APPENDIX B

Definite Plan Hydraulic Conductivity Testing

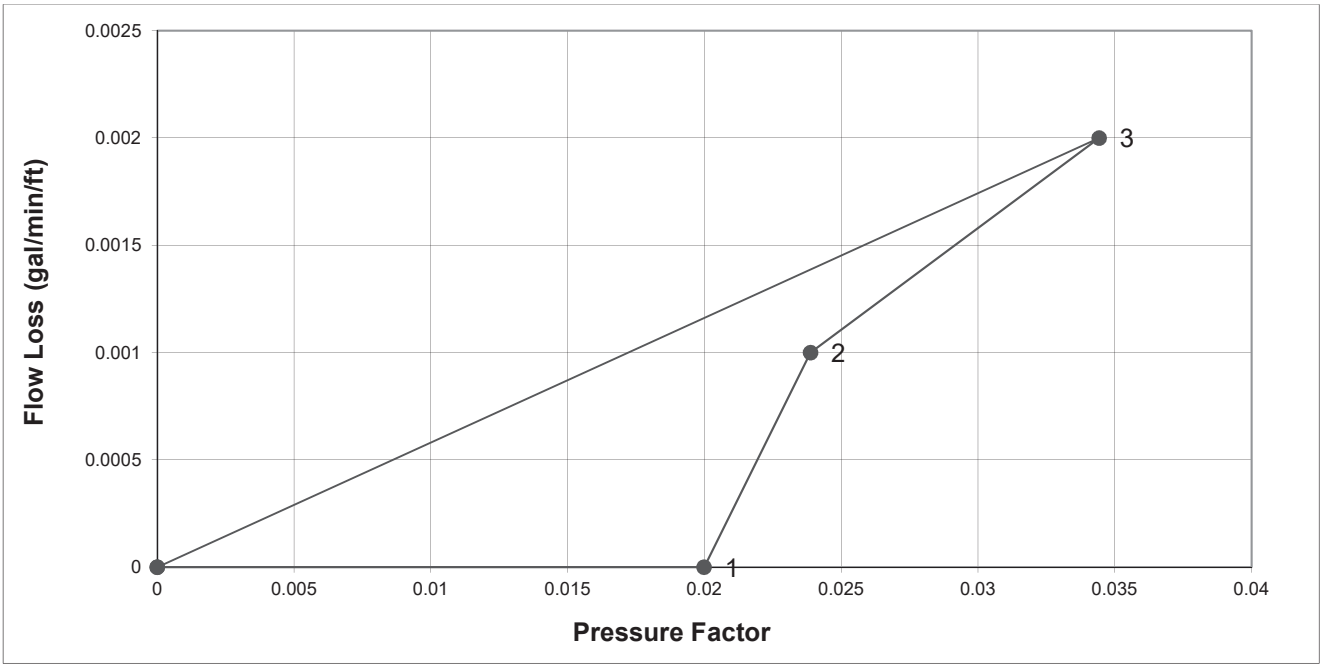
(Pages B-1 to B-9)

DRAFT

Boring	B-203
Surface El. (ft)	2305
Groundwater El. (ft)	2330
Test No.	1
Test Interval Center Elevation (ft)	2268.5
Test Interval Length, L (ft)	20.0
Max. Measured Pressure, P_{MAX} (psi)	62.0
Reference Pressure, P_0 (psi)	145
Representative Lugeon Value	0

Top of Test Elevation (ft)	2278.5
Bottom of Test Elevation (ft)	2258.5
Top of Test Depth (ft)	26.5
Bottom of Test Depth (ft)	46.5
Angle from Vertical (deg)	0

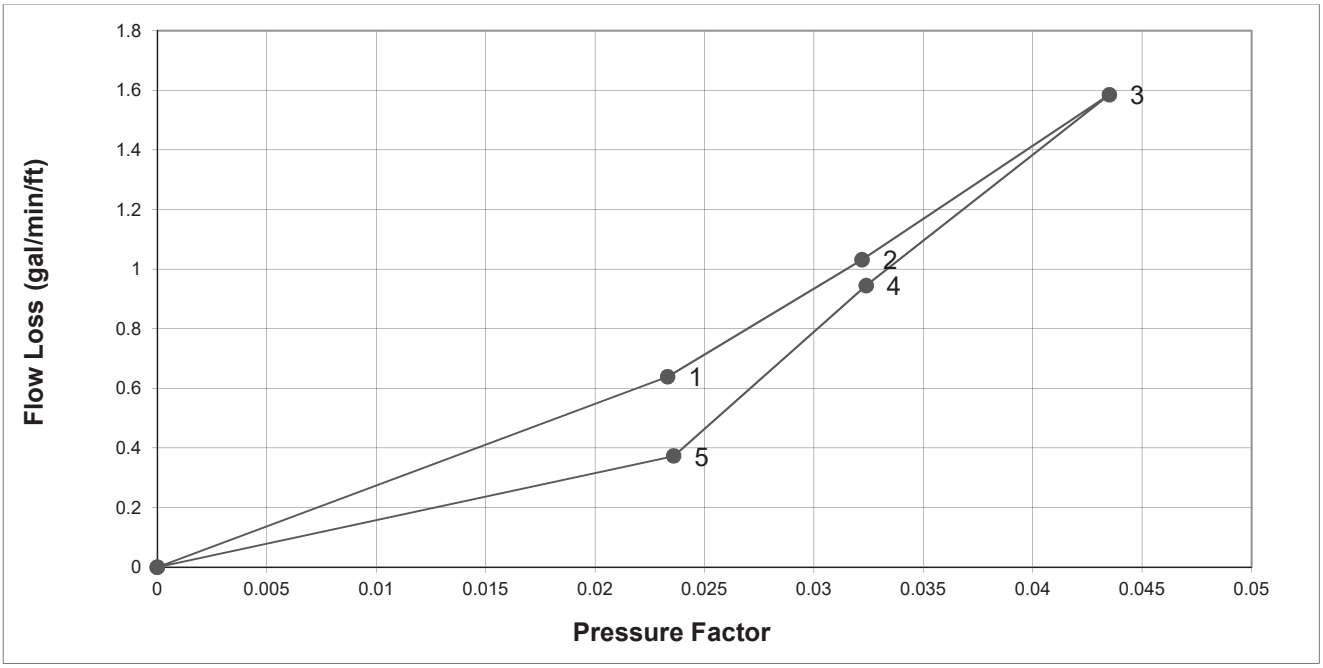
Step No.	$\%P_{MAX}$	Measured Pressure (psi)	Pressure Factor, ψ	Flow, q (gal/min)	Flow loss (gal/min/ft)	Lugeon
0	0		0	0	0	-
1	50%	36.00	0.019990005	0.00	0.0000	0
2	75%	43.00	0.02387695	0.02	0.0010	0
3	100%	62.00	0.034427231	0.04	0.0020	0
4	75%		#N/A			
5	50%		#N/A			
0	0		0	0	0	



Boring	B-203
Surface El. (ft)	2305
Groundwater El. (ft)	2330
Test No.	2
Test Interval Center Elevation (ft)	2249.5
Test Interval Length, L (ft)	20.0
Max. Measured Pressure, P_{MAX} (psi)	78.3
Reference Pressure, P_0 (psi)	145
Representative Lugeon Value	36

Top of Test Elevation (ft)	2259.5
Bottom of Test Elevation (ft)	2239.5
Top of Test Depth (ft)	45.5
Bottom of Test Depth (ft)	65.5
Angle from Vertical (deg)	0

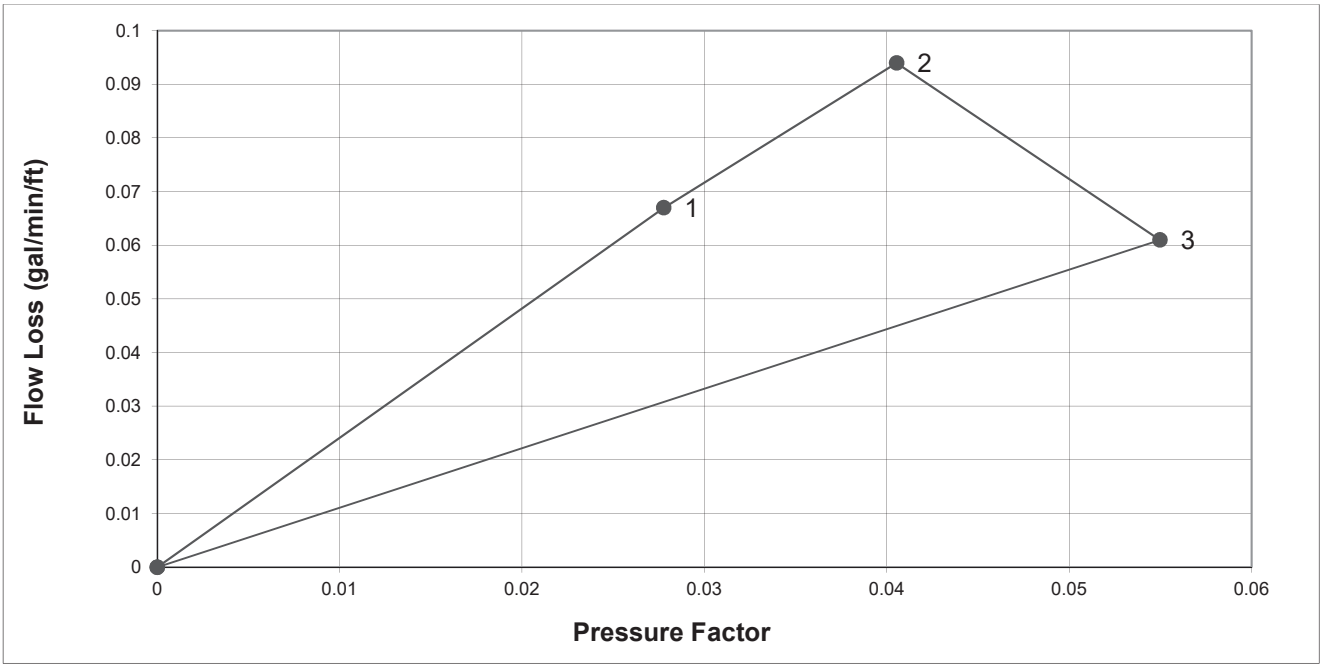
Step No.	$\%P_{MAX}$	Measured Pressure (psi)	Pressure Factor, ψ	Flow, q (gal/min)	Flow loss (gal/min/ft)	Lugeon
0	0		0	0	0	-
1	50%	42.00	0.023321672	12.78	0.6390	27
2	75%	58.00	0.032206119	20.64	1.0320	32
3	100%	78.33	0.04349677	31.70	1.5850	36
4	75%	58.33	0.032391212	18.90	0.9450	29
5	50%	42.50	0.023599311	7.46	0.3730	16
0	0		0	0	0	



Boring	B-203
Surface El. (ft)	2305
Groundwater El. (ft)	2330
Test No.	3
Test Interval Center Elevation (ft)	2229.5
Test Interval Length, L (ft)	20.0
Max. Measured Pressure, P_{MAX} (psi)	99.0
Reference Pressure, P_0 (psi)	145
Representative Lugeon Value	1

Top of Test Elevation (ft)	2239.5
Bottom of Test Elevation (ft)	2219.5
Top of Test Depth (ft)	65.5
Bottom of Test Depth (ft)	85.5
Angle from Vertical (deg)	0

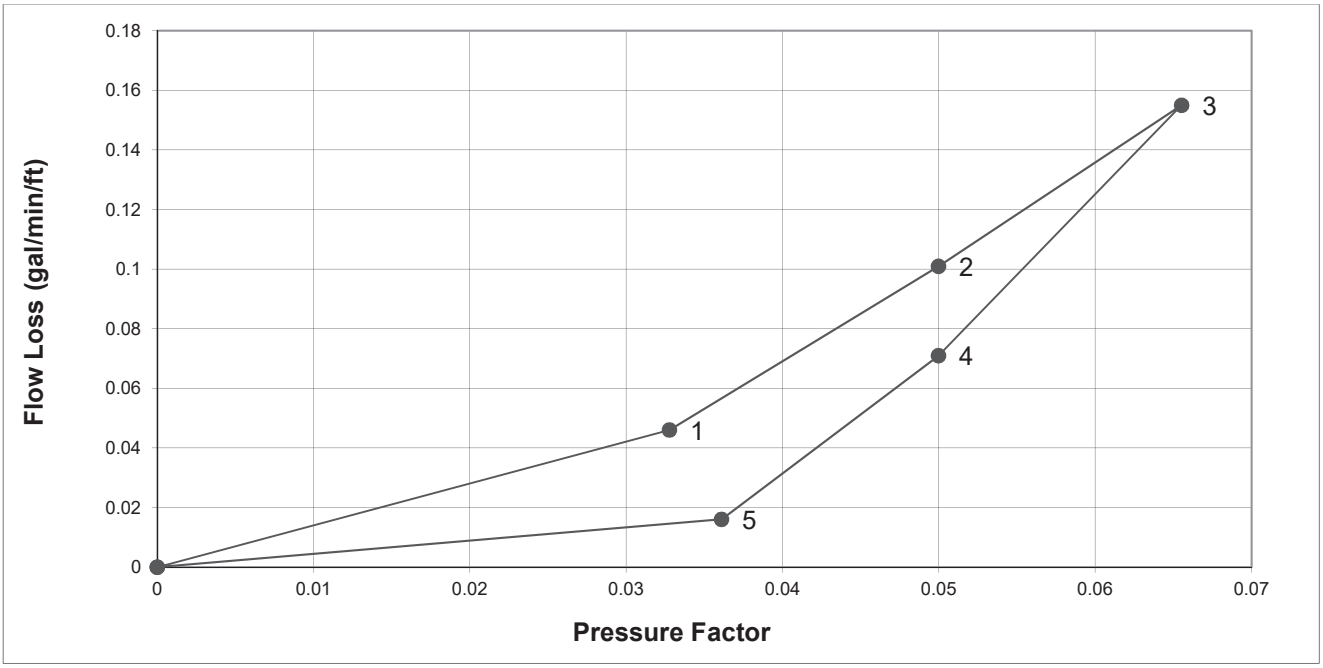
Step No.	$\%P_{MAX}$	Measured Pressure (psi)	Pressure Factor, ψ	Flow, q (gal/min)	Flow loss (gal/min/ft)	Lugeon
0	0		0	0	0	-
1	50%	50.00	0.027763896	1.34	0.0670	2
2	75%	73.00	0.040535288	1.88	0.0940	2
3	100%	99.00	0.054972514	1.22	0.0610	1
4	75%		#N/A			
5	50%		#N/A			
0	0		0	0	0	



Boring	B-203
Surface El. (ft)	2305
Groundwater El. (ft)	2330
Test No.	4
Test Interval Center Elevation (ft)	2209.5
Test Interval Length, L (ft)	20.0
Max. Measured Pressure, P_{MAX} (psi)	118.0
Reference Pressure, P_0 (psi)	145
Representative Lugeon Value	2

Top of Test Elevation (ft)	2219.5
Bottom of Test Elevation (ft)	2199.5
Top of Test Depth (ft)	85.5
Bottom of Test Depth (ft)	105.5
Angle from Vertical (deg)	0

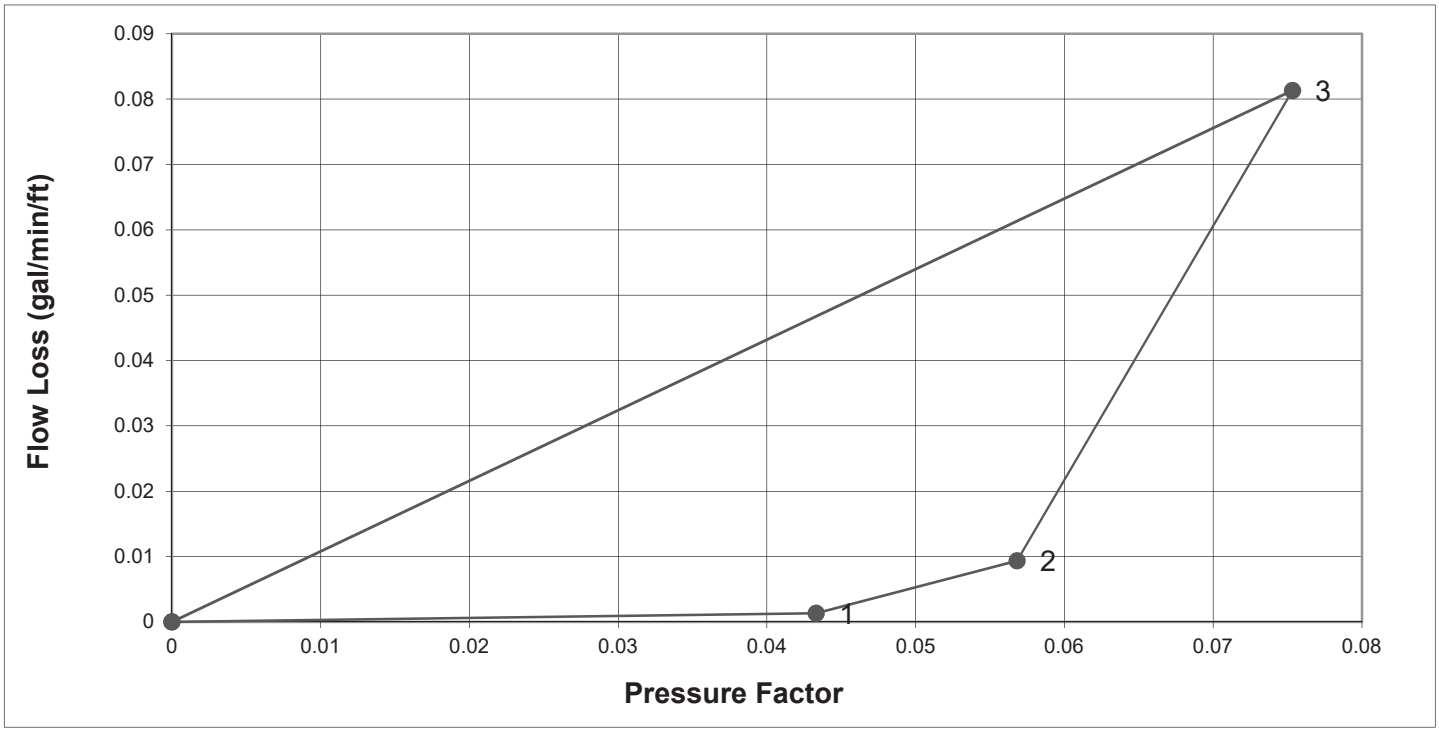
Step No.	$\%P_{MAX}$	Measured Pressure (psi)	Pressure Factor, ψ	Flow, q (gal/min)	Flow loss (gal/min/ft)	Lugeon
0	0		0	0	0	-
1	50%	59.00	0.032761397	0.92	0.0460	1
2	75%	90.00	0.049975012	2.02	0.1010	2
3	100%	118.00	0.065522794	3.10	0.1550	2
4	75%	90.00	0.049975012	1.42	0.0710	1
5	50%	65.00	0.036093065	0.32	0.0160	0
0	0		0	0	0	



Boring	B-203
Surface El. (ft)	2305
Groundwater El. (ft)	2330
Test No.	5
Test Interval Center Elevation (ft)	2192.5
Test Interval Length, L (ft)	15.0
Max. Measured Pressure, P_{MAX} (psi)	135.7
Reference Pressure, P_0 (psi)	145
Representative Lugeon Value	1

Top of Test Elevation (ft)	2200.0
Bottom of Test Elevation (ft)	2185.0
Top of Test Depth (ft)	105
Bottom of Test Depth (ft)	120
Angle from Vertical (deg)	0

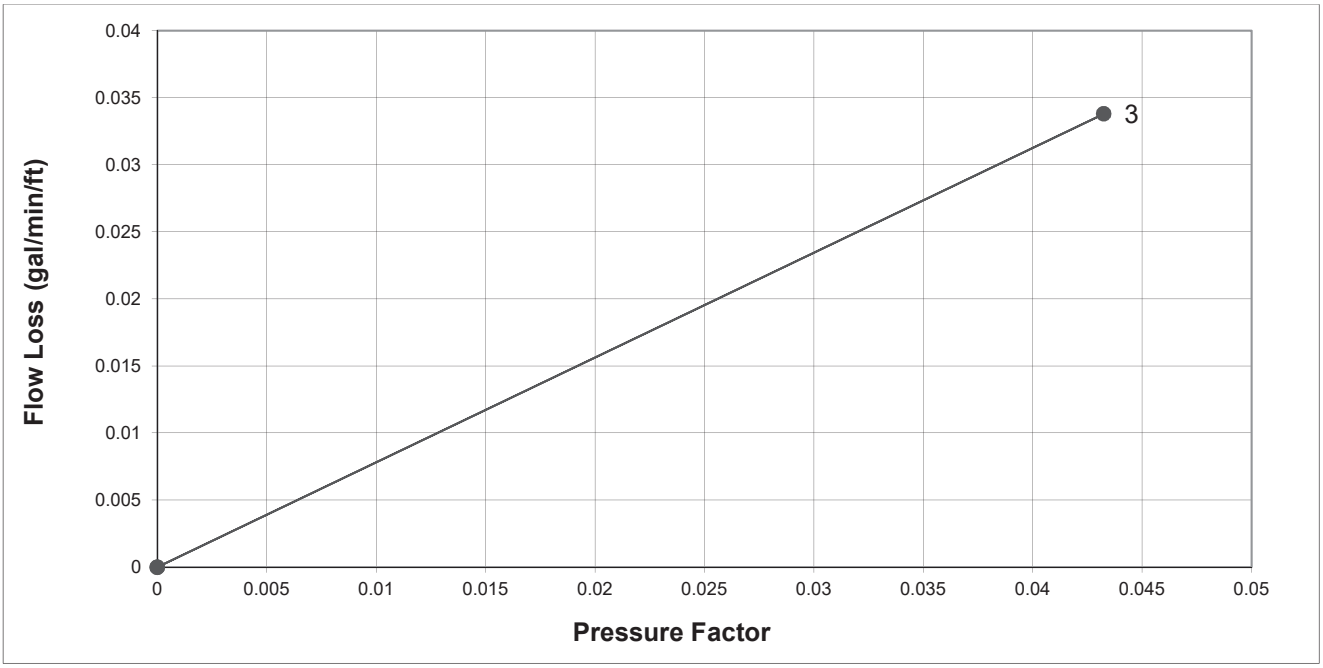
Step No.	$\%P_{MAX}$	Measured Pressure (psi)	Pressure Factor, ψ	Flow, q (gal/min)	Flow loss (gal/min/ft)	Lugeon
0	0		0	0	0	-
1	50%	78.00	0.043311677	0.02	0.0013	0
2	75%	102.33	0.05682344	0.14	0.0093	0
3	100%	135.67	0.075332704	1.22	0.0813	1
4	75%		#N/A			
5	50%		#N/A			
0	0		0	0	0	



Boring	B-206
Surface El. (ft)	2336.62231
Groundwater El. (ft)	2328.02231
Test No.	1
Test Interval Center Elevation (ft)	2258.7
Test Interval Length, L (ft)	10.0
Max. Measured Pressure, P_{MAX} (psi)	77.9
Reference Pressure, P_0 (psi)	145
Representative Lugeon Value	1

Top of Test Elevation (ft)	2263.0
Bottom of Test Elevation (ft)	2254.3
Top of Test Depth (ft)	85
Bottom of Test Depth (ft)	95
Angle from Vertical (deg)	30

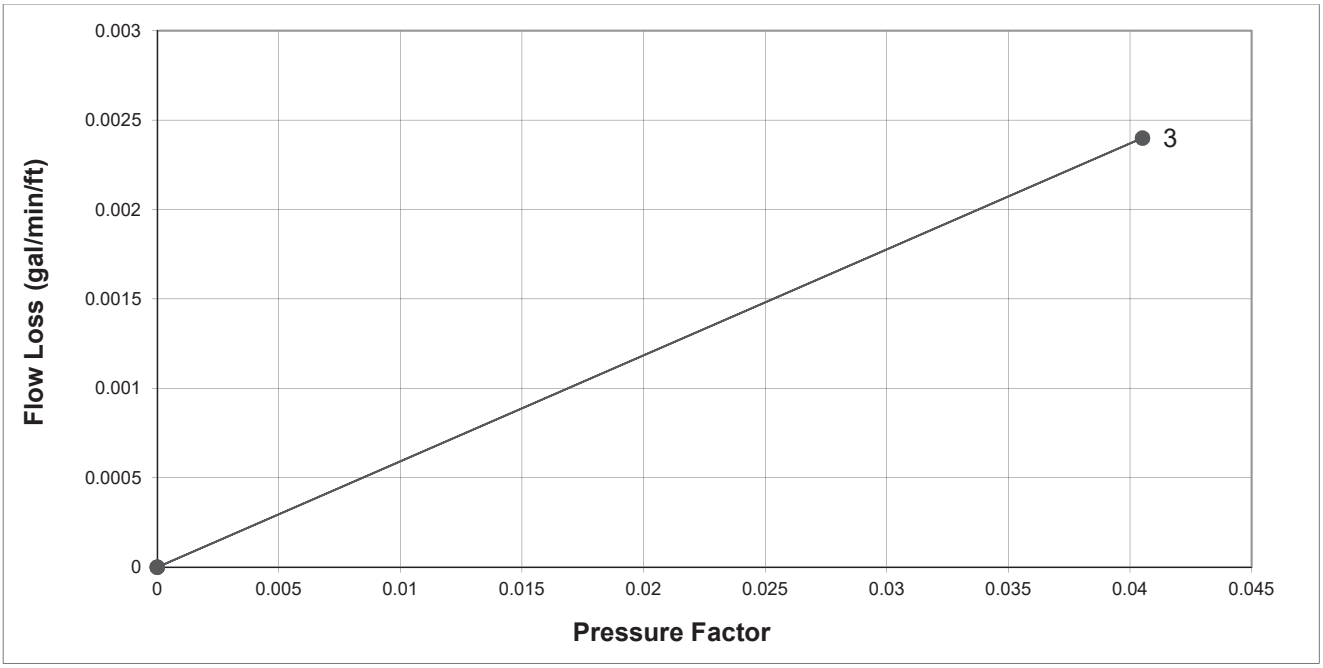
Step No.	$\%P_{MAX}$	Measured Pressure (psi)	Pressure Factor, ψ	Flow, q (gal/min)	Flow loss (gal/min/ft)	Lugeon
0	0		0	0	0	-
1	50%		#N/A			
2	75%		#N/A			
3	100%	77.88	0.043245044	0.34	0.0338	1
4	75%		#N/A			
5	50%		#N/A			
0	0		0	0	0	



Boring	B-206
Surface El. (ft)	2336.62231
Groundwater El. (ft)	2328.02231
Test No.	2
Test Interval Center Elevation (ft)	2267.3
Test Interval Length, L (ft)	10.0
Max. Measured Pressure, P_{MAX} (psi)	73.0
Reference Pressure, P_0 (psi)	145
Representative Lugeon Value	0

Top of Test Elevation (ft)	2271.7
Bottom of Test Elevation (ft)	2263.0
Top of Test Depth (ft)	75
Bottom of Test Depth (ft)	85
Angle from Vertical (deg)	30

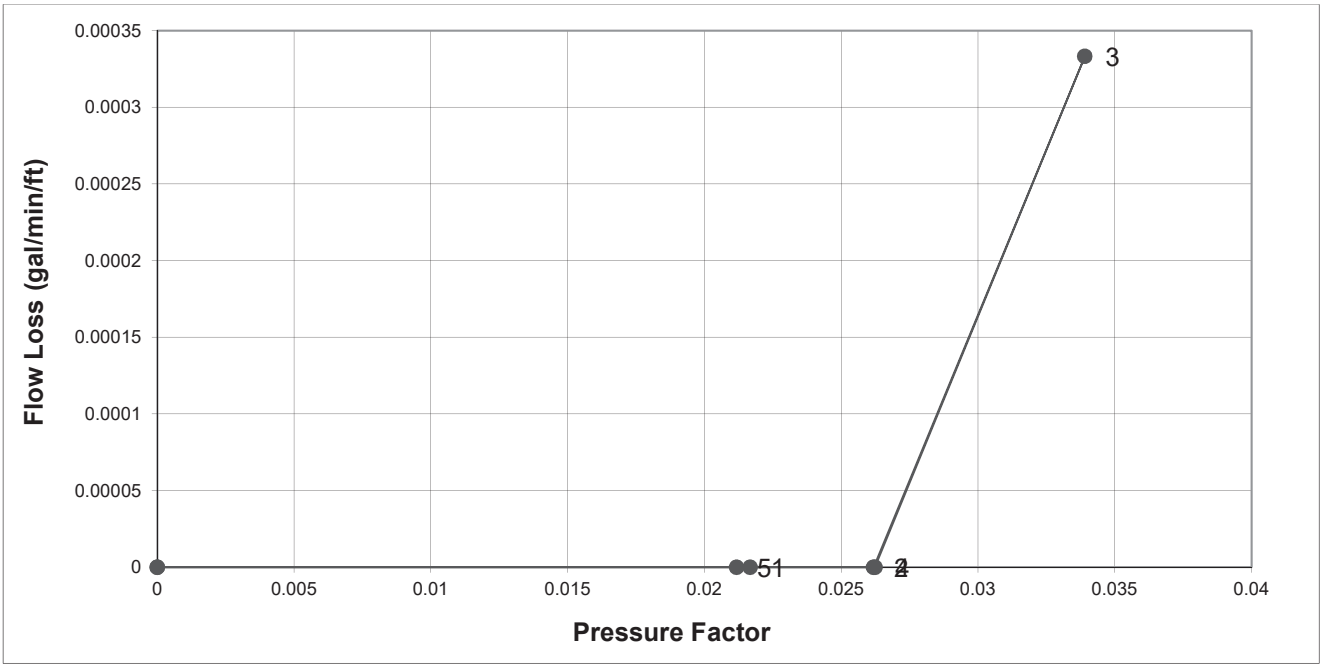
Step No.	$\%P_{MAX}$	Measured Pressure (psi)	Pressure Factor, ψ	Flow, q (gal/min)	Flow loss (gal/min/ft)	Lugeon
0	0		0	0	0	-
1	50%		#N/A			
2	75%		#N/A			
3	100%	72.96	0.040513077	0.02	0.0024	0
4	75%		#N/A			
5	50%		#N/A			
0	0		0	0	0	



Boring	BI-02
Surface El. (ft)	2334.3
Groundwater El. (ft)	2329.5
Test No.	1
Test Interval Center Elevation (ft)	2277.3
Test Interval Length, L (ft)	20.0
Max. Measured Pressure, P_{MAX} (psi)	61.1
Reference Pressure, P_0 (psi)	145
Representative Lugeon Value	0

Top of Test Elevation (ft)	2287.3
Bottom of Test Elevation (ft)	2267.3
Top of Test Depth (ft)	47
Bottom of Test Depth (ft)	67
Angle from Vertical (deg)	0

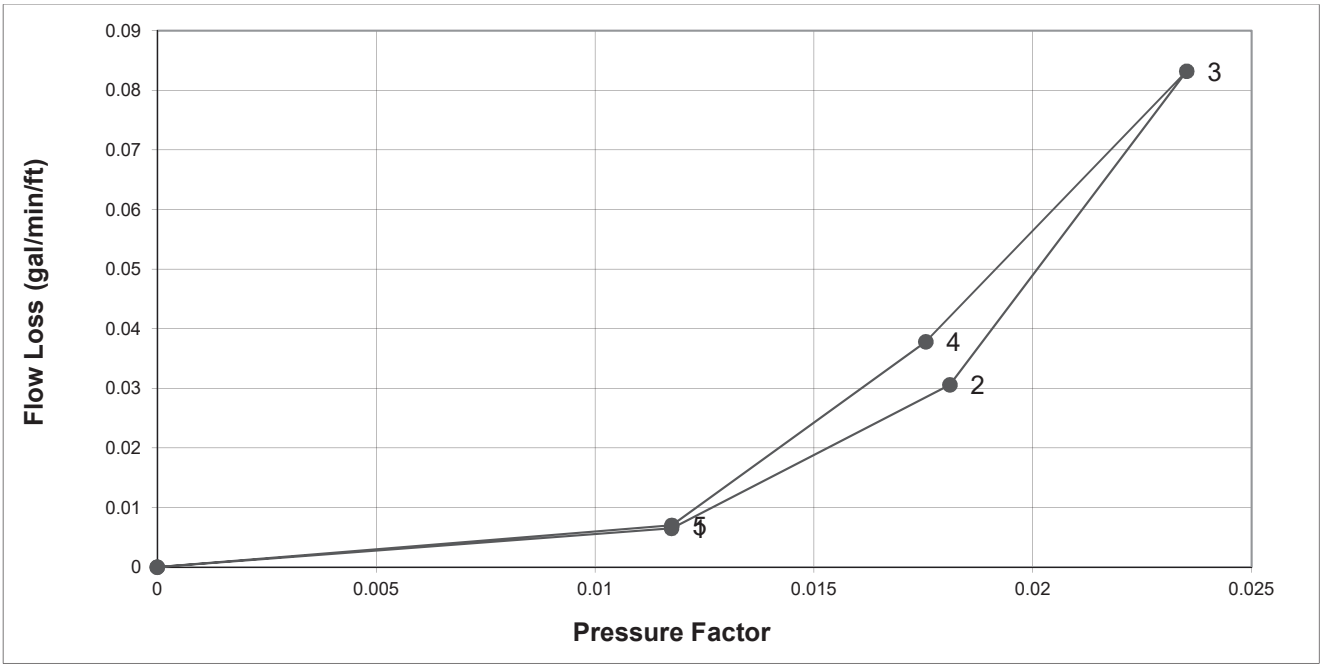
Step No.	$\%P_{MAX}$	Measured Pressure (psi)	Pressure Factor, ψ	Flow, q (gal/min)	Flow loss (gal/min/ft)	Lugeon
0	0		0	0	0	-
1	50%	39.02	0.021669027	0.00	0.0000	0
2	75%	47.15	0.026180984	0.00	0.0000	0
3	100%	61.06	0.033903789	0.01	0.0003	0
4	75%	47.24	0.026232069	0.00	0.0000	0
5	50%	38.13	0.021173117	0.00	0.0000	0
0	0		0	0	0	



Boring	BI-03
Surface El. (ft)	2302.2
Groundwater El. (ft)	2327.5
Test No.	1
Test Interval Center Elevation (ft)	2277.1
Test Interval Length, L (ft)	20.0
Max. Measured Pressure, P_{MAX} (psi)	42.4
Reference Pressure, P_0 (psi)	145
Representative Lugeon Value	4

Top of Test Elevation (ft)	2287.1
Bottom of Test Elevation (ft)	2267.1
Top of Test Depth (ft)	15.1
Bottom of Test Depth (ft)	35.1
Angle from Vertical (deg)	0

Step No.	$\%P_{MAX}$	Measured Pressure (psi)	Pressure Factor, ψ	Flow, q (gal/min)	Flow loss (gal/min/ft)	Lugeon
0	0		0	0	0	-
1	50%	21.16	0.011748459	0.13	0.0065	1
2	75%	32.61	0.018106835	0.61	0.0306	2
3	100%	42.36	0.023519129	1.66	0.0832	4
4	75%	31.62	0.017556	0.76	0.0378	2
5	50%	21.16	0.01175168	0.14	0.0070	1
0	0		0	0	0	



APPENDIX C

Definite Plan Televiewer Data

(Pages C-1 to C-35)

DRAFT

NORCAL GEOPHYSICAL CONSULTANTS INC.
A Terracon COMPANY

October 11, 2018

AECOM
300 Lakeside Drive, Suite 400
Oakland, CA 94612, USA

Subject: Borehole Televiewer Logging Survey
Klamath River Project
Iron Gate Reservoir
Siskiyou County, California

NORCAL Job No: NS185074

Attention: Ben Kozlowicz

This report presents the findings of a borehole geophysical investigation performed by NORCAL Geophysical Consultants, Inc. at the Klamath River Project at the northeast end of Iron Gate Reservoir. This investigation was part of a geotechnical study to assess subsurface conditions along a propose water tunnel alignment. The survey was performed on two separate mobilizations during the period of August 16 through 23, 2018 by NORCAL Professional Geophysicist William J. Henrich PGp 893. Logistical support and safety information were provided onsite by Mr. Tim VandeVoorde, Engineering Geologist of AECOM.

1.0 SITE DESCRIPTION

Our work concerned 2 boreholes situated near the north and south shore at the very northeastern end of Iron Gate Reservoir (see Plate 1, Borehole Location Map). The purpose of this investigation was to help determine rock mass characteristics that included orientations and depth distribution of bedrock discontinuities. The site was underlain by unconsolidated river deposits, basalt flows and tuff breccia.

2.0 SCOPE

Geophysical borehole logging was conducted in two drilled boreholes labeled as B-202 and B-206. The geophysical logging methods consisted of acoustic televiewer and caliper. The scope of work included a report detailing analysis, methods, and presentation of results.

3.0 BOREHOLE CONDITIONS

Both boreholes were inclined 60 degrees from horizontal. They contained shallow Hwt. 4.5- inch diameter steel conductor casings from depths of 9 to 29.5-ft bgs. The casing was installed to prevent caving from unconsolidated river deposits. Below the conductor casing the boreholes were advanced with a HQ- diamond coring method. The HQ open bore diameter was approximately 3.82-inches. The principle rock types consisted of relatively hard, well consolidated basalt and highly weathered, weak tuff breccia. The latter geologic unit tended to cave and create washouts of the borehole wall. This impeded the advancement of the acoustic televiewer in Borehole B-202.

4.0 GEOPHYSICAL LOGGING EQUIPMENT AND METHODOLOGY

NORCAL conducted geophysical borehole logging using a digital ***MICROLOGGER2*** System manufactured by **Robertson Geologging, Ltd.** This system consisted of the following components:

- control console,
- computer,
- motorized cable winch,
- Televiewer (acoustic)
- caliper

4.1 TELEVIEWER

Complete descriptions of the methodology, data acquisition and data analysis procedures are presented in Appendix A.

4.2 CALIPER

Caliper logs are a measure of the borehole diameter versus depth. The tool was used both as a survey technique to assess the relative consolidation of bedrock and provide parameter input to a computer program that calculates discontinuity dip. The caliper tool consists of three interconnected mechanical arms that are spring loaded against the borehole wall. The horizontal deflections of the arms gauge the borehole diameter in units of inches with depth. The logging measurement was made in the up hole direction at a speed of approximately 12-ft per minute. The data sampling rate for this instrumentation was every 0.2-ft.

5.0 RESULTS AND INTERPRETATION

Caliper and televiewer field logs are presented in Appendix B. Specific interpreted log plots (Televiewer Analysis of Dips) from the televiewer logging are presented in Appendix C. Supporting numerical tables (Discontinuity Tables) that tabulated depth, dip angles, dip azimuths, aperture thickness where applicable and fracture classification are presented in Appendix D.

Over 95 percent of all discontinuities subjected to orientation analysis were classified as fractures. The remaining percentage were attributed to lithologic contacts between basalt and tuff breccia. Fracture classifications are discussed in Appendix A. The discontinuities classified as fractures were present only in the basalt unit in Borehole B-206. No discontinuities in the tuff breccia in the lower portion of this borehole and the entire logged open borehole section of B-202 were observed. This is because this unit, based on very low BHTV amplitude returns and variable borehole diameters (washouts), is highly weathered and poorly consolidated. As a result, this geologic unit was not capable of supporting brittle fractures. Note that not all visible fractures-joints on the televiewer images were chosen for orientation analysis. This was because these non-selected features were either too fragmented or feint to be considered representative. We did subdivide or classify the fractures-joints based on the appearance of the televiewer image and related caliper responses.

6.0 STANDARD OF CARE

The scope of NORCAL's services for this project consisted of using geophysical methods to characterize the subsurface. The accuracy of our findings is subject to specific site conditions and limitations inherent to the techniques used. We performed our services in a manner consistent with the standard of care ordinarily exercised by members of the profession currently employing similar methods. No warranty, with respect to the performance of services or products delivered under this agreement, expressed or implied, is made by NORCAL.

NORCAL GEOPHYSICAL CONSULTANTS INC.
A Terracon COMPANY

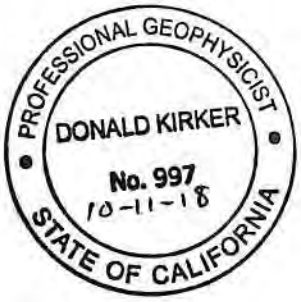
Thank you for the opportunity to participate on this project.

Sincerely,

NORCAL Geophysical Consultants, Inc.

William J. Henrich
Professional Geophysicist PGp 893

Donald J. Kirker



Donald J. Kirker
Professional Geophysicist PGp 997

WJH/DJK/tlt
Enclosures:

Appendix A: Borehole Imaging Televiewer Surveying and Data Processing
Appendix B: Field Logs Televiewer and Caliper Survey, Boreholes B-202 and B-206
Appendix C: Interpreted Televiewer Plot, Borehole B-206
Appendix D: Discontinuity Table Borehole B-206

NORCAL GEOPHYSICAL CONSULTANTS INC.
A Terracon COMPANY

Appendix A:

Televiewer Analysis Boreholes B-202 and B-206

NORCAL GEOPHYSICAL CONSULTANTS INC.
A Terracon COMPANY

APPENDIX A

BOREHOLE TELEVIEWER SURVEY

1.0 METHODOLOGY

Televiewers are downhole tools that are used to produce radial images of the interior of a borehole. The images are composited sequentially using computer software to produce continuous color images. These images are like unfolded, or unwrapped, cylinders displayed on a two-dimensional surface. The "unwrapped" radial images are referenced to magnetic north by an on-board magnetic compass. In addition, an on-board three-axis magnetic inclinometer determines the inclination and azimuth of the borehole.

Televiewer images can be used to detect bedrock discontinuities (joints, fractures, bedding planes, geologic contacts, etc.) in boreholes and determine their frequency, depths and orientations. Interpretable discontinuities appear as thin sinusoidal forms that stretch across the image. Interactively fitting lines to these sinusoids provides data that computer software uses to determine the orientation and dip of the discontinuities. The midpoint or half amplitude of the sinusoid is taken as the depth of the discontinuity.

There are two types of televiewers; optical and acoustic. Optical televiewers (OPTV) use a digital optical sensor to produce radial images to a vertical resolution as fine as 0.004 feet and a radial resolution to 720 pixels. However, they can only be used in dry holes or in water filled holes with sufficient clarity to create an interpretable high resolution image. Acoustic televiewers (BHTV) require a water column to act as a medium for the transmission and reception of acoustic signals. The water does not have to be optically clear. In operation the BHTV transmits an ultrasonic signal into the borehole fluid and detects ultrasonic energy that is reflected from the borehole wall. Sidewall borehole images are created by measuring variations in the two-way travel time of the ultrasonic pulses as well as variations in the amplitude of the reflected signals.

2.0 DATA ACQUISITION

Prior to Televiewer logging we checked the correct operation of the onboard tool compass of bearing direction against the readings provided by a Brunton Compass. This procedure involves setting the probe vertically in a jig with a bar situated in the south (magnetic) direction and recording a time-drive record so that the bar forms a straight line down the center of the waterfall image. Alternately,

we incline the probe (greater than 45 degrees from vertical) in an arbitrary direction and compare the bearing displayed in test mode to the bearing indicated on the Brunton compass face. Variations of 1 to 2 degrees in azimuth between the tool display and Brunton Compass bearing confirms the tools compass is operating satisfactory.

Given that all boreholes maintained a shallow fluid level, image logging was accomplished with the acoustic method. We acquired acoustic BHTV data at a rate of approximately 1000 two-way pulses times per second. The tool was raised/lowered at a rate of 4.5-ft per minute. This resulted in a BHTV depth sample interval of 0.006 ft. Two logs were acquired in each borehole; one in the up direction and one in the down direction. This allowed us to demonstrate the tools compass stability by comparing the orientations of common features between the two logs.

3.0 DATA ANALYSIS

We used the computer program ***WELLCAD*** (Version 5.1, ALT, and Luxemburg) to display BHTV images and to calculate the orientations of interpreted discontinuities (e.g. fractures, joints, bedding).

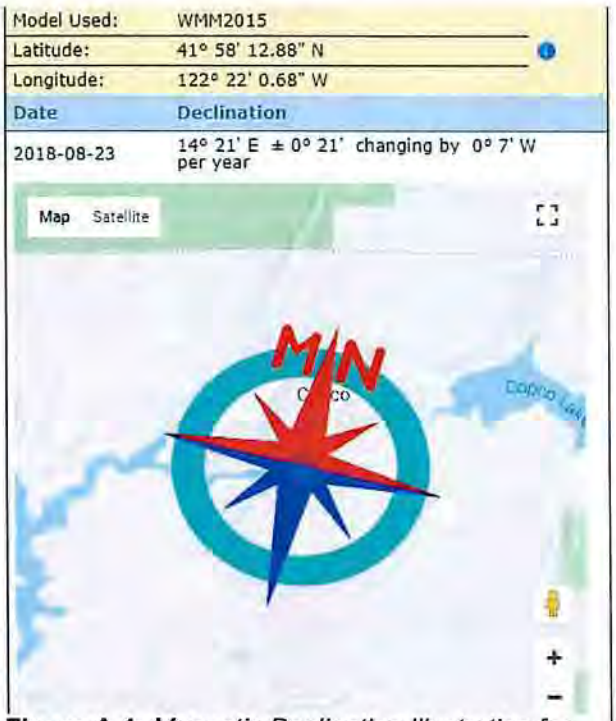


Figure A-1: *Magnetic Declination Illustration for Eastern Iron Gate Reservoir.*

Corrections for the magnetic declination in the survey area required adding 14.3 degrees to the magnetic compass bearings in order to orient the borehole images to true north (see Figure A-1 below). Since borehole diameter is a major reduction parameter in determining dip magnitude, we input caliper log measurements. In each borehole, discontinuity analyses were performed interactively on sections of the unwrapped optical or acoustic amplitude images as viewed on a computer monitor. An interpretable discontinuity on a two-dimensional unwrapped borehole televiewer log appears as a recognizable sinusoidal trace that usually extends across the full width of the borehole image. The sinusoidal shape is a manifestation of planar discontinuities intercepting a three-dimensional cylindrical borehole. Planar discontinuities can be geologic features that include discrete fractures or joints, bedding planes and planar intrusions such as veins and geologic contacts. The traces of discontinuities identified on the image logs were

NORCAL GEOPHYSICAL CONSULTANTS INC.
A Terracon COMPANY

fitted with a bendable sinusoid overlying the trace, as shown in Figure A-2. This provided data that were used by ***WELLCAD*** to calculate a plane representing the orientation of the discontinuity in terms of dip direction and dip magnitude. This process was repeated for every significant discontinuity until the entire borehole was interpreted. At this stage, the apparent dip direction and dip magnitude of the identified discontinuities were converted to true geographic dip azimuth and dip magnitude by factoring the borehole tilt (inclination) and azimuth at the depth of the discontinuity.

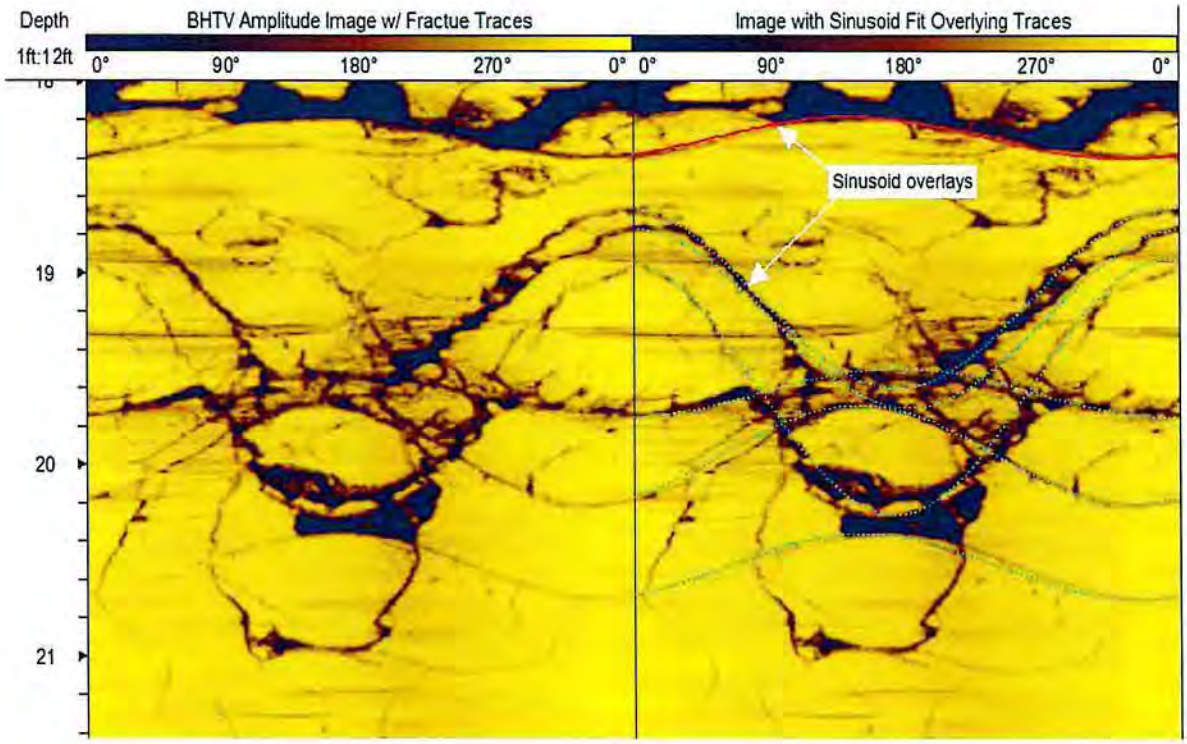


Figure A-2: *A sample BHTV section showing observable discontinuity traces (left) versus the same image (right) with the addition of interpreted sinusoidal overlays (solid red and green colored traces).*

Based on observations of the core and discussions with the on-site geologist, as well as our own experience identifying planar features in acoustic televiewer images, we classified discontinuity features into three fracture/joints categories as follows:

1) "Open continuous fractures". These have characteristics that are relatively wide (measureable >> 1mm) apparent apertures, continuous sinusoidal traces across the circumference of the borehole wall and show relief/breakage along the borehole wall. This relief is usually shown as diameter enlargements on the caliper log.

2) "Thin partial to continuous fracture". These features are "thin" (indicative of very small apertures 1 mm or less) partial or discontinuous across the full 360 degrees span of the image to continuous. Feature traces can be irregular (non-sinusoidal) especially if the dip angles are greater than 60 degrees.

3) "Lithologic Contacts". Boundaries between basalt and tuff breccia.

We did not tabulate (interpret) cemented or highly discontinuous or fragmented fractures.

4.0 PRESENTATIONS

Field Logs showing the two completed BHTV logging runs referenced to magnetic North are presented in Appendix B. Two televiewer images are presented to show the stability of the compass orientation of common fracture features between separate logging runs. The Televiewer Analysis for B-206 referenced to true geographic North, is presented in Appendix C. This plot is several pages long, with header information presented at the top of the first page only. The plot contains several columns of information described, from left to right, as follows:

COLUMN 1 – DEPTH AXIS

The depth axis indicates the relative vertical distance below the ground surface. Ground surface was set equal to zero feet. Depth values are positive and increase in the downward direction.

COLUMN 2 - TELEVIEWER IMAGE

This is an unwrapped false color (BHTV) image representing the interior of the borehole wall. On the BHTV images the relationship between color and signal amplitude is indicated by the color bar at the top of the header. Dark shades (blue) indicate relatively low amplitude and the brighter shades (yellow) indicate relatively high amplitudes. BHTV images are oriented relative to true North as indicated by the azimuth information presented in the header where North, East, South and West correspond to 0°, 90°, 180° and 270°, respectively. The diameter of the borehole is indicated by the white dashed line superimposed on the image. Solid and dashed color lines superimposed on

NORCAL GEOPHYSICAL CONSULTANTS INC.
A Terracon COMPANY

sinusoidal fracture/joint traces depict interpreted discontinuities. The colors of the lines relate to the fracture/joint classification as follows, red = open continuous fractures, teal = "thin", partial to complete fractures and blue = lithologic contacts. Note, that due to the wide apparent thickness of some fractures, we expanded the line trace into a broader hachured sinusoidal section.

COLUMN 3 - DIPS PLOT

The Dips Plot indicates the dip of discontinuities and their direction of maximum dip. These parameters are indicated by small symbols called "tadpoles" which consist of colored circles or squares with a straight line (tail) extending from them. The position of the tadpole indicates the degree of dip, from 0° on the left to 90° on the right, according to the scale shown at the top of the column. The direction that the tail is pointing indicates the direction of dip where straight up is true north and 90° to the right indicates due east. The tadpole symbol colors relate to the three classifications of fractures and joints. A Discontinuity Legend in the sub-header related the colors to the classification. The numerical values of dip azimuth and dip angle are also presented in discontinuity tables presented at the end of this appendix.

COLUMN 4 - CORE PLOT

This plot is a graphic rendering of the BHTV image into a 3-D core based on amplitude variations. This is basically what the image shown in Column 2 would look like if it was re-wrapped to form a cylinder where the vertical center line of the cylinder represents true north (0°), the right edge represents west (270°) and the left edge represents east (90°). South (180°) is out of view behind the core. Although the color spectrum of the core is the same as that used for the BHTV image, the core reconstruction tends to compress the amplitude spectrum into a darker range. This has the effect of making the core appear to be reddish rather than yellow. Planes drawn through the interpreted discontinuities illustrate the relative dip and dip direction of the discontinuities.

COLUMN 5 - BOREHOLE DEVIATION

This plot indicates the azimuth and tilt of the borehole. The solid blue line represents the dip direction, from 0° to 360°, according to the header scale labeled "Azimuth". The dotted green line represents the angle of the borehole from true vertical according to the header scale labeled "Tilt". This scale ranges from 0° to 4°.

NORCAL GEOPHYSICAL CONSULTANTS INC.
A Terracon COMPANY

5.0 DISCONTINUITY TABLES

The dip azimuth and dip angle of all interpreted discontinuities from the televiewer analysis plot are tabulated Appendix D. The tables present 5 column headers listed left to right as follows: Depth, Dip Azimuth, Dip Angle, Corrected Aperture and Discontinuity Classification. A brief description of the meaning of these terms is presented below.

Depth – relates to the center of discontinuity's sinusoid in feet below ground surface.

Dip Azimuth – dip direction of the discontinuity in degrees from true North.

Dip Angle – inclination of the plane of the discontinuity in degrees from horizontal.

Corrected Aperture – true thickness of fracture/joint corrected for dip measured in tenths of inches. In this survey, we used this processing facility to indicate the true thickness of weathered/altered fractures.

Discontinuity Classification – number designating classification type of fracture/joint (see Legend for explanation).

NORCAL GEOPHYSICAL CONSULTANTS INC.
A Terracon COMPANY

Appendix B:

Field Logs Televiewer and Caliper Survey
Boreholes B-202 and B-206

PRIVILEGED AND CONFIDENTIAL

NORCAL

NORCAL GEOPHYSICAL CONSULTANTS, INC.

ACOUSTIC TELEVIEWER, CALIPER LOGS

CO AECOM
WELL B-202
FLD IRON GATE RESERVOIR
CTY SISKIYOU CO.
STE CA
FILING No NS185074

COMPANY AECOM
WELL ID B-202
FIELD IRON GATE RESERVOIR
COUNTRY USA STATE CA

LOCATION
LAT 41.97048
LONG -122.37038

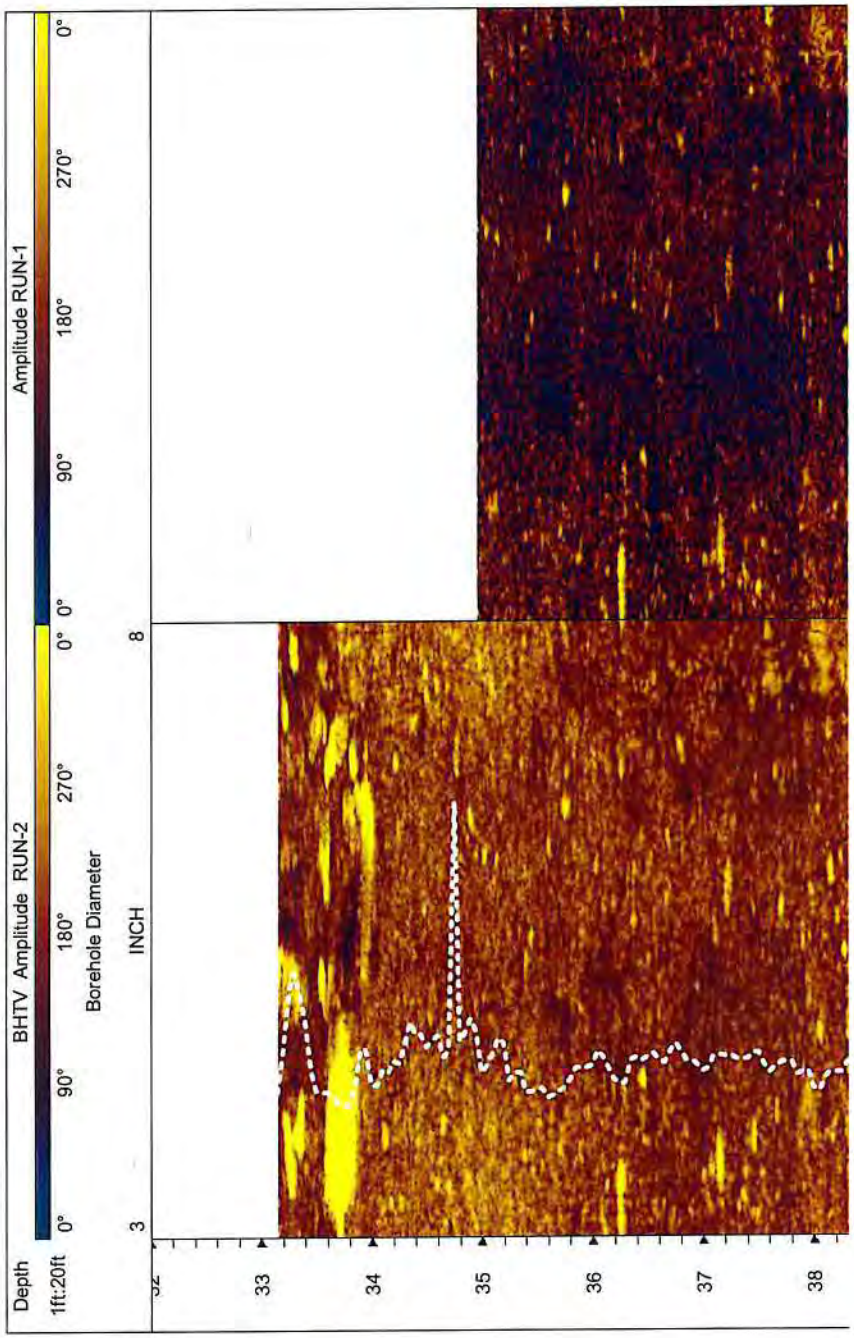
SEC TWP RGE

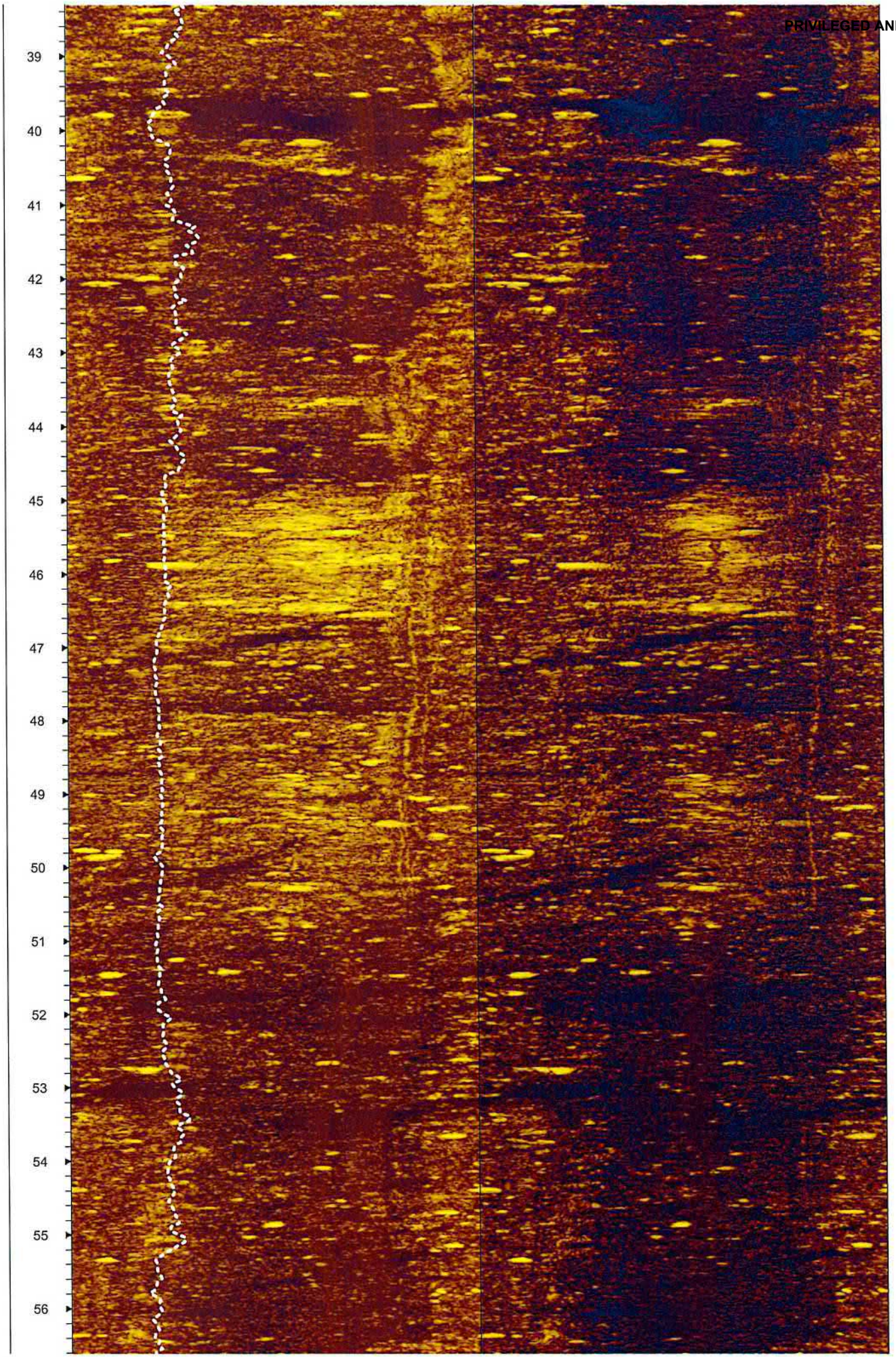
OTHER SERVICES

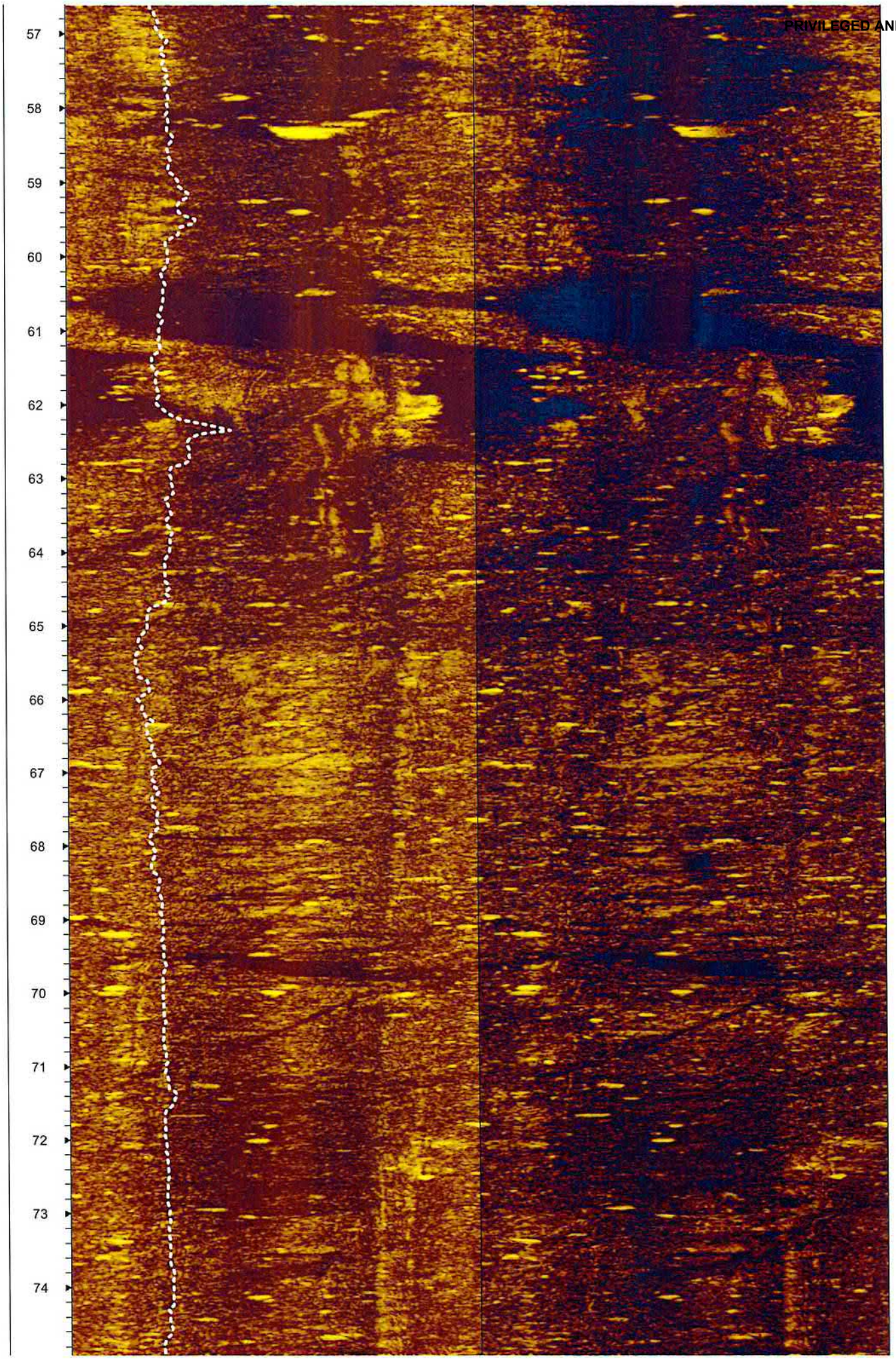
PERMANENT DATUM	GROUND SURFACE	ELEVATION ~2300' msl	K.B.
LOG MEAS. FROM	GROUND SURFACE	ABOVE PERM. DATUM	D.F.
DRILLING MEAS. FROM	GROUND SURFACE		G.L.

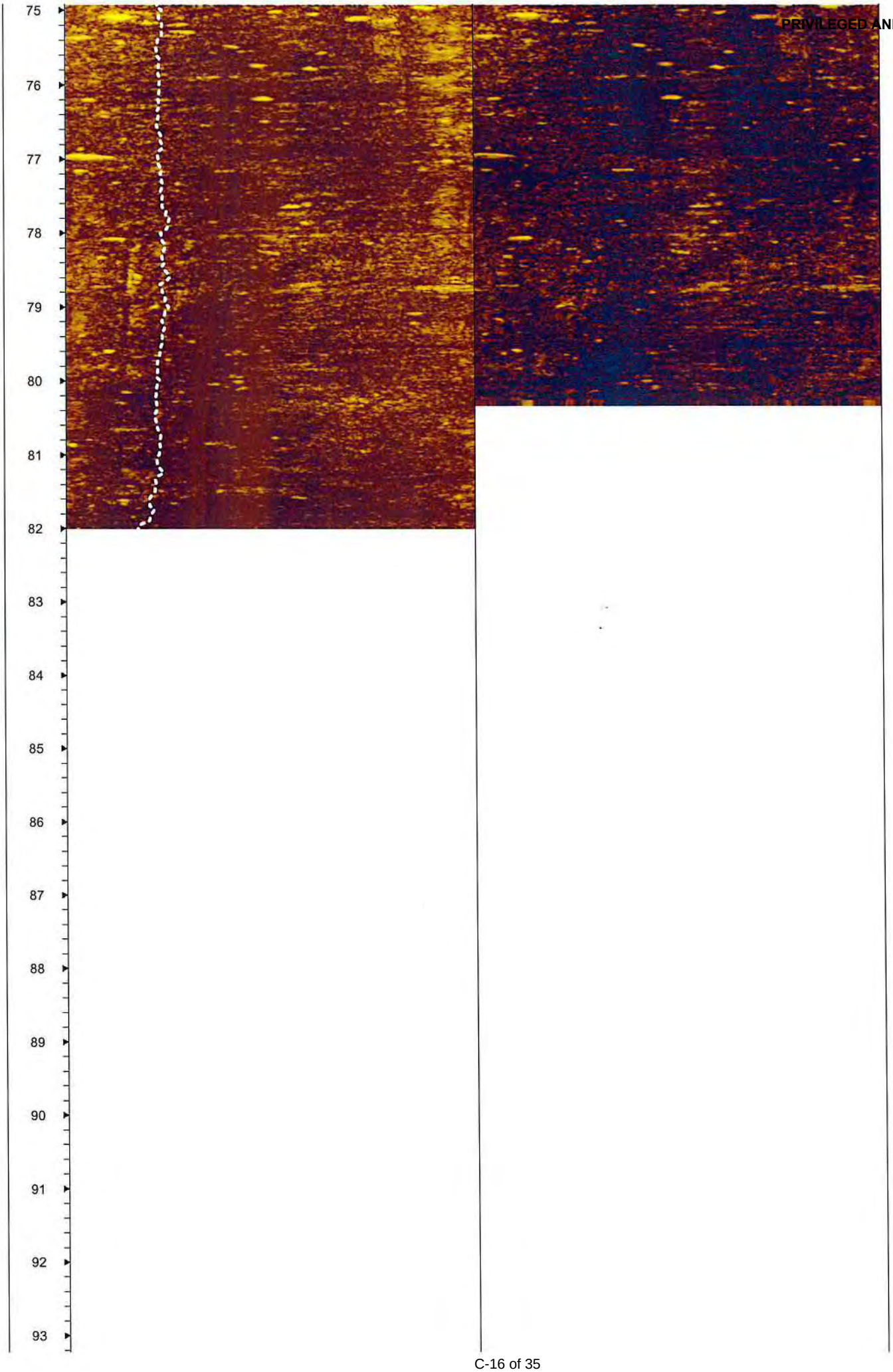
DATE	AUGUST 23, 2018	TYPE FLUID IN HOLE	water w/ polymer
RUN No	RUNS 1 through 3	SALINITY	na
TYPE LOG	CALIPER AND BHTV (3)	DENSITY	
DEPTH-DRILLER	100	LEVEL	11
DEPTH-LOGGER	97.8' bgs	MAX. REC. TEMP.	na
BTM LOGGED INTERVAL	BHTV 82' BGS		
TOP LOGGED INTERVAL	BHTV 18.06' BGS		
OPERATING RIG TIME	3		
RECORDED BY	W HENRICH		
WITNESSED BY	Tim VerdeVoorde		

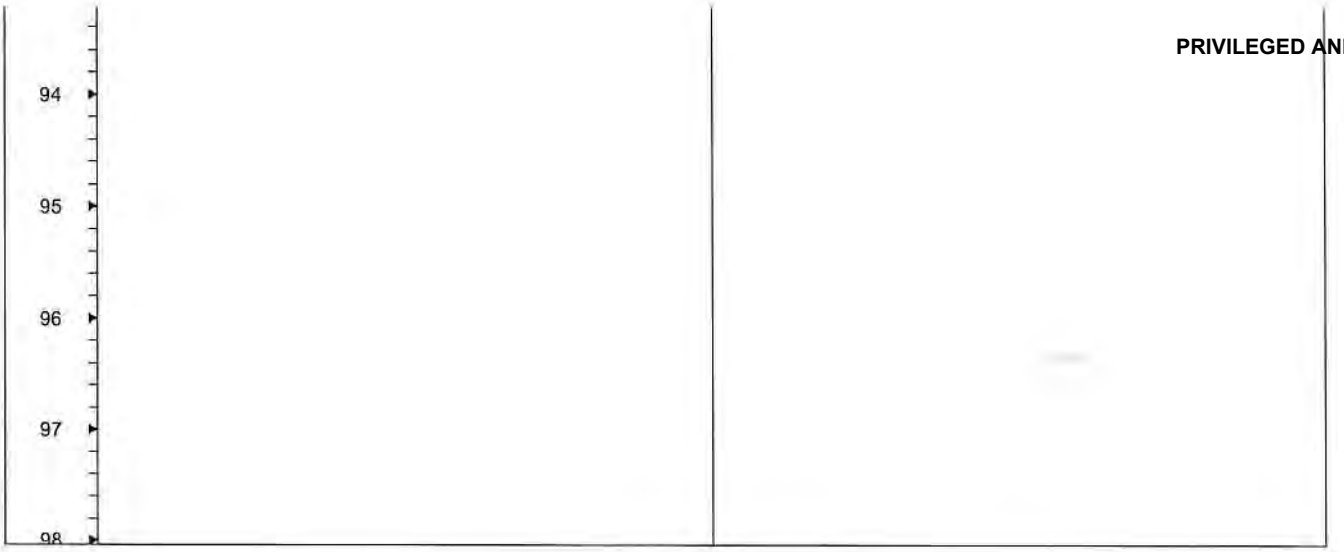
RUN	BOREHOLE RECORD			CASING RECORD			
NO.	BIT	FROM	TO	SIZE	WGT.	FROM	TO
1	4.25"	0	29.5 ft	4.25"	Hwt	0	29.5
2	HQ 3.825"	29.5	100 ft				




39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56


57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74


75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93


94
95
96
97
98

PRIVILEGED AND CONFIDENTIAL

NORCAL

NORCAL GEOPHYSICAL CONSULTANTS, INC.

ACOUSTIC TELEVIEWER, CALIPER LOGS

CO AECOM
WELL B-206
FLD IRON GATE RESERVOIR
CTY SISKIYOU CO.
STE CA
FILING No NS185074

COMPANY AECOM
WELL ID B-206
FIELD IRON GATE RESERVOIR
COUNTRY USA STATE CA

LOCATION
LAT 41.972184
LONG -122.36915

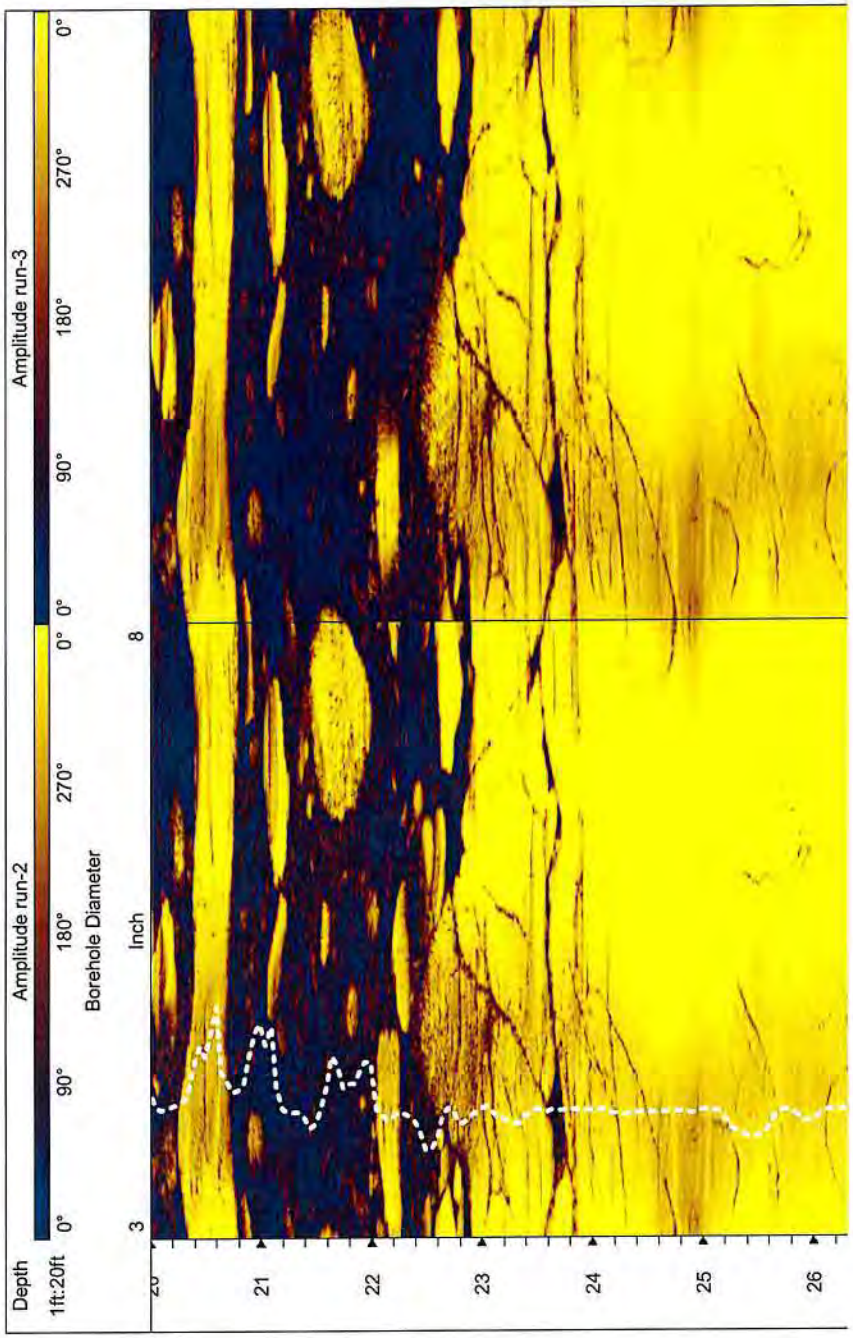
SEC TWP RGE

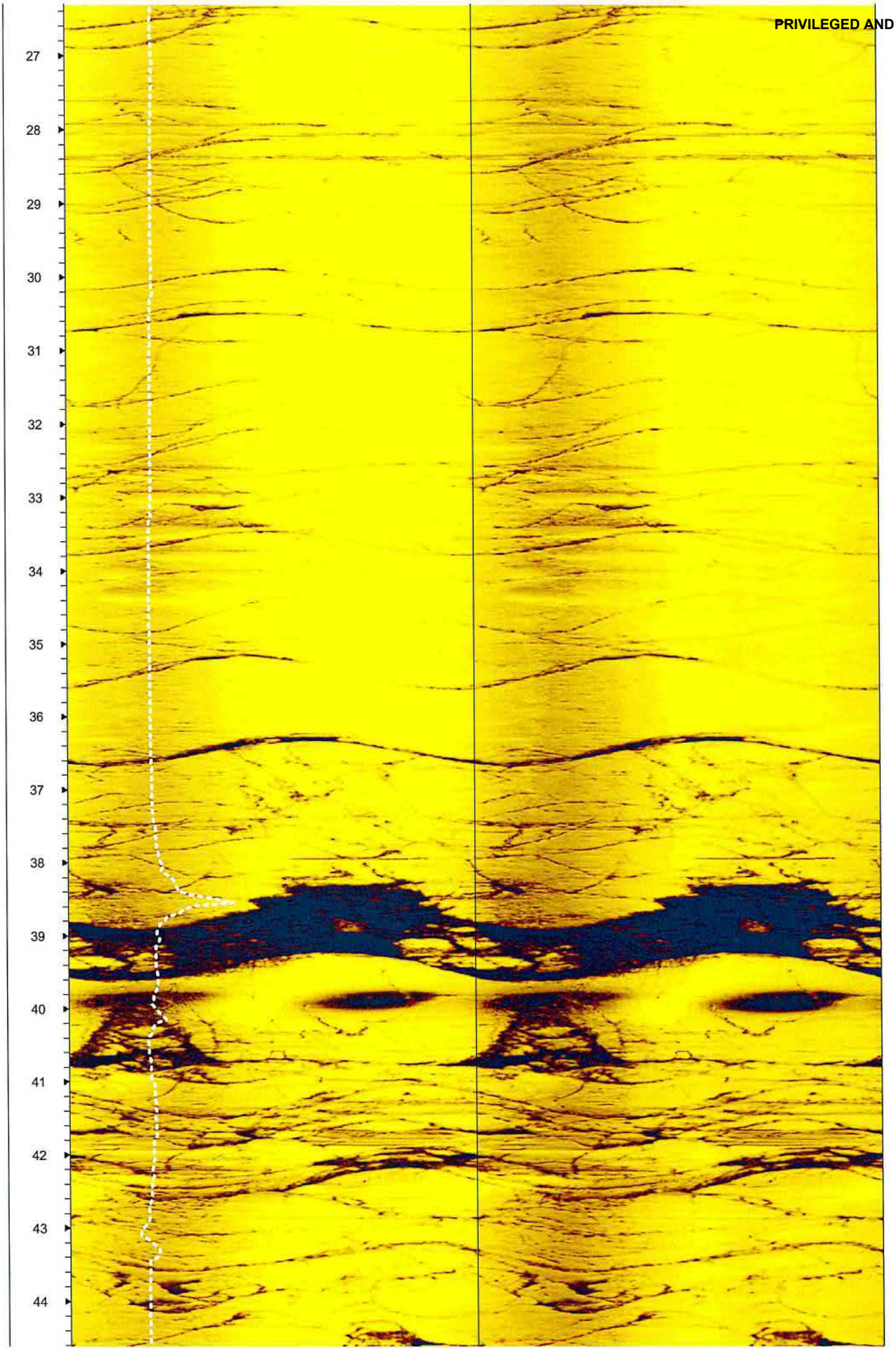
OTHER SERVICES

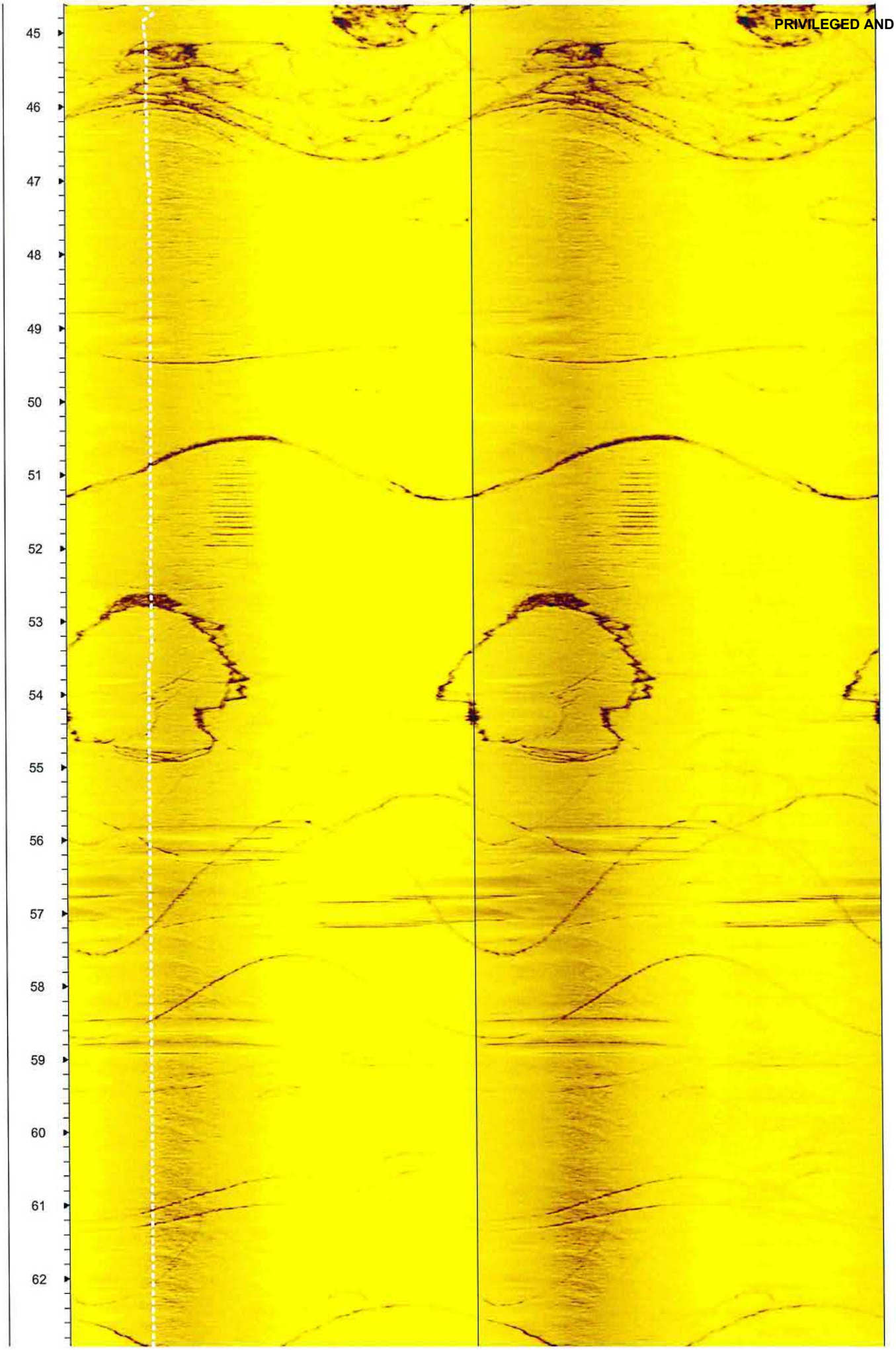
PERMANENT DATUM	GROUND SURFACE	ELEVATION ~2300' msl	K.B.
LOG MEAS. FROM	GROUND SURFACE	ABOVE PERM. DATUM	D.F.
DRILLING MEAS. FROM	GROUND SURFACE		G.L.

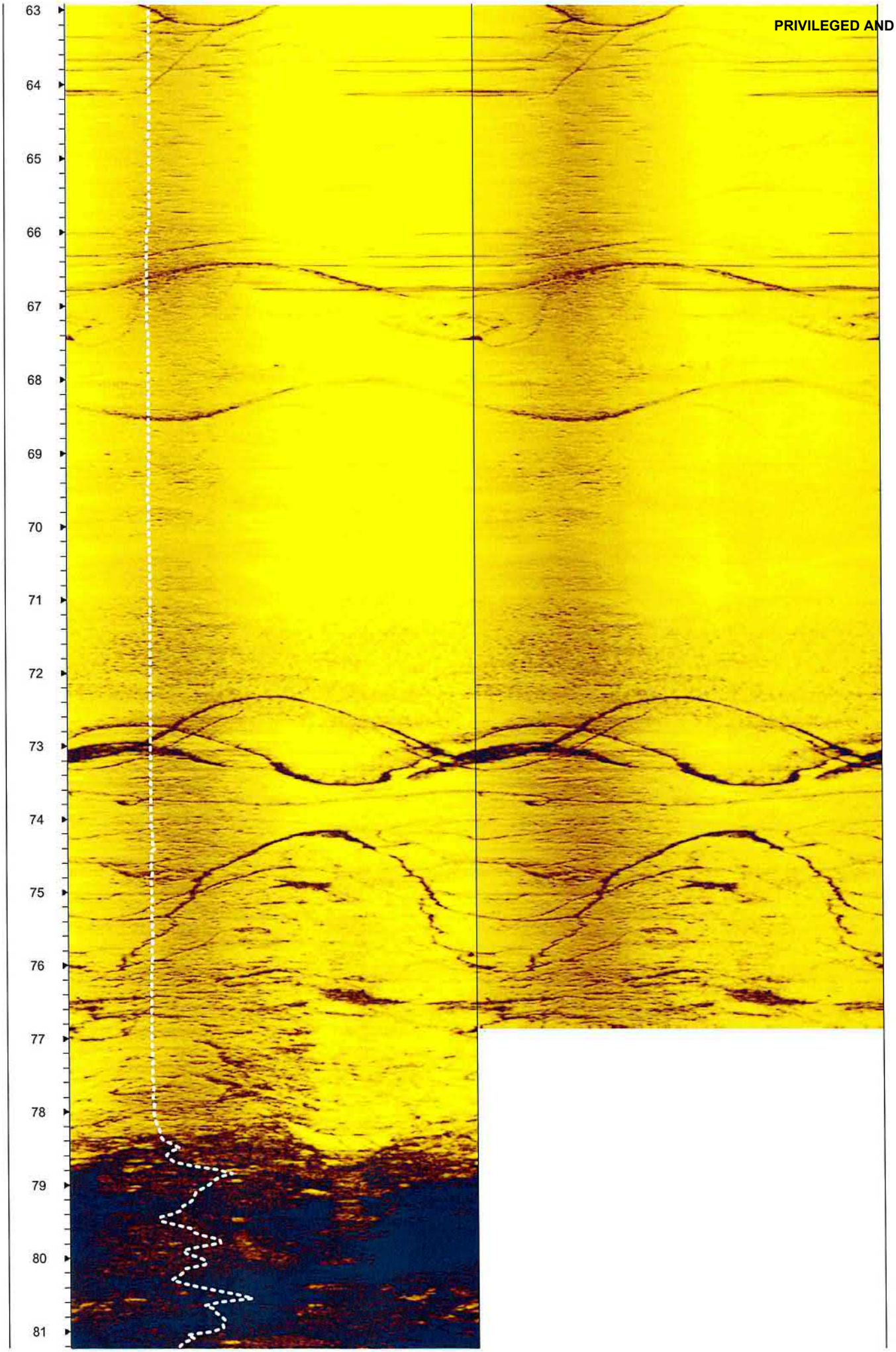
DATE	AUGUST 18, 2018	TYPE FLUID IN HOLE	
RUN No	RUNS 1 through 4	SALINITY	na
TYPE LOG	CALIPER AND BHTV (3)	DENSITY	
DEPTH-DRILLER	100	LEVEL	10
DEPTH-LOGGER	98.45	MAX. REC. TEMP.	na
BTM LOGGED INTERVAL	98.5		
TOP LOGGED INTERVAL	BHTV 18.06' BGS		
OPERATING RIG TIME	3		
RECORDED BY	W HENRICH		
WITNESSED BY	Tim VerdeVoorde		

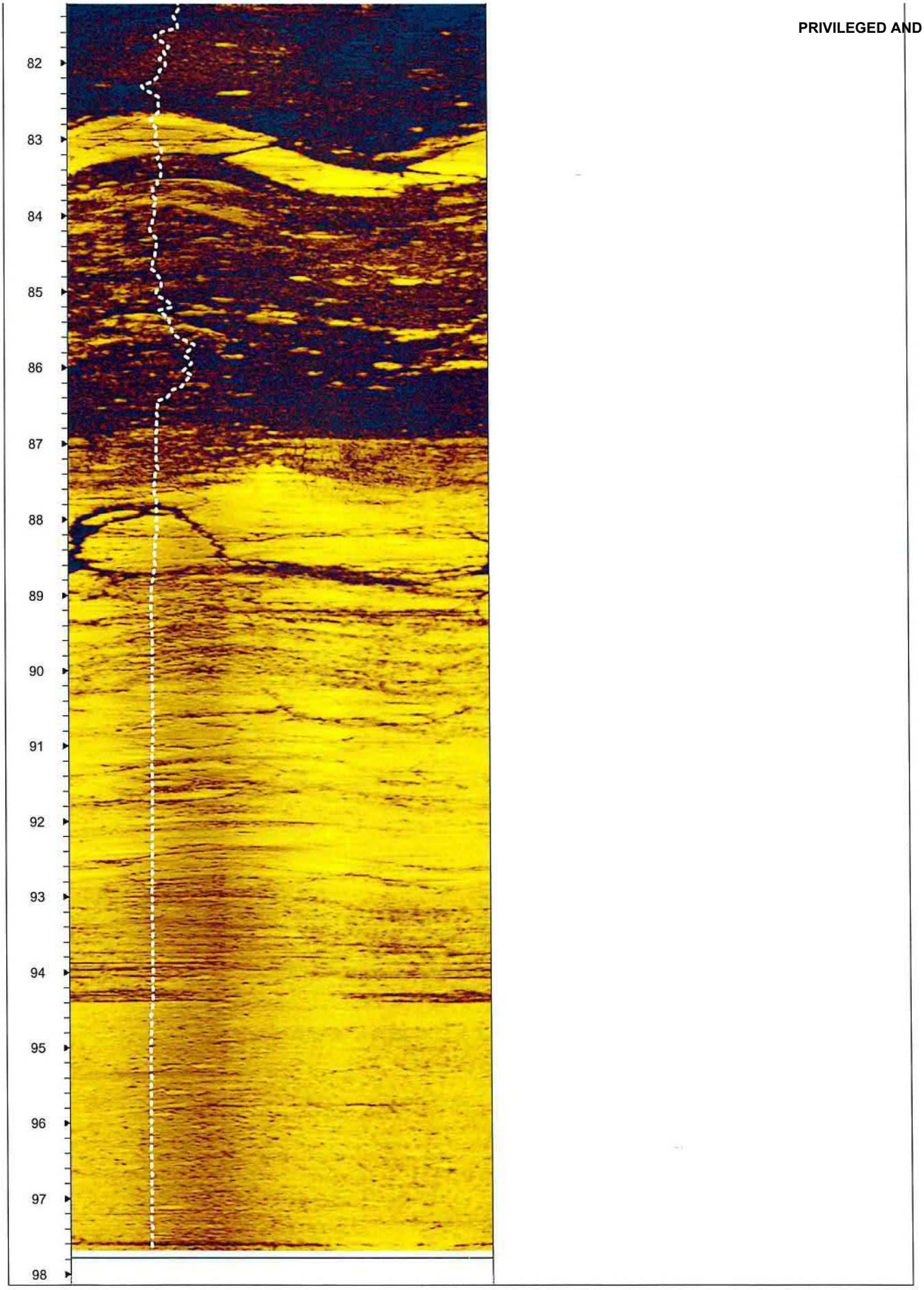
RUN	BOREHOLE RECORD			CASING RECORD			
NO.	BIT	FROM	TO	SIZE	WGT.	FROM	TO
1	4.25"	0	9 ft	4.25	Hwt	0	9
2	HQ 3.825"	9	100 ft				




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
55
56
57
58
59
60
61
62


63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81


82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98

NORCAL
GEOPHYSICAL CONSULTANTS INC.
A Terracon COMPANY

Appendix C:

Televiewer Analysis Plot
Borehole B-206

NORCAL GEOPHYSICAL CONSULTANTS INC. A Terracon COMPANY

TELEVIEWER ANALYSIS

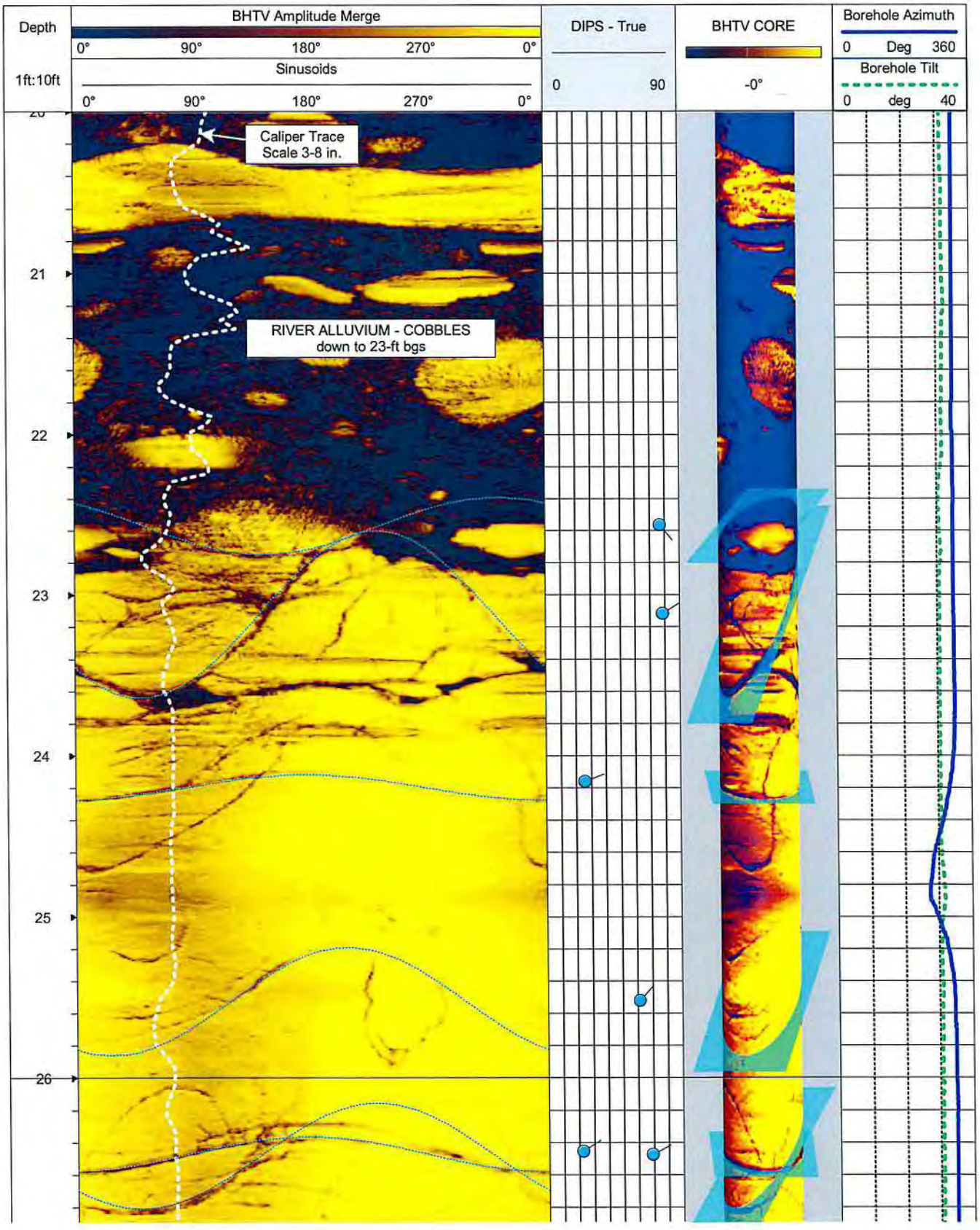
COMPANY:	AECOM	DATE:	8-16-2018
WELL ID:	B-206	CASING:	Steel to 9 ft-bgs
FIELD:	Iron Gate Reservoir	JOB NO.	NS185074
COUNTY:	Siskiyou	STATE:	CA

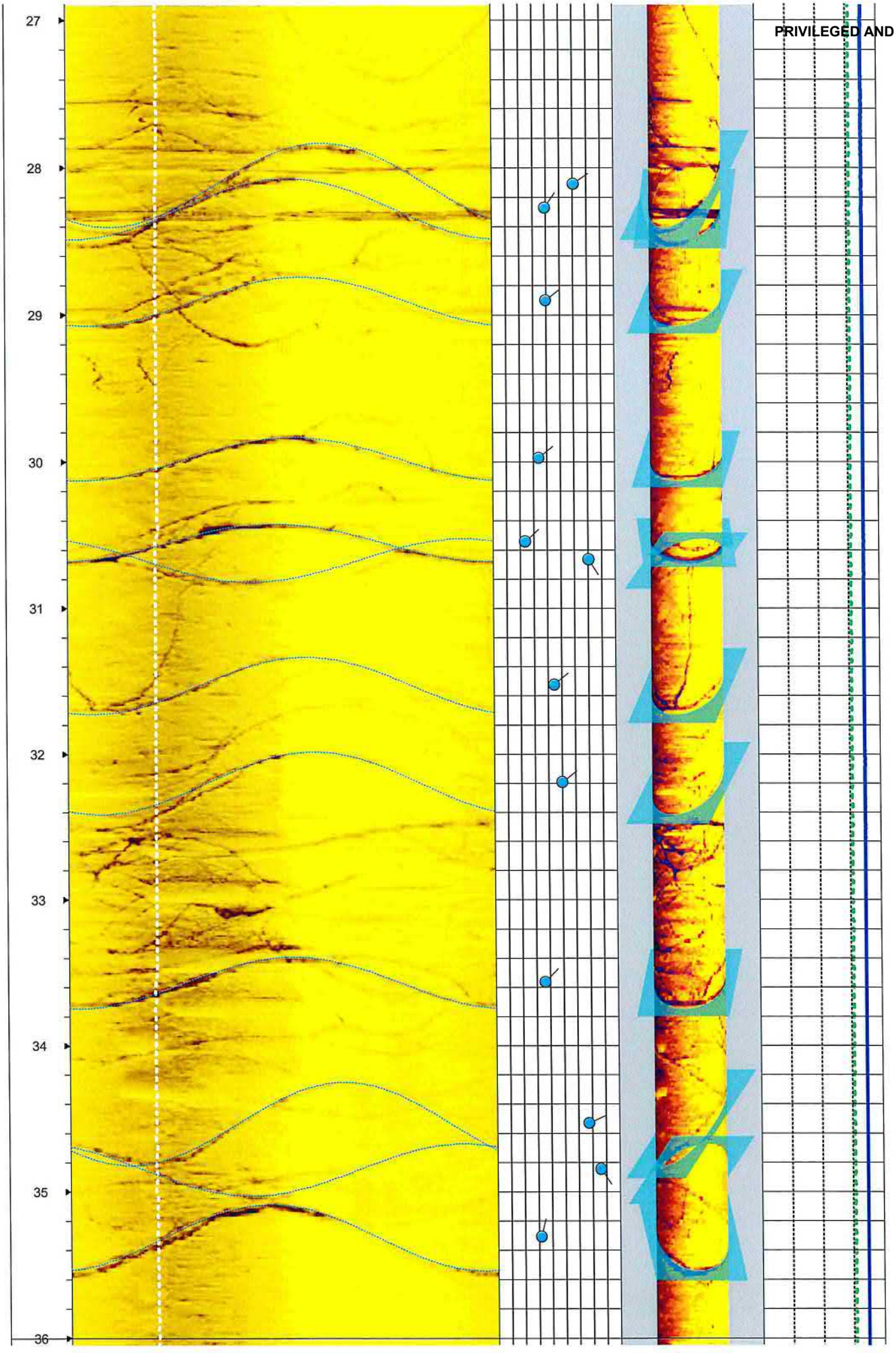
PRIVILEGED AND CONFIDENTIAL

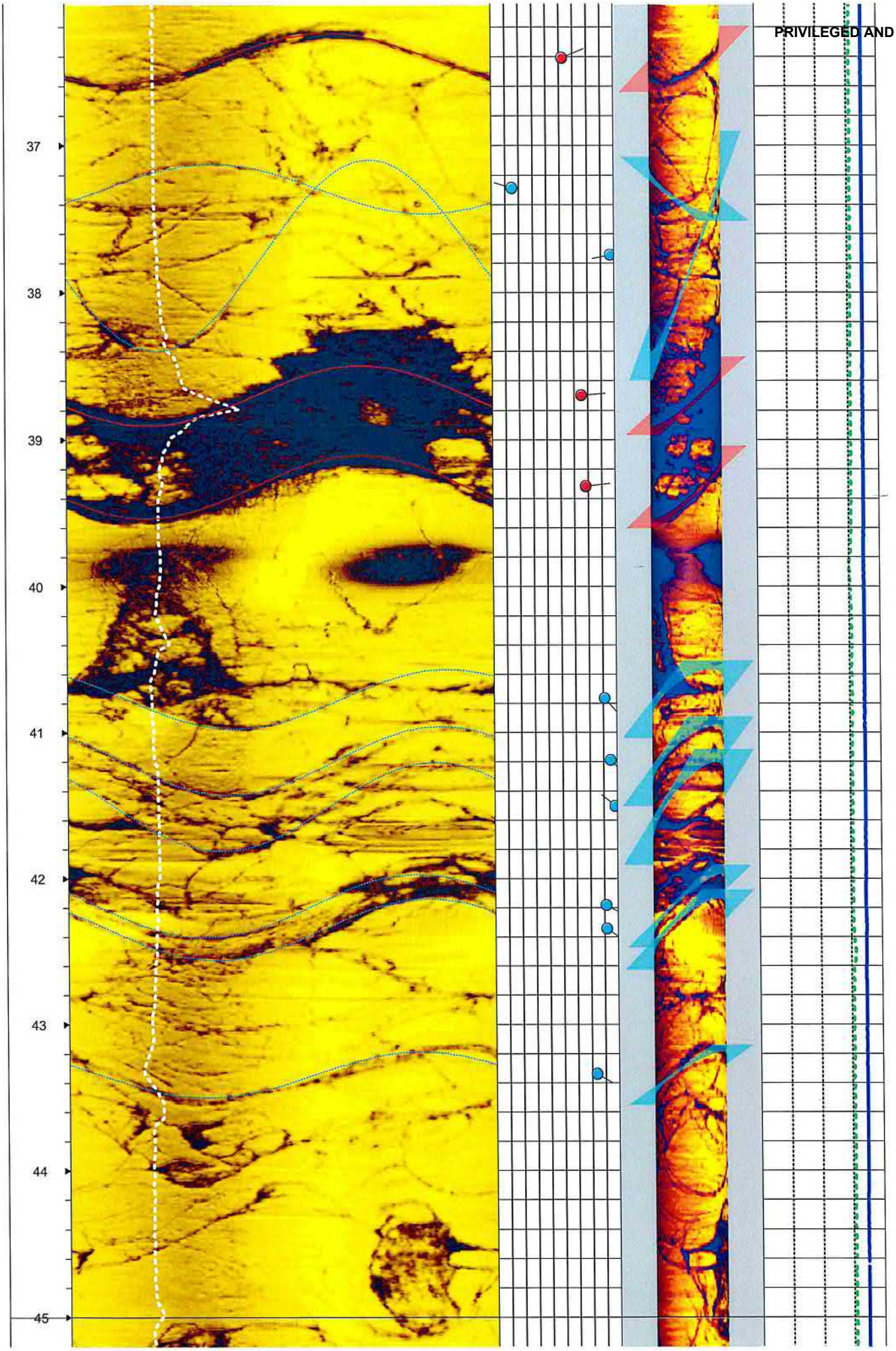
NOTES:

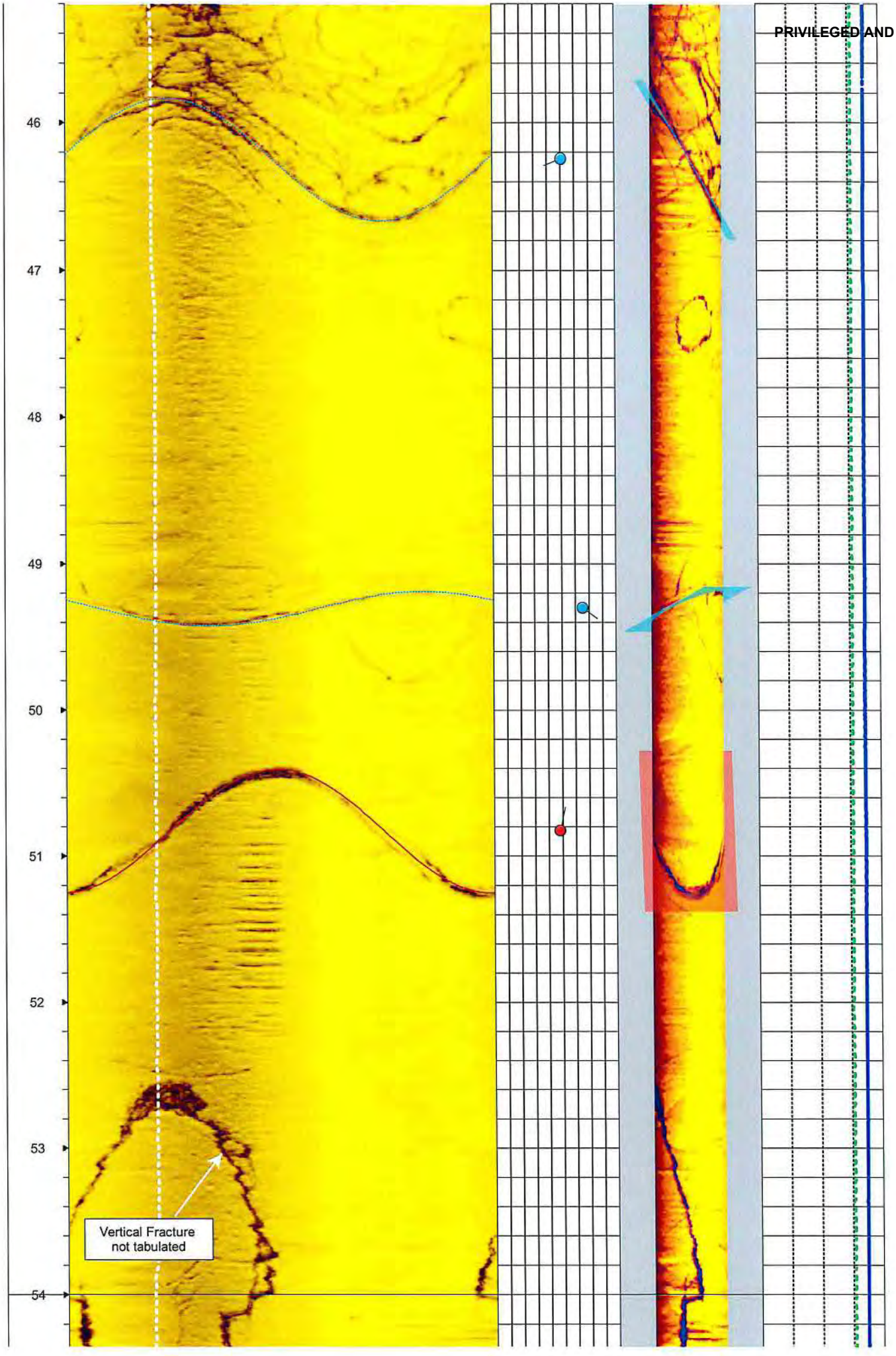
DISCONTINUITY LEGEND

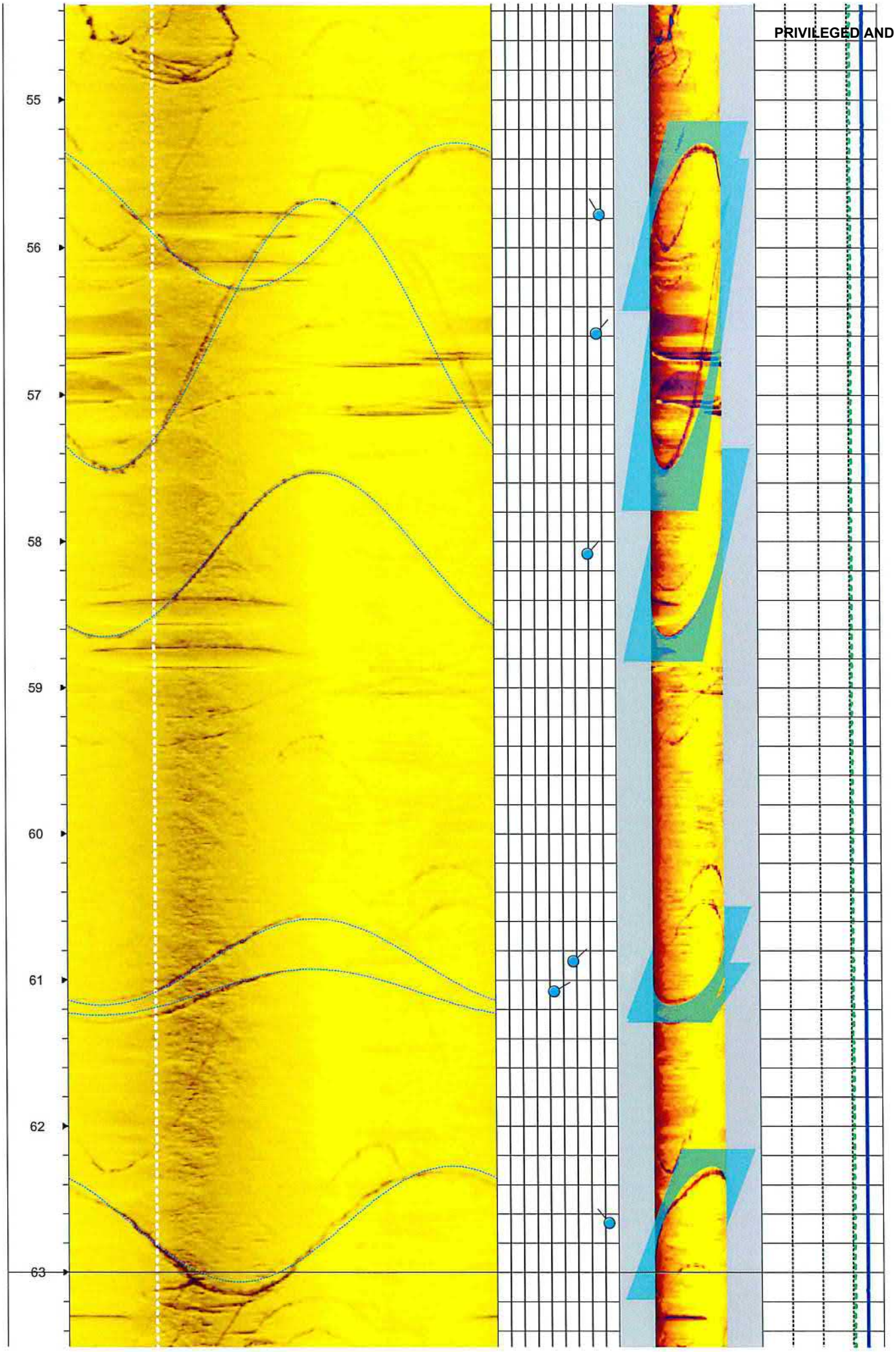
Code	Tadpole	Sine Wave	Name
1		———	Open, continuous fracture
2		- - - - -	Thin, partial to continuous fracture
3		———	Lithologic contact

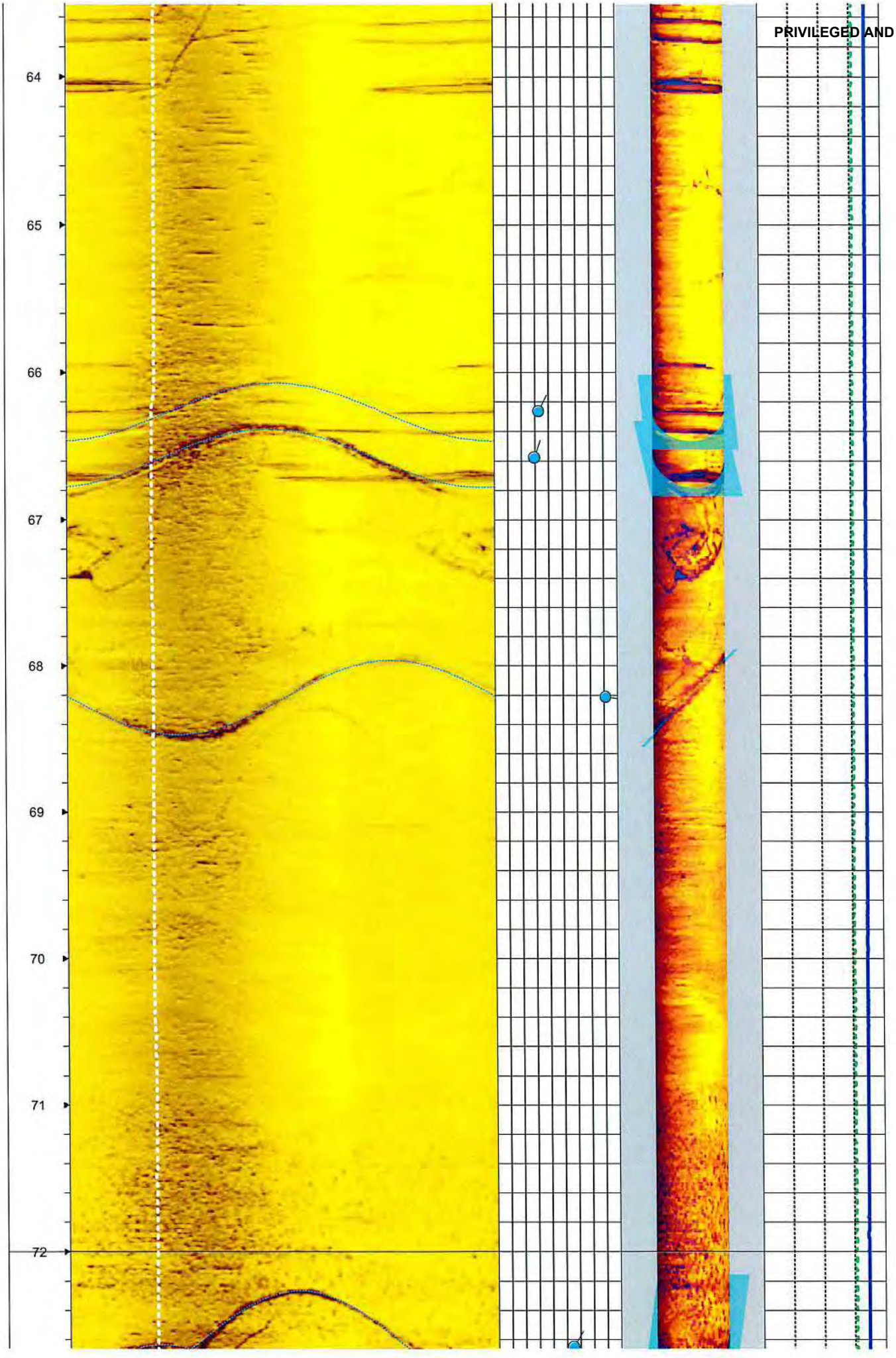


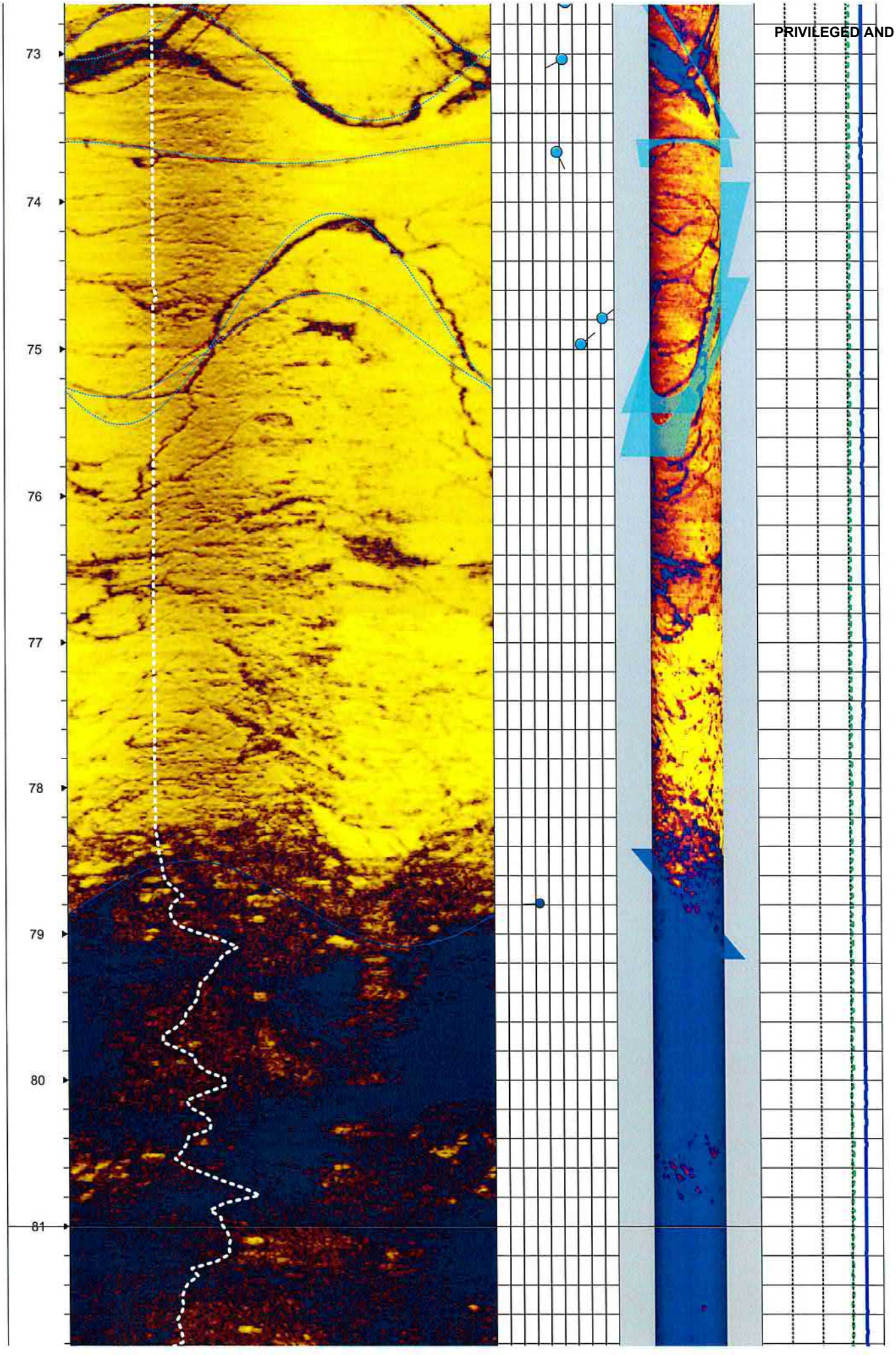

27
28
29
30
31
32
33
34
35
36

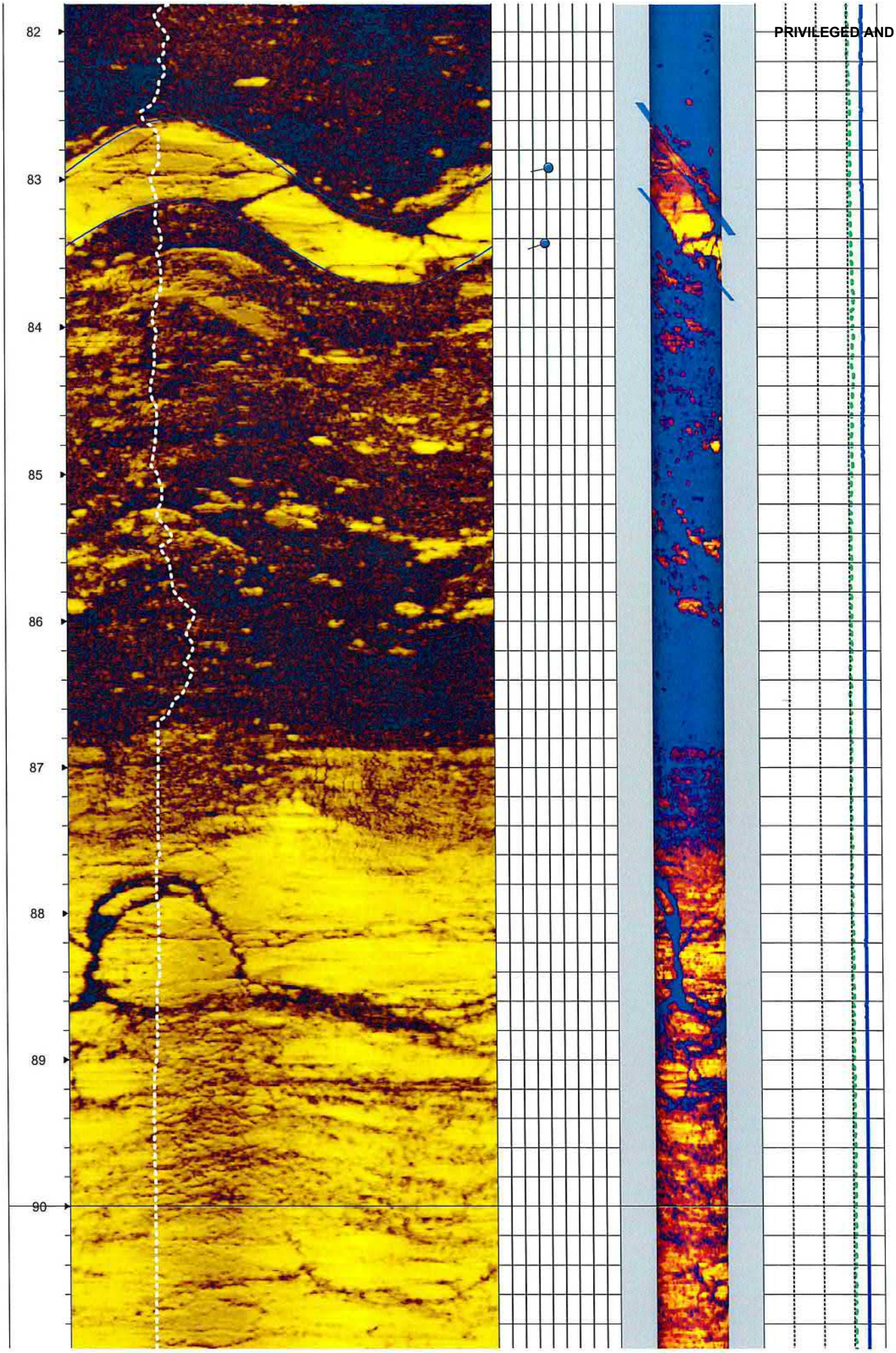

37
38
39
40
41
42
43
44
45

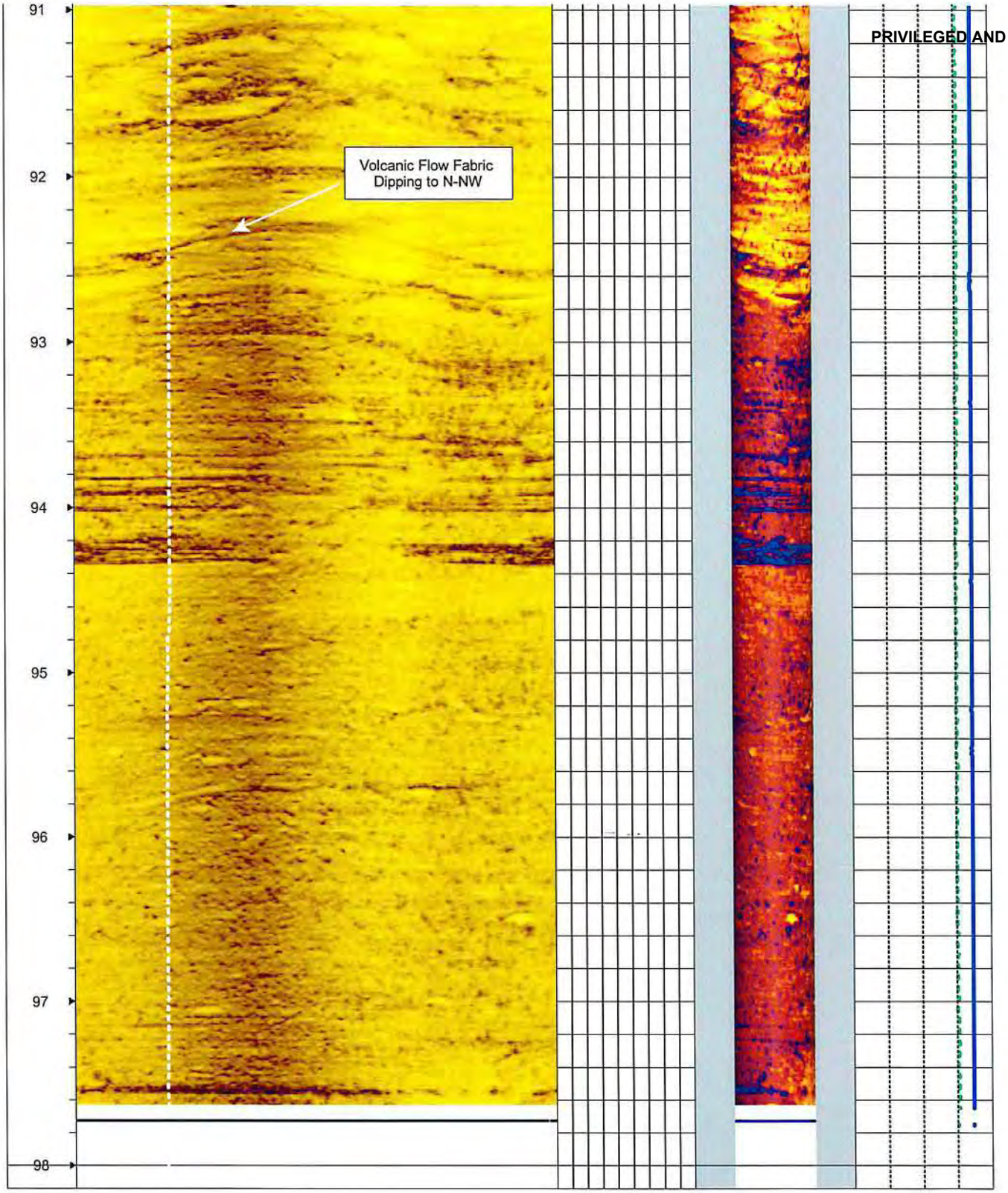

46
47
48
49
50
51
52
53
54
Vertical Fracture
not tabulated


55
56
57
58
59
60
61
62
63


64
65
66
67
68
69
70
71
72


73
74
75
76
77
78
79
80
81


82
83
84
85
86
87
88
89
90


91
92
93
94
95
96
97
98
Volcanic Flow Fabric
Dipping to N-NW

NORCAL
GEOPHYSICAL CONSULTANTS INC.
A Terracon COMPANY

Appendix D:

Discontinuity Table
Boreholes B-206

Borehole-B-206 Borehole Discontinuity Orientations from Televiewer Analysis
Klamath River Project, Siskiyou Co., CA
NORCAL JOB NO. NS185074

DISCONTINUITY LEGEND

Code	Tadpole	Sine Wave	Name
1		———	Open, continuous fracture
2		- - - - - -	Thin, partial to continuous fracture
3		———	Lithologic contact

Field work conducted in July, 2018				
Depth	Dip Azimuth	Dip Angle	Vein Thickness	Discontinuity Classification
ft	deg	deg	1/10 inches	(see Explanation)
22.57	140.32	76.75	na	2
23.12	58.29	78.68	na	2
24.16	67.97	25.98	na	2
25.52	42.73	61.45	na	2
26.46	57.25	22.54	na	2
26.48	62.09	69.06	na	2
28.11	53.72	60.46	na	2
28.27	35.86	39.18	na	2
28.9	52	39.62	na	2
29.97	51.76	33.87	na	2
30.54	46.92	23.86	na	2
30.67	148.32	70.68	na	2
31.53	49.6	44.6	na	2
32.19	52.06	49.96	na	2
33.56	43.07	36.46	na	2
34.53	65.47	67.69	na	2
34.85	146.65	76.34	na	2
35.31	13.66	32.06	na	2
36.41	68.13	52.28	na	1
37.29	286.06	15.36	na	2
37.74	258.54	87.17	na	2
38.7	85.98	65.14	0.47	1
39.32	82.73	68.45	0.34	1
40.77	138.04	81.09	na	2
41.19	134.45	85.46	na	2
41.51	309.75	88.64	na	2
42.19	118.19	81.57	na	2
42.35	126.15	81.88	na	2
43.34	120.37	73.78	na	2
46.25	249.1	50.56	na	2
49.3	124.62	65.04	na	2
50.83	11.82	48.04	na	1
55.78	328.96	79.19	na	2
56.58	41.25	76.59	na	2
58.08	41.73	69.34	na	2

60.87	46.4	57.42	na	2
61.08	59.22	43.18	na	2
62.66	321.44	82.92	na	2
66.26	26.68	32.79	na	2
66.58	18.98	29.74	na	2
68.21	99.31	81.31	na	2
72.65	29.26	54.98	na	2
73.03	242.35	52.54	na	2
73.66	155.6	48.28	na	2
74.79	53.08	81.3	na	2
74.97	50.2	65.09	na	2
78.79	266.85	33.13	na	3
82.92	257.8	41.65	na	3
83.43	251.52	38.95	na	3

Note: "na" = true thickness of discontinuty aperture not determined

APPENDIX D

Definite Plan Laboratory Test Data

Appendix D1 Lab Testing Summary Tables
Appendix D2 Soil Lab Testing Results
Appendix D3 Rock Lab Testing Results

DRAFT

APPENDIX D1

Lab Testing Summary Tables

(Pages D1-1 to D1-10)

DRAFT

Knight Piésold CONSULTING

TABLE D1.1

KIEWIT INFRASTRUCTURE WEST CO.
KLAMATH RIVER RENEWAL PROJECT

GEOTECHNICAL DATA SUMMARY
DEFINITE PLAN SOIL INDEX LABORATORY TESTING

Print Jul/20/20 17:10:32

Drillhole/ Test Pit ID[1,2]	Sample ID	Material[3]	Sample Typle	Depth From (ft)	Depth To (ft)	Moisture Content (%)	Bulk Density (pcf)	Dry Density (pcf)	Particle Size Distribution					Atterberg Limits			USCS Group	Description
									Cobbles	Gravel	Sand	Silt	Clay	LL	PL	PI		
									%	%	%	%	%					
B-02	S-01	Alluvium	SPT	27.00	27.50	14.4			0.0	32.0	53.0	15.0						Gravelly SAND, some clay/silt
B-04	S-01	Fill	ModCal	5.00	6.50	12.7	129.0	114.5										
B-05	S-01	Fill	ModCal	5.00	6.50				0.0	7.0	25.0	68.0						Sandy CLAY/SILT, trace gravel
B-05	S-02	Alluvium	SPT	7.50	9.00	4.5												
B-06	S-02	Alluvium	ModCal	10.00	11.50	50.8	95.3	63.2	0.0	0.0	75.0	25.0						Clayey/silty SAND
B-06	S-03	Alluvium	ModCal	15.00	16.50	28.6												
B-06	S-04	Alluvium	ModCal	30.00	31.50	13.5	134.2	118.2	0.0	53.0	22.0	25.0						Clayey/silty, sandy GRAVEL
B-06	S-05	Alluvium	ModCal	40.00	41.50	3.9												
B-06	S-06	Alluvium	ModCal	45.00	46.50	6.1			0.0	93.0	6.9	0.2						GRAVEL, trace sand
B-07	S-02	Alluvium	SPT	16.50	18.00	49.1			0.0	4.0	55.0	41.0						CLAY/SILT and SAND, trace gravel
B-08	S-01	Fill	SPT	13.00	14.50	24.9								69	22	47	CH	
B-08	S-02	Fill	Cal	16.00	17.50	66.5			0.0	8.0	12.0	50.0	30.0					Clayey SILT, some sand, trace gravel
B-08	S-03	Fill	Cal	20.00	21.50	31.0												
B-08	S-04	Alluvium	SPT	25.00	25.50	10.5												
B-10	S-02	Fill	SPT	25.50	27.00	8.3												
B-14	S-01	Alluvium	ModCal	6.40	7.90				0.0	1.0	29.0	35.0	35.0	62	22	40	CH	Sandy CLAY and SILT
B-15	S-01	Fill	ModCal	5.00	5.50	23.7	114.1	92.3	0.0	42.4	27.0	30.6						Clayey/silty, sandy GRAVEL
B-19	S-01	Fill	ModCal	5.00	6.50	22.0	115.1	94.4	0.0	0.0	30.0	45.0	25.0					Clayey, sandy SILT
B-19	S-02	Fill	ModCal	10.00	11.50									54	22	32	CH	
B-19	S-03	Fill	ModCal	15.00	16.50	23.3			0.0	6.0	42.0	52.0						CLAY/SILT and SAND, trace gravel
B-19	S-04	Alluvium	ModCal	20.00	21.50	22.8			0.0	40.0	34.0	26.0						Clayey/silty SAND and GRAVEL
B-20	S-01	Fill	ModCal	5.00	6.50									87	24	63	CH	
B-20	S-02	Fill	ModCal	10.00	11.50				0.0	3.0	33.0	35.0	29.0					Clayey SILT and SAND, trace gravel
B-20	S-03	Fill	ModCal	15.00	16.50	35.7												
B-20	S-04	Alluvium	ModCal	20.00	21.50	23.0			0.0	14.0	42.0	44.0						CLAY/SILT and SAND, some gravel
B-20	S-05	Alluvium	ModCal	25.00	26.50	18.0												
B-201	S-01	Alluvium	ModCal	5.00	6.50	20.1			2.0	6.0	42.0	50.0		52	23	29	CH	CLAY/SILT and SAND, trace gravel
B-201	S-03	Alluvium	SPT	15.00	16.50	19.4			0.0	0.0	14.0	49.0	37.0	64	26	38	CH	CLAY and SILT, some sand
B-205	S-01	Colluvium	ModCal	10.00	11.50	15.1			0.0	40.0	25.0	35.0		61	22	39	GC	Sandy CLAY/SILT and GRAVEL
BC-01	S-02	Lacustrine	ModCal	6.50	8.00	43.1								33	25	8		
BC-01	S-03	Diatomite	ModCal	11.50	13.00	98.6	91.0	45.8										
BC-01	S-04	Diatomite	ModCal	21.50	23.00	92.9			0.0	0.0	1.0	56.2	42.8	85	51	34	MH	CLAY and SILT, trace sand
BC-02	S-01	Diatomite	ModCal	0.00	2.00				0.0	52.0	20.3	27.7						Clayey/silty, sandy GRAVEL
BC-02	S-05	Diatomite	ModCal	14.50	16.00	83.7			0.0	0.0	0.7	52.5	46.9	105	59	46	MH	CLAY and SILT, trace sand
BC-02	S-06	Diatomite	Shelby	19.50	21.80	147.5		31.6										
BC-02	S-08	Diatomite	Shelby	34.50	37.00	148.8		32.7										
BC-02	S-09	Diatomite	ModCal	44.50	46.00	177.8			0.0	0.0	0.5	67.9	31.7	187	85	102	MH	Clayey SILT
BC-02	S-10	Diatomite	ModCal	54.80	55.30	170.6	80.3	29.7										
BC-03	S-01	Colluvium	ModCal	1.00	3.00	34.7			0.0	3.2	30.2	66.6		48	25	23	CL	Sandy CLAY/SILT, trace gravel
BC-03	S-02	Colluvium	ModCal	5.50	6.00	25.4	125.2	99.9										
BC-03	S-05	Diatomite	ModCal	24.50	26.00	80.3			0.0	0.0	0.0	72.3	27.7	69	59	10	MH	Clayey SILT
BC-03	S-10	Diatomite	Shelby	90.00	92.00	119.8		35.8										
BC-04	S-01	Lacustrine	ModCal	1.50	5.00				0.0	4.3	51.4	44.3						CLAY/SILT and SAND, trace gravel
BC-04	S-02	Lacustrine	ModCal	7.00	9.00				0.0	3.2	39.3	57.5						CLAY/SILT and SAND, trace gravel
BC-04	S-03	Diatomite	ModCal	11.00	12.50				0.0	9.4	50.1	40.5						CLAY/SILT and SAND, trace gravel
BC-04	S-05	Diatomite	Shelby	17.50	20.00	104.7		42.1										
BC-04	S-06	Diatomite	Shelby	22.50	25.00	154.6		31.7										
BC-04	S-08	Diatomite	Shelby	32.50	35.00	117.2		36.9	0.0	0.0	0.9	38.5	60.7	120	85	35	MH	CLAY and SILT, trace sand
BC-04	S-10	Diatomite	Shelby	52.00	55.00	160.5		30.5										
BC-07	S-02	Colluvium	ModCal	4.00	4.50	34.1	117.5	87.6	0.0	15.2	20.3	64.5		60	24	36	CH	Sandy CLAY/SILT, some gravel
BC-07	S-04	Colluvium	ModCal	13.00	14.50				0.0	26.7	65.3	8.0						Gravelly SAND, trace clay/silt
BC-08	S-01	Colluvium	ModCal	3.00	4.50	31.4								56	24	32		
BC-08A	S-05	Diatomite	ModCal	54.00	55.50	178.6			0.0	0.0	1.0	75.9	23.1	200	88	112	MH	Clayey SILT, trace sand
BC-09	S-05	Diatomite	Shelby	23.00	24.50	76.3		54.0	0.0	0.0	0.3	78.3	21.4	74	53	21	MH	Clayey SILT, trace sand
BC-09	S-09	Diatomite	Shelby	68.00	70.50	88.4		48.6										
BC-10	S-01	Fluvio-Lacustrine	ModCal	9.50	11.00	21.9		77.6	0.0	84.8	14.5	0.7						GRAVEL, some sand
BC-13	S-02	Diatomite	Shelby	12.00	13.50	23.3		59.6										
BC-13	S-03	Diatomite	Shelby	17.00	18.50	30.1	78.8	60.6										
BC-13	S-04	Diatomite	Shelby	22.00	24.30	59.1	74.4	46.8										
BC-13	S-05	Diatomite	Shelby	30.50	32.50	72.2	39.4	60.3										
BC-13	S-06	Colluvium	Shelby	40.00	41.50	20.8	119.9	99.0										
BC-14	S-01	Diatomite	Shelby	5.00	6.20	23.3		59.7										
BC-14	S-03	Diatomite	Shelby	9.00	10.50	45.1		54.7										
BC-14	S-04	Diatomite	Shelby	12.00	13.20	24.2		63.5										
BI-02	S-01	Alluvium	ModCal	5.00	6.50	27.8			0.0	10.9	20.8	27.7	40.6	78	28	50	CH	Silty, sandy CLAY, some gravel
BI-02	S-02	Alluvium	ModCal	10.00	11.50	28.7			0.0	4.5	33.0	34.4	28.1	58	28	30	CH	Clayey, sandy SILT, trace gravel
BI-02	S-03	Alluvium	ModCal	15.50	16.50	38.4			0.0	7.6	39.5	31.1	21.8	51	27	24	CH	Clayey, silty SAND, trace gravel
BI-03	S-01	Alluvium	ModCal	3.50	3.50	12.0			0.0	61.4	29.6	9.0		41	26	15	GP-GM	Sandy GRAVEL, trace clay/silt

M:\1\03\00640\01\A\Report\2 - Geotechnical Data Report\Rev C\Appendices\[Appendix Tables_rC.xlsx]D1.1 Soil Index

NOTES:

1. DRILLHOLE SAMPLES WERE COLLECTED BY AECOM AND TESTED AT COOPER TESTING LABORATORY IN PALTO ALTO, CA AND INSPECTION SERVICES INC. IN BERKELEY, CA.
2. DRILLHOLE SOIL MATERIAL INTERPRETATION BY AECOM AS PRESENTED IN THE BOREHOLE LOGS PROVIDED IN THE GDR (KRRC, 2019).

C	20JUL'20	ISSUED WITH REPORT VA103-640/01-2	CYP	SY
REV	DATE	DESCRIPTION	PREP'D	RVW'D

Knight Piésold CONSULTING

TABLE D1.2

KIEWIT INFRASTRUCTURE WEST CO.
KLAMATH RIVER RENEWAL PROJECT

GEOTECHNICAL DATA SUMMARY
DEFINITE PLAN SOIL STRENGTH LABORATORY TESTING

Drillhole ID	Sample ID	Material	Sample Typle	Depth From (ft)	Depth To (ft)	Consolidated Undrained Triaxial				Unconsolidated Undrained Triaxial			
						σ_1 (ksf)	σ_3 (ksf)	p (ksf)	q (ksf)	σ_1 (ksf)	σ_3 (ksf)	p (ksf)	q (ksf)
BC-02	S-06	Diatomite	Shelby	19.50	21.80	1.97	0.25	1.11	0.86				
BC-02	S-08	Diatomite	Shelby	34.50	37.00	4.37	0.54	2.45	1.92				
BC-03	S-06	Diatomite	Shelby	39.50	42.00	4.78	0.81	2.79	1.98				
						4.39	0.78	2.58	1.80				
BC-03	S-10	Diatomite	Shelby	90.00	92.00	5.79	0.78	3.28	2.51				
BC-04	S-04	Diatomite	Shelby	12.50	14.50	16.87	1.74	9.31	7.57				
						11.08	1.59	6.34	4.74				
BC-04	S-05	Diatomite	Shelby	17.50	20.00	6.45	0.77	3.61	2.84				
BC-04	S-06	Diatomite	Shelby	22.50	25.00	3.51	0.36	1.93	1.58				
BC-04	S-08	Diatomite	Shelby	32.50	35.00	4.39	0.39	2.39	2.00				
BC-04	S-10	Diatomite	Shelby	52.00	55.00	3.78	0.52	2.15	1.63	4.97	1.53	3.25	1.72
BC-05	S-04	Diatomite	Shelby	14.50	16.70	2.90	0.17	1.54	1.36				
						2.43	0.53	1.48	0.95				
BC-09	S-05	Diatomite	Shelby	23.00	24.50	4.0	0.6	2.3	1.7	4.03	0.91	2.47	1.56
BC-09	S-09	Diatomite	Shelby	68.00	70.50	4.9	0.7	2.8	2.1				
						5.1	0.7	2.9	2.2				
BC-13	S-01	Diatomite	Shelby	7.00	8.00					1.85	0.55	1.20	0.65
BC-13	S-02	Diatomite	Shelby	12.00	13.50	4.2	0.8	2.5	1.7				
BC-13	S-04	Diatomite	Shelby	22.00	24.30					4.91	1.76	3.33	1.57
										16.40	1.90	9.15	7.25
BC-13	S-05	Diatomite	Shelby	30.50	32.50					5.46	2.35	3.91	1.56
BC-14	S-01	Diatomite	Shelby	5.00	6.20	3.3	0.7	2.0	1.3				
BC-14	S-02	Diatomite	Shelby	7.00	8.50					6.80	0.60	3.70	3.10
BC-14	S-03	Diatomite	Shelby	9.00	10.50					4.69	0.71	2.70	1.99
BC-14	S-04	Diatomite	Shelby	12.00	13.20	4.3	1.0	2.6	1.6				
Outcrop #1	-	Diatomite	Block	-	-	1.7	0.1	0.9	0.8				
						4.3	0.7	2.5	1.8				
						5.5	1.5	3.5	2.0				

M:\1\03\00640\01\A\Report\2 - Geotechnical Data Report\Rev C\Appendices\[Appendix Tables_rC.xlsx]D1.2 Soil Strength

NOTES:

1. SAMPLES COLLECTED BY AECOM AND TESTED AT COOPER TESTING LABORATORY IN PALTO ALTO, CA AND INSPECTION SERVICES INC. IN BERKELEY, CA.
2. SOIL MATERIAL INTERPRETATION BY AECOM AS PRESENTED IN THE BOREHOLE LOGS PROVIDED IN THE GDR (KRRC, 2019).

REV	DATE	DESCRIPTION	PREP'D	RVW'D
C	20JUL'20	ISSUED WITH REPORT VA103-640/01-2	CYP	SY

Knight Piésold CONSULTING

TABLE D1.3

KIEWIT INFRASTRUCTURE WEST CO.
KLAMATH RIVER RENEWAL PROJECT

GEOTECHNICAL DATA SUMMARY
DEFINITE PLAN CORROSIVITY TESTING

Print Jul/20/20 17:10:32

Drillhole ID	Sample ID	Depth From (ft)	Depth To (ft)	pH	Min. Resistivity (ohms-cm)	Chloride (mg/kg)	Sulfate (mg/kg)	Description Based on Resistivity
B-06	S-01	5.0	6.5	8.97	840	N.D	N.D	corrosive
B-19	S-01, S-02	5.0	11.5	7.97	980	N.D	26.00	corrosive
B-20	S-01, S-02	5.0	11.5	7.84	470	N.D	N.D	severely corrosive

M:\1\03\00640\01\A\Report\2 - Geotechnical Data Report\Rev C\Appendices\[Appendix Tables_rC.xlsx]D1.3 Corr.

NOTES:

1. SAMPLES COLLECTED BY AECOM AND TESTED AT CERCO ANALYTICAL IN CONCORD, CA.

REV	DATE	DESCRIPTION	PREP'D	RVW'D
C	20JUL'20	ISSUED WITH REPORT VA103-640/01-2	CYP	SY

Knight Piésold CONSULTING

TABLE D1.4

KIEWIT INFRASTRUCTURE WEST CO.
KLAMATH RIVER RENEWAL PROJECT

GEOTECHNICAL DATA SUMMARY
DEFINITE PLAN BEDROCK LABORATORY TESTING (1 OF 2)

Print Jul/20/20 17:31:51

Drillhole ID	Material	Depth From (ft)	Depth To (ft)	Moisture Content (%)	Bulk Density (pcf)	UCS (psi)	Young's Modulus, E (psi)	Brazilian Tensile Strength (psi)	Point Load Index Strength	
									Is (psi)	Is50 (psi)
B-01	Vol. Breccia	15.60	16.00	9.3					8	8
B-01	Vol. Breccia	17.20	17.50	5.1					7	7
									17	18
									18	17
									18	16
B-04	Basalt	26.20	26.50	10.5					5	5
B-05	Boulder (Basalt)	19.60	20.20	0.7	160.2	14975	4.45E+06			
B-05	Boulder (Basalt)	26.20	26.90	0.8					1165	1235
									1234	1308
									1065	1139
									858	913
									1218	1194
									1057	1093
B-05	Boulder (Basalt)	36.90	37.30	0.3					1430	1528
									1408	1499
									1060	1007
									1088	1083
B-05	Boulder (Basalt)	46.10	46.80	0.4					1040	1112
									1464	1565
									1184	1271
									1052	1124
									1208	1226
									1432	1382
B-07	Vol. Sandstone	29.30	29.60	7.7					10	10
B-08	Vol. Conglomerate	37.10	37.60	9.2					29	31
									20	21
									14	15
B-08	Vol. Conglomerate	38.60	38.90	6.1					47	50
B-08	Vol. Sandstone	46.10	47.00	1.8	162.2	15268	3.30E+06			
B-08	Vol. Sandstone	50.20	50.60	3.7					139	150
B-10	Vol. Conglomerate	30.40	30.70	3.1					412	441
B-10	Vol. Conglomerate	33.40	33.70	11.6					16	17
									5	5
B-10	Vol. Conglomerate	37.10	37.40	11.7					18	20
									23	24
									13	13
									21	20

Drillhole ID	Material	Depth From (ft)	Depth To (ft)	Moisture Content (%)	Bulk Density (pcf)	UCS (psi)	Young's Modulus, E (psi)	Brazilian Tensile Strength (psi)	Point Load Index Strength	
									Is (psi)	Is50 (psi)
B-10	Vol. Conglomerate	49.00	49.50	6.8					87	93
									131	127
B-13	Basalt	11.90	12.40	0.1					525	567
									865	929
									701	758
									697	749
									818	836
B-13	Basalt	17.60	18.50	0.9	141.3	6528	1.63E+06			
B-14	Andesite	14.20	14.90	7.7					9	9
									8	9
									7	8
									2	2
									2	2
									3	3
B-14	Andesite	20.80	21.20	5.6					13	13
B-14	Andesite	23.70	23.90	6.0					1	2
B-14	Andesite	26.10	26.40	2.8					69	74
									87	95
B-15	Vol. Breccia	33.00	33.50	4.5					30	32
									36	38
									44	48
									65	69
									51	53
									7	7
B-15	Vol. Breccia	43.10	43.60	4.8					48	51
									66	70
									50	53
									85	83
									81	80
									54	52
B-15	Vol. Breccia	46.50	47.10	5.8	144.2	1546	2.21E+05			
B-17	Vol. Breccia	17.90	18.60	5.9	142.9	2130	2.25E+05			
B-17	Vol. Breccia	25.10	25.70	5.5					24	26
									31	34
									17	18
									76	75
									102	105
									100	97
B-17	Vol. Breccia	40.00	41.50	3.9	145.6	2985	5.36E+05			
B-19	Vol. Siltstone	31.30	32.20	8.7					24	25
B-20	Basalt	40.10	40.60	3.7	164	343	3.89E+05			
B-20	Basalt	45.30	46.30	3.4	166	7517	4.33E+06			
B-201	Boulder (Basalt)	25.50	26.00						1063	1148
B-201	Basalt	28.50	29.00						154	168
B-202	Vol. Breccia	56.20	57.50	12.9				24		
B-202	Vol. Breccia	70.50	71.70						23	24

Drillhole ID	Material	Depth From (ft)	Depth To (ft)	Moisture Content (%)	Bulk Density (pcf)	UCS (psi)	Young's Modulus, E (psi)	Brazilian Tensile Strength (psi)	Point Load Index Strength	
									Is (psi)	Is50 (psi)
B-202	Vol. Breccia	81.50	81.90						5	6
B-202	Vol. Breccia	82.00	82.80	17.1	133	614				
B-202	Vol. Breccia	82.80	83.50					37		
B-205	Vol. Conglomerate	22.70	23.60						27	29
B-206	Basalt	47.40	48.70	2.5	166	20886			691	756
B-206	Basalt	48.70	50.00					1069		
B-206	Basalt	60.00	61.70					1474		
B-206	Basalt	65.20	66.50	1.2	169	15739				
B-206	Vol. Breccia	74.60	75.00						833	911
B-207	Vol. Breccia	17.00	18.10						516	564
B-207	Vol. Breccia	74.50	75.50	5.3	151	3141				
B-208	Vol. Breccia	26.80	27.50						736	806
BI-02	Vol. Breccia	22.10	22.60						20	22
BI-02	Vol. Breccia	27.00	27.90	4.9	141	841				
BI-02	Vol. Breccia	28.20	28.70						80	87
BI-02	Vol. Breccia	32.80	33.20						104	113
BI-02	Vol. Breccia	37.40	37.90						102	110
BI-02	Vol. Breccia	42.80	43.30						81	87
BI-02	Vol. Breccia	47.00	48.90					275		
BI-02	Vol. Breccia	48.90	50.30	6.4	150	1736				80
BI-02	Vol. Breccia	52.00	54.70					206		
BI-02	Vol. Breccia	55.00	55.50						57	62
BI-02	Vol. Breccia	55.40	56.30	5.8	148	2288				
BI-02	Vol. Breccia	64.20	64.70						152	158
BI-03	Vol. Breccia	10.30	10.80						42	46
BI-03	Vol. Breccia	17.20	17.70						23	25
BI-03	Vol. Breccia	17.40	18.40	12.5	138	221				
BI-03	Vol. Breccia	18.40	20.10					54		
BI-03	Vol. Breccia	21.30	21.80						30	33
BI-03	Vol. Breccia	21.50	22.90	10.1	135	352				
BI-03	Vol. Breccia	22.90	24.20					16		
BI-03	Vol. Breccia	29.80	30.30						29	32
BI-03	Vol. Breccia	32.70	33.20						30	33

M:\1\03\00640\01\A\Report\2 - Geotechnical Data Report\Rev C\Appendices\[Appendix Tables_rC.xlsx]D1.4 Rock Lab 1

NOTES:

1. SAMPLES COLLECTED BY AECOM.
2. SAMPLES TESTED AT COOPER TESTING LABORATORY IN PALO ALTO, CA, TONON IN AUSTIN, TX, AND THE EARTH MECHANICS INSTITUE AT THE COLORADO SCHOOL OF MINES IN GOLDEN, CO.
3. ROCK MATERIAL INTERPRETATION BY AECOM AS PRESENTED IN THE BOREHOLE LOGS PROVIDED IN THE GDR (KRRC, 2019).

REV	DATE	DESCRIPTION	PREP'D	RVW'D
C	20JUL'20	ISSUED WITH REPORT VA103-640/01-2	CYP	SY

Knight Piésold CONSULTING

TABLE D1.5

KIEWIT INFRASTRUCTURE WEST CO.
KLAMATH RIVER RENEWAL PROJECT

GEOTECHNICAL DATA SUMMARY
DEFINITE PLAN BEDROCK LABORATORY TESTING (2 OF 2)

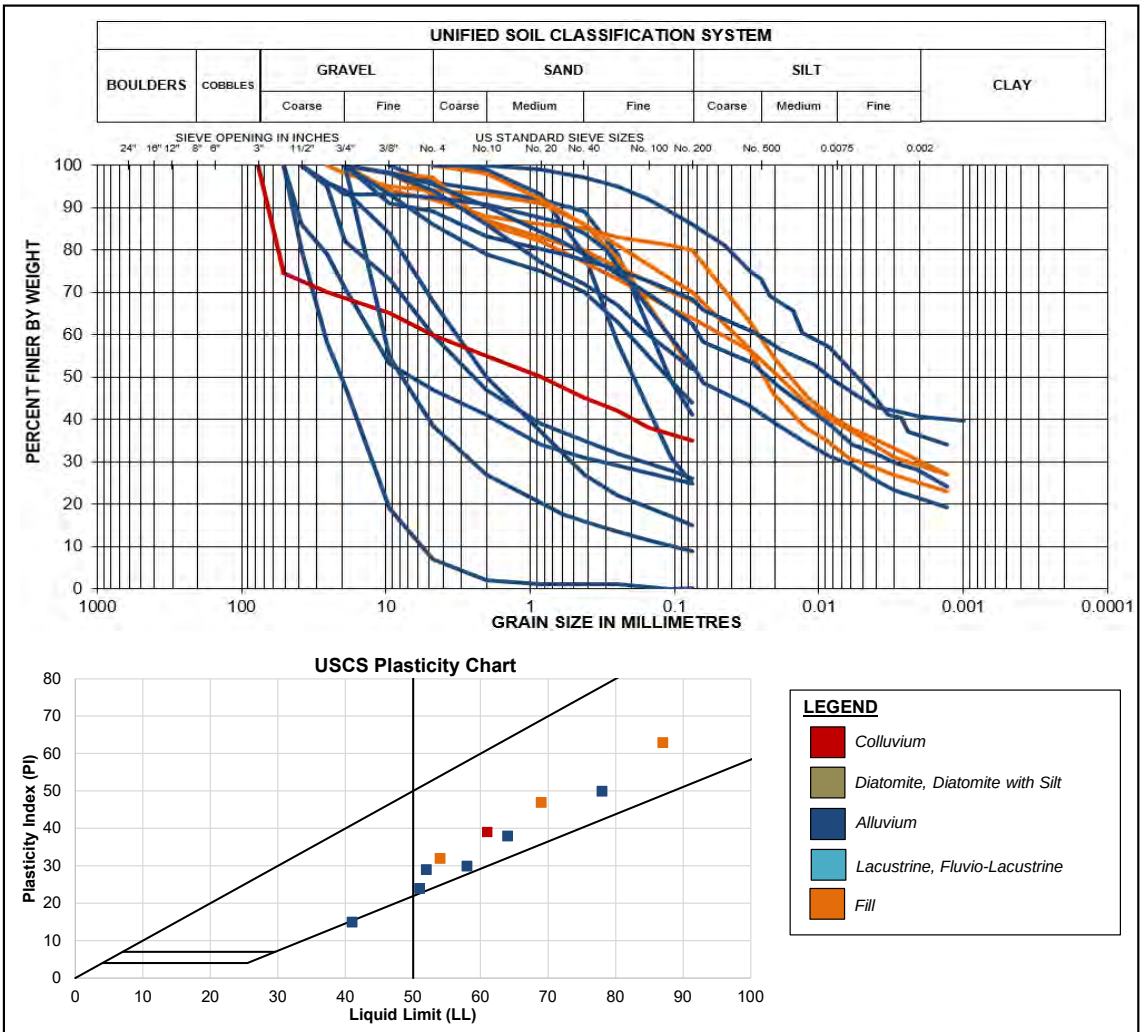
Drillhole ID	Material	Depth From (ft)	Depth To (ft)	Cerchar Abrasiveness			Mohs Hardness	Punch Penetration Peak Slope Index (kip/in)
				CAIs	CAI	Classification		
B-202	Vol. Breccia	69.80	70.50	0.60				
B-202	Vol. Breccia	70.50	71.70					9
B-206	Basalt	47.40	48.70				3 to 4	
B-206	Basalt	60.00	61.70	3.00				
B-206	Basalt	65.20	66.50				3 to 4	195
BI-02	Vol. Breccia	27.00	27.90				3	
BI-02	Vol. Breccia	48.90	50.30				3	
BI-02	Vol. Breccia	50.30	51.30					39
BI-02	Vol. Breccia	51.30	51.70	1.43	1.89	Medium Abrasiveness		
BI-02	Vol. Breccia	55.40	56.30				3	
BI-03	Vol. Breccia	17.40	18.40				3	
BI-03	Vol. Breccia	21.50	22.90				3	
BI-03	Vol. Breccia	24.20	25.10					18
BI-03	Vol. Breccia	25.10	26.10	0.81	1.28	Medium Abrasiveness		

M:\1\03\00640\01\A\Report\2 - Geotechnical Data Report\Rev C\Appendices\[Appendix Tables_rC.xlsx]D1.5 Rock 2

NOTES:

1. SAMPLES COLLECTED BY AECOM.
2. SAMPLES TESTED AT COOPER TESTING LABORATORY IN PALO ALTO, CA, TONON IN AUSTIN, TX, AND THE EARTH MECHANICS INSTITUE AT THE COLORADO SCHOOL OF MINES IN GOLDEN, CO.
3. ROCK MATERIAL INTERPRETATION BY AECOM AS PRESENTED IN THE BOREHOLE LOGS PROVIDED IN THE GDR (KRRC, 2019).

REV	DATE	DESCRIPTION	PREP'D	RVW'D
C	20JUL'20	ISSUED WITH REPORT VA103-640/01-2	CYP	SY



NOTES:

1. OVERBURDEN UNITS PROVIDED IN BOREHOLE LOGS BY AECOM (KRRC, 2019).
2. OVERBURDEN PROPERTIES SUMMARIZED FROM BOREHOLE LOGS AND LABORATORY TEST RESULTS.

REV	DATE	DESCRIPTION	PREP'D	RVW'D
C	20JUL'20	ISSUED WITH REPORT	CYP	SY

KIEWIT INFRASTRUCTURE WEST CO.

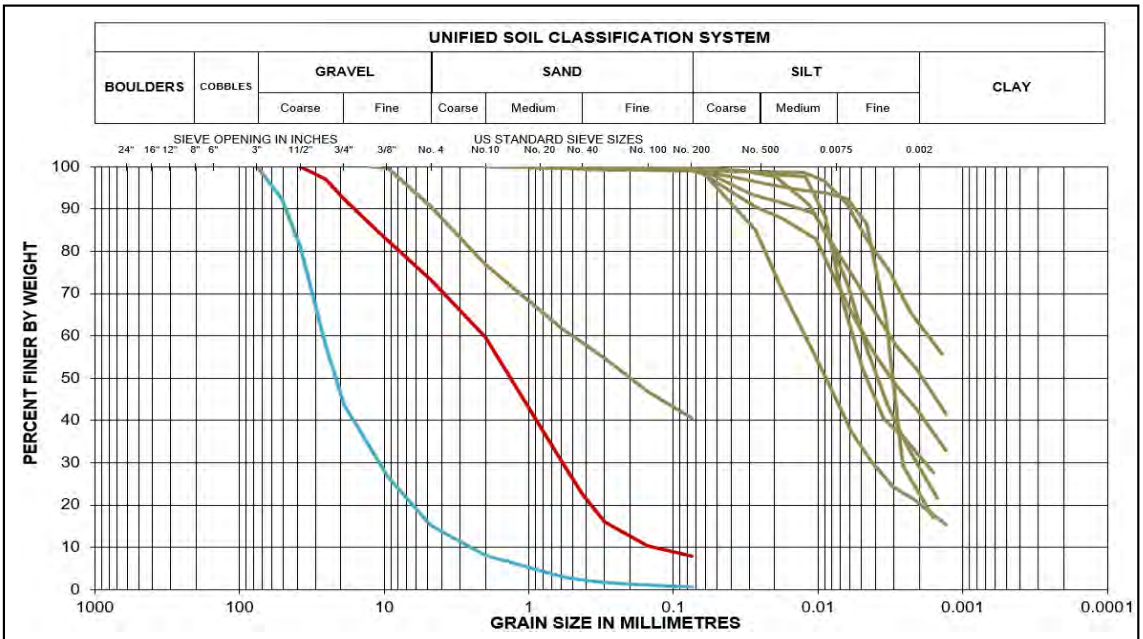
KLAMATH RIVER RENEWAL PROJECT

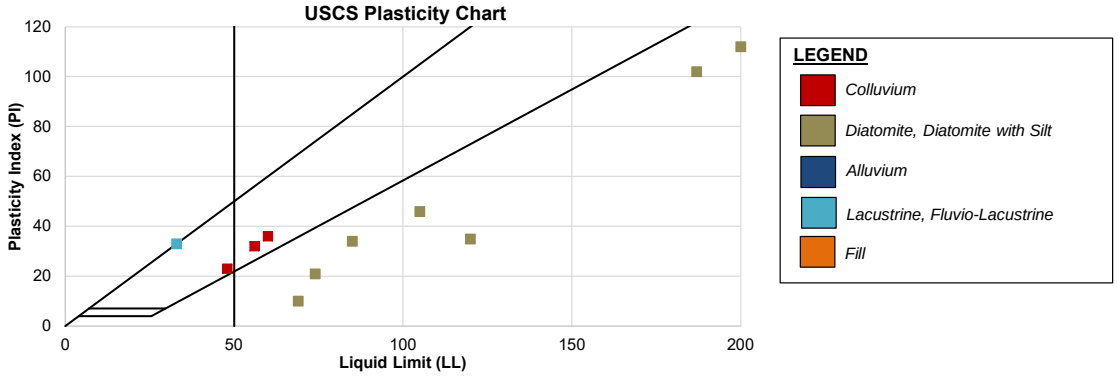
GEOTECHNICAL DATA SUMMARY
IRON GATE AREA
OVERBURDEN INDEX PROPERTIES

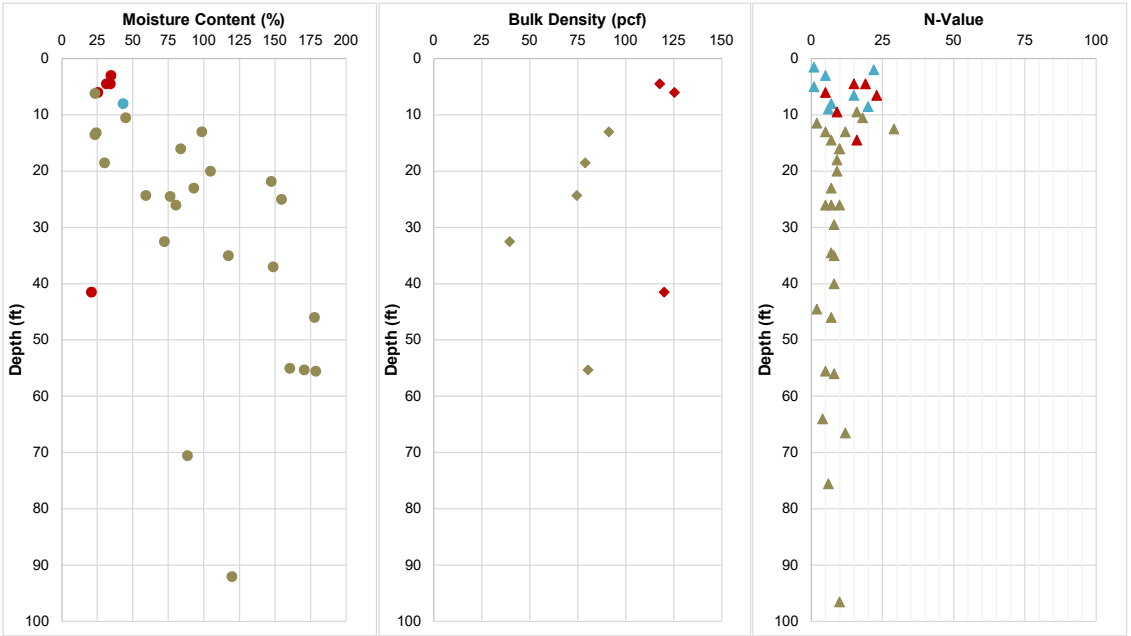
Knight Piésold CONSULTING

P/A NO. VA103-640/01 | REF. NO. 2

FIGURE D1.1 REV







NOTES:

1. OVERBURDEN UNITS PROVIDED IN BOREHOLE LOGS BY AECOM (KRRC, 2019).
2. OVERBURDEN PROPERTIES SUMMARIZED FROM BOREHOLE LOGS AND LABORATORY TEST RESULTS.

REV	DATE	DESCRIPTION	PREP'D	RVW'D
C	20JUL'20	ISSUED WITH REPORT	CYP	SY

KIEWIT INFRASTRUCTURE WEST CO.

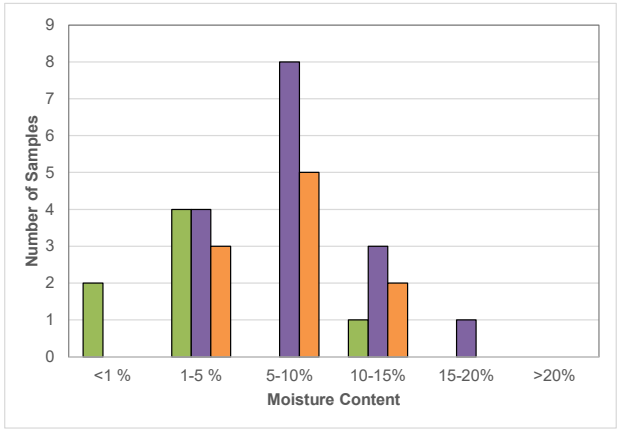
KLAMATH RIVER RENEWAL PROJECT

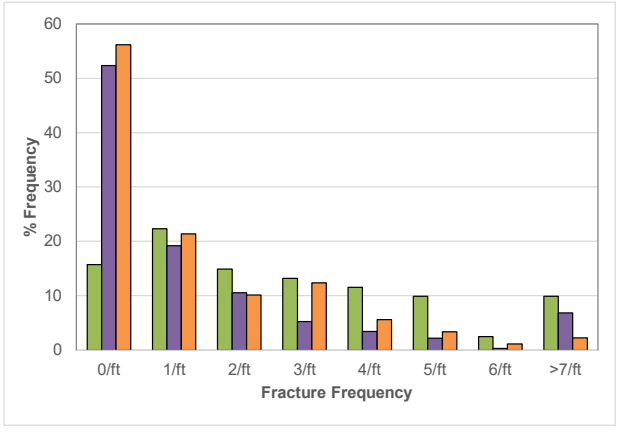
GEOTECHNICAL DATA SUMMARY
COPCO AREA
OVERBURDEN INDEX PROPERTIES

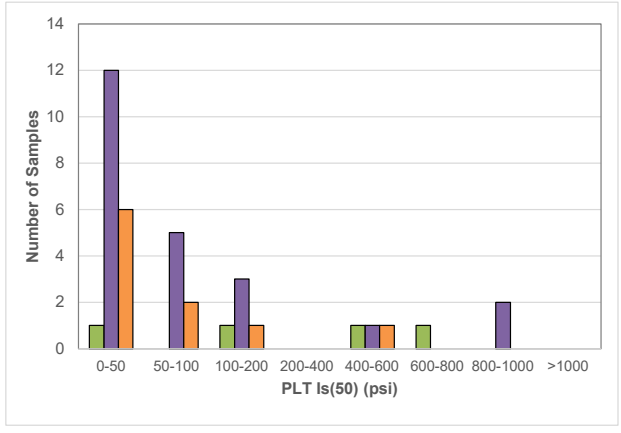
Knight Piésold CONSULTING

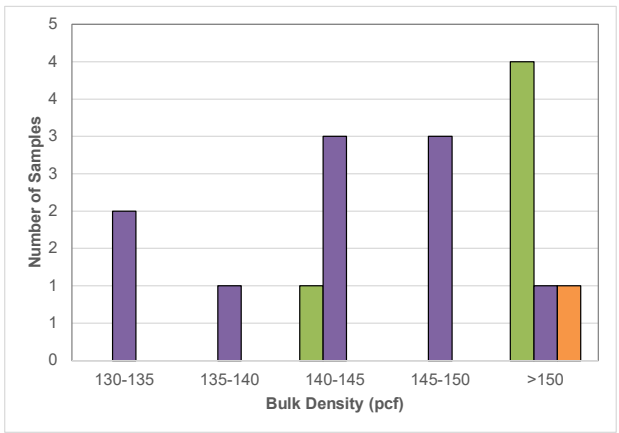
P/A NO. VA103-640/01 | REF. NO. 2

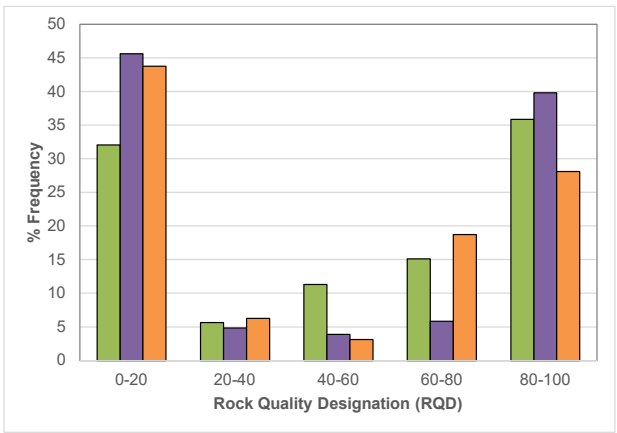
FIGURE D1.2 REV

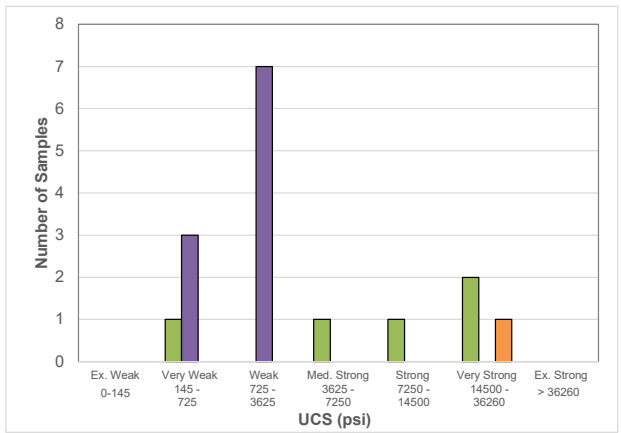












NOTES:

1. BEDROCK UNITS PROVIDED IN BOREHOLE LOGS BY AECOM (KRRC, 2019).
2. ROCK MASS PROPERTIES SUMMARIZED FROM BOREHOLE LOGS AND LABORATORY TEST RESULTS.
3. BEDROCK LAB TESTING WAS NOT PERFORMED ON SAMPLES FROM THE COPCO AREA.

LEGEND

- *Basalt*
- *Volcanic and Volcaniclastic Breccias*
- *Volcanic Sediments (Conglomerate, Sandstone, Siltstone, Claystone)*

REV	DATE	DESCRIPTION	PREP'D	RVW'D
C	20JUL'20	ISSUED WITH REPORT	CYP	SY

KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

GEOTECHNICAL DATA SUMMARY
IRON GATE AREA
BEDROCK GEOTECHNICAL PROPERTIES

Knight Piésold CONSULTING

P/A NO. VA103-640/01

REF. NO. 2

FIGURE D1.3

REV C

APPENDIX D2

Soil Lab Testing Results

(Pages D2-1 to D2-181)

DRAFT

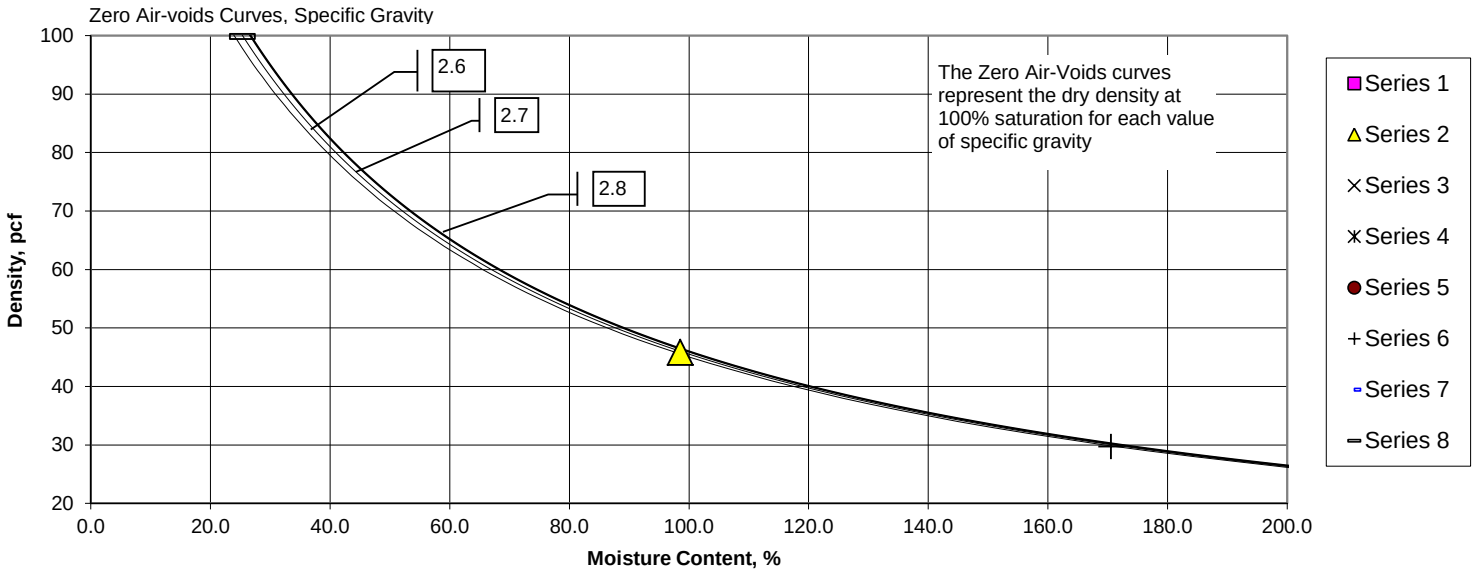
Moisture-Density-Porosity Report
Cooper Testing Labs, Inc. (ASTM D7263b)

CTL Job No:	020-251a	**Project No.**	60537920	**By:**	RU
Client:	AECOM	**Date:**	06/13/18		
Project Name:	Klamath River Dam Removal Project	**Remarks:**			

Boring:	BC-01	BC-01	BC-01	BC-02	BC-02	BC-02	BC-03	BC-03
Sample:	S-02	S-03	S04	S05	S09	S10	S-01	S-02
Depth, ft:	6.5	12.5-13	21.5	14.5	44.5	54.8-55.3	1	5.5-6.0
Visual Description:	Dark Olive Gray Sandy SILT	Light Yellowish Brown Sandy CLAY	Gray Elastic SILT	Gray Elastic SILT	Gray Elastic SILT	Black CLAY	Dark Olive Brown Sandy Lean CLAY	Dark Olive Brown Sandy CLAY w/ Gravel
Actual G_s								
Assumed G_s		2.70				2.70		2.70
Moisture, %	43.1	98.6	92.9	83.7	177.8	170.6	34.7	25.4
Wet Unit wt, pcf		91.0				80.3		125.2
Dry Unit wt, pcf		45.8				29.7		99.9
Dry Bulk Dens.ρb, (g/cc)		0.73				0.48		1.60
Saturation, %		99.3				98.3		99.4
Total Porosity, %		72.8				82.4		40.8
Volumetric Water Cont,Θw,%		72.3				81.0		40.6
Volumetric Air Cont., Θa,%		0.5				1.4		0.2
Void Ratio		2.68				4.68		0.69
Series	1	2	3	4	5	6	7	8

Note: All reported parameters are from the as-received sample condition unless otherwise noted. If an assumed specific gravity (Gs) was used then the saturation, porosities, and void ratio should be considered approximate.

Moisture-Density

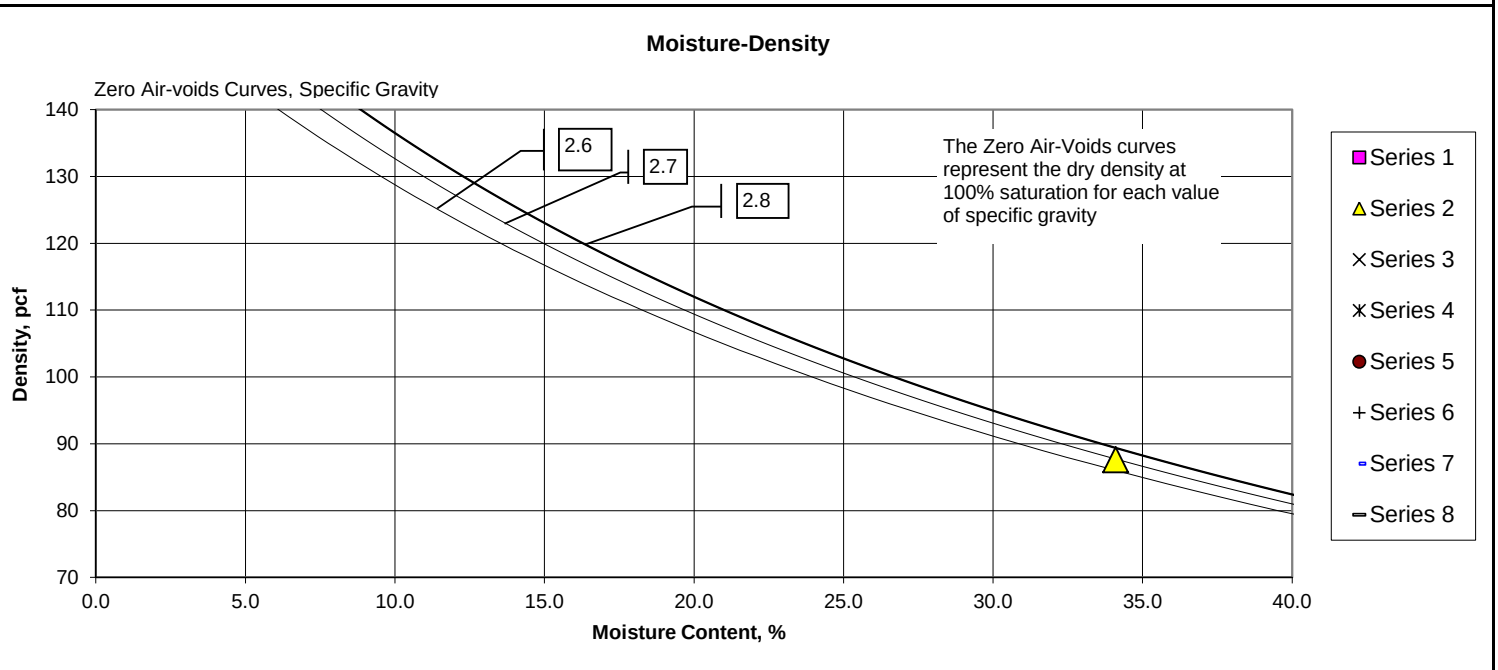


Moisture-Density-Porosity Report
Cooper Testing Labs, Inc. (ASTM D7263b)

CTL Job No:	020-251b	**Project No.**	60537920	**By:**	RU
Client:	AECOM	**Date:**	06/13/18		
Project Name:	Klamath River Dam Removal Project	**Remarks:**			

Boring:	BC-03	BC-07	BC-08	BC-08A	BI-02	BI-02	BI-02	BI-03
Sample:	S05	S-02	S-01	S05	S1	S2	S3	S-1
Depth, ft:	24.5	4-4.5	3	54	5	10	15	3.5
Visual Description:	Light Olive Brown Elastic SILT	Very Dark Olive Brown Sandy Fat CLAY w/ Gravel	Dark Reddish Brown Sandy Fat CLAY	Light Olive Brown Elastic SILT	Dark Reddish Brown Sandy Fat CLAY	Yellowish Brown Sandy Fat CLAY	Yellowish Brown Sandy Fat CLAY	Olive Gray Poorly Graded GRAVEL w/ Silt & Sand
Actual G_s								
Assumed G_s		2.70						
Moisture, %	80.3	34.1	31.4	178.6	27.8	28.7	38.4	12.0
Wet Unit wt, pcf		117.5						
Dry Unit wt, pcf		87.6						
Dry Bulk Dens.ρb, (g/cc)		1.40						
Saturation, %		99.5						
Total Porosity, %		48.1						
Volumetric Water Cont,Θw,%		47.8						
Volumetric Air Cont., Θa,%		0.2						
Void Ratio		0.93						
Series	1	2	3	4	5	6	7	8

Note: All reported parameters are from the as-received sample condition unless otherwise noted. If an assumed specific gravity (Gs) was used then the saturation, porosities, and void ratio should be considered approximate.



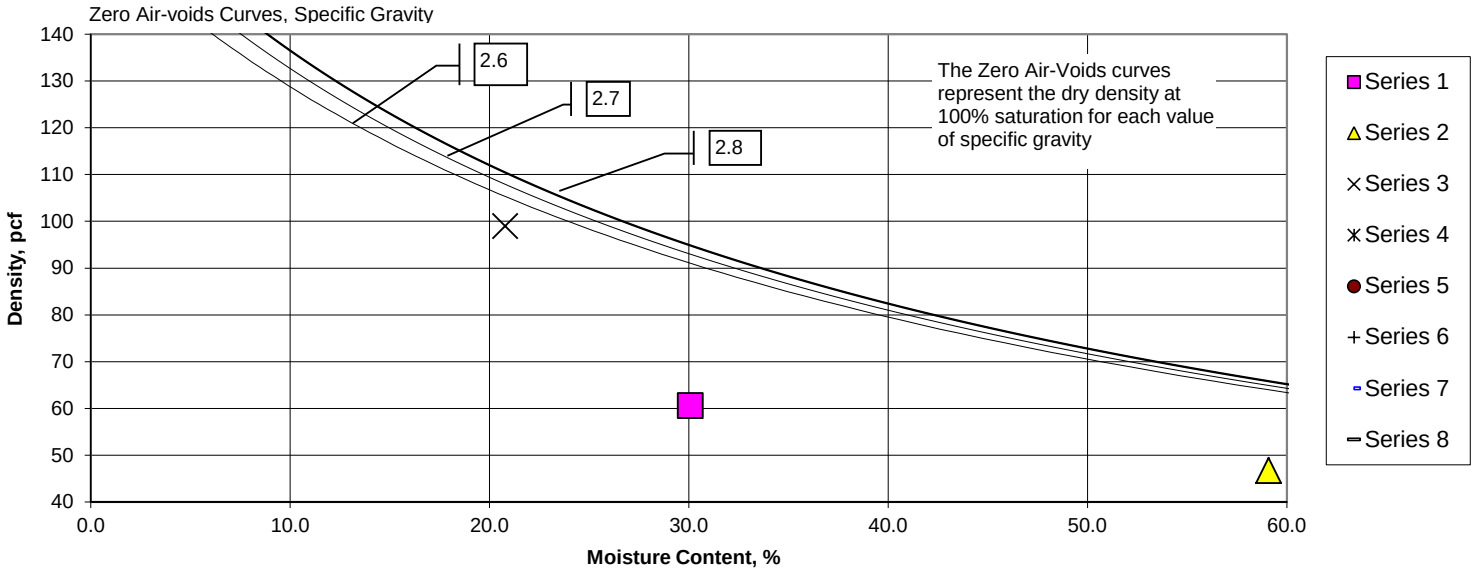
Moisture-Density-Porosity Report
Cooper Testing Labs, Inc. (ASTM D7263b)

CTL Job No:	020-272	**Project No.**	60537920	**By:**	RU
Client:	AECOM	**Date:**	01/18/19		
Project Name:	Klamath	**Remarks:**			

Boring:	BC-13	BC-13	BC-13					
Sample:	S03	S04	S06					
Depth, ft:	17	22	40					
Visual Description:	Light Brown SILT (Siltstone) (slightly plastic)	Pale Olive SILT (slightly plastic)	Olive Brown Clayey SAND					
Actual G_s								
Assumed G_s	2.70	2.70	2.70					
Moisture, %	30.1	59.1	20.8					
Wet Unit wt, pcf	78.8	74.4	119.6					
Dry Unit wt, pcf	60.6	46.8	99.0					
Dry Bulk Dens.ρb, (g/cc)	0.97	0.75	1.59					
Saturation, %	45.5	61.2	79.7					
Total Porosity, %	64.1	72.3	41.3					
Volumetric Water Cont,Θw,%	29.2	44.2	32.9					
Volumetric Air Cont., Θa,%	34.9	28.0	8.4					
Void Ratio	1.79	2.61	0.70					
Series	1	2	3	4	5	6	7	8

Note: All reported parameters are from the as-received sample condition unless otherwise noted. If an assumed specific gravity (Gs) was used then the saturation, porosities, and void ratio should be considered approximate.

Moisture-Density

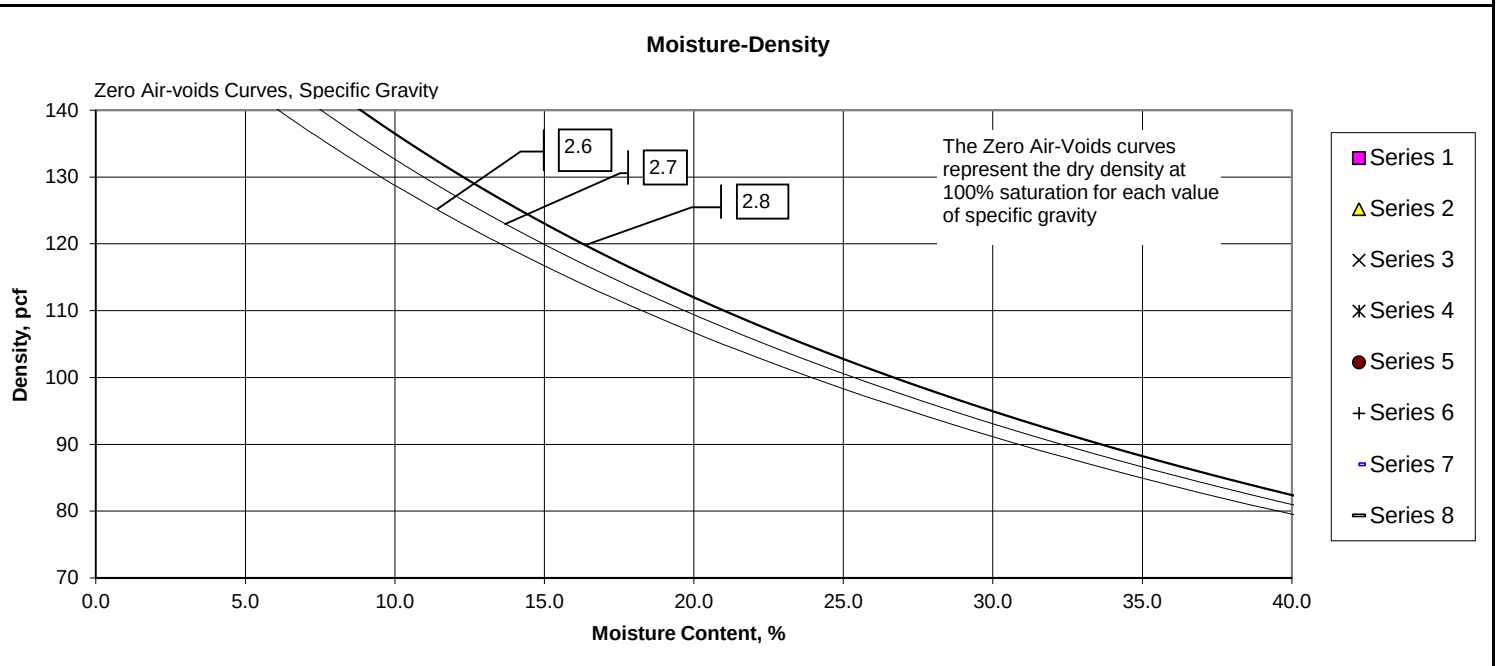


Moisture-Density-Porosity Report
Cooper Testing Labs, Inc. (ASTM D7263b)

CTL Job No:	020-251b	**Project No.**	60537920	**By:**	RU
Client:	AECOM	**Date:**	06/13/18		
Project Name:	Klamath River Dam Removal Project	**Remarks:**			

Boring:					BI-02	BI-02	BI-02	BI-03
Sample:					S1	S2	S3	S-1
Depth, ft:					5	10	15	3.5
Visual Description:					Dark Reddish Brown Sandy Fat CLAY	Yellowish Brown Sandy Fat CLAY	Yellowish Brown Sandy Fat CLAY	Olive Gray Poorly Graded GRAVEL w/ Silt & Sand
Actual G_s								
Assumed G_s								
Moisture, %					27.8	28.7	38.4	12.0
Wet Unit wt, pcf								
Dry Unit wt, pcf								
Dry Bulk Dens.ρb, (g/cc)								
Saturation, %								
Total Porosity, %								
Volumetric Water Cont,Θw,%								
Volumetric Air Cont., Θa,%								
Void Ratio								
Series					1	2	3	4

Note: All reported parameters are from the as-received sample condition unless otherwise noted. If an assumed specific gravity (Gs) was used then the saturation, porosities, and void ratio should be considered approximate.



MOISTURE & DENSITY TEST

Client : AECOM Project : Klamath River Dam Removal Project ISI Lab No.: G-63174 Job no : 60537920

	Boring #	B-2	B-4	B-5	B-6	B-6	B-6	B-6	B-6
	Sample #	S-01	S-01	S-02	S-02	S-03	S-04	S-05	S-06
	Depth (ft.)	27-27.5	5-6.5	7.5-9	10-11.5	15-16.5	30-31.5	40-41.5	45-46.5
	Soil type: (visual)	Gray silty sand with gravel	Grayish brown sandy clay with gravel	Grayish brown clayey gravel with sand	Grayish brown silty sand with organics	Dark gray clayey sand	Reddish brown clayey gravel with sand	Grayish brown gravel with sand	Gray gravel
1.	Date tested:	01/23/19	01/26/19	01/26/19	01/23/19	01/26/19	01/26/19	01/26/19	01/26/19
2.	Tested by:	JH	JH	JH	JH	JH	JH	JH	JH
3.	Specimen height (in.)		5.17		5.37		5.98		
4.	Wt. of specimen + tare (gm)		805.91		824.75		1173.34		
5.	Tare wt. (gm)		0.00		206.10		203.70		
6.	Diameter (in.)		2.42		2.42		2.42		
7.	Wet wt. of soil + dish wt. (gm)	1157.51	1002.84	453.90	446.32	384.60	1323.52	974.35	825.39
8.	Dry wt. of soil + dish wt. (gm)	1032.81	912.52	437.81	359.22	317.89	1209.09	945.10	788.49
9.	Wt. of dish (gm)	166.03	200.96	83.11	187.89	84.88	361.35	187.94	188.28
10.	Dish ID								
	Wet Density (pcf)		129.0		95.3		134.2		
	Dry Density (pcf)		114.5		63.2		118.2		
	Moisture Content (%)	14.4	12.7	4.5	50.8	28.6	13.5	3.9	6.1
	Gs (Assumed)	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70
	Void Ratio		0.472		1.666		0.425		
	Saturation (%)		72.6		82.4		85.7		

Additional data:

Wt. of dry soil + dish before washing (gm)								
Wt. of dry soil + dish after washing (gm)								
% Passing # 200 sieve								
USCS symbol								

MOISTURE & DENSITY TEST

Client : AECOM Project : Klamath River Dam Removal Project ISI Lab No.: G-63174 Job no : 60537920

	Boring #	B-7	B-8	B-8	B-8	B-8	B-10	B-19	B-19
	Sample #	S-02	S-01	S-02	S-03	S-04	S-02	S-01	S-03
	Depth (ft.)	16.5-18	13-14.5	16-17.5	20-21.5	25-25.5	25.5-27	5-6.5	15-16.5
	Soil type: (visual)	Gray clayey sand with organics			Grayish brown clay with sand	Dark grayish brown clayey sand	Grayish brown clayey sand		Mottled grayish brown sandy clay
1.	Date tested:	01/26/19	01/26/19	01/26/19	01/26/19	01/26/19	01/26/19	01/26/19	01/26/19
2.	Tested by:	JH	JH	JH	JH	JH	JH	JH	JH
3.	Specimen height (in.)							5.67	
4.	Wt. of specimen + tare (gm)							788.65	
5.	Tare wt. (gm)							0.00	
6.	Diameter (in.)							2.42	
7.	Wet wt. of soil + dish wt. (gm)	359.80	113.16	124.99	133.28	499.55	457.34	237.77	1074.57
8.	Dry wt. of soil + dish wt. (gm)	269.65	100.69	95.27	113.85	469.95	428.90	204.03	939.01
9.	Wt. of dish (gm)	85.87	50.55	50.56	51.16	188.28	85.30	50.63	356.12
10.	Dish ID								
	Wet Density (pcf)							115.1	
	Dry Density (pcf)							94.4	
	Moisture Content (%)	49.1	24.9	66.5	31.0	10.5	8.3	22.0	23.3
	Gs (Assumed)	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70
	Void Ratio							0.786	
	Saturation (%)							75.6	

Additional data:

Wt. of dry soil + dish before washing (gm)								
Wt. of dry soil + dish after washing (gm)								
% Passing # 200 sieve								
USCS symbol								

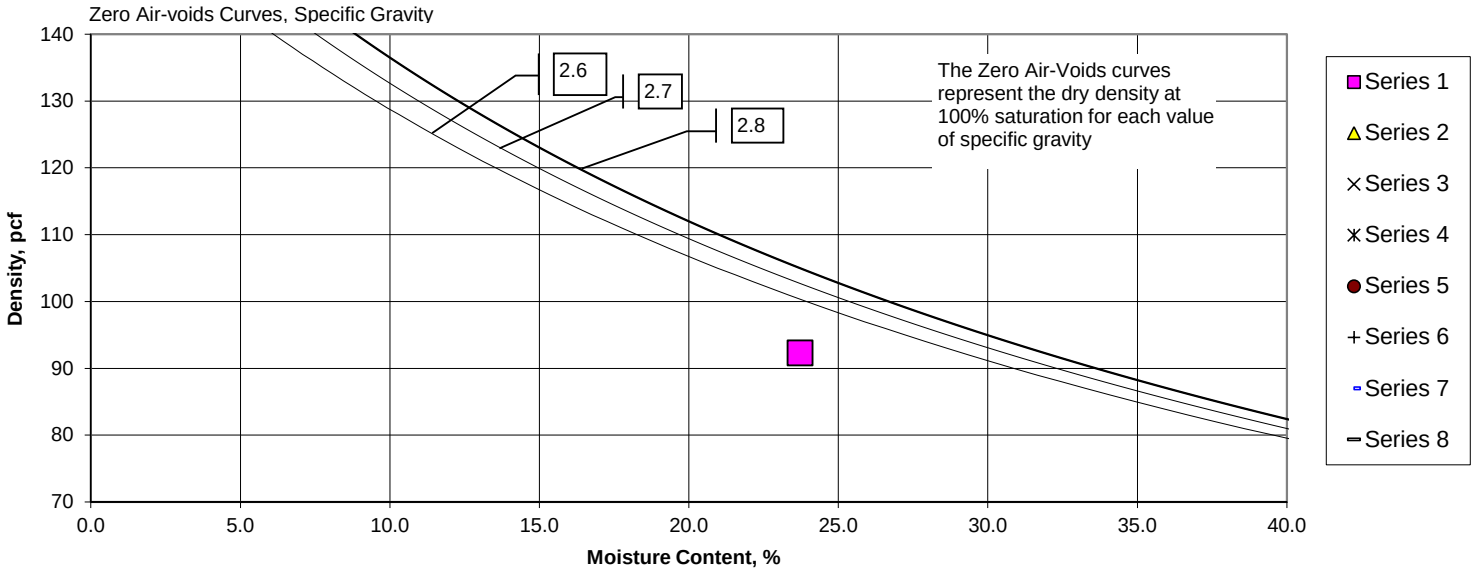
Moisture-Density-Porosity Report
Cooper Testing Labs, Inc. (ASTM D7263b)

CTL Job No:	020-277	**Project No.**	60537920	**By:**	RU
Client:	AECOM	**Date:**	03/21/19		
Project Name:	Klamath River Renewal Project	**Remarks:**			

Boring:	B-15							
Sample:	S1							
Depth, ft:	5-5.5							
Visual Description:	Brown Sandy Fat CLAY							
Actual G_s								
Assumed G_s	2.70							
Moisture, %	23.7							
Wet Unit wt, pcf	114.1							
Dry Unit wt, pcf	92.3							
Dry Bulk Dens.ρb, (g/cc)	1.48							
Saturation, %	77.3							
Total Porosity, %	45.3							
Volumetric Water Cont,Θw,%	35.0							
Volumetric Air Cont., Θa,%	10.3							
Void Ratio	0.83							
Series	1	2	3	4	5	6	7	8

Note: All reported parameters are from the as-received sample condition unless otherwise noted. If an assumed specific gravity (Gs) was used then the saturation, porosities, and void ratio should be considered approximate.

Moisture-Density



MOISTURE & DENSITY TEST

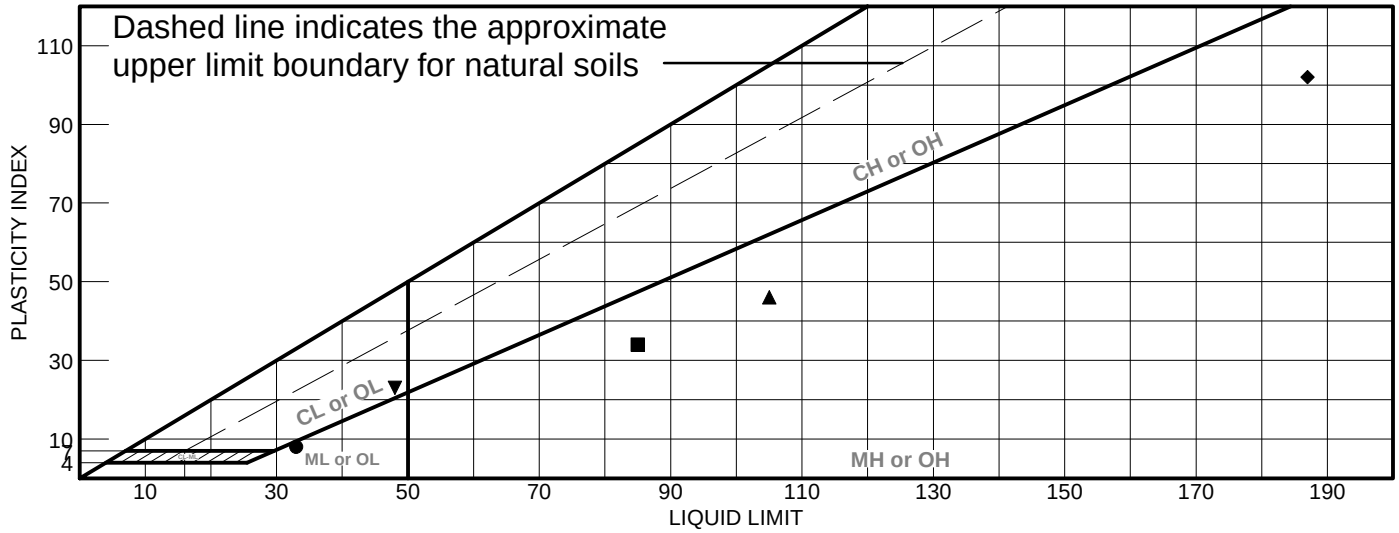
Client : AECOM Project : Klamath River Dam Removal Project ISI Lab No.: G-63174 Job no : 60537920

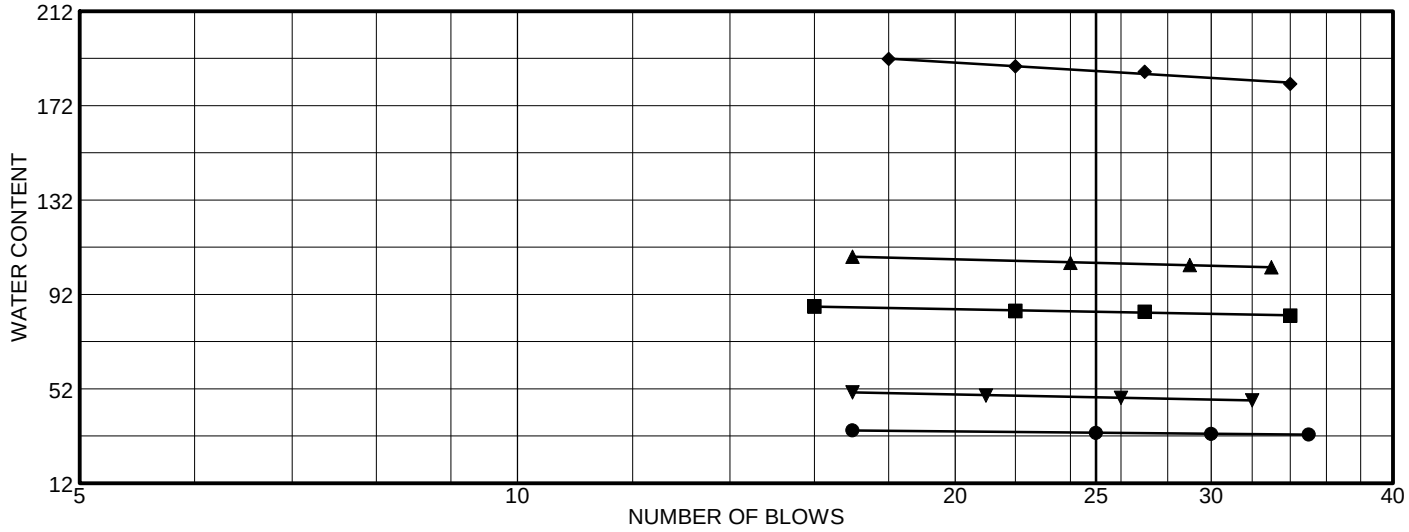
	Boring #	B-19	B-20	B-20	B-20				
	Sample #	S-04	S-03	S-04	S-05				
	Depth (ft.)	20-21.5	15-16.5	20-21.5	25-26.5				
	Soil type: (visual)	Grayish brown clayey gravel with sand	Grayish brown sandy clay	Grayish brown clayey sand	Grayish brown clayey sand with gravel				
1.	Date tested:	01/26/19	01/26/19	01/26/19	01/26/19				
2.	Tested by:	JH	JH	JH	JH				
3.	Specimen height (in.)								
4.	Wt. of specimen + tare (gm)								
5.	Tare wt. (gm)								
6.	Diameter (in.)								
7.	Wet wt. of soil + dish wt. (gm)	1187.41	680.92	765.13	630.86				
8.	Dry wt. of soil + dish wt. (gm)	1024.76	550.85	657.31	563.27				
9.	Wt. of dish (gm)	311.57	186.22	188.13	187.57				
10.	Dish ID								
	Wet Density (pcf)								
	Dry Density (pcf)								
	Moisture Content (%)	22.8	35.7	23.0	18.0				
	Gs (Assumed)	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70
	Void Ratio								
	Saturation (%)								

Additional data:

Wt. of dry soil + dish before washing (gm)								
Wt. of dry soil + dish after washing (gm)								
% Passing # 200 sieve								
USCS symbol								

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Dark Olive Gray Sandy SILT	33	25	8			
■	Olive Gray Elastic SILT	85	51	34	99.9	99.0	MH
▲	Gray Elastic SILT	105	59	46	99.7	99.3	MH
◆	Gray Elastic SILT	187	85	102	99.6	99.5	MH
▼	Dark Olive Brown Sandy Lean CLAY	48	25	23			

Project No. 020-251 **Client:** AECOM

Project: Klamath River Dam Removal Project - 60537920

●	**Source:** BC-01	**Sample No.:** S-02	**Elev./Depth:** 6.5'
■	**Source:** BC-01	**Sample No.:** S-04	**Elev./Depth:** 21.5'
▲	**Source:** BC-02	**Sample No.:** S-05	**Elev./Depth:** 14.5'
◆	**Source:** BC-02	**Sample No.:** S-09	**Elev./Depth:** 44.5'
▼	**Source:** BC-03	**Sample No.:** S-01	**Elev./Depth:** 1'

Remarks:

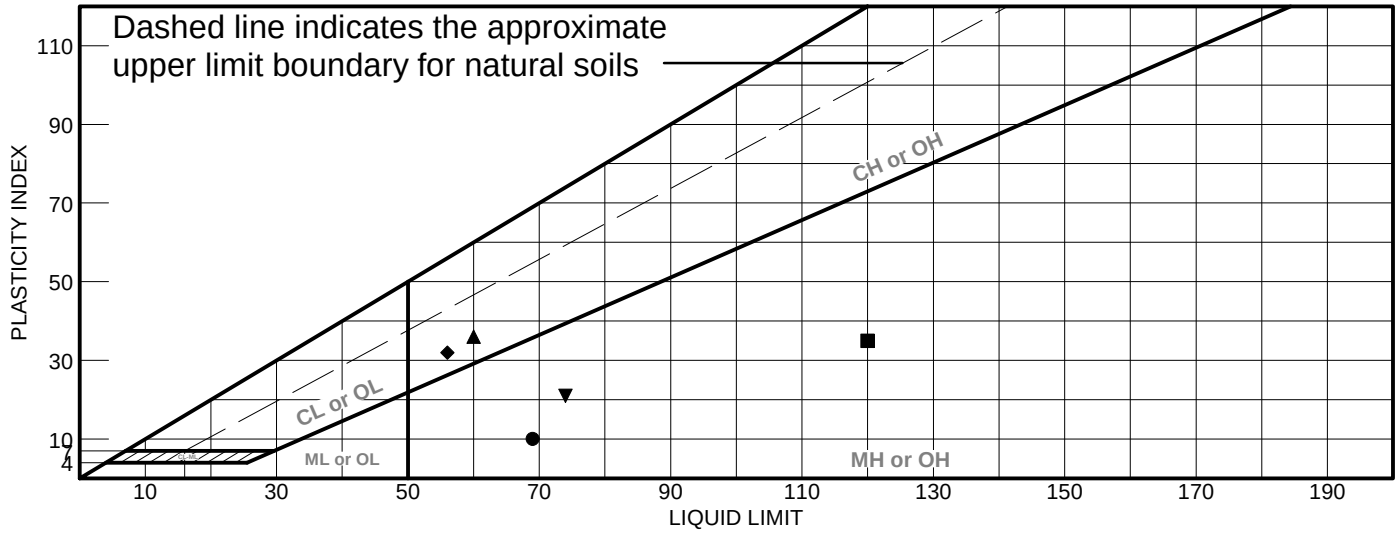
●
■
▲
◆
▼

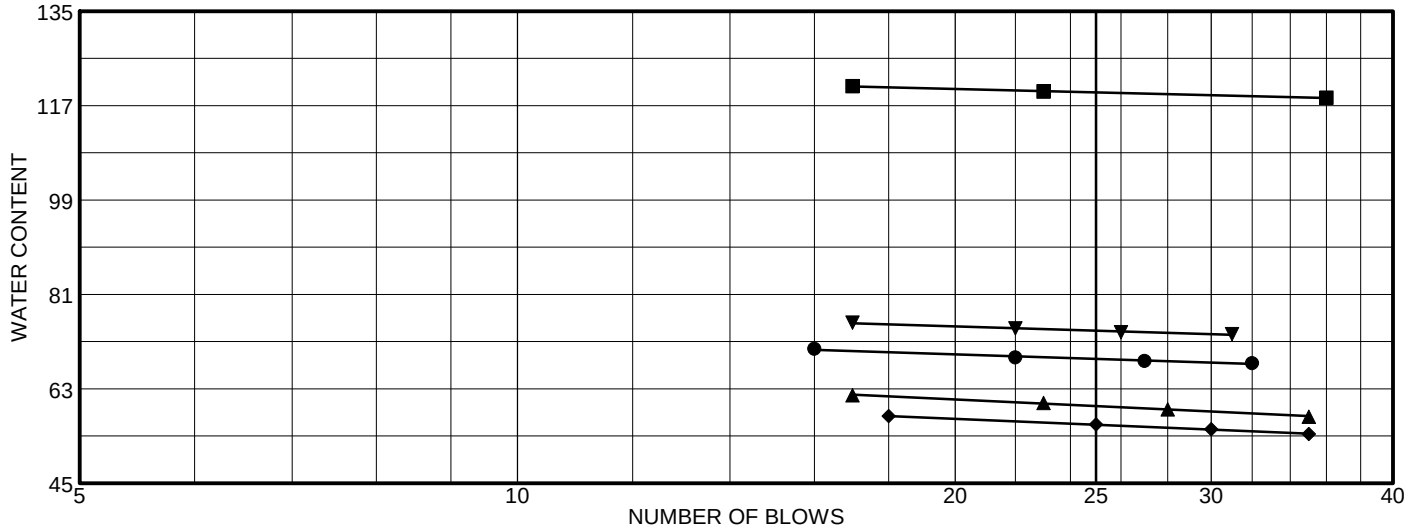
LIQUID AND PLASTIC LIMITS TEST REPORT

COOPER TESTING LABORATORY

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Light Olive Brown Elastic SILT	69	59	10	100.0	100.0	MH
■	Pale Brown Mottled Gray Elastic SILT	120	85	35	99.4	99.1	MH
▲	Very Dark Olive Brown Sandy Fat CLAY w/ Gravel	60	24	36			
◆	Dark Reddish Brown Sandy Fat CLAY	56	24	32			
▼	Dark Gray Elastic SILT	74	53	21	99.9	99.7	MH

Project No. 020-251 **Client:** AECOM

Project: Klamath River Dam Removal Project - 60537920

●	**Source:** BC-03	**Sample No.:** S-05	**Elev./Depth:** 24.5'
■	**Source:** BC-04	**Sample No.:** S-08	**Elev./Depth:** 32.5(Tip-16")
▲	**Source:** BC-07	**Sample No.:** S02	**Elev./Depth:** 4-4.5'
◆	**Source:** BC-08	**Sample No.:** S-01	**Elev./Depth:** 3.0'
▼	**Source:** BC-09	**Sample No.:** S-05	**Elev./Depth:** 23(Tip-5")

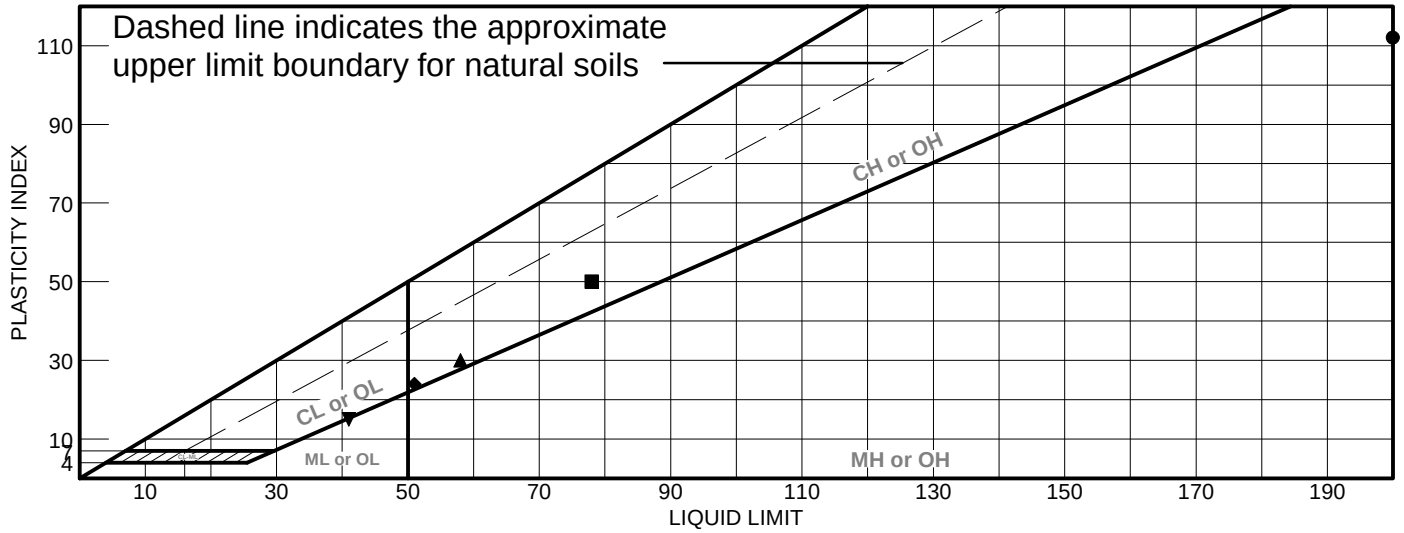
Remarks:
●
■
▲
◆
▼

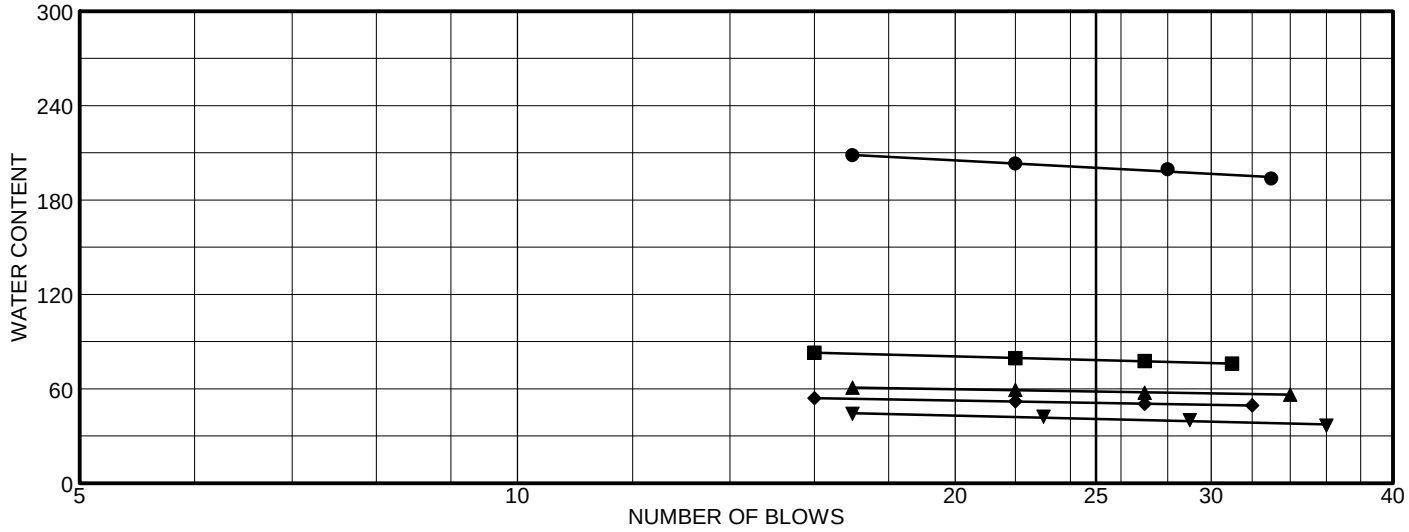
LIQUID AND PLASTIC LIMITS TEST REPORT

COOPER TESTING LABORATORY

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Light Olive Brown Elastic SILT	200	88	112	99.6	99.0	MH
■	Dark Reddish Brown Sandy Fat CLAY	78	28	50	77.6	68.3	CH
▲	Yellowish Brown Sandy Fat CLAY	58	28	30	79.1	62.5	CH
◆	Yellowish Brown Sandy Fat CLAY	51	27	24	83.9	52.9	CH
▼	Olive Gray Poorly Graded GRAVEL w/ Silt & Sand	41	26	15	15.9	9.0	GP-GM

Project No. 020-251 **Client:** AECOM

Project: Klamath River Dam Removal Project - 60537920

●	**Source:** BC-08A	**Sample No.:** S-05	**Elev./Depth:** 54'
■	**Source:** BI-02	**Sample No.:** S-01	**Elev./Depth:** 5'
▲	**Source:** BI-02	**Sample No.:** S-02	**Elev./Depth:** 10'
◆	**Source:** BI-02	**Sample No.:** S-03	**Elev./Depth:** 15'
▼	**Source:** BI-03	**Sample No.:** S-01	**Elev./Depth:** 3.5'

Remarks:

●

■

▲

◆

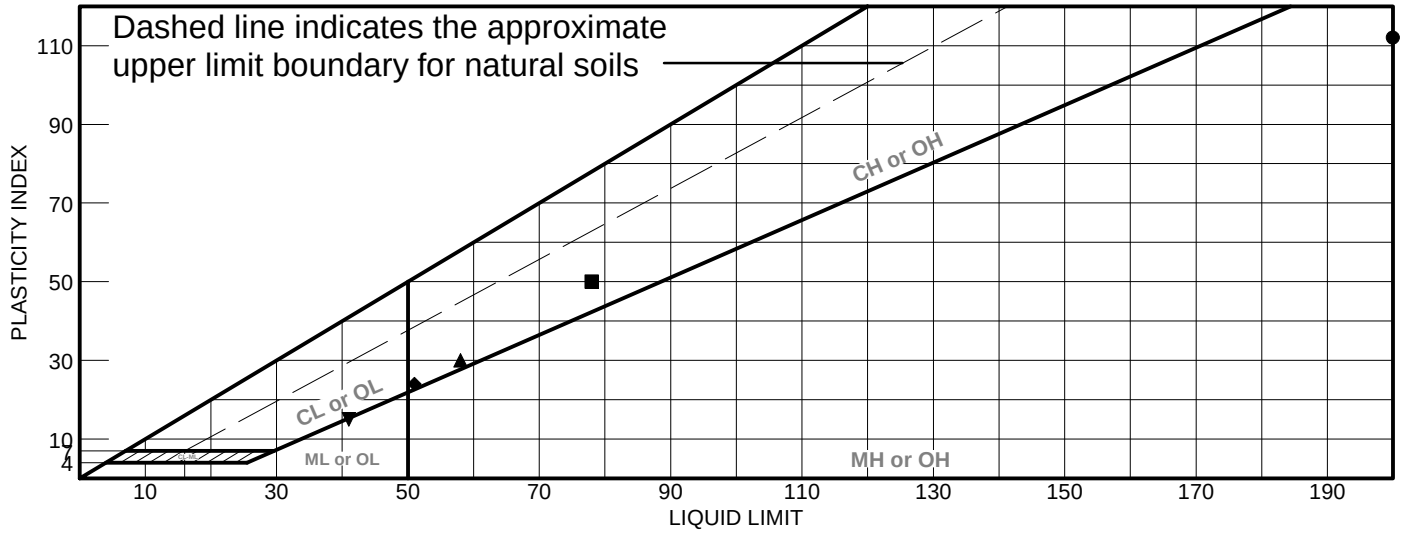
▼

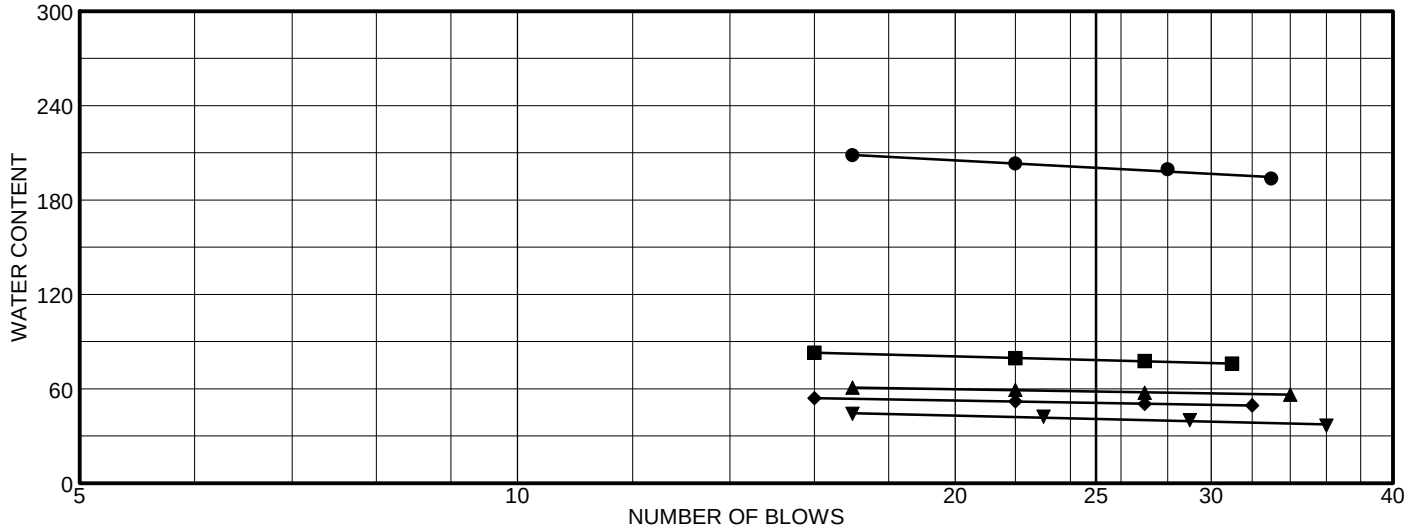
LIQUID AND PLASTIC LIMITS TEST REPORT

COOPER TESTING LABORATORY

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Light Olive Brown Elastic SILT	200	88	112	99.6	99.0	MH
■	Dark Reddish Brown Sandy Fat CLAY	78	28	50	77.6	68.3	CH
▲	Yellowish Brown Sandy Fat CLAY	58	28	30	79.1	62.5	CH
◆	Yellowish Brown Sandy Fat CLAY	51	27	24	83.9	52.9	CH
▼	Olive Gray Poorly Graded GRAVEL w/ Silt & Sand	41	26	15	15.9	9.0	GP-GM

Project No. 020-251 **Client:** AECOM

Project: Klamath River Dam Removal Project - 60537920

●	**Source:** BC-08A	**Sample No.:** S-05	**Elev./Depth:** 54'
■	**Source:** BI-02	**Sample No.:** S-01	**Elev./Depth:** 5'
▲	**Source:** BI-02	**Sample No.:** S-02	**Elev./Depth:** 10'
◆	**Source:** BI-02	**Sample No.:** S-03	**Elev./Depth:** 15'
▼	**Source:** BI-03	**Sample No.:** S-01	**Elev./Depth:** 3.5'

Remarks:

●

■

▲

◆

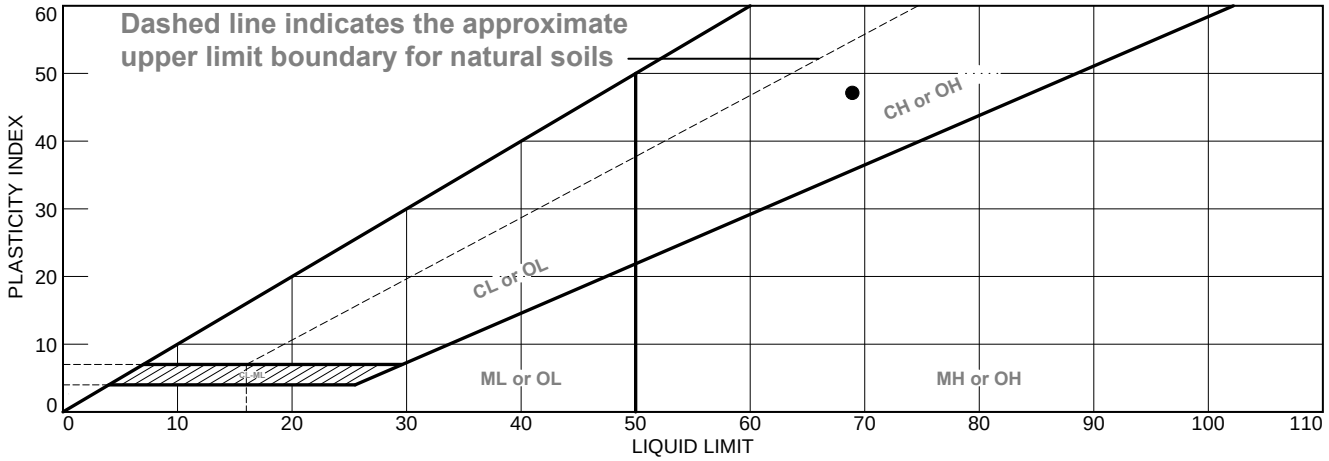
▼

LIQUID AND PLASTIC LIMITS TEST REPORT

COOPER TESTING LABORATORY

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Dark brown clay with sand	69	22	47			CH

Project No. 2301-069.0 **Client:** AECOM

Project: Klamath River Dam Removal Project

60537920

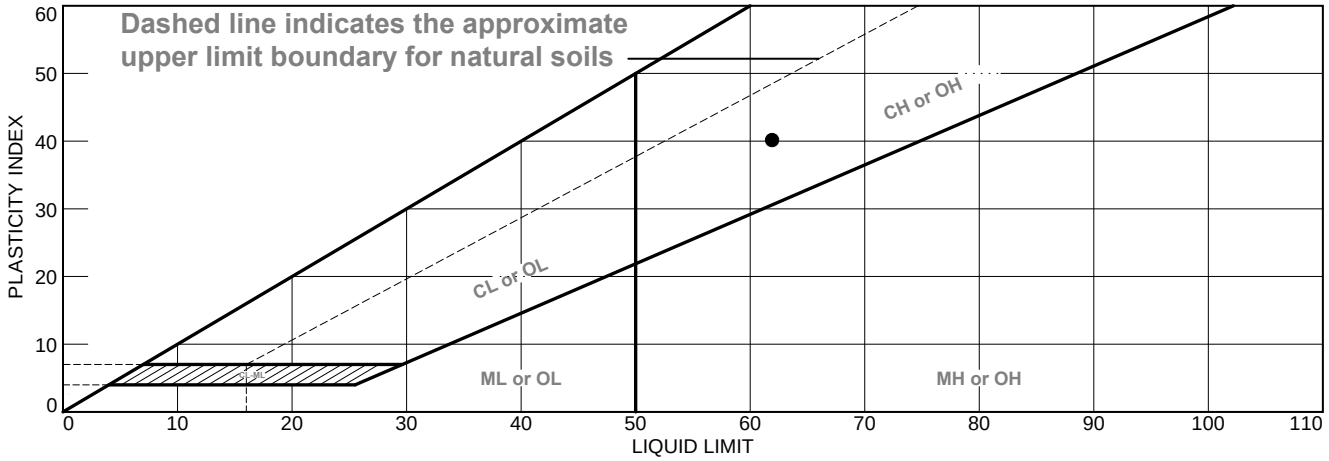
●**Source of Sample:** B-8 **Depth:** 13-14.5 **Sample Number:** S-01

Remarks:

Figure

Tested By: JH **Checked By:** JH

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown sandy clay	62	22	40	90	70	CH

Project No. 2301-069.0 **Client:** AECOM

Project: Klamath River Dam Removal Project

60537920

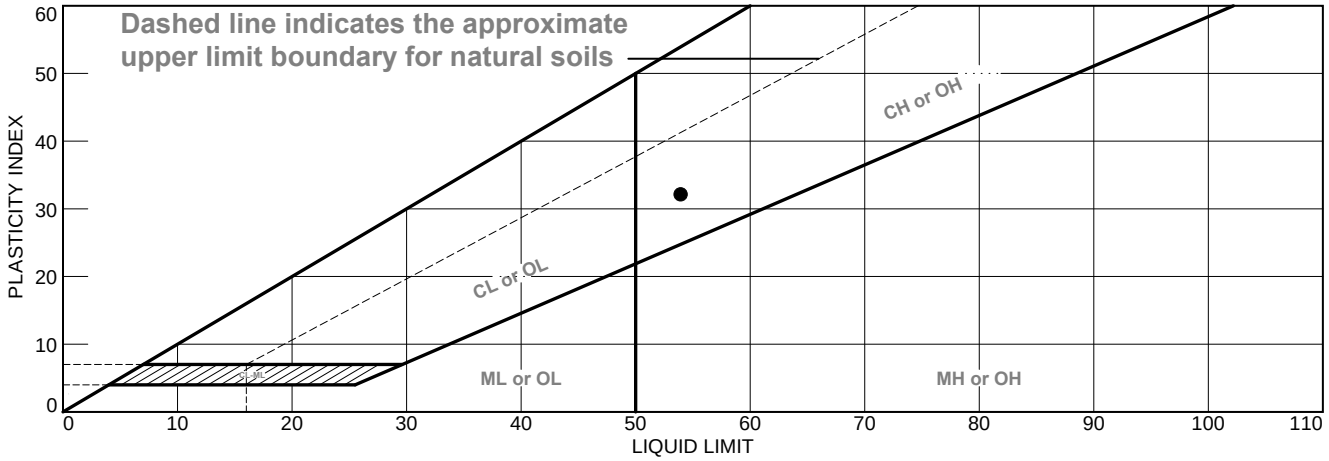
●**Source of Sample:** B-14 **Depth:** 6.4-7.9 **Sample Number:** S-01

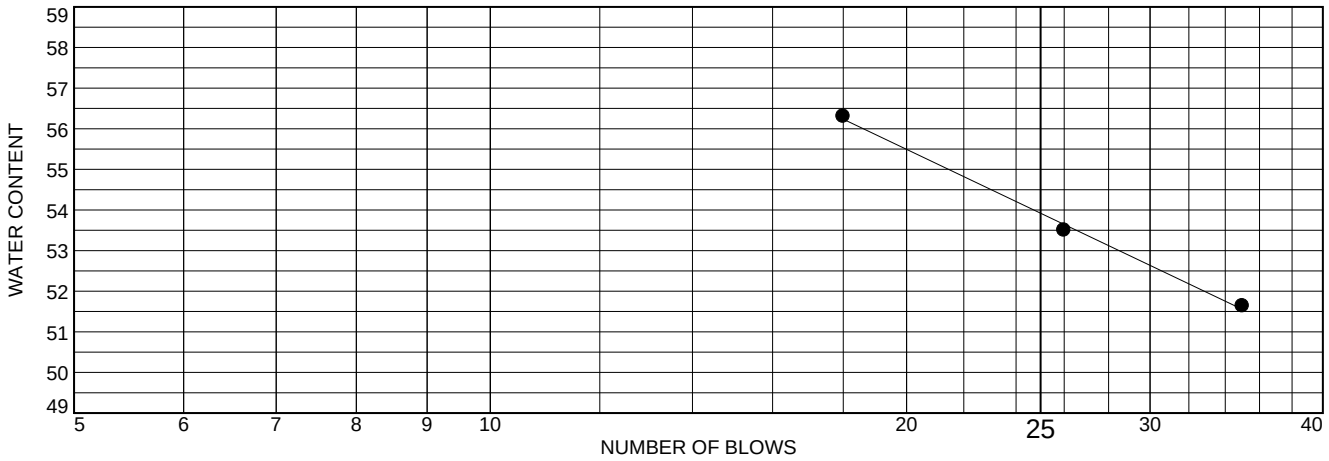
Remarks:

Figure

Tested By: JH **Checked By:** JH

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown clay	54	22	32			CH

Project No. 2301-069.0 **Client:** AECOM

Project: Klamath River Dam Removal Project

60537920

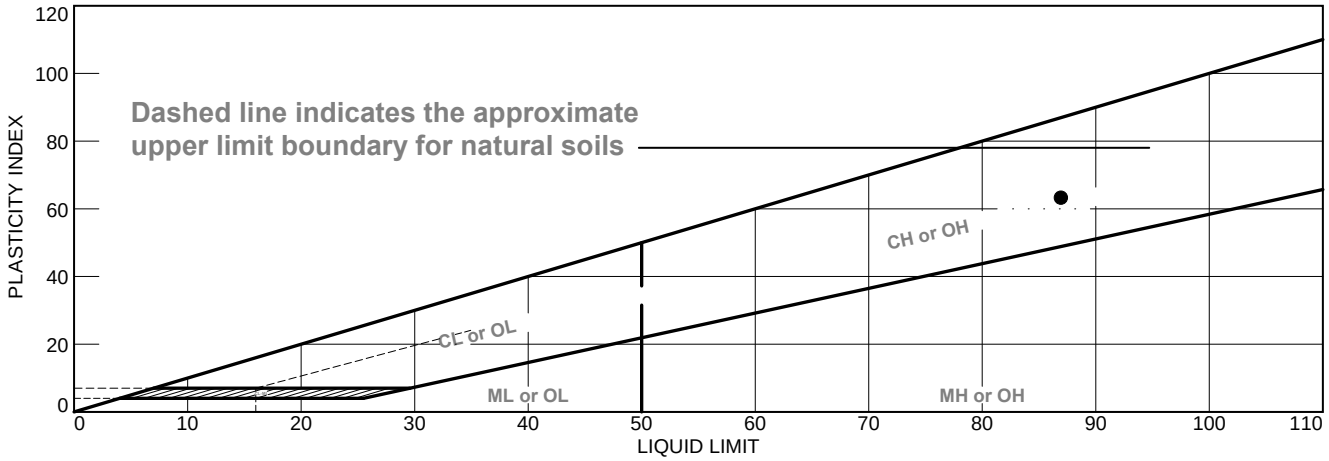
●**Source of Sample:** B-19 **Depth:** 10-11.5 **Sample Number:** S-02

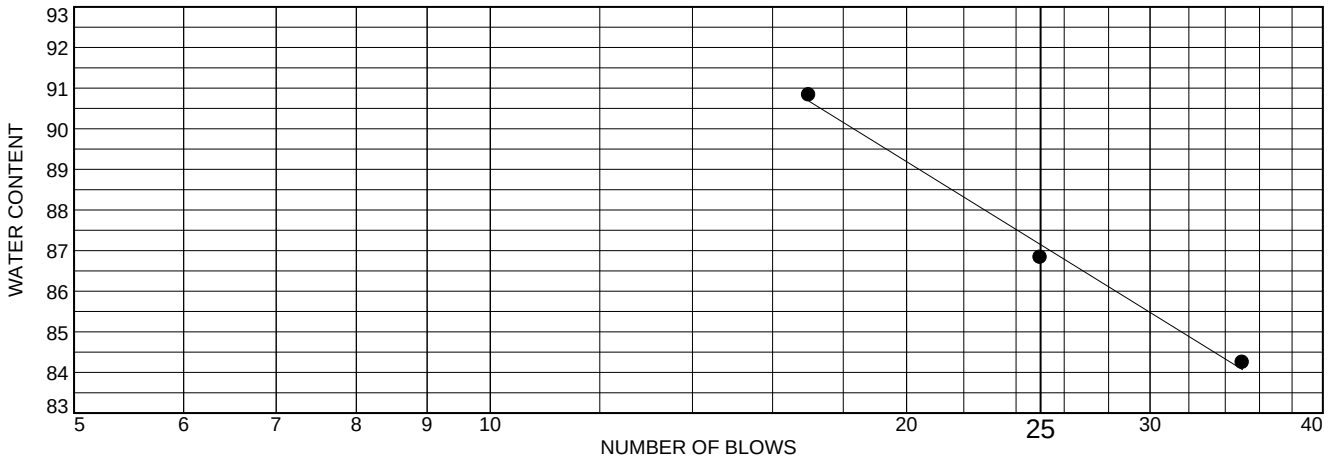
Remarks:

Figure

Tested By: JH **Checked By:** JH

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown clay	87	24	63			CH

Project No. 2301-069.0 **Client:** AECOM

Project: Klamath River Dam Removal Project

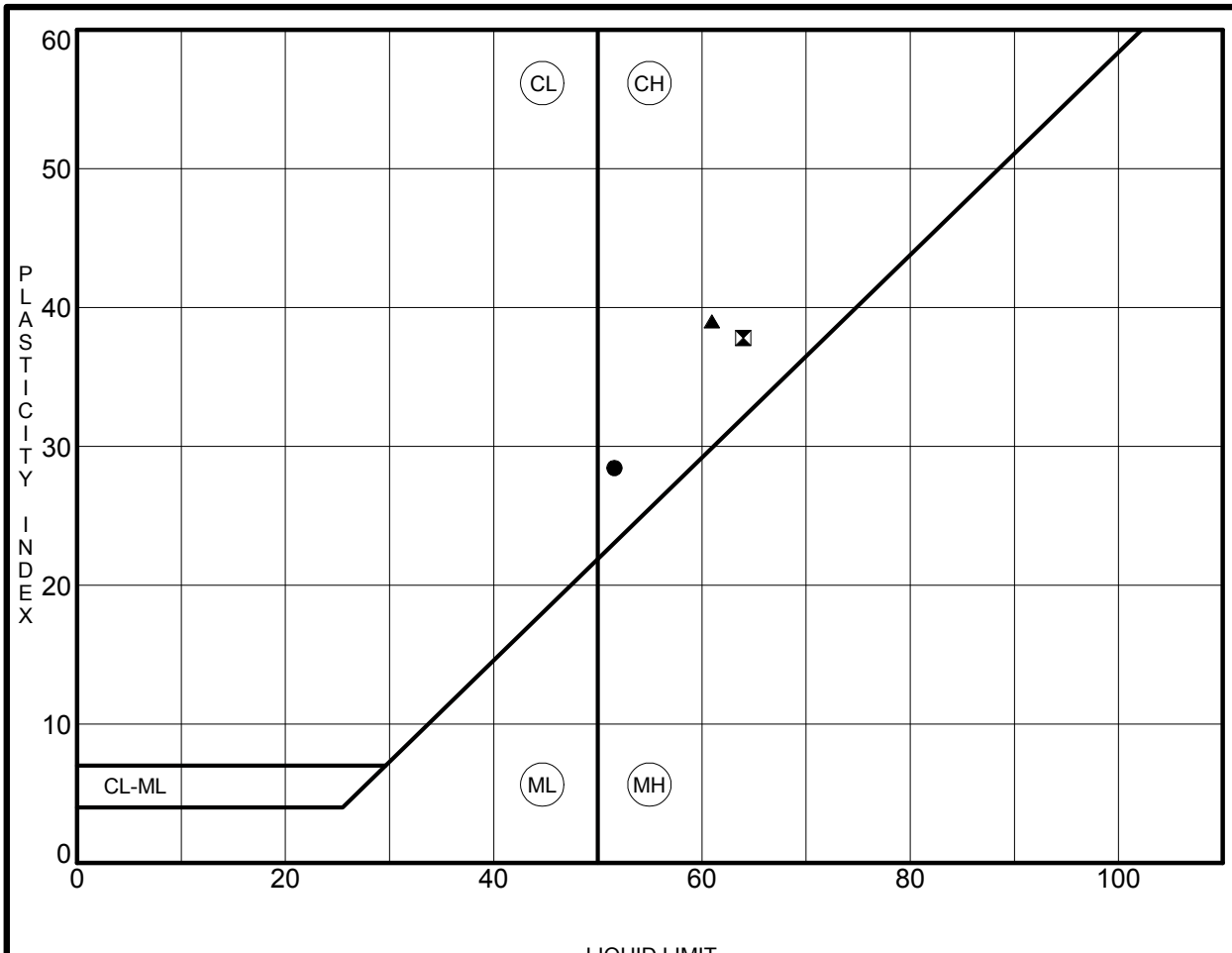
60537920

●**Source of Sample:** B-20 **Depth:** 5-6.5 **Sample Number:** S-01

Remarks:

Figure

Tested By: JH **Checked By:** JH



	Point	Depth (Ft)	LL	PL	PI	MC (%)	Classification
●	**B-201**	**6**	**52**	**23**	**29**	**20.1**	**SANDY FAT CLAY(CH)**
⊠	**B-201**	**16**	**64**	**26**	**38**	**19.4**	**FAT CLAY(CH)**
▲	**B-205**	**10**	**61**	**22**	**39**	**15.1**	**CLAYEY GRAVEL with SAND(GC)**

ATTERBERG LIMITS RESULTS

AECOM
Klamath River Dam Removal
Yreka Water Main Crossing, CA

CDM Smith

Project No: 217930 Figure: 2

ATTERBERG_LIMITS W/MC KLAMATH RIVER DAM REMOVAL.GPJ GINT STD US LAB.GDT 10/22/18 REV.

COOPER TESTING LABORATORY

#200 Sieve Wash Analysis
ASTM D 1140

Job No.:	020-251	**Project No.:**	60537920	**Run By:**	MD
Client:	AECOM	**Date:**	6/14/2018	**Checked By:**	DC
Project:	Klamath River Dam Removal Project				

Boring:	BC-02	BC-03	BC-04	BC-04				
Sample:	S-01	S-01	S-01	S02				
Depth, ft.:	1-2	1	1.5	7				
Soil Type:	Dark Olive Brown Clayey GRAVEL w/ Sand	Dark Olive Brown Sandy Lean CLAY	Dark Olive Brown Clayey SAND	Dark Olive Brown Sandy CLAY				
Wt of Dish & Dry Soil, gm	1247.4	707.6	696.3	656.3				
Weight of Dish, gm	175.6	175.8	172.4	173.0				
Weight of Dry Soil, gm	1071.8	531.8	523.9	483.3				
Wt. Ret. on #4 Sieve, gm	556.7	16.7	22.3	15.6				
Wt. Ret. on #200 Sieve, gm	774.5	177.4	291.7	205.6				
% Gravel	**51.9**	**3.1**	**4.3**	**3.2**				
% Sand	**20.3**	**30.2**	**51.4**	**39.3**				
% Silt & Clay	**27.7**	**66.6**	**44.3**	**57.5**				

Remarks: As an added benefit to our clients, the gravel fraction may be included in this report. Whether or not it is included is dependent upon both the technician's time available and if there is a significant enough amount of gravel. The gravel is always included in the percent retained on the #200 sieve but may not be weighed separately to determine the percentage, especially if there is only a trace amount, (5% or less).

COOPER TESTING LABORATORY

#200 Bulk Sieve Wash Analysis
ASTM D 1140m

Job No.:	020-251	**Project No.:**	60537920	**Run By:**	MD
Client:	AECOM	**Date:**	6/14/2018	**Checked By:**	DC
Project:	Klamath River Dam Removal Project				

Boring:	BC-07							
Sample:	S-02							
Depth, ft.:	4-4.5							
Soil Type:	Very Dark Olive Brown Sandy Fat CLAY w/ Gravel							
Bulk Sample wt. lb.	218.0							
Wt of Dish & Dry Soil <#4,gm	389.5							
Weight of Dish, gm	171.0							
Weight of Dry Soil <#4, gm	218.5							
Wt. Ret. on #4 Sieve, lb	33.1							
Wt. Ret. on #200 Sieve, gm	52.3							
% Gravel	**15.2**							
% Sand	**20.3**							
% Silt & Clay	**64.5**							

Remarks: As an added benefit to our clients, the gravel fraction may be included in this report. Whether or not it is included is dependent upon both the technician's time available and if there is a significant enough amount of gravel. The gravel is always included in the percent retained on the #200 sieve but may not be weighed separately to determine the percentage, especially if there is only a trace amount, (5% or less).

ASTM D-1140
PERCENT PASSING NO. 200 SIEVE REPORT

Method A
Specimens Soaked Overnight without Deflocculating Agent
Dry Mass Determined Directly

Client Name AECOM
Project Name Klamath River Dam Removal Project
Project Number 60537920

Boring Number	B-6	B-6	B-8	B-10	B-20
Sample Number	S-03	S-05	S-04	S-02	S-03
Depth (ft)	15-16.5	40-41.5	25-25.5	25.5-27	15-16.5
Percent of Soil Finer than No. 200 Sieve	36.2	2.4	27.6	15.7	67.8
Visual Classification	Dark gray clayey sand	Grayish brown gravel with sand	Dark grayish brown clayey sand	Grayish brown clayey sand	Grayish brown sandy clay
Date	01/26/19	01/26/19	01/26/19	01/26/19	01/26/19
Weight of Dry Soil + Pan (before wash)	317.9	945.1	470.0	428.9	550.9
Weight of Dry Soil + Pan (after wash)	233.5	927.2	392.2	375.1	303.7
Weight of Pan	84.9	187.9	188.3	85.3	186.2

COOPER TESTING LABORATORY

#200 Sieve Wash Analysis
ASTM D 1140

Job No.:	020-277	**Project No.:**	60537920	**Run By:**	MD
Client:	AECOM	**Date:**	3/26/2019	**Checked By:**	DC
Project:	Klamath River Renewal Project				

Boring:	B-15							
Sample:	S3							
Depth, ft.:	15-16.5							
Soil Type:	Brown Clayey GRAVEL w/ Sand							
Wt of Dish & Dry Soil, gm	687.3							
Weight of Dish, gm	172.2							
Weight of Dry Soil, gm	515.1							
Wt. Ret. on #4 Sieve, gm	218.3							
Wt. Ret. on #200 Sieve, gm	357.6							
% Gravel	**42.4**							
% Sand	**27.0**							
% Silt & Clay	**30.6**							

Remarks: As an added benefit to our clients, the gravel fraction may be included in this report. Whether or not it is included is dependent upon both the technician's time available and if there is a significant enough amount of gravel. The gravel is always included in the percent retained on the #200 sieve but may not be weighed separately to determine the percentage, especially if there is only a trace amount, (5% or less).

ASTM D-1140
PERCENT PASSING NO. 200 SIEVE REPORT

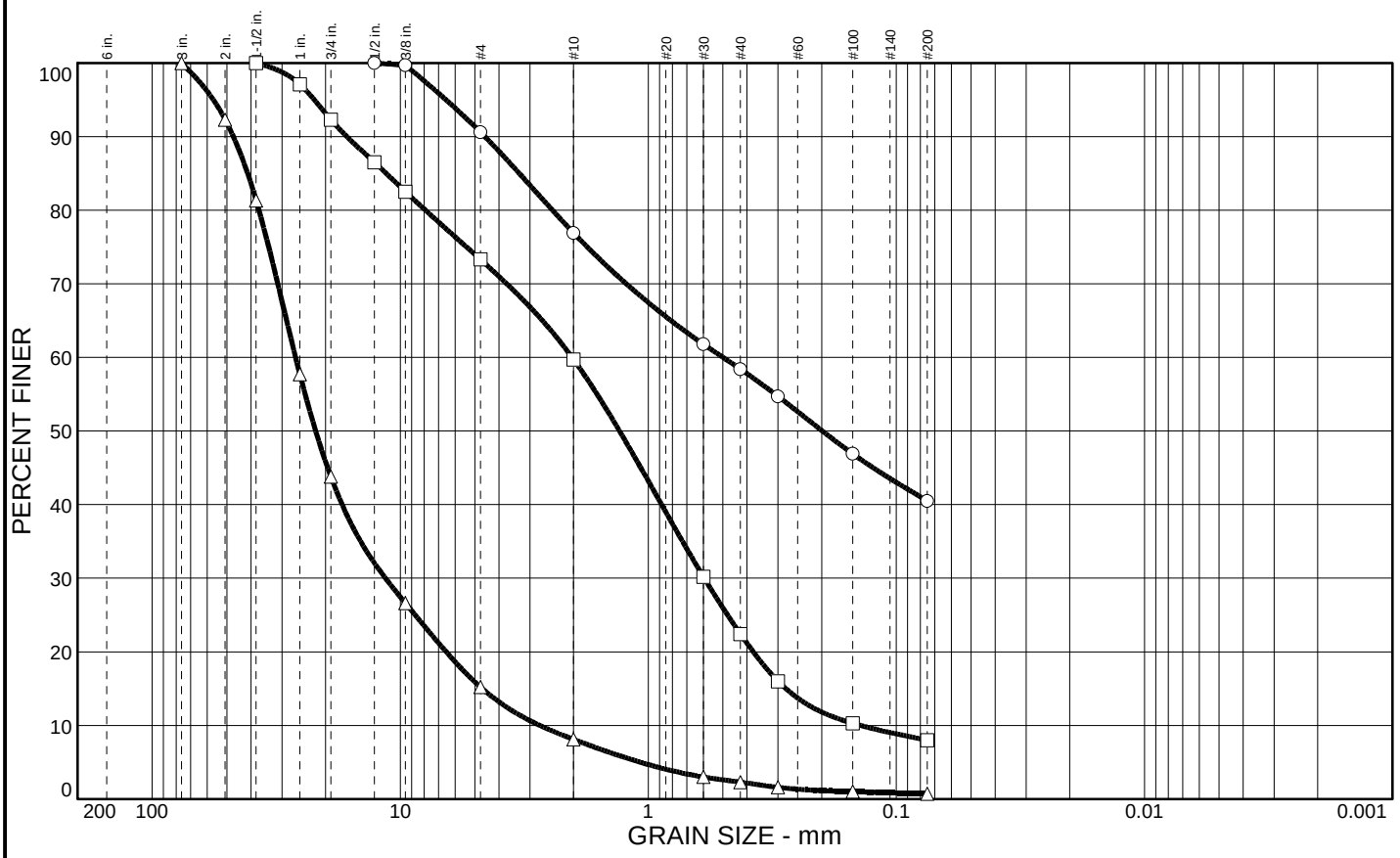
Method A
Specimens Soaked Overnight without Deflocculating Agent
Dry Mass Determined Directly

Client Name AECOM
Project Name Klamath River Dam Removal Project
Project Number 60537920

Boring Number	B-20				
Sample Number	S-05				
Depth (ft)	25-26.5				
Percent of Soil Finer than No. 200 Sieve	23.1				
Visual Classification	Grayish brown clayey sand with gravel				

Date	01/26/19				
Weight of Dry Soil + Pan (before wash)	563.3				
Weight of Dry Soil + Pan (after wash)	476.3				
Weight of Pan	187.6				

Particle Size Distribution Report



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○		9.4	50.1	40.5					
□		26.7	65.3	8.0					
△		84.8	14.5	0.7					

SIEVE inches size	PERCENT FINER ○	□	△
3			100.0
2			92.3
1.5"		100.0	81.3
1"		97.1	57.7
3/4"		92.3	43.8
1/2"	100.0	86.5	
3/8"	99.7	82.5	26.6
GRAIN SIZE			
D_{60}	0.500	2.03	26.4
D_{30}		0.595	11.5
D_{10}		0.139	2.74
COEFFICIENTS			
C_c		1.25	1.82
C_u		14.56	9.65

SIEVE number size	PERCENT FINER ○	□	△
#4	90.6	73.3	15.2
#10	76.9	59.7	8.1
#30	61.8	30.2	3.0
#40	58.4	22.4	2.3
#50	54.7	16.0	1.6
#100	46.9	10.3	1.0
#200	40.5	8.0	0.7

SOIL DESCRIPTION

○ Reddish Brown Clayey SAND

□ Dark Olive Brown Well-Graded SAND w/ Silt & Gravel

△ Dark Olive Brown Well-Graded GRAVEL

REMARKS:

○

□ Due to the small sample size, relative to the largest particle size, this data should be considered to be approximate.

△

○ Source: BC-04 Sample No.: S-03 Elev./Depth: 11-12.5'

□ Source: BC-07 Sample No.: S-04 Elev./Depth: 13'

△ Source: BC-10 Sample No.: S-01 Elev./Depth: 9.5'

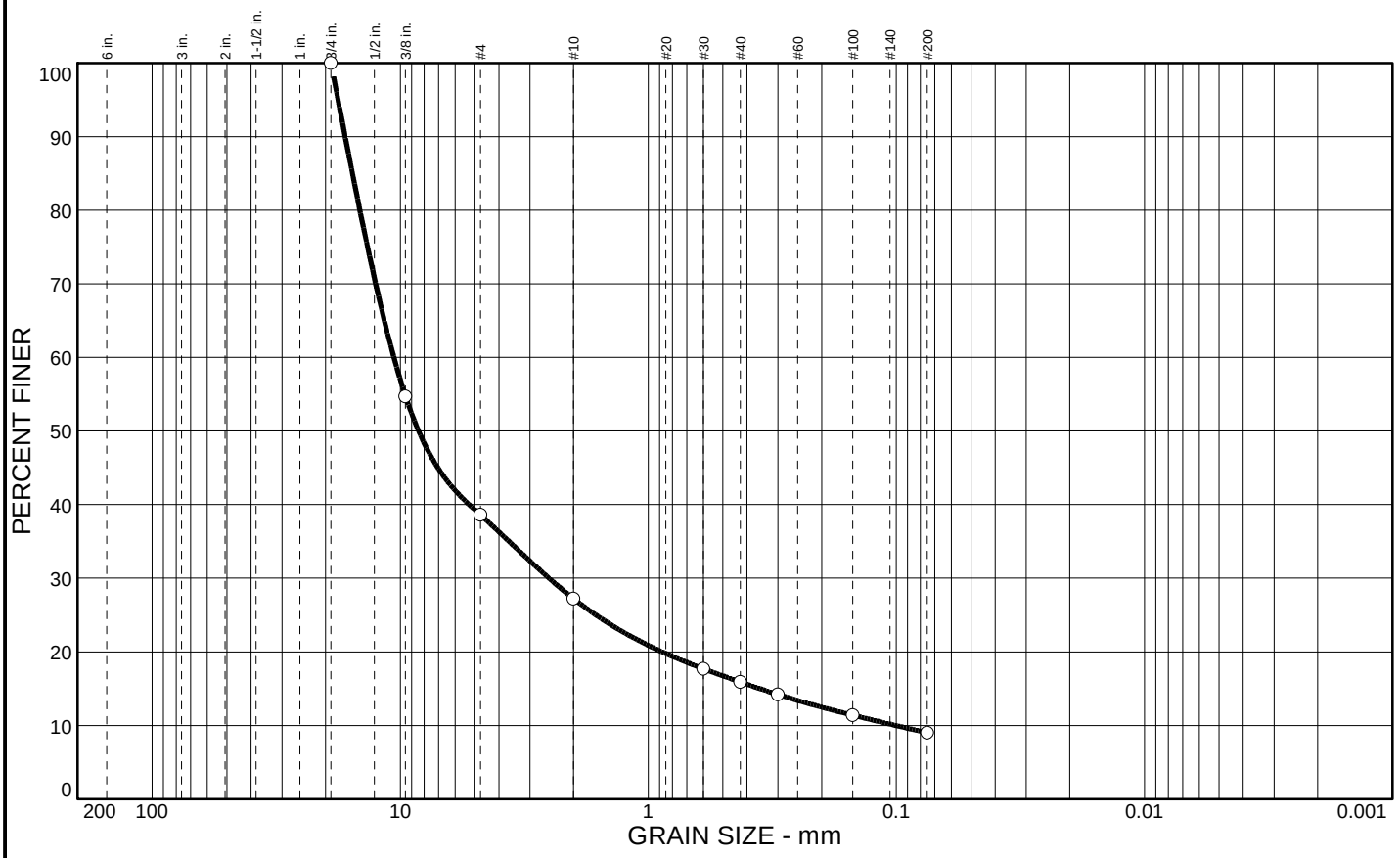
COOPER TESTING LABORATORY

Client: AECOM

Project: Klamath River Dam Removal Project - 60537920

Project No.: 020-251 Figure

Particle Size Distribution Report



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○		61.4	29.6	9.0		GP-GM		26	41

SIEVE inches size	PERCENT FINER ○		
3/4"	100.0		
3/8"	54.7		

GRAIN SIZE			
D_{60}	10.6		
D_{30}	2.52		
D_{10}	0.101		

COEFFICIENTS			
C_c	5.92		
C_u	105.44		

SIEVE number size	PERCENT FINER ○		
#4	38.6		
#10	27.2		
#30	17.7		
#40	15.9		
#50	14.2		
#100	11.4		
#200	9.0		

SOIL DESCRIPTION

○ Olive Gray Poorly Graded GRAVEL w/ Silt & Sand

REMARKS:

○

○ Source: BI-03 Sample No.: S-01 Elev./Depth: 3.5'

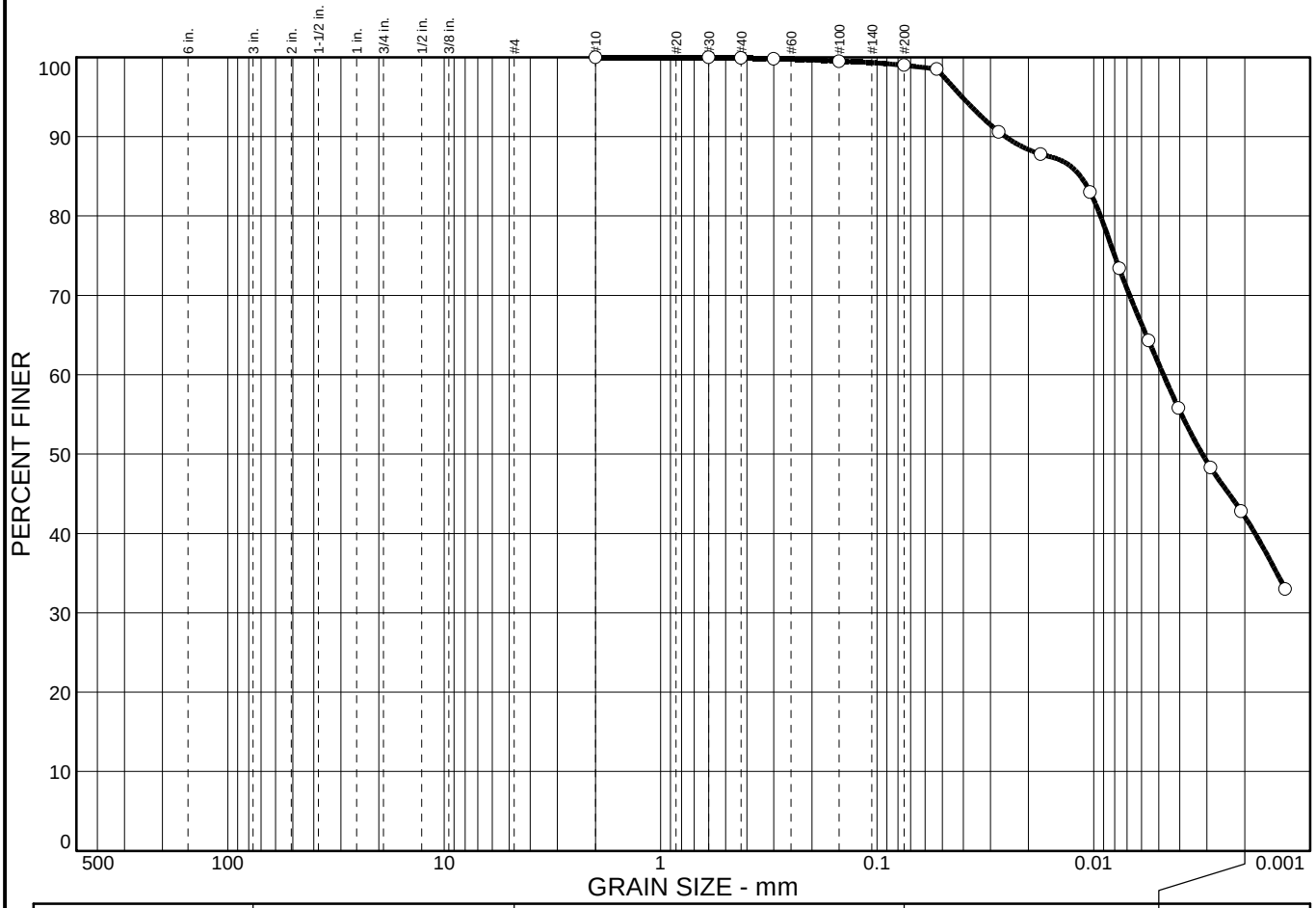
COOPER TESTING LABORATORY

Client: AECOM

Project: Klamath River Dam Removal Project - 60537920

Project No.: 020-251 Figure

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	1.0	56.9	42.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#30	100.0		
#40	99.9		
#50	99.8		
#100	99.5		
#200	99.0		
#270	98.5		
0.0274 mm.	90.6		
0.0176 mm.	87.8		
0.0104 mm.	83.0		
0.0076 mm.	73.4		
0.0056 mm.	64.3		
0.0041 mm.	55.8		
0.0029 mm.	48.3		
0.0021 mm.	42.8		
0.0013 mm.	33.0		

* (no specification provided)

Soil Description

Olive Gray Elastic SILT

Atterberg Limits

PL= 51 LL= 85 PI= 34

Coefficients

D_{85}= 0.0115 D_{60}= 0.0048 D_{50}= 0.0031
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= MH AASHTO=

Remarks

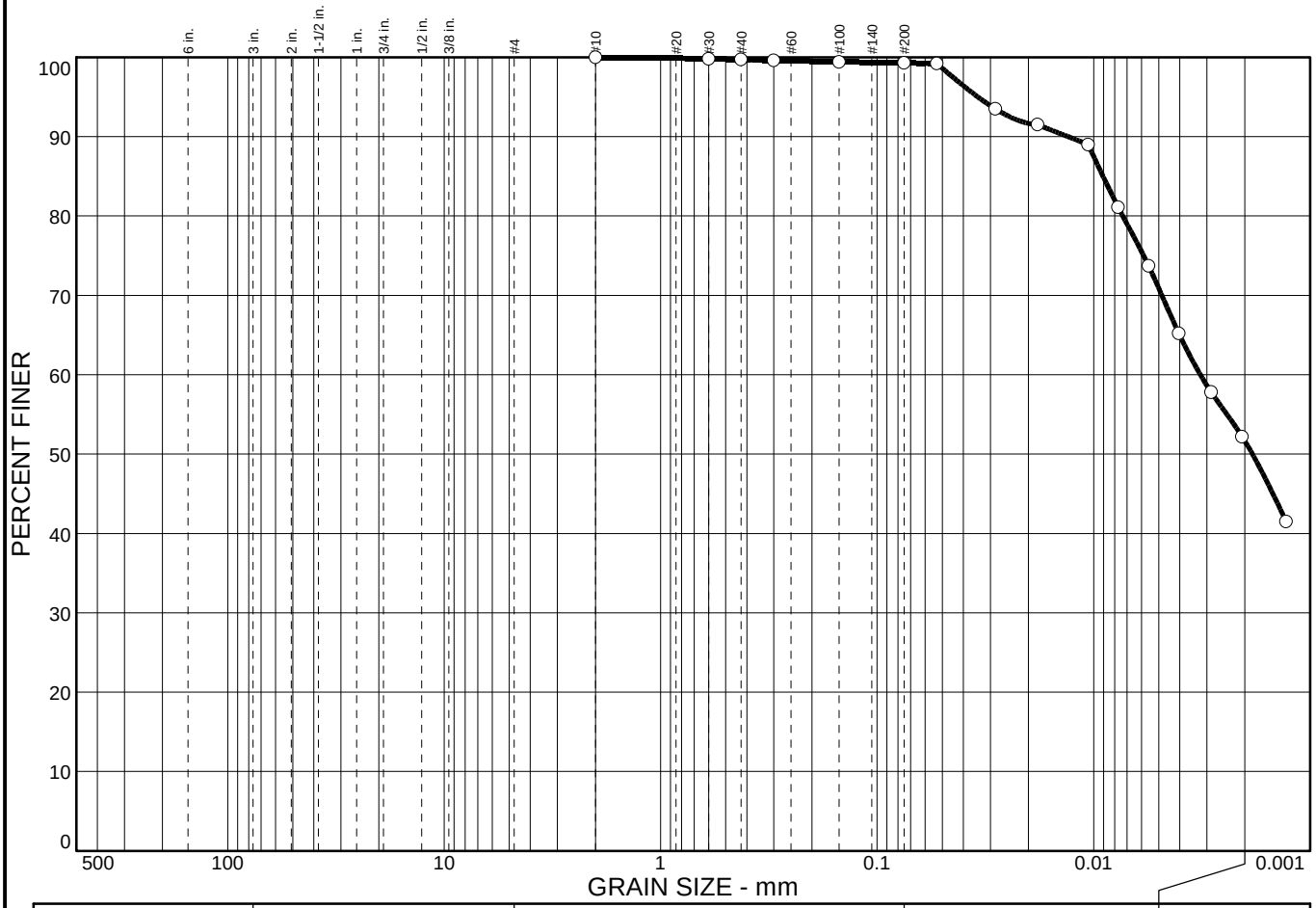
Sample No.: S-04 **Source of Sample:** BC-01 **Date:** 6/5/18
Location: **Elev./Depth:** 21.5'

COOPER TESTING LABORATORY

Client: AECOM
Project: Klamath River Dam Removal Project - 60537920

Project No: 020-251 **Figure**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	0.7	47.7	51.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#30	99.8		
#40	99.7		
#50	99.6		
#100	99.4		
#200	99.3		
#270	99.2		
0.0285 mm.	93.5		
0.0182 mm.	91.5		
0.0106 mm.	89.0		
0.0077 mm.	81.1		
0.0056 mm.	73.7		
0.0040 mm.	65.2		
0.0029 mm.	57.8		
0.0021 mm.	52.2		
0.0013 mm.	41.5		

* (no specification provided)

Soil Description

Gray Elastic SILT

Atterberg Limits

PL= 59 LL= 105 PI= 46

Coefficients

D_{85}= 0.0090 D_{60}= 0.0032 D_{50}= 0.0018
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= MH AASHTO=

Remarks

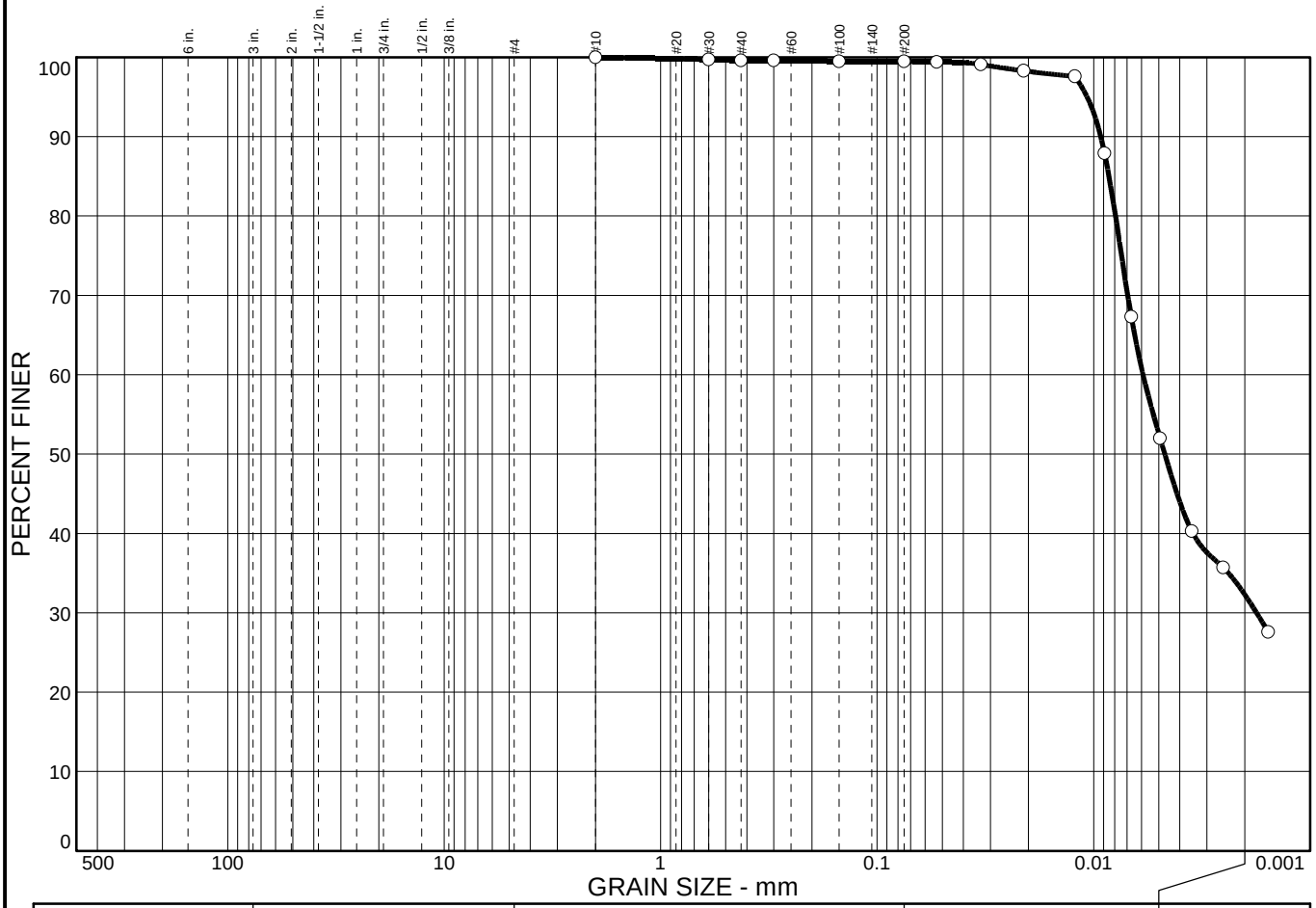
Sample No.: S-05 **Source of Sample:** BC-02 **Date:** 6/5/18
Location: **Elev./Depth:** 14.5'

COOPER TESTING LABORATORY

Client: AECOM
Project: Klamath River Dam Removal Project - 60537920

Project No: 020-251 **Figure**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	0.5	67.2	32.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#30	99.7		
#40	99.6		
#50	99.6		
#100	99.5		
#200	99.5		
#270	99.4		
0.0331 mm.	99.1		
0.0210 mm.	98.3		
0.0122 mm.	97.6		
0.0089 mm.	87.9		
0.0067 mm.	67.3		
0.0049 mm.	52.0		
0.0035 mm.	40.3		
0.0025 mm.	35.7		
0.0016 mm.	27.6		

* (no specification provided)

Soil Description

Gray Elastic SILT

Atterberg Limits

PL= 85 LL= 187 PI= 102

Coefficients

D_{85}= 0.0085 D_{60}= 0.0059 D_{50}= 0.0047
D_{30}= 0.0018 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= MH AASHTO=

Remarks

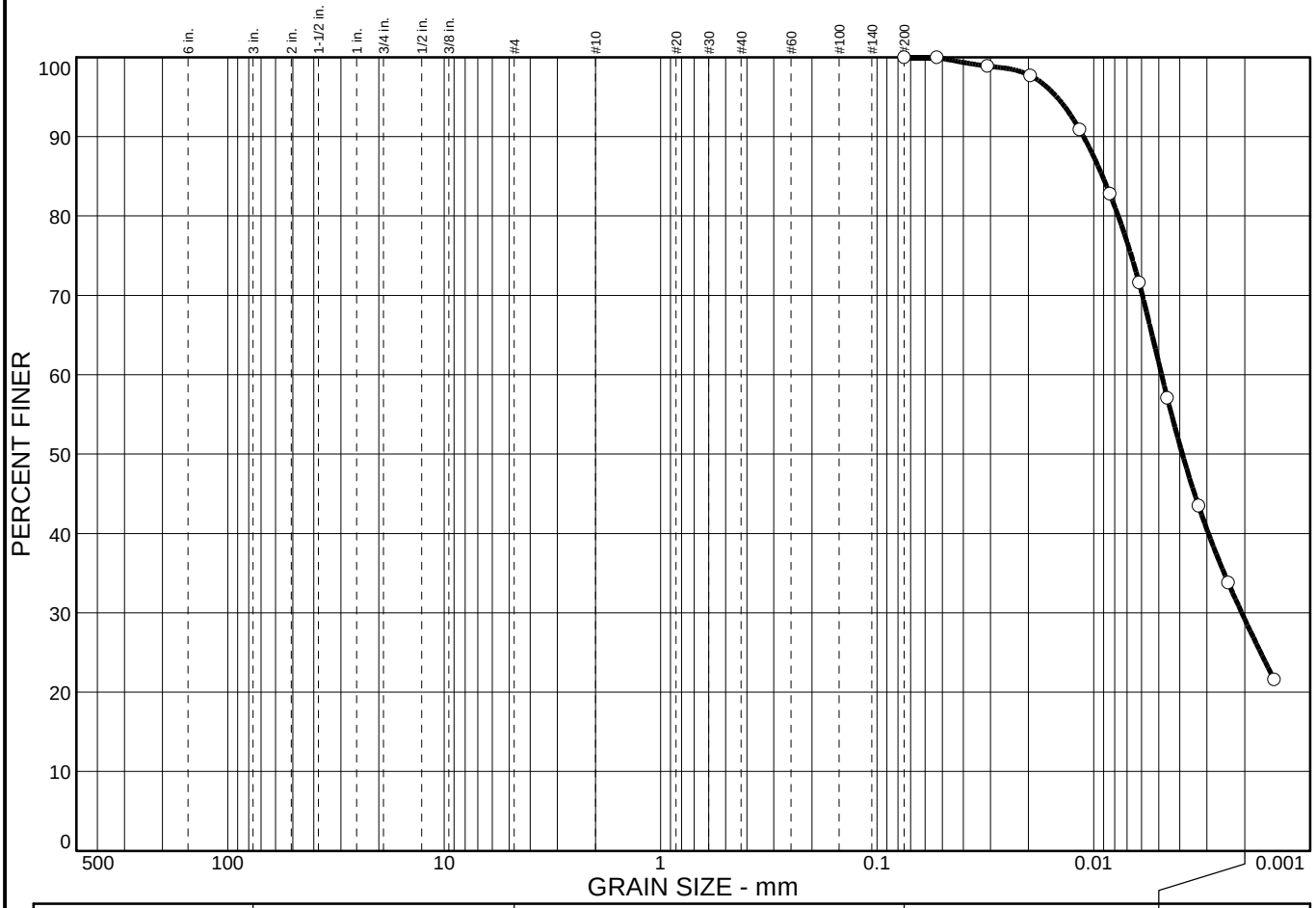
Sample No.: S-09 **Source of Sample:** BC-02 **Date:** 6/5/18
Location: **Elev./Depth:** 44.5'

COOPER TESTING LABORATORY

Client: AECOM
Project: Klamath River Dam Removal Project - 60537920

Project No: 020-251 **Figure**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	0.0	70.9	29.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	100.0		
#270	100.0		
0.0309 mm.	98.9		
0.0196 mm.	97.7		
0.0116 mm.	90.9		
0.0084 mm.	82.8		
0.0062 mm.	71.6		
0.0046 mm.	57.1		
0.0033 mm.	43.5		
0.0024 mm.	33.8		
0.0015 mm.	21.6		

* (no specification provided)

Soil Description

Light Olive Brown Elastic SILT

Atterberg Limits

PL= 59 LL= 69 PI= 10

Coefficients

D_{85}= 0.0091 D_{60}= 0.0049 D_{50}= 0.0039
D_{30}= 0.0021 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= MH AASHTO=

Remarks

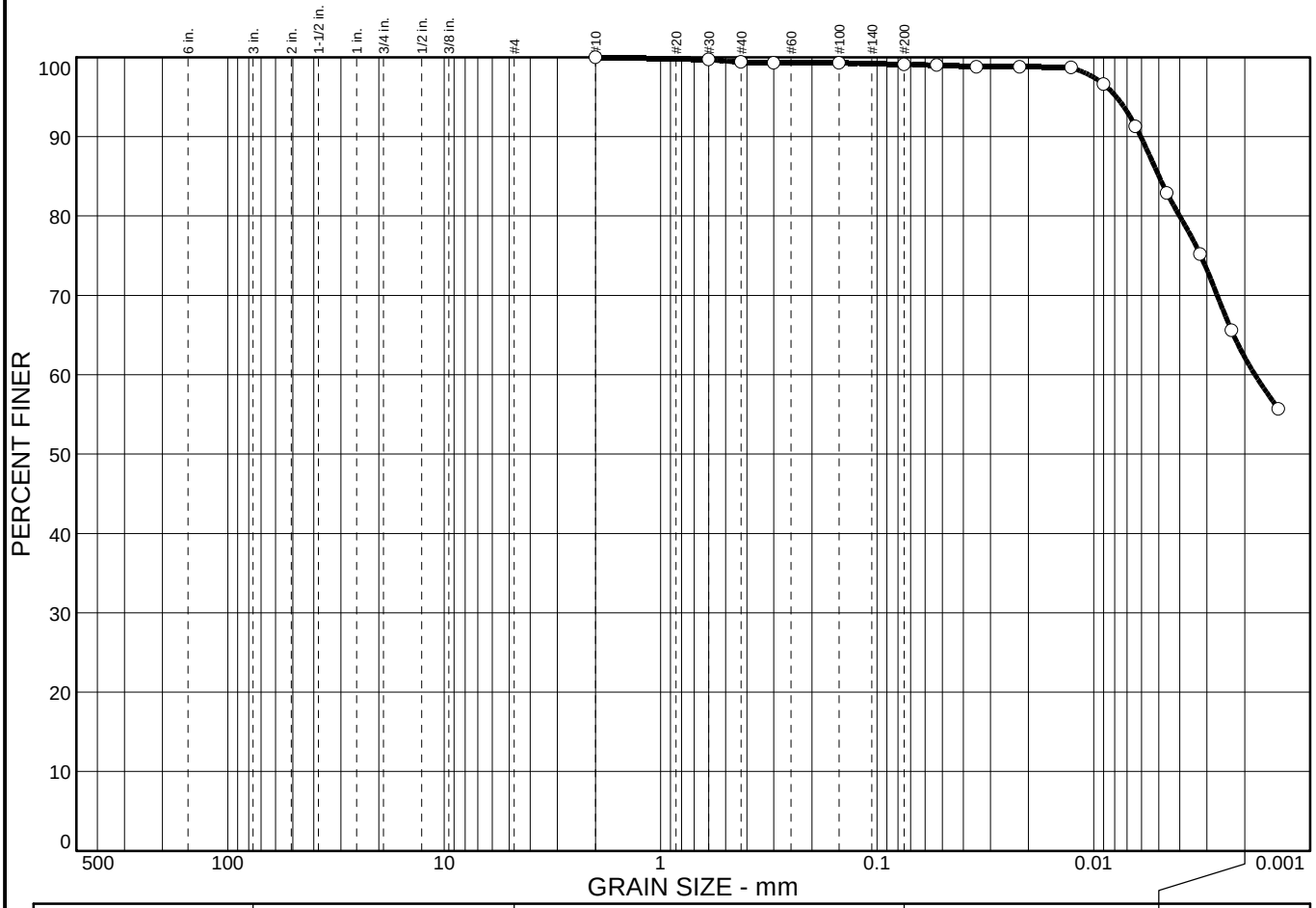
Sample No.: S-05 **Source of Sample:** BC-03 **Date:** 6/5/18
Location: **Elev./Depth:** 24.5'

COOPER TESTING LABORATORY

Client: AECOM
Project: Klamath River Dam Removal Project - 60537920

Project No: 020-251 **Figure**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	0.9	37.0	62.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#30	99.7		
#40	99.4		
#50	99.3		
#100	99.3		
#200	99.1		
#270	99.0		
0.0347 mm.	98.8		
0.0219 mm.	98.8		
0.0127 mm.	98.7		
0.0090 mm.	96.6		
0.0064 mm.	91.3		
0.0046 mm.	82.9		
0.0032 mm.	75.2		
0.0023 mm.	65.6		
0.0014 mm.	55.7		

* (no specification provided)

Soil Description

Pale Brown Mottled Gray Elastic SILT

Atterberg Limits

PL= 85 LL= 120 PI= 35

Coefficients

D_{85}= 0.0050 D_{60}= 0.0018 D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= MH AASHTO=

Remarks

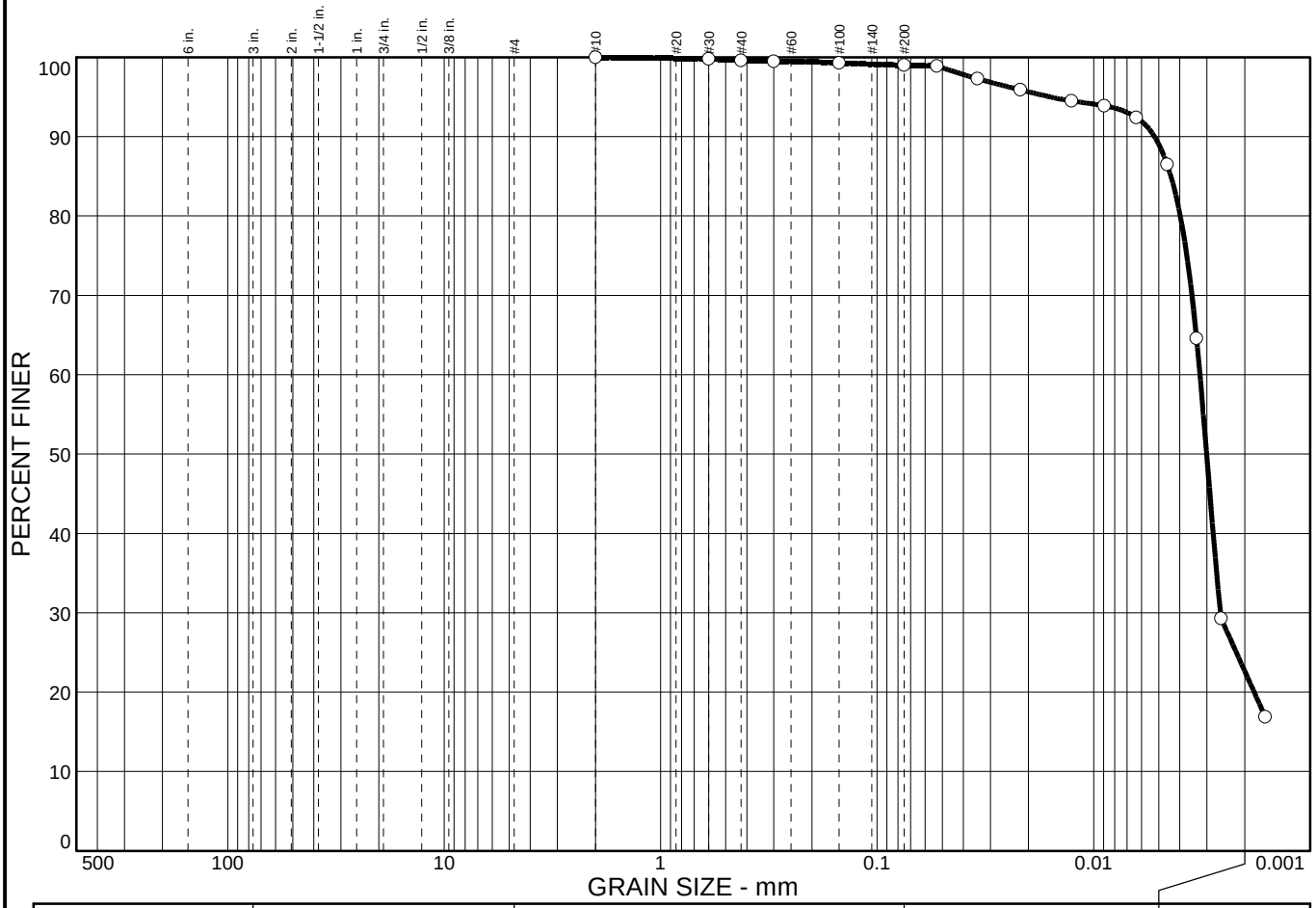
Sample No.: S-08 **Source of Sample:** BC-04 **Date:** 5/16/18
Location: **Elev./Depth:** 32.5(Tip-16")

COOPER TESTING LABORATORY

Client: AECOM
Project: Klamath River Dam Removal Project - 60537920

Project No: 020-251 **Figure**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	1.0	76.4	22.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#30	99.8		
#40	99.6		
#50	99.5		
#100	99.3		
#200	99.0		
#270	98.9		
0.0343 mm.	97.3		
0.0218 mm.	95.9		
0.0126 mm.	94.5		
0.0089 mm.	93.9		
0.0063 mm.	92.4		
0.0046 mm.	86.5		
0.0034 mm.	64.6		
0.0026 mm.	29.3		
0.0016 mm.	16.9		

* (no specification provided)

Soil Description

Light Olive Brown Elastic SILT

Atterberg Limits

PL= 88 LL= 200 PI= 112

Coefficients

D_{85}= 0.0044 D_{60}= 0.0032 D_{50}= 0.0030
D_{30}= 0.0026 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= MH AASHTO=

Remarks

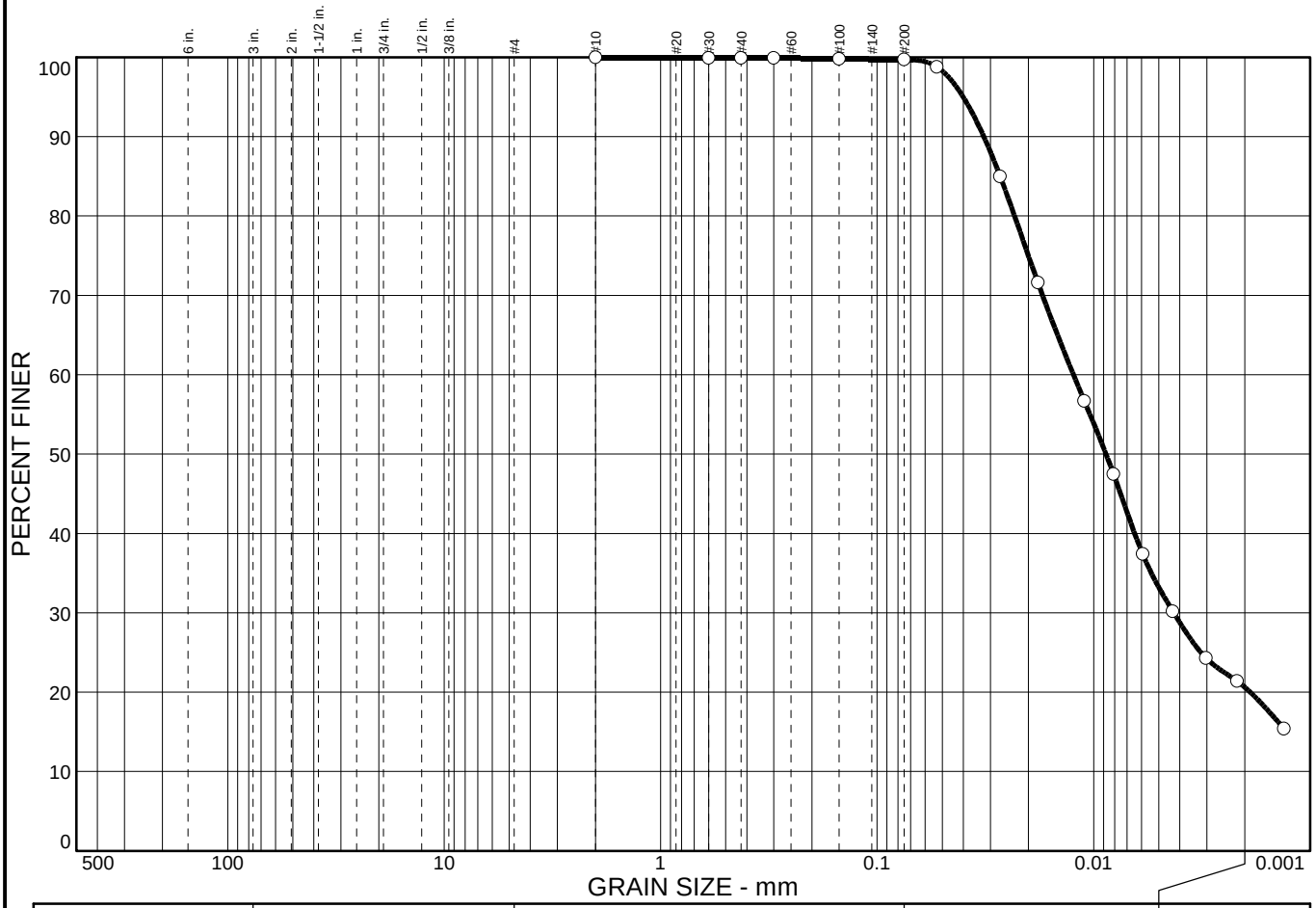
Sample No.: S-05 **Source of Sample:** BC-08A **Date:** 6/5/18
Location: **Elev./Depth:** 54'

COOPER TESTING LABORATORY

Client: AECOM
Project: Klamath River Dam Removal Project - 60537920

Project No: 020-251 **Figure**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	0.3	79.1	20.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#30	99.9		
#40	99.9		
#50	99.9		
#100	99.8		
#200	99.7		
#270	98.8		
0.0270 mm.	85.0		
0.0181 mm.	71.6		
0.0110 mm.	56.7		
0.0081 mm.	47.5		
0.0059 mm.	37.4		
0.0043 mm.	30.2		
0.0030 mm.	24.3		
0.0022 mm.	21.4		
0.0013 mm.	15.4		

* (no specification provided)

Soil Description

Dark Gray Elastic SILT

Atterberg Limits

PL= 53 LL= 74 PI= 21

Coefficients

D_{85}= 0.0270 D_{60}= 0.0124 D_{50}= 0.0088
D_{30}= 0.0043 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= MH AASHTO=

Remarks

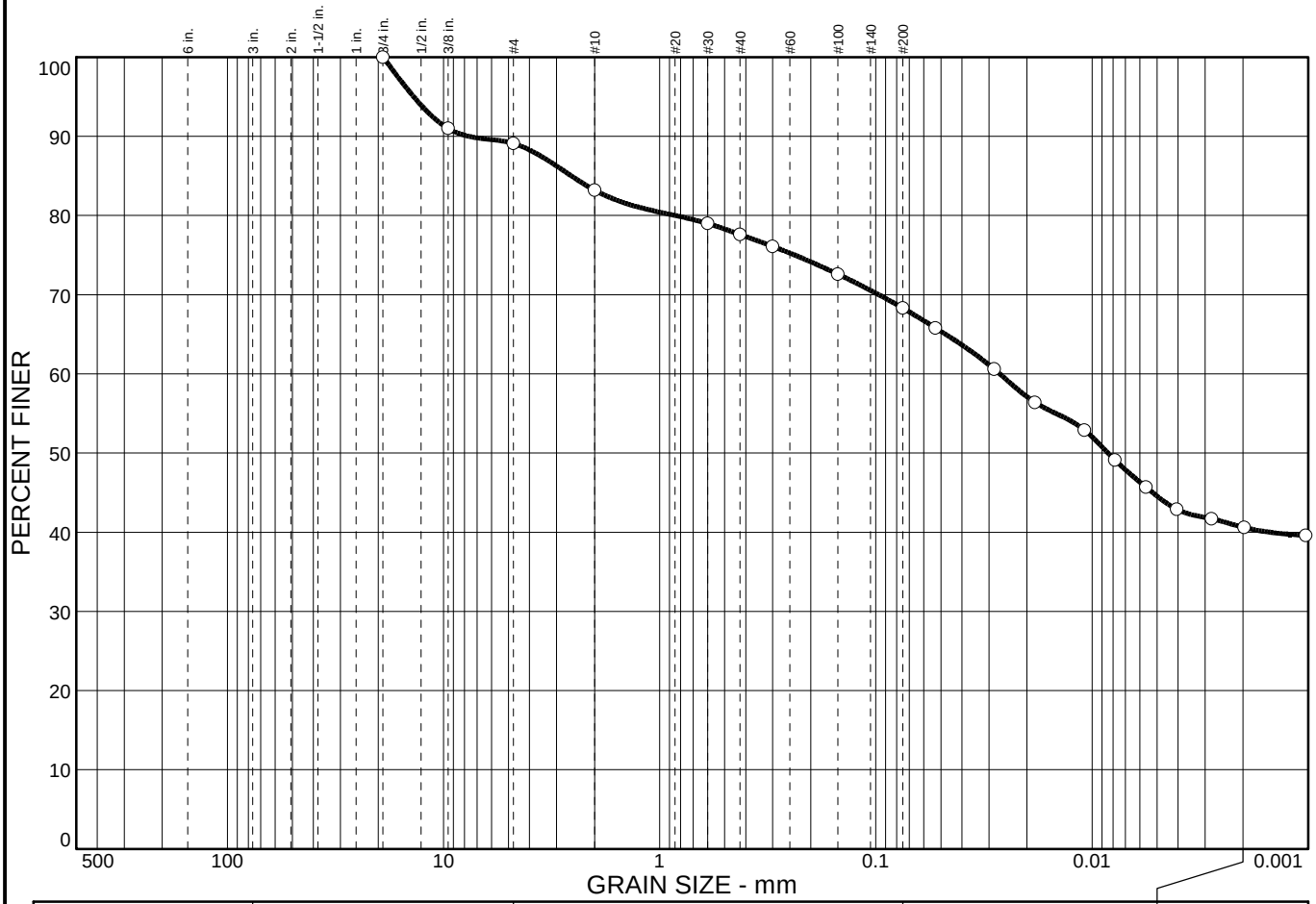
Sample No.: S-05 **Source of Sample:** BC-09 **Date:** 6/5/18
Location: **Elev./Depth:** 23(Tip-5")

COOPER TESTING LABORATORY

Client: AECOM
Project: Klamath River Dam Removal Project - 60537920

Project No: 020-251 **Figure**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	10.9	20.8	27.7	40.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
3/8 in.	91.0		
#4	89.1		
#10	83.2		
#30	79.0		
#40	77.6		
#50	76.1		
#100	72.6		
#200	68.3		
#270	65.8		
0.0284 mm.	60.6		
0.0184 mm.	56.4		
0.0108 mm.	52.9		
0.0078 mm.	49.1		
0.0056 mm.	45.7		
0.0041 mm.	42.9		
0.0028 mm.	41.7		
0.0020 mm.	40.6		
0.0010 mm.	39.6		

* (no specification provided)

Soil Description

Dark Reddish Brown Sandy Fat CLAY

Atterberg Limits

PL= 28 LL= 78 PI= 50

Coefficients

D_{85}= 2.56 D_{60}= 0.0267 D_{50}= 0.0084
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

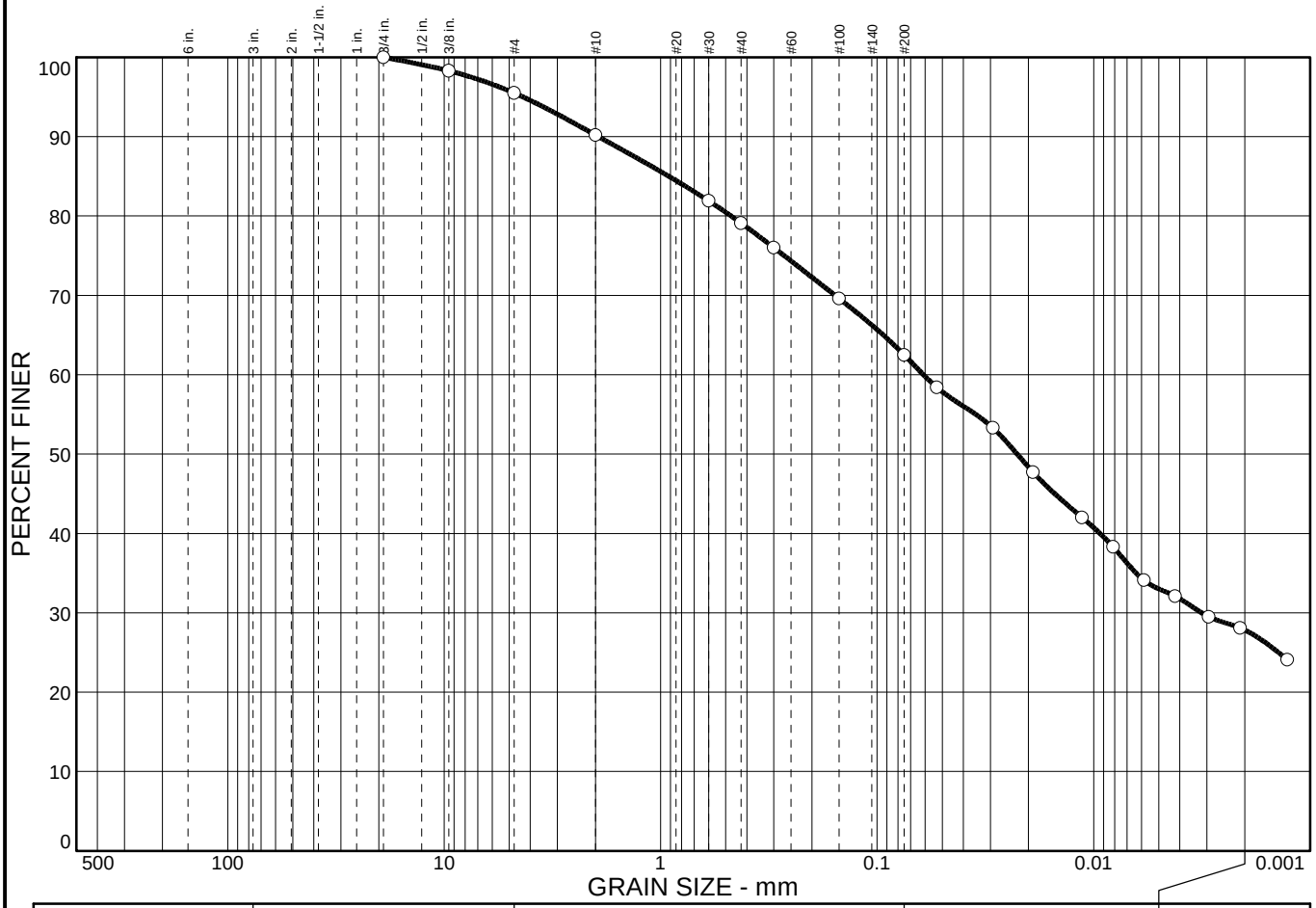
Sample No.: S-01 **Source of Sample:** BI-02 **Date:** 6/6/18
Location: **Elev./Depth:** 5'

COOPER TESTING LABORATORY

Client: AECOM
Project: Klamath River Dam Removal Project - 60537920

Project No: 020-251 **Figure**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	4.5	33.0	34.7	27.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
3/8 in.	98.3		
#4	95.5		
#10	90.2		
#30	81.9		
#40	79.1		
#50	76.0		
#100	69.6		
#200	62.5		
#270	58.4		
0.0292 mm.	53.3		
0.0190 mm.	47.7		
0.0113 mm.	42.0		
0.0081 mm.	38.3		
0.0059 mm.	34.1		
0.0042 mm.	32.1		
0.0029 mm.	29.5		
0.0021 mm.	28.1		
0.0013 mm.	24.1		

* (no specification provided)

Soil Description

Yellowish Brown Sandy Fat CLAY

Atterberg Limits

PL= 28 LL= 58 PI= 30

Coefficients

D_{85}= 0.917 D_{60}= 0.0612 D_{50}= 0.0226
D_{30}= 0.0032 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

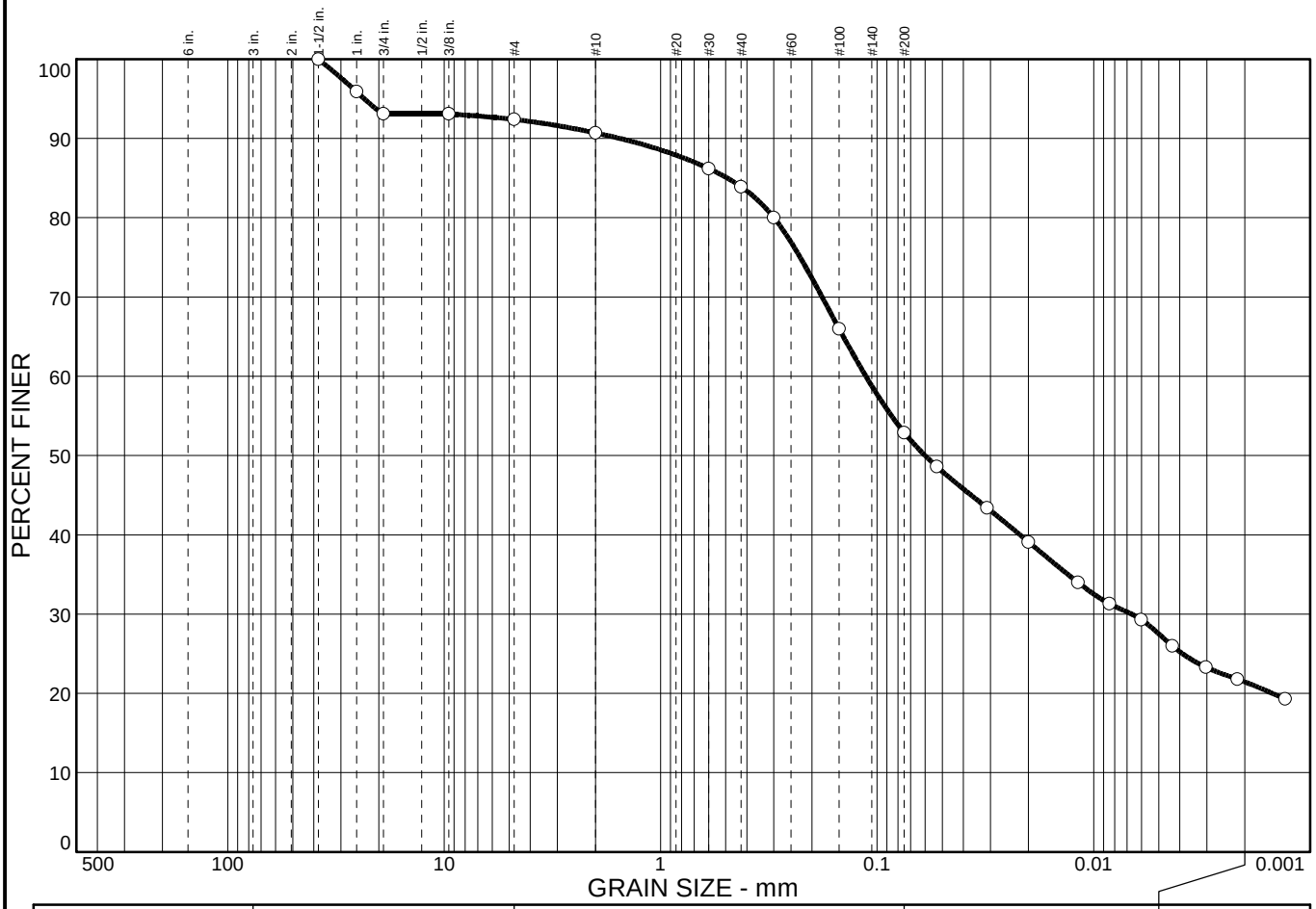
Sample No.: S-02 **Source of Sample:** BI-02 **Date:** 6/6/18
Location: **Elev./Depth:** 10'

COOPER TESTING LABORATORY

Client: AECOM
Project: Klamath River Dam Removal Project - 60537920

Project No: 020-251 **Figure**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	7.6	39.5	31.5	21.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1 in.	95.9		
3/4 in.	93.1		
3/8 in.	93.1		
#4	92.4		
#10	90.7		
#30	86.2		
#40	83.9		
#50	80.0		
#100	66.0		
#200	52.9		
#270	48.6		
0.0311 mm.	43.4		
0.0200 mm.	39.1		
0.0118 mm.	34.0		
0.0084 mm.	31.3		
0.0060 mm.	29.3		
0.0043 mm.	26.0		
0.0030 mm.	23.3		
0.0022 mm.	21.8		
0.0013 mm.	19.3		

* (no specification provided)

Soil Description

Yellowish Brown Sandy Fat CLAY

Atterberg Limits

PL= 27 LL= 51 PI= 24

Coefficients

D_{85}= 0.492 D_{60}= 0.113 D_{50}= 0.0601
D_{30}= 0.0067 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

Due to the small sample size, relative to the largest particle size, this data should be considered to be approximate.

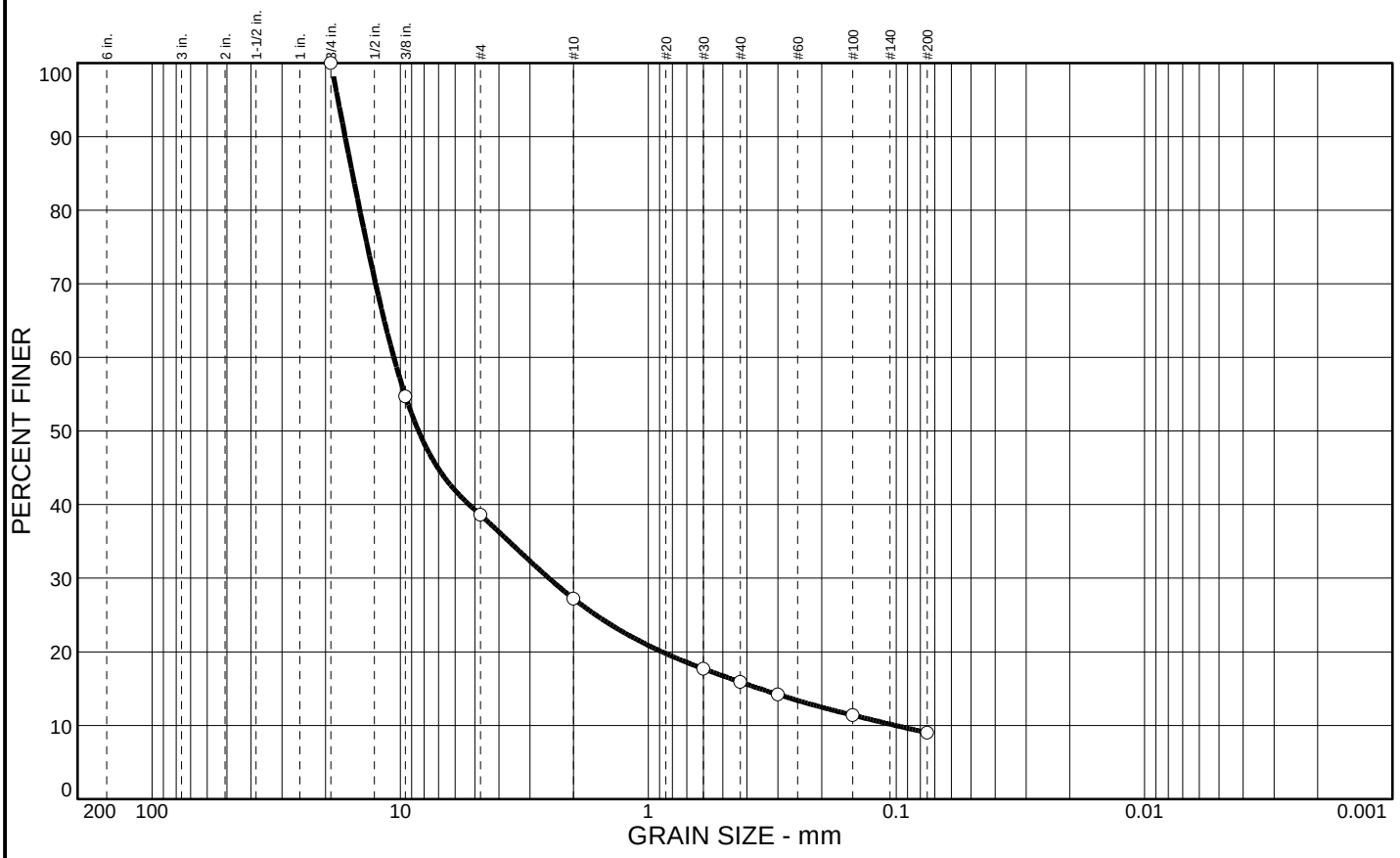
Sample No.: S-03 **Source of Sample:** BI-02 **Date:** 6/6/18
Location: **Elev./Depth:** 15'

COOPER TESTING LABORATORY

Client: AECOM
Project: Klamath River Dam Removal Project - 60537920

Project No: 020-251 **Figure**

Particle Size Distribution Report



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○		61.4	29.6	9.0		GP-GM		26	41

SIEVE inches size	PERCENT FINER ○		
3/4"	100.0		
3/8"	54.7		

GRAIN SIZE			
D_{60}	10.6		
D_{30}	2.52		
D_{10}	0.101		

COEFFICIENTS			
C_c	5.92		
C_u	105.44		

SIEVE number size	PERCENT FINER ○		
#4	38.6		
#10	27.2		
#30	17.7		
#40	15.9		
#50	14.2		
#100	11.4		
#200	9.0		

SOIL DESCRIPTION

○ Olive Gray Poorly Graded GRAVEL w/ Silt & Sand

REMARKS:

○

○ Source: BI-03 Sample No.: S-01 Elev./Depth: 3.5'

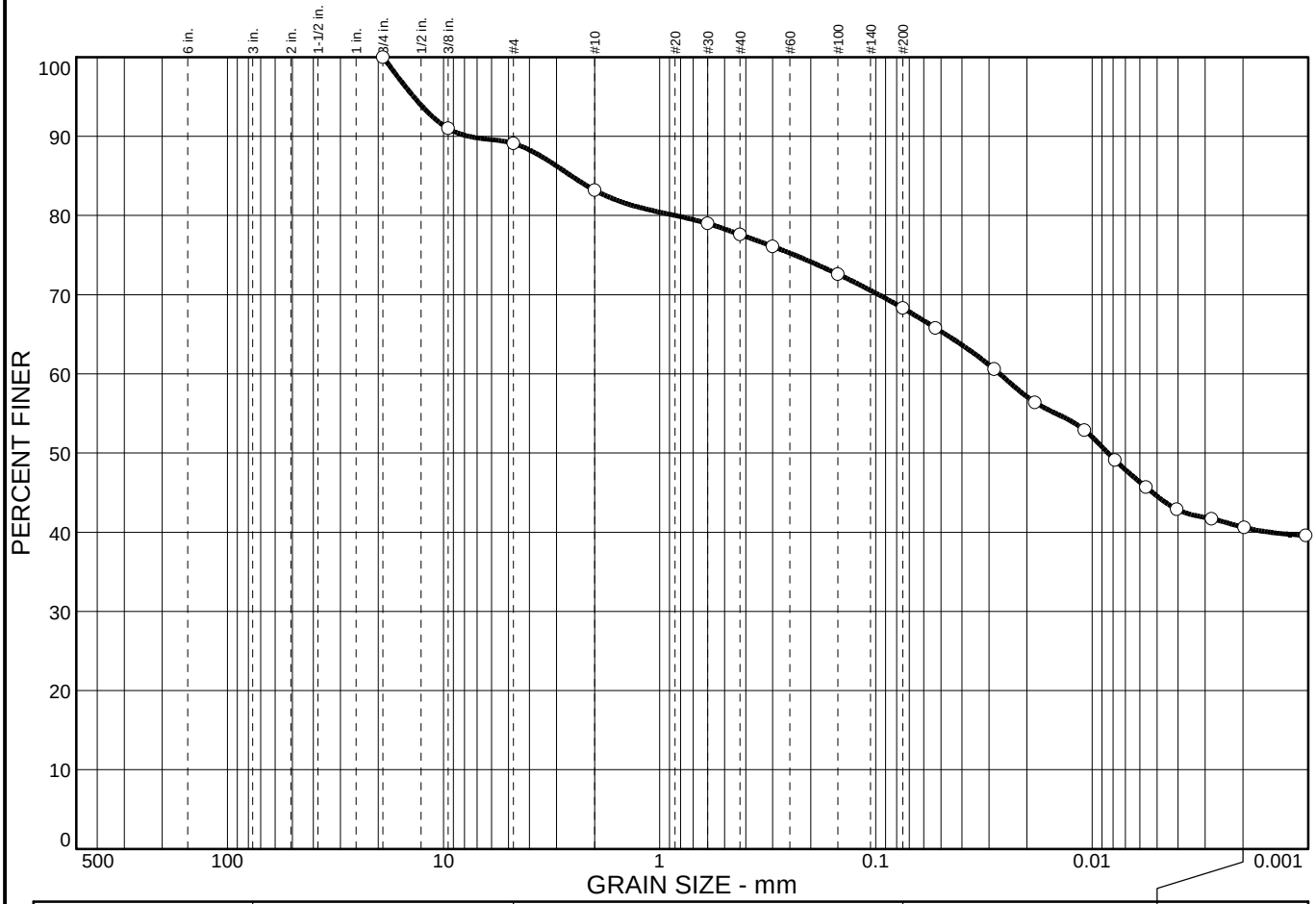
COOPER TESTING LABORATORY

Client: AECOM

Project: Klamath River Dam Removal Project - 60537920

Project No.: 020-251 Figure

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	10.9	20.8	27.7	40.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
3/8 in.	91.0		
#4	89.1		
#10	83.2		
#30	79.0		
#40	77.6		
#50	76.1		
#100	72.6		
#200	68.3		
#270	65.8		
0.0284 mm.	60.6		
0.0184 mm.	56.4		
0.0108 mm.	52.9		
0.0078 mm.	49.1		
0.0056 mm.	45.7		
0.0041 mm.	42.9		
0.0028 mm.	41.7		
0.0020 mm.	40.6		
0.0010 mm.	39.6		

* (no specification provided)

Soil Description

Dark Reddish Brown Sandy Fat CLAY

Atterberg Limits

PL= 28 LL= 78 PI= 50

Coefficients

D_{85}= 2.56 D_{60}= 0.0267 D_{50}= 0.0084
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

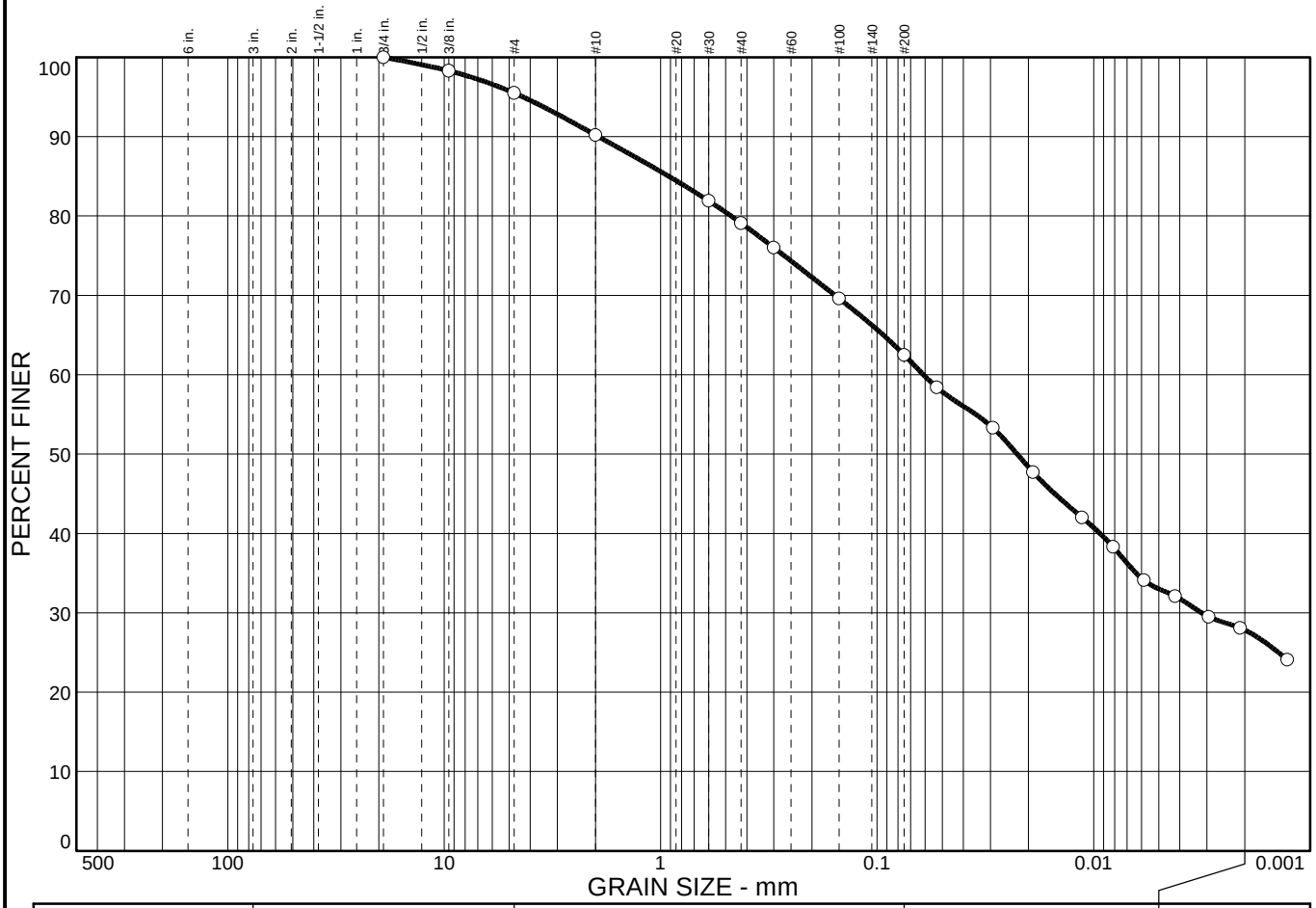
Sample No.: S-01 **Source of Sample:** BI-02 **Date:** 6/6/18
Location: **Elev./Depth:** 5'

COOPER TESTING LABORATORY

Client: AECOM
Project: Klamath River Dam Removal Project - 60537920

Project No: 020-251 **Figure**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	4.5	33.0	34.7	27.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
3/8 in.	98.3		
#4	95.5		
#10	90.2		
#30	81.9		
#40	79.1		
#50	76.0		
#100	69.6		
#200	62.5		
#270	58.4		
0.0292 mm.	53.3		
0.0190 mm.	47.7		
0.0113 mm.	42.0		
0.0081 mm.	38.3		
0.0059 mm.	34.1		
0.0042 mm.	32.1		
0.0029 mm.	29.5		
0.0021 mm.	28.1		
0.0013 mm.	24.1		

* (no specification provided)

Soil Description

Yellowish Brown Sandy Fat CLAY

Atterberg Limits

PL= 28 LL= 58 PI= 30

Coefficients

D_{85}= 0.917 D_{60}= 0.0612 D_{50}= 0.0226
D_{30}= 0.0032 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

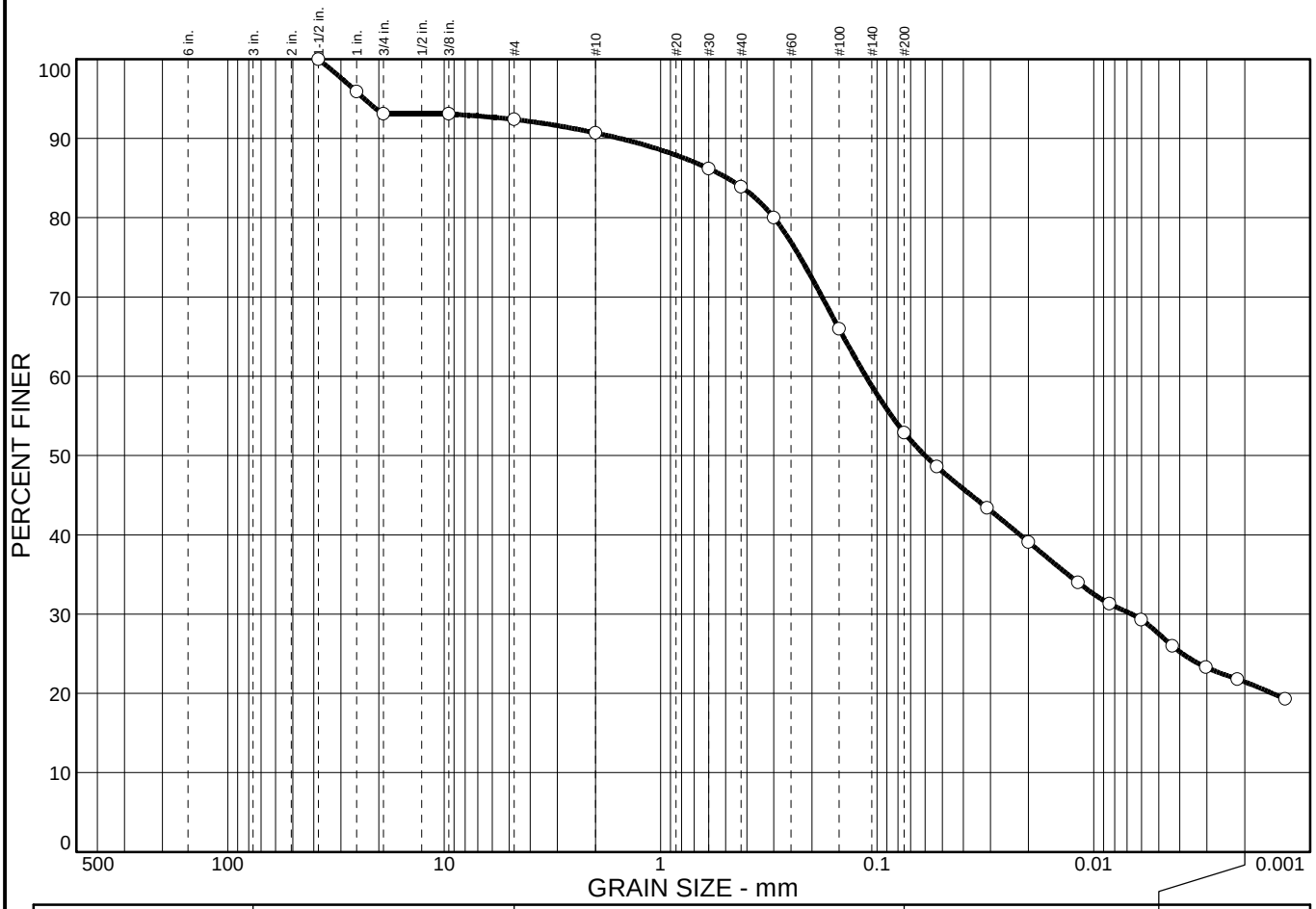
Sample No.: S-02 **Source of Sample:** BI-02 **Date:** 6/6/18
Location: **Elev./Depth:** 10'

COOPER TESTING LABORATORY

Client: AECOM
Project: Klamath River Dam Removal Project - 60537920

Project No: 020-251 **Figure**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	7.6	39.5	31.5	21.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1 in.	95.9		
3/4 in.	93.1		
3/8 in.	93.1		
#4	92.4		
#10	90.7		
#30	86.2		
#40	83.9		
#50	80.0		
#100	66.0		
#200	52.9		
#270	48.6		
0.0311 mm.	43.4		
0.0200 mm.	39.1		
0.0118 mm.	34.0		
0.0084 mm.	31.3		
0.0060 mm.	29.3		
0.0043 mm.	26.0		
0.0030 mm.	23.3		
0.0022 mm.	21.8		
0.0013 mm.	19.3		

* (no specification provided)

Soil Description

Yellowish Brown Sandy Fat CLAY

Atterberg Limits

PL= 27 LL= 51 PI= 24

Coefficients

D_{85}= 0.492 D_{60}= 0.113 D_{50}= 0.0601
D_{30}= 0.0067 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

Due to the small sample size, relative to the largest particle size, this data should be considered to be approximate.

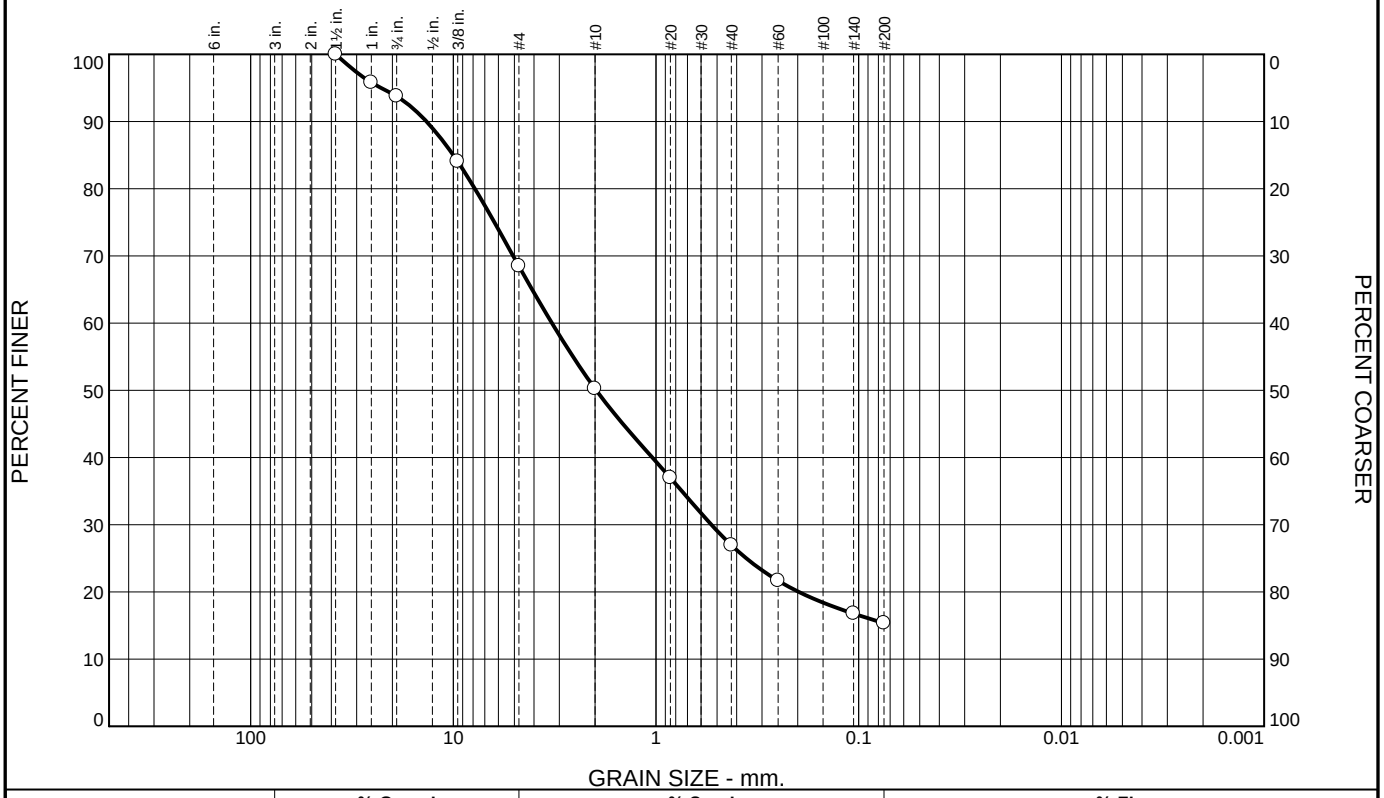
Sample No.: S-03 **Source of Sample:** BI-02 **Date:** 6/6/18
Location: **Elev./Depth:** 15'

COOPER TESTING LABORATORY

Client: AECOM
Project: Klamath River Dam Removal Project - 60537920

Project No: 020-251 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	6	26	18	23	12	15	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100		
1	96		
3/4	94		
3/8	84		
#4	68		
#10	50		
#20	37		
#40	27		
#60	22		
#140	17		
#200	15		

* (no specification provided)

Soil Description

Gray silty sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 13.5779 D_{85}= 10.0161 D_{60}= 3.2642
D_{50}= 1.9723 D_{30}= 0.5334 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO=

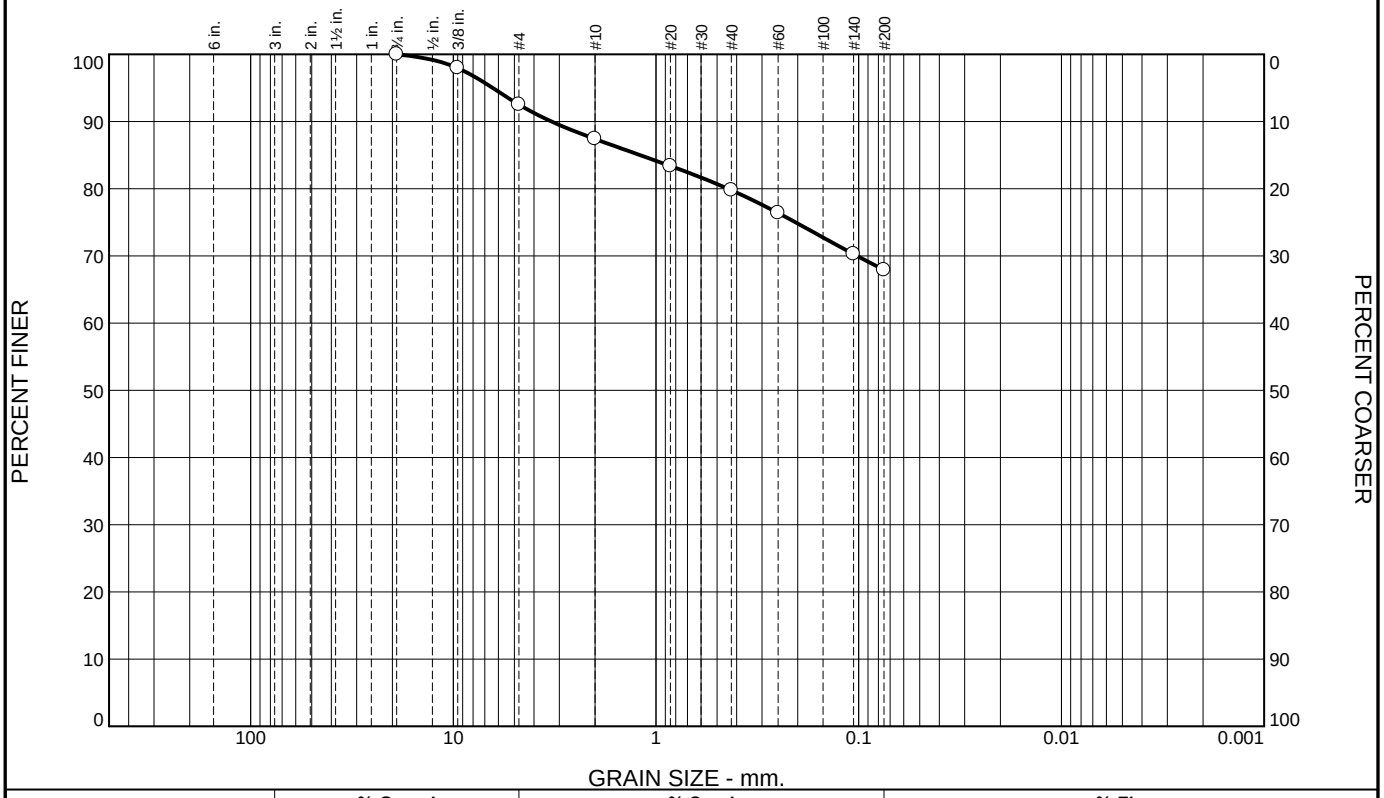
Remarks

Source of Sample: B-2 **Depth:** 27-27.5
Sample Number: S-01 **Date:** 2-1-19

Client: AECOM
Project: Klamath River Dam Removal Project
60537920
Project No: 2301-069.0 **Figure**

Tested By: JH **Checked By:** JH

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	7	6	7	12	68	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100		
3/8	98		
#4	93		
#10	87		
#20	83		
#40	80		
#60	76		
#140	70		
#200	68		

* (no specification provided)

Soil Description

Brown clay with sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 3.2821 D_{85}= 1.2011 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Source of Sample: B-5 **Depth:** 5-6.5
Sample Number: S-01 **Date:** 2-1-19

Client: AECOM
Project: Klamath River Dam Removal Project
60537920
Project No: 2301-069.0 **Figure**

Tested By: JH **Checked By:** JH

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	1	20	54	25	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100		
#10	99		
#20	93		
#40	79		
#60	58		
#140	31		
#200	25		

* (no specification provided)

Soil Description

Grayish brown silty sand with organics

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.6851 D_{85}= 0.5329 D_{60}= 0.2650
D_{50}= 0.2048 D_{30}= 0.1007 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO=

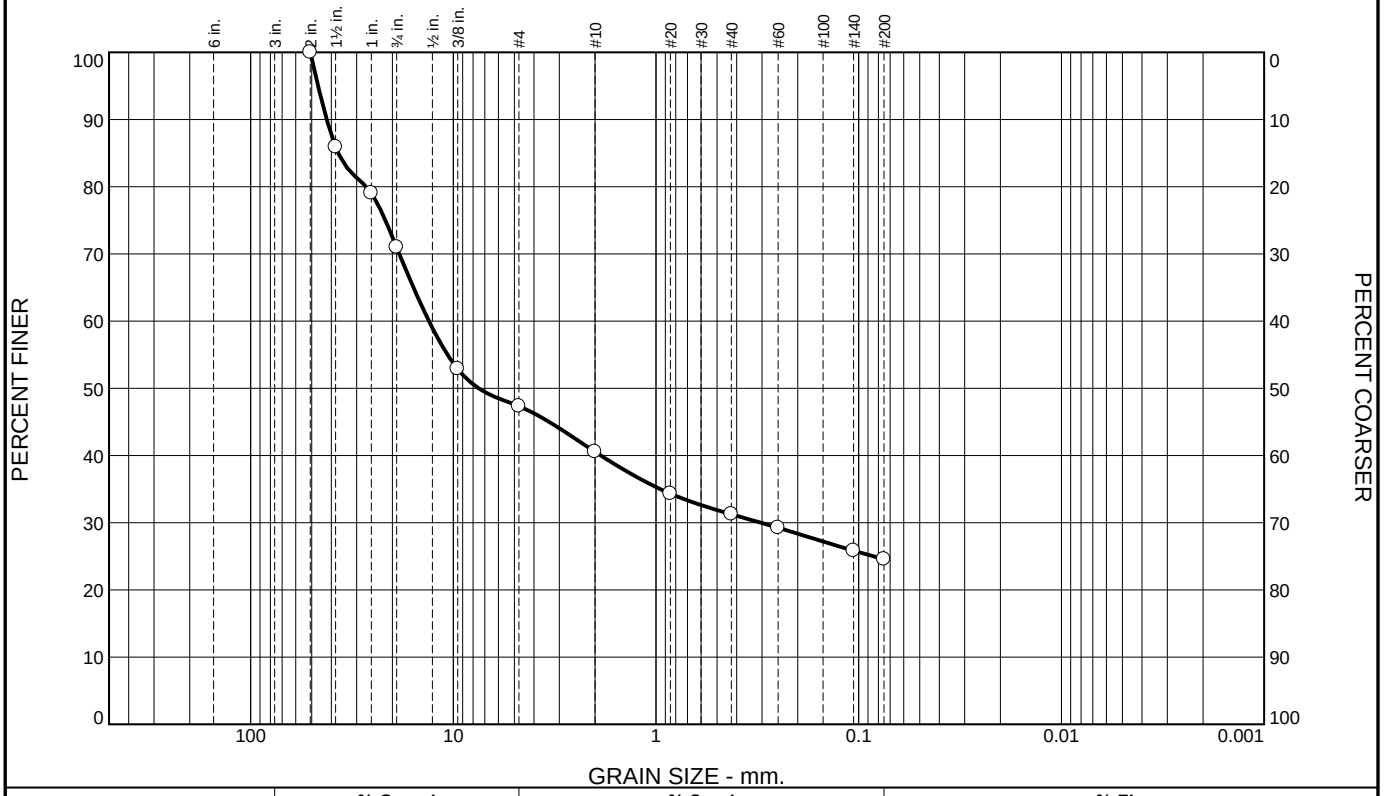
Remarks

Source of Sample: B-6 **Depth:** 10-11.5
Sample Number: S-02 **Date:** 2-1-19

Client: AECOM
Project: Klamath River Dam Removal Project
60537920
Project No: 2301-069.0 **Figure**

Tested By: JH **Checked By:** JH

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	29	24	6	10	6	25	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2	100		
1.5	86		
1	79		
3/4	71		
3/8	53		
#4	47		
#10	41		
#20	34		
#40	31		
#60	29		
#140	26		
#200	25		

* (no specification provided)

Soil Description

Reddish brown clayey gravel with sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 42.1617 D_{85}= 36.9884 D_{60}= 13.2018
D_{50}= 7.5052 D_{30}= 0.3044 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= GC AASHTO=

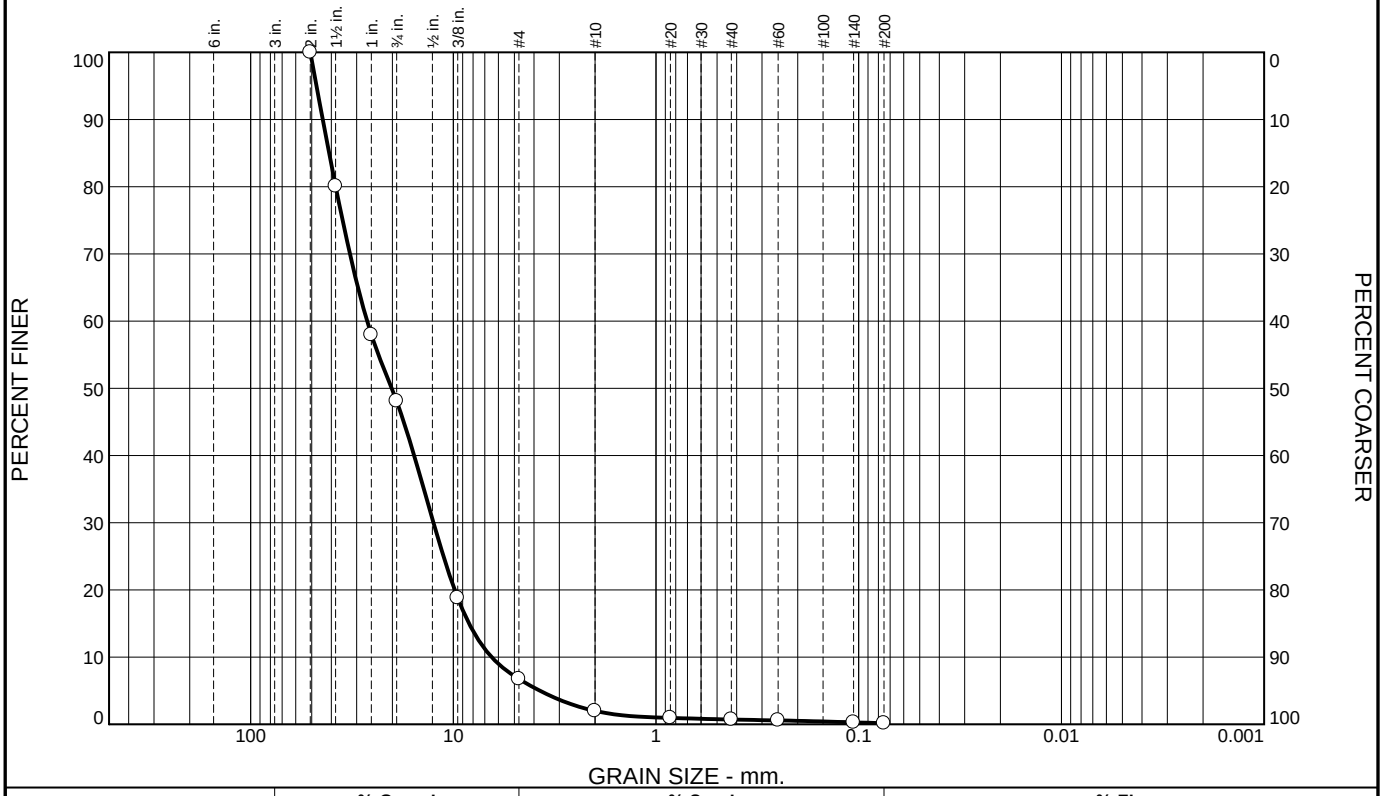
Remarks

Source of Sample: B-6 **Depth:** 30-31.5
Sample Number: S-04 **Date:** 2-1-19

Client: AECOM
Project: Klamath River Dam Removal Project
60537920
Project No: 2301-069.0 **Figure**

Tested By: JH **Checked By:** JH

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	52	41	5	1	1	0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2	100		
1.5	80		
1	58		
3/4	48		
3/8	19		
#4	7		
#10	2		
#20	1		
#40	1		
#60	1		
#140	0		
#200	0.2		

* (no specification provided)

Soil Description

Gray gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 44.0963 D_{85}= 41.0141 D_{60}= 26.6693
D_{50}= 20.1288 D_{30}= 12.5388 D_{15}= 8.3745
D_{10}= 6.4815 C_u= 4.11 C_c= 0.91

Classification

USCS= GP AASHTO=

Remarks

Source of Sample: B-6 **Depth:** 45-46.5
Sample Number: S-06 **Date:** 2-1-19

Client: AECOM
Project: Klamath River Dam Removal Project
60537920
Project No: 2301-069.0 **Figure**

Tested By: JH **Checked By:** JH

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	4	2	5	48	41	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8	100		
#4	96		
#10	94		
#20	92		
#40	89		
#60	79		
#140	49		
#200	41		

* (no specification provided)

Soil Description

Gray clayey sand with organics

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.4544 D_{85}= 0.3191 D_{60}= 0.1478
D_{50}= 0.1102 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO=

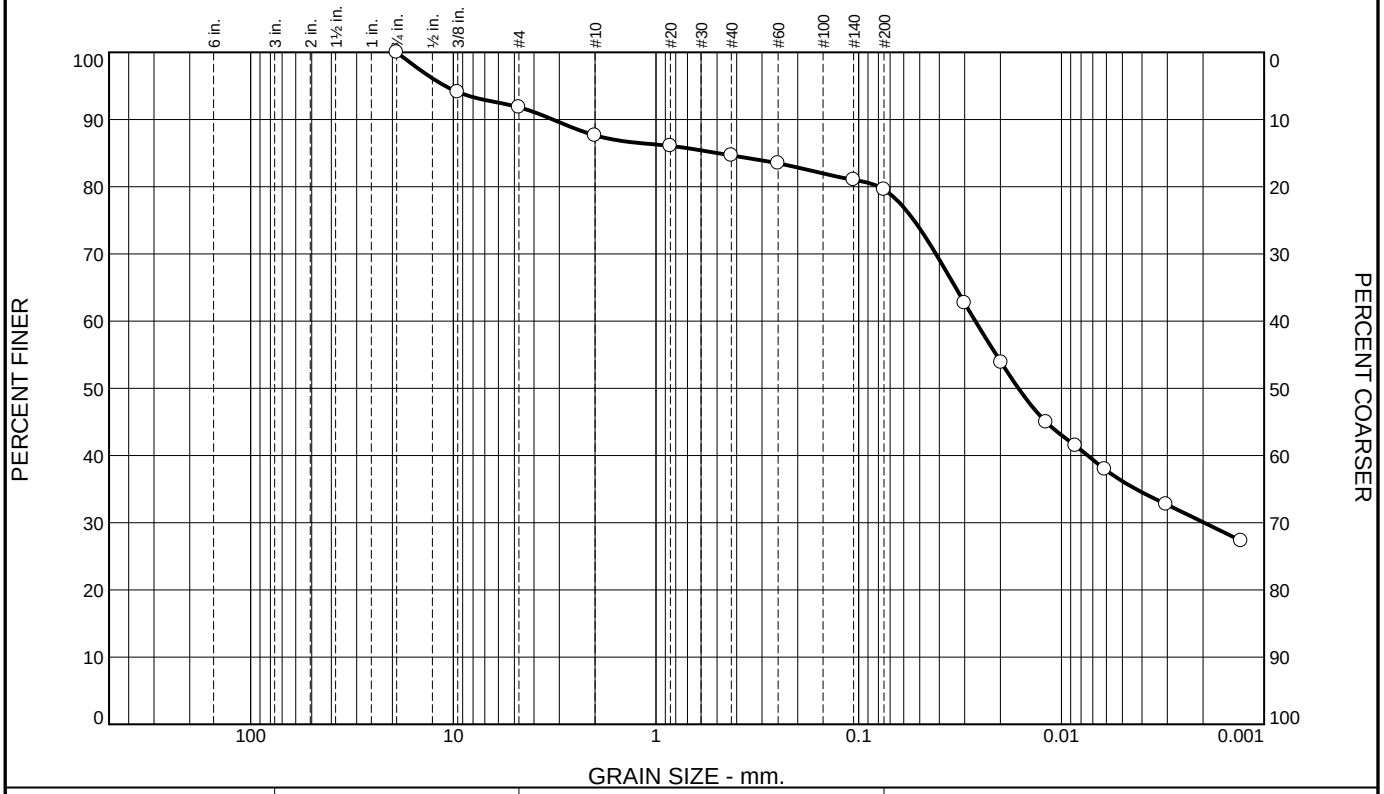
Remarks

Source of Sample: B-7 **Depth:** 16.5-18
Sample Number: S-02 **Date:** 2-1-19

Client: AECOM
Project: Klamath River Dam Removal Project
60537920
Project No: 2301-069.0 **Figure**

Tested By: JH **Checked By:** JH

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	8	4	3	5	44	36

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100		
3/8	94		
#4	92		
#10	88		
#20	86		
#40	85		
#60	83		
#140	81		
#200	80		
0.0301 mm.	63		
0.0198 mm.	54		
0.0119 mm.	45		
0.0085 mm.	41		
0.0061 mm.	38		
0.0030 mm.	33		
0.0013 mm.	27		

* (no specification provided)

Soil Description

Black silt with sand and organics

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 3.2357 D_{85}= 0.4971 D_{60}= 0.0266
D_{50}= 0.0163 D_{30}= 0.0020 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO=

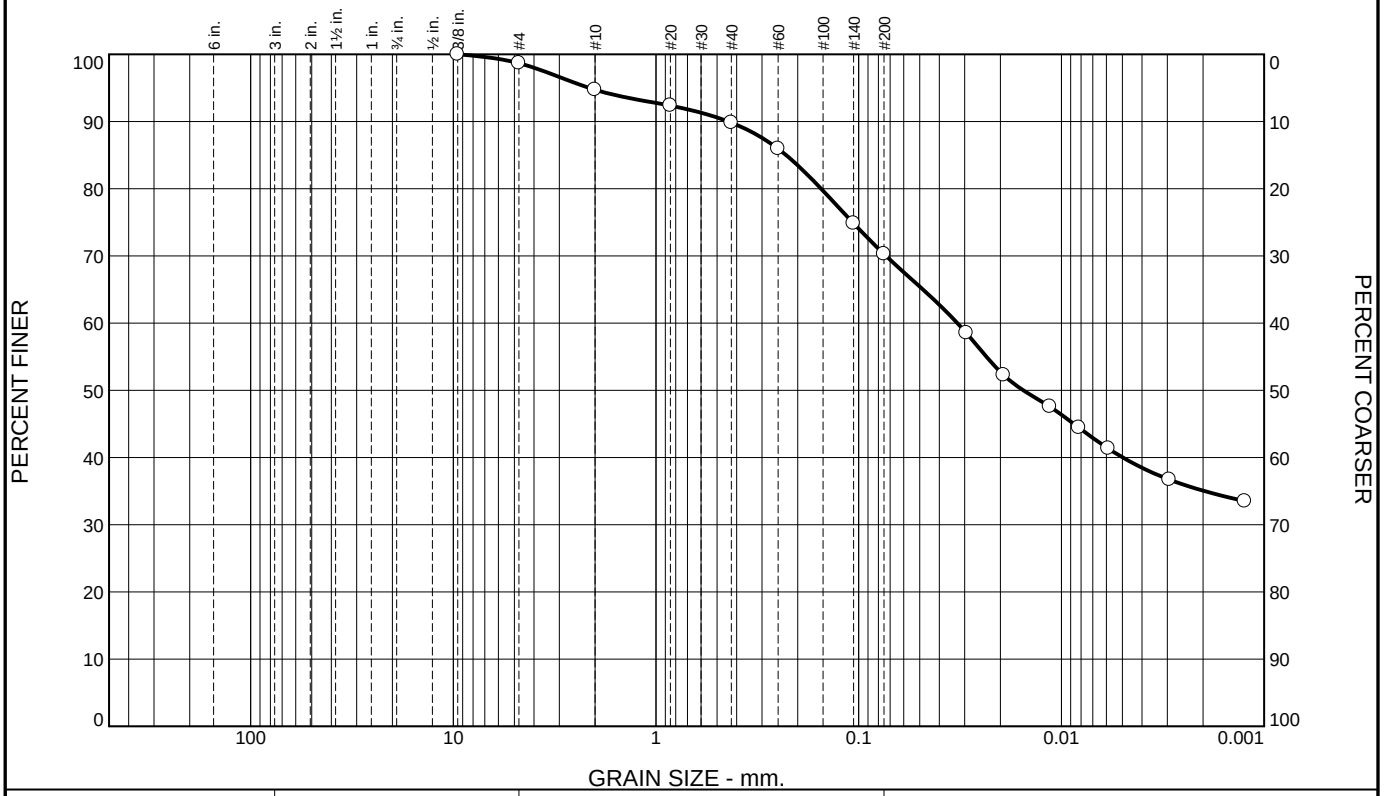
Remarks

Source of Sample: B-8 **Depth:** 16-17.5
Sample Number: S-02 **Date:** 2-11-19

Client: AECOM
Project: Klamath River Dam Removal Project
60537920
Project No: 2301-069.0 **Figure**

Tested By: JH **Checked By:** JH

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	1	4	5	20	30	40

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8	100		
#4	99		
#10	95		
#20	92		
#40	90		
#60	86		
#140	75		
#200	70		
0.0294 mm.	59		
0.0193 mm.	52		
0.0114 mm.	48		
0.0082 mm.	44		
0.0059 mm.	41		
0.0029 mm.	37		
0.0012 mm.	33		

* (no specification provided)

Soil Description

Brown sandy clay

Atterberg Limits

PL= 22 LL= 62 PI= 40

Coefficients

D_{90}= 0.4406 D_{85}= 0.2283 D_{60}= 0.0326
D_{50}= 0.0154 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-6(27)

Remarks

Source of Sample: B-14 **Depth:** 6.4-7.9
Sample Number: S-01 **Date:** 2-11-19

Client: AECOM
Project: Klamath River Dam Removal Project
60537920
Project No: 2301-069.0 **Figure**

Tested By: JH **Checked By:** JH

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	2	12	16	41	29

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100		
#10	98		
#20	92		
#40	86		
#60	81		
#140	73		
#200	70		
0.0313 mm.	57		
0.0207 mm.	46		
0.0123 mm.	38		
0.0088 mm.	35		
0.0063 mm.	31		
0.0031 mm.	27		
0.0013 mm.	23		

* (no specification provided)

Soil Description

Brown sandy silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.6889 D_{85}= 0.3736 D_{60}= 0.0355
D_{50}= 0.0243 D_{30}= 0.0057 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO=

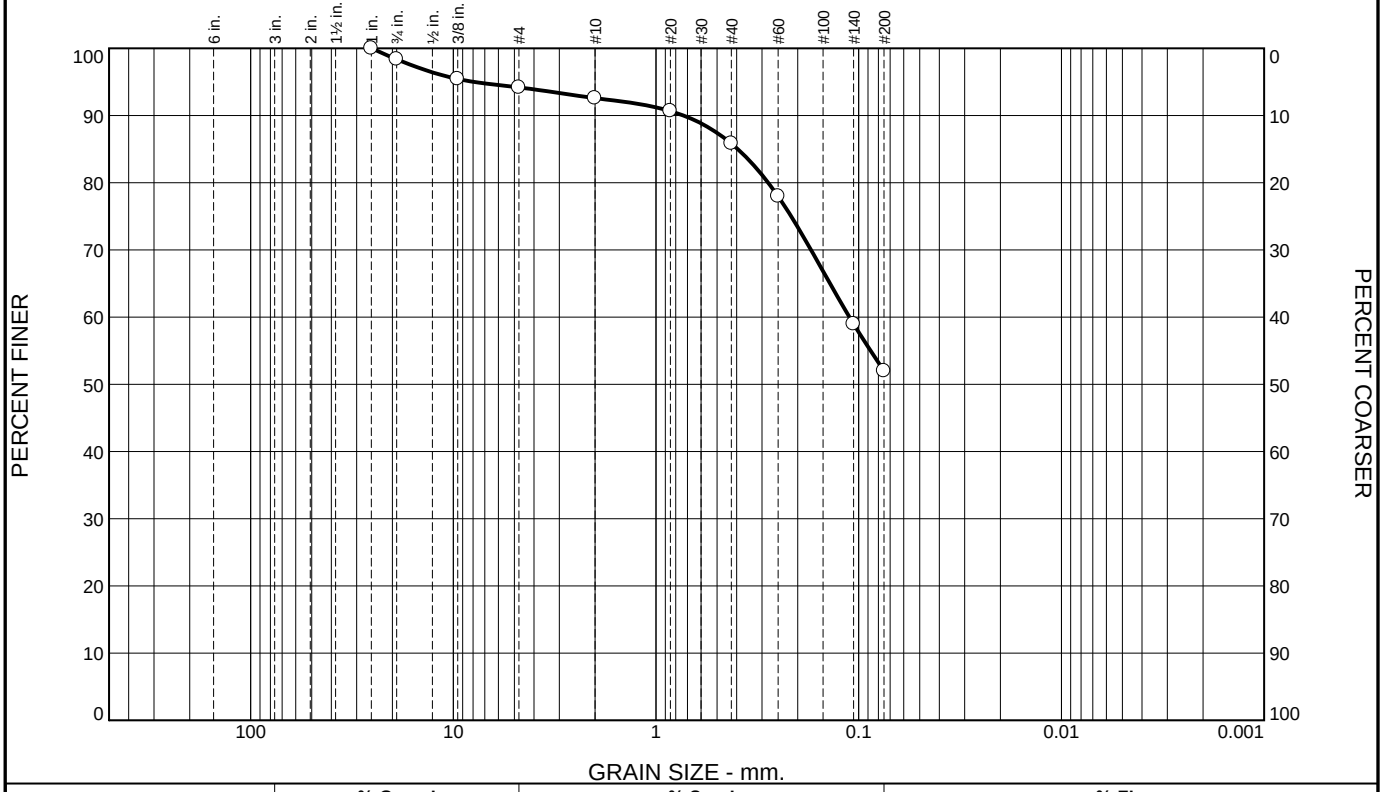
Remarks

Source of Sample: B-19 **Depth:** 5-6.5
Sample Number: S-01 **Date:** 2-11-19

Client: AECOM
Project: Klamath River Dam Removal Project
60537920
Project No: 2301-069.0 **Figure**

Tested By: JH **Checked By:** JH

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	2	4	1	7	34	52	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100		
3/4	98		
3/8	95		
#4	94		
#10	93		
#20	91		
#40	86		
#60	78		
#140	59		
#200	52		

* (no specification provided)

Soil Description

Mottled grayish brown sandy clay

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.7332 D_{85}= 0.3954 D_{60}= 0.1112
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO=

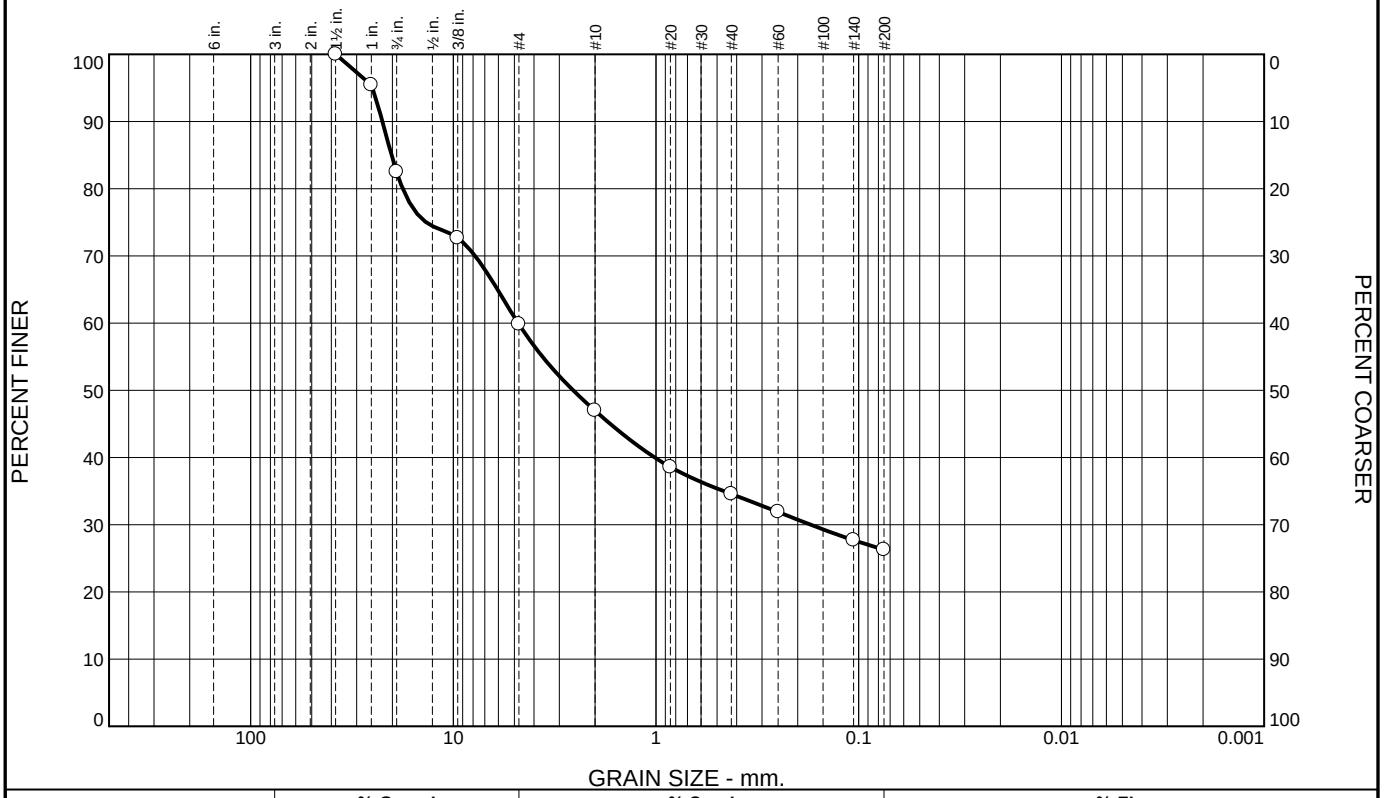
Remarks

Source of Sample: B-19 **Depth:** 15-16.5
Sample Number: S-03 **Date:** 2-1-19

Client: AECOM
Project: Klamath River Dam Removal Project
60537920
Project No: 2301-069.0 **Figure**

Tested By: JH **Checked By:** JH

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	18	22	13	12	9	26	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100		
1	95		
3/4	82		
3/8	73		
#4	60		
#10	47		
#20	39		
#40	35		
#60	32		
#140	28		
#200	26		

* (no specification provided)

Soil Description

Grayish brown clayey gravel with sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 22.3903 D_{85}= 20.1845 D_{60}= 4.7896
D_{50}= 2.5659 D_{30}= 0.1726 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= GC AASHTO=

Remarks

Source of Sample: B-19 **Depth:** 20-21.5
Sample Number: S-04 **Date:** 2-1-19

Client: AECOM
Project: Klamath River Dam Removal Project
60537920
Project No: 2301-069.0 **Figure**

Tested By: JH **Checked By:** JH

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	3	11	9	13	29	35

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100		
3/8	98		
#4	97		
#10	86		
#20	82		
#40	77		
#60	73		
#140	66		
#200	64		
0.0292 mm.	56		
0.0191 mm.	50		
0.0115 mm.	43		
0.0083 mm.	40		
0.0059 mm.	37		
0.0030 mm.	31		
0.0013 mm.	27		

* (no specification provided)

Soil Description

Brown sandy clay

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 2.7420 D_{85}= 1.7874 D_{60}= 0.0448
D_{50}= 0.0191 D_{30}= 0.0025 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Source of Sample: B-20 **Depth:** 10-11.5
Sample Number: S-02 **Date:** 2-11-19

Client: AECOM
Project: Klamath River Dam Removal Project
60537920
Project No: 2301-069.0 **Figure**

Tested By: JH **Checked By:** JH

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	14	7	9	26	44	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100		
3/8	93		
#4	86		
#10	79		
#20	75		
#40	70		
#60	63		
#140	49		
#200	44		

* (no specification provided)

Soil Description

Grayish brown clayey sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 7.0418 D_{85}= 4.1173 D_{60}= 0.2068
D_{50}= 0.1119 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

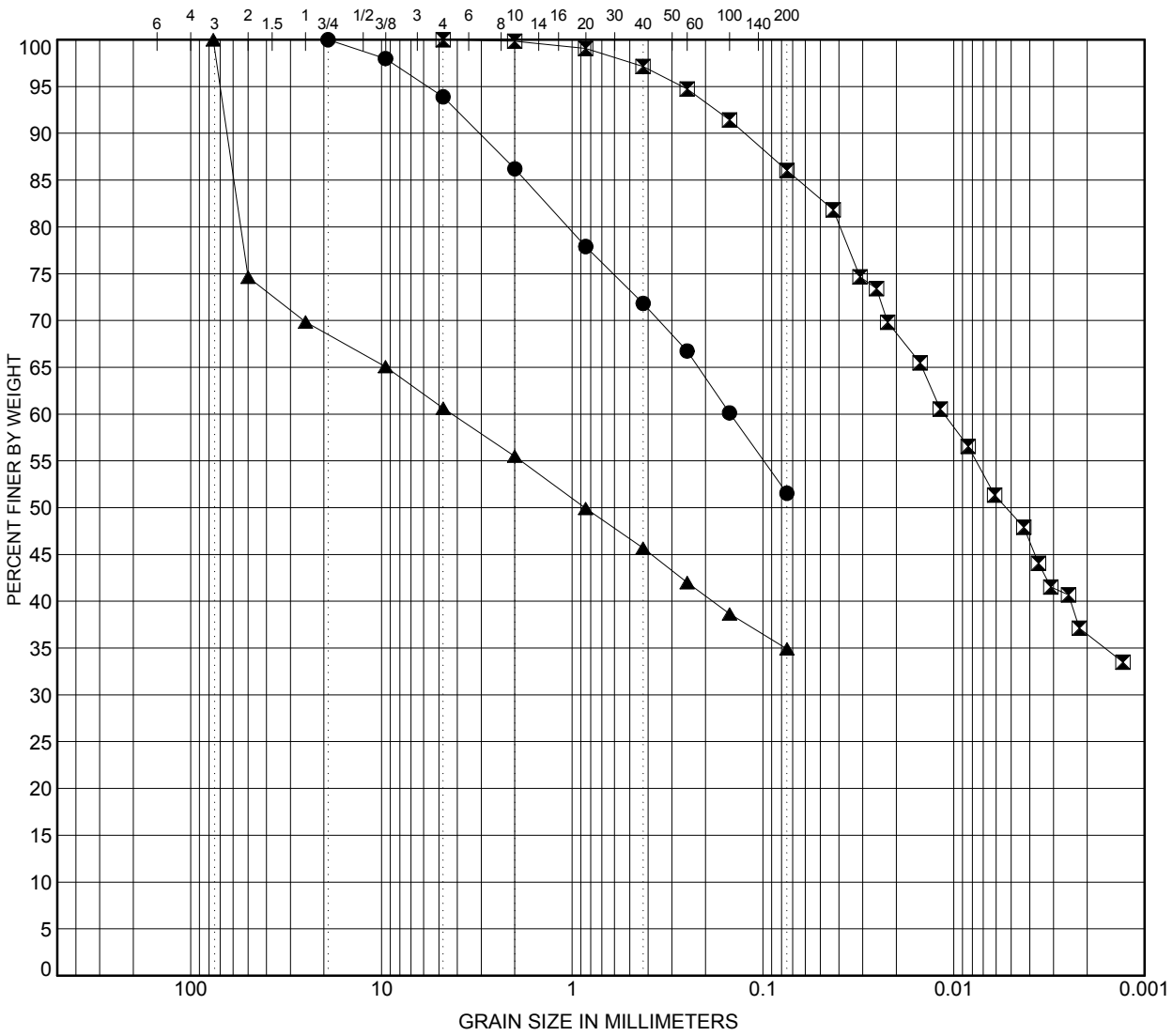
USCS= SC AASHTO=

Remarks

Source of Sample: B-20 **Depth:** 20-21.5
Sample Number: S-04 **Date:** 2-1-19

Client: AECOM
Project: Klamath River Dam Removal Project
60537920
Project No: 2301-069.0 **Figure**

Tested By: JH **Checked By:** JH



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring ID & Depth	Classification	Moisture Content	LL	PL	PI	Cc	Cu
●	**B-201: 6 (Ft)**	SANDY FAT CLAY(CH)	**20.1%**	**52**	**23**	**29**		
⧓	**B-201: 16 (Ft)**	FAT CLAY(CH)	**19.4%**	**64**	**26**	**38**		
▲	**B-205: 10 (Ft)**	CLAYEY GRAVEL with SAND(GC)	**15.1%**	**61**	**22**	**39**		

	Boring ID	Depth	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-201**	**6 (Ft)**	**0.15**			**6.1**	**42.4**	**51.5**	
⧓	**B-201**	**16 (Ft)**	**0.01**				**14.0**	**36.6**	**49.4**
▲	**B-205**	**10 (Ft)**	**4.27**			**38.4**	**25.7**	**34.9**	

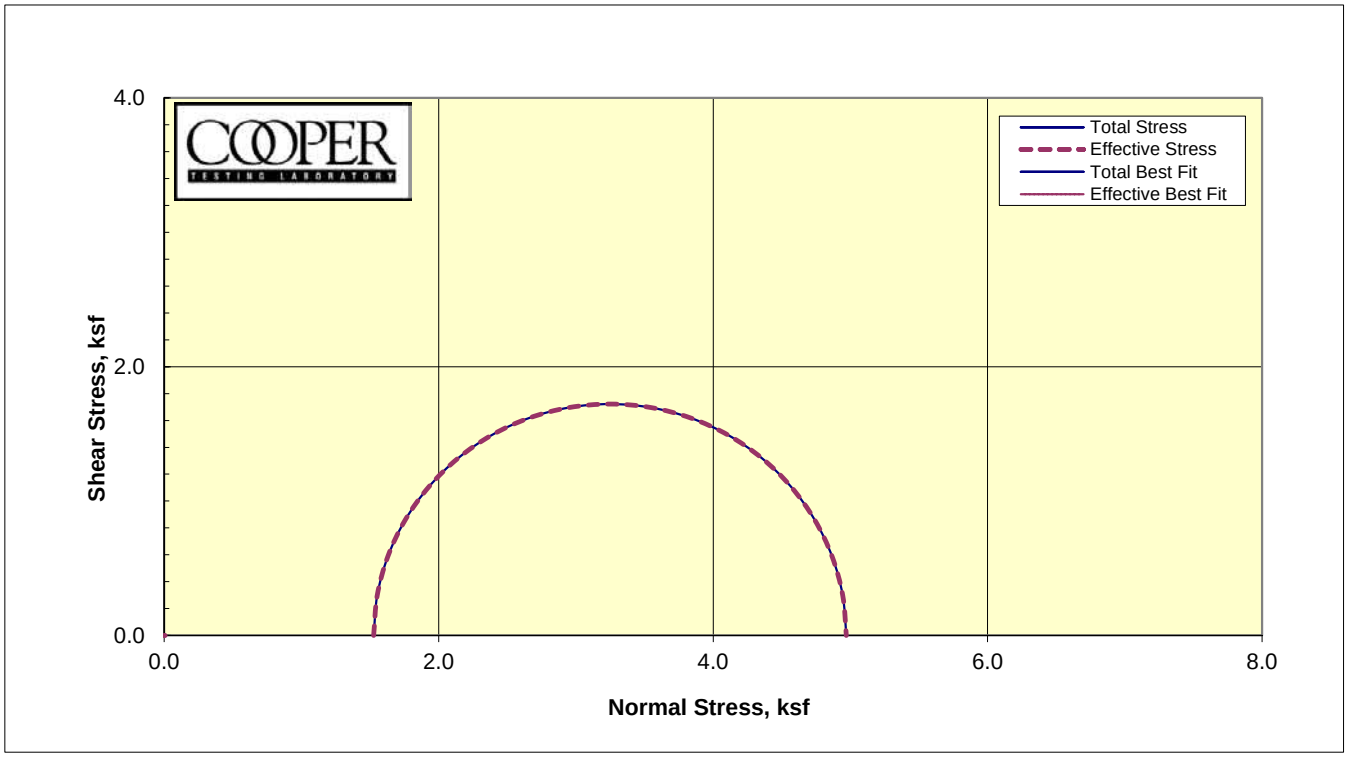
GRAIN SIZE DISTRIBUTION

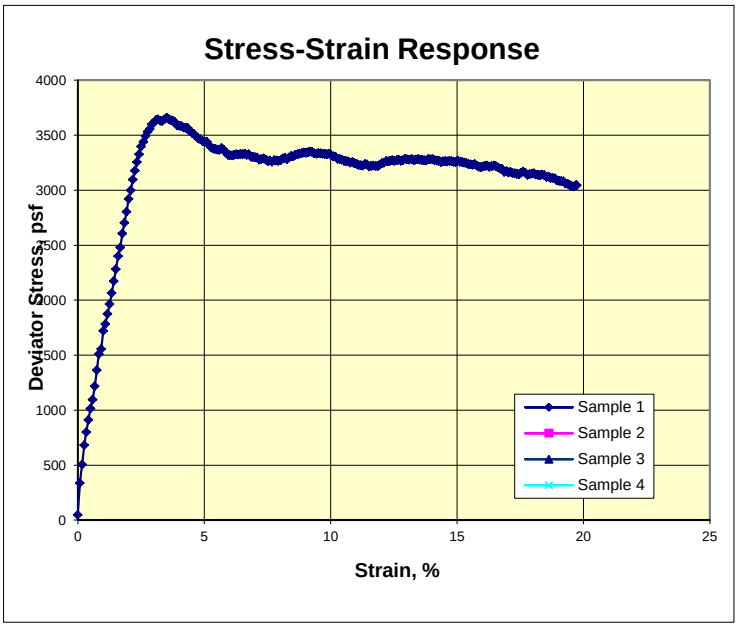
AECOM
Klamath River Dam Removal
Yreka Water Main Crossing, CA

CDM Smith

Project No: 217930 Figure: 1

GRAIN_SIZE_W-CLAY-MC_SHORT ID_KLAMATH RIVER DAM REMOVAL.GPJ_GINT STD US LAB.GDT 10/22/18 REV.

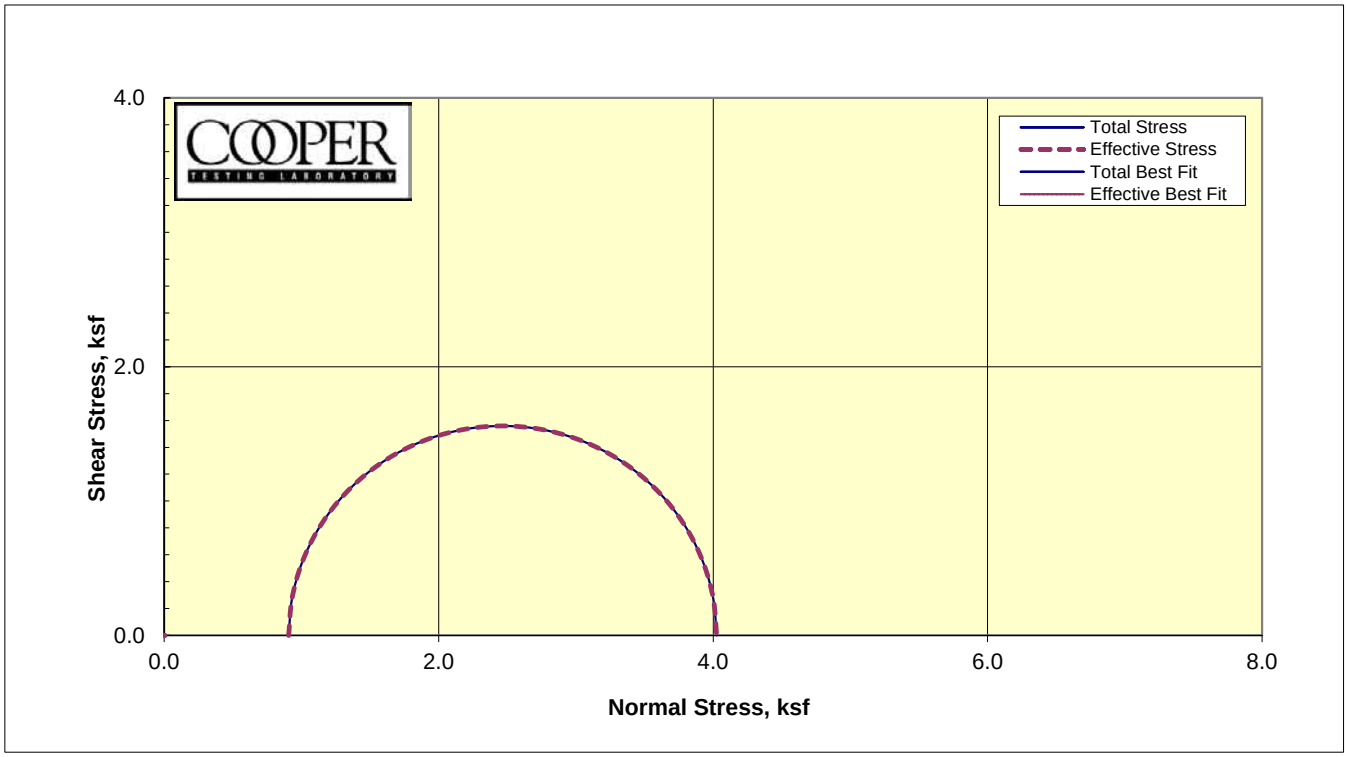


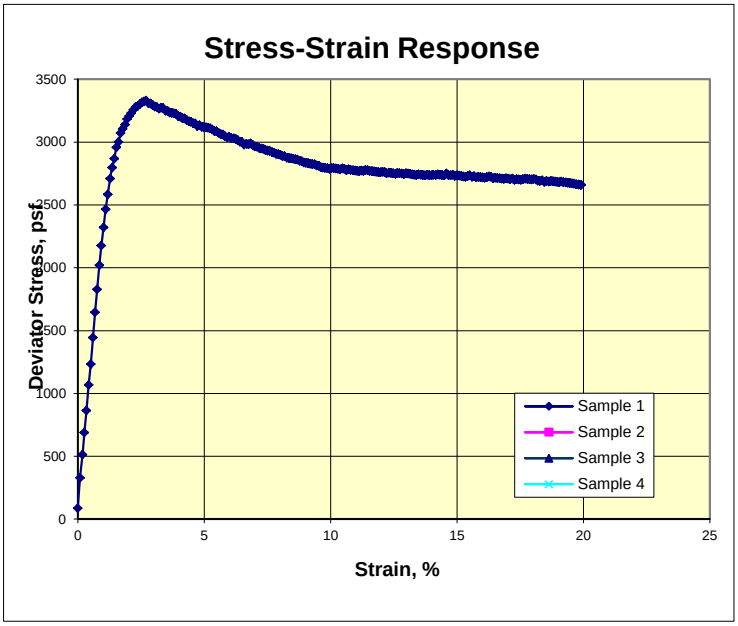


Job No.:	020-251 **Date:** 5/24/2018
Client:	AECOM BY:MD/DC
Project:	60537920
Sample 1)	BC-04_S-10 @ 52.5(Tip-18") Bluish Gray CLAY (Silty)
Sample 2)	
Sample 3)	
Sample 4)	

REMARKS: Strengths picked at 5% strain.
*Sample was back-pressure saturated prior to shear.

Sample:	**1**	**2**	**3**	**4**
MC, %	160.5			
Dry Dens, pcf	30.5			
Sat. %	95.9			
Void Ratio	4.519			
Diameter in	2.87			
Height, in	6.08			
	Final			
MC, %	163.5			
Dry Dens, pcf	31.1			
Sat. %	100.0			
Void Ratio	4.414			
Diameter, in	2.84			
Height, in	6.08			
Cell, psi	49.1			
BP, psi	38.5			
	Effective Stresses At:			
Strain, %	5.0			
Deviator ksf	3.444			
Excess PP	0.000			
Sigma 1	4.970			
Sigma 3	1.526			
P, ksf	3.248			
Q, ksf	1.722			
Stress Ratio	3.256			
Rate in/min	0.0588			
Total C	N/A	ksf		
Total Phi	N/A	Degrees		
Eff. C	N/A	ksf		
Eff. Phi	N/A	Degrees		





Job No.:	020-251	Date:	5/25/2018
Client:	AECOM		BY:MD/DC
Project:	60537920		
Sample 1)	BC-09_S-05 @ 23(Tip-13") Dark Gray Elastic SILT		
Sample 2)			
Sample 3)			
Sample 4)			

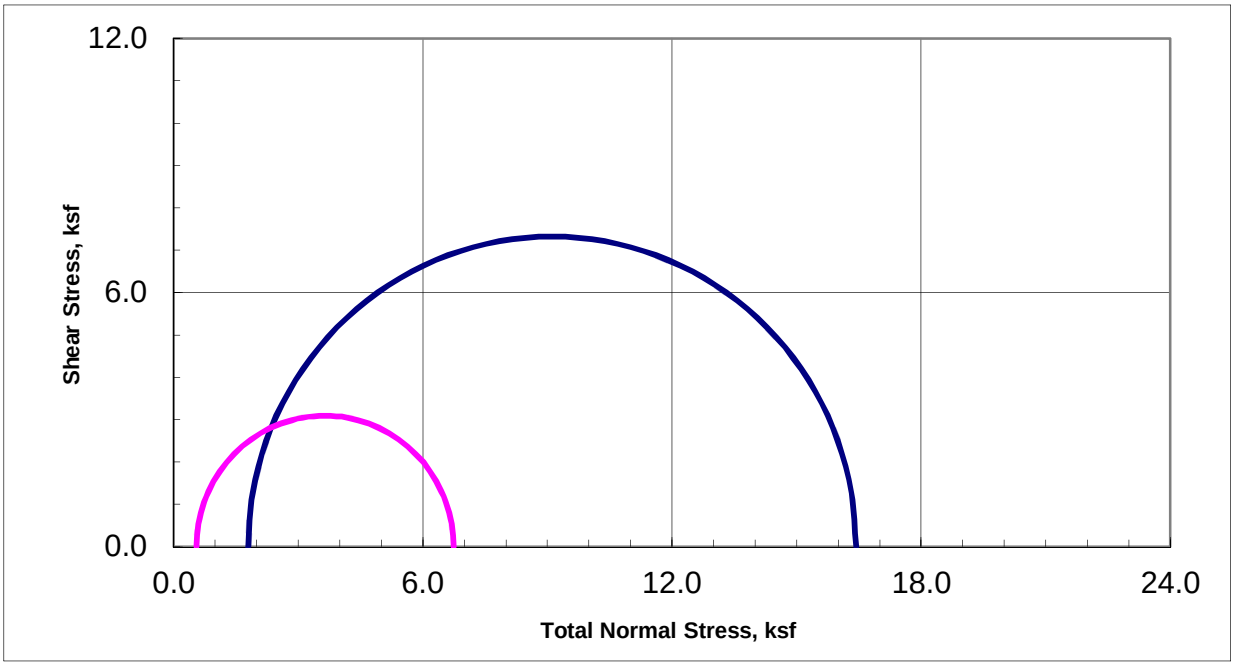
REMARKS: Strengths picked at 5% strain.
*Sample was back-pressure saturated prior to shear.

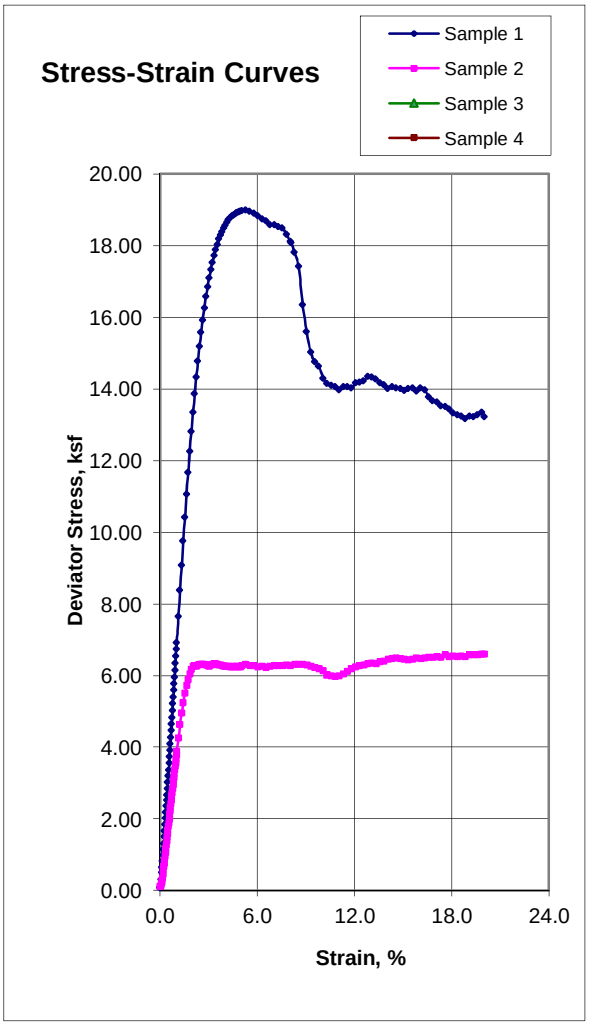
Sample:	1	2	3	4
MC, %	76.3			
Dry Dens, pcf	54.0			
Sat. %	97.1			
Void Ratio	2.121			
Diameter in	2.87			
Height, in	6.05			
	Final			
MC, %	76.6			
Dry Dens, pcf	54.9			
Sat. %	100.0			
Void Ratio	2.068			
Diameter, in	2.85			
Height, in	6.03			
Cell, psi	54.8			
BP, psi	48.5			
	Effective Stresses At:			
Strain, %	5.0			
Deviator ksf	3.118			
Excess PP	0.000			
Sigma 1	4.025			
Sigma 3	0.907			
P, ksf	2.466			
Q, ksf	1.559			
Stress Ratio	4.437			
Rate in/min	0.0588			
Total C	N/A	ksf		
Total Phi	N/A	Degrees		
Eff. C	N/A	ksf		
Eff. Phi	N/A	Degrees		

Cooper Testing Labs, Inc.
937 Commercial Street
Palo Alto, CA 94303

PRIVILEGED AND CONFIDENTIAL

Unconsolidated-Undrained Triaxial Test
ASTM D2850





Sample Data	1	2	3	4
Moisture %	76.6	34.4		
Dry Den,pcf	48.3	70.8		
Void Ratio	2.363	1.293		
Saturation %	84.3	69.3		
Height in	6.06	6.04		
Diameter in	2.86	2.85		
Cell psi	12.4	3.8		
Strain %	10.00	10.00	10.00	10.00
Deviator, ksf	14.642	6.188		
Rate %/min	1.00	1.00		
in/min	0.061	0.060		
Job No.:	020-272			
Client:	AECOM			
Project:	60537920			
Boring:	BC-13	BC-14		
Sample:	S04	S02		
Depth ft:	22(Tip-12')	7(Tip-1")		

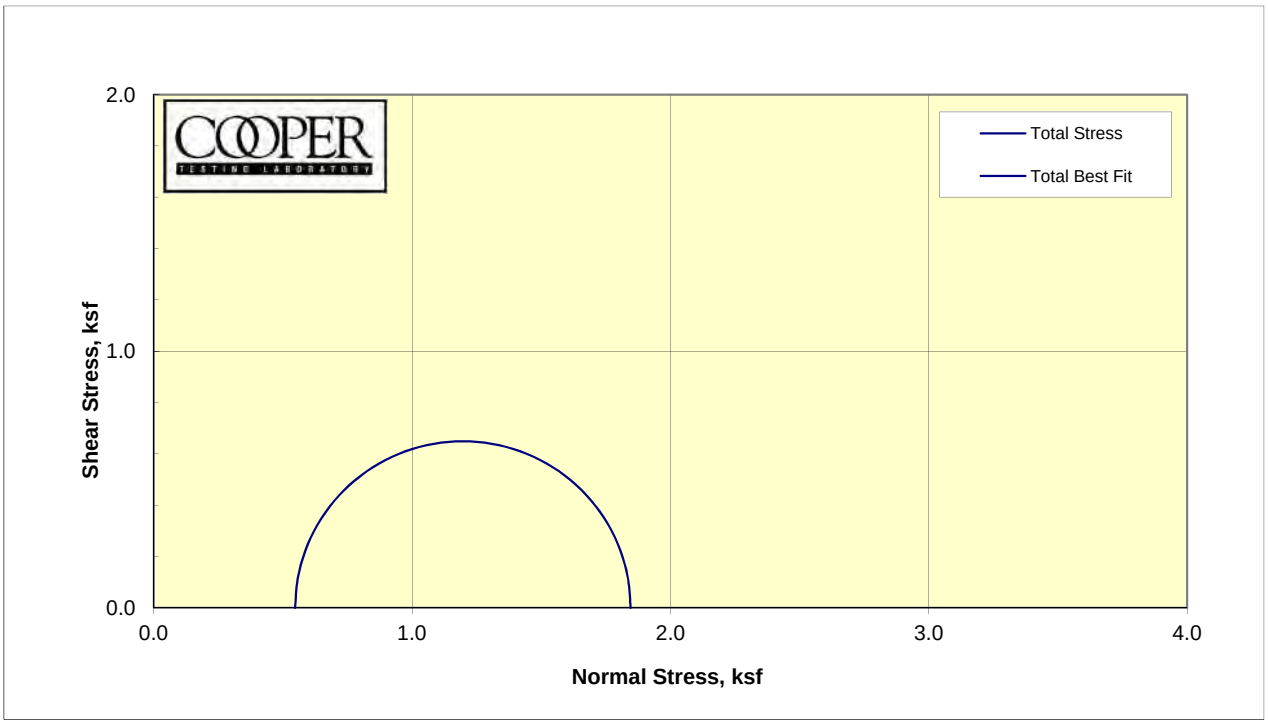
Visual Soil Description	
Sample #	
1	Olive Brown CLAY w/ Sand
2	Light Yellowish Brown Sandy CLAY w/ Claystone
3	
4	

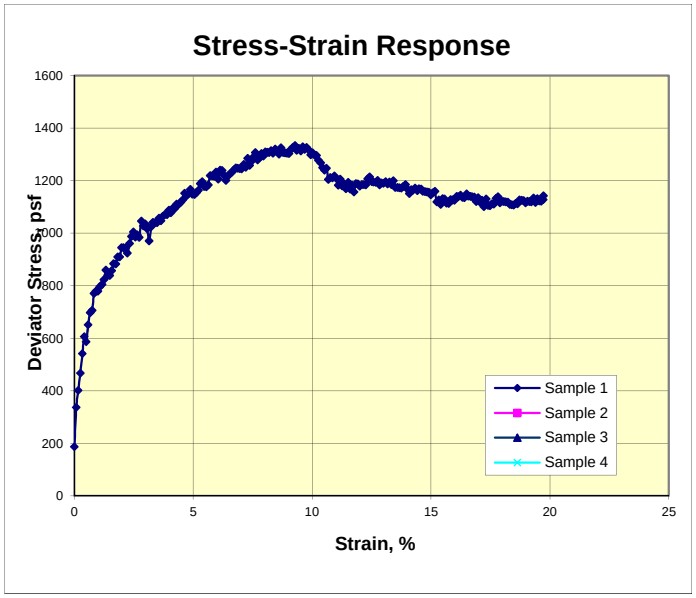
Remarks:

Note: Strengths are picked at the peak deviator stress or 15% strain which ever occurs first per ASTM D2850.

Triaxial Unconsolidated-Undrained

(ASTM D2850m)





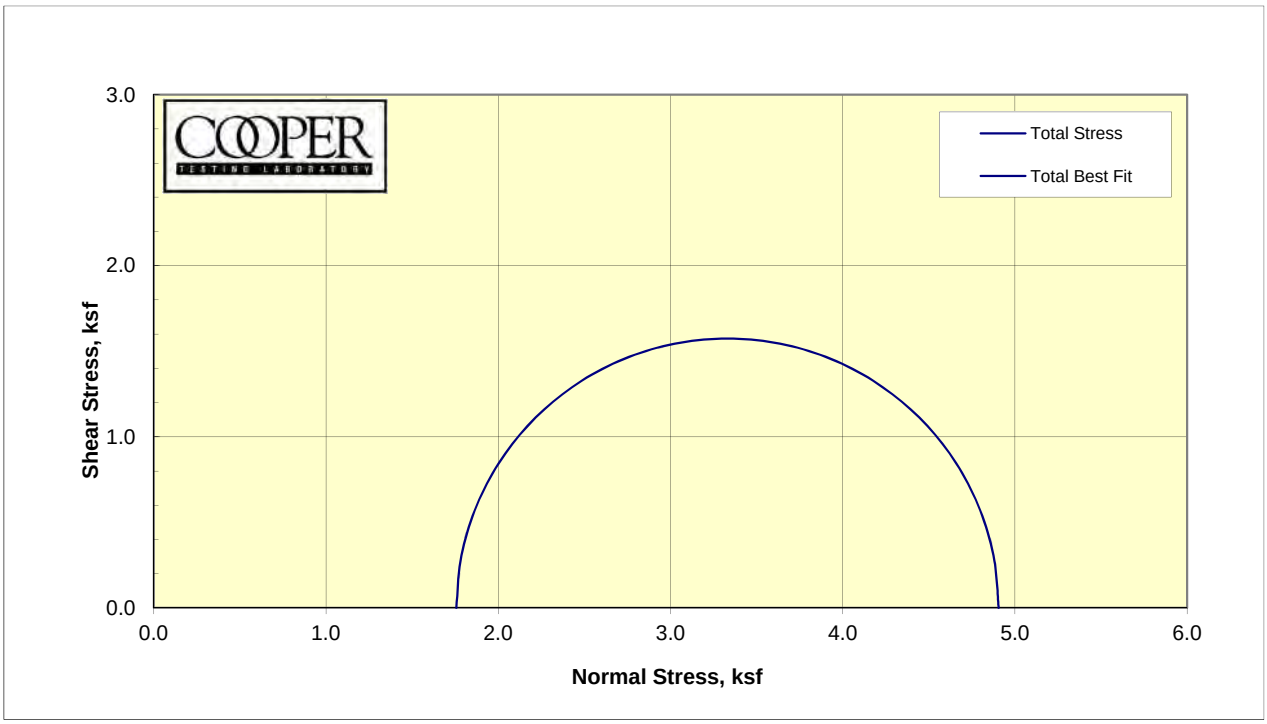
Job No.:	020-272
Date:	12/19/2018
Client:	AECOM
	BY:MD/DC
Project:	60537950
Sample 1)	BC-13_S01 @ 7(Tip-4") Olive Brown Silty SAND (Weathered Rock)
Sample 2)	
Sample 3)	
Sample 4)	

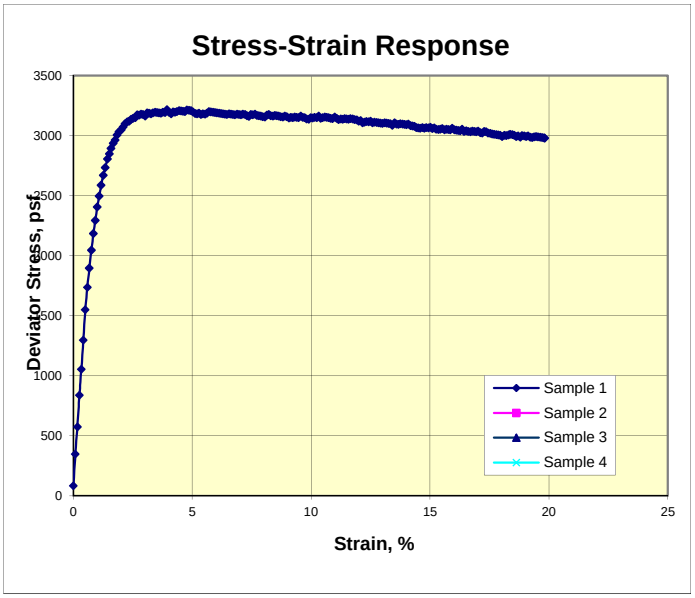
REMARKS: Strengths picked at 10% strain.
*Sample was back-pressure saturated prior to shear.

Sample:	**1**	**2**	**3**	**4**
MC, %	21.9			
Dry Dens, pcf	77.6			
Sat. %	52.3			
Void Ratio	1.090			
Diameter in	2.87			
Height, in	6.09			
	Final			
MC, %	39.9			
Dry Dens, pcf	79.6			
Sat. %	100.0			
Void Ratio	1.038			
Diameter, in	2.84			
Height, in	6.09			
Cell, psi	92.8			
BP, psi	89.0			
	Effective Stresses At:			
Strain, %	10.0			
Deviator ksf	1.299			
Excess PP	0.000			
Sigma 1	1.846			
Sigma 3	0.547			
P, ksf	1.196			
Q, ksf	0.649			
Stress Ratio	3.373			
Rate in/min	0.0600			
Total C	N/A	ksf		
Total Phi	N/A	Degrees		
Eff. C	N/A	ksf		
Eff. Phi	N/A	Degrees		

Triaxial Unconsolidated-Undrained

(ASTM D2850m)





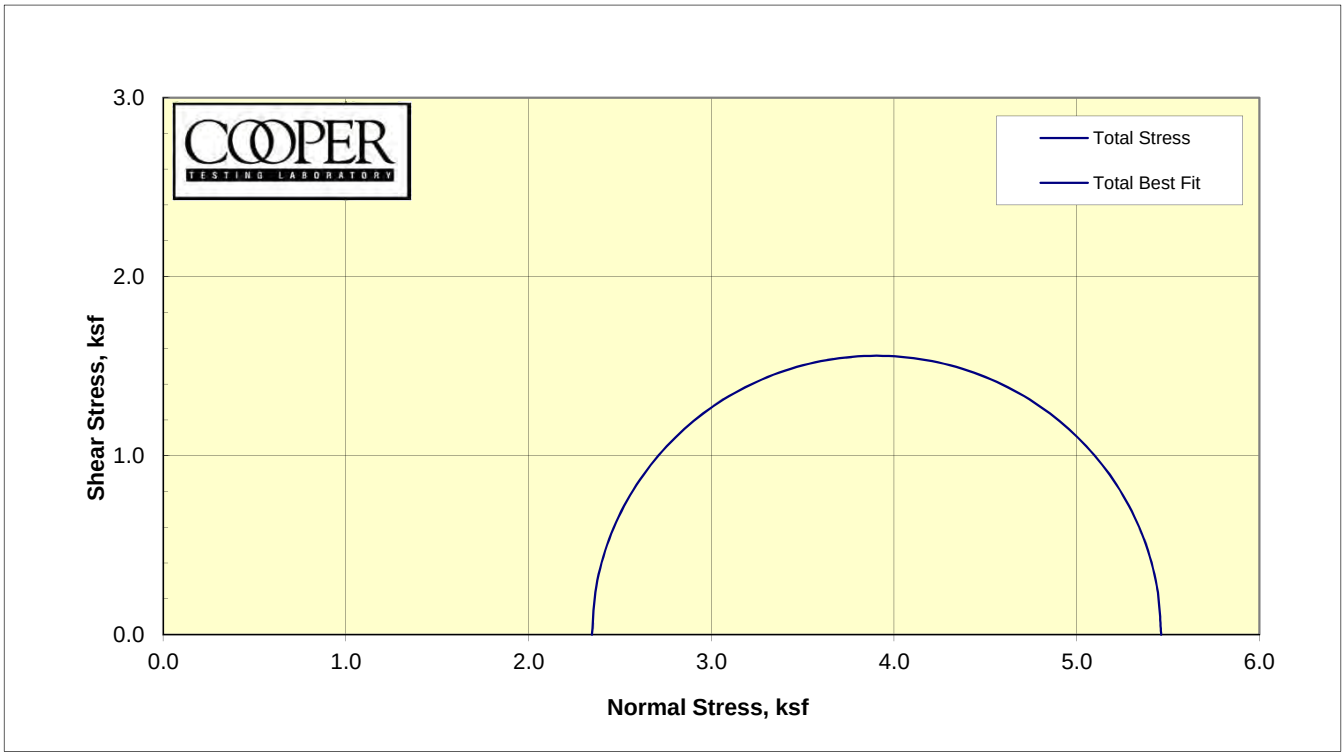
Job No.:	020-272	**Date:**	12/19/2018
Client:	AECOM		BY:MD/DC
Project:	60537920		
Sample 1)	BC-13_S04 @ 22(Tip-18.5") Olive Brown Silty SAND/ Clayey SAND (Weathered Rock)		
Sample 2)			
Sample 3)			
Sample 4)			

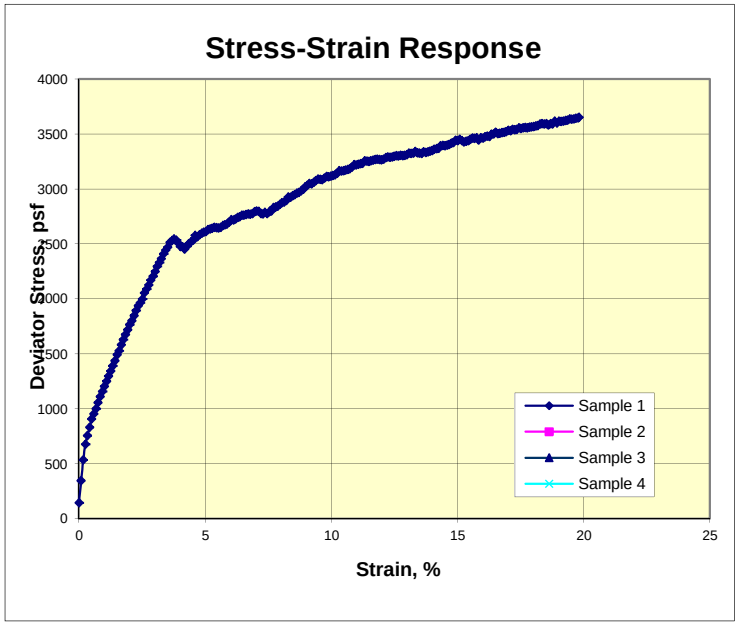
REMARKS: Strengths picked at 10% strain.
*Sample was back-pressure saturated prior to shear.

Sample:	**1**	**2**	**3**	**4**
MC, %	28.4			
Dry Dens, pcf	74.3			
Sat. %	62.4			
Void Ratio	1.184			
Diameter in	2.87			
Height, in	6.08			
	Final			
MC, %	42.6			
Dry Dens, pcf	77.0			
Sat. %	100.0			
Void Ratio	1.108			
Diameter, in	2.83			
Height, in	6.06			
Cell, psi	91.2			
BP, psi	79.0			
	Effective Stresses At:			
Strain, %	10.0			
Deviator ksf	3.148			
Excess PP	0.000			
Sigma 1	4.905			
Sigma 3	1.757			
P, ksf	3.331			
Q, ksf	1.574			
Stress Ratio	2.792			
Rate in/min	0.0592			
Total C	N/A	ksf		
Total Phi	N/A	Degrees		
Eff. C	N/A	ksf		
Eff. Phi	N/A	Degrees		

Triaxial Unconsolidated-Undrained

(ASTM D2850m)





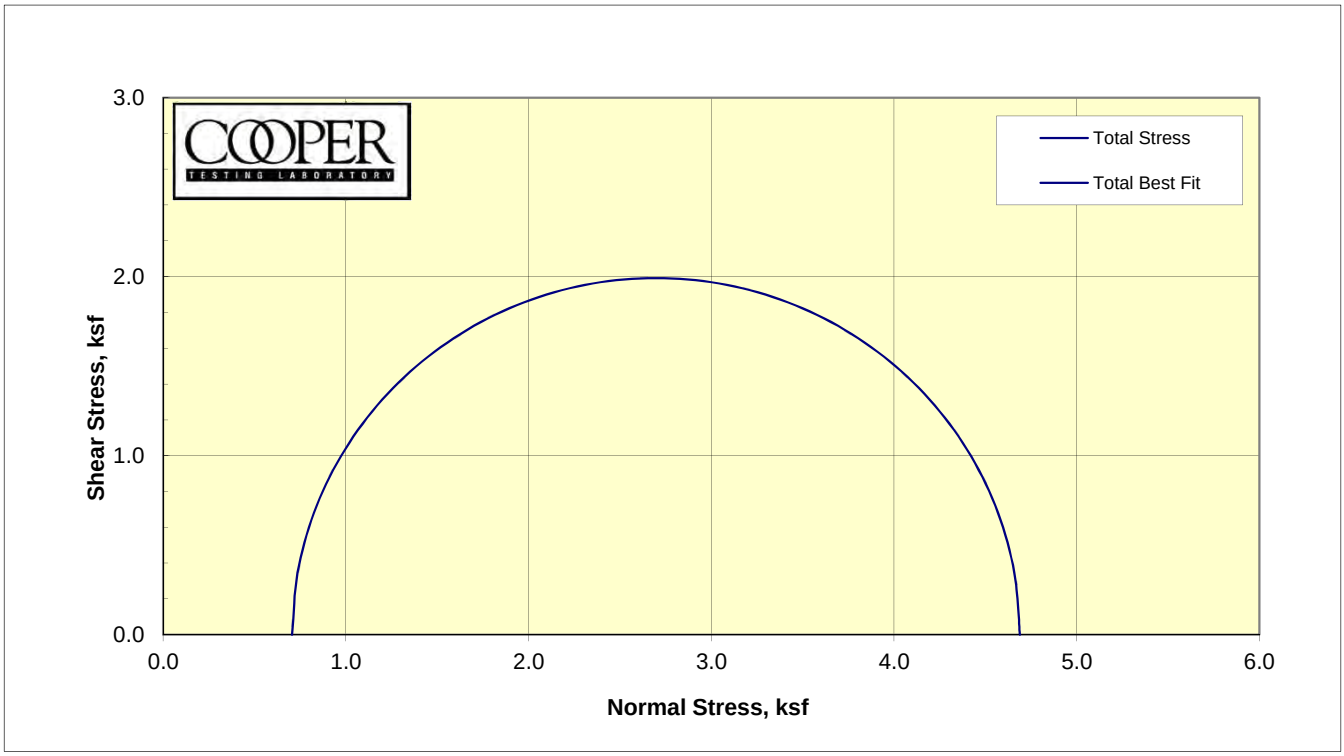
Sample:	1	2	3	4
MC, %	72.2			
Dry Dens, pcf	39.4			
Sat. %	60.3			
Void Ratio	3.116			
Diameter in	2.87			
Height, in	6.08			
	Final			
MC, %	112.3			
Dry Dens, pcf	41.4			
Sat. %	100.0			
Void Ratio	2.919			
Diameter, in	2.81			
Height, in	6.06			
Cell, psi	95.3			
BP, psi	79.0			
	Effective Stresses At:			
Strain, %	10.0			
Deviator ksf	3.116			
Excess PP	0.000			
Sigma 1	5.463			
Sigma 3	2.347			
P, ksf	3.905			
Q, ksf	1.558			
Stress Ratio	2.327			
Rate in/min	0.0588			
Total C	N/A	ksf		
Total Phi	N/A	Degrees		
Eff. C	N/A	ksf		
Eff. Phi	N/A	Degrees		

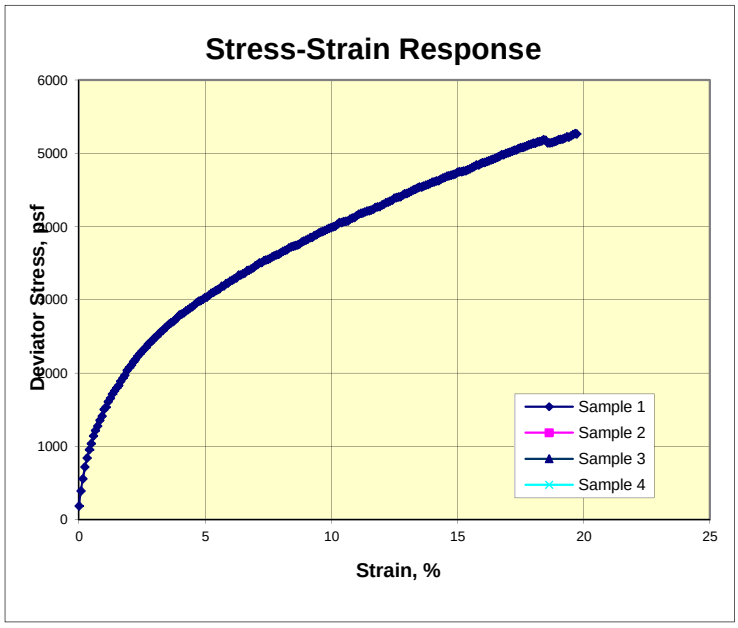
Job No.:	020-272	Date:	12/19/2018
Client:	AECOM		BY:MD/DC
Project:	60537920		
Sample 1)	BC-13_S05 @ 30.5(Tip-11") Pale Brown SILT (slightly plastic) w/ CaCO3 deposits (Weathered Rock)		
Sample 2)			
Sample 3)			
Sample 4)			

REMARKS: Strengths picked at 5% strain.
*Sample was back-pressure saturated prior to shear.

Triaxial Unconsolidated-Undrained

(ASTM D2850m)



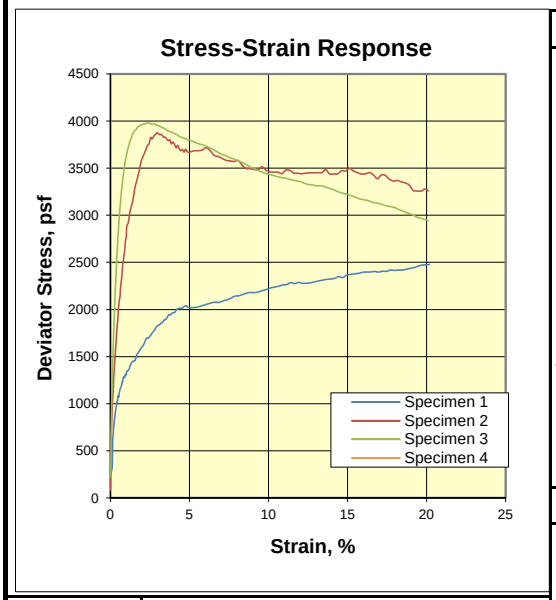


Job No.:	020-272	**Date:**	12/19/2018	
Client:	AECOM		BY:MD/DC	
Project:	60537920			
Sample 1)	BC-14_S03 @ 9(Tip-1") Olive Brown Clayey GRAVEL w/ Sand (Weathered Rock)			
Sample 2)				
Sample 3)				
Sample 4)				

REMARKS: Strengths picked at 10% strain.
*Sample was back-pressure saturated prior to shear.

Sample:	**1**	**2**	**3**	**4**
MC, %	45.1			
Dry Dens, pcf	54.7			
Sat. %	59.6			
Void Ratio	1.968			
Diameter in	2.87			
Height, in	6.09			
	Final			
MC, %	72.9			
Dry Dens, pcf	56.0			
Sat. %	100.0			
Void Ratio	1.895			
Diameter, in	2.84			
Height, in	6.09			
Cell, psi	73.9			
BP, psi	69.0			
	Effective Stresses At:			
Strain, %	10.0			
Deviator ksf	3.984			
Excess PP	0.000			
Sigma 1	4.690			
Sigma 3	0.706			
P, ksf	2.698			
Q, ksf	1.992			
Stress Ratio	6.646			
Rate in/min	0.0587			
Total C	N/A	ksf		
Total Phi	N/A	Degrees		
Eff. C	N/A	ksf		
Eff. Phi	N/A	Degrees		

Consolidated Undrained Triaxial Compression with Pore Pressure
ASTM D4767

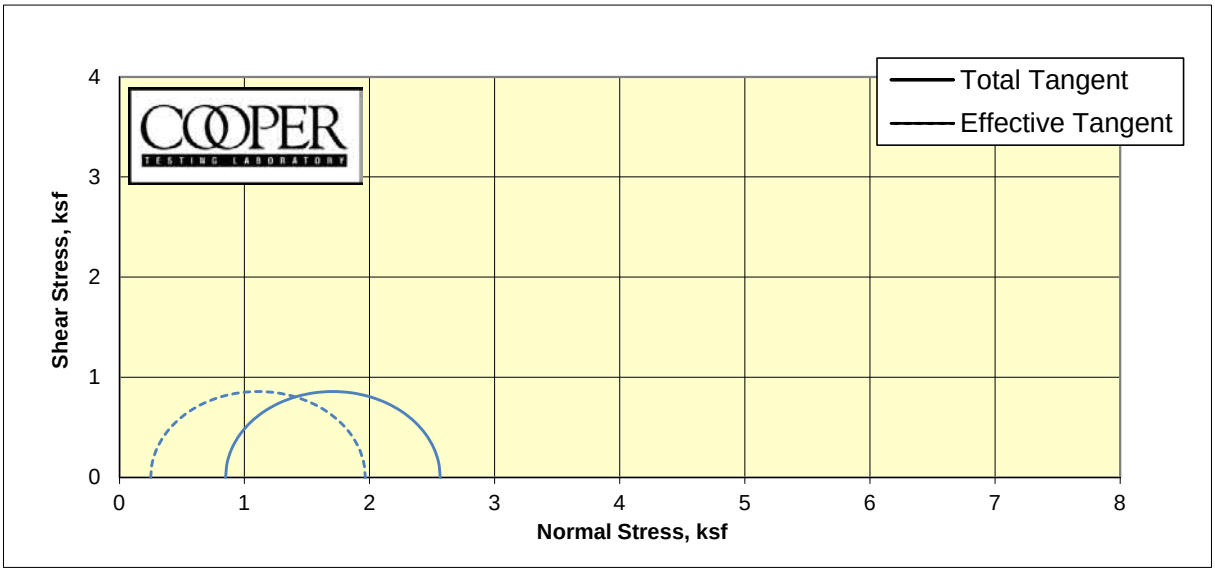


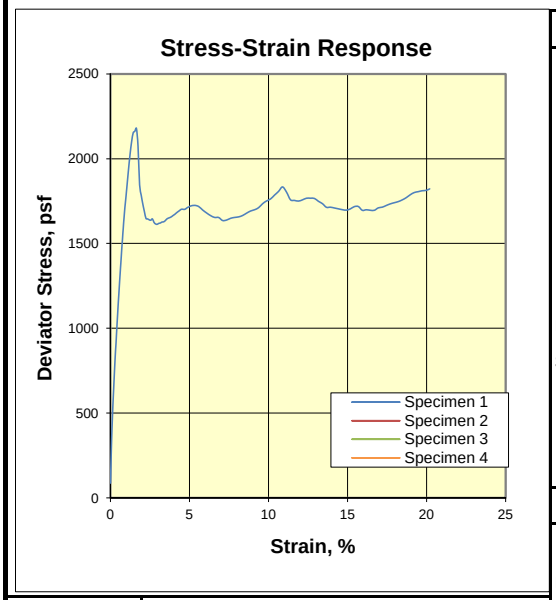
CTL Number:	020-232
Client Name:	AECOM
Project Name:	Klamath
Project Number:	60537920
Date:	9/25/2017 By: MD/DC
Total C	0.470 ksf
Total phi	17.2 degrees
Eff. C	0.470 ksf
Eff. Phi	28.4 degrees ©

Remarks: The sample was delivered as singular 13" x 16" block. The specimens were trimmed into a brass tube 2" x 4". The orientation of the outcrop block was unknown. All samples were trimmed in the same approximate orientation. The material is highly structured and cemented. It disperses when exposed to water. All three specimens behaved differently during shear.

Specimen	1	2	3	4
Boring	Outcrop #1	Outcrop #1	Outcrop #1	
Sample				
Depth				
Visual Description	Pale Brown Siltstone (Diatomite)	Pale Brown Siltstone (Diatomite)	Pale Brown Siltstone (Diatomite)	
MC (%)	8.2	7.1	5.9	
Dry Density (pcf)	53.1	56.9	58.0	
Saturation (%)	10.2	9.7	8.4	
Void Ratio	2.176	1.961	1.907	
Diameter (in)	1.86	1.86	1.85	
Height (in)	4.00	4.00	4.00	
	Final			
MC (%)	78.4	73.5	71.9	
Dry Density (pcf)	54.1	56.5	57.3	
Saturation (%)	100.0	100.0	100.0	
Void Ratio	2.116	1.984	1.942	
Diameter (in)	1.85	1.87	1.87	
Height (in)	3.96	3.98	3.98	
Cell Pressure (psi)	124.0	135.0	144.9	
Back Pressure (psi)	119.7	119.8	120.4	
	Effective Stresses At:			
Strain (%)	2.0	2.0	2.0	
Deviator (ksf)	1.596	3.571	3.959	
Excess PP (psi)	3.5	10.2	14.0	
Sigma 1 (ksf)	1.708	4.282	5.488	
Sigma 3 (ksf)	0.111	0.712	1.529	
P (ksf)	0.909	2.497	3.509	
Q (ksf)	0.798	1.785	1.980	
Stress Ratio	15.338	6.018	3.589	
Rate (in/min)	0.0003	0.0003	0.0003	

Consolidated Undrained Triaxial Compression with Pore Pressure
ASTM D4767

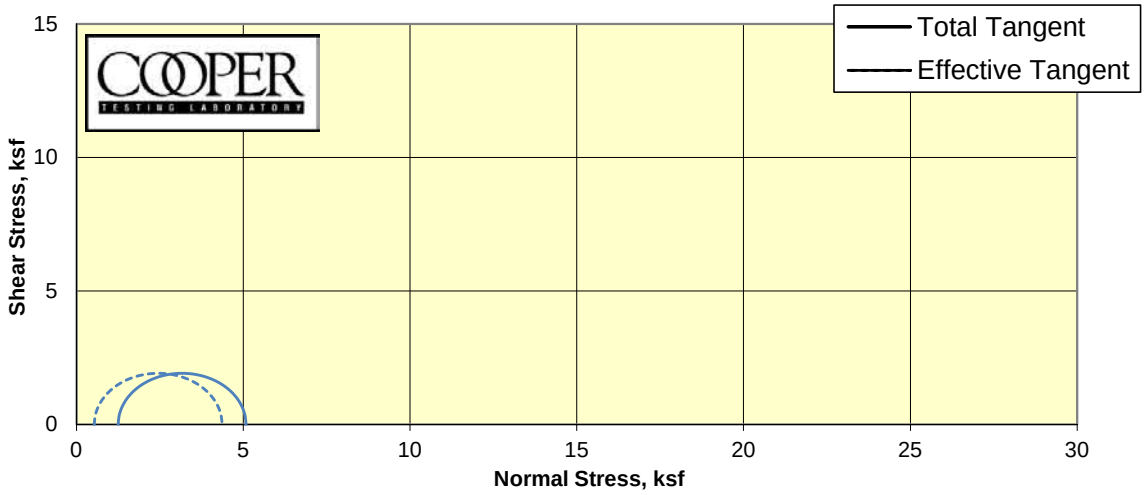


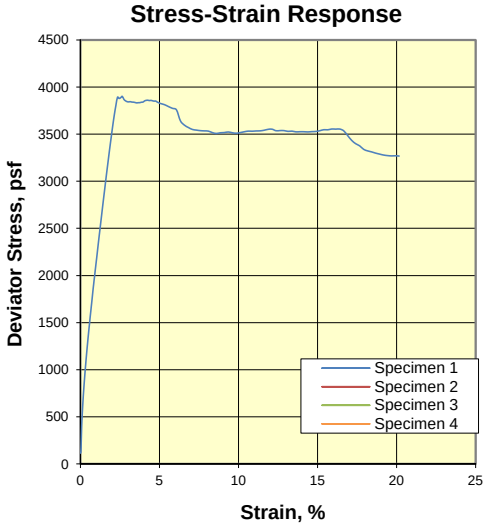


CTL Number:	020-251
Client Name:	AECOM
Project Name:	Klamath River Dam Removal Project
Project Number:	60537920
Date:	5/30/2018 By: MD/DC
Total C	#DIV/0! ksf
Total phi	#DIV/0! degrees
Eff. C	#DIV/0! ksf
Eff. Phi	#DIV/0! degrees ©

Specimen	1	2	3	4
Boring	BC-02			
Sample	S-06			
Depth	19.5(Tip-2")			
Visual Description	Gray CLAY (Silty)			
MC (%)	147.5			
Dry Density (pcf)	31.6			
Saturation (%)	92.6			
Void Ratio	4.139			
Diameter (in)	2.86			
Height (in)	6.07			
	Final			
MC (%)	147.6			
Dry Density (pcf)	33.6			
Saturation (%)	100.0			
Void Ratio	3.838			
Diameter (in)	2.79			
Height (in)	6.02			
Cell Pressure (psi)	86.4			
Back Pressure (psi)	80.5			
	Effective Stresses At:			
Strain (%)	5.0			
Deviator (ksf)	1.716			
Excess PP (psi)	4.2			
Sigma 1 (ksf)	1.966			
Sigma 3 (ksf)	0.250			
P (ksf)	1.108			
Q (ksf)	0.858			
Stress Ratio	7.869			
Rate (in/min)	0.0005			

Consolidated Undrained Triaxial Compression with Pore Pressure
ASTM D4767

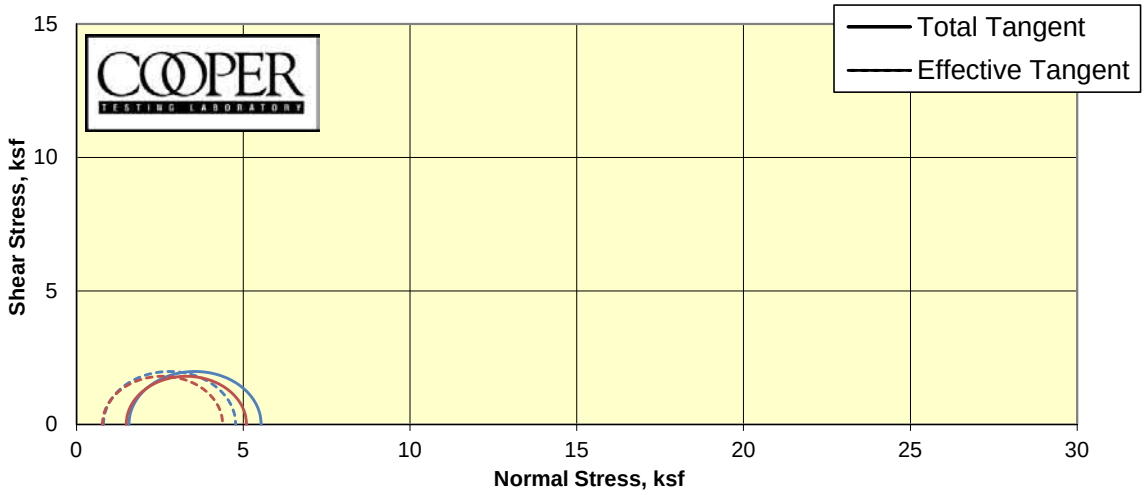


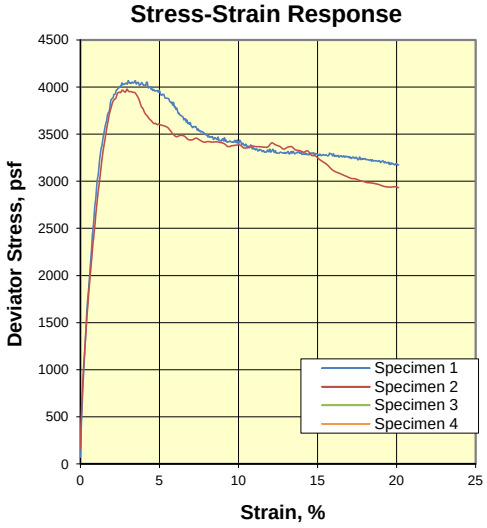


CTL Number:	020-251
Client Name:	AECOM
Project Name:	Klamath River Dam Removal Project
Project Number:	60537920
Date:	5/14/2018 By: MD/DC
Total C	#DIV/0! ksf
Total phi	#DIV/0! degrees
Eff. C	#DIV/0! ksf
Eff. Phi	#DIV/0! degrees ©

Specimen	1	2	3	4
Boring	BC-02			
Sample	S-08			
Depth	34.5(Tip-6")			
Visual Description	Pale Brown CLAY (Silty)			
MC (%)	148.8			
Dry Density (pcf)	32.7			
Saturation (%)	96.6			
Void Ratio	4.158			
Diameter (in)	2.87			
Height (in)	6.07			
	Final			
MC (%)	148.5			
Dry Density (pcf)	33.6			
Saturation (%)	100.0			
Void Ratio	4.010			
Diameter (in)	2.84			
Height (in)	6.02			
Cell Pressure (psi)	88.8			
Back Pressure (psi)	80.1			
	Effective Stresses At:			
Strain (%)	5.0			
Deviator (ksf)	3.832			
Excess PP (psi)	5.0			
Sigma 1 (ksf)	4.368			
Sigma 3 (ksf)	0.536			
P (ksf)	2.452			
Q (ksf)	1.916			
Stress Ratio	8.153			
Rate (in/min)	0.0005			

Consolidated Undrained Triaxial Compression with Pore Pressure
ASTM D4767

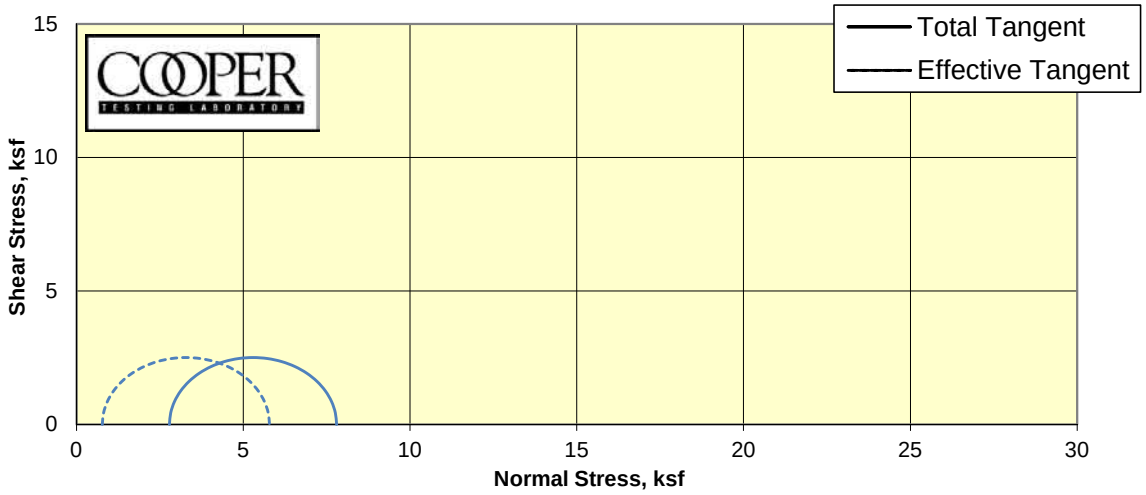


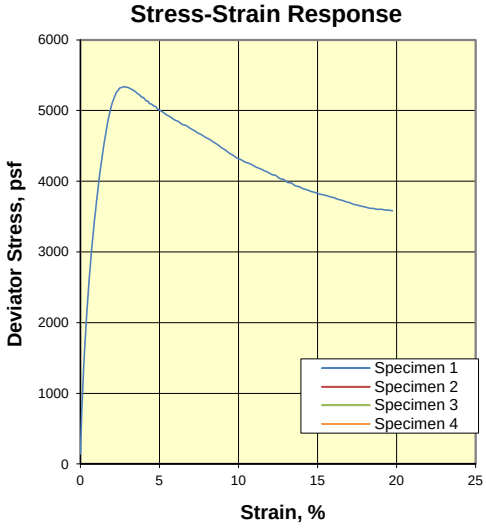


CTL Number:	020-251
Client Name:	Klamath River Dam Removal Project
Project Name:	60537920
Project Number:	43237
Date:	5/17/2018 By: MD/DC
Total C	#DIV/0! ksf
Total phi	#DIV/0! degrees
Eff. C	#DIV/0! ksf
Eff. Phi	#DIV/0! degrees ©

Specimen	1	2	3	4
Boring	BC-03	BC-03		
Sample	S-06	S-06		
Depth	39.5-42(Tip-11")	39.5-42(Tip-4")		
Visual Description	Dark Gray CLAY (Silty)	Dark Gray CLAY		
MC (%)	84.9	90.1		
Dry Density (pcf)	50.2	47.7		
Saturation (%)	99.0	97.6		
Void Ratio	2.230	2.402		
Diameter (in)	2.87	2.87		
Height (in)	6.06	6.08		
	Final			
MC (%)	83.0	87.9		
Dry Density (pcf)	51.4	49.4		
Saturation (%)	100.0	100.0		
Void Ratio	2.158	2.285		
Diameter (in)	2.85	2.83		
Height (in)	6.02	6.04		
Cell Pressure (psi)	90.5	91.6		
Back Pressure (psi)	79.5	81.2		
	Effective Stresses At:			
Strain (%)	5.0	5.0		
Deviator (ksf)	3.966	3.607		
Excess PP (psi)	5.3	5.0		
Sigma 1 (ksf)	4.775	4.386		
Sigma 3 (ksf)	0.809	0.779		
P (ksf)	2.792	2.582		
Q (ksf)	1.983	1.804		
Stress Ratio	5.901	5.632		
Rate (in/min)	0.0005	0.0005		

Consolidated Undrained Triaxial Compression with Pore Pressure
ASTM D4767

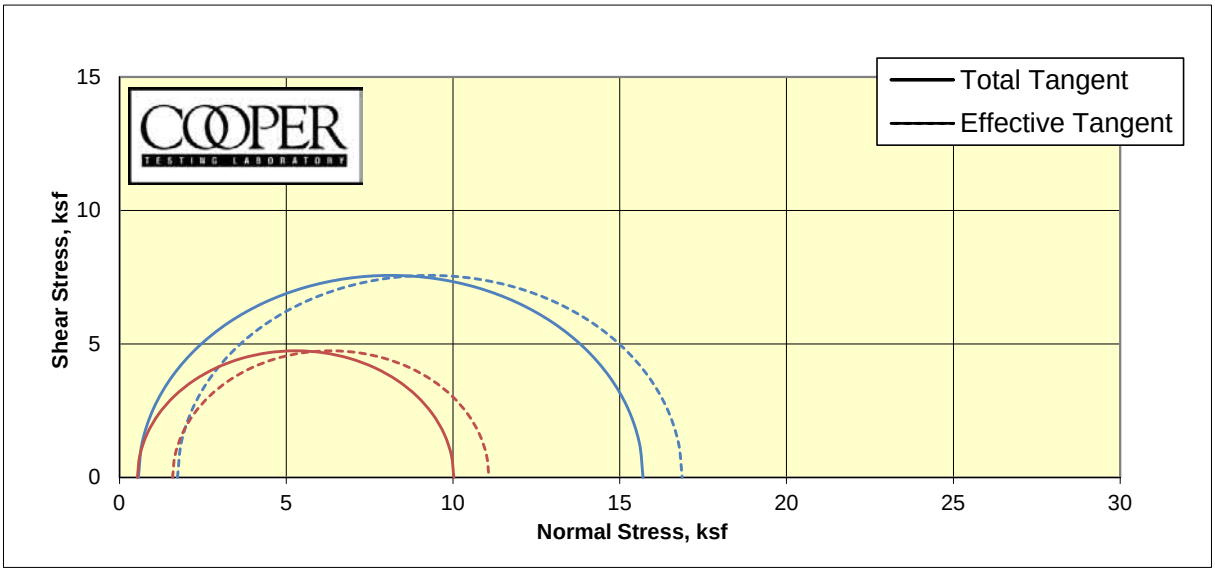


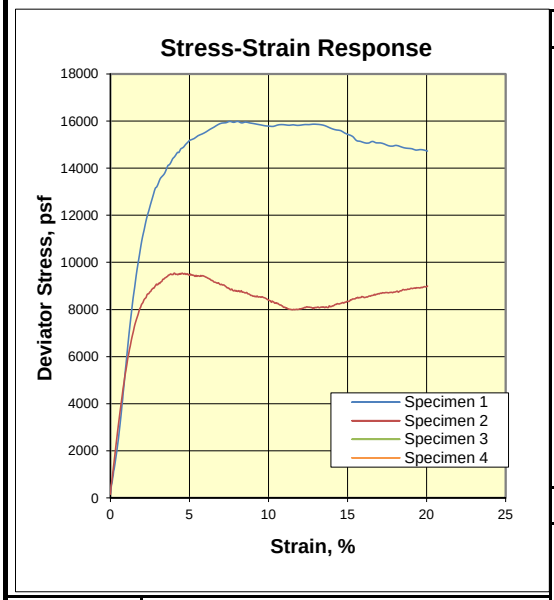


CTL Number:	020-251
Client Name:	AECOM
Project Name:	Klamath River Dam Removal Project
Project Number:	60537920
Date:	5/21/2018 By: MD/DC
Total C	#DIV/0! ksf
Total phi	#DIV/0! degrees
Eff. C	#DIV/0! ksf
Eff. Phi	#DIV/0! degrees ©

Specimen	1	2	3	4
Boring	BC-03			
Sample	S-10			
Depth	90(Tip-13")			
Visual Description	Dark Gray CLAY			
MC (%)	119.8			
Dry Density (pcf)	35.8			
Saturation (%)	88.1			
Void Ratio	3.533			
Diameter (in)	2.87			
Height (in)	6.08			
	Final			
MC (%)	116.3			
Dry Density (pcf)	40.3			
Saturation (%)	100.0			
Void Ratio	3.023			
Diameter (in)	2.69			
Height (in)	6.16			
Cell Pressure (psi)	99.9			
Back Pressure (psi)	80.5			
	Effective Stresses At:			
Strain (%)	5.0			
Deviator (ksf)	5.012			
Excess PP (psi)	14.0			
Sigma 1 (ksf)	5.788			
Sigma 3 (ksf)	0.777			
P (ksf)	3.283			
Q (ksf)	2.506			
Stress Ratio	7.452			
Rate (in/min)	0.0005			

Consolidated Undrained Triaxial Compression with Pore Pressure
ASTM D4767

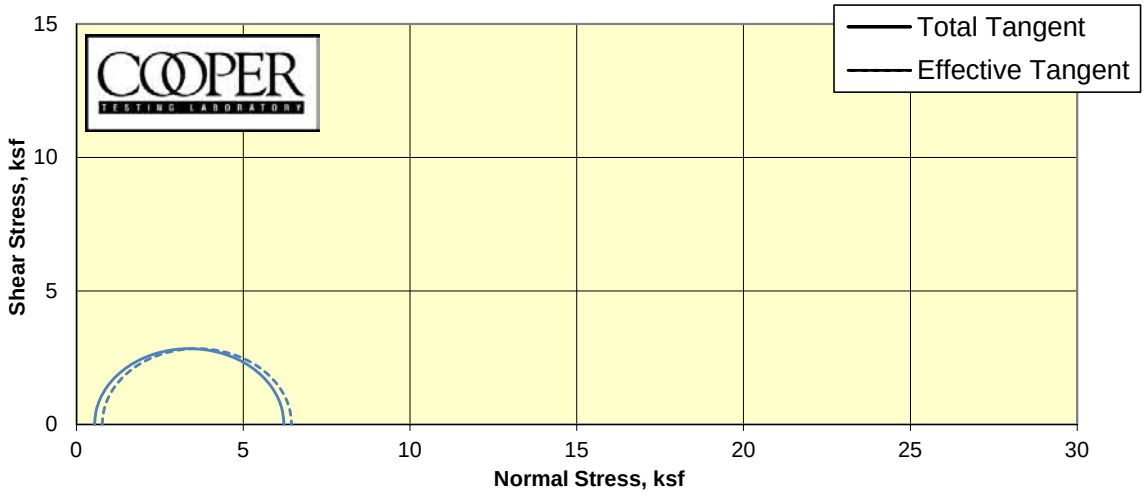


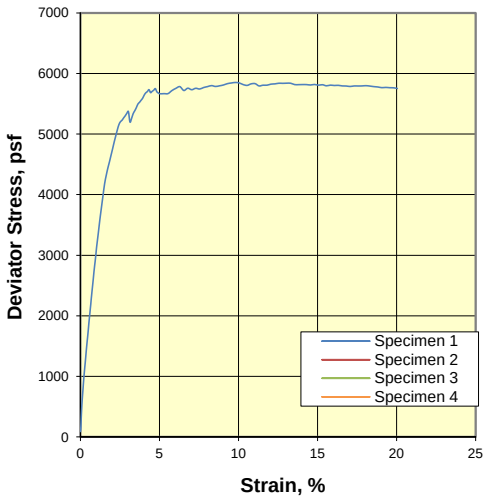


CTL Number:	020-251
Client Name:	AECOM
Project Name:	Klamath River Dam Removal Project
Project Number:	60537920
Date:	6/6/2018 By: MD/DC
Total C	#DIV/0! ksf
Total phi	#DIV/0! degrees
Eff. C	#DIV/0! ksf
Eff. Phi	#DIV/0! degrees ©

Specimen	1	2	3	4
Boring	BC-04	BC-04		
Sample	S-04	S-04		
Depth	12.5-14(Tip-15")	12.5-14.5(Tip-4")		
Visual Description	Brown Weathered Rock	Dark Brown Clayey GRAVEL (Weathered Rock)		
MC (%)	60.8	53.9		
Dry Density (pcf)	59.2	65.0		
Saturation (%)	90.8	93.7		
Void Ratio	1.740	1.497		
Diameter (in)	2.87	2.86		
Height (in)	6.06	6.06		
	Final			
MC (%)	61.4	54.7		
Dry Density (pcf)	62.5	67.0		
Saturation (%)	100.0	100.0		
Void Ratio	1.597	1.422		
Diameter (in)	2.80	2.82		
Height (in)	6.04	6.04		
Cell Pressure (psi)	83.2	82.9		
Back Pressure (psi)	79.2	79.1		
	Effective Stresses At:			
Strain (%)	5.0	5.0		
Deviator (ksf)	15.130	9.485		
Excess PP (psi)	-8.1	-7.3		
Sigma 1 (ksf)	16.872	11.080		
Sigma 3 (ksf)	1.741	1.594		
P (ksf)	9.306	6.337		
Q (ksf)	7.565	4.743		
Stress Ratio	9.688	6.949		
Rate (in/min)	0.0005	0.0005		

Consolidated Undrained Triaxial Compression with Pore Pressure
ASTM D4767

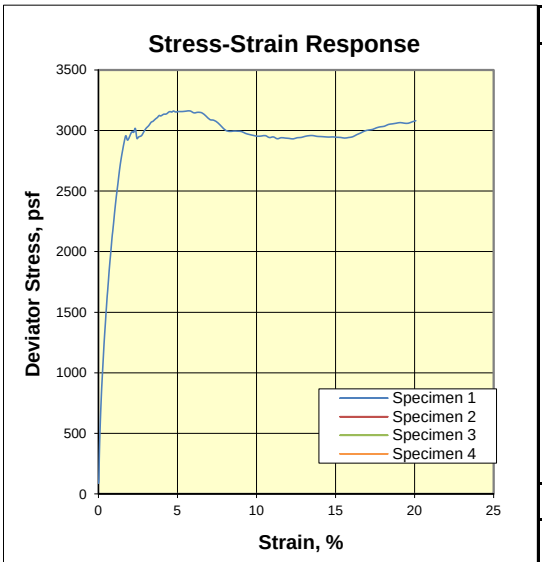




CTL Number:	020-251
Client Name:	AECOM
Project Name:	Klamath River Dam Removal Project
Project Number:	60537920
Date:	5/14/2018 By: MD/DC
Total C	#DIV/0! ksf
Total phi	#DIV/0! degrees
Eff. C	#DIV/0! ksf
Eff. Phi	#DIV/0! degrees ©

Specimen	1	2	3	4
Boring	BC-04			
Sample	S-5			
Depth	17.5(Tip-6")			
Visual Description	Light Gray CLAY			
MC (%)	104.7			
Dry Density (pcf)	42.1			
Saturation (%)	94.2			
Void Ratio	3.000			
Diameter (in)	2.87			
Height (in)	6.08			
	Final			
MC (%)	105.4			
Dry Density (pcf)	43.8			
Saturation (%)	100.0			
Void Ratio	2.846			
Diameter (in)	2.82			
Height (in)	6.07			
Cell Pressure (psi)	84.0			
Back Pressure (psi)	80.2			
	Effective Stresses At:			
Strain (%)	5.0			
Deviator (ksf)	5.677			
Excess PP (psi)	-1.6			
Sigma 1 (ksf)	6.450			
Sigma 3 (ksf)	0.774			
P (ksf)	3.612			
Q (ksf)	2.838			
Stress Ratio	8.336			
Rate (in/min)	0.0005			

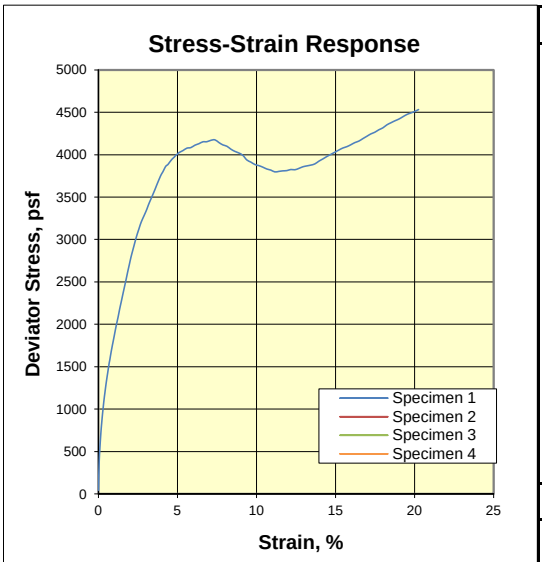
Consolidated Undrained Triaxial Compression with Pore Pressure
ASTM D4767



CTL Number:	020-251
Client Name:	AECOM
Project Name:	Klamath River Dam Removal Project
Project Number:	60537920
Date:	5/30/2018 By: MD/DC
Total C	#DIV/0! ksf
Total phi	#DIV/0! degrees
Eff. C	#DIV/0! ksf
Eff. Phi	#DIV/0! degrees ©

Specimen	1	2	3	4
Boring	BC-04			
Sample	S-06			
Depth	22.5(Tip-2")			
Visual Description	Greenish Gray CLAY (Silty)/ SILT (slightly plastic)			
MC (%)	154.6			
Dry Density (pcf)	31.7			
Saturation (%)	97.4			
Void Ratio	4.127			
Diameter (in)	2.87			
Height (in)	6.07			
	Final			
MC (%)	152.8			
Dry Density (pcf)	32.6			
Saturation (%)	100.0			
Void Ratio	3.974			
Diameter (in)	2.83			
Height (in)	6.05			
Cell Pressure (psi)	85.0			
Back Pressure (psi)	80.1			
	Effective Stresses At:			
Strain (%)	5.0			
Deviator (ksf)	3.153			
Excess PP (psi)	2.5			
Sigma 1 (ksf)	3.511			
Sigma 3 (ksf)	0.358			
P (ksf)	1.935			
Q (ksf)	1.576			
Stress Ratio	9.796			
Rate (in/min)	0.0005			

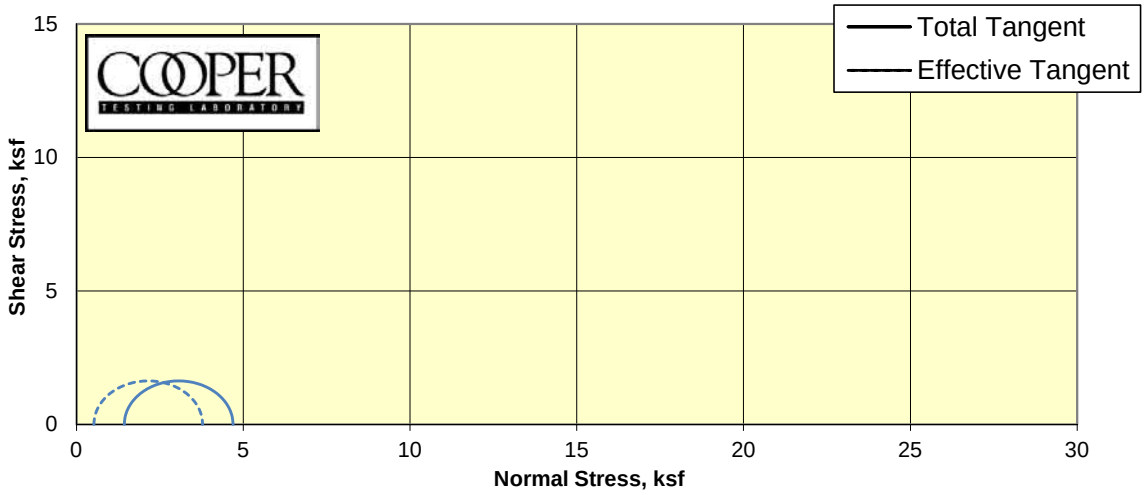
Consolidated Undrained Triaxial Compression with Pore Pressure
ASTM D4767

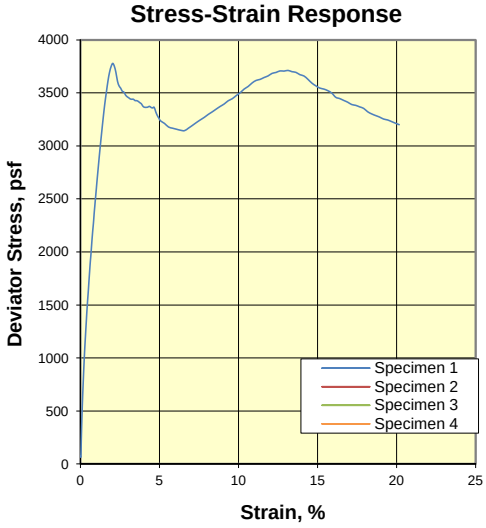


CTL Number:	020-251
Client Name:	AECOM
Project Name:	Klamath River Dam Removal Project
Project Number:	60537920
Date:	5/17/2018 By: MD/DC
Total C	#DIV/0! ksf
Total phi	#DIV/0! degrees
Eff. C	#DIV/0! ksf
Eff. Phi	#DIV/0! degrees ©

Specimen	1	2	3	4
Boring	BC-04			
Sample	S-08			
Depth	32.5(Tip-10")			
Visual Description	Pale Brown Mottled Gray Elastic SILT			
MC (%)	117.2			
Dry Density (pcf)	36.9			
Saturation (%)	89.7			
Void Ratio	3.397			
Diameter (in)	2.87			
Height (in)	6.08			
	Final			
MC (%)	115.5			
Dry Density (pcf)	40.5			
Saturation (%)	100.0			
Void Ratio	3.004			
Diameter (in)	2.76			
Height (in)	6.01			
Cell Pressure (psi)	86.8			
Back Pressure (psi)	80.0			
	Effective Stresses At:			
Strain (%)	5.0			
Deviator (ksf)	4.005			
Excess PP (psi)	4.2			
Sigma 1 (ksf)	4.390			
Sigma 3 (ksf)	0.385			
P (ksf)	2.388			
Q (ksf)	2.003			
Stress Ratio	11.403			
Rate (in/min)	0.0005			

Consolidated Undrained Triaxial Compression with Pore Pressure
ASTM D4767

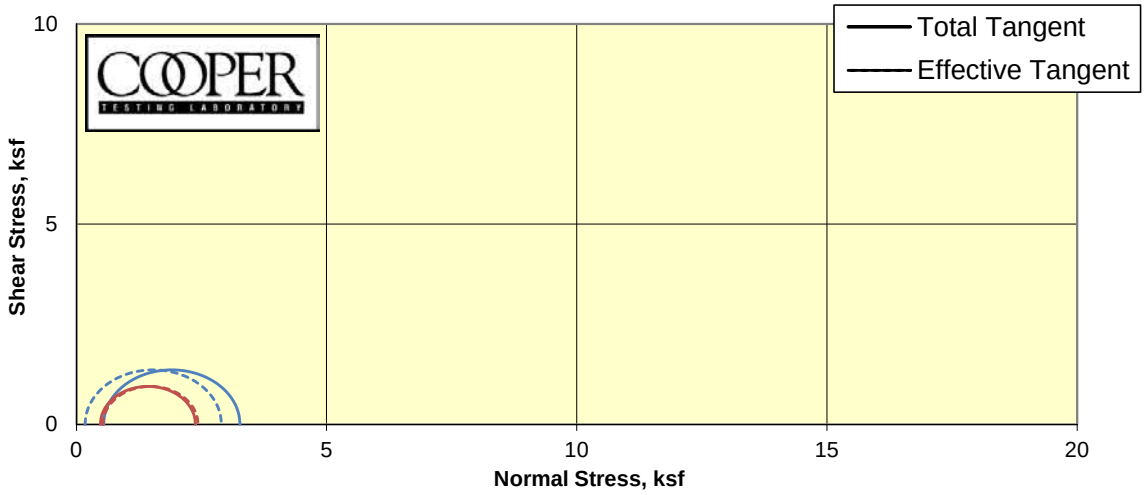


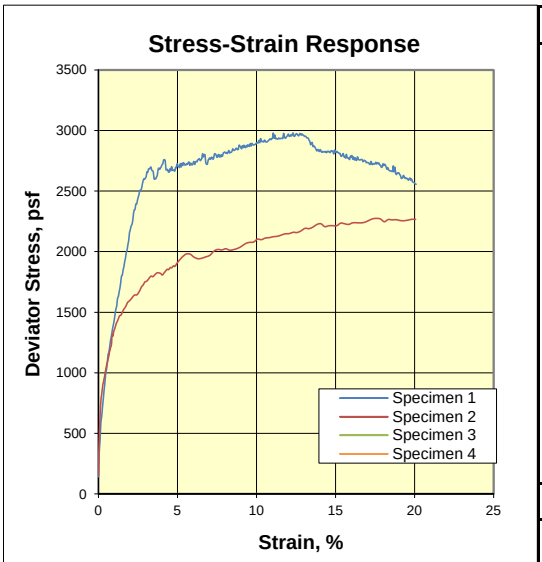


CTL Number:	020-251
Client Name:	AECOM
Project Name:	Klamath River Dam Removal Project
Project Number:	60537920
Date:	5/25/2018 By: MD/DC
Total C	#DIV/0! ksf
Total phi	#DIV/0! degrees
Eff. C	#DIV/0! ksf
Eff. Phi	#DIV/0! degrees ©

Specimen	1	2	3	4
Boring	BC-04			
Sample	S-10			
Depth	52.5(Tip-4")			
Visual Description	Bluish Gray CLAY (Silty)/ SILT (slightly plastic)			
MC (%)	153.6			
Dry Density (pcf)	32.1			
Saturation (%)	97.9			
Void Ratio	4.156			
Diameter (in)	2.87			
Height (in)	6.08			
	Final			
MC (%)	151.2			
Dry Density (pcf)	33.0			
Saturation (%)	100.0			
Void Ratio	4.007			
Diameter (in)	2.84			
Height (in)	6.03			
Cell Pressure (psi)	90.6			
Back Pressure (psi)	80.6			
	Effective Stresses At:			
Strain (%)	5.0			
Deviator (ksf)	3.260			
Excess PP (psi)	6.3			
Sigma 1 (ksf)	3.784			
Sigma 3 (ksf)	0.523			
P (ksf)	2.154			
Q (ksf)	1.630			
Stress Ratio	7.229			
Rate (in/min)	0.0005			

Consolidated Undrained Triaxial Compression with Pore Pressure
ASTM D4767

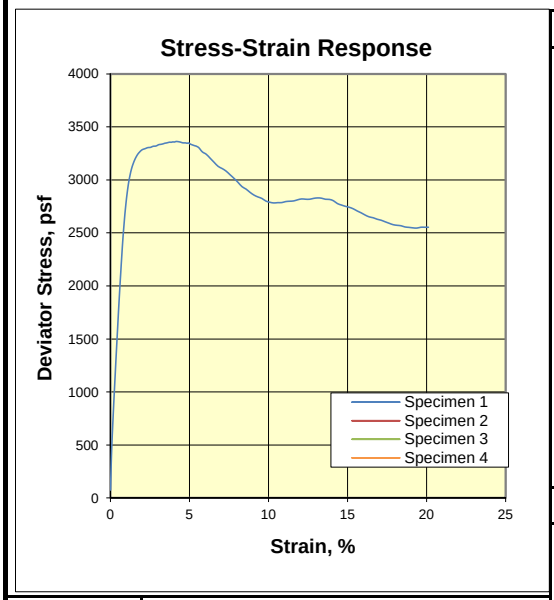




CTL Number:	020-251
Client Name:	AECOM
Project Name:	Klamath River Dam Removal Project
Project Number:	60537920
Date:	5/24/2018 By: MD/DC
Total C	#DIV/0! ksf
Total phi	#DIV/0! degrees
Eff. C	#DIV/0! ksf
Eff. Phi	#DIV/0! degrees ©

Specimen	1	2	3	4
Boring	BC-05	BC-05		
Sample	S-04	S-04		
Depth	14.5(Tip-16")	14.5(Tip-1")		
Visual Description	Olive CLAY (Silty)/SILT (slightly plastic)	Olive Mottled Yellow Clayey SAND/ Sandy CLAY		
MC (%)	135.1	30.0		
Dry Density (pcf)	35.4	92.8		
Saturation (%)	97.0	99.2		
Void Ratio	3.760	0.816		
Diameter (in)	2.87	2.87		
Height (in)	5.83	6.09		
	Final			
MC (%)	135.4	29.8		
Dry Density (pcf)	36.2	93.4		
Saturation (%)	100.0	100.0		
Void Ratio	3.656	0.805		
Diameter (in)	2.85	2.87		
Height (in)	5.80	6.07		
Cell Pressure (psi)	84.2	84.1		
Back Pressure (psi)	80.4	80.8		
	Effective Stresses At:			
Strain (%)	5.0	5.0		
Deviator (ksf)	2.725	1.900		
Excess PP (psi)	2.6	-0.4		
Sigma 1 (ksf)	2.899	2.431		
Sigma 3 (ksf)	0.173	0.531		
P (ksf)	1.536	1.481		
Q (ksf)	1.363	0.950		
Stress Ratio	16.726	4.577		
Rate (in/min)	0.0005	0.0005		

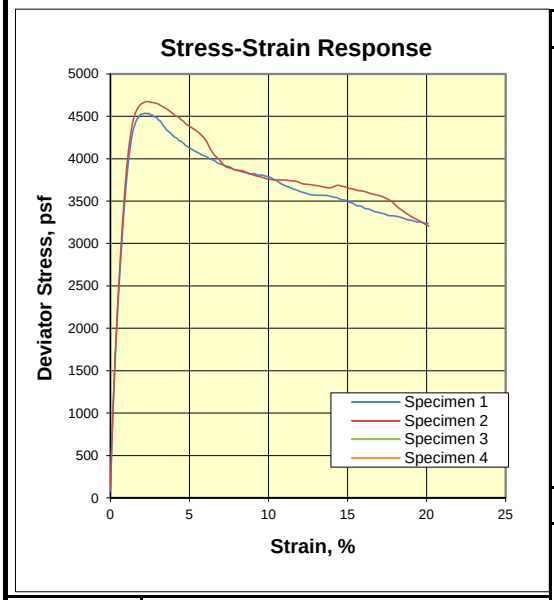
Consolidated Undrained Triaxial Compression with Pore Pressure
ASTM D4767



CTL Number:	020-251		
Client Name:	AECOM		
Project Name:	Klamath River Dam Removal Project		
Project Number:	60537920		
Date:	5/30/2018	By:	MD/DC
Total C	#DIV/0!	ksf	
Total phi	#DIV/0!	degrees	
Eff. C	#DIV/0!	ksf	
Eff. Phi	#DIV/0!	degrees	©

Specimen	1	2	3	4
Boring	BC-09			
Sample	S-05			
Depth	23(Tip-5")			
Visual Description	Dark Gray Elastic SILT			
MC (%)	79.5			
Dry Density (pcf)	51.9			
Saturation (%)	97.1			
Void Ratio	2.130			
Diameter (in)	2.87			
Height (in)	6.07			
	Final			
MC (%)	79.4			
Dry Density (pcf)	53.0			
Saturation (%)	100.0			
Void Ratio	2.065			
Diameter (in)	2.85			
Height (in)	6.04			
Cell Pressure (psi)	86.8			
Back Pressure (psi)	80.3			
	Effective Stresses At:			
Strain (%)	5.0			
Deviator (ksf)	3.348			
Excess PP (psi)	2.2			
Sigma 1 (ksf)	3.969			
Sigma 3 (ksf)	0.621			
P (ksf)	2.295			
Q (ksf)	1.674			
Stress Ratio	6.396			
Rate (in/min)	0.0005			

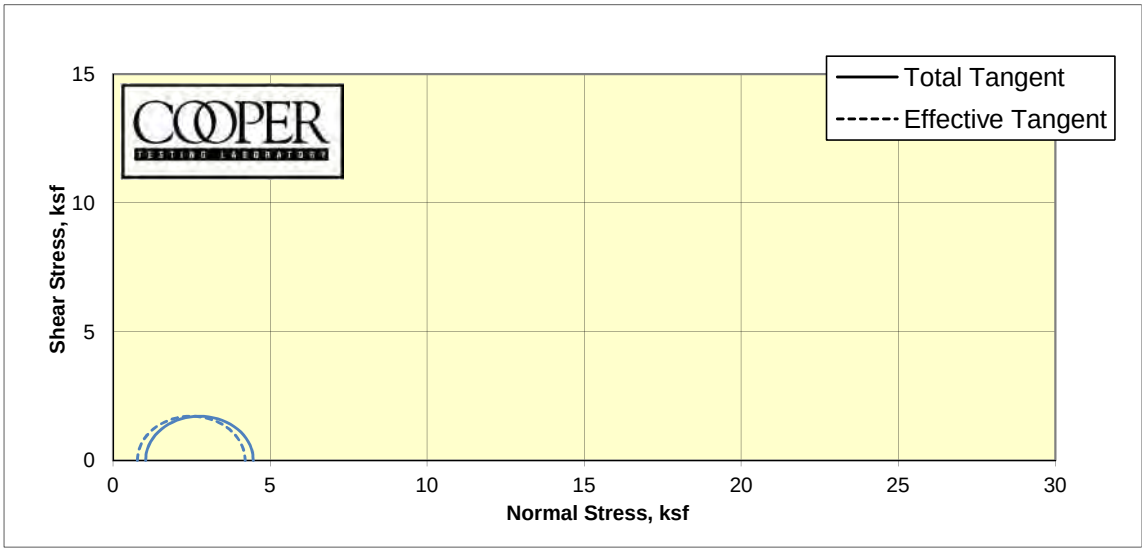
Consolidated Undrained Triaxial Compression with Pore Pressure
ASTM D4767

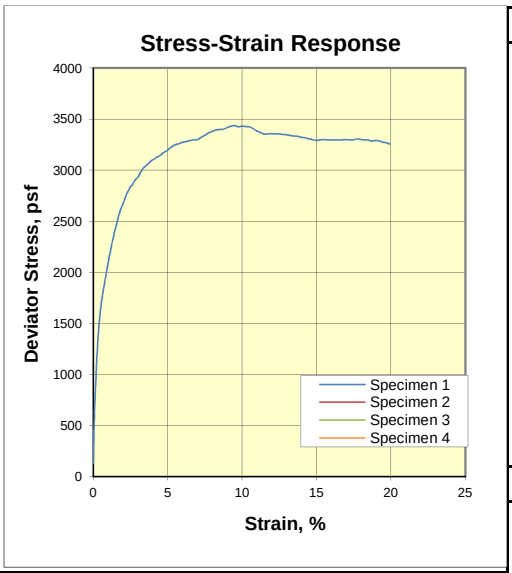


CTL Number:	020-251
Client Name:	AECOM
Project Name:	Klamath River Dam Removal Project
Project Number:	60537920
Date:	6/6/2018 By: MD/DC
Total C	#DIV/0! ksf
Total phi	#DIV/0! degrees
Eff. C	#DIV/0! ksf
Eff. Phi	#DIV/0! degrees ©

Specimen	1	2	3	4
Boring	BC-09	BC-09		
Sample	S-09	S-09		
Depth	68-70.5(Tip-10")	68-70.5(Tip-4")		
Visual Description	Dark Greenish Gray CLAY (Silty)/ SILT (slightly plastic)	Dark Greenish Gray CLAY (Silty)/ SILT (slightly plastic)		
MC (%)	92.0	95.5		
Dry Density (pcf)	47.2	46.1		
Saturation (%)	98.2	98.5		
Void Ratio	2.436	2.520		
Diameter (in)	2.87	2.87		
Height (in)	6.06	6.06		
	Final			
MC (%)	90.6	93.7		
Dry Density (pcf)	48.4	47.2		
Saturation (%)	100.0	100.0		
Void Ratio	2.355	2.436		
Diameter (in)	2.84	2.85		
Height (in)	6.03	6.02		
Cell Pressure (psi)	94.2	94.1		
Back Pressure (psi)	80.1	79.7		
	Effective Stresses At:			
Strain (%)	5.0	5.0		
Deviator (ksf)	4.134	4.387		
Excess PP (psi)	9.1	9.6		
Sigma 1 (ksf)	4.860	5.084		
Sigma 3 (ksf)	0.726	0.697		
P (ksf)	2.793	2.891		
Q (ksf)	2.067	2.194		
Stress Ratio	6.693	7.293		
Rate (in/min)	0.0005	0.0005		

Consolidated Undrained Triaxial Compression with Pore Pressure
ASTM D4767



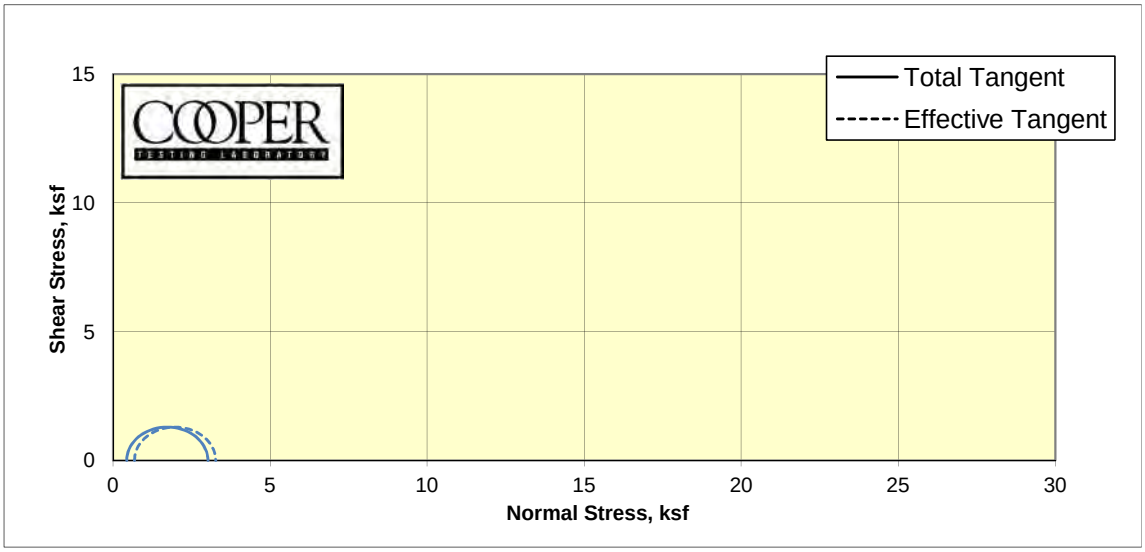


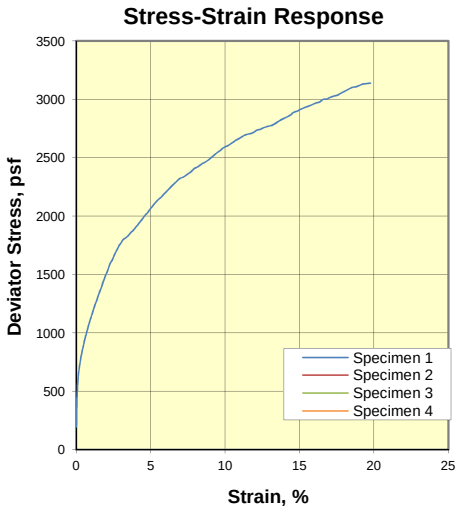
CTL Number:	020-272
Client Name:	AECOM
Project Name:	Klamath River Dam Removal Project
Project Number:	60537920
Date:	1/2/2019 By: MD/DC
Total C	#DIV/0! ksf
Total phi	#DIV/0! degrees
Eff. C	#DIV/0! ksf
Eff. Phi	#DIV/0! degrees

©

Specimen	1	2	3	4
Boring	BC-13			
Sample	S02			
Depth	12(Tip-0.5')			
Visual Description	Pale Brown SILT (slightly plastic) (Weathered Rock)			
MC (%)	23.3			
Dry Density (pcf)	59.6			
Saturation (%)	35.1			
Void Ratio	1.725			
Diameter (in)	2.87			
Height (in)	6.09			
	Final			
MC (%)	63.5			
Dry Density (pcf)	61.2			
Saturation (%)	100.0			
Void Ratio	1.651			
Diameter (in)	2.83			
Height (in)	6.11			
Cell Pressure (psi)	136.9			
Back Pressure (psi)	129.7			
	Effective Stresses At:			
Strain (%)	10.0			
Deviator (ksf)	3.431			
Excess PP (psi)	1.8			
Sigma 1 (ksf)	4.206			
Sigma 3 (ksf)	0.775			
P (ksf)	2.491			
Q (ksf)	1.716			
Stress Ratio	5.425			
Rate (in/min)	0.0005			

Consolidated Undrained Triaxial Compression with Pore Pressure
ASTM D4767



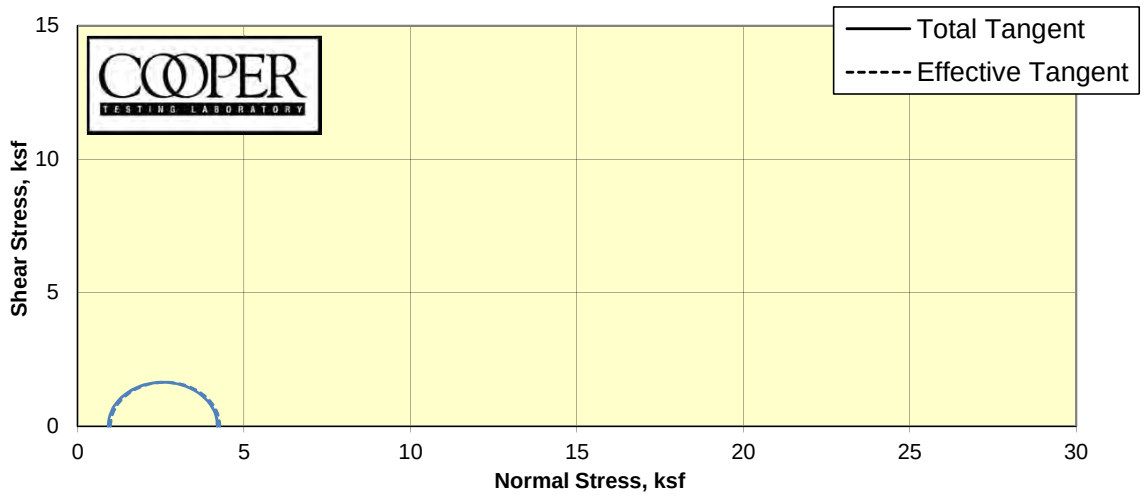


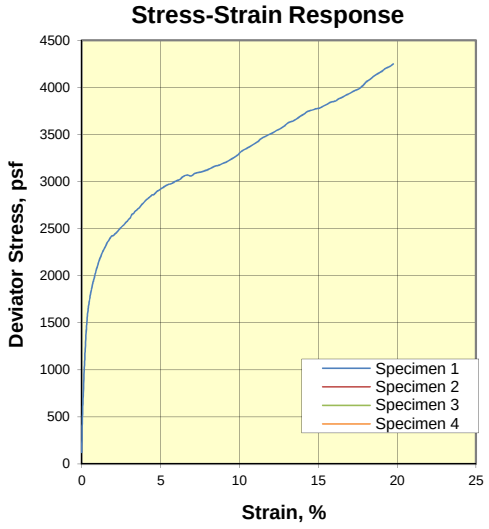
CTL Number:	020-272
Client Name:	AECOM
Project Name:	Klamath River Dam Removal Project
Project Number:	60537920
Date:	1/3/2019 By: MD/DC
Total C	#DIV/0! ksf
Total phi	#DIV/0! degrees
Eff. C	#DIV/0! ksf
Eff. Phi	#DIV/0! degrees

©

Specimen	1	2	3	4
Boring	BC-14			
Sample	S01			
Depth	5(Tip-1")			
Visual Description	Pale Brown SILT w/ Gravel (Weathered Rock)			
MC (%)	23.3			
Dry Density (pcf)	59.7			
Saturation (%)	34.5			
Void Ratio	1.823			
Diameter (in)	2.87			
Height (in)	6.09			
	Final			
MC (%)	66.8			
Dry Density (pcf)	60.1			
Saturation (%)	100.0			
Void Ratio	1.804			
Diameter (in)	2.84			
Height (in)	6.16			
Cell Pressure (psi)	132.4			
Back Pressure (psi)	129.4			
	Effective Stresses At:			
Strain (%)	10.0			
Deviator (ksf)	2.587			
Excess PP (psi)	-1.7			
Sigma 1 (ksf)	3.269			
Sigma 3 (ksf)	0.682			
P (ksf)	1.976			
Q (ksf)	1.293			
Stress Ratio	4.791			
Rate (in/min)	0.0005			

Consolidated Undrained Triaxial Compression with Pore Pressure
ASTM D4767





CTL Number:	020-272
Client Name:	AECOM
Project Name:	Klamath River Dam Removal Project
Project Number:	60537920
Date:	1/3/2019 By: MD/DC
Total C	#DIV/0! ksf
Total phi	#DIV/0! degrees
Eff. C	#DIV/0! ksf
Eff. Phi	#DIV/0! degrees ©

Specimen	1	2	3	4
Boring	BC-14			
Sample	S04			
Depth	12(Tip-1")			
Visual Description	Olive Brown Sandy SILT w/ Gravel (Weathered Rock)			
MC (%)	24.2			
Dry Density (pcf)	63.5			
Saturation (%)	39.5			
Void Ratio	1.653			
Diameter (in)	2.86			
Height (in)	6.09			
	Final			
MC (%)	61.1			
Dry Density (pcf)	63.6			
Saturation (%)	100.0			
Void Ratio	1.649			
Diameter (in)	2.84			
Height (in)	6.17			
Cell Pressure (psi)	136.6			
Back Pressure (psi)	130.2			
	Effective Stresses At:			
Strain (%)	10.0			
Deviator (ksf)	3.284			
Excess PP (psi)	-0.5			
Sigma 1 (ksf)	4.272			
Sigma 3 (ksf)	0.989			
P (ksf)	2.630			
Q (ksf)	1.642			
Stress Ratio	4.322			
Rate (in/min)	0.0005			

List of Photos

Photo 1: 020-272 BC-13 S01 @ 7' (Tip-4'') After TXUU.JPG
Photo 2: 020-272 BC-13 S01 @ 7' (Tip-4'') Before TXUU.JPG
Photo 3: 020-272 BC-13 S02 @ 12' (Tip-0.5'') After TXCUPP #1.JPG
Photo 4: 020-272 BC-13 S02 @ 12' (Tip-0.5'') After TXCUPP #2.JPG
Photo 5: 020-272 BC-13 S02 @ 12' (Tip-0.5'') Before TXCUPP.JPG
Photo 6: 020-272 BC-13 S04 @ 22' (Tip-12'') After TXUU.JPG
Photo 7: 020-272 BC-13 S04 @ 22' (Tip-12'') Before TXUU.JPG
Photo 8: 020-272 BC-13 S04 @ 22' (Tip-18.5'') After TXUU.JPG
Photo 9: 020-272 BC-13 S04 @ 22' (Tip-18.5'') Before TXUU.JPG
Photo 10: 020-272 BC-13 S05 @ 30.5' (Tip-0.5'') Before TXCUPP.JPG
Photo 11: 020-272 BC-13 S05 @ 30.5' (Tip-11'') After TXUU #1.JPG
Photo 12: 020-272 BC-13 S05 @ 30.5' (Tip-11'') After TXUU #2.JPG
Photo 13: 020-272 BC-13 S05 @ 30.5' (Tip-11'') Before TXUU.JPG
Photo 14: 020-272 BC-14 S01 @ 5' (Tip-1'') After TXCUPP #1.JPG
Photo 15: 020-272 BC-14 S01 @ 5' (Tip-1'') After TXCUPP #2.JPG
Photo 16: 020-272 BC-14 S01 @ 5' (Tip-1'') Before TXCUPP.JPG
Photo 17: 020-272 BC-14 S02 @ 7' (Tip-1'') After TXUU #1.JPG
Photo 18: 020-272 BC-14 S02 @ 7' (Tip-1'') After TXUU #2.JPG
Photo 19: 020-272 BC-14 S02 @ 7' (Tip-1'') Before TXUU.JPG
Photo 20: 020-272 BC-14 S03 @ 9' (Tip-1'') After TXUU #1.JPG
Photo 21: 020-272 BC-14 S03 @ 9' (Tip-1'') After TXUU #2.JPG
Photo 22: 020-272 BC-14 S03 @ 9' (Tip-1'') After TXUU #3.JPG
Photo 23: 020-272 BC-14 S03 @ 9' (Tip-1'') Before TXCUPP.JPG
Photo 24: 020-272 BC-14 S04 @ 12' (Tip-1'') After TXCUPP #1.JPG
Photo 25: 020-272 BC-14 S04 @ 12' (Tip-1'') After TXCUPP #2.JPG
Photo 26: 020-272 BC-14 S04 @ 12' (Tip-1'') Before TXCUPP.JPG
Photo 27: 202-251 BC-02 S06 @ 19.5' (tip-2'') After TXCUPP #1.JPG
Photo 28: 202-251 BC-02 S06 @ 19.5' (tip-2'') After TXCUPP #2.JPG
Photo 29: 202-251 BC-02 S06 @ 19.5' (tip-2'') Before TXCUPP.JPG
Photo 30: 202-251 BC-02 S08 @ 34.5' (tip-6'') After TXCUPP #1.JPG
Photo 31: 202-251 BC-02 S08 @ 34.5' (tip-6'') After TXCUPP #2.JPG
Photo 32: 202-251 BC-03 S06 @ 39.5' (tip-4'') After TXCUPP #1.JPG
Photo 33: 202-251 BC-03 S06 @ 39.5' (tip-4'') After TXCUPP #2.JPG
Photo 34: 202-251 BC-03 S06 @ 39.5' (tip-4'') Before TXCUPP.JPG
Photo 35: 202-251 BC-03 S06 @ 39.5' (tip-11'') After TXCUPP #1.JPG
Photo 36: 202-251 BC-03 S06 @ 39.5' (tip-11'') After TXCUPP #2.JPG
Photo 37: 202-251 BC-03 S06 @ 39.5' (tip-11'') Before TXCUPP.JPG
Photo 38: 202-251 BC-03 S10 @ 90' (tip-13'') After TXCUPP #1.JPG
Photo 39: 202-251 BC-03 S10 @ 90' (tip-13'') After TXCUPP #2.JPG
Photo 40: 202-251 BC-03 S10 @ 90' (tip-13'') Before TXCUPP.JPG
Photo 41: 202-251 BC-04 S04 @ 12.5' (tip-4'') After TXCUPP #1.JPG
Photo 42: 202-251 BC-04 S04 @ 12.5' (tip-4'') After TXCUPP #2.JPG
Photo 43: 202-251 BC-04 S04 @ 12.5' (tip-4'') Before TXCUPP.JPG

Photo 44: 202-251 BC-04 S04 @ 12.5' (tip-15'') After TXCUPP #1.JPG
Photo 45: 202-251 BC-04 S04 @ 12.5' (tip-15'') After TXCUPP #2.JPG
Photo 46: 202-251 BC-04 S04 @ 12.5' (tip-15'') Before TXCUPP.JPG
Photo 47: 202-251 BC-04 S05 @ 17.6' (tip-6'') After TXCUPP #1.JPG
Photo 48: 202-251 BC-04 S05 @ 17.6' (tip-6'') After TXCUPP #2.JPG
Photo 49: 202-251 BC-04 S05 @ 17.6' (tip-6'') Before TXCUPP.JPG
Photo 50: 202-251 BC-04 S06 @ 22.5' (tip-2'') After TXCUPP #1.JPG
Photo 51: 202-251 BC-04 S06 @ 22.5' (tip-2'') After TXCUPP #2.JPG
Photo 52: 202-251 BC-04 S06 @ 22.5' (tip-2'') Before TXCUPP.JPG
Photo 53: 202-251 BC-04 S08 @ 32.5' (tip-10'') After TXCUPP #1.JPG
Photo 54: 202-251 BC-04 S08 @ 32.5' (tip-10'') After TXCUPP #2.JPG
Photo 55: 202-251 BC-04 S08 @ 32.5' (tip-10'') Before TXCUPP.JPG
Photo 56: 202-251 BC-04 S10 @ 52.5' (tip-4'') After TXCUPP #1.JPG
Photo 57: 202-251 BC-04 S10 @ 52.5' (tip-4'') After TXCUPP #2.JPG
Photo 58: 202-251 BC-04 S10 @ 52.5' (tip-4'') Before TXCUPP.JPG
Photo 59: 202-251 BC-04 S10 @ 52.5' (tip-18'') After TXCUPP #1.JPG
Photo 60: 202-251 BC-04 S10 @ 52.5' (tip-18'') After TXCUPP #2.JPG
Photo 61: 202-251 BC-04 S10 @ 52.5' (tip-18'') Before TXCUPP.JPG
Photo 62: 202-251 BC-05 S04 @ 14.5' (tip-1'') After TXCUPP #1.JPG
Photo 63: 202-251 BC-05 S04 @ 14.5' (tip-1'') After TXCUPP #2.JPG
Photo 64: 202-251 BC-05 S04 @ 14.5' (tip-1'') Before TXCUPP.JPG
Photo 65: 202-251 BC-05 S04 @ 14.5' (tip-16'') After TXCUPP #1.JPG
Photo 66: 202-251 BC-05 S04 @ 14.5' (tip-16'') After TXCUPP #2.JPG
Photo 67: 202-251 BC-05 S04 @ 14.5' (tip-16'') Before TXCUPP.JPG
Photo 68: 202-251 BC-09 S05 @ 23' (tip-5'') After TXCUPP #1.JPG
Photo 69: 202-251 BC-09 S05 @ 23' (tip-5'') After TXCUPP #2.JPG
Photo 70: 202-251 BC-09 S05 @ 23' (tip-5'') Before TXCUPP.JPG
Photo 71: 202-251 BC-09 S05 @ 23' (tip-13'') After TXCUPP #1.JPG
Photo 72: 202-251 BC-09 S05 @ 23' (tip-13'') After TXCUPP #2.JPG
Photo 73: 202-251 BC-09 S05 @ 23' (tip-13'') Before TXCUPP.JPG
Photo 74: 202-251 BC-09 S09 @ 68' (tip-4'') After TXCUPP #1.JPG
Photo 75: 202-251 BC-09 S09 @ 68' (tip-4'') After TXCUPP #2.JPG
Photo 76: 202-251 BC-09 S09 @ 68' (tip-4'') Before TXCUPP.JPG
Photo 77: 202-251 BC-09 S09 @ 68' (tip-10'') After TXCUPP #1.JPG
Photo 78: 202-251 BC-09 S09 @ 68' (tip-10'') After TXCUPP #2.JPG
Photo 79: 202-251 BC-09 S09 @ 68' (tip-10'') Before TXCUPP.JPG