INFORMATION HANDOUT

For Contract No. 01-0B2804
At DN-101-17.4

Identified by
Project ID 0112000112

MATERIALS INFORMATION

Foundation Report for Log Fill Repair Wall dated October 2, 2014

State of California Business, Transportation and Housing Agency

DEPARMENT OF TRANSPORTATION

M e m o r a n d u m

To: MANODE KODSUNTIE
Structure Design Engineer
Design Branch 7
Office of Bridge Design North & Central

Date: October 2, 2014
File: 01-DN-101-PM 17.5
EFIS ID: 0112000112
Retaining Wall No.: 01E0016

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
GEOTECHNICAL SERVICES
OFFICE OF GEOTECHNICAL DESIGN NORTH – BRANCH B

Subject: Foundation Report for Log Fill Repair Wall

INTRODUCTION

This Foundation Report summarizes the results of the foundation investigation and provides geotechnical recommendations for a soldier pile and lagging wall with ground anchors on Route 101 at post mile (PM) 17.5 in Del Norte County, CA (Figure 1). The wall is required to repair a slope failure along the southbound edge of the highway.

PROJECT DESCRIPTION

The existing alignment was constructed in 1933 as a state highway (Contract 61TC1), and included a 9.9 mile realignment of the 1920's era highway (from Last Chance to Flannigan's) up onto the ridge and away from the previous narrow winding coastal alignment. The realignment was designed to limit the amount of tree removal. One of the techniques utilized at that time was to reuse the old growth that had to be felled in construction as fill material. This reduced the need for imported borrow, allowed for steeper fills that reduced the alignment footprint and eliminated costs associated with removing the timber. The Final Construction report for this project indicates that the constructed roadway width at this location was 37 feet, and the structural section was composed of 0.5 ft crusher run base with a 0.2 ft untreated crushed stone surface.

A subsequent project in 1958 (Contract 59-1TC10) added six passing lane locations to this portion of the Redwood Highway, including a passing lane at the project site. Another project (01-062204) in 1966 slightly widened and repaved the highway north of Last Chance.

The project site is a fill failure at one of the log fill locations in this realigned section. As-builts of the site do not specify the size of the logs and of the log fill. At the time of the storm damage event, the roadway consisted of three 12 foot lanes with two 4 foot paved shoulders. In March 2012, the southbound lane was abandoned and the centerline was shifted east to the lane line between the #1 and 2 NB lanes, creating a 2 lane highway.

The FHWA Damage Assessment Form (DAF) signed 7/13/2011 noted “Slipout/Sink Along Southbound Lane” and identified the assumed log fill failure area on the plan and profile damage sketch.

Construction photos of typical log fill structures from the 1933 highway construction are shown

The slope failure is characterized as a fill failure of the log fill probably caused by deterioration of the logs in the roadway fill. At this location, District 1 plans to construct a soldier pile wall with ground anchors to repair the failing slope and support the roadway. The project scope includes restoring the tangent alignment, shoulder widening, and associated minor drainage improvements. The cross culverts located at PM 17.41 and 17.51 will be replaced. A location map showing the project location (Figure 1) and a Site Plan (Figures 2A and 2B) are attached.

The proposed wall is 500 feet in length with a maximum wall height of 25 feet. The restored alignment will consist of two 12 foot lanes with 8 foot SB and 6-8 ft NB paved shoulders.

EXCEPTIONS

The recommendations contained in this report are based on a review of geotechnical/geologic literature, a subsurface investigation, laboratory testing of soil samples, geotechnical calculations and field observations.

Subsurface conditions were evaluated only at the boring locations and may deviate elsewhere within the Project Limits. The elevations reported in this memorandum are with respect to Mean Sea Level (MSL).

REFERENCES

"Childs Hill, Calif" (NE/4 Klamath 15' Quadrangle) 7.5 Minute Quadrangle (Topographic) Map N4137.5-W12400/7.5, United States Geological Survey (USGS), 1966, Photoinspected 1975, map scale 1:24,000

Davenport, C.W., 1984, Geology and Geomorphic Features Related to Landsliding, Childs Hill 7.5' Quadrangle, Del Norte County, California: California Division of Mines and Geology Open-File Report OFR 84-7 S.F., map scale 1:24,000

US Department of Transportation, Federal Highway Administration – California Division, Damage Assessment Form (DAF) Title 23, Inspection date March 25, 2011.

Wills, C.J., 2000, Landslides in the Highway 101 Corridor Between Wilson Creek and Crescent City, Del
Norte County, California: Department of Conservation, California Geologic Survey, Special Report 184

Caltrans Reports and Plans

01-DN-101-PM 17.5 FHWA Damage Assessment Form (DAF) CEP-CT01-003-0 (signed 07/13/2011)

Caltrans Corrosion Guidelines Version 2.0, 11/2012

Preliminary Caltrans Design Plans, dated 07/2012

Log Fill Repair Wall General Plan, dated 09/17/2013

Log Fill Repair Wall Unchecked Details, dated 08/06/2014

Caltrans Bridge Design Specifications Section 5, 8/2004

Caltrans Structure Design – Memo to Designers 5-12, dated July 2012
Caltrans Soil and Rock Logging, Classification, and Presentation Manual, 2010 Edition.

Caltrans As-Built Plans and District 1 Materials Laboratory Records (Various)

California Division of Highways Final Construction Report for Contract 61TC1, dated February 9, 1935

FIELD INVESTIGATION AND TESTING PROGRAM

A total of nine borings were completed between May 2012 and May 2013 (Figure 2). The borings were advanced using a truck mounted Acker MPCA drill rig using a 94-mm HXB casing equipped with a steel finger bit or diamond impregnated core bit.

Samples of the soil and bedrock from the borings were obtained by punch core, coring and a 1.4-inch (inside diameter) Standard Penetration Test (SPT) sampler driven with an automatic 140-pound hammer dropped 30 inches. The blows required to drive the samplers were recorded for each 6 inches of penetration or fraction thereof (ASTM D1586-11 Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils).

Visual classifications were made in accordance to the Caltrans Soil and Rock Logging, Classification, and Presentation Manual 2010 Edition which conforms to ASTM D2488-09a Standard Practice for Description and Identification of Soils (Visual-Manual Procedure).

Slope inclinometer (SI) casings were installed in all borings. The annular space around the casings were backfilled with #8 sand, and the bottom 20 feet of the SI casings were perforated to allow groundwater measurement. The borings were completed at the surface with traffic-rated access boxes.

Inclinometer readings were obtained between May 2012 and September of 2013. The boring locations and wall layout line are shown on Figures 2A and 2B. A summary of the borings and inclinometer monitoring results are summarized in Table 1. The SI data are included in Appendix A.

TABLE 1

BORING AND INCLINOMETER DATA SUMMARY

I.D.	STATION/ OFFSET ("A" LINE)	DEPTH OF BORING (ft, bgs)	SURFACE ELEVATION (ft, MSL)	DATE COMPLETED	DEPTH TO TKfs ROCK (ft, bgs)	DEPTH TO FAILURE SURFACE (ft, bgs)
RC-12-001	263+24.48 LT 17.48'	40	1061.57	5/15/2012	20	N/A

I.D.	STATION/ OFFSET ("A" LINE)	DEPTH OF BORING (ft, bgs)	SURFACE ELEVATION (ft, MSL)	DATE COMPLETED	DEPTH TO TKfs ROCK (ft, bgs)	DEPTH TO FAILURE SURFACE (ft, bgs)
RC-12-002	263+36.35 LT 22.23'	40	1061.70	5/16/2012	28	20
RC-12-003	262+40.15 LT 14.15'	60	1058.01	5/17/2012	21	N/A
RC-12-004	263+19.58 LT 25.50'	50	1059.71	5/17/2012	30[2]	12
RC-12-005	261+39.65 LT 17.48'	60	1053.14	6/13/2012	23	8
RC-13-006[1]	261+89.65 RT 16.25'	65	1055.4	5/08/2013	15	N/A
RC-13-007[1]	261+89.65 LT 16.55'	99	1055.5	5/16/2013	41.5	22
RC-13-008[1]	263+49.66 LT 14.16'	50	1062.0	5/22/2013	30[2]	N/A
RC-13-009[1]	260+92.35 LT 22.47	60	1050.3	5/22/2-13	28	N/A

[1]Approximate STATION/OFFSET and SURFACE ELEVATION
[2]Approximate depth to bedrock

LABORATORY TESTING

Laboratory testing of soil samples obtained from boring RC-08-001was performed at Caltrans' Geotechnical Materials Laboratory in Sacramento, California. The following tests were performed:

- Grading Analysis (CA Test Method No. 202)
- Unit Weight
- Moisture Content
- Mechanical Analysis
- Atterberg limits
- Corrosivity test (pH and Resistivity) (CA Test Method No. 643)
- Corrosivity tests (Chloride Content, Sulfate Content) (CA Test Method Nos. 422 and 417)

Test Results are included in Appendix B.

SITE GEOLOGY AND SUBSURFACE CONDITIONS

Site Description

Currently the road surface is approximately 38 feet wide with narrow to nonexistent NB shoulders and up to 12 foot wide SB shoulders. The head scarp of the slope failure is located within the SB shoulder and is closed to traffic with delineators. The wall layout line is near the hinge point of the failing slope (Figures 2A and 2B).

Site Geology

A geologic map of the area is provided in Figure 3. Bedrock within the project limits is mapped as Franciscan Mélange (KJfm) consisting of highly sheared shale and argillite near the contact with Cretatious to Jurassic age rock of the Franciscan Broken Formation (KJfbf) consisting of hard sandstone and sheared shale.

The bedrock at the site is gray to very dark gray, medium to fine-grained, slightly weathered to decomposed sandstone, mudstone and shale. The bedrock is overlain by Clayey SAND (SC) and Sandy CLAY with GRAVEL (CL).

In addition to the numerous field reviews conducted by personnel from this Office, A site reconnaissance was performed by Tom Whitman of the Office of Geotechnical Design West in January of 2013. The consensus is that the deformation of the roadway is the result of a failure of the log fill, probably due to deterioration of the logs and migration of fill material through the logs. Although the log fill is locally oversteepened possibly indicating a foundation failure, no evidence of larger (global) instability was observed at the site.

Subsurface Conditions

The borings encountered 5 to 10 feet of AC, cold mix and road base material. Note that most borings were located in failed pavement areas within AC or cold mix patches. The asphalt concrete is underlain by up to 15 feet of native material recompacted as fill and consisting of Clayey SAND (SC) and Sandy CLAY with GRAVEL (CL). Beneath this was a similar in-place native material identified as Clayey SAND (SC) and Sandy CLAY with GRAVEL (CL). Voids were noted at various locations in these layers. These have been noted on the Subsurface Profile Along the Wall Layout Line (WLOL) (Figures 4A and 4B). There was little woody debris encountered in the borings.

The depth to bedrock ranges between 15 and 42 feet. The bedrock consists of interbedded sandstone, shale, siltstone and mudstone that ranges from fresh to very intensely weathered, soft to hard and moderately to very intensely fractured. Bedrock throughout all the borings contained layers of varying thicknesses that were decomposed.

Logs of Test Borings (LOTBs) will be provided at a future date to be included in the plans.

Groundwater Conditions

Groundwater levels were checked in the perforated SI casings installed in all borings during and after their installation. The groundwater measurements are reported in Table 2.

TABLE 2

WATER LEVEL MEASUREMENTS[1]

Date Measured		RC-12-001	RC-12-002	RC-12-003	RC-12-004	RC-12-005	RC-13-006	RC-13-007	RC-13-008	RC-13-009
05/22/12		30	32.6	59.3	49.2					
06/12/12		32.4	36.7	59.6	49.5					
06/13/12						42.9				

Date Measured		RC-12-001	RC-12-002	RC-12-003	RC-12-004	RC-12-005	RC-13-006	RC-13-007	RC-13-008	RC-13-009
10/10/12		36	dry	dry	dry					
01/03/13		35.1	dry	dry	dry	38.9				
05/09/13							45.1			
05/23/13			28.0			44.0		87.0	37.0	38.0
06/25/13			35.6			45.3	47.1	85.6	36.7	44.1
06/27/13		35.7		dry						
09/26/13		dry	34.2			46.0		85.3	37.6	44.4

Notes: 1 - All water levels measured from the top of casings as feet below ground surface.

CORROSION EVALUATION

Chemical analyses were performed on samples collected from borings RC-13-006 and RC-13-007 to evaluate corrosion potential of the on-site soils. Testing was performed by the Caltrans Materials Laboratory and Corrosion Branch in Sacramento, CA and at the District1 Materials Laboratory in Sacramento, CA. Table 3 summarizes the test results.

TABLE 3

SOIL CORROSION TEST SUMMARY

BOREHOLE ID	DEPTH (ft, bgs)	pH	MINIMUM RESISTIVITY (ohm-cm)	IS SAMPLE CORROSIVE?
RC-13-007	10- 15	8.23	6908	NO
RC-13-007	26.5 - 30	4.46	6815	YES
RC-13-006	29	3.77	866	YES

The Corrosion Test Summary Report dated 11/22/2013 is included in Appendix B.

Based on the Caltrans Corrosion Guidelines (2003 version 1.0) and the laboratory test results, the site is corrosive to foundation elements.

SEISMIC RECOMMENDATIONS

For LRFD seismic design criteria, we consulted Anoosh Shamsabadi from the Caltrans Office of Earthquake Engineering.

A shear wave velocity of 278 m/s was determined from soil types and corrected SPT N values. Utilizing the Caltrans ARS Online tool (V2.3.06), we recommend using the USGS 5% in 50 years hazard (2008) curve, which yields a spectral acceleration of 0.5g at period T = 0 seconds. The horizontal seismic coefficient (Kh) is typically taken as $^{1}/_{3}$ to $^{1}/_{2}$ of the PGA; we recommend using **Kh = 0.2** for LRFD Extreme Event analysis. We recommend a value for vertical seismic coefficient **Kv =0**.

The ARS online data sheet utilized is attached to this report as Appendix C.

GEOTECHNICAL AND FOUNDATION RECOMMENDATIONS

Wall Location and Height

We recommend a soldier pile wall with timber lagging and ground anchors wall be constructed to retain the roadway prism and the underlying soils. The wall layout line is shown on the attached Site Plan sheets (Figures 2A and 2B). The wall, as shown, will extend from roadway station 260+00 to station 265+00 for a wall length of 500 feet. The maximum wall height is 25 feet from top of wall to bottom of lagging. A Subsurface Profile Along the WLOL (Figures 4A and 4B) is provided.

Design Parameters

Soil strength parameters for design were determined by using the standard penetration test (SPT) N values, published correlations and laboratory data. The soil design parameters were determined from the slope stability program SLOPE/W 2007 using the critical cross section at Station 261+89.65 (“A” Line). Observed ground surface features and depth to the failure plane (from inclinometer data) were used to fix the entry, depth and exit points of the failure surface. A factor of safety of 1.0 was assumed for the existing slope. The Spenser method of limit equilibrium that satisfies both force and moment equilibrium was used for this back analysis. The soil and rock parameters are provided in Table 4.

TABLE 4

Soil Design Parameters

LAYER	APPROXIMATE THICKNESS (at WLOL) (ft)	TOTAL UNIT WEIGHT (pcf)	ANGLE OF INTERNAL FRICTION (degrees)	COHESION (c, psf)
AC/Cold Mix/Base	5-10	120	32	0
Clayey SAND and Sandy CLAY with GRAVEL	5-25	110	32	140
BEDROCK Interbedded Sandstone/Shale	20-50	135	35	200

See the attached Subsurface Profile Along the WLOL (Figures 4A and 4B) and Design Cross Section (Figure 5) for subsurface material representation.

Hydrostatic Forces

For wall design we recommend that the groundwater level be assumed to be at bottom of lagging.

Design pressures should be based on moist unit weights of the soil above the groundwater surface and saturated unit weights should be applied below the groundwater surface.

Lateral Earth Pressure

The recommended active earth pressure is based on Caltrans Bridge Design Specifications, Section 5 - Retaining Walls (August 2004) and Caltrans Memo to Designers 5-12, Earth Retaining Systems Using Ground Anchors (July 2012). The active earth pressure distribution diagram was developed based on

a soldier pile wall with a maximum height of 25 feet and ground anchors located at 7 feet and 17 feet below top of wall.

Recommended active lateral earth pressures for the wall design are given in Table 5. The pressures are derived from the following soil parameters which are for the two soil layers in Table 4 combined:

coefficient of active lateral earth pressure ($k_{a)}$ = 0.31
unit weight of soil(γ) = 115 pcf,
soil friction angle (ϕ) = 32°
cohesion (c) = 0 psf

Additional wall conditions based on a 20 foot wall section with one ground anchor located 7 feet below top of wall and a 12 foot high cantilever wall section were also developed. These unfactored values are provided in Table 5.

TABLE 5

Design Active Earth Parameters

Wall Height (H) (feet)	**Anchor 1 (H_1) (feet below top of wall)**	**Anchor 2 (H_2) (feet below top of wall)**	**Active Lateral Earth Pressure Resultant acting on Wall Height H per unit width of wall P_a (Kips/Ft)**
25	7	17	11.4
20	7	N/A	7.1
12	N/A	N/A	2.6

Pile Length and Embedment

We recommend all piles extend a minimum of 10 feet into bedrock. All piles should be a minimum length of 40 feet, except for those from Station 161+80 through162+28 ("A" Line). These piles (# 22 through #28) should be a minimum length of 55 feet.

Ground Anchors

Ground anchors are assumed to be at 7 feet and 17 feet below the top of wall at an inclination of 20^{o} from horizontal (based on Log Fill Repair Wall General Plan dated 9-27-13). We recommend that the upper row of ground anchors have an unbounded length of 40 feet, and the lower row of ground anchors have an unbounded length of 30 feet.

EARTH WORK AND WALL BACKFILL RECOMMENDATIONS

The wall is designed so that the design height H provides a berm in front of the wall face at least 4 feet wide measured from the face of the wall and provides a design grade at least 2 feet below finished grade measured at the face of the wall (Caltrans Bridge Design Specifications, 5.8.6.1). It is anticipated that portions of the fill slope below the roadway will be removed to construct the wall.

To assure adequate wall drainage, shims should be placed between the timber lagging in conjunction with free-draining backfill material.

RIPPABILITY

Based on the boring logs and field observations, we expect the material within the anticipated limits of excavation to be rippable. The boring locations are shown in Figure 2.

CONSTRUCTION CONSIDERATIONS

The typical sequence of Soldier Pile Wall installation shall follow the Structure Plans and the Special Provisions for this project.

Excavation and Drilling Difficulties

Caving conditions may be encountered during drilling holes for piles and for ground anchor installation due to the granular soils and the very intensely fractured rock.

Groundwater may be encountered in the drilled holes for piles and ground anchor installation.

Temporary casing or tremie seals shall be furnished and placed where necessary to control water or to prevent caving of the hole in conformance with the provisions in Section 49-4.03, “Drilled Holes,” of the Standard Specifications.

Difficult drilling for piles is anticipated due to the presence of caving conditions, ground water, and traffic control. Difficult drilling and installation of ground anchors is anticipated with limited access in front of the WLOL due to the presence of redwood trees.

Hazardous Materials

The Cretaceous to Jurassic age Franciscan rock (KJfbf and KJfm) and the soils overlying them within the Project Limits do not contain NOA.

PROJECT INFORMATION

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

Data and information attached with the project plans are:

A. Log of Test Borings for Log Fill Repair Wall

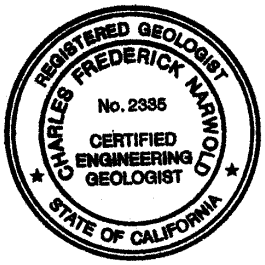
Data and information included in the Information Handout provided to the bidders and contractors are:

A. Foundation Report for Log Fill Repair Wall No.01E0016 dated October 2, 2014

Data and Information available for observation at the CalTrans District 1 Office in Eureka, CA:

A. Borehole Core Samples

If you have any questions or need additional information, please contact Kathy Gallagher at (707) 441-2024 or Charlie Narwold at (707) 445-6036.



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Transportation Engineer
Office of Geotechnical Design North

CHARLIE NARWOLD
Senior Engineering Geologist
Office of Geotechnical Design North

List of Figures

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Figures 2A and 2B - Site Plan

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Figures 4A and 4B- Subsurface Profile Along the WLOL

Figure 5 - Design Cross Section

Appendices

Appendix A: Slope Inclinometer Monitoring Results

Appendix B: Laboratory Test Summary and Data Sheets

Appendix C: ARS Online Data Sheet

C: RMahallati (E-copy)

GS File Room (email gs_file_room@dot.ca.gov)

Structure Construction RE Pending File (email RE_pending_file@dot.ca.gov)

Project Manager

INDEX OF PLANS

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

PROJECT PLANS FOR CONSTRUCTION ON

STATE HIGHWAY

IN DEL NORTE COUNTY
4.8 MILES NORTH OF WILSON CREEK BRIDGE

TO BE SUPPLEMENTED BY STANDARD PLANS DATED MAY 2010

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
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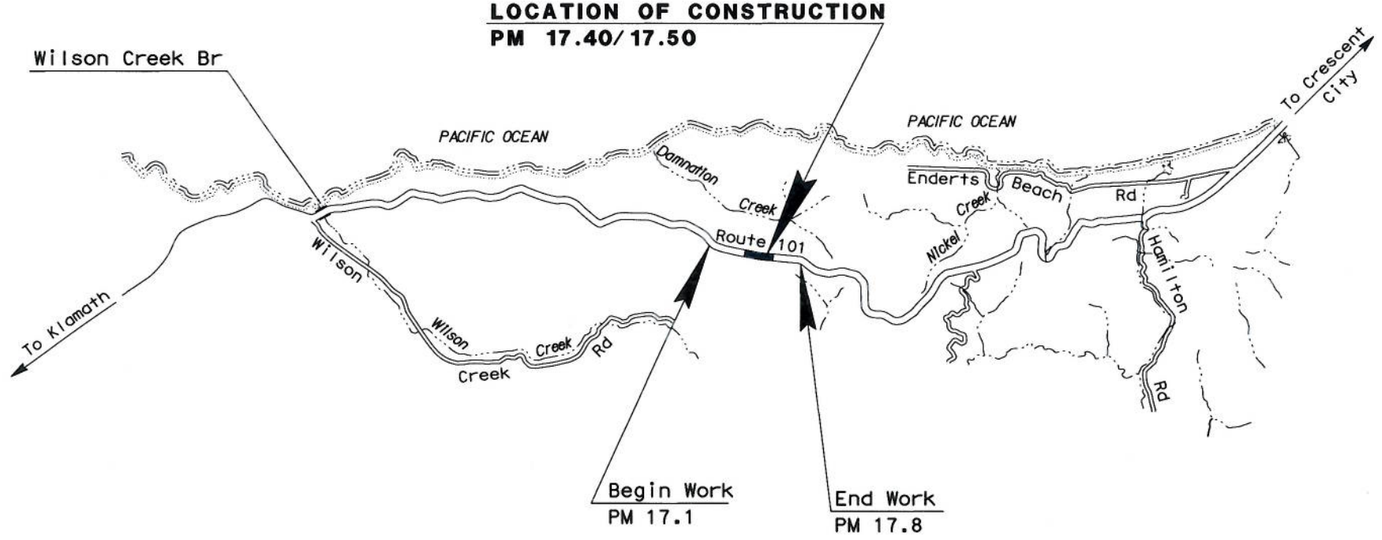
PM 17.40/17.50



LOCATION MAP
No Scale

LOG FILL REPAIR WALL FOUNDATION REPORT

FIGURE 1
LOCATION MAP

DESIGN ENGINEER	PROJECT MANAGER
L. R. ASHLEY	TALITHA HODGSON

DATE PLOTTED => 29-JAN-2014
TIME PLOTTED => 10:54

LAST REVISION 00-00-00

CONTRACT No.	01-0B2804
PROJECT ID	01120001121

THE CONTRACTOR SHALL POSSESS THE CLASS (OR CLASSES) OF LICENSE AS SPECIFIED IN THE "NOTICE TO BIDDERS."

BORDER LAST REVISED 7/2/2010 | CALTRANS WEB SITE IS: HTTP//WWW.DOT.CA.GOV/

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UNIT 0000 | PROJECT NUMBER & PHASE 01120001121

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
No.
Exp.
CIVIL
STATE OF CALIFORNIA

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APPROXIMATE LOCATION OF LOG FILL

R/W

PROPOSED WALL CATCH POINT

RC-13-009

WLOL

RC-12-005

RC-13-007

RC-12-003

260

261

262

RC-12-006

EP

R/W

Boring Location and Number

RC-1X-00X

FIGURE 2A
SITE PLAN

REVISED BY | DATE REVISED

CALCULATED-DESIGNED BY | CHECKED BY

FUNCTIONAL SUPERVISOR

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans

LAST REVISION | DATE PLOTTED => $DATE | TIME PLOTTED => $TIME
00-00-00

BORDER LAST REVISED 7/2/2010

KGallagher July 27, 2014
Log Fill Repair Wall Foundation Report

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

01-0B280

01-DN-101-PM 17.5

GEOTECH SITE PLAN

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

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REVISED BY | DATE REVISED

CALCULATED-DESIGNED BY | CHECKED BY

FUNCTIONAL SUPERVISOR

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

APPROXIMATE LOCATION OF LOG FILL

R/W

PROPOSED WALL CATCH POINT

RC-12-004

RC-12-002

WLOL

RC-12-003

RC-12-001

RC-13-008

263

264

265

EP

R/W

Boring Location and Number

RC-1X-00X

FIGURE 2B
SITE PLAN

LAST REVISION DATE PLOTTED => $DATE
00-00-00 TIME PLOTTED => $TIME

BORDER LAST REVISED 7/2/2010

KGallagher July 27, 2014
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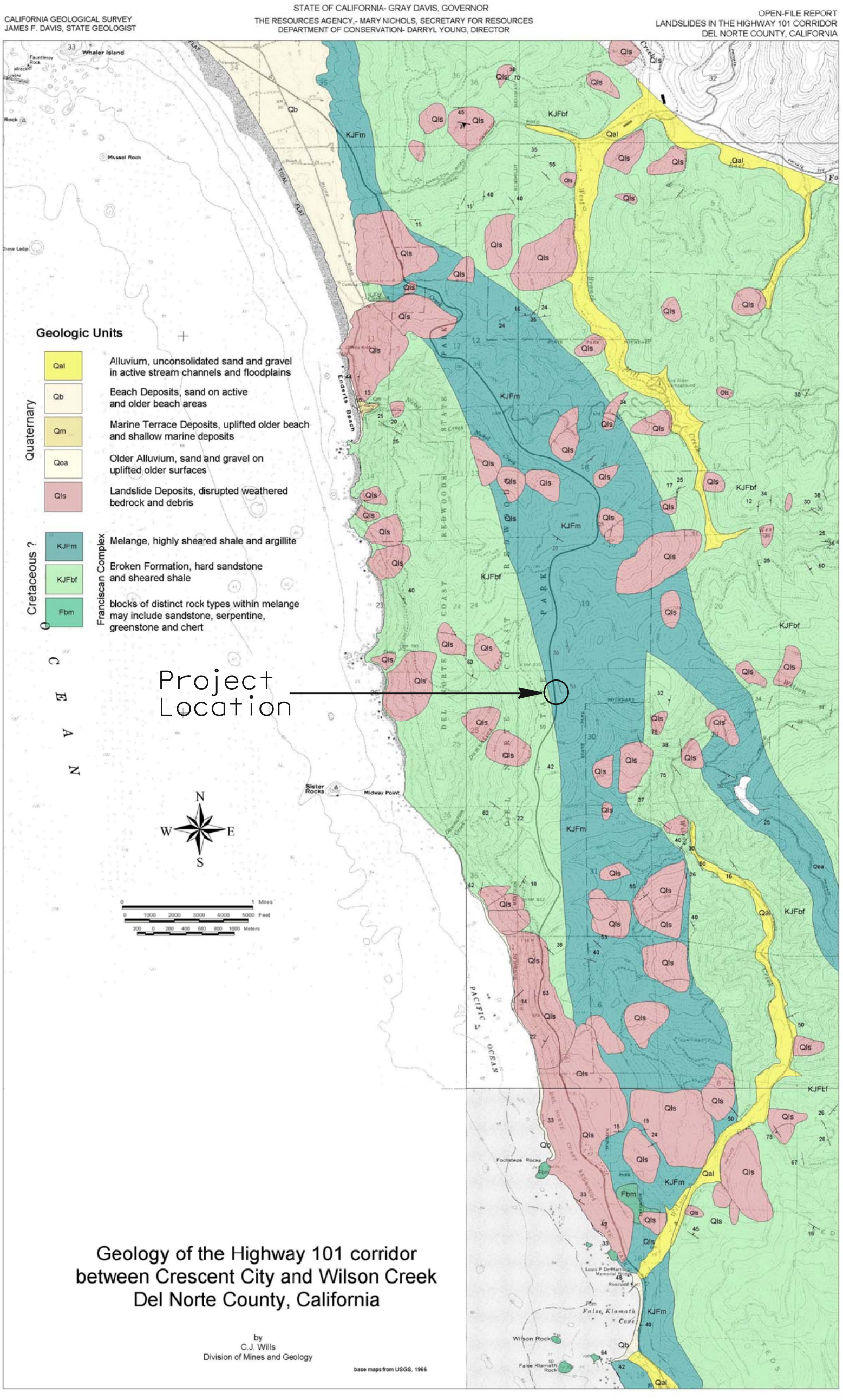
RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

01-0B280

01-DN-101-PM 17.5

GEOTECH SITE PLAN

Foundation Report
LOG FILL REPAIR WALL



DATE: 7/27/2014

KGallagher

SCALE: As Shown

01-DN-101-PM 17.5

EA: 01-0B280

EFIS: 0112000112

FIGURE 3
GEOLOGIC MAP

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

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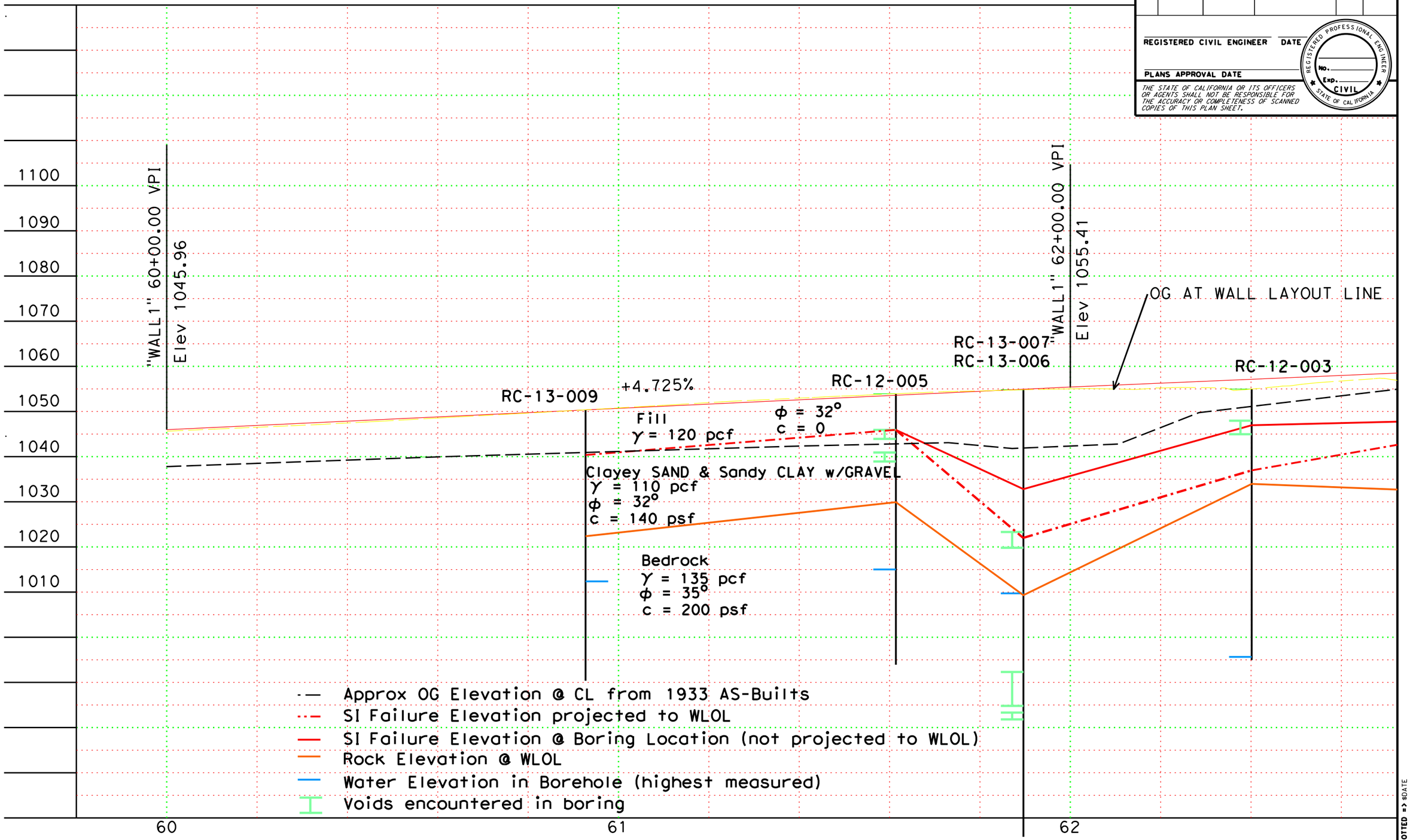

FIGURE 4A
SUBSURFACE PROFILE
ALONG THE WLOL

REVISED BY | DATE REVISED

CALCULATED-DESIGNED BY | CHECKED BY

FUNCTIONAL SUPERVISOR

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

LAST REVISION 00-00-00 | DATE PLOTTED => $DATE | TIME PLOTTED => $TIME

BORDER LAST REVISED 7/2/2010

KGallagher July 30, 2014
Log Fill Foundation Report

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

01-0B280

01-DN-101-P< 17.5

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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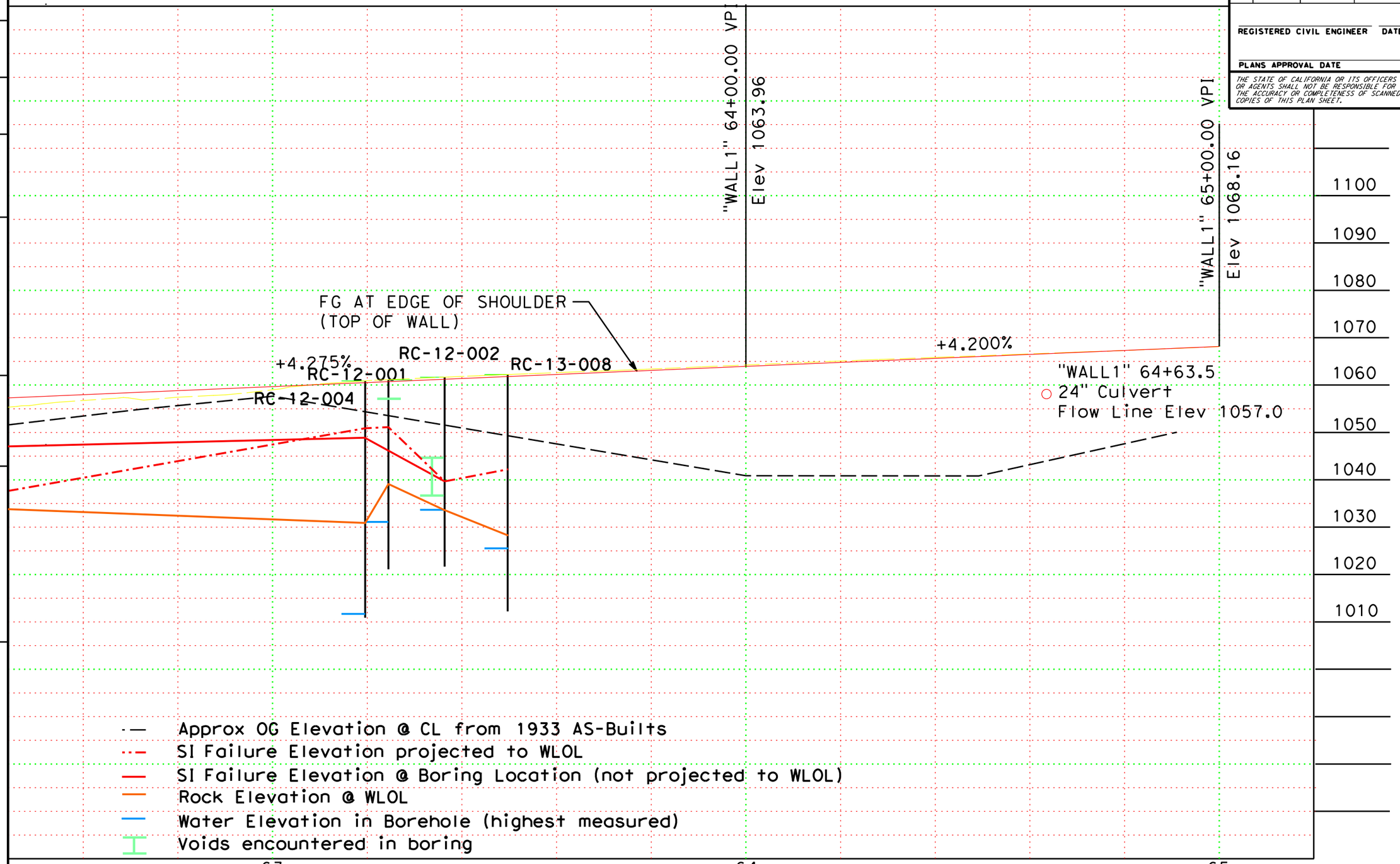


FIGURE 4B
SUBSURFACE PROFILE
ALONG THE WLOL

REVISED BY | DATE REVISED

CALCULATED-DESIGNED BY | CHECKED BY

FUNCTIONAL SUPERVISOR

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

LAST REVISION 00-00-00 | DATE PLOTTED => $DATE | TIME PLOTTED => $TIME

BORDER LAST REVISED 7/2/2010

Kgallagher July 30, 2014
Log Fill Foundation Report

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

01-0B280

01-DN-101-PM 17.5

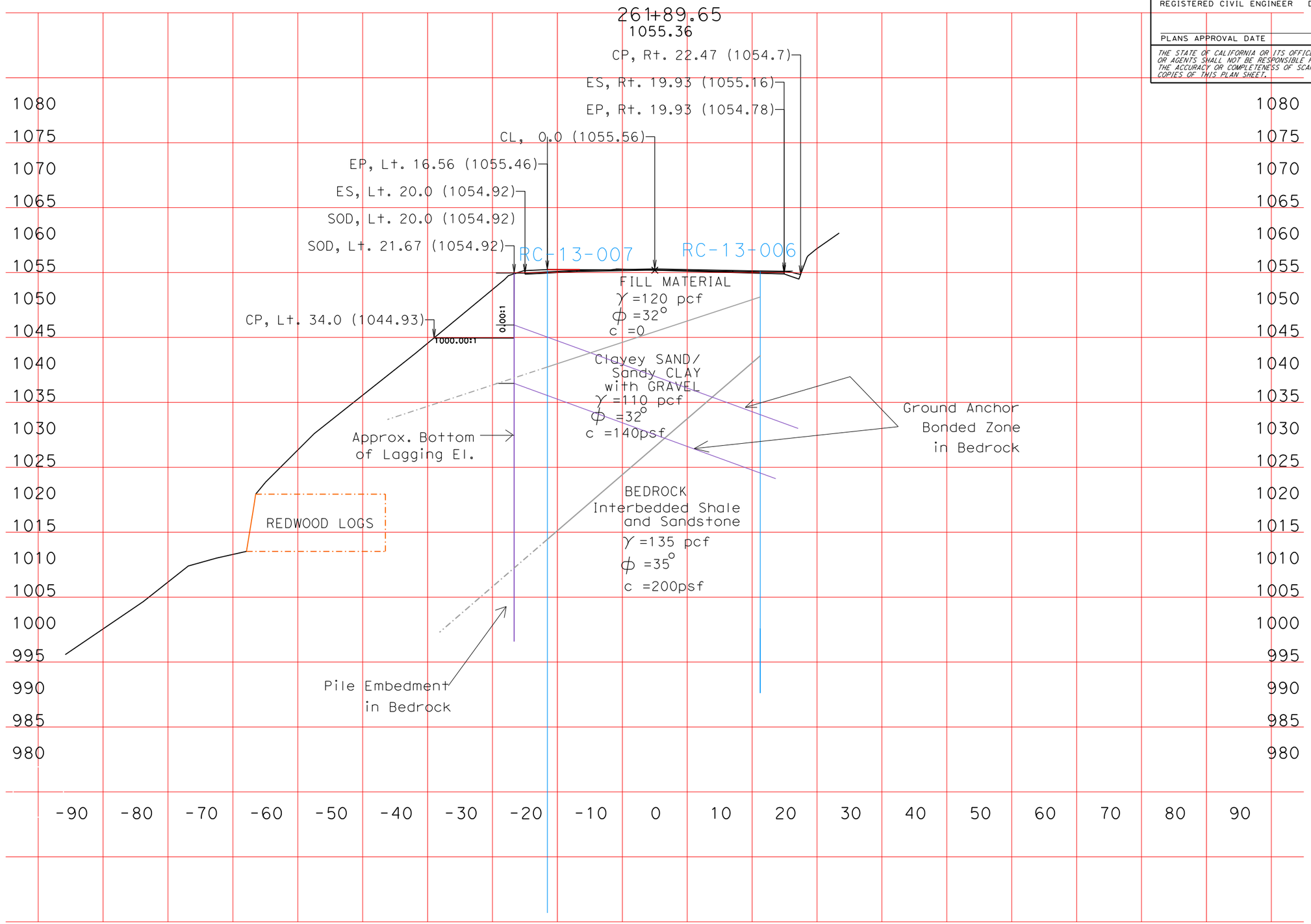
Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — No. Exp. CIVIL — 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.



NOTE: contacts dashed where approximate

FIGURE 5

REVISED BY | DATE REVISED

CALCULATED-DESIGNED BY | CHECKED BY

FUNCTIONAL SUPERVISOR

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

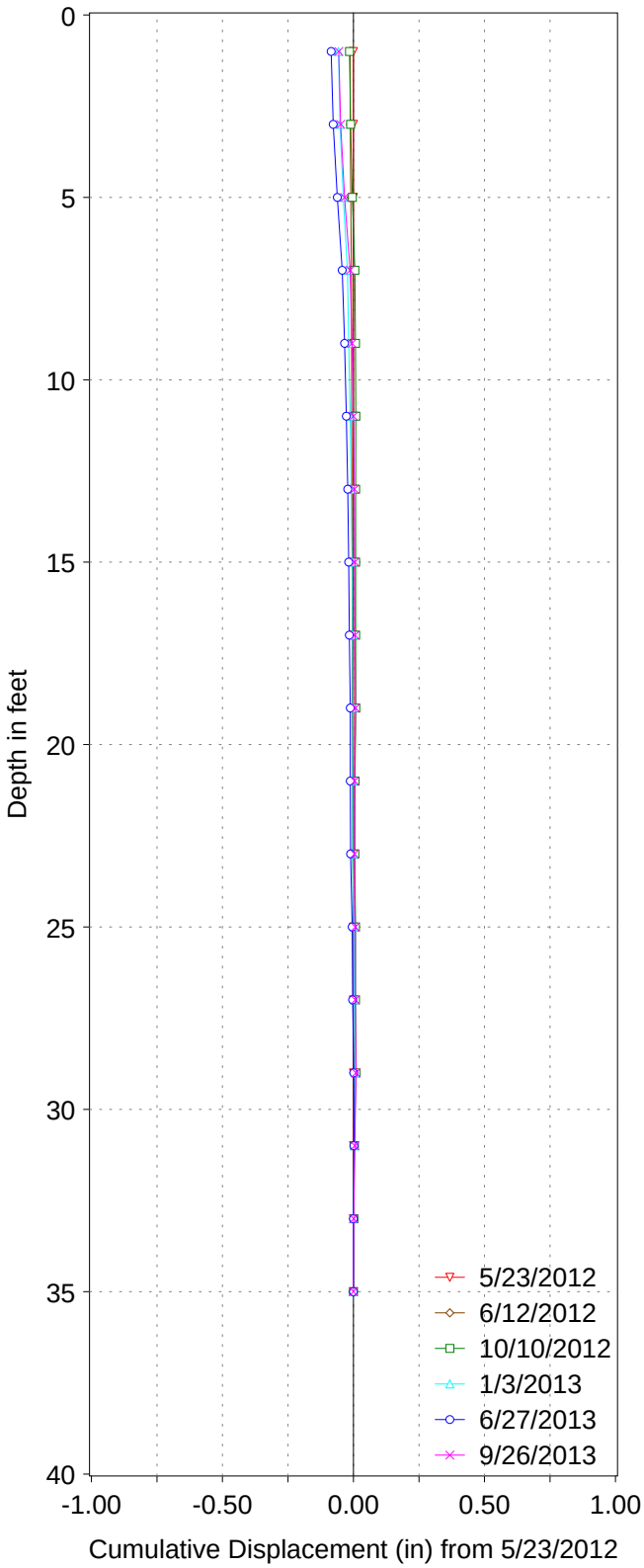
LAST REVISION 00-00-00 | DATE PLOTTED => $DATE | TIME PLOTTED => $TIME

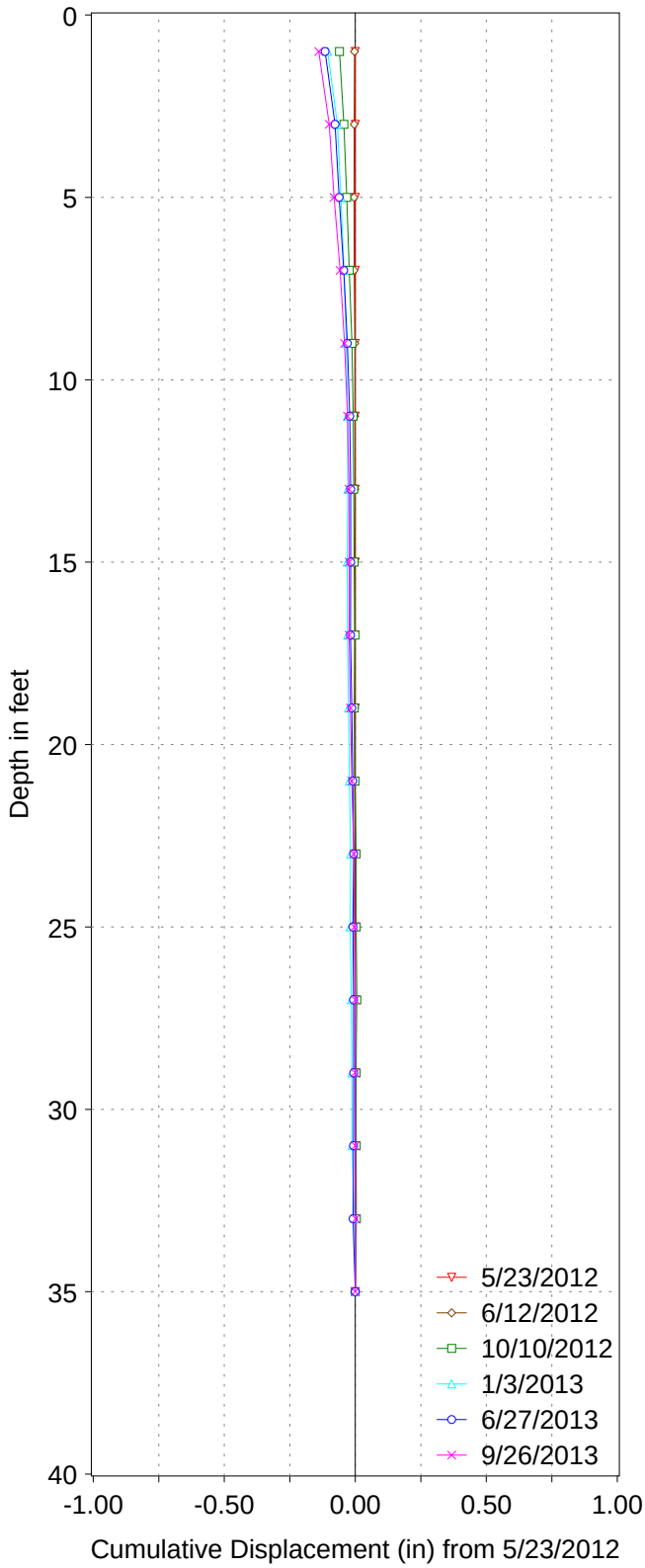
BORDER LAST REVISED 7/2/2010 | USERNAME => $USER | DGN FILE => $REQUEST | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | March 26, 2014 | 01-DN-101-PM 17.5 | DESIGN X-SECTION

Design X-Section March 2014.dgn 3/26/2014 6:33:19 PM

APPENDIX A

SLOPE INCLINOMETER MONITORING RESULTS





RESULT OF SI MONITORING

01-DN-101-PM17.5

Site: Humboldt Crossing RC-12-001

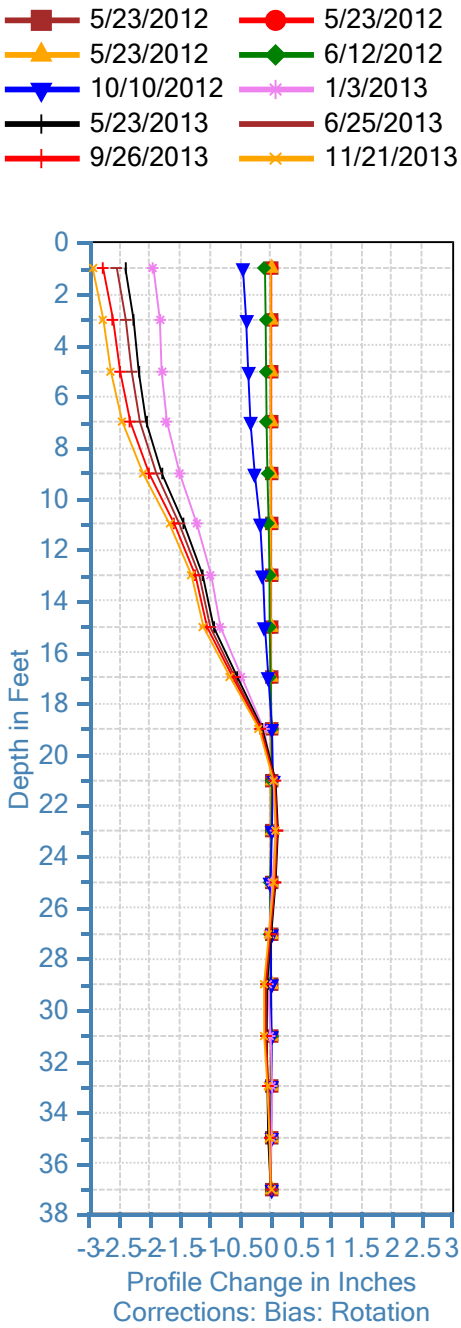
E.A.: 0112000112/230

Depth of casing: 37 ft

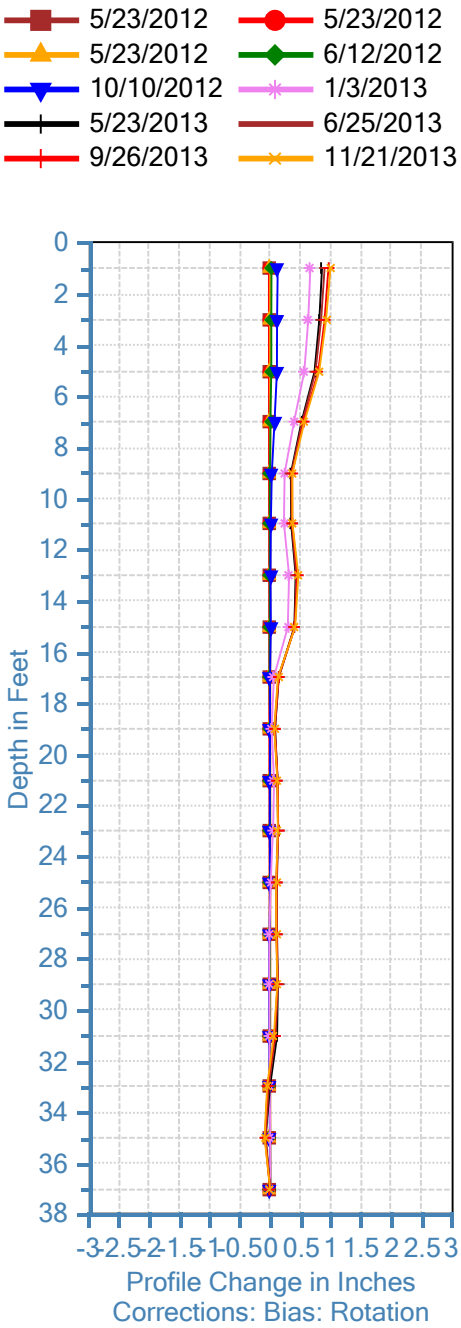
A0 direction (magnetic north): 210 deg.

Location: N41°40'06.0",W124°06'47.8"

RC-12-002, A-Axis



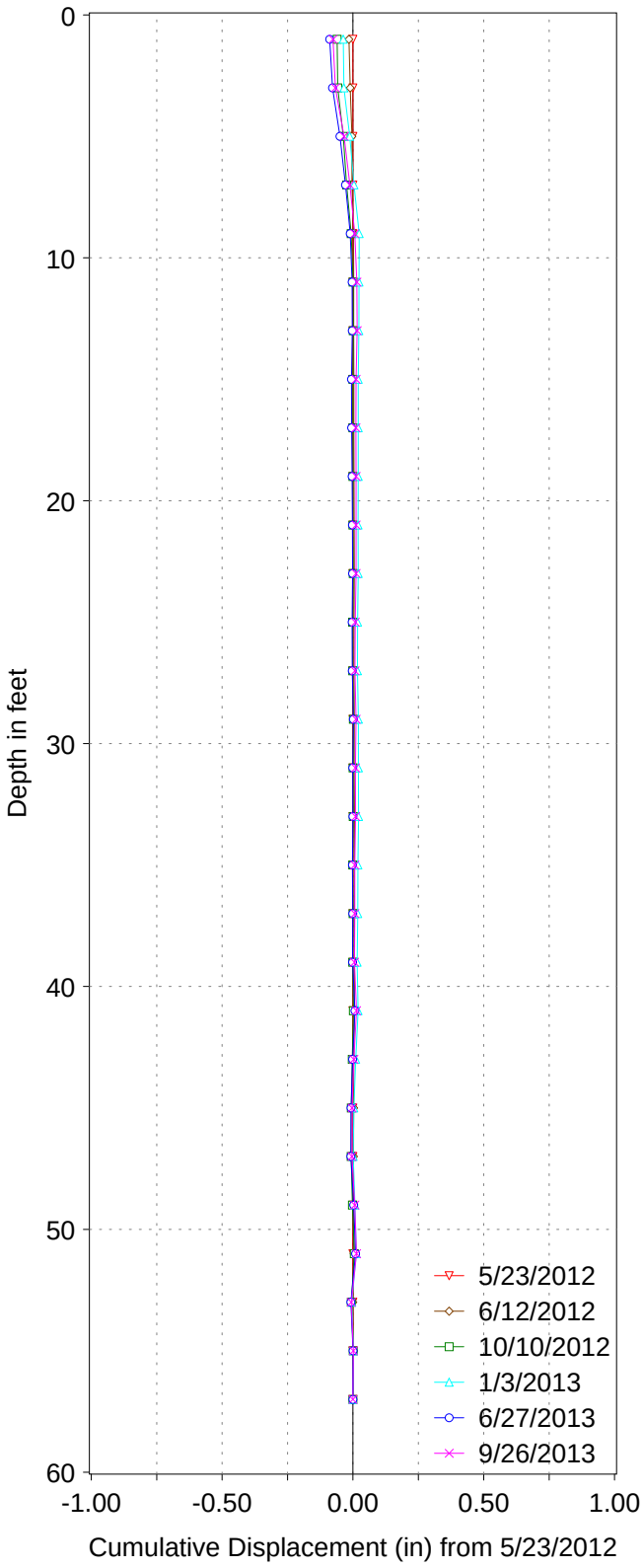
RC-12-002, B-Axis

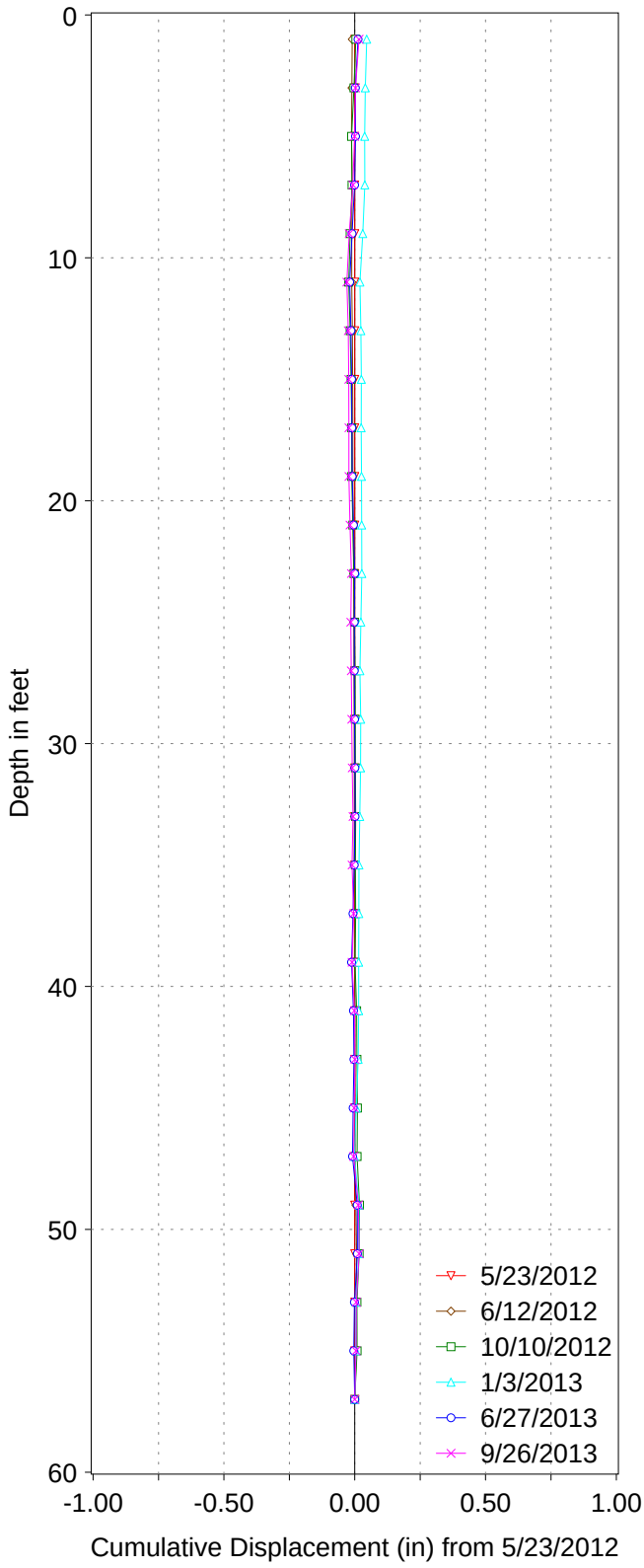


RESULT OF SI MONITORING

01-DN-101-PM17.5
Site: Humboldt Crossing RC-12-002
E.A.: 0112000112/230

Depth of casing: 39.0 ft
A0 direction (magnetic north): 250 deg.
Location: N41°40'05.7",W124°06'47.1"

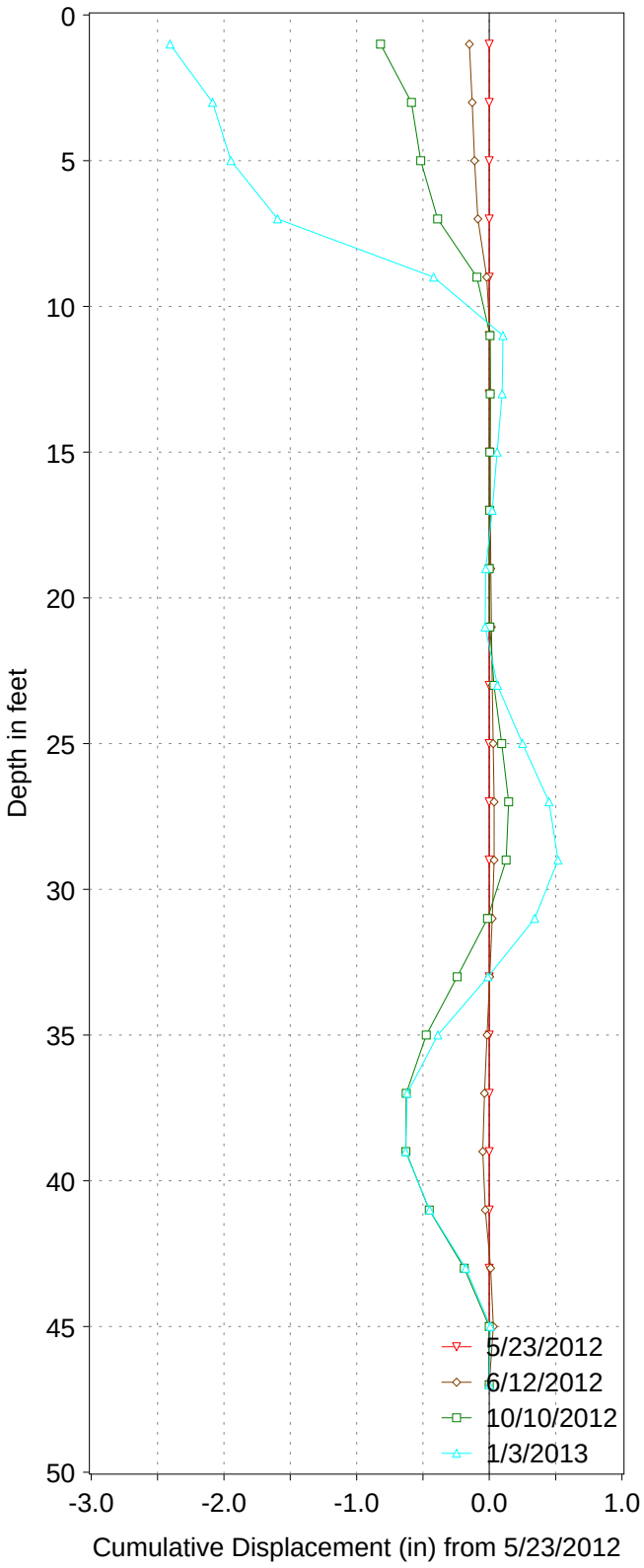


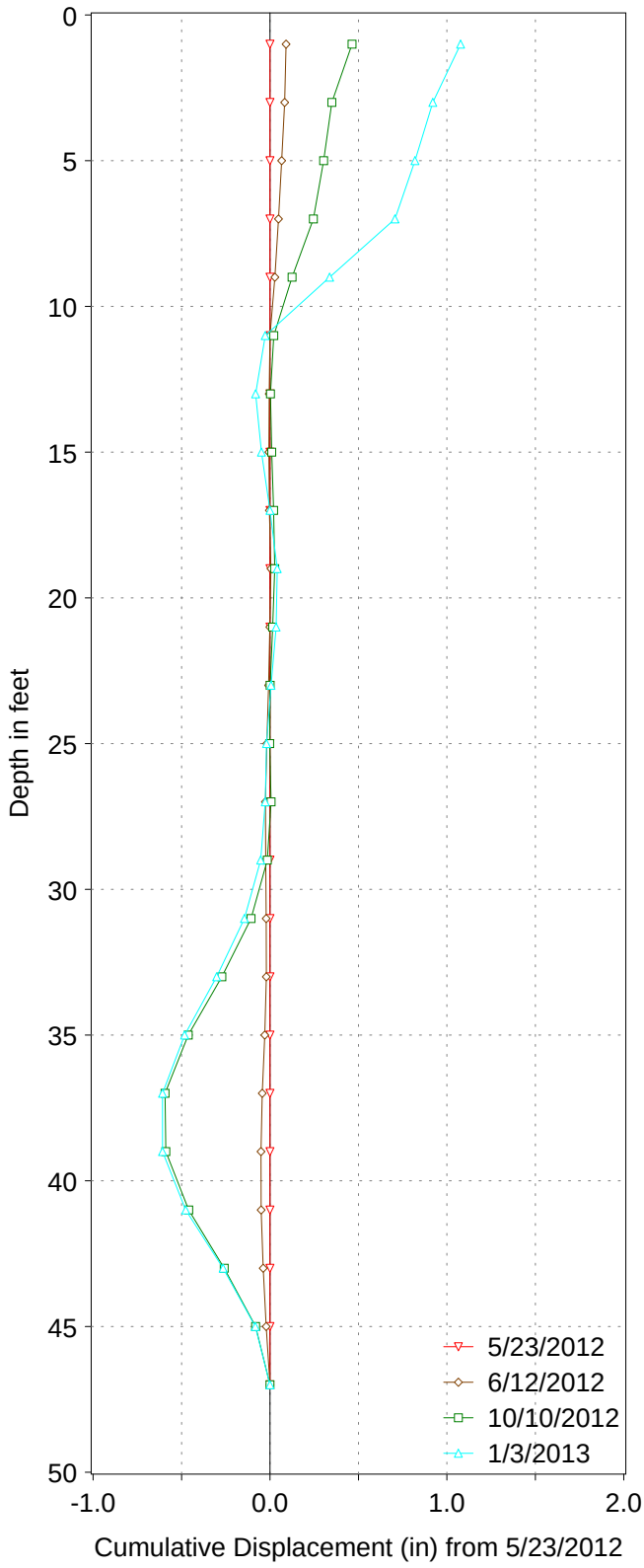


RESULT OF SI MONITORING

01-DN-101-PM17.5
Site: Humboldt Crossing RC-12-003
E.A.: 0112000112/230

Depth of casing: 60 ft
A0 direction (magnetic north): 262 deg.
Location: N41°40'05.9",W124°06'47.6"





RESULT OF SI MONITORING

01-DN-101-PM17.5

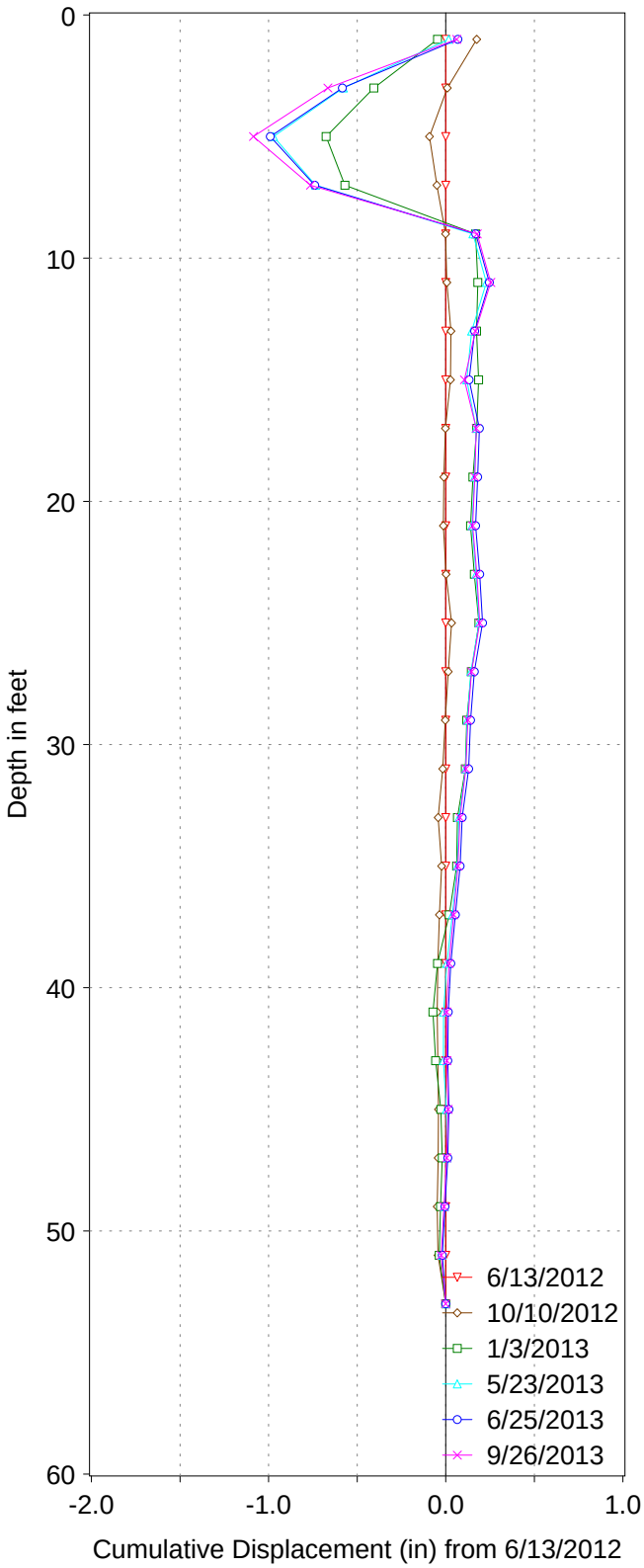
Site: Humboldt Crossing RC-12-004

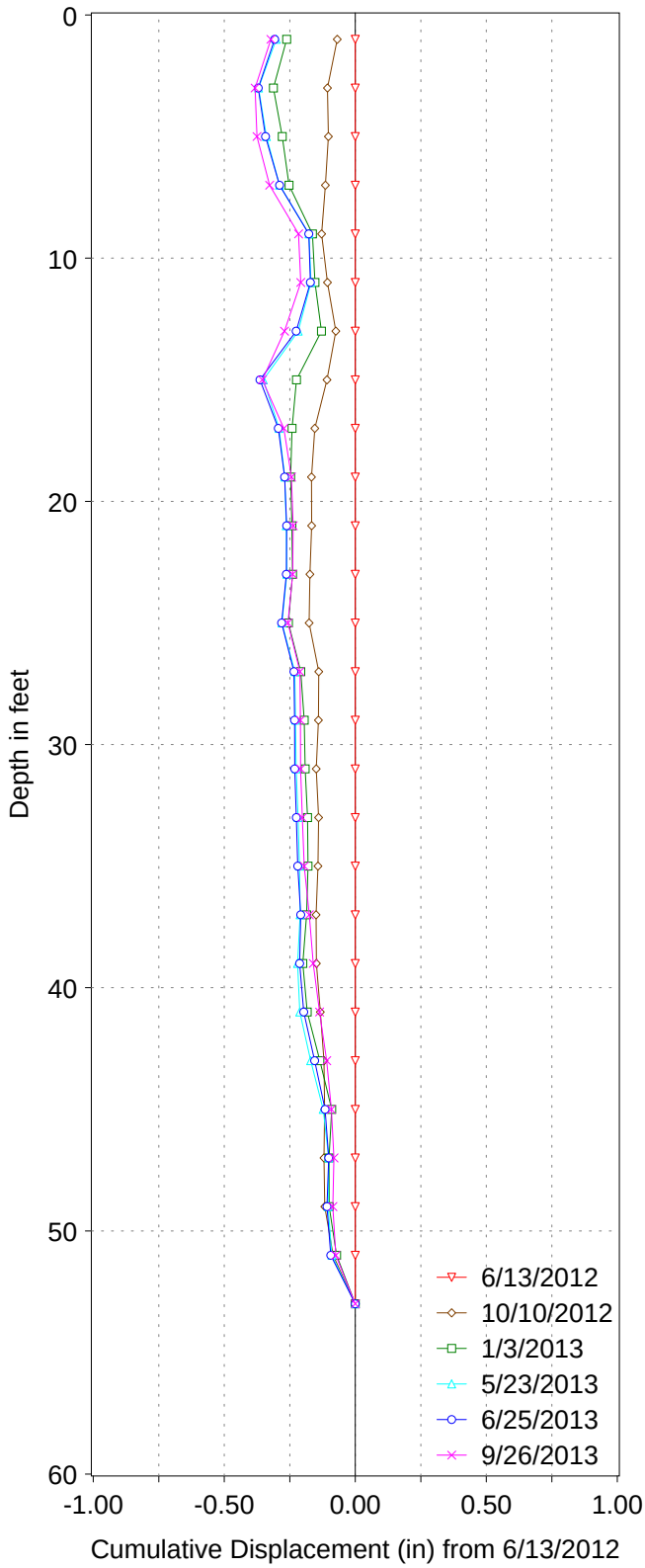
E.A.: 0112000112

Depth of casing:

A0 direction:

Location:





RESULT OF SI MONITORING

01-DN-101-PM17.5

Site: Humboldt Crossing RC-12-005

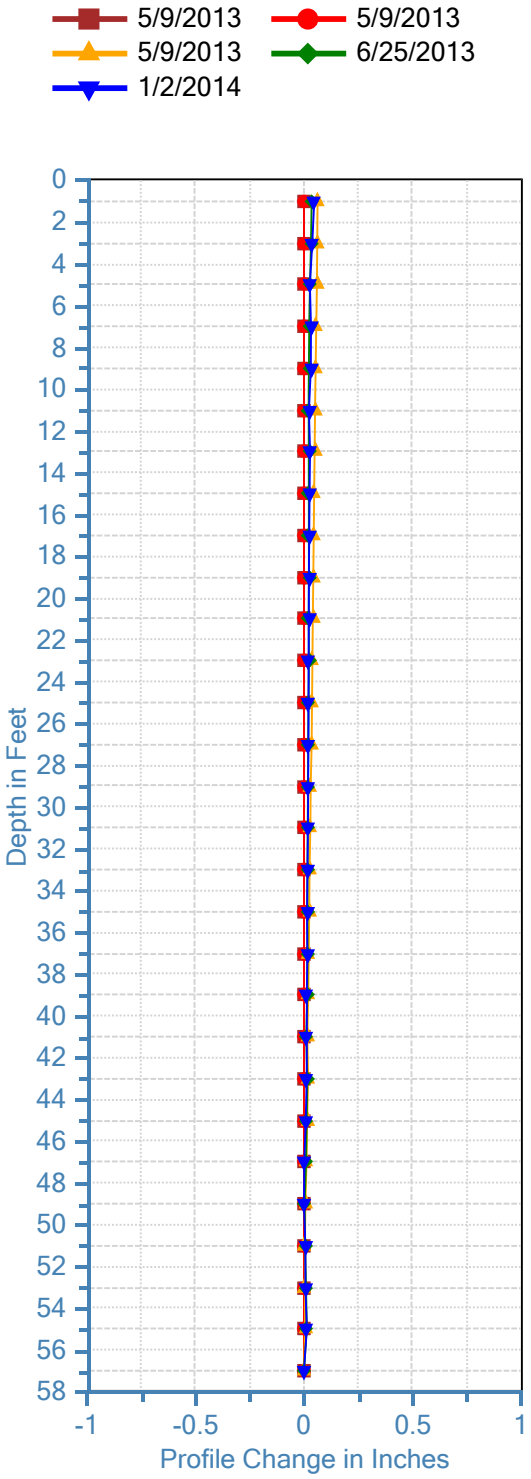
E.A.: 0112000112/230

Depth of Casing:

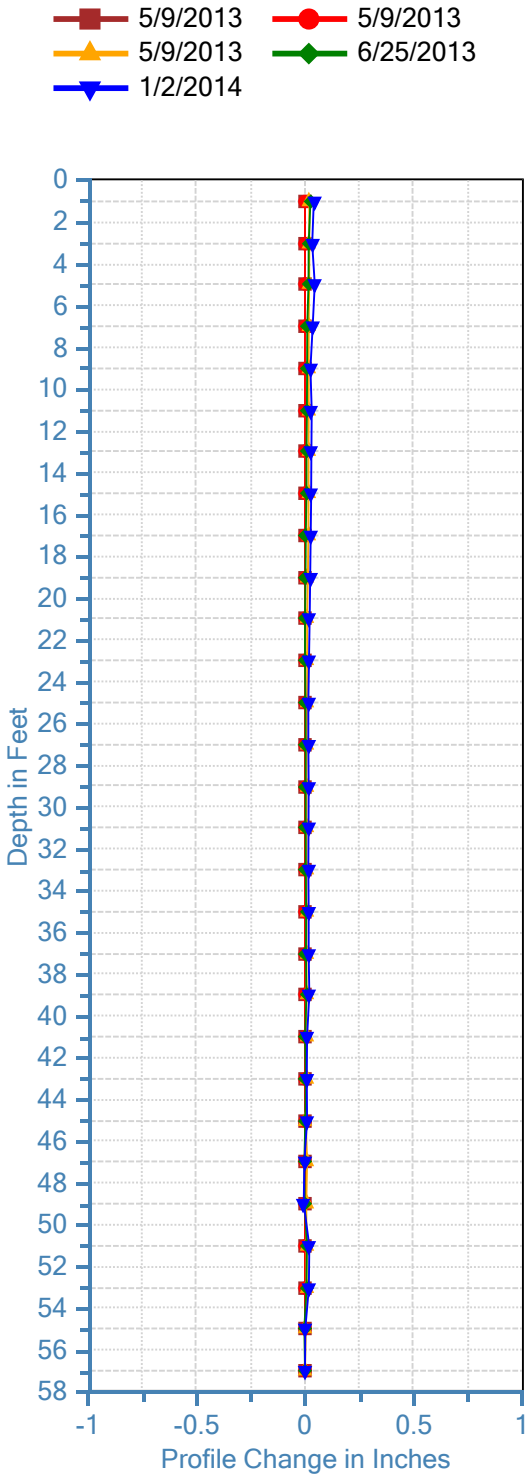
A0 direction:

Location:

RC-13-006, A-Axis



RC-13-006, B-Axis

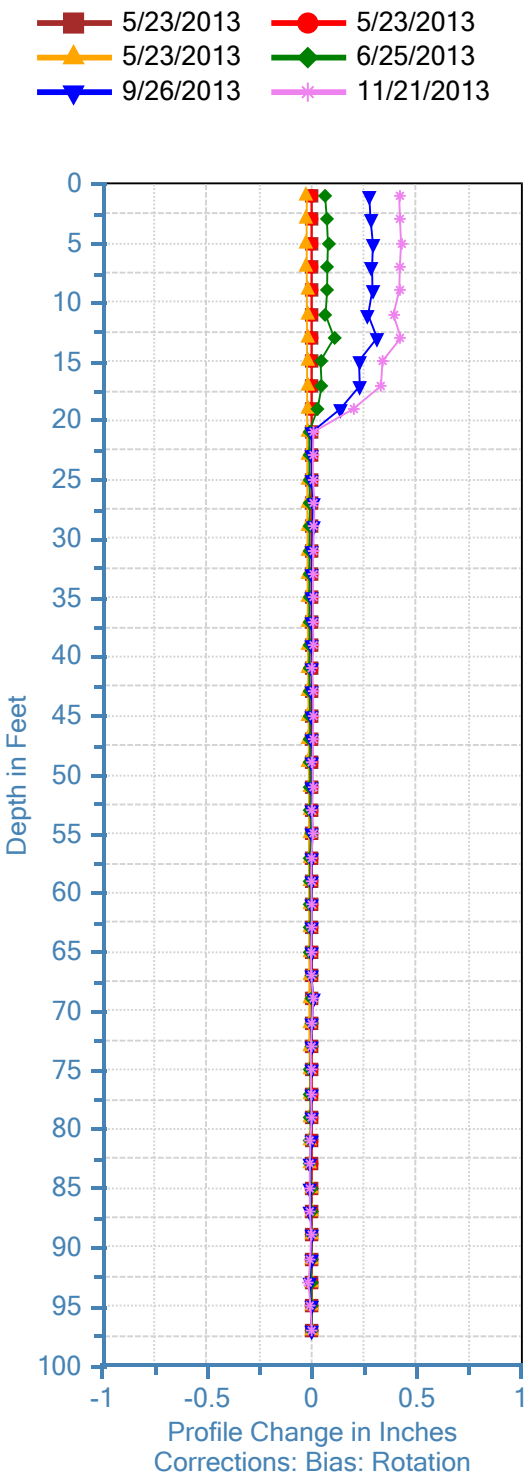


RESULT OF SI MONITORING

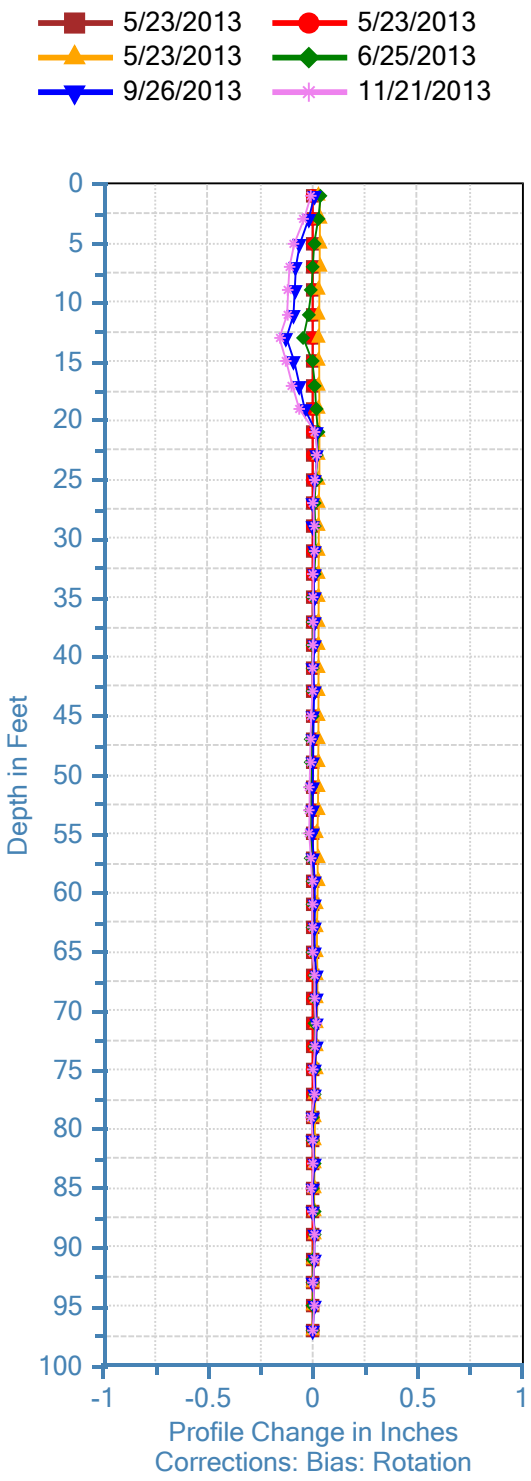
01-DN-101-PM17.5
Site: Humboldt Crossing RC-12-006
E.A.: 0112000112/230

Depth of Casing: 59 ft
A0 direction (magnetic north): 246 deg.
Location: N41°40'05.6",W124°06'46.3"

RC-13-007, A-Axis



RC-13-007, B-Axis

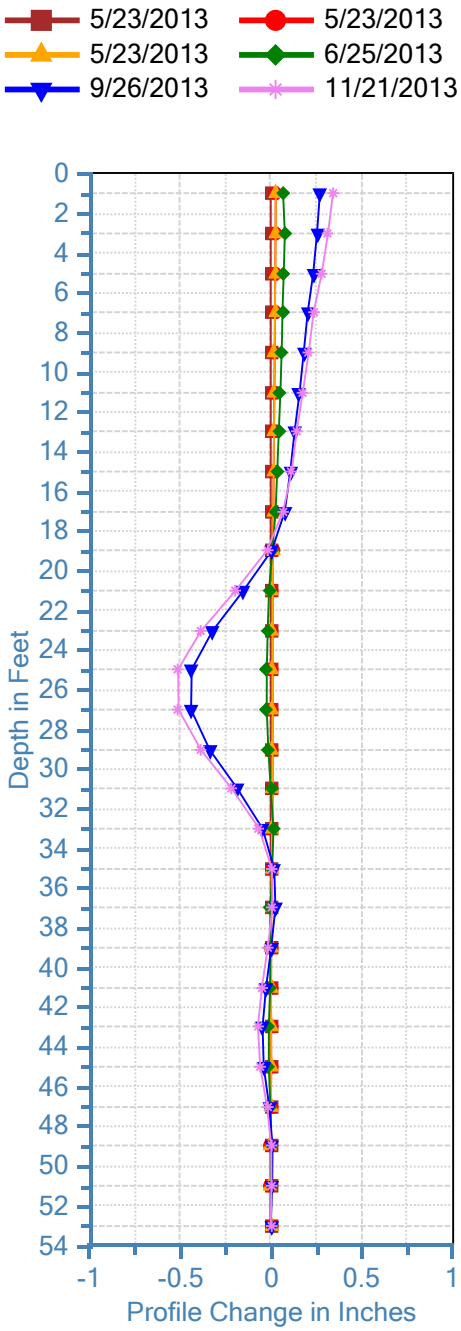


RESULT OF SI MONITORING

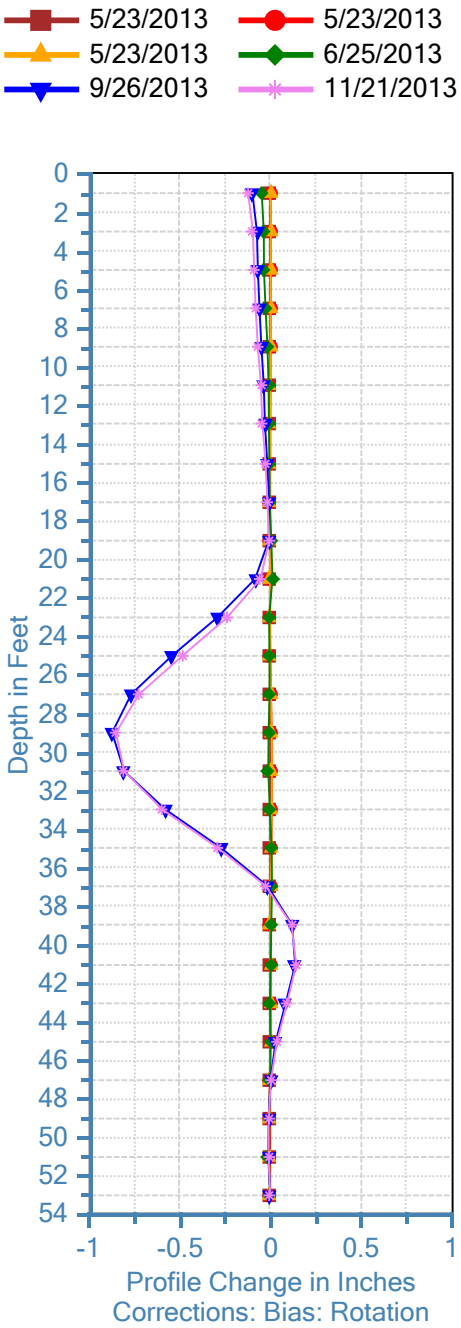
01-DN-101-PM17.5
Site: Humboldt Crossing RC-13-007
E.A.: 0112000112/230

Depth of Casing: 98.5 ft
A0 direction (magnetic north): 315 deg.
Location: N41°40'05.4",W124°06'46.7"

RC-13-008, A-Axis



RC-008, B-Axis

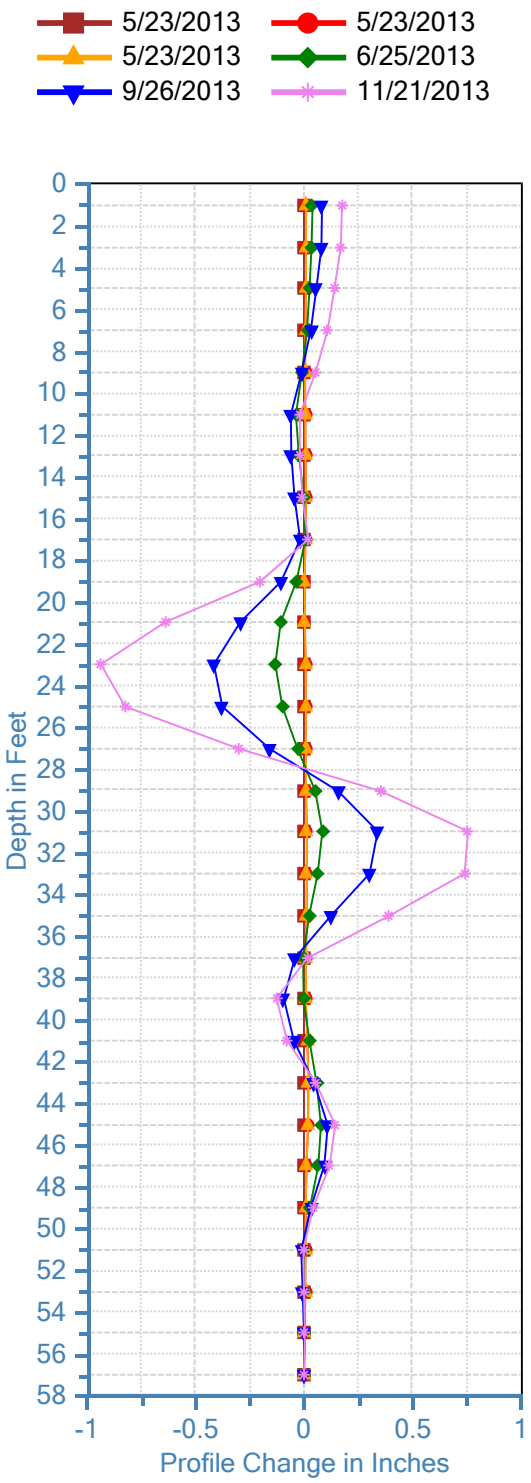


RESULT OF SI MONITORING

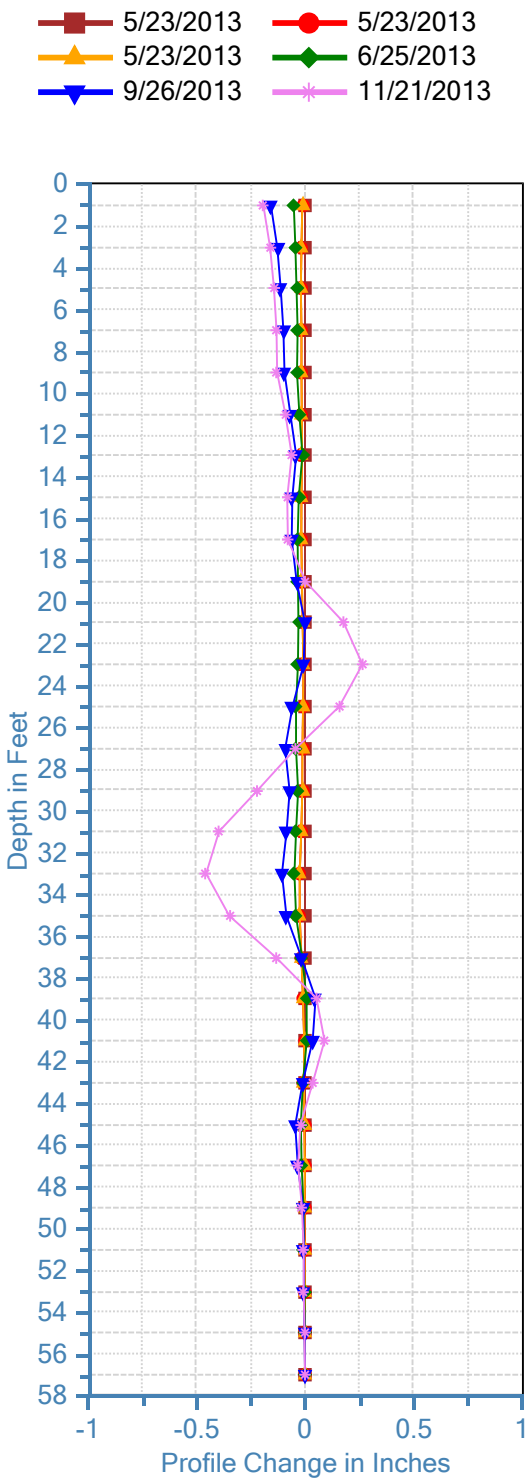
01-DN-101-PM17.5
Site: Humboldt Crossing RC-13-008
E.A.: 0112000112/230

Depth of Casing: 56 ft
A0 direction (magnetic north): 254 deg.
Location: N41°40'06.6",W124°06'50.0"

RC-009, A-Axis



RC-009, B-Axis



RESULT OF SI MONITORING

01-DN-101-PM17.5
Site: Humboldt Crossing RC-13-009
E.A.: 0112000112/230

Depth of Casing: 59 ft
A0 direction (magnetic north): 276 deg.
Location: N41°40'04.3",W124°06'44.3"

APPENDIX B

LABORATORY TEST SUMMARY AND DATA SHEETS

DIVISION OF
ENGINEERING SERVICES
OFFICE OF GEOTECHNICAL SUPPORT
GEOTECHNICAL LABORATORY
5900 Folsom Boulevard
Sacramento, CA 95819

Date: **11/20/2013**

To: **Kathy Gallagher / GDN**

From: **Lilibeth C. Purta / (916) 227-5239**

RE: **Laboratory Test Report -- EA: 01-0B2801**
Project: 0112000112
GL 13-065

Final test results.

Note: All remaining test specimens will be disposed of in 30 calendar days from the release date of the final test results.

AASHTO R18

CALIFORNIA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL LABORATORY

GL TRACKING NO : 13-065
Dist - EA: 01-0B2801
Report Date: November 20, 2013
Page: 1/1

CLASSIFICATION TEST SUMMARY

SAMPLE ID	% FINER THAN																	ATTERBERG LIMITS		AS RECEIVED		Gs
	3"	2 1/2"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	No. 4	No. 8	No. 16	No. 30	No. 50	No. 100	No. 200	5μ	1μ	LL	PI	γ_d (pcf)	%m	
RC-13-006_005								100	99	97	94	92	89	76	59	24	12	21	8			
RC-13-006_006						100	99	98	87	76	65	58	53	48	45	16	7	23	8			
RC-13-007_001-002																						
RC-13-007_003																				97.3	30.4	
RC-13-007_004								100	99	84	76	70	65	60	53	26	15	40	12			

CA Department of Transportation 5900 Folsom Blvd., Sacramento CA 95819 Phone: (916) 227-7204

11/5/2013

Sample ID No.	Sampled	Received	Approved	Sample of	E.A.	District	TL-101
AG130357	5/7/2013	10/30/2013	EP	SOIL			C638138

Sample From	SMARA#	Location	Depth
RG-13-06 , #5			

Grading Analysis
Test Method CT 202

Aggregate Size	% Passing	Combined
3 in	100	
21/2 in	100	
2 in	100	
11/2 in	100	
1 in	100	
3/4 in	100	
1/2 in	100	
3/8 in	100	
No. 4	99	
No. 8		
No. 16		
No. 30		
No. 50		
No. 100		
No. 200		
5um		
1um		

Rubber Size	% Passing
No. 8	
No. 10	
No. 16	
No. 30	
No. 50	
No. 100	
No. 200	

Plasticity Index
Test Method CT 204

LL
PL
PI

Sand Equivalent
Test Method CT 217

SE

Specific Gravity
Test Method CT 206, 207, 208

Retained No.4		Passing No.4	
SSD Sp Gr		SSD Sp Gr	
Apparent		Apparent	
Bulk OD			
% Absorption		% Absorption	

Los Angeles Rattler
Test Method CT 211

Grade
100 Revs
500 Revs

Relative Mortar Strength
Test Method CT 515

Ratio

Organic Impurities
Test Method CT 213

Quality
Debris?

Cleanness Value
Test Method CT 227

21/2 x 11/2	
11/2 x 3/4	
1 x No.4	
1/2 max	
Pit Run	
Combined	

Durability Index
Test Method CT 229

Coarse Durability

Fine Durability

Sodium Sulfate Soundness
Test Method CT 214

Type

Sieve Size	Individual % Loss
21/2 x 2 in	
2 x 11/2 in	
11/2 x 1 in	
1 x 3/4 in	
3/4 x 1/2 in	
1/2 x 3/8 in	
3/8 in x No. 4	

Weighted Average Loss of Sample

Fine Aggregate Loss

Percent Crushed Particles
Test Method CT 205

Weighted Average

Remarks: Sample sent to soils lab for further testing..

CA Department of Transportation 5900 Folsom Blvd., Sacramento CA 95819 Phone: (916) 227-7204

11/5/2013

Sample ID No.	Sampled	Received	Approved	Sample of	E.A.	District	TL-101
AG130358	5/7/2013	10/30/2013	EP	SOIL			C638139

Sample From	SMARA#	Location	Depth
RC-13-006, #6			

Grading Analysis
Test Method CT 202

Aggregate Size	% Passing	Combined
3 in	100	
21/2 in	100	
2 in	100	
11/2 in	100	
1 in	100	
3/4 in	100	
1/2 in	99	
3/8 in	98	
No. 4	87	
No. 8		
No. 16		
No. 30		
No. 50		
No. 100		
No. 200		
5um		
1um		

Rubber Size	% Passing
No. 8	
No. 10	
No. 16	
No. 30	
No. 50	
No. 100	
No. 200	

Plasticity Index
Test Method CT 204

LL
PL
PI

Sand Equivalent
Test Method CT 217

SE

Specific Gravity
Test Method CT 206, 207, 208

Retained No.4		Passing No.4	
SSD Sp Gr		SSD Sp Gr	
Apparent		Apparent	
Bulk OD			
% Absorption		% Absorption	

Los Angeles Rattler
Test Method CT 211

Grade
100 Revs
500 Revs

Relative Mortar Strength
Test Method CT 515

Ratio

Organic Impurities
Test Method CT 213

Quality
Debris?

Cleanness Value
Test Method CT 227

21/2 x 11/2	
11/2 x 3/4	
1 x No.4	
1/2 max	
Pit Run	
Combined	

Durability Index
Test Method CT 229

Coarse Durability

Fine Durability

Sodium Sulfate Soundness
Test Method CT 214

Type

Sieve Size	Individual % Loss
21/2 x 2 in	
2 x 11/2 in	
11/2 x 1 in	
1 x 3/4 in	
3/4 x 1/2 in	
1/2 x 3/8 in	
3/8 in x No. 4	

Weighted Average Loss of Sample

Fine Aggregate Loss

Percent Crushed Particles
Test Method CT 205

Weighted Average

Remarks: Sample sent to both Corrosion and Soils lab for further testing.

CA Department of Transportation 5900 Folsom Blvd., Sacramento CA 95819 Phone: (916) 227-7204

11/5/2013

Sample ID No.	Sampled	Received	Approved	Sample of	E.A.	District	TL-101
AG130355	5/14/201	10/30/2013	EP	SOIL			C638134

Sample From	SMARA#	Location	Depth
RC-13-007, #1&2		#1 & 2	

Grading Analysis
Test Method CT 202

Aggregate Size	% Passing	Combined	Rubber Size	% Passing
3 in	100		No. 8	
21/2 in	100		No. 10	
2 in	100		No. 16	
11/2 in	100		No. 30	
1 in	100		No. 50	
3/4 in	98		No. 100	
1/2 in	92		No. 200	
3/8 in	80			
No. 4	55			
No. 8	60	33		
No. 16				
No. 30				
No. 50				
No. 100				
No. 200				
5um				
1um				

Plasticity Index
Test Method CT 204

LL	
PL	
PI	

Sand Equivalent
Test Method CT 217

SE	

Specific Gravity
Test Method CT 206, 207, 208

Retained No.4		Passing No.4	
SSD Sp Gr		SSD Sp Gr	
Apparent		Apparent	
Bulk OD			
% Absorption		% Absorption	

Los Angeles Rattler
Test Method CT 211

Grade		
100 Revs		
500 Revs		

Relative Mortar Strength
Test Method CT 515

Ratio	

Organic Impurities
Test Method CT 213

Quality	
Debris?	

Cleanness Value
Test Method CT 227

21/2 x 11/2	
11/2 x 3/4	
1 x No.4	
1/2 max	
Pit Run	
Combined	

Durability Index
Test Method CT 229

Coarse Durability	
Fine Durability	

Sodium Sulfate Soundness
Test Method CT 214

Type	

Sieve Size	Individual % Loss
21/2 x 2 in	
2 x 11/2 in	
11/2 x 1 in	
1 x 3/4 in	
3/4 x 1/2 in	
1/2 x 3/8 in	
3/8 in x No. 4	
Weighted Average Loss of Sample	
Fine Aggregate Loss	

Percent Crushed Particles
Test Method CT 205

Weighted Average	

Remarks: Sample was short material for Soils Lab testing.

Note: If corrosion testing was requested, the sample has been processed and sent to Corrosion for CT 417, 422 and 643.

CA Department of Transportation 5900 Folsom Blvd., Sacramento CA 95819 Phone: (916) 227-7204

11/5/2013

Sample ID No.	Sampled	Received	Approved	Sample of	E.A.	District	TL-101
AG130356	5/14/2013	10/30/2013	EP	SOIL			C638136

Sample From	SMARA#	Location	Depth
RC-18-007, #4			

Grading Analysis
Test Method CT 202

Aggregate Size	% Passing	Combined
3 in	100	
21/2 in	100	
2 in	100	
11/2 in	100	
1 in	100	
3/4 in	100	
1/2 in	100	
3/8 in	100	
No. 4	99	
No. 8		
No. 16		
No. 30		
No. 50		
No. 100		
No. 200		
5um		
1um		

Rubber Size	% Passing
No. 8	
No. 10	
No. 16	
No. 30	
No. 50	
No. 100	
No. 200	

Plasticity Index
Test Method CT 204

LL
PL
PI

Sand Equivalent
Test Method CT 217

SE

Specific Gravity
Test Method CT 206, 207, 208

Retained No.4		Passing No.4	
SSD Sp Gr		SSD Sp Gr	
Apparent		Apparent	
Bulk OD			
% Absorption		% Absorption	

Los Angeles Rattler
Test Method CT 211

Grade
100 Revs
500 Revs

Relative Mortar Strength
Test Method CT 515

Ratio

Organic Impurities
Test Method CT 213

Quality
Debris?

Cleanness Value
Test Method CT 227

21/2 x 11/2	
11/2 x 3/4	
1 x No.4	
1/2 max	
Pit Run	
Combined	

Durability Index
Test Method CT 229

Coarse Durability

Fine Durability

Sodium Sulfate Soundness
Test Method CT 214

Type

Sieve Size	Individual % Loss
21/2 x 2 in	
2 x 11/2 in	
11/2 x 1 in	
1 x 3/4 in	
3/4 x 1/2 in	
1/2 x 3/8 in	
3/8 in x No. 4	

Weighted Average Loss of Sample

Fine Aggregate Loss

Percent Crushed Particles
Test Method CT 205

Weighted Average

Remarks: Sample sent to both Corrosion and Soils lab for further testing..

Results sent to: KATHY GALLAGHER

Division of Engineering Services
Materials Engineering and Testing Services
Corrosion and Structural Concrete Field Investigation Branch

CORROSION TEST SUMMARY REPORT - SOIL

Report Date: 11/22/2013
Reported by Michael Mifkovic

EA

EFIS: **0112000112**

Dist/Co/Rte/PM **01 / DN /101/ / 17.5 PM**

CORROSION LAB #	TL101 #	BORE #	DEPTH (FT) START	DEPTH (FT) END	MINIMUM RESISTIVITY[1] (ohm-cm)	pH[1]	CHLORIDE CONTENT[2] (ppm)	SULFATE CONTENT[3] (ppm)	IS SAMPLE CORROSIVE?
SOIL SAMPLE FROM:									
CR20130385	C638134	RC-13-007	10	15	6908	8.23			NO
CR20130386	C638136	RC-13-007	26.5	30	6815	4.46	13	250	YES
CR20130387	C638139	RC-13-006	29	29	866	3.77	2	2330	YES

This site is corrosive to foundation elements (see note below).

Controlling corrosion parameters are as follows:

- pH is 5.5 or less

- Sulfate concentration is 2000 ppm or greater

Note: For Structural Elements, the Department considers a site corrosive if one or more of the following conditions exist: pH is 5.5 or less, chloride concentration is 500 ppm or greater, sulfate concentration is 2000 ppm or greater. Resistivity is not considered for Structural Elements. MSE backfill shall conform to the requirements of section 47-2.02C Structure Backfill in the 2010 Standard Specifications.

[1]CT 643, [2]CT 422, [3]CT 417

APPENDIX

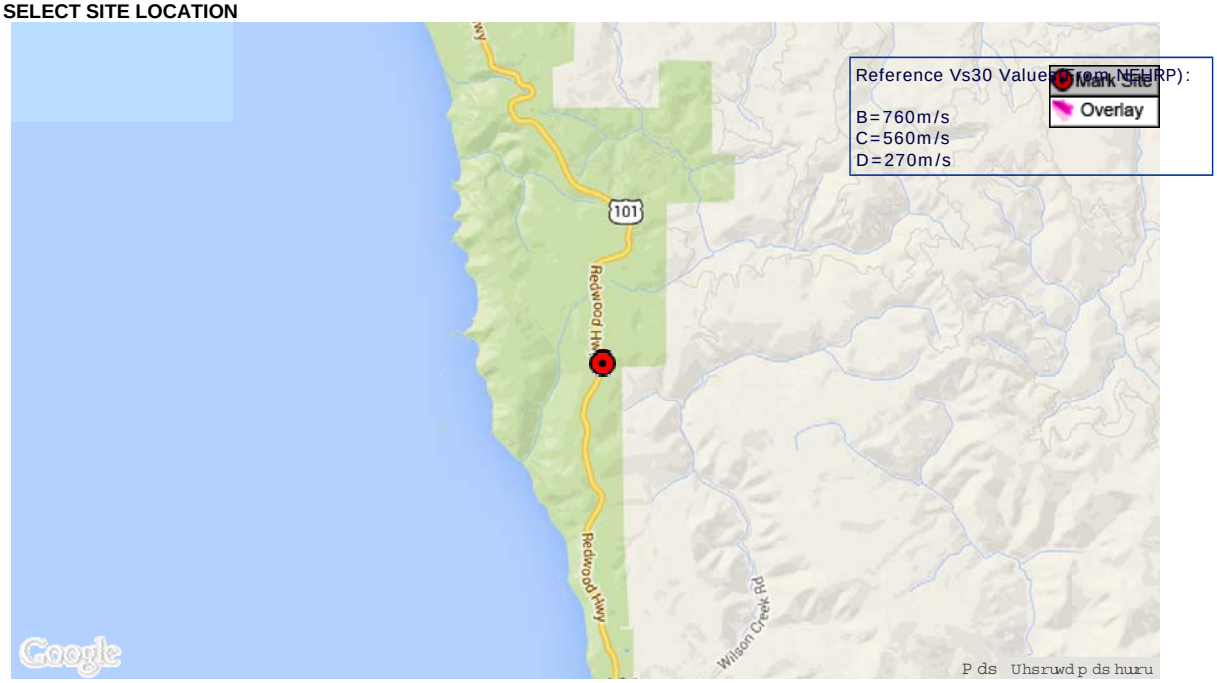
ARS Online Data Sheet

CALIFORNIA DEPARTMENT OF
TRANSPORTATION

Caltrans ARS Online (v2.3.06)

This web-based tool calculates both deterministic and probabilistic acceleration response spectra for any location in California based on criteria provided in *Appendix B of Caltrans Seismic Design Criteria*. More...

SELECT SITE LOCATION



Latitude: 41.668025 **Longitude:** -124.113086 ***Vs30*:** 278 m/s Calculate

CALCULATED SPECTRA Display Curves: 3