STRUCTURES PRELIMINARY GEOTECHNICAL REPORT INTERSTATE 80/STATE ROUTE 65 INTERCHANGE IMPROVEMENT PROJECT

Placer County, California EA 03-4E3200; 03-PLA-80/65-PM 1.9-6.1/ R4.8-R7.3

> Prepared by: BLACKBURN CONSULTING Auburn, California

> > November 2014

Prepared for: CH2M HILL Sacramento, California



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Geotechnical

Geo-Environmental
Construction Services
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Mr. Christopher Benson CH2M Hill 2485 Natomas Park Drive Suite 600 Sacramento, CA 95833-2937

Subject: Structures Preliminary Geotechnical Report Interstate 80/State Route 65 Interchange Improvement Project Placer County, California EA 03-4E3200; 03-PLA-80/65 PM 1.9–6.1/ R4.8–R7.3

Dear Mr. Benson,

Blackburn Consulting (BCI) prepared this Structures Preliminary Geotechnical Report for the Interstate 80 and State Route 65 Interchange improvement project located in Placer County, California.

BCI prepared this report in accordance with the February 2011 Agreement between BCI and CH2M Hill. We submit this draft report for review and comment.

Thank you for the opportunity to be part of your design team. Please call us if you have questions or require additional information.

Sincerely;

BLACKBURN CONSULTING

Patrick Fischer, P.E., C.E.G. Engineering Geologist, Principal



Rob Pickard, C.E.G. Engineering Geologist

Structures Preliminary Geotechnical Report Interstate 80 & State Route 65 Interchange Improvement Project Placer County, California EA 03-4E3200; 03-PLA-80/65, PM 1.9-6.1/ R4.8-R7.3

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APPENDIX B

Caltrans Comments and BCI Response

1 INTRODUCTION

1.1 Purpose

CH2M Hill retained Blackburn Consulting (BCI) to prepare this Structures Preliminary Geotechnical Report (SPGR) for the proposed improvements at the Interstate 80 (I-80)/State Route 65 (SR 65) Interchange located in Placer County, California. This report provides preliminary geotechnical/geologic information for advance planning purposes. Additional geotechnical studies are required for design level recommendations.

BCI prepared this SPGR for CH2M Hill for advance planning purposes only. Do not use or rely upon this report for other locations or for final project design.

1.2 Scope of Services

To prepare this report, BCI:

- Discussed the project with the project team
- Reviewed preliminary site plans prepared by the team
- Reviewed published maps and literature related to site soil, rock, and geologic conditions
- Reviewed published geotechnical data and as-built information for existing structures in the project area
- Conducted a preliminary geologic site reconnaissance to confirm reported conditions

1.3 Site Location and Description

The project site is located in the area of the I-80/SR 65 interchange in the Cities of Rocklin and Roseville, Placer County, California. Figure 1 shows the overall project area.

In the project area, I-80 has three to six lanes in each direction and SR 65 is a divided highway with two to three lanes in each direction. The overall project consists of modifications along I-80 from the Douglas Boulevard Interchange to the Rocklin Road Interchange (Post Miles 1.9-6.1), and along SR 65 from the I-80 junction to the Pleasant Grove Boulevard Interchange (Post Miles R4.8-R7.3).

Area topography is characterized by rolling hills with southwest trending ridges and relatively gentle slope gradients. Elevations range from a high of approximately 250 feet along SR 65 to a low of approximately 150 feet at the west end of the project area along I-80. In the project area, I-80 is constructed near natural grade with some cuts through ridges and fills across low lying areas. SR 65 is mostly elevated (by fills and bridges) above natural grade from the interchange area to the northwest side of Antelope Creek (near PM 5.4). Northwest of Antelope Creek to Pleasant Grove Blvd., SR 65 is constructed near natural grade with some cuts and fills.

Several west-southwest flowing creeks are located in and near the project area. The major creeks flowing through this area are:

- Antelope Creek located northwest of I-80 with a crossing beneath SR 65
- Secret Ravine located southeast of I-80
- Miners Ravine located southeast of I-80 with a crossing beneath I-80 west of Eureka Road

These creeks (and their ancestral equivalents) have created a low southwest trending valley in the project area along which I-80 is constructed. Storm drainage at I-80 and SR 65 is directed through roadside ditches that flow to the local drainages.

2 PROJECT DESCRIPTION

Three "Build" alternatives are proposed (after the screening process) for the project and are as follows:

- Alternative 1 Taylor Road Full Access Interchange
- Alternative 2 Collector-Distributor System Ramps
- Alternative 3 Taylor Road Interchange Eliminated

The alternatives propose to add capacity, a bi-directional HOV system, and high-speed connections. Local and regional circulation and access would be improved along I-80 between Eureka Road/Atlantic Street, Taylor Road, and along SR 65 between the I-80/SR 65 Interchange and Pleasant Grove Boulevard.

This SPGR focuses on preliminary geotechnical information for new structures included under all three "Build" alternatives. Figures 2A through 2C (Alternatives 1, 2, and 3) show the preliminary configuration of interchange modifications and proposed structure locations based on preliminary Planning Study maps (CH2M Hill, 2014). The proposed structures are:

Structures Common to Alternatives 1 through 3

- East I-80/North SR 65 Connector
- I-80/SR 65 HOV Connector
- South SR 65/East I-80 Connector
- Taylor Road Overcrossing (Replace)
- East Roseville Viaduct Widening (two structures)Roseville Parkway Tieback Wall
- Galleria Boulevard Tieback Wall

Structures Common to Alternative 2 and 3

- Collector-Distributor (CD), Northbound SR 65 On-Ramp
- Collector-Distributor (CD), Eastbound I-80 On-Ramp

Structures in Alternative 1 Only

- T –Undercrossing at Eastbound/Westbound 80 (two structures)
- South SR 65/West I-80 Connector

Structures in Alternative 2 Only

- Miners Ravine Bridge
- Eureka Road On-Ramp Undercrossing (cut and cover tunnel)

Structures in Alternative 3 Only

• Miners Ravine Eastbound Off-Ramp Widening

3 EXCEPTIONS TO POLICY

No exceptions to Caltrans departmental policy are included for this SPGR.

4 FIELD INVESTIGATION AND TESTING PROGRAM

4.1 Subsurface Investigation and Laboratory Testing

New subsurface investigation and laboratory testing was not completed for this SPGR. Subsurface data obtained for existing structures was used to evaluate site conditions within the project area. See Appendix A for copies of the Logs of Test Borings (LOTB's) used in our review.

4.2 Site Review and Geologic Mapping

BCI completed a site reconnaissance to observe the site and confirm published geologic conditions. A discussion of area geology is included below.

5 DOCUMENT REVIEW

For preliminary evaluation of site subsurface conditions, our review included the following documents:

- Log of Test Borings, Atlantic Street Overcrossing, Caltrans, As-Built, 12/29/1989, Sheets 18 and 19 of 19
- Log of Test Borings, Harding Boulevard Overcrossing (Galleria Blvd.), CH2M Hill, As-Built, 10/17/1988, Sheet 12 of 12
- Log of Test Borings, Roseville Parkway Overcrossing, Kleinfelder Inc., As-Built, 11/10/2000, Sheets 47 to 51 of 51
- Memorandum, Foundation Investigation, Taylor Road Overcrossing, Caltrans, 11/20/1986

- Log of Test Borings, Miners Ravine Bridge (EB off-ramp), Caltrans, As-Built, 12/29/1989, Sheets 13 and 14 of 14
- Log of Test Borings, Miners Ravine Bridge (WB on-ramp), Caltrans, As-Built, 12/29/1989, Sheets 10 to 12 of 12
- Log of Test Borings, Miners Ravine Bridge (Widen), Kleinfelder, Inc., 11/17/2008, Sheets 477 to 481 of 539
- Log Borings, Roseville 150 Joint Venture, Road "E" & Antelope Creek Bridge, Roseville 150 Center, The Spink Corporation (Logs by Wallace Kuhl & Associates Inc.), 1995, Sheet 17 of 17
- Memorandum, Route 65/80 Separation Foundation Recommendations, Caltrans, 3/21/1984
- Highway 65 and I-80, Site Exploration Results, Anderson Geotechnical Consultants, Inc., 11/29/1984
- Log of Test Borings, Route 65/80 Separation, Caltrans, As-Built, 10/6/1987, Sheet 14 of 14
- Log of Test Borings, East Roseville Viaduct, Caltrans, As-Built, 8/6/1987, Sheet 173 to 175 of 175
- Log of Test Borings, Retaining Wall 39E-41E, Kleinfelder, Inc., 12/2006, Sheet 24 to 29 of 29
- Log of Test Borings, Retaining Wall 40W-42W, Kleinfelder, Inc., 12/2006, Sheet 23 to 29 of 29
- Log of Test Borings, Retaining Wall 48W, Kleinfelder, Inc., 11/2008, Sheet 11 to 14 of 14
- Log of Test Borings, Retaining Wall 49E, Kleinfelder, Inc., 9/2008, Sheet 11 to 14 of 14
- Log of Test Borings, Retaining Wall 58E, Kleinfelder, Inc., 9/2008, Sheet 11 to 14 of 14
- Log of Test Borings, Retaining Wall 59W, Kleinfelder, Inc., 11/2008, Sheet 10 to 13 of 13

Appendix A contains copies of the applicable Logs of Test Borings (LOTB's) sheets from the above references.

6 SITE GEOLOGY AND SUBSURFACE CONDITIONS

6.1 General Project Area Geology

The project area lies on the eastern margin of the Great Valley Geomorphic Province (Sacramento Valley portion). The Great Valley is bordered by the Cascade and Klamath Ranges to the north, the Coast Ranges to the west, and the Sierra Nevada to the east. The valley was formed by tilting of the Sierran Block with the western side dropping to form the valley and the eastern side uplifted to form the Sierra Nevada. The western slope of the Sierra Nevada is underlain by intrusive, volcanic, and metamorphic rock. Valley deposits are characterized by a thick sequence of alluvial, lacustrine, and marine sediments. The thickness of the sediments varies from a thin veneer at the valley margin, to thousands of feet in the central portion. In the project area, granitic rock and volcanic deposits occur along the valley margin.

Based on review of published geologic maps (Livingston, 1974, Wagner et al, 1981; Loyd, 1995, Mulder, 2007), our site review, and available subsurface information, the project area is underlain by the following:

Granitic Rock

Granitic rock in the project area is known as the Rocklin Pluton; it is comprised of quartz diorite and is deeply weathered (decomposed) in many areas. Within the project area, granitic rock occurs immediately west of the Rocklin Road Interchange. The rock is typically decomposed to intensely weathered within approximately 5 to 10 feet of the surface with isolated "boulders" (or bodies) of moderately to slightly weathered, hard rock. Figure 3 shows mapped locations of granitic rock as "Mzg".

Mehrten Formation

Deposits of the Mehrten Formation in the project area consist primarily of andesitic, volcanic mudflow breccia, and cobble conglomerate. This formation is likely to be encountered along I-80 between Eureka Road and Douglas Blvd., within the eastern portion of the I-80/SR 65 interchange, and northwest of Antelope Creek along SR 65. The breccia consists of a gray mixture of gravel to boulder size, angular, andesitic fragments. These fragments are well cemented in a matrix of volcanic lapilli and ash (tuff). The conglomerate consists primarily of cobbles in a well-cemented matrix of andesitic sand and silt, and often contains interbedded layers of sandstone, siltstone, and lenses of mudflow breccia. In the project area, the lowest portions of the Mehrten Formation are often underlain by claystones possibly associated with the Valley Springs or Ione Formations. Bedding of sediments and flows within the Mehrten Formation typically dip gently (2 to 4 degrees) to the west/southwest. These volcanic materials were deposited during Miocene time (5 to 20 million years ago). Figure 3 shows mapped locations of the Mehrten Formation as "Tva".

Riverbank and Turlock Lake Formations

Sediments of the Riverbank and Turlock Lake Formation occur in the central portion of the project area. These are alluvial deposits that are typically composed of interbedded medium dense to dense sands (often cemented) and gravels, and stiff to hard silts and clays. Bedding is typically horizontal, lenticular, and discontinuous. These sediments are Late to Middle Pleistocene age (deposited over 150,000 years ago). Figure 3 shows mapped locations of the Riverbank and Turlock Lake Formations as "Qa".

Other Geologic Units

Several shallow waterways cross the project area (including Secret Ravine, Miners Ravine, and Antelope Creek) and we expect these waterways will contain a certain thickness of young alluvial

deposits. This includes alluvial deposits at the banks (stream terrace deposits) as well as active channel deposits. Alluvium likely consists of several feet of loose sand and gravel with some cobbles and boulders.

Highway embankment fill is also present at a number of locations along the project corridor. We expect embankment fill to be engineered fill, placed in accordance with Caltrans specifications, that consists of locally derived clay, silt, sand, and gravel with occasional boulders (from the Mehrten Formation).

6.2 Faulting

Faulting is not identified within or adjacent to the site. Based on the Caltrans ARS Online (V2.3.06), the closest seismic source is a portion of the Foothills Fault System (Deadman Fault) located approximately 9 miles (14.8 km) to the east. Figure 4 shows general fault locations in the region.

6.3 Subsurface Soil and Rock

Table 1 below summarizes the expected soil and rock conditions for various portions of the project. The descriptions are based on mapped geologic conditions, subsurface data made available for the project area, and our site reconnaissance.

TABLE 1 – PRELIMINARY SUBSURFACE CONDITIONS						
General Project Area	Planned Structures in Area	General Soil and Rock Conditions				
East End, I-80 Between South SR 65/East I-80 Connector and Rocklin Road; Approximate PM 4.7 to 6.1	 No new bridge structures are planned in this area Retaining walls along eastbound I-80 	Underlain by granitic rock that transitions to andesitic volcanic deposits and alluvial deposits at the west end. Very stiff/dense silt and sand associated with weathered granitic rock and alluvial deposits are anticipated. Isolated occurrence of shallow, hard, granitic rock can occur. Moderately hard sandstone and conglomerate associated with andesitic volcanics are anticipated at the west end of this area.				
South Interchange Area, I- 80 between South SR 65/East I-80 Connector Ramp and South SR 65/West I-80 Connector Ramp; Approximate PM 4.1 to 4.7	 E80/N65 Connector 80/65 HOV Connector S65/E80 Connector T –Undercrossing at EB/WB 80 CD EB80 On-Ramp CD NB65 On-Ramp 	Transition area between engineered fill placed for ramps and abutments, andesitic volcanics that consist of moderately hard breccia and sandstone, and alluvium that consists of medium dense to dense sands, and hard silts and clays.				

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TABLE 1 – PRELIMINARY SUBSURFACE CONDITIONS						
General Project	Planned Structures	General Soil and Rock Conditions				
Area	in Area					
Northwest End, SR 65 between 80/65 Connector and northwest end of East Roseville Viaduct; Approximate PM R5.1 to R5.4	• East Roseville Viaduct Widening	Underlain by alluvial deposits that typically consist of dense sands and very stiff to hard silts and clays. At the northwest end of this area (northwest side of Antelope Creek), there is a transition to andesitic volcanics that consist of moderately hard, breccia and sandstone. Significant depth of engineered fill is present at the south viaduct abutment.				
Northwest End, SR 65 between East Roseville Viaduct and Stanford Ranch Road; Approximate PM R5.4 to R5.9	• Galleria Blvd Tieback Wall	Underlain by andesitic volcanic deposits. Moderately hard breccia, sandstone and conglomerate are anticipated at shallow depths.				
West End, I-80 between South SR 65/West I-80 Connector and Miners Ravine; Approximate PM 2.9 to 4.1	 S65/W80 Connector 80/65 HOV Connector Taylor Road Overcrossing (Replace) Roseville Parkway Tieback Wall Eureka Road On-Ramp UC Miners Ravine EB Off- Ramp Widening Miners Ravine Bridge 	Underlain by alluvial deposits that typically consist of medium dense to dense sands and very stiff to hard silts and clays. At the east and west ends of this area, andesitic volcanics that consist of breccia, conglomerate, sandstone, and siltstone are present at the surface and at relatively shallow depths below alluvial deposits. Significant depths of engineered fill are present at existing ramps and abutments.				
West End, I-80 between Miners Ravine and Douglas Blvd.; Approximate PM 1.9 to 2.9	No new bridge structures are planned in this area	Underlain by andesitic volcanic deposits. Moderately hard breccia, sandstone and conglomerate are anticipated very shallow depths. The west end, near Douglas Blvd, transitions to alluvial deposits expected to consist of medium dense to dense sands and very stiff to hard silts and clays.				

6.4 Groundwater

The depth to groundwater beneath the project area is variable due to:

- Significant changes in ground surface elevation
- The presence of alluvial sediments that extend through the central portion of the area
- Relatively hard, well consolidated sediments and hard rock on the project perimeter
- Presence of several creek beds

Regionally, MWH (2007) shows groundwater elevation ranging from approximately 45 feet above mean sea level (msl) at the west end of the project to approximately 65 feet at the east end. Figure 5 is a portion of the MWH (2007) groundwater elevation map. Based on this map, regional groundwater levels are generally greater than 100 feet below the ground surface and the gradient is to the west-southwest. While the groundwater mapping provides the approximate elevation of the deeper/regional groundwater conditions, perched groundwater that can impact project design and construction may occur much shallower. In general, groundwater should be expected near the elevation of water in the adjacent creek beds such as Secret Ravine, Miners Ravine, and Antelope Creek. Existing subsurface data that we reviewed indicates shallow groundwater occurrence at the locations and elevations shown in Table 2.

TABLE 2 – SUMMARY OF SHALLOW GROUNDWATER OCCURRENCE					
General Location	Approximate Depth to Groundwater (ft)	Approximate Groundwater Elevation (ft)	Reference Used	Notes	
West end (Miners Ravine)	2 to 5 feet	151	Topographic map and Miners Ravine Bridge LOTB (1989)	At Miners Ravine	
West end (Atlantic St)	15	165	Atlantic St. OC LOTB (1988)		
West End (Roseville Pkwy)	17 to 20	154 – 185	Roseville Pkwy OC LOTB (1998)	Groundwater elevation increases to the southeast	
West Central (Taylor Road)	29	171	Taylor Road OC, Foundation Investigation (1986)		
Central (65/80 Separation)	<0.5 - 25	193 to 207	Route 65/80 Separation LOTB (1984)	Shallow water appears to be a localized condition	
East Central	10 – 25	200	Topographic map	Adjacent to Secret Ravine	
Northwest (East Roseville Viaduct)	12 – 14	199 – 202	East Roseville Viaduct LOTB (1984)	Near Taylor Road	
Northwest (East Roseville Viaduct)	<0.5 - 9	169 -175	East Roseville Viaduct LOTB (1984)	Near Antelope Creek	

7 PRELIMINARY GEOLOGIC HAZARDS AND SEISMIC DATA

7.1 Geologic Hazards

Available site information and our site review did not indicate significant geologic hazards (such as landsliding, ground settlement, very soft soils, severe erosion, etc) within the project area. There is a potential for weak claystones to occur near the base of the Mehrten Formation (area labeled as "Tva" on Figure 3), particularly at the eastern portion of the I-80/SR 65 interchange; the claystone can impact slope stability and design parameters for new structures.

7.2 Seismic Data

7.2.1 Ground Motion

The project area is subject to ground motions from a seismic event. BCI used seismic design procedures outlined by Caltrans 'Geotechnical Services Manual' to develop the preliminary Acceleration Response Spectrum (ARS) Curve for preliminary design of new bridge structures. We summarize the data in Table 3. Figure 6a shows a graphical display of the Preliminary Design Response Spectrum. Figure 6b shows tabled spectrum data.

TABLE 3 – PRELIMINARY GROUND MOTION STUDY RESULTS				
Peak Ground Acceleration (PGA)	0.21g			
V _{S30} (Small Strain Shear Wave Velocity) ¹	1,800 feet per second (560 m/s)			
Near Fault Factor	Yes			
Basin Amplification Factor	NA			
Controlling Deterministic Scenario	 Minimum Deterministic: > Style: Vertical strike-slip > Maximum Magnitude (Mmax): 6.5 > Site to fault distance (R_{RUP})²: 7.5 mi 			
Nearest Late Quaternary Fault	 Foothills Fault System – Deadman Fault Fault ID Number: 422 Style: Normal Dip: 50 degrees, West Maximum Magnitude (Mmax): 6.2 Site-to-Fault Distance (R_{RUP})²: 9 miles/14.8 km (from central portion of interchange) 			
RECOMMENDED PRELIMINARY DESIGN RESPONSE SPECTRUM	 Envelope that consists of the minimum deterministic spectrum and the probabilistic spectrum (probability of exceedance equal to 5% in 50 years, a 975-year return period). ARS Response Spectra - See Figure 6a/6b PGA = 0.21g (based on minimum deterministic spectrum) Mmax = 6.5 			

1) Preliminary $V_{\rm S30}$ value based on Soil Profile Type C (very dense soil and soft rock) present throughout the project area

2) R_{RUP} is defined as the closest distance to the fault rupture plane (as defined in Caltrans' "Methodology for Developing Design Response Spectrum for Use in Seismic Design Recommendations," Appendix B, November 2012)

The information provided in Table 3 and the Preliminary Design Response Spectrum will need to be updated for final design. Each structure needs to be analyzed separately and ARS developed based on site specific data (such as V_{S30}).

7.2.2 Liquefaction

Liquefaction can occur when saturated, loose to medium dense, granular soils (generally within 50 feet of the surface), or specifically defined cohesive soils, are subjected to ground shaking. According to our document and site review, non-liquefiable soils (medium dense to very dense granular soils, very stiff to hard, cohesive soils, and/or soft rock) are present at relatively shallow depths at planned structure locations. We consider the potential for detrimental liquefaction to be low at planned structure locations throughout the project.

7.2.3 Fault Rupture

Faulting is not mapped through the site, and the site does not lie within or adjacent to a Fault Rupture Hazard Zone (Bryant and Hart, 2007). Based on the Caltrans ARS Online (V2.3.06), the closest seismic source is a portion of the Foothills Fault System (Deadman Fault) located approximately 9 miles (14.8 km) to the east. We consider the potential for fault rupture within the project area to be very low. Figure 4 shows the general fault locations in the region.

7.2.4 Seismic Settlement

During a seismic event, ground shaking can cause densification of granular soil above the water table that can result in settlement of the ground surface. Based on our review, medium dense to dense soils and/or rock is present at relatively shallow depths throughout the project area and probable ground motions are relatively low (Peak Ground Acceleration of 0.21g). We consider the potential for detrimental seismic settlement within the project area to be low for native soil/rock and engineered fill, provided engineered fills are constructed in accordance with Caltrans guidelines.

7.2.5 Seismic Slope Instability

Based on geologic conditions and past performance, we consider the potential for seismic slope instability in the form of landslides and mudslides within the project area to be very low. Similarly, we consider the potential for seismic instability of engineered cut or fill slopes constructed at typical allowable gradients of (2.1H:1V or flatter) to be low. An exception to this may be at cut slopes and/or structure locations at the base of the Mehrten Formation (area labeled as "Tva" on Figure 3) where there is a potential for weak claystones to occur (particularly at the eastern portion of the I-80/SR 65 interchange).

8 PRELIMINARY GEOTECHNICAL RECOMMENDATIONS

8.1 Structure Foundations

Variable soil and groundwater conditions in the project area make different foundation types better suited for each structure location. Table 4 below summarizes the suitable foundation types anticipated for each planned structure location (based on the preliminary Planning Study by CH2M Hill dated 7/24/14). Subsurface investigation will need to be completed to verify suitable foundation types and provide final design parameters.

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TABLE 4 - PRELIMINARY STRUCTURE FOUNDATION TYPES						
Structure	Existing Foundation	Suitable Foundation	Installation Notes			
(Alternate)	Reference Data	Expected Soil Conditions	Types Anticipated			
E80/N65 Connector (1, 2, and 3)	Located west of the S65/E80 Connector bridge which is the closest existing structure and supported on CIDH (Abut 1) and H-Piles (Abut 3, N end) with spread footing at Bent 2.	Dense silt and sand of the Turlock and/or Riverbank Formations) on north end and embankment fill over Turlock and/or Mehrten Formations at southwest end.	Driven H-piles for Abutment 1 through Bent 2, and Bent 6 through Abutment 11 (or through Abutment 13 for Alt. 2 and 3). Spread footings for Bent 3 through 5 (or Bent 4 through 6 for Alt. 2 and 3). CIDH are possible option at all locations. Large diameter shaft is feasible in median and adjacent to I-80.	CIDH may require temporary casing due to existing fill, and loose surface soil and groundwater near Secret Ravine.		
80/65 HOV Connector (1, 2, and 3)	Located west of the S65/E80 connector bridge which has H- Piles (Abut 3 – N end) with spread footing at Bent 2.	Dense silt and sand of the Riverbank and/or Turlock Formations, with some Mehrten (sandstone/siltstone) possible (below embankment fill) at depth at the west end.	Driven H-piles and CIDH are possible options for Abutment 1 through Bent 5. Driven H-piles, spread footings and CIDH are possible options at Bent 6 through Abutment 10. Large diameter shaft is feasible in median and adjacent to I- 80. MSE wall is suitable at approaches.	Temporary casing may be necessary for installation of large diameter shaft or CIDH due to existing fill depths.		
S65/E80 Connector (1, 2, and 3)	The east end of this structure will be close to the existing S65/E80 Separation which is supported on a mix of CIDH, Spread and H- Piles.	Dense silt and sand (likely Turlock Formation) on north end and fill over Mehrten (likely conglomerate) at south- southeast end. Possible embankment fill placed over granitic rock at the far east end.	 Driven H-piles or spread footings are possible options at the north end (to Bent 8). Large diameter shaft feasible in median. Spread footings likely best option from Bent 9 to Abutment 19 (Abut 17 for Alt 2 and 3). CIDH is an option at all locations. 			
S65/W80 Connector (1 only)	Located south of E. Roseville Viaduct. Should be similar to the conditions for the 65/Taylor Road Undercrossing at the viaduct which has H-Piles.	Medium dense to dense, silty sand underlain by hard silt and clay of the Turlock and/or Riverbank Formations.	Driven H-Piles. Spread footings and CIDH are possible options (particularly at Abutment 2 where original ground is higher).			
CD NB65 On-Ramp (2 and 3)	Located west of the S65/E80 Connector Bridge and east of Taylor Road OC (south of I-80 EB). These bridges are supported on CIDH, H-Piles, and spread footings.	Dense silt and sand of the Turlock and/or Riverbank Formation. Mehrten (sandstone/siltstone) possible at depth.	Driven H-Piles, spread footings and CIDH are possible options.			

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	TABLE 4 - PRELIMINARY STRUCTURE FOUNDATION TYPES						
Structure	Existing Foundation	Foundation Geology and	Suitable Foundation	Installation Notes			
(Alternate)	Reference Data	Expected Soil Conditions	Types Anticipated				
CD EB80 On-Ramp (2 and 3)	Located west of the S65/E80 Connector Bridge and east of Taylor Road OC (south of I-80 EB). These bridges are supported on CIDH, H-Piles, and spread footings.	Dense silt and sand of the Turlock and/or Riverbank Formation. Mehrten (sandstone/siltstone) possible at depth at west end, and expected to be shallow at the east end.	Driven H-piles for Abutment 1 through Bent 3. Spread footing for Bent 4 through Abutment 8. CIDH are possible option at all locations. MSE wall is suitable at the west and east ends.	CIDH may require temporary casing due to existing loose surface soil and groundwater near Secret Ravine.			
T -Undercrossing at EB/WB 80 (1 only)	At and west of the S65/E80 Connector bridge which is supported on CIDH (Abut 1) and H-Piles (Abut 3, N end) with spread footing at Bent 2.	Transition area between breccia/sandstone of the Mehrten Formation, and dense sands/hard silts of Turlock or Riverbank Formations.	Spread footings or CIDH are possible options.				
Taylor Road Overcrossing (Replace) (1, 2, and 3)	Located west of the existing Taylor Overcrossing which is supported on H-Piles.	Medium dense to very dense and hard, interbedded, silt, sand, and gravel with clay, Riverbank Formation	Driven H-Piles or Concrete Piles. CIDH and spread footings are possible options. Large diameter shaft is feasible in median.				
E. Roseville Viaduct Widening (1, 2, and 3)	Located adjacent to existing viaduct which is supported on H- Piles and spread footings.	Predominately dense sands and hard clays of the Riverbank and Turlock Formations	Driven H-Piles and spread footings – preliminary plans should match the existing foundation types. CIDH is an option at all support locations.	CIDH may require temporary casing (10-20ft) at abutment fill (Abut 1) and isolated Bent locations due to groundwater and loose, upper soils (such as at Bents 2, 3, 6, 9 and 10)			
Eureka Road On-Ramp Overcrossing (2 only)	Located adjacent/behind Abutment 3 (east) of the Atlantic St OC. Abutment 3 is supported on driven piles with base of cap at elevation 189.00 to 189.75	Engineered fill at approach/abutment on the order of 26 feet in depth (down to near elevation 180 ft). Underlain by medium dense to dense silty sand with gravel and sandy gravel of the Riverbank Formation and breccia of the Mehrten Formation at greater depth.	Suitable for strip footing support of cut and cover tunnel walls.	Excavations and foundation placement will need to consider the presence of adjacent piles. Lateral loading from abutments will need to be considered for adjacent tunnel wall.			
Miners Ravine Bridge (2 only)	Between the existing eastbound Miners Ravine Bridge and eastbound off-ramp bridge. These bridges are supported on a combination of driven H-Piles, CIDH, and spread footings.	Engineered fill adjacent to existing approach/abutment for Miners Ravine Bridge (I-80). Underlain by medium dense to dense silty sand with gravel and sandy gravel of the Riverbank Formation and sandstone/breccia of the Mehrten Formation at greater depth.	Driven H-Piles at abutments and CIDH at bents – preliminary plans should match the existing bridge foundation types for the I-80 EB Miners Ravine Bridge (Widen). CIDH is an option at the abutments.	CIDH may require temporary casing due to presence of fill, loose surface soils, and groundwater.			

STRUCTURES PRELIMINARY GEOTECHNICAL REPORT

Interstate 80 & State Route 65 Interchange Improvement Project Placer County, California, EA 03-4E3200; 03-PLA-80/6, PM 1.9–6.1/R4.8–R7.3

	TABLE 4 - PRELIMINARY STRUCTURE FOUNDATION TYPES							
Structure	Existing Foundation	Foundation Geology and	Suitable Foundation	Installation Notes				
(Alternate)	Reference Data	Expected Soil Conditions	Types Anticipated					
Miners Ravine EB Off-Ramp Widening (3 only)	Adjacent to the existing Miners Ravine EB Off-Ramp Bridge which is supported on driven H- Piles at abutments and spread footings at bents. Spread footings at bents are deep (16 to 26 feet).	Engineered fill at abutments, medium dense to dense sand and very stiff to hard silt of the Riverbank Formation overlying breccia, conglomerate, sandstone, and siltstone of the Mehrten Formation.	Driven H-Piles at abutments and spread footings at bents – preliminary plans should match the existing bridge foundation types. CIDH is an option at abutments and bents.	CIDH may require temporary casing due to presence of fill, loose surface soils, and groundwater. Deep spread footings at existing bridge will require significant excavation.				
Roseville Parkway Tieback Wall (1, 2, and 3)	Located beneath the Roseville Parkway OC at east abutment.	Engineered fill at abutment slope with dense, clayey sand of the Riverbank Formation behind the slope.	Tieback wall is appropriate at this location.					
Galleria Blvd Tieback Wall (1, 2, and 3)	Located beneath Galleria Blvd OC (old Harding Blvd OC) at east abutment	Engineered fill at abutments and approach overlying breccia, conglomerate and sandstone of the Mehrten Formation.	Tieback wall is appropriate at this location.	Increased tieback length/depth due to presence of approximately 30 ft. of engineered fill.				

8.2 Cuts and Cut-slopes

Most cuts and cut slopes are expected to occur within engineered fill placed for existing improvements, and within older alluvial sediments that consist of medium dense to dense, silty sands and hard silts and clays. We expect that cut-slopes will be stable at slopes of 2H:1V or flatter within native soils and engineered fills.

Moderately hard rock can be encountered near the surface where underlain by andesitic volcanics (labeled as "Tva" on Figure 3) or granitic rock ("Mzg" on Figure 3). Granitic rock in the eastern portion of the project area is typically deeply weathered and excavatable with isolated, hard knobs that may require blasting and/or drilling/splitting to aid in removal.

Volcanic mudflow breccia, associated with the andesitic volcanics, can be difficult to excavate but is typically rippable with heavy equipment. Oversize material (boulders) can be generated. The breccia is likely to be encountered along I-80 between Eureka Road and Douglas Blvd. and northwest of Antelope Creek along SR 65. For preliminary excavation considerations, minimize cut depth in the areas labeled as "Tva" and "Mzg" on Figure 3.

8.3 Fill and Fill-slopes

We did not identify areas of potentially soft/compressible soils within the existing subsurface information or during our site reconnaissance for those areas that are likely to have significant, engineered fills constructed. We anticipate that settlement of engineered fill established on appropriately prepared subgrade will be minimal and occur primarily during fill placement. Long settlement waiting periods are not expected. We expect engineered fill slopes constructed of local materials will be stable at gradients of 2H:1V or flatter. A slope gradient of 1.5H:1V can be used in front of abutments. Consider the use of slope paving where abutment slopes have a gradient steeper than 2H:1V; slope paving is used to minimize erosion and slope maintenance.

8.4 Erosion

Embankment slopes and areas disrupted by grading are susceptible to erosion from surface runoff. Cut and fill slopes will require erosion control, such as vegetation, and control of surface runoff. Cuts within the andesitic volcanics and granitic rock will be less susceptible to erosion and likely not suitable for planting.

8.5 Scour

Several structures will be located over or adjacent to creek beds and subject to potential scour, these are:

- SR 65 East Roseville Viaduct Widening over Antelope Creek
- I-80 Eastbound Off-Ramp Widening at Miners Ravine
- Miners Ravine Bridge

- E80/N65 Connector, Northbound SR 65 On-Ramp, Eastbound I-80 On-Ramp
- South SR 65/East I-80 Connector adjacent to Secret Ravine

At the East Roseville Viaduct, the As-Built LOTB's indicate that within the main channel area (north end of the viaduct) hard and/or dense cohesive soils are present within 5 to 8 feet of the ground surface. These soils will be resistant to scour.

At the I-80 Eastbound Off-Ramp Widening at Miners Ravine, the As-Built LOTB's indicate that adjacent to the main channel dense to very dense, sandy gravel and silt, and hard, volcanic breccia present within 8 feet of the ground surface. These soils will be resistant to scour.

At Miners Ravine Bridge, the As-Built LOTB's indicate that adjacent to the main channel (approximately elevation 154 ft) very stiff and weakly cemented silt and moderately hard, volcanic breccia is present within 12 to 23 feet of the ground surface. These soils will be resistant to scour.

At the E80/N65 Connector, Northbound SR 65 On-Ramp, and Eastbound I-80 On-Ramp, there is no available subsurface data where these structures will be located within and/or adjacent to Secret Ravine. However, we expect this location to be underlain at relatively shallow depths (on the order of 5 to 10 feet) by scour resistant soils and/or rock of the Turlock Lake Formation and/or Mehrten Formation. Existing and/or newly constructed embankment fill located adjacent to the creek bed will have a high scour potential.

At the South SR 65/East I-80 Connector, there is no available subsurface data where the connector will be adjacent to Secret Ravine. However, we expect this location to be underlain at relatively shallow depths (on the order of 4 to 8 feet) by scour resistant rock of the Mehrten Formation and possibly granitic rock at the east end. Existing embankment fill located adjacent to the creek bed will have a high scour potential.

9 PRELIMINARY SOIL CORROSION EVALUATION

Soil corrosivity has not yet been evaluated for this project. Based on available subsurface data, the soil and rock within the project area is generally expected to be non-corrosive to structural elements (as defined by Caltrans, 2012, Corrosion Guidelines, Version 2.0). Andesitic volcanics (labeled as "Tva" on Figure 3) found in the interchange area, west of Miners Ravine, and northwest of Antelope Creek can have a relatively low pH and require concrete water/cement ratio considerations.

According to the USDA Web Soil Survey (<u>http://websoilsurvey.nrcs.usda.gov/app/</u>), the risk of corrosion of concrete is considered low to moderate throughout the project area. The risk of corrosion of steel is considered moderate to high. Corrosion testing and analysis will be completed during the design-level investigations.

10 CONSTRUCTION CONSIDERATIONS

<u>Excavation</u>: As noted above, moderately hard rock can be encountered near the surface in portions of the project area where underlain by volcanic mudflow breccia of the Mehrten Formation (labeled as "Tva" on Figure 3) or granitic rock (labeled as "Mzg" on Figure 3). Excavation of some of these materials can be difficult and can generate large diameter material that will need to be screened and/or crushed prior to use as engineered fill.

<u>Dewatering</u>: We expect that shallow groundwater, if encountered, will be of limited quantity and controllable with sump pumps. In general, we do not anticipate the presence of significant groundwater at shallow depth within footing excavations during dry season construction (June through October) unless adjacent to active creek beds (such as at Antelope Creek, Secret Ravine, and Miners Ravine structure locations). Deep foundations (such as drilled shafts in the interchange median) can encounter perched groundwater and wet foundation construction conditions should be anticipated.

<u>Rock Drilling/Coring:</u> Drilling for Cast-in-drilled-hole (CIDH) piles at locations underlain by volcanic mudflow breccia of the Mehrten Formation (labeled as "Tva" on Figure 3) or granitic rock (labeled as "Mzg" on Figure 3) can require drilling with rock bits and/or rock coring to achieve adequate pile penetration.

11 SUBSURFACE EXPLORATION AND LABORATORY TESTING

To provide design level reports, subsurface exploration and laboratory testing is required. Specifically, we recommend the following:

- Drill, log and sample a minimum of one boring at each proposed bridge abutment and bent location (this can be modified based on applicability of existing data)
- Complete borings and/or exploratory trenches along ramps and at wall locations
- Anticipate rock coring in areas adjacent to or underlain by Mehrten volcanics or granitic rock (shown as areas labeled as "Tva" and "Mzg" on Figure 3).
- Record groundwater depths during drilling
- Complete laboratory tests that include moisture content, density, unconfined compressive strength, direct shear, maximum density (proctor), R-value, and corrosivity

12 LIMITATIONS

This SPGR is based on site review and subsurface information provided to BCI and is not intended for final design. Additional study, including subsurface exploration, laboratory testing, and analyses are required for final design. BCI performed these services in accordance with generally accepted geotechnical engineering principles and practices currently used in this area. We do not warranty our services.

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FIGURES

Figure 1 – Vicinity Map Figure 2A -2C – Site Map Figure 3 – Geologic Map Figure 4 – Regional Fault Map Figure 5 – Groundwater Elevation Map Figure 6a and 6b – Preliminary ARS Response Spectra



















Figure 6b
Preliminary Design ARS Spectrum Data

Period	SA	Period	SA	Period	SA	Period	SA
0	0.210	0.085	0.386	0.35	0.400	1.4	0.121
0.01	0.210	0.09	0.399	0.36	0.394	1.5	0.114
0.02	0.214	0.095	0.413	0.38	0.381	1.6	0.108
0.022	0.217	0.1	0.425	0.4	0.369	1.7	0.102
0.025	0.221	0.11	0.444	0.42	0.355	1.8	0.097
0.029	0.227	0.12	0.461	0.44	0.341	1.9	0.093
0.03	0.228	0.13	0.476	0.45	0.335	2	0.089
0.032	0.233	0.133	0.480	0.46	0.329	2.2	0.079
0.035	0.240	0.14	0.488	0.48	0.317	2.4	0.072
0.036	0.243	0.15	0.499	0.5	0.306	2.5	0.068
0.04	0.252	0.16	0.502	0.55	0.278	2.6	0.065
0.042	0.257	0.17	0.503	0.6	0.254	2.8	0.06
0.044	0.262	0.18	0.504	0.65	0.233	3	0.055
0.045	0.265	0.19	0.505	0.667	0.227	3.2	0.051
0.046	0.267	0.2	0.504	0.7	0.216	3.4	0.047
0.048	0.272	0.22	0.490	0.75	0.201	3.5	0.045
0.05	0.277	0.24	0.477	0.8	0.188	3.6	0.043
0.055	0.294	0.25	0.470	0.85	0.180	3.8	0.04
0.06	0.310	0.26	0.463	0.9	0.173	4	0.038
0.065	0.326	0.28	0.449	0.95	0.167	4.2	0.036
0.067	0.332	0.29	0.442	1	0.161	4.4	0.035
0.07	0.342	0.3	0.436	1.1	0.148	4.6	0.033
0.075	0.357	0.32	0.421	1.2	0.138	4.8	0.032
0.08	0.371	0.34	0.407	1.3	0.128	5	0.031

Period = seconds;	SA = Spectral	Acceleration	(g)
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APPENDIX A

Logs of Test Borings

Atlantic Street Overcrossing Harding Boulevard OC Roseville Parkway Overcrossing Miners Ravine Bridge (EB off-ramp) Miners Ravine Bridge (WB on-ramp) Miners Ravine Bridge (Widen) Route 65/80 Separation East Roseville Viaduct Retaining Wall - 39E-41E Retaining Wall - 40W-42W Retaining Wall - 48W Retaining Wall - 48W Retaining Wall - 49E Retaining Wall - 58E Retaining Wall - 59W









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	KLE 307 SACE	INFELDER 7 FITE CI RAMENTO, 0	INC. R. CA 95826								

DESCRIPTION	
	DESCRIPTION

BRIDGE NO. 19-0056	MINE	RS	RAVINE	BRID	GE (WI	DEN)	
LOMETER POST	LOG	OF	TEST	BORIN	IGS	1	OF	5	
DISREGARD PRI	NTS BEARING	5/28/08 8	REVISION DATES (PREL /1/08	MINARY STAGE ONLY	<u>,</u>		5н	еет 4	of 28



	-				louger	
Caltrans	DIST	COUNTY	ROUTE	TOTAL PROJECT	No	SHEETS
	03	PIO	189	4.5/8.3	478	539
etric	1	R/lastat	H.O			
	REC	STERED	LIVIL ENGLA	VEER 5-14-08	FESSION	
	/			E EE	ARK H.	(E)
	/11	-17-08	/	615	TANLEY	INE
	PL	ANS APPRON	AL DATE	We. Ge	9-30-08	
	The St	ate of Califor	nia or its offic	cers or agents *	TECHNICAL	*
	comple	teness of elec	tronic copies o	f this plan sheet.	CALIFOR	
	KLE	INFELDER	INC.			
	307	7 FITE CI	R.			
	SAC	RAMENTO,	LA 95826			
					60	
	1				00	-
Approximate exis	s †				57	
						-
\						
RETE	AND	00-04	odium der			
ubangular, fine to coars	e sar	id, fine t	o coarse	58,	54	
nic gravels (FILL).						
u comented						
y cemented.					51	
decomposed aranite from	Imen+	s. modera	tely cemer	nted.	51	
decomposed granne mag	Jinerri	a, moder d	rery center	neu.		
GRAVEL with SILT and S	AND (SP): loose	e, brown, f	ine		
nd, fine to coarse grave (SC): light brown wet br	il, vo	ine to co	ovels (Fill)		48	
		1110 10 00		,		-
th GRAVEL (SM): brown m	oist	subanaul	ar, fine +c			
fine gravel, moderately	ceme	nted.		1.	45	-
ID (ML): dark gray, wet, h	hard,	medium p	lasticity.	h	45	Ē
imm each), quartz sand,	micac	eous, roo	ts in clay	S		z
M): dark gray, moist to	wet.	poorly ar	aded, fine	to		I.O
micaceous.	1,				42	/AT
um sand, some areas wea	kly c	emented (River Bank	Formation).	72	Ē Ē
1 SAND (SP)		omostad				ш
ie sand and silt lenses i	up to	20mm th	ick.			
wet, fine to medium san	d, un	cemented	to weakly		39	
L): light brown, moist to	o wet	, fine to	medium so	und,		-
d, weakly cemented, micad	ceous	•				
cemented areas, zones of	ofsa	ndy silt	up to		70	
					36	
rse sand.						
1						
SAND with SILT (SP-SM)	: ligh	t gray-br	own, wet,		33	
1); light brown wat bar	d fi	ne sand ·	poorly area	hed	55	-
ented, lenses of silt/clo	y (R	ver Bank	Formation).		
					30	
					100	
					~ 7	
					27	
17.00	_	-				
47+20 4	(+4)	0	47+60	47+8	30	
		2 - 820,511-19-19-20-		-	00.000	10
MINERS	R	AVINE	BRI	DGE (WID	DEN)
R POST				,		-
6 LOG OF	· T	EST	BORI	NGS 2 C)F	5
	MP of	FIGH DATES (DB)	INTRIDY STACE OF	M V 3		



	12	DIST	COUNTY	ROUTE	KILOMETER POST	SHEET	TOTAL
	Caltrans	03	Pla	800	4.5/8.3	No 479	SHEETS
	etric	-//	3/1.1.5	40	,		
		REG	-17-08	CIVIL ENGIN	VEER 5-14-08 PROF	ARK H.	ENGIN
		PLA	NS APPROV	AL DATE		2397 9-30-08	
		The Sta shall i complet	nte of Califor not be respons teness of elec	nia or its offic tible for the acc tronic copies of	cers or agents * State curacy or f this plan sheet.	CALIFORN	14
		KLE 307 SACI	INFELDER 7 FITE CI RAMENTO,	INC. R. CA 95826			
						54	-
						51	-
2	Approximat ground sur	e exi face	st			48	
ided GRA to 150 IP-RAP,	VEL with SAND (mm diameter, gu FILL).	GP): Io ranite	oose, gra and and	y, rounded, esite grav	, coarse el and	15	-
						40	-
			23 1 2		19: 0	42	2
nd.	TAVEL (SM): medi	um de	mse, pro	wii, moist,	TINE TO		
very st edium so	int, readish bro and, weakly ceme	own, m ented.	oist, low	plasticity	, TRACE	39	(m) N
nd cobbl ly ceme	es to 100mm mo nted.	aximun	n dimensi	on.		36	EVATIO
d (SM): H	bose, brown and Bank Formation	gray, 1).	moist, f	ine sand,		1000 0000	EL
d gray,	moderately cem	ented				33	-
brown, w	ell defined cros	ss bed	lding.				
ly ceme	nted, grading to		rse sand.			30	
wn, fine	to medium san	d, moc	ierately	cemented.		27	
ided GRA d, fine barse sa reccia B	VEL with SAND (to coarse grave nd. Boulder: moderat	GP): d I, tra tely w	ark gray ce cobble eathered	, moist, su es, weakly , hard.	brounded cemented,	24	
ided GRA rounde cemen	VEL (GP): gray, d gravel and col red.	wet, f bbles	ine to co up to 12	oarse sand 5mm, weakl	, fine y to	5.13	
						21	-
47-	-40 4	7+6	0	47+80	48+0	0	
NO. 156	MINERS	R/	VINE	BRI	DGE (WID)EN)
POST	LOG OF	= т	EST	BORI	NGS 3 C	F	5



		DIST	COUNTY	ROUTE	KILOMETER P		HEET	TOTAL
	Caltrans	03	PIg	89	4.5/8.3	4	480	539
	etri	° //	Valet	Hal	, 5-14-08			
		REG	STERED	IVIL ENGI	NEER	PROFES	SIONA	E.
		11	-17-08		EGIST	STAN	LEY 397	GINEE
		PLA The Sta	NS APPROV	AL DATE	cers or agents	xp. 9-3	80-08	/*/-
		shall i complet	not be respons teness of elec	ible for the ac tronic copies o	of this plan sheet.	TE OF CH	LIFORN	*/
		KLE 307	INFELDER 7 FITE CI	INC. R.				
		SAC	RAMENTO,	CA 95826				
						6	50	
				54				
							= 7	
							1	-
						!	54	-
							51	
							- 1	~
3	(Approxi	mate ex surface	is†					
(1897-18) 						4	18	
graded (coarse	GRAVEL (GP): g gravel, 2, tro	ray, moi ace clay	st, subro and silt	unded to , weakly c	rounded, emented			
							45	Ê
SILT with	GRAVEL (ML):	aray, m	oist, fin	e to coars	se sand.) NC
isticity, ic Brecci	weakly cemen a: reddish bro	ted, fine own and	e to coar gray, mo	se gravel. ist, intens	ely to		10	ATI(
red, no i clasts u	nfilling, suba nfilling, suba up to 150mm n	ately no ngular t naximum	o sub ro dimensic	unded and	esite and		+2	ELEV
EN FORMAT rately we	TION). eathered.							ш
							39	-
						-	36	
							.0	
						3	33	
						-	30	
						2	27	e .
47-	+80	48+0	0	48+20	48	+40)	
NO.		C D					- NU	\
056 R POST	MINER	S RA	AV I NE	BRI	DGE (W	I DE	<u>IN</u>)	-
6	LOG)F T	EST	BORI	NGS 4	0	-	5
GARD PRINTS B ER REVISION D	EARING	/28/08	STON DATES (PRE	LIMINARY STAGE C	m.1.1		27	28



	Coltrono	DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
	Caltrans	03	PIQ	80	4.5/8.3	481	539
	V eti	ic 1	Valex	Hal	5-14-08	FESSIO	
		REC	STERED	CIVIL ENGIN	VEER PHO	ARK H.	ENG
			11-17-	08 /		ANLEY 2397	INEE
		PL. The St	ANS APPROV	IAL DATE	cers or agents	9-30-08]. _* ⊢
		shall comple	not be respons teness of elec	ible for the accepted of the control	curacy or state of this plan sheet.	CALIFORN	10
		KLE	INFELDER	INC.			
		307 SAC	RAMENTO,	R. CA 95826			
						60	
						E 7	
34—		ximate e d surfac	e ist			ЪГ	-
CONCRET	E: about 100	MM.	medium	dense red	tish	54	
wet, angu	llar, fine to	coarse	sand, fine	gravel (F1	LL).	51	
ean CLAY se sand,	(SC): hard, (FILL).	dark gra	y and bro	wn, moist,	medium	51	
graded G	RAVEL (GP): I	oose, gro	by, wet, c	oarse grav	el.		
ean CLAY edium pl	(SC): very s asticity.	tiff, bro	own, wet,	medium to	coarse		
to coars	se sand, med	(SC): ha ium plas	rd, brown ticity, fi	, moist, ro ne to coar	unded, se gravel	48	
dark gra	ıх .						
Y lean C	LAY with SAN	v :(20) 0	ery stiff	. dark ara	v. moist.	4.5	
, fine to Breccio	medium san	nd, mediu	m plastic	ity, fine g	ravel.	45	Ē
clasts of	hered, moder	ately so and basa	ft, thick It up to	y bedded 1 10cm rangi	ng from		NO
hard, wi N FORMAT	idely spaced ION).	fracture	es, no inf	illing		10	AT I
						42	LEV
ately we	thered and	aratoly	oard				ш
ulelà Méd			u u.			39	
ately to	slightly wer	thered					-
01019-10	Singinity wet						
						36	
ately wea	athered.						
						33	
						7.0	
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						27	
						21	
48-	+20	48+4	0	48+60	48+8	30	
NO		1340 - 5164 K	0 1990 19 Matoria			0.00	
056	MINE	RS R	AVINE	BRI	DGE (WID)EN)
r post	LOG	OF T	EST	BORI	NGS 5 C)F	5
GARD PRINTS B	EARING	REV	ISION DATES (PRI	LIMINARY STAGE OF	w, Y)	SHEET	OF
TR HEVISION D		5/28/08				28	28



SCALE

		1		"打"
	Pla 80,65 37	13: FA. B/RG.3 Minda 7	/ 2 122 /75 165	2
BATE APPA	wveo <u>June 24</u>	, 1985		
21~				
2 2 2				
Ē	<u>2LAN</u> 1* = 20*			
с.р. 4-11-88	CORRECTIONS THIS SH CORRECTIONS BY CONTRACT NO.22 DATE 8-6-87	T. DE PO 5-242914	514	
SILTY medium SAND,	22	:0	-14	
brown, poorly sorled, medium grading to	<u> </u>	0	z ori T	,
ge krawn, poorly sorted, dama.	20	0	24 - 1. 	
SILTY line SAND with trace	19	0		
ILTY SANDSTONE	18	0	-	
NDSTONE, damp with ayors. EY SILTSTONE, slighty	17	0		I
EY SILTSTONE AY, Molel, high plusifully	16	0		
PROFILE Hor.: 1" = 20' Ver.: 1" = 10'	15	0		
JTE 65/80 LOG OF TE	SEPARATIC	S		
TREVEITED DATE		74		
			NA ST	







ClibPDF



MODERATELY TO SLIGHTLY FRACTURED (FD4)*

INTENSELY TO MODERATELY FRACTURED (FD6)*

ered short core lengths.

VERY INTENSELY TO INTENSELY FRACTURED (FD8)*

MODERATELY FRACTURED (FD5): Core recovered mostly in 100 to 300 mm lenghts with most lengths

INTENSELY FRACTURED (F07): Lengths average from 30 to 100 mm with scattered fragmented intervals Core recovered mostly in lengths less than 100 mm.

Combinations of fracture densities (e.g. Very intensely to intensely fractured, or Moderately to slightly fractured) are used where equal distribution of both fracture density characteristic are presently over a significant interval or exposure, or where characteristics are "in between" the descriptor definitions.

VERY INTENSELY FRACTURED (FD9): Core recovered mostly as chips and fragments with a few

		1	WEATHER	RING DESCRIPTORS		of Reclana	Modified from United States Bureau tion, Engineering Geology Field manual.	RQD LO	GGING	BEDDING, FOLIA	TION, OR FLOW
Des	scriptors		Diagn	nostic features	-		the second second second			Descriptors	Thickness / Spacing
		Chemical weathering- and/or oxid	ation	Mechanical weathering- Grain boundary condition	Texture a	nd solutioning	General characteristics	N		Mossive	Greater than 3 m
Iphanumeric descriptor	Descriptive term	Body of rock	Fracture surfaces t	for granitics and some coarse-grained sediments	Texture	Solutioning		x * x L=250 mm	∑ Length of Sound core >100 mm	Very thickly (bedded, foliated,	1 to 3 m
W1	Fresh	No discoloration, not oxidized.	No discoloration or oxidation.	No separation, intact (tight).	No change.	No solutioning.	Hammer rings when crystalline rocks are struck. Almost always rock excavation except for naturally work or work to creented		ROD = Total core run length	Thickly	300 mm to 1 m
	Slightly weathered						rocks such as siltstones or shales.	i s does not meet s soundness requirement		Moderately	100 to 300 mm
wz	to fresh 0	-	112	the state of a second second	Descention	Alfana transferen	Nemer since then enoded the	+	Ron - 250+190+200 × 100%	Thinty	30 to 100 mm
W3	Slightly weathered	Discoloration or oxidation is limited to surface of, or short distance from, fractures; some feidsoor	discoloration or oxidation of most surfaces.	No visible separation, intact (tight).	Preserved.	of some soluble minerals may be noted.	rocks are struck, Body of rock not weakened. With few exceptions, such as sittstones or shales.	L=0 Centerline pieces (100 mm and highly	1200	Very thinly	10 to 30 mm
	Madagasatu sa stianatu	crystals are dull.	001100001				classified as rack excavation.	weathered	5	Laminoted (intensely foliated	Less than 10 mm
W4	weathered 0							× ++		Modified from United States Bureau o	of
W5	Moderately weathered	Discoloration or axidation extends from fractures usually throughout: Fe-Mg minerals are "rusty," feldspor crystals are "cloudy."	All fracture surfaces are discolored or oxidized.	Partial separation of boundaries visible.	Generally preserved.	Soluble minerals may be mostly leached.	Hammer does not ring when rock is struck. Body of rock is slightly weakened. Depending on fracturing, usually is rock excavation except in naturally weak rocks such as slitstones or shales.	x x L=190 mm	ROD = 53% (foir)	Reclamation, Engineering Geology Fie	id manual;
W6	Intensely to moderately weathered 0							* L=0	ROD DESCRIPTION OF		
w7	Intensely weathered	Discoloration or oxidation throughout; all feldspars and Fe-Mg minerals are altered to clay to some extent; or chemical alteration produces in-situ disaggregation, see grain boundary conditions.	All fracture surfaces are discolored or oxidized, surfaces friable,	Partial separation, rock is friable; in semi-arid conditions granitics are disaggregated.	Texture altered by chemical disintegra- tion (hy- dration, argillation).	Leaching of soluble minerals may be complete.	Dull sound when struck with hommer, usually can be broken with moderate to heavy manual pressure or by light hommer blow without reference to planes of weakings such as incipient or hairline fractures, or winiets, Rock is significantly weakened. Usually common excavation.	Mechanical break-caused by drilling process	DESIGNATION HOLK GUALITY 0 - 25% VERY POOR 25 - 50% POOR 50 - 75% FAIR 75 - 90% GOOD 90 - 100% EXCELLENT		
W8	Very intensely weathered										
W9	Decomposed	Discolored or oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe-Mg minerals are completely altered to clay.		Complete separation of grain boundaries (disaggregated).	Resembles a s complete remr structure may leaching of i usually compl	soil, partial or hant rock / be preserved; soluble minerals lete.	Can be granulated by hand. Always common excavation. Resistant minerals such as guartz may be present as "stringers" or "dikes."	No recovery	After Deere & Deere, 1989		
Note: This limestones conditions ^o Combinati are "in b two adjac t Does not rock mass § These are naturally	chart and its horizont and poorly indurated s or diferation such as the such as a such as a such as the such as a such as a such as a network the diagnostic ent ferms may be combi- licitude directional we would not require the generalizations and si weak materials or cem	(a) categories are more readi- ediments, will not always fit hydrothermal effects; however feature. However, dual descr feature. However, dual descr thering clong shears or faul- rock mass to be classified an hould not be used as diagnost entration and type of excavation.	y applied to rocks w the categories esto , the basic framewor tion of both weather iptors should not be weathered, "or "mode ts and their associa s weathered. Is features for weath on.	with feldspors and motion fin bilished. This chart and wea k and similar descriptors a ling characteristics are pre- used where significant, id rately weathered to fresh ted features. For example, on hering or excavation classi	erals. Weatheri thering categor re to be used. sent over signi- entifiable zones are not accepted a shear zone the fication. These	ng in various sedi ies may have to be ficant intervals or s can be delineated le. It carried weatheri characteristics va	mentary rocks, particularly modified for particular site where characteristics present , When given as a range, only ng to great depths into a fresh my to a large extent based on				in-situ, lab
			Modified from L	United States Bureau of		ROCK	HARDNESS STRENCTH DESCRI				TEST DESIGN
	NCITY- Broad on the	INAVIONE DENGITI A	eclamation. Engineerin	g Geology Field manual.	Alphanumeric	Descriptor	THE BERGER DESCRIPTION				AL ATTERBERG
lengths in distributed	boreholes; excludes m zones (fracturing ou	echanical breaks, shears, an tside the shear) are include	id shear zones; howe	fracture density	Descriptor	Extremely hard	Core, fragment, or exposure canno	be scratched with knife or			CA) CHEMICAL A
slopes and borehole co	inverts, as well as be res where lengths are	medsured along the core axi	io presented below s, for other exposu	are based on tres the	H2	Very hard	sharp pick; can only be chipped w Cannot be scratched with knife of	th repeated heavy hammer blows,			(CN) CONSOLIDA
UNFRACTURED	(FDØ): No fractures.	tween tractures (size of bio	GK8).		1. A.C.		breaks with repeated heavy hammer	blows.			CU CONSOLIDA UNDRAINED
VERY SLIGHT	LY FRACTURED (FD1): Co	ore recovered mostly in leng	ths greater than 1	m.	H3	Hard	Can be scratched with knife or sh pressure). Heavy hammer blow requ	rp pick with difficulty (heavy red to break specimen.			
SLIGHTLY TO	VERY SLIGHTLY FRACTU	RED (FD2)*	2100-1 <u>000</u> 000-000000	I MINTER C	H4	Moderately hard	Can be scratched with knife or sh pressure. Core or fragment breaks	urp pick with light or moderate with moderate blow.			OS UNILUT SI
SLIGHTLY FR	ACTURED (FD3): Core r	ecovered mostly in lengths t	from 300 to 1000 mm.	, with few	1100	Hadacate Di Sole	Can be accound 0 and doop by holds	or sharp pick with moderate			(MD) MAX. DRY

	- CD	0 0 0	- X - X																
ng to the	Granuf	very Loose Medium D Dense Very Den	Classific inspectio	D Brittsan	DRAWN BY	A. Sanchez	GZhang/BVonDessoneck		PREPARED FOR THE	K Chowdhury	BRIDGE NO. 19E0005	RE		I I N G	WALL	. 391	- 41	E	
Accord	N-Value (Blows/ 0.3m)	0-4 5-10 11-30 31-50 250	NOTE:	June 29, 2007	CHECKED BY	M. Briseno	DATE: August 2006		DEPARTMENT OF TRANSPORTATION	PROJECT ENGINEER	KILOMETER POST	ROCK	LEGENDS	AND LAB	ORATORY A	ND FIELD	TEST (SYMBO)LS
CIVIL LOG OF T	EST BO	INGS SHEET (M	ETRIC) (RE	V. 2/1/00)						CII 03262				REVISION DAT	ES (PRELIMINARY STAGE	ONLY)		SHEET	OF
01112 200 01 1	201 001	intes since i the	211107 (12				FOR RED	UCED PLANS 0 10	20 30 40 50 60 70 80 90 100	EA 367821	EARLIER REVI	SION DATES -	6/27/	07				23	29
										FILE => 19e0005-z-log-01.dgn					00 00 000 -				

Any bedrock unit softer than H7, very soft, is to be described using ASTM D-2488 consistency descriptors

Note: Although "sharp pick" is included in these definitions, descriptions of ability to be scratched, grooved or gouged by a knife is the preferred criteria. Modified from United States Bureau of Reclamation, Engineering Geology Field manual.

Moderately soft Can be grooved 2 mm deep by knife or sharp pick with moderate or heavy pressure. Core or fragment breaks with light hammer blow or heavy manual pressure.

Con be grooved or gouged easily by knife ar sharp pick with light pressure, can be scratched with fingernail, Breaks with light to moderate manual pressure.

Can be readily indented, grooved or gouged with fingernall, or carved with a knife. Breaks with light manual pressure.

H5

H6

H7

Soft

Very soft

Caltrans	dist 03	county Sac,Pla	ROUTE 80	KILOMETER POST TOTAL PROJECT 28.1/29.0, 0.0/4.7	SHEET No 493	total sheets 528
etric	Khi REG	11-26-07	wellw IVIL ENGI	MEER 6-27-07 PRO	aled H.	ENGINEE
	PLA The Sto shall i comple	ans APPROV ate of Californ not be responsi teness of elect	AL DATE ia or its offi ble for the au ronic copies o	icers or agents * Exp. ccuracy or State of of this plan sheet.	6-30-09 IVIL CALIFORN	1 m
	KLE 307 SAC	INFELDER I 7 FITE CIR RAMENTO, C	NC. A 95826			

- (MD) MAX. DRY DENSITY
- PP POCKET PENETROMETER
- SA SIEVE ANALYSIS
- TV TORVANE
- UNCONFINED COMPRESSION UNCONSOLIDATED UNDRAINED TRIAXIAL
- VS VANE SHEAR



Calleran	DIST COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET	SHEETS
Caltrans	03 Sac,Pla	80	28.1/29.0,	494	528
etr	ic <u>KLaledHLL</u> REGISTERED C <u>11-26-07</u> PLANS APPROV	owdhw SIVIL ENGI AL DATE	HEER 6-27-07 RO RD	FESSION aled H. owdhury C67823	ENGINEER
7	The State of Californ shall not be respons completeness of elec	nia or its off ible for the a tronic copies	icers or agents * Exp. ccuracy or of this plan sheet.	IVIL CALIFORD	an a
	KLEINFELDER 1 3077 FITE CIF SACRAMENTO, (INC. R. CA 95826			

1. 51 mm samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 51 mm and an outside diameter (0.D.) of 64 mm.

2. A safety semi-automatic hammer (63.5 kg) with a 760 mm drop was used to advance the sampler.

3. Blowcounts noted for boring are field blowcounts and have not been corrected.

35 mm samples were taken using a SPT split-barrel sampler with an inside diameter (I.D.) of 35 mm and an outside diameter (0.D.) of 51 mm.

5. 63.5 mm core samples were taken using an H0 core sampler with a 63.5 mm inside diameter (I.D.) and 94 mm outside diameter (0.D.) core barrel.

6. Blowcounts 50/125 means 50 blows per 125 mm penetration.

7. Horizontal Borings were started approximately 1.5m above adjacent shoulder grade and inclined downward at a 10 degree angle. Horizontal borings intersect shoulder grade at a depth of approximately 8.8 meters.

NO. 005	RET	AIN	ING	WALL	39E-4	41E	E.
a post 4	LOG	OF	TEST	BORING	às 10	F 6	
	NTC 05401N0		REVISION DATES (PR	ELIMINARY STAGE ONLY)		SHEET	OF
R REVIS	ION DATES	6/27/07				24	29
		10 - 10 - 10 - 10 - 10 - 10 - 10 - 10 -		10 ACC 27 1			



	DIST COUN	TY RO	UTE	KILOMETER POST	SHEET	TOTAL
Caltrans	03 Sac,		30	28.1/29.0, 0.0/4.7	495	528
etric	Khaledt	Hhowo ED CIVIL	ENGINE	6-27-07 ER 6-27-07	FESSIONA	
	11-26	5-07		SISTERS	aled H.	ENGINE
	PLANS AP	PROVAL DA	ATE	No. (6-30-09	
	shall not be ro completeness o	esponsible fo f electronic	r the accu copies of	racy or this plan sheet.	CALIFORN	
	KLEINFELD 3077 FITE	DER INC. E CIR.				
	SACRAMEN	TO, CA 95	826		- -	
					57	6
+23.678						
52						
					54	
: pale brown, dry, fine sa el, trace sand and gravel T (ML): hard, brown, wet	nd fine					
n sand, trace rock fragm Breccia (Mehrten Formatic	ents. on): reddis	h				
oderately weathered, moderately to slightly fract to to 150 mm.	erately ha ured, mass	rd, live,				
					51	
ly worthous d						
ly to moderately weather	ed.					_
by soft.	,				48	(m) Z
						ATION
ly weathered.						TEVE
						ш
					45	
ely weathered.					45	8
ely to slightly weathered	t.					
					42	8
up to 175 mm.						
					39	
40+60 40+80	41+	00				
RETAI	NING	WA	A L L	39E-4	41E	
LOG OF	TES	ТВС	ORIN	IGS 2 0)F (6
GARD PRINTS BEARING	REVISION DATE	S (PRELIMINAR)	Y STAGE ONL	Y)	SHEET 25	oF 29







Caltrans	DIST COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT 28.1/29.0	SHEET No	SHEETS
an etric		1/	0.0/4.7 4	498	528
in a state of the	REGISTERED CI	VIL ENGIN	6-27-07	ESSIONA	
5 kg) with a	11-26-07		SI Che	wdhury	ENGIN
sampier.	PLANS APPROVA	L DATE		67823 6-30-09	
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T iameter	KLEINFELDER IN	NC.		CALI	
fer	3077 FITE CIR. SACRAMENTO, C/	A 95826			
ng an					
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ELEV	DESCRI	PTION			
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d on the California	coordinate sy	ystem			
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	DJ				
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	egate Base. CLAY with GRAV	EL (CL): h	ard, dark	62	
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reddi weath	ish brown, moder nered, moderate	rately to ly hard, i	slightly ntensely to		(
=60% mode =60% subro to 8	ounded, no infil cm range from	ling, rock soft to	ular to clasts up hard.	~~	ь) 7
- 63.5		0000000000000		60	TION
=60%					EVA
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7/27/2006				58	
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10 41+60	41+80	41	2+00	50	8
	0011	42			
RETAI	NING	WAL	L 39E-	41E	
	TEST	BORI	NGS 5 C	E (6



NAME => trrichf DATE PLOTTED => 28-NOV-2007 T.



			WEATHER	RING DESCRIPTORS		of Reclanat	Modified from United States Bureau ion, Engineering Geology Field manual.		ROD LOO	GGING	BEDDING, FOLIA	TION, OR FLOW
Dee	orlotors		Diagn	iostic features							TEXTURE DE	SCRIPTORS
000	criptors.	Chemical weathering	-Discoloration	Mechanical weathering- Grain boundary condition	Texture a	nd solutioning	General characteristics		x		Descriptors	Inickness / spacing
Alphanumeric	Descriptive term	Body of rock	Frocture surfaces t	(disaggregation) primaril for granitics and some	y Texture	Solutioning	 (strength, excavation, etc.)⁵ 		* * * L=250 mm	Length of	Mossive	Greater than 3 m
W1	Fresh	No discoloration, not	No discoloration	No separation, intact	No change.	No solutioning.	Hammer rings when crystalline rocks are struck. Almost always		A	ROD = Total acco con locato	or banded)	1 to 3 m
		origized.	or oxiderion.	cright?.			rock excavation except for naturaly weak or weakly cemented rocks such as siltstones or shales.		L 1 L=0 L 1 L Highly weathered L 1 L does not meet	fordi core run rengin	Thickly	300 mm to 1 m
W2	Slightly weathered to fresh 0								soundness requirement		Moderately	100 to 300 mm
W3	Slightly weathered	Discoloration or exidation is limited to surface of,	Minor to complete discoloration or	No visible separation, intact (tight).	Preserved.	Minor leaching of some soluble	Hammer rings when crystalline rocks are struck, Body of rock		L=0	$\ ROD = \frac{250+190+200}{1200} \times 100\%$	Thinty	30 to 100 mm
		or short distance from, fractures; some feldspar crystals are dull,	oxidation of most surfaces.			minerals may be noted.	such as siltstones or shales, classified as rock excavation.		Centerline pieces (100 mm and highly weathered		Very thinly	10 to 30 mm
W.4	Moderately to slightly weathered 0	y .									or banded)	Less than 10 mm
W5	Moderately weathered	Discoloration or oxidation extends from fractures usually throughout: Fe-Mg minerals are rusty," feldspar crystals are "cloudy."	All fracture surfaces are discolored or oxidized.	Partial separation of boundaries visible,	Generally preserved.	Soluble minerals may be mostly leached.	Hammer does not ring when rock is struck, Body of rock is slightly weekened. Depending on fracturing, usually is rock excavation except in noturally week rocks such as slitstomes or shales.		L=190 mm	ROD = 53% (foir)	Reclamation, Engineering Geology Fie	n d manual;
W6	Intensely to moderately weathered ^O	,							x L=0	ROD DESCRIPTION OF		
W7	Intensely weathered	Discoloration or axidation throughout; all feldspars and Fo-Mg minerats are altered to clay to some extent; or chemical alteration produces in-situ disaggregation, see grain boundary conditions.	All fracture surfaces are discolored or oxidized, surfaces friable.	Partial separation, rock is friable; in semi-arid conditions granitics are disaggregated.	Texture altered by chemical disintegra- tion (hy- dration, argillation).	Leaching of soluble minerals may be complete.	Dull sound when struck with hommer, usually can be broken with moderate to heavy manual pressure or by light hommer blow without reference to planes of weakness such as incipient or nairline fractures, or winiets, Rock is significantly weakened. Usually common excavation.	Mechanical break caused by drilling process	(100 mm	DESIGNATION RDCK QUALITY 0 - 25% VERY POOR 25 - 50% POOR 50 - 75% FAIR 75 - 90% GOOD 90% EVERT		
W8	Very intensely weathered								·	SO - 100% EXCELLENT		
мЭ	Decomposed	Discolored or oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe-Mg minerals are completely altered to clay.		Complete separation of grain boundaries (disaggregated).	Resembles a s complete rom structure may leaching of i usually compl	oil, partial or ant rock / be preserved; oluble minerals ete.	Can be granulated by Hand. Always common excavation. Resistant minerals such as guartz may be present as "stringers" or "dikes."		L=0 No recovery	After Deere & Deere, 1989		
Note: This limestones conditions ^o Combinati are "in b two adjac t Does not rock mass § These are noturally	chart and its horizon and poorly indurated : or alteration such as an descriptors are per etween" the diagnostic ent terms may be combi- include directional we would not require the generalizations and s weak materials or cem	tal categories are more readi esdiments, will not always fi hydrothermal effects; however missible where equal distribu- r feature, However, dual descr inde. "Decomposed to slightly wathering along shears or faul rock mass to be classified a hould not be used as diagnost entation and type of excavati	() applied to rocks with the categories estation, the basic framework in the categories of the the the categories of the the the categories of the the the the categories of the the categories and their associations weathered. The the categories for weather down and the categories for weather down.	ith feldspors and moffe mir blished. This chart and wea k and similar descriptors a ing characteristics are pre used where significant, id rately weathered to fresh" def features. For example, a hering or excavation classi	erals. Weatheri thering categor er to be used. sent over signi- entifiable zones re not acceptab i shear zone the fication. These	ng în various sedin les may have to be licant intervais or i can be delineated le. t carried weatheri characteristics va	entary rocks, particularly modified for particular site where characteristics present , When given as a range, only ng to great depths into a fresh ry to a large extent based on					IN-SITU
		FRACTURE DENSITY	Modified from U	mited States Bureau of		ROCK	HARDNESS/STRENGTH DESCRI	PTORS				
FRACTURE DE	SITY- Based on the s	spacing of <u>all natura</u>) fract	ures in an exposure	or core recovery	Alphanumeric Descriptor	Descriptor	Criterio					
aistributed apply to al	zones (frocturing ou rock exposures such overts, os well com	itside the shear) are include to as tunnel walls, dozer tren pareholes. Descriptive criter	ed. Descriptors for hoches, outcrops, or rio presented below	fracture density foundation cut are based on	H1	Extremely hard	Core, fragment, or exposure cannot sharp pick; can only be chipped wi	be scratched with th repeated heavy	v knife or hommer blows,			
borehole co criteria is	res where lengths are distance measured be	measured along the core ax itween fractures (size of blo	is, for other exposu ocks),	res the	H2	Very hard	Cannot be scratched with knife of breaks with repeated heavy hammer	sharp pick. Core o blows.	or fragment			CIN CON
UNFRACTURED VERY SLIGHT	(FDØ): No fractures. Y FRACTURED (FD1): C	ore recovered mostly in lend	iths greater than 1 i	m	Н3	Hard	Can be scratched with knife or sho pressurel. Heavy nammer blow requi	rp pick with diffi	culty (heavy			
SLIGHTLY TO	VERY SLIGHTLY FRACTU	JRED (FD2)*			H4	Moderately hard	Can be scratched with knife or sho pressure. Core or fragment breaks	rp pick with light with moderate hamm	t or moderate mer blow.			
SCOTTERED IN MODERATELY	rogths less than 300 SLIGHTLY FRACTURED	mm or greater than 1000 mm. (FD4)*	TTON 300 TO 1000 MM.	, міттр таж	H5	Moderately soft	Can be grooved 2 mm deep by knife or heavy pressure. Core or fragmer blow or beavy monual pressure.	or sharp pick with t breaks with ligh	n moderate nt hammer			(MD) MAX

MODERATELY TO SLIGHTLY FRACTURED (FD4)* MODERATELY FRACTURED (FD5): Core recovered mostly in 100 to 300 mm lenghts with most lengths

INTENSELY TO MODERATELY FRACTURED (FD6)*

INTENSELY FRACTURED (F07): Lengths average from 30 to 100 mm with scattered fragmented intervals Core recovered mostly in lengths less than 100 mm. VERY INTENSELY TO INTENSELY FRACTURED (FD8)*

VERY INTENSELY FRACTURED (FD9): Core recovered mostly as chips and fragments with a few ed short core lengths

Combinations of fracture densities (e.g. Very intensely to intensely fractured, or Moderately to slightly fractured) are used where equal distribution of both fracture density characteristic are presently over a significant interval or exposure, or where characteristics are "in between" the descriptor definitions.

Can be readily indented, grooved or gouged with fingernail, or carved with a knife. Breaks with light manual pressure. H7 Very soft Any bedrock unit softer than H7, very soft, is to be described using ASTM D-2488 consistency descriptor Note: Although "sharp pick" is included in these definitions, descriptions of ability to be scratched, grooved or gouged by a knife is the preferred criteria. Modified from United States Bureau of Reclamation, Engineering Geology Field manual.

Can be grooved or gouged easily by knife or sharp pick with light pressure, can be scratched with fingernail. Breaks with light to moderate manual pressure.

H6

	8.8																
SISTENC F F Cranul Cranul Very Loo Loose Medium D Dense Very Den	Classific inspectic	D Brittsan DESIGN OVERSIGHT	DRAWN BY	A. Sanchez	GZhang/BVonDessoneck		PREPARED FOR THE STATE OF CALIFORNIA	K Chowdhury	BRIDGE NO. 19E0006	RE	ΤΑΙΝ	ING	WALL	401	/ - 42	2 W	
CON Accord 87 87 87 81 0.301 0.301 0.301 0.4 5-10 11-30 31-50 250	NOTE:	June 29, 2007 SIGN OFF DATE	CHECKED BY	M. Briseno	DATE: August 2006		DEPARTMENT OF TRANSPORTATION	PROJECT ENGINEER	KILOMETER POST 4.14	ROCK	EGENDS	AND LAB	BORATORY	AND FIELD	TEST	SYMBO	OLS
CIVIL LOG OF TEST BORINGS SHEET (METR	IC) (RE	/. 2/1/00)			0010104	CON 5 IN MULTINETERS		CII 03262	010000400.00			REVISION DA	TES (PRELIMINARY STA	E ONLY)		SHEET	OF
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								FILE => 19e0006-z-log-01.dgn					12 12 AV			17 A	

Caltrans	DIST 03	COUNTY Sac,Pla	ROUTE 80	KILOMETER POST TOTAL PROJECT 28.1/29.0, 0.0/4.7	SHEET No	TOTAL SHEETS 528					
etric	KLI REG	-26-07	AL DATE	HEER 6-27-07 PROF	ESS10N, alled H. wdhury 667823	ENGINEER					
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	KLE 307 SAC	INFELDER 1 7 FITE CIR RAMENTO, C	NC. 1. A 95826								



- RG LIMITS
- ANALYSIS
- DATION
- IDATED NED TRIAXIAL
- SHEAR
- (MD) MAX. DRY DENSITY
- PP POCKET PENETROMETER
- SA SIEVE ANALYSIS

- UNCONFINED COMPRESSION UNCONSOLIDATED UNDRAINED TRIAXIAL
- VS VANE SHEAR



Caltrans	DIST 03	COUNTY Sac,Pla	ROUTE 80	KILOMETER POST TOTAL PROJECT 28.1/29.0, 0.0/4.7	SHEET No	total sheets 528					
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		et	ric KL	aledAlh	owdher	<u>0.0/</u> 6-27	-07	527	528
				Sac Pla	ROUTE	28.1/2	ROJECT	No 527	520
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NO. 06	RE	TAI	NING	WA	LL	40W	-4	2 W	/	
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REVISION	DATES	6/27/07							29	29



Notes:

- 51 mm samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 51 mm and an outside diameter (0.D.) of 64 mm.
- 2. A safety semi-automatic hammer (63.5 kg) with a 760 mm drop was used to advance the sampler.
- 3. Blowcounts noted for boring are field blowcounts and have not been corrected.
- 35 mm samples were taken using a SPT split-barrel sampler with an inside diameter (I.D.) of 35 mm and an outside diameter (0.D.) of 51 mm.
- 5. 63.5 mm core samples were taken using an HQ core sampler with a 63.5 mm inside diameter (I.D.) and 94 mm outside diameter (O.D.) core barrel.
- 6. Blowcounts 50/125 means 50 blows per 125 mm penetration.
- 7. Groundwater was not encountered at the time of drilling.
- 8. The descriptions and classifications of soil, including consistency and relative density descriptions, used by the field personnel for the exploration bole holes on "Soil and Rock Logging Classification Manual (Field Guide)", Engineering Service Center, Office of Structural Foundations, August 1996.

BENCHMARKS

STATION	OFFSET	N	E	ELEV	DESCRIPTION
15+79.190	4.62 R†	618564.792	2062442.621	44.552	

SURVEY CONTROL

1. Coordinates bearing and distances are based on the California coordinate system of Nad 1983 HPGN, zone 6. (EPOCH 1991.35). Elevations are based on NGVD 29.



ORIGINAL SCALE IN MILLIMETERS

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Calturana	DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET	TOTAL SHEETS
Caltrans	03	Pla	/ 80	4.5/8.3	508	539
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m	KLE 1 3077 SACF	INFELDER 7 FITE CI RAMENTO,	INC. R. CA 95826		CALI	

BRIDGE NO. 19E0008	RE	ТА	INING	WALL	-	4	8 W		
LOMETER POST 4.7	LOG	OF	TEST	BORING	S	1	OF	: 4	
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_		DIST	COUNTY	ROUTE	KILOMETER POST	SHEET	TOTAL
C	altrans	03	Pla	80	4.5/8.3	_{No}	539
	etric		Yh		5/28/08	ESC.	
		REG	ISTERED	CIVIL ENGI	NEER PROV	NETH C	E
		11	-17-08			2520	GINEE
		PLA The Sta	NS APPRO	VAL DATE nia or its offici	cers or agents	9-30-08	/*/-
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(CL): hard	l, brown, mois	t, tro	ice cobbi	es.		51	LEVA
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		1	WEATHER	RING DESCRIPTORS		of Recianat	ion, Engineering Geology Field manual.	ROD LOG	SING	BEDDING, FOLIAT	SCRIPTORS
De	scriptors		Diagr	iostic features	_					Descriptors	Thickness / Spacing
		Chemical weathering and/or oxic	-Discoloration dation	Mechanical weathering- Grain boundary conditions	Texture a	nd solutioning	General characteristics	8 - ⁵ 4 3 - ⁷		Mossive	Greater than 3 m
phanumeric escriptor	Descriptive term	Body of rock	Frocture surfaces t	for granitics and some coarse-grained sediments	Texture	Solutioning	CALL AND THE MEMORY PROFILE COUNTY	* * L=250 mm	∑ Length of Sound core >100 mm	Very thickly (bedded, foliated,	1 to 3 m
W 1	Fresh	No discoloration, not oxidized.	No discoloration or oxidation.	No separation, intact (tight).	No change.	No solutioning.	Hammer rings when crystalline rocks are struck. Almost always rock excavation except for	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	ROD = Total core run length	or banded) Thickly	300 mm to 1 m
							naturaly weak or weakly cemented rocks such as siltstones or shales.	(i s i Highly weathered does not meet		The dependent of	100 1. 700
W2	Slightly weathered to fresh [©]							soundness requirement	250+100+200	Moderurery	100 TO 300 mm
W3	Slightly weathered	Discoloration or exidation is limited to surface of,	Minor to complete discoloration or	No visible separation, intact (tight).	Preserved.	Minor leaching of some soluble	Hammer rings when crystalline rocks are struck. Body of rock	L=0	$ROD = \frac{25071307200}{1200} \times 100\%$	Thinty	30 to 100 mm
		or short distance from, fractures; some feldspar crystals are dull,	oxidation of most surfaces.			minerals may be noted.	such as siltstones or shales, classified as rock excavation.	Centerline pieces (100 mm and highly weathered		Very thinly	10 to 30 mm
W.4	Moderately to slightly weathered ⁰									or banded)	Less than 10 mm
W5	Moderately weathered	Discoloration or oxidation extends from fractures usually throughout: Fe-Mg minerals are rusty," feidspar crystals are "cloudy."	All frocture surfaces are discolored or oxidized.	Partial separation of boundaries visible.	Generally preserved.	Soluble minerals may be mostly leached.	Hammer does not ring when rock is struck. Body of rock is slightly weekened. Depending on fracturing, usually is rock excavation except in naturally week rocks such as slitstones or shales.	L=190 mm	ROD = 53% (fair)	Modified from united stars oured of Reclamation, Engineering Geology Fiel	d manuel.
WG	Intensely to moderately weathered o								ROD DESCRIPTION OF		
W7	Intensely weathered	Discoloration or exidation throughout: all feldspars and Fe-Mg minerals are altered to clay to some extent: or chemical alteration produces in-situ disaggregation, see grain boundary conditions.	All fracture surfaces are discolored or oxidized, surfaces friable.	Partial separation, rock is friable; in semi-arid conditions granitics are disaggregated.	Texture altered by chemical disintegro- tion (hy- dration, argillation),	Leaching of soluble minerals may be complete.	Dull sound when struck with hammer, usually can be broken with moderate to heavy manual pressure or by light hammer blow without reference to planes of weakness such as incipient or hairline fractures, or veinlets, Rock is significantly weakened. Usually common excavation.	Mechanical break caused by drilling process	DESIGNATION ROCK QUALITY 0 - 25% VERY POOR 25 - 50% POOR 50 - 75% FAIR 75 - 90% GOOD 000 EVENUEANT		
W8	Very intensely weathered							+	30 - 100% EXCEPTENT		
W9	Decomposed	Discolored or oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe-Mg minerals are completely altered to clay.		Complete separation of grain boundaries (disaggregated).	Resembles a s complete remn structure may leaching of s usually compl	oil, partial or ant rock be preserved; olublé minerals ete.	Con be granulated by hand. Always common excavation. Resistant minerals such as quartz may be present as "stringers" or "dikes."	No recovery	Affer Deere & Deere, 1989		
Note: This Limestones conditions [©] Combinat are "in two adjo ! Does not rock mas \$ These are naturally	chart and its horizont and poorly indurated as or alteration such as ion descriptors are per setween' the diagnostic test terms may be combi- include directional we would not require the generalizations and si wook materials or come	al categories are more readi ediments, will not always fi hydrothermal effects; howeve missible where equal distribu feature. However, dual descr ned. "Decomposed to slightly athering along shears or faul rock mass to be classified c hould not be used as alagnest intration and type of excavati	<pre>ly applied to rocks ; t the categories est- r, the basic framewor tion of both weather "phors should not be weathered." of "mode its and their associa as weathered. tic features for weat ion. Modified from i Reclamation, engineerin</pre>	<pre>ith feldspors and mafic mine bilished. This chart and weat to and similar descriptors an ing characteristics are pres used where significant, ide rately weathered to fresh" a ted features. For example, a hering or excavation classif mited States Bureau of a Geology Field monual.</pre>	rais. Weatherin hering categori e to be used. ent over signif rifiable zones re not acceptab shear zone tha ication. These	ig in various sedim es may have to be licant intervals or can be delineated le. t carried weatherir characteristics var ROCK	entary rocks, particularly modified for particular site where characteristics present when given as a range, only ig to great depths into a fresh by to a large extent based on HARDNESS/STRENGTH DESCRI	PTORS			IN-SITU, LA <u>TEST DESIC</u> (AL) ATTERBERG
FRACTURE DE	NSITY- Based on the s	pocing of all natural fract	ures in an exposure	or core recovery	iphanumeric	Descriptor	Criterio				
lengths in distributed apply to a	boreholes; <u>excludes</u> m zones (fracturing ou I rock exposures such	echanical breaks, shears, a tside the shear) are includ as tunnel walls, dozer tre	nd shear zones; how led. Descriptors for nches, outcrops, or	frocture density	Descriptor H1	Extremely hard	Core, fragment, or exposure canno	t be scratched with knife or			CA) CHEMICAL
slopes and borehole co	inverts, as well as bi res where lengths are distance measured ba	oreholes. Descriptive crite measured along the core ax tween fractures (size of b)	rio presented below is, for other exposi- ocks).	are based on ires the	H2	Very hard	sharp pick; can only be chipped a Cannot be scratched with knife of	ith repeated heavy hammer blows, sharp pick. Core or fragment			(CN) CONSOLID
UNFRACTURE	(FDØ): No froctures.				H3	Hard	breaks with repeated heavy hammer Can be scratched with knife or sh	blows. arp pick with difficulty (heavy			
VERY SLIGHT	VERY SLIGHTLY FRACTURE	are recovered mostly in leng RED (FD2)*	gths greater than 1	m.,		History at the heat	pressure). Heavy hammer blow requ	ired to break specimen.			(DS) DIRECT S
SLIGHTLY FI	ACTURED (FD3): Core r engths less than 300 r	ecovered mostly in lengths mm or greater than 1000 mm,	from 300 to 1000 mm	, with few	H5	Moderately hard	can be scratched with knite of sh pressure. Core or fragment breaks Can be grooved 2 mm deep by knife	with moderate hammer blow. or sharp pick with moderate			MD MAX. DRY
MODERATELY MODERATELY	TO SLIGHTLY FRACTURED FRACTURED (FD5): Core	(FD4)* recovered mostly in 100 to	300 mm lenghts with	n most lengths	HG	Soft	or neavy pressure, core or fragme blow or heavy manual pressure. Can be grooved or gouged easily b	y knife or sharp pick with light			PP POCKET P
INTENSELY	O MODERATELY FRACTURE	D (FD6)*				101 A	moderate manual pressure.	ingeriaari, breaks with right to			(SA) SIEVE AN
1. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2.	and the state of the			A TOTAL CONTRACTOR AND A CONTRACT A	117	Marry rolf +	Con be readily indepted proceed	or coulded with finderodil or			-

INTENSELY FRACTURED (FD7): Lengths average from 30 Core recovered mostly in lengths less than 100 mm. VERY INTENSELY TO INTENSELY FRACTURED (FD8)*

VERY INTENSELY FRACTURED (FD9): Core recovered mostly as chips and fragments with a few tered short core lengths.

Combinations of fracture densities (e.g. Very intensely to intensely fractured, or Moderately to slightly fractured) are used where equal distribution of both fracture density characteristic are presently over a significant interval or exposure, or where characteristics are "in between" the descriptor definitions.

carved with a knife. Breaks with light manual pressure. Any bedrock unit softer than H7, very soft, is to be described using ASTM D-2488 consistency descriptors. Note: Although "sharp pick" is included in these definitions, descriptions of ability to be scratched, grooved or gouged by a knife is the preferred criteria. Modified from United States Bureau of Reclamation, Engineering Geology Field manual.

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STENC	ng to the Granul	Very Loo	Loose Medium D Dense Very Den	Classific Inspectio	Kenneth Sorensen	DRAWN BY	A. Sanchez	G. Zhang		PREPARED FOR THE		BRIDGE NO. 19E0008	RETA	INING	WALL -	48 W	/	
CONS	Accordi SPT N-Vatue (Btows/	0-4	5-10 11-30 31-50 250	NOTE:	05/18/08 SIGN OFF DATE	CHECKED BY	G. Zhang	DATE: 01/15/07		DEPARTMENT OF TRANSPORTATION	PROJECT ENGINEER	KILOMETER POST 4.7	LOG OF	TEST	BORINGS	4 0	F 4	
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- UC UNCONFINED COMPRESSION UUU UNCONSOLIDATED UNCONSOLIDATED UNDRAINED TRIAXIAL VS VANE SHEAR


		1	WEATHER	RING DESCRIPTORS		of Reclamat	fion, Engineering Geology Field manual,		RQD LO	GGING	BEDDING, FOLIA	TION, OR FLOW
Des	criptors		Diagr	iostic features					-•n •		Descriptors	Thickness / Spacing
		and/or oxid	ation	Grain boundary conditions (disaggregation) primarily	Texture d	and solutioning	General characteristics (strength.excavation.etc.) [§]		x x x 1 = 250 mm		Mossive	Greater than 3 m
scriptor	Descriptive term	Body of rock	surfices t	coarse-grained sediments	Texture	Solutioning	Memory of the second lifes			∑ Length of sound core >100 mm	Very thickly (bedded, foliated, or banded)	1 to 3 m
W1	Fresh	No discoloration, not oxidized.	No discoloration or oxidation.	No separation, intact (tight).	No change.	No solutioning.	rocks are struck. Almost always rock excavation except for naturally weak or weakly comented		1 1 L=0	ROD = Total core run length	Thickly	300 mm to 1 m
wo	Slightly weathered						rocks such as siltstones or shales.	6	does not meet soundness requirement		Moderately	100 to 300 mm
W2	to fresh ^o	Discoloration or exidation	Minor to complete	No visible separation.	Preserved.	Minor Leaching	Hommer rings when crystalline		•	ROD =X 100%	Thin(y	30 to 100 mm
***	anging weathered	is limited to surface of, or short distance from, fractures; some feldspar	discoloration or oxidation of most surfaces.	intect (tight).		of some soluble minerals may be noted.	rocks are struck. Body of rock not weakened. With few exceptions, such as siltstones or shales,		L=0 Centerline pieces (100 mm and highly	1200	Very thinly	10 to 30 mm
W4	Moderately_to_slightly	crystals are duit.					classified as rock excavation.		* weathered	5	Laminated (intensely foliated or banded)	Less than 10 mm
7/22	weathered o	Discoloration or exidation	All fronture	Portial separation of	Generally	Soluble minerals	Hommer does not ring when rock	6		ROD = 53% (fair)	Modified from United States Bureau o Reclamation, Englneering Geology Fie	f (d manua),
W5	Moderately weathered	extends from tractures usually throughout; Fe-Mg minerals are "rusty," feldspar crystals are "cloudy,"	surfaces are discolored or oxidized.	boundaries visible.	preserved.	may be mostly leached.	is struck, Body of rock is slightly weakened. Depending on fracturing, usually is rock excavation except in naturally weak rocks such as siltstones or shales.		4 X L=190 mm			
Wő	Intensely to moderately weathered ^o								× L=0	ROD DESCRIPTION OF		
W7	Intensely weathered	Discoloration or oxidation throughout; all feldspars	All fracture surfaces are	Partial separation, rock is friable; in semi-arid	Texture altered by	Leaching of soluble minerals	Dull sound when struck with hammer, usually can be broken with		<100 mm	B DESIGNATION) HOLK GUALITY		
		and Fo-Mg minerals are altered to clay to some extent; or chemical alteration produces in-situ disaggregation, see grain boundary conditions.	discolored or oxidized, surfaces friable.	conditions granitics are disaggregated.	chemical disintegra- tion (hy- dration, argillation)	may be complete.	moderate to heavy manual pressure or by light hommer blow without reference to planes of weakness such as incipient or hairline fractures, or veinlets, Rock is significantly weakened. Usually common exclusion	Mechanical break caused by drilling process	L=200 mm	0 - 253 VERT HOUR 25 - 502 POOR 50 - 752 FAIR 75 - 902 6000		
W8	Very intensely weathered								×	30 - 100% EXCELLENT		
wə	Decomposed	Discolored or axidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe-Mg minerals are completely altered to clay.		Complete separation of grain boundaries (disaggregated).	Resembles a complete rem structure ma leaching of usually comp	soil, partial or nant rock y be preserved; soluble minerals lete.	Can be granulated by hand. Always common excavation, Resistant minerals such as guartz may be present as "stringers" or "dikes."		L=0 No recovery	After Deere & Deere, 1989		
two odjoc loes not rock mass These are naturally	ent terms may be combi- include directional we would not require the generalizations and si weak materials or ceme	ned. "Decomposed to slightly athering along shears or faul rock mass to be classified a hould not be used as diagnost entation and type of excavati	weathered," or "mode ts and their associa s weathered. ic features for weat on.	rately weathered to fresh" a ted features. For example, a hering or excavation classif	re not acceptal shear zone th ication. These	ole. at carried weatheri characteristics va	ng to great depths into a fresh ry to a large extent based on					IN-SITU, LA
		FRACTURE DENSITY	lecianation, Engineerin	g Geology Fleid manual.	(Personal at a	ROCK	HARDNESS/STRENGTH DESCRI	PTORS				AL ATTERBERG
ACTURE DE	NSITY- Based on the s boreholes; excludes m	pacing of <u>all natural</u> fractu echanical breaks, shears, ar	ures in an exposure id shear zones; howe	or core recovery	Descriptor	Descriptor	Criterio					CA CHEMICAL
ply to al opes and	I rock exposures such inverts, as well as be	as tunnel walls, dozer tren oreholes. Descriptive criter	rid presented below	foundation cut are based on	H1	Extremely hord	Core, fragment, or exposure canno sharp pick; can only be chipped w	t be scratched with ith repeated heavy	knife or hommer blows,			(CN) CONSOLIDA
rehole co iteria is	res where lengths are distance measured be	measured along the core axi tween fractures (size of blo	is, for other exposi ocks),	ines the	HZ	Very hard	Cannot be scratched with knife of breaks with repeated heavy hammer	sharp pick. Core o blows.	r fragment			CONSOLIDA
FRACTURED	(FDØ): No fractures. LY FRACTURED (FD1): Co	ore recovered mostly in lend	iths greater than 1	m	нз	Hard	Can be scratched with knife or sh pressurel. Heavy pammer blow requ	arp plak with diffi	cuity (heavy			
IGHTLY TO	VERY SLIGHTLY FRACTU	RED (FD2)*			H4	Moderately hard	Con be scratched with knife or sh pressure. Core or froment bracks	arp pick with light	or moderate			OS DIRECT SH
GHTLY FR	ACTURED (FD3): Core r engths less than 300 r TO SLIGHTLY FRACTURED	ecovered mostly in lengths i mm or greater than 1000 mm. (FD4)*	from 300 to 1000 mm.	, with few	H5	Moderately soft	Can be grooved 2 mm deep by knife or heavy pressure. Core or fragmen	or sharp pick with it breaks with ligh	moderate t hammer			(MD) MAX. DRY
DERATELY	FRACTURED (FD5): Core	recovered mostly in 100 to	300 mm lenghts with	n most lengths	H6	Soft	Can be grooved or gouged easily b pressure, can be scratched with f	y knife or sharp pi ingernail. Breaks w	ck with light ith light to			(PP) POCKET PE
TENSELY T	O MODERATELY FRACTURES RACTURED (FD7): Lengt	D (FD6)* hs average from 30 to 100 mm	n with scattered fro	ogmented intervols.	H7	Very soft	Can be readily indented, grooved	or gouged with fing	ernall, or			(SA) SIEVE ANA
Core recovered mostly in lengths less than 100 mm.					Any bedrock un	it softer than H7.	very soft, is to be described using As	TM D-2488 consistent	cy descriptors.			
Y INTENSELY FRACTURED (FD9): Core recovered mostly as chips and fragments with a few attered short core lengths.				ith a few	Note: Although "sharp pick" is included in these definitions, descriptions of ability to be scratched, grooved or gouged by a knife is the preferred ariteria. Modified from United States Bureau of Reclamation, Engineering Geology Field manual.							
* Combinati to slightly are present the descrip	ons of fracture densi fractured) are used ly over a significant tor definitions.	ties (e.g. Very intensely to where equal distribution of interval or exposure, or wi	o intensely fracture both fracture dens here characteristic:	ed, or Moderately ity characteristics s are "in between"		a						(VS) VAN

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69 Approximately 125mm thick.								
Approximately 125mm thick. 66 (a) 63 Approximately 125mm thick. 60 (b): very dense, brown, moist, fine 60 (c): plasticity, fine gravel (FILL). 57 (c): wery dense, brown, moist, fine 54 (c): occorse gravel, cobile fragments. 54 (c): occorse gravel, cobile fragments. 51 (c): occorse gravel, cobile fragments. 51 (c): occorse gravel, cobile fragments. 48 (c): occorse gravel, cobile fragments. 48 (c): occorse gravel, cobile fragments. 43 (c): occorse gravel, cobile fragments. 44 (c): occorse gravel, cobile fragments. 45 (c): occorse gravel, cobile fragments. 42 (c): occorse gravel, cobile fragments. 42 (c): occorse gravel, cobile fragments. 50							69	
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Approximately 125mm thick. 63 .): hard, brown, moist, coarse sand, low 60 SAND (CM): very dense, brown, moist, fine 57 iff, brown, moist, coarse sand, (FILL). 57 with Sill and SAND (CM): dense, brown, moist, fine to to coarse gravel, cobble fragments. 51 vwith Sill and SAND (CM): very dense, brown, moist, fine to to coarse gravel, cobble fragments. 61 with Sill and SAND (CW): brown, moist, fine to to coarse sand, weakly 51 with Sill and SAND (CW): very dense, 48 asticity. 45 with Sill and SAND (CW-GM): very dense, 45 asticity. 45 with Sill and SAND (CW-GM): very dense, 45 asticity. 45 asticity. 45 asticity. 45 asticity. 45 asticity. 45 asticity. 42 asticity. 45 asticity. 45 asticity. 45 asticity. 46 asticity. 45 asticity. 45 asticity. 45 asticity. 46								
Approximately 125mm thick. 63 J: hard, brown, moist, coarse sand, low 60 SAND (GM): very dense, brown, moist, fine 57 iff, brown, moist, coarse sand, (FILL). 57 NVEL (SM): medium dense, brown, moist, 54 SAND (GM): dense, brown, moist, fine to 51 oc coarse gravel, coble fragments. 51 with SILT and SAND (GW): brown, moist, 63 ocoarse sond. 48 with SILT and SAND (GW-GM): very dense, 48 asticity. 45 gasticity. 45 asticity. 45 Mith SILT and SAND (GW-GM): very dense, 48 asticity. 45 asticity. 42 asticity. 42 asticity. 42 asticity. 42 asticity. 50+60 50+80 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>66</td> <td>_</td>							66	_
Approximately 125mm thick. 63 J: hard, brown, moist, coarse sand, low 60 SAND (GM): very dense, brown, moist, fine 57 iff, brown, moist, coarse sand, (FILL). 57 NVEL (SM): medium dense, brown, moist, 54 Go coarse gravel, coble fragments. 51 own, moist, fine to coarse sand, weakly 51 with SILT and SAND (GW): brown, moist, 48 ocarse grand. 45 with SILT and SAND (GW-GM): very dense, 48 asticity. 45 gasticity. 45 asticity. 45 MUE SILT and SAND (GW-GM): very dense, 48 asticity. 45 gasticity. 45 asticity. 45 MUE SILT and SAND (GW-GM): very dense, 48 asticity. 45 asticity. 42 asticity. 45 b.02 OF TEST BORINGS 3 OF								
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iff, brown, moist, coarse sand, (FILL). 57 AVEL (SM): medium dense, brown, moist, fine to coarse sand, weakly 54 SAND (CM): dense, brown, moist, fine to coarse sand, weakly 51 with SILT and SAND (GW): brown, moist, or coarse sand, meakly 48 with SILT and SAND (GW): very dense, 48 with SILT and SAND (GW-GM): very dense, 45 with SILT and SAND (GW-GM): very dense, 42 issticity. 45 Solution 39 issticity. 39 Methods 50+20 Sol+20 50+40 50+60 Sol+20 50+40 50+80 Methods KETAINING WALL - 49E LOG OF TEST BORINGS 3 OF 4 4.7 LUGG OF TEST BORINGS 3 OF 4 1.1								
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AVEL (SM): medium dense, brown, moist, 54 GAND (CM): dense, brown, moist, fine to 51 ocorse gravel, cobble fragments. 51 with SILT and SAND (GW): brown, moist, 51 ocorse sand. 48 with SILT and SAND (GW): brown, moist, 48 asse, brown, fine to medium sand, gravel, 48 with SILT and SAND (GW-GM): very dense, 43 assticity. 45 Gange 42 assticity. 45 assticity. 45 BRIDDE NO. 50+20 RETAINING WALL - 49E LOG OF TEST BORINGS 3 OF 4	,							
BRIDGE NO. BRIDGE NO. RETAINING WALL - 49E BRIDGE NO. RETAINING WALL - 49E BRIDGE NO. LOG OF TEST BORINGS 3 OF 4	AVEL (SM).	medium dense	brown mo	ist			F 4	
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BRIDDE NO. RETAINING WALL - 49E BRIDDE NO. RETAINING WALL - 49E	SAND (GM): o coarse	dense, brown, m gravel, cobble	noist, fine fragments	e to 3.				NO
with SILT and SAND (GW): brown, moist, o coarse sand. 51 nse, brown, fine to medium sand, gravel, with SILT and SAND (GW-GM): very dense, lasticity. 48 45 45 39 45 39 36 50+20 50+40 50+60 50+80 RETAINING WALL - 49E LOG OF TEST BORINGS 3 OF 4 States monitor interview parts in	own, moist	t, fine to coars	se sand, w	eakly			F 4	ATI
with SILT and SAND (GW): brown, moist, nee, brown, fine to medium sand, gravel, 48 with SILT and SAND (GW-GM): very dense, 45 lasticity. 45 gasticity. 45 Solution 45 Interview 39 Interview 36 50+20 50+40 50+60 50+80 Interview Interview 50+60 50+80 Interview Interview Interview Interview Interview Interview I							51	Ε<
BRIDGE NO. RETAINING WALL - 49E LONG OF TEST BORINGS 3 OF 4 PLANETER POINTS BAREING	with SILT coarse s	and SAND (GW): Sand.	brown, mo	oist,				Ш
with SILT and SAND (GW-GM): very dense, 48 Jasticity. 45 Jasticity. 45 Jasticity. 42 Jasticity. 42 Jasticity. 39 Jasticity. 39 Jasticity. 36 S0+20 50+40 50+60 S0+20 50+40 50+60 Jasticity. RETAINING WALL - 49E LONG OF TEST BORINGS 3 OF 4 13	nse, brown	n, fine to mediu	um sand, g	gravel,			40	
BRIDGE NO. 45 19E0009 RETAINING WALL - 49E LONG OF TEST BORINGS 3 OF 4 PLANETER POST LOG OF TEST BORINGS 3 OF 4	with SILT	and SAND (GW-0	GM): very	dense, _			48	-
BRIDGE NO. 45 50+20 50+40 50+20 50+40 50+20 50+40 S0+20 50+40 S0+40 50+60 S0+80 50+80	asticity.							
BRIDGE NO. 42 50+20 50+40							4 5	
A2 39 39 39 36 50+20 50+20 50+40 50+60 50+80							45	
BRIDGE NO. 39 50+20 50+40 50+20 50+40 50+20 50+40 S0+20 50+40 S0+40 50+60 S0+80 50+80								
BRIDGE NO. 39 50+20 50+40							40	
BRIDGE NO. 39 50+20 50+40 50+20 50+40 50+20 50+40 50+20 50+40 50+20 50+40 50+20 50+40 50+20 50+40 50+20 50+60 50+20 50+40							42	ŝ
BRIDGE NO. 39 50+20 50+40								
BRIDGE NO. 36 50+20 50+40 50+60 50+80 BRIDGE NO. S0+40 50+60 50+80 BRIDGE NO. RETAINING WALL - 49E 10009 LOMETER POST LOG OF TEST BORINGS 3 OF 4 PLANDER REVISION DATES (PRELIMINARY STAGE ON Y) SHEET 0							30	
36 50+20 50+40 50+60 50+80 BRIDGE NO. 19E0009 RETAINING WALL - 49E LOG OF TEST BORINGS 3 OF 4 4.7 DISREGARD PRINTS BEARING PISION DATES (PRELIMINARY STAGE ON Y) SHEET O PISION DATES (PRELIMINARY STAGE ON Y)							23	
BRIDGE NO. 50+20 50+40 50+60 50+80 BRIDGE NO. 19E0009 RETAINING WALL - 49E LOMETER POST 4.7 LOG OF TEST BORINGS 3 OF 4 DISREGARD PRINTS BEARING 9/12/04 5140000 133 11								
BRIDGE NO. 50+20 50+40 50+60 50+80 BRIDGE NO. 19E0009 RETAINING WALL - 49E LONG OF TEST BORINGS 3 OF 4 PISREGARD PRINTS BEARING 9/12/04 514000000000000000000000000000000000000							36	
50+20 50+40 50+60 50+80 BRIDGE NO. 19E0009 RETAINING WALL - 49E LOMETER POST 4.7 LOG OF TEST BORINGS 3 OF 4 DISREGARD PRINTS BEARING ACTOR DATES (PRELIMINARY STACE ONLY) SHEET O MULTION DATES (PRELIMINARY STACE ONLY)							50	-
BRIDGE NO. 19E0009 LOMETER POST 4.7 LOG OF TEST BORINGS 3 OF 4 PISTOR DATES (PRELIMINARY STAGE ONLY) SHEET O PISTOR DATES (PRELIMINARY STAGE ONLY) SHEET O SHEET O	5	50+20	50+4	0	50+60	50+8	30	
BRIDGE NO. RETAINING WALL - 49E 19E0009 LOG OF TEST BORINGS 3 OF 4 4.7 LOG OF TEST BORINGS 3 OF 4 DISREGARD PRINTS BEARING PIZMON DATES (PRELIMINARY STAGE OWLY) SHEET 0 PISTOR 13								
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BRIDGE NO. RETAINING WALL - 49E 19E0009 LOG OF TEST BORINGS 3 OF 4 4.7 LOG OF TEST BORINGS 3 OF 4 DISREGARD PRINTS BEARING REVISION DATES (PRELIMINARY STAGE ORLY) SHEET 9/12/08								
LONG OF TEST BORINGS 3 OF 4	BRIDGE NO.		RFT		G WALL	- 49F		
4.7 LOG OF IESI BORINGS 3 OF 4	LOMETER POST	100	<u>05 7</u>	E O T	DOD			
DISREGARD PRINTS BEARING EARLIER REVISION DATES - 9/12/08 1 1 3 1	4.7	LOG	OF T	EST	ROBI	NGS 3 (7	4
1.0.1	DISREGARD PRI EARLIER REVIS	INTS BEARING	9/12/08	STON DATES (PRI	LIMINARY STACE O	N. T.]	13	14



Caltrans					Lou-	100 co 100
Caltrans	DIST	COUNTY	ROUTE	TOTAL PROJECT	SHEET	SHEETS
	03	Pla	/ 80	4.5/8.3	525	539
etric		V	/			
	0500	Th		9/12/08 .RO	FESSION	
	REGI	SIERED (JIVIL ENGI	ALER AND	NETU	(E)
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	PLAN	NS APPROV	AL DATE	No. GE	2520	EER
	The Stat	e of Califor	nia or its offic	ers or agents * Exp.	9-30-08	1*/
	shall no complete	of be respons eness of elec	ible for the ac tronic copies o	f this plan sheet.	CALIFORN	IA
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CATE BASE						
CLAY with SAND (CL) . brown	mois+	low place	ticity (FT	1).		
SAND with GRAVEL (SM): Very	dense	brown	moist. fine	to	60	
e sand, low plasticity, weak	ly ceme	nted (FI	LL).			-
CLAY (CL): very stiff. brown	, moist	, weakly	to modera	tely		
ted (FILL).	,	,			57	
rd.						-
SAND (SM): reddish brown, m	oist, fi	ne to co	oarse sand	, angular		
ients of cobbles and volcani	c breck	SIG (FILL	1.			
NIC BRECCIA FRAGMENIS: angu	iar, (FI	LL).	d flore !!	koly.	54	Ē
d away.	lainters	, sand ar	iu rines li	Nely		z
						IO
Y SAND (SC): very dense, bro	wn, moi	st, fine	to coarse	sand.	51	/AT
lean CLAY (CL): brown, mois	t, fine	to coar	se sand, ti	race	51	Ш
Y SAND (SC): dense brown m	oist f	ine to co	ourse cand			Ш
v camp with applies (co)	5151, 11	10 00				
r SAND with GRAVEL (SC): der e sand, fine to coarse arav	nse, bro el, rour	wn, mois ided.	T, fine to		48	
NIC BRECCIA: reddish brown,	highly	weathere	d, moderat	alu		
andonito cabbles - to and	mm diar	notor ar	the second s	ery	10	
undesite cobbies up to 280		nerer, gi	ray, hard.	ery	10	-
undesite coddies up to 280		nerer, gi	ráy, hard.	ery	10	-
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undesite cobbles up to 280		ine rer , gr	ráy, hard.		45	
undesite cobbles up to 280			ráy, hard.		45	1 - 1
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50+60 5	50+80)	51+00	51+2	45 42 39 36	
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50+60 5	50+80)	51+00	51+2	45 42 39 36	
50+60 5	50+80)	51+00	51+2	45 42 39 36 20	
BRIDGE NO. 19F.00.09	50+80 RETA		51+00	51+2 - 49E	45 42 39 36	
BRIDGE NO. 19E0009	50+80 RETA		51+00	51+2 - 49E	45 42 39 36 0	
BRIDGE NO. 19E0009 LOOG TO LOG O	50+80 RETA) ININ(EST	51+00 G WALL BORI	51+2 - 49E NGS 4 C	45 42 39 36 0	4
BRIDGE NO. 19E0009 LONG TO POINTS READING LOGG O	50+80 RETA) ININ(EST	51+00 G WALL	- 49E NGS 4 C	45 42 39 36 20	4



L

			WEATHER	RING DESCRIPTORS		of Reclana	Modified from united States Bureau tion, Engineering Geology Field manual.		RQD LOG	GING		BEDDING, FOLIAT	ION, OR FLOW
Des	criptors		Diagr	iostic features	-				••			Descriptors	Thickness / Spacina
phonemetr		Chemical weathering and/or oxid	-Discoloration lation	Mechanical weathering- Grain boundary conditions (disaggregation) primarily	Texture o	and solutioning	General characteristics (strength.excavation.etc.) ⁵	8. 14	* L=250 mm			Mossive	Greater than 3 m
scriptor	Descriptive term	Body of rock	surfaces t	coarse-grained sediments	Texture	Solutioning	1. And the second secon		2 1	Sound core >100	mm	Very thickly (bedded, foliated, or bonded)	1 to 3 m
W1	Fresh	No discoloration, not oxidized.	No discoloration or oxidation.	No separation, intact (tight).	No change.	No solutioning.	rocks are struck. Almost always rock excavation except for naturaly weak or weakly cemented		1 L=0 1 L=0 1 Highly weathered	ROD = Total core run	length	Thickly	300 mm to 1 m
	Slightly weathered						rocks such as siltstones or shales.	E E	does not meet soundness requirement			Moderately	100 to 300 mm
w2	to fresh 0	Discoloration or ovidation	When to comiste	No vietnie conception	Propertied	Minor Leasting	Hommer rings when crystalline		t	ROD = 250+190+200 × 100	×	Thin(y)	30 to 100 mm
w3	singinny weathered	is limited to surface of, or short distance from, fractures; some feldspor	discoloration or oxidation of most surfaces.	Intact (+Ight).		of some soluble minerals may be noted.	racks are struck. Body of rack not weakened. With few exceptions, such as siltstones or shales, classified as rack excavation.		L=0 Centerline pieces (100 mm and highly	1200		Very thinly	10 to 30 mm
W4	Moderately to slightly	/						1				Laminated (intensely foliated or banded)	Less than 10 mm
777	weathered o	Discoloration or axidation	All frocture	Portial separation of	Generally	Soluble minerals	Hammer does not ring when rock	1		ROD = 53% (fair)		Modified from United States Bureau of Reclamation, Engineering Geology Fiel	d manual.
WS	woderotely weathered	extends from fractures usually throughout: Fe-Mg minerals are "rusty," feldspar crystals are "cloudy,"	surfaces are discolored or oxidized.	boundaries visible.	preserved.	may be mostly leached.	is struck, Body of rock is slightly weakened, Depending on fracturing, usually is rock exavation except in naturally weak rocks such as slitstones or shales.	5 5 3	x L=190 mm H01				
W6	Intensely to moderately weathered ⁰								× L=0	ROD DESCRIPTI	ON OF		
W7	Intensely weathered	Discoloration or exidation	All frocture	Partial separation, rock	Texture offered by	Leaching of	Dull sound when struck with hammer, usually can be broken with		(100 mm	DESIGNATION) ROCK QUA	.1TY		
		and Fe-Mg minerals are altered to clay to some extents or chemical atteration produces in-situ disaggregation, see grain boundary conditions.	discolored or oxidized, surfaces fridble.	conditions granitics are disaggregated.	chemical disintegra- tion (hy- dration, argillation)	may be complete.	moderate to heavy manual pressure or by light hommer blow without reference to planes of weakness such as incipient or hairline fractures, or veiniets. Rock is significantly weakened. Usually	Mechanical break caused by dritting process	* L=200 mm	0 - 25% VERY PO 25 - 50% POOR 50 - 75% FAIR 75 - 90% GOOD	98		
W8	Very intensely						Somer Brown for	2	2	90 - 100% EXCELLE	17		
w9	Decomposed	Discolored or oxidized throughout, but resistant minerols such as quartz may be unaltered; all feldspars and Fe-Mg minerols are completely altered to clay.		Complete separation of grain boundaries (disaggregated),	Resembles a complete rem structure ma leaching of usually comp	soil, partial or nant rock y be preserved; soluble minerals lete.	Can be granulated by hand. Always common excavation, Resistant minerals such as quartz may be present as "stringers" or "dikes."		L=0 No recovery	After Deere & D	ere, 1989		
are in b two adjac Does not rock mass These are naturally	erween the diagnostic ent ferms may be combin include directional weo would not require the generalizations and st weak materials or ceme	<pre>recture. However, cubi descr ned. "Decomposed to slightly athering clong shears or faul rock mass to be classified a hould not be used as diagnost entation and type of excavation</pre>	iptors should not be weathered, " or "mode ts and their associa s weathered. ic features for weat on.	used where significant, lod trately weathered to fresh" a ted features. For example, a hering or excavation classif	re not acceptal shear zone the ication. These	s can be defineated ble. at carried weatheri characteristics va	, when given as a range, only ng to great depths into a fresh ry to a large extent based on						IN-SITU, LAN TEST DESIG
		FRACTURE DENSITY	lecianation, Engineerin	g Geology Fleid manual.	(Personal of a	ROCK	HARDNESS/STRENGTH DESCRI	PTORS					(AL) ATTERBERG
RACTURE DE	SITY- Based on the sporeholes; excludes me	pocing of <u>all natura</u>) fractu echanical breaks, shears, an	ures in an exposure id shear zones; howe	or core recovery	Descriptor	Descriptor	Criterio						CA) CHEMICAL
ply to all opes and	rock exposures such nverts, as well as bo	as tunnel walls, dozer tren oreholes. Descriptive criter	nches, outcrops, or rid presented below	foundation cut are based on	Н1	Extremely hard	Core, fragment, or exposure canno sharp pick; can only be chipped w	t be scratched with kr ith repeated heavy har	nife or mer blows,				(CN) CONSOLIDA
rehole co iteria is	es where lengths are distance measured bet	measured along the core axi tween fractures (size of blo	is, for other exposu ocks).	res the	H2	Very hard	Cannot be scratched with knife of breaks with repeated heavy hammer	sharp pick. Care or t blows.	Fragment				CONSOLIDA
FRACTURED	(FDØ): No fractures. Y ERACTURED (FD1): Co	ore recovered mostly in lend	the greater than 1	m.	нз	Hard	Can be scratched with knife or sh	arp pick with difficu	ty (heavy				
IGHTLY TO	VERY SLIGHTLY FRACTUR	RED (FD2)*	and growned that t		H4	Moderately hard	Can be scratched with knife or sh	arp pick with light or	- moderate				(DS) DIRECT SH
IGHTLY FR.	ACTURED (FD3): Core re engths less than 300 m	ecovered mostly in lengths t mm or greater than 1000 mm, (FD4)*	from 300 to 1000 mm	, with few	Н5	Moderately soft	Can be grooved 2 mm deep by knife or heavy pressure. Core or fragmen	or sharp pick with me threaks with light t	oderate Nammer				MD MAX. DRY
DERATELY I	RACTURED (FD5): Core	recovered mostly in 100 to	300 mm lenghts with	n most lengths	H6	Soft	Can be grooved or gouged easily b pressure, can be scratched with f	y knife or sharp pick Ingernall. Breaks with	with light rlight to				(PP) POCKET PE
NTENSELY T	MODERATELY FRACTURED	D (FD6)*	- with southout	amontal intervals	H7	Very soft	Con be readily indented, proved	or gouged with finger	nail. or				SA) SIEVE ANA
ore recove	red mostly in lengths	less than 100 mm.	a ann sourierea fri	agmented three volto,			carved with a knife. Breaks with	light manual pressure					(TV) TORVANE
ERY INTENS	LT TO INTENSELY FRACT	Core recovered mostly as chi	ips and fragments w	ith a few	Any bedrock un	an "sharp mick" to	very sort, is to be described using As	rintions of ability	o be				UC UNCONFINE COMPRESSI
cottered s	ombinations of fracture densities (e.g. Very intensely to intensely fractured, or Moderately					united States Bureau	v a knife is the preferred criteria. To Reclamation, Engineering Geology Fi	eid manual.	o be				UU UNCONSOL I UNDRAINED
o slightly re present he descrip	fractured) are used of ly over a significant tor definitions.	where equal distribution of interval or exposure, or wi	both fracture dens here characteristic:	ity characteristics s are "in between"									VS VANE SHE

CONSISTENC EVENT CONSISTENC EVENT	CHECKED BY E. Ortakci	G. Zhang Field investigation by: Date: 01/15/07	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	PROJECT ENGINEER	No.RETAINING WALL - 58EPOSTLOG OF TEST BORINGS 1 OF 4
CIVIL LOG OF TEST BORINGS SHEET (METRIC) (REV. 2/1/00)		ORIGINAL FOR REDU	SCALE IN MILLIMETERS 0 10 20 30 40 50 60 70 80 90 100	CU 03262 EA 367831	REVISION DATES PRINTS BEARING 9/12/08 11 1 14
				FILE => 19e0010-g-log-01.dgn	

Caltrans	dist 03	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT 4.5/8.3	SHEET No 536	total sheets 539
etric	REG 11- PLA	13TERED O	CIVIL ENGI	9/12/08 NEER	NETH G. RENSEN	ENGINEER
	The Sta shall n complet	te of Califor ot be respons reness of elec	nia or its off ible for the a tronic copies	icers or agents * Exp. ccuracy or of this plan sheet.	TECHNICAL CALIFORN	*
	KLE 307 SACF	INFELDER 7 FITE CI RAMENTO,	INC. R. CA 95827			

- VS VANE SHEAR



LOG OF TEST BORINGS 2 OF 4
RETAINING WALL - 58E
e Center, Office of Structural Foundations, August 1996.
escriptions and classifications of soil, including tency and relative density descriptions, used by the personnel for the exploration bole holes on "Soil and ogging Classification Manual (Field Guide)", Engineering
oles are backfilled immediately after completion. Vertical s were accomplished with rotary wash methods and utilizing as the drill fluid. During the investigation, groundwater rements were not attempted in the boreholes.
unts 50/125 means 50 blows per 125 mm penetration.
nm core samples were taken using an HQ core sampler 63.5 mm inside diameter (I.D.) and 94 mm outside er (0.D.) core barrel.
samples were taken using a SPT split-barrel sampler n inside diameter (I.D.) of 35 mm and an outside er (0.D.) of 51 mm.
unts noted for boring are field blowcounts and have een corrected.
yty semi-automatic hammer (63.5 kg) with a 760 mm drop ged to advance the sampler.
samples were taken using a California split-barrel er with an inside diameter (I.D.) of 51 mm and an e diameter (O.D.) of 64 mm.
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Notes:

- 51 mm samples were taken using a California split-barrel sampler with an inside diameter (I.D.) of 51 mm and an outside diameter (0.D.) of 64 mm.
- 2. A safety semi-automatic hammer (63.5 kg) with a 760 mm drop was used to advance the sampler.
- 3. Blowcounts noted for boring are field blowcounts and have not been corrected.
- 35 mm samples were taken using a SPT split-barrel sampler with an inside diameter (I.D.) of 35 mm and an outside diameter (0.D.) of 51 mm.
- 5. 63.5 mm core samples were taken using an H0 core sampler with a 63.5 mm inside diameter (I.D.) and 94 mm outside diameter (0.D.) core barrel.
- 6. Blowcounts 50/125 means 50 blows per 125 mm penetration.
- 7. Groundwater was not encountered at the time of drilling.
- 8. The descriptions and classifications of soil, including consistency and relative density descriptions, used by the field personnel for the exploration bole holes on "Soil and Rock Logging Classification Manual (Field Guide)", Engineering Service Center, Office of Structural Foundations, August 1996.

BENCHMARKS

STATION	OFFSET	N	E	ELEV	DESCRIPTION
15+79.190	4.62 R†	618564.792	2062442.621	44.552	

SURVEY CONTROL

1. Coordinates bearing and distances are based on the California coordinate system of Nad 1983 HPGN, zone 6. (EPOCH 1991.35). Elevations are based on NGVD 29.

EA 367831

ILE => 19e0007-x-lotblof4.dgn





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			REVISION DATES (PRE	LIMINARY :	STAGE ONLY)				SHEET	OF
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		DIST	COUNTY	ROUTE	KILOMETER POST	SHEET	TOTAL
Caltr	ans	03	Pla	/ 80	4.5/8.3	496	539
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BORING)						63	(m) N
Poorly graded Reddish Brown,	SAND with dry, fine	CLAY to co	(SP-SC): oarse, lo	Brown to	[a	60	ELEVATIO
CLAYEY SAND (S coarse, low to -with trace o	C): Reddisl medium. f volcanic	n bro frag	wn, dry, ments.	fine to		57	-
-Brown to Red	ldish Browr	n, wea	k.			54	-
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			WEATHER	RING DESCRIPTORS		of Reclanat	ion, Engineering Geology Field manual.			RQD LOG	SING	BEDDING, FOLIA	TION, OR FLOW
De	criptors		Diagr	iostic features								Descriptors	Thickness / Spacing
		Chemical weathering- and/or oxid	-Discoloration ation	Mechanical weathering- Grain boundary conditions (disagaregation) primaril	Texture o	and solutioning	General characteristics (strength, excavation, etc.) ⁵		1			Massive	Greater than 3 m
phanumeric escriptor	Descriptive term	Body of rock	Frocture surfaces t	for granitics and some coarse-grained sediments	Texture	Solutioning				L=250 mm	> Length of sound core >100 mm	Very thickly (bedded, foliated,	I to 3 m
W1	Fresh	No discoloration, not oxidized.	No discoloration or oxidation.	No separation, intact (tight).	No change.	No solutioning.	Hammer rings when crystalline rocks are struck. Almost always rock excavation except for			L=0	ROD = Total core run length	Thickly	300 mm to 1 m
							naturaly weak or weakly cemented rocks such as siltstones or shales.		1 5 5 1 5 x5	Highly weathered does not meet soundness requirement		Moderately	100 to 300 mm
W2	Slightly weathered to fresh ^o								1	+	250+190+200	ThileTo	30 to 100 mm
W3	Slightly weathered	Discoloration or exidation is limited to surface of, or short distance from, frostures: some feldenor	Minor to complete discoloration or oxidation of most	No visible separation, intact (tight).	Preserved.	Minor leaching of some soluble minerals may be	Hammer rings when crystalline rocks are struck. Body of rock not weakened. With few exceptions, such as elitationes or shales			L=0 Centerline pieces	ROD = 1200 × 100%	Very thinly	10 to 30 mm
854 C	Moderately to slightly	crystals are duil.					classified as rock excavation.		5	weathered gg		Laminated (intensely foliated or banded)	Less than 10 mm
89	weathered ⁰			a contra constante de						• ~	ROD = 53% (fgir)	Modified from United States Bureau o Reclamation, Engineering Geology Fie	f 1d manual.
W5	Moderately weathered	Discoloration of axidation extends from fractures usually throughout: Fe-Mg minerals are "rusty," feldspar crystals are "cloudy,"	All frocture surfaces are discolored or oxidized.	Partial separation of boundaries visible.	preserved.	Soluble minerals may be mostly leached.	Hammer does not ring when rock is struck. Body of rock is slightly weakened. Depending on fracturing, usually is rock excavation except in naturally weak rocks such as siltstones or shales.			L=190 mm		· · · · · · · · · · · · · · · · · · ·	
Wő	Intensely to moderately weathered®								1 1	L=0	ROD DESCRIPTION OF		
W7 Intensely weathered Discoloration or oxidation throughout; dll feldpars and Fe-Mg minerais are differed to clay to some extent; or chemical discolored produces in-situ discolored produces in-situ discolored produces friable. All fracture surfaces are oxidized, surfaces friable; in semi-arid conditions granitics are disaggregated. W8 Very intensely weathered Very intensely		Partial separation, rock is friable; in semi-arid conditions granitics are disaggregated.	Texture altered by chemical disintegra- tion (hy- dration, argillation)	Leaching of soluble minerals may be complete.	Dull sound when struck with hommer, usually can be broken with moderate to heavy manual pressure or by light hommer blow without reference to planes of weakness such as incipient or nairline significantly weakened, Usually common excavation.	Mechanical break caused by dritting process —		L=200 mm	DESIGNATION HULK GUALITY 0 - 25% VERY POOR 25 - 50% POOR 50 - 75% FAIR 75 - 90% GOOD 0000 CVERULANT				
						1		90 - 100% EXCELLENT					
W9 Decomposed Discolored or oxidized throughout, but resistant allocation of grain boundaries (disaggregated), the disparation of grain boundaries (disaggregated), the disparation of grain boundaries (disaggregated), the disparation of the d				Complete separation of grain boundaries (disaggregated),	Resembles a complete rem structure ma leaching of usually comp	soil, partial or nant rock y be preserved; soluble minerals lete.	Can be granulated by hand. Always common excountion. Resistant minerals such as guartz may be present as "stringers" or "dikes."			L=0 No recovery	After Deere & Deere, 1989		
 Combinati are "in t two adjac t Does not rock mass These are noturally 	on descriptors are pert etween" the diagnostic ent ferms may be combin include directional we would not require the generolizations and st weak materials or ceme	indicipation of precise, non- transport of the second second second second feature. However, dual descr read, "Decomposed to slightly intering along shears or faul rock mass to be classified a would not be used as diagnost intation and type of excavation	, the cost of both weather iptors should not be weathered, "or "mode ts and their associa s weathered, ic features for weat on.	<pre>k und similar descriptions or e pre used where significant, id ordely worthered to fresh" ted features. For example, a hering or excavation classi</pre>	sent over signi intifiable zone ire not accepta i shear zone th fication. These	floant intervals or s can be delineated ble. at carried weatheri characteristics va	where characteristics present . When given as a range, only ng to great depths into a fresh ry to a large extent based on						IN-SITU, LAE <u>TEST DESIG</u>
		FRACTURE DENSITY	Modified from (eclamation, Engineerin	mited States Bureau of g Geology Field manual.		ROCK	HARDNESS/STRENGTH DESCRI	PTORS					AL ATTERBERG
RACTURE DE	NSITY- Based on the sp boreholes; <u>excludes me</u>	chanical breaks, shears, an	ures in an exposure <u>ad shear zones</u> ; how	or core recovery	Alphanumeric Descriptor	Descriptor	Criterio						CA CHEMICAL
pply to al lopes and	I rock exposures such inverts, as well as bo	as tunnel walls, dozer tren preholes. Descriptive criter	iches, outcrops, or io presented below	foundation cut are based on	H1	Extremely hord	Core, fragment, or exposure cannot sharp pick; can only be chipped w	be scratched wit th repeated heavy	h knife / hammer	or Diows.			(CN) CONSOLIDA
borehole cores where lengths are measured along the core axis, for other exposures the criteria is distance measured between fractures (size of blocks).					H2	Very hard	Cannot be scratched with knife of sharp pick. Care or fragment breaks with repeated heavy hammer blows.					CU CONSOLIDA	
RY SLIGHT	LY FRACTURED (FD1): Co	re recovered mostly in leng	ths greater than 1	m	H 3	Hard	Can be scratched with knife or sho pressure). Heavy hammer blow requi	rp pick with diff red to break spec	iculty {	heavy			DS DIRECT SH
SLIGHTLY TO VERY SLIGHTLY FRACTURED (FD2)* SLIGHTLY FRACTURED (FD3): Core recovered mostly in lengths from 300 to 1000 mm, with few					H4	Moderately hard	Can be scratched with knife or she pressure. Core or fragment breaks	urp pick with ligh with moderate ham	nt or mod mer blow	erate			
scottered lengths less than 300 mm or greater than 1000 mm. H5 MODERATELY TO SLIGHTLY FRACTURED (FD4)*					H5	Moderately soft	Can be grooved 2 mm deep by knife or heavy pressure. Core or fragmer blow or beavy manual pressure.	or sharp pick wit t breaks with lig	n modera pht hamme	r r			
DOERATELY	FRACTURED (FD5): Core	recovered mostly in 100 to	300 mm lenghts wit	n most lengths	HG	Soft	Can be grooved or gouged easily by pressure, can be scratched with f	knife or sharp p ngerngil, Breaks	lck with	light ht to			(PP) POCKET PE
NTENSELY T	O MODERATELY FRACTURED) (FD6)*	n with scottered fro	amented intervals.	Н7	Very soft	moderate manual pressure. Can be readily indented, grooved (r gouged with fir	ngernaîi,	or			(SA) SIEVE ANA
OFE FECOVE	red mostly in lengths	Tess than 100 mm.			how hadronic use	14 poffer than 1/2	carved with a knife. Breaks with	light manual press	sure.	Intere			
ERY INTENS	ELY FRACTURED (FD9):	Core recovered mostly as ch	ips and fragments w	ith a few	Note: Althous	ah "sharp pick" is	included in these definitions, desc	riptions of dbill	ty to be	iptors.			UC UNCONFINE COMPRESSI
cottered s	nort core lengths.				scratched, gr Modified from	rooved or gouged by United States Bureau	a knife is the preferred criteria. of Reclamation, Engineering Geology Fi	rid manual.					UU UNCONSOLI

PREPARED FOR THE BRIDGE DRAWN BY Kenneth Sorensen Sarat Ponapalli FIELD INVESTIGATION BY: 19E0 A. Sanchez STATE OF CALIFORNIA DESIGN OVERSIGHT PROJECT ENGINEER KILOMETE 05/14/08 CHECKED BY DATE: 03/05/07 DEPARTMENT OF TRANSPORTATION 5. S. Ponapalli SIGN OFF DATE CU 03262 EA 367831 ORIGINAL SCALE IN MILLIMETERS 0 10 20 30 40 50 60 70 80 90 100 CIVIL LOG OF TEST BORINGS SHEET (METRIC) (REV. 2/1/00) D1SREC

* Combinations of fracture densities (e.g. Very intensely to intensely fractured, or Moderately to slightly fractured) are used where equal distribution of both fracture density characteristic are presently over a significant intervol or exposure, or where characteristics are "in between"

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APPENDIX B

Caltrans Comments and BCI Response



Structures Preliminary Geotechnical Report Interstate 80/State Route 65 Interchange Improvement Project Prepared by BLACKBURN CONSULTING, Auburn, California for CH2M Hill September 2014

Page 6 - Section 6.2 Faulting

Seismic related information including faults, distance to seismic sources, PGA, PBA, as well as ARS curves for both Probabilistic Seismic Hazard Analysis and Deterministic Seismic Hazard Analysis have been updated with the latest Caltrans On-line V2.3.06. All references to PGA (Merriam and Shantz, 2007) shall be modified and the data from the latest version shall be used and referenced in all future submittals.

Pages 6 and 7 - Section 6.3 Subsurface Soil and Rock

Several "General Soil and Rock Conditions" are outlined for each of the 6 general project areas, yet a single Acceleration Response Spectrum curve using a Vs30=560 m/s is used to represent the entire project area. The LOTBs on pages 33 through 83 of the report indicate a wide range of geological formations through the project which will yield different Vs30s. For the next phase of design, separate seismic analysis and ARS curves shall be submitted for each separate structure based on site specific Vs30s.

Page 8 - Section 7.1 Geologic Hazards

The third line indicates that "There is a potential for weak claystones to occur near the base of the Mehrten Formation... the claystone can impact slope stability and design parameters for new structures". However, Section 7.2.5 Seismic Slope Stability states that potential for seismic slope instability within the project area is very low. Please clarify whether or not this may be an issue.

Page 9 - Table 3

- Please use "Maximum Magnitude" instead of "Maximum Moment Magnitude".

-Please specify what **R**RUP represents.

-Need to specify that the Peak Ground Acceleration (PGA) is based on the minimum Deterministic Spectrum.

Pages 11, 12, 13 I reviewed Table 4 and for the time being have not further comments.

Page 31 - Preliminary ARS

The recommended ARS curve shown is incorrect. A composite curve using the minimum deterministic spectrum for periods between 0 to about 0.7 seconds and probabilistic spectrum for periods between 0.7 and 5 seconds should have been used. Figure 6 only shows the deterministic curve.

General Comments

Please note that the current Caltrans Seismic Design Criteria (SDC) have been updated, and the foundation design procedures are currently being updated. It is the responsibility of the consultant to make sure the procedures/methods used for foundation related design are the most current.

BCI Response to Caltrans Comments

Comment on Page 6 - Section 6.2 Faulting

Seismic related information is referenced to the latest Caltrans ARS Online V2.3.06.

Comment on Pages 6 and 7 - Section 6.3 Subsurface Soil and Rock

Acknowledged and comment included in the SPGR that for the next phase of design, separate seismic analysis and ARS curves shall be submitted for each separate structure based on site specific Vs30's.

Comment on Page 8 - Section 7.1 Geologic Hazards

We provide clarification in Section 7.2.5 "Seismic Slope Stability" that possible claystones near the base of the Mehrten Formation can impact slope stability.

Comment on Page 9 - Table 3

- Changed "Maximum Moment Magnitude" to "Maximum Magnitude".

- Included definition of R_{RUP} as the closest distance to the fault rupture plane (as defined in Caltrans' "Methodology for Developing Design Response Spectrum for Use in Seismic Design Recommendations," Appendix B, November 2012).

- Included a note that the Peak Ground Acceleration (PGA) is based on the Minimum Deterministic Spectrum.

Comment on Page 31 - Preliminary ARS

The recommended ARS curve shown is correct. The curve shown in Figure 6 is a composite curve (envelope) that uses the minimum deterministic spectrum for periods between 0 to about 0.75 seconds and probabilistic spectrum for periods between 0.75 and 5 seconds.

The apparent discrepancy appears to be that the probabilistic spectrum we use is based on a deaggregated event distance of 73.2 km rather than the default minimum deterministic distance (in accordance with Section 6 of Caltrans' "Methodology for Developing Design Response Spectrum for Use in Seismic Design Recommendations" (November 2012). This results in less deviation of the probabilistic curve from the minimum deterministic curve. We provide tabled spectrum data in Figure 6b for clarification of values used.

General Comments

We acknowledge that the current Caltrans Seismic Design Criteria (SDC) have been updated, and the foundation design procedures are currently being updated, and that it is the responsibility of the consultant to make sure the procedures/methods used for foundation related design are the most current.