

Memorandum

To: DUNG SY
Branch Chief, Design M14
North Region Division of Project Development

Date: September 12, 2022

Attention: Ash Arreola

File: 01-MEN-001-PM 59.8/62.1
EA: 01-0B220
EFIS: 0112000110
Fort Bragg ADA

From: GEOTECHNICAL SERVICES
Office of Geotechnical Design West
Branches A and B

Subject: **REVISED GEOTECHNICAL RECOMMENDATIONS FOR FORT BRAGG ADA
STANDARD RETAINING WALLS**

Introduction

This Revised Memorandum was prepared in response to the request dated September 9, 2022, for the proposed Fort Bragg ADA project located along State Route (SR) 1 near the intersection with SR 20 in Mendocino County, from PM 59.8 to 62.1. This Memorandum has been revised to update the stationing of Retaining Wall No. 1 and to include recommendations for Retaining Wall No. 2.

The purpose of this memorandum is to provide geotechnical recommendations for the proposed retaining walls. The scope of work included review of pertinent documents, engineering analysis and preparation of this memorandum. No subsurface investigation was performed. The recommendations in this memorandum are based on the Project Plans dated April 12, 2021.

This Memorandum is not intended to be part of the Information Handout and Contract Documents. If needed, a Geotechnical Design Report (GDR) can be prepared for this use.

Project Description

The Fort Bragg ADA pedestrian infrastructure project consists of the following proposed improvements: replacement and installation of curb ramps, installation of sidewalks, installation of driveways, installation of two retaining walls, and grade corrections by the intersections and crosswalk pavement markings. This memorandum provides geotechnical recommendations for the retaining walls only.

The proposed retaining walls are Standard Retaining Wall, Type 6A. Retaining Wall No. 1 will be parallel to SR 1 in an existing vegetated slope. The slope is approximately 1:1 (H:V)

near the bottom and 3:1 (H:V) near the top. Retaining Wall No. 2 will be parallel to SR 1 in relatively flat terrain. A summary of the proposed retaining wall information is provided in Table 1.

Table 1: Proposed Retaining Wall Summary

Retaining Wall No.	Location			Length (feet)	Maximum Design Height (feet)	Notes
	Line	Begin Station	End Station			
1	RW1	118+18.73	125+58.73	740	6.0	Sloping Backfill
2	RW2	229+98.34	231+86.99	118.65	4.0	Level Backfill

Geotechnical Investigation

No geotechnical investigation was performed for this project.

A 461-foot long Standard Retaining Wall – Type 6 was constructed near the intersection of SR 1 and SR 20 (EA: 01-0A2304). Proposed Retaining Wall No. 1 is a continuation of this existing wall. A subsurface investigation was conducted for the existing wall in August and September 2011. Three hand auger borings and four mud rotary borings were performed. The hand auger borings were advanced to depths of 1.5 to 5.5 feet below ground surface. The mud rotary borings were extended to depths of 15 and 20 feet below ground surface.

The closest geotechnical investigation to Retaining Wall No. 2 was performed for the Pudding Creek Bridge Widening Project (EA 01-43804). Two mud rotary borings were performed in 2016. The closest of the two borings (RC-16-051) is located about 1,000 feet north of proposed Retaining Wall No.1. The boring was advanced to a depth of 105 feet.

A complete description of the subsurface investigations, including the boring locations boring logs, and LOTB are provided in Appendix A.

Geotechnical Conditions

Geology

The project is in the Coast Ranges geomorphic province of California. Both walls are located on the western edge of an uplifted Pleistocene (11,000 to 2,600,000 years old) marine terrace dissected by Pudding Creek to the north and Hare Creek to the south. Approximately 1,500 feet to the west of the site the terrace terminates in an approximately 40-foot high precipitous coastal bluff and to the east a series of older terraces step up into the foothills of the coast range mountains. According to published geologic maps of the area (Jennings 1960, Braun 2005), the site is underlain by rock of the Tertiary to

Cretaceous, Franciscan Coastal Belt locally overlain by marine terrace deposits. The Coastal Belt Franciscan rock is described as light-colored, well-cemented to deeply weathered, fractured and sheared clastic sedimentary rocks; mostly graywacke sandstone and shale with arkosic sandstone and minor amounts of conglomerate, chert and volcanics. The rock is characterized by coherent and disjointed blocks of various sizes, separated by broad shear zones and faults. The marine terrace deposits are described as consisting of well sorted quartz sand with minor gravel, increasing in age and weathering with increased elevation. There are no known active or potentially active faults within the project limits.

Subsurface Conditions

Based on the 2011 investigation for the existing retaining wall near Retaining Wall No. 1, the subsurface soils consist of 6 feet of dune sands underlain by sandstone.

Boring RC-16-051 encountered approximately 9.5 feet of loose clayey sand with gravel interpreted as terrace deposits. Between 9.5 feet and 31.8 feet below ground surface (bgs) (approximate elevations 38.9 to 16.6 NGVD29, feet) the boring encountered dense to very dense, well graded gravel with clay and sand interpreted as decomposed sandstone. Below 31.8 feet the boring encountered rock dominated by sandstone with subordinate argillite which persisted to the depth explored of 105 feet bgs (approximate elevation -56.6 NGVD29, feet).

Groundwater

The 2011 subsurface investigation located groundwater at a depth of 9 feet below surface grade, approximately 300 feet from the proposed retaining wall. The same groundwater depth is assumed for Retaining Wall No.1.

Groundwater was measured in RC-16-051 at a depth of 17 feet. The measurement is presumably a partially relaxed groundwater measured between drilling days. The same groundwater depth is assumed for Retaining Wall No. 2.

Groundwater should be expected to vary with time due to seasonal groundwater fluctuations, surface and subsurface flows, ground surface run-off, and other factors that may not be present at the time of the field investigations.

Seismic Hazards

Site Seismic Parameters

The retaining wall sites may be subject to strong ground motions from nearby earthquake sources during the design life of the walls. The coordinates used in the analysis for Retaining Wall No. 1 and Retaining Wall No. 2 are latitude 39.4209° and longitude -123.8077°, and latitude 39.4508° and longitude -123.8060°, respectively. Based on available subsurface information and SPT correlations for determining shear wave velocity, the time-average shear wave velocity (V_{s30}) for the upper 100 feet of soil/rock is

estimated to be 560 m/s (about 1,835 ft/s) for Retaining Wall No. 1 and 390 m/s (about 1,276 ft/s) for Retaining Wall No. 2.

Ground Motion Parameters

The Design Spectrum for the Safety Evaluation Earthquake, as specified in Caltrans Seismic Design Criteria with October 2019 interim revisions, version 2.0 (SDC v2.0) is the probabilistic response spectrum representing the horizontal ground motion at the site with a 5% probability of exceedance in 50 years (return period = 975 years). The USGS's 2014 NSHM is used as the basis to determine the Design Spectrum in the form of the design Acceleration Response Spectrum (ARS).

Caltrans' web-based tool, ARS online v3.0.2, was utilized to determine the design ground motion parameters, including the ARS, for the subject retaining wall sites. Based on the ARS Online v3.0.2 tool, the design PGA is 0.67g, the deaggregated mean earthquake moment magnitude for PGA, M , is 7.57 and the mean site-to-source distance for 1.0 second period spectral acceleration, R , is 20.8 km (12.9 miles) for Retaining Wall No. 1 and 19.2 km (11.9 miles) for Retaining Wall No. 2.

Fault Rupture

The project sites are not located within an Alquist Priolo Earthquake Fault Zone or 1,000 feet from any Holocene or younger aged fault. The nearest active fault is the offshore section of the San Andreas, about 5.8 miles west. There are a series of folds in the marine terraces and one of the folds has been mapped as a compressional fault between Hare Creek and the Noyo River near PM 60.1. This is not an active fault, but rather a mapped remnant of previous tectonic activity. The potential for surface fault rupture does not exist.

Liquefaction

Based on the depth of groundwater and the subsurface soil/rock conditions in the nearest borings, the potential for liquefaction does not exist.

Recommendations

Proposed Retaining Wall No. 1 is a Standard Plan Retaining Wall, Type 6A (Case 2), with a maximum height of 6 feet. The backfill slope angle should not exceed those shown on the Standard Plans. Proposed Retaining Wall No. 2 is a Standard Plan Retaining Wall, Type 6A (Case 1), with a maximum height of 4 feet.

The footings for Retaining Wall No. 1 will be generally founded in medium dense to dense sands. The factored bearing resistance of the soil will exceed the minimum bearing stresses shown on Standard Plan B3-7B. Since the closest boring to Retaining Wall No. 2 is about 1,000 feet away, the subsurface soils may vary from those disclosed in RC-16-051. The subsurface soils are likely to consist of loose sands. The footing excavation for Retaining Wall No. 2 are to be inspected and approved by the Office of Geotechnical Design West, Branch A. The inspections are to be made after the excavation has been

completed to the bottom of footing elevations and prior to placing concrete or rebar in the excavations. If the subsurface soils are not satisfactory, a minimum of 2-feet of soil below the bottom of footing shall be removed and replaced with angular drain rock. The over-excavation shall extend 2-feet beyond the footing footprint in all directions.

Overall slope stability analyses were performed for Service and Extreme Event Limit States. A horizontal seismic acceleration coefficient of 1/3HPGA (0.22g) was used for the extreme event. Two-dimensional slope stability analyses were performed using the program Slide2 by Rocscience. The factors of safety exceed 1.3 (resistance factor = 0.75) and 1.1 (resistance factor = 0.9) for service and extreme events, respectively.

Standard Plan Earth Retaining Systems (ERS) are designed based on a horizontal seismic acceleration coefficient of 0.2g, corresponding to a HPGA of 0.6g. A Standard Plan ERS can be used in areas with a HPGA greater than 0.6g if the resulting permanent displacement is acceptable for the project. Since the site HPGA is greater than 0.6g, permanent seismic displacement analyses were performed. The Bray et al. (2010) and Bray and Travasarou (2009) methods were used. Based on the analyses, a permanent seismic displacement of 6 inches was estimated.

A Standard Plan Retaining Wall, Type 6A, is acceptable from a geotechnical standpoint if the Designer verifies that 6 inches of permanent seismic displacement is acceptable for the project. In addition, Structure Design should verify the adequacy of the wall design for this site.

As stated earlier, this Memorandum is not intended to be part of the Information Handout and Contract Documents. If needed, a Geotechnical Design Report (GDR) can be prepared for this use

Questions relating to this report should be directed to Nick Briffa at (213) 604-4261 or Branch Chief John Moore at (510) 622-8742.



NICK BRIFFA
Transportation Engineer
Office of Geotechnical Design West
Branch A

JOHN MOORE
Chief, Branch A
Office of Geotechnical Design West



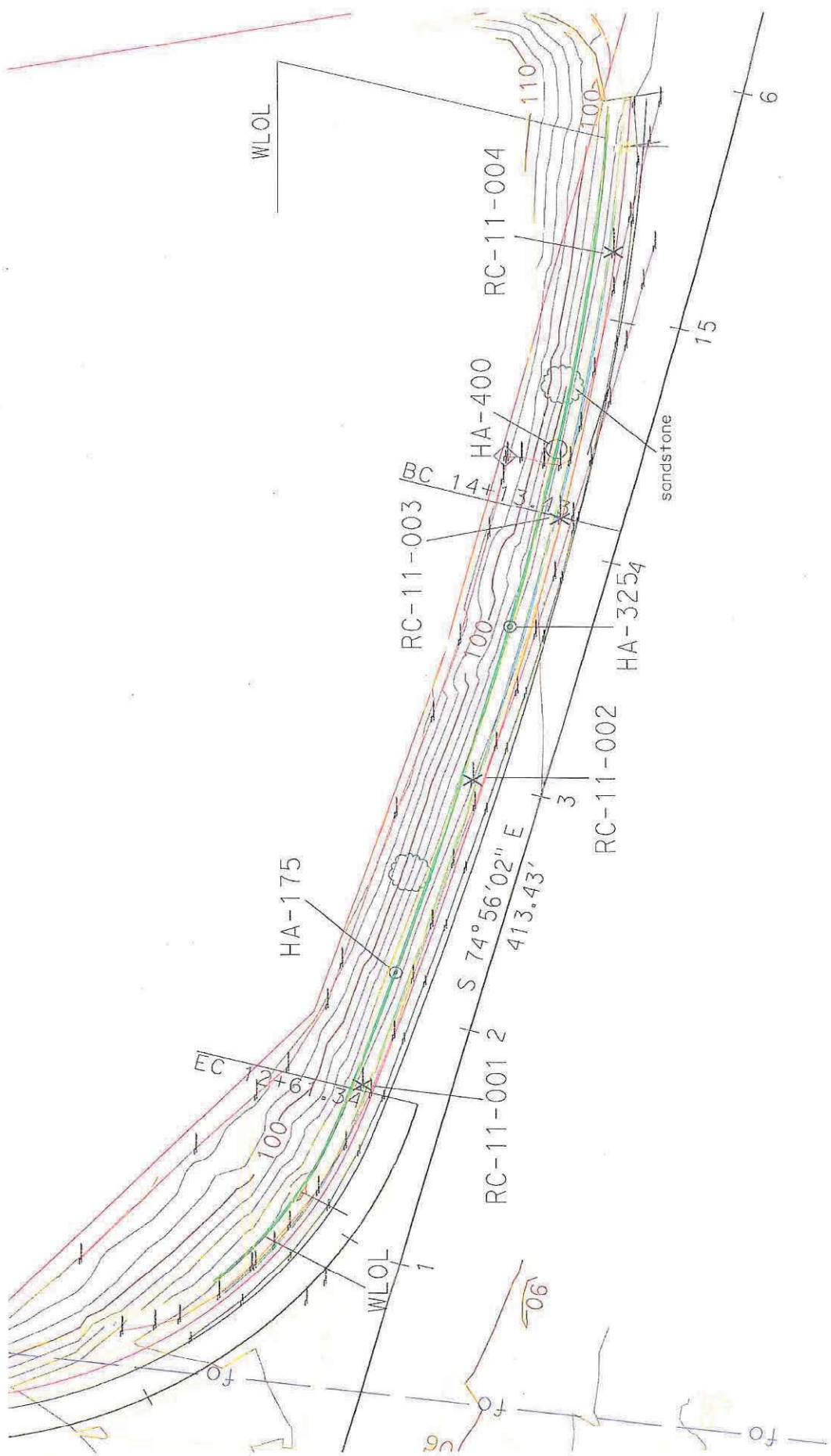
CHRIS RISDIEN
Chief, Branch A
Office of Geotechnical Design West

Attachment

Appendix A Pertinent Subsurface Investigations

c: Robert King, Project Manager, District 3

PERTINENT SUBSURFACE INVESTIGATIONS



EA/EFIS:	01-0A2301	DATE:	10/27/2011	Figure	6
	0100020				
DEPARTMENT OF TRANSPORTATION Division of Engineering Services Geotechnical Services Office of Geotechnical Design - North (OGDN)			Forg Bragg ADA Boring Location Plan		



TYPE 6A RETAINING WALL 464' LONG

Elevation

100

98

96

94

92

90

88

86

84

82

80

78

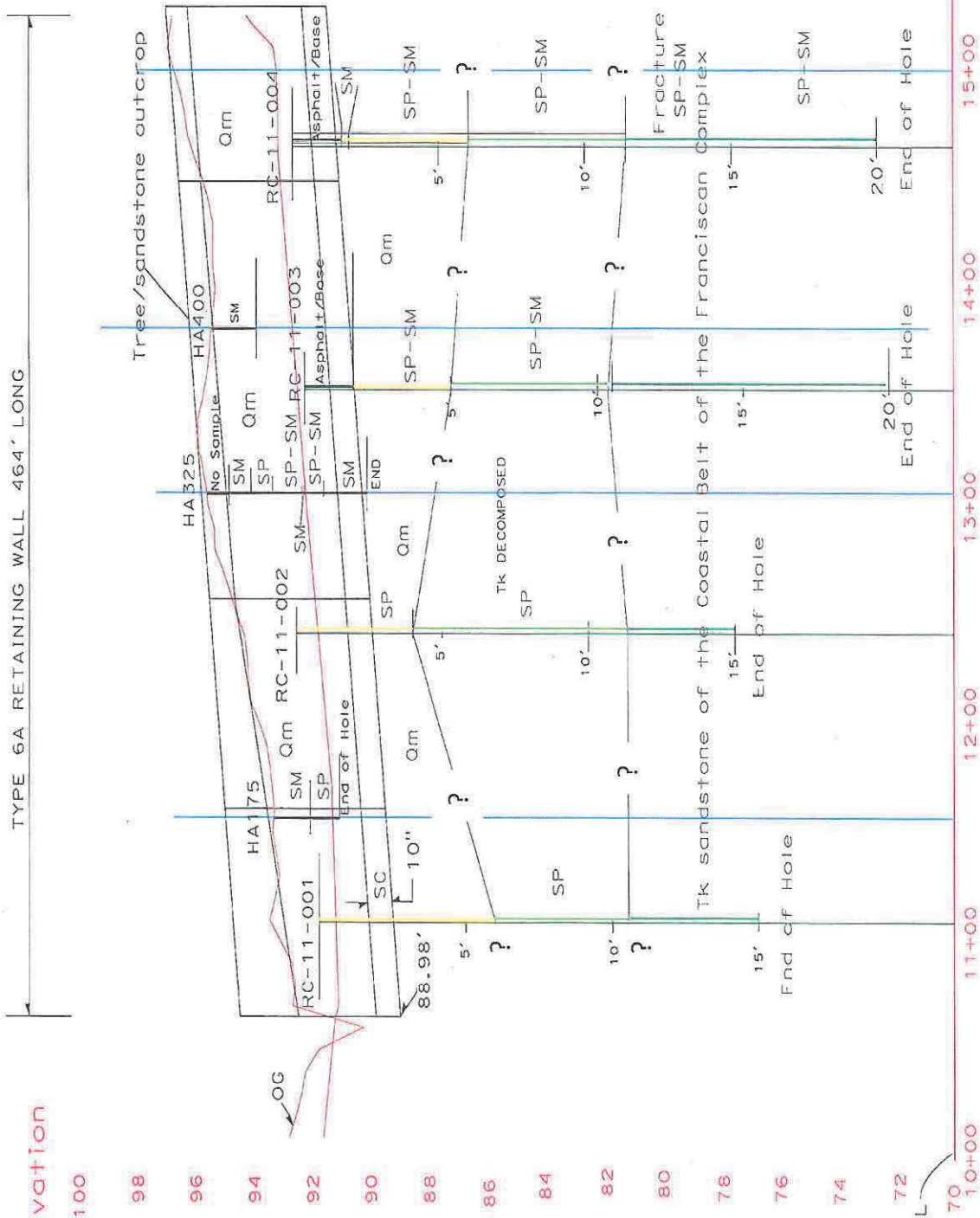
76

74

72

RW1 LOL

70



DEPARTMENT OF TRANSPORTATION
 Division of Engineering Services
 Geotechnical Services
 Office of Geotechnical Design - North
 (OGDN)

EA/EFIS: 01-0A2301
 0100020
 DATE: 10/27/2011

Forg Bragg ADA

Estimated Subsurface Profile

Figure 7

ROTARY FIELD NOTES

TL-1271a (REV. 01/31/00)

BORING NUMBER: HA-175
DATE: 08/25/2011

DIST. 01 CO. MEN RTE. 20 P.M. (K.P.) R0.0/R0.1 BRIDGE #

LOCATION (STA/OFFSET or NORTHING/EASTING)
Wall Station: 11+57

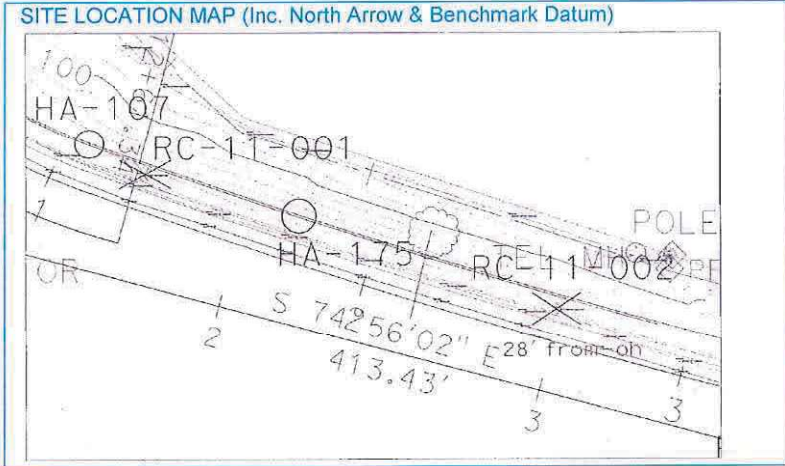
BRIDGE OR PROJECT NAME: Fort Bragg ADA EA NUMBER: EA 01-0A2310//EFIS 0100020260

TOP HOLE ELEVATION: 92.84'

NOTES EQUIPMENT CHC NUMBER

BOTTOM HOLE ELEVATION

SUMMARY



LOGGER D. McGuire	
GW	DATE
GWS	DATE
CASING SIZE	CASING DEPTH
CASING SIZE	CASING DEPTH
SLURRY TYPE	
SURFACE CONDITIONS (Slope, Water, Vegetation, etc) Sunny, dry hillside	

REMARKS (Tool Sizes/Type - Rods & Bits, etc) (Hole Condition - Caving, Squeezing, Loss of Circulation, etc. Drill Rig reactions - slowing, chattering, skipping, blocking off)	FIELD TESTING				DEPTH (inches)	GRAPHIC LOG	DESCRIPTION Soil Classification (group name, group symbol, consistency/relative density, color, moisture, particle size, gradation, plasticity, structure, cementation, organics, fill, q _u , s _u , Other characteristics) Rock Classification (rock name, color, degree of weathering, relative hardness, bedding, discontinuity characteristics, voids, slaking, odor, other characteristics)
	SAMPLE #	BLOWS PER 6"	SPT (N)	Recovery %			
Hole advanced with a 3.25" sand auger					1		
					2		
					3		
					4		
					5		
					6		
					7		
					8		
					9		
					10		trace coarse to fine GRAVEL, angular;
					11		beach/dune sand present
					12		
					13		beach/dune sand present
					14		
					15		
					16		
					17		Poorly graded SAND (SP); dry to moist; light brownish gray; mostly fine SAND (dune sand); weak cementation
					18		
					19		
					20		
					21		

ROTARY FIELD NOTES

TL-1271b (REV. 01/31/00)

BORING NUMBER HA-175	DATE 08/25/2011	DIST. 01	CO. MEN	RTE. 20	P.M. (K.P.) R0.0/R0.1
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LOCATION (STA/OFFSET or NORTHING/EASTING) 92.84'	TOP HOLE ELEVATION 92.84'	BRIDGE # EA 01-0A2310//EFIS 0100020260	EA NUMBER
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REMARKS (Tool Sizes/Type - Rods & Bits, etc) (Hole Condition – Caving, Squeezing, Loss of Circulation, etc. Drill Rig reactions – slowing, chattering, skipping, blocking off)	FIELD TESTING				DEPTH	GRAPHIC LOG	DESCRIPTION <i>Soil Classification (group name, group symbol, consistency/relative density, color, moisture, particle size, gradation, plasticity, structure, cementation, organics, fill, q_u, s_u, Other characteristics)</i> <i>Rock Classification (rock name, color, degree of weathering, relative hardness, bedding, discontinuity characteristics, voids, slaking, odor, other characteristics)</i>
	SAMPLE #	BLOWS PER 6"	SPT (N)	Recovery %			
					22	Poorly graded SAND with GRAVEL (SP); reddish brown; moist; mostly SAND, fine to coarse, subangular; little to some GRAVEL, from coarse to fine, includes igneous rocks, subangular; weak cementation.	
					23		
					24		
					25		
					26		
					27		
					28		
					29		
					30		
					31		
					32		
					33		
					34		
					35		
					36		
					37		
					38		
					39		
					40		
					41		
					42		
					43		
					44		
					45		
					46		
					47		
					48		
					49		
					50		
					51		
					52		
					53		
					54		

ROTARY FIELD NOTES

TL-1271a (REV. 01/31/00)

AUGER HOLE NUMBER	DATE
HA-325	08/24/25/2011

LOCATION (STA/OFFSET or NORTHING/EASTING)
Wall Station: 13+6.28

TOP HOLE ELEVATION
95.6'

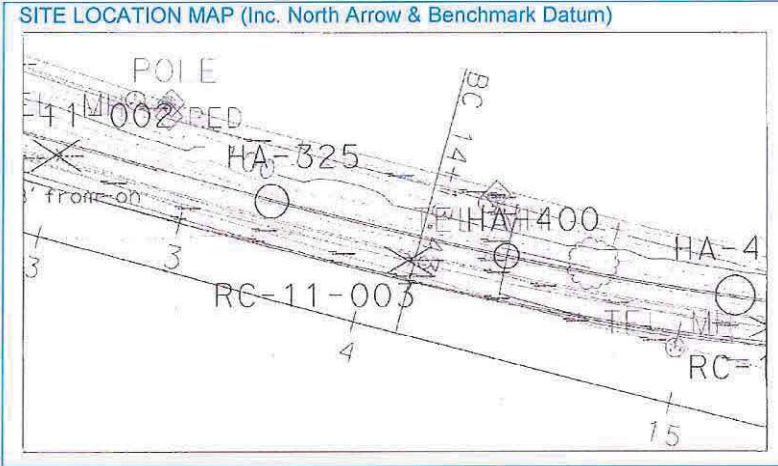
BOTTOM HOLE ELEVATION
90.1'

DIST.	CO.	RTE.	P.M. (K.P.)	BRIDGE #
01	MEN	20	R0.0/R0.1	

BRIDGE OR PROJECT NAME	EA NUMBER
Fort Bragg ADA	EA 01-0A2310//EFIS 0100020260

CREW	EQUIPMENT	CHC NUMBER
Beach/dune sand 91' - 93' elevation		

SUMMARY: Beach/dune sand 2.25-4 ft depth; igneous clasts in 48"-60"



LOGGER D. McGuire	
GW	DATE
GWS	DATE
CASING SIZE	CASING DEPTH
CASING SIZE	CASING DEPTH
SLURRY TYPE	
SURFACE CONDITIONS (Slope, Water, Vegetation, etc) Sunny, dry hillslope	

REMARKS (Tool Sizes/Type - Rods & Bits, etc) (Hole Condition - Caving, Squeezing, Loss of Circulation, etc. Drill Rig reactions - slowing, chattering, skipping, blocking off)	FIELD TESTING				DEPTH (inches)	GRAPHIC LOG	DESCRIPTION <i>Soil Classification</i> (group name, group symbol, consistency/relative density, color, moisture, particle size, gradation, plasticity, structure, cementation, organics, fill, q _u , S _u , Other characteristics) <i>Rock Classification</i> (rock name, color, degree of weathering, relative hardness, bedding, discontinuity characteristics, voids, slaking, odor, other characteristics)
	SAMPLE #	BLOWS PER 6"	ELEVATION	DEPTH (feet)			
Hole advanced with a 3.25' sand auger					1	0-9" No Samples	
					2		
					3		
					4		
					5		
					6		
					7		
					8		
					9		
94.6' at bottom of this cell			94	1	12	Silty SAND (SM); pinkish gray; dry; mostly SAND, fine; little to few fines; little to few GRAVEL, fine, subangular; weak cementation.	
					13		
					14		
				1.25	15		
					16		
					17		
94.1' at bottom of this cell			93.5	1.5	18		
					19		
					20		
				1.25	21		
						Poorly graded SAND (SP)	

ROTARY FIELD NOTES

TL-1271b (REV. 01/31/00)

BORING NUMBER	DATE	DIST.	CO.	RTE.	P.M. (K.P.)
HA-325	08/24/25/2011	01	MEN	20	R0.0/R0.1
LOCATION (STA/OFFSET or NORTHING/EASTING)	TOP HOLE ELEVATION	BRIDGE #	EA NUMBER		
Wall Station: 13+6.28	95.6'	EA 01-0A2310//EFIS 0100020260			

REMARKS (Tool Sizes/Type - Rods & Bits, etc) (Hole Condition - Caving, Squeezing, Loss of Circulation, etc. Drill Rig reactions - slowing, chattering, skipping, blocking off)	FIELD TESTING				DEPTH (inches)	GRAPHIC LOG	DESCRIPTION <i>Soil Classification (group name, group symbol, consistency/relative density, color, moisture, particle size, gradation, plasticity, structure, cementation, organics, fill, q_u, s_u, Other characteristics)</i> <i>Rock Classification (rock name, color, degree of weathering, relative hardness, bedding, discontinuity characteristics, voids, slaking, odor, other characteristics)</i>
	SAMPLE #	BLOWS PER 6"	ELEVATION	DEPTH (feet)			
					22		
					23		
93.6' at bottom of this cell			93	2	24		Poorly graded SAND (SP); reddish brown; dry; mostly SAND, fine; few GRAVEL, fine, angular to subangular; weak cementation
					25		
					26		
				2.25	27		
					28		Poorly graded SAND with SILT (SP-SM); dark reddish brown; moist; mostly SAND, coarse to fine (beach/dune sand included), subrounded to subangular; few to little GRAVEL, coarse to fine; subangular to angular; weak cementation.
					29		
93.1' at bottom of this cell			92.5	2.5	30		beach/dune sand
					31		
					32		
				2.75	33		
					34		
					35		
93.1' at bottom of this cell			92	3	36		
					37		
					38		
				3.25	39		
					40		Silty SAND with GRAVEL (SM); reddish brown; moist; mostly SAND, from coarse to fine, angular; little fines; little GRAVEL, coarse to fine, angular, intensely weathered rock; weak cementation.
					41		
92.1' at bottom of this cell			91.5	3.5	42		
					43		
					44		Poorly graded SAND with SILT (SP-SM); very pale brown; moist; mostly SAND, fine, rounded quartz
				3.75	45		beach/dune sand; few to little fines; trace Gravel, fine (soft clumps of silty sand); weak cementation
					46		
					47		
91.6' at bottom of this cell			91	4	48		
					49		
					50		
				4.25	51		Silty SAND (SM); brownish yellow to reddish brown (redder below 48"); moist; mostly SAND, from coarse to fine; little to some fines, includes coarse white fragments of igneous rocks; few-trace GRAVEL, fine, subangular (including hard igneous rocks); weak cementation
					52		
					53		
91.1' at bottom of this cell			90.5	4.5	54		

ROTARY FIELD NOTES

TL-1271b (REV. 01/31/00)

BORING NUMBER HA-325	DATE 08/24/25/2011	DIST. 01	CO. MEN	RTE. 20	P.M. (K.P.) R0.0/R0.1
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LOCATION (STA/OFFSET or NORTHING/EASTING) Wall Station: 13+6.28	TOP HOLE ELEVATION 95.6'	BRIDGE # EA 01-0A2310//EFIS 0100020260	EA NUMBER
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REMARKS (Tool Sizes/Type - Rods & Bits, etc) (Hole Condition - Caving, Squeezing, Loss of Circulation, etc. Drill Rig reactions - slowing, chattering, skipping, blocking off)	FIELD TESTING				DEPTH (inches)	GRAPHIC LOG	DESCRIPTION <i>Soil Classification (group name, group symbol, consistency/relative density, color, moisture, particle size, gradation, plasticity, structure, cementation, organics, fill, q_u, s_u, Other characteristics)</i> <i>Rock Classification (rock name, color, degree of weathering, relative hardness, bedding, discontinuity characteristics, voids, slaking, odor, other characteristics)</i>
	SAMPLE #	BLOWS PER 6"	ELEVATION	DEPTH (feet)			
					55		
					56		
				4.75	57		
					58		
					59		
90.6' at bottom of this cell			90	5	60		few GRAVEL, coarse to fine, angular (very soft sandstone clasts-weathered bedrock?)
					61		
					62		
				5.25	63		
					64		increase in fines to "some fines"
					65		
90.1' at bottom of this cell			89.5	5.5	66		
					67		End of auger hole at 66"
					68		
					69		
					70		
					71		
					72		
					73		
					74		
					75		
					76		
					77		
					78		
					79		
					80		
					81		
					82		
					83		
					84		
					85		
					86		
					87		

ROTARY FIELD NOTES

TL-1271a (REV. 01/31/00)

BORING NUMBER	DATE
HA-400	08/24/2011

DIST.	CO.	RTE.	P.M. (K.P.)	BRIDGE #
01	MEN	20	R0.0/R0.1	

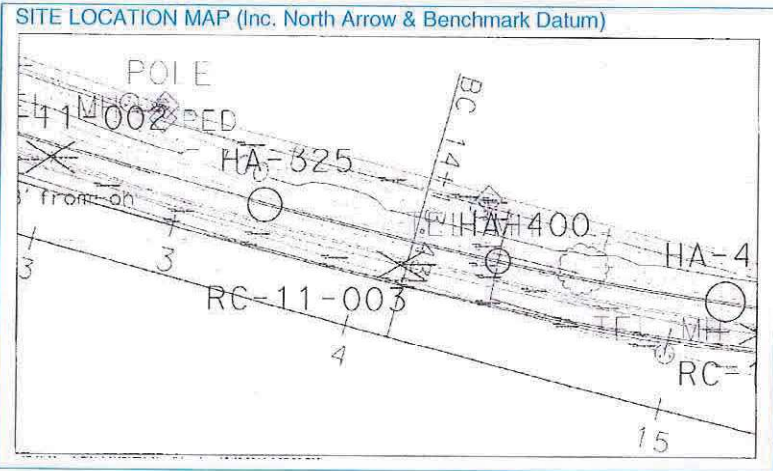
LOCATION (STA/OFFSET or NORTHING/EASTING)
Wall Station: 13+82

BRIDGE OR PROJECT NAME	EA NUMBER
Fort Bragg ADA	EA 01-0A2310//EFIS 0100020

TOP HOLE ELEVATION
95.43

CREW	EQUIPMENT	CHC NUMBER

HAMMER ID#



LOGGER	
D. McGuire	
GW	DATE
GWS	DATE
CASING SIZE	CASING DEPTH
CASING SIZE	CASING DEPTH
SLURRY TYPE	
SURFACE CONDITIONS (Slope, Water, Vegetation, etc)	
Sunny, dry hillslope	

REMARKS (Tool Sizes/Type - Rods & Bits, etc) (Hole Condition - Caving, Squeezing, Loss of Circulation, etc. Drill Rig reactions - slowing, chattering, skipping, blocking off)	FIELD TESTING				DEPTH	GRAPHIC LOG	DESCRIPTION <i>Soil Classification (group name, group symbol, consistency/relative density, color, moisture, particle size, gradation, plasticity, structure, cementation, organics, fill, q_u, S_u, Other characteristics)</i> <i>Rock Classification (rock name, color, degree of weathering, relative hardness, bedding, discontinuity characteristics, voids, slaking, odor, other characteristics)</i>
	SAMPLE #	BLOWS PER 6"	SPT (N)	Recovery %			
Hole advanced with a 3.25" sand auger					1	[Graphic Log Column]	Silty SAND with GRAVEL (SM); loose; brownish yellow; moist; mostly SAND, fine; little fines; little fine to coarse GRAVEL; subangular. Gravel consists of soft fragments of intensely weathered fine sandstone.
					2		
					3		
					4		
					5		
					6		
					7		
					8		
					9		
					10		
					11		
					12		
					13		
					14		
					15		
					16		
					17		
					18		
					19		
					20		
					21		

ROTARY FIELD NOTES

TL-1271a (REV. 01/31/00)

BORING NUMBER	DATE
RC-11-001	09/07/2011

DIST.	CO.	RTE.	P.M. (K.P.)
01	MEN	20	R0.0/R0.1

LOCATION (STA/OFFSET or NORTHING/EASTING)
Roadway Station: 11+67, 31 L

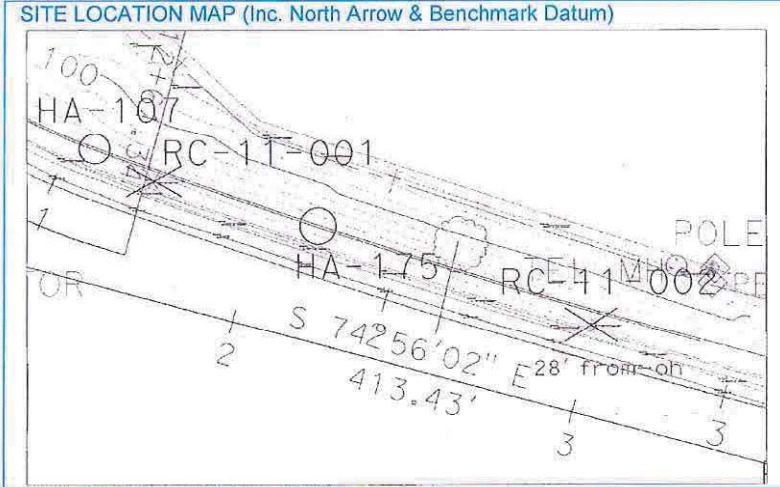
PROJECT	EA NUMBER
Fort Bragg ADA	EA 01-0A2310//EFIS 0100020260

TOP HOLE ELEVATION
91.78

CREW	EQUIPMENT	CHC NUMBER
Eureka Drill Crew	Acker	1974

BOTTOM HOLE ELEVATION
76.78'

HAMMER
Automatic, ER=80% (Calibrated 04/19/2011)



LOGGER D. McGuire	
GW	DATE
GW	DATE
CASING SIZE 94 mm	CASING DEPTH 10'
CASING SIZE	CASING DEPTH
SLURRY TYPE None	Drilled with Water
SURFACE CONDITIONS (Slope, Water, Vegetation, etc) Foggy; intermittent sun in later morning; dry; drilled into soil at edge of pavement	

REMARKS (Tool Sizes/Type - Rods & Bits, etc) (Hole Condition - Caving, Squeezing, Loss of Circulation, etc. Drill Rig reactions - slowing, chattering, skipping, blocking off)	FIELD TESTING			DEPTH	GRAPHIC LOG	DESCRIPTION Soil Classification (group name, group symbol, consistency/relative density, color, moisture, particle size, gradation, plasticity, structure, cementation, organics, fill, q _u , s _u , Other characteristics) Rock Classification (rock name, color, degree of weathering, relative hardness, bedding, discontinuity characteristics, voids, slaking, odor, other characteristics)
	SAMPLE #	BLOWS PER 6"	SPT (N) Recovery %			
Mud rotary punch core, 4.75" finger bit to 10.6'. Drilled dry to 2'.		4		1	[Soil Log]	Clayey SAND (SC); medium dense; reddish brown; moist; mostly SAND, fine; little fines; weak cementation to 3". [Qm]
Corrected N: 13 x 1.33=17.3, medium dense		8	13	3		
				4	[Soil Log]	brownish yellow from 3' to 7'. fewer fines; weak cementation; becoming decomposed sandstone
Corrected N: 22 x 1.33=29, medium dense		18		6		
		9		7	[Rock Log]	SEDIMENTARY ROCK (Sandstone); brownish yellow; intensely weathered to decomposed; (Poorly graded SAND (SP); medium dense; moist; mostly SAND, from coarse to fine; little fines; few GRAVEL, from coarse to fine, angular; weak cementation). [DECOMPOSED BEDROCK, Tk]
Refusal at 10.6' 81.1' elevation) 3 3/4" diamond core bit from 10.6' to 15'.		13	22	8		
				9	[Rock Log]	SEDIMENTARY ROCK (Sandstone); massive; yellowish brown; intensely weathered; moderately hard; very intensely fractured. [BEDROCK, Tk]
				10		
		41		11	[Rock Log]	SEDIMENTARY ROCK (Sandstone); massive; yellowish brown; intensely weathered; moderately hard; very intensely fractured. [BEDROCK, Tk]
3 3/4" diamond core bit from 10.6' to 15'.		65/1.5	R	12		
	4			13	[Rock Log]	SEDIMENTARY ROCK (Sandstone); massive; yellowish brown; intensely weathered; moderately hard; very intensely fractured. [BEDROCK, Tk]
				14		
End of hole at 15' (Elevation 76.78').				15	[Rock Log]	SEDIMENTARY ROCK (Sandstone); massive; yellowish brown; intensely weathered; moderately hard; very intensely fractured. [BEDROCK, Tk]
Perforated 0- 10'. Bentonite below 10'.				16		
One bag of sand. .				17	[Rock Log]	SEDIMENTARY ROCK (Sandstone); massive; yellowish brown; intensely weathered; moderately hard; very intensely fractured. [BEDROCK, Tk]
				18		
				19	[Rock Log]	SEDIMENTARY ROCK (Sandstone); massive; yellowish brown; intensely weathered; moderately hard; very intensely fractured. [BEDROCK, Tk]
				20		
				21	[Rock Log]	SEDIMENTARY ROCK (Sandstone); massive; yellowish brown; intensely weathered; moderately hard; very intensely fractured. [BEDROCK, Tk]
				22		

ROTARY FIELD NOTES

TL-1271a (REV. 01/31/00)

BORING NUMBER DATE
RC-11-002 09/07/2011

DIST. CO. RTE. P.M. (K.P.)
01 MEN 20 R0.0/R0.1

LOCATION (STA/OFFSET or NORTHING/EASTING)
Roadway Station: 13+00, 25.3 L

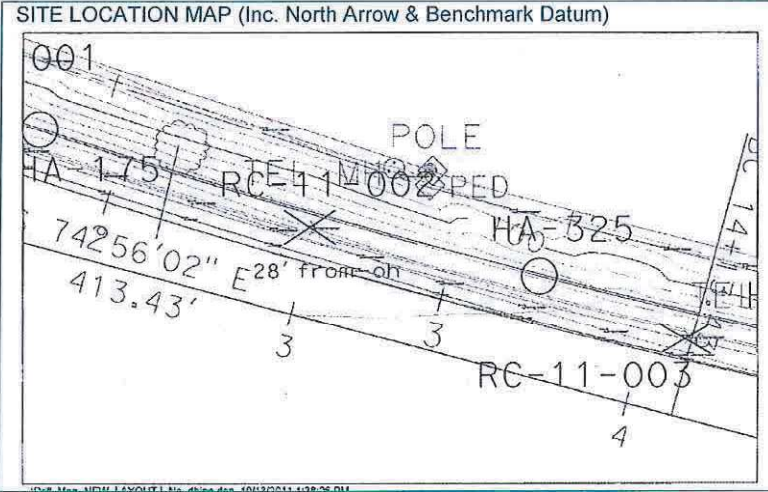
PROJECT EA NUMBER
Fort Bragg ADA EA 01-0A2310//EFIS 0100020260

TOP HOLE ELEVATION
92.54'

CREW EQUIPMENT CHC NUMBER
Eureka Drill Crew Acker 1974

BOTTOM HOLE ELEVATION
77.54'

HAMMER
Automatic, ER=80% (Calibrated 04/19/2011)



LOGGER D. McGuire	
GW 9.3' bgs	DATE 9/8/2011
GW	DATE
CASING SIZE 94 mm	CASING DEPTH 15'
CASING SIZE	CASING DEPTH
SLURRY TYPE None	Drilled with Water
SURFACE CONDITIONS (Slope, Water, Vegetation, etc) Sunny side of a fog bank, surface dry, drilled into soil adjacent to adjacent to edge of pavement,	

REMARKS (Tool Sizes/Type - Rods & Bits, etc) (Hole Condition - Caving, Squeezing, Loss of Circulation, etc. Drill Rig reactions - slowing, chattering, skipping, blocking off)	FIELD TESTING			DEPTH	GRAPHIC LOG	DESCRIPTION Soil Classification (group name, group symbol, consistency/relative density, color, moisture, particle size, gradation, plasticity, structure, cementation, organics, fill, q _u , s _u , Other characteristics) Rock Classification (rock name, color, degree of weathering, relative hardness, bedding, discontinuity characteristics, voids, slaking, odor, other characteristics)
	SAMPLE #	BLOWS PER 6"	SPT (N)			
Mud rotary punch core, 4.5" finger bit to 10.75'. Drilled dry to 2'.		4		1	[SP]	Poorly graded SAND (SP); dense; reddish brown; moist; mostly SAND, fine to coarse; little fines; weak cementation to (0" to 6"). [Qm]
Corrected N: 27x 1.33=36 (dense due to a fragment of coarse gravel)		6		2		
		21	27	3	[SM]	Brownish yellow; trace to few GRAVEL, coarse; subangular (6" to 1.5').
				4		
				5	[SM]	Poorly graded SAND with SILT and GRAVEL (SP-SM); dense to medium dense; brownish yellow; moist; mostly SAND, from coarse to fine; little GRAVEL, fine, from angular to subrounded; cementation from weak to moderate (1.5'-5').
Corrected N: 19x 1.33=25.3 (medium dense)		13		6		
		7		7	[TR]	SEDIMENTARY ROCK (Sandstone); brownish yellow; intensely weathered to decomposed; (Poorly graded SAND (SP); medium dense; moist; mostly SAND, fine; little fines; moderate cementation). [DECOMPOSED BEDROCK, Tk]
		12	19	8		
				9	[TR]	SEDIMENTARY ROCK (Sandstone); massive; dark grayish brown; intensely weathered; moderately hard; very intensely fractured. [BEDROCK, Tk]
Refusal at 11.3' (81.24')		14		11		
3 3/4" diamond core bit from 11.3' to 15'.		50/5.5		12	[TR]	SEDIMENTARY ROCK (Sandstone); massive; dark grayish brown; intensely weathered; moderately hard; very intensely fractured. [BEDROCK, Tk]
		50/3.5	100/9	13		
				14	[TR]	
End of hole at 15' (77.54' elevation).				15		
Casing perforated 5' to 15'.				16	[TR]	
Two bags of sand and bentonite.				17		
				18	[TR]	
				19		
				20	[TR]	
				21		

ROTARY FIELD NOTES

TL-1271a (REV. 01/31/00)

BORING NUMBER	DATE
RC-11-003	09/08/2011

LOCATION (STA/OFFSET or NORTHING/EASTING)
Roadway Station: 14+13, 23 L;

TOP HOLE ELEVATION
92.24'

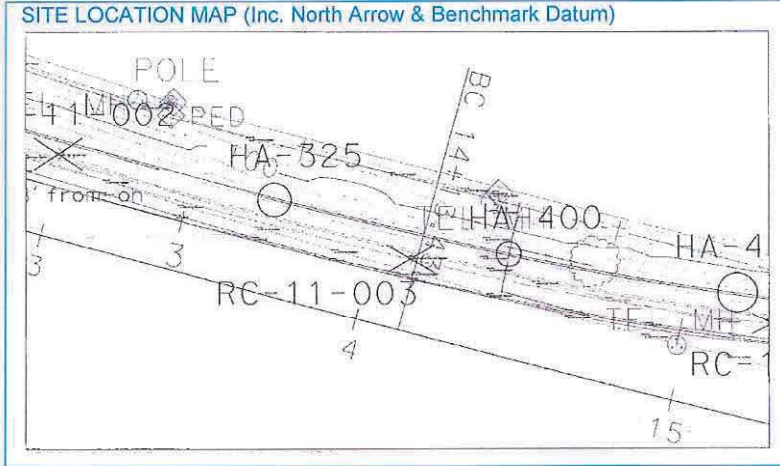
BOTTOM HOLE ELEVATION
72.24'

DIST.	CO.	RTE.	P.M. (K.P.)
01	MEN	20	R0.0/R0.1

PROJECT	EA NUMBER
Fort Bragg ADA	EA 01-0A2310//EFIS 0100020260

CREW	EQUIPMENT	CHC NUMBER
Eureka Drill Crew	Acker	1974

HAMMER
Automatic, ER=80% (Calibrated on 04/19/2011)



LOGGER D. McGuire	
GW	DATE
GW	DATE
CASING SIZE 94 mm	CASING DEPTH 20'
CASING SIZE	CASING DEPTH
SLURRY TYPE None	Drilled with Water
SURFACE CONDITIONS (Slope, Water, Vegetation, etc) Foggy, air moist, pavement dry, drilled at edge of pavement. Became sunny by 10:30 am.	

REMARKS (Tool Sizes/Type - Rods & Bits, etc) (Hole Condition - Caving, Squeezing, Loss of Circulation, etc. Drill Rig reactions - slowing, chattering, skipping, blocking off)	FIELD TESTING			DEPTH	GRAPHIC LOG	DESCRIPTION <i>Soil Classification (group name, group symbol, consistency/relative density, color, moisture, particle size, gradation, plasticity, structure, cementation, organics, fill, q_u, s_u, Other characteristics)</i> <i>Rock Classification (rock name, color, degree of weathering, relative hardness, bedding, discontinuity characteristics, voids, slaking, odor, other characteristics)</i>
	SAMPLE #	BLOWS PER 6"	SPT (N) Recovery %			
Mud rotary punch core, 4 3/4" finger bit to 10.5'. Dry SPT 0-1.5'.				1		ASPHALT and road base.
				2		
				3		Poorly graded SAND with SILT (SP-SM); very dense; brownish yellow to yellowish red; moist; mostly SAND, fine; few to little fines; from moderate to weak cementation.
				4		
18"-36" very dense, N>50		31	58	5		[Qm]
				6		
Very dense, N>50		33		6		SEDIMENTARY ROCK (Sandstone); brownish yellow; very intensely weathered to decomposed; (Poorly graded SAND with SILT and GRAVEL (SP-SM); very dense; moist; mostly SAND, fine; few to little fines; from moderate to weak cementation.). [DECOMPOSED BEDROCK, Tk]
				7		
		60/6		7		
				8		
		29	89/12	8		
				9		
				10		
Refusal at 10.5' (81.74' elevation).		50/5.5	R	11		
3 3/4" diamond core bit from 10.5' to 20'.				12		SEDIMENTARY ROCK (fine-grained Sandstone); massive; reddish brown; intensely weathered; moderately soft; very intensely fractured; fracture zone. [BEDROCK, Tk]
				13		
				14		
				15		
				16		
				17		
End of hole at 20' (elevation 72.24')				18		
Casing perforated 10' to 20'.				19		
Two bags of sand; bentonite to seal hole.				20		

ROTARY FIELD NOTES

TL-1271a (REV. 01/31/00)

BORING NUMBER	DATE
RC-11-004	09/08/2011

DIST.	CO.	RTE.	P.M. (K.P.)
01	MEN	20	R0.0/R0.1

LOCATION (STA/OFFSET or NORTHING/EASTING)
Roadway Station: 15+25, 31.3 L

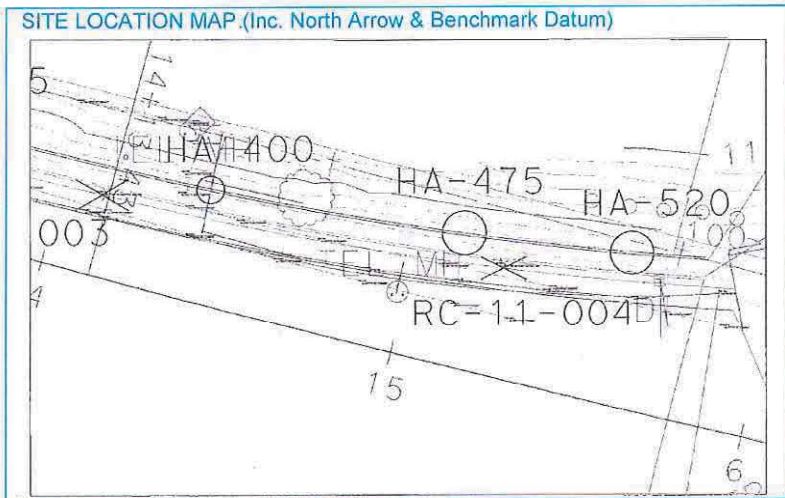
PROJECT	EA NUMBER
Fort Bragg ADA	EA 01-0A2310//EFIS 0100020260

TOP HOLE ELEVATION
92.64

CREW	EQUIPMENT	CHC NUMBER
Eureka Drill Crew	Acker	1974

BOTTOM HOLE ELEVATION
72.64

HAMMER
Automatic, ER=80% (Calibrated 04/19/2011)



LOGGER D. McGuire	
GW	DATE
GW	DATE
CASING SIZE 94 mm	CASING DEPTH 20'
CASING SIZE	CASING DEPTH
SLURRY TYPE None	Drilled with Water
SURFACE CONDITIONS (Slope, Water, Vegetation, etc) Sunny, dry pavement	

REMARKS (Tool Sizes/Type - Rods & Bits, etc) (Hole Condition - Caving, Squeezing, Loss of Circulation, etc. Drill Rig reactions - slowing, chattering, skipping, blocking off)	FIELD TESTING			DEPTH	GRAPHIC LOG	DESCRIPTION <i>Soil Classification (group name, group symbol, consistency/relative density, color, moisture, particle size, gradation, plasticity, structure, cementation, organics, fill, q_u, s_u, Other characteristics)</i> <i>Rock Classification (rock name, color, degree of weathering, relative hardness, bedding, discontinuity characteristics, voids, slaking, odor, other characteristics)</i>
	SAMPLE #	BLOWS PER 6"	SPT (N)			
Mud rotary punch core; 4 3/4" finger bit.				1	[Solid black bar]	ASPHALT and road base.
		10		2	[Dotted pattern]	
Corrected N (20"-38"): 15x 1.33=20		7		3	[Dotted pattern]	Poorly graded SAND with SILT (SP-SM); medium dense; reddish brown; moist; mostly SAND, fine; few to little fines; moderate cementation (1.7'-4.3') [Qm]
Medium dense		8	15	4	[Dotted pattern]	
				5	[Dotted pattern]	very dense; brownish yellow; few to little GRAVEL, from coarse to fine; (4.3'-5.3'). [Qm]
		13		6	[Dotted pattern]	
Very dense, N>50		20		7	[Horizontal lines]	SEDIMENTARY ROCK (Sandstone); reddish brown; intensely weathered to decomposed; (Poorly graded SAND with SILT (SP-SM); very dense; moist; mostly SAND, fine; few to little fines; moderate cementation. (5.3'-11.4'). [DECOMPOSED BEDROCK, Tk]
		37	57	8	[Horizontal lines]	
				9	[Horizontal lines]	
				10	[Horizontal lines]	
Refusal at 11.4' (81.2' elevation)		22		11	[Horizontal lines]	
3 3/4" diamond core bit from 11.4' to 20'.		37		12	[Horizontal lines]	SEDIMENTARY ROCK (Sandstone); reddish brown; intensely weathered to decomposed; (Poorly graded SAND with SILT (SP-SM); very dense; moist; mostly SAND, mostly fine but includes coarse; few to little fines; moderate cementation) [BEDROCK, Tk].
		60/5	97/11	13	[Horizontal lines]	
				14	[Horizontal lines]	
				15	[Horizontal lines]	
18' drill rate increased through soft material and black organic film appeared in mud pit.				16	[Horizontal lines]	
				17	[Horizontal lines]	fracture zone 18'-20'.
End of hole at 20'(elevation 72.64).				18	[Horizontal lines]	
Casing perforated 10' to 20'.				19	[Horizontal lines]	gray at 19'-20'.
Two bags of sand; bentonite plug).				20	[Horizontal lines]	

BENCH MARK

BM FB-20 Elev 48.69
 Found Brass Disk stamped FB-20, 0.8 mile northerly along Hwy 1 from the junction of Oak street, in the east end of the south concrete abutment of Pudding Creek Bridge, 17.1 feet east of the Hwy 1 and 8.2 feet north of the south end of the east guardrail. NGVD29

TO FORT BRAGG



PLAN
 1" = 40'

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
01	Men	1	62.0/62.3	146	184

Maritta James
 REGISTERED CIVIL ENGINEER
 DATE: 4-13-21
 EXPIRES: 6-30-22
 No. 5509
 CIVIL
 STATE OF CALIFORNIA

PLANS APPROVAL DATE: 3-7-22

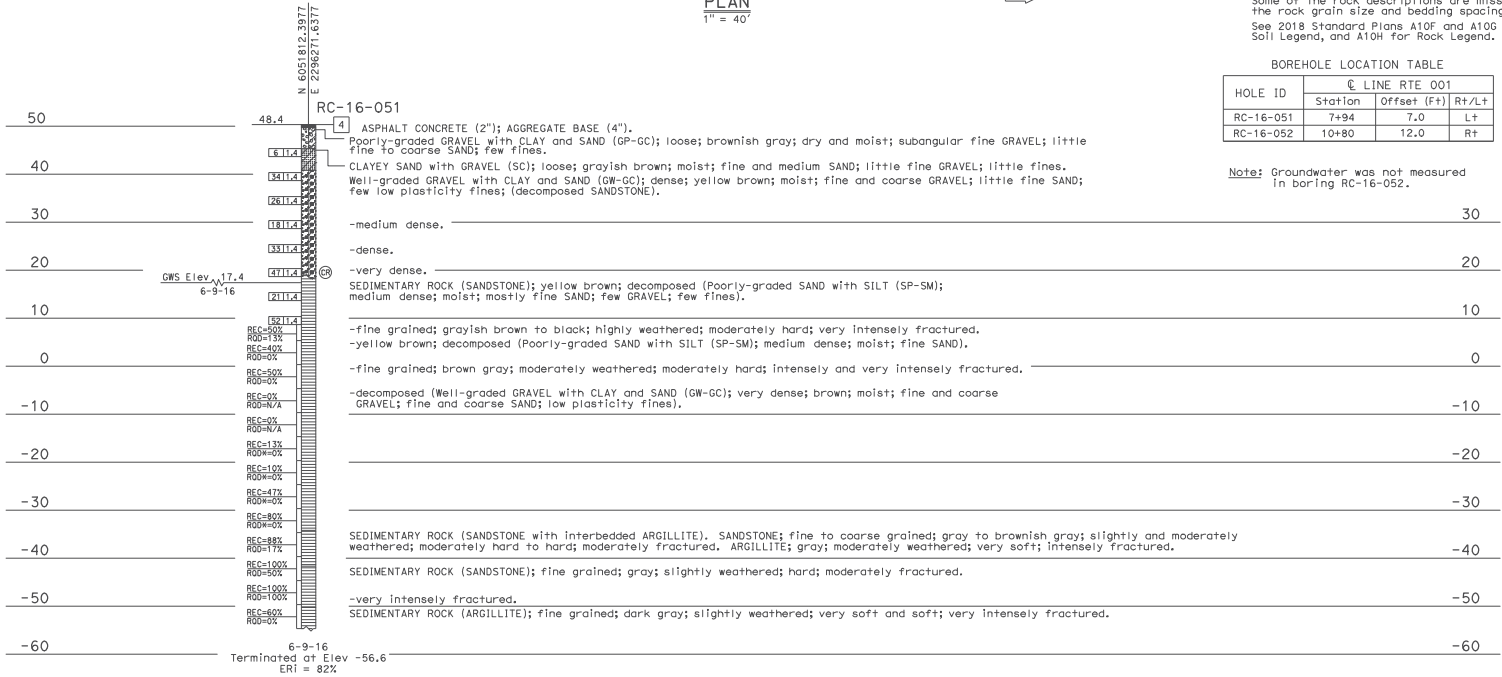
THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

This LOTB sheet was prepared in accordance with the Caltrans Soil & Rock Logging, Classification, and Presentation Manual (2010 Edition) except as noted below:
 Some of the soil descriptions are missing the proportions and particle size of soil. Some of the rock descriptions are missing the rock grain size and bedding spacing. See 2018 Standard Plans A10F and A10G for Soil Legend, and A10H for Rock Legend.

BOREHOLE LOCATION TABLE

HOLE ID	LINE RTE 001		Rt/Lt
	Station	Offset (Ft)	
RC-16-051	7+94	7.0	Lt
RC-16-052	10+80	12.0	Rt

Note: Groundwater was not measured in boring RC-16-052.



ENGINEERING SERVICES		GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION		DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN		BRIDGE No. 10-0158		PUDDING CREEK BRIDGE (WIDEN)	
FUNCTIONAL SUPERVISOR: NAME: C. Norwood	DRAWN BY: I.G. Remmen	FIELD INVESTIGATION BY: NAME: C. Ewing	CHECKED BY: C. Turner	DATE PLOTTED -> 2-MAY-2022 FILE -> 10-0158-1076-1075.dgn		TIME PLOTTED -> 08:08 USER NAME -> s148889		ORIGINAL SCALE OR INCHES FOR REDUCED PLANS: 0 1 2 3		UNIT: 3650 PROJECT NUMBER & PHASE: 01000006721	
				CONTRACT No.: 01-434804		DISSEMINATED PRINTS BEARING EARLIER REVISION DATES		REVISION DATES		SHEET 32 OF 34	

Memorandum

To: DUNG SY
Design M14
North Region Division of Project Development

Date: October 31, 2022

Attention: Ash Arreola

File: 01-MEN-001-PM 59.8/62.1
EA: 01-0B220
EFIS: 0112000110
Fort Bragg ADA
Retaining Wall – 1N
Retaining Wall – 2S

From: GEOTECHNICAL SERVICES
Office of Geotechnical Design - West
Branches A and B

Subject: **GEOTECHNICAL DESIGN REPORT FOR FORT BRAGG ADA RW-1N and RW-2S**

Introduction

This Geotechnical Design Report (GDR) was prepared in response to the request dated September 9, 2022, for the proposed Fort Bragg Americans with Disabilities Act (ADA) project located along State Route (SR) 1 in Mendocino County, from PM 59.8 to 62.1. The purpose of this report is to provide geotechnical recommendations for the proposed retaining walls. The recommendations in this memorandum are based on the Project Plans dated April 12, 2021. The scope of work included review of pertinent documents, engineering analysis and preparation of this memorandum. No subsurface investigation was performed.

Project Description

The Fort Bragg ADA pedestrian infrastructure project consists of the following proposed improvements: replacement and installation of curb ramps, installation of sidewalks, installation of driveways, installation of two retaining walls, and grade corrections by the intersections and crosswalk pavement markings. This memorandum provides geotechnical recommendations for the retaining walls only.

Retaining Wall No. 1 (RW-1N) is a Standard Retaining Wall, Type 6A, and will be constructed parallel to SR 1 in an existing vegetated slope. The slope is approximately 1H:1V near the bottom and 3H:1V near the top. Retaining Wall No. 2 (RW-2S) is a Standard Retaining Wall, Type 6B, and will be constructed parallel to SR 1 in relatively flat terrain. A summary of the proposed retaining wall information is provided in Table 1 and the locations of the walls are shown in Figure 1, Site Vicinity Map.

All elevations referenced in this report are based on the North American Vertical Datum of 1988 (NAVD88), unless otherwise noted.

Table 1: Proposed Retaining Wall Summary

Retaining Wall	Wall Type	Location			Length (feet)	Maximum Design Height (feet)	Notes
		Line	Begin Station	End Station			
RW-1N	Type 6A Case 2	RW1	118+18.73	125+58.73	740	6.0	Sloping Backfill
RW-2S	Type 6B Case 1	RW2	229+98.34	231+86.99	188.65	4.0	Level Backfill

Geotechnical Investigation

No subsurface exploration or laboratory tests were performed for this project.

A 461-foot long Standard Retaining Wall – Type 6 was constructed near the intersection of SR 1 and SR 20 (EA: 01-0A2304). Proposed RW-1N is a continuation of this existing wall. A subsurface investigation was conducted for the existing wall in August and September 2011. Three hand auger borings and four mud rotary borings were performed. The hand auger borings were advanced to depths of 1.5 to 5.5 feet below ground surface (El. 93.9 to 90.1 feet). The mud rotary borings were extended to depths of 15 and 20 feet below ground surface (El. 76.8 to 72.2 feet).

The closest geotechnical investigation to RW-2S was performed for the Pudding Creek Bridge Widening Project (EA 01-43804, Bridge No. 10-0158). Two mud rotary borings were performed in 2016. The closest of the two borings (RC-16-051) is located about 1,000 feet north of proposed RW-2S. The boring was advanced to a depth of 105 feet (El. -56.6 feet).

A complete description of the subsurface investigations, including the boring locations boring logs, and LOTB are provided in Appendix A.

Geotechnical Conditions

Geology

The project is in the Coast Ranges geomorphic province of California. Both walls are located on the western edge of an uplifted Pleistocene (11,000 to 2,600,000 years old) marine terrace dissected by Pudding Creek to the north and Hare Creek to the south. Approximately 1,500 feet to the west of the site the terrace terminates in an approximately 40-foot high precipitous coastal bluff and to the east a series of older terraces step up into the foothills of the coast range mountains. According to published geologic maps of the area (Jennings 1960, Braun 2005), the site is underlain by rock of the Tertiary to Cretaceous, Franciscan Coastal Belt locally overlain by marine terrace deposits. The Coastal Belt Franciscan rock is described as light-colored, well-cemented to deeply

weathered, fractured and sheared clastic sedimentary rocks; mostly graywacke sandstone and shale with arkosic sandstone and minor amounts of conglomerate, chert and volcanics. The rock is characterized by coherent and disjointed blocks of various sizes, separated by broad shear zones and faults. The marine terrace deposits are described as consisting of well sorted quartz sand with minor gravel, increasing in age and weathering with increased elevation. There are no known active or potentially active faults within the project limits.

Surface Conditions

The retaining wall locations are located near the Pacific Coast on SR 1 where the Noyo River and Pudding Creek flow into the Pacific Ocean. Pavement elevations near RW-1N on the existing highway range from 91 feet to 112 feet, south to north, respectively. Existing cut and natural slopes in the vicinity range from 1H:1V to 3H:1V. Upslope of proposed RW-1N is a shopping center.

Near RW-2S, the ground surface is relatively flat with a pavement elevation of about 64 feet to 65 feet. Proposed RW-2S is adjacent to a vacant lot.

Subsurface Conditions

Based on the 2011 investigation for the existing retaining wall near RW-1N, the subsurface soils consist of 6 feet of dune sands underlain by sandstone.

For RW-2S, Boring RC-16-051 encountered approximately 9.5 feet of loose clayey sand with gravel interpreted as terrace deposits. Between 9.5 feet and 31.8 feet below ground surface (bgs) (approximate elevations 38.9 to 16.6 NGVD29, feet) the boring encountered dense to very dense, well graded gravel with clay and sand interpreted as decomposed sandstone. Below 31.8 feet the boring encountered rock dominated by sandstone with subordinate argillite which persisted to the exploration depth of 105 feet bgs (approximate elevation -56.6 NGVD29, feet).

Groundwater

The 2011 subsurface investigation located groundwater in boring RC-11-002 on September 8, 2011, at a depth of 9.3 feet below surface grade (El. 83.2 feet), approximately 300 feet from the proposed retaining wall. The same groundwater depth is assumed for RW-1N.

Groundwater was measured in RC-16-051 on June 9, 2016, at a depth of 31 feet (El. 17.4 feet). The measurement is presumably a partially relaxed groundwater measured between drilling days. The same groundwater depth is assumed for RW-2S.

Groundwater should be expected to vary with time due to seasonal groundwater fluctuations, surface and subsurface flows, ground surface run-off, and other factors that may not have been present at the time of the field investigations.

Seismic Hazards

Site Seismic Parameters

The retaining wall sites may be subject to strong ground motions from nearby earthquake sources during the design life of the walls. The coordinates used in the analysis for RW-1N and RW-2S are latitude 39.4209° and longitude -123.8077°, and latitude 39.4508° and longitude -123.8060°, respectively. Based on available subsurface information and SPT correlations for determining shear wave velocity, the time-average shear wave velocity (V_{s30}) for the upper 100 feet of soil/rock is estimated to be 560 m/s (about 1,835 ft/s) for RW-1N and 350 m/s (about 1,148 ft/s) for RW-2S.

Ground Motion Parameters

The Design Spectrum for the Safety Evaluation Earthquake, as specified in Caltrans Seismic Design Criteria with October 2019 interim revisions, version 2.0 (SDC v2.0) is the probabilistic response spectrum representing the horizontal ground motion at the site with a 5% probability of exceedance in 50 years (return period = 975 years). The USGS's 2014 National Seismic Hazard Model (NSHM) is used as the basis to determine the Design Spectrum in the form of the design Acceleration Response Spectrum (ARS).

Caltrans' web-based tool, ARS online v3.0.2, was utilized to determine the design ground motion parameters, including the ARS, for the subject retaining wall sites. Ground motion parameters are summarized in Table 2.

Table 2: Recommended Ground Motion Parameter for Geotechnical Design

Project Component ID	Site Parameters			Design Ground Motion Parameters		
				(Return Period = 975 Years)		
	Latitude (degrees)	Longitude (degrees)	Shear Wave Velocity (V_{s30}) (m/s)	Horizontal Peak Ground Acceleration (HPGA) ⁽¹⁾ (g)	Mean Earthquake ⁽¹⁾ Moment Magnitude (M)	Mean Site-to-Fault Source Distance ⁽¹⁾ (R) (km)
RW-1N	39.4209°	-123.8077°	560	0.65	7.57	20.8
RW-2S	39.4508°	-123.8060°	350	0.67	7.58	21.3

1. Based on Caltrans web tool ARS Online (Version 3.0.2)

Parameters for Seismic Slope Stability Analysis

A horizontal seismic coefficient (k_h) of 0.22g, equal to 1/3 HPGA, is used for seismic slope stability analyses of the retaining walls.

Fault Rupture

The project sites are not located within an Alquist Priolo Earthquake Fault Zone or 1,000 feet from any Holocene or younger aged fault. The nearest active fault is the offshore section of the San Andreas, about 5.8 miles west. There are a series of folds in the marine terraces and one of the folds has been mapped as a compressional fault between Hare Creek and the Noyo River near PM 60.1. This is not an active fault, but rather a mapped remnant of previous tectonic activity. The potential for surface fault rupture does not exist.

Liquefaction

Based on the depth of groundwater and the subsurface soil/rock conditions in the nearest borings, the potential for liquefaction does not exist.

Analyses and Design

Project Design Information

As stated in the Project Description section, Table 1 provides a summary of the retaining walls. RW-1N is a Standard Plan Retaining Wall, Type 6A (Case 2), with a maximum height of 6 feet. Based on the project plans, the backfill slope angle is 2H:1V. RW-2S is a Standard Plan Retaining Wall, Type 6B (Case 1), with a maximum height of 4 feet.

Standard Plan Earth Retaining Systems (ERS) are designed based on a horizontal seismic acceleration coefficient of 0.2g, corresponding to a HPGA of 0.6g. The proposed retaining wall sites have an HPGA greater than 0.6g. A Standard Plan ERS can be used in areas with a HPGA greater than 0.6g if the resulting permanent seismic displacement is acceptable for the project. It is the District's responsibility to determine how much permanent seismic displacement is acceptable for the subject project.

Soil/Rock Engineering Properties

The soil and rock engineering properties were estimated from the nearest borings and are summarized in Table 3A and Table 3B.

Table 3A: RW-1N Soil Engineering Properties

Layer No.	Layer Boundaries ¹ , Depth (feet)	General Soil Description	SPT N Value	Interpreted Soil Engineering Properties		
				Effective Unit Weight (γ'), pcf	Apparent Cohesion (C), psf	Effective Friction Angle (Φ), degrees
1	Ground Surface to 6	Dune Sand	13-27	120	0	32
2	6 to 8	Decomposed Sandstone	19-22	125	0	36
3	8 to 11	Decomposed Sandstone	19-22	63	0	36
4	Below 11	Sandstone	>50	68	0	40

1. 0-foot depth is top of footing.

Table 3B: RW-2S Soil Engineering Properties

Layer No.	Layer Boundaries ¹ , Depth (feet)	General Soil Description	SPT N Value	Interpreted Soil Engineering Properties		
				Effective Unit Weight (γ'), pcf	Apparent Cohesion (C), psf	Effective Friction Angle (Φ), degrees
1	Ground Surface to 1	Structure Backfill	N/A	120	0	34
2	1 to 11	Loose Clayey Sand	6	120	0	28
3	11 to 31	Decomposed Sandstone	18-47	125	0	36

1. 0-foot depth is top of footing.

Geotechnical Model and Analyses

The footings for RW-1N and RW-2S will be generally founded in medium dense to dense sands and loose sand, respectively. The factored bearing resistance of the soil will exceed the minimum bearing stresses shown on the Standard Plans.

Since the site HPGA is greater than 0.6g, permanent seismic displacement analyses were performed. The Bray et al. (2010) and Bray and Travararou (2009) methods were used. Based on the analyses, a permanent seismic displacement of 6 inches was estimated.

Global slope stability analyses were performed for Service and Extreme Event Limit States. A horizontal seismic acceleration coefficient of 1/3HPGA (0.22g) was used for the extreme event. Two-dimensional slope stability analyses were performed using the

program Slide2 by Rocscience. The factors of safety exceed 1.5 (resistance factor = 0.65) and 1.1 (resistance factor = 0.9) for service and extreme events, respectively.

Recommendations

Standard Plan Earth Retaining System

A Standard Plan Retaining Wall, Type 6A (case 2) and 6B (case 1), are acceptable from a geotechnical standpoint. The District shall verify if 6 inches of permanent seismic displacement is acceptable for the project.

Site-specific borings were not performed for the retaining walls; the nearest borings were used for design. The subsurface soils may vary from those disclosed in the nearest borings. Therefore, the footing excavations for RW-1N and RW-2S are to be inspected and approved by the Office of Geotechnical Design West (OGDW), Branch A. The inspections are to be made after the excavation has been completed to the bottom of footing elevations and prior to placing rebar or concrete in the excavations. The contractor is to allow seven working days for the inspection of each footing excavation to be completed. The Structures Representative is to provide OGDW, Branch A, one-week notification prior to beginning the seven-day contractor waiting period.

Site-specific corrosion testing was not performed. It should be assumed that the on-site soils are corrosive.

Notes for Specifications

SSP 90-1.02H – Concrete in Direct Contact with a Corrosive Environment

Concrete in direct contact with native soil should be considered in a corrosive environment.

Questions relating to this report should be directed to Nick Briffa at (213) 604-4261 or Branch Chief John Moore at (510) 622-8742.



NICK BRIFFA
Transportation Engineer
Office of Geotechnical Design West
Branch A



CHRIS RISDIEN
Chief, Branch B
Office of Geotechnical Design West

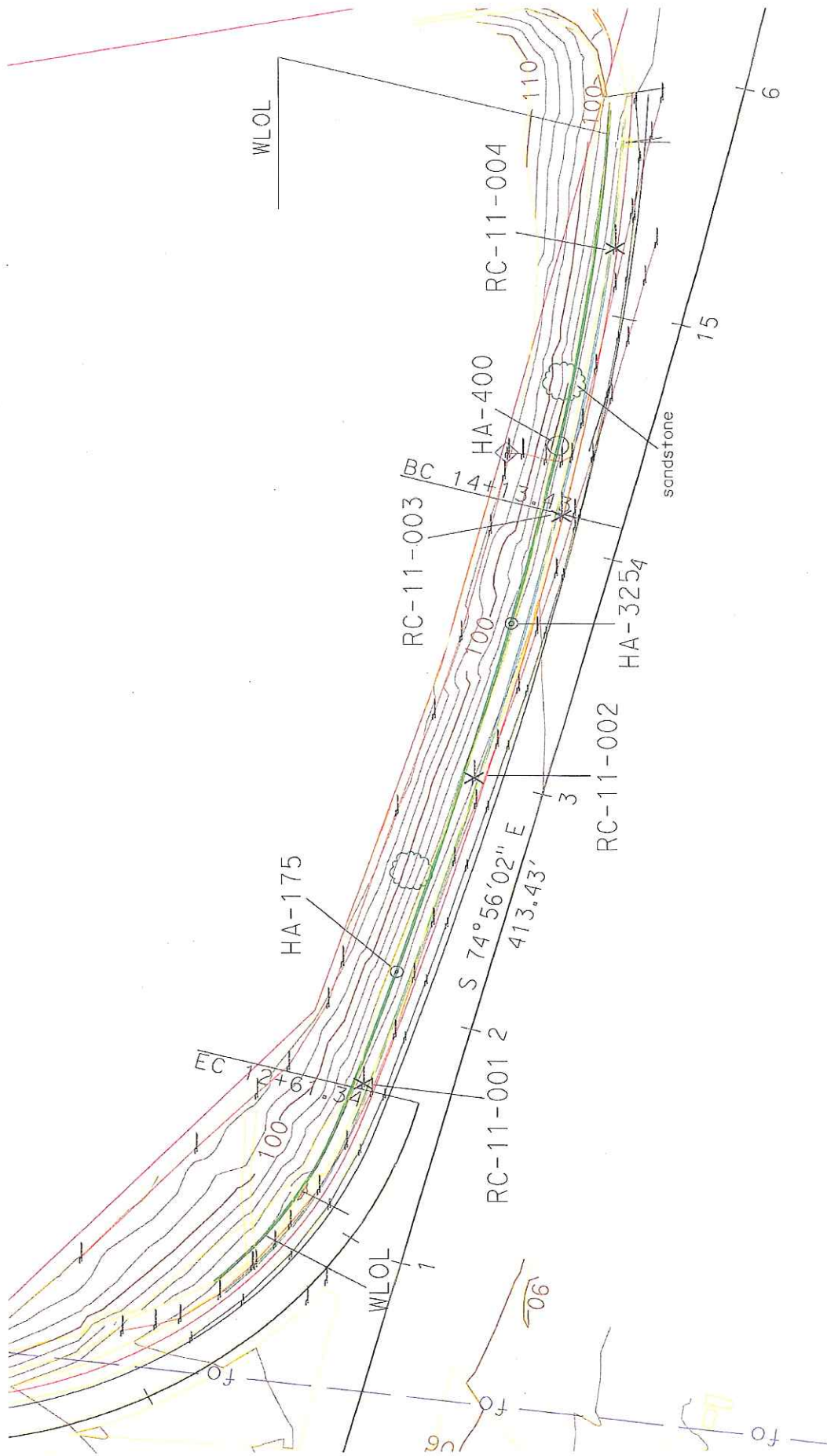
JOHN MOORE
Chief, Branch A
Office of Geotechnical Design West


Attachment

Appendix A Pertinent Subsurface Investigations

- c: Robert King, Project Manager, District 3
Andre Guimaraes, District Materials Engineer, District 1

APPENDIX A
PERTINENT SUBSURFACE INVESTIGATIONS



	DEPARTMENT OF TRANSPORTATION Division of Engineering Services Geotechnical Services Office of Geotechnical Design - North (OGDN)		Forg Bragg ADA	
	EA/EFIS:	01-0A2301 0100020	DATE:	10/27/2011
			Boring Location Plan	
			Figure	6

TYPE 6A RETAINING WALL 464' LONG

Elevation

100

98

96

94

92

90

88

86

84

82

80

78

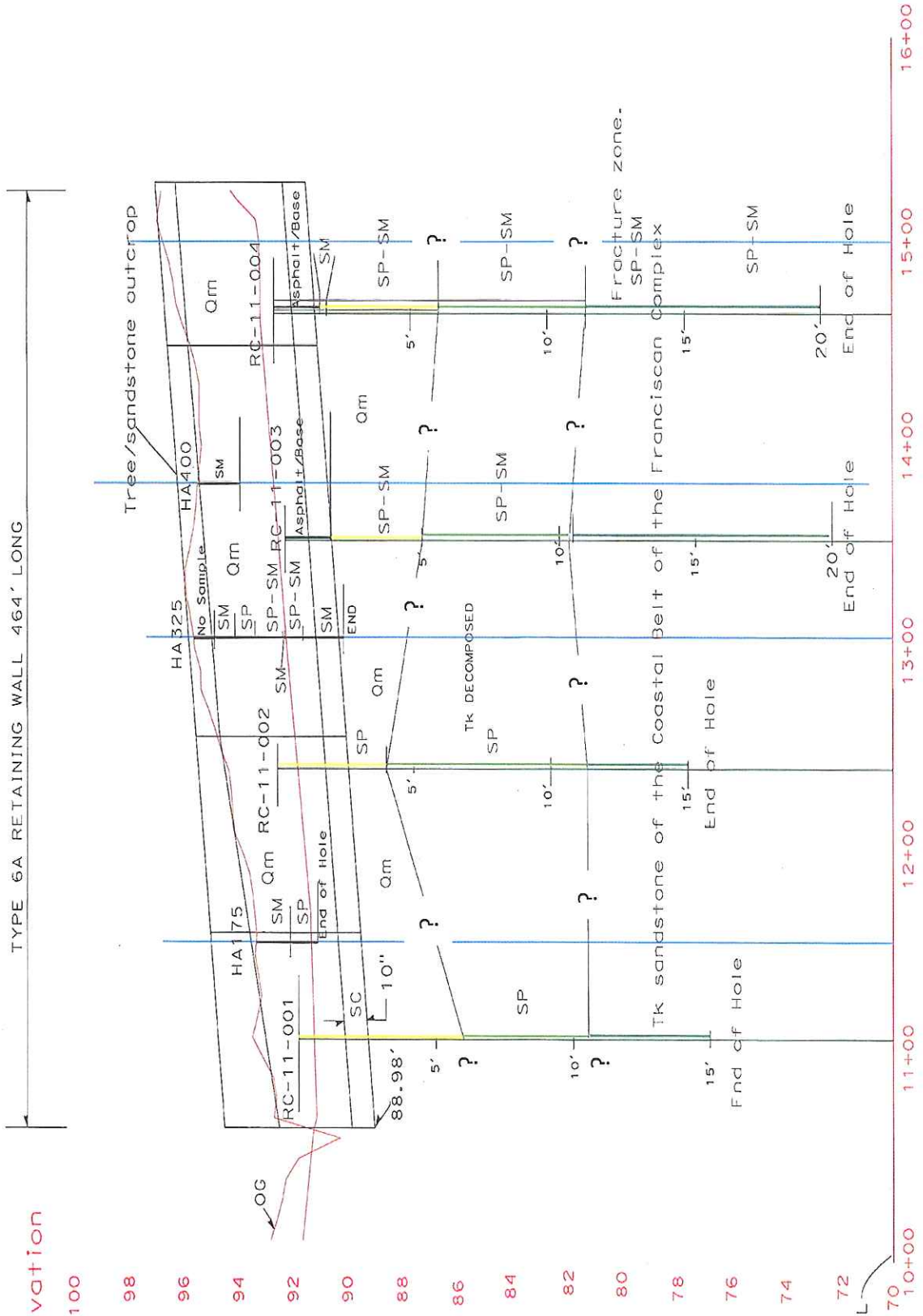
76

74

72

RW1 LOL

70



DEPARTMENT OF TRANSPORTATION
 Division of Engineering Services
 Geotechnical Services
 Office of Geotechnical Design - North
 (OGDN)

EA/EFIS:	01-0A2301 0100020
DATE:	10/27/2011

Forg Bragg ADA

Estimated Subsurface Profile

Figure
7

ROTARY FIELD NOTES

TL-1271a (REV. 01/31/00)

BORING NUMBER	DATE
HA-175	08/25/2011

DIST.	CO.	RTE.	P.M. (K.P.)	BRIDGE #
01	MEN	20	R0.0/R0.1	

LOCATION (STA/OFFSET or NORTHING/EASTING)
Wall Station: 11+57

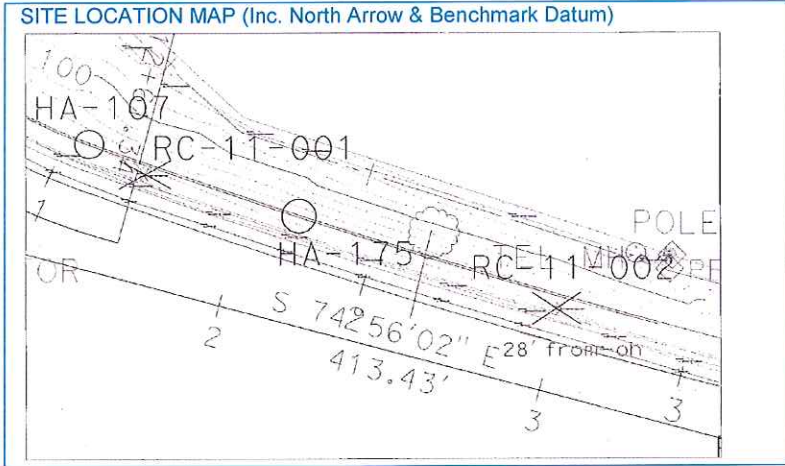
BRIDGE OR PROJECT NAME	EA NUMBER
Fort Bragg ADA	EA 01-0A2310//EFIS 0100020260

TOP HOLE ELEVATION
92.84'

NOTES	EQUIPMENT	CHC NUMBER
-------	-----------	------------

BOTTOM HOLE ELEVATION

SUMMARY



LOGGER	
D. McGuire	
GW	DATE
GWS	DATE
CASING SIZE	CASING DEPTH
CASING SIZE	CASING DEPTH
SLURRY TYPE	
SURFACE CONDITIONS (Slope, Water, Vegetation, etc)	
Sunny, dry hillslope	


REMARKS (Tool Sizes/Type - Rods & Bits, etc) (Hole Condition - Caving, Squeezing, Loss of Circulation, etc. Drill Rig reactions - slowing, chattering, skipping, blocking off)	FIELD TESTING				DEPTH (inches)	GRAPHIC LOG	DESCRIPTION <i>Soil Classification</i> (group name, group symbol, consistency/relative density, color, moisture, particle size, gradation, plasticity, structure, cementation, organics, fill, q _u , s _u , Other characteristics) <i>Rock Classification</i> (rock name, color, degree of weathering, relative hardness, bedding, discontinuity characteristics, voids, slaking, odor, other characteristics)
	SAMPLE #	BLOWS PER 6"	SPT (N)	Recovery %			
Hole advanced with a 3.25" sand auger					1		
					2		
					3		
					4		
					5		
					6		
					7		
					8		
					9		
					10		trace coarse to fine GRAVEL, angular;
					11		beach/dune sand present
					12		
					13		beach/dune sand present
					14		
					15		
					16		
					17		Poorly graded SAND (SP); dry to moist; light brownish gray; mostly fine SAND (dune sand); weak cementation
					18		
					19		
					20		
					21		

ROTARY FIELD NOTES

TL-1271b (REV. 01/31/00)

BORING NUMBER HA-175	DATE 08/25/2011	DIST. 01	CO. MEN	RTE. 20	P.M. (K.P.) R0.0/R0.1
-------------------------	--------------------	-------------	------------	------------	--------------------------

LOCATION (STA/OFFSET or NORTHING/EASTING) 92.84'	TOP HOLE ELEVATION 92.84'	BRIDGE # EA 01-0A2310//EFIS 0100020260	EA NUMBER
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REMARKS (Tool Sizes/Type - Rods & Bits, etc) (Hole Condition – Caving, Squeezing, Loss of Circulation, etc. Drill Rig reactions – slowing, chattering, skipping, blocking off)	FIELD TESTING				DEPTH	GRAPHIC LOG	DESCRIPTION <i>Soil Classification (group name, group symbol, consistency/relative density, color, moisture, particle size, gradation, plasticity, structure, cementation, organics, fill, q_u, s_u, Other characteristics)</i> <i>Rock Classification (rock name, color, degree of weathering, relative hardness, bedding, discontinuity characteristics, voids, slaking, odor, other characteristics)</i>
	SAMPLE #	BLOWS PER 6"	SPT (N)	Recovery %			
					22		Poorly graded SAND with GRAVEL (SP); reddish brown; moist; mostly SAND, fine to coarse, subangular; little to some GRAVEL, from coarse to fine, includes igneous rocks, subangular; weak cementation.
					23		
					24		
					25		
					26		
					27		
					28		
					29		
					30		
					31		
					32		
					33		
					34		
					35		
					36		
					37		
					38		
					39		
					40		
					41		
					42		
					43		
					44		
					45		
					46		
					47		
					48		
					49		
					50		
					51		
					52		
					53		
					54		

ROTARY FIELD NOTES

TL-1271a (REV. 01/31/00)

AUGER HOLE NUMBER	DATE
HA-325	08/24/25/2011

LOCATION (STA/OFFSET or NORTHING/EASTING)
Wall Station: 13+6.28

TOP HOLE ELEVATION
95.6'

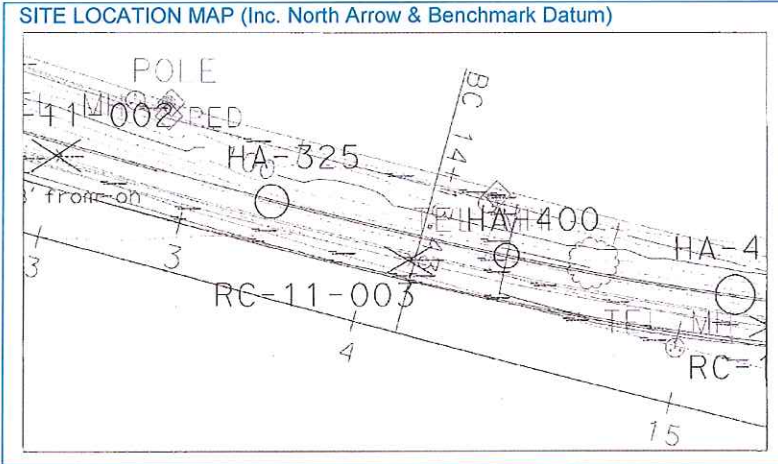
BOTTOM HOLE ELEVATION
90.1'

DIST.	CO.	RTE.	P.M. (K.P.)	BRIDGE #
01	MEN	20	R0.0/R0.1	

BRIDGE OR PROJECT NAME	EA NUMBER
Fort Bragg ADA	EA 01-0A2310//EFIS 0100020260

CREW	EQUIPMENT	CHC NUMBER
Beach/dune sand 91' – 93' elevation		

SUMMARY: Beach/dune sand 2.25-4 ft depth; igneous clasts in 48"-60"



LOGGER	
D. McGuire	
GW	DATE
GWS	DATE
CASING SIZE	CASING DEPTH
CASING SIZE	CASING DEPTH
SLURRY TYPE	
SURFACE CONDITIONS (Slope, Water, Vegetation, etc)	
Sunny, dry hillslope	

REMARKS (Tool Sizes/Type - Rods & Bits, etc) (Hole Condition – Caving, Squeezing, Loss of Circulation, etc. Drill Rig reactions – slowing, chattering, skipping, blocking off)	FIELD TESTING				DEPTH (inches)	GRAPHIC LOG	DESCRIPTION Soil Classification (group name, group symbol, consistency/relative density, color, moisture, particle size, gradation, plasticity, structure, cementation, organics, fill, q _u , s _u , Other characteristics) Rock Classification (rock name, color, degree of weathering, relative hardness, bedding, discontinuity characteristics, voids, slaking, odor, other characteristics)
	SAMPLE #	BLOWS PER 6"	ELEVATION	DEPTH (feet)			
Hole advanced with a 3.25' sand auger					1		
					2		
					3		
					4		
					5		0-9" No Samples
					6		
					7		
					8		
					9		
					10		
					11		
94.6' at bottom of this cell			94	1	12		
					13		Silty SAND (SM); pinkish gray; dry; mostly SAND, fine; little to few fines; little to few GRAVEL, fine, subangular; weak cementation.
					14		
				1.25	15		
					16		
					17		
94.1' at bottom of this cell			93.5	1.5	18		
					19		
					20		Poorly graded SAND (SP)
				1.25	21		

ROTARY FIELD NOTES

TL-1271b (REV. 01/31/00)

BORING NUMBER HA-325	DATE 08/24/25/2011	DIST. 01	CO. MEN	RTE. 20	P.M. (K.P.) R0.0/R0.1
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LOCATION (STA/OFFSET or NORTHING/EASTING) Wall Station: 13+6.28	TOP HOLE ELEVATION 95.6'	BRIDGE # EA 01-0A2310//EFIS 0100020260	EA NUMBER
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REMARKS (Tool Sizes/Type - Rods & Bits, etc) (Hole Condition - Caving, Squeezing, Loss of Circulation, etc. Drill Rig reactions - slowing, chattering, skipping, blocking off)	FIELD TESTING				DEPTH (inches)	GRAPHIC LOG	DESCRIPTION <u>Soil Classification</u> (group name, group symbol, consistency/relative density, color, moisture, particle size, gradation, plasticity, structure, cementation, organics, fill, q _u , s _u , Other characteristics) <u>Rock Classification</u> (rock name, color, degree of weathering, relative hardness, bedding, discontinuity characteristics, voids, slaking, odor, other characteristics)
	SAMPLE #	BLOWS PER 6"	ELEVATION	DEPTH (feet)			
					22		
					23		
93.6' at bottom of this cell			93	2	24		Poorly graded SAND (SP); reddish brown; dry; mostly SAND, fine; few GRAVEL, fine, angular to subangular; weak cementation
					25		
					26		
					27		
				2.25	27		
					28		Poorly graded SAND with SILT (SP-SM); dark reddish brown; moist; mostly SAND, coarse to fine (beach/dune sand included), subrounded to subangular; few to little GRAVEL, coarse to fine; subangular to angular; weak cementation.
					29		
93.1' at bottom of this cell			92.5	2.5	30		beach/dune sand
					31		
					32		
					33		
				2.75	33		
					34		
					35		
93.1' at bottom of this cell			92	3	36		
					37		
					38		
					39		
				3.25	39		
					40		Silty SAND with GRAVEL (SM); reddish brown; moist; mostly SAND, from coarse to fine, angular; little fines; little GRAVEL, coarse to fine, angular, intensely weathered rock; weak cementation.
					41		
92.1' at bottom of this cell			91.5	3.5	42		
					43		
					44		Poorly graded SAND with SILT (SP-SM); very pale brown; moist; mostly SAND, fine, rounded quartz beach/dune sand; few to little fines; trace Gravel, fine (soft clumps of silty sand); weak cementation
					45		
				3.75	45		
					46		
					47		
91.6' at bottom of this cell			91	4	48		
					49		
					50		
					51		Silty SAND (SM); brownish yellow to reddish brown (redder below 48"); moist; mostly SAND, from coarse to fine; little to some fines, includes coarse white fragments of igneous rocks; few-trace GRAVEL, fine, subangular (including hard igneous rocks); weak cementation
					52		
				4.25	52		
					53		
91.1' at bottom of this cell			90.5	4.5	54		

ROTARY FIELD NOTES

TL-1271b (REV. 01/31/00)

BORING NUMBER HA-325	DATE 08/24/25/2011	DIST. 01	CO. MEN	RTE. 20	P.M. (K.P.) R0.0/R0.1
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LOCATION (STA/OFFSET or NORTHING/EASTING) Wall Station: 13+6.28	TOP HOLE ELEVATION 95.6'	BRIDGE # EA 01-0A2310//EFIS 0100020260	EA NUMBER
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REMARKS (Tool Sizes/Type - Rods & Bits, etc) (Hole Condition – Caving, Squeezing, Loss of Circulation, etc. Drill Rig reactions – slowing, chattering, skipping, blocking off)	FIELD TESTING				DEPTH (inches)	GRAPHIC LOG	DESCRIPTION <i>Soil Classification</i> (group name, group symbol, consistency/relative density, color, moisture, particle size, gradation, plasticity, structure, cementation, organics, fill, q _u , s _u , Other characteristics) <i>Rock Classification</i> (rock name, color, degree of weathering, relative hardness, bedding, discontinuity characteristics, voids, slaking, odor, other characteristics)
	SAMPLE #	BLOWS PER 6"	ELEVATION	DEPTH (feet)			
					55		
					56		
				4.75	57		
					58		
					59		
90.6' at bottom of this cell			90	5	60		few GRAVEL, coarse to fine, angular (very soft sandstone clasts-weathered bedrock?)
					61		
					62		
				5.25	63		
					64		increase in fines to "some fines"
					65		
90.1' at bottom of this cell			89.5	5.5	66		
					67		End of auger hole at 66"
					68		
					69		
					70		
					71		
					72		
					73		
					74		
					75		
					76		
					77		
					78		
					79		
					80		
					81		
					82		
					83		
					84		
					85		
					86		
					87		

ROTARY FIELD NOTES

TL-1271a (REV. 01/31/00)

BORING NUMBER: HA-400 DATE: 08/24/2011

DIST. 01 CO. MEN RTE. 20 P.M. (K.P.) R0.0/R0.1 BRIDGE #

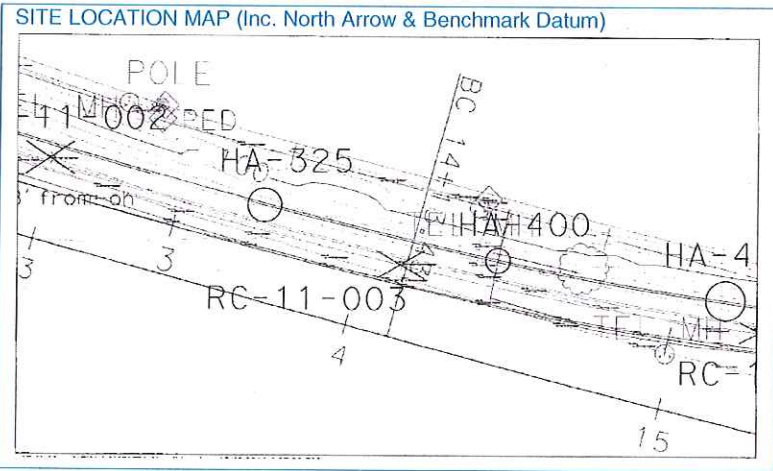
LOCATION (STA/OFFSET or NORTHING/EASTING): Wall Station: 13+82

BRIDGE OR PROJECT NAME: Fort Bragg ADA EA NUMBER: EA 01-0A2310//EFIS 0100020

TOP HOLE ELEVATION: 95.43

CREW EQUIPMENT CHC NUMBER

HAMMER ID#



LOGGER D. McGuire	
GW	DATE
GWS	DATE
CASING SIZE	CASING DEPTH
CASING SIZE	CASING DEPTH
SLURRY TYPE	
SURFACE CONDITIONS (Slope, Water, Vegetation, etc) Sunny, dry hillslope	

REMARKS (Tool Sizes/Type - Rods & Bits, etc) (Hole Condition - Caving, Squeezing, Loss of Circulation, etc. Drill Rig reactions - slowing, chattering, skipping, blocking off)	FIELD TESTING				DEPTH	GRAPHIC LOG	DESCRIPTION <i>Soil Classification (group name, group symbol, consistency/relative density, color, moisture, particle size, gradation, plasticity, structure, cementation, organics, fill, q_u, S_u, Other characteristics)</i> <i>Rock Classification (rock name, color, degree of weathering, relative hardness, bedding, discontinuity characteristics, voids, slaking, odor, other characteristics)</i>
	SAMPLE #	BLOWS PER 6"	SPT (N)	Recovery %			
Hole advanced with a 3.25" sand auger					1		Silty SAND with GRAVEL (SM); loose; brownish yellow; moist; mostly SAND, fine; little fines; little fine to coarse GRAVEL; subangular. Gravel consists of soft fragments of intensely weathered fine sandstone.
					2		
					3		
					4		
					5		
					6		
					7		
					8		
					9		
					10		
					11		
					12		
					13		
					14		
					15		
					16		
					17		
					18		
					19		
					20		
					21		

ROTARY FIELD NOTES

TL-1271a (REV. 01/31/00)

BORING NUMBER RC-11-001 **DATE** 09/07/2011

LOCATION (STA/OFFSET or NORTHING/EASTING)
Roadway Station: 11+67, 31 L

TOP HOLE ELEVATION
91.78

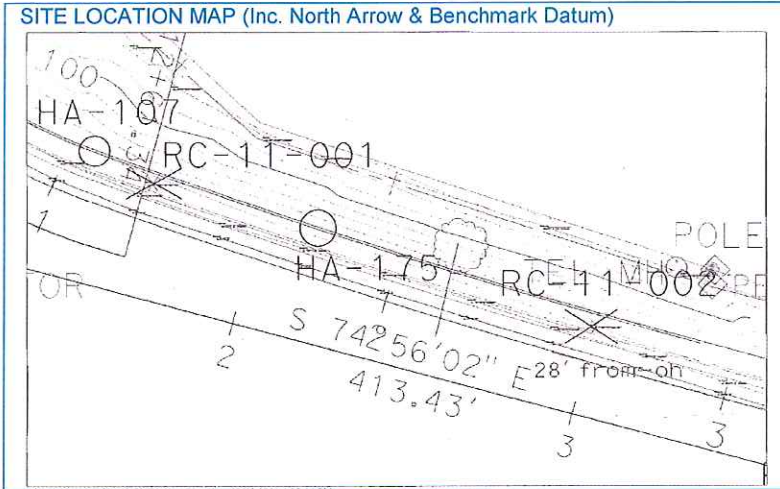
BOTTOM HOLE ELEVATION
76.78'

DIST. 01 **CO.** MEN **RTE.** 20 **P.M. (K.P.)** R0.0/R0.1

PROJECT Fort Bragg ADA **EA NUMBER** EA 01-0A2310//EFIS 0100020260

CREW Eureka Drill Crew **EQUIPMENT** Acker **CHC NUMBER** 1974

HAMMER Automatic, ER=80% (Calibrated 04/19/2011)



LOGGER D. McGuire	
GW	DATE
GW	DATE
CASING SIZE 94 mm	CASING DEPTH 10'
CASING SIZE	CASING DEPTH
SLURRY TYPE None	Drilled with Water
SURFACE CONDITIONS (Slope, Water, Vegetation, etc) Foggy; intermittent sun in later morning; dry; drilled into soil at edge of pavement	

REMARKS (Tool Sizes/Type - Rods & Bits, etc) (Hole Condition - Caving, Squeezing, Loss of Circulation, etc. Drill Rig reactions - slowing, chattering, skipping, blocking off)	FIELD TESTING			DEPTH	GRAPHIC LOG	DESCRIPTION <i>Soil Classification (group name, group symbol, consistency/relative density, color, moisture, particle size, gradation, plasticity, structure, cementation, organics, fill, q_u, s_u, Other characteristics)</i> <i>Rock Classification (rock name, color, degree of weathering, relative hardness, bedding, discontinuity characteristics, voids, slaking, odor, other characteristics)</i>
	SAMPLE #	BLOWS PER 6"	SPT (N) Recovery %			
Mud rotary punch core, 4.75" finger bit to 10.6'. Drilled dry to 2'.		4		1	[Pattern]	Clayey SAND (SC); medium dense; reddish brown; moist; mostly SAND, fine; little fines; weak cementation to 3". [Qm]
Corrected N: 13 x 1.33=17.3, medium dense		5		2		
		8	13	3	[Pattern]	moderate cementation from 3' to 5' brownish yellow from 3' to 7'. fewer fines; weak cementation; becoming decomposed sandstone
				4		
				5		
Corrected N: 22 x 1.33=29, medium dense		18		6	[Pattern]	SEDIMENTARY ROCK (Sandstone); brownish yellow; intensely weathered to decomposed; (Poorly graded SAND (SP); medium dense; moist; mostly SAND, from coarse to fine; little fines; few GRAVEL, from coarse to fine, angular; weak cementation). [DECOMPOSED BEDROCK, Tk]
		9	22	7		
		13		8	[Pattern]	SEDIMENTARY ROCK (Sandstone); massive; yellowish brown; intensely weathered; moderately hard; very intensely fractured. [BEDROCK, Tk]
				9		
				10		
Refusal at 10.6' 81.1' elevation) 3 3/4" diamond core bit from 10.6' to 15'.		41		11	[Pattern]	
		65/1.5R		12		
	4			13		
				14		
End of hole at 15' (Elevation 76.78').				15	[Pattern]	
Perforated 0- 10'. Bentonite below 10'.				16		
One bag of sand. .				17		
				18		
				19		
				20		
				21		

ROTARY FIELD NOTES

TL-1271a (REV. 01/31/00)

BORING NUMBER DATE
RC-11-002 09/07/2011

DIST. CO. RTE. P.M. (K.P.)
01 MEN 20 R0.0/R0.1

LOCATION (STA/OFFSET or NORTHING/EASTING)
Roadway Station: 13+00, 25.3 L

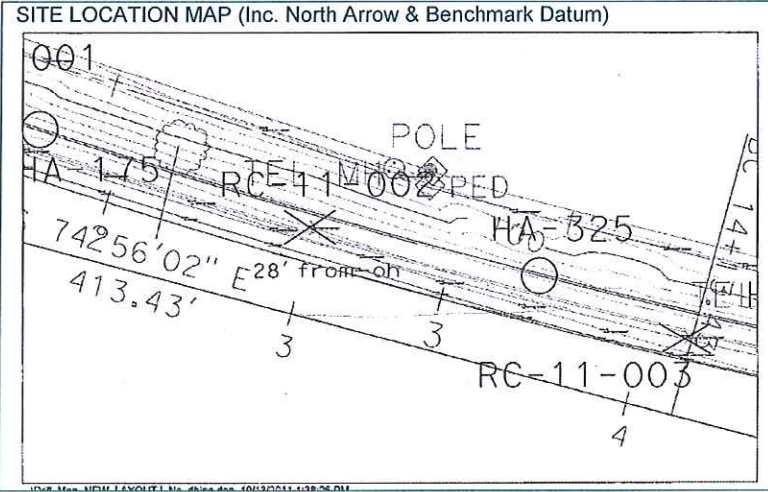
PROJECT EA NUMBER
Fort Bragg ADA EA 01-0A2310//EFIS 0100020260

TOP HOLE ELEVATION
92.54'

CREW EQUIPMENT CHC NUMBER
Eureka Drill Crew Acker 1974

BOTTOM HOLE ELEVATION
77.54'

HAMMER
Automatic, ER=80% (Calibrated 04/19/2011)



LOGGER D. McGuire	
GW 9.3' bgs	DATE 9/8/2011
GW	DATE
CASING SIZE 94 mm	CASING DEPTH 15'
CASING SIZE	CASING DEPTH
SLURRY TYPE None	Drilled with Water
SURFACE CONDITIONS (Slope, Water, Vegetation, etc) Sunny side of a fog bank, surface dry, drilled into soil adjacent to adjacent to edge of pavement,	

REMARKS (Tool Sizes/Type - Rods & Bits, etc) (Hole Condition - Caving, Squeezing, Loss of Circulation, etc. Drill Rig reactions - slowing, chattering, skipping, blocking off)	FIELD TESTING			DEPTH	GRAPHIC LOG	DESCRIPTION Soil Classification (group name, group symbol, consistency/relative density, color, moisture, particle size, gradation, plasticity, structure, cementation, organics, fill, q _u , s _u , Other characteristics) Rock Classification (rock name, color, degree of weathering, relative hardness, bedding, discontinuity characteristics, voids, slaking, odor, other characteristics)
	SAMPLE #	BLOWS PER 6"	SPT (N)			
Mud rotary punch core, 4.5" finger bit to 10.75'. Drilled dry to 2'.		4		1		Poorly graded SAND (SP); dense; reddish brown; moist; mostly SAND, fine to coarse; little fines; weak cementation to (0" to 6"). [Qm]
Corrected N: 27x 1.33=36 (dense due to a fragment of coarse gravel)		21	27	3		Brownish yellow; trace to few GRAVEL, coarse; subangular (6" to 1.5').
				4		
				5		
Corrected N: 19x 1.33=25.3 (medium dense)		13		6		Poorly graded SAND with SILT and GRAVEL (SP-SM); dense to medium dense; brownish yellow; moist; mostly SAND, from coarse to fine; little GRAVEL, fine, from angular to subrounded; cementation from weak to moderate (1.5'-5').
		7		7		
		12	19	8		
				9		
				10		
Refusal at 11.3' (81.24')		14		11		SEDIMENTARY ROCK (Sandstone); brownish yellow; intensely weathered to decomposed; (Poorly graded SAND (SP); medium dense; moist; mostly SAND, fine; little fines; moderate cementation). [DECOMPOSED BEDROCK, Tk]
3 3/4" diamond core bit from 11.3' to 15'.		50/5.5		12		
		50/3.5	100/9	13		SEDIMENTARY ROCK (Sandstone); massive; dark grayish brown; intensely weathered; moderately hard; very intensely fractured. [BEDROCK, Tk]
				14		
End of hole at 15' (77.54' elevation).				15		
Casing perforated 5' to 15'.				16		
Two bags of sand and bentonite.				17		
				18		
				19		
				20		
				21		

ROTARY FIELD NOTES

TL-1271a (REV. 01/31/00)

BORING NUMBER	DATE
RC-11-003	09/08/2011

DIST.	CO.	RTE.	P.M. (K.P.)
01	MEN	20	R0.0/R0.1

LOCATION (STA/OFFSET or NORTHING/EASTING)
Roadway Station: 14+13, 23 L;

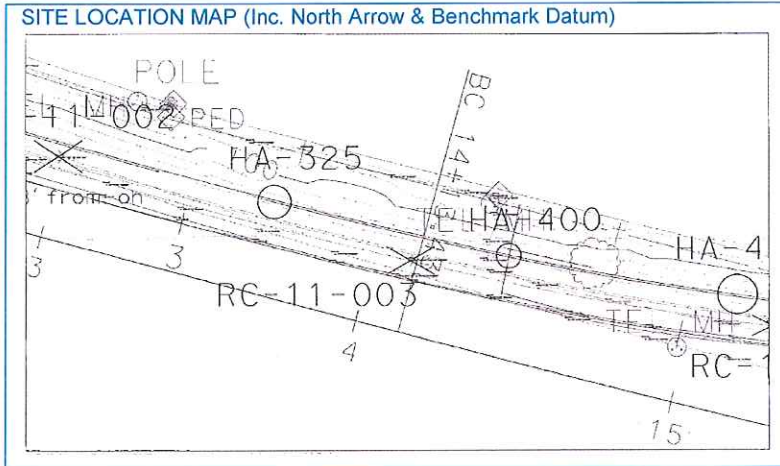
PROJECT	EA NUMBER
Fort Bragg ADA	EA 01-0A2310//EFIS 0100020260

TOP HOLE ELEVATION
92.24'

CREW	EQUIPMENT	CHC NUMBER
Eureka Drill Crew	Acker	1974

BOTTOM HOLE ELEVATION
72.24'

HAMMER
Automatic, ER=80% (Calibrated on 04/19/2011)



LOGGER D. McGuire	
GW	DATE
GW	DATE
CASING SIZE	CASING DEPTH
94 mm	20'
CASING SIZE	CASING DEPTH
SLURRY TYPE	Drilled with Water
SURFACE CONDITIONS (Slope, Water, Vegetation, etc) Foggy, air moist, pavement dry, drilled at edge of pavement. Became sunny by 10:30 am.	

REMARKS (Tool Sizes/Type - Rods & Bits, etc) (Hole Condition - Caving, Squeezing, Loss of Circulation, etc) Drill Rig reactions - slowing, chattering, skipping, blocking off)	FIELD TESTING			DEPTH	GRAPHIC LOG	DESCRIPTION <i>Soil Classification (group name, group symbol, consistency/relative density, color, moisture, particle size, gradation, plasticity, structure, cementation, organics, fill, q_u, s_u, Other characteristics)</i> <i>Rock Classification (rock name, color, degree of weathering, relative hardness, bedding, discontinuity characteristics, voids, slaking, odor, other characteristics)</i>
	SAMPLE #	BLOWS PER 6"	SPT (N) Recovery %			
Mud rotary punch core, 4 3/4" finger bit to 10.5'. Dry SPT 0-1.5'.				1		ASPHALT and road base.
				2		
	12			3		Poorly graded SAND with SILT (SP-SM); very dense; brownish yellow to yellowish red; moist; mostly SAND, fine; few to little fines; from moderate to weak cementation.
	27			4		
18"-36" very dense, N>50	31	58		5		[Qm]
	33			6		
Very dense, N>50	60/6			7		SEDIMENTARY ROCK (Sandstone); brownish yellow; very intensely weathered to decomposed; (Poorly graded SAND with SILT and GRAVEL (SP-SM); very dense; moist; mostly SAND, fine; few to little fines; from moderate to weak cementation.). [DECOMPOSED BEDROCK, Tk]
	29	89/12		8		
				9		
				10		
Refusal at 10.5' (81.74' elevation).	50/5.5 R			11		
3 3/4" diamond core bit from 10.5' to 20'.				12		SEDIMENTARY ROCK (fine-grained Sandstone); massive; reddish brown; intensely weathered; moderately soft; very intensely fractured; fracture zone. [BEDROCK, Tk]
				13		
				14		
				15		
				16		
				17		
End of hole at 20' (elevation 72.24')				18		
Casing perforated 10' to 20'.				19		
Two bags of sand; bentonite to seal hole.				20		

ROTARY FIELD NOTES

TL-1271a (REV. 01/31/00)

BORING NUMBER	DATE
RC-11-004	09/08/2011

DIST.	CO.	RTE.	P.M. (K.P.)
01	MEN	20	R0.0/R0.1

LOCATION (STA/OFFSET or NORTHING/EASTING)
Roadway Station: 15+25, 31.3 L

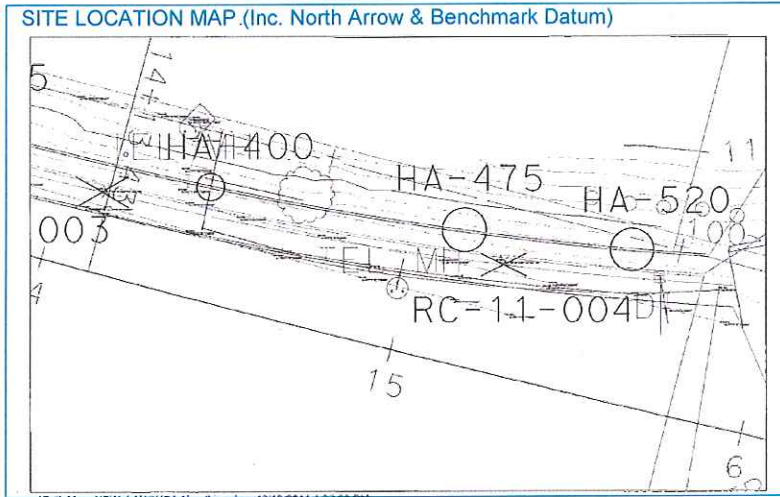
PROJECT	EA NUMBER
Fort Bragg ADA	EA 01-0A2310//EFIS 0100020260

TOP HOLE ELEVATION
92.64

CREW	EQUIPMENT	CHC NUMBER
Eureka Drill Crew	Acker	1974

BOTTOM HOLE ELEVATION
72.64

HAMMER
Automatic, ER=80% (Calibrated 04/19/2011)

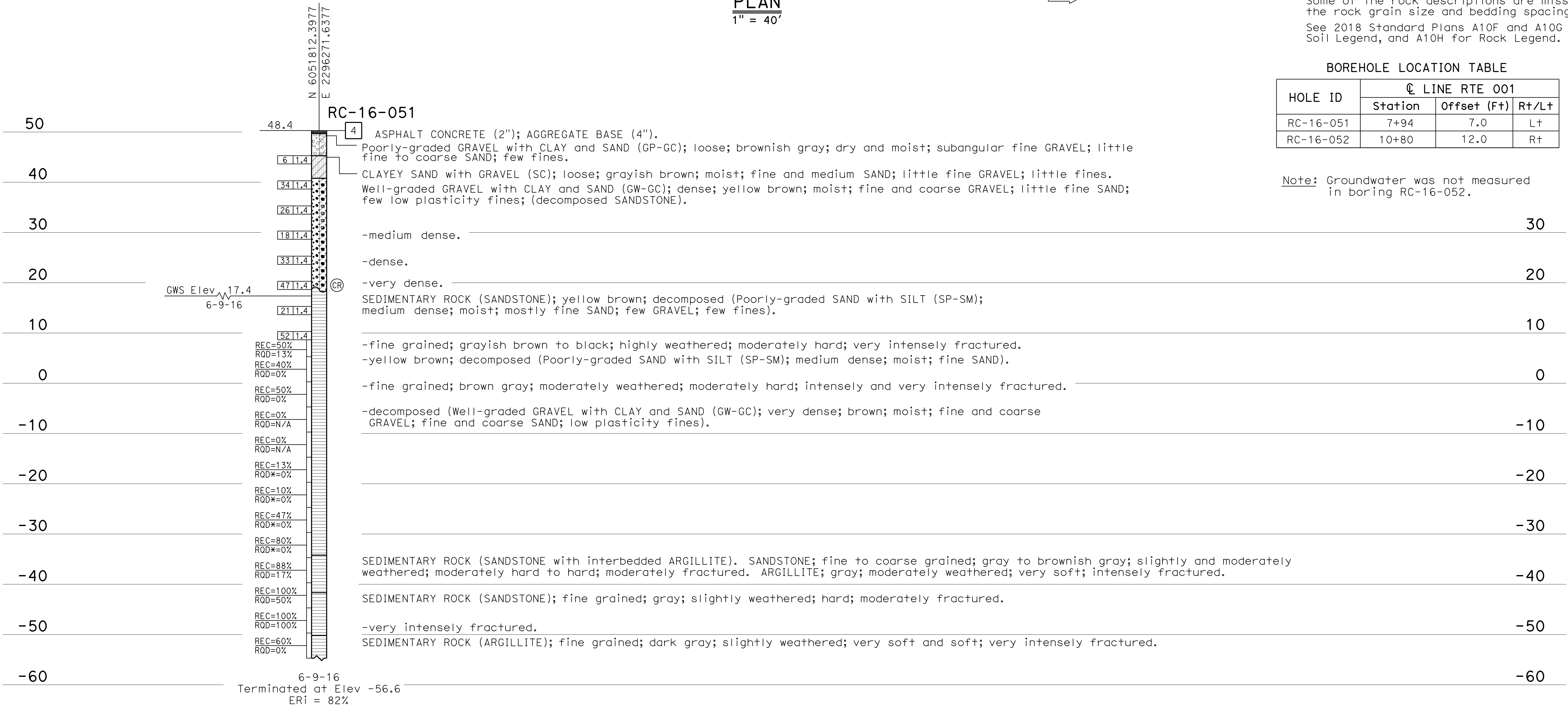
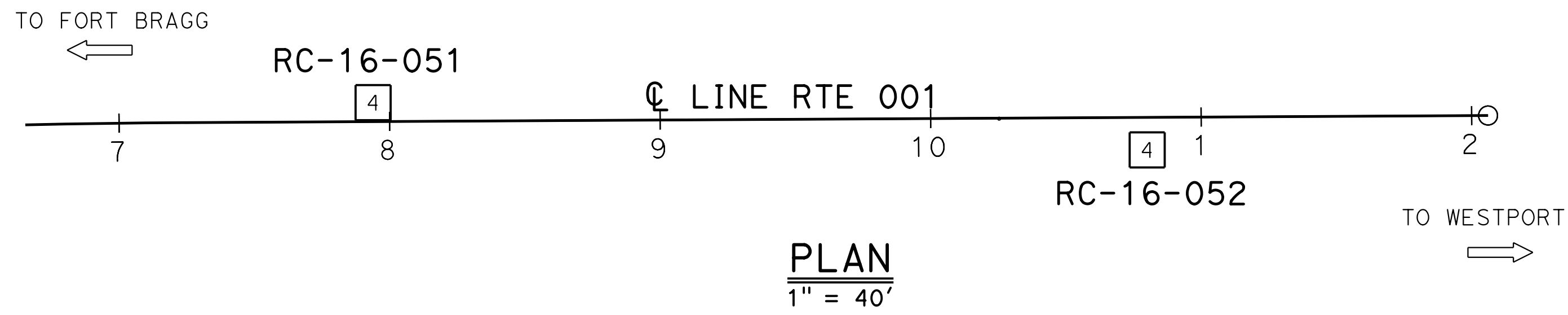
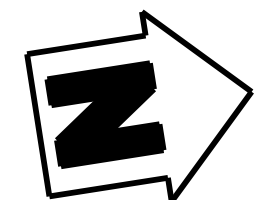


LOGGER D. McGuire	
GW	DATE
GW	DATE
CASING SIZE 94 mm	CASING DEPTH 20'
CASING SIZE	CASING DEPTH
SLURRY TYPE None	Drilled with Water
SURFACE CONDITIONS (Slope, Water, Vegetation, etc) Sunny, dry pavement	

REMARKS (Tool Sizes/Type - Rods & Bits, etc) (Hole Condition - Caving, Squeezing, Loss of Circulation, etc. Drill Rig reactions - slowing, chattering, skipping, blocking off)	FIELD TESTING			DEPTH	GRAPHIC LOG	DESCRIPTION <i>Soil Classification (group name, group symbol, consistency/relative density, color, moisture, particle size, gradation, plasticity, structure, cementation, organics, fill, q_u, s_u, Other characteristics)</i> <i>Rock Classification (rock name, color, degree of weathering, relative hardness, bedding, discontinuity characteristics, voids, slaking, odor, other characteristics)</i>
	SAMPLE #	BLOWS PER 6"	SPT (N)			
Mud rotary punch core; 4 3/4" finger bit.				1		ASPHALT and road base.
		10		2		
Corrected N (20"-38"): 15x 1.33=20		7		3		Poorly graded SAND with SILT (SP-SM); medium dense; reddish brown; moist; mostly SAND, fine; few to little fines; moderate cementation (1.7'-4.3') [Qm]
Medium dense		8	15	4		
				5		very dense; brownish yellow; few to little GRAVEL, from coarse to fine; (4.3'-5.3'). [Qm]
		13		6		
Very dense, N>50		20		7		SEDIMENTARY ROCK (Sandstone); reddish brown; intensely weathered to decomposed; (Poorly graded SAND with SILT (SP-SM); very dense; moist; mostly SAND, fine; few to little fines; moderate cementation. (5.3'-11.4'). [DECOMPOSED BEDROCK, Tk]
		37	57	8		
				9		
				10		
Refusal at 11.4' (81.2' elevation)		22		11		
3 3/4" diamond core bit from 11.4' to 20'.		37		12		SEDIMENTARY ROCK (Sandstone); reddish brown; intensely weathered to decomposed; (Poorly graded SAND with SILT (SP-SM); very dense; moist; mostly SAND, mostly fine but includes coarse; few to little fines; moderate cementation) [BEDROCK, Tk].
		60/5	97/11	13		
				14		
				15		
18' drill rate increased through soft material and black organic film appeared in mud pit.				16		
				17		fracture zone 18'-20'.
End of hole at 20' (elevation 72.64).				18		
Casing perforated 10' to 20'.				19		gray at 19'-20'.
Two bags of sand; bentonite plug).				20		

BENCH MARK

BM FB-20 Elev 48.69
 Found Brass Disk stamped FB-20, 0.8 mile northerly along Hwy 1 from the junction of Oak street, in the east end of the south concrete abutment of Pudding Creek Bridge. 17.1 feet east of the Hwy CL and 8.2 feet north of the south end of the east guardrail. NGVD29



BOREHOLE LOCATION TABLE

HOLE ID	CL LINE RTE 001		
	Station	Offset (Ft)	Rt/Lt
RC-16-051	7+94	7.0	L+
RC-16-052	10+80	12.0	R+

Note: Groundwater was not measured in boring RC-16-052.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
01	Men	1	62.0/62.3	146	184

REGISTERED CIVIL ENGINEER: *Marietta James*
 DATE: 4-13-21
 PLANS APPROVAL DATE: 3-7-22
 No. 5509
 Exp. 6-30-22
 CIVIL
 STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

This LOTB sheet was prepared in accordance with the Caltrans Soil & Rock Logging, Classification, and Presentation Manual (2010 Edition) except as noted below:
 Some of the soil descriptions are missing the proportions and particle size of soil. Some of the rock descriptions are missing the rock grain size and bedding spacing.
 See 2018 Standard Plans A10F and A10G for Soil Legend, and A10H for Rock Legend.

ENGINEERING SERVICES		GEOTECHNICAL SERVICES		STATE OF CALIFORNIA		DIVISION OF ENGINEERING SERVICES		BRIDGE No.		PUDDING CREEK BRIDGE (WIDEN)			
FUNCTIONAL SUPERVISOR:		DRAWN BY: I.G-Remmen		FIELD INVESTIGATION BY:		DESIGN BRANCH 8		10-0158		LOG OF TEST BORINGS 1 OF 3			
NAME: C. Narwold		CHECKED BY: C. Turner		NAME: C. Ewing		DEPARTMENT OF TRANSPORTATION		POST MILE					
								62.12					
OGS CIVIL LOG OF TEST BORINGS SHEET (ENGLISH) (REVISION 12/13/2019)				DATE PLOTTED => 2-MAY-2022 TIME PLOTTED => 08:06 ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3				UNIT: 3650 PROJECT NUMBER & PHASE: 01000006721		CONTRACT No.: 01-434804		DISREGARD PRINTS BEARING EARLIER REVISION DATES	
										REVISION DATES		SHEET OF	
										03-02-21 03-15-21 03-29-21 04-13-21		32 34	

From: King, Robert W@DOT
To: Umbertis, Stephen@DOT; Arreola, Ash@DOT; Stillmunkes, Keith P@DOT; Briffa, Nick@DOT; Meyer, Jason J@DOT; Gurewitz, Heather; Ranu Aggarwal
Cc: Sy, Dung@DOT; Moore, J C@DOT
Subject: RE: review of Standard Plan wall design
Date: Tuesday, November 15, 2022 2:58:23 PM
Attachments: [Geotech Memo Revised 9-12-22.pdf](#)
[01-0B220_MEN101_PM59.8-62.1_FortBraggADA_GDR_2022.10.31.pdf](#)

[EXTERNAL EMAIL] DO NOT CLICK links or attachments unless you know the content is safe. Be aware that the sending address can be faked or manipulated.

Hi Ranu,

Attached are the Geotech Memo and the Geotechnical Design Report.

The District confirms that 6" of permanent seismic displacement is acceptable for the project.

6" of seismic displacement would only occur during an earthquake of magnitude M7.57.

In addition, this is a landscape retaining wall and has historically performed well during seismic events. In the event of any damage to the retaining wall, Caltrans Maintenance would be dispatched immediately to cleanup any debris and Caltrans would immediately make plans to repair the retaining wall.

Thanks

Robert King, PE
Project Manager
Caltrans - District 1
Cell (707) 296-5573
<https://cadot.webex.com/meet/robert.king>

-----Original Appointment-----

From: Umbertis, Stephen@DOT <Stephen.Umbertis@dot.ca.gov>
Sent: Tuesday, November 15, 2022 12:40 PM
To: Umbertis, Stephen@DOT; Arreola, Ash@DOT; Stillmunkes, Keith P@DOT; Briffa, Nick@DOT; Meyer, Jason J@DOT; Gurewitz, Heather; Ranu Aggarwal
Cc: King, Robert W@DOT; Sy, Dung@DOT; Moore, J C@DOT
Subject: review of Standard Plan wall design
When: Tuesday, November 15, 2022 2:00 PM-2:30 PM (UTC-08:00) Pacific Time (US & Canada).
Where: webex

Meeting with City of Fort Bragg Staff and consultant to discuss the use of the Standard Wall Plan approved in the attached email.

-- Do not delete or change any of the following text. --