

**REFERENCE: B-3186/B-5898**

**PROJECT: 38332/48030**

**STATE OF NORTH CAROLINA**  
**DEPARTMENT OF TRANSPORTATION**  
**DIVISION OF HIGHWAYS**  
**GEOTECHNICAL ENGINEERING UNIT**

**STRUCTURE**  
**SUBSURFACE INVESTIGATION**

COUNTY HAYWOOD  
 PROJECT DESCRIPTION US 23/US 74/US 19 (GREAT SMOKY MOUNTAIN HWY) FROM WEST OF NC 209 (CRABTREE RD.) TO EAST OF RUSS AVE.  
 SITE DESCRIPTION BRIDGE NO. 430468 ON - L- (US 74/US 23) OVER RICHLAND CREEK BETWEEN US 276 AND NC 209

**CONTENTS**

<u>SHEET NO.</u>	<u>DESCRIPTION</u>
1	TITLE SHEET
2	LEGEND
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3	SITE PLAN
4-5	PROFILES
6-9	CROSS SECTIONS
10-34	BORE LOGS, CORE REPORTS & CORE PHOTOGRAPHS
35	ROCK TEST RESULTS

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-3186/B-5898	1	35

**CAUTION NOTICE**

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 707-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

- NOTES:
1. THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT.
  2. BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

PERSONNEL

C. SWAFFORD

N. YACOBI

R. DUGGER

GEOTECHNOLOGY, INC.

INVESTIGATED BY C. SWAFFORD

DRAWN BY T. LYNN

CHECKED BY K. BUSSEY

SUBMITTED BY HDR

DATE AUGUST 2021



Kenneth R. Bussey, Jr.  
SIGNATURE

9/6/2023  
DATE



**NORTH CAROLINA DEPARTMENT OF TRANSPORTATION**  
**DIVISION OF HIGHWAYS**  
**GEOTECHNICAL ENGINEERING UNIT**  


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**SUBSURFACE INVESTIGATION**

**SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES**  
**FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS**

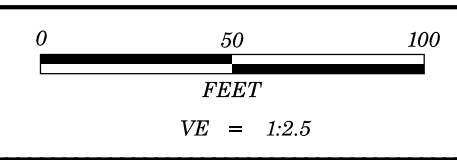
AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jointed Rock Mass (Marinos and Hoek, 2000)

AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonically Deformed Heterogeneous Rock Masses (Marinos and Hoek, 2000)

GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000)		SURFACE CONDITIONS					GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos, P and Hoek E., 2000)		SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)					
<p>From the lithology, structure and surface conditions of the discontinuities, estimate the average value of GSI. Do not try to be too precise. Quoting a range from 33 to 37 is more realistic than stating that GSI = 35. Note that the table does not apply to structurally controlled failures. Where weak planar structural planes are present in an unfavorable orientation with respect to the excavation face, these will dominate the rock mass behaviour. The shear strength of surfaces in rocks that are prone to deterioration as a result of changes in moisture content will be reduced if water is present. When working with rocks in the fair to very poor categories, a shift to the right may be made for wet conditions. Water pressure is dealt with by effective stress analysis.</p>		VERY GOOD	GOOD	FAIR	POOR	VERY POOR	<p>From a description of the lithology, structure and surface conditions (particularly of the bedding planes), choose a box in the chart. Locate the position in the box that corresponds to the condition of the discontinuities and estimate the average value of GSI from the contours. Do not attempt to be too precise. Quoting a range from 33 to 37 is more realistic than giving GSI = 35. Note that the Hoek-Brown criterion does not apply to structurally controlled failures. Where unfavourably oriented continuous weak planar discontinuities are present, these will dominate the behaviour of the rock mass. The strength of some rock masses is reduced by the presence of groundwater and this can be allowed for by a slight shift to the right in the columns for fair, poor and very poor conditions. Water pressure does not change the value of GSI and it is dealt with by using effective stress analysis.</p>	VERY GOOD	GOOD	FAIR	POOR	VERY POOR		
		Very rough, fresh unweathered surfaces	Rough, slightly weathered, iron stained surfaces	Smooth, moderately weathered and altered surfaces	Slickensided, highly weathered surfaces with compact coatings or fillings or angular fragments	Slickensided, highly weathered surfaces with soft clay coatings or fillings		Very Rough, fresh unweathered surfaces	Rough, slightly weathered surfaces	Smooth, moderately weathered and altered surfaces	Very smooth, occasionally slickensided surfaces with compact coatings or fillings with angular fragments	Very smooth, slickensided or highly weathered surfaces with soft clay coatings or fillings		
STRUCTURE		DECREASING SURFACE QUALITY →					COMPOSITION AND STRUCTURE							
	INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities	90			N/A	N/A		A. Thick bedded, very blocky sandstone The effect of pelitic coatings on the bedding planes is minimized by the confinement of the rock mass. In shallow tunnels or slopes these bedding planes may cause structurally controlled instability.	70					
	BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets	80	70					B. Sandstone with thin inter-layers of siltstone	60					
	VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets		60	50				C. Sandstone and siltstone in similar amounts		50				
	BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity			40				D. Siltstone or silty shale with sandstone layers		40				
	DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces				30			E. Weak siltstone or clayey shale with sandstone layers			30			
	LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes					20		F. Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure				20		
						10		G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers					10	
		N/A	N/A					H. Tectonically deformed silty or clayey shale forming a chaotic structure with pockets of clay. Thin layers of sandstone are transformed into small rock pieces.						10

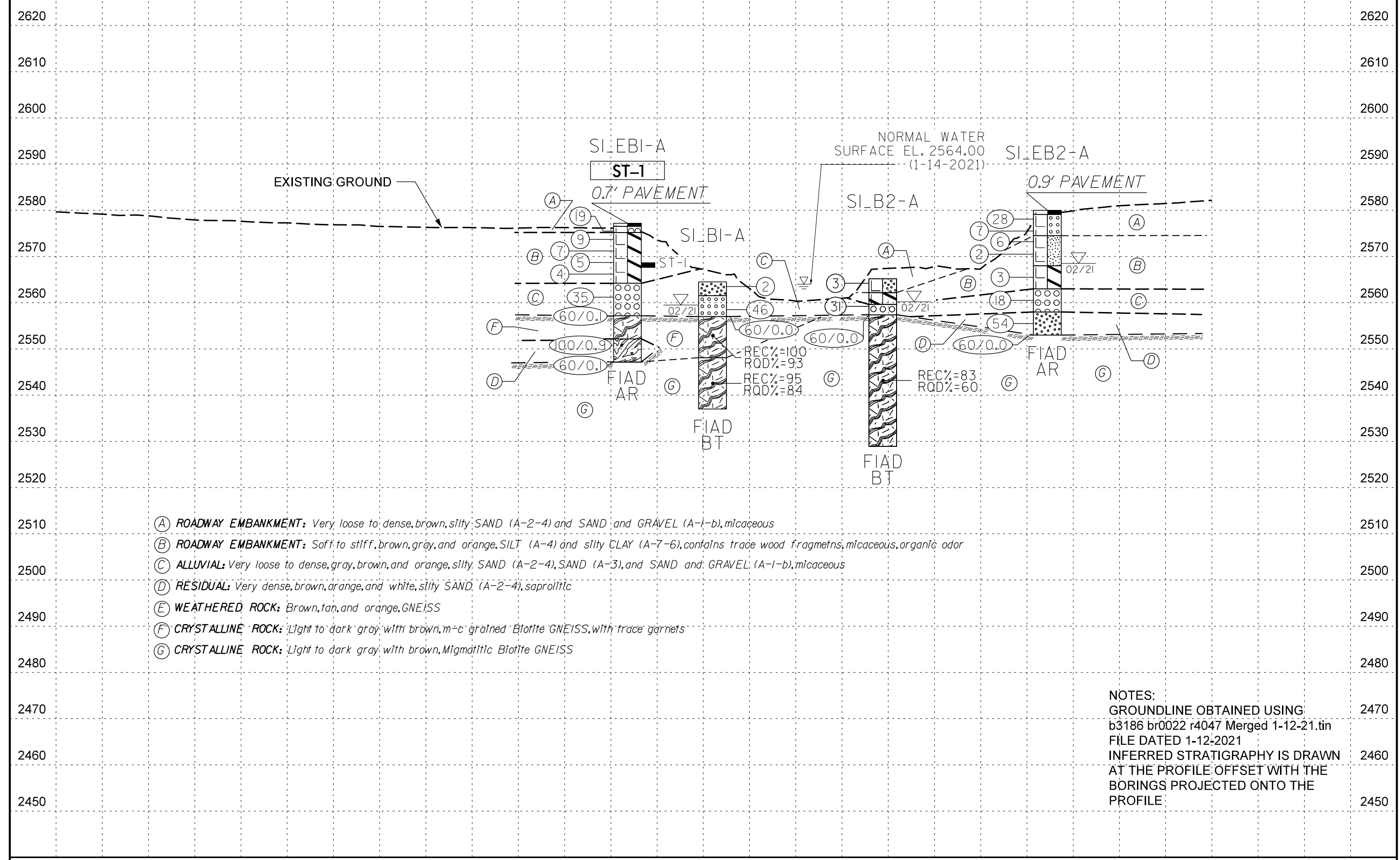
→ Means deformation after tectonic disturbance





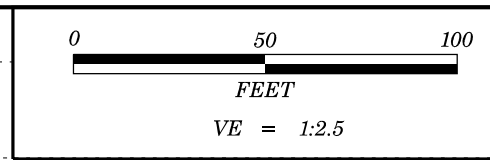
<b>PROJECT REFERENCE NO.</b>	<b>SHEET NO.</b>
B-3816/B-5898	4
<b>BRIDGE NO. 1 PROFILE</b> 60' LT OF -L-	

<b>SOIL TEST RESULTS</b>															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
ST-1	42' LT	41+84	8.5' - 9.6'	A-7-6 (21)	51	27	7.8	19.6	26.4	46.2	98.9	96.8	75.4	26	-



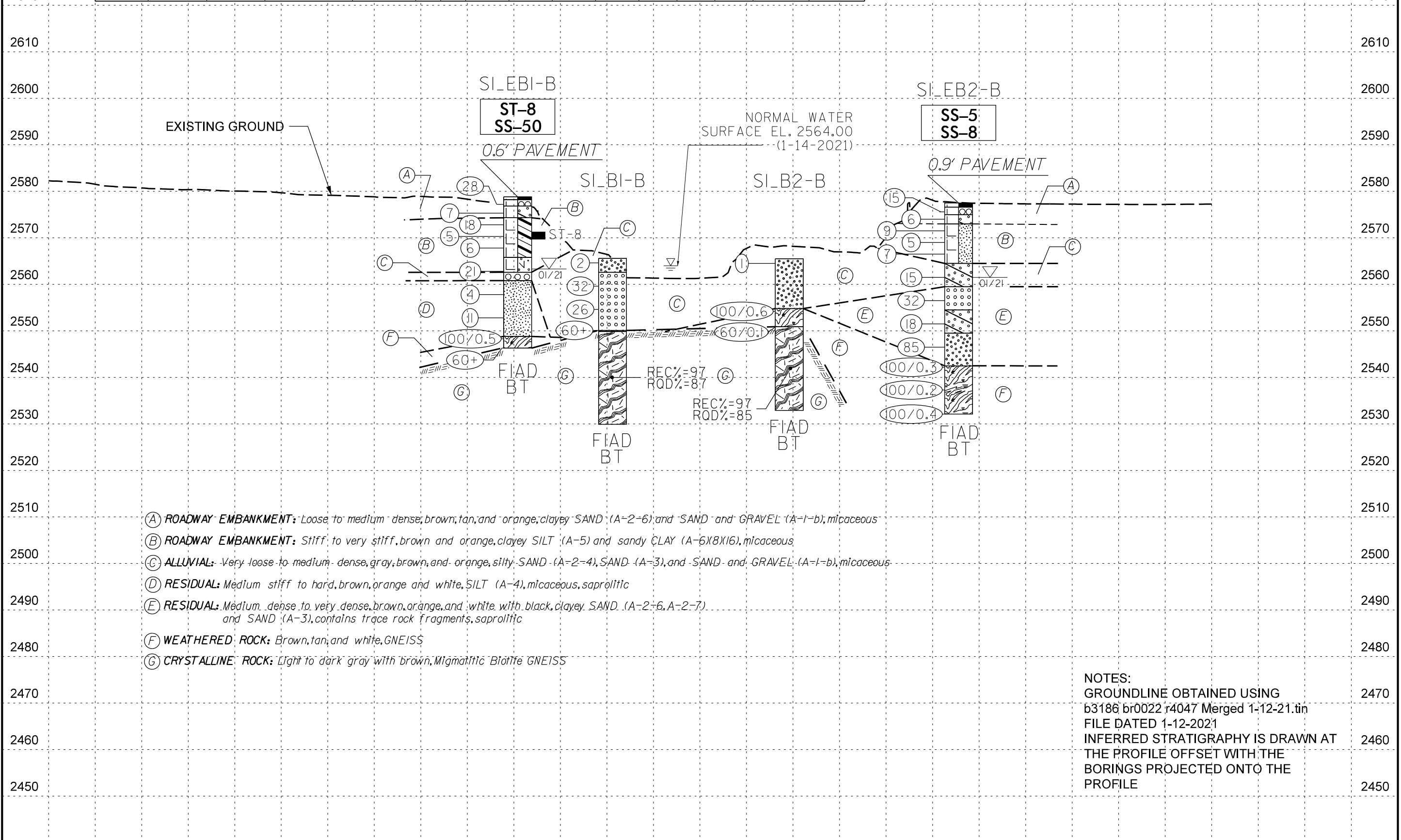
- (A) ROADWAY EMBANKMENT: Very loose to dense, brown, silty SAND (A-2-4) and SAND and GRAVEL (A-1-b), micaceous
- (B) ROADWAY EMBANKMENT: Soft to stiff, brown, gray, and orange, SILT (A-4) and silty CLAY (A-7-6), contains trace wood fragments, micaceous, organic odor
- (C) ALLUVIAL: Very loose to dense, gray, brown, and orange, silty SAND (A-2-4), SAND (A-3), and SAND and GRAVEL (A-1-b), micaceous
- (D) RESIDUAL: Very dense, brown, orange, and white, silty SAND (A-2-4), saprolitic
- (E) WEATHERED ROCK: Brown, tan, and orange, GNEISS
- (F) CRYSTALLINE ROCK: Light to dark gray, with brown, m-c grained Biotite GNEISS, with trace garnets
- (G) CRYSTALLINE ROCK: Light to dark gray with brown, Migmatitic Biotite GNEISS

NOTES:  
 GROUNDLINE OBTAINED USING  
 b3186 br0022 r4047 Merged 1-12-21.tin  
 FILE DATED 1-12-2021  
 INFERRED STRATIGRAPHY IS DRAWN  
 AT THE PROFILE OFFSET WITH THE  
 BORINGS PROJECTED ONTO THE  
 PROFILE



<b>PROJECT REFERENCE NO.</b>	<b>SHEET NO.</b>
B-3816/B-5898	5
<b>BRIDGE NO. 1 PROFILE</b> 57' RT OF -L-	

<b>SOIL TEST RESULTS</b>															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							10/20	40/75	60/100	100/200	75	100	200		
ST-8	42' RT	41+27	7.5' - 9.1'	A-6 (8)	39	20	29.1	11.0	23.0	36.9	91.4	70.3	55.1	28	-
SS-50	42' RT	41+30	7.5' - 9.0'	A-6 (16)	40	20	14.0	10.3	44.4	31.3	99.7	90.9	80.9	63	-
SS-5	43' RT	43+63	10.0' - 11.5'	A-4 (1)	34	9	35.7	25.1	22.0	17.2	93.2	71.2	43.3	28	-
SS-8	43' RT	43+63	25.0' - 26.5'	A-2-7 (4)	52	30	47.3	29.7	18.3	4.7	91.9	58.9	28.6	18	-

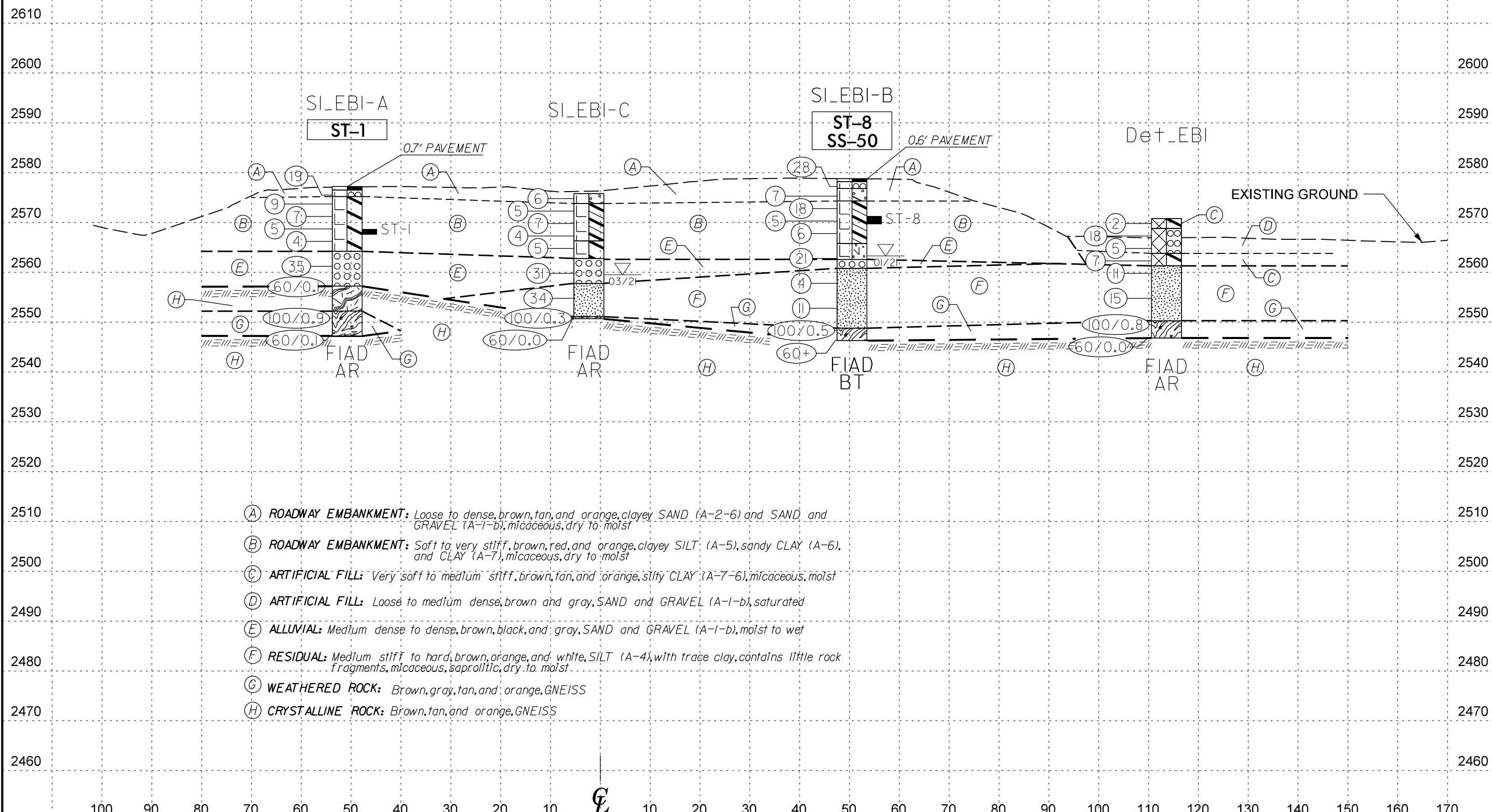


- (A) ROADWAY EMBANKMENT: Loose to medium dense, brown, tan, and orange, clayey SAND (A-2-6) and SAND and GRAVEL (A-1-b), micaceous
- (B) ROADWAY EMBANKMENT: Stiff to very stiff, brown and orange, clayey SILT (A-5) and sandy CLAY (A-6)(8)(16), micaceous
- (C) ALLUVIAL: Very loose to medium dense, gray, brown, and orange, silty SAND (A-2-4), SAND (A-3), and SAND and GRAVEL (A-1-b), micaceous
- (D) RESIDUAL: Medium stiff to hard, brown, orange and white, SILT (A-4), micaceous, saprolitic
- (E) RESIDUAL: Medium dense to very dense, brown, orange, and white with black, clayey SAND (A-2-6, A-2-7) and SAND (A-3), contains trace rock fragments, saprolitic
- (F) WEATHERED ROCK: Brown, tan, and white, GNEISS
- (G) CRYSTALLINE ROCK: Light to dark gray with brown, Migmatitic Biotite GNEISS

**NOTES:**  
 GROUNDLINE OBTAINED USING  
 b3186 br0022 r4047 Merged 1-12-21.tin  
 FILE DATED 1-12-2021  
 INFERRED STRATIGRAPHY IS DRAWN AT  
 THE PROFILE OFFSET WITH THE  
 BORINGS PROJECTED ONTO THE  
 PROFILE

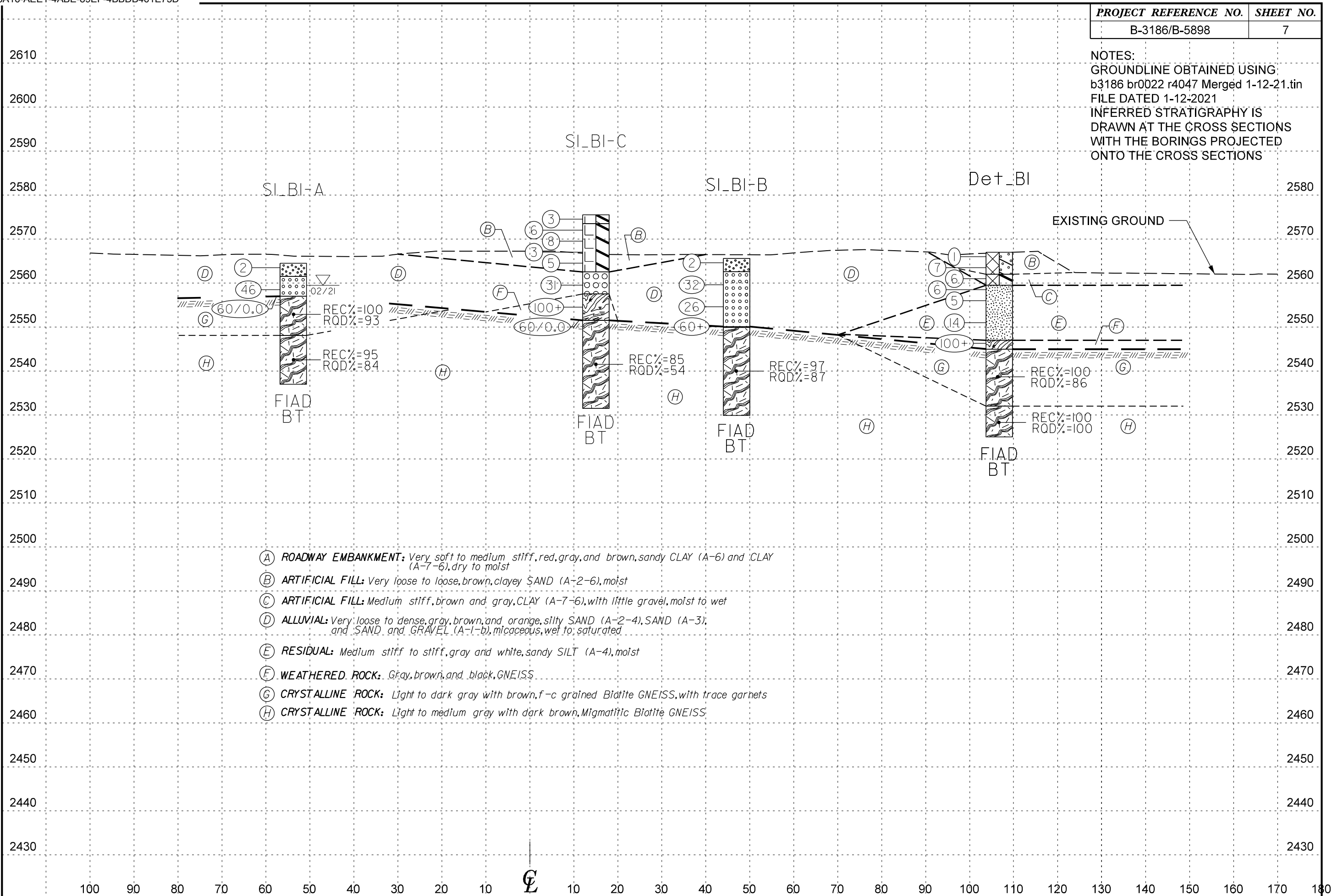
SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT			% PASSING (SIEVES)			% MOISTURE	% ORGANIC	
ST-1	42' LT	41+84	8.5' - 9.6'	A-7-6 (21)	51	27	7.8	19.6	26.4	46.2	98.9	96.8	75.4	26	-
ST-8	42' RT	41+27	7.5' - 9.1'	A-6 (8)	39	20	29.1	11.0	23.0	36.9	91.4	70.3	55.1	28	-
SS-50	42' RT	41+30	7.5' - 9.0'	A-6 (16)	40	20	14.0	10.3	44.4	31.3	99.7	90.9	80.9	63	-

NOTES:  
GROUNDLINE OBTAINED USING  
b3186 br0022 r4047 Merged 1-12-21.tin  
FILE DATED 1-12-2021  
INFERRED STRATIGRAPHY IS  
DRAWN AT THE CROSS SECTIONS  
WITH THE BORINGS PROJECTED  
ONTO THE CROSS SECTIONS



- (A) ROADWAY EMBANKMENT: Loose to dense, brown, tan, and orange, clayey SAND (A-2-6) and SAND and GRAVEL (A-1-b), micaceous, dry to moist
- (B) ROADWAY EMBANKMENT: Soft to very stiff, brown, red, and orange, clayey SILT (A-5), sandy CLAY (A-6), and CLAY (A-7), micaceous, dry to moist
- (C) ARTIFICIAL FILL: Very soft to medium stiff, brown, tan, and orange, silty CLAY (A-7-6), micaceous, moist
- (D) ARTIFICIAL FILL: Loose to medium dense, brown and gray, SAND and GRAVEL (A-1-b), saturated
- (E) ALLUVIAL: Medium dense to dense, brown, black, and gray, SAND and GRAVEL (A-1-b), moist to wet
- (F) RESIDUAL: Medium stiff to hard, brown, orange, and white, SILT (A-4), with trace clay, contains little rock fragments, micaceous, saprolitic, dry to moist
- (G) WEATHERED ROCK: Brown, gray, tan, and orange, GNEISS
- (H) CRYSTALLINE ROCK: Brown, tan, and orange, GNEISS

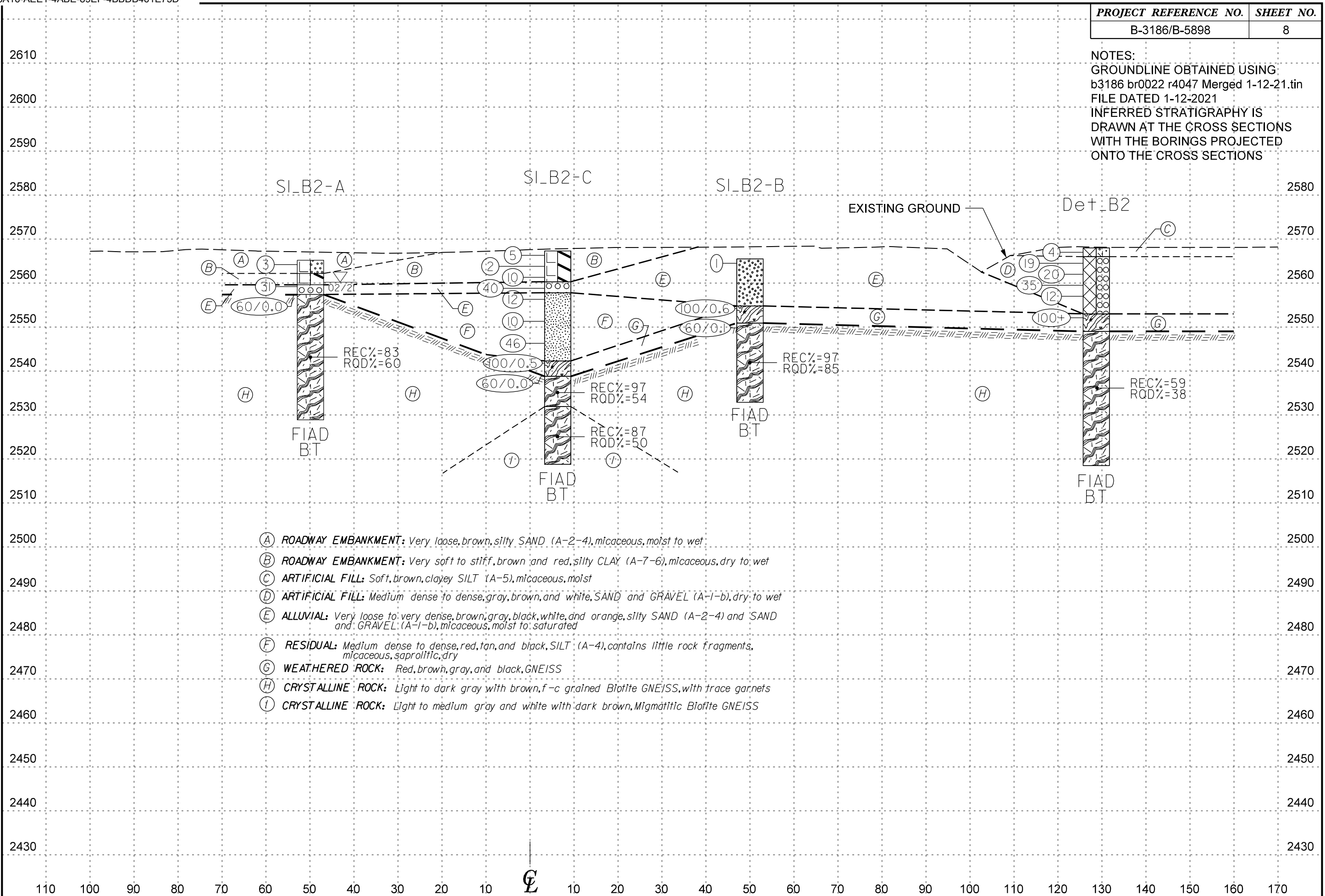
NOTES:  
 GROUNDLINE OBTAINED USING:  
 b3186 br0022 r4047 Merged 1-12-21.tin  
 FILE DATED 1-12-2021  
 INFERRED STRATIGRAPHY IS  
 DRAWN AT THE CROSS SECTIONS  
 WITH THE BORINGS PROJECTED  
 ONTO THE CROSS SECTIONS



- (A) ROADWAY EMBANKMENT: Very soft to medium stiff, red, gray, and brown, sandy CLAY (A-6) and CLAY (A-7-6), dry to moist
- (B) ARTIFICIAL FILL: Very loose to loose, brown, clayey SAND (A-2-6), moist
- (C) ARTIFICIAL FILL: Medium stiff, brown and gray, CLAY (A-7-6), with little gravel, moist to wet
- (D) ALLUVIAL: Very loose to dense, gray, brown, and orange, silty SAND (A-2-4), SAND (A-3); and SAND and GRAVEL (A-1-b), micaceous, wet to saturated
- (E) RESIDUAL: Medium stiff to stiff, gray and white, sandy SILT (A-4), moist
- (F) WEATHERED ROCK: Gray, brown, and black, GNEISS
- (G) CRYSTALLINE ROCK: Light to dark gray with brown, f-c grained Biotite GNEISS, with trace garnets
- (H) CRYSTALLINE ROCK: Light to medium gray with dark brown, Migmatitic Biotite GNEISS



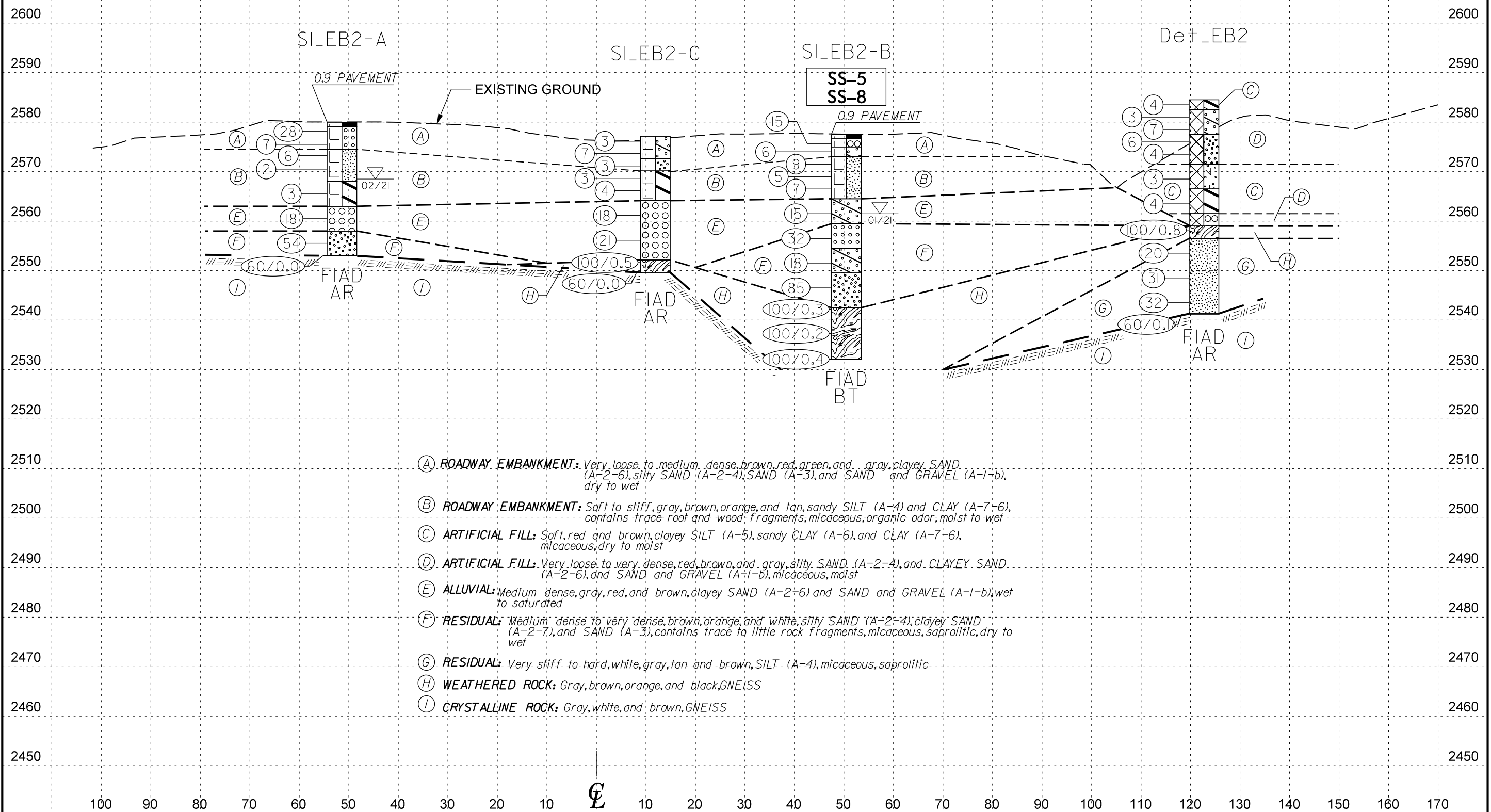
**NOTES:**  
 GROUNDLINE OBTAINED USING:  
 b3186 br0022 r4047 Merged 1-12-21.tin  
 FILE DATED 1-12-2021  
 INFERRED STRATIGRAPHY IS  
 DRAWN AT THE CROSS SECTIONS  
 WITH THE BORINGS PROJECTED  
 ONTO THE CROSS SECTIONS



- (A) ROADWAY EMBANKMENT: Very loose, brown, silty SAND (A-2-4), micaceous, moist to wet
- (B) ROADWAY EMBANKMENT: Very soft to stiff, brown and red, silty CLAY (A-7-6), micaceous, dry to wet
- (C) ARTIFICIAL FILL: Soft, brown, clayey SILT (A-5), micaceous, moist
- (D) ARTIFICIAL FILL: Medium dense to dense, gray, brown, and white, SAND and GRAVEL (A-1-b), dry to wet
- (E) ALLUVIAL: Very loose to very dense, brown, gray, black, white, and orange, silty SAND (A-2-4) and SAND and GRAVEL (A-1-b), micaceous, moist to saturated
- (F) RESIDUAL: Medium dense to dense, red, tan, and black, SILT (A-4), contains little rock fragments, micaceous, saprolitic, dry
- (G) WEATHERED ROCK: Red, brown, gray, and black, GNEISS
- (H) CRYSTALLINE ROCK: Light to dark gray with brown, f-c grained Biotite GNEISS, with trace garnets
- (I) CRYSTALLINE ROCK: Light to medium gray and white with dark brown, Migmatitic Biotite GNEISS

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
SS-5	43' RT	43+6.3	10.0' - 11.5'	A-4 (1)	34	9	35.7	25.1	22.0	17.2	93.2	71.2	43.3	28	-
SS-8	43' RT	43+6.3	25.0' - 26.5'	A-2-7 (4)	52	30	47.3	29.7	18.3	4.7	91.9	58.9	28.6	18	-

NOTES:  
 GROUNDLINE OBTAINED USING  
 b3186 br0022 r4047 Merged 1-12-21.tin  
 FILE DATED 1-12-2021  
 INFERRED STRATIGRAPHY IS  
 DRAWN AT THE CROSS SECTIONS  
 WITH THE BORINGS PROJECTED  
 ONTO THE CROSS SECTIONS



- (A) ROADWAY EMBANKMENT: Very loose to medium dense, brown, red, green, and gray, clayey SAND (A-2-6), silty SAND (A-2-4), SAND (A-3), and SAND and GRAVEL (A-1-b), dry to wet
- (B) ROADWAY EMBANKMENT: Soft to stiff, gray, brown, orange, and tan, sandy SILT (A-4) and CLAY (A-7-6), contains trace root and wood fragments, micaceous, organic odor, moist to wet
- (C) ARTIFICIAL FILL: Soft, red and brown, clayey SILT (A-5), sandy CLAY (A-6), and CLAY (A-7-6), micaceous, dry to moist
- (D) ARTIFICIAL FILL: Very loose to very dense, red, brown, and gray, silty SAND (A-2-4), and CLAYEY SAND (A-2-6), and SAND and GRAVEL (A-1-b), micaceous, moist
- (E) ALLUVIAL: Medium dense, gray, red, and brown, clayey SAND (A-2-6) and SAND and GRAVEL (A-1-b), wet to saturated
- (F) RESIDUAL: Medium dense to very dense, brown, orange, and white, stiff SAND (A-2-4), clayey SAND (A-2-7), and SAND (A-3), contains trace to little rock fragments, micaceous, saprolitic, dry to wet
- (G) RESIDUAL: Very stiff to hard, white, gray, tan and brown, SILT (A-4), micaceous, saprolitic
- (H) WEATHERED ROCK: Gray, brown, orange, and black, GNEISS
- (I) CRYSTALLINE ROCK: Gray, white, and brown, GNEISS

# GEOTECHNICAL BORING REPORT

## BORE LOG

WBS 38332.1.FS1		TIP B-3186 / B-5898		COUNTY HAYWOOD		GEOLOGIST R. Dugger									
SITE DESCRIPTION US 23/ US 74 (Great Smoky Mountain Highway)							GROUND WTR (ft)								
BORING NO. S1_EB1-A		STATION 41+84		OFFSET 42 ft LT		ALIGNMENT -L-									
COLLAR ELEV. 2,577.2 ft		TOTAL DEPTH 30.1 ft		NORTHING 666,335		EASTING 818,860									
DRILL RIG/HAMMER EFF./DATE GTC9083 CME-550X 80% (11/24/2020)			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic									
DRILLER L. Wanstrath		START DATE 03/01/21		COMP. DATE 03/01/21		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
2580															
	2,576.5	0.7													
2575	2,574.7	2.5	13	13	6										
	2,572.2	5.0	3	3	6										
2570	2,569.7	7.5	3	4	3										
	2,567.2	10.0	1	2	3										
2565			1	2	2										
	2,562.2	15.0	14	16	19										
2560															
	2,557.2	20.0	60/0.1												
2555															
	2,552.2	25.0	17	20	80/0.4										
2550															
	2,547.2	30.0	60/0.1												

WBS 38332.1.FS1		TIP B-3186 / B-5898		COUNTY HAYWOOD		GEOLOGIST N. Yacobi									
SITE DESCRIPTION US 23/ US 74 (Great Smoky Mountain Highway)							GROUND WTR (ft)								
BORING NO. S1_EB1-C		STATION 41+52		OFFSET 4 ft LT		ALIGNMENT -L-									
COLLAR ELEV. 2,575.8 ft		TOTAL DEPTH 25.1 ft		NORTHING 666,287		EASTING 818,871									
DRILL RIG/HAMMER EFF./DATE GTC9083 CME-550X 80% (11/24/2020)			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic									
DRILLER L. Wanstrath		START DATE 03/09/21		COMP. DATE 03/09/21		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
2580															
	2,575.8	0.0													
2575	2,573.3	2.5	2	3	3										
	2,570.8	5.0	4	2	3										
2570	2,568.3	7.5	2	3	4										
	2,565.8	10.0	2	2	2										
2565			1	1	4										
	2,560.8	15.0	6	11	20										
2560															
	2,555.8	20.0	14	13	21										
2555															
	2,551.1	24.7	100/0.3												
2550			60/0.0												

NCDOT BORE DOUBLE B3186\_GEO\_SPT.GPJ NC\_DOT.GDT 7/28/21

Other Samples:  
ST-1 (8.5 - 9.6)

Boring Terminated with Standard Penetration Test Refusal at Elevation 2,550.7 ft on Crystalline Rock (GNEISS)

# GEOTECHNICAL BORING REPORT

## BORE LOG

<b>WBS</b> 38332.1.FS1		<b>TIP</b> B-3186 / B-5898		<b>COUNTY</b> HAYWOOD		<b>GEOLOGIST</b> R. Dugger	
<b>SITE DESCRIPTION</b> US 23/ US 74 (Great Smoky Mountain Highway)							<b>GROUND WTR (ft)</b>
<b>BORING NO.</b> S1_EB1-B		<b>STATION</b> 41+27		<b>OFFSET</b> 42 ft RT		<b>ALIGNMENT</b> -L-	
<b>COLLAR ELEV.</b> 2,578.8 ft		<b>TOTAL DEPTH</b> 32.5 ft		<b>NORTHING</b> 666,239		<b>EASTING</b> 818,893	
<b>DRILL RIG/HAMMER EFF./DATE</b> GTC9083 CME-550X 80% (11/24/2020)				<b>DRILL METHOD</b> H.S. Augers		<b>HAMMER TYPE</b> Automatic	
<b>DRILLER</b> L. Wanstrath		<b>START DATE</b> 01/29/21		<b>COMP. DATE</b> 01/21/21		<b>SURFACE WATER DEPTH</b> N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
2580														2,578.8 GROUND SURFACE 0.0	
	2,578.2	0.6	15	18	10									2,578.2 0.6	
2575	2,576.3	2.5	2	3	4								D	2,576.8 ROADWAY EMBANKMENT 2.0	
	2,573.8	5.0	11	11	7								D	2,574.3 Medium dense, brown, tan, and orange, SAND and GRAVEL (A-1-b) 4.5	
	2,571.3	7.5	1	2	3								D	Loose, brown and orange, clayey SAND (A-2-6), micaceous	
2570	2,568.8	10.0	2	2	4								SS-50	Stiff to medium stiff, brown and orange, sandy CLAY (A-6)(8)(16), micaceous	
	2,563.8	15.0	2	7	14								D	2,565.8 Very stiff, brown, clayey SILT (A-5) 13.0	
2565	2,558.8	20.0	2	2	2									2,562.6 16.2	
	2,553.8	25.0	2	5	6									2,560.8 ALLUVIAL 18.0	
2560	2,548.8	30.0	100/0.5											2,560.8 Medium dense, brown and gray, SAND and GRAVEL (A-1-b)	
	2,546.3	32.5	100/0.0											RESIDUAL	
2555														Medium stiff to hard, brown, orange and white, SILT (A-4), micaceous, saprolitic	
2550															
	2,548.8	30.0	100/0.5											2,548.8 WEATHERED ROCK 30.0	
	2,546.3	32.5	100/0.0											2,546.3 Brown, tan and white, GNEISS 32.5	
														Boring Terminated at Elevation 2,546.3 ft on Crystalline Rock (GNEISS)	
														Other Samples: ST-8 (7.5 - 9.1)	

NCDOT BORE DOUBLE B3186\_GEO\_SPT.GPJ NC\_DOT.GDT 8/2/21

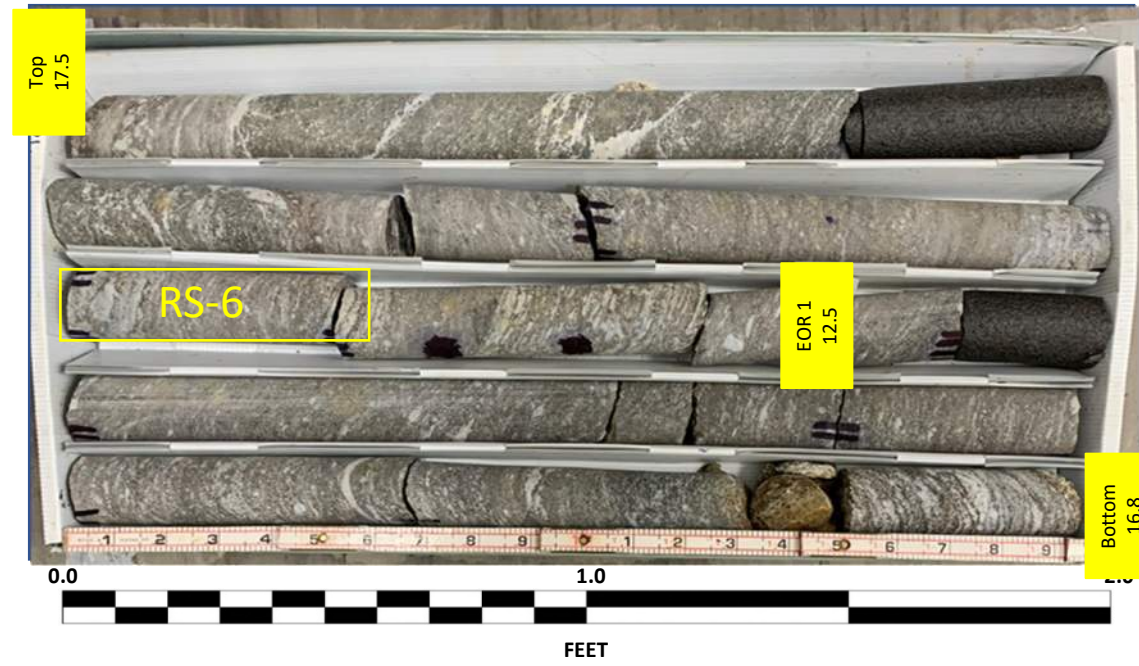


# CORE PHOTOGRAPHIC RECORD

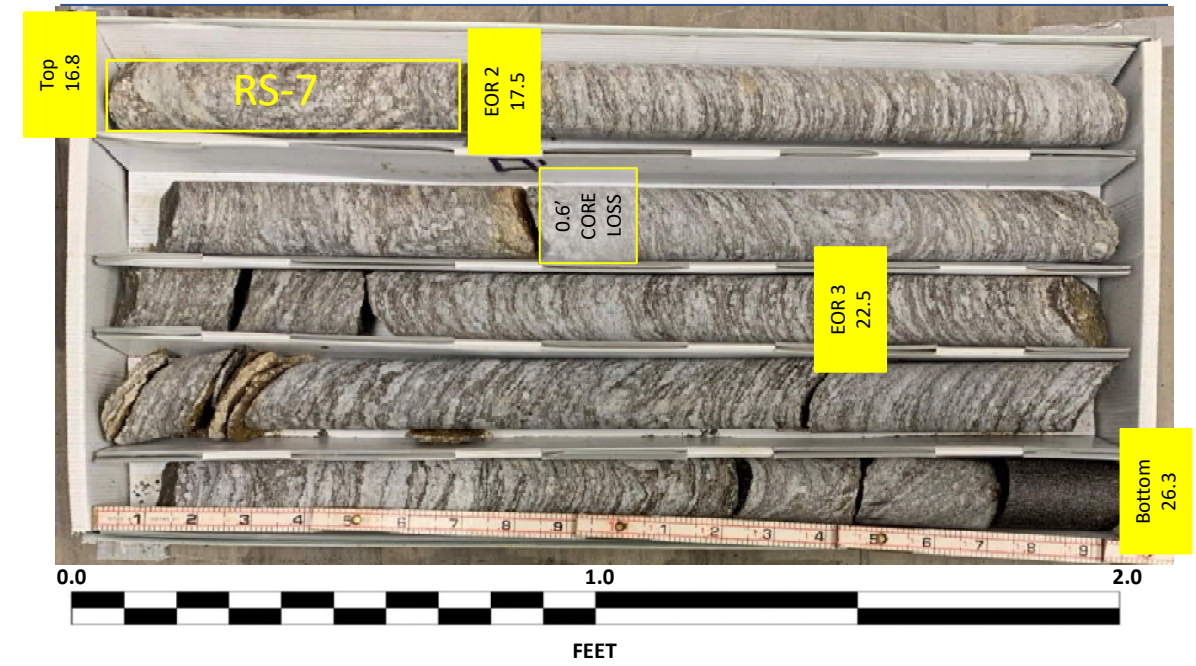
38330.1.FS1 (B-3186/B-5898)

US 23/ US 74 Great Smokey Mountain Highway

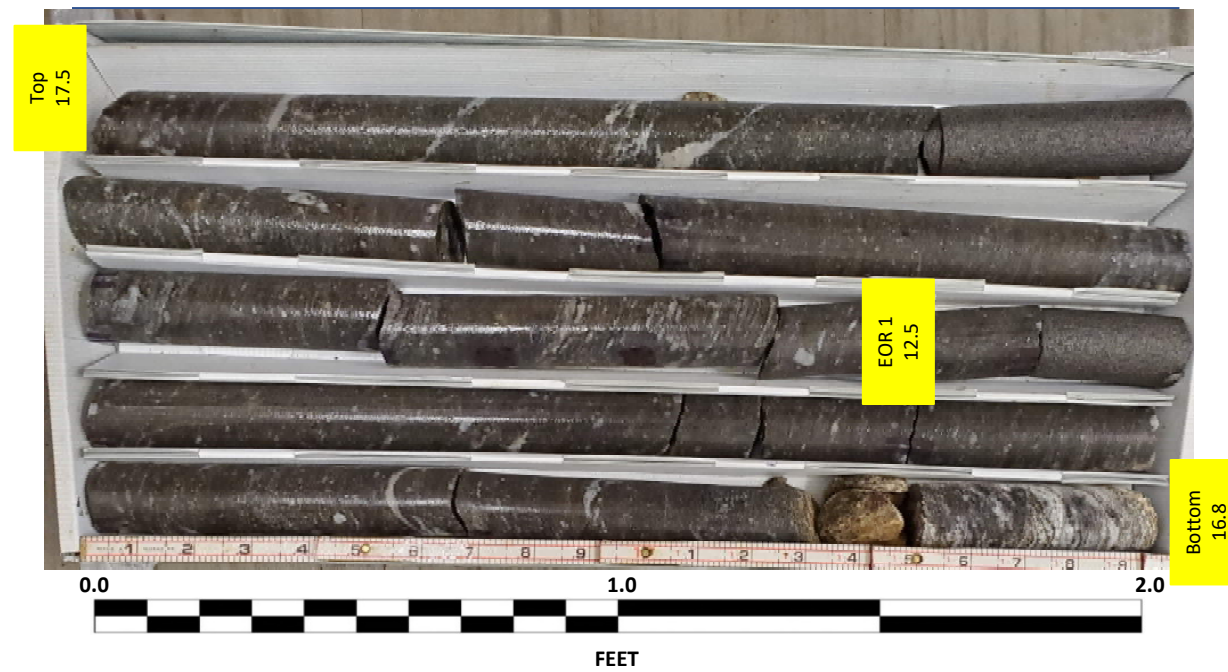
**S1\_B1-A**  
**Box 1 of 3: 7.5 – 16.8 FEET**  
**DRY**



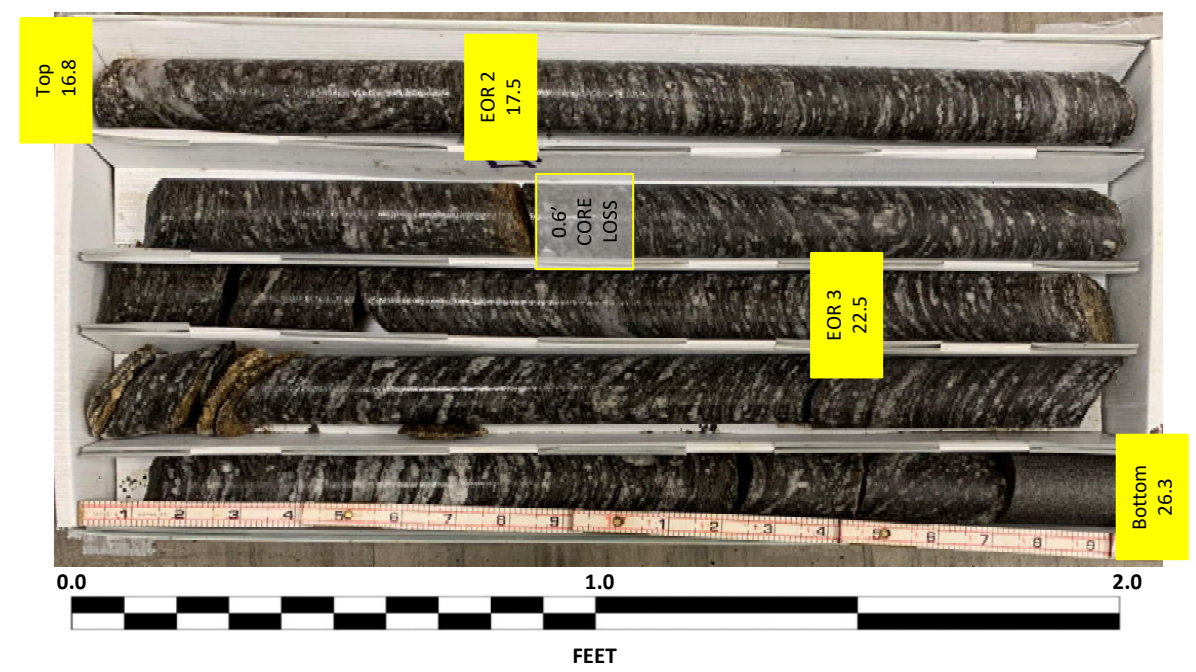
**S1\_B1-A**  
**Box 2 of 3: 16.8 – 26.3 FEET**  
**DRY**



**S1\_B1-A**  
**Box 1 of 3: 7.5 – 16.8 FEET**  
**WET**



**S1\_B1-A**  
**Box 2 of 3: 16.8 – 26.3 FEET**  
**WET**

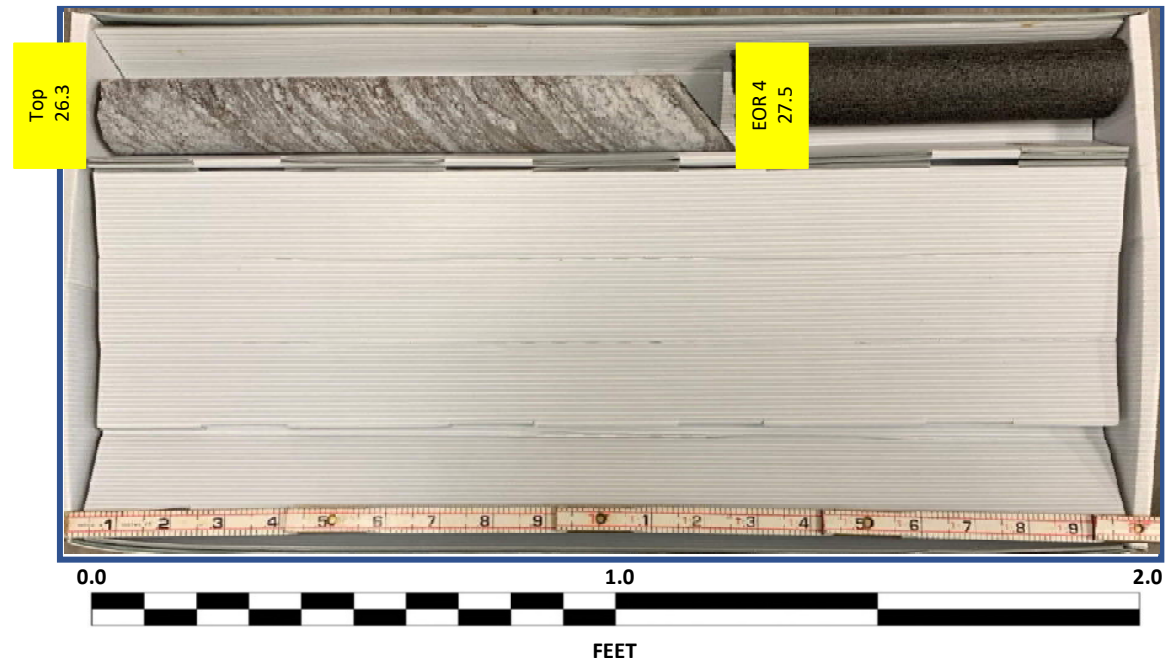


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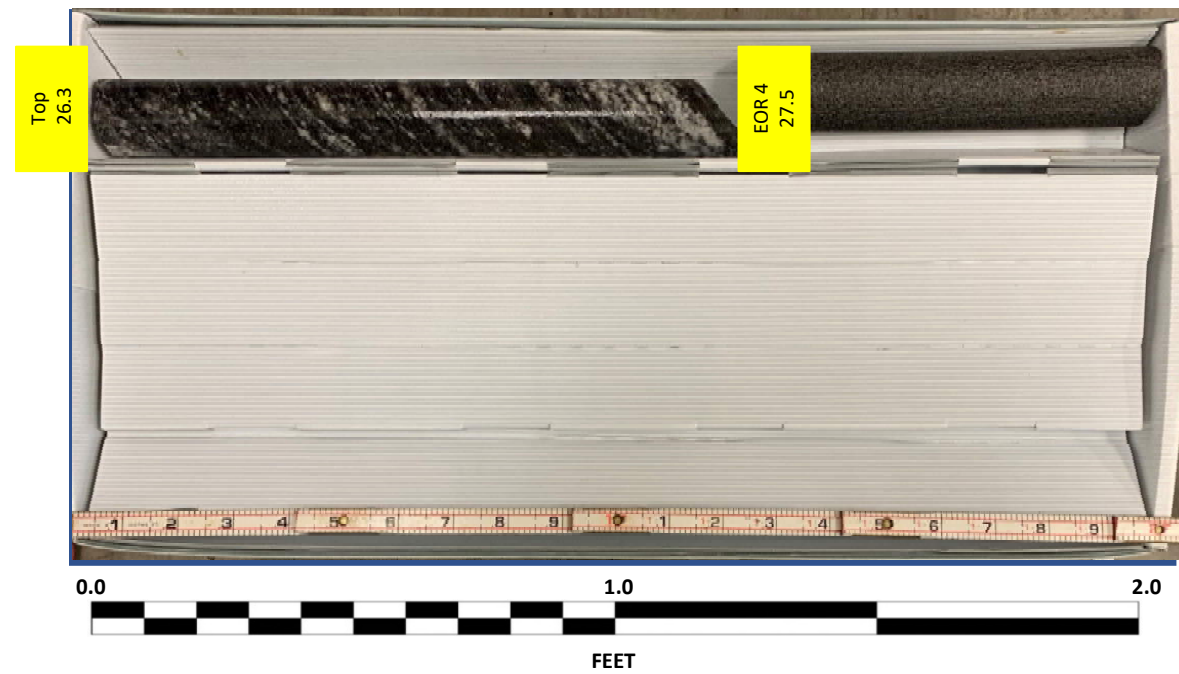
38330.1.FS1 (B-3186/B-5898)

US 23/ US 74 Great Smokey Mountain Highway

**S1\_B1-A**  
**Box 3 of 3: 26.3 – 27.5 FEET**  
**DRY**



**S1\_B1-A**  
**Box 3 of 3: 26.3 – 27.5 FEET**  
**WET**







# CORE PHOTOGRAPHIC RECORD

38330.1.FS1 (B-3186/B-5898)

US 23/ US 74 Great Smokey Mountain Highway

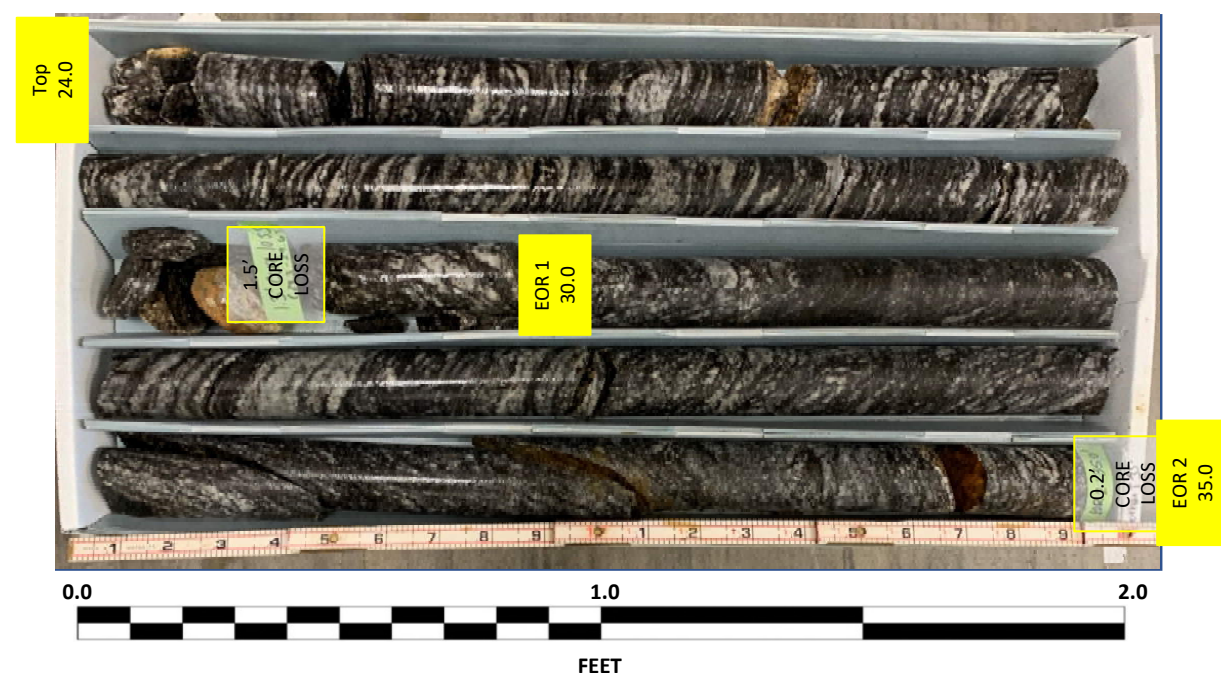
**S1\_B1-C**  
Box 1 of 2: 24.0 – 35.0 FEET  
DRY



**S1\_B1-C**  
Box 2 of 2: 35.0 – 44.0 FEET  
DRY



**S1\_B1-C**  
Box 1 of 2: 24.0 - 35.0 FEET  
WET



**S1\_B1-C**  
Box 2 of 2: 35.0 – 44.0 FEET  
WET



# GEOTECHNICAL BORING REPORT BORE LOG

# GEOTECHNICAL BORING REPORT CORE LOG

WBS 38332.1.FS1		TIP B-3186 / B-5898		COUNTY HAYWOOD		GEOLOGIST R. Dugger									
SITE DESCRIPTION US 23/ US 74 (Great Smoky Mountain Highway)							GROUND WTR (ft)								
BORING NO. S1_B1-B		STATION 41+78		OFFSET 43 ft RT		ALIGNMENT -L-									
COLLAR ELEV. 2,565.6 ft		TOTAL DEPTH 35.7 ft		NORTHING 666,279		EASTING 818,924									
DRILL RIG/HAMMER EFF./DATE GTC9083 CME-550X 80% (11/24/2020)			DRILL METHOD SPT Core Boring		HAMMER TYPE Automatic										
DRILLER L. Wanstrath		START DATE 02/16/21		COMP. DATE 02/16/21		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
2570															
2565	2,565.6	0.0	2	1	1								W	2,565.6	0.0
2560	2,560.6	5.0	15	20	12								Sat.	2,562.6	3.0
2555	2,555.6	10.0	10	12	14								Sat.		
2550	2,550.6	15.0	10	100/0.0										2,550.1	15.5
2545			60/0.0												
2540															
2535															
2530													RS-8		
CRISTALLINE ROCK Brown, GNEISS Light to dark gray with brown, Migmatitic Biotite GNEISS															
Boring Terminated at Elevation 2,529.9 ft in Crystalline Rock (GNEISS)															

WBS 38332.1.FS1		TIP B-3186 / B-5898		COUNTY HAYWOOD		GEOLOGIST R. Dugger						
SITE DESCRIPTION US 23/ US 74 (Great Smoky Mountain Highway)							GROUND WTR (ft)					
BORING NO. S1_B1-B		STATION 41+78		OFFSET 43 ft RT		ALIGNMENT -L-						
COLLAR ELEV. 2,565.6 ft		TOTAL DEPTH 35.7 ft		NORTHING 666,279		EASTING 818,924						
DRILL RIG/HAMMER EFF./DATE GTC9083 CME-550X 80% (11/24/2020)			DRILL METHOD SPT Core Boring		HAMMER TYPE Automatic							
DRILLER L. Wanstrath		START DATE 02/16/21		COMP. DATE 02/16/21		SURFACE WATER DEPTH N/A						
CORE SIZE NQ2		TOTAL RUN 20.0 ft										
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (%)	RQD (%)		REC. (%)	RQD (%)			
2549.9	2,549.9	15.7	5.0	1:10 1:24 1:45 1:46 1:40	(4.8) 96%	(3.6) 72%		(19.4) 97%	(17.3) 87%		Begin Coring @ 15.7 ft <b>CRYSTALLINE ROCK (continued)</b> Light to dark gray with brown, Migmatitic Biotite GNEISS slight to moderate weathering, hard, close to moderately close fracture spacing 0.2' core loss	
2545	2,544.9	20.7	5.0	2:10 2:12 2:14 2:17 2:13	(4.6) 92%	(3.5) 70%					0.4' core loss; Moderately severe weathering, medium to moderately hard, very close fracture spacing Moderate to slight weathering, hard, close to moderately close fracture spacing	
2540	2,539.9	25.7	5.0	2:31 2:31 2:35 2:34 2:31	(5.0) 100%	(4.6) 92%						
2535	2,534.9	30.7	5.0	2:35 2:37 2:39 2:45 2:41	(5.0) 100%	(4.7) 94%				RS-8	RS-8 32.1' - 32.5' GSI= 70 - 80 Qu= 10,265 psi	
2530	2,529.9	35.7									Boring Terminated at Elevation 2,529.9 ft in Crystalline Rock (GNEISS)	35.7

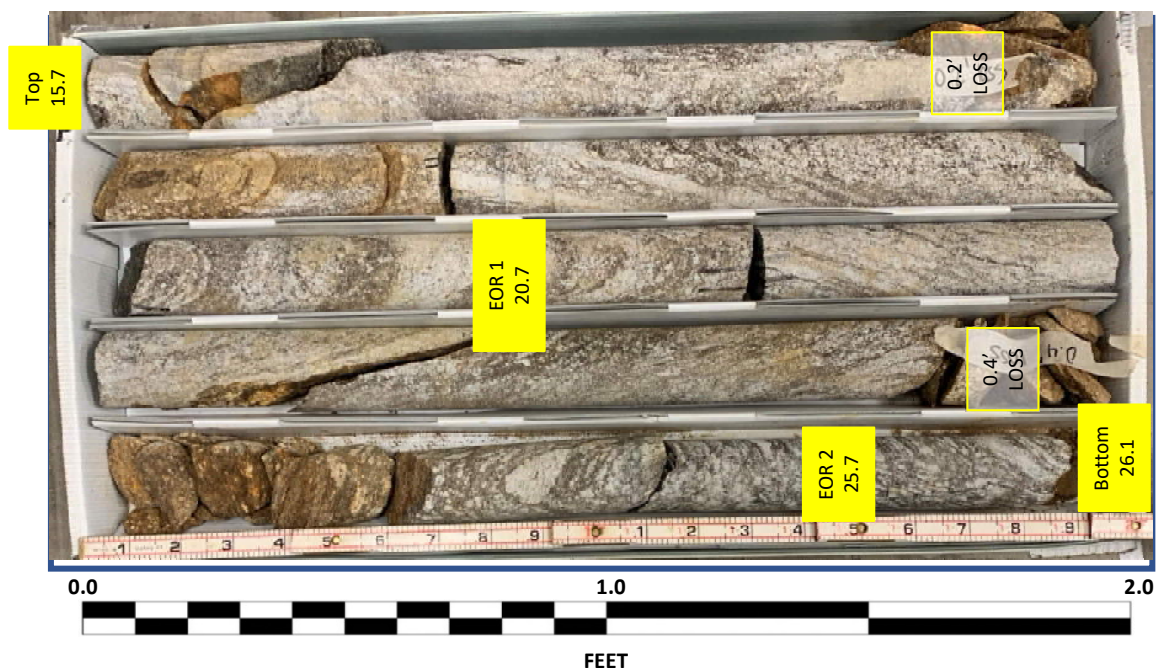
NCDOT BORE DOUBLE\_B3186\_GEO\_SPT.GPJ\_NC\_DOT.GDT 7/28/21

# CORE PHOTOGRAPHIC RECORD

38330.1.FS1 (B-3186/B-5898)

US 23/ US 74 Great Smokey Mountain Highway

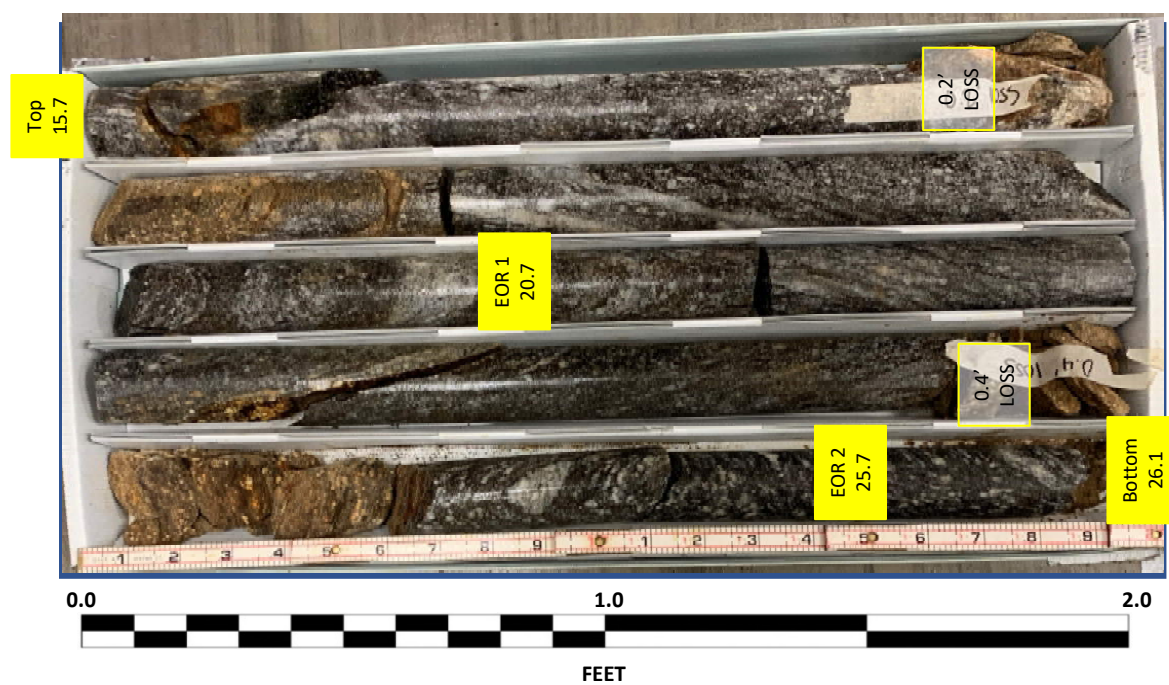
**S1\_B1-B**  
Box 1 of 2: 15.7 – 26.1 FEET  
DRY



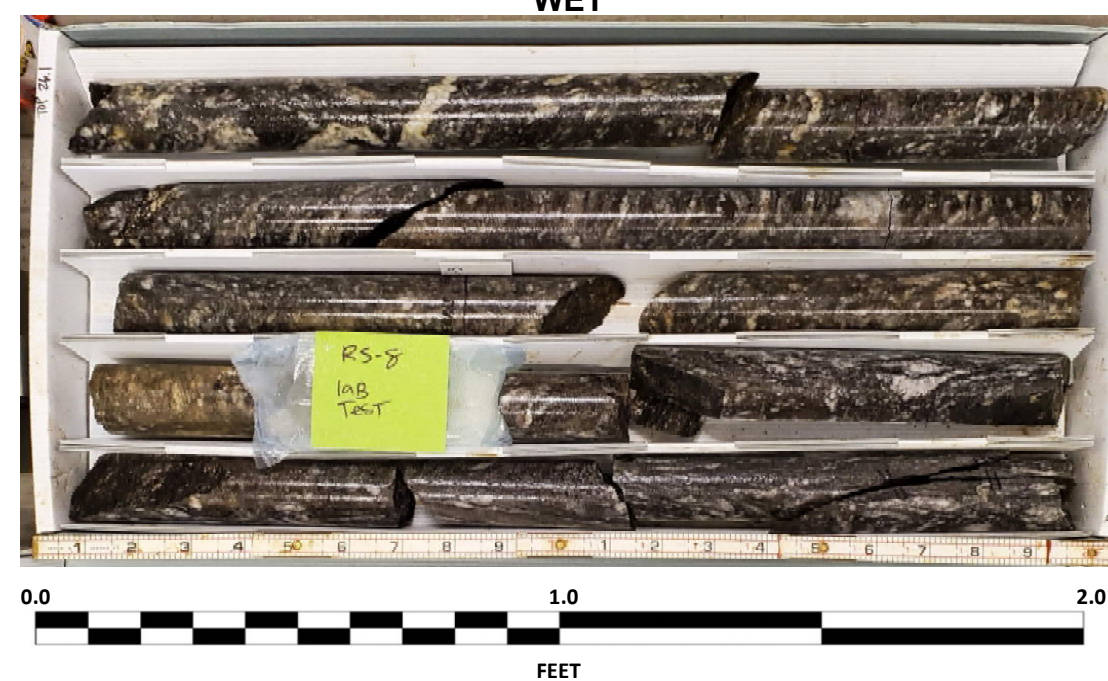
**S1\_B1-B**  
Box 2 of 2: 26.1 – 35.7 FEET  
DRY



**S1\_B1-B**  
Box 1 of 2: 15.7 – 26.1 FEET  
WET



**S1\_B1-B**  
Box 2 of 2: 26.1 – 35.7 FEET  
WET



# GEOTECHNICAL BORING REPORT BORE LOG

# GEOTECHNICAL BORING REPORT CORE LOG

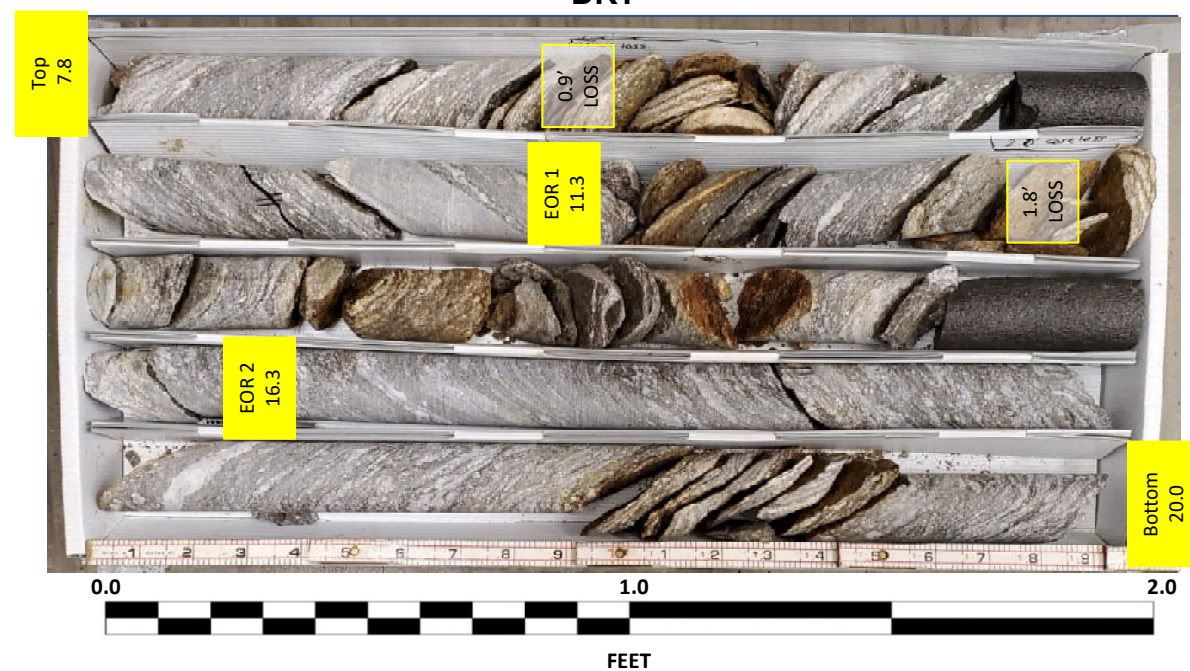
WBS 38332.1.FS1		TIP B-3186 / B-5898		COUNTY HAYWOOD		GEOLOGIST R. Dugger									
SITE DESCRIPTION US 23/ US 74 (Great Smoky Mountain Highway)							GROUND WTR (ft)								
BORING NO. S1_B2-A		STATION 43+22		OFFSET 43 ft LT		ALIGNMENT -L-									
COLLAR ELEV. 2,565.2 ft		TOTAL DEPTH 36.3 ft		NORTHING 666,446		EASTING 818,943									
DRILL RIG/HAMMER EFF./DATE GTC9083 CME-550X 80% (11/24/2020)			DRILL METHOD SPT Core Boring		HAMMER TYPE Automatic										
DRILLER L. Wanstrath		START DATE 03/01/21		COMP. DATE 03/01/21		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
2570															
2565	2,565.2	0.0	3	2	1									2,565.2	GROUND SURFACE
2560	2,560.2	5.0	7	13	18									2,562.2	ROADWAY EMBANKMENT Very loose, brown, silty SAND (A-2-4), micaceous
2555	2,557.4	7.8	60/0.0											2,559.6	Stiff, brown, CLAY (A-7-6)
2550														2,557.4	ALLUVIAL Dense, brown and orange, SAND and GRAVEL (A-1-b)
2545															CRYSTALLINE ROCK Light to medium gray with dark brown, Migmatitic Biotite GNEISS
2540															
2535															
2530															
Boring Terminated at Elevation 2,528.9 ft in Crystalline Rock (GNEISS)															

WBS 38332.1.FS1		TIP B-3186 / B-5898		COUNTY HAYWOOD		GEOLOGIST R. Dugger						
SITE DESCRIPTION US 23/ US 74 (Great Smoky Mountain Highway)							GROUND WTR (ft)					
BORING NO. S1_B2-A		STATION 43+22		OFFSET 43 ft LT		ALIGNMENT -L-						
COLLAR ELEV. 2,565.2 ft		TOTAL DEPTH 36.3 ft		NORTHING 666,446		EASTING 818,943						
DRILL RIG/HAMMER EFF./DATE GTC9083 CME-550X 80% (11/24/2020)			DRILL METHOD SPT Core Boring		HAMMER TYPE Automatic							
DRILLER L. Wanstrath		START DATE 03/01/21		COMP. DATE 03/01/21		SURFACE WATER DEPTH N/A						
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC (ft) %	RQD (ft) %		REC (ft) %	RQD (ft) %			
2557.4		7.8	3.5	0:53/0.5 2:00/1.0 1:45/1.0 3:22/1.0	(2.6) 74%	(1.3) 37%		(23.7) 83%	(14.2) 50%		Begin Coring @ 7.8 ft	7.8
2555	2,557.4										CRYSTALLINE ROCK	
	2,553.9	11.3	5.0	1:18/1.0 3:02/1.0 0:47/1.0 0:55/1.0 1:25/1.0	(3.2) 64%	(0.0) 0%					Light to medium gray with dark brown, Migmatitic Biotite GNEISS, moderate weathering, medium hard to hard, very close to close fracture spacing 0.9' core loss; very severely weathered, soft With trace epidote on fractures, moderate weathering, moderately hard Very severely weathered, soft 1.8' core loss	
2550	2,548.9	16.3	5.0	1:50/1.0 1:33/1.0 1:37/1.0 1:54/1.0 2:13/1.0	(5.0) 100%	(4.0) 80%					Moderate to slight weathering, hard, close fracture spacing	
2545	2,543.9	21.3	5.0	1:18/1.0 1:39/1.0 1:31/1.0 1:29/1.0 2:09/1.0	(3.8) 76%	(1.9) 38%	RS-10				Severe weathering, soft, very close fracture spacing Moderate to slight weathering, hard, close fracture spacing RS-10 20.0' - 20.8' GSI= 75 - 85 Qu= 9,796 psi	
2540	2,538.9	26.3	5.0	1:18/1.0 1:47/1.0 1:50/1.0 2:23/1.0 2:38/1.0	(5.0) 100%	(4.5) 90%					Very close fracture spacing 1.2' core loss With trace garnets, slight weathering, hard, close to wide fracture spacing	
2535	2,533.9	31.3	5.0	2:15/1.0 2:09/1.0 2:14/1.0 1:16/1.0 2:05/1.0	(5.0) 100%	(2.5) 50%					Very close to close fracture spacing	
2530	2,528.9	36.3									Boring Terminated at Elevation 2,528.9 ft in Crystalline Rock (GNEISS)	36.3

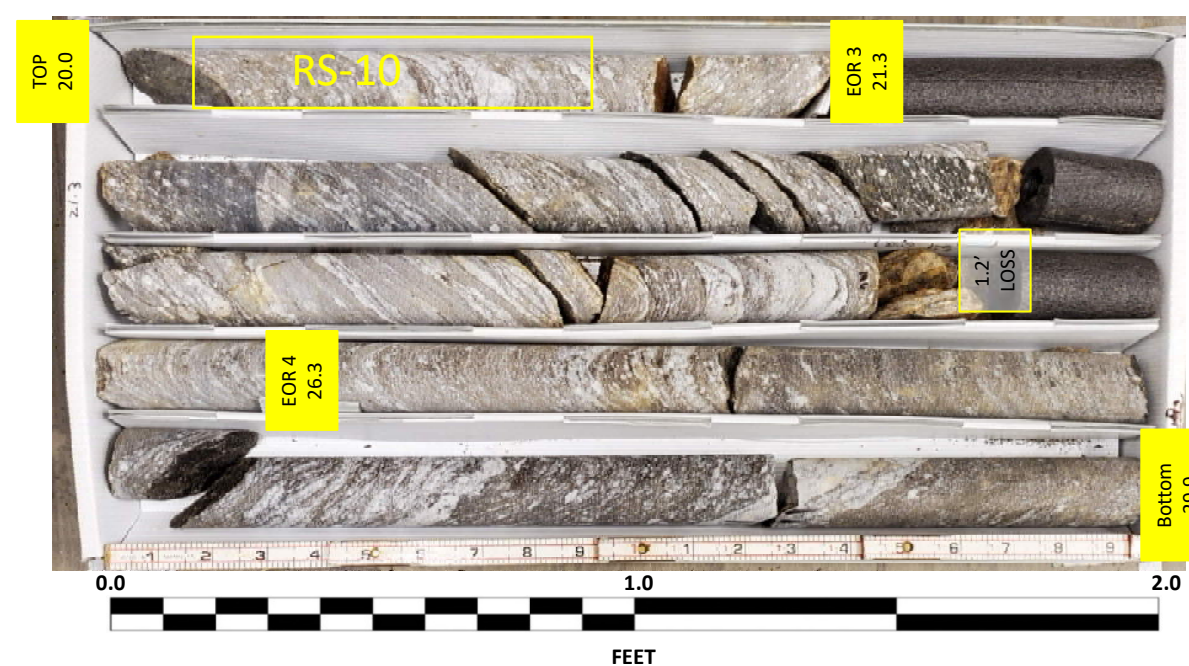
NCDOT BORE DOUBLE\_B3186\_GEO\_SPT.GPJ\_NC\_DOT.GDT 7/28/21

CORE PHOTOGRAPHIC RECORD  
38330.1.FS1 (B-3186/B-5898)  
US 23/ US 74 Great Smokey Mountain Highway

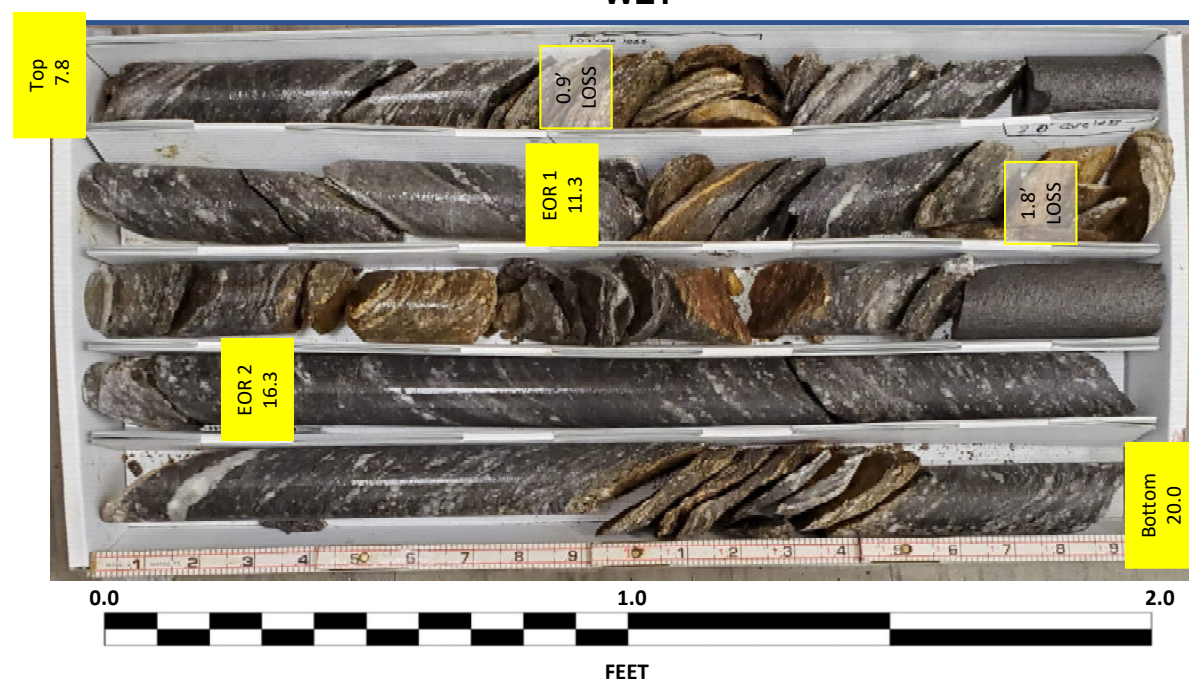
S1\_B2-A  
Box 1 of 3: 7.8 – 20.0 FEET  
DRY



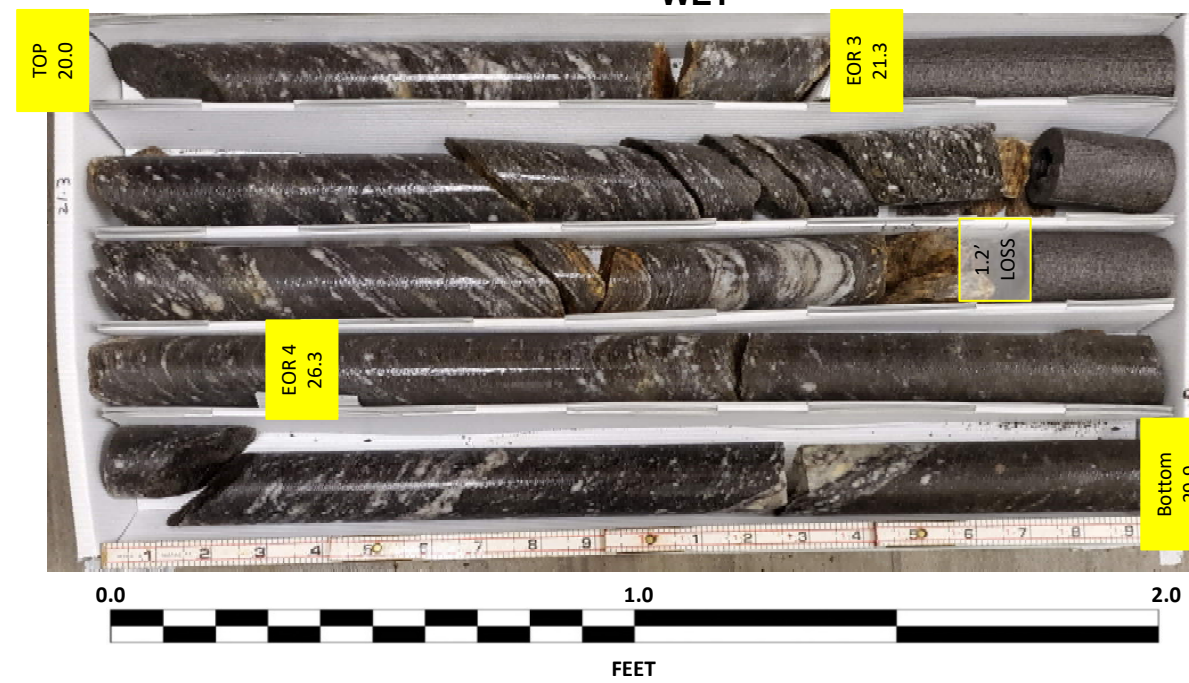
S1\_B2-A  
Box 2 of 3: 20.0-29.9 FEET  
DRY



S1\_B2-A  
Box 1 of 3: 7.8 – 20.0 FEET  
WET



S1\_B2-A  
Box 2 of 3: 20.0 – 29.9 FEET  
WET

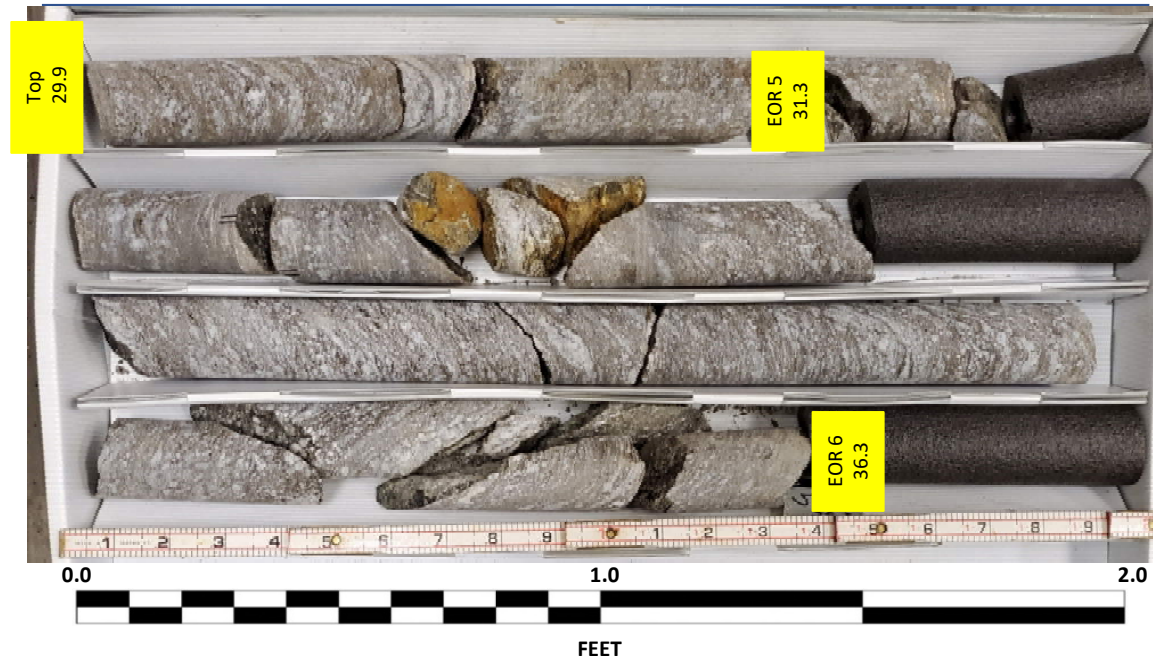


# CORE PHOTOGRAPHIC RECORD

38330.1.FS1 (B-3186/B-5898)

US 23/ US 74 Great Smokey Mountain Highway

**S1\_B2-A**  
**Box 3 of 3: 29.9 – 36.3 FEET**  
**DRY**



**S1\_B2-A**  
**Box 3 of 3: 29.9 – 36.3 FEET**  
**WET**



# GEOTECHNICAL BORING REPORT BORE LOG

# GEOTECHNICAL BORING REPORT CORE LOG

WBS 38332.1.FS1		TIP B-3186 / B-5898		COUNTY HAYWOOD		GEOLOGIST N. Yacobi									
SITE DESCRIPTION US 23/ US 74 (Great Smoky Mountain Highway)							GROUND WTR (ft)								
BORING NO. S1_B2-C		STATION 42+87		OFFSET 1 ft RT		ALIGNMENT -L-									
COLLAR ELEV. 2,567.3 ft		TOTAL DEPTH 48.5 ft		NORTHING 666,391		EASTING 818,957									
DRILL RIG/HAMMER EFF./DATE GTC9083 CME-550X 80% (11/24/2020)			DRILL METHOD SPT Core Boring			HAMMER TYPE Automatic									
DRILLER L. Wanstrath		START DATE 03/10/21		COMP. DATE 03/10/21		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
2570														2,567.3	0.0
	2,567.3	0.0	1	2	3										
2565	2,564.8	2.5	1	1	1										
	2,562.3	5.0	3	3	7										
2560	2,559.8	7.5	18	14	26										
	2,557.3	10.0	4	5	7										
2555	2,552.3	15.0	3	4	6										
2550	2,547.3	20.0	8	16	30										
2545	2,542.3	25.0	100/0.5												
2540	2,538.8	28.5	60/0.0												
2535															
2530															
2525															
2520															

WBS 38332.1.FS1		TIP B-3186 / B-5898		COUNTY HAYWOOD		GEOLOGIST N. Yacobi						
SITE DESCRIPTION US 23/ US 74 (Great Smoky Mountain Highway)							GROUND WTR (ft)					
BORING NO. S1_B2-C		STATION 42+87		OFFSET 1 ft RT		ALIGNMENT -L-						
COLLAR ELEV. 2,567.3 ft		TOTAL DEPTH 48.5 ft		NORTHING 666,391		EASTING 818,957						
DRILL RIG/HAMMER EFF./DATE GTC9083 CME-550X 80% (11/24/2020)			DRILL METHOD SPT Core Boring			HAMMER TYPE Automatic						
DRILLER L. Wanstrath		START DATE 03/10/21		COMP. DATE 03/10/21		SURFACE WATER DEPTH N/A						
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	TOTAL RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (ft) %	RQD (ft) %		REC. (ft) %	RQD (ft) %			
2538.8	2,538.8	28.5	1.5	N=60/0.0 1:49/0.5 2:09	(1.5)	(1.3)		(6.7)	(3.7)		Begin Coring @ 28.5 ft	28.5
	2,537.3	30.0	5.0	2:32 1:49 2:31 2:49 2:49	100%	87%		97%	54%		WEATHERED ROCK (continued)	
2535					(4.8)	(2.4)					CRYSTALLINE ROCK	
	2,532.3	35.0	5.0		96%	48%					Light to dark gray with brown, f-c grained Biotite GNEISS, with trace garnets, moderately severe to slight weathering, moderately hard to hard, very close to close fracture spacing	
	2,531.9										Severe weathering, medium to moderately hard, very close fracture spacing 0.2' core loss	35.4
2530					(5.0)	(4.3)		(11.4)	(6.6)		Moderate to slight weathering, moderately hard to hard, very close to close fracture spacing	
	2,527.3	40.0	5.0	2:37 3:02 2:42 2:18 1:59	100%	86%					RS-11 33.5' - 34.1'	
											GSi= 60 - 70	
2525					(5.0)	(1.0)					Qu= 3,264 psi (sampled along healed joint)	
	2,522.3	45.0	3.5	1:37 1:42 1:57 1:53 1:59	100%	20%					Light to dark gray with brown, Migmatitic Biotite GNEISS, moderate to slight weathering, hard to moderately hard, very close to close fracture spacing	
											Core barrel blocked off	
2520					(1.6)	(0.4)					1.9' core loss	
	2,518.8	48.5		1:38 1:41 2:09 1:08/0.5	46%	11%					Boring Terminated at Elevation 2,518.8 ft in Crystalline Rock (GNEISS)	48.5

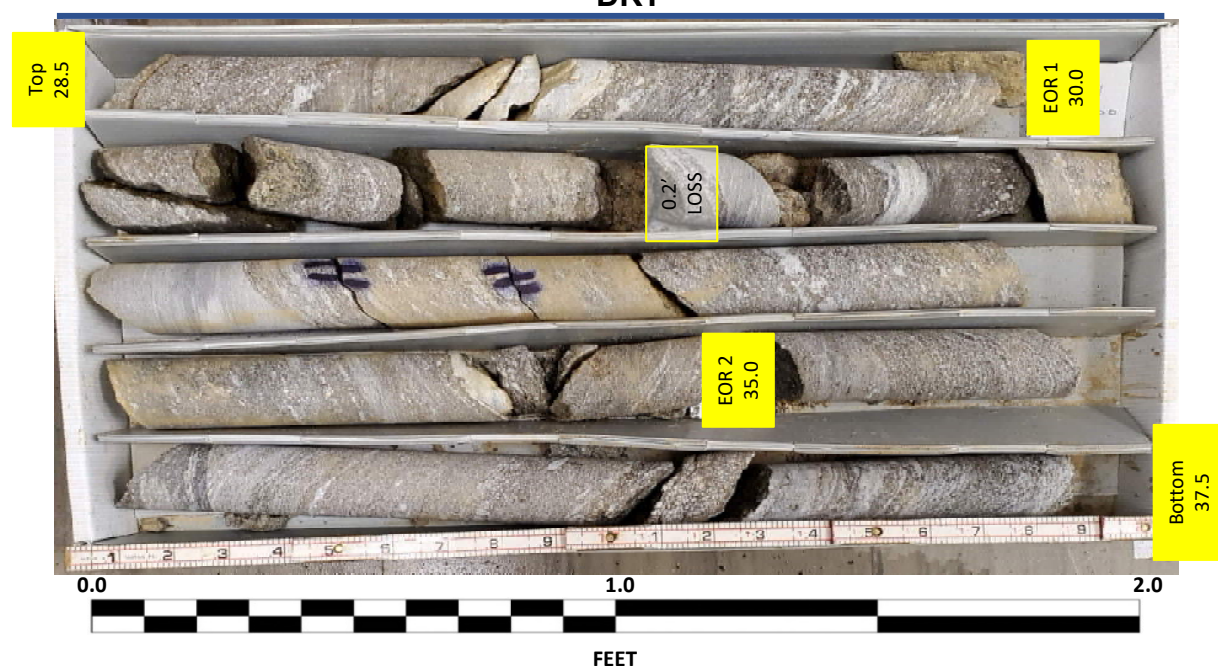
NCDOT BORE DOUBLE\_B3186\_GEO\_SPT.GPJ\_NC\_DOT.GDT\_8/2/21

# CORE PHOTOGRAPHIC RECORD

38330.1.FS1 (B-3186/B-5898)

US 23/ US 74 Great Smokey Mountain Highway

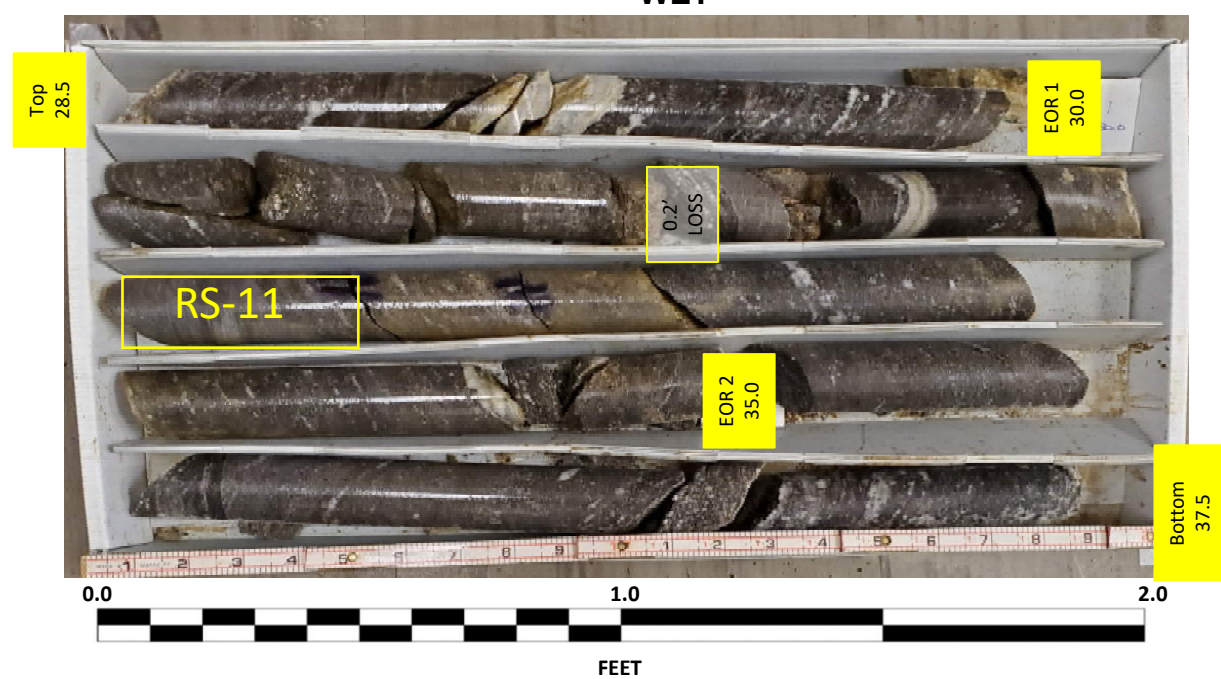
**S1\_B2-C**  
Box 1 of 2: 28.5 – 37.5 FEET  
DRY



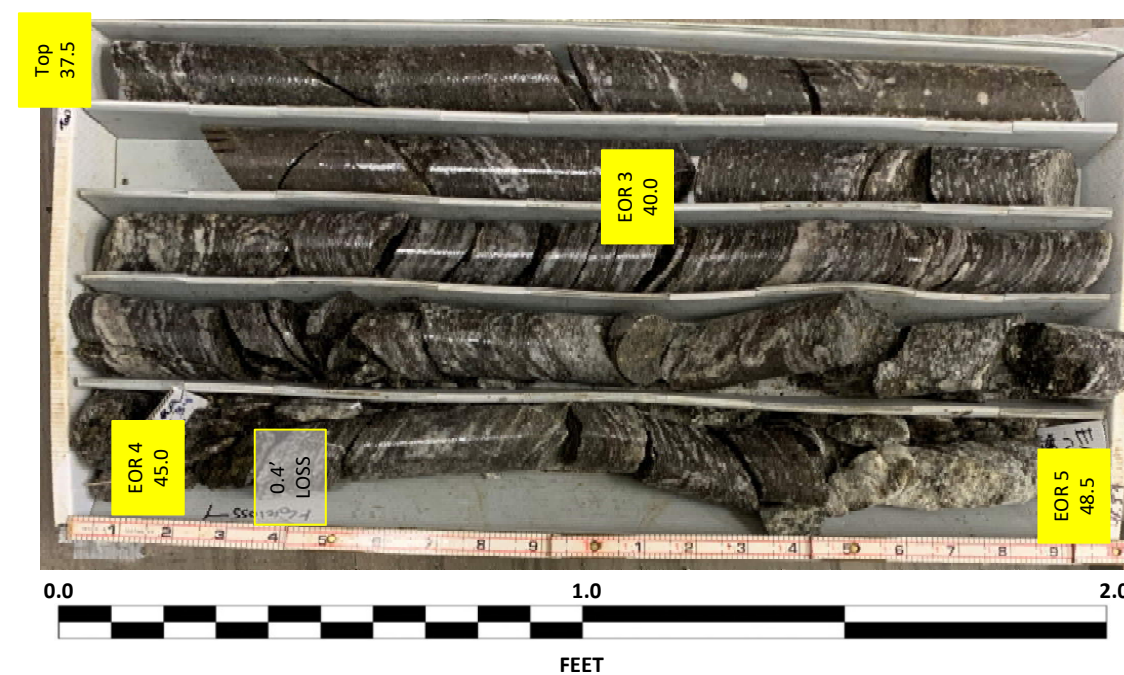
**S1\_B2-C**  
Box 2 of 2: 37.5 – 48.5 FEET  
DRY



**S1\_B2-C**  
Box 1 of 2: 28.5 – 37.5 FEET  
WET



**S1\_B2-C**  
Box 2 of 2: 37.5 – 48.5 FEET  
WET





## GEOTECHNICAL BORING REPORT BORE LOG

## GEOTECHNICAL BORING REPORT CORE LOG

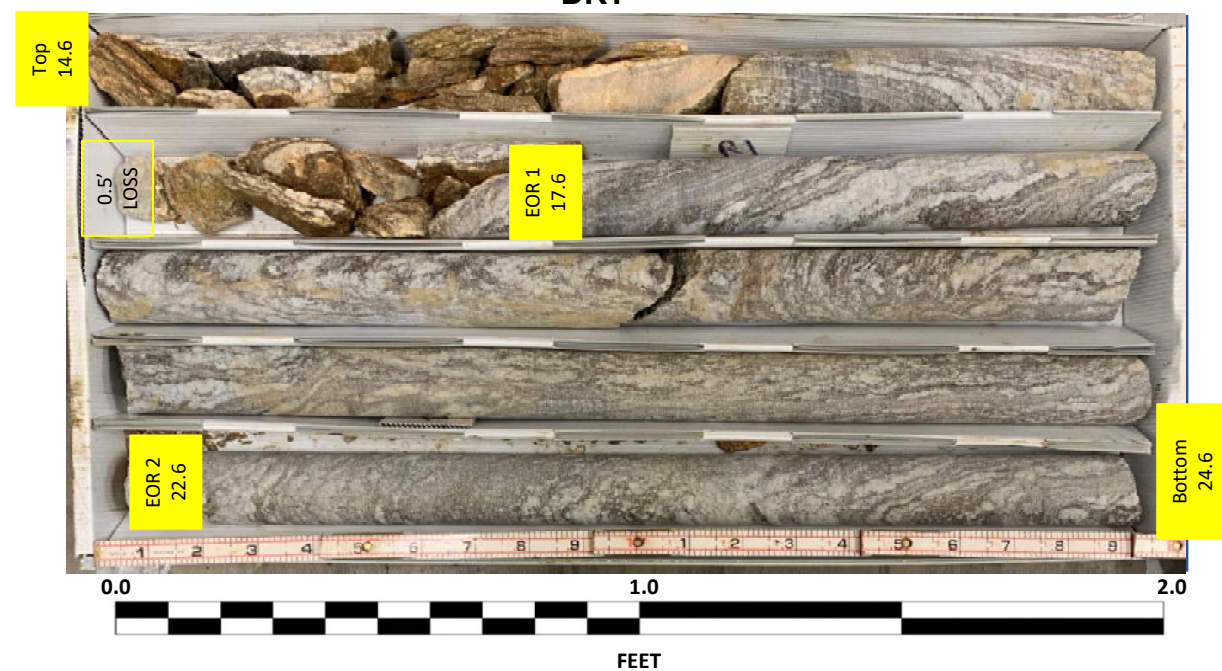
WBS 38332.1.FS1		TIP B-3186 / B-5898		COUNTY HAYWOOD		GEOLOGIST N. Yacobi									
SITE DESCRIPTION US 23/ US 74 (Great Smoky Mountain Highway)							GROUND WTR (ft)								
BORING NO. S1_B2-B		STATION 42+73		OFFSET 43 ft RT		ALIGNMENT -L-									
COLLAR ELEV. 2,565.5 ft		TOTAL DEPTH 32.6 ft		NORTHING 666,354		EASTING 818,982									
DRILL RIG/HAMMER EFF./DATE GTC3277 CME-75 83% (09/15/2020)				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic									
DRILLER K. Boone		START DATE 02/15/21		COMP. DATE 02/15/21		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
2570															
2565	2,565.5	0.0	1	1	0									2,565.5	0.0
2560															
2555	2,554.8	10.7												2,554.8	10.7
2550	2,550.9	14.6												2,550.9	14.6
2545															
2540															
2535															
WEATHERED ROCK Brown, GNEISS															
CRYSTALLINE ROCK Light to dark gray with brown, Migmatitic Biotite GNEISS															
Boring Terminated at Elevation 2,532.9 ft in Crystalline Rock (GNEISS)															
<b>NOTES</b> Rocking coring times not available															

WBS 38332.1.FS1		TIP B-3186 / B-5898		COUNTY HAYWOOD		GEOLOGIST N. Yacobi	
SITE DESCRIPTION US 23/ US 74 (Great Smoky Mountain Highway)							GROUND WTR (ft)
BORING NO. S1_B2-B		STATION 42+73		OFFSET 43 ft RT		ALIGNMENT -L-	
COLLAR ELEV. 2,565.5 ft		TOTAL DEPTH 32.6 ft		NORTHING 666,354		EASTING 818,982	
DRILL RIG/HAMMER EFF./DATE GTC3277 CME-75 83% (09/15/2020)				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic	
DRILLER K. Boone		START DATE 02/15/21		COMP. DATE 02/15/21		SURFACE WATER DEPTH N/A	
CORE SIZE		TOTAL RUN		STRATA		LOG	DESCRIPTION AND REMARKS
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	REC. (ft) %		
2550.9							
2550	2,550.9	14.6	3.0	0:0 N=60/0.1 0:0 0:0	(2.5) 83%	(0.5) 17%	
2545	2,547.9	17.6	5.0	0:0 0:0 0:0	(5.0) 100%	(5.0) 100%	
2540	2,542.9	22.6	5.0	0:0 0:0 0:0	(5.0) 100%	(4.7) 94%	
2535	2,537.9	27.6	5.0	0:0 0:0 0:0	(5.0) 100%	(4.7) 94%	
	2,532.9	32.6		0:0 0:0 0:0			
Begin Coring @ 14.6 ft <b>CRYSTALLINE ROCK</b> Light to dark gray with brown, Migmatitic Biotite GNEISS moderately severe to moderate weathering, soft to moderately hard, very close to close fracture spacing 0.4' core loss Slight weathering, hard, moderately close to wide fracture spacing Close to moderately close fracture spacing							
Boring Terminated at Elevation 2,532.9 ft in Crystalline Rock (GNEISS)							
<b>NOTES</b> Rocking coring times not available							

NCDOT BORE DOUBLE\_B3186\_GEO\_SPT.GPJ\_NC\_DOT.GDT\_8/2/21

CORE PHOTOGRAPHIC RECORD  
38330.1.FS1 (B-3186/B-5898)  
US 23/ US 74 Great Smokey Mountain Highway

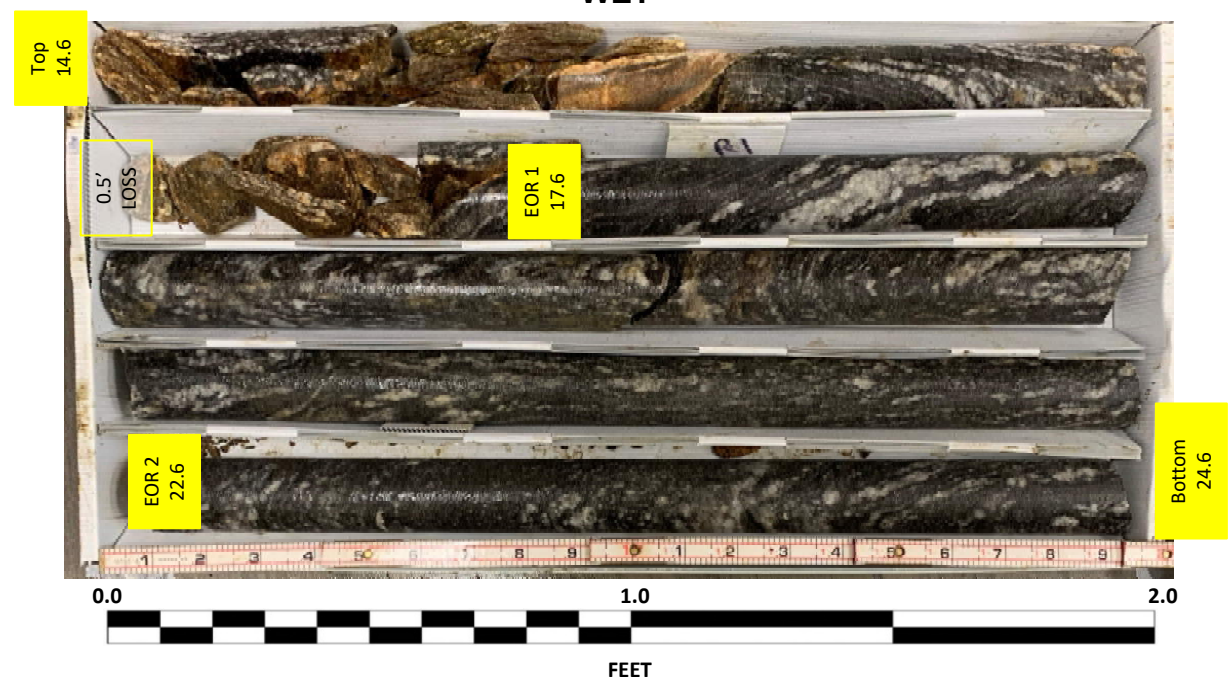
S1\_B2-B  
Box 1 of 2: 14.6 – 24.6 FEET  
DRY



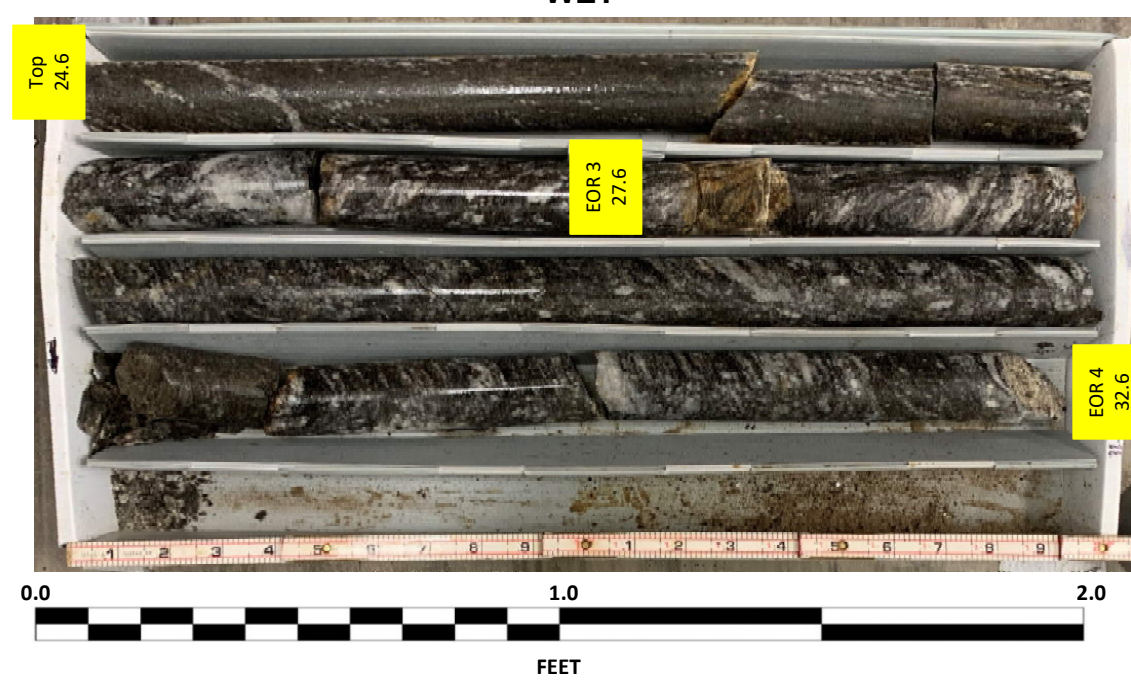
S1\_B2-B  
Box 2 of 2: 24.6 – 32.6 FEET  
DRY



S1\_B2-B  
Box 1 of 2: 14.6 – 24.6 FEET  
WET



S1\_B2-B  
Box 2 of 2: 24.6 – 32.6 FEET  
WET



# GEOTECHNICAL BORING REPORT

## BORE LOG

WBS 38332.1.FS1		TIP B-3186 / B-5898		COUNTY HAYWOOD		GEOLOGIST C. Swafford										
SITE DESCRIPTION US 23/ US 74 (Great Smoky Mountain Highway)							GROUND WTR (ft)									
BORING NO. S1_EB2-A		STATION 44+11		OFFSET 46 ft LT		ALIGNMENT -L-										
COLLAR ELEV. 2,580.0 ft		TOTAL DEPTH 27.0 ft		NORTHING 666,518		EASTING 818,995										
DRILL RIG/HAMMER EFF./DATE GTC3277 CME-75 83% (09/15/2020)			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic										
DRILLER K. Boone		START DATE 02/28/21		COMP. DATE 02/28/21		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2580														2,580.0	GROUND SURFACE	0.0
	2,579.1	0.9	14	19	9									2,579.1	0.9' PAVEMENT	0.9
	2,576.5	3.5	6	3	4									2,574.5	ROADWAY EMBANKMENT Loose to medium dense, brown, SAND (A-3), with some gravel	5.5
2575	2,574.2	5.8	4	3	3									2,568.0	Soft to medium stiff, gray, SILT (A-4), contains trace root fragments, micaceous, organic odor	
	2,571.5	8.5	2	1	1									2,563.0	Soft, gray, CLAY (A-7-6), contains trace wood fragments, micaceous	12.0
2570	2,566.5	13.5	2	1	2									2,558.0	ALLUVIAL Very loose, gray, SAND and GRAVEL (A-1-b)	17.0
	2,561.5	18.5	4	6	12									2,553.0	RESIDUAL Very dense, brown, orange, and white, silty SAND (A-2-4), saprolitic	22.0
2565	2,556.5	23.5	13	21	33									2,553.0	Boring Terminated with Standard Penetration Test Refusal at Elevation 2,553.0 ft on Crystalline Rock (GNEISS)	27.0
2560	2,553.0	27.0	60/0.0													
2555																

**NOTES**  
 Shelby tube obtained from 6.0'-8.0'  
 Shelby tube obtained from 13.5'-15.5'  
 Rig chatter and grinding at 27.0'

WBS 38332.1.FS1		TIP B-3186 / B-5898		COUNTY HAYWOOD		GEOLOGIST N. Yacobi										
SITE DESCRIPTION US 23/ US 74 (Great Smoky Mountain Highway)							GROUND WTR (ft)									
BORING NO. S1_EB2-C		STATION 43+71		OFFSET 5 ft RT		ALIGNMENT -L-										
COLLAR ELEV. 2,577.1 ft		TOTAL DEPTH 27.5 ft		NORTHING 666,456		EASTING 819,011										
DRILL RIG/HAMMER EFF./DATE GTC9083 CME-550X 80% (11/24/2020)			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic										
DRILLER L. Wanstrath		START DATE 03/10/21		COMP. DATE 03/10/21		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2580														2,577.1	GROUND SURFACE	0.0
	2,577.1	0.0	1	2	1									2,572.6	ROADWAY EMBANKMENT Very loose to loose, red and brown, clayey SAND (A-2-6)	4.5
2575	2,574.6	2.5	3	4	3									2,570.1	Very loose, gray and green, silty SAND (A-2-4)	7.0
	2,572.1	5.0	2	1	2									2,564.1	Soft, red, gray and tan, CLAY (A-7-6), with trace sand	13.0
2570	2,569.6	7.5	1	1	2									2,552.1	ALLUVIAL Medium dense, gray, red, and brown, SAND and GRAVEL (A-1-b)	25.0
	2,567.1	10.0	1	1	3									2,549.6	WEATHERED ROCK Gray and black, granitic GNEISS	27.5
2565	2,562.1	15.0	5	10	8											
2560	2,557.1	20.0	25	15	6											
2555	2,552.1	25.0	100/0.5													
2550	2,549.6	27.5	60/0.0													

NCDOT BORE DOUBLE\_B3186\_GEO\_SPT.GPJ\_NC\_DOT.GDT\_8/2/21

# GEOTECHNICAL BORING REPORT

## BORE LOG

WBS 38332.1.FS1		TIP B-3186 / B-5898		COUNTY HAYWOOD		GEOLOGIST R. Dugger										
SITE DESCRIPTION US 23/ US 74 (Great Smoky Mountain Highway)							GROUND WTR (ft)									
BORING NO. S1_EB2-B		STATION 43+64		OFFSET 45 ft RT		ALIGNMENT -L-										
COLLAR ELEV. 2,577.5 ft		TOTAL DEPTH 45.4 ft		NORTHING 666,426		EASTING 819,039										
DRILL RIG/HAMMER EFF./DATE GTC9083 CME-550X 80% (11/24/2020)			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic										
DRILLER L. Wansrath		START DATE 01/28/21		COMP. DATE 01/28/21		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2580																
	2,576.6	0.9														
2575	2,575.0	2.5	11	10	5											
	2,572.5	5.0	4	2	4											
2570	2,570.0	7.5	2	4	5											
	2,567.5	10.0	4	2	3											
2565	2,565.0	12.5	5	3	4											
	2,562.5	15.0	9	9	6											
2560	2,560.0	17.5														
	2,557.5	20.0	6	12	20											
2555	2,555.0	22.5														
	2,552.5	25.0	4	7	11											
2550	2,550.0	27.5														
	2,547.5	30.0	52	40	45											
2545	2,545.0	32.5														
	2,542.5	35.0	100/0.3													
2540	2,540.0	37.5														
	2,537.5	40.0	100/0.2													
2535	2,535.0	42.5														
	2,532.5	45.0	100/0.4													

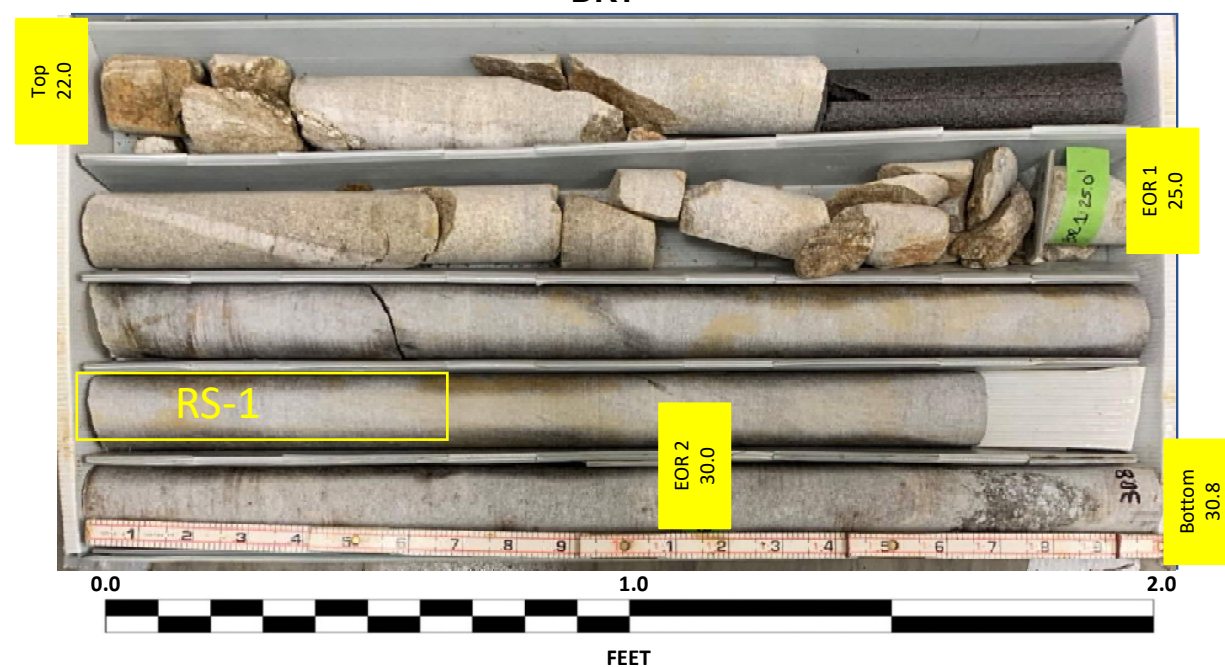
WBS 38332.1.FS1		TIP B-3186 / B-5898		COUNTY HAYWOOD		GEOLOGIST R. Dugger										
SITE DESCRIPTION US 23/ US 74 (Great Smoky Mountain Highway)							GROUND WTR (ft)									
BORING NO. Det_EB1		STATION 40+58		OFFSET 75 ft RT		ALIGNMENT -L-										
COLLAR ELEV. 2,570.8 ft		TOTAL DEPTH 24.0 ft		NORTHING 666,164		EASTING 818,877										
DRILL RIG/HAMMER EFF./DATE GTC8255 CME-55 93% (11/24/2020)			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic										
DRILLER L. Wansrath		START DATE 03/22/21		COMP. DATE 03/22/21		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2575																
	2,570.8	0.0														
2570	2,570.8	0.0	1	1	1											
	2,568.3	2.5	10	11	7											
2565	2,565.8	5.0	10	3	2											
	2,563.3	7.5	3	3	4											
2560	2,560.8	10.0	2	3	8											
	2,558.3	12.5														
2555	2,555.8	15.0	6	8	7											
	2,553.3	17.5														
2550	2,550.8	20.0	22	15	85/0.3											
	2,548.3	22.5														
	2,546.8	24.0	60/0.0													

NCDOT BORE DOUBLE B3186\_GEO\_SPT.GPJ NC\_DOT.GDT 7/28/21

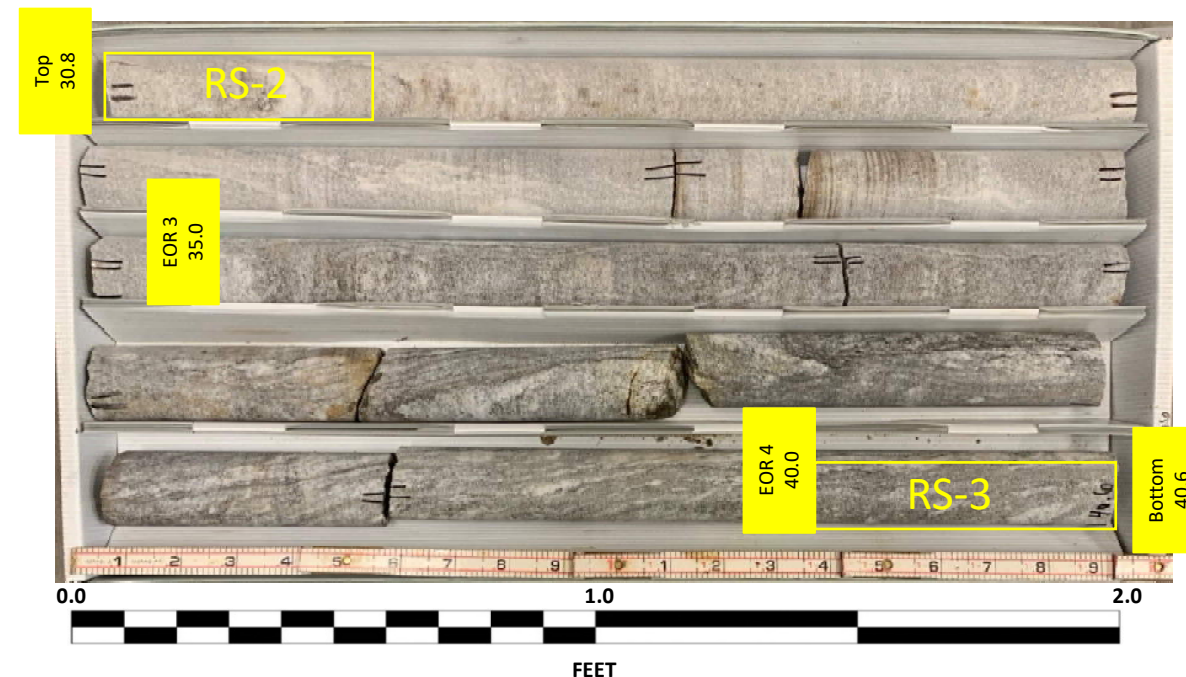


CORE PHOTOGRAPHIC RECORD  
38330.1.FS1 (B-3186/B-5898)  
US 23/ US 74 Great Smokey Mountain Highway

DET-B1  
Box 1 of 3: 22.0 – 30.8 FEET  
DRY



DET-B1  
Box 2 of 3: 30.8 – 40.6 FEET  
DRY



DET-B1  
Box 1 of 3: 22.0 – 30.8 FEET  
WET



DET-B1  
Box 2 of 3: 30.8 – 40.6 FEET  
WET

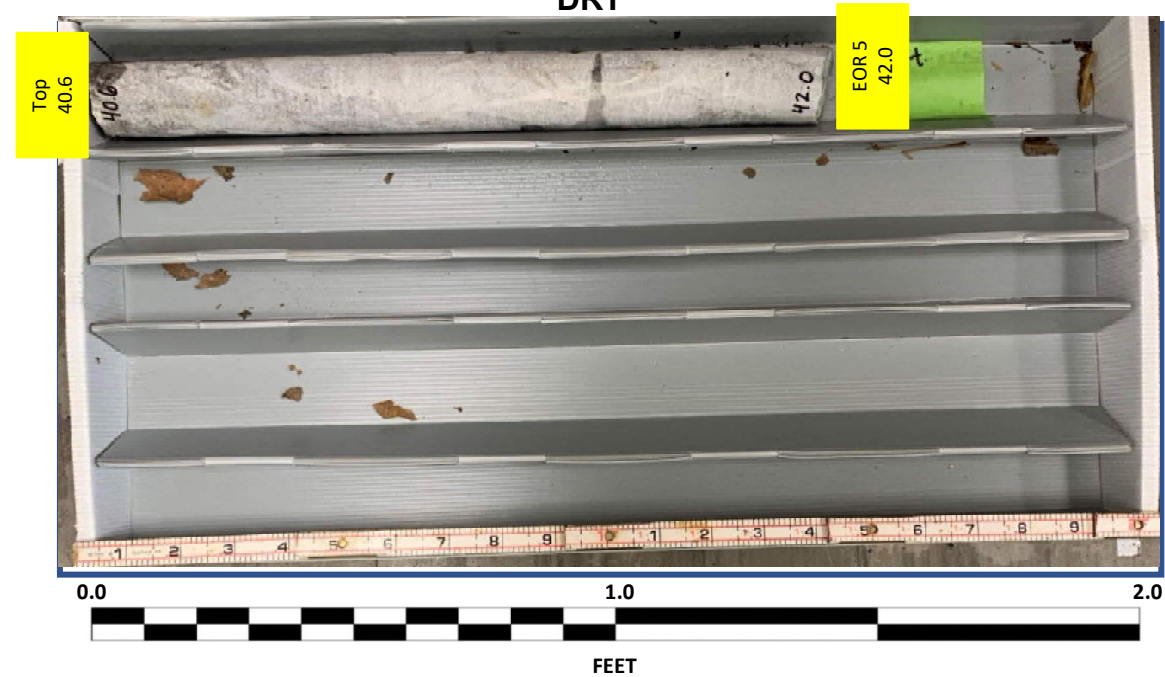


# CORE PHOTOGRAPHIC RECORD

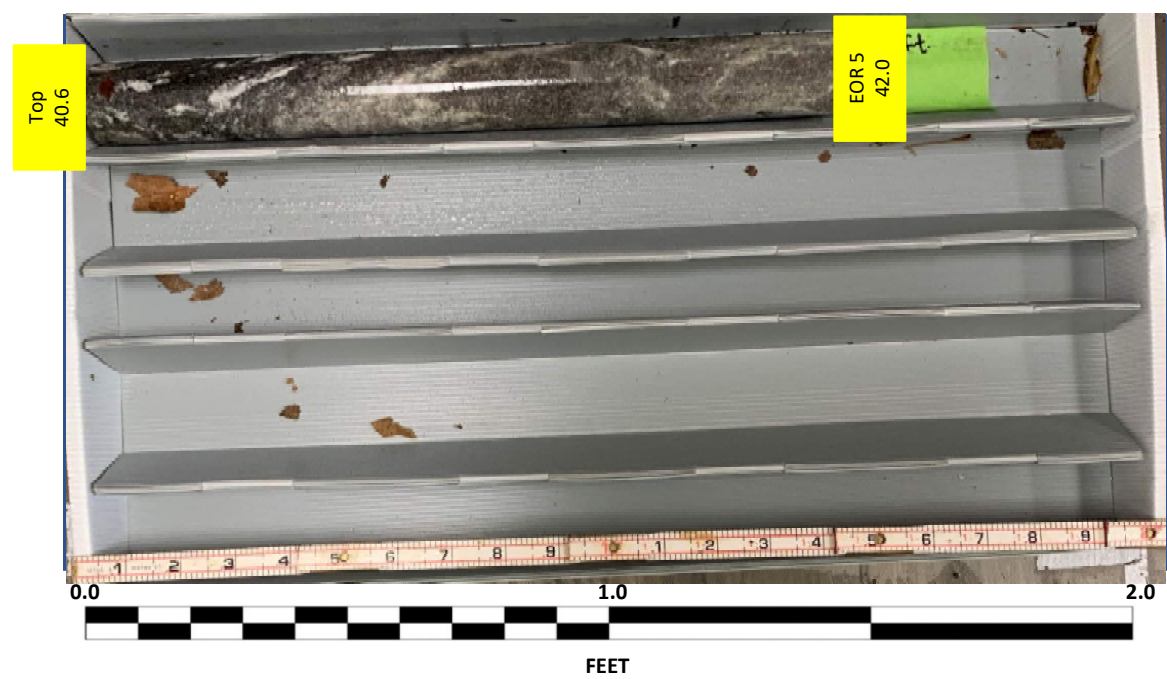
38330.1.FS1 (B-3186/B-5898)

US 23/ US 74 Great Smokey Mountain Highway

**DET-B1**  
**Box 3 of 3: 40.6 – FEET**  
**DRY**



**DET-B1**  
**Box 3 of 3: 40.6 – 42.0 FEET**  
**WET**





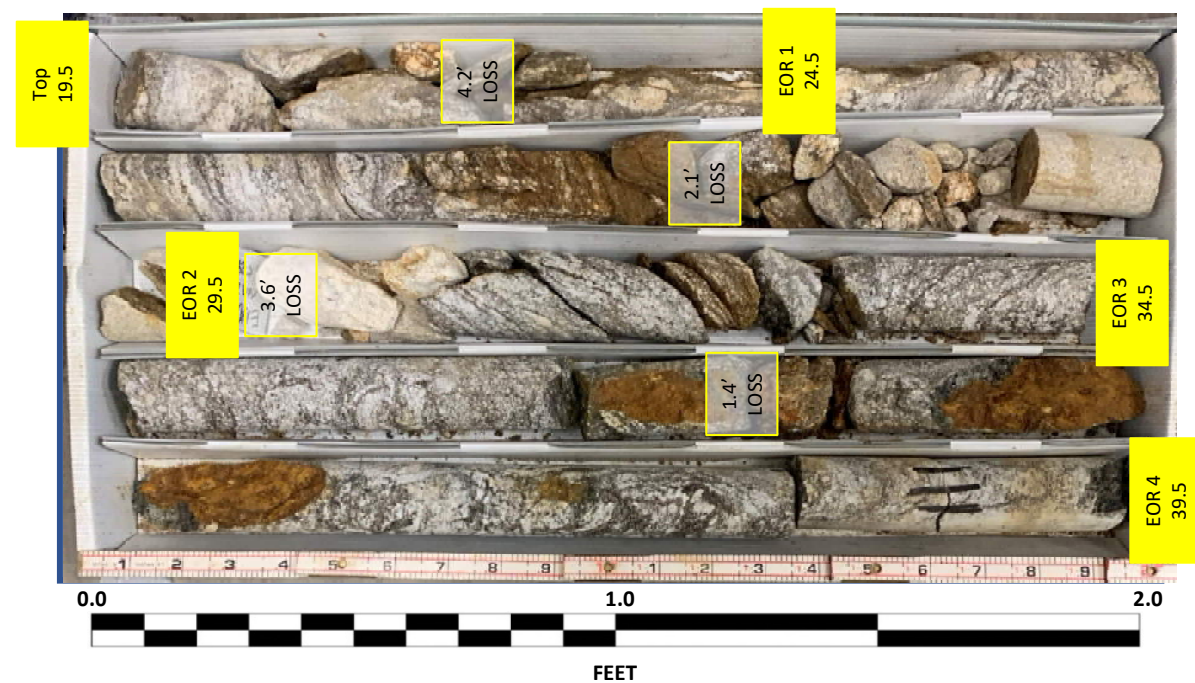


# CORE PHOTOGRAPHIC RECORD

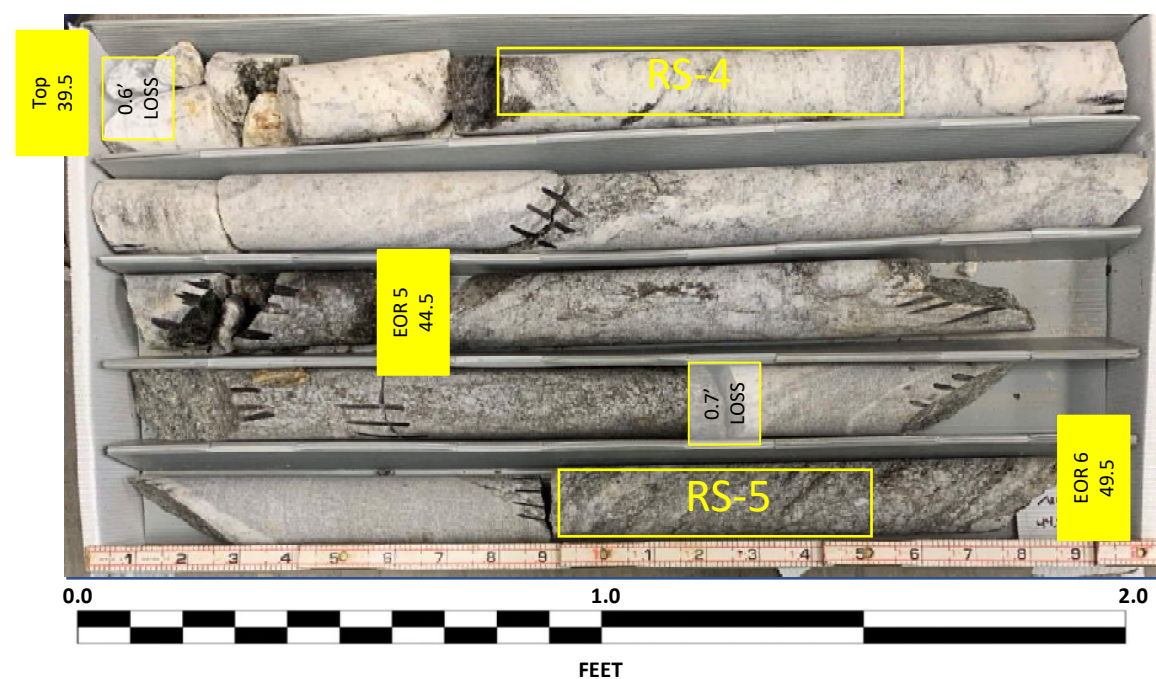
38330.1.FS1 (B-3186/B-5898)

US 23/ US 74 Great Smokey Mountain Highway

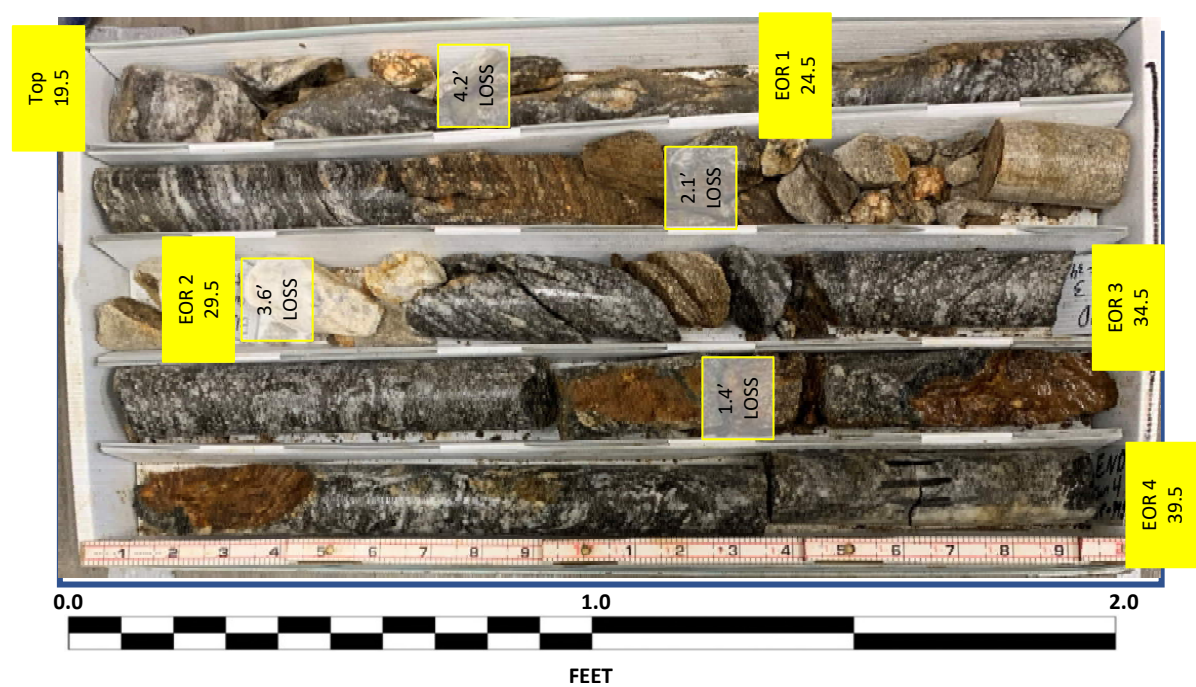
**DET-B2**  
**Box 1 of 2: 19.5 – 39.5 FEET**  
**DRY**



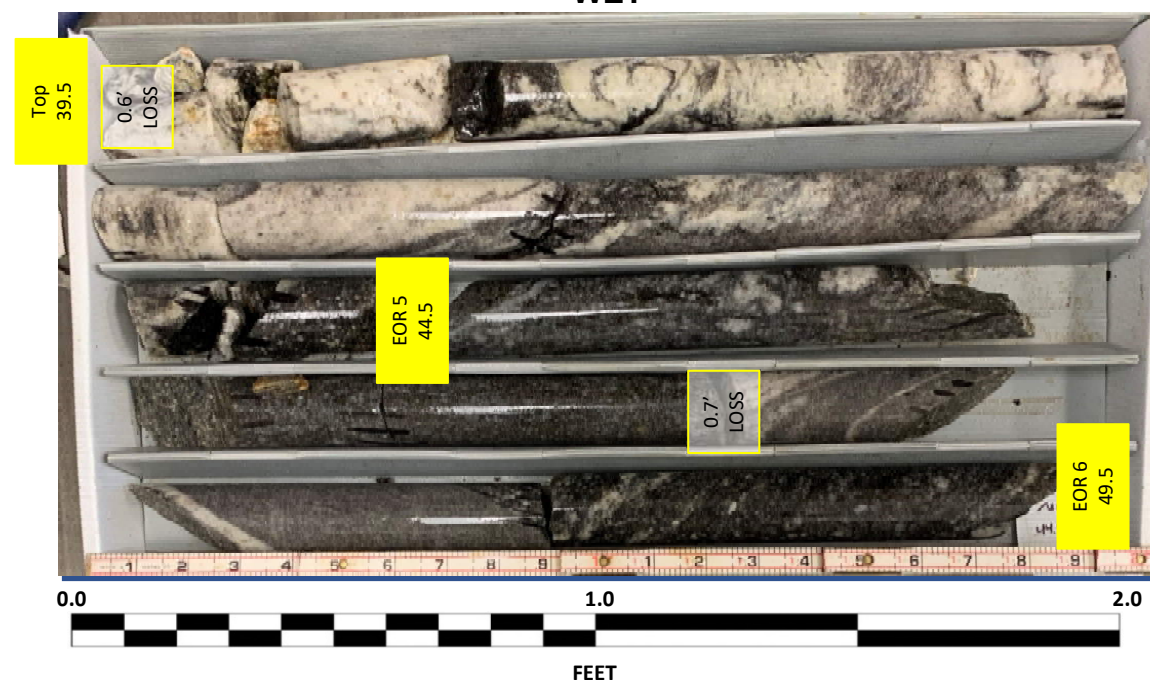
**DET-B2**  
**Box 2 of 2: 39.5 – 49.5 FEET**  
**DRY**



**DET-B2**  
**Box 1 of 2: 19.5 – 39.5 FEET**  
**WET**



**DET-B2**  
**Box 2 of 2: 39.5 – 49.5 FEET**  
**WET**



# GEOTECHNICAL BORING REPORT

## BORE LOG

<b>WBS</b> 38332.1.FS1		<b>TIP</b> B-3186 / B-5898		<b>COUNTY</b> HAYWOOD		<b>GEOLOGIST</b> N. Yacobi									
<b>SITE DESCRIPTION</b> US 23/ US 74 (Great Smoky Mountain Highway)							<b>GROUND WTR (ft)</b>								
<b>BORING NO.</b> Det_EB2		<b>STATION</b> 43+52		<b>OFFSET</b> 121 ft RT		<b>ALIGNMENT</b> -L-	0 HR. N/A								
<b>COLLAR ELEV.</b> 2,584.5 ft		<b>TOTAL DEPTH</b> 43.3 ft		<b>NORTHING</b> 666,370		<b>EASTING</b> 819,092	24 HR. FIAD								
<b>DRILL RIG/HAMMER EFF./DATE</b> GTC8255 CME-55 93% (11/24/2020)				<b>DRILL METHOD</b> H.S. Augers		<b>HAMMER TYPE</b> Automatic									
<b>DRILLER</b> L. Wansrath		<b>START DATE</b> 03/11/21		<b>COMP. DATE</b> 03/11/21		<b>SURFACE WATER DEPTH</b> N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100			ELEV. (ft)	DEPTH (ft)	
2585	2,584.5	0.0	3	2	2								2,584.5	0.0	GROUND SURFACE
	2,582.0	2.5	1	1	2							D	2,582.5	2.0	<b>ARTIFICIAL FILL</b> Soft, red and brown, sandy CLAY (A-6), micaceous
2580	2,579.5	5.0	2	3	4							D			Very loose to loose, red, brown, and gray, clayey SAND (A-2-6), micaceous
	2,577.0	7.5	4	3	3							D	2,577.5	7.0	
2575	2,574.5	10.0	2	2	2							D			Loose, red, brown, and gray, silty SAND (A-2-4), micaceous
	2,571.5	13.0										M	2,571.5	13.0	Soft, gray, clayey SILT (A-5), micaceous
2570	2,569.5	15.0	1	1	2							M	2,566.5	18.0	Soft, gray, lean CLAY (A-7-6)
2565	2,564.5	20.0	1	1	3							M	2,561.5	23.0	Very dense, gray, white and tan, SAND and GRAVEL (A-1-b)
2560	2,559.5	25.0	14	86	24/0.5					100+			2,559.0	25.5	
2555	2,554.5	30.0	15	9	11								2,556.5	28.0	<b>WEATHERED ROCK</b> Gray, white, and tan, GNEISS
2550	2,549.5	35.0	8	15	16										<b>RESIDUAL</b> Very stiff to hard, white, gray, tan and brown, SILT (A-4), micaceous, saprolitic
2545	2,544.5	40.0	6	7	25										
	2,541.3	43.2											2,541.3	43.2	<b>CRYSTALLINE ROCK</b> Gray, white, and brown, GNEISS
		60/0.1								60/0.1			2,541.2	43.3	Boring Terminated with Standard Penetration Test Refusal at Elevation 2,541.2 ft in Crystalline Rock (GNEISS)
<b>NOTES</b> Offset and augered down to 18.0' for shelly tube sample															

NCDOT BORE DOUBLE B3186\_GEO\_SPT.GPJ NC\_DOT.GDT 7/28/21



REPORT ON SAMPLES OF: Rock For Quality

PROJECT: B-3186 / B-5898  
 DATE SAMPLED: 05/11/2021  
 SAMPLED FROM: Test Borings  
 SUBMITTED BY: HDR

COUNTY: Haywood  
 RECEIVED: 5/11/2021  
 REPORTED: 5/12/2021  
 BY / CERT NO: Kevin E. Walker

BORING NO	SAMPLE	DEPTH (FT)	ROCK TYPE	LENGTH (IN)	DIAMETER (IN)	UNIT WEIGHT (PCF)	UNCONFINED COMPRESSIVE STRENGTH (PSI)
S1_B1-A	RS-6	11.0-11.5	Biotite Gneiss	4.16	1.86	175.8	18,520
S1_B1-A	RS-7	16.8-17.5	Migmatitic Biotite Gneiss	3.49	1.86	173.40	10,027
S1_B1-B	RS-8	32.1-32.5	Migmatitic Biotite Gneiss	4.17	1.87	172.90	10,268
S1_B1-C	RS-9	39.4-40.0	Migmatitic Biotite Gneiss	4.14	1.87	171.40	13,205
S1_B2-A	RS-10	20.0-20.8	Migmatitic Biotite Gneiss	4.15	1.87	171.50	9,796
S1_B2-C	RS-11	33.5-34.1	Biotite Gneiss	4.16	1.86	173.10	3,264
DET_B1	RS-1	27.0-27.7	Granite	4.17	1.86	165.5	22,108
DET_B1	RS-2	30.8-31.3	Granite	4.19	1.86	165.1	20,364
DET_B1	RS-3	40.1-40.6	Migmatitic Biotite Gneiss	4.11	1.86	170.4	16,519
DET_B2	RS-4	40.2-41.0	Migmatitic Biotite Gneiss	4.25	1.87	170.3	8,866
DET_B2	RS-5	48.5-49.0	Migmatitic Biotite Gneiss	4.24	1.87	169.5	8,389