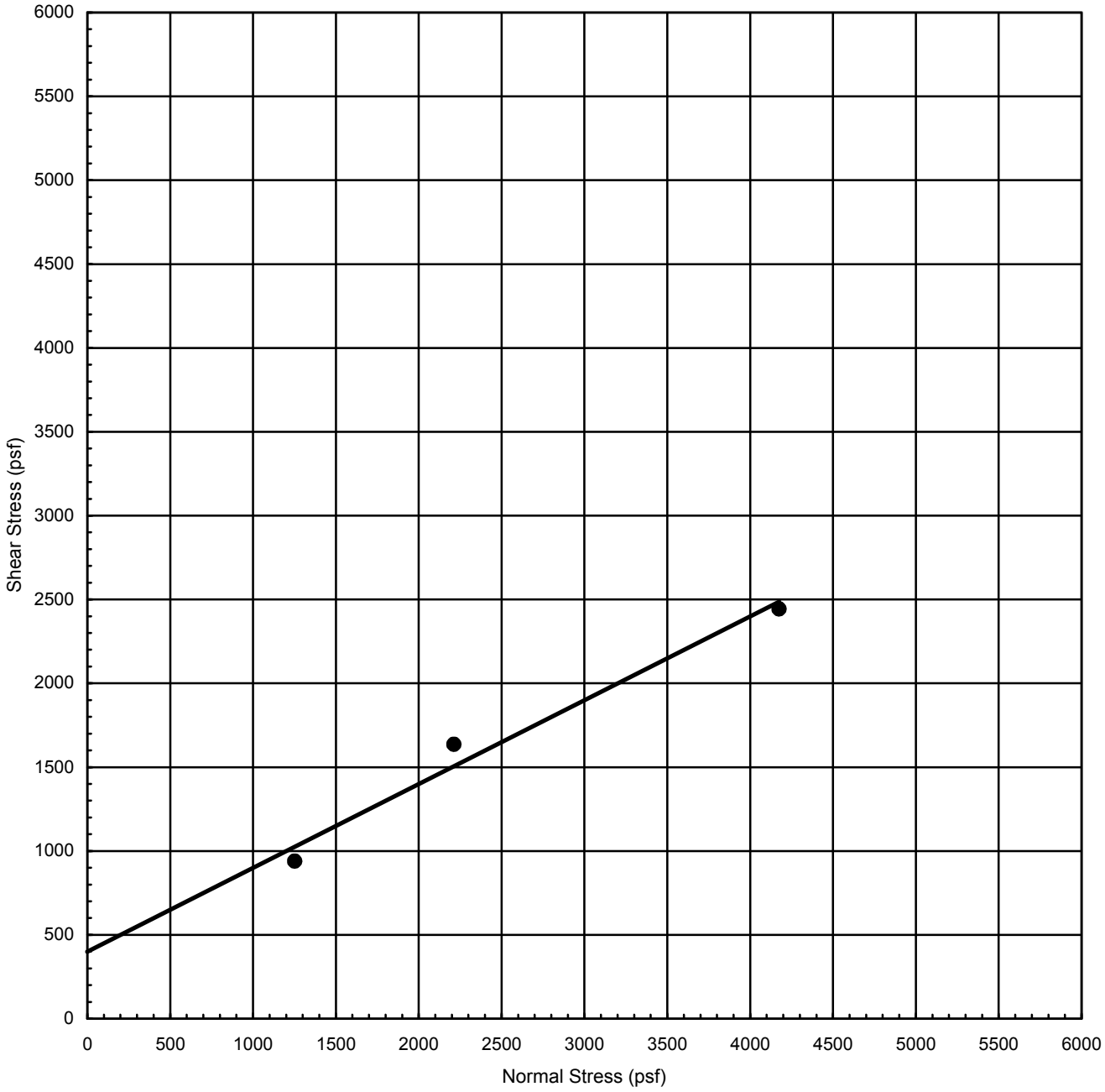
A = mL of $AgNO_3$ A= 7

B = 23 mL of the blank

N = 0.0493 N, normality of the titrant

Cl^- (mg/L) = A * 5 * 3

Tested By: YS Date: 9/10/2010 Checked By: TJO



Peak Values are : ● ,solid trend line Ultimate Values are: ❍ ,dashed trend line

Exploration No.:	R-10-009		Strength Intercept (C) :	399.4	psf	Peak	XXXXX	psf	Ultimate
Sample No.:	5			19.1	kPa		XXXXX	kPa	
Depth (ft | m)	25	7.6	Friction Angle (ϕ) :	27	degree		XXXXX	degree	

Description: **Very dark gray Clay with sand (CL)** Shear rate : 0.0050 (in/min) , 0.0127 (cm/min)

SYMBOL		% Water Content	Total Unit Weight (pcf)	Total Unit Weight (kN/m^3)	Dry Unit Weight (pcf)	Dry Unit Weight (kN/m^3)	Normal Stress (psf)	Normal Stress (kPa)	Peak Stress (psf)	Peak Stress (kPa)	Ultimate Stress (psf)	Ultimate Stress (kPa)
Initial / Set up		18.5	132.6	20.8	111.9	17.6	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
pre-shear	spec. 1	20.8	140.7	22.1	116.5	18.3	1252	60	938	45	XXXXX	XXXXX
	spec. 2	19.9	139.0	21.8	115.9	18.2	2214	106	1635	78	XXXXX	XXXXX
	spec. 3	21.1	141.3	22.2	116.7	18.3	4175	200	2443	117	XXXXX	XXXXX

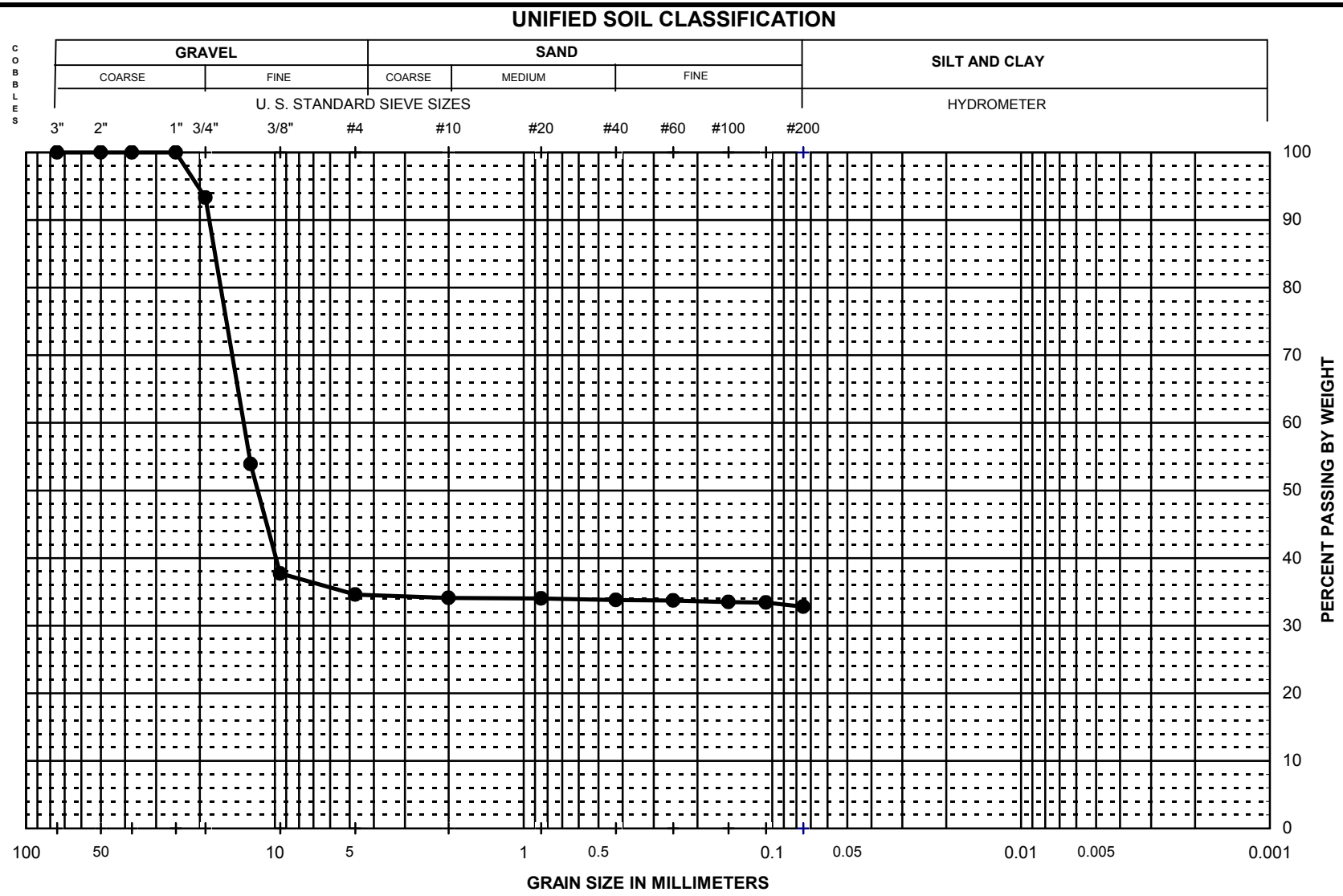
URS

I5 & SR 74 IC

Project Number: 30989830
Test Date: 9/9/2010

DIRECT SHEAR TEST
ASTM D 3080

@BCL@B4045090.xls



Sieve No.	Dia. mm	% Finer
3"	75.0	100.0
2"	50.0	100.0
1.5"	37.5	100.0
1"	25.0	100.0
3/4"	19.00	93.3
1/2"	12.50	53.9
3/8"	9.50	37.7
#4	4.75	34.6
#10	2.00	34.1
#20	0.850	34.0
#40	0.425	33.8
#60	0.250	33.7
#100	0.150	33.5
#140	0.106	33.4
#200	0.075	32.8
Hydrometer Analysis		

% Cobbles	XX
% Gravel	65.4
% Sand	1.8
% Fines	32.8
D_{85}	17.396
D_{60}	13.337
D_{50}	11.701
D_{30}	#N/A
D_{15}	#N/A
D_{10}	#N/A
C_u	XXX
C_c	XXX

Boring No.	Sample No.	Depth (ft)	SYMBOL	Wn (%)	LL	PI	% 2 μm	Description and Classification
R-10-008	s12	60.0	●	9.7	NA	NA	NA	**Olive gray clayey Gravel (GC)**

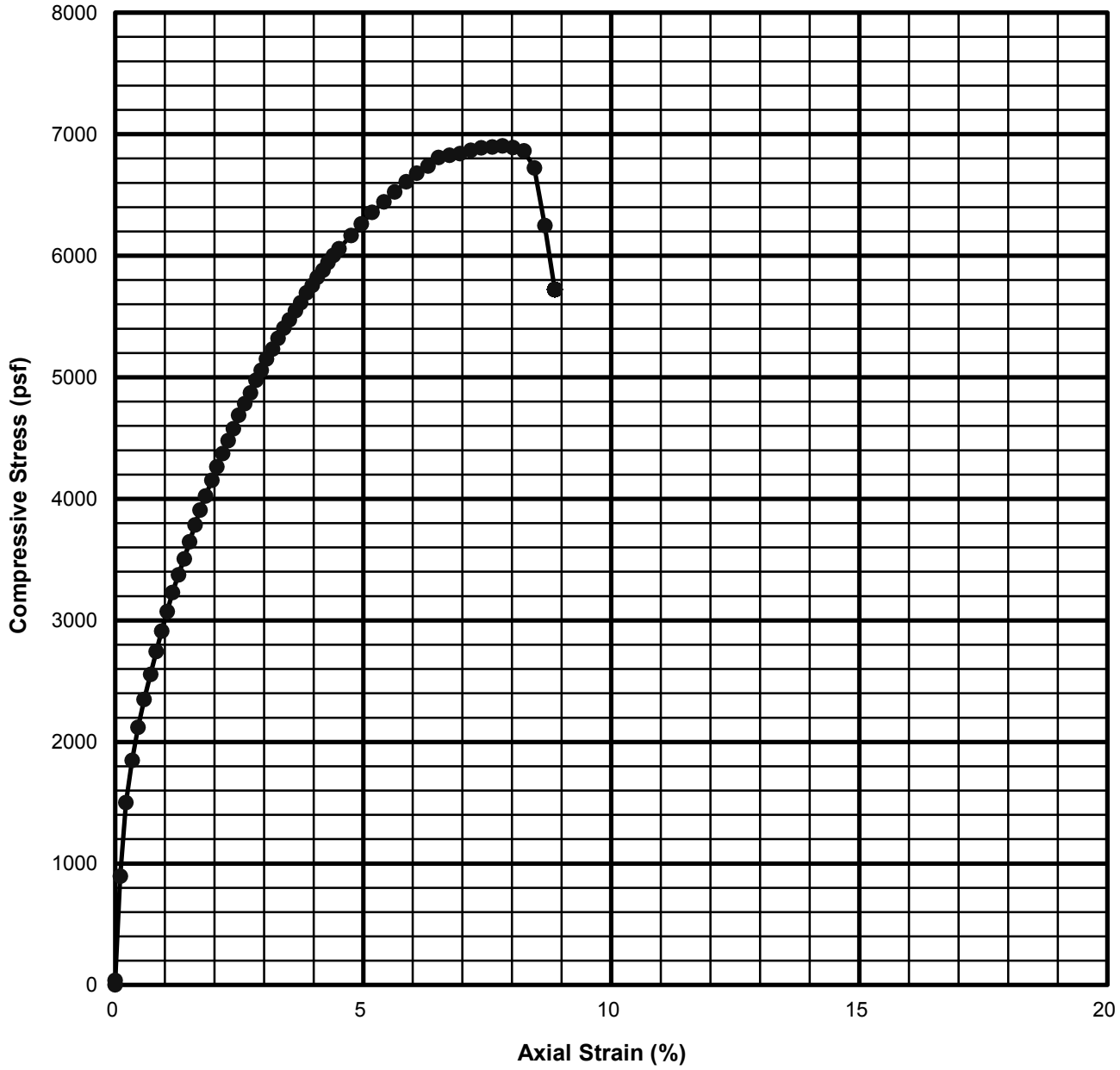
PROJECT NAME: **I-5 & SR-74 IC**

PROJECT NUMBER: **30989830**

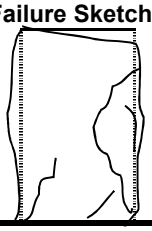
PARTICLE-SIZE DISTRIBUTION CURVES

@BCL@0C0CD282.xls

URS



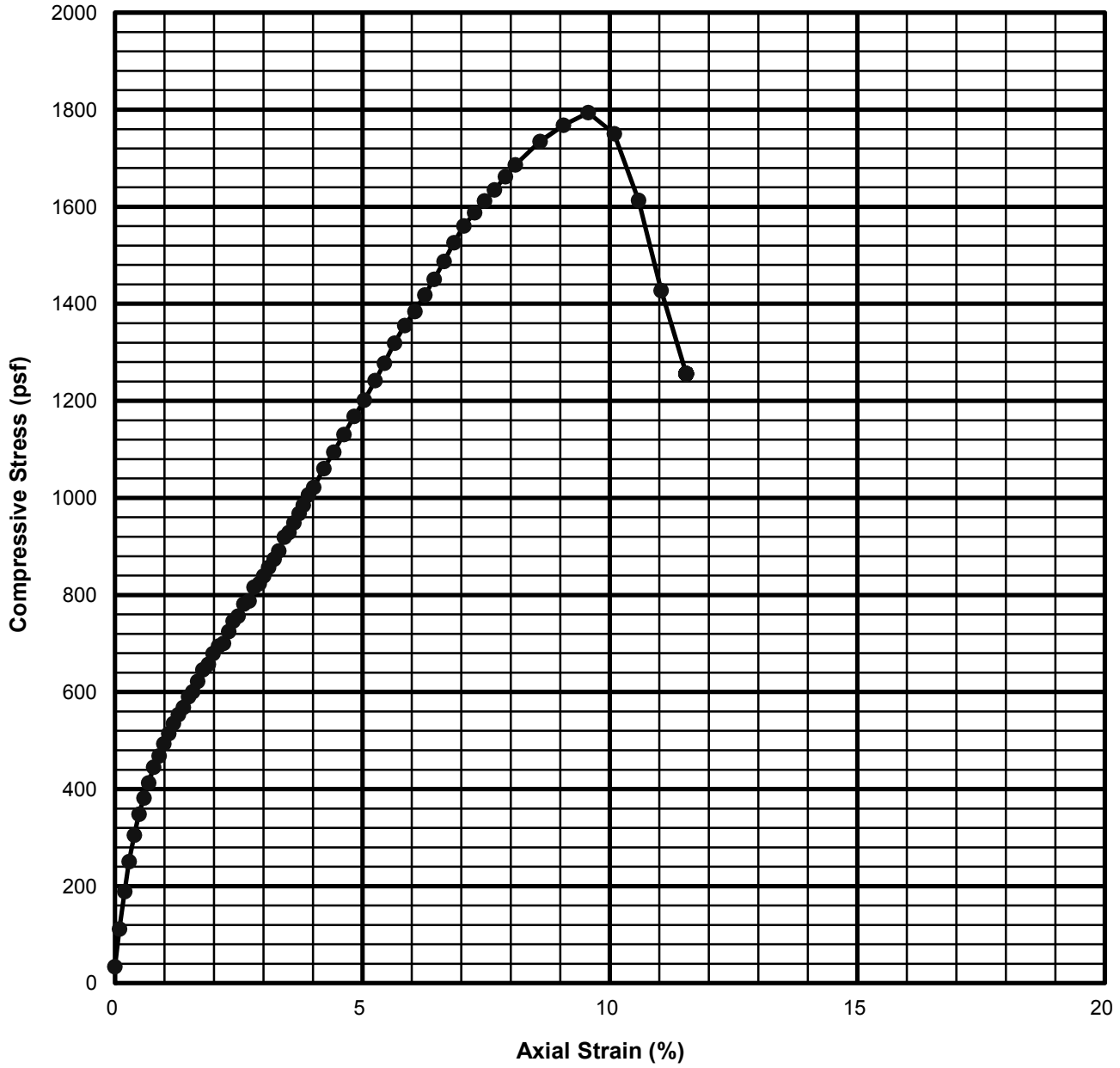
Failure Sketch



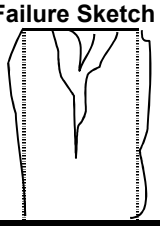
Water Content (%)	Length (in)	Diameter (in)	Wet Density (pcf)	Degree of Saturation (%)	Peak Stress (psf)
31.5	4.793	2.406	119.5	94.2	6904.6

Project Name:	**I-5 Widening Segment 3**				
Project Number:	**30989830**				
Boring Number:	**R-11-001**	**Sample No.:**	**2**	**Depth (ft):**	**6.5**
Description and/or Classification:	**Light olive brown Clay (CL)**				

UNCONFINED COMPRESSION TEST
ASTM D2166



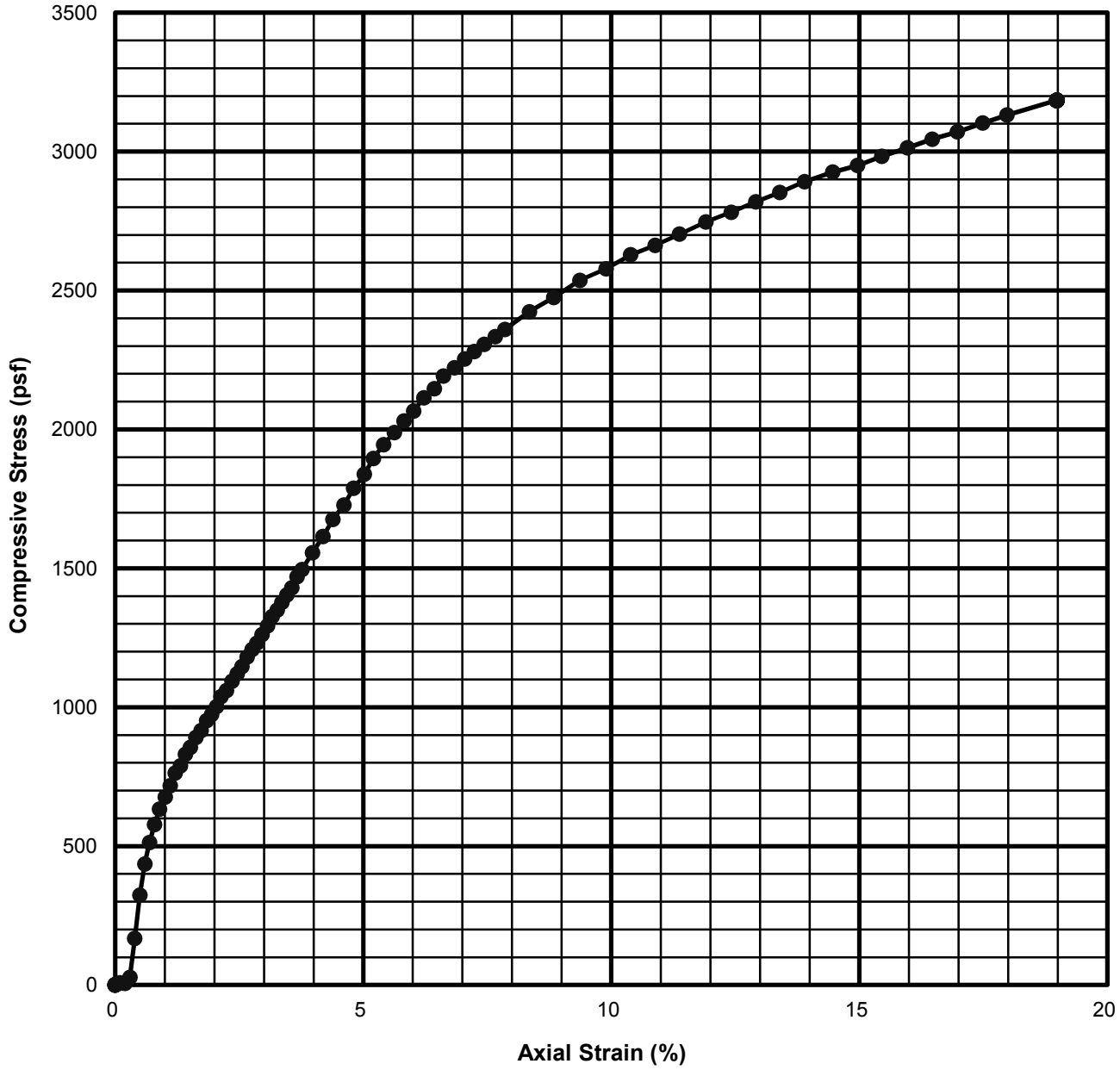
Failure Sketch



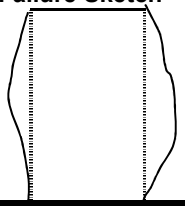
Water Content (%)	Length (in)	Diameter (in)	Wet Density (pcf)	Degree of Saturation (%)	Peak Stress (psf)
26.4	4.999	2.400	121.6	89.4	1794.0

Project Name:	**I-5 Widening Segment 3**				
Project Number:	**30989830**				
Boring Number:	**R-11-001**	**Sample No.:**	**7**	**Depth (ft):**	**25**
Description and/or Classification:	**Dark gray Clay (CL)**				

UNCONFINED COMPRESSION TEST
ASTM D2166



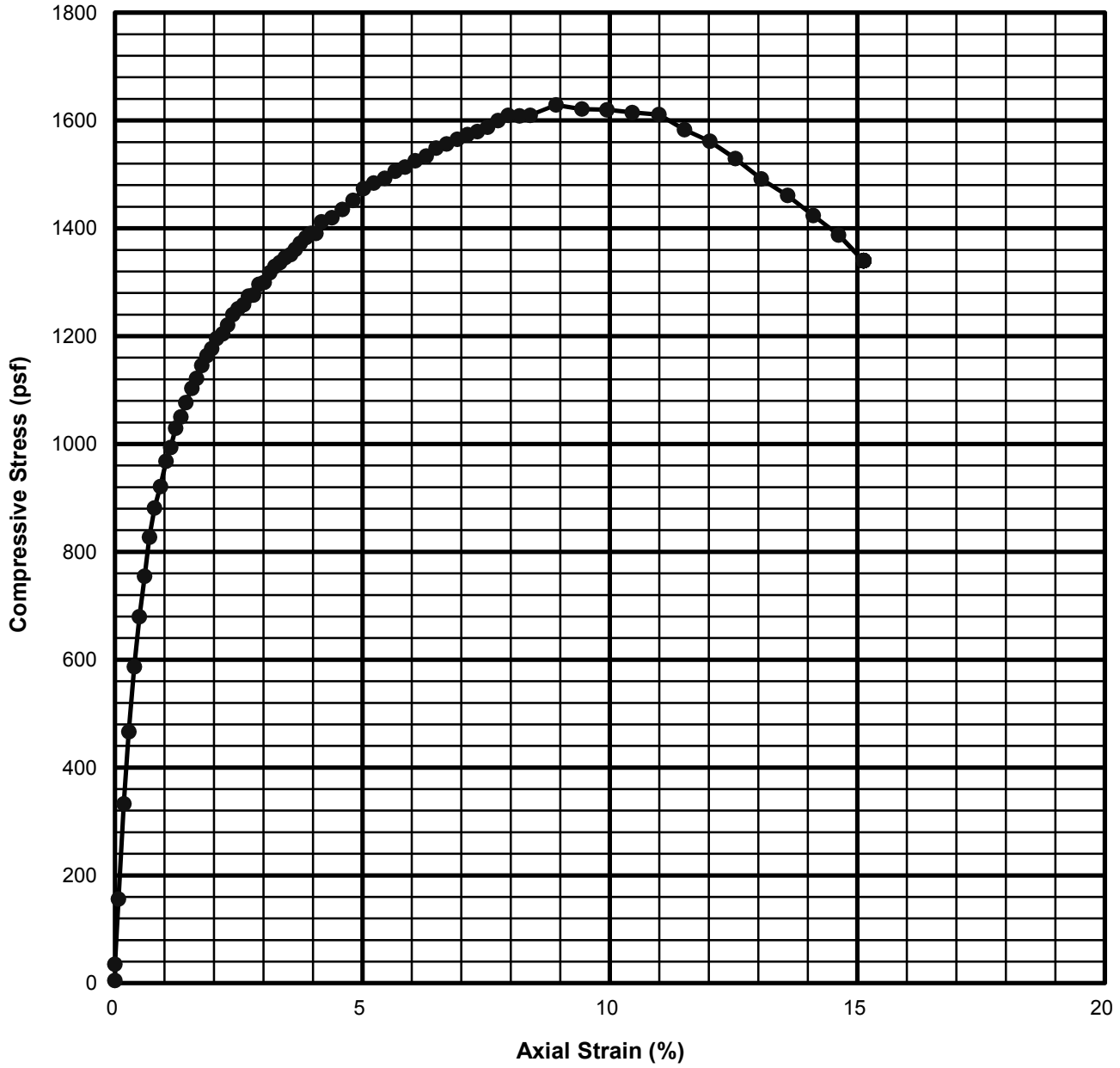
Failure Sketch



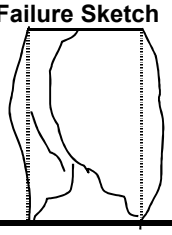
Water Content (%)	Length (in)	Diameter (in)	Wet Density (pcf)	Degree of Saturation (%)	Peak Stress @ 15% (psf)
29.3	4.988	2.407	121.4	94.0	2950.0

Project Name:	**I-5 Widening Segment 3**				
Project Number:	**30989830**				
Boring Number:	**R-11-001**	**Sample No.:**	**9**	**Depth (ft):**	**35**
Description and/or Classification:	**Olive gray Clay (CL)**				

UNCONFINED COMPRESSION TEST
ASTM D2166



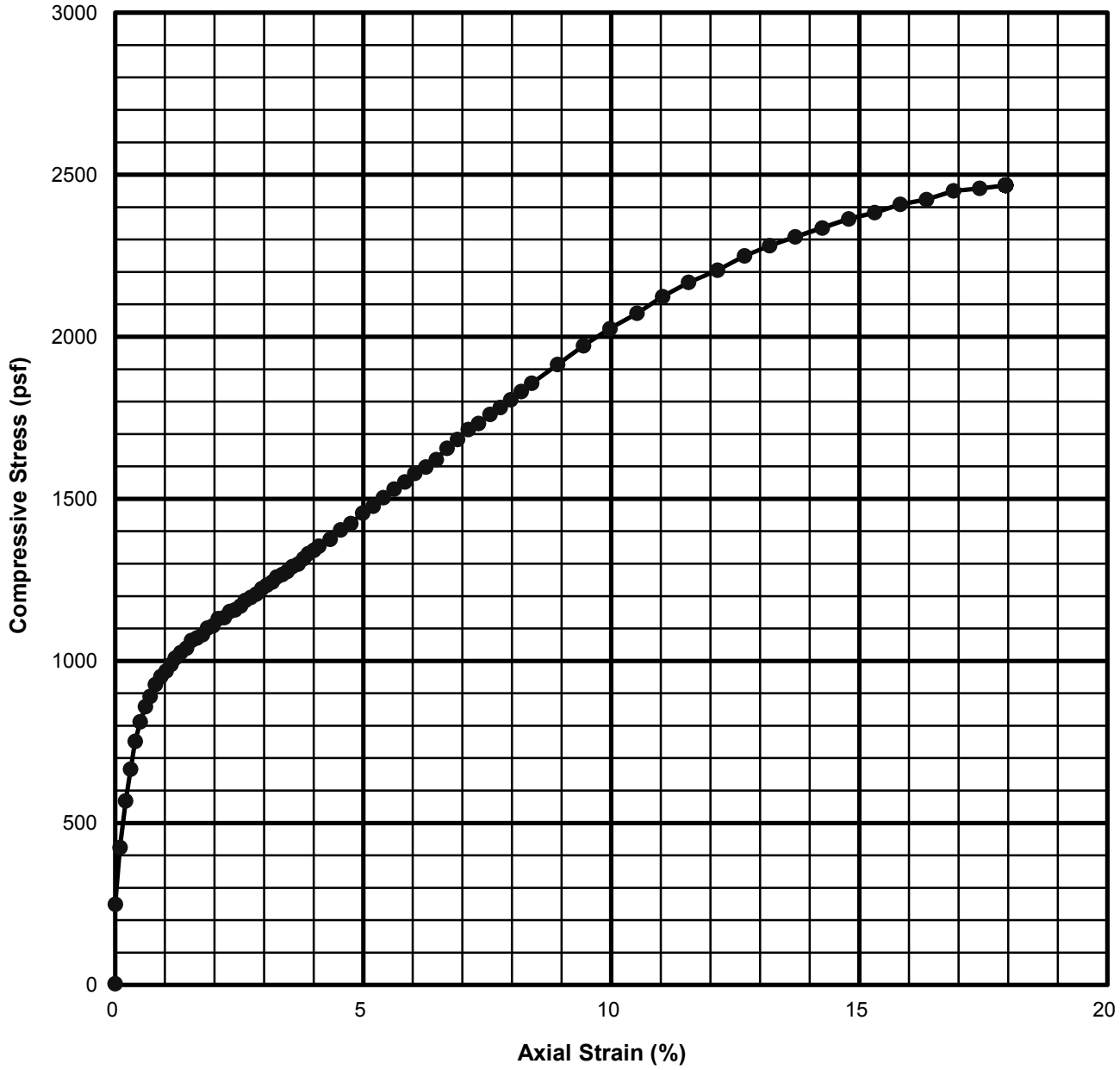
Failure Sketch



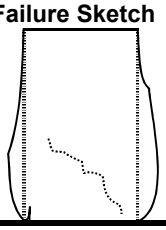
Water Content (%)	Length (in)	Diameter (in)	Wet Density (pcf)	Degree of Saturation (%)	Peak Stress (psf)
26.6	4.981	2.412	123.2	92.4	1628.7

Project Name:	**I-5 Widening Segment 3**				
Project Number:	**30989830**				
Boring Number:	**R-11-002**	**Sample No.:**	**4**	**Depth (ft):**	**11.5**
Description and/or Classification:	**Very dark grayish brown Clay (CL)**				

UNCONFINED COMPRESSION TEST
ASTM D2166



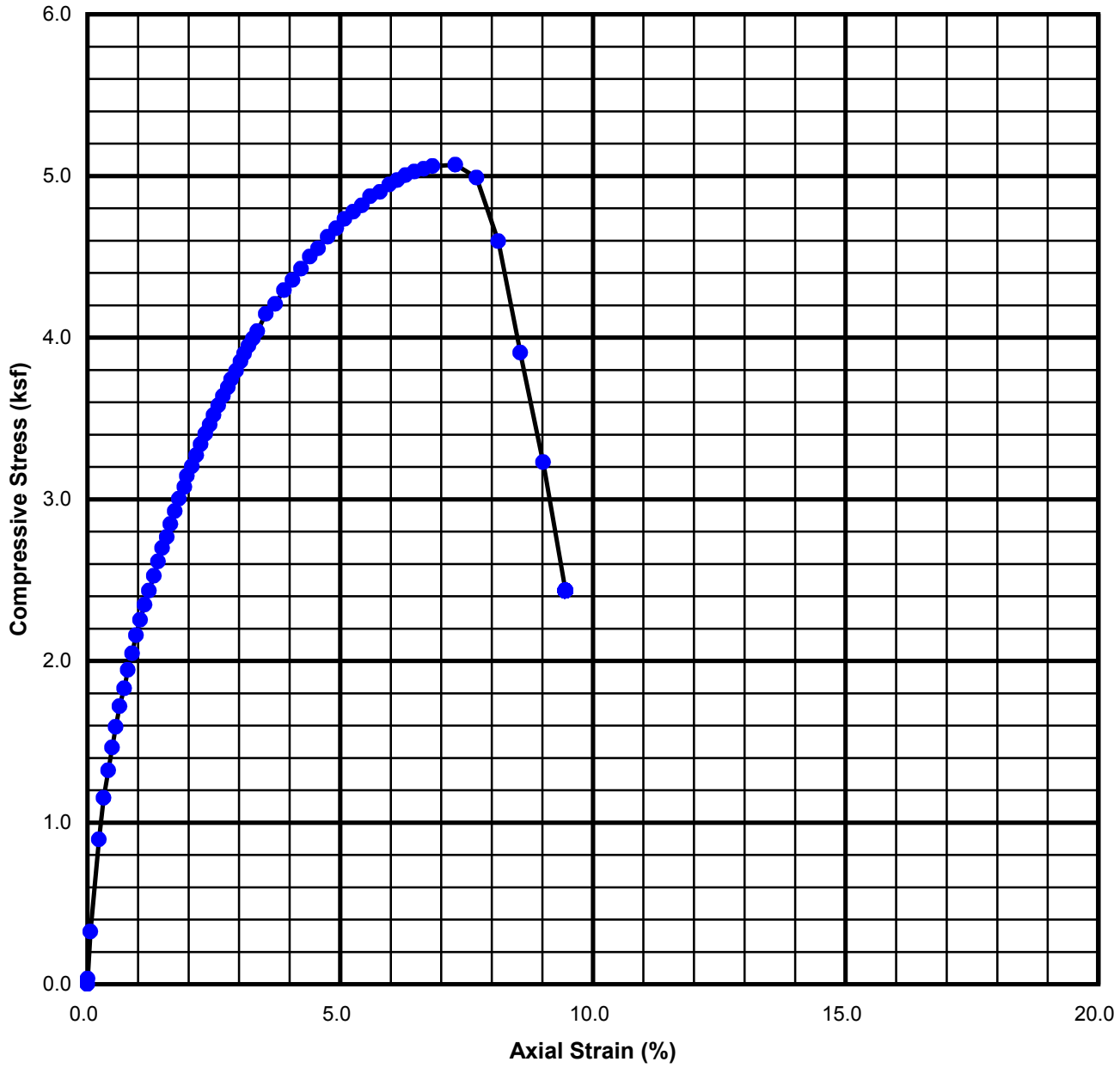
Failure Sketch



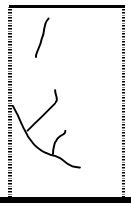
Water Content (%)	Length (in)	Diameter (in)	Wet Density (pcf)	Degree of Saturation (%)	Peak Stress (psf)
32.3	4.989	2.405	119.3	95.1	2467.3

Project Name:	**I-5 Widening Segment 3**				
Project Number:	**30989830**				
Boring Number:	**R-11-002**	**Sample No.:**	**8**	**Depth (ft):**	**25**
Description and/or Classification:	**Olive brown Clay (CH)**				

UNCONFINED COMPRESSION TEST
ASTM D2166

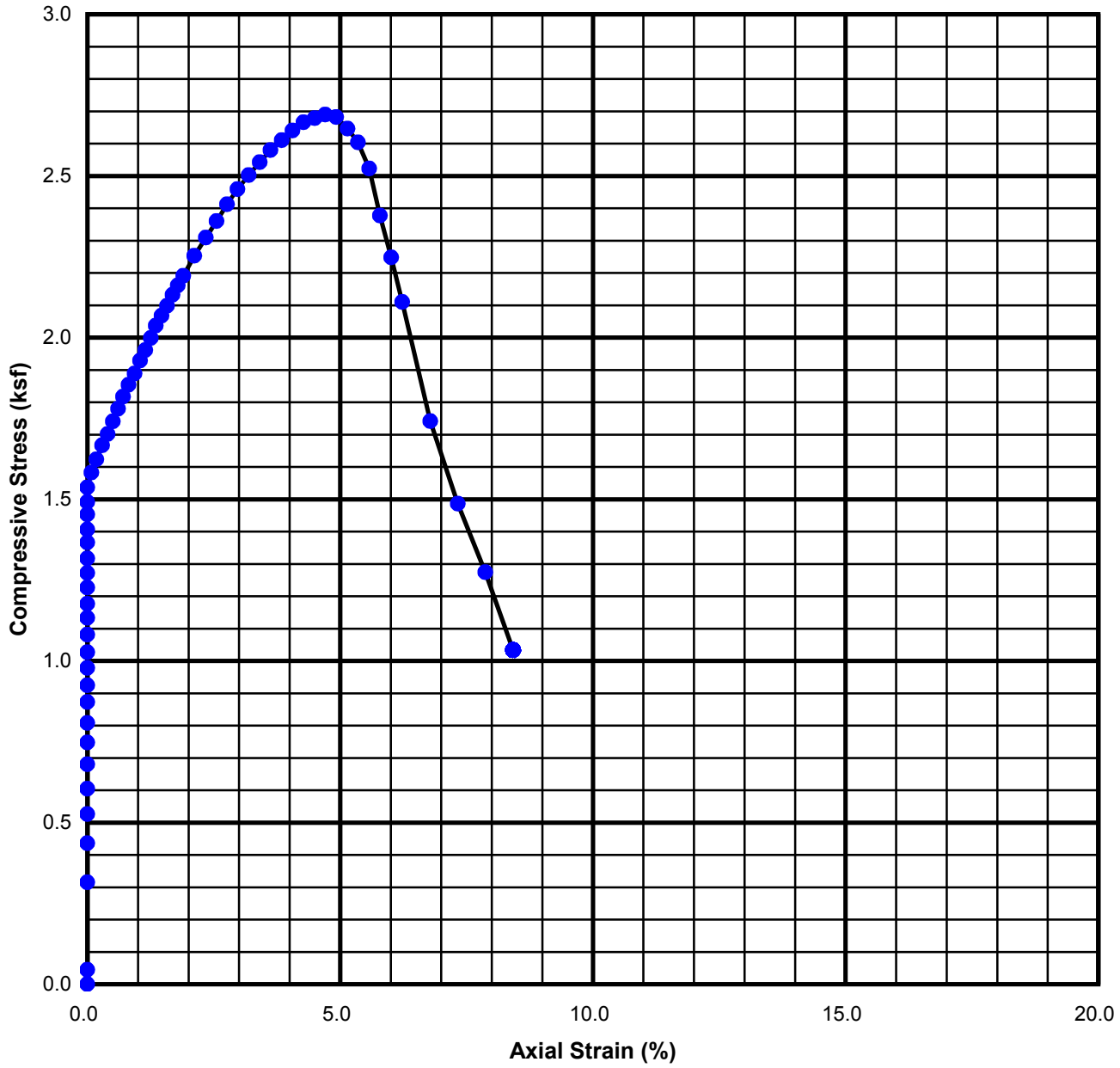


Failure Sketch



Water Content (%)	LL (%)	PI (%)	Length (in)	Diameter (in)	Wet Density (pcf)	Degree of Saturation (%)	Peak Stress (ksf)
19.6			3.476	1.898	124.3	83.0	5.07

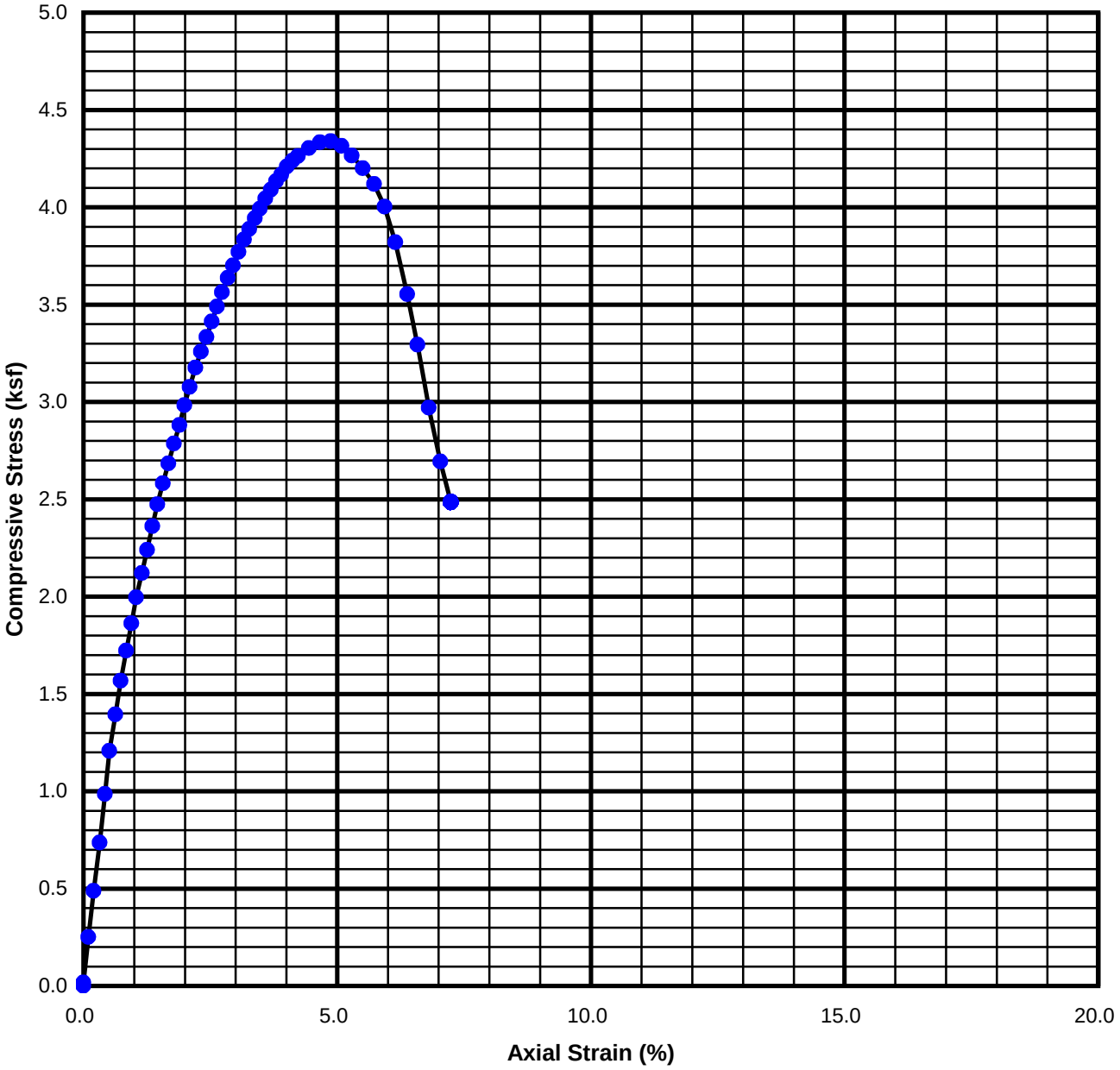
Project Name:	**I5 & SR 74 IC**				**UNCONFINED COMPRESSION TEST**
Project Number:	**30989830**				
Exploration No:	**R-10-007**	**Sample No.:**	**s2**	**Depth (ft):** **10**	**ASTM D 2166**
Description and/or Classification:	**Dark olive gray Clay with sand (CL)**				**Figure :**



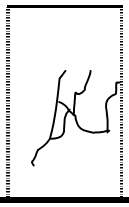
Failure Sketch

Water Content (%)	LL (%)	PI (%)	Length (in)	Diameter (in)	Wet Density (pcf)	Degree of Saturation (%)	Peak Stress (ksf)
29.2	57	40	5.552	2.405	120.7	96.1	2.69

Project Name:	**I5 & SR 74 IC**				**UNCONFINED COMPRESSION TEST**
Project Number:	**30989830**				
Exploration No:	**R-10-008**	**Sample No.:**	**S3**	**Depth (ft):**	**15**
					ASTM D 2166
Description and/or Classification:	**Olive Clay (CH)**				**Figure :**

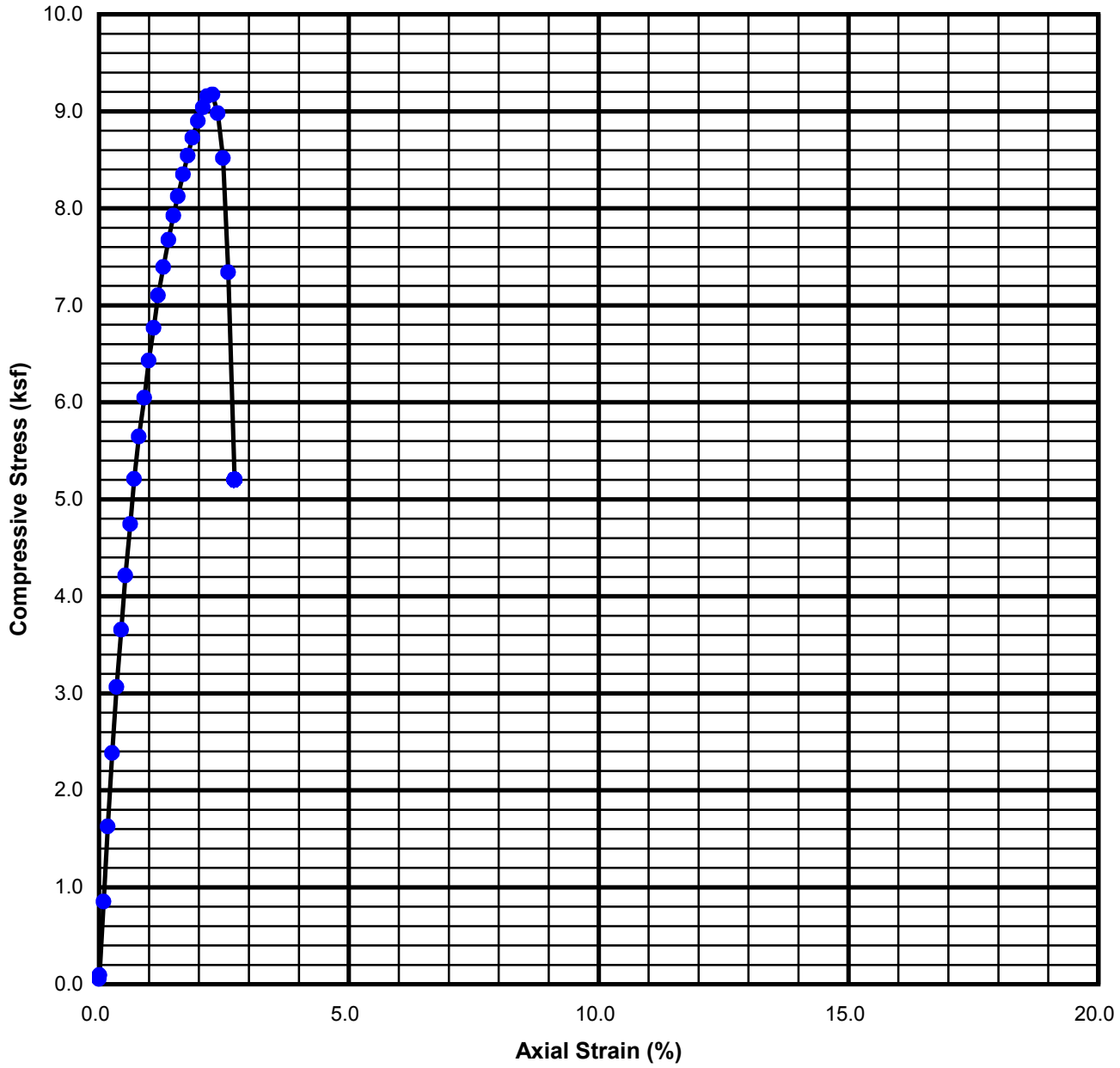


Failure Sketch

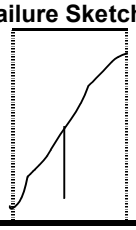


Water Content (%)	LL (%)	PI (%)	Length (in)	Diameter (in)	Wet Density (pcf)	Degree of Saturation (%)	Peak Stress (ksf)
32.1			5.634	2.404	118.4	96.8	4.34

Project Name:	**I5 & SR 74 IC**				**UNCONFINED COMPRESSION TEST**
Project Number:	**30989830**				
Exploration No:	**R-10-008**	**Sample No.:**	**S5**	**Depth (ft):**	**25**
					ASTM D 2166
Description and/or Classification:	**Olive Clay (CL)**				**Figure :**

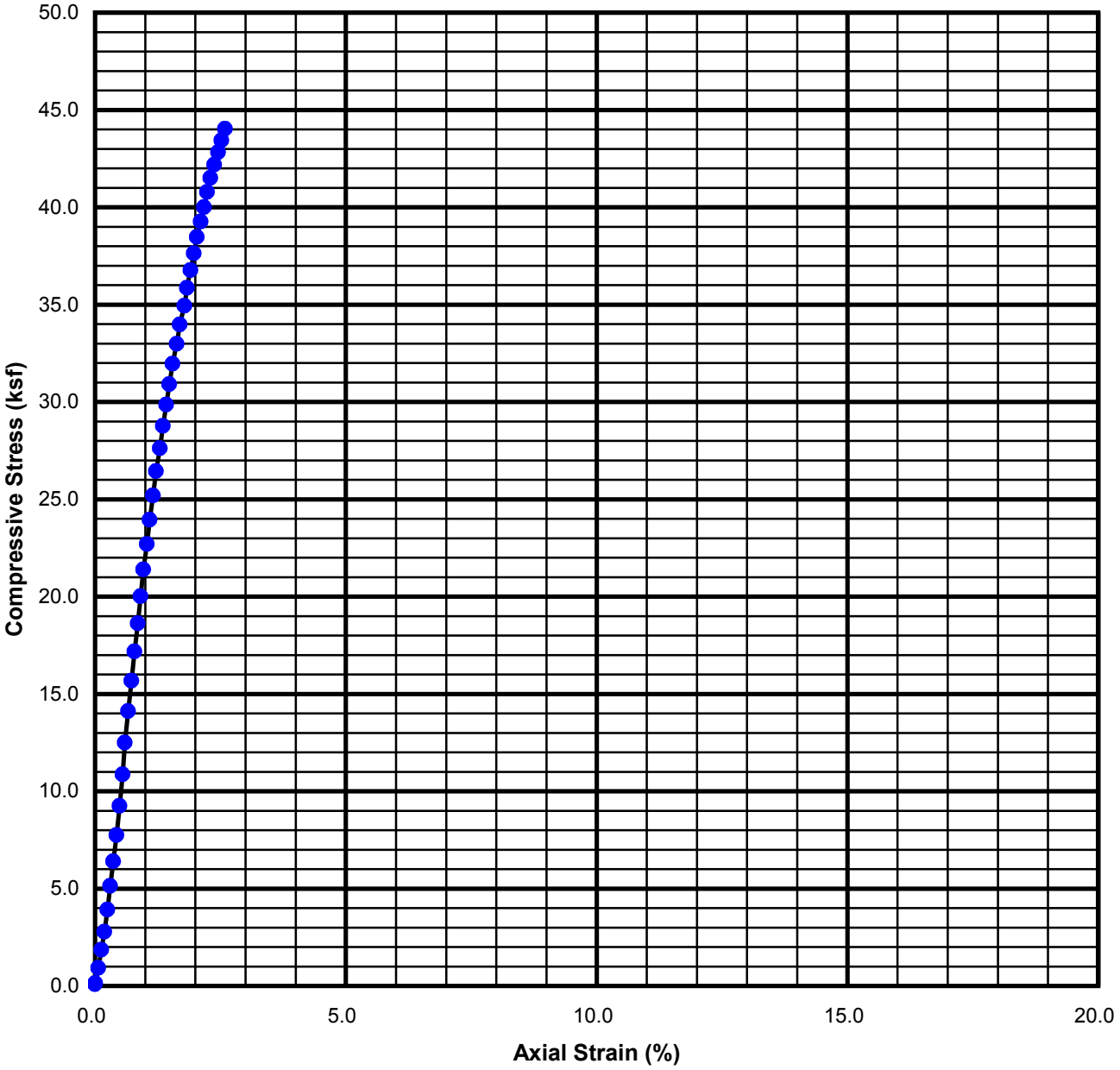


Failure Sketch

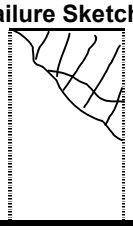


Water Content (%)	LL (%)	PI (%)	Length (in)	Diameter (in)	Wet Density (pcf)	Degree of Saturation (%)	Peak Stress (ksf)
28.8			6.020	2.324	120.9	95.9	9.17

Project Name:	**I5 & SR 74 IC**				**UNCONFINED COMPRESSION TEST**
Project Number:	**30989830**				
Exploration No:	**R-10-008**	**Sample No.:**	**core**	**Depth (ft):**	**62**
Description and/or Classification:	**Olive Clay (CH)**				**ASTM D 2166**
					Figure :

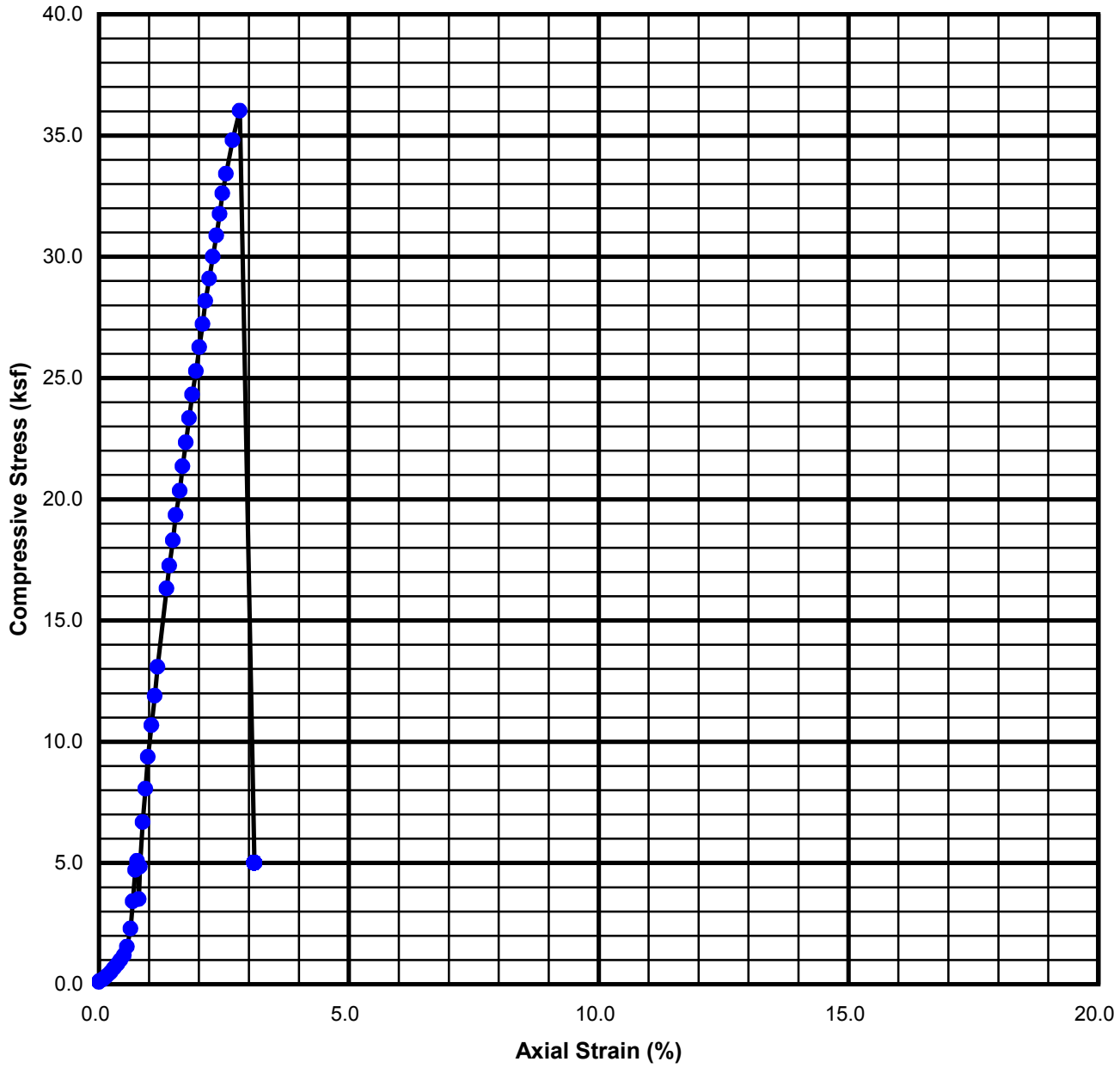


Failure Sketch



Water Content (%)	LL (%)	PI (%)	Length (in)	Diameter (in)	Wet Density (pcf)	Degree of Saturation (%)	Peak Stress (ksf)
23.2			4.187	1.758	121.4	88.5	44.03

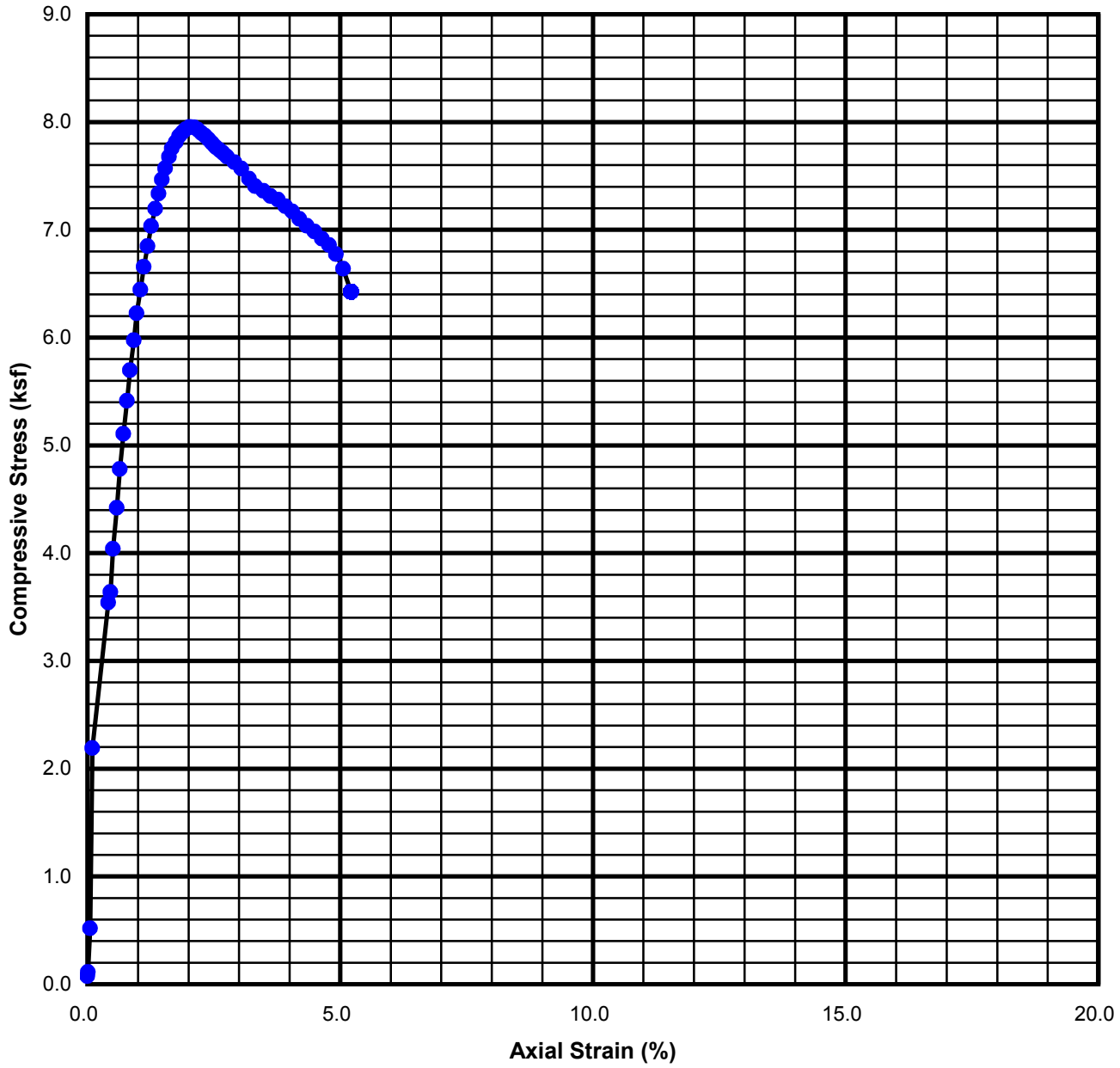
Project Name:	**I5 & SR 74 IC**				**UNCONFINED COMPRESSION TEST**
Project Number:	**30989830**				
Exploration No:	**R-10-008**	**Sample No.:**	**core**	**Depth (ft):**	**75**
Description and/or Classification:	**Very dark gray Clay (CH)**				**ASTM D 2166**
					Figure :



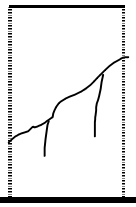
Failure Sketch

Water Content (%)	LL (%)	PI (%)	Length (in)	Diameter (in)	Wet Density (pcf)	Degree of Saturation (%)	Peak Stress (ksf)
23.0			4.238	1.723	123.3	91.4	36.02

Project Name:	**I-5 & SR-74 IC**				**UNCONFINED COMPRESSION TEST**
Project Number:	**30989830**				
Exploration No:	**R-10-008**	**Sample No.:**	**core**	**Depth (ft):** **81**	**ASTM D 2166**
Description and/or Classification:	**Very dark gray Clay (CH)**				**Figure :**

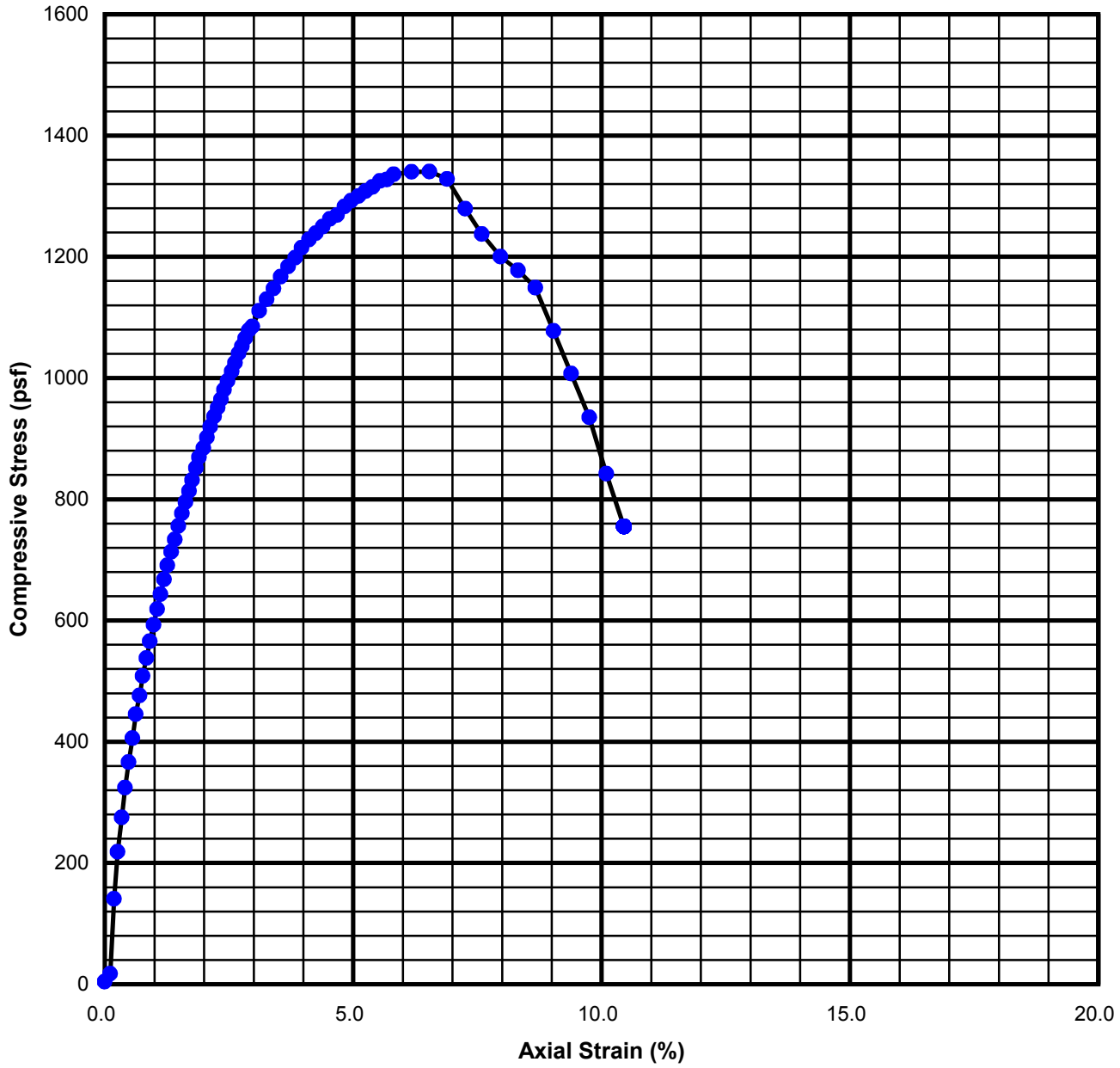


Failure Sketch

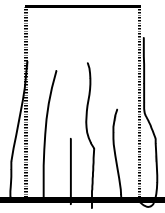


Water Content (%)	LL (%)	PI (%)	Length (in)	Diameter (in)	Wet Density (pcf)	Degree of Saturation (%)	Peak Stress (ksf)
28.8			4.213	1.780	119.3	93.1	7.95

Project Name:	**I5 & SR 74 IC**				**UNCONFINED COMPRESSION TEST**
Project Number:	**30989830**				
Exploration No:	**R-10-008**	**Sample No.:**	**core**	**Depth (ft):** **93**	**ASTM D 2166**
Description and/or Classification:	**Dark olive gray Clay (CH)**				**Figure :**

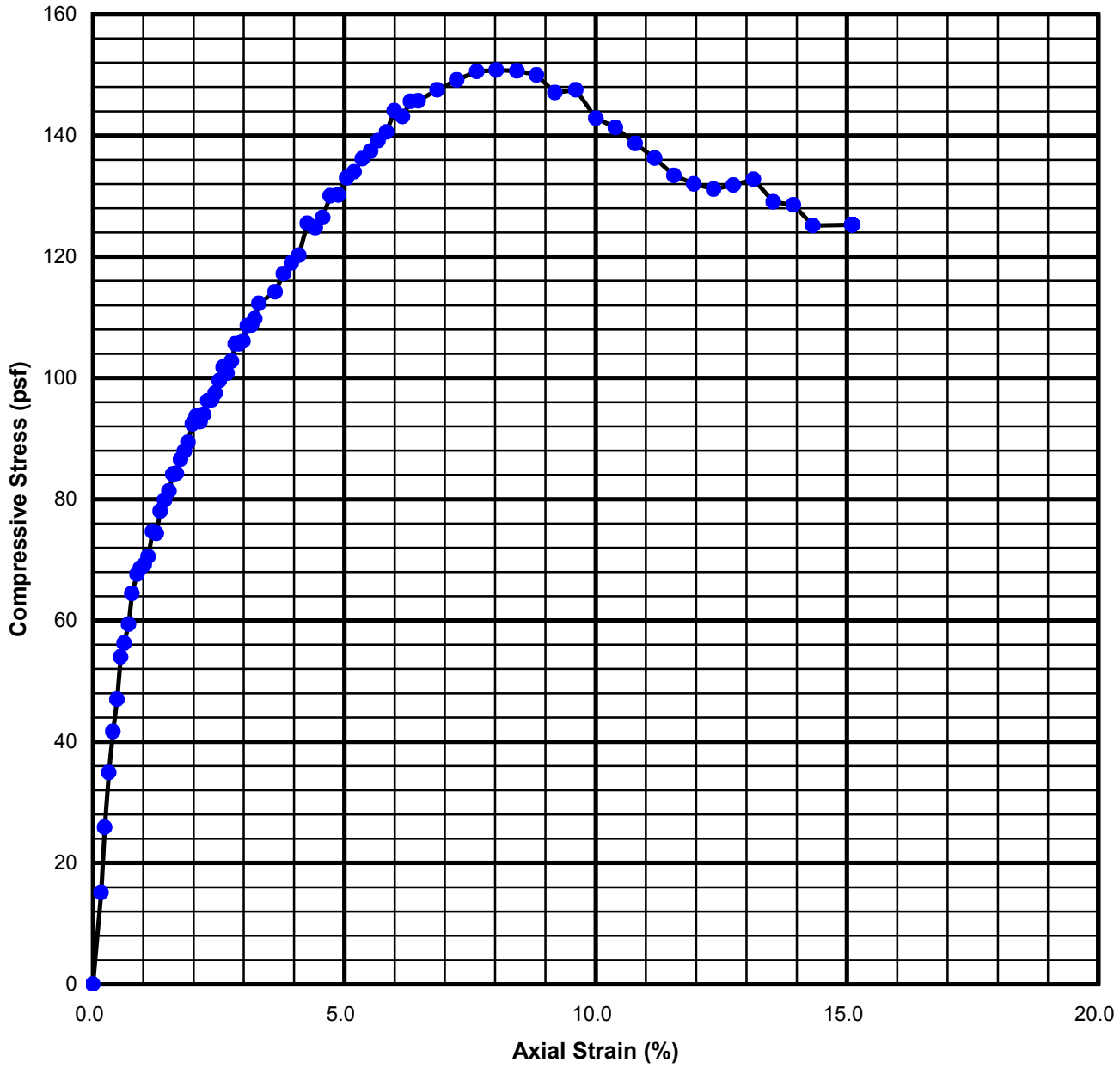


Failure Sketch

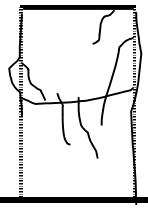


Water Content (%)	LL (%)	PI (%)	Length (in)	Diameter (in)	Wet Density (pcf)	Degree of Saturation (%)	Peak Stress (psf)
22.8	39	24	5.442	2.402	124.4	90.8	1340

Project Name:	**I5 & SR 74 IC**				**UNCONFINED COMPRESSION TEST**
Project Number:	**30989830**				
Exploration No:	**R-10-009**	**Sample No.:**	**3**	**Depth (ft):** **15**	**ASTM D 2166**
Description and/or Classification:	**Dark olive gray Clay (CL)**				**Figure :**

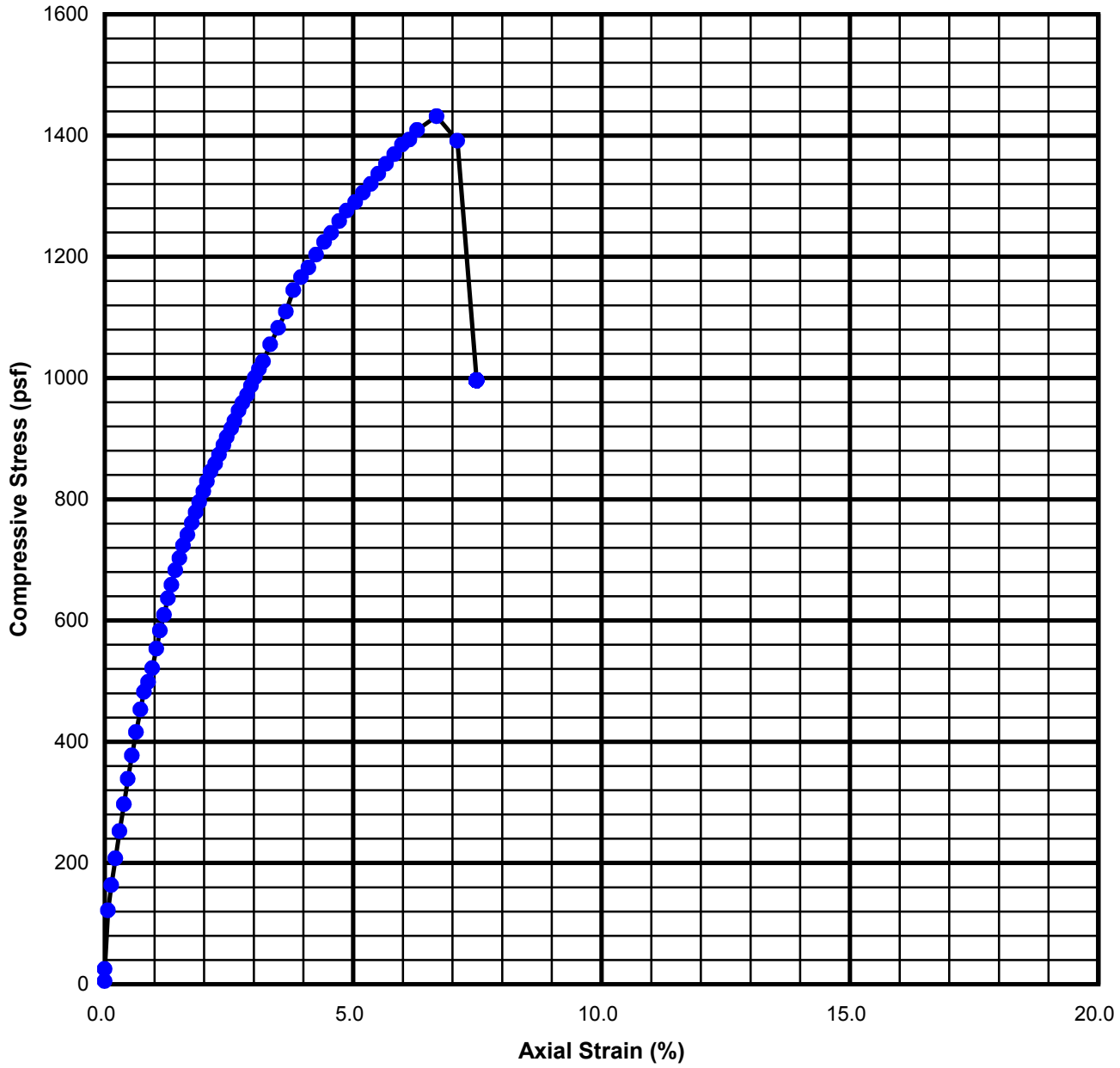


Failure Sketch

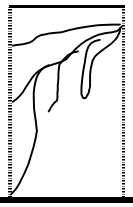


Water Content (%)	LL (%)	PI (%)	Length (in)	Diameter (in)	Wet Density (pcf)	Degree of Saturation (%)	Peak Stress (psf)
20.7			4.735	2.402	133.1	102.8	151

Project Name:	**I5 & SR 74 IC**				**UNCONFINED COMPRESSION TEST**
Project Number:	**30989830**				
Exploration No:	**R-10-009**	**Sample No.:**	**7**	**Depth (ft):** **35**	**ASTM D 2166**
Description and/or Classification:	**Dark yellowish brown clayey Sand with gravel (SC)**				**Figure :**

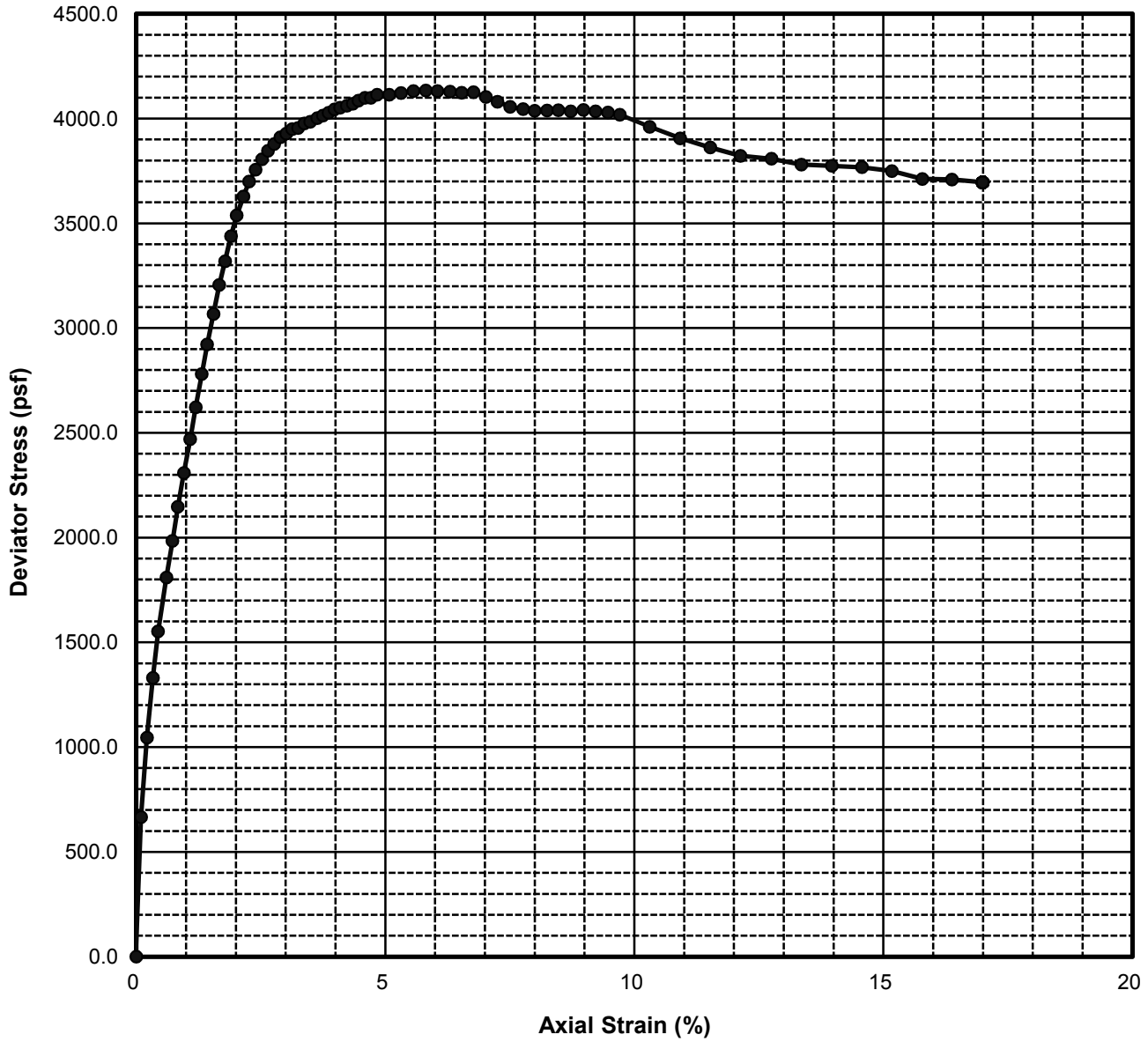


Failure Sketch



Water Content (%)	LL (%)	PI (%)	Length (in)	Diameter (in)	Wet Density (pcf)	Degree of Saturation (%)	Peak Stress (psf)
25.7			4.640	2.406	122.9	93.8	1432

Project Name:	**I5 & SR74 IC**				**UNCONFINED COMPRESSION TEST**
Project Number:	**30989830**				
Exploration No:	**R-10-009**	**Sample No.:**	**10**	**Depth (ft):** **50**	**ASTM D 2166**
Description and/or Classification:	**Dark olive gray Clay with gravel (CH)**				**Figure :**



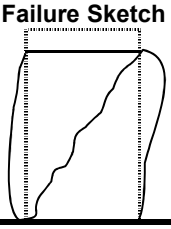
Cell Pressure (psf) = 936.00

Strain Rate (%/min) = 1.20

Axial Strain during confinment (%): 0.12

Peak Deviator Stress (psf): 4134.4

Failure Sketch

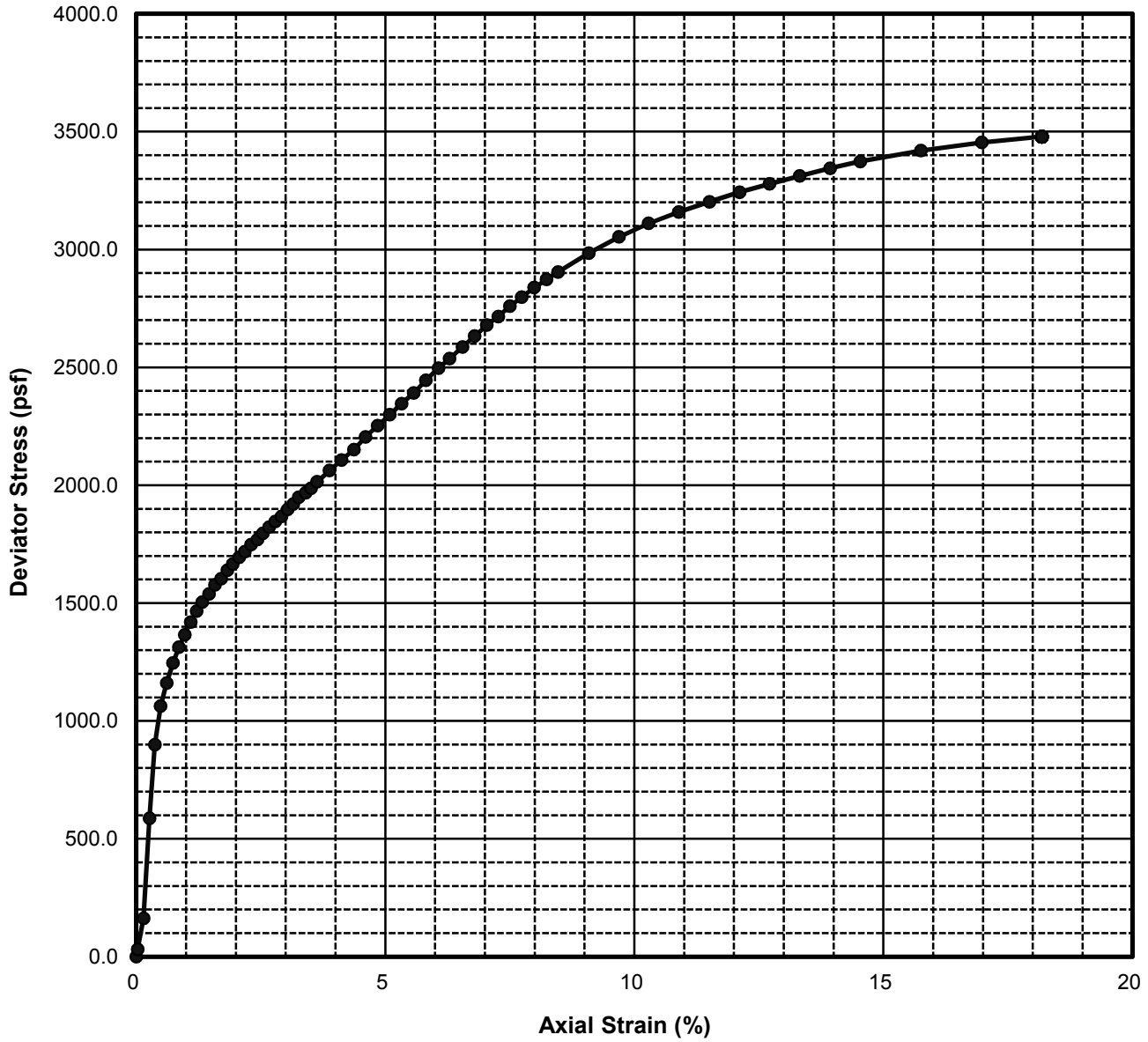


Water Content (%)	Length (in)	Diameter (in)	Wet Unit Weight (pcf)	Degree of Saturation (%)
23.5	4.995	2.398	124.2	91.8

assumed Specific Gravity, Gs = 2.75

Project Name:	**I-5 Widening, Segment 3**				
Project Number:	**30989830**				
Boring Number:	**R-11-022**	**Sample No.:**	**2**	**Depth (ft):**	**6.5**
Description and/or Classification:	**Dark gray Clay (CL)**				

UNCONSOLIDATED - UNDRAINED TRIAXIAL COMPRESSION TEST ASTM D2850



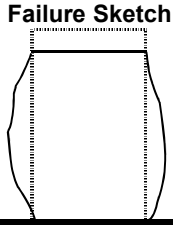
Cell Pressure (psf) = 1382.40

Strain Rate (%/min) = 1.20

Axial Strain during confinment (%): 0.34

Peak Deviator Stress (psf): 3478.6

Failure Sketch

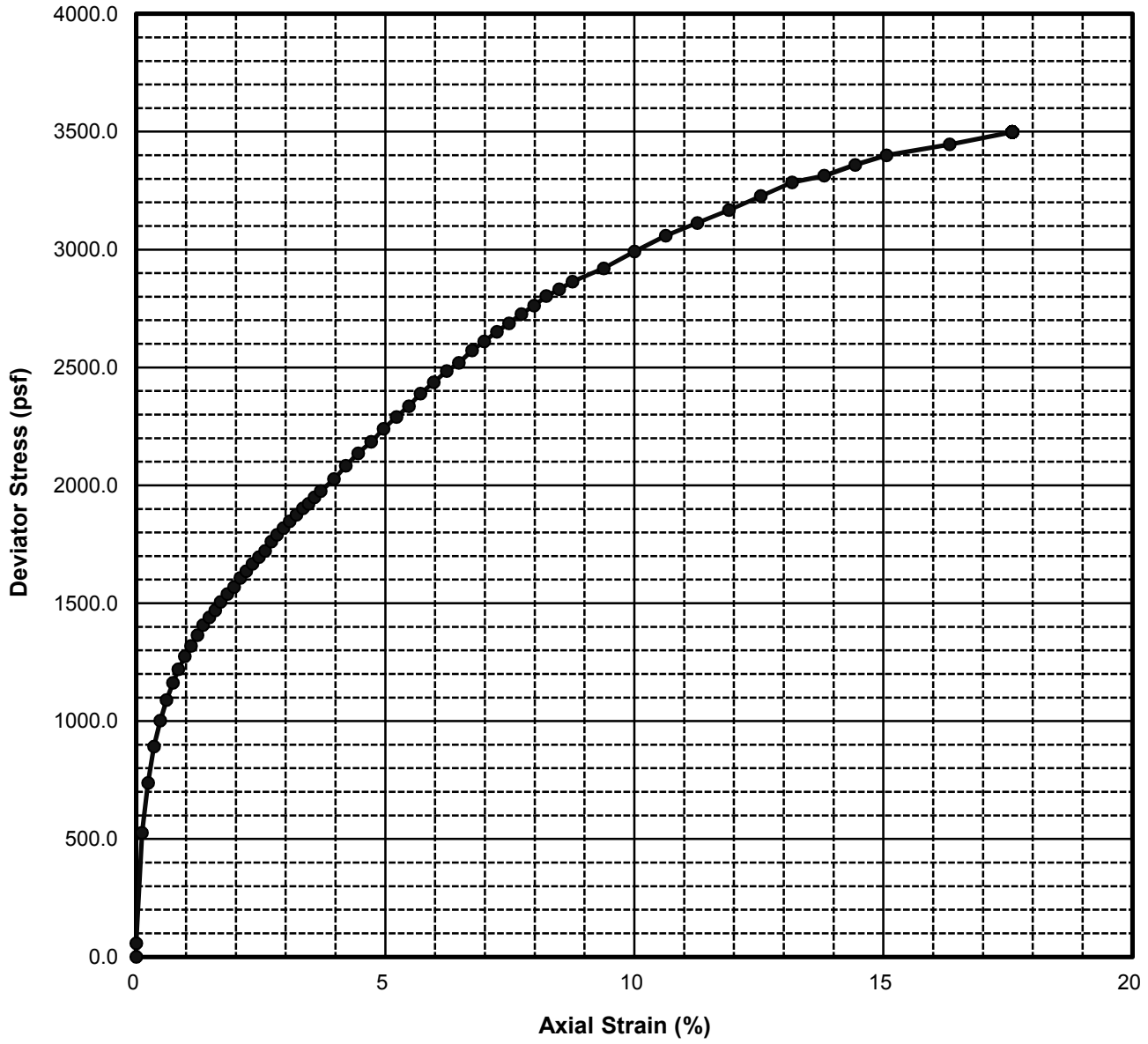


Water Content (%)	Length (in)	Diameter (in)	Wet Unit Weight (pcf)	Degree of Saturation (%)
29.4	4.991	2.401	119.6	94.6

assumed Specific Gravity, Gs = 2.75

Project Name:	**I-5 Widening, Segment 3**				
Project Number:	**30989830**				
Boring Number:	**R-11-022**	**Sample No.:**	**4**	**Depth (ft):**	**11.5**
Description and/or Classification:	**Dark olive gray Clay (CH)**				

UNCONSOLIDATED - UNDRAINED TRIAXIAL COMPRESSION TEST ASTM D2850



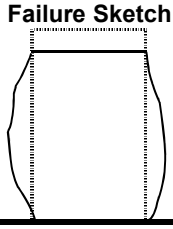
Cell Pressure (psf) = 2491.20

Strain Rate (%/min) = 1.25

Axial Strain during confinment (%): 0.23

Peak Deviator Stress (psf): 3498.7

Failure Sketch

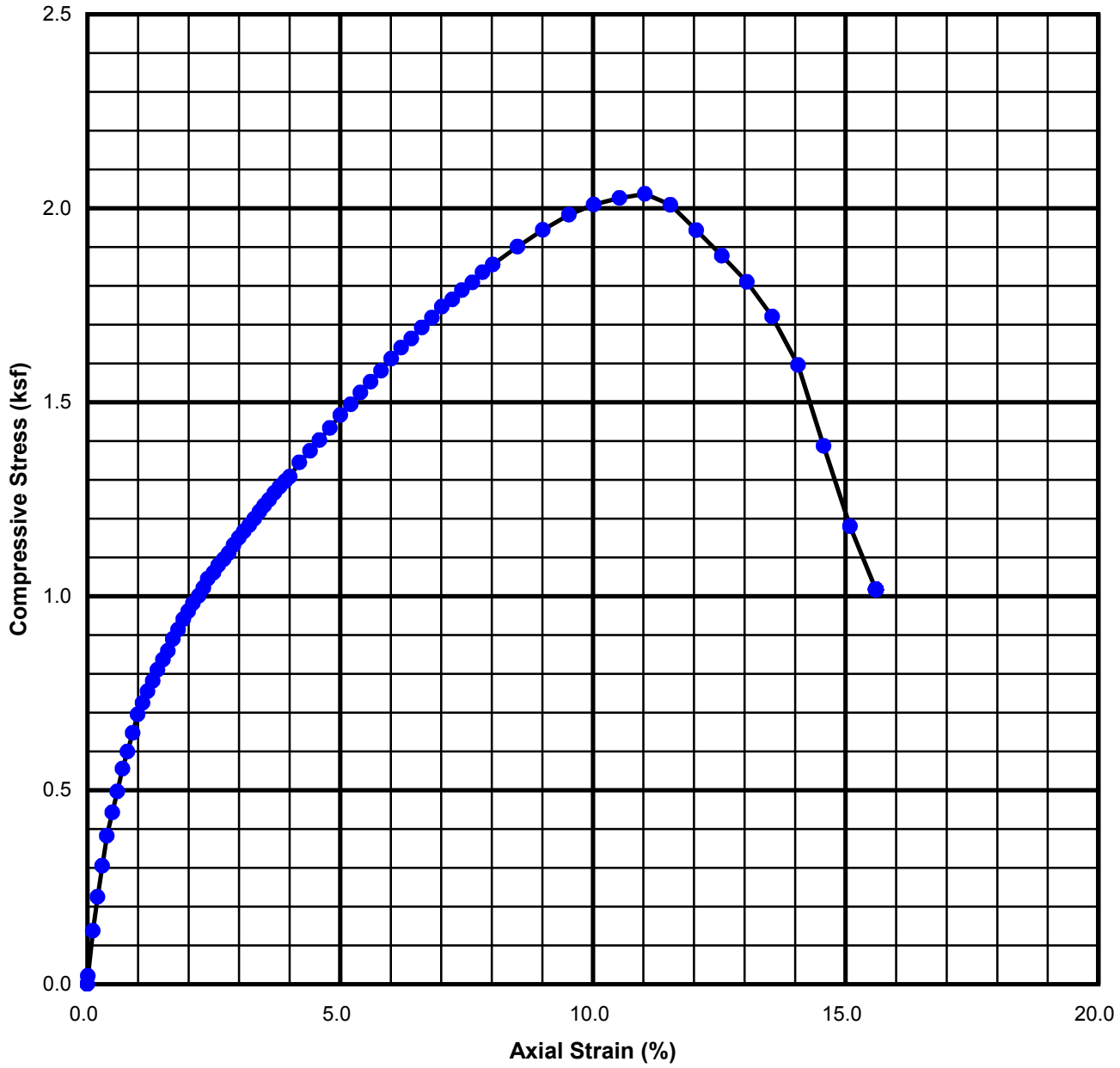


Water Content (%)	Length (in)	Diameter (in)	Wet Unit Weight (pcf)	Degree of Saturation (%)
25.7	4.794	2.402	124.4	96.6

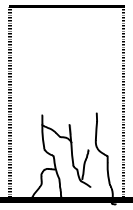
assumed Specific Gravity, Gs = 2.75

Project Name:	**I-5 Widening, Segment 3**				
Project Number:	**30989830**				
Boring Number:	**R-11-022**	**Sample No.:**	**6**	**Depth (ft):**	**20.0**
Description and/or Classification:	**Dark olive brown Clay (CH)**				

UNCONSOLIDATED - UNDRAINED TRIAXIAL COMPRESSION TEST ASTM D2850

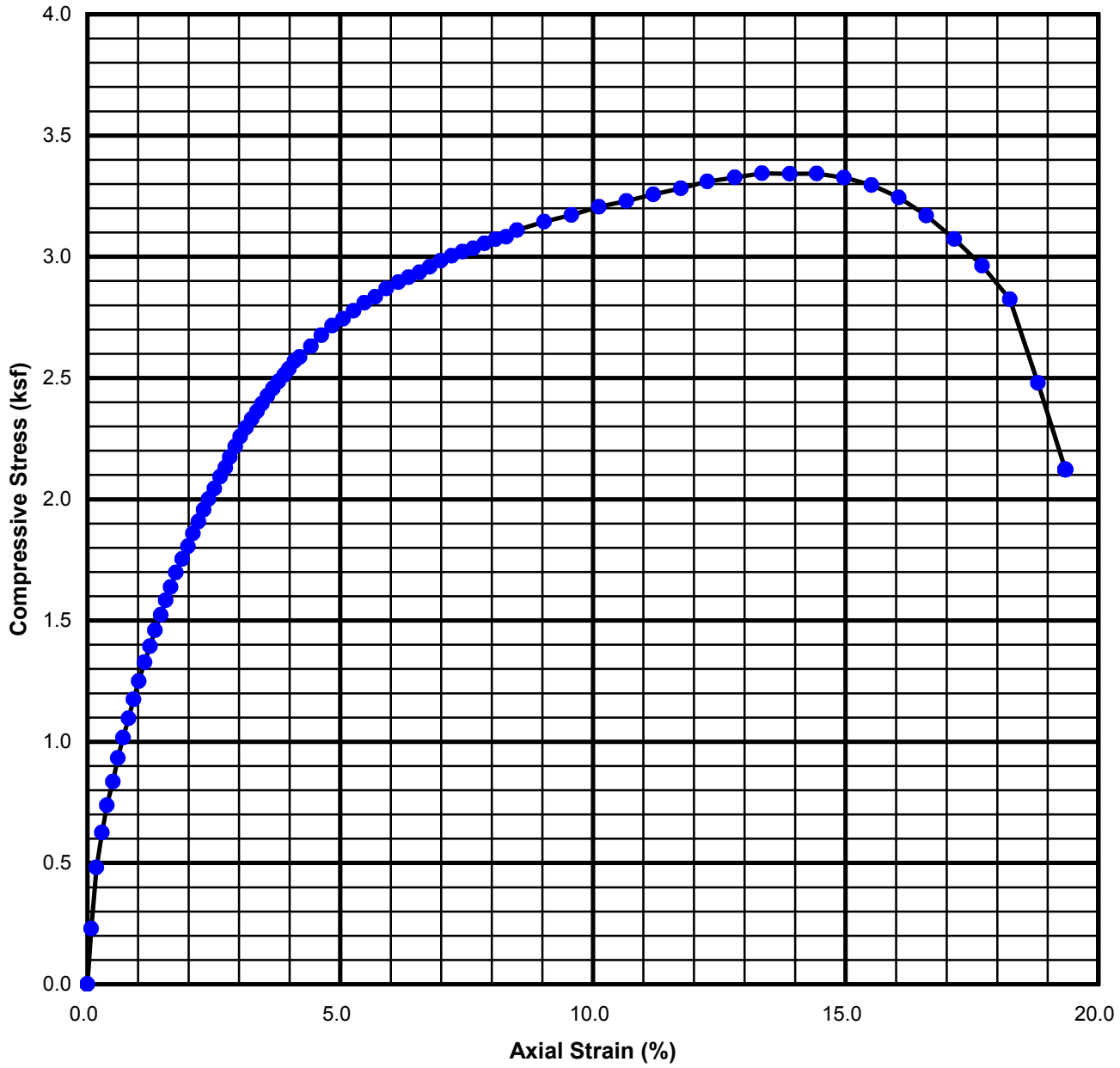


Failure Sketch

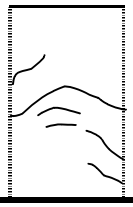


Water Content (%)	LL (%)	PI (%)	Length (in)	Diameter (in)	Wet Density (pcf)	Degree of Saturation (%)	Peak Stress (ksf)
23.6	47	33	5.994	2.404	97.3	55.2	2.04

Project Name:	**I5 & SR 74 IC**				**UNCONFINED COMPRESSION TEST**
Project Number:	**30989830**				
Exploration No:	**R-10-024**	**Sample No.:**	**S3**	**Depth (ft):** **15**	**ASTM D 2166**
Description and/or Classification:	**Very dark gray Clay with sand (CL)**				**Figure :**

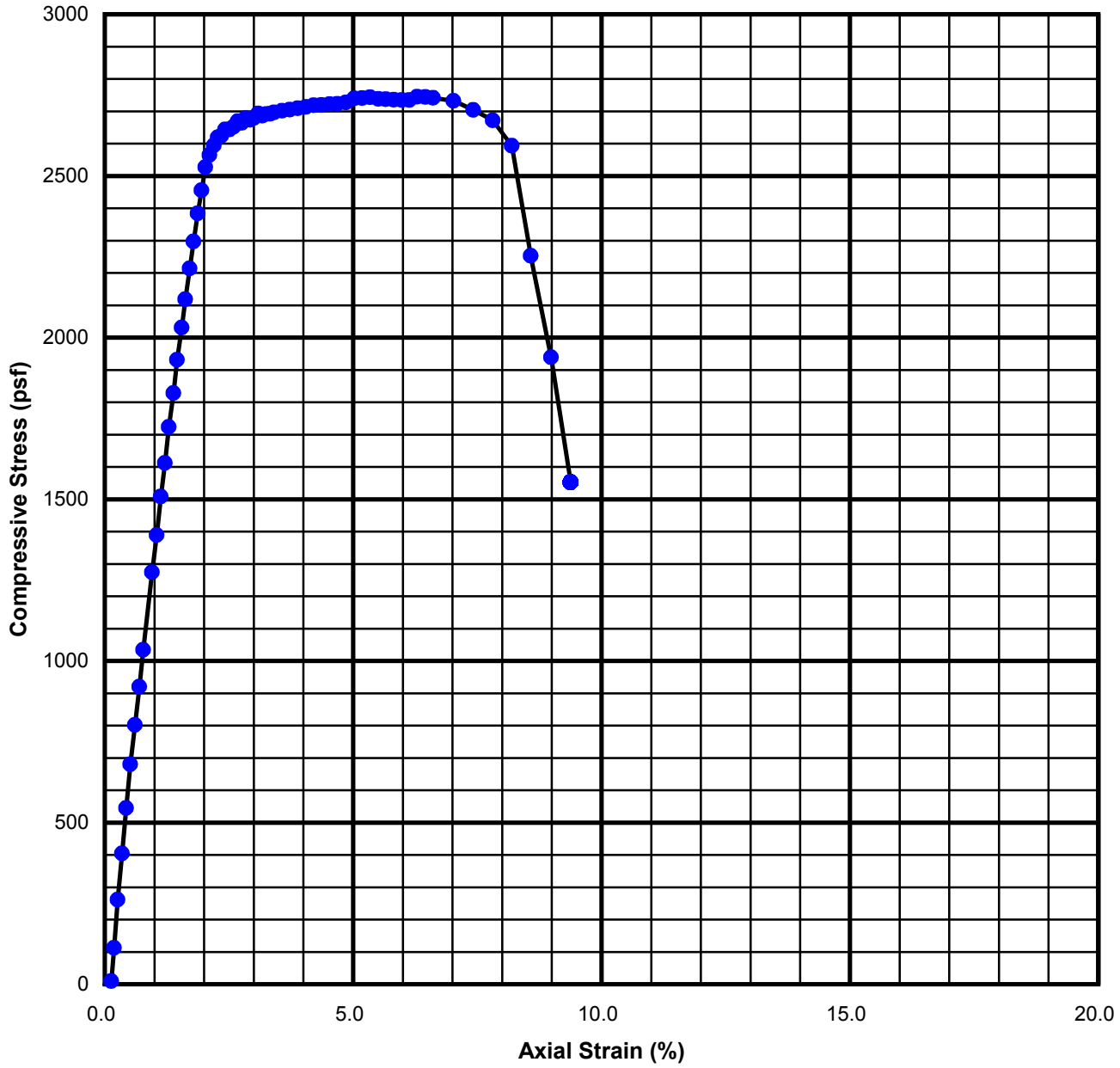


Failure Sketch

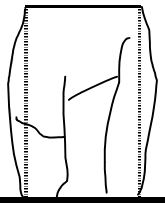


Water Content (%)	LL (%)	PI (%)	Length (in)	Diameter (in)	Wet Density (pcf)	Degree of Saturation (%)	Peak Stress (ksf)
31.7	61	45	5.612	2.411	117.9	95.3	3.34

Project Name:	**I5 &SR 74 IC**				**UNCONFINED COMPRESSION TEST**
Project Number:	**30989830**				
Exploration No:	**R-10-024**	**Sample No.:**	**S5**	**Depth (ft):**	**25**
Description and/or Classification:	**Olive Clay (CH)**				**ASTM D 2166**
					Figure :

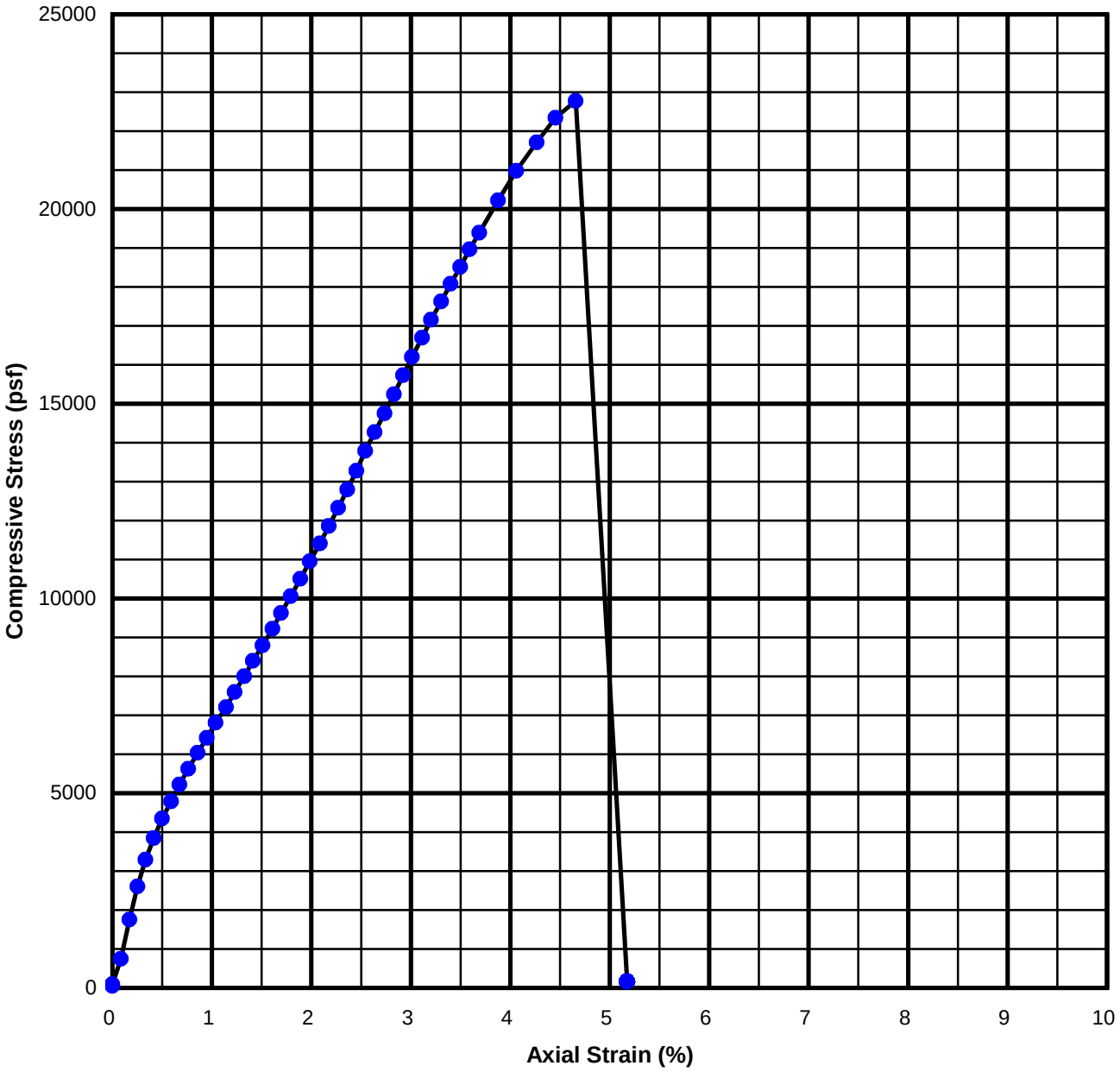


Failure Sketch

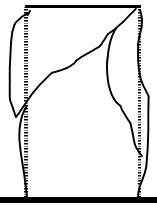


Water Content (%)	LL (%)	PI (%)	Length (in)	Diameter (in)	Wet Density (pcf)	Degree of Saturation (%)	Peak Stress (psf)
17.6	39	26	5.625	2.884	131.7	91.3	2745

Project Name:	**I-5 & sr-74 IC**				**UNCONFINED COMPRESSION TEST**
Project Number:	**3030989830**				
Exploration No:	**R-10-028**	**Sample No.:**	**3**	**Depth (ft):** **16.5**	**ASTM D 2166**
Description and/or Classification:	**Dark grayish brown sandy Clay (CL)**				**Figure :**



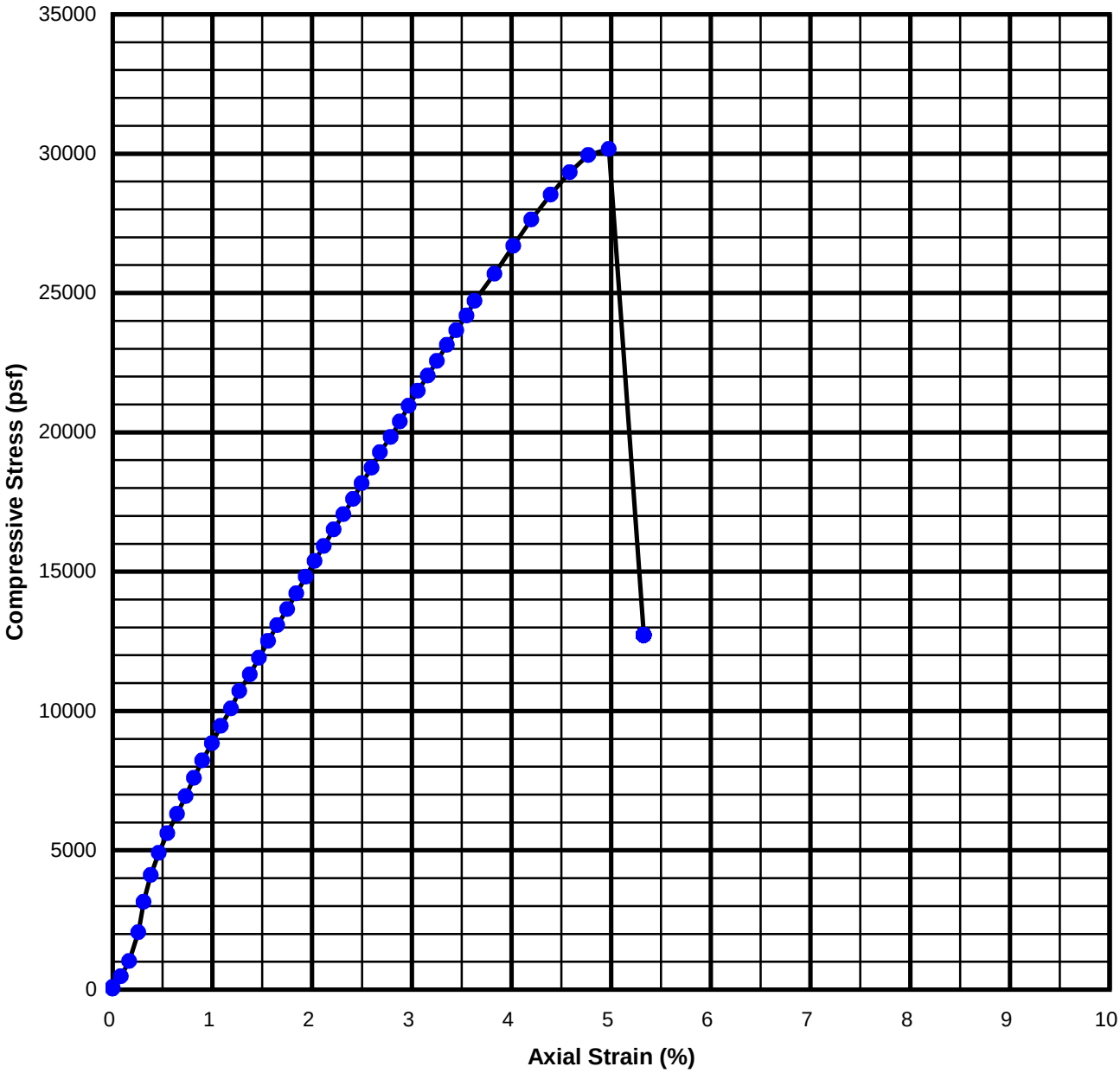
Failure Sketch



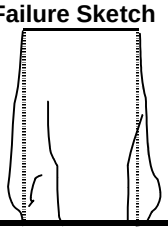
Water Content (%)	Length (in)	Diameter (in)	Wet Density (pcf)	Degree of Saturation (%)	Peak Stress (psf)
26.0	6.028	2.440	123.7	94.3	22776

Project Name:	**I-5 & SR-74 IC**			
Project Number:	**30989830**			
Boring Number:	**R-10-028A**	**Sample No.:**	**Depth (ft):**	**56**
Description and/or Classification:	**Dark olive gray Clay (CL)**			

UNCONFINED COMPRESSION TEST
ASTM D2166



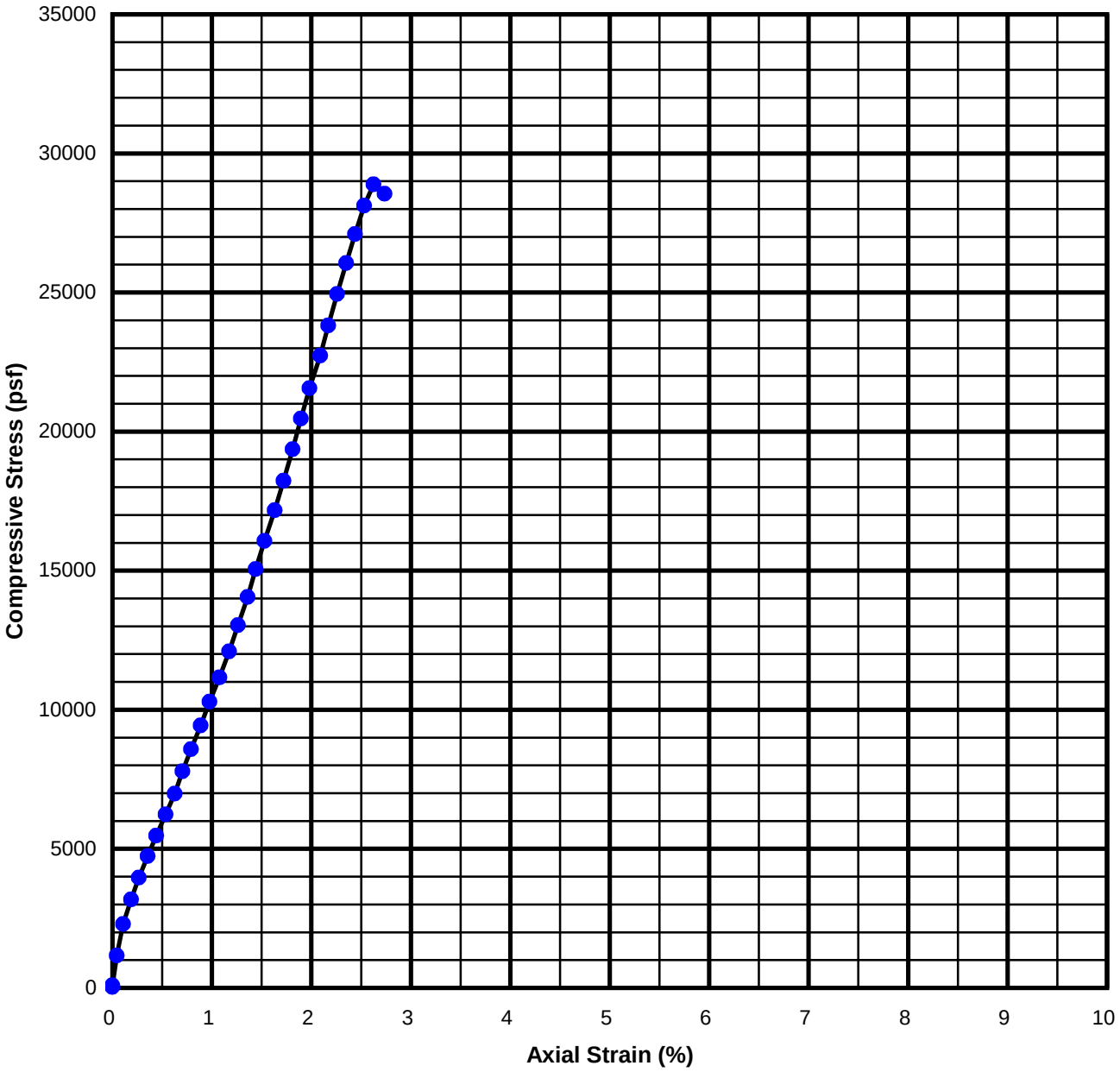
Failure Sketch



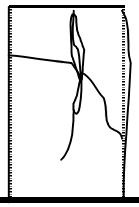
Water Content (%)	Length (in)	Diameter (in)	Wet Density (pcf)	Degree of Saturation (%)	Peak Stress (psf)
25.0	6.028	2.430	123.7	92.6	30160

Project Name:	**I-5 & SR-74 IC**		
Project Number:	**30989830**		
Boring Number:	**R-10-028A**	**Sample No.:**	**Depth (ft): 63.5**
Description and/or Classification:	**Very dark gray Clay (CL)**		

UNCONFINED COMPRESSION TEST
ASTM D2166



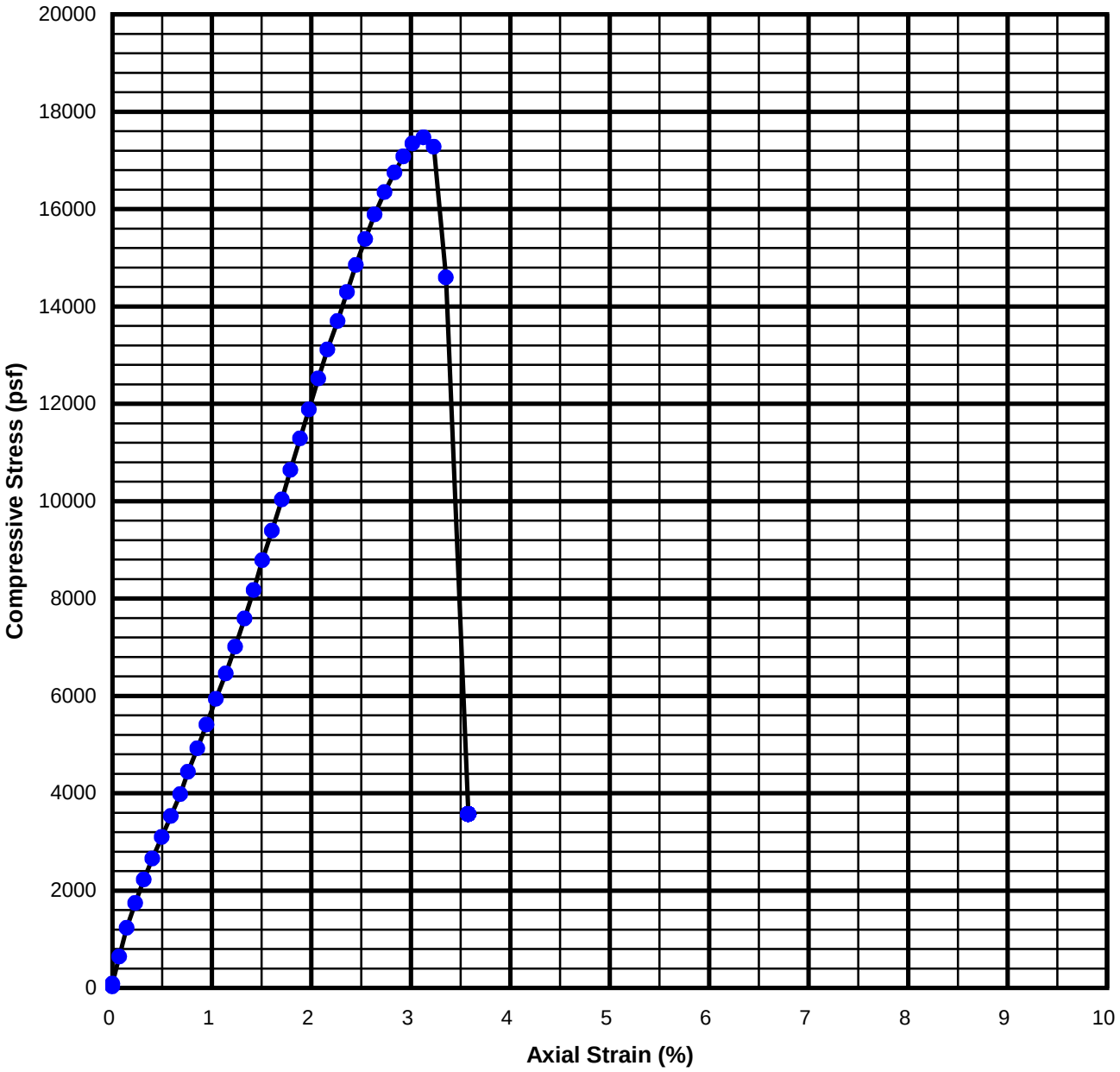
Failure Sketch



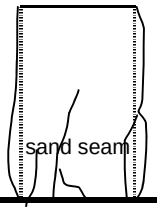
Water Content (%)	Length (in)	Diameter (in)	Wet Density (pcf)	Degree of Saturation (%)	Peak Stress (psf)
27.6	6.030	2.481	120.5	91.6	28883

Project Name:	**I-5 & SR-74 IC**			
Project Number:	**30989830**			
Boring Number:	**R-10-028A**	**Sample No.:**	**Depth (ft):**	**73**
Description and/or Classification:	**Dark olive gray Clay (CL)**			

UNCONFINED COMPRESSION TEST
ASTM D2166



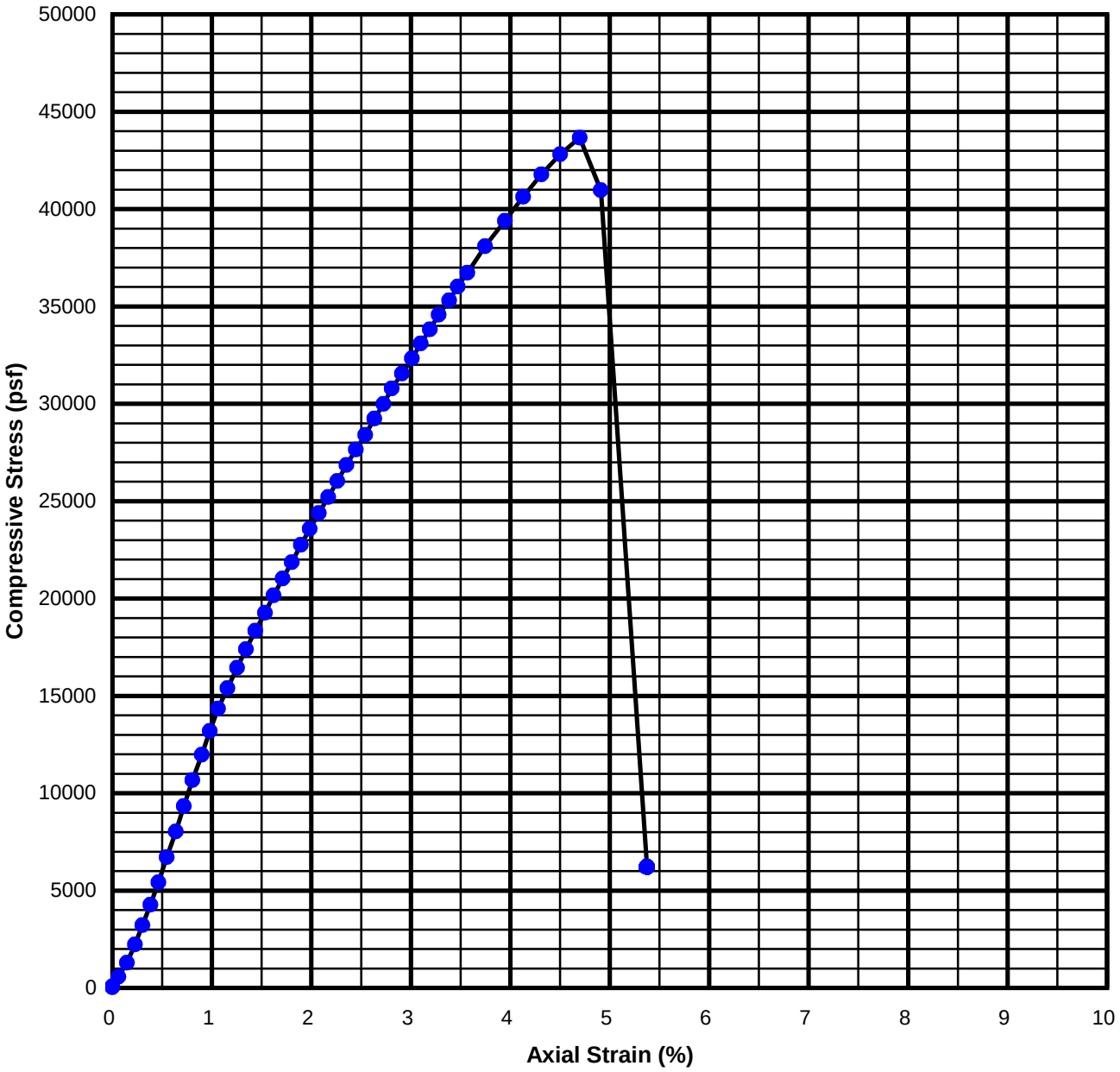
Failure Sketch



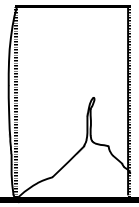
Water Content (%)	Length (in)	Diameter (in)	Wet Density (pcf)	Degree of Saturation (%)	Peak Stress (psf)
22.8	6.028	2.428	125.1	90.4	17469

Project Name:	**I-5 & SR-74 IC**			
Project Number:	**30989830**			
Boring Number:	**R-10-028A**	**Sample No.:**	**Depth (ft):**	**80**
Description and/or Classification:	**Dark olive gray Clay (CL)**			

UNCONFINED COMPRESSION TEST
ASTM D2166



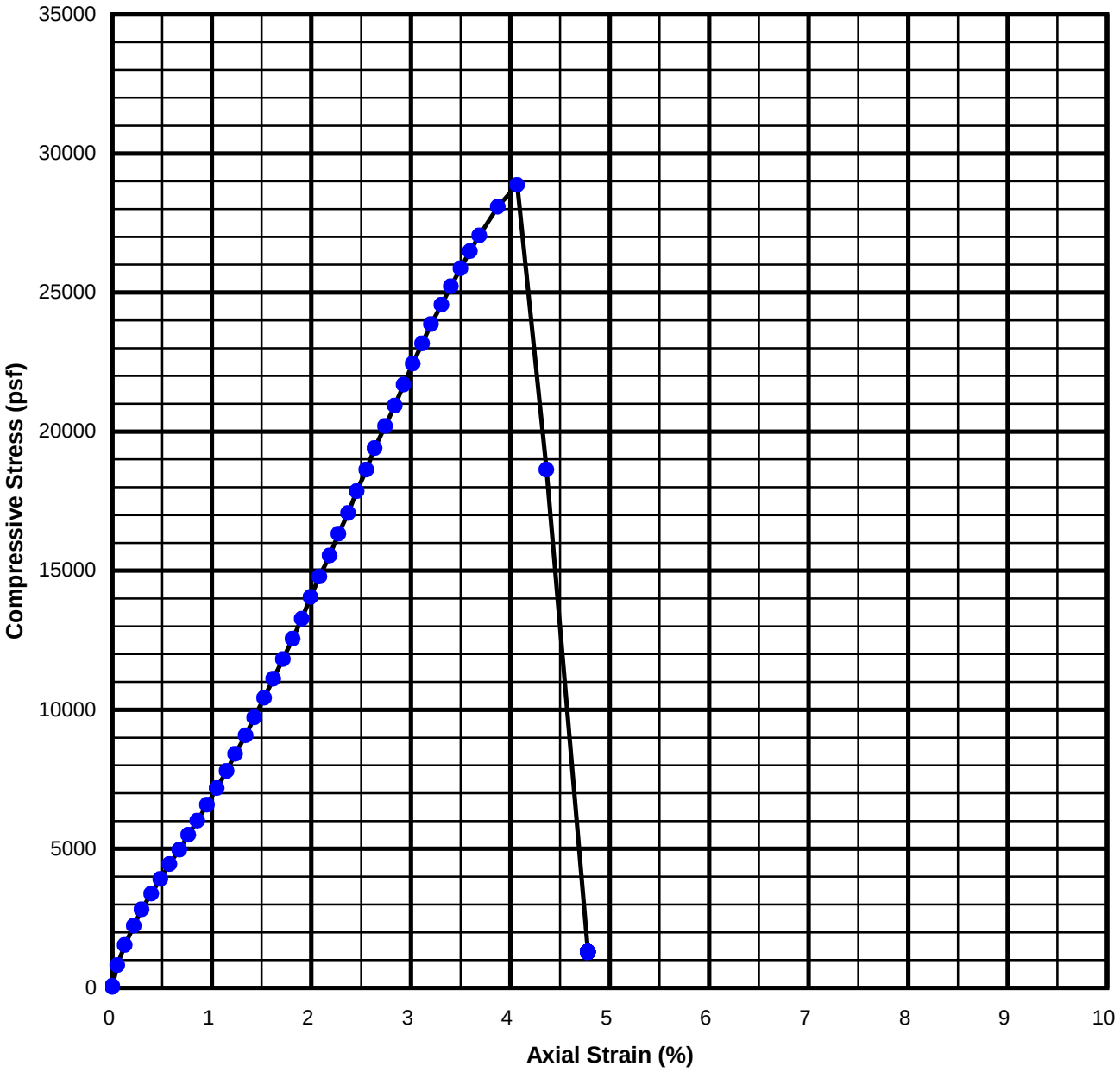
Failure Sketch



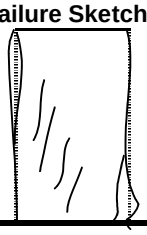
Water Content (%)	Length (in)	Diameter (in)	Wet Density (pcf)	Degree of Saturation (%)	Peak Stress (psf)
20.4	6.040	2.464	123.7	82.6	43654

Project Name:	**I-5 & SR-74 IC**			
Project Number:	**30989830**			
Boring Number:	**R-10-028A**	**Sample No.:**	**Depth (ft):**	**93**
Description and/or Classification:	**Dark olive gray Clay (CL)**			

UNCONFINED COMPRESSION TEST
ASTM D2166



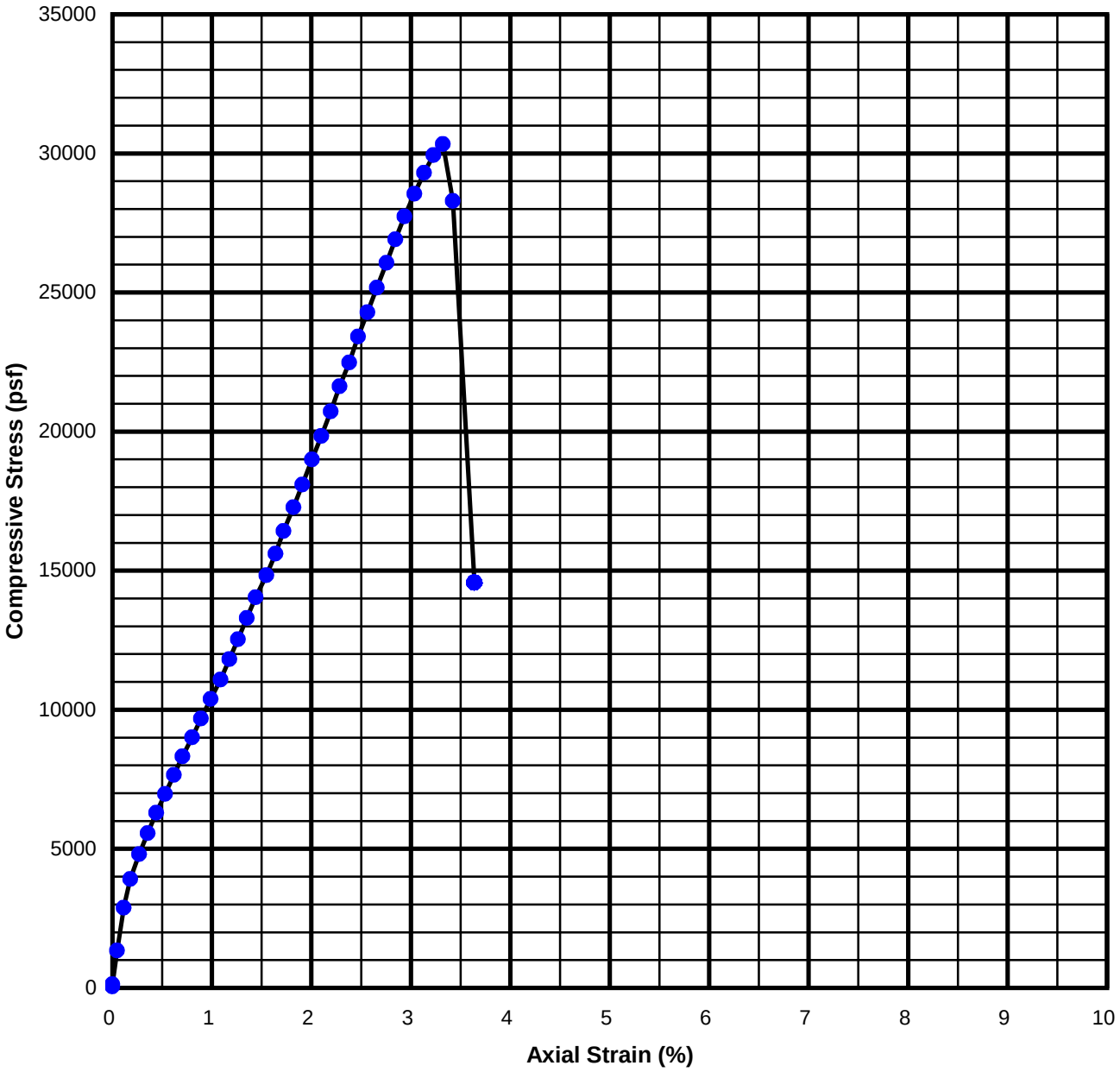
Failure Sketch



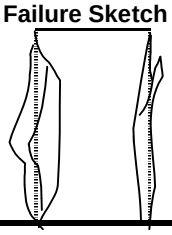
Water Content (%)	Length (in)	Diameter (in)	Wet Density (pcf)	Degree of Saturation (%)	Peak Stress (psf)
23.1	6.030	2.488	125.1	91.3	28859

Project Name:	**I-5 & SR-74 IC**			
Project Number:	**30989830**			
Boring Number:	**R-10-028A**	**Sample No.:**	**Depth (ft):**	**97**
Description and/or Classification:	**Dark olive gray Clay (CL)**			

UNCONFINED COMPRESSION TEST
ASTM D2166



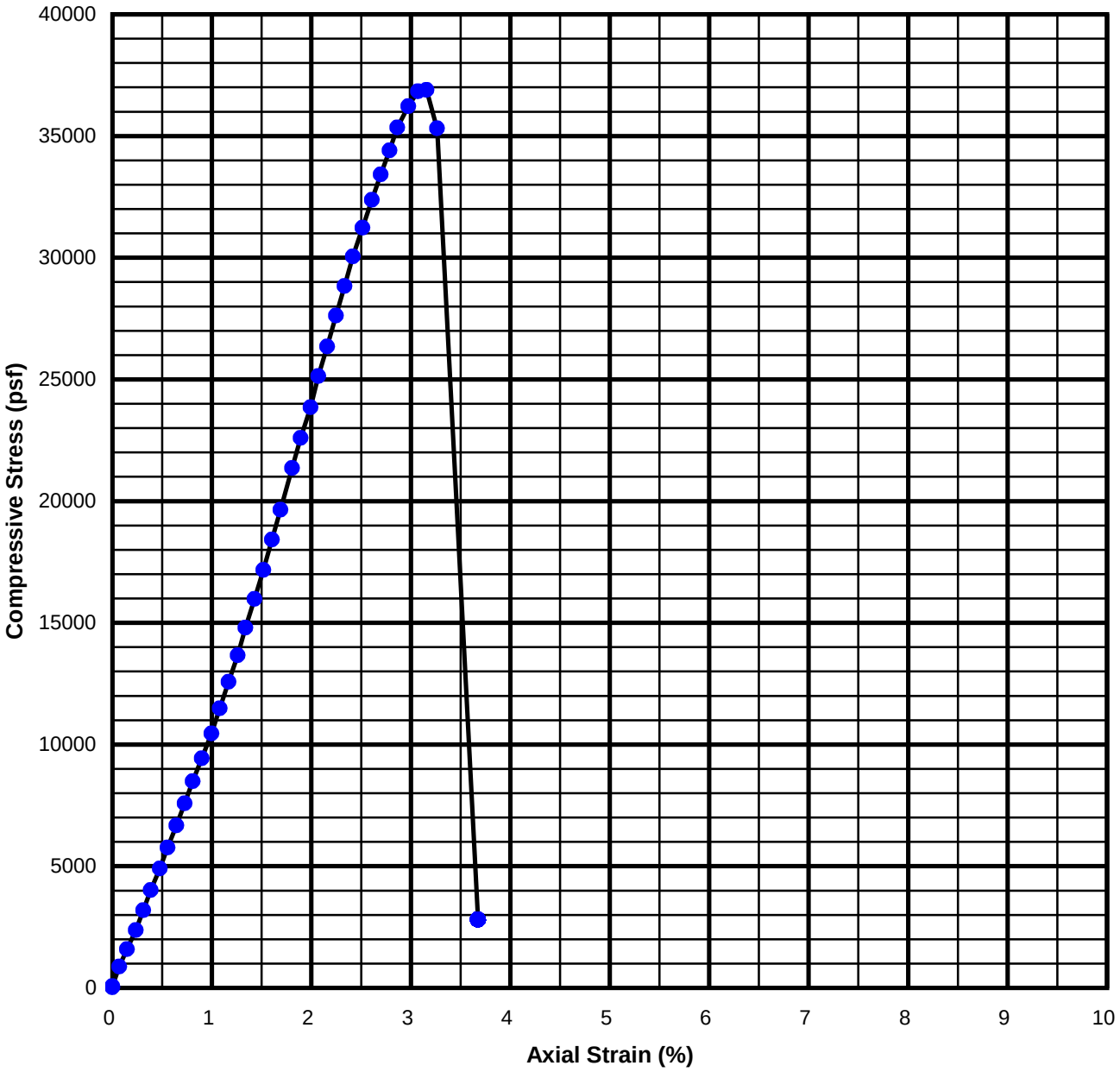
Failure Sketch



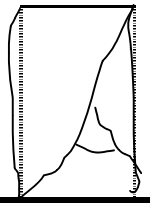
Water Content (%)	Length (in)	Diameter (in)	Wet Density (pcf)	Degree of Saturation (%)	Peak Stress (psf)
23.4	6.029	2.493	124.1	90.0	30335

Project Name:	**I-5 & SR-74 IC**		
Project Number:	**30989830**		
Boring Number:	**R-10-028A**	**Sample No.:**	**Depth (ft): 117**
Description and/or Classification:	**Dark olive gray Clay (CL)**		

UNCONFINED COMPRESSION TEST
ASTM D2166



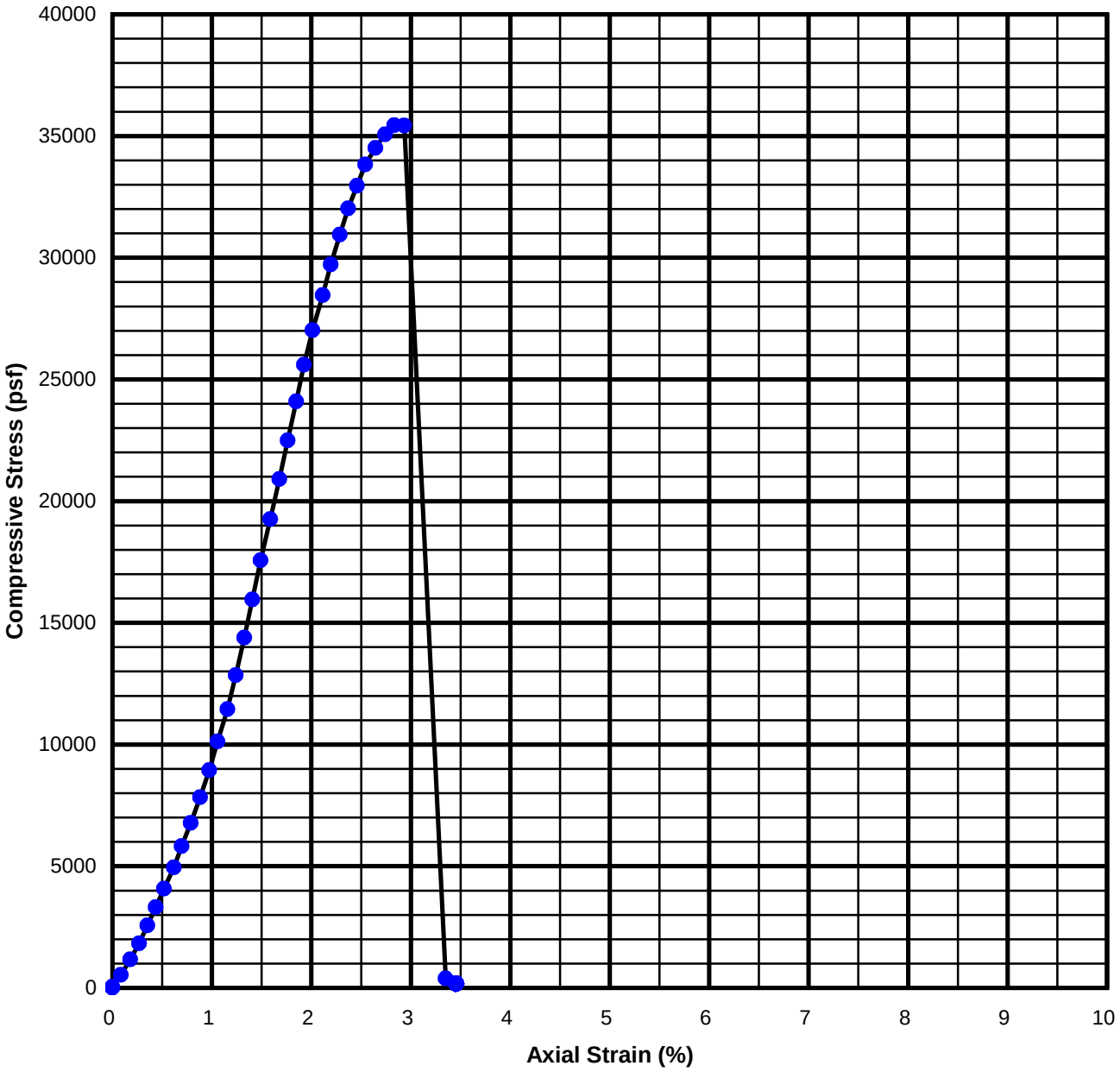
Failure Sketch



Water Content (%)	Length (in)	Diameter (in)	Wet Density (pcf)	Degree of Saturation (%)	Peak Stress (psf)
23.7	6.027	2.470	124.7	91.6	36896

Project Name:	**I-5 & SR-74 IC**			
Project Number:	**30989830**			
Boring Number:	**R-10-028A**	**Sample No.:**	**Depth (ft):**	**125**
Description and/or Classification:	**Dark olive gray Clay (CL)**			

UNCONFINED COMPRESSION TEST
ASTM D2166



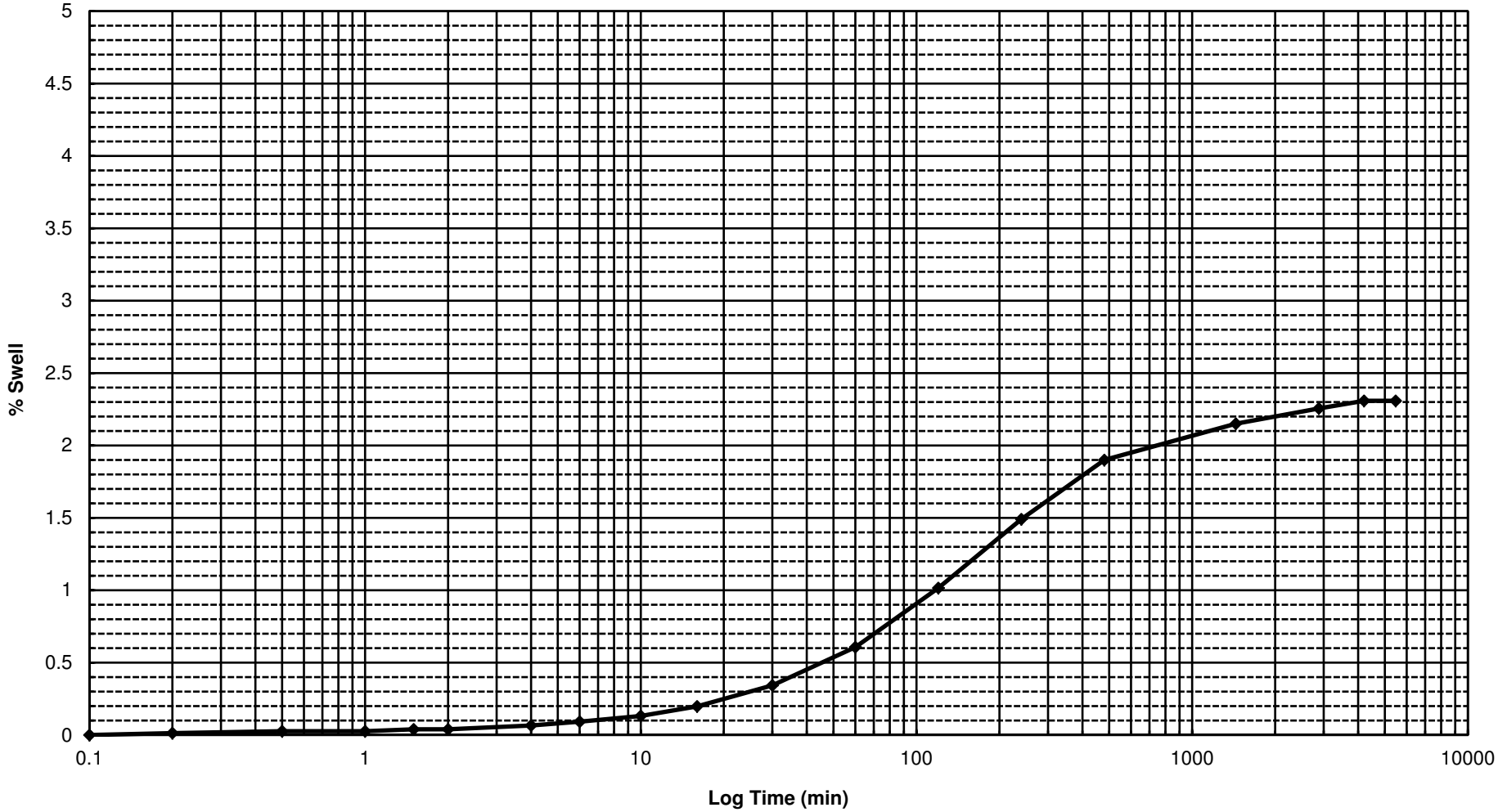
Failure Sketch

Water Content (%)	Length (in)	Diameter (in)	Wet Density (pcf)	Degree of Saturation (%)	Peak Stress (psf)
24.3	6.035	2.452	124.9	93.1	35439

Project Name:	**I-5 & SR-74 IC**		
Project Number:	**30989830**		
Boring Number:	**R-10-028A**	**Sample No.:**	**Depth (ft): 133**
Description and/or Classification:	**Very dark gray Clay (CL)**		

UNCONFINED COMPRESSION TEST
ASTM D2166

APPENDIX B



Expansion Index, EI @ S=50%:	0 to 20	21 to 50	51 to 90	91 to 130	> 130
Potential Expansion:	Very Low	Low	Medium	High	Very High

Exploration No.	Sample No.	Depth (ft)	WC (%)	DUW (pcf)	Saturation (%)	EI S (%)	Description and/or Classification
A-11-002	2	6.5	18.2	108.2	86	23	Very dark gray Clay with sand (CL)

PROJECT NAME: I-5 & SR-74 IC
PROJECT NUMBER: 30989830

EXPANSION INDEX TEST
ASTM D 4829

FIGURE No.

Expansion Index Test
Set-up / Take down Worksheet
ASTM: D 4829

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM

Exploration No.: A-11-002
Sample No.: 2
Depth (ft): 6.5

Apparatus No.: C-11

Specimen Description : Very dark gray Clay with sand (CL)
Duration: end of swelling

Ring Number: R5
Weight of Wet Spec. and Ring: 521.45 g
Weight of Ring: 201.57 g
Initial Weight of Wet Spec.: 319.88 g

Take Down Weight with Ring: 531.06 g

Excess Oven-dried Cont. No.: L7
Weight of Cont. and Dry Spec.: 141.07 g
Weight of Container: 140.70 g
Weight of Excess Dried Soil: 0.37 g
Weight of Excess Wet Soil 0.45 g
Final Weight of Wet Specimen: 329.94 g

Height of Specimen (in)

	Initial	Final
1	0.755	0.786
2	0.757	0.781
3	0.758	0.784
4	0.762	0.794
5	0.748	0.776
Ave:	0.756	0.784

Initial Height - Final Height = -0.028 in
Change in Dial (Δd) = -0.025 in
Initial Height - Δd = 0.781 in
Final Height + Δd = 0.759 in
Weight of Top Cap = 535.68 g

Specimen Analysis					Initial Trim	Initial Spec.	Final
				Container Number:	SF6	**XXXXX**	s32
				Mass of Container and Wet Specimen M1 (g)	511.06	319.88	406.59
				Mass of Container and Dry Specimen, M2 (g)	455.02	271.47	348.42
				Mass of Container, M3 (g)	147.18	**XXXXX**	78.33
				Water Content, w (%)	18.20	17.83	21.54
				Mass of Wet Specimen, M4 (g)	319.88	319.88	329.94
				Mass of Dry Specimen, M5 (g)	271.47	271.47	271.47
Nominal		Measured	x	Specimen Height, H (in)	0.756	0.756	0.784
Nominal	x	Measured		Specimen Diameter, D (in)	4.006	4.006	4.006
				Area of Specimen, A (in^2)	12.604	12.604	12.604
				Volume of Specimen, V (cc)	156.15	156.15	161.97
Assumed	x	Measured		Specific Gravity, Gs	2.75	2.75	2.75
				Wet Unit Weight, WUW (pcf)	**127.9**	**127.9**	**127.2**
				Dry Unit Weight, DUW (pcf)	**108.2**	**108.5**	**104.6**
				Void Ratio	**0.584**	**0.579**	**0.638**
				Degree of Saturation, S (%)	**85.7**	**84.7**	**92.9**

Set-up by: YS
Date: 11-Jul-11

Dial Reading before Loading (in): 0.1233
Dial Reading after inundation (in): 0.1213

URS

Expansion Index Test
Reading Worksheet
ASTM: D 4829

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM

Exploration No.: A-11-002
Sample No.: 2
Depth (ft): 7

Apparatus No.: C-11

Specimen Description : Very dark gray Clay with sand (CL)

Dial Reading before Loading: 0.1233 inch
Dial Reading after inundation: 0.1213 inch

Initial Specimen Height: 0.756 inch
Consol. Specimen Height: 0.758 inch

Date	Time	Elapsed Time (min)	Dial Reading (inch)	Total Swell (inch)	% Swell
7/11/2011	14:45	0.00	0.1212	0.0000	0.00
		0.01	0.1214	0.0001	0.00
		0.05	0.1214	0.0001	0.00
		0.10	0.1214	0.0001	0.00
		0.20	0.1214	0.0001	0.01
		0.50	0.1215	0.0002	0.03
		1.00	0.1215	0.0002	0.03
		1.50	0.1216	0.0003	0.04
		2.00	0.1216	0.0003	0.04
		4	0.1218	0.0005	0.07
		6	0.1220	0.0007	0.09
		10	0.1223	0.0010	0.13
		16	0.1228	0.0015	0.20
		30	0.1239	0.0026	0.34
		60	0.1259	0.0046	0.61
		120	0.1290	0.0077	1.02
		240	0.1326	0.0113	1.49
		480	0.1357	0.0144	1.90
		1440	0.1376	0.0163	2.15
		2880	0.1384	0.0171	2.26
		4200	0.1388	0.0175	2.31
		5472	0.1388	0.0175	2.31

Final Dial Reading prior to Unloading (inch): 0.1388 0.0175 2.31

Final Dial Reading prior to Take down (inch): 0.1487

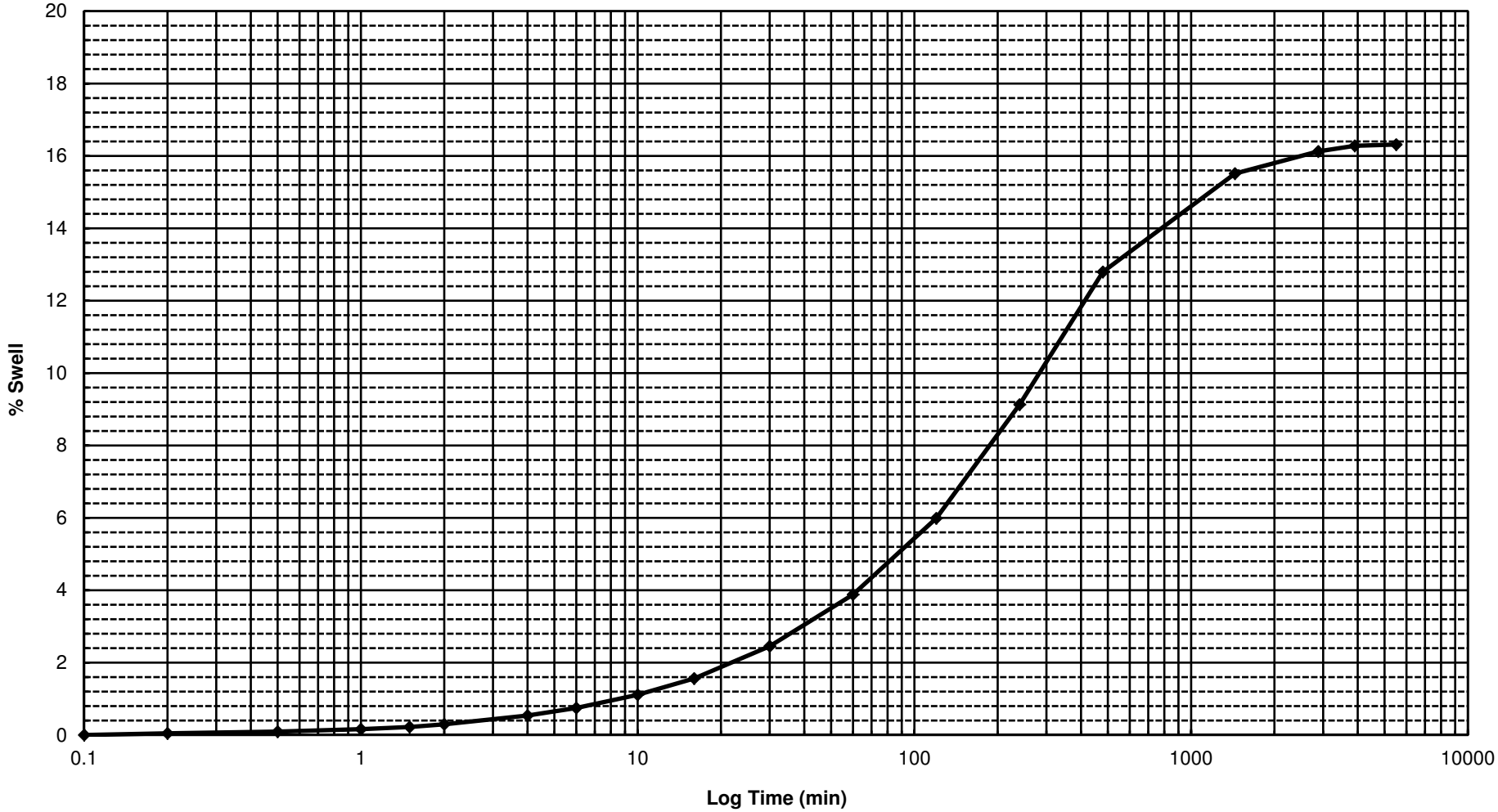
Take down by: TJO
Date: 17-Jul-11

EXPANSION INDEX MEASURED @ %S, EI : 23

current elepsed time

EIT I5 A11002 007

URS



Expansion Index, EI @ S=50%:	0 to 20	21 to 50	51 to 90	91 to 130	> 130
Potential Expansion:	Very Low	Low	Medium	High	Very High

Exploration No.	Sample No.	Depth (ft)	WC (%)	DUW (pcf)	Saturation (%)	EI S (%)	Description and/or Classification
A-11-020	4	15.0	24.6	95.7	86	163	Olive Clay (CH)

PROJECT NAME: I-5 & SR-74 IC
PROJECT NUMBER: 30989830

EXPANSION INDEX TEST
ASTM D 4829

FIGURE No.

Expansion Index Test
Set-up / Take down Worksheet
ASTM: D 4829

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM

Exploration No.: A-11-020
Sample No.: 4
Depth (ft): 15.0

Apparatus No.: C-9

Specimen Description : Olive Clay (CH)
Duration: end of swelling

Ring Number: R2
Weight of Wet Spec. and Ring: 492.14 g
Weight of Ring: 200.68 g
Initial Weight of Wet Spec.: 291.46 g

Take Down Weight with Ring: 533.38 g

Excess Oven-dried Cont. No.: L21
Weight of Cont. and Dry Spec.: 137.26 g
Weight of Container: 136.56 g
Weight of Excess Dried Soil: 0.70 g
Weight of Excess Wet Soil 1.00 g
Final Weight of Wet Specimen: 333.70 g

Height of Specimen (in)

	Initial	Final
1	0.743	0.907
2	0.746	0.919
3	0.741	0.901
4	0.727	0.900
5	0.748	0.911
Ave:	0.741	0.908

Initial Height - Final Height = -0.167 in
Change in Dial (Δd) = -0.166 in
Initial Height - Δd = 0.907 in
Final Height + Δd = 0.742 in
Weight of Top Cap = 494.11 g

Specimen Analysis					Initial Trim	Initial Spec.	Final
				Container Number:	SNA9	**XXXXX**	s40
				Mass of Container and Wet Specimen M1 (g)	377.25	291.46	381.92
				Mass of Container and Dry Specimen, M2 (g)	328.96	233.78	291.93
				Mass of Container, M3 (g)	132.81	**XXXXX**	81.37
				Water Content, w (%)	24.62	24.67	42.74
				Mass of Wet Specimen, M4 (g)	291.46	291.46	333.70
				Mass of Dry Specimen, M5 (g)	233.78	233.78	233.78
Nominal		Measured	x	Specimen Height, H (in)	0.741	0.741	0.908
Nominal	x	Measured		Specimen Diameter, D (in)	3.999	3.999	3.999
				Area of Specimen, A (in^2)	12.560	12.560	12.560
				Volume of Specimen, V (cc)	152.51	152.51	186.80
Assumed	x	Measured		Specific Gravity, Gs	2.75	2.75	2.75
				Wet Unit Weight, WUW (pcf)	**119.3**	**119.3**	**111.5**
				Dry Unit Weight, DUW (pcf)	**95.7**	**95.7**	**78.1**
				Void Ratio	**0.790**	**0.791**	**1.194**
				Degree of Saturation, S (%)	**85.7**	**85.8**	**98.5**

Set-up by: YS
Date: 11-Jul-11

Dial Reading before Loading (in): 0.2374
Dial Reading after inundation (in): 0.2364

EIT I5 A11020 015

URS

Expansion Index Test
Reading Worksheet
ASTM: D 4829

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM

Exploration No.: A-11-020
Sample No.: 4
Depth (ft): 15

Apparatus No.: C-9

Specimen Description : Olive Clay (CH)

Dial Reading before Loading: 0.2374 inch
Dial Reading after inundation: 0.2364 inch

Initial Specimen Height: 0.741 inch
Consol. Specimen Height: 0.742 inch

Date	Time	Elapsed Time (min)	Dial Reading (inch)	Total Swell (inch)	% Swell
7/11/2011	14:06	0.00	0.2364	0.0000	0.00
		0.01	0.2366	0.0002	0.00
		0.05	0.2366	0.0002	0.00
		0.10	0.2367	0.0003	0.00
		0.20	0.2368	0.0003	0.05
		0.50	0.2371	0.0007	0.09
		1.00	0.2376	0.0012	0.16
		1.50	0.2381	0.0017	0.22
		2.00	0.2386	0.0022	0.30
		4	0.2404	0.0040	0.54
		6	0.2420	0.0056	0.75
		10	0.2447	0.0083	1.11
		16	0.2480	0.0116	1.56
		30	0.2546	0.0182	2.45
		60	0.2652	0.0288	3.88
		120	0.2809	0.0445	5.99
		240	0.3042	0.0678	9.13
		480	0.3314	0.0950	12.80
		1440	0.3515	0.1151	15.51
		2880	0.3561	0.1197	16.13
		3902	0.3572	0.1208	16.28
		5510	0.3575	0.1211	16.32

Final Dial Reading prior to Unloading (inch): 0.3575 0.1211 16.32

Final Dial Reading prior to Take down (inch): 0.4031

Take down by: TJO
Date: 17-Jul-11

EXPANSION INDEX MEASURED @ %S, EI : 163

current elepsed time

EIT I5 A11020 015

URS

State of California | Business, Transportation and Housing Agency

Memorandum

To: Fred Faizi, Chief
Design Branch "C"

Date: May 2, 2011

File: 12-Ora- (I-5/74)
Driveways
PM: 9.4-9.9
EA: 0E3101

From: **DEPARTMENT OF TRANSPORTATION**
District 12
Materials and Research Branch

Cat: 441.01

Subject: **Recommendation of Structural Sections of Driveways at SR-74.**

The District Materials and Research (M&R) Branch has reviewed your April 27, 2011 Plans through e-mail. This project is proposed by City of San Juan Capistrano, in cooperation with the California Department of Transportation (Caltrans) to reconstruct the existing I-5/74 (Ortega Highway) Interchange (widening all On and Off Ramps, and bridge,...) in City of San Juan Capistrano. The construction will require the temporary closure of half of the Ortega Highway / I-5 freeway Overcrossing in each direction for the duration of construction (construction of new bridge), also this project requires additional HOV Lane, widening of on and off ramps (Cloverleaf design) and reconstruction of existing driveways for hotel and other commercial facilities.
The area is located within the reference limits.

1. Materials Letter Report (MLR) prepared by Materials and Research (M&R) Branch. All structural sections are recommended in MLR dated February 01, 2010. The report include the results of field tests and sampling for R-Value, Sieve analysis, Sand Equivalent, Expansion, Plasticity Index, structural sections are calculated based on R-Value obtained from sampling and testing of the native materials and Traffic Index.

There are other issues such as settlement/slope stability of ramp embankment fills, groundwater elevations, retaining wall, bridge, etc. that will be addressed by Roadway Geotechnical Design South from HQ. Please make sure you send them a separate request.

2. Section of SR-74 at west side of freeway 5 requires profile grade adjustment, M&R Branch recommends imported borrow or class-3 aggregate Sub-Base for the fill area. The imported borrow materials used for embankment shall have an R-Value of at least 40 (top 4 feet from finished grade) and be non-corrosive, low expansion and free of other deleterious properties that adversely affect all concrete/steel structures. The Imported borrow shall conform to Section 19-7.02 of Caltrans Standard Specifications (May 2006) and be tested prior to placement.

3. Plan sheet X-1 Typical Cross Section, revise typical cross sections for item number 12, 13 and 14, maximum thickness of RHMA-G shall not exceed 0.20'. If profile adjustment needed, use 0.20' of RHMA-G over required thickness of HMA Type "A". Revise following items in plan sheet X-1:

    a. Item #12; Cold Plane 0.20' of existing pavement, then place 0.20' RHMA-G over 0.60 HMA Type "A". Please note the thickness of the pavement may varies from 0.20' to 0.80', please refer to your design.

    b. Item #13 and 14; **recommended for proposed structural sections over 1 foot**, pulverize, scarify and compact existing pavement to 95% compaction per section 19 of Caltrans Standard Specification May 2006. Then construct structural sections of the pavement per Materials Letter Report (MLR).

    c. Due to low traffic volume at City Street, cold plain 0.10' then place 0.20' of RHMA-G over cold plain area.

    d. Structural sections for widening driveway requires; 0.20' RHMA over 0.75' HMA Type "A" over 0.85' AS Class-2. M&R Branch recommends cold plain 0.10' thickness of the existing AC layer of existing driveways then place 0.20' of RHMA-G to finished grade in order to provide a uniform surface layer.

4. The join between the existing pavement and the new pavement shall be sealed. A layer of tack coat shall be applied to all vertical-cut faces and between subsequent HMA lifts.

For further assistant, please contact Farhad Hadjibabaie at (949) 724-2129.

Prepared by:

Farhad Hadjibabaie, PE
Materials & Research Branch
Division of Project Delivery
RCE # 50175

Concurred by:

Behdad Baseghi, Ph.D, PE, GE, PMP
Chief, Materials & Research Branch
Division of Project Delivery
RCE # 47051

Cc: Matt Cugini
David Lam
File

12-ORA 5/74, PM 9.4-9.9
EA 0E3101
05-02-11

State of California

Business, Transportation and Housing Agency

Memorandum

To: Fred Faizi, Chief
Design Branch "C"

Date: August 09, 2011

File: 12-Ora- (I-5/74)
Interchange
PM: 9.4-9.9
EA: 0E3101

From: **DEPARTMENT OF TRANSPORTATION**
District 12
Materials and Research Branch

Cat: 441.01

Subject: **Recommendation of Structural Sections of Ortega Highway (SR-74), On Ramps and Off-Ramps at I-5 and SR-74 interchanges.**

The District Materials and Research (M&R) Branch has reviewed your July 11, 2011 hard copy Plans and specifications through e-mail. This project is proposed by City of San Juan Capistrano, in cooperation with the California Department of Transportation (Caltrans) to reconstruct the existing I-5/74 (Ortega Highway) Interchange (realigning and widening all On and Off Ramps, and bridge,...) in City of San Juan Capistrano. The construction will require the temporary closure of half of the Ortega Highway / I-5 freeway Overcrossing in each direction for the duration of construction (construction of new bridge). Also widening construction of on and off ramps (Cloverleaf design) and reconstruction of existing driveways for hotel and other commercial facilities requires closure too.
The area is located within the reference limits.

1. Materials Letter Report (MLR) prepared by Materials and Research (M&R) Branch. All structural sections are recommended in MLR dated February 01, 2010. The report include the results of field tests and sampling for R-Value, Sieve analysis, Sand Equivalent, Expansion, Plasticity Index, structural sections are calculated based on R-Value obtained from sampling and testing of the native materials and Traffic Index.

   Geothechnical South noticed soft sub-grade materials beneath proposed embankment area. Due to existence of soft sub-grade material beneath embankment, therefore surcharge of the embankment at widening area is required for a long period of time (that is impossible task due to traffic congestions). To mitigate the surcharge problem, Geotech south recommended use of light weight materials EPS Block or (Geofoam) to build the embankment. Materials and Research (M&R) Branch would like to recommend another structural sections alternative that, incorporate EPS Block within top 4 feet of structural sections. This recommendation will increase the cost of construction of the roadway pavement. Please note that, it is engineering decision of the project engineer to select from these alternatives for roadway embankment that requires surcharge. These additional alternative structural section

recommendations combined with recommended structural sections in February 01, 2010 Materials Report (MR) has own unique application that, to be used by the project engineer. M&R Branch requires 0.80' Continuously Reinforced Concrete Pavement (CRCP) as a protective layer beneath structural sections of the roadways pavement (on top of EPS Block). Due to existence of petroleum materials (solvent) in the existing embankment, it is recommended to wrap the EPS Block with Geo membrane.

There are other issues such as settlement/slope stability of roadway embankment fills, groundwater elevations, retaining wall, bridge, etc. that will be addressed by Roadway Geotechnical Design South from HQ. Please make sure you send them a separate request.

2. Sections of SR-74 at east and west side of freeway I-5 requires profile grade increase, M&R Branch recommends imported borrow or class-3 aggregate Sub-Base or EPS Block for the fill area. The imported borrow materials used for embankment shall have an R-Value of at least 40 (top 4 feet from finished grade) and be non-corrosive, low expansion and free of other deleterious properties that adversely affect all concrete/steel structures. The Imported borrow shall conform to Section 19-7.02 of Caltrans Standard Specifications (May 2006) and be tested prior to placement.

3. Adjust cost of following Items:

    a. Lean Concrete Base Rapid Set (LCBRS) from $300.00 to $700.00 per CY.

    b. Joint Plain Concrete Pavement (JPCP) from $500.00 to $140.00 per CY.

    c. Hot Mix Asphalt (HMA) Type "A" from $40.00 to $65.00 per ton.

    d. Rubberized Hot Mix Asphalt Type "G" from $85.00 to $95.00 per ton.

    e. (JPCP) Rapid Strength Concrete (RSC) from $500.00 to $800.00 per CY.

4. Due to curing time constraint (if needed), use RSC for all 0.80' Continuously Reinforced Concrete Pavement (CRCP) as a protective layer beneath structural sections over EPS (expanded Polystyrene) Block of the ramps and Ortega Highway pavement.

All On/Off Ramps

The following structural sections for all On-Ramps and Off-Ramps and all ramp Shoulders are based upon recommended construction of embankment by EPS Block and TI of 12:

Alternative 1

0.20' RHMA-G/0.95'HMA Type "A"/0.80' CRCP (protective slab)/ EPS Block

Alternative 2

0.85' JPCP / 0.35' LCB (RS) / 0.80' CRCP (protective slab)/ EPS Block

Alternative 3

0.80' CRCP / 0.25' HMA Type "A"/0.80' CRCP (protective slab)/ EPS Block

SR-74 (Ortega Highway)

Realign Ortega HWY Caltrans Section **(TI_{20}=14.5, EPS Block)**

The following structural sections for Ortega Highway based upon recommended construction of embankment by EPS Block and TI of 14.5:

Alternative 1

0.20'RHMA-G / 1.20' HMA Type "A" / 0.80' CRCP / (protective slab)/ EPS Block

Alternative 2

1.00' JPCP / 0.35' LCB / 0.80' CRCP (protective slab)/ EPS Block

Alternative 3

0.95' JPCP / 0.35' LCB / 0.80' CRCP (protective slab)/ EPS Block

Realign Ortega HWY (Shoulder) Caltrans Section **(TI_{20}=9.0, R=40)**

Alternative 1

0.20'RHMA-G / 0.65' HMA Type "A" / 0.80' CRCP / (protective slab)/ EPS Block

Alternative 2

0.70' JPCP / 0.35' LCB / 0.80' CRCP (protective slab)/ EPS Block

5. The join between the existing pavement and the new pavement shall be sealed. A layer of tack coat shall be applied to all vertical-cut faces and between subsequent HMA lifts.

For further assistance, please contact Farhad Hadjibabaie at (949) 724-2129.

Prepared by:

Farhad Hadjibabaie, PE
Materials & Research Branch
Division of Project Delivery
RCE # 50175

Concurred by:

Behdad Baseghi, Ph.D, PE, GE, PMP
Chief, Materials & Research Branch
Division of Project Delivery
RCE # 47051

Cc: Matt Cugini
David Lam
File

12-ORA 5/74, PM 9.4-9.9
EA 0E3101
08-09-11

State of California | Business, Transportation and Housing Agency

Memorandum

To: Fred Faizi, Chief
Design Branch "C"

Date: March 17, 2011

File: 12-Ora- (I-5/74)
Ortega Highway Interchange
PM: 9.4-9.9
EA: 0E3101

From: **DEPARTMENT OF TRANSPORTATION**
District 12
Materials and Research Branch

Cat: 441.01

Subject: **Revised thickness of LCB and pavement for Ramp Termini.**

Per PPB 08-nn Rigid Pavement Base Design change the thickness of the Lean Concrete Base Rapid Set (LCBRS) from 0.40' to 0.35'.
Also per Highway Design Manual July 2008, change the thickness of the Joint Plane Concrete Pavement (JPCPT) Rapid Strength (RSC) from 0.85' to 0.80' with lateral support. This project is proposed by City of San Juan Capistrano, in cooperation with the California Department of Transportation (Caltrans) to reconstruct the existing I-5/74 (Ortega Highway) Interchange (widening all On and Off Ramps, and bridge,...) in City of San Juan Capistrano. The construction will require the temporary closure of half of the Ortega Highway / I-5 freeway Overcrossing in each direction for the duration of construction (construction of new bridge), also this project requires additional HOV Lane, widening of on and off ramps (Cloverleaf design).
The area is located within the reference limits.

M&R Branch is in process to provide you with most updated and edited SSP's and nSSP's at 65% PS&E stage.

For further assistant, please contact Farhad Hadjibabaie at (949) 724-2129.

Prepared by:

Farhad Hadjibabaie, PE
Materials & Research Branch
Division of Project Delivery
RCE # 50175

Concurred by:

Behdad Baseghi, Ph.D, PE, GE, PMP
Chief, Materials & Research Branch
Division of Project Delivery
RCE # 47051

Cc: Matt Cugini
David Lam
File

12-ORA 5/74, PM 9.4-9.9
EA 0E3101
03-17-11

Farhad Hadjibabaie /D12/Caltrans/CA Gov

08/04/2011 02:20 PM

To David Lam/D12/Caltrans/CAGov@DOT

cc

bcc

Subject SR-74 & I-5

Hi David, for all on and off ramp for alternative 1 use "0.20' RHMA-G/0.95' HMA Type A/0.80' CRCP", Also for Ortega Highway with TI of 14.5 (in Caltrans R/W) use "0.20' RHMA-G/1.20' HMA Type A/0.80' CRCP". Use these value, I will provide you a memo next week. In our materials report we used 0.35' of AS class-2, that why it was less HMA type A.
Farhad

State of California

Business, Transportation and Housing Agency

Memorandum

To: Matthew Cugini, Chief
Design Branch "C"

From: **DEPARTMENT OF TRANSPORTATION**
District 12
Materials and Research Branch

Date: February 01, 2010
File: 12-Ora-I-5, SR-74
PM: (9.40-9.90), (0.0-0.2)
Materials Letter Report
MLR-EA#0E3101
Cat: 441.01

Subject: I-5, SR-74 Construction of new Traffic Interchange, widening the ramps on Northbound Southbound of I-5 to and from SR-74.

In accordance with your request, Materials and Research (M&R) Branch has reviewed the proposed construction of new traffic interchange, realignment of proposed new on/off ramps project to provide you with recommendations for pavement structural sections.

This report provides pavement design and materials recommendations in accordance with Topic 114 of Highway Design Manual (September 2006). There are other issues such as settlement/slope stability of ramp embankment fills, groundwater elevations, etc. that will be addressed by Roadway Geotechnical Design-South from HQ.

1.0 Introduction

The California Department of Transportation (Department), in cooperation with the City of San Juan Capistrano (the City), it is proposes to construct a new traffic interchange to replace the existing San Diego Freeway (I-5)/SR-74 (Ortega Highway) Interchange in San Juan Capistrano. Realign existing ramps and reconstruction of new bridge over southbound and northbound lanes of I-5 from PM 9.40 through PM R9.9 and PM 0.00 through PM 0.20 of SR-74. The proposed improvements will facilitate traffic flows and ease congestion along Ortega Highway.

2.0 Existing Facility

The existing Interchange is a compact diamond Interchange consisting of I-5 Freeway and Ortega Highway separation. Ortega Highway forms the principal East-West Route from the I-5 Freeway to the Eastern San Juan Capistrano. The Western end of Ortega Highway terminate in a T-Intersection at Camino Capistrano. The Ortega Highway is designated as SR-74 from I-5 Freeway to East and terminate in Riverside County. The number of lanes in I-5 varies from 4 mixed-flow lanes, and 1 HOV lane in each direction. The SR-74 (Ortega Highway) consist of two Westbound and two Eastbound lanes from I-5 freeway to Via Cordova, there is additional dedicated right turn lane on each side of SR-74. The number of lanes on all existing ramps varies from one to three lanes at interchange of I-5 and SR-74.

3.0 Proposed Project Improvement

The proposed project is composed of the following components:

1. Construction of new realigned on/off ramp at Interchange I-5 / SR-74 and construction of partial Cloverleaf at interchange.
2. Removal of existing bridge and construction of a new bridge on SR-74 over I-5.
3. Construction of Retaining walls

4.0 Terrain and Surface Drainage

The project site is located in a commercial/residential area. The topography of the roadway alignment slopes up gently from I-5 to SR-74 for all ramps. Drainage is generally toward the outer shoulders in the traveled way.

5.0 Subsurface and Groundwater Conditions

The subsurface investigation that was conducted by Materials & Research (M&R) Branch is discussed in detail in Section 9. The purpose of this investigation was to obtain samples from the sub-grade soils for laboratory testing. Details of laboratory testing are discussed in Section 10. Drilling was conducted in the ramps, shoulders, gores and Gas Station Parking lot where proposed reconstruction is planned. Groundwater was not detected in any of our coring and we have no information regarding the groundwater elevations in this area. The groundwater issues shall be addressed by Roadway Geotechnical Design-South. It is required that groundwater levels be kept a minimum of 5 feet below the pavement structural section.

6.0 Cut and Fill Construction

The proposed reconstruction of interchange is listed in Section 3.0. Per laboratory test results of the core sample it is imperative to consider this sub-grade as unsuitable material. Also construction of embankment (4 feet finish grade) need imported materials with R-Value of 40 and an expansion index of less than 50 ant PI of less than 12 per section 19-5 of Caltrans May 2006 edition of Standard Specifications, and subject to inspection and approval by the Resident Engineer.
The other alternative is that, place Class 3 AS for top 4 feet finish grade, the Class 3 Aggregate Sub-Base (AS Class 3) shall comply with sections 25-1.02A, 25-1.04, 25-1.05 of Caltrans May 2006 edition of Standard Specifications.

7.0 Earthwork

7.1 General Earthwork Requirements

All earthworks shall conform to requirements of Section 19 of Caltrans May 2006 edition of Standard Specifications, and project Special Provisions. Compaction of soils shall be conducted

in accordance with Section 19-5 of the Caltrans Standard Specifications. Any temporary sloping, sheeting and shoring shall be made the Contractor's responsibility. Appropriate measures shall be taken to prevent damage to adjacent structures and utilities. It should be noted that it is the responsibility of the Contractor to oversee the safety of the workers in the field during construction. The Contractor shall conform to all applicable occupational safety and health standards, rules, regulations, and orders established by the State of California.

7.2 Construction Observation and Testing

It is recommended that inspection and testing be performed during the following stages of construction:

- Grading operations.
- Removal of existing shoulder structural sections and dikes.
- Preparation of pavement sub-grade.
- Placement of aggregate sub-base.
- Placement of Pavement sections.
- When any unusual conditions are encountered.

For all flexible pavements, it is imperative that special attention be given to mix design and compaction requirements. A copy of the approved mix design (field samplings/ laboratory test results) for Hot Mix Asphalt (HMA) and summary of all field compaction records (HMA, AS and sub-grade) shall be provided to our office at the conclusion of the construction activities and during the project closeout. We also request a copy of all field temperature measurements to be submitted to our office at project closeout.

8.0 Traffic Index

Traffic Index (TI) value of 15.0 for I-5 Traveled Lane, TI value of 9.5 for Traveled Lane Shoulder. TI value of 14.5 for SR-74 at East of Del Obispo, TI value of 9.0 for SR-74 Shoulder, TI value of 12.0 for all Ramps and Ramps Shoulders, TI value of 12 for all Ramp Termini and TI value of 10 for Ortega Highway at the West of Del Obispo (City Section). The TI Values are per section 613.5 (Specific Traffic Loading Consideration) of Highway Design Manual September 2006, that traveled way and shoulders should be engineered using the mainline ESALs and the load distribution factor of 1.0 for exclusive truck lanes as noted in Table 613.3B.

9.0 Summary of Field Investigation

There was no **Deflection Study conducted** for the above-mentioned Traveled Lane, Shoulder and Ramps.

Our field investigation was performed on July 27, 2009 and July 28, 2009, and consisted of conducting eight cores in the traveled lane, shoulder, ramp and gore areas, but five sub-grade material sample taken for sub-grade material analysis. The purpose of these cores were to obtain a representative sample from the subsurface soils from auxiliary lane, shoulder, ramps and gas station parking lot (See Coring MB-1, MB-3, MB-5, MB-8 and MB-10 shown on Boring Location Layout Plans), but remaining 3 cores were for informational purposes only. Five bulk

soil samples collected from the subsurface soils sent to District 7 laboratory for testing. Table 3 presents summary of Laboratory Test Results for these samples. Coring of pavement sections and base layer was conducted at ten locations, followed by auguring of sub-grade soils. The purpose of these cores were to measure the thickness of each layer and to evaluate presence of water and any drainage layer (ATPB, or CTPB) below the pavement, as well as obtaining representative sample of subsurface soils for laboratory testing. In our field coring investigation, there are ATPB at two locations.

Table 1 presents summary of boring location and sampling data. Table 2 presents summary of pavement section data as found during coring compared with the pavement sections presented on the as-built plans.

10.0 Laboratory Testing

The following laboratory tests were performed on each sample collected from the boring:

- Sieve Analysis (CTM 202)
- Mechanical Analysis (CTM 203)
- Atterberg Limits (CTM 204)
- Sand Equivalent (CTM 217)
- R-Value (CTM 301)
- Expansion Index (UBC 29.2)
- Resistivity and pH (CTM 643)

Table 3 presents summary of laboratory test results from sample and its location (on-ramp).

10.1 Corrosion Testing

Soil sample obtained from Boring MB-1, MB-3, MB-5, MB-8 and MB-10 were sent to District 7 Materials Laboratory for PH and resistivity testing. Results of laboratory corrosion testing indicate as a corrosive sub-grade and laboratory results are presented in Table 3.

10.2 Site Corrosion Recommendations

Types of pipes or structures planned for this project and their location is not shown on the plans. Once they are identified M&R Branch should be notified and a copy of plans and specs should be provided for review. In the presents of sulfate and chloride data for subsurface soils at this Traveled lane, auxiliary lane, On Ramps and Off Ramps and shoulders, we recommend the following corrosion guidelines for structures planned for this project.

At I-5 SB Off-Ramp to SR-74 Sample MB-1:

Standard Reinforced Concrete Pipe design should be suitable for this user defined level of Chlorides.

For sulfate resistance concrete and RCP use Type IP MS Modified cement or Type II MC, minimum requirement by section 90-1.01 of Caltrans Standard Specification May 2006. The maximum Water Cement Ratio is 0.45.

A Corrugated Aluminum Pipe (CAP) and a Corrugated Aluminized Steel Pipe (CASP) should not be used due to corrosive conditions.

Plastic pipe is approved for 50 years service life for corrosive conditions. Abrasion must be elevated. Also, consider concrete headwall and concrete or metal end treatment where high fire potential exist.

At Chevron Gas Station, West side of the freeway, Sample MB-3:

Standard Reinforced Concrete Pipe design should be suitable for this user defined level of Chlorides.

For sulfate resistance concrete and RCP use Type II (MS) Modified cement or Type V Cement 7 sk/cy with 25% mineral admixture replacement (by weight), and a maximum Water Cement Ratio is 0.40.

A Corrugated Aluminum Pipe (CAP) and a Corrugated Aluminized Steel Pipe (CASP), should not be used due to corrosive conditions.

Plastic pipe is approved for 50 years service life for corrosive conditions. Abrasion must be elevated. Also, consider concrete headwall and concrete or metal end treatment where high fire potential exist.

At I-5 SB On-Ramp from SR-74 Sample MB-5:

Standard Reinforced Concrete Pipe design should be suitable for this user defined level of Chlorides.

For sulfate resistance concrete and RCP use Type IP MS Modified cement or Type II MC, minimum requirement by section 90-1.01 of Caltrans Standard Specification May 2006. The maximum Water Cement Ratio is 0.45.

A Corrugated Aluminum Pipe (CAP) and a Corrugated Aluminized Steel Pipe (CASP) should not be used due to corrosive conditions.

Plastic pipe is approved for 50 years service life for corrosive conditions. Abrasion must be elevated. Also, consider concrete headwall and concrete or metal end treatment where high fire potential exist.

At SR-74/I-5 Chevron Gas Station, at the East side of the freeway, Sample MB-8:

Standard Reinforced Concrete Pipe design should be suitable for this user defined level of Chlorides.

For sulfate resistance concrete and RCP use Type II (MS) Modified cement or Type V Cement 7 sk/cy with 25% mineral admixture replacement (by weight), and a maximum Water Cement Ratio is 0.40.

A Corrugated Aluminum Pipe (CAP) and a Corrugated Aluminized Steel Pipe (CASP), should not be used due to corrosive conditions.

Plastic pipe is approved for 50 years service life for corrosive conditions. Abrasion must be elevated. Also, consider concrete headwall and concrete or metal end treatment where high fire potential exist.

At I-5 On-Ramp NB From SR-74, Sample MB-10:

Standard Reinforced Concrete Pipe design should be suitable for this user defined level of Chlorides.

For sulfate resistance concrete and RCP use Type II (MS) Modified cement or Type V Cement 7 sk/cy with 25% mineral admixture replacement (by weight), and a maximum Water Cement Ratio is 0.40.

A Corrugated Aluminum Pipe (CAP) and a Corrugated Aluminized Steel Pipe (CASP), should not be used due to corrosive conditions.

Plastic pipe is approved for 50 years service life for corrosive conditions. Abrasion must be elevated. Also, consider concrete headwall and concrete or metal end treatment where high fire potential exist.

11.0 Findings, Conclusions and Recommendations

Our field investigation revealed that the existing pavement is not different than what is shown on the As-Built plans provided to us. Also in our field coring investigation, there are ATPB in existing traveled lane structural sections. Attached Table 2 presents a summary of existing pavement as depicted in our coring operations agrees with As-Built data presented.

Based on TI value of 15.0, and the expected heavy truck volume that uses these traveled lane, we are recommending that the pavement to be reconstructed with RHMA-G over ¾" HMA Type "A" over class 2 aggregate sub-base (below summarized all alternatives). **All ramps will have same structural sections in order to compensate for wheel off tracking of heavy trucks on the shoulder area.**

Per as built plan this project may encounter areas that from top of the pipe to finish grade and/or top of RCB to finished grade may require special structural sections. If thickness of the cover on

portion of the widening over the existing Reinforced Concrete Box (RCB) and Reinforced Concrete Pipe (RCP) are less than 1.00', M&R Branch recommends special full depth HMA [0.20' of Rubberized Hot Mix Asphalt Type "G" (RHMA-G) over 0.80' of Hot Mix Asphalt (HMA) Type "A"] over all RCB and RCP. This special section shall extend at least 2.0' from each side of the RCB and RCP. For all other areas over excavate 4' below finished grade and 2' from each side of all RCB and RCP, then replace with compacted fill with class 2 aggregate base to elevation of top of the pipe with 95% compaction per Section 19-3.06 of Caltrans Standard Specification (May 2006). The other alternative is over excavate 3' below finish grade and 2' from each side of all RCB and RCP, then place 2-sack cement slurry mix to the elevation of top of the pipe per section 19-3.062 of Caltrans Standard Specifications (May 2006).

Based on our sample test results of sub-grade material within 5 feet of finished grade (EI=71, PI=15), the result of our laboratory test classified the sub-grade is a unsuitable material. Therefore M&R Branch recommends 4 feet over excavate from finish grade. Also, Prior to the placement of pavement sections, scarify 0.5' of sub-grade then compact the scarified sub-grade to 95%, then place class 3 AS or imported borrow with R-value 40 per section 19-5 of the Caltrans Standard Specifications.

The following summarizes our recommendations that are also summarized in Table 3:

Ramp Widening ***(TI_{20}=12.0, R=40)***

Alternative 1

0.20' RHMA-G / 0.95' HMA Type "A" / 0.35' AS (Class-2) / 2.50' Imported Borrow

Alternative 2

0.20' RHMA-G / 0.95' HMA Type "A" / 2.85' AS (Class-3)

Ramp Shoulder Widening ***(TI_{20}=12.0, R=40)***

Alternative 1

0.20' RHMA-G / 0.95' HMA Type "A" / 0.35' AS (Class-2) / 2.50' Imported Borrow

Alternative 2

0.20' RHMA-G / 0.95' HMA Type "A" / 2.85' AS (Class-3)

Traveled Way (I-5) ***(TI_{20}=15.0, R=40)***

Alternative 1

0.20' RHMA-G / 1.30' HMA Type "A" / 0.35' AS (Class-2) / 2.15' Imported Borrow

Alternative 2

0.20' RHMA-G / 1.30' HMA Type "A" / 2.50' AS (Class-3)

Traveled Way Shoulder Widening ***(TI_{20}=9.5, R=40)***

Alternative 1

0.20 RHMA-G / 0.60' HMA Type "A" / 0.35' AS (Class-2) / 2.85' Imported Borrow

Alternative 2

0.20 RHMA-G / 0.70' HMA Type "A" / 3.10' AS (Class-3)

Realign Ortega HWY Caltrans Section ***(TI_{20}=14.5, R=40)***

Alternative 1

0.20'RHMA-G / 1.05' HMA Type "A" / 0.35' AS (Class-2) / 2.40' Imported Borrow

Alternative 2

0.20'RHMA-G / 1.05' HMA Type "A" / 2.75' AS (Class-3)

Realign Ortega HWY (Shoulder) Caltrans Section ***(TI_{20}=9.0, R=40)***

Alternative 1

0.20'RHMA-G / 0.55' HMA Type "A" / 0.35' AS (Class-2) / 2.90' Imported Borrow

Alternative 2

0.20'RHMA-G / 0.55' HMA Type "A" / 3.25' AS (Class-3)

Detour Ortega HWY Caltrans Section ***(TI=10.0, R=40)***

1.0' HMA Type "A"/0.35' AS (Class-2)

Detour I-5 ***(TI=10.0, R=40)***

1.0' HMA Type "A"/0.35' AS (Class-2)

Detour All Ramp ***(TI=10.0, R=40)***

1.0' HMA Type "A"/0.35' AS (Class-2)

Realign Ortega HWY City Section ***(TI_{20}=10.0, R=40)***

Alternative 1

0.20 RHMA-G / 0.65' HMA Type "A" / 0.35' AS (Class-2) / 2.80' Imported Borrow

Alternative 2

0.20 RHMA-G / 0.65' HMA Type "A" / 0.35' AS (Class-2) / 2.80' AS (Class-3)

Ramp Termini ***(TI_{20}=12.0, R=40)***

Alternative 1

0.85' JPCP / 0.40' LCB / 0.60' AS (Class-2)

Alternative 2

0.85' JPCP / 0.40' HMA Type "A" / 0.60' AS (Class-2)

12.0 Materials Available

Imported borrow is required for construction of embankments within the project limits. Local sources of construction materials were not investigated in this study. However, materials are available from several commercial suppliers throughout Orange, Los Angeles, Riverside and San Bernardino Counties. Furthermore, the Web-Site of Department of Conservation on the Internet contains a current listing of mining operations eligible to sell materials to the State of California. The page can be accessed at: http://www.consrv.ca.gov/omr/index.htm

13.0 Limitations

This report is intended for the use of Caltrans for the proposed construction of new interchange, traveled lane, shoulder and ramps in the City of San Juan Capistrano, California. This report is based on the project as described and the information obtained from the exploratory borings at the approximate locations indicated on the attached plans. The findings and recommendations contained in this report are based on the results of the field investigation, laboratory tests, and engineering analyses. In addition, soils and subsurface conditions encountered in the exploratory borings are presumed to be representative of the project site. However, subsurface conditions and characteristics of soils between exploratory borings can vary. The findings reflect an interpretation of the direct evidence obtained. The recommendations presented in this report are based on the assumption that an appropriate level of quality control and quality assurance (inspections and tests) will be provided during construction. District Materials and Research Branch should be notified of any pertinent changes in the project plans or if subsurface conditions are found to vary from those described herein. Such changes or variations may require a re-evaluation of the recommendations contained in this report.

The data, opinions, and recommendations contained in this report are applicable to the specific design element(s) and location(s) which is (are) the subject of this report. They have no applicability to any other design elements or to any other locations and any and all subsequent users accept any and all liability resulting from any use or reuse of the data, opinions, and recommendations without the prior written consent of the District Materials and Research Branch.

This report is prepared in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions. No other representation, expressed or implied, and no warranty or guarantee is included or intended.

14.0 Recommended Materials Specifications

The following requirements shall be included in the project specifications:

- Prior to the placement of pavement construction sections on native soils, the native soils within upper 4.0 feet to the finished grade shall be tested and verified to have a minimum R-value of 40 as required in Table 3. The native soils be non-corrosive to metal and concrete and have an expansive index (EI) of less than 50 or plasticity index of less than 12. If the existing native soils within upper 4.0 feet to the finished grade is determined that not meeting the above requirements, the existing native soils shall be over-excavated and replaced with imported borrow or class 3 aggregate sub-base to meet the imported fill recommendations herein. Borrow materials shall conform to Section 19-7.02 of Caltrans Standard Specifications (May 2006).

- If needed, for pavement reconstruction sections on imported fill areas, the engineering fill within the upper 4.0 feet to the finished grade shall have an R-value of at least 40. If imported material needed, the imported fill be non-corrosive to metal and concrete and have an expansive index (EI) of less than 50 or plasticity index (PI) of less than 12. Non-corrosive

requirements shall be based on Caltrans Corrosion Guidelines (1996), class 3 aggregate sub-base may be used for this project.

- Edge drain does not required for this project.

- Prior to the placement of pavement sections, scarify 0.5' of sub-grade then compact the scarified sub-grade to 95% per section 19-5 of the Caltrans Standard Specifications. All sub-grade soils shall be compacted in accordance with Section 19-5.03 of Caltrans Standard Specification (May 2006).

- Saw cut and remove the existing traveled ways and shoulders (HMA pavement). The HMA pavement shall be saw cut to full depth.

- It is imperative that special attention is given to the mix design, compaction and temperature requirements for rigid and flexible pavement as stated in Caltrans Standard Specifications and Project Standard Special Provisions (SSPs).

- The prime coat and tack coat applications and requirements shall follow Sections 39-4.02 of the Caltrans Standard Specifications July 2007.

- Specifications are required for Hot Mix Asphalt (HMA) treatment by applying prime coat on AS prior to the placement of HMA.

- Tack coat shall be applied to all vertical faces of existing HMA pavement and construction joints in which additional HMA material is to be placed, and to other surfaces designated in the Special Provisions.

- Special attention is required to be given to the following sections of May 2006 Standard Specifications:

  Section 19: Earthwork;
  Section 25: Aggregate Sub-bases;
  Section 39: Hot Mix Asphalt;
  Section 61: Culvert and Drainage Pipe Joints;
  Section 63: Cast-In-Place Concrete Pipe;
  Section 64: Plastic Pipe;
  Section 65: Reinforced Concrete Pipe;
  Section 68: Subsurface Drains (Edge Drains);
  Section 90: Portland Cement Concrete;
  Section 92: Asphalts;
  Section 93: Liquid Asphalts;
  Section 94: Asphaltic Emulsion.

- All Standard Special Provisions (SSPs) to be included in the project shall be submitted to the Materials and Research Branch for review and approval.

- It is critical that construction and rehabilitation effort be coordinated such that a uniform superior product is delivered.

If you have any questions, please call Farhad Hadjibabaie at Ex-2129.

Prepared by:

Farhad Hadjibabaie, P.E.
Materials & Research Branch
Division of Project Delivery
RCE No. 50175

Concurred by:

Behdad Baseghi, Ph.D., P.E., G.E., PMP
Chief, Materials & Research Branch
Division of Project Delivery
RCE No. 47051, GE No. 2310

Attachments: Figure 1: Site Location Map
Boring Location Layout Plans
Tables: 1 through 3

Cc: Frank Lin
David Lam
File

REGISTERED PROFESSIONAL ENGINEER
FARHAD HADJIBABAIE
No. C50175
Exp 6/30/11
CIVIL
STATE OF CALIFORNIA

Ora-I5/SR-74, PM 9.4-9.9, 0.0-0.20
EA: 0E3101
February 01, 2010

Table 1-SUMMARY OF BORING AND SAMPLING DATA (I-5/SR-74)

Route No.	Boring No.	Boring Location Station	Offset (ft)	Sample Depth (ft)	Sample Type	USCS Soil Type	Existing AC/CTB /AB (ft)	Sampled by	Sampling Date	Date sent to Lab	As Built Info. Available	Proposed OGFC (ft)	Proposed RHMA-G (ft)	Proposed HMA (ft)	Proposed AS (ft)
I-5/SR74	MB-1	3+30 SB off-ramp	8'	5.0	Sub-grade	CL	0.35'	FH/MA	07/29/09	07/29/09	N/A	0	0.20	0.95	2.85
I-5/SR74	MB-3	10+00, SB Chevron	SE corner	5.0	Sub-grade	CL	0.67'	FH/MA	07/29/09	07/29/09	N/A	0	0.20	0.95	2.85
I-5/SR74	MB-5	515+35 SN on-ramp	6'	5.0	Sub-grade	CL	0	FH/MA	07/29/09	07/29/09	N/A	0	0.20	0.95	2.85
I-5/SR74	MB-8	517+40 NB off-ramp	8'	5.0	Sub-grade	CL	0.35	FH/MA	07/29/09	07/29/09	N/A	0	0.20	0.95	2.85
I-5/SR74	MB-10	525+00 NB on-ramp	4'	5.0	Sub-grade	CL	0.40'/0.25/ 0.50/0.35	FH/MA	07/29/09	07/29/09	N/A	0	0.20	0.95	2.85

Table 2-SUMMARY OF LABORATORY TEST RESULTS (I-5/SR-74)

Route No.	Boring No.	Sample No.	Sample Depth (ft)	% Passing #200	SE	USCS Soil Type	Expansion Index	LL	PL	PI	R-Value	PH	Sulfate Content (ppm)	Chloride Content (ppm)	Resistivity (Ohm-cm)	Dry Density (PCF)	Remarks
I-5/SR74	MB-1	MB-1	5	66	7	CL	65	39	19	20	12	7.94	1,700	50	690	109.6	
I-5/SR74	MB-3	MB-3	5	84	4	CL	100	53	26	27	15	5.61	3.900	30	810	97.9	
I-5/SR74	MB-5	MB-5	5	91	3	CL	139	53	27	26	14	5.84	550	45	500	98.3	
I-5/SR74	MB-8	MB-8	5	83	4	CL	115	53	27	26	14	7.37	9,200	390	440	99.9	
I-5/SR74	MB-10	MB-10	5	47	12	CL	40	32	17	26	15	8.04	6,100	450	960	115.3	

MB	1"	¾"	½"	3/8"	#4	#8	#16	#30	#50	#100	#200	PI	EI	SE	R-V	Remarks
1	100	100	100	100	98	96	94	89	81	74	66	20	65	7	12	
3	100	100	100	99	98	98	96	95	92	89	84	27	100	4	15	
5	100	100	100	100	100	100	98	97	97	95	91	26	139	3	14	
8	100	100	99	99	96	94	93	91	90	87	83	26	115	4	14	
10	100	99	97	95	90	85	80	73	63	54	47	15	40	12	15	

Table 3-SUMMARY OF CORING VS As-BUILT DATA (I-5/SR-74)

			Existing Pavement (ft)								As-Built Pavement (ft)						
Route No. & Direction	Boring No.	Boring Location Station	HMA (ft)	ATPB (ft)	CTB (ft)	AB (ft)	AS (ft)	PCC (ft)	AC (ft)	AB/ AS (ft)	AC (ft)	ATPB (ft)	CTB (ft)	AB (ft)	AS (ft)	AB/AS (ft)	Remarks
I-5	MB-1	3+30	0.35'	-	-	0.50	-	-	-	-	-	-	-	-	-	-	I-5, SB, off-ramp shoulder @ MVP, 8' from Rt. of right shoulder.
I-5	MB-2	3+30	0.60'	0.25'	0.65'	-	-	-	-	-	-	-	-	-	-	-	I-5, SB, off-ramp lane @ MVP, 8' left of right shoulder
I-5	MB-3	10+00	0.67'	-	-	0.50	-	-	-	-	-	-	-	-	-	-	I-5, SE corner of Chevron Gas station @ Del Obispo and Ortega HWY.
I-5	MB-4	515+35	0.67'	-	0.50'	-	-	-	-	-	-	-	-	-	-	-	I-5, SB on-ramp, lane #2, 8' from right shoulder.
I-5	MB-5	515+35	0.67'	-	-	-	-	-	-	-	-	-	-	-	-	-	I-5, SB on-ramp, 6' right of right shoulder (on the dirt)
I-5	MB-7	6+80	0.67'	-	0.50'	-	-	-	-	-	-	-	-	-	-	-	I-5, NB off-ramp, 6' from right of right shoulder.
I-5	MB-8	517+40	0.35'	-	-	-	-	-	-	-	-	-	-	-	-	-	I-5, NB off-ramp, @ MVP, 8' right of right shoulder.
I-5	MB-10	526+00	0.40'	0.25'	0.50'	-	0.35	-	-	-	-	-	-	-	-	-	I-5, NB on-ramp @ MVP, 4' left of right shoulder in lane # 5

Core #	Location	AC thickness	ATPB	CTB	AB/AS	Remarks
MB-1	MVP, 400' N. of SR-74, SB off-ramp from I-5	4"				Dark Brown Silty Clay with Grave
MB-2	Lane #2, 400' N. of SR-74, SB off-ramp from I-5	7"	3"	7.5"		
MB-3	Chevron gas station @ SE corner, 26988 Del Obispo/74	8"				Brown Sity Clay
MB-4	Lane #2, 200' S. of SR-74 SB on-ramp to I-5	8"		6"		
MB-5	Rt. Shoulder, 200' S. of SR-74 SB on-ramp to I-5					Silty Clay
MB-7	Rt. Shoulder, 500' S. of SR-74, NB off-ramp from I-5	8"		6"		
MB-8	MVP, 50' S. of SR-74, NB off-ramp from I-5	4"				Brown Silty Clay
MB-10	MVP, 500' N. of SR-74, on-ramp to I-5	5"	3"	6"	4"	Black, organic clay

MB-1 SB, Off-Ramp at MVP 8' from Edge of shoulder.
MB-2 SB, Off-Ramp at MVP, 15' from MB-1, 8' inside Off-Ramp Shoulder.
MB-3 in the Chevron Gas Station at the corner of Del Obispo and Ortega HWY. MB-3 is SE corner of Gas station building.
MB-4 SB On-Ramp Lane #2, 8' from right shoulder.
MB-5 SB On-Ramp, 6' right of right shoulder.
MB-6 NB Off-Ramp, 8' from Right Shoulder at the beginning of ramp.
MB-7 NB Off-Ramp, 6' from right of right shoulder.
MB-8 NB Off-Ramp, at MVP, 8' Right of right shoulder.
MB-9 at gas station 76 and driveway to Best western Hotel, at 10' south of 76 gas sign, or 12' south of sidewalk.
MB-10 NB On-Ramp at MVP 4' left of the right shoulder in the lane.

DISTRICT 7 SOIL & AGGREGATE TESTS

1	2	0	E	3	1	0	1			M	B	-	1		0523
CONTRACT NO.										SAMPLE NO.					LAB. NO.

Sample of: SOIL

Sampled from: I - 5 OFF RAMP TO SR 74 ORTEGA HWY

Material Source: ORIGINAL GROUND AT JOBSITE

Owner / Mfr.: STATE

Date Sampled: 7/28/09

Materials Lab. Stamp

By PSA for

G. ANYANWU

District Materials Engineer

DATE RCV'D: 07/29/09 DATE OUT: 8-18

NUMBER OF CONTAINERS: 1 BAG

By: FAX ✓ MAIL PHONE OTHER

NORMAL PRIORITY ✓ DATE NEEDED:

R.E.: FARHAD HADJIBABAIE

Address: PROJ. DELIVERY - 505
3337 MICHELSON DR.
SUITE 300
IRVINE, CA 92612-8894

Phone No.: 949-724-2129

Fax. No.: 949-724-2591

DISTRICT MATERIALS LABORATORY
1616 S. Maple Street
Los Angeles, CA 90015

Phone: (213) 620-5692
Calnet: 8-640-5692
Fax: (213) 620-5540
Calnet: 8-640-5540

GRADING ANALYSIS

Total Wt 9720 g By: HC/AR Date: 7/29/09

Wt. Ret.	Size (mm)	Acc. Wt. Ret.	% Ret.	% Pass	Comb. % Pass	SPEC.
	87.5					
	75					
	62.5					
	50					
	37.5					
	25					
	19					
0	12.5	0				
48	9.5	48	0		100	
126	4.75	174	2		98	
9546		9720				

FINE GRADE / MECHANICAL ANALYSIS

Dry Wt. (g) 115.0 g

			0	100	98	
	2.36 mm	2	2	98	96	
	1.18 mm	5	4	96	94	
	600 µm	10	9	91	89	
	300 µm	19	17	83	81	
	150 µm	28	24	76	74	
	75 µm	38	33	67	66	

MECH. / HYDRO.		R	Corr.	C.R.	Mat'l in Sus.	Comb % Pass
1hr.	5M	38.0	7.0	31.0	27%	26%
24hr.	1M	31.0	7.0	24.0	21%	21%

SAND EQUIVALENT

				MIN. SPEC.
Sand R2	0.9	0.9	Avg.	
Clay R1	13.6	13.4	7	
S.E. Value	7	7		

L.A.R.T.	Rev.	Wt.	Wt. Ret.	% Ret.	% Loss	% SPEC
A B	100	5000g				
C D	500	5000g				

No. of spheres = Wt. of spheres =

DURABILITY INDEX

		SPEC.
Dura-Coarse	Sed.Ht.=	
Dura-Fine	R2/R1 =	

R-VALUE BATCH

% Run	Size	Wt.
	25 mm	
100	19 mm	1200
100	12.5 mm	1200
100	9.5 mm	1200
98	4.75 mm	1176

% CRUSHED PARTICLES

%Ret.x(Wt.Cr./Tot.Wt.) = Prod.

% CP = P/R

Wtd. Avg. % CP Ret. No.4 =

SPEC.

R-VALUE

RESULT 12 SPEC.

SP. G. FINE (SSD)

(B) S.S. Dry	
(A) Ov. Dry	
ABS. %	
Wt. S+C+H2O	
Wt. S+C	
W=Wt. H2O	

$$\text{Bulk} = \frac{500}{500 - W} =$$

SP. GR. COARSE CT206/CT209, +4

(B) S.S. Dry	
(A) Ov. Dry	
ABS. %	
(C) Wt. S. in H2O	

$$\text{App} = \frac{A}{A - C} =$$

$$\text{SSD} = \frac{B}{B - C} =$$

$$\text{OD} = \frac{A}{B - C} =$$

MOISTURE CONTENT

		SPEC.
Gr. Wet		
Gr. Dry		
H2O		
Tare		
Net Dry		
% H2O		

PLASTICITY INDEX

L.L.	39
P.L.	19
P.I.	20

pH / RESISTIVITY

	Field	Lab.	MIN. SPEC.
Soil pH		7.94	5.5~10.0
H2O pH			
Min. Resistivity		690	NL/ 1000

Based on 18 gauge CMP. ☆

Estimated life:

CLEANNESS VALUE

NL	SED. HT.	RESULT

FILM STRIPPING

NL

ORGANIC IMPURITIES

Satisfactory

Unsatisfactory

TEST(S) REQUESTED

			✓
■	Fine Grade	202	✓
■	Coarse Grade	202	✓
	Filler Material	202	
■	Mech. Analysis	203	✓
■	Plasticity Index	204	✓
	% Crushed Particles	205	
	SpG. Coarse	206	
	SpG. Fine (SSD)	207	
	SpG. of Soils	209	
	L.A.R.T.	211	
	Unit Wt.	212	
	Organic Impurities	213	
	Soundness	214	
	Relative Compaction	216	
■	Sand Equivalent	217	✓
	Moisture Content	226	
	Cleaness Value	227	
	Durability Fine	229	
	Durability Coarse	229	
	Reactivity	ASTM C-289	
■	R-Value	301	✓
	Film Strip	302	
	Mortar Strength	515	
	pH (RC)	532	
	Resistivity (RC)	532	
■	pH (CMP)	643	✓
■	Resistivity (CMP)	643	✓
■	Expansion Index	UBC-29-2	✓
	Max. Dry Density/ Opt. Moist Content	ASTM-D1557	

SAMPLE TYPE

A.B.		PCC	
A.S.		Bk.Fill	
EMB.		MISC.	
O.G.		Sub-Grade	
A.C. Agg.		SOIL	✓

TL-101 S.I.C. NO.

C 101084

Expansion Index

65.0

Initial Dry Density (pcf)	109.6
Molded Moisture, (%)	10.1

0 - 20 Very Low
21 - 50 Low
51 - 90 Medium
91 - 130 High
≥ 131 Very High/Critical

Laboratory Remarks:

☆Send sample to Sacramento for CT 417 & CT 422, resistivity is < 1000 ohm / cc.

SPECIFIC GRAVITY OF SOILS

Wt Oven Dry Soil (Wo)
Wt Pycnometer + H_2O (Wa)
Wt Pycnometer + H2O + Soil (Wb)
Wo / (Wo + Wa - Wb)

Wo		Spec.	
Wa		Grav.	
Wb			

CONTRACT NO. 12-0E3101 LAB. NO. 0523

DISTRICT 7 SOIL & AGGREGATE TESTS

1	2	0	E	3	1	0	1			M	B	-	3		0524
		CONTRACT NO.								SAMPLE NO.					LAB. NO.

Sample of: SOIL

Sampled from: I - 5 @ CHEVRON GAS STATION WEST PARKING LOT

Material Source: ORIGINAL GROUND AT JOBSITE

Owner / Mfr.: STATE

Materials Lab. Stamp

By PSQ for

G. ANYANWU

District Materials Engineer

DATE RCV'D: 07/29/09 DATE OUT: 8-18

NUMBER OF CONTAINERS: 1 BAG

By: FAX ✓ MAIL PHONE OTHER

NORMAL PRIORITY ✓ DATE NEEDED:

Date Sampled: 7/28/09

R.E.: FARHAD HADJIBABAIE

Address: PROJ. DELIVERY - 505, 3337 MICHELSON DR., SUITE 300, IRVINE, CA 92612-8894

Phone No.: 949-724-2129

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Los Angeles, CA 90015

Phone: (213) 620-5692
Calnet: 8-640-5692
Fax: (213) 620-5540
Calnet: 8-640-5540

GRADING ANALYSIS

Total Wt 10895 g By: HC/AR Date: 8/3/09

Wt. Ret.	Size (mm)	Acc. Wt. Ret.	% Ret.	% Pass	Comb. % Pass	SPEC.
	87.5					
	75					
	62.5					
	50					
	37.5					
	25					
0	19	0				
49	12.5	49	0		100	
47	9.5	96	1		99	
119	4.75	215	2		98	
10680		10895				

R-VALUE BATCH

% Run	Size	Wt.
	25 mm	
100	19 mm	1200
100	12.5 mm	1200
99	9.5 mm	1188
98	4.75 mm	1176

% CRUSHED PARTICLES

%Ret.x(Wt.Cr./Tot.Wt.) = Prod.

% CP = P/R

Wtd. Avg. % CP Ret. No.4 = SPEC.

FINE GRADE / MECHANICAL ANALYSIS

Dry Wt. (g)						
			0	100	98	
	2.36 mm	0	0	100	98	
	1.18 mm	1	2	98	96	
65.0 g	600 µm	2	3	97	95	
	300 µm	4	6	94	92	
	150 µm	6	9	91	89	
	75 µm	9	14	86	84	

MECH. / HYDRO.		R	Corr.	C.R.	Mat'l in Sus.	Comb % Pass
1hr.	5M	32.0	7.0	25.0	38%	37%
24hr.	1M	23.0	7.0	16.0	25%	25%

SAND EQUIVALENT

					MIN. SPEC.
Sand R2	0.4	0.4		Avg.	
Clay R1	13.2	13.1		4	
S.E. Value	4	4			

L.A.R.T.	Rev.	Wt.	Wt. Ret.	% Ret.	% Loss	% SPEC
A B	100	5000g				
C D	500	5000g				

No. of spheres = Wt. of spheres =

DURABILITY INDEX

			SPEC.
Dura-Coarse	Sed.Ht.=		
Dura-Fine	R2/R1 =		

R-VALUE

RESULT 15 SPEC.

SP. G. FINE (SSD)

(B) S.S. Dry	
(A) Ov. Dry	
ABS. %	
Wt. S+C+H2O	
Wt. S+C	
W=Wt. H2O	

$$\text{Bulk} = \frac{500}{500 - W} =$$

SP. GR. COARSE CT206/CT209, +4

(B) S.S. Dry	
(A) Ov. Dry	
ABS. %	
(C) Wt. S. in H2O	

$$\text{App} = \frac{A}{A - C} =$$

$$\text{SSD} = \frac{B}{B - C} =$$

$$\text{OD} = \frac{A}{B - C} =$$

MOISTURE CONTENT

		SPEC.
Gr. Wet		
Gr. Dry		
H2O		
Tare		
Net Dry		
% H2O		

PLASTICITY INDEX

L.L.	53
P.L.	26
P.I.	27

pH / RESISTIVITY

	Field	Lab.	MIN. SPEC.
Soil pH		5.61	5.5~10.0
H2O pH			
Min. Resistivity		810	NL/ 1000

Based on 18 gauge CMP. ☆

Estimated life:

CLEANNESS VALUE

NL	SED. HT.	RESULT

FILM STRIPPING

NL

ORGANIC IMPURITIES

Satisfactory

Unsatisfactory

TEST(S) REQUESTED

			✓
■	Fine Grade	202	✓
■	Coarse Grade	202	✓
	Filler Material	202	
■	Mech. Analysis	203	✓
■	Plasticity Index	204	✓
	% Crushed Particles	205	
	SpG. Coarse	206	
	SpG. Fine (SSD)	207	
	SpG. of Soils	209	
	L.A.R.T.	211	
	Unit Wt.	212	
	Organic Impurities	213	
	Soundness	214	
	Relative Compaction	216	
■	Sand Equivalent	217	✓
	Moisture Content	226	
	Cleaness Value	227	
	Durability Fine	229	
	Durability Coarse	229	
	Reactivity	ASTM C-289	
■	R-Value	301	✓
	Film Strip	302	
	Mortar Strength	515	
	pH (RC)	532	
	Resistivity (RC)	532	
■	pH (CMP)	643	✓
■	Resistivity (CMP)	643	✓
■	Expansion Index	UBC-29-2	✓
	Max. Dry Density/ Opt. Moist Content	ASTM-D1557	

SAMPLE TYPE

			✓
A.B.		PCC	
A.S.		Bk.Fill	
EMB.		MISC.	
O.G.		Sub-Grade	
A.C. Agg.		SOIL	✓

TL-101 S.I.C. NO.

C 101085

Expansion Index

100.0

Initial Dry Density (pcf)	97.9
Molded Moisture, (%)	13.6

0 - 20 Very Low
21 - 50 Low
51 - 90 Medium
91 - 130 High
≥ 131 Very High/Critical

Laboratory Remarks:

☆Send sample to Sacramento for CT 417 & CT 422, resistivity is < 1000 ohm / cc.

SPECIFIC GRAVITY OF SOILS

Wt Oven Dry Soil (Wo)
Wt Pycnometer + H_2O (Wa)
Wt Pycnometer + H2O + Soil (Wb)
Wo / (Wo + Wa - Wb)

Wo		Spec. Grav.	
Wa			
Wb			

CONTRACT NO. 12-0E3101 LAB. NO. 0524

07-AGG-SSD (RG/SD 7/93, Rev. DH 03/17/01)

DISTRICT 7 SOIL & AGGREGATE TESTS

1	2	0	E	3	1	0	1			M	B	-	5		0525
		CONTRACT NO.								SAMPLE NO.					LAB. NO.

Sample of: SOIL

Sampled from: I - 5 ON RAMP SB TO SR 74 ORTEGA HWY

Material Source: ORIGINAL GROUND AT JOBSITE

Owner / Mfr.: STATE

Date Sampled: 7/27/09

Materials Lab. Stamp

By PSA for

G. ANYANWU

District Materials Engineer

DATE RCV'D: 07/29/09

DATE OUT: 8-18

NUMBER OF CONTAINERS: 1 BAG

By: FAX ✓ MAIL PHONE OTHER

NORMAL PRIORITY ✓ DATE NEEDED:

R.E.: FARHAD HADJIBABAIE

Address: PROJ. DELIVERY - 505, 3337 MICHELSON DR., SUITE 300, IRVINE, CA 92612-8894

Phone No.: 949-724-2129

Fax. No.: 949-724-2591

DISTRICT MATERIALS LABORATORY
1616 S. Maple Street
Los Angeles, CA 90015

Phone: (213) 620-5692
Calnet: 8-640-5692
Fax: (213) 620-5540
Calnet: 8-640-5540

GRADING ANALYSIS

Total Wt 11585 g By: HC/AR Date: 8/3/09

Wt. Ret.	Size (mm)	Acc. Wt. Ret.	% Ret.	% Pass	Comb. % Pass	SPEC.
	87.5					
	75					
	62.5					
	50					
	37.5					
	25					
0	19	0				
3	12.5	3				
13	9.5	16				
37	4.75	53	0		100	
11532		11585				

R-VALUE BATCH

% Run	Size	Wt.
	25 mm	
100	19 mm	1200
100	12.5 mm	1200
100	9.5 mm	1200
100	4.75 mm	1200

% CRUSHED PARTICLES

%Ret.x(Wt.Cr./Tot.Wt.) = Prod.

% CP = P/R

SPEC.

Wtd. Avg. % CP Ret. No.4 =

FINE GRADE / MECHANICAL ANALYSIS

Dry Wt.			0	100	100	
(g)	2.36 mm	0	0	100	100	
65.0 g	1.18 mm	1	2	98	98	
	600 µm	2	3	97	97	
	300 µm	2	3	97	97	
	150 µm	3	5	95	95	
	75 µm	6	9	91	91	

MECH. / HYDRO.		R	Corr.	C.R.	Mat in Sus.	Comb % Pass
1hr.	5M	31.0	7.0	24.0	37%	37%
24hr.	1M	20.0	7.0	13.0	20%-	20%

SAND EQUIVALENT

Sand R2	0.2	0.3		Avg.	MIN. SPEC.
Clay R1	12.9	13.1		3	
S.E. Value	2	3			

L.A.R.T.	Rev.	Wt.	Wt. Ret.	% Ret.	% Loss	% SPEC
A B	100	5000g				
C D	500	5000g				

No. of spheres = Wt. of spheres =

DURABILITY INDEX

			SPEC.
Dura-Coarse	Sed.Ht.=		
Dura-Fine	R2/R1 =		

R-VALUE

RESULT 14 SPEC.

SP. G. FINE (SSD)

(B) S.S. Dry	
(A) Ov. Dry	
ABS. %	
Wt. S+C+H2O	
Wt. S+C	
W=Wt. H2O	
Bulk = 500 / 500 - W =	

SP. GR. COARSE CT206/CT209, +4

(B) S.S. Dry	
(A) Ov. Dry	
ABS. %	
(C) Wt. S. in H2O	
App = A / A - C =	
SSD = B / B - C =	
OD = A / B - C =	

MOISTURE CONTENT

		SPEC.
Gr. Wet		
Gr. Dry		
H2O		
Tare		
Net Dry		
% H2O		

PLASTICITY INDEX

L.L.	53
P.L.	27
P.I.	26

pH / RESISTIVITY

	Field	Lab.	MIN. SPEC.
Soil pH		5.84	5.5~10.0
H2O pH			
Min. Resistivity		500	NL/ 1000

Based on 18 gauge CMP. ☆

Estimated life:

CLEANNESS VALUE

NL	SED. HT.	RESULT

FILM STRIPPING

NL

ORGANIC IMPURITIES

Satisfactory

Unsatisfactory

TEST(S) REQUESTED

			✓	SAMPLE TYPE			✓
■	Fine Grade	202	✓	A.B.		PCC	
■	Coarse Grade	202	✓	A.S.		Bk.Fill	
	Filler Material	202		EMB.		MISC.	
■	Mech. Analysis	203	✓	O.G.		Sub-Grade	
■	Plasticity Index	204	✓	A.C. Agg.		SOIL	✓
	% Crushed Particles	205					
	SpG. Coarse	206					
	SpG. Fine (SSD)	207					
	SpG. of Soils	209					
	L.A.R.T.	211					
	Unit Wt.	212					
	Organic Impurities	213					
	Soundness	214					
	Relative Compaction	216					
■	Sand Equivalent	217	✓				
	Moisture Content	226					
	Cleaness Value	227					
	Durability Fine	229					
	Durability Coarse	229					
	Reactivity	ASTM C-289					
■	R-Value	301	✓				
	Film Strip	302					
	Mortar Strength	515					
	pH (RC)	532					
	Resistivity (RC)	532					
■	pH (CMP)	643	✓				
■	Resistivity (CMP)	643	✓				
■	Expansion Index	UBC-29-2	✓				
	Max. Dry Density/ Opt. Moist Content	ASTM-D1557					

TL-101 S.I.C. NO.

C 101086

Expansion Index

139.0

Initial Dry Density (pcf)	98.3
Molded Moisture, (%)	13.0

0 - 20 Very Low
21 - 50 Low
51 - 90 Medium
91 - 130 High
≥131 Very High/Critical

Laboratory Remarks:

☆Send sample to Sacramento for CT 417 & CT 422, resistivity is < 1000 ohm / cc.

SPECIFIC GRAVITY OF SOILS

Wt Oven Dry Soil (Wo)
Wt Pycnometer + H_2O (Wa)
Wt Pycnometer + H2O + Soil (Wb)
Wo / (Wo + Wa - Wb)

Wo		Spec. Grav.	
Wa			
Wb			

CONTRACT NO. 1 2 - 0 E 3 1 0 1

LAB. NO. 0 5 2 5

☆ 07-AGG-SSD (RG/SD 7/93, Rev. DH 03/17/01)

DISTRICT 7 SOIL & AGGREGATE TESTS

Sample of: SOIL

Sampled from: I - 5 OFF RAMP NB TO SR 74 ORTEGA HWY

Material Source: ORIGINAL GROUND AT JOBSITE

Owner / Mfr.: STATE

Date Sampled: 7/27/09

Materials Lab. Stamp

By PSQ for

G. ANYANWU

District Materials Engineer

1	2	0	E	3	1	0	1			M	B	-	8		0526
CONTRACT NO.										SAMPLE NO.					LAB. NO.

DATE RCV'D: 07/29/09

DATE OUT: 8-18

NUMBER OF CONTAINERS: 1 BAG

NORMAL | PRIORITY ✓ | DATE NEEDED:

By: FAX ✓ MAIL PHONE OTHER

R.E.: FARHAD HADJIBABAIE

Address:
PROJ. DELIVERY - 505
3337 MICHELSON DR.
SUITE 300
IRVINE, CA 92612-8894

Phone No.: 949-724-2129

Fax. No.: 949-724-2591

DISTRICT MATERIALS LABORATORY
1616 S. Maple Street
Los Angeles, CA 90015

Phone: (213) 620-5692
Calnet: 8-640-5692
Fax: (213) 620-5540
Calnet: 8-640-5540

GRADING ANALYSIS

Total Wt 10475 g | By: HC/AR | Date: 8/5/09

Wt. Ret.	Size (mm)	Acc. Wt. Ret.	% Ret.	% Pass	Comb. % Pass	SPEC.
	87.5					
	75					
	62.5					
	50					
	37.5					
0	25	0				
24	19	24	0		100	
47	12.5	71	1		99	
79	9.5	150	1		99	
225	4.75	375	4		96	
10100		10475				

R-VALUE BATCH

% Run	Size	Wt.
	25 mm	
100	19 mm	1200
99	12.5 mm	1188
99	9.5 mm	1188
96	4.75 mm	1152

% CRUSHED PARTICLES

%Ret.x(Wt.Cr./Tot.Wt.) = Prod.

% CP = P/R

SPEC.

Wtd. Avg. % CP Ret. No.4 =

FINE GRADE / MECHANICAL ANALYSIS

Dry Wt. (g) 65.0 g

		0	100	96	
2.36 mm	1	2	98	94	
1.18 mm	2	3	97	93	
600 µm	3	5	95	91	
300 µm	4	6	94	90	
150 µm	6	9	91	87	
75 µm	9	14	86	83	

MECH. / HYDRO.		R	Corr.	C.R.	Mat In Sus.	Comb % Pass
1hr.	5M	31.0	7.0	24.0	37%	36%
24hr.	1M	22.0	7.0	15.0	23%	22%

R-VALUE

RESULT 14 | SPEC.

SP. G. FINE (SSD)

(B) S.S. Dry
(A) Ov. Dry
ABS. %
Wt. S+C+H2O
Wt. S+C
W=Wt. H2O

$$\text{Bulk} = \frac{500}{500 - W} =$$

MOISTURE CONTENT

Gr. Wet
Gr. Dry
H2O
Tare
Net Dry
% H2O

SPEC.

PLASTICITY INDEX

L.L. 53

P.L. 27

P.I. 26

SAND EQUIVALENT

					MIN. SPEC.
Sand R2	0.4	0.4		Avg.	
Clay R1	12.4	12.4		4	
S.E. Value	4	4			

SP. GR. COARSE CT206/CT209, +4

(B) S.S. Dry
(A) Ov. Dry
ABS. %
(C) Wt. S. in H2O

$$App = \frac{A}{A - C} =$$

$$SSD = \frac{B}{B - C} =$$

$$OD = \frac{A}{B - C} =$$

pH / RESISTIVITY

	Field	Lab.	MIN. SPEC.
Soil pH		7.37	5.5~10.0
H2O pH			
Min. Resistivity		440	NL/ 1000

Based on 18 gauge CMP. ☆

Estimated life:

L.A.R.T.

	Rev.	Wt.	Wt. Ret.	% Ret.	% Loss	% SPEC
A B	100	5000g				
C D	500	5000g				

No. of spheres = Wt. of spheres =

DURABILITY INDEX

		SPEC.
Dura-Coarse	Sed.Ht.=	
Dura-Fine	R2/R1 =	

CLEANNESS VALUE

NL	SED. HT.	RESULT

FILM STRIPPING

NL

ORGANIC IMPURITIES

Satisfactory
Unsatisfactory

TEST(S) REQUESTED

			✓
■	Fine Grade	202	✓
■	Coarse Grade	202	✓
	Filler Material	202	
■	Mech. Analysis	203	✓
■	Plasticity Index	204	✓
	% Crushed Particles	205	
	SpG. Coarse	206	
	SpG. Fine (SSD)	207	
	SpG. of Soils	209	
	L.A.R.T.	211	
	Unit Wt.	212	
	Organic Impurities	213	
	Soundness	214	
	Relative Compaction	216	
■	Sand Equivalent	217	✓
	Moisture Content	226	
	Cleaness Value	227	
	Durability Fine	229	
	Durability Coarse	229	
	Reactivity	ASTM C-289	
■	R-Value	301	✓
	Film Strip	302	
	Mortar Strength	515	
	pH (RC)	532	
	Resistivity (RC)	532	
■	pH (CMP)	643	✓
■	Resistivity (CMP)	643	✓
■	Expansion Index	UBC-29-2	✓
	Max. Dry Density/ Opt. Moist Content	ASTM-D1557	

SAMPLE TYPE

A.B.		PCC	
A.S.		Bk.Fill	
EMB.		MISC.	
O.G.		Sub-Grade	
A.C. Agg.		SOIL	✓

TL-101 S.I.C. NO.

C 101087

Expansion Index

115.0

Initial Dry Density (pcf)	99.9
Molded Moisture, (%)	12.5

0 - 20 Very Low
21 - 50 Low
51 - 90 Medium
91 - 130 High
≥ 131 Very High/Critical

Laboratory Remarks:
☆Send sample to Sacramento for CT 417 & CT 422, resistivity is < 1000 ohm / cc.

SPECIFIC GRAVITY OF SOILS

Wt Oven Dry Soil (Wo)
Wt Pycnometer + H_2O (Wa)
Wt Pycnometer + H2O + Soil (Wb)
Wo / (Wo + Wa - Wb)

Wo | Spec.
Wa | Grav.
Wb

CONTRACT NO. 12-0E3101

LAB. NO. 0526

DISTRICT 7 SOIL & AGGREGATE TESTS

Sample of: SOIL

Sampled from: I - 5 ON RAMP NB TO SR 74 ORTEGA HWY

Material Source: ORIGINAL GROUND AT JOBSITE

Owner / Mfr.: STATE

Date Sampled: 7/27/09

Materials Lab. Stamp

By PSQ for

G. ANYANWU

District Materials Engineer

1	2	0	E	3	1	0	1		M	B	-	1	0		0527
CONTRACT NO.									SAMPLE NO.						LAB. NO.

DATE RCV'D: 07/29/09

DATE OUT: 8-18

NUMBER OF CONTAINERS: 1 BAG

By: FAX ✓ MAIL PHONE OTHER

NORMAL PRIORITY ✓

DATE NEEDED:

R.E.: FARHAD HADJIBABAIE

Address:
PROJ. DELIVERY - 505
3337 MICHELSON DR.
SUITE 300
IRVINE, CA 92612-8894

Phone No.: 949-724-2129

Fax. No.: 949-724-2591

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Los Angeles, CA 90015

Phone: (213) 620-5692
Calnet: 8-640-5692
Fax: (213) 620-5540
Calnet: 8-640-5540

GRADING ANALYSIS

Total Wt 12589 g By: HC/AR Date: 7/30/09

Wt. Ret.	Size (mm)	Acc. Wt. Ret.	% Ret.	% Pass	Comb. % Pass	SPEC.
	87.5					
	75					
	62.5					
	50					
0	37.5	0				
47	25	47	0		100	
53	19	100	1		99	
280	12.5	380	3		97	
201	9.5	581	5		95	
634	4.75	1215	10		90	
11374		12589				

R-VALUE BATCH

% Run	Size	Wt.
	25 mm	
100	19 mm	1200
98	12.5 mm	1176
96	9.5 mm	1152
91	4.75 mm	1092

% CRUSHED PARTICLES

%Ret.x(Wt.Cr./Tot.Wt.) = Prod.

Wtd. Avg. % CP Ret. No.4 =

% CP = P/R

SPEC.

FINE GRADE / MECHANICAL ANALYSIS

Dry Wt.			0	100	90	
(g)	2.36 mm	7	6	94	85	
115.0 g	1.18 mm	13	11	89	80	
	600 µm	22	19	81	73	
	300 µm	35	30	70	63	
	150 µm	46	40	60	54	
	75 µm	55	48	52	47	

MECH. / HYDRO.		R	Corr.	C.R.	Mat'l in Sus.	Comb % Pass
1hr.	5M	34.0	7.0	27.0	23%	21%
24hr.	1M	26.0	7.0	19.0	17%	15%

R-VALUE

RESULT 15 SPEC.

SP. G. FINE (SSD)

(B) S.S. Dry
(A) Ov. Dry
ABS. %
Wt. S+C+H2O
Wt. S+C
W=Wt. H2O

$$\text{Bulk} = \frac{500}{500 - W} =$$

MOISTURE CONTENT

		SPEC.
Gr. Wet		
Gr. Dry		
H2O		
Tare		
Net Dry		
% H2O		

PLASTICITY INDEX

L.L.	32	
P.L.	17	
P.I.	15	

SAND EQUIVALENT

					MIN. SPEC.
Sand R2	1.6	1.6		Avg.	
Clay R1	13.5	13.4		12	
S.E. Value	12	12			

SP. GR. COARSE CT206/CT209, +4

(B) S.S. Dry
(A) Ov. Dry
ABS. %
(C) Wt. S. in H2O

$$\text{App} = \frac{A}{A - C} =$$

$$\text{SSD} = \frac{B}{B - C} =$$

$$\text{OD} = \frac{A}{B - C} =$$

pH / RESISTIVITY

	Field	Lab.	MIN. SPEC.
Soil pH		8.04	5.5~10.0
H2O pH			
Min. Resistivity		960	NL/ 1000

Based on 18 gauge CMP. ☆

Estimated life:

CLEANNESS VALUE

NL	SED. HT.	RESULT

L.A.R.T.

	Rev.	Wt.	Wt. Ret.	% Ret.	% Loss	% SPEC
A B	100	5000g				
C D	500	5000g				

No. of spheres = Wt. of spheres =

DURABILITY INDEX

		SPEC.
Dura-Coarse	Sed.Ht.=	
Dura-Fine	R2/R1 =	

FILM STRIPPING

NL

ORGANIC IMPURITIES

Satisfactory
Unsatisfactory

TEST(S) REQUESTED

			✓
■	Fine Grade	202	✓
■	Coarse Grade	202	✓
	Filler Material	202	
■	Mech. Analysis	203	✓
■	Plasticity Index	204	✓
	% Crushed Particles	205	
	SpG. Coarse	206	
	SpG. Fine (SSD)	207	
	SpG. of Soils	209	
	L.A.R.T.	211	
	Unit Wt.	212	
	Organic Impurities	213	
	Soundness	214	
	Relative Compaction	216	
■	Sand Equivalent	217	✓
	Moisture Content	226	
	Cleaness Value	227	
	Durability Fine	229	
	Durability Coarse	229	
	Reactivity	ASTM C-289	
■	R-Value	301	✓
	Film Strip	302	
	Mortar Strength	515	
	pH (RC)	532	
	Resistivity (RC)	532	
■	pH (CMP)	643	✓
■	Resistivity (CMP)	643	✓
■	Expansion Index	UBC-29-2	✓
	Max. Dry Density/ Opt. Moist Content	ASTM-D1557	

SAMPLE TYPE

			✓
A.B.		PCC	
A.S.		Bk.Fill	
EMB.		MISC.	
O.G.		Sub-Grade	
A.C. Agg.		SOIL	✓

TL-101 S.I.C. NO.

C 101088

Expansion Index

40.0

Initial Dry Density (pcf)	115.3
Molded Moisture, (%)	8.5

0 - 20 Very Low
21 - 50 Low
51 - 90 Medium
91 - 130 High
≥ 131 Very High/Critical

Laboratory Remarks:

☆Send sample to Sacramento for CT 417 & CT 422, resistivity is < 1000 ohm / cc.

SPECIFIC GRAVITY OF SOILS

Wt Oven Dry Soil (Wo)
Wt Pycnometer + H_2O (Wa)
Wt Pycnometer + H2O + Soil (Wb)
Wo / (Wo + Wa - Wb)

Wo		Spec.	
Wa		Grav.	
Wb			

CONTRACT NO. 1 2 - 0 E 3 1 0 1

LAB. NO. 0 5 2 7

07-AGG-SSD (RG/SD 7/93, Rev. DH 03/17/01)

CORROSION TEST SUMMARY REPORT - Soil/Water

Bridge Name:
Bridge Number:
EA No.: **12-0E3101**
Dist/Co/Rte/PM or KP: **12 / ORA / I-5/SR-74 Interchange/ PM 9.4-9.9**

SIC Number (TL101)	Sample Location	Sample Type	Sample Depth	Minimum Resistivity[1](ohm-cm)	pH[2]	Chloride Content[3] (ppm)	Sulfate Content[4](ppm)
C101084/MB-1	I-5 SB OFF RAMP TO SR 74 ORTEGA HWY	SOIL	0/JOBSITE	690	7.94	50	1700
C101085/MB-3	I-5 @ CHEVRON GAS STATION West	SOIL	0/JOBSITE	810	5.61	30	3900
C101086/MB-5	I-5 ON RAMP SB from SR 74	SOIL	0/JOBSITE	500	5.84	45	550
C101087/MB-8	SR 74/I5 @ Chevron Gas Station East	SOIL	0/JOBSITE	440	7.37	390	9200
C101088/MB-10	I-5 ON RAMP NB from SR 74	SOIL	0/JOBSITE	960	8.04	450	6100

This site is corrosive (see note below for MSE wall backfill).

Controlling corrosion parameters are as follows:

5.61 pH
450 ppm Chloride
9200 ppm Sulfate

Note: For MSE wall structure backfill material, minimum resisitivity must be 2000 ohm-cm or greater, pH must be between 5.5 and 10.0, chloride content must not be greater than 250 ppm, and sulfate content must not be greater than 500 ppm.

[1,2]CTM 643, [3]CTM 422, [4]CTM 417

MAINTENANCE-FREE SERVICE DESIGN ESTIMATES FOR DRAINAGE FACILITIES USING:
CALIFORNIA CULVERT CRITERIA AND CULVERT4.EXE, (RELEASE DATE 04-16-98)

PROJECT LOCATION...I-5 and SR-74 Interchange

PROJECT ACCOUNT NO.EA 12-0E3101

SAMPLE LOCATION....I-5 SB Off-Ramp to SR-74

TEST SAMPLE NO.....C101084, MB-1

OPERATOR.....FH

TEST DATE.....07-29-09

********** A DATA VALUE OF ZERO INDICATES NO DATA INPUT **********

CSP SITE pH = 7.9 , WATER pH = 7.9 , SOIL pH = 7.9

MINIMUM RESISTIVITY, OHM-CM: CSP SITE = 690 , WATER = 690 , SOIL = 690

CHLORIDES, PPM... 50 , SULFATES, PPM... 1700

****

ESTIMATED SERVICE LIFE OF CSP CULVERTS, YEARS
SEE CALTRANS HIGHWAY DESIGN MANUAL CHAPTER 850

CSP THICK Gage & in	GALV. 2 oz	GALV.+ BIT COAT. (WATER SIDE)	GALV.+ BIT COAT & PAVED INV. (ABRASION)	GALV.+ BIT COAT (SOIL SIDE)	GALV.+ POLYMER 90 DEG INVERT
18 0.052	21	29	36	46	71
16 0.064	27	35	42	52	77
14 0.079	34	42	49	59	84
12 0.109	47	55	62	72	97
10 0.138	60	68	75	85	110
08 0.168	72	80	87	97	122

FLOW VEL. <5 fps WITH NON-ABRASIVE CONDITIONS, (DEFAULT VALUES)
CAP, 18 GAGE (0.052 in) CSP AND CASP MAY BE USED WITH THESE FLOW VELOCITIES

STANDARD REINFORCED CONCRETE PIPE DESIGN SHOULD BE
SUITABLE FOR THIS USER DEFINED LEVEL OF CHLORIDES

FOR SULFATE RESISTANT CONCRETE AND RCP
TYPE IP (MS) MODIFIED CEMENT OR TYPE II MODIFIED CEMENT
MINIMUM REQUIURED BY CALTRANS STD. SPECS. 90-1.01
MAXIMUM W/C RATIO OF 0.45

A CORRUGATED ALUMINUM PIPE, CAP, SHOULD NOT BE USED
DUE TO CORROSIVE CONDITIONS

A CORRUGATED ALUMINIZED STEEL PIPE, CASP, SHOULD NOT BE USED
DUE TO CORROSIVE CONDITIONS

PLASTIC PIPE IS APPROVED FOR 50 YEARS SERVICE LIFE FOR
CORROSIVE CONDITIONS. ABRASION MUST BE EVALUATED. ALSO,
CONSIDER CONCRETE HEADWALLS AND CONCRETE OR METAL END
TREATMENT WHERE HIGH FIRE POTENTIAL EXISTS.

MAINTENANCE-FREE SERVICE DESIGN ESTIMATES FOR DRAINAGE FACILITIES USING:
CALIFORNIA CULVERT CRITERIA AND CULVERT4.EXE, (RELEASE DATE 04-16-98)

PROJECT LOCATION...I-5 and SR-74 Interchange

PROJECT ACCOUNT NO.EA 12-0E3101

SAMPLE LOCATION....I-5 Chevron Gas Station West

TEST SAMPLE NO.....C101085, MB-3

OPERATOR.....FH

TEST DATE.....07-29-09

********** A DATA VALUE OF ZERO INDICATES NO DATA INPUT **********

CSP SITE pH = 5.6 , WATER pH = 5.6 , SOIL pH = 5.6

MINIMUM RESISTIVITY, OHM-CM: CSP SITE = 810 , WATER = 810 , SOIL = 810

CHLORIDES, PPM... 30 , SULFATES, PPM... 3900

****

ESTIMATED SERVICE LIFE OF CSP CULVERTS, YEARS
SEE CALTRANS HIGHWAY DESIGN MANUAL CHAPTER 850

CSP THICK Gage & in	GALV. 2 oz	GALV.+ BIT COAT. (WATER SIDE)	GALV.+ BIT COAT & PAVED INV. (ABRASION)	GALV.+ BIT COAT (SOIL SIDE)	GALV.+ POLYMER 90 DEG INVERT
18 0.052	6	14	21	31	56
16 0.064	7	15	22	32	57
14 0.079	9	17	24	34	59
12 0.109	13	21	28	38	63
10 0.138	16	24	31	41	66
08 0.168	20	28	35	45	70

FLOW VEL. <5 fps WITH NON-ABRASIVE CONDITIONS, (DEFAULT VALUES)
CAP, 18 GAGE (0.052 in) CSP AND CASP MAY BE USED WITH THESE FLOW VELOCITIES

STANDARD REINFORCED CONCRETE PIPE DESIGN SHOULD BE
SUITABLE FOR THIS USER DEFINED LEVEL OF CHLORIDES

FOR SULFATE RESISTANT CONCRETE AND RCP
TYPE II MODIFIED CEMENT OR TYPE V CEMENT
7 sk/cy WITH 25% MINERAL ADMIXTURE REPLACEMENT (BY WEIGHT)
AND A MAXIMUM WATER-TO-CEMENTITIOUS RATIO OF 0.40

A CORRUGATED ALUMINUM PIPE, CAP, SHOULD NOT BE USED
DUE TO CORROSIVE CONDITIONS

A CORRUGATED ALUMINIZED STEEL PIPE, CASP, SHOULD NOT BE USED
DUE TO CORROSIVE CONDITIONS

PLASTIC PIPE IS APPROVED FOR 50 YEARS SERVICE LIFE FOR
CORROSIVE CONDITIONS. ABRASION MUST BE EVALUATED. ALSO,
CONSIDER CONCRETE HEADWALLS AND CONCRETE OR METAL END
TREATMENT WHERE HIGH FIRE POTENTIAL EXISTS.

MAINTENANCE-FREE SERVICE DESIGN ESTIMATES FOR DRAINAGE FACILITIES USING:
CALIFORNIA CULVERT CRITERIA AND CULVERT4.EXE, (RELEASE DATE 04-16-98)

PROJECT LOCATION...I-5 and SR-74 Interchange

PROJECT ACCOUNT NO.EA 12-0E3101

SAMPLE LOCATION....I-5 On-ramp SB From SR-74

TEST SAMPLE NO.....C101086, MB-5

OPERATOR.....FH

TEST DATE.....07-29-09

********** A DATA VALUE OF ZERO INDICATES NO DATA INPUT **********

CSP SITE pH = 5.8 , WATER pH = 5.8 , SOIL pH = 5.8

MINIMUM RESISTIVITY, OHM-CM: CSP SITE = 500 , WATER = 500 , SOIL = 500

CHLORIDES, PPM... 45 , SULFATES, PPM... 550

****

ESTIMATED SERVICE LIFE OF CSP CULVERTS, YEARS
SEE CALTRANS HIGHWAY DESIGN MANUAL CHAPTER 850

CSP THICK Gage & in	GALV. 2 oz	GALV.+ BIT COAT. (WATER SIDE)	GALV.+ BIT COAT & PAVED INV. (ABRASION)	GALV.+ BIT COAT (SOIL SIDE)	GALV.+ POLYMER 90 DEG INVERT
18 0.052	4	12	19	29	54
16 0.064	5	13	20	30	55
14 0.079	6	14	21	31	56
12 0.109	9	17	24	34	59
10 0.138	11	19	26	36	61
08 0.168	13	21	28	38	63

FLOW VEL. <5 fps WITH NON-ABRASIVE CONDITIONS, (DEFAULT VALUES)
CAP, 18 GAGE (0.052 in) CSP AND CASP MAY BE USED WITH THESE FLOW VELOCITIES

STANDARD REINFORCED CONCRETE PIPE DESIGN SHOULD BE
SUITABLE FOR THIS USER DEFINED LEVEL OF CHLORIDES

CONCRETE AND RCP MITIGATION MEASURES FOR pH
TYPE IP (MS) MODIFIED CEMENT OR TYPE II MODIFIED CEMENT
MINIMUM REQUIRED BY CALTRANS STD. SPECS. 90-1.01
MAXIMUM W/C RATIO OF 0.45

A CORRUGATED ALUMINUM PIPE, CAP, SHOULD NOT BE USED
DUE TO CORROSIVE CONDITIONS

A CORRUGATED ALUMINIZED STEEL PIPE, CASP, SHOULD NOT BE USED
DUE TO CORROSIVE CONDITIONS

PLASTIC PIPE IS APPROVED FOR 50 YEARS SERVICE LIFE FOR
CORROSIVE CONDITIONS. ABRASION MUST BE EVALUATED. ALSO,
CONSIDER CONCRETE HEADWALLS AND CONCRETE OR METAL END
TREATMENT WHERE HIGH FIRE POTENTIAL EXISTS.

MAINTENANCE-FREE SERVICE DESIGN ESTIMATES FOR DRAINAGE FACILITIES USING:
CALIFORNIA CULVERT CRITERIA AND CULVERT4.EXE, (RELEASE DATE 04-16-98)

PROJECT LOCATION...I-5 and SR-74 Interchange

PROJECT ACCOUNT NO.EA 12-0E3101

SAMPLE LOCATION....SR-74/I-5 at Chevron Gas Station East

TEST SAMPLE NO.....C101087, MB-8

OPERATOR.....FH

TEST DATE.....07-29-09

********** A DATA VALUE OF ZERO INDICATES NO DATA INPUT **********

CSP SITE pH = 7.4 , WATER pH = 7.4 , SOIL pH = 7.4

MINIMUM RESISTIVITY, OHM-CM: CSP SITE = 440 , WATER = 440 , SOIL = 440

CHLORIDES, PPM... 390 , SULFATES, PPM... 9200

****

ESTIMATED SERVICE LIFE OF CSP CULVERTS, YEARS
SEE CALTRANS HIGHWAY DESIGN MANUAL CHAPTER 850

CSP THICK Gage & in	GALV. 2 oz	GALV.+ BIT COAT. (WATER SIDE)	GALV.+ BIT COAT & PAVED INV. (ABRASION)	GALV.+ BIT COAT (SOIL SIDE)	GALV.+ POLYMER 90 DEG INVERT
18 0.052	17	25	32	42	67
16 0.064	23	31	38	48	73
14 0.079	28	36	43	53	78
12 0.109	39	47	54	64	89
10 0.138	49	57	64	74	99
08 0.168	60	68	75	85	110

FLOW VEL. <5 fps WITH NON-ABRASIVE CONDITIONS, (DEFAULT VALUES)
CAP, 18 GAGE (0.052 in) CSP AND CASP MAY BE USED WITH THESE FLOW VELOCITIES

STANDARD REINFORCED CONCRETE PIPE DESIGN SHOULD BE
SUITABLE FOR THIS USER DEFINED LEVEL OF CHLORIDES

FOR SULFATE RESISTANT CONCRETE AND RCP
TYPE II MODIFIED CEMENT OR TYPE V CEMENT
7 sk/cy WITH 25% MINERAL ADMIXTURE REPLACEMENT (BY WEIGHT)
AND A MAXIMUM WATER-TO-CEMENTITIOUS RATIO OF 0.40

A CORRUGATED ALUMINUM PIPE, CAP, SHOULD NOT BE USED
DUE TO CORROSIVE CONDITIONS

A CORRUGATED ALUMINIZED STEEL PIPE, CASP, SHOULD NOT BE USED
DUE TO CORROSIVE CONDITIONS

PLASTIC PIPE IS APPROVED FOR 50 YEARS SERVICE LIFE FOR
CORROSIVE CONDITIONS. ABRASION MUST BE EVALUATED. ALSO,
CONSIDER CONCRETE HEADWALLS AND CONCRETE OR METAL END
TREATMENT WHERE HIGH FIRE POTENTIAL EXISTS.

MAINTENANCE-FREE SERVICE DESIGN ESTIMATES FOR DRAINAGE FACILITIES USING:
CALIFORNIA CULVERT CRITERIA AND CULVERT4.EXE, (RELEASE DATE 04-16-98)

PROJECT LOCATION...I-5 and SR-74 Interchange

PROJECT ACCOUNT NO.EA 12-0E3101

SAMPLE LOCATION....I-5 On-Ramp NB From SR-74

TEST SAMPLE NO.....C101088, MB-10

OPERATOR.....FH

TEST DATE.....07-29-09

********** A DATA VALUE OF ZERO INDICATES NO DATA INPUT **********

CSP SITE pH = 8.0 , WATER pH = 8.0 , SOIL pH = 8.0

MINIMUM RESISTIVITY, OHM-CM: CSP SITE = 960 , WATER = 960 , SOIL = 960

CHLORIDES, PPM... 450 , SULFATES, PPM... 6100

****

ESTIMATED SERVICE LIFE OF CSP CULVERTS, YEARS
SEE CALTRANS HIGHWAY DESIGN MANUAL CHAPTER 850

CSP THICK Gage & in	GALV. 2 oz	GALV.+ BIT COAT. (WATER SIDE)	GALV.+ BIT COAT & PAVED INV. (ABRASION)	GALV.+ BIT COAT (SOIL SIDE)	GALV.+ POLYMER 90 DEG INVERT
18 0.052	24	32	39	49	74
16 0.064	31	39	46	56	81
14 0.079	39	47	54	64	89
12 0.109	54	62	69	79	104
10 0.138	68	76	83	93	118
08 0.168	83	91	98	108	133

FLOW VEL. <5 fps WITH NON-ABRASIVE CONDITIONS, (DEFAULT VALUES)
CAP, 18 GAGE (0.052 in) CSP AND CASP MAY BE USED WITH THESE FLOW VELOCITIES

STANDARD REINFORCED CONCRETE PIPE DESIGN SHOULD BE
SUITABLE FOR THIS USER DEFINED LEVEL OF CHLORIDES

FOR SULFATE RESISTANT CONCRETE AND RCP
TYPE II MODIFIED CEMENT OR TYPE V CEMENT
7 sk/cy WITH 25% MINERAL ADMIXTURE REPLACEMENT (BY WEIGHT)
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PLASTIC PIPE IS APPROVED FOR 50 YEARS SERVICE LIFE FOR
CORROSIVE CONDITIONS. ABRASION MUST BE EVALUATED. ALSO,
CONSIDER CONCRETE HEADWALLS AND CONCRETE OR METAL END
TREATMENT WHERE HIGH FIRE POTENTIAL EXISTS.

Memorandum

To: Matthew Cugini, Chief
Design Branch "C"

Attn: David Lam

From: **DEPARTMENT OF TRANSPORTATION**
Traffic Studies – District 12

Date: July 14, 2009

File: 12-ORA-005, 9.40/9.90
12-ORA-074, 0.00/0.20
EA: 12-0E3101

Subject: Traffic Index (TI) Calculations

Per your July 8, 2009 request, we have calculated the 10-year and 20-year design mainline and ramps TI values for the above listed project as follow:

Route	Postmile	10-Year TI (100%)	20-Year TI (100%)
005	9.40/9.90	13.5	14.7
074	0.00/0.20	13.1	14.3

Due to high volume of truck traffic on SR-74 (Ortega Highway), we recommend using a TI of 11.0 for 10-Year and a TI of 12.0 for 20-Year Design Life for all on/off ramps at this interchange.

Please be advised that the Highway Manual procedures and 2007 traffic data were used to determine these values. Should you have any questions, please contact Habib Temori, Traffic Safety Investigator, at (949) 724-2360.

JASON OSMAN, Chief
Traffic Studies Branch

c: File

Memorandum

To: Behdad Baseghi, Chief
Materials & Research Branch
Division of Project Delivery

Attn: Farhad Hadjibabaie

Date: July 21, 2009

File: 12-ORA-005, 9.40/9.90
12-ORA-074, 0.00/0.20
EA: 12-0E3100

From: **DEPARTMENT OF TRANSPORTATION**
Traffic Studies – District 12

Subject: 10-year & 20-year Traffic Index (TI) Calculations

Per your July 15, 2009 request, we have calculated the 10-year and 20-year design mainline and ramps TI values for the above listed project as follow:

Route	Postmile	10-Year TI (100%)	20-Year TI (100%)
005	9.40/9.90	13.5	14.7
074	0.00/0.20	13.1	14.3

Due to high volume of truck traffic on SR-74 (Ortega Highway), we recommend using a TI of 11.0 for 10-Year and a TI of 12.0 for 20-Year Design Life for all on/off ramps at this interchange.

Please be advised that the Highway Manual procedures and 2007 traffic data were used to determine these values. Should you have any questions, please contact Habib Temori, Traffic Safety Investigator, at (949) 724-2360.

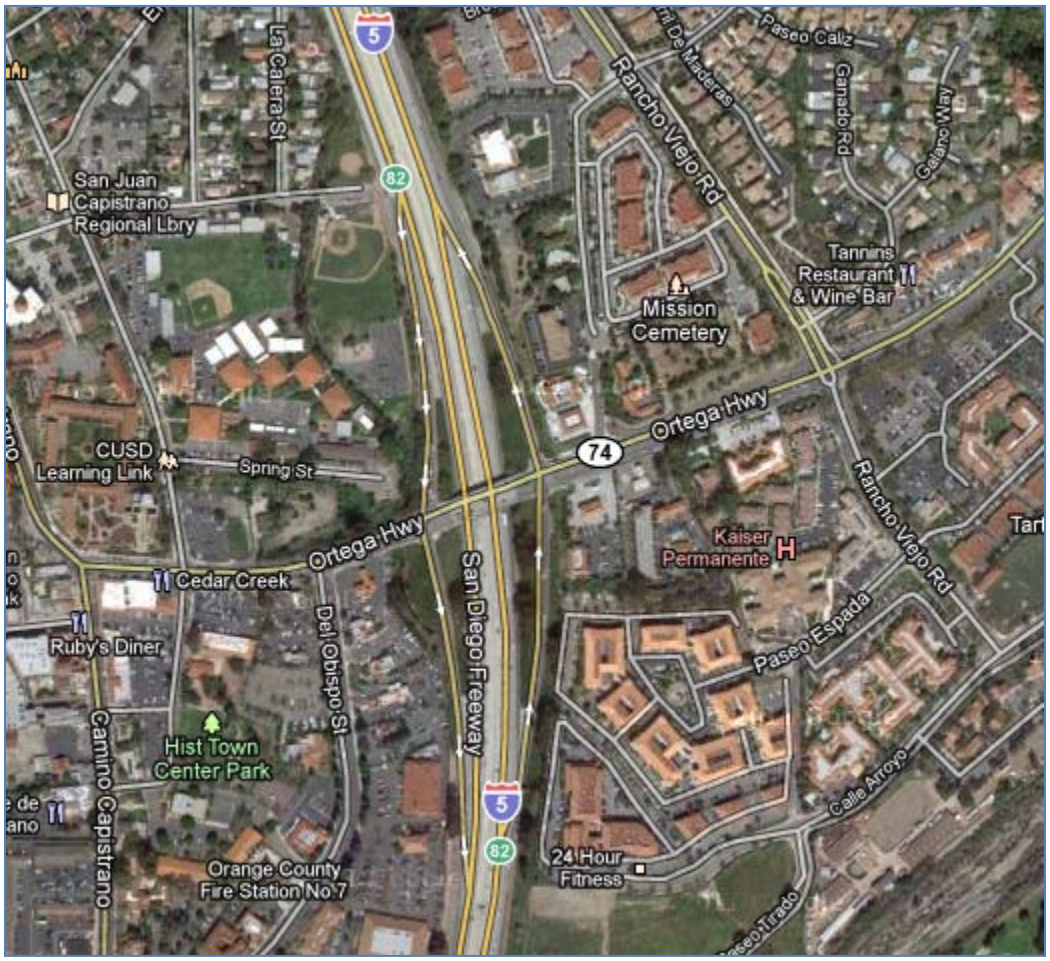
JASON OSMAN, Chief
Traffic Studies Branch

c: File

FOUNDATION REPORTS

for the replacement of the existing SR-74/I-5 interchange in the City of San Juan Capistrano

12-ORA-5/74 PM 0.01 PROJECT ID-1200000102 (EA 0E3101)



November 14, 2011

State of California

Business, Transportation and Housing Agency

Memorandum

Flex your power!
Be energy efficient!

To: **MINA PEZESHPUOR**
Senior Bridge Engineer
DES Structure Design
Office of Bridge Design South 2
21073 Pathfinder Rd., Suite 200
Diamond Bar, CA 91765

Date: November 14, 2011

File: 12-ORA-5/74- PM 0.01
Project ID 1200000102
EA 12-0E3101
Geotechnical Foundation
Recommendation Reports

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
Geotechnical Services
Office of Geotechnical Design – South 1

Subject: **Geotechnical Foundation Recommendations Reports for the replacement of the existing SR-74/I-5 interchange**

Attached please find signed copies of the following geotechnical Foundation Recommendations Reports prepared for above-referenced project. These reports incorporated the review comments received from your Office on the draft versions submitted earlier during the design phase of the project.

Report	Applicable Structures
Foundation Report for Route 74/5 Separation (Replace)	Bridge No. 55-1104
Foundation Report for RW 10, 83, 533A	Retaining wall nos. 10, 83, 533A
Foundation Report for RW 96	Retaining wall no. 96
Foundation Report for RW 513	Retaining wall no. 513

If you have any questions or need for additional information, please contact Mohammed Islam at (916) 227- 0993.

Distribution:

OGDS-1
Nooshin Yoosefi, D12 Project Manager
Mark Williams, GS Corporate
DES Office Engineer, Office of PS&E
Farhad Hadjibabaie, D12 Material Engineer
Structure Construction R.E. Pending file

FOUNDATION REPORT
for
Bridge No. 55-1104

State of California **Business, Transportation and Housing Agency**

M e m o r a n d u m

To : MR. MOHAMMAD RAVANIPOUR – CHIEF
Structures Design – Branch 19
Office of Bridge Design South 2

Date: November 9, 2011

File: 12-ORA-5/74-PM 0.01
1200000102
Bridge No. 55-1104
Route 74/5 Separation (Replace)

Attn. : Mr. Chuck Lomicka
Project Engineer

From : **DEPARTMENT OF TRANSPORTATION**
Division of Engineering Services
Geotechnical Services

Subject : Foundation Report For Route 74/5 Separation (Replace)

Scope of Work

In response to the request from the Office of Structure Design – Branch 19, dated April 29, 2011, the Office of Geotechnical Design South-1 has prepared the following foundation recommendations for the proposed bridge replacement:

Table 1: Bridge Information

Bridge Name	(New) Bridge No.	(Existing) Bridge No.
Route 74/5 Separation (Replace)	55-1104	55-0229

This Foundation Report supersedes the Preliminary Foundation Report dated June 30, 2010.

This report is based on the review of the following information:

1. Foundation Investigation for Bridge 55-0229, Route 74/5 Separation, June 1956.
2. Log of Test Borings for Bridge 55-0229, Route 74/5 Separation, May 1956.
3. "As Built" file maintained in Los Angeles Office for the existing Rte. 64/2 Sep. (Bridge No. 55-0229) dated September 24, 1958.
4. Foundation Recommendations for Bridge 55-0229, Route 74/5 Separation, July 1965.
5. Log of Test Borings and General Plan for Bridge 55-0229, Route 74/5 Separation, February 1967
6. "As Built" file maintained in Los Angeles Office for the existing Rte. 74/5 Sep. (Bridge No. 55-0229) dated April 29, 1969.
7. Field investigations including borings and Cone Penetration Test (CPT) soundings conducted by URS Corporation between June and August 2010.
8. District Preliminary Geotechnical Report for EA 12-0E3101, 5/74 Interchange Improvement Project, dated June 25, 2010.

Project Description

This project consists of constructing a new interchange that will replace the existing Route 74/5 interchange in the city of San Juan Capistrano. The project is intended to alleviate existing and future traffic congestion along SR74 (Ortega Highway) and improve non-standard roadway features to the current Caltrans standards. The project limits on Route 74 start just east of El Camino Real and end at Avenida Los Cerritos (0.20 mile). The project also includes a re-aligned I-5 NB off-ramp to SR74 and a new NB loop on-ramp from EB SR74. As part of this project, the existing Route 74/5 Separation structure will be replaced.

The existing structure was completed in 1969, and is located along Route 74 in Orange County. This segment of the freeway is currently a 10-lane freeway with 5 lanes in each direction. An advance planning study was prepared in 2004 by Parsons Transportation Group showing replacement of the existing bridge. The current General Plan shows the proposed replacement bridge will be a 2-span, Cast-in-Place/Prestressed (CIP/PS) box girder, with a total length of 278'-7" and width of 125'-6". The longer structure will accommodate the new NB loop on-ramp to I-5 and future widening of I-5. The final structure has four traffic lanes with 8'-0" shoulder in each direction, and type 26 barrier on both sides of the structure.

Field Investigation and Testing Program

The project site has been defined as hazardous waste potential area. As a result subsurface exploration of the site was performed by a Consultant, URS Corporation. For the proposed bridge replacement, one Cone Penetration Test (CPT), and seven boreholes were drilled between June and August, 2010; 1. Three boreholes were drilled using rotary wash method, and samples were collected at 5 foot interval using SPT sampler. 2. Three boreholes were continuously cored using rotary wire-line core. 3. One borehole was drilled using hollow-stem auger and samples were collected at 5 foot interval using SPT sampler.

The relatively undisturbed samples were also collected using Modified California sampler.

The borehole locations and elevations are summarized in Table 2:

Table 2: Summary of Boreholes

Borehole Number	Location (ft)		Surface Elevation (ft)	Boring Termination Elevation (ft)
	Station	Offset		
R-10-008	517+32.88	162.19 LT	136.1	45.6
RC-10-008	517+32.88	157.19 LT	136.1	-4.9
R-10-009	518+95.59	9.51 LT	120.9	64.9
R-10-010	519+40.15	173.19 LT	134.2	117.2
RC-10-021	518+19.41	142.79 RT	143.5	3.1
RC-10-028A	517+74.09	10.31 LT	119.1	-22.4
A-10-028	517+79.34	9.83 LT	119.1	67.6
CPT-10-026	519+52.02	175.74 LT	133.5	79.1

The CPT was conducted using a 20 ton capacity cone truck with a tip area of 15 cm^2 and a friction sleeve area of 225 cm^2. During CPT sounding, a Pore Pressure Dissipation Test (PPDT) was performed at selected depths to determine the groundwater elevations.

Laboratory Testing Program

Soil samples collected during subsurface exploration were tested for engineering properties and soil classification. The tests included particle size distribution (California Test Method (CTM) 203), Plasticity Index (CTM 204)), moisture content, consolidation, unconfined compression tests and corrosivity. The results of the tests are summarized and included in Appendix IV.

Site Geology and Subsurface Conditions

The subject site is located within the Peninsular Range Geomorphic Province. The Peninsular Ranges are characterized by northerly and northwesterly trending mountain ranges and associated valleys. The site is located along the southwest foothills of the Santa Ana Mountains in Orange County, which are comprised of Tertiary marine sediments overlain by Quaternary (younger) alluvium and terrace deposits along stream terraces and valleys (Edgington, W. J., CDMG 1970). The southwest foothills of the Santa Ana Mountains are bounded by the Santa Ana Mountains to the north, east and southeast and bounded by the San Joaquin Hills to the west and bounded by the Pacific Ocean to the south. Northwest-southeast trending strike-slip faults are present bordering the Santa Ana Mountains and the San Joaquin Hills (Newport-Inglewood-Rose Canyon Fault (offshore) and San Joaquin Hills Thrust Fault).

The project is located within the alluvial valleys of the Trabuco Creek and San Juan Creek and their tributaries. The lower parts of the valleys are covered with older alluvium (Quaternary age). The upper or higher elevation portions of the valleys comprised of terrace deposits (Quaternary age) which are older alluvium deposited by streams then uplifted and

down-cut into by younger streams. The alluvium and older alluvium was deposited primarily by floods emanating from the Trabuco and San Juan Creeks and their tributaries from the mountains and hills to the northeast of the project location. The alluvium and the terrace deposits are underlain by the Capistrano Formation (Tertiary age). The alluvium consists of clay, silt and fine to coarse sand and gravel that in some areas include sparse to abundant cobbles with occasional boulders. The terrace deposits consist of sandy silt, clayey sand and conglomeratic coarse-grained sand, also occasional relict clayey soil horizons. The Capistrano Formation consists of marine derived siltstone with interbedded fine grained sandstone, thin pebble sand beds, and thin hard calcareous beds, and also can be locally diatomaceous and tuffaceous. There are fill slopes associated primarily with the existing southbound on and off ramps and with Route 74 west of the I-5. The fill is estimated to range in thickness up to approximately 25 feet. The material of the fill slopes consists of varied amounts of sand, clay, sandy clay, silty clay and silty sand.

Based on the review of subsurface exploration data prepared by URS Corporation and available As-Built LOTBs, the site specific subsurface conditions at the bridge location generally consist of medium stiff to very stiff clay layers with a sandy layer embedded between clay layers, underlain by sedimentary rock (siltstone and claystone). Near Abutment 3, subsurface materials consist of mostly sandy materials with a clay layer, underlain by sedimentary rock. The generalized soil layer information is presented in the geotechnical recommendation section.

The groundwater elevation was estimated to be at an elevation 108.0 feet based on PPDT performed by URS.

Corrosion Evaluation

Corrosivity of subsurface materials was tested in accordance with CTM 532, 643, 417, and 422. The test results indicated that the subsurface materials in the project area are non-corrosive. The test results are presented as follows:

Table 3: Corrosion Test Result Summary

Borehole Number	Depth Interval (ft)	Lab Sample Number	pH	Minimum Resistivity (ohm-cm)	Sulfate Content (ppm)	Chloride Content (ppm)
R-10-008	5 – 60	NA	7.3	285	1572	270
R-10-009	6 - 55	NA	7.3	600	930	150

Note: Caltrans currently considers a site to be corrosive to foundation elements if one or more of the following conditions exist: Chloride concentration is greater than or equal to 500 ppm, sulfate concentration is greater than or equal to 2000 ppm, or the pH is 5.5 or less.

Seismic Recommendations

Based on shear wave velocity measured using CPTs equipped with a shear wave measuring device, the average estimated shear wave velocity at the project site is 250 m/sec. Following Geotechnical Services Design Manual, Version 1.0, dated August 2009, both deterministic and probabilistic analyses were performed, including ARS online and 2008 USGS Interactive deaggregation tool (Beta). Based on the analysis, the seismic design at the project site with Vs equal to 250 m/sec is governed by a design ARS curve developed from 2008 USGS Interactive deaggregation tool. The design ARS curve is shown below. Fault parameters used for the analysis were summarized in Tables 4 and 5.

Table No. 4: Summary of Faults

Fault Name	Type	M_{max}	R_X	R_{JB}	R_{RUP}
San Joaquin Hills Thrust	R	6.6	4.0 mile	5.4 mile	6.1 mile
New Port Inglewood – Rose Canyon Fault Zone	RLSS	7.5	6.0 mile	6.0 mile	6.0 mile

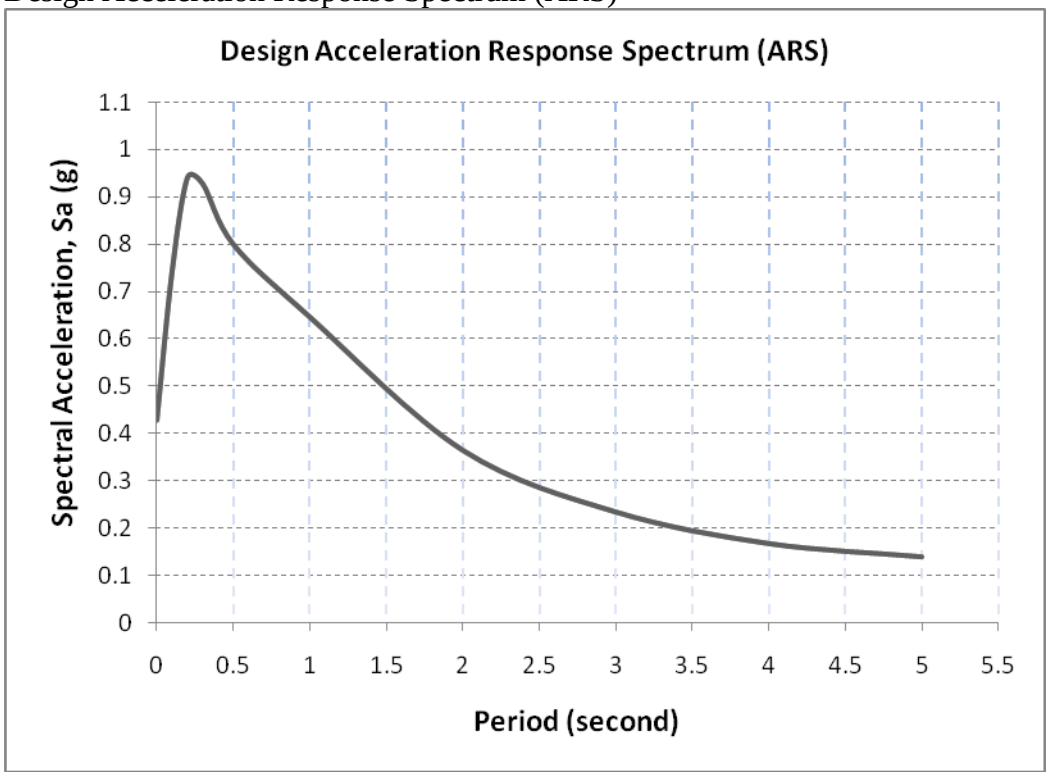
Notes:
R_X = Horizontal distance to the fault trace
R_{JB} = Shortest horizontal distance to the surface projection of the rupture area
R_{RUP} = Closest distance to the fault rupture plane

Table No. 5: Parameters used for probabilistic analysis

Near Fault Factor (km)	$Z_{1.0}$ (m)	$Z_{2.5}$ (km)
8.3	332	2

Estimated design PGA value is 0.43 g based on the design ARS curve.

Design Acceleration Response Spectrum (ARS)



Liquefaction

Liquefaction is a phenomenon in which loose, saturated, fine grained granular soils behave like a fluid when subjected to high intensity ground shaking. Liquefaction occurs when three general conditions exist: (1) shallow ground water (2) low-density, fine, sandy soils and (3) high-intensity ground motion. Saturated, loose and medium dense, cohesionless soils exhibit the liquefaction potential, while dense cohesionless soil and cohesive soil exhibit the lowest, negligible liquefaction potential. Effects of liquefaction on ground surface include sand boils, settlement and lateral spreading.

According to the Seismic Hazard Zones Map of Whittier Quadrangle dated on March 25, 1999, the bridge sites are not located within areas delineated as liquefaction zones. In addition, based on subsurface condition and estimated water table, the liquefaction potential and its effect on the bridge are negligible.

<u>As-Built Foundation Data</u>

The existing Route 74/5 Separation Bridge (Br. No. 55-0229) consists of a single two-span continuous cast-in-place pre-stressed concrete (CIP PS) box girder structure. Reinforced concrete open-end diaphragm type abutments and a center bent support the structure. The profile of this bridge has a vertical curve with a length of 500 ft and an algebraic grade difference of 5.72%.

The bridge is a two-span bridge supported on driven concrete piles or steel H (10BP42) piles. A 1969 As-Built foundation data are summarized in Table No. 6.

Table No. 6: 1969 As-Built Foundation Data

Support Location	Pile Type	Bottom of Pile Cap Elevation (ft)	Specified Pile Tip Elevation (ft)	As-Built Average Pile Penetration Elevations (ft)
Abutment 1	45 Ton Class 1 Concrete or Steel H (10BP42) Piles	126.30	83.00	Ave. Tip El.=79.0 Min. Tip El.=84.0 Max. Tip El.=71.0
Bent 2	45 Ton Class 1 Concrete or Steel H (10BP42) Piles	111.00	83.00	Ave. Tip El.=80.0 Min. Tip El.=85.0 Max. Tip El.=73.0
Abutment 3	45 Ton Class 1 Concrete or Steel H (10BP42) Piles	130.50	83.00	Ave. Tip El.=81.0 Min. Tip El.=91.0 Max. Tip El.=76.0

Geotechnical Recommendations

Considering axial and lateral load demand from the superstructure, under both static and seismic conditions, and observed subsurface condition, we recommend driven HP steel piles as the bridge foundation. Detailed engineering parameters and lateral and axial capacity analyses are presented as follows.

Engineering Parameters for Lateral Analysis

Based on observed subsurface condition and laboratory test results, the engineering parameters are interpreted for lateral analysis of the piles. The groundwater table was assumed to be at an elevation of 110.0 feet. The interpreted engineering parameters used as input for Lpile Plus are shown in the following tables.

Abutment 1

Elevation (ft)	Soil Type	Effective Unit Weight (γ'), lb/in^3 (lb/ft^3)	Apparent Friction Angle, (ϕ), degree	Undrained Shear Strength (Su), lb/in^2 (lb/ft^2)	Soil Strain Parameter (ε_{50})	Soil Modulus (k), lb/in^3
136 to 123	Clayey Sand/sandy Clay	0.066 (115)		3.5 (500)	0.01	100
123 to 111	Clay	0.066 (115)		9.0 (1300)	0.007	500
111 to 97	Sandy Clay	0.033 (52.6)		10.5 (1500)	0.007	500
97 to 88	Sandy Clay	0.033 (52.6)		3.5 (500)	0.01	100
88 to 81	Sandy Clay	0.033 (52.6)		10.5 (1500)	0.007	500
81 to 75	Clayey Sand/Gravel	0.036 (63)	36			125
Below 75	Sedimentary Rock	0.036 (63)		28 (4000)	0.004	2000

Note: ε_{50}: strain corresponding to a stress of 50 percent of the ultimate stress

Bent 2

Elevation (ft)	Soil Type	Effective Unit Weight (γ'), lb/in^3 (lb/ft^3)	Apparent Friction Angle, (ϕ), degree	Undrained Shear Strength (Su), lb/in^2 (lb/ft^2)	Soil Strain Parameter (ε_{50})	Soil Modulus (k), lb/in^3
120 to 111	Clay/Silt	0.066 (115)		6.9 (1000)	0.01	100
111 to 101	Clay/Sandy Clay	0.033 (52.6)		4.9 (700)	0.01	100
101 to 90	Sandy Clay	0.033 (52.6)		9.0 (1300)	0.007	500
90 to 85	Clayey/Silty Sand	0.033 (52.6)	33			60
85 to 80	Sandy Clay	0.033 (52.6)		10.5 (1500)	0.007	500
80 to 70	Sedimentary Rock	0.036 (63)		17.0 (2500)	0.005	1000
Below 70	Sedimentary Rock	0.036 (63)		28 (4000)	0.004	2000

Note: ε_{50}: strain corresponding to a stress of 50 percent of the ultimate stress

Abutment 3

Elevation (ft)	Soil Type	Effective Unit Weight (γ'), lb/in^3 (lb/ft^3)	Apparent Friction Angle, (ϕ), degree	Undrained Shear Strength (Su), lb/in^2 (lb/ft^2)	Soil Strain Parameter (ε_{50})	Soil Modulus (k), lb/in^3
143 to 127	Silty Sand/Clay	0.069 (120)		14.0 (2000)	0.005	1000
127 to 111	Silty Sand	0.069 (120)	32			90
111 to 97	Clayey Sand/Gravel	0.036 (63)	36			125
97 to 78	Sedimentary Rock	0.036 (63)		14.0 (2000)	0.005	1000
Below 78	Sedimentary Rock	0.036 (63)		28 (4000)	0.004	2000

Note: ε_{50}: strain corresponding to a stress of 50 percent of the ultimate stress

Lateral Capacity Reduction Factor (P-Multipliers)
According to AASHTO LRFD Bridge Design Specifications (2007), a reduction factor (P-Multipliers) for the lateral analysis of the pile should be applied to p-y curves developed based on the engineering parameters provided above. The p-y curve should be modified by multiplying p values (lbs/in.) with reduction factors recommended by AASHTO LRFD Bridge Design Specifications (2007), while the y values (in.) remain the same.

Engineering Parameters for Axial Analysis
The material strength parameters and unit weight used for pile axial analyses (Driven 1.2) are presented in the three tables above.

Pile Group Effect for Axial Capacity
Following Caltrans Bridge Design Specifications, the bearing capacity of driven pile group for cohesive and cohesionless soil was calculated based on the pile layout and pile cap size provided by Structure Design. Based on the analysis, single pile capacity controls the pile design.

Geotechnical Design Recommendation Summary Table
The foundation design recommendation table including pile type, cutoff elevation, pile tip elevations, design load and nominal resistance are presented in Tables No. 7a and 7b.

Table 7a: Geotechnical Design Recommendation Table for Bridge No. 55-1104

Bent Foundation Design Recommendation												
Support No.	Pile Type	Cut-off Ele. (ft)	Service-I Limit State Load per Support (kips)		Total Permissible Support Settlement (inches)	Required Factored Nominal Resistance (kips)				Design Tip Elevations (ft)	Specified Tip Elevation (ft)	Nominal Driving Resistance Required (kips)
			Total	Perm.		Strength Limit		Extreme Event				
						Comp. (φ=0.7)	Tension (φ=0.7)	Comp. (φ=1.0)	Tension (φ=1.0)			
Bent 2	HP 14x89	112.0	10534	8354	1	227	0	116	0	52.0(a) 80.0(c)	52.0(a)	330

- Design tip elevations are controlled by: (a-I) Compression (Strength Limit), (b-I) Tension (Strength Limit), (a-II) Compression (Extreme Event), (b-II) Tension (Extreme Event), (c) Settlement, and (d) Lateral Load, respectively.
- The specified tip elevation shall not be raised above the design tip elevations for Tension, Settlement, and Lateral Load.
- The Nominal Driving Resistance required is equal to the nominal resistance needed to support the factored load plus driving resistance from the liquefiable soil layers, which do not contribute to the design resistance.

Table 7b. Geotechnical Design Recommendation Table for Bridge No. 55-1104

Abutment Foundation Design Recommendation									
Support Location	Pile Type	Cut-off Ele. (ft)	Service-I Limit State Load per Support (kips)		Service-I Limit State Load per Pile (Compression) (kips)	Nominal Resistance (kips)	Design Tip Elevations (ft)	Specified Tip Elevation (ft)	Nominal Driving Resistance Required (kips)
			Total	Perm.					
Abut 1	HP 10x57	126.00	4365	3585	119	240	66.0(a)	66.0(a)	240
Abut 3	HP 10x57	130.92	4831	3791	122	250	78.0(a)	78.0(a)	250

- Design tip elevations are controlled by: (a) Compression, (b) Tension, (c) Settlement, and (d) Lateral Load, respectively.
- The specified tip elevation shall not be raised above the design tip elevations for Tension, Settlement, and Lateral Load.
- The Nominal Driving Resistance required is equal to the nominal resistance needed to support the factored load plus driving resistance from the liquefiable soil layers, if any, which do not contribute to the design resistance.

The specified tip elevations for the lateral load should be calculated by Structure Design, and be included in the Pile Data Table. The reduction of p-y curve, if applicable, should be considered in the analysis as described above.

Approach Fill Earthwork

Based on the information provided by Structure Design, the vertical stresses caused by embankment fill are negligible at both abutments 1 and 3. Due to the negligible vertical stresses and subsurface condition with the groundwater elevation of about 110.0 feet, most of approach fill settlements should occur during construction and negligible, and downdrag forces induced on the pile should be negligible.

Notes to Structure Designer

Should the specified pile tip elevation required for lateral load demands lower than the specified pile tip elevations provided in this report, contact the Geotechnical Engineer for further recommendation.

Construction Considerations

The piles should be driven to the specific tip elevation by impact hammers with sufficient energy. The pile should be driven into sedimentary rock. Should the refusal occur at an elevation above the specified tip elevation for the lateral load demand and settlement demand, undersized pre-drilling complying with Section 49-1.05 of the Standard Specification may be used.

Should you have any questions or comments, please contact me at (916) 227-4533.

Seungwoon Han, Ph.D, P.E.
Transportation Engineer–Civil
Office of Geotechnical Design South-1
Branch A

CC: OGDS1- LA
Nooshin Yoosefi, D12 Project Manager
Mark Williams, GS Corporate
DES Office Engineer, Office of PS&E
Farhad Hadjibabaie, D12 Material Engineer
Structure Construction R.E. Pending file

Appendix I: Site Map

Vicinity Map

Appendix II: Log of Test Borings

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	74			

REGISTERED GEOTECHNICAL ENGINEER DATE

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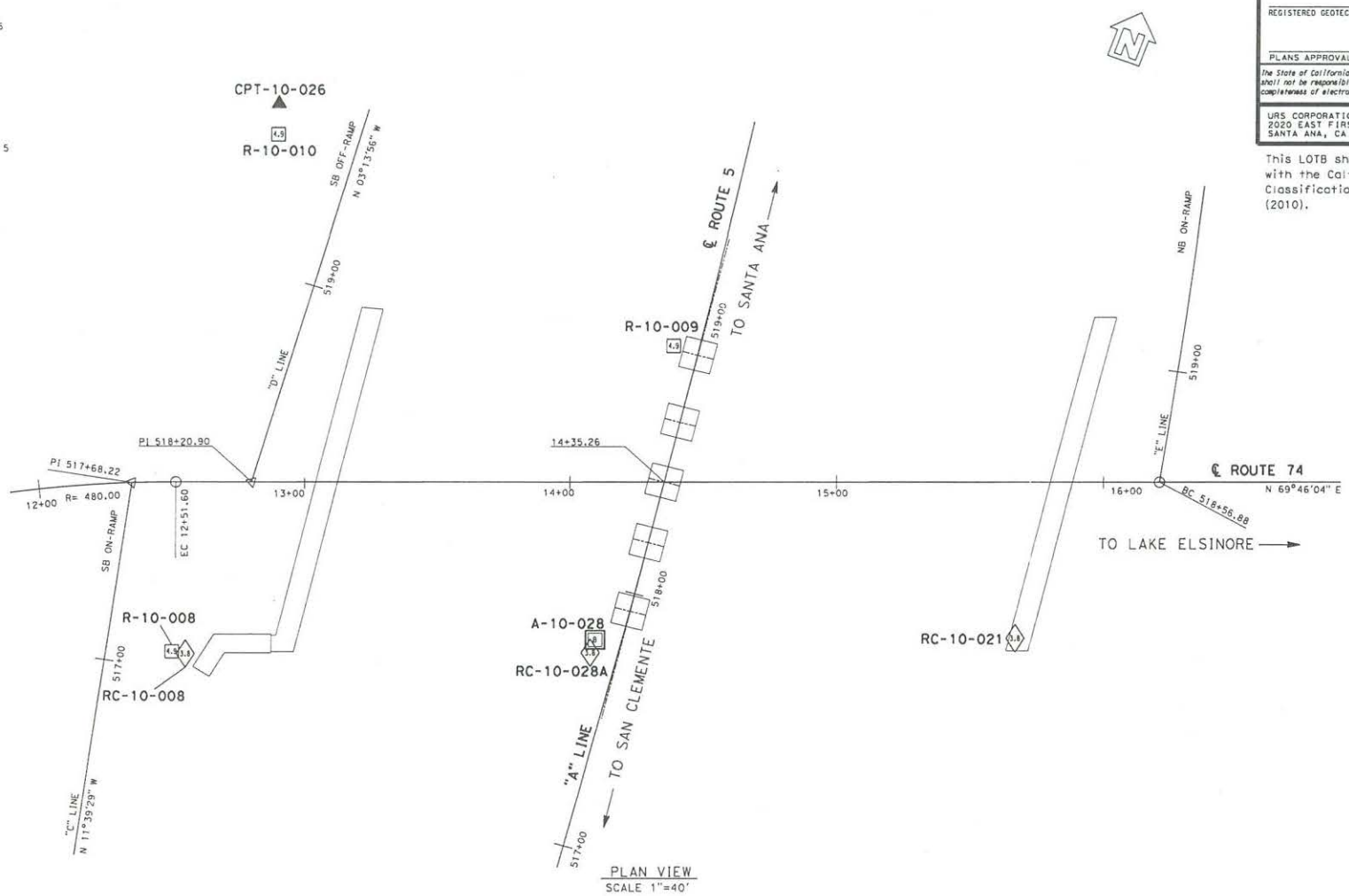
URS CORPORATION
2020 EAST FIRST STREET, SUITE 400
SANTA ANA, CA 92705

This LOTB sheet was prepared in accordance with the Caltrans Soil & Rock Logging, Classification, and Presentation Manual (2010).

BENCH MARK

SUHV-20021
FND PK/TIN
80.10 Ft Lt ℄ Route 5
Sta 517+51.39
N 2 129 242.32
E 6 132 248.24
Elev= 117.01'
NAVD88

SUHV-20027
FND PK/NAIL
136.66 Ft Rt ℄ Route 5
Sta 519+18.34
N 2 129 431.43
E 6 132 446.66
Elev= 144.30'
NAVD88



PLAN VIEW
SCALE 1"=40'

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN DESIGN BRANCH	BRIDGE NO. 55-1104 POST MILE 0.01	ROUTE 74/5 SEPARATION (REPLACE) LOG OF TEST BORINGS SHEET 1 OF 8
FUNCTIONAL SUPERVISOR NAME: F.MOTAMED	DRAWN BY: P.QUACH CHECKED BY: E.PINTARD	FIELD INVESTIGATION BY: EJ.JEON/P.MCDONALD/L.ROEBUCK	CU 59A0590 EA 0E3101		

DGS CIVIL LOG OF TEST BORINGS SHEET

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

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12	ORA	74			

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SANTA ANA, CA 92705

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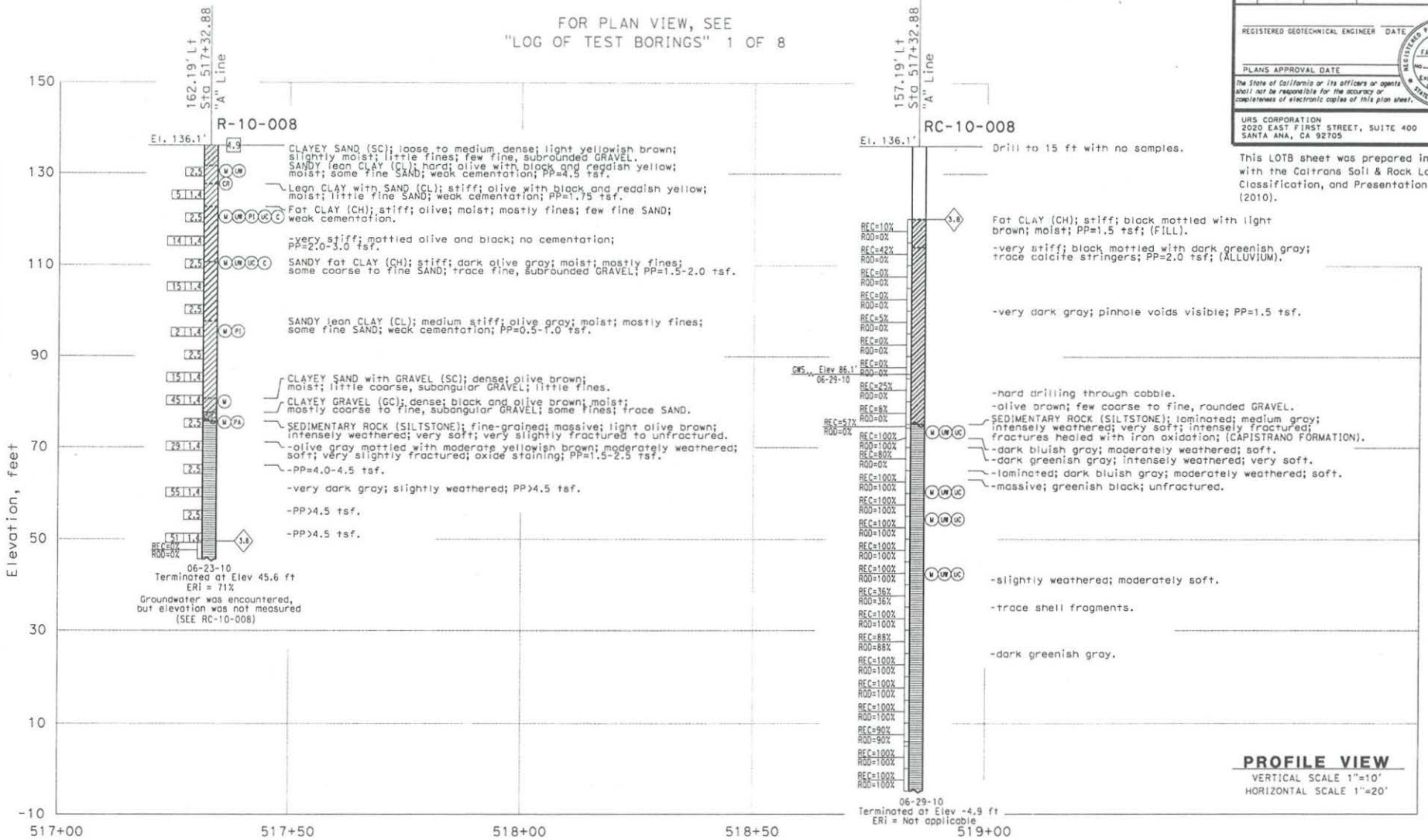
FOR PLAN VIEW, SEE "LOG OF TEST BORINGS" 1 OF 8



PROFILE VIEW
VERTICAL SCALE 1"=10'
HORIZONTAL SCALE 1"=20'

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN DESIGN BRANCH	BRIDGE NO. 55-1104 POST MILE 0.01	ROUTE 74/5 SEPARATION (REPLACE) LOG OF TEST BORINGS SHEET 2 OF 8
FUNCTIONAL SUPERVISOR NAME: F.MOTAMED	DRAWN BY: P.QUACH CHECKED BY: E.PINTARD	FIELD INVESTIGATION BY: EJ.JEON/P.MCDONALD/L.ROEBUCK		CU 59A0590 EA 0E3101		

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ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

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12	ORA	74			

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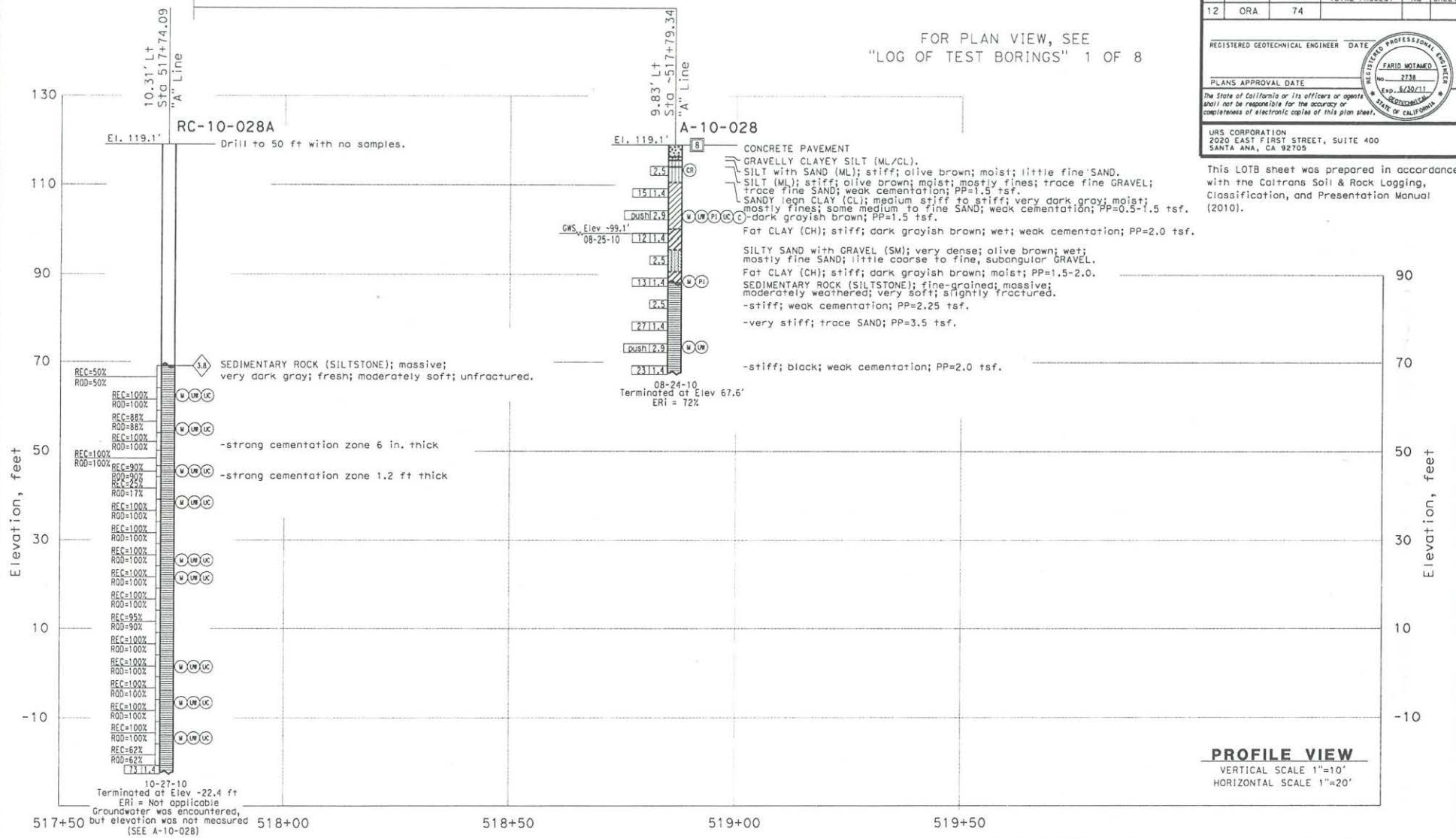
FOR PLAN VIEW, SEE "LOG OF TEST BORINGS" 1 OF 8



PROFILE VIEW
VERTICAL SCALE 1"=10'
HORIZONTAL SCALE 1"=20'

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN DESIGN BRANCH	BRIDGE NO. 55-1104 POST MILE 0.01	ROUTE 74/5 SEPARATION (REPLACE) LOG OF TEST BORINGS SHEET 3 OF 8
FUNCTIONAL SUPERVISOR NAME: F.MOTAMED	DRAWN BY: P.QUACH CHECKED BY: E.PINTARD	FIELD INVESTIGATION BY: EJ.JEON/P.MCDONALD/L.ROEBUCK		CU 59A0590 EA 0E3101		

OGS CIVIL LOG OF TEST BORINGS SHEET

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

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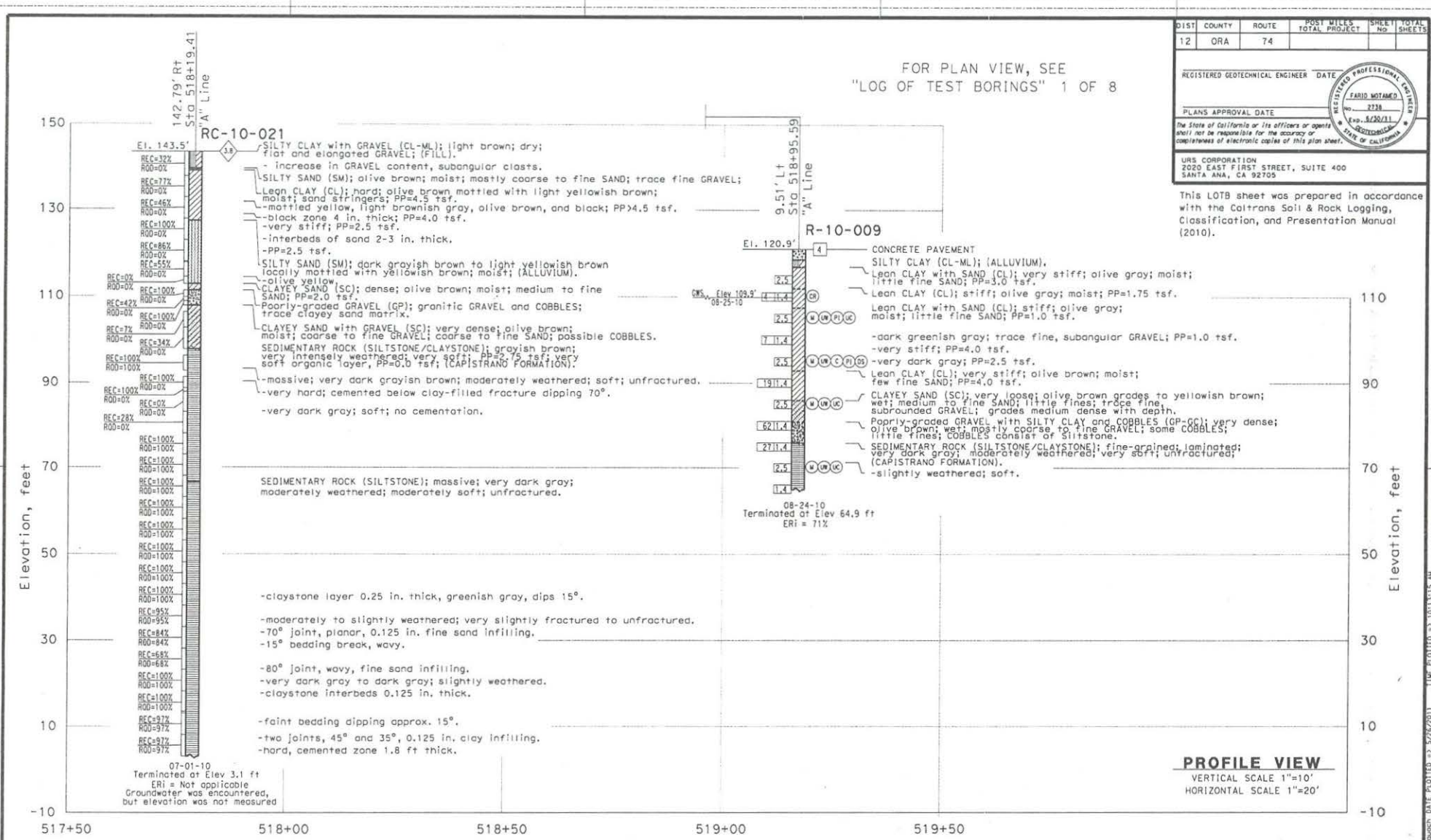
FOR PLAN VIEW, SEE "LOG OF TEST BORINGS" 1 OF 8



PROFILE VIEW
VERTICAL SCALE 1"=10'
HORIZONTAL SCALE 1"=20'

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN DESIGN BRANCH	BRIDGE NO. 55-1104 POST MILE 0.01	ROUTE 74/5 SEPARATION (REPLACE) LOG OF TEST BORINGS SHEET 4 OF 8
FUNCTIONAL SUPERVISOR NAME: F.MOTAMED	DRAWN BY: P.QUACH CHECKED BY: E.PINTARD	FIELD INVESTIGATION BY: EJ.JEON/P.MCDONALD/L.ROEBUCK	CU 59A0590 EA 0E3101	DISREGARD PRINTS BEARING EARLIER REVISION DATES	REVISION DATES SHEET OF

OGS CIVIL LOG OF TEST BORINGS SHEET

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12	ORA	74			

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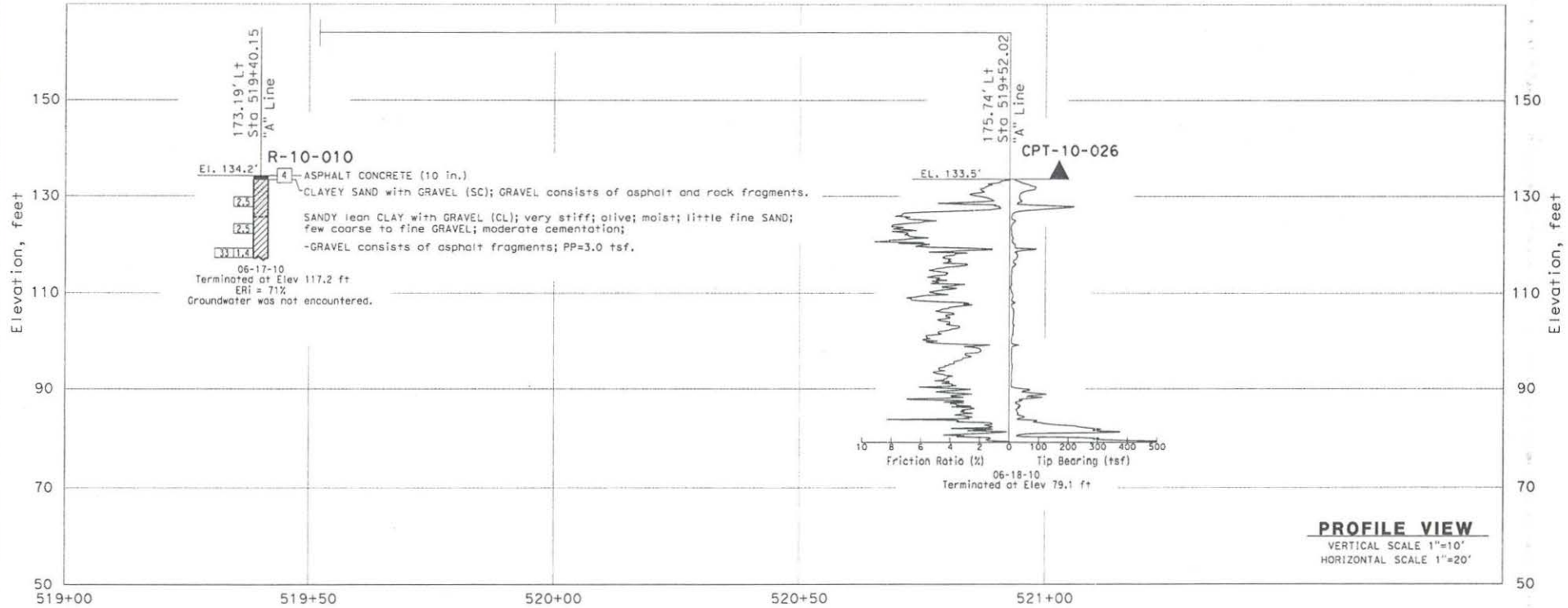
FOR PLAN VIEW, SEE
"LOG OF TEST BORINGS" 1 OF 8



ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN DESIGN BRANCH	BRIDGE NO. 55-1104 POST MILE 0.01	ROUTE 74/5 SEPARATION (REPLACE) LOG OF TEST BORINGS SHEET 5 OF 8
FUNCTIONAL SUPERVISOR NAME: F.MOTAMED	DRAWN BY: P.QUACH CHECKED BY: E.PINTARD	FIELD INVESTIGATION BY: EJ.JEON/P.MCDONALD/L.ROEBUCK	CU 59A0590 EA 0E3101	DISREGARD PRINTS BEARING EARLIER REVISION DATES	REVISION DATES SHEET OF

OGS CIVIL LOG OF TEST BORINGS SHEET

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

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12	ORA	74			

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2020 EAST FIRST STREET, SUITE 400
SANTA ANA, CA 92705

REFERENCE: CALTRANS SOIL & ROCK LOGGING, CLASSIFICATION, AND PRESENTATION MANUAL (2010)

CEMENTATION

Description	Criteria
Weak	Crumbles or breaks with handling or little finger pressure.
Moderate	Crumbles or breaks with considerable finger pressure.
Strong	Will not crumble or break with finger pressure.

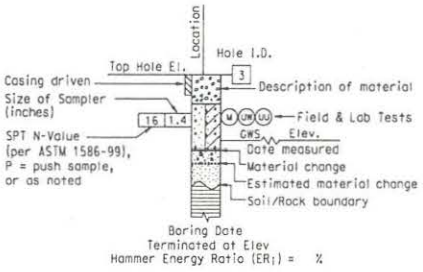
BOREHOLE IDENTIFICATION

Symbol	Hole Type	Description
Size	A	Auger Boring (hollow or solid stem bucket)
Size	R RW RC P	Rotary drilled boring (conventional) Rotary drilled with self-casing wire-line Rotary core with continuously-sampled, self-casing wire-line Rotary percussion boring (air)
Size	R	Rotary drilled diamond core
Size	HD HA	Hand driven (1-inch soil tube) Hand Auger
●	D	Dynamic Cone Penetration Boring
▲	CPT	Cone Penetration Test (ASTM D 5778)
☐	O	Other (note on LOTB)

Note: Size in inches.

CONSISTENCY OF COHESIVE SOILS

Description	Shear Strength (tsf)	Pocket Penetrometer Measurement, PP, (tsf)	Torvane Measurement, TV, (tsf)	Vane Shear Measurement, VS, (tsf)
Very Soft	Less than 0.12	Less than 0.25	Less than 0.12	Less than 0.12
Soft	0.12 - 0.25	0.25 - 0.5	0.12 - 0.25	0.12 - 0.25
Medium Stiff	0.25 - 0.5	0.5 - 1	0.25 - 0.5	0.25 - 0.5
Stiff	0.5 - 1	1 - 2	0.5 - 1	0.5 - 1
Very Stiff	1 - 2	2 - 4	1 - 2	1 - 2
Hard	Greater than 2	Greater than 4	Greater than 2	Greater than 2



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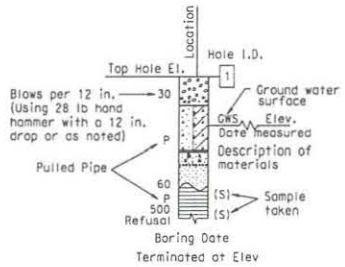

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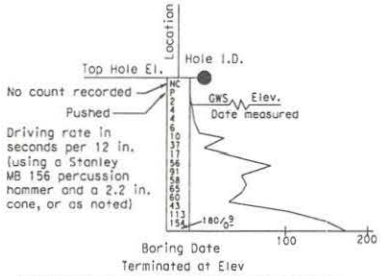

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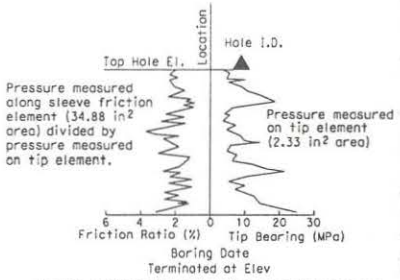

CONE PENETRATION TEST (CPT) BORING

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN DESIGN BRANCH	BRIDGE NO. 55-1104 POST MILE 0.01	ROUTE 74/5 SEPARATION (REPLACE) LOG OF TEST BORINGS SHEET 6 OF 8
FUNCTIONAL SUPERVISOR	DRAWN BY: P.QUACH	FIELD INVESTIGATION BY:				
NAME: F.MOTAMED	CHECKED BY: E.PINTARD	EJ.JEON/P.MCDONALD/L.ROEBUCK				

OGS CIVIL LOG OF TEST BORINGS SHEET

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 59A0590
EA 0E3101

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REFERENCE: CALTRANS SOIL & ROCK LOGGING, CLASSIFICATION, AND PRESENTATION MANUAL (2010)

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	74			

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URS CORPORATION
2020 EAST FIRST STREET, SUITE 400
SANTA ANA, CA 92705

GROUP SYMBOLS AND NAMES

Graphic/Symbol	Group Names	Graphic/Symbol	Group Names
GW	Well-graded GRAVEL Well-graded GRAVEL with SAND	CL	Lean CLAY Lean CLAY with SAND Lean CLAY with GRAVEL SANDY lean CLAY SANDY lean CLAY with GRAVEL GRAVELLY lean CLAY GRAVELLY lean CLAY with SAND
GP	Poorly-graded GRAVEL Poorly-graded GRAVEL with SAND		
GW-GM	Well-graded GRAVEL with SILT Well-graded GRAVEL with SILT and SAND	CL-ML	SILTY CLAY SILTY CLAY with SAND SILTY CLAY with GRAVEL SANDY SILTY CLAY SANDY SILTY CLAY with GRAVEL GRAVELLY SILTY CLAY GRAVELLY SILTY CLAY with SAND
GW-GC	Well-graded GRAVEL with CLAY (or SILTY CLAY) Well-graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)		
GP-GM	Poorly-graded GRAVEL with SILT Poorly-graded GRAVEL with SILT and SAND	ML	SILT SILT with SAND SILT with GRAVEL SANDY SILT SANDY SILT with GRAVEL GRAVELLY SILT GRAVELLY SILT with SAND
GP-GC	Poorly-graded GRAVEL with CLAY (or SILTY CLAY) Poorly-graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)		
GM	SILTY GRAVEL SILTY GRAVEL with SAND	OL	ORGANIC lean CLAY ORGANIC lean CLAY with SAND ORGANIC lean CLAY with GRAVEL SANDY ORGANIC lean CLAY SANDY ORGANIC lean CLAY with GRAVEL GRAVELLY ORGANIC lean CLAY GRAVELLY ORGANIC lean CLAY with SAND
GC	CLAYEY GRAVEL CLAYEY GRAVEL with SAND		
GC-GM	SILTY, CLAYEY GRAVEL SILTY, CLAYEY GRAVEL with SAND	OL	ORGANIC SILT ORGANIC SILT with SAND ORGANIC SILT with GRAVEL SANDY ORGANIC SILT SANDY ORGANIC SILT with GRAVEL GRAVELLY ORGANIC SILT GRAVELLY ORGANIC SILT with SAND
SW	Well-graded SAND Well-graded SAND with GRAVEL		
SP	Poorly-graded SAND Poorly-graded SAND with GRAVEL	CH	Fat CLAY Fat CLAY with SAND Fat CLAY with GRAVEL SANDY fat CLAY SANDY fat CLAY with GRAVEL GRAVELLY fat CLAY GRAVELLY fat CLAY with SAND
SW-SM	Well-graded SAND with SILT Well-graded SAND with SILT and GRAVEL		
SW-SC	Well-graded SAND with CLAY (or SILTY CLAY) Well-graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)	MH	Elastic SILT Elastic SILT with SAND Elastic SILT with GRAVEL SANDY elastic SILT SANDY elastic SILT with GRAVEL GRAVELLY elastic SILT GRAVELLY elastic SILT with SAND
SP-SM	Poorly-graded SAND with SILT Poorly-graded SAND with SILT and GRAVEL		
SP-SC	Poorly-graded SAND with CLAY (or SILTY CLAY) Poorly-graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)	OH	ORGANIC fat CLAY ORGANIC fat CLAY with SAND ORGANIC fat CLAY with GRAVEL SANDY ORGANIC fat CLAY SANDY ORGANIC fat CLAY with GRAVEL GRAVELLY ORGANIC fat CLAY GRAVELLY ORGANIC fat CLAY with SAND
SM	SILTY SAND SILTY SAND with GRAVEL		
SC	CLAYEY SAND CLAYEY SAND with GRAVEL	OH	ORGANIC elastic SILT ORGANIC elastic SILT with SAND ORGANIC elastic SILT with GRAVEL SANDY ORGANIC elastic SILT SANDY ORGANIC elastic SILT with GRAVEL GRAVELLY ORGANIC elastic SILT GRAVELLY ORGANIC elastic SILT with SAND
SC-SM	SILTY, CLAYEY SAND SILTY, CLAYEY SAND with GRAVEL		
PT	PEAT	OL/OH	ORGANIC SOIL ORGANIC SOIL with SAND ORGANIC SOIL with GRAVEL SANDY ORGANIC SOIL SANDY ORGANIC SOIL with GRAVEL GRAVELLY ORGANIC SOIL GRAVELLY ORGANIC SOIL with SAND
	COBBLES COBBLES and BOULDERS BOULDERS		

FIELD AND LABORATORY TESTING

- (C) Consolidation (ASTM D 2435)
- (CL) Collapse Potential (ASTM D 5333)
- (CP) Compaction Curve (CTM 216)
- (CR) Corrosivity Testing (CTM 643, CTM 422, CTM 417)
- (CU) Consolidated Undrained Triaxial (ASTM D 4767)
- (DS) Direct Shear (ASTM D 3080)
- (EI) Expansion Index (ASTM D 4829)
- (M) Moisture Content (ASTM D 2216)
- (OC) Organic Content-% (ASTM D 2974)
- (P) Permeability (CTM 220)
- (PA) Particle Size Analysis (ASTM D 422)
- (PI) Plasticity Index (AASHTO T 90) Liquid Limit (AASHTO T 89)
- (PL) Point Load Index (ASTM D 5731)
- (PM) Pressure Meter
- (R) R-Value (CTM 301)
- (SE) Sand Equivalent (CTM 217)
- (SG) Specific Gravity (AASHTO T 100)
- (SL) Shrinkage Limit (ASTM D 427)
- (SW) Swell Potential (ASTM D 4546)
- (UC) Unconfined Compression-Soil (ASTM D 2166) Unconfined Compression-Rock (ASTM D 2938)
- (UU) Unconsolidated Undrained Triaxial (ASTM D 2850)
- (UW) Unit Weight (ASTM D 4767)

APPARENT DENSITY OF COHESIONLESS SOILS

Description	SPT N_{60} (Blows / 12 in.)
Very Loose	0 - 5
Loose	5 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	Greater than 50

MOISTURE

Description	Criteria
Dry	No discernable moisture
Moist	Moisture present, but no free water
Wet	Visible free water

PERCENT OR PROPORTION OF SOILS

Description	Criteria
Trace	Particles are present but estimated to be less than 5%
Few	5% - 10%
Little	15% - 25%
Some	30% - 45%
Mostly	50% - 100%

PARTICLE SIZE

Description		Size (in.)
Boulder		Greater than 12
Cobble		3 - 12
Gravel	Coarse	3/4 - 3
	Fine	1/5 - 3/4
Sand	Coarse	1/16 - 1/5
	Medium	1/64 - 1/16
	Fine	1/300 - 1/64
Silt and Clay		Less than 1/300

ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN DESIGN BRANCH	BRIDGE NO. 55-1104 POST MILE 0.01	ROUTE 74/5 SEPARATION (REPLACE) LOG OF TEST BORINGS SHEET 7 OF 8
FUNCTIONAL SUPERVISOR NAME: F.MOTAMED	DRAWN BY: P.QUACH CHECKED BY: E.PINTARD	FIELD INVESTIGATION BY: EJ.JEON/P.MCDONALD/L.ROEBUCK		CU 59A0590 EA 0E3101	DISREGARD PRINTS BEARING EARLIER REVISION DATES	REVISION DATES SHEET OF

DOS CIVIL LOG OF TEST BORINGS SHEET

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

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REFERENCE: CALTRANS SOIL & ROCK LOGGING, CLASSIFICATION, AND PRESENTATION MANUAL (2010)

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO	TOTAL SHEETS
12	ORA	74			

REGISTERED GEOTECHNICAL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER FARID MOTAMED No. 2738 EXP. 6/30/11 GEOTECHNICAL STATE OF CALIFORNIA

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

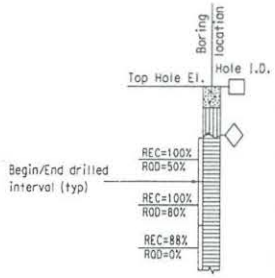
URS CORPORATION
2020 EAST FIRST STREET, SUITE 400
SANTA ANA, CA 92705

This LOTB sheet was prepared in accordance with the Caltrans Soil & Rock Logging, Classification, and Presentation Manual (2010).

PERCENT CORE RECOVERY (REC) & ROCK QUALITY DESIGNATION (RQD)

$$REC = \frac{\sum \text{Length of the recovered core pieces (in.)}}{\text{Total length of core run (in.)}} \times 100\%$$

$$RQD = \frac{\sum \text{Length of intact core pieces} \geq 4 \text{ in.}}{\text{Total length of core run (in.)}} \times 100\%$$



RQD* Indicates soundness criteria not met.

BEDDING SPACING

Description	Thickness / Spacing
Massive	Greater than 10 ft
Very Thickly Bedded	3 ft - 10 ft
Thickly Bedded	1 ft - 3 ft
Moderately Bedded	4 in. - 1 ft
Thinly Bedded	1 in. - 4 in.
Very Thinly Bedded	1/4 in. - 1 in.
Laminated	Less than 1/4 in.

LEGEND OF ROCK MATERIALS

- IGNEOUS ROCK
- SEDIMENTARY ROCK
- METAMORPHIC ROCK

ROCK HARDNESS

Description	Criteria
Extremely Hard	Cannot be scratched with a pocketknife or sharp pick. Can only be chipped with repeated heavy hammer blows.
Very Hard	Cannot be scratched with a pocketknife or sharp pick. Breaks with repeated heavy hammer blows.
Hard	Can be scratched with a pocketknife or sharp pick with difficulty (heavy pressure). Breaks with heavy hammer blows.
Moderately Hard	Can be scratched with pocketknife or sharp pick with light or moderate pressure. Breaks with moderate hammer blows.
Moderately Soft	Can be grooved 1/16 in. deep with a pocketknife or sharp pick with moderate or heavy pressure. Breaks with light hammer blow or heavy manual pressure.
Soft	Can be grooved or gouged easily by a pocketknife or sharp pick with light pressure, can be scratched with fingernail. Breaks with light to moderate manual pressure.
Very Soft	Can be readily indented, grooved or gouged with fingernail, or carved with a pocketknife. Breaks with light manual pressure.

FRACTURE DENSITY

Description	Observed Fracture Density
Unfractured	No fractures.
Very Slightly Fractured	Core lengths greater than 3 ft.
Slightly Fractured	Core lengths mostly from 1 to 3 ft.
Moderately Fractured	Core lengths mostly from 4 in. to 1 ft.
Intensely Fractured	Core lengths mostly from 1 to 4 in.
Very Intensely Fractured	Mostly chips and fragments.

WEATHERING DESCRIPTORS FOR INTACT ROCK

Description	Diagnostic Features					General Characteristics
	Chemical Weathering-Discoloration and/or Oxidation		Mechanical Weathering-Grain Boundary Conditions (Disaggregation) Primarily for Granitics and Some Coarse-Grained Sediments	Texture and Leaching		
	Body of Rock	Fracture Surfaces		Texture	Leaching	
Fresh	No discoloration, not oxidized.	No discoloration or oxidation.	No separation, intact (tight).	No change	No leaching	Hammer rings when crystalline rocks are struck.
Slightly Weathered	Discoloration or oxidation is limited to surface of, or short distance from, fractures; some feldspar crystals are dull.	Minor to complete discoloration or oxidation of most surfaces.	No visible separation, intact (tight).	Preserved	Minor leaching of some soluble minerals.	Hammer rings when crystalline rocks are struck. Body of rock not weakened.
Moderately Weathered	Discoloration or oxidation extends from fractures usually throughout; Fe-Mg minerals are "rusty," feldspar crystals are "cloudy."	All fracture surfaces are discolored or oxidized.	Partial separation of boundaries visible.	Generally preserved	Soluble minerals may be mostly leached.	Hammer does not ring when rock is struck. Body of rock is slightly weakened.
Intensely Weathered	Discoloration or oxidation throughout; all feldspars and Fe-Mg minerals are altered to clay to some extent; or chemical alteration produces in-situ disaggregation, see grain boundary conditions.	All fracture surfaces are discolored or oxidized, surfaces friable.	Partial separation, rock is friable; in semiarid conditions granitics are disaggregated.	Texture altered by chemical disintegration (hydration, argillation).	Leaching of soluble minerals may be complete.	Dull sound when struck with hammer, usually can be broken with moderate to heavy manual pressure or by light hammer blow without reference to planes of weakness such as incipient or hairline fractures, or veinlets. Rock is significantly weakened.
Decomposed	Discolored or oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe-Mg minerals are completely altered to clay.		Complete separation of grain boundaries (disaggregated).	Resembles a soil, partial or complete remnant rock structure may be preserved; leaching of soluble minerals usually complete.		Can be granulated by hand. Resistant minerals such as quartz may be present as "stringers" or "dikes."

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN DESIGN BRANCH	BRIDGE NO. 55-1104 POST MILE 0.01	ROUTE 74/5 SEPARATION (REPLACE) LOG OF TEST BORINGS SHEET 8 OF 8
FUNCTIONAL SUPERVISOR NAME: F.MOTAMED	DRAWN BY: P.OUACH CHECKED BY: E.PINTARD	FIELD INVESTIGATION BY: EJ.JEON/P.MCDONALD/L.ROEBUCK	CU 59A0590 EA 0E3101	DISREGARD PRINTS BEARING EARLIER REVISION DATES →	REVISION DATES SHEET OF

OGS CIVIL LOG OF TEST BORINGS SHEET

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

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Appendix III: Field Exploration and Testing

CPT Shear Wave Velocity Measurement

Location	Depth (ft)	Travel Distance (ft)	S-Wave Arrival (msec)	S-Wave Velocity from Surface (ft/sec)	Interval S-Wave Velocity (ft/sec)
CPT-10-003	10.34	11.49	16.76	685.29	
	20.05	20.66	32.35	638.76	588.75
	30.18	30.59	48.73	627.77	606.06
	40.32	40.63	60.83	667.91	829.54
	50.15	50.40	76.75	656.66	613.68
	60.84	61.05	92.33	661.16	683.34
	70.11	70.29	104.51	672.55	758.86
	80.05	80.21	115.52	694.30	900.81
	90.45	90.59	127.33	711.44	879.09
	100.23	100.35	139.43	719.75	807.15
CPT-10-011	10.14	11.31	10.46	1080.85	
	20.10	20.71	22.79	908.84	762.92
	30.10	30.51	37.49	813.88	666.66
	40.28	40.59	52.29	776.23	680.86
CPT-10-012	10.21	11.37	15.67	725.50	
	20.18	20.79	30.41	683.66	639.19
	30.35	30.76	51.96	591.98	462.59
	40.52	40.83	64.44	633.57	806.75
CPT-10-014	10.10	11.27	9.59	1175.17	
	20.19	20.80	18.46	1126.76	1074.41
	27.25	27.70	23.94	1157.26	1260.04
CPT-10-018	5.07	7.12	7.43	958.38	
	10.10	11.27	12.58	895.86	805.66
	15.13	15.93	18.28	871.71	818.40
CPT-10-019	10.13	11.30	13.11	861.69	
	20.10	20.71	25.05	826.85	788.59
	23.05	23.59	28.41	830.20	855.21
CPT-10-026	10.17	11.33	13.63	831.45	
	20.14	20.75	26.92	770.85	708.71
	30.16	30.57	43.16	708.33	604.70
	40.22	40.53	62.22	651.39	522.45
	50.08	50.33	73.10	688.49	900.68

CPT-10-026 Dissipation Test Results

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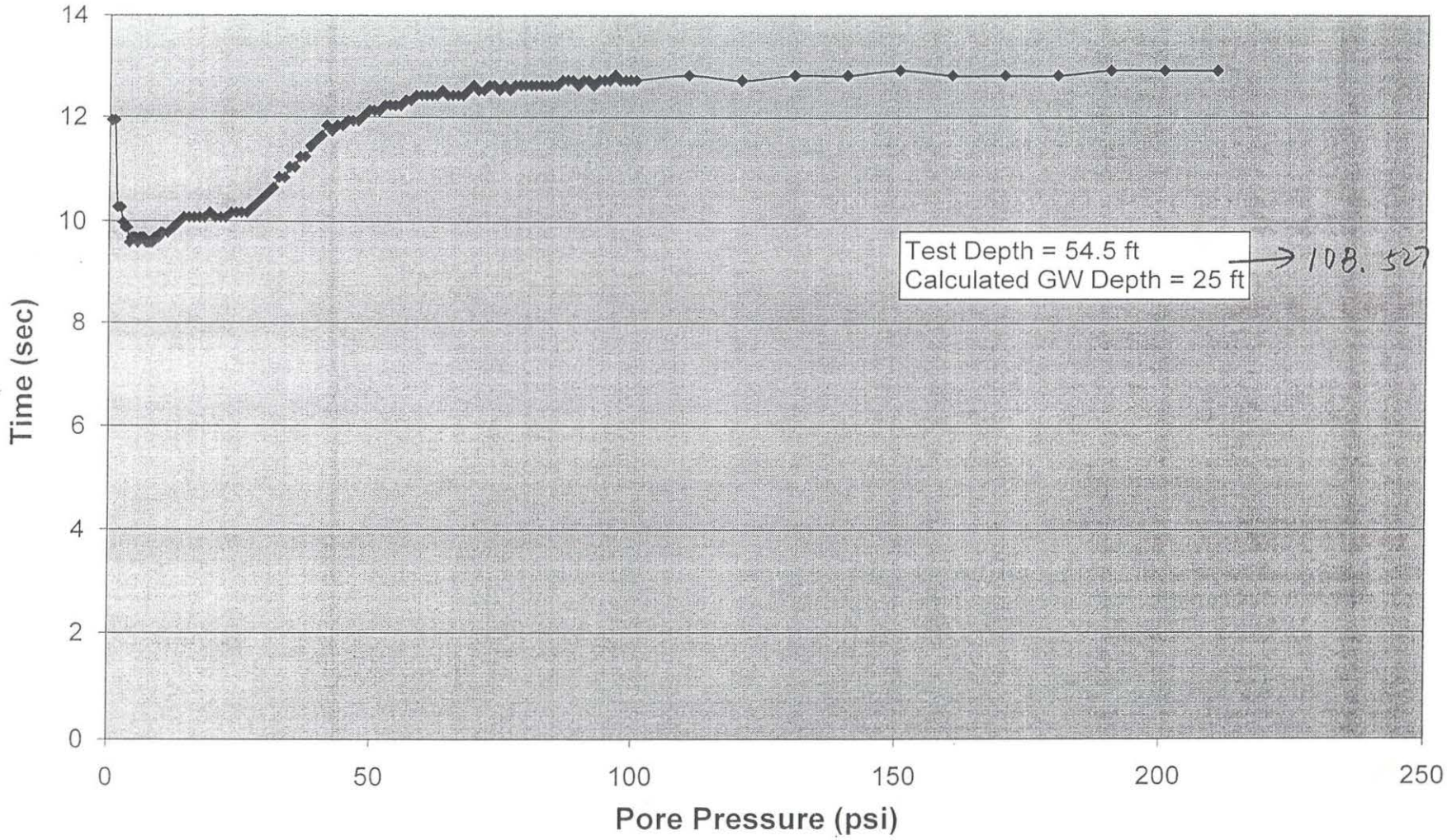


Appendix IV: Laboratory Test Results

Santa Ana Geotechnical Laboratory Testing Summary

Project Name: I-5 / SR-74 Interchange
Project Number: 30989830, TO 59030
Project Engineer: FM

LOCATION				INITIAL CONDITION			INDEX								
							Limits				UC	CORROSIVITY			
Exploration Number	Sample/ Specimen Number	Depth (ft)	USCS Symbol	Water Content (%)	Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Liquid Limit (%)	Plasticity Index (%)	Liquidity Index	Fines (%)	Unconfined Comp. peak (ksf)	pH	Min. Resistivity (ohm - cm)	Sulfate Content (ppm)	Chloride Content (ppm)
R-10-028		5~50										6.5	640	606	105
R-10-028	3	16.0	CL	17.6	131.7	112.0	39	26	0.18	64.5	2.75				
R-10-028	5	25.0	SC							16.2					
R-10-028	6	30.0	CH	38.1			65	35	0.23						
R-10-028	9	45.0	CH	33.23	115.8	86.9									
R-10-028		56.0	ROCK	26.0	123.7	98.2					22.8				
R-10-028		63.5	ROCK	25.0	123.7	99.0					30.2				
R-10-028		73.0	ROCK	27.6	120.5	94.4					28.9				
R-10-028		80.0	ROCK	22.8	125.1	101.9					17.5				
R-10-028		93.0	ROCK	20.4	123.7	102.7					43.7				
R-10-028		97.0	ROCK	23.1	125.1	101.6					28.9				
R-10-028		117.0	ROCK	23.4	124.1	100.6					30.3				
R-10-028		125.0	ROCK	23.7	124.7	100.8					36.9				
R-10-028		133.0	ROCK	24.3	124.9	100.5					35.4				

FOUNDATION REPORT
for
Retaining Walls 10, 83, 533A

Memorandum

To : **MR. MOHAMMAD RAVANIPOUR**
Senior Bridge Supervisor
DES Structure Design, Branch 19
Office of Bridge Design South 2
21073 Pathfinder Rd., Suite 200
Diamond Bar, CA 91765

Date: November 9, 2011

File: 12-ORA-5/74
PM 0.01
Project ID 00000102
EA 12-0E3101
Retaining Wall Nos. 10, 83, 533A.

Attn. : Chuck Lomicka, P.E.
Project Engineer

From : **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
METS-Geotechnical Services
Office of Geotechnical Design – South 1

Subject : Foundation Report for Retaining Walls Nos. 10, 83, and 533A

INTRODUCTION

The Office of Geotechnical Design-South 1 (OGDS1) has prepared this Foundation Report to provide foundation recommendations for the three proposed special design retaining walls identified as Nos. 10, 83, and 533A for the above-referenced project. The approximate locations of these walls as provided by your Office are shown in Figure 2 in the below. This work was performed as per your request dated April 29, 2011

As per your request, geotechnical recommendations were provided to design the wall as per the Department's current Load and Resistance Factor Design (LRFD) methodology. In preparing this report, we reviewed the subsurface field exploration and laboratory testing conducted by URS Consultants. We started with a set of preliminary general plans provided by your Office. However, due to the complexities involved with this project, including but not limited to soft and weak surface conditions, right-of-way constraints, presence of existing facilities in close proximity, and time constraints, we communicated extensively with the project design engineers to discuss the various requirements, constraints, results of preliminary analysis, and evaluations of various options or alternatives and to provide geotechnical recommendations on an as-needed basis during the development of the PS&E package.

This report presents the results of the site subsurface exploration conducted by URS Corporation. It summarizes our evaluation and interpretation of the subsurface conditions based on our review of the subsurface information collected by URS and other available relevant data. It also includes our geotechnical recommendations for analysis, design and construction of the subject walls.

Geotechnical recommendations for the associated roadway elements were provided by our Office to District 12 in a separate report.

PROJECT LOCATION

The subject retaining walls will be constructed to improve roadway facilities at the intersection of the SR-74 and I-5 intersection. This intersection is located in the City of San Juan Capistrano, California, as shown in the attached Figure 1, Vicinity Map. The approximate site latitude and longitude coordinates are 33.5025^{o} and -117.6585^{o}, respectively.

SCOPE OF WORK

Our scope of work for this project included providing geotechnical design and construction recommendation for the proposed retaining walls based on review and evaluation of the site-specific field exploration and laboratory testing conducted by URS Corporation, Irvine, California. Our scope of work also included consultation with the project design engineers during the PS&E development and preparation of this Foundation Recommendations (FR) report.

The following documents/information has also been reviewed for the preparation of this FR:

- Several versions of draft plan sheets developed and forwarded to us by your office during the design period. The latest version of the general plans, foundation plans and the structure plans available at the time of the preparation of this report are included in Appendix A, attached with this report.

- Preliminary Foundation Report, Route 74/5 Separation (Replace), Bridge Number 55-1104, dated June 30, 2010, prepared for the Office of Bridge Design South 2 by the Office of Geotechnical Design–South 1.

- Foundation Recommendations for Bridge 55-229, Route 74/5 Separation, July 1965.

- Logs of Test Borings and General Plan for Bridge 55-229, Route 74/5 Separation, February 1967.

- Project Report for I-5/Ortega Highway Interchange Improvement Project, May 2009.

- Second Quarter 2009 Groundwater Monitoring Progress Report Chevron Service Station 26988 Ortega Highway, *Holguin, Fahan & Associates, Inc.*, June 29, 2009.

- District Preliminary Geotechnical Report for EA 12-0E3101, 5/74 Interchange Improvement Project, dated June 25, 2010.

PROJECT DESCRIPTION

The overall project consists of constructing a new interchange to replace the existing Route 74/5 interchange in the City of San Juan Capistrano, California. The purpose of the project is to alleviate existing and future traffic congestion along SR74 (Ortega Highway) and improve non-standard roadway features to the current Caltrans standards. The project limit on Route 74 starts just east of El Camino Real and ends at Avenida Los Cerritos (0.20 mile).

The proposed project includes widening of three ramps, a re-aligned I-5 NB off-ramp to SR-74 and a new NB loop on-ramp from EB SR74. As part of the project, three (3) non-standard retaining walls (RW 10, 83, 533A) were proposed. The approximate locations and the alignments of these walls are shown in Figure 2 below. Wall design requirements or data including the maximum wall heights, the wall lengths, and the maximum fill heights for these walls lengths as provided by your Office are reproduced in Table 1 – Wall Information below.

Table 1 - Information on RW #10, #83, and #533A

RW No	Location	Reference P&Q plan no.	Station				Max Wall Height (ft)	Length (ft)	Max height over the existing grade (ft)
			From		To				
			Stationing	Reference line	Stationing	Reference line			
10	WB Rte 74 (west of 5/74 Interchange) at Horno Creek	Figure A-1 to A-3	5+00.00	B	6+41.00	B	22	141.0	18
83	I-5 SB off ramp (Westside)	Figure A-4 to A-6	6+41.00	D	11+14.30	D	22	473.3	13
533A	I-5 NB on ramp (eastside)	Figure A-7 to A-9	533+80.00	A	533+99.80	A	6	19’-9 5/8”	4
			533+99.80	A	534+45.00	A	8	45’-2 3/8”	4

An existing sound wall structure constructed by the state is located immediately adjacent and parallel to RW 83. It is our understanding that this sound wall needs to be protected in place during the construction of this project.

As can be seen from Figure 2, the El Horno Creek flows through existing culverts located underneath and across the proposed RW#10 and RW#533A alignments. The existing culvert crosses the RW#10 alignment near station 12+00 (reference “B” line). It consists of one 10 ft x 8 ft and one 8 ft x 8 ft RCBs and has a soil cover of about 4 to 7 feet along the wall layout line. The existing culvert beneath RW#533A consists of three 8 ft by 7 ft RCBs and has about seven (7) to eight (8) feet of soil cover

along the wall layout line. A 30-inch diameter RCP storm drain with a soil cover of about 13 feet passes underneath the RW#83.

The purpose of the subject retaining walls is to support cut and/or fill embankment to be constructed for grade separations associated with the proposed existing ramp widening or new ramp construction.

SITE EXPLORATION

In order to obtain subsurface condition and engineering properties at the location of retaining walls, site-specific subsurface exploration consisting of mud rotary borings with 94 mm finger bit wire-line and Cone Penetration Tests (CPT) were performed by the Department's consultant URS Corporation, Irvine, California. Samples were obtained using California Modified sampler, Standard Penetration sampler, and rock coring. URS also measured the depth to the groundwater table within the CPT sounding holes about one hour after the completion of the CPT test. The measured groundwater depths are presented in Table 2 below.

Standard Penetration Test (SPT) blow count (N) values were recorded at a depth interval of 5 feet during drilling the mud rotary boreholes.

Representative soil samples from different depths were collected and tested for relevant engineering properties, including corrosion potential. A summary of the information on the exploratory borings applicable to the three proposed walls is presented in Table 2 below.

Plots showing the locations of the exploratory boreholes and the CPT sounding holes are attached in Appendix B. Logs of the boreholes and the CPT data, as provided by URS Corporation, and utilized for the preparation of this report are also included in Appendix B. The Log of Test Borings (LOTB) in format appropriate for inclusion in the contract PS&E package are being prepared by the URS consultant and will be submitted upon completion.

Table 2 - Site Investigations on RW 10, 83, and 533A

Boring No.	Location		Reference Wall Nos.	Approx. Surface Elevation (ft)	Boring Depth (ft)	Groundwater Depth (ft)
	Reference Line	Station				
R-11-001	B	10+20.00	RW 10/83	130.00	51.5	22
R-11-002	B	11+75.00	RW 10/83	119.00	41.5	22
CPT-10-005	B	9+40.00	RW 10	125.92	60.0	> 60
CPT-10-006	B	9+80.00	RW 10	129.53	50.4	> 50
CPT-10-026	D	519+50.00	RW 83	133.53	54.5	25
CPT-10-018	A	533+60.00	RW 533A	147.94	16.2	16

LABORATORY TESTING

Soil samples obtained from borings were transported to the URS soil laboratory. The laboratory tests were performed and the associated test standards are summarized in Table 3 below:

Table 3 – Laboratory Tests

Test	Standard
Mechanical Analysis of Soils	CTM 203
Atterberg Limits of Soils	CTM 204
Consolidation test	ASTM D 2435
Unconfined Undrained	ASTM D 2850
Unconfined compression	CTM 221
Direct shear test	ASTM D 3080
Corrosion – Resistivity, pH	CTM 643
Corrosion – Chloride content	CTM 422
Corrosion – Sulfate content	CTM 417

Results of the laboratory tests, as provided by the URS Corporation, are included in Appendix C of this report.

SITE AND SUBSURFACE CONDITIONS

Site Geology

The project is located within the alluvial valleys of the Trabuco Creek and San Juan Creek and their tributaries. The lower parts of the valleys are covered with (Quaternary age) and older alluvium (Quaternary age). The upper or higher elevation portions of the valleys are comprised of terrace deposits (Quaternary age) which are older alluvial surfaces deposited by streams then uplifted and down-cut into by younger streams. The alluvium and older alluvium was deposited primarily by floods emanating from the Trabuco and San Juan Creeks and their tributaries from the mountains and hills to the northeast of the project location. The alluvium and the terrace deposits are underlain by the Capistrano Formation (Tertiary age). The alluvium consists of clay, clayey sand, sandy clay, sandy clay with gravel. It is possible that some areas include sparse to abundant cobbles with occasional boulders. The terrace deposits consist of sandy silt, clayey sand and conglomeratic coarse-grained sand, also occasional relict clayey soil horizons. The Capistrano Formation consists of marine derived siltstone with interbedded fine grained sandstone, thin pebble sand beds, and thin hard calcareous beds, and also can be locally diatomaceous and tuffaceous. There are fill slopes associated primarily with the existing southbound on and off ramps and with Route 74 west of the I-5. The fill is estimated to range in thickness up to approximately 25 feet. The material of the fill consists of clayey sand and sandy clay including some gravel.

Subsurface Conditions

The area east of the present northbound freeway mainline and near the RW 533A consists of terrace deposits over Capistrano Formation bedrock. This area forms a topographic high with fill in the area of the northbound on-ramp and terrace deposits in the rest of this area. The rest of the project areas, including the locations of the RW #10 and #83, consist of various thickness of fill over alluvium, which in turn is underlain by Capistrano Formation bedrock. The fill soils are associated with construction of southbound off- and on-ramps and Ortega Highway west of the mainline.

The depth of the artificial fill soils at the location of the borings ranges from about 12 to 18 feet. The fill soils at the site are comprised mainly of medium to stiff lean clay (CL) and clayey sand (SC) with sand and gravel, and medium dense clayey gravel (GC). The Liquid Limit (LL) and Plastic Limit (PL) of the samples of fill soils tested ranged from about 37 to 49 and 21 to 30, respectively. The fine content of these soils ranged from about 70 to 90 percent.

The alluvium at the site generally consists of medium to stiff lean clay (CL) and fat clay (CH) stiff clay/sandy clay (CL). Occasional layers of silty sand (SM) and clayed sand (SC) were encountered at borings locations drilled nearby for other project elements.

The terrace deposits encountered during the site exploration consist of sand (SP) and silty sand (SM) with gravel and cobbles. The Capistrano Formation at the site consists of soil-like weathered siltstone and siltstone with shale at shallow depths and becomes less weathered with depth.

GROUNDWATER CONDITIONS

Depths to groundwater at the end of drilling were measured within the Boring R-11-001 and R-11-002 as shown in Table 2 above. Depths to groundwater within several of the CPT sounding holes were measured about an hour after the withdrawal of the CPT cone is also presented in Table 2 above.
Based on these data, at the time of the present field exploration, depths to groundwater along the RW#10 and RW#83 varied from about 22 to 25 feet below existing ground surface at the exploration locations.

Near the proposed RW 533A, groundwater was encountered in the CPT sounding hole CPT-10-018 at a depth of about 16 feet (Elev. 130 feet) below existing ground surface.

During the 1967 investigation, groundwater was encountered between elevation~~s~~ 108.2 to elevation 111.2 feet above Mean Sea Level (MSL). Groundwater was also encountered during the investigations for the Chevron gas station (west side of I-5) and 76 Gas Station (east side of I-5) as reported in 2009 reports prepared for these property owners by their consultants. Groundwater elevations reported for the 76 Gas Station ranged from 107.64 to 130.96 feet above MSL while groundwater elevations reported for the Chevron gas station range from 108.0 to 116.0 feet above MSL.

The results of these investigations indicate that groundwater elevation is likely to range from about 110 feet at RW#10 to about 130 feet at RW#533A. During construction, some variations in the

depths to the static groundwater should be expected due to the clayey nature of the soil, topography, seasonal variations, and adjacent construction or other water recharge/discharge activities. Perched water may be encountered at isolated locations.

CORROSION EVALUATION

Results of corrosion tests are presented in Table 4 below. Caltrans considers 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: Chloride concentration is greater than or equal to 500 ppm, sulfate concentration is greater than or equal to 2000 ppm, or the pH is 5.5 or less (Corrosion Guidelines, 2003). Based on the test results summarized in the Table 4, the site soils are considered non-corrosive.

Table 4 - Corrosion Test Results

Boring	Sample Depth (ft)	pH	Minimum Resistivity (ohm-cm)	Sulfate Content (PPM)	Chloride Content (PPM)
R-11-001	5 to 50	7.3	430	396	165
R-11-002	5 to 40	7.2	350	471	330

SCOUR POTENTIAL

Soil scour hazard is considered low at the wall locations and need not be considered in the design.

SWELL/COLLAPSE HAZARDS

The potential hazards to the subject retaining walls due to soil swelling or collapse are considered low.

SEISMIC RECOMMENDATIONS

Fault Rupture Hazard

The subject retaining walls are not considered susceptible to fault rupture hazard since no known faults pass through the wall alignments**.**

Design Ground Motion

Based on the Department's current fault database, the San Joaquin Hills Thrust Fault is the nearest seismic source to the proposed project site. Another significant nearby seismic source is the Newport Inglewood-Rose Canyon Fault.

Table 5 below summarizes the Maximum Moment Magnitude (MMax) of the faults, type of faulting, distance, and Peak Ground Acceleration (PGA) of the faults mentioned above. The PGA is based on the 2009 ARS Online Report.

Table 5 - Summary of Seismic Parameters

Fault	Fault Type	M_{max}	R_{RUP} (mile)	PGA
San Joaquin Hills Thrust	R	6.6	6.1	0.37
Newport Inglewood-Rose Canyon	RLSS	7.5	6.0	0.33

Based on the above information, seismic design of retaining walls with a seismic horizontal acceleration coefficient k_h =0.2 are considered adequate.

Liquefaction Hazards

Due to the cohesive nature of the subsurface soils below groundwater table, the wall alignments are not considered susceptible soil liquefaction during earthquakes**.**

DESIGN SOIL PARAMETERS

Relevant soil parameters were evaluated for use in the design of the subject walls. Table 6 presents the general subsurface properties used for the geotechnical analyses.

Table 6 – Summary of Engineering Soil Properties

Wall No.	Beginning station		End Station		Ref. Boring Nos.	Approx. Boring Surface Elev. (ft)	Boring depth (ft)	Bottom of footing Elev. (ft)	Soil Description	Groundwater[1] Elev. (ft)	Effective Frcition angle, ϕ	Undrained shear strength, C (psf)
10	B	5+00	B	6+41	R-11-001, R-11-002, CPT-10-005, CPT-10-006	130.00 119.00 125.92 129.53	51.5 41.5 60.0 50.4	119.67 to 123.9	Silty Clay (CL)	110.0	N/A	1000
83	D	6+41	D	11+14.3	R-11-001, R-11-002, CPT-10-026, CPT-10-012	130.00 119.00 133.53 122.27	51.5 41.5 54.5 44.1	124.58 to 117.83	Silty Clay (CL)	110.0	N/A	1000
533A	A	533+80	A	534+45	CPT-10-018	147.94	16.1	141.24 & 139.24	Sand/Silty Sand (SP/SM)	130.0	35	N/A

The medium to stiff clayey soils (CL and CH) are at site exhibited a relatively high compressibility. Based on the consolidation tests performed on representative samples of these soils, the compression

(C_c) ranged from 0.14 to 0.2. The mean value of the coefficient of consolidation (C_v) of these soils was estimated to be about 0.3 ft^2/day.

RETAINING WALL DESIGN RECOMMENDATIONS

Wall Types Selection

The primary geotechnical design concerns at the site are:

- The presence of significant depth of relatively low strength and highly compressible fine-grained soils (CL and CH)
- The presence of the culverts underneath RW#10 and 533A that need to be protected in place.
- The close proximity of the RW#83 alignment to an existing sound wall that needs to be protected in place.

To protect the existing culverts, RW#10 and 533A were proposed to be founded on a structural slab spanning over the culverts. Deep foundations were proposed to support the slabs. These conditions necessitated special design walls at these locations. A special design Standard Type 1 type (i.e., semi-gravity cantilever) wall with standard structure backfill was proposed.

The presence of the soundwall necessitated the RW#83 to be a special design wall. A Standard Type 5 Type (L Shape) wall founded on deep foundations and backfilled with standard structure backfill soils were proposed.

Subsurface soil conditions at the RW 10 and 83 retaining wall locations consist of thick compressible clay soils. Within the thick clayey soils, settlements (elastic and consolidation) will occur due to the placement of embankment fill for RW 10 and 83.

Our preliminary analyses showed that a consolidation settlement on the order of 5.0 inches was likely to occur for the sections of the proposed RW 10 and RW 83 with regular soil backfill. It was estimated that it will take almost 2 years for the 90% settlement to occur due to loads from the fills behind the walls.

Thus, due to the presence of relatively weak and compressible foundation soils, foundation settlement due to the fill placement and, to a lesser degree, soil bearing resistance are major concerns at the sites of RW#10 and #83. Additionally, the need to span over the existing culverts and the height of the RW#10 demands a large number of piles is the diameter is smaller or large diameter piles if the fewer piles are to be used. In addition, slab and other retaining wall structural elements are required to be massive when standard soil backfill is used.

Various options including preloading the foundation soils, different wall types, and structural designs were considered to overcome the challenges associated with the design and construction of the subject walls.

Based on our evaluation, to reduce settlement and for economy in the design of the wall elements, we recommend using light weight as backfill for the retaining walls. In general, the foundation soil settlement can be mostly eliminated if a few feet of existing soils are excavated and replaced with geofoam (in addition to the new fill) so that no additional stress is applied to the foundation soils due to the new fill and the pavement structures. As a minimum, we recommend that any new fill over five (5) feet consist of geofoam. We also recommend that 3 to 5 feet of structural regular backfill soils be placed over the geofoam backfill for the walls. The wall backfill zone should start 2 to 4 feet behind the wall at the top of the footing and extend 1:1 (H:V) away from the wall as shown in the attached Figure 3.

Due to the close proximity of RW#83 to an existing soundwall, special design Standard Type 1 wall is not considered feasible. Additionally, use of batter pile to support lateral load on a Type 5 type wall is subject to conflict during construction. Use of geofoam as wall backfill should allow this wall to be supported on vertical piles since lateral load on the wall will be significantly reduced. Additional, we recommend using Standard Type 1 types special design wall whenever the distance between the soundwall and the proposed new wall alignments permits the use of such wall type without conflict.

Due to the presence of more competent soils and the relatively smaller wall height, the proposed RW#533A may consist of Standard Type 1 type wall backfilled with standard structure backfill soils with specially designed foundation.

LATERAL EARTH PRESSURES

The proposed walls should be designed to resist active earth pressure due to the retained backfill materials. Recommended backfill soil and geofoam parameters for the calculation of active lateral earth pressures for the design of retaining walls are presented in Table 7 below.

Table 7. Wall Backfill Soil and Geofoam Parameters

Backfill Type	Unit Weight (pcf)	Coefficient of Lateral Active Earth Pressure
Geofoam	2.5	0.15
Standard Structure Backfill Soils	125	0.28

FOUNDATION DESIGN RECOMMENDATIONS

We have conducted several iterations based on the various foundation configurations, pile sizes and loads provided by your Office to evaluate the appropriate pile types and sizes. Based on the soil conditions, loads, construction constraints including the proximity of existing structures, and the results of our preliminary axial and lateral analyses for Service, Strength and Extreme (Seismic) Limit States, we recommend open ended pipe piles for the proposed retaining walls.

The required pile elevations for the recommended pile type and sizes were estimated for both short-term and long-term loading conditions and the corresponding performance requirements for the above three LRFD Limit States. Permissible pile top settlement and lateral deflection under Service Limit State Load and pile axial compression and lateral nominal resistances were considered in accordance with the Departments LRFD design requirements. In estimating the pile size and tip elevation, considerations were given to p-multiplier factors for group interaction effects on lateral deflection and nominal resistance, and pile group effect for axial nominal resistance. Also appropriate pipe pile wall thicknesses are recommended.

The recommended pile tip elevation and other relevant design requirements/parameters are presented Table 8 through Table 12 below.

Table 8- Foundation Recommendation for RW#10 - Type 1 Section (Station 5+00 to 5+71.5)

Location	Wall Height (ft)	Pile type	Cut-off Elevation (ft)	Service Limit state Load (kips) per	Total Permissible settlement (in)	Required Factored Nominal Resistance (kips)				Design Tip Elevation (ft)	Specified Tip Elevation (ft)	Nominal Driving Resistance (kips)
						Strength Limit		Extreme event				
						Compression (ϕ=0.7)	Tension (ϕ=0.7)	Compression (ϕ=1.0)	Tension (ϕ=1.0)			
5+00.0 to 5+16.0	14	PP 14*0.375	124.59	260	1	100	0	94	0	74.59(a-I)* 78.59(a-II) 105.59(d)	74.59	140
5+16.0 to 5+71.5	18	PP 14*0.375	122.59	1254	1	85	0	74	0	72.59(a-I)* 82.59(a-II) 104.59(d)	72.59	120

* a-I: Compression for Strength Limit, b-I: Tension for Strength Limit, a-II: Compression for Extreme Event, b-II: Tension for Extreme Event, d: Lateral Load for service limit

Table 9 - Foundation Recommendation for RW10- RCB section (station 5+71.5 to 6+41)

Location	Pile type	Cut-off Elevation (ft)	Service Limit state Load (kips) per Pile	Total Permissible settlement (in)	Required Factored Nominal Resistance (kips)				Design Tip Elevation (ft)	Specified Tip Elevation (ft)	Nominal Driving Resistance required (kips)
					Strength Limit		Extreme event				
					Compression (ϕ=0.7)	Tension (ϕ=0.7)	Compression (ϕ=1.0)	Tension (ϕ=1.0)			
Sta. 5+71.5 to 6+41.00	PP 36*0.5	119.61	220	1	290	N/A	250	N/A	64.61(a-I)* 80.61(a-II) 87.61(d)	64.61	420

* a-I: Compression for Strength Limit, b-I: Tension for Strength Limit, a-II: Compression for Extreme Event, b-II: Tension for Extreme Event, d: Lateral Load for service limit

Table 10- Foundation Recommendation for RW83- Type 1 section (station 6+41 to 8+94)

Location	Wall Height (ft)	Pile type	Cut-off Elevation (ft)	Service Limit state Load (kips) per support	Total Permissible settlement (in)	Required Factored Nominal Resistance (kips)				Design Tip Elevation (ft)	Specified Tip Elevation (ft)	Nominal Driving Resistance required (kips)
						Strength Limit		Extreme event				
						Compression (ϕ=0.7)	Tension (ϕ=0.7)	Compression (ϕ=1.0)	Tension (ϕ=1.0)			
Sta. 6+41 to 8+94	22	PP 14*0.375	119.92	80	1	121	32	114	34	69.92(a-I)* 80.92(a-II) 99.92(b-I) 102.92(b-II) 104.92(d)	69.92	175
	18		124.67	68	1	94	18	101	32	74.67(a-I) 90.67(a-II) 110.67(b-I) 108.67(b-II) 110.67(d)	74.67	135
	16		124.67	72	1	108	17	129	57	79.67(a-I) 82.67(a-II) 111.67(b-I) 101.67(b-II) 109.67(d)	79.67	155
	16		123.67	72	1	108	17	129	57	78.67(a-I) 81.67(a-II) 110.67(b-I) 100.67(b-II) 108.67(d)	78.67	155
	14		123.67	64	1	90	19	116	53	86.67(a-I) 88.67(a-II) 109.67(b-I) 101.67(b-II) 108.67(d)	86.67	130
	14		122.92	64	1	90	19	116	53	85.92(a-I) 87.92(a-II) 108.92(b-I) 100.92(b-II) 107.92(d)	85.92	130

* a-I: Compression for Strength Limit, b-I: Tension for Strength Limit, a-II: Compression for Extreme Event, b-II: Tension for Extreme Event, d: Lateral Load for service limit

Note that the four piles adjacent to the 30-in RCP to avoid vibration impact shall be pre-drilled up to 9 ft from the cut-off elevation. For more details, please look at the section of construction consideration.

Table 11- Foundation Recommendation for RW83- Type 5 section (station 8+94 to 11+14.3)

Location	Wall Height (ft)	Pile type	Cut-off Elevation (ft)	Service Limit state Load (kips) per support	Total Permissible settlement (in)	Required Factored Nominal Resistance (kips)				Design Tip Elevation (ft)	Specified Tip Elevation (ft)	Nominal Driving Resistance (kips)
						Strength Limit		Extreme event				
						Compression (ϕ=0.7)	Tension (ϕ=0.7)	Compression (ϕ=1.0)	Tension (ϕ=1.0)			
Sta. 8+94 to 11+14.3	14	PP 14*0.375	120.17	67	1	108	29	108	41	83.17(a-I) 86.17(a-II) 101.17(b-I) 101.17(b-II) 120.17(d)	83.17	155
	14		118.17	67	1	108	29	108	41	81.17(a-I) 84.17(a-II) 99.17(b-I) 99.17(b-II) 118.17(d)	81.17	155
	12		118.17	54	1	88	24	97	43	83.17(a-I) 87.17(a-II) 101.17(b-I) 98.67(b-II) 118.17(d)	83.17	130
	12		118.17	111	1	112	0	102	0	83.17(a-I) 87.17(a-II) 118.17(d)	83.17	160
	8		119.92	106	1	98	0	110	4	84.92(a-I) 88.92(a-II) 119.92(d)	84.92	140

* a-I: Compression for Strength Limit, b-I: Tension for Strength Limit, a-II: Compression for Extreme Event, b-II: Tension for Extreme Event, d: Lateral Load for service limit

Table 12- Foundation Recommendation for RW533A (station 533+99.80 to 534+45.00)

Location	Pile type	Cut-off Elevation (ft)	Service Limit state Load (kips) per Pile	Total Permissible settlement (in)	Required Factored Nominal Resistance (kips)				Design Tip Elevation (ft)	Specified Tip Elevation (ft)	Nominal Driving Resistance required (kips)
					Strength Limit		Extreme event				
					Compression (ϕ=0.7)	Tension (ϕ=0.7)	Compression (ϕ=1.0)	Tension (ϕ=1.0)			
533+99.80 to 534+45.00	**CISS 36*0.5**	138.66	134	1	180	N/A	210	N/A	97.66(a-I)* 102.66(a-II) 111.66(d)	97.66	260

* a-I: Compression for Strength Limit, b-I: Tension for Strength Limit, a-II: Compression for Extreme Event, b-II: Tension for Extreme Event, d: Lateral Load for service limit

<u>RW 533A - Standard Type I wall with footing (Station 533+80 to 533+99.80)</u>

Based on soil conditions and wall height (4 feet) and the 2010 Standard Plan Sheet B3-1, Standard Type I wall on spread footing may be used for this section of RW#533A. Foundation recommendations are provided below.

Table 13- Geotechnical analysis for RW533A - Type 1 section (station 533+80 to 533+ 99.80)

Service limit state				Strength limit state			
Permissible settlement (in)	Net bearing stress for H = 4 ft, ksf from Sta. Plan	Permissible net contact pressure, qn (ksf)	Checking	Nominal bearing resistance, qn (ksf)	Factored Nominal bearing resistance, qn (ksf)	Gross uniform bearing stress, Qo (ksf)- from Sta. Plan	Checking
1.0	0.7	3.2	**O.K.**	13.9	6.9	1.5	**O.K.**

SETTLEMENT

Total settlement of the proposed wall supported on the foundations and backfilled as recommended herein was estimated to be less than 1.0 inches. Differential settlement within any 100 feet segment of the walls should be less than half of the total settlement

ADDITIONAL RECOMMENDATIONS

For the improvements of the roadway fill, we recommend that geofoam (or EPS block) be placed over the roadway areas where grade is to be raised by more than 5 feet including the areas over the existing RCBs.

We also recommend that the upper two (2) feet existing soils be excavated and replaced with geofoams or by compacted engineered fill soils.

We also recommend placing a non-woven geotextile fabric over the subgrade soils prior to placing any geofoam or soils behind the retaining walls.

Geocomposite drain and blanket drains should be installed behind the wall as shown in Figure 3. The areas should be graded with adequate surface slope to prevent ponding and infiltration of water into the wall backfill.

To prevent damage to the geofoam due to gasoline infiltration, a geomembrane should be placed over the geofoam prior to placing any soil fills.

CONSTRUCTION CONSIDERATIONS

1. Earthwork should be performed in accordance with Section 19 of the Caltrans Standard Specifications (2006).
2. Care must be exercised to limit ground vibration during pile installation to prevent any distress to the existing underground culverts and other above and below ground utilities, and existing adjacent State and private facilities.

3. For the construction of RW 10 and 533A - RCB section, we recommend that permanent casing, 20 ft deep, be installed without any vibration or driving. For filling between the permanent casing and pipe pile, we recommend lean concrete be placed.
4. For the construction of RW 533A, coarse gravel, cobble**s,** and boulders should be expected during excavation of the footings and hard pile driving.
5. For the construction of RW 533 A, we recommend that the minimum soil plug depth required for the design of end bearing of CISS piles be 10 ft and minimum sealing course depth be 2 ft.
6. For the construction of RW 83, caution should be exercised during driving for pipe pile due to conflict with existing 30 inch storm drain pipe.
7. For the four piles near the 30 inch RCP of RW 83, we recommend that minimum pre-drilling depth be 9 ft from the cut-off elevation. The pre-drilling diameter (or permanent casing) would be more than one feet of driven pile diameter (14*0.375). Then insert permanent casing to the pre-drilled depth, and pile driving to the elevation 79.67 should be done. Fill in the space with low strength cement, Sand Slurry, or grouting.
8. Groundwater is present at the site at relatively shallow depths. Due to seasonal rainfall and fluctuating groundwater elevations, there is the high potential for perched groundwater and groundwater to be encountered in excavations and/or pile holes. The Contractor should anticipate this condition.
9. Care must be exercised not to damage geofoam during transport, storing and installation.
10. All backfill soils or geofoam placed against existing ground should be keyed in a minimum of two feet.
11. Backfill should not be placed on yielding or soft subgrade soils. Such subgrade soils, if encountered during earthwork should be removed and replaced with compacted granular soils.

If you have any questions or comments, please call Jongkoo Jeon at (916) 227-5389, or Mohammed Islam at (916) 227-0993.

Prepared by: Date: 11/09/2011

Jongkoo Jeon, Ph.D., P.E.
Transportation Engineer
Office of Geotechnical Design – South 1

Attachments
Figures
Appendices A-C

CC: OGDS1- LA
Nooshin Yoosefi, D12 Project Manager
Mark Williams, GS Corporate
DES Office Engineer, Office of PS&E
Farhad Hadjibabaie, D12 Material Engineer
Structure Construction R.E. Pending file

FIGURES

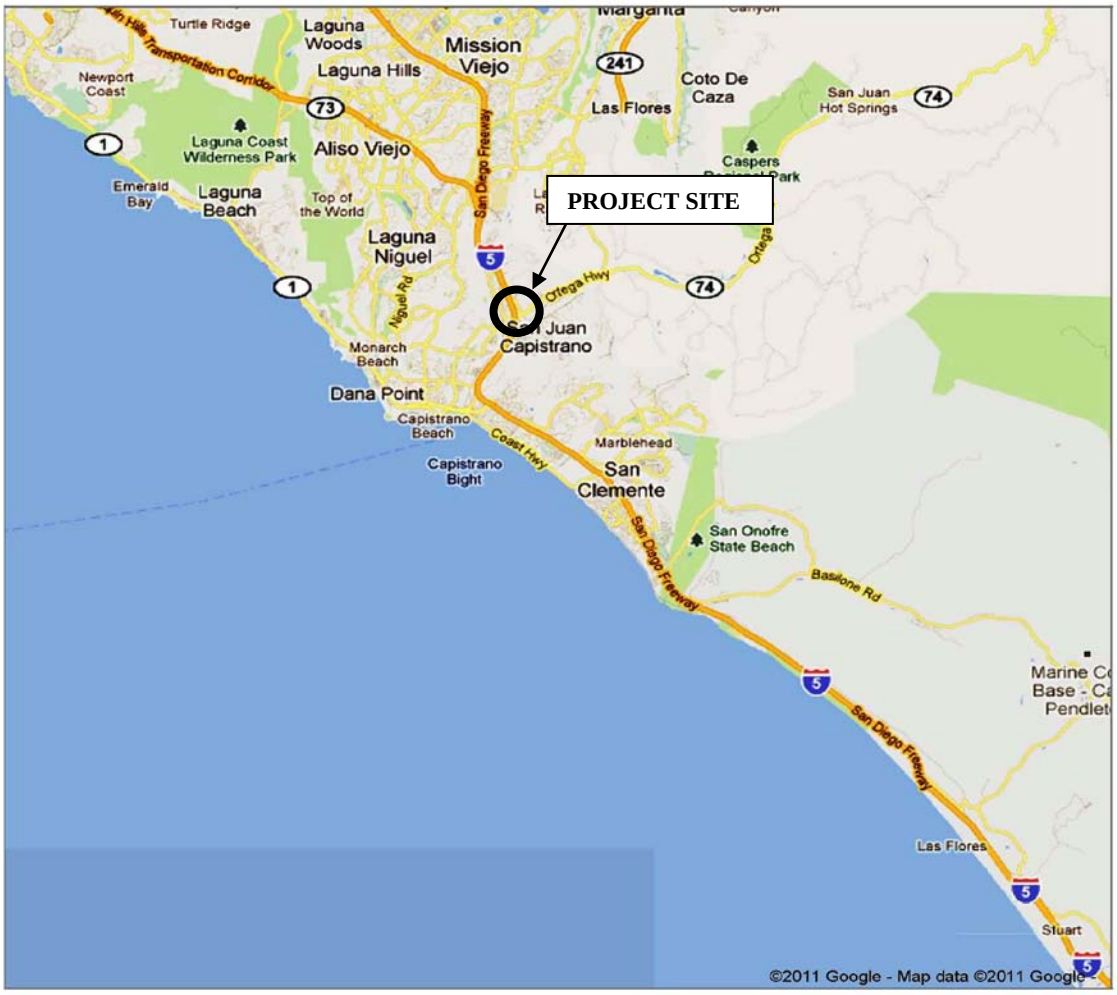


Figure 1. Project Location Map

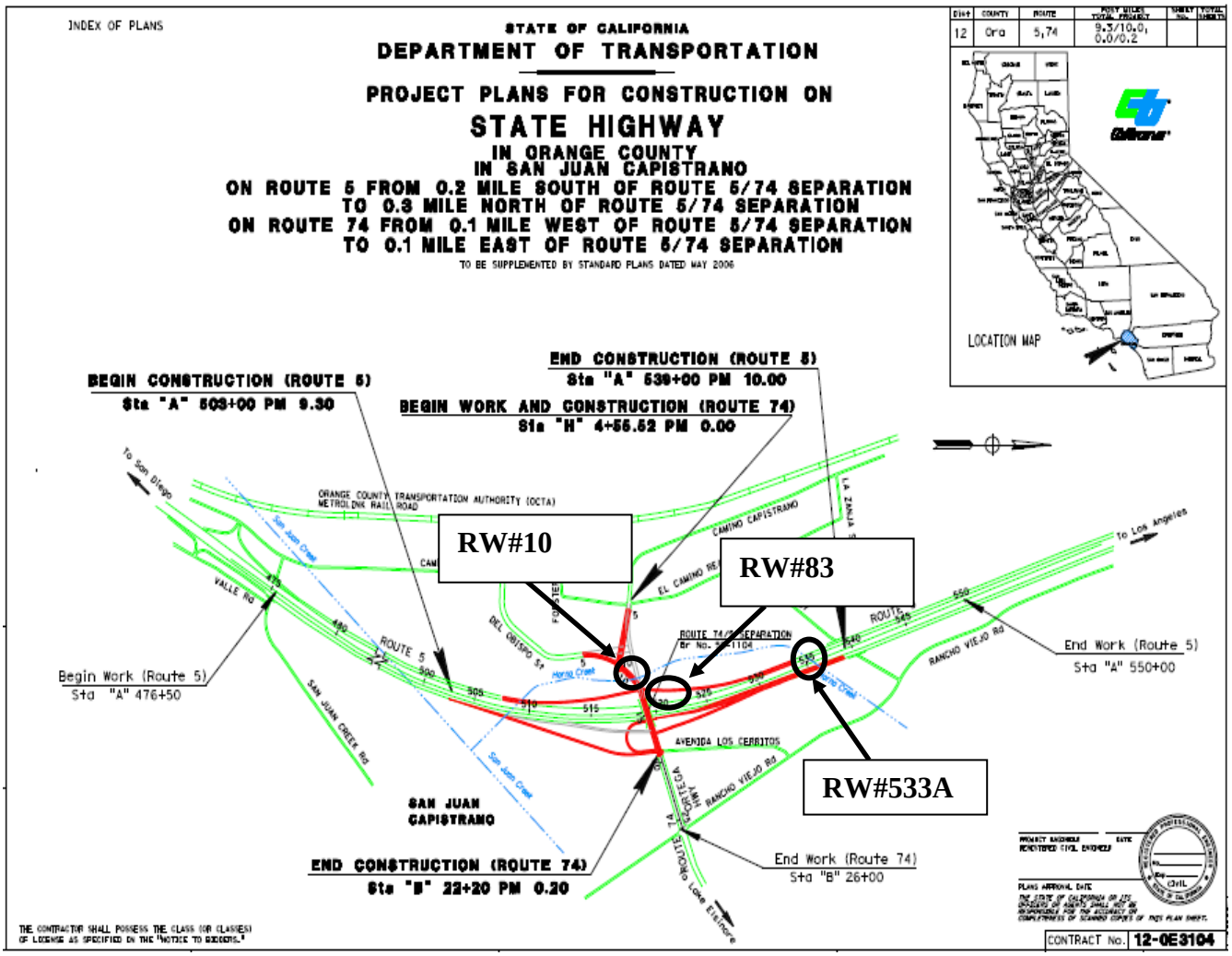


Figure 2. Proposed Retaining Wall Locations

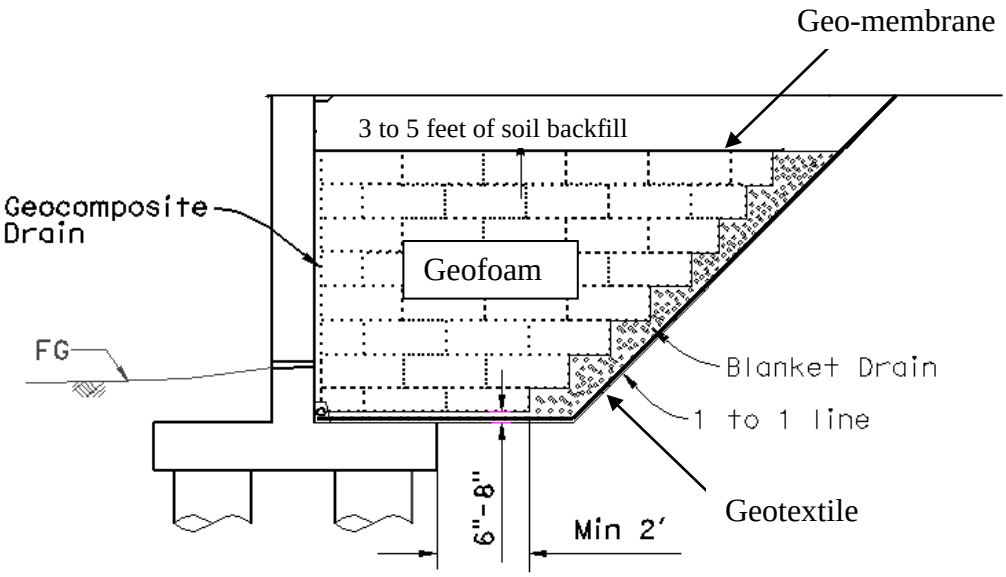


Figure 3. Recommended Geo-foam Backfill (Schematic)

APPENDIX A

- GENERAL PLAN
- FOUNDATION PLAN
- STRUCTURE PLAN

Retaining Wall 10

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
12	ORA	74			

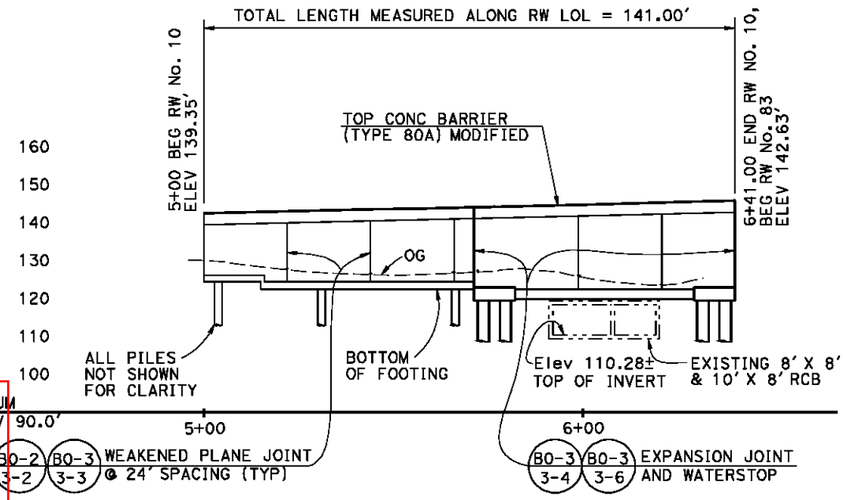
REGISTERED CIVIL ENGINEER X DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER CHARLES LONICKA No. C 71172 Exp. 6/30/13 CIVIL STATE OF CALIFORNIA

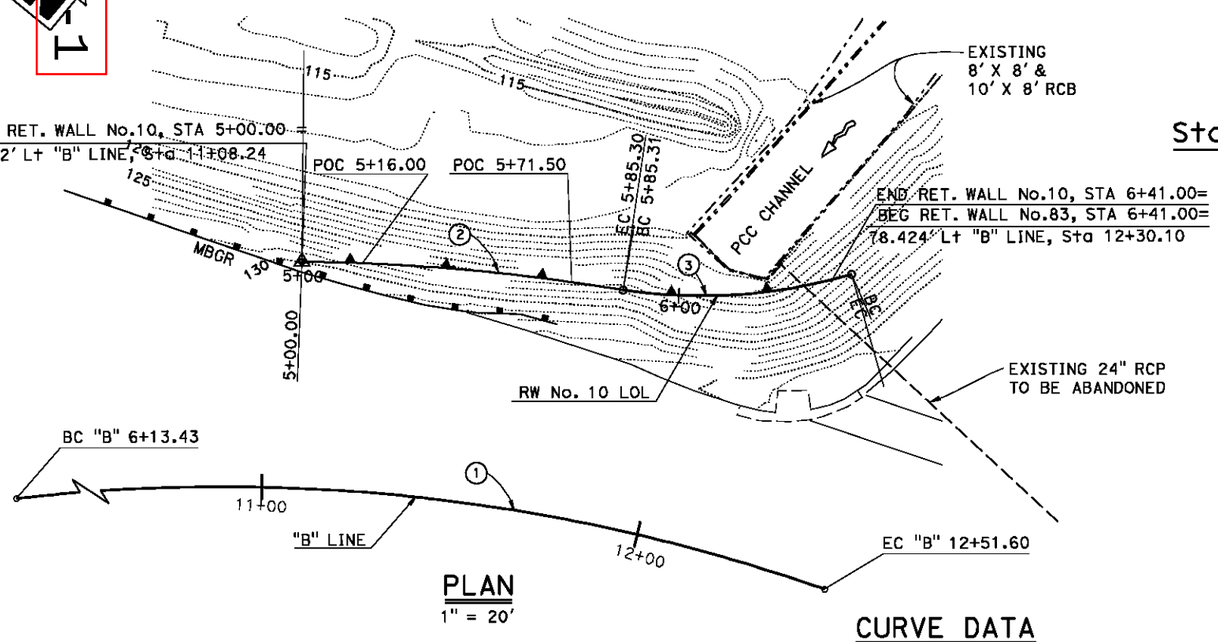
The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

P & Q



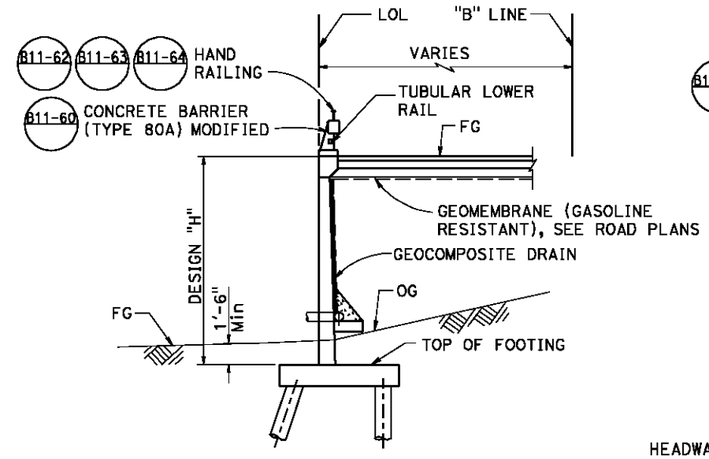
MIRRORED ELEVATION

1" = 20'

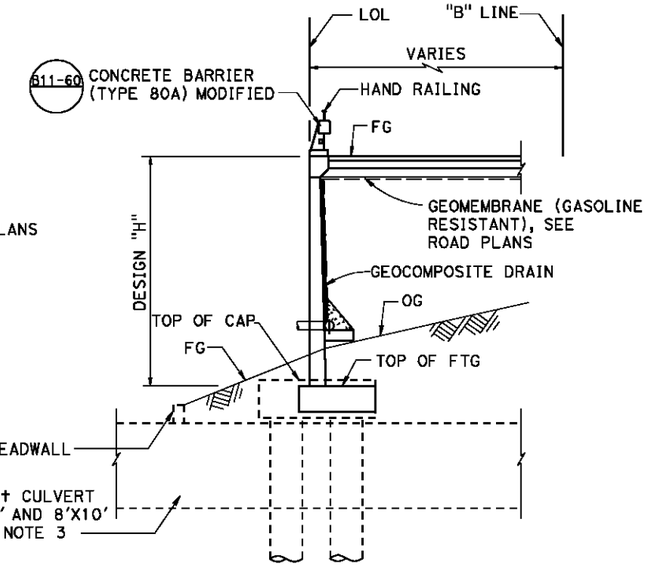


PLAN

1" = 20'



Sta 5+00.00 TO Sta 5+71.50



Sta 5+71.50 TO Sta 6+41.00

TYPICAL SECTION

NO SCALE

CURVE DATA

No.	R	Δ	T	L
1	480.00'	76°10'36"	376.21'	638.17'
2	540.76'	09°02'16"	42.74'	85.30'
3	142.23'	24°31'05"	30.91'	60.87'

STANDARD PLANS DATED MAY 2006

	A10A	ACRONYMS AND ABBREVIATIONS (A-L)
	A10B	ACRONYMS AND ABBREVIATIONS (M-Z)
	A10C	SYMBOLS (SHEETS 1 OF 2))
	A10D	SYMBOLS (SHEETS 2 OF 2))
	B0-3	BRIDGE DETAILS
	B2-5	PILE DETAILS CLASS 90 AND CLASS 140
	B3-8	RETAINING WALL DETAILS NO. 1
RSP	B11-60	CONCRETE BARRIER TYPE 80
	B11-62	CONCRETE BARRIER TYPE 80SW (SHEET 1 OF 3)
	B11-63	CONCRETE BARRIER TYPE 80SW (SHEET 2 OF 3)
	B11-64	CONCRETE BARRIER TYPE 80SW (SHEET 3 OF 3)

STANDARD PLAN SHEET NO.

DETAIL NO.

INDEX TO PLANS

NO. SHEET NAME

1. GENERAL PLAN
2. FOUNDATION PLAN
3. STRUCTURE PLAN
4. RETAINING WALL DETAILS NO. 1
5. RETAINING WALL DETAILS NO. 2
6. RETAINING WALL DETAILS NO. 3
7. ARCHITECTURAL TREATMENT DETAILS
8. LOG OF TEST BORINGS 1 OF 2
9. LOG OF TEST BORINGS 2 OF 2

NOTES:

1. Top of wall elevations measured along retaining wall LOL.
2. All dimensions measured radial along retaining wall LOL.
3. Culvert to be extended, see road plans.

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

Figure 1

MOHAMMAD RAVANIPOUR, DESIGN ENGINEER	DESIGN	BY EDWARD MERCADO	CHECKED CHARLES LOMICKA	LOAD & RESISTANCE FACTOR DESIGN
	DETAILS	BY HENGAMEH MAHBOOBI / H.B.	CHECKED CHARLES LOMICKA	LAYOUT: BY EDWARD MERCADO; CHECKED CHARLES LOMICKA
	QUANTITIES	BY EDWARD MERCADO	CHECKED HTOON WIN	SPECIFICATIONS: BY X; PLANS AND SPECS COMPARED X

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DIVISION OF ENGINEERING SERVICES
STRUCTURE DESIGN
DESIGN BRANCH 19

BRIDGE NO. 55 E0117
POST MILE 0.01

RETAINING WALL NO. 10
GENERAL PLAN

UNIT: 3621
PROJECT NUMBER & PHASE: 1200000102 1
CONTRACT NO.: 0E3101

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES: 01-25-11 07-14-11 07-06-11

SHEET 1 OF 9

FILE => 01-RW10-a-gp01.dgn

STRUCTURES DESIGN GENERAL PLAN SHEET (ENGLISH) (REV.09-01-10)

USERNAME => s120514 DATE PLOTTED => 21-JUL-2011 TIME PLOTTED => 15:04

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
12	ORA	74			

REGISTERED CIVIL ENGINEER X DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER CHARLES LOWICKA No. C 71172 Exp. 6/30/13 CIVIL STATE OF CALIFORNIA

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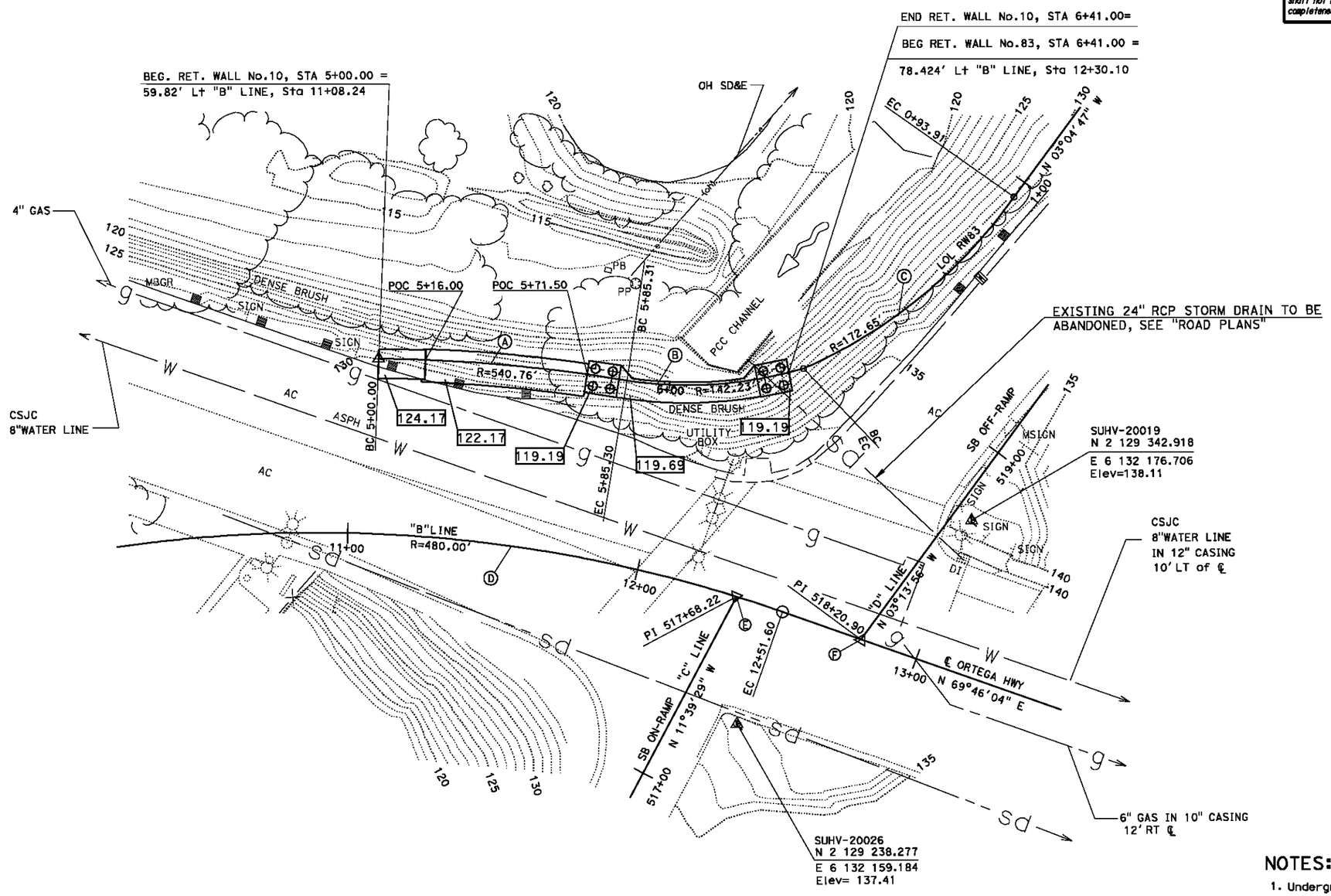
P & Q

Figure A-2

CURVE DATA				
No.	R	Δ	T	L
Ⓐ	540.76	09°02'16"	42.74	85.30
Ⓑ	142.23	24°31'05"	30.91	60.87
Ⓒ	172.65	31°09'53"	48.15	93.91
Ⓓ	480.00	76°10'36"	376.21	638.17

Ⓔ STA.12+35.07 "B" LINE = STA.517+68.22 "C" LINE

Ⓕ STA.12+80.00 "B" LINE = STA.518+20.90 "D" LINE



SURVEY CONTROL

SUHV-20019

60D NAIL & CH. "X"
6.30 Ft Rt "D" LINE
Sta 518+76.06
N 2 129 342.918
E 6 132 176.706
Elev= 138.11

SUHV-20026

60D NAIL
41.26 Ft Rt "B" LINE
Sta 12+49.30
N 2 129 238.277
E 6 132 159.184
Elev= 137.41

NOTES:

1. Underground Utilities as shown are approximate
2. XX.XX Indicates Bottom of Ftg Elev

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

PRELIMINARY INVESTIGATION SECTION							
SCALE 1"=20'	VERT.DATUM NAVD88	PHOTOGRAMMETRY AS OF: X					
	HORZ.DATUM NAD83 (1991.35)	SURVEYED	BY DISTRICT 12	CHECKED	BY T.PHUNG 3/2010		
ALIGNMENT TIES DIST.TRAVERSE SHEETS		DRAFTED	BY S. ABASSY 02/2011	CHECKED	BY S. ALIVIO 02/2011		

DESIGN	BY EDWARD MERCADO	CHECKED CHARLES LOWICKA
DETAILS	BY HENGAMEH MAHBOOBI	CHECKED CHARLES MERCADO
QUANTITIES	BY EDWARD MERCADO	CHECKED HTOON WIN

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DIVISION OF ENGINEERING SERVICES
STRUCTURE DESIGN
DESIGN BRANCH 19

BRIDGE NO. 55 E0117
POST MILE 0.01

RETAINING WALL NO.10
FOUNDATION PLAN

STRUCTURES FOUNDATION PLAN SHEET (ENGLISH) (REV. 09-01-10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 3621
PROJECT NUMBER & PHASE: 1200000102 1 CONTRACT NO.: 0E3101

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES 02-17-11 01-06-11 06-06-11 SHEET 2 OF 9

FILE => 02-RW10-e-fdp101.dgn

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
12	ORA	74			

REGISTERED CIVIL ENGINEER X DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER CHARLES LOMICKA No. C 71172 Exp. 6/30/13 CIVIL STATE OF CALIFORNIA

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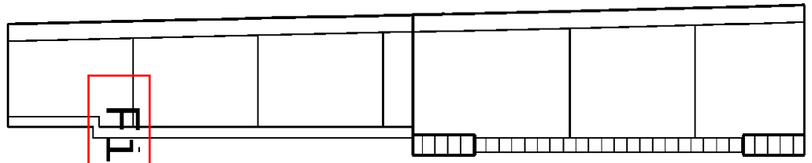
Figure A-3



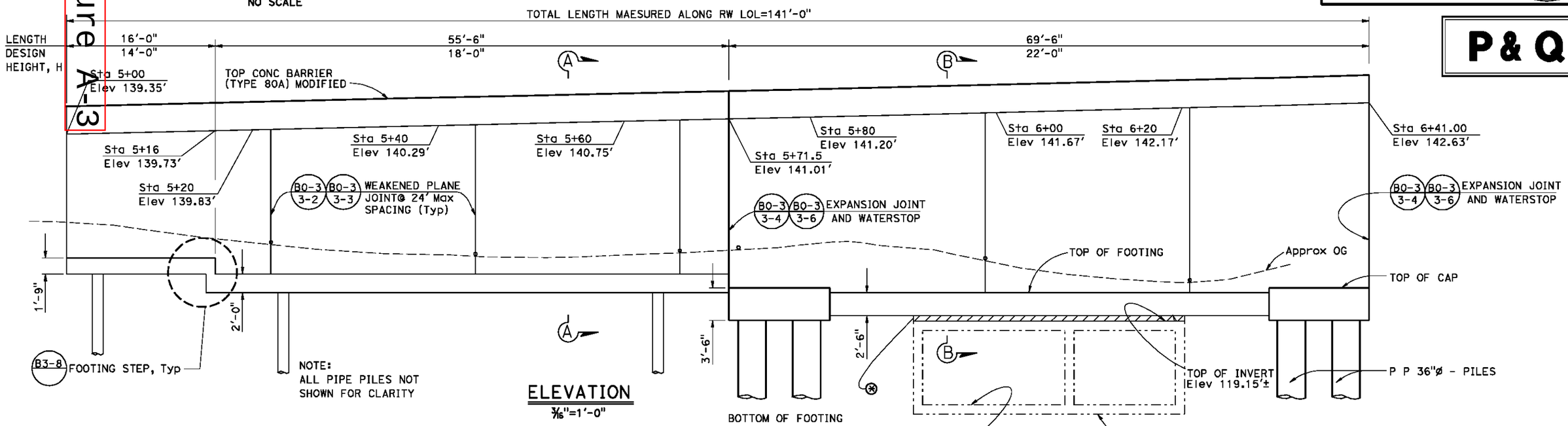
CONCRETE STRENGHT AND TYPE LIMITS

NO SCALE

LEGEND

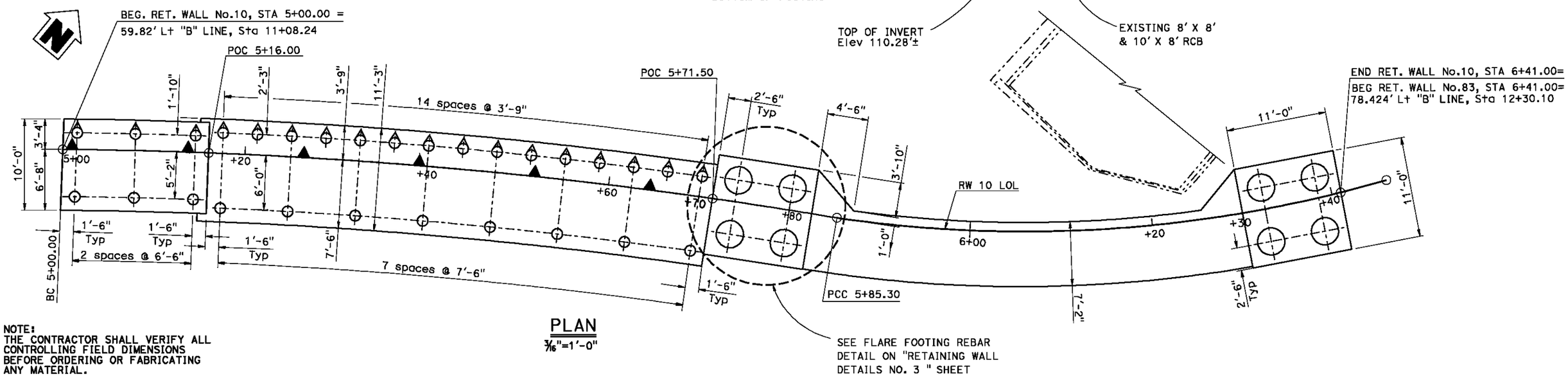
- Structural Concrete (Retaining Wall)
- Structural Concrete (Retaining Wall f'c 4000 psi)
- 36"ø PIPE PILE
- Indicates 1:3 Battered Pipe Pile
- Indicates Vertical Pipe Pile
- 5"± Expanded Polystyrene between footing and top of existing RCB

P & Q



ELEVATION

3/16"=1'-0"



PLAN

3/16"=1'-0"

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

	BY	CHECKED
DESIGN	EDWARD MERCADO	CHARLES LOMICKA
DETAILS	HENGAMEH MAHBOOBI	CHARLES LOMICKA
QUANTITIES	EDWARD MERCADO	HTOON WIN

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DIVISION OF ENGINEERING SERVICES
STRUCTURE DESIGN
DESIGN BRANCH 19

BRIDGE NO. 55 E0117
POST MILE 0.01

RETAINING WALL NO. 10
STRUCTURE PLAN

STRUCTURES DESIGN DETAIL SHEET (ENGLISH) (REV. 09-01-10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 3621
PROJECT NUMBER & PHASE: 1200000102 1 CONTRACT NO.: 0E3101

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES: 04-01-11 02-08-11 05-14-11

SHEET 3 OF 9

FILE => 03-RW10-c-sp01.dgn

USERNAME => s120514 DATE PLOTTED => 21-JUL-2011 TIME PLOTTED => 15:05

Retaining Wall 83

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
12	ORA	5			

REGISTERED CIVIL ENGINEER X DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER CHARLES LOWICKA No. C 71172 Exp. 06-30-2011 CIVIL STATE OF CALIFORNIA

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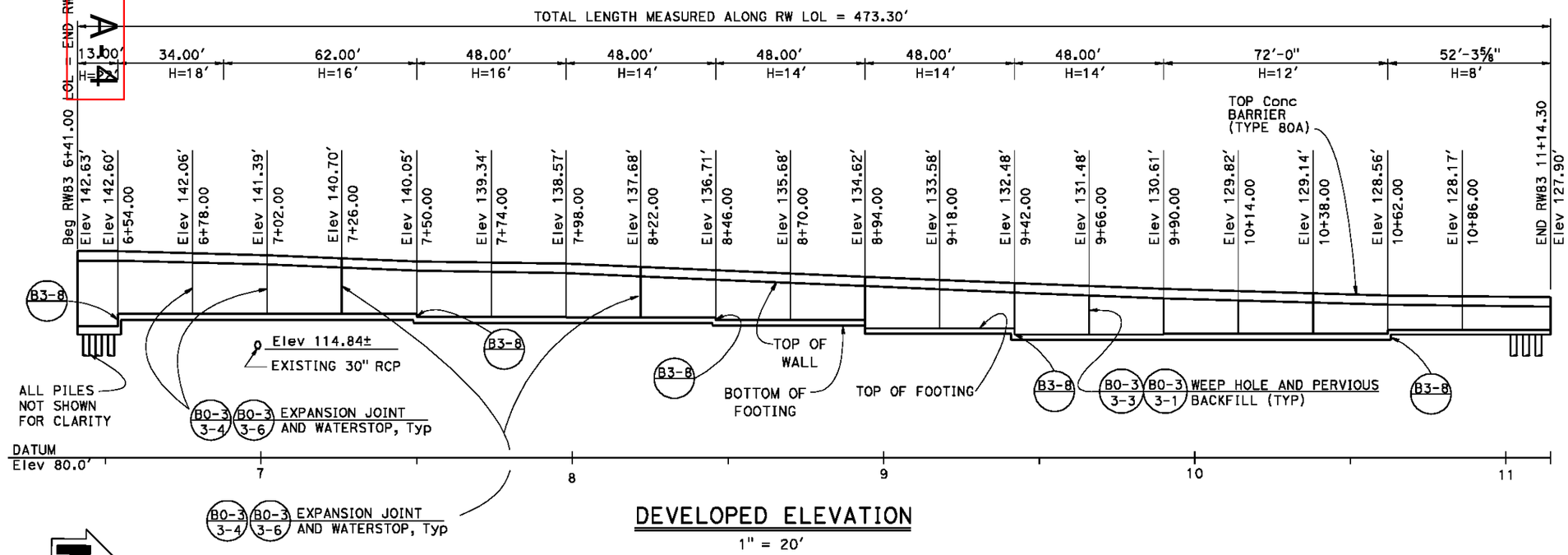
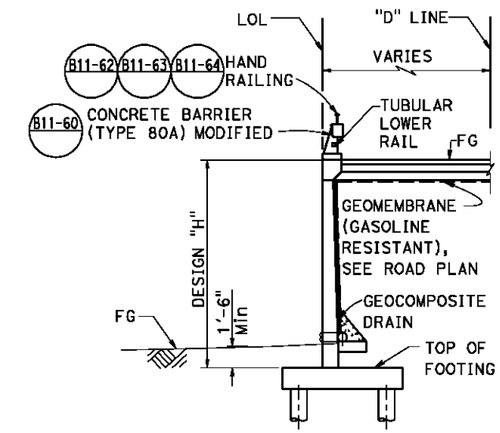


DEVELOPED ELEVATION

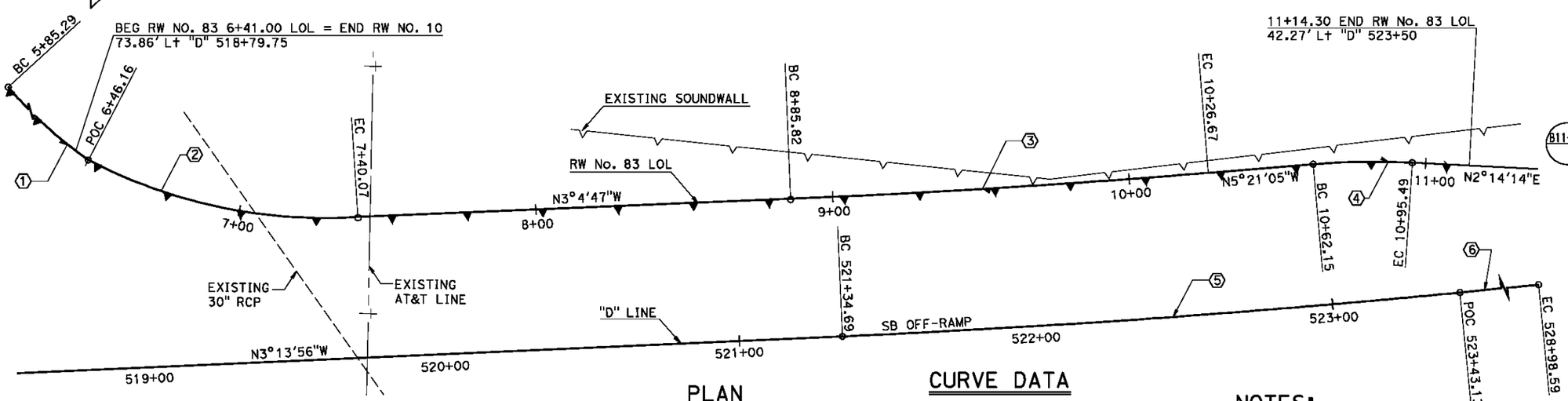
1" = 20'



TYPICAL SECTION

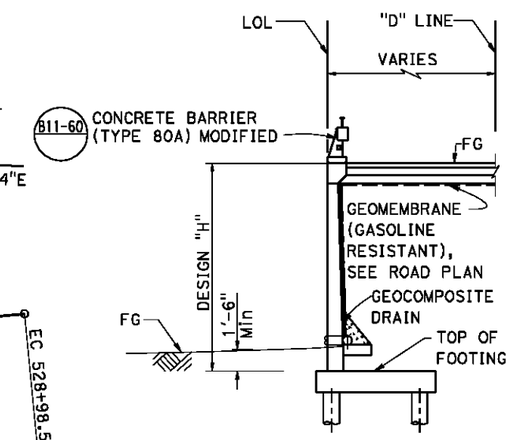
Sta 6+41.00 TO Sta 8+94.00

NO SCALE



PLAN

1" = 20'



TYPICAL SECTION

Sta 8+94.00 TO Sta 11+14.30

NO SCALE

CURVE DATA

No.	R	Δ	T	L
1	142.23'	24°31'05"	30.91'	60.87'
2	172.65'	31°09'53"	48.15'	93.91'
3	3552.23'	02°16'19"	70.44'	140.85'
4	251.76'	07°35'20"	16.70'	33.35'
5	3999.99'	02°59'08"	104.24'	208.44'
6	5399.98'	05°53'37"	277.97'	555.46'

NOTES:

1. Top of wall elevations measured along retaining wall LOL @ locations noted.
2. All dimensions measured along retaining wall LOL.
3. Underground utilities as shown are approximate.

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

P&Q

MOHAMMAD RAVANIPOUR
DESIGN ENGINEER

	BY	CHECKED				
DESIGN	MAMUNUR RAHMAN	EDWARD MERCADO	LOAD & RESISTANCE FACTOR DESIGN			
DETAILS	H. M. - H. B.	EDWARD MERCADO	LAYOUT	MAMUNUR RAHMAN	EDWARD MERCADO	
QUANTITIES	EDWARD MERCADO	DARYOUSH BALBAS	SPECIFICATIONS	X	PLANS AND SPECS COMPARED X	

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DIVISION OF ENGINEERING SERVICES
STRUCTURE DESIGN
DESIGN BRANCH 19

BRIDGE NO. 55 E0119
POST MILE 9.6

RETAINING WALL NO. 83
GENERAL PLAN

UNIT: 3621
PROJECT NUMBER & PHASE: 1200000102 1 CONTRACT NO.: 0E3101

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES 01-17-11 02-21-11 07-12-11

SHEET 1 OF 9

STRUCTURES DESIGN GENERAL PLAN SHEET (ENGLISH) (REV.09-01-10)

FILE => 01-RW83-a-gp01.dgn

USERNAME => s120514 DATE PLOTTED => 21-JUL-2011 TIME PLOTTED => 15:10

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
12	ORA	5			

REGISTERED CIVIL ENGINEER X DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER CHARLES LOMICKA No. C 71172 Exp. 6/30/13 CIVIL STATE OF CALIFORNIA

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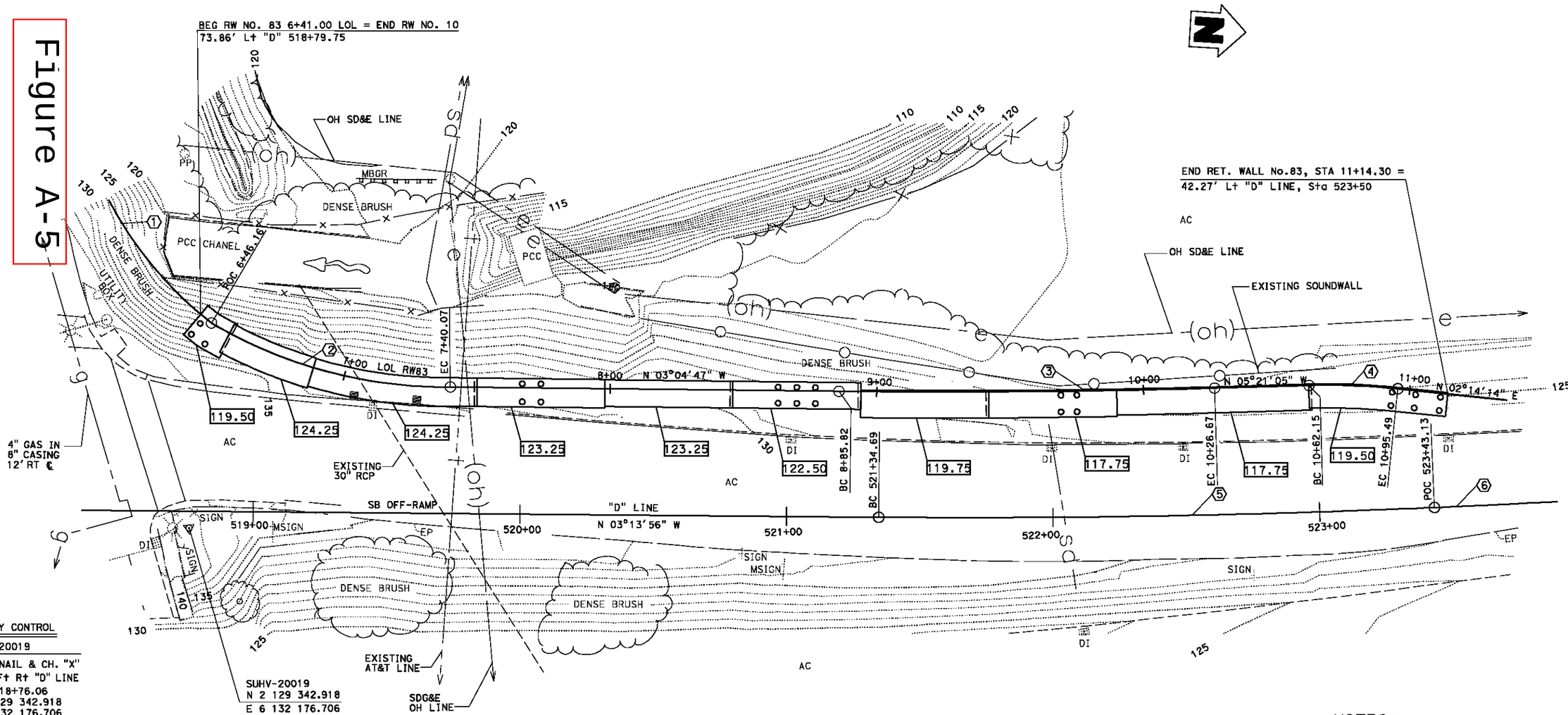
P & Q

CURVE DATA

No.	R	Δ	T	L
1	142.23′	24°31′05"	30.91′	60.87′
2	172.65′	31°09′53"	48.15′	93.91′
3	3552.23′	02°16′19"	70.44′	140.85′
4	251.76′	07°35′20"	16.70′	33.35′
5	3999.99′	02°59′08"	104.24′	208.44′
6	5399.98′	05°53′37"	277.97′	555.46′

Figure A-5



SURVEY CONTROL

SUHV-20019

60 D NAIL & CH. "X"
6.30 Ft Rt "D" LINE
Sta 518+76.06
N 2 129 342.918
E 6 132 176.706
Elev= 138.11

SUHV-20026 (NOT SHOWN)

60 D NAIL
41.26 Ft Rt "B" LINE
Sta 12+49.30
N 2 129 238.277
E 6 132 159.184
Elev= 137.41

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

NOTES:

1. Underground Utilities as shown are approximate
2. XX.XX Indicates Bottom of Footing Elevation
3. All Piles not shown, see "PILE LAYOUT" sheet

PRELIMINARY INVESTIGATION SECTION

SCALE	VERT.DATUM NAVD88	PHOTOGRAMMETRY AS OF: X		
1"=20′	HORZ.DATUM NAD83 (1991.35)	SURVEYED BY DISTRICT 12	CHECKED BY T.PHUNG 3/2010	
ALIGNMENT TIES DIST.TRAVERSE SHEETS		DRAFTED BY S. ABASSY 02/2011	CHECKED BY S. ALIVIO 02/2011	

STRUCTURES FOUNDATION PLAN SHEET (ENGLISH) (REV. 09-01-10)

DESIGN	BY MAMUNUR RAHMAN	CHECKED EDWARD MERCADO
DETAILS	BY HENGAMEH MAHBOOBI/H.B.	CHECKED EDWARD MERCADO
QUANTITIES	BY EDWARD MERCADO	CHECKED DARYOUSH BALBAS

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DIVISION OF ENGINEERING SERVICES
STRUCTURE DESIGN
DESIGN BRANCH 19

BRIDGE NO. 55 E0119
POST MILE 9.6

RETAINING WALL No.83
FOUNDATION PLAN

UNIT: 3621
PROJECT NUMBER & PHASE: 1200000102 1 CONTRACT NO.: 0E3101

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES 03/08/11 07-12-11 07-06-11

SHEET 3 OF 9

FILE => 03-RW83-e-fdp01.dgn

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
12	ORA	5			

P & Q

REGISTERED CIVIL ENGINEER X DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER CHARLES LONICKA No. C 71172 Exp. 6/30/11 CIVIL STATE OF CALIFORNIA

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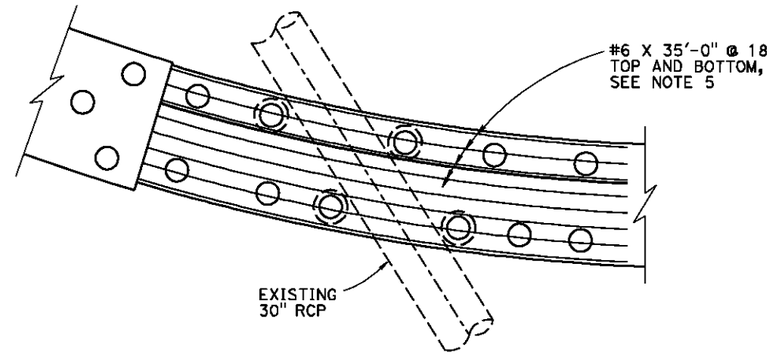
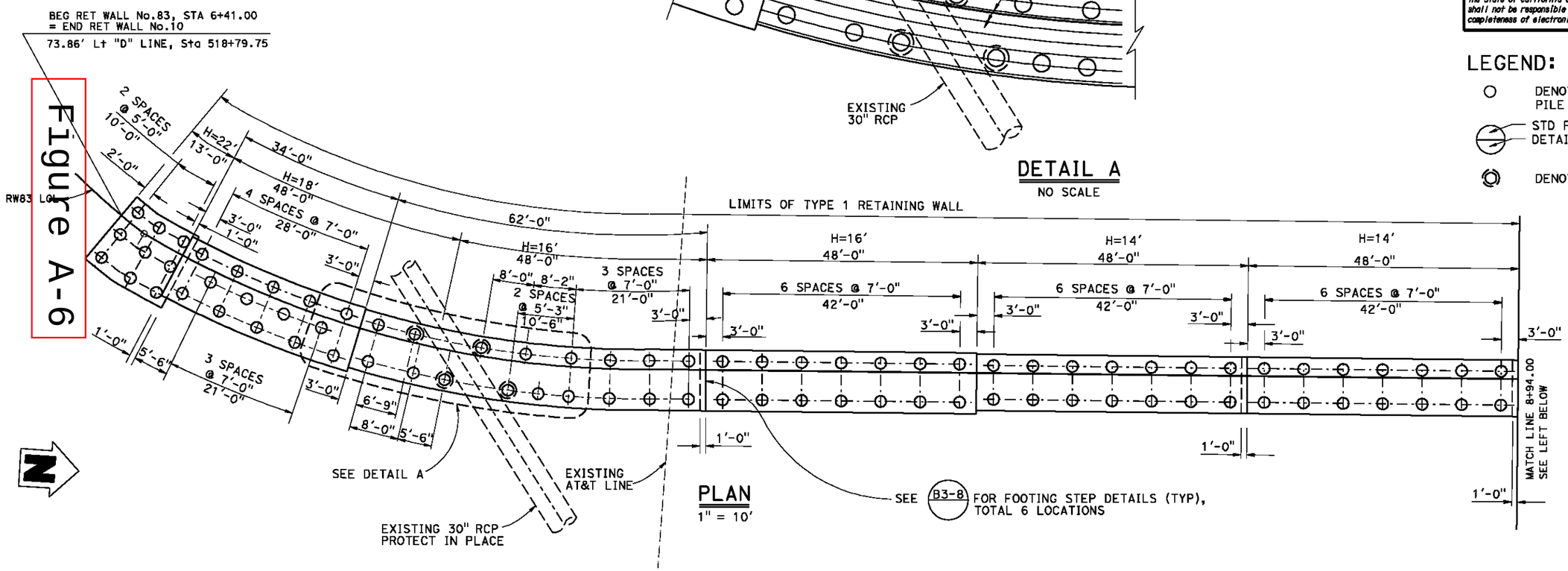


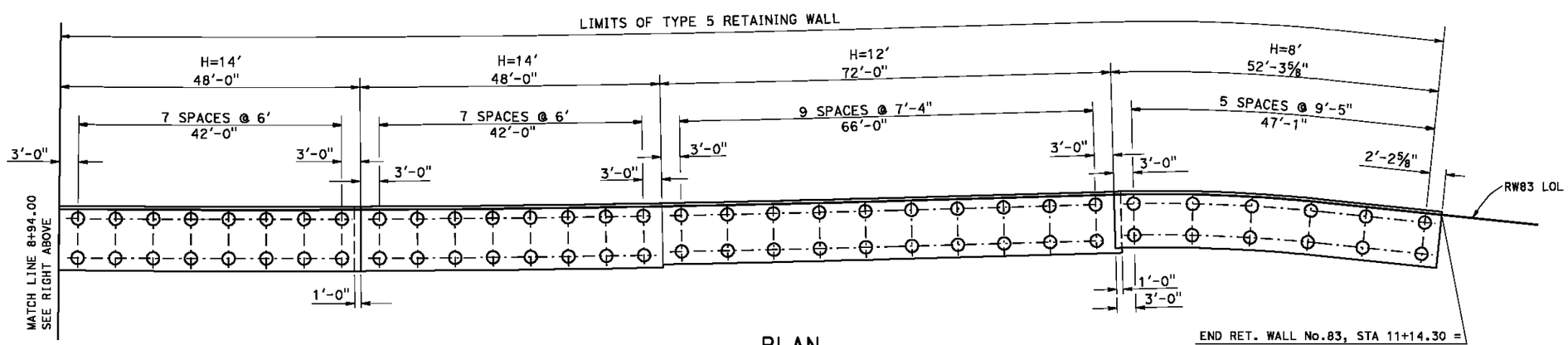
DETAIL A
NO SCALE

LEGEND:

- ○ DENOTES 24"ø PIPE PILE
- STD PLAN SHEET NO. / DETAIL NO.
- DENOTES PREDRILLING PILE



PLAN
1" = 10'



PLAN
1" = 10'

NOTES:

1. For additional details and dimensions, see "RETAINING WALL DETAILS NO.1" and "RETAINING WALL DETAILS NO. 2" sheets
2. All dimensions measured along retaining wall LOL.
3. For pile data table, see "INDEX TO PLANS" sheet.
4. Underground utilities as shown are approximate. Contractor to verify location prior to pile driving. Adjustment of pile locations shall be approved by the Engineer.
5. Reinforcement shown is in addition to that shown on "RETAINING WALL DETAILS NO. 1" sheet.

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

Figure A-6

	BY	CHECKED
DESIGN	MAMUNUR RAHMAN	EDWARD MERCADO
DETAILS	HENGAMEH MAHBOOBI / H.B.	EDWARD MERCADO
QUANTITIES	EDWARD MERCADO	DARYOUSH BALBAS

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DIVISION OF ENGINEERING SERVICES
STRUCTURE DESIGN
DESIGN BRANCH 19

BRIDGE NO. 55 E0119
POST MILE 9.6

RETAINING WALL NO. 83
PILE LAYOUT

STRUCTURES DESIGN DETAIL SHEET (ENGLISH) (REV. 09-01-10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 3621
PROJECT NUMBER & PHASE: 1200000102 1 CONTRACT NO.: 0E3101

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES 05-02-11 07-12-11 08-16-11

SHEET 4 OF 9

FILE => 04-RW83-g-lo01.dgn

USERNAME => s120514 DATE PLOTTED => 21-JUL-2011 TIME PLOTTED => 15:10

Retaining Wall 533A

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
12	ORA	5			

REGISTERED CIVIL ENGINEER X DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER CHARLES LOMICKA No. C 71172 Exp. 06-30-2013 CIVIL STATE OF CALIFORNIA

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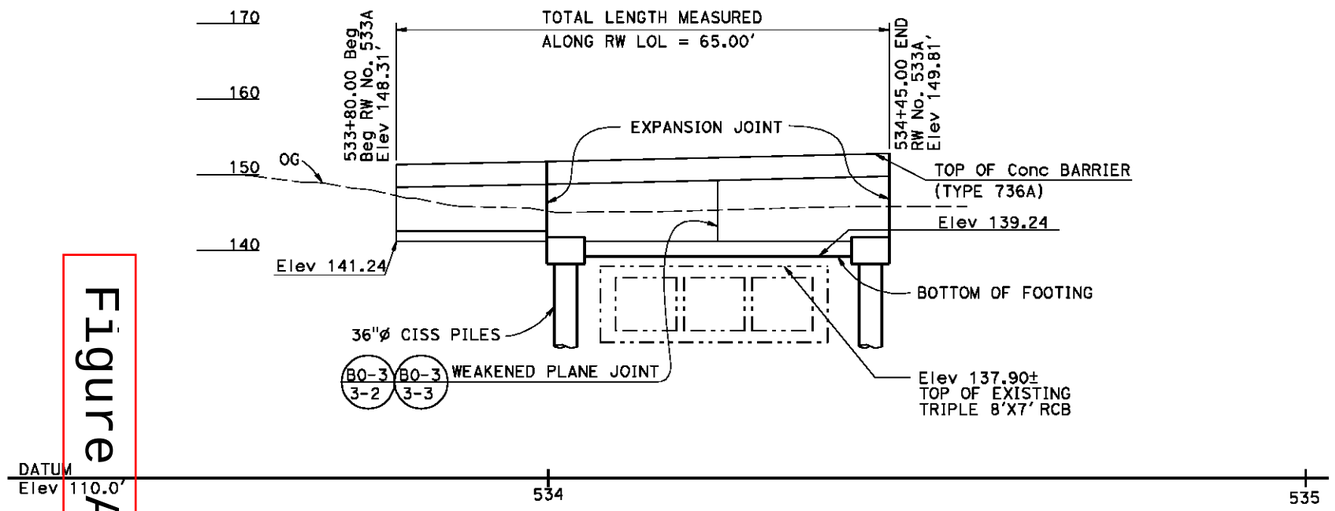
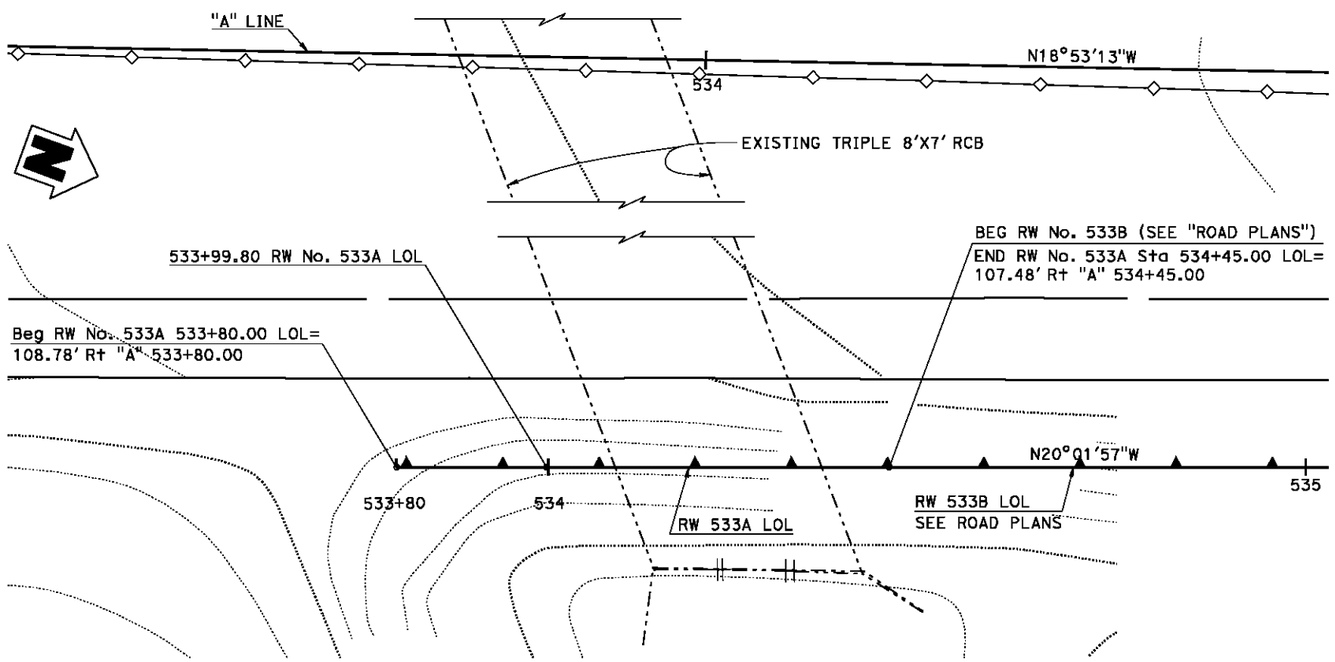
P & Q

Figure A-7



MIRRORED ELEVATION

1"=10'



PLAN

1" = 10'

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

STANDARD PLANS DATED MAY 2006

	A10A	ACRONYMS AND ABBREVIATIONS (A-L)
	A10B	ACRONYMS AND ABBREVIATIONS (M-Z)
	A10C	SYMBOLS (SHEETS 1 OF 2))
	A10D	SYMBOLS (SHEETS 2 OF 2))
	A62B	LIMITS OF PAYMENT FOR EXCAVATION AND BACKFILL - BRIDGE SURCHARGE AND WALL
	B0-3	BRIDGE DETAILS
RSP	B11-56	CONCRETE BARRIER TYPE 736

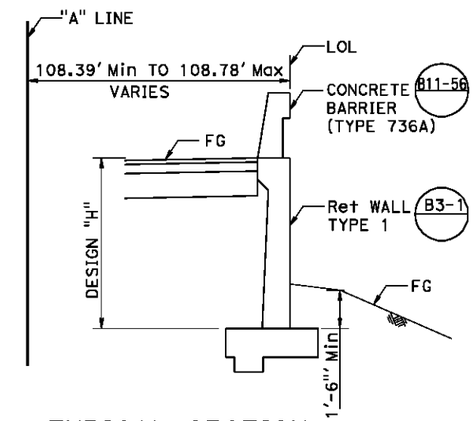
STANDARD PLAN SHEET NO.

DETAIL NO.

INDEX TO PLANS

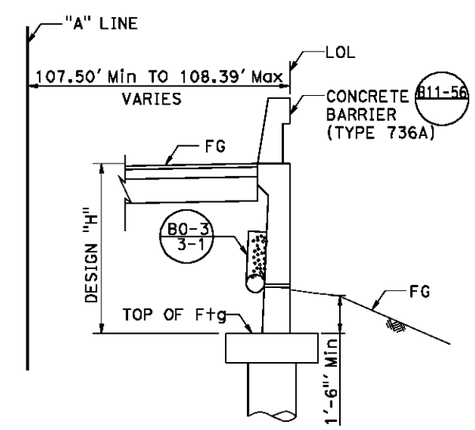
NO. SHEET NAME
1. GENERAL PLAN
2. FOUNDATION PLAN
3. STRUCTURE PLAN
4. RETAINING WALL DETAILS NO. 1
5. RETAINING WALL DETAILS NO. 2
6. ARCHITECTURAL TREATMENT DETAILS
7. LOG OF TEST BORINGS 1 OF 2
8. LOG OF TEST BORINGS 2 OF 2

QUANTITIES



TYPICAL SECTION

NO SCALE
FROM Sta 533+80
TO 533+99.80



TYPICAL SECTION

NO SCALE
FROM Sta 533+99.80
TO 534+45.00

MOHAMMAD RAVANIOUR, DESIGN ENGINEER	DESIGN	BY EDWARD MERCADO	CHECKED CHARLES LOMICKA	LOAD & RESISTANCE FACTOR DESIGN	LIVE LOADING: HL93 W/"LOW-BOY"; PERMIT DESIGN VEHICLE	
	DETAILS	BY HENGAMEH MAHBOOBI / H.B.	CHECKED CHARLES LOMICKA	LAYOUT	BY EDWARD MERCADO	CHECKED CHARLES LOMICKA
	QUANTITIES	BY EDWARD MERCADO	CHECKED HTOON WIN	SPECIFICATIONS	BY X	PLANS AND SPECS COMPARED X

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DIVISION OF ENGINEERING SERVICES
STRUCTURE DESIGN
DESIGN BRANCH 19

BRIDGE NO. 55 E0120
POST MILE 9.90

RETAINING WALL NO. 533A
GENERAL PLAN

UNIT: 3621
PROJECT NUMBER & PHASE: 1200000102 1 CONTRACT NO.: 0E3101

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES: 01-25-11 07-14-11 08-25-11

SHEET 1 OF 8

USERNAME => s120514 DATE PLOTTED => 21-JUL-2011 TIME PLOTTED => 15:25

STRUCTURES DESIGN GENERAL PLAN SHEET (ENGLISH) (REV.09-01-10)

FILE => 01-RW533A-a-gp01.dgn

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
12	ORA	5			

REGISTERED CIVIL ENGINEER X DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER CHARLES LONICKA No. C 71172 Exp. 6/30/13 CIVIL STATE OF CALIFORNIA

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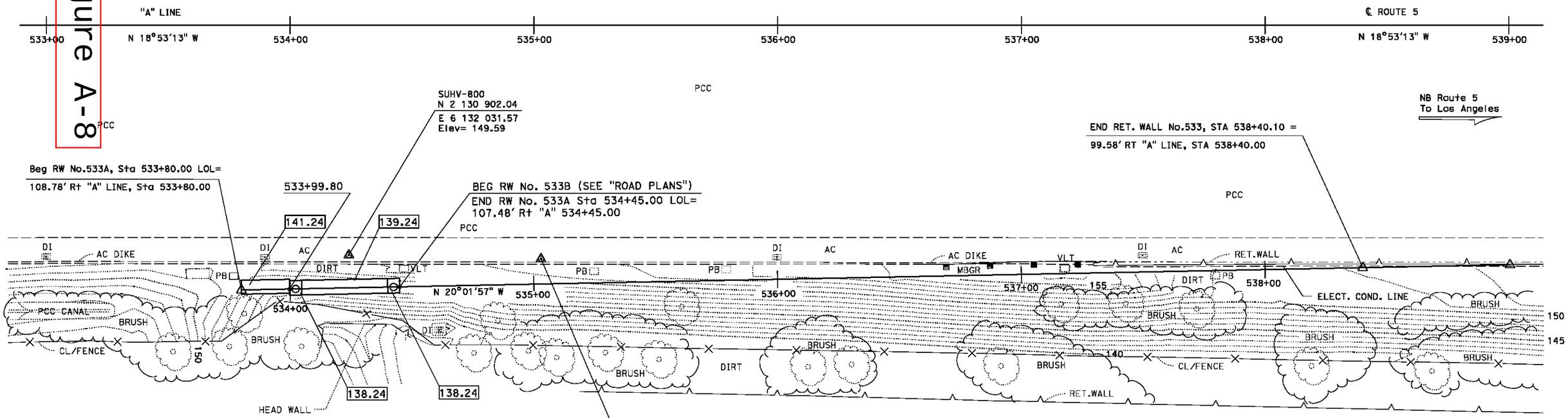
P & Q

LEGEND:

XX.XX BOTTOM FOOTING ELEVATION

Figure A-8



SURVEY CONTROL

SUHV-800

FND PK/Tin/ AC Shdr
94.41 Ft Rt ℄ Route 5
Sta 534+24.06
N 2 130 902.04
E 6 132 031.57
Elev= 149.59

SUHV-413

FND PK/Tin/ AC Shdr
95.97 Ft Rt ℄ Route 5
Sta 535+02.87
N 2 130 977.11
E 6 132 007.54
Elev= 151.28

PRELIMINARY INVESTIGATION SECTION

SCALE 1"=20'	VERT.DATUM NAVD88	PHOTOGRAMMETRY AS OF: X			
	HORZ.DATUM NAD83 (1991.35)	SURVEYED	BY T.PHUNG 02/2011	CHECKED	BY C.STEWART 02/2011
ALIGNMENT TIES DIST.TRAVERSE SHEETS		DRAFTED	BY V.PHAM 02/2011	CHECKED	BY S.ALIVIO 02/2011

DESIGN	BY EDWARD MERCADO	CHECKED CHARLES LOWICKA
DETAILS	BY H. MAHBOOBI / H. B.	CHECKED CHARLES LOWICKA
QUANTITIES	BY EDWARD MERCADO	CHECKED HTOON WIN

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DIVISION OF ENGINEERING SERVICES
STRUCTURE DESIGN
DESIGN BRANCH 19

BRIDGE NO. 55 E0120
POST MILE 9.90

RETAINING WALL NO. 533A
FOUNDATION PLAN

STRUCTURES FOUNDATION PLAN SHEET (ENGLISH) (REV. 09-01-10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 3621
PROJECT NUMBER & PHASE: 1200000102 1 CONTRACT NO.: 0E3101

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES 02-17-11 07-14-11 08-05-11

SHEET 2 OF 8

FILE => 02-RW533A-e-fdp101.dgn

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
12	ORA	5			

P & Q

REGISTERED CIVIL ENGINEER X DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER CHARLES LOMICKA No. C 71172 Exp. 6/30/13 CIVIL STATE OF CALIFORNIA

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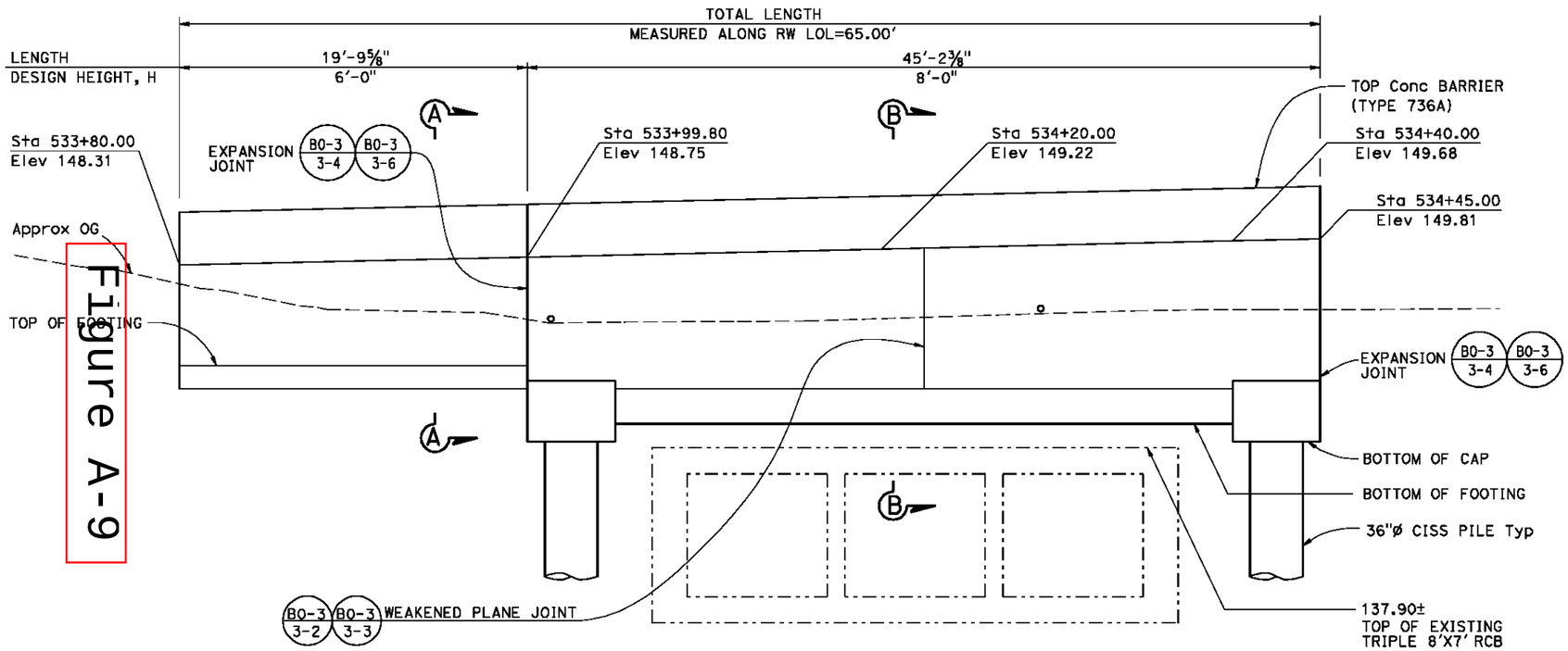
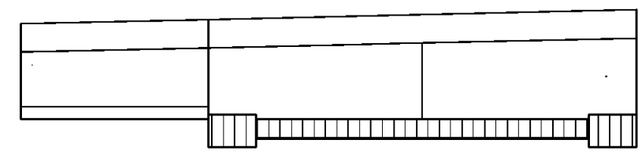


Figure A-9

ELEVATION

¼" = 1'-0"



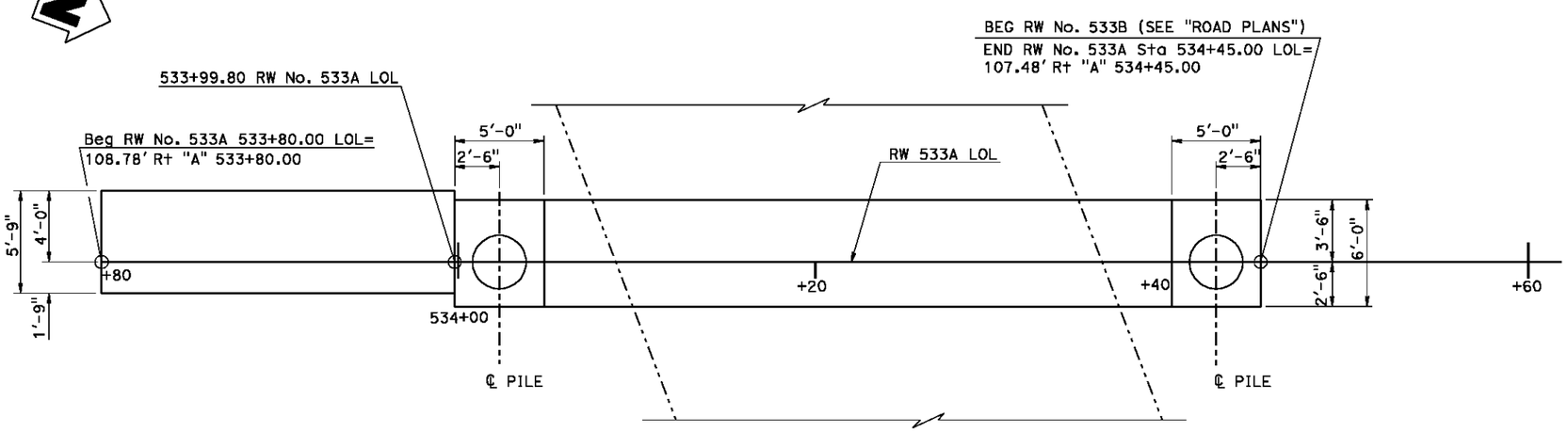
CONCRETE STRENGHT AND TYPE LIMITS

NO SCALE

LEGEND

Structural Concrete (Retaining Wall)

Structural Concrete (Retaining Wall f'c 4000 psi)



PLAN

¼" = 1'-0"

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

	BY	CHECKED
DESIGN	EDWARD MERCADO	CHARLES LOMICKA
DETAILS	HENGAMEH MAHBOOBI / H.B.	CHARLES LOMICKA
QUANTITIES	EDWARD MERCADO	HTOON WIN

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DIVISION OF ENGINEERING SERVICES
STRUCTURE DESIGN
DESIGN BRANCH 19

BRIDGE NO. 55 E0120
POST MILE 9.90

RETAINING WALL NO. 533A
STRUCTURE PLAN

STRUCTURES DESIGN DETAIL SHEET (ENGLISH) (REV. 09-01-10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 3621
PROJECT NUMBER & PHASE: 1200000102 1 CONTRACT NO.: 0E3101

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES: 01-04-11 02-14-11 05-10-11

SHEET 3 OF 8

FILE => 03-RW533A-c-sp01.dgn

USERNAME => s120514 DATE PLOTTED => 21-JUL-2011 TIME PLOTTED => 15:25

APPENDIX B

FIELD EXPLORATION

Boring Logs for RW 10

- Boring/CPT Location Map
- Boring Logs
- CPT Logs

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	74			

REGISTERED GEOTECHNICAL ENGINEER — DATE July 2011

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — MICHAEL G. SMITH — No. 2229 — Exp. 3-31-2012 — GEOTECHNICAL — STATE OF CALIFORNIA

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

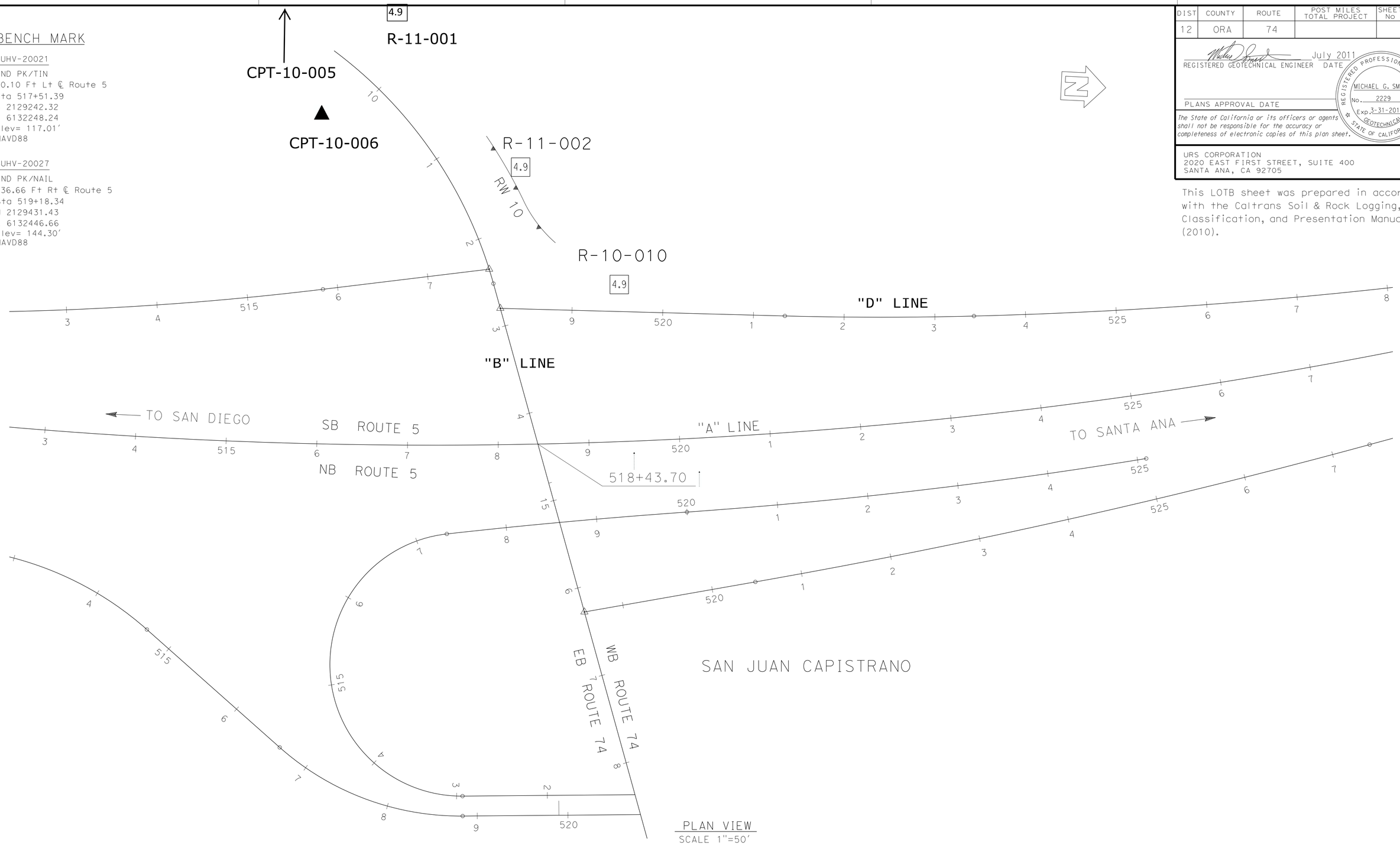
URS CORPORATION
2020 EAST FIRST STREET, SUITE 400
SANTA ANA, CA 92705

This LOTB sheet was prepared in accordance with the Caltrans Soil & Rock Logging, Classification, and Presentation Manual (2010).

BENCH MARK

SUHV-20021
FND PK/TIN
80.10 Ft Lt ℄ Route 5
Sta 517+51.39
N 2129242.32
E 6132248.24
Elev= 117.01'
NAVD88

SUHV-20027
FND PK/NAIL
136.66 Ft Rt ℄ Route 5
Sta 519+18.34
N 2129431.43
E 6132446.66
Elev= 144.30'
NAVD88



PLAN VIEW
SCALE 1"=50'

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. ×	RETAINING WALL 10
FUNCTIONAL SUPERVISOR	DRAWN BY: P.QUACH	FIELD INVESTIGATION BY:	DESIGN BRANCH	POST MILE ×	LOG OF TEST BORINGS SHEET 1 OF 4
NAME: M. SMITH	CHECKED BY: P.YERRA	EJ.JEON/D.ORRIS			

OGS CIVIL LOG OF TEST BORINGS SHEET

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 59A0590
EA 0E3101

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES — SHEET — OF

FILE => ...\Wall 10\Boring location.dgn

USERNAME => phuong_quach DATE PLOTTED => 7/29/2011 TIME PLOTTED => 11:48:07 AM

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
EJ. Jeon	1-13-11	1-14-11	2129186.8 ft / 6131886.4 ft NAD83	R-11-001
DRILLING CONTRACTOR: C&L Drilling			BOREHOLE LOCATION (Offset, Station, Line): ~445.30' Lt Sta ~517+25.50"A" Line	SURFACE ELEVATION: ~127.8 ft MLLW
DRILLING METHOD: Rotary Wash			DRILL RIG: Mayhew 1000 with 4-7/8-in. tricone bit	BOREHOLE DIAMETER: 4-7/8
SAMPLER TYPE(S) AND SIZE(S) (ID): Std Cal (2.5"), SPT (1.4")			SPT HAMMER TYPE: Automatic; 140 lb, 30-inch drop	HAMMER EFFICIENCY, ERi: 71%
BOREHOLE BACKFILL AND COMPLETION: Backfilled with cement grout			GROUNDWATER READINGS: DURING DRILLING; AFTER DRILLING (DATE): 22.0 ft on 1-14-11	TOTAL DEPTH OF BORING: 51.5 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		ASPHALT.												
	1		Lean CLAY (CL); medium stiff; olive; moist; few SAND; mostly fines; weak cementation.												Hand auger to 5 ft
125.84	2														
	3														
123.84	4														
	5		- stiff; olive mottled with black; PP=1.5 tsf.		S01	3 5 9	14					PP = 1.5			CR
121.84	6														
	7		- very stiff; no cementation; PP=2.5 tsf.		S02					31	92	PP = 2.5 UC = 3.5			WA: 91%<#200 sieve C
119.84	8														
	9														
117.84	10				S03	12 12 12	24	0							
	11														
115.84	12														
	13		CLAYEY GRAVEL (GC); medium dense; olive brown; moist; mostly fine GRAVEL; little SAND; some fines.												
113.84	14														
	15				S04	6 7 8	15								WA: 34%<#200 sieve
111.84	16														
	17														
109.84	18		SANDY lean CLAY (CL); stiff; dark olive gray; moist; few fine GRAVEL; some SAND; mostly fines; PP=1.2 tsf.												
	19														
	20														

(continued)

URS

REPORT TITLE			HOLE ID
BORING RECORD			R-11-001
DIST. 12	COUNTY ORA	ROUTE I-5	PROJECT NO. 0E3101
PROJECT OR BRIDGE NAME: I-5 and SR-74 Interchange			
BRIDGE NUMBER 55-1104	PREPARED BY EJ. Jeon	DATE 6-10-11	SHEET 1 of 3

BR - STANDARD - URSLOGO I5SR74SJ_BR.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/30/11

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	20		SANDY lean CLAY (CL) *(continued)*.		S05			0							
	21														
105.84	22				S06	3 3 5	8					PP = 1.2			
	23														
103.84	24														
	25		- few SAND.		S07					26	96	PP = 1.3 UC = 0.9			LL=43, PI=27 C, PI WA: 87%<#200 sieve
101.84	26														
	27														
99.84	28														
	29														
97.84	30				S08	3 6 6	12					PP = 1.5			
	31														
95.84	32														
	33														
93.84	34														
	35				S09					29	94	PP = 1.5 UC = 1.4			LL=49, PI=39 PI
91.84	36														
	37														
89.84	38														
	39														
87.84	40				S10	P 5 6	11					PP = 1.3			
	41														
85.84	42														
	43														
	44														

(continued)

URS

REPORT TITLE			HOLE ID
BORING RECORD			**R-11-001**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	PROJECT NO. **0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**			
BRIDGE NUMBER **55-1104**	PREPARED BY **EJ. Jeon**	DATE **6-10-11**	SHEET **2 of 3**

BR - STANDARD - URSLOGO I5SR74SJ_BR.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/30/11

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	44														
	45				S11										
81.84	46														
	47														
79.84	48														
	49														
77.84	50				S12	P 3 5	8					PP = 1.5			
	51														
			Bottom of borehole at 51.5 ft bgs												
75.84	52														
	53														
73.84	54														
	55														
71.84	56														
	57														
69.84	58														
	59														
67.84	60														
	61														
65.84	62														
	63														
63.84	64														
	65														
61.84	66														
	67														
	68														

URS

REPORT TITLE			HOLE ID
BORING RECORD			**R-11-001**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	PROJECT NO. **0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**			
BRIDGE NUMBER **55-1104**	PREPARED BY **EJ. Jeon**	DATE **6-10-11**	SHEET **3 of 3**

BR - STANDARD - URSLOGO I5SR74SJ_BR.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/30/11

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
D. Orris	1-13-11	1-13-11	2129285.3 ft / 6131977.7 ft NAD83	R-11-002
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Crux Subsurface, Inc.			~345.41' Lt Sta ~518+22.29"A" Line	~116.5 ft MLLW
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			Burley 4000 with HWT Chevron Advancer	4.5 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Std Cal (2.5"), SPT (1.4")			Manual; 140 lb, 30-inch drop	74%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS: DURING DRILLING / AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Backfilled with cement grout			22.0 ft on 1-14-11	41.5 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		Lean CLAY (CL); stiff; olive and very dark gray; moist; trace white mineralization; (FILL).												Hand auger to 5 ft
	1														
114.50	2														
	3														
112.50	4														
	5		- dark grayish brown; few SAND; PP=1.25 tsf.		S01	2 2 2	4					PP = 1.25			CR
110.50	6														
	7				S02										
108.50	8														
	9														
106.50	10		- medium stiff to stiff; PP=0.5-1.5 tsf.		S03	2 3 4	7					PP = 0.5-1.5			
	11														
104.50	12		- stiff; very dark grayish brown; PP=1.75 tsf; (ALLUVIUM).		S04					27	97	PP = 1.75 UC = 0.8			LL=47, PI=30 C, PI WA: 86%<#200 sieve
	13														
102.50	14														
	15		- trace roots, trace white mineralization; PP=1.25 tsf.		S05	2 4 4	8					PP = 1.25			WA: 86%<#200 sieve
100.50	16														
	17				S06					26	98	UC = 1.2			LL=37, PI=21 C, PI WA: 69%<#200 sieve
98.50	18														
	19														
	20														

(continued)

URS

REPORT TITLE			HOLE ID
BORING RECORD			R-11-002
DIST. 12	COUNTY ORA	ROUTE I-5	PROJECT NO. 0E3101
PROJECT OR BRIDGE NAME: I-5 and SR-74 Interchange			
BRIDGE NUMBER 55-1104	PREPARED BY EJ. Jeon	DATE 6-10-11	SHEET 1 of 2

BR - STANDARD - URSLOGO I5SR74SJ_BR.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/30/11

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	20		- medium stiff; PP=0.75 tsf. Lean CLAY (CL) *(continued)*.		S07	1 2 3	5					PP = 0.75			
	21														
94.50	22														
	23		Fat CLAY (CH); stiff; dark grayish brown; moist.												
92.50	24														
	25				S08					32	90	PP = 1.25			LL=56, PI=36 PI
90.50	26														
	27														
88.50	28														
	29														
86.50	30		- medium stiff; olive gray.		S09	2 3 3	6					PP = 0.75			
	31														
84.50	32														
	33		Lean CLAY (CL); medium stiff; olive gray; moist.												
82.50	34														
	35				S10							PP = 0.75			LL=47, PI=28 PI
80.50	36														
	37														
78.50	38														
	39														
76.50	40				S11	2 2 3	5	22							
	41														
74.50	42		Bottom of borehole at 41.5 ft bgs												
	43														
	44														

URS

REPORT TITLE			HOLE ID
BORING RECORD			**R-11-002**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	PROJECT NO. **0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**			
BRIDGE NUMBER **55-1104**	PREPARED BY **EJ. Jeon**	DATE **6-10-11**	SHEET **2 of 2**

BR - STANDARD - URSLOGO I5SR74SJ_BR.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/30/11

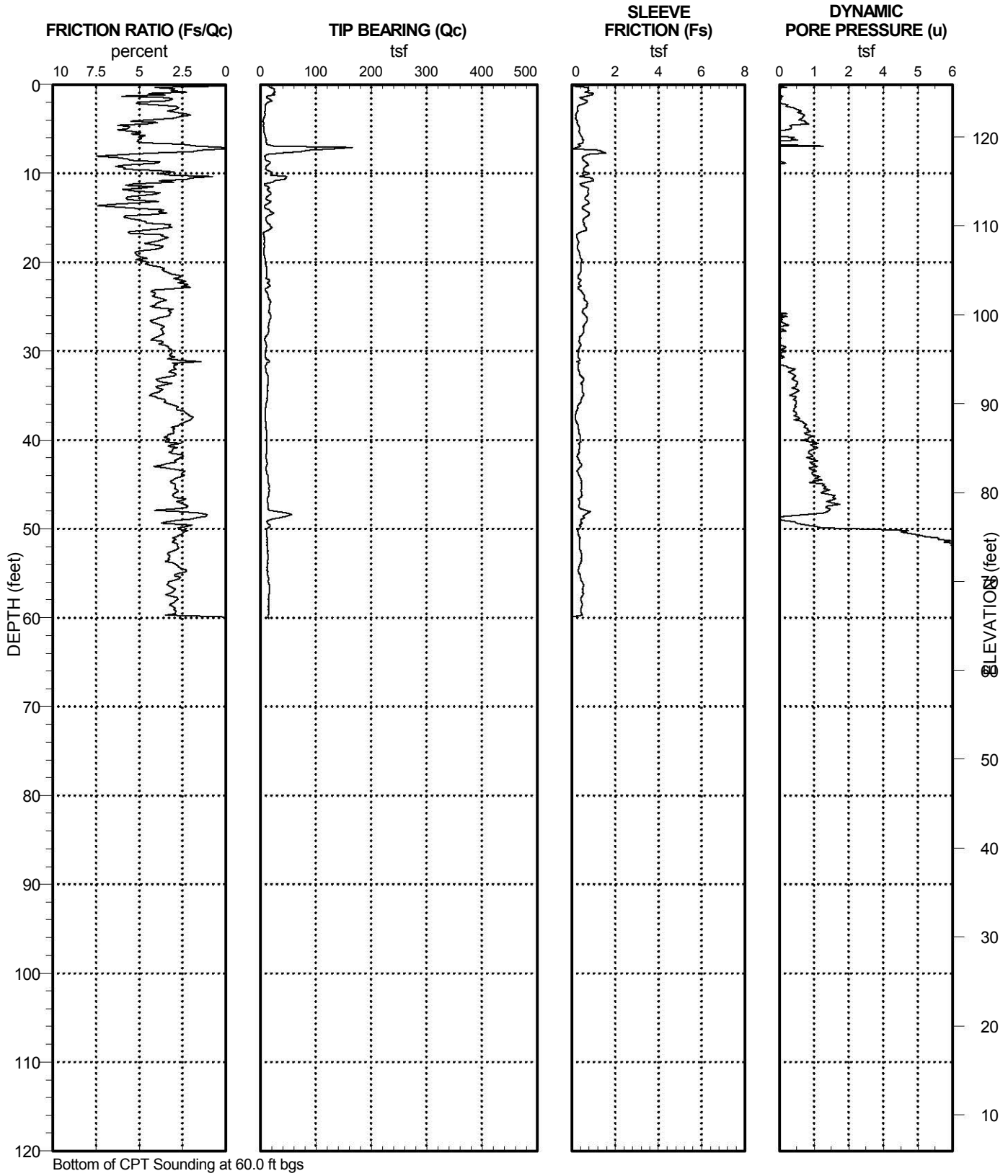
LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
EJ. Jeon	6-17-10	6-17-10	2129416.0 ft / 6132136.4 ft NAD83	R-10-010
DRILLING CONTRACTOR: C&L Drilling			BOREHOLE LOCATION (Offset, Station, Line): ~173.19' Lt Sta ~519+40.15"A" Line	SURFACE ELEVATION: ~134.2 ft MLLW
DRILLING METHOD: Rotary Wash			DRILL RIG: Mayhew 1000 with 4-7/8-in. tricone bit	BOREHOLE DIAMETER: 4-7/8
SAMPLER TYPE(S) AND SIZE(S) (ID): Std Cal (2.5"), SPT (1.4")			SPT HAMMER TYPE: Automatic; 140 lb, 30-inch drop	HAMMER EFFICIENCY, ERi: 71%
BOREHOLE BACKFILL AND COMPLETION: Backfilled with grout			GROUNDWATER READINGS: DURING DRILLING Not measured; AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING: 17.0 ft

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0	ASPHALT (10 in.) [FILL].												Hand auger only to 4.5 ft due to asphalt and gravel.
	1	CLAYEY SAND with GRAVEL (SC); GRAVEL consists of asphalt and rock fragments.												
132.16	2													
	3													
130.16	4													
	5			S01	15 16 13/3"	29/9								
128.16	6													
	7													
126.16	8													
	9	SANDY lean CLAY with GRAVEL (CL); very stiff; olive; moist; few coarse to fine GRAVEL; little fine SAND; moderate cementation; GRAVEL consists of asphalt fragments; PP=3.0 tsf.												
124.16	10			S02							PP = 3.0			S02 was pushed with rig.
	11													
122.16	12													
	13													
120.16	14													
	15			S03	9 15 18	33								
118.16	16													
	17	Bottom of borehole at 17.0 ft bgs												Encounter and break concrete storm drain (Caltrans error on drainage map). Lose circulation. Abandon hole.
116.16	18													
	19													
	20													

URS

REPORT TITLE			HOLE ID
BORING RECORD			R-10-010
DIST. 12	COUNTY ORA	ROUTE I-5	PROJECT NO. 0E3101
PROJECT OR BRIDGE NAME: I-5 and SR-74 Interchange			
BRIDGE NUMBER 55-1104	PREPARED BY D. Nelson	DATE 10-14-10	SHEET 1 of 1

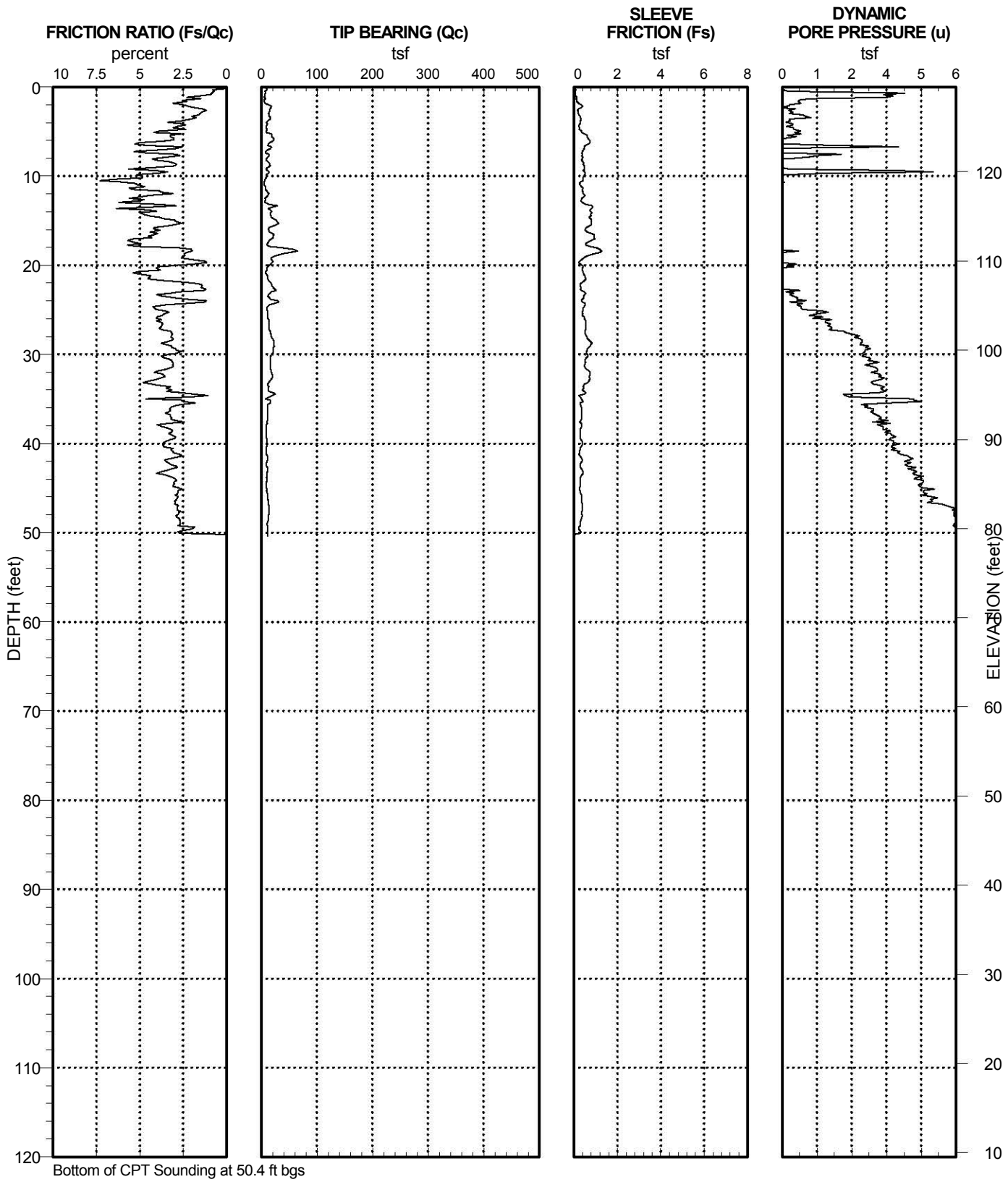
BR - STANDARD - URSLOGO I5SR74SJ_LOTB.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/30/11



Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**CPT-10-005**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	POSTMILE **D0.0/D**	EA **12-0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**				
BRIDGE NUMBER **55-1104**	PREPARED BY	DATE		SHEET **1 of 1**

6 BR - CPT I5SR74SJ_LOTB.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/23/11



Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**CPT-10-006**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	POSTMILE **D0.0/D**	EA **12-0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**				
BRIDGE NUMBER **55-1104**	PREPARED BY	DATE		SHEET **1 of 1**

6 BR - CPT I5SR74SJ_LOTB.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/23/11

Boring Logs for RW 83

- Boring /CPT Location Map
- Boring Logs
- CPT Logs

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	74			

REGISTERED GEOTECHNICAL ENGINEER — DATE July 2011

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — MICHAEL G. SMITH — No. 2229 — Exp. 3-31-2012 — GEOTECHNICAL — STATE OF CALIFORNIA

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

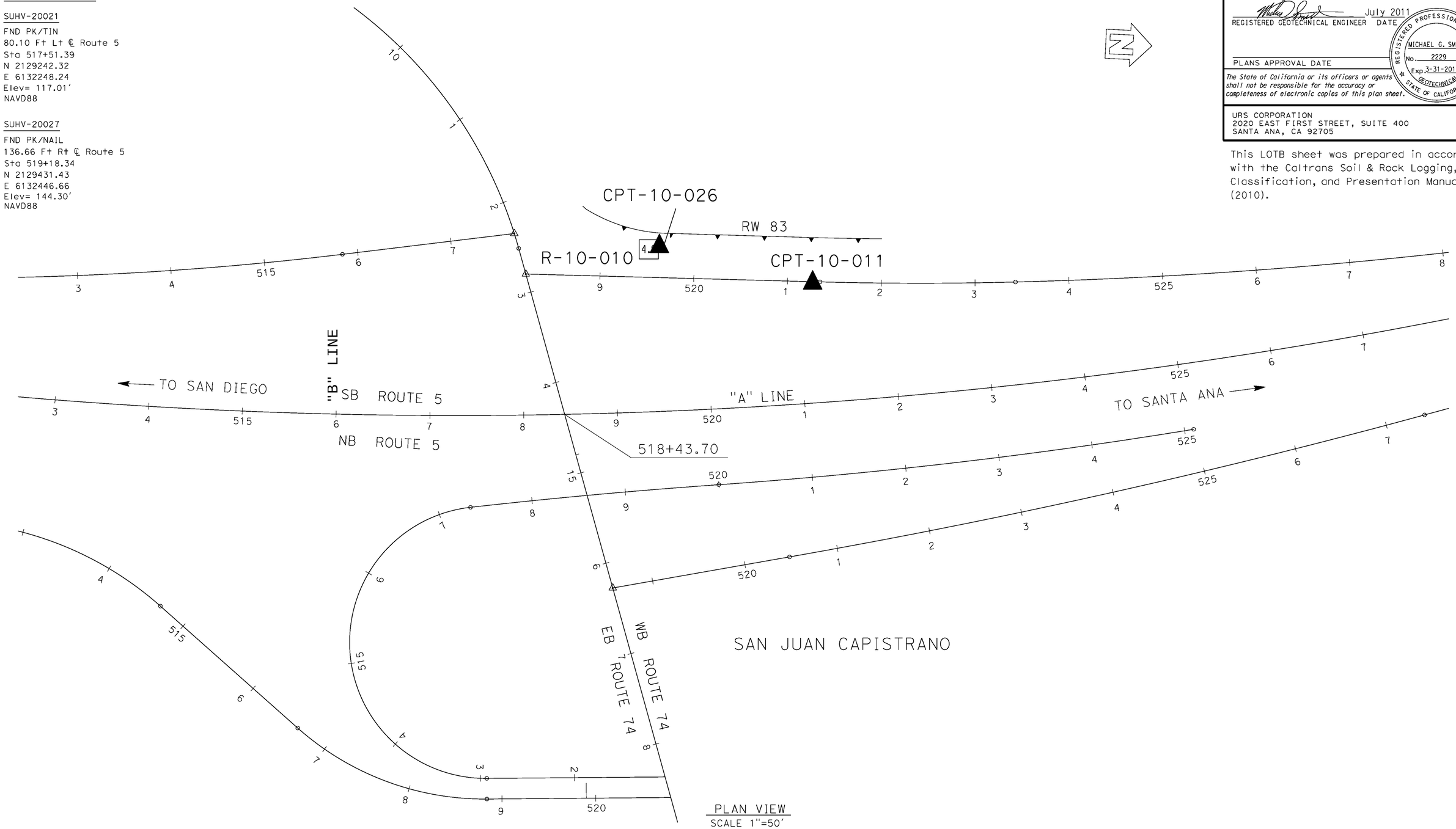
URS CORPORATION
2020 EAST FIRST STREET, SUITE 400
SANTA ANA, CA 92705

This LOTB sheet was prepared in accordance with the Caltrans Soil & Rock Logging, Classification, and Presentation Manual (2010).

BENCH MARK

SUHV-20021
FND PK/TIN
80.10 Ft Lt ℄ Route 5
Sta 517+51.39
N 2129242.32
E 6132248.24
Elev= 117.01′
NAVD88

SUHV-20027
FND PK/NAIL
136.66 Ft Rt ℄ Route 5
Sta 519+18.34
N 2129431.43
E 6132446.66
Elev= 144.30′
NAVD88



PLAN VIEW
SCALE 1"=50′

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN DESIGN BRANCH	BRIDGE NO. × POST MILE ×	RETAINING WALL 83
FUNCTIONAL SUPERVISOR	DRAWN BY: P.QUACH	FIELD INVESTIGATION BY:				LOG OF TEST BORINGS SHEET 1 OF 4
NAME: M. SMITH	CHECKED BY: P.YERRA	EJ.JEON				

OGS CIVIL LOG OF TEST BORINGS SHEET — ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3 — CU 59A0590 EA 0E3101 — DISREGARD PRINTS BEARING EARLIER REVISION DATES — REVISION DATES — SHEET OF

FILE => ...\Wall 83\Boring location.dgn

USERNAME => pnuong_quach DATE PLOTTED => 7/29/2011 TIME PLOTTED => 11:26:31 AM

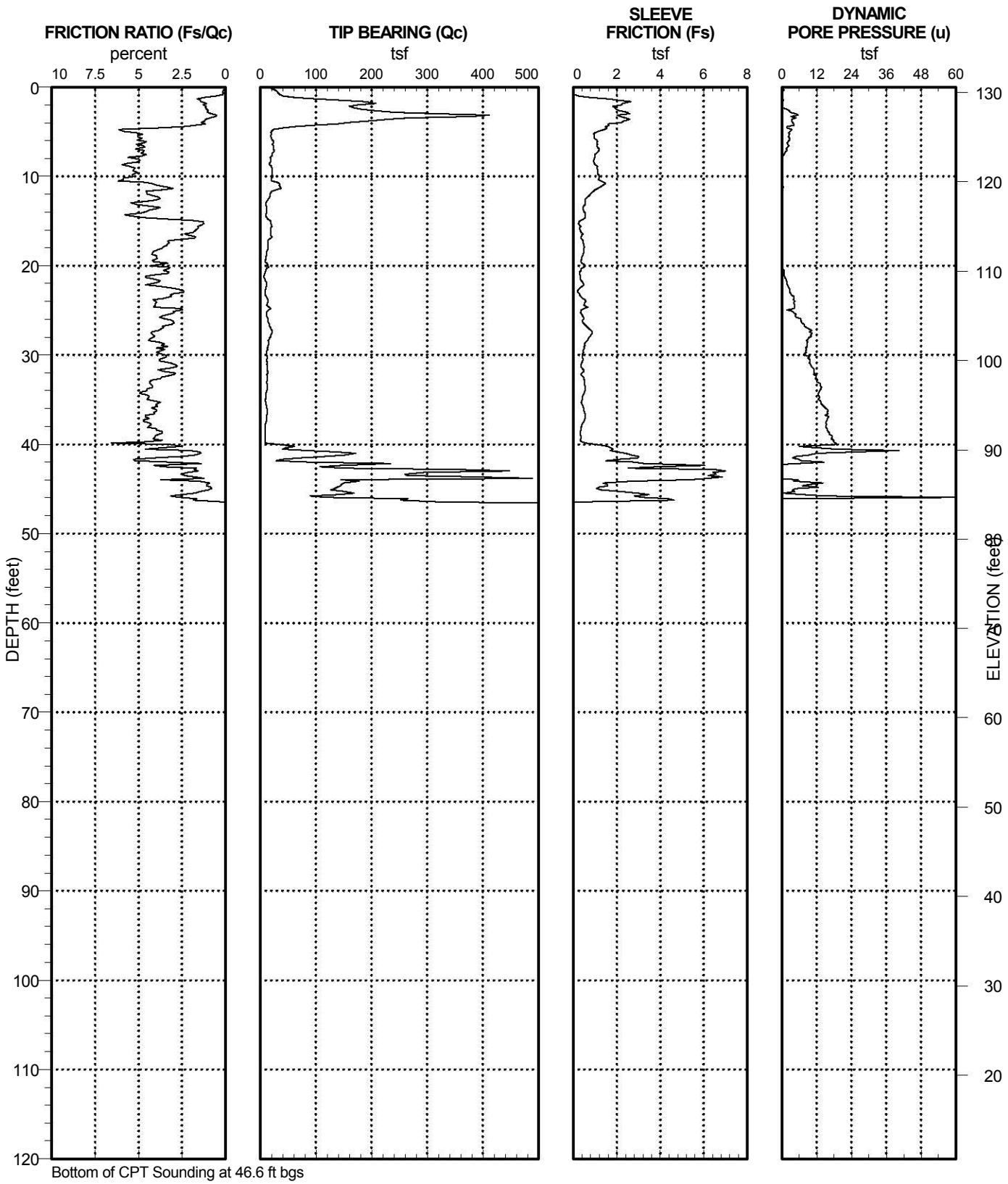
LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
EJ. Jeon	6-17-10	6-17-10	2129416.0 ft / 6132136.4 ft NAD83	R-10-010
DRILLING CONTRACTOR: C&L Drilling			BOREHOLE LOCATION (Offset, Station, Line): ~173.19' Lt Sta ~519+40.15"A" Line	SURFACE ELEVATION: ~134.2 ft MLLW
DRILLING METHOD: Rotary Wash			DRILL RIG: Mayhew 1000 with 4-7/8-in. tricone bit	BOREHOLE DIAMETER: 4-7/8
SAMPLER TYPE(S) AND SIZE(S) (ID): Std Cal (2.5"), SPT (1.4")			SPT HAMMER TYPE: Automatic; 140 lb, 30-inch drop	HAMMER EFFICIENCY, ERi: 71%
BOREHOLE BACKFILL AND COMPLETION: Backfilled with grout			GROUNDWATER READINGS: DURING DRILLING Not measured; AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING: 17.0 ft

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0	ASPHALT (10 in.) [FILL].												Hand auger only to 4.5 ft due to asphalt and gravel.
	1	CLAYEY SAND with GRAVEL (SC); GRAVEL consists of asphalt and rock fragments.												
132.16	2													
	3													
130.16	4													
	5			S01	15 16 13/3"	29/9								
128.16	6													
	7													
126.16	8													
	9	SANDY lean CLAY with GRAVEL (CL); very stiff; olive; moist; few coarse to fine GRAVEL; little fine SAND; moderate cementation; GRAVEL consists of asphalt fragments; PP=3.0 tsf.												
124.16	10			S02							PP = 3.0			S02 was pushed with rig.
	11													
122.16	12													
	13													
120.16	14													
	15			S03	9 15 18	33								
118.16	16													
	17	Bottom of borehole at 17.0 ft bgs												Encounter and break concrete storm drain (Caltrans error on drainage map). Lose circulation. Abandon hole.
116.16	18													
	19													
	20													

URS

REPORT TITLE			HOLE ID
BORING RECORD			R-10-010
DIST. 12	COUNTY ORA	ROUTE I-5	PROJECT NO. 0E3101
PROJECT OR BRIDGE NAME: I-5 and SR-74 Interchange			
BRIDGE NUMBER 55-1104	PREPARED BY D. Nelson	DATE 10-14-10	SHEET 1 of 1

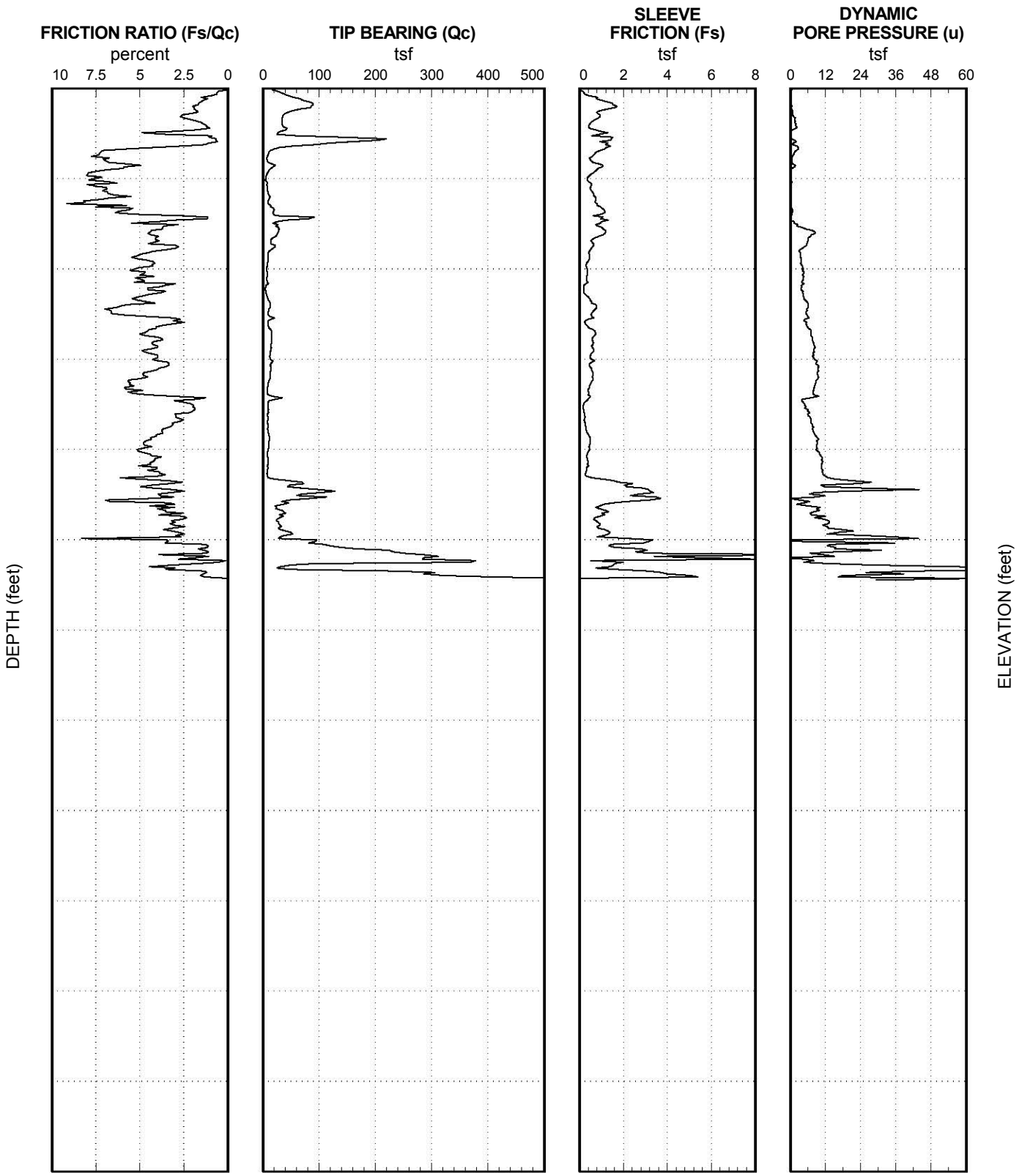
BR - STANDARD - URSLOGO I5SR74SJ_LOTB.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/30/11



Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**CPT-10-011**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	POSTMILE **D0.0/D**	EA **12-0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**				
BRIDGE NUMBER **55-1104**	PREPARED BY	DATE		SHEET **1 of 1**

6 BR - CPT I5SR74SJ_LOTB.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/23/11



Bottom of CPT Sounding at 54.5 ft bgs

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**CPT-10-026**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	POSTMILE	EA **12-30989830**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**				
BRIDGE NUMBER	PREPARED BY	DATE		SHEET **1 of 1**

6 BR - CPT I5SR74SJ.GPJ CALTRANS LIBRARY DOT 2010.GLB 10/14/10

Boring Logs for RW 533A

- CPT Location Map
- CPT Logs

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	74			

REGISTERED GEOTECHNICAL ENGINEER — DATE: July 2011

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — MICHAEL G. SMITH — No. 2229 — Exp. 3-31-2012 — GEOTECHNICAL — STATE OF CALIFORNIA

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

URS CORPORATION
2020 EAST FIRST STREET, SUITE 400
SANTA ANA, CA 92705

This LOTB sheet was prepared in accordance with the Caltrans Soil & Rock Logging, Classification, and Presentation Manual (2010).

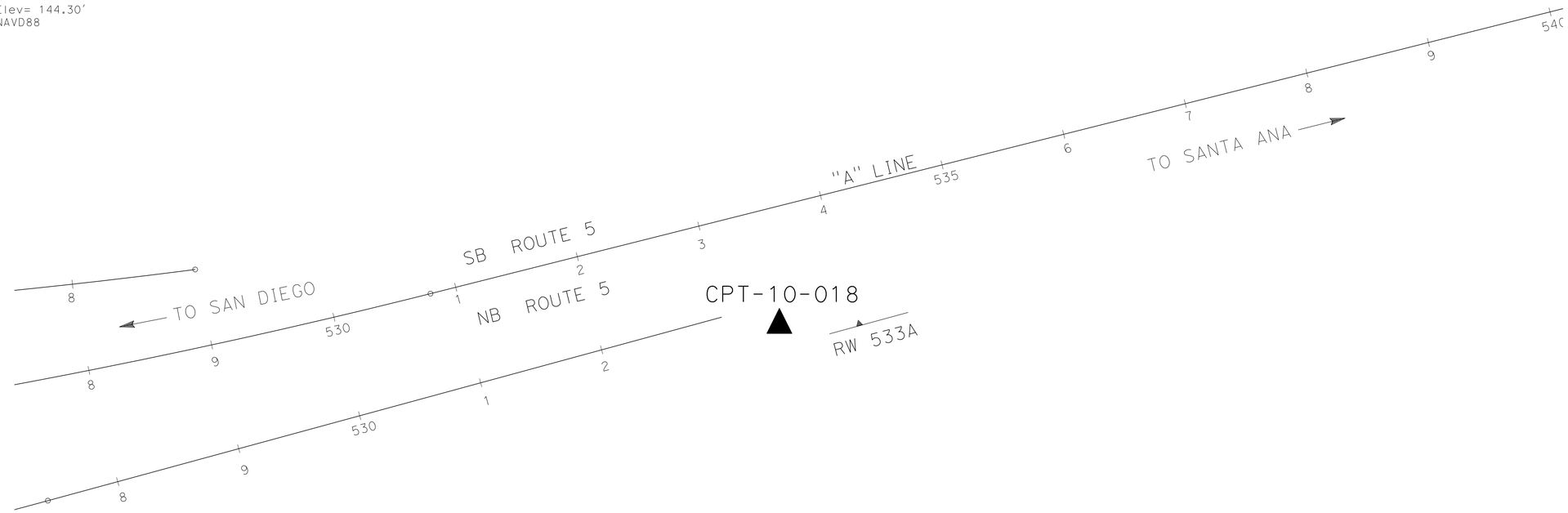
BENCH MARK

SUHV-20021

FND PK/TIN
80.10 Ft Lt ℄ Route 5
Sta 517+51.39
N 2129242.32
E 6132248.24
Elev= 117.01'
NAVD88

SUHV-20027

FND PK/NAIL
136.66 Ft Rt ℄ Route 5
Sta 519+18.34
N 2129431.43
E 6132446.66
Elev= 144.30'
NAVD88



PLAN VIEW
SCALE 1"=50'

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN DESIGN BRANCH	BRIDGE NO. × POST MILE ×	RETAINING WALL 533A LOG OF TEST BORINGS SHEET 1 OF 4
FUNCTIONAL SUPERVISOR NAME: M. SMITH	DRAWN BY: P.QUACH CHECKED BY: P.YERRA	FIELD INVESTIGATION BY: EJ.JEON			

OGS CIVIL LOG OF TEST BORINGS SHEET

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

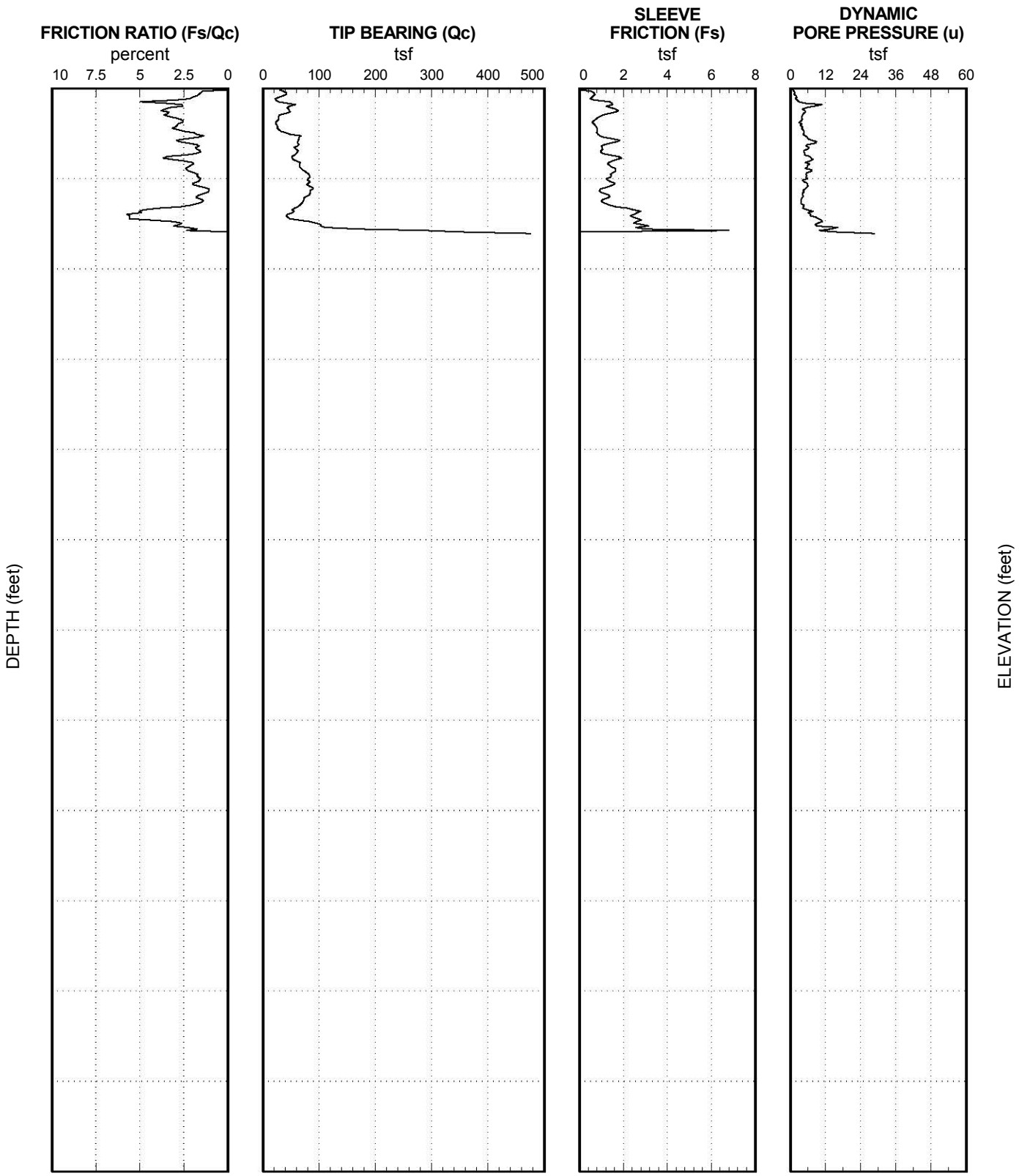
CU 59A0590
EA 0E3101

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES — SHEET — OF

FILE => ...\Wall 533A\Boring location.dgn

USERNAME => phuong_quach DATE PLOTTED => 7/29/2011 TIME PLOTTED => 11:53:00 AM



Bottom of CPT Sounding at 16.1 ft bgs

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**CPT-10-018**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	POSTMILE	EA **12-30989830**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**				
BRIDGE NUMBER	PREPARED BY	DATE		SHEET **1 of 1**

6 BR - CPT I5SR74SJ.GPJ CALTRANS LIBRARY DOT 2010.GLB 10/14/10

APPENDIX C

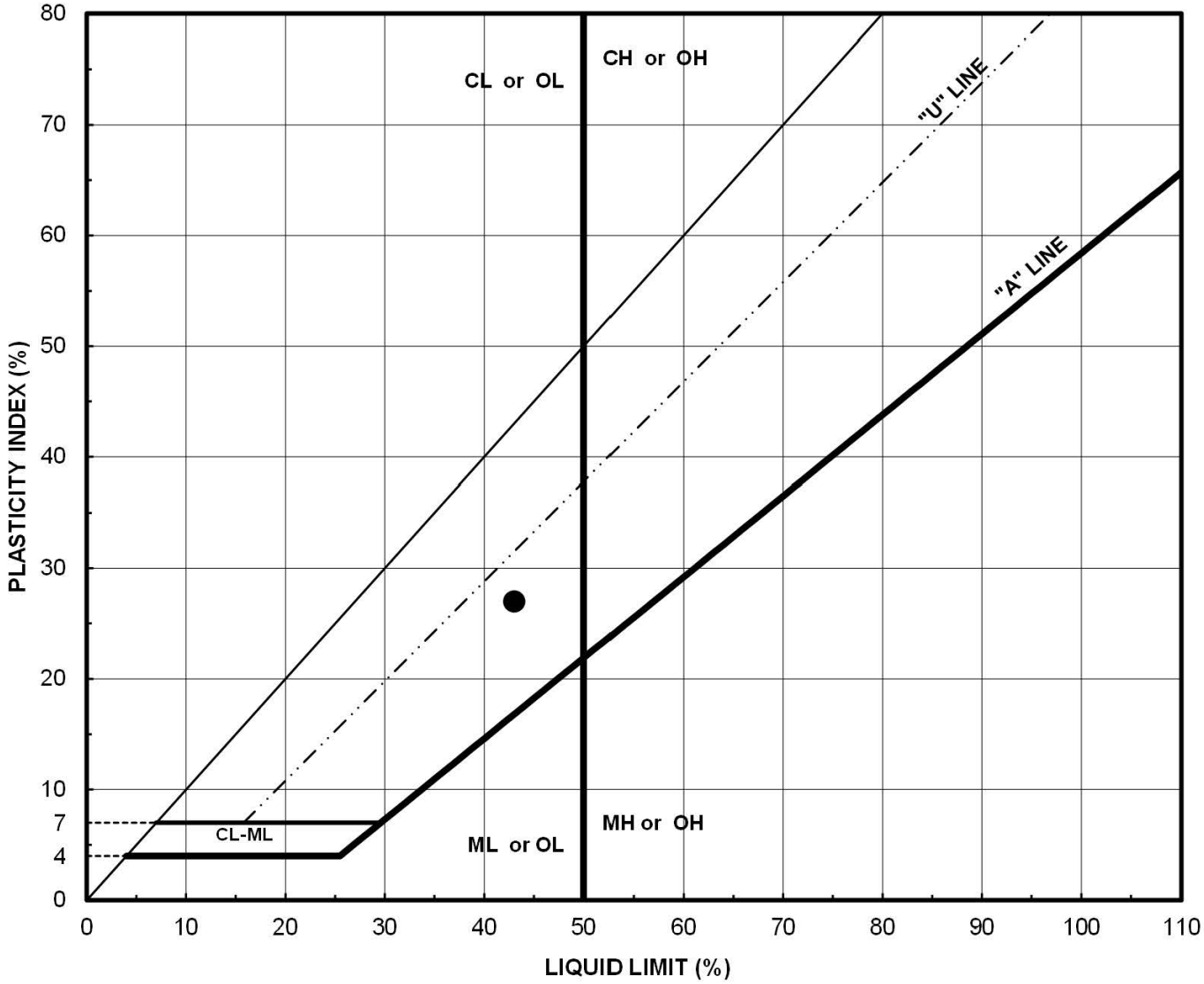
LABORATORY TESTING

Laboratory Testing for RW 10 / 83

Santa Ana Geotechnical Laboratory Testing Summary

Project Name: I-5 / SR-74 Interchange
Project Number: 30989830, TO 59030
Project Engineer: FM

LOCATION				INITIAL CONDITION			INDEX																
							Limits			Gradation				SG	C	CU	UU	DS	UC	CORROSIVITY			
Exploration Number	Sample/ Specimen Number	Depth (ft)	USCS Symbol	Water Content (%)	Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Liquid Limit (%)	Plasticity Index (%)	Liquidity Index	Gravel (%)	Sand (%)	Fines (%)	Clay Fraction, finer than 5mm (%)	Specific Gravity	Consolidation	Consolidated Undrained Triaxial	Unconsolidated Undrained peak dev. (ks	Direct Shear, Peak Friction Angle (deg)	Unconfined Compression peak (ksf)	pH	Minimum Resistivity (ohm - cm)	Sulfate Content (ppm)	Chloride Content (ppm)
R-11-001		5~50																		7.3	430	396	165
R-11-001	1	6.0	CL	30.7	119.8	91.7						90.7			done				6.9				
R-11-001	4	15.0	GC									33.9											
R-11-001	7	25.0	CL	26.4	121.6	96.2	43	27	0.39			87.1			done				1.79				
R-11-001	9	35.0	CL	29.3	121.4	93.9	49	30	0.34										2.95				
R-11-002		5~40																		7.2	350	471	330
R-11-002	4	11.5	CL	26.6	123.2	97.3	47	30	0.32			85.9			done				1.63				
R-11-002	5	15.0	CL									86.4											
R-11-002	6	16.5	CL	26.2	123.5	97.9	37	21	0.49			69.3			done				2.47				
R-11-002	8	25.0	CH	32.3	119.3	90.2	56	36	0.34														
R-11-002	10	35.0	CL				47	28															
R-10-007		5~45																		7.4	430	1349	345

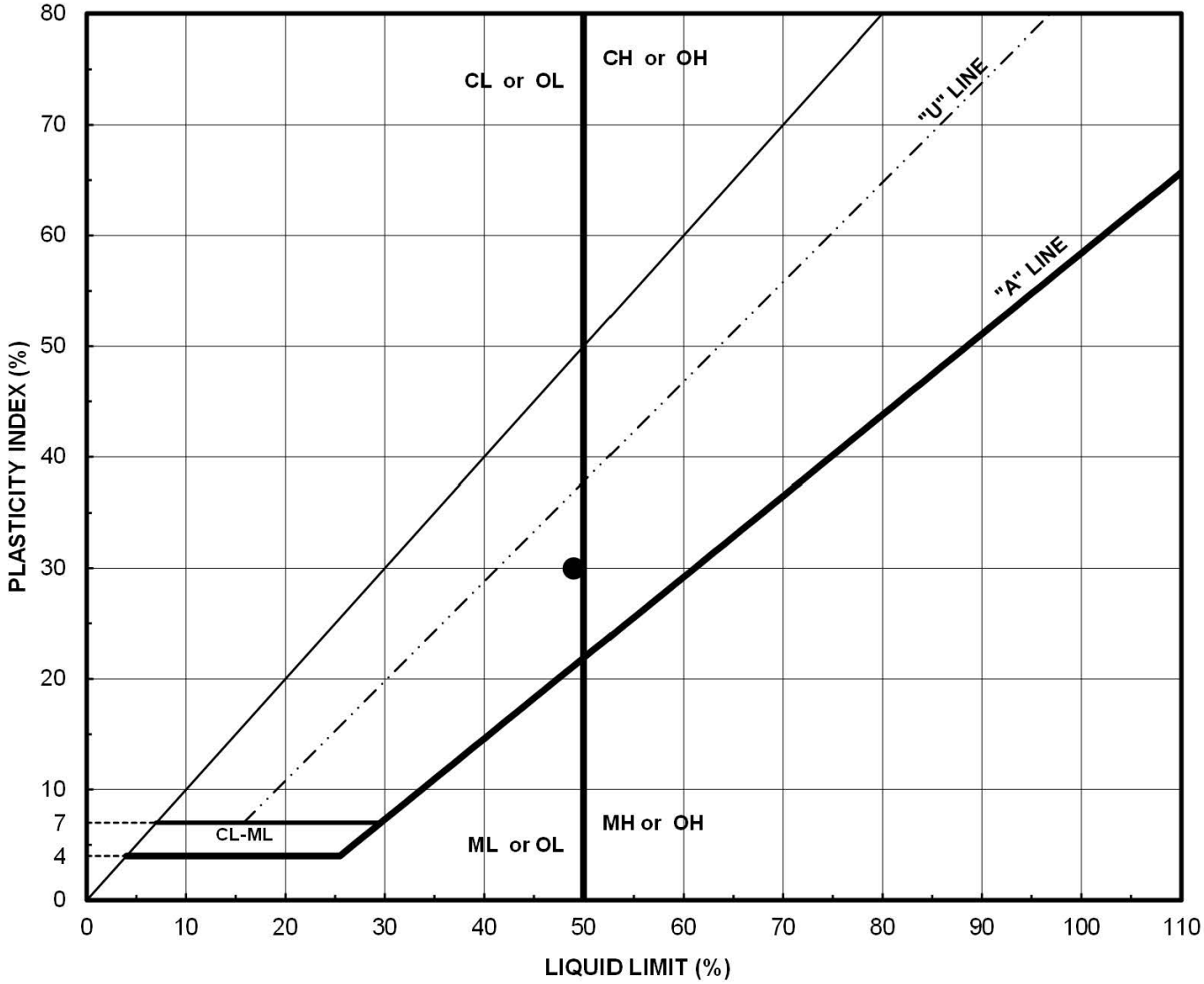


BORING No.	SAMPLE No.	DEPTH (ft.)	WATER CONTENT (%)	LL	PI	DESCRIPTION / CLASSIFICATION
R-11-001	7	25.0	26.4	43	27	Dark gray Clay (CL)

Project Name: **I-5 & SR-74 IC**

Project Number: **30989830**

PLASTICITY CHART



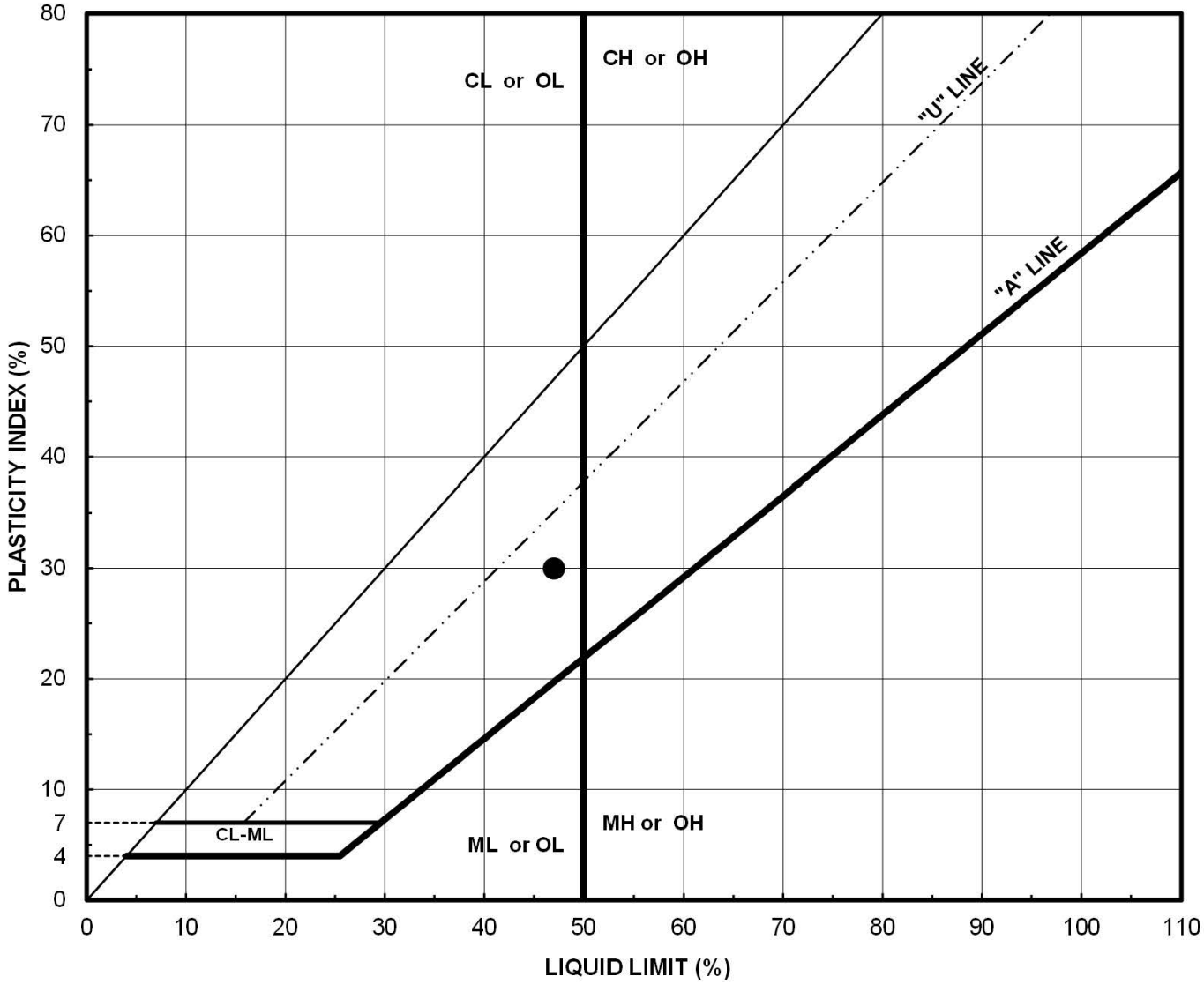
BORING No.	SAMPLE No.	DEPTH (ft.)	WATER CONTENT (%)	LL	PI	DESCRIPTION / CLASSIFICATION
R-11-001	9	35.0	29.3	49	30	Olive gray Clay (CL)

Project Name: **I-5 & SR-74 IC**

Project Number: **30989830**

PLASTICITY CHART

URS

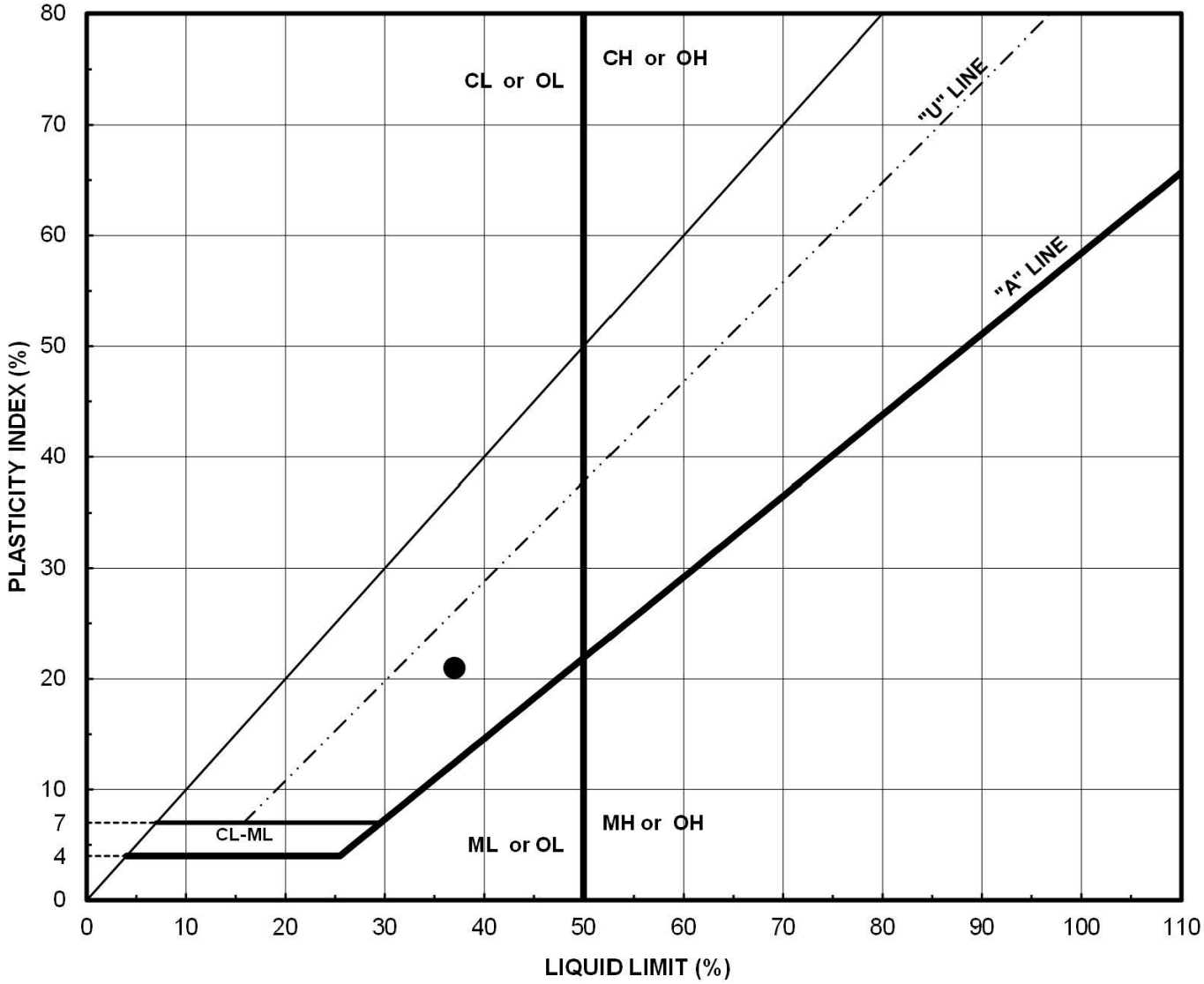


BORING No.	SAMPLE No.	DEPTH (ft.)	WATER CONTENT (%)	LL	PI	DESCRIPTION / CLASSIFICATION
R-11-002	4	11.5	26.6	47	30	Very dark grayish brown Clay (CL)

Project Name: **I-5 & SR-74 IC**

Project Number: **30989830**

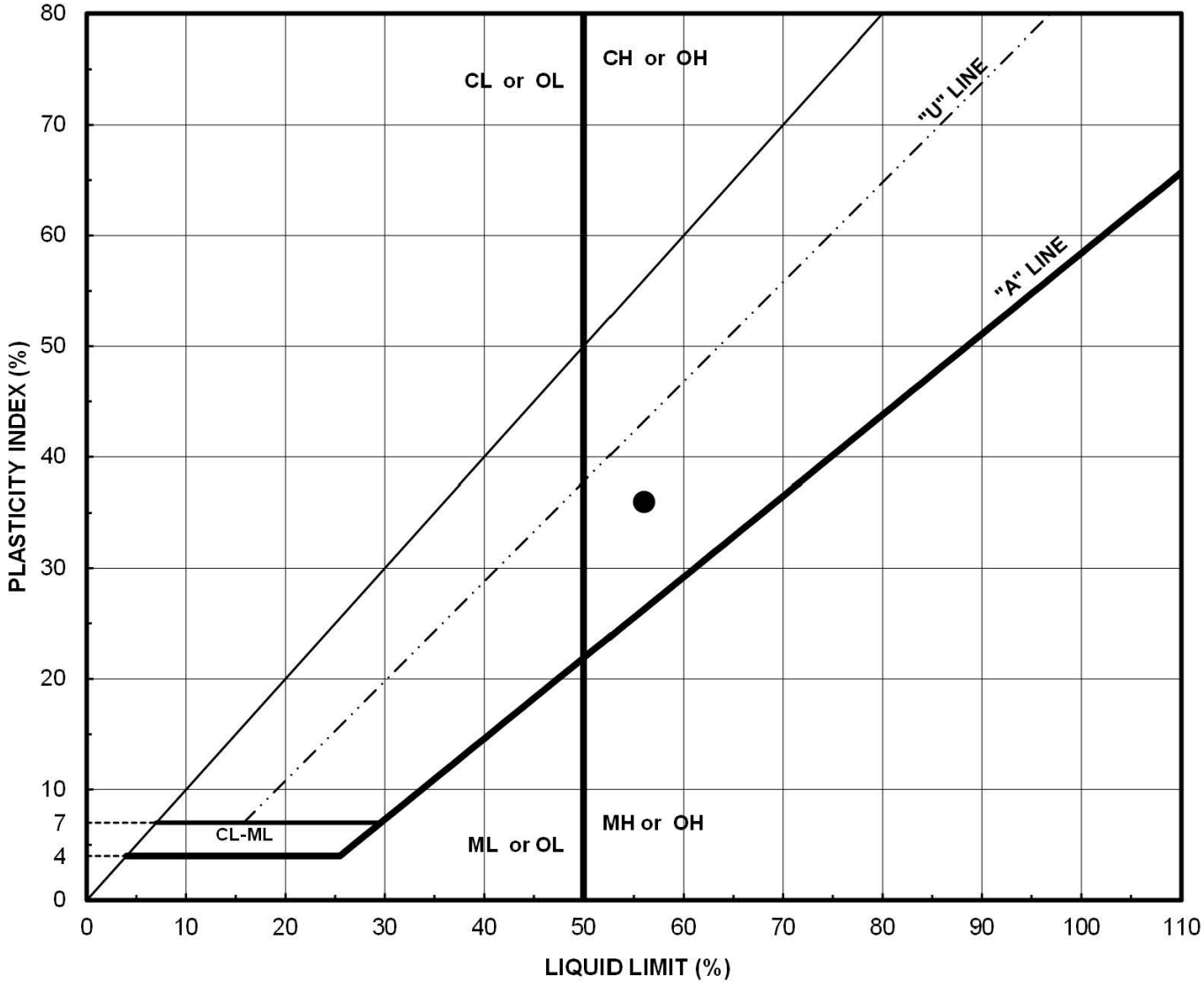
PLASTICITY CHART



BORING No.	SAMPLE No.	DEPTH (ft.)	WATER CONTENT (%)	LL	PI	DESCRIPTION / CLASSIFICATION
R-11-002	6	16.5	NA	37	21	Olive brown sandy Clay (CL)

Project Name: **I-5 & SR-74 IC** **PLASTICITY CHART**

Project Number: **30989830**

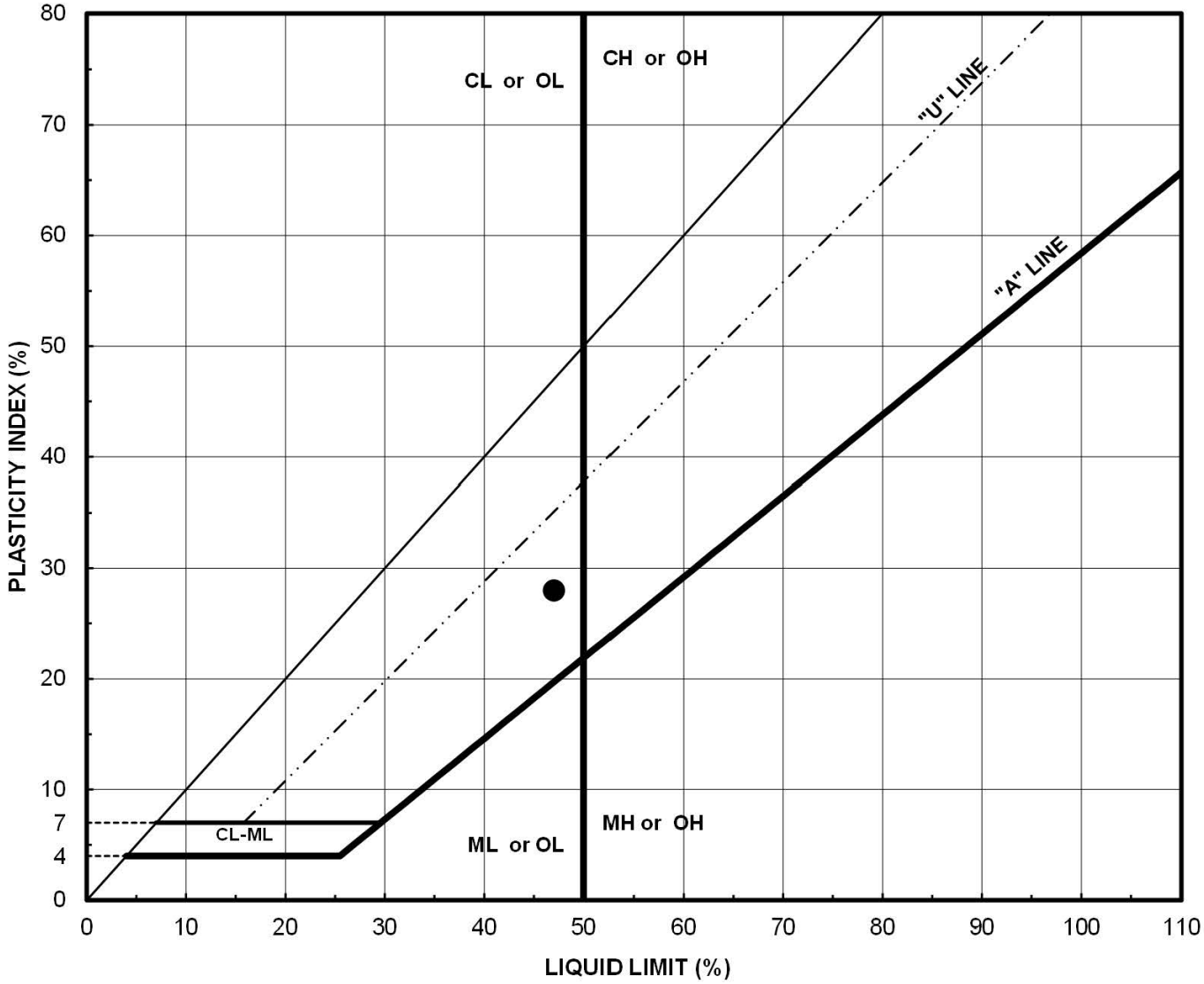


BORING No.	SAMPLE No.	DEPTH (ft.)	WATER CONTENT (%)	LL	PI	DESCRIPTION / CLASSIFICATION
R-11-002	8	25.0	32.3	56	36	Olive brown Clay (CH)

Project Name: I-5 & SR-74 IC

Project Number: 30989830

PLASTICITY CHART



BORING No.	SAMPLE No.	DEPTH (ft.)	WATER CONTENT (%)	LL	PI	DESCRIPTION / CLASSIFICATION
R-11-002	10	35.0	34.8	47	28	Olive gray Clay (CL)

Project Name: **I-5 & SR-74 IC**

Project Number: **30989830**

PLASTICITY CHART

CORROSIVITY TEST ANALYSIS

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM

Boring No.: R-11-001
Sample No.: composite
Depth (ft): 5 ~ 50

Initial Visual Classification Symbol: CL

State of Specimen before Processing

X	Passing soil through #8 sieve
X	Moist State
	Air Dried
	Oven Dried at 60 C

Set-Up Water Content	Minus No. 8 or ( )
Container No.	s39
Mass Container + Wet Soil (g), M1	219.78
Mass Container + Dry Soil (g), M2	198.1
Mass Container (g), M3	113.5
Water Content, w (%)	25.63

Resistivity Test: California Test Method 643

Mininum Resistence value: 430 ohm-cm

	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5
Weight of Soil in bowl (g):	359.16	368.17	381.85	399.28	
Weight of mixing bowl (g):	151.03	151.03	151.03	151.03	
Wet weight of Soil (g):	208.13	217.14	230.82	248.25	
Amount of water added (ml):	0	10	15	15	
Soil Box + Wet Soil (g), M5	254.86	260.04	253.29	247.58	
Weight of Soil Box (g), M6	124.73	124.73	124.73	124.73	
Wt. of Wet Soil for test (g), M7	130.13	135.31	128.56	122.85	
Volume of Soil Box (cm^3)	79.2	79.2	79.2	79.2	79.2
Est. Saturation (%)	65.2	86.1	89.2	90.3	
Resistivity Reading (ohm)	560	440	430	455	
Resistence (ohm-cm)	560	440	430	455	

Resistence = Soil Box Constant x Reading

pH Test : California Test Method 532

50g wet weight of soil mixed with 50 mL of de-ionized water.

pH of slurry: 7.30

Temperature : 21.2 Celsius

Sulfate Content:

100g of soil mixed with 300 mL of de-ionized water.

SO_4 (ppm) : 396

recorded mg of SO_4 in sample, x, = 52 mg

soil / water ratio, r, = 3

number of dilutions to obtain above value, d, = 1 = 396 mg/ L = ppm

Dilution Equation, d > 0; $SO_4 = ((x / 80) * (r\ 80 * 2^{d} - r\ 80 * 2^{(d-1)})) + r\ 80 * 2^{(d-1)}$

Chloride Content:

100g of soil mixed with 300 mL of de-ionized water.

Cl^- (ppm) : 165

mg/L of Cl^- = ((A-B) x N x 35453) x 3

A = mL of $AgNO_3$ A= 11

B = 23 mL of the blank

N = 0.0493 N, normality of the titrant

Cl^- (mg/L) = A * 5 * 3

Tested By: YS Date: 2/15/2011 Checked By: TJO

CORROSIVITY TEST ANALYSIS

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM

Boring No.: R-11-002
Sample No.: composite
Depth (ft): 5 ~ 40

Initial Visual Classification Symbol: CL

State of Specimen before Processing

X	Passing soil through #8 sieve
X	Moist State
	Air Dried
	Oven Dried at 60 C

Set-Up Water Content	Minus No. 8 or ( )
Container No.	s10
Mass Container + Wet Soil (g), M1	200.91
Mass Container + Dry Soil (g), M2	175.65
Mass Container (g), M3	84.04
Water Content, w (%)	27.57

Resistivity Test: California Test Method 643

Mininum Resistence value: 350 ohm-cm

	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5
Weight of Soil in bowl (g):	540.32	550.23	563.94	576.26	
Weight of mixing bowl (g):	155.75	155.75	155.75	155.75	
Wet weight of Soil (g):	384.57	394.48	408.19	420.51	
Amount of water added (ml):	0	10	15	15	
Soil Box + Wet Soil (g), M5	277.77	274.03	269.97	269.81	
Weight of Soil Box (g), M6	130.40	130.40	130.40	130.40	
Wt. of Wet Soil for test (g), M7	147.37	143.63	139.57	139.41	
Volume of Soil Box (cm^3)	79.2	79.2	79.2	79.2	79.2
Est. Saturation (%)	87.8	92.8	95.1	99.1	
Resistivity Reading (ohm)	350	350	360	365	
Resistence (ohm-cm)	350	350	360	365	

Resistence = Soil Box Constant x Reading

pH Test : California Test Method 532

50g wet weight of soil mixed with 50 mL of de-ionized water.

pH of slurry: 7.20

Temperature : 21.2 Celsius

Sulfate Content:

100g of soil mixed with 300 mL of de-ionized water.

SO_4 (ppm) : 471

recorded mg of SO_4 in sample, x, = 77 mg

soil / water ratio, r, = 3

number of dilutions to obtain above value, d, = 1 = 471 mg/ L = ppm

Dilution Equation, d > 0; $SO_4 = ((x / 80) * (r\ 80 * 2^{d} - r\ 80 * 2^{(d-1)})) + r\ 80 * 2^{(d-1)}$

Chloride Content:

100g of soil mixed with 300 mL of de-ionized water.

Cl^- (ppm) : 330

mg/L of Cl^- = ((A-B) x N x 35453) x 3

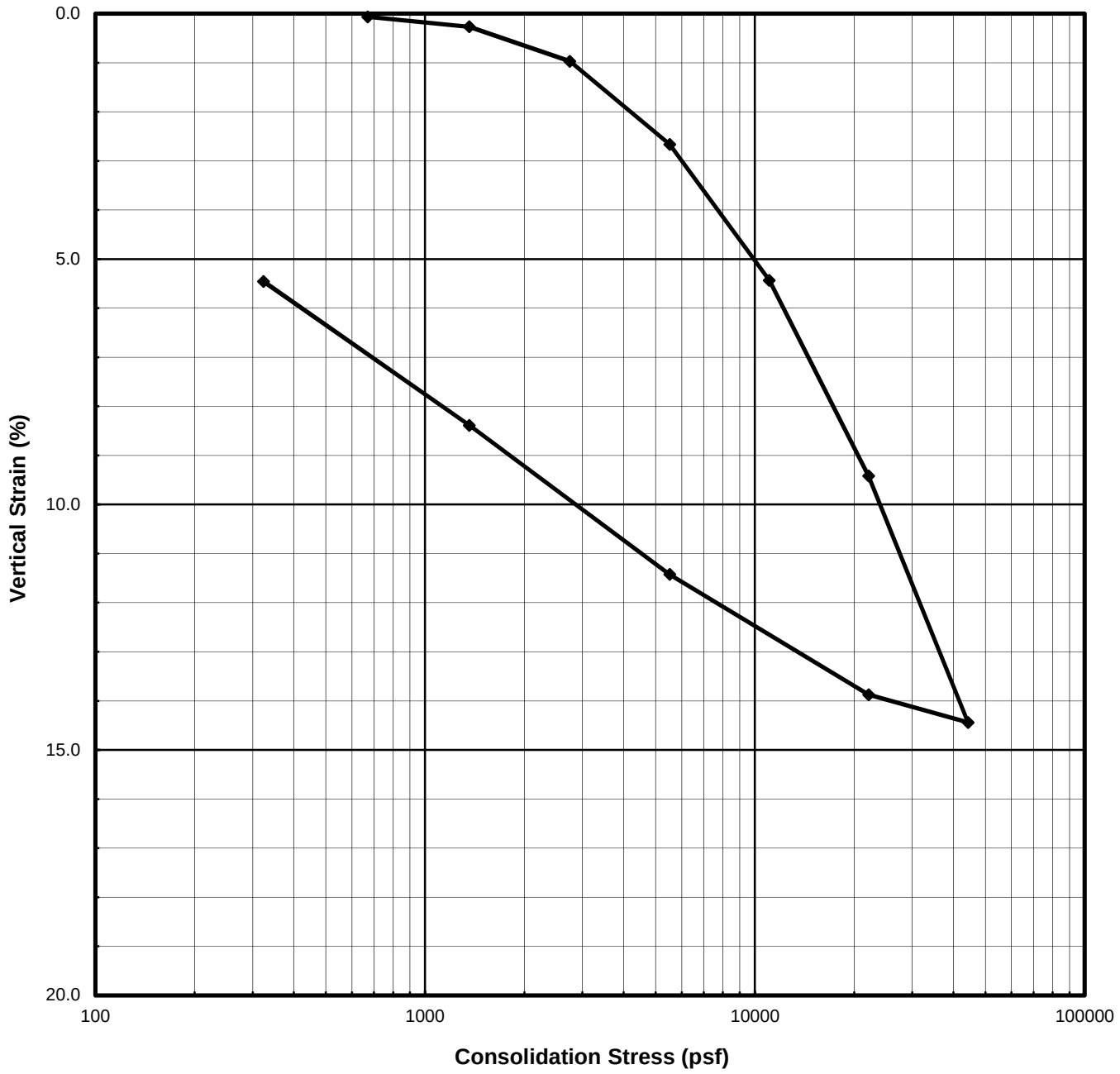
A = mL of $AgNO_3$ A= 22

B = 23 mL of the blank

N = 0.0493 N, normality of the titrant

Cl^- (mg/L) = A * 5 * 3

Tested By: YS Date: 2/15/2011 Checked By: TJO



Description:	**Light olive brown Clay (CL)**							
Boring No.:	R-11-001		Liquid Limit		%	Specific Gravity	2.75	assumed
Sample No.:	2		Plasticity Index		%	Strain for Saturation	0.42	%
Depth (ft | m)	6.5	1.98	Fines Content	90.7	%	Water added at	67	psf

	Water Content (%)	Total Unit Weight		Dry Unit Weight		Saturation (%)	Void Ratio	Height		Diameter	
		(pcf)	(kN/m^3)	(pcf)	(kN/m^3)			(inches)	(cm)	(inches)	(cm)
Initial	30.7	119.8	18.82	91.7	14.40	97.1	0.87	0.938	2.38	2.416	6.137
Final	30.5	122.6	19.27	94.0	14.76	101.9	0.82	0.915	2.32		

URS

I-5 & SR-74 IC

Project Number: 30989830
Test Start Date: 2/9/2011

CONSOLIDATION TEST
ASTM D2435

SUBMITTED BY: Thomas J. O'Meara

Con I5 SR74 R11001 006.xls

One-Dimensional Oedometer Testing
Set-up / Take down Worksheet
ASTM D2435

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM

Boring No.: R-11-001
Sample No.: 2
Depth (ft): 6.5

Apparatus No.: C-6

Specimen Description : Light olive brown Clay (CL)
Duration: end of increment

Ring Number: R21
Weight of Wet Spec. and Ring: 352.25 g
Weight of Ring: 216.96 g
Initial Weight of Wet Spec.: 135.29 g

Take Down Weight with Ring: 351.85 g

Excess Oven-dried Cont. No.: cp5
Weight of Cont. and Dry Spec.: 163.51 g
Weight of Container: 163.37 g
Weight of Excess Dried Soil: 0.14 g
Weight of Excess Wet Soil 0.18 g
Final Weight of Wet Specimen: 135.07 g

Height of Specimen (in)

	Initial	Final
1	0.941	0.917
2	0.942	0.910
3	0.936	0.919
4	0.938	0.913
5	0.935	0.917
Ave:	0.938	0.915

Initial Height - Final Height = 0.023 in
Change in Dial (Dd) = 0.031 in
Initial Height - Dd = 0.907 in
Final Height + Dd = 0.946 in
Weight of Top Cap = 370.52 g

Specimen Analysis					Initial Trim	Initial Spec.	Final
				Container Number:	c33	**XXXXX**	s29
				Mass of Container and Wet Specimen M1 (g)	447.84	135.29	260.01
				Mass of Container and Dry Specimen, M2 (g)	378.94	103.50	228.69
				Mass of Container, M3 (g)	139.33	**XXXXX**	126.02
				Water Content, w (%)	28.76	30.72	30.51
				Mass of Wet Specimen, M4 (g)	135.29	135.29	135.07
				Mass of Dry Specimen, M5 (g)	103.50	103.50	103.50
Nominal		Measured	**x**	Specimen Height, H (in)	0.938	0.938	0.915
Nominal	**x**	Measured		Specimen Diameter, D (in)	2.416	2.416	2.416
				Area of Specimen, A (in^2)	4.584	4.584	4.584
				Volume of Specimen, V (cc)	70.50	70.50	68.75
Assumed	**x**	Measured		Specific Gravity, Gs	2.75	2.75	2.75
				Wet Unit Weight, WUW (pcf)	**119.8**	**119.8**	**122.6**
				Dry Unit Weight, DUW (pcf)	**93.0**	**91.7**	**94.0**
				Void Ratio	**0.842**	**0.870**	**0.824**
				Degree of Saturation, S (%)	**93.9**	**97.1**	**101.9**

Set-up by: TJO
Date: 2/9/11

Calculated by: TJO
Checked by: TJO

Strain for Saturation (%) = **0.420**

One-Dimensional Oedometer Testing

Loading Worksheet

ASTM D2435

Project Number: 30989830 Boring No.: R-11-001

Project Name: I-5 & SR-74 IC Sample No.: 2

Project Engineer: FM Apparatus No.: C-6 Depth (ft): 6.5

Initial Dial Reading: 0.3489 inch Initial Specimen Height: 0.938 inch

Stage No.	Normal Stress (psf)	Dial Reading (in)		Compressibility Correction (in)	Vertical Strain (%)	
		End of Duration	End of Increment		End of Duration	End of Increment
Seat	67		0.3489	0.0000		0.00
1	150	0.3488	0.3489	0.0003	-0.02	-0.03
2	323	0.3479	0.3480	0.0011	-0.01	-0.02
3	670	0.3459	0.3460	0.0024	0.06	0.05
4	1362	0.3426	0.3426	0.0038	0.27	0.27
5	2747	0.3344	0.3338	0.0054	0.97	1.03
6	5517	0.3160	0.3153	0.0079	2.66	2.74
7	11057	0.2880	0.2855	0.0099	5.43	5.70
8	22137	0.2475	0.2435	0.0130	9.42	9.85
9	44296	0.1970	0.1974	0.0164	14.44	14.40
10	22137		0.2043	0.0144		13.87
11	5517		0.2314	0.0103		11.42
12	1362		0.2623	0.0079		8.39
13	323		0.2914	0.0063		5.46
14	67		0.3179	0.0053		2.74
15						
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32						
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Final dial reading prior to take down (inch): 0.3179 Take down by: TJO Date: 3/2/11

One-Dimensional Oedometer Testing
ASTM D2435
Table of Incremental Values

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM
Apparatus No.: C-6

Boring No.: R-11-001
Sample No.: 2
Depth (ft): 6.5
Inundation at stage: Seat

10 **20** Hanger Ratios

Stage Number	Incremental Weight Applied (kg) Back	Front	Vertical Stress (psf)	Specimen Hieght (in)	Deflections (in) $d_{initial}$	d_o	d_{50}	d_{100}	d_{final}	Porous Stone (in)	t_{50} (min)	cv (in^2/min)	cv (ft^2/day)
Top Cap			26	0.938	0.3489	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
Seat	0.06		67	0.938	0.3489	XXXXX	XXXXX	XXXXX	0.3489	0.0000	XXXXX	XXXXX	XXXXX
1		0.06	150	0.939	0.3489	0.3488	0.3488	0.3488	0.3489	0.0003	XXXXX	XXXXX	XXXXX
2	0.25		323	0.939	0.3489	0.3484	0.3482	0.3479	0.3480	0.0011	XXXXX	XXXXX	XXXXX
3	0.50		670	0.939	0.3480	0.3467	0.3463	0.3459	0.3460	0.0024	XXXXX	XXXXX	XXXXX
4	1.0		1362	0.940	0.3460	0.3446	0.3436	0.3426	0.3426	0.0038	XXXXX	XXXXX	XXXXX
5		1.0	2747	0.936	0.3426	0.3411	0.3378	0.3344	0.3338	0.0054	6.00	0.007	0.072
6	4.0		5517	0.926	0.3338	0.3318	0.3239	0.3160	0.3153	0.0079	12.00	0.004	0.035
7		4.0	11057	0.906	0.3153	0.3128	0.3004	0.2880	0.2855	0.0099	16.00	0.003	0.025
8		8.0	22137	0.877	0.2855	0.2831	0.2653	0.2475	0.2435	0.0130	22.00	0.002	0.017
9		16.0	44296	0.847	0.2435	0.2408	0.2189	0.1970	0.1974	0.0164	25.00	0.001	0.014
10		-16.0	22137	0.868	0.1974	0.1994	XXXXX	XXXXX	0.2043	0.0144	XXXXX	XXXXX	XXXXX
11		-12.0	5517	0.906	0.2043	0.2081	XXXXX	XXXXX	0.2314	0.0103	XXXXX	XXXXX	XXXXX
12	-4.0	-1.0	1362	0.945	0.2314	0.2328	XXXXX	XXXXX	0.2623	0.0079	XXXXX	XXXXX	XXXXX
13	-1.50		323	0.980	0.2623	0.2629	XXXXX	XXXXX	0.2914	0.0063	XXXXX	XXXXX	XXXXX
14	-0.250	-0.060	67	1.012	0.2914	XXXXX	XXXXX	XXXXX	0.3179	0.0053	XXXXX	XXXXX	XXXXX
15			67	XXXXX	0.3179	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
16			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
17			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
18			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
19			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
20			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
21			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
22			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
23			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
24			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
25			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX

One-Dimensional Oedometer Testing Increment

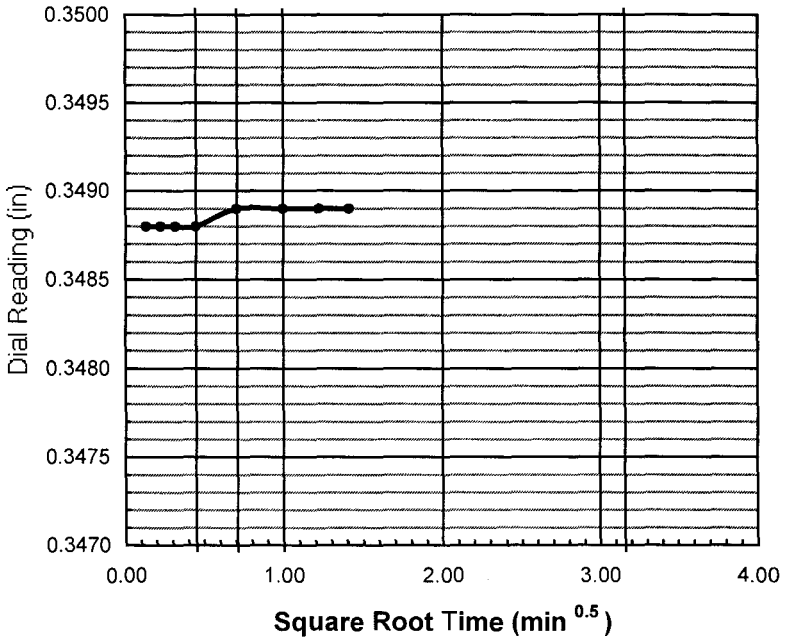
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C-6 | Stage Number: 1 | Curves by: TJO

Boring No.: R-11-001 | Sample No.: 2 | Depth (ft.) 6.5

Date: 9-Feb-11 | Load (psf): 150 | Zero Reading: 0.3489

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:24:52	0	0.00	0.3489
	0.02	0.13	0.3488
	0.05	0.22	0.3488
	0.10	0.32	0.3488
	0.20	0.45	0.3488
	0.50	0.71	0.3489
	1.00	1.00	0.3489
	1.50	1.22	0.3489
swelling	2.00	1.41	0.3489



do = 0.3488

d90 = _____ t90 = _____ min

d100 = 0.3488

df = 0.3489

square root

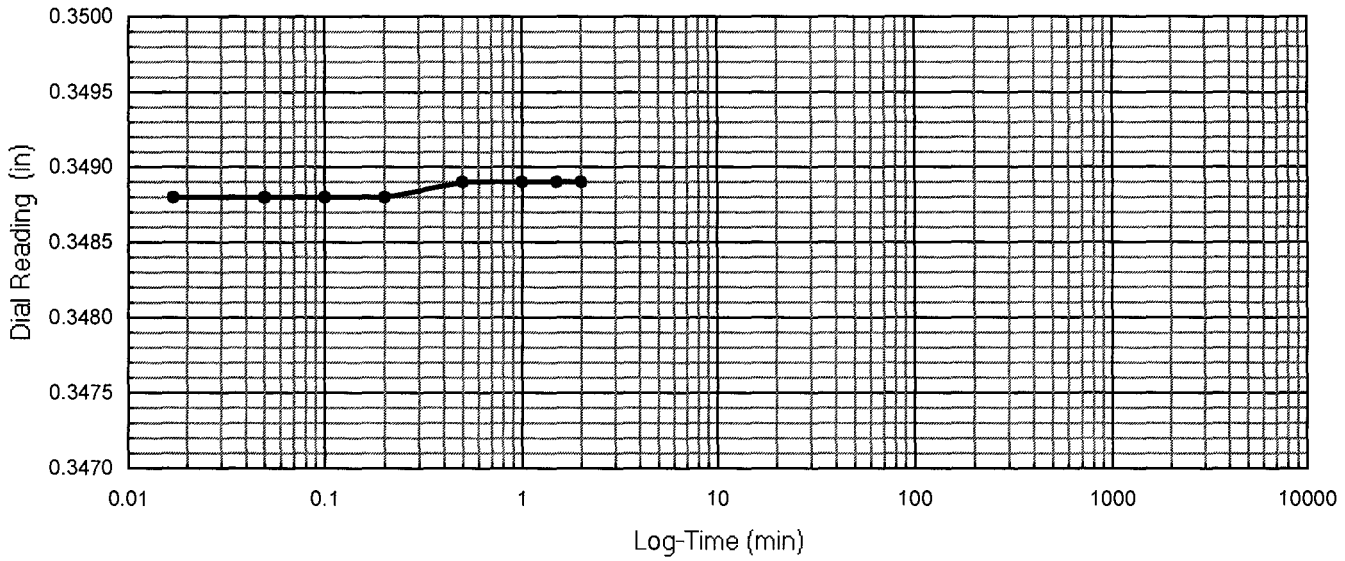
d50 = _____

t50 = _____ min

log time

d50 = 0.3488

t50 = _____ min



One-Dimensional Oedometer Testing Increment

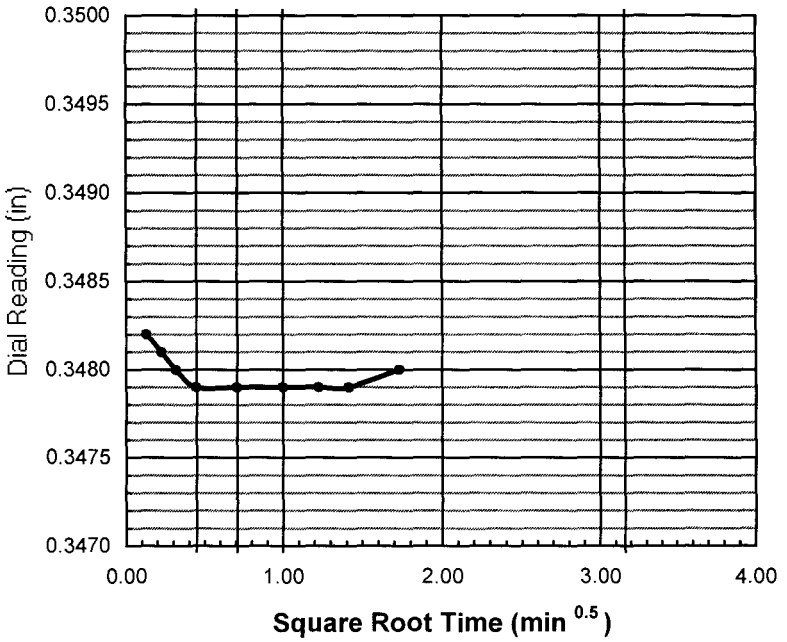
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C-6 | Stage Number: 2 | Curves by: TJO

Boring No.: R-11-001 | Sample No.: 2 | Depth (ft.) 6.5

Date: 9-Feb-11 | Load (psf): 323 | Zero Reading: 0.3489

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:25:31	0	0.00	0.3489
	0.02	0.13	0.3482
	0.05	0.22	0.3481
	0.10	0.32	0.3480
	0.20	0.45	0.3479
	0.50	0.71	0.3479
	1.00	1.00	0.3479
	1.50	1.22	0.3479
	2.00	1.41	0.3479
swelling	3.0	1.73	0.3480



do = 0.3484

d90 = _____ t90 = _____ min

d100 = 0.3479

df = 0.3480

square root

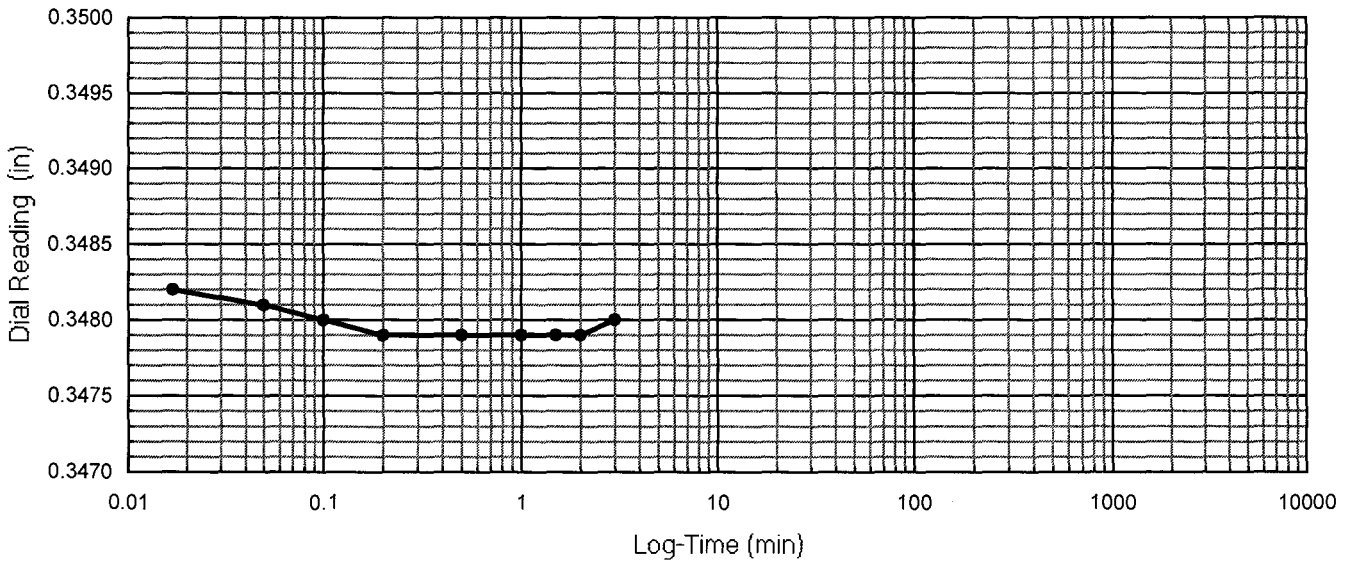
d50 = _____

t50 = _____ min

log time

d50 = 0.3481

t50 = _____ min



One-Dimensional Oedometer Testing Increment

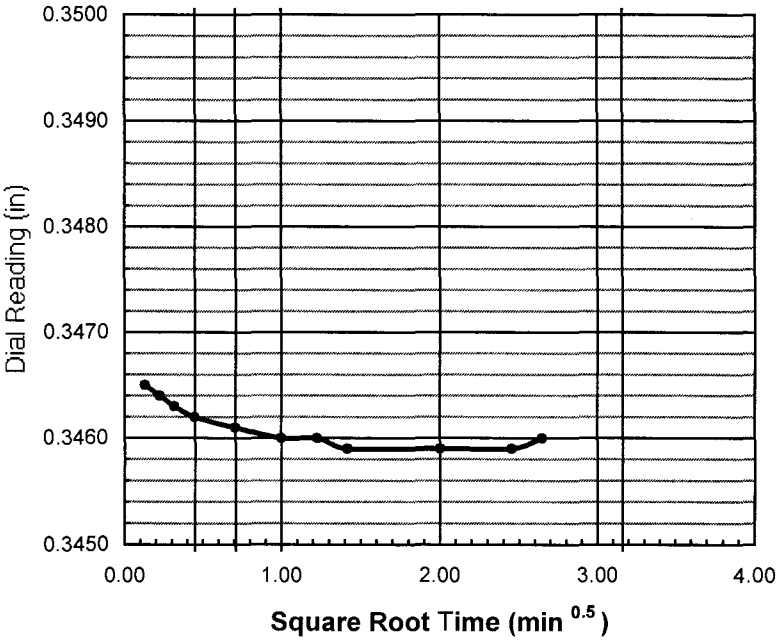
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C-6 | Stage Number: 3 | Curves by: TJO

Boring No.: R-11-001 | Sample No.: 2 | Depth (ft.) 6.5

Date: 9-Feb-11 | Load (psf): 670 | Zero Reading: 0.3489

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:28:17	0	0.00	0.3480
	0.02	0.13	0.3465
	0.05	0.22	0.3464
	0.10	0.32	0.3463
	0.20	0.45	0.3462
	0.50	0.71	0.3461
	1.00	1.00	0.3460
	1.50	1.22	0.3460
	2.00	1.41	0.3459
	4.0	2.00	0.3459
	6.0	2.45	0.3459
swelling	7.0	2.65	0.3460



do = 0.3467

d90 = _____ t90 = _____ min

d100 = 0.3459

df = 0.3460

square root

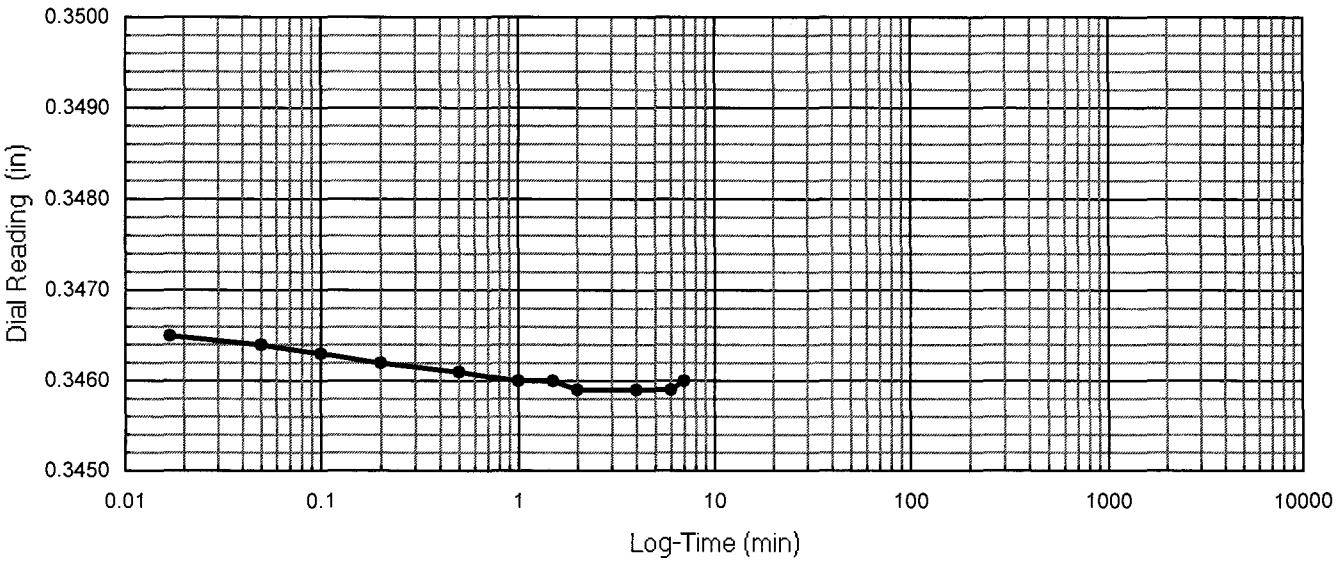
d50 = _____

t50 = _____ min

log time

d50 = 0.3463

t50 = _____ min



One-Dimensional Oedometer Testing Increment

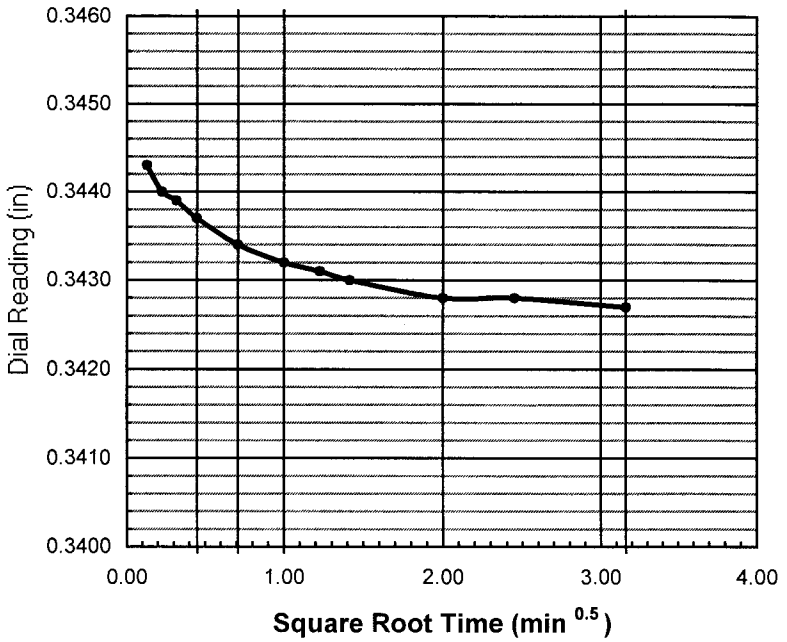
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C-6 | Stage Number: 4 | Curves by: TJO

Boring No.: R-11-001 | Sample No.: 2 | Depth (ft.) 6.5

Date: 9-Feb-11 | Load (psf): 1362 | Zero Reading: 0.3489

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:35:30	0	0.00	0.3460
	0.02	0.13	0.3443
	0.05	0.22	0.3440
	0.10	0.32	0.3439
	0.20	0.45	0.3437
	0.50	0.71	0.3434
	1.00	1.00	0.3432
	1.50	1.22	0.3431
	2.00	1.41	0.3430
	4.0	2.00	0.3428
	6.0	2.45	0.3428
	10.0	3.16	0.3427
	16.0		0.3426
	30		0.3426
	60		0.3426
	91		0.3426



do = 0.3446

d90 = _____ t90 = _____ min

d100 = 0.3426

df = 0.3426

square root

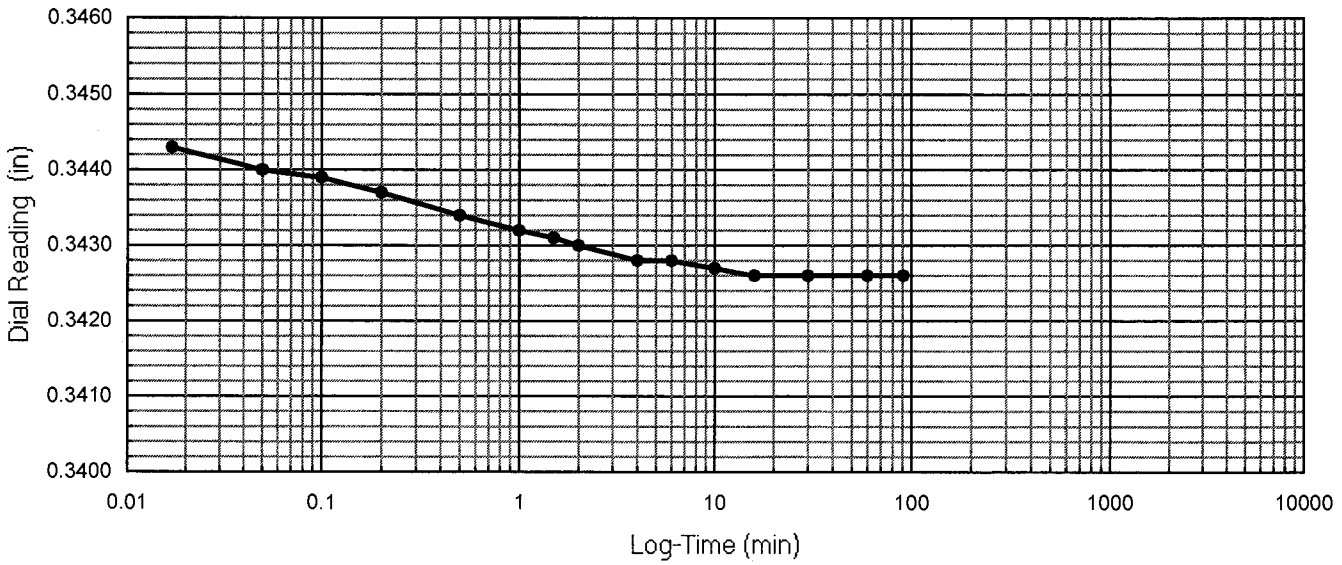
d50 = _____

t50 = _____ min

log time

d50 = 0.3436

t50 = _____ min



One-Dimensional Oedometer Testing Increment

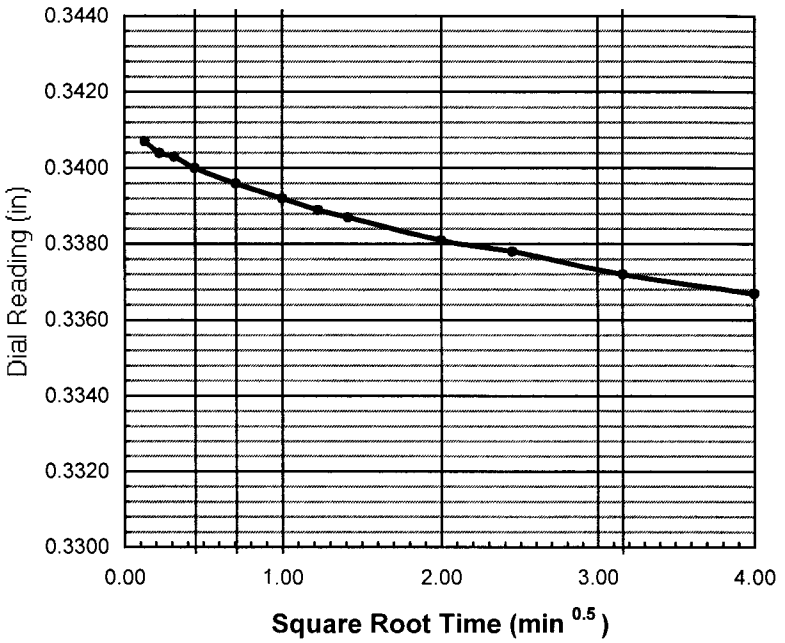
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C-6 | Stage Number: 5 | Curves by: TJO

Boring No.: R-11-001 | Sample No.: 2 | Depth (ft.) 6.5

Date: 9-Feb-11 | Load (psf): 2747 | Zero Reading: 0.3489

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
12:06:59	0	0.00	0.3426
	0.02	0.13	0.3407
	0.05	0.22	0.3404
	0.10	0.32	0.3403
	0.20	0.45	0.3400
	0.50	0.71	0.3396
	1.00	1.00	0.3392
	1.50	1.22	0.3389
	2.00	1.41	0.3387
	4.0	2.00	0.3381
	6.0	2.45	0.3378
	10.0	3.16	0.3372
	16.0	4.00	0.3367
	30		0.3360
	60		0.3353
	120		0.3348
	240		0.3344
	480		0.3341
	1260		0.3338



do = 0.3411

d90 = _____ t90 = _____ min

d100 = 0.3344

df = 0.3338

square root

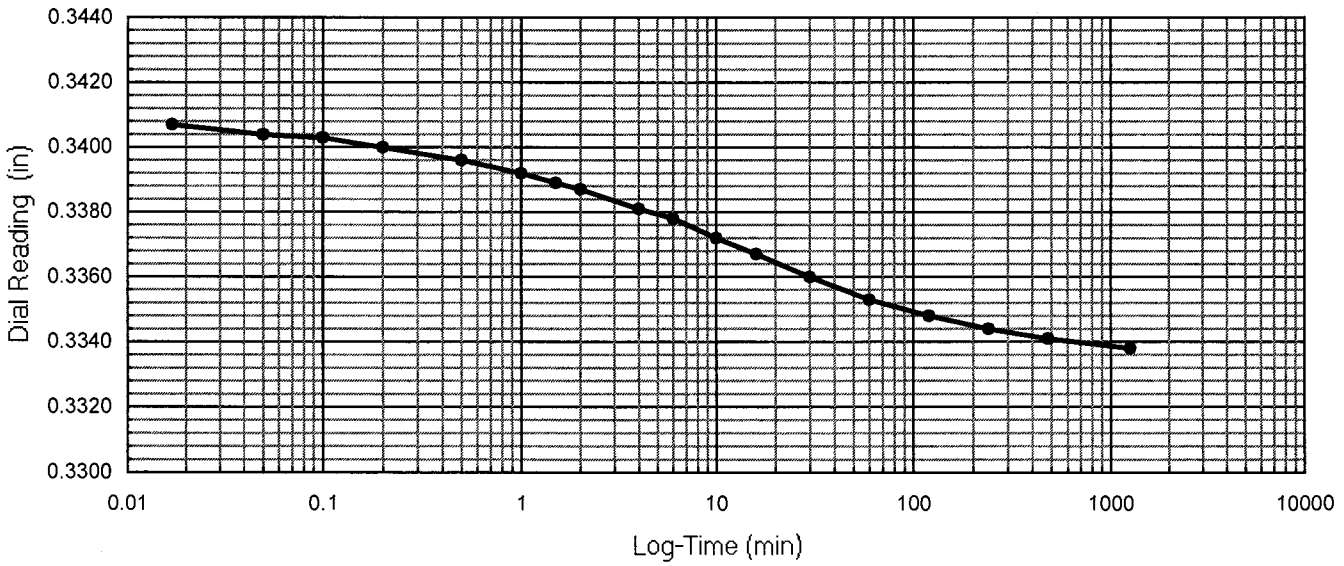
d50 = _____

t50 = _____ min

log time

d50 = 0.3377

t50 = 6.0 min



One-Dimensional Oedometer Testing Increment

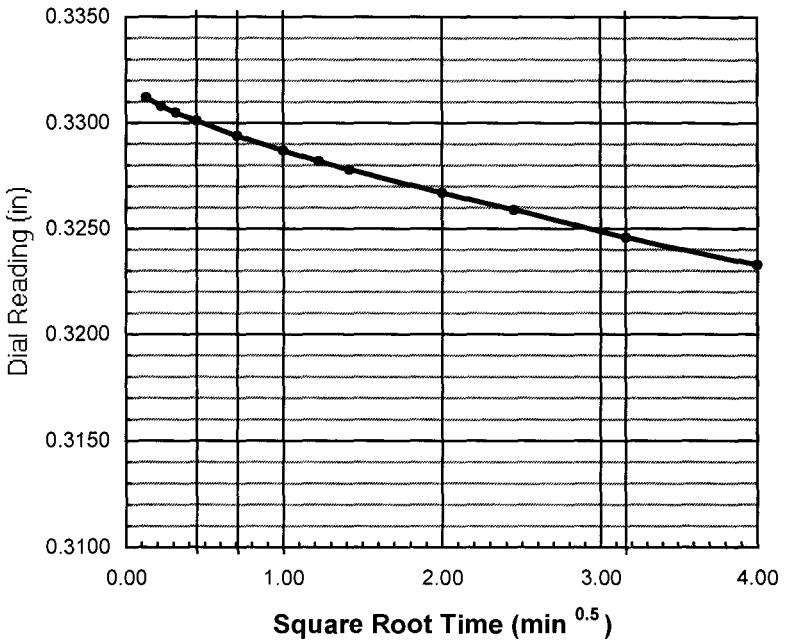
for ASTM D2435, method B

Project Number: 30989830 Apparatus No.: C-6 Stage Number: 6 Curves by: TJO

Boring No.: R-11-001 Sample No.: 2 Depth (ft.) 6.5

Date: 10-Feb-11 Load (psf): 5517 Zero Reading: 0.3489

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:08:16	0	0.00	0.3338
	0.02	0.13	0.3312
	0.05	0.22	0.3308
	0.10	0.32	0.3305
	0.20	0.45	0.3301
	0.50	0.71	0.3294
	1.00	1.00	0.3287
	1.50	1.22	0.3282
	2.00	1.41	0.3278
	4.0	2.00	0.3267
	6.0	2.45	0.3259
	10.0	3.16	0.3246
	16.0	4.00	0.3233
	30		0.3213
	60		0.3193
	120		0.3178
	240		0.3169
	480		0.3161
	960		0.3155
	1456		0.3153



do = 0.3318

d90 = t90 = min

d100 = 0.3160

df = 0.3153

square root

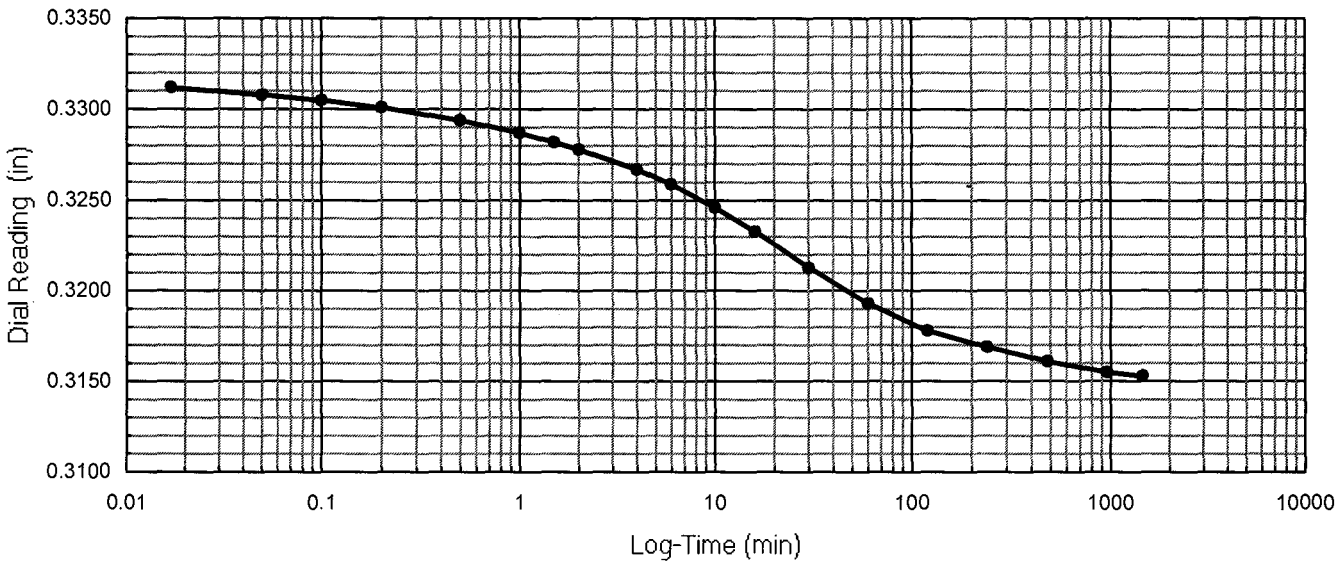
d50 =

t50 = min

log time

d50 = 0.3239

t50 = 12.0 min



One-Dimensional Oedometer Testing Increment

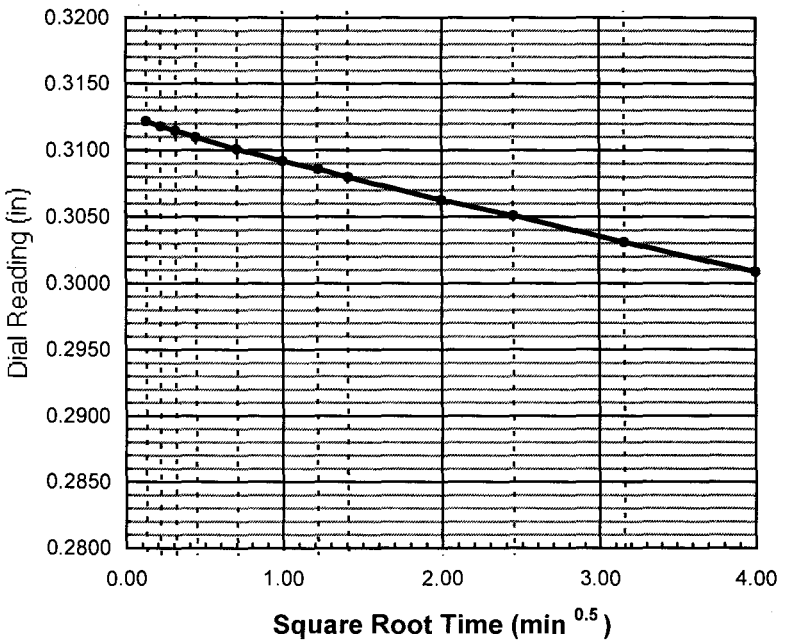
for ASTM D2435, method B

Project Number: 30989830 Apparatus No.: C-6 Stage Number: 7 Curves by: TJO

Boring No.: R-11-001 Sample No.: 2 Depth (ft.) 6.5

Date: 11-Feb-11 Load (psf): 11057 Zero Reading: 0.3489

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:24:37	0	0.00	0.3153
	0.02	0.13	0.3122
	0.05	0.22	0.3118
	0.10	0.32	0.3115
	0.20	0.45	0.3110
	0.50	0.71	0.3101
	1.00	1.00	0.3092
	1.50	1.22	0.3086
	2.00	1.41	0.3080
	4.0	2.00	0.3063
	6.0	2.45	0.3051
	10.0	3.16	0.3031
	16.0	4.00	0.3009
	30		0.2973
	60		0.2933
	120		0.2902
	240		0.2881
	480		0.2868
	960		0.2859
	1520		0.2855



do = 0.3128

d90 = t90 = min

d100 = 0.2880

df = 0.2855

square root

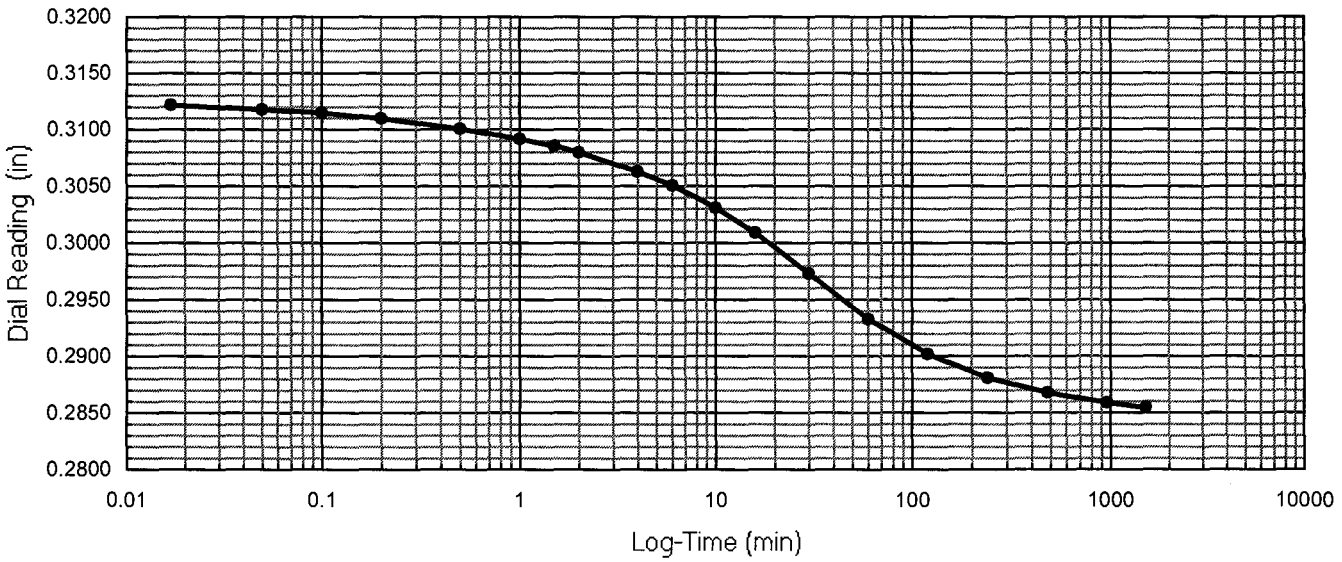
d50 =

t50 = min

log time

d50 = 0.3004

t50 = 16.0 min



One-Dimensional Oedometer Testing Increment

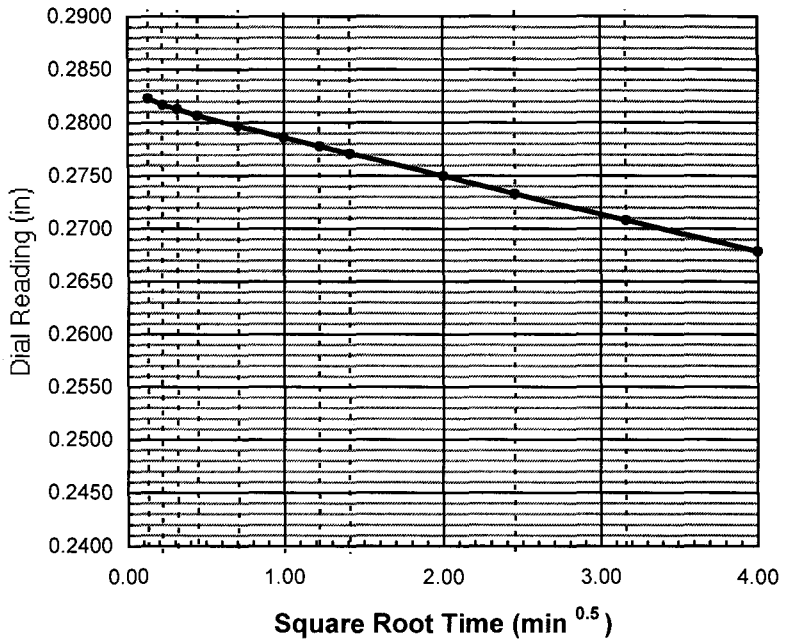
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C-6 | Stage Number: 8 | Curves by: TJO

Boring No.: R-11-001 | Sample No.: 2 | Depth (ft.) 6.5

Date: 12-Feb-11 | Load (psf): 22137 | Zero Reading: 0.3489

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:45:24	0	0.00	0.2855
	0.02	0.13	0.2823
	0.05	0.22	0.2817
	0.10	0.32	0.2813
	0.20	0.45	0.2807
	0.50	0.71	0.2797
	1.00	1.00	0.2786
	1.50	1.22	0.2778
	2.00	1.41	0.2771
	4.0	2.00	0.2750
	6.0	2.45	0.2733
	10.0	3.16	0.2708
	16.0	4.00	0.2679
	30		0.2631
	60		0.2570
	120		0.2517
	240		0.2483
	480		0.2462
	960		0.2449
	1440		0.2444
	2792		0.2435



do = 0.2831

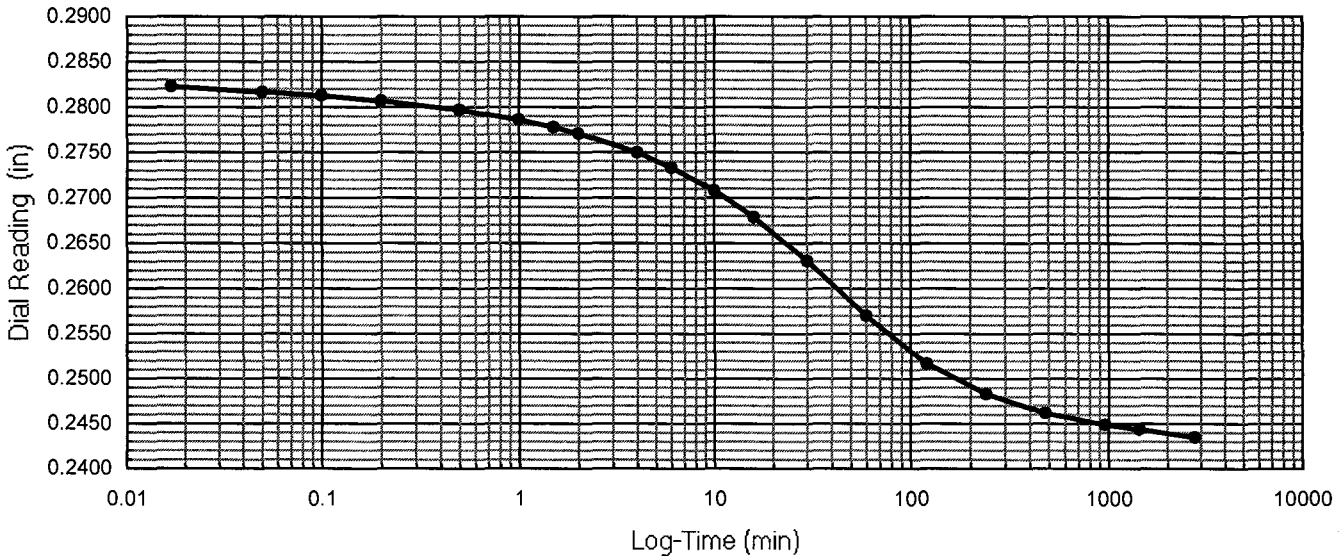
d90 = _____ t90 = _____ min

d100 = 0.2475

df = 0.2435

square root: d50 = _____ t50 = _____ min

log time: d50 = 0.2653 t50 = 22.0 min



One-Dimensional Oedometer Testing Increment

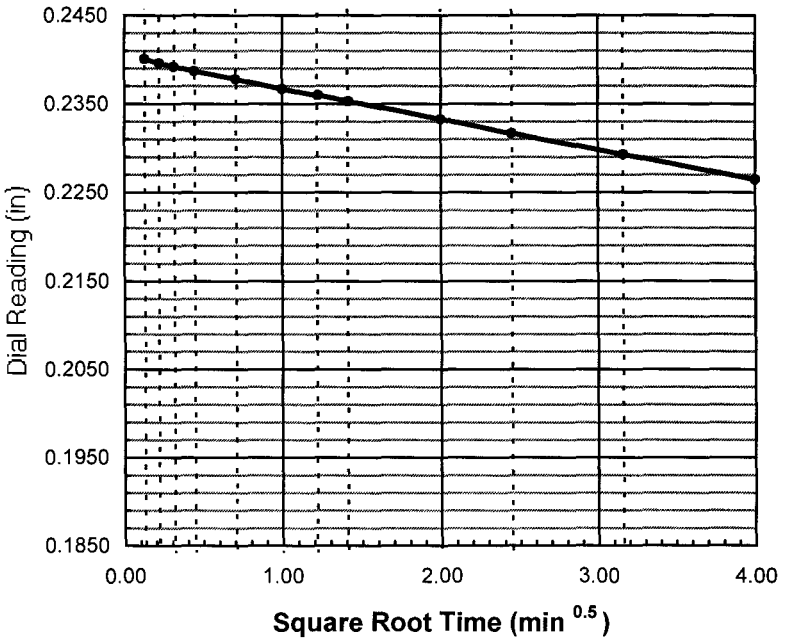
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C-6 | Stage Number: 9 | Curves by: TJO

Boring No.: R-11-001 | Sample No.: 2 | Depth (ft.) 6.5

Date: 14-Feb-11 | Load (psf): 44296 | Zero Reading: 0.3489

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:17:42	0	0.00	0.2435
	0.02	0.13	0.2401
	0.05	0.22	0.2396
	0.10	0.32	0.2392
	0.20	0.45	0.2387
	0.50	0.71	0.2378
	1.00	1.00	0.2367
	1.50	1.22	0.2360
	2.00	1.41	0.2353
	4.0	2.00	0.2333
	6.0	2.45	0.2317
	10.0	3.16	0.2293
	16.0	4.00	0.2265
	30		0.2217
	60		0.2152
	120		0.2084
	240		0.2031
	480		0.1998
	960		0.1980
	1402		0.1974



do = 0.2408

d90 = _____ t90 = _____ min

d100 = 0.1970

df = 0.1974

square root

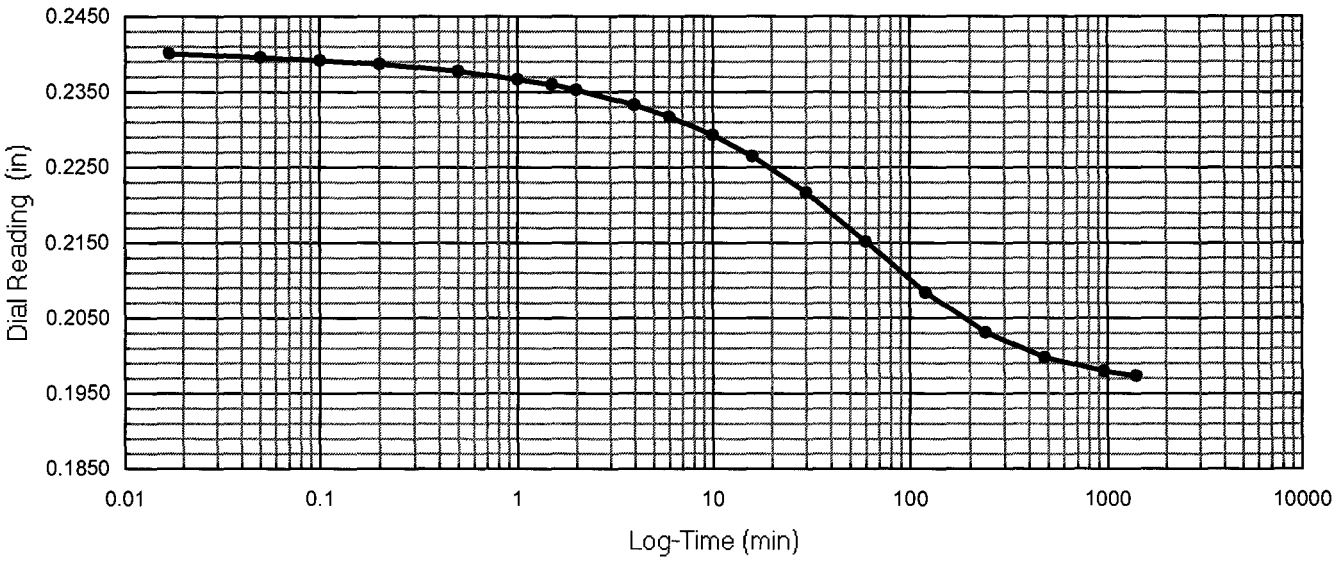
d50 = _____

t50 = _____ min

log time

d50 = 0.2189

t50 = 25.0 min



One-Dimensional Oedometer Testing Increment

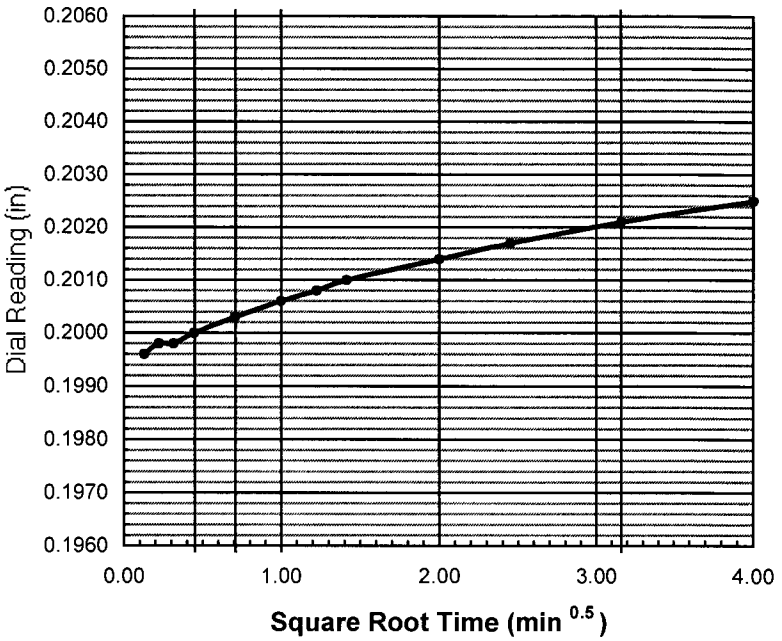
for ASTM D2435, method B

Project Number: 30989830 Apparatus No.: C-6 Stage Number: 10 Curves by: TJO

Boring No.: R-11-001 Sample No.: 2 Depth (ft.) 6.5

Date: 15-Feb-11 Load (psf): 22137 Zero Reading: 0.3489

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:40:33	0	0.00	0.1974
	0.02	0.13	0.1996
	0.05	0.22	0.1998
	0.10	0.32	0.1998
	0.20	0.45	0.2000
	0.50	0.71	0.2003
	1.00	1.00	0.2006
	1.50	1.22	0.2008
	2.00	1.41	0.2010
	4.0	2.00	0.2014
	6.0	2.45	0.2017
	10.0	3.16	0.2021
	16.0	4.00	0.2025
	30		0.2031
	60		0.2036
	120		0.2040
	240		0.2042
	529		0.2043



do = 0.1994

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2043

square root

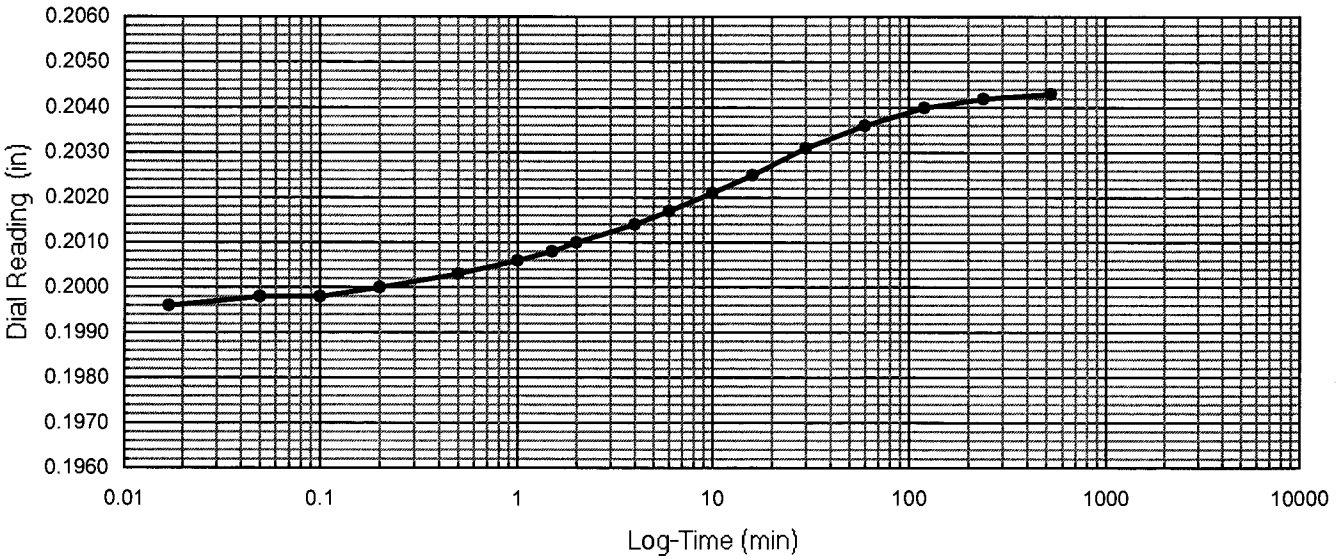
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

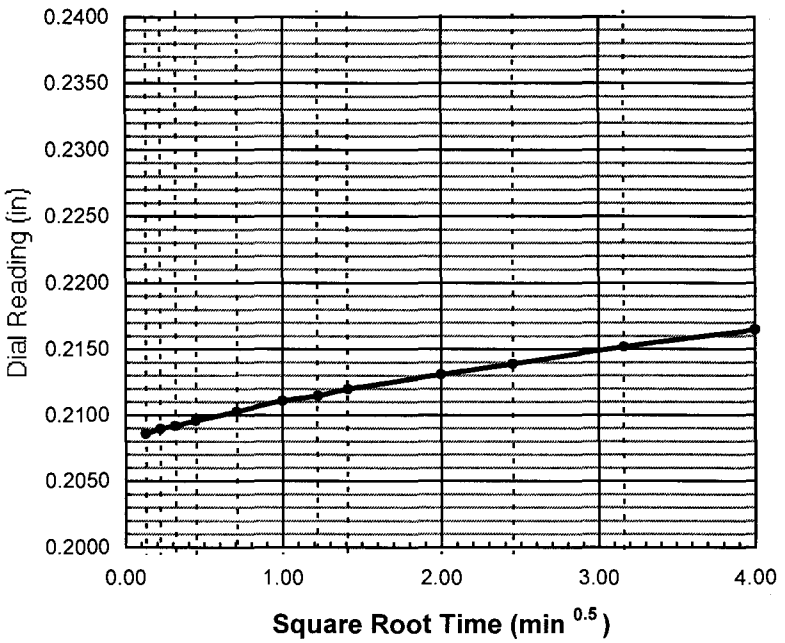
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C-6 | Stage Number: 11 | Curves by: TJO

Boring No.: R-11-001 | Sample No.: 2 | Depth (ft.) 6.5

Date: 15-Feb-11 | Load (psf): 5517 | Zero Reading: 0.3489

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
17:30:34	0	0.00	0.2043
	0.02	0.13	0.2086
	0.05	0.22	0.2090
	0.10	0.32	0.2092
	0.20	0.45	0.2096
	0.50	0.71	0.2103
	1.00	1.00	0.2111
	1.50	1.22	0.2115
	2.00	1.41	0.2120
	4.0	2.00	0.2131
	6.0	2.45	0.2139
	10.0	3.16	0.2152
	16.0	4.00	0.2165
	30		0.2189
	60		0.2222
	120		0.2257
	240		0.2287
	480		0.2306
	866		0.2314



do = 0.2081

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2314

square root

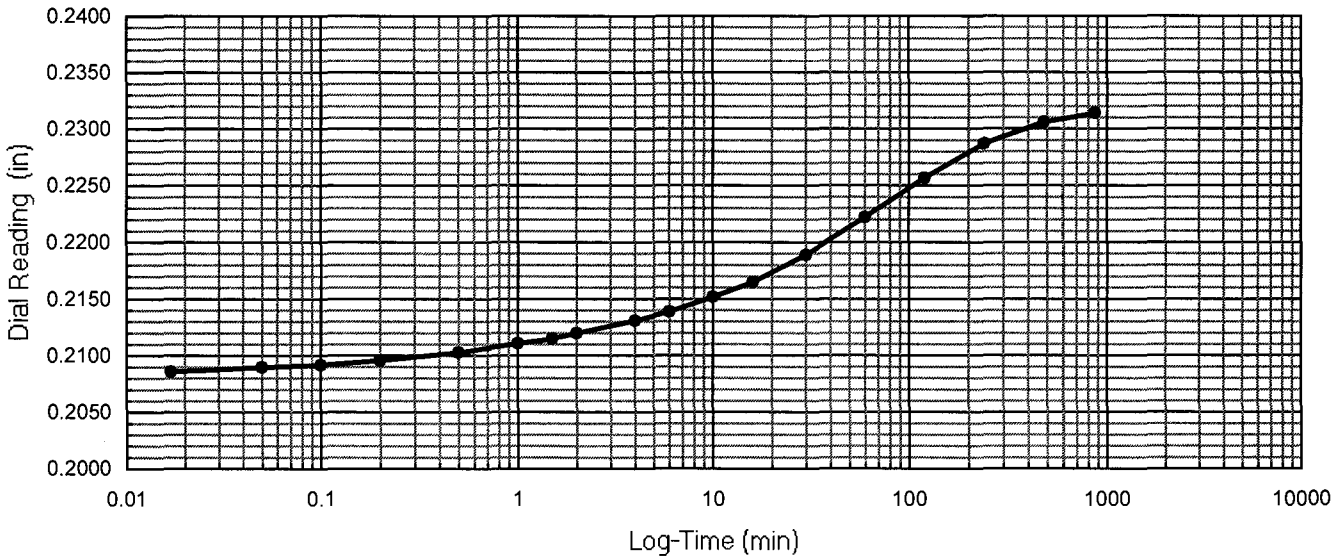
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

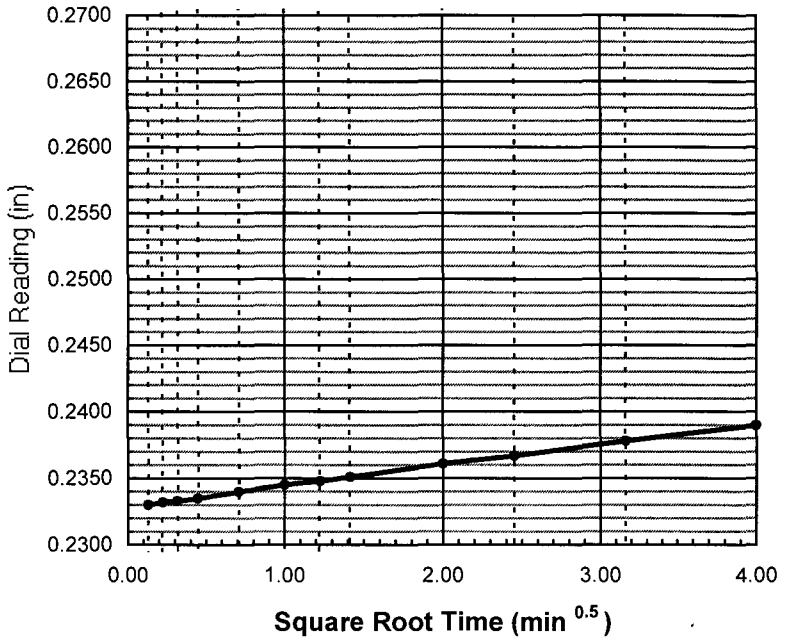
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C-6 | Stage Number: 12 | Curves by: TJO

Boring No.: R-11-001 | Sample No.: 2 | Depth (ft.) 6.5

Date: 16-Feb-11 | Load (psf): 1362 | Zero Reading: 0.3489

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
7:56:54	0	0.00	0.2314
	0.02	0.13	0.2330
	0.05	0.22	0.2332
	0.10	0.32	0.2333
	0.20	0.45	0.2335
	0.50	0.71	0.2340
	1.00	1.00	0.2345
	1.50	1.22	0.2348
	2.00	1.41	0.2351
	4.0	2.00	0.2361
	6.0	2.45	0.2367
	10.0	3.16	0.2378
	16.0	4.00	0.2390
	30		0.2411
	60		0.2443
	120		0.2486
	240		0.2538
	480		0.2584
	960		0.2613
	1511		0.2623



do = 0.2328

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2623

square root

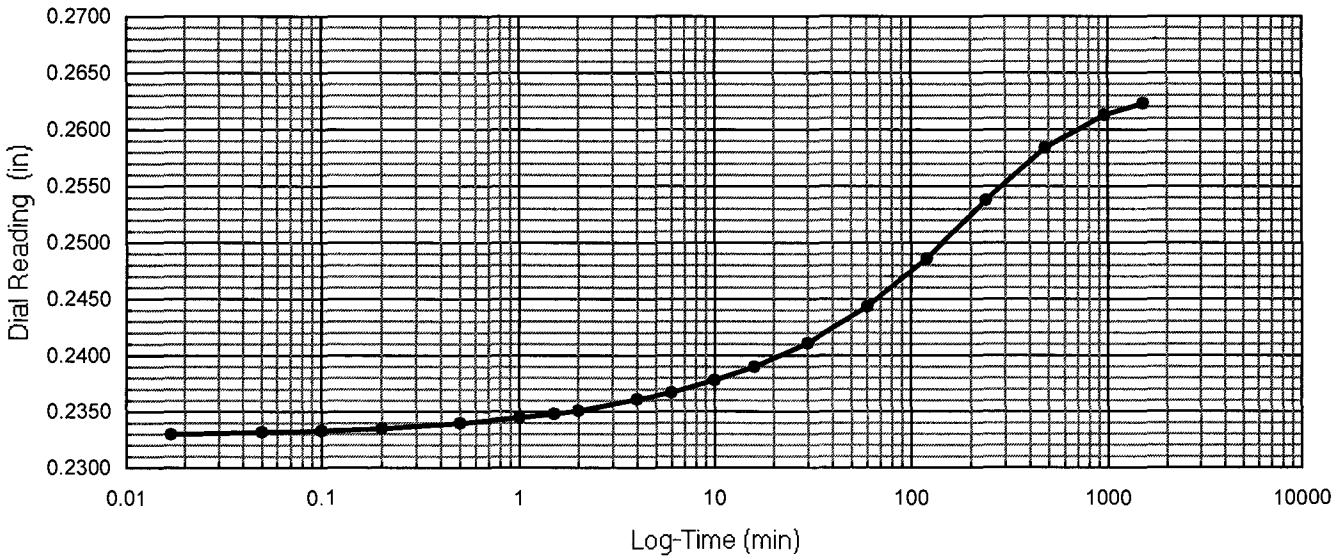
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

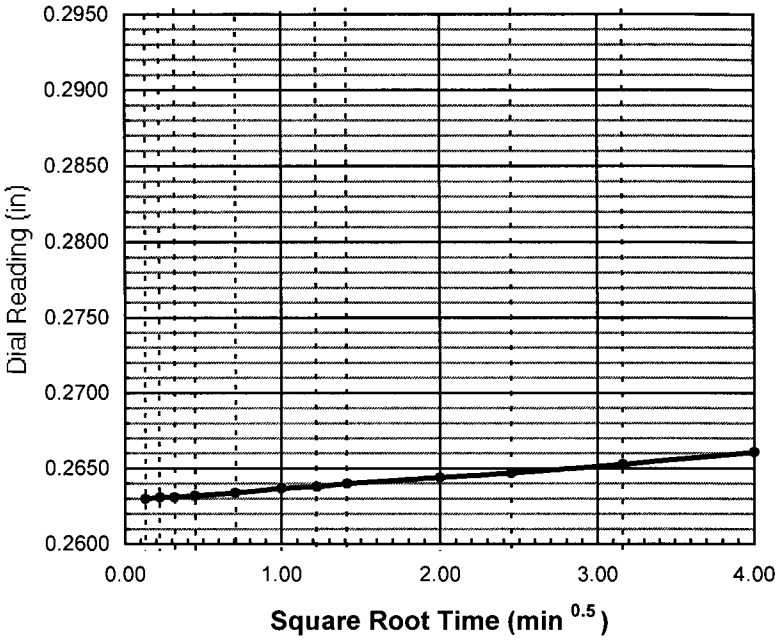
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C-6 | Stage Number: 13 | Curves by: TJO

Boring No.: R-11-001 | Sample No.: 2 | Depth (ft.) 6.5

Date: 17-Feb-11 | Load (psf): 323 | Zero Reading: 0.3489

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:07:57	0	0.00	0.2623
	0.02	0.13	0.2630
	0.05	0.22	0.2631
	0.10	0.32	0.2631
	0.20	0.45	0.2632
	0.50	0.71	0.2634
	1.00	1.00	0.2637
	1.50	1.22	0.2638
	2.00	1.41	0.2640
	4.0	2.00	0.2644
	6.0	2.45	0.2647
	10.0	3.16	0.2653
	16.0	4.00	0.2661
	30		0.2674
	60		0.2696
	120		0.2728
	240		0.2770
	480		0.2821
	960		0.2865
	1980		0.2895
	2930		0.2905
	4395		0.2914



do = 0.2629

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2914

square root

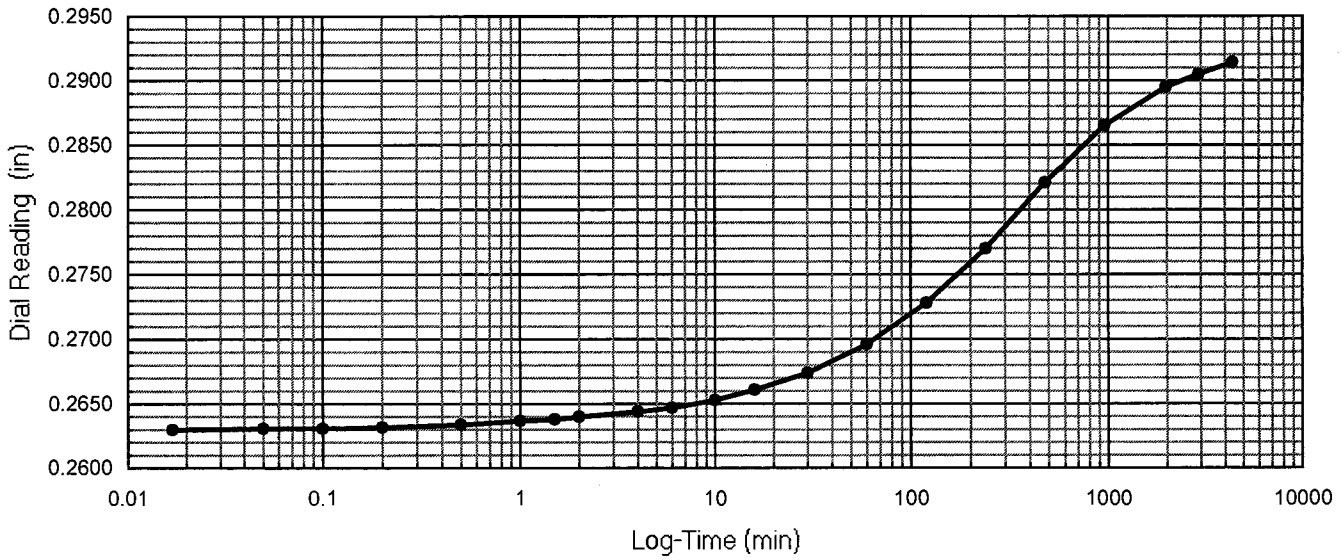
d50 = _____

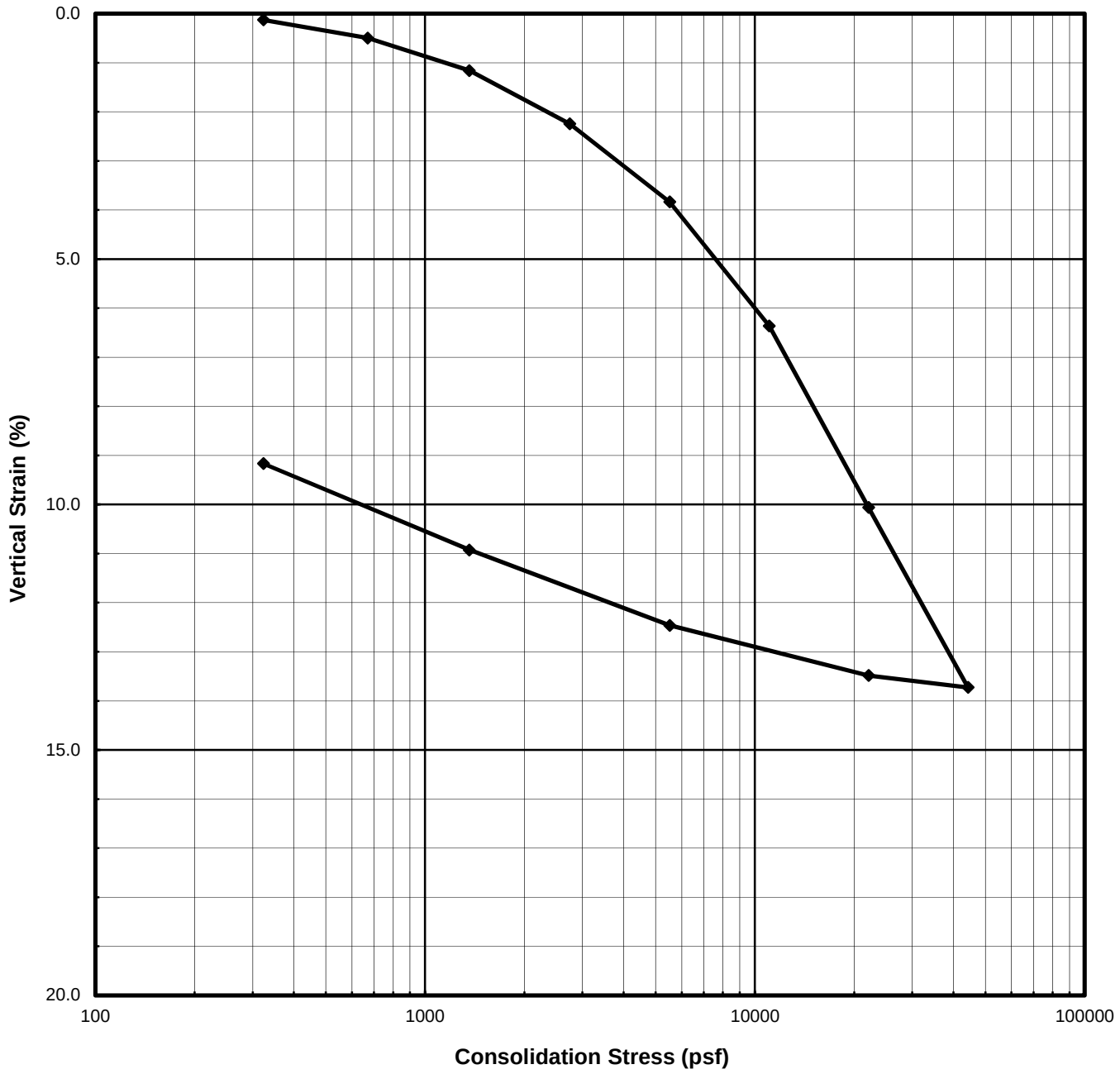
t50 = _____ min

log time

d50 = _____

t50 = _____ min





Description:	**Dark gray Clay (CL)**							
Boring No.:	R-11-001		Liquid Limit	43	%	Specific Gravity	2.75	assumed
Sample No.:	7		Plasticity Index	27	%	Strain for Saturation	3.56	%
Depth (ft | m)	25.0	7.62	Fines Content	87.1	%	Water added at	150	psf

	Water Content (%)	Total Unit Weight		Dry Unit Weight		Saturation (%)	Void Ratio	Height		Diameter	
		(pcf)	(kN/m^3)	(pcf)	(kN/m^3)			(inches)	(cm)	(inches)	(cm)
Initial	24.1	122.4	19.22	98.6	15.49	89.8	0.74	0.949	2.41	2.416	6.137
Final	21.5	130.1	20.43	107.0	16.81	98.5	0.60	0.875	2.22		

URS

I-5 & SR-74 IC

Project Number: 30989830
Test Start Date: 2/9/2011

CONSOLIDATION TEST
ASTM D2435

SUBMITTED BY: Thomas J. O'Meara

Con I5 SR74 R11001 025.xls

One-Dimensional Oedometer Testing
Set-up / Take down Worksheet
ASTM D2435

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM
Apparatus No.: C8

Boring No.: R-11-001
Sample No.: 7
Depth (ft): 25.0

Specimen Description : Dark gray Clay (CL)
Duration: end of increment
Ring Number: R24

Weight of Wet Spec. and Ring:	357.83	g
Weight of Ring:	218.06	g
Initial Weight of Wet Spec.:	139.77	g
Take Down Weight with Ring:	354.77	g
Excess Oven-dried Cont. No.:	cp12	
Weight of Cont. and Dry Spec.:	164.48	g
Weight of Container:	164.34	g
Weight of Excess Dried Soil:	0.14	g
Weight of Excess Wet Soil	0.17	g
Final Weight of Wet Specimen:	136.88	g

Height of Specimen (in)

	Initial	Final
1	0.950	0.877
2	0.952	0.877
3	0.949	0.874
4	0.950	0.872
5	0.945	0.873
Ave:	0.949	0.875

Initial Height - Final Height =	0.075	in
Change in Dial (Dd) =	0.081	in
Initial Height - Dd =	0.868	in
Final Height + Dd =	0.956	in
Weight of Top Cap =	369.47	g

Specimen Analysis					Initial Trim	Initial Spec.	Final
				Container Number:	x17	**XXXXX**	s15
				Mass of Container and Wet Specimen M1 (g)	400.33	139.77	194.84
				Mass of Container and Dry Specimen, M2 (g)	346.01	112.63	174.44
				Mass of Container, M3 (g)	139.31	**XXXXX**	79.68
				Water Content, w (%)	26.28	24.09	21.53
				Mass of Wet Specimen, M4 (g)	139.77	139.77	136.88
				Mass of Dry Specimen, M5 (g)	112.63	112.63	112.63
Nominal		Measured	x	Specimen Height, H (in)	0.949	0.949	0.875
Nominal	x	Measured		Specimen Diameter, D (in)	2.416	2.416	2.416
				Area of Specimen, A (in^2)	4.584	4.584	4.584
				Volume of Specimen, V (cc)	71.31	71.31	65.70
Assumed	x	Measured		Specific Gravity, Gs	2.75	2.75	2.75
				Wet Unit Weight, WUW (pcf)	**122.4**	**122.4**	**130.1**
				Dry Unit Weight, DUW (pcf)	**96.9**	**98.6**	**107.0**
				Void Ratio	**0.769**	**0.738**	**0.601**
				Degree of Saturation, S (%)	**94.0**	**89.8**	**98.5**

Set-up by: TJO
Date: 2/9/11
Calculated by: TJO
Checked by: TJO
Strain for Saturation (%) = **3.557**

One-Dimensional Oedometer Testing

Loading Worksheet

ASTM D2435

Project Number: 30989830 Boring No.: R-11-001

Project Name: I-5 & SR-74 IC Sample No.: 7

Project Engineer: FM Apparatus No.: C8 Depth (ft): 25.0

Initial Dial Reading: 0.3662 inch Initial Specimen Height: 0.949 inch

Stage No.	Normal Stress (psf)	Dial Reading (in)		Compressibility Correction (in)	Vertical Strain (%)	
		End of Duration	End of Increment		End of Duration	End of Increment
Seat	150		0.3600	0.0000		0.65
1	323	0.3647	0.3649	0.0003	0.13	0.11
2	670	0.3610	0.3600	0.0015	0.39	0.50
3	1362	0.3524	0.3521	0.0031	1.13	1.16
4	2747	0.3412	0.3400	0.0049	2.12	2.24
5	5517	0.3250	0.3230	0.0068	3.62	3.83
6	11057	0.3010	0.2967	0.0091	5.91	6.36
7	22137	0.2640	0.2593	0.0114	9.57	10.06
8	44296	0.2250	0.2221	0.0138	13.42	13.73
9	22137		0.2254	0.0128		13.49
10	5517		0.2380	0.0099		12.46
11	1362		0.2550	0.0075		10.92
12	323		0.2735	0.0057		9.17
13	67		0.2853	0.0044		8.06
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						
33						

Final dial reading prior to take down (inch): 0.2853 Take down by: TJO Date: 3/2/11

One-Dimensional Oedometer Testing
ASTM D2435
Table of Incremental Values

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM
Apparatus No.: C8

Boring No.: R-11-001
Sample No.: 7
Depth (ft): 25.0
Inundation at stage: Seat

10 **20** Hanger Ratios

Stage Number	Incremental Weight Applied (kg) Back	Front	Vertical Stress (psf)	Specimen Hieght (in)	Deflections (in) $d_{initial}$	d_o	d_{50}	d_{100}	d_{final}	Porous Stone (in)	t_{50} (min)	cv (in^2/min)	cv (ft^2/day)
Top Cap			26	0.949	0.3662	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
Seat	0.06	0.06	150	0.943	0.3662	XXXXX	XXXXX	XXXXX	0.3600	0.0000	XXXXX	XXXXX	XXXXX
1	0.25		323	0.948	0.3600	0.3654	0.3651	0.3647	0.3649	0.0003	XXXXX	XXXXX	XXXXX
2	0.50		670	0.945	0.3649	0.3632	0.3621	0.3610	0.3600	0.0015	0.50	0.088	0.879
3	1.00		1362	0.940	0.3600	0.3580	0.3552	0.3524	0.3521	0.0031	2.00	0.022	0.218
4		1.0	2747	0.933	0.3521	0.3495	0.3454	0.3412	0.3400	0.0049	1.00	0.043	0.429
5	4.0		5517	0.923	0.3400	0.3367	0.3309	0.3250	0.3230	0.0068	1.00	0.042	0.419
6		4.0	11057	0.905	0.3230	0.3177	0.3094	0.3010	0.2967	0.0091	1.00	0.040	0.404
7		8.0	22137	0.879	0.2967	0.2898	0.2769	0.2640	0.2593	0.0114	1.50	0.025	0.254
8		16.0	44296	0.856	0.2593	0.2531	0.2391	0.2250	0.2221	0.0138	2.50	0.014	0.144
9		-16.0	22137	0.872	0.2221	0.2240	XXXXX	XXXXX	0.2254	0.0128	XXXXX	XXXXX	XXXXX
10		-12.0	5517	0.895	0.2254	0.2296	XXXXX	XXXXX	0.2380	0.0099	XXXXX	XXXXX	XXXXX
11	-4.0	-1.0	1362	0.919	0.2380	0.2400	XXXXX	XXXXX	0.2550	0.0075	XXXXX	XXXXX	XXXXX
12	-1.5		323	0.943	0.2550	0.2559	XXXXX	XXXXX	0.2735	0.0057	XXXXX	XXXXX	XXXXX
13	-0.25	-0.06	67	0.960	0.2735	XXXXX	XXXXX	XXXXX	0.2853	0.0044	XXXXX	XXXXX	XXXXX
14			67	XXXXX	0.2853	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
15			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
16			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
17			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
18			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
19			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
20			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
21			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
22			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
23			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
24			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
25			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX

One-Dimensional Oedometer Testing Increment

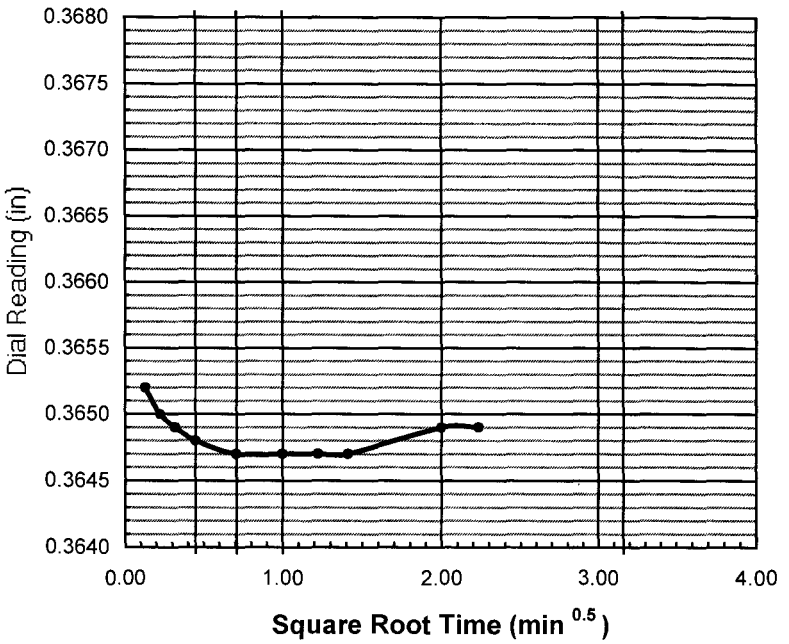
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 1 | Curves by: TJO

Boring No.: R-11-001 | Sample No.: 7 | Depth (ft.) 25.0

Date: 9-Feb-11 | Load (psf): 323 | Zero Reading: 0.3662

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:44:54	0	0.00	0.3662
	0.02	0.13	0.3652
	0.05	0.22	0.3650
	0.10	0.32	0.3649
	0.20	0.45	0.3648
	0.50	0.71	0.3647
	1.00	1.00	0.3647
	1.50	1.22	0.3647
	2.00	1.41	0.3647
	4.0	2.00	0.3649
swelling	5.0	2.24	0.3649



do = 0.3654

d90 = _____ t90 = _____ min

d100 = 0.3647

df = 0.3649

square root

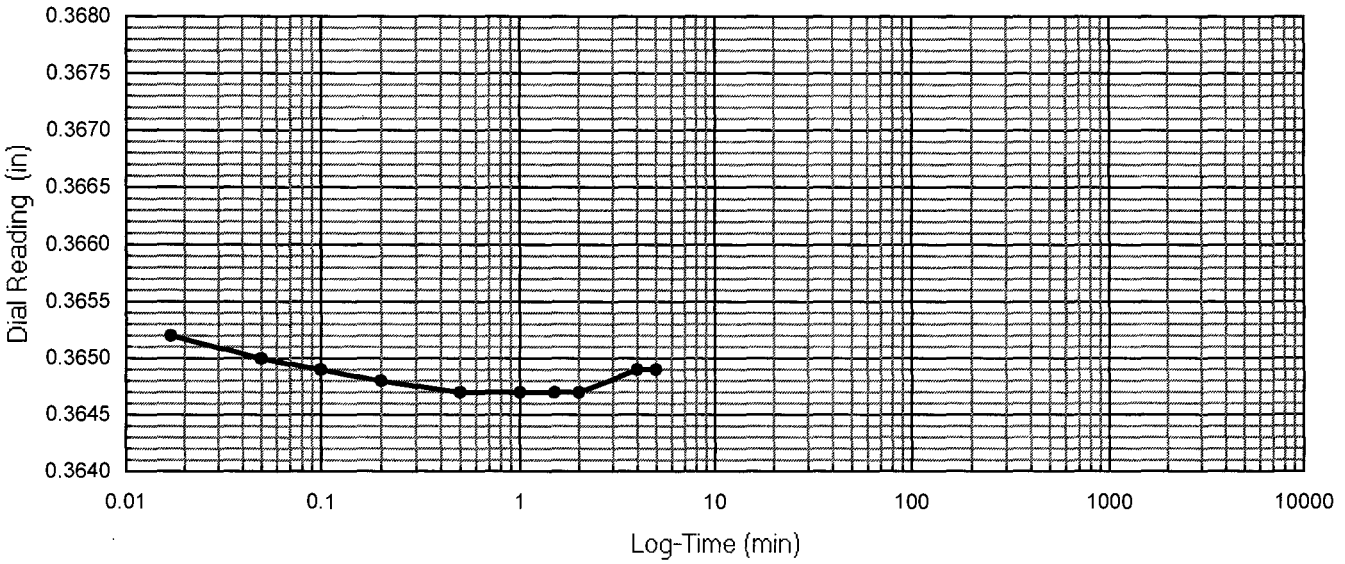
d50 = _____

t50 = _____ min

log time

d50 = 0.3651

t50 = _____ min



One-Dimensional Oedometer Testing Increment

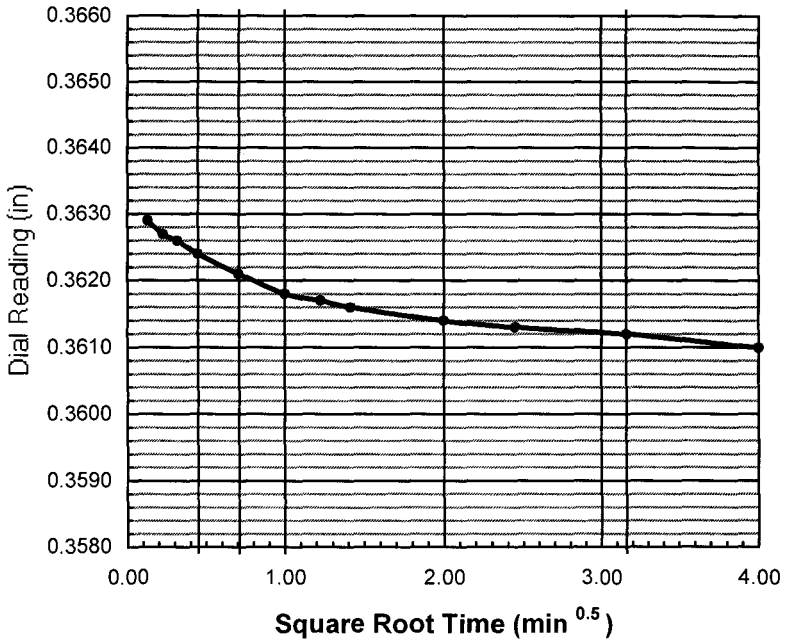
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 2 | Curves by: TJO

Boring No.: R-11-001 | Sample No.: 7 | Depth (ft.) 25.0

Date: 9-Feb-11 | Load (psf): 670 | Zero Reading: 0.3662

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:49:39	0	0.00	0.3649
	0.02	0.13	0.3629
	0.05	0.22	0.3627
	0.10	0.32	0.3626
	0.20	0.45	0.3624
	0.50	0.71	0.3621
	1.00	1.00	0.3618
	1.50	1.22	0.3617
	2.00	1.41	0.3616
	4.0	2.00	0.3614
	6.0	2.45	0.3613
	10.0	3.16	0.3612
	16.0	4.00	0.3610
	30		0.3609
	60		0.3607
	120		0.3605
	240		0.3604
	480		0.3602
	1340		0.3600



do = 0.3632

d90 = ____ t90 = ____ min

d100 = 0.3610

df = 0.3600

square root

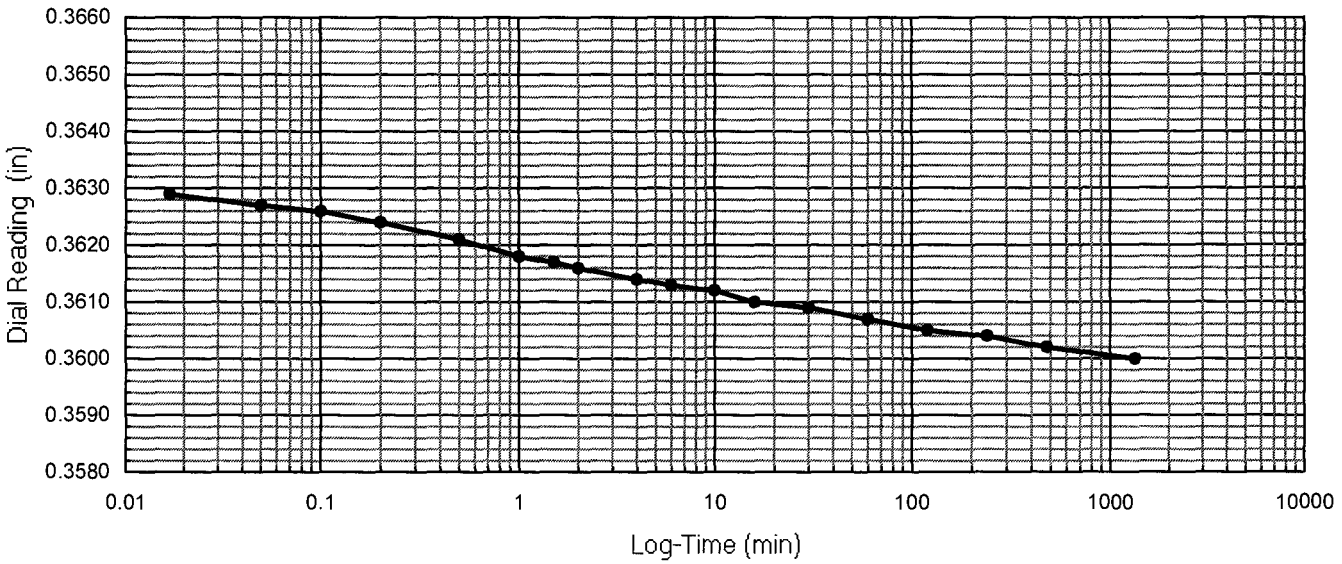
d50 = ____

t50 = ____ min

log time

d50 = 0.3621

t50 = 0.5 min



One-Dimensional Oedometer Testing Increment

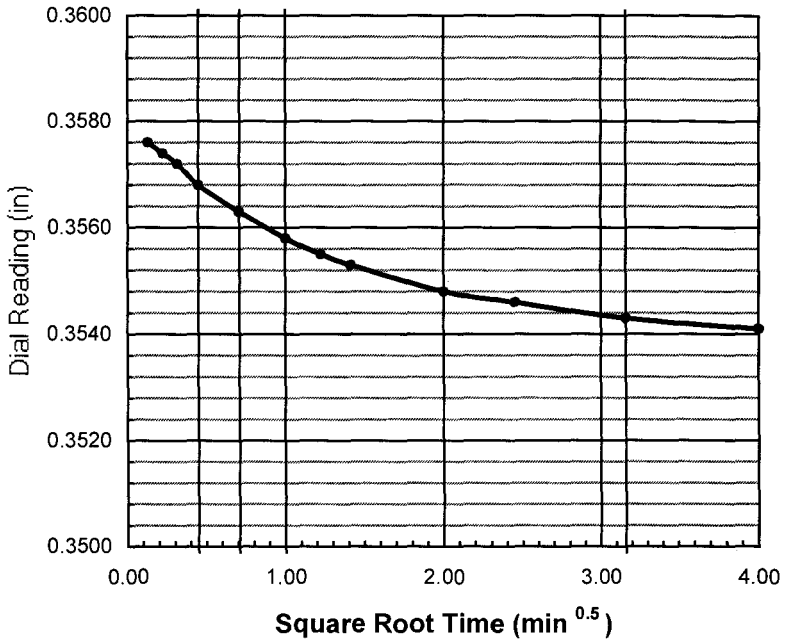
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 3 | Curves by: TJO

Boring No.: R-11-001 | Sample No.: 7 | Depth (ft.) 25.0

Date: 10-Feb-11 | Load (psf): 1362 | Zero Reading: 0.3662

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:10:22	0	0.00	0.3600
	0.02	0.13	0.3576
	0.05	0.22	0.3574
	0.10	0.32	0.3572
	0.20	0.45	0.3568
	0.50	0.71	0.3563
	1.00	1.00	0.3558
	1.50	1.22	0.3555
	2.00	1.41	0.3553
	4.0	2.00	0.3548
	6.0	2.45	0.3546
	10.0	3.16	0.3543
	16.0	4.00	0.3541
	30		0.3538
	60		0.3535
	120		0.3532
	240		0.3528
	480		0.3525
	960		0.3522
	1456		0.3521



do = 0.3580

d90 = ____ t90 = ____ min

d100 = 0.3524

df = 0.3521

square root

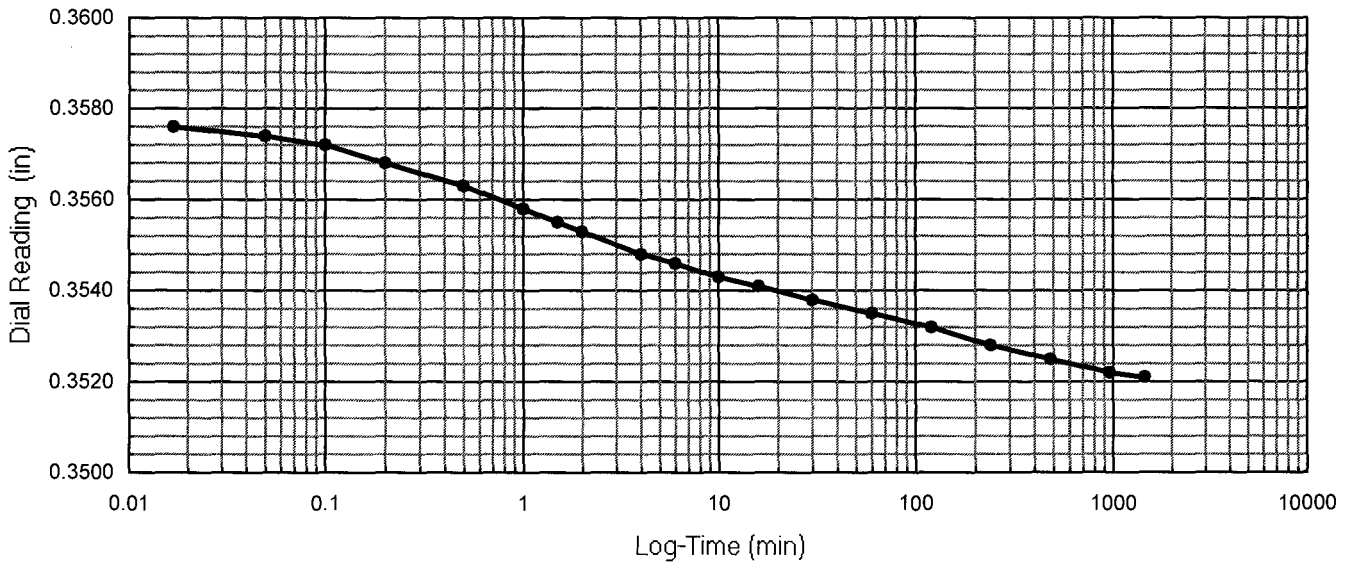
d50 = ____

t50 = ____ min

log time

d50 = 0.3552

t50 = 2.0 min



One-Dimensional Oedometer Testing Increment

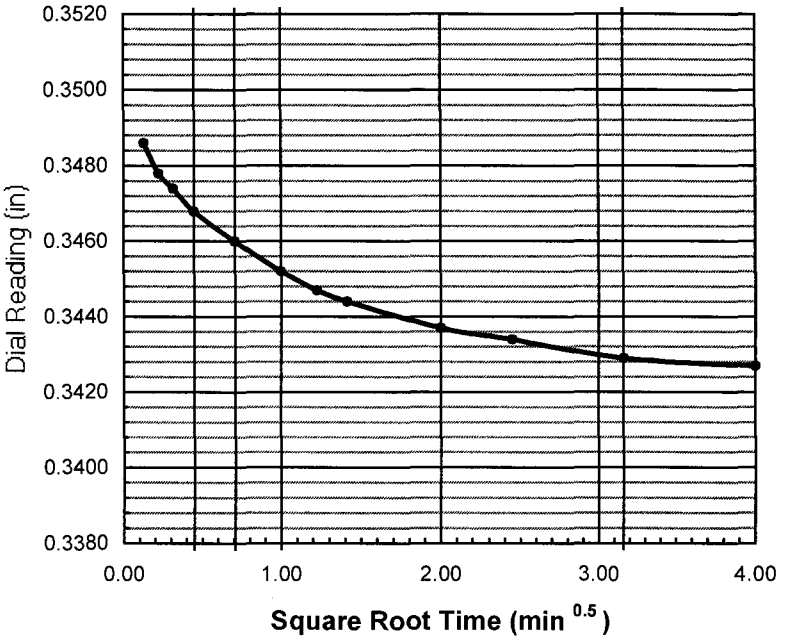
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 4 | Curves by: TJO

Boring No.: R-11-001 | Sample No.: 7 | Depth (ft.) 25.0

Date: 11-Feb-11 | Load (psf): 2747 | Zero Reading: 0.3662

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:26:42	0	0.00	0.3521
	0.02	0.13	0.3486
	0.05	0.22	0.3478
	0.10	0.32	0.3474
	0.20	0.45	0.3468
	0.50	0.71	0.3460
	1.00	1.00	0.3452
	1.50	1.22	0.3447
	2.00	1.41	0.3444
	4.0	2.00	0.3437
	6.0	2.45	0.3434
	10.0	3.16	0.3429
	16.0	4.00	0.3427
	30		0.3423
	60		0.3419
	120		0.3417
	240		0.3410
	480		0.3406
	960		0.3402
	1520		0.3400



do = 0.3495

d90 = _____ t90 = _____ min

d100 = 0.3412

df = 0.3400

square root

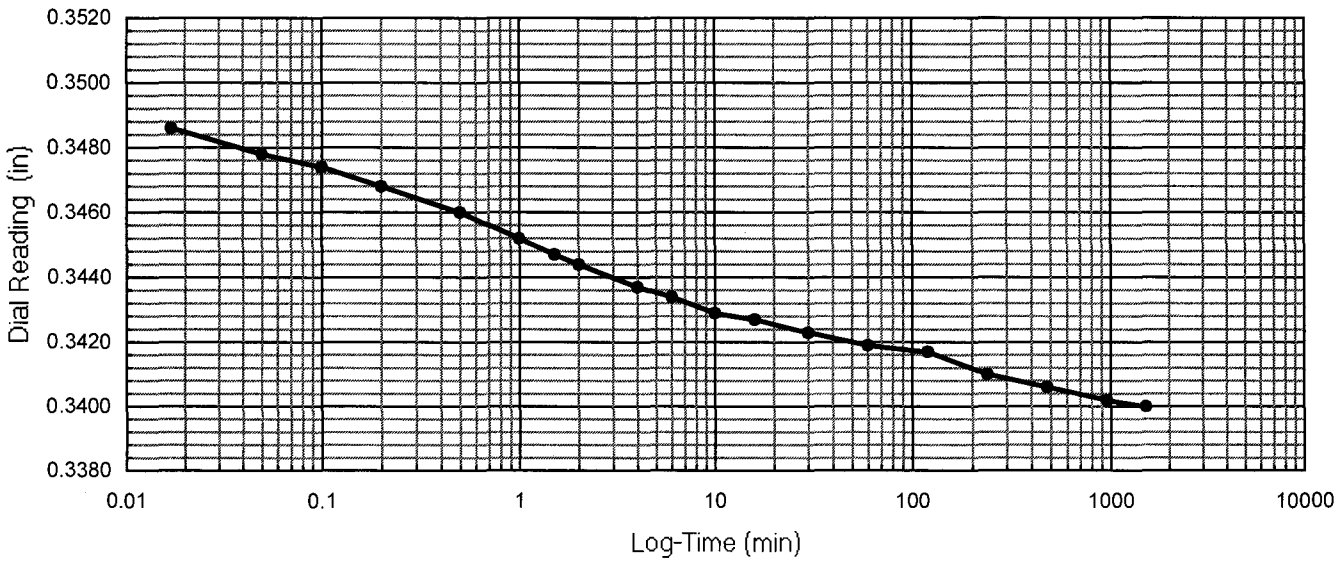
d50 = _____

t50 = _____ min

log time

d50 = 0.3454

t50 = 1.0 min



One-Dimensional Oedometer Testing Increment

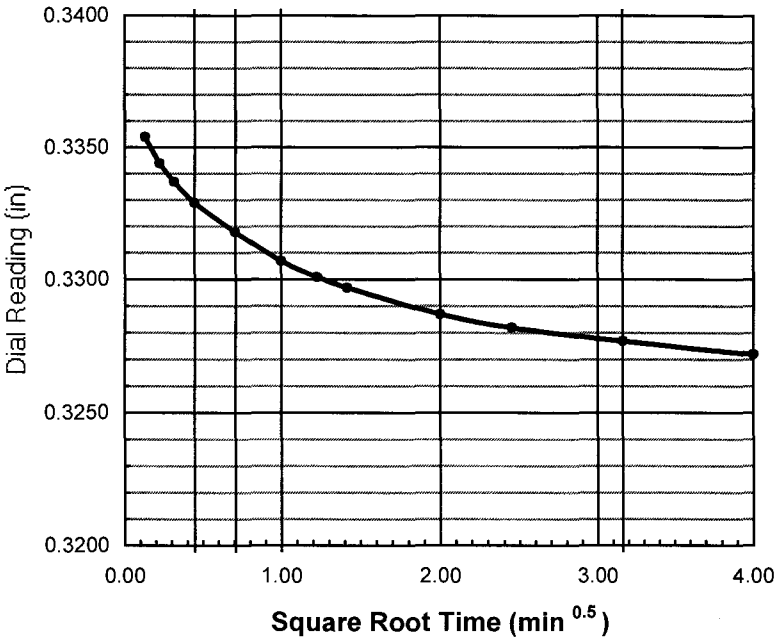
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 5 | Curves by: TJO

Boring No.: R-11-001 | Sample No.: 7 | Depth (ft.) 25.0

Date: 12-Feb-11 | Load (psf): 5517 | Zero Reading: 0.3662

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:47:34	0	0.00	0.3400
	0.02	0.13	0.3354
	0.05	0.22	0.3344
	0.10	0.32	0.3337
	0.20	0.45	0.3329
	0.50	0.71	0.3318
	1.00	1.00	0.3307
	1.50	1.22	0.3301
	2.00	1.41	0.3297
	4.0	2.00	0.3287
	6.0	2.45	0.3282
	10.0	3.16	0.3277
	16.0	4.00	0.3272
	30		0.3266
	60		0.3261
	120		0.3255
	240		0.3249
	480		0.3243
	960		0.3238
	1440		0.3235
	2792		0.3230



do = 0.3367

d90 = _____ t90 = _____ min

d100 = 0.3250

df = 0.3230

square root

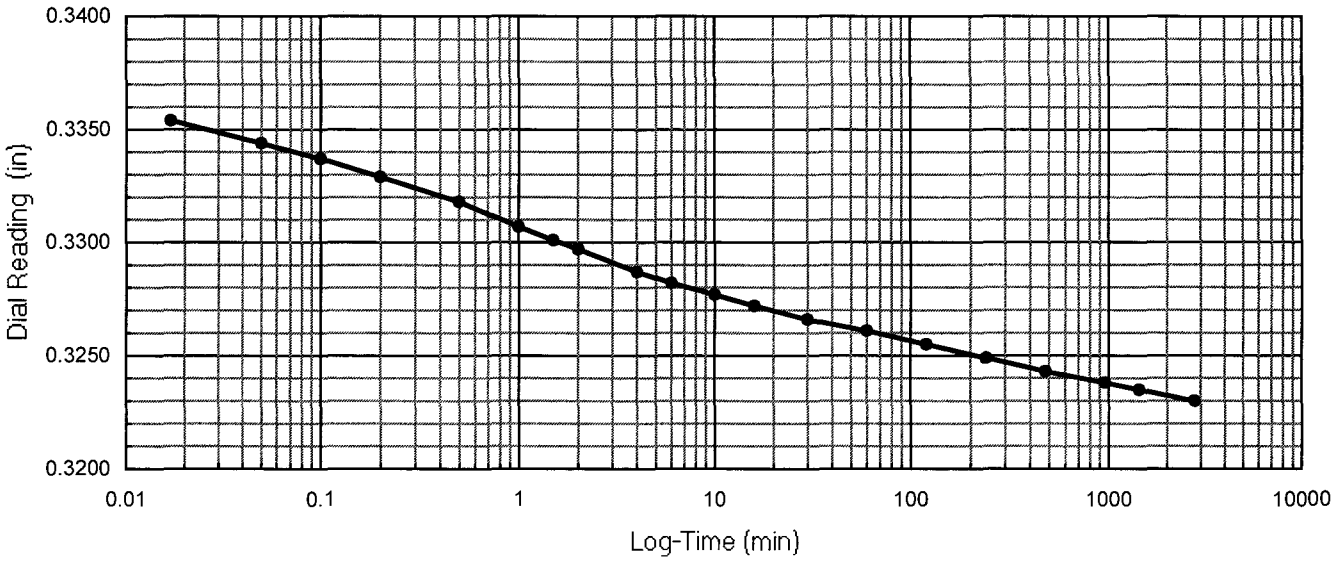
d50 = _____

t50 = _____ min

log time

d50 = 0.3308

t50 = 1.0 min



One-Dimensional Oedometer Testing Increment

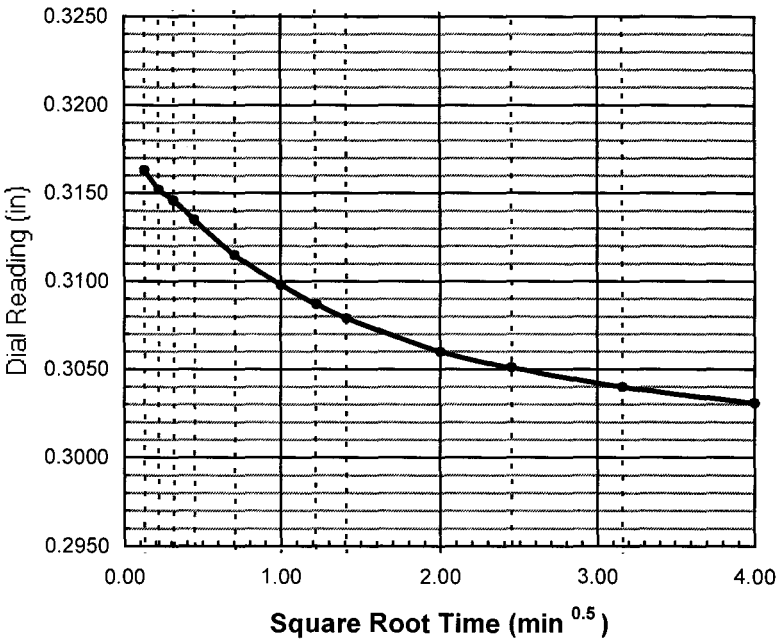
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 6 | Curves by: TJO

Boring No.: R-11-001 | Sample No.: 7 | Depth (ft.) 25.0

Date: 14-Feb-11 | Load (psf): 11057 | Zero Reading: 0.3662

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:19:49	0	0.00	0.3230
	0.02	0.13	0.3163
	0.05	0.22	0.3152
	0.10	0.32	0.3146
	0.20	0.45	0.3135
	0.50	0.71	0.3115
	1.00	1.00	0.3098
	1.50	1.22	0.3087
	2.00	1.41	0.3079
	4.0	2.00	0.3060
	6.0	2.45	0.3051
	10.0	3.16	0.3040
	16.0	4.00	0.3031
	30		0.3020
	60		0.3009
	120		0.2999
	240		0.2989
	480		0.2980
	960		0.2972
	1402		0.2967



do = 0.3177

d90 = _____ t90 = _____ min

d100 = 0.3010

df = 0.2967

square root

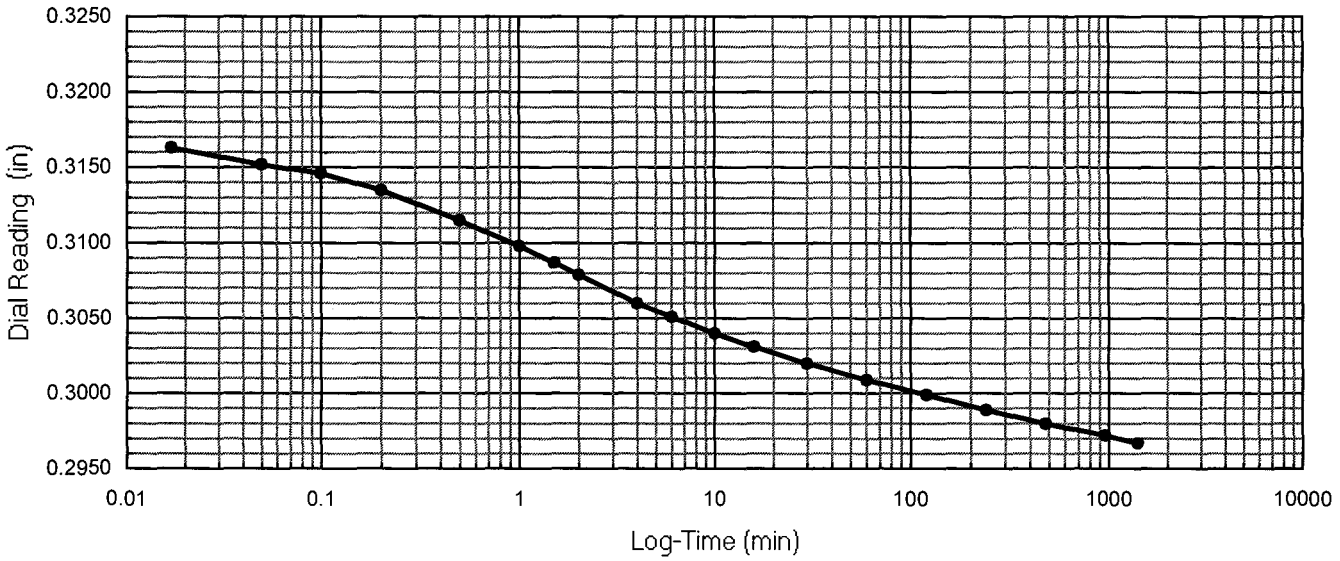
d50 = _____

t50 = _____ min

log time

d50 = 0.3094

t50 = 1.5 min



One-Dimensional Oedometer Testing Increment

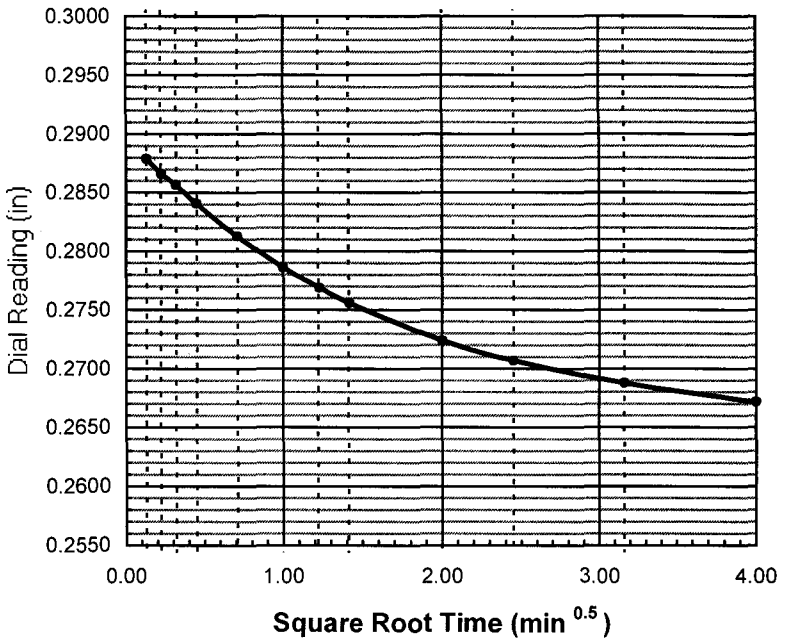
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 7 | Curves by: TJO

Boring No.: R-11-001 | Sample No.: 7 | Depth (ft.) 25.0

Date: 15-Feb-11 | Load (psf): 22137 | Zero Reading: 0.3662

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:42:40	0	0.00	0.2967
	0.02	0.13	0.2879
	0.05	0.22	0.2866
	0.10	0.32	0.2857
	0.20	0.45	0.2841
	0.50	0.71	0.2813
	1.00	1.00	0.2786
	1.50	1.22	0.2769
	2.00	1.41	0.2756
	4.0	2.00	0.2724
	6.0	2.45	0.2707
	10.0	3.16	0.2688
	16.0	4.00	0.2672
	30		0.2656
	60		0.2641
	120		0.2629
	240		0.2617
	480		0.2607
	960		0.2597
	1395		0.2593



do = 0.2898

d90 = _____ t90 = _____ min

d100 = 0.2640

df = 0.2593

square root

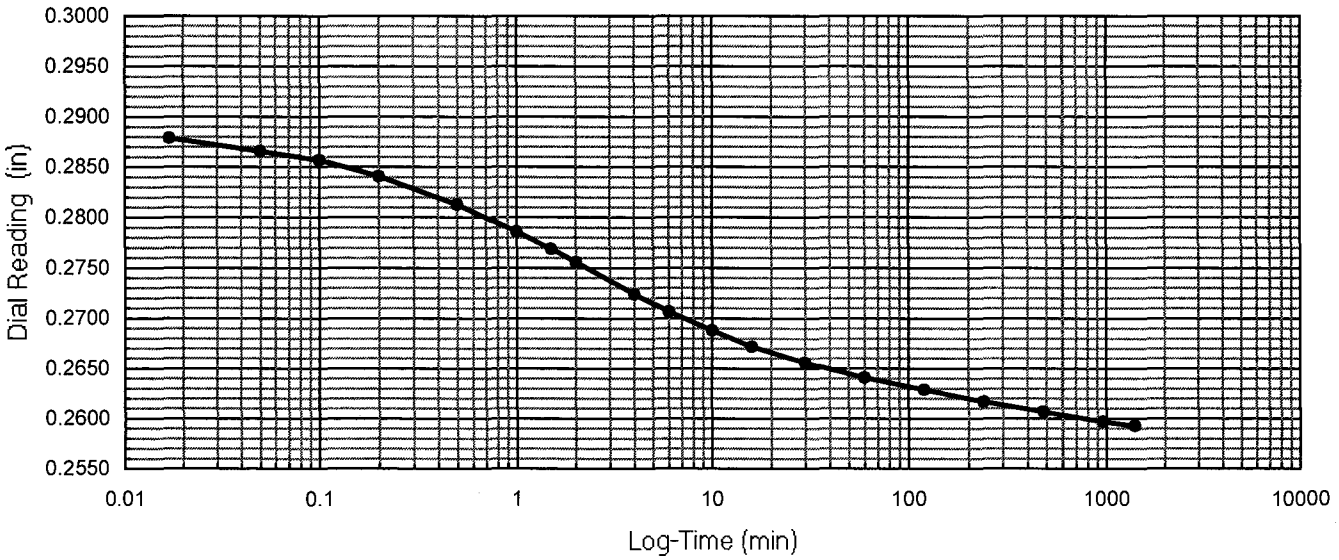
d50 = _____

t50 = _____ min

log time

d50 = 0.2769

t50 = 1.5 min



One-Dimensional Oedometer Testing Increment

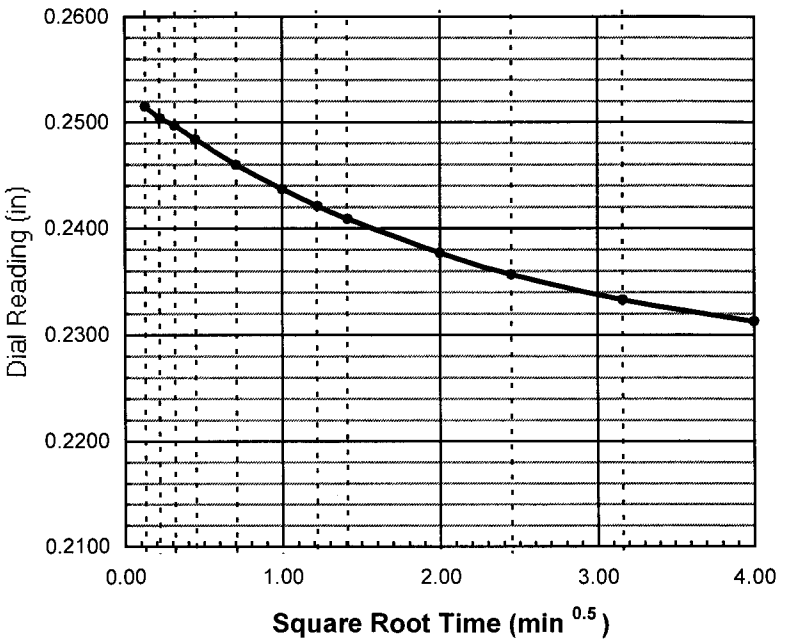
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 8 | Curves by: TJO

Boring No.: R-11-001 | Sample No.: 7 | Depth (ft.) 25.0

Date: 16-Feb-11 | Load (psf): 44296 | Zero Reading: 0.3662

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
7:59:00	0	0.00	0.2592
	0.02	0.13	0.2515
	0.05	0.22	0.2504
	0.10	0.32	0.2497
	0.20	0.45	0.2484
	0.50	0.71	0.2460
	1.00	1.00	0.2437
	1.50	1.22	0.2421
	2.00	1.41	0.2409
	4.0	2.00	0.2377
	6.0	2.45	0.2357
	10.0	3.16	0.2333
	16.0	4.00	0.2313
	30		0.2290
	60		0.2271
	120		0.2256
	240		0.2244
	480		0.2234
	960		0.2226
	15010		0.2221



do = 0.2531

d90 = _____ t90 = _____ min

d100 = 0.2250

df = 0.2221

square root

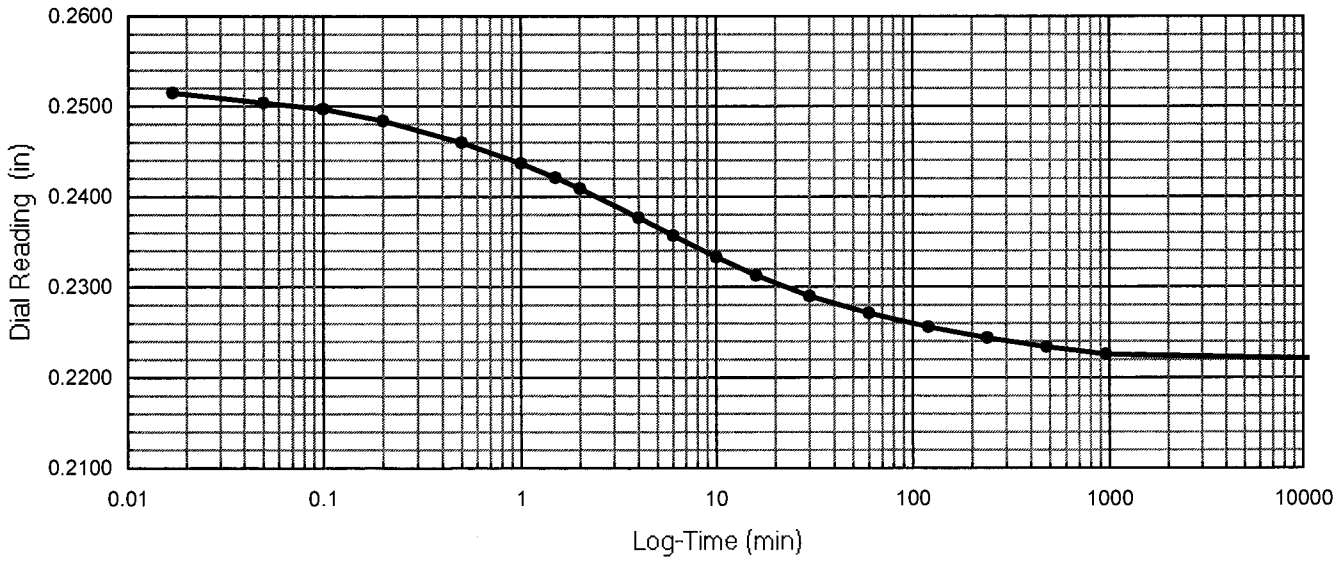
d50 = _____

t50 = _____ min

log time

d50 = 0.2390

t50 = 2.5 min



One-Dimensional Oedometer Testing Increment

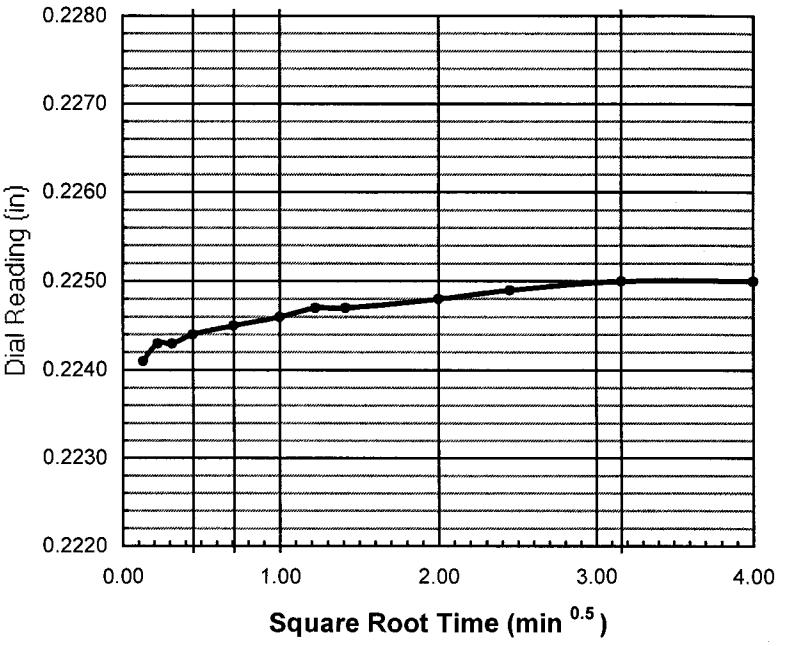
for ASTM D2435, method B

Project Number: 30989830 Apparatus No.: C8 Stage Number: 9 Curves by: TJO

Boring No.: R-11-001 Sample No.: 7 Depth (ft.) 25.0

Date: 17-Feb-11 Load (psf): 22137 Zero Reading: 0.3662

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:10:00	0	0.00	0.2221
	0.02	0.13	0.2241
	0.05	0.22	0.2243
	0.10	0.32	0.2243
	0.20	0.45	0.2244
	0.50	0.71	0.2245
	1.00	1.00	0.2246
	1.50	1.22	0.2247
	2.00	1.41	0.2247
	4.0	2.00	0.2248
	6.0	2.45	0.2249
	10.0	3.16	0.2250
	16.0	4.00	0.2250
	30		0.2251
	60		0.2252
	120		0.2252
	240		0.2253
	566		0.2254



do = 0.2240

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2254

square root

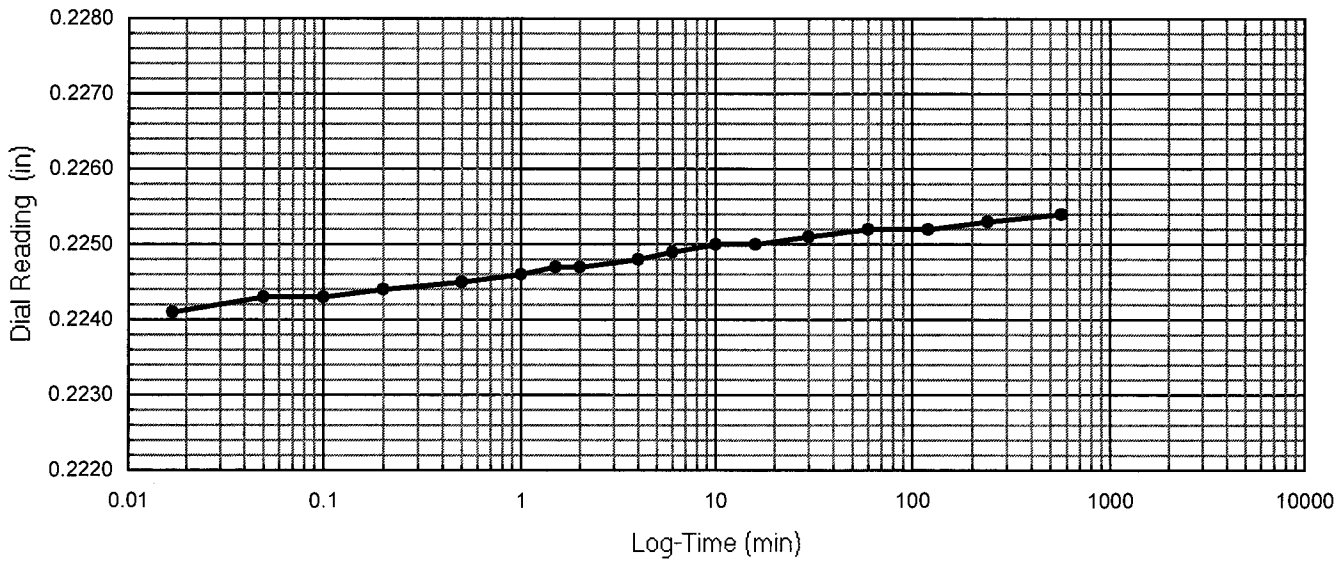
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

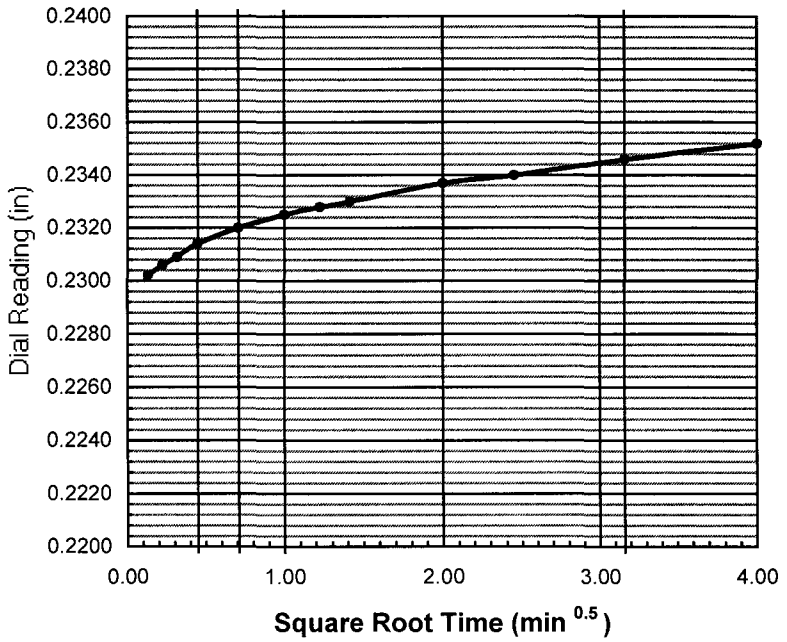
for ASTM D2435, method B

Project Number: 30989830 Apparatus No.: C8 Stage Number: 10 Curves by: TJO

Boring No.: R-11-001 Sample No.: 7 Depth (ft.) 25.0

Date: 17-Feb-11 Load (psf): 5517 Zero Reading: 0.3662

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
18:36:54	0	0.00	0.2254
	0.02	0.13	0.2302
	0.05	0.22	0.2306
	0.10	0.32	0.2309
	0.20	0.45	0.2314
	0.50	0.71	0.2320
	1.00	1.00	0.2325
	1.50	1.22	0.2328
	2.00	1.41	0.2330
	4.0	2.00	0.2337
	6.0	2.45	0.2340
	10.0	3.16	0.2346
	16.0	4.00	0.2352
	30		0.2359
	60		0.2366
	120		0.2372
	240		0.2376
	480		0.2378
	841		0.2380



do = 0.2296

d90 = t90 = min

d100 =

df = 0.2380

square root

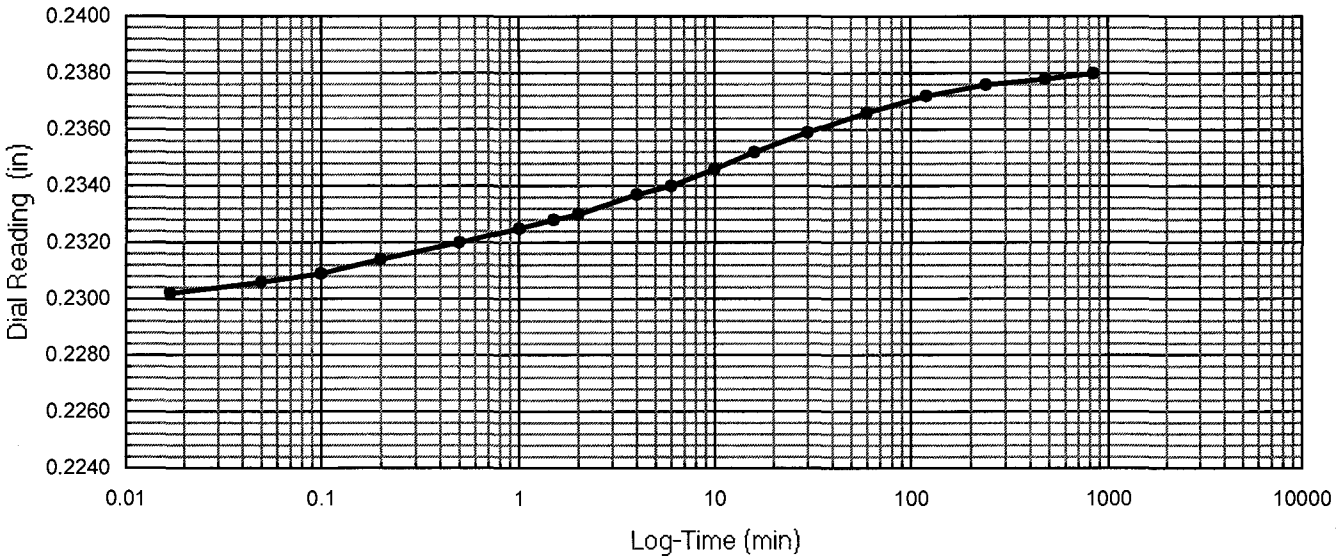
d50 =

t50 = min

log time

d50 =

t50 = min



One-Dimensional Oedometer Testing Increment

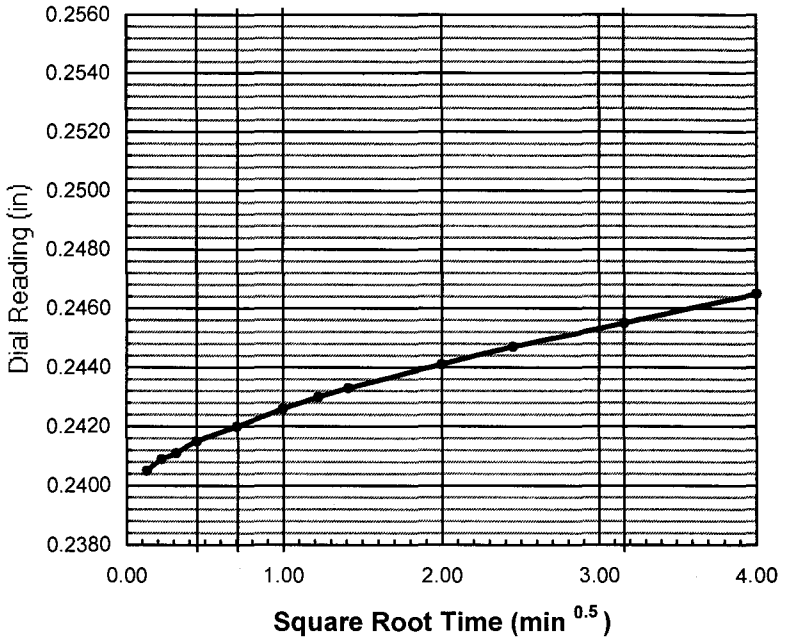
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 11 | Curves by: TJO

Boring No.: R-11-001 | Sample No.: 7 | Depth (ft.) 25.0

Date: 18-Feb-11 | Load (psf): 1362 | Zero Reading: 0.3662

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:39:03	0	0.00	0.2380
	0.02	0.13	0.2405
	0.05	0.22	0.2409
	0.10	0.32	0.2411
	0.20	0.45	0.2415
	0.50	0.71	0.2420
	1.00	1.00	0.2426
	1.50	1.22	0.2430
	2.00	1.41	0.2433
	4.0	2.00	0.2441
	6.0	2.45	0.2447
	10.0	3.16	0.2455
	16.0	4.00	0.2465
	30		0.2480
	60		0.2498
	120		0.2516
	240		0.2531
	480		0.2540
	960		0.2546
	1530		0.2550



do = 0.2400

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2550

square root

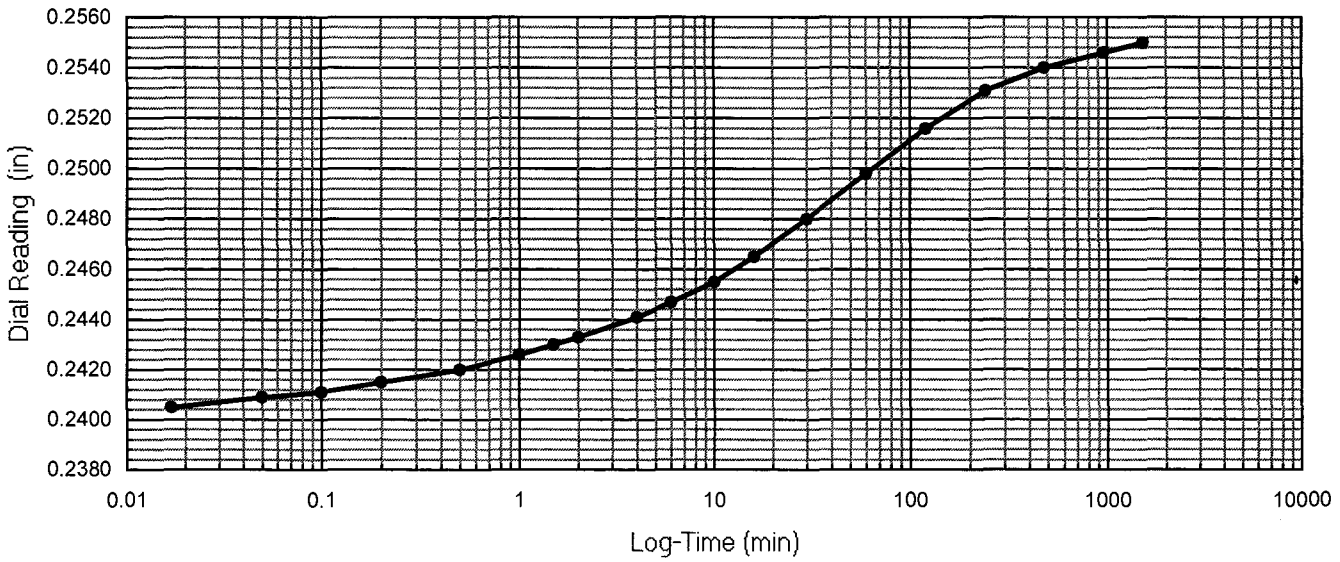
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

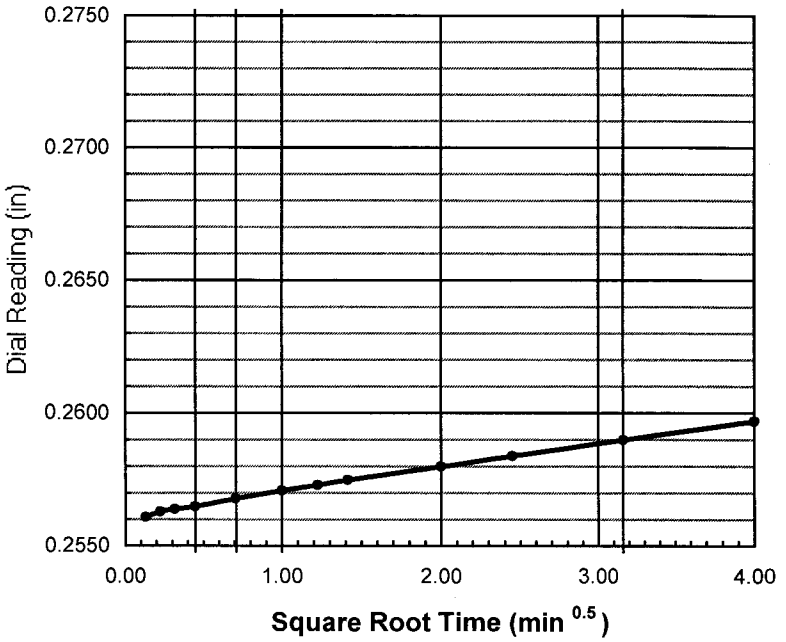
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 12 | Curves by: TJO

Boring No.: R-11-001 | Sample No.: 7 | Depth (ft.) 25.0

Date: 19-Feb-11 | Load (psf): 323 | Zero Reading: 0.3662

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:10:24	0	0.00	0.2550
	0.02	0.13	0.2561
	0.05	0.22	0.2563
	0.10	0.32	0.2564
	0.20	0.45	0.2565
	0.50	0.71	0.2568
	1.00	1.00	0.2571
	1.50	1.22	0.2573
	2.00	1.41	0.2575
	4.0	2.00	0.2580
	6.0	2.45	0.2584
	10.0	3.16	0.2590
	16.0	4.00	0.2597
	30		0.2609
	60		0.2628
	120		0.2649
	240		0.2671
	480		0.2690
	960		0.2703
	2080		0.2715
	6900		0.2732
	8537		0.2735



do = 0.2559

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2735

square root

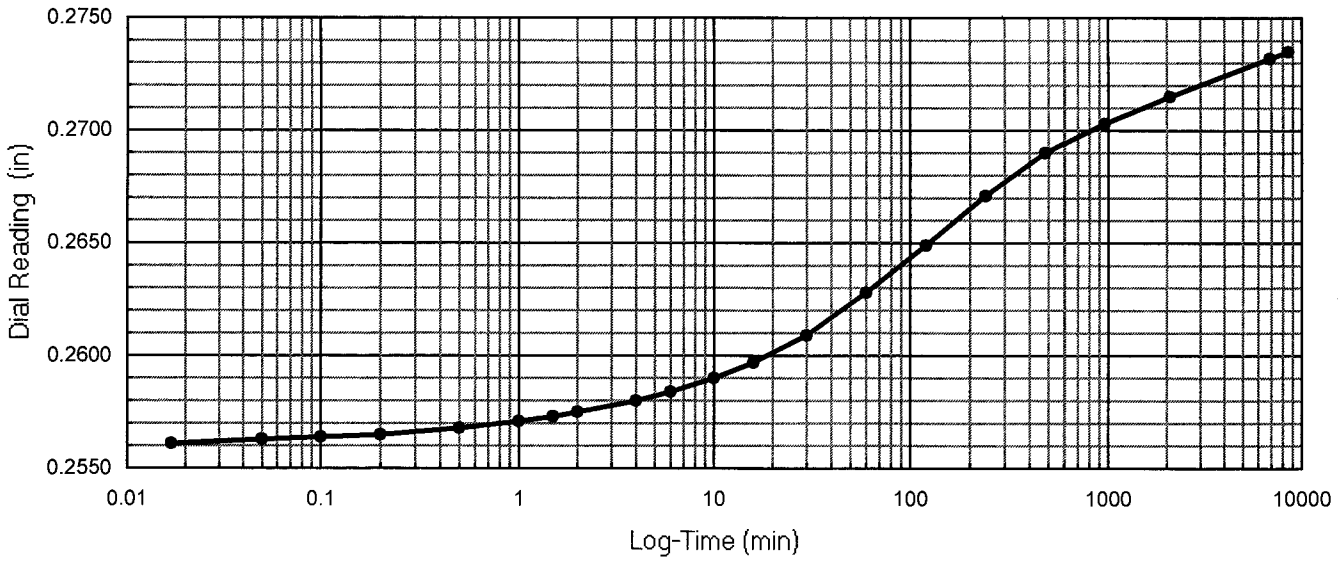
d50 = _____

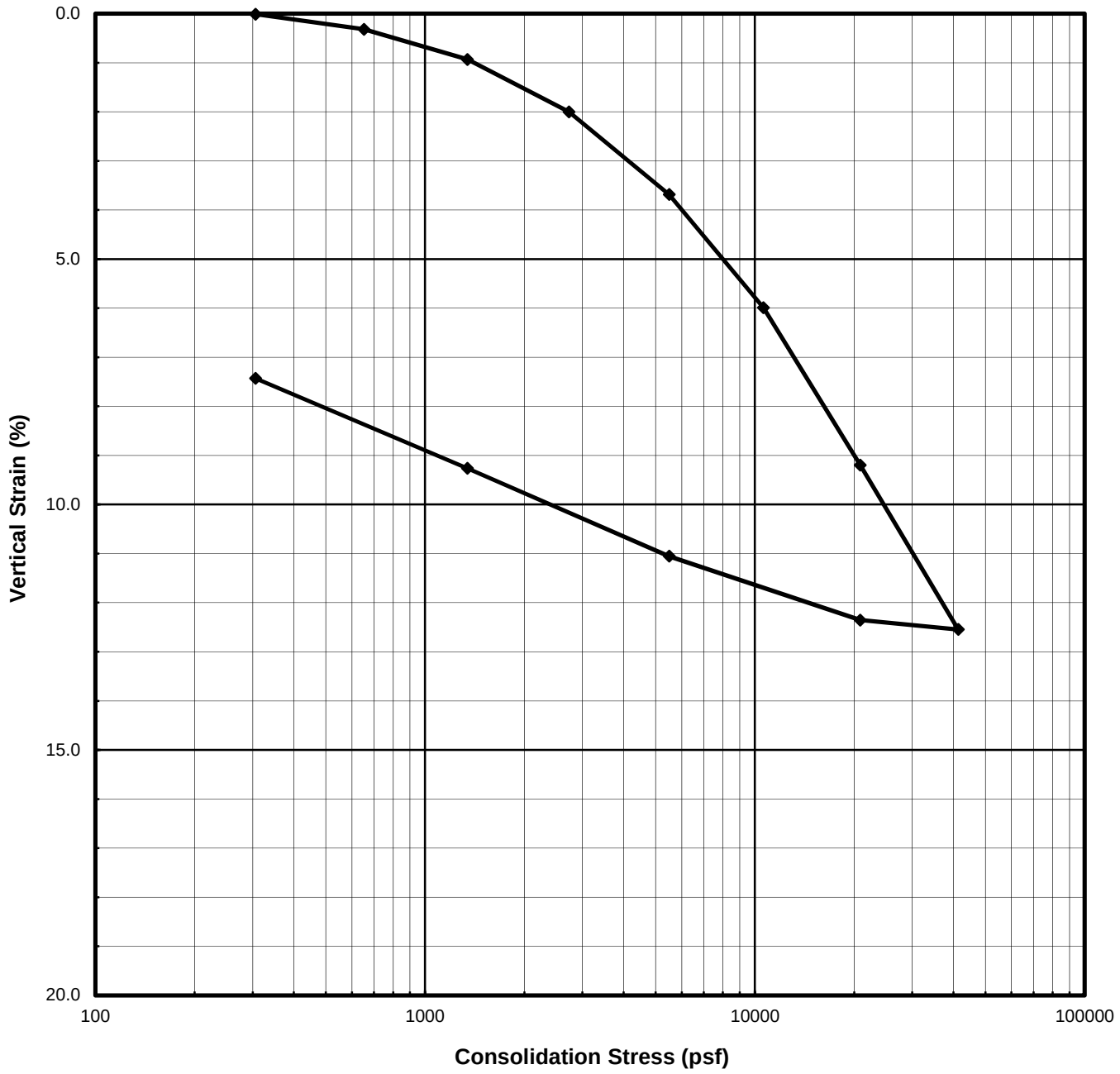
t50 = _____ min

log time

d50 = _____

t50 = _____ min





Description:	**Very dark grayish brown Clay (CL)**							
Boring No.:	R-11-002		Liquid Limit	47	%	Specific Gravity	2.75	assumed
Sample No.:	4		Plasticity Index	30	%	Strain for Saturation	1.75	%
Depth (ft | m)	11.5	3.51	Fines Content	85.9	%	Water added at	46	psf

	Water Content (%)	Total Unit Weight		Dry Unit Weight		Saturation (%)	Void Ratio	Height		Diameter	
		(pcf)	(kN/m^3)	(pcf)	(kN/m^3)			(inches)	(cm)	(inches)	(cm)
Initial	24.4	124.3	19.53	100.0	15.70	93.9	0.71	0.945	2.40	2.416	6.137
Final	22.6	129.3	20.31	105.5	16.57	99.4	0.62	0.895	2.27		

URS

I-5 & SR-74 IC

Project Number: 30989830
Test Start Date: 2/9/2011

CONSOLIDATION TEST
ASTM D2435

SUBMITTED BY: Thomas J. O'Meara

Con I5 SR74 R11002 011.xls

One-Dimensional Oedometer Testing
Set-up / Take down Worksheet
ASTM D2435

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM

Boring No.: R-11-002
Sample No.: 4
Depth (ft): 11.5

Apparatus No.: C12

Specimen Description : Very dark grayish brown Clay (CL)
Duration: end of increment

Ring Number: R20
Weight of Wet Spec. and Ring: 360.49 g
Weight of Ring: 219.15 g
Initial Weight of Wet Spec.: 141.34 g

Take Down Weight with Ring: 358.18 g

Excess Oven-dried Cont. No.: cp10
Weight of Cont. and Dry Spec.: 84.49 g
Weight of Container: 84.28 g
Weight of Excess Dried Soil: 0.21 g
Weight of Excess Wet Soil 0.26 g
Final Weight of Wet Specimen: 139.29 g

Height of Specimen (in)

	Initial	Final
1	0.945	0.898
2	0.944	0.902
3	0.946	0.888
4	0.944	0.890
5	0.944	0.898
Ave:	0.945	0.895

Initial Height - Final Height = 0.049 in
Change in Dial (Dd) = 0.059 in
Initial Height - Dd = 0.886 in
Final Height + Dd = 0.954 in
Weight of Top Cap = 371.41 g

Specimen Analysis					Initial Trim	Initial Spec.	Final
				Container Number:	sf4	**XXXXX**	s19
				Mass of Container and Wet Specimen M1 (g)	344.33	141.34	240.61
				Mass of Container and Dry Specimen, M2 (g)	301.21	113.63	215.18
				Mass of Container, M3 (g)	130.58	**XXXXX**	102.57
				Water Content, w (%)	25.27	24.39	22.58
				Mass of Wet Specimen, M4 (g)	141.34	141.34	139.29
				Mass of Dry Specimen, M5 (g)	113.63	113.63	113.63
Nominal		Measured	x	Specimen Height, H (in)	0.945	0.945	0.895
Nominal	x	Measured		Specimen Diameter, D (in)	2.416	2.416	2.416
				Area of Specimen, A (in^2)	4.584	4.584	4.584
				Volume of Specimen, V (cc)	70.96	70.96	67.25
Assumed	x	Measured		Specific Gravity, Gs	2.75	2.75	2.75
				Wet Unit Weight, WUW (pcf)	**124.3**	**124.3**	**129.3**
				Dry Unit Weight, DUW (pcf)	**99.3**	**100.0**	**105.5**
				Void Ratio	**0.727**	**0.714**	**0.625**
				Degree of Saturation, S (%)	**95.7**	**93.9**	**99.4**

Set-up by: TJO
Date: 2/9/11
Calculated by: TJO
Checked by: TJO
Strain for Saturation (%) = **1.749**

One-Dimensional Oedometer Testing

Loading Worksheet

ASTM D2435

Project Number: 30989830 Boring No.: R-11-002

Project Name: I-5 & SR-74 IC Sample No.: 4

Project Engineer: FM Apparatus No.: C12 Depth (ft): 11.5

Initial Dial Reading: 0.3257 inch Initial Specimen Height: 0.945 inch

Stage No.	Normal Stress (psf)	Dial Reading (in)		Compressibility Correction (in)	Vertical Strain (%)	
		End of Duration	End of Increment		End of Duration	End of Increment
Seat	46		0.3255	0.0000		0.02
1	133	0.3252	0.3254	0.0005	0.00	-0.02
2	306	0.3240	0.3240	0.0016	0.01	0.01
3	652	0.3196	0.3196	0.0031	0.32	0.32
4	1345	0.3121	0.3121	0.0048	0.93	0.93
5	2730	0.3005	0.3001	0.0067	1.96	2.00
6	5500	0.2830	0.2819	0.0090	3.57	3.68
7	10624	0.2595	0.2570	0.0121	5.73	5.99
8	20873	0.2260	0.2229	0.0159	8.87	9.20
9	41371	0.1900	0.1872	0.0200	12.25	12.54
10	20873		0.1913	0.0177		12.35
11	5500		0.2096	0.0117		11.05
12	1345		0.2295	0.0087		9.26
13	306		0.2490	0.0065		7.43
14	46		0.2667	0.0053		5.68
15						
16						
17						
18						
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Final dial reading prior to take down (inch): 0.2667 Take down by: TJO Date: 3/2/11

One-Dimensional Oedometer Testing
ASTM D2435
Table of Incremental Values

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM
Apparatus No.: C12

Boring No.: R-11-002
Sample No.: 4
Depth (ft): 11.5
Inundation at stage: Seat

5 **10** Hanger Ratios

Stage Number	Incremental Weight Applied (kg) Back	Front	Vertical Stress (psf)	Specimen Hieght (in)	Deflections (in) $d_{initial}$	d_o	d_{50}	d_{100}	d_{final}	Porous Stone (in)	t_{50} (min)	cv (in^2/min)	cv (ft^2/day)
Top Cap			26	0.945	0.3257	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
Seat	0.06		46	0.944	0.3257	XXXXX	XXXXX	XXXXX	0.3255	0.0000	XXXXX	XXXXX	XXXXX
1	0.25		133	0.945	0.3255	0.3254	0.3253	0.3252	0.3254	0.0005	XXXXX	XXXXX	XXXXX
2	0.50		306	0.945	0.3254	0.3247	0.3244	0.3240	0.3240	0.0016	XXXXX	XXXXX	XXXXX
3	1.00		652	0.944	0.3240	0.3228	0.3212	0.3196	0.3196	0.0031	6.00	0.007	0.073
4		1.0	1345	0.941	0.3196	0.3179	0.3150	0.3121	0.3121	0.0048	6.00	0.007	0.073
5	4.0		2730	0.936	0.3121	0.3096	0.3051	0.3005	0.3001	0.0067	6.00	0.007	0.072
6		4.0	5500	0.927	0.3001	0.2976	0.2903	0.2830	0.2819	0.0090	6.00	0.007	0.070
7		7.4	10624	0.914	0.2819	0.2787	0.2691	0.2595	0.2570	0.0121	6.00	0.007	0.069
8		14.8	20873	0.896	0.2570	0.2531	0.2396	0.2260	0.2229	0.0159	10.00	0.004	0.039
9		29.6	41371	0.880	0.2229	0.2195	0.2048	0.1900	0.1872	0.0200	20.00	0.002	0.019
10		-29.6	20873	0.902	0.1872	0.1893	XXXXX	XXXXX	0.1913	0.0177	XXXXX	XXXXX	XXXXX
11		-22.2	5500	0.932	0.1913	0.1969	XXXXX	XXXXX	0.2096	0.0117	XXXXX	XXXXX	XXXXX
12	-4.0	-4.0	1345	0.960	0.2096	0.2113	XXXXX	XXXXX	0.2295	0.0087	XXXXX	XXXXX	XXXXX
13	-1.00	-1.00	306	0.986	0.2295	0.2303	XXXXX	XXXXX	0.2490	0.0065	XXXXX	XXXXX	XXXXX
14	-0.750		46	1.009	0.2490	XXXXX	XXXXX	XXXXX	0.2667	0.0053	XXXXX	XXXXX	XXXXX
15			46	XXXXX	0.2667	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
16			46	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
17			46	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
18			46	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
19			46	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
20			46	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
21			46	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
22			46	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
23			46	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
24			46	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
25			46	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX

One-Dimensional Oedometer Testing Increment

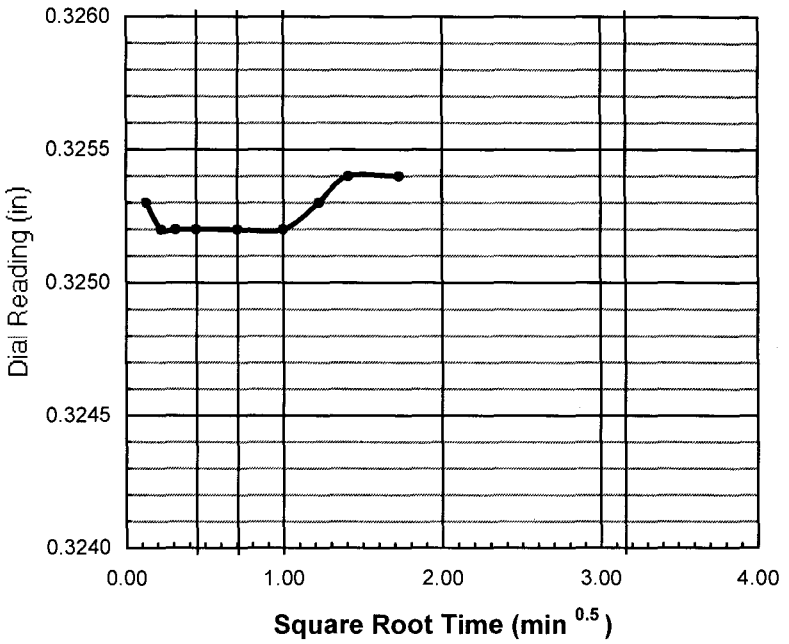
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C12 | Stage Number: 1 | Curves by: TJO

Boring No.: R-11-002 | Sample No.: 4 | Depth (ft.) 11.5

Date: 9-Feb-11 | Load (psf): 133 | Zero Reading: 0.3257

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
11:26:20	0	0.00	0.3255
	0.02	0.13	0.3253
	0.05	0.22	0.3252
	0.10	0.32	0.3252
	0.20	0.45	0.3252
	0.50	0.71	0.3252
	1.00	1.00	0.3252
	1.50	1.22	0.3253
	2.00	1.41	0.3254
swelling	3.0	1.73	0.3254



do = 0.3254

d90 = _____ t90 = _____ min

d100 = _____

df = 0.3254

square root

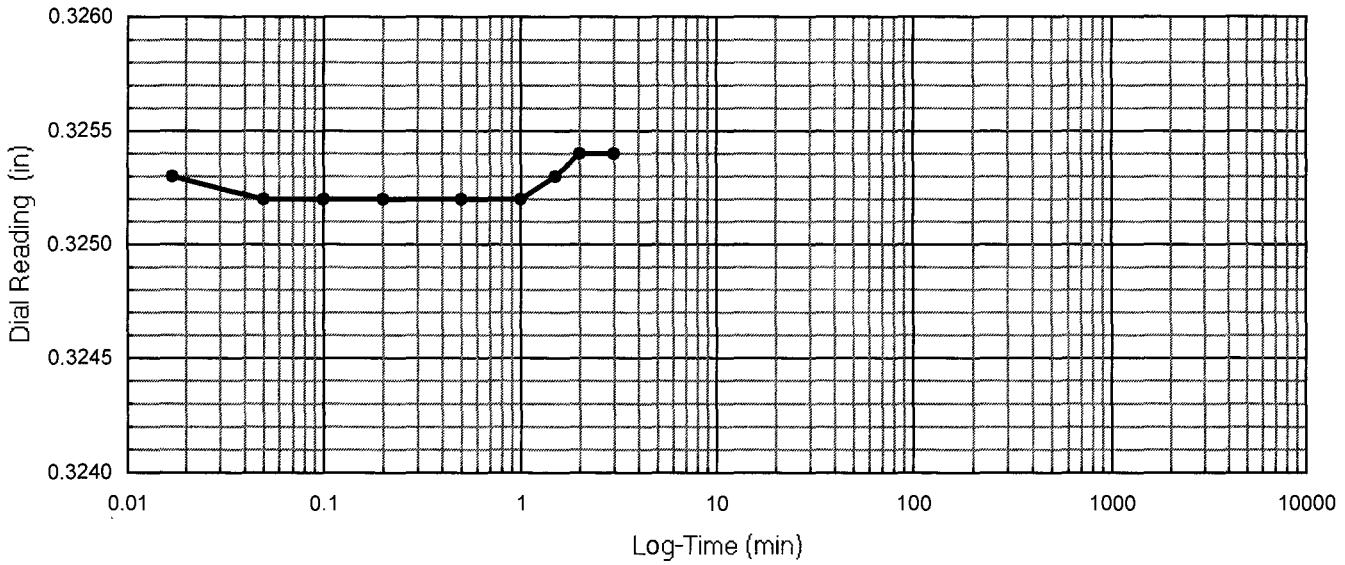
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

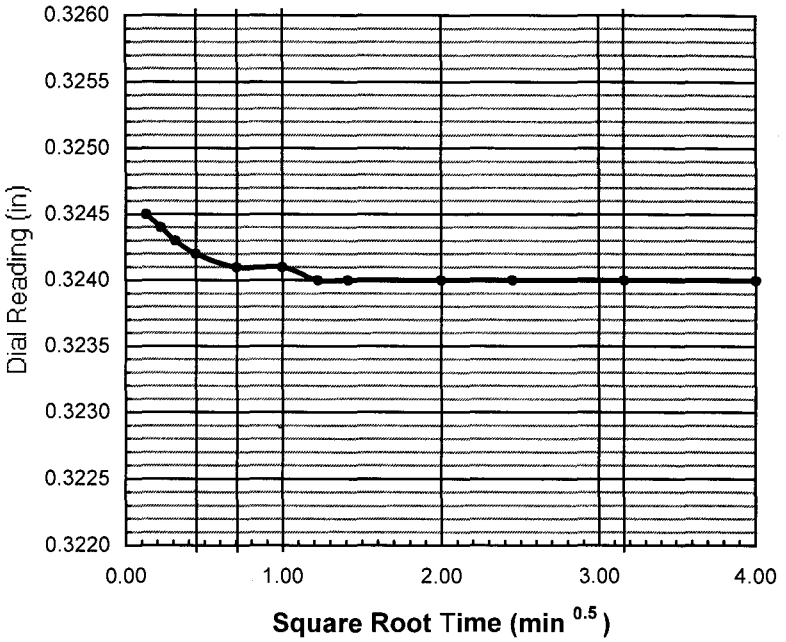
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C12 | Stage Number: 2 | Curves by: TJO

Boring No.: R-11-002 | Sample No.: 4 | Depth (ft.) 11.5

Date: 9-Feb-11 | Load (psf): 306 | Zero Reading: 0.3257

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
11:28:27	0	0.00	0.3254
	0.02	0.13	0.3245
	0.05	0.22	0.3244
	0.10	0.32	0.3243
	0.20	0.45	0.3242
	0.50	0.71	0.3241
	1.00	1.00	0.3241
	1.50	1.22	0.3240
	2.00	1.41	0.3240
	4.0	2.00	0.3240
	6.0	2.45	0.3240
	10.0	3.16	0.3240
	16.0	4.00	0.3240
	30		0.3240



do = 0.3247

d90 = _____ t90 = _____ min

d100 = 0.3240

df = 0.3240

square root

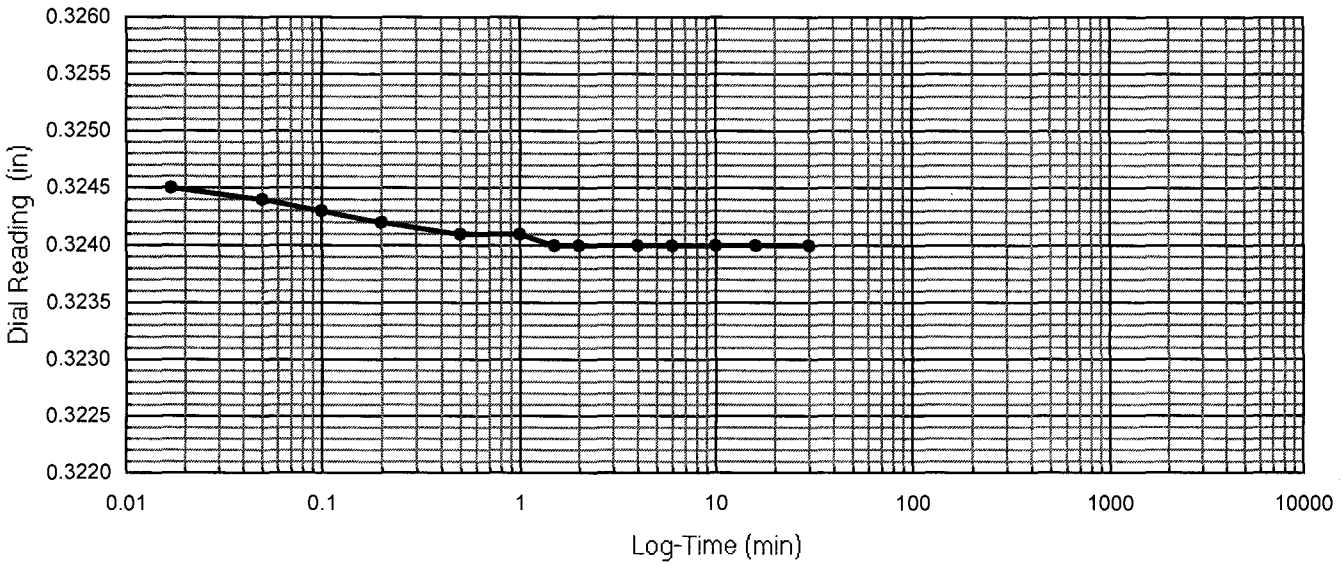
d50 = _____

t50 = _____ min

log time

d50 = 0.3243

t50 = _____ min



One-Dimensional Oedometer Testing Increment

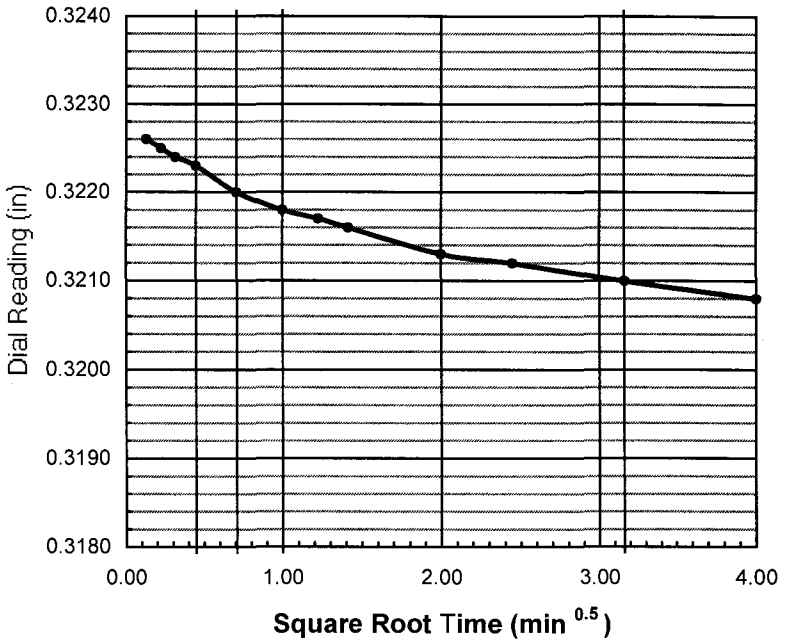
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C12 | Stage Number: 3 | Curves by: TJO

Boring No.: R-11-002 | Sample No.: 4 | Depth (ft.) 11.5

Date: 9-Feb-11 | Load (psf): 652 | Zero Reading: 0.3257

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
12:09:10	0	0.00	0.3240
	0.02	0.13	0.3226
	0.05	0.22	0.3225
	0.10	0.32	0.3224
	0.20	0.45	0.3223
	0.50	0.71	0.3220
	1.00	1.00	0.3218
	1.50	1.22	0.3217
	2.00	1.41	0.3216
	4.0	2.00	0.3213
	6.0	2.45	0.3212
	10.0	3.16	0.3210
	16.0	4.00	0.3208
	30		0.3206
	60		0.3203
	120		0.3201
	240		0.3198
	480		0.3197
	960		0.3196
	1262		0.3196



do = 0.3228

d90 = _____ t90 = _____ min

d100 = 0.3196

df = 0.3196

square root

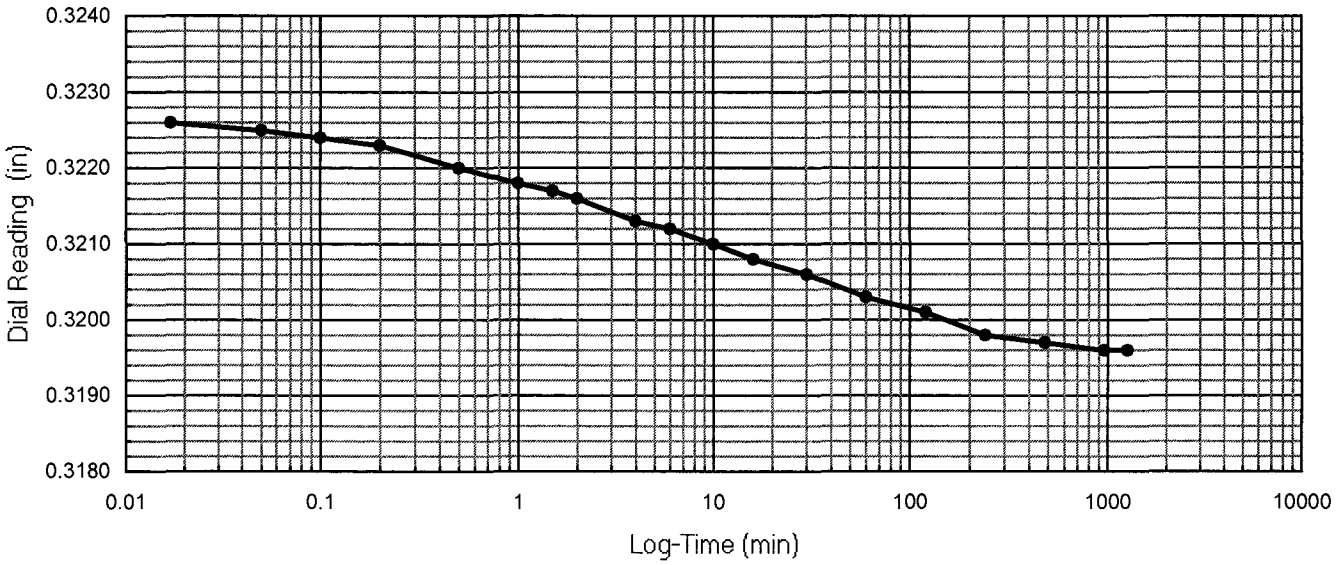
d50 = _____

t50 = _____ min

log time

d50 = 0.3212

t50 = 6.0 min



One-Dimensional Oedometer Testing Increment

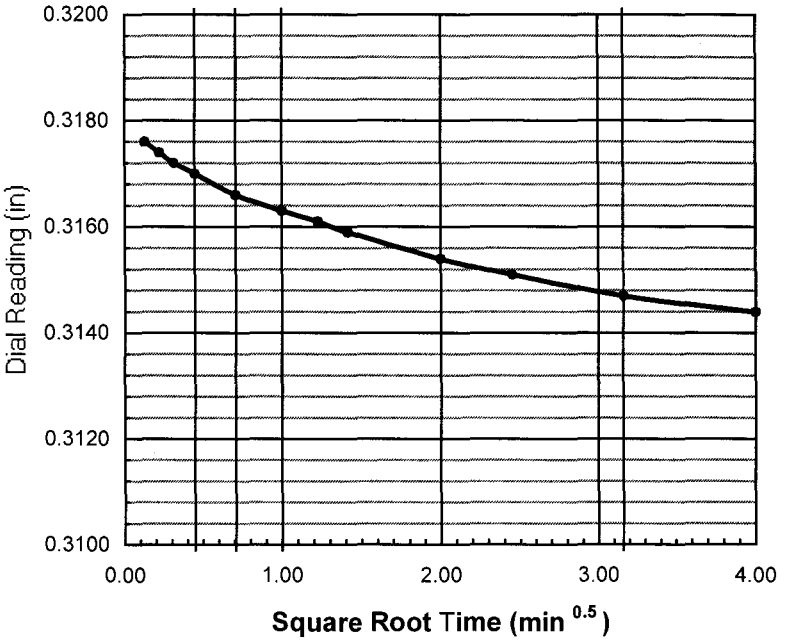
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C12 | Stage Number: 4 | Curves by: TJO

Boring No.: R-11-002 | Sample No.: 4 | Depth (ft.) 11.5

Date: 10-Feb-11 | Load (psf): 1345 | Zero Reading: 0.3257

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:12:28	0	0.00	0.3196
	0.02	0.13	0.3176
	0.05	0.22	0.3174
	0.10	0.32	0.3172
	0.20	0.45	0.3170
	0.50	0.71	0.3166
	1.00	1.00	0.3163
	1.50	1.22	0.3161
	2.00	1.41	0.3159
	4.0	2.00	0.3154
	6.0	2.45	0.3151
	10.0	3.16	0.3147
	16.0	4.00	0.3144
	30		0.3140
	60		0.3136
	120		0.3133
	240		0.3128
	480		0.3123
	960		0.3121
	1456		0.3121



do = 0.3179

d90 = _____ t90 = _____ min

d100 = 0.3121

df = 0.3121

square root

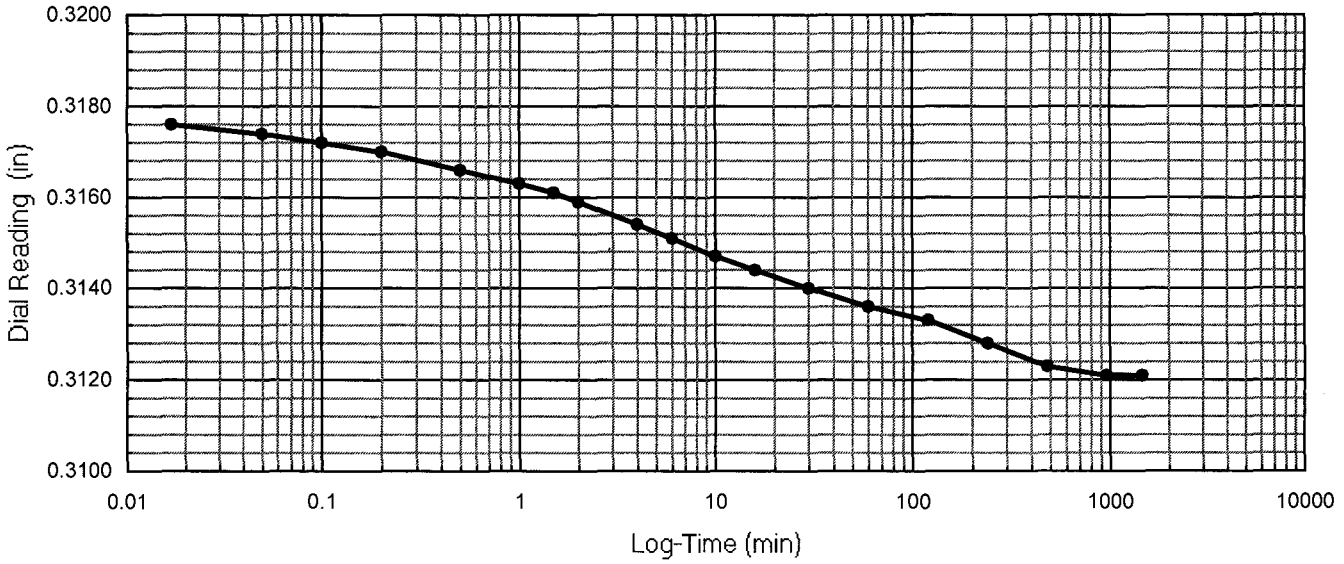
d50 = _____

t50 = _____ min

log time

d50 = 0.3150

t50 = 6.0 min



One-Dimensional Oedometer Testing Increment

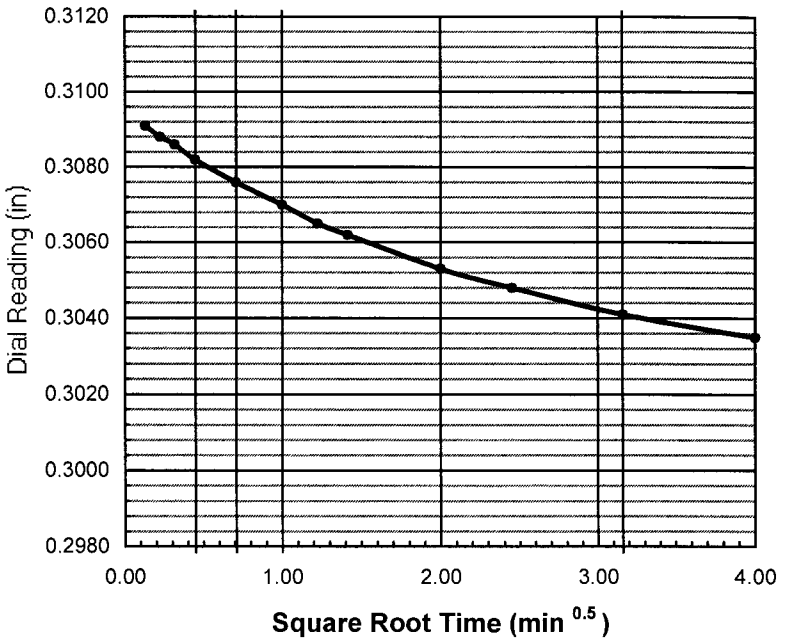
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C12 | Stage Number: 5 | Curves by: TJO

Boring No.: R-11-002 | Sample No.: 4 | Depth (ft.) 11.5

Date: 11-Feb-11 | Load (psf): 2730 | Zero Reading: 0.3257

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:28:51	0	0.00	0.3121
	0.02	0.13	0.3091
	0.05	0.22	0.3088
	0.10	0.32	0.3086
	0.20	0.45	0.3082
	0.50	0.71	0.3076
	1.00	1.00	0.3070
	1.50	1.22	0.3065
	2.00	1.41	0.3062
	4.0	2.00	0.3053
	6.0	2.45	0.3048
	10.0	3.16	0.3041
	16.0	4.00	0.3035
	30		0.3028
	60		0.3022
	120		0.3017
	240		0.3011
	480		0.3005
	960		0.3002
	1520		0.3001



do = 0.3096

d90 = ____ t90 = ____ min

d100 = 0.3005

df = 0.3001

square root

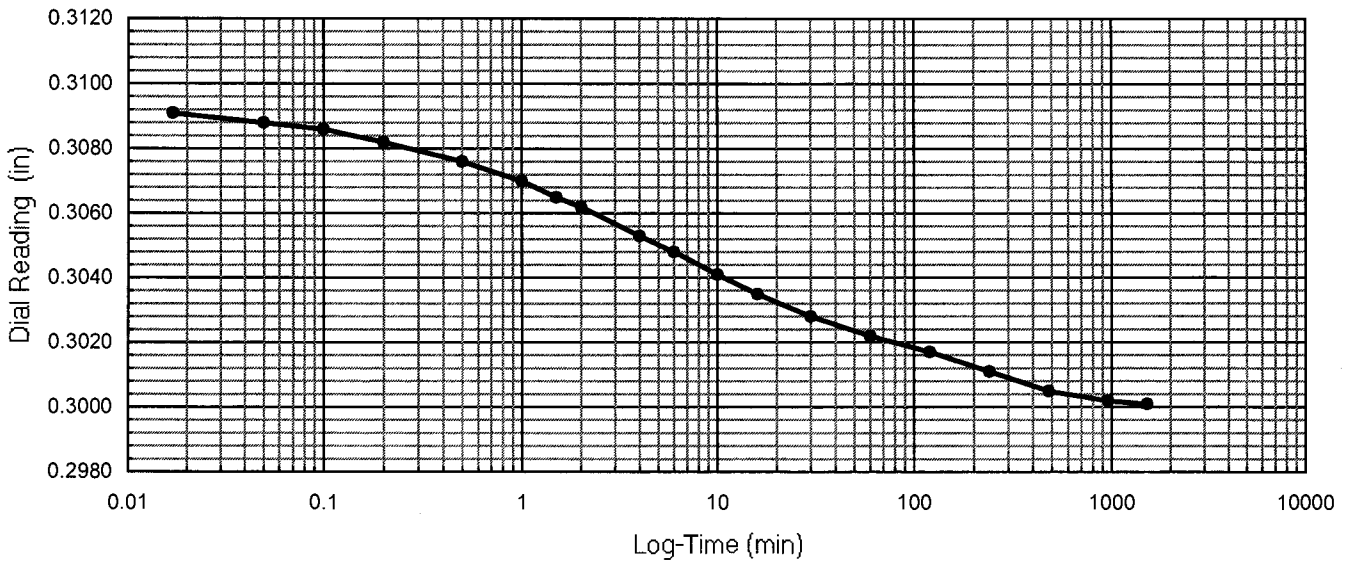
d50 = ____

t50 = ____ min

log time

d50 = 0.3050

t50 = 6.0 min



One-Dimensional Oedometer Testing Increment

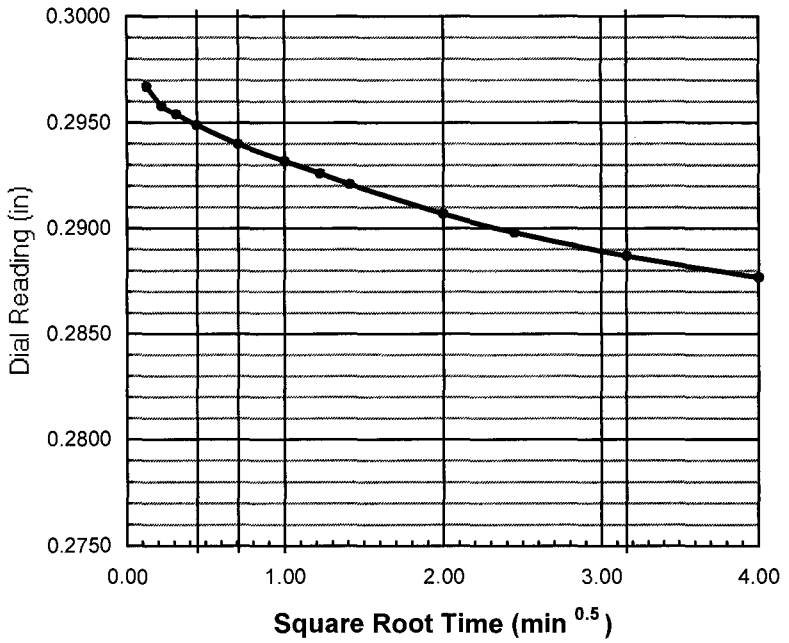
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C12 | Stage Number: 6 | Curves by: TJO

Boring No.: R-11-002 | Sample No.: 4 | Depth (ft.) 11.5

Date: 12-Feb-11 | Load (psf): 5500 | Zero Reading: 0.3257

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:49:41	0	0.00	0.3001
	0.02	0.13	0.2967
	0.05	0.22	0.2958
	0.10	0.32	0.2954
	0.20	0.45	0.2949
	0.50	0.71	0.2940
	1.00	1.00	0.2932
	1.50	1.22	0.2926
	2.00	1.41	0.2921
	4.0	2.00	0.2907
	6.0	2.45	0.2898
	10.0	3.16	0.2887
	16.0	4.00	0.2877
	30		0.2865
	60		0.2854
	120		0.2846
	240		0.2837
	480		0.2830
	960		0.2825
	1440		0.2824
	2792		0.2819



do = 0.2976

d90 = ____ t90 = ____ min

d100 = 0.2830

df = 0.2819

square root

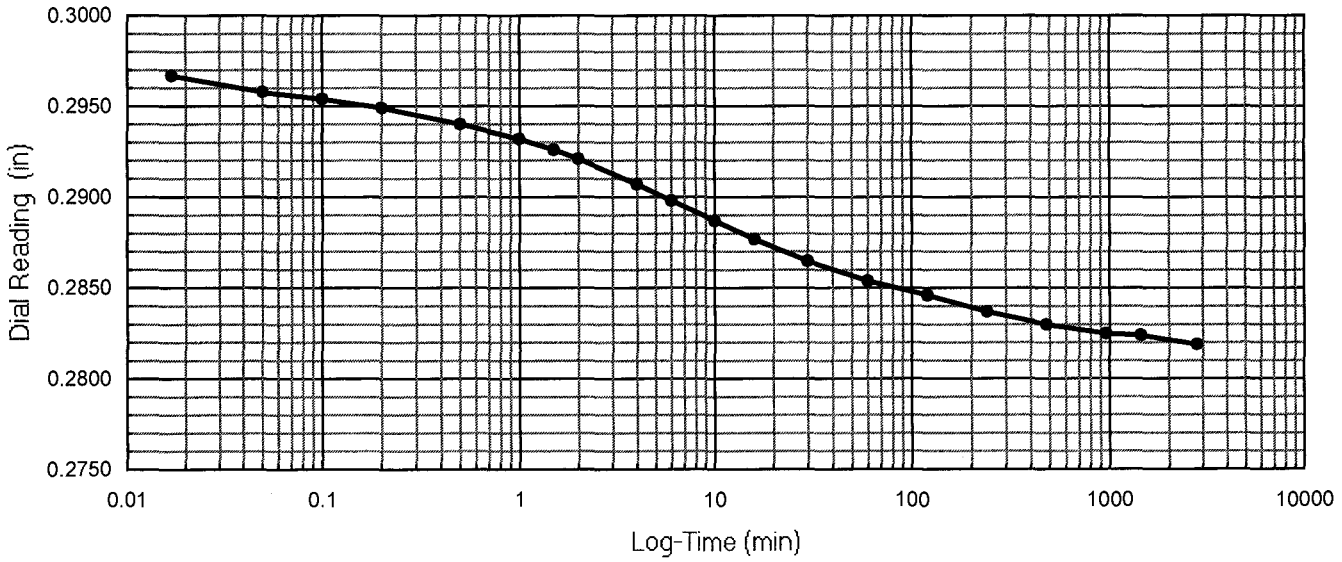
d50 = ____

t50 = ____ min

log time

d50 = 0.2903

t50 = 5.0 min



One-Dimensional Oedometer Testing Increment

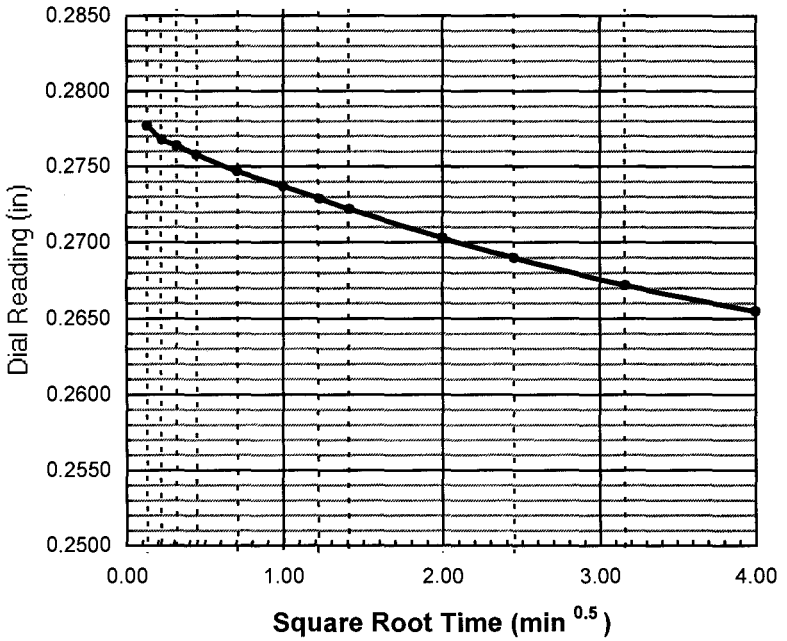
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C12 | Stage Number: 7 | Curves by: TJO

Boring No.: R-11-002 | Sample No.: 4 | Depth (ft.) 11.5

Date: 14-Feb-11 | Load (psf): 10624 | Zero Reading: 0.3257

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:22:07	0	0.00	0.2819
	0.02	0.13	0.2777
	0.05	0.22	0.2768
	0.10	0.32	0.2764
	0.20	0.45	0.2758
	0.50	0.71	0.2747
	1.00	1.00	0.2737
	1.50	1.22	0.2729
	2.00	1.41	0.2722
	4.0	2.00	0.2703
	6.0	2.45	0.2690
	10.0	3.16	0.2672
	16.0	4.00	0.2655
	30		0.2635
	60		0.2617
	120		0.2603
	240		0.2591
	480		0.2581
	960		0.2573
	1402		0.2570



do = 0.2787

d90 = ____ t90 = ____ min

d100 = 0.2595

df = 0.2570

square root

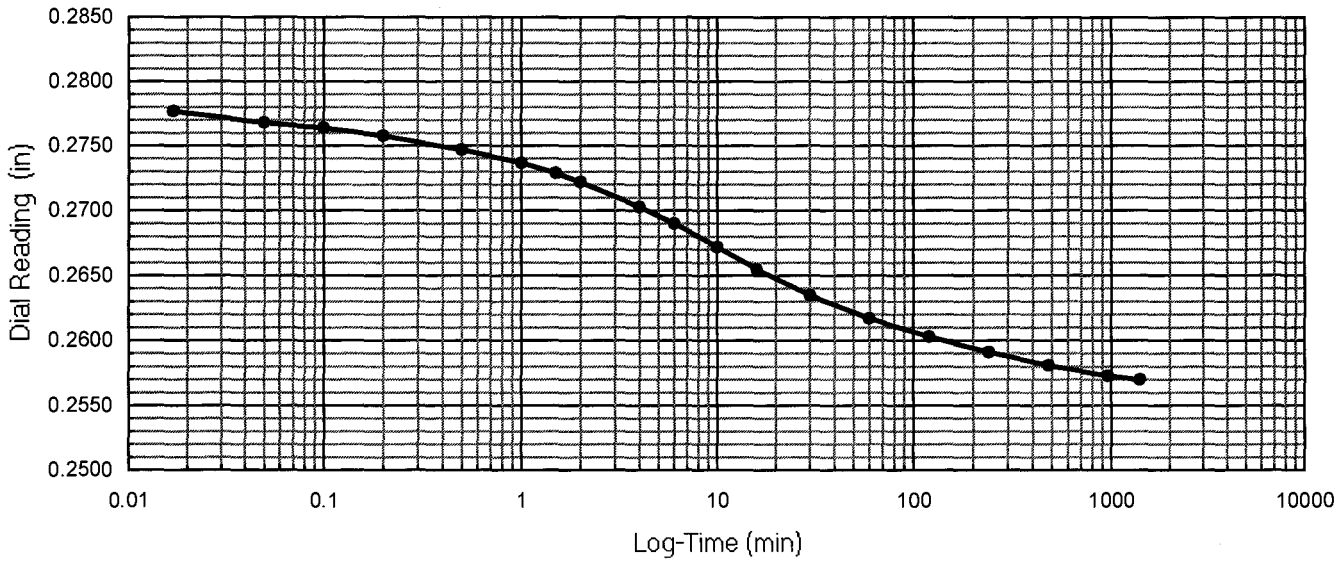
d50 = ____

t50 = ____ min

log time

d50 = 0.2691

t50 = 6.0 min



One-Dimensional Oedometer Testing Increment

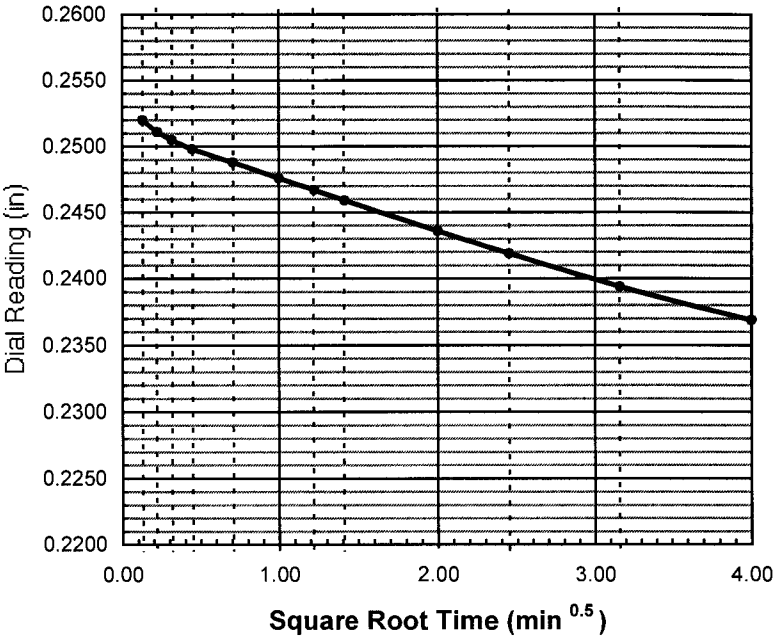
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C12 | Stage Number: 8 | Curves by: TJO

Boring No.: R-11-002 | Sample No.: 4 | Depth (ft.) 11.5

Date: 15-Feb-11 | Load (psf): 20873 | Zero Reading: 0.3257

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:44:53	0	0.00	0.2570
	0.02	0.13	0.2520
	0.05	0.22	0.2511
	0.10	0.32	0.2505
	0.20	0.45	0.2498
	0.50	0.71	0.2488
	1.00	1.00	0.2476
	1.50	1.22	0.2467
	2.00	1.41	0.2459
	4.0	2.00	0.2436
	6.0	2.45	0.2419
	10.0	3.16	0.2394
	16.0	4.00	0.2369
	30		0.2334
	60		0.2301
	120		0.2276
	240		0.2258
	480		0.2244
	960		0.2234
	1395		0.2229



do = 0.2531

d90 = ____ t90 = ____ min

d100 = 0.2260

df = 0.2229

square root

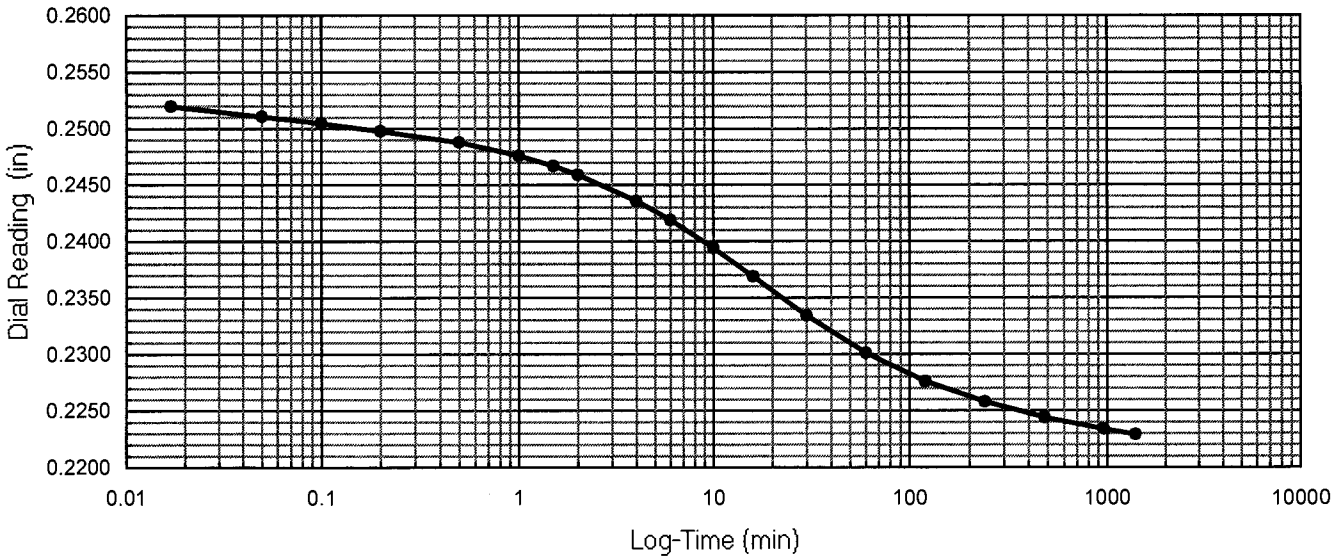
d50 = ____

t50 = ____ min

log time

d50 = 0.2396

t50 = 10.0 min



One-Dimensional Oedometer Testing Increment

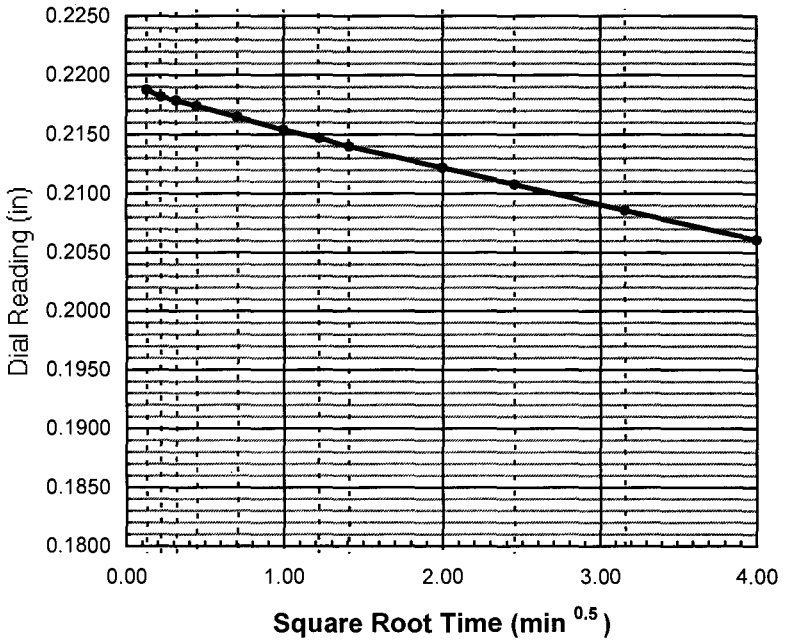
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C12 | Stage Number: 9 | Curves by: TJO

Boring No.: R-11-002 | Sample No.: 4 | Depth (ft.) 11.5

Date: 16-Feb-11 | Load (psf): 41371 | Zero Reading: 0.3257

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:01:09	0	0.00	0.2229
	0.02	0.13	0.2188
	0.05	0.22	0.2182
	0.10	0.32	0.2179
	0.20	0.45	0.2174
	0.50	0.71	0.2165
	1.00	1.00	0.2154
	1.50	1.22	0.2147
	2.00	1.41	0.2140
	4.0	2.00	0.2122
	6.0	2.45	0.2108
	10.0	3.16	0.2086
	16.0	4.00	0.2061
	30		0.2021
	60		0.1974
	120		0.1933
	240		0.1904
	480		0.1886
	960		0.1875
	1510		0.1872



do = 0.2195

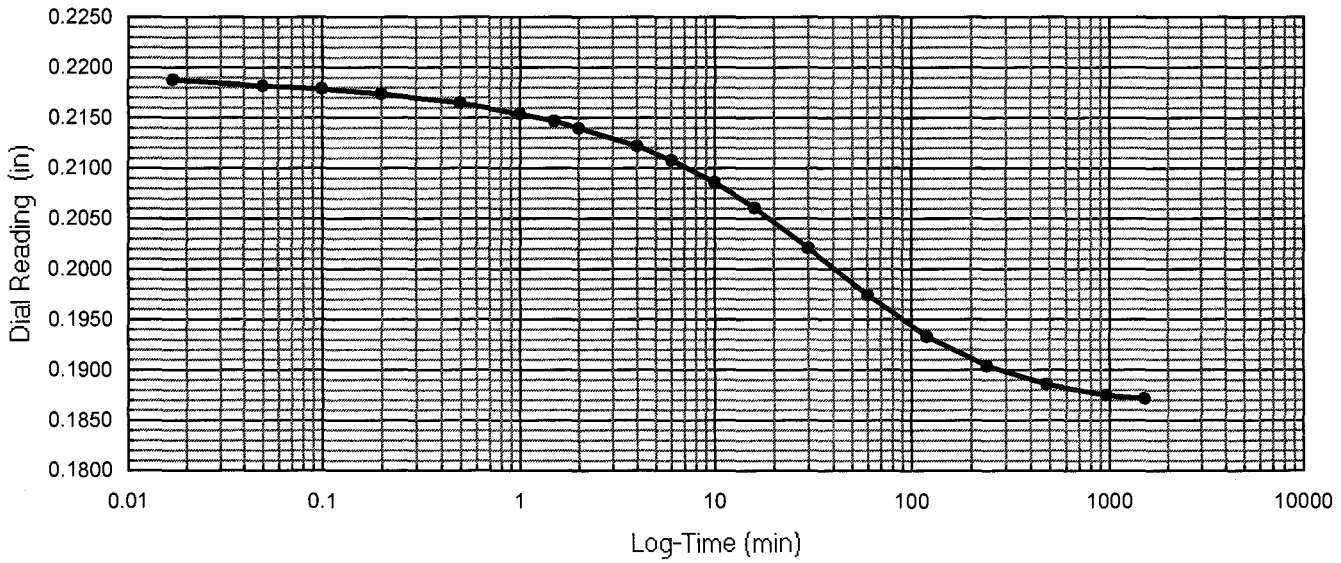
d90 = ____ t90 = ____ min

d100 = 0.1900

df = 0.1872

square root: d50 = ____ t50 = ____ min

log time: d50 = 0.2048 t50 = 20.0 min



One-Dimensional Oedometer Testing Increment

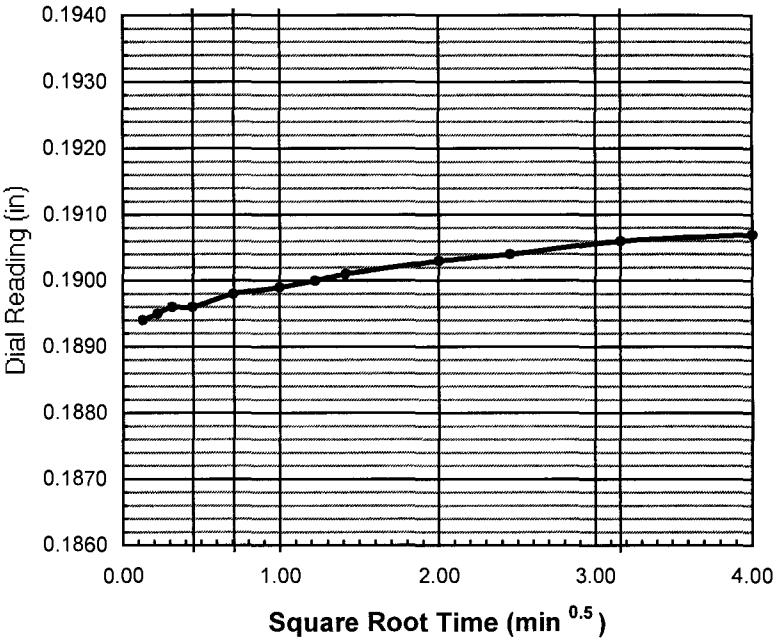
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C12 | Stage Number: 10 | Curves by: TJO

Boring No.: R-11-002 | Sample No.: 4 | Depth (ft.) 11.5

Date: 17-Feb-11 | Load (psf): 20873 | Zero Reading: 0.3257

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:12:05	0	0.00	0.1872
	0.02	0.13	0.1894
	0.05	0.22	0.1895
	0.10	0.32	0.1896
	0.20	0.45	0.1896
	0.50	0.71	0.1898
	1.00	1.00	0.1899
	1.50	1.22	0.1900
	2.00	1.41	0.1901
	4.0	2.00	0.1903
	6.0	2.45	0.1904
	10.0	3.16	0.1906
	16.0	4.00	0.1907
	30		0.1909
	60		0.1911
	120		0.1912
	240		0.1912
	566		0.1913



do = 0.1893

d90 = _____ t90 = _____ min

d100 = _____

df = 0.1913

square root

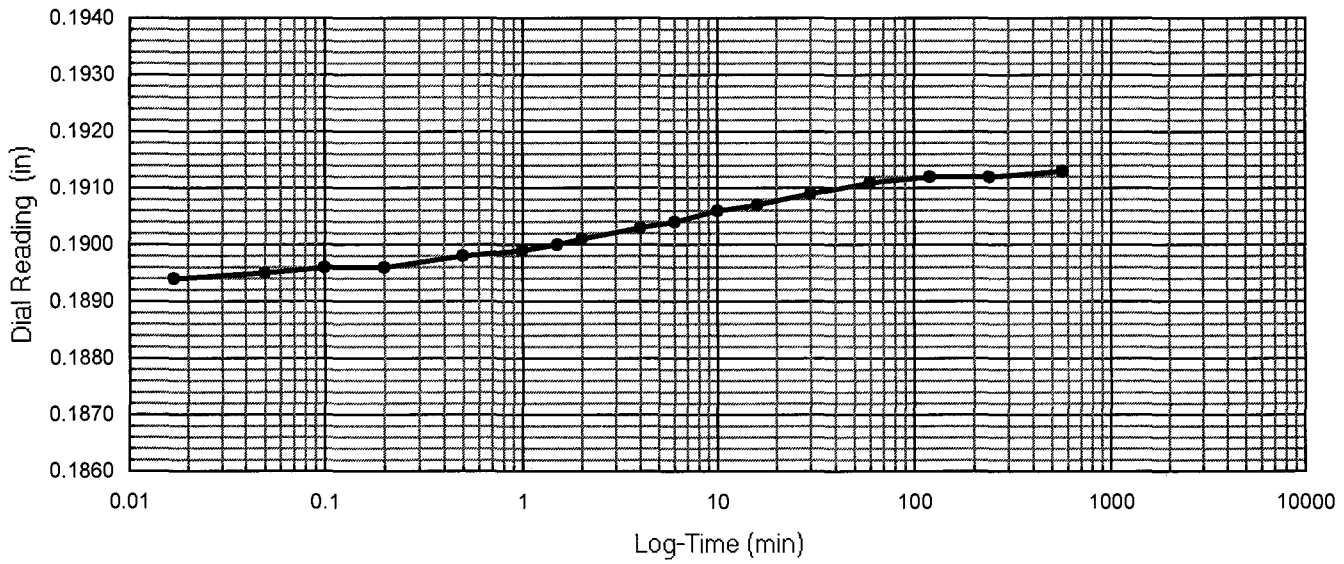
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

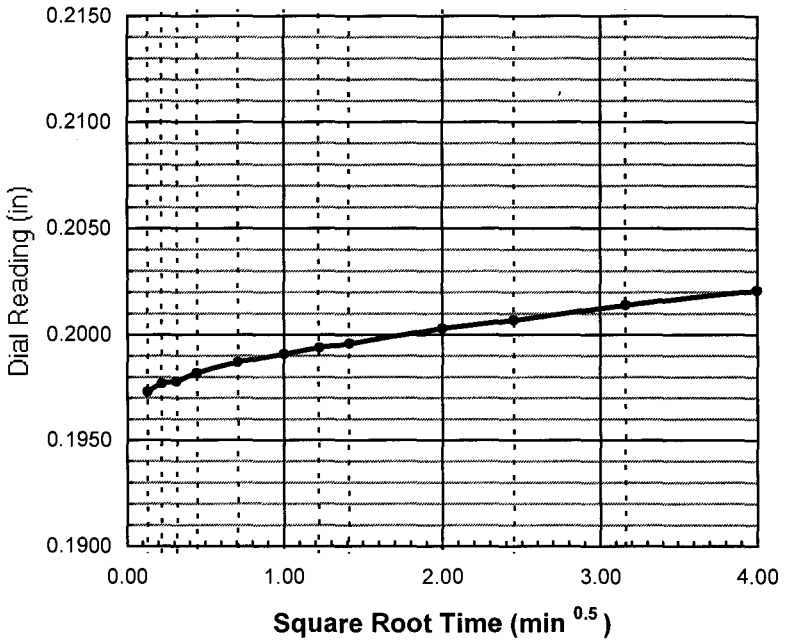
for ASTM D2435, method B

Project Number: 30989830 Apparatus No.: C12 Stage Number: 11 Curves by: TJO

Boring No.: R-11-002 Sample No.: 4 Depth (ft.) 11.5

Date: 17-Feb-11 Load (psf): 5500 Zero Reading: 0.3257

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
18:38:58	0	0.00	0.1913
	0.02	0.13	0.1973
	0.05	0.22	0.1977
	0.10	0.32	0.1978
	0.20	0.45	0.1982
	0.50	0.71	0.1987
	1.00	1.00	0.1991
	1.50	1.22	0.1994
	2.00	1.41	0.1996
	4.0	2.00	0.2003
	6.0	2.45	0.2007
	10.0	3.16	0.2014
	16.0	4.00	0.2021
	30		0.2034
	60		0.2051
	120		0.2068
	240		0.2083
	480		0.2091
	841		0.2096



do = 0.1969

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2096

square root

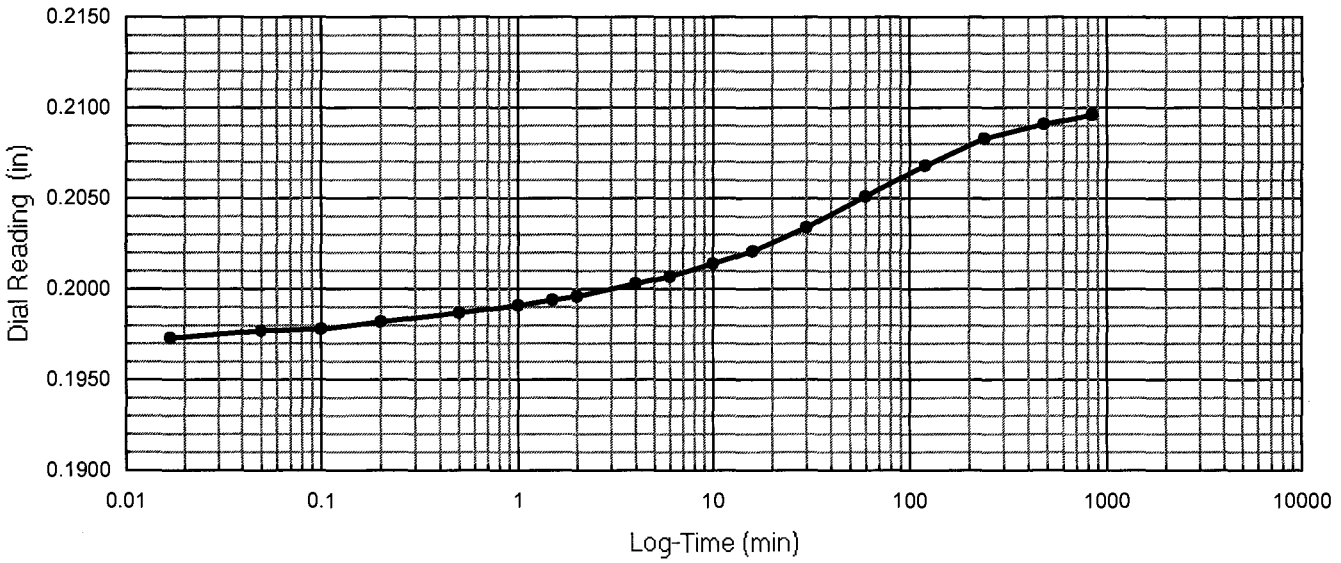
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

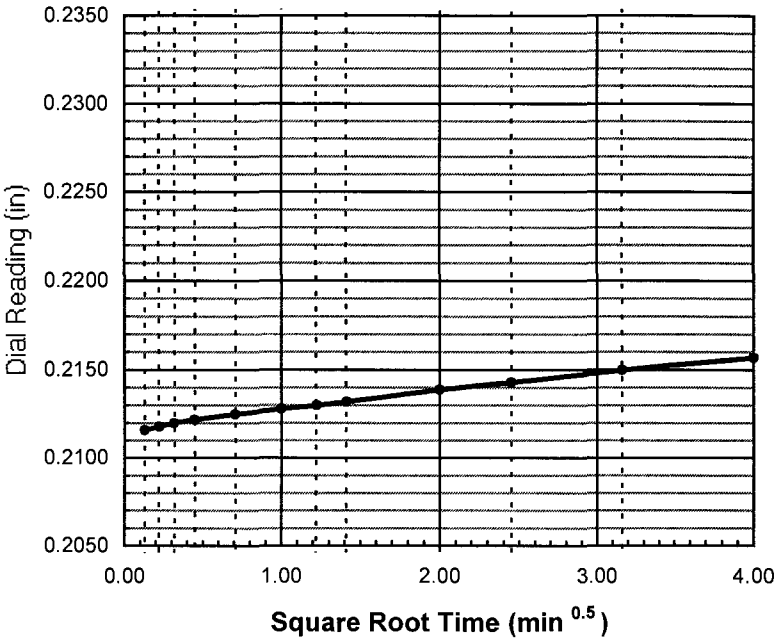
for ASTM D2435, method B

Project Number: 30989830 Apparatus No.: C12 Stage Number: 12 Curves by: TJO

Boring No.: R-11-002 Sample No.: 4 Depth (ft.) 11.5

Date: 18-Feb-11 Load (psf): 1345 Zero Reading: 0.3257

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:41:09	0	0.00	0.2096
	0.02	0.13	0.2116
	0.05	0.22	0.2118
	0.10	0.32	0.2120
	0.20	0.45	0.2122
	0.50	0.71	0.2125
	1.00	1.00	0.2128
	1.50	1.22	0.2130
	2.00	1.41	0.2132
	4.0	2.00	0.2139
	6.0	2.45	0.2143
	10.0	3.16	0.2150
	16.0	4.00	0.2157
	30		0.2170
	60		0.2191
	120		0.2217
	240		0.2246
	480		0.2272
	960		0.2288
	1530		0.2295



do = 0.2113

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2295

square root

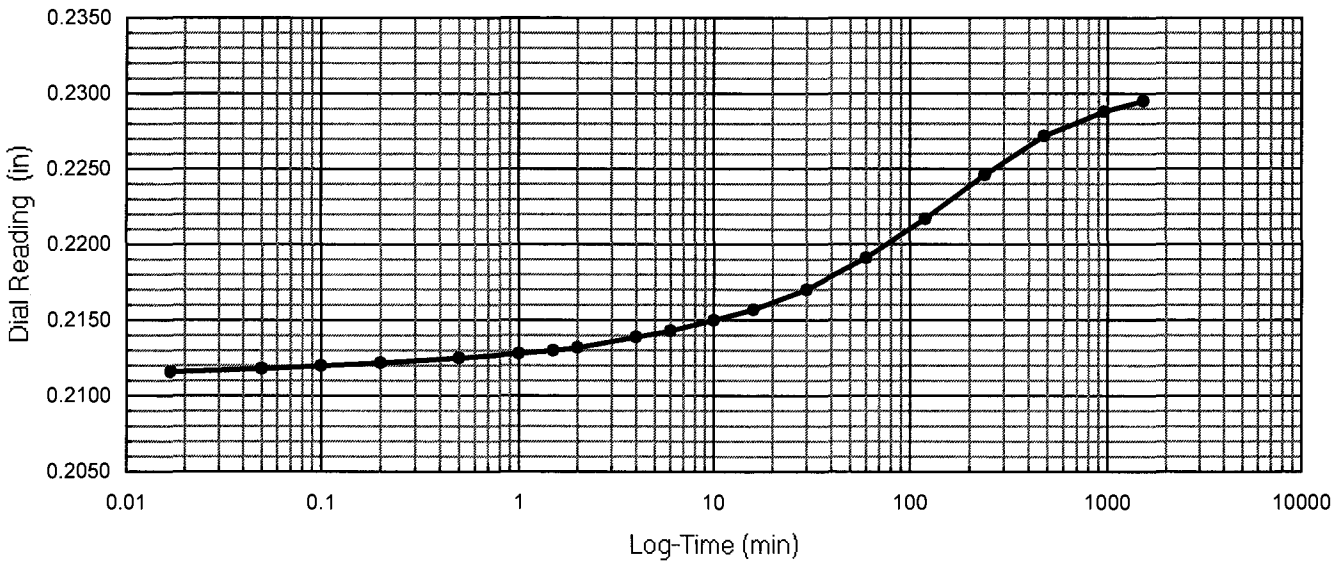
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

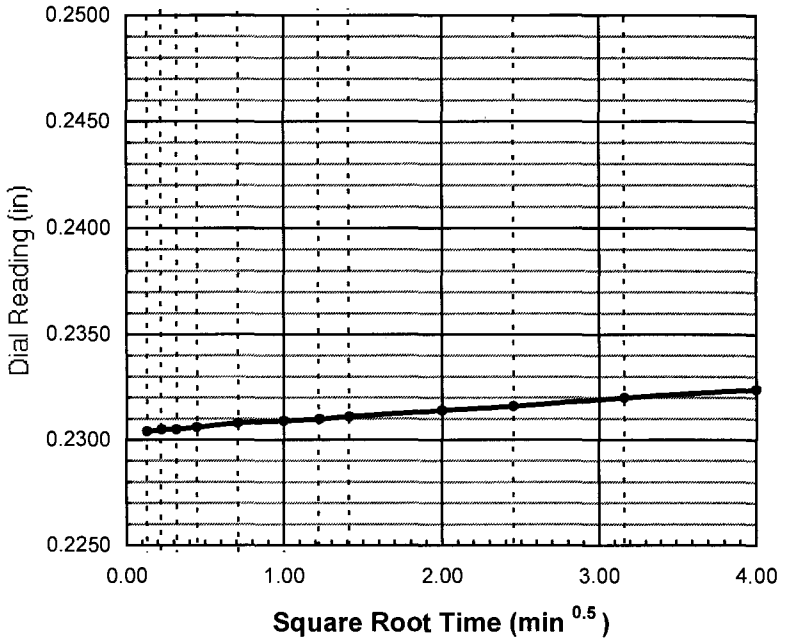
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C12 | Stage Number: 13 | Curves by: TJO

Boring No.: R-11-002 | Sample No.: 4 | Depth (ft.) 11.5

Date: 19-Feb-11 | Load (psf): 306 | Zero Reading: 0.3257

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:12:28	0	0.00	0.2295
	0.02	0.13	0.2304
	0.05	0.22	0.2305
	0.10	0.32	0.2305
	0.20	0.45	0.2306
	0.50	0.71	0.2308
	1.00	1.00	0.2309
	1.50	1.22	0.2310
	2.00	1.41	0.2311
	4.0	2.00	0.2314
	6.0	2.45	0.2316
	10.0	3.16	0.2320
	16.0	4.00	0.2324
	30		0.2332
	60		0.2346
	120		0.2365
	240		0.2392
	480		0.2419
	960		0.2445
	2080		0.2464
	4500		0.2479
	8536		0.2490



do = 0.2303

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2490

square root

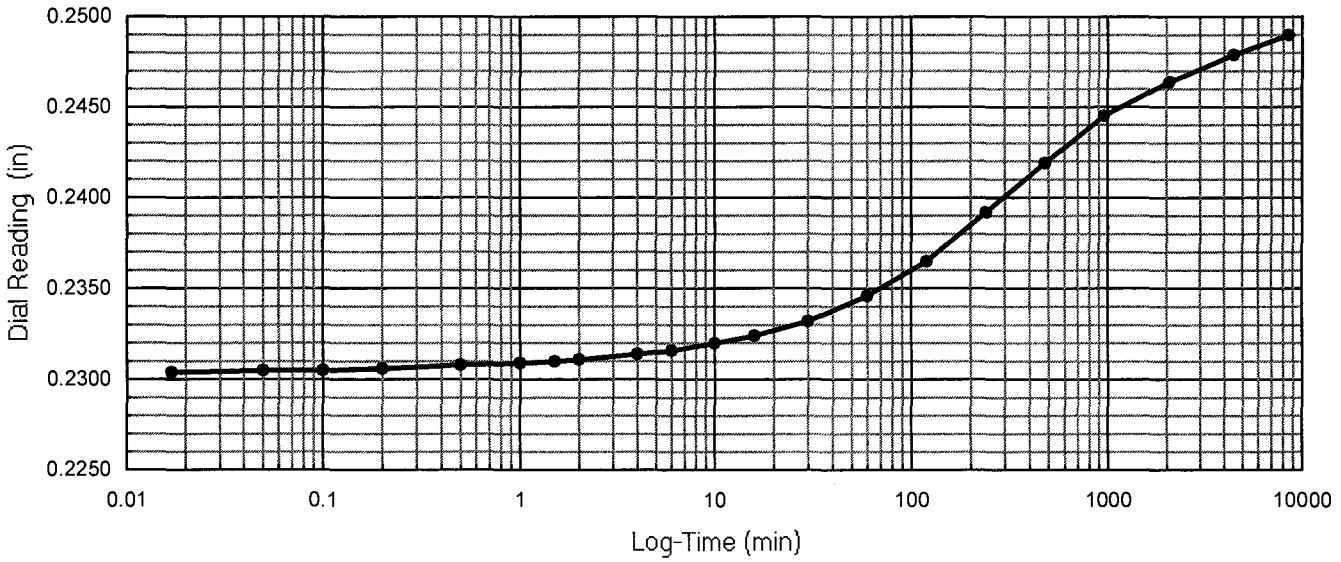
d50 = _____

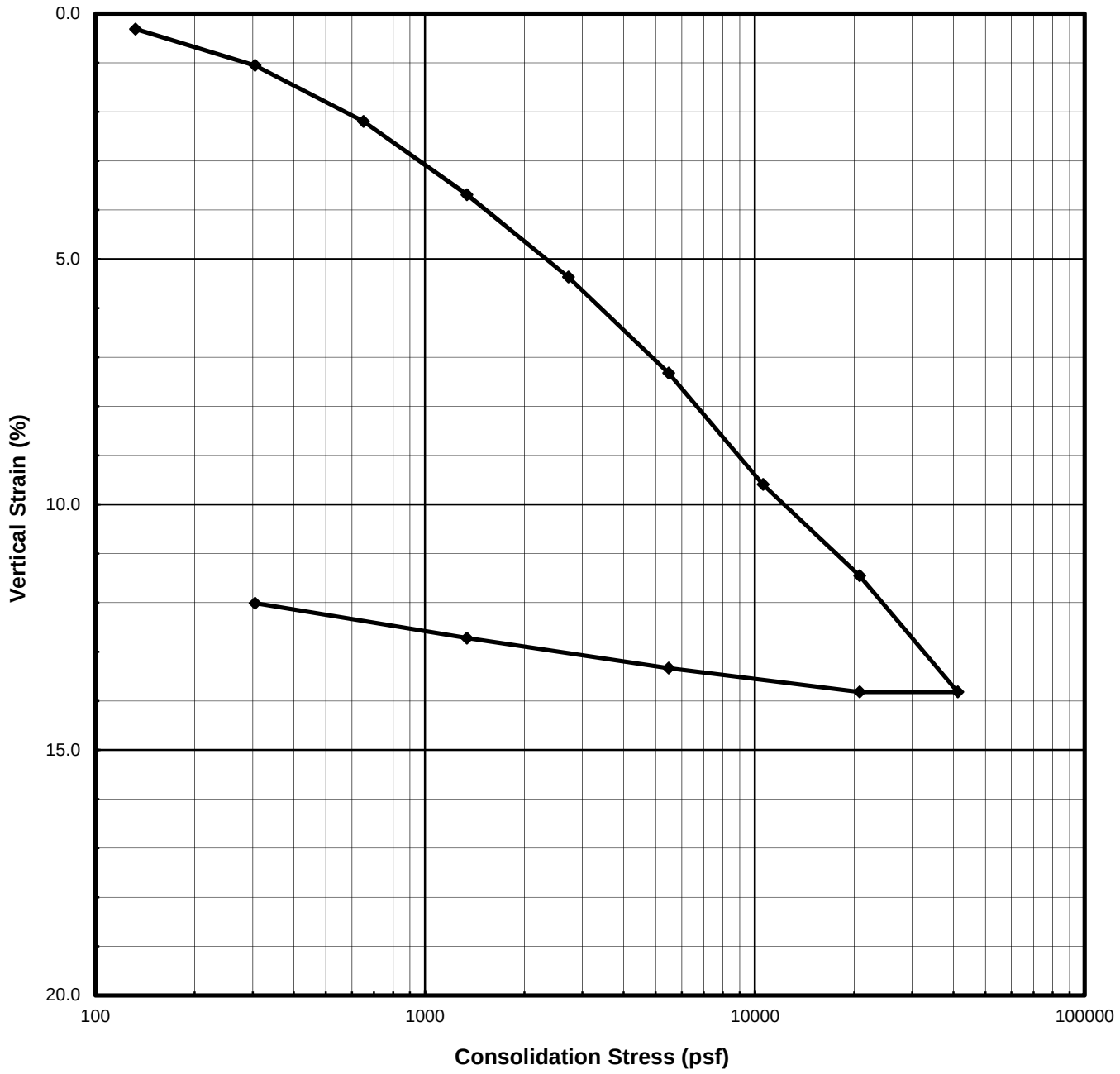
t50 = _____ min

log time

d50 = _____

t50 = _____ min





Description:	**Olive brown sandy Clay (CL)**							
Boring No.:	R-11-002		Liquid Limit	37	%	Specific Gravity	2.75	assumed
Sample No.:	6		Plasticity Index	21	%	Strain for Saturation	0.95	%
Depth (ft | m)	16.5	5.03	Fines Content	69.3	%	Water added at	46	psf

	Water Content (%)	Total Unit Weight		Dry Unit Weight		Saturation (%)	Void Ratio	Height		Diameter	
		(pcf)	(kN/m^3)	(pcf)	(kN/m^3)			(inches)	(cm)	(inches)	(cm)
Initial	26.2	123.5	19.40	97.9	15.38	95.8	0.75	0.930	2.36	2.420	6.147
Final	20.0	131.8	20.70	109.8	17.25	98.2	0.56	0.829	2.11		

URS

I-5 & SR-74 IC

Project Number: 30989830
Test Start Date: 2/9/2011

CONSOLIDATION TEST
ASTM D2435

SUBMITTED BY: Thomas J. O'Meara

Con I5 SR74 R11002 016.xls

One-Dimensional Oedometer Testing
Set-up / Take down Worksheet
ASTM D2435

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM
Boring No.: R-11-002
Sample No.: 6
Depth (ft): 16.5
Apparatus No.: C10

Specimen Description : Olive brown sandy Clay (CL)
Duration: end of increment
Ring Number: R22
Weight of Wet Spec. and Ring: 356.36 g
Weight of Ring: 217.69 g
Initial Weight of Wet Spec.: 138.67 g
Take Down Weight with Ring: 349.55 g
Excess Oven-dried Cont. No.: cp7
Weight of Cont. and Dry Spec.: 172.16 g
Weight of Container: 172.12 g
Weight of Excess Dried Soil: 0.04 g
Weight of Excess Wet Soil 0.05 g
Final Weight of Wet Specimen: 131.91 g

Height of Specimen (in)

	Initial	Final
1	0.928	0.829
2	0.930	0.827
3	0.930	0.832
4	0.930	0.824
5	0.932	0.833
Ave:	0.930	0.829

Initial Height - Final Height = 0.101 in
Change in Dial (Dd) = 0.111 in
Initial Height - Dd = 0.819 in
Final Height + Dd = 0.940 in
Weight of Top Cap = 366.47 g

Specimen Analysis					Initial Trim	Initial Spec.	Final
				Container Number:	x34	**XXXXX**	s24
				Mass of Container and Wet Specimen M1 (g)	379.00	138.67	202.32
				Mass of Container and Dry Specimen, M2 (g)	328.60	109.92	182.21
				Mass of Container, M3 (g)	136.95	**XXXXX**	81.69
				Water Content, w (%)	26.30	26.16	20.01
				Mass of Wet Specimen, M4 (g)	138.67	138.67	131.91
				Mass of Dry Specimen, M5 (g)	109.92	109.92	109.92
Nominal		Measured	x	Specimen Height, H (in)	0.930	0.930	0.829
Nominal	x	Measured		Specimen Diameter, D (in)	2.420	2.420	2.420
				Area of Specimen, A (in^2)	4.600	4.600	4.600
				Volume of Specimen, V (cc)	70.10	70.10	62.49
Assumed	x	Measured		Specific Gravity, Gs	2.75	2.75	2.75
				Wet Unit Weight, WUW (pcf)	**123.5**	**123.5**	**131.8**
				Dry Unit Weight, DUW (pcf)	**97.8**	**97.9**	**109.8**
				Void Ratio	**0.753**	**0.751**	**0.560**
				Degree of Saturation, S (%)	**96.1**	**95.8**	**98.2**

Set-up by: TJO
Date: 2/9/11
Calculated by: TJO
Checked by: TJO
Strain for Saturation (%) = **0.948**

One-Dimensional Oedometer Testing

Loading Worksheet

ASTM D2435

Project Number: 30989830 Boring No.: R-11-002

Project Name: I-5 & SR-74 IC Sample No.: 6

Project Engineer: FM Apparatus No.: C10 Depth (ft): 16.5

Initial Dial Reading: 0.3701 inch Initial Specimen Height: 0.930 inch

Stage No.	Normal Stress (psf)	Dial Reading (in)		Compressibility Correction (in)	Vertical Strain (%)	
		End of Duration	End of Increment		End of Duration	End of Increment
Seat	46		0.3697	0.0000		0.04
1	132	0.3666	0.3665	0.0006	0.31	0.32
2	305	0.3584	0.3584	0.0019	1.05	1.05
3	650	0.3460	0.3458	0.0037	2.19	2.22
4	1340	0.3305	0.3292	0.0053	3.69	3.83
5	2721	0.3130	0.3120	0.0072	5.37	5.47
6	5481	0.2930	0.2928	0.0090	7.32	7.34
7	10589	0.2700	0.2728	0.0109	9.59	9.29
8	20804	0.2505	0.2499	0.0131	11.45	11.52
9	41234	0.2260	0.2250	0.0156	13.82	13.92
10	20804		0.2270	0.0146		13.82
11	5481		0.2340	0.0121		13.33
12	1340		0.2421	0.0097		12.72
13	305		0.2504	0.0080		12.01
14	46		0.2592	0.0065		11.23
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						
33						

Final dial reading prior to take down (inch): 0.2592 Take down by: TJO Date: 3/2/11

One-Dimensional Oedometer Testing
ASTM D2435
Table of Incremental Values

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM
Apparatus No.: C10

Boring No.: R-11-002
Sample No.: 6
Depth (ft): 16.5
Inundation at stage: Seat

5 **10** Hanger Ratios

Stage Number	Incremental Weight Applied (kg) Back	Front	Vertical Stress (psf)	Specimen Hieght (in)	Deflections (in) $d_{initial}$	d_o	d_{50}	d_{100}	d_{final}	Porous Stone (in)	t_{50} (min)	cv (in^2/min)	cv (ft^2/day)
Top Cap			25	0.930	0.3701	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
Seat	0.06		46	0.930	0.3701	XXXXX	XXXXX	XXXXX	0.3697	0.0000	XXXXX	XXXXX	XXXXX
1	0.25		132	0.927	0.3697	0.3691	0.3679	0.3666	0.3665	0.0006	XXXXX	XXXXX	XXXXX
2	0.50		305	0.921	0.3665	0.3656	0.3620	0.3584	0.3584	0.0019	1.50	0.028	0.278
3	1.00		650	0.912	0.3584	0.3572	0.3516	0.3460	0.3458	0.0037	1.00	0.041	0.410
4		1.0	1340	0.901	0.3458	0.3438	0.3372	0.3305	0.3292	0.0053	1.00	0.040	0.399
5	4.0		2721	0.891	0.3292	0.3277	0.3204	0.3130	0.3120	0.0072	1.00	0.039	0.391
6		4.0	5481	0.880	0.3120	0.3109	0.3020	0.2930	0.2928	0.0090	0.50	0.076	0.763
7		7.4	10589	0.871	0.2928	0.2908	0.2804	0.2700	0.2728	0.0109	0.50	0.075	0.748
8		14.8	20804	0.862	0.2728	0.2712	0.2609	0.2505	0.2499	0.0131	0.50	0.073	0.731
9		29.6	41234	0.852	0.2499	0.2467	0.2364	0.2260	0.2250	0.0156	0.50	0.072	0.715
10		-29.6	20804	0.869	0.2250	0.2268	XXXXX	XXXXX	0.2270	0.0146	XXXXX	XXXXX	XXXXX
11		-22.2	5481	0.888	0.2270	0.2312	XXXXX	XXXXX	0.2340	0.0121	XXXXX	XXXXX	XXXXX
12	-4.0	-4.0	1340	0.906	0.2340	0.2359	XXXXX	XXXXX	0.2421	0.0097	XXXXX	XXXXX	XXXXX
13	-1.00	-1.00	305	0.922	0.2421	0.2423	XXXXX	XXXXX	0.2504	0.0080	XXXXX	XXXXX	XXXXX
14	-0.750		46	0.937	0.2504	XXXXX	XXXXX	XXXXX	0.2592	0.0065	XXXXX	XXXXX	XXXXX
15			46	XXXXX	0.2592	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
16			46	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
17			46	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
18			46	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
19			46	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
20			46	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
21			46	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
22			46	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
23			46	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
24			46	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
25			46	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX

One-Dimensional Oedometer Testing Increment

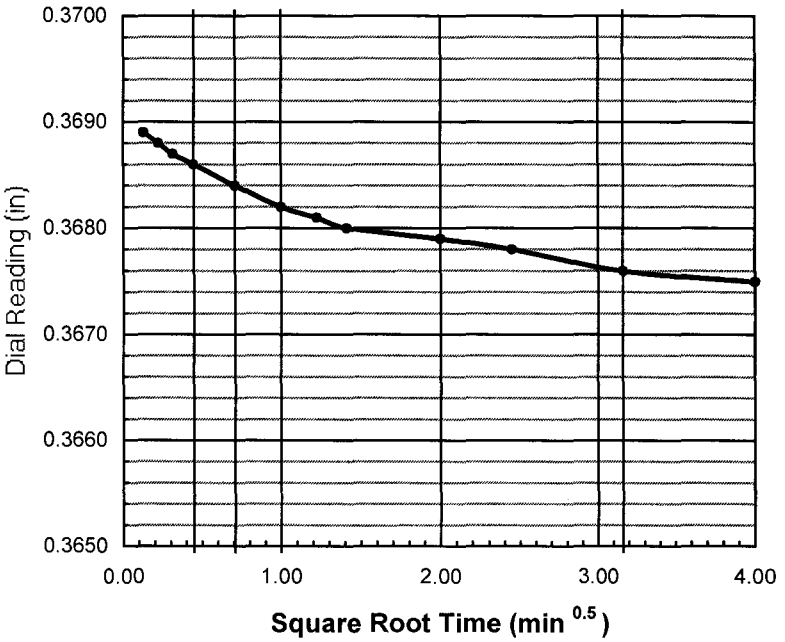
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C10 | Stage Number: 1 | Curves by: TJO

Boring No.: R-11-002 | Sample No.: 6 | Depth (ft.) 16.5

Date: 9-Feb-11 | Load (psf): 132 | Zero Reading: 0.3701

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
11:45:27	0	0.00	0.3697
	0.02	0.13	0.3689
	0.05	0.22	0.3688
	0.10	0.32	0.3687
	0.20	0.45	0.3686
	0.50	0.71	0.3684
	1.00	1.00	0.3682
	1.50	1.22	0.3681
	2.00	1.41	0.3680
	4.0	2.00	0.3679
	6.0	2.45	0.3678
	10.0	3.16	0.3676
	16.0	4.00	0.3675
	30		0.3674
	60		0.3672
	120		0.3670
	240		0.3667
	480		0.3666
	1288		0.3665



do = 0.3691

d90 = _____ t90 = _____ min

d100 = 0.3666

df = 0.3665

square root

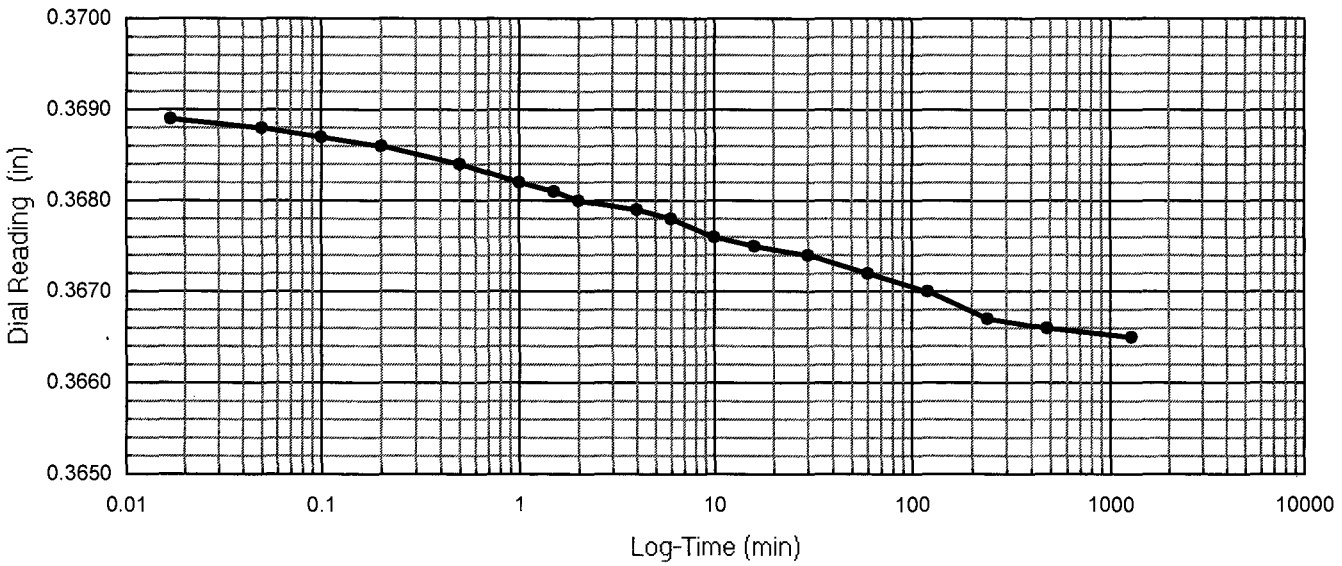
d50 = _____

t50 = _____ min

log time

d50 = 0.3678

t50 = 6.0 min



One-Dimensional Oedometer Testing Increment

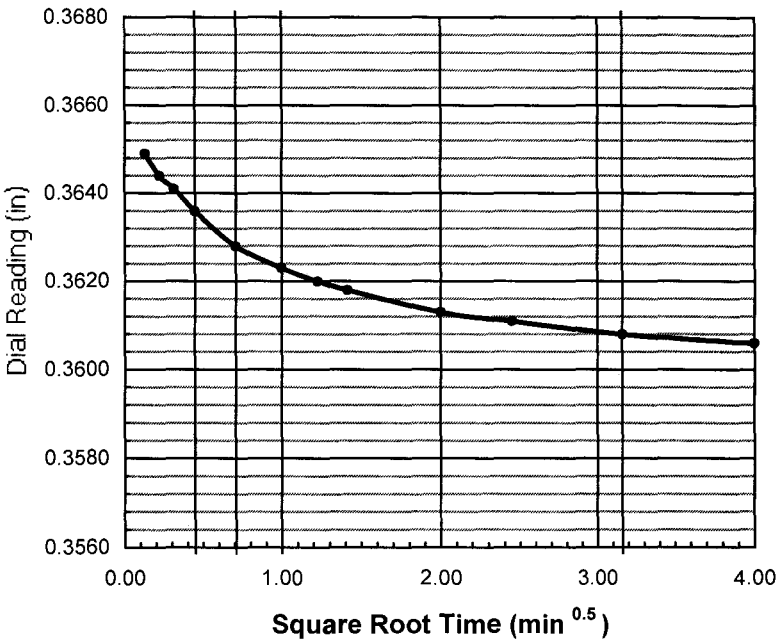
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C10 | Stage Number: 2 | Curves by: TJO

Boring No.: R-11-002 | Sample No.: 6 | Depth (ft.) 16.5

Date: 10-Feb-11 | Load (psf): 305 | Zero Reading: 0.3701

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:15:10	0	0.00	0.3665
	0.02	0.13	0.3649
	0.05	0.22	0.3644
	0.10	0.32	0.3641
	0.20	0.45	0.3636
	0.50	0.71	0.3628
	1.00	1.00	0.3623
	1.50	1.22	0.3620
	2.00	1.41	0.3618
	4.0	2.00	0.3613
	6.0	2.45	0.3611
	10.0	3.16	0.3608
	16.0	4.00	0.3606
	30		0.3603
	60		0.3599
	120		0.3595
	240		0.3591
	480		0.3586
	960		0.3584
	1456		0.3584



do = 0.3656

d90 = _____ t90 = _____ min

d100 = 0.3584

df = 0.3584

square root

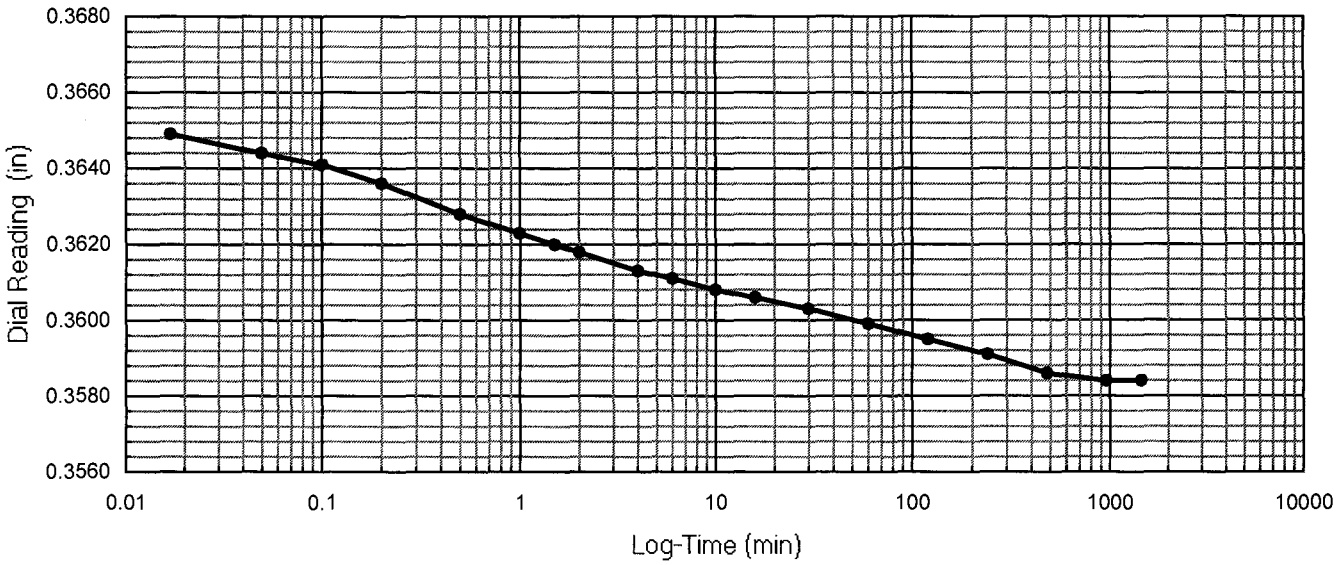
d50 = _____

t50 = _____ min

log time

d50 = 0.3620

t50 = 1.5 min



One-Dimensional Oedometer Testing Increment

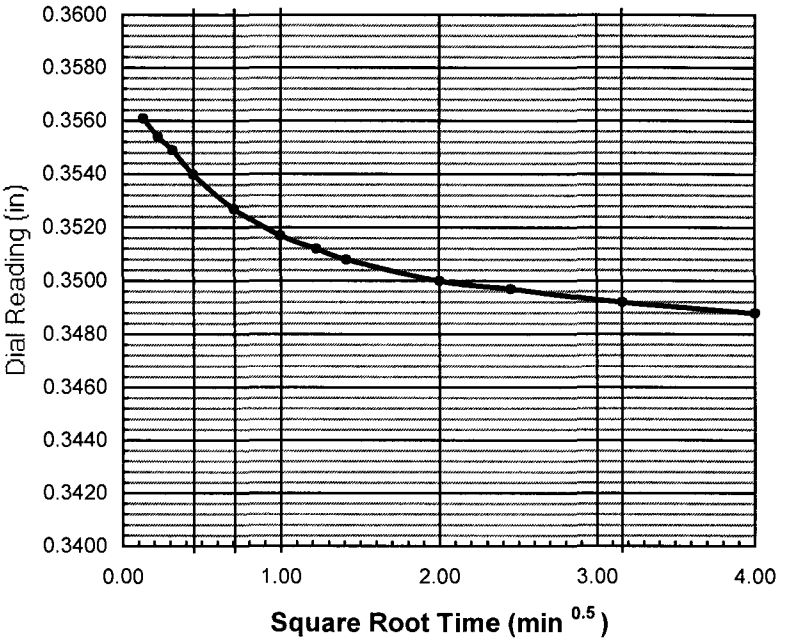
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C10 | Stage Number: 3 | Curves by: TJO

Boring No.: R-11-002 | Sample No.: 6 | Depth (ft.) 16.5

Date: 11-Feb-11 | Load (psf): 650 | Zero Reading: 0.3701

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:30:57	0	0.00	0.3584
	0.02	0.13	0.3561
	0.05	0.22	0.3554
	0.10	0.32	0.3549
	0.20	0.45	0.3540
	0.50	0.71	0.3527
	1.00	1.00	0.3517
	1.50	1.22	0.3512
	2.00	1.41	0.3508
	4.0	2.00	0.3500
	6.0	2.45	0.3497
	10.0	3.16	0.3492
	16.0	4.00	0.3488
	30		0.3484
	60		0.3479
	120		0.3474
	240		0.3467
	480		0.3462
	960		0.3459
	1520		0.3458



do = 0.3572

d90 = _____ t90 = _____ min

d100 = 0.3460

df = 0.3458

square root

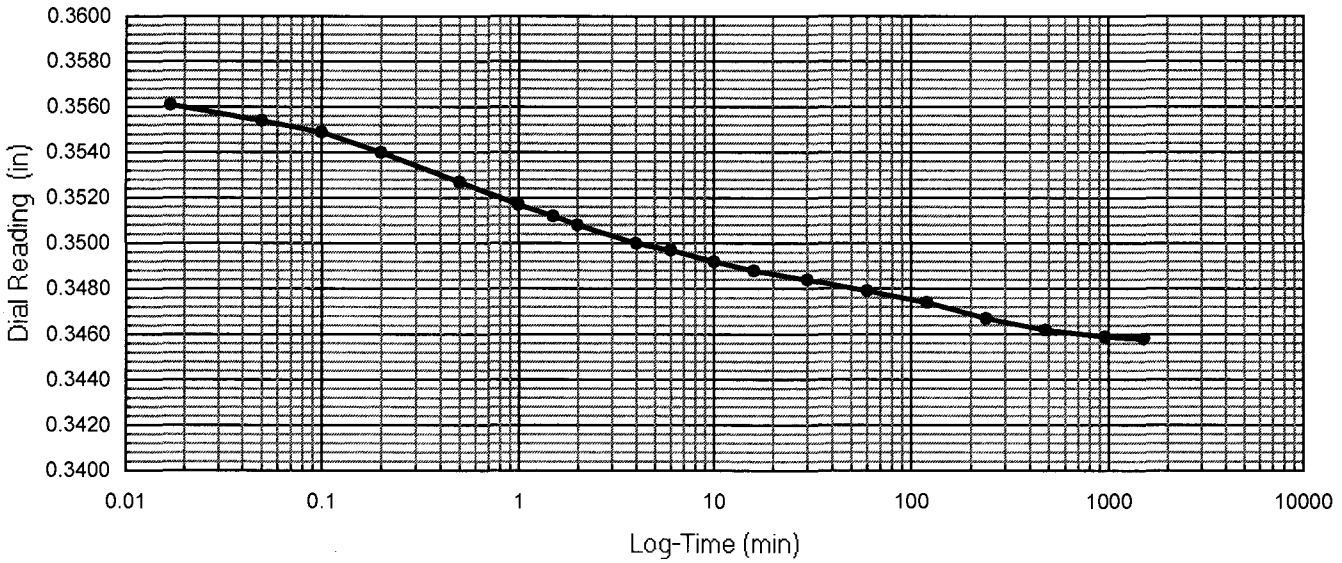
d50 = _____

t50 = _____ min

log time

d50 = 0.3516

t50 = 1.0 min



One-Dimensional Oedometer Testing Increment

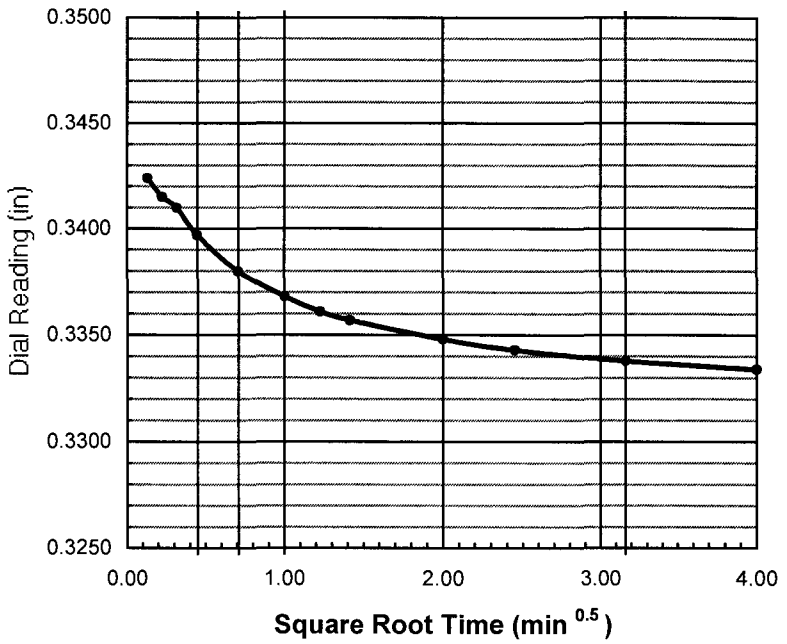
for ASTM D2435, method B

Project Number: 30989830 Apparatus No.: C10 Stage Number: 4 Curves by: TJO

Boring No.: R-11-002 Sample No.: 6 Depth (ft.) 16.5

Date: 12-Feb-11 Load (psf): 1340 Zero Reading: 0.3701

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:51:48	0	0.00	0.3458
	0.02	0.13	0.3424
	0.05	0.22	0.3415
	0.10	0.32	0.3410
	0.20	0.45	0.3397
	0.50	0.71	0.3380
	1.00	1.00	0.3368
	1.50	1.22	0.3361
	2.00	1.41	0.3357
	4.0	2.00	0.3348
	6.0	2.45	0.3343
	10.0	3.16	0.3338
	16.0	4.00	0.3334
	30		0.3328
	60		0.3322
	120		0.3315
	240		0.3308
	480		0.3302
	960		0.3299
	1440		0.3297
	2792		0.3292



do = 0.3438

d90 = ____ t90 = ____ min

d100 = 0.3305

df = 0.3292

square root

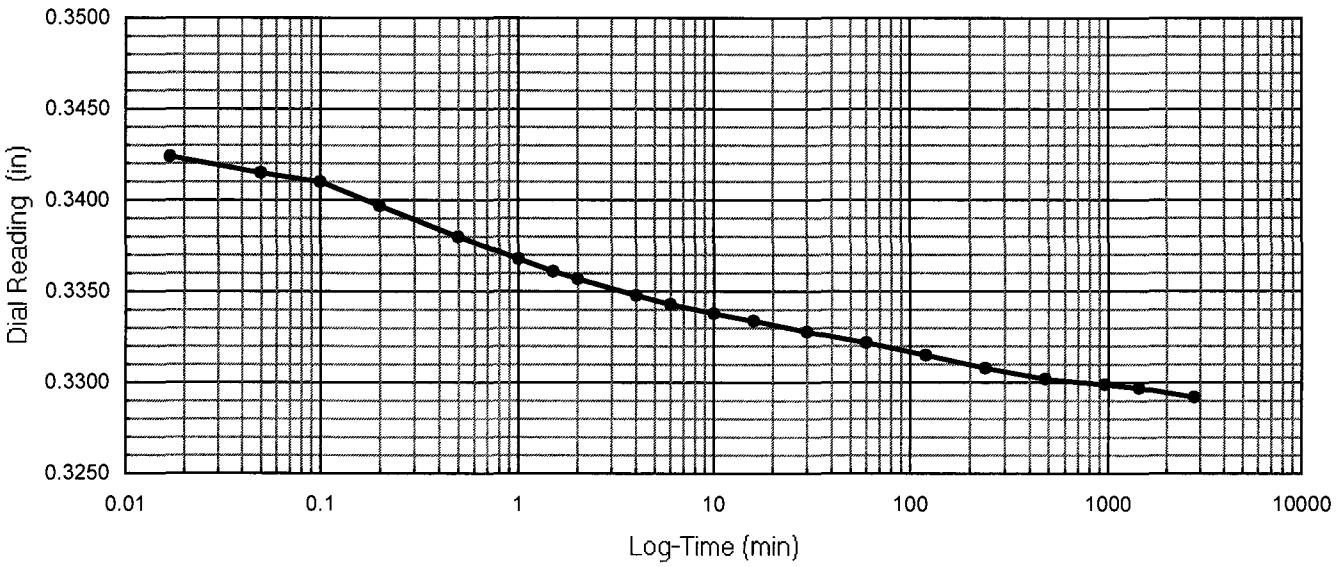
d50 = ____

t50 = ____ min

log time

d50 = 0.3371

t50 = 1.0 min



One-Dimensional Oedometer Testing Increment

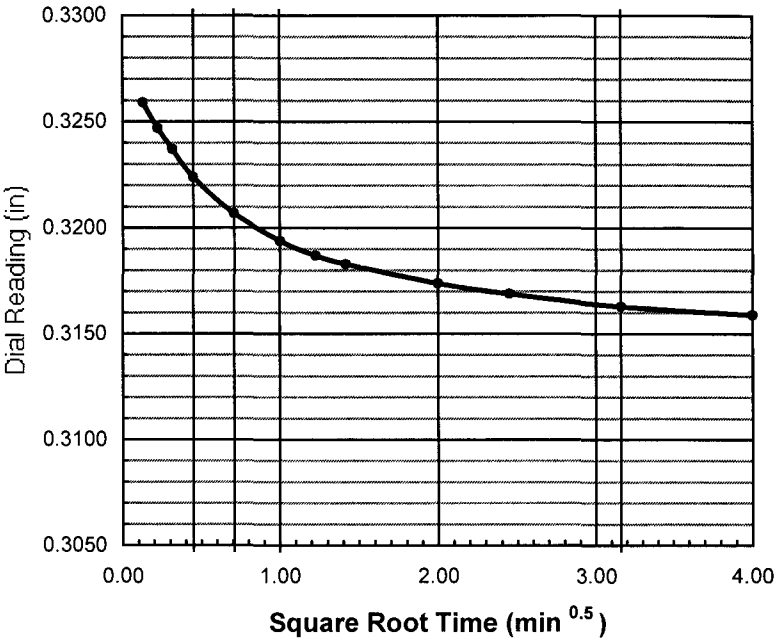
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C10 | Stage Number: 5 | Curves by: TJO

Boring No.: R-11-002 | Sample No.: 6 | Depth (ft.) 16.5

Date: 14-Feb-11 | Load (psf): 2721 | Zero Reading: 0.3701

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:24:17	0	0.00	0.3292
	0.02	0.13	0.3259
	0.05	0.22	0.3247
	0.10	0.32	0.3237
	0.20	0.45	0.3224
	0.50	0.71	0.3207
	1.00	1.00	0.3194
	1.50	1.22	0.3187
	2.00	1.41	0.3183
	4.0	2.00	0.3174
	6.0	2.45	0.3169
	10.0	3.16	0.3163
	16.0	4.00	0.3159
	30		0.3152
	60		0.3146
	120		0.3139
	240		0.3133
	480		0.3126
	960		0.3122
	1402		0.3120



do = 0.3277

d90 = ____ t90 = ____ min

d100 = 0.3130

df = 0.3120

square root

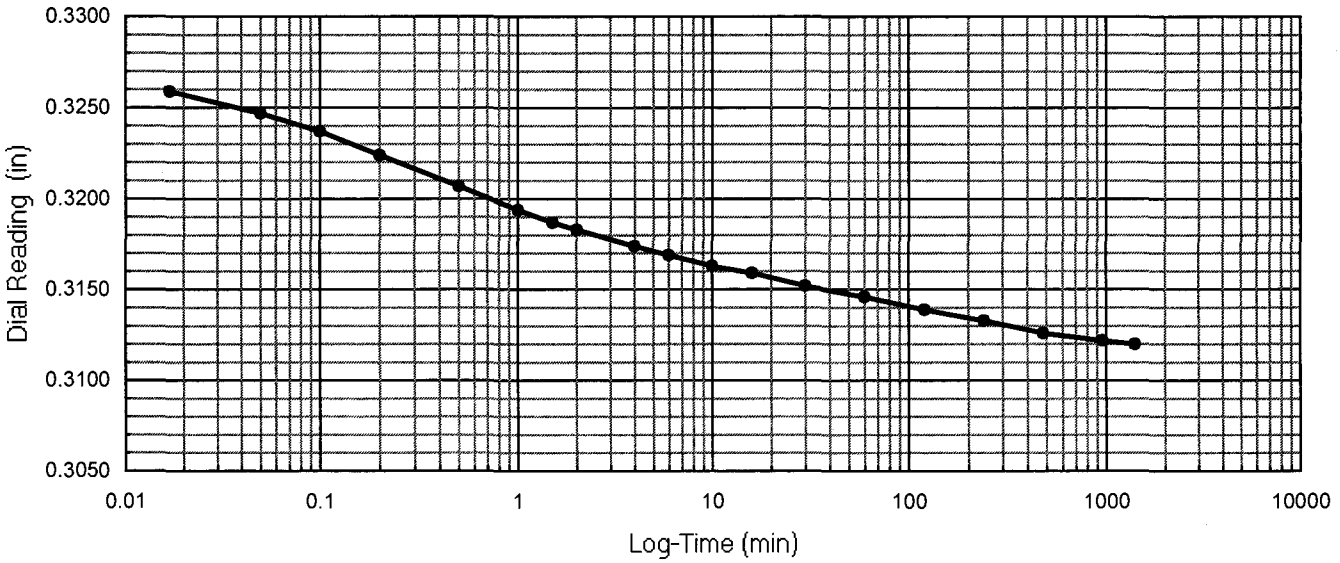
d50 = ____

t50 = ____ min

log time

d50 = 0.3203

t50 = 1.0 min



One-Dimensional Oedometer Testing Increment

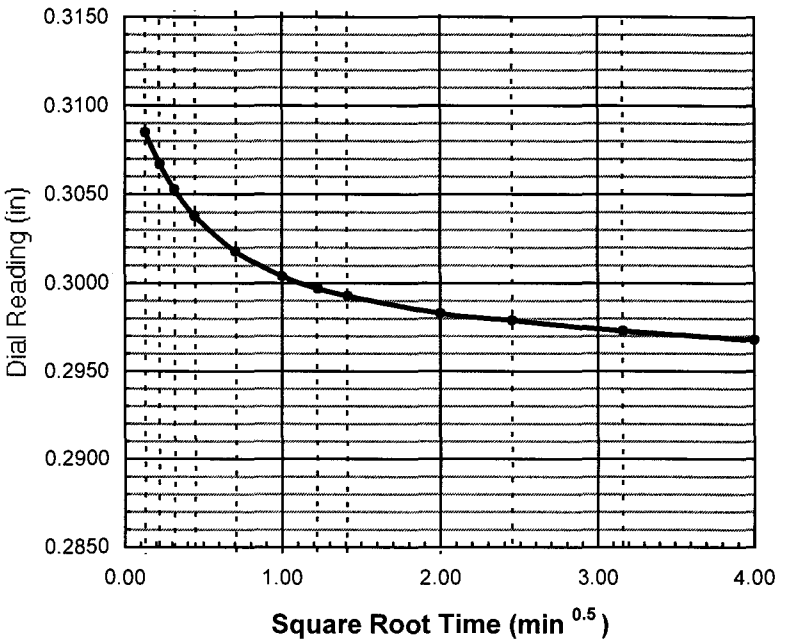
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C10 | Stage Number: 6 | Curves by: TJO

Boring No.: R-11-002 | Sample No.: 6 | Depth (ft.) 16.5

Date: 15-Feb-11 | Load (psf): 5481 | Zero Reading: 0.3701

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:47:01	0	0.00	0.3119
	0.02	0.13	0.3085
	0.05	0.22	0.3067
	0.10	0.32	0.3053
	0.20	0.45	0.3038
	0.50	0.71	0.3018
	1.00	1.00	0.3004
	1.50	1.22	0.2997
	2.00	1.41	0.2993
	4.0	2.00	0.2983
	6.0	2.45	0.2979
	10.0	3.16	0.2973
	16.0	4.00	0.2968
	30		0.2962
	60		0.2956
	120		0.2949
	240		0.2942
	480		0.2936
	960		0.2930
	1395		0.2928



do = 0.3109

d90 = _____ t90 = _____ min

d100 = 0.2930

df = 0.2928

square root

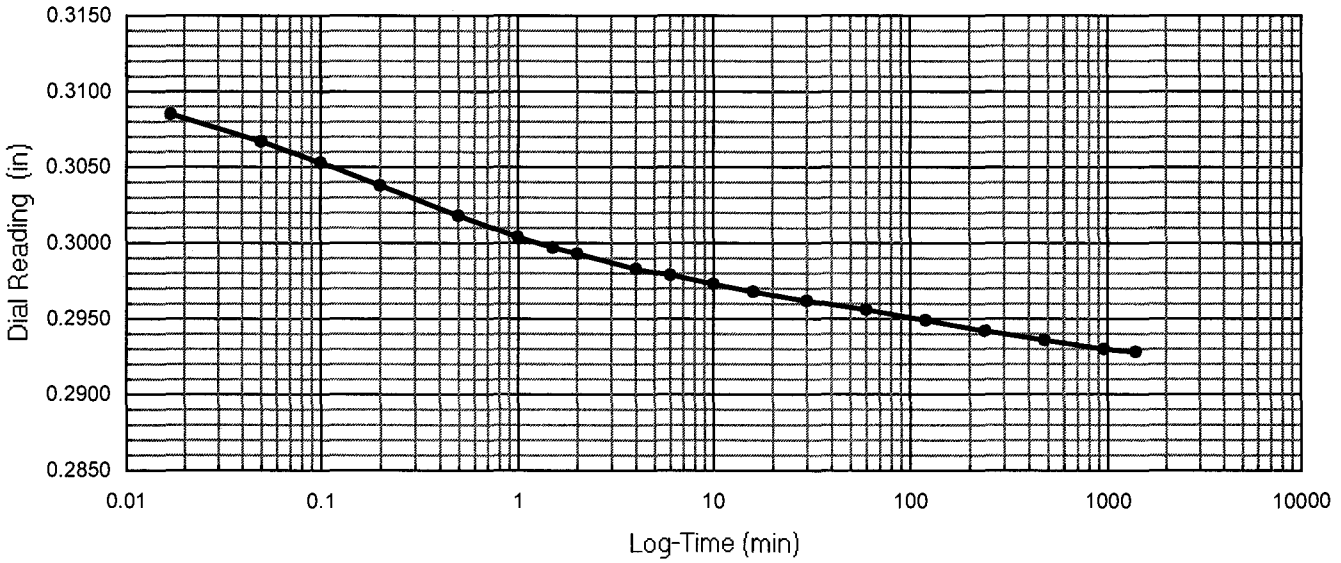
d50 = _____

t50 = _____ min

log time

d50 = 0.3019

t50 = 0.5 min



One-Dimensional Oedometer Testing Increment

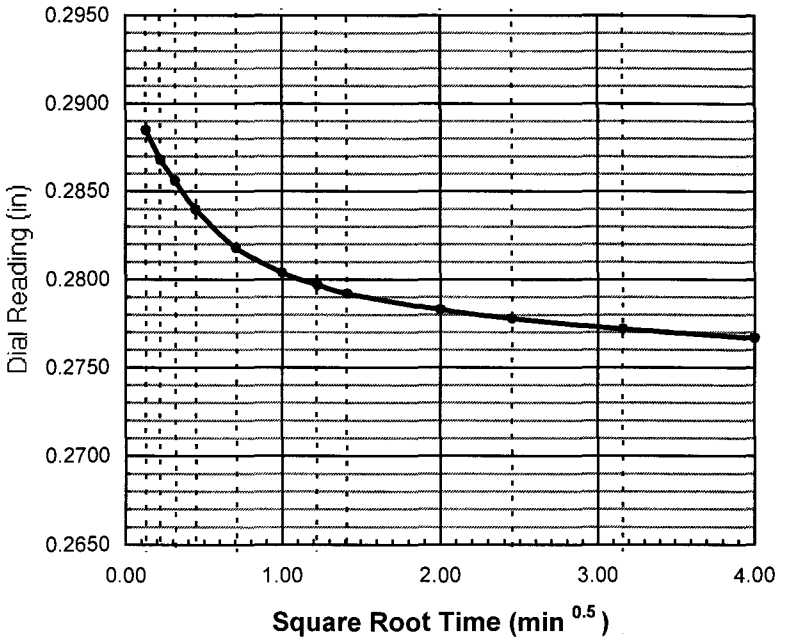
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C10 | Stage Number: 7 | Curves by: TJO

Boring No.: R-11-002 | Sample No.: 6 | Depth (ft.) 16.5

Date: 16-Feb-11 | Load (psf): 10589 | Zero Reading: 0.3701

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:03:16	0	0.00	0.2928
	0.02	0.13	0.2885
	0.05	0.22	0.2868
	0.10	0.32	0.2856
	0.20	0.45	0.2840
	0.50	0.71	0.2818
	1.00	1.00	0.2804
	1.50	1.22	0.2797
	2.00	1.41	0.2792
	4.0	2.00	0.2783
	6.0	2.45	0.2778
	10.0	3.16	0.2772
	16.0	4.00	0.2767
	30		0.2761
	60		0.2754
	120		0.2748
	240		0.2741
	480		0.2735
	960		0.2731
	1510		0.2728



do = 0.2908

d90 = _____ t90 = _____ min

d100 = 0.2740

df = 0.2728

square root

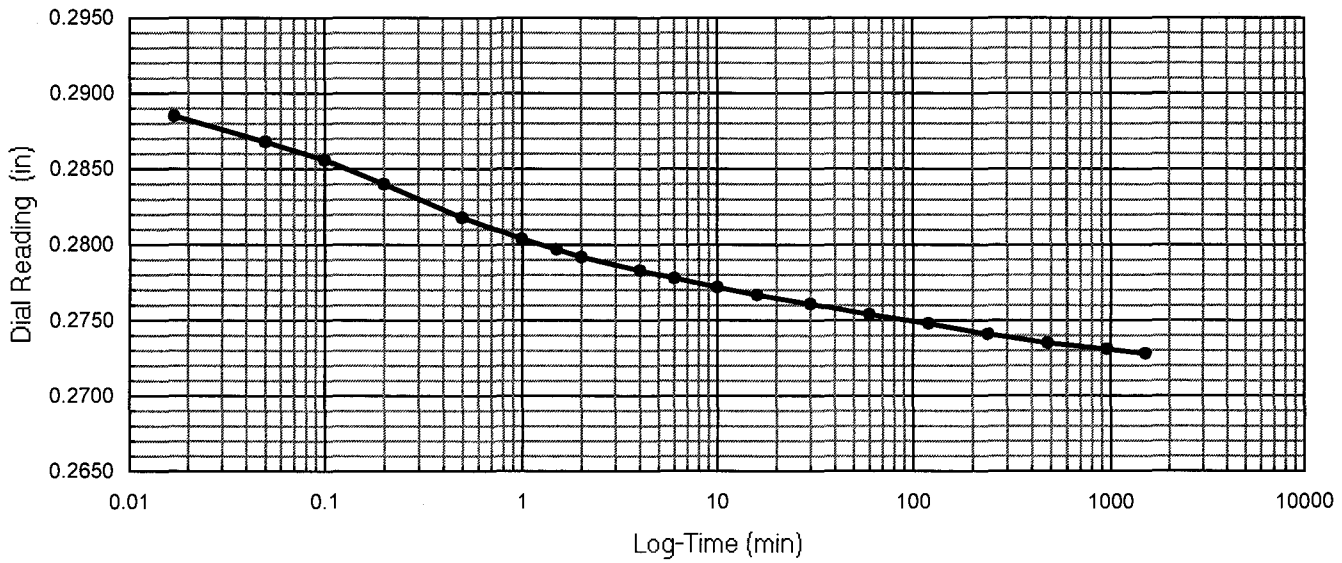
d50 = _____

t50 = _____ min

log time

d50 = 0.2824

t50 = 0.5 min



One-Dimensional Oedometer Testing Increment

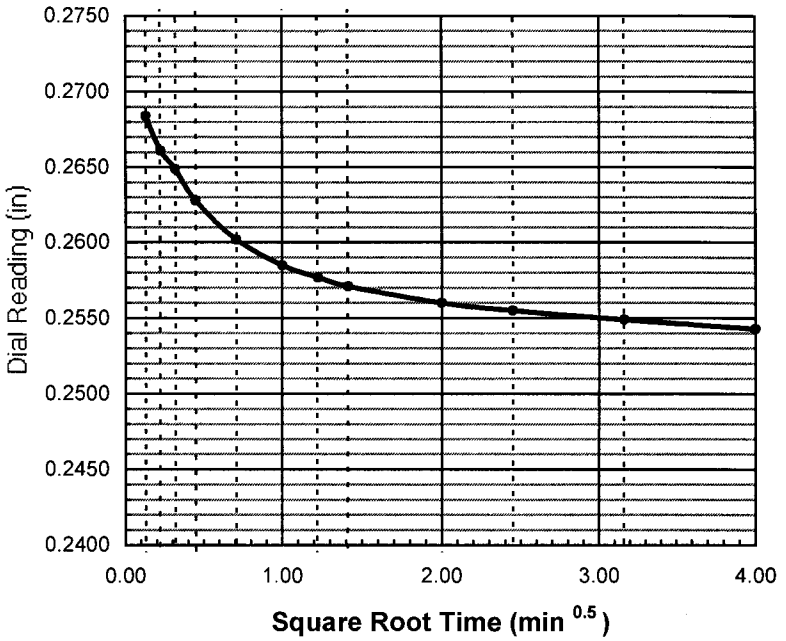
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C10 | Stage Number: 8 | Curves by: TJO

Boring No.: R-11-002 | Sample No.: 6 | Depth (ft.) 16.5

Date: 17-Feb-11 | Load (psf): 20804 | Zero Reading: 0.3701

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:14:12	0	0.00	0.2728
	0.02	0.13	0.2684
	0.05	0.22	0.2661
	0.10	0.32	0.2649
	0.20	0.45	0.2628
	0.50	0.71	0.2602
	1.00	1.00	0.2585
	1.50	1.22	0.2577
	2.00	1.41	0.2571
	4.0	2.00	0.2560
	6.0	2.45	0.2555
	10.0	3.16	0.2549
	16.0	4.00	0.2543
	30		0.2537
	60		0.2530
	120		0.2523
	240		0.2516
	480		0.2508
	960		0.2502
	1408		0.2499



do = 0.2712

d90 = ____ t90 = ____ min

d100 = 0.2505

df = 0.2499

square root

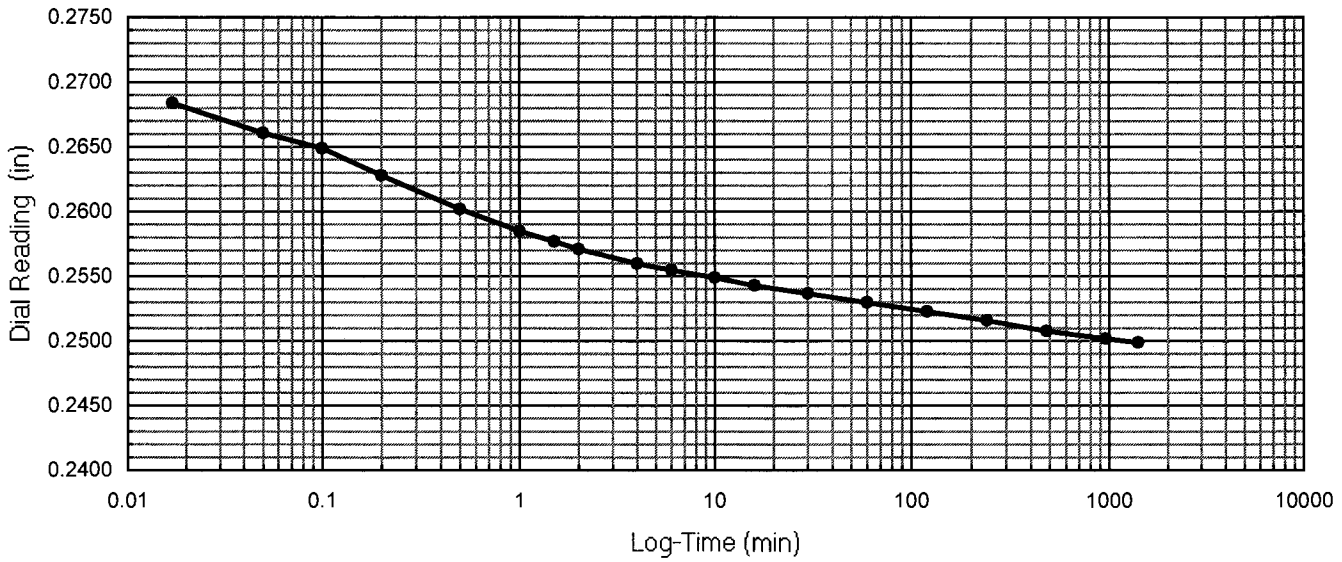
d50 = ____

t50 = ____ min

log time

d50 = 0.2609

t50 = 0.5 min



One-Dimensional Oedometer Testing Increment

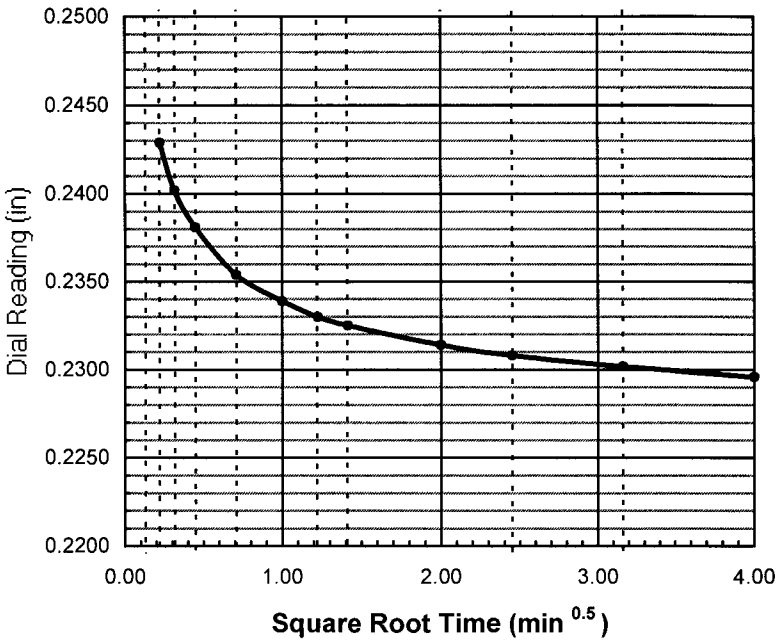
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C10 | Stage Number: 9 | Curves by: TJO

Boring No.: R-11-002 | Sample No.: 6 | Depth (ft.) 16.5

Date: 18-Feb-11 | Load (psf): 41234 | Zero Reading: 0.3701

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:43:22	0	0.00	0.2499
	0.05	0.22	0.2429
	0.05	0.22	0.2429
	0.10	0.32	0.2402
	0.20	0.45	0.2381
	0.50	0.71	0.2354
	1.00	1.00	0.2339
	1.50	1.22	0.2330
	2.00	1.41	0.2325
	4.0	2.00	0.2314
	6.0	2.45	0.2308
	10.0	3.16	0.2302
	16.0	4.00	0.2296
	30		0.2289
	60		0.2282
	120		0.2275
	240		0.2266
	480		0.2260
	960		0.2253
	1530		0.2250



do = 0.2467

d90 = ____ t90 = ____ min

d100 = 0.2260

df = 0.2250

square root

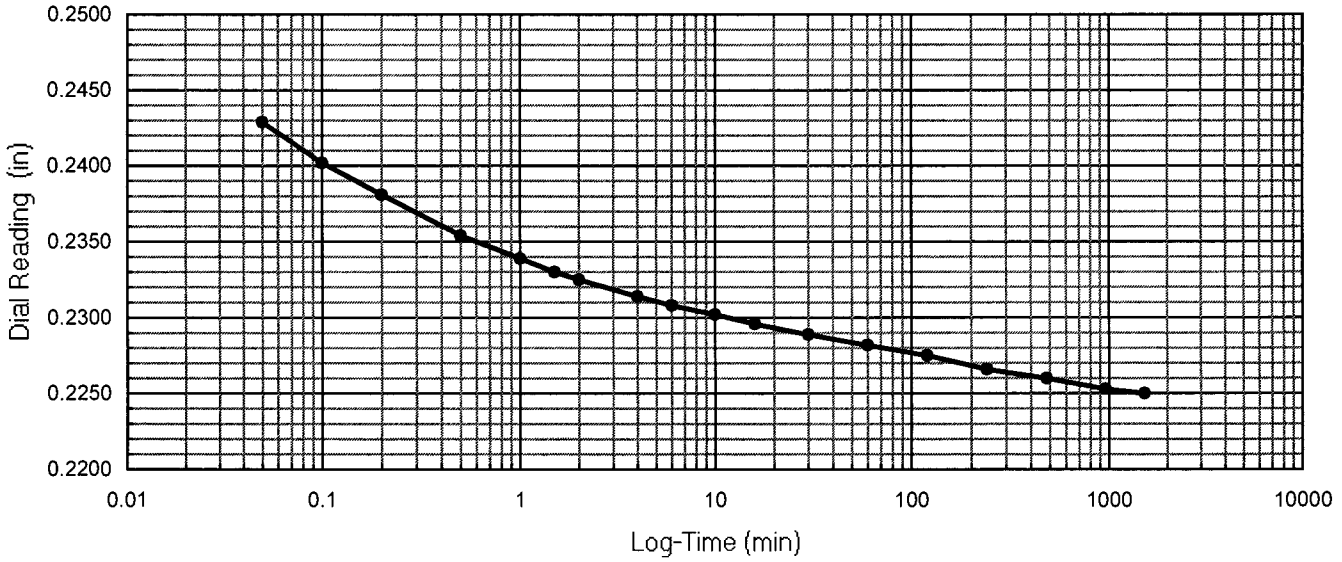
d50 = ____

t50 = ____ min

log time

d50 = 0.2363

t50 = 0.5 min



One-Dimensional Oedometer Testing Increment

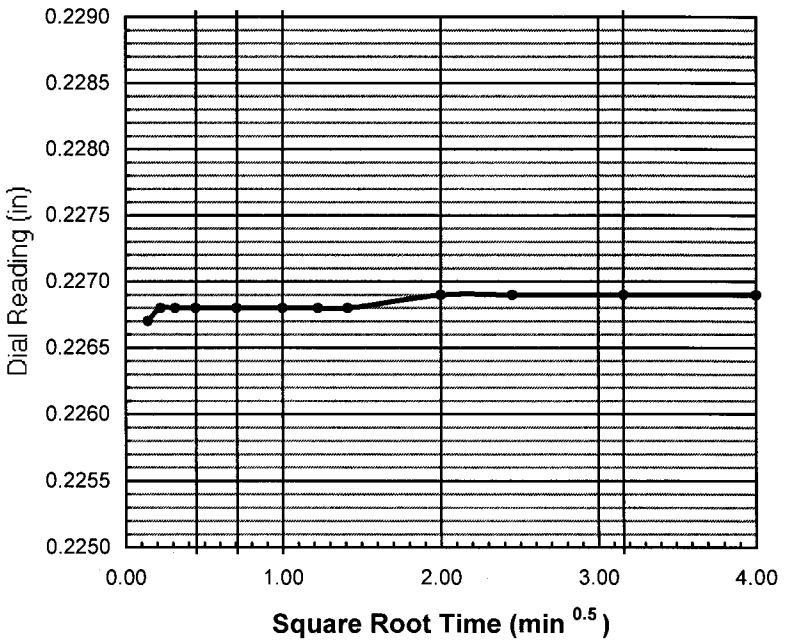
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C10 | Stage Number: 10 | Curves by: TJO

Boring No.: R-11-002 | Sample No.: 6 | Depth (ft.) 16.5

Date: 19-Feb-11 | Load (psf): 20804 | Zero Reading: 0.3701

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:14:34	0	0.00	0.2250
	0.02	0.14	0.2267
	0.05	0.22	0.2268
	0.10	0.32	0.2268
	0.20	0.45	0.2268
	0.50	0.71	0.2268
	1.00	1.00	0.2268
	1.50	1.22	0.2268
	2.00	1.41	0.2268
	4.0	2.00	0.2269
	6.0	2.45	0.2269
	10.0	3.16	0.2269
	16.0	4.00	0.2269
	30		0.2269
	60		0.2269
	120		0.2269
	240		0.2270
	400		0.2270



do = 0.2267

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2270

square root

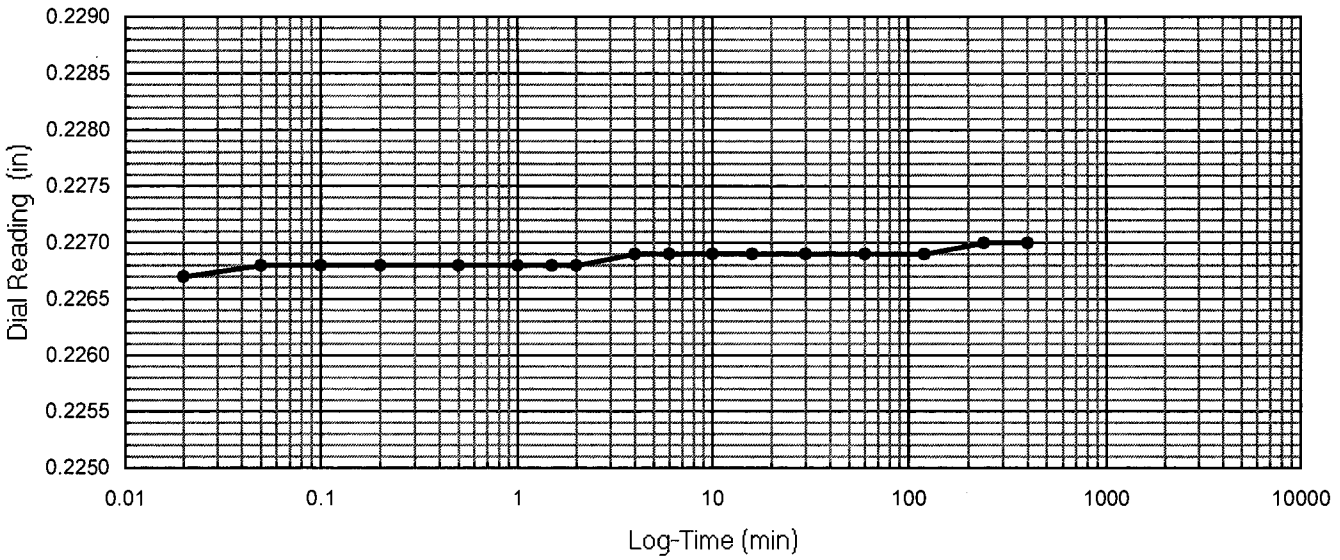
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

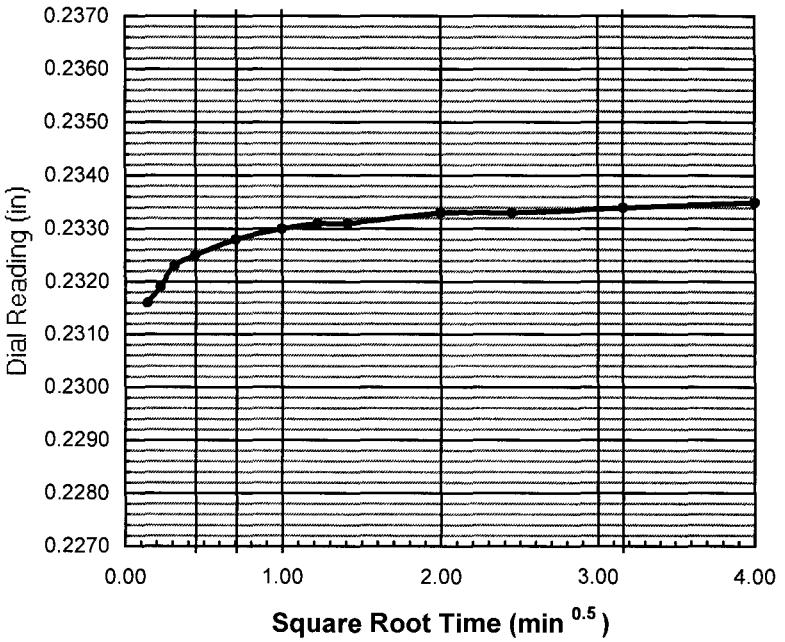
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C10 | Stage Number: 11 | Curves by: TJO

Boring No.: R-11-002 | Sample No.: 6 | Depth (ft.) 16.5

Date: 19-Feb-11 | Load (psf): 5481 | Zero Reading: 0.3701

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
16:55:28	0	0.00	0.2270
	0.02	0.14	0.2316
	0.05	0.22	0.2319
	0.10	0.32	0.2323
	0.20	0.45	0.2325
	0.50	0.71	0.2328
	1.00	1.00	0.2330
	1.50	1.22	0.2331
	2.00	1.41	0.2331
	4.0	2.00	0.2333
	6.0	2.45	0.2333
	10.0	3.16	0.2334
	16.0	4.00	0.2335
	30		0.2336
	60		0.2336
	120		0.2337
	240		0.2338
	480		0.2339
	1060		0.2340



do = 0.2312

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2340

square root

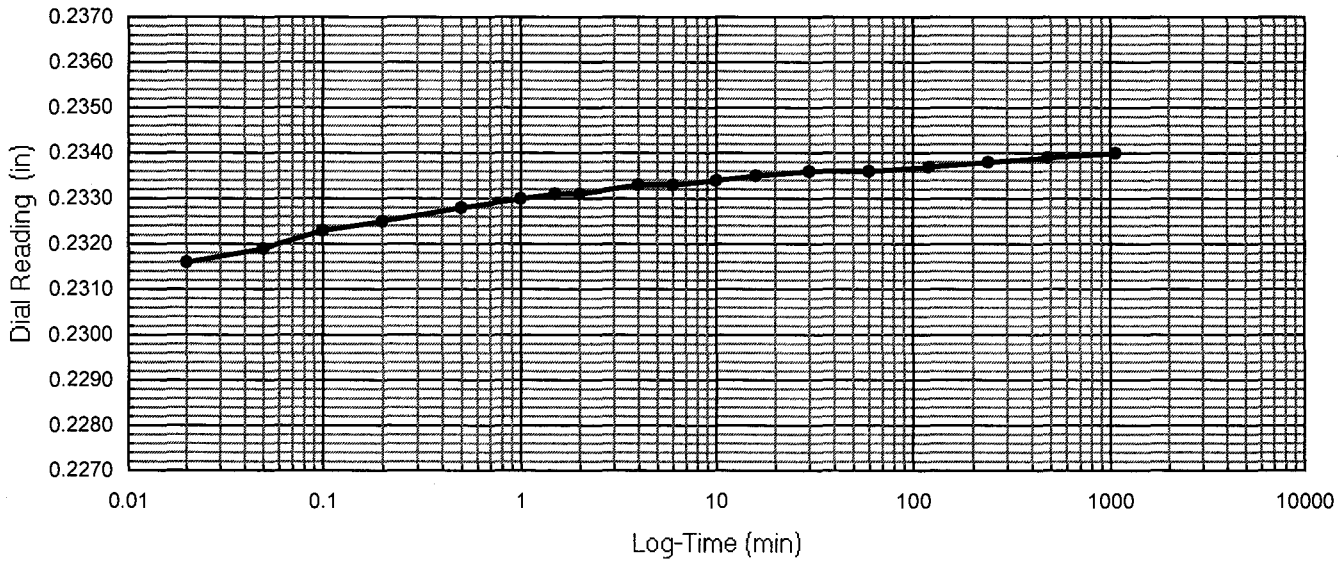
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

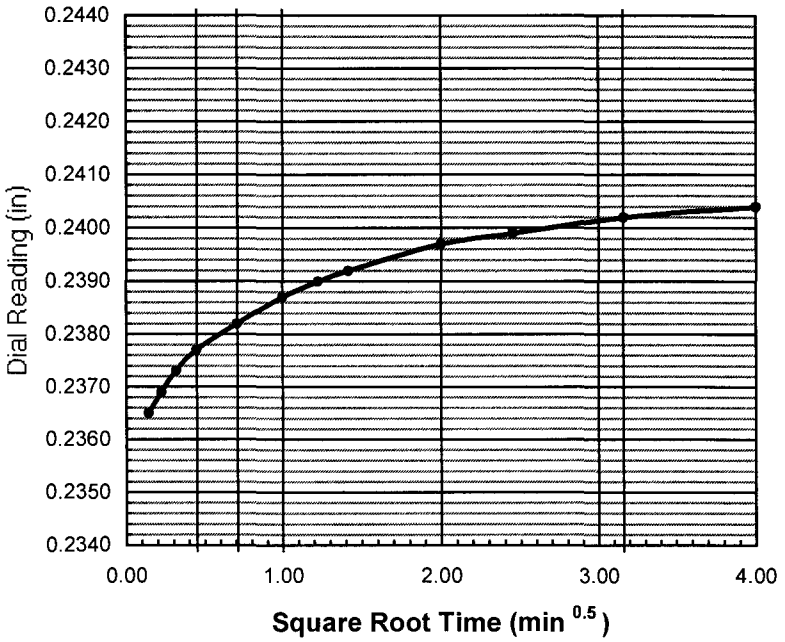
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C10 | Stage Number: 12 | Curves by: TJO

Boring No.: R-11-002 | Sample No.: 6 | Depth (ft.) 16.5

Date: 20-Feb-11 | Load (psf): 1340 | Zero Reading: 0.3701

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:37:13	0	0.00	0.2340
	0.02	0.14	0.2365
	0.05	0.22	0.2369
	0.10	0.32	0.2373
	0.20	0.45	0.2377
	0.50	0.71	0.2382
	1.00	1.00	0.2387
	1.50	1.22	0.2390
	2.00	1.41	0.2392
	4.0	2.00	0.2397
	6.0	2.45	0.2399
	10.0	3.16	0.2402
	16.0	4.00	0.2404
	30		0.2406
	60		0.2409
	120		0.2411
	240		0.2413
	480		0.2414
	980		0.2417
	1440		0.2419
	2740		0.2421



do = 0.2359

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2421

square root

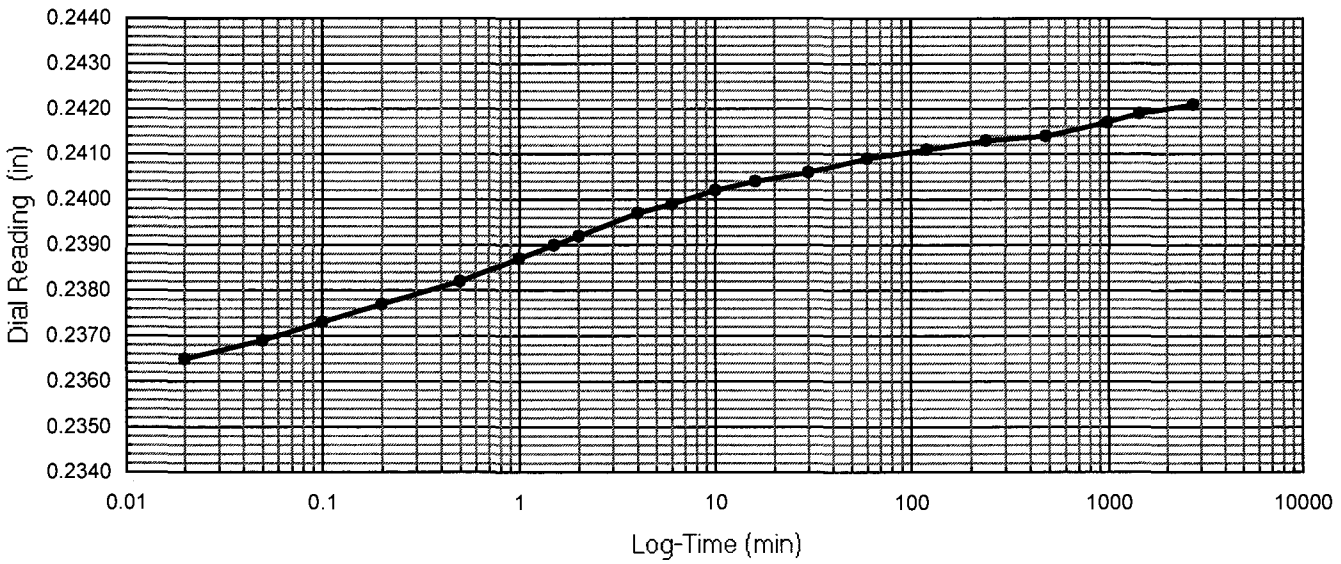
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

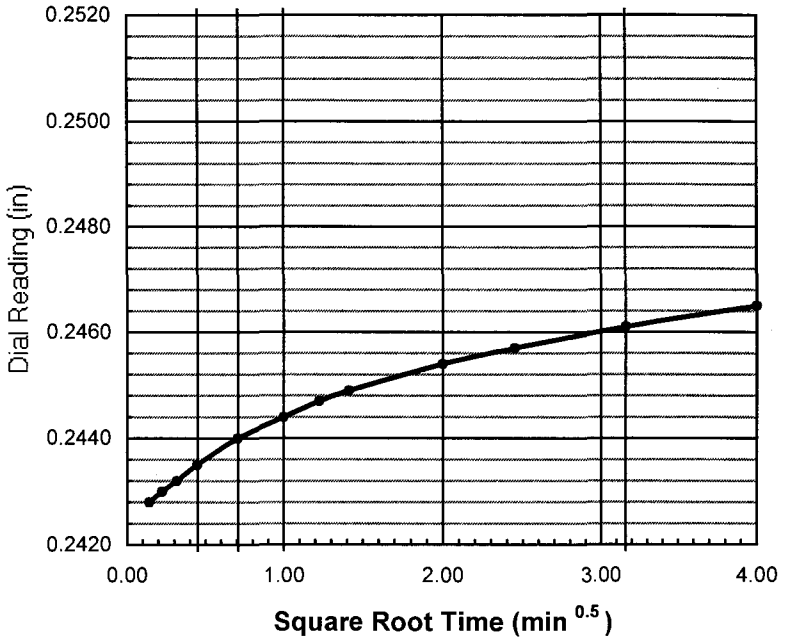
for ASTM D2435, method B

Project Number: 30989830 Apparatus No.: C10 Stage Number: 13 Curves by: TJO

Boring No.: R-11-002 Sample No.: 6 Depth (ft.) 16.5

Date: 22-Feb-11 Load (psf): 305 Zero Reading: 0.3701

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:17:50	0	0.00	0.2421
	0.02	0.14	0.2428
	0.05	0.22	0.2430
	0.10	0.32	0.2432
	0.20	0.45	0.2435
	0.50	0.71	0.2440
	1.00	1.00	0.2444
	1.50	1.22	0.2447
	2.00	1.41	0.2449
	4.0	2.00	0.2454
	6.0	2.45	0.2457
	10.0	3.16	0.2461
	16.0	4.00	0.2465
	30		0.2469
	60		0.2475
	120		0.2479
	240		0.2485
	480		0.2489
	980		0.2494
	1800		0.2499
	3467		0.2503
	4332		0.2504



do = 0.2423

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2504

square root

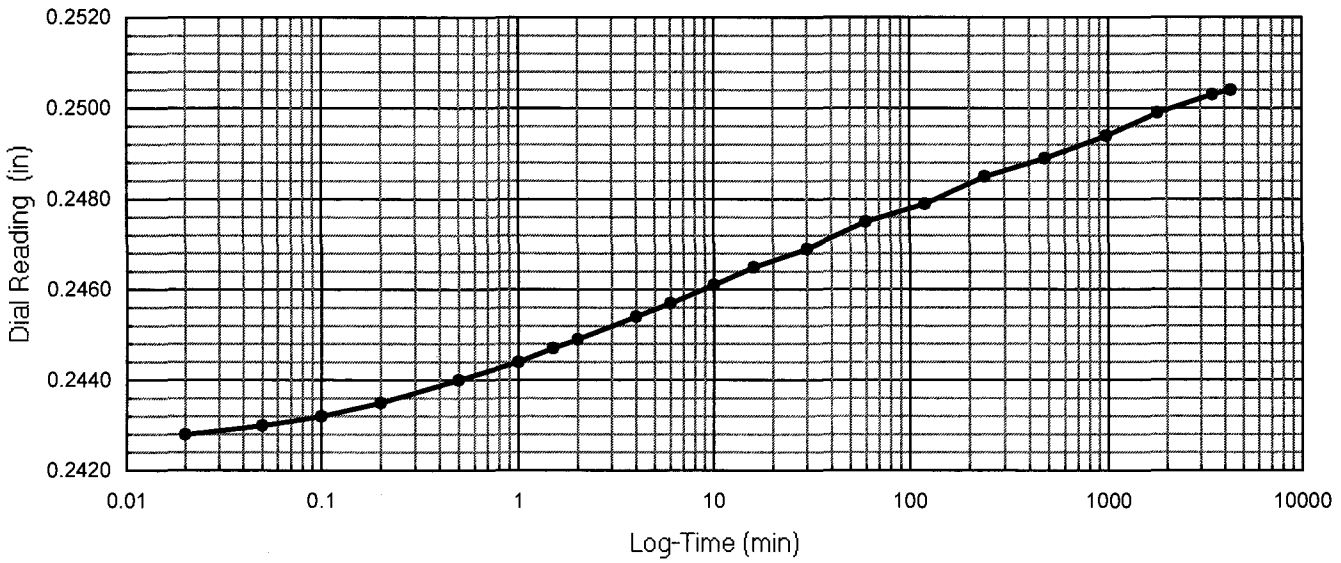
d50 = _____

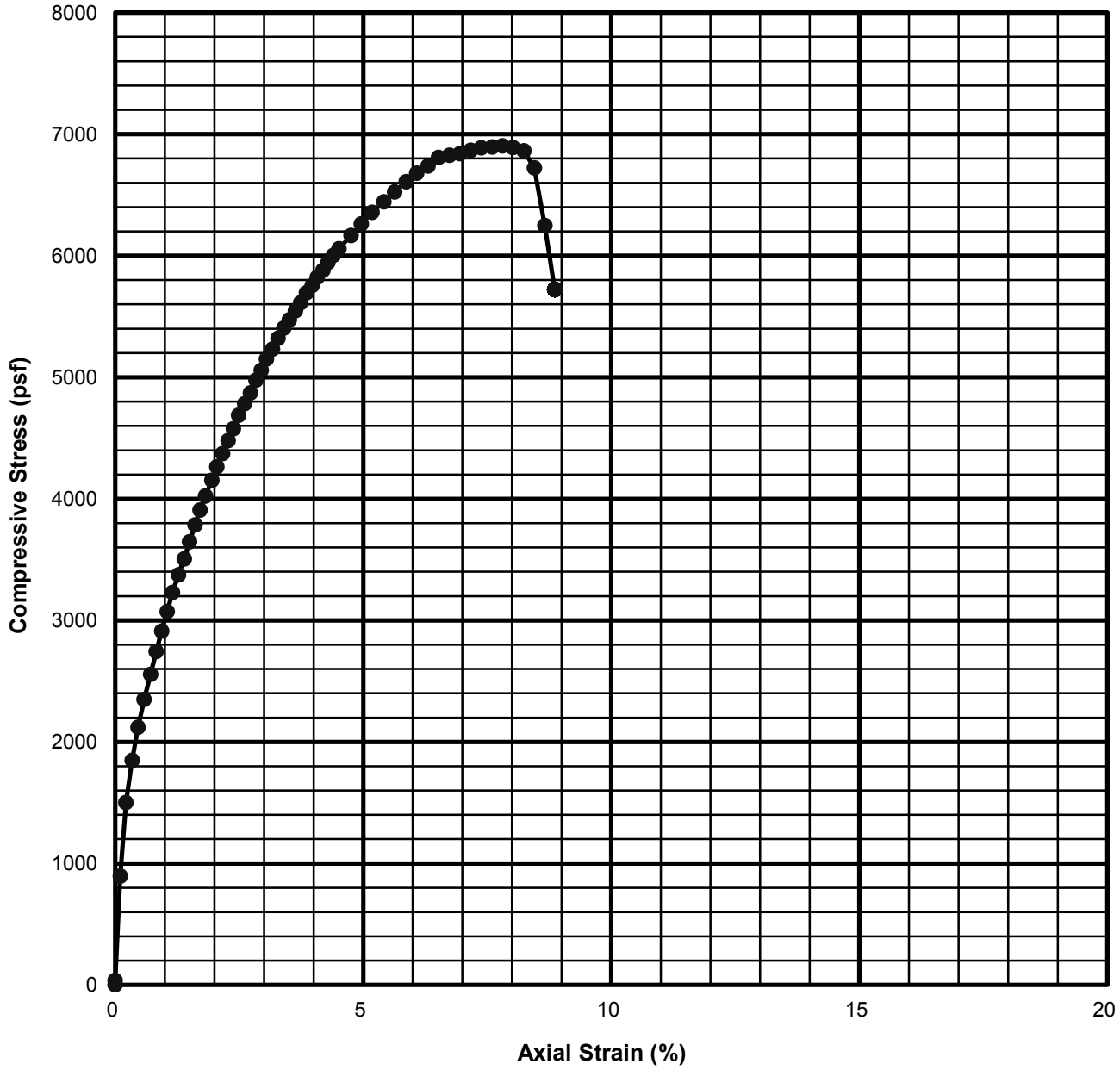
t50 = _____ min

log time

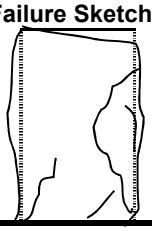
d50 = _____

t50 = _____ min





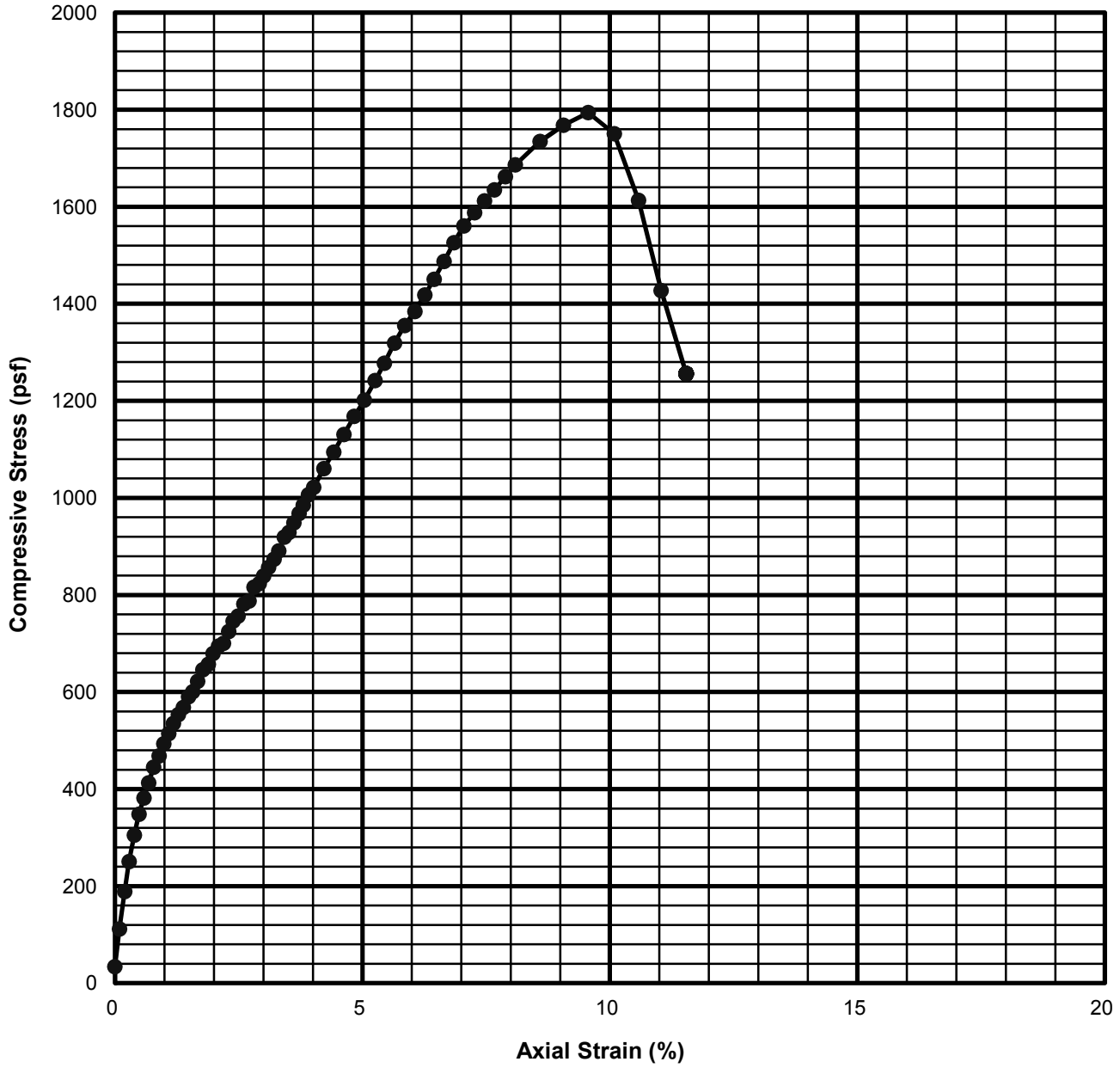
Failure Sketch



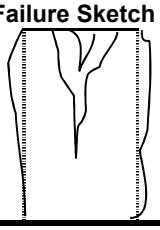
Water Content (%)	Length (in)	Diameter (in)	Wet Density (pcf)	Degree of Saturation (%)	Peak Stress (psf)
31.5	4.793	2.406	119.5	94.2	6904.6

Project Name:	**I-5 Widening Segment 3**				
Project Number:	**30989830**				
Boring Number:	**R-11-001**	**Sample No.:**	**2**	**Depth (ft):**	**6.5**
Description and/or Classification:	**Light olive brown Clay (CL)**				

UNCONFINED COMPRESSION TEST
ASTM D2166



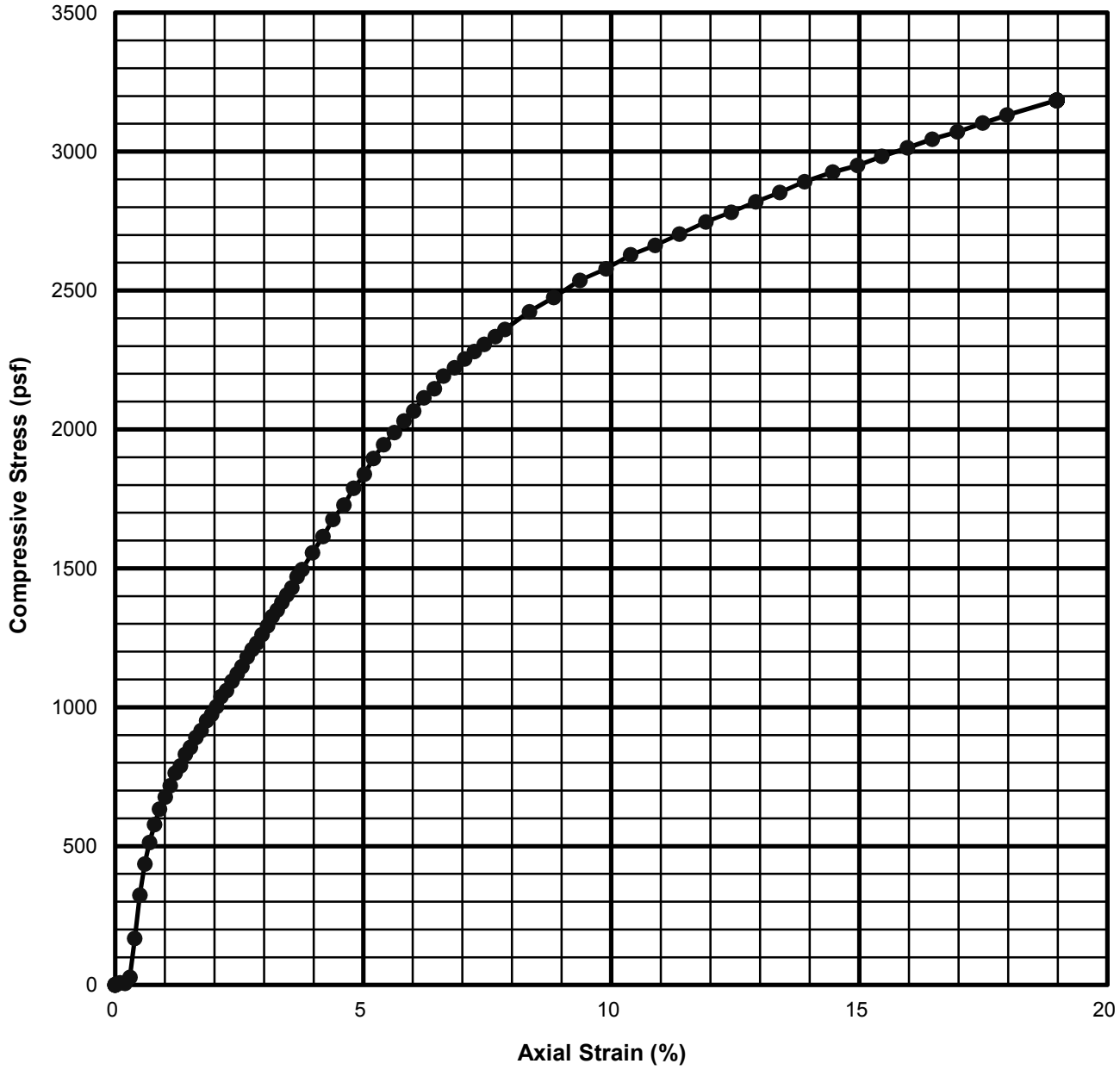
Failure Sketch



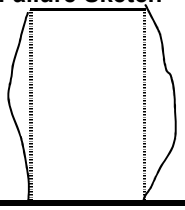
Water Content (%)	Length (in)	Diameter (in)	Wet Density (pcf)	Degree of Saturation (%)	Peak Stress (psf)
26.4	4.999	2.400	121.6	89.4	1794.0

Project Name:	**I-5 Widening Segment 3**				
Project Number:	**30989830**				
Boring Number:	**R-11-001**	**Sample No.:**	**7**	**Depth (ft):**	**25**
Description and/or Classification:	**Dark gray Clay (CL)**				

UNCONFINED COMPRESSION TEST
ASTM D2166



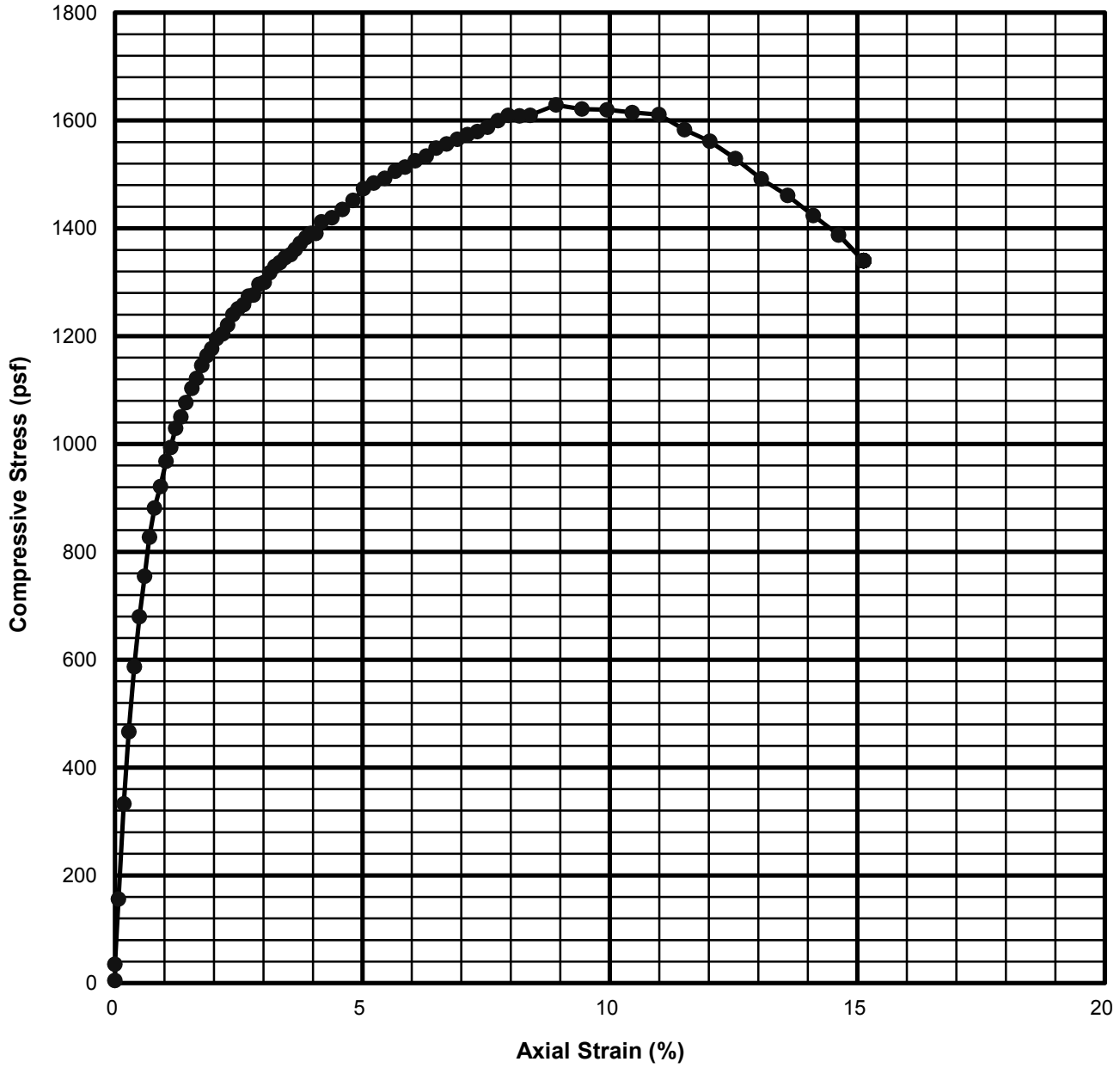
Failure Sketch



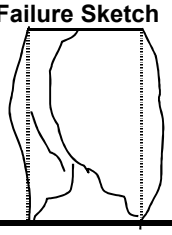
Water Content (%)	Length (in)	Diameter (in)	Wet Density (pcf)	Degree of Saturation (%)	Peak Stress @ 15% (psf)
29.3	4.988	2.407	121.4	94.0	2950.0

Project Name:	**I-5 Widening Segment 3**				
Project Number:	**30989830**				
Boring Number:	**R-11-001**	**Sample No.:**	**9**	**Depth (ft):**	**35**
Description and/or Classification:	**Olive gray Clay (CL)**				

UNCONFINED COMPRESSION TEST
ASTM D2166



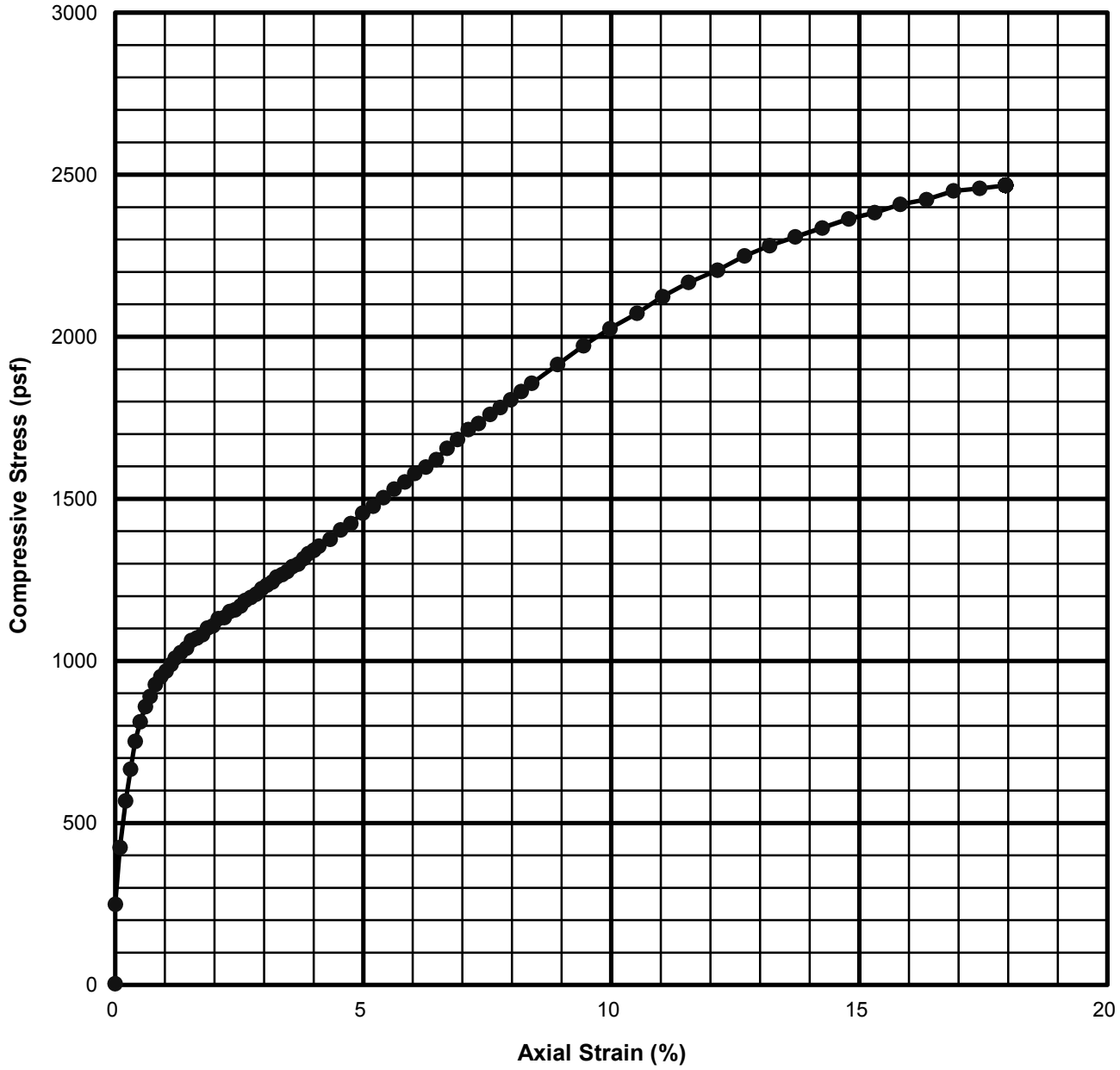
Failure Sketch



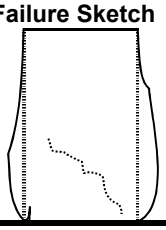
Water Content (%)	Length (in)	Diameter (in)	Wet Density (pcf)	Degree of Saturation (%)	Peak Stress (psf)
26.6	4.981	2.412	123.2	92.4	1628.7

Project Name:	**I-5 Widening Segment 3**				
Project Number:	**30989830**				
Boring Number:	**R-11-002**	**Sample No.:**	**4**	**Depth (ft):**	**11.5**
Description and/or Classification:	**Very dark grayish brown Clay (CL)**				

UNCONFINED COMPRESSION TEST
ASTM D2166



Failure Sketch



Water Content (%)	Length (in)	Diameter (in)	Wet Density (pcf)	Degree of Saturation (%)	Peak Stress (psf)
32.3	4.989	2.405	119.3	95.1	2467.3

Project Name:	**I-5 Widening Segment 3**				
Project Number:	**30989830**				
Boring Number:	**R-11-002**	**Sample No.:**	**8**	**Depth (ft):**	**25**
Description and/or Classification:	**Olive brown Clay (CH)**				

UNCONFINED COMPRESSION TEST
ASTM D2166

FOUNDATION REPORT
for
Retaining Wall 96

Memorandum

To : **MR. MOHAMMAD RAVANIPOUR**
Senior Bridge Supervisor
DES Structure Design, Branch 19
Office of Bridge Design South 2
21073 Pathfinder Rd., Suite 200
Diamond Bar, CA 91765

Date: November 9, 2011

File: 12-ORA-5/74
PM 0.01
Project ID 00000102
EA 12-0E3101
Retaining Wall No. 96

Attn. : Chuck Lomicka, P.E.
Project Engineer

From : **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
METS-Geotechnical Services
Office of Geotechnical Design – South 1

Subject : Foundation Report for Retaining Walls No. 96

INTRODUCTION

The proposed project includes widening of three ramps, a re-aligned I-5 NB off-ramp to SR-74 and a new NB loop on-ramp from EB SR74. As part of the project, non-standard retaining wall (RW 96) was proposed. A proposed retaining wall no. 96 is located on the eastside edge of I-5 southbound off ramp and parallel to RW 83, which is located on the westside edge of I-5 southbound off ramp. Wall design requirements or data including the maximum wall heights, the wall lengths, and the maximum fill heights for these walls lengths as provided by your Office are reproduced in Table 1 – Wall Information below.

TABLE 1 – INFORMATION ON RW 96

RW Type	Location	Station				Max Wall Height (ft)	Length (ft)	Max height over the existing grade (ft)
		From		To				
		Stationing	Reference line	Stationing	Reference line			
Type 1	I-5 SB off ramp (Eastside)	5+03.73	D	9+16.34	D	16	412' – 7 $^{3}/_{8}$"	10

SUBSURFACE CONDITIONS

The project areas of RW 96 consist of various thickness of fill over alluvium, which in turn is underlain by Capistrano Formation bedrock.

The depth of the artificial fill soils at the location of the borings ranges from about 12 to 18 feet. The fill soils at the site are comprised mainly of medium to stiff lean clay (CL) and clayey sand (SC) with sand and gravel, and medium dense clayey gravel (GC). The Liquid Limit (LL) and Plastic Limit (PL) of the samples of fill soils tested ranged from about 37 to 49 and 21 to 30, respectively. The fine content of these soils ranged from about 70 to 90 percent.

The alluvium at the site generally consists of medium to stiff lean clay (CL) and fat clay (CH) stiff clay/sandy clay (CL). Occasional layers of silty sand (SM) and clayed sand (SC) were encountered at borings locations drilled.

GROUNDWATER CONDITIONS

Depths to groundwater were measured about an hour after the withdrawal of CPT cones (CPT-10-011, CPT-10-012, and CPT-10-026). Based on these data, depths to groundwater along RW 96 varied from about 15 to 25 feet below existing ground surface at the exploration locations.

The results of these investigations indicate that groundwater elevation is likely to range from about 110 feet at RW 96. During construction, some variations in the depths to the static groundwater should be expected due to the clayey nature of the soil, topography, seasonal variations, and adjacent construction or other water recharge/discharge activities. Perched water may be encountered at isolated locations.

DESIGN SOIL PARAMETERS

Relevant soil parameters were evaluated for use in the design of the subject walls. Table 2 presents the general subsurface properties used for the geotechnical analyses.

TABLE 2 – SUMMARY OF ENGINEERING SOIL PROPERTIES

Refer. Line	Begin station	End Station	Ref. Boring Nos.	Approx. Boring Surface Elev. (ft)	Boring depth (ft)	Soil description	Groundwater Elev. (ft)	Effective Friction angle, ϕ	Undrained shear strength, C (psf)
D	5+03.73	9+16.34	R-10-010 CPT-10-026 CPT-10-012 CPT-10-011	N/A 133.53 122.27 130.62	17.0 54.5 44.1 46.6	Silty Clay (CL)	110.0	N/A	1000

The medium to stiff clayey soils (CL and CH) at the site exhibited a relatively high compressibility. Based on the consolidation tests performed on representative samples of these soils, the compression (C_c) ranged from 0.14 to 0.2. The mean value of the coefficient of consolidation (C_v) of these soils

was estimated to be about 0.3 ft^2/day. Please look at the appendices of FR of RW 83 for more laboratory test results.

RETAINING WALL DESIGN RECOMMENDATIONS

Subsurface soil conditions at the RW 96 retaining wall locations consist of thick compressible clay soils. Within the thick compressible clay soils, settlements (elastic and consolidation) beyond criteria would occur due to the placement of embankment fill and wall footing of RW 96. In order to ignore the settlements occurring by additional loadings, we recommend that geofoam be used rather than normal structure backfill for the fill above the existing grade, and also a few feet of existing soils below the footings be removed and replaced with compacted structure backfill.

Due to the presence of relatively weak and compressible foundation soils, soil bearing resistance is a also major concern at the sites of RW 96. In general, the foundation soil settlement / bearing resistance shortage can be mostly eliminated if a few feet of existing soils are excavated and replaced with compacted granular soils. As a minimum, we recommend that five (5) feet of soil below the footing be removed and replaced with compacted structure backfill for the higher wall height areas (stationing 5+03.73 to 7+43.73, or wall height of 10 to 16 ft), and 3 feet be for the lower wall height areas (stationing 7+43.73 to 9+16.34, or wall height of 6 to 8 ft).

The structure backfill materials below the footing should be well compacted, and conform to the gradation of the earthwork of Standard Specifications (2006).

TABLE 3 - FOUNDATION DESIGN RECOMMENDATIONS FOR SPREAD FOOTING*

Stationing	Wall Height (ft)	Footing size (ft)		Bottom of Footing Elevation	Minimum Footing Embedment Depth (ft)	LRFD Limit State		
						Service	Strength φ= 0.5	Extreme Event φ = 1.0
		B	L			Permissible Net Contact Stress (ksf)	Factored Gross Nominal Bearing Resistance (ksf)	Factored Gross Nominal Bearing Resistance (ksf)
5+03.73 to 5+75.73	16	14’-6”	1	126.52	2	2.2	2.6	5.0
5+75.73 to 6+23.73	12	10’-6”	1	128.85	2	3.6	5.6	11.0
6+23.73 to 7+43.73	10	8’-6”	1	127.93	2	3.6	5.6	11.0
7+43.73 to 8+39.73	8	7’-6”	1	125.68	2	3.3	2.6	5.0
8+39.73 to 8+66.13	6	7’-0”	1	123.43	2	3.2	2.6	5.0
8+66.13 to 9+16.34	6	7’-0”	1	123.43	2	3.6	2.6	5.0

*Note: the above recommendation table is based on removal and replacement of in-situ subsurface / foundation soils below the footing with engineered fill consists of granular soils as follows: 5 feet as replacement depth for wall height (16, 12, 10) and 3 feet as replacement depth for wall height (8, 6, 6).

CONSTRUCTION CONSIDERATIONS

1. Earthwork should be performed in accordance with Section 19 of the Caltrans Standard Specifications (2006).
2. We recommend RW 83 foundation construction be completed prior to RW 96 due to ground vibration during pile installation.
3. Groundwater is present at the site at relatively shallow depths. Due to seasonal rainfall and fluctuating groundwater elevations, there is the high potential for perched groundwater and groundwater to be encountered in excavations and/or pile holes. The Contractor should anticipate this condition.
4. Care must be exercised not to damage geofoam during transport, storing and installation.

If you have any questions or comments, please call Jongkoo Jeon at (916) 227-5389, or Mohammed Islam at (916) 227-0993.

Prepared by: Date: 11/09/2011

Jongkoo Jeon, Ph.D., P.E.
Transportation Engineer
Office of Geotechnical Design – South 1

Attachments
Figure 1
Appendices A, B

CC: OGDS1- LA
Nooshin Yoosefi, D12 Project Manager
Mark Williams, GS Corporate
DES Office Engineer, Office of PS&E
Farhad Hadjibabaie, D12 Material Engineer
Structure Construction R.E. Pending file

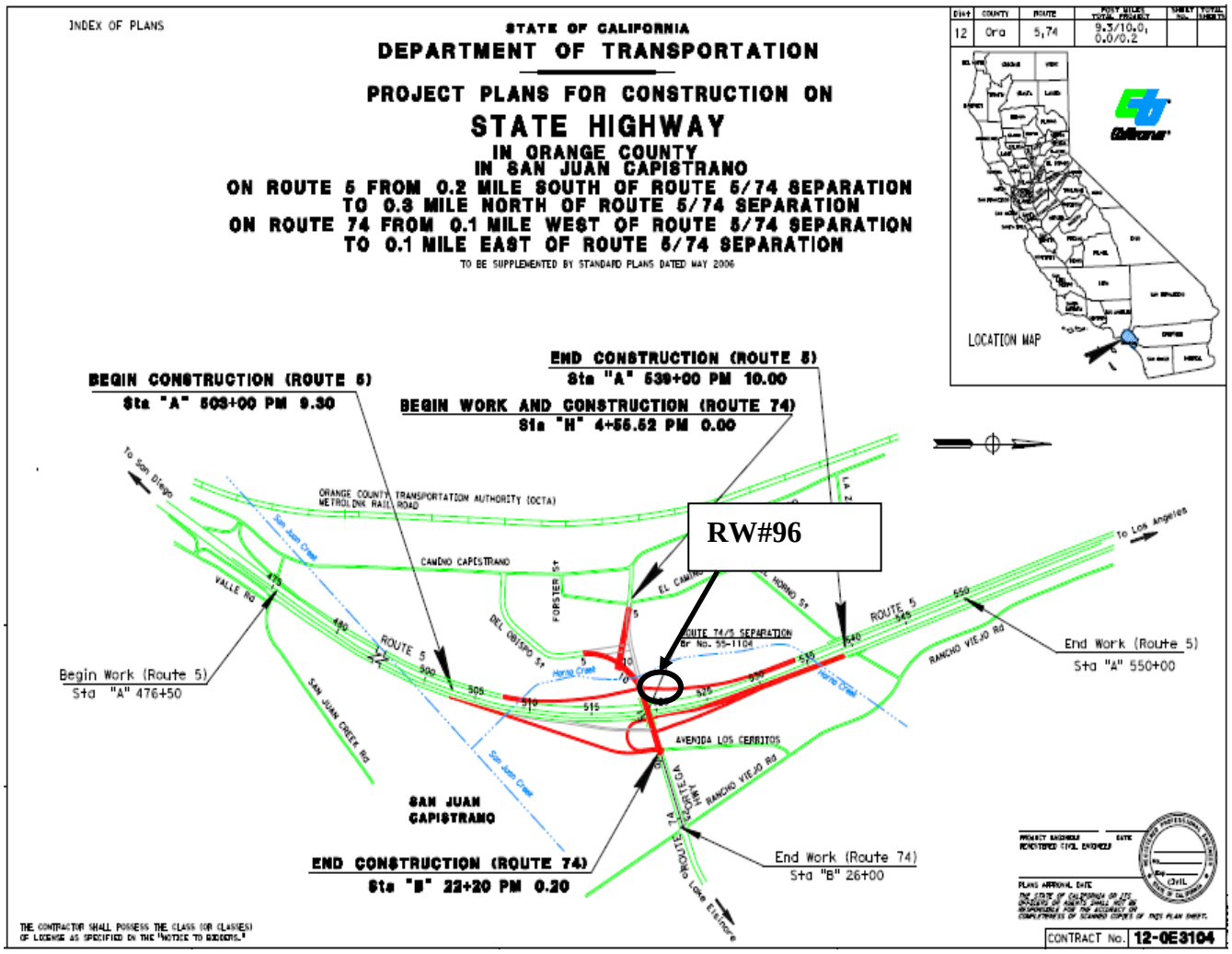


Figure 1. Proposed Retaining Wall 96 Location

APPENDIX A

Retaining Wall 96

Figure A-1 General plan

Figure A-2 Foundation plan

Figure A-3 Typical section of wall

STANDARD PLANS DATED MAY 2006

A10A	ACRONYMS AND ABBREVIATIONS (SHEET 1 OF 2)
A10B	ACRONYMS AND ABBREVIATIONS (SHEET 2 OF 2)
A10C	SYMBOLS (SHEETS 1 OF 2))
A10D	SYMBOLS (SHEETS 2 OF 2))
A62B	LIMITS OF PAYMENT FOR EXCAVATION AND BACKFILL- BRIDGE SURCHARGE AND WALL.
B0-3	BRIDGE DETAILS
B3-8	RETAINING WALL DETAILS NO. 1
B3-9	RETAINING WALL DETAILS NO. 2
B11-60	CONCRETE BARRIER TYPE 80 (SHEET I OF 2)
B11-61	CONCRETE BARRIER TYPE 80 (SHEET 2 OF 2)

INDEX TO PLANS

NO. SHEET NAME
1. GENERAL PLAN
2. FOUNDATION PLAN
3. TYPICAL SECTIONS
4. RETAINING WALL DETAIL
5. ARCHITECTURAL TREATMENT DETAILS
6. LOG OF TEST BORINGS 1 OF 2
7. LOG OF TEST BORINGS 2 OF 2

P & Q

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
12	ORA	5			

REGISTERED CIVIL ENGINEER X DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER CHARLES LOMICKA No. C 71172 Exp. 06/30/13 CIVIL STATE OF CALIFORNIA

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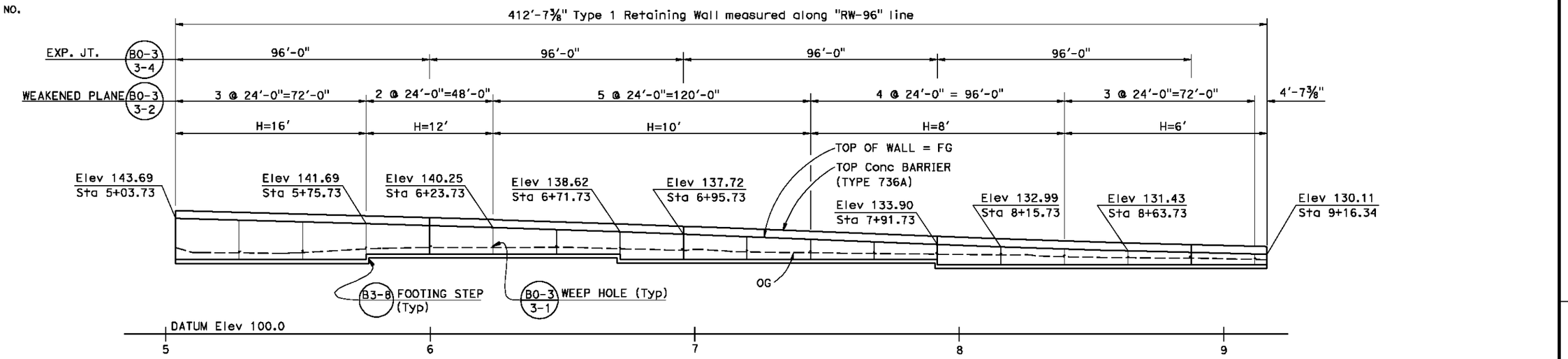
STANDARD PLAN SHEET NO.

DETAIL NO.

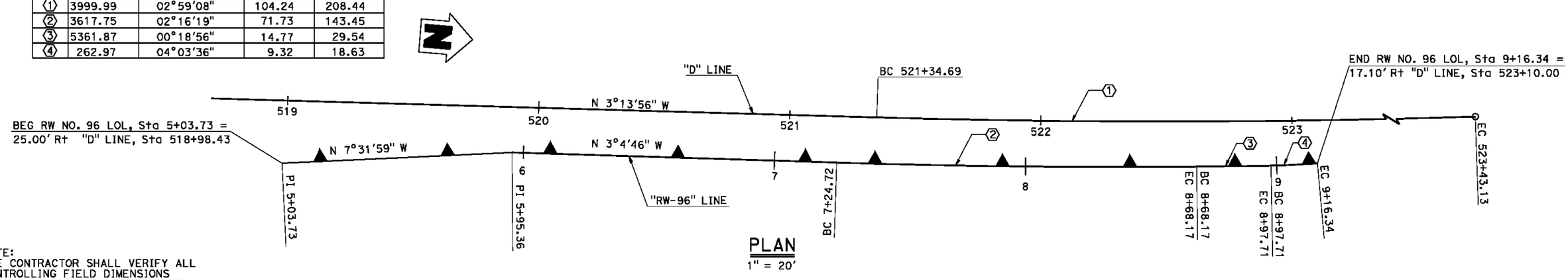


ELEVATION

1" = 20'

CURVE DATA

No.	R	Δ	T	L
1	3999.99	02°59'08"	104.24	208.44
2	3617.75	02°16'19"	71.73	143.45
3	5361.87	00°18'56"	14.77	29.54
4	262.97	04°03'36"	9.32	18.63



PLAN

1" = 20'

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

Figure A-1

MOHAMMAD RAVANIPOUR, DESIGN ENGINEER	DESIGN	BY RUI WANG	CHECKED MAMUNUR RAHMAN	LOAD & RESISTANCE FACTOR DESIGN — LIVE LOADING: HL-93 W/"LOW-BOY"; PERMIT DESIGN VEHICLE
	DETAILS	BY HENGAMEH MAHBOOBI	CHECKED MAMUNUR RAHMAN	LAYOUT — BY RUI WANG — CHECKED MAMUNUR RAHMAN
	QUANTITIES	BY EDWARD MERCADO	CHECKED HTOON WIN	SPECIFICATIONS — BY X — PLANS AND SPECS COMPARED X

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DIVISION OF ENGINEERING SERVICES
STRUCTURE DESIGN
DESIGN BRANCH 19

BRIDGE NO. 55E 0121
POST MILE 9.6

RETAINING WALL NO. 96
GENERAL PLAN

UNIT: 3621
PROJECT NUMBER & PHASE: 1200000102 1
CONTRACT NO.: 0E3101

DISREGARD PRINTS BEARING EARLIER REVISION DATES
REVISION DATES 07-01-11 07-14-11 07-18-11 07-21-11

SHEET 1 OF 7

USERNAME => s120514 DATE PLOTTED => 21-JUL-2011 TIME PLOTTED => 15:15

STRUCTURES DESIGN GENERAL PLAN SHEET (ENGLISH) (REV.09-01-10)

FILE => 01-RW96-a-gp01.dgn

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
12	ORA	05			

REGISTERED CIVIL ENGINEER X DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER CHARLES LOMICKA No. C 71172 Exp. 06/30/13 CIVIL STATE OF CALIFORNIA

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P & Q

① Sta 12+80.00, "B" LINE, ℄ ROUTE 74 =
Sta 518+20.90, "D" LINE, SB OFF-RAMP

CURVE DATA				
No.	R	Δ	T	L
Ⓐ	480.00	76°10'36"	376.21	638.17
Ⓑ	3999.99	02°59'08"	104.24	208.44
Ⓒ	3617.75	02°16'19"	71.73	143.45
Ⓓ	5361.87	00°18'56"	14.77	29.54
Ⓔ	262.97	04°03'36"	9.32	18.63

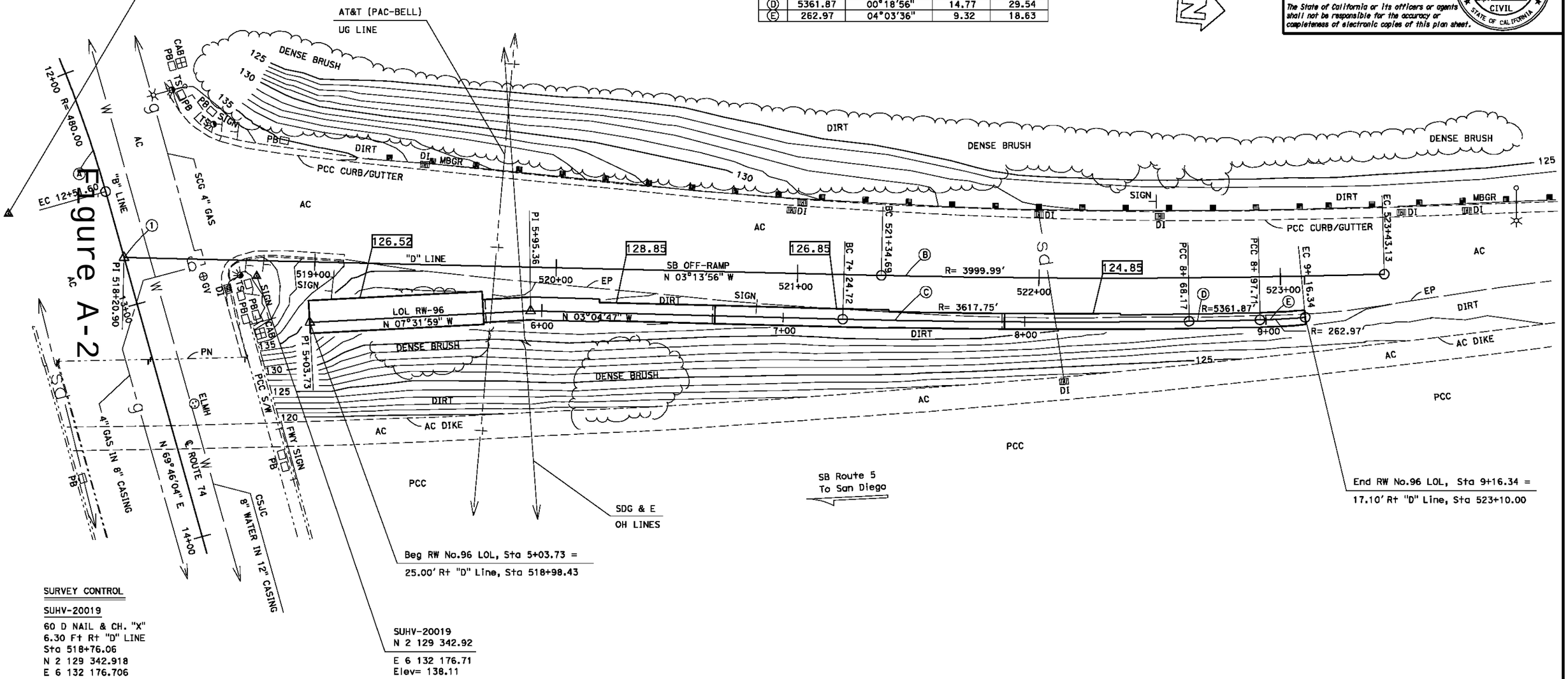

Figure A-2

SURVEY CONTROL

SUHV-20019

60 D NAIL & CH. "X"
6.30 Ft Rt "D" LINE
Sta 518+76.06
N 2 129 342.918
E 6 132 176.706
Elev= 138.11

SUHV-20026

60 D NAIL
41.26 Ft Rt "B" LINE
Sta 12+49.30
N 2 129 238.277
E 6 132 159.184
Elev= 137.41

NOTES:

1. Underground Utilities as shown are approximate
2. XX.XX Indicates Bottom of Footing Elevation

PRELIMINARY INVESTIGATION SECTION

SCALE	VERT.DATUM NAVD88	PHOTOGRAMMETRY AS OF: X			
1"=20'	HORZ.DATUM NAD83 (1991.35)	SURVEYED	BY DISTRICT 12	CHECKED	BY T.PHUNG 06/2011
ALIGNMENT TIES Dist. Traverse Sheet		DRAFTED	BY V.PHAM 06/2011	CHECKED	BY S.ALIVIO 06/2011

STRUCTURES FOUNDATION PLAN SHEET (ENGLISH) (REV. 09-01-10)

	BY	CHECKED
DESIGN	RUI WANG	MAMUNUR RAHMAN
DETAILS	HENGAMEH MAHBOOBI	MAMUNUR RAHMAN
QUANTITIES	EDWARD MERCADO	HTOON WIN

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DIVISION OF ENGINEERING SERVICES
STRUCTURE DESIGN
DESIGN BRANCH 19

BRIDGE NO. 55E 0121
POST MILE 9.6

RETAINING WALL No.96
FOUNDATION PLAN

UNIT: 3647
PROJECT NUMBER & PHASE: 1200000102 1 CONTRACT NO.: 0E3101

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES 07-08-11 07-11-11 07-15-11 07-21-11

SHEET 2 OF 7

FILE => 02_RW96-e-fdp101.dgn

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
12	ORA	5			

REGISTERED CIVIL ENGINEER X DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER CHARLES LOMICKA No. C 711 72 Exp. 06/30/11 CIVIL STATE OF CALIFORNIA

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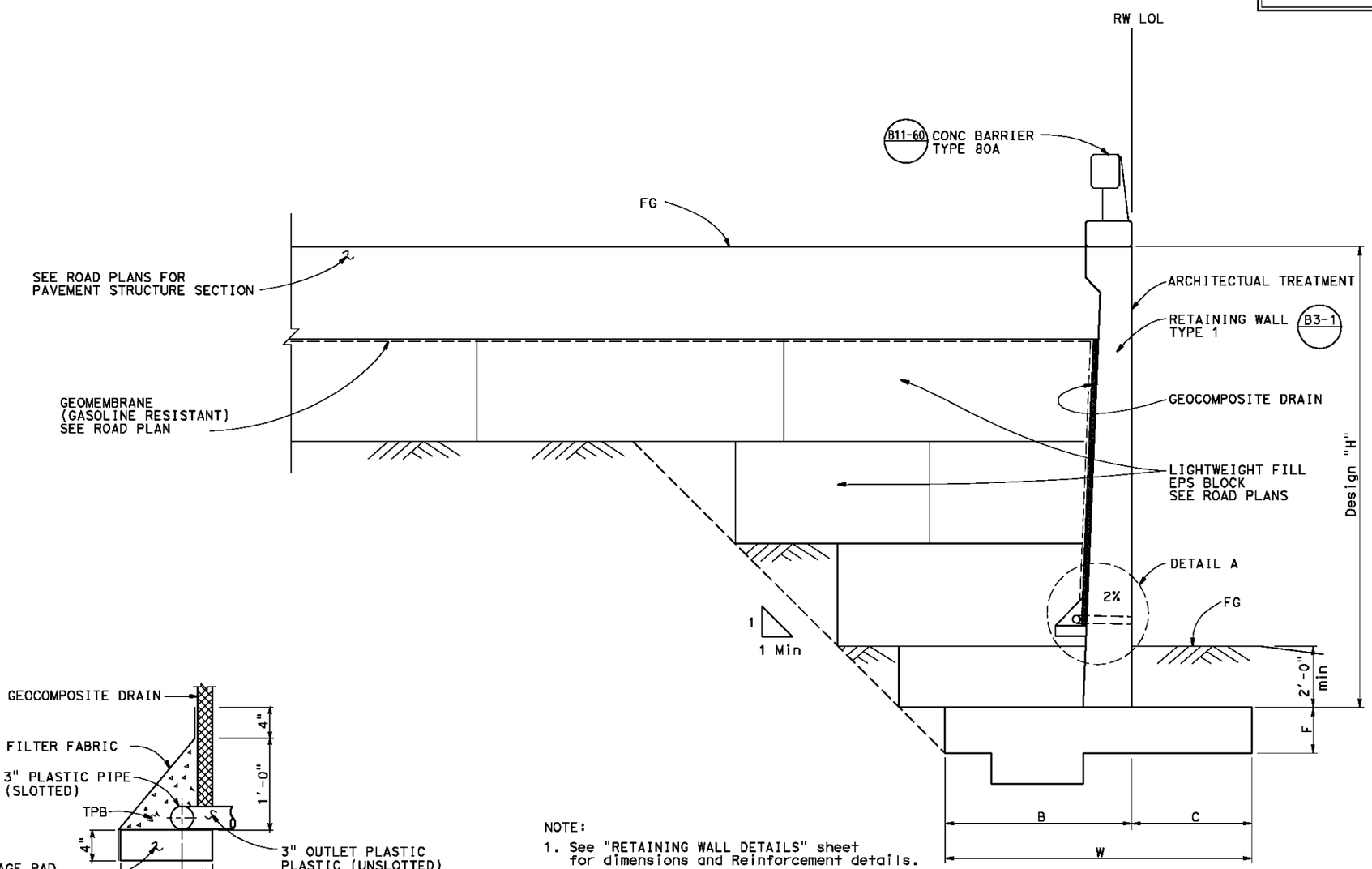
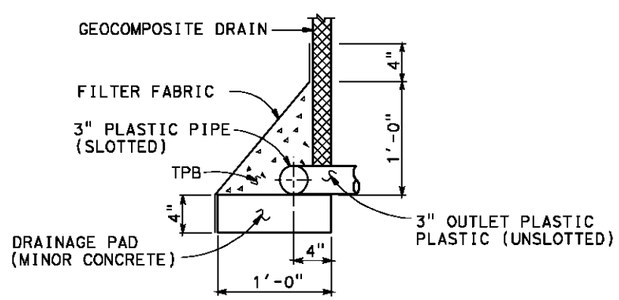
P & Q



NOTE:
1. See "RETAINING WALL DETAILS" sheet for dimensions and Reinforcement details.

TYPICAL SECTION
½"=1'-0"



DETAIL A
NO SCALE

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

Figure A-3

	BY	CHECKED
DESIGN	RUI WANG	MAMUNUR RAHMAN
DETAILS	HENGAMEH MAHBOOBI	MAMUNUR RAHMAN
QUANTITIES	EDWARD MERCADO	HTOON WIN

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DIVISION OF ENGINEERING SERVICES
STRUCTURE DESIGN
DESIGN BRANCH 19

BRIDGE NO. 55E 0121
POST MILE 9.6

RETAINING WALL NO. 96
TYPICAL SECTION

STRUCTURES DESIGN DETAIL SHEET (ENGLISH) (REV. 09-01-10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 3621
PROJECT NUMBER & PHASE: 1200000102 1 CONTRACT NO.: 0E3101

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES 07-01-11 07-11-11 07-15-11 07-21-11

SHEET 3 OF 7

FILE => 03-RW96-k-ta01.dgn

USERNAME => s120514 DATE PLOTTED => 21-JUL-2011 TIME PLOTTED => 15:15

APPENDIX B

Field Exploration

Boring/CPT Location Map

Boring Logs

CPT Logs

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	74			

REGISTERED GEOTECHNICAL ENGINEER — DATE July 2011

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — MICHAEL G. SMITH — No. 2229 — Exp. 3-31-2012 — GEOTECHNICAL — STATE OF CALIFORNIA

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URS CORPORATION
2020 EAST FIRST STREET, SUITE 400
SANTA ANA, CA 92705

This LOTB sheet was prepared in accordance with the Caltrans Soil & Rock Logging, Classification, and Presentation Manual (2010).

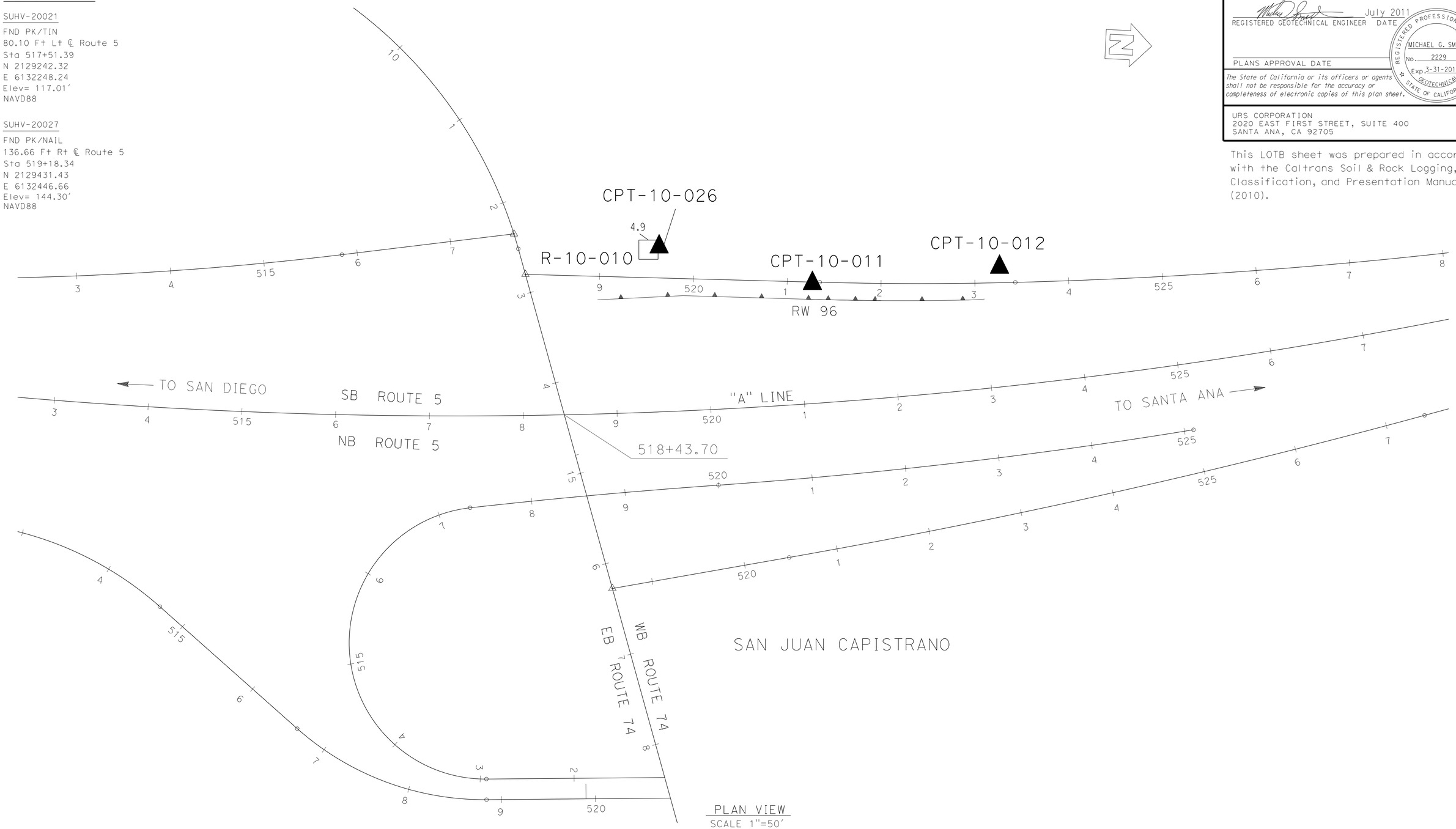
BENCH MARK

SUHV-20021

FND PK/TIN
80.10 Ft Lt ℄ Route 5
Sta 517+51.39
N 2129242.32
E 6132248.24
Elev= 117.01'
NAVD88

SUHV-20027

FND PK/NAIL
136.66 Ft Rt ℄ Route 5
Sta 519+18.34
N 2129431.43
E 6132446.66
Elev= 144.30'
NAVD88



PLAN VIEW
SCALE 1"=50'

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN DESIGN BRANCH	BRIDGE NO. × POST MILE ×	RETAINING WALL 96 LOG OF TEST BORINGS SHEET 1 OF 5
FUNCTIONAL SUPERVISOR NAME: M. SMITH	DRAWN BY: P.QUACH CHECKED BY: P.YERRA	FIELD INVESTIGATION BY: EJ.JEON			

OGS CIVIL LOG OF TEST BORINGS SHEET

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 59A0590
EA 0E3101

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES — SHEET — OF

FILE => ...\Wall 96\Boring location.dgn

USERNAME => phuong_quach DATE PLOTTED => 7/29/2011 TIME PLOTTED => 11:28:11 AM

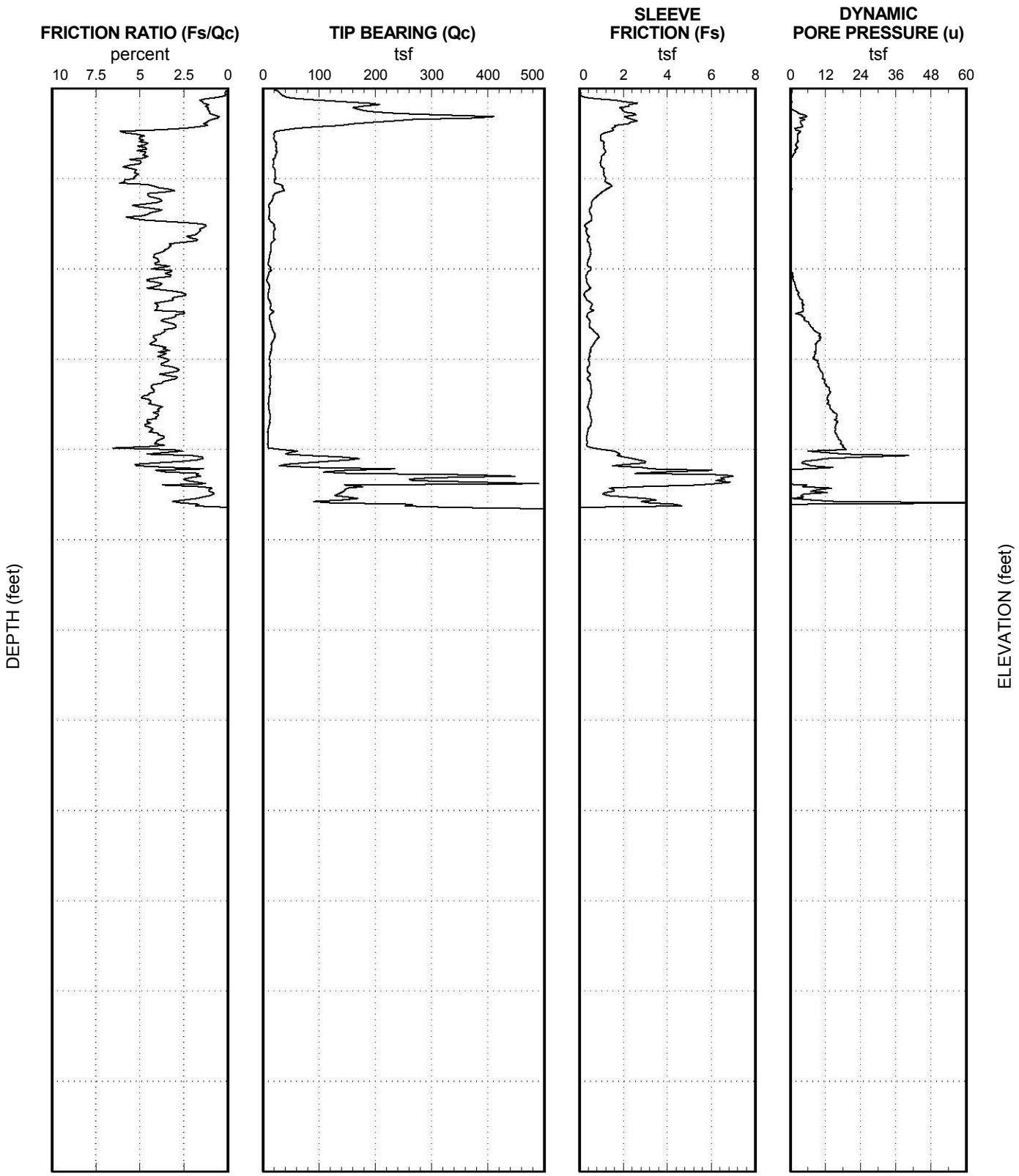
LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
E-J. Jeon	6-17-10	6-17-10		R-10-010
DRILLING CONTRACTOR: C&L Drilling			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
DRILLING METHOD: Rotary Wash			DRILL RIG: Mayhew 1000 with 4-7/8-in. tricone bit	BOREHOLE DIAMETER: 4-7/8
SAMPLER TYPE(S) AND SIZE(S) (ID): Std Cal (2.5"), SPT (1.4")			SPT HAMMER TYPE: Automatic; 140 lb, 30-inch drop	HAMMER EFFICIENCY, ERi: 71%
BOREHOLE BACKFILL AND COMPLETION: Backfilled with grout			GROUNDWATER READINGS: DURING DRILLING: Not measured; AFTER DRILLING (DATE):	TOTAL DEPTH OF BORING: 17.0 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		ASPHALT (10 in.) [FILL].												Hand auger only to 4.5 ft due to asphalt and gravel.
	1		CLAYEY SAND with GRAVEL (SC); GRAVEL consists of asphalt and rock fragments.												
	2														
	3														
	4														
	5				S01	15 16 13/3"	29/9								
	6														
	7														
	8														
	9		SANDY lean CLAY with GRAVEL (CL); very stiff; olive; moist; few coarse to fine GRAVEL; little fine SAND; moderate cementation; GRAVEL consists of asphalt fragments; PP=3.0 tsf.												
	10				S02										S02 was pushed with rig.
	11														
	12														
	13														
	14														
	15				S03	9 15 18	33								
	16														
	17		Bottom of borehole at 17.0 ft bgs												Encounter and break concrete storm drain (Caltrans error on drainage map). Lose circulation. Abandon hole.
	18														
	19														
	20														

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				R-10-010
DIST. 12	COUNTY ORA	ROUTE I-5	POSTMILE	EA 12-30989830
PROJECT OR BRIDGE NAME: I-5 and SR-74 Interchange				
BRIDGE NUMBER	PREPARED BY: D. Nelson	DATE: 10-14-10	SHEET: 1 of 1	

5 BR - STANDARD ISSR74SJ.GPJ CALTRANS LIBRARY DOT 2010.GLB 10/14/10

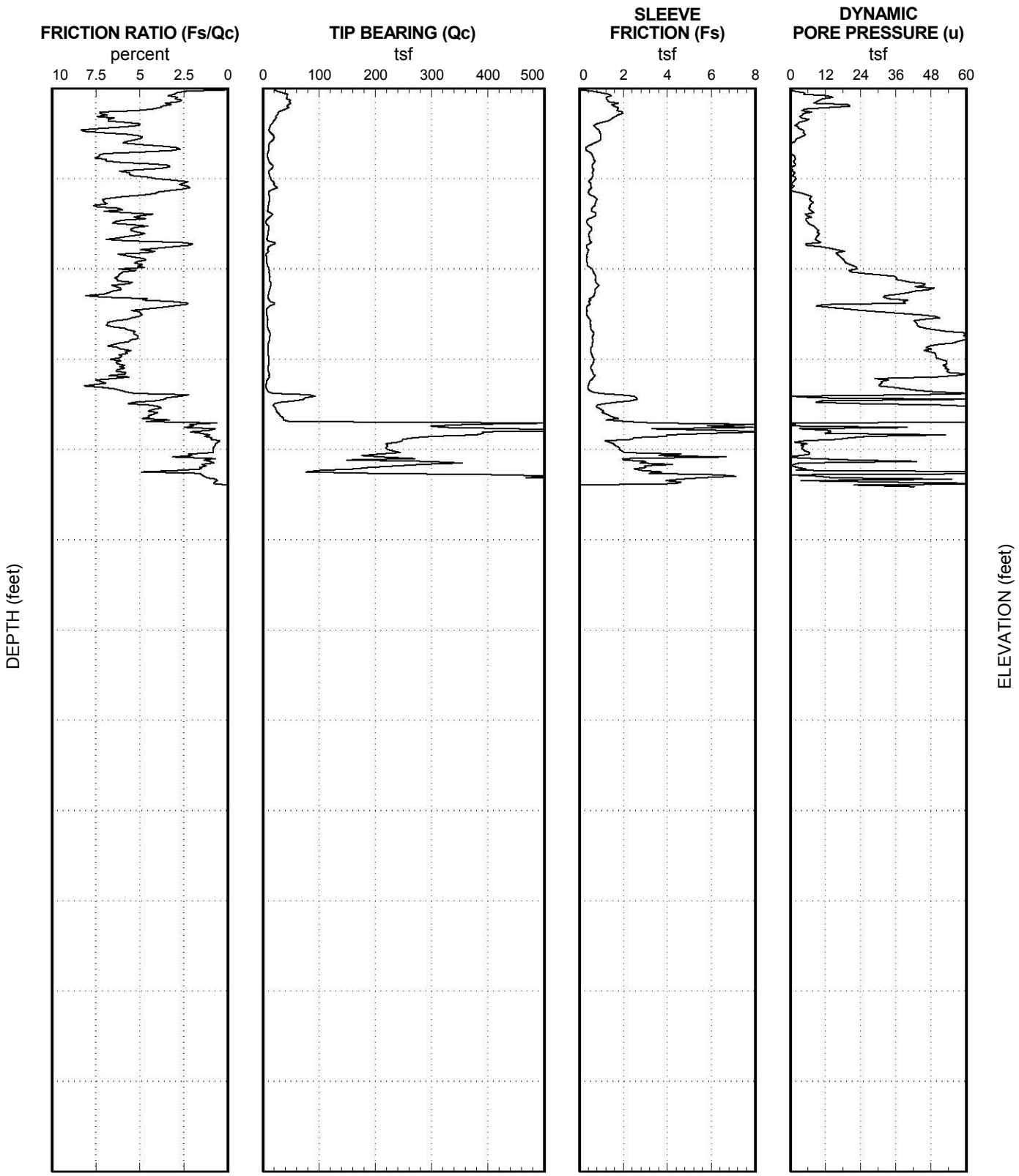


Bottom of CPT Sounding at 46.6 ft bgs

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**CPT-10-011**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	POSTMILE	EA **12-30989830**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**				
BRIDGE NUMBER	PREPARED BY	DATE		SHEET **1 of 1**

6 BR - CPT I5SR74SJ.GPJ CALTRANS LIBRARY DOT 2010.GLB 10/14/10

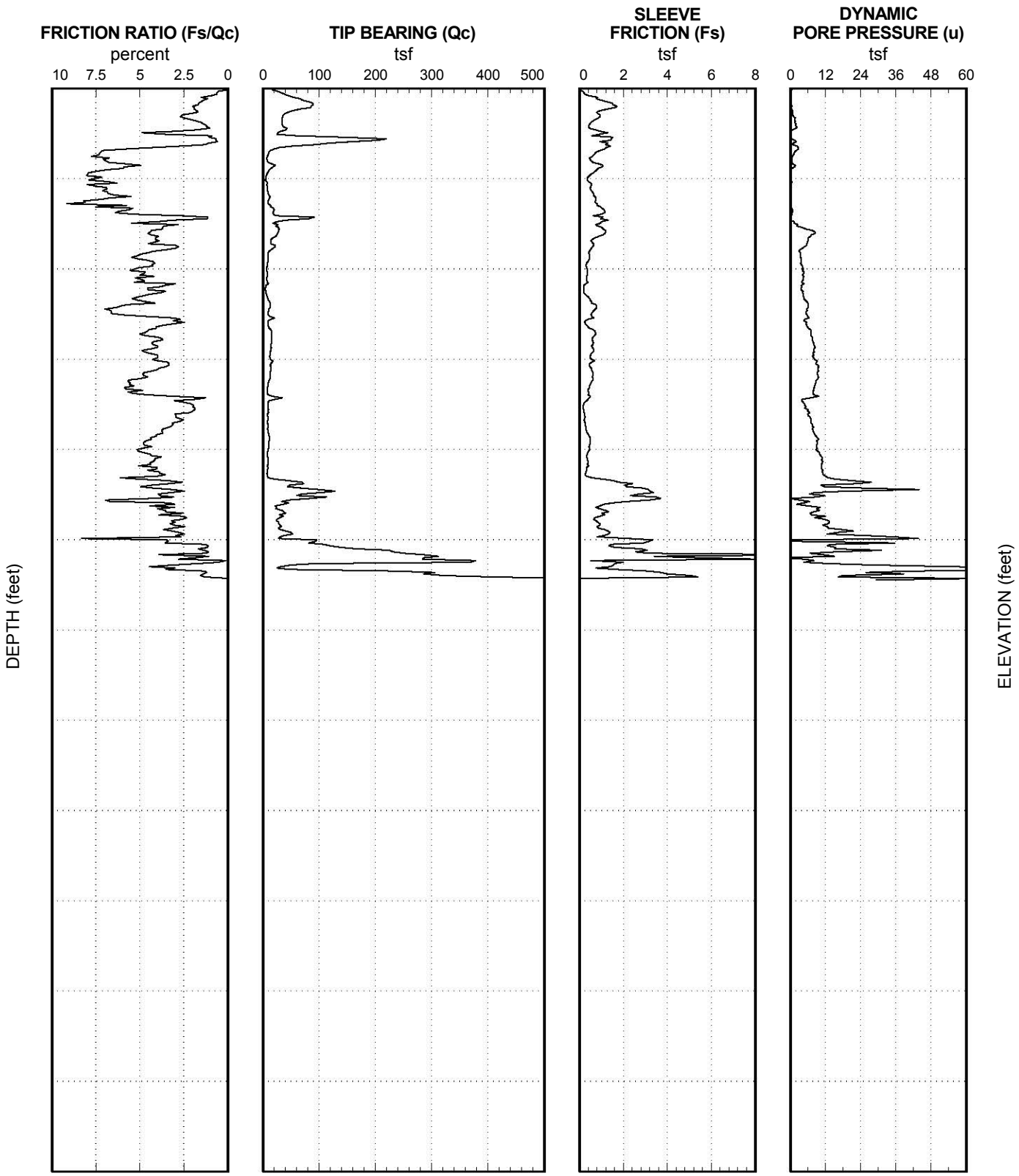


Bottom of CPT Sounding at 44.1 ft bgs

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**CPT-10-012**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	POSTMILE	EA **12-30989830**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**				
BRIDGE NUMBER	PREPARED BY	DATE		SHEET **1 of 1**

6 BR - CPT I5SR74SJ.GPJ CALTRANS LIBRARY DOT 2010.GLB 10/14/10



Bottom of CPT Sounding at 54.5 ft bgs

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**CPT-10-026**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	POSTMILE	EA **12-30989830**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**				
BRIDGE NUMBER	PREPARED BY	DATE		SHEET **1 of 1**

6 BR - CPT I5SR74SJ.GPJ CALTRANS LIBRARY DOT 2010.GLB 10/14/10

FOUNDATION REPORT
for
Retaining Wall 513

State of California **Business, Transportation and Housing Agency**

M e m o r a n d u m

To : Mr. Mohammad Ravanipour
Structures Design – Branch 19
Office of Bridge Design South 2

Date: November 10, 2011

File: 12-ORA-5/74-PM 0.01
1200000102(EA 12-0E3101)
Retaining wall No. 513

Attn. : Mr. Chuck Lomicka
Project Engineer

From : **DEPARTMENT OF TRANSPORTATION**
Division of Engineering Services
METS-Geotechnical Service
Office of Geotechnical Design South-1

Subject : Foundation Report For Retaining Wall 513 at Route 74/I-5 Interchnage

1.0 INTRODUCTION

As requested by your office in the memo dated April 29, 2011, the Office of Geotechnical Design South-1 (OGDS-1) has prepared the foundation recommendations for the above-referenced proposed retaining wall.

As per your request, geotechnical recommendations were provided to design the wall as per the Department's current Load and Resistance Factor Design (LRFD) methodology. In preparing this report, we reviewed the subsurface field exploration and laboratory testing conducted by URS Consultants. We started with a set of preliminary general plans provided by your Office for the construction of a MSE wall at this location. However, due to the complexities involved with this project, including but not limited to the relatively high wall, relatively weak and compressible foundation soils and right-of-way constraints, we communicated extensively with the project design engineers to discuss the various requirements, constraints, results of our preliminary analysis, and evaluations of various wall options or alternatives and foundation soil improvements. We provided geotechnical recommendations on an as-needed basis during the type selection, analysis, design and development of the PS&E package.

This report presents the results of the site subsurface exploration conducted by URS Corporation. It summarizes our evaluation and interpretation of the subsurface conditions based on our review of the subsurface information collected by URS and other available relevant data. It also includes our geotechnical recommendations for wall type, analysis, design and construction of the subject wall.

2.0 PROJECT LOCATION

The subject retaining wall will be constructed to improve roadway facilities at the interchange of the SR-74 and I-5. This interchange is located in the City of San Juan Capistrano, California, as shown in the attached Figure 1, Project Location Map. The

approximate site latitude and longitude coordinates are 33.5025^{o} and -117.6585^{o}, respectively.

3.0 SCOPE OF WORK

Our scope of work for this project included review and evaluation of the site subsurface conditions based on field and laboratory testing conducted by the Department's consultant URS Corporation, Irvine, California. Our scope of work also included providing geotechnical recommendations for the wall type selection, soil parameters for the stability analysis, and structural design, construction, and preparation of this foundation report.

This report is based on the review of the following information:

- Field investigations including one Cone Penetration Test (CPT) sounding and two borings conducted by URS Corporation dated December 7, 2010, January 14, 2011, and February 28, 2011.

- Laboratory testing conducted by URS Corporation on samples collected during the above field investigation.

- Review of the draft preliminary plans for the originally proposed MSE wall and several versions of the work-on progress plans, including the P&Q plans included in Appendix A of this report.

- Preliminary Foundation Report for EA 12-0E3101, 5/74 Interchange Improvement Project, dated June 30, 2010, prepared by this office, and

- Communications between Geotechnical Services and Structure Design through in person meetings, emails and telephone conferences.

This report supersedes the Preliminary Geotechnical Report for EA 12-0E3101, 5/74 Interchange Improvement Project, dated June 25, 2010.

4.0 PROJECT DESCRIPTION

As a part of the project that proposes to construct a new interchange to replace the existing Route 74/5 interchange in the city of San Juan Capistrano, as shown in Figure 2, Retaining wall 513 will be located at I-5 North bound off-ramp. The project is intended to alleviate existing and future traffic congestion along SR74 (Ortega Highway) and improve non-standard roadway features to the current Caltrans standards. The project limits on Route 74 start just east of El Camino Real and end at Avenida Los Cerritos (0.20 mile). The project also includes a re-aligned I-5 NB off-ramp to EB SR74 and a new NB I-5 loop on-ramp from EB SR74.

The purpose of the proposed wall is to support the grade separation associated with the construction of re-aligned NB I-5 off-ramp to SR 74. Relevant basic wall information provided by your Office is summarized in Table 1.

Table 1 - Retaining Wall Information

Retaining Wall Number	Station (23.76 ft RT "G" line)	Wall Length	Wall Height
513	Sta. 513+10.22 to Sta. 516+70.22	360 ft	5 to 29 ft

5.0 FIELD EXPLORATION

As stated above, the site and project specific field subsurface exploration was performed by URS Corporation. The field investigation for the subject wall included one Cone Penetration Test (CPT), one mud rotary, and one hollow stem auger borings.

The borehole locations and elevations are summarized in Table 2. Surface elevations, stations, and offsets of the borings were provided by District 12 Survey Branch. Plots of the approximate boring and CPT sounding locations and the boring logs are included in Appendix B of this report.

Table 2 - Summary of Borehole Information

Borehole Number (Types)	Location (ft)		Reference Line	Surface Elevation	Boring Termination Elevation (ft)
	Station	Offset			
A-11-020 (Hollow Stem Auger)	516+22.42	362.5	A	139.58	107.5
R-11-022 (Mud Rotary)	514+98.99	285.7	A	107.85	65.5
CPT-10-023 (CPT)	512+53.55	148.3	A	114.40	69.2

The CPT was conducted using a 20 ton capacity cone truck with a tip area of 15 cm^2 and a friction sleeve area of 225 cm^2.
Borings were logged based on visual observations of the soil cuttings and collected samples. Soil samples were collected using a Standard Penetration Test (SPT) sampler and California Modified sampler. The SPT was performed in accordance with ASTM Test Method D1584-84 using a standard 1.4 inch I.D. sampler with a 140-lb hammer dropped 30-inches.

Log of Test Borings (LOTB) in the format appropriate for inclusion in the contract plans are being prepared by URS Corporation and will be submitted to your office upon completion.

6.0 LABORATORY TESTING PROGRAM

Soil samples collected during subsurface exploration, which included proposed additional walls at adjacent locations, were transported to the URS soil testing laboratory and tested for the following:

Table 3 – Laboratory Test Methods

Test	Standard
Mechanical Analysis of Soils	CTM 203
Atterberg Limits of Soils	CTM 204
Consolidation test	ASTM D 2435
Unconfined Undrained	ASTM D 2850
Unconfined compression	CTM 221
Direct shear test	ASTM D 3080
Corrosion – Resistivity, pH	CTM 643
Corrosion – Chloride content	CTM 422
Corrosion – Sulfate content	CTM 417

Results of the laboratory tests, as provided by the URS Corporation, are included in Appendix C of this report.

7.0 SITE GEOLOGY AND SUBSURFACE CONDITIONS

7.1 Site Geology

The project is located within the alluvial valleys of the Trabuco Creek and San Juan Creek and their tributaries. The lower parts of the valleys are covered with alluvium (Quaternary age) and older alluvium (Quaternary age). The upper or higher elevation portions of the valleys are comprised of terrace deposits (Quaternary age) which are older alluvial surfaces deposited by streams then uplifted and down-cut into by younger streams. The alluvium and older alluvium was deposited primarily by floods emanating from the Trabuco and San Juan Creeks and their tributaries from the mountains and hills to the northeast of the project location.

The alluvium and the terrace deposits are underlain by the Capistrano Formation (Tertiary age). The alluvium consists of clay, silt and fine to coarse sand and gravel that in some areas include sparse to abundant cobbles with occasional boulders. The terrace deposits consist of sandy silt, clayey sand and conglomeratic coarse-grained sand, also occasional relict clayey soil horizons.

The Capistrano Formation consists of marine derived siltstone with interbedded fine grained sandstone, thin pebble sand beds, and thin hard calcareous beds, and also can be locally diatomaceous and tuffaceous. There are fill slopes associated primarily with the existing southbound on and off ramps and with Route 74 west of the I-5. The fill is estimated to range in thickness up to approximately 25 feet. The material of the fill slopes consists of varied amounts of sand, clay, sandy clay, silty clay and silty sand.

7.2 Subsurface Conditions

Based on the review of the subsurface investigation data prepared by URS Corporation, the site-specific subsurface profile consists of up to about nine (9) feet of fill over alluvium. The fill soils consist mainly of lean sandy clay (CL).

The alluvium, consisting lean sandy clay (CL) and highly plastic and compressible fat clay (CH), extends to a depth of about 40 feet below existing ground surface.

The underlying Capistrano Formation bedrock consists of mainly siltstone and claystone. An idealized soil profile along the proposed wall alignment is shown in Figure 3.

Soil scour hazard is considered low at the wall location and need not be considered in the design.

7.3 Groundwater Conditions

The groundwater table at the CPT 10-023 location is estimated to be at an elevation of 82 feet above mean sea level (MSL). This estimate is based on URS's tape measurements of the groundwater depth within the CPT sounding after about an hour of the cone withdrawal.

Groundwater was not encountered within the hollow stem auger boring drilled at A-11-020 location. Groundwater conditions were not observed or measured at the location of the mud rotary boring R-11-022.

The results of these investigations indicate that ground water along this project site could be approximately 10 to 40 ft below ground surface.

8.0 SCOUR EVALUATION

Soil scour hazard is considered low at the wall location and need not be considered in the design.

9.0 CORROSION EVALUATION

Corrosivity of subsurface materials was tested in accordance with CTM 532, 643, 417, and 422. The results of the corrosion testing are summarized in Table 4.

Table 4 - Corrosion Test Result Summary

Borehole Number	Depth Interval (ft)	Lab Sample Number	pH	Minimum Resistivity (ohm-cm)	Sulfate Content (ppm)	Chloride Content (ppm)
R-11-022	5 - 30	NA	7.5	515	0	120

Note: Caltrans currently considers a site to be corrosive to foundation elements if one or more of the following conditions exist: Chloride concentration is greater than or equal to 500 ppm, sulfate concentration is greater than or equal to 2000 ppm, or the pH is 5.5 or less.

The test results indicated that the subsurface materials in the project area are non-corrosive.

10.0 SEISMIC DESIGN RECOMMENDATIONS

10.1 Fault Rupture Hazard

The subject retaining wall is not considered susceptible to fault rupture hazard since no known faults pass through the wall alignment**.**

10.2 Design Ground Motion

Based on the Department's current fault database, the San Joaquin Hills Thrust Fault is the nearest seismic source to the proposed project site. Another significant nearby seismic source is the Newport Inglewood-Rose Canyon Fault.

Table 5 summarizes the Maximum Moment Magnitude (M_{max}) of the faults, type of faulting, distance, and Peak Ground Acceleration (PGA) of the faults mentioned above. The PGA values are based on the Department's current design ground motion evaluation methodology as documented in SDC (2010) and utilizing the current version of the Department's 2009 ARS Online ground motion analysis tool.

Table 5 - Summary of Seismic Parameters

Fault	Fault Type	M_{max}	R_{rup} (mile)	PGA
San Joaquin Hills Thrust	R	6.6	6.1	0.37
Newport Inglewood-Rose Canyon	RLSS	7.5	6.0	0.33

Based on the above information, seismic design of retaining walls with a seismic horizontal acceleration coefficient k_h =0.2 are considered adequate.

10.3 Liquefaction and Other Secondary Hazards

Due to the cohesive nature of the subsurface soils below groundwater table, the wall alignment is not considered susceptible soil liquefaction during earthquakes**.** The site is not considered susceptible to other secondary seismic hazards such as earthquake induced ground settlement, landslide, and tsunami.

11. RETAINING WALL DESIGN RECOMMENDATIONS

11.1 Wall Types Selection

The primary geotechnical design concerns at the site are:

- Bearing nominal resistance and settlement of the wall due to the presence of significant depth of relatively low strength and highly compressible fine-grained foundation soils (CL and CH).

- Differential settlement along the wall alignment due to the height of the wall, thickness of the low strength and compressible clayey soils and the fill height behind the retaining wall.

- The maximum height of the proposed wall, which is about 30 feet, limiting the types of walls that can be constructed considering the other constraints.

- Right-of-Way limitations.

- Subsurface drainage issues due to limiting R/W, site elevations/topography and the absence of an existing discharge facility.

- Tight PS&E delivery schedule after the completion of the field exploration.

Our preliminary analyses and evaluations showed the bearing capacity or nominal resistance in compression of the existing foundation soil is not adequate to support the MSE wall originally proposed. Additionally, the resulting increase in stress was estimated to induce about 15 to 18 inches of foundation soil settlement underneath the tallest wall location.

Various wall type options were explored, analyzed and evaluated to overcome the above limitations. After extensive evaluation and discussion with the SD design engineers, we recommended the proposed wall to consist of light weight cellular concrete with steel mesh reinforcement and backfilled with geofoam or Expanded Polystyrne (EPS) block materials, except the upper few feet. The upper 3 to 4 feet of wall backfill is recommended to consist of regular non-cohesive soils and/or pavement structure. In addition, preloading along with vertical drains was recommended to eliminate most of the estimated settlement prior to the construction of the wall.

The recommended light weight cellular concrete wall and geofoam backfill configurations and design parameters are shown in Figure 4. The geofoam should meet the requirements of the Type EPS39 as defined in ASTM D6817 (ASTM, 2007).

11.2 Design Recommendations

We provided preliminary geotechnical design recommendations on an on-going basis during the development of the project design. Based on these recommendations, your Office has provided us with the updated information on wall design geometric data and other requirements. The general plans, foundation plan and the wall layout plan for which the recommendations were developed and provided in this report are attached in Appendix A of this report.

Recommendation on the idealized soil profile with design foundation soil, wall and geofoam materials, drainage and material separation using geo-membrane or non-woven geotextile fabric are presented in Figure 4.

Findings and recommendations provided below are based on the information provided by SD on the elevation of the bottom of the leveling pad, minimum wall embedment depth, and the potential range of wall base width (B_w').

11.2.1. Service Limit State

11.2.1.1. Settlement

Based on the wall effective width, about 5 to 8 inches of consolidation settlement has been estimated for the net bearing stress of 1300 psf due to the proposed wall. To limit post-construction wall settlement and reduce the potential wall and/or the supporting roadway distress, preloading of the foundation soils by constructing a 10 feet high temporary soil embankment (unit weight of 120 pcf) is recommended. To reduce the preloading time period by accelerating the time rate of soil consolidation or settlement, we also recommend installing prefabricated vertical or wick drains underneath the preloading soil embankment.

Recommendations on the preloading embankment, vertical drain configuration, limits of foundation soils removal and replacement materials, and subsurface drainage are presented in Figure 5.
For the 90% consolidation settlement to occur within 3 to 5 months, 25 feet long vertical drains are recommended to be installed at a center to center spacing of 4 ft or less.

Effective Base Width (B_w') versus estimated settlement for the proposed wall is shown in Figure 6. Differential settlement in the longitudinal wall direction is anticipated to be within tolerable limit (1/100).

11.2.1.2. Wall Rotation

To limit wall rotations to within acceptably small values, the wall should be designed to limit the resultant force eccentricity (e) to B/6 or less. That is, the location of the resultant reaction force at the base of the wall shall fall within the middle third of the wall base.

11.2.1.3. Global Stability

Global slope stability analyses were performed to verify the overall stability of the proposed wall using the commercial program SLOPE/W under both static and pseudo-static conditions. A surcharge load of 240 pounds per square foot (psf) was applied for walls supporting the roadway.

As for the seismic stability, the design PGA at the site is about 0.43g. Therefore, the base width can be designed based on k_h= 0.2g, which is about 1/2 of the PGA. For the short-term condition, our analyses indicate that the proposed wall will have factors of safety against global sliding failure greater than 3.0 for the static loading conditions and 1.9 for the pseudo-static condition. For the long term condition, our analyses indicate that the proposed wall will have factors of safety of about 2.4.

11.2.2. Strength Limit State

11.2.2.1. Bearing Stability

A plot of Factored Gross Nominal Bearing Resistance vs. Effective Wall Base Width (B_w') for the Strength Limit State design is shown in Figure 7. This information can be used to size the wall base to achieve the required short term as well as long-term stability against bearing failure when subjected to the design Strength Limit State (i.e., factored) loads .

11.2.2.2. Rotational Stability

Rotational stability can be achieved by designing the wall base width such that the location of the resultant reaction force falls within the wall base, and the corresponding factored nominal bearing resistance in compression determined based on Figure 7 is equal to or greater than the imposed factored uniform bearing stress.

11.2.2.3. Sliding Stability:

The wall must be designed to provide adequate safety or resistance against sliding failure under Strength Limit State lateral loads. Addition geotechnical parameters necessary to design the wall to provide adequate short term and long-term sliding stability for the Strength Limit State design are summarized in Table 6.

Factored adhesion/friction at the wall base and the fabric, and passive resistance may be combined directly. The upper one foot of soil should be neglected in calculating the passive soil lateral resistance.

Table 6 – Recommended Additional Design Parameters

Type	Adhesion/friction at the wall /permeable/native soil contact	Coefficient of Soil Passive Resistance (K_p)
Short-term	825 psf (Adhesion) for permeable materials/fabric and native soil contact	1.0
Long-term	0.45 (Friction factor) for wall/permeable materials/fabric/native soils contact.	2.5

11.2.3. Seismic (Extreme Event) Limit State

11.2.3.1. Bearing Stability:

A plot of Factored Gross Nominal Bearing Resistance vs. Effective Base Width (B_w') for Extreme Limit State design is shown in Figure 8. This information can be used to size the wall base to achieve the required stability against bearing capacity failure when subjected to the design seismic (Extreme Event) loads.

11.2.3.2. Rotational Stability:

Rotational stability can be achieved by designing the wall base width such that the location of the resultant reaction force falls within the wall base and the corresponding factored nominal bearing resistance in compression determined based on Figure 8 is equal to or greater than the imposed factored uniform bearing stress.

11.2.3.3. Sliding Stability:

Recommended design parameters presented in Table 6 above for the short-term loading may be used to design the wall to ensure sliding stability during the design seismic event. Factored adhesion/friction at the wall base and the fabric, and passive resistance may be combined directly.

12.0 FOUNDATION SOIL/WALL MOVEMENT MONITORING

12.0 General

Recommendations are provided herein to monitor the settlement of the foundation soil during the preloading period and the post construction movements of the wall on a long term basis.
A map showing the exact location and depth of data monitoring, and description of the devices used should be submitted to this Office prior to installation. Monitoring data should be forwarded to this Office as soon as collected. Data should be presented as a semi-log time versus settlement plot and in electronic format.

12.1 Foundation Soil Settlement Due to Pre-loading

We recommend installing measurement devices as per California Test Method 112 to monitor foundation soil settlement due to preloading. Foundation soil settlement should be measured at a depth of at least 2 feet below the bottom of the excavation for installing prefabricated vertical drains. Foundation soil settlement should be measured at Station 514+75, 515+25, and 515+75.

During and until the completion of preloading soil embankment construction, foundation settlement data should be collected twice daily; once at the start and other at the end of the work days or at least twice a week if no work is performed. Once the preloading embankment construction is complete, data should be measured once a week for at least six months or until 90% settlement occurs, whichever is earlier. Data should be forwarded to this Office as soon as collected to determine at what time preloading soil may be removed and the wall construction may start.

12.3 Post-Construction Wall Movement Monitoring

We also recommend installing devices to monitor wall settlement, lateral and rotation starting from the end of construction as follows. Data collected should be forwarded to this Office for review and evaluation. These monitoring should continue until recommended otherwise by this Office. Data should be collected on a weekly basis for three months and biweekly for additional six months. Thereafter, data should be measured once every month for one additional year and then once every four month until recommended otherwise by this Office.

- Wall top settlements should be measured on a long-term basis at stations 514+75, 515+25, and 515+75.

- Wall rotation and lateral movement should be measured at the above stations at the top of the wall and at points located on the face of the walls at one-third height from the finish grade.

13.0 CONSTRUCTION CONSIDERATIONS

The followings should be considered in the construction of the subject wall.

- Earthwork should be performed in accordance with Section 19 of the latest Caltrans Standard Specifications.

- The bottom of the over-excavation should be at least: 1) two feet below the leveling pad (to accommodate 2-foot thick geotextile wrapped permeable drainage blanket), or 2) five feet below the original ground surface, whichever is deeper.

- Due to seasonal variations in the precipitation, localized perched groundwater or wet or soft and yielding subgrade soils may be encountered during construction. Such soils, if encountered, should be removed and replaced with compacted Class II aggregate or structural backfill materials to the depth and extent necessary to establish a firm working surface before the installation of any vertical drains or placement of any permanent fill or the retaining wall.

- On-site excavated soils should not be used as structure backfill or embankment fills.

- Only experienced personnel should be utilized to place and construction the lightweight concrete wall and the geofoam block.

- Cellular concrete should be proportioned, mixed, placed, cured, sampled, and tested as per applicable ASTM and ACI standards and guidelines to obtain the in-place air dry density within ± 3 pcf of the design densities.

- As-cast density of the cellular concrete used in the construction of the wall shall be controlled carefully so that the wall is constructed of uniform and specified density concrete.

- Care must be exercised not to exert excessive loads or covering on the lightweight concrete until sufficiently set and gained the necessary strength.

- Care should be exercised not to expose geofoam materials to ultraviolet light, sources of fire or ignition and gasoline and other chemical or liquids during handling and placement. No organic or contaminated soil should come in contact with geofoam.

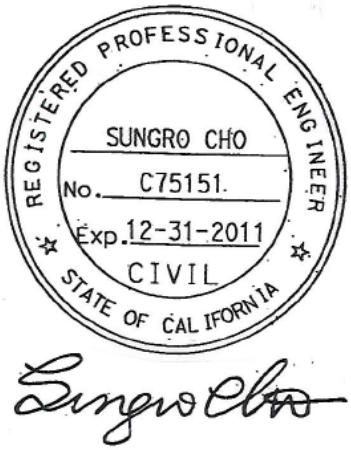
- Geofoam blocks should be placed tightly and horizontally restrained. Successive layers of geofoam should be oriented 90 degree to the previous layer.

- Care must be exercised not to puncture the geofoam geomembrane cover during construction.

- Materials overlying the geofoam backfill should be placed as quickly as practical.

If you have any questions or comments, please call Sungro Cho at (916) 227-5398, or Mohammed Islam at (916) 227-0993.

Prepared by: Date: 11/10/2011



Sungro Cho, Ph.D., P.E.
Transportation Engineer
Office of Geotechnical Design – South 1

Attachments
Figure 1 through 8

cc: OGDS1- LA
Nooshin Yoosefi, D12 Project Manager
Mark Williams, GS Corporate
DES Office Engineer, Office of PS&E
Farhad Hadjibabaie, D12 Material Engineer
Structure Construction R.E. Pending file

REFERENCES

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FIGURES

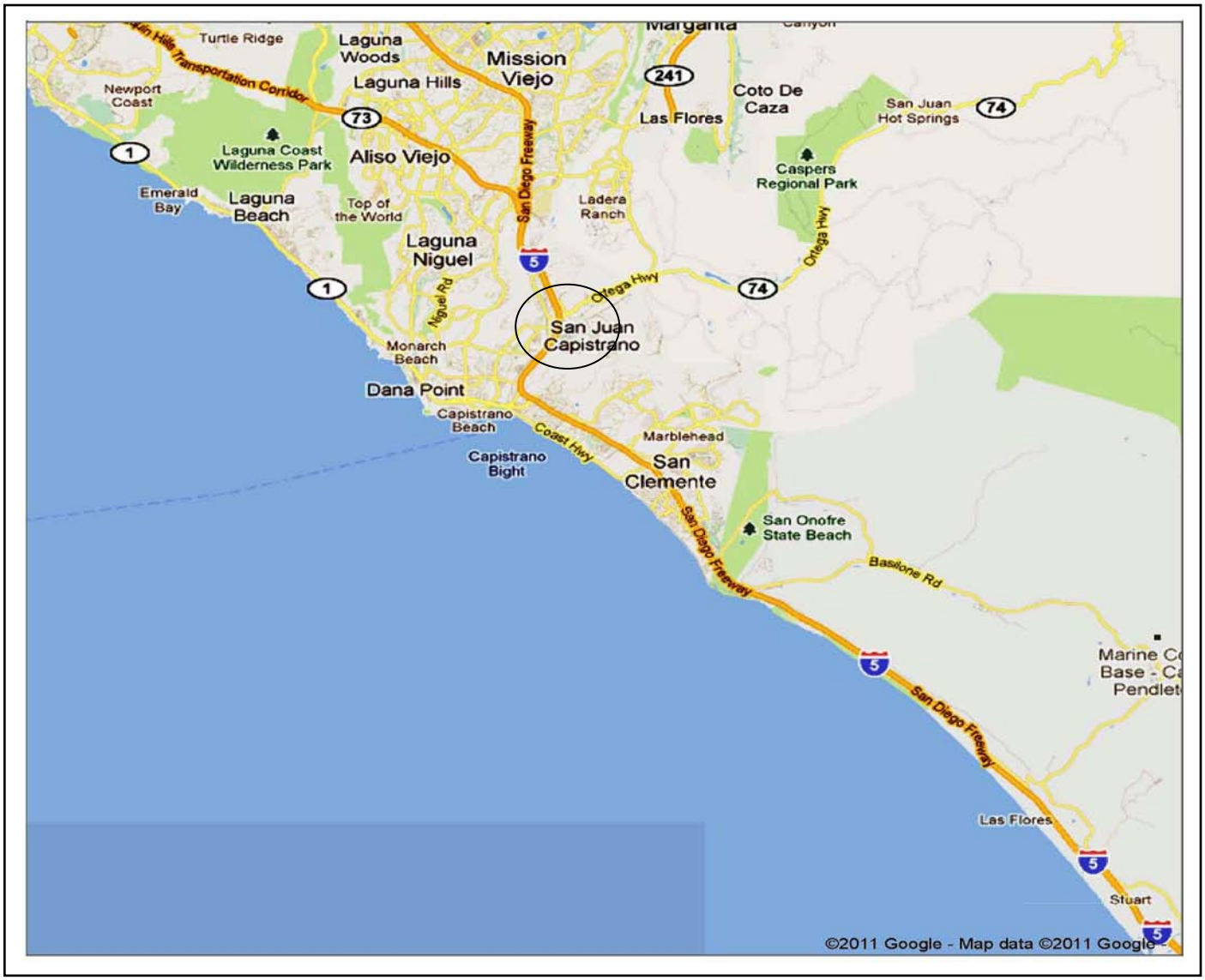

Figure 1. Project Location Map

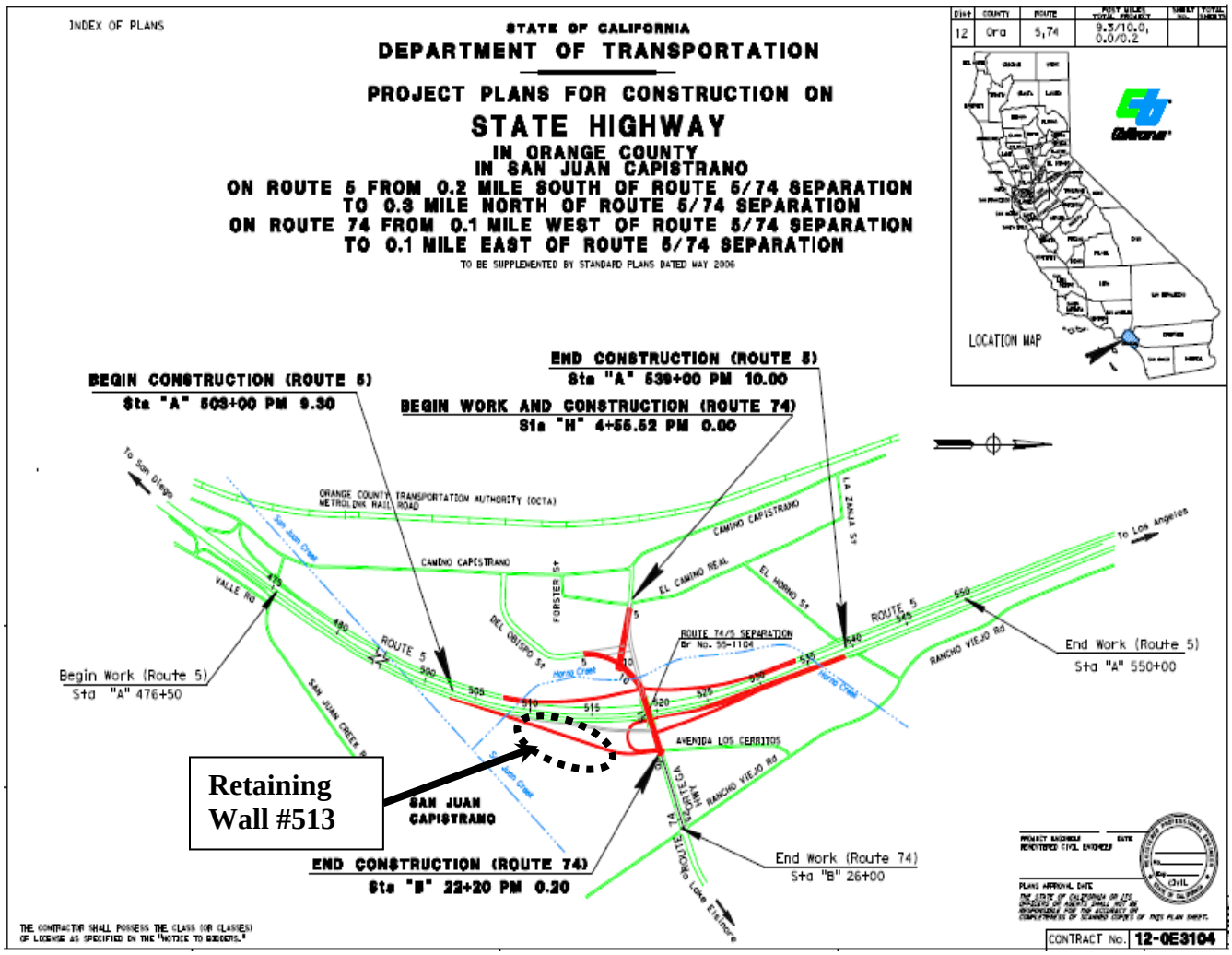

Figure 2. Proposed Retaining Wall #513 Location/Alignment

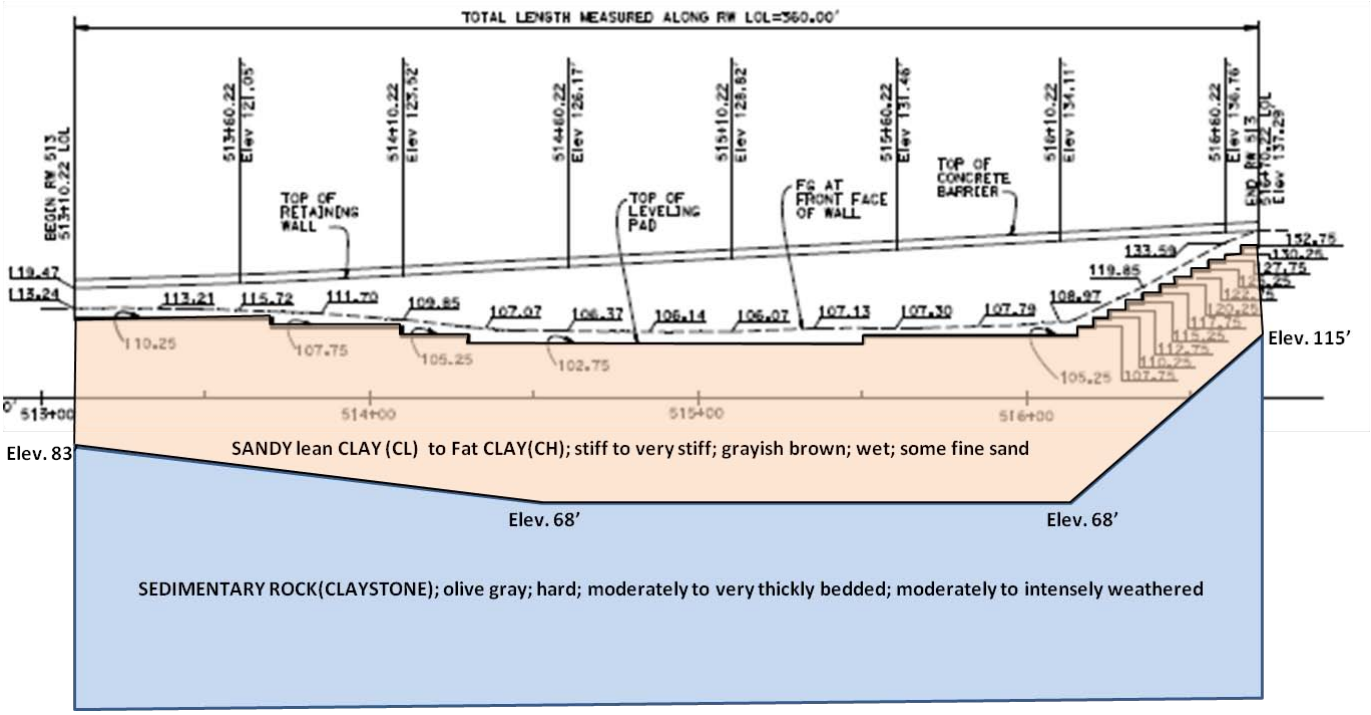

Figure 3. Idealized Soil Profile

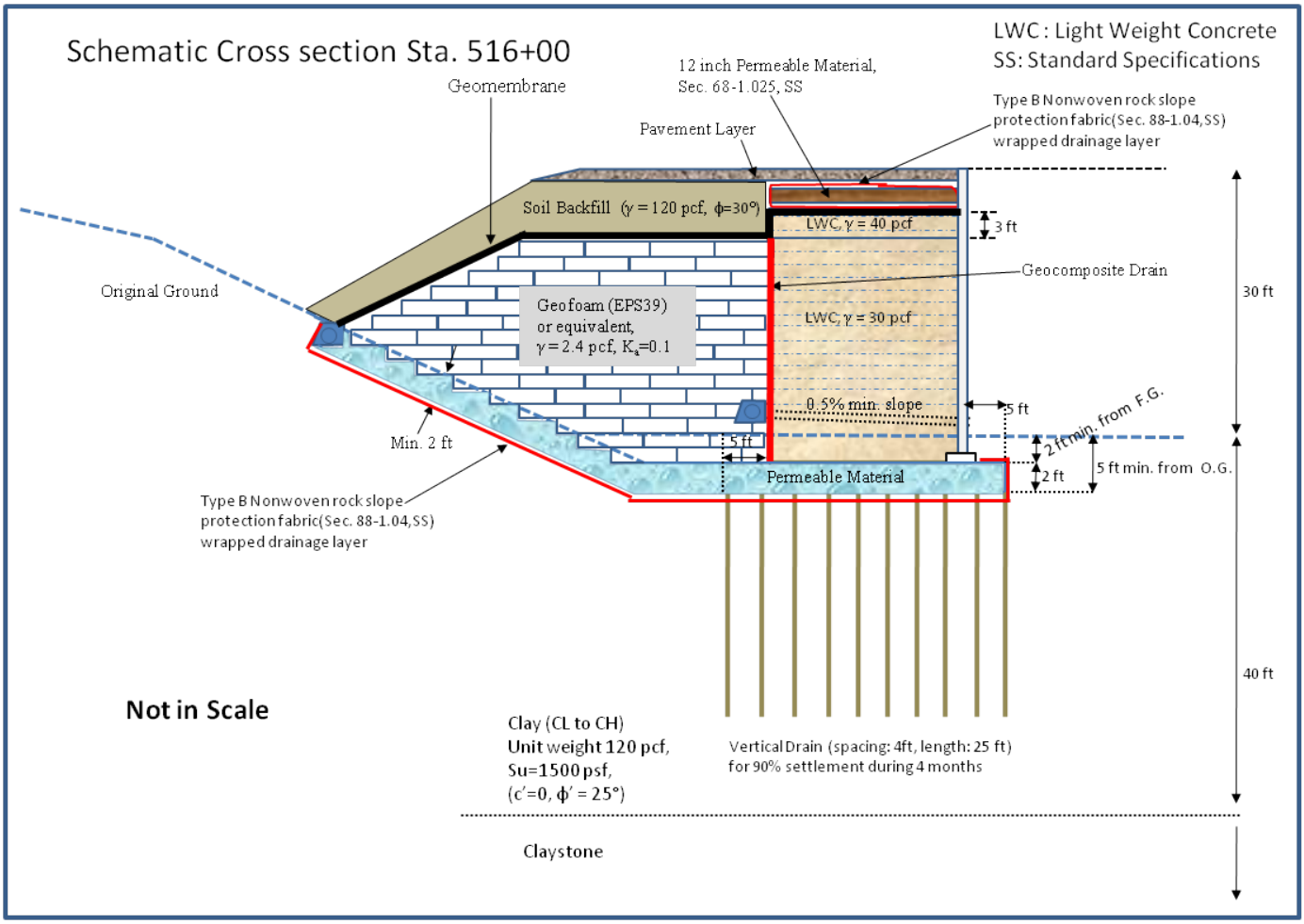

Figure 4. Recommended Wall and Backfill Details and Geotechnical Design Parameters

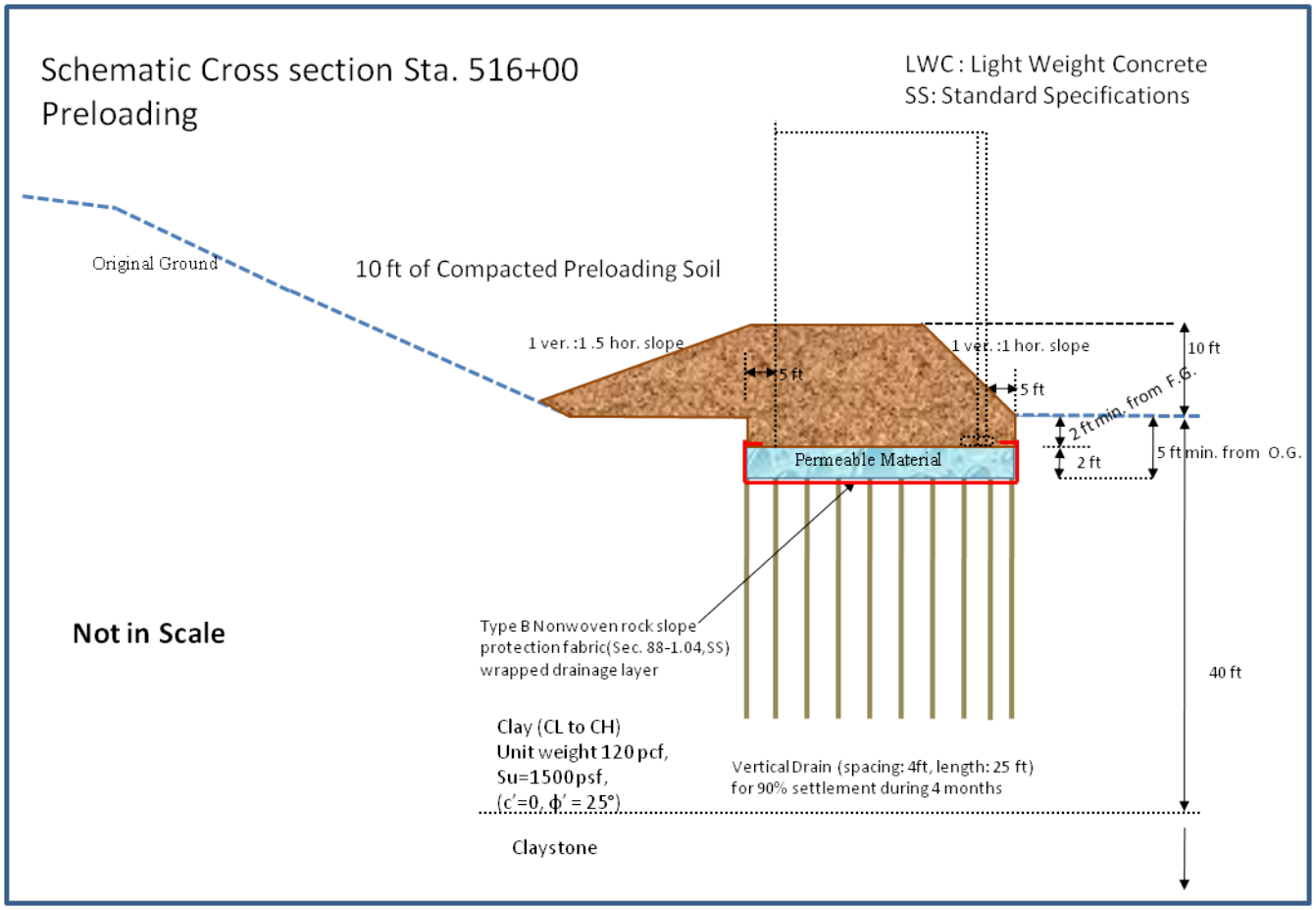

Figure 5. Recommended Preloading Details (Schematic at Cross Section at Sta. 516+00)

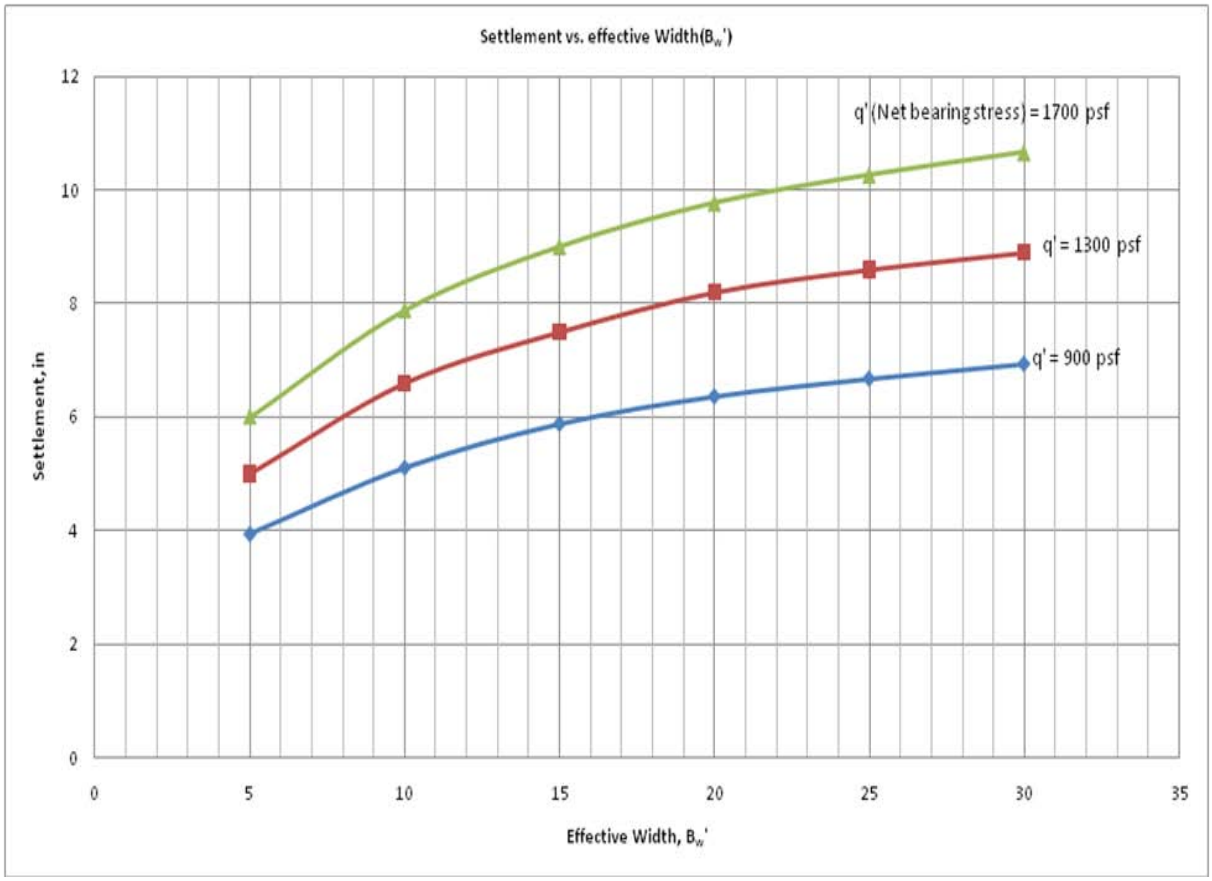

Figure 6. Wall Effective Width (B_w') vs. Foundation Soil Settlement

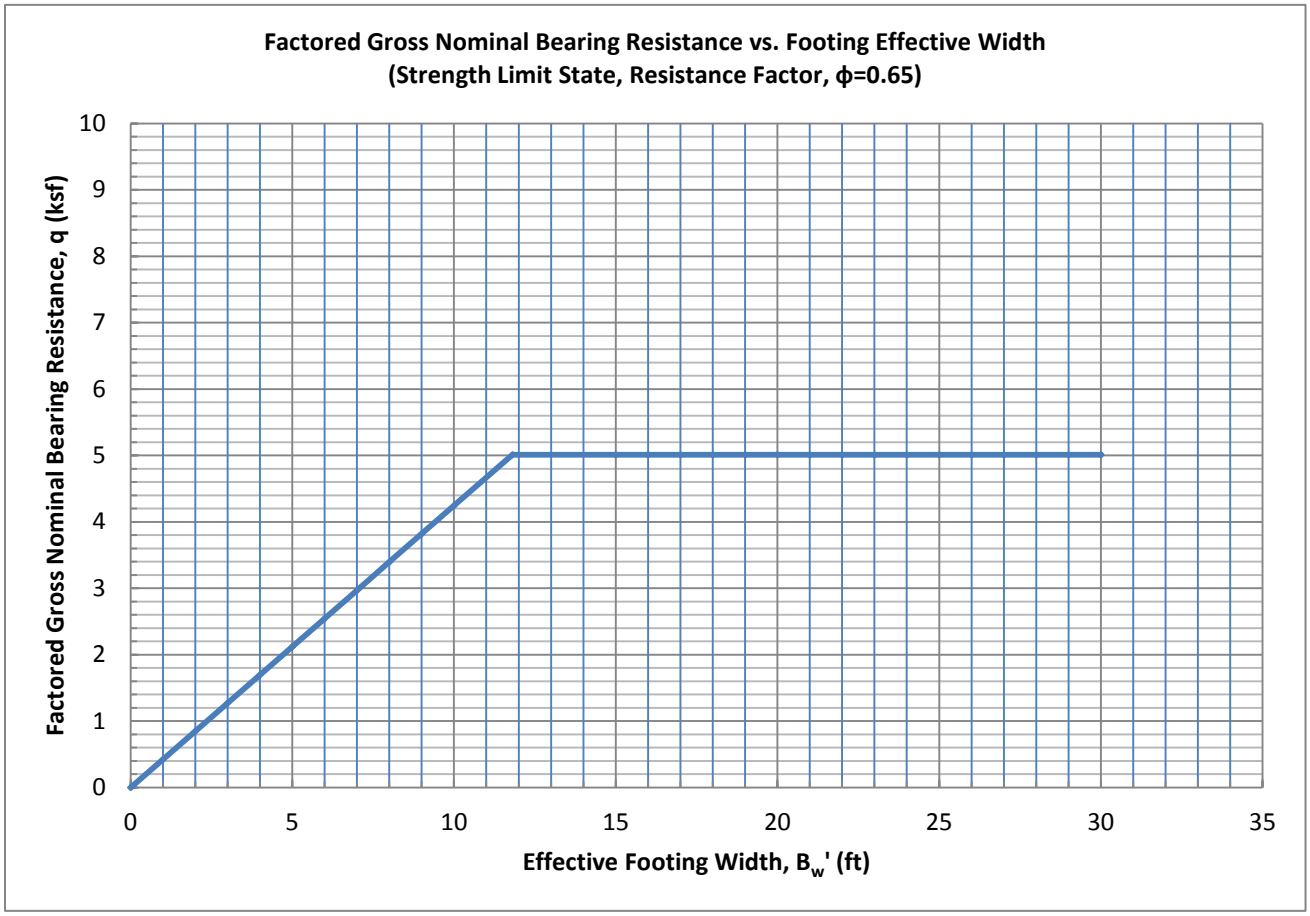

Figure 7. Effective Footing Width (B_w') vs. Factored Nominal bearing Resistance, q_{NR}

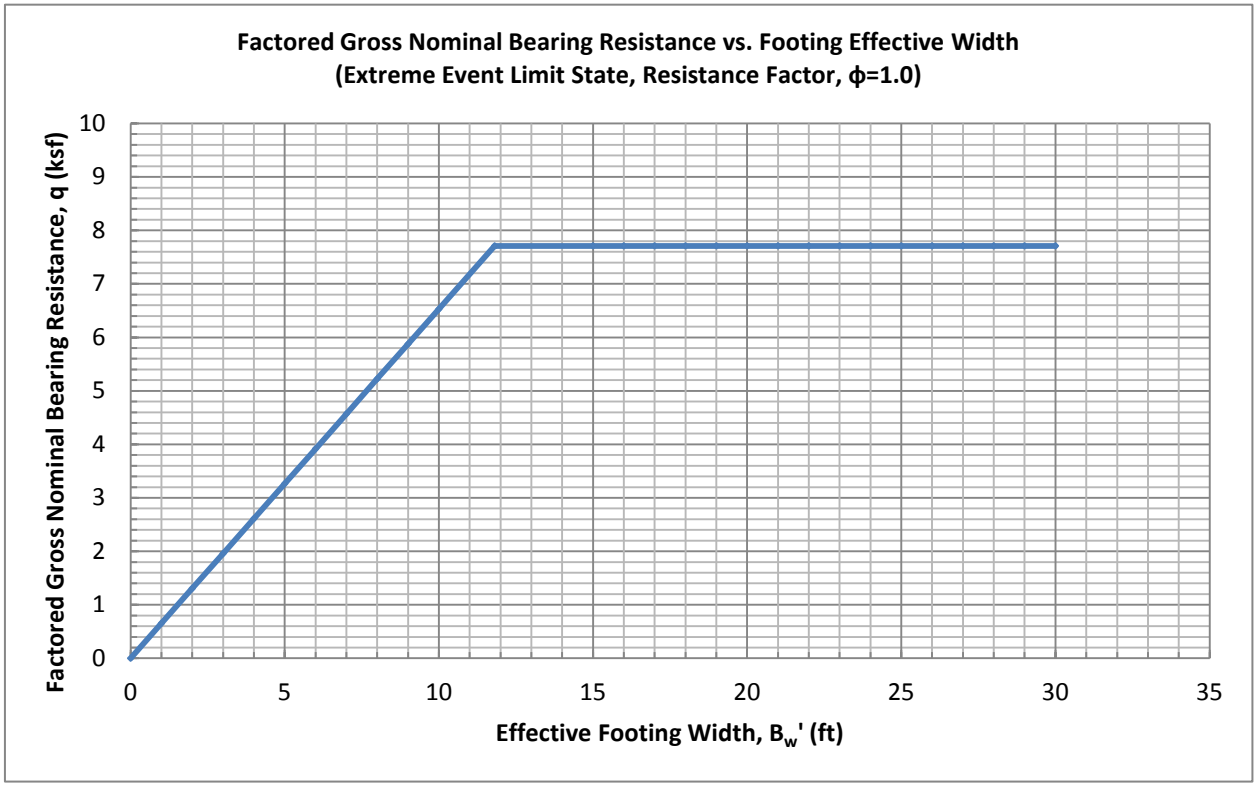

Figure 8. Effective Footing Width (B_w') vs. Factored Nominal bearing Resistance, q_{NR}

APPENDIX A

- GENERAL PLAN
- FOUNDATION PLAN
- STRUCTURE PLAN

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
12	ORA	5			

REGISTERED CIVIL ENGINEER X DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER CHARLES LOMICKA No. C 71172 Exp. 6/30/13 CIVIL STATE OF CALIFORNIA

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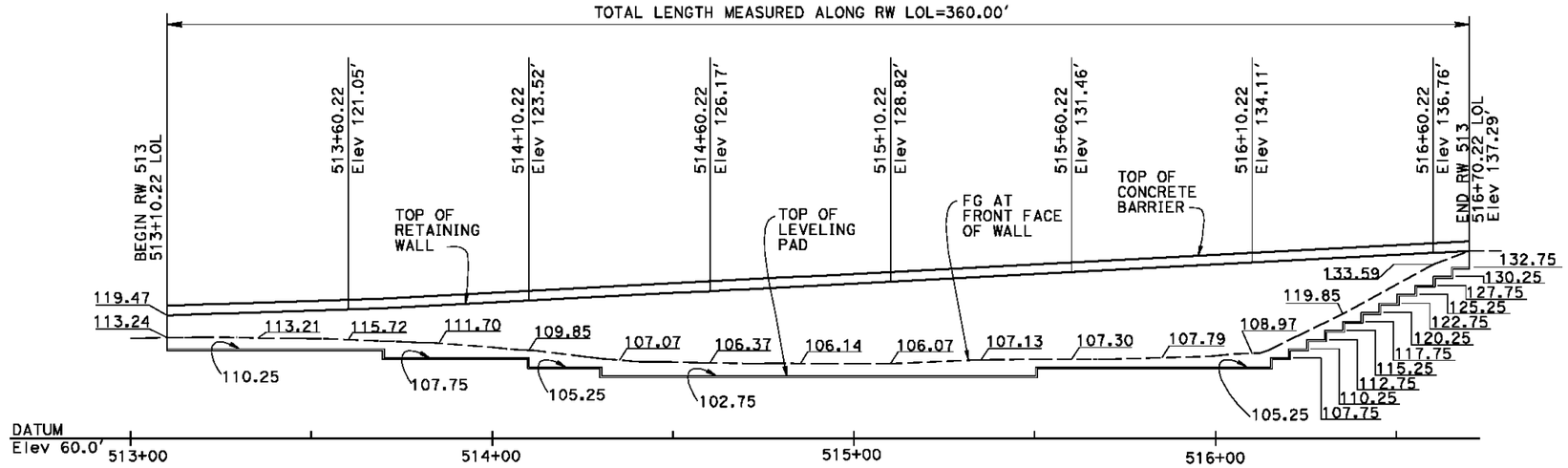
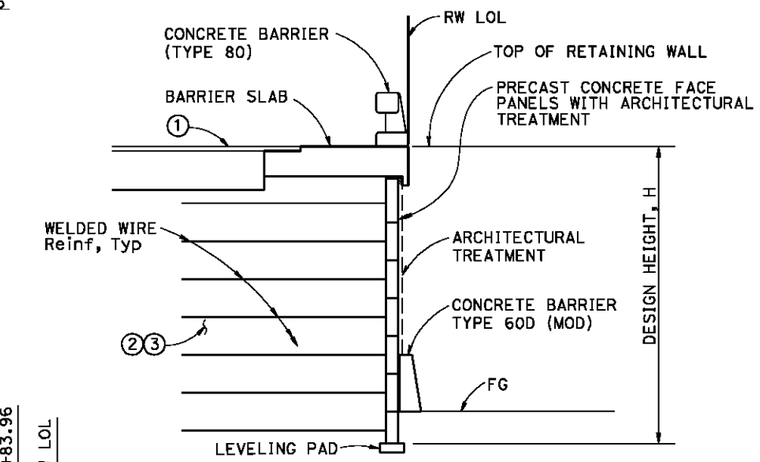
P & Q



DEVELOPED ELEVATION

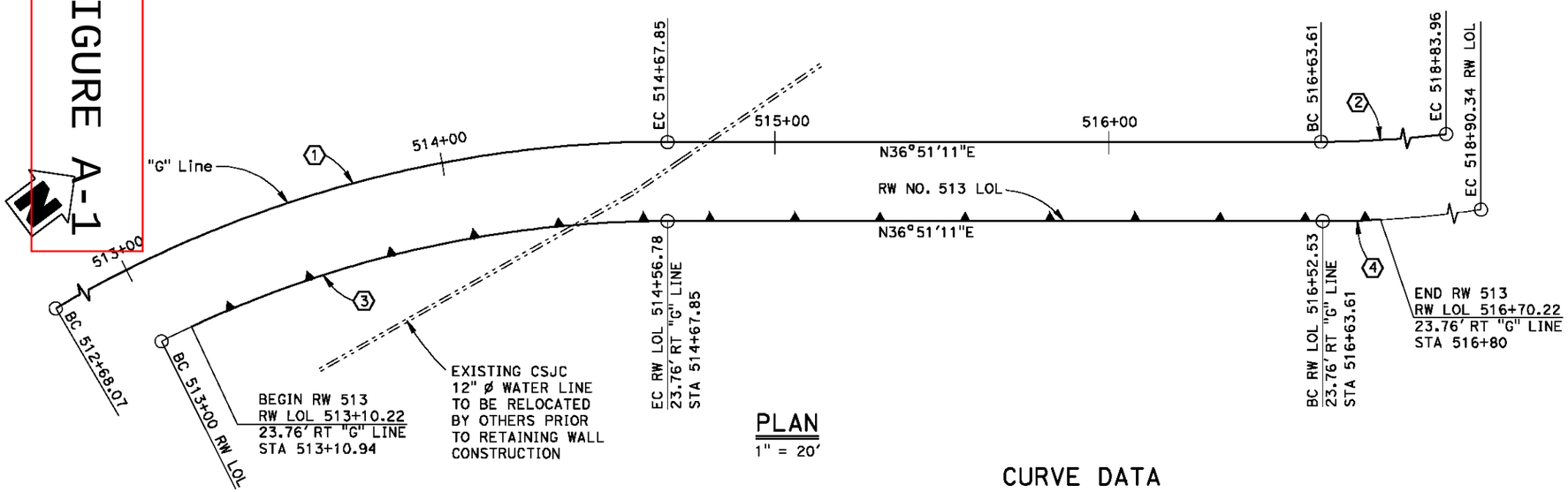
1" = 20'



TYPICAL SECTION

NO SCALE

FIGURE A-1



PLAN

1" = 20'

CURVE DATA

NO.	R	Δ	L	T
1	360.00	31°47'50"	199.79	102.54
2	300.00	42°05'07"	220.36	115.42
3	336.24	26°42'53"	156.78	79.84
4	323.76	42°05'07"	237.81	124.56

NOTES:

1. Roadway Section, see Road Plans
2. Lightweight Fill (Cellular Concrete) Sta 513+70.22 to Sta 516+50.22
3. Granular Backfill Sta 513+10.22 to Sta 513+70.22 Sta 516+50.22 to Sta 516+70.22

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

MOHAMMAD RAVANIPOUR, DESIGN ENGINEER	DESIGN	BY CHARLES LOMICKA	CHECKED MINA PEZESHPOUR	LOAD & RESISTANCE FACTOR DESIGN	LIVE LOADING: HL93 W/"LOW-BOY"; PERMIT DESIGN VEHICLE
	DETAILS	BY HECTOR INIGUEZ - H.W.	CHECKED MINA PEZESHPOUR	LAYOUT BY MAMUNUR RAHMAN	CHECKED CHARLES LOMICKA
	QUANTITIES	BY CHARLES LOMICKA	CHECKED HTOON WIN	SPECIFICATIONS BY X	PLANS AND SPECS COMPARED X

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DIVISION OF ENGINEERING SERVICES
STRUCTURE DESIGN
DESIGN BRANCH 19

BRIDGE NO. 55 E0118
POST MILE 9.5

RETAINING WALL NO. 513
GENERAL PLAN

UNIT: 3621
PROJECT NUMBER & PHASE: 1200000102 1
CONTRACT NO.: 0E3101

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES 01-18-11 07-21-11 07-15-11

SHEET 1 OF 16

FILE => 01-RW513-a-gp01.dgn

USERNAME => s120514 DATE PLOTTED => 21-JUL-2011 TIME PLOTTED => 15:20

STRUCTURES DESIGN GENERAL PLAN SHEET (ENGLISH) (REV.09-01-10)

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
12	ORA	5			

P & Q

REGISTERED CIVIL ENGINEER X DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER CHARLES LOMICKA No. C 71172 Exp. 6/30/13 CIVIL STATE OF CALIFORNIA

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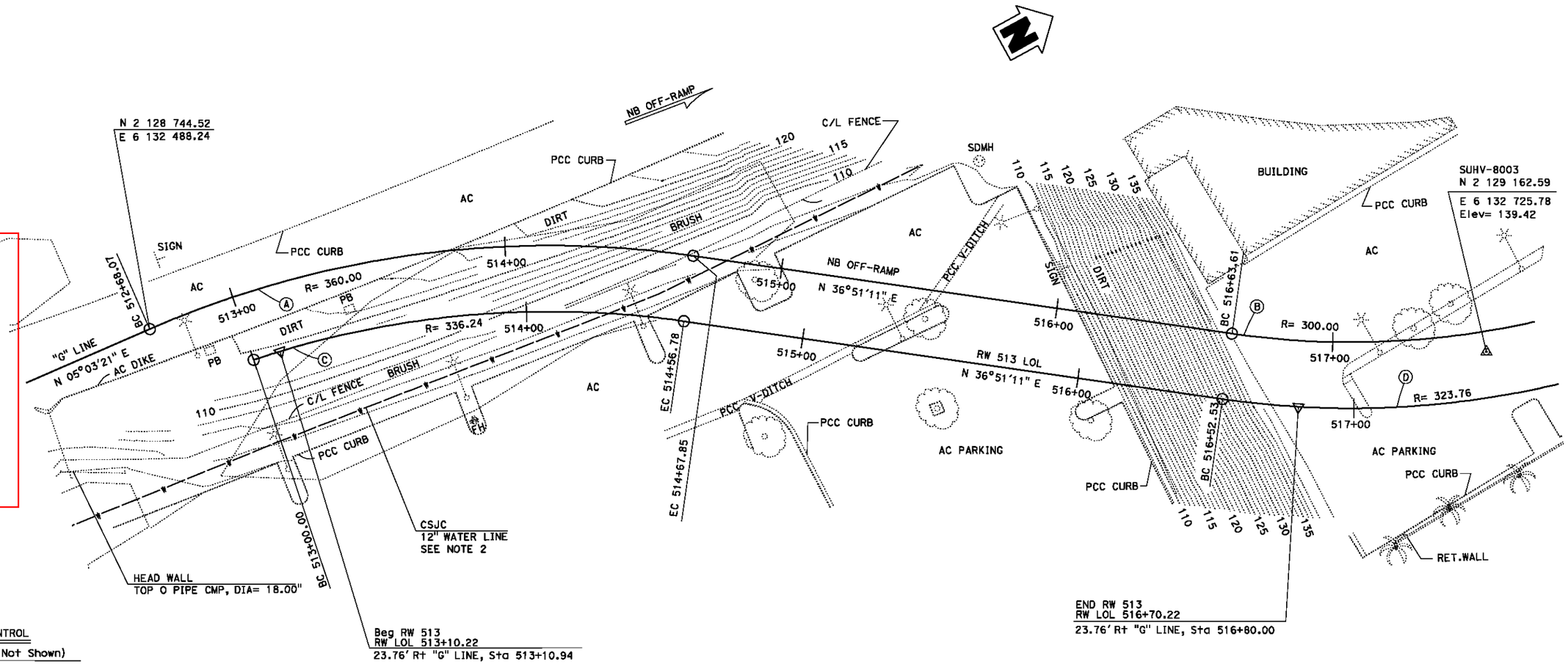
FIGURE A-2

CURVE DATA				
No.	R	Δ	T	L
A	360.00	31°47'47"	102.54	199.79
B	300.00	42°05'07"	115.42	220.36
C	336.24	26°42'53"	79.84	156.78
D	323.76	42°05'07"	124.56	237.81



SURVEY CONTROL

SUHV-405 (Not Shown)

FND PK/TIN
83.46 Ft Rt ℄ Route 5
Sta 510+67.02
N 2 128 562.45
E 6 132 428.46
Elev= 110.11

SUHV-8003

FND PK/TIN
389.92 Ft Rt ℄ Route 5
Sta 516+38.35
N 2 129 162.59
E 6 132 725.78
Elev= 139.42

Notes:

1. Underground utilities as shown are approximate
2. Water line to be relocated by others prior to Retaining Wall construction.

PRELIMINARY INVESTIGATION SECTION

SCALE	VERT.DATUM NAVD88	PHOTOGRAMMETRY AS OF: X		
1"=20'	HORZ.DATUM NAD83 (1991.35)	SURVEYED	BY DISTRICT 12	CHECKED BY T.PHUNG 3/2010
ALIGNMENT TIES DIST.TRAVERSE SHEETS		DRAFTED	BY S. ABASSY 02/2011	CHECKED BY S. ALIVIO 02/2011

STRUCTURES FOUNDATION PLAN SHEET (ENGLISH) (REV. 09-01-10)

DESIGN	BY CHARLES LOMICKA	CHECKED MINA PEZESHPOUR
DETAILS	BY HENGAMEH MAHBOOBI	CHECKED MINA PEZESHPOUR
QUANTITIES	BY CHARLES LOMICKA	CHECKED HTOON WIN

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DIVISION OF ENGINEERING SERVICES
STRUCTURE DESIGN
DESIGN BRANCH 19

BRIDGE NO. 55 E0118
POST MILE 9.5

RETAINING WALL NO. 513
FOUNDATION PLAN

UNIT: 3621
PROJECT NUMBER & PHASE: 1200000102 1 CONTRACT NO.: 0E3101

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES 02-11-11 07-21-11 07-25-11

SHEET 3 OF 16

FILE => 03-RW513-e-fdpl01.dgn

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
12	ORG	5			

REGISTERED CIVIL ENGINEER X DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER CHARLES LOWICKA No. C 71172 Exp. 6/30/13 CIVIL STATE OF CALIFORNIA

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P & Q

NOTES:

1. FOR TOP OF WALL ELEVATIONS, SEE "WALL LAYOUT NO. 2" SHEET.
2. WATER LINE TO BE RELOCATED BY OTHERS PRIOR TO RETAINING WALL CONSTRUCTION.

LEGEND

- • INDICATES LOCATION OF INSPECTION WIRE PLACEMENT. SEE "RETAINING WALL DETAILS NO. 3" SHEET.
- ◯ INDICATES INTERVAL IN YEARS FROM TIME OF CONSTRUCTION TO TIME OF REMOVAL OF INSPECTION WIRE.

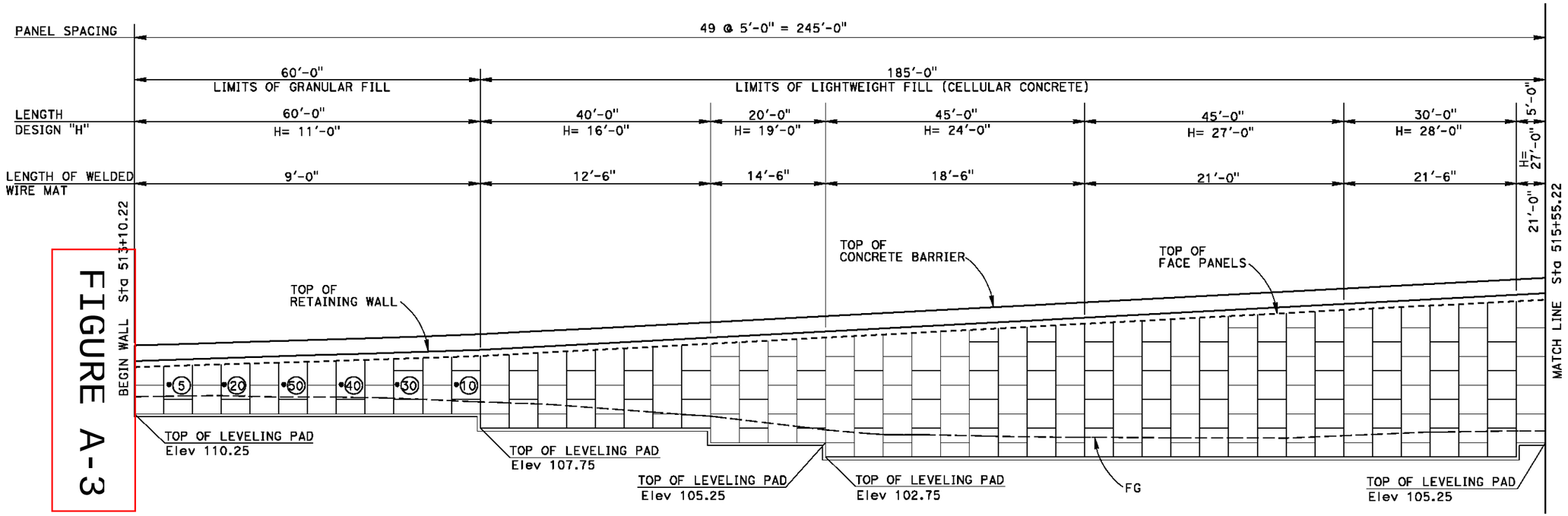
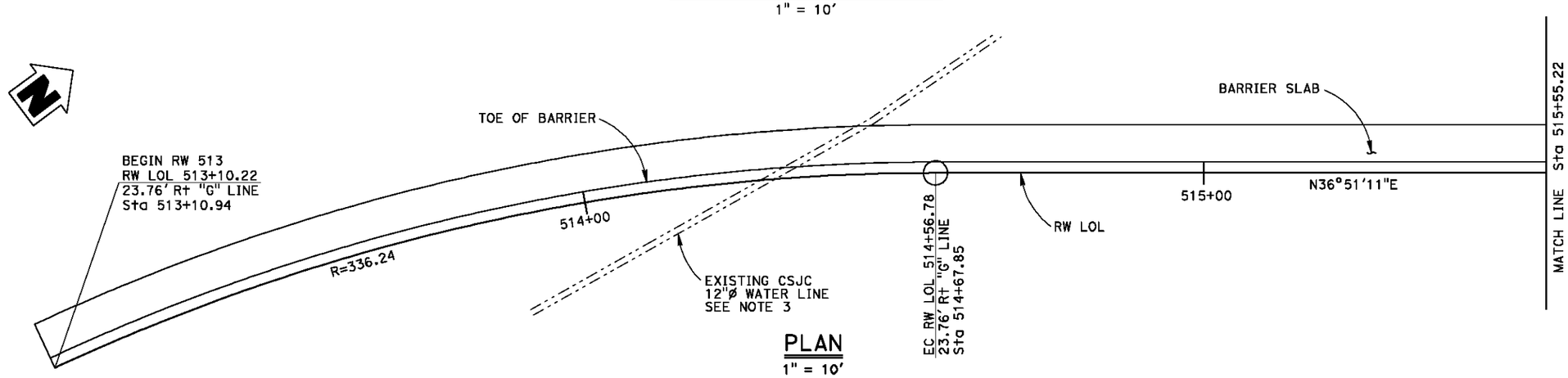


FIGURE A-3

DEVELOPED ELEVATION

1" = 10'



PLAN

1" = 10'

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

	BY	CHECKED
DESIGN	CHARLES LOWICKA	WINA PEZESHPOUR
DETAILS	HENGAMEH MAHBOOBI	WINA PEZESHPOUR
QUANTITIES	CHARLES LOWICKA	HTOON WIN

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DIVISION OF ENGINEERING SERVICES
STRUCTURE DESIGN
DESIGN BRANCH 19

BRIDGE NO. 55 E0118
POST MILE 9.5

RETAINING WALL NO. 513
WALL LAYOUT NO. 1

STRUCTURES DESIGN DETAIL SHEET (ENGLISH) (REV. 09-01-10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 3621
PROJECT NUMBER & PHASE: 1200000102 1 CONTRACT NO.: 0E3101

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES: 04-19-11 07-21-11 07-19-11

SHEET 4 OF 16

FILE => 04-RW513-g-lo01.dgn

USERNAME => s120514 DATE PLOTTED => 21-JUL-2011 TIME PLOTTED => 15:21

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
12	ORG	5			

REGISTERED CIVIL ENGINEER X DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER CHARLES LOMICKA No. C 71172 Exp. 6/30/13 CIVIL STATE OF CALIFORNIA

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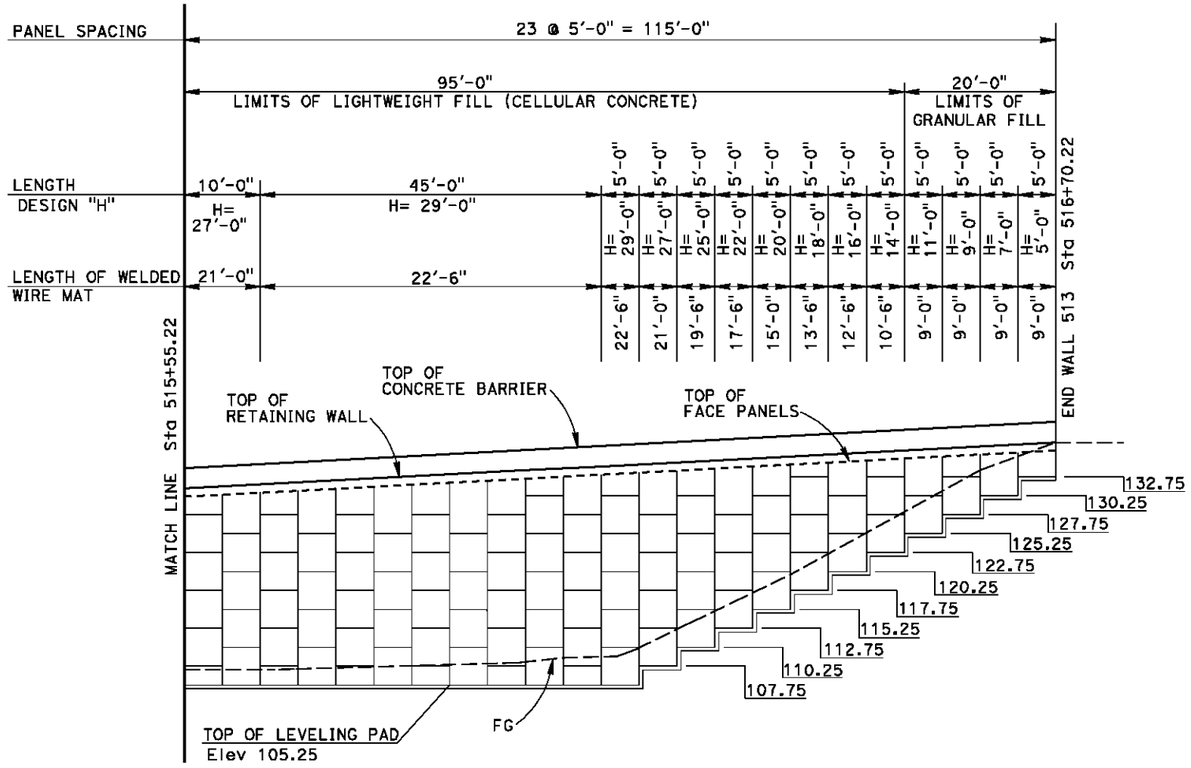
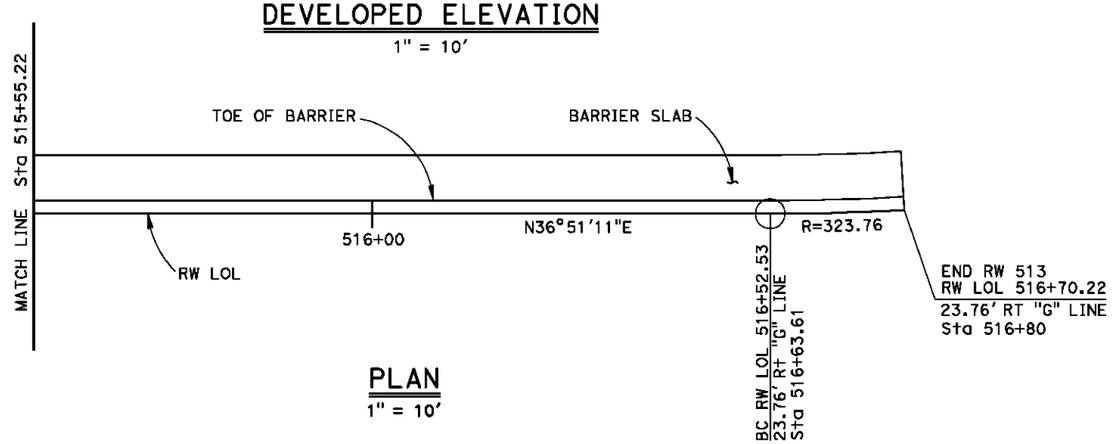
P & Q



DEVELOPED ELEVATION

1" = 10'



PLAN

1" = 10'

TOP OF WALL ELEVATIONS

LOL Stations	Top of Wall Elevation (ft)
513+10.22	119.47
513+22.72	119.86
513+35.22	120.26
513+47.72	120.65
513+60.22	121.05
513+72.72	121.53
513+85.22	122.20
513+97.72	122.86
514+10.22	123.52
514+22.72	124.18
514+35.22	124.85
514+47.72	125.51
514+60.22	126.17
514+72.72	126.83
514+85.22	127.50
514+97.72	128.16
515+10.22	128.82
515+22.72	129.48
515+35.22	130.14
515+47.72	130.80
515+60.22	131.46
515+72.72	132.13
515+85.22	132.79
515+97.72	133.45
516+10.22	134.11
516+22.72	134.78
516+35.22	135.44
516+47.72	136.10
516+60.22	136.76
516+70.22	137.29

FIGURE A-4

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

	BY	CHECKED
DESIGN	CHARLES LOMICKA	MINA PEZESHPOUR
DETAILS	HENGAMEH MAHBOOBI	MINA PEZESHPOUR
QUANTITIES	CHARLES LOMICKA	HTOON WIN

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DIVISION OF ENGINEERING SERVICES
STRUCTURE DESIGN
DESIGN BRANCH 19

BRIDGE NO. 55 E0118
POST MILE 9.5

RETAINING WALL NO. 513
WALL LAYOUT NO. 2

STRUCTURES DESIGN DETAIL SHEET (ENGLISH) (REV. 09-01-10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 3621
PROJECT NUMBER & PHASE: 1200000102 1 CONTRACT NO.: 0E3101

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES 04-18-11 07-21-11 07-19-11

SHEET 5 OF 16

FILE => 05-RW513-g-lo02.dgn

USERNAME => s120514 DATE PLOTTED => 21-JUL-2011 TIME PLOTTED => 15:21

APPENDIX B

FIELD EXPLORATION

Boring Logs for RW 513

- Boring / CPT location Map
- Boring Logs
- CPT Logs

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	74			

REGISTERED GEOTECHNICAL ENGINEER — DATE: July 2011

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — MICHAEL G. SMITH — No. 2229 — Exp. 3-31-2012 — GEOTECHNICAL — STATE OF CALIFORNIA

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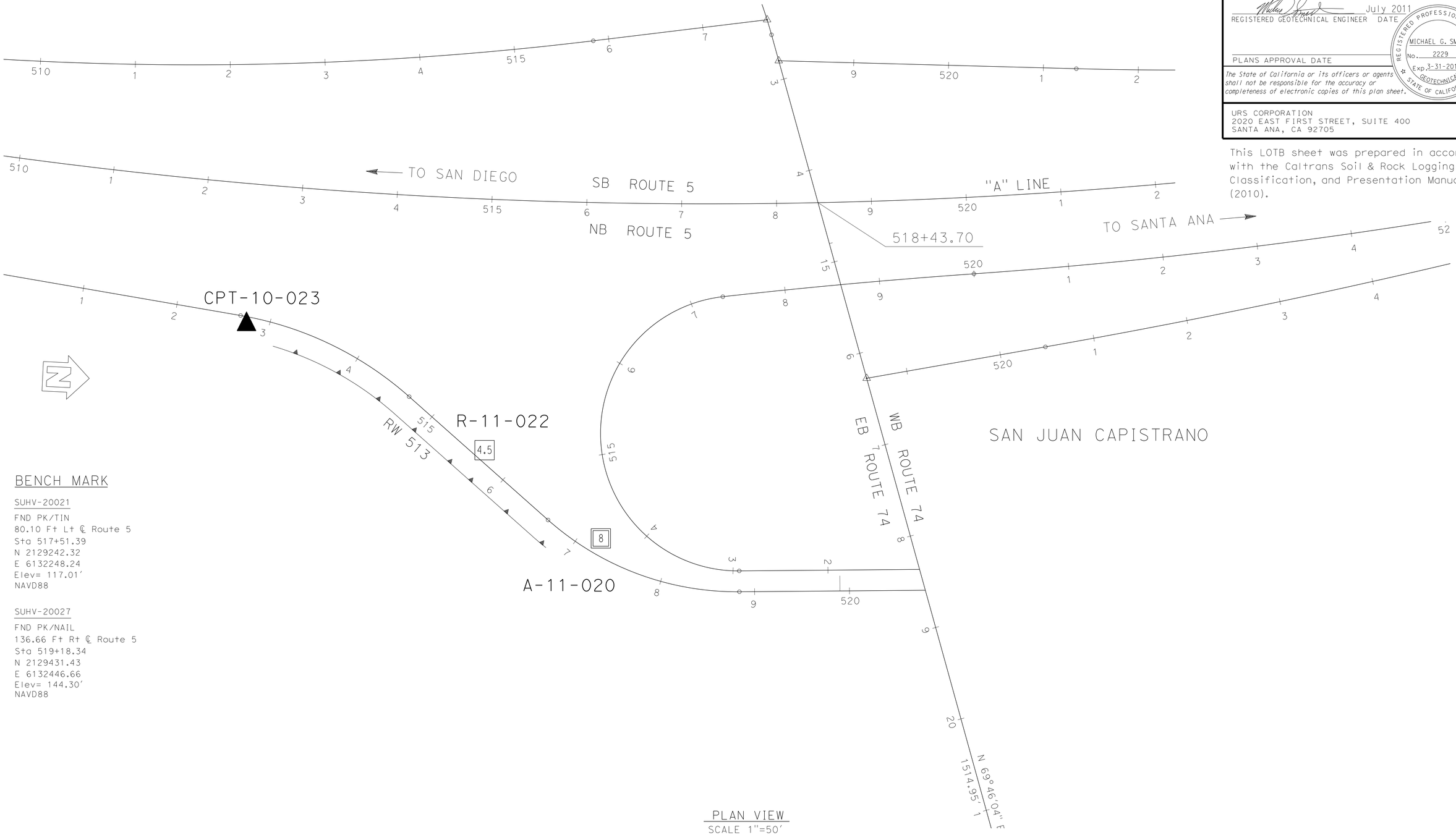
URS CORPORATION
2020 EAST FIRST STREET, SUITE 400
SANTA ANA, CA 92705

This LOTB sheet was prepared in accordance with the Caltrans Soil & Rock Logging, Classification, and Presentation Manual (2010).



PLAN VIEW
SCALE 1"=50'

BENCH MARK

SUHV-20021
FND PK/TIN
80.10 Ft Lt ℄ Route 5
Sta 517+51.39
N 2129242.32
E 6132248.24
Elev= 117.01'
NAVD88

SUHV-20027
FND PK/NAIL
136.66 Ft Rt ℄ Route 5
Sta 519+18.34
N 2129431.43
E 6132446.66
Elev= 144.30'
NAVD88

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN DESIGN BRANCH	BRIDGE NO. × / POST MILE ×	RETAINING WALL 513
FUNCTIONAL SUPERVISOR NAME: M. SMITH	DRAWN BY: P.QUACH / CHECKED BY: P.YERRA	FIELD INVESTIGATION BY: EJ.JEON/D.ORRIS			LOG OF TEST BORINGS SHEET 1 OF 5

OGS CIVIL LOG OF TEST BORINGS SHEET

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 59A0590
EA 0E3101

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES — SHEET — OF

FILE => ...\Wall 513\Boring location.dgn

USERNAME => phuong_quach DATE PLOTTED => 7/29/2011 TIME PLOTTED => 11:51:13 AM

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
D. Orris	2-28-11	2-28-11	2129143.8 ft / 6132699.5 ft NAD83	A-11-020
DRILLING CONTRACTOR: Tri-County Drilling, Inc.			BOREHOLE LOCATION (Offset, Station, Line): ~362.50' Rt Sta ~516+22.42"A" Line	SURFACE ELEVATION: ~139.6 ft MLLW
DRILLING METHOD: Hollow-Stem Auger			DRILL RIG: Diedrich 120	BOREHOLE DIAMETER: 8 in
SAMPLER TYPE(S) AND SIZE(S) (ID): Std Cal (2.5"), SPT (1.4")			SPT HAMMER TYPE: 140 lb, 30-inch drop	HAMMER EFFICIENCY, ERi: 87%
BOREHOLE BACKFILL AND COMPLETION: Backfilled with cement grout			GROUNDWATER READINGS: DURING DRILLING / AFTER DRILLING (DATE): Not Encountered	TOTAL DEPTH OF BORING: 31.5 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		SANDY lean CLAY (CL); medium stiff; mottled very dark gray to black; moist; few GRAVEL; some medium to fine SAND [FILL].												
	1														
137.58	2														
	3														
135.58	4														
	5		- stiff; mottled olive brown to dark grayish brown; PP=1.0 tsf.		S01	3 4 5	9					PP = 1			CR
133.58	6														
	7		Fat CLAY with SAND (CH); very stiff; mottled dark gray to dark olive gray; moist; little medium to fine SAND; PP=2.5 tsf.		S02					25	95	PP = 2.5			C WA: 83%<#200 sieve
131.58	8														
	9		SEDIMENTARY ROCK (CLAYSTONE); moderately to thickly bedded; olive gray; intensely to moderately weathered; soft; moderately to slightly fractured.												
129.58	10				S03	3 6 7	13			32					LL=75, PI=48 PI WA: 99%<#200 sieve
	11														
127.58	12														
	13														
125.58	14														
	15				S04	3 5 8	13					PP = 3.5			
123.58	16														
	17														
121.58	18														
	19														
	20														

(continued)

URS

REPORT TITLE			HOLE ID
BORING RECORD			A-11-020
DIST. 12	COUNTY ORA	ROUTE I-5	PROJECT NO. 0E3101
PROJECT OR BRIDGE NAME: I-5 and SR-74 Interchange			
BRIDGE NUMBER 55-1104	PREPARED BY EJ. Jeon	DATE 6-10-11	SHEET 1 of 2

BR - STANDARD - URSLOGO I5SR74SJ_LOTB.GPJ CALTRANS LIBRARY DOT 2011.GLB 7/6/11

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	20		- moderately weathered. SEDIMENTARY ROCK (Claystone) *(continued)*.		S05	3 5 7	12			28		PP = 3.75			LL=63, PI=37 PI WA: 98%<#200 sieve
	21														
117.58	22														
	23														
115.58	24														
	25		- moderately soft.		S06	6 8 13	21					PP = 4.25			
113.58	26														
	27														
111.58	28														
	29														
109.58	30				S07	6 10 14	24					PP = 24			
	31														
			Bottom of borehole at 31.5 ft bgs												
107.58	32														
	33														
105.58	34														
	35														
103.58	36														
	37														
101.58	38														
	39														
99.58	40														
	41														
97.58	42														
	43														
	44														

URS

REPORT TITLE			HOLE ID
BORING RECORD			**A-11-020**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	PROJECT NO. **0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**			
BRIDGE NUMBER **55-1104**	PREPARED BY **EJ. Jeon**	DATE **6-10-11**	SHEET **2 of 2**

BR - STANDARD - URSLOGO I5SR74SJ_LOTB.GPJ CALTRANS LIBRARY DOT 2011.GLB 7/6/11

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
D. Orris	1-14-11	1-14-11	2129009.2 ft / 6132629.7 ft NAD83	R-11-022
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Crux Subsurface, Inc.			~285.70' Rt Sta ~514+98.99"A" Line	~107.9 ft MLLW
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			Burley 4000 with HWT Chevron Advancer	4.5 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Std Cal (2.5"), SPT (1.4")			Manual; 140 lb, 30-inch drop	74%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING / AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Backfilled with cement grout			Not measured	42.0 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		ASPHALT.												
	1		SANDY lean CLAY (CL); stiff; grayish brown; moist; some medium to fine SAND.												
105.85	2														
	3														
103.85	4														
	5		- dark grayish brown; few GRAVEL; few SAND; PP=1.0 tsf.		S01	2 2 3	5					PP = 1			CR
101.85	6														
	7		Fat CLAY (CH); very stiff; dark olive gray to black; moist; trace mineralization nodules; trace roots; PP=2.5 tsf.		S02					24	101	PP = 2.5 UU = 2.1			C
99.85	8														
	9														
97.85	10		- dark grayish brown; PP=2.25 tsf.		S03	4 4 6	10					PP = 2.25			
	11														
95.85	12				S04					29	92	UU = 1.7			LL=58, PI=36 C, PI
	13														
93.85	14														
	15		- stiff; PP=1.0 tsf.		S05	2 3 3	6					PP = 1			
91.85	16														
	17														
89.85	18														
	19														
	20														

(continued)

URS

REPORT TITLE			HOLE ID
BORING RECORD			R-11-022
DIST. 12	COUNTY ORA	ROUTE I-5	PROJECT NO. 0E3101
PROJECT OR BRIDGE NAME I-5 and SR-74 Interchange			
BRIDGE NUMBER 55-1104	PREPARED BY EJ. Jeon	DATE 6-10-11	SHEET 1 of 2

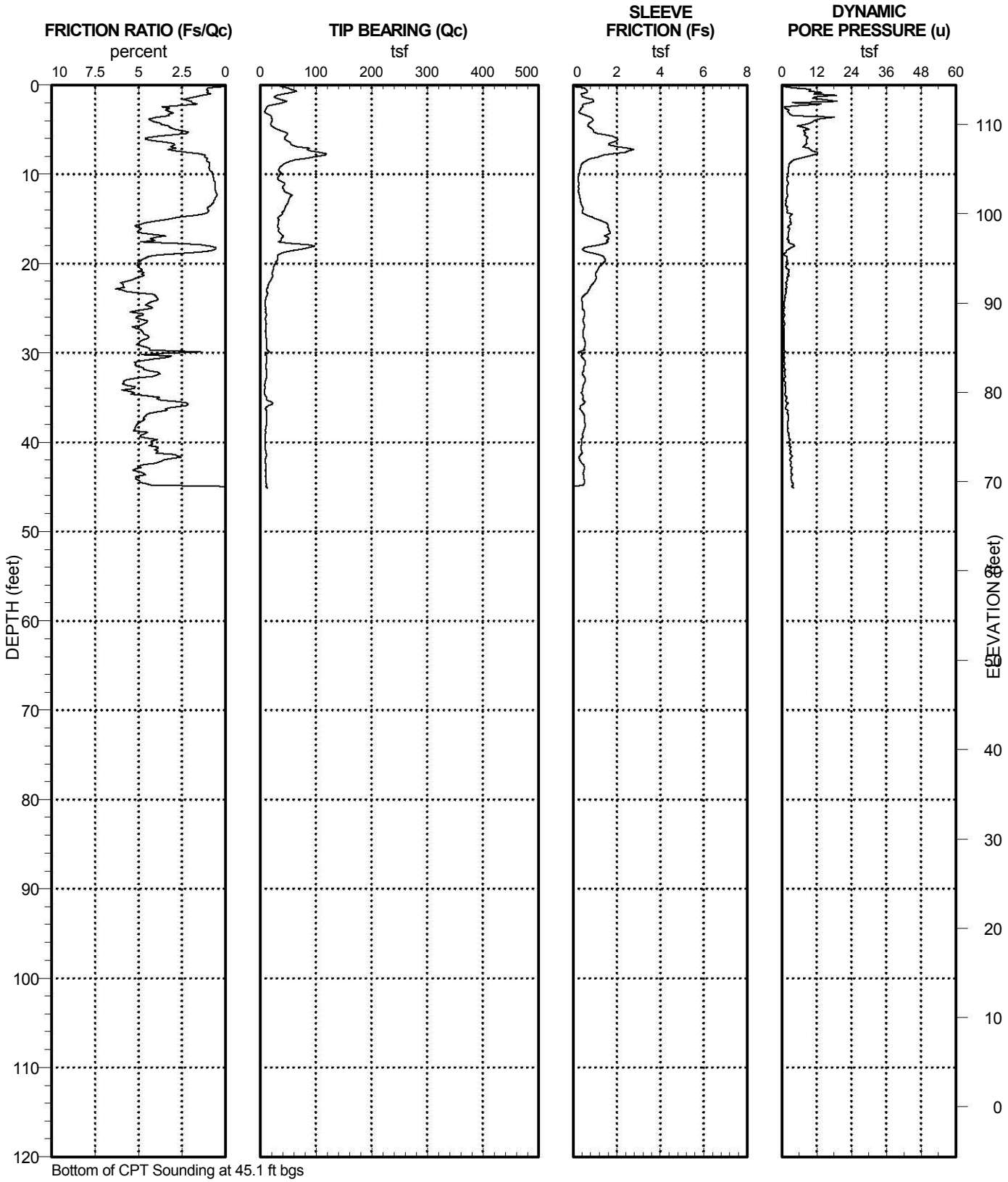
BR - STANDARD - URSLOGO I5SR74SJ_LOTB.GPJ CALTRANS LIBRARY DOT 2011.GLB 7/6/11

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	20	- very stiff; PP=2.0 tsf. Fat CLAY (CH) *(continued)*.		S06					26	99	PP = 2 UU = 1.8			LL=50, PI=32 C, PI
	21													
85.85	22													
	23	SANDY lean CLAY (CL); stiff; dark grayish brown; moist; trace GRAVEL; some SAND; PP=1.0 tsf.												
83.85	24													
	25			S07	4 3 3	6					PP = 1			WA: 67%<#200 sieve
81.85	26													
	27													
79.85	28													
	29													
77.85	30	- few coarse to fine GRAVEL; few SAND; PP=1.0 tsf.		S08					20	109				LL=39, PI=24 C, PI
	31													
75.85	32													
	33													
73.85	34													
	35			S09	3 5 6	11								No Recovery
71.85	36													
	37													
69.85	38													
	39	SEDIMENTARY ROCK (CLAYSTONE); moderately to thickly bedded; olive gray; intensely to moderately weathered; soft; intensely to moderately fractured.		S10	5 7 10	17								
67.85	40													
	41			S11	5 7 9	16								
65.85	42	Bottom of borehole at 42.0 ft bgs												
	43													
	44													

URS

REPORT TITLE			HOLE ID
BORING RECORD			**R-11-022**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	PROJECT NO. **0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**			
BRIDGE NUMBER **55-1104**	PREPARED BY **EJ. Jeon**	DATE **6-10-11**	SHEET **2 of 2**

BR - STANDARD - URSLOGO I5SR74SJ_LOTB.GPJ CALTRANS LIBRARY DOT 2011.GLB 7/6/11



Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**CPT-10-023**
DIST. **12**	COUNTY **ORA**	ROUTE **I-5**	POSTMILE **D0.0/D**	EA **12-0E3101**
PROJECT OR BRIDGE NAME **I-5 and SR-74 Interchange**				
BRIDGE NUMBER **55-1104**	PREPARED BY	DATE		SHEET **1 of 1**

6 BR - CPT I5SR74SJ_LOTB.GPJ CALTRANS LIBRARY DOT 2011.GLB 6/23/11

APPENDIX C

LABORATORY TESTING

Santa Ana Geotechnical Laboratory Testing Summary

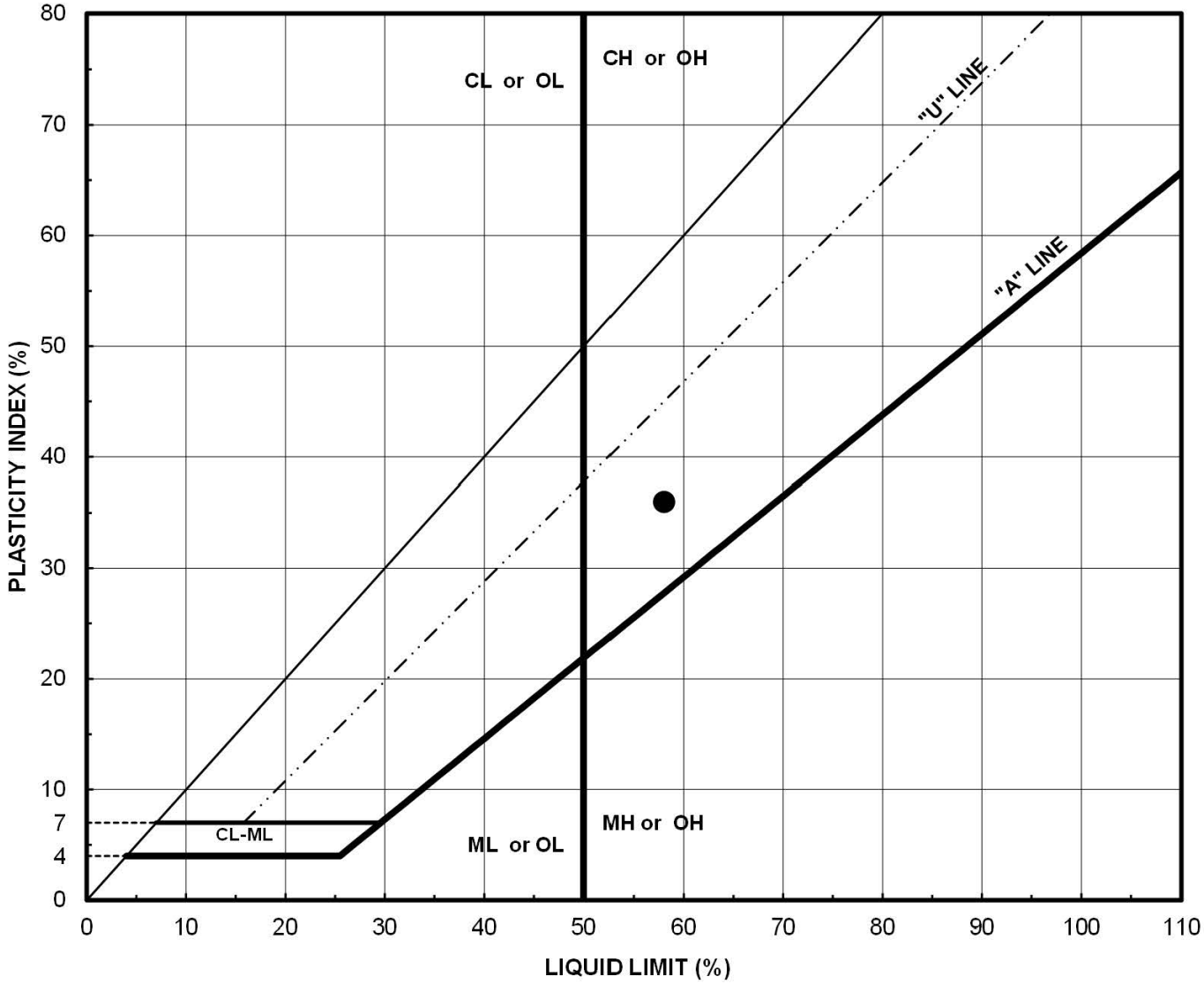
Project Name: I-5 / SR-74 Interchange
Project Number: 30989830, TO 59030
Project Engineer: FM

LOCATION				INITIAL CONDITION			INDEX																
							Limits			Gradation				SG	C	CU	UU	DS	UC	CORROSIVITY			
Exploration Number	Sample/ Specimen Number	Depth (ft)	USCS Symbol	Water Content (%)	Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Liquid Limit (%)	Plasticity Index (%)	Liquidity Index	Gravel (%)	Sand (%)	Fines (%)	Clay Fraction, finer than 5mm (%)	Specific Gravity	Consolidation	Consolidated Undrained Triaxial	Unconsolidated Undrained peak dev. (ks	Direct Shear, Peak Friction Angle (deg)	Unconfined Compression peak (ksf)	pH	Minimum Resistivity (ohm - cm)	Sulfate Content (ppm)	Chloride Content (ppm)
R-10-008		81.0	ROCK	23.0	123.3	100.2													36.02				
R-10-008		93.0	ROCK	28.8	119.3	92.6													7.95				
R-10-009		6~55																		7.3	600	930	150
R-10-009	3	15.0	CL	22.8	124.4	101.3	39	24	0.33										1.34				
R-10-009	5	25.0	CL	18.5	132.6	111.9	26	10	0.25			74.0			done			27					
R-10-009	7	35.0	SC	20.7	133.1	110.3													0.15				
R-10-009	10	50.0	CH	25.7	122.9	97.8													1.43				
A-11-020	1,2	5~8	CH																	7.6	580	0	600
A-11-020	2	6.5	CH	25.1	119.0	95.1						83.1			done								
A-11-020	3	10.0	CH	31.5			75	48	0.09			98.6											
A-11-020	5	20.0	CH	28.1			63	37	0.06			97.9											
R-11-022		5~30																		7.5	515	0	120

Santa Ana Geotechnical Laboratory Testing Summary

Project Name: I-5 / SR-74 Interchange
Project Number: 30989830, TO 59030
Project Engineer: FM

LOCATION				INITIAL CONDITION			INDEX																
							Limits			Gradation				SG	C	CU	UU	DS	UC	CORROSIVITY			
Exploration Number	Sample/ Specimen Number	Depth (ft)	USCS Symbol	Water Content (%)	Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Liquid Limit (%)	Plasticity Index (%)	Liquidity Index	Gravel (%)	Sand (%)	Fines (%)	Clay Fraction, finer than 5mm (%)	Specific Gravity	Consolidation	Consolidated Undrained Triaxial	Unconsolidated Undrained peak dev. (ks	Direct Shear, Peak Friction Angle (deg)	Unconfined Compression peak (ksf)	pH	Minimum Resistivity (ohm - cm)	Sulfate Content (ppm)	Chloride Content (ppm)
R-11-022	2	6.5	CH	23.5	124.2	100.6									done		4.13						
R-11-022	4	11.5	CH	29.4	119.6	92.4	58	36	0.21						done		3.48						
R-11-022	6	20.0	CH	25.7	124.4	99.0	50	32	0.24						done		3.5						
R-11-022	7	25.0	CL									66.8											
R-11-022	8	30.0	CL	19.5	130.0	108.8	39	24	0.19						done								
R-10-024		5~60																		7.5	445	1692	90
R-10-024	1	5.0	CL	27.6	119.6	93.8																	
R-10-024	3	15.0	CL	23.6	97.3	78.7	47	33	0.29										2.04				
R-10-024	4	20.0	CL	28.7								82.7											
R-10-024	5	25.0	CH	31.7	117.9	89.5	61	45	0.35						done				3.34				
R-10-024	6	30.0	SM	27.3								17.9											
R-10-028		5~50																		6.5	640	606	105

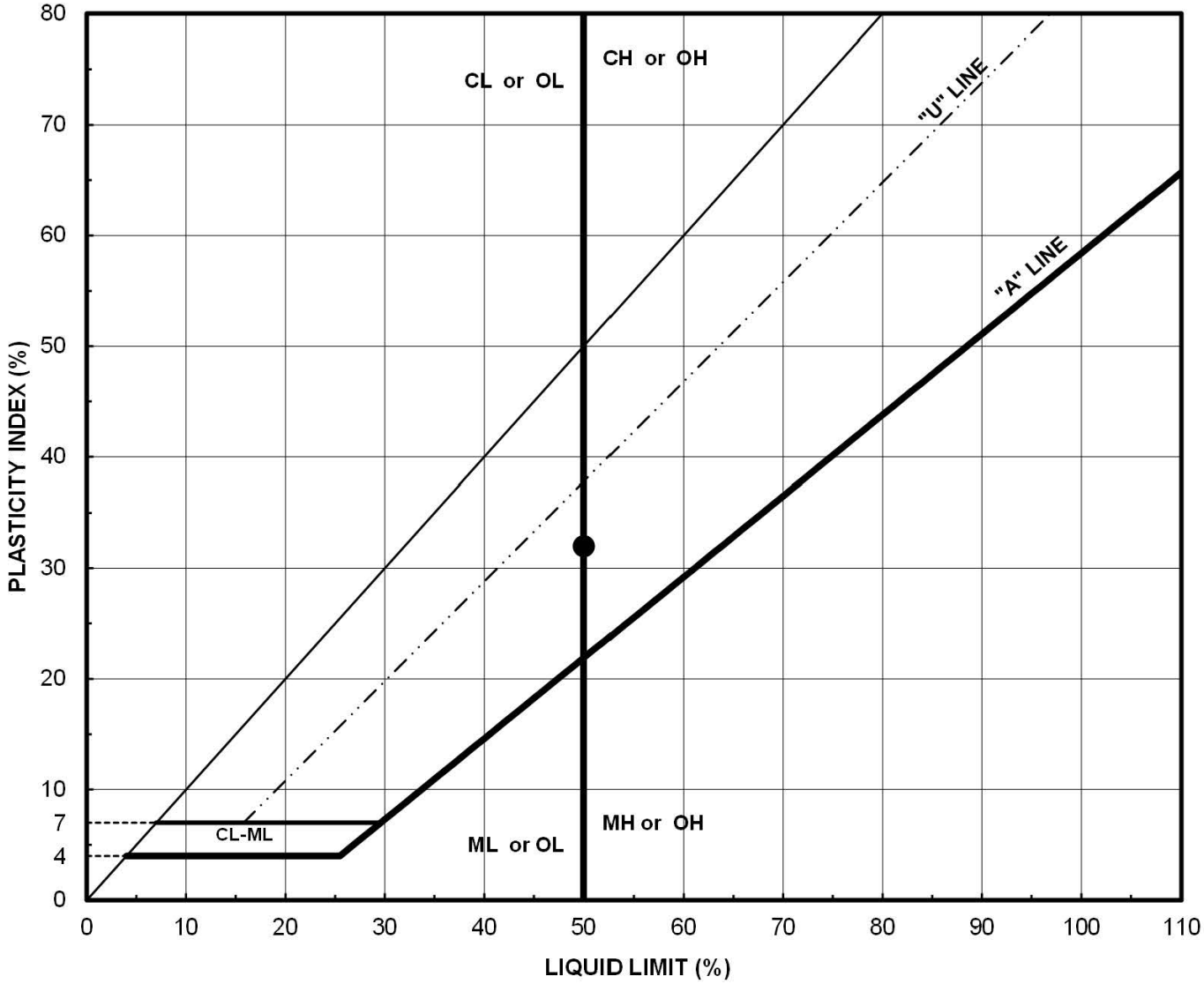


BORING No.	SAMPLE No.	DEPTH (ft.)	WATER CONTENT (%)	LL	PI	DESCRIPTION / CLASSIFICATION
R-11-022	4	11.5	29.4	58	36	Dark olive gray Clay (CH)

Project Name: **I-5 & SR-74 IC**

Project Number: **30989830**

PLASTICITY CHART

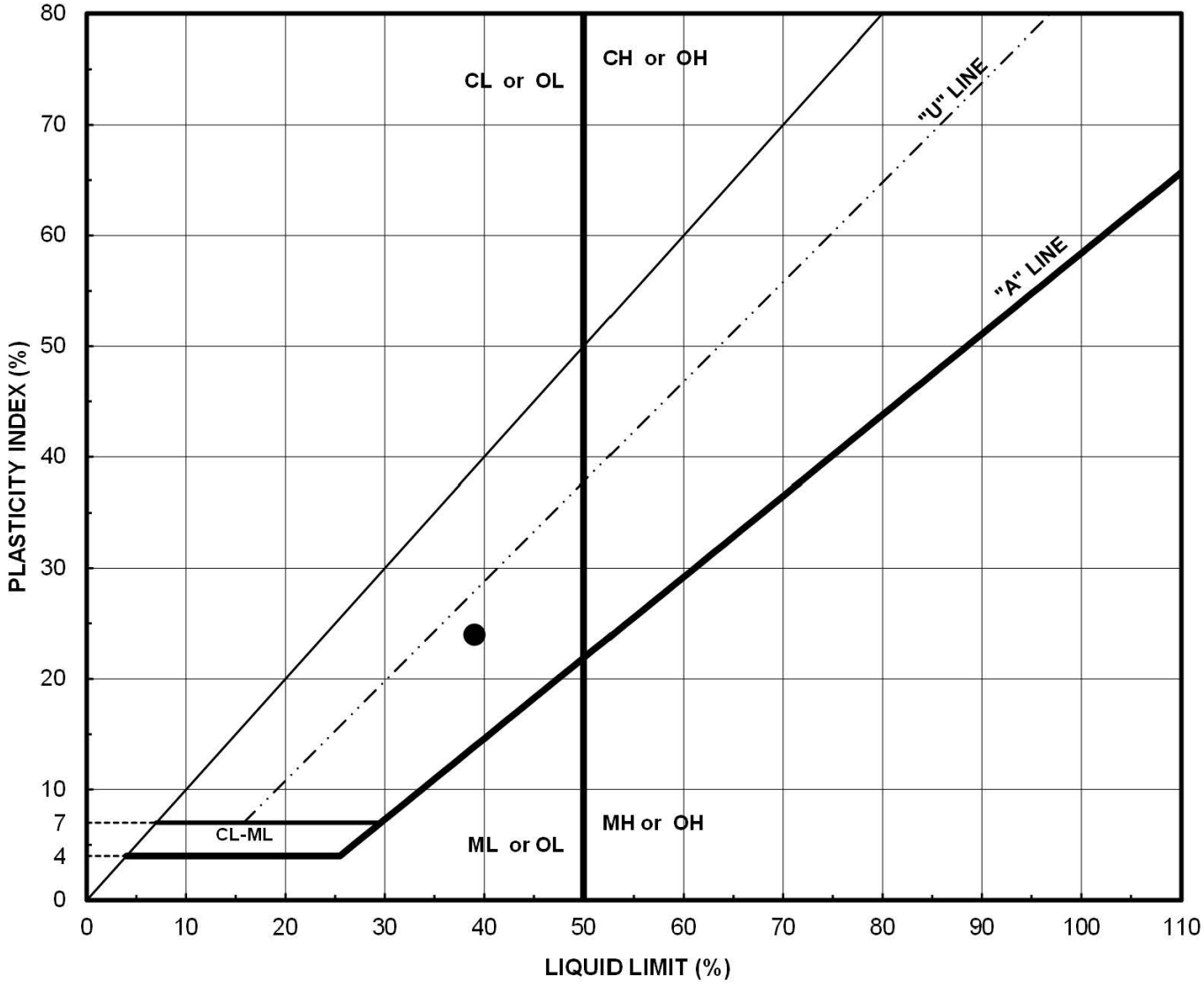


BORING No.	SAMPLE No.	DEPTH (ft.)	WATER CONTENT (%)	LL	PI	DESCRIPTION / CLASSIFICATION
R-11-022	6	20.0	NA	50	32	Dark olive gray Clay (CH)

Project Name: **I-5 & SR-74 IC**

Project Number: **30989830**

PLASTICITY CHART



BORING No.	SAMPLE No.	DEPTH (ft.)	WATER CONTENT (%)	LL	PI	DESCRIPTION / CLASSIFICATION
R-11-022	8	30.0	NA	39	24	Olive brown sandy Clay (CL)

Project Name: **I-5 & SR-74 IC**

Project Number: **30989830**

PLASTICITY CHART

CORROSIVITY TEST ANALYSIS

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM

Boring No.: A-11-020
Sample No.: 1, 2
Depth (ft): 5 ~ 6.5

Initial Visual Classification Symbol: CH

State of Specimen before Processing

X	Passing soil through #8 sieve
X	Moist State
	Air Dried
	Oven Dried at 60 C

Set-Up Water Content	Minus No. 8 or ( )
Container No.	s1
Mass Container + Wet Soil (g), M1	137.2
Mass Container + Dry Soil (g), M2	134.9
Mass Container (g), M3	85.24
Water Content, w (%)	4.63

Resistivity Test: California Test Method 643

Mininum Resistence value: 580 ohm-cm

	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5
Weight of Soil in bowl (g):	407.55	426.4	464.57	493.03	509.52
Weight of mixing bowl (g):	132.75	132.75	132.75	132.75	132.75
Wet weight of Soil (g):	274.8	293.65	331.82	360.28	376.77
Amount of water added (ml):	0	20	41	30	20
Soil Box + Wet Soil (g), M5	220.83	227.20	246.95	252.20	251.66
Weight of Soil Box (g), M6	124.67	124.67	124.67	124.67	124.67
Wt. of Wet Soil for test (g), M7	96.16	102.53	122.28	127.53	126.99
Volume of Soil Box (cm^3)	79.2	79.2	79.2	79.2	79.2
Est. Saturation (%)	9.5	35.3	76.6	88.2	89.6
Resistivity Reading (ohm)	10,000	3,600	695	580	640
Resistence (ohm-cm)	10,000	3,600	695	580	640

Resistence = Soil Box Constant x Reading

pH Test : California Test Method 532

50g wet weight of soil mixed with 50 mL of de-ionized water.

pH of slurry: 7.60

Temperature : 21.7 Celsius

Sulfate Content:

100g of soil mixed with 300 mL of de-ionized water.

SO_4 (ppm) : not detected

recorded mg of SO_4 in sample, x, = 0 mg

soil / water ratio, r, = 3

number of dilutions to obtain above value, d, = _____ = _____ mg/ L = ppm

Dilution Equation, d > 0; $SO_4 = ((x / 80) * (r\ 80 * 2^{d} - r\ 80 * 2^{(d-1)})) + r\ 80 * 2^{(d-1)}$

Chloride Content:

100g of soil mixed with 300 mL of de-ionized water.

Cl^- (ppm) : 600

mg/L of Cl^- = ((A-B) x N x 35453) x 3

A = mL of $AgNO_3$ A= 40

B = 23 mL of the blank

N = 0.0493 N, normality of the titrant

Cl^- (mg/L) = A * 5 * 3

Tested By: YS Date: 5/15/2011 Checked By: TJO

CORROSIVITY TEST ANALYSIS

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM

Boring No.: R-11-022
Sample No.: composite
Depth (ft): 5 ~ 30

Initial Visual Classification Symbol: CL

State of Specimen before Processing

X	Passing soil through #8 sieve
X	Moist State
	Air Dried
	Oven Dried at 60 C

Set-Up Water Content	Minus No. 8 or ( )
Container No.	c4
Mass Container + Wet Soil (g), M1	115.87
Mass Container + Dry Soil (g), M2	106.7
Mass Container (g), M3	71.92
Water Content, w (%)	26.37

Resistivity Test: California Test Method 643

Mininum Resistence value: 515 ohm-cm

	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5
Weight of Soil in bowl (g):	403.98	413.67	423.36		
Weight of mixing bowl (g):	134.86	134.86	134.86		
Wet weight of Soil (g):	269.12	278.81	288.5		
Amount of water added (ml):	0	10	10		
Soil Box + Wet Soil (g), M5	245.27	254.08	255.16		
Weight of Soil Box (g), M6	126.47	126.47	126.47		
Wt. of Wet Soil for test (g), M7	118.8	127.61	128.69		
Volume of Soil Box (cm^3)	79.2	79.2	79.2	79.2	79.2
Est. Saturation (%)	56.0	75.8	81.8		
Resistivity Reading (ohm)	695	515	525		
Resistence (ohm-cm)	695	515	525		

Resistence = Soil Box Constant x Reading

pH Test : California Test Method 532

50g wet weight of soil mixed with 50 mL of de-ionized water.

pH of slurry: 7.50

Temperature : 21.2 Celsius

Sulfate Content:

100g of soil mixed with 300 mL of de-ionized water.

SO_4 (ppm) : not detected

recorded mg of SO_4 in sample, x, = 0 mg

soil / water ratio, r, = 3

number of dilutions to obtain above value, d, = _____ = _____ mg/ L = ppm

Dilution Equation, d > 0; $SO_4 = ((x / 80)* (r\ 80 * 2^{d} - r\ 80 * 2^{(d-1)})) + r\ 80 * 2^{(d-1)}$

Chloride Content:

100g of soil mixed with 300 mL of de-ionized water.

Cl^- (ppm) : 120

mg/L of Cl^- = ((A-B) x N x 35453) x 3

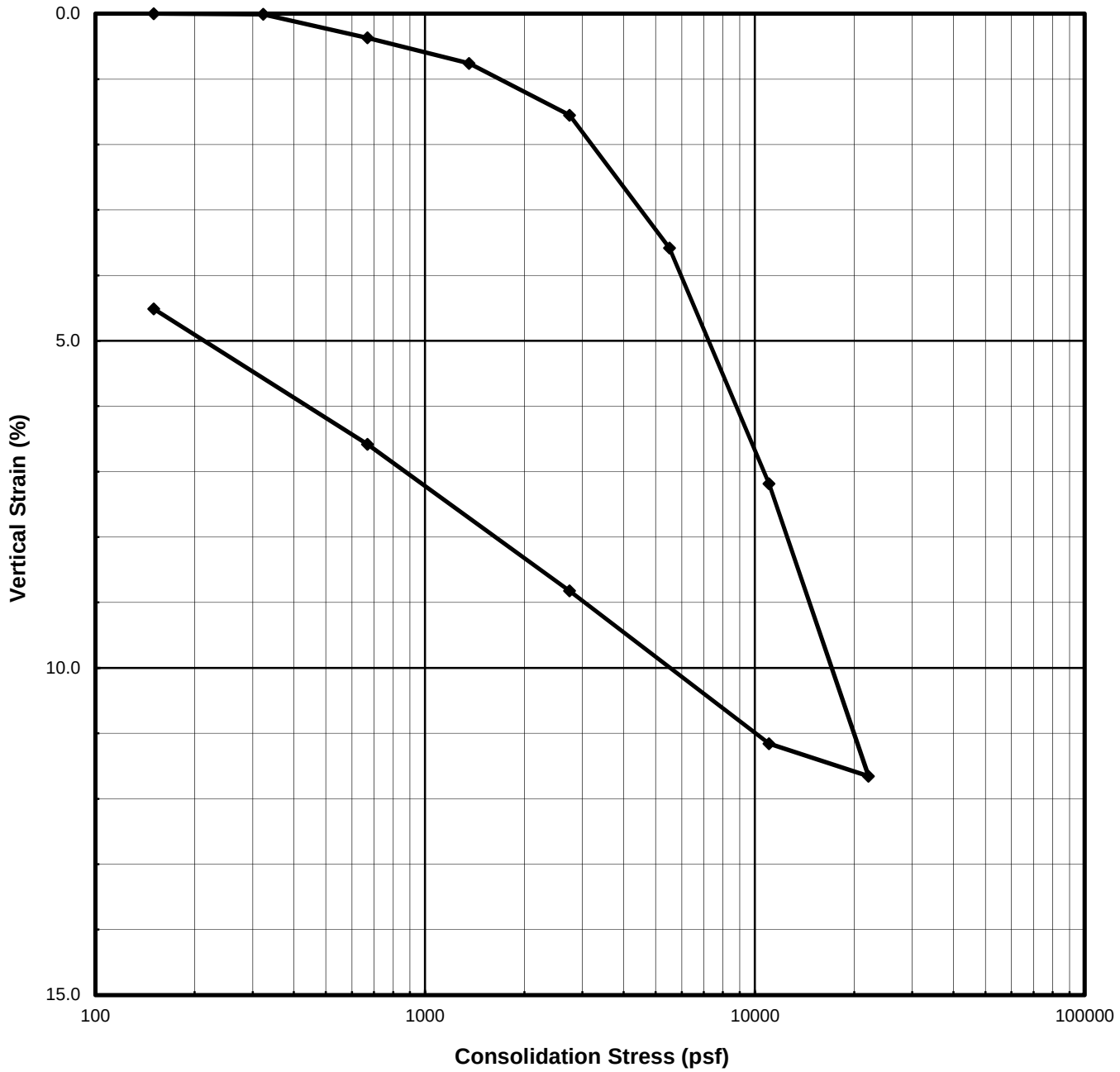
A = mL of $AgNO_3$ A= 8

B = 23 mL of the blank

N = 0.0493 N, normality of the titrant

Cl^- (mg/L) = A * 5 * 3

Tested By: YS Date: 2/15/2011 Checked By: TJO



Description:	**Very dark greenish gray Clay with sand (CH)**							
Boring No.:	A-11-020		Liquid Limit		%	Specific Gravity	2.70	assumed
Sample No.:	2		Plasticity Index		%	Strain for Saturation	4.37	%
Depth (ft | m)	6.5	1.98	Fines Content	83.1	%	Water added at	67	psf

	Water Content (%)	Total Unit Weight		Dry Unit Weight		Saturation (%)	Void Ratio	Height		Diameter	
		(pcf)	(kN/m^3)	(pcf)	(kN/m^3)			(inches)	(cm)	(inches)	(cm)
Initial	25.1	119.0	18.70	95.2	14.95	88.1	0.77	0.946	2.40	2.418	6.142
Final	26.2	125.2	19.67	99.2	15.58	101.8	0.70	0.908	2.31		

URS

I-5 & SR-74 IC

Project Number: 30989830
Test Start Date: 5/10/2011

CONSOLIDATION TEST
ASTM D2435

SUBMITTED BY: Thomas J O'Meara

Con SR 74 A11020 006.xls

One-Dimensional Oedometer Testing
Set-up / Take down Worksheet
ASTM D2435

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM

Boring No.: A-11-020
Sample No.: 2
Depth (ft): 6.5

Apparatus No.: C-8

Specimen Description : Very dark greenish gray Clay with sand (CH)
Duration: end of increment

Ring Number: R25
Weight of Wet Spec. and Ring: 354.50 g
Weight of Ring: 218.71 g
Initial Weight of Wet Spec.: 135.79 g

Take Down Weight with Ring: 355.50 g

Excess Oven-dried Cont. No.: rp1
Weight of Cont. and Dry Spec.: 116.31 g
Weight of Container: 116.09 g
Weight of Excess Dried Soil: 0.22 g
Weight of Excess Wet Soil 0.28 g
Final Weight of Wet Specimen: 137.07 g

Height of Specimen (in)

	Initial	Final
1	0.943	0.909
2	0.954	0.911
3	0.941	0.906
4	0.943	0.919
5	0.951	0.895
Ave:	0.946	0.908

Initial Height - Final Height = 0.038 in
Change in Dial (Dd) = 0.047 in
Initial Height - Dd = 0.900 in
Final Height + Dd = 0.955 in
Weight of Top Cap = 373.48 g

Specimen Analysis					Initial Trim	Initial Spec.	Final
				Container Number:	sx6	**XXXXX**	s7
				Mass of Container and Wet Specimen M1 (g)	300.49	135.79	213.14
				Mass of Container and Dry Specimen, M2 (g)	261.47	108.58	185.52
				Mass of Container, M3 (g)	108.79	**XXXXX**	80.25
				Water Content, w (%)	25.56	25.06	26.24
				Mass of Wet Specimen, M4 (g)	135.79	135.79	137.07
				Mass of Dry Specimen, M5 (g)	108.58	108.58	108.58
Nominal		Measured	x	Specimen Height, H (in)	0.946	0.946	0.908
Nominal	x	Measured		Specimen Diameter, D (in)	2.418	2.418	2.418
				Area of Specimen, A (in^2)	4.592	4.592	4.592
				Volume of Specimen, V (cc)	71.22	71.22	68.33
Assumed	x	Measured		Specific Gravity, Gs	2.70	2.70	2.70
				Wet Unit Weight, WUW (pcf)	**119.0**	**119.0**	**125.2**
				Dry Unit Weight, DUW (pcf)	**94.8**	**95.2**	**99.2**
				Void Ratio	**0.775**	**0.768**	**0.696**
				Degree of Saturation, S (%)	**89.1**	**88.1**	**101.8**

Set-up by: TJO
Date: 5/10/11
Calculated by: TJO
Checked by: TJO
Strain for Saturation (%) = **4.372**

One-Dimensional Oedometer Testing

Loading Worksheet

ASTM D2435

Project Number: 30989830 Boring No.: A-11-020

Project Name: I-5 & SR-74 IC Sample No.: 2

Project Engineer: FM Apparatus No.: C-8 Depth (ft): 6.5

Initial Dial Reading: 0.3791 inch Initial Specimen Height: 0.946 inch

	Stage No.	Normal Stress (psf)	Dial Reading (in)		Compressibility Correction (in)	Vertical Strain (%)	
			End of Duration	End of Increment		End of Duration	End of Increment
w	Seat	67		0.3791	0.0000		0.00
	1	150		0.3791	0.0004		-0.04
	2	323	0.3780	0.3781	0.0009	0.02	0.01
	3	669	0.3736	0.3736	0.0020	0.37	0.37
	4	1360	0.3684	0.3684	0.0035	0.76	0.76
	5	2743	0.3596	0.3593	0.0051	1.52	1.55
	6	5508	0.3384	0.3382	0.0070	3.56	3.58
	7	11039	0.3020	0.3017	0.0094	7.15	7.19
	8	22100	0.2590	0.2568	0.0120	11.42	11.65
	9	11039		0.2628	0.0107		11.16
	10	2743		0.2880	0.0076		8.82
	11	669		0.3114	0.0054		6.58
	12	150		0.3324	0.0040		4.51
	13						
	14						
	15						
	16						
	17						
	18						
	19						
	20						
	21						
	22						
	23						
	24						
	25						
	26						
	27						
	28						
	29						
	30						
	31						
	32						
	33						

Final dial reading prior to take down (inch): 0.3324 Take down by: TJO Date: 5/31/11

One-Dimensional Oedometer Testing
ASTM D2435
Table of Incremental Values

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM
Apparatus No.: C-8

Boring No.: A-11-020
Sample No.: 2
Depth (ft): 6.5
Inundation at stage: Seat

10 **20** Hanger Ratios

Stage Number	Incremental Weight Applied (kg) Back	Front	Vertical Stress (psf)	Specimen Hieght (in)	Deflections (in) $d_{initial}$	d_o	d_{50}	d_{100}	d_{final}	Porous Stone (in)	t_{50} (min)	cv (in^2/min)	cv (ft^2/day)
Top Cap			26	0.946	0.3791	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
Seat	0.06		67	0.946	0.3791	XXXXX	XXXXX	XXXXX	0.3791	0.0000	XXXXX	XXXXX	XXXXX
1		0.06	150	0.946	0.3791	0.3791	XXXXX	XXXXX	0.3791	0.0004	XXXXX	XXXXX	XXXXX
2	0.25		323	0.944	0.3791	0.3784	0.3782	0.3780	0.3781	0.0009	XXXXX	XXXXX	XXXXX
3	0.50		669	0.938	0.3781	0.3762	0.3749	0.3736	0.3736	0.0020	XXXXX	XXXXX	XXXXX
4	1.0		1360	0.929	0.3736	0.3713	0.3699	0.3684	0.3684	0.0035	0.60	0.071	0.708
5		1.0	2743	0.915	0.3684	0.3665	0.3631	0.3596	0.3593	0.0051	6.00	0.007	0.069
6	4.0		5508	0.887	0.3593	0.3548	0.3466	0.3384	0.3382	0.0070	7.00	0.006	0.055
7		4.0	11039	0.841	0.3382	0.3311	0.3166	0.3020	0.3017	0.0094	38.00	0.001	0.009
8		8.0	22100	0.784	0.3017	0.2957	0.2774	0.2590	0.2568	0.0120	60.00	0.001	0.005
9		-8.0	11039	0.779	0.2568	0.2584	XXXXX	XXXXX	0.2628	0.0107	XXXXX	XXXXX	XXXXX
10	-4.0	-4.0	2743	0.797	0.2628	0.2657	XXXXX	XXXXX	0.2880	0.0076	0.50	0.063	0.625
11	-1.0	-1.0	669	0.815	0.2880	0.2890	XXXXX	XXXXX	0.3114	0.0054	XXXXX	XXXXX	XXXXX
12	-0.8		150	0.832	0.3114	0.3119	XXXXX	XXXXX	0.3324	0.0040	XXXXX	XXXXX	XXXXX
13			150	XXXXX	0.3324	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
14			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
15			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
16			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
17			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
18			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
19			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
20			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
21			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
22			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
23			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
24			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
25			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX

One-Dimensional Oedometer Testing Increment

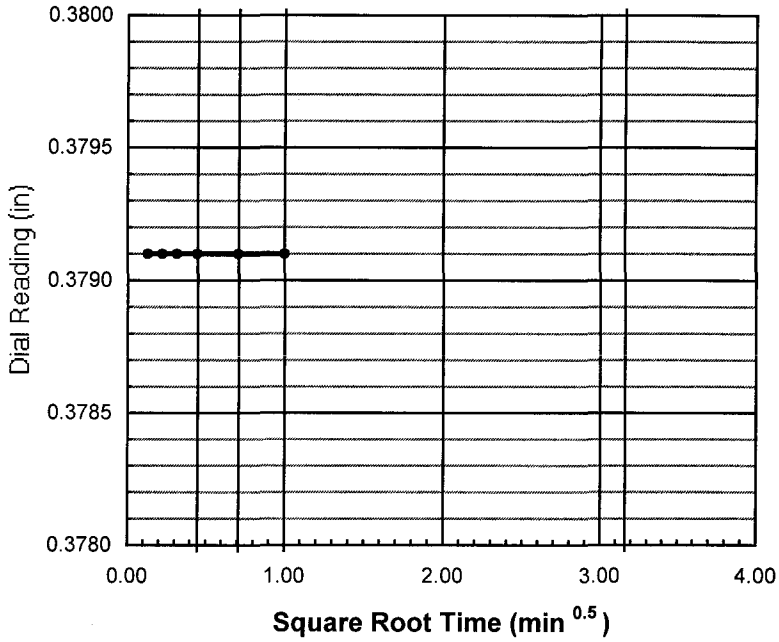
for ASTM D2435, method B

Project Number: 30989830 Apparatus No.: C-8 Stage Number: 1 Curves by: TJO

Boring No.: A-11-020 Sample No.: 2 Depth (ft.) 6.5

Date: 10-May-11 Load (psf): 150 Zero Reading: 0.3791

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
17:01:18	0	0.00	0.3791
	0.02	0.13	0.3791
	0.05	0.22	0.3791
	0.10	0.32	0.3791
	0.20	0.45	0.3791
	0.50	0.71	0.3791
	1.00	1.00	0.3791



do = 0.3791

d90 = _____ t90 = _____ min

d100 = _____

df = 0.3791

square root

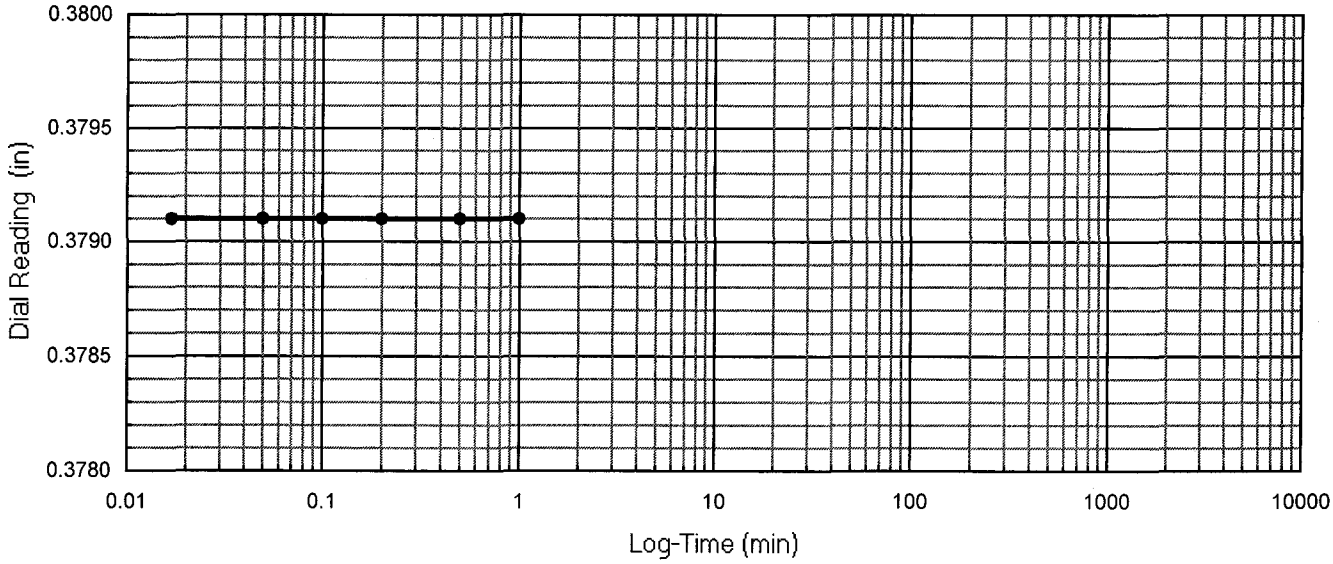
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

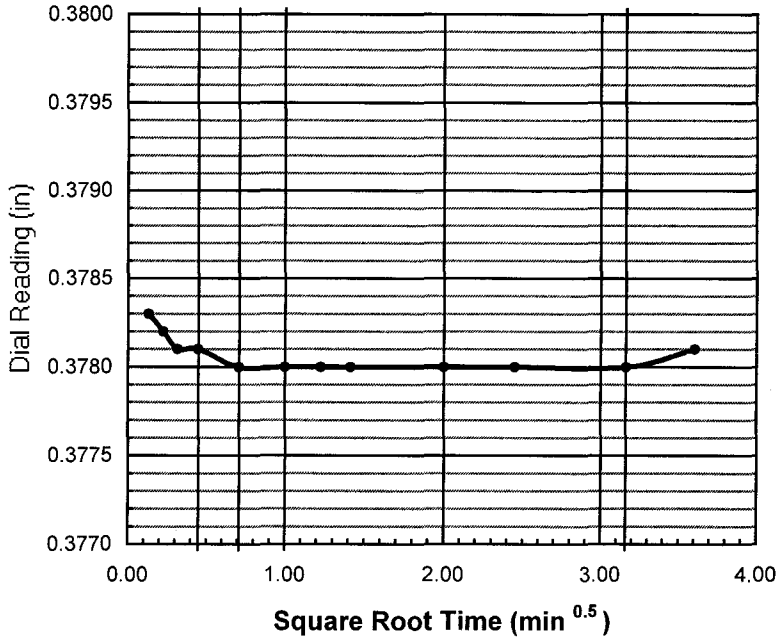
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C-8 | Stage Number: 2 | Curves by: TJO

Boring No.: A-11-020 | Sample No.: 2 | Depth (ft.) 6.5

Date: 10-May-11 | Load (psf): 323 | Zero Reading: 0.3791

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
17:02:17	0	0.00	0.3790
	0.02	0.13	0.3783
	0.05	0.22	0.3782
	0.10	0.32	0.3781
	0.20	0.45	0.3781
	0.50	0.71	0.3780
	1.00	1.00	0.3780
	1.50	1.22	0.3780
	2.00	1.41	0.3780
	4.0	2.00	0.3780
	6.0	2.45	0.3780
	10.0	3.16	0.3780
swelling	13.0	3.61	0.3781



do = 0.3784

d90 = _____ t90 = _____ min

d100 = 0.3780

df = 0.3781

square root

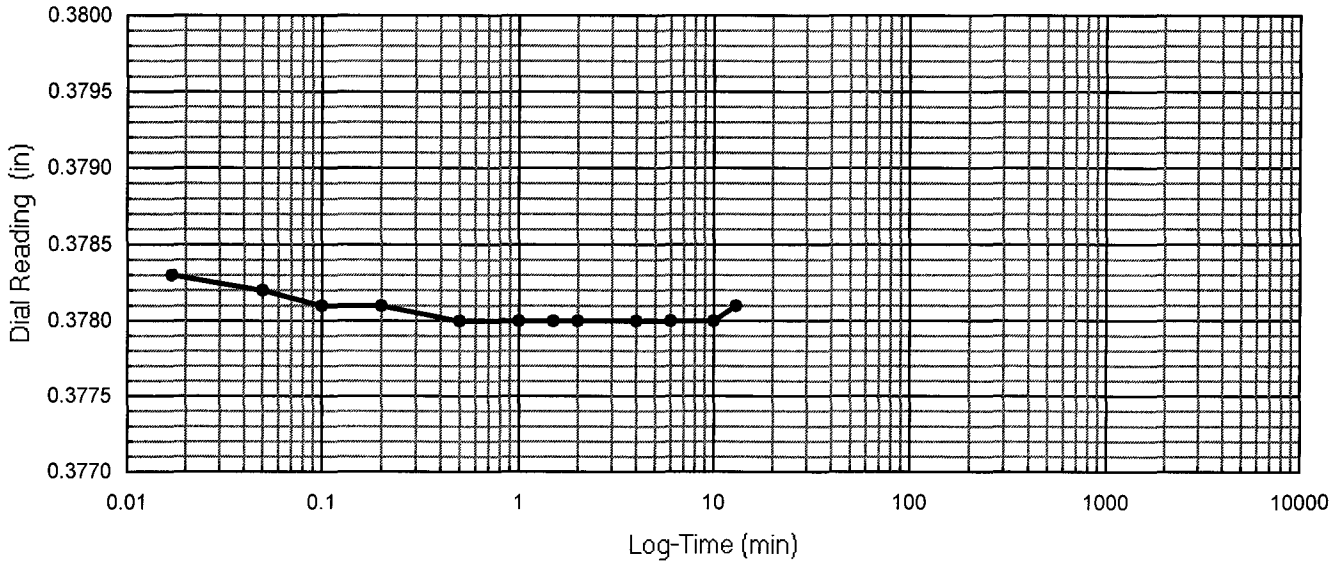
d50 = _____

t50 = _____ min

log time

d50 = 0.3782

t50 = _____ min



One-Dimensional Oedometer Testing Increment

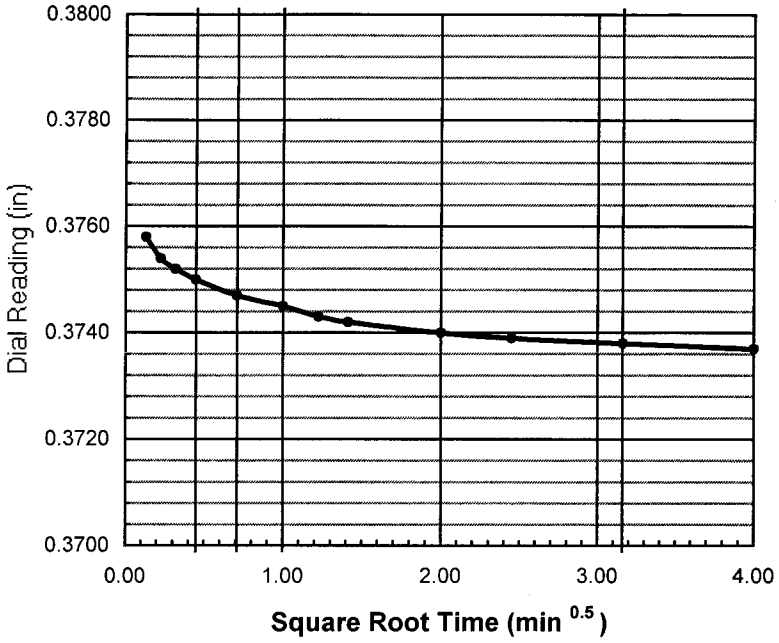
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C-8 | Stage Number: 3 | Curves by: TJO

Boring No.: A-11-020 | Sample No.: 2 | Depth (ft.) 6.5

Date: 10-May-11 | Load (psf): 669 | Zero Reading: 0.3791

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
17:15:24	0	0.00	0.3781
	0.02	0.13	0.3758
	0.05	0.22	0.3754
	0.10	0.32	0.3752
	0.20	0.45	0.3750
	0.50	0.71	0.3747
	1.00	1.00	0.3745
	1.50	1.22	0.3743
	2.00	1.41	0.3742
	4.0	2.00	0.3740
	6.0	2.45	0.3739
	10.0	3.16	0.3738
	16.0	4.00	0.3737
	30		0.3737
	60		0.3736
	90		0.3736



do = 0.3762

d90 = _____ t90 = _____ min

d100 = 0.3736

df = 0.3736

square root

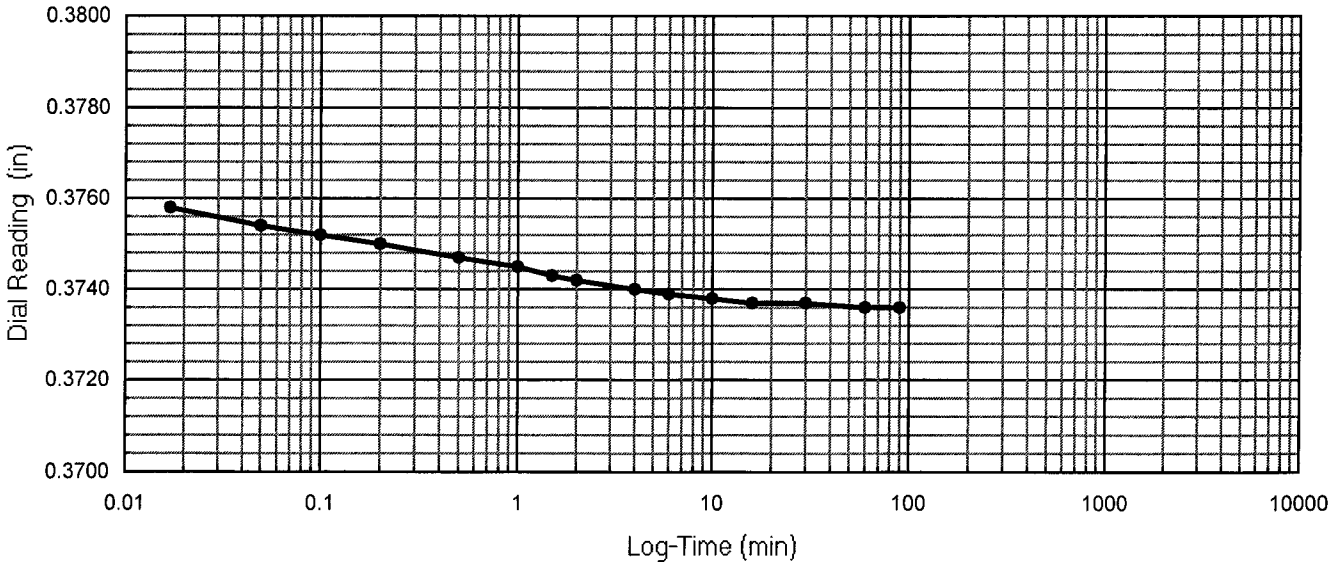
d50 = _____

t50 = _____ min

log time

d50 = 0.3749

t50 = _____ min



One-Dimensional Oedometer Testing Increment

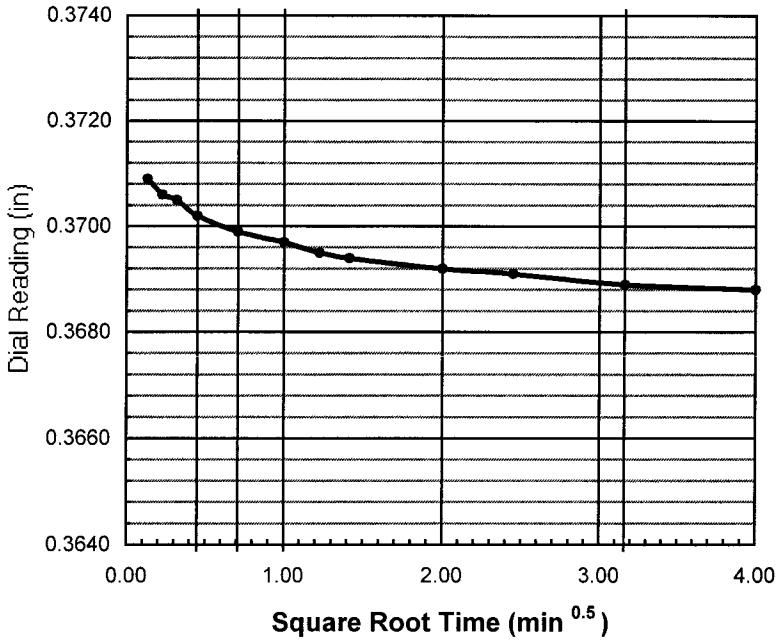
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C-8 | Stage Number: 4 | Curves by: TJO

Boring No.: A-11-020 | Sample No.: 2 | Depth (ft.) 6.5

Date: 10-May-11 | Load (psf): 1360 | Zero Reading: 0.3791

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
18:46:26	0	0.00	0.3736
	0.02	0.13	0.3709
	0.05	0.22	0.3706
	0.10	0.32	0.3705
	0.20	0.45	0.3702
	0.50	0.71	0.3699
	1.00	1.00	0.3697
	1.50	1.22	0.3695
	2.00	1.41	0.3694
	4.0	2.00	0.3692
	6.0	2.45	0.3691
	10.0	3.16	0.3689
	16.0	4.00	0.3688
	30		0.3686
	60		0.3685
	120		0.3685
	240		0.3684
	480		0.3684
	878		0.3684



do = 0.3713

d90 = _____ t90 = _____ min

d100 = 0.3684

df = 0.3684

square root

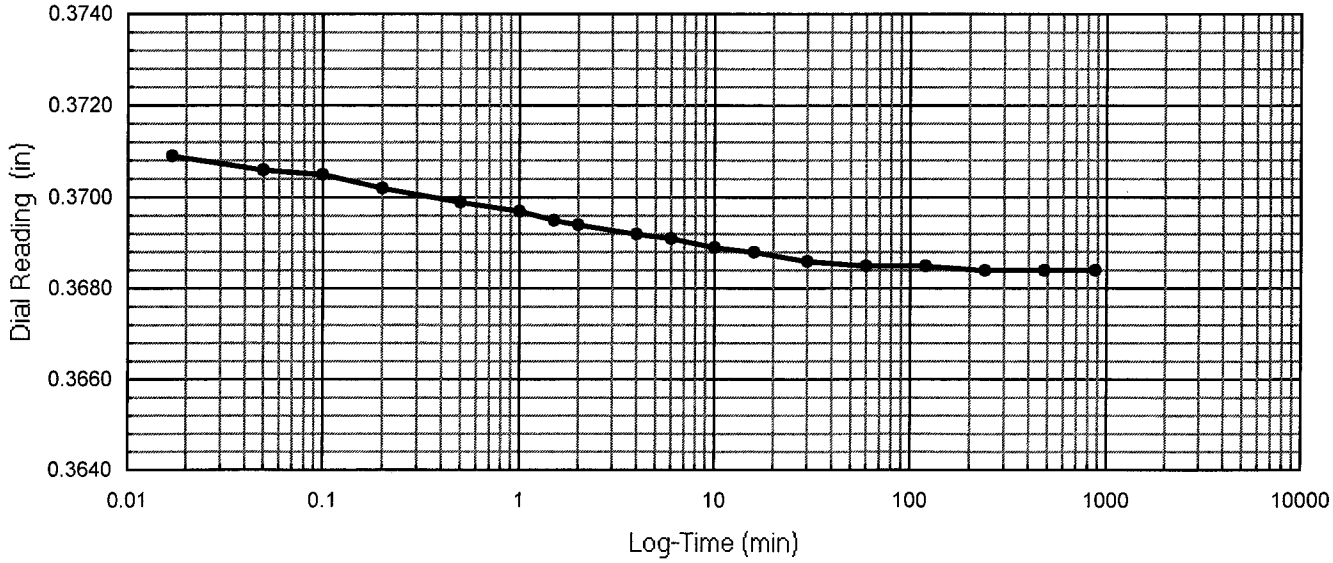
d50 = _____

t50 = _____ min

log time

d50 = 0.3698

t50 = 0.6 min



One-Dimensional Oedometer Testing Increment

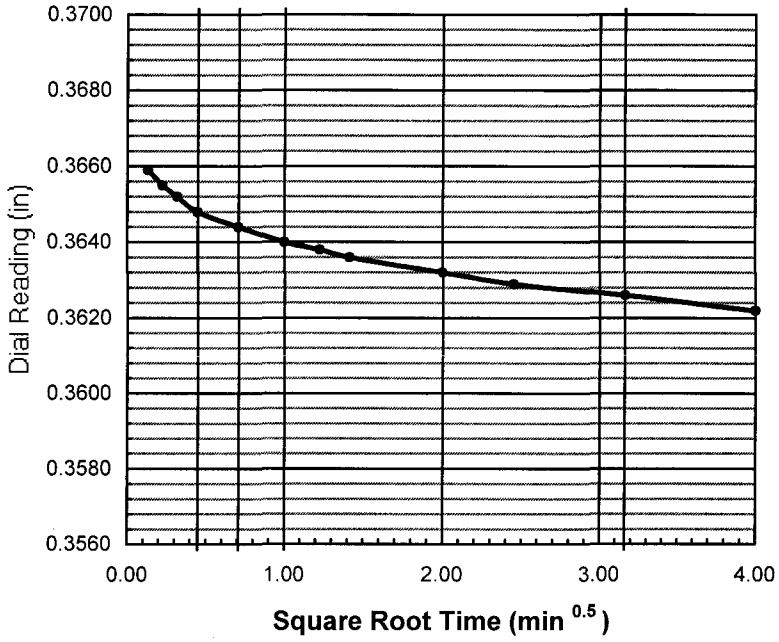
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C-8 | Stage Number: 5 | Curves by: TJO

Boring No.: A-11-020 | Sample No.: 2 | Depth (ft.) 6.5

Date: 11-May-11 | Load (psf): 2743 | Zero Reading: 0.3791

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:25:11	0	0.00	0.3684
	0.02	0.13	0.3659
	0.05	0.22	0.3655
	0.10	0.32	0.3652
	0.20	0.45	0.3648
	0.50	0.71	0.3644
	1.00	1.00	0.3640
	1.50	1.22	0.3638
	2.00	1.41	0.3636
	4.0	2.00	0.3632
	6.0	2.45	0.3629
	10.0	3.16	0.3626
	16.0	4.00	0.3622
	30		0.3617
	60		0.3612
	120		0.3607
	240		0.3603
	480		0.3599
	1440		0.3594
	1984		0.3593



do = 0.3665

d90 = _____ t90 = _____ min

d100 = 0.3596

df = 0.3593

square root

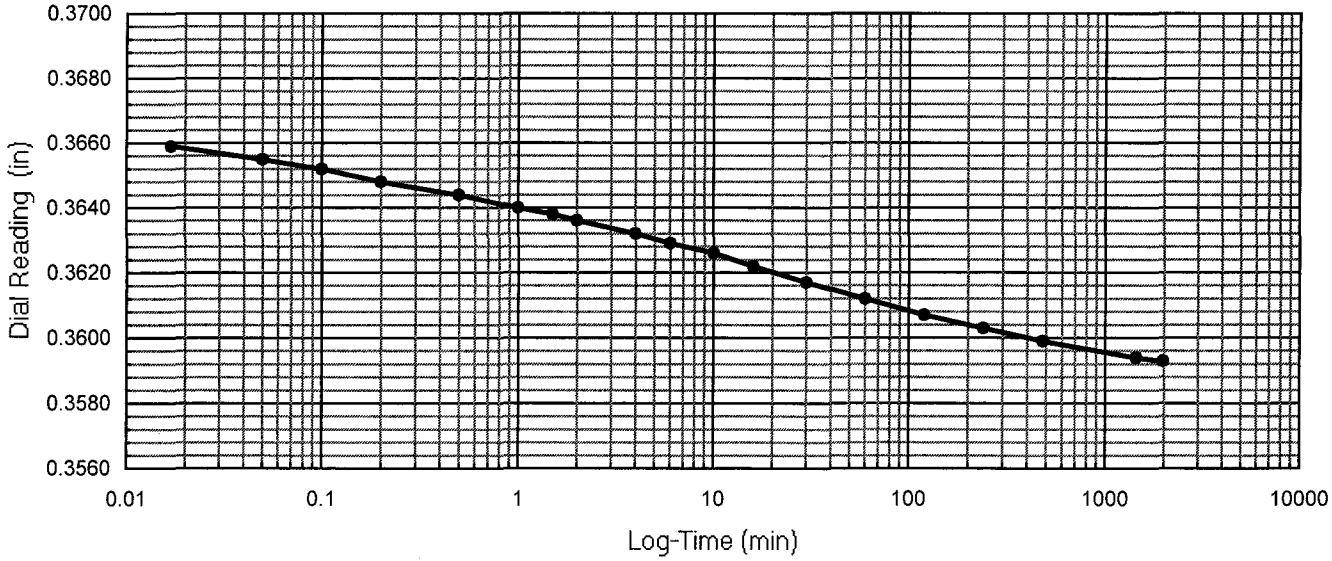
d50 = _____

t50 = _____ min

log time

d50 = 0.3630

t50 = 6.0 min



One-Dimensional Oedometer Testing Increment

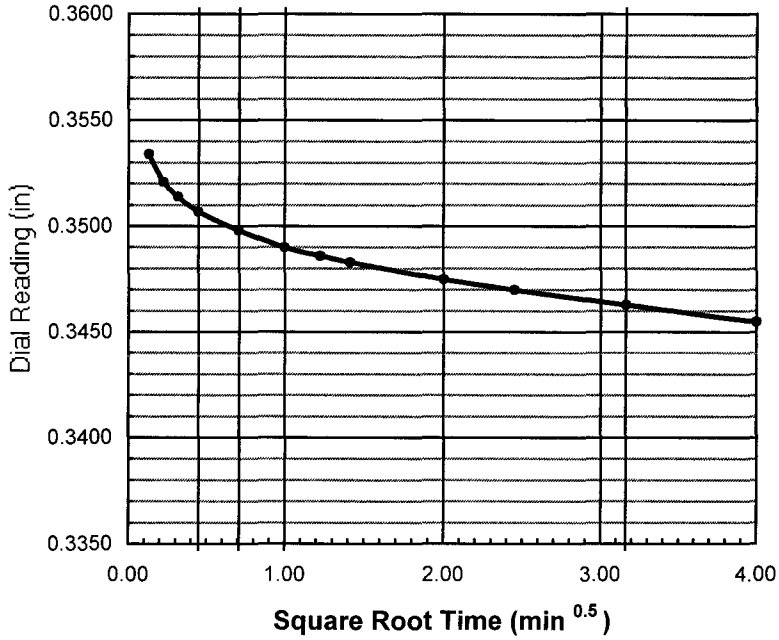
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C-8 | Stage Number: 6 | Curves by: TJO

Boring No.: A-11-020 | Sample No.: 2 | Depth (ft.) 6.5

Date: 12-May-11 | Load (psf): 5508 | Zero Reading: 0.3791

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
18:30:20	0	0.00	0.3593
	0.02	0.13	0.3534
	0.05	0.22	0.3521
	0.10	0.32	0.3514
	0.20	0.45	0.3507
	0.50	0.71	0.3498
	1.00	1.00	0.3490
	1.50	1.22	0.3486
	2.00	1.41	0.3483
	4.0	2.00	0.3475
	6.0	2.45	0.3470
	10.0	3.16	0.3463
	16.0	4.00	0.3455
	30		0.3442
	60		0.3426
	120		0.3410
	240		0.3398
	480		0.3389
	878		0.3382



do = 0.3548

d90 = ____ t90 = ____ min

d100 = 0.3384

df = 0.3382

square root

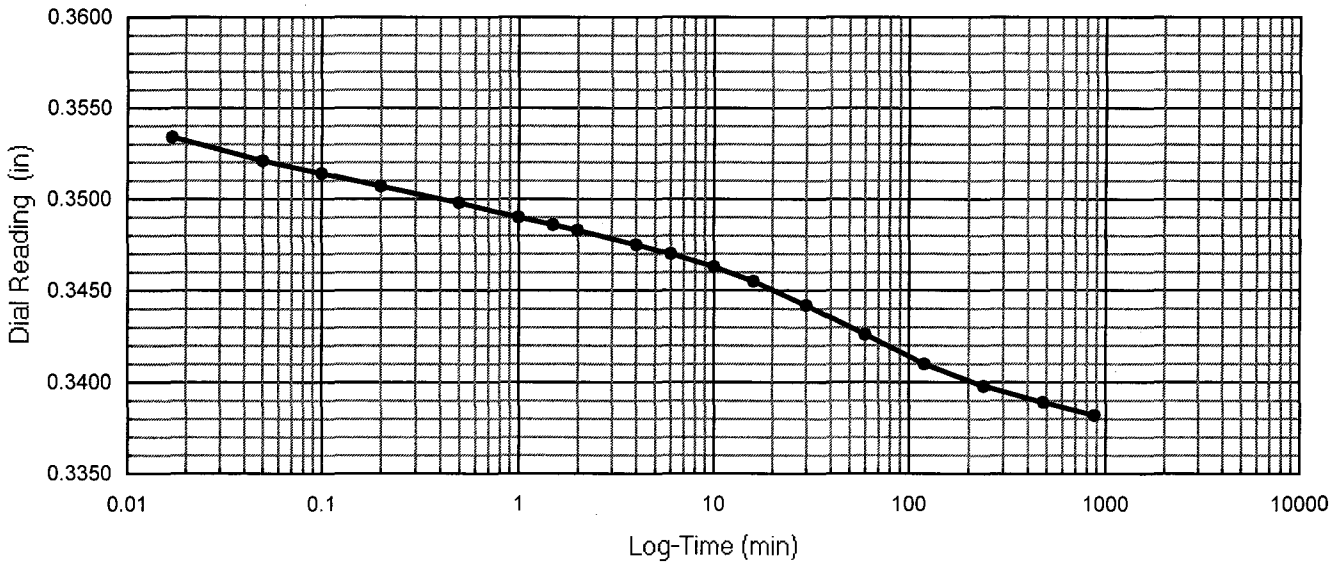
d50 = ____

t50 = ____ min

log time

d50 = 0.3466

t50 = 7.0 min



One-Dimensional Oedometer Testing Increment

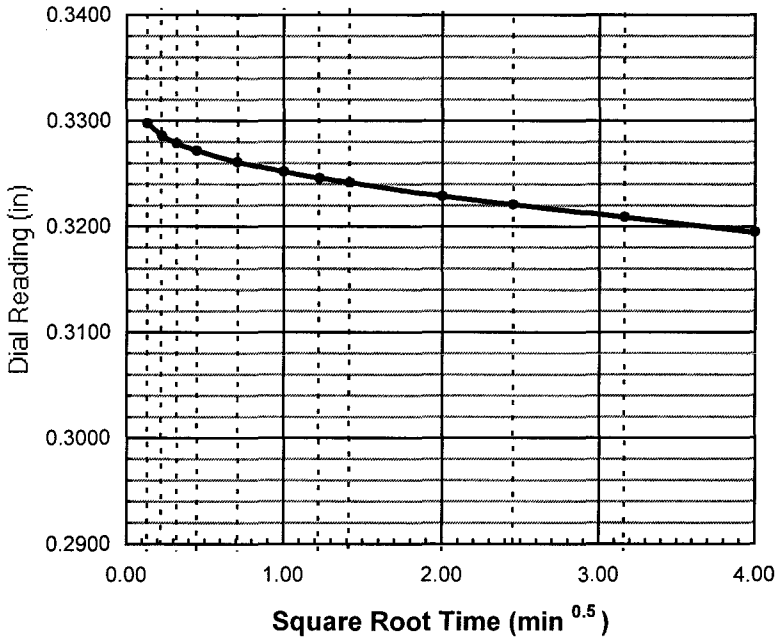
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C-8 | Stage Number: 7 | Curves by: TJO

Boring No.: A-11-020 | Sample No.: 2 | Depth (ft.) 6.5

Date: 13-May-11 | Load (psf): 11039 | Zero Reading: 0.3791

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:09:42	0	0.00	0.3382
	0.02	0.13	0.3298
	0.05	0.22	0.3286
	0.10	0.32	0.3279
	0.20	0.45	0.3272
	0.50	0.71	0.3261
	1.00	1.00	0.3252
	1.50	1.22	0.3246
	2.00	1.41	0.3242
	4.0	2.00	0.3229
	6.0	2.45	0.3221
	10.0	3.16	0.3209
	16.0	4.00	0.3195
	30		0.3172
	60		0.3140
	120		0.3101
	240		0.3065
	480		0.3039
	960		0.3025
	1584		0.3017



do = 0.3311

d90 = _____ t90 = _____ min

d100 = 0.3020

df = 0.3017

square root

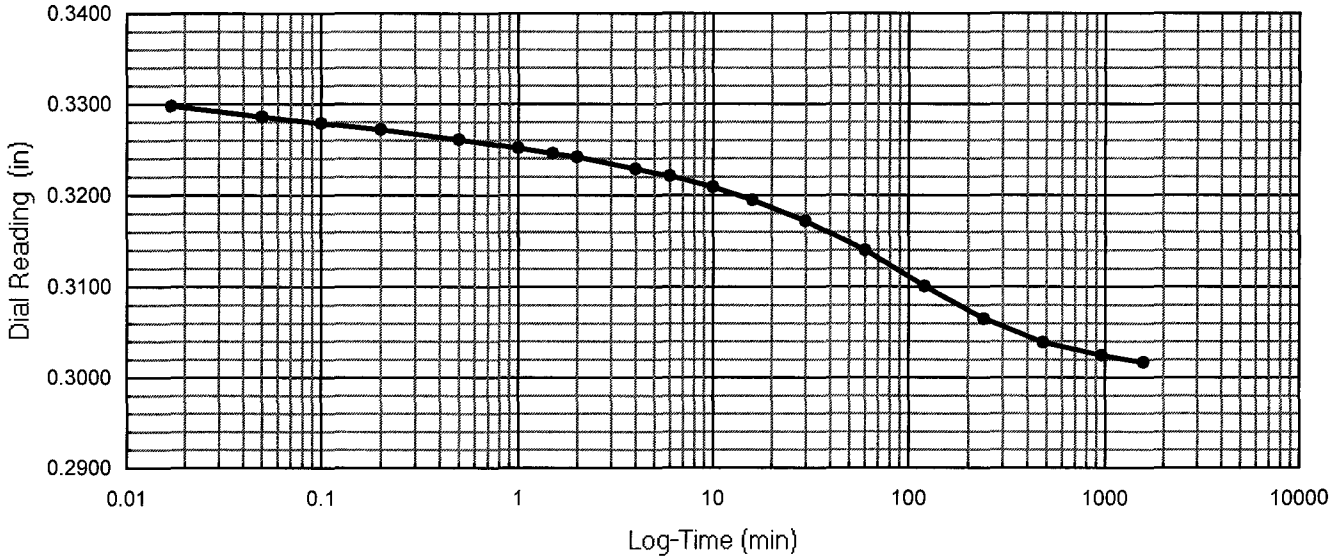
d50 = _____

t50 = _____ min

log time

d50 = 0.3166

t50 = 38.0 min



One-Dimensional Oedometer Testing Increment

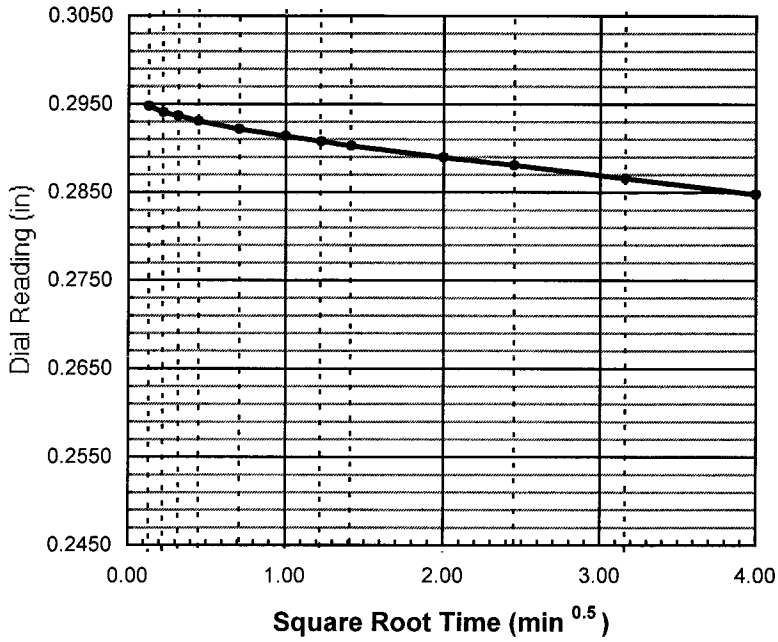
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C-8 | Stage Number: 8 | Curves by: TJO

Boring No.: A-11-020 | Sample No.: 2 | Depth (ft.) 6.5

Date: 14-May-11 | Load (psf): 22100 | Zero Reading: 0.3791

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
11:35:40	0	0.00	0.3017
	0.02	0.13	0.2948
	0.05	0.22	0.2941
	0.10	0.32	0.2937
	0.20	0.45	0.2931
	0.50	0.71	0.2922
	1.00	1.00	0.2914
	1.50	1.22	0.2908
	2.00	1.41	0.2903
	4.0	2.00	0.2890
	6.0	2.45	0.2881
	10.0	3.16	0.2866
	16.0	4.00	0.2848
	30		0.2818
	60		0.2772
	120		0.2714
	240		0.2652
	480		0.2604
	960		0.2578
	1476		0.2568



do = 0.2957

d90 = _____ t90 = _____ min

d100 = 0.2590

df = 0.2568

square root

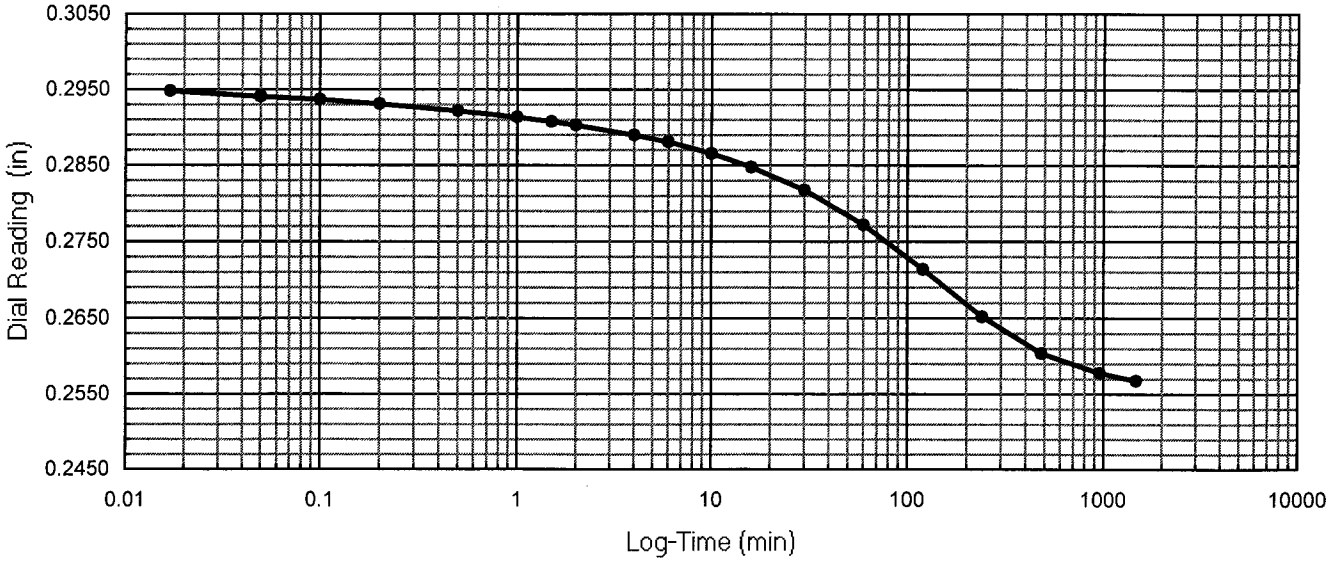
d50 = _____

t50 = _____ min

log time

d50 = 0.2773

t50 = 60.0 min



One-Dimensional Oedometer Testing Increment

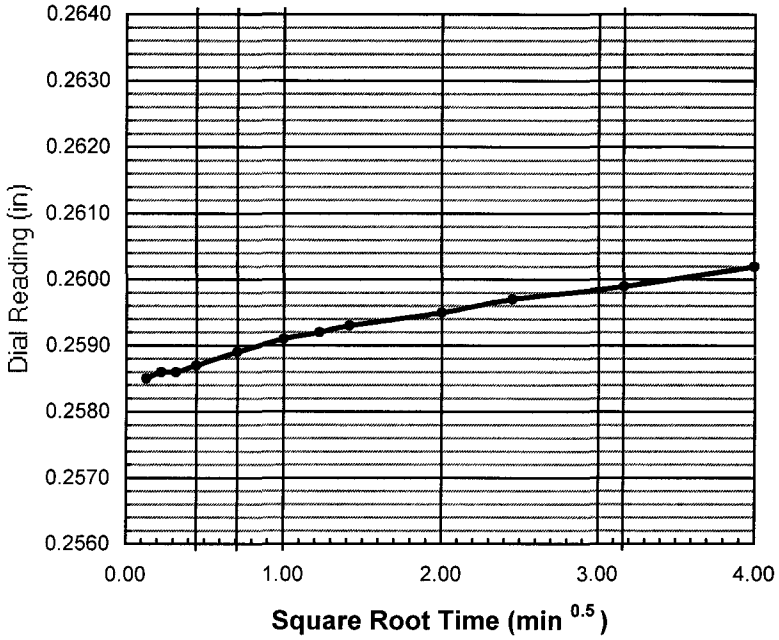
for ASTM D2435, method B

Project Number: 30989830 Apparatus No.: C-8 Stage Number: 9 Curves by: TJO

Boring No.: A-11-020 Sample No.: 2 Depth (ft.) 6.5

Date: 15-May-11 Load (psf): 11039 Zero Reading: 0.3791

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
12:12:49	0	0.00	0.2569
	0.02	0.13	0.2585
	0.05	0.22	0.2586
	0.10	0.32	0.2586
	0.20	0.45	0.2587
	0.50	0.71	0.2589
	1.00	1.00	0.2591
	1.50	1.22	0.2592
	2.00	1.41	0.2593
	4.0	2.00	0.2595
	6.0	2.45	0.2597
	10.0	3.16	0.2599
	16.0	4.00	0.2602
	30		0.2606
	60		0.2613
	120		0.2619
	240		0.2623
	480		0.2626
	960		0.2627
	1350		0.2628



do = 0.2584

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2628

square root

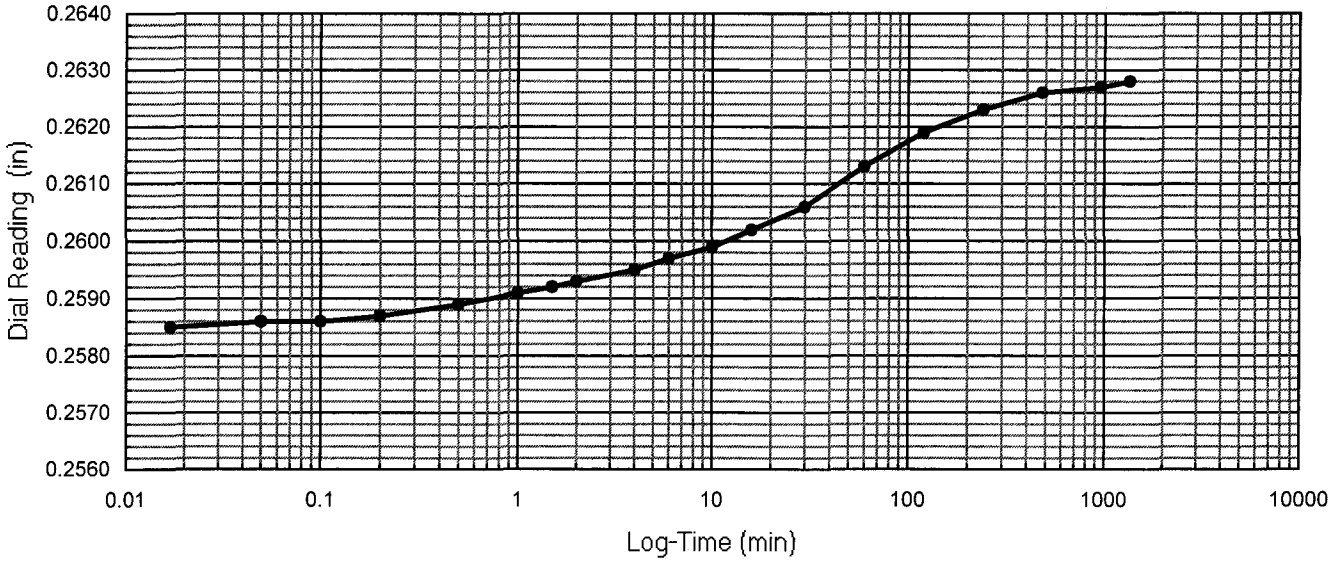
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

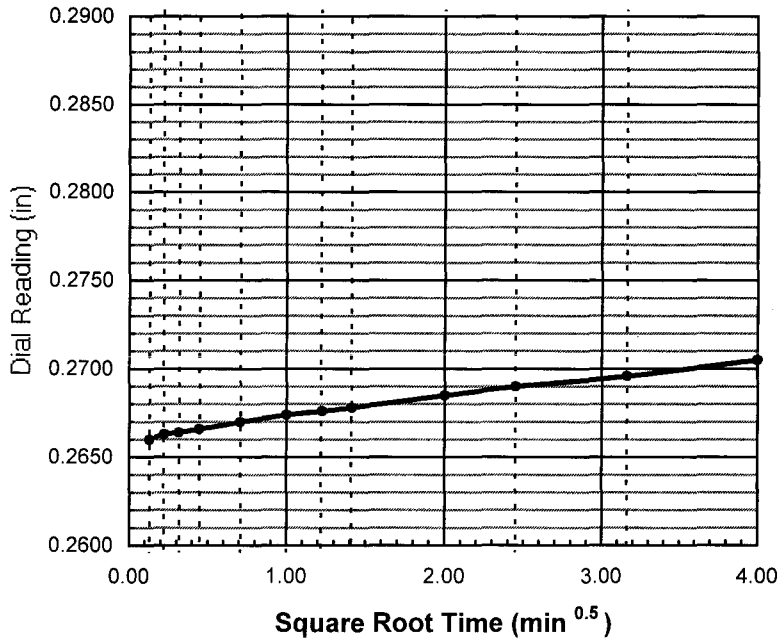
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C-8 | Stage Number: 10 | Curves by: TJO

Boring No.: A-11-020 | Sample No.: 2 | Depth (ft.) 6.5

Date: 16-May-11 | Load (psf): 2743 | Zero Reading: 0.3791

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:44:37	0	0.00	0.2631
	0.02	0.13	0.2660
	0.05	0.22	0.2663
	0.10	0.32	0.2664
	0.20	0.45	0.2666
	0.50	0.71	0.2670
	1.00	1.00	0.2674
	1.50	1.22	0.2676
	2.00	1.41	0.2678
	4.0	2.00	0.2685
	6.0	2.45	0.2690
	10.0	3.16	0.2696
	16.0	4.00	0.2705
	30		0.2719
	60		0.2741
	120		0.2771
	240		0.2806
	480		0.2839
	1440		0.2869
	2880		0.2879
	4188		0.2880



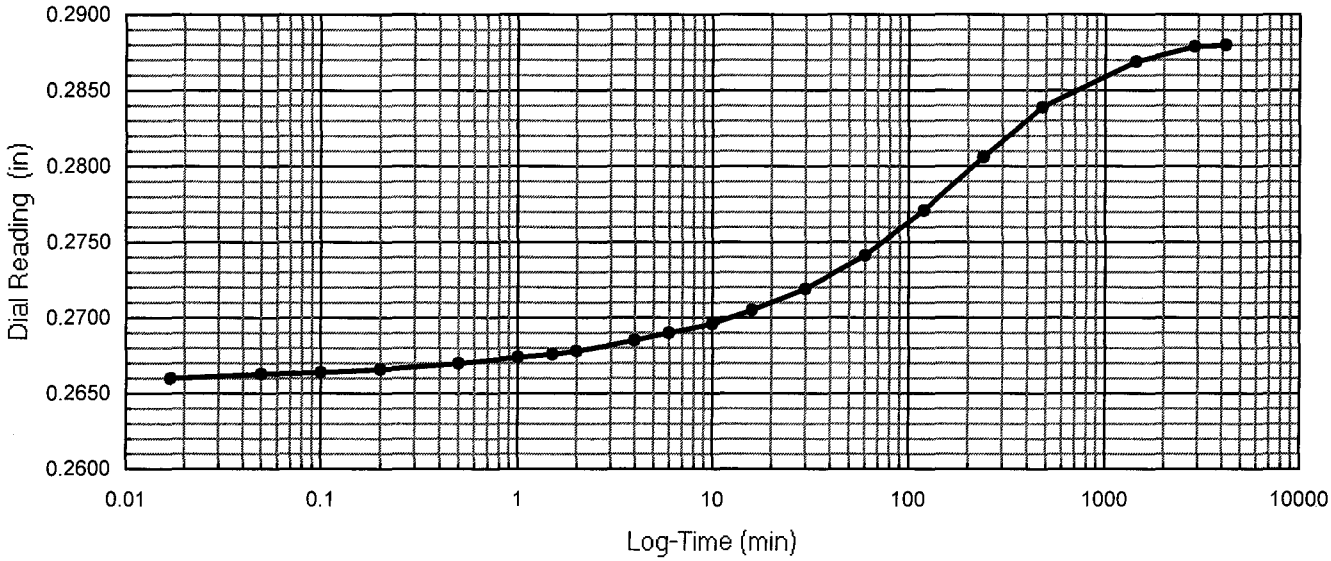
do = 0.2657

d90 = _____ t90 = _____ min

d100 = 0.2680

df = 0.2880

square root	log time
d50 = _____	d50 = 0.2669
t50 = _____ min	t50 = 0.5 min



One-Dimensional Oedometer Testing Increment

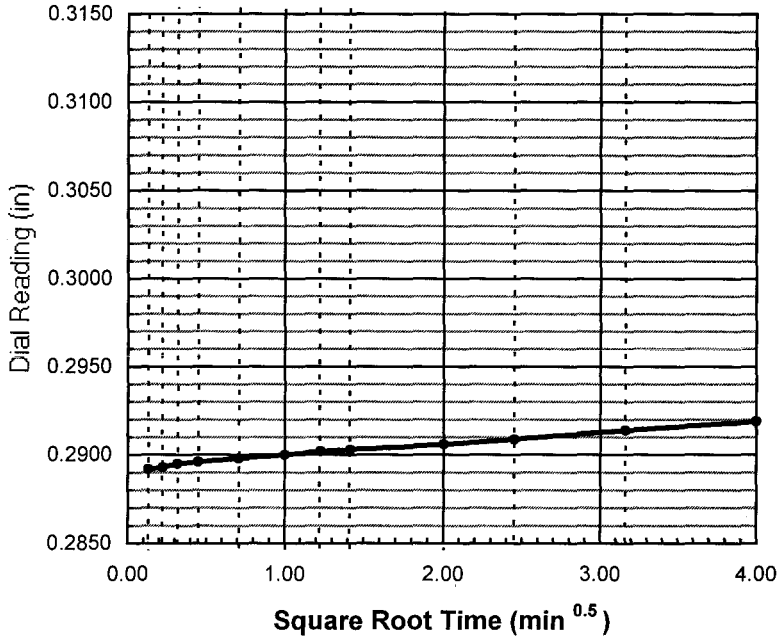
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C-8 | Stage Number: 11 | Curves by: TJO

Boring No.: A-11-020 | Sample No.: 2 | Depth (ft.) 6.5

Date: 19-May-11 | Load (psf): 669 | Zero Reading: 0.3791

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:32:56	0	0.00	0.2880
	0.02	0.13	0.2892
	0.05	0.22	0.2893
	0.10	0.32	0.2895
	0.20	0.45	0.2896
	0.50	0.71	0.2898
	1.00	1.00	0.2900
	1.50	1.22	0.2902
	2.00	1.41	0.2903
	4.0	2.00	0.2906
	6.0	2.45	0.2909
	10.0	3.16	0.2914
	16.0	4.00	0.2919
	30		0.2928
	60		0.2943
	120		0.2963
	240		0.2993
	480		0.3031
	1440		0.3084
	2880		0.3099
	4188		0.3105
	7270		0.3114



do = 0.2890

d90 = _____ t90 = _____ min

d100 = _____

df = 0.3114

square root

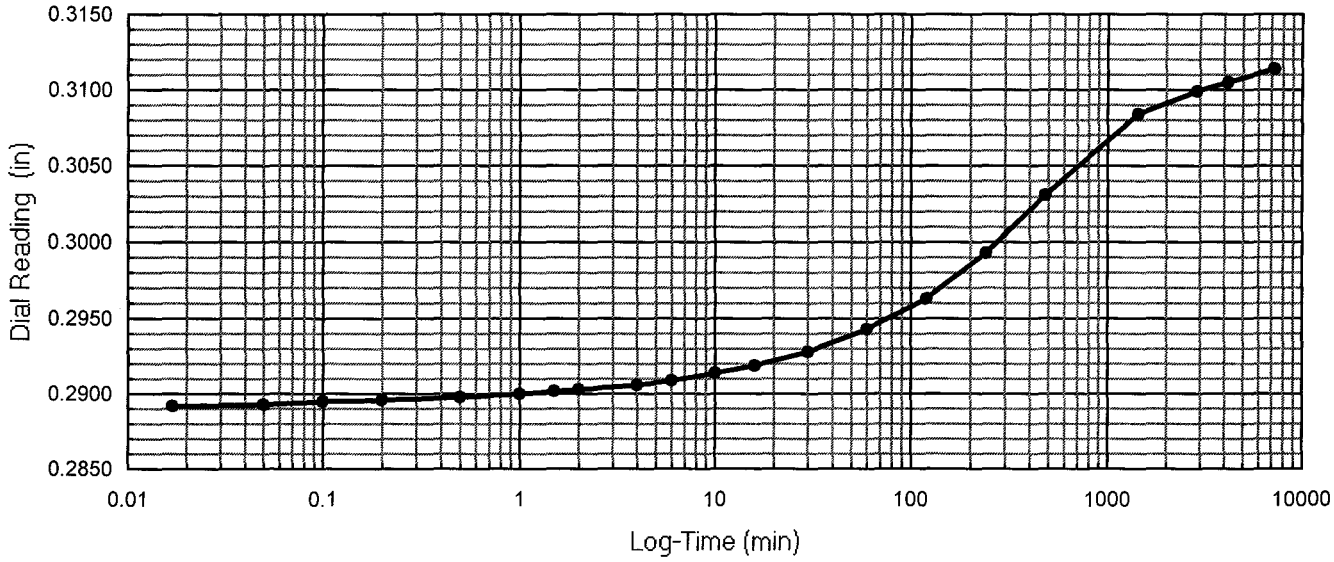
d50 = _____

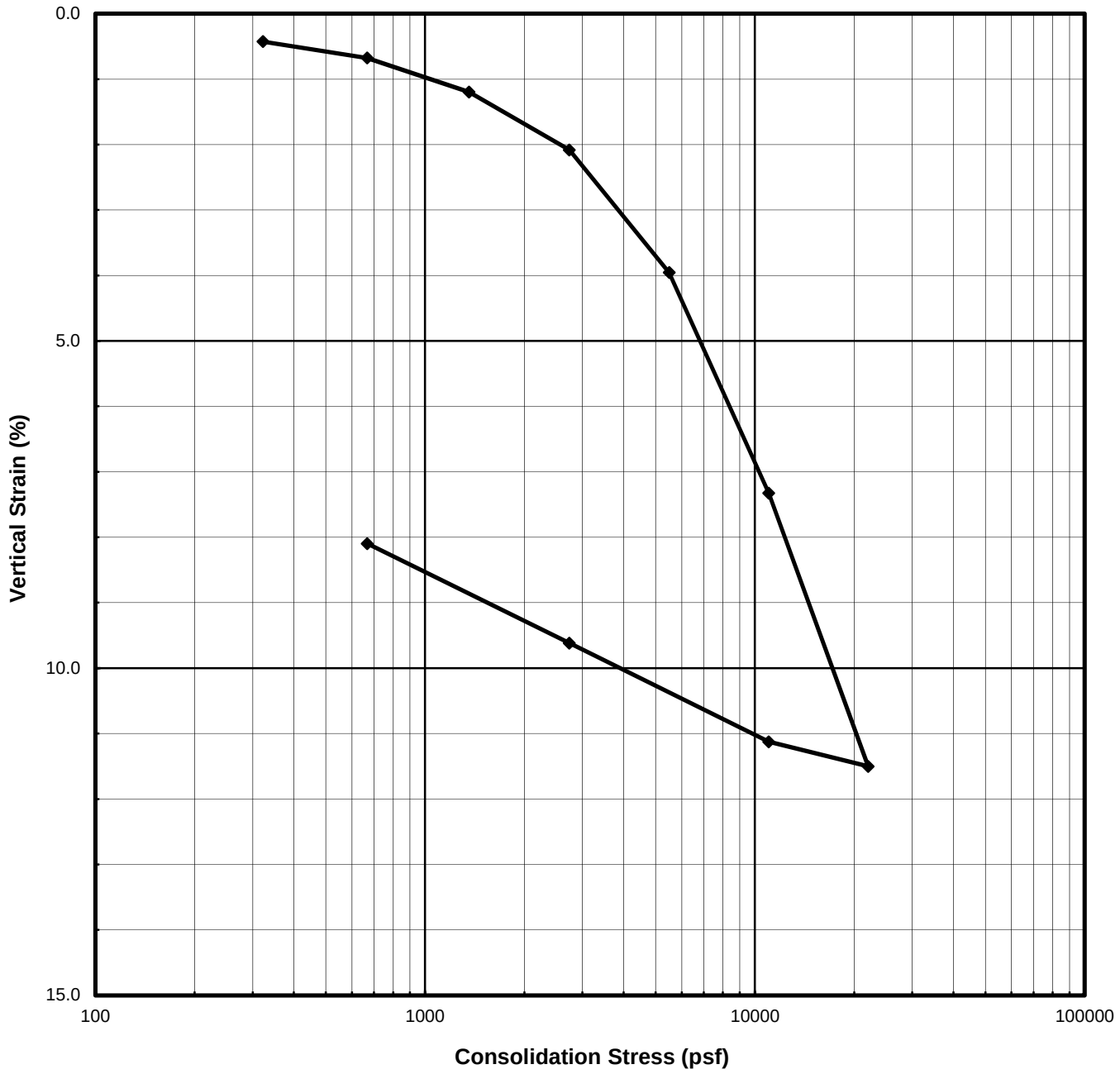
t50 = _____ min

log time

d50 = _____

t50 = _____ min





Description:	**Very dark gray Clay (CH)**							
Boring No.:	R-11-022		Liquid Limit		%	Specific Gravity	2.75	assumed
Sample No.:	2		Plasticity Index		%	Strain for Saturation	6.41	%
Depth (ft | m)	6.5	1.98	Fines Content	85.3	%	Water added at	150	psf

	Water Content (%)	Total Unit Weight		Dry Unit Weight		Saturation (%)	Void Ratio	Height		Diameter	
		(pcf)	(kN/m^3)	(pcf)	(kN/m^3)			(inches)	(cm)	(inches)	(cm)
Initial	23.8	119.1	18.70	96.2	15.11	83.7	0.78	0.961	2.44	2.420	6.147
Final	22.5	126.9	19.94	103.6	16.27	94.7	0.65	0.892	2.27		

URS

I-5 & SR-74 IC

Project Number: 30989830
Test Start Date: 3/4/2011

CONSOLIDATION TEST
ASTM D2435

SUBMITTED BY: Thomas J. O'Meara

Con I5 SR74 R11022 006.xls

One-Dimensional Oedometer Testing
Set-up / Take down Worksheet
ASTM D2435

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM
Apparatus No.: C6

Boring No.: R-11-022
Sample No.: 2
Depth (ft): 6.5

Specimen Description : Very dark gray Clay (CH)
Duration: end of primary

Ring Number: R22
Weight of Wet Spec. and Ring: 355.82 g
Weight of Ring: 217.71 g
Initial Weight of Wet Spec.: 138.11 g

Take Down Weight with Ring: 354.34 g

Excess Oven-dried Cont. No.: rp12
Weight of Cont. and Dry Spec.: 115.05 g
Weight of Container: 114.99 g
Weight of Excess Dried Soil: 0.06 g
Weight of Excess Wet Soil 0.07 g
Final Weight of Wet Specimen: 136.70 g

Height of Specimen (in)

	Initial	Final
1	0.960	0.892
2	0.959	0.892
3	0.962	0.894
4	0.966	0.892
5	0.957	0.891
Ave:	0.961	0.892

Initial Height - Final Height = 0.069 in
Change in Dial (Dd) = 0.075 in
Initial Height - Dd = 0.886 in
Final Height + Dd = 0.967 in
Weight of Top Cap = 374.01 g

Specimen Analysis					Initial Trim	Initial Spec.	Final
				Container Number:	m4	**XXXXX**	s44
				Mass of Container and Wet Specimen M1 (g)	474.59	138.11	253.12
				Mass of Container and Dry Specimen, M2 (g)	400.05	111.56	228.06
				Mass of Container, M3 (g)	91.90	**XXXXX**	116.87
				Water Content, w (%)	24.19	23.80	22.54
				Mass of Wet Specimen, M4 (g)	138.11	138.11	136.70
				Mass of Dry Specimen, M5 (g)	111.56	111.56	111.56
Nominal		Measured	x	Specimen Height, H (in)	0.961	0.961	0.892
Nominal	x	Measured		Specimen Diameter, D (in)	2.420	2.420	2.420
				Area of Specimen, A (in^2)	4.600	4.600	4.600
				Volume of Specimen, V (cc)	72.42	72.42	67.25
Assumed	x	Measured		Specific Gravity, Gs	2.75	2.75	2.75
				Wet Unit Weight, WUW (pcf)	**119.1**	**119.1**	**126.9**
				Dry Unit Weight, DUW (pcf)	**95.9**	**96.2**	**103.6**
				Void Ratio	**0.788**	**0.782**	**0.655**
				Degree of Saturation, S (%)	**84.5**	**83.7**	**94.7**

Set-up by: TJO
Date: 3/4/11
Calculated by: TJO
Checked by: YS
Strain for Saturation (%) = **6.405**

One-Dimensional Oedometer Testing

Loading Worksheet

ASTM D2435

Project Number: 30989830 Boring No.: R-11-022

Project Name: I-5 & SR-74 IC Sample No.: 2

Project Engineer: FM Apparatus No.: C6 Depth (ft): 6.5

Initial Dial Reading: 0.3725 inch Initial Specimen Height: 0.961 inch

Stage No.	Normal Stress (psf)	Dial Reading (in)		Compressibility Correction (in)	Vertical Strain (%)	
		End of Duration	End of Increment		End of Duration	End of Increment
Seat	150		0.3713	0.0000		0.12
1	323		0.3676	0.0008		0.43
2	668		0.3638	0.0022		0.68
3	1358	0.3574	0.3570	0.0040	1.16	1.20
4	2738	0.3466	0.3465	0.0060	2.07	2.08
5	5499	0.3263	0.3263	0.0082	3.96	3.96
6	11021	0.2930	0.2914	0.0107	7.16	7.33
7	22064	0.2510	0.2483	0.0137	11.22	11.50
8	11021		0.2536	0.0120		11.13
9	2738		0.2711	0.0090		9.62
10	668		0.2878	0.0069		8.10
11	150		0.2975	0.0053		7.25
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						
33						

Final dial reading prior to take down (inch): 0.2975 Take down by: TJO Date: 3/16/11

One-Dimensional Oedometer Testing
ASTM D2435
Table of Incremental Values

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM
Apparatus No.: C6

Boring No.: R-11-022
Sample No.: 2
Depth (ft): 6.5
Inundation at stage: Seat

10 **20** Hanger Ratios

Stage Number	Incremental Weight Applied (kg) Back	Front	Vertical Stress (psf)	Specimen Hieght (in)	Deflections (in) $d_{initial}$	d_o	d_{50}	d_{100}	d_{final}	Porous Stone (in)	t_{50} (min)	cv (in^2/min)	cv (ft^2/day)
Top Cap			26	0.961	0.3725	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
Seat	0.06	0.06	150	0.960	0.3725	XXXXX	XXXXX	XXXXX	0.3713	0.0000	XXXXX	XXXXX	XXXXX
1	0.25		323	0.957	0.3713	0.3695	XXXXX	XXXXX	0.3676	0.0008	XXXXX	XXXXX	XXXXX
2	0.50		668	0.955	0.3676	0.3665	XXXXX	XXXXX	0.3638	0.0022	XXXXX	XXXXX	XXXXX
3	1.00		1358	0.952	0.3638	0.3620	0.3597	0.3574	0.3570	0.0040	2.00	0.022	0.223
4		1.0	2738	0.948	0.3570	0.3541	0.3504	0.3466	0.3465	0.0060	2.00	0.022	0.221
5	4.0		5499	0.936	0.3465	0.3430	0.3347	0.3263	0.3263	0.0082	3.00	0.014	0.144
6		4.0	11021	0.912	0.3263	0.3193	0.3062	0.2930	0.2914	0.0107	3.00	0.014	0.136
7		8.0	22064	0.882	0.2914	0.2823	0.2667	0.2510	0.2483	0.0137	10.00	0.004	0.038
8		-8.0	11021	0.900	0.2483	0.2508	XXXXX	XXXXX	0.2536	0.0120	XXXXX	XXXXX	XXXXX
9	-4.0	-4.0	2738	0.926	0.2536	0.2569	XXXXX	XXXXX	0.2711	0.0090	XXXXX	XXXXX	XXXXX
10	-1.0	-1.0	668	0.950	0.2711	0.2727	XXXXX	XXXXX	0.2878	0.0069	XXXXX	XXXXX	XXXXX
11	-0.75		150	0.965	0.2878	0.2878	XXXXX	XXXXX	0.2975	0.0053	XXXXX	XXXXX	XXXXX
12			150	XXXXX	0.2975	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
13			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
14			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
15			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
16			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
17			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
18			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
19			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
20			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
21			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
22			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
23			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
24			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
25			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX

One-Dimensional Oedometer Testing Increment

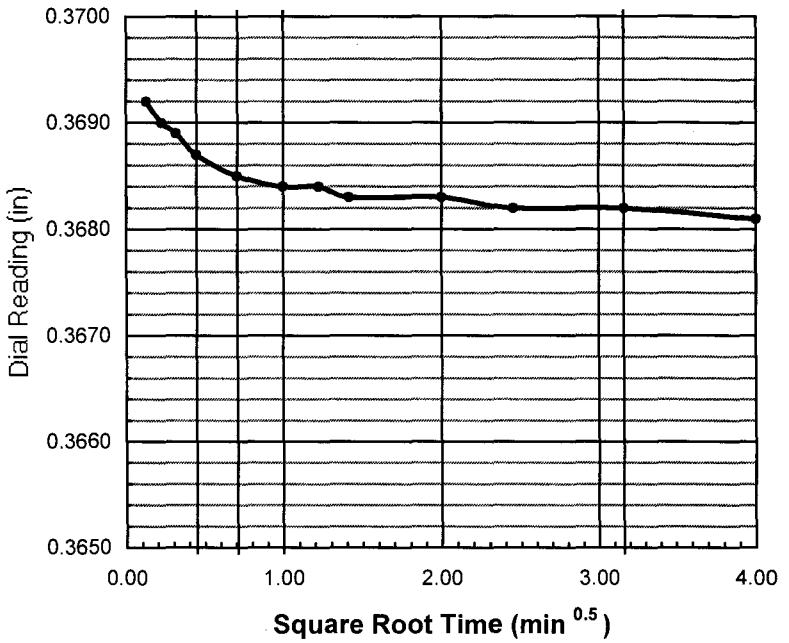
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C6 | Stage Number: 1 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 2 | Depth (ft.) 6.5

Date: 4-Mar-11 | Load (psf): 323 | Zero Reading: 0.3725

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:50:06	0	0.00	0.3713
	0.02	0.13	0.3692
	0.05	0.22	0.3690
	0.10	0.32	0.3689
	0.20	0.45	0.3687
	0.50	0.71	0.3685
	1.00	1.00	0.3684
	1.50	1.22	0.3684
	2.00	1.41	0.3683
	4.0	2.00	0.3683
	6.0	2.45	0.3682
	10.0	3.16	0.3682
	16.0	4.00	0.3681
	30		0.3680
	60		0.3679
	120		0.3678
	240		0.3677
	480		0.3676
	960		0.3676
	1306		0.3676



do = 0.3695

d90 = _____ t90 = _____ min

d100 = _____

df = 0.3676

square root

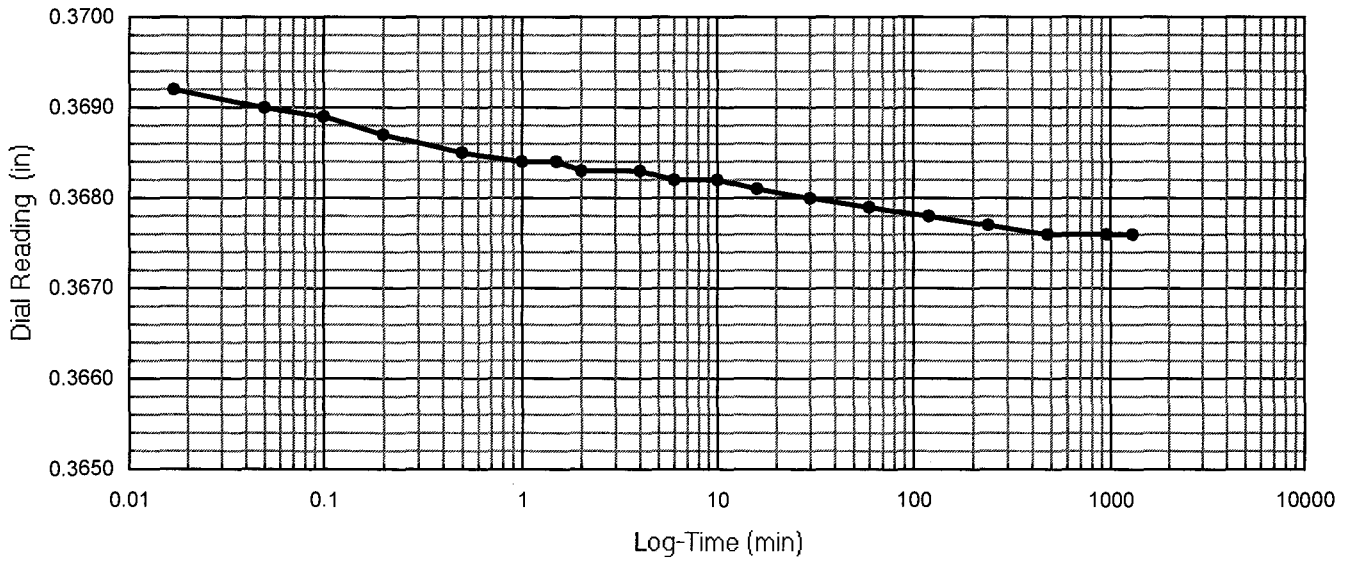
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

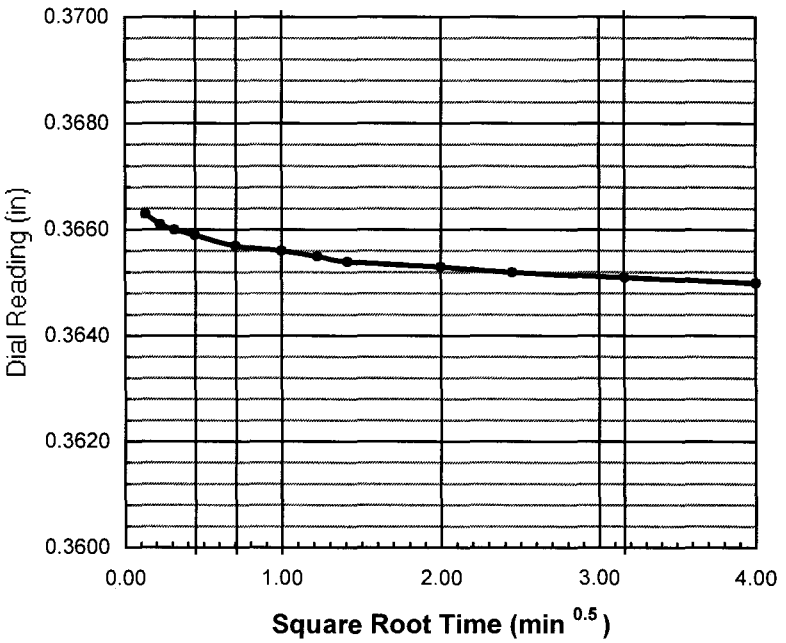
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C6 | Stage Number: 2 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 2 | Depth (ft.) 6.5

Date: 5-Mar-11 | Load (psf): 668 | Zero Reading: 0.3725

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:36:17	0	0.00	0.3676
	0.02	0.13	0.3663
	0.05	0.22	0.3661
	0.10	0.32	0.3660
	0.20	0.45	0.3659
	0.50	0.71	0.3657
	1.00	1.00	0.3656
	1.50	1.22	0.3655
	2.00	1.41	0.3654
	4.0	2.00	0.3653
	6.0	2.45	0.3652
	10.0	3.16	0.3651
	16.0	4.00	0.3650
	30		0.3649
	60		0.3647
	120		0.3646
	240		0.3644
	480		0.3641
	960		0.3639
	1691		0.3638



do = 0.3665

d90 = _____ t90 = _____ min

d100 = _____

df = 0.3638

square root

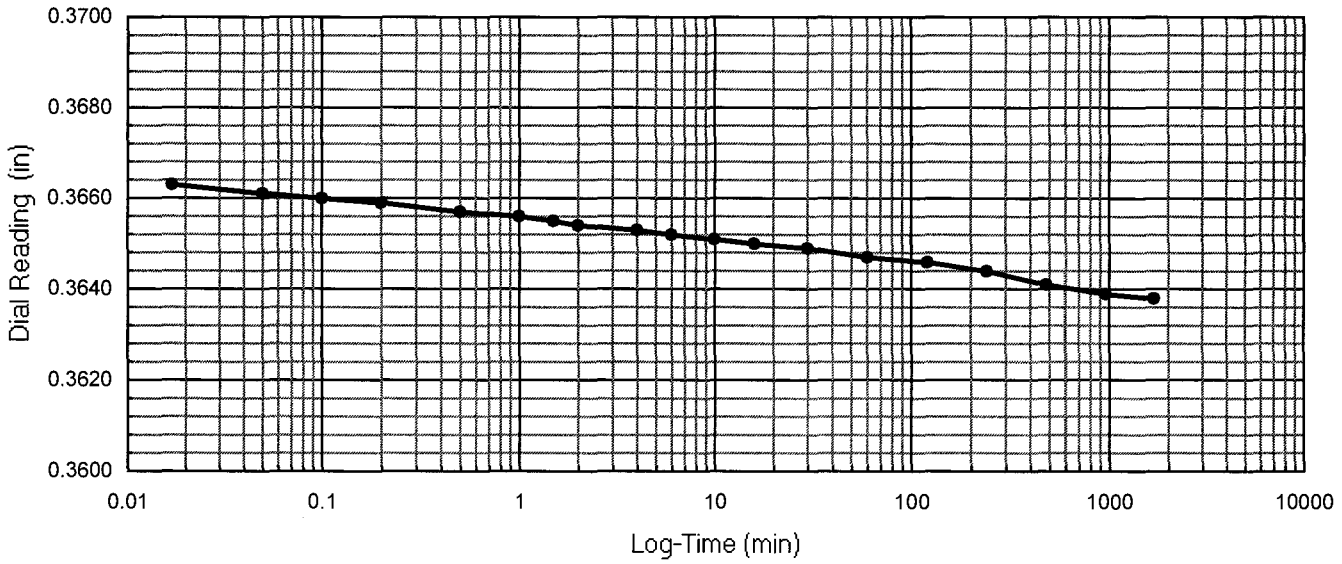
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

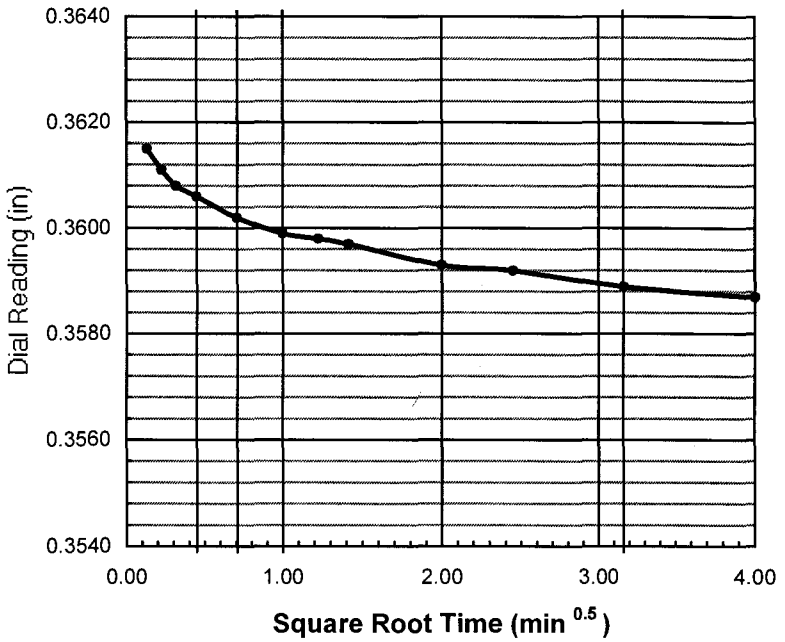
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C6 | Stage Number: 3 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 2 | Depth (ft.) 6.5

Date: 6-Mar-11 | Load (psf): 1358 | Zero Reading: 0.3725

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
12:47:44	0	0.00	0.3638
	0.02	0.13	0.3615
	0.05	0.22	0.3611
	0.10	0.32	0.3608
	0.20	0.45	0.3606
	0.50	0.71	0.3602
	1.00	1.00	0.3599
	1.50	1.22	0.3598
	2.00	1.41	0.3597
	4.0	2.00	0.3593
	6.0	2.45	0.3592
	10.0	3.16	0.3589
	16.0	4.00	0.3587
	30		0.3585
	60		0.3582
	120		0.3579
	240		0.3576
	480		0.3573
	1184		0.3570



do = 0.3620

d90 = _____ t90 = _____ min

d100 = 0.3574

df = 0.3570

square root

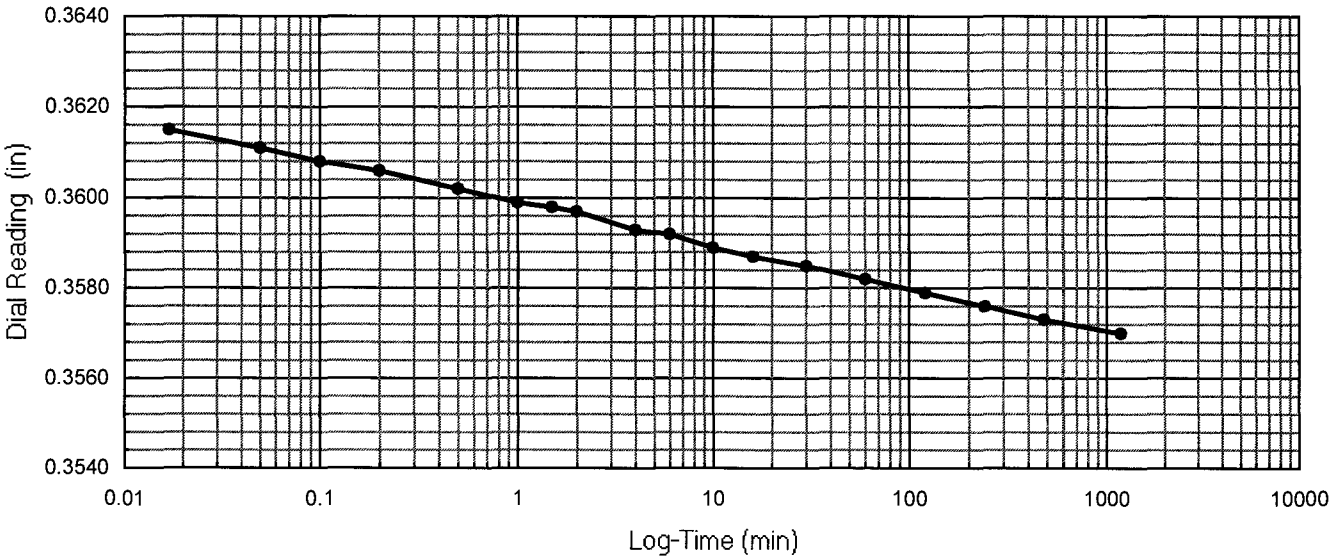
d50 = _____

t50 = _____ min

log time

d50 = 0.3597

t50 = 2.0 min



One-Dimensional Oedometer Testing Increment

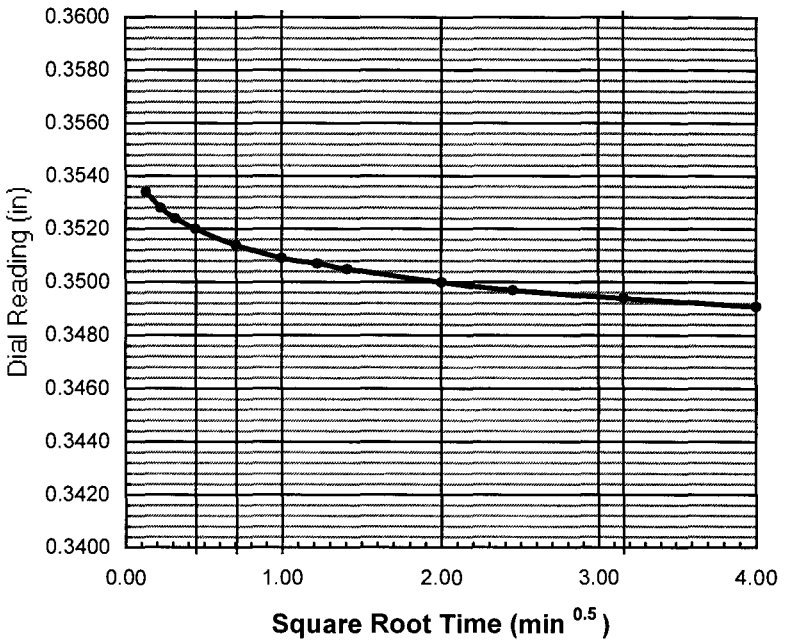
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C6 | Stage Number: 4 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 2 | Depth (ft.) 6.5

Date: 7-Mar-11 | Load (psf): 2738 | Zero Reading: 0.3725

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:32:20	0	0.00	0.3570
	0.02	0.13	0.3534
	0.05	0.22	0.3528
	0.10	0.32	0.3524
	0.20	0.45	0.3520
	0.50	0.71	0.3514
	1.00	1.00	0.3509
	1.50	1.22	0.3507
	2.00	1.41	0.3505
	4.0	2.00	0.3500
	6.0	2.45	0.3497
	10.0	3.16	0.3494
	16.0	4.00	0.3491
	30		0.3487
	60		0.3483
	120		0.3479
	240		0.3475
	480		0.3470
	960		0.3466
	1443		0.3465



do = 0.3541

d90 = ____ t90 = ____ min

d100 = 0.3466

df = 0.3465

square root

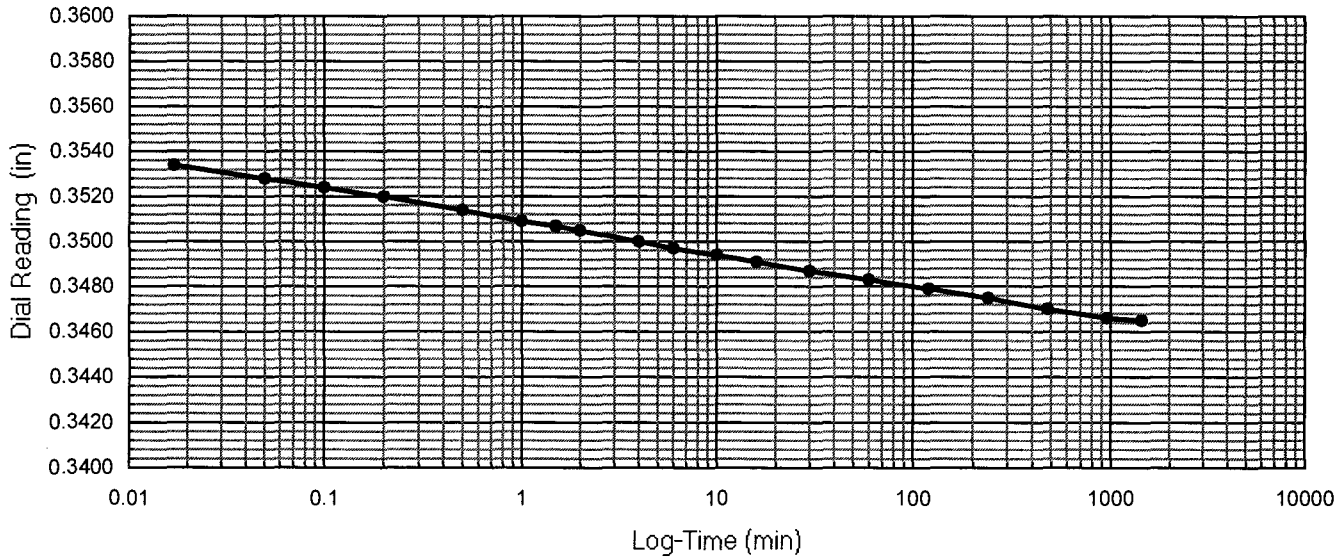
d50 = ____

t50 = ____ min

log time

d50 = 0.3504

t50 = 2.0 min



One-Dimensional Oedometer Testing Increment

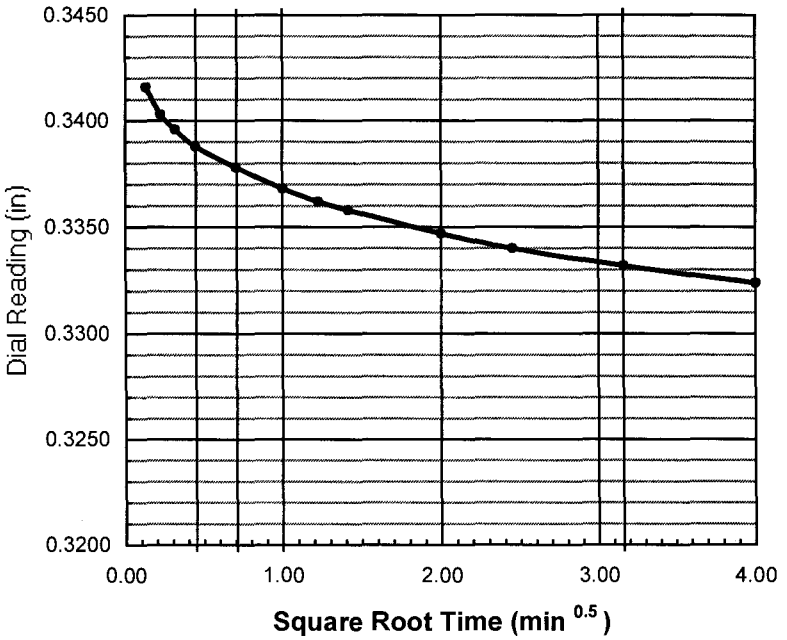
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C6 | Stage Number: 5 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 2 | Depth (ft.) 6.5

Date: 8-Mar-11 | Load (psf): 5499 | Zero Reading: 0.3725

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:36:44	0	0.00	0.3465
	0.02	0.13	0.3416
	0.05	0.22	0.3403
	0.10	0.32	0.3396
	0.20	0.45	0.3388
	0.50	0.71	0.3378
	1.00	1.00	0.3368
	1.50	1.22	0.3362
	2.00	1.41	0.3358
	4.0	2.00	0.3347
	6.0	2.45	0.3340
	10.0	3.16	0.3332
	16.0	4.00	0.3324
	30		0.3315
	60		0.3304
	120		0.3295
	240		0.3285
	480		0.3275
	960		0.3266
	1430		0.3263



do = 0.3430

d90 = _____ t90 = _____ min

d100 = 0.3263

df = 0.3263

square root

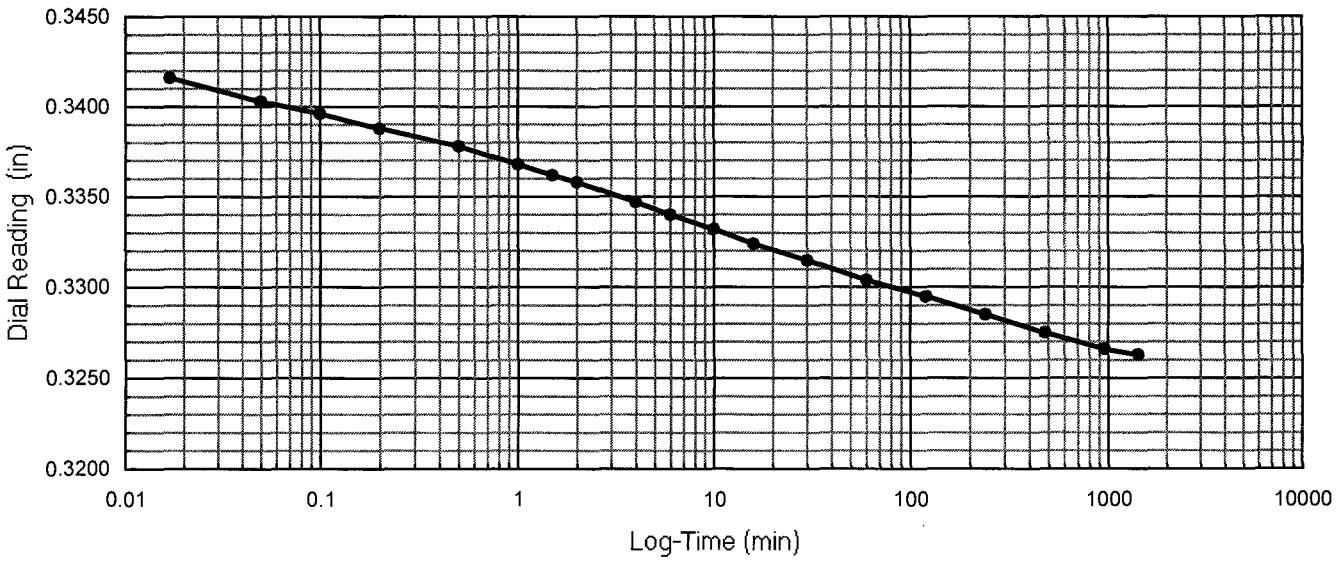
d50 = _____

t50 = _____ min

log time

d50 = 0.3347

t50 = 4.0 min



One-Dimensional Oedometer Testing Increment

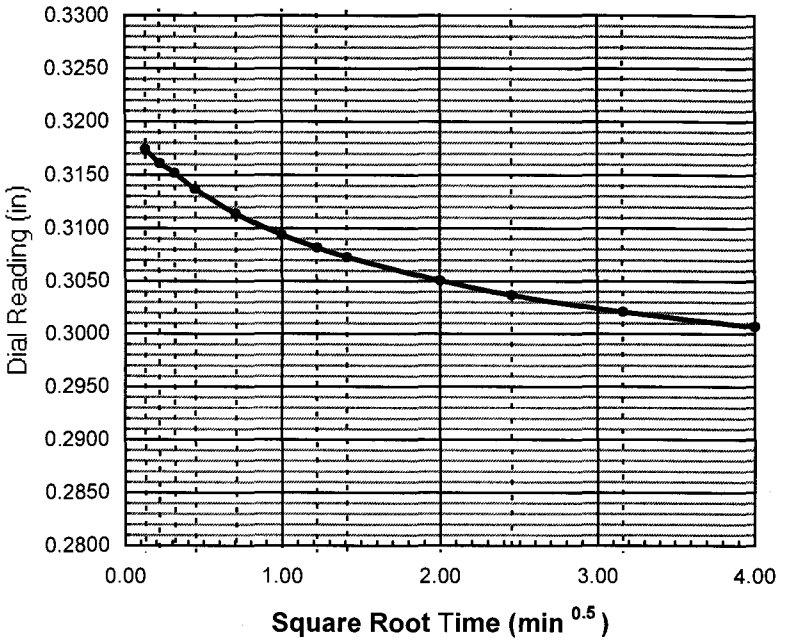
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C6 | Stage Number: 6 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 2 | Depth (ft.) 6.5

Date: 9-Mar-11 | Load (psf): 11021 | Zero Reading: 0.3725

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:27:58	0	0.00	0.3263
	0.02	0.13	0.3174
	0.05	0.22	0.3161
	0.10	0.32	0.3152
	0.20	0.45	0.3137
	0.50	0.71	0.3114
	1.00	1.00	0.3094
	1.50	1.22	0.3082
	2.00	1.41	0.3073
	4.0	2.00	0.3051
	6.0	2.45	0.3037
	10.0	3.16	0.3021
	16.0	4.00	0.3007
	30		0.2990
	60		0.2973
	120		0.2958
	240		0.2945
	480		0.2932
	960		0.2920
	1480		0.2914



do = 0.3193

d90 = _____ t90 = _____ min

d100 = 0.2930

df = 0.2914

square root

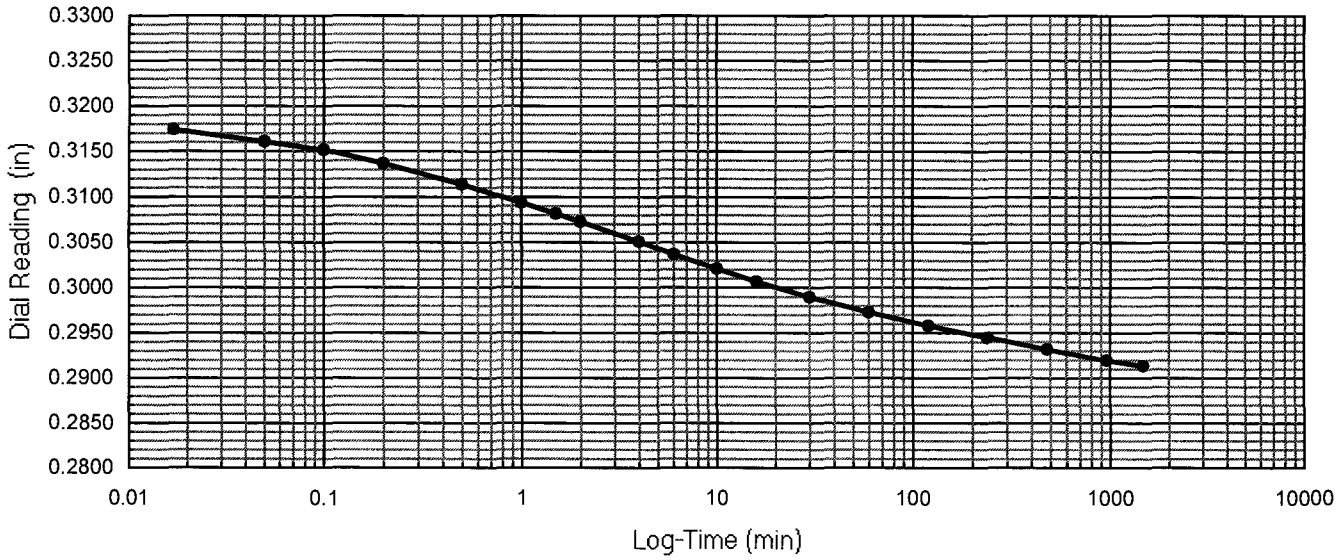
d50 = _____

t50 = _____ min

log time

d50 = 0.3061

t50 = 3.0 min



One-Dimensional Oedometer Testing Increment

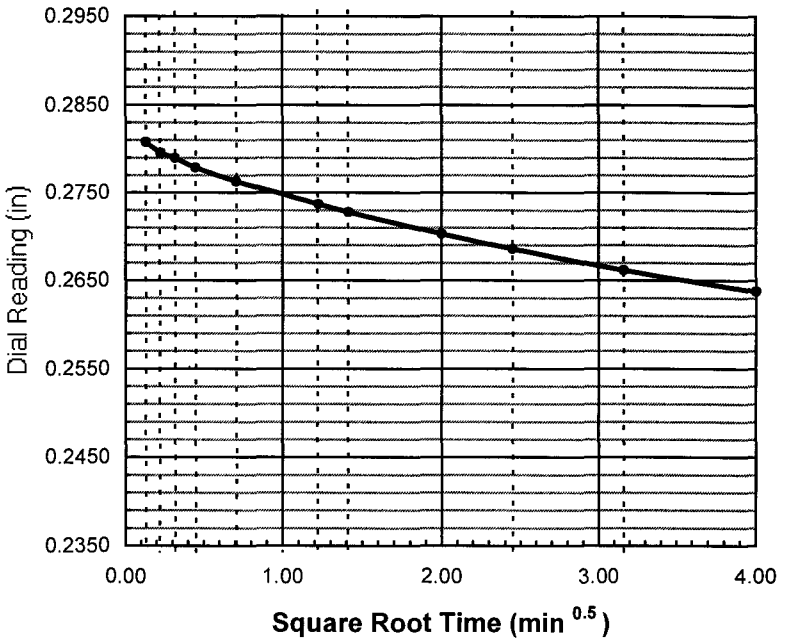
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C6 | Stage Number: 7 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 2 | Depth (ft.) 6.5

Date: 10-Mar-11 | Load (psf): 22064 | Zero Reading: 0.3725

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:10:02	0	0.00	0.2914
	0.02	0.13	0.2808
	0.05	0.22	0.2796
	0.10	0.32	0.2790
	0.20	0.45	0.2779
	0.50	0.71	0.2763
	0.50	0.71	0.2763
	1.50	1.22	0.2737
	2.00	1.41	0.2728
	4.0	2.00	0.2703
	6.0	2.45	0.2686
	10.0	3.16	0.2662
	16.0	4.00	0.2638
	30		0.2605
	60		0.2570
	120		0.2541
	240		0.2518
	480		0.2501
	960		0.2489
	1494		0.2483



do = 0.2823

d90 = ____ t90 = ____ min

d100 = 0.2510

df = 0.2483

square root

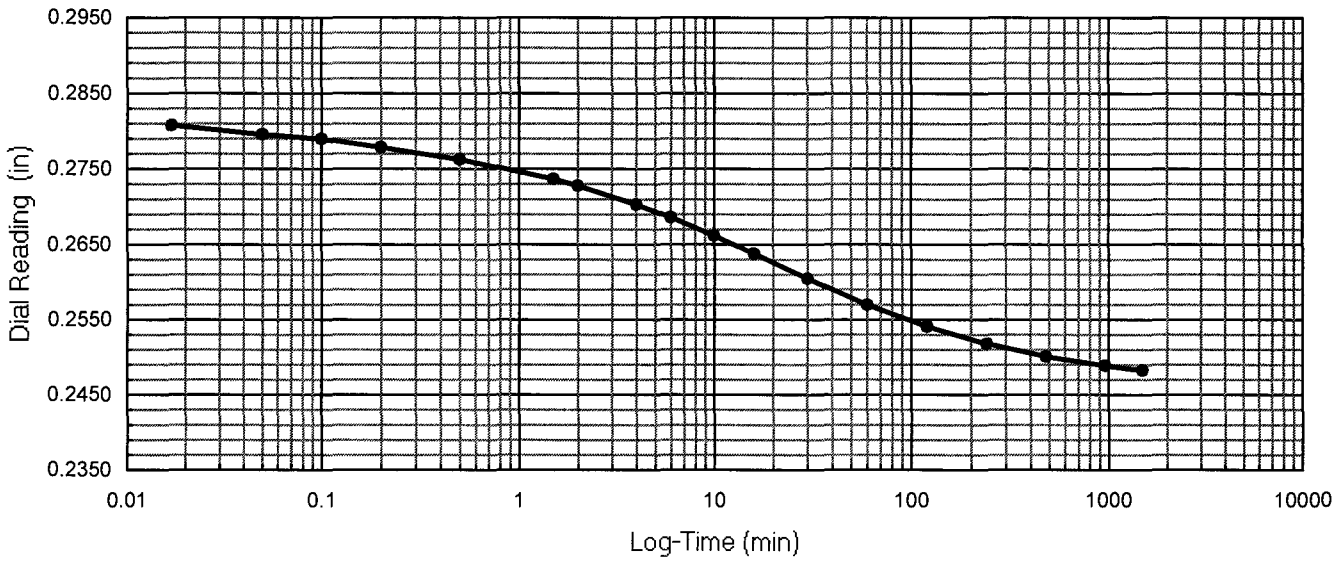
d50 = ____

t50 = ____ min

log time

d50 = 0.2666

t50 = 10.0 min



One-Dimensional Oedometer Testing Increment

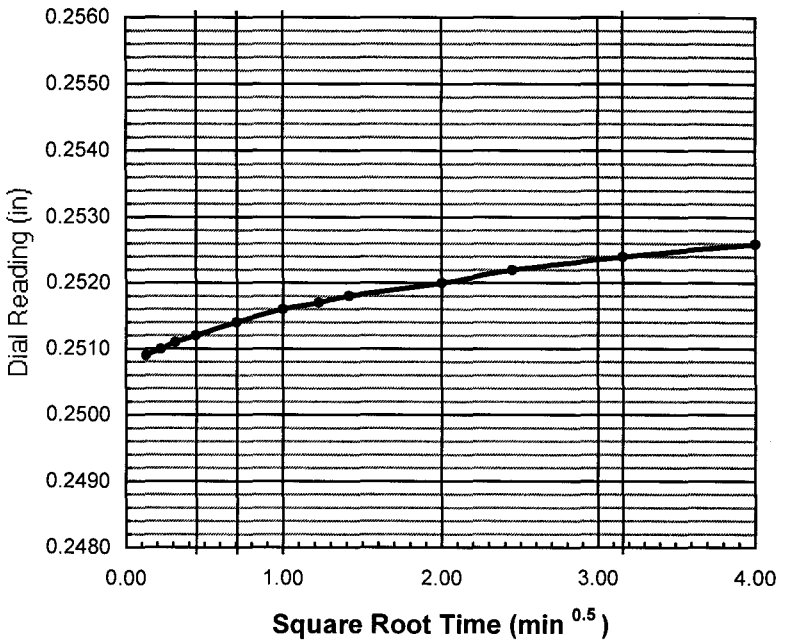
for ASTM D2435, method B

Project Number: 30989830 Apparatus No.: C6 Stage Number: 8 Curves by: TJO

Boring No.: R-11-022 Sample No.: 2 Depth (ft.) 6.5

Date: 11-Mar-11 Load (psf): 11021 Zero Reading: 0.3725

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:04:43	0	0.00	0.2483
	0.02	0.13	0.2509
	0.05	0.22	0.2510
	0.10	0.32	0.2511
	0.20	0.45	0.2512
	0.50	0.71	0.2514
	1.00	1.00	0.2516
	1.50	1.22	0.2517
	2.00	1.41	0.2518
	4.0	2.00	0.2520
	6.0	2.45	0.2522
	10.0	3.16	0.2524
	16.0	4.00	0.2526
	30		0.2529
	60		0.2532
	120		0.2534
	240		0.2535
	480		0.2536



do = 0.2508

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2536

square root

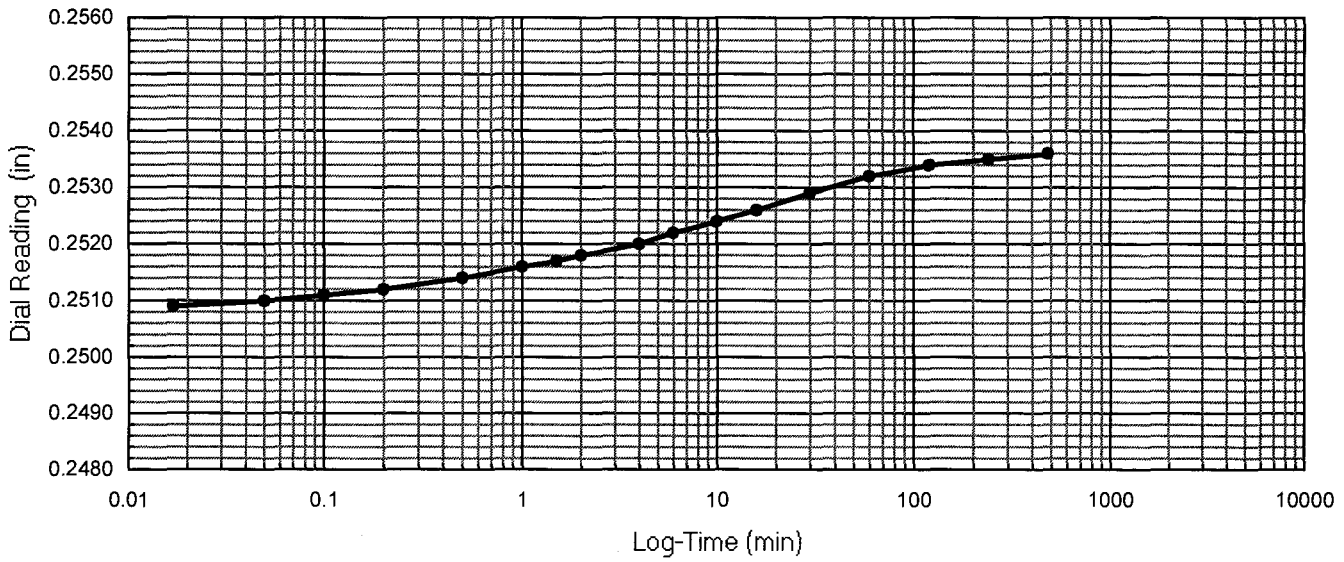
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

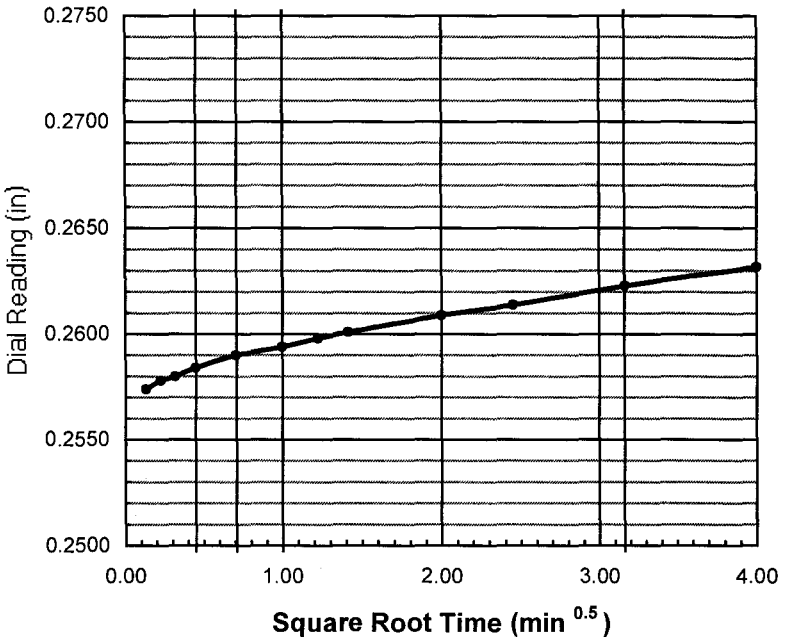
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C6 | Stage Number: 9 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 2 | Depth (ft.) 6.5

Date: 11-Mar-11 | Load (psf): 2738 | Zero Reading: 0.3725

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
18:07:01	0	0.00	0.2536
	0.02	0.13	0.2574
	0.05	0.22	0.2578
	0.10	0.32	0.2580
	0.20	0.45	0.2584
	0.50	0.71	0.2590
	1.00	1.00	0.2594
	1.50	1.22	0.2598
	2.00	1.41	0.2601
	4.0	2.00	0.2609
	6.0	2.45	0.2614
	10.0	3.16	0.2623
	16.0	4.00	0.2632
	30		0.2647
	60		0.2667
	120		0.2685
	240		0.2699
	480		0.2706
	974		0.2711



do = 0.2569

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2711

square root

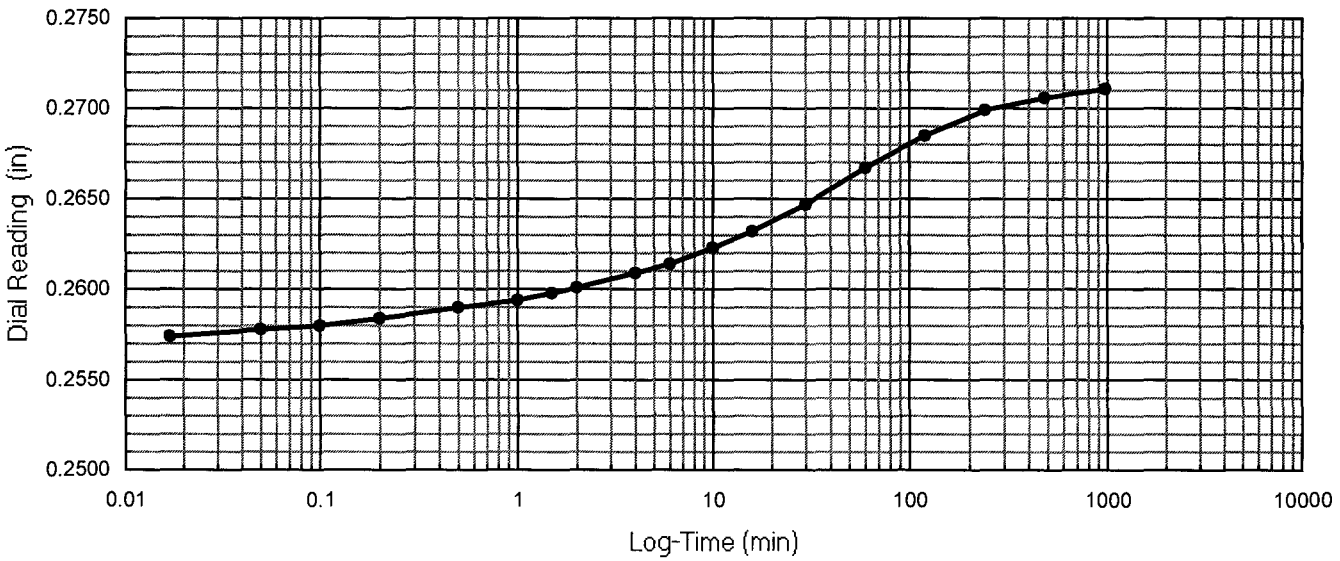
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

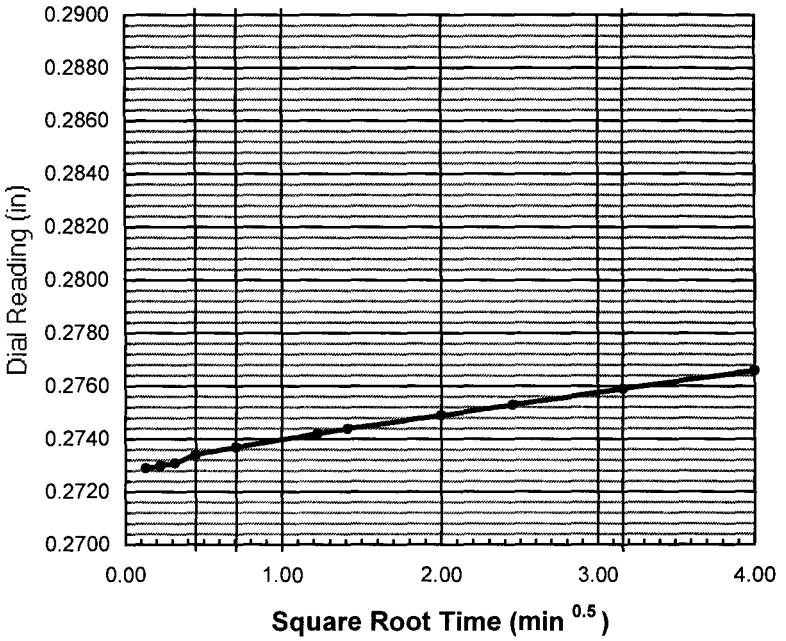
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C6 | Stage Number: 10 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 2 | Depth (ft.) 6.5

Date: 12-Mar-11 | Load (psf): 668 | Zero Reading: 0.3725

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:21:14	0	0.00	0.2711
	0.02	0.13	0.2729
	0.05	0.22	0.2730
	0.10	0.32	0.2731
	0.20	0.45	0.2734
	0.50	0.71	0.2737
	1.50	1.22	0.2742
	1.50	1.22	0.2742
	2.00	1.41	0.2744
	4.0	2.00	0.2749
	6.0	2.45	0.2753
	10.0	3.16	0.2759
	16.0	4.00	0.2766
	30		0.2779
	60		0.2797
	120		0.2819
	240		0.2841
	480		0.2856
	974		0.2866
	1440		0.2871
	2880		0.2877
	3488		0.2878



do = 0.2727

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2878

square root

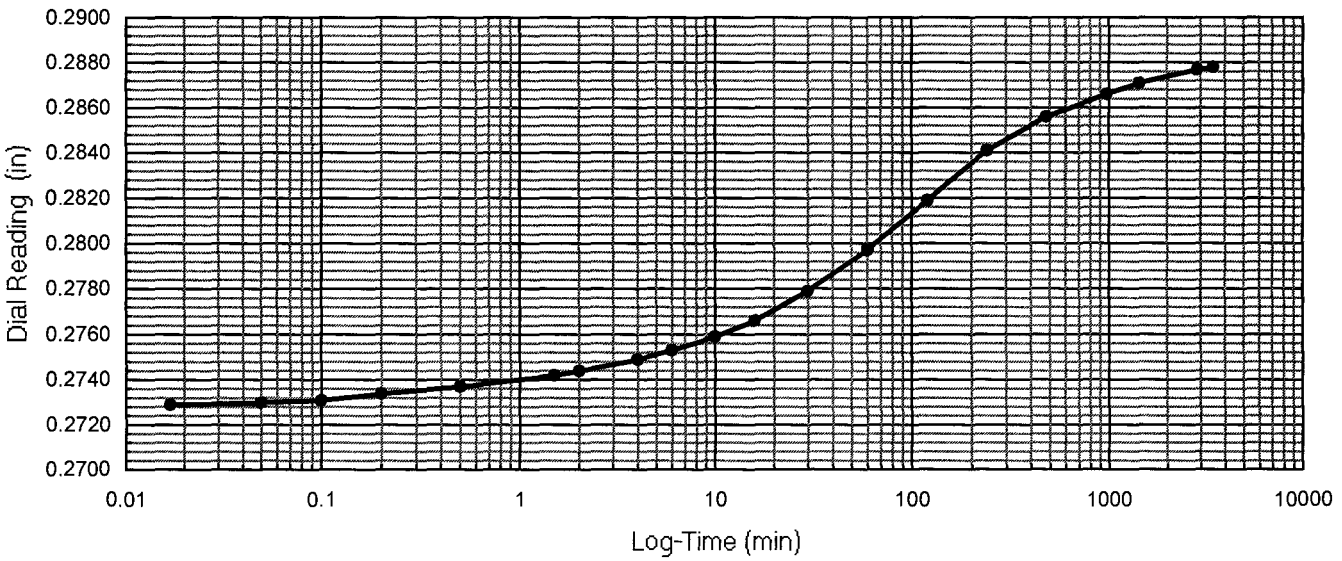
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

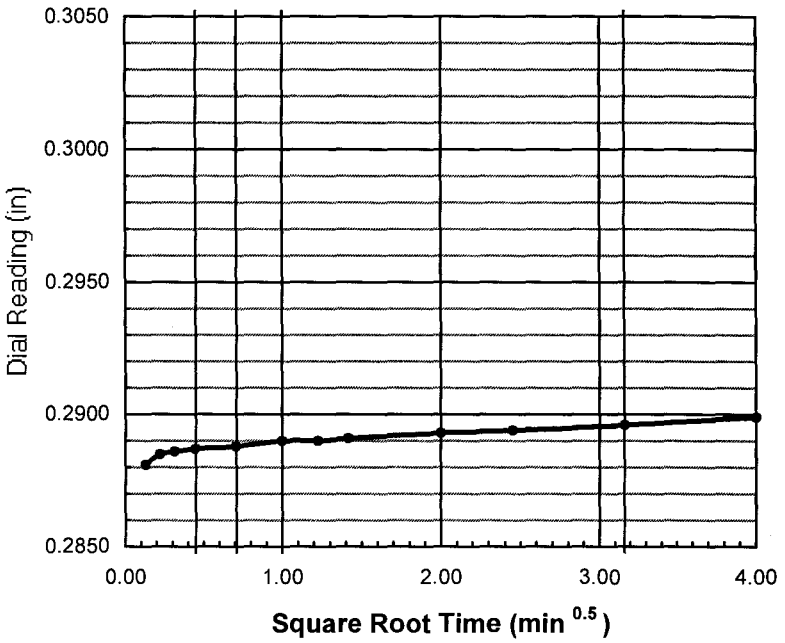
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C6 | Stage Number: 11 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 2 | Depth (ft.) 6.5

Date: 14-Mar-11 | Load (psf): 150 | Zero Reading: 0.3725

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
20:30:16	0	0.00	0.2878
	0.02	0.13	0.2881
	0.05	0.22	0.2885
	0.10	0.32	0.2886
	0.20	0.45	0.2887
	0.50	0.71	0.2888
	1.00	1.00	0.2890
	1.50	1.22	0.2890
	2.00	1.41	0.2891
	4.0	2.00	0.2893
	6.0	2.45	0.2894
	10.0	3.16	0.2896
	16.0	4.00	0.2899
	30		0.2903
	60		0.2911
	120		0.2921
	240		0.2933
	480		0.2946
	960		0.2958
	1440		0.2965
	2109		0.2970
	2835		0.2975



do = 0.2878

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2975

square root

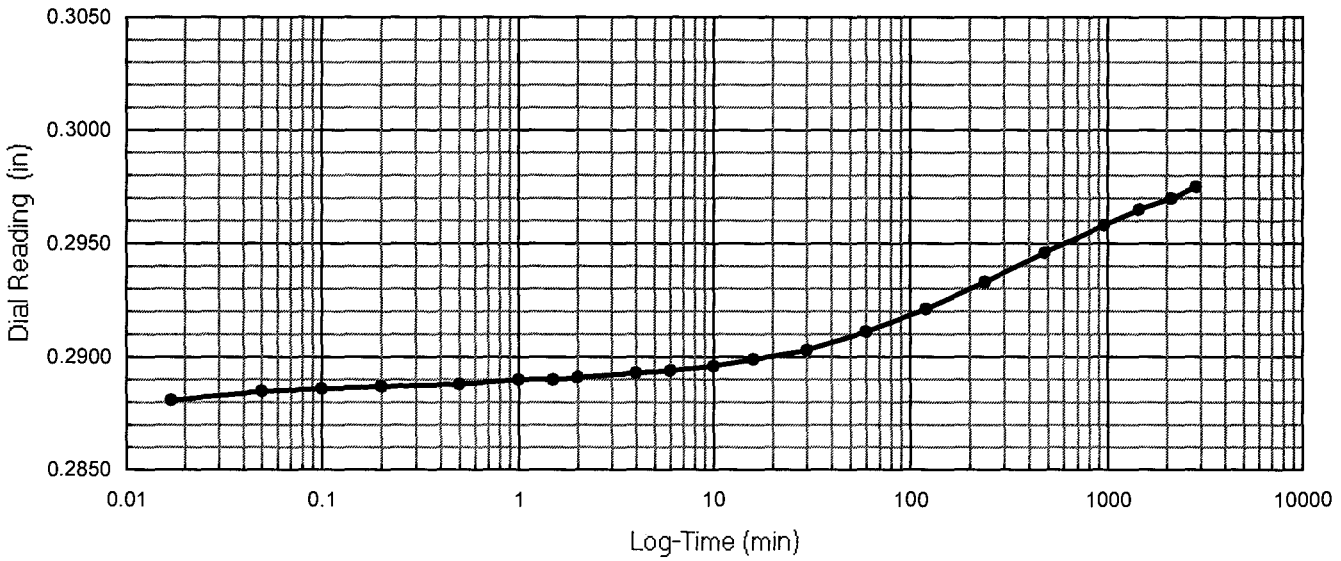
d50 = _____

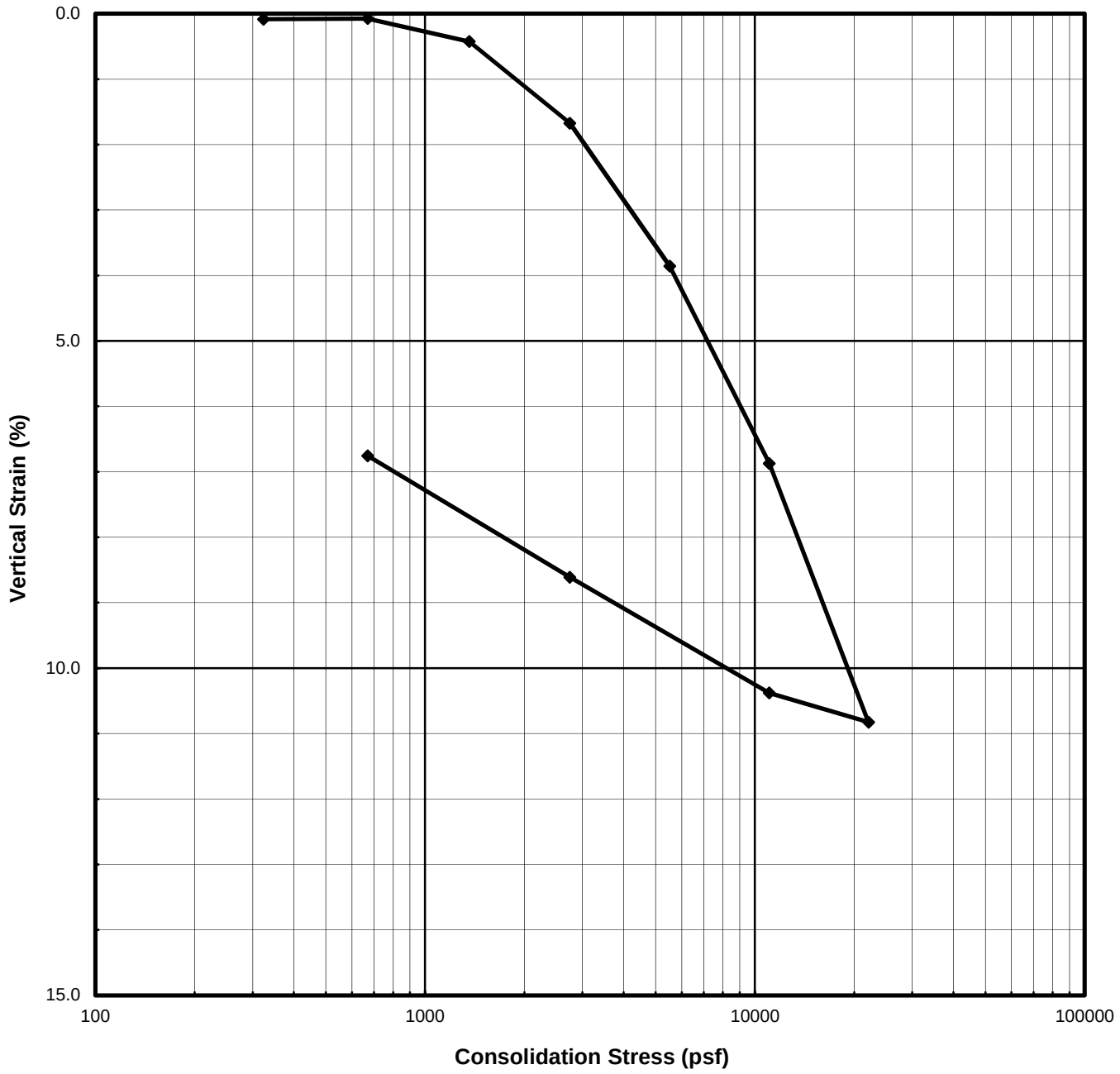
t50 = _____ min

log time

d50 = _____

t50 = _____ min





Description:	**Dark olive gray Clay (CH)**							
Boring No.:	R-11-022		Liquid Limit		%	Specific Gravity	2.75	assumed
Sample No.:	4		Plasticity Index		%	Strain for Saturation	3.57	%
Depth (ft | m)	11.5	3.51	Fines Content	94.5	%	Water added at	150	psf

	Water Content (%)	Total Unit Weight		Dry Unit Weight		Saturation (%)	Void Ratio	Height		Diameter	
		(pcf)	(kN/m^3)	(pcf)	(kN/m^3)			(inches)	(cm)	(inches)	(cm)
Initial	28.3	118.2	18.57	92.2	14.48	90.4	0.86	0.938	2.38	2.416	6.137
Final	26.5	123.2	19.36	97.4	15.30	96.0	0.76	0.888	2.26		

URS

I-5 & SR-74 IC

Project Number: 30989830
Test Start Date: 3/4/2011

CONSOLIDATION TEST
ASTM D2435

SUBMITTED BY: Thomas J. O'Meara

Con I5 SR74 R11022 011.xls

One-Dimensional Oedometer Testing
Set-up / Take down Worksheet
ASTM D2435

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM

Boring No.: R-11-022
Sample No.: 4
Depth (ft): 11.5

Apparatus No.: C8

Specimen Description : Dark olive gray Clay (CH)
Duration: end of primary
Ring Number: R24

Weight of Wet Spec. and Ring: 351.56 g
Weight of Ring: 218.07 g
Initial Weight of Wet Spec.: 133.49 g

Take Down Weight with Ring: 349.55 g

Excess Oven-dried Cont. No.: rp00
Weight of Cont. and Dry Spec.: 117.17 g
Weight of Container: 117.03 g
Weight of Excess Dried Soil: 0.14 g
Weight of Excess Wet Soil 0.18 g
Final Weight of Wet Specimen: 131.66 g

Height of Specimen (in)

	Initial	Final
1	0.941	0.889
2	0.939	0.892
3	0.936	0.885
4	0.939	0.886
5	0.937	0.887
Ave:	0.938	0.888

Initial Height - Final Height = 0.051 in
Change in Dial (Dd) = 0.059 in
Initial Height - Dd = 0.880 in
Final Height + Dd = 0.947 in
Weight of Top Cap = 371.22 g

Specimen Analysis					Initial Trim	Initial Spec.	Final
				Container Number:	m5	**XXXXX**	s2
				Mass of Container and Wet Specimen M1 (g)	374.32	133.49	231.04
				Mass of Container and Dry Specimen, M2 (g)	311.26	104.08	203.62
				Mass of Container, M3 (g)	91.31	**XXXXX**	100.13
				Water Content, w (%)	28.67	28.26	26.50
				Mass of Wet Specimen, M4 (g)	133.49	133.49	131.66
				Mass of Dry Specimen, M5 (g)	104.08	104.08	104.08
Nominal		Measured	x	Specimen Height, H (in)	0.938	0.938	0.888
Nominal	x	Measured		Specimen Diameter, D (in)	2.416	2.416	2.416
				Area of Specimen, A (in^2)	4.584	4.584	4.584
				Volume of Specimen, V (cc)	70.50	70.50	66.70
Assumed	x	Measured		Specific Gravity, Gs	2.75	2.75	2.75
				Wet Unit Weight, WUW (pcf)	**118.2**	**118.2**	**123.2**
				Dry Unit Weight, DUW (pcf)	**91.9**	**92.2**	**97.4**
				Void Ratio	**0.865**	**0.859**	**0.759**
				Degree of Saturation, S (%)	**91.1**	**90.4**	**96.0**

Set-up by: TJO
Date: 3/4/11
Calculated by: TJO
Checked by: TJO
Strain for Saturation (%) = **3.572**

One-Dimensional Oedometer Testing

Loading Worksheet

ASTM D2435

Project Number: 30989830 Boring No.: R-11-022

Project Name: I-5 & SR-74 IC Sample No.: 4

Project Engineer: FM Apparatus No.: C8 Depth (ft): 11.5

Initial Dial Reading: 0.3780 inch Initial Specimen Height: 0.938 inch

Stage No.	Normal Stress (psf)	Dial Reading (in)		Compressibility Correction (in)	Vertical Strain (%)	
		End of Duration	End of Increment		End of Duration	End of Increment
Seat	150		0.3776	0.0000		0.04
1	323	0.3765	0.3774	0.0007	0.09	-0.01
2	670		0.3755	0.0018		0.07
3	1362	0.3708	0.3706	0.0034	0.40	0.43
4	2747	0.3580	0.3574	0.0049	1.61	1.67
5	5517	0.3360	0.3350	0.0068	3.75	3.86
6	11057	0.3090	0.3043	0.0092	6.37	6.87
7	22137	0.2670	0.2642	0.0122	10.53	10.83
8	11057		0.2698	0.0108		10.38
9	2747		0.2897	0.0075		8.61
10	670		0.3090	0.0056		6.76
11	150		0.3191	0.0041		5.84
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						
33						

Final dial reading prior to take down (inch): 0.3191 Take down by: TJO Date: 3/16/11

One-Dimensional Oedometer Testing
ASTM D2435
Table of Incremental Values

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM
Apparatus No.: C8

Boring No.: R-11-022
Sample No.: 4
Depth (ft): 11.5
Inundation at stage: Seat

10 **20** Hanger Ratios

Stage Number	Incremental Weight Applied (kg) Back	Front	Vertical Stress (psf)	Specimen Hieght (in)	Deflections (in) $d_{initial}$	d_o	d_{50}	d_{100}	d_{final}	Porous Stone (in)	t_{50} (min)	cv (in^2/min)	cv (ft^2/day)
Top Cap			26	0.938	0.3780	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
Seat	0.06	0.06	150	0.938	0.3780	XXXXX	XXXXX	XXXXX	0.3776	0.0000	XXXXX	XXXXX	XXXXX
1	0.25		323	0.939	0.3776	0.3768	0.3767	0.3765	0.3774	0.0007	XXXXX	XXXXX	XXXXX
2	0.50		670	0.938	0.3774	0.3766	XXXXX	XXXXX	0.3755	0.0018	XXXXX	XXXXX	XXXXX
3	1.00		1362	0.937	0.3755	0.3748	0.3728	0.3708	0.3706	0.0034	6.00	0.007	0.072
4		1.0	2747	0.929	0.3706	0.3688	0.3634	0.3580	0.3574	0.0049	5.00	0.008	0.085
5	4.0		5517	0.913	0.3574	0.3554	0.3457	0.3360	0.3350	0.0068	5.00	0.008	0.082
6		4.0	11057	0.892	0.3350	0.3327	0.3209	0.3090	0.3043	0.0092	6.00	0.007	0.065
7		8.0	22137	0.864	0.3043	0.3011	0.2841	0.2670	0.2642	0.0122	16.00	0.002	0.023
8		-8.0	11057	0.880	0.2642	0.2656	XXXXX	XXXXX	0.2698	0.0108	XXXXX	XXXXX	XXXXX
9	-4.0	-4.0	2747	0.907	0.2698	0.2723	XXXXX	XXXXX	0.2897	0.0075	XXXXX	XXXXX	XXXXX
10	-1.0	-1.0	670	0.932	0.2897	0.2907	XXXXX	XXXXX	0.3090	0.0056	XXXXX	XXXXX	XXXXX
11	-0.8		150	0.947	0.3090	XXXXX	XXXXX	XXXXX	0.3191	0.0041	XXXXX	XXXXX	XXXXX
12			150	XXXXX	0.3191	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
13			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
14			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
15			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
16			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
17			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
18			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
19			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
20			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
21			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
22			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
23			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
24			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
25			150	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX

One-Dimensional Oedometer Testing Increment

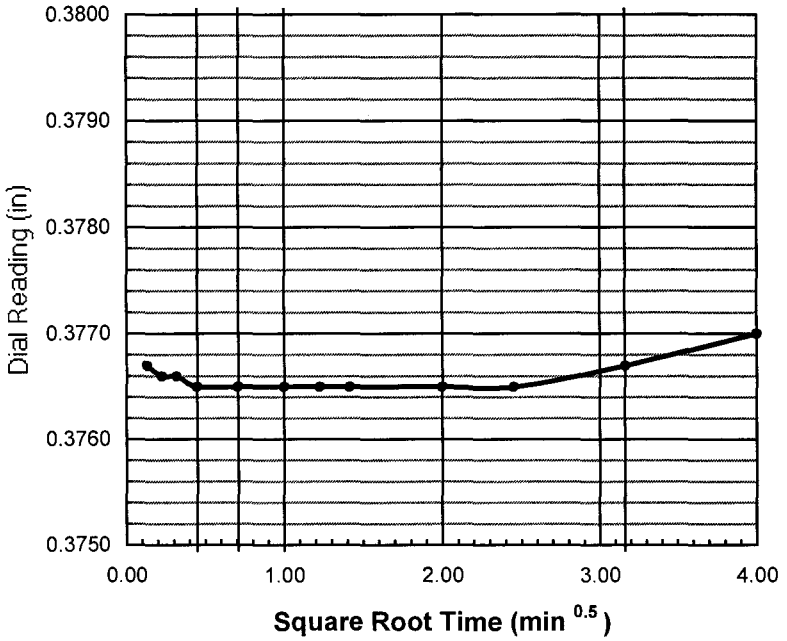
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 1 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 4 | Depth (ft.) 11.5

Date: 4-Mar-11 | Load (psf): 323 | Zero Reading: 0.3780

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
11:08:41	0	0.00	0.3776
	0.02	0.13	0.3767
	0.05	0.22	0.3766
	0.10	0.32	0.3766
	0.20	0.45	0.3765
	0.50	0.71	0.3765
	1.00	1.00	0.3765
	1.50	1.22	0.3765
	2.00	1.41	0.3765
	4.0	2.00	0.3765
	6.0	2.45	0.3765
	10.0	3.16	0.3767
	16.0	4.00	0.3770
swelling	26		0.3774



do = 0.3768

d90 = _____ t90 = _____ min

d100 = 0.3765

df = 0.3774

square root

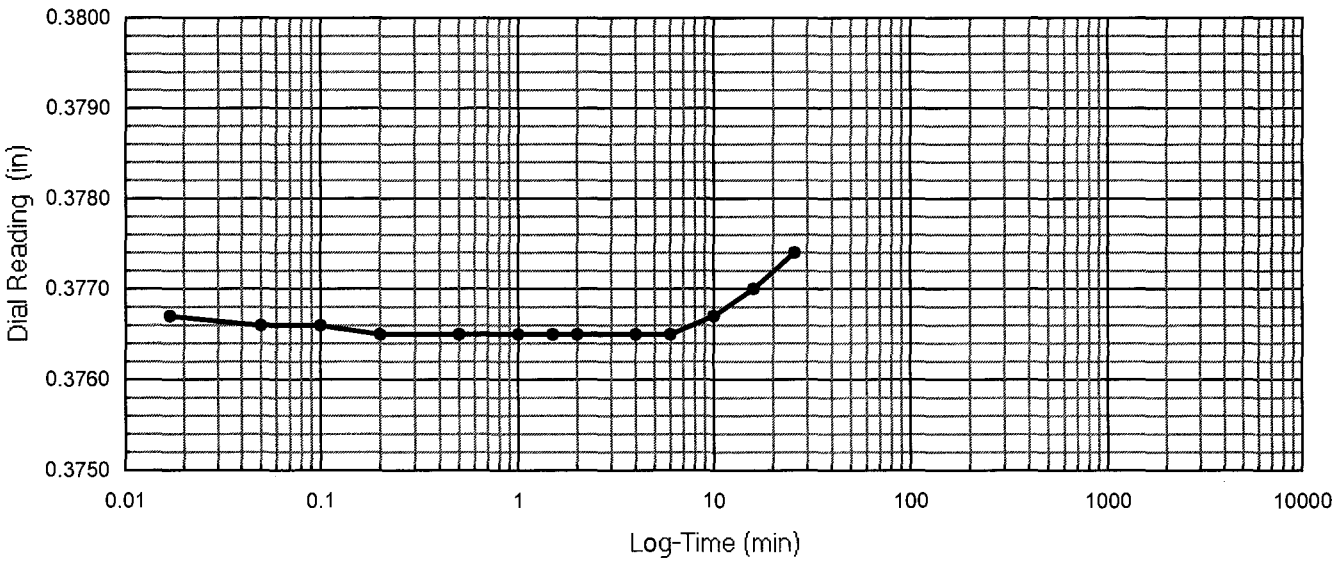
d50 = _____

t50 = _____ min

log time

d50 = 0.3767

t50 = _____ min



One-Dimensional Oedometer Testing Increment

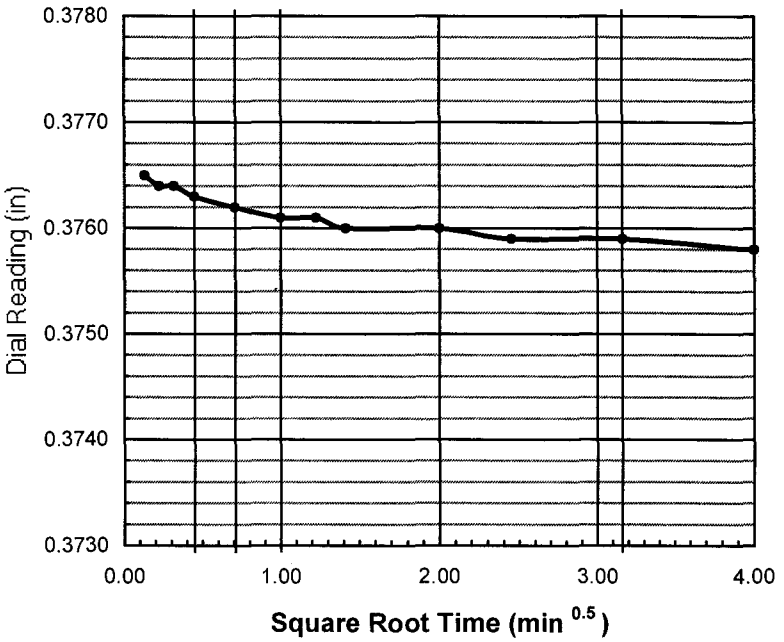
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 2 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 4 | Depth (ft.) 11.5

Date: 4-Mar-11 | Load (psf): 670 | Zero Reading: 0.3780

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
11:34:58	0	0.00	0.3774
	0.02	0.13	0.3765
	0.05	0.22	0.3764
	0.10	0.32	0.3764
	0.20	0.45	0.3763
	0.50	0.71	0.3762
	1.00	1.00	0.3761
	1.50	1.22	0.3761
	2.00	1.41	0.3760
	4.0	2.00	0.3760
	6.0	2.45	0.3759
	10.0	3.16	0.3759
	16.0	4.00	0.3758
	30		0.3758
	60		0.3757
	120		0.3757
	240		0.3756
	480		0.3756
	960		0.3756
	1263		0.3755



do = 0.3766

d90 = _____ t90 = _____ min

d100 = _____

df = 0.3755

square root

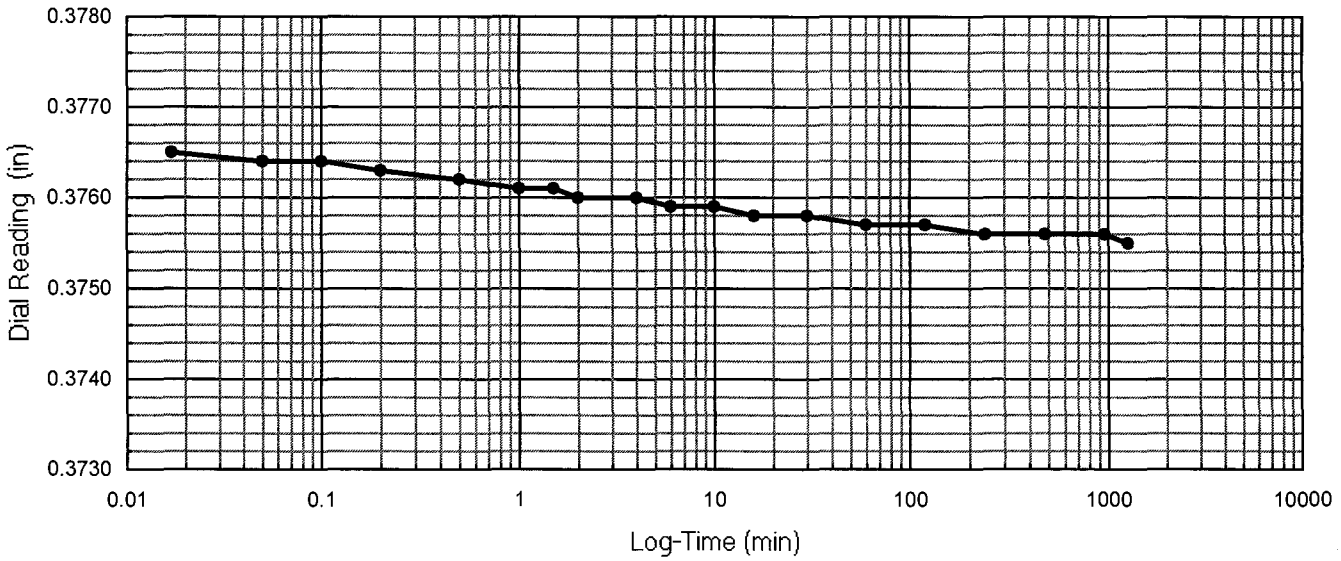
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

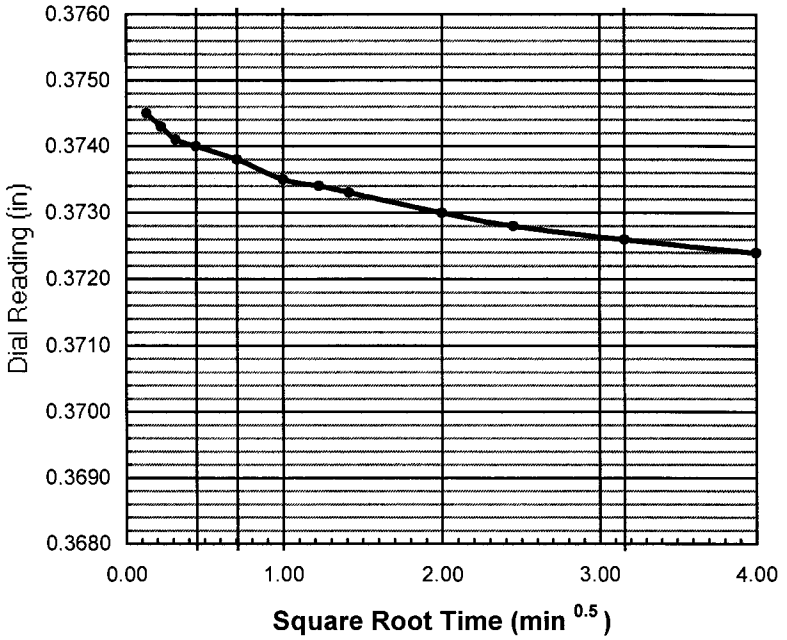
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 3 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 4 | Depth (ft.) 11.5

Date: 5-Mar-11 | Load (psf): 1362 | Zero Reading: 0.3780

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:38:31	0	0.00	0.3755
	0.02	0.13	0.3745
	0.05	0.22	0.3743
	0.10	0.32	0.3741
	0.20	0.45	0.3740
	0.50	0.71	0.3738
	1.00	1.00	0.3735
	1.50	1.22	0.3734
	2.00	1.41	0.3733
	4.0	2.00	0.3730
	6.0	2.45	0.3728
	10.0	3.16	0.3726
	16.0	4.00	0.3724
	30		0.3722
	60		0.3719
	120		0.3717
	240		0.3714
	480		0.3712
	960		0.3709
	1440		0.3708
	2874		0.3706



do = 0.3748

d90 = ____ t90 = ____ min

d100 = 0.3708

df = 0.3706

square root

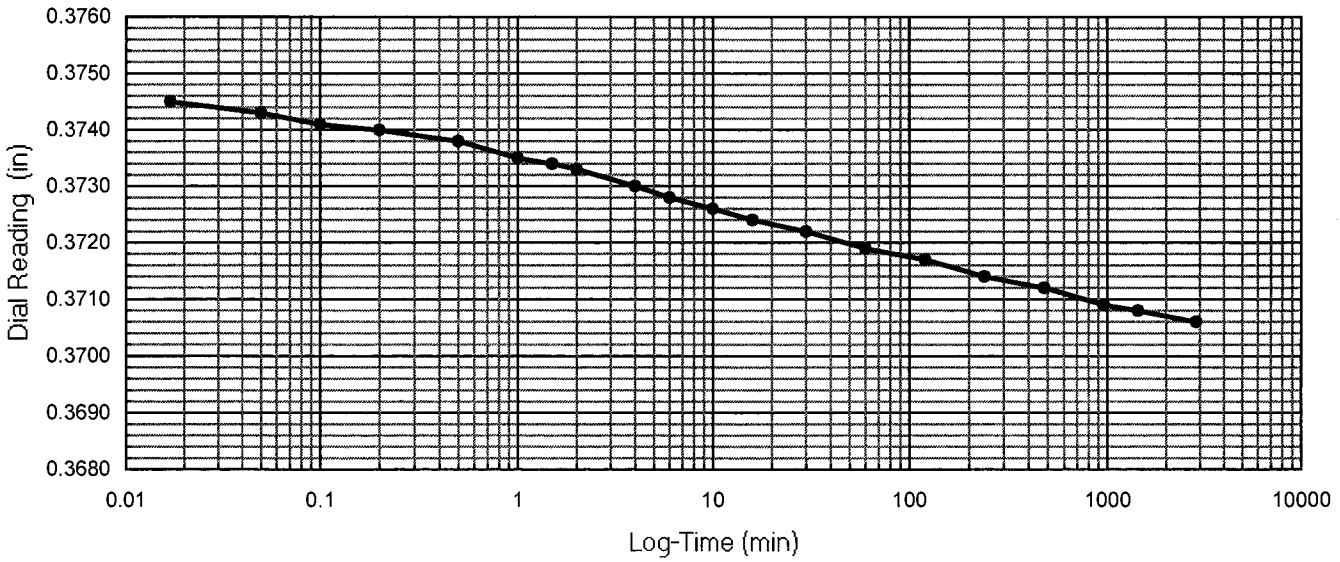
d50 = ____

t50 = ____ min

log time

d50 = 0.3728

t50 = 6.0 min



One-Dimensional Oedometer Testing Increment

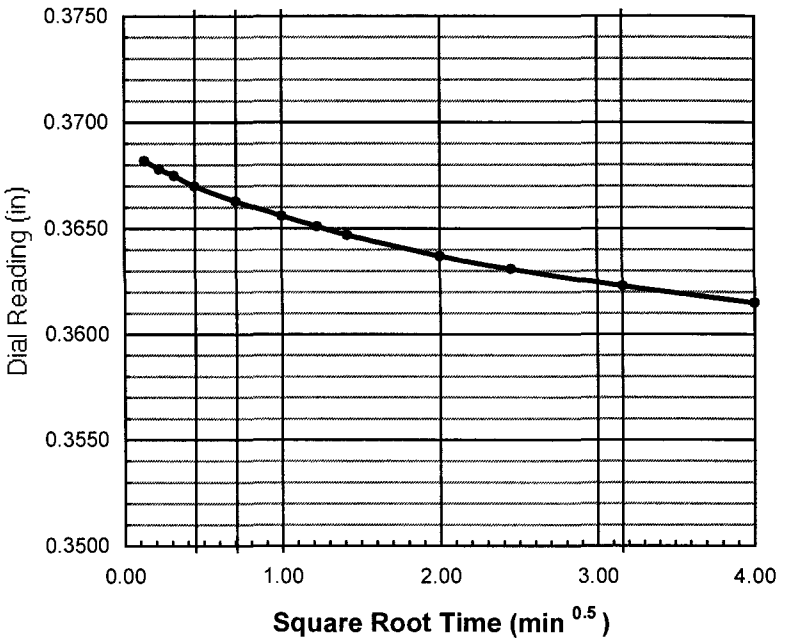
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 4 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 4 | Depth (ft.) 11.5

Date: 7-Mar-11 | Load (psf): 2747 | Zero Reading: 0.3780

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:34:26	0	0.00	0.3706
	0.02	0.13	0.3682
	0.05	0.22	0.3678
	0.10	0.32	0.3675
	0.20	0.45	0.3670
	0.50	0.71	0.3663
	1.00	1.00	0.3656
	1.50	1.22	0.3651
	2.00	1.41	0.3647
	4.0	2.00	0.3637
	6.0	2.45	0.3631
	10.0	3.16	0.3623
	16.0	4.00	0.3615
	30		0.3607
	60		0.3600
	120		0.3593
	240		0.3587
	480		0.3582
	960		0.3577
	1443		0.3574



do = 0.3688

d90 = ____ t90 = ____ min

d100 = 0.3580

df = 0.3574

square root

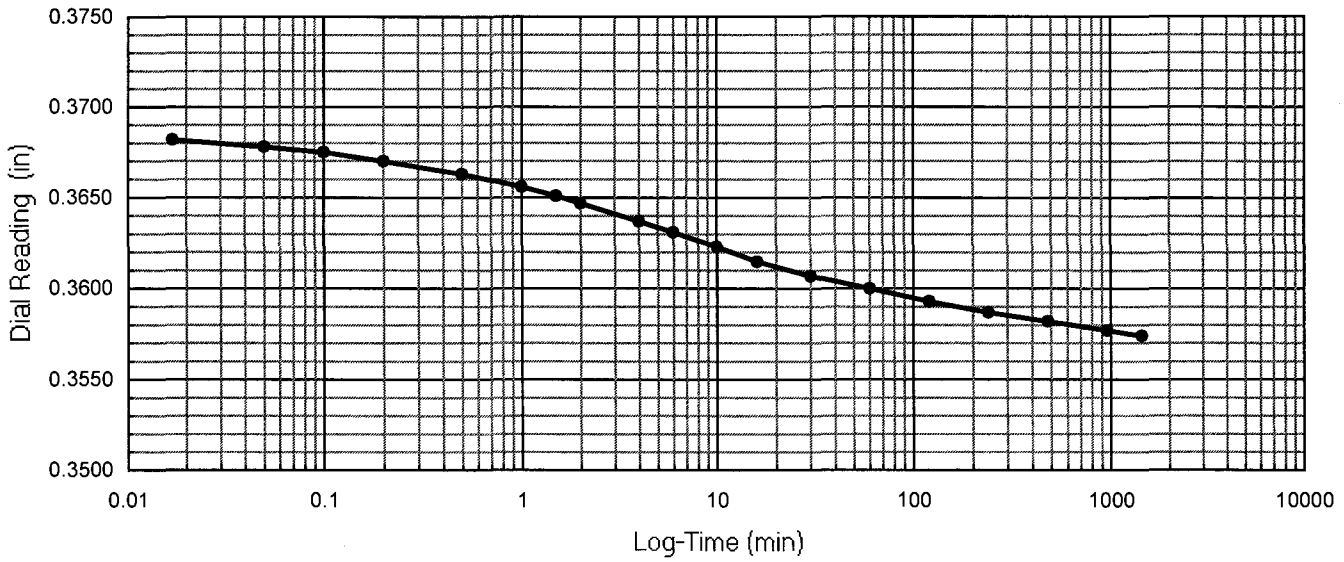
d50 = ____

t50 = ____ min

log time

d50 = 0.3634

t50 = 5.0 min



One-Dimensional Oedometer Testing Increment

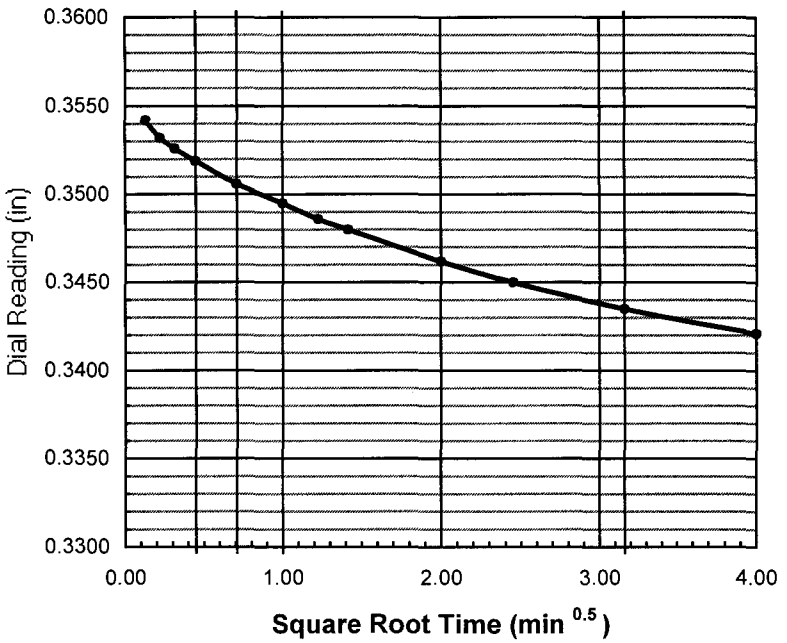
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 5 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 4 | Depth (ft.) 11.5

Date: 8-Mar-11 | Load (psf): 5517 | Zero Reading: 0.3780

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:38:55	0	0.00	0.3574
	0.02	0.13	0.3542
	0.05	0.22	0.3532
	0.10	0.32	0.3526
	0.20	0.45	0.3519
	0.50	0.71	0.3506
	1.00	1.00	0.3495
	1.50	1.22	0.3486
	2.00	1.41	0.3480
	4.0	2.00	0.3462
	6.0	2.45	0.3450
	10.0	3.16	0.3435
	16.0	4.00	0.3421
	30		0.3404
	60		0.3390
	120		0.3379
	240		0.3370
	480		0.3361
	960		0.3353
	1430		0.3350



do = 0.3554

d90 = ____ t90 = ____ min

d100 = 0.3360

df = 0.3350

square root

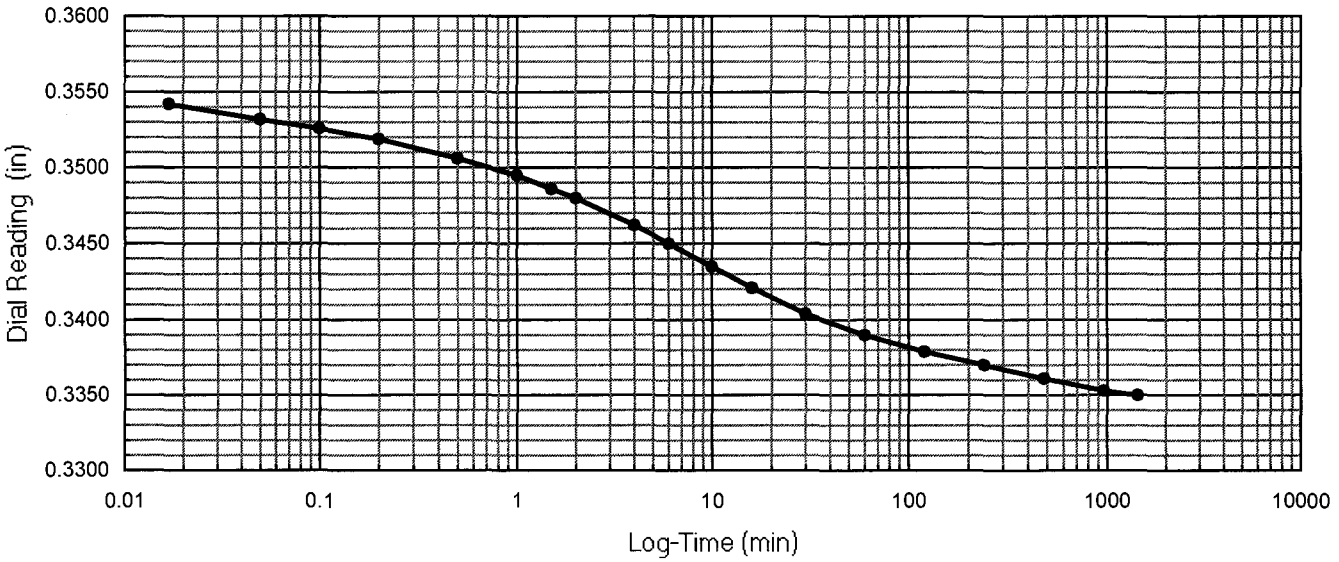
d50 = ____

t50 = ____ min

log time

d50 = 0.3457

t50 = 5.0 min



One-Dimensional Oedometer Testing Increment

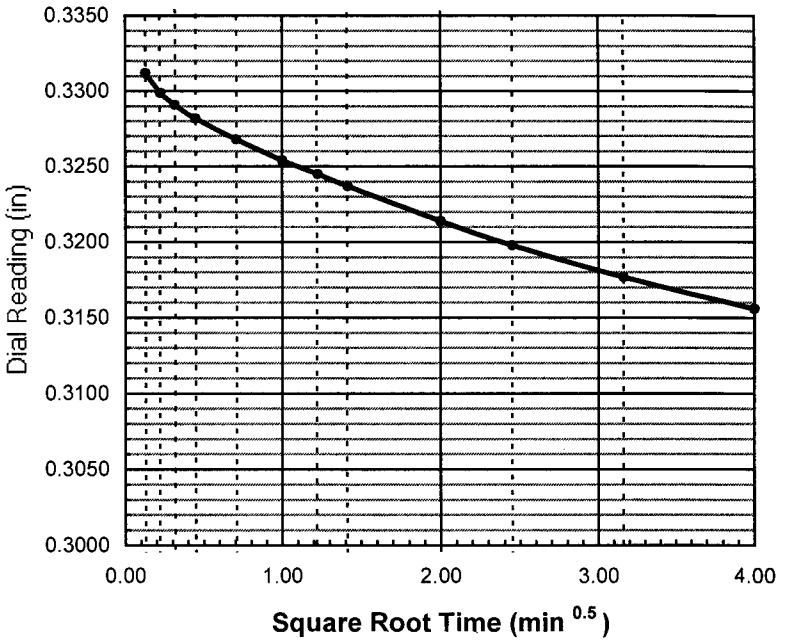
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 6 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 4 | Depth (ft.) 11.5

Date: 9-Mar-11 | Load (psf): 11057 | Zero Reading: 0.3780

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:30:03	0	0.00	0.3350
	0.02	0.13	0.3312
	0.05	0.22	0.3299
	0.10	0.32	0.3291
	0.20	0.45	0.3282
	0.50	0.71	0.3268
	1.00	1.00	0.3254
	1.50	1.22	0.3245
	2.00	1.41	0.3237
	4.0	2.00	0.3214
	6.0	2.45	0.3198
	10.0	3.16	0.3177
	16.0	4.00	0.3156
	30		0.3129
	60		0.3105
	120		0.3086
	240		0.3072
	480		0.3060
	960		0.3048
	1481		0.3043



do = 0.3327

d90 = ____ t90 = ____ min

d100 = 0.3090

df = 0.3043

square root

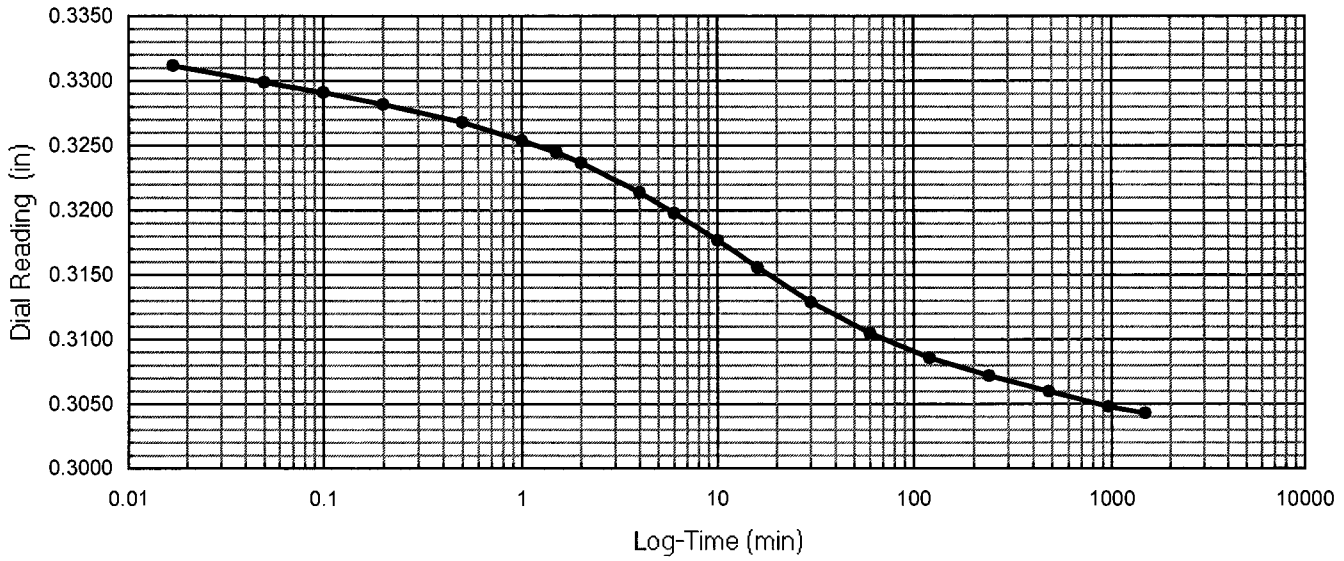
d50 = ____

t50 = ____ min

log time

d50 = 0.3209

t50 = 6.0 min



One-Dimensional Oedometer Testing Increment

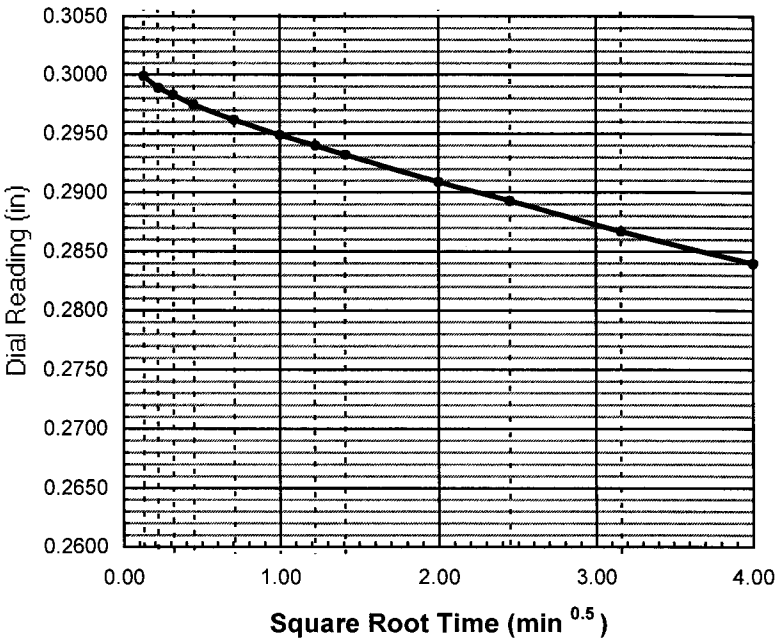
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 7 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 4 | Depth (ft.) 11.5

Date: 10-Mar-11 | Load (psf): 22137 | Zero Reading: 0.3780

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:12:07	0	0.00	0.3043
	0.02	0.13	0.2999
	0.05	0.22	0.2989
	0.10	0.32	0.2983
	0.20	0.45	0.2975
	0.50	0.71	0.2962
	1.00	1.00	0.2949
	1.50	1.22	0.2940
	2.00	1.41	0.2932
	4.0	2.00	0.2909
	6.0	2.45	0.2893
	10.0	3.16	0.2867
	16.0	4.00	0.2840
	30		0.2798
	60		0.2751
	120		0.2711
	240		0.2682
	480		0.2663
	960		0.2649
	1493		0.2642



do = 0.3011

d90 = ____ t90 = ____ min

d100 = 0.2670

df = 0.2642

square root

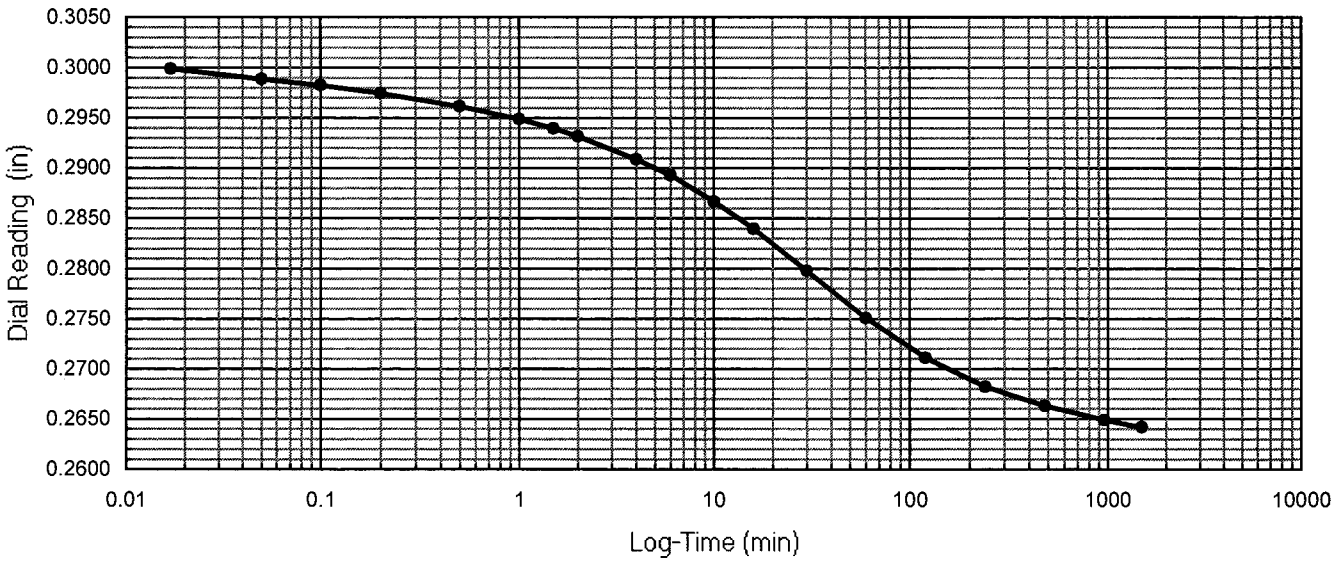
d50 = ____

t50 = ____ min

log time

d50 = 0.2841

t50 = 16.0 min



One-Dimensional Oedometer Testing Increment

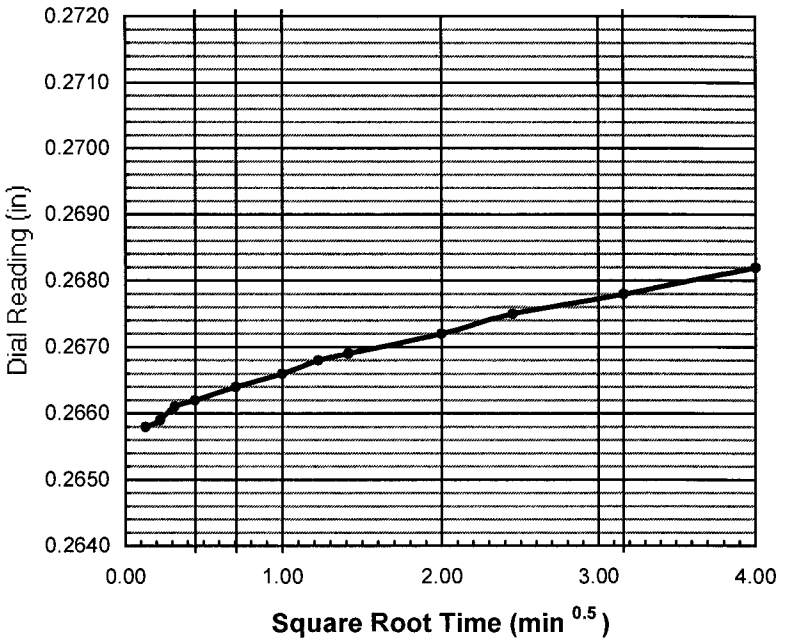
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 8 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 4 | Depth (ft.) 11.5

Date: 11-Mar-11 | Load (psf): 11057 | Zero Reading: 0.3780

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:06:46	0	0.00	0.2642
	0.02	0.13	0.2658
	0.05	0.22	0.2659
	0.10	0.32	0.2661
	0.20	0.45	0.2662
	0.50	0.71	0.2664
	1.00	1.00	0.2666
	1.50	1.22	0.2668
	2.00	1.41	0.2669
	4.0	2.00	0.2672
	6.0	2.45	0.2675
	10.0	3.16	0.2678
	16.0	4.00	0.2682
	30		0.2687
	60		0.2691
	120		0.2693
	240		0.2695
	480		0.2697
	960		0.2698
	1455		0.2698



do = 0.2656

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2698

square root

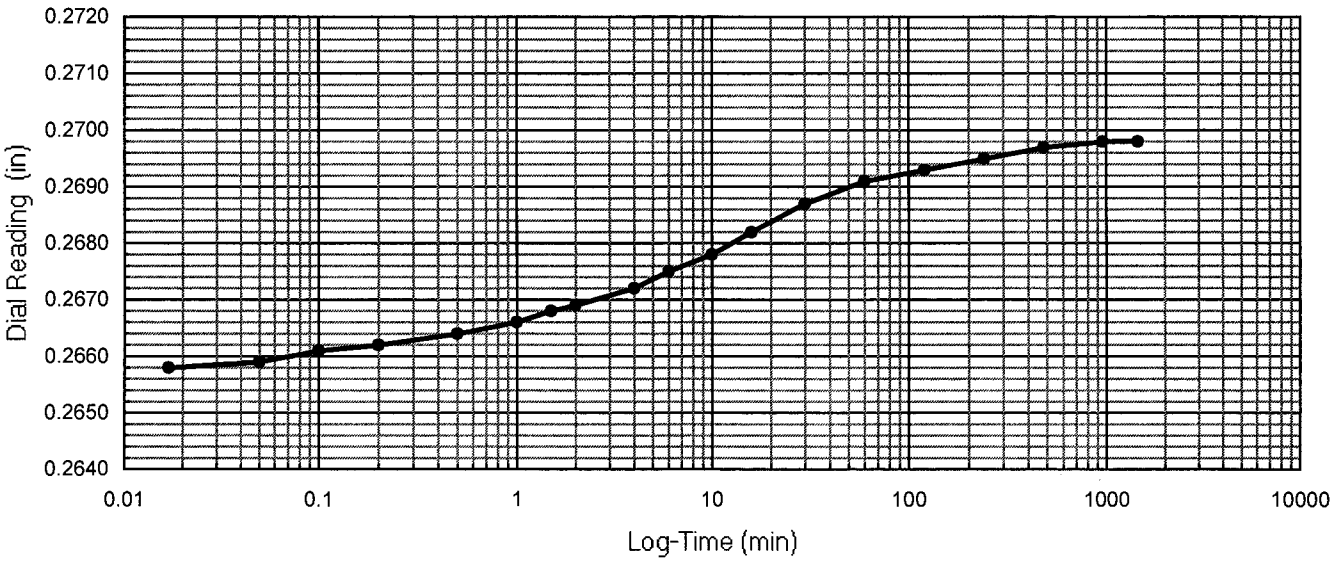
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

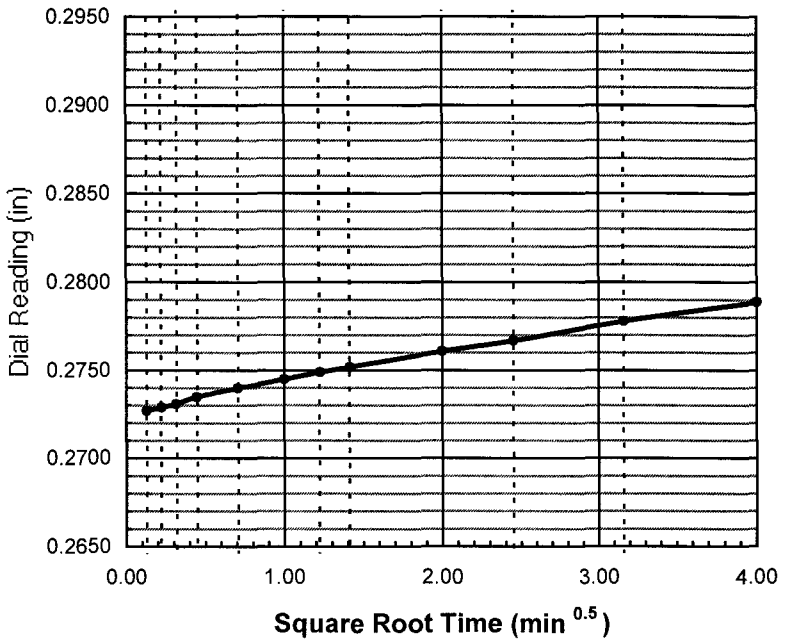
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 9 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 4 | Depth (ft.) 11.5

Date: 12-Mar-11 | Load (psf): 2747 | Zero Reading: 0.3780

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:23:19	0	0.00	0.2698
	0.02	0.13	0.2727
	0.05	0.22	0.2729
	0.10	0.32	0.2731
	0.20	0.45	0.2735
	0.50	0.71	0.2740
	1.00	1.00	0.2745
	1.50	1.22	0.2749
	2.00	1.41	0.2752
	4.0	2.00	0.2761
	6.0	2.45	0.2767
	10.0	3.16	0.2778
	16.0	4.00	0.2789
	30		0.2808
	60		0.2834
	120		0.2859
	240		0.2878
	480		0.2888
	960		0.2894
	1541		0.2897



do = 0.2723

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2897

square root

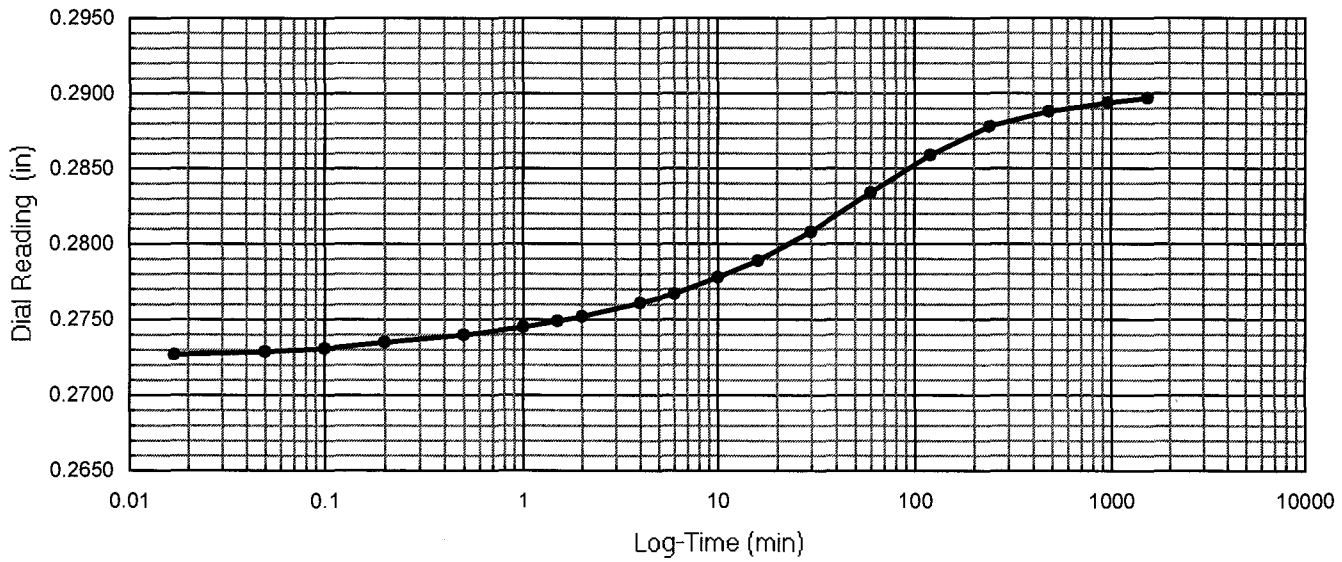
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

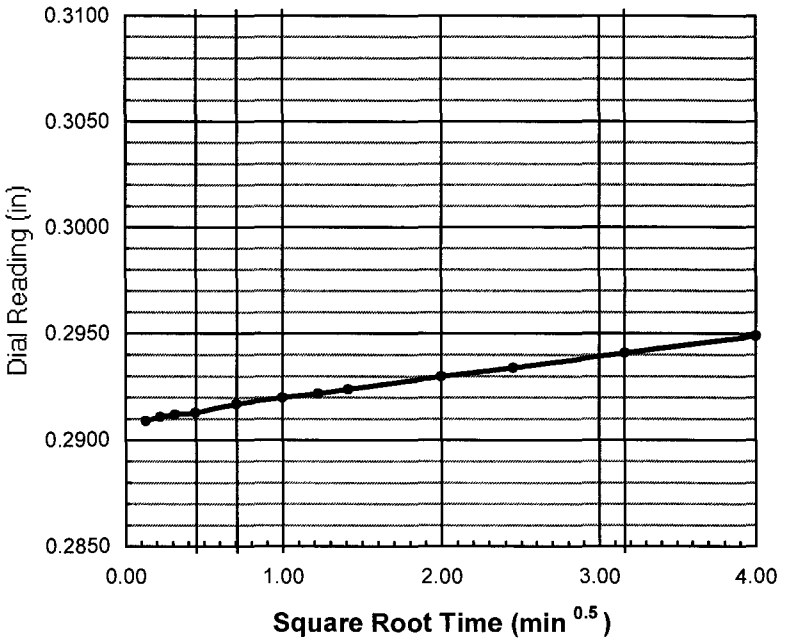
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C8 | Stage Number: 10 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 4 | Depth (ft.) 11.5

Date: 13-Mar-11 | Load (psf): 670 | Zero Reading: 0.3780

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
12:04:44	0	0.00	0.2897
	0.02	0.13	0.2909
	0.05	0.22	0.2911
	0.10	0.32	0.2912
	0.20	0.45	0.2913
	0.50	0.71	0.2917
	1.00	1.00	0.2920
	1.50	1.22	0.2922
	2.00	1.41	0.2924
	4.0	2.00	0.2930
	6.0	2.45	0.2934
	10.0	3.16	0.2941
	16.0	4.00	0.2949
	30		0.2964
	60		0.2984
	120		0.3010
	240		0.3038
	480		0.3059
	960		0.3072
	1440		0.3078
	2880		0.3087
	4054		0.3090



do = 0.2907

d90 = _____ t90 = _____ min

d100 = _____

df = 0.3090

square root

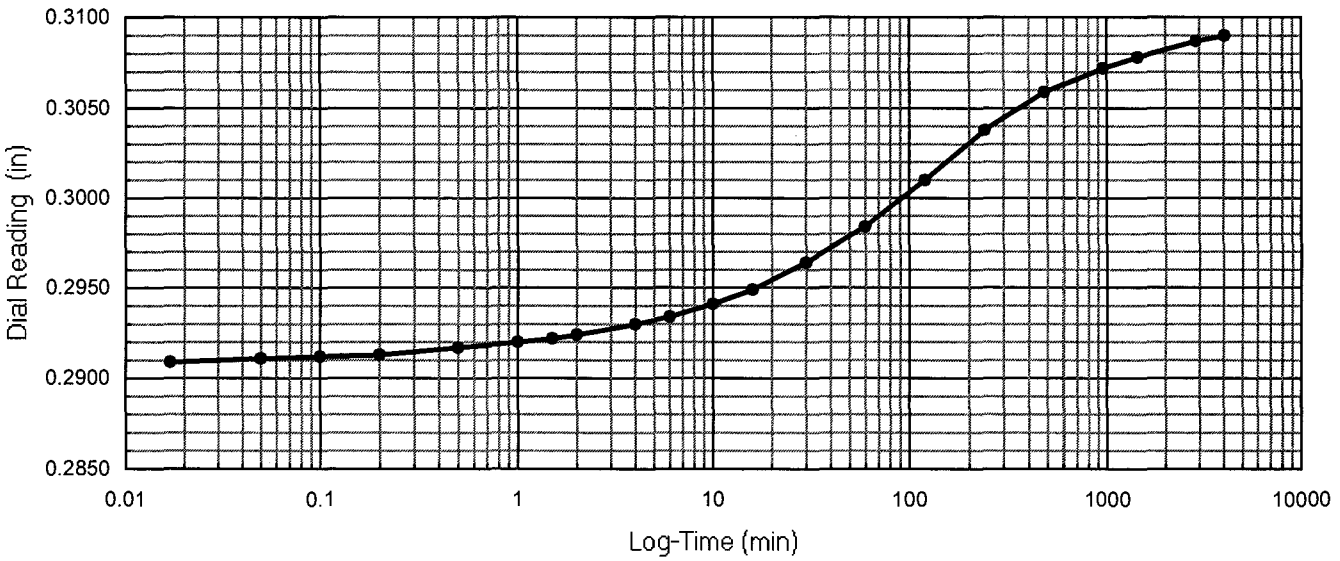
d50 = _____

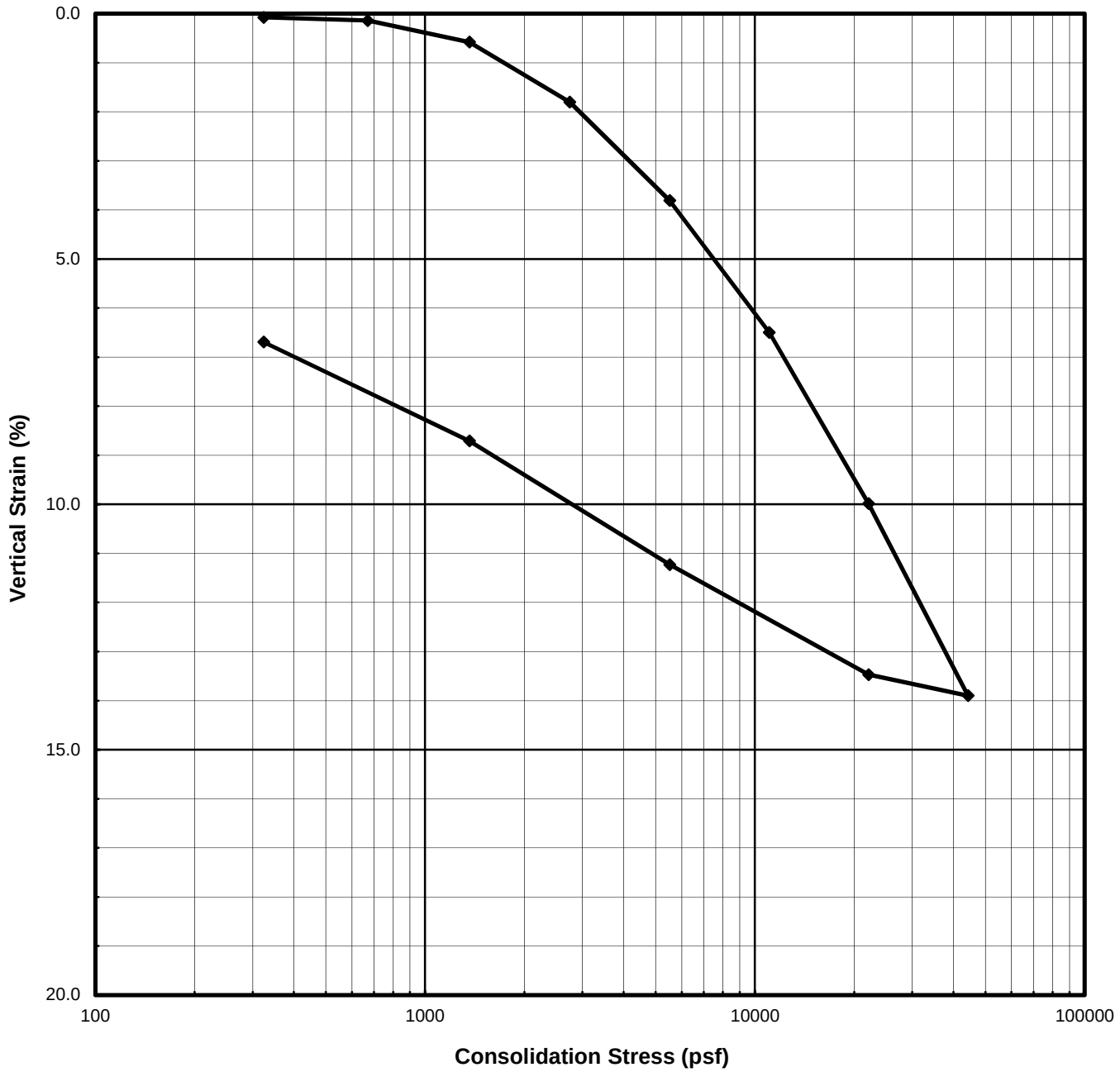
t50 = _____ min

log time

d50 = _____

t50 = _____ min





Description:	**Dark olive gray Clay (CH)**							
Boring No.:	R-11-022		Liquid Limit	50	%	Specific Gravity	2.75	assumed
Sample No.:	6		Plasticity Index	32	%	Strain for Saturation	1.64	%
Depth (ft | m)	20.0	6.10	Fines Content	87.0	%	Water added at	151	psf

	Water Content (%)	Total Unit Weight		Dry Unit Weight		Saturation (%)	Void Ratio	Height		Diameter	
		(pcf)	(kN/m^3)	(pcf)	(kN/m^3)			(inches)	(cm)	(inches)	(cm)
Initial	25.6	123.2	19.35	98.1	15.41	94.2	0.75	0.932	2.37	2.416	6.137
Final	24.6	126.8	19.92	101.8	16.00	98.9	0.68	0.898	2.28		

URS

I-5 & SR-74 IC

Project Number: 30989830
Test Start Date: 2/18/2011

CONSOLIDATION TEST
ASTM D2435

SUBMITTED BY: Thomas J. O'Meara

Con I5 SR74 R11022 020.xls

One-Dimensional Oedometer Testing
Set-up / Take down Worksheet
ASTM D2435

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM
Apparatus No.: C5

Boring No.: R-11-022
Sample No.: 6
Depth (ft): 20.0

Specimen Description : Dark olive gray Clay (CH)
Duration: end of increment
Ring Number: R23

Weight of Wet Spec. and Ring:	355.68	g
Weight of Ring:	217.46	g
Initial Weight of Wet Spec.:	138.22	g
Take Down Weight with Ring:	354.27	g
Excess Oven-dried Cont. No.:	rp10	
Weight of Cont. and Dry Spec.:	116.20	g
Weight of Container:	116.00	g
Weight of Excess Dried Soil:	0.20	g
Weight of Excess Wet Soil	0.25	g
Final Weight of Wet Specimen:	137.06	g

Height of Specimen (in)

	Initial	Final
1	0.932	0.899
2	0.931	0.899
3	0.932	0.898
4	0.932	0.894
5	0.935	0.900
Ave:	0.932	0.898

Initial Height - Final Height =	0.034	in
Change in Dial (Dd) =	0.041	in
Initial Height - Dd =	0.891	in
Final Height + Dd =	0.939	in
Weight of Top Cap =	378.97	g

Specimen Analysis					Initial Trim	Initial Spec.	Final
				Container Number:	m13	**XXXXX**	s20
				Mass of Container and Wet Specimen M1 (g)	337.78	138.22	212.23
				Mass of Container and Dry Specimen, M2 (g)	286.50	110.04	185.43
				Mass of Container, M3 (g)	89.82	**XXXXX**	76.30
				Water Content, w (%)	26.07	25.61	24.56
				Mass of Wet Specimen, M4 (g)	138.22	138.22	137.06
				Mass of Dry Specimen, M5 (g)	110.04	110.04	110.04
Nominal		Measured	x	Specimen Height, H (in)	0.932	0.932	0.898
Nominal	x	Measured		Specimen Diameter, D (in)	2.416	2.416	2.416
				Area of Specimen, A (in^2)	4.584	4.584	4.584
				Volume of Specimen, V (cc)	70.05	70.05	67.46
Assumed	x	Measured		Specific Gravity, Gs	2.75	2.75	2.75
				Wet Unit Weight, WUW (pcf)	**123.2**	**123.2**	**126.8**
				Dry Unit Weight, DUW (pcf)	**97.7**	**98.1**	**101.8**
				Void Ratio	**0.754**	**0.747**	**0.683**
				Degree of Saturation, S (%)	**95.1**	**94.2**	**98.9**

Set-up by: TJO
Date: 2/18/11
Calculated by: TJO
Checked by: TJO
Strain for Saturation (%) = **1.643**

One-Dimensional Oedometer Testing

Loading Worksheet

ASTM D2435

Project Number: 30989830 Boring No.: R-11-022

Project Name: I-5 & SR-74 IC Sample No.: 6

Project Engineer: FM Apparatus No.: C5 Depth (ft): 20.0

Initial Dial Reading: 0.3580 inch Initial Specimen Height: 0.932 inch

Stage No.	Normal Stress (psf)	Dial Reading (in)		Compressibility Correction (in)	Vertical Strain (%)	
		End of Duration	End of Increment		End of Duration	End of Increment
Seat	151		0.3579	0.0000		0.01
1	324	0.3562	0.3564	0.0009	0.10	0.08
2	670	0.3544	0.3545	0.0022	0.15	0.14
3	1363	0.3490	0.3488	0.0038	0.56	0.58
4	2748	0.3370	0.3357	0.0055	1.66	1.80
5	5518	0.3170	0.3147	0.0078	3.56	3.81
6	11058	0.2900	0.2867	0.0107	6.15	6.50
7	22137	0.2520	0.2501	0.0148	9.78	9.98
8	44297	0.2140	0.2106	0.0178	13.53	13.90
9	22137		0.2162	0.0162		13.47
10	5518		0.2429	0.0104		11.23
11	1363		0.2695	0.0073		8.71
12	324		0.2904	0.0052		6.69
13	68		0.3167	0.0043		3.97
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						
33						

Final dial reading prior to take down (inch): 0.3167 Take down by: TJO Date: 3/16/11

One-Dimensional Oedometer Testing
ASTM D2435
Table of Incremental Values

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM
Apparatus No.: C5

Boring No.: R-11-022
Sample No.: 6
Depth (ft): 20.0
Inundation at stage: Seat

10 **20** Hanger Ratios

Stage Number	Incremental Weight Applied (kg) Back	Front	Vertical Stress (psf)	Specimen Hieght (in)	Deflections (in) $d_{initial}$	d_o	d_{50}	d_{100}	d_{final}	Porous Stone (in)	t_{50} (min)	cv (in^2/min)	cv (ft^2/day)
Top Cap			26	0.932	0.3580	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
Seat	0.06	0.06	151	0.932	0.3580	XXXXX	XXXXX	XXXXX	0.3579	0.0000	XXXXX	XXXXX	XXXXX
1	0.25		324	0.932	0.3579	0.3570	0.3566	0.3562	0.3564	0.0009	XXXXX	XXXXX	XXXXX
2	0.50		670	0.932	0.3564	0.3550	0.3547	0.3544	0.3545	0.0022	XXXXX	XXXXX	XXXXX
3	1.00		1363	0.930	0.3545	0.3530	0.3510	0.3490	0.3488	0.0038	1.50	0.028	0.284
4		1.0	2748	0.923	0.3488	0.3475	0.3423	0.3370	0.3357	0.0055	10.00	0.004	0.042
5	4.0		5518	0.909	0.3357	0.3341	0.3256	0.3170	0.3147	0.0078	15.00	0.003	0.027
6		4.0	11058	0.892	0.3147	0.3125	0.3013	0.2900	0.2867	0.0107	18.00	0.002	0.022
7		8.0	22137	0.870	0.2867	0.2835	0.2678	0.2520	0.2501	0.0148	35.00	0.001	0.011
8		16.0	44297	0.849	0.2501	0.2477	0.2309	0.2140	0.2106	0.0178	70.00	0.001	0.005
9		-16.0	22137	0.870	0.2106	0.2122	XXXXX	XXXXX	0.2162	0.0162	XXXXX	XXXXX	XXXXX
10		-12.0	5518	0.907	0.2162	0.2207	XXXXX	XXXXX	0.2429	0.0104	XXXXX	XXXXX	XXXXX
11	-4.0	-1.0	1363	0.941	0.2429	0.2447	XXXXX	XXXXX	0.2695	0.0073	XXXXX	XXXXX	XXXXX
12	-1.5		324	0.967	0.2695	0.2703	XXXXX	XXXXX	0.2904	0.0052	XXXXX	XXXXX	XXXXX
13	-0.25	-0.06	68	0.998	0.2904	XXXXX	XXXXX	XXXXX	0.3167	0.0043	XXXXX	XXXXX	XXXXX
14			68	XXXXX	0.3167	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
15			68	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
16			68	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
17			68	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
18			68	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
19			68	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
20			68	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
21			68	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
22			68	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
23			68	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
24			68	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
25			68	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX

One-Dimensional Oedometer Testing Increment

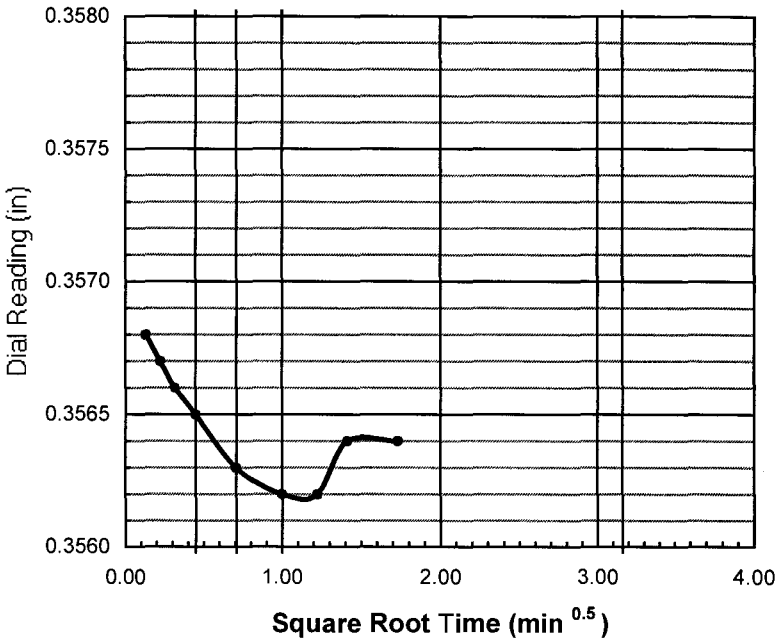
for ASTM D2435, method B

Project Number: 30989830 Apparatus No.: C5 Stage Number: 1 Curves by: TJO

Boring No.: R-11-022 Sample No.: 6 Depth (ft.) 20.0

Date: 18-Feb-11 Load (psf): 324 Zero Reading: 0.3580

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
12:14:05	0	0.00	0.3579
	0.02	0.13	0.3568
	0.05	0.22	0.3567
	0.10	0.32	0.3566
	0.20	0.45	0.3565
	0.50	0.71	0.3563
	1.00	1.00	0.3562
	1.50	1.22	0.3562
	2.00	1.41	0.3564
swelling	3.0	1.73	0.3564



do = 0.3570

d90 = _____ t90 = _____ min

d100 = _____

df = 0.3564

square root

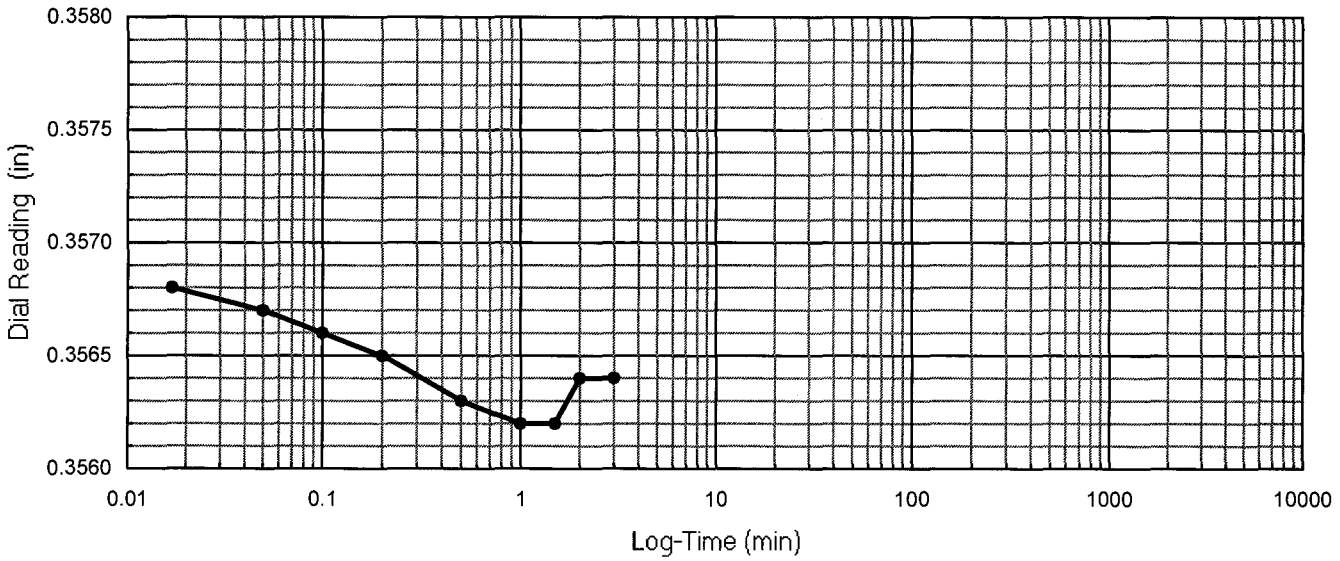
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

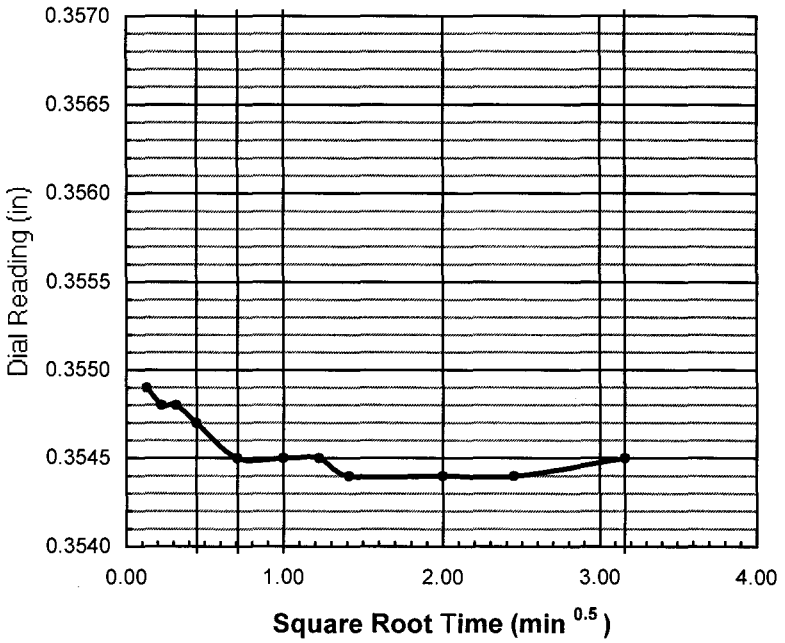
for ASTM D2435, method B

Project Number: 30989830 Apparatus No.: C5 Stage Number: 2 Curves by: TJO

Boring No.: R-11-022 Sample No.: 6 Depth (ft.) 20.0

Date: 18-Feb-11 Load (psf): 670 Zero Reading: 0.3580

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
12:16:27	0	0.00	0.3564
	0.02	0.13	0.3549
	0.05	0.22	0.3548
	0.10	0.32	0.3548
	0.20	0.45	0.3547
	0.50	0.71	0.3545
	1.00	1.00	0.3545
	1.50	1.22	0.3545
	2.00	1.41	0.3544
	4.0	2.00	0.3544
	6.0	2.45	0.3544
swelling	10.0	3.16	0.3545



do = 0.3550

d90 = _____ t90 = _____ min

d100 = _____

df = 0.3545

square root

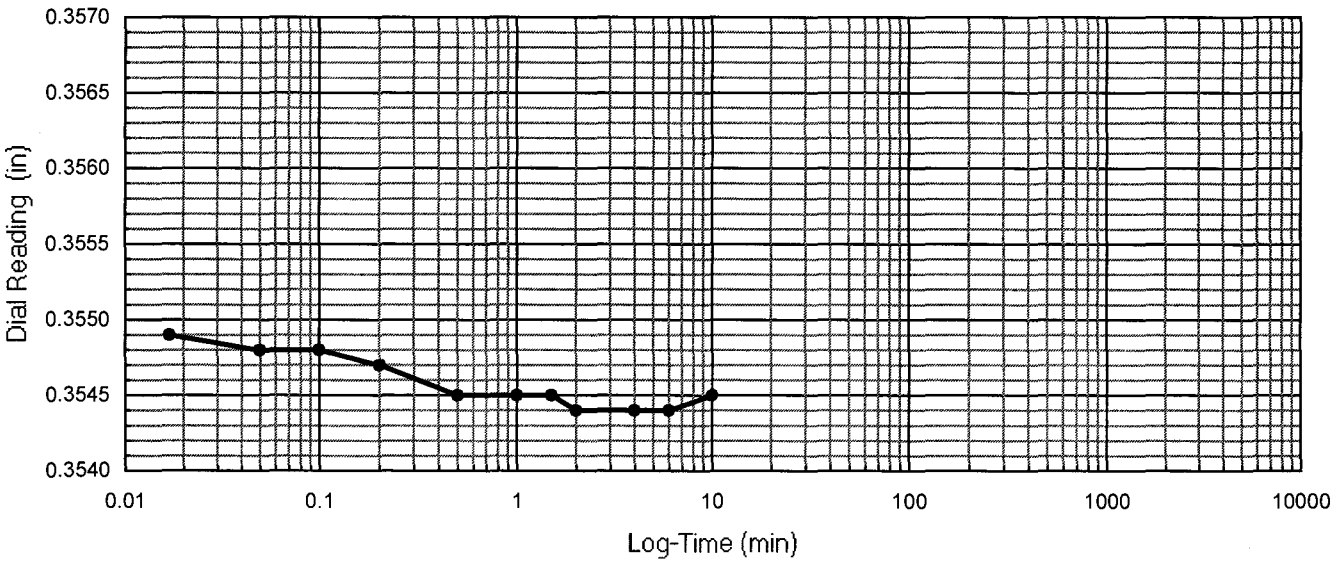
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

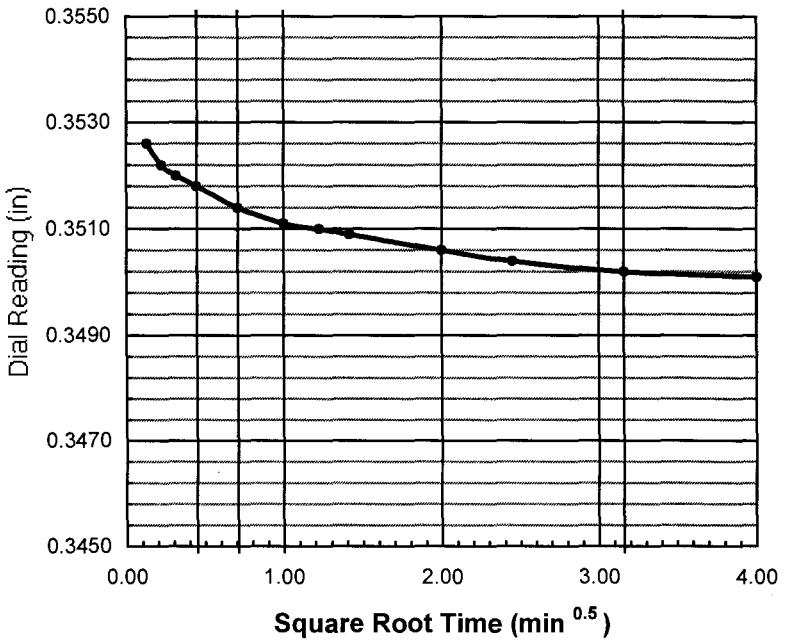
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C5 | Stage Number: 3 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 6 | Depth (ft.) 20.0

Date: 18-Feb-11 | Load (psf): 1363 | Zero Reading: 0.3580

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
12:26:50	0	0.00	0.3545
	0.02	0.13	0.3526
	0.05	0.22	0.3522
	0.10	0.32	0.3520
	0.20	0.45	0.3518
	0.50	0.71	0.3514
	1.00	1.00	0.3511
	1.50	1.22	0.3510
	2.00	1.41	0.3509
	4.0	2.00	0.3506
	6.0	2.45	0.3504
	10.0	3.16	0.3502
	16.0	4.00	0.3501
	30		0.3499
	60		0.3497
	120		0.3494
	240		0.3492
	480		0.3490
	960		0.3488
	1300		0.3488



do = 0.3530

d90 = _____ t90 = _____ min

d100 = 0.3490

df = 0.3488

square root

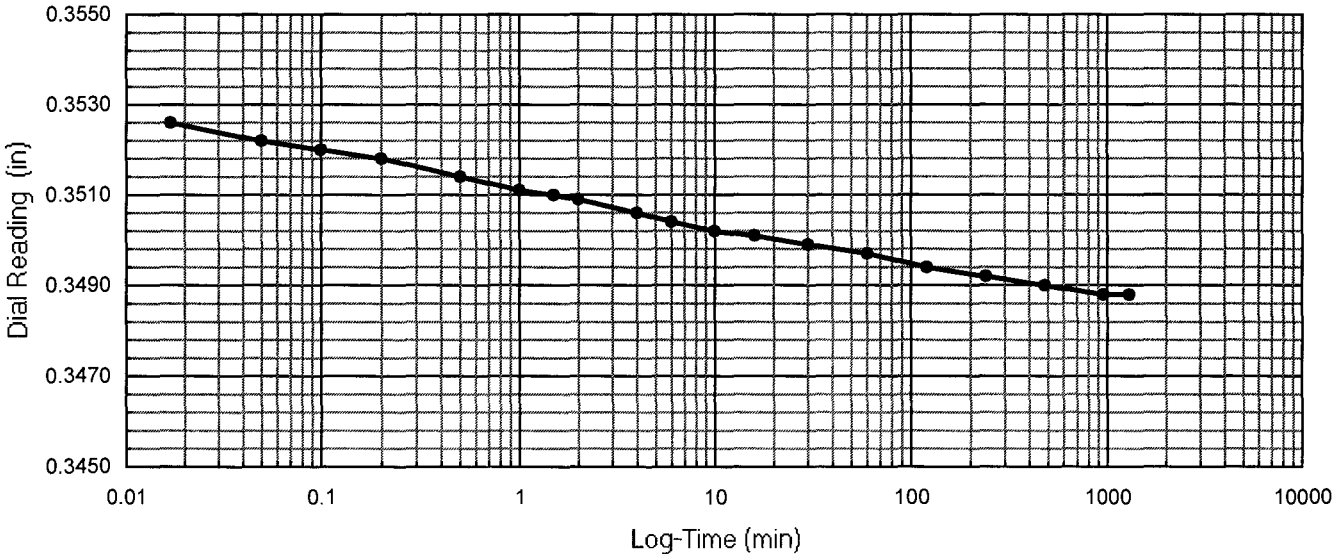
d50 = _____

t50 = _____ min

log time

d50 = 0.3510

t50 = 1.5 min



One-Dimensional Oedometer Testing Increment

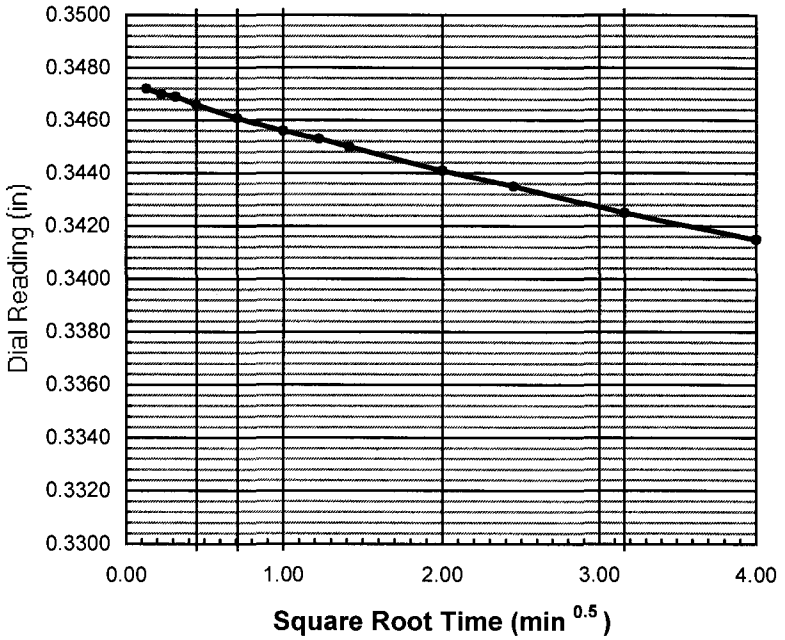
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C5 | Stage Number: 4 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 6 | Depth (ft.) 20.0

Date: 19-Feb-11 | Load (psf): 2748 | Zero Reading: 0.3580

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:06:15	0	0.00	0.3488
	0.02	0.13	0.3472
	0.05	0.22	0.3470
	0.10	0.32	0.3469
	0.20	0.45	0.3466
	0.50	0.71	0.3461
	1.00	1.00	0.3456
	1.50	1.22	0.3453
	2.00	1.41	0.3450
	4.0	2.00	0.3441
	6.0	2.45	0.3435
	10.0	3.16	0.3425
	16.0	4.00	0.3415
	30		0.3401
	60		0.3387
	120		0.3377
	240		0.3370
	480		0.3364
	960		0.3360
	1466		0.3357



do = 0.3475

d90 = _____ t90 = _____ min

d100 = 0.3370

df = 0.3357

square root

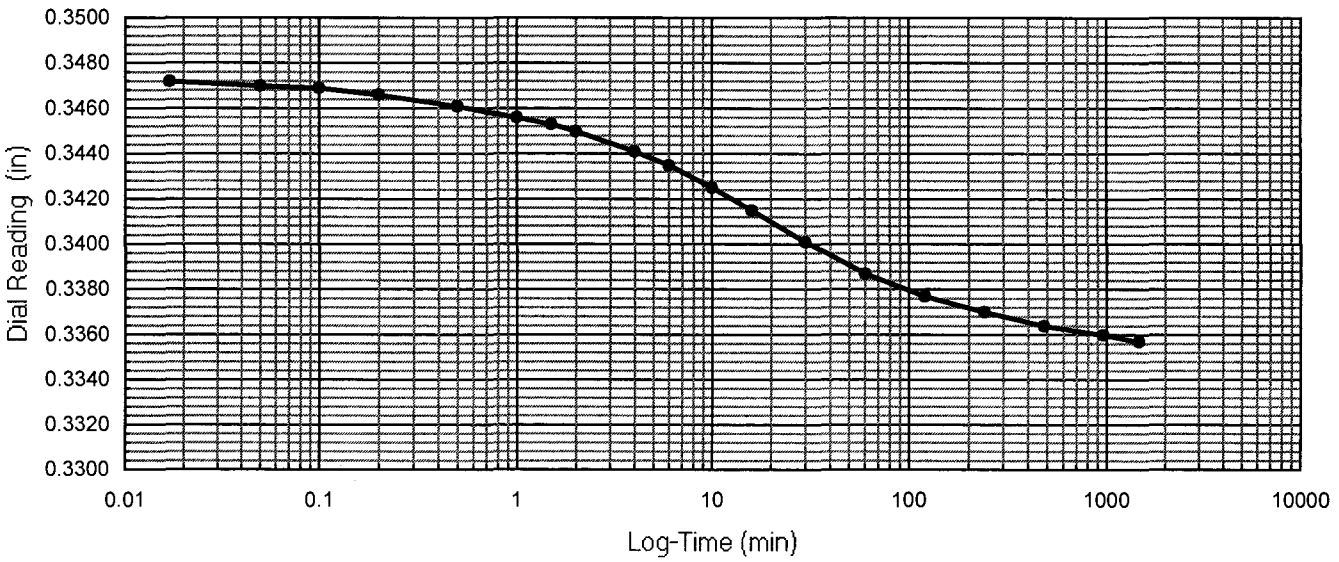
d50 = _____

t50 = _____ min

log time

d50 = 0.3423

t50 = 10.0 min



One-Dimensional Oedometer Testing Increment

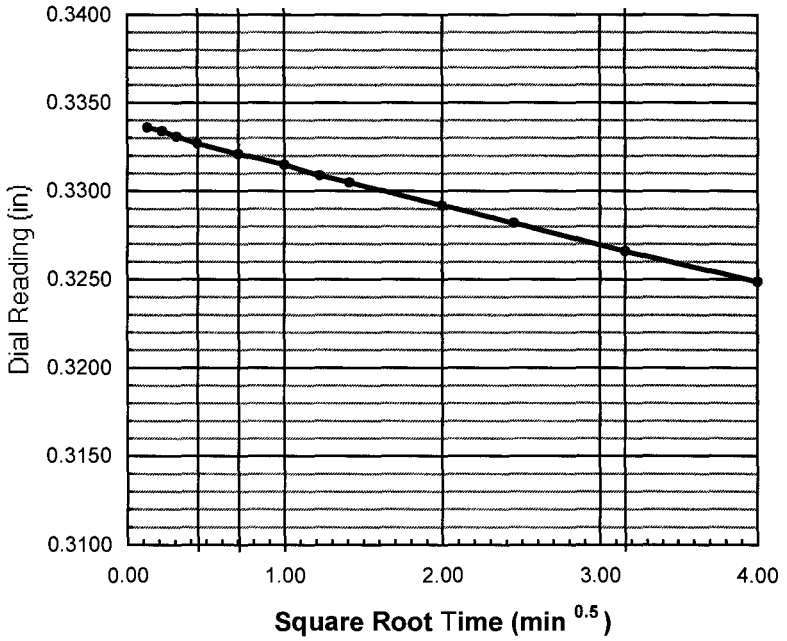
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C5 | Stage Number: 5 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 6 | Depth (ft.) 20.0

Date: 20-Feb-11 | Load (psf): 5518 | Zero Reading: 0.3580

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:33:03	0	0.00	0.3357
	0.02	0.13	0.3336
	0.05	0.22	0.3334
	0.10	0.32	0.3331
	0.20	0.45	0.3327
	0.50	0.71	0.3321
	1.00	1.00	0.3315
	1.50	1.22	0.3309
	2.00	1.41	0.3305
	4.0	2.00	0.3292
	6.0	2.45	0.3282
	10.0	3.16	0.3266
	16.0	4.00	0.3249
	30		0.3223
	60		0.3196
	120		0.3177
	240		0.3165
	480		0.3156
	960		0.3149
	1276		0.3147



do = 0.3341

d90 = _____ t90 = _____ min

d100 = 0.3170

df = 0.3147

square root

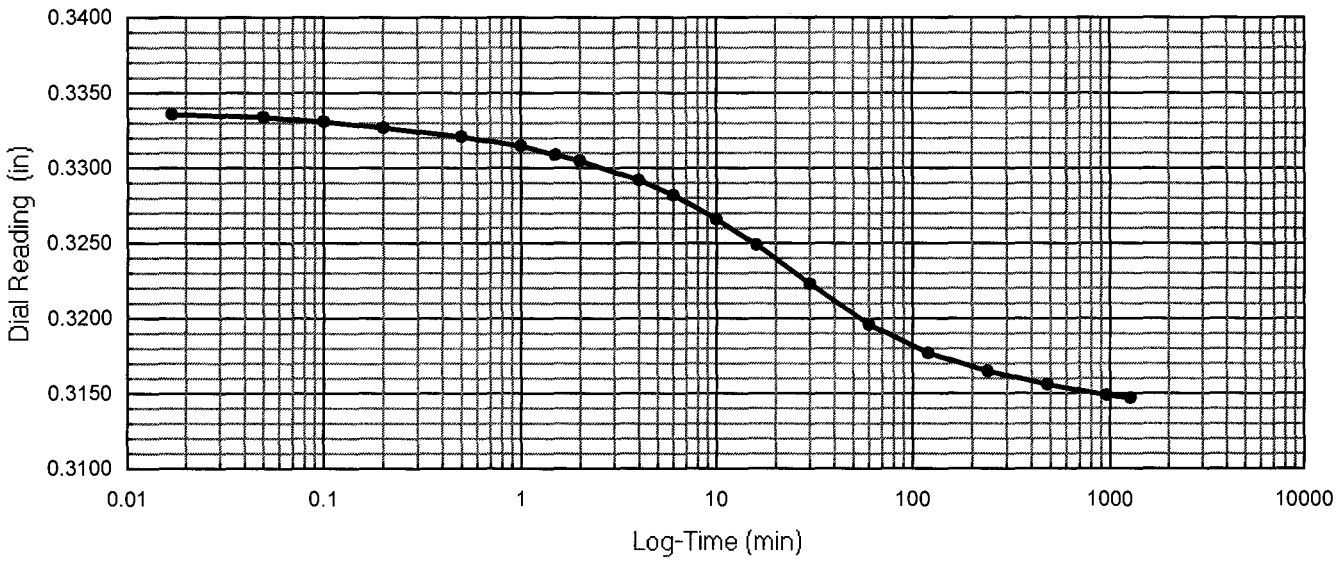
d50 = _____

t50 = _____ min

log time

d50 = 0.3255

t50 = 15.0 min



One-Dimensional Oedometer Testing Increment

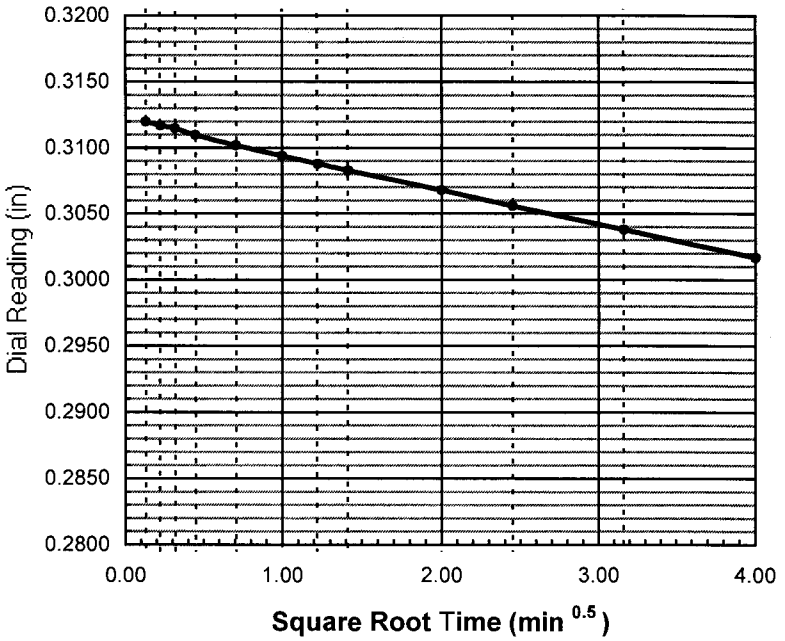
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C5 | Stage Number: 6 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 6 | Depth (ft.) 20.0

Date: 21-Feb-11 | Load (psf): 11058 | Zero Reading: 0.3580

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
7:50:04	0	0.00	0.3147
	0.02	0.13	0.3120
	0.05	0.22	0.3117
	0.10	0.32	0.3115
	0.20	0.45	0.3110
	0.50	0.71	0.3102
	1.00	1.00	0.3094
	1.50	1.22	0.3088
	2.00	1.41	0.3083
	4.0	2.00	0.3068
	6.0	2.45	0.3056
	10.0	3.16	0.3038
	16.0	4.00	0.3017
	30		0.2985
	60		0.2948
	120		0.2918
	240		0.2898
	480		0.2883
	960		0.2872
	1463		0.2867



do = 0.3125

d90 = ____ t90 = ____ min

d100 = 0.2900

df = 0.2867

square root

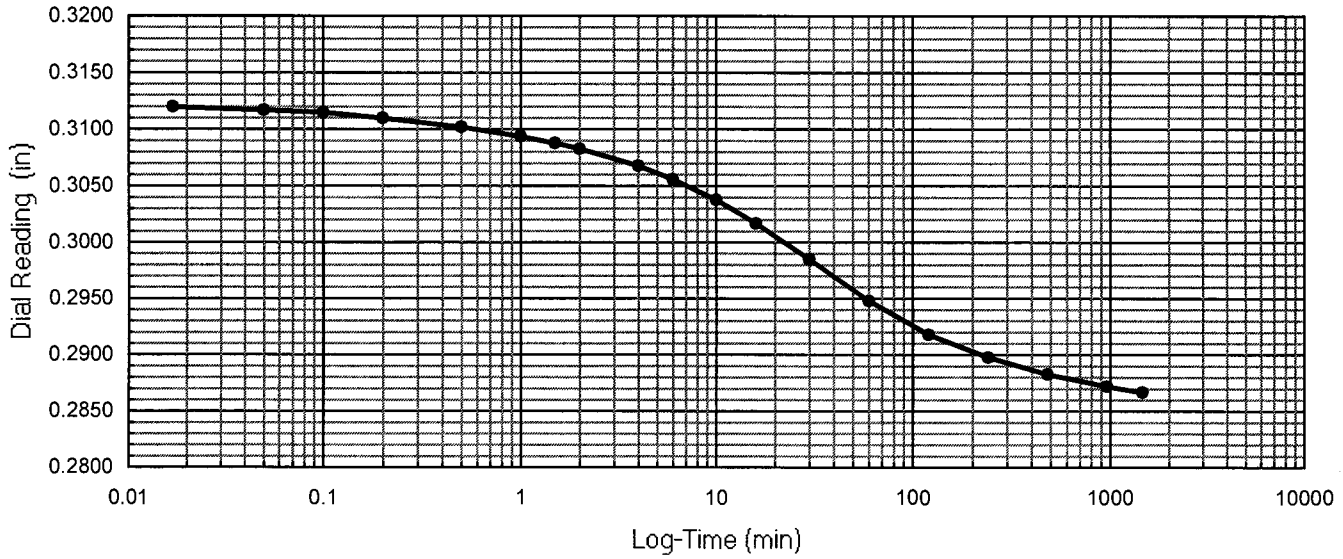
d50 = ____

t50 = ____ min

log time

d50 = 0.3013

t50 = 18.0 min



One-Dimensional Oedometer Testing Increment

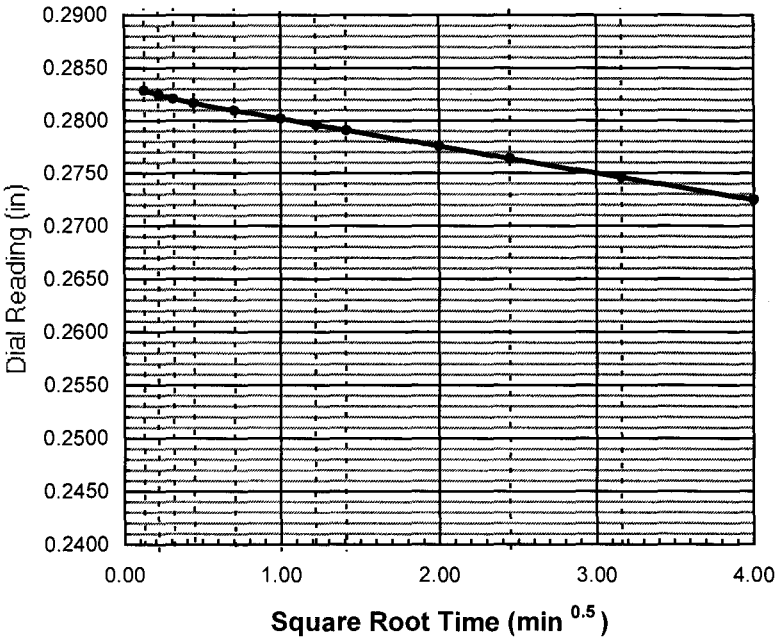
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C5 | Stage Number: 7 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 6 | Depth (ft.) 20.0

Date: 22-Feb-11 | Load (psf): 22137 | Zero Reading: 0.3580

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:13:38	0	0.00	0.2867
	0.02	0.13	0.2829
	0.05	0.22	0.2825
	0.10	0.32	0.2821
	0.20	0.45	0.2817
	0.50	0.71	0.2810
	1.00	1.00	0.2802
	1.50	1.22	0.2796
	2.00	1.41	0.2791
	4.0	2.00	0.2776
	6.0	2.45	0.2764
	10.0	3.16	0.2746
	16.0	4.00	0.2725
	30		0.2691
	60		0.2643
	120		0.2593
	240		0.2552
	480		0.2523
	960		0.2506
	1451		0.2501



do = 0.2835

d90 = _____ t90 = _____ min

d100 = 0.2520

df = 0.2501

square root

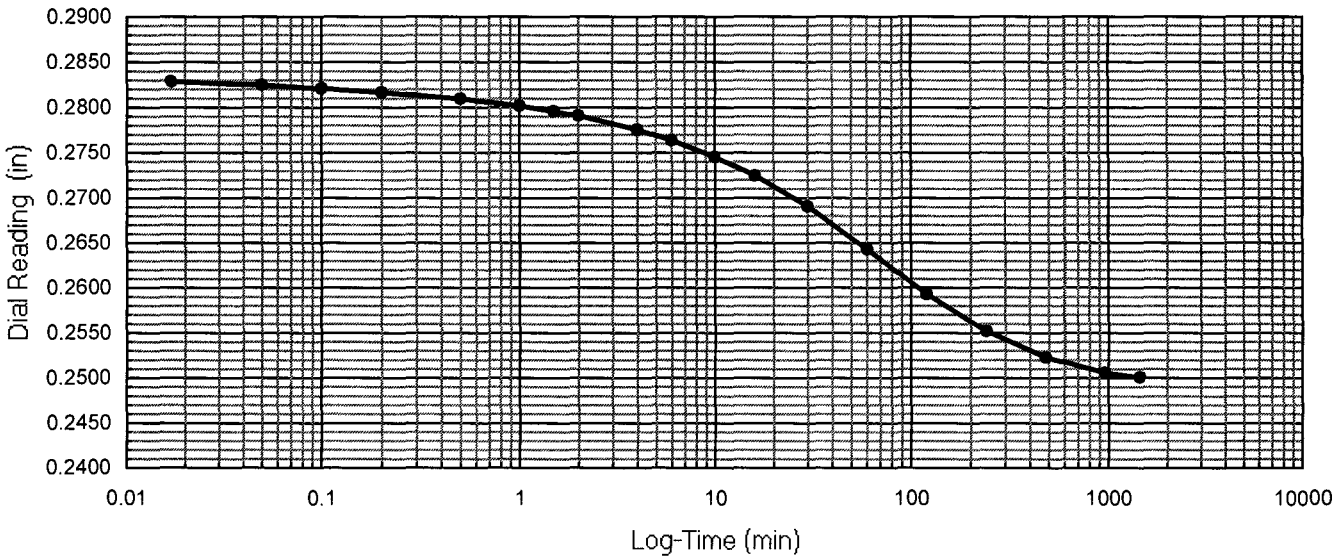
d50 = _____

t50 = _____ min

log time

d50 = 0.2678

t50 = 35.0 min



One-Dimensional Oedometer Testing Increment

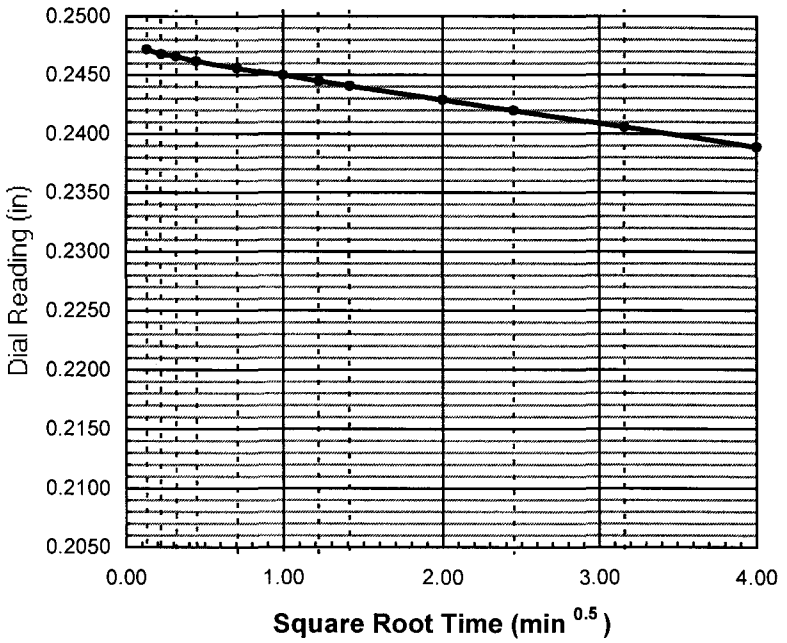
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C5 | Stage Number: 8 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 6 | Depth (ft.) 20.0

Date: 23-Feb-11 | Load (psf): 44297 | Zero Reading: 0.3580

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:24:51	0	0.00	0.2501
	0.02	0.13	0.2472
	0.05	0.22	0.2468
	0.10	0.32	0.2466
	0.20	0.45	0.2462
	0.50	0.71	0.2456
	1.00	1.00	0.2450
	1.50	1.22	0.2445
	2.00	1.41	0.2441
	4.0	2.00	0.2429
	6.0	2.45	0.2420
	10.0	3.16	0.2406
	16.0	4.00	0.2389
	30		0.2361
	60		0.2318
	120		0.2264
	240		0.2206
	480		0.2158
	960		0.2128
	1440		0.2118
	2889		0.2106



do = 0.2477

d90 = ____ t90 = ____ min

d100 = 0.2140

df = 0.2106

square root

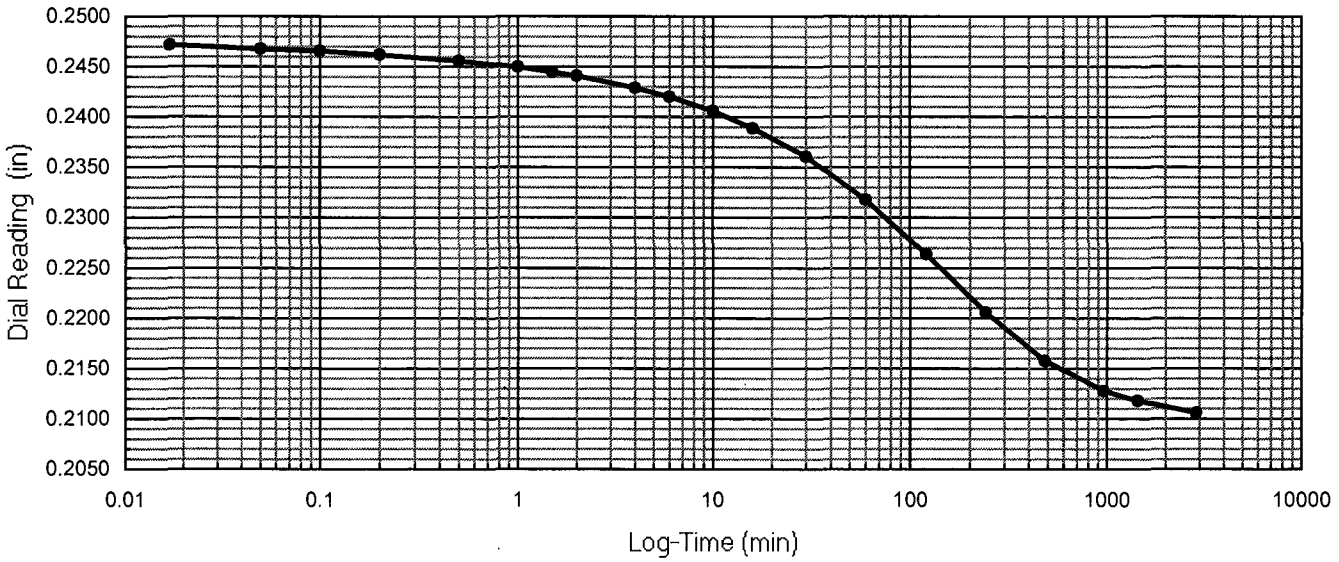
d50 = ____

t50 = ____ min

log time

d50 = 0.2309

t50 = 70.0 min



One-Dimensional Oedometer Testing Increment

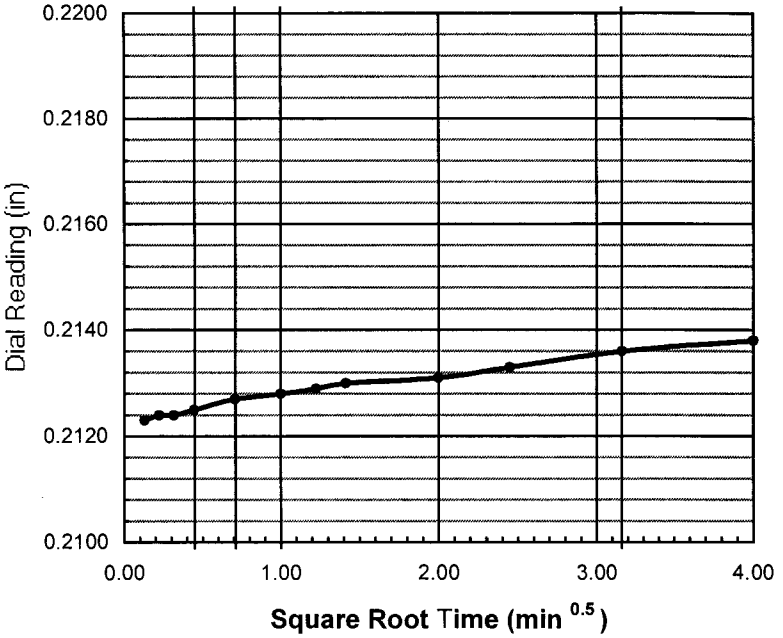
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C5 | Stage Number: 9 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 6 | Depth (ft.) 20.0

Date: 25-Feb-11 | Load (psf): 22137 | Zero Reading: 0.3580

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:34:44	0	0.00	0.2106
	0.02	0.13	0.2123
	0.05	0.22	0.2124
	0.10	0.32	0.2124
	0.20	0.45	0.2125
	0.50	0.71	0.2127
	1.00	1.00	0.2128
	1.50	1.22	0.2129
	2.00	1.41	0.2130
	4.0	2.00	0.2131
	6.0	2.45	0.2133
	10.0	3.16	0.2136
	16.0	4.00	0.2138
	30		0.2143
	60		0.2149
	120		0.2154
	240		0.2159
	560		0.2162



do = 0.2122

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2162

square root

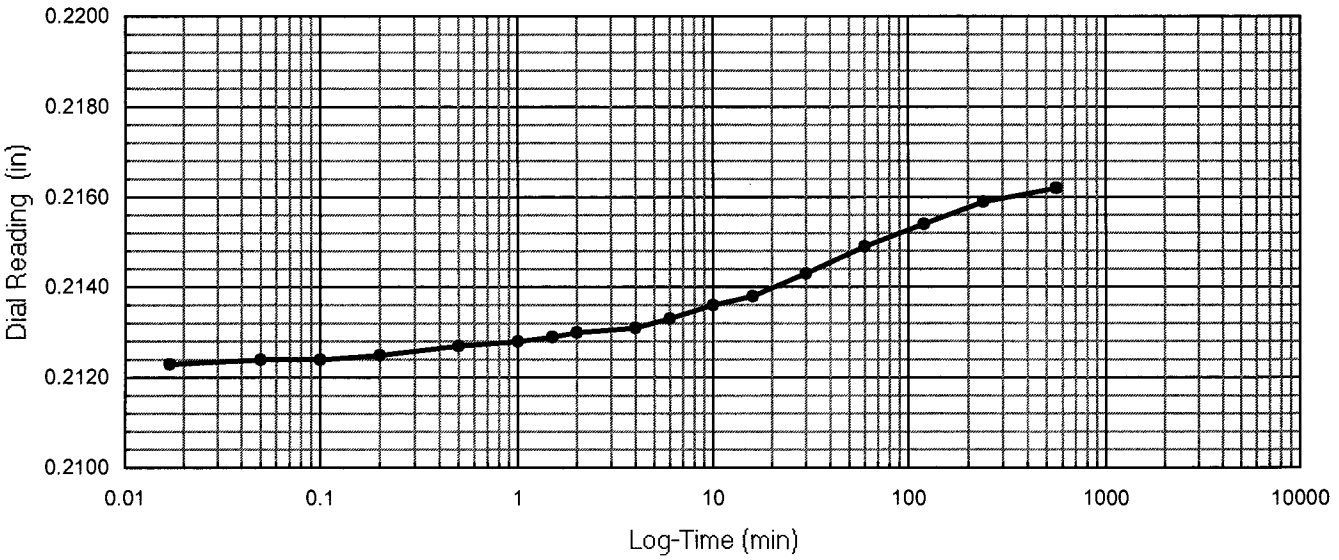
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

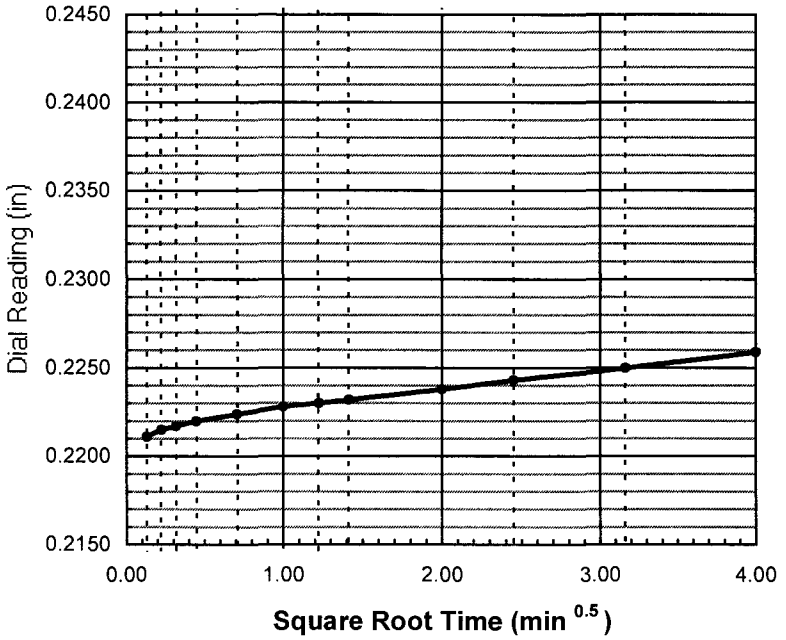
for ASTM D2435, method B

Project Number: 30989830 Apparatus No.: C5 Stage Number: 10 Curves by: TJO

Boring No.: R-11-022 Sample No.: 6 Depth (ft.) 20.0

Date: 25-Feb-11 Load (psf): 5518 Zero Reading: 0.3580

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
17:54:16	0	0.00	0.2162
	0.02	0.13	0.2211
	0.05	0.22	0.2215
	0.10	0.32	0.2217
	0.20	0.45	0.2220
	0.50	0.71	0.2224
	1.00	1.00	0.2228
	1.50	1.22	0.2230
	2.00	1.41	0.2232
	4.0	2.00	0.2238
	6.0	2.45	0.2243
	10.0	3.16	0.2250
	16.0	4.00	0.2259
	30		0.2273
	60		0.2295
	120		0.2325
	240		0.2360
	480		0.2393
	960		0.2416
	1440		0.2423
	2410		0.2429



do = 0.2207

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2429

square root

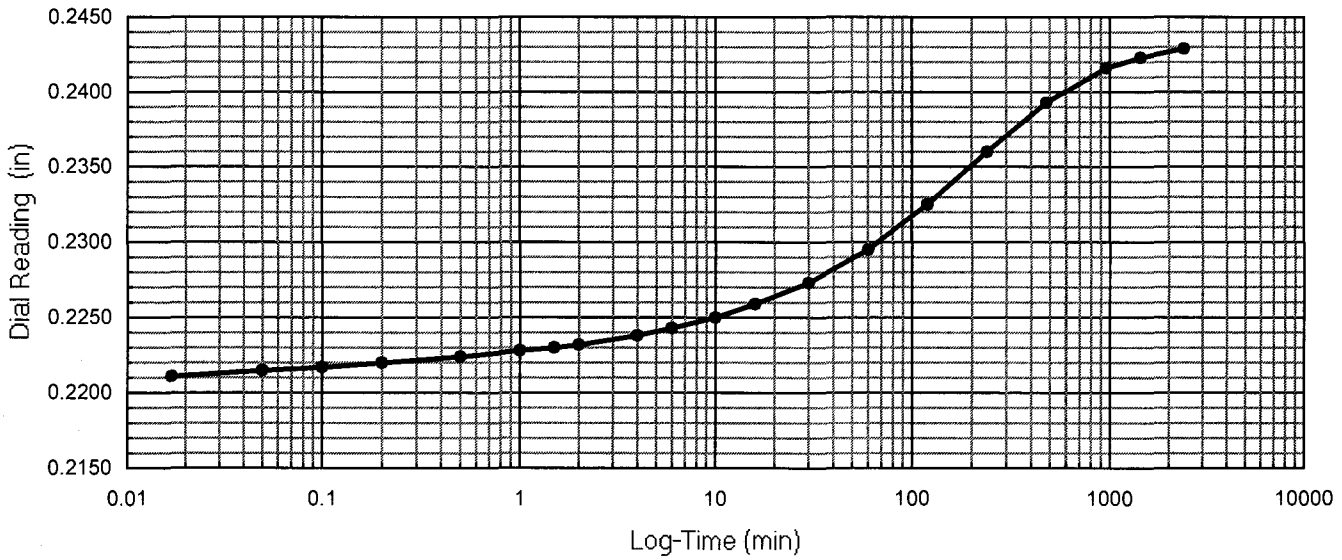
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

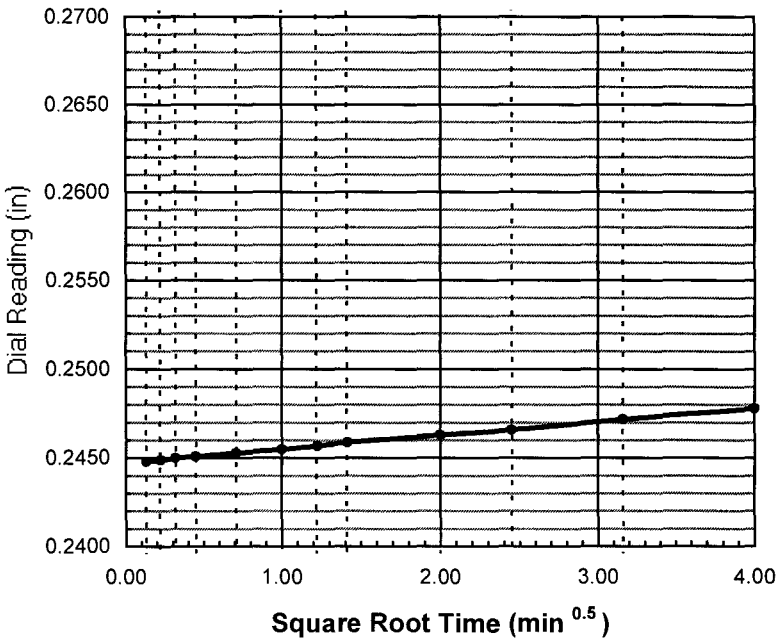
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C5 | Stage Number: 11 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 6 | Depth (ft.) 20.0

Date: 27-Feb-11 | Load (psf): 1363 | Zero Reading: 0.3580

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:04:29	0	0.00	0.2429
	0.02	0.13	0.2448
	0.05	0.22	0.2449
	0.10	0.32	0.2450
	0.20	0.45	0.2451
	0.50	0.71	0.2453
	1.00	1.00	0.2455
	1.50	1.22	0.2457
	2.00	1.41	0.2459
	4.0	2.00	0.2463
	6.0	2.45	0.2466
	10.0	3.16	0.2472
	16.0	4.00	0.2478
	30		0.2489
	60		0.2506
	120		0.2529
	240		0.2562
	480		0.2604
	960		0.2645
	1440		0.2665
	2786		0.2684
	5886		0.2695



do = 0.2447

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2695

square root

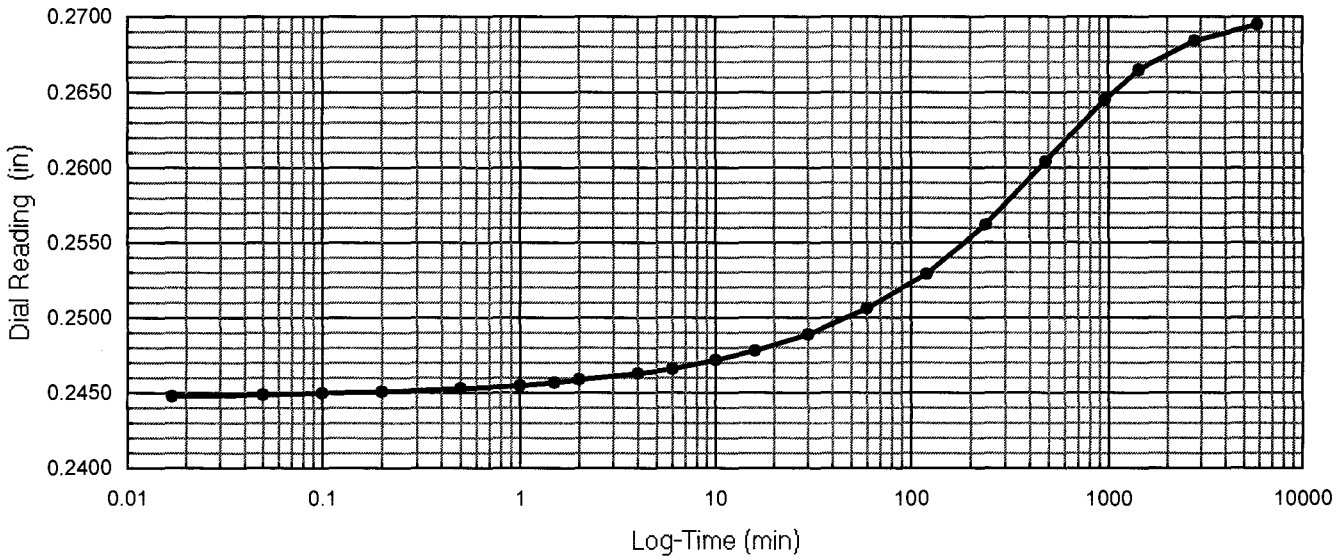
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

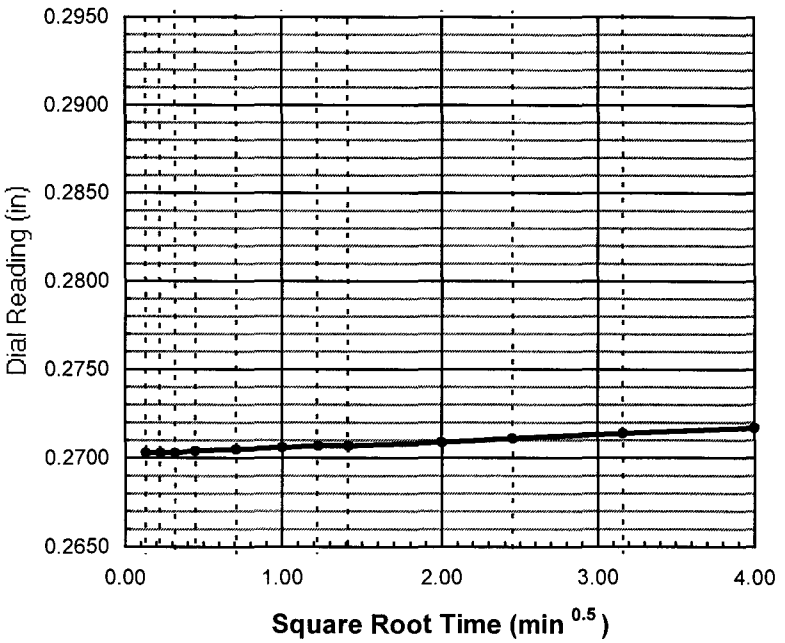
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C5 | Stage Number: 12 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 6 | Depth (ft.) 20.0

Date: 3-Mar-11 | Load (psf): 324 | Zero Reading: 0.3580

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
12:11:26	0	0.00	0.2695
	0.02	0.13	0.2703
	0.05	0.22	0.2703
	0.10	0.32	0.2703
	0.20	0.45	0.2704
	0.50	0.71	0.2705
	1.00	1.00	0.2706
	1.50	1.22	0.2707
	2.00	1.41	0.2707
	4.0	2.00	0.2709
	6.0	2.45	0.2711
	10.0	3.16	0.2714
	16.0	4.00	0.2717
	30		0.2723
	60		0.2732
	120		0.2746
	240		0.2767
	480		0.2795
	960		0.2829
	2100		0.2866
	4020		0.2887
	8405		0.2904



do = 0.2703

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2904

square root

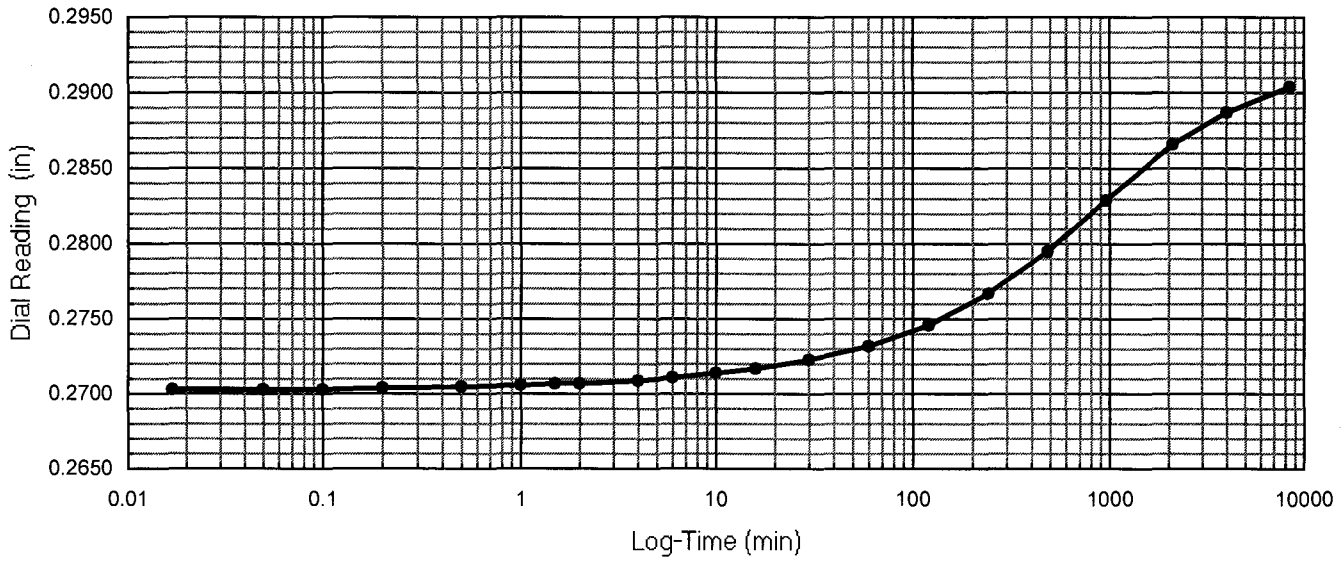
d50 = _____

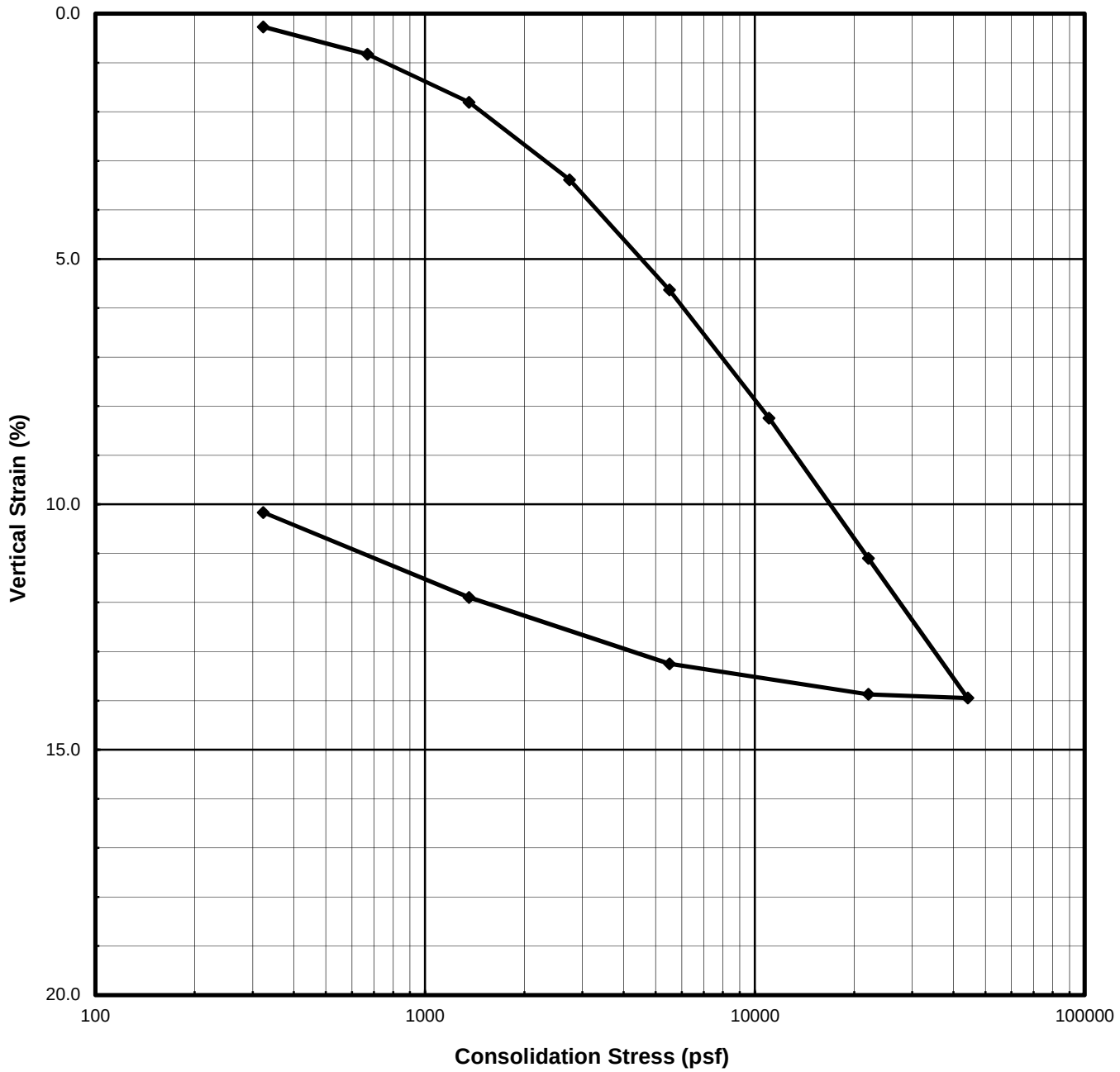
t50 = _____ min

log time

d50 = _____

t50 = _____ min





Description:	**Dark olive brown sandy Clay (CL)**							
Boring No.:	R-11-022		Liquid Limit	39	%	Specific Gravity	2.75	assumed
Sample No.:	8		Plasticity Index	24	%	Strain for Saturation	1.76	%
Depth (ft | m)	30.0	9.14	Fines Content	57.4	%	Water added at	150	psf

	Water Content (%)	Total Unit Weight		Dry Unit Weight		Saturation (%)	Void Ratio	Height		Diameter	
		(pcf)	(kN/m^3)	(pcf)	(kN/m^3)			(inches)	(cm)	(inches)	(cm)
Initial	19.5	130.0	20.42	108.8	17.09	93.3	0.58	0.931	2.36	2.418	6.142
Final	16.2	136.3	21.41	117.3	18.42	96.6	0.46	0.863	2.19		

URS

I-5 & SR-74 IC

Project Number: 30989830
Test Start Date: 2/18/2011

CONSOLIDATION TEST
ASTM D2435

SUBMITTED BY: Thomas J. O'Meara

Con I5 SR74 R11022 030.xls

One-Dimensional Oedometer Testing
Set-up / Take down Worksheet
ASTM D2435

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM

Boring No.: R-11-022
Sample No.: 8
Depth (ft): 30.0

Apparatus No.: C7

Specimen Description : Dark olive brown sandy Clay (CL)
Duration: end of increment

Ring Number: R25
Weight of Wet Spec. and Ring: 364.56 g
Weight of Ring: 218.72 g
Initial Weight of Wet Spec.: 145.84 g

Take Down Weight with Ring: 360.37 g

Excess Oven-dried Cont. No.: rp5
Weight of Cont. and Dry Spec.: 115.72 g
Weight of Container: 115.58 g
Weight of Excess Dried Soil: 0.14 g
Weight of Excess Wet Soil 0.16 g
Final Weight of Wet Specimen: 141.81 g

Height of Specimen (in)

	Initial	Final
1	0.927	0.864
2	0.932	0.866
3	0.935	0.861
4	0.932	0.863
5	0.927	0.863
Ave:	0.931	0.863

Initial Height - Final Height = 0.067 in
Change in Dial (Dd) = 0.082 in
Initial Height - Dd = 0.848 in
Final Height + Dd = 0.946 in
Weight of Top Cap = 373.52 g

Specimen Analysis					Initial Trim	Initial Spec.	Final
				Container Number:	m60	**XXXXX**	s5
				Mass of Container and Wet Specimen M1 (g)	353.32	145.84	253.36
				Mass of Container and Dry Specimen, M2 (g)	309.51	122.03	233.68
				Mass of Container, M3 (g)	91.46	**XXXXX**	112.28
				Water Content, w (%)	20.09	19.51	16.21
				Mass of Wet Specimen, M4 (g)	145.84	145.84	141.81
				Mass of Dry Specimen, M5 (g)	122.03	122.03	122.03
Nominal		Measured	x	Specimen Height, H (in)	0.931	0.931	0.863
Nominal	x	Measured		Specimen Diameter, D (in)	2.418	2.418	2.418
				Area of Specimen, A (in^2)	4.592	4.592	4.592
				Volume of Specimen, V (cc)	70.03	70.03	64.97
Assumed	x	Measured		Specific Gravity, Gs	2.75	2.75	2.75
				Wet Unit Weight, WUW (pcf)	**130.0**	**130.0**	**136.3**
				Dry Unit Weight, DUW (pcf)	**108.3**	**108.8**	**117.3**
				Void Ratio	**0.583**	**0.575**	**0.462**
				Degree of Saturation, S (%)	**94.8**	**93.3**	**96.6**

Set-up by: TJO
Date: 2/18/11
Calculated by: TJO
Checked by: TJO
Strain for Saturation (%) = **1.762**

One-Dimensional Oedometer Testing

Loading Worksheet

ASTM D2435

Project Number: 30989830 Boring No.: R-11-022

Project Name: I-5 & SR-74 IC Sample No.: 8

Project Engineer: FM Apparatus No.: C7 Depth (ft): 30.0

Initial Dial Reading: 0.3502 inch Initial Specimen Height: 0.931 inch

Stage No.	Normal Stress (psf)	Dial Reading (in)		Compressibility Correction (in)	Vertical Strain (%)	
		End of Duration	End of Increment		End of Duration	End of Increment
Seat	150		0.3502	0.0000		0.00
1	323		0.3470	0.0007		0.27
2	669		0.3407	0.0018		0.83
3	1360	0.3316	0.3301	0.0033	1.64	1.81
4	2743	0.3155	0.3137	0.0050	3.19	3.38
5	5508	0.2940	0.2908	0.0070	5.29	5.63
6	11039	0.2660	0.2641	0.0094	8.04	8.24
7	22100	0.2370	0.2346	0.0123	10.84	11.10
8	44223	0.2070	0.2055	0.0149	13.79	13.95
9	22100		0.2074	0.0137		13.87
10	5508		0.2174	0.0095		13.25
11	1360		0.2326	0.0069		11.90
12	323		0.2506	0.0050		10.17
13	67		0.2680	0.0037		8.44
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						
33						

Final dial reading prior to take down (inch): 0.2680 Take down by: TJO Date: 3/16/11

One-Dimensional Oedometer Testing
ASTM D2435
Table of Incremental Values

Project Number: 30989830
Project Name: I-5 & SR-74 IC
Project Engineer: FM
Apparatus No.: C7

Boring No.: R-11-022
Sample No.: 8
Depth (ft): 30.0
Inundation at stage: Seat

10 **20** Hanger Ratios

Stage Number	Incremental Weight Applied (kg) Back	Front	Vertical Stress (psf)	Specimen Hieght (in)	Deflections (in) $d_{initial}$	d_o	d_{50}	d_{100}	d_{final}	Porous Stone (in)	t_{50} (min)	cv (in^2/min)	cv (ft^2/day)
Top Cap			26	0.931	0.3502	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
Seat	0.06	0.06	150	0.931	0.3502	XXXXX	XXXXX	XXXXX	0.3502	0.0000	XXXXX	XXXXX	XXXXX
1	0.25		323	0.928	0.3502	0.3488	XXXXX	XXXXX	0.3470	0.0007	XXXXX	XXXXX	XXXXX
2	0.50		669	0.924	0.3470	0.3454	XXXXX	XXXXX	0.3407	0.0018	XXXXX	XXXXX	XXXXX
3	1.00		1360	0.916	0.3407	0.3392	0.3354	0.3316	0.3301	0.0033	4.00	0.010	0.103
4		1.0	2743	0.905	0.3301	0.3283	0.3219	0.3155	0.3137	0.0050	6.00	0.007	0.067
5	4.0		5508	0.889	0.3137	0.3110	0.3025	0.2940	0.2908	0.0070	7.00	0.006	0.056
6		4.0	11039	0.872	0.2908	0.2880	0.2770	0.2660	0.2641	0.0094	10.00	0.004	0.037
7		8.0	22100	0.855	0.2641	0.2619	0.2495	0.2370	0.2346	0.0123	12.00	0.003	0.030
8		16.0	44223	0.840	0.2346	0.2064	0.2067	0.2070	0.2055	0.0149	120.00	0.000	0.003
9		-16.0	22100	0.856	0.2055	0.2068	XXXXX	XXXXX	0.2074	0.0137	XXXXX	XXXXX	XXXXX
10		-12.0	5508	0.875	0.2074	0.2110	XXXXX	XXXXX	0.2174	0.0095	XXXXX	XXXXX	XXXXX
11	-4.0	-1.0	1360	0.898	0.2174	0.2192	XXXXX	XXXXX	0.2326	0.0069	XXXXX	XXXXX	XXXXX
12	-1.5		323	0.921	0.2326	0.2335	XXXXX	XXXXX	0.2506	0.0050	XXXXX	XXXXX	XXXXX
13	-0.25	-0.06	67	0.942	0.2506	XXXXX	XXXXX	XXXXX	0.2680	0.0037	XXXXX	XXXXX	XXXXX
14			67	XXXXX	0.2680	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
15			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
16			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
17			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
18			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
19			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
20			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
21			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
22			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
23			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
24			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX
25			67	XXXXX	0.0000	XXXXX	XXXXX	XXXXX	XXXXX	0.0000	XXXXX	XXXXX	XXXXX

One-Dimensional Oedometer Testing Increment

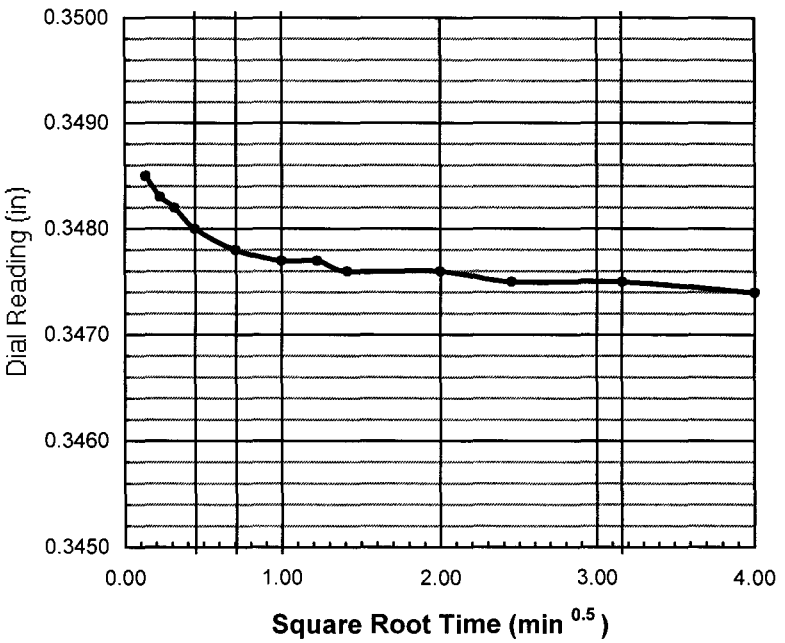
for ASTM D2435, method B

Project Number: 30989830 Apparatus No.: C7 Stage Number: 1 Curves by: TJO

Boring No.: R-11-022 Sample No.: 8 Depth (ft.) 30.0

Date: 18-Feb-11 Load (psf): 323 Zero Reading: 0.3502

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
12:37:09	0	0.00	0.3502
	0.02	0.13	0.3485
	0.05	0.22	0.3483
	0.10	0.32	0.3482
	0.20	0.45	0.3480
	0.50	0.71	0.3478
	1.00	1.00	0.3477
	1.50	1.22	0.3477
	2.00	1.41	0.3476
	4.0	2.00	0.3476
	6.0	2.45	0.3475
	10.0	3.16	0.3475
	16.0	4.00	0.3474
	30		0.3474
	60		0.3473
	120		0.3471
	240		0.3470
	312		0.3470



do = 0.3488

d90 = _____ t90 = _____ min

d100 = _____

df = 0.3470

square root

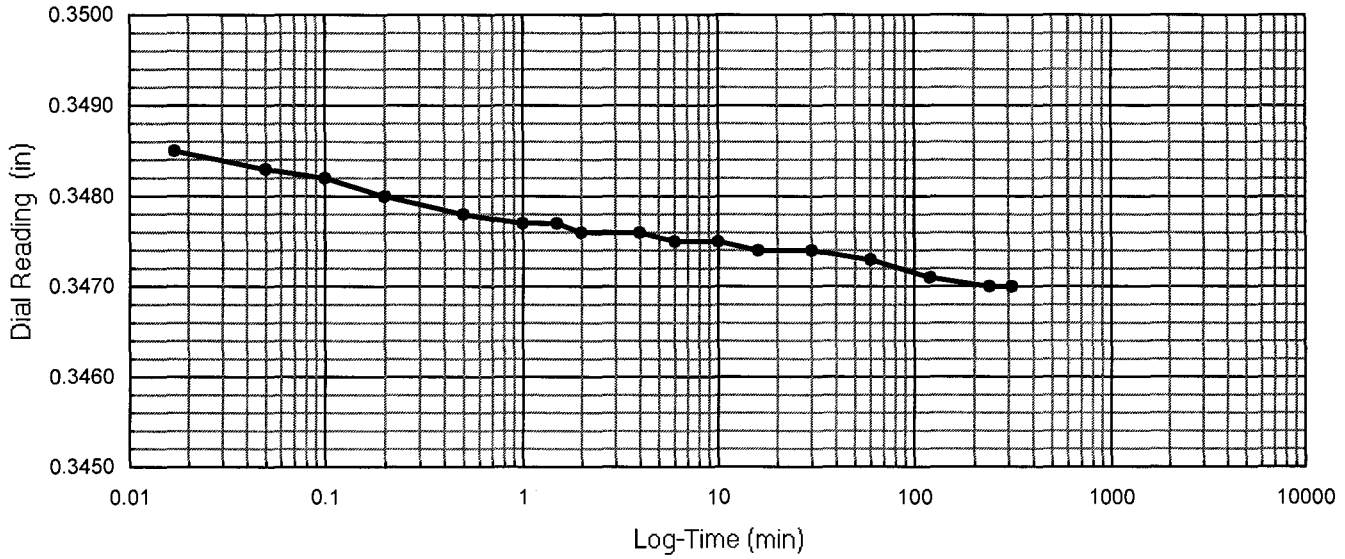
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

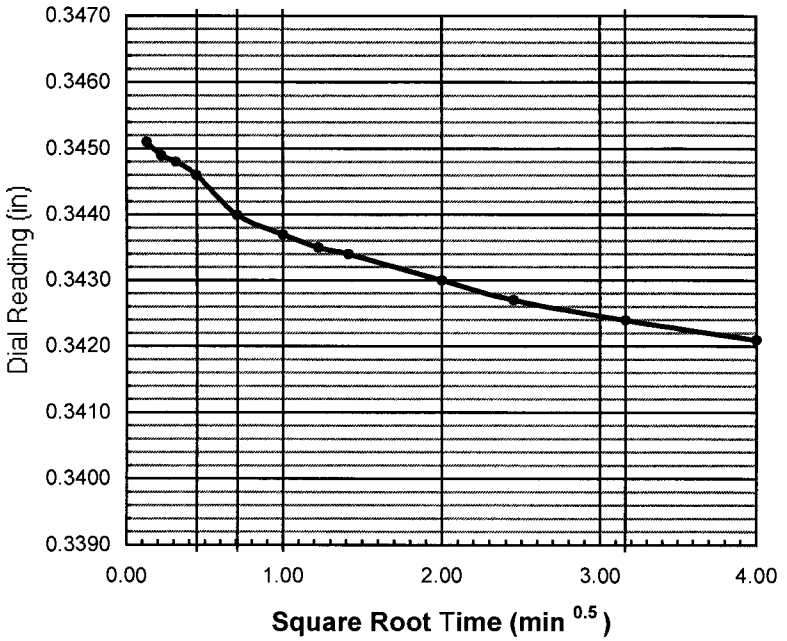
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C7 | Stage Number: 2 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 8 | Depth (ft.) 30.0

Date: 18-Feb-11 | Load (psf): 669 | Zero Reading: 0.3502

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
17:49:58	0	0.00	0.3470
	0.02	0.13	0.3451
	0.05	0.22	0.3449
	0.10	0.32	0.3448
	0.20	0.45	0.3446
	0.50	0.71	0.3440
	1.00	1.00	0.3437
	1.50	1.22	0.3435
	2.00	1.41	0.3434
	4.0	2.00	0.3430
	6.0	2.45	0.3427
	10.0	3.16	0.3424
	16.0	4.00	0.3421
	30		0.3417
	60		0.3414
	120		0.3412
	240		0.3410
	480		0.3408
	978		0.3407



do = 0.3454

d90 = ____ t90 = ____ min

d100 = 0.3414

df = 0.3407

square root

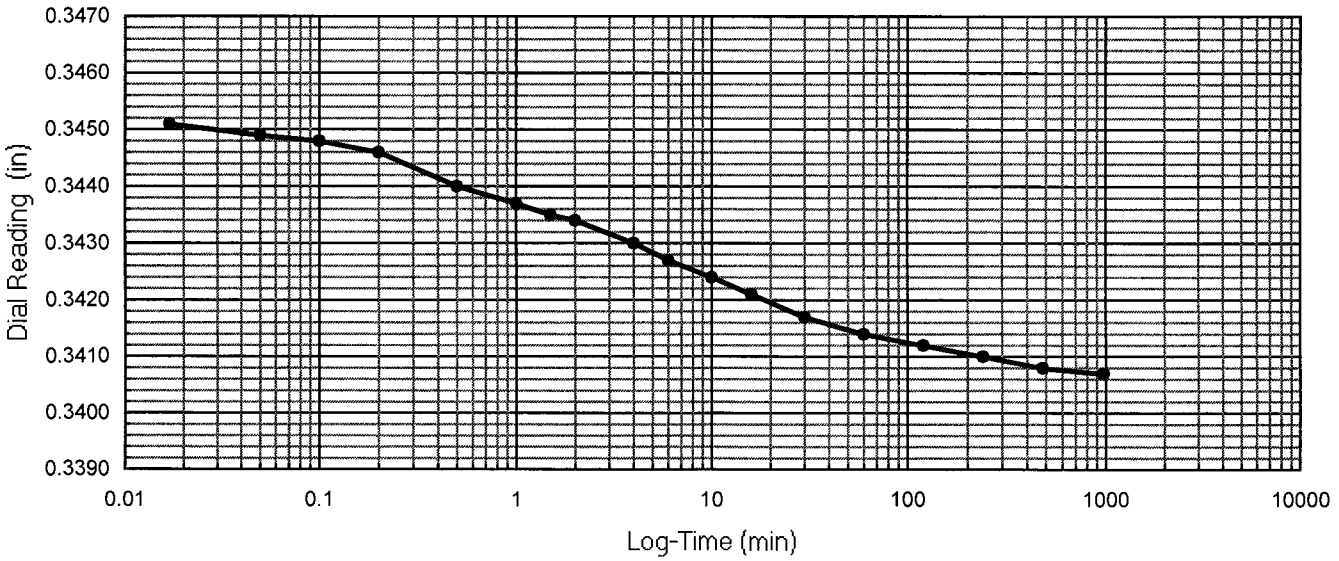
d50 = ____

t50 = ____ min

log time

d50 = 0.3434

t50 = 2.0 min



One-Dimensional Oedometer Testing Increment

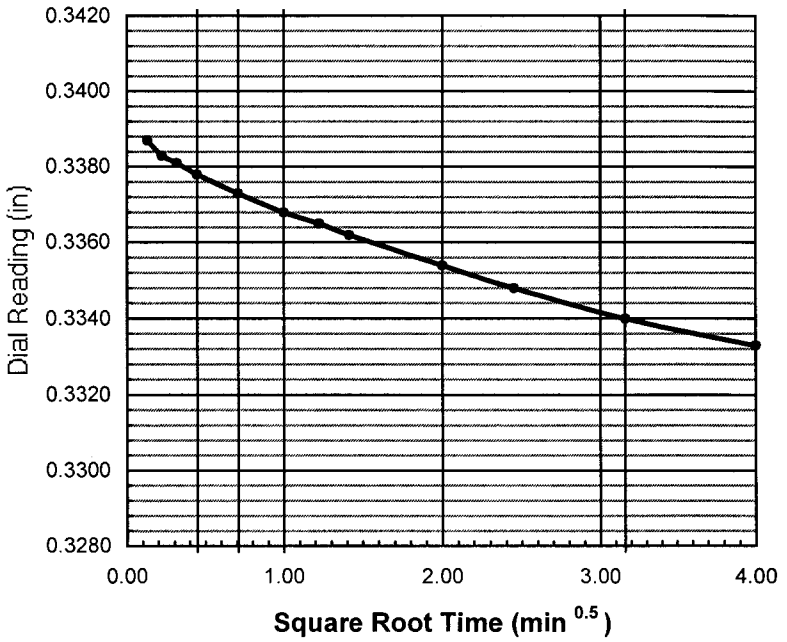
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C7 | Stage Number: 3 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 8 | Depth (ft.) 30.0

Date: 19-Feb-11 | Load (psf): 1360 | Zero Reading: 0.3502

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:08:19	0	0.00	0.3407
	0.02	0.13	0.3387
	0.05	0.22	0.3383
	0.10	0.32	0.3381
	0.20	0.45	0.3378
	0.50	0.71	0.3373
	1.00	1.00	0.3368
	1.50	1.22	0.3365
	2.00	1.41	0.3362
	4.0	2.00	0.3354
	6.0	2.45	0.3348
	10.0	3.16	0.3340
	16.0	4.00	0.3333
	30		0.3325
	60		0.3319
	120		0.3314
	240		0.3310
	480		0.3305
	980		0.3303
	1465		0.3301



do = 0.3392

d90 = ____ t90 = ____ min

d100 = 0.3316

df = 0.3301

square root

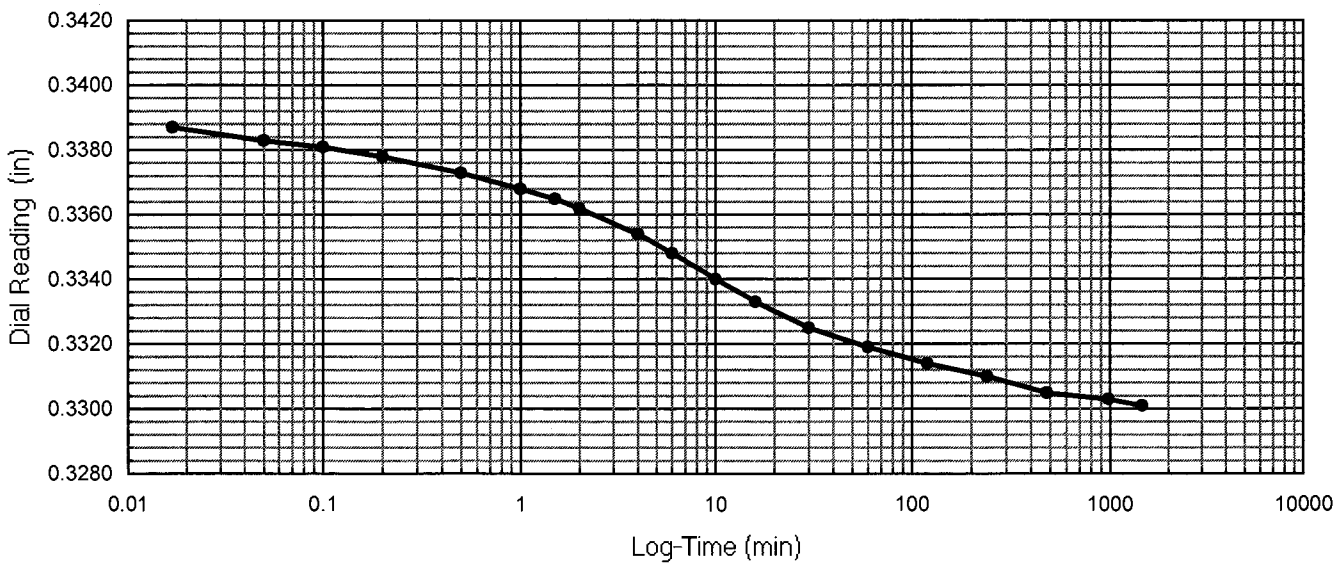
d50 = ____

t50 = ____ min

log time

d50 = 0.3354

t50 = 4.0 min



One-Dimensional Oedometer Testing Increment

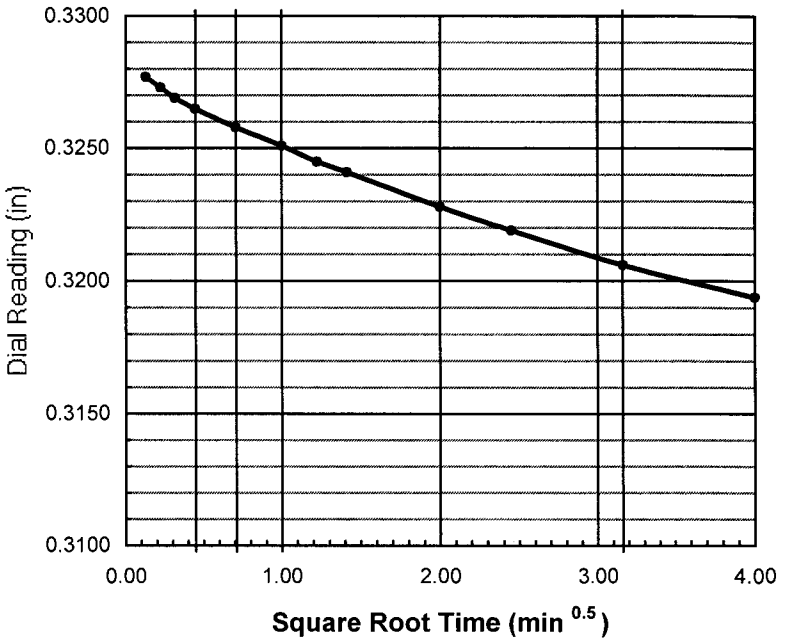
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C7 | Stage Number: 4 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 8 | Depth (ft.) 30.0

Date: 20-Feb-11 | Load (psf): 2743 | Zero Reading: 0.3502

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:35:08	0	0.00	0.3301
	0.02	0.13	0.3277
	0.05	0.22	0.3273
	0.10	0.32	0.3269
	0.20	0.45	0.3265
	0.50	0.71	0.3258
	1.00	1.00	0.3251
	1.50	1.22	0.3245
	2.00	1.41	0.3241
	4.0	2.00	0.3228
	6.0	2.45	0.3219
	10.0	3.16	0.3206
	16.0	4.00	0.3194
	30		0.3178
	60		0.3165
	120		0.3156
	240		0.3149
	480		0.3144
	980		0.3139
	1276		0.3137



do = 0.3283

d90 = _____ t90 = _____ min

d100 = 0.3155

df = 0.3137

square root

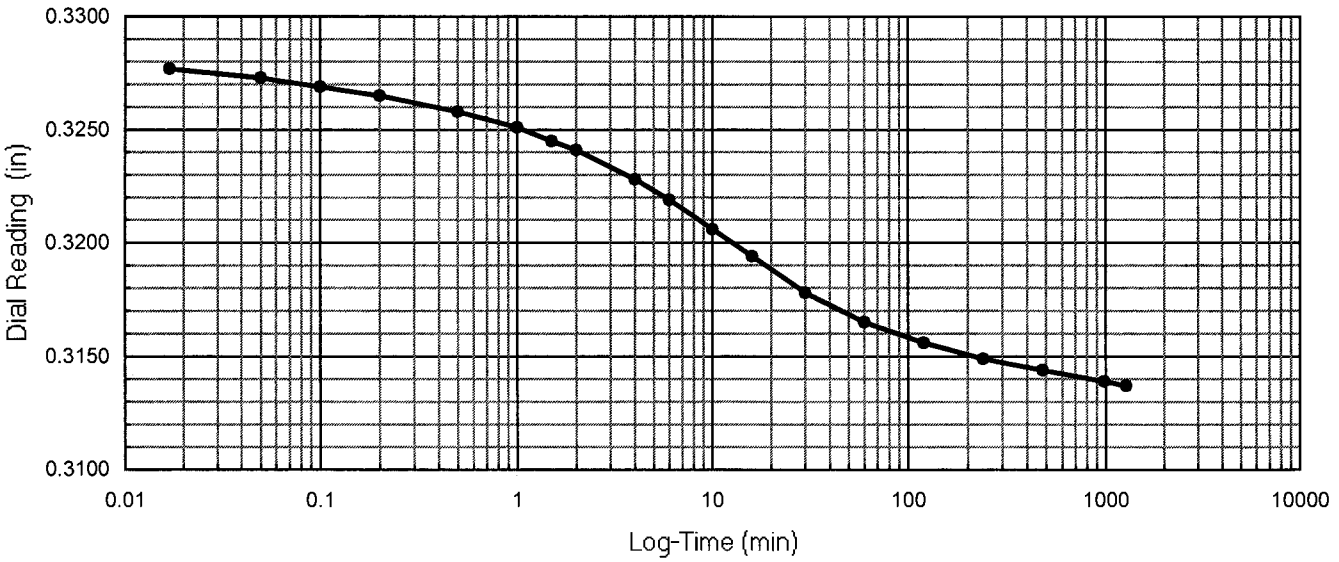
d50 = _____

t50 = _____ min

log time

d50 = 0.3219

t50 = 6.0 min



One-Dimensional Oedometer Testing Increment

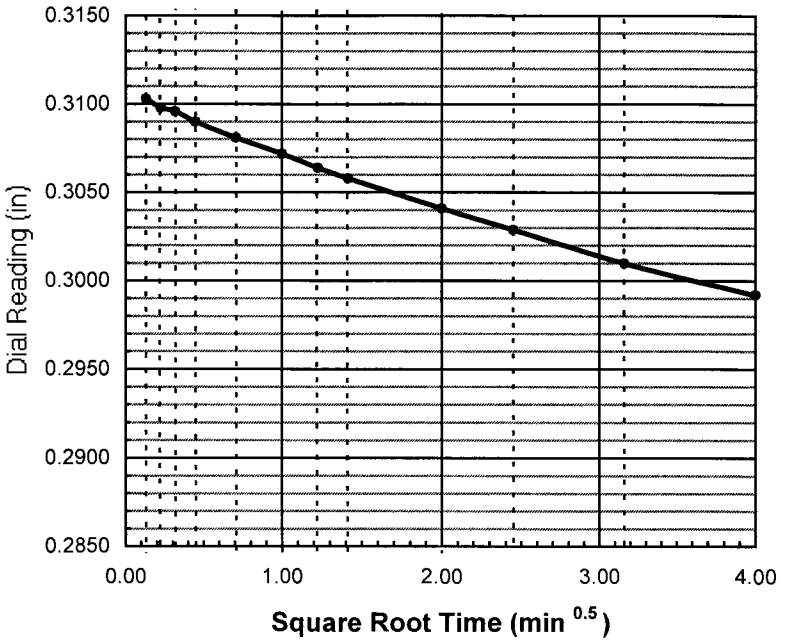
for ASTM D2435, method B

Project Number: 30989830 Apparatus No.: C7 Stage Number: 5 Curves by: TJO

Boring No.: R-11-022 Sample No.: 8 Depth (ft.) 30.0

Date: 21-Feb-11 Load (psf): 5508 Zero Reading: 0.3502

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
7:52:12	0	0.00	0.3137
	0.02	0.13	0.3103
	0.05	0.22	0.3098
	0.10	0.32	0.3096
	0.20	0.45	0.3090
	0.50	0.71	0.3081
	1.00	1.00	0.3072
	1.50	1.22	0.3064
	2.00	1.41	0.3058
	4.0	2.00	0.3041
	6.0	2.45	0.3029
	10.0	3.16	0.3010
	16.0	4.00	0.2992
	30		0.2968
	60		0.2948
	120		0.2935
	240		0.2926
	480		0.2919
	980		0.2912
	1463		0.2908



do = 0.3110

d90 = t90 = min

d100 = 0.2940

df = 0.2908

square root

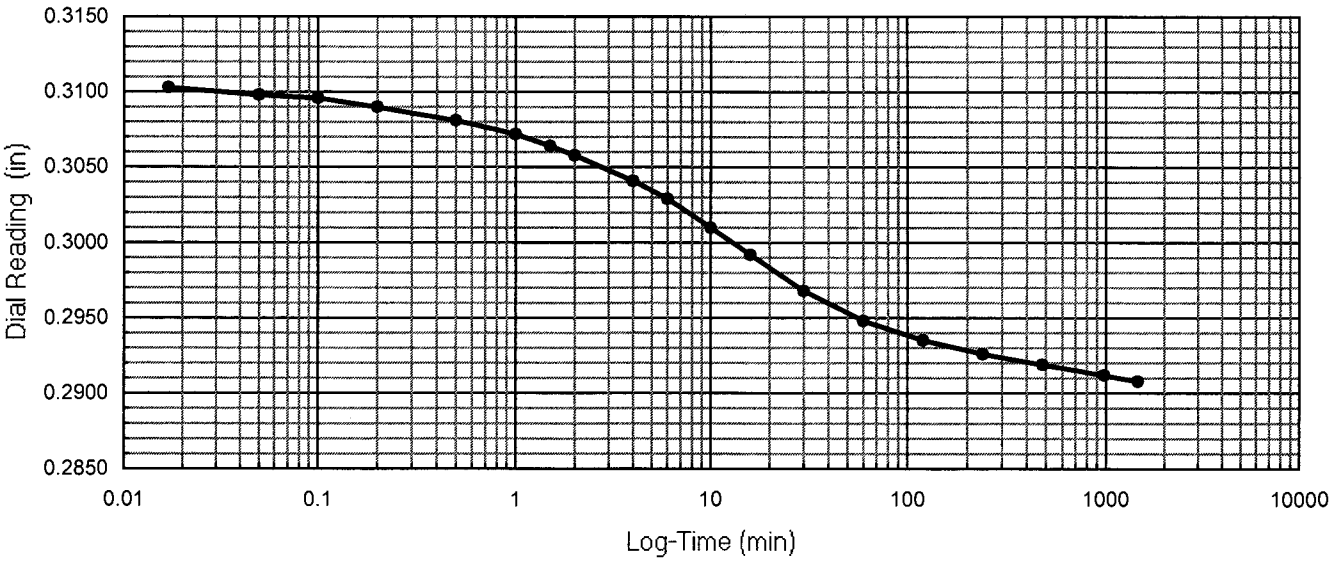
d50 =

t50 = min

log time

d50 = 0.3025

t50 = 7.0 min



One-Dimensional Oedometer Testing Increment

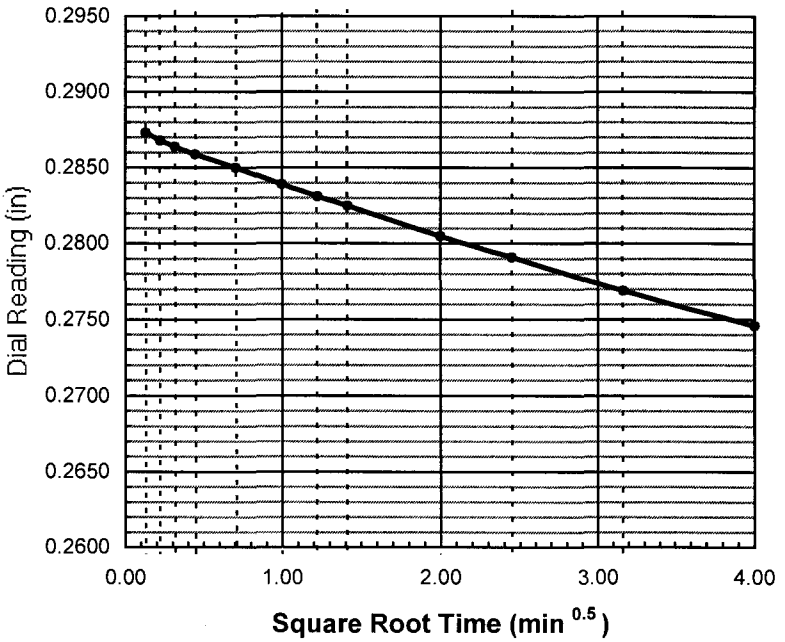
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C7 | Stage Number: 6 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 8 | Depth (ft.) 30.0

Date: 22-Feb-11 | Load (psf): 11039 | Zero Reading: 0.3502

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:15:45	0	0.00	0.2908
	0.02	0.13	0.2873
	0.05	0.22	0.2868
	0.10	0.32	0.2864
	0.20	0.45	0.2859
	0.50	0.71	0.2850
	1.00	1.00	0.2839
	1.50	1.22	0.2831
	2.00	1.41	0.2825
	4.0	2.00	0.2805
	6.0	2.45	0.2791
	10.0	3.16	0.2769
	16.0	4.00	0.2746
	30		0.2715
	60		0.2687
	120		0.2669
	240		0.2658
	480		0.2650
	980		0.2643
	1450		0.2641



do = 0.2880

d90 = ____ t90 = ____ min

d100 = 0.2660

df = 0.2641

square root

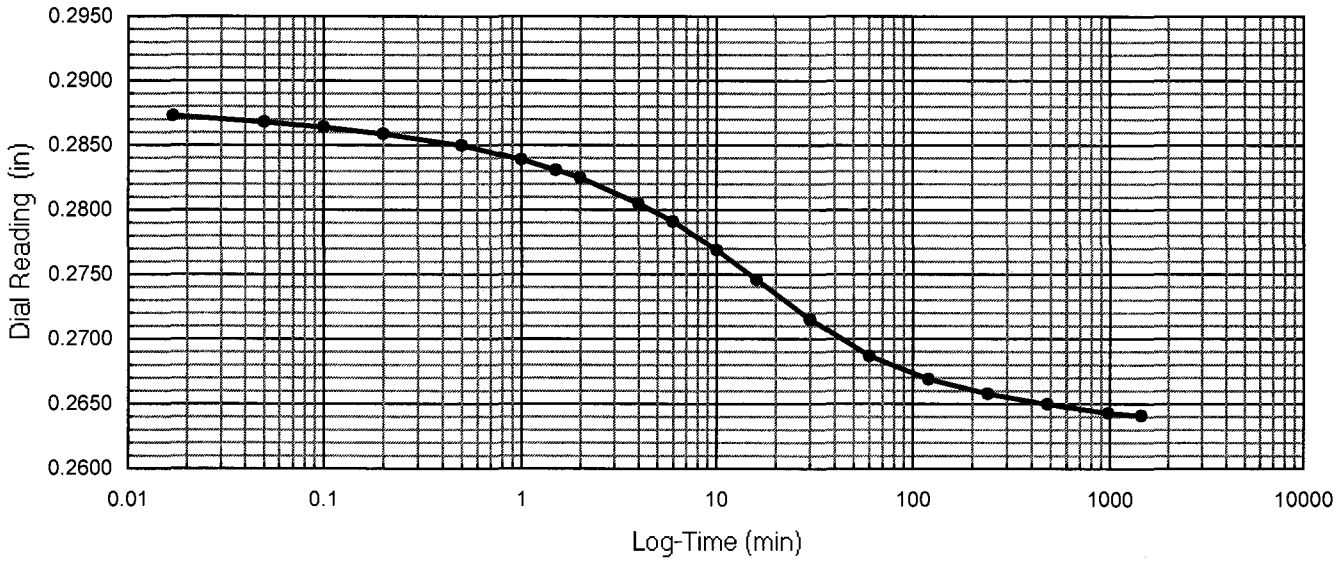
d50 = ____

t50 = ____ min

log time

d50 = 0.2770

t50 = 10.0 min



One-Dimensional Oedometer Testing Increment

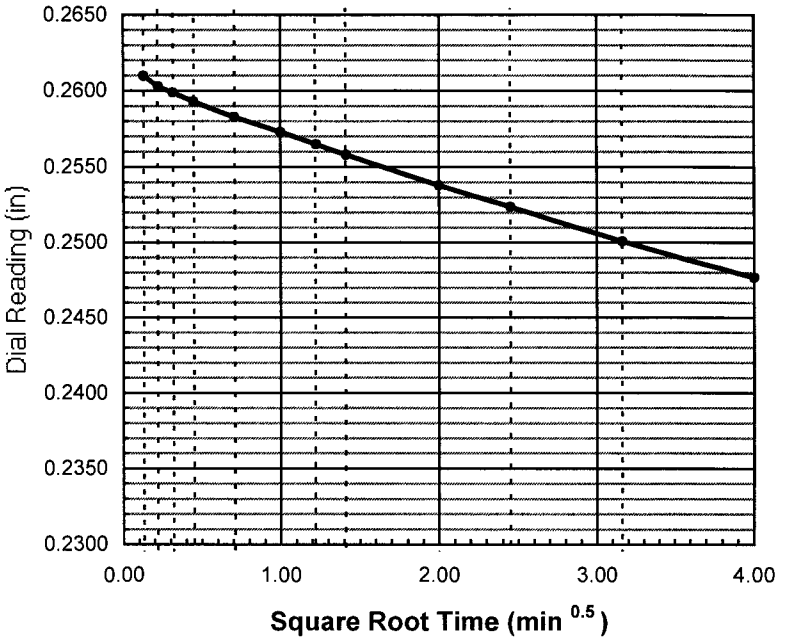
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C7 | Stage Number: 7 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 8 | Depth (ft.) 30.0

Date: 23-Feb-11 | Load (psf): 22100 | Zero Reading: 0.3502

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:26:58	0	0.00	0.2640
	0.02	0.13	0.2610
	0.05	0.22	0.2603
	0.10	0.32	0.2599
	0.20	0.45	0.2593
	0.50	0.71	0.2583
	1.00	1.00	0.2573
	1.50	1.22	0.2565
	2.00	1.41	0.2558
	4.0	2.00	0.2538
	6.0	2.45	0.2524
	10.0	3.16	0.2501
	16.0	4.00	0.2477
	30		0.2440
	60		0.2404
	120		0.2380
	240		0.2367
	480		0.2357
	980		0.2349
	1456		0.2346



do = 0.2619

d90 = _____ t90 = _____ min

d100 = 0.2370

df = 0.2346

square root

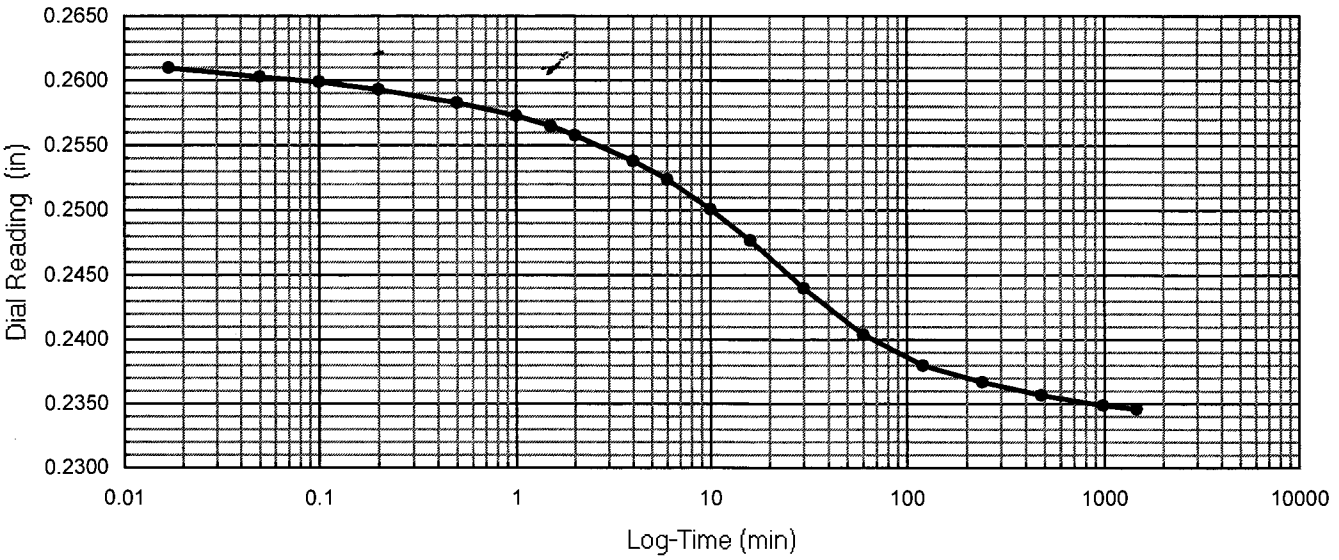
d50 = _____

t50 = _____ min

log time

d50 = 0.2494

t50 = 12.0 min



One-Dimensional Oedometer Testing Increment

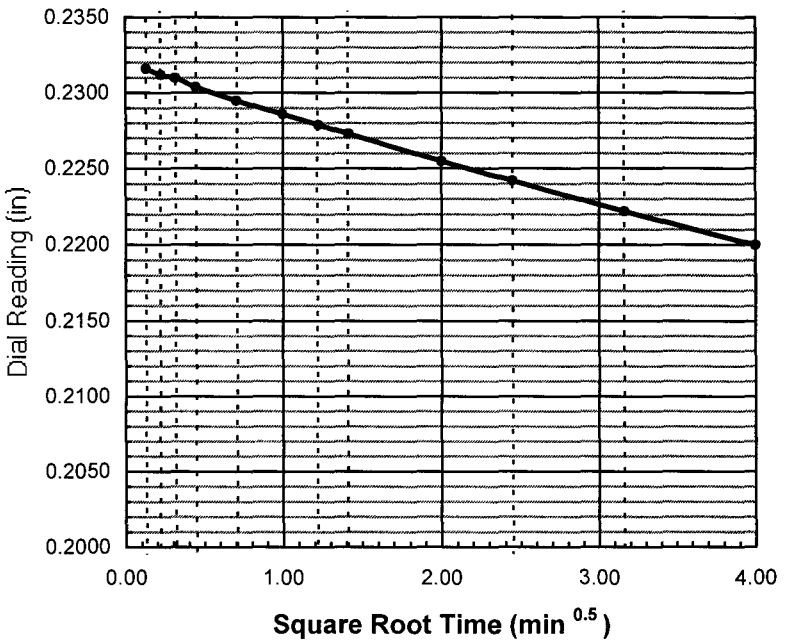
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C7 | Stage Number: 8 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 8 | Depth (ft.) 30.0

Date: 24-Feb-11 | Load (psf): 44223 | Zero Reading: 0.3502

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:43:22	0	0.00	0.2346
	0.02	0.13	0.2316
	0.05	0.22	0.2312
	0.10	0.32	0.2310
	0.20	0.45	0.2304
	0.50	0.71	0.2295
	1.00	1.00	0.2286
	1.50	1.22	0.2279
	2.00	1.41	0.2273
	4.0	2.00	0.2255
	6.0	2.45	0.2242
	10.0	3.16	0.2222
	16.0	4.00	0.2200
	30		0.2165
	60		0.2125
	120		0.2095
	240		0.2077
	480		0.2066
	980		0.2058
	1434		0.2055



do = 0.2322

d90 = ____ t90 = ____ min

d100 = 0.2070

df = 0.2055

square root

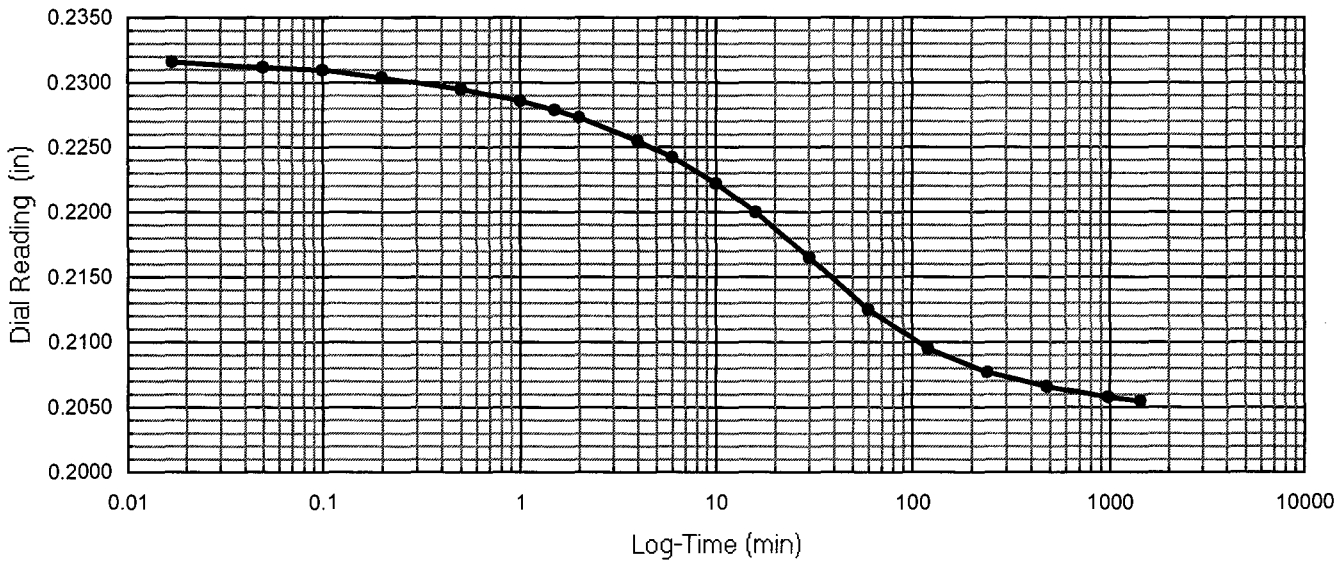
d50 = ____

t50 = ____ min

log time

d50 = 0.2196

t50 = 120.0 min



One-Dimensional Oedometer Testing Increment

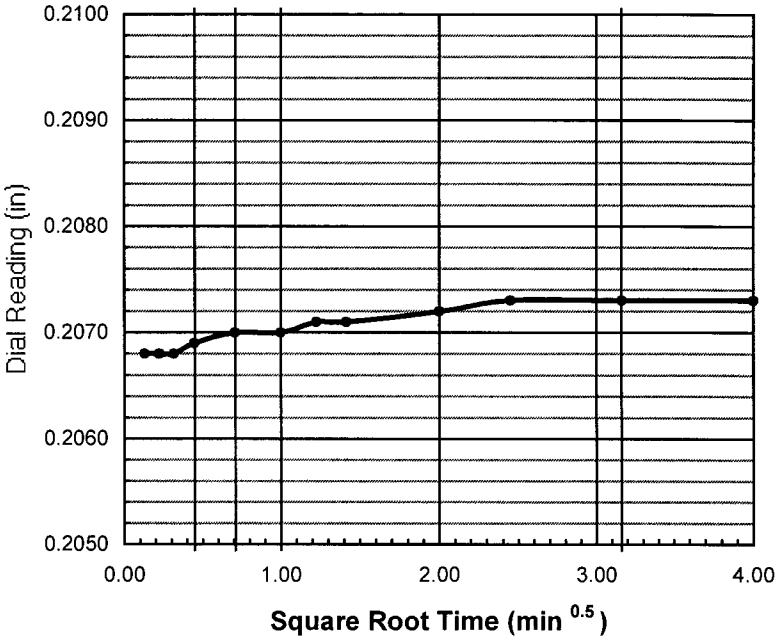
for ASTM D2435, method B

Project Number: 30989830 Apparatus No.: C7 Stage Number: 9 Curves by: TJO

Boring No.: R-11-022 Sample No.: 8 Depth (ft.) 30.0

Date: 25-Feb-11 Load (psf): 22100 Zero Reading: 0.3502

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
8:37:48	0	0.00	0.2054
	0.02	0.13	0.2068
	0.05	0.22	0.2068
	0.10	0.32	0.2068
	0.20	0.45	0.2069
	0.50	0.71	0.2070
	1.00	1.00	0.2070
	1.50	1.22	0.2071
	2.00	1.41	0.2071
	4.0	2.00	0.2072
	6.0	2.45	0.2073
	10.0	3.16	0.2073
	16.0	4.00	0.2073
	30		0.2074
	60		0.2074
	120		0.2074
	240		0.2074
	558		0.2074



do = 0.2068

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2074

square root

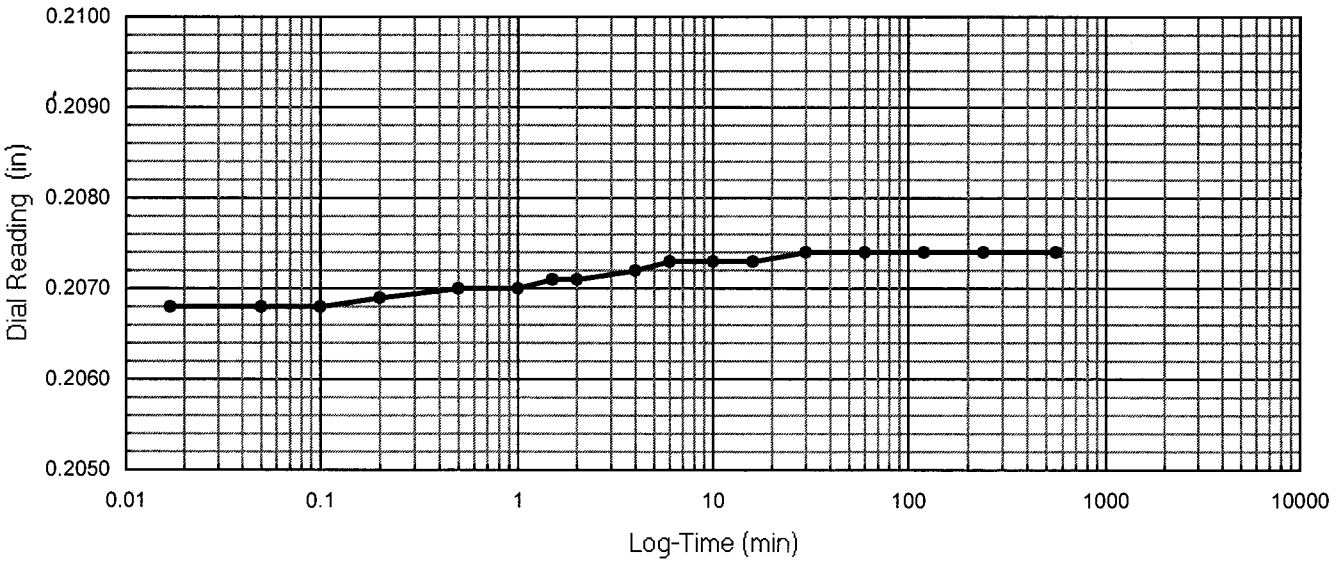
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

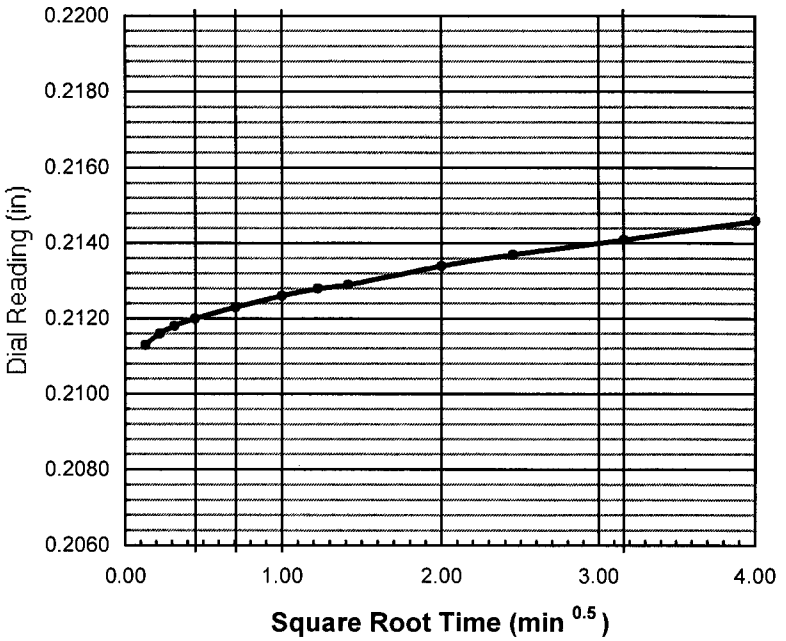
for ASTM D2435, method B

Project Number: 30989830 Apparatus No.: C7 Stage Number: 10 Curves by: TJO

Boring No.: R-11-022 Sample No.: 8 Depth (ft.) 30.0

Date: 25-Feb-11 Load (psf): 5508 Zero Reading: 0.3502

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
17:56:20	0	0.00	0.2074
	0.02	0.13	0.2113
	0.05	0.22	0.2116
	0.10	0.32	0.2118
	0.20	0.45	0.2120
	0.50	0.71	0.2123
	1.00	1.00	0.2126
	1.50	1.22	0.2128
	2.00	1.41	0.2129
	4.0	2.00	0.2134
	6.0	2.45	0.2137
	10.0	3.16	0.2141
	16.0	4.00	0.2146
	30		0.2153
	60		0.2160
	120		0.2166
	240		0.2170
	480		0.2173
	1021		0.2174



do = 0.2110

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2174

square root

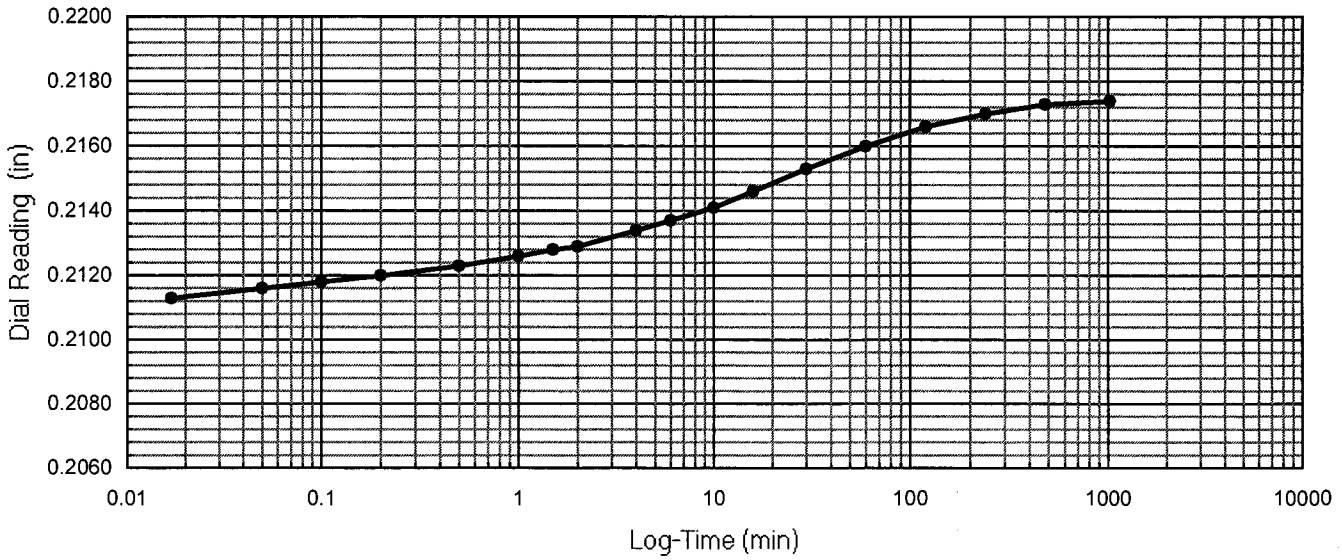
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

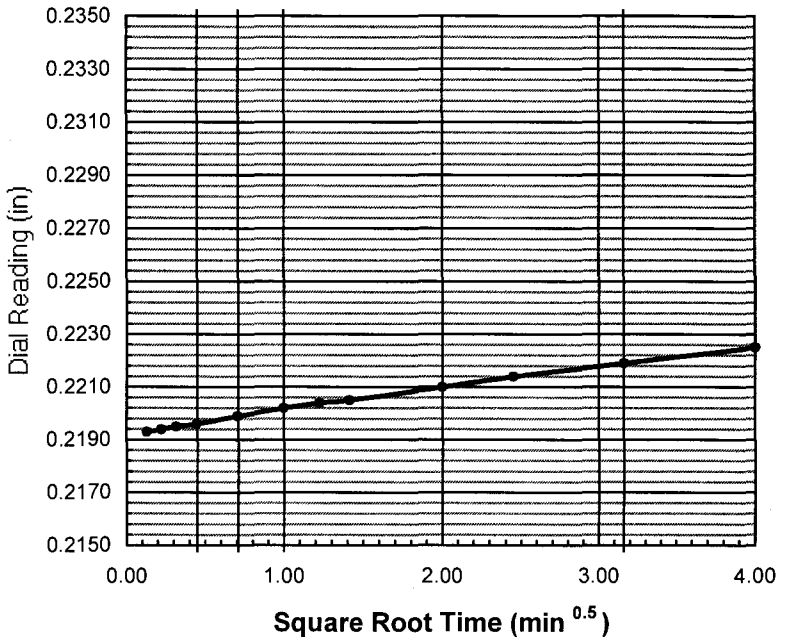
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C7 | Stage Number: 11 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 8 | Depth (ft.) 30.0

Date: 26-Feb-11 | Load (psf): 1360 | Zero Reading: 0.3502

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
10:57:34	0	0.00	0.2174
	0.02	0.13	0.2193
	0.05	0.22	0.2194
	0.10	0.32	0.2195
	0.20	0.45	0.2196
	0.50	0.71	0.2199
	1.00	1.00	0.2202
	1.50	1.22	0.2204
	2.00	1.41	0.2205
	4.0	2.00	0.2210
	6.0	2.45	0.2214
	10.0	3.16	0.2219
	16.0	4.00	0.2225
	30		0.2236
	60		0.2251
	120		0.2270
	240		0.2290
	480		0.2307
	960		0.2318
	1440		0.2322
	2772		0.2326



do = 0.2192

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2326

square root

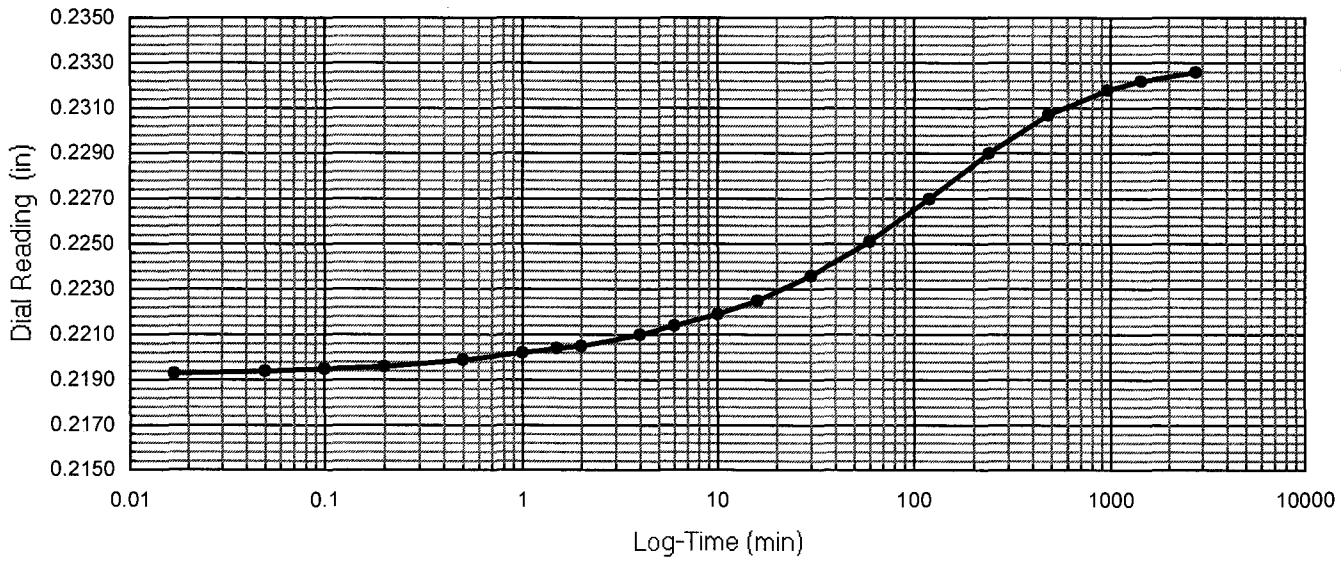
d50 = _____

t50 = _____ min

log time

d50 = _____

t50 = _____ min



One-Dimensional Oedometer Testing Increment

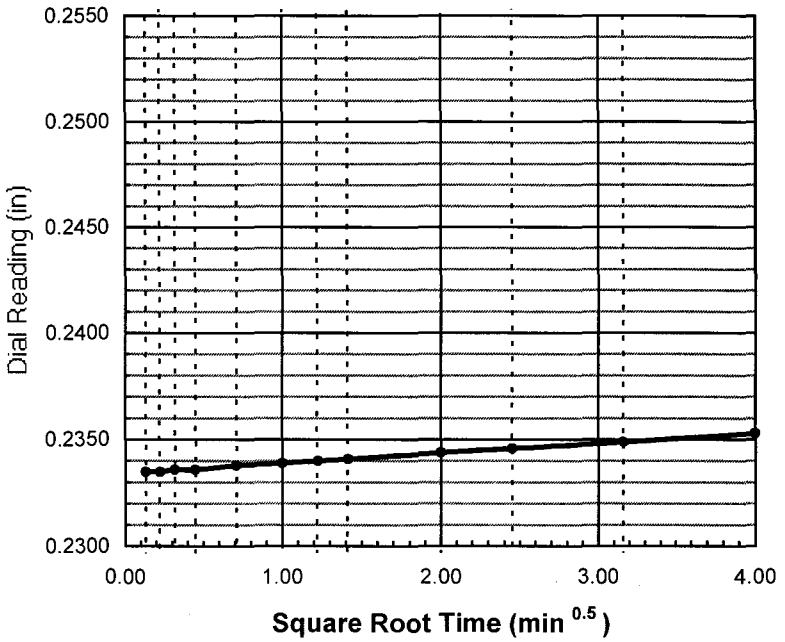
for ASTM D2435, method B

Project Number: 30989830 | Apparatus No.: C7 | Stage Number: 12 | Curves by: TJO

Boring No.: R-11-022 | Sample No.: 8 | Depth (ft.) 30.0

Date: 28-Feb-11 | Load (psf): 323 | Zero Reading: 0.3502

Time	Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)
9:10:01	0	0.00	0.2326
	0.02	0.13	0.2335
	0.05	0.22	0.2335
	0.10	0.32	0.2336
	0.20	0.45	0.2336
	0.50	0.71	0.2338
	1.00	1.00	0.2339
	1.50	1.22	0.2340
	2.00	1.41	0.2341
	4.0	2.00	0.2344
	6.0	2.45	0.2346
	10.0	3.16	0.2349
	16.0	4.00	0.2353
	30		0.2361
	60		0.2372
	120		0.2390
	240		0.2414
	480		0.2444
	960		0.2471
	2040		0.2488
	4500		0.2501
	7160		0.2506



do = 0.2335

d90 = _____ t90 = _____ min

d100 = _____

df = 0.2506

square root

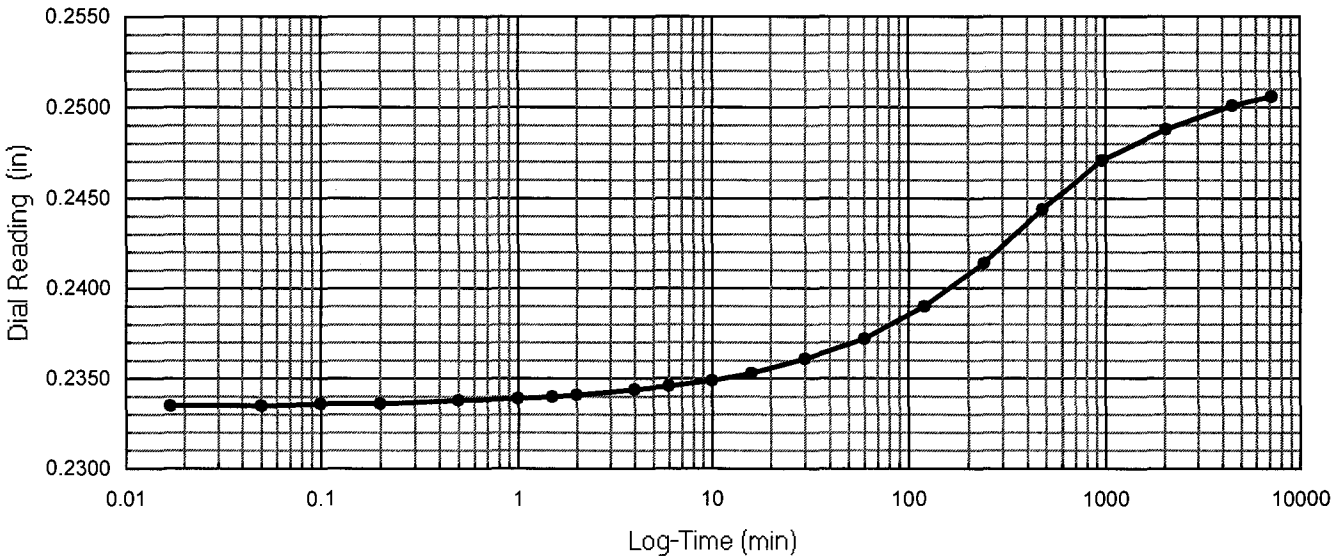
d50 = _____

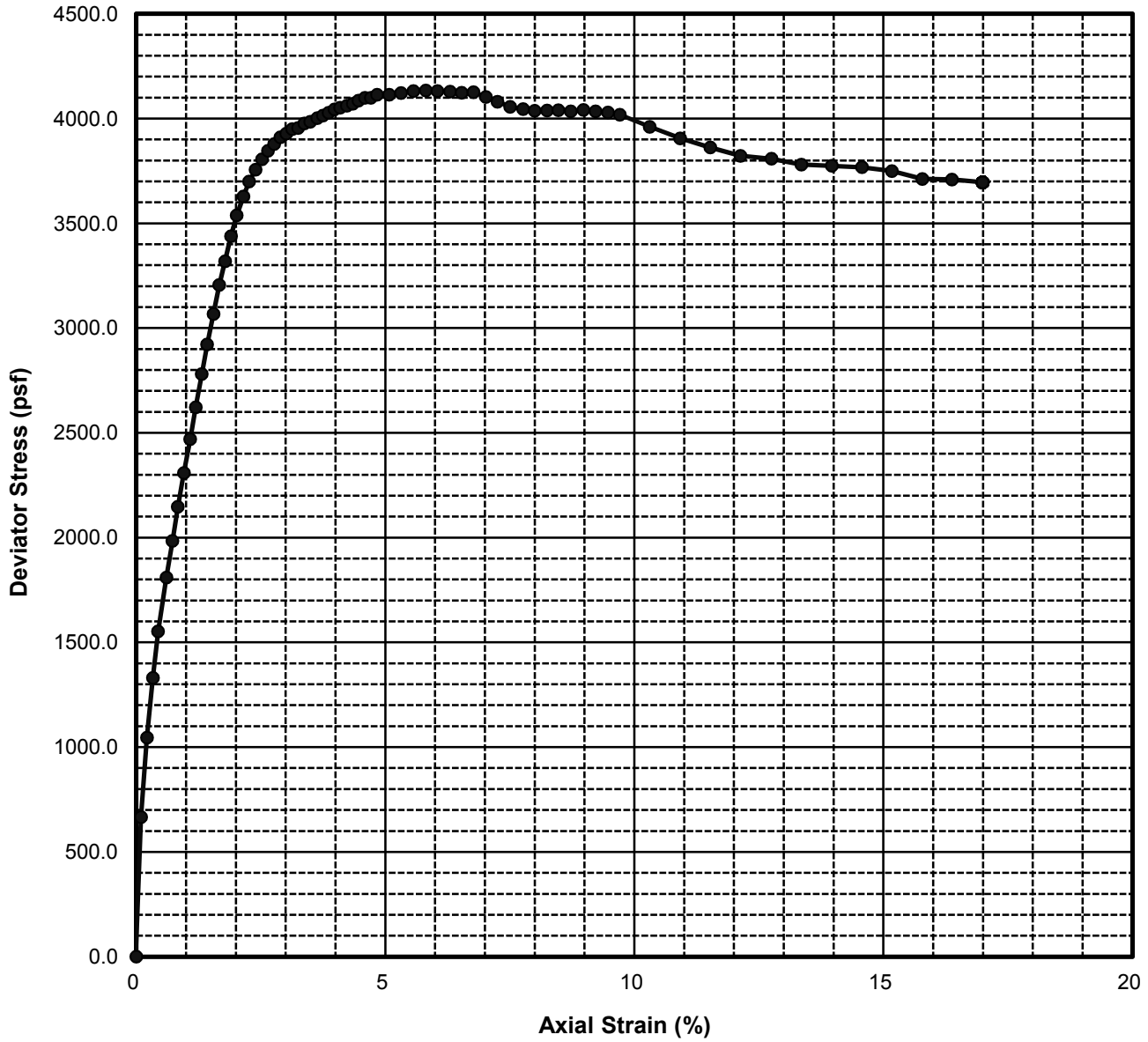
t50 = _____ min

log time

d50 = _____

t50 = _____ min





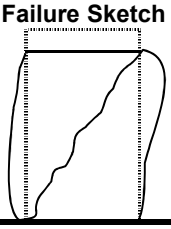
Cell Pressure (psf) = 936.00

Strain Rate (%/min) = 1.20

Axial Strain during confinment (%): 0.12

Peak Deviator Stress (psf): 4134.4

Failure Sketch

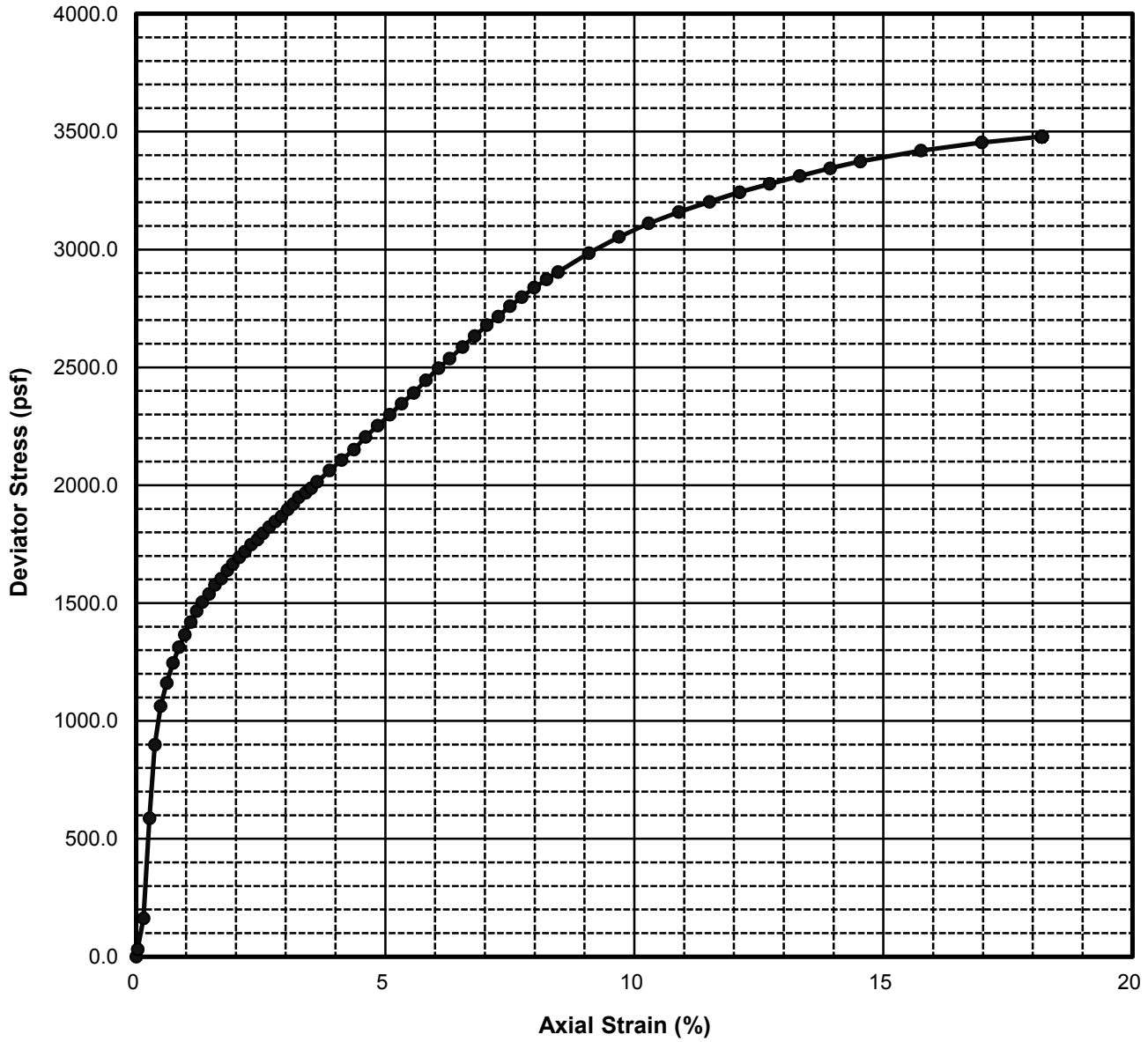


Water Content (%)	Length (in)	Diameter (in)	Wet Unit Weight (pcf)	Degree of Saturation (%)
23.5	4.995	2.398	124.2	91.8

assumed Specific Gravity, Gs = 2.75

Project Name:	**I-5 Widening, Segment 3**				
Project Number:	**30989830**				
Boring Number:	**R-11-022**	**Sample No.:**	**2**	**Depth (ft):**	**6.5**
Description and/or Classification:	**Dark gray Clay (CL)**				

UNCONSOLIDATED - UNDRAINED TRIAXIAL COMPRESSION TEST ASTM D2850



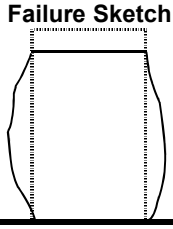
Cell Pressure (psf) = 1382.40

Strain Rate (%/min) = 1.20

Axial Strain during confinment (%): 0.34

Peak Deviator Stress (psf): 3478.6

Failure Sketch

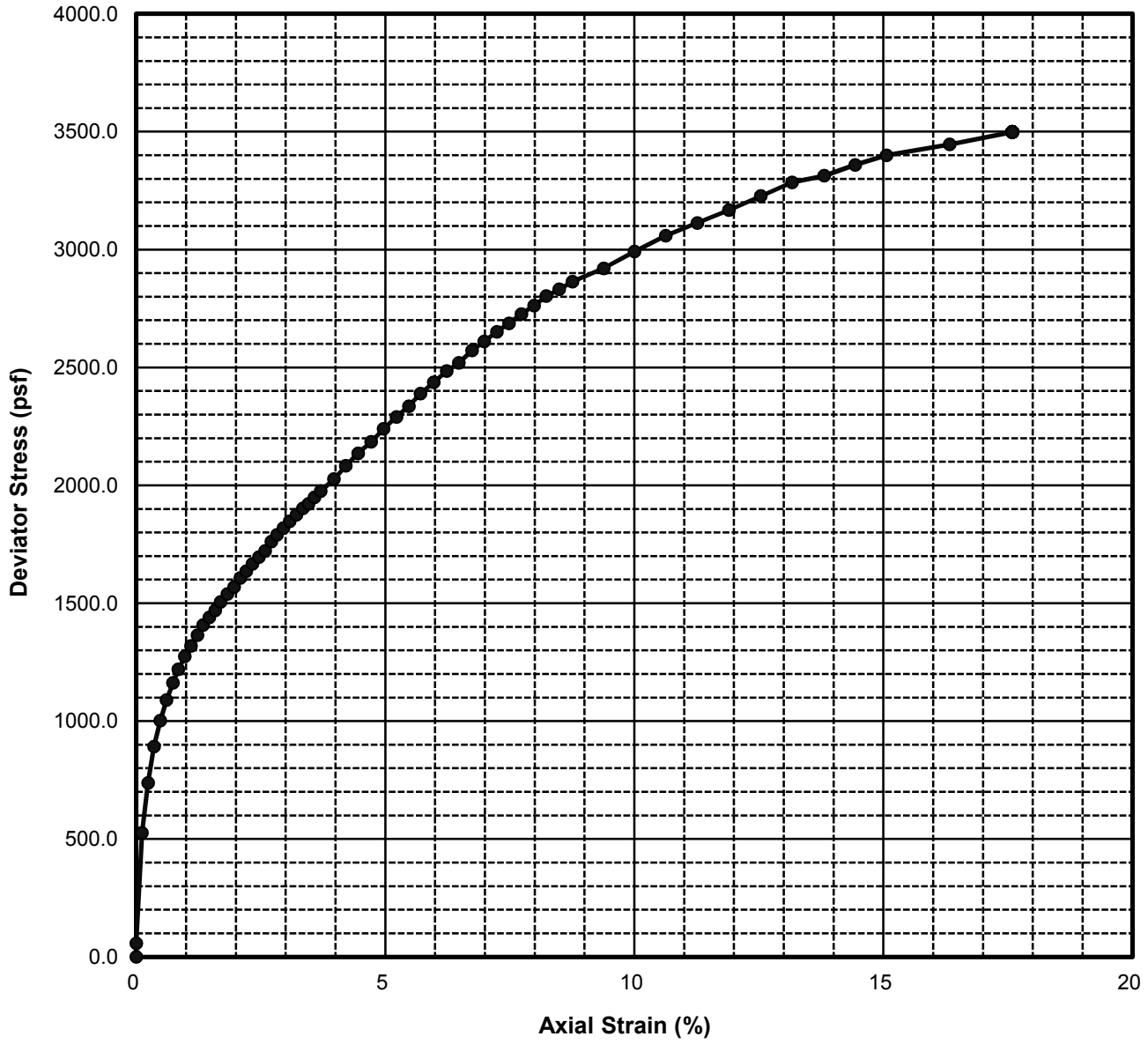


Water Content (%)	Length (in)	Diameter (in)	Wet Unit Weight (pcf)	Degree of Saturation (%)
29.4	4.991	2.401	119.6	94.6

assumed Specific Gravity, Gs = 2.75

Project Name:	**I-5 Widening, Segment 3**				
Project Number:	**30989830**				
Boring Number:	**R-11-022**	**Sample No.:**	**4**	**Depth (ft):**	**11.5**
Description and/or Classification:	**Dark olive gray Clay (CH)**				

UNCONSOLIDATED - UNDRAINED TRIAXIAL COMPRESSION TEST ASTM D2850



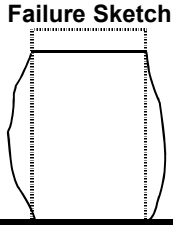
Cell Pressure (psf) = 2491.20

Strain Rate (%/min) = 1.25

Axial Strain during confinment (%): 0.23

Peak Deviator Stress (psf): 3498.7

Failure Sketch



Water Content (%)	Length (in)	Diameter (in)	Wet Unit Weight (pcf)	Degree of Saturation (%)
25.7	4.794	2.402	124.4	96.6

assumed Specific Gravity, Gs = 2.75

Project Name:	**I-5 Widening, Segment 3**				
Project Number:	**30989830**				
Boring Number:	**R-11-022**	**Sample No.:**	**6**	**Depth (ft):**	**20.0**
Description and/or Classification:	**Dark olive brown Clay (CH)**				

UNCONSOLIDATED - UNDRAINED TRIAXIAL COMPRESSION TEST ASTM D2850

INSTALLATION DETAILS FOR BATTERY BACKUP SYSTEM

(BBS wiring details and external cabinet details, Exhibit 1)

Dist	COUNTY	LOCATION CODE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER Theresa Gabriel DATE 12-20-07

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER Theresa A. Gabriel No. E15129 Exp. 6-30-10 ELECT STATE OF CALIFORNIA

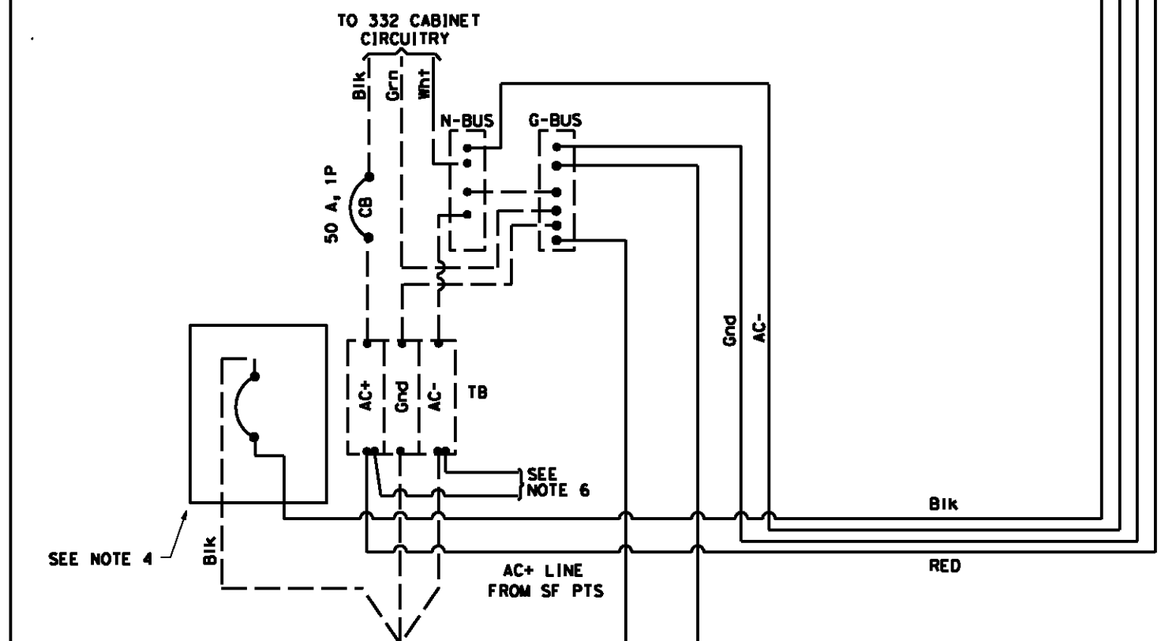
THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

LEGEND: (THIS SHEET ONLY)

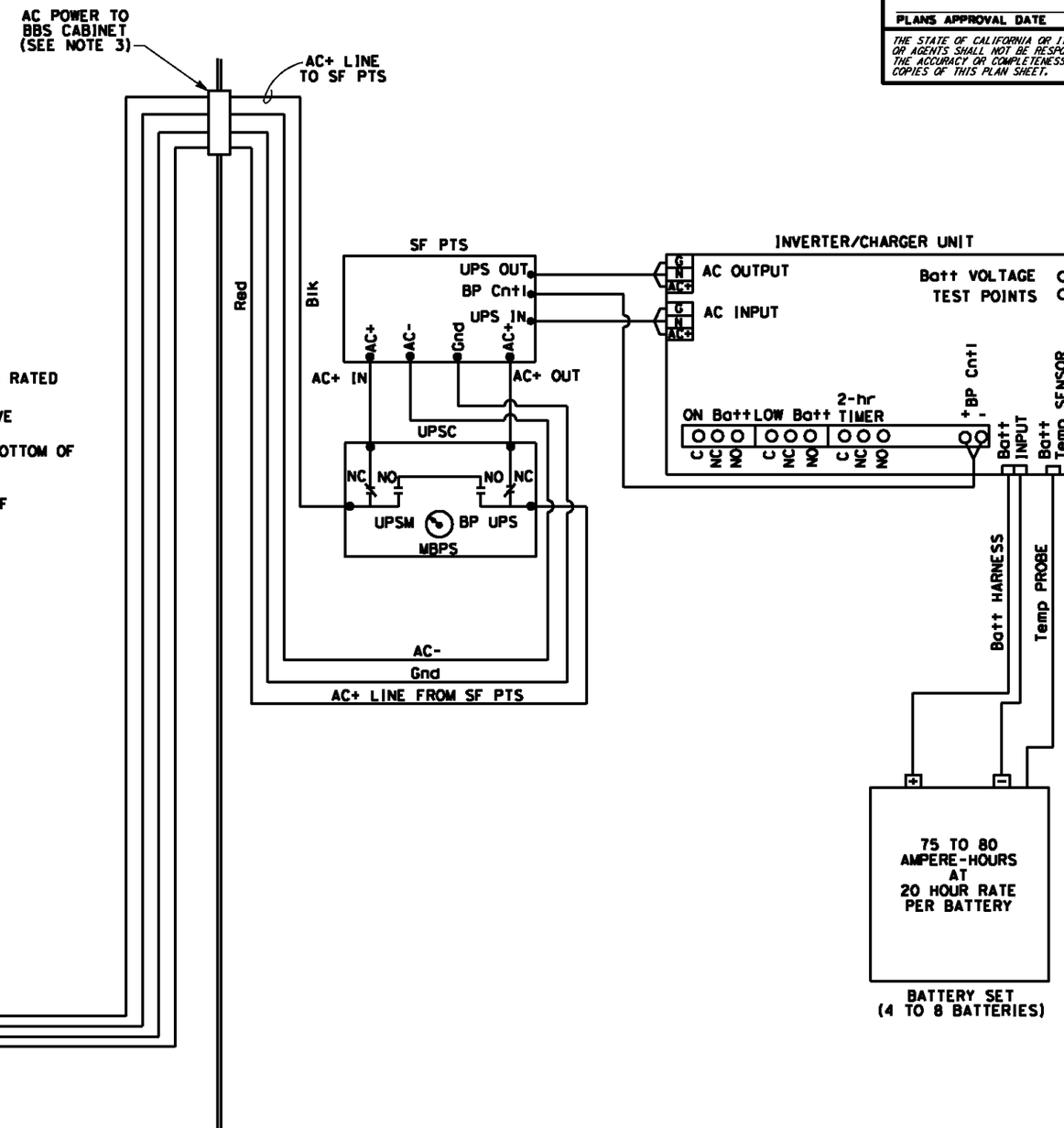
PTS = POWER TRANSFER SWITCH
UPS = UNINTERRUPTIBLE POWER SUPPLY
UPSC = UNINTERRUPTIBLE POWER SUPPLY CONTROLLER
UPSM = UPS MODE
BP = BYPASS
MBPS = MANUAL BYPASS SWITCH
AC+ = UNGROUNDED CONDUCTOR
AC- = GROUNDED CONDUCTOR
C = COMMON
Grn = GREEN
Blk = BLACK
Wht = WHITE
SF = STATE-FURNISHED
TB = TERMINAL BOARD
Cntl = CONTROL
Gnd = GROUND
Temp = TEMPERATURE
Batt = BATTERY

NOTES: (THIS SHEET ONLY)

1. TYPE A REFERS TO THE BBS EQUIPMENT FROM MANUFACTURER A.
2. CASE-1 REFERS TO THE SITUATION WHEN THE ENTIRE BBS EQUIPMENT INCLUDING THE BATTERIES ARE INSTALLED IN THE BBS CABINET.
3. THE LOCATION OF THE 2"C NIPPLE WILL BE DETERMINED BY THE ENGINEER IN THE FIELD.
4. THE CONTRACTOR SHALL FURNISH AND INSTALL A NEMA-1 ENCLOSURE WITH 30 A, 1P, 120/240 VOLTS RATED CIRCUIT BREAKER MANUFACTURED PER UL STANDARD 489.
5. A TEMPERATURE PROBE SHALL BE ATTACHED TO THE BATTERY BY TAPE OR ATTACHED TO THE NEGATIVE TERMINAL OF THE BATTERY.
6. THE ELECTRICAL POWER FOR THE COOLING FAN FOR THE BBS CABINET SHALL BE TAPPED FROM THE BOTTOM OF THE TB IN THE 332 CABINET.
7. THE CONTRACTOR SHALL PROVIDE A 9-WIRE WIRING HARNESS OR BUNDLED 9 MULTICOLOR CONDUCTORS, #18 AWG WIRES FROM THE RELAY ON THE INVERTER/CHARGER UNIT TO THE CONTROLLER. THE ENDS OF THE CONDUCTORS SHALL BE INSULATED WITH TAPE AND A SIX-FOOT COIL ON EACH END.



332 CONTROLLER CABINET



BBS CABINET

ELECTRIC SYSTEM
(BBS POWER CONNECTION DIAGRAM, TYPE A, CASE-1)

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

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

LAST REVISION 3-11-09 | DATE PLOTTED => $DATE | TIME PLOTTED => $TIME

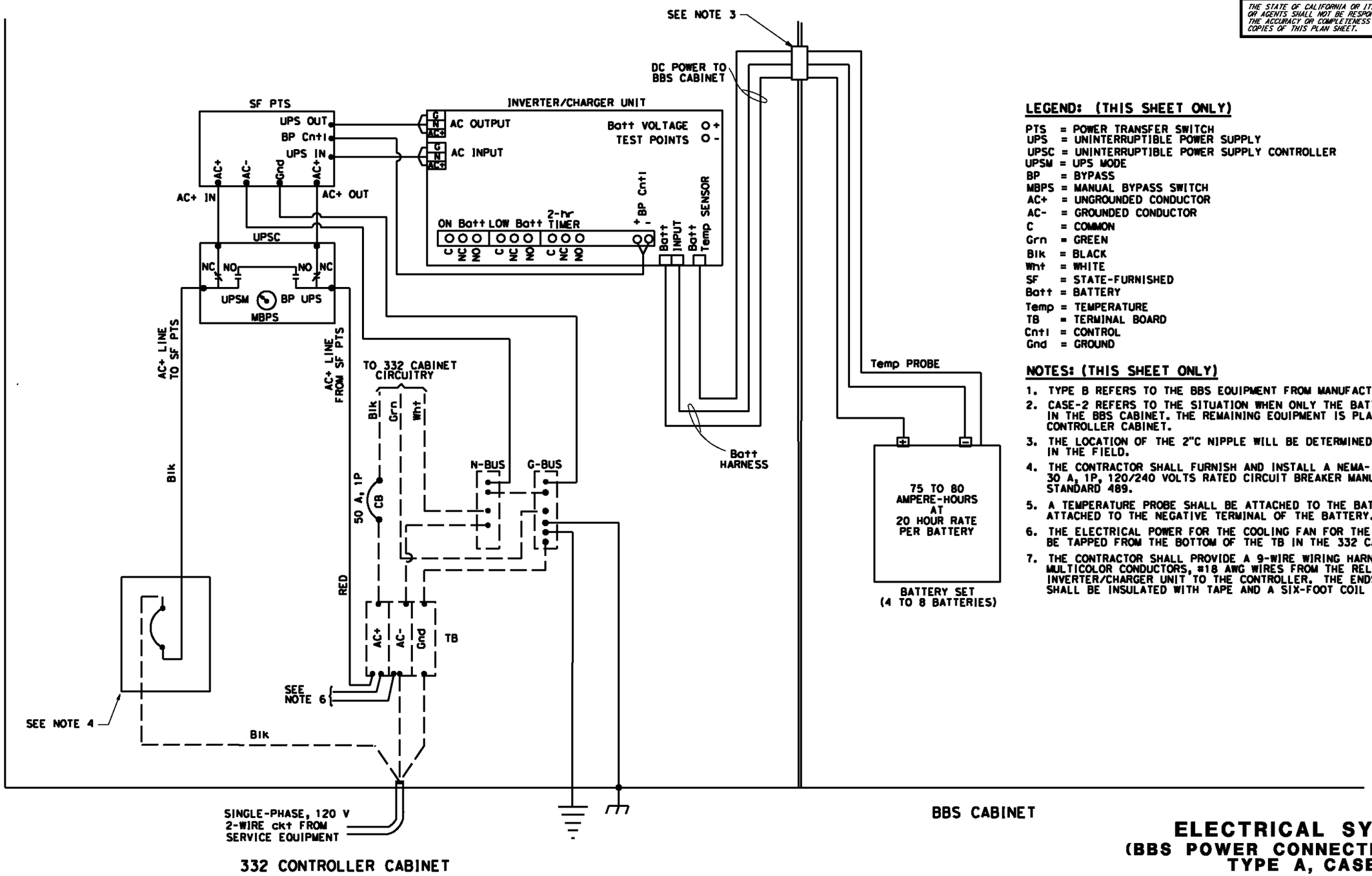
Dist	COUNTY	LOCATION CODE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS

Theresa Gabriel 12-20-07
REGISTERED ~~CIVIL ENGINEER~~ DATE

Theresa A. Gabriel No. E15129 Exp. 6-30-10 ELECT
REGISTERED PROFESSIONAL ENGINEER STATE OF CALIFORNIA

PLANS APPROVAL DATE

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



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UPS = UNINTERRUPTIBLE POWER SUPPLY
UPSC = UNINTERRUPTIBLE POWER SUPPLY CONTROLLER
UPSM = UPS MODE
BP = BYPASS
MBPS = MANUAL BYPASS SWITCH
AC+ = UNGROUNDED CONDUCTOR
AC- = GROUNDED CONDUCTOR
C = COMMON
Grn = GREEN
Blk = BLACK
Wht = WHITE
SF = STATE-FURNISHED
Batt = BATTERY
Temp = TEMPERATURE
TB = TERMINAL BOARD
Cntl = CONTROL
Gnd = GROUND

NOTES: (THIS SHEET ONLY)

1. TYPE B REFERS TO THE BBS EQUIPMENT FROM MANUFACTURER B.
2. CASE-2 REFERS TO THE SITUATION WHEN ONLY THE BATTERIES ARE INSTALLED IN THE BBS CABINET. THE REMAINING EQUIPMENT IS PLACED IN THE 332 CONTROLLER CABINET.
3. THE LOCATION OF THE 2"C NIPPLE WILL BE DETERMINED BY THE ENGINEER IN THE FIELD.
4. THE CONTRACTOR SHALL FURNISH AND INSTALL A NEMA-1 ENCLOSURE WITH 30 A, 1P, 120/240 VOLTS RATED CIRCUIT BREAKER MANUFACTURED PER UL STANDARD 489.
5. A TEMPERATURE PROBE SHALL BE ATTACHED TO THE BATTERY BY TAPE OR ATTACHED TO THE NEGATIVE TERMINAL OF THE BATTERY.
6. THE ELECTRICAL POWER FOR THE COOLING FAN FOR THE BBS CABINET SHALL BE TAPPED FROM THE BOTTOM OF THE TB IN THE 332 CABINET.
7. THE CONTRACTOR SHALL PROVIDE A 9-WIRE WIRING HARNESS OR BUNDLED 9 MULTICOLOR CONDUCTORS, #18 AWG WIRES FROM THE RELAY ON THE INVERTER/CHARGER UNIT TO THE CONTROLLER. THE ENDS OFTHE CONDUCTORS SHALL BE INSULATED WITH TAPE AND A SIX-FOOT COIL ON EACH END.

ELECTRICAL SYSTEMS
(BBS POWER CONNECTION DIAGRAM, TYPE A, CASE-2)

NO SCALE

REVISED BY	DATE REVISED

CALCULATED-DESIGNED BY	CHECKED BY

FUNCTIONAL SUPERVISOR

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

LAST REVISION 2-2-09

DATE PLOTTED => $DATE
TIME PLOTTED => $TIME

Dist	COUNTY	LOCATION CODE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS

Theresa Gabriel 12-20-07
REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER Theresa A. Gabriel No. E15129 Exp. 6-30-10 ELECT STATE OF CALIFORNIA

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

LEGEND: (THIS SHEET ONLY)

PTS = POWER TRANSFER SWITCH
UPS = UNINTERRUPTIBLE POWER SUPPLY
UPSC = UNINTERRUPTIBLE POWER SUPPLY CONTROLLER
UPSM = UPS MODE
BP = BYPASS
MBPS = MANUAL BYPASS SWITCH
AC+ = UNGROUNDED CONDUCTOR
AC- = GROUNDED CONDUCTOR
C = COMMON
Grn = GREEN
Blk = BLACK
Wht = WHITE
SF = STATE-FURNISHED
Batt = BATTERY
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NOTES: (THIS SHEET ONLY)

1. TYPE B REFERS TO THE BBS EQUIPMENT FROM MANUFACTURER B.
2. CASE-1 REFERS TO THE SITUATION WHEN THE ENTIRE BBS EQUIPMENT INCLUDING THE BATTERIES ARE INSTALLED IN THE BBS CABINET.
3. THE LOCATION OF THE 2"C NIPPLE WILL BE DETERMINED BY THE ENGINEER IN THE FIELD.
4. THE CONTRACTOR SHALL FURNISH AND INSTALL A NEMA-1 ENCLOSURE WITH 30 A, 1P, 120/240 VOLTS RATED CIRCUIT BREAKER MANUFACTURED PER UL STANDARD 489.
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6. THE ELECTRICAL POWER FOR THE COOLING FAN FOR THE BBS CABINET SHALL BE TAPPED FROM THE BOTTOM OF THE TB IN THE 332 CABINET.
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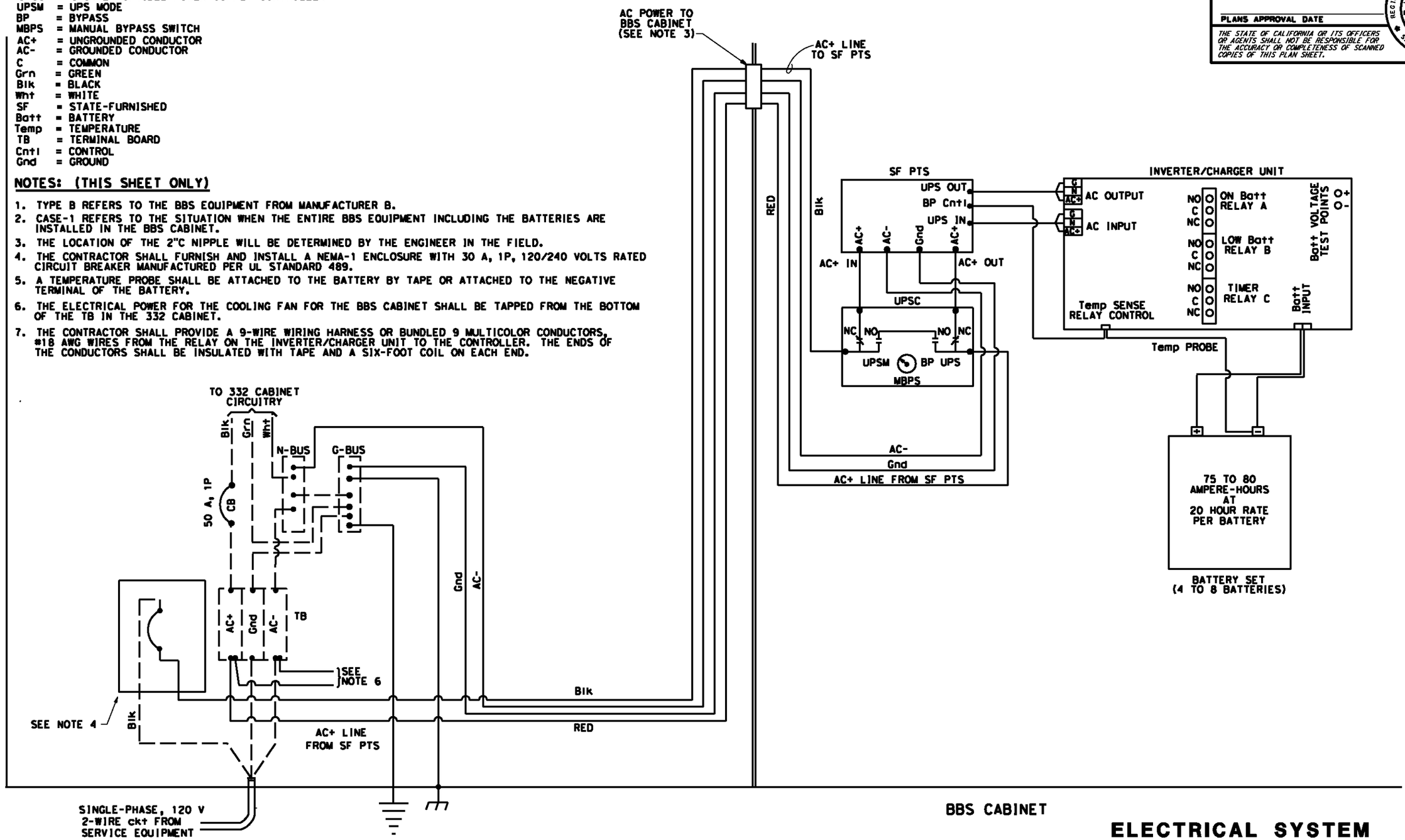


ELECTRICAL SYSTEM

(BBS POWER CONNECTION DIAGRAM, TYPE B, CASE-1)

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

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

LAST REVISION 3-11-09 | DATE PLOTTED => $DATE | TIME PLOTTED => $TIME

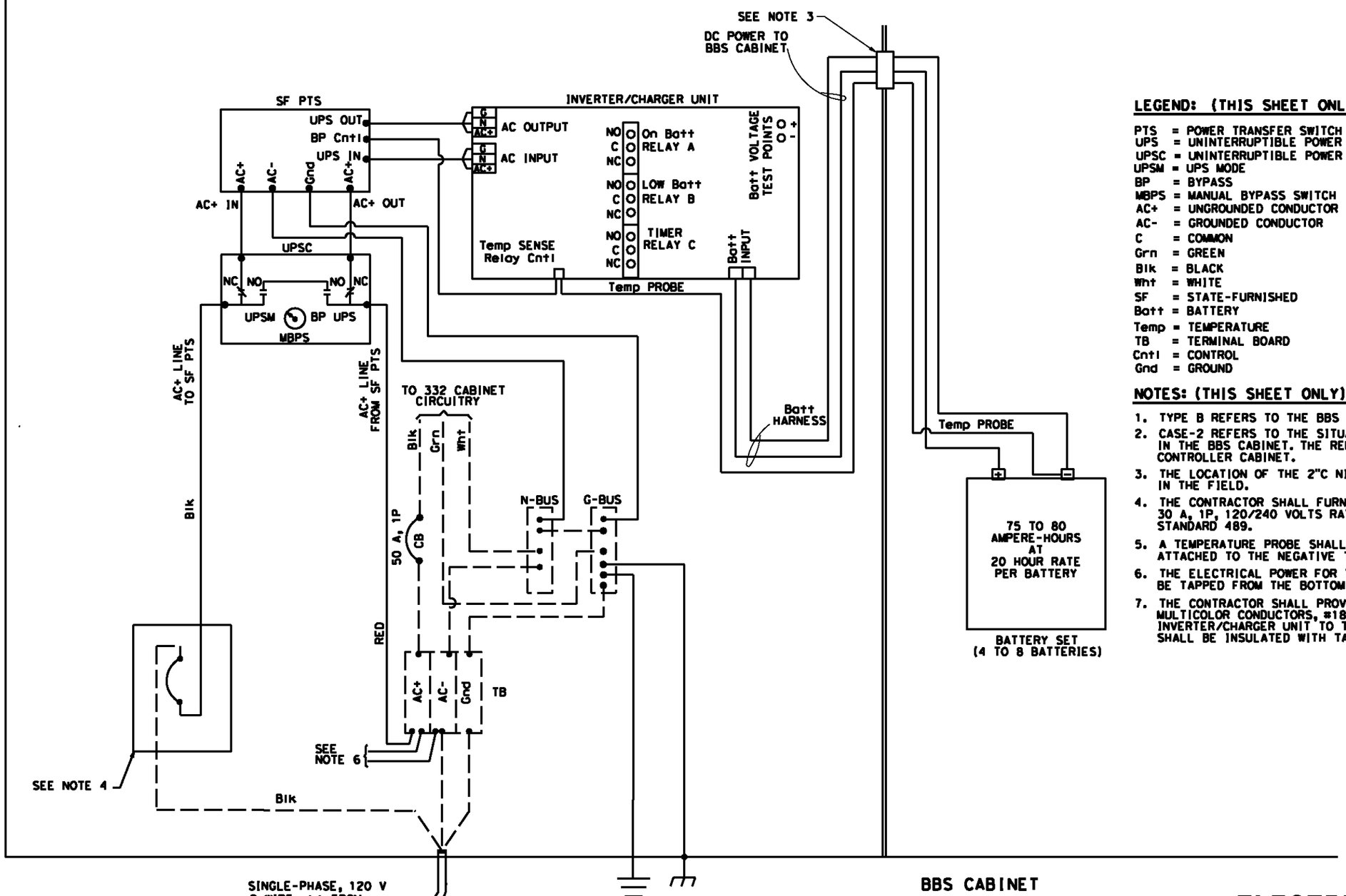
Dist	COUNTY	LOCATION CODE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS

REGISTERED ~~CIVIL ENGINEER~~ 12-20-07 DATE

PLANS APPROVAL DATE

Theresa A. Gabriel No. E15129 Exp. 6-30-10 ELECT — REGISTERED PROFESSIONAL ENGINEER — STATE OF CALIFORNIA

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



LEGEND: (THIS SHEET ONLY)

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UPS = UNINTERRUPTIBLE POWER SUPPLY
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MBPS = MANUAL BYPASS SWITCH
AC+ = UNGROUNDED CONDUCTOR
AC- = GROUNDED CONDUCTOR
C = COMMON
Grn = GREEN
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NOTES: (THIS SHEET ONLY)

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ELECTRICAL SYSTEM

(BBS POWER CONNECTION DIAGRAM, TYPE B, CASE-2)

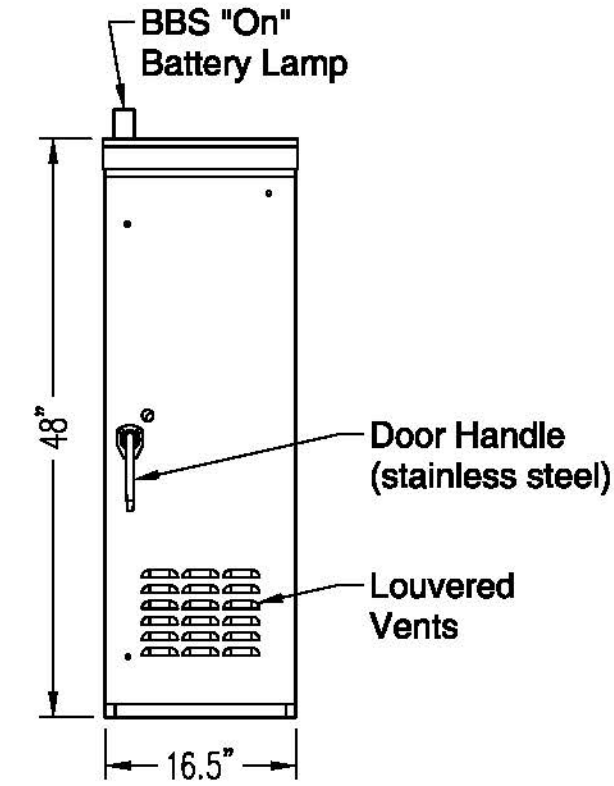
REVISED BY | DATE REVISED | CALCULATED-DESIGNED BY | CHECKED BY | FUNCTIONAL SUPERVISOR

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

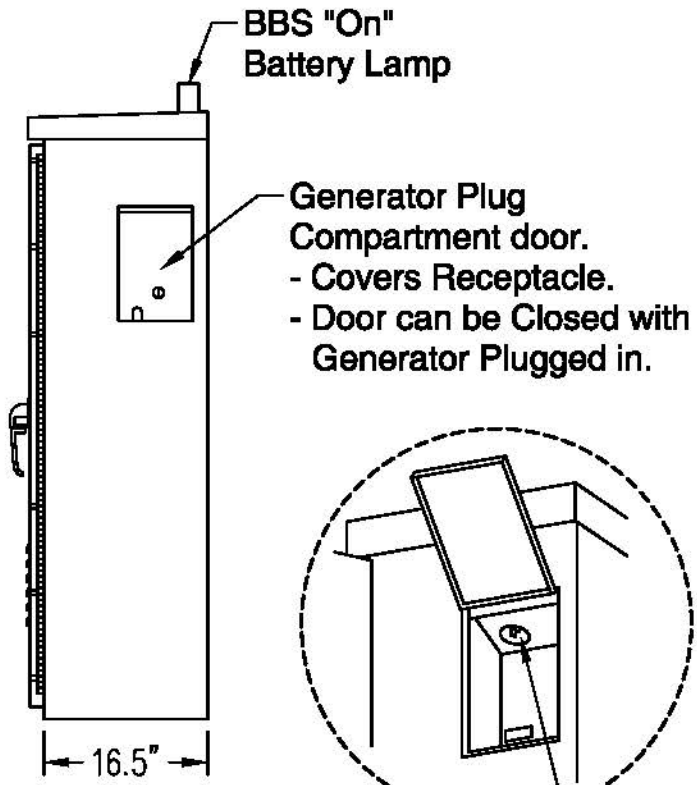
LAST REVISION 3-11-09 | DATE PLOTTED => $DATE | TIME PLOTTED => $TIME

BBS

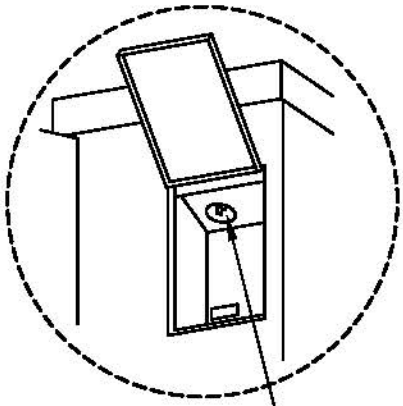
EXTERNAL CABINET DETAILS

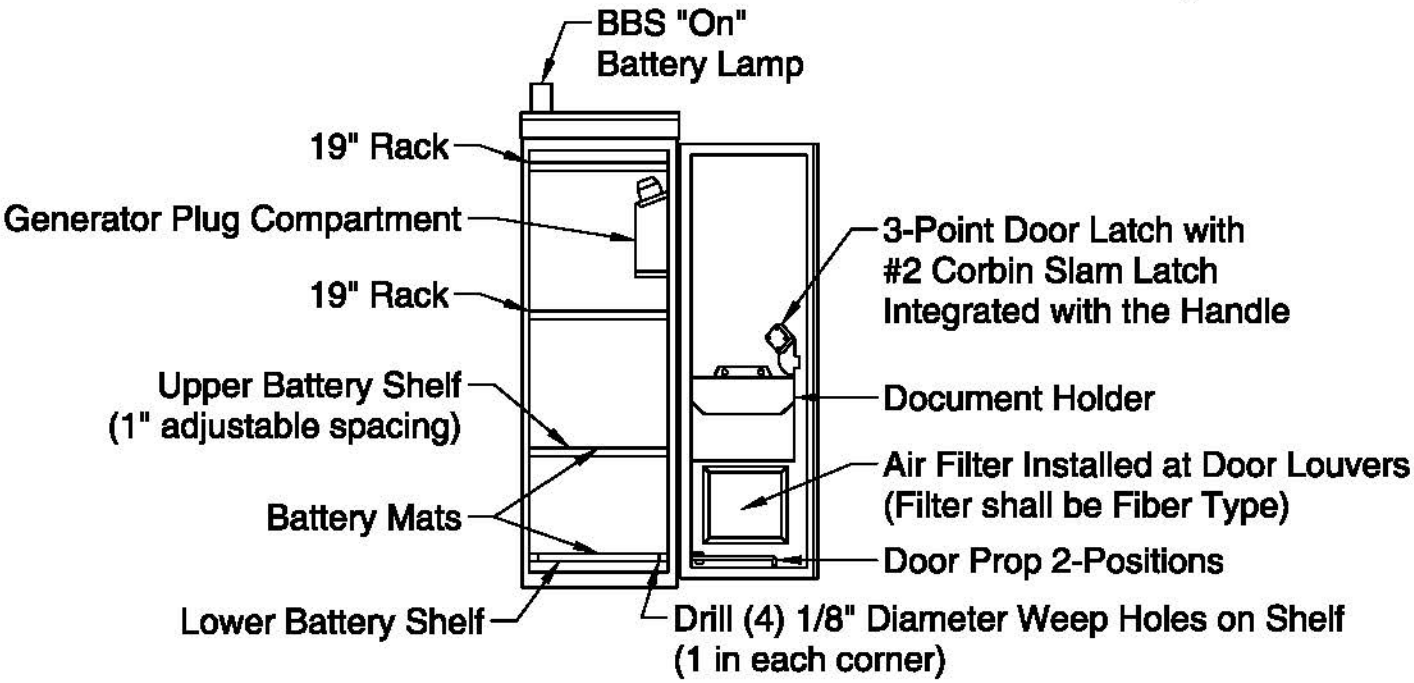


FRONT VIEW
(SHOWN WITH DOOR CLOSED)



SIDE VIEW
(SHOWN WITH GENERATOR
PLUG COMPARTMENT)





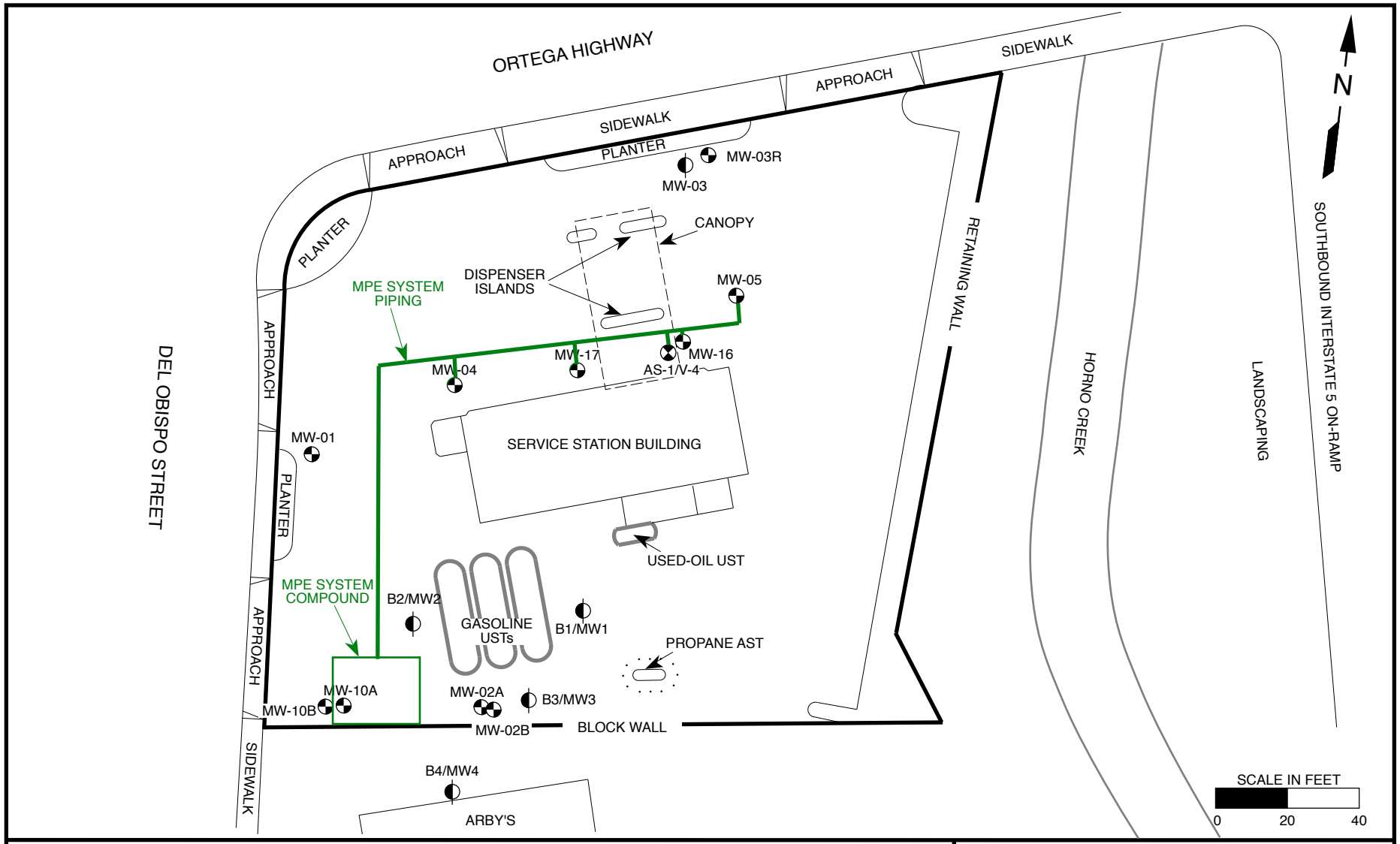
FRONT VIEW
(SHOWN WITH DOOR OPEN)

BBS OUTDOOR ENCLOSURE SIDE MOUNT

City of San Juan Capistrano

EXHIBIT 1

FILE: SPECS/SJC/BBS/EXHIBIT 5.dwg



EXPLANATION

- MONITORING WELL
- ABANDONED MONITORING WELL
- NESTED AIR SPARGING AND VADOSE WELL

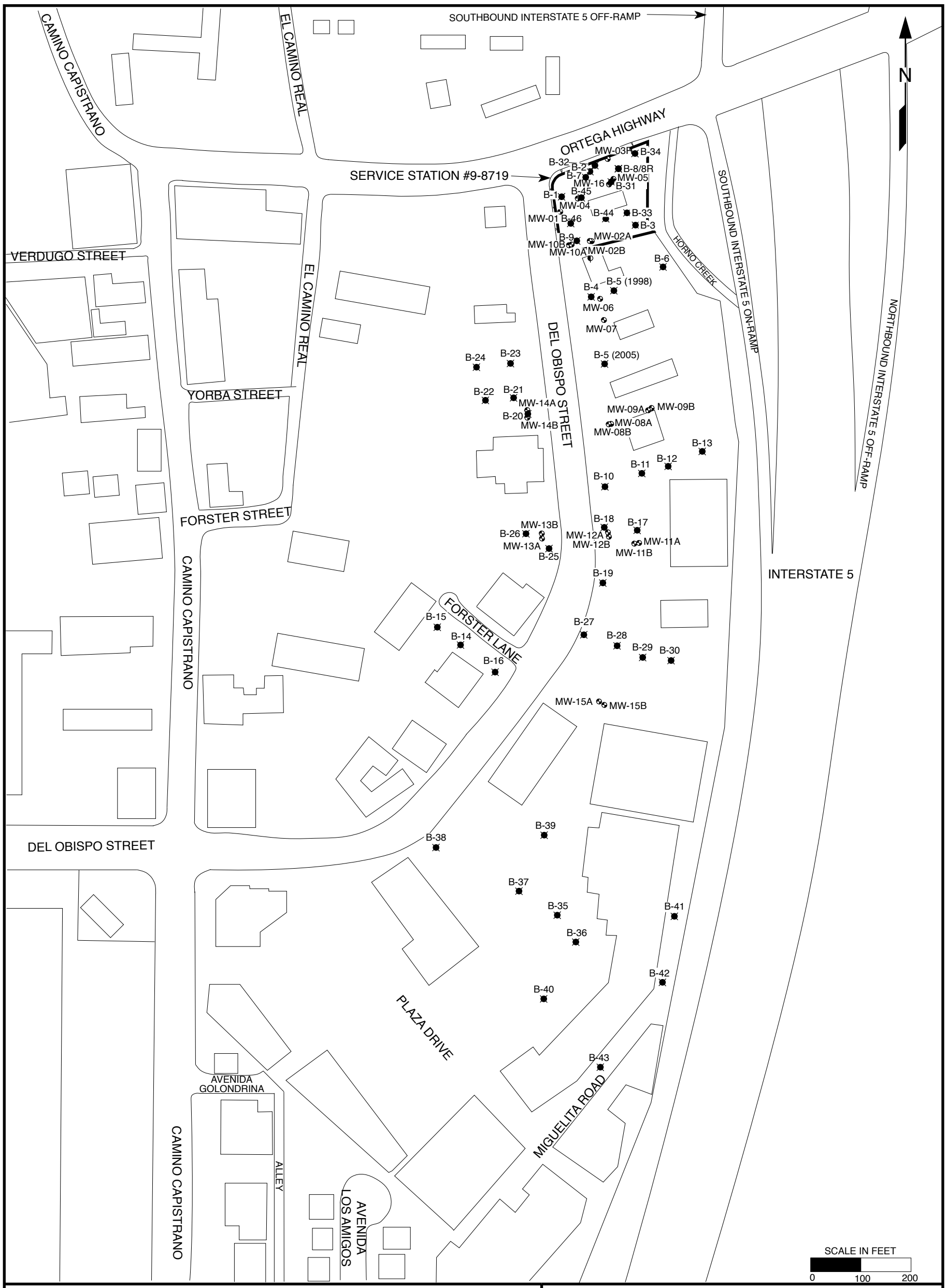
CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY

FIGURE 1 - FACILITY MAP

SERVICE STATION #9-8719
26988 ORTEGA HIGHWAY
SAN JUAN CAPISTRANO, CALIFORNIA

HOLGUIN, FAHAN & ASSOCIATES, INC.

REVISION DATE: JANUARY 6, 2012: ANG



LEGEND	CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY
MONITORING WELL SOIL BORING	**FIGURE 4 - PLOT PLAN** SERVICE STATION #9-8719 26988 ORTEGA HIGHWAY SAN JUAN CAPISTRANO, CALIFORNIA
	HOLGUIN, FAHAN & ASSOCIATES, INC.

REVISION DATE: NOVEMBER 15, 2010: ANG

CLIENT: Chevron U.S.A Products Company

PROJECT: Service Station #9-8719

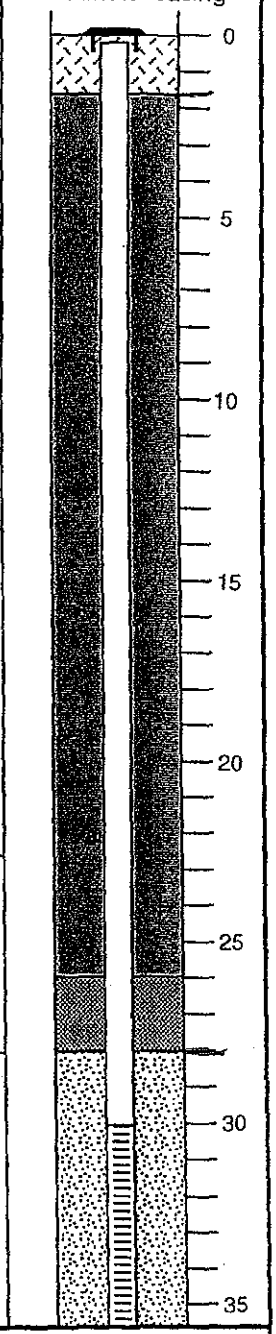
LOCATION: San Juan Capistrano, California

SAMPLE INTERVAL	DEPTH (fbg)	DESCRIPTION AND SOIL CLASSIFICATION NAME: %gravel/sand/fines, grain size, gradation/plasticity, color, angularity, max. size (gravels), density/consistency, moisture, odor	BLOWS PER 6 INCHES	PID (ppmv)	USCS
	0	6" of asphalt			
		CLAY: 0/0/100, medium to high plasticity, brown/gray/black, soft, moist, no odor, no stain			CH
	5		2,2,2	0	
	10	dark brown/tan, medium stiff	2,3,5	0	
	15	gray/dark brown, stiff	3,4,6	0	
	20	dark brown	6,6,7	0	
		SILTY CLAY: 0/0/100, low to medium plasticity, dark brown, very stiff, moist, no odor, no stain			CL
	25		6,10,20	0	
		CLAY: 0/0/100, high plasticity, dark brown, hard, moist, no odor, no stain			CH
	30		15,20,25	0	
	35	brown	12,18,15	0	

BOREHOLE COMPLETION DETAIL

☒ WELL ☒ GW ☐ VW

☐ BORING ☐ SPARGE POINT



DRILLING METHOD: Mobile B-61, 10"-OD, hollow-stem auger	DATE DRILLED: November 7, 1995
SAMPLER TYPE: 2.5"-diameter, California modified split spoon	LOGGED BY: D. Pessler
TOTAL BORING DEPTH: 50 fbg	APPROVED BY: J. Haslett, RG #5641
DEPTH TO WATER: 40 fbg	DRILLED BY: Drill Line, Inc.

HOLGUIN, FAHAN & ASSOCIATES, INC.

LOG OF EXPLORATORY BORING

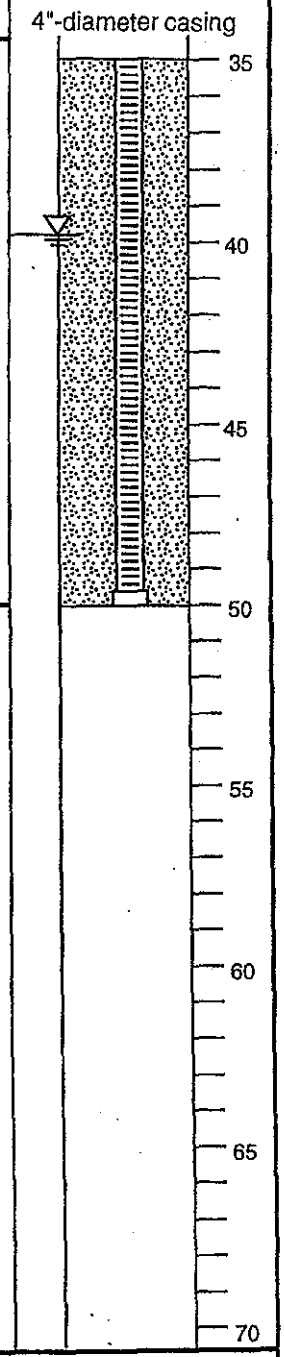
MW-1

SAMPLE INTERVAL	DEPTH (fbg)	CLIENT: Chevron U.S.A Products Company PROJECT: Service Station #9-8719 LOCATION: San Juan Capistrano, California DESCRIPTION AND SOIL CLASSIFICATION NAME: %gravel/sand/fines, grain size, gradation/plasticity, color, angularity, max. size (gravels), density/consistency, moisture, odor	BLOWS PER 6 INCHES	PID (ppmv)	USCS
	35				CH
	40	stiff, wet	6,7,8	0	
	45		5,6,7	0	
	50	medium stiff	2,2,3	0	
	55				
	60				
	65				
	70				

BOREHOLE COMPLETION DETAIL

☒ WELL ☒ GW ☐ VW

☐ BORING ☐ SPARGE POINT



DRILLING METHOD: Mobile B-61, 10"-OD, hollow-stem auger	DATE DRILLED: November 7, 1995
SAMPLER TYPE: 2.5"-diameter, California modified split spoon	LOGGED BY: D. Pessler
TOTAL BORING DEPTH: 50 fbg	APPROVED BY: J. Haslett, RG #5641
DEPTH TO WATER: 40 fbg	DRILLED BY: Drill Line, Inc.

HOLGUIN, FAHAN & ASSOCIATES, INC.

LOG OF EXPLORATORY BORING

MW-1

CLIENT: Chevron U.S.A Products Company

PROJECT: Service Station #9-8719

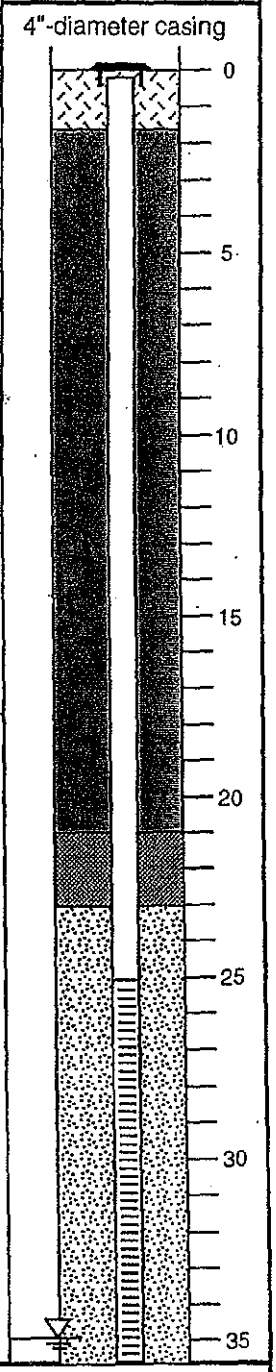
LOCATION: San Juan Capistrano, California

SAMPLE INTERVAL	DEPTH (fbg)	DESCRIPTION AND SOIL CLASSIFICATION NAME: %gravel/sand/fines, grain size, gradation/plasticity, color, angularity, max. size (gravels), density/consistency, moisture, odor	BLOWS PER 6 INCHES	PID (ppmv)	USCS
	0	4" of asphalt Hand augered to a depth of 5 fbg			
		CLAY: 0/0/100, medium to high plasticity, dark brown/gray, stiff, moist, no odor, no stain	3,4,5	0	CL
	5	SANDY CLAY: 0/30/70, medium-grained sand, medium plasticity, light brown, moist, no odor, no stain			SC
	10	CLAY: 0/0/100, medium to high plasticity, dark brown, stiff, moist, no odor, no stain	3,5,7	0	CH
	15	CLAYEY SILT: 0/0/100, no to low plasticity, dark brown, stiff, moist, no odor, no stain	4,6,7	0	ML
	20	CLAY: 0/0/100, medium plasticity, dark brown, stiff, moist, no odor, no stain	4,5,6	0	CH
	25	very stiff	6,9,10	0	
	30	stiff	4,5,6	0	
	35	brown, wet	4,4,5	0	

BOREHOLE COMPLETION DETAIL

☒ WELL ☒ GW ☐ VW

☐ BORING ☐ SPARGE POINT



DRILLING METHOD: Mobile B-61, 10"-OD, hollow-stem auger	DATE DRILLED: November 7, 1995
SAMPLER TYPE: 2.5"-diameter, California modified split spoon	LOGGED BY: D. Pessler
TOTAL BORING DEPTH: 45 fbg	APPROVED BY: J. Haslett, RG #5641
DEPTH TO WATER: approximately 35 fbg	DRILLED BY: Drill Line, Inc.

HOLGUIN, FAHAN & ASSOCIATES, INC.

LOG OF EXPLORATORY BORING

MW-2

SAMPLE INTERVAL	DEPTH (fbg)	CLIENT: Chevron U.S.A Products Company PROJECT: Service Station #9-8719 LOCATION: San Juan Capistrano, California DESCRIPTION AND SOIL CLASSIFICATION NAME: %gravel/sand/fines, grain size, gradation/plasticity, color, angularity, max. size (gravels), density/consistency, moisture, odor	BLOWS PER 6 INCHES	PID (ppmv)	USCS	BOREHOLE COMPLETION DETAIL ☒ WELL ☒ GW ☐ VW ☐ BORING ☐ SPARGE POINT
	35				CH	4"-diameter casing
	40	high plasticity	4,5,6	0		
	45	medium stiff	2,2,3	0		
	50					
	55					
	60					
	65					
	70					

DRILLING METHOD: Mobile B-61, 10"-OD, hollow-stem auger	DATE DRILLED: November 7, 1995
SAMPLER TYPE: 2.5"-diameter, California modified split spoon	LOGGED BY: D. Pessler
TOTAL BORING DEPTH: 45 fbg	APPROVED BY: J. Haslett, RG #5641
DEPTH TO WATER: approximately 35 fbg	DRILLED BY: Drill Line, Inc.

HOLGUIN, FAHAN & ASSOCIATES, INC.

LOG OF EXPLORATORY BORING

MW-2

SAMPLE INTERVAL	DEPTH (fbg)	DESCRIPTION AND SOIL CLASSIFICATION NAME: %gravel/sand/fines, gradation/plasticity, color, angularity, maximum size (gravels), density/consistency, moisture, stain	BLOWS PER 6 INCHES	PID (ppmv)	USCS
	0	CLAYEY SILT: 0/0/100, medium plasticity, yellowish orange, stiff, moist, dark gray stain			ML
	5				
	10		5,6,6	0	
	15	Very stiff, olive gray, dark gray stain	8,13,16	0.6	
	20	Dark gray, no stain	10,11,13	0	
	25	Hard, olive gray, no stain	11,15,17	2.2	
	30		11,12,18	0	
	35				

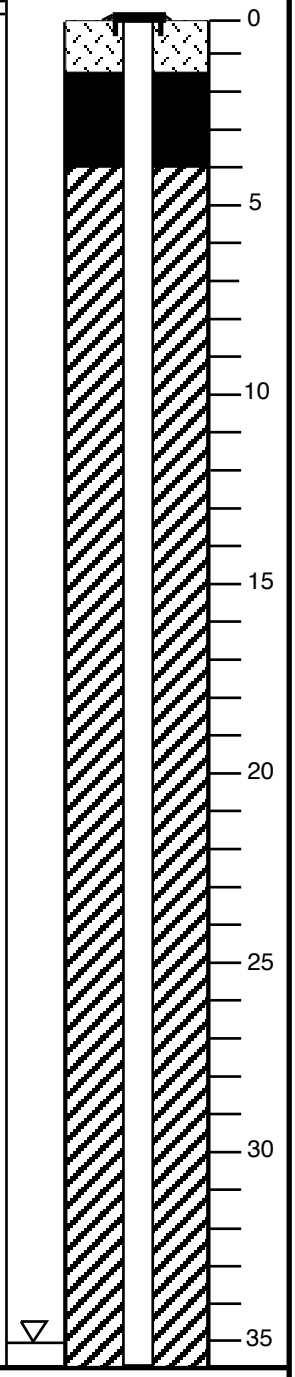
CLIENT: Chevron Environmental Management Company

PROJECT: Service Station #9-8719

LOCATION: 26988 Ortega Highway, San Juan Capistrano, California

COMPLETION DETAIL
- [X] GROUNDWATER WELL
- [ ] VADOSE WELL
- [ ] SPARGE WELL
- [ ] BORING

CASING: 4-inch PVC
SLOT SIZE: 0.02 inch
FILTER PACK: #3 Sand



DRILLING METHOD: Limited access rig, 10-inch hollow-stem auger	DATE DRILLED: June 9, 2009; June 22, 2009; June 23, 2009
SAMPLER TYPE: 2-inch California-modified split spoon	LOGGED BY: Eli Scott
TOTAL BORING DEPTH: 60 fbg	APPROVED BY: Todd McFarland, PG #7685
DEPTH TO WATER: 35 fbg	DRILLED BY: Cascade Drilling, Inc.

HOLGUIN, FAHAN & ASSOCIATES, INC.

LOG OF EXPLORATORY BORING

MW-2B

REVISION DATE: APRIL 9, 2010:MCH

SAMPLE INTERVAL	DEPTH (fbg)	DESCRIPTION AND SOIL CLASSIFICATION NAME: %gravel/sand/fines, gradation/plasticity, color, angularity, maximum size (gravels), density/consistency, moisture, stain	BLOWS PER 6 INCHES	PID (ppmv)	USCS
	35	Very stiff	7,11,15	0	
	40	SILTY CLAY: 0/0/100, high plasticity, light brown, hard, moist, no stain	12,16,23	0	CH
	45		8,11,19	0	
	50	CLAYEY SILT: 0/0/100, low plasticity, yellow orange, hard, wet, no stain	7,14,22	0	ML
	55	SILTY SAND: 0/80/20, poorly graded, light brown, fine-grained sand, dense, wet, no stain	13,20,25	0	SM
		CLAYEY SILT: 0/0/100, medium plasticity, olive gray, hard, wet, no stain	7,14,16	0	ML
X	60				
	65				
	70				

CLIENT: Chevron Environmental Management Company

PROJECT: Service Station #9-8719

LOCATION: 26988 Ortega Highway, San Juan Capistrano, California

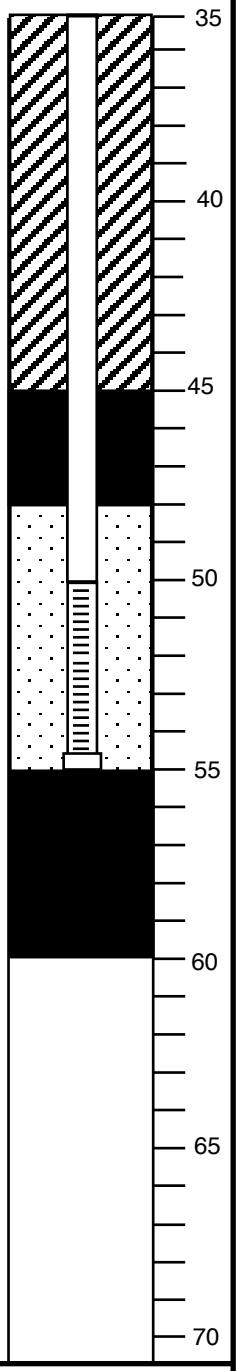
COMPLETION DETAIL

- [X] GROUNDWATER WELL
- [ ] VADOSE WELL
- [ ] SPARGE WELL
- [ ] BORING

CASING: 4-inch PVC

SLOT SIZE: 0.02 inch

FILTER PACK: #3 Sand



DRILLING METHOD: Limited access rig, 10-inch hollow-stem auger	DATE DRILLED: June 9, 2009; June 22, 2009; June 23, 2009
SAMPLER TYPE: 2-inch California-modified split spoon	LOGGED BY: Eli Scott
TOTAL BORING DEPTH: 60 fbg	APPROVED BY: Todd McFarland, PG #7685
DEPTH TO WATER: 35 fbg	DRILLED BY: Cascade Drilling, Inc.

HOLGUIN, FAHAN & ASSOCIATES, INC.

LOG OF EXPLORATORY BORING

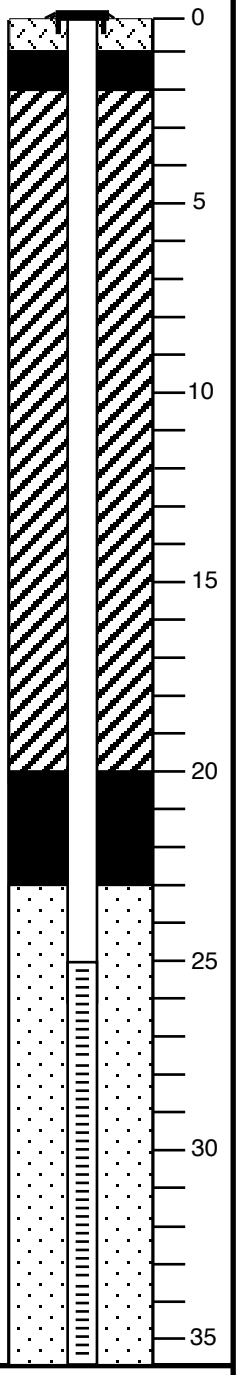
MW-2B

REVISION DATE: APRIL 9, 2010:MCH

SAMPLE INTERVAL			CLIENT: Chevron Environmental Management Company	BLOWS PER 6 INCHES	PID (ppmv)	USCS
SOIL	GROUNDWATER	DEPTH (fbg)	PROJECT: Service Station #9-8719			
			LOCATION: 26988 Ortega Highway, San Juan Capistrano, California			
			DESCRIPTION AND SOIL CLASSIFICATION NAME: %gravel/sand/fines, gradation/plasticity, color, angularity, maximum size (gravels), density/consistency, moisture, stain			
		0	6 inches asphalt			
			SILT WITH CLAY: 0/0/100, low plasticity, gray, medium stiff, moist, no stain			ML
		5				
		10		7,9,12	0.0	
		15	dark brown	12,14,17	0.0	
		20	SILT WITH SAND: 0/10/90, low plasticity, dark brown, medium stiff, moist, no stain	8,16,21	0.0	
		25	SILT WITH CLAY: 0/0/100, medium plasticity, dark brown, medium stiff, moist, no stain	10,20,27	0.0	
		30		15,18,28	0.0	
		35				

- [ ] SOIL BORING
- [x] GROUNDWATER WELL
- [ ] VADOSE WELL
- [ ] SPARGING WELL
- [ ] SOIL GAS PROBE

CASING: 4-inch SCH 40 PVC
SLOT SIZE: 0.02-inch
FILTER PACK: #3 sand



DRILLING METHOD: Limited Access Rig, 10-inch OD, hollow-stem auger	DATE DRILLED: July 15, 2010; July 21, 2010
SAMPLER TYPE: 2-inch California Modified Split Spoon	LOGGED BY: Josh Barraza
TOTAL BORING DEPTH: 46.5 fbg	APPROVED BY: Todd McFarland, PG #7685
DEPTH TO WATER: 35 fbg	DRILLED BY: Cascade Drilling LP

HOLGUIN, FAHAN & ASSOCIATES, INC.

LOG OF EXPLORATORY BORING

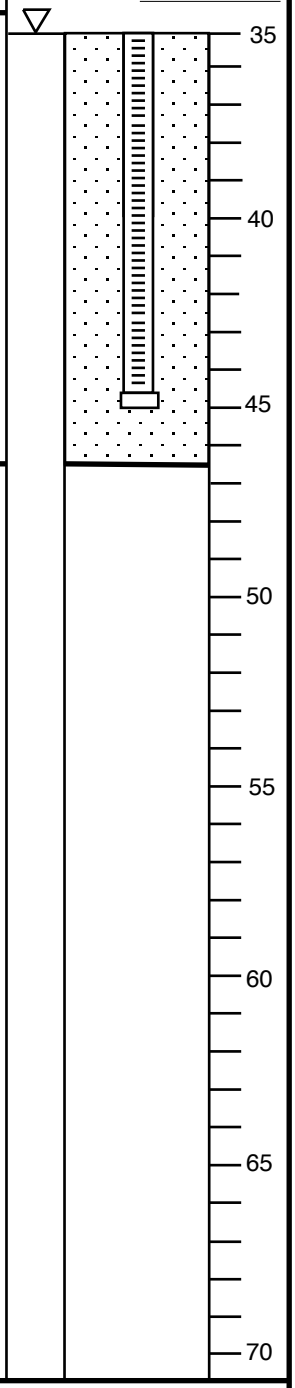
MW-03R

REVISION DATE: AUGUST 3, 2010: ANG

SAMPLE INTERVAL			CLIENT: Chevron Environmental Management Company	BLOWS PER 6 INCHES	PID (ppmv)	USCS
SOIL	GROUNDWATER	DEPTH (fbg)	PROJECT: Service Station #9-8719			
			LOCATION: 26988 Ortega Highway, San Juan Capistrano, California			
			DESCRIPTION AND SOIL CLASSIFICATION NAME: %gravel/sand/fines, gradation/plasticity, color, angularity, maximum size (gravels), density/consistency, moisture, stain			
		35	wet	17,24,33	0.0	ML
		40		13,18,25	0.0	
X		45		12,16,21	0.0	
		50				
		55				
		60				
		65				
		70				

- ☐ SOIL BORING
- ☒ GROUNDWATER WELL
- ☐ VADOSE WELL
- ☐ SPARGING WELL
- ☐ SOIL GAS PROBE

CASING: 4-inch SCH 40 PVC
SLOT SIZE: 0.02-inch
FILTER PACK: #3 sand



DRILLING METHOD: Limited Access Rig, 10-inch OD, hollow-stem auger	DATE DRILLED: July 15, 2010; July 21, 2010
SAMPLER TYPE: 2-inch California Modified Split Spoon	LOGGED BY: Josh Barraza
TOTAL BORING DEPTH: 46.5 fbg	APPROVED BY: Todd McFarland, PG #7685
DEPTH TO WATER: 35 fbg	DRILLED BY: Cascade Drilling LP

HOLGUIN, FAHAN & ASSOCIATES, INC.

LOG OF EXPLORATORY BORING

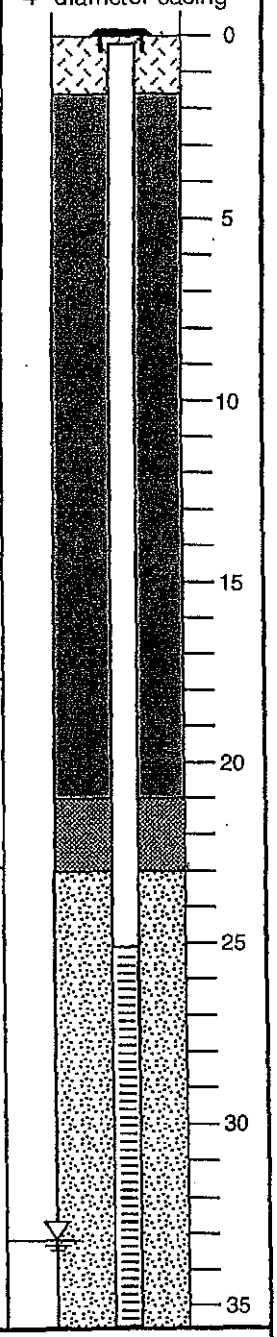
MW-03R

REVISION DATE: AUGUST 3, 2010: ANG

SAMPLE INTERVAL	DEPTH (fbg)	CLIENT: Chevron U.S.A Products Company PROJECT: Service Station #9-8719 LOCATION: San Juan Capistrano, California DESCRIPTION AND SOIL CLASSIFICATION NAME: %gravel/sand/fines, grain size, gradation/plasticity, color, angularity, max. size (gravels), density/consistency, moisture, odor	BLOWS PER 6 INCHES	PID (ppmv)	USCS
	0	6" of asphalt			
		CLAY: 0/0/100, medium plasticity, gray, moist, degraded hydrocarbon odor, black stain			CH
	5	medium to high plasticity, stiff, no odor, no stain	3,4,7	0	
	10	gray and brown	3,6,6	0	
	15		6,7,8	0	
	20	CLAYEY SILT: 0/0/100, slight plasticity, black, very stiff, moist, very slight degraded gasoline odor, no stain	7,9,11	0	ML
	25	CLAY: 0/0/100, high plasticity, brown, stiff, moist, no odor, no stain	3,4,5	0	CH
	30	gray, very stiff	6,7,9	0	
	35	brown, stiff, wet	4,4,4	0	

BOREHOLE COMPLETION DETAIL

☒ WELL ☒ GW ☐ VW ☐ BORING ☐ SPARGE POINT



DRILLING METHOD: Mobile B-61, 10"-OD, hollow-stem auger	DATE DRILLED: November 7, 1995
SAMPLER TYPE: 2.5"-diameter, California modified split spoon	LOGGED BY: D. Pessler
TOTAL BORING DEPTH: 45 fbg	APPROVED BY: J. Haslett, RG #5641
DEPTH TO WATER: 33 fbg	DRILLED BY: Drill Line, Inc.

HOLGUIN, FAHAN & ASSOCIATES, INC.

LOG OF EXPLORATORY BORING

MW-4

SAMPLE INTERVAL	DEPTH (fbg)	CLIENT: Chevron U.S.A Products Company PROJECT: Service Station #9-8719 LOCATION: San Juan Capistrano, California DESCRIPTION AND SOIL CLASSIFICATION NAME: %gravel/sand/fines, grain size, gradation/plasticity, color, angularity, max. size (gravels), density/consistency, moisture, odor	BLOWS PER 6 INCHES	PID (ppmv)	USCS	BOREHOLE COMPLETION DETAIL ☒ WELL ☒ GW ☐ VW ☐ BORING ☐ SPARGE POINT
	35				CH	4"-diameter casing
	40		3,5,5	0.0		
			3,7,8	0.0		
	45					
	50					
	55					
	60					
	65					
	70					

DRILLING METHOD: Mobile B-61, 10"-OD, hollow-stem auger	DATE DRILLED: November 7, 1995
SAMPLER TYPE: 2.5"-diameter, California modified split spoon	LOGGED BY: D. Pessler
TOTAL BORING DEPTH: 45 fbg	APPROVED BY: J. Haslett, RG #5641
DEPTH TO WATER: 33 fbg	DRILLED BY: Drill Line, Inc.

HOLGUIN, FAHAN & ASSOCIATES, INC.

LOG OF EXPLORATORY BORING

MW-4

CLIENT: Chevron U.S.A Products Company

PROJECT: Service Station #9-8719

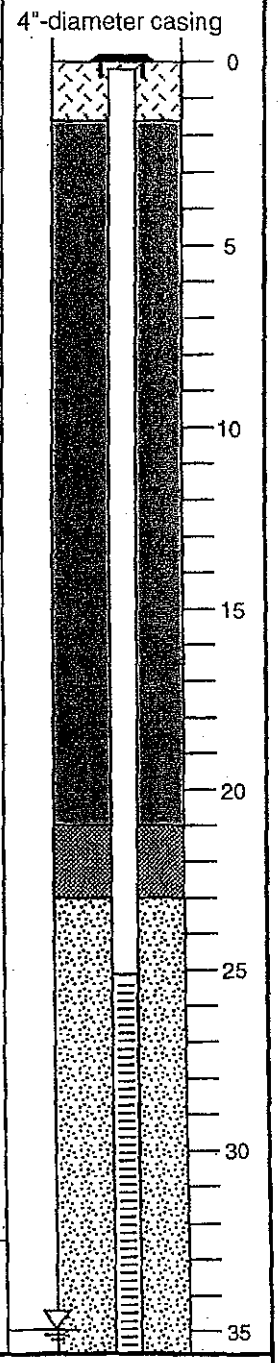
LOCATION: San Juan Capistrano, California

SAMPLE INTERVAL	DEPTH (fbg)	DESCRIPTION AND SOIL CLASSIFICATION NAME: %gravel/sand/fines, grain size, gradation/plasticity, color, angularity, max. size (gravels), density/consistency, moisture, odor	BLOWS PER 6 INCHES	PID (ppmv)	USCS
	0	6" of asphalt			
		CLAY: 0/0/100, medium plasticity, brown/gray, stiff, moist, no odor, no stain			CL
	5		4,6,8	0	
	10	slight degraded hydrocarbon odor	5,6,7	0	
	15	gray, very stiff, degraded hydrocarbon odor, black staining	5,9,12	0	
	20	medium stiff	3,3,4	0	
	25	stiff, very slight degraded hydrocarbon odor	3,4,5	0	
	30		5,6,7	0	
		CLAY: 0/0/100, high plasticity, brown, very stiff, wet, no odor, no stain			CH
	35		7,9,11	0	

BOREHOLE COMPLETION DETAIL

☒ WELL ☒ GW ☐ VW

☐ BORING ☐ SPARGE POINT



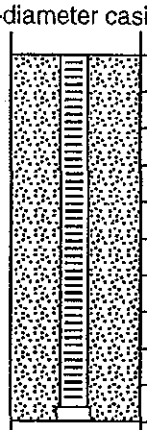
DRILLING METHOD: Mobile B-61, 10"-OD, hollow-stem auger	DATE DRILLED: November 7, 1995
SAMPLER TYPE: 2.5"-diameter, California modified split spoon	LOGGED BY: D. Pessler
TOTAL BORING DEPTH: 45 fbg	APPROVED BY: J. Haslett, RG #5641
DEPTH TO WATER: 35 fbg	DRILLED BY: Drill Line, Inc.

HOLGUIN, FAHAN & ASSOCIATES, INC.

LOG OF EXPLORATORY BORING

MW-5

SAMPLE INTERVAL	DEPTH (fbg)	CLIENT: Chevron U.S.A Products Company PROJECT: Service Station #9-8719 LOCATION: San Juan Capistrano, California DESCRIPTION AND SOIL CLASSIFICATION NAME: %gravel/sand/fines, grain size, gradation/plasticity, color, angularity, max. size (gravels), density/consistency, moisture, odor	BLOWS PER 6 INCHES	PID (ppmv)	USCS	BOREHOLE COMPLETION DETAIL ☒ WELL ☒ GW ☐ VW ☐ BORING ☐ SPARGE POINT
	35				CH	4"-diameter casing
	40		5,7,9	0		
	45		4,7,12	0		
	50					
	55					
	60					
	65					
	70					



DRILLING METHOD: Mobile B-61, 10"-OD, hollow-stem auger	DATE DRILLED: November 7, 1995
SAMPLER TYPE: 2.5"-diameter, California modified split spoon	LOGGED BY: D. Pessler
TOTAL BORING DEPTH: 45 fbg	APPROVED BY: J. Haslett, RG #5641
DEPTH TO WATER: 35 fbg	DRILLED BY: Drill Line, Inc.

HOLGUIN, FAHAN & ASSOCIATES, INC.

LOG OF EXPLORATORY BORING

MW-5

CLIENT: Chevron Products Company

PROJECT: Service Station #9-8719

LOCATION: 26988 Ortega Hwy, San Juan Capistrano, CA

DESCRIPTION AND SOIL CLASSIFICATION

NAME: %gravel/sand/fines, gradation/plasticity, color, angularity, maximum size (gravels), density/consistency, moisture, odor, stain

COMPLETION DETAIL

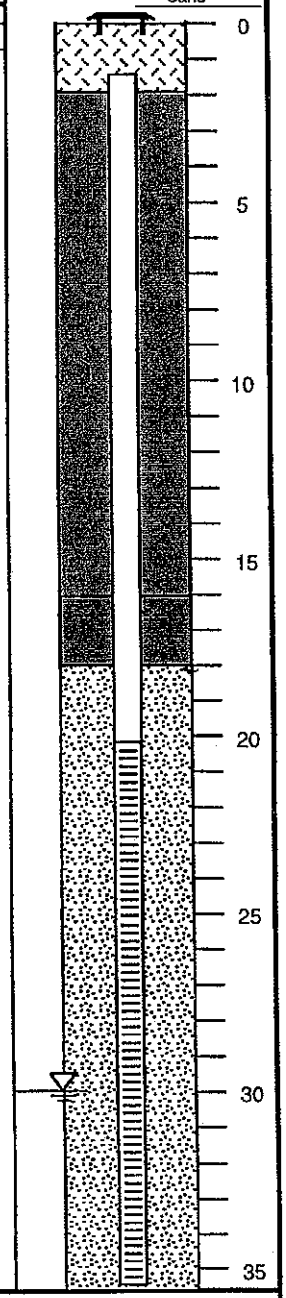
- [x] GROUNDWATER WELL
- [ ] VADOSE WELL
- [ ] SPARGE WELL
- [ ] BORING

CASING: 4-inch SCH 40 PVC

SLOT SIZE: 0.02 inch

FILTER PACK: #3 Monterey Sand

SAMPLE INTERVAL	DEPTH (fbg)	DESCRIPTION	BLOWS PER 6 INCHES	PID (ppmv)	USCS
	0	6" of asphalt			
		SILTY CLAY: 0/0/100, low plasticity, brown, very stiff, slightly moist, no odor, no stain			CL
	5		11,12,13	0	
	10		12,13,14	0	
	15	dark olive gray	13,15,18	2	
	20	olive gray	12,21,25	0	
	25		7,11,15	0	
	30	very moist	7,8,11	0	
	35	wet	9,9,12	0	



DRILLING METHOD: CME-75 10"-OD, hollow-stem auger	DATE DRILLED: April 26, 1999
SAMPLER TYPE: 1.5"-ID, California-modified split spoon	LOGGED BY: J. Zenor
TOTAL BORING DEPTH: 40 fbg	APPROVED BY: J. Haslett, RG #5641
DEPTH TO WATER: 30 fbg	DRILLED BY: Cascade Drilling, Inc.-California

HOLGUIN, FAHAN & ASSOCIATES, INC.

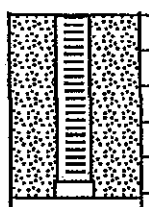
LOG OF EXPLORATORY BORING

MW-6

SAMPLE INTERVAL	DEPTH (fbg)	CLIENT: Chevron Products Company PROJECT: Service Station #9-8719 LOCATION: 26988 Ortega Hwy, San Juan Capistrano, CA DESCRIPTION AND SOIL CLASSIFICATION NAME: %gravel/sand/fines, gradation/plasticity, color, angularity, maximum size (gravels), density/consistency, moisture, odor, stain	BLOWS PER 6 INCHES	PID (ppmv)	USCS
	35				CL
	40		9,11,13	0	
	45				
	50				
	55				
	60				
	65				
	70				

COMPLETION DETAIL
- [x] GROUNDWATER WELL
- [ ] VADOSE WELL
- [ ] SPARGE WELL
- [ ] BORING

CASING: 4-inch SCH 40 PVC
SLOT SIZE: 0.02 inch
FILTER PACK: #3 Monterey Sand



DRILLING METHOD: CME-75 10"-OD, hollow-stem auger	DATE DRILLED: April 26, 1999
SAMPLER TYPE: 1.5"-ID, California-modified split spoon	LOGGED BY: J. Zenor
TOTAL BORING DEPTH: 40 fbg	APPROVED BY: J. Haslett, RG #5641
DEPTH TO WATER: 30 fbg	DRILLED BY: Cascade Drilling, Inc.-California

HOLGUIN, FAHAN & ASSOCIATES, INC.

LOG OF EXPLORATORY BORING

MW-6

CLIENT: Chevron Products Company

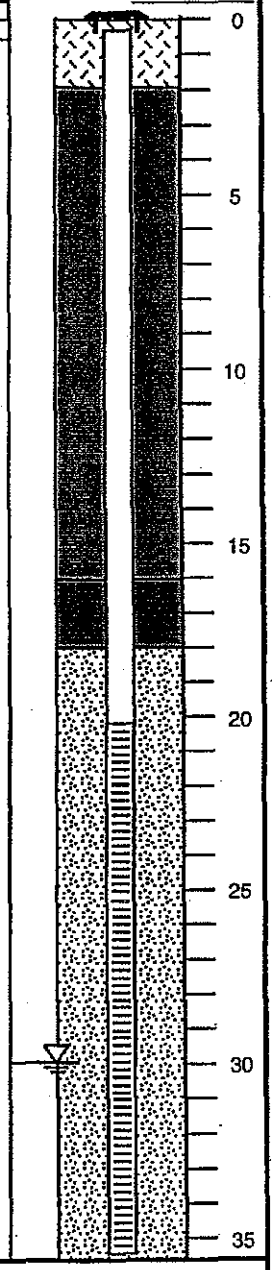
PROJECT: Service Station #9-8719

LOCATION: 26988 Ortega Hwy, San Juan Capistrano, CA

COMPLETION DETAIL
- [x] GROUNDWATER WELL
- [ ] VADOSE WELL
- [ ] SPARGE WELL
- [ ] BORING

CASING: 4-Inch SCH 40 PVC
SLOT SIZE: 0.02 inch
FILTER PACK: #3 Monterey Sand

Depth	DESCRIPTION AND SOIL CLASSIFICATION NAME: %gravel/sand/fines, gradation/plasticity, color, angularity, maximum size (gravels), density/consistency, moisture, odor, stain	BLOWS PER 6 INCHES	PID (ppmv)	USCS
0	6" of asphalt			
	SILTY CLAY: 0/0/100, low plasticity, brown, very stiff, slightly moist, no odor, no stain			CL
5		7/11/13	0	
10		10/12/14	0	
15	dark olive gray	9/12/13	0	
20	olive gray	9/12/16	0	
25		10/13/14	0	
30	very moist	11/13/15	0	
35	wet	5/11/17	0	



DRILLING METHOD: CME™-75 10"-OD, hollow-stem auger	DATE DRILLED: April 14, 2000
SAMPLER TYPE: 1.5"-ID, California-modified split spoon	LOGGED BY: J. Zenor, RG #6701
TOTAL BORING DEPTH: 40 fbg	APPROVED BY: J. Haslett, RG #5641
DEPTH TO WATER: 30 fbg	DRILLED BY: Cascade Drilling, Inc.-California

HOLGUIN, FAHAN & ASSOCIATES, INC.

LOG OF EXPLORATORY BORING

MW-7

CLIENT: Chevron Products Company

PROJECT: Service Station #9-8719

LOCATION: 26988 Ortega Hwy, San Juan Capistrano, CA

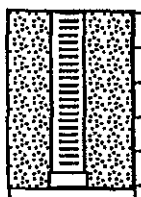
DESCRIPTION AND SOIL CLASSIFICATION

NAME: %gravel/sand/fines, gradation/plasticity, color, angularity, maximum size (gravels), density/consistency, moisture, odor, stain

COMPLETION DETAIL
- [x] GROUNDWATER WELL
- [ ] VADOSE WELL
- [ ] SPARGE WELL
- [ ] BORING

CASING: 4-Inch SCH 40 PVC
SLOT SIZE: 0.02 Inch
FILTER PACK: #3 Monterey Sand

D (fbg)	BLOWS PER 6 INCHES	PID (ppmv)	USCS
35			CL
	9,11,13	0	
40			
45			
50			
55			
60			
65			
70			



DRILLING METHOD: CME™-75 10"-OD, hollow-stem auger	DATE DRILLED: April 14, 2000
SAMPLER TYPE: 1.5"-ID, California-modified split spoon	LOGGED BY: J. Zenor, RG #6701
TOTAL BORING DEPTH: 40 fbg	APPROVED BY: J. Haslett, RG #5641
DEPTH TO WATER: 30 fbg	DRILLED BY: Cascade Drilling, Inc.-California

HOLGUIN, FAHAN & ASSOCIATES, INC.

LOG OF EXPLORATORY BORING

MW-7

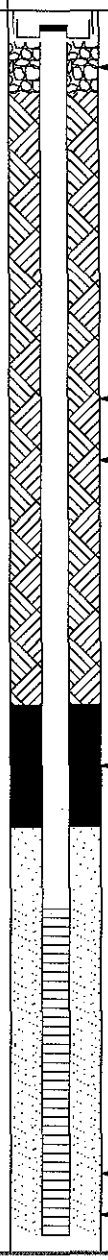
Cambria Environmental Technology Inc.
18 Technology Drive, Suite 167
Irvine, CA 92618
Telephone: (949) 428-8990
Fax: (949) 428-8995

BORING/WELL LOG

CLIENT NAME	Chevron Environmental Management Company	**BORING/WELL NAME**	MW-8
JOB/SITE NAME	Chevron Station 9-8719	**DRILLING STARTED**	21-Aug-06
LOCATION	26988 Ortega Highway, San Juan Capistrano ,CA	**DRILLING COMPLETED**	22-Aug-06
PROJECT NUMBER	61H-2129	**WELL DEVELOPMENT DATE (YIELD)**	12-Sep-06 (90 Gallons)
DRILLER	BC2 Environmental Corp.	**GROUND SURFACE ELEVATION**	107.62 ft above msl
DRILLING METHOD	Hollow-stem auger	**TOP OF CASING ELEVATION**	108.06 ft above msl
BORING DIAMETER	10	**SCREENED INTERVAL**	22 to 37 fbg
LOGGED BY	Derek Wilken	**DEPTH TO WATER (First Encountered)**	28.5 fbg (22-Aug-06) ▽
REVIEWED BY	L. Lowry, PG# 7870	**DEPTH TO WATER (Static)**	23.2 fbg (12-Sep-06) ▼
REMARKS	Cleared to 8 fbg using air knife.		

PID (ppm)	BLOW COUNTS	SAMPLE ID	EXTENT	DEPTH (fbg)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH (fbg)
					SP		**SAND with gravel:** Brown; dry; 75% sand, 25% gravel; high estimated permeability.	1.0
					CL		**CLAY:** Blue-gray; damp; 80% clay, 20% silt; high estimated plasticity, low estimated permeability.	2.0
								4.0
0		MW-8 @ 5'		5	ML		**SILT:** Brown; dry; 80% silt, 10% clay, 10% sand; low estimated plasticity, medium estimated permeability.	5.0
								8.5
0	7 9 15	MW-8 @ 10'		10	CL		**CLAY:** Brown; dry; 60% clay, 40% silt; medium estimated plasticity, low estimated permeability.	10.0
								13.5
0	5 9 13	MW-8 @ 15'		15	CL		**CLAY:** Brown; damp; 60% clay, 40% silt; medium estimated plasticity, low estimated permeability.	15.0
								18.5
0	8 11 13	MW-8 @ 20'		20	CL		**CLAY:** Brown; damp; 80% clay, 20% silt; high estimated plasticity, low estimated permeability.	20.0
								▼ 23.5
0	7 9 11	MW-8 @ 25'		25	CL		**CLAY:** Brown; damp; 90% clay, 10% silt; high estimated plasticity, low estimated permeability.	25.0
								▽ 28.5
0.1	7 10 15	MW-8 @		30	CL		**CLAY:** Brown; wet; 75% clay, 25% silt; high estimated plasticity, low estimated permeability.	30.0

WELL DIAGRAM



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WELL LOG PID IRVINE C:\DOCUMENTS AND SETTINGS\MCGOWAN\DESKTOP\9-8719.GPJ DEFAULT.GDT 9/28/06

Cambria Environmental Technology Inc.
18 Technology Drive, Suite 167
Irvine, CA 92618
Telephone: (949) 428-8990
Fax: (949) 428-8995

BORING/WELL LOG

CLIENT NAME	Chevron Environmental Management Company	**BORING/WELL NAME**	MW-8
JOB/SITE NAME	Chevron Station 9-8719	**DRILLING STARTED**	21-Aug-06
LOCATION	26988 Ortega Highway, San Juan Capistrano ,CA	**DRILLING COMPLETED**	22-Aug-06

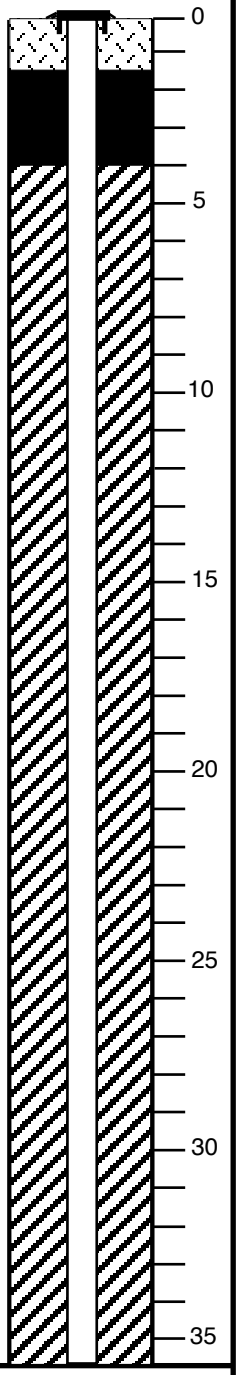
Continued from Previous Page

PID (ppm)	BLOW COUNTS	SAMPLE ID	EXTENT	DEPTH (fbg)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH (fbg)	WELL DIAGRAM
		30'							Slotted Schedule 40 PVC
								33.5	
	7 11 14				CL		**CLAY:** Brown; wet; 85% clay, 15% silt; high estimated plasticity, low estimated permeability.		
1.8		MW-8 @ 35'		35				35.0	
								37.0	Bottom of Boring @ 37 fbg

SAMPLE INTERVAL	DEPTH (fbg)	CLIENT: Chevron Environmental Management Company PROJECT: Service Station #9-8719 LOCATION: 26988 Ortega Highway, San Juan Capistrano, California DESCRIPTION AND SOIL CLASSIFICATION NAME: %gravel/sand/fines, gradation/plasticity, color, angularity, maximum size (gravels), density/consistency, moisture, stain	BLOWS PER 6 INCHES	PID (ppmv)	USCS
	0	4 inches asphalt			
		CLAYEY SILT: 0/0/100, medium plasticity, olive gray, very stiff, moist, no stain			ML
	5				
	10		8,8,10	0	
	15				
	20				
		SILTY CLAY: 0/0/100, medium plasticity, olive gray, very stiff, moist, no stain	5,7,9	0	CL
	25				
	30		7,8,10	0	
	35				

COMPLETION DETAIL
- [X] GROUNDWATER WELL
- [ ] VADOSE WELL
- [ ] SPARGE WELL
- [ ] BORING

CASING: 4-inch PVC
SLOT SIZE: 0.02 inch
FILTER PACK: #3 Sand



DRILLING METHOD: Limited access rig, 10-inch hollow-stem auger	DATE DRILLED: June 9, 2009; June 15, 2009; June 16, 2009
SAMPLER TYPE: 2-inch California-modified split spoon	LOGGED BY: Eli Scott
TOTAL BORING DEPTH: 56.5 fbg	APPROVED BY: Todd McFarland, PG #7685
DEPTH TO WATER: 40 fbg	DRILLED BY: Cascade Drilling, Inc.

HOLGUIN, FAHAN & ASSOCIATES, INC.

LOG OF EXPLORATORY BORING

MW-8B

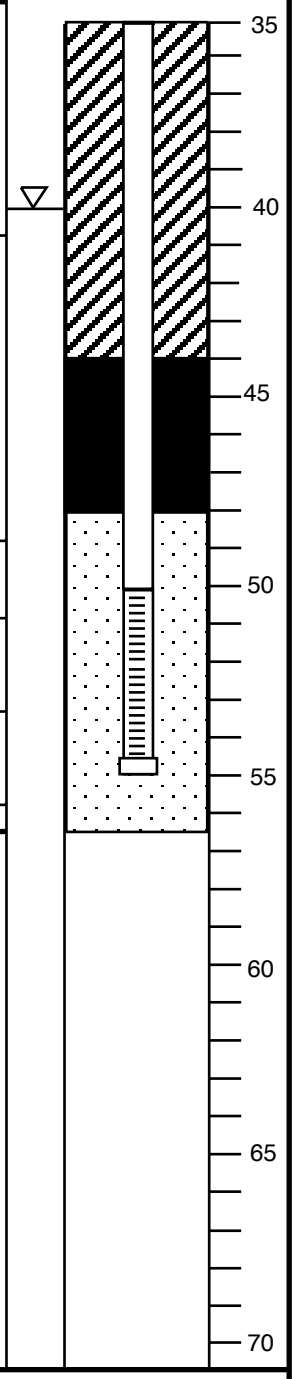
REVISION DATE: APRIL 9, 2010:MCH

SAMPLE INTERVAL	DEPTH (fbg)	CLIENT: Chevron Environmental Management Company PROJECT: Service Station #9-8719 LOCATION: 26988 Ortega Highway, San Juan Capistrano, California DESCRIPTION AND SOIL CLASSIFICATION NAME: %gravel/sand/fines, gradation/plasticity, color, angularity, maximum size (gravels), density/consistency, moisture, stain	BLOWS PER 6 INCHES	PID (ppmv)	USCS
	35				CL
	40	wet	5,9,11	0	
		SILT WITH CLAY: 0/0/100, low plasticity, olive gray, very stiff, wet, no stain			ML
	45				
	50	SILTY CLAY: 0/0/100, medium plasticity, olive gray, stiff, wet, no stain	4,6,7	0	CL
		SILT WITH CLAY: 0/0/100, low plasticity, olive gray, stiff, wet, no stain			ML
	55	SILTY CLAY: 0/0/100, medium plasticity, olive gray, stiff, wet, no stain	5,5,8	0	CL
		SILTY SAND: 0/70/30, well-graded, olive gray, fine- to coarse-grained sand, medium dense, wet, no stain			SM
	60				
	65				
	70				

COMPLETION DETAIL

- [X] GROUNDWATER WELL
- [ ] VADOSE WELL
- [ ] SPARGE WELL
- [ ] BORING

CASING: 4-inch PVC
SLOT SIZE: 0.02 inch
FILTER PACK: #3 Sand



DRILLING METHOD: Limited access rig, 10-inch hollow-stem auger	DATE DRILLED: June 9, 2009; June 15, 2009; June 16, 2009
SAMPLER TYPE: 2-inch California-modified split spoon	LOGGED BY: Eli Scott
TOTAL BORING DEPTH: 56.5 fbg	APPROVED BY: Todd McFarland, PG #7685
DEPTH TO WATER: 40 fbg	DRILLED BY: Cascade Drilling, Inc.

HOLGUIN, FAHAN & ASSOCIATES, INC.

LOG OF EXPLORATORY BORING

MW-8B

REVISION DATE: APRIL 9, 2010:MCH

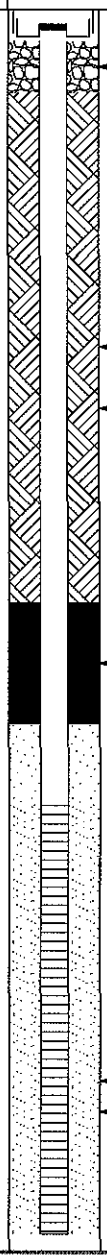
Cambria Environmental Technology Inc.
18 Technology Drive, Suite 167
Irvine, CA 92618
Telephone: (949) 428-8990
Fax: (949) 428-8995

BORING/WELL LOG

CLIENT NAME	Chevron Environmental Management Company	**BORING/WELL NAME**	MW-9
JOB/SITE NAME	Chevron Station 9-8719	**DRILLING STARTED**	21-Aug-06
LOCATION	26988 Ortega Highway, San Juan Capistrano ,CA	**DRILLING COMPLETED**	24-Aug-06
PROJECT NUMBER	61H-2129	**WELL DEVELOPMENT DATE (YIELD)**	12-Sep-06 (60 Gallons)
DRILLER	BC2 Environmental Corp.	**GROUND SURFACE ELEVATION**	108.04 ft above msl
DRILLING METHOD	Hollow-stem auger	**TOP OF CASING ELEVATION**	108.42 ft above msl
BORING DIAMETER	10	**SCREENED INTERVAL**	19.5 to 34.5 fbg
LOGGED BY	Derek Wilken	**DEPTH TO WATER (First Encountered)**	24.5 fbg (24-Aug-06) ▽
REVIEWED BY	L. Lowry, PG# 7870	**DEPTH TO WATER (Static)**	23.1 fbg (12-Sep-06) ▼
REMARKS	Cleared to 8 fbg using air knife.		

PID (ppm)	BLOW COUNTS	SAMPLE ID	EXTENT	DEPTH (fbg)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH (fbg)
					SP		**SAND with gravel:** Brown; dry; 75% sand, 25% gravel; high estimated permeability.	1.0
					CL		**CLAY:** Blue-gray; damp; 85% clay, 15% silt; high estimated plasticity, low estimated permeability.	2.0
					ML		**SILT :** Blue-gray; dry; 95% silt, 5% clay; low estimated plasticity, moderate estimated permeability.	3.0
								4.0
1.5		MW-9 @ 5'		5	CL		**CLAY:** Brown; dry; 80% clay, 20% silt; high estimated plasticity, low estimated permeability.	5.0
	5 7 10				ML		**SILT:** Brown; dry; 65% silt, 35% clay, low estimated plasticity, high estimated permeability.	8.5
0		MW-9 @ 10'		10				10.0
	8 10 11				CL		**CLAY:** Brown; dry; 75% clay, 20% silt, 5% sand; medium estimated plasticity, medium estimated permeability.	13.5
0		MW-9 @ 15'		15				15.0
	10 13 16				ML		**SILT:** Brown; dry; 60% silt, 40% clay; low estimated plasticity, medium estimated permeability.	18.5
0.2		MW-9 @ 20'		20				20.0
								▼ 23.5
	7 10 14				ML		**SILT with gravel:** Brown; wet; 65% silt, 15% clay, 15% gravel, 5% sand; low estimated plasticity, high estimated permeability. ▽	
0		MW-9 @ 25'		25				25.0
	7 10 16				ML		**SILT with sand:** Brown; wet; 45% silt, 35% clay, 20% sand; moderate estimated plasticity, high estimated	28.5
0		MW-9 @		30				30.0

WELL DIAGRAM



Continued Next Page

WELL LOG PID IRVINE C:\DOCUMENTS AND SETTINGS\MCGOWAN\DESKTOP\9-8719.GPJ DEFAULT.GDT 9/28/06

Cambria Environmental Technology Inc.
18 Technology Drive, Suite 167
Irvine, CA 92618
Telephone: (949) 428-8990
Fax: (949) 428-8995

BORING/WELL LOG

CLIENT NAME	Chevron Environmental Management Company	**BORING/WELL NAME**	MW-9
JOB/SITE NAME	Chevron Station 9-8719	**DRILLING STARTED**	21-Aug-06
LOCATION	26988 Ortega Highway, San Juan Capistrano ,CA	**DRILLING COMPLETED**	24-Aug-06

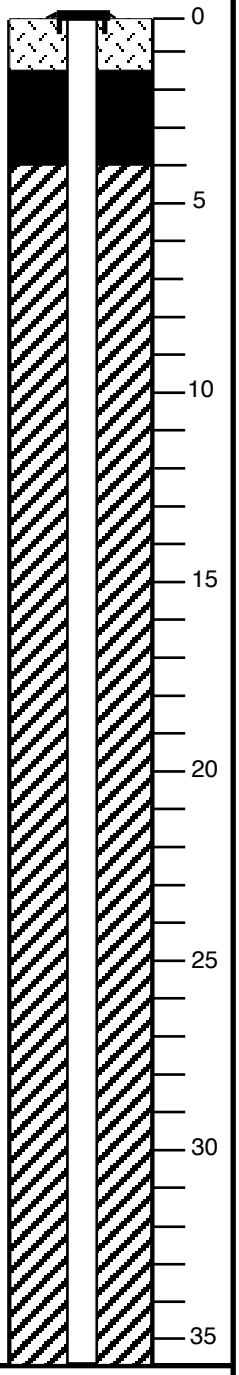
Continued from Previous Page

PID (ppm)	BLOW COUNTS	SAMPLE ID	EXTENT	DEPTH (fbg)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH (fbg)	WELL DIAGRAM
		30'					permeability.		
								33.5	
	10 14 16				ML		**SILT** : Brown; wet; 55% silt, 40% clay, 5% sand; medium estimated plasticity, medium estimated permeability.		
0		MW-9 @ 35'		35				35.0	Bottom of Boring @ 35 fbg

SAMPLE INTERVAL	DEPTH (fbg)	CLIENT: Chevron Environmental Management Company PROJECT: Service Station #9-8719 LOCATION: 26988 Ortega Highway, San Juan Capistrano, California DESCRIPTION AND SOIL CLASSIFICATION NAME: %gravel/sand/fines, gradation/plasticity, color, angularity, maximum size (gravels), density/consistency, moisture, stain	BLOWS PER 6 INCHES	PID (ppmv)	USCS
	0	4 inches asphalt			
		CLAYEY SILT: 0/0/100, medium plasticity, olive gray, stiff, moist, no stain			ML
	5				
	10		4,5,8	27	
	15				
	20	SILTY CLAY: 0/0/100, high plasticity, olive gray, very stiff, moist, no stain	9,9,13	31	CH
	25				
	30	hard	12,14,20	19.6	
	35				

COMPLETION DETAIL
- [X] GROUNDWATER WELL
- [ ] VADOSE WELL
- [ ] SPARGE WELL
- [ ] BORING

CASING: 4-inch PVC
SLOT SIZE: 0.02 inch
FILTER PACK: #3 Sand



DRILLING METHOD: Limited access rig, 10-inch hollow-stem auger	DATE DRILLED: June 9, 2009; June 22, 2009; June 23, 2009
SAMPLER TYPE: 2-inch California-modified split spoon	LOGGED BY: Eli Scott
TOTAL BORING DEPTH: 56.5 fbg	APPROVED BY: Todd McFarland, PG #7685
DEPTH TO WATER: 40 fbg	DRILLED BY: Cascade Drilling, Inc.

HOLGUIN, FAHAN & ASSOCIATES, INC.

LOG OF EXPLORATORY BORING

MW-9B

REVISION DATE: APRIL 9, 2010:MCH

SAMPLE INTERVAL	DEPTH (fbg)	DESCRIPTION AND SOIL CLASSIFICATION NAME: %gravel/sand/fines, gradation/plasticity, color, angularity, maximum size (gravels), density/consistency, moisture, stain	BLOWS PER 6 INCHES	PID (ppmv)	USCS
	35				CH
	40	SILTY CLAY: 0/0/100, high plasticity, olive gray, very stiff, wet, no stain	5,11,16	7.1	
	45				
	50	CLAYEY SILT: 0/0/100, medium plasticity, olive gray, very stiff, wet, no stain	11,11,17	1.9	ML
	55	Hard	8,15,16	1.1	
	60				
	65				
	70				

CLIENT: Chevron Environmental Management Company

PROJECT: Service Station #9-8719

LOCATION: 26988 Ortega Highway, San Juan Capistrano, California

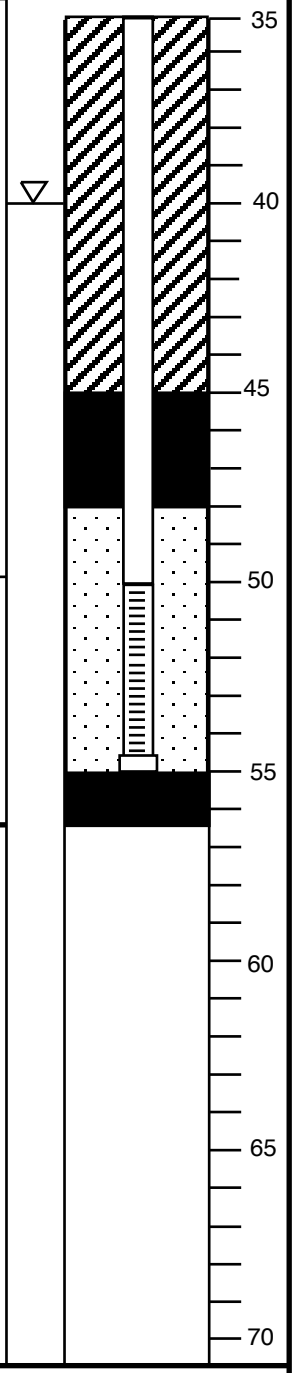
COMPLETION DETAIL

- [X] GROUNDWATER WELL
- [ ] VADOSE WELL
- [ ] SPARGE WELL
- [ ] BORING

CASING: 4-inch PVC

SLOT SIZE: 0.02 inch

FILTER PACK: #3 Sand



DRILLING METHOD: Limited access rig, 10-inch hollow-stem auger	DATE DRILLED: June 9, 2009; June 22, 2009; June 23, 2009
SAMPLER TYPE: 2-inch California-modified split spoon	LOGGED BY: Eli Scott
TOTAL BORING DEPTH: 56.5 fbg	APPROVED BY: Todd McFarland, PG #7685
DEPTH TO WATER: 40 fbg	DRILLED BY: Cascade Drilling, Inc.

HOLGUIN, FAHAN & ASSOCIATES, INC.

LOG OF EXPLORATORY BORING

MW-9B

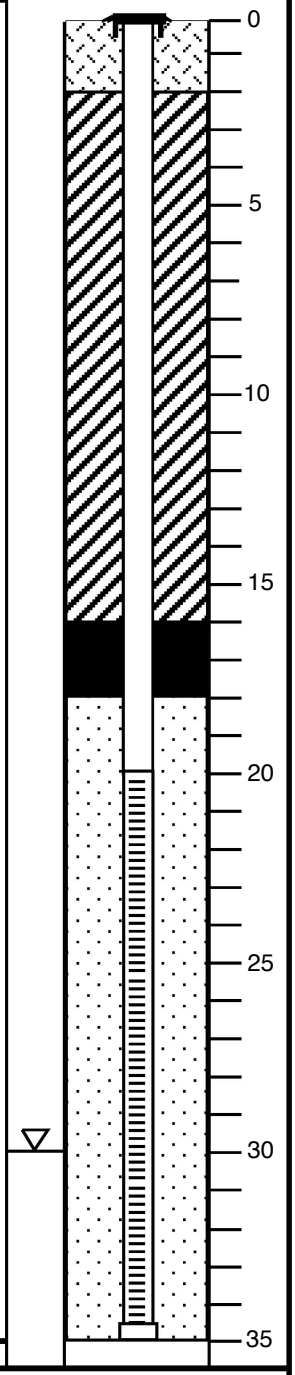
REVISION DATE: APRIL 9, 2010:MCH

SAMPLE INTERVAL	DEPTH (fbg)	CLIENT: Chevron Environmental Management Company PROJECT: Service Station #9-8719 LOCATION: 26988 Ortega Highway, San Juan Capistrano, California DESCRIPTION AND SOIL CLASSIFICATION NAME: %gravel/sand/fines, gradation/plasticity, color, angularity, maximum size (gravels), density/consistency, moisture, stain	BLOWS PER 6 INCHES	PID (ppmv)	USCS
	0	See MW-10B for lithology			
	5				
	10				
	15				
	20				
	25				
	30				
	35				

COMPLETION DETAIL

- [X] GROUNDWATER WELL
- [ ] VADOSE WELL
- [ ] SPARGE WELL
- [ ] BORING

CASING: 4-inch PVC
SLOT SIZE: 0.02-inch
FILTER PACK: #3 Sand



DRILLING METHOD: Limited access rig, 10-inch hollow-stem auger	DATE DRILLED: April 29, 2009; May 4, 2009
SAMPLER TYPE: 2-inch California-modified split spoon	LOGGED BY: Eli Scott
TOTAL BORING DEPTH: 35 fbg	APPROVED BY: Todd McFarland, PG #7685
DEPTH TO WATER: 30 fbg	DRILLED BY: Cascade Drilling, Inc.

HOLGUIN, FAHAN & ASSOCIATES, INC.

LOG OF EXPLORATORY BORING

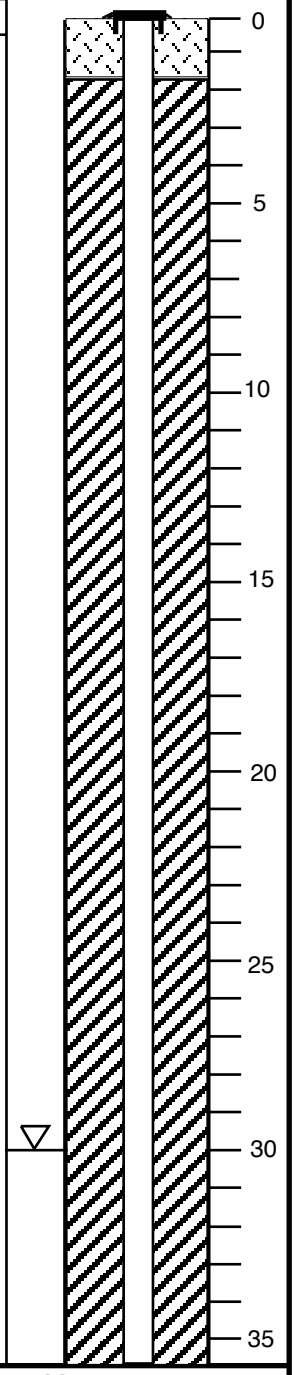
MW-10A

REVISION DATE: APRIL 9, 2010:MCH

SAMPLE INTERVAL	DEPTH (fbg)	CLIENT: Chevron Environmental Management Company PROJECT: Service Station #9-8719 LOCATION: 26988 Ortega Highway, San Juan Capistrano, California DESCRIPTION AND SOIL CLASSIFICATION NAME: %gravel/sand/fines, gradation/plasticity, color, angularity, maximum size (gravels), density/consistency, moisture, stain	BLOWS PER 6 INCHES	PID (ppmv)	USCS
	0	6 inches asphalt			
		SILTY CLAY: 0/0/100, medium plasticity, olive gray, soft, moist, dark gray stain			CL
	5				
	10		5,7,8	0	
	15				
	20	stiff, no stain	7,7,14	0.9	
	25		8,12,17	0	
	30	dark gray, no stain wet	10,13,14	0	
	35				

COMPLETION DETAIL
- [X] GROUNDWATER WELL
- [ ] VADOSE WELL
- [ ] SPARGE WELL
- [ ] BORING

CASING: 4-inch PVC
SLOT SIZE: 0.02 inch
FILTER PACK: #3 Sand



DRILLING METHOD: Limited access rig, 10-inch hollow-stem auger	DATE DRILLED: April 29, 2009; May 4, 2009
SAMPLER TYPE: 2-inch California-modified split spoon	LOGGED BY: Eli Scott
TOTAL BORING DEPTH: 55 fbg	APPROVED BY: Todd McFarland, PG #7685
DEPTH TO WATER: 30 fbg	DRILLED BY: Cascade Drilling, Inc.

HOLGUIN, FAHAN & ASSOCIATES, INC.

LOG OF EXPLORATORY BORING

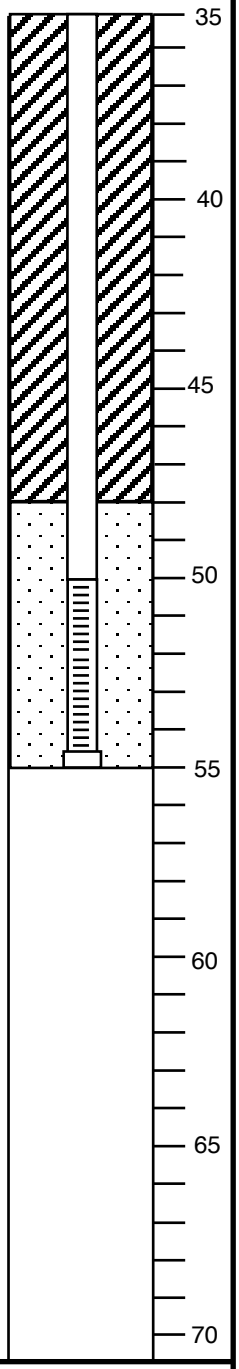
MW-10B

REVISION DATE: APRIL 9, 2010:MCH

SAMPLE INTERVAL	DEPTH (fbg)	CLIENT: Chevron Environmental Management Company PROJECT: Service Station #9-8719 LOCATION: 26988 Ortega Highway, San Juan Capistrano, California DESCRIPTION AND SOIL CLASSIFICATION NAME: %gravel/sand/fines, gradation/plasticity, color, angularity, maximum size (gravels), density/consistency, moisture, stain	BLOWS PER 6 INCHES	PID (ppmv)	USCS
	35				CL
	40	CLAY: 0/0/100, high plasticity, light brown, very stiff, wet, no stain	10,10,15	0	CH
	45				
	50		7,9,17	0	
	55				
	60				
	65				
	70				

COMPLETION DETAIL
- [X] GROUNDWATER WELL
- [ ] VADOSE WELL
- [ ] SPARGE WELL
- [ ] BORING

CASING: 4-inch PVC
SLOT SIZE: 0.02 inch
FILTER PACK: #3 Sand



DRILLING METHOD: Limited access rig, 10-inch hollow-stem auger	DATE DRILLED: April 29, 2009; May 4, 2009
SAMPLER TYPE: 2-inch California-modified split spoon	LOGGED BY: Eli Scott
TOTAL BORING DEPTH: 55 fbg	APPROVED BY: Todd McFarland, PG #7685
DEPTH TO WATER: 30 fbg	DRILLED BY: Cascade Drilling, Inc.

HOLGUIN, FAHAN & ASSOCIATES, INC.

LOG OF EXPLORATORY BORING

MW-10B

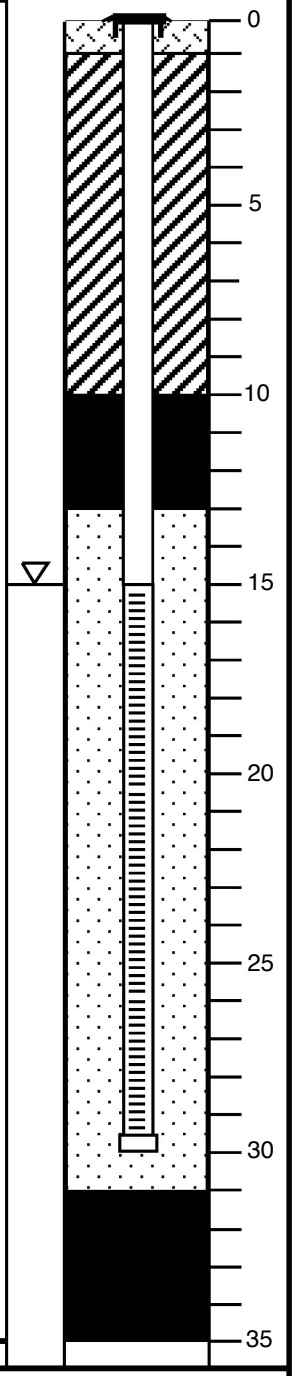
REVISION DATE: APRIL 9, 2010:MCH

SAMPLE INTERVAL	DEPTH (fbg)	CLIENT: Chevron Environmental Management Company PROJECT: Service Station #9-8719 LOCATION: 26988 Ortega Highway, San Juan Capistrano, California DESCRIPTION AND SOIL CLASSIFICATION NAME: %gravel/sand/fines, gradation/plasticity, color, angularity, maximum size (gravels), density/consistency, moisture, stain	BLOWS PER 6 INCHES	PID (ppmv)	USCS
	0	See MW-11B for lithology			
	5				
	10				
	15				
	20				
	25				
	30				
	35				

COMPLETION DETAIL

- [X] GROUNDWATER WELL
- [ ] VADOSE WELL
- [ ] SPARGE WELL
- [ ] BORING

CASING: 4-inch PVC
SLOT SIZE: 0.02 inch
FILTER PACK: #3 Sand



DRILLING METHOD: Limited access rig, 10-inch hollow-stem auger	DATE DRILLED: April 20, 2009; April 21, 2009; May 6, 2009
SAMPLER TYPE: 2-inch California-modified split spoon	LOGGED BY: Jeff Nobriga
TOTAL BORING DEPTH: 35 fbg	APPROVED BY: Todd McFarland, PG #7685
DEPTH TO WATER: 15 fbg	DRILLED BY: Cascade Drilling, Inc.

HOLGUIN, FAHAN & ASSOCIATES, INC.

LOG OF EXPLORATORY BORING

MW-11A

REVISION DATE: APRIL 9, 2010:MCH

SAMPLE INTERVAL	DEPTH (fbg)	DESCRIPTION AND SOIL CLASSIFICATION NAME: %gravel/sand/fines, gradation/plasticity, color, angularity, maximum size (gravels), density/consistency, moisture, stain	BLOWS PER 6 INCHES	PID (ppmv)	USCS
	0	6 inches asphalt			
		CLAYEY SILT: 0/0/100, low plasticity, olive gray, very stiff, moist, no stain			ML
	5				
■	10		6,7,11	0.5	
	15				
■	20	wet	9,9,10	0.7	
	25				
■	30	wet, 1-inch band of fine-grained sand	7,12,14	0	
	35				

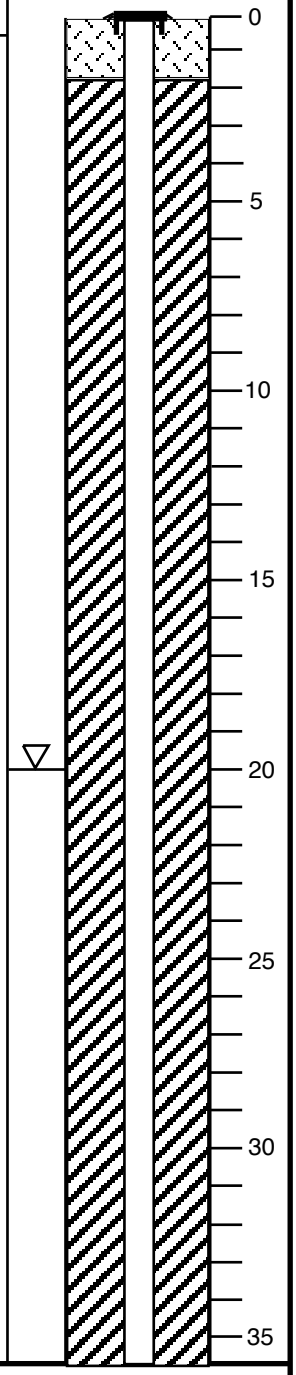
CLIENT: Chevron Environmental Management Company

PROJECT: Service Station #9-8719

LOCATION: 26988 Ortega Highway, San Juan Capistrano, California

COMPLETION DETAIL
- [X] GROUNDWATER WELL
- [ ] VADOSE WELL
- [ ] SPARGE WELL
- [ ] BORING

CASING: 4-inch PVC
SLOT SIZE: 0.02 inch
FILTER PACK: #3 Sand



DRILLING METHOD: Limited access rig, 10-inch hollow-stem auger	DATE DRILLED: April 20, 2009; April 21, 2009; May 5, 2009
SAMPLER TYPE: 2-inch California-modified split spoon	LOGGED BY: Joshua Barraza
TOTAL BORING DEPTH: 55 fbg	APPROVED BY: Todd McFarland, PG #7685
DEPTH TO WATER: 20 fbg	DRILLED BY: Cascade Drilling, Inc.

HOLGUIN, FAHAN & ASSOCIATES, INC.

LOG OF EXPLORATORY BORING

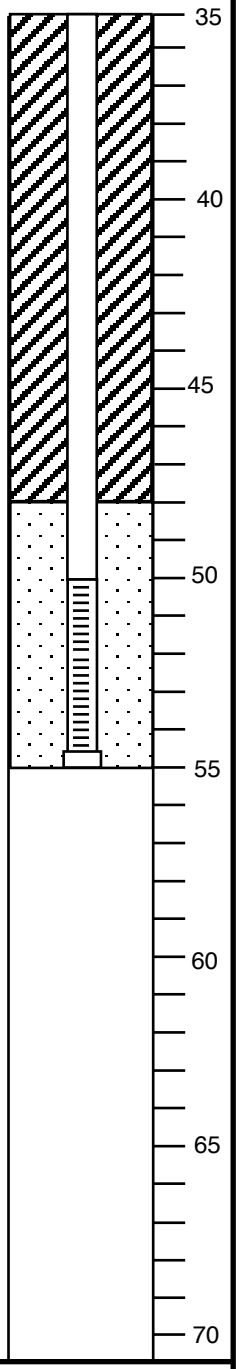
MW-11B

REVISION DATE: APRIL 9, 2010:MCH

SAMPLE INTERVAL	DEPTH (fbg)	CLIENT: Chevron Environmental Management Company PROJECT: Service Station #9-8719 LOCATION: 26988 Ortega Highway, San Juan Capistrano, California DESCRIPTION AND SOIL CLASSIFICATION NAME: %gravel/sand/fines, gradation/plasticity, color, angularity, maximum size (gravels), density/consistency, moisture, stain	BLOWS PER 6 INCHES	PID (ppmv)	USCS
	35				ML
	40	SILTY CLAY: 0/0/100, low plasticity, olive gray, very stiff, wet, no stain	10,14,15	0.1	CL
	45				
	50	CLAYEY SILT: 0/0/100, low plasticity, olive gray, very stiff, wet, no stain	7,9,13	0	ML
	55		8,8,9	0	
	60				
	65				
	70				

COMPLETION DETAIL
- [X] GROUNDWATER WELL
- [ ] VADOSE WELL
- [ ] SPARGE WELL
- [ ] BORING

CASING: 4-inch PVC
SLOT SIZE: 0.02 inch
FILTER PACK: #3 Sand



DRILLING METHOD: Limited access rig, 10-inch hollow-stem auger	DATE DRILLED: April 20, 2009; April 21, 2009; May 5, 2009
SAMPLER TYPE: 2-inch California Modified-split spoon	LOGGED BY: Joshua Barraza
TOTAL BORING DEPTH: 55 fbg	APPROVED BY: Todd McFarland, PG #7685
DEPTH TO WATER: 20 fbg	DRILLED BY: Cascade Drilling, Inc.

HOLGUIN, FAHAN & ASSOCIATES, INC.

LOG OF EXPLORATORY BORING

MW-11B

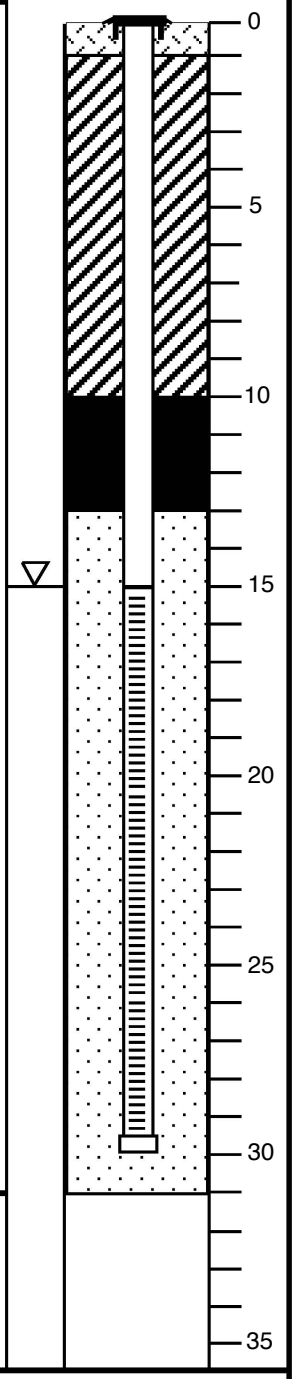
REVISION DATE: APRIL 9, 2010:MCH

SAMPLE INTERVAL	DEPTH (fbg)	CLIENT: Chevron Environmental Management Company PROJECT: Service Station #9-8719 LOCATION: 26988 Ortega Highway, San Juan Capistrano, California DESCRIPTION AND SOIL CLASSIFICATION NAME: %gravel/sand/fines, gradation/plasticity, color, angularity, maximum size (gravels), density/consistency, moisture, stain	BLOWS PER 6 INCHES	PID (ppmv)	USCS
	0	See MW-12B for lithology			
	5				
	10				
	15				
	20				
	25				
	30				
	35				

COMPLETION DETAIL

- [X] GROUNDWATER WELL
- [ ] VADOSE WELL
- [ ] SPARGE WELL
- [ ] BORING

CASING: 4-inch PVC
SLOT SIZE: 0.02 inch
FILTER PACK: #3 Sand



DRILLING METHOD: Limited access rig, 10-inch hollow-stem auger	DATE DRILLED: April 20, 2009; April 21, 2009; May 7, 2009
SAMPLER TYPE: 2-inch California-modified split spoon	LOGGED BY: Jeff Nobriga
TOTAL BORING DEPTH: 31 fbg	APPROVED BY: Todd McFarland, PG #7685
DEPTH TO WATER: 15 fbg	DRILLED BY: Cascade Drilling, Inc.

HOLGUIN, FAHAN & ASSOCIATES, INC.

LOG OF EXPLORATORY BORING

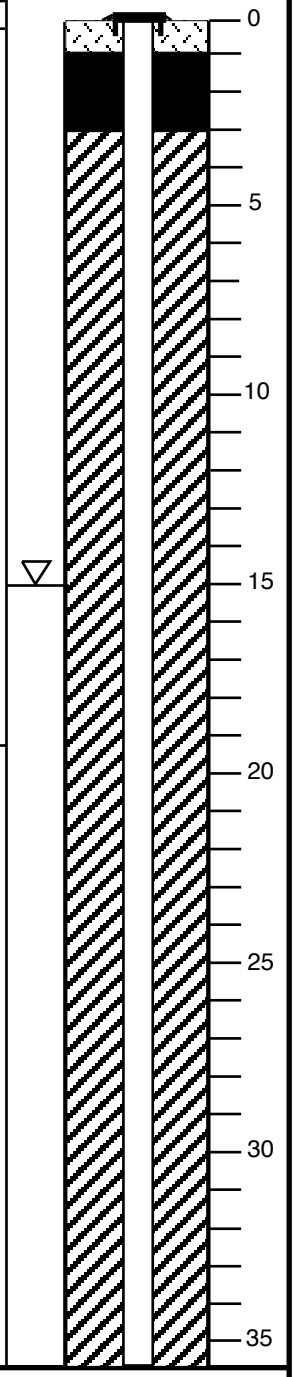
MW-12A

REVISION DATE: APRIL 9, 2010:MCH

SAMPLE INTERVAL	DEPTH (fbg)	CLIENT: Chevron Environmental Management Company PROJECT: Service Station #9-8719 LOCATION: 26988 Ortega Highway, San Juan Capistrano, California DESCRIPTION AND SOIL CLASSIFICATION NAME: %gravel/sand/fines, gradation/plasticity, color, angularity, maximum size (gravels), density/consistency, moisture, stain	BLOWS PER 6 INCHES	PID (ppmv)	USCS
	0	4 inches asphalt			
		SILTY CLAY: 0/0/100, low plasticity, olive gray, hard, moist, no stain			CL
	5				
	10		9,13,22	0	
	15				
	20	CLAYEY SILT: 0/0/100, medium plasticity, olive gray, very stiff, wet, no stain	7,9,14	0	ML
	25				
	30	Wet, 0.39 inch lense of silty sand	6,6,8	0	
	35				

COMPLETION DETAIL
- [X] GROUNDWATER WELL
- [ ] VADOSE WELL
- [ ] SPARGE WELL
- [ ] BORING

CASING: 4-inch PVC
SLOT SIZE: 0.02 inch
FILTER PACK: #3 Sand



DRILLING METHOD: Limited access rig, 10-inch hollow-stem auger	DATE DRILLED: April 20, 2009; April 21, 2009; May 6, 2009
SAMPLER TYPE: 2-inch California-modified-split spoon	LOGGED BY: Joshua Barraza
TOTAL BORING DEPTH: 61.5 fbg	APPROVED BY: Todd McFarland, PG #7685
DEPTH TO WATER: 15 fbg	DRILLED BY: Cascade Drilling, Inc.

HOLGUIN, FAHAN & ASSOCIATES, INC.

LOG OF EXPLORATORY BORING

MW-12B

REVISION DATE: APRIL 9, 2010:MCH

SAMPLE INTERVAL	DEPTH (fbg)	DESCRIPTION AND SOIL CLASSIFICATION NAME: %gravel/sand/fines, gradation/plasticity, color, angularity, maximum size (gravels), density/consistency, moisture, stain	BLOWS PER 6 INCHES	PID (ppmv)	USCS
	35				ML
	40	wet, 0.39 inch lense of silty sand	10,13,16	0	
	45				
	50		10,10,6	0	
	55	low plasticity, stiff	4,5,6	--	
	60	medium plasticity, very stiff	11,14,15	0	
	65				
	70				

CLIENT: Chevron Environmental Management Company

PROJECT: Service Station #9-8719

LOCATION: 26988 Ortega Highway, San Juan Capistrano, California

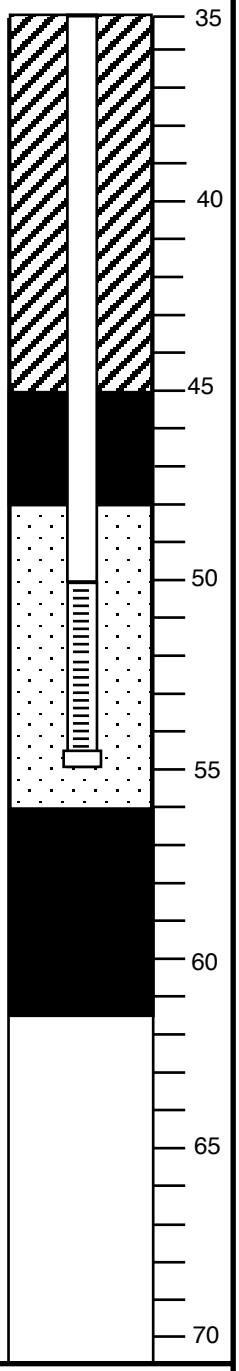
COMPLETION DETAIL

- [X] GROUNDWATER WELL
- [ ] VADOSE WELL
- [ ] SPARGE WELL
- [ ] BORING

CASING: 4-inch PVC

SLOT SIZE: 0.02 inch

FILTER PACK: #3 Sand



DRILLING METHOD: Limited access rig, 10-inch hollow-stem auger	DATE DRILLED: April 20, 2009; April 21, 2009; May 6, 2009
SAMPLER TYPE: 2-inch California-modified-split spoon	LOGGED BY: Joshua Barraza
TOTAL BORING DEPTH: 61.5 fbg	APPROVED BY: Todd McFarland, PG #7685
DEPTH TO WATER: 15 fbg	DRILLED BY: Cascade Drilling, Inc.

HOLGUIN, FAHAN & ASSOCIATES, INC.

LOG OF EXPLORATORY BORING

MW-12B

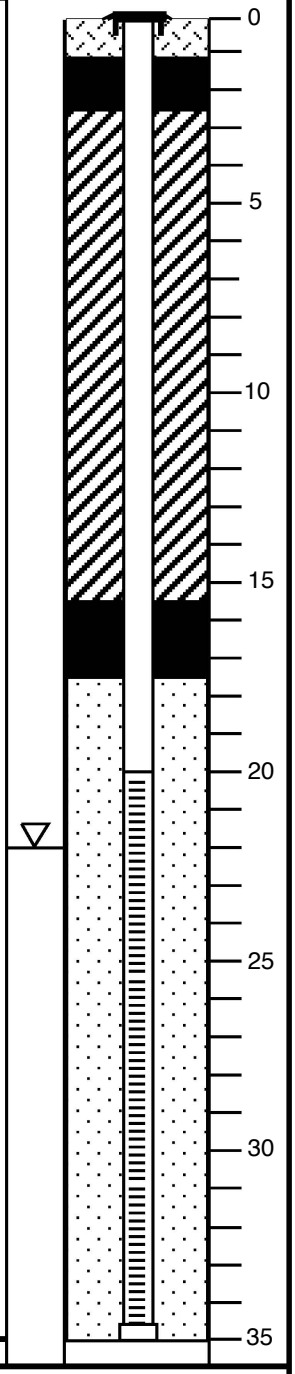
REVISION DATE: APRIL 9, 2010:MCH

SAMPLE INTERVAL	DEPTH (fbg)	CLIENT: Chevron Environmental Management Company PROJECT: Service Station #9-8719 LOCATION: 26988 Ortega Highway, San Juan Capistrano, California DESCRIPTION AND SOIL CLASSIFICATION NAME: %gravel/sand/fines, gradation/plasticity, color, angularity, maximum size (gravels), density/consistency, moisture, stain	BLOWS PER 6 INCHES	PID (ppmv)	USCS
	0	See MW-13B for lithology			
	5				
	10				
	15				
	20				
	25				
	30				
	35				

COMPLETION DETAIL

- [X] GROUNDWATER WELL
- [ ] VADOSE WELL
- [ ] SPARGE WELL
- [ ] BORING

CASING: 4-inch PVC
SLOT SIZE: 0.02 inch
FILTER PACK: #3 Sand



DRILLING METHOD: Limited access rig, 10-inch hollow-stem auger	DATE DRILLED: January 4, 2010; January 13, 2010
SAMPLER TYPE: 2-inch California-modified split spoon	LOGGED BY: Joshua Barraza
TOTAL BORING DEPTH: 35 fbg	APPROVED BY: Todd McFarland, PG #7685
DEPTH TO WATER: 22 fbg	DRILLED BY: WDC Exploration and Wells

HOLGUIN, FAHAN & ASSOCIATES, INC.

LOG OF EXPLORATORY BORING

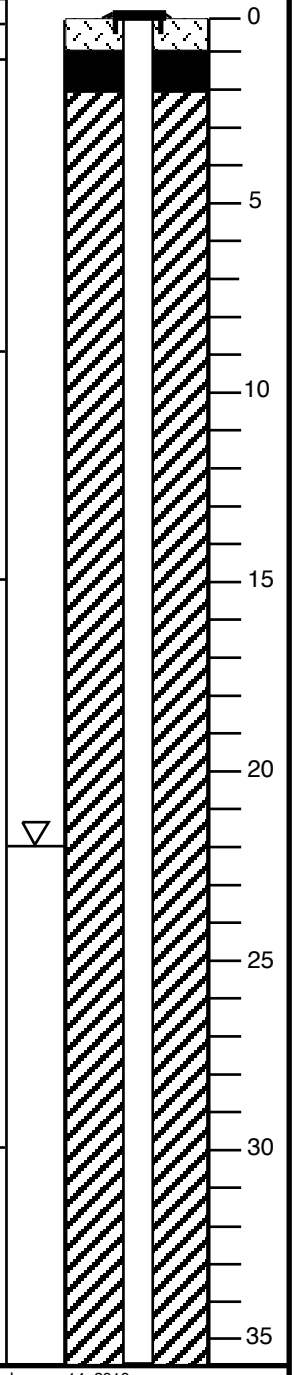
MW-13A

REVISION DATE: APRIL 9, 2010:MCH

SAMPLE INTERVAL	DEPTH (fbg)	CLIENT: Chevron Environmental Management Company PROJECT: Service Station #9-8719 LOCATION: 26988 Ortega Highway, San Juan Capistrano, California DESCRIPTION AND SOIL CLASSIFICATION NAME: %gravel/sand/fines, gradation/plasticity, color, angularity, maximum size (gravels), density/consistency, moisture, stain	BLOWS PER 6 INCHES	PID (ppmv)	USCS
	0	3 inches asphalt			
		12 inches base fill material			
	5	SILTY CLAY: 0/0/100, high plasticity, olive gray, medium stiff, moist, no stain	--	0	CH
	10	SILTY SAND: 0/80/20, poorly graded, olive gray, fine-grained sand, medium dense, moist, no stain	8,18,35	0	SM
	15	SILT WITH SAND: 0/10/90, low plasticity, olive gray, poorly graded, fine-grained sand, hard, moist, no stain	15,20,24	0	ML
	20	CLAYEY SILT: 0/0/100, medium plasticity, olive gray, stiff, moist, no stain	9,13,23	0	
	25	SILT WITH SAND: 0/10/90, low plasticity, olive gray, poorly graded, fine-grained sand, very stiff, wet, no stain	10,11,17	0	
	30	SILTY CLAY: 0/0/100, medium plasticity, olive gray, very stiff, wet, no stain	4,7,10	0	CL
	35				

COMPLETION DETAIL
- [X] GROUNDWATER WELL
- [ ] VADOSE WELL
- [ ] SPARGE WELL
- [ ] BORING

CASING: 4-inch PVC
SLOT SIZE: 0.02 inch
FILTER PACK: #3 Sand



DRILLING METHOD: CME-75, 10-inch hollow-stem auger	DATE DRILLED: January 4, 2010; January 14, 2010; January 25, 2010; February 1, 2010
SAMPLER TYPE: 2-inch California-modified-split spoon	LOGGED BY: Joshua Barraza
TOTAL BORING DEPTH: 57 fbg	APPROVED BY: Todd McFarland, PG #7685
DEPTH TO WATER: 22 fbg	DRILLED BY: WDC Exploration and Wells

HOLGUIN, FAHAN & ASSOCIATES, INC.

LOG OF EXPLORATORY BORING

MW-13B

REVISION DATE: APRIL 9, 2010:MCH

SAMPLE INTERVAL	DEPTH (fbg)	DESCRIPTION AND SOIL CLASSIFICATION NAME: %gravel/sand/fines, gradation/plasticity, color, angularity, maximum size (gravels), density/consistency, moisture, stain	BLOWS PER 6 INCHES	PID (ppmv)	USCS
	35	CLAY WITH SILT: 0/0/100, high plasticity, olive gray, stiff, wet, no stain	6,6,7	0	CL
	40	SILT WITH CLAY: 0/0/100, high plasticity, olive gray, hard, wet, no stain	9,14,24	0	ML
	45	SANDY SILT: 0/20/80, low plasticity, olive gray, hard, wet, no stain	12,14,17	0	
	50	SILTY SAND: 0/80/20, poorly graded, olive gray, fine-grained sand, dense, wet, no stain	17,19,31	0	SM
	55		12,19,27	0	
	60				
	65				
	70				

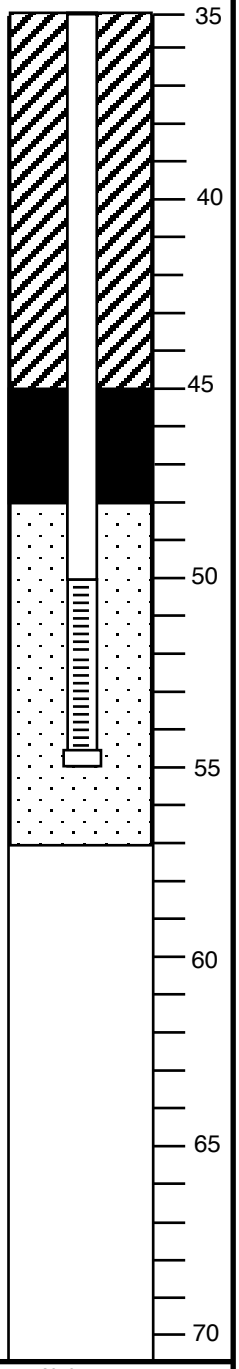
CLIENT: Chevron Environmental Management Company

PROJECT: Service Station #9-8719

LOCATION: 26988 Ortega Highway, San Juan Capistrano, California

COMPLETION DETAIL
- [X] GROUNDWATER WELL
- [ ] VADOSE WELL
- [ ] SPARGE WELL
- [ ] BORING

CASING: 4-inch PVC
SLOT SIZE: 0.02 inch
FILTER PACK: #3 Sand



DRILLING METHOD: CME-75, 10-inch hollow-stem auger	DATE DRILLED: January 4, 2010; January 14, 2010; January 25, 2010; February 1, 2010
SAMPLER TYPE: 2-inch California-modified-split spoon	LOGGED BY: Joshua Barraza
TOTAL BORING DEPTH: 57 fbg	APPROVED BY: Todd McFarland, PG #7685
DEPTH TO WATER: 22 fbg	DRILLED BY: WDC Exploration and Wells

HOLGUIN, FAHAN & ASSOCIATES, INC.

LOG OF EXPLORATORY BORING

MW-13B

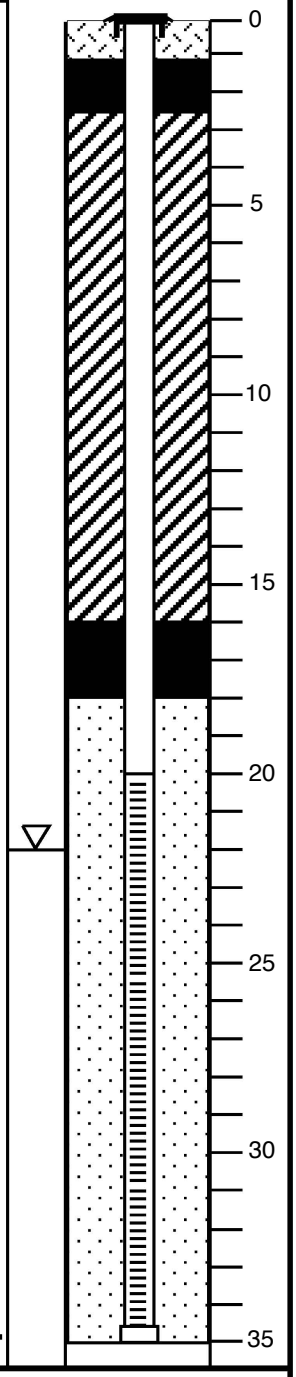
REVISION DATE: APRIL 9, 2010:MCH

SAMPLE INTERVAL	DEPTH (fbg)	CLIENT: Chevron Environmental Management Company PROJECT: Service Station #9-8719 LOCATION: 26988 Ortega Highway, San Juan Capistrano, California DESCRIPTION AND SOIL CLASSIFICATION NAME: %gravel/sand/fines, gradation/plasticity, color, angularity, maximum size (gravels), density/consistency, moisture, stain	BLOWS PER 6 INCHES	PID (ppmv)	USCS
	0	See MW-14B for lithology			
	5				
	10				
	15				
	20				
	25				
	30				
	35				

COMPLETION DETAIL

- [X] GROUNDWATER WELL
- [ ] VADOSE WELL
- [ ] SPARGE WELL
- [ ] BORING

CASING: 4-inch PVC
SLOT SIZE: 0.02 inch
FILTER PACK: #3 Sand



DRILLING METHOD: Limited access rig, 10-inch hollow-stem auger	DATE DRILLED: January 5, 2010; January 12, 2010
SAMPLER TYPE: 2-inch California-modified split spoon	LOGGED BY: Joshua Barraza
TOTAL BORING DEPTH: 35 fbg	APPROVED BY: Todd McFarland, PG #7685
DEPTH TO WATER: 22 fbg	DRILLED BY: WDC Exploration and Wells

HOLGUIN, FAHAN & ASSOCIATES, INC.

LOG OF EXPLORATORY BORING

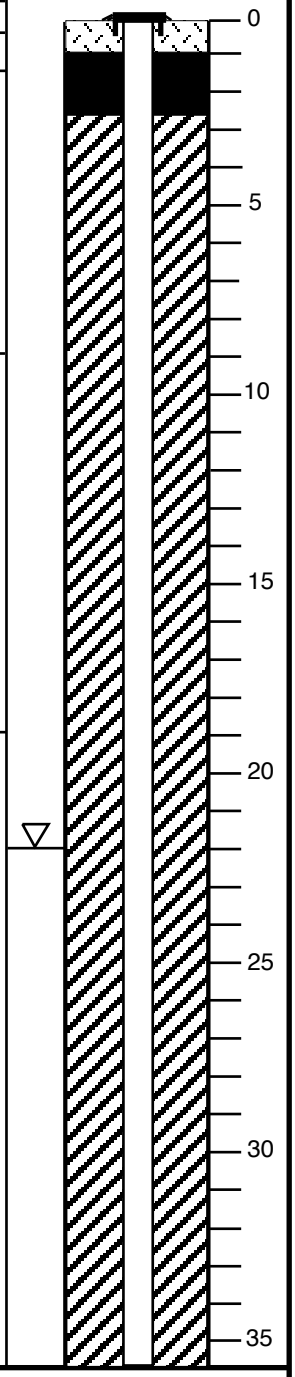
MW-14A

REVISION DATE: APRIL 9, 2010:MCH

SAMPLE INTERVAL	DEPTH (fbg)	CLIENT: Chevron Environmental Management Company PROJECT: Service Station #9-8719 LOCATION: 26988 Ortega Highway, San Juan Capistrano, California DESCRIPTION AND SOIL CLASSIFICATION NAME: %gravel/sand/fines, gradation/plasticity, color, angularity, maximum size (gravels), density/consistency, moisture, stain	BLOWS PER 6 INCHES	PID (ppmv)	USCS
	0	5 inches asphalt			
		12 inches base fill material			
		SILTY SAND: 0/70/30, well-graded, olive gray, fine- to coarse-grained sand, loose, moist, no stain	--	0	SM
	5				
	10	CLAYEY SILT: 0/0/100, medium plasticity, olive gray, very stiff, moist, no stain	9,13,17	0.8	ML
	15	SILT WITH SAND: 0/10/90, low plasticity, olive gray, poorly graded, fine-grained sand, very stiff, moist, no stain	10,15,22	0	
	20	SILTY CLAY: 0/0/100, high plasticity, olive gray, very stiff, moist, no stain	7,18,22	0	CL
	25		7,22,24	0	
	30	CLAY WITH SILT: 0/0/100, low plasticity, olive gray, very stiff, wet, no stain	10,19,24	0	
	35				

COMPLETION DETAIL
- [X] GROUNDWATER WELL
- [ ] VADOSE WELL
- [ ] SPARGE WELL
- [ ] BORING

CASING: 4-inch PVC
SLOT SIZE: 0.02 inch
FILTER PACK: #3 Sand



DRILLING METHOD: Limited access rig, 10-inch hollow-stem auger	DATE DRILLED: January 5, 2010; January 11, 2010
SAMPLER TYPE: 2-inch California-modified-split spoon	LOGGED BY: Joshua Barraza
TOTAL BORING DEPTH: 55 fbg	APPROVED BY: Todd McFarland, PG #7685
DEPTH TO WATER: 22 fbg	DRILLED BY: WDC Exploration and Wells

HOLGUIN, FAHAN & ASSOCIATES, INC.

LOG OF EXPLORATORY BORING

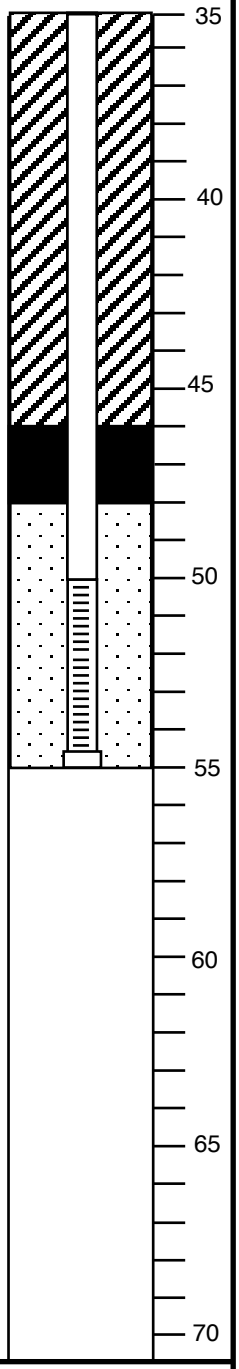
MW-14B

REVISION DATE: APRIL 9, 2010:MCH

SAMPLE INTERVAL	DEPTH (fbg)	CLIENT: Chevron Environmental Management Company PROJECT: Service Station #9-8719 LOCATION: 26988 Ortega Highway, San Juan Capistrano, California DESCRIPTION AND SOIL CLASSIFICATION NAME: %gravel/sand/fines, gradation/plasticity, color, angularity, maximum size (gravels), density/consistency, moisture, stain	BLOWS PER 6 INCHES	PID (ppmv)	USCS
	35	SILTY CLAY WITH SAND: 0/10/90, medium plasticity, olive gray, poorly graded, fine-grained sand, very stiff, wet, no stain	6,6,7	0	CL
	40	CLAYEY SILT WITH SAND: 0/10/90, low plasticity, olive gray, poorly graded, fine-grained sand, very stiff, wet, no stain	9,14,24	0	ML
	45	SILTY CLAY WITH SAND: 0/10/90, medium plasticity, olive gray, poorly graded, fine-grained sand, very stiff, wet, no stain	12,14,17	0	CL
	50	CLAYEY SILT WITH SAND: 0/10/90, low plasticity, olive gray, stiff, wet, no stain	17,19,31	0	ML
	55	SILTY SAND: 0/88/12, poorly graded, olive gray, fine-grained sand, medium dense, wet, no stain	12,19,27	0	SM
	60				
	65				
	70				

COMPLETION DETAIL
- [X] GROUNDWATER WELL
- [ ] VADOSE WELL
- [ ] SPARGE WELL
- [ ] BORING

CASING: 4-inch PVC
SLOT SIZE: 0.02 inch
FILTER PACK: #3 Sand



DRILLING METHOD: Limited access rig, 10-inch hollow-stem auger	DATE DRILLED: January 5, 2010; January 11, 2010
SAMPLER TYPE: 2-inch California-modified-split spoon	LOGGED BY: Joshua Barraza
TOTAL BORING DEPTH: 55 fbg	APPROVED BY: Todd McFarland, PG #7685
DEPTH TO WATER: 22 fbg	DRILLED BY: WDC Exploration and Wells

HOLGUIN, FAHAN & ASSOCIATES, INC.

LOG OF EXPLORATORY BORING

MW-14B

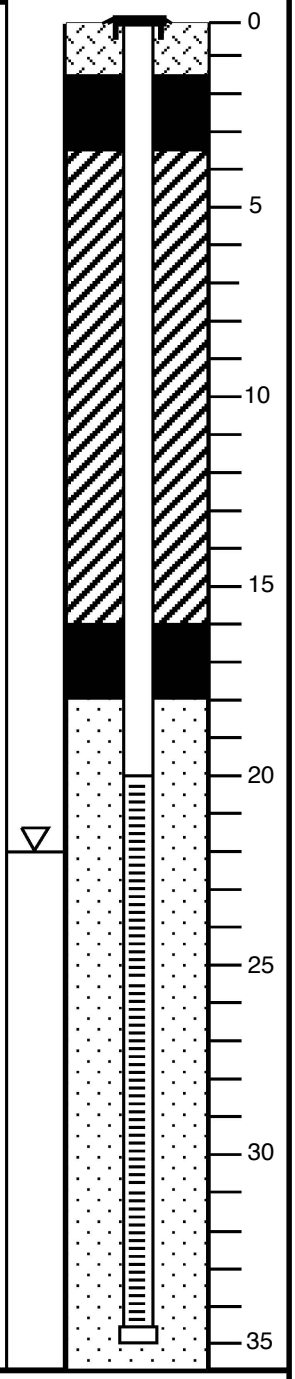
REVISION DATE: APRIL 9, 2010:MCH

SAMPLE INTERVAL	DEPTH (fbg)	CLIENT: Chevron Environmental Management Company PROJECT: Service Station #9-8719 LOCATION: 26988 Ortega Highway, San Juan Capistrano, California DESCRIPTION AND SOIL CLASSIFICATION NAME: %gravel/sand/fines, gradation/plasticity, color, angularity, maximum size (gravels), density/consistency, moisture, stain	BLOWS PER 6 INCHES	PID (ppmv)	USCS
	0	See MW-15B for lithology			
	5				
	10				
	15				
	20				
	25				
	30				
	35				

COMPLETION DETAIL

- [X] GROUNDWATER WELL
- [ ] VADOSE WELL
- [ ] SPARGE WELL
- [ ] BORING

CASING: 4-inch PVC
SLOT SIZE: 0.02 inch
FILTER PACK: #3 Sand



DRILLING METHOD: Limited access rig, 10-inch hollow-stem auger	DATE DRILLED: January 18, 2010; January 27, 2010
SAMPLER TYPE: 2-inch California-modified split spoon	LOGGED BY: Joshua Barraza
TOTAL BORING DEPTH: 37 fbg	APPROVED BY: Todd McFarland, PG #7685
DEPTH TO WATER: 22 fbg	DRILLED BY: WDC Exploration and Wells

HOLGUIN, FAHAN & ASSOCIATES, INC.

LOG OF EXPLORATORY BORING

MW-15A

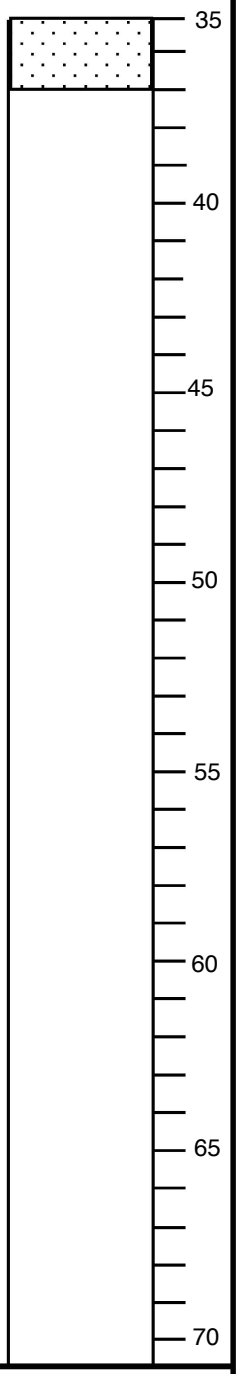
REVISION DATE: APRIL 9, 2010:MCH

SAMPLE INTERVAL	DEPTH (fbg)	CLIENT: Chevron Environmental Management Company PROJECT: Service Station #9-8719 LOCATION: 26988 Ortega Highway, San Juan Capistrano, California DESCRIPTION AND SOIL CLASSIFICATION NAME: %gravel/sand/fines, gradation/plasticity, color, angularity, maximum size (gravels), density/consistency, moisture, stain	BLOWS PER 6 INCHES	PID (ppmv)	USCS
	35	See MW-15B for lithology			
	40				
	45				
	50				
	55				
	60				
	65				
	70				

COMPLETION DETAIL

- [X] GROUNDWATER WELL
- [ ] VADOSE WELL
- [ ] SPARGE WELL
- [ ] BORING

CASING: 4-inch PVC
SLOT SIZE: 0.02-inch
FILTER PACK: #3 Sand



DRILLING METHOD: Limited access rig, 10-inch hollow-stem auger	DATE DRILLED: January 18, 2010; January 27, 2010
SAMPLER TYPE: 2-inch California-modified split spoon	LOGGED BY: Joshua Barraza
TOTAL BORING DEPTH: 37 fbg	APPROVED BY: Todd McFarland, PG #7685
DEPTH TO WATER: 22 fbg	DRILLED BY: WDC Exploration and Wells

HOLGUIN, FAHAN & ASSOCIATES, INC.

LOG OF EXPLORATORY BORING

MW-15A

REVISION DATE: APRIL 9, 2010:MCH

SAMPLE INTERVAL	DEPTH (fbg)	DESCRIPTION AND SOIL CLASSIFICATION NAME: %gravel/sand/fines, gradation/plasticity, color, angularity, maximum size (gravels), density/consistency, moisture, stain	BLOWS PER 6 INCHES	PID (ppmv)	USCS
	0	8 inches asphalt			
		8 inches base fill material			
		SILT WITH SAND: 0/10/90, low plasticity, olive gray, medium stiff, moist, no stain			ML
	5		--	0	
	10		11,20,30	0	
	15				
		SILT: 0/0/100, low plasticity, brown, hard, moist, no stain	9,18,26	0	
	20	SILT WITH SAND: 0/10/90, low plasticity, brown, hard, moist, no stain	18,22,26	0	
	25	SANDY SILT: 0/20/80, low plasticity, brown, poorly graded, very stiff, wet, no stain	12,12,17	0	
	30	SILTY SAND: 0/70/30, poorly graded, light brown, fine-grained sand, medium dense, wet, no stain	10,11,19	0	SM
	35				

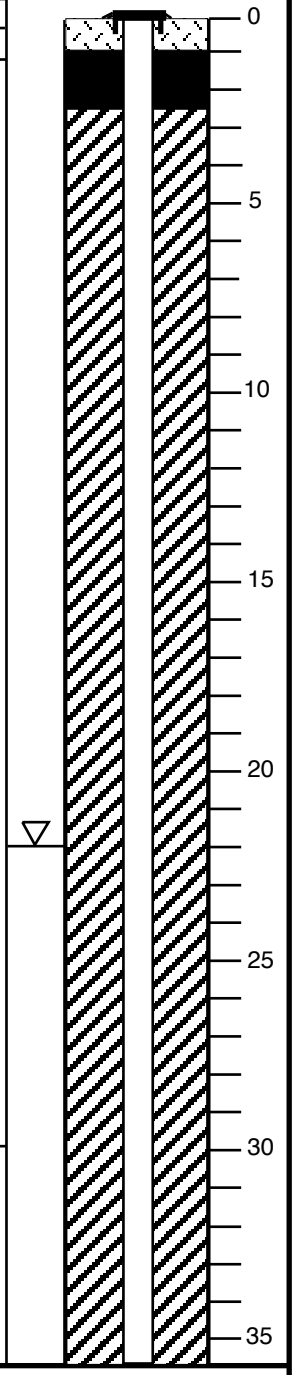
CLIENT: Chevron Environmental Management Company

PROJECT: Service Station #9-8719

LOCATION: 26988 Ortega Highway, San Juan Capistrano, California

COMPLETION DETAIL
- [X] GROUNDWATER WELL
- [ ] VADOSE WELL
- [ ] SPARGE WELL
- [ ] BORING

CASING: 4-inch PVC
SLOT SIZE: 0.02 inch
FILTER PACK: #3 Sand



DRILLING METHOD: Limited access rig, 10-inch hollow-stem auger	DATE DRILLED: January 18, 2010; January 25, 2010; January 26, 2010
SAMPLER TYPE: 2-inch California-modified-split spoon	LOGGED BY: Joshua Barraza
TOTAL BORING DEPTH: 56.5 fbg	APPROVED BY: Todd McFarland, PG #7685
DEPTH TO WATER: 22 fbg	DRILLED BY: WDC Exploration and Wells

HOLGUIN, FAHAN & ASSOCIATES, INC.

LOG OF EXPLORATORY BORING

MW-15B

REVISION DATE: APRIL 9, 2010:MCH

SAMPLE INTERVAL	DEPTH (fbg)	DESCRIPTION AND SOIL CLASSIFICATION NAME: %gravel/sand/fines, gradation/plasticity, color, angularity, maximum size (gravels), density/consistency, moisture, stain	BLOWS PER 6 INCHES	PID (ppmv)	USCS
	35		10,16,19	0	SM
	40	well-graded	12,17,22	0	
	45	SANDY SILT: 0/20/80, low plasticity, light brown, stiff, wet, no stain	8,9,16	0	ML
	50	SANDY SILT: 0/15/85, low plasticity, light brown, hard, wet, no stain	12,19,22	0	
	55		13,17 21	0	
	60				
	65				
	70				

CLIENT: Chevron Environmental Management Company

PROJECT: Service Station #9-8719

LOCATION: 26988 Ortega Highway, San Juan Capistrano, California

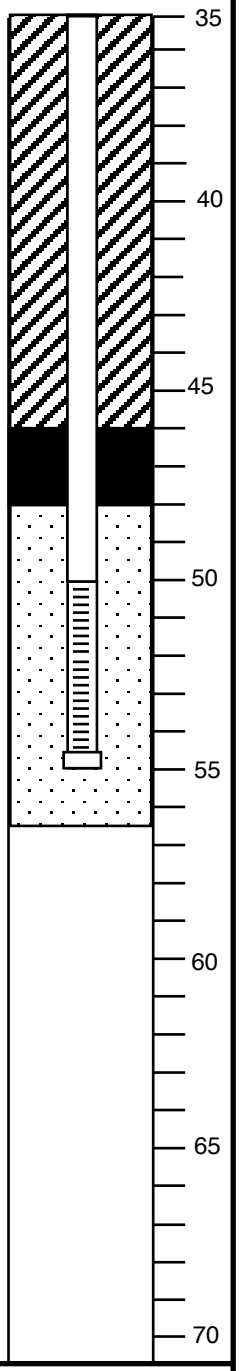
COMPLETION DETAIL

- [X] GROUNDWATER WELL
- [ ] VADOSE WELL
- [ ] SPARGE WELL
- [ ] BORING

CASING: 4-inch PVC

SLOT SIZE: 0.02 inch

FILTER PACK: #3 Sand



DRILLING METHOD: Limited access rig, 10-inch hollow-stem auger	DATE DRILLED: January 18, 2010; January 25, 2010; January 26, 2010
SAMPLER TYPE: 2-inch California-modified-split spoon	LOGGED BY: Joshua Barraza
TOTAL BORING DEPTH: 56.5 fbg	APPROVED BY: Todd McFarland, PG #7685
DEPTH TO WATER: 22 fbg	DRILLED BY: WDC Exploration and Wells

HOLGUIN, FAHAN & ASSOCIATES, INC.

LOG OF EXPLORATORY BORING

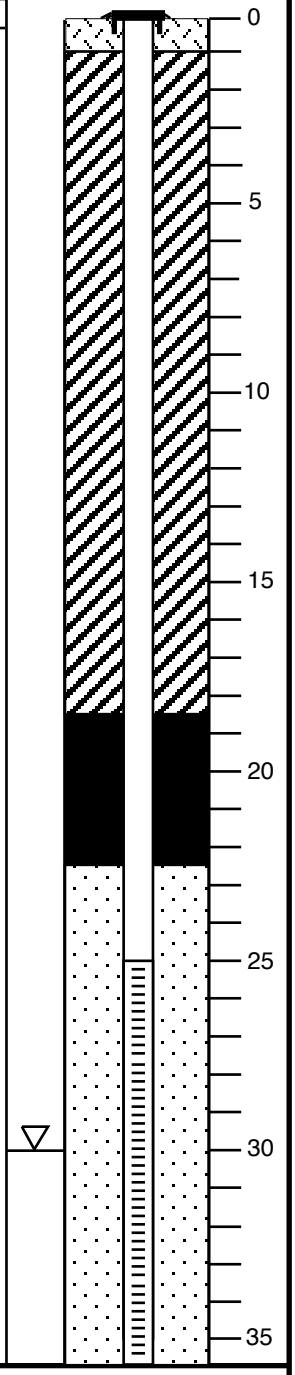
MW-15B

REVISION DATE: APRIL 9, 2010:MCH

SAMPLE INTERVAL			CLIENT: Chevron Environmental Management Company	BLOWS PER 6 INCHES	PID (ppmv)	USCS
SOIL	GROUNDWATER	DEPTH (fbg)	PROJECT: Service Station #9-8719			
			LOCATION: 26988 Ortega Highway, San Juan Capistrano, California			
			DESCRIPTION AND SOIL CLASSIFICATION NAME: %gravel/sand/fines, gradation/plasticity, color, angularity, maximum size (gravels), density/consistency, moisture, stain			
		0	5 inches concrete			
			CLAYEY SILT: 0/0/100, medium plasticity, dark gray, stiff, moist, no stain	--	459	ML
				--	105	
		5				
		10		10,12,16	>5,000	
		15		9,11,15	>5,000	
		20	SILT WITH SAND: 0/10/90, low plasticity, dark gray, medium stiff, moist, no stain, brick debris encounterd in sampler	11,14,16	>5,000	
		25		12,15,12	>5,000	
		30	wet	6,7,9	>5,000	
		35				

- [ ] SOIL BORING
- [x] GROUNDWATER WELL
- [ ] VADOSE WELL
- [ ] SPARGING WELL
- [ ] SOIL GAS PROBE

CASING: 4-inch SCH 40 PVC
SLOT SIZE: 0.02-inch
FILTER PACK: #3 sand



DRILLING METHOD: Limited Access Rig, 10-inch OD, hollow-stem auger	DATE DRILLED: July 15, 2010; July 20, 2010
SAMPLER TYPE: 2-inch California Modified Split Spoon	LOGGED BY: Josh Barraza
TOTAL BORING DEPTH: 46.5 fbg	APPROVED BY: Todd McFarland, PG #7685
DEPTH TO WATER: 30 fbg	DRILLED BY: Cascade Drilling LP

HOLGUIN, FAHAN & ASSOCIATES, INC.

LOG OF EXPLORATORY BORING

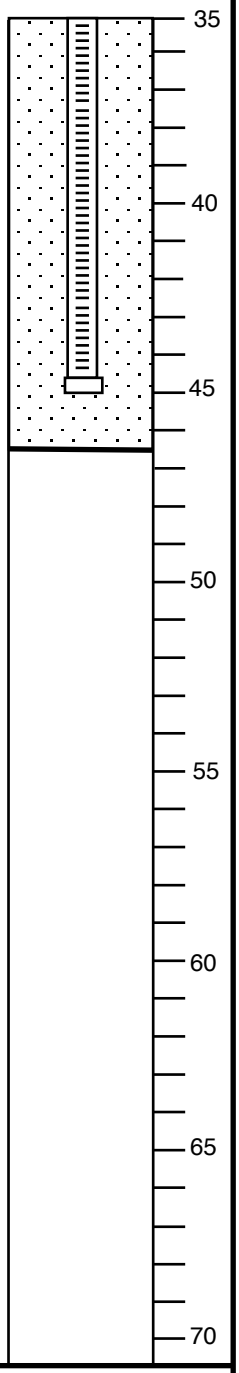
MW-16

REVISION DATE: AUGUST 3, 2010: ANG

SAMPLE INTERVAL			CLIENT: Chevron Environmental Management Company	BLOWS PER 6 INCHES	PID (ppmv)	USCS
SOIL	GROUNDWATER	DEPTH (fbg)	PROJECT: Service Station #9-8719			
			LOCATION: 26988 Ortega Highway, San Juan Capistrano, California			
			DESCRIPTION AND SOIL CLASSIFICATION NAME: %gravel/sand/fines, gradation/plasticity, color, angularity, maximum size (gravels), density/consistency, moisture, stain			
		35	wet	12,17,20	2,883	ML
		40	CLAYEY SILT: 0/0/100, medium plasticity, brown, medium stiff, wet, no stain	20,21,26	26	
		45		12,16,18	159	
		50				
		55				
		60				
		65				
		70				

- [ ] SOIL BORING
- [x] GROUNDWATER WELL
- [ ] VADOSE WELL
- [ ] SPARGING WELL
- [ ] SOIL GAS PROBE

CASING: 4-inch SCH 40 PVC
SLOT SIZE: 0.02-inch
FILTER PACK: #3 sand



DRILLING METHOD: Limited Access Rig, 10-inch OD, hollow-stem auger	DATE DRILLED: July 15, 2010; July 20, 2010
SAMPLER TYPE: 2-inch California Modified Split Spoon	LOGGED BY: Josh Barraza
TOTAL BORING DEPTH: 46.5 fbg	APPROVED BY: Todd McFarland, PG #7685
DEPTH TO WATER: 30 fbg	DRILLED BY: Cascade Drilling LP

HOLGUIN, FAHAN & ASSOCIATES, INC.

LOG OF EXPLORATORY BORING

MW-16

REVISION DATE: AUGUST 3, 2010: ANG

SAMPLE INTERVAL: SOIL	GROUNDWATER	DEPTH (fbg)	DESCRIPTION AND SOIL CLASSIFICATION NAME: %gravel/sand/fines, gradation/plasticity, color, angularity, maximum size (gravels), density/consistency, moisture, stain	BLOWS PER 6 INCHES	PID (ppmv)	USCS
		0	4" Asphalt			
			SILTY CLAY: 0/0/100, medium plasticity, dark brown, dense, moist, no stain	--	0	CL
		5		--	15	
		10				
		15	CLAYEY SILT: 0/0/100, low plasticity, dark brown, dense, moist, no stain	--	28	ML
		20				
		25	SILTY CLAY: 0/0/100, medium plasticity, dark brown, dense, moist, no stain			CL
		30	wet	--	64	
		35				

CLIENT: Chevron Environmental Management Company

PROJECT: Service Station #9-8719

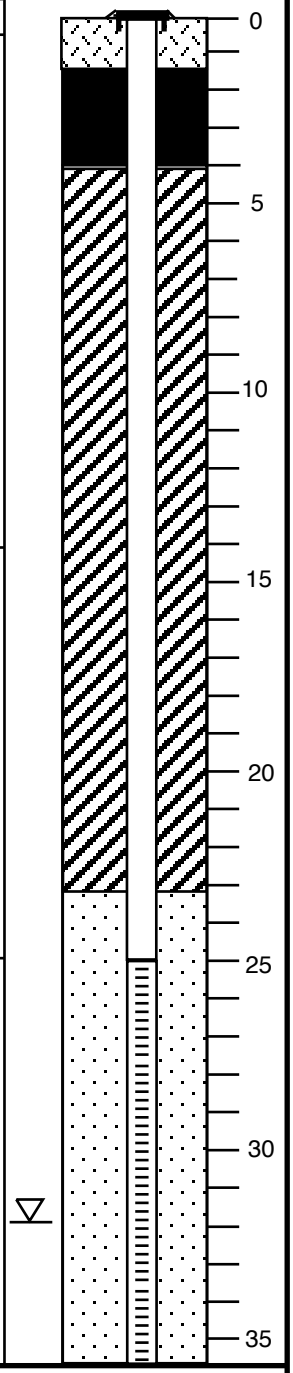
LOCATION: 26988 Ortega Highway, San Juan Capistrano, California

- [ ] SOIL BORING
- [x] GROUNDWATER WELL
- [ ] VADOSE WELL
- [ ] SPARGING WELL
- [ ] SOIL GAS PROBE

CASING: 4" Schedule 40 PVC

SLOT SIZE: 0.02"

FILTER PACK: #3 sand



DRILLING METHOD: Limited Access Rig - 8" hollow stem auger	DATE DRILLED: September 7–8, 2011
SAMPLER TYPE: N/A	LOGGED BY: Josh Barraza
TOTAL BORING DEPTH: 45 fbg	APPROVED BY: Todd McFarland, PG #7685
DEPTH TO WATER: 32 fbg	DRILLED BY: WDC Exploration & Wells

HOLGUIN, FAHAN & ASSOCIATES, INC.

LOG OF EXPLORATORY BORING

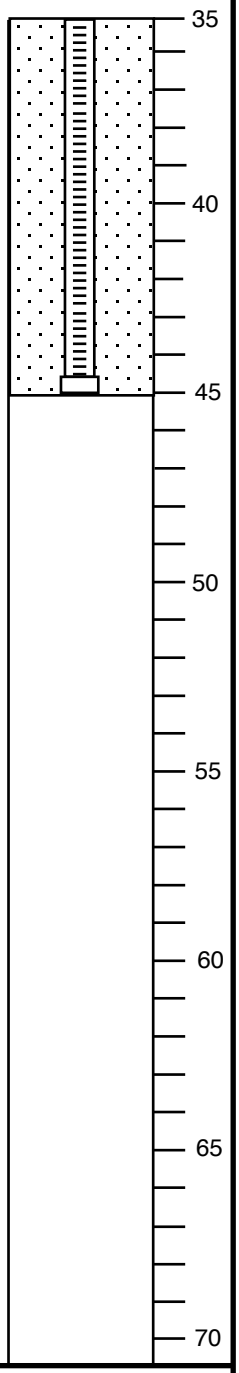
MW-17

REVISION DATE: JANUARY 23, 2012:ANG

SAMPLE INTERVAL			CLIENT: Chevron Environmental Management Company	BLOWS PER 6 INCHES	PID (ppmv)	USCS	
SOIL	GROUNDWATER	DEPTH (fbg)	PROJECT: Service Station #9-8719				
			LOCATION: 26988 Ortega Highway, San Juan Capistrano, California				
			DESCRIPTION AND SOIL CLASSIFICATION NAME: %gravel/sand/fines, gradation/plasticity, color, angularity, maximum size (gravels), density/consistency, moisture, stain				
		35		--	57	CL	
		40					
				--	45		
		45					
		50					
		55					
		60					
		65					
		70					

- [ ] SOIL BORING
- [x] GROUNDWATER WELL
- [ ] VADOSE WELL
- [ ] SPARGING WELL
- [ ] SOIL GAS PROBE

CASING: 4" Schedule 40 PVC
SLOT SIZE: 0.02"
FILTER PACK: #3 sand



DRILLING METHOD: Limited Access Rig - 8" hollow stem auger	DATE DRILLED: September 7-8, 2011
SAMPLER TYPE: N/A	LOGGED BY: Josh Barraza
TOTAL BORING DEPTH: 45 fbg	APPROVED BY: Todd McFarland, PG #7685
DEPTH TO WATER: 32 fbg	DRILLED BY: WDC Exploration & Wells

HOLGUIN, FAHAN & ASSOCIATES, INC.

LOG OF EXPLORATORY BORING

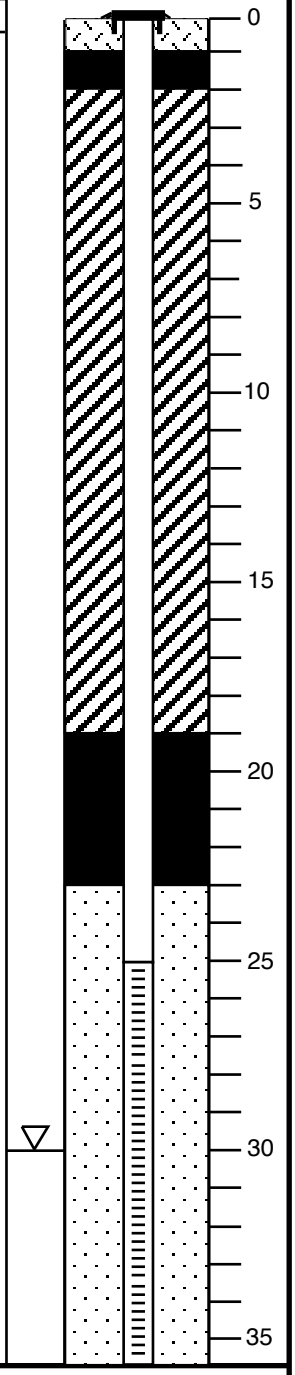
MW-17

REVISION DATE: JANUARY 23, 2012:ANG

SAMPLE INTERVAL			CLIENT: Chevron Environmental Management Company	BLOWS PER 6 INCHES	PID (ppmv)	USCS
SOIL	GROUNDWATER	DEPTH (fbg)	PROJECT: Service Station #9-8719			
			LOCATION: 26988 Ortega Highway, San Juan Capistrano, California			
			DESCRIPTION AND SOIL CLASSIFICATION NAME: %gravel/sand/fines, gradation/plasticity, color, angularity, maximum size (gravels), density/consistency, moisture, stain			
		0	7 inches asphalt and concrete			
			CLAYEY SILT: 0/0/100, medium plasticity, dark brown, medium stiff, moist, no stain			ML
		5				
		10				
		15				
		20				
		25				
		30	wet	--	635	
		35				

- [ ] SOIL BORING
- [x] GROUNDWATER WELL
- [ ] VADOSE WELL
- [ ] SPARGING WELL
- [ ] SOIL GAS PROBE

CASING: 1.5-inch prepack
SLOT SIZE: 0.01-inch
FILTER PACK: 20/40 mesh sand



DRILLING METHOD: Limited Access Rig, 6-inch OD, hollow-stem auger	DATE DRILLED: July 14, 2010; July 19, 2010
SAMPLER TYPE: N/A	LOGGED BY: Josh Barraza
TOTAL BORING DEPTH: 47 fbg	APPROVED BY: Todd McFarland, PG #7685
DEPTH TO WATER: 30 fbg	DRILLED BY: Cascade Drilling LP

HOLGUIN, FAHAN & ASSOCIATES, INC.

LOG OF EXPLORATORY BORING

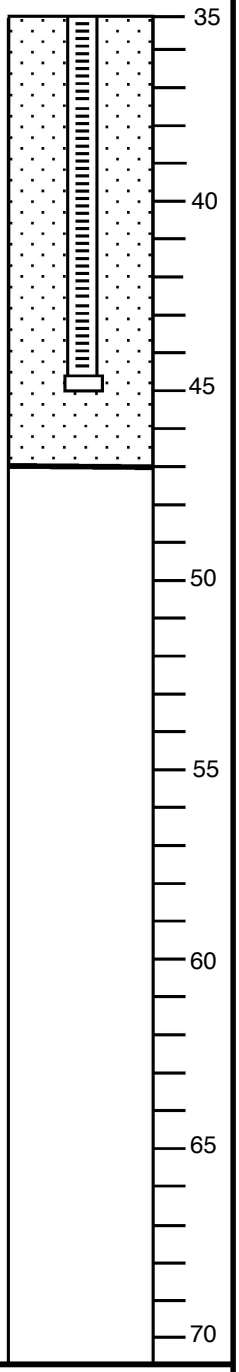
P-1

REVISION DATE: AUGUST 3, 2010: ANG

SAMPLE INTERVAL			CLIENT: Chevron Environmental Management Company	BLOWS PER 6 INCHES	PID (ppmv)	USCS	
SOIL	GROUNDWATER	DEPTH (fbg)	PROJECT: Service Station #9-8719				
			LOCATION: 26988 Ortega Highway, San Juan Capistrano, California				
			DESCRIPTION AND SOIL CLASSIFICATION NAME: %gravel/sand/fines, gradation/plasticity, color, angularity, maximum size (gravels), density/consistency, moisture, stain				
		35				ML	
		40					
		45					
		50					
		55					
		60					
		65					
		70					

- [ ] SOIL BORING
- [x] GROUNDWATER WELL
- [ ] VADOSE WELL
- [ ] SPARGING WELL
- [ ] SOIL GAS PROBE

CASING: 1.5-inch prepack
SLOT SIZE: 0.01-inch
FILTER PACK: 20/40 mesh sand



DRILLING METHOD: Limited Access Rig, 6-inch OD, hollow-stem auger	DATE DRILLED: July 14, 2010; July 19, 2010
SAMPLER TYPE: N/A	LOGGED BY: Josh Barraza
TOTAL BORING DEPTH: 47 fbg	APPROVED BY: Todd McFarland, PG #7685
DEPTH TO WATER: 30 fbg	DRILLED BY: Cascade Drilling LP

HOLGUIN, FAHAN & ASSOCIATES, INC.

LOG OF EXPLORATORY BORING

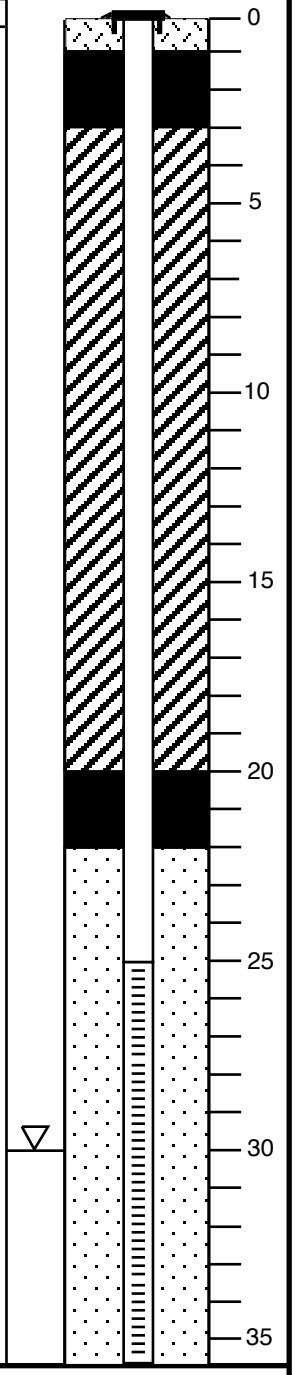
P-1

REVISION DATE: AUGUST 3, 2010: ANG

SAMPLE INTERVAL			CLIENT: Chevron Environmental Management Company	BLOWS PER 6 INCHES	PID (ppmv)	USCS
SOIL	GROUNDWATER	DEPTH (fbg)	PROJECT: Service Station #9-8719			
			LOCATION: 26988 Ortega Highway, San Juan Capistrano, California			
			DESCRIPTION AND SOIL CLASSIFICATION NAME: %gravel/sand/fines, gradation/plasticity, color, angularity, maximum size (gravels), density/consistency, moisture, stain			
		0	3 inches concrete			
			CLAYEY SILT: 0/0/100, medium plasticity, dark brown, stiff, moist, no stain			ML
		5				
		10		--	>5,000	
		15				
		20		--	3,015	
		25				
		30	wet			
		35				

SOIL BORING
[X] GROUNDWATER WELL
VADOSE WELL
SPARGING WELL
SOIL GAS PROBE

CASING: 1.5-inch prepack
SLOT SIZE: 0.01-inch
FILTER PACK: 20/40 mesh sand



DRILLING METHOD: Limited Access Rig, 6-inch OD, hollow-stem auger	DATE DRILLED: July 15, 2010; July 19, 2010
SAMPLER TYPE: N/A	LOGGED BY: Josh Barraza
TOTAL BORING DEPTH: 47 fbg	APPROVED BY: Todd McFarland, PG #7685
DEPTH TO WATER: 30 fbg	DRILLED BY: Cascade Drilling LP

HOLGUIN, FAHAN & ASSOCIATES, INC.

LOG OF EXPLORATORY BORING

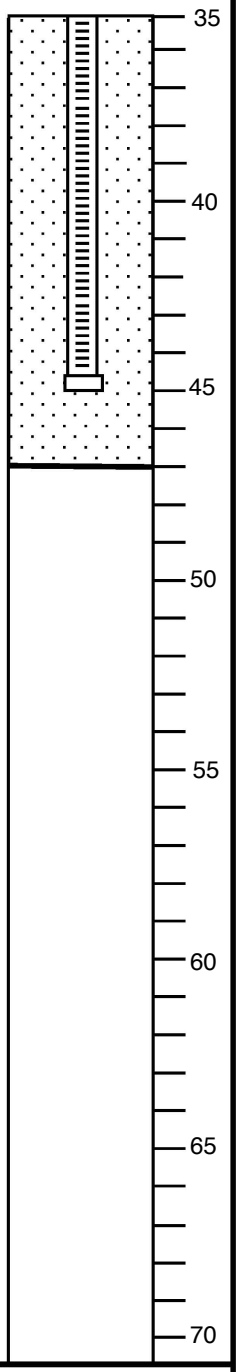
P-2

REVISION DATE: AUGUST 3, 2010: ANG

SAMPLE INTERVAL			CLIENT: Chevron Environmental Management Company	BLOWS PER 6 INCHES	PID (ppmv)	USCS	
SOIL	GROUNDWATER	DEPTH (fbg)	PROJECT: Service Station #9-8719				
			LOCATION: 26988 Ortega Highway, San Juan Capistrano, California				
			DESCRIPTION AND SOIL CLASSIFICATION NAME: %gravel/sand/fines, gradation/plasticity, color, angularity, maximum size (gravels), density/consistency, moisture, stain				
		35				ML	
		40					
		45					
		50					
		55					
		60					
		65					
		70					

- [ ] SOIL BORING
- [x] GROUNDWATER WELL
- [ ] VADOSE WELL
- [ ] SPARGING WELL
- [ ] SOIL GAS PROBE

CASING: 1.5-inch prepack
SLOT SIZE: 0.01-inch
FILTER PACK: 20/40 mesh sand



DRILLING METHOD: Limited Access Rig, 6-inch OD, hollow-stem auger	DATE DRILLED: July 15, 2010; July 19, 2010
SAMPLER TYPE: N/A	LOGGED BY: Josh Barraza
TOTAL BORING DEPTH: 47 fbg	APPROVED BY: Todd McFarland, PG #7685
DEPTH TO WATER: 30 fbg	DRILLED BY: Cascade Drilling LP

HOLGUIN, FAHAN & ASSOCIATES, INC.

LOG OF EXPLORATORY BORING

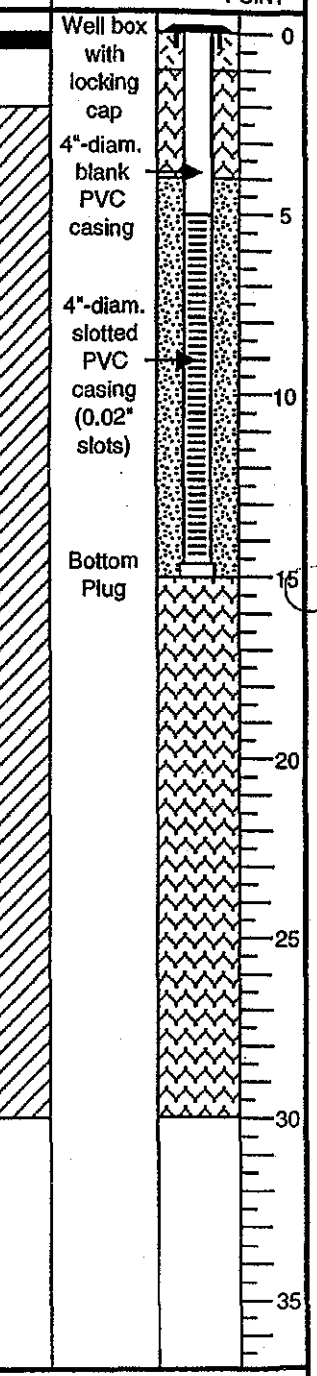
P-2

REVISION DATE: AUGUST 3, 2010: ANG

CLIENT/PROJECT: Chevron Service Station #9-8719
LOCATION: 26988 Ortega Highway
San Juan Capistrano, California

SAMPLE INTERVAL	DEPTH (fbg)	DESCRIPTION AND SOIL CLASSIFICATION	BLOWS PER 6 INCHES	PID (ppm)	USCS	GRAPHIC LOG
	0	8" of asphalt / Hand augered to a depth of 5 fbg Artificial fill			AF	
	5	SILTY CLAY: gray, moist, low to medium plasticity, very stiff, very slightly degraded hydrocarbon odor	3,7,12	38.5	CL	
	10	CLAY: light brown and gray, moist, medium plasticity, very stiff, no odor	7,10,13	4.1	CL	
	15	no odor	10,12,15	35.0		
	20	dark gray, moist, low plasticity	9,12,17	4.1		
	25	hard	7,11,20	9.1		
	30		11,19,28	7.1		
	35					

BOREHOLE COMPLETION DETAIL
[X] WELL [ ] GW [X] VW
[ ] BORING [ ] SPARGE POINT



DRILLING METHOD: 10-Inch O.D. Hollow Stem Auger	DATE DRILLED: June 14, 1995
SAMPLER/SAMPLE TYPE: 2-Inch Diameter California Split Spoon	LOGGED BY: D. Pessler
TOTAL BORING DEPTH: 30 fbg	APPROVED BY: J. Haslett, R.G. #5641
DEPTH TO WATER: N/A	DRILLED BY: Drill Line, Inc.

HOLGUIN, FAHAN & ASSOCIATES, INC.

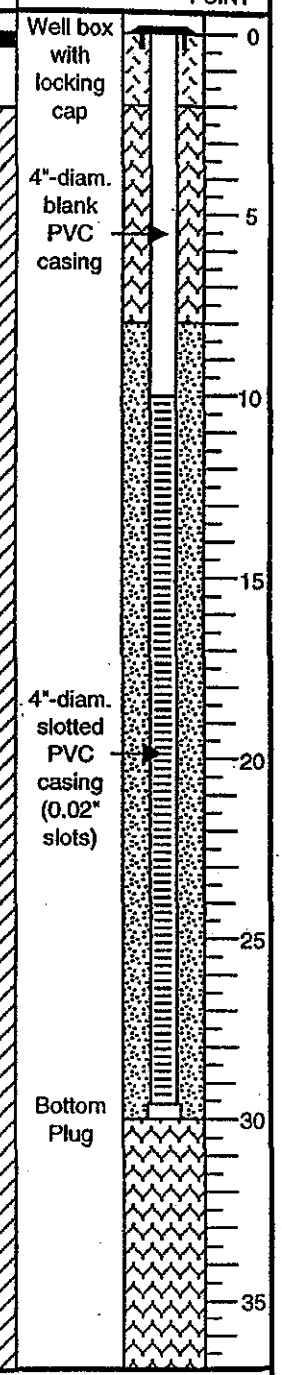
LOG OF EXPLORATORY BORING

VW-1

CLIENT/PROJECT: Chevron Service Station #9-8719
LOCATION: 26988 Ortega Highway
San Juan Capistrano, California

SAMPLE INTERVAL	DEPTH (fbg)	DESCRIPTION AND SOIL CLASSIFICATION	BLOWS PER 6 INCHES	PID (ppm)	USCS	GRAPHIC LOG
	0	8" of asphalt / Hand augered to a depth of 5 fbg Artificial fill			AF	
	5	CLAY: light brown and gray, moist, low plasticity, very stiff, slight hydrocarbon odor	5,7,12	0	CL	
	10		10,12,14	603		
	15		5,11,13	2,646		
	20		4,6,12	1,517		
	25	SILTY CLAY: light brown and gray, moist, low plasticity, hard, strong hydrocarbon odor	8,12,23	1,524	CL	
	30	dark brown, strong hydrocarbon odor	8,14,24	3,034		
	35		8,13,19	2,900		

BOREHOLE COMPLETION DETAIL
☒ WELL ☐ GW ☒ VW
☐ BORING ☐ SPARGE POINT



DRILLING METHOD: 10-Inch O.D. Hollow Stem Auger	DATE DRILLED: June 14, 1995
SAMPLER/SAMPLE TYPE: 2-Inch Diameter California Split Spoon	LOGGED BY: D. Pessler
TOTAL BORING DEPTH: 40 fbg	APPROVED BY: J. Haslett, R.G. #5641
DEPTH TO WATER: N/A	DRILLED BY: Drill Line, Inc.

HOLGUIN, FAHAN & ASSOCIATES, INC.

LOG OF EXPLORATORY BORING

VW-2

SAMPLE INTERVAL	DEPTH (fbg)	CLIENT/PROJECT: Chevron Service Station #9-8719 LOCATION: 26988 Ortega Highway San Juan Capistrano, California DESCRIPTION AND SOIL CLASSIFICATION	BLOWS PER 6 INCHES	PID (ppm)	USCS	GRAPHIC LOG	BOREHOLE COMPLETION DETAIL ☒ WELL ☐ GW ☒ VW ☐ BORING ☐ SPARGE POINT
■	35	SILTY CLAY: dark brown and gray, moist, low plasticity, hard, strong hydrocarbon odor	8,13,19	2,900	CL		
■	40	moderate hydrocarbon odor	13,15,18	3,027			
	45						
	50						
	55						
	60						
	65						
	70						

DRILLING METHOD: 10-Inch O.D. Hollow Stem Auger	DATE DRILLED: June 14, 1995
SAMPLER/SAMPLE TYPE: 2-Inch Diameter California Split Spoon	LOGGED BY: D. Pessler
TOTAL BORING DEPTH: 40 fbg	APPROVED BY: J. Haslett, R.G. #5641
DEPTH TO WATER: N/A	DRILLED BY: Drill Line, Inc.

HOLGUIN, FAHAN & ASSOCIATES, INC.

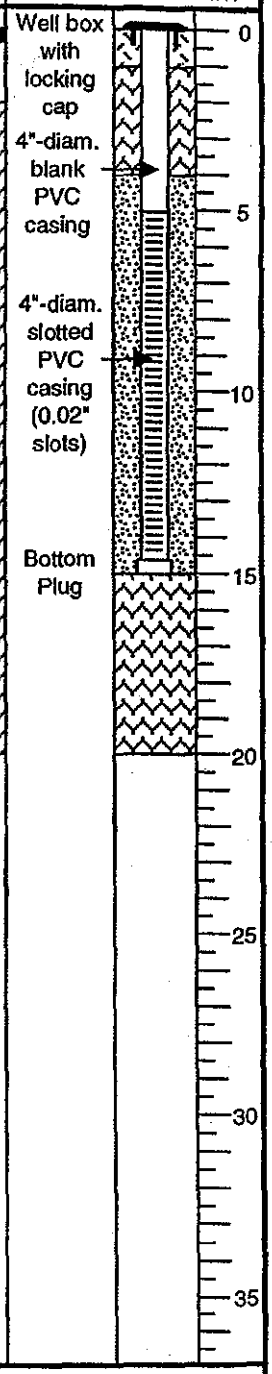
LOG OF EXPLORATORY BORING

VW-2

CLIENT/PROJECT: Chevron Service Station #9-8719
LOCATION: 26988 Ortega Highway
San Juan Capistrano, California

SAMPLE INTERVAL	DEPTH (fbg)	DESCRIPTION AND SOIL CLASSIFICATION	BLOWS PER 6 INCHES	PID (ppm)	USCS	GRAPHIC LOG
	0	8" of asphalt / Hand augered to a depth of 5 fbg Artificial fill			AF	
	5	CLAY: gray and dark brown, moist, medium plasticity, very stiff	5,8,12	0	CL	
	10	CLAY: gray and reddish-brown, moist, medium plasticity, medium stiff, with fine-grained sand	4,4,4	0	CL	
	15	stiff	4,5,10	0		
	20	CLAY: dark brown, moist, low to medium plasticity, very stiff	5,8,10	0	CL	
	25					
	30					
	35					

BOREHOLE COMPLETION DETAIL
[X] WELL [ ] GW [X] VW
[ ] BORING [ ] SPARGE POINT



DRILLING METHOD: 10-Inch O.D. Hollow Stem Auger	DATE DRILLED: June 14, 1995
SAMPLER/SAMPLE TYPE: 2-Inch Diameter California Split Spoon	LOGGED BY: D. Pessler
TOTAL BORING DEPTH: 20 fbg	APPROVED BY: J. Haslett, R.G. #5641
DEPTH TO WATER: N/A	DRILLED BY: Drill Line, Inc.

HOLGUIN, FAHAN & ASSOCIATES, INC.

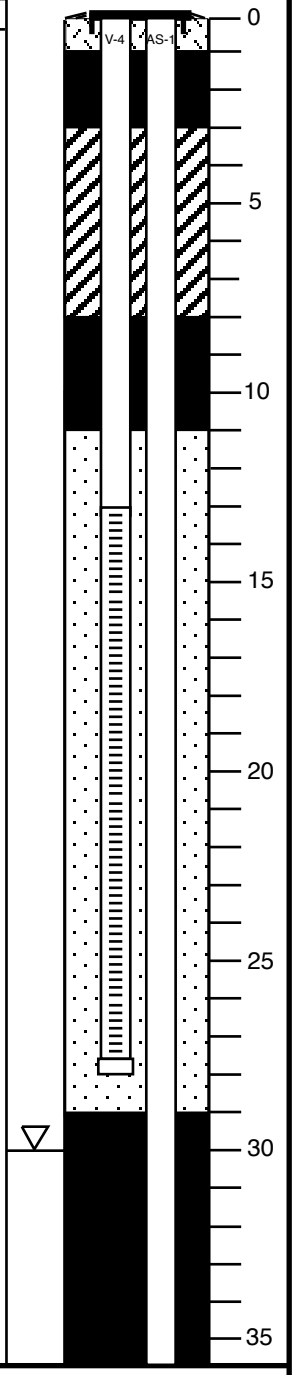
LOG OF EXPLORATORY BORING

VW-3

SAMPLE INTERVAL						
SOIL	GROUNDWATER	DEPTH (fbg)	CLIENT: Chevron Environmental Management Company PROJECT: Service Station #9-8719 LOCATION: 26988 Ortega Highway, San Juan Capistrano, California DESCRIPTION AND SOIL CLASSIFICATION NAME: %gravel/sand/fines, gradation/plasticity, color, angularity, maximum size (gravels), density/consistency, moisture, stain	BLOWS PER 6 INCHES	PID (ppmv)	USCS
		0	5 inches concrete			
			CLAYEY SILT: 0/0/100, medium plasticity, dark gray, stiff, moist, no stain			ML
		5		--	378	
				--	1,035	
		10		12,15,17	>5,000	
		15		9,12,16	>5,000	
		20	1/2-inch gravel encountered in cuttings	8,13,17	>5,000	
		25		9,9,17	>5,000	
		30	SILT WITH CLAY: 0/0/100, low plasticity, dark gray, stiff, wet, no stain	7,11,13	>5,000	
		35				

- [ ] SOIL BORING
- [ ] GROUNDWATER WELL
- [x] VADOSE WELL
- [x] SPARGING WELL
- [ ] SOIL GAS PROBE

CASING: V-4, 3-inch PVC/AS-1, 2-inch PVC
SLOT SIZE: 0.02-inch
FILTER PACK: #3 sand



DRILLING METHOD: Limited Access Rig, 12-inch OD, hollow-stem auger	DATE DRILLED: July 15, 2010; July 22, 2010
SAMPLER TYPE: 2-inch California Modified Split Spoon	LOGGED BY: Josh Barraza
TOTAL BORING DEPTH: 47 fbg	APPROVED BY: Todd McFarland, PG #7685
DEPTH TO WATER: 30 fbg	DRILLED BY: Cascade Drilling LP

HOLGUIN, FAHAN & ASSOCIATES, INC.

LOG OF EXPLORATORY BORING

AS-1/V-4

REVISION DATE: AUGUST 3, 2010: ANG

SAMPLE INTERVAL: SOIL	GROUNDWATER	DEPTH (fbg)	DESCRIPTION AND SOIL CLASSIFICATION NAME: %gravel/sand/fines, gradation/plasticity, color, angularity, maximum size (gravels), density/consistency, moisture, stain	BLOWS PER 6 INCHES	PID (ppmv)	USCS
X		35	CLAYEY SILT: 0/0/100, medium plasticity, dark brown, stiff, wet, no stain	7,8,15	>5,000	ML
X		40	SILT: 0/0/100, low plasticity, light brown, stiff, wet, no stain	10,12,20	430	
		45	CLAYEY SILT: 0/0/100, medium plasticity, brown, stiff, wet, no stain	7,7,14	46	
		50				
		55				
		60				
		65				
		70				

CLIENT: Chevron Environmental Management Company

PROJECT: Service Station #9-8719

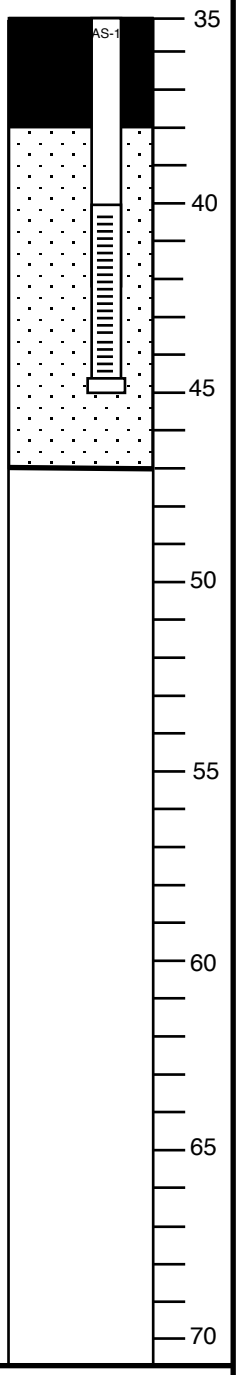
LOCATION: 26988 Ortega Highway, San Juan Capistrano, California

- [ ] SOIL BORING
- [ ] GROUNDWATER WELL
- [X] VADOSE WELL
- [X] SPARGING WELL
- [ ] SOIL GAS PROBE

CASING: V-4, 3-inch PVC/AS-1, 2-inch PVC

SLOT SIZE: 0.02-inch

FILTER PACK: #3 sand



DRILLING METHOD: Limited Access Rig, 12-inch OD, hollow-stem auger	DATE DRILLED: July 15, 2010; July 22, 2010
SAMPLER TYPE: 2-inch California Modified Split Spoon	LOGGED BY: Josh Barraza
TOTAL BORING DEPTH: 47 fbg	APPROVED BY: Todd McFarland, PG #7685
DEPTH TO WATER: 30 fbg	DRILLED BY: Cascade Drilling LP

HOLGUIN, FAHAN & ASSOCIATES, INC.

LOG OF EXPLORATORY BORING

AS-1/V-4

REVISION DATE: AUGUST 3, 2010: ANG

ON SITE APPROVED PLANS/
OWNER SET

MULTIPHASE EXTRACTION REMEDIATION SYSTEM DESIGN

CHEVRON SERVICE STATION #9-8719
26988 ORTEGA HIGHWAY
SAN JUAN CAPISTRANO, CALIFORNIA
(CRWQCB-SDR CASE #9UT3039)

CITY OF SAN JUAN CAPISTRANO
Approved
Utilities Department
Sig. [signature]
Date 8/24/11

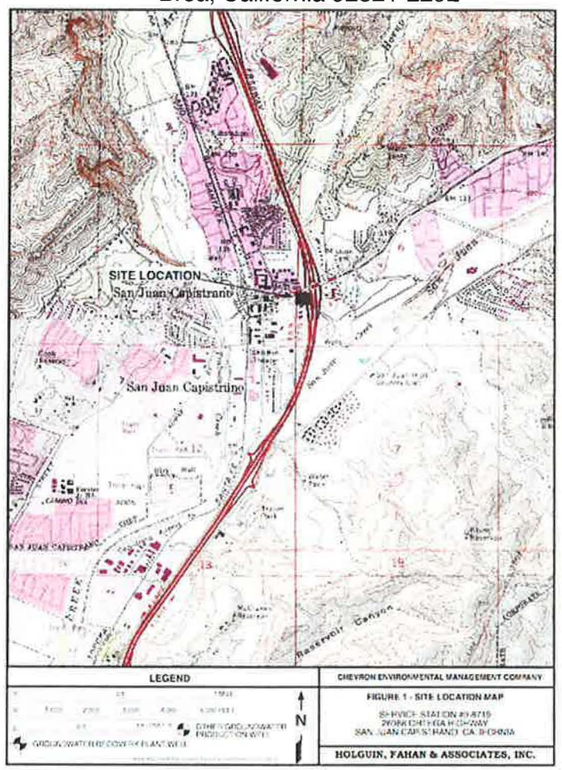
RECEIVED
JUL 25 2011
CITY OF SAN JUAN CAPISTRANO
BUILDING DIVISION

PREPARED FOR:
CHEVRON ENVIRONMENTAL
MANAGEMENT COMPANY
145 South State College Boulevard, Suite 400
Brea, California 92821-2292

BY GENERAL CONTRACTOR:
HOLGUIN, FAHAN & ASSOCIATES, INC.
Contractor License A HAZ #683838
50 West Main Street
Ventura, California 93001
(805) 641-1056

ON SITE APPROVED PLANS/
OWNER SET

WORK HOURS
Construction Permitted
During These Hours Only:
Mon-Fri: 7 AM - 6 PM
Sat: 8:30 AM - 4:30 PM
Sunday: None
Federal Holidays: None
Sat: Earth Hauling
8:30 AM - 12:30 PM



SITE LOCATION MAP 1 G1

SHT	PAGE	TITLE
1	G1	MPE REMEDIATION SYSTEM DESIGN
2	G2	DESIGN AND CONSTRUCTION NOTES
3	P1	SITE AS-BUILTS
4	P2	PROPOSED MPE SYSTEM LOCATION
5	P3	COMPOUND PLAN
6	P4	ELEVATION DRAWING
7	M1	STANDARD DESIGN DETAILS
8	M2	TRENCH DETAIL
9	M3	WELL CONNECTION DETAIL
10	M4	PROPANE ISOMETRIC CONVEYANCE
11	E1	ELECTRICAL DIAGRAM

DRAWING INDEX 2 G1

MULTIPHASE EXTRACTION (MPE) INVOLVES THE SIMULTANEOUS EXTRACTION OF VAPOR AND LIQUID. VAPOR WILL BE REMOVED USING A SUBSURFACE VACUUM AND LIQUID WILL BE REMOVED USING A PNEUMATIC DOWNWELL PUMP. AS THE GROUNDWATER IS REMOVED, THE WATER TABLE BENEATH THE SITE IS LOWERED AND HYDROCARBON-CONTAINING SOIL IN THE SATURATED ZONE IS EXPOSED. EXPOSED SOIL IS REMEDIATED BY THE VAPOR EXTRACTION. THE VAPORIZED HYDROCARBONS WILL BE TREATED WITH AN OXIDIZER.

MPE IS A COMBINATION OF TWO REMEDIATION TECHNOLOGIES AND RESULTS IN INCREASED WELL CAPACITY AND DEWATERING OF THE SOIL ZONE TARGETED FOR VAPOR-PHASE REMOVAL.

THE OXIDIZER WILL BE OPERATED WITH A PERMIT TO OPERATE AUTHORIZED BY THE SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT AND THE ORANGE COUNTY FIRE AUTHORITY. DISCHARGE OF TREATED GROUNDWATER WILL BE PERMITTED BY THE SOUTH ORANGE COUNTY WASTEWATER AUTHORITY. THE CONSTRUCTION OF THE SYSTEM WILL BE PERMITTED BY THE CITY OF SAN JUAN CAPISTRANO.

CONSTRUCTION OF THE COMPOUND AND INSTALLATION OF THE EQUIPMENT WILL MEET THE 2010 CALIFORNIA BUILDING CODE, 2010 CALIFORNIA ELECTRICAL CODE, 2010 CALIFORNIA MECHANICAL CODE, 2010 CALIFORNIA PLUMBING CODE, AND THE 2010 CALIFORNIA FIRE CODE.

PROJECT DESCRIPTION 3 G1

PLANNING DEPARTMENT
These plans are approved based on conformance with applicable provisions of Title 9, Land Use Code, and CC/PC Resolution _____. Any subsequent revisions to these plans require review and approval by the Planning Dept.
☐ Code requirements/conditions of approval have been met.
☐ Prior to issuance of a CO, outstanding conditions of approval must be met (refer to plancheck.)
APPROVED BY [signature] DATE 8/24/11

*Revision to Compound location

HOLGUIN, FAHAN & ASSOCIATES, INC.
ENVIRONMENTAL MANAGEMENT CONSULTANTS

50 WEST MAIN STREET
VENTURA, CALIFORNIA 93001
(805) 641-1056

Rev. B11-0356 West

GENERAL NOTES:

1.0 GENERAL

1.1 ALL WORK IS TO BE PERFORMED ACCORDING TO THE CHEVRON REMEDIATION SYSTEM DESIGN MANUAL. THIS MANUAL IS AVAILABLE UPON REQUEST.

1.2 THE SELECTED CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND SITE CONDITIONS BEFORE STARTING WORK. THE ENGINEER'S PROJECT MANAGER SHALL BE NOTIFIED OF ANY DISCREPANCY.

1.3 ALL MATERIALS USED FOR CONSTRUCTION OF THE SYSTEM SHALL BE NEW UNLESS OTHERWISE NOTED. THE REMEDIATION EQUIPMENT SHALL BE PROVIDED BY CHEVRON AND HFA.

1.4 THE CONTRACTOR SHALL RESTORE ANY EXCAVATED SURFACE AREA TO MATCH EXISTING.

1.5 ALL CONSTRUCTION AREAS SHALL BE CLEARLY MARKED WITH BARRICADES, CONES, PLATES, OR OTHER APPROVED SAFETY MARKERS TO RESTRICT ACCESS AND PROVIDE A SAFE WORK ENVIRONMENT FOR THE CONTRACTOR AND STATION CUSTOMERS.

1.6 A PRE-CONSTRUCTION MEETING BETWEEN CHEVRON, THE CONTRACTOR, AND ENGINEER WILL BE REQUIRED BEFORE WORK BEGINS. THE MEETING WILL BE HELD AT THE SITE.

1.7 THE CONTRACTOR SHALL WARRANTY ALL MATERIALS AND CONSTRUCTION FOR A PERIOD OF ONE-YEAR. ALL DEFECTS SHALL BE CORRECTED AT THE CONTRACTOR'S EXPENSE.

1.8 ALL WORK SHALL BE CONDUCTED UNDER CHEVRON'S "PERMIT TO WORK" SYSTEM. NO WORK SHALL BE CONDUCTED WITHOUT A PERMIT TO WORK.

1.9 THE CONTRACTOR WILL BE RESPONSIBLE FOR LOCATING, VERIFYING, AND MAINTAINING THE INTEGRITY OF ALL UNDERGROUND UTILITIES, TANKS, WELLS, STRUCTURES, AND PIPING DURING ALL CONSTRUCTION ACTIVITIES. THE CONTRACTOR SHALL HAND-DIG ALL HIGH RISK AREAS (I.E. AREAS WITHIN 10-FEET OF PRODUCT FACILITIES, TANKS, PIPES, KNOWN UTILITIES, ETC). THE CONTRACTOR WILL REPAIR OR REPLACE, AT THEIR OWN COST, ANY DAMAGE DURING CONSTRUCTION ACTIVITIES.

1.10 ALL NECESSARY INSPECTIONS SHALL BE OBTAINED AND COORDINATED BY THE CONTRACTOR.

2.0 TRENCHING AND EXCAVATION

2.1 ALL EXCAVATED SOIL SHALL BE MONITORED BY THE ENGINEER IN ACCORDANCE WITH SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT GUIDELINES. IF SOIL WITH PETROLEUM HYDROCARBONS IS DETECTED, THE SOIL SHALL BE STOCKPILED ON AND COVERED WITH PLASTIC SHEETS IN AN AREA DESIGNATED BY THE ENGINEER. THE ENGINEER WILL SAMPLE THE EXCAVATED SOIL FOR PETROLEUM HYDROCARBONS. CHEVRON WILL BE RESPONSIBLE FOR DISPOSAL OF SOIL WITH PETROLEUM HYDROCARBONS. THE CONTRACTOR SHALL DISPOSE OF ALL CLEAN SOIL AND CONSTRUCTION DEBRIS INCLUDING ANY PAVEMENT REMOVED DURING TRENCHING.

2.2 WHERE PIPING IS INSTALLED BELOW GROUND, THE PIPE SHALL BE BURIED IN A TRENCH OR EXCAVATED AT A MINIMUM DEPTH OF 18-INCHES TO THE TOP OF THE PIPE, UNLESS OTHERWISE STATED. IF CONDITIONS EXIST, THE EXCAVATIONS SHALL BE SAW-CUT TO PROVIDE A SQUARE VERTICAL JOINT FOR REPAVING. IF TRENCHES REMAIN OPEN AFTER NORMAL WORK HOURS, THEY SHALL BE COVERED WITH METAL TRENCH PLATES CAPABLE OF SUPPORTING VEHICULAR TRAFFIC, AT THE CONTRACTORS EXPENSE. TRENCHES SHALL NOT REMAIN OPEN OVER A WEEKEND UNLESS COVERED BY TRENCH PLATES. IN CASES WHERE THE BUSINESS MUST REMAIN OPEN DURING CONSTRUCTION, ALL TRENCH PLATES SHALL BE COLD PATCHED WITH ASPHALT TO PREVENT ACCIDENTAL TRIPS OR SLIPS BY THE GENERAL PUBLIC.

2.3 PIPING, TRENCHES, AND EXCAVATIONS SHALL BE BACKFILLED WITH IMPORTED SAND FROM 2-INCHES BELOW THE PIPING TO 2-INCHES ABOVE THE PIPING. THE BACKFILL MATERIAL SHALL BE COMPACTED TO 95% OF THE RELATIVE DRY DENSITY. ALTERNATIVELY, A CONCRETE SLURRY MAY BE USED AS BACKFILL WHEN APPROVED BY THE PROJECT MANAGER. NO COMPACTION TESTING IS REQUIRED FOR SLURRY BACKFILL IF THE MATERIAL SPECIFICATIONS INDICATE A POST-PLACEMENT COMPACTION OF AT LEAST 95% OF THE MAXIMUM DRY DENSITY.

2.4 PAVEMENT REMOVED FROM TRENCHES OR OTHER EXCAVATIONS SHALL BE REPLACED WITH NEW MATERIAL TO MATCH EXISTING SURFACE. BASE MATERIAL SHALL BE COMPACTED TO 95% OF THE RELATIVE DRY DENSITY. THE ASPHALT MIX SHALL BE DESIGNED AND INSTALLED TO ALLOW FOR NORMAL COMMERCIAL BUSINESS TRAFFIC INCLUDING DELIVERY TRUCKS. WHEN RESURFACING WITH CONCRETE, REINFORCED CONCRETE SHALL BE USED OVER AGGREGATE BASE. BASE MATERIAL SHALL BE COMPACTED TO 95% OF THE RELATIVE DRY DENSITY. REINFORCING SHALL BE NO. 4 REBAR TIED TO AN EXISTING SLAB STAGGERED ON EACH SIDE OF THE TRENCH ON 18-INCH CENTERS PLACED AT MIDHEIGHT.

2.5 THE CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO PREVENT DAMAGE TO UNDERGROUND UTILITIES, PIPING, AND ADJOINING STRUCTURES.

2.6 CONTRACTOR SHALL MAKE EVERY EFFORT TO UTILIZE EXISTING EDGES OF PAVEMENT WHEN SAW-CUTTING TO REDUCE UNNECESSARY SAW-CUTS.

2.7 CONTRACTOR SHALL USE AQUACRETE OR EQUIVALENT SEALANT TO SEAL THE CONCRETE JOINTS, IF INSTALLED.

2.8 CONTRACTOR SHALL RETURN TO THE SITE AFTER ONE WEEK AND APPLY ASPHALT JOINT SEALER TO ALL AREAS THAT WERE TRENCHED AND REPLACED, IF ASPHALT WAS PLACED.

2.9 THE CONTRACTOR SHALL POSSESS A CURRENT LICENSE FOR THE EXCAVATION AND HANDLING OF CONTAMINATED MATERIAL. ALL CONTRACTORS AND SUBCONTRACTORS SHALL POSSESS CURRENT AND APPLICABLE STATE LICENSES FOR PERFORMING THEIR RESPECTIVE SCOPE OF WORK.

2.10 DISPOSAL OF ALL NON-CONTAMINATED WASTE GENERATED DURING CONSTRUCTION SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

2.11 AN ARCHAEOLOGICAL MONITOR, PROVIDED BY HFA, WILL BE PRESENT DURING ANY EXCAVATION ACTIVITES >18 INCHES.

3.0 PIPING

3.1 ALL UNDERGROUND PROCESS PIPING SHALL BE SCHEDULE 80 PVC (UNLESS OTHERWISE INDICATED) WITH GLUED SLIP FITTINGS. ALL ABOVEGROUND PROCESS PIPING SHALL BE SCHEDULE 80 PVC (UNLESS OTHERWISE INDICATED) WITH GLUED SLIP FITTINGS AS INDICATED BY THE DRAWINGS. CONTRACTOR TO USE LOW VOLATILE ORGANIC COMPOUND EMITTING PRIMERS AND SOLVENTS WHEN INSTALLING GLUED SLIP FITTINGS. UNLESS OTHERWISE STATED, ALL VALVES SHALL BE PVC SLIP FITTED AS INDICATED BY THE DRAWINGS.

3.2 LARGE RADIUS FITTINGS SHALL BE USED WHEN POSSIBLE TO MINIMIZE PRESSURE DROP. HARD 90-DEGREE FITTINGS MAY BE USED WHEN APPROVED BY THE CONSULTANT.

3.3 WHEN CONNECTING TO OR BYPASSING EXISTING UNDERGROUND PIPING THE CONTRACTOR SHALL FIRST VERIFY THE EXISTING PIPING PATH AND PRESSURE TEST.

3.4 WHERE PIPING IS ROUTED ABOVEGROUND INSIDE THE EQUIPMENT ENCLOSURE, THE PIPING SHALL BE SUPPORTED BY UNI-STRUT PIPE SUPPORTS AND CLAMPS. THE UNISTRUT SUPPORT SHALL BE FASTENED TO THE WALL, OR MOUNTED ON A BASE THAT IS SECURED TO THE GROUND.

3.5 ALL PROCESS PIPING SHALL BE PRESSURE TESTED AT 15 PSI FOR ONE-HOUR AND WITNESSED BY THE CONSULTANT. NO TESTING WILL BE CONDUCTED THROUGH INSTRUMENTS OR EQUIPMENT.

4.0 ELECTRICAL

4.1 THE CONTRACTOR SHALL FURNISH AND INSTALL ALL EQUIPMENT NECESSARY TO CONNECT TO THE UTILITIES EXISTING ELECTRICAL SERVICE AND ROUTE THE APPROPRIATE ELECTRIC SERVICE TO THE REMEDIATION SYSTEM AND REMEDIATION CONTROL PANELS. THE CONTRACTOR WILL BE RESPONSIBLE FOR PROVIDING POWER TO THE REMEDIATION EQUIPMENT AND OBTAINING THE ELECTRICAL PERMIT FOR OPERATION OF THE EQUIPMENT. THE CONTRACTOR SHALL VERIFY OPERATION OF ALL ELECTRICAL EQUIPMENT UPON COMPLETION OF WORK.

4.2 THE CONTRACTOR SHALL ACQUIRE ALL NECESSARY PERMITS AND PAY ALL ASSOCIATED FEES. THE CONTRACTOR SHALL PAY FOR INSTALLATION / DEPOSIT FOR POWER POLE, IF REQUIRED.

4.3 THE ELECTRIC SERVICE SHALL BE EQUIPPED WITH A POWER METER AND WEATHER-TIGHT MAIN PANEL WITH A LOCKABLE SHUT-OFF SWITCH LOCATED OUTSIDE THE EQUIPMENT ENCLOSURE.

4.4 ALL ELECTRICAL WORK SHALL BE COMPLETED IN ACCORDANCE WITH THE MOST RECENT EDITION OF THE N.E.C., THE LOCAL BUILDING DEPARTMENT, AND THE LOCAL FIRE DEPARTMENT. ANY DRAWINGS REQUIRED FOR PERMITS OTHER THAN THOSE PRESENTED HEREIN WILL BE THE RESPONSIBILITY OF THE CONTRACTOR AND SHALL BE REVIEWED BY THE ENGINEER PRIOR TO USE.

4.5 IF NECESSARY, THE INSTALLATION WITHIN THE EQUIPMENT ENCLOSURE SHALL COMPLY WITH A CLASS I, DIVISION II ENVIRONMENT AS PER N.E.C. AND LOCAL CODES. ALL WIRING CONNECTORS, CONDUIT, AND CONTRACTOR SUPPLIED EQUIPMENT SHALL COMPLY WITH CLASS I, DIVISION II REQUIREMENTS, IF REQUIRED BY THE N.E.C. OR LOCAL CODES.

4.6 ELECTRICAL WIRING SHALL BE CONTAINED IN RIGID CONDUIT AND ROUTED ALONG THE ENCLOSURE FLOOR AND WALLS OR BURIED AS ALLOWED BY LOCAL CODE.

4.7 ALL COMPONENTS NECESSARY TO INSTALL THE REMEDIATION SYSTEM CONTROL PANEL SHALL BE SUPPLIED, CONSTRUCTED, AND INSTALLED BY THE CONTRACTOR.

4.8 ALL ELECTRICAL CONNECTIONS IN SUBSURFACE VAULTS OR PULL BOXES SHALL BE COMPLETED IN A WATERTIGHT JUNCTION BOX. EXPOSED WIRING IS NOT ACCEPTABLE IN VAULTS OR PULL BOXES.

4.9 A QUALIFIED ELECTRICIAN SHALL BE ON-SITE FOR A MINIMUM OF TWO DAYS FOR THE STARTUP OF THE EQUIPMENT. THE ELECTRICIAN WILL DEMONSTRATE PROPER MOTOR ROTATION, PROPER CONNECTIONS OF EQUIPMENT TO CIRCUIT BREAKERS, AND BE AVAILABLE TO TROUBLESHOOT ELECTRICAL PROBLEMS WITH THE SYSTEM.

5.0 EQUIPMENT ENCLOSURES

5.1 FENCE POST FOOTINGS SHALL BE CONCRETE, MINIMUM 1-FOOT DIAMETER AND 3-FEET DEEP, UNLESS OTHERWISE SPECIFIED IN THE APPLICABLE PERMIT CONDITIONS.

5.2 CONTRACTOR TO INSTALL THE FOLLOWING SIGNAGE ON MAIN SIDE OF THE ENCLOSURE
A. DANGER HIGH VOLTAGE
B. NO SMOKING
C. CALIFORNIA PROPOSITION 65
D. EMERGENCY SHUTOFF SIGN NEAR THE SHUTOFF CONTROLS
E. HOLGUIN, FAHAN, AND ASSOCIATES, INC. SIGN (PROVIDED BY HFA)

5.3 CONTRACTOR TO SUPPLY AND INSTALL ONE 20 LBS. ABC RATED FIRE EXTINGUISHER IN THE ENCLOSURE IN ACCORDANCE WITH CHEVRON REQUIREMENTS AND THE LOCAL FIRE CODES.

5.4 CONTRACTOR SHALL CONSTRUCT A SECONDARY CONTAINMENT BERM WITH A VOLUME OF 110% OF THE LARGEST LIQUID VESSEL WITHIN THE ENCLOSURE.

6.0 CONSTRUCTION

6.1 THE CONTRACTOR SHALL CONFIRM A CONSTRUCTION SCHEDULE WITH HFA'S ENGINEERING PROJECT MANAGER AT LEAST 72-HOURS PRIOR TO ANY WORK AT THE SITE.

7.0 SAFETY / CLEAN-UP

7.1 ALL SITE WORKERS SHALL HAVE LOSS PREVENTION SYSTEM (LPS) TRAINING AND CERTIFICATION. CONTRACTOR SHALL MEET REQUIREMENTS OF CHEVRON'S SHORT SERVICE EMPLOYEE PROCESS (SSE).

7.2 THE CONTRACTOR (INCLUDING WORKERS AND SUBCONTRACTORS) SHALL PREPARE A SITE-SPECIFIC HEALTH AND SAFETY PLAN (HASP), JOURNEY MANAGEMENT PLAN (JMP), AND TASK SPECIFIC JOB LOSS ANALYSIS (JLA) PRIOR TO BEGINNING ANY WORK. THE CONTRACTOR SHALL ABIDE BY THE HASP, JMP, AND ALL JLA's DURING SITE WORK. A COPY OF ALL SAFETY MATERIAL AND WORKER CERTIFICATIONS SHALL BE PROVIDED TO THE CONSULTANT PRIOR TO ANY WORK.

7.3 PRIOR TO DEPARTURE FROM THE SITE, THE CONTRACTOR SHALL MAKE SURE THAT THE WORK AREA IS CLEAN AND ORDERLY.

7.4 THE CONTRACTOR SHALL CONTAIN LOOSE DEBRIS AND STORE CONSTRUCTION MATERIALS ON A DAILY BASIS PRIOR TO DEPARTURE FROM THE SITE TO PROVIDE A CLEAN AND ORDERLY WORK AREA.

7.5 SAFETY RESPONSIBILITY: THE CONTRACTOR AGREES TO ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION, INCLUDING ALL PERSONS AND PROPERTY. THE REQUIREMENT SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS. THE CONTRACTOR SHALL DEFEND, INDEMNIFY, AND HOLD CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY, CHEVRON PRODUCTS COMPANY, AND HOLGUIN, FAHAN & ASSOCIATES, INC. HARMLESS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THE PROJECT, EXCEPT FOR LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF CHEVRON OR HOLGUIN, FAHAN & ASSOCIATES, INC.

8.0 INSPECTIONS

8.1 ALL SITE INSPECTIONS REQUIRE A MINIMUM OF 24 HOURS NOTICE. ALL FIRE DEPARTMENT INSPECTIONS ARE TO BE REQUESTED THROUGH THE BUILDING DIVISION, PLEASE SPECIFY AS TO TYPE OF INSPECTION.

8.2 A FINAL INSPECTION WILL BE PERFORMED BY THE CONSULTANT AND/OR THE CHEVRON PROJECT MANAGER. ALL ITEMS NOT MEETINGTHE SPECIFICATIONS AND THE RDP SHALL BE PROMPTLY REPAIRED AND/OR REPLACED BY THE CONTRACTOR AT NO EXPENSE TO CHEVRON OR HOLGUIN, FAHAN & ASSOCAITES, INC.

9.0 REFERENCE

1 ← Note Reference Number

2 / M2 ← Detail Number / Drawing Number

SIGNATURE	DATE
REVIEW ENGR:	
PROJECT ENGR:	
PROJECT MGR:	
CLIENT:	

HOLGUIN, FAHAN & ASSOCIATES, INC.
ENVIRONMENTAL MANAGEMENT CONSULTANTS
50 West Main Street
Ventura, California 93001
(805) 641-1056

CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY

CHEVRON SERVICE STATION #9-8719

26988 ORTEGA HIGHWAY

SAN JUAN CAPISTRANO, CA

DESIGN AND CONSTRUCTION NOTES

DESIGNED BY:	DETAILED BY:	CHECKED BY:
NOP	NOP	RAJ

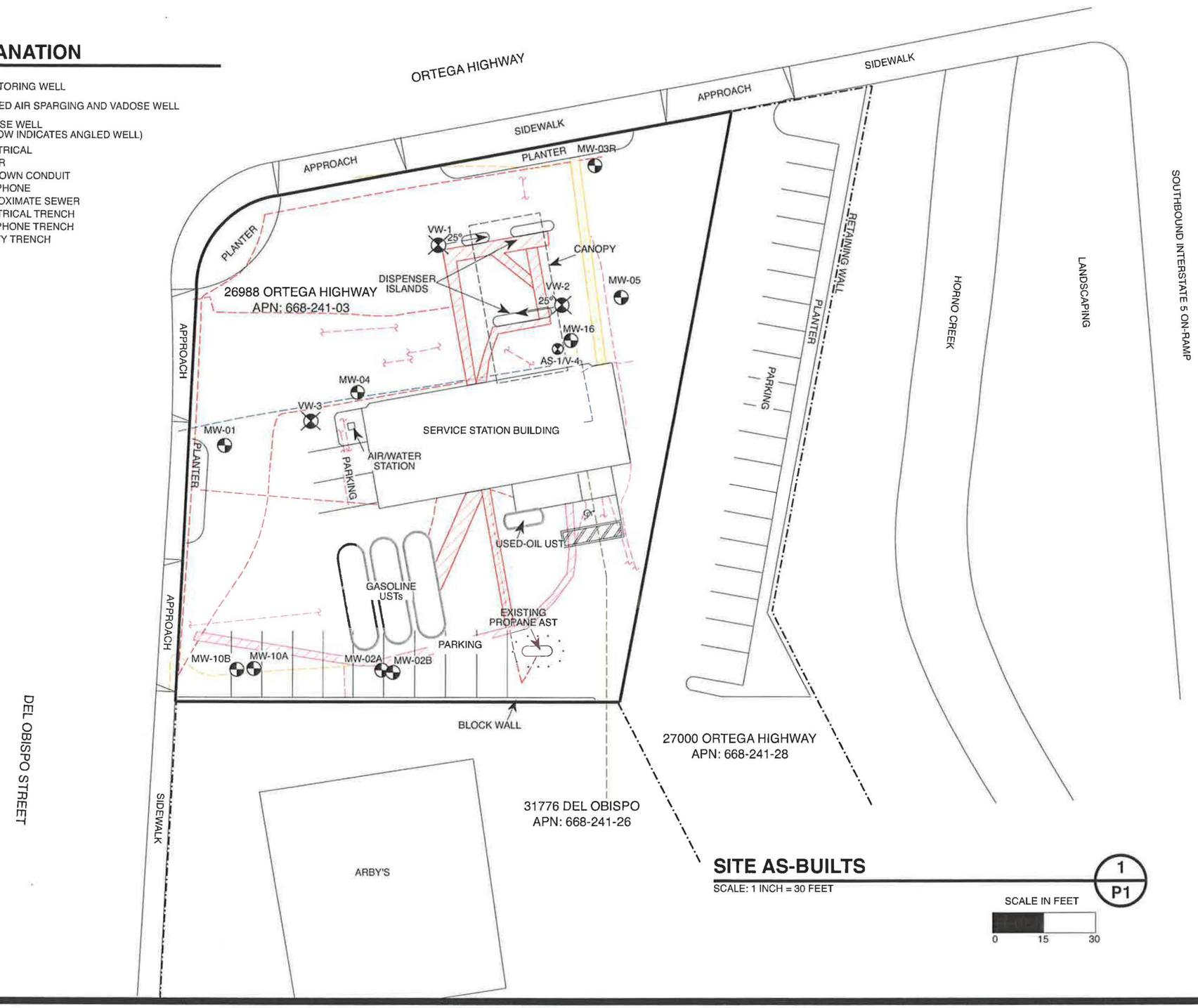
DATE:	FILE:
7/18/2011	9-8719

PROJECT NO:	CONTRACT:
9-8719	11-98719R2

DRAWING:	REVISION:	SHEET NUMBER:
G2	1	2 of 11

EXPLANATION

- MONITORING WELL
- NESTED AIR SPARGING AND VADOSE WELL
- 25° VADOSE WELL (ARROW INDICATES ANGLED WELL)
- ELECTRICAL
- WATER
- UNKNOWN CONDUIT
- TELEPHONE
- APPROXIMATE SEWER
- ELECTRICAL TRENCH
- TELEPHONE TRENCH
- UTILITY TRENCH



SITE AS-BUILTS

SCALE: 1 INCH = 30 FEET

1
P1

SCALE IN FEET
0 15 30

SIGNATURE	DATE
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PROJECT ENGR:	
PROJECT MGR:	
CLIENT:	

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SITE AS-BUILTS

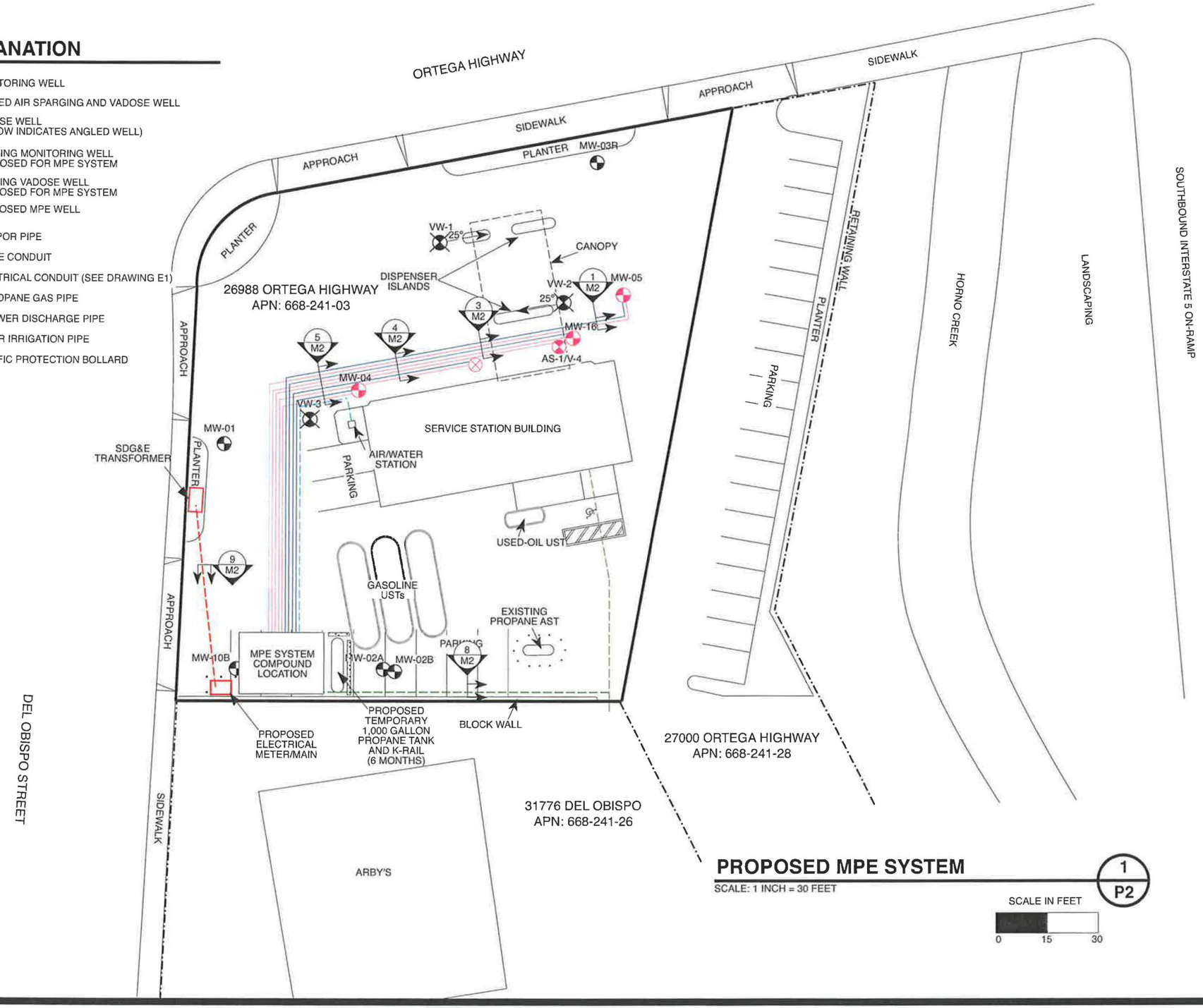
DESIGNED BY:	DETAILED BY:	CHECKED BY:
NOP	NOP	RAJ

DATE:	FILE:
7/18/2011	9-8719
PROJECT NO: 9-8719	CONTRACT: 11-98719R2

DRAWING: P1 REVISION: SHEET NUMBER: 3 of 11

EXPLANATION

- MONITORING WELL
- NESTED AIR SPARGING AND VADOSE WELL
- 25° VADOSE WELL (ARROW INDICATES ANGLED WELL)
- EXISTING MONITORING WELL PROPOSED FOR MPE SYSTEM
- EXISTING VADOSE WELL PROPOSED FOR MPE SYSTEM
- PROPOSED MPE WELL
- 3" VAPOR PIPE
- 3" MPE CONDUIT
- ELECTRICAL CONDUIT (SEE DRAWING E1)
- 1" PROPANE GAS PIPE
- 3" SEWER DISCHARGE PIPE
- WATER IRRIGATION PIPE
- TRAFFIC PROTECTION BOLLARD



PROPOSED MPE SYSTEM

SCALE: 1 INCH = 30 FEET

1 / P2

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CHEVRON SERVICE STATION #9-8719

26988 ORTEGA HIGHWAY

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PROPOSED MPE SYSTEM LOCATION

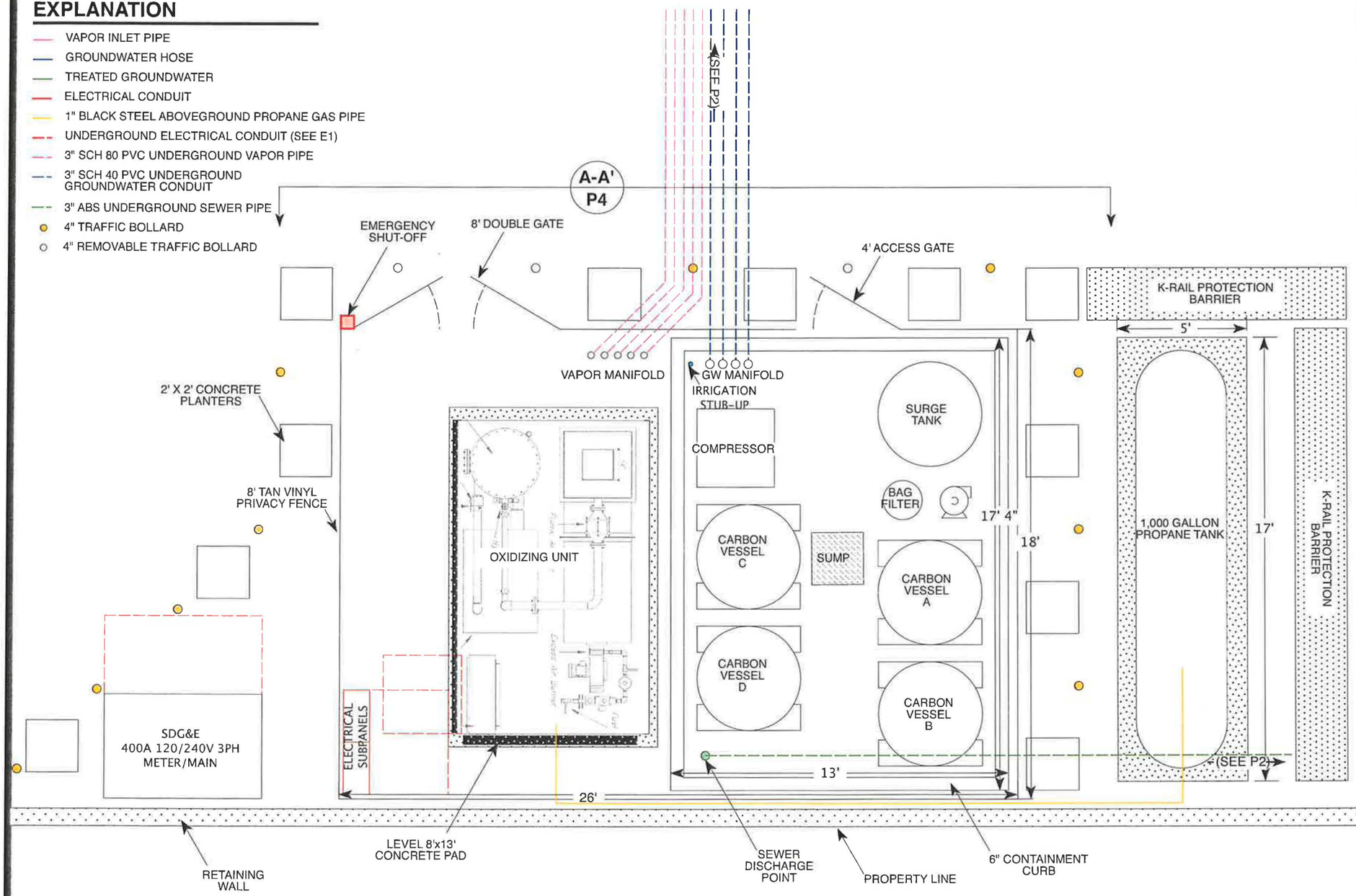
DESIGNED BY:	DETAILED BY:	CHECKED BY:
NOP	NOP	RAJ

DATE:	FILE:
7/18/2011	9-8719
PROJECT NO: 9-8719	CONTRACT: 11-98719R2

DRAWING: P2 REVISION: SHEET NUMBER: 4 of 11

EXPLANATION

- VAPOR INLET PIPE
- GROUNDWATER HOSE
- TREATED GROUNDWATER
- ELECTRICAL CONDUIT
- 1" BLACK STEEL ABOVEGROUND PROPANE GAS PIPE
- UNDERGROUND ELECTRICAL CONDUIT (SEE E1)
- 3" SCH 80 PVC UNDERGROUND VAPOR PIPE
- 3" SCH 40 PVC UNDERGROUND GROUNDWATER CONDUIT
- 3" ABS UNDERGROUND SEWER PIPE
- 4" TRAFFIC BOLLARD
- 4" REMOVABLE TRAFFIC BOLLARD



COMPOUND PLAN

SCALE: 1 INCH = 4 FEET

1 / P3

SCALE IN FEET

0 2' 4'

N

SIGNATURE	DATE
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PROJECT ENGR:	
PROJECT MGR:	
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CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY

CHEVRON SERVICE STATION #9-8719

26988 ORTEGA HIGHWAY

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COMPOUND PLAN

DESIGNED BY:	DETAILED BY:	CHECKED BY:
NOP	NOP	RAJ

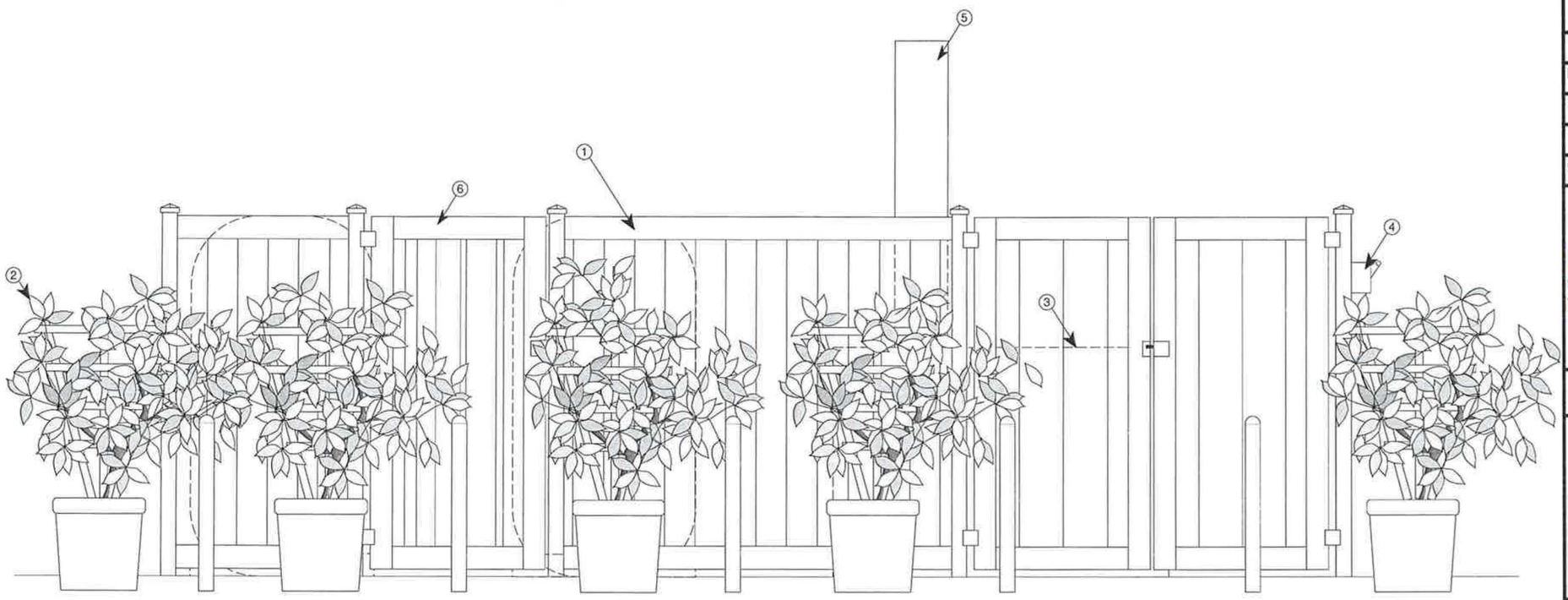
DATE:	FILE:
7/19/2011	9-8719

PROJECT NO:	CONTRACT:
9-8719	11-98719R2

DRAWING:	REVISION:	SHEET NUMBER:
P3	1	5 of 11

NOTES

1. 8-FOOT VINYLCRAFT PRIVACY FENCE, TAN COLOR
2. SOFTSCAPE SCREENING WITH BOUGANVILLEA PLANT (OR LIKE) IN 2 FEET x 2 FEET CONCRETE PLANTER POTS. PLANTS TO BE MAINTAINED BY HFA
3. MAJORITY OF REMEDIATION EQUIPMENT TO BE SCREENED FROM VIEW BEHIND COMPOUND FENCE
4. EMERGENCY SHUT-OFF SWITCH
5. VENT STACK
6. 4-FOOT ACCESS GATE



EQUIPMENT COMPOUND ELEVATION A-A' P4

SCALE: 1 INCH = 5 FEET 4 INCHES

SCALE IN FEET

0 2'8" 5'4"

SIGNATURE	DATE
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PROJECT MGR:	
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26988 ORTEGA HIGHWAY

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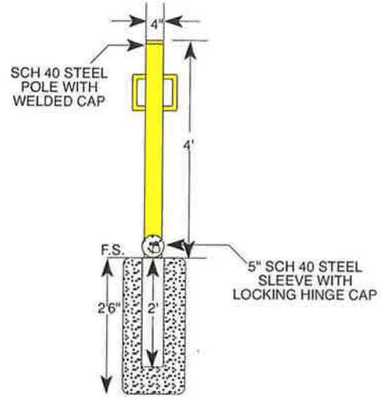
ELEVATION DRAWING

DESIGNED BY:	DETAILED BY:	CHECKED BY:
NOP	NOP	RAJ

DATE:	FILE:
7/19/2011	9-8719

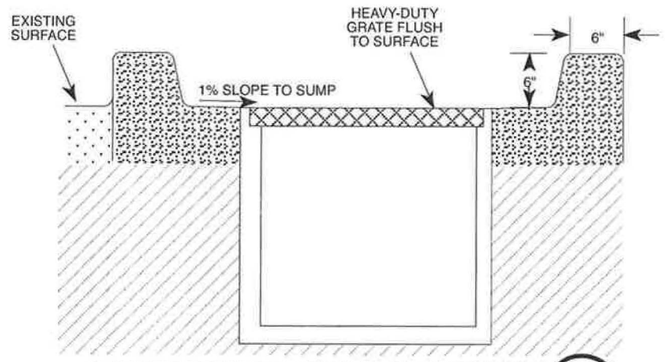
PROJECT NO:	CONTRACT:
9-8719	11-98719R2

DRAWING:	REVISION:	SHEET NUMBER:
P4	1	6 of 11



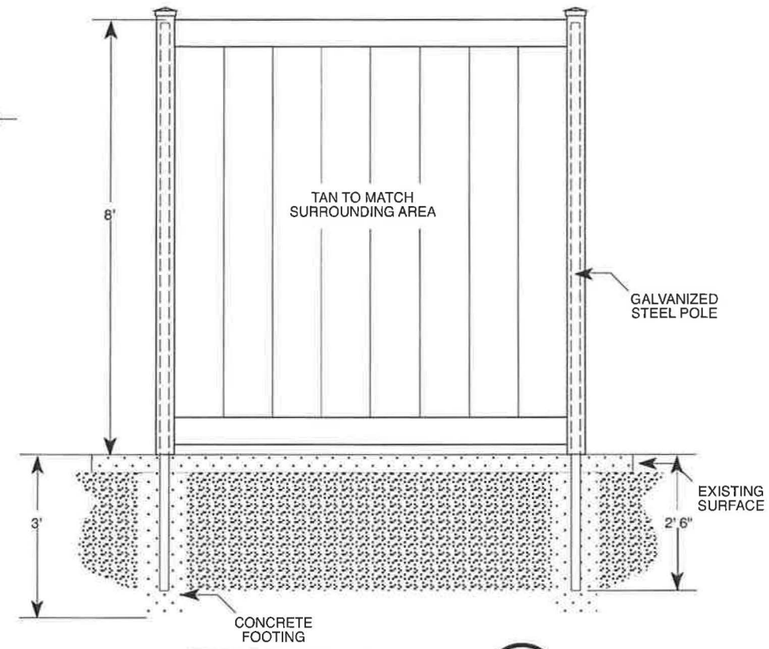
REMOVABLE BOLLARD (1 / M1)

SCALE: 3/8" = 1'



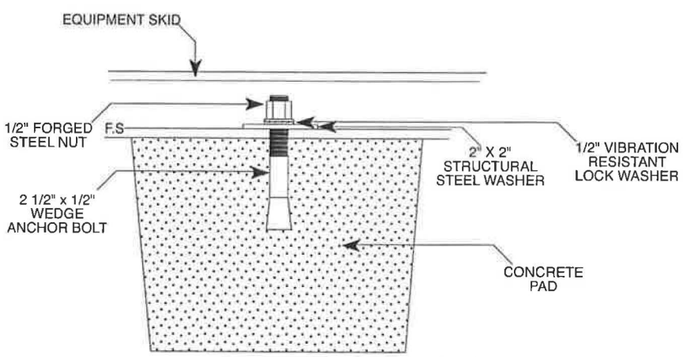
CONTAINMENT BERM AND SUMP (2 / M1)

SCALE: NTS



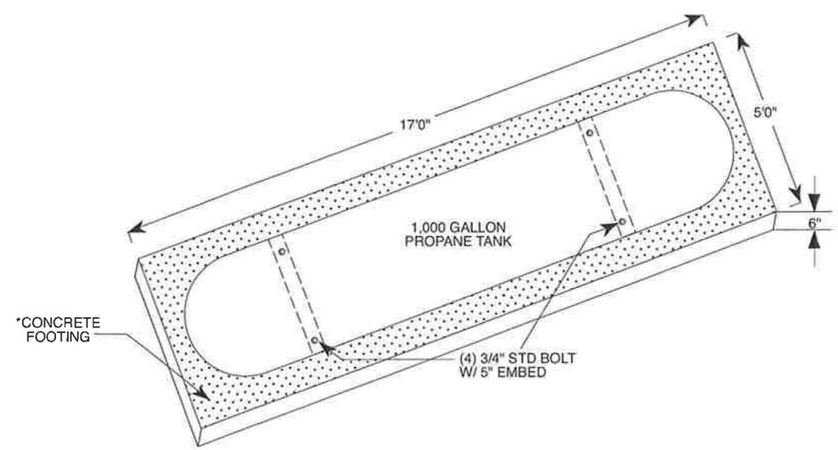
FENCE DETAIL (3 / M1)

SCALE: 3/8" = 1'



EQUIPMENT ANCHOR (4 / M1)

SCALE: NTS



PROPANE TANK (5 / M1)

SCALE: 1/4" = 1'

* 2500 PSI CONCRETE
NO. 4 REBAR 18' O.C.

SIGNATURE	DATE
REVIEW ENGR:	
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PROJECT MGR:	
CLIENT:	

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CHEVRON SERVICE STATION #9-8719

26988 ORTEGA HIGHWAY

SAN JUAN CAPISTRANO, CA

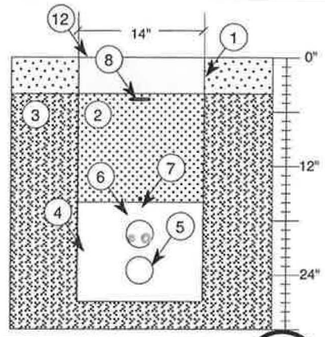
STANDARD DESIGN DETAILS

DESIGNED BY:	DETAILED BY:	CHECKED BY:
NOP	NOP	RAJ

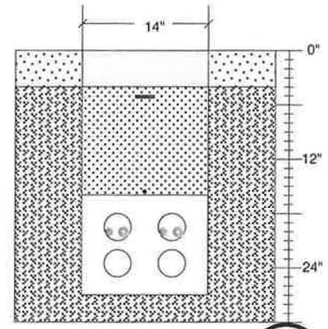
DATE:	FILE:
6/20/2011	9-8719

PROJECT NO:	CONTRACT:
9-8719	11-98719R2

DRAWING:	REVISION:	SHEET NUMBER:
M1		7 of 11



TRENCH DETAIL 1 / M2
SCALE: 3/4" = 1'



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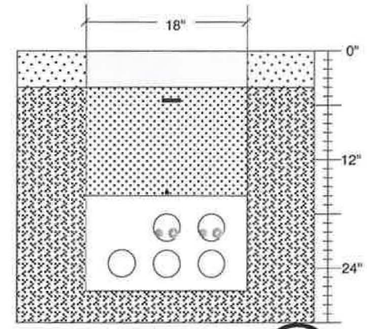

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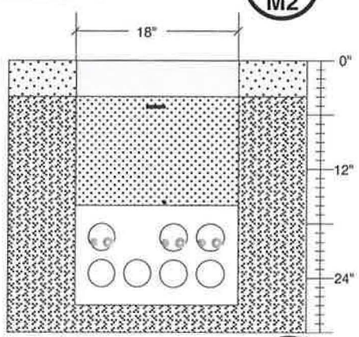

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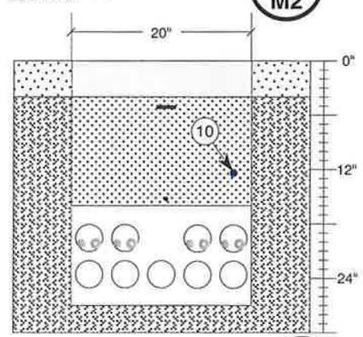

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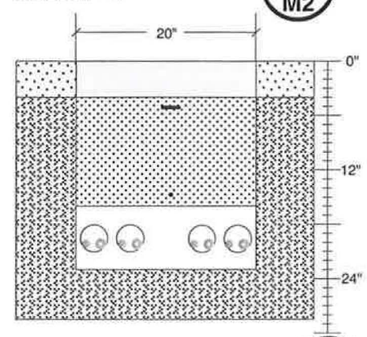

TRENCH DETAIL 6 / M2
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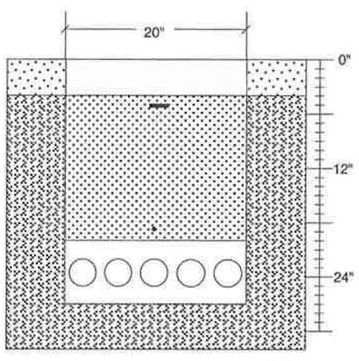
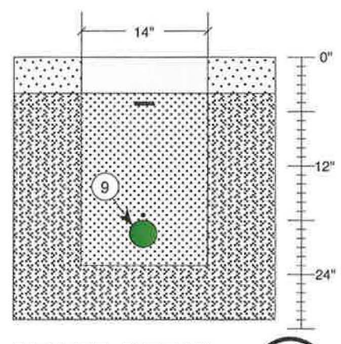
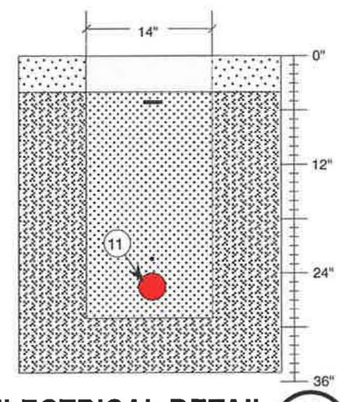


TRENCH DETAIL 7 / M2
SCALE: 3/4" = 1'



SEWER DETAIL 8 / M2
SCALE: 3/4" = 1'



ELECTRICAL DETAIL 9 / M2
SCALE: 3/4" = 1'

NOTES:

1. SAWCUT AND BREAKOUT WITH VERTICAL FACE
2. BACKFILL WITH 1-SACK SLURRY
3. NATIVE SOIL
4. SHADE WITH SAND
5. 3" DIAMETER SCH 80 PVC VAPOR CONVEYANCE PIPE
6. 3" DIAMETER SCH 40 PVC CONDUIT CONTAINING:
   - 1/2" AIR HOSE RATED FOR 150% MAX OPERATING PRESSURE
   - 3/4" WATER HOSE RATED FOR CHEMICAL COMPATIBILITY
7. 12-GAUGE, PLASTIC COATED, TRACER WIRE
8. METALLIC UNDERGROUND WARNING TAPE
9. 3" DIAMETER ABS TREATED WASTEWATER DISCHARGE PIPE
10. IRRIGATION PIPE CONNECTED AT AIR/WATER STATION. PIPE SIZE, MATERIAL, AND BURIAL DEPTH TO COMPLY WITH UPC AND CITY OF SAN JUAN CAPISTRANO PLUMBING CODE
11. 3" DIAMETER ELECTRICAL SERVICE CONDUIT
12. REPAVE TO MATCH SURROUNDING SURFACE

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CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY

CHEVRON SERVICE STATION #9-8719

26988 ORTEGA HIGHWAY

SAN JUAN CAPISTRANO, CA

TRENCH DETAIL

DESIGNED BY:	DETAILED BY:	CHECKED BY:
NOP	NOP	RAJ

DATE:	FILE:
2/1/2011	9-8719

PROJECT NO:	CONTRACT:
9-8719	11-98719R2

DRAWING:	REVISION:	SHEET NUMBER:
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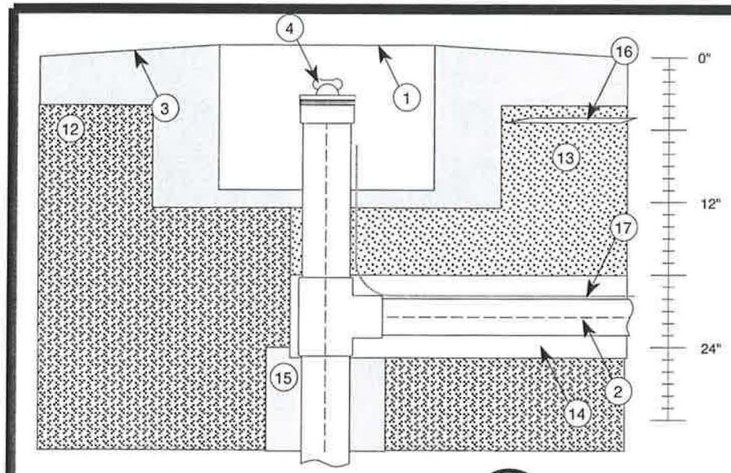
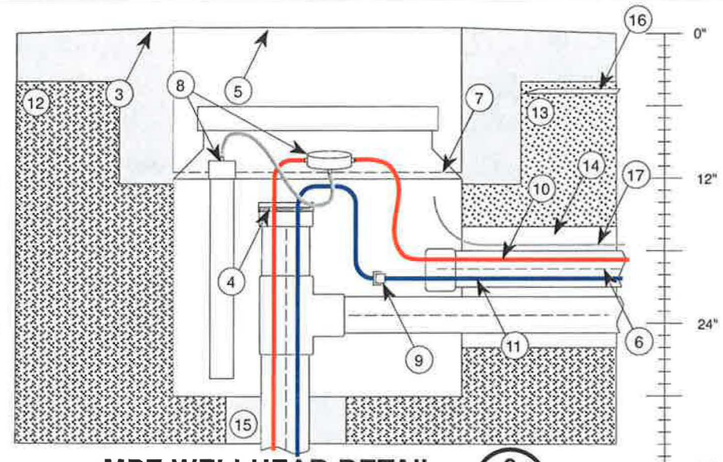


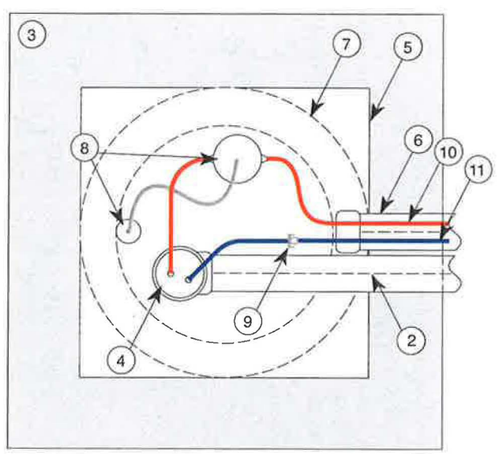
VAPOR WELLHEAD DETAIL (1 / M3)

SCALE: 1" = 1'



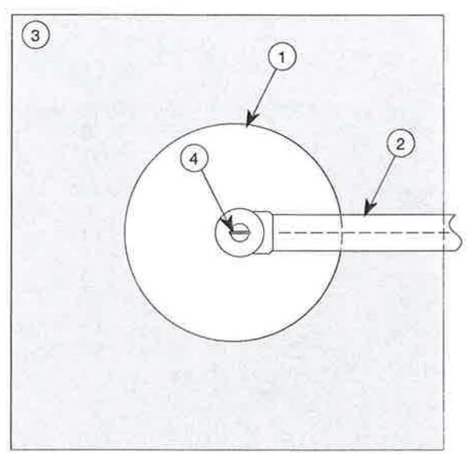
MPE WELLHEAD DETAIL (2 / M3)

SCALE: 1" = 1'



MPE WELL PAD DETAIL (3 / M3)

SCALE: 1" = 1'



VAPOR WELL PAD DETAIL (4 / M3)

SCALE: 1" = 1'

NOTES:

1. 18" WELL VAULT
2. 3" VAPOR CONVEYANCE PIPE
3. 3' x 3' CONCRETE WELL PAD (1/2" SLOPE PER FOOT)
4. 4" WELL SEAL
5. 2' x 2' x 1' WELL VAULT
6. 3" SCH 40 PVC CONTAINMENT CONDUIT
7. 30-GALLON RONCO SUMP TANK
8. AIR PUMP CONTROL VALVE AND SENSING TUBE
9. QUICK-CONNECT FITTING
10. 1/2" AIR HOSE RATED FOR 150% MAX OPERATING PRESSURE
11. 3/4" WATER HOSE RATED FOR CHEMICAL COMPATIBILITY
12. NATIVE SOIL
13. 1-SACK SLURRY
14. SHADE WITH SAND
15. BENTONITE WELL SEAL
16. METALLIC UNDERGROUND WARNING TAPE
17. 12-GAUGE, PLASTIC COATED, TRACER WIRE

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26988 ORTEGA HIGHWAY

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WELL CONNECTION DETAIL

DESIGNED BY:	DETAILED BY:	CHECKED BY:
NOP	NOP	RAJ

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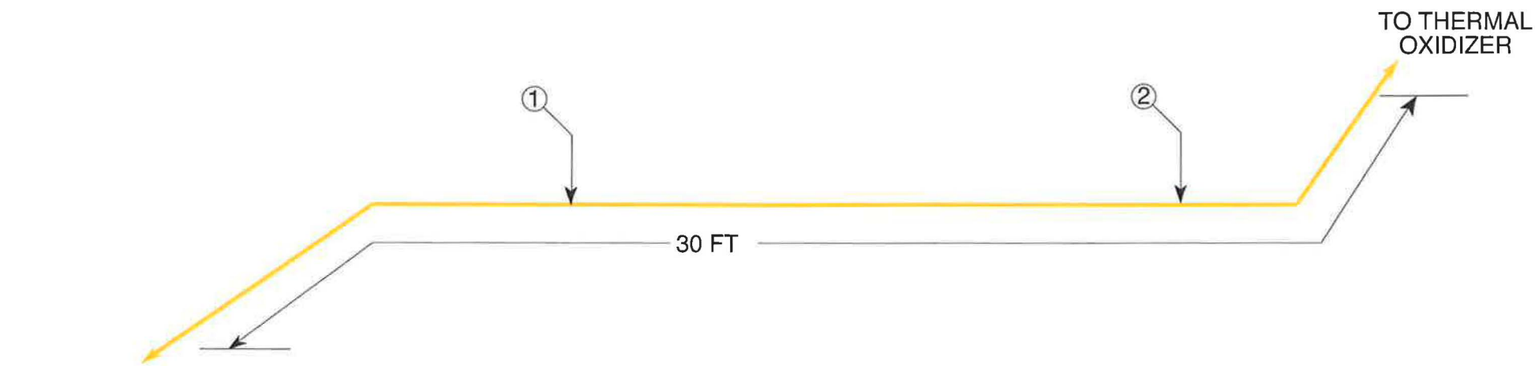

ISOMETRIC GAS CONVEYANCE LINE 1 / M4

CALCULATIONS:

TOTAL DEVELOPED LENGTH OF NATURAL GAS LINE = 30'

TOTAL CFH/(BTU/HR) LOAD CALCULATION:

HEATING VALUE FOR PROPANE = 2,580 BTU/CF
OXIDIZER NATURAL GAS REQUIREMENT = (1,500,000 BTU/HR)
PROPANE VOLUMETRIC FLOW RATE = (1,500,000BTU/HR)/(2,580BTU/CF) = 580 CFH

UPC TABLE 12-6 (1994 EDITION) FOR 5 PSI, 0.6 S.G., 1.5 PSI DROP:

1" PIPE @ 100 FT = 3,786 CFH	1"PIPE @ 250 FT = 2,306 CFH
1" PIPE @ 150 FT = 3,041 CFH	1"PIPE @ 300 FT = 2,090 CFH
1" PIPE @ 200 FT = 2,602 CFH	1"PIPE @ 350 FT = 1,923 CFH

NOTES:

1. THE GAS LINE TO CONSIST OF 1" BLACK STEEL, HDPE, OR OTHER APPROVED MATERIAL WITH APPROPRIATE CORROSION PROTECTION
2. ALL ABOVE-GRADE GAS LINE SHALL BE INSTALLED A MINIMUM OF 6' ABOVE GRADE WITH SECURED STRUT

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SAN JUAN CAPISTRANO, CA

PROPANE ISOMETRIC CONVEYANCE

DESIGNED BY:	DETAILED BY:	CHECKED BY:
NOP	NOP	RAJ

DATE: 7/21/2011	FILE: 9-8719
PROJECT NO: 9-8719	CONTRACT: 11-98719R2

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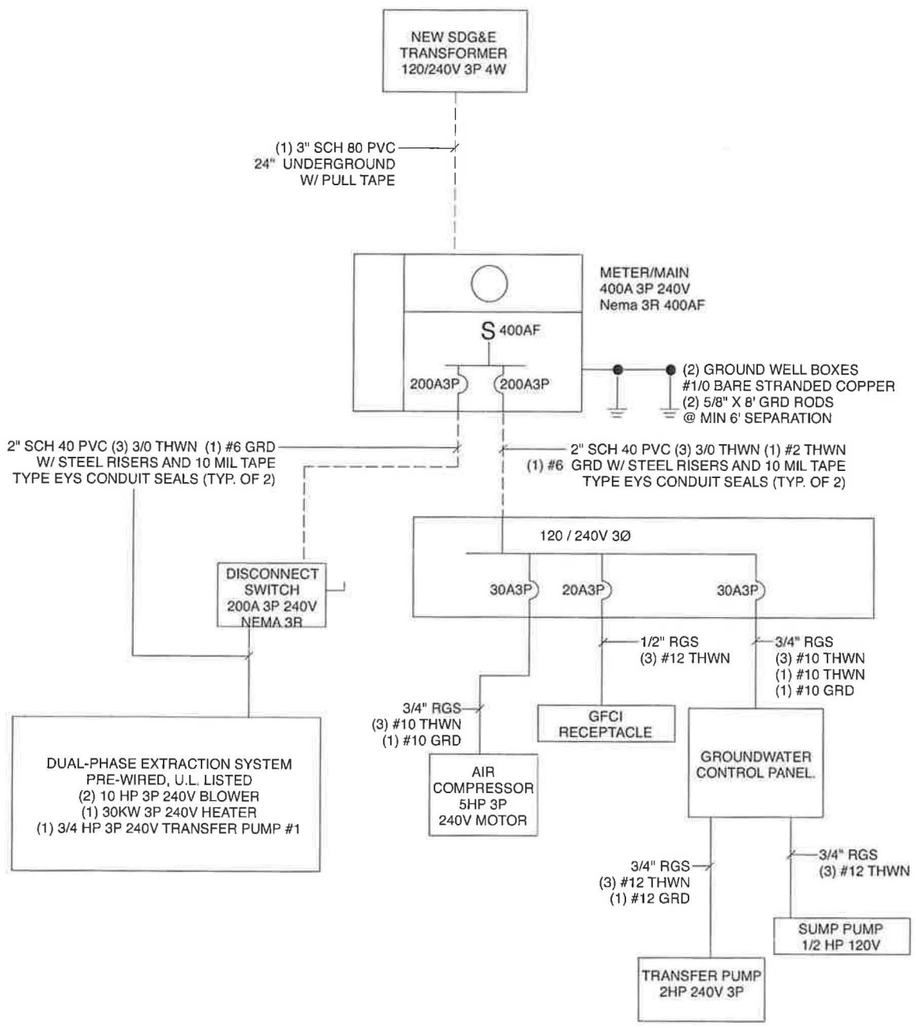

SINGLE-LINE DIAGRAM (1 / E1)

LOAD SCHEDULE

OXIDIZER EQUIPMENT	HP	VOLTS	PHASE	WATTS
VES BLOWER #1	10 HP	240 V	3Ø	11,625
VES BLOWER #2	10 HP	240 V	3Ø	11,625
CATOX HEATER	30 KW	240 V	3Ø	30,000
TRANSFER PUMP #1	3/4 HP	240 V	3Ø	1,163
CONTROL POWER		120 V		1,000
GW EQUIPMENT				
AIR COMPRESSOR	5 HP	240 V	3Ø	6,311
TRANSFER PUMP #2	2 HP	240 V	3Ø	2,824
SUMP PUMP	1/2 HP	120 V	1Ø	1,840
GFCI RECEPTACLE		120 V		1,000
25% LCL				7,500
			TOTAL WATTS	74,888
TOTAL SYSTEM AMPS: 74,888W / 240V * 1.73 = 180A				

LOAD SCHEDULE (2 / E1)

NOTES:

1. METER / MAIN TO CONFORM WITH SDG&E REQUIREMENTS FOR 120/240V POWER
2. ALL ELECTRICAL CONSTRUCTION SHALL COMPLY WITH THE NATIONAL ELECTRIC CODE AND THE CITY OF SAN JUAN CAPISTRANO
3. ALL EQUIPMENT IS TO BE LISTED AND APPROVED FOR THE INTENDED USE
4. ALL CONDUCTORS TO BE STRANDED COPPER WIRE TYPE THWN-2. EXCEPT WHERE NOTED
5. ALL ABOVEGROUND CONDUITS TO BE RIGID GALVANIZED STEEL. EXCEPT WHERE NOTED
6. ALL MOTORS TO BE CONNECTED WITH LIQUID TIGHT FLEXIBLE METAL CORE CONDUIT

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CHEVRON SERVICE STATION #9-8719

26988 ORTEGA HIGHWAY

SAN JUAN CAPISTRANO, CA

ELECTRICAL DIAGRAM

DESIGNED BY:	DETAILED BY:	CHECKED BY:
DJ	DJ	NOP

DATE: 3/8/2011	FILE: 9-8719
PROJECT NO: 9-8719	CONTRACT: 11-98719R2

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E1	1	11 of 11