FOR CONTRACT NO.: **03-1A4644**

INFORMATION HANDOUT

MATERIALS INFORMATION

FOUNDATION REPORT

GEOTECHNICAL DESIGN REPORT

ROUTE: 03-Sut-99/113-R20.0,16.4

State of California
DEPARTMENT OF TRANSPORTATION

Business, Transportation and Housing Agency

Memorandum

Flex your power!
Be energy efficient!

To: GUDMUND SETBERG
Branch Chief,
Bridge Design Branch 2
Office of Bridge Design North

Attention: Gregory Slocum

Date: November 8, 2011

File: Sut-3-PM 20.7/21.4
Rte 99/113 Separation
Bridge No. 18-0051
Project No. 0300020246

From: **DEPARTMENT OF TRANSPORTATION**
Division of Engineering Services
Geotechnical Services

Subject: Foundation Report (FR) for the New 99/113 Separation

Scope of Work

In response to your request in a memo dated September 16, 2011, The Office of Geotechnical Design North (OGD-N) presents this Foundation Report for the proposed new 99/113 Separation located at the intersection of State Routes (SR) 99 and 113 south of Yuba City in Sutter County. This report provides foundation recommendations based on the subject bridge General and Foundation Plans (GP) dated August 9, 2011 and September 13, 2011, respectively. The project proposes to convert the current at-grade 99/113 intersection to a modified diamond shape type interchange on a raised grade.

OGD-N completed a foundation investigation for the new bridge in September 2010. The foundation recommendations presented herein are based mainly on the data generated during this field investigation and on a review of pertinent documents including the following:

1. FR request for 99/113 Separation, dated September 16, 2010, received from the Office of Structure Design, (OSD).
2. Route 99/113 Separation General Plan dated August, 2011.
3. Route 99/113 Separation Foundation Plan dated September 13, 2011.
4. Geologic Map of the Chico Quadrangle (G.J. Saucedo and D.L. Wagner, 1992).
5. Geology of California (Norris and Webb, 2nd Edition, 1990).
6. Preliminary Geologic Recommendations and Resource Estimate for Advanced Planning Studies, dated 7th August, 2000.

Project Description

According to the Type Selection Recommendations, "the purpose of this project is to improve operational efficiency and traffic safety" along the new re-aligned SR 99 corridor. The project is located on a flat farmland area with few houses, approximately 10 miles south of Yuba City in Sutter County. A new interchange will replace the existing signalized at-grade intersection.

A modified diamond shape interchange, including an overcrossing bridge over SR 99, will be constructed on a raised roadway profile within the project limits. According to the GP, the proposed new structure (Br. No. 18-0051) will consist of a 2-span Cast-in-Place/prestressed (CIP/PS) concrete box-girder with a two column bent and short seat abutments all supported on driven piles. The maximum height of the approach embankments may range from 25 to 30 feet. This project is part of the road improvement program involving re-alignment and widening of the SR 99 corridor. Within the current project limits, the re-alignment and conversion of SR 99 from a two to a four lane roadway has been completed.

The Geotechnical Design Recommendations report for the bridge approach embankments will be provided to the District in a separate report by OGD-N Branch C.

Field Investigation and Testing Program

The Office of Geotechnical Design North (OGD-N) conducted an on-site foundation investigation program in August/September 2010, for the proposed new bridge and interchange. The program consisted of surface and subsurface field exploration. The subsurface investigation included drilling, sampling and testing the foundation soils at the site. One mud rotary soil boring was drilled for each proposed support location of the new bridge. Borings RC-10-002 and RC-10-004 were respectively drilled and sampled to depths of approximately 121 and 116 feet for the proposed locations of Abutments 1 and 3. Boring RC-10-003 was drilled to a depth of approximately 120 feet at the proposed location of Bent 2. Ten additional borings were drilled at the site to evaluate the foundation soils for the approach embankments and for percolation tests. Temporary piezometers were installed in Borings RC-10-002 and RC-10-004 for groundwater level measurements.

A maximum depth of 121 feet (approximately elevation -82 ft) was explored during the August/September 2010 field investigation. Drilling was performed using an Acker drill (C No. 3711) equipped with an automatic hammer to perform standard penetration tests (SPT). The stated hammer is rated as having 68 % efficiency by Caltrans hammer efficiency test (HET) report dated June 25, 2008. The borings were advanced using a self-casing 3.5-inch diameter wireline drill system.

Selected soil samples collected from the field were submitted to the Caltrans soils laboratory for analysis. The data generated are used to characterize and evaluate the subsurface soils and determine the suitability as foundation material for the new bridge. The Log of Test Borings (LOTB) for this project will be submitted when completed.

The elevations used in this report are referenced to the NAVD29 Vertical Datum.

Laboratory Testing Program

Selected soil samples were submitted to the Caltrans soils laboratory for analysis. Soil samples were analyzed for corrosion, mechanical analysis, and for strength properties. The results were utilized in the design of the foundations recommended in this report.

Summary of Site Geology and Subsurface Conditions

The project site is located within the Great Valley geomorphic province of California (Norris and Webb 2nd Edition). The Geologic Map of the Chico Quadrangle (G.J. Saucedo and D.L. Wagner, 1992) indicates that the site is underlain by the Modesto-Riverbank Formations (Qm) and (Qr), which are Pleistocene alluvial deposits comprised of gravel, sand, silt and clay.

The foundation material encountered during this field exploration consists of interbeds of granular and cohesive soils comprised of sand, silty sand, sandy silt, silt, silty clay and clay. Generally, the granular soil layers (sand and silty sand) from ground level to elevation - 37 feet are medium dense. Below elevation - 37 feet, the granular soils are dense to very dense. Similarly, the cohesive soils above elevation - 37 feet range from stiff to very stiff, while the silts and clays below elevation – 37 feet are hard. The high relative density and consistency of the soil layers below elevation -37 feet can be attributed to the disseminated calcite and/or iron oxides within the soil mass which act as cementing agents. The boring data will be provided on the LOTB for this project.

A temporary piezometer was installed in Boring RC-10-002 and in Boring RC-10-004 during the September 2010 drilling program for groundwater measurements. Groundwater was measured in September 2010, at elevation 23 feet (approx. 16 feet below the existing ground surface or 25 feet below the newly completed SR 99 road surface). In November 2011, groundwater was measured at elevation 28 feet (approximately 10 feet below existing ground surface). Depending on prevailing factors, vertical changes of groundwater level can therefore be expected during construction of this bridge.

Scour Evaluation

Surface water in the vicinity of the project will be limited to local storm water run-off, which must be controlled in shallow ditches or channels and directed away from foundation elements and embankment fills. Scour will not affect the structure foundations because there is no watercourse under, or adjacent to the proposed new structure.

Corrosion Evaluation

Soil samples were collected and analyzed for corrosion during this investigation.
Caltrans considers a site to be corrosive to foundation elements if one or more of the following conditions exist for the representative soil and/or water samples taken at the site:

Chloride concentration is 500 ppm or greater, sulfate concentration is 2000 ppm or greater, or the pH is 5.5 or less.

Table 1 below shows laboratory results for soil samples collected and analyzed during the foundation investigations conducted in September 2010 for this project.

Table 1: Corrosion Test Summary Report-99/113 OC

SIC Number (TL101)	Sample Location (Boring Number)	Sample Type	Sample Depth (ft)	Minimum Resistivity (ohm-cm)	pH	Chloride Content (ppm)	Sulfate Content (ppm)
C639707	RC-10-002	Soil	10-15	997	7.18	145	112
C639708	RC-10-002	Soil	30-35	1113	7.64	-	-
C639709	RC-10-003	Soil	0-5	3120	7.54	-	-
C639710	RC-10-004	Soil	15-20	3936	7.66	-	-
C639711	RC-10-004	Soil	40-45	1181	7.98	-	-
C639712	RC-10-004	Soil	55-60	1951	8.10	-	-

Note: For MSE wall structure backfill material, the minimum resistivity must be 2000 ohm-cm or greater, pH must be between 5.5 and 10.0, chloride content must not be greater than 250 ppm, and sulfate content must not be greater than 500 ppm.

Based on these corrosion results, the native soil beneath the proposed new 99/113 Separation bridge site is non-corrosive to foundation elements per Caltrans standards.

Seismic Recommendations

Based on the Caltrans 2009 Seismic Design Procedure, the nearest active fault to the site is the Great Valley fault 3 (Fault ID No. 22) with a Mmax of 6.9 which is located southwest of the proposed bridge site. The rupture distance to the fault plane from the bridge site is estimated to be 28 miles. The fault is referred to as a reverse fault dipping 15 degrees west.

Based on the project log of test borings developed from the September 2010 drilling program, a V_{s30} (average shear wave velocity for the top 30 meters of soil column) was estimated using the SPT blow counts and the correlation formulas for both cohesive and granular soil. The estimated shear wave velocity is 850 feet/second.

Using the above shear wave velocity, the design Acceleration Response Spectrum, (ARS) curve is controlled by the USGS 5% probability of exceedance in 50 years (return period of 975 years). Please note the spectral acceleration (SA) by the probabilistic method is higher than both the deterministic SA and the statewide minimum SA. Furthermore the design ARS curve was obtained from "USGS 2008 Interactive Deaggregation (Beta)" web site, and is attached. The estimated peak ground acceleration as shown on the ARS curve is .23g.

Furthermore, the potential for surface rupture at the site due to fault movement is considered insignificant since there are no known faults projecting towards or passing directly through the project site.

The liquefaction analysis indicates the foundation material has minimal potential to liquefy during an earthquake.

As-Built Foundation Data

The proposed structure is a new bridge and has no existing As-Built information.

Foundation Recommendations

The foundation recommendations provided below for the proposed new 99/113 Separation are based on the General and Foundation Plans of the subject project dated respectively August 9 and September 13, 2011.

The design and analysis of the axial capacities of the piles recommended below were performed using the computer software program "Driven", version 1.2, dated March 10, 2001, by the Federal Highway Administration (FHWA). The piles derive their capacities from both skin friction and end bearing.

The proposed new Route 99/113 Separation (Br. No. 18-0051), as indicated on the Route 99/113 Separation General Plan dated August 9, 2011, may be supported on Steel H-piles (HP14x89) at Abutments 1 and 3, according to the table below.

Table 2: Abutment Foundations Design Recommendations (99/113 Separation, Br. No. 18-0051)

Support Location	Pile Type	Cut-off Elevation (ft)	LRFD Service-I Limit State Load (kips) per Support		LRFD Service-I Limit State Total Load (kips) per Pile (Compression)	Nominal Resistance (kips)	Design Tip Elevations (ft)	Specified Tip Elevation (ft)	Nominal Driving resistance (kips)
			Total	Permanent					
Abutment 1	Steel H-Piles (HP 14x89)	57.40	1882	1607	105	210	- 4.0(a)	- 4.0	210
Abutment 3	Steel H-Piles (HP 14x89)	57.15	2106	1847	104	210	- 4.0 (a)	- 4.0	210

Notes:
1) Design tip elevations are controlled by: a) Compression at Abutments 1 and 3.
2) Design tip elevation for settlement is not applicable to Abutments 1 and 3.

The proposed new Route 99/113 Separation (Br. No. 18-0051), as indicated on the General Plan for this project dated August 9, 2011, may be supported on Steel H-piles (HP14x89) at Bent 2, according to the table below.

Table 3: Bent Foundations Design Recommendations (99/113 Separation, Br. No. 18-0051)

Support Location	Pile Type	Cut-off Elevation (ft)	Service-I Limit State Load per Support (kips)	Total Permissible Support Settlement (inches)	Required Factored Nominal Resistance (kips)				Design Tip Elevations (ft)	Specified Tip Elevation (ft)	Nominal Driving Resistance Required (kips)
					Strength Limit		Extreme Event				
					Comp. (φ=0.7)	Tension (φ=0.7)	Comp (φ=1)	Tension (φ=1)			
Bent 2	Steel H-Piles (HP14x89)	41.80	1915	1	194	0	223	63	- 2.0 (a-I) 7.0 (a-II) 20.0 (b-II)	- 2.0	280

Notes:

1) *Design tip elevations are controlled by (a-I) Compression (Strength Limit), (a-II) Compression (Extreme Event), (b-II), Tension (Extreme Event).*
2) *The specified tip elevation shall not be raised above the design tip elevation for tension.*
3) *Design tip elevation for settlement is not applicable to Bent 2.*

Table 4: PILE DATA TABLE (99/113 SEPARATION BR. No. 18-0051)

Location	Pile Type	Nominal Resistance (kips)		Design Tip Elevation (ft)	Specified Tip Elevation (ft)	Nominal Driving Resistance (kips)
		Compression	Tension			
Abutment. 1	Steel H-Piles (HP 14x89)	210	NA	- 4.0 (a)	- 4.0	210
Bent 2	Steel H-Piles (HP14x89)	280	70	- 2.0 (a) 20.0 (b)	- 2.0	280
Abutment 3	Steel H-Piles (HP 14x89	210	NA	- 4.0 (a)	- 4.0	210

Notes *1) Design tip elevations for Abutments are controlled by: (a) Compression.*
2) Design tip elevations for Bents are controlled by: (a) Compression, (b) Tension.
3) The specified tip elevation shall not be raised above the design tip elevation for tension.
4) Design tip elevation for settlement is not applicable to Abutments 1and 2 and to Bent 2 because the foundation soils are not compressible and susceptible to post construction settlement.

Construction Considerations

1. Groundwater was encountered at elevation 23 feet during the geotechnical field investigation in September 2010. Groundwater was further measured in November 2011 at elevation 28 feet. This suggests that groundwater levels fluctuate due to different factors and may occur at different elevations during construction of this bridge.

2. All newly placed embankment fills shall undergo a minimum settlement period of thirty (30) days prior to driving the piles at Abutments 1 and 2.

3. Piles shall be driven in oversized drilled holes in conformance with the provisions in Section 49-1.06 "Predrilled Holes," of the 2006 Standard Specifications at the locations and to the corresponding bottom of hole elevations listed in the following table:

Bridge Name/Number	Support Location	Elevation of Bottom of Hole (ft)
Route 99/113Separation Bridge No. 18-0051	Abutment 1	38
	Bent 2	N/A
	Abutment 3	38

4. At all the support locations of the new bridge (No. 18-0051), we recommend that the piles be driven to the specified tip elevations provided in this report. However, at the Engineer's opinion, if the steel H-Piles are driven to a depth that is within 5.0 feet of the specified tip and two times the required pile acceptance criteria is achieved, the pile tip elevation may be considered adequate and the excess pile length cut-off. Refer to the 2006 Caltrans Standard Specifications Section 49-1.08 for information concerning the pile driving acceptance criteria.

5. Any pile that does not achieve bearing at the recommended specified pile tip elevation should be re-struck after a minimum of one day (24 hours) setup time.

6. Due to the presence of very dense and hard soil layers, hard pile driving should be anticipated at, or near elevation 35-33 feet at Abutment 1. At Bent 2, hard pile driving is anticipated from elevation 40-38 feet due the presence of hard concrete blocks encountered within the fill.

7. At the Engineer's discretion, if the H-piles run during pile driving, lugs may be added to the H-piles at all support locations in order to achieve bearing at the specified tip elevations. If needed, the lugs shall be installed in accordance with Bridge Construction Memo 130-5.0.

8. The piles at all the support locations shall be driven to the specified elevations and shall not be installed by vibratory method.

9. The Office of Geotechnical Design-North should be invited to a pre-construction meeting.

The recommendations contained in this memorandum are based on specific project information regarding structure type, location and design loads that have been provided by Structure Design. If any conceptual changes to the structure are proposed during final project design, the Office of Geotechnical Design-North should review those changes to determine if the foundation recommendations herein provided are still applicable.

Project Information

Standard Special Provision S5-280, "Project Information", discloses to bidders and contractors a list of pertinent information available for their inspection prior to bid opening. The following is an excerpt from SSP S5-280 disclosing information originating from Geotechnical Services.

Items listed to be included in the Information Handout will be provided in Acrobat (.pdf) format to the addressee (s) of this report via electronic mail.

Data and information attached with the project plans are:

1. *Log of Test Boring (Route 99/113 Separation, Br. No. 18-0051)*

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

2. *Foundation Report (Route 99/113 Separation, Br No.18-0051)*
3. *Geotechnical Design Report, for Project No.0300020246*

If you have any questions regarding this project, please contact Abu Barrie at (916) 227-1043, Reid Buell at (916) 227-1012, or Reza Mahallati at (916) 227-1033.

Report by:

REGISTERED GEOLOGIST
REID L. BUELL
No. 1481
Exp. 4/30/13
CERTIFIED ENGINEERING GEOLOGIST
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STATE OF CALIFORNIA

Attachment: ARS Curve for 99/113 Separation

c: RBuell
GDNFile
Winder Bajwa, District Project Manager (E-copy)
Jan Rutenberg, Project Coordination Engineer (E-copy)
Mark Willian, GS Corporate (E-copy)
Julia Rockenstein, DME (E-copy)

REZA MAHALLATI, P.E
Office of Geotechnical Design-North
Senior Materials and Research Engineer

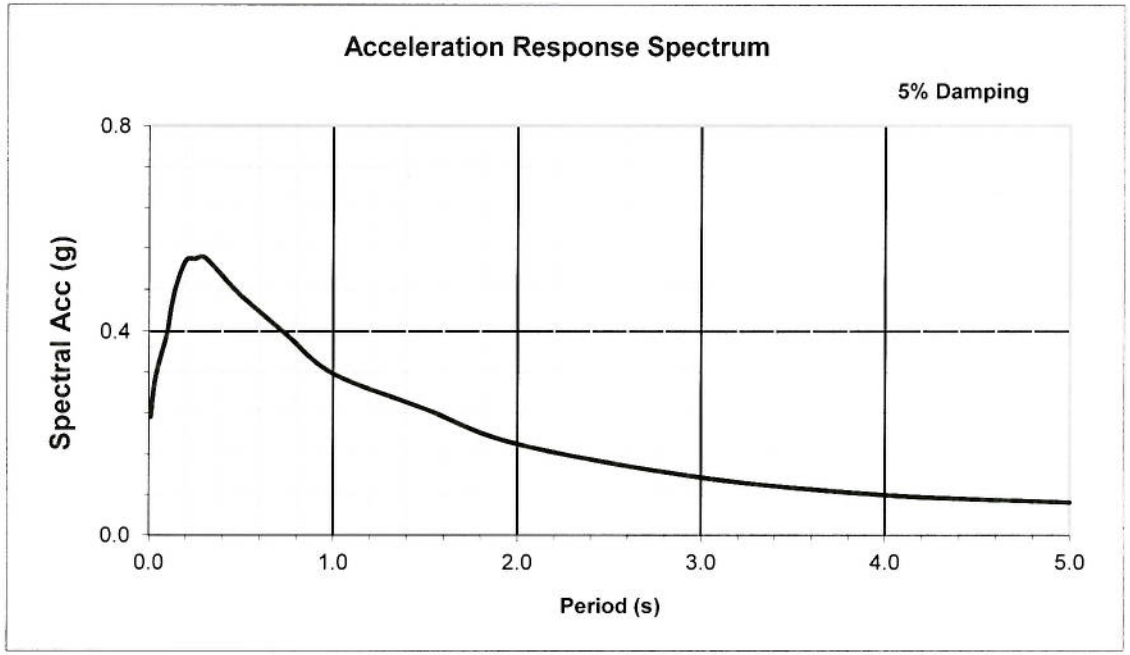
Route 99/113 Separation

Bridge No. 18-0051
EFIS 0300020246

Latitude 39.0030
Longitude -121.6341

Control **Probabilistic**

Period (s)	Sa(g)
0.010	0.232
0.020	0.266
0.030	0.299
0.050	0.332
0.075	0.366
0.100	0.399
0.120	0.444
0.150	0.490
0.200	0.536
0.250	0.539
0.300	0.542
0.400	0.505
0.500	0.468
0.750	0.393
1.000	0.317
1.500	0.248
2.000	0.180
3.000	0.114
4.000	0.079
5.000	0.064



Deterministic Procedure Data

Fault	Great Valley fault 3	
Fault ID	22	
Style	R	
Mmax	6.9	
Dip	15	deg
Z_{TOR}	7	km

R_{rup}	45	km
R_{jb}	45	km
R_x	45	km
V_{S30}	260	m/s
$Z_{1.0}$	330	m
$Z_{2.5}$	2.00	km

Notes

Please note the Design ARS curve is based on the 5% USGS Probability of Exceedance in 50 years (975 years return period)

Final

Design Response Spectrum

Memorandum

Flex your power!
Be energy efficient!

To: DEANN SPLANGLER
Senior, Design S2
District 3, Marysville

Attention: Jackson Lai

Date: February 2, 2012

File: 03-SUT-99-PM R33.7/R33.9
03-00000207
Route 99/113 Interchange

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

Subject: Geotechnical Design Report

1. Introduction

This Geotechnical Design Report (GDR) presents recommendations for the construction for the proposed new 99/113 Interchange. The project proposes to convert the current at-grade 99/113 interchange to a modified diamond shape interchange on a raised grade. This involves the construction of an overcrossing over SR 99, approach embankments, access ramps, and detention basins. The overcrossing structure will connect SR 113 with Tudor Rd located on the east side of the SR 99. The project site is located approximately 10 miles south of Yuba City at the intersection of SR 99 and 113 in Sutter County. (See figure 1, Vicinity Map).

2. Existing Facilities and Proposed Improvements

Within the project limits, State Route 99 is a newly realigned conventional highway with four 12-foot lanes with standard 8-foot paved shoulders. The vehicular traffic at the at-grade intersection of SR 99 and 113 is currently controlled by four-way traffic lights. The project site is surrounded by agricultural fields. Farming facilities and structures are present on both southern quadrants of the project site outside the project right of way.

According to the planning studies, alternative 3 is being considered. This alternative consists of a 2-span Cast-in-Place/Prestressed (CIP/PS) concrete box girder structure to be supported on Class 140 and 200 piles at the abutments and the bent respectively. The height of the approach embankments is up to 33 feet. This project is part of a road improvement program involving re-alignment and widening of the SR 99 corridor.

Detention basins will be constructed in the areas between the on and off ramps and both state routes. These areas were assessed to determine their suitability for either infiltration

or detention basins. Percolation tests were performed on all the basins in November, 2010.

Underground utilities such as a gas line intersect diagonally SR 113 immediately west of the proposed overcrossing location and remain parallel to the highway after they cross the at-grade intersection.

This GDR addresses geotechnical recommendations related only to the construction of the proposed interchange at the intersection of the SR 99 and 113.

3. Pertinent Reports and Investigations

The Design office of District 3 provided plans layout plans dated March 1, 2007 and April 6, 2011 and general plan with cross sections and profiles date August 12, 2011. Our research yielded the following documents, and maps that were utilized in preparing this report. No previous reports for geotechnical concerns were available for our review.

- Geologic Map of California, Chico Sheet - Scale 1: 250,000 (1992) published by California Geologic Survey (CGS).
- Mualchin, L, A Technical Report to Accompany the Caltrans-California Seismic Hazard Map 1996.
- Natural Resources Conservation Service, Soil Map Butte Area, Parts of Butte and Plumas County; and Tehama County, California, Web Soil Survey 2.0, National Cooperative Soil Survey.
- Geology of California by Norris and Webb, 2nd Edition, 1990.
- Preliminary Geologic Recommendations and Resource Estimate for Advanced Planning Studies, dated August 7, 2000.
- Planning Study (Alternative 3), Route 99.113 Separation, dated April 4, 2001.
- Index of Plans (Project plans for construction on state highway in Sutter County in Tudor), dated November 30, 2010.

4. Physical Setting

4.1 Climate

According to the National Weather Service, the average annual precipitation at the Marysville Station (045385) is about 22 inches, based on record from 07/01/1948 to 12/31/2005. Over 75 percent of the precipitation falls between November and March. The mean annual temperature is approximately 63 °F with the highest daily temperature of 95°F during the month of August and the lowest daily temperature of 38°F during the

month of January. The annual average maximum temperature for this region is 75.6°F and the annual minimum average temperature is 49.7°F. A moderately hot and dry season extends from June through September. A cold and wet season occurs from November through March. There is no historic record of snowfall in this locality.

4.2 Topography and Drainage

The project is located in the extreme eastern section of Sutter County bordering with Yuba County. According to the topographic maps of 3D TopoQuads from DeLorme software the area surrounding the site is mostly rural agricultural land that is essentially flat at an approximate elevation of 35 feet above mean sea level (MSL). All surface drainage is to the east toward Feather River which is located 2.3 miles to the east of the project site.

4.3 Regional Geology and Area Geology

The project site is located in the northern section of the Sacramento Valley, which forms the northern segment of the Great Valley. The Great Valley is elongated lowland of about 400 miles long and 50 miles wide flanked to the west by the Coast Ranges and to the east by the Sierra Nevada. It is divided in two segments, the northern, where the project is located, the Sacramento Valley and the southern, the San Joaquin Valley. The former occupies about two thirds of the Great Valley, whereas the latter makes up one third of the province. The south-flowing Sacramento River drains the northern Valley and the north-flowing San Joaquin River the southern portion of the Great Valley.

Unconsolidated Recent and Pleistocene Sediments from eroded sediments mainly from the Sierra Nevada, form the surface of the Great Valley (See figures 2 and 3, Geologic Map, and Geologic Map Legend). Underlying the recent alluvium is a 65,000 ft thick sedimentary basin filled with a sequence of sedimentary rocks deposited from the Mesozoic (Jurassic and Cretaceous) to Cenozoic. This sequence of sedimentary rocks, also called the Great Valley Sequence, consists of marine and terrestrial sediments that reflect the geologic history of the Great Valley. Mesozoic sediments, consisting of sandstone, shale, and conglomerate, were deposited in an ocean basin that lay west of the Mesozoic North American Margin. Cenozoic rocks deposited in increasingly shallow marine environments reflect the rapid uplift of the Sierra Nevada and gradual filling up of the sedimentary basin.

Terrestrial sediments began to be deposited in the Sacramento Valley as early as 24 million years ago when the Lovejoy Basalt buried alluvium across the Sacramento Valley. However, a deep marine environment persisted much longer in the San Joaquin Valley as

marine shale and sandstone were deposited during early and middle Cenozoic time. Sediments from the Sierra Nevada and the newly formed Coast Ranges were deposited until the late Pliocene. During the same time, pyroclasts flows and ash from the Cascades were deposited throughout the Sacramento Valley particularly in the northern portion of the valley. During the late Pliocene more volcanic debris flows and pyroclastic lavas flowed into the northeastern portion of the Sacramento Valley. These deposits form the Tuscan Formation. At the same time, alluvial deposits eroded from the sediments of the Coast Ranges deposited in the western portion of the Sacramento Valley as the Tehama Formation.

4.4 Soil Survey Mapping

Based on the Web Soil Survey 2.0, National Cooperative Soil Survey at http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm, the soils within the project area consist mainly of *Marcum-Gridley clay loam, Conejo loam,* and *Conejo loam siltstone* Soils in the vicinity of the project area are mapped as *Oswald clay loam*. A soil map and soil map legends are presented in Figure 4 titled Soils Map. According to the National Cooperative Soil Survey, the *Conejo loam* is present in 0 to 2% slopes and 75 % of the soil consists of loam, siltstone substratum and similar soils. Their parent material is mixed loamy alluvium. These soils are considered well-drained and are present in the toe slope of the terraces. The capacity of the most limiting layer to transmit water is moderately high (0.20 to 0.57 in/hr)

Conejo loam siltstone is present in 0 to 2% slopes and 75 % of the soil consists of loam, siltstone substratum and similar soils. Their parent material is mixed loamy alluvium. These soils are considered well-drained and are present in the toe slope of the terraces. The capacity of the most limiting layer to transmit water is moderately high (0.20 to 0.57 in/hr)

Marcus-Gridley clay loam, 0 to 1 percent slopes. This soil consists mainly of clay loam down to 43 inches where bedrock is encountered. It is classified as moderately well drained. The capacity of the most limiting layer to transmit water is very low (0.00 in/hr)

Oswald clay, 0 to 2 percent slopes. This soil consists of loam and its thickness in a typical profile is 33 inches. It is characterized as having poor drainage. Its parent material is considered mixed clayey alluvium. This soil is characteristic of flood plains and it is generally located in the toe slopes. The capacity of the most limiting layer to transmit water is moderately low to moderately high (0.06 to 0.2 in/hr)

4.5. Naturally Occurring Asbestos (NOA)

We reviewed the State of California, Air Resources Board (ARB) Map of California Showing Principal Asbestos Deposits. The site is not located in an area known to contain naturally occurring asbestos and no rock fragments containing serpentine was observed during the field review.

5. Exploration

5.1 Drilling and Sampling

Our Office conducted a subsurface investigation program in August/September, 2010, for the proposed new bridge and interchange. The subsurface investigation included drilling, sampling, and testing the foundation soils at the site. Five 4.5 inch-diameter mud rotary borings were drilled to characterized the subsurface soil materials at the site, including the borings for the bridge foundation. (See Figure 5, Boring Location Map).

In addition to the five mud rotary borings, eight 6.5-inch diameter flight auger borings were dedicated to test the percolation or surface permeability of the basins located between the major thoroughfares and off and on access ramps.

Three mud rotary soil borings were drilled at the proposed bridge location. The mud rotary exploratory borings were advanced using self-casing wire-line drilling method to a maximum depth 121 feet (boring RC-010-002), 120 feet (boring RC-010-003) and 116 feet (RC-010-004). The two additional mud rotary were drilled and sampled to maximum depth of 71.5 feet (borings RC-010- 001 and RC-010-005). The boring data is shown in the following table. Boring records and Log of Test Borings (LOTB's) are available in Appendix A.

Table 1: Summary of the Geotechnical Exploration Information

Boring Number[(1)]	Station (ft)	Offset from "U2" Line (ft)	Top of Borehole Elevation (ft)	Depth of Borehole (ft)	Bottom of Borehole Elevation (ft)
RC-010-001	56+46.3	68.3 Rt. CL	38.12	71.5	-33.38
RC-010-002	57+81.3	33.0 Rt. CL	39.04	121.5	-82.46
RC-010-003	58+87.3	10.7 Rt. CL	47.76	121.5	-73.74
RC-010-004	60+13.2	0.9 Lt. CL	38.12	116.5	-78.38
RC-010-005	63+03	0.9 Lt. CL	38.78	71.5	-32.72
A-010-006	62+82.5	237.9 Rt. CL	37.80	4.5	33.3
A-010-007	61+55	124.7 Rt. CL	38.20	4.5	33.7
A-010-008	63+28	561.9 Rt. CL	37.86	4.5	33.36
A-010-009	60+30.5	611.0 Rt. CL	38.06	4.5	33.56
A-010-010	57+04.1	159.1 Rt. CL	38.29	4.5	33.79
A-010-011	56+16.4	113.3 Lt. CL	37.36	4.5	32.86
A-010-012	55+17.3	358.1 Lt. CL	37.14	4.5	32.64
A-010-013	59+01.1	200.0 Lt. CL	44.88	4.5	40.38

Notes: Borings with prefix "RC" used mud rotary wash method with continuous sampling. Borings with prefix "A" were drilled using flight auger.

Borings A-010-006 through A-010-013, used for percolation tests, were drilled using solid augers to a maximum depth of 4.5 feet.

Drilling equipment used for the subsurface investigation consisted of an Acker drill (C No. 3711) equipped with an automatic hammer and a mobile B-47 (C No. 5082) equipped with a safety hammer. Sampling was achieved by utilizing standard penetration tests (SPT) at 5-foot intervals for the bridge foundation borings and continuous SPT for the first 10 feet and 5-foot intervals thereafter for the approach embankments. Selected soil samples were bagged for subsequent laboratory testing.

The elevations used in this report are referenced to the NAVD29 Vertical Datum, which was provided by the project field survey crew that was on site during the September 2010 field investigation.

5.2 Piezometers

Two of these borings RC-10-002 and RC-010-004, were completed as stand pipe piezometers to measure ground water levels during and immediately after the subsurface investigation.

6. Geotechnical Testing

6.1 In-Situ Testing

Two percolation tests each were performed at Basin 1 and Basin 4, one percolation test at Basin 2 and three percolation tests at Basin 3 (See Figure 5, Boring Location Map). The results of the percolation tests are shown in the table below.

Table 2: Summary of the Geotechnical Exploration Information

BORING				PERCOLATION	
Number	Basin Number	Station (ft)	Offset from "D1" Line (ft)	Gal/ft^2/day	Inch/hour
A-010-006	3	1051+64.0	222.3 Rt. CL	7.20	0.50
A-010-007	3	1053+24.7	168.7 Rt. CL	2.00	0.13
A-010-008	3	1048+58.9	108.4 Rt. CL	0.81	0.05
A-010-009	4	1049+62.5	174.7 Lt. CL	1.30	0.08
A-010-010	4	1055+16.5	236.7 Lt. CL	16.70	1.10
A-010-011	1	1057+96.7	179.92 Lt. CL	2.44	0.16
A-010-012	1	1060+58.8	147.5 Lt. CL	8.80	0.60
A-010-013	2	1057+32.5	111.5 Rt. CL	1.20	0.07

6.2 Laboratory Testing

Selected soils samples were submitted to the Translab soils laboratory for the following tests:

- Moisture Content (ASTM D 2216-05)
- Unit Weight (ASTM D 4767-04)
- Particle-Size Analysis (ASTM D 422-63)
- Liquid Limit, Plastic Limit and Plasticity Index (AASHTO T 89-02 & 90-00)
- Direct Shear (ASTM D 3080)
- Organic Content and Cation Exchange (EPA 9081)

- Corrosion
- Triaxial UU (1 point) (ASTM 2850)
- Direct Shear (ASTM D 3080)

The referenced tests were used to assist in classifying the soil encountered during the subsurface investigation. A summary of these soils laboratory analyses is provided in Appendix B.

6.3 Corrosion Potential

Six composite soil samples were collected from borings R-010-002, R-010-003 and R-010-004 during the 2010 subsurface exploration. The Office of Testing and Technology Services, Corrosive Technology Branch tested the composite samples for corrosion potential. The Corrosion Technology Branch considers a site to be corrosive if one or more of the following conditions exist for the representative soil and/or water samples taken at the site: Chloride concentration is 550 ppm or greater, sulfate concentration is 2000 ppm or greater, of the pH is 5.5 or less. The minimum resistivity serves only as an indicator parameter for the possible presence of soluble salts and is not included to define a corrosive site. It is the practice of the Corrosion Technology Branch that if the minimum resistivity of the sample is greater than 1000 ohm-cm, the sample is considered to be non-corrosive and testing to determine the sulfate and chloride content is not performed.

The results of the laboratory tests determined that the composite samples were considered to be non-corrosive to any type of metal structure that may be utilized in this site. Refer to Table 3 below for specific test results.

Table 3: Corrosion Test Summary

SIC Corrosion Number	Boring Number	Sample Depth (feet)	pH	Minimum Resistivity (Ohm-cm)	Sulfate Content (ppm)	Chloride Content (ppm)
C639707	R-010-002	10.0 – 15.0	7.18	997	112	145
C639708	R-010-002	30.0 – 35.0	7.64	1113		
C639709	R-010-003	0.0 – 5.0	7.54	3120		
C639710	R-010-004	15.0 – 20.0	7.66	3936		
C639711	R-010-004	40.0 – 45.0	7.98	1181		
C639712	R-010-004	55.0 – 60.0	8.10	1951		

7. Geotechnical Conditions

7.1 Site Geology

Based on the interpretation of the September, 2010 exploration, the project area is underlain by interbedded granular and cohesive soils comprised of sand, silt, silty clay and clay. The granular soil consists of mostly medium dense fine grained layers sand, clayey sand and silty sand. The cohesive fraction consists of hard to stiff clay, sandy clay, and silty clay. The high consistency and relative density of the soil layers below elevation -37 feet can be attributed to the disseminated calcite and /or oxides within the soil mass which act a cementing agent. More detailed descriptions of borings RC-010-001, RC-010-005, and auger borings, A-010-006 thru A-010-013 will be available in the boring records presented in Appendix A. Refer to the Foundation Report for the LOTB's for boring RC-010-002 thru RC-010-004

7.2 Soils

Based on the subsurface exploration for the bridge and detention basins and the soils map shown in Figure 4, the surface materials at both sides of the state route consist of a continuous layer of lean clay with variable amounts of sand and silt, except the easternmost section of the embankment from station 67+00 to the end of the embankment where silt is present. The thickness of lean clay layer varies from 2.5 to 6.0 ft. Results from standard penetration tests (SPT) and pocket penetrometer (PP) performed in soils at borings R-010-001 and R-010-005 indicate that this layer is very stiff to hard at these locations. Mechanical analysis results indicated that the granular portion of this layer ranges between 5 to 30% of sand. The fine material of this layer, that passes sieve No. 200, varies from 70 to 95%. This layer is generally continuous within the project area. Results of the soils laboratory tests are presented in Appendix B.

7.3 Water

7.3.1 Surface Water

Man-made drainage facilities such as canals, farming structures and private irrigation pipelines are present in the vicinity of the project.

Water in drainage canals located both adjacent to the north and south sides of the eastern approach embankment flows north and south or away from the project site since no drainage structure was built under the overcrossing.

7.3.2 Ground Water

A temporary piezometer was installed in Borings RC- 10-002 and RC-010-004. Ground water was measured at elevation 23 feet during the September 2010 drilling program. This corresponds to 16 feet below the existing ground surface or 25 feet below the new SR 99 road surface. Ground water level was also measured on November 2, 2011 at elevation 28 feet (approximately 10 feet below the existing ground surface).

Ground water is usually susceptible to seasonal vertical variations and depending on the season, ground water may be encountered at different elevations during construction from that provided in this report.

7.4 Project Seismicity

7.4.1 Ground Motion

According to the Caltrans 2000 Seismic Design Procedure, the nearest active fault to the site is The Great Valley Fault (Fault ID No. 22) with a Mmax of 6.9 which is located southwest of the proposed project site. The rupture distance to the fault plane to the project site is estimated to be 28 miles. The fault is referred to as a reverse fault dipping 15 degrees west.

Based on the September 2010 subsurface investigation for this project, a Vs30 (average shear wave velocity for the top 100 feet of soil column) was estimated using the SPT blow counts and the correlation formulas for both cohesive and granular soil. The estimated shear wave velocity is 850 feet/second.

Using the above shear wave velocity, the design Acceleration Response Spectrum (ARS) curve is controlled by the USGS 5% probability of exceedance in 50 years (return period of 975 years). Please note the spectral acceleration (SA) by the probabilistic method is higher than both the deterministic SA and the statewide minimum SA. Furthermore, the design ARS curve was obtained from "USGS 2008 Interactive Deaggregation (Beta)" web site. The estimated peak ground acceleration as shown on the ARS curve is .23g.

7.4.2 Fault Surface Rupture Hazard

The potential for rupture surface at the site due to fault movement is considered insignificant since there are no known faults projecting towards or passing directly through the project area.

7.4.3 Liquefaction

Standard penetration test (SPT) results as well as mechanical analysis results indicate that the foundation material has minimal potential to liquefy during an earthquake.

8. Geotechnical Analysis and Design

8.1 Approach Embankments

The east and west approach embankments will be approximately 1575 and 1637 feet long, respectively. The east abutment will be a maximum of 33 feet high and 80 feet wide. The west abutment will have a maximum height of 24 feet and maximum width of 70 feet. The maximum height of 25 feet for the southeast and northeast quadrants on and off ramps will be at the junction with the east embankment. For the southwest and northwest quadrants on and off ramps the maximum height will be 22.5 feet where they join the west embankment.

8.2 Settlement Analysis

The presence of clay and sand layers in the underlying soils will produce consolidation and settlement, respectively, under the weight of the proposed embankment and the external static loads from the overlying structures. Most of the settlement will take place in granular material and will occur during the construction of the embankment. The settlement for cohesionless or granular material was calculated using the Modified Hough method, and was based on the Standard Penetration Test (SPT) blow counts. Calculations using the Modified Hough method, indicate a settlement of the east and west embankments will be up to 4 inches and it may generally occur in the foundation soils where the embankment height is greater than 10 feet. The clay layer mentioned in section 7.2 may consolidate under the weight of the embankment and it is recommended that a 30-day waiting period be implemented after the construction of the embankment has been completed.

8.3 Expansion Potential

Based on our subsurface investigation and the results of soils laboratory tests (Liquid Limit, Plastic Limit, and Plasticity Index), the potential for expansive soils for the proposed project is considered very low.

8.4 Rippability

No rock-like materials were encountered during the field investigation.

8.5 Basin Analysis

Based on the results of mechanical analysis of the material as well as infiltration rates shown on Table 2, our Office recommends that all the basins be considered as detention basins. Infiltration rates and clay content of the soils contained within the interchange areas indicate that the permeability of the existing soils does not meet the criteria for infiltration basins. Therefore our Office recommends that the basins be considered as detention basins.

9 Project Design Recommendations

9.1 Material Sources

At the time this report was prepared, the project borrow area had not been selected. For design purposes OGDN assumed the borrow material to be granular with some amount of cohesive soil, and having a moist density (γs) of 120 pcf, an angle of internal friction (Φ) of 35, and a cohesion (c) of 150 psf, and that the majority of the soil material used for construction of the EB and WB on and off ramps will be from the same source location. Our Office recommends that the excavated material from the detention basins be used for the construction of the on and off ramps and the embankments. At this moment, it is unknown to this Office the amount that will be excavated from the proposed detention basins.

9.2 Grading Factors

Grading factors cannot be determined at this time since borrow areas have not been selected.

9.3 Embankments and Fills

The 2(H):1(V) side slopes proposed for the embankment fill will be adequate for the construction of the embankment fill.

As stated in Section 8.2 calculated immediate settlement for these fills at their maximum height, which will occur during construction, will be as much as 4 inches. The settlement may occur in the foundations materials where the embankment height is greater than 10

feet. Our Office recommends adjusting the calculated volumes for the embankment and ramps fill accordingly.

10 Construction Considerations

Conventional excavation equipment such as excavators is sufficient to excavate surficial soil, deeper soil material, and known fill materials present within the project limits.

10.1 Embankment

The foundation materials of the proposed eastern embankment are characterized by a 4 to 6 feet thick clay layer located from station 60+10 to 67+00 approximately and it overlays a layer of variable thickness of silt and sand. The cohesive material may produce undesirable settlements in the embankment and off and on ramps; and to prevent this from happening, our Office recommends that a 30-day waiting period be implemented after the construction of the embankment and ramps is complete.

9. Project Information

The recommendations contained in this report are based on specific project information regarding structure type, location, and design loads. If any conceptual changes are made during final project design, the Office of Geotechnical Design - North should review those changes to determine if these foundation recommendations are still applicable

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

Data and information attached with the project plans are:

1. *None*

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

A. *Geotechnical Design Report for 99/113 IC, dated August 26, 2011*

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

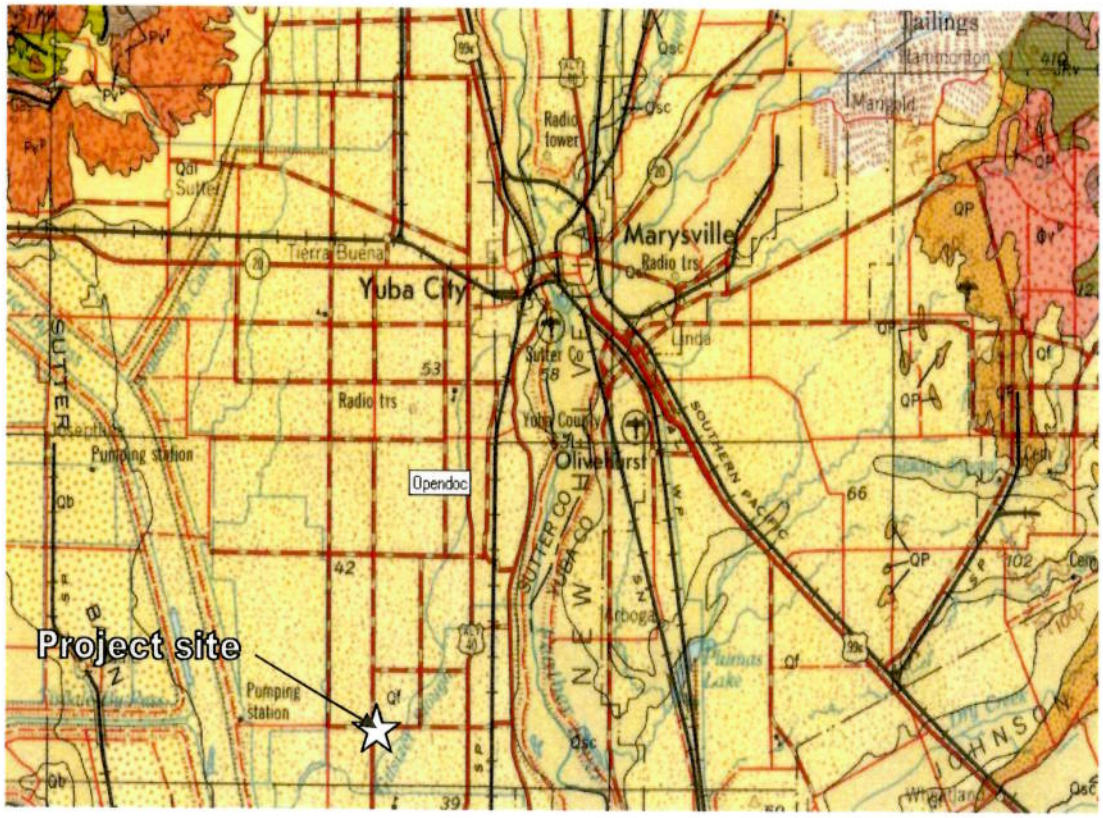
A. *None*

If you have any questions or comments, please call Luis Paredes-Mejia at (916) 227-1081 or Douglas Brittsan at (916) 227-1079.

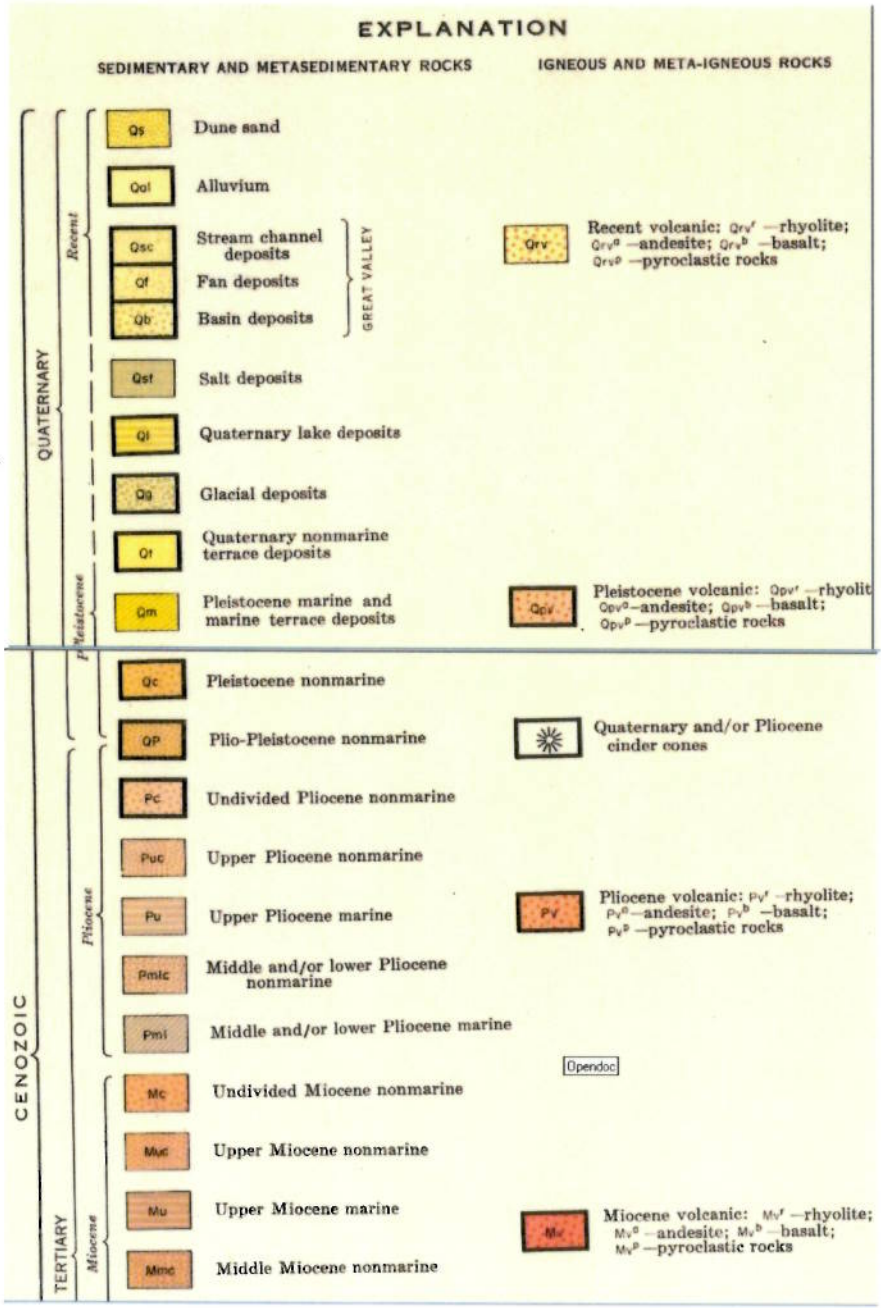
LUIS M. PAREDES-MEJIA
Engineering Geologist, CEG 2329
Geotechnical Design – North, Branch C

C: Darold Heinkens (D3-PM) (e-copy)
Mark William, GS Corporate
D3 Construction Pending Files
Joe Peterson D3-DME
Mark Hagy, (OGDN)
OGDN File

CALTRANS Division of Engineering Services Geotechnical Services Geotechnical Design – North	Project ID: 03-00000207	**Vicinity Map**	
	03-SUT-99-PM 33.7/33.9 99/113 Interchange		Figure 1



CALTRANS Division of Engineering Services Geotechnical Services Geotechnical Design – North	Project ID: 03-00000207	**Geologic Map**	
	03-SUT-99-PM 33.7/33.9 **99/113 Interchange**		**Figure 2**

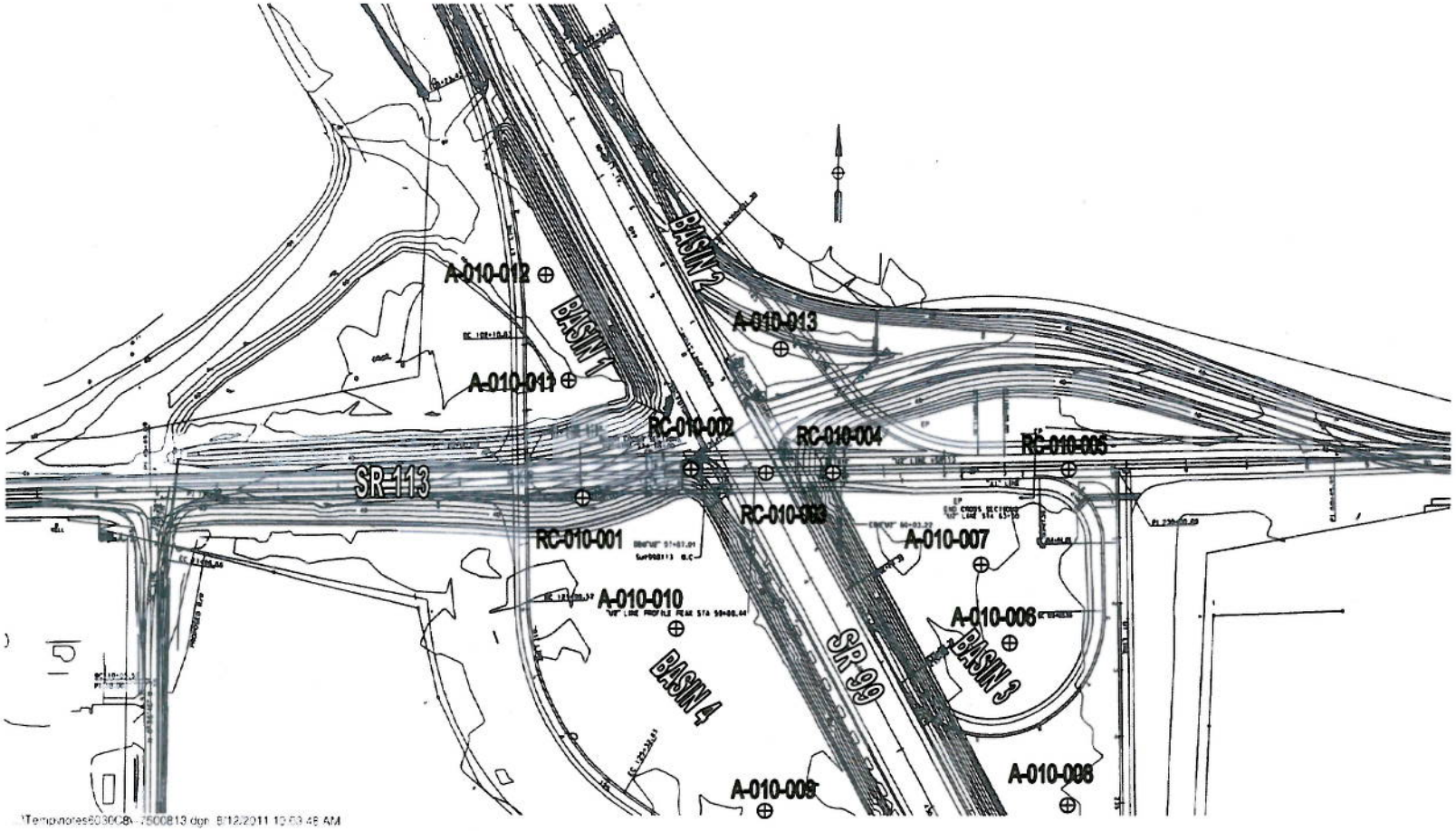


CALTRANS Division of Engineering Services Geotechnical Services Geotechnical Design – North	Project ID: 03-00000207	**Geologic Map Legend**
	03-SUT-99-PM 33.7/33.9 **99/113 Interchange**	**Figure 3**

Soil Map Legend

124 - Conejo loam, 0 to 2 percent slopes
125 - Conejo loam siltstone, 0 to 2 percent slopes
143 - Marcus-Gridley clay loam, 0 to 1 percent slopes
153 - Oswald clay. 0 to 2 percent slopes

CALTRANS Division of Engineering Services Geotechnical Services Geotechnical Design – North	Project ID: 03-00000207	**Soils Map**
	03-SUT-99-PM 33.7/33.9 99/113 Interchange	Figure 4



Caltrans CALTRANS Division of Engineering Services Geotechnical Services Geotechnical Design – North	Project ID: 03-00000207	**Boring Location Map**	
	03-SUT-99-PM 33.7/33.9 **99/113 Interchange**		**Figure 5**

CALTRANS Division of Engineering Services Geotechnical Services Geotechnical Design – North	Project ID: 03-00000207	**Seismic Map**	
	03-SUT-99-PM 33.7/33.9 99/113 Interchange		Figure 6

APPENDICES

A. BORING RECORDS

B. SOIL LABORATORY TEST RESULTS

APPENDIX A

BORING RECORDS

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
Luis Paredes	9-21-11	9-21-10	NAD83	RC-010-001
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			242.3' Lt Sta 1056+22.8 R99 "D1" LINE	38.12 ft NGVD29
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wire-Line			Mobile B47	4.5 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT AND PUNCH CORE			automatic	1.13%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING / AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
			30.0 ft on 9-27-11	71.5 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0														
	1		SANDY SILT (ML); medium dense; light yellowish brown; dry; some fine SAND; mostly nonplastic fines; Trace clay.		1	4 10 11	21								
36.12	2		Lean CLAY (CL); hard; brown; moist; little fine SAND; mostly medium plasticity fines; well indurated.												
	3				2	4 10 16	26					PP = >4.5,>4.5,>4.5			PA, PI
34.12	4														
	5				3	10 50 >50/2"									PA, PI
32.12	6		SILT (ML); medium dense; brown; moist; some fine SAND; mostly medium plasticity fines.												
	7				4	7 9 11	20								PA, PI
30.12	8		SILT with SAND (ML); loose; yellowish brown; moist; little fine SAND; mostly medium plasticity fines.												
	9				5	2 2 6	8								PA, PI
28.12	10		Medium dense.												
	11				6	6 13 11	24					PP = >4.5, >4.5			PA, PI
26.12	12		SANDY SILT (ML); brown; moist; some fine SAND; mostly low plasticity fines.												
	13														
24.12	14														
	15														
	16		SILT (ML); medium dense; yellowish brown; moist; few fine SAND; mostly medium to high plasticity fines; micaceous.		7	2 4 8	12					PP = 1			PA, PI
22.12	17				7A							PP = >4.5, >4.5			
	18														
20.12	19														
	20				8	4 6 11	17								PA, PI
18.12	21														
	22				8A							PP = 4, 4			
16.12	23														
	24														
14.12	25		SILTY SAND (SM); medium dense; dark grayish brown;												

(continued)

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

REPORT TITLE				HOLE ID
BORING RECORD				RC-010-001
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	Sutter	99	R33.7/R33.9	03-03-1A4613
PROJECT OR BRIDGE NAME				
99/113 INTERCHANGE				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
NEW	Luis Paredes			1 of 3

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	25		moist; mostly fine SAND; some nonplastic fines.		9	4 6 9	15								
12.12	26		SILTY SAND (SM); medium dense; olive gray; moist; mostly fine SAND; little nonplastic fines; micaceous.												
	27														
10.12	28														
	29														
8.12	30				10	6 7 7	14								PA
	31														
6.12	32														
	33														
4.12	34														
	35		SANDY lean CLAY (CL); very stiff to hard; brown to greenish gray; moist; some fine SAND; mostly low to medium plasticity fines; moderate to strong cementation; cemented with calcite.		11	6 13 23	36					PP = 4			
2.12	36														
	37				11A							PP = 2,2,3,1.5			PA, PI
0.12	38														
	39														
-1.88	40		CLAYEY SAND (SC); medium dense; olive gray; moist; mostly fine SAND; some fines.		12	7 17 22	39					PP = 4, >4.5, >4.5			
	41		SANDY lean CLAY (CL); hard; dark greenish gray; moist; little fine SAND; mostly low to medium plasticity fines.												
-3.88	42				12A							PP = 3.5, 4, 3.5			
	43														
-5.88	44														
	45														
-7.88	46		SILT (ML); medium dense; dark greenish gray; moist; trace fine SAND; mostly low plasticity fines; micaceous.		13	5 9 14	23					PP = 1			
	47		Fat CLAY (CH); hard; dark greenish gray; moist; trace fine SAND; mostly medium to high plasticity fines; faded laminations.												
-9.88	48														
	49														
-11.88	50				14	10 12 16	28					PP = >4.5			PA, PI
	51														
-13.88	52				14A							PP = 4, 3.5, 2.5			
	53														
-15.88	54		SILTY SAND (SM); medium dense; dark greenish gray; moist; mostly fine SAND; some low plasticity fines; trace												
	55														

(continued)

CALTRANS BORING RECORD MET+ENG FIXED 03-SUT-99-PM33.7HWY113-99INTER.GPJ CALTRANS LIBRARY 040808.GLB 9/8/11

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

REPORT TITLE				HOLE ID
BORING RECORD				**RC-010-001**
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	**Sutter**	**99**	**R33.7/R33.9**	**03-03-1A4613**
PROJECT OR BRIDGE NAME				
99/113 INTERCHANGE				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
NEW	**Luis Paredes**			**2 of 3**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	55		clay, micaceous. SILTY SAND (SM) *(continued)*.		15	6 7 11	18								PA
-17.88	56														
	57		SANDY SILT (ML); stiff; greenish gray; moist; some fine SAND; mostly low to medium plasticity fines; micaceous.		15A							PP = 3.5, 3.5			
-19.88	58														
	59														
-21.88	60		Poorly graded SAND (SP); medium dense; dark greenish gray; moist; mostly fine SAND; trace fines; micaceous.		16	6 12 24	36								
	61														
-23.88	62		SANDY lean CLAY (CL); very stiff; dark greenish gray; moist; little fine SAND; mostly medium plasticity fines; micaceous.		15A							PP = 4, 3.5			
	63														
-25.88	64		SILTY SAND (SM); medium dense; dark greenish gray; moist; mostly fine SAND; trace nonplastic fines; micaceous.												
	65				17	10 12 9	21								PA
-27.88	66														
	67		SILT (ML); medium dense; dark greenish gray; moist; mostly medium plasticity fines; few clay.		17A							PP = 4,4.5,3			
-29.88	68		SANDY lean CLAY (CL); very stiff; dark greenish gray; moist; little fine SAND; mostly medium plasticity fines; micaceous.												
	69		Poorly graded SAND (SP); dense; dark greenish gray; moist; mostly fine SAND; few nonplastic fines; trace clay, micaceous.												
-31.88	70				18	12 20 20	40								
	71														
-33.88	72		Bottom of borehole at 71.5 ft bgs ABANDONED WITH BENTONITE PELLETS TO TOP												
	73														
-35.88	74														
	75														
-37.88	76														
	77														
-39.88	78														
	79														
-41.88	80														
	81														
-43.88	82														
	83														
-45.88	84														
	85														

CALTRANS BORING RECORD MET+ENG FIXED 03-SUT-99-PM33 7HWY113-99INTER.GPJ CALTRANS LIBRARY 040808 GLB 9/8/11

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

REPORT TITLE				HOLE ID
BORING RECORD				**RC-010-001**
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	**Sutter**	**99**	**R33.7/R33.9**	**03-03-1A4613**
PROJECT OR BRIDGE NAME				
99/113 INTERCHANGE				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
NEW	**Luis Paredes**			**3 of 3**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
Luis Paredes	9-7-10	9-7-10	NAD83	RC-010-005
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			263.6' Rt Sta 1053+99.6 R99 "D1" LINE	38.78 ft NGVD29
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wire-Line			Acker AD2	4.5 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT AND PUNCH CORE			automatic	1.13%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
				71.5 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0														
	1		Lean CLAY (CL); stiff; brown to yellowish brown; dry to moist; mostly medium plasticity fines; few silt, indurated..		1	9 4 4	8					PP = 3.5, >4.5			PA, PI
36.78	2														
	3		SILT with SAND (ML); medium dense; yellowish brown; moist; trace fine GRAVEL; little fine SAND; mostly nonplastic fines.		2	11 10 12	22								
34.78	4														
	5				3	8 21 24	45								PA, PI
32.78	6														
	7				4	8 11 16	27								
30.78	8														
	9		Poorly graded SAND (SP); dense; grayish brown; moist; few fine, subrounded GRAVEL; mostly coarse to medium SAND.		5	10 17 24	41								PA
28.78	10		SILT with SAND (ML); stiff; yellowish brown; moist; little fine SAND; mostly medium plasticity fines; moderate cementation.		6A										PA, PI
	11														
26.78	12		Lean CLAY with SAND (CL); stiff; yellowish brown to brown; moist; little fine SAND; mostly medium plasticity fines; indurated.		6B										PA, PI
	13														
24.78	14														
	15		SILTY SAND (SM); medium dense; yellowish brown; moist; mostly fine GRAVEL; little fine SAND; mostly nonplastic fines.		7										C, DS, PA, PI
22.78	16														
	17				8	5 8 11	19								
20.78	18														
	19														
18.78	20				9	6 7 8	15								PA
	21														
16.78	22				10										CR
	23														
14.78	24														
	25		Poorly graded SAND (SP); medium dense; olive gray; moist; few fine, subangular GRAVEL; mostly coarse to												

(continued)

CALTRANS BORING RECORD MET+ENG FIXED 03-SUT-99-PM33.7HWY113-99INTER.GPJ CALTRANS LIBRARY 040808.GLB 9/8/11

Department of Transportation
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Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE				HOLE ID
BORING RECORD				RC-010-005
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	Sutter	99	R33.7/R33.9	03-03-1A4613
PROJECT OR BRIDGE NAME				
99/113 INTERCHANGE				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
NEW	Luis Paredes			1 of 3

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	25		medium, subrounded SAND; little nonplastic fines. Poorly graded SAND (SP)*(continued)*.		11	4 4 6	10								
12.78	26														
	27				12										PA
10.78	28														
	29														
8.78	30		Poorly graded GRAVEL with SAND (GP); medium dense; grayish green; moist; mostly fine, subangular GRAVEL; some coarse to medium, subrounded SAND; fragments are volcanic and quartz..		13	7 11 16	27								
	31		Fat CLAY (CH); very stiff; bluish gray; moist; mostly high plasticity fines; weak to moderate cementation; well indurated.												
6.78	32		SILTY SAND (SM); medium dense; bluish gray; moist; mostly fine SAND; little nonplastic fines.		14							PP = 3.5, 4, 4.5			C, DS, PA, PI
	33														
4.78	34														
	35				15	10 13 16	29								
2.78	36		SANDY lean CLAY (CL); very stiff; dark greenish gray; moist; some fine SAND; mostly medium plasticity fines; indurated, micaceous.		16										PA, PI
	37														
0.78	38														
	39		Fat CLAY (CH); very stiff; dark greenish gray; moist; little fine SAND; mostly medium plasticity fines.												
-1.22	40		SANDY SILT (ML); very stiff; dark greenish gray; moist; some fine SAND; mostly nonplastic fines; trace clay.		17	9 10 13	23								
	41														
-3.22	42				18										
	43		SILTY SAND (SM); medium dense; dark greenish gray; moist; mostly fine SAND; some nonplastic fines; trace clay.												
-5.22	44		SANDY fat CLAY (CH); very stiff; dark greenish gray; moist; some fine SAND; mostly medium plasticity fines; well indurated.												PA, PI
	45														
-7.22	46		Lean CLAY with SAND (CL); very stiff; dark greenish gray; moist; little fine SAND; mostly medium plasticity fines.		19	13 15 16	31					PP = 3.5, 4			
	47				20							PP = 3.5, 4, 0.5			PA, PI
-9.22	48														
	49		Soft.												
-11.22	50		Stiff.		21	5 7 9	16					PP = 0.5, 0.5, 2, 2.5, 2			
	51				22										
-13.22	52		SILT with SAND (ML); stiff; dark greenish gray; moist; little fine SAND; mostly low plasticity fines; laminated.												PA, PI
	53														
-15.22	54														
	55														

(continued)

CALTRANS BORING RECORD MET+ENG FIXED 03-SUT-99-PM33.7HWY113-99INTER.GPJ CALTRANS LIBRARY 040808.GLB 9/8/11

Department of Transportation
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Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE: **BORING RECORD**

HOLE ID: **RC-010-005**

DIST.	COUNTY	ROUTE	POSTMILE	EA
03	Sutter	99	R33.7/R33.9	03-03-1A4613

PROJECT OR BRIDGE NAME: **99/113 INTERCHANGE**

BRIDGE NUMBER	PREPARED BY	DATE	SHEET
NEW	Luis Paredes		2 of 3

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	55		SILTY SAND (SM); medium dense; dark greenish gray; moist; mostly fine SAND; mostly nonplastic fines; micaceous.		23	5 11 14	25								
-17.22	56														
	57														
-19.22	58														
	59														
-21.22	60				24	8 9 13	22								
	61														
-23.22	62				25										CR
	63														
-25.22	64														
	65				26	10 12 13	25								
-27.22	66														
	67				27										PA
-29.22	68														
	69														
-31.22	70				28	14 11 15	26								
	71		Bottom of borehole at 71.5 ft bgs ABANDONED WITH BENTONITE PELLETS TO TOP												
-33.22	72														
	73														
-35.22	74														
	75														
-37.22	76														
	77														
-39.22	78														
	79														
-41.22	80														
	81														
-43.22	82														
	83														
-45.22	84														
	85														

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Department of Transportation
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Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE				HOLE ID
BORING RECORD				**RC-010-005**
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	**Sutter**	**99**	**R33.7/R33.9**	**03-03-1A4613**
PROJECT OR BRIDGE NAME				
99/113 INTERCHANGE				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
NEW	**Luis Paredes**			**3 of 3**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
Luis Paredes	9-20-10	9-20-10	NAD83	A-010-006
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			222.3' Rt Sta 1051+64 R99 "D1" LINE	37.80 ft NGVD29
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Solid-Stem Auger			Mobile B47	6.5 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
BULK				
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER DURING DRILLING AFTER DRILLING (DATE) READINGS	TOTAL DEPTH OF BORING 4.5 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0														
	1		CLAYEY SILT (ML/CL); yellowish brown; dry to moist; some fine SAND; mostly fines.		1										PA, PI
35.80	2														
	3				2										PA, PI
33.80	4														
	5		Bottom of borehole at 4.5 ft bgs SLOTTED PIPE WAS INSTALLED FOR PERCOLATION TEST. STICK OUT ABOUT 1.0 FT. PROTECTIVE CASING WITH LOCK WAS INSTALLED.												
31.80	6														
	7														
29.80	8														
	9														
27.80	10														
	11														
25.80	12														
	13														
23.80	14														
	15														
21.80	16														
	17														
19.80	18														
	19														
17.80	20														
	21														
15.80	22														
	23														
13.80	24														
	25														

CALTRANS BORING RECORD MET+ENG FIXED 03-SUT-99-PM33.7HWY113-99INTER.GPJ CALTRANS LIBRARY 040808.GLB 8/30/11

Department of Transportation
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Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE				HOLE ID
BORING RECORD				A-010-006
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	Sutter	99	R33.7/R33.9	03-03-1A4613
PROJECT OR BRIDGE NAME				
99/113 INTERCHANGE				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
NEW	Luis Paredes			1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
Luis Paredes	9-20-10	9-20-10	NAD83	A-010-007
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			168.7' Rt Sta 1053+24.7 R99 "D1" LINE	38.20 ft NGVD29
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Solid-Stem Auger			Mobile B47	6.5 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
BULK				
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER DURING DRILLING AFTER DRILLING (DATE) READINGS	TOTAL DEPTH OF BORING 4.5 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		SANDY SILT (ML); dark yellowish brown; some fine SAND; mostly low plasticity fines; few clay.		1										PA, PI
36.20	2														
34.20	4														
	5		Bottom of borehole at 4.5 ft bgs SLOTTED PIPE WAS INSTALLED FOR PERCOLATION TEST. STICK OUT ABOUT 1.0 FT. PROTECTIVE CASING WITH LOCK WAS INSTALLED.												
32.20	6														
30.20	8														
28.20	10														
26.20	12														
24.20	14														
22.20	16														
20.20	18														
18.20	20														
16.20	22														
14.20	24														
	25														

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Office of Geotechnical Design - North

REPORT TITLE				HOLE ID
BORING RECORD				A-010-007
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	Sutter	99	R33.7/R33.9	03-03-1A4613
PROJECT OR BRIDGE NAME				
99/113 INTERCHANGE				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
NEW	Luis Paredes			1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
Luis Paredes	9-20-10	9-20-10	NAD83	A-010-008
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			108.43' Rt Sta 1048+58.9 R99 "D1" LINE	37.86 ft NGVD29
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Solid-Stem Auger			Mobile B47	6.5 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
BULK				
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER DURING DRILLING AFTER DRILLING (DATE) READINGS	TOTAL DEPTH OF BORING
				4.5 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		SANDY SILT (ML); yellowish brown; dry; little fine SAND; mostly nonplastic fines; trace clay.		1										PA, PI
35.86	2														
	3		Light yellowish brown.		2										PA, PI
33.86	4														
	5		Bottom of borehole at 4.5 ft bgs SLOTTED PIPE WAS INSTALLED FOR PERCOLATION TEST. STICK OUT ABOUT 1.0 FT. PROTECTIVE CASING WITH LOCK WAS INSTALLED.												
31.86	6														
	7														
29.86	8														
	9														
27.86	10														
	11														
25.86	12														
	13														
23.86	14														
	15														
21.86	16														
	17														
19.86	18														
	19														
17.86	20														
	21														
15.86	22														
	23														
13.86	24														
	25														

CALTRANS BORING RECORD MET+ENG FIXED 03-SUT-99-PM33.7HWY113-99INTER.GPJ CALTRANS LIBRARY 040808.GLB 8/30/11

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REPORT TITLE				HOLE ID
BORING RECORD				A-010-008
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	Sutter	99	R33.7/R33.9	03-03-1A4613
PROJECT OR BRIDGE NAME				
99/113 INTERCHANGE				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
NEW	Luis Paredes			1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
Luis Paredes	9-20-10	9-20-10	NAD83	A-010-009
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			174.7' Lt Sta 1049+62.5 R99 "D1" LINE	38.06 ft NGVD29
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Solid-Stem Auger			Mobile B47	6.5 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
BULK				
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER DURING DRILLING AFTER DRILLING (DATE) READINGS	TOTAL DEPTH OF BORING 4.5 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0														
	1		SANDY SILT (ML); dark yellowish brown; moist; little fine SAND; mostly nonplastic fines.		1										PA, PI
36.06	2														
	3				2										PA, PI
34.06	4														
	5		Bottom of borehole at 4.5 ft bgs SLOTTED PIPE WAS INSTALLED FOR PERCOLATION TEST. STICK OUT ABOUT 1.0 FT. PROTECTIVE CASING WITH LOCK WAS INSTALLED.												
32.06	6														
	7														
30.06	8														
	9														
28.06	10														
	11														
26.06	12														
	13														
24.06	14														
	15														
22.06	16														
	17														
20.06	18														
	19														
18.06	20														
	21														
16.06	22														
	23														
14.06	24														
	25														

CALTRANS BORING RECORD MET+ENG FIXED 03-SUT-99-PM33.7HWY113-99INTER.GPJ CALTRANS LIBRARY 040808 GLB 8/30/11

Department of Transportation
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Office of Geotechnical Design - North

REPORT TITLE				HOLE ID
BORING RECORD				A-010-009
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	Sutter	99	R33.7/R33.9	03-03-1A4613
PROJECT OR BRIDGE NAME				
99/113 INTERCHANGE				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
NEW	Luis Paredes			1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
Luis Paredes	9-20-10	9-20-10	NAD83	A-010-010
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			236.7' Lt Sta 1055+16.5 R99 "D1" LINE	38.29 ft NGVD29
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Solid-Stem Auger			Mobile B47	6.5 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
BULK				
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER DURING DRILLING AFTER DRILLING (DATE) READINGS	TOTAL DEPTH OF BORING 4.5 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		SANDY SILT (ML); yellowish brown; moist; some fine SAND; mostly fines; few clay.												PA, PI
36.29	2														
	3														PA, PI
34.29	4														
	5		Bottom of borehole at 4.5 ft bgs SLOTTED PIPE WAS INSTALLED FOR PERCOLATION TEST. STICK OUT ABOUT 1.0 FT. PROTECTIVE CASING WITH LOCK WAS INSTALLED.												
32.29	6														
	7														
30.29	8														
	9														
28.29	10														
	11														
26.29	12														
	13														
24.29	14														
	15														
22.29	16														
	17														
20.29	18														
	19														
18.29	20														
	21														
16.29	22														
	23														
14.29	24														
	25														

Department of Transportation
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Office of Geotechnical Design - North

REPORT TITLE				HOLE ID
BORING RECORD				A-010-010
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	Sutter	99	R33.7/R33.9	03-03-1A4613
PROJECT OR BRIDGE NAME				
99/113 INTERCHANGE				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
NEW	Luis Paredes			1 of 1

CALTRANS BORING RECORD MET+ENG FIXED 03-SUT-99-PM33.7HWY113-99INTER GPJ CALTRANS LIBRARY 040808.GLB 8/30/11

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
Luis Paredes	9-20-10	9-20-10	NAD83	A-010-011
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			179.92' Lt Sta 1057+96.7 R99 "D1" LINE	37.36 ft NGVD29
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Solid-Stem Auger			Mobile B47	6.5 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
BULK				
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER DURING DRILLING AFTER DRILLING (DATE) READINGS	TOTAL DEPTH OF BORING
				4.5 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0														
	1		SANDY SILT (ML); light yellowish brown; dry; some fine SAND; mostly fines; few clay.		1										PA, PI
35.36	2														
	3		Yellowish brown; moist.		2										PA, PI
33.36	4														
	5		Bottom of borehole at 4.5 ft bgs SLOTTED PIPE WAS INSTALLED FOR PERCOLATION TEST. STICK OUT ABOUT 1.0 FT. PROTECTIVE CASING WITH LOCK WAS INSTALLED.												
31.36	6														
	7														
29.36	8														
	9														
27.36	10														
	11														
25.36	12														
	13														
23.36	14														
	15														
21.36	16														
	17														
19.36	18														
	19														
17.36	20														
	21														
15.36	22														
	23														
13.36	24														
	25														

CALTRANS BORING RECORD MET+ENG FIXED 03-SUT-99-PM33.7HWY113-99INTER.GPJ CALTRANS LIBRARY 040808.GLB 8/30/11

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

REPORT TITLE				HOLE ID
BORING RECORD				A-010-011
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	Sutter	99	R33.7/R33.9	03-03-1A4613
PROJECT OR BRIDGE NAME				
99/113 INTERCHANGE				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
NEW	Luis Paredes			1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
Luis Paredes	9-20-10	9-20-10	NAD83	A-010-012
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			147.5' Lt Sta 1060+58.8 R99 "D1" LINE	37.14 ft NGVD29
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Solid-Stem Auger			Mobile B47	6.5 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
BULK				
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER DURING DRILLING AFTER DRILLING (DATE) READINGS	TOTAL DEPTH OF BORING
				4.5 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0														
	1		SANDY lean CLAY (CL); yellowish brown; dry to moist; some fine SAND; mostly fines.		1										PA, PI
35.14	2														
	3		Light yellowish brown.		2										PA, PI
33.14	4														
	5		Bottom of borehole at 4.5 ft bgs SLOTTED PIPE WAS INSTALLED FOR PERCOLATION TEST. STICK OUT ABOUT 1.0 FT. PROTECTIVE CASING WITH LOCK WAS INSTALLED.												
31.14	6														
	7														
29.14	8														
	9														
27.14	10														
	11														
25.14	12														
	13														
23.14	14														
	15														
21.14	16														
	17														
19.14	18														
	19														
17.14	20														
	21														
15.14	22														
	23														
13.14	24														
	25														

CALTRANS BORING RECORD MET+ENG FIXED 03-SUT-99-PM33.7HWY113-99INTER.GPJ CALTRANS LIBRARY 040808.GLB 8/30/11

Department of Transportation
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REPORT TITLE				HOLE ID
BORING RECORD				A-010-012
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	Sutter	99	R33.7/R33.9	03-03-1A4613
PROJECT OR BRIDGE NAME				
99/113 INTERCHANGE				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
NEW	Luis Paredes			1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
Luis Paredes	9-20-10	9-20-10	NAD83	A--010-013
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			111.5' Rt Sta 1057+32.5 R99 "D1" LINE	44.88 ft NGVD29
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Solid-Stem Auger			Mobile B47	6.5 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
BULK				
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER DURING DRILLING AFTER DRILLING (DATE) READINGS	TOTAL DEPTH OF BORING
				4.5 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		SILTY SAND (SM); yellowish brown; moist; mostly fine SAND; little nonplastic fines.		1										PA, PI
42.88	2														
	3				2										PA, PI
40.88	4		Dark brown.												
	5		Bottom of borehole at 4.5 ft bgs SLOTTED PIPE WAS INSTALLED FOR PERCOLATION TEST. STICK OUT ABOUT 1.0 FT. PROTECTIVE CASING WITH LOCK WAS INSTALLED.												
38.88	6														
	7														
36.88	8														
	9														
34.88	10														
	11														
32.88	12														
	13														
30.88	14														
	15														
28.88	16														
	17														
26.88	18														
	19														
24.88	20														
	21														
22.88	22														
	23														
20.88	24														
	25														

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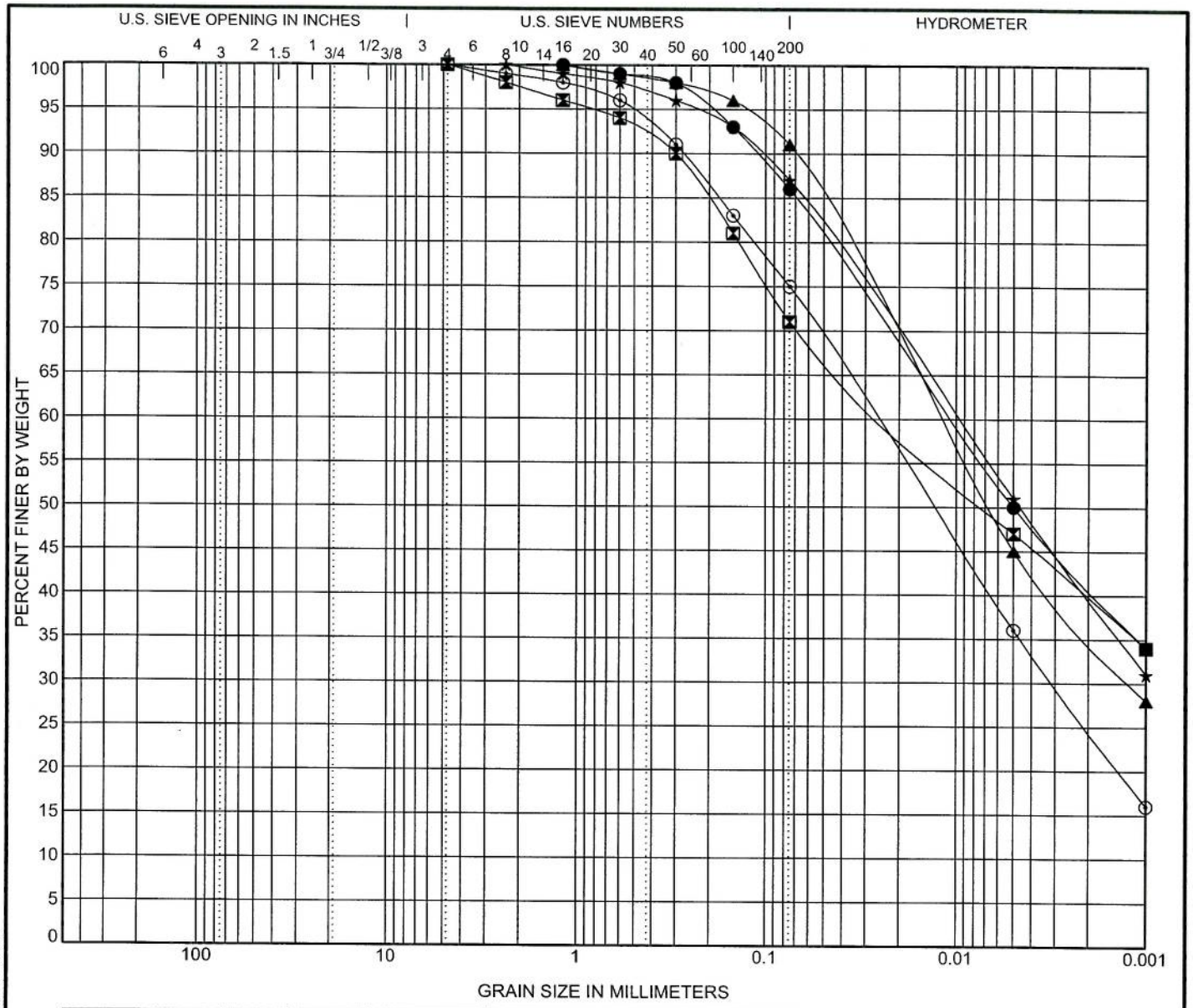
REPORT TITLE				HOLE ID
BORING RECORD				A--010-013
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	Sutter	99	R33.7/R33.9	03-03-1A4613
PROJECT OR BRIDGE NAME				
99/113 INTERCHANGE				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
NEW	Luis Paredes			1 of 1

APPENDIX B

SOIL LABORATORY TEST RESULTS

Boring Number	Sample Number	Sample Depth (ft)	Shear Test		Triaxial Test (Unconsolidated Undrained, one point)		Cation Exchange Capacity (CEC)			
			Cohesion (psf)	Angle of Friction Φ	Ver. Eff. Cons. Stress (psf)	Shear Strength (psf)	pH	Organic Content	Na (mg/kg)	meq Na/100g
RC-010-005	7-1	15.0	807	33.9						
RC-010-005	7-1	32.0	978	36.6						
RC-010-005	16	36.0			9998	11010				
RC-010-005	18	43.5			12000	3648				
A-010-006 thru A-010-008*	1	0.0 – 4.0					6.3	5.2	189	41

Note: Shear test (ASTM D 3080) , Unconsolidated Undrained Triaxial Test (ASTM d 2850). Organic Content, pH, Cation Exchange (EPA 9081). *Combined sample from borings R-010-006, R-010-007, and R-010-008.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	A-010-006	0.0	LEAN CLAY(CL)	34	17	17		
⊠	A-010-006	2.5	LEAN CLAY with SAND(CL)	32	17	15		
▲	A-010-007	0.0	LEAN CLAY(CL)	34	20	14		
★	A-010-008	0.0	SANDY SILT	33	18	15		
⊙	A-010-008	2.5	SANDY SILT	31	18	13		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	A-010-006	0.0	1.18	0.011			0.0	14.0	36.0	50.0
⊠	A-010-006	2.5	4.75	0.022			0.0	29.0	24.0	47.0
▲	A-010-007	0.0	1.18	0.012	0.001		0.0	9.0	46.0	45.0
★	A-010-008	0.0	2.36	0.01			0.0	13.0	36.0	51.0
⊙	A-010-008	2.5	4.75	0.026	0.003		0.0	25.0	39.0	36.0

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PROJECT OR BRIDGE NAME: 99/113 INTERCHANGE

BRIDGE NUMBER	PREPARED BY	DATE	SHEET
NEW	Luis Paredes		1 of 10

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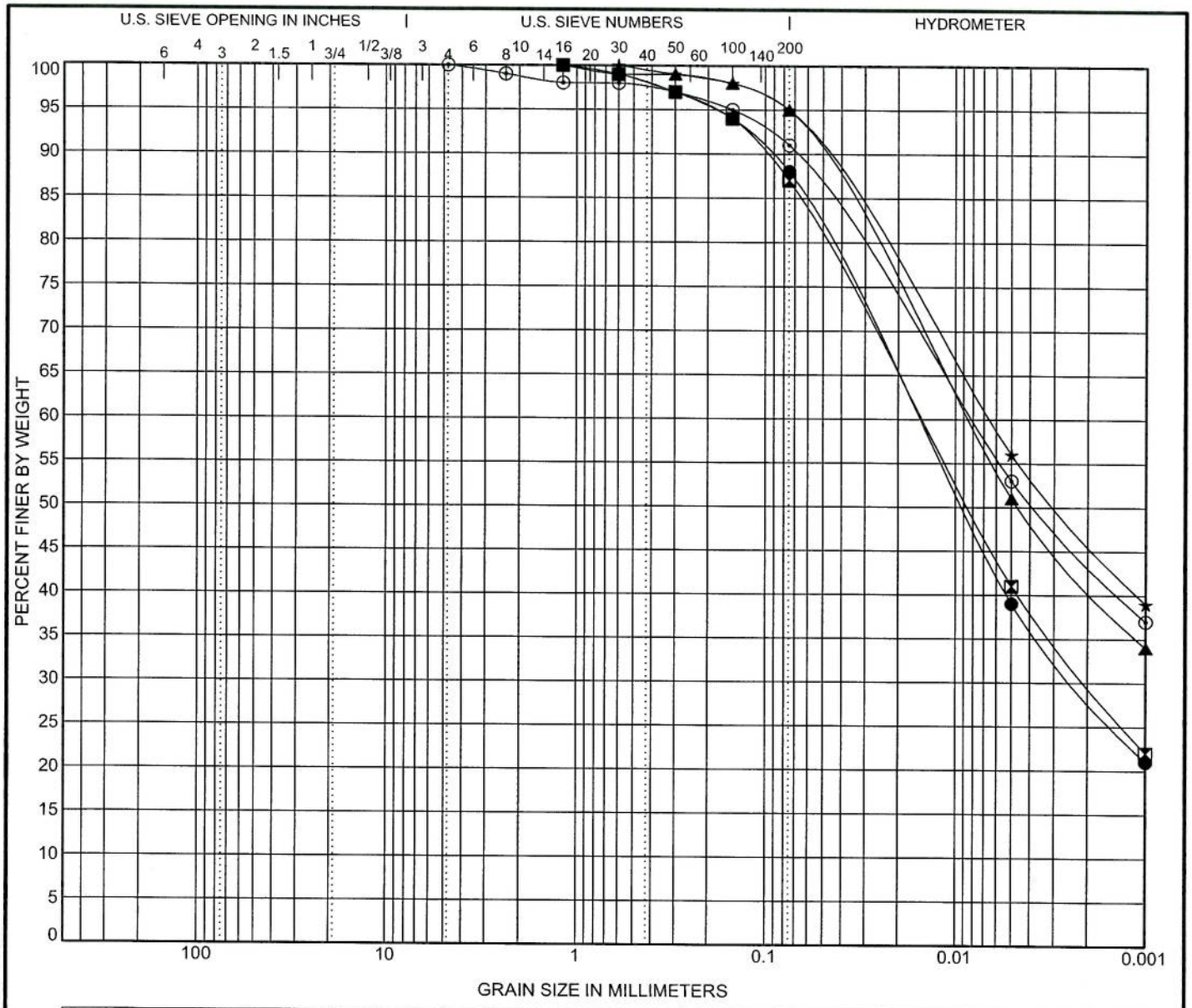

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	A-010-009	0.0	LEAN CLAY(CL)	31	18	13		
⊠	A-010-009	2.5	LEAN CLAY(CL)	33	17	16		
▲	A-010-010	0.0	SANDY SILT	40	19	21		
★	A-010-010	2.5	SANDY SILT	43	24	19		
⊙	A-010-011	0.0	SANDY SILT	39	19	20		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	A-010-009	0.0	1.18	0.016	0.002		0.0	12.0	49.0	39.0
⊠	A-010-009	2.5	1.18	0.015	0.002		0.0	13.0	46.0	41.0
▲	A-010-010	0.0	1.18	0.009			0.0	5.0	44.0	51.0
★	A-010-010	2.5	0.6	0.007			0.0	5.0	39.0	56.0
⊙	A-010-011	0.0	4.75	0.008			0.0	9.0	38.0	53.0

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DIST.	COUNTY	ROUTE	POSTMILE	EA
03	Sutter	99	R33.7/R33.9	03-03-1A4613

PROJECT OR BRIDGE NAME: **99/113 INTERCHANGE**

BRIDGE NUMBER	PREPARED BY	DATE	SHEET
NEW	Luis Paredes		2 of 10

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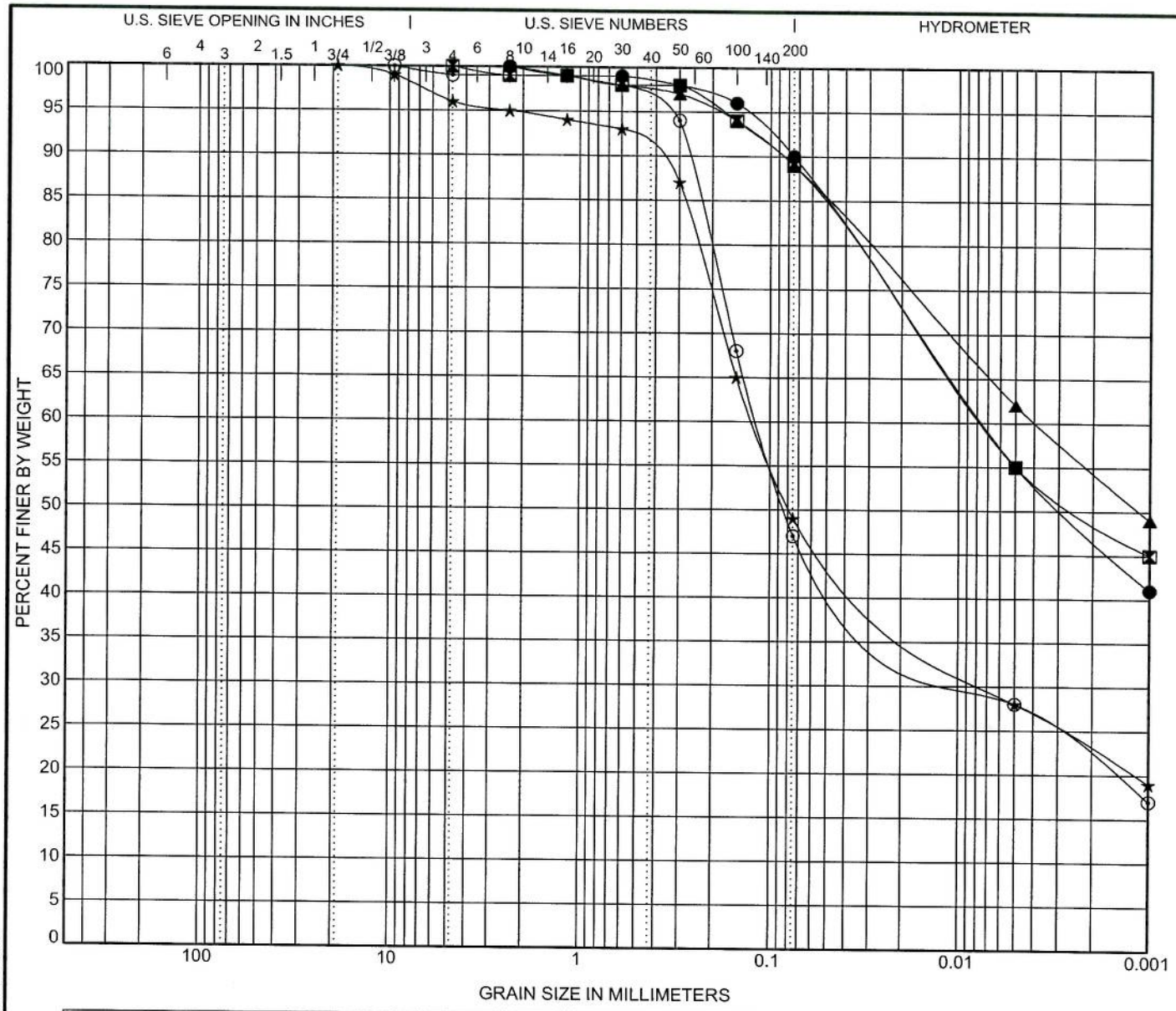

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	A-010-011	2.5	SANDY SILT	43	18	25		
⊠	A-010-012	0.0	LEAN CLAY(CL)	45	18	27		
▲	A-010-012	2.5	LEAN CLAY(CL)	41	17	24		
★	A--010-013	0.0	SILTY, CLAYEY SAND(SC-SM)	22	17	5		
⊙	A--010-013	2.5	CLAYEY SAND(SC)	22	5	17		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	A-010-011	2.5	2.36	0.007			0.0	10.0	35.0	55.0
⊠	A-010-012	0.0	4.75	0.007			0.0	11.0	34.0	55.0
▲	A-010-012	2.5	2.36	0.004			0.0	11.0	27.0	62.0
★	A--010-013	0.0	19	0.121	0.006		4.0	47.0	21.0	28.0
⊙	A--010-013	2.5	9.5	0.115	0.007		1.0	52.0	19.0	28.0

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PROJECT OR BRIDGE NAME: 99/113 INTERCHANGE

BRIDGE NUMBER	PREPARED BY	DATE	SHEET
NEW	Luis Paredes		3 of 10

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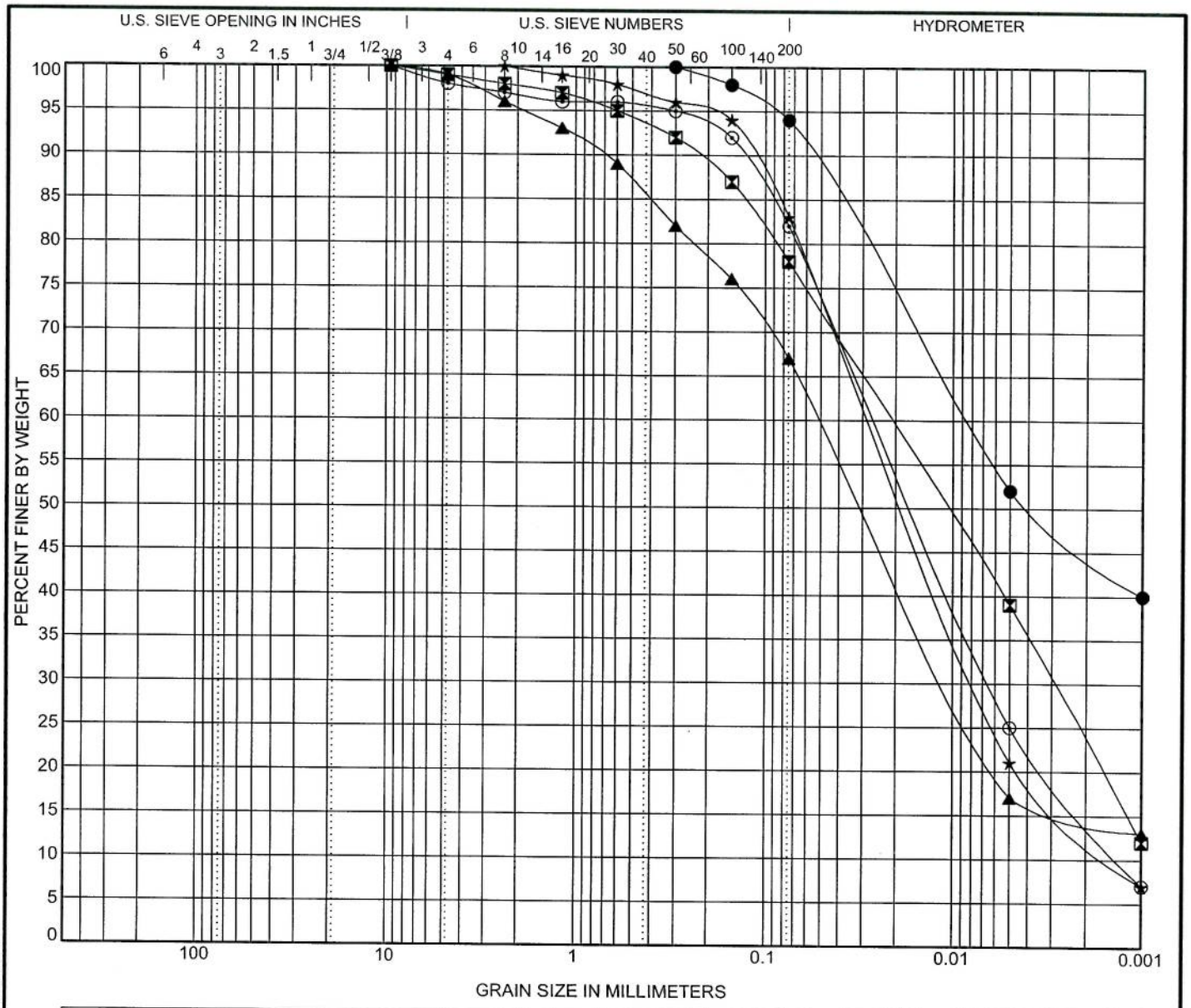

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	R-010-001	2.0	LEAN CLAY(CL)	48	19	29		
⊠	R-010-001	4.0	LEAN CLAY with SAND(CL)	32	19	13		
▲	R-010-001	6.0	SANDY LEAN CLAY(CL)	33	21	12		
★	R-010-001	8.0	LEAN CLAY with SAND(CL)	34	20	14	1.42	19.45
⊙	R-010-001	10.0	LEAN CLAY with SAND(CL)	34	20	14	1.17	20.17

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	R-010-001	2.0	0.3	0.008			0.0	6.0	42.0	52.0
⊠	R-010-001	4.0	9.5	0.021	0.003		1.0	21.0	39.0	39.0
▲	R-010-001	6.0	9.5	0.051	0.01		1.0	32.0	50.0	17.0
★	R-010-001	8.0	2.36	0.027	0.007	0.001	0.0	17.0	62.0	21.0
⊙	R-010-001	10.0	9.5	0.026	0.006	0.001	2.0	16.0	57.0	25.0

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DIST.	COUNTY	ROUTE	POSTMILE	EA
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PROJECT OR BRIDGE NAME: 99/113 INTERCHANGE

BRIDGE NUMBER	PREPARED BY	DATE	SHEET
NEW	Luis Paredes		4 of 10

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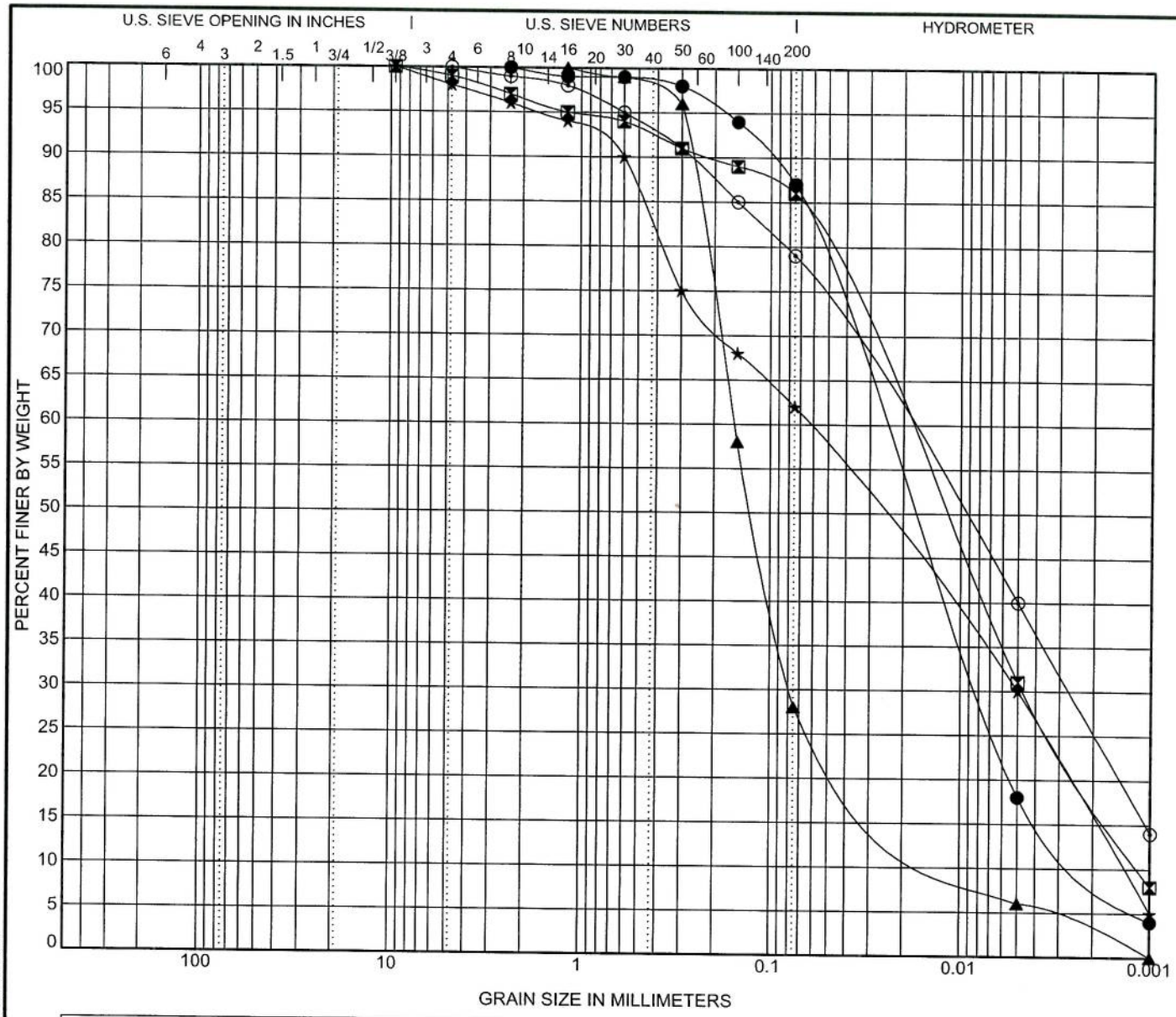

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification	LL	PL	PI	Cc	Cu
●	R-010-001	15.0	LEAN CLAY(CL)	32	22	10	1.24	13.04
⊠	R-010-001	20.0	SILT(ML)	40	26	14	0.91	18.13
▲	R-010-001	30.0					4.85	19.02
★	R-010-001	36.5	SANDY LEAN CLAY(CL)	39	18	21	0.29	45.89
⊙	R-010-001	50.0	FAT CLAY with SAND(CH)	51	26	25		

Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	R-010-001	15.0	2.36	0.026	0.008	0.002	0.0	13.0	69.0	18.0
⊠	R-010-001	20.0	9.5	0.021	0.005	0.001	1.0	13.0	55.0	31.0
▲	R-010-001	30.0	1.18	0.156	0.079	0.008	0.0	72.0	22.0	6.0
★	R-010-001	36.5	9.5	0.063	0.005	0.001	2.0	36.0	32.0	30.0
⊙	R-010-001	50.0	4.75	0.02	0.003		0.0	21.0	39.0	40.0

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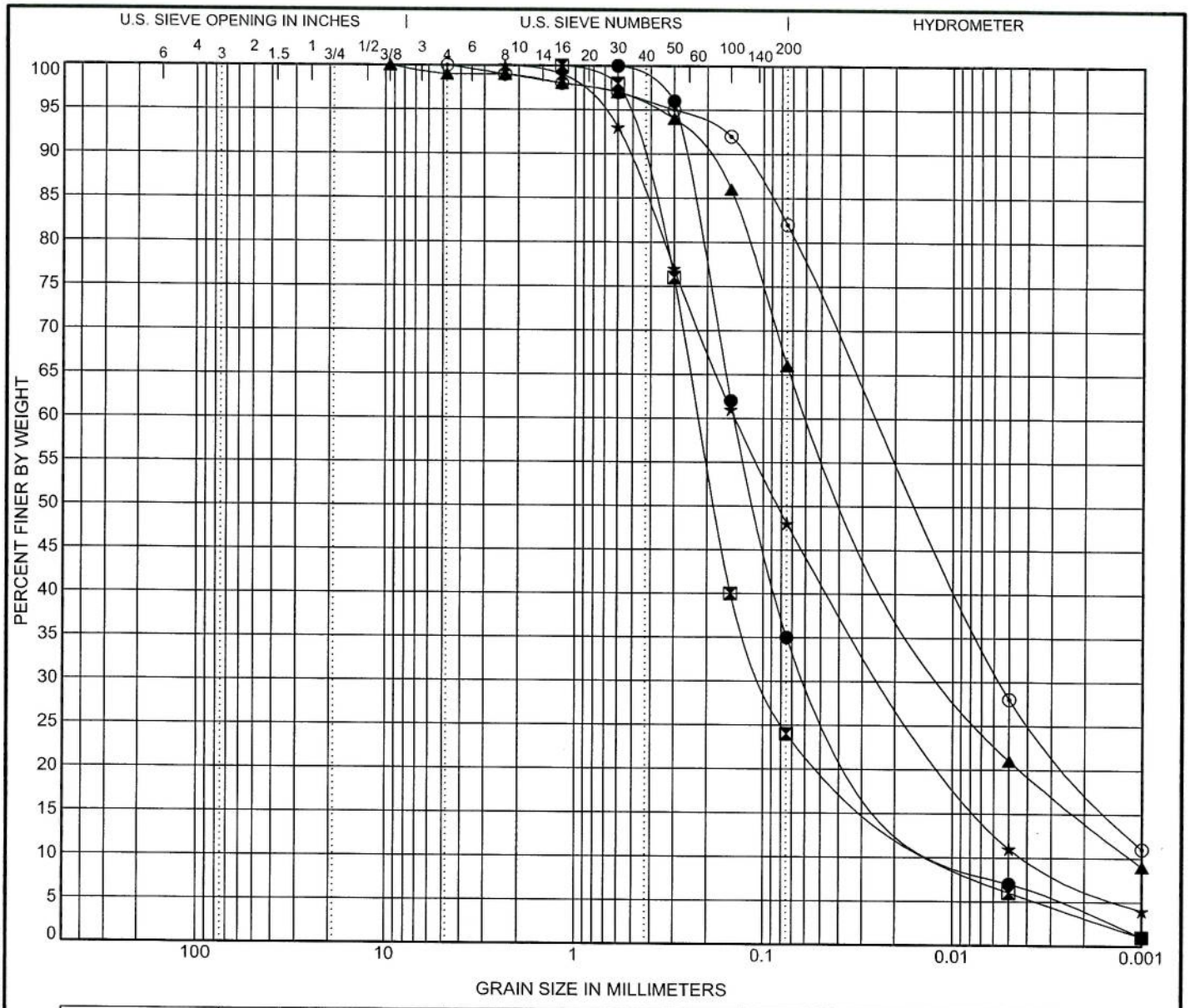
BRIDGE NUMBER	PREPARED BY	DATE	SHEET
NEW	Luis Paredes		5 of 10

CALTRANS GRAIN SIZE 03-SUT-99-PM33.7/HWY113-99INTER.GPJ CALTRANS LIBRARY 040808.GLB 8/30/11



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	R-010-001	55.0					2.25	21.32
⊠	R-010-001	65.0					4.70	24.15
▲	R-010-002	25.0	SILTY SAND				1.24	45.71
★	R-010-002	35.0	SILTY SAND				0.71	35.79
⊙	R-010-003	25.0	SILT					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	R-010-001	55.0	0.6	0.142	0.046	0.007	0.0	65.0	28.0	7.0
⊠	R-010-001	65.0	1.18	0.22	0.097	0.009	0.0	76.0	18.0	6.0
▲	R-010-002	25.0	9.5	0.052	0.009	0.001	1.0	33.0	45.0	21.0
★	R-010-002	35.0	2.36	0.142	0.02	0.004	0.0	52.0	37.0	11.0
⊙	R-010-003	25.0	4.75	0.025	0.006		0.0	18.0	54.0	28.0

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03	Sutter	99	R33.7/R33.9	03-03-1A4613

PROJECT OR BRIDGE NAME: 99/113 INTERCHANGE

BRIDGE NUMBER	PREPARED BY	DATE	SHEET
NEW	Luis Paredes		6 of 10

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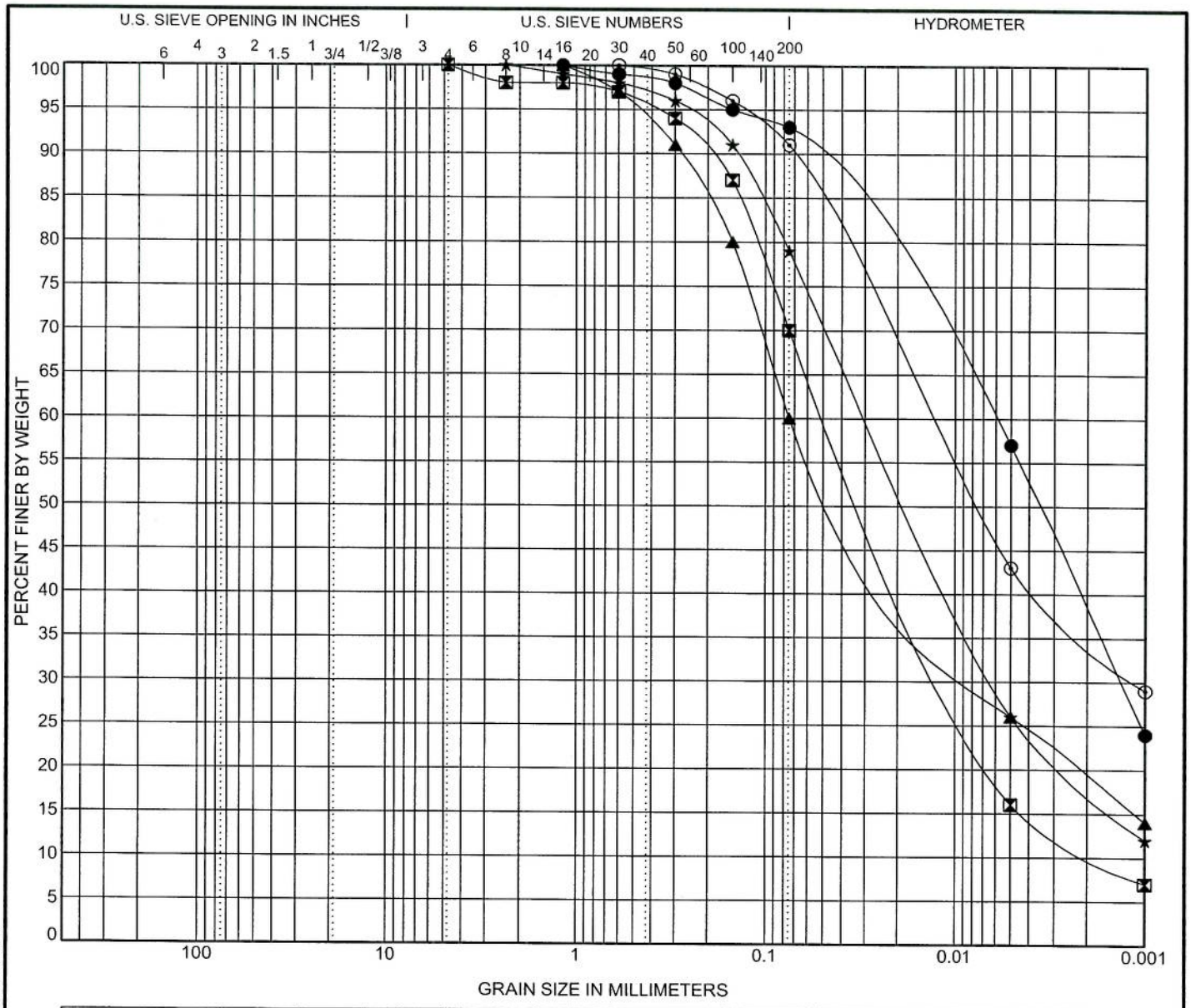

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	R-010-003	37.0	Lean CLAY	57	30	27		
⊠	R-010-003	40.0	SANDY SILT				1.31	26.56
▲	R-010-003	90.0	SANDY SILTY CLAY					
★	R-010-004	33.5	Lean CLAY	55	30	25		
⊙	R-010-005	0.0	LEAN CLAY(CL)	41	18	23		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	R-010-003	37.0	1.18	0.006	0.001		0.0	7.0	36.0	57.0
⊠	R-010-003	40.0	4.75	0.045	0.01	0.002	0.0	30.0	54.0	16.0
▲	R-010-003	90.0	1.18	0.075	0.007		0.0	40.0	34.0	26.0
★	R-010-004	33.5	2.36	0.028	0.006		0.0	21.0	53.0	26.0
⊙	R-010-005	0.0	0.6	0.013	0.001		0.0	9.0	48.0	43.0

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NEW	Luis Paredes		7 of 10

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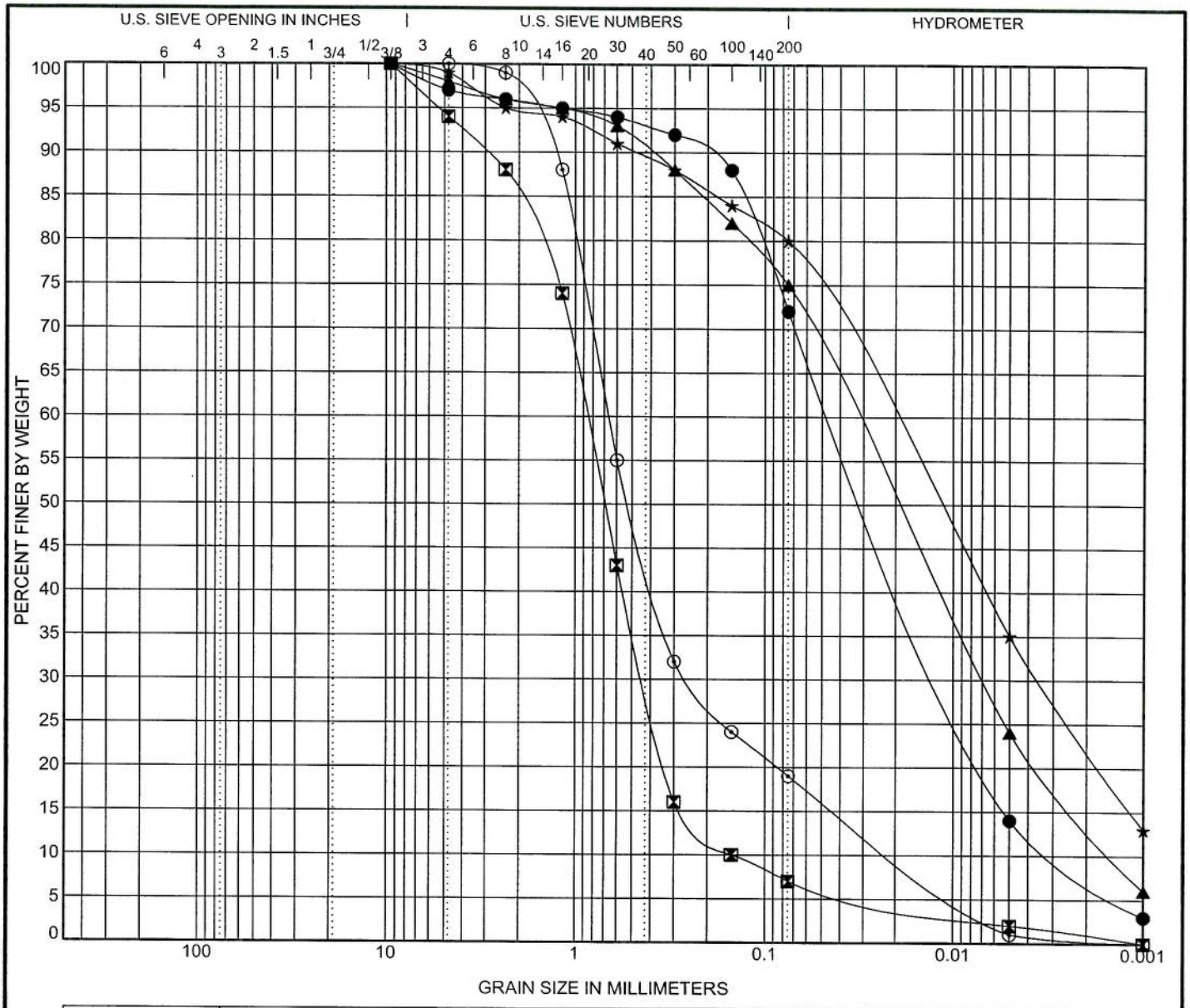

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	R-010-005	4.0	SILT with SAND(ML)	33	29	4	0.93	15.38
⊠	R-010-005	8.0					1.42	5.80
▲	R-010-005	9.5	SILT with SAND(ML)	41	29	12	0.98	23.65
★	R-010-005	11.5	LEAN CLAY with SAND(CL)	45	25	20		
⊙	R-010-005	15.0	SILTY SAND(SM)	30	25	5	4.94	34.33

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	R-010-005	4.0	9.5	0.043	0.011	0.003	3.0	25.0	58.0	14.0
⊠	R-010-005	8.0	9.5	0.869	0.43	0.15	6.0	87.0	5.0	2.0
▲	R-010-005	9.5	9.5	0.034	0.007	0.001	2.0	23.0	51.0	24.0
★	R-010-005	11.5	9.5	0.023	0.003		1.0	19.0	45.0	35.0
⊙	R-010-005	15.0	4.75	0.665	0.252	0.019	0.0	81.0	18.0	1.0

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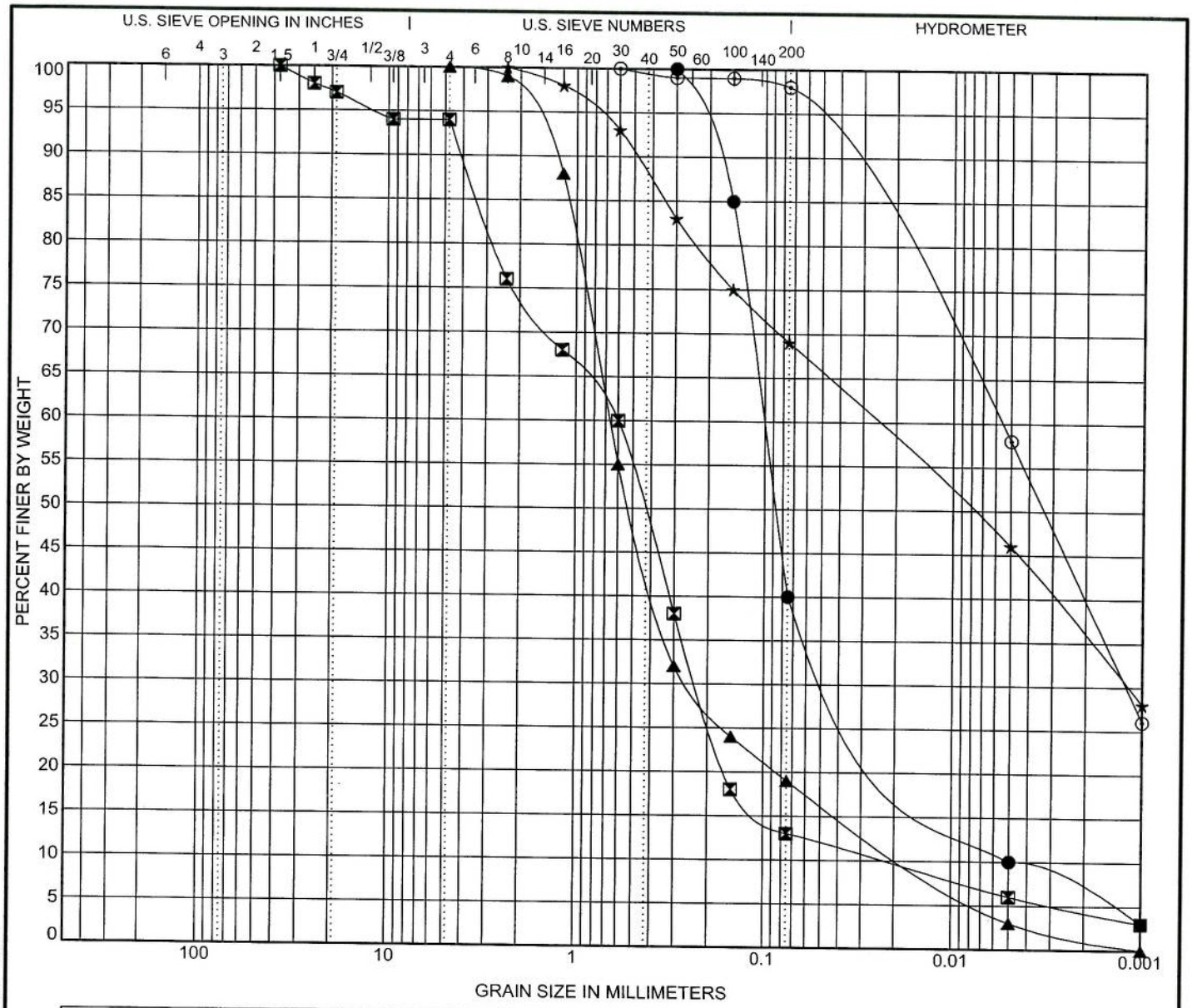
PROJECT OR BRIDGE NAME: 99/113 INTERCHANGE

BRIDGE NUMBER	PREPARED BY	DATE	SHEET
NEW	Luis Paredes		8 of 10

CALTRANS GRAIN SIZE 03-SUT-99-PM33.7HWY113-99INTER.GPJ CALTRANS LIBRARY 040808.GLB 8/30/11



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	R-010-005	20.0					1.81	20.41
⊠	R-010-005	26.5					3.67	25.53
▲	R-010-005	32.0	SILTY SAND(SM)	38	32	6	5.86	40.66
★	R-010-005	36.0	SANDY LEAN CLAY(CL)	42	19	23		
⊙	R-010-005	43.5	FAT CLAY(CH)	52	28	24		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	R-010-005	20.0	0.3	0.102	0.03	0.005	0.0	60.0	30.0	10.0
⊠	R-010-005	26.5	37.5	0.6	0.227	0.023	6.0	81.0	7.0	6.0
▲	R-010-005	32.0	4.75	0.665	0.252	0.016	0.0	81.0	16.0	3.0
★	R-010-005	36.0	2.36	0.026	0.001		0.0	31.0	23.0	46.0
⊙	R-010-005	43.5	0.6	0.006	0.001		0.0	2.0	40.0	58.0

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GRAIN SIZE DISTRIBUTION

DIST.	COUNTY	ROUTE	POSTMILE	EA
03	Sutter	99	R33.7/R33.9	03-03-1A4613

PROJECT OR BRIDGE NAME: 99/113 INTERCHANGE

BRIDGE NUMBER	PREPARED BY	DATE	SHEET
NEW	Luis Paredes		9 of 10

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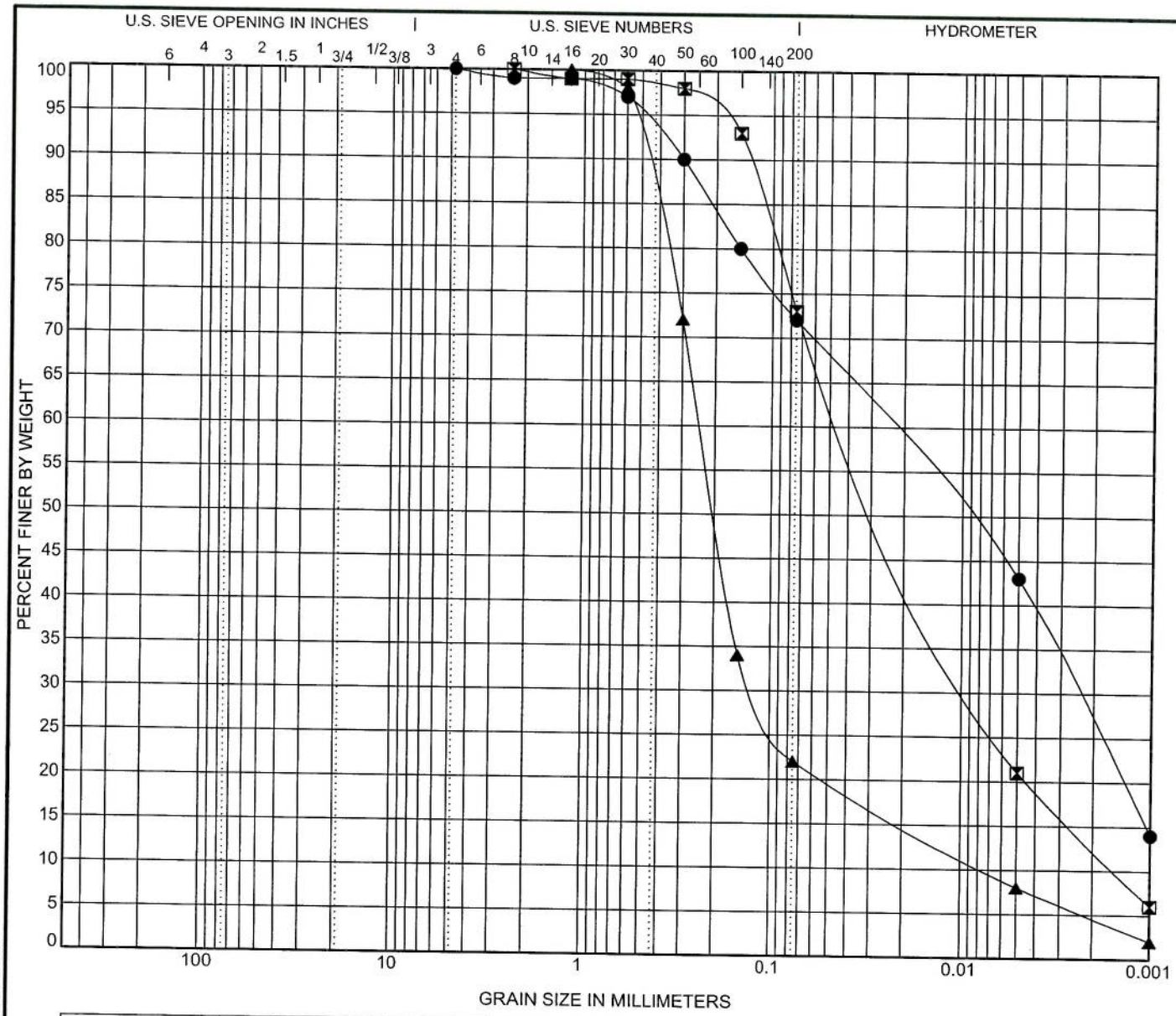

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	R-010-005	46.5	LEAN CLAY with SAND(CL)	49	25	24		
⊠	R-010-005	51.5	SILT with SAND(ML)	32	25	7	1.09	24.81
▲	R-010-005	66.5					7.99	32.74

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	R-010-005	46.5	4.75	0.024	0.002		0.0	28.0	29.0	43.0
⊠	R-010-005	51.5	2.36	0.038	0.008	0.002	0.0	27.0	52.0	21.0
▲	R-010-005	66.5	1.18	0.241	0.119	0.007	0.0	78.0	14.0	8.0

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

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