INFORMATION HANDOUT
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PROJECT: La Honda Creek Retaining Wall at PM 9.9
CONTRACT NO.: 04-3S8201

SUBMITTAL TYPE:	PS&E (to District)	EXPEDITE (to HQOE with copy to District)	POST EXPEDITE (to HQOE with copy to District)
SUBMITTAL DATE:			06-14-2010

STRUCTURES SPEC ENGINEER: Evan Franciliso
PHONE: (916) 227-8468

Contents	Bridge Number(s)
Updated Final Landslide Repair Recommendations for Storm Damage at 4-SM-84, PM 9.85, Near La Honda, California	35E0034
Foundation Reviews	35E0034

30 extra copies of information handout needed for piling subcontractors.

State of California
DEPARTMENT OF TRANSPORTATION

Business, Transportation and Housing Agency

Memorandum

Flex your power!
Be energy efficient!

To: MR. RON MORIGUCHI
Regional Project Manager
San Mateo County

Date: September 25, 2009

Attention: N. Shridhar

File: 04-SM-84, PM 9.85
04-3S8301
Updated Storm Damage
Recommendations

From: JOHN C. MOORE
Transportation Engineer
Office of Geotechnical Design – West
Geotechnical Services
Division of Engineering Services

MAHMOOD MOMENZADEH
Chief, Branch C
Office of Geotechnical Design – West
Geotechnical Services
Division of Engineering Services

Subject: Updated Final Landslide Repair Recommendations for storm damage at 4-SM-84, PM 9.85, near La Honda, California

This memo presents our updated (metric to imperial units conversion) geotechnical recommendations for the above referenced storm damaged site. The site is located on Route 84, PM 9.85, in San Mateo County, California (Please refer to Location Map, Figure 1). The recommendations contained within this memorandum are based upon our subsurface investigation, lab tests performed on samples retrieved during our subsurface investigation, site observations, and our engineering judgment.

SITE DESCRIPTION

During the rainstorms of January and February 2006, a large slip out on the downhill slope adjacent to the edge of pavement of the westbound lane of Highway 84 was observed. The top of the slip out was observed, at its closest, to be 8-ft. from the edge of pavement and, at its furthest, 12- to 14-ft. from the edge of pavement. This failure may have been initiated by erosion at the slope toe from La Honda Creek. In addition, several large trees have fallen into La Honda Creek and have created a natural dam, obstructing the flow of the creek. It is possible, that, with time, the influence of the natural dam on the flow of the creek will become greater and increase erosive action at the toe of the slope. The approximate size of the slide is 90-ft. long by 60-ft. deep, or approximately 5400-ft^2. The approximate limits of the landslide adjacent to the roadway are shown in Figure 2.

SCOPE OF WORK

The work performed for this investigation included:

- Review of available information on site geology and seismicity.
- A subsurface investigation consisting of three power borings (BH-1, BH-2, and BH-3) adjacent to the landslide to determine subsurface conditions.
- Laboratory testing of selected rock samples.
- Engineering analysis and formulation of the repair recommendations.

REGIONAL AND SITE GEOLOGY

The project lies within the Coast Range geomorphic province and is in the northern extent of the Santa Cruz Mountains, a chain of steep ridges and valleys that traverse roughly WNW toward the coast. Bedrock within the project area consists of Mindigo Basalt, an Oligocene age volcanic unit deposited in the submarine La Honda Basin (Brabb and Pampeyan, 1972).

SEISMIC CONSIDERATIONS

The project is located within the seismically active San Andreas Fault system and may be prone to moderate to large earthquakes over time. This fault system is composed of northwest trending, generally right-lateral, strike-slip faults. Several faults within the San Andreas Fault system are capable of affecting the project site. Below is a list of those faults and their predicted ground accelerations (reported as a percentage of the force of gravity) based upon a likely maximum credible event (earthquake, given in moment magnitude, Mw) as calculated by Mualchin (1996).

TABLE 1: Faults, Maximum Credible Earthquake Magnitudes, and Peak Bedrock Accelerations

FAULT	DISTANCE FROM PROJECT (mi.)	MAXIMUM CREDIBLE EVENT (Mw)	PEAK BEDROCK ACCELERATION
San Andreas	4.0	8.0	0.58 g
San Gregorio	6.7	7.5	0.43 g
Hayward	21.4	7.5	0.19 g

Brabb, E.E., Graymer, R.W., and Jones, D.L., 1998, Geology of the onshore part of San Mateo County, California: a digital database, USGS Open File Report 98-137.

Mualchin, L, 1996, California Seismic Hazard Map, California Department of Transportation.

EXPLORATION AND SUBSURFACE CONDITIONS

Three borings (BH-1, BH-2, and BH-3) were drilled during the respective months of December 2006 and January - February 2007. Coring methods were utilized to achieve depths of 95-ft., 100-ft., and 25-ft., respectively. Rock core samples were collected. Standard Penetration Tests (SPT's) were performed in the borings whenever sands or gravels were encountered. The boring locations are shown in the attached Boring Layout Map, Figure 3. The subsurface conditions encountered in the borings are summarized below.

Based on the subsurface investigation, the subsurface conditions at the site consist of 6.5-ft. to 15-ft. of clayey sand with gravel (fill). The fill material is underlain by intensely weathered, highly fractured, soft to hard Midigo Basalt. The RQD in the Basalt is highly variable and ranges from 0% to 100%. See attached field boring logs for details.

Due to drilling scheduling conflicts and also to the drilling method used, groundwater measurements were only performed in Boring B-1. Groundwater was measured at a depth of 39.4-ft. in Boring B-1. Groundwater measurements were not performed for Boring B-2. Groundwater was not encountered in Boring B-3.

A Log of Test Borings (LOTB) sheet should be included with the contract plans and will be forwarded to Design upon completion.

LABORATORY TESTING

Unconfined compression tests were performed on selected rock samples retrieved from the borings in accordance with ASTM C-39. The laboratory test results are attached.

RECOMMENDATIONS

Due to the close proximity of La Honda Creek, with respect to Route 84, conventional methods, such as the construction of a restrained system such as an anchored soldier beam and lagging wall to retain the roadway, would be undesirable. Excavation of a soldier beam would require significant excavation and this is not desirable, especially when environmental and biologic concerns during construction are considered.

Our borings show that Route 84, PM 9.9, except for approximately the top 15-ft., which is soil, is underlain by weak rock. Knowing this fact, it is clear that the most viable alternative would be the construction of an unrestrained system, such as a segmented pile wall. Construction of a segmented pile wall near the edge of the existing pavement would consist of installing Cast-In-Drilled-Hole (CIDH) piles followed by integrating them using a 'link' beam or 'grade' beam at pavement level. The CIDH piles themselves would be drilled and installed to a tip elevation insuring that each pile is 'socketed' into relatively competent rock.

Station 102+00 to 102+60 – Segmented Pile Wall

Construct a segmented pile wall consisting of closely spaced Cast-In-Drilled-Hole (CIDH) piles. The recommended wall limits are shown on Figures 2 and 3. The design of a segmented pile retaining system is similar to the design of an excavation support wall that is considered flexible. The pattern used is a single row of tangentially spaced CIDH piles. The cross-section design of this system consists of designing vertical members (H-

piles, etc.) to resist bending moment, shear stress, and deflection along the vertical direction of the wall. The spacing of the piles is such that no lagging is needed between the piles, and the earth pressure is resisted by the arching capability of the soil. Some space between the piles, however, is necessary to maintain drainage and avoid build-up of hydrostatic pressure behind the tangent piles. The design height of the wall is dependent on the existing slope topography and the anticipated height of potentially unstable material in front of the wall.

These walls should be designed using the following criteria:

1. Assume a design height of 16.4-ft.
2. For lateral loads against the wall, use the following soil parameters (internal friction angle, $\phi = 35°$, cohesion, c = 0 psf, and a soil total unit weight, $\Upsilon = 125$ lbs/ft.^{3}).
3. Add to the active pressure a uniform load of 240 lbs/ft.^{2} to a depth of 10-ft. below the top of the wall for traffic surcharge.
4. Calculate passive pressure against the piles using the log spiral method with a friction angle of 34°, cohesion, c = 600 lbs/ft.^{2}, and a unit weight (γ) of 147 lbs/ft.^{3}. For design purposes, use a minimum bench width of 23-ft. at the base of the retaining wall, followed by a 1:1 slope.
5. Because of the potential for high ground acceleration, the seismic stability of the wall should be checked.
6. The pile diameter should be a minimum of 24-in with a clear spacing between each pile of no more than 2.5 times the pile diameter. The minimum length of each segmented pile should be 30-ft. long. The minimum tip elevation for each pile should be at 140 feet.
7. Construct a continuous pile cap for the wall. The pile cap should extend to a minimum depth of 3-feet below the existing finished grade.

Please refer to the Typical Cross-Section for Segmented Pile Wall, Figure 4.

CONSTRUCTION CONSIDERATIONS AND REQUIREMENTS

It is possible that the Contractor may experience moderate to difficult drilling through the weathered Midigo Basalt. Casing should be considered to minimize the possibility of constructing cold joints or other pile discontinuities. Groundwater may be encountered. The installation of the Segmented Pile Wall may require drilling and placing concrete in wet conditions. If dewatering is not desirable, specifications should require the

displacement of water via a closed system using concrete pumps or a tremie tube to place concrete at the bottom of the hole for either retaining system. A positive head should be maintained at all times to reduce potential segregation of concrete.

In addition to wet conditions, running sands and gravels may be encountered during drilling and construction of the CIDH piles. Casing should be considered to minimize the possibility of construction cold joints or other pile discontinuities.

Because of the close spacing of the CIDH piles for the segmented pile wall, proper vertical control is essential when drilling the CIDH. The measured vertical alignment of the CIDH shall not deviate in any direction more than one percent from vertical anywhere along the measured length. Construct each row of the CIDH in two stages. First, construct the odd-numbered piles of each row. Second, construct the even-numbered piles of each row. This information should be included in the Contract Special Provisions.

In general, the installation of the CIDH piles should be performed in accordance with Section 49-4 of the Standard Specifications.

Any recommendation that the Designer wishes to change should be discussed with our unit prior to implementation.

CORROSION

A corrosion study was performed in April 2000 for a CIDH earth retaining system project located at Post Mile 10.2. The results are presented in Table 2 for the Designer. Please contact Caltrans' Corrosion Technology Branch for protection measures for this project.

TABLE 2: Corrosion Study

Boring ID	Sample Type	Sample Depth (ft.)	pH	Resistivity (ohm-cm)
B-1	Soil	5	8.3	1386
B-1	Soil	15	8.1	1584
B-2	Soil	5	7.8	1188
B-2	Soil	15	8.3	960
-	Water	Surface Water	8.1	3310

If you have any questions, please contact me at (510) 622-8742 or Mahmood Momenzadeh at (510) 286-5732.

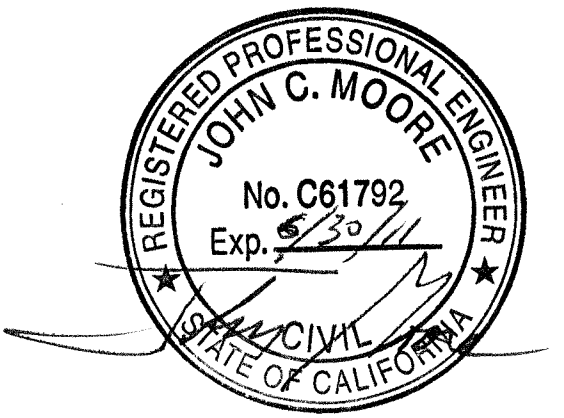
Attachments:

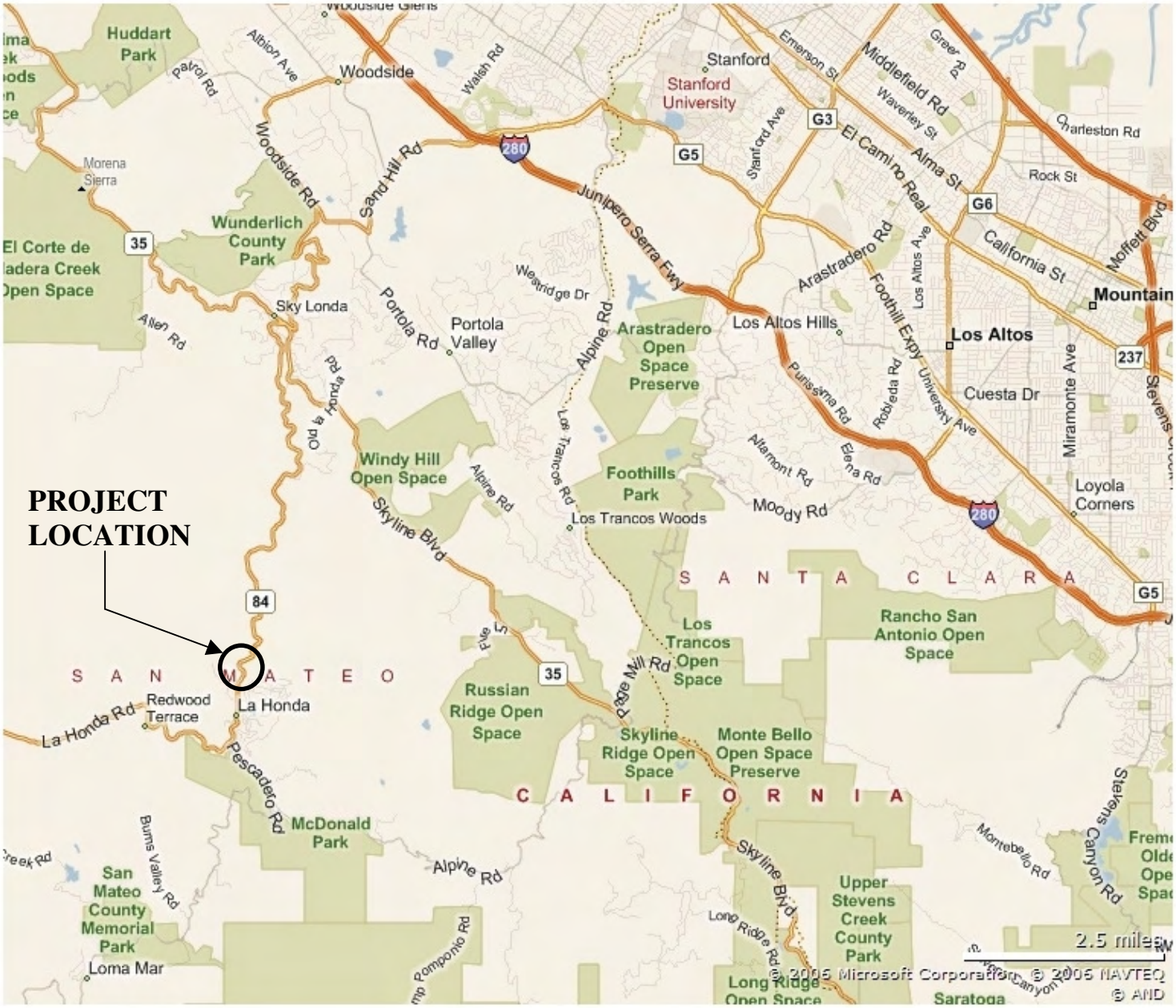
Figures:
Figure 1 – Location Map
Figure 2 – Approximate Limits of the Landslide adjacent to the Roadway Map
Figure 3 – Storm Damage Repair Boring Layout Map
Figure 4 – Storm Damage Repair Typical Cross-section for Segmented Pile Wall

Appendix A:
Boring Logs
Laboratory Tests

c: MMomenzadeh, TJPokrywka, Daily File, Route File

JMoore/jm





Office of Geotechnical Design – West
Geotechnical Services
Division of Engineering Services

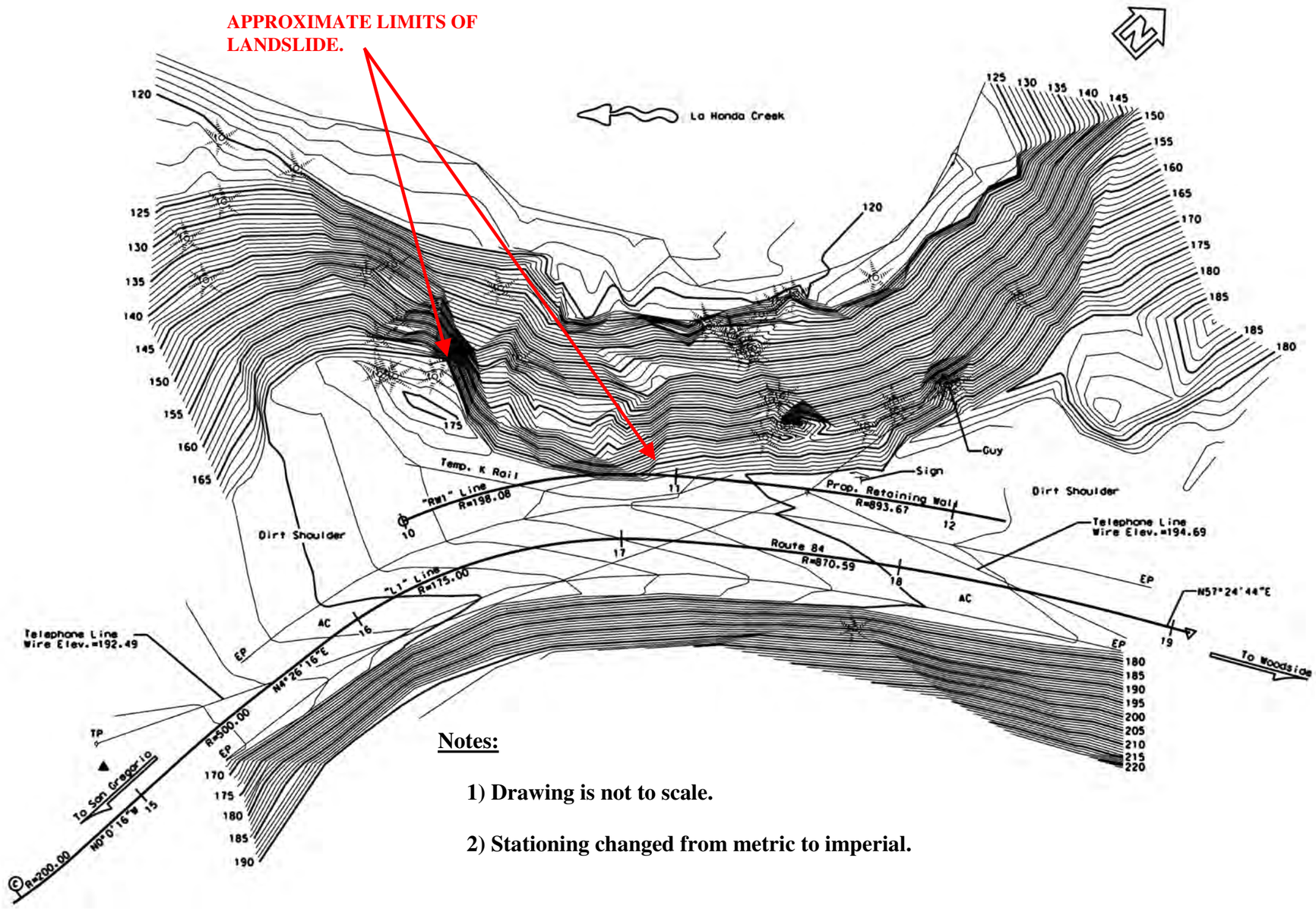
STORM DAMAGE REPAIR

LOCATION MAP

FIGURE 1

04-SM-84, PM 9.85

04-3S8201 **SEPTEMBER 2009**



Notes:

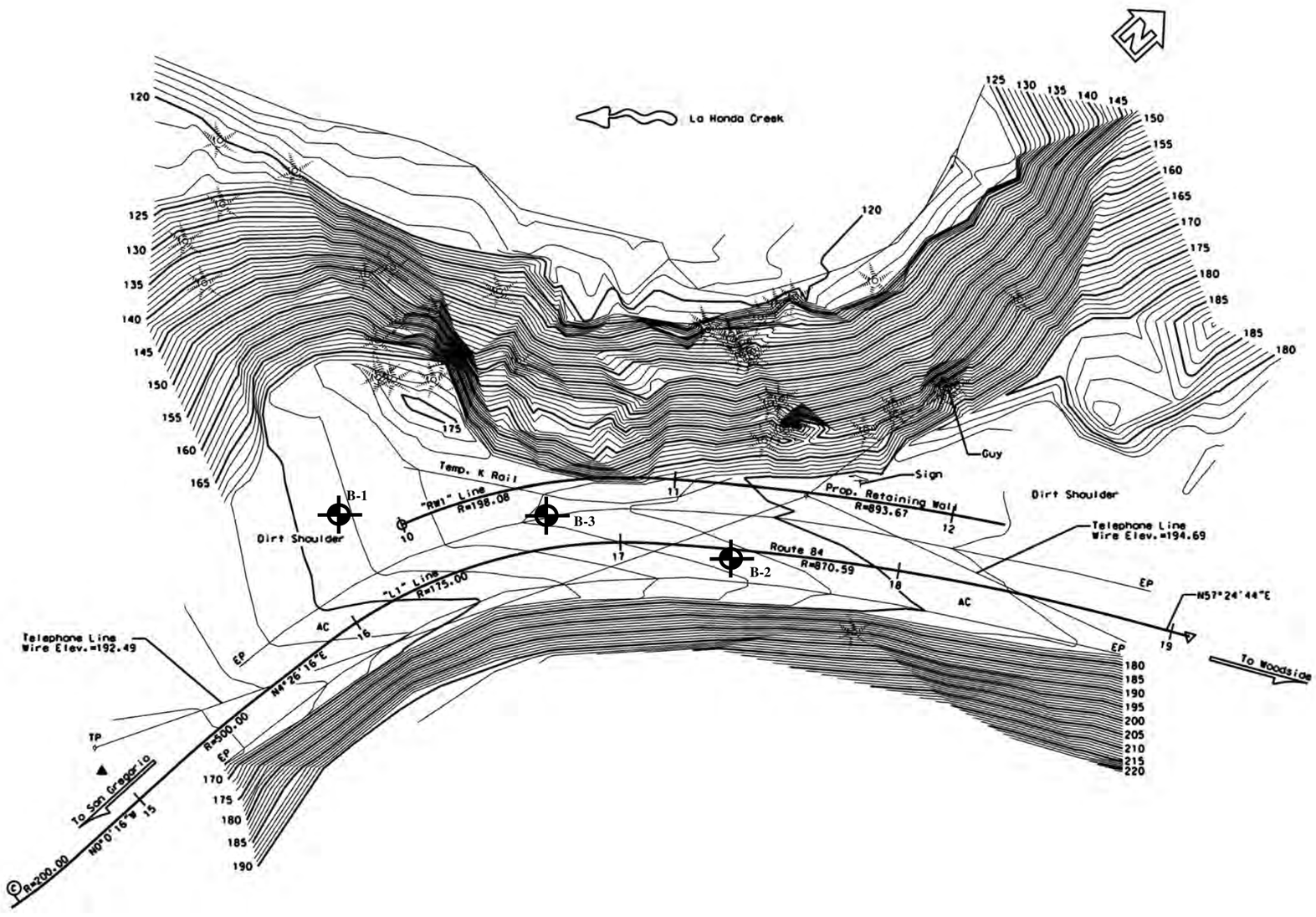
1) Drawing is not to scale.

2) Stationing changed from metric to imperial.

Office of Geotechnical Design – West **Geotechnical Services** **Division of Engineering Services**	**APPROXIMATE LIMITS OF LANDSLIDE ADJACENT TO THE ROADWAY MAP (Updated)**	**04 – SM – 84, PM 9.85** **EA 04 – 3S8201** **SEPTEMBER 2009** **FIGURE 2**

LEGEND:

- Borings performed in 2006.
B-1



Notes:

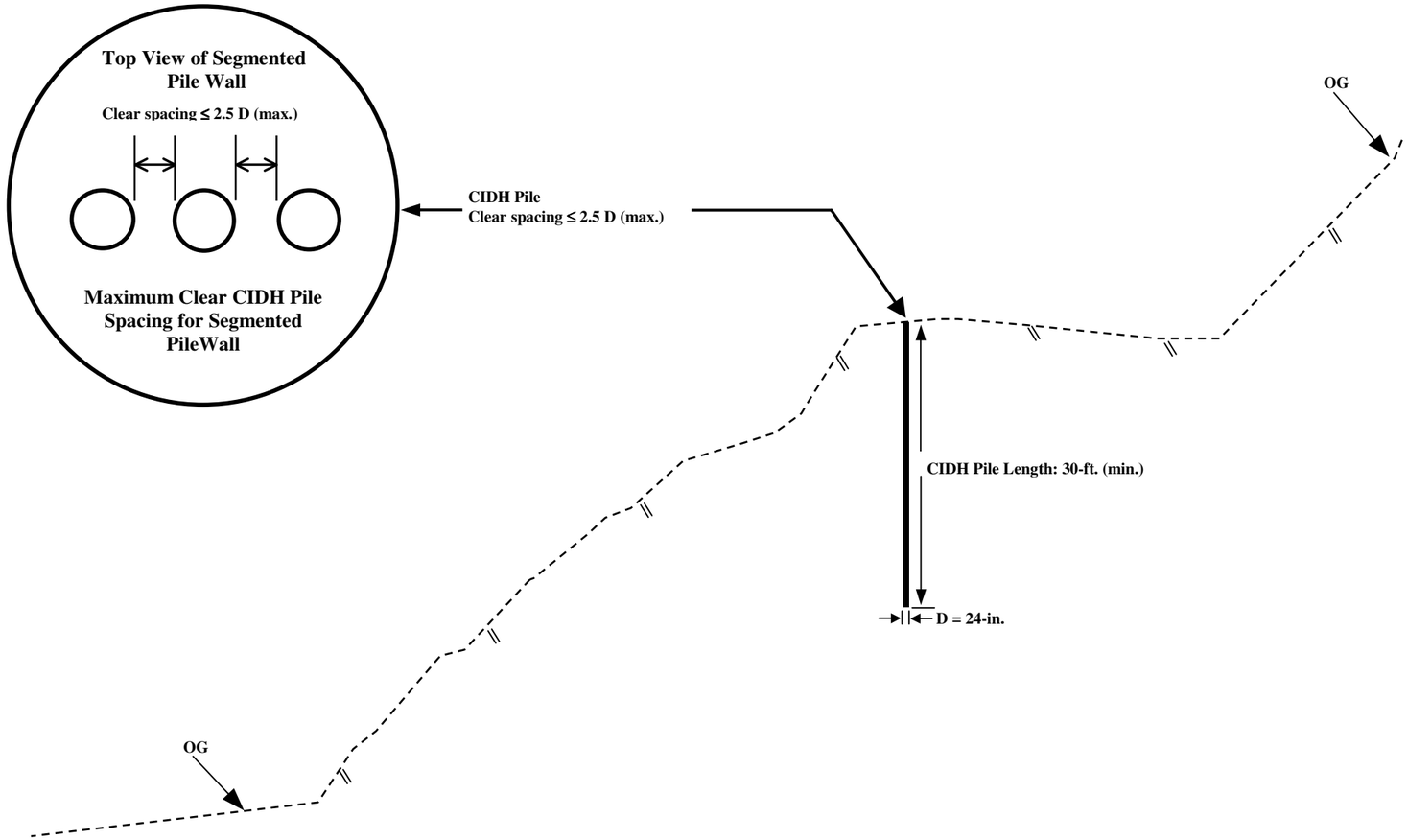
1) Drawing is not to scale.

2) Units changed from metric to imperial.

2) Boring Locations are approximate.

Office of Geotechnical Design – West **Geotechnical Services** **Division of Engineering Services**	**STORM DAMAGE REPAIR** **BORING LAYOUT MAP (Updated)**	**04 – SM – 84, PM 9.85** **EA 04 – 3S8201** **SEPTEMBER 2009** **FIGURE 3**

Note: Drawing is not to scale.



Office of Geotechnical Design – West **Geotechnical Services** **Division of Engineering Services**	**UPDATED STORM DAMAGE REPAIR** **TYPICAL CROSS-SECTION FOR** **SEGMENTED PILE WALL**	**04 – SM – 84, PM 9.85** **EA 04 – 3S8201** **SEPTEMBER 2009** **FIGURE 4**

APPENDIX A

Caltrans

EXPLORATION BORING FIELD LOG

Date 12/12/06 Boring No. B-1

Location HWY 84, PM 9.9, SAN MATEO County | Lab No. | EA No. 358201 | Page 1 of

Dist. 04 Co. SM Rt. 84 P.M. 9.9 Br. No. | Purpose of Work GEOTECHNICAL

Ft., Rt. Lt. Line. Sta. | Northings. 37°19'49.79" Eastings. -122°16'12.72" Elev. ≈520'

Ground Water Data	Date / Time	Water Level	Bot. of Boring
	11/30/07	39'5"	95'

Logged By : J. MOORE | Drill Crew : WILSON, PEARSON, OREY

Drill rig : CS2000 | Hammer Type and Weight : TRIP, 130 #s dropped 30"

Drilling Method : PUNCH CORE | Casing :

Hole Completion :

Depth	Sample Interval Tool	Blows / RQD	Sample I.D.	% Rec.	Strength	Graphic Log	Description	Remarks
1						SC	CLAYEY ~~GRAVEL~~ SAND with ~~SAND~~ GRAVEL, soft gray,	Baggie Sample
2								
3								
4								
5								
6	SPT	9				GP-GC	Poorly graded GRAVEL with clay and sand, dense, gray, moist, gravel grades fine	Baggie Sample
7		12 / 23	(35)					
8								
9							Increasing Rock content	
10								
11	SPT	20 / 30 / 34				Rx	Decomposed Rock, Black, very soft to soft, moist. (As a soil, very dense)	Switched to coring. Samples stuck in barrel
12	1							
13							(Argillite?) fracture zone, RQD = 0.	27" recovered
14	2						SAME, intact pieces becoming larger and more frequently.	24" Recovered
15								
16	SPT	10 / 11 / 22				Rx		(SHALE?)
17	3						SAME, (as a soil, dense)	26" Recovered
18								
19	4					Rx	Same, very low recovery, clay matrix (argillite?) washed out. Intensely wx, soft to moderately soft	4" Recovered to 8"
20								

Caltrans EXPLORATION BORING FIELD LOG

Date | Boring No.

Location HWY 84, PM 9.9, SAN MATEO County | Loc No. | EA No. 358201 | Page ___ of ___

Dist. 04 Co. SM Rt. 84 P.M. 9.9 Br. No. | Purpose of Work GEOTECHNICAL

___ Ft., Rt. / Lt. ___ Line, Sta. ___ Northings. 37°19'49.79" Eastings. -122°16'12.72" Elev. 2520'

Ground Water Data: Date/Time | Water Level | Bot. of Boring

Logged By : J. MOORE | Drill Crew : WELSON PEARSON OREY

Drill rig : CS2000 | Hammer Type and Weight : TRIP, 130 lbs dropped 30"

Drilling Method : PUNCH CORE | Casing :

Hole Completion :

Depth	Sample Interval	Tool	Blows/ROD	Sample I.D.	% Rec.	Strength	Graphic Log	Description	Remarks
20						RX		Rock, green, intensely WX, moderately soft, very intensely fractured to fractured	SHALE in an argillite matrix?
21									
22	5								12" recovered.
23									RQD = 0 to 5%
24									
20	5/1		28			R+			
24			50 = 5"						
22									
23	6								
24									
25									
25	5/1		39			R+		SAME	
26			50 = 2½"						
27								SAME	Changed to SHARKY bit (more aggressive) 12/13/00
28	7								
29									Bottom Return.
30	8					R+		SAME	
31									
34								SAME, intensely to moderately fractured	
32	9								60" Recovered
33						R+			RQD = 38" = 63 / 60"
34									
35									

Caltrans | EXPLORATION BORING FIELD LOG | Date | Boring No.

Location HWY 84, PM 9.9, SAN MATEO County | Lab No. | FA No. 358201 | Page of

Dist. 04 Co. SM Rt. 84 P.M. 9.9 Br. No. | Purpose of Work GEOTECHNICAL

Rt. Ft., Lt. Line, Sta. | Northings. 37°19'49.79" | Eastings. -122°16'12.72" | Elev. 2520'

Ground Water Data: Date/Time | Water Level | Bot. of Boring

Logged By: J. MOORE | Drill Crew: WELSON PEARSON OREY

Drill rig: CS2000 | Hammer Type and Weight: TRIP, 130 lbs dropped 30"

Drilling Method: PUNCH CORE | Casing:

Hole Completion:

Depth	Sample Interval	Tool	Blows	RQD	Sample I.D.	% Rec.	Strength	Graphic Log	Description	Remarks
36								RX	SAME,	60" Recovered
42										
47	10									RQD = 35 / 60 = 58
48										
54										
60										
46								RX	SAME, increasing fractures, and weathering.	30" Recovered
42	11									RQD = 4" / 36" = 11
48										
44								RX	SAME, decreasing fractures, moderately weathered to slightly weathered, moderately hard to hard.	24" Recovered
40	12									RQD = 22" / 24" = ?
46									SAME moderately to slightly fractured, moderately to slightly weathered, moderately hard to hard	60" Recovered
47	13									RQD = 40" / 60" = 66
48										
49										
50										
51									SAME,	60" Recovered
52	14									RQD = 46" / 60" = 77
53										
54									COLOR CHANGES FROM GREEN to GRAY/BLACK.	
55										

Caltrans | EXPLORATION BORING FIELD LOG | Date | Boring No.

Location HWY 84, PM 9.9, SAN MATEO County | Loc No. | FA No. 358201 | Page of

Dist. 04 Co. SM Rt. 84 P.M. 9.9 Br. No. | Purpose of Work GEOTECHNICAL

Ft.. Rt./Lt. Line. Sta. Northings. 37°19'49.79" Eastings. -122°16'12.72" Elev. 2520'

Ground Water Data: Date/Time | Water Level | Bot. of Boring

Logged By : J. MOORE | Drill Crew : NELSON, PEARSON, OREY

Drill rig : CS2000 | Hammer Type and Weight : TRIP, 130 lbs dropped 30"

Drilling Method : PUNCH CORE | Casing :

Hole Completion :

Depth	Sample Interval	Tool	Blows	RQD	Sample I.D.	% Rec.	Strength	Graphic Log	Description	Remarks
55								RX	SAME, increasing weathering and fractures.	60" Recovered.
56										
57	15									RQD = 40" / 60" = 66
58										
59										
60										
61								RX	SAME	Started Losing WATER?
62										60" Recovered
63	16									RQD = 36" / 60" = 60
64										
65										
66								RX	SAME very intensely fractured, very soft to soft,	42" Recovered
67	17									
68										RQD = 11" / 42" = 26
69										
70	18							RX	SAME, moderately weathered, moderately hard.	14" recovered
										RQD = 14" / 18" = 78
71								RX	SAME	
72	19									60" Recovered
73										RQD = 44" / 60" = 73
74										
75										

Caltrans

EXPLORATION BORING FIELD LOG

Date | Boring No.

Location HWY 84, PM 9.9, SAN MATEO County | Lab No. | EA No. 358201 | Page of

Dist. 04 Co. SM Rt. 84 P.M. 9.9 Br. No. | Purpose of Work GEOTECHNICAL

Ft. Rt. Lt. | Line. Sta. | Northings. 37°19'49.79" | Eastings. -122°16'12.72" | Elev. ≈520'

Ground Water Data

Date / Time	Water Level	Bot. of Boring

Logged By : J. MOORE | Drill Crew : WILSON PEARSON OREY

Drill rig : CS2000 | Hammer Type and Weight : TRIP, 130 #s dropped 30"

Drilling Method : PUNCH CORE | Casing :

Hole Completion :

Depth	Sample Interval Tool	Blows RQD	Sample I.D.	% Rec.	Strength	Graphic Log	Description	Remarks
75						Rx	SAME,	
76								54" Recovered
77								RQD = 47"/60" = 78
78	20							
79								
80						Rx	SAME	Lost core, will retrieve on 12/14/06 morning
81								
82								
83	21							43½" Recovered
84								RQD = 43½/60" = 73
85						Rx	SAME	60" Recovered
86								
87								
88	22							RQD = 38"/60" = 63
89								
90						Rx	SAME	60" Recovered
91								
92	23							RQD = 53"/60" = 88
93								
94								
95							END OF BORING	

////

Caltrans | EXPLORATION BORING FIELD LOG

Location HWY 84, PM 9.9, SAN MATEO County | Date 1/30/07 | Boring No. B-2

Lab No. | EA No. 358201 | Page 1 of

Dist. 04 Co. SM Rt. 84 P.M. 9.9 Br. No. | Purpose of Work GEOTECHNICAL

Ft. Rt. Lt. Line. Sta. | Northings. 37°19'49.79" | Eastings. -122°16'12.72" | Elev. ≈520'

Ground Water Data: Date / Time | Water Level | Bot. of Boring

Logged By : J. MOORE | Drill Crew : ~~WILSON PEARSON OREY~~

Drill rig : CS2000 | Hammer Type and Weight : TRIP, 130 #s dropped 30"

Drilling Method : ~~PUNCH~~ CORE | Casing :

Hole Completion :

Depth	Sample Interval Tool	Blows / RQD	Sample I.D.	% Rec.	Strength	Graphic Log	Description	Remarks
1						AC	Asphalt - EASTBOUND LANE	
2	1					CL	CLAY with GRAVEL and SAND, ~~[illegible]~~ stiff, moist, gray	
3						SC	CLAYEY SAND with gravel dense, moist, light brown.	
4								
5	5 P 1	18 25 46						
6								
7						Rt	Mudego Basalt, gray, intensely to moderately weathered moderately hard, moderately to slightly fractured.	Core recovery = 48"/60" = 80
8	2							
9							With calcite	RQD = 37"/48" = 77
10								
11						Rt	SAME	Core Recovery = 60"/60"
12							With calcite	RQD = 49"/60" = 81
13	3							
14								
15								
16						Rt	SAME	Core Recovery = 60"/60"
17	4						Moderately fractured with increasing calcite	
18								RQD = 36"/60" = 60
19								
20								

Caltrans | EXPLORATION BORING FIELD LOG | Date | Boring No.

Location HWY 84 PM 9.9, SAN MATEO COUNTY | Lab No. | EA No. 358201 | Page of

Dist. 04 Co. SM Rt. 84 P.M. 9.9 Br. No. | Purpose of Work GEOTECHNICAL

Ft. Rt. Lt. Line. Sta. Northings. 37°19'49.79" Eastings. -122°16'12.72" Elev. 2520'

Ground Water Data: Date / Time | Water Level | Bot. of Boring

Logged By : J. MOORE | Drill Crew : WILSON, PEARSON, OREY

Drill rig : CS2000 | Hammer Type and Weight : TRIP, 130 LBS dropped 30"

Drilling Method : PUNCH CORE | Casing :

Hole Completion :

Depth	Sample Interval	Tool	Blows	RQD	Sample I.D.	% Rec.	Strength	Graphic Log	Description	Remarks
20										
21								Rx	SAME	Core Recovery = 53" / 60"
22										
23	5									RQD = 24" / 60" = 57
24										
25										
26								Rx	SAME	Core Recovery = 60" / 60"
27										
28	6									RQD = 42" / 60" = 70
29										
30										
31								Rx	SAME, Slightly fractured	Core Recovery = 60" / 60"
32										
33	9									RQD = 38" / 60" = 63
34										
35										
36								Rx	SAME	Core Recovery = 42" / 42"
37	8									
38										RQD = 38" / 42" = 91
39										Ended for the day. 1400
40	9							Lr	SAME	Started @ 0900 11/31/07
										Completed five foot run.

Caltrans | EXPLORATION BORING FIELD LOG | Date | Boring No.

Location: HWY 84, PM 9.9, SAN MATEO COUNTY | Lab No. | EA No. 358201 | Page ___ of ___

Dist. 04 Co. SM Rt. 84 P.M. 9.9 Br. No. | Purpose of Work: GEOTECHNICAL

Ft.. Rt./Lt. Line. Sta. Northings: 37°19'49.79" Eastings: -122°16'12.72" Elev.: 2520'

Ground Water Data: Date/Time | Water Level | Bot. of Boring

Logged By: J. MOORE | Drill Crew: WELSON, PEARSON, OREY

Drill rig: CS2000 | Hammer Type and Weight: TRIP, 130 #'s dropped 30"

Drilling Method: PUNCH CORE | Casing:

Hole Completion:

Depth	Sample Interval	Tool	Blows/RQD	Sample I.D.	% Rec.	Strength	Graphic Log	Description	Remarks
41							R+	SAME, VERY INTENSELY WEATHERED, SOFT, FRACTURE ZONE.	CORE RECOVERY = 53" / 60"
42									
43	10								RQD = 10" / 60" = 17
44									
45									
46							R+	SAME, INTENSELY TO MODERATELY WEATHERED, MODERATELY HARD	CORE RECOVERY = 34" / 36"
47	11								RQD = 20" / 36" = 55
48									
49	12						R+	SAME, MODERATELY WEATHERED, MODERATELY HARD.	CORE RECOVERY = 20" / 24"
50									RQD = 8" / 24" = 33
51							R+	SAME,	CORE RECOVERY = 60" / 60"
52	13								RQD = 40" / 60" = 66
53									
54									
55									
56							R+	SAME, MODERATELY TO SLIGHTLY WEATHERED, MODERATELY HARD	CORE RECOVERY = 60" / 60"
57	14								
58									RQD = 48" / 60 = 80
59									
60									

Caltrans

EXPLORATION BORING FIELD LOG

Location: HWY 84, PM 9.9, SAN MATEO COUNTY | Date | Boring No.

Dist. 04 Co. SM Rt. 84 P.M. 9.9 Br. No. | Lab No. | EA No. 358201 | Page of

Ft., Rt./Lt. Line. Sta. Northings. 37°9'49.79" Eastings. -122°16'12.72" Elev. 2520'

Purpose of Work: GEOTECHNICAL

Ground Water Data: Date/Time | Water Level | Bot. of Boring

Logged By: J. MOORE | Drill Crew: WELSON, PEARSON, OREY

Drill rig: CS2000 | Hammer Type and Weight: TRIP, 130 lbs dropped 30"

Drilling Method: PUNCH CORE | Casing:

Hole Completion:

Depth	Sample # / Interval / Tool / Blows	RQD	Sample I.D.	% Rec.	Strength	Graphic Log	Description	Remarks
60								
61					Rx		SAME,	CORE RECOVERY = 60" / 60"
62	15							
63								RQD = 38.5" / 60" = 64
64								
65								
66					Rx		SAME	CORE RECOVERY = 60" / 60"
67								RQD = 24" / 60" = 35
68	16							
69								
70								
71					Rx		SAME	CORE RECOVERY = 59" / 60"
72								
73	17							RQD = 35" / 60" = 58
74								
75								Ended drilling for the day @ 1430 1/31/07
76					Cx		SAME,	
77							fracture zone, some sand,	STARTED @ 0900 2/1/07
2	18						EOD of fracture zone.	CR = 29" / 48", RQD = 20" / 48" = 42
7								
2	19				Rx			~~CR = 24" / 48"~~ ~~RQD = 20"~~

Page 8

Caltrans | EXPLORATION BORING FIELD LOG | Date | Boring No.

Location: HWY 84, PM 9.9, SAN MATEO County | Lab No. | EA No. 358201 | Page of

Dist. 04 Co. SM Rt. 84 P.M. 9.9 Br. No. | Purpose of Work GEOTECHNICAL

Ft. Rt. Lt. Line. Sta. | Northings. 37°19'49.79" | Eastings. -122°16'12.72" | Elev. 2520'

Ground Water Data: Date / Time | Water Level | Bot. of Boring

Logged By: J. MOORE | Drill Crew: WELSON PEARSON OREY

Drill rig: CS2000 | Hammer Type and Weight: TRIP, 130 #S dropped 30"

Drilling Method: PUNCH CORE | Casing:

Hole Completion:

Depth	Sample Interval	Tool	Blows	RQD	Sample I.D.	% Rec.	Strength	Graphic Log	Description	Remarks
80							RX		SAME, moderately to slightly weathered, hard.	C.R. = 40"/42"
81	19									RQD = 33"/42" = .79
82										
83							RX		SAME,	C.R. = 32"/36"
84	20									RQD = 32"/36" = .89
85										
86							R		SAME,	C.R. = 60"/60"
87	21									RQD = 47"/60" = .78
88										
89										
90										
91							RX		SAME,	C.R. = 58"/60"
92	22									RQD = 58"/60" = .97
93										
94										
95										
96							R		SAME,	C.R. = 60"/60"
97	23									RQD = 60"/60" = 100
98										
99										
100									END OF CORE	

Caltrans

EXPLORATION BORING FIELD LOG

Date 2/6/07 | Boring No. B-3

Location HWY 84, PM 9.9, SAN MATEO County | Lab No. | EA No. 358201 | Page 1 of

Dist. 04 Co. SM Rt. 84 P.M. 9.9 Br. No. | Purpose of Work GEOTECHNICAL

Ft. Rt. Lt. | Line. Sta. | Northings. 37°19'49.79" | Eastings. -122°16'12.72" | Elev. ≈520'

Ground Water Data: Date / Time | Water Level | Bot. of Boring

Logged By : J. MOORE | Drill Crew : ~~WILSON PEARSON OREY~~

Drill rig : CS2000 | Hammer Type and Weight : TRIP, 130 #s dropped 30"

Drilling Method : PUNCH CORE | Casing :

Hole Completion :

Depth	Sample Interval Tool	Blows / RQD	Sample I.D.	% Rec.	Strength	Graphic Log	Description			Remarks
						AC	Asphalt			
1						RB	Road Base			Core Recovery = 54"/60"
2						SC	Clayey Sand with gravel, soft, gray			RQD = 0.
3	1									Started 0900
4						Rt	Sandstone, light brown, very soft			
5						Rt	Decomposed Rock reddish-brown, very soft to soft			
6						Rt	SAME, Mindego Basalt? Decomposed.			Core Recovery = 43"/60"
7										
8	2									RQD = 0
9										
10										
11						Rt	SAME			Core Recovery = 45"/60"
12	3					ML	Silt, gray, moist, soft, low plasticity			RQD = 0.
13							(Siltstone?)			
14							Siltstone, gray, decomposed, very soft			
15										
16						Rt	Mindego Basalt, gray, intensely to moderately weathered, moderately hard			Core Recovery = 57"/60"
17	4									
18										RQD = 57"/60" = 95
19										
20										

Caltrans

EXPLORATION BORING FIELD LOG

Date | Boring No.

Location: HWY 84, PM 9.9, SAN MATEO County | Lab No. | EA No. 358201 | Page ___ of ___

Dist. 04 Co. SM Rt. 84 P.M. 9.9 Br. No. | Purpose of Work: GEOTECHNICAL

Ft., Rt./Lt. Line. Sta. | Northings: 30°9'49.79" Eastings: -122°16'12.72" Elev.: 2520'

Ground Water Data: Date/Time | Water Level | Bot. of Boring

Logged By: J. MOORE | Drill Crew: NELSON PEARSON OREY

Drill rig: CS2000 | Hammer Type and Weight: TRIP, 130 lbs dropped 30"

Drilling Method: PUNCH CORE | Casing:

Hole Completion:

Depth	Sample Interval	Tool	Blows	RQD	Sample I.D.	% Rec.	Strength	Graphic Log	Description	Remarks
20									JAME,	Core Recovery = 60" / 60"
21										
22										
23	4									RQD = 39" / 60" = 65
24										
25									Bottom of Hole @ 25'	1200
26										
27										
28										
29										
30										
31										
32										
33										
34										
35										
36										
37										
38										
39										
40										

Caltrans

EXPLORATION BORING FIELD LOG

Date | Boring No.

Location: HWY 84, PM 9.9, SAN MATEO COUNTY | Lab No. | EA No. 358201 | Page ___ of ___

Dist. 04 Co. SM Rt. 84 P.M. 9.9 Br. No. | Purpose of Work: GEOTECHNICAL

___ Ft. Rt. / Lt. ___ Line. Sta. ___ Northings. 37°19'49.79" Eastings. -122°16'12.72" Elev. 2520'

Ground Water Data

Date	Time	Water Level	Bot. of Boring

Logged By: J. MOORE | Drill Crew: NELSON, PEARSON, OREY

Drill rig: CS2000 | Hammer Type and Weight: TRIP, 130 lbs dropped 30"

Drilling Method: PUNCH CORE | Casing:

Hole Completion:

Depth	Sample Interval	Tool	Blows / RQD	Sample I.D.	% Rec.	Strength	Graphic Log	Description			Remarks
40											
41											
42											
43											
44											
45											
46											
47											
48											
49											
50											
51											
52											
53											
54											
55											
56											
57											
58											
59											
60											

Caltrans

EXPLORATION BORING FIELD LOG

Date | Boring No.

Location HWY 84 PM 9.9 SAN MATEO County | Lab No. | EA No. 358201 | Page of

Dist. 04 Co. SM Rt. 84 P.M. 9.9 Br. No. | Purpose of Work GEOTECHNICAL

Ft., Rt. Lt. Line. Sta. Northings. 37°9'49.79" Eastings. -122°16'12.72" Elev. 2520'

Ground Water Data: Date/Time | Water Level | Bot. of Boring

Logged By : J. MOORE | Drill Crew : NELSON PEARSON OREY

Drill rig : CS2000 | Hammer Type and Weight : TRIP, 130 lbs dropped 30"

Drilling Method : PUNCH CORE | Casing :

Hole Completion :

Depth	Sample Interval	Tool	Blows	RQD	Sample I.D.	% Rec.	Strength	Graphic Log	Description			Remarks
60												
61												
62												
63												
64												
65												
66												
67												
68												
69												
70												
71												
72												
73												
74												
75												
76												
77												
78												
79												
80												

Caltrans

EXPLORATION BORING FIELD LOG

Location: HWY 84, PM 9.9, SAN MATEO COUNTY | Lab No. | Date | Boring No.

Dist. 04 Co. SM Rt. 84 P.M. 9.9 Br. No. | EA No. 358201 | Page of

Ft. Rt. Lt. Line. Sta. | Purpose of Work: GEOTECHNICAL

Northings: 37°19'49.79" Eastings: 122°16'12.72" Elev. 2520'

Ground Water Data: Date / Time | Water Level | Bot. of Boring

Logged By: J. MOORE | Drill Crew: WELSON PEARSON OREY

Drill rig: CS2000 | Hammer Type and Weight: TRIP, 130 lbs dropped 30"

Drilling Method: PUNCH CORE | Casing:

Hole Completion:

Depth	Sample Interval	Tool	Blows	RQD	Sample I.D.	% Rec.	Strength	Graphic Log	Description			Remarks
81												
82												
83												
84												
85												
86												
87												
88												
89												
90												
91												
92												
93												
94												
95												
96												
97												
98												
99												
100												

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

Date: 5/3/2007

To: John Moore / GDW

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

RE: Laboratory Test Report -- EA: 04-3S8201

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

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
OFFICE OF GEOTECHNICAL SUPPORT
GEOTECHNICAL LABORATORY

UNCONFINED COMPRESSION TEST (ASTM D2938)

JOB LOCATION **04-SM-84 PM 9.85**

JOB NUMBER **04-3S8201 San Mateo County Rte 84**

DATE 5/1/2007
TEST BY MJS
CHECKED BY LP 5/3/07

SAMPLE NO.	DEPTH FT.	DIA. IN.	LENGTH IN.	L/D RATIO	WEIGHT LBS.	LOAD LBS.	DENSITY PCF	STRESS TSF	REMARKS
B-1-1 *	31 (9.5)	2.39	5.20	2.18	1.95	5615.8	144	90.1	1251 psc
B-1-2 *	43 (13)	2.40	4.80	2.00	1.94	8842.9	154	140.8	1956 T
B-1-3 **	51.0 (15.5)							**	
B-1-4 *	59-60 (18)	2.41	5.21	2.16	2.17	7771.5	158	122.7	1704
B-1-5 **	69-70 (21)							**	
B-2-1 **	13 (4)							**	
B-2-2 **	37 (11.3)							**	
B-2-3 *	48-49 (15)	2.38	4.83	2.03	1.75	5801.3	141	93.9	1304
B-2-4 *	57 (17.3)	2.37	5.22	2.20	1.92	7136.1	144	116.5	1618
B-2-5 *	92-93 (28)	2.38	5.21	2.19	1.93	11151.1	144	180.5	2509
B-3-1 *	19-20 (6)	2.34	5.15	2.20	1.89	4025.7	147	67.4	936 psi

* Test was done at the the concrete lab, no moistures recorded

** Sample fell apart while preparing for testing -- Not suitable for testing

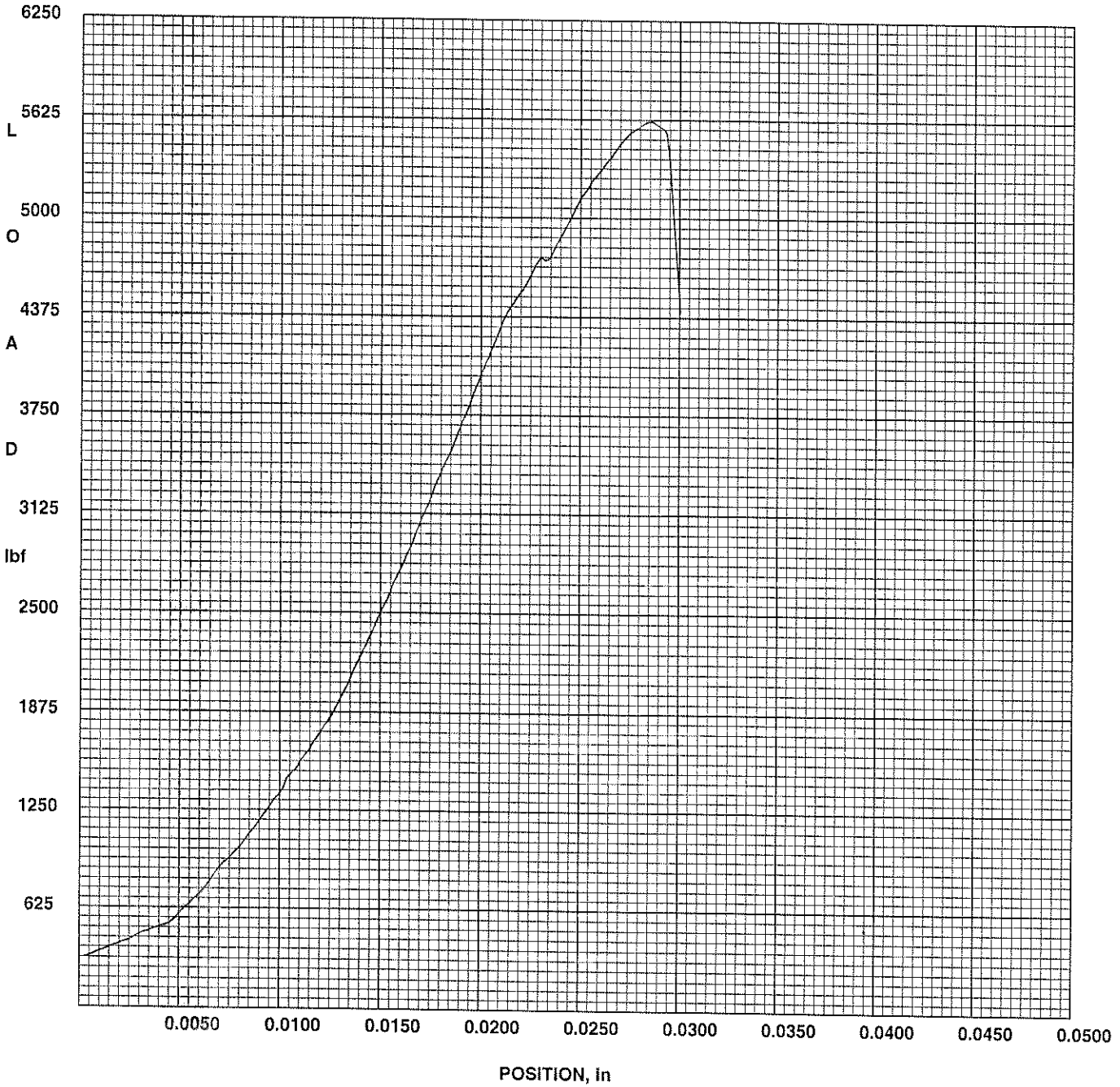
*** Sample received very dried out -- Test results may not represent the true soil conditions

**** The test specimen length/dimeter ratio was not in compliance with the test method

142.4 pcf 115.99 TSF

116 TSF / 1611.11 psi

= 232,000 psf = 11108.22 kPA



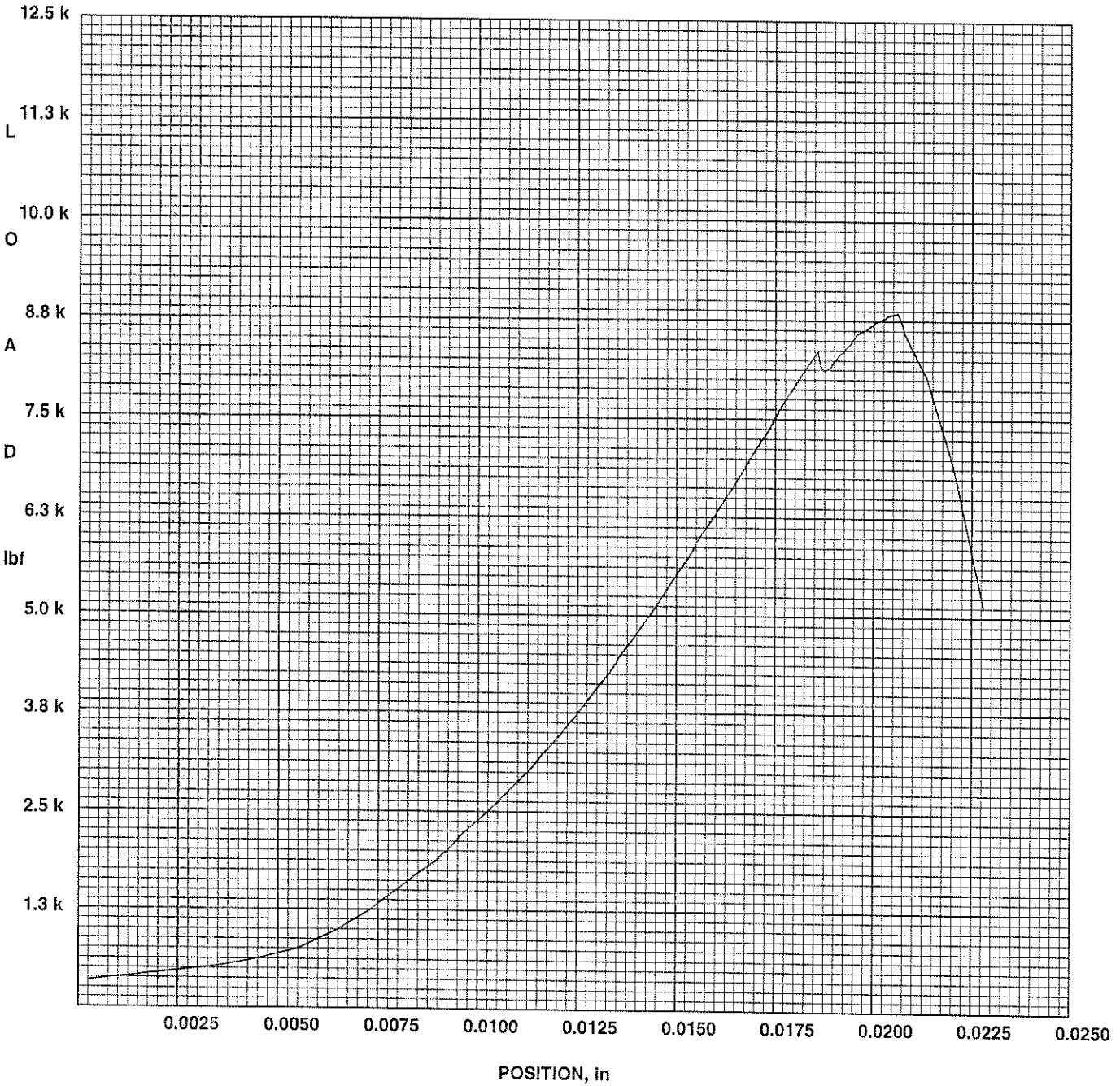
State of California
Department of Transportatio
Concrete and Structure Testi
Office of Rigid Pavement

Compression Test C-39

Contract Number	04-3S8201
TL101	N/A
Lab Number	

Sample No.:	B-1-1
Contract:	04-3S8201
TL101:	N/A
Lab:	Concrete
Specimen, in:	5.2000
Diameter, in:	2.3900
Area, in²:	4.49
Ultimate, lbf:	5615.76
Ultimate, psi:	1252
Ultimate, MPa:	8.63
Elapsed, sec:	35

May 2, 2007 1:40:13 PM
SN: 198661-R1 V7.01.08



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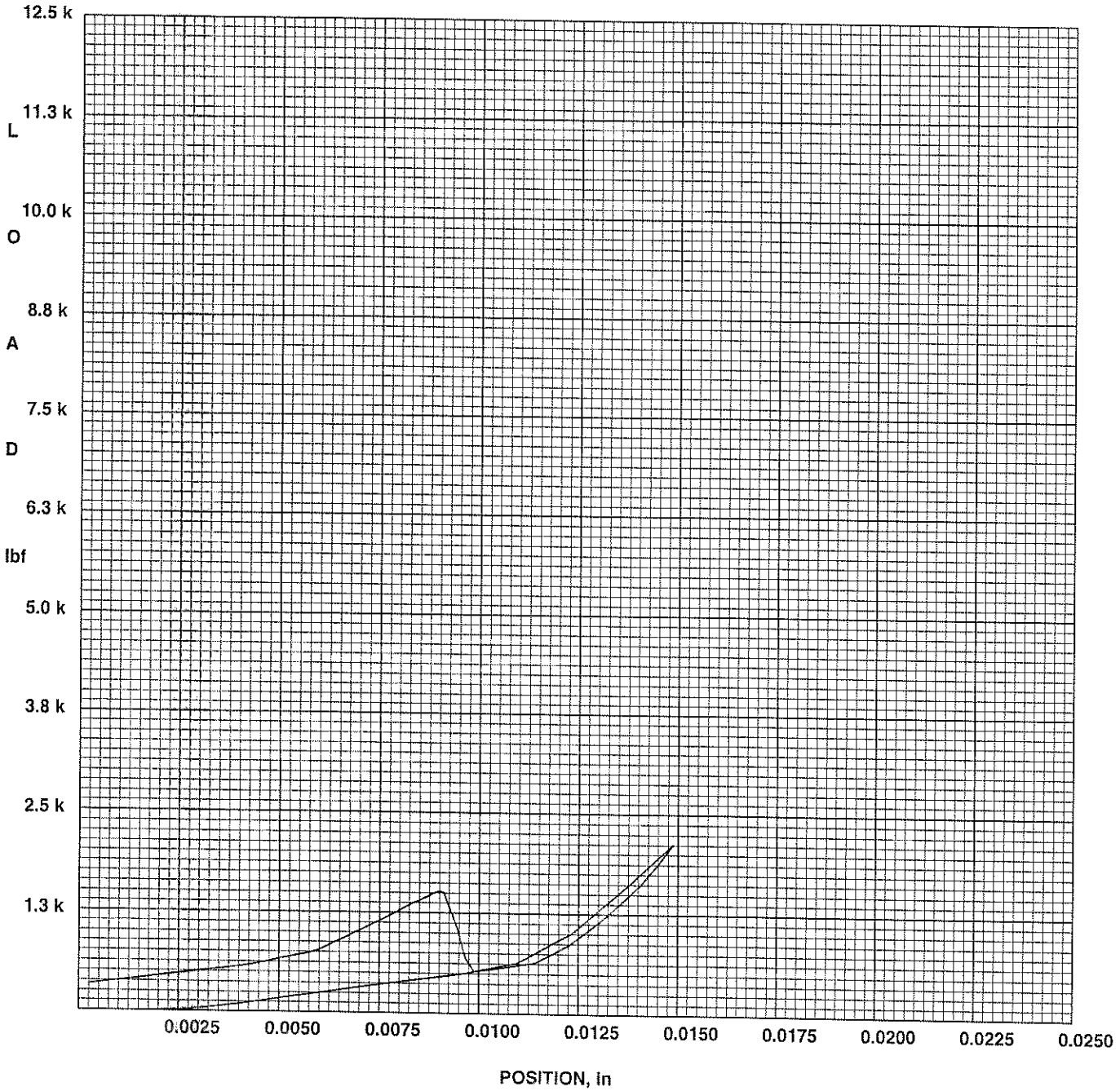
Department of Transportatio
Concrete and Structure Testi
Office of Rigid Pavement

Compression Test C-39

Contract Number	04-3S8201
TL101	N/A
Lab Number	

Sample No.:	B-1-2
Contract:	04-3S8201
TL101:	N/A
Lab:	Concrete
Specimen, in:	4.8000
Diameter, in:	2.4000
Area, in²:	4.52
Ultimate, lbf:	8842.91
Ultimate, psi:	1955
Ultimate, MPa:	13.48
Elapsed, sec:	54.5

May 2, 2007 1:35:41 PM
SN: 198661-R1 V7.01.08



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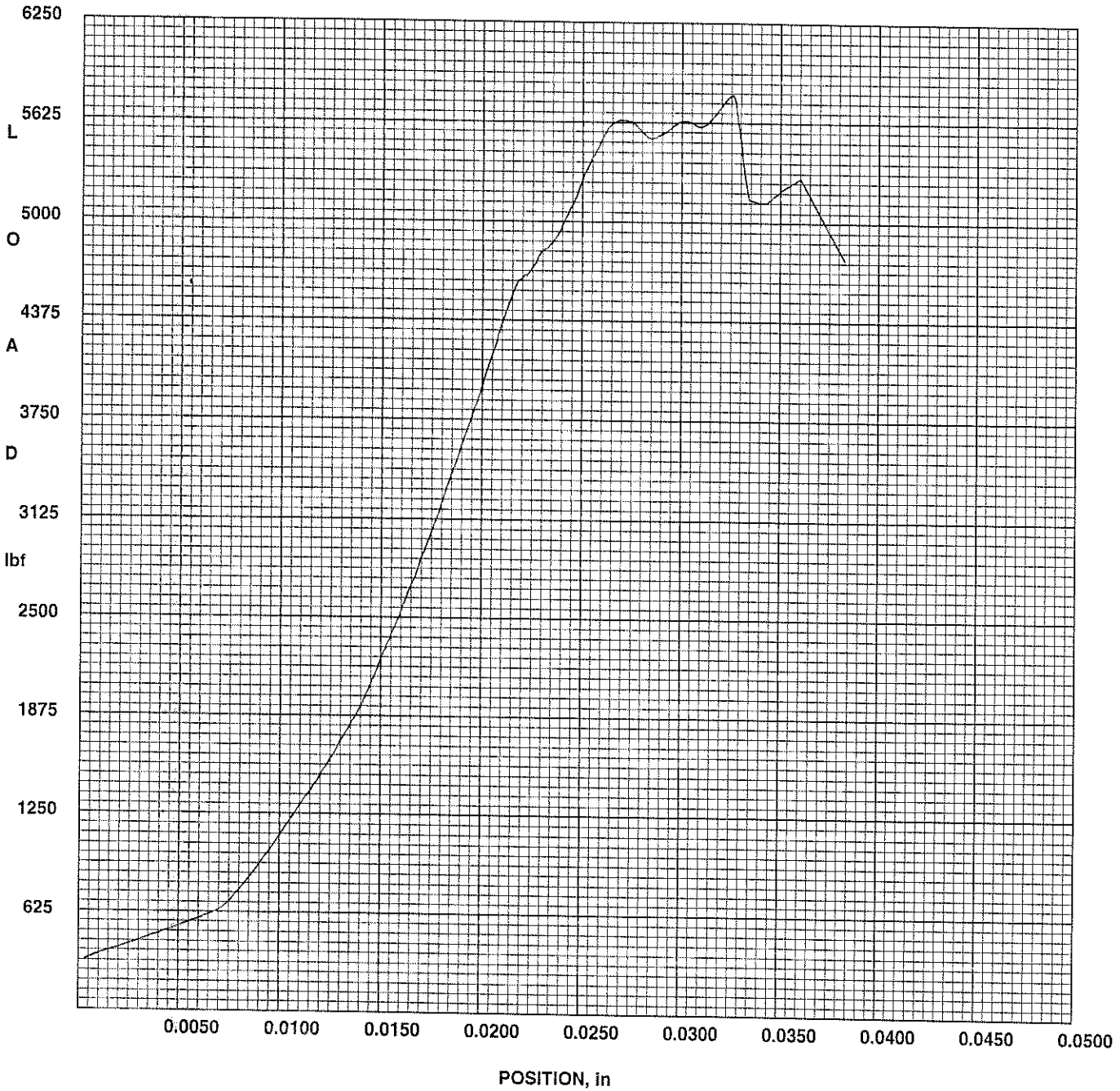
Department of Transportatio
Concrete and Structure Testi
Office of Rigid Pavement

Compression Test C-39

Contract Number	04-3S8201
TL101	N/A
Lab Number	

Sample No.:	B-1-4
Contract:	04-3S8201
TL101:	N/A
Lab:	Concrete
Specimen, in:	5.2100
Diameter, in:	2.4100
Area, in²:	4.56
Ultimate, lbf:	7771.51
Ultimate, psi:	1704
Ultimate, MPa:	11.75
Elapsed, sec:	59.2

May 2, 2007 1:38:56 PM
SN: 198661-R1 V7.01.08



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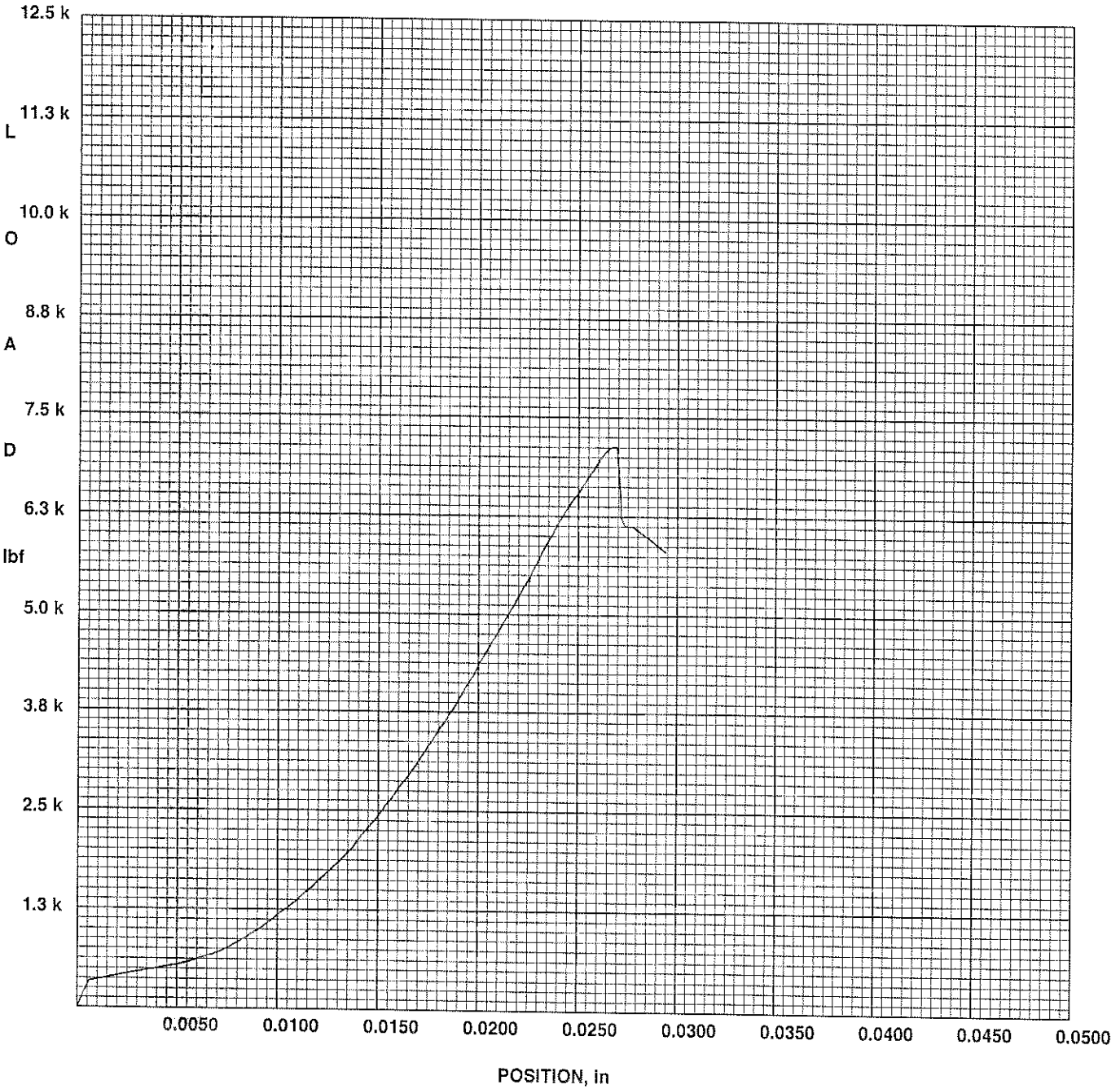
Department of Transportatio
Concrete and Structure Testi
Office of Rigid Pavement

Compression Test C-39

Contract Number	04-3S8201
TL101	N/A
Lab Number	

Sample No.:	B-2-3
Contract:	04-3S8201
TL101:	N/A
Lab:	Concrete
Specimen, in:	4.8300
Diameter, in:	2.3800
Area, in²:	4.45
Ultimate, lbf:	5801.28
Ultimate, psi:	1304
Ultimate, MPa:	8.99
Elapsed, sec:	37.9

May 2, 2007 1:53:53 PM
SN: 198661-R1 V7.01.08



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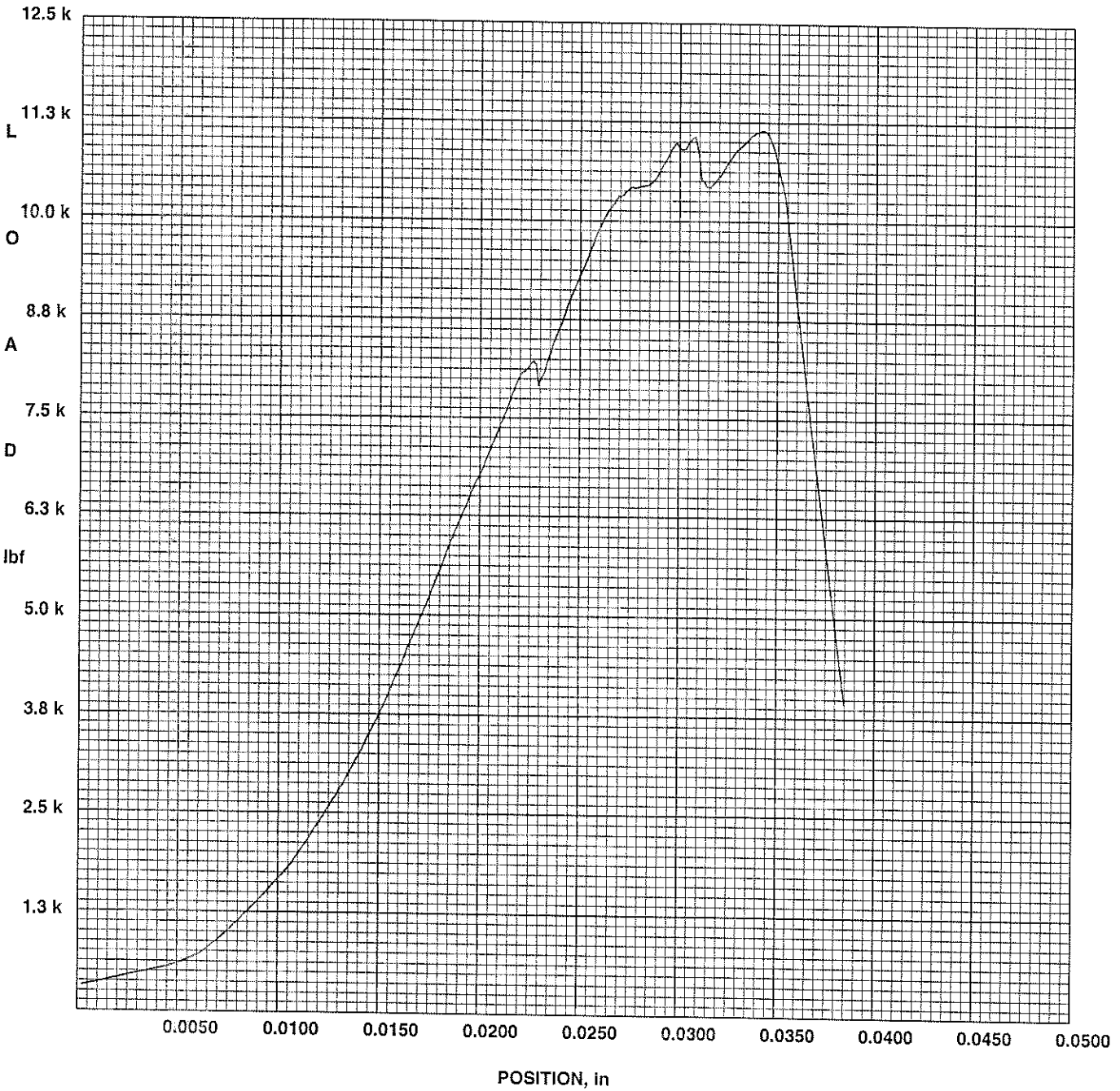
Concrete and Structure Testi
Office of Rigid Pavement

Compression Test C-39

Contract Number	04-3S8201
TL101	N/A
Lab Number	

Sample No.:	B-2-4
Contract:	04-3S8201
TL101:	N/A
Lab:	Concrete
Specimen, in:	5.2200
Diameter, in:	2.3700
Area, in²:	4.41
Ultimate, lbf:	7136.09
Ultimate, psi:	1618
Ultimate, MPa:	11.15
Elapsed, sec:	44.9

May 3, 2007 9:00:00 AM
SN: 198661-R1 V7.01.08



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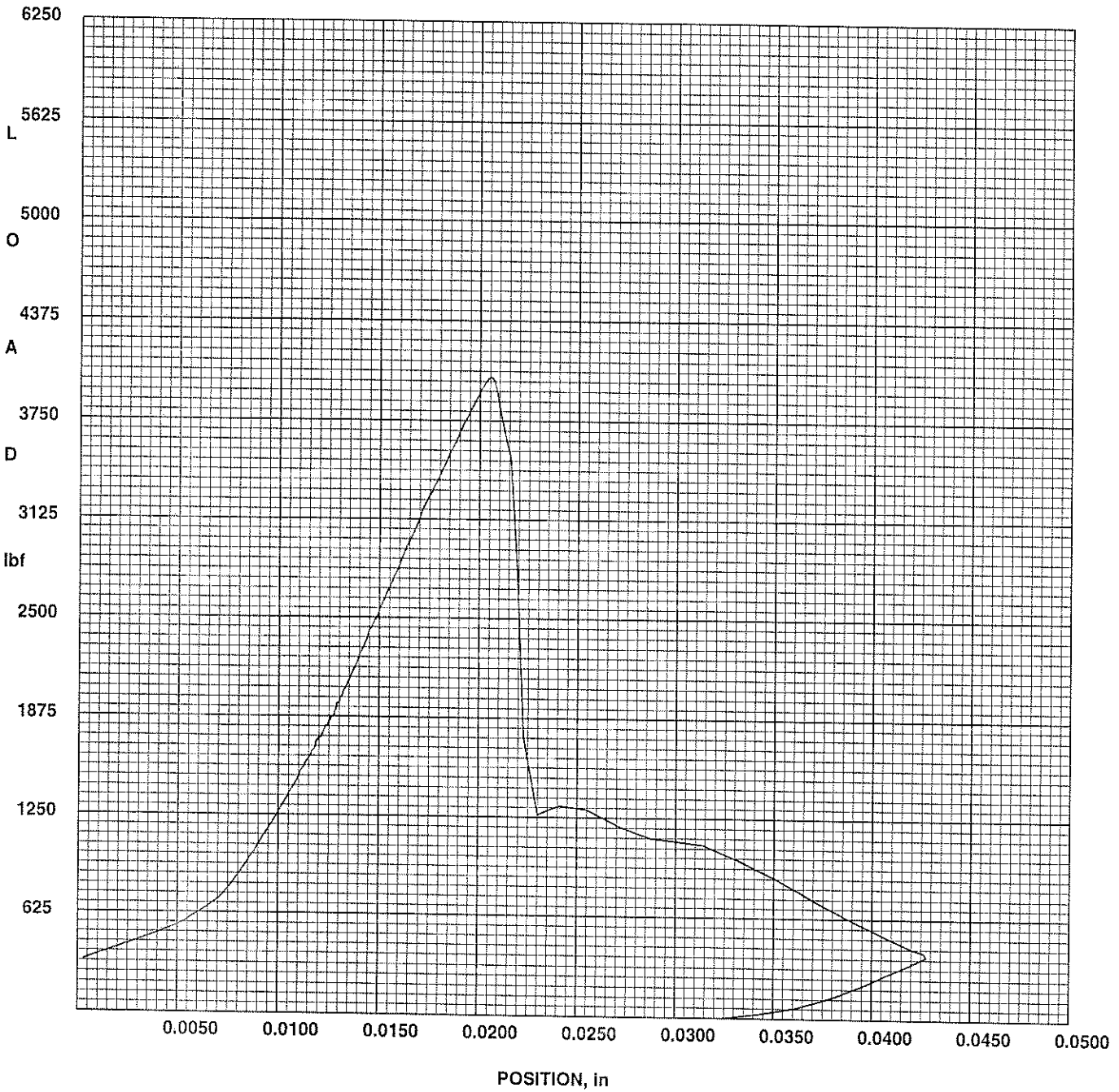
Office of Rigid Pavement

Compression Test C-39

Contract Number	04-3S8201
TL101	N/A
Lab Number	

Sample No.:	B-2-5
Contract:	04-3S8201
TL101:	N/A
Lab:	Concrete
Specimen, in:	5.2100
Diameter, in:	2.3800
Area, in^2:	4.45
Ultimate, lbf:	11151.11
Ultimate, psi:	2510
Ultimate, MPa:	17.28
Elapsed, sec:	71.3

May 2, 2007 2:04:47 PM
SN: 198661-R1 V7.01.08



State of California
Department of Transportatio
Concrete and Structure Testi
Office of Rigid Pavement

Compression Test C-39

Contract Number	04-3S8201
TL101	N/A
Lab Number	

Sample No.:	B-3-1
Contract:	04-3S8201
TL101:	N/A
Lab:	Concrete
Specimen, in:	5.1500
Diameter, in:	2.3400
Area, in²:	4.3
Ultimate, lbf:	4025.7
Ultimate, psi:	936
Ultimate, MPa:	6.45
Elapsed, sec:	38.3

May 2, 2007 2:07:29 PM
SN: 198661-R1 V7.01.08

State of California
DEPARTMENT OF TRANSPORTATION

Business, Transportation and Housing Agency

Memorandum

Flex your power!
Be energy efficient!

To: MR. RON MORIGUCHI
Regional Project Manager
San Mateo County

Date: July 31, 2007

Attention: N. Shridhar

File: 04-SM-84, PM 9.85
04-3S8301
Storm Damage

From: JOHN C. MOORE JM
Transportation Engineer
Office of Geotechnical Design – West
Geotechnical Services
Division of Engineering Services

WAJAHAT NYAZ WN
Chief, Branch C
Office of Geotechnical Design – West
Geotechnical Services
Division of Engineering Services

Subject : Final Landslide Repair Recommendations for storm damage at 4-SM-84, PM 9.85, near La Honda, California

This memo presents our geotechnical recommendations for the above referenced storm damaged site. The site is located on Route 84, PM 9.85, in San Mateo County, California (Please refer to Location Map, Figure 1). The recommendations contained within this memorandum are based upon our subsurface investigation, lab tests performed on samples retrieved during our subsurface investigation, site observations, and our engineering judgment.

SITE DESCRIPTION

During the rainstorms of January and February 2006, a large slip out on the downhill slope adjacent to the edge of pavement of the westbound lane of Highway 84 was observed. The top of the slip out was observed, at its closest, to be 2.4 m from the edge of pavement and, at its furthest, 3.7 to 4.3 m from the edge of pavement. This failure may have been initiated by erosion at the slope toe from La Honda Creek. In addition, several large trees have fallen into La Honda Creek and have created a natural dam, obstructing the flow of the creek. It is possible, that, with time, the influence of the natural dam on the flow of the creek will become greater and increase erosive action at the toe of the slope. The approximate size of the slide is 27.4 m long by 18.3 m deep, or approximately 501 square meters. The approximate limits of the landslide adjacent to the roadway are shown in Figure 2.

SCOPE OF WORK

The work performed for this investigation included:

- Review of available information on site geology and seismicity.
- A subsurface investigation consisting of three power borings (BH-1, BH-2, and BH-3) adjacent to the landslide to determine subsurface conditions.
- Laboratory testing of selected rock samples.
- Engineering analysis and formulation of the repair recommendations.

REGIONAL AND SITE GEOLOGY

The project lies within the Coast Range geomorphic province and is in the northern extent of the Santa Cruz Mountains, a chain of steep ridges and valleys that traverse roughly WNW toward the coast. Bedrock within the project area consists of Mindigo Basalt, an Oligocene age volcanic unit deposited in the submarine La Honda Basin (Brabb and Pampeyan, 1972).

SEISMIC CONSIDERATIONS

The project is located within the seismically active San Andreas Fault system and may be prone to moderate to large earthquakes over time. This fault system is composed of northwest trending, generally right-lateral, strike-slip faults. Several faults within the San Andreas Fault system are capable of affecting the project site. Below is a list of those faults and their predicted ground accelerations (reported as a percentage of the force of gravity) based upon a likely maximum credible event (earthquake, given in moment magnitude, Mw) as calculated by Mualchin (1996).

TABLE 1: Faults, Maximum Credible Earthquake Magnitudes, and Peak Bedrock Accelerations

FAULT	DISTANCE FROM PROJECT (km)	MAXIMUM CREDIBLE EVENT (Mw)	PEAK BEDROCK ACCELERATION
San Andreas	6.4	8.0	0.58 g
San Gregorio	10.8	7.5	0.43 g
Hayward	34.5	7.5	0.19 g

Brabb, E.E., Graymer, R.W., and Jones, D.L., 1998, Geology of the onshore part of San Mateo County, California: a digital database, USGS Open File Report 98-137.

Mualchin, L, 1996, California Seismic Hazard Map, California Department of Transportation.

EXPLORATION AND SUBSURFACE CONDITIONS

Three borings (BH-1, BH-2, and BH-3) were drilled during the respective months of December 2006 and January - February 2007. Coring methods were utilized to achieve depths of 29-m, 30.5-m, and 7.6-m, respectively. Rock core samples were collected. Standard Penetration Tests (SPT's) were performed in the borings whenever sands or gravels were encountered. The boring locations are shown in the attached Boring Layout Map, Figure 3. The subsurface conditions encountered in the borings are summarized below.

Based on the subsurface investigation, the subsurface conditions at the site consist of 2 to 4.6 m of clayey sand with gravel (fill). The fill material is underlain by intensely weathered, highly fractured, soft to hard Midigo Basalt. The RQD in the Basalt is highly variable and ranges from 0% to 100%. See attached field boring logs for details.

Due to drilling scheduling conflicts and also to the drilling method used, groundwater measurements were only performed in Boring B-1. Groundwater was measured at a depth of 12 m in Boring B-1. Groundwater measurements were not performed for Boring B-2. Groundwater was not encountered in Boring B-3.

A Log of Test Borings (LOTB) sheet should be included with the contract plans and will be forwarded to Design upon completion.

LABORATORY TESTING

Unconfined compression tests were performed on selected rock samples retrieved from the borings in accordance with ASTM C-39. The laboratory test results are attached.

RECOMMENDATIONS

Due to the close proximity of La Honda Creek, with respect to Route 84, conventional methods, such as the construction of a restrained system such as an anchored soldier beam and lagging wall to retain the roadway, would be undesirable. Excavation of a soldier beam would require significant excavation and this is not desirable, especially when environmental and biologic concerns during construction are considered.

Our borings show that Route 84, PM 9.9, except for approximately the top 4.6 m, which is soil, is underlain by weak rock. Knowing this fact, it is clear that the most viable alternative would be the construction of an unrestrained system, such as a segmented pile wall. Construction of a segmented pile wall near the edge of the existing pavement would consist of installing Cast-In-Drilled-Hole (CIDH) piles followed by integrating them using a 'link' beam or 'grade' beam at pavement level. The CIDH piles themselves would be drilled and installed to a tip elevation insuring that each pile is 'socketed' into relatively competent rock.

Station 102+00 to 102+60 – Segmented Pile Wall

Construct a segmented pile wall consisting of closely spaced Cast-In-Drilled-Hole (CIDH) piles. The recommended wall limits are shown on Figures 2 and 3. The design of a segmented pile retaining system is similar to the design of an excavation support wall that is considered flexible. The pattern used is a single row of tangentially spaced CIDH piles. The cross-section design of this system consists of designing vertical members (H-

piles, etc.) to resist bending moment, shear stress, and deflection along the vertical direction of the wall. The spacing of the piles is such that no lagging is needed between the piles, and the earth pressure is resisted by the arching capability of the soil. Some space between the piles, however, is necessary to maintain drainage and avoid build-up of hydrostatic pressure behind the tangent piles. The design height of the wall is dependent on the existing slope topography and the anticipated height of potentially unstable material in front of the wall.

These walls should be designed using the following criteria:

1. Assume a design height of 5.0 m.
2. For lateral loads against the wall, use the following soil parameters (internal friction angle, $\phi = 35°$, cohesion, c = 0 kPa, and a soil total unit weight, $\Upsilon = 19.6$ kN/m^3).
3. Add to the active pressure a uniform load of 11.5 kN/m^2 to a depth of 3.0 m below the top of the wall for traffic surcharge.
4. Calculate passive pressure against the piles using the log spiral method with a friction angle of 34°, cohesion, c = 28.7 kPa, and a unit weight (γ) of 23.1 kN/m^3. For design purposes, use a minimum bench width of 7 m at the base of the retaining wall, followed by a 1:1 slope.
5. Because of the potential for high ground acceleration, the seismic stability of the wall should be checked.
6. The pile diameter should be a minimum of 610 mm with a clear spacing between each pile of no more than 2.5 times the pile diameter. The minimum length of each segmented pile should be 9.1-m long. The minimum tip elevation for each pile should be 43.61 m.
7. Construct a continuous pile cap for the wall. The pile cap should extend to a minimum depth of 1 m below the existing finished grade.

Please refer to the Typical Cross-Section for Segmented Pile Wall, Figure 4.

CONSTRUCTION CONSIDERATIONS AND REQUIREMENTS

It is possible that the Contractor may experience moderate to difficult drilling through the weathered Midigo Basalt. Casing should be considered to minimize the possibility of constructing cold joints or other pile discontinuities. Groundwater may be encountered. The installation of the Segmented Pile Wall may require drilling and placing concrete in wet conditions. If dewatering is not desirable, specifications should require the

displacement of water via a closed system using concrete pumps or a tremie tube to place concrete at the bottom of the hole for either retaining system. A positive head should be maintained at all times to reduce potential segregation of concrete.

In addition to wet conditions, running sands and gravels may be encountered during drilling and construction of the CIDH piles. Casing should be considered to minimize the possibility of construction cold joints or other pile discontinuities.

Because of the close spacing of the CIDH piles for the segmented pile wall, proper vertical control is essential when drilling the CIDH. The measured vertical alignment of the CIDH shall not deviate in any direction more than one percent from vertical anywhere along the measured length. Construct each row of the CIDH in two stages. First, construct the odd-numbered piles of each row. Second, construct the even-numbered piles of each row. This information should be included in the Contract Special Provisions.

In general, the installation of the CIDH piles should be performed in accordance with Section 49-4 of the Standard Specifications.

Any recommendation that the Designer wishes to change should be discussed with our unit prior to implementation.

CORROSION

A corrosion study was performed in April 2000 for a CIDH earth retaining system project located at Post Mile 10.2. The results are presented in Table 2 for the Designer. Please contact Caltrans' Corrosion Technology Branch for protection measures of this project.

TABLE 2: Corrosion Study

Boring ID	Sample Type	Sample Depth (m)	pH	Resistivity (ohm-cm)
B-1	Soil	1.5	8.3	1386
B-1	Soil	4.6	8.1	1584
B-2	Soil	1.5	7.8	1188
B-2	Soil	4.6	8.3	960
-	Water	Surface Water	8.1	3310

If you have any questions, please contact me at (510) 622-8742 or Wajahat Nyaz at (510) 622-1777.

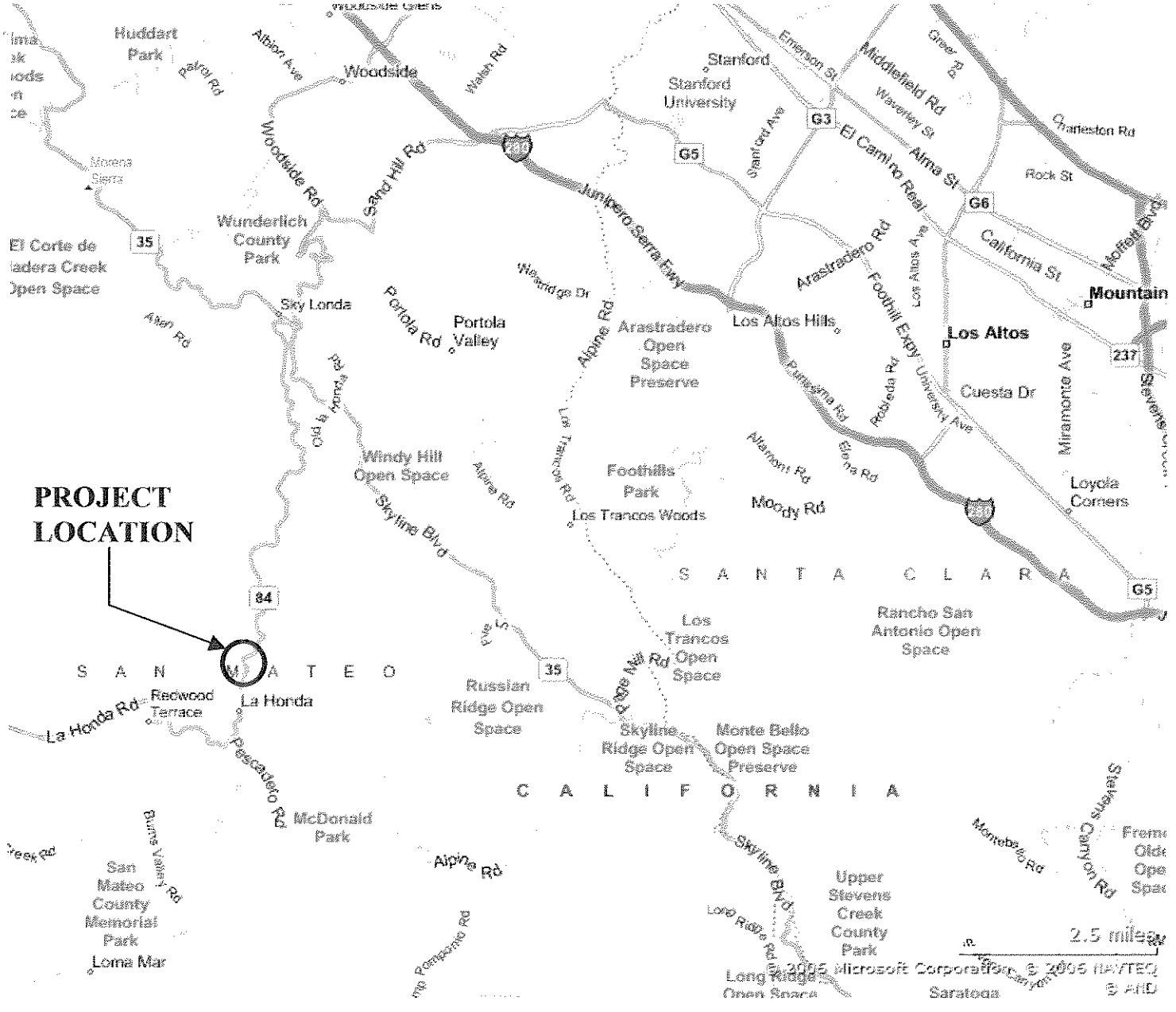
Attachments:

Figures:
Figure 1 – Location Map
Figure 2 – Approximate Limits of the Landslide adjacent to the Roadway Map
Figure 3 – Storm Damage Repair Boring Layout Map
Figure 4 – Storm Damage Repair Typical Cross-section for Segmented Pile Wall

Appendix A:
Boring Logs
Laboratory Tests

c: WNyaz, TJPokrywka, Daily File, Route File

JMoore/mm



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Geotechnical Services
Division of Engineering Services

STORM DAMAGE REPAIR

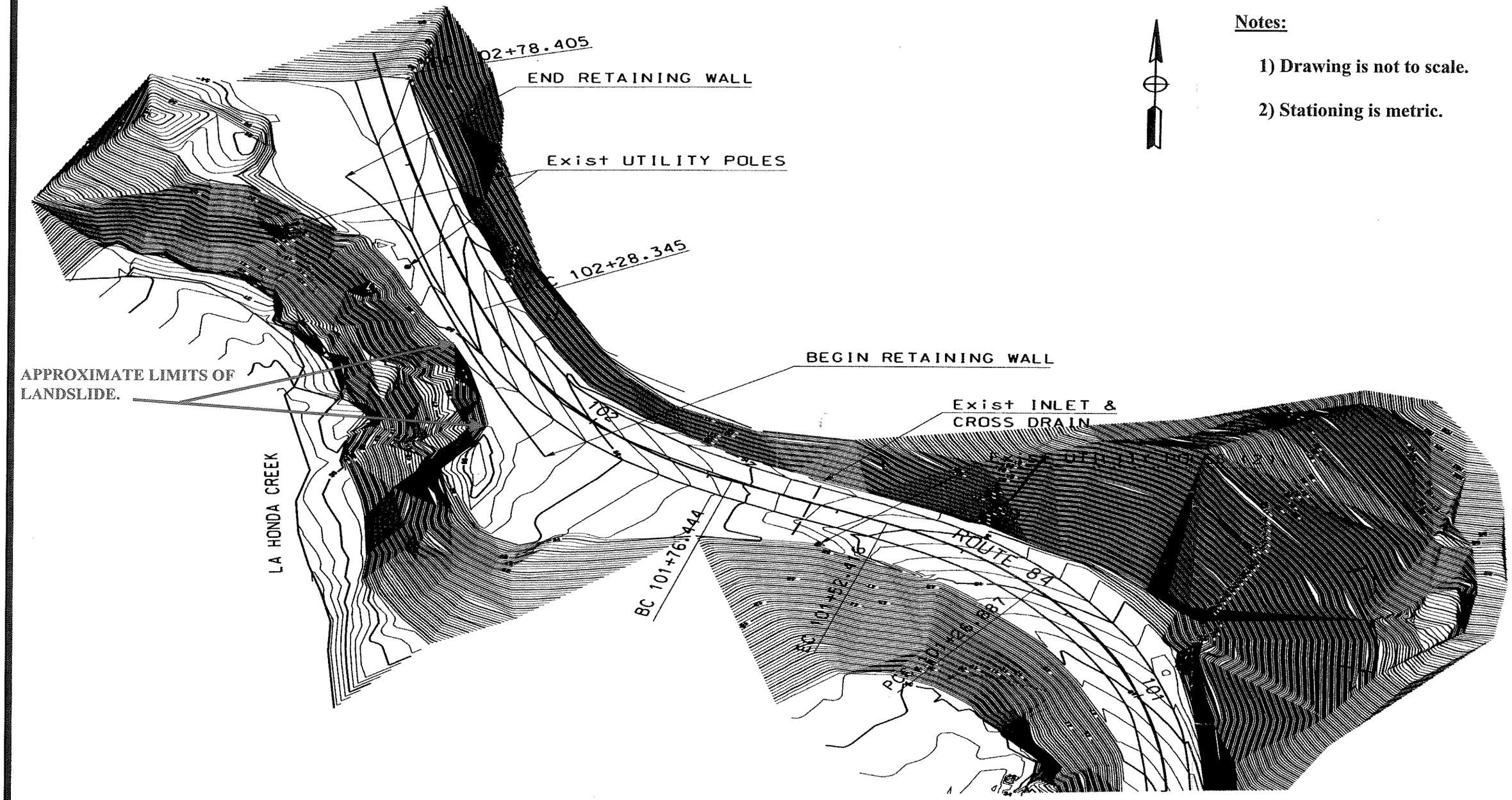
LOCATION MAP

FIGURE 1

04-SM-84, PM 9.85

04-3S8201

JULY 2007



Notes:

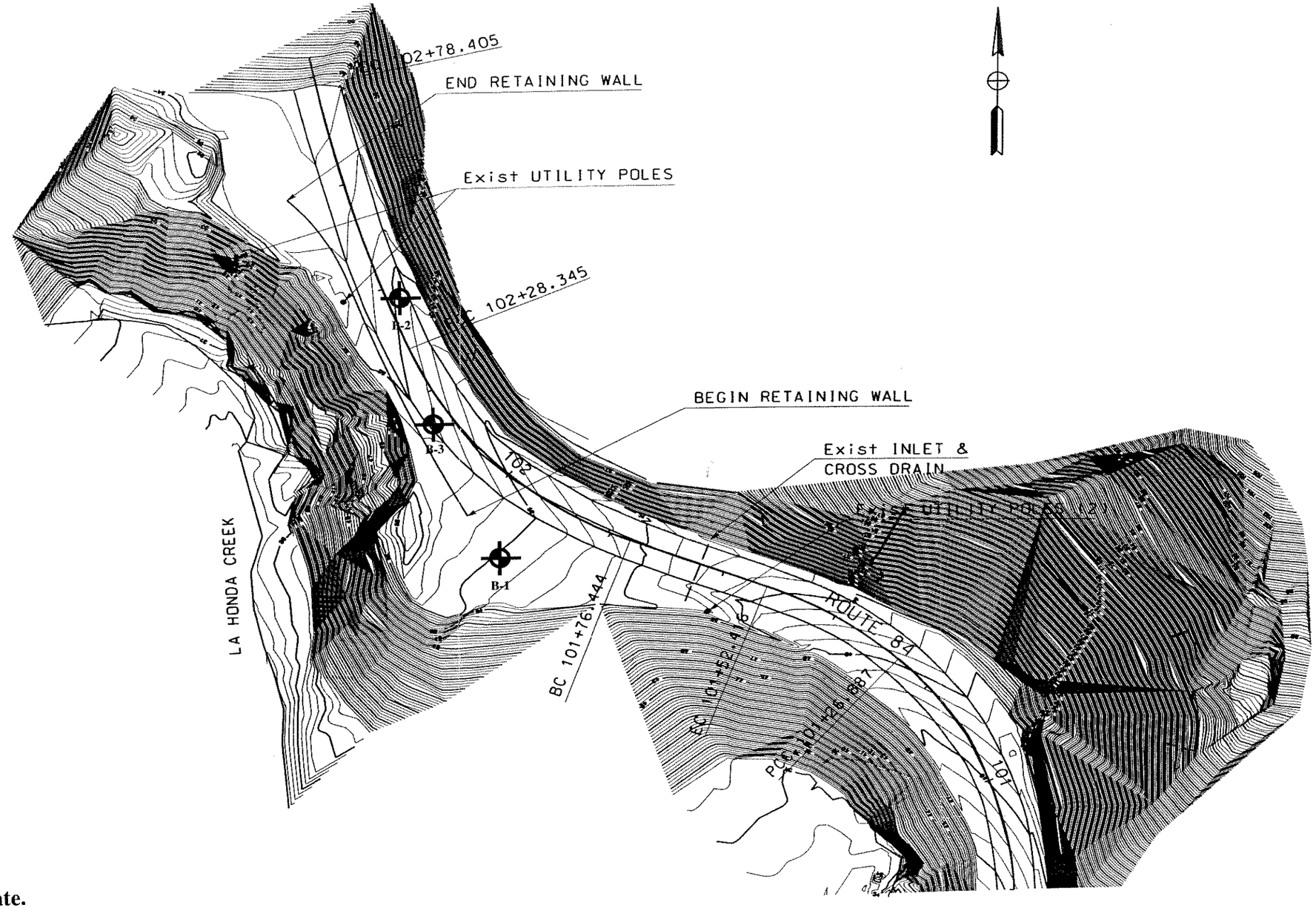
1) Drawing is not to scale.

2) Stationing is metric.

Office of Geotechnical Design – West **Geotechnical Services** **Division of Engineering Services**	**APPROXIMATE LIMITS OF LANDSLIDE ADJACENT TO THE ROADWAY MAP**	**04 – SM – 84, PM 9.85** **EA 04 – 3S8201** **JULY 2007** **FIGURE 2**

LEGEND:

- Borings performed in 2006.
B-1



Notes:

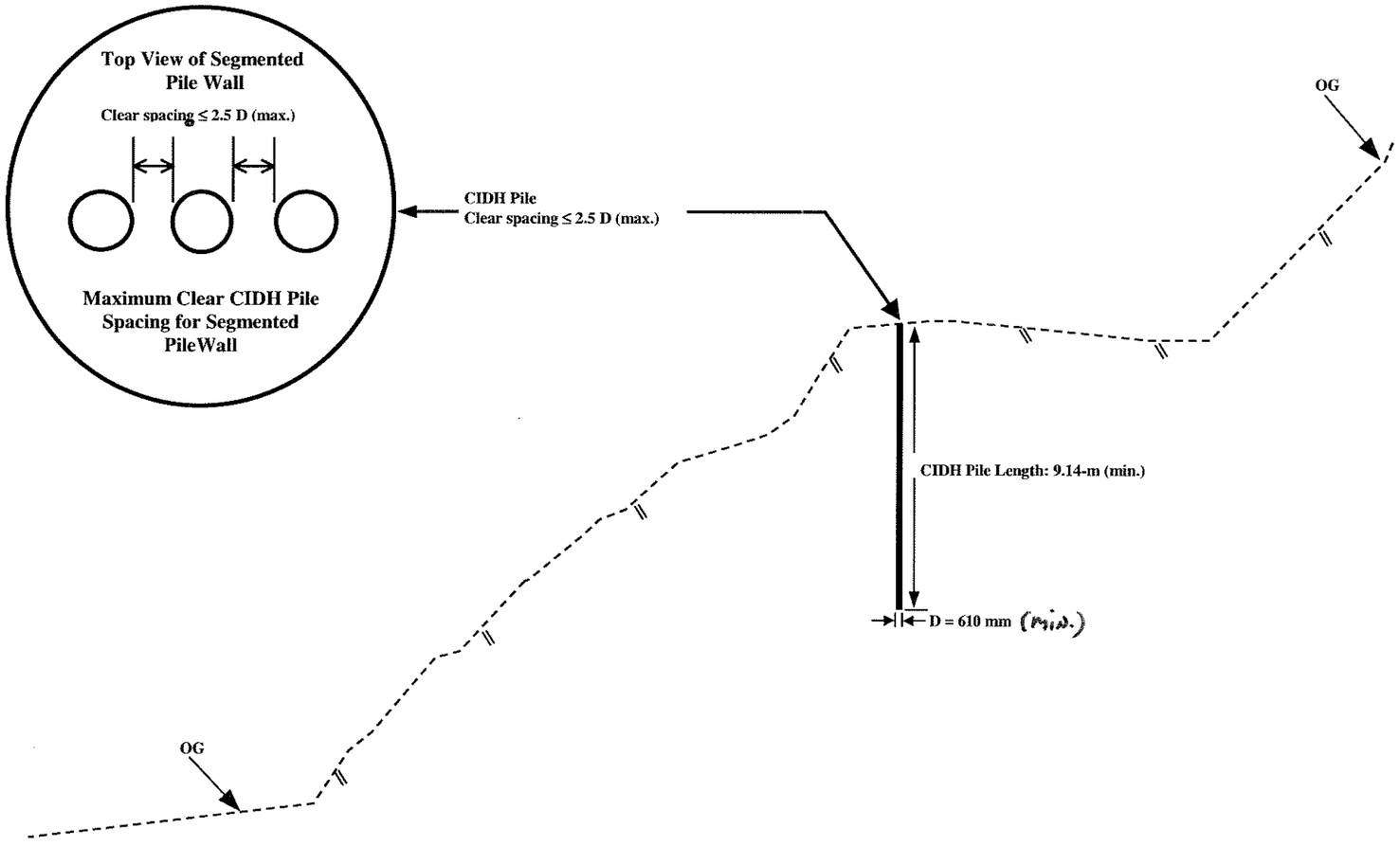
1) Drawing is not to scale.

2) Stationing is metric.

3) Boring Locations are approximate.

Office of Geotechnical Design – West Geotechnical Services Division of Engineering Services	STORM DAMAGE REPAIR BORING LAYOUT MAP	04 – SM – 84, PM 9.85 EA 04 – 3S8201 JULY 2007 FIGURE 3

Note: Drawing is not to scale.



Office of Geotechnical Design – West **Geotechnical Services** **Division of Engineering Services**	STORM DAMAGE REPAIR TYPICAL CROSS-SECTION FOR SEGMENTED PILE WALL	**04 – SM – 84, PM 9.85**	**EA 04 – 3S8201**
		JULY 2007	**FIGURE 4**

APPENDIX A

Caltrans

EXPLORATION BORING FIELD LOG

Date 12/12/06 Boring No. B-1

Location HWY 84, PM 9.9, SAN MATEO County | Lab No. | EA No. 358201 | Page 1 of

Dist. 04 Co. SM Rt. 84 P.M. 9.9 Br. No. | Purpose of Work GEOTECHNICAL

Ft., Rt. Lt. | Line. Sta. | Northings. 37°19'49.79" | Eastings. -122°16'12.72" | Elev. ≈520'

Ground Water Data	Date / Time	Water Level	Bot. of Boring
	11/30/07	39'5"	95'

Logged By : J. MOORE | Drill Crew : WILSON, PEARSON, OREY

Drill rig : CS2000 | Hammer Type and Weight : TRIP, 130 #s dropped 30"

Drilling Method : PUNCH CORE | Casing :

Hole Completion :

Depth	Sample Interval Tool	Blows / RQD	Sample I.D.	% Rec.	Strength	Graphic Log	Description	Remarks
1						SC	CLAYEY ~~GRAVEL~~ SAND with ~~SAND~~ GRAVEL, soft gray,	Baggie Sample
2								
3								
4								
5								
6	SP	9				GP-GC	Poorly graded GRAVEL with clay and sand, dense, gray, moist, gravel grades fine	Baggie Sample
7	T	12 23	(35)					
8								
9							Increasing Rock content	
10								
11	SP	20 30				Rx	Decomposed Rock, Black, very soft to soft, moist.	Switched to coring. Samples stuck in barrel
12	T	34					(As a soil, very dense)	
13	1						(Argillite?) Fracture zone, RQD = 0.	27" recovered
14	2						SAME, intact pieces becoming larger and more frequently.	24" Recovered
15								
16	SP	10 11				Rx		(SHALE?)
17	T	22					SAME, (as a soil, dense)	
18	3							26" Recovered
19	4					Rx	Same, very low recovery, clay matrix (argillite?) washed out. Intensely wx, soft to moderately soft	4" Recovered to 8"
20								

Caltrans EXPLORATION BORING FIELD LOG

Date | Boring No.

Location HWY 84, PM 9.9, SAN MATEO County | Loc No. | EA No. 358201 | Page ___ of ___

Dist. 04 Co. SM Rt. 84 P.M. 9.9 Br. No. | Purpose of Work GEOTECHNICAL

___ Ft., Rt. / Lt. ___ Line, Sta. ___ Northings. 37°19'49.79" Eastings. -122°16'12.72" Elev. 2520'

Ground Water Data: Date/Time | Water Level | Bot. of Boring

Logged By : J. MOORE | Drill Crew : WELSON PEARSON OREY

Drill rig : CS2000 | Hammer Type and Weight : TRIP, 130 lbs dropped 30"

Drilling Method : PUNCH CORE | Casing :

Hole Completion :

Depth	Sample Interval	Tool	Blows/ROD	Sample I.D.	% Rec.	Strength	Graphic Log	Description	Remarks
20						RX		Rock, green, intensely WX, moderately soft, very intensely fractured to fractured	SHALE in an argillite matrix?
21									
22	5								12" recovered.
23									RQD = 0 to 5%
24									
20	5/1		28			R+			
24			50 = 5"						
22									
23	6								
24									
25									
25	5/1		39			R+		SAME	
26			50 = 2½"						
27								SAME	Changed to SHARKY bit (more aggressive) 12/13/00
28	7								
29									Bottom Return.
30	8					R+		SAME	
31									
34								SAME, intensely to moderately fractured	
32	9								60" Recovered
33						R+			RQD = 38" = 63 / 60"
34									
35									

Caltrans | EXPLORATION BORING FIELD LOG | Date | Boring No.

Location HWY 84, PM 9.9, SAN MATEO County | Lab No. | FA No. 358201 | Page of

Dist. 04 Co. SM Rt. 84 P.M. 9.9 Br. No. | Purpose of Work GEOTECHNICAL

Rt. Ft., Lt. Line, Sta. | Northings. 37°19'49.79" | Eastings. -122°16'12.72" | Elev. 2520'

Ground Water Data: Date/Time | Water Level | Bot. of Boring

Logged By: J. MOORE | Drill Crew: WELSON PEARSON OREY

Drill rig: CS2000 | Hammer Type and Weight: TRIP, 130 lbs dropped 30"

Drilling Method: PUNCH CORE | Casing:

Hole Completion:

Depth	Sample Interval	Tool	Blows	RQD	Sample I.D.	% Rec.	Strength	Graphic Log	Description	Remarks
36								RX	SAME,	60" Recovered
42										
47	10									RQD = 35 / 60 = 58
48										
54										
60										
46								RX	SAME, increasing fractures, and weathering.	30" Recovered
42	11									RQD = 4" / 36" = 11
48										
44								RX	SAME, decreasing fractures, moderately weathered to slightly weathered, moderately hard to hard.	24" Recovered
40	12									RQD = 22" / 24" = ?
46									SAME moderately to slightly fractured, moderately to slightly weathered, moderately hard to hard	60" Recovered
47	13									RQD = 40" / 60" = 66
48										
49										
50										
51									SAME,	60" Recovered
52	14									RQD = 46" / 60" = 77
53										
54									COLOR CHANGES FROM GREEN to GRAY/BLACK.	
55										

Caltrans | EXPLORATION BORING FIELD LOG | Date | Boring No.

Location HWY 84, PM 9.9, SAN MATEO County | Loc No. | FA No. 358201 | Page of

Dist. 04 Co. SM Rt. 84 P.M. 9.9 Br. No. | Purpose of Work GEOTECHNICAL

Ft.. Rt./Lt. Line. Sta. Northings. 37°19'49.79" Eastings. -122°16'12.72" Elev. 2520'

Ground Water Data: Date/Time | Water Level | Bot. of Boring

Logged By : J. MOORE | Drill Crew : NELSON, PEARSON, OREY

Drill rig : CS2000 | Hammer Type and Weight : TRIP, 130 lbs dropped 30"

Drilling Method : PUNCH CORE | Casing :

Hole Completion :

Depth	Sample Interval	Tool	Blows	RQD	Sample I.D.	% Rec.	Strength	Graphic Log	Description	Remarks
55								RX	SAME, increasing weathering and fractures.	60" Recovered.
56										
57	15									RQD = 40" / 60" = 66
58										
59										
60										
61								RX	SAME	Started Losing WATER?
62										60" Recovered
63	16									RQD = 36" / 60" = 60
64										
65										
66								RX	SAME very intensely fractured, very soft to soft,	42" Recovered
67	17									
68										RQD = 11" / 42" = 26
69										
70	18							RX	SAME, moderately weathered, moderately hard.	14" recovered
										RQD = 14" / 18" = 78
71								RX	SAME	
72	19									60" Recovered
73										RQD = 44" / 60" = 73
74										
75										

Caltrans

EXPLORATION BORING FIELD LOG

Date | Boring No.

Location HWY 84, PM 9.9, SAN MATEO County | Lab No. | EA No. 358201 | Page of

Dist. 04 Co. SM Rt. 84 P.M. 9.9 Br. No. | Purpose of Work GEOTECHNICAL

Ft. Rt. Lt. | Line. Sta. | Northings. 37°19'49.79" | Eastings. -122°16'12.72" | Elev. ≈520'

Ground Water Data

Date / Time	Water Level	Bot. of Boring

Logged By : J. MOORE | Drill Crew : WILSON PEARSON OREY

Drill rig : CS2000 | Hammer Type and Weight : TRIP, 130 #s dropped 30"

Drilling Method : PUNCH CORE | Casing :

Hole Completion :

Depth	Sample Interval Tool	Blows RQD	Sample I.D.	% Rec.	Strength	Graphic Log	Description	Remarks
75						Rx	SAME,	
76								54" Recovered
77								RQD = 47"/60" = 78
78	20							
79								
80						Rx	SAME	Lost core, will retrieve on 12/14/06 morning
81								
82								
83	21							43½" Recovered
84								RQD = 43½/60" = 73
85						Rx	SAME	60" Recovered
86								
87								
88	22							RQD = 38"/60" = 63
89								
90						Rx	SAME	60" Recovered
91								
92	23							RQD = 53"/60" = 88
93								
94								
95							END OF BORING	

////

Caltrans | EXPLORATION BORING FIELD LOG

Location HWY 84, PM 9.9, SAN MATEO County | Date 1/30/07 | Boring No. B-2

Lab No. | EA No. 358201 | Page 1 of

Dist. 04 Co. SM Rt. 84 P.M. 9.9 Br. No. | Purpose of Work GEOTECHNICAL

Ft. Rt. Lt. Line. Sta. | Northings. 37°19'49.79" | Eastings. -122°16'12.72" | Elev. ≈520'

Ground Water Data: Date / Time | Water Level | Bot. of Boring

Logged By : J. MOORE | Drill Crew : ~~WILSON PEARSON OREY~~

Drill rig : CS2000 | Hammer Type and Weight : TRIP, 130 #s dropped 30"

Drilling Method : ~~PUNCH~~ CORE | Casing :

Hole Completion :

Depth	Sample Interval Tool	Blows / RQD	Sample I.D.	% Rec.	Strength	Graphic Log	Description	Remarks
1						AC	Asphalt - EASTBOUND LANE	
2	1					CL	CLAY with GRAVEL and SAND, ~~[illegible]~~ stiff, moist, gray	
3						SC	CLAYEY SAND with gravel dense, moist, light brown.	
4								
5	5 P 1	18 25 46						
6								
7						Rt	Mudego Basalt, gray, intensely to moderately weathered moderately hard, moderately to slightly fractured.	Core recovery = 48"/60" = 80
8	2							
9							With calcite	RQD = 37"/48" = 77
10								
11						Rt	SAME	Core Recovery = 60"/60"
12							With calcite	RQD = 49"/60" = 81
13	3							
14								
15								
16						Rt	SAME	Core Recovery = 60"/60"
17	4						Moderately fractured with increasing calcite	
18								RQD = 36"/60" = 60
19								
20								

Caltrans | EXPLORATION BORING FIELD LOG | Date | Boring No.

Location HWY 84 PM 9.9, SAN MATEO COUNTY | Lab No. | EA No. 358201 | Page of

Dist. 04 Co. SM Rt. 84 P.M. 9.9 Br. No. | Purpose of Work GEOTECHNICAL

Ft. Rt. Lt. Line. Sta. Northings. 37°19'49.79" Eastings. -122°16'12.72" Elev. 2520'

Ground Water Data: Date / Time | Water Level | Bot. of Boring

Logged By : J. MOORE | Drill Crew : WILSON, PEARSON, OREY

Drill rig : CS2000 | Hammer Type and Weight : TRIP, 130 LBS dropped 30"

Drilling Method : PUNCH CORE | Casing :

Hole Completion :

Depth	Sample Interval	Tool	Blows	RQD	Sample I.D.	% Rec.	Strength	Graphic Log	Description	Remarks
20										
21								Rx	SAME	Core Recovery = 53" / 60"
22										
23	5									RQD = 24" / 60" = 57
24										
25										
26								Rx	SAME	Core Recovery = 60" / 60"
27										
28	6									RQD = 42" / 60" = 70
29										
30										
31								Rx	SAME, Slightly fractured	Core Recovery = 60" / 60"
32										
33	9									RQD = 38" / 60" = 63
34										
35										
36								Rx	SAME	Core Recovery = 42" / 42"
37	8									
38										RQD = 38" / 42" = 91
39										Ended for the day. 1400
40	9							Lr	SAME	Started @ 0900 11/31/07
										Completed five foot run.

Caltrans | EXPLORATION BORING FIELD LOG | Date | Boring No.

Location: HWY 84, PM 9.9, SAN MATEO COUNTY | Lab No. | EA No. 358201 | Page ___ of ___

Dist. 04 Co. SM Rt. 84 P.M. 9.9 Br. No. | Purpose of Work: GEOTECHNICAL

Ft.. Rt./Lt. Line. Sta. Northings: 37°19'49.79" Eastings: -122°16'12.72" Elev.: 2520'

Ground Water Data: Date/Time | Water Level | Bot. of Boring

Logged By: J. MOORE | Drill Crew: WELSON, PEARSON, OREY

Drill rig: CS2000 | Hammer Type and Weight: TRIP, 130 #'s dropped 30"

Drilling Method: PUNCH CORE | Casing:

Hole Completion:

Depth	Sample Interval	Tool	Blows/RQD	Sample I.D.	% Rec.	Strength	Graphic Log	Description	Remarks
41							R+	SAME, VERY INTENSELY WEATHERED, SOFT, FRACTURE ZONE.	CORE RECOVERY = 53" / 60"
42									
43	10								RQD = 10" / 60" = 17
44									
45									
46							R+	SAME, INTENSELY TO MODERATELY WEATHERED, MODERATELY HARD	CORE RECOVERY = 34" / 36"
47	11								RQD = 20" / 36" = 55
48									
49	12						R+	SAME, MODERATELY WEATHERED, MODERATELY HARD.	CORE RECOVERY = 20" / 24"
50									RQD = 8" / 24" = 33
51							R+	SAME,	CORE RECOVERY = 60" / 60"
52	13								RQD = 40" / 60" = 66
53									
54									
55									
56							R+	SAME, MODERATELY TO SLIGHTLY WEATHERED, MODERATELY HARD	CORE RECOVERY = 60" / 60"
57	14								
58									RQD = 48" / 60 = 80
59									
60									

Caltrans

EXPLORATION BORING FIELD LOG

Location: HWY 84, PM 9.9, SAN MATEO COUNTY | Date | Boring No.

Dist. 04 Co. SM Rt. 84 P.M. 9.9 Br. No. | Lab No. | EA No. 358201 | Page of

Ft., Rt./Lt. Line. Sta. Northings. 37°9'49.79" Eastings. -122°16'12.72" Elev. 2520'

Purpose of Work: GEOTECHNICAL

Ground Water Data: Date/Time | Water Level | Bot. of Boring

Logged By: J. MOORE | Drill Crew: WELSON, PEARSON, OREY

Drill rig: CS2000 | Hammer Type and Weight: TRIP, 130 lbs dropped 30"

Drilling Method: PUNCH CORE | Casing:

Hole Completion:

Depth	Sample # / Interval / Tool / Blows	RQD	Sample I.D.	% Rec.	Strength	Graphic Log	Description	Remarks
60								
61					Rx		SAME,	CORE RECOVERY = 60" / 60"
62	15							
63								RQD = 38.5" / 60" = 64
64								
65								
66					Rx		SAME	CORE RECOVERY = 60" / 60"
67								RQD = 24" / 60" = 35
68	16							
69								
70								
71					Rx		SAME	CORE RECOVERY = 59" / 60"
72								
73	17							RQD = 35" / 60" = 58
74								
75								Ended drilling for the day @ 1430 1/31/07
76					Cx		SAME,	
77							fracture zone, some sand,	STARTED @ 0900 2/1/07
2	18						EOD of fracture zone.	CR = 29" / 48", RQD = 20" / 48" = 42
7								
2	19				Rx			~~CR = 24" / 48"~~ ~~RQD = 20"~~

Page 8

Caltrans | EXPLORATION BORING FIELD LOG | Date | Boring No.

Location: HWY 84, PM 9.9, SAN MATEO County | Lab No. | EA No. 358201 | Page of

Dist. 04 Co. SM Rt. 84 P.M. 9.9 Br. No. | Purpose of Work GEOTECHNICAL

Ft. Rt. Lt. Line. Sta. | Northings. 37°19'49.79" | Eastings. -122°16'12.72" | Elev. 2520'

Ground Water Data: Date / Time | Water Level | Bot. of Boring

Logged By: J. MOORE | Drill Crew: WELSON PEARSON OREY

Drill rig: CS2000 | Hammer Type and Weight: TRIP, 130 #S dropped 30"

Drilling Method: PUNCH CORE | Casing:

Hole Completion:

Depth	Sample Interval	Tool	Blows	RQD	Sample I.D.	% Rec.	Strength	Graphic Log	Description	Remarks
80							RX		SAME, moderately to slightly weathered, hard.	C.R. = 40"/42"
81	19									RQD = 33"/42" = .79
82										
83							RX		SAME,	C.R. = 32"/36"
84	20									RQD = 32"/36" = .89
85										
86							R		SAME,	C.R. = 60"/60"
87	21									RQD = 47"/60" = .78
88										
89										
90										
91							RX		SAME,	C.R. = 58"/60"
92	22									RQD = 58"/60" = .97
93										
94										
95										
96							R		SAME,	C.R. = 60"/60"
97	23									RQD = 60"/60" = 100
98										
99										
100									END OF CORE	

Caltrans

EXPLORATION BORING FIELD LOG

Date 2/6/07 | Boring No. B-3

Location HWY 84, PM 9.9, SAN MATEO County | Lab No. | EA No. 358201 | Page 1 of

Dist. 04 Co. SM Rt. 84 P.M. 9.9 Br. No. | Purpose of Work GEOTECHNICAL

Ft. Rt. Lt. | Line. Sta. | Northings. 37°19'49.79" | Eastings. -122°16'12.72" | Elev. ≈520'

Ground Water Data: Date / Time | Water Level | Bot. of Boring

Logged By : J. MOORE | Drill Crew : ~~WILSON PEARSON OREY~~

Drill rig : CS2000 | Hammer Type and Weight : TRIP, 130 #s dropped 30"

Drilling Method : PUNCH CORE | Casing :

Hole Completion :

Depth	Sample Interval Tool	Blows / RQD	Sample I.D.	% Rec.	Strength	Graphic Log	Description			Remarks
						AC	Asphalt			
1						RB	Road Base			Core Recovery = 54"/60"
2						SC	Clayey Sand with gravel, soft, gray			RQD = 0.
3	1									Started 0900
4						Rt	Sandstone, light brown, very soft			
5						Rt	Decomposed Rock reddish-brown, very soft to soft			
6						Rt	SAME, Mindego Basalt? Decomposed.			Core Recovery = 43"/60"
7										
8	2									RQD = 0
9										
10										
11						Rt	SAME			Core Recovery = 45"/60"
12	3					ML	Silt, gray, moist, soft, low plasticity			RQD = 0.
13							(Siltstone?)			
14							Siltstone, gray, decomposed, very soft			
15										
16						Rt	Mindego Basalt, gray, intensely to moderately weathered, moderately hard			Core Recovery = 57"/60"
17	4									
18										RQD = 57"/60" = 95
19										
20										

Caltrans

EXPLORATION BORING FIELD LOG

Date | Boring No.

Location: HWY 84, PM 9.9, SAN MATEO County | Lab No. | EA No. 358201 | Page ___ of ___

Dist. 04 Co. SM Rt. 84 P.M. 9.9 Br. No. | Purpose of Work: GEOTECHNICAL

Ft., Rt./Lt. Line. Sta. | Northings: 30°9'49.79" Eastings: -122°16'12.72" Elev.: 2520'

Ground Water Data: Date/Time | Water Level | Bot. of Boring

Logged By: J. MOORE | Drill Crew: NELSON PEARSON OREY

Drill rig: CS2000 | Hammer Type and Weight: TRIP, 130 lbs dropped 30"

Drilling Method: PUNCH CORE | Casing:

Hole Completion:

Depth	Sample Interval	Tool	Blows	RQD	Sample I.D.	% Rec.	Strength	Graphic Log	Description	Remarks
20									JAME,	Core Recovery = 60" / 60"
21										
22										
23	4									RQD = 39" / 60" = 65
24										
25									Bottom of Hole @ 25'	1200
26										
27										
28										
29										
30										
31										
32										
33										
34										
35										
36										
37										
38										
39										
40										

Caltrans

EXPLORATION BORING FIELD LOG

Date | Boring No.

Location: HWY 84, PM 9.9, SAN MATEO COUNTY | Lab No. | EA No. 358201 | Page ___ of ___

Dist. 04 Co. SM Rt. 84 P.M. 9.9 Br. No. | Purpose of Work: GEOTECHNICAL

___ Ft. Rt. / Lt. ___ Line. Sta. ___ Northings. 37°19'49.79" Eastings. -122°16'12.72" Elev. 2520'

Ground Water Data

Date	Time	Water Level	Bot. of Boring

Logged By: J. MOORE | Drill Crew: NELSON, PEARSON, OREY

Drill rig: CS2000 | Hammer Type and Weight: TRIP, 130 lbs dropped 30"

Drilling Method: PUNCH CORE | Casing:

Hole Completion:

Depth	Sample Interval	Tool	Blows / RQD	Sample I.D.	% Rec.	Strength	Graphic Log	Description			Remarks
40											
41											
42											
43											
44											
45											
46											
47											
48											
49											
50											
51											
52											
53											
54											
55											
56											
57											
58											
59											
60											

Caltrans

EXPLORATION BORING FIELD LOG

Date | Boring No.

Location HWY 84 PM 9.9 SAN MATEO County | Lab No. | EA No. 358201 | Page of

Dist. 04 Co. SM Rt. 84 P.M. 9.9 Br. No. | Purpose of Work GEOTECHNICAL

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Drilling Method : PUNCH CORE | Casing :

Hole Completion :

Depth	Sample Interval	Tool	Blows	RQD	Sample I.D.	% Rec.	Strength	Graphic Log	Description			Remarks
60												
61												
62												
63												
64												
65												
66												
67												
68												
69												
70												
71												
72												
73												
74												
75												
76												
77												
78												
79												
80												

Caltrans

EXPLORATION BORING FIELD LOG

Location: HWY 84, PM 9.9, SAN MATEO COUNTY | Lab No. | Date | Boring No.

Dist. 04 Co. SM Rt. 84 P.M. 9.9 Br. No. | EA No. 358201 | Page of

Ft. Rt. Lt. Line. Sta. | Purpose of Work: GEOTECHNICAL

Northings: 37°19'49.79" Eastings: 122°16'12.72" Elev. 2520'

Ground Water Data: Date / Time | Water Level | Bot. of Boring

Logged By: J. MOORE | Drill Crew: WELSON PEARSON OREY

Drill rig: CS2000 | Hammer Type and Weight: TRIP, 130 lbs dropped 30"

Drilling Method: PUNCH CORE | Casing:

Hole Completion:

Depth	Sample Interval	Tool	Blows	RQD	Sample I.D.	% Rec.	Strength	Graphic Log	Description			Remarks
81												
82												
83												
84												
85												
86												
87												
88												
89												
90												
91												
92												
93												
94												
95												
96												
97												
98												
99												
100												

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

Date: 5/3/2007

To: John Moore / GDW

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

RE: Laboratory Test Report -- EA: 04-3S8201

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

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
OFFICE OF GEOTECHNICAL SUPPORT
GEOTECHNICAL LABORATORY

UNCONFINED COMPRESSION TEST (ASTM D2938)

JOB LOCATION **04-SM-84 PM 9.85**

JOB NUMBER **04-3S8201 San Mateo County Rte 84**

DATE 5/1/2007
TEST BY MJS
CHECKED BY LP 5/3/07

SAMPLE NO.	DEPTH FT.	DIA. IN.	LENGTH IN.	L/D RATIO	WEIGHT LBS.	LOAD LBS.	DENSITY PCF	STRESS TSF	REMARKS
B-1-1 *	31 (9.5)	2.39	5.20	2.18	1.95	5615.8	144	90.1	1251 psc
B-1-2 *	43 (13)	2.40	4.80	2.00	1.94	8842.9	154	140.8	1956 T
B-1-3 **	51.0 (15.5)							**	
B-1-4 *	59-60 (18)	2.41	5.21	2.16	2.17	7771.5	158	122.7	1704
B-1-5 **	69-70 (21)							**	
B-2-1 **	13 (4)							**	
B-2-2 **	37 (11.3)							**	
B-2-3 *	48-49 (15)	2.38	4.83	2.03	1.75	5801.3	141	93.9	1304
B-2-4 *	57 (17.3)	2.37	5.22	2.20	1.92	7136.1	144	116.5	1618
B-2-5 *	92-93 (28)	2.38	5.21	2.19	1.93	11151.1	144	180.5	2509
B-3-1 *	19-20 (6)	2.34	5.15	2.20	1.89	4025.7	147	67.4	936 psi

* Test was done at the the concrete lab, no moistures recorded

** Sample fell apart while preparing for testing -- Not suitable for testing

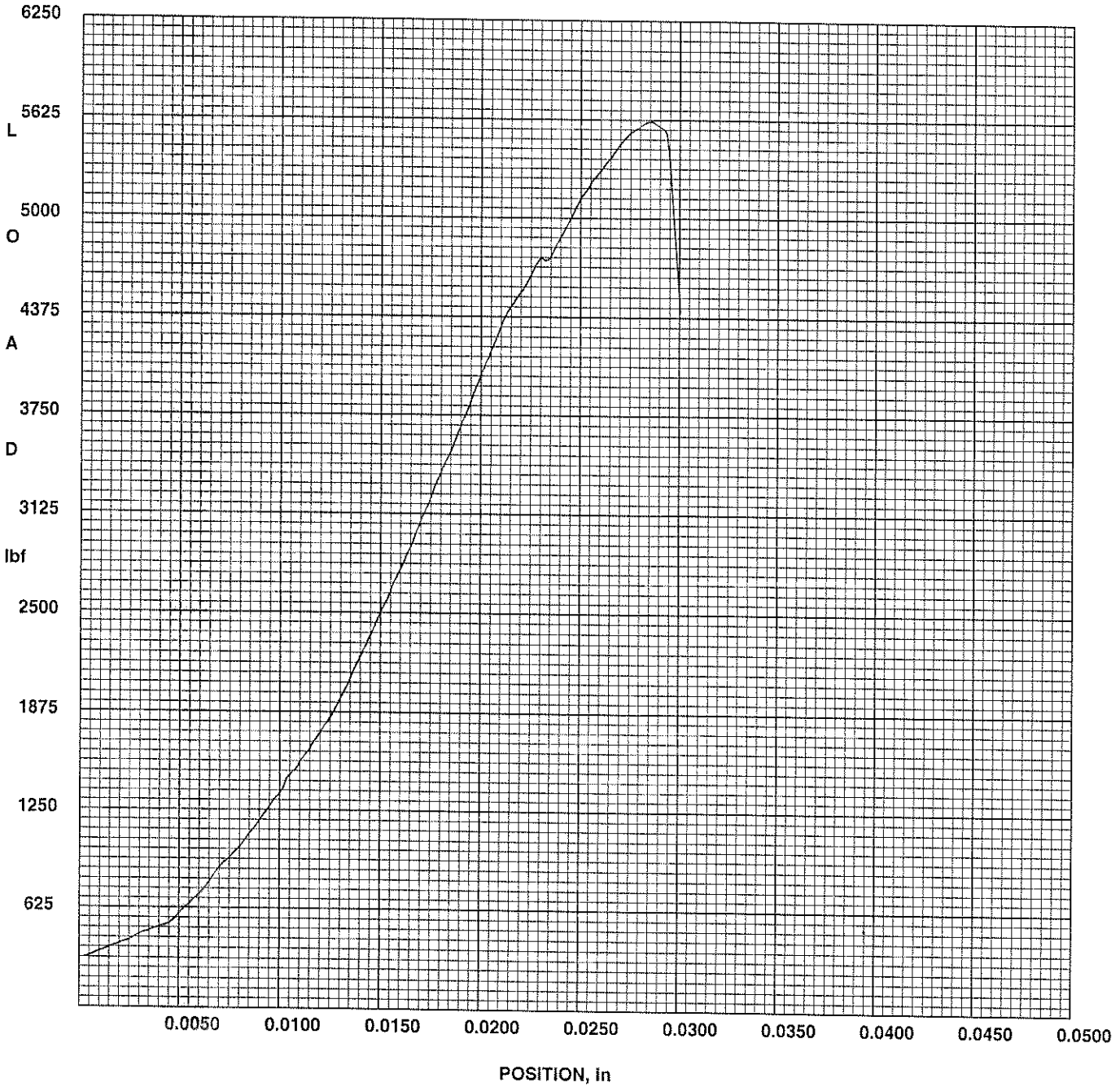
*** Sample received very dried out -- Test results may not represent the true soil conditions

**** The test specimen length/dimeter ratio was not in compliance with the test method

142.4 pcf 115.99 TSF

116 TSF / 1611.11 psi

= 232,000 psf = 11108.22 kPA



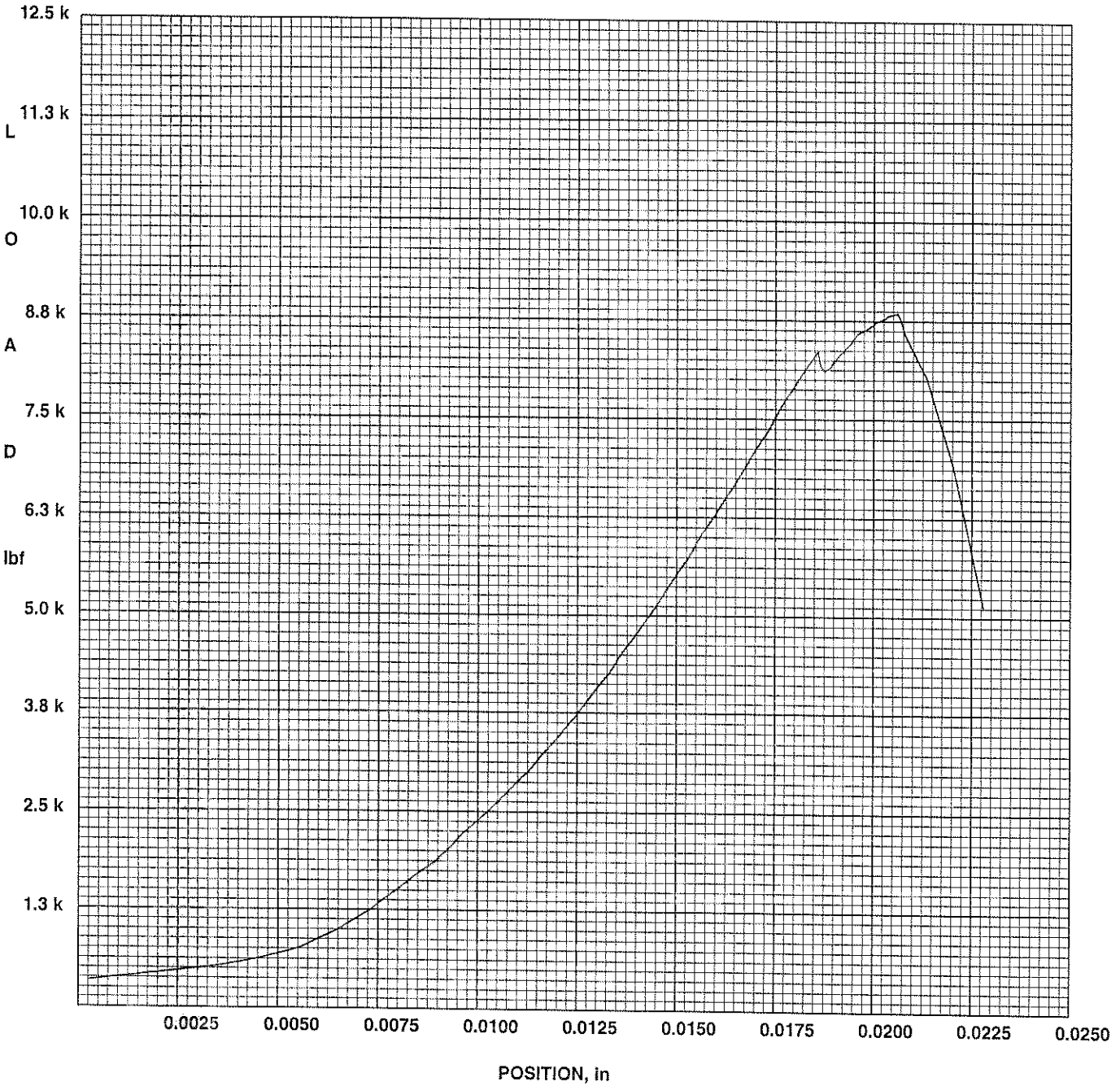
State of California
Department of Transportatio
Concrete and Structure Testi
Office of Rigid Pavement

Compression Test C-39

Contract Number	04-3S8201
TL101	N/A
Lab Number	

Sample No.:	B-1-1
Contract:	04-3S8201
TL101:	N/A
Lab:	Concrete
Specimen, in:	5.2000
Diameter, in:	2.3900
Area, in²:	4.49
Ultimate, lbf:	5615.76
Ultimate, psi:	1252
Ultimate, MPa:	8.63
Elapsed, sec:	35

May 2, 2007 1:40:13 PM
SN: 198661-R1 V7.01.08



State of California
Department of Transportatio
Concrete and Structure Testi
Office of Rigid Pavement

Compression Test C-39

Contract Number	04-3S8201
TL101	N/A
Lab Number	

Sample No.:	B-1-2
Contract:	04-3S8201
TL101:	N/A
Lab:	Concrete
Specimen, in:	4.8000
Diameter, in:	2.4000
Area, in²:	4.52
Ultimate, lbf:	8842.91
Ultimate, psi:	1955
Ultimate, MPa:	13.48
Elapsed, sec:	54.5

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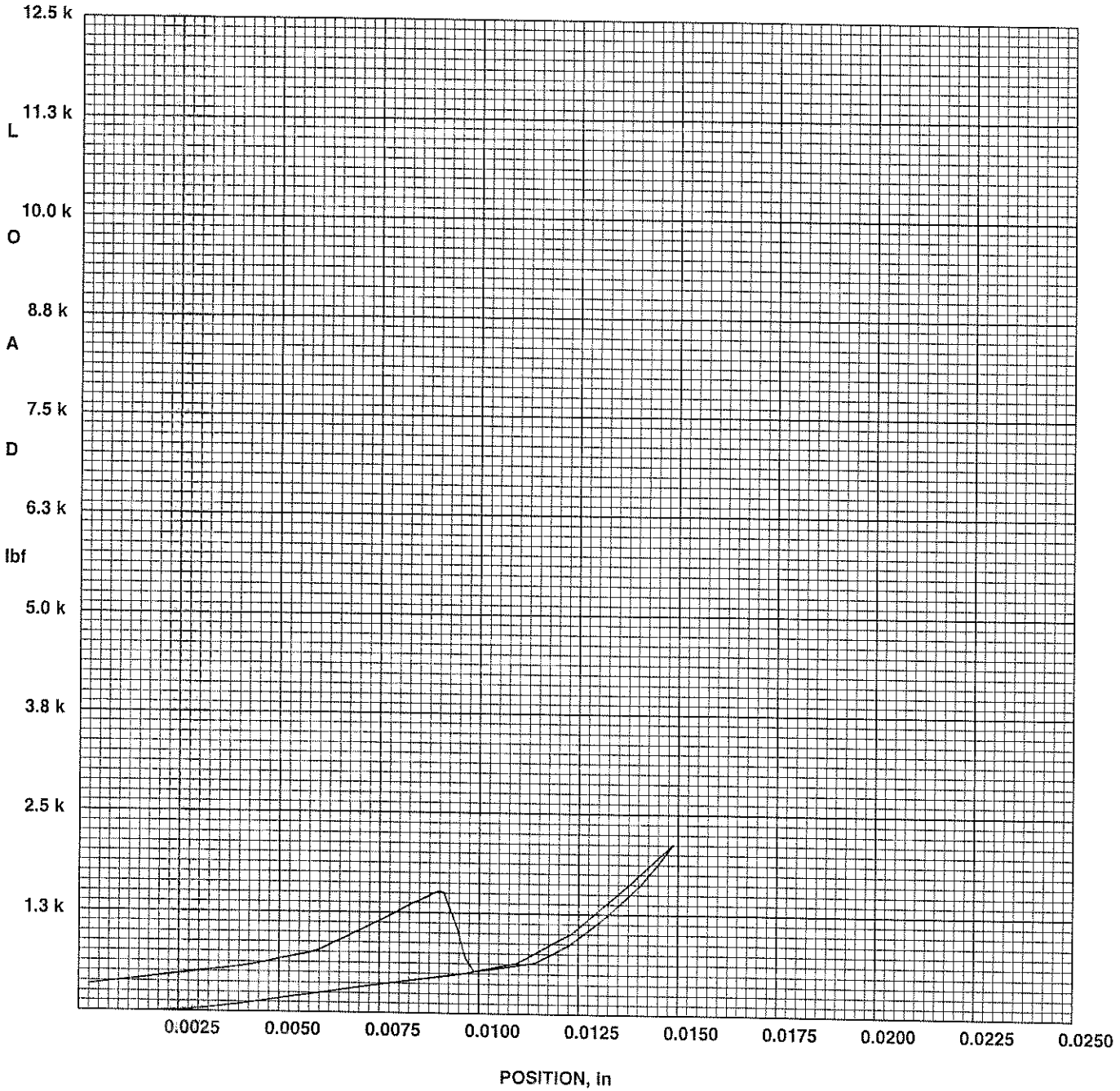

State of California
Department of Transportatio
Concrete and Structure Testi
Office of Rigid Pavement

Compression Test C-39

Contract Number	04-3S8201
TL101	N/A
Lab Number	

Sample No.:	B-1-4
Contract:	04-3S8201
TL101:	N/A
Lab:	Concrete
Specimen, in:	5.2100
Diameter, in:	2.4100
Area, in²:	4.56
Ultimate, lbf:	7771.51
Ultimate, psi:	1704
Ultimate, MPa:	11.75
Elapsed, sec:	59.2

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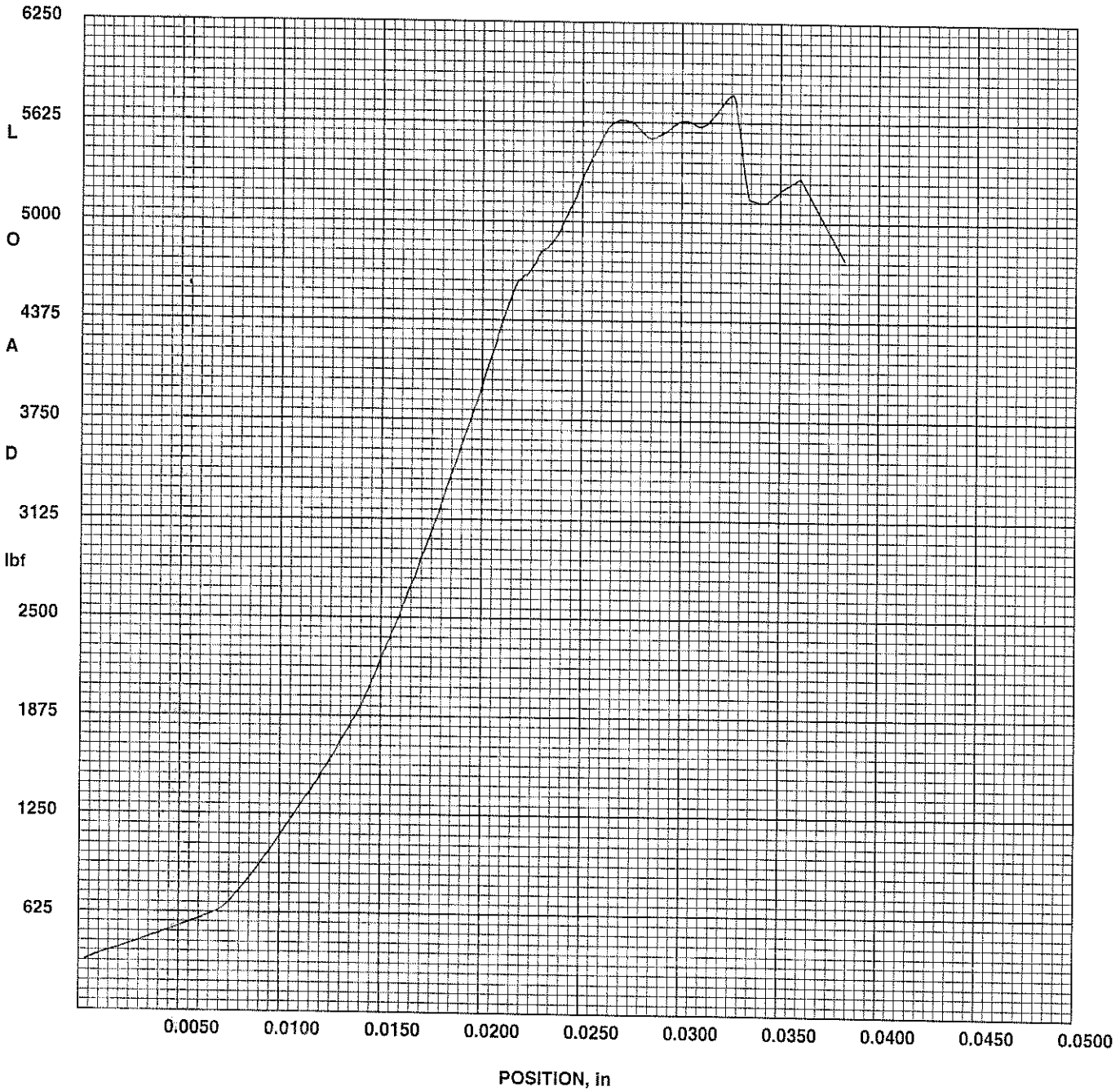

State of California
Department of Transportatio
Concrete and Structure Testi
Office of Rigid Pavement

Compression Test C-39

Contract Number	04-3S8201
TL101	N/A
Lab Number	

Sample No.:	B-2-3
Contract:	04-3S8201
TL101:	N/A
Lab:	Concrete
Specimen, in:	4.8300
Diameter, in:	2.3800
Area, in²:	4.45
Ultimate, lbf:	5801.28
Ultimate, psi:	1304
Ultimate, MPa:	8.99
Elapsed, sec:	37.9

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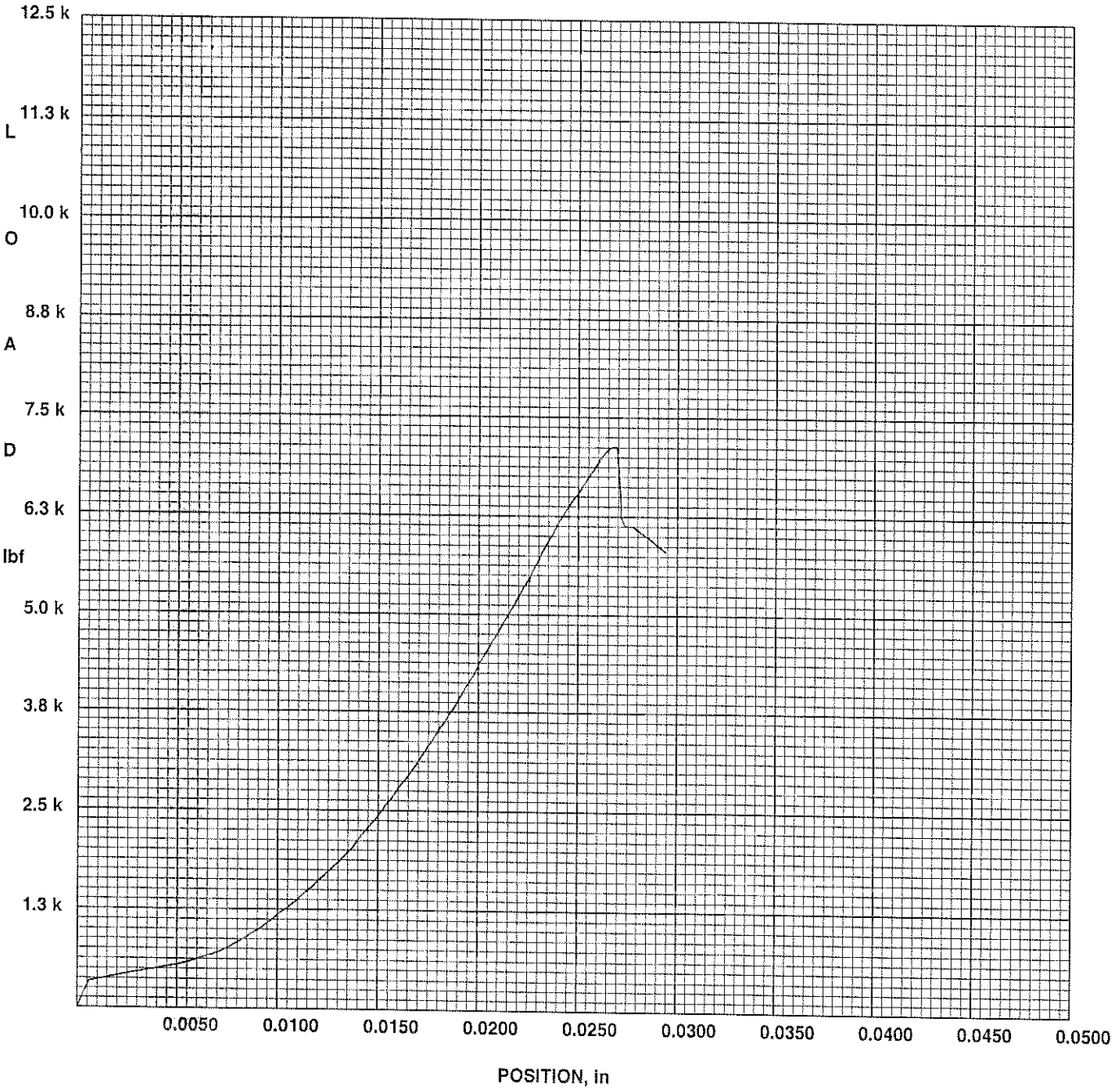


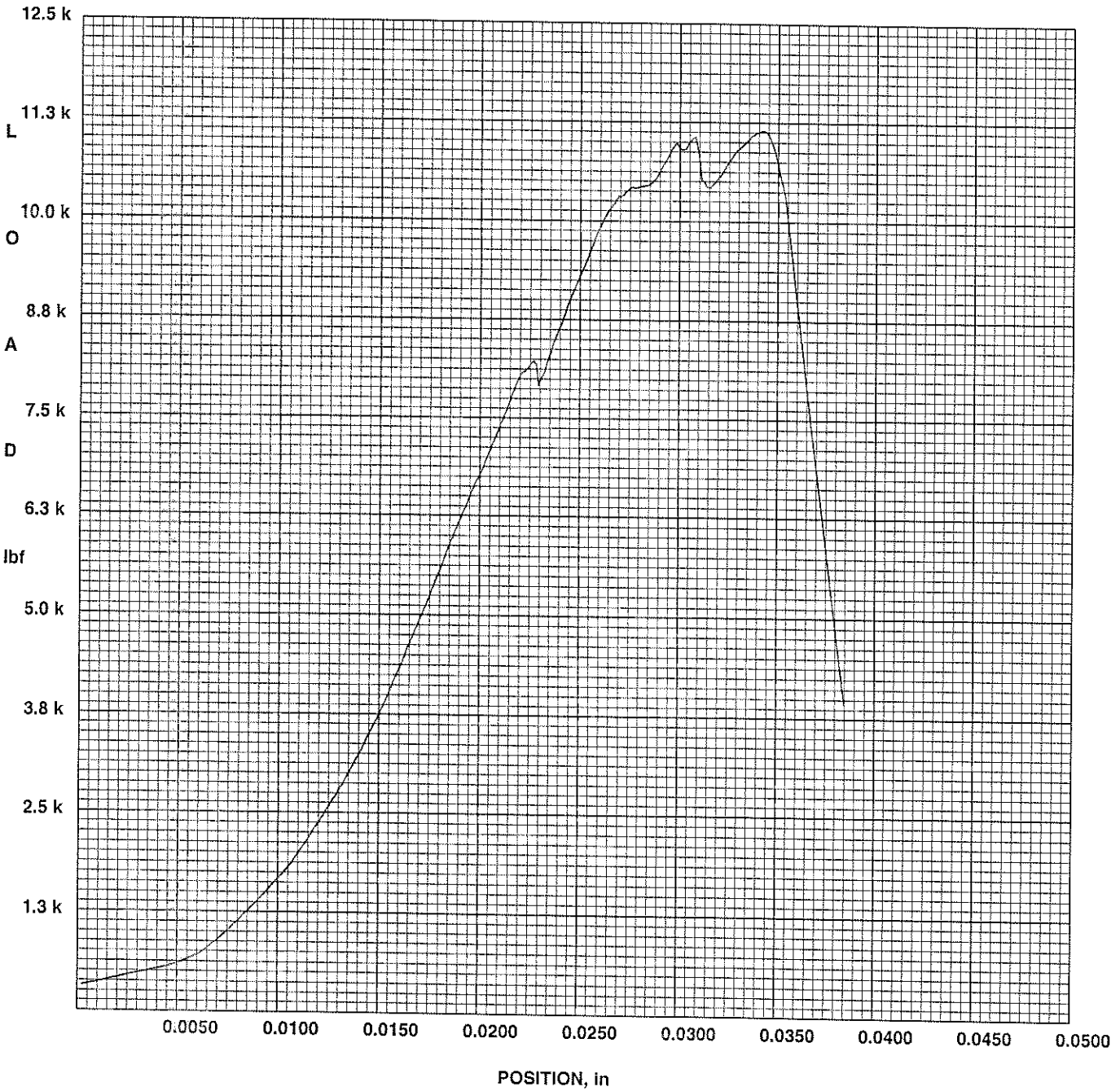
State of California
Department of Transportatio
Concrete and Structure Testi
Office of Rigid Pavement

Compression Test C-39

Contract Number	04-3S8201
TL101	N/A
Lab Number	

Sample No.:	B-2-4
Contract:	04-3S8201
TL101:	N/A
Lab:	Concrete
Specimen, in:	5.2200
Diameter, in:	2.3700
Area, in²:	4.41
Ultimate, lbf:	7136.09
Ultimate, psi:	1618
Ultimate, MPa:	11.15
Elapsed, sec:	44.9

May 3, 2007 9:00:00 AM
SN: 198661-R1 V7.01.08



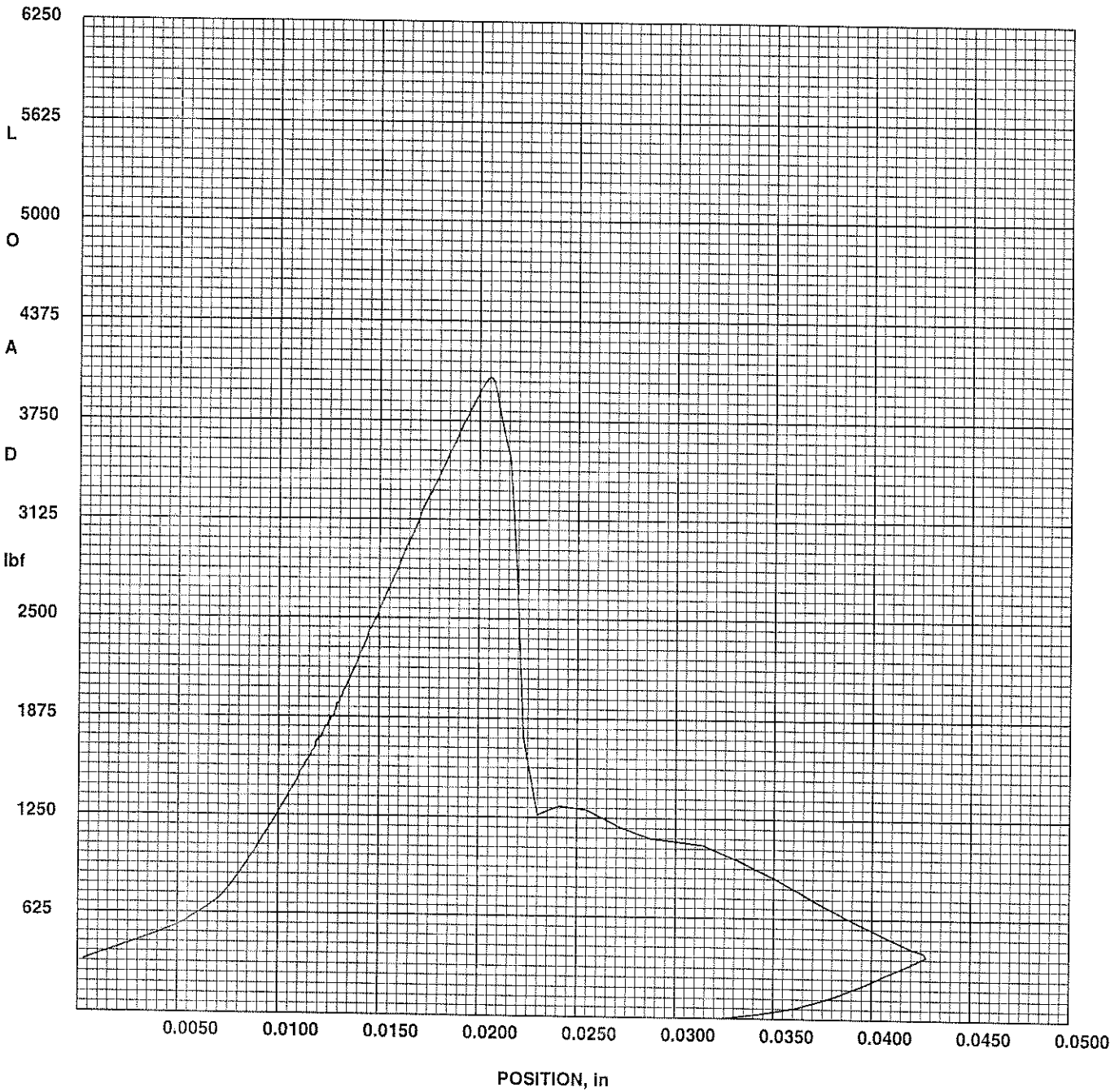
State of California
Department of Transportatio
Concrete and Structure Testi
Office of Rigid Pavement

Compression Test C-39

Contract Number	04-3S8201
TL101	N/A
Lab Number	

Sample No.:	B-2-5
Contract:	04-3S8201
TL101:	N/A
Lab:	Concrete
Specimen, in:	5.2100
Diameter, in:	2.3800
Area, in^2:	4.45
Ultimate, lbf:	11151.11
Ultimate, psi:	2510
Ultimate, MPa:	17.28
Elapsed, sec:	71.3

May 2, 2007 2:04:47 PM
SN: 198661-R1 V7.01.08



State of California
Department of Transportatio
Concrete and Structure Testi
Office of Rigid Pavement

Compression Test C-39

Contract Number	04-3S8201
TL101	N/A
Lab Number	

Sample No.:	B-3-1
Contract:	04-3S8201
TL101:	N/A
Lab:	Concrete
Specimen, in:	5.1500
Diameter, in:	2.3400
Area, in²:	4.3
Ultimate, lbf:	4025.7
Ultimate, psi:	936
Ultimate, MPa:	6.45
Elapsed, sec:	38.3

May 2, 2007 2:07:29 PM
SN: 198661-R1 V7.01.08

FOUNDATION REVIEW

DIVISION OF ENGINEERING SERVICES
GEOTECHNICAL SERVICES

To: **Structure Design** ✓

1. Design
2. R.E. Pending File
3. Specifications & Estimates
4. File

Geotechnical Services

1. GD - North ; South ; West
2 GS File Room

Date: 3/17/10

La Honda Ck. Ret. Wall
Structure Name

04 - SM - 84 - 9.9
District County Route ~~km~~ Post M.

District Project Development
District Project Engineer

04-358201 E.A. Number

35E0034 Structure Number

Foundation Report By: J. Moore Dated: 9/28/09

Reviewed By: I Yalan (SD) R. Price (GS)

General Plan Dated: 3/1/10 Foundation Plan Dated:

☒ No changes. ☐ The following changes are necessary.

FOUNDATION CHECKLIST

Pile Types and Design Loads
Pile Lengths
Predrilling
Pile Load Test
Substitution of H Piles For Concrete Piles ☐ Yes ☐ No
Footing Elevations, Design Loads, and Locations
Seismic Data
Location of Adjacent Structures and Utilities
Stability of Cuts or Fills
Fill Time Delay
Effect of Fills on Abutments and Bents
Fill Surcharge
Approach Paving Slabs
Scour
Ground Water
Tremie Seals/Type D Excavation

I Yalan 9
Structure Design Bridge Design Branch No.

Geotechnical Services

Rev. 06/02