

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

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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.

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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.

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DATE AUGUST 2021



SIGNATURE

DATE

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SUBSURFACE INVESTIGATION
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, *VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6*

SOIL LEGEND AND AASHTO CLASSIFICATION

GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)							SILT-CLAY MATERIALS (> 35% PASSING #200)							ORGANIC MATERIALS				
	A-1	A-1-b	A-2	A-2-4	A-2-5	A-2-6	A-2-7	A-4	A-5	A-6	A-7	A-1, A-2	A-3	A-4, A-5	A-6, A-7				
GROUP CLASS.	A-1-a	A-1-b	A-2	A-2-4	A-2-5	A-2-6	A-2-7	A-4	A-5	A-6	A-7	A-1, A-2	A-3	A-4, A-5	A-6, A-7				
SYMBOL																			
% PASSING #10 #40 #200	50 MX 30 MX 15 MX	50 MX 25 MX	51 MN 35 MX	35 MX 35 MX	35 MX 35 MX	35 MX 35 MX	35 MX 35 MX	36 MN 36 MN	36 MN 36 MN	36 MN 36 MN	36 MN 36 MN	36 MN 36 MN	36 MN 36 MN	36 MN 36 MN	36 MN 36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT	
MATERIAL PASSING #40 LL PI	-	-	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 11 MN	41 MN 11 MN	40 MX 11 MN	41 MN 11 MN	40 MX 11 MN	41 MN 11 MN	40 MX 11 MN	41 MN 11 MN	40 MX 11 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER	HIGHLY ORGANIC SOILS	
GROUP INDEX	0	0	0	4 MX	8 MX	12 MX	16 MX	NO MX											
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND	FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND	SILTY SOILS	CLAYEY SOILS														
GEN. RATING AS SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSATURABLE					

PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	< 4 4 TO 10 10 TO 30 30 TO 50 > 50	N/A
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	< 2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 > 30	< 0.25 0.25 TO 0.5 0.5 TO 1.0 1 TO 2 2 TO 4 > 4

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE OPENING (MM)	4	10	40	60	200	270
	4.76	2.00	0.42	0.25	0.075	0.053
BOULDER (BLDR.)						
COBBLE (COB.)						
GRAVEL (GR.)						
COARSE SAND (CSE. SD.)						
FINE SAND (F SD.)						
SILT (SL.)						
CLAY (CL.)						
GRAIN SIZE	305 IN.	75	2.0	0.25	0.05	0.005

SOIL MOISTURE - CORRELATION OF TERMS

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
LL - LIQUID LIMIT	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE
PLASTIC RANGE (PI)	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
OM - OPTIMUM MOISTURE SHRINKAGE LIMIT	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
SL - SHRINKAGE LIMIT	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

NON PLASTIC	PLASTICITY INDEX (PI)	DRY STRENGTH
SLIGHTLY PLASTIC	0-5	VERY LOW
MODERATELY PLASTIC	6-15	SLIGHT
HIGHLY PLASTIC	16-25	MEDIUM
	26 OR MORE	HIGH

COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.

GRADATION

WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.
 UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.
 GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.

ANGULARITY OF GRAINS

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.

MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE LL < 31
 MODERATELY COMPRESSIBLE LL = 31 - 50
 HIGHLY COMPRESSIBLE LL > 50

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE 1 - 10%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE 10 - 20%
MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME 20 - 35%
HIGHLY ORGANIC	> 10%	> 20%	HIGHLY 35% AND ABOVE

GROUND WATER

WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING
 STATIC WATER LEVEL AFTER 24 HOURS
 PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA
 SPRING OR SEEP

MISCELLANEOUS SYMBOLS

	ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION		DIP & DIP DIRECTION OF ROCK STRUCTURES
	SOIL SYMBOL		TEST BORING
	ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT		AUGER BORING
	INFERRED SOIL BOUNDARY		CORE BORING
	INFERRED ROCK LINE		MONITORING WELL
	ALLUVIAL SOIL BOUNDARY		PIEZOMETER INSTALLATION
	SLOPE INDICATOR INSTALLATION		CONE PENETROMETER TEST
	SOUNDING ROD		TEST BORING WITH CORE
	SPT N-VALUE		

RECOMMENDATION SYMBOLS

	UNDERCUT		UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE		UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL
	SHALLOW UNDERCUT		UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK		

ABBREVIATIONS

AR - AUGER REFUSAL	BT - BORING TERMINATED	CL - CLAY	CPT - CONE PENETRATION TEST	CSE - COARSE	DMT - DILATOMETER TEST	DPT - DYNAMIC PENETRATION TEST	e - VOID RATIO	F - FINE	FOSS. - FOSSILIFEROUS	FRAC. - FRACTURED, FRACTURES	FRAGS. - FRAGMENTS	HI. - HIGHLY	MED. - MEDIUM	MICA - MICACEOUS	MOD. - MODERATELY	NP - NON PLASTIC	ORG. - ORGANIC	PMT - PRESSUREMETER TEST	SAP. - SAPROLITIC	SD. - SAND, SANDY	SL. - SILT, SILTY	SLI. - SLIGHTLY	TCR - TRICONE REFUSAL	w - MOISTURE CONTENT	V - VERY	VST - VANE SHEAR TEST	WEA. - WEATHERED	UNIT WEIGHT	DRY UNIT WEIGHT
												SAMPLE ABBREVIATIONS S - BULK SS - SPLIT SPOON ST - SHELBY TUBE RS - ROCK RT - RECOMPACTED TRIAXIAL CBR - CALIFORNIA BEARING RATIO																	

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:	ADVANCING TOOLS:	HAMMER TYPE:
<input type="checkbox"/> CME-45C	<input type="checkbox"/> CLAY BITS	<input checked="" type="checkbox"/> AUTOMATIC <input type="checkbox"/> MANUAL
<input checked="" type="checkbox"/> CME-55	<input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER	CORE SIZE:
<input checked="" type="checkbox"/> CME-550	<input checked="" type="checkbox"/> 8" HOLLOW AUGERS	<input type="checkbox"/> -B <input type="checkbox"/> -H
<input type="checkbox"/> VANE SHEAR TEST	<input type="checkbox"/> HARD FACED FINGER BITS	<input checked="" type="checkbox"/> -N Q2
<input type="checkbox"/> PORTABLE HOIST	<input type="checkbox"/> TUNG-CARBIDE INSERTS	HAND TOOLS:
<input type="checkbox"/> CME-75	<input type="checkbox"/> CASING <input type="checkbox"/> W/ ADVANCER	<input type="checkbox"/> POST HOLE DIGGER
<input type="checkbox"/>	<input type="checkbox"/> TRICONE *STEEL TEETH	<input type="checkbox"/> HAND AUGER
<input type="checkbox"/>	<input type="checkbox"/> TRICONE *TUNG-CARB.	<input type="checkbox"/> SOUNDING ROD
<input type="checkbox"/>	<input checked="" type="checkbox"/> CORE BIT	<input type="checkbox"/> VANE SHEAR TEST
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED, AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

	WEATHERED ROCK (WR)		NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.
	CRYSTALLINE ROCK (CR)		FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.
	NON-CRYSTALLINE ROCK (NCR)		FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.
	COASTAL PLAIN SEDIMENTARY ROCK (CP)		COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.

WEATHERING

FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
VERY SLIGHT (IV SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN. CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.
SLIGHT (SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.
MODERATE (MOD.)	SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.
MODERATELY SEVERE (MOD. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. <i>IF TESTED, WOULD YIELD SPT REFUSAL</i>
SEVERE (SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. <i>IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF</i>
VERY SEVERE (IV SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <i>IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF</i>
COMPLETE	ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

ROCK HARDNESS

VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
MODERATELY HARD	CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROUDED OR GOUGED 0.25 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
SOFT	CAN BE GROUDED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.
VERY SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGER NAIL.

FRACTURE SPACING		BEDDING	
TERM	SPACING	TERM	THICKNESS
VERY WIDE	MORE THAN 10 FEET	VERY THICKLY BEDDED	4 FEET
WIDE	3 TO 10 FEET	THICKLY BEDDED	1.5 - 4 FEET
MODERATELY CLOSE	1 TO 3 FEET	THINLY BEDDED	0.16 - 1.5 FEET
CLOSE	0.16 TO 1 FOOT	VERY THINLY BEDDED	0.03 - 0.16 FEET
VERY CLOSE	LESS THAN 0.16 FEET	THINLY LAMINATED	0.008 - 0.03 FEET
		VERY THINLY LAMINATED	< 0.008 FEET

INDURATION

FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.

FRIABLE	RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.
MODERATELY INDURATED	GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.
INDURATED	GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.
EXTREMELY INDURATED	SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.

TERMS AND DEFINITIONS

ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.
AQUIFER - A WATER BEARING FORMATION OR STRATA.
ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.
ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC.
ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.
CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.
CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.
DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.
DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOADED FROM PARENT MATERIAL.
FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.
FORMATION (FM) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.
JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.
LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.
MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.
RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
ROCK QUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.
SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.
STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.
STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.
TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

ELEVATION: _____ FEET

NOTES:
 BORING ELEVATIONS OBTAINED FROM TRIMBLE R12 GNSS RECEIVER CERTIFIED WITH FCC PART 15 (CLASS B DEVICE), 24, 32; RCM; PTCRB; BT SIG
 FIAD - FILLED IMMEDIATELY AFTER DRILLING

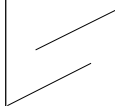
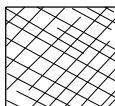
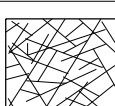

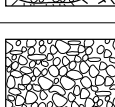

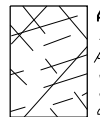
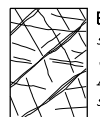


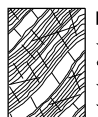

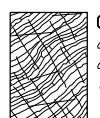

**NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT**

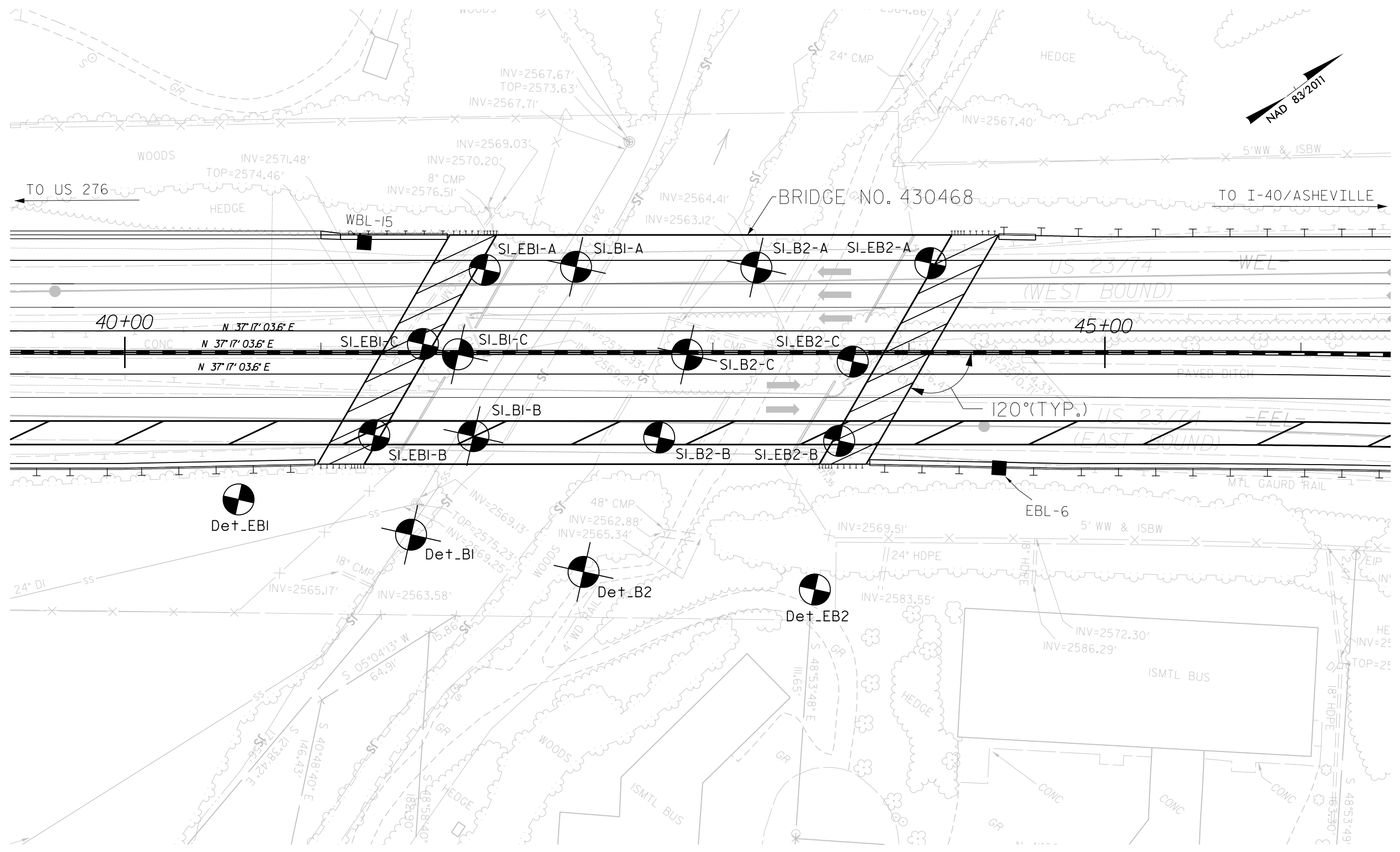
SUBSURFACE INVESTIGATION

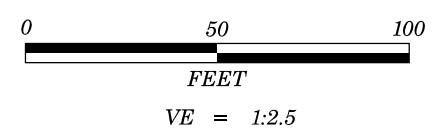
**SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES
FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS**

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

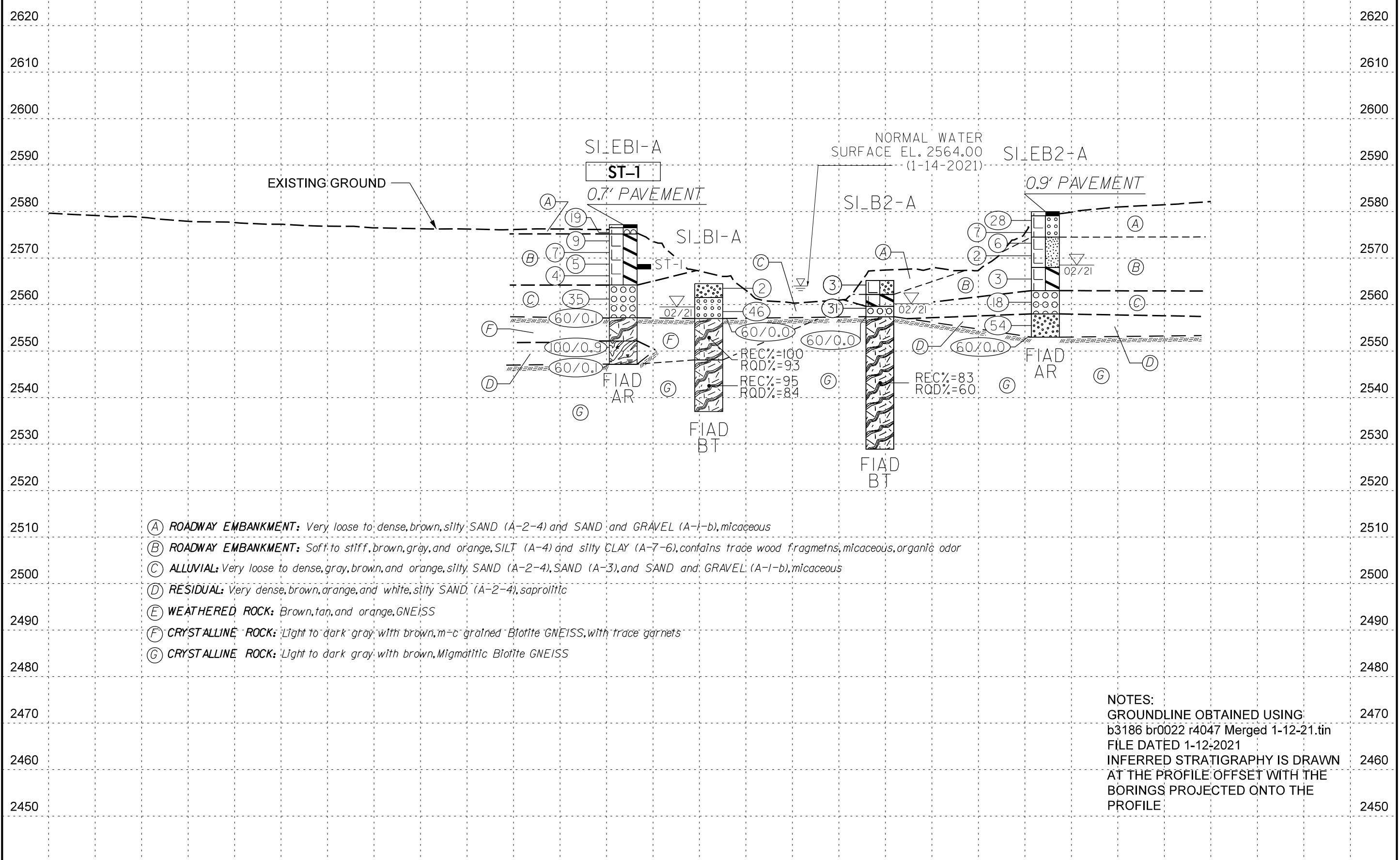
AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonically Deformed Heterogeneous Rock Masses (Marinos and Hoek, 2000)

<p>GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000)</p> <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> <p>STRUCTURE</p>	<p>SURFACE CONDITIONS</p> <p>VERY GOOD Very rough, fresh unweathered surfaces</p> <p>GOOD Rough, slightly weathered, iron stained surfaces</p> <p>FAIR Smooth, moderately weathered and altered surfaces</p> <p>POOR Slickensided, highly weathered surfaces with compact coatings or fillings or angular fragments</p> <p>VERY POOR Slickensided, highly weathered surfaces with soft clay coatings or fillings</p> <p align="center">DECREASING SURFACE QUALITY →</p>	<p>GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos, P and Hoek E., 2000)</p> <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> <p>SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)</p> <p>VERY GOOD - Very Rough, fresh unweathered surfaces</p> <p>GOOD - Rough, slightly weathered surfaces</p> <p>FAIR - Smooth, moderately weathered and altered surfaces</p> <p>POOR - Very smooth, occasionally slickensided surfaces with compact coatings or fillings with angular fragments</p> <p>VERY POOR - Very smooth, slickensided or highly weathered surfaces with soft clay coatings or fillings</p>																																																																																																						
<p>DECREASING INTERLOCKING OF ROCK PIECES</p> <p>↓</p> <p> INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities</p> <p> BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets</p> <p> VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets</p> <p> BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity</p> <p> DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces</p> <p> LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes</p>	<table border="1"> <tr> <td>90</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>80</td> <td></td> <td></td> <td></td> <td></td> <td>N/A</td> </tr> <tr> <td>70</td> <td></td> <td></td> <td></td> <td></td> <td>N/A</td> </tr> <tr> <td>60</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>50</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>40</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>30</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>20</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>10</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>N/A</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>	90						80					N/A	70					N/A	60						50						40						30						20						10						N/A						<p>COMPOSITION AND STRUCTURE</p> <p> 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.</p> <p> B. Sandstone with thin inter-layers of siltstone</p> <p> C. Sandstone and siltstone in similar amounts</p> <p> D. Siltstone or silty shale with sandstone layers</p> <p> E. Weak siltstone or clayey shale with sandstone layers</p> <p>C, D, E, and G - may be more or less folded than illustrated but this does not change the strength. Tectonic deformation, faulting and loss of continuity moves these categories to F and H.</p> <p> F. Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure</p> <p> G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers</p> <p> 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.</p> <p>→ Means deformation after tectonic disturbance</p> <table border="1"> <tr> <td>70</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>60</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>50</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>40</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>30</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>20</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>10</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>	70						60						50						40						30						20						10					
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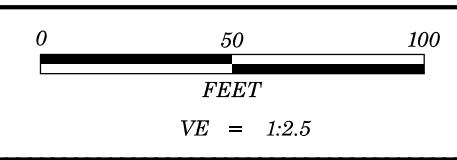


SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
ST-1	42' LT	41+84	8.5' - 9.6'	A-7-6 (21)	51	27	7.8	19.6	26.4	46.2	98.9	96.8	75.4	26	-

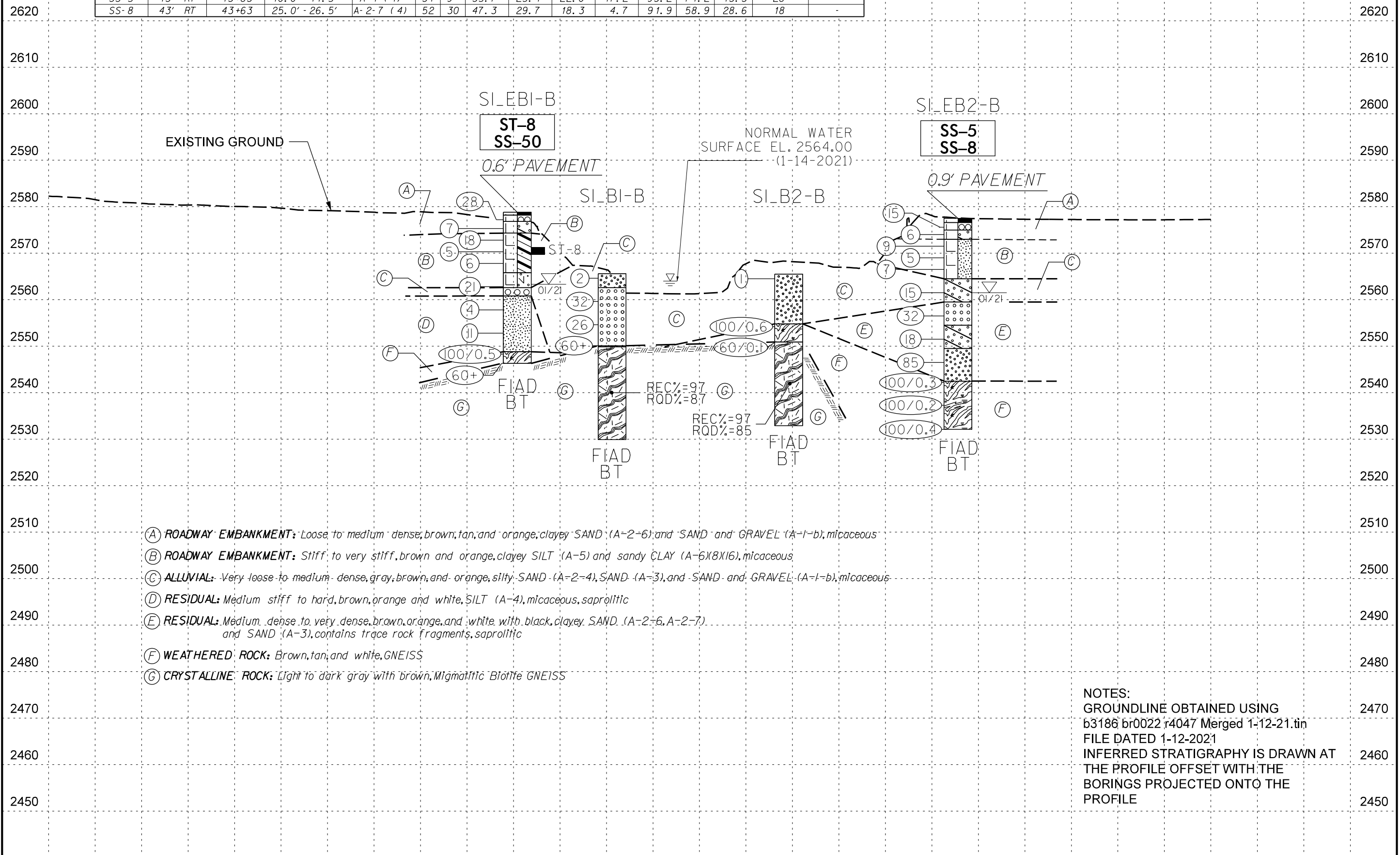


- (A) ROADWAY EMBANKMENT: Very loose to dense, brown, silty SAND (A-2-4) and SAND and GRAVEL (A-1-b), micaceous
- (B) ROADWAY EMBANKMENT: Soft to stiff, brown, gray, and orange, SILT (A-4) and silty CLAY (A-7-6), contains trace wood fragments, micaceous, organic odor
- (C) ALLUVIAL: Very loose to dense, 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



SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							29.1	11.0	23.0	36.9	91.4	70.3	55.1		
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	-

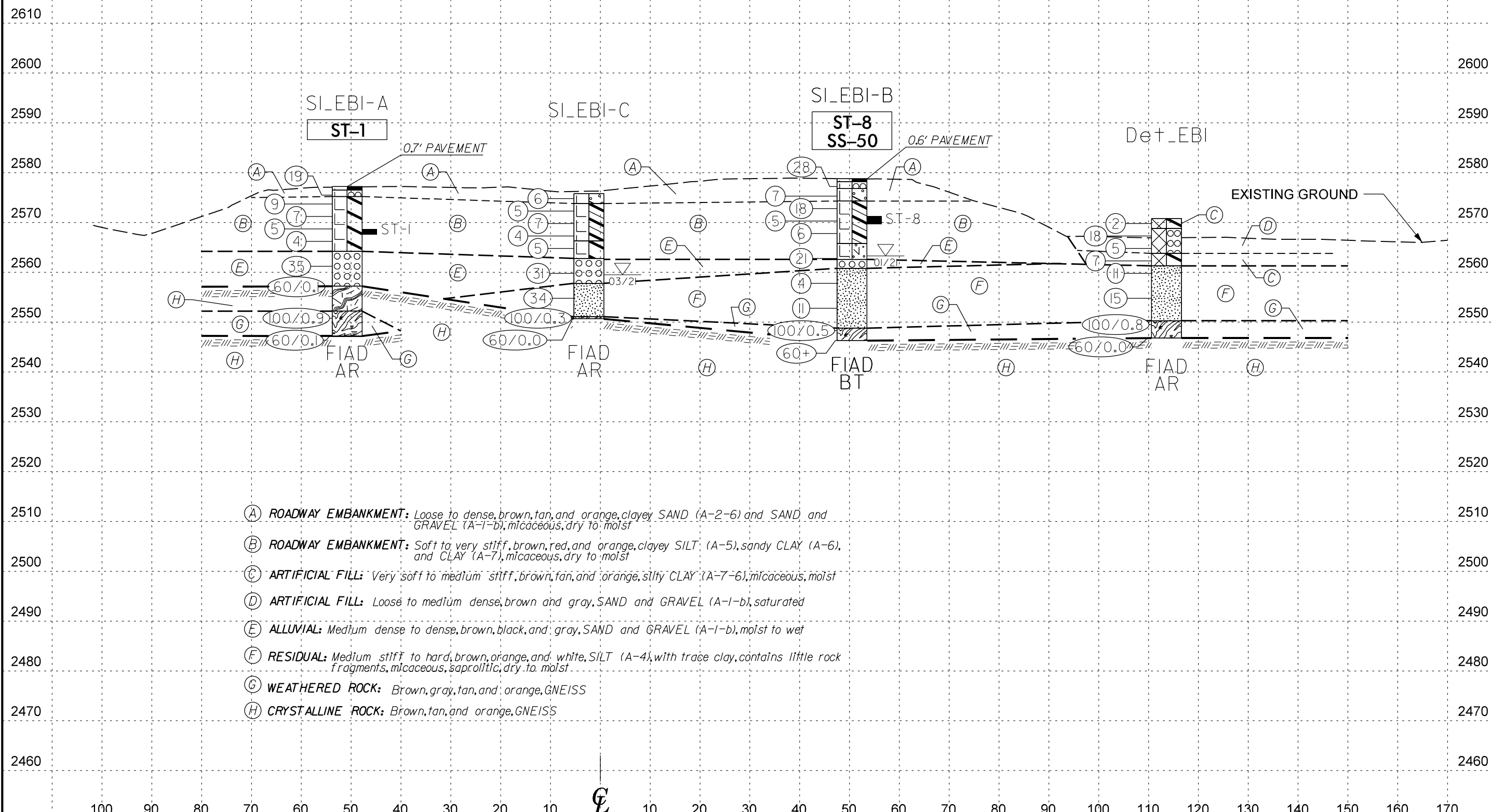


- (A) ROADWAY EMBANKMENT: Loose to medium dense, brown, tan, and orange, clayey SAND (A-2-6) and SAND and GRAVEL (A-1-b), micaceous
- (B) ROADWAY EMBANKMENT: Stiff to very stiff, brown and orange, clayey SILT (A-5) and sandy CLAY (A-6)(8)(16), micaceous
- (C) ALLUVIAL: Very loose to medium dense, gray, 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:
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 b3186 br0022 r4047 Merged 1-12-21.tin
 FILE DATED 1-12-2021
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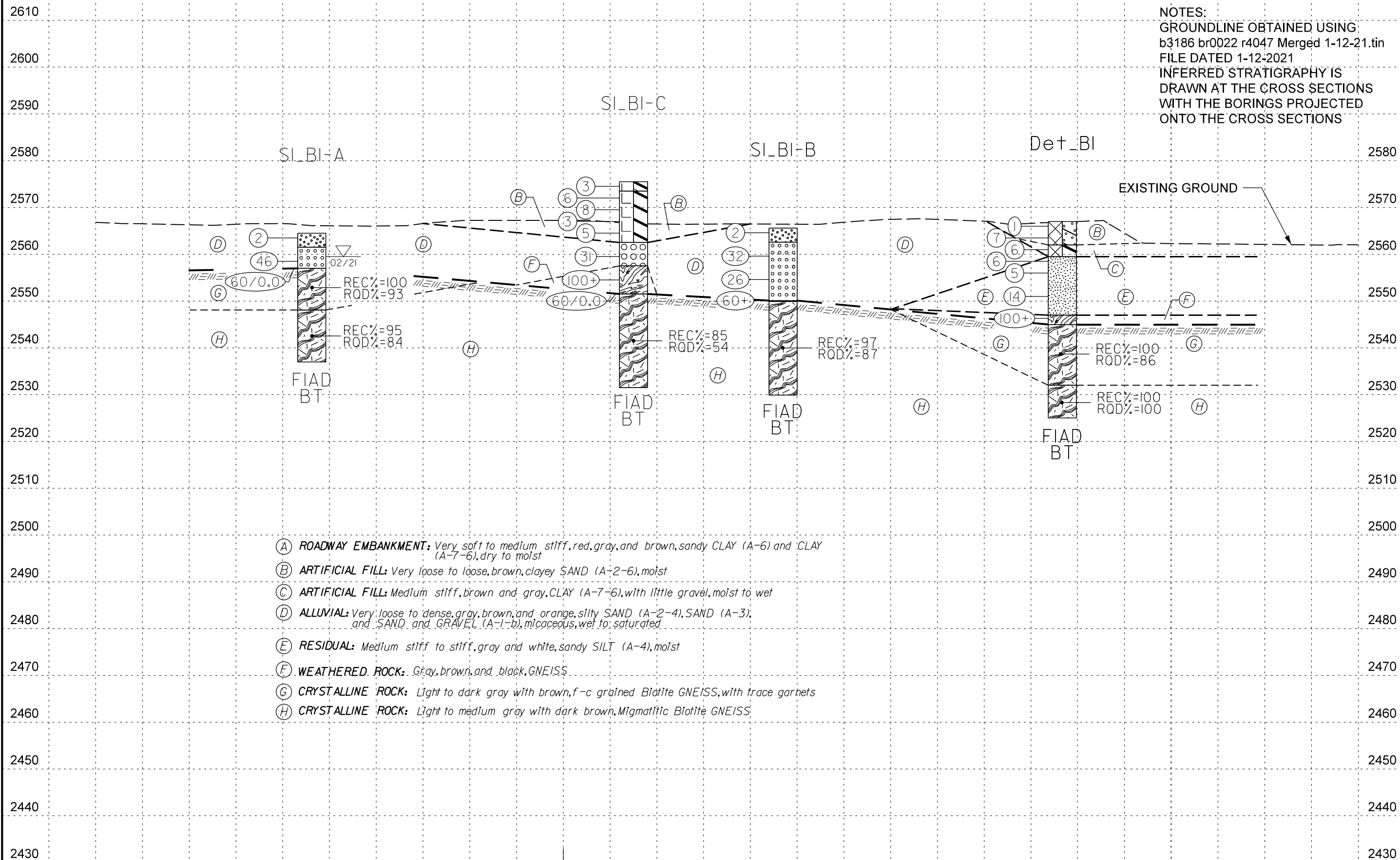
SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT			% PASSING (SIEVES)			% MOISTURE	% ORGANIC	
ST-1	42' LT	41+84	8.5' - 9.6'	A-7-6 (21)	51	27	7.8	19.6	26.4	46.2	98.9	96.8	75.4	26	-
ST-8	42' RT	41+27	7.5' - 9.1'	A-6 (8)	39	20	29.1	11.0	23.0	36.9	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
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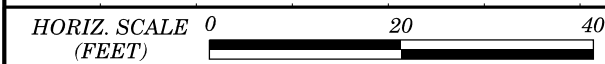


- (A) ROADWAY EMBANKMENT: Loose to dense, brown, tan, and orange, clayey SAND (A-2-6) and SAND and GRAVEL (A-1-b), micaceous, dry to moist
- (B) ROADWAY EMBANKMENT: Soft to very stiff, brown, red, and orange, clayey SILT (A-5), sandy CLAY (A-6), and CLAY (A-7), micaceous, dry to moist
- (C) ARTIFICIAL 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
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INFERRED STRATIGRAPHY IS
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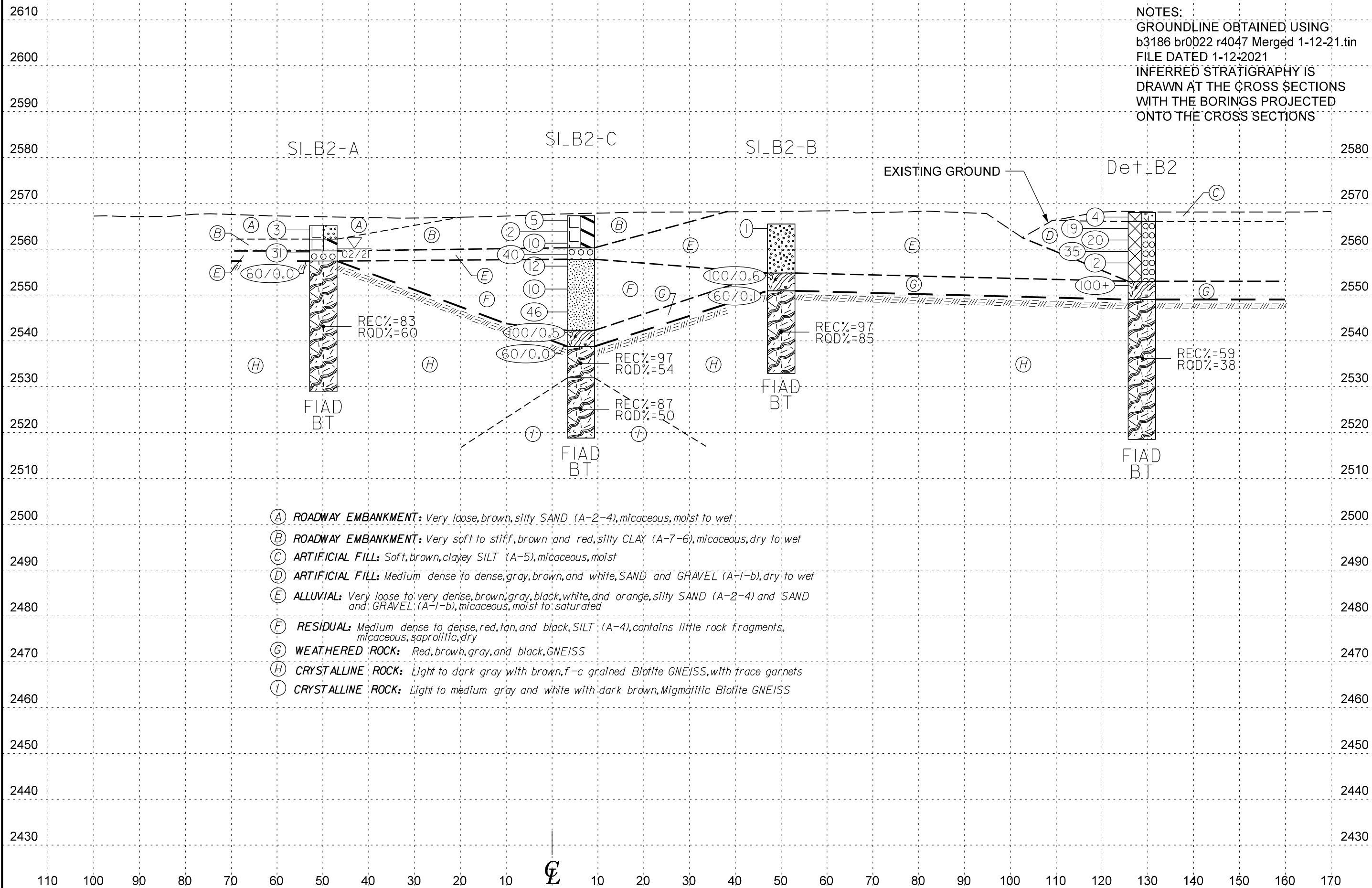
- (A) ROADWAY EMBANKMENT: Very soft to medium stiff, red, gray, and brown, sandy CLAY (A-6) and CLAY (A-7-6), dry to moist
- (B) ARTIFICIAL FILL: Very loose to loose, brown, clayey SAND (A-2-6), moist
- (C) ARTIFICIAL FILL: Medium stiff, brown and gray, CLAY (A-7-6), with little gravel, moist to wet
- (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



VE = 1:1

BRIDGE NO. 1 - BENT 1 - -L- STA. 41+98.31 120° SKEW

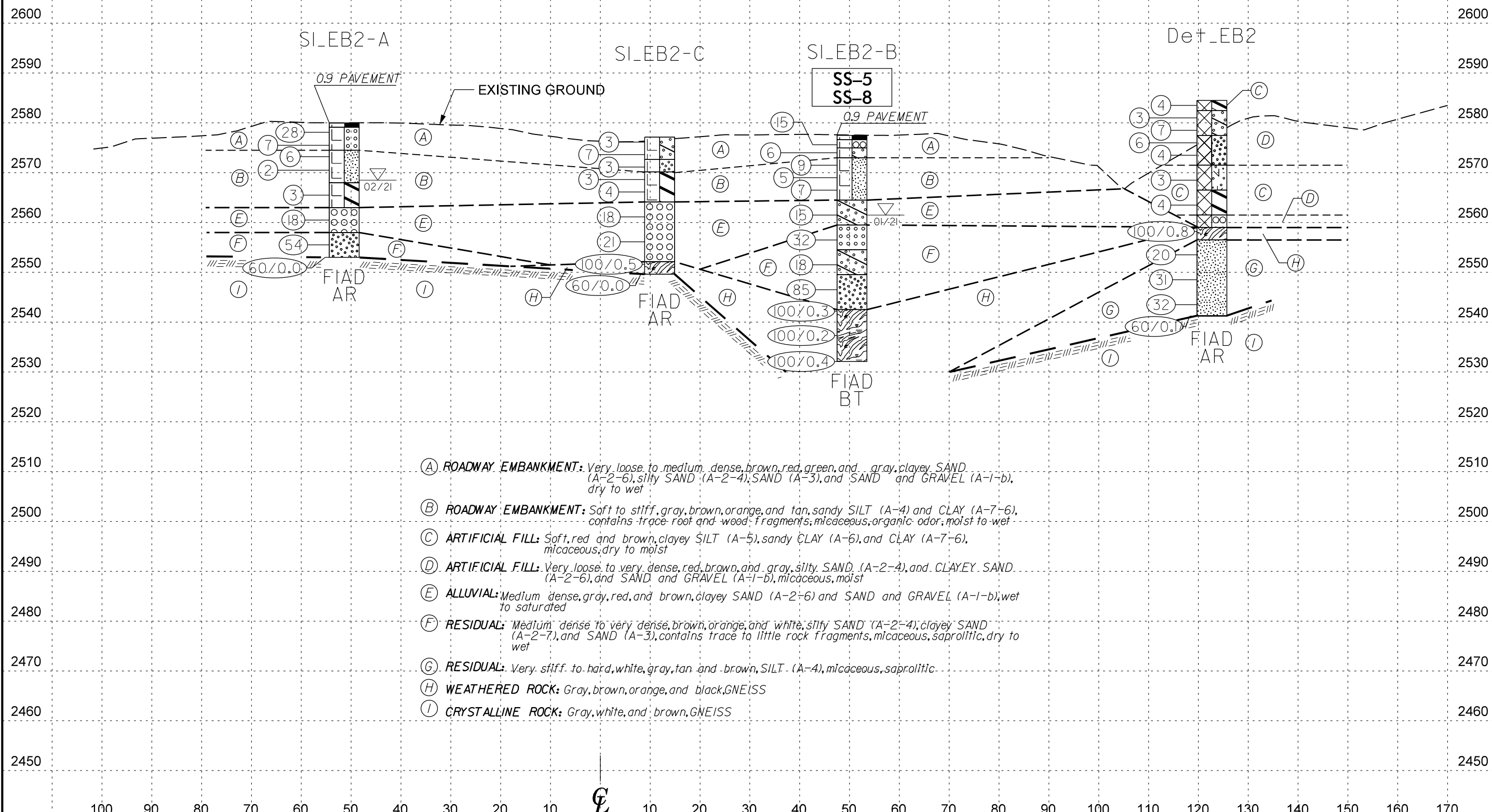
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- (A) ROADWAY EMBANKMENT: Very loose, brown, silty SAND (A-2-4), micaceous, moist to wet
- (B) ROADWAY EMBANKMENT: Very soft to stiff, brown and red, silty CLAY (A-7-6), micaceous, dry to wet
- (C) ARTIFICIAL FILL: Soft, brown, clayey SILT (A-5), micaceous, 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

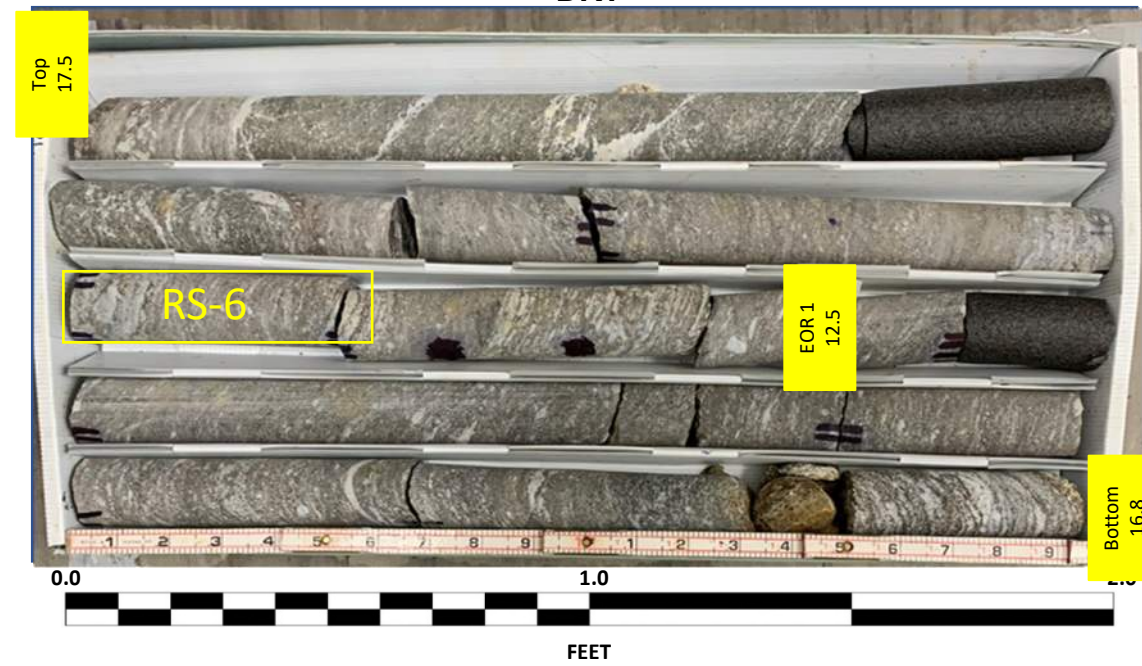
WBS 38332.1.FS1		TIP B-3186 / B-5898		COUNTY HAYWOOD		GEOLOGIST R. Dugger										
SITE DESCRIPTION US 23/ US 74 (Great Smoky Mountain Highway)							GROUND WTR (ft)									
BORING NO. S1_EB1-A		STATION 41+84		OFFSET 42 ft LT		ALIGNMENT -L-										
COLLAR ELEV. 2,577.2 ft		TOTAL DEPTH 30.1 ft		NORTHING 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														
2560			14	16	19											
	2,557.2	20.0														
2555			60/0.1													
	2,552.2	25.0														
2550			17	20	80/0.4											
	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	3	3											
	2,573.3	2.5	4	2	3											
2570			2	3	4											
	2,568.3	7.5	2	2	2											
2565			1	1	4											
	2,565.8	10.0														
2560			6	11	20											
	2,560.8	15.0														
2555			14	13	21											
	2,555.8	20.0														
	2,551.1	24.7														
	2,550.7	25.1	100/0.3													
			60/0.0													

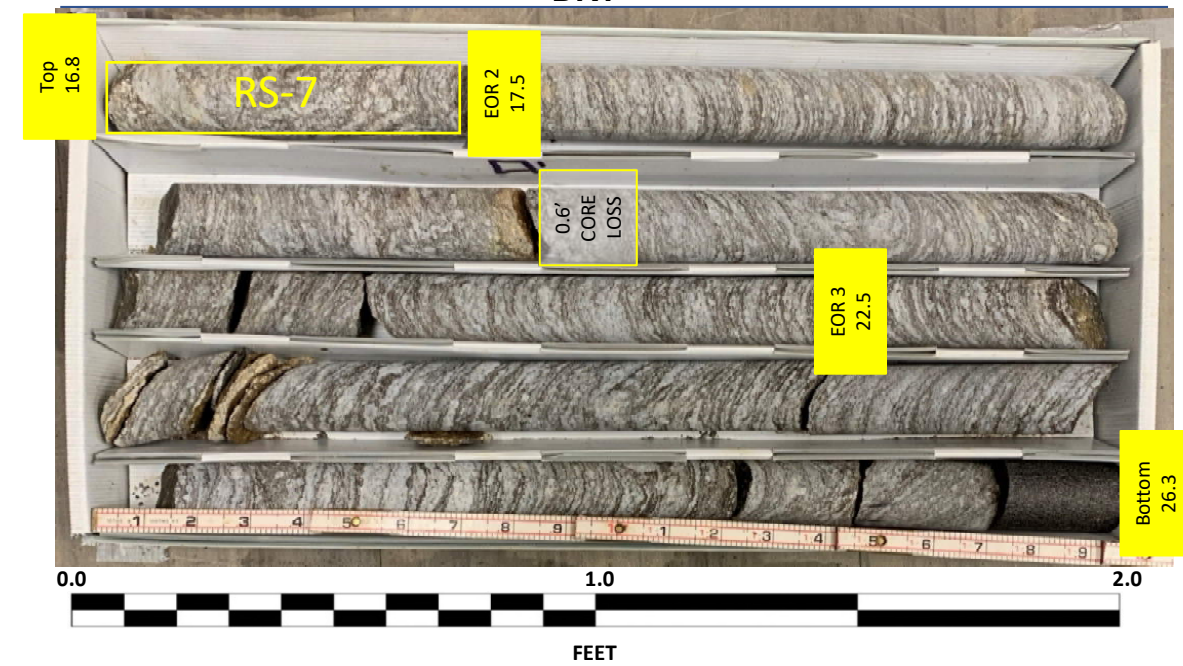
NCDOT BORE DOUBLE B3186_GEO_SPT.GPJ NC_DOT.GDT 7/28/21

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

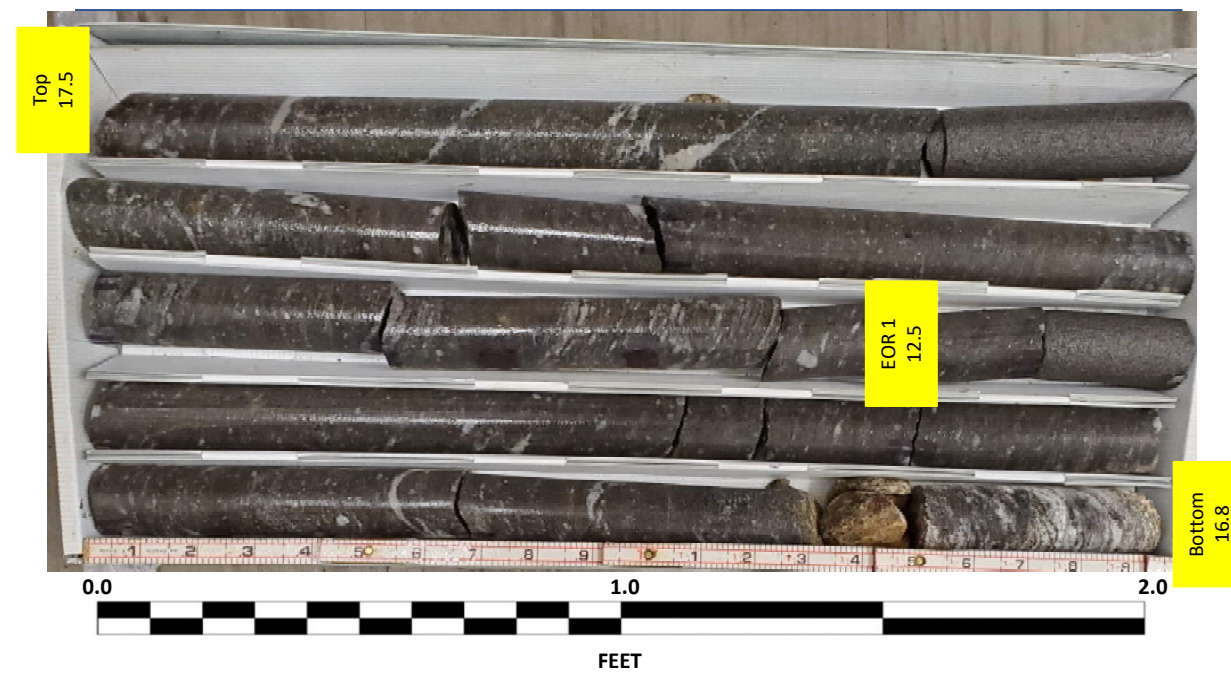
S1_B1-A
Box 1 of 3: 7.5 – 16.8 FEET
DRY



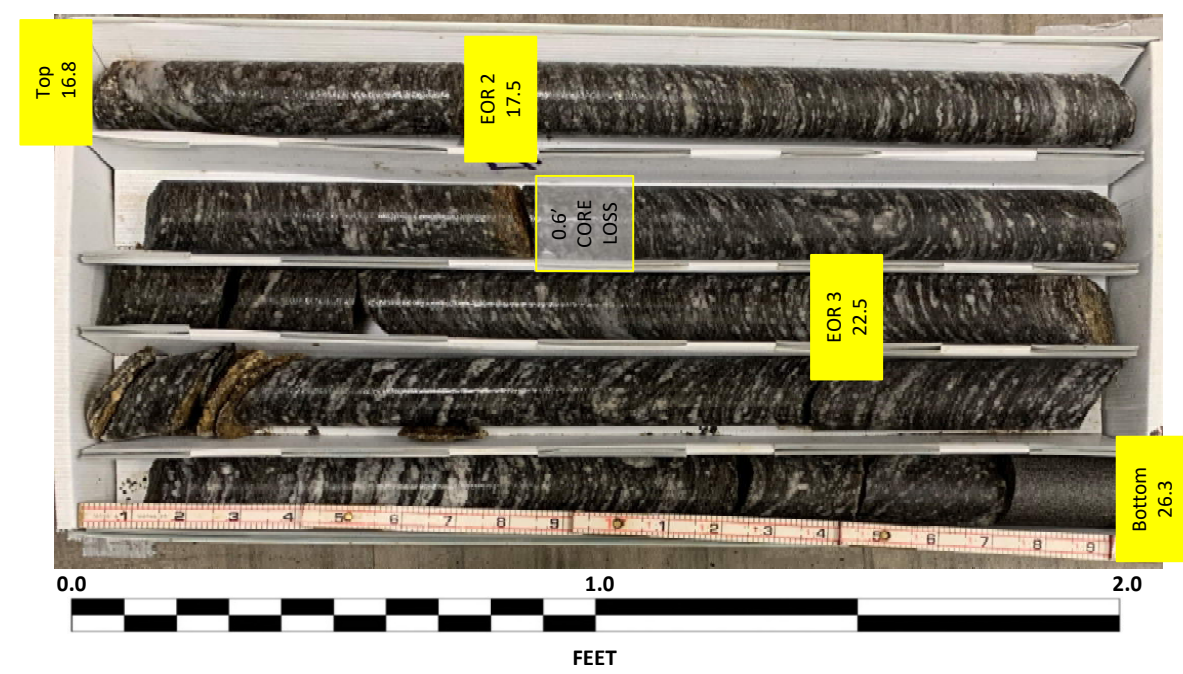
S1_B1-A
Box 2 of 3: 16.8 – 26.3 FEET
DRY



S1_B1-A
Box 1 of 3: 7.5 – 16.8 FEET
WET

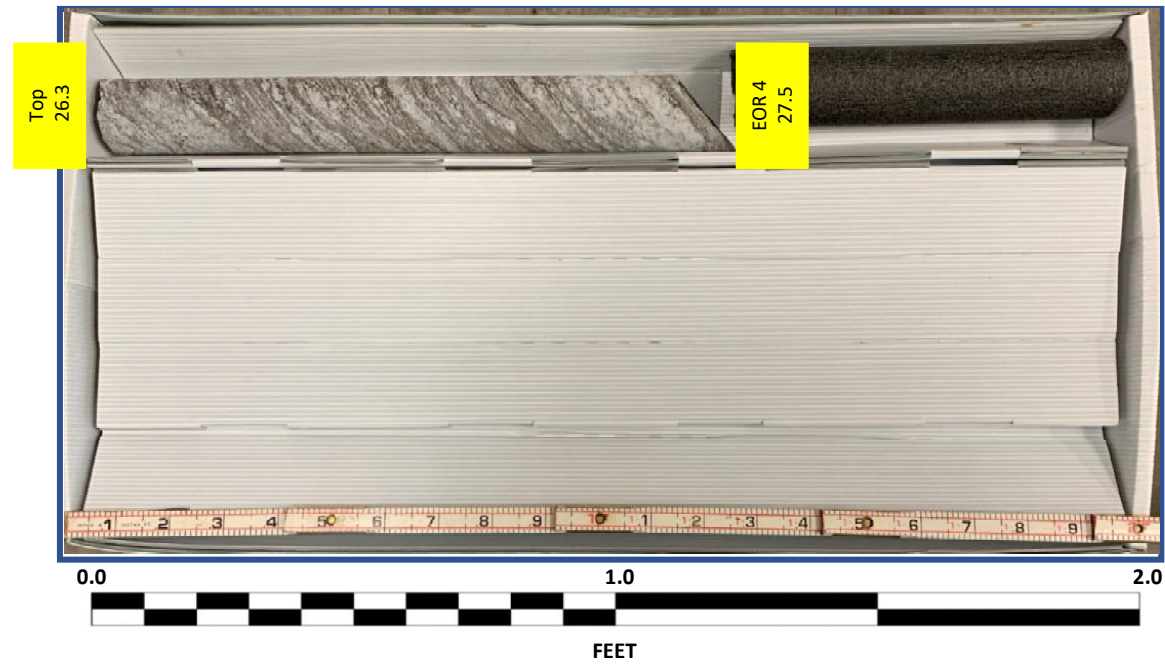


S1_B1-A
Box 2 of 3: 16.8 – 26.3 FEET
WET

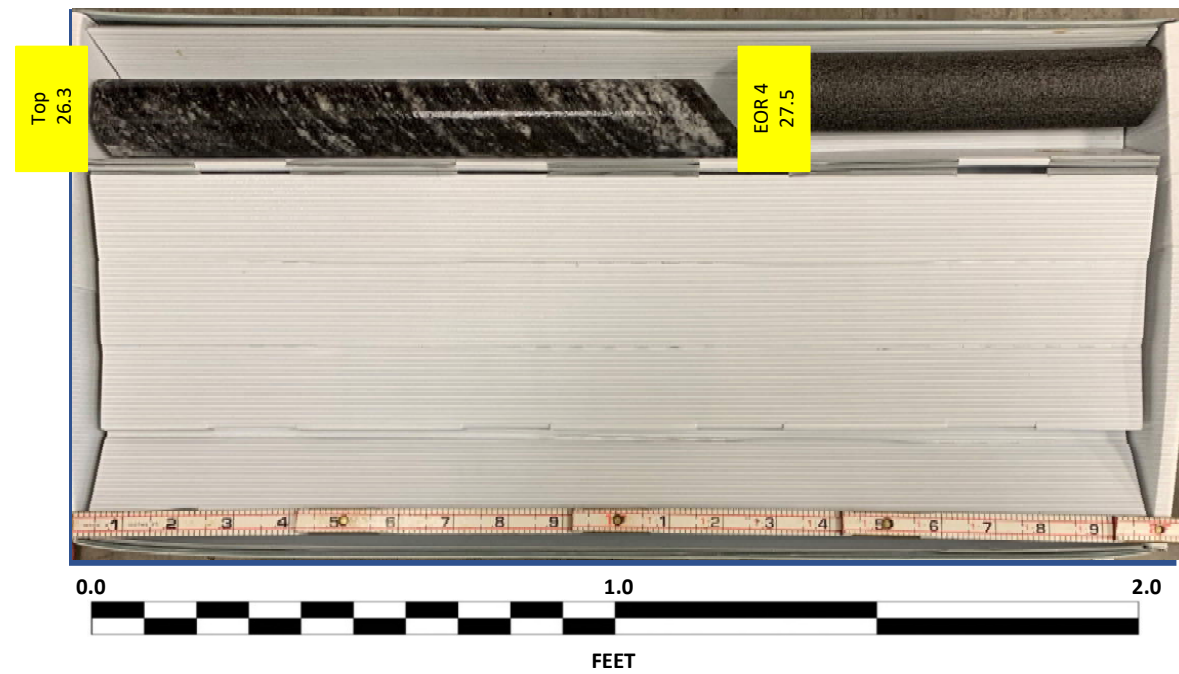


CORE PHOTOGRAPHIC RECORD
38330.1.FS1 (B-3186/B-5898)
US 23/ US 74 Great Smokey Mountain Highway

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



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_B1-C		STATION 41+70		OFFSET 1 ft RT		ALIGNMENT -L-									
COLLAR ELEV. 2,575.5 ft		TOTAL DEPTH 44.0 ft		NORTHING 666,298		EASTING 818,886									
DRILL RIG/HAMMER EFF./DATE GTC3277 CME-75 83% (09/15/2020)			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					
2580															
2575	2,575.5	0.0	1	1	2									2,575.5	GROUND SURFACE
	2,573.0	2.5	3	3	3									2,573.5	ROADWAY EMBANKMENT Very soft, red and brown, sandy CLAY (A-6)
2570	2,570.5	5.0	2	3	5										Soft to medium stiff, red, gray, and brown, CLAY (A-7-6)
	2,568.0	7.5	2	2	1										
2565	2,565.5	10.0	1	2	3										
2560	2,560.5	15.0	11	16	15									2,562.5	ALLUVIAL Dense, gray, SAND and GRAVEL (A-1-b)
2555	2,555.5	20.0	87	50/0.5										2,557.5	WEATHERED ROCK Gray and black, GNEISS
2550	2,551.5	24.0	60/0.0											2,551.5	CRYSTALLINE ROCK Gray, black, and white, Migmatitic Biotite GNEISS
2545															
2540															
2535														2,531.5	Boring Terminated at Elevation 2,531.5 ft in Crystalline Rock (GNEISS)

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_B1-C		STATION 41+70		OFFSET 1 ft RT		ALIGNMENT -L-				
COLLAR ELEV. 2,575.5 ft		TOTAL DEPTH 44.0 ft		NORTHING 666,298		EASTING 818,886				
DRILL RIG/HAMMER EFF./DATE GTC3277 CME-75 83% (09/15/2020)			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				
CORE SIZE		TOTAL RUN		RUN		STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	REC. (ft) %	RQD (ft) %	SAMP. NO.			
2551.5	2,551.5	24.0	6.0	2:18 2:09 2:20 2:13 2:07 2:08	(4.5) 75%	(2.9) 48%				
2545	2,545.5	30.0	5.0	2:19 2:13 2:17 1:58 2:09	(4.8) 96%	(3.5) 70%		(17.0) 85%	(10.7) 54%	Begin Coring @ 24.0 ft CRYSTALLINE ROCK Gray, black, and white, Migmatitic Biotite GNEISS moderate to slight weathering, hard, close fracture spacing (<i>continued</i>) 1.5' core loss Close to moderately close fracture spacing; 0.2' core loss
2540	2,540.5	35.0	5.0	1:46 1:48 1:53 1:50 1:59	(4.0) 80%	(1.9) 38%				Moderately hard, very close to close fracture spacing Close to moderately close fracture spacing, hard, moderate to slight weathering; 1.0' core loss
2535	2,535.5	40.0	4.0	2:11 1:49 2:21 2:13	(3.7) 93%	(2.4) 60%	RS-9			RS-9 39.4' - 40.0' GSI= 70 - 80 Qu= 13,205 psi
	2,531.5	44.0								0.3' core loss Boring Terminated at Elevation 2,531.5 ft in Crystalline Rock (GNEISS)

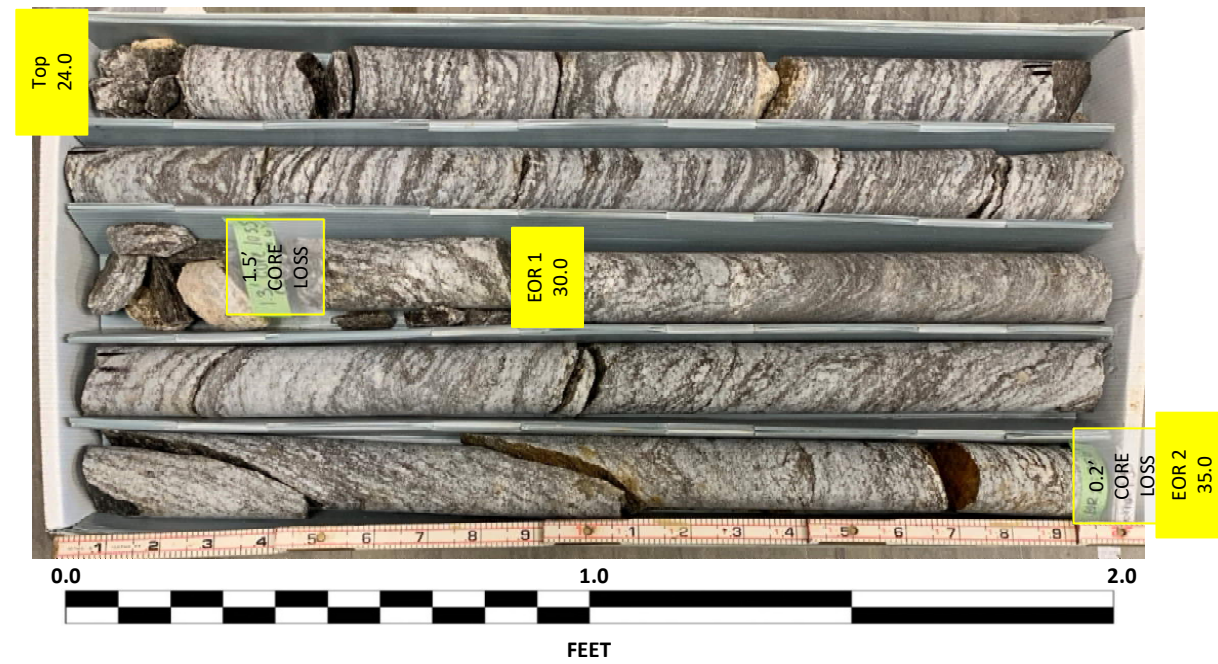
NCDOT BORE DOUBLE_B3186_GEO_SPT.GPJ NC_DOT.GDT 8/3/21

CORE PHOTOGRAPHIC RECORD

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

US 23/ US 74 Great Smokey Mountain Highway

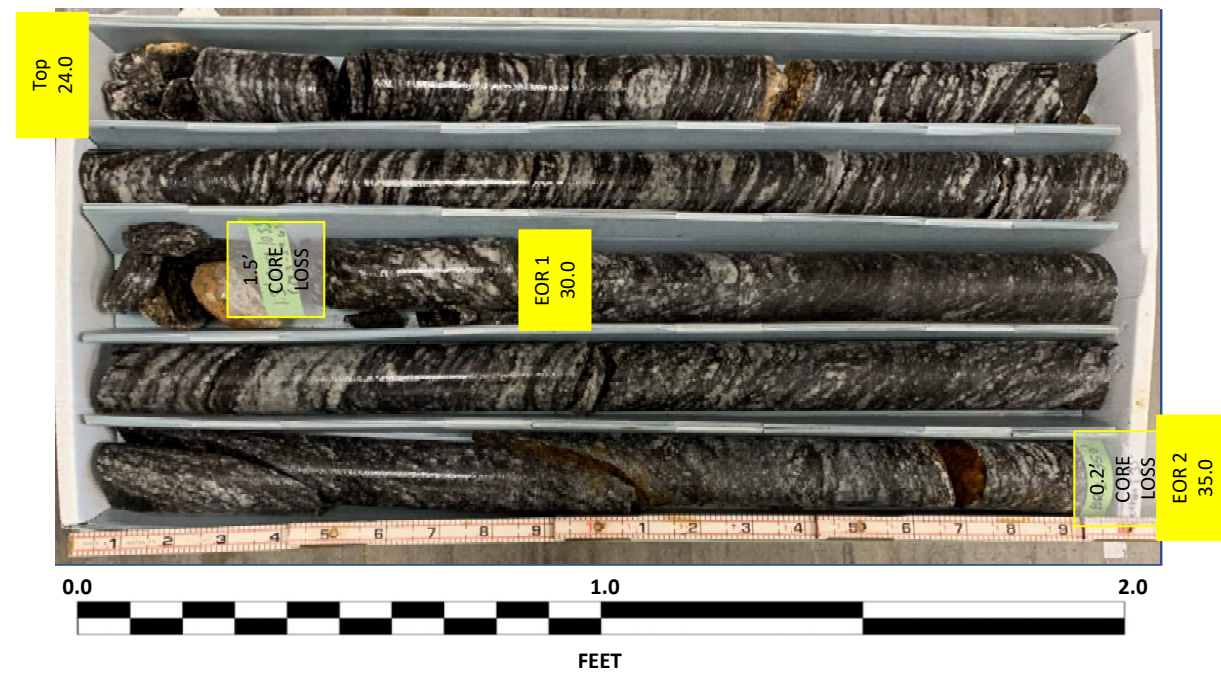
S1_B1-C
Box 1 of 2: 24.0 – 35.0 FEET
DRY



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



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

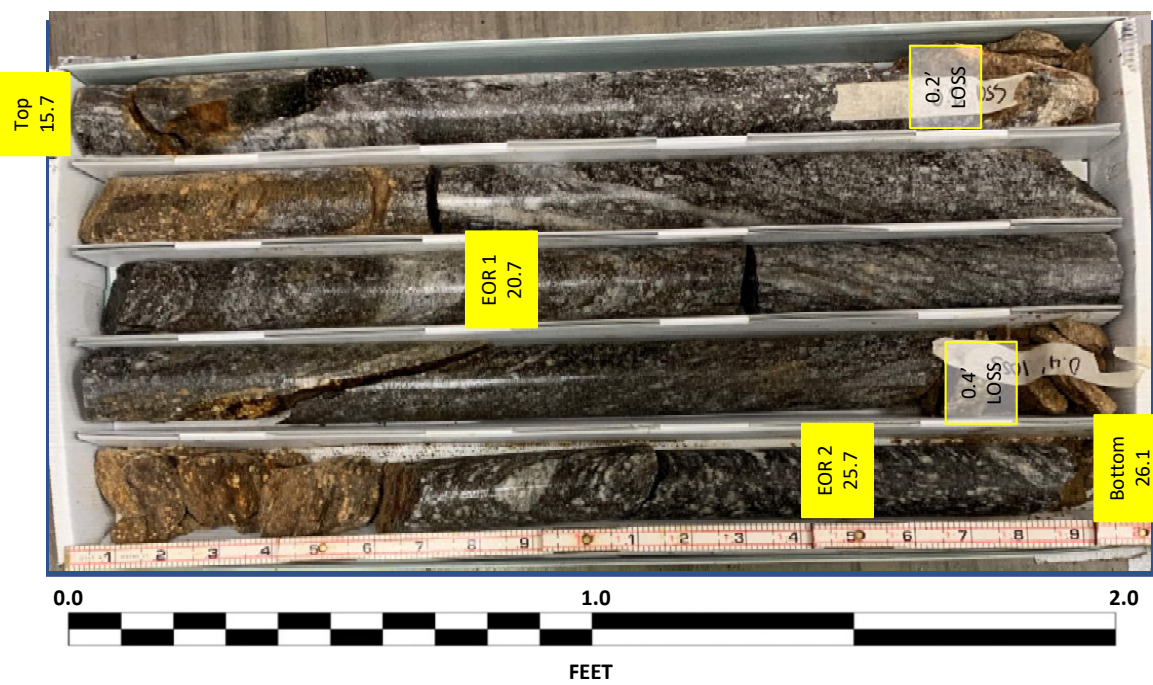
S1_B1-B
Box 1 of 2: 15.7 – 26.1 FEET
DRY



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								W	2,565.2	0.0
2560	2,560.2	5.0	7	13	18								W	2,562.2	3.0
2555	2,557.4	7.8	60/0.0										Sat.	2,559.6	5.6
2550														2,557.4	7.8
2545															
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. (%)	RQD (%)		REC. (%)	RQD (%)			
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										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	
	2,553.9	11.3	5.0	3:02/1.0 0:47/1.0 0:55/1.0 1:25/1.0	(3.2) 64%	(0.0) 0%						
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	
2535	2,533.9	31.3	5.0	2:01/1.0 1:47/1.0 1:50/1.0 2:23/1.0 2:38/1.0	(5.0) 100%	(2.5) 50%					With trace garnets, slight weathering, hard, close to wide fracture spacing	
2530	2,528.9	36.3		2:15/1.0 2:09/1.0 2:14/1.0 1:16/1.0 2:05/1.0							Very close to close fracture spacing	
Boring Terminated at Elevation 2,528.9 ft in Crystalline Rock (GNEISS)												

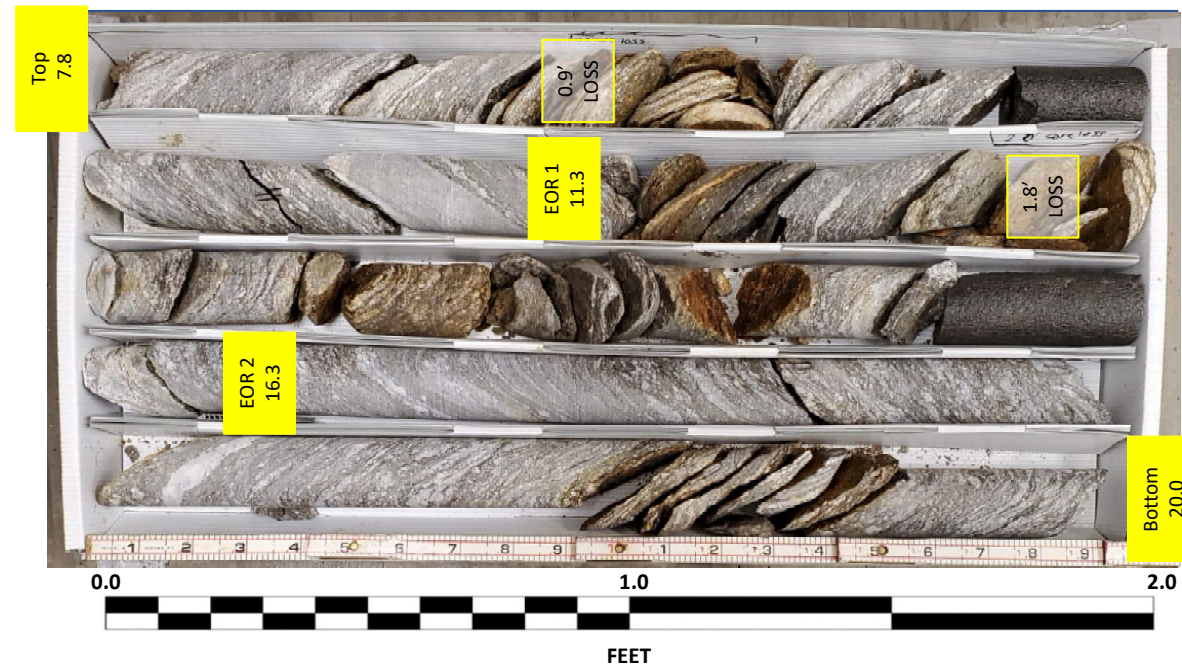
NCDOT BORE DOUBLE_B3186_GEO_SPT.GPJ_NC_DOT.GDT 7/28/21

CORE PHOTOGRAPHIC RECORD

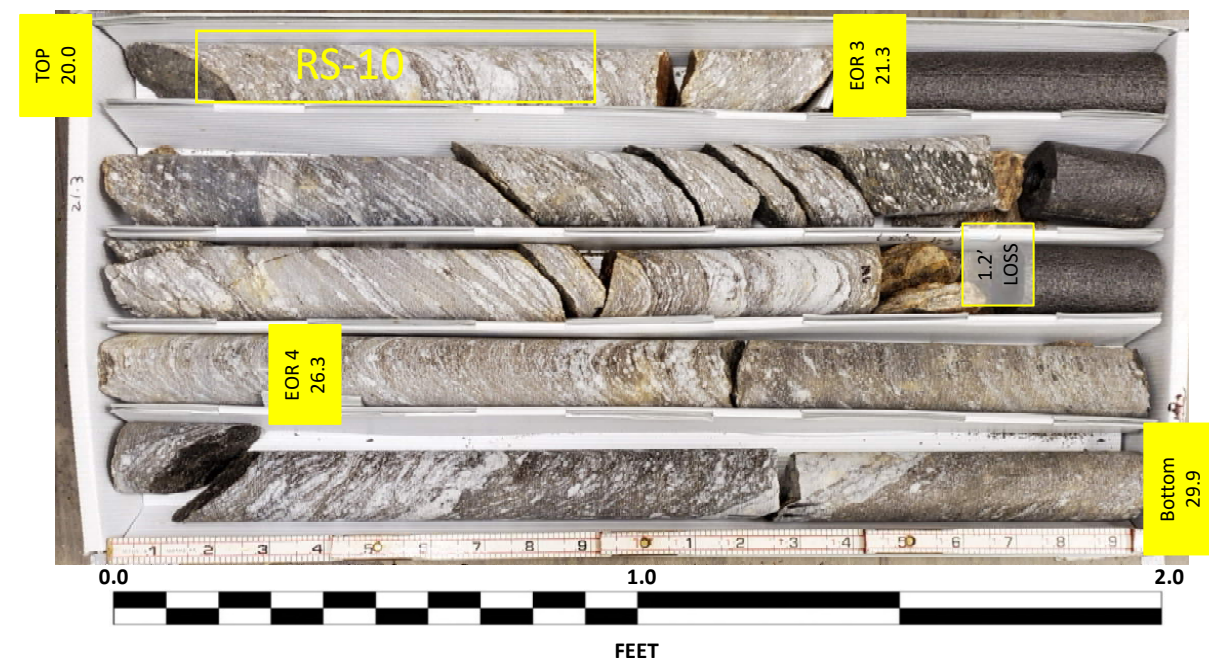
38330.1.FS1 (B-3186/B-5898)

US 23/ US 74 Great Smokey Mountain Highway

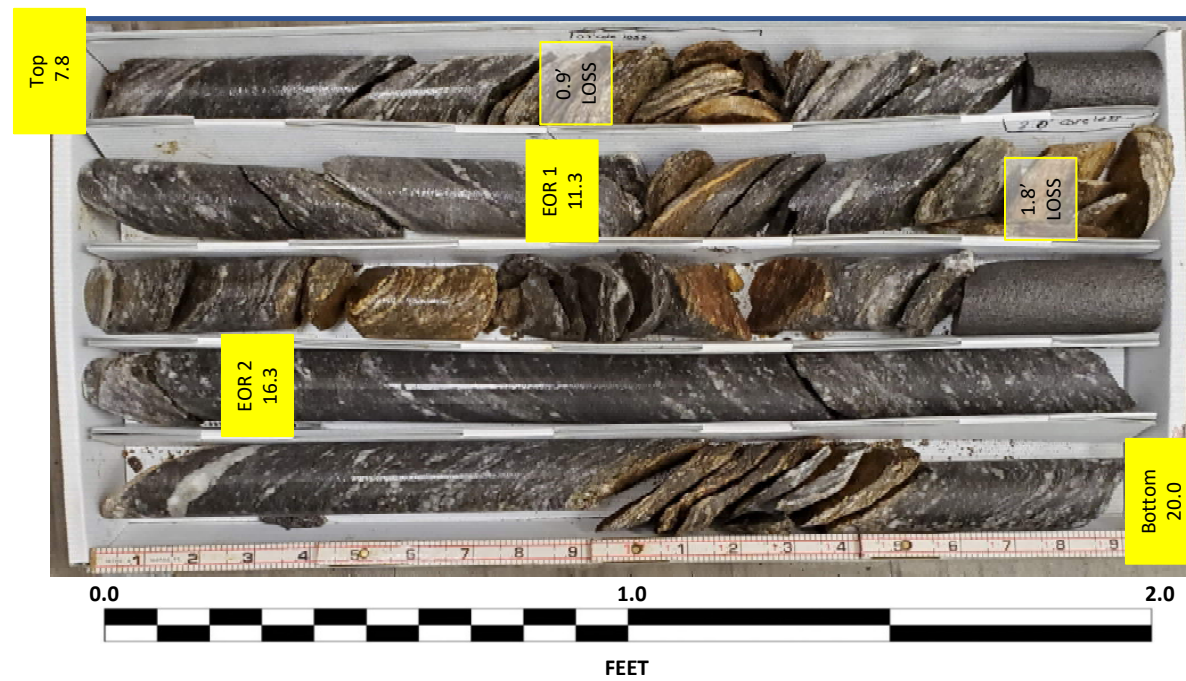
S1_B2-A
Box 1 of 3: 7.8 – 20.0 FEET
DRY



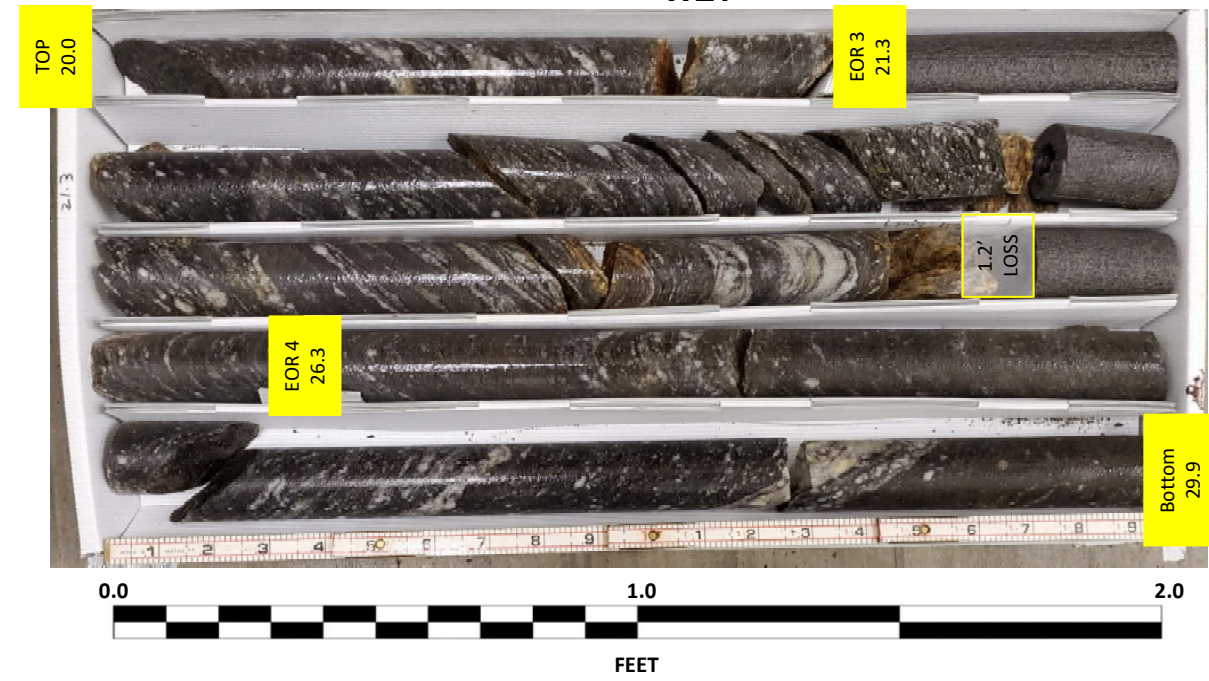
S1_B2-A
Box 2 of 3: 20.0-29.9 FEET
DRY



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

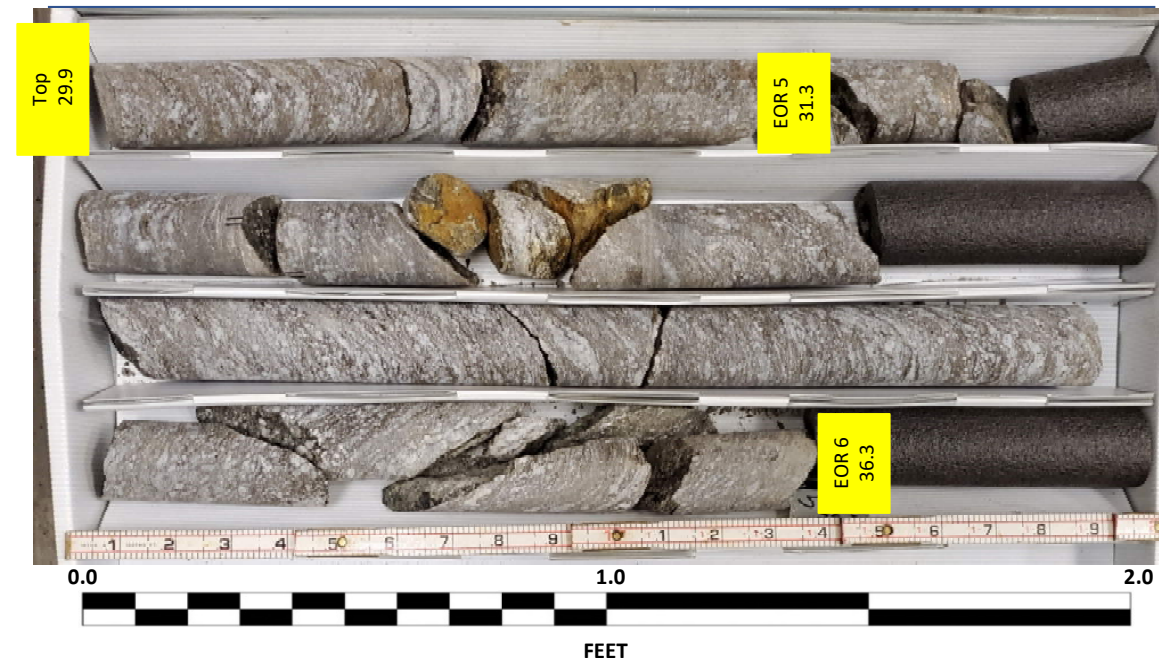


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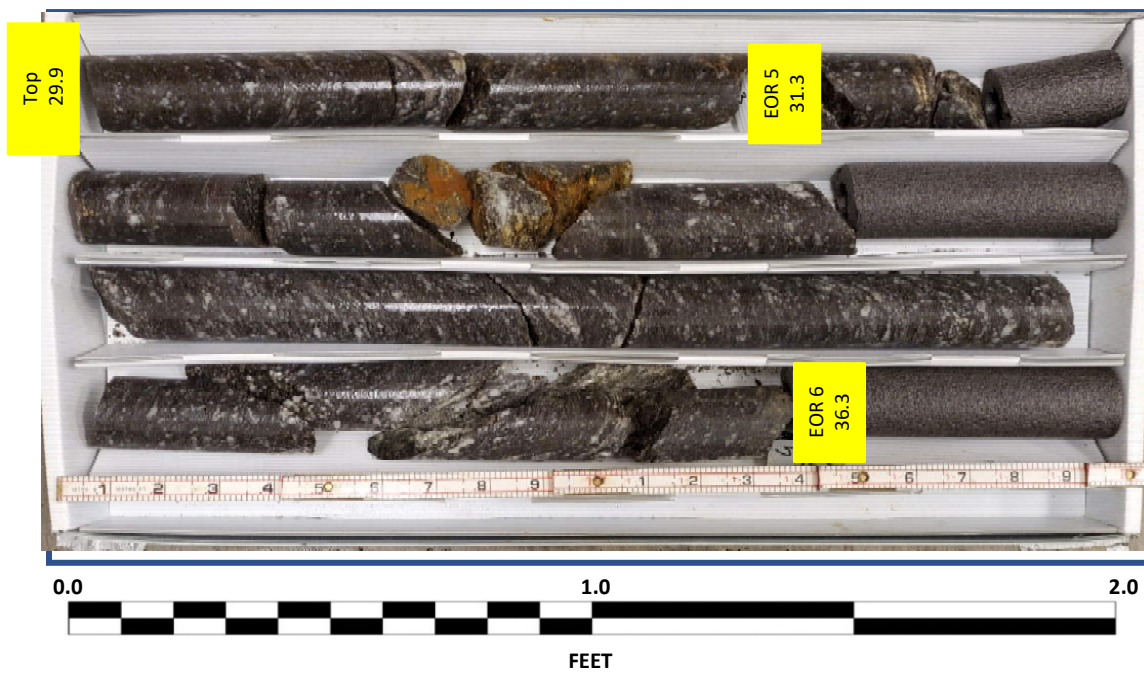
38330.1.FS1 (B-3186/B-5898)

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	1	2	3									2,567.3	0.0	GROUND SURFACE
2565	2,564.8	2.5	1	1	1											ROADWAY EMBANKMENT Very soft to medium stiff, red and brown, silty CLAY (A-7-6), micaceous
	2,562.3	5.0	3	3	7											
2560	2,559.8	7.5	18	14	26											ALLUVIAL
	2,557.3	10.0	4	5	7									2,557.8	9.5	Medium dense to very dense, gray, black, and white, SAND and GRAVEL (A-1-b)
2555																RESIDUAL
	2,552.3	15.0	3	4	6											Medium dense to dense, red, tan, and black, SILT (A-4), contains little rock fragments, micaceous, saprolitic
2550																
	2,547.3	20.0	8	16	30											
2545																
	2,542.3	25.0	100/0.5											2,542.3	25.0	WEATHERED ROCK
2540																Red, brown, and black, GNEISS
	2,538.8	28.5	60/0.0											2,538.8	28.5	CRYSTALLINE ROCK
2535																Light to dark gray with brown, f-c grained Biotite GNEISS, with trace garnets
2530														2,531.9	35.4	Light to dark gray with brown, Migmatic Biotite GNEISS
2525																
2520														2,518.8	48.5	Boring Terminated at Elevation 2,518.8 ft in Crystalline Rock (GNEISS)

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	1:49/0.5 2:09	100%	87%		97%	54%		WEATHERED ROCK (continued)	28.5
2535											CRYSTALLINE ROCK	
											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	
	2,532.3	35.0	5.0	2:32 1:49 2:31 2:49 2:49	(4.8)	(2.4)	RS-11				Severe weathering, medium to moderately hard, very close fracture spacing 0.2' core loss	35.4
2530											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	(5.0)	(4.3)		(11.4)	(6.6)		RS-11 33.5' - 34.1' GSI= 60 - 70 Qu= 3,264 psi (sampled along healed joint)	
2525											Light to dark gray with brown, Migmatic Biotite GNEISS, moderate to slight weathering, hard to moderately hard, very close to close fracture spacing	
	2,522.3	45.0	3.5	1:37 1:42 1:57 1:53 1:59	(5.0)	(1.0)					Core barrel blocked off	
2520											1.9' core loss	
	2,518.8	48.5		1:38 1:41 2:09 1:08/0.5	(1.6)	(0.4)					Boring Terminated at Elevation 2,518.8 ft in Crystalline Rock (GNEISS)	48.5

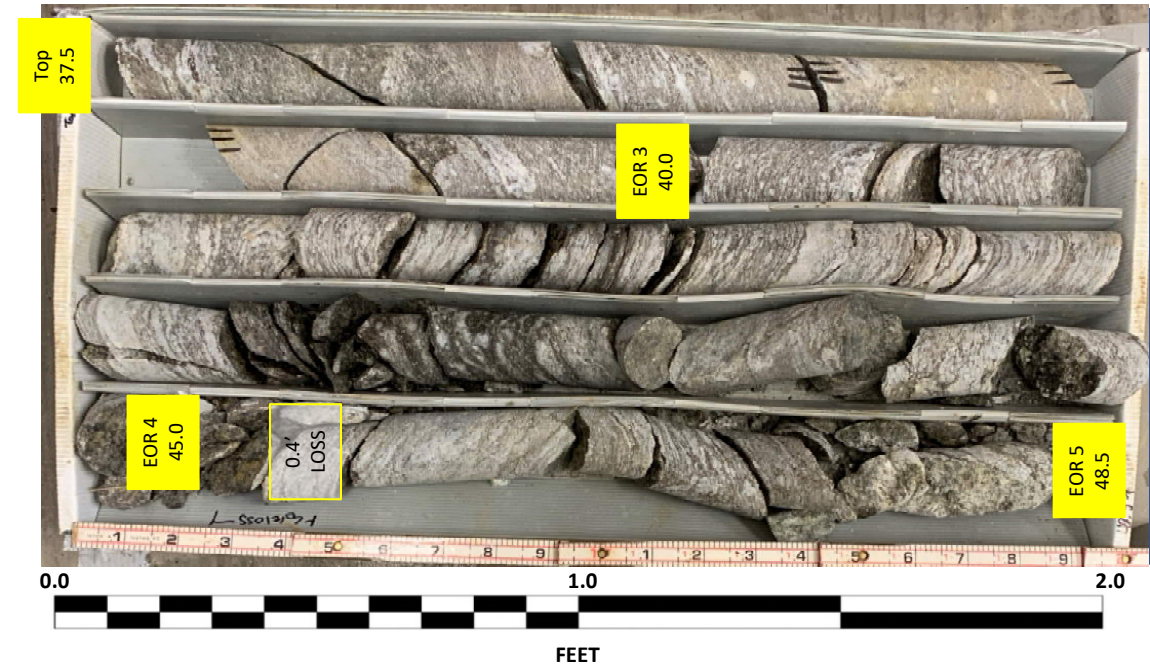
NCDOT BORE DOUBLE_B3186_GEO_SPT.GPJ NC_DOT.GDT 8/2/21

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

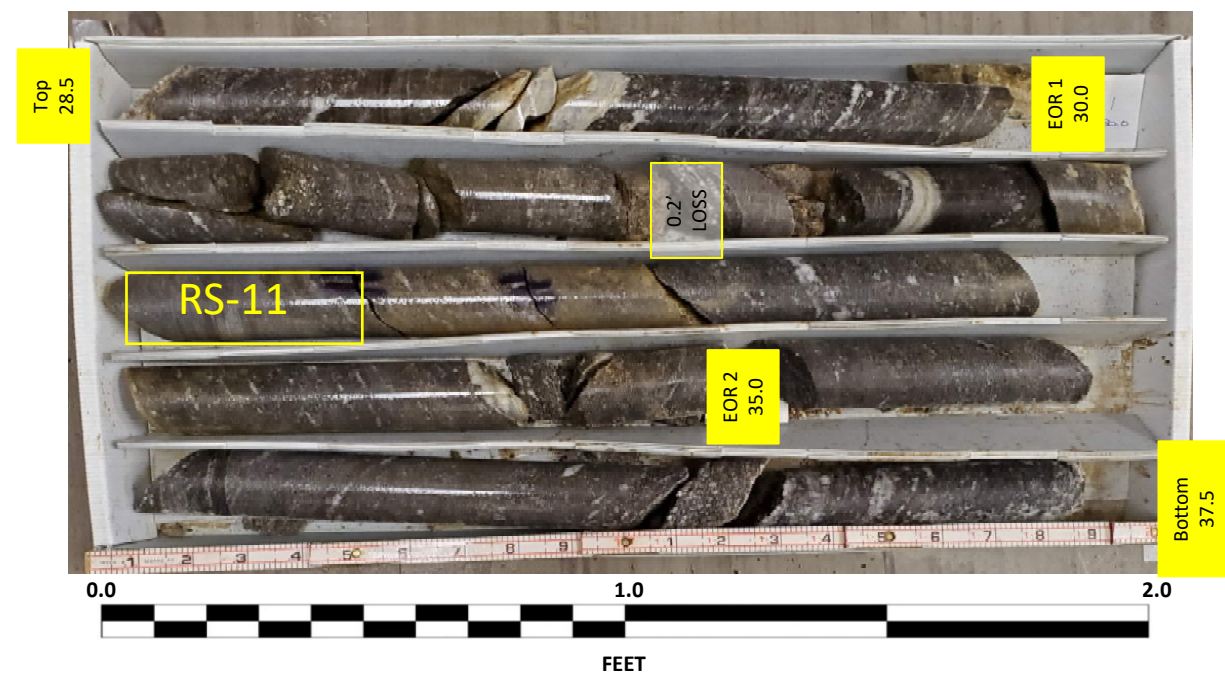
S1_B2-C
Box 1 of 2: 28.5 – 37.5 FEET
DRY



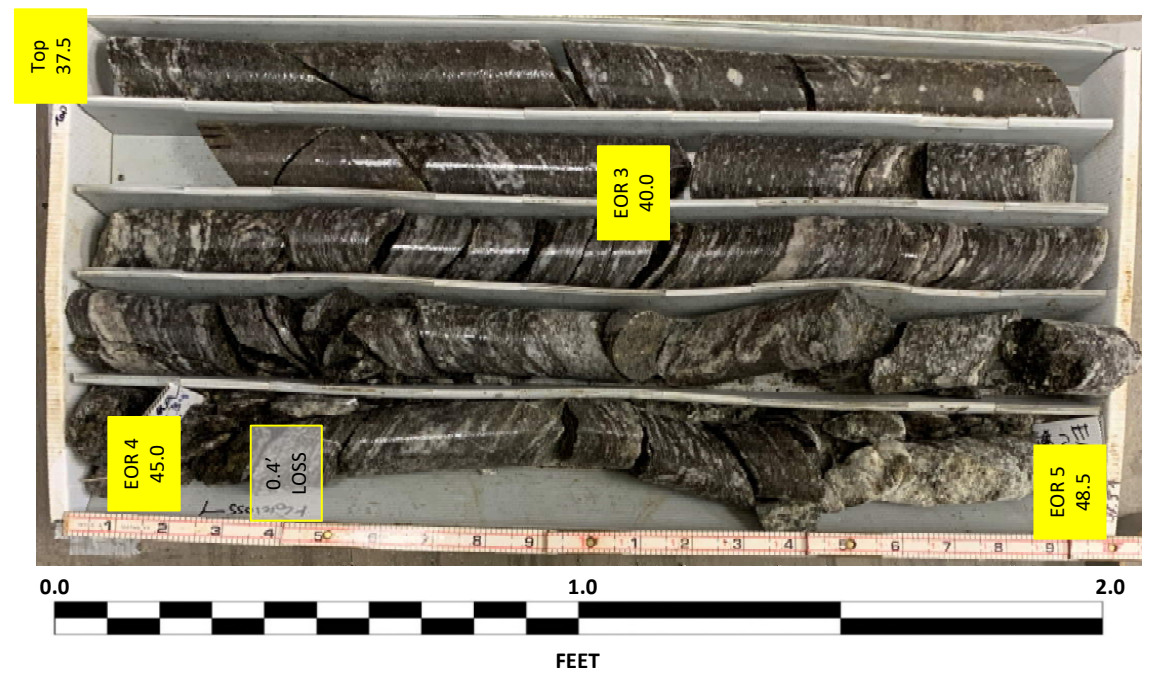
S1_B2-C
Box 2 of 2: 37.5 – 48.5 FEET
DRY



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

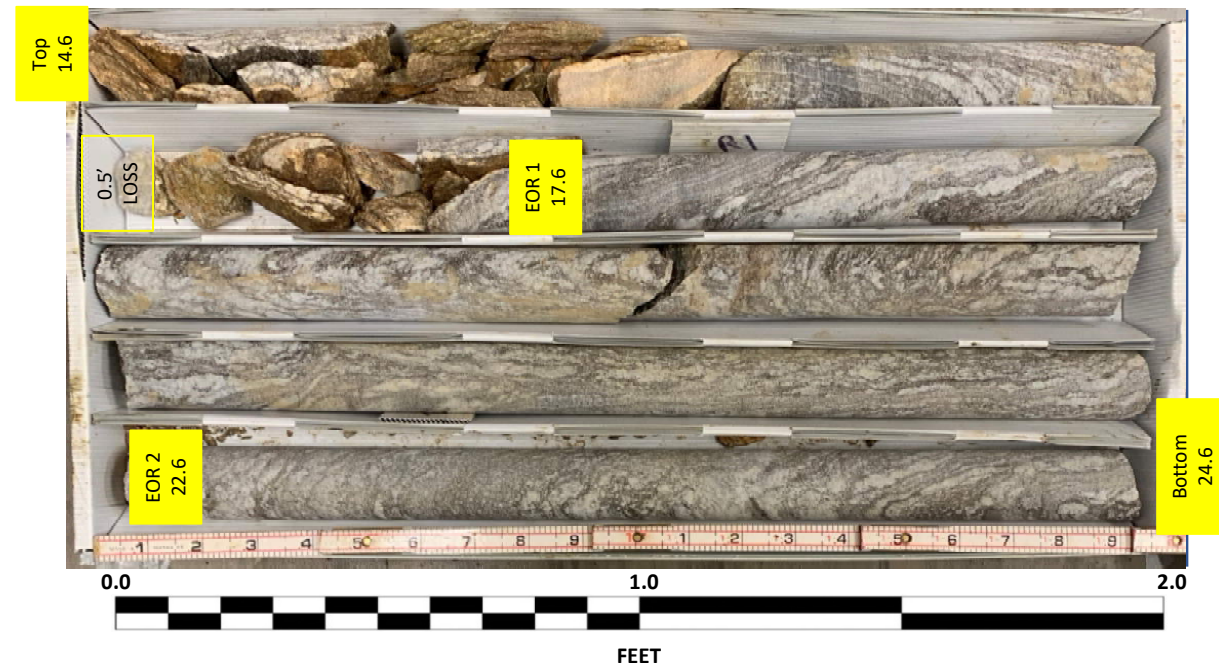
CORE LOG

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															
Boring Terminated at Elevation 2,532.9 ft in Crystalline Rock (GNEISS)															
NOTES 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						
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) %			
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%		(17.5) 97%	(14.9) 83%		Begin Coring @ 14.6 ft	14.6
	2,547.9	17.6	5.0	0:0 0:0 0:0	(5.0) 100%	(5.0) 100%					CRYSTALLINE ROCK 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	
2545											Slight weathering, hard, moderately close to wide fracture spacing	
	2,542.9	22.6	5.0	0:0 0:0 0:0	(5.0) 100%	(4.7) 94%						
2540											Close to moderately close fracture spacing	
	2,537.9	27.6	5.0	0:0 0:0 0:0	(5.0) 100%	(4.7) 94%						
2535												
	2,532.9	32.6		0:0 0:0 0:0							Boring Terminated at Elevation 2,532.9 ft in Crystalline Rock (GNEISS)	32.6
NOTES Rocking coring times not available												

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

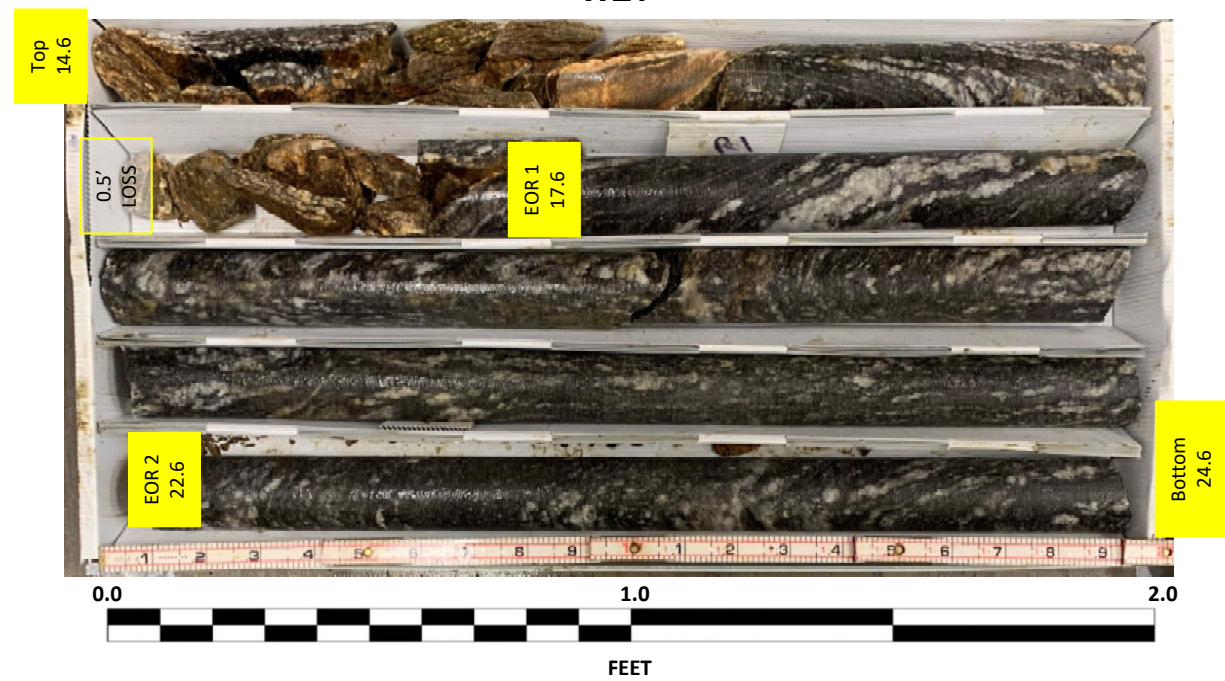
S1_B2-B
Box 1 of 2: 14.6 – 24.6 FEET
DRY



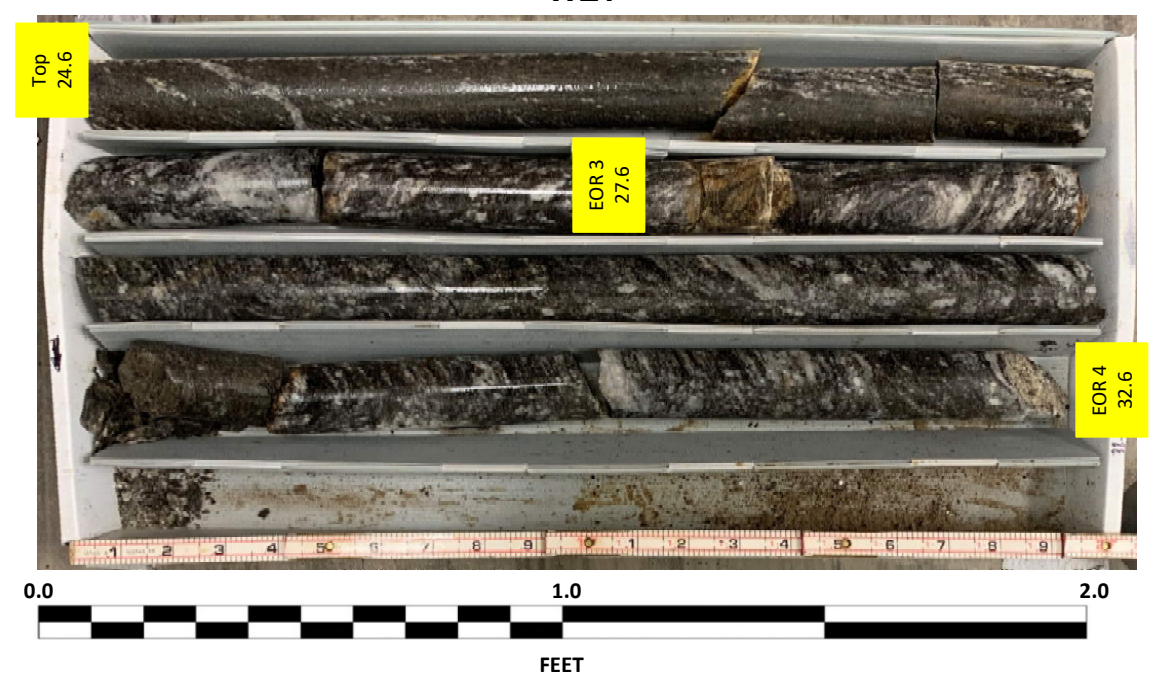
S1_B2-B
Box 2 of 2: 24.6 – 32.6 FEET
DRY



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									2,568.0	Soft, gray, CLAY (A-7-6), contains trace wood fragments, micaceous	12.0
2570	2,566.5	13.5	2	1	2									2,563.0	ALLUVIAL Very loose, gray, SAND and GRAVEL (A-1-b)	17.0
	2,561.5	18.5	4	6	12									2,558.0	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
	2,553.0	27.0	60/0.0													
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									2,574.6	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									2,569.6	Soft, red, gray and tan, CLAY (A-7-6), with trace sand	
2570	2,569.6	7.5	1	1	2									2,567.1	ALLUVIAL Medium dense, gray, red, and brown, SAND and GRAVEL (A-1-b)	13.0
	2,567.1	10.0	1	1	3									2,562.1	RESIDUAL Very dense, brown, orange, and white, silty SAND (A-2-4), saprolitic	22.0
2565	2,562.1	15.0	5	10	8									2,557.1	Boring Terminated with Standard Penetration Test Refusal at Elevation 2,553.0 ft on Crystalline Rock (GNEISS)	27.0
	2,557.1	20.0	25	15	6									2,552.1	WEATHERED ROCK Gray and black, granitic GNEISS	25.0
2560	2,552.1	25.0	100/0.5											2,549.6	Boring Terminated with Standard Penetration Test Refusal at Elevation 2,549.6 ft on Crystalline Rock (GNEISS)	27.5
	2,549.6	27.5	60/0.0													

GEOTECHNICAL BORING REPORT

BORE LOG

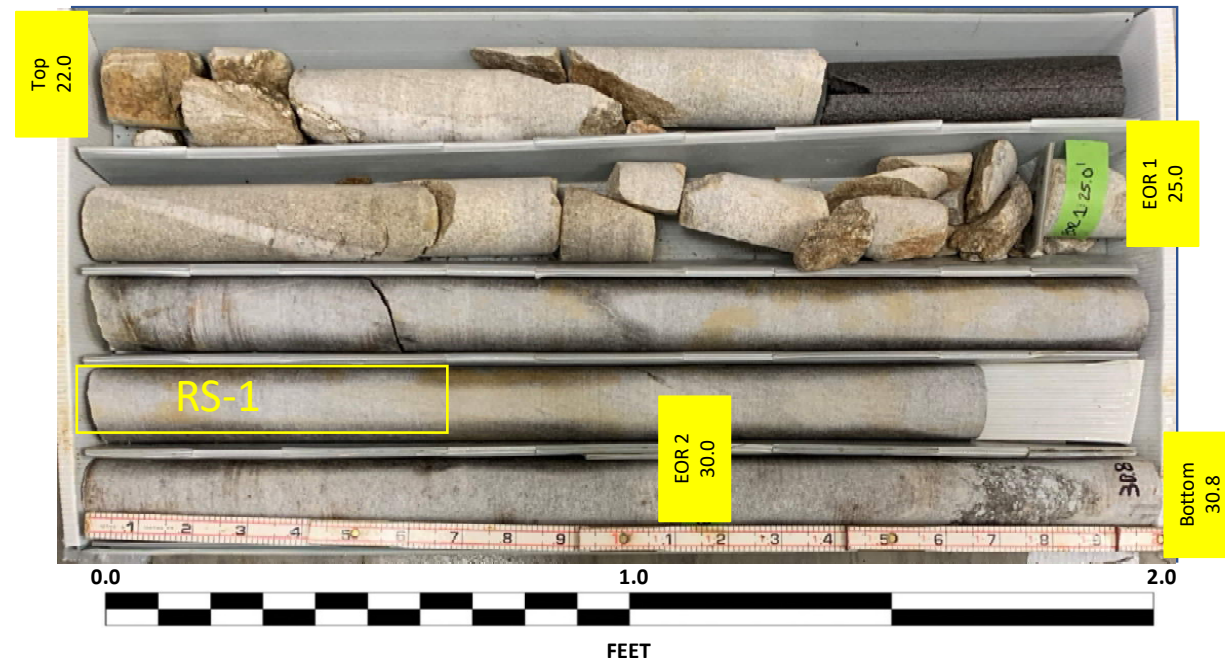
WBS 38332.1.FS1		TIP B-3186 / B-5898		COUNTY HAYWOOD		GEOLOGIST R. Dugger										
SITE DESCRIPTION US 23/ US 74 (Great Smoky Mountain Highway)							GROUND WTR (ft)									
BORING NO. S1_EB2-B		STATION 43+64		OFFSET 45 ft RT		ALIGNMENT -L-										
COLLAR ELEV. 2,577.5 ft		TOTAL DEPTH 45.4 ft		NORTHING 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	6	12	20											
	2,557.5	20.0	4	7	11											
2555	2,555.0	22.5														
	2,552.5	25.0														
2550	2,550.0	27.5	52	40	45											
	2,547.5	30.0														
2545	2,545.0	32.5														
	2,542.5	35.0														
2540	2,540.0	37.5														
	2,537.5	40.0														
2535	2,535.0	42.5														
	2,532.5	45.0														
Boring Terminated at Elevation 2,532.1 ft in Weathered 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. 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	6	8	7											
2555	2,555.8	15.0														
	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														
Boring Terminated with Standard Penetration Test Refusal at Elevation 2,546.8 ft on Crystalline Rock (GNEISS)																

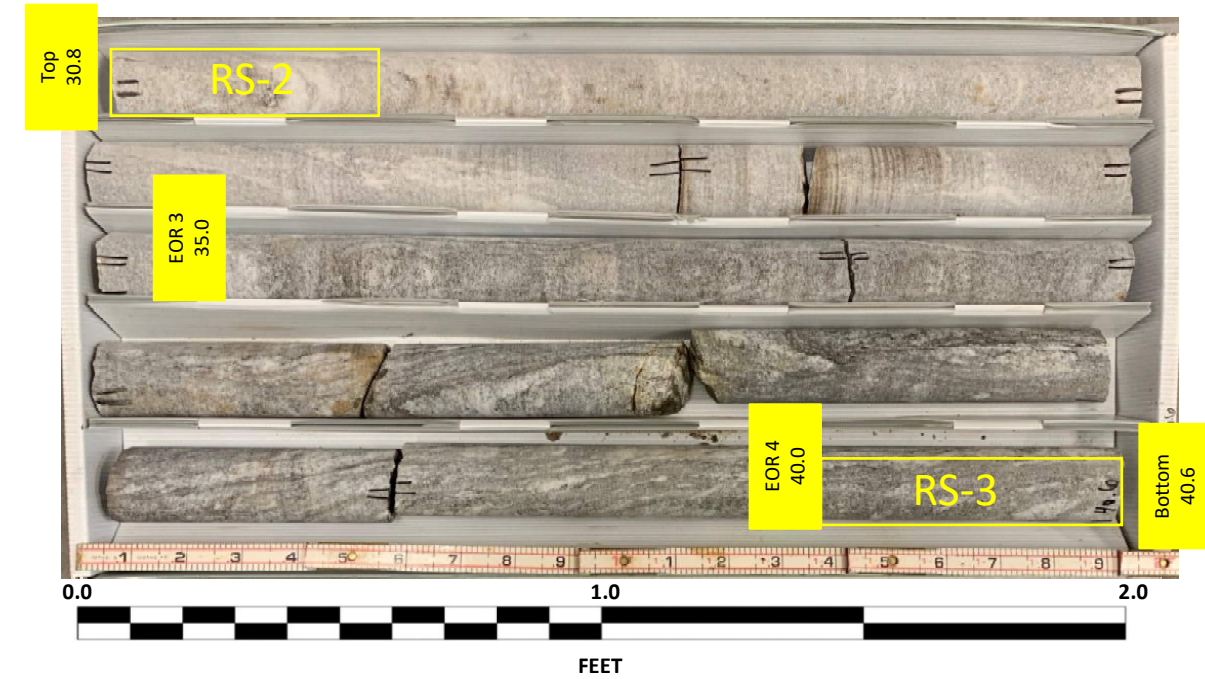
NCDOT BORE DOUBLE B3186_GEO_SPT.GPJ NC_DOT.GDT 7/28/21

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

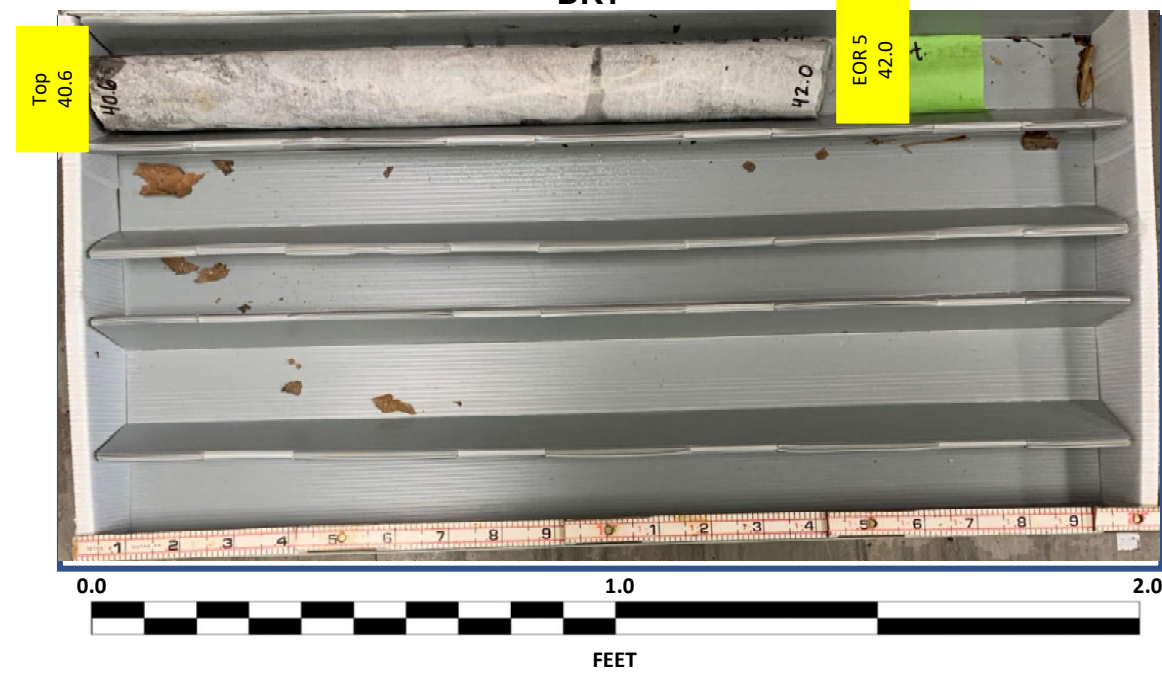


CORE PHOTOGRAPHIC RECORD

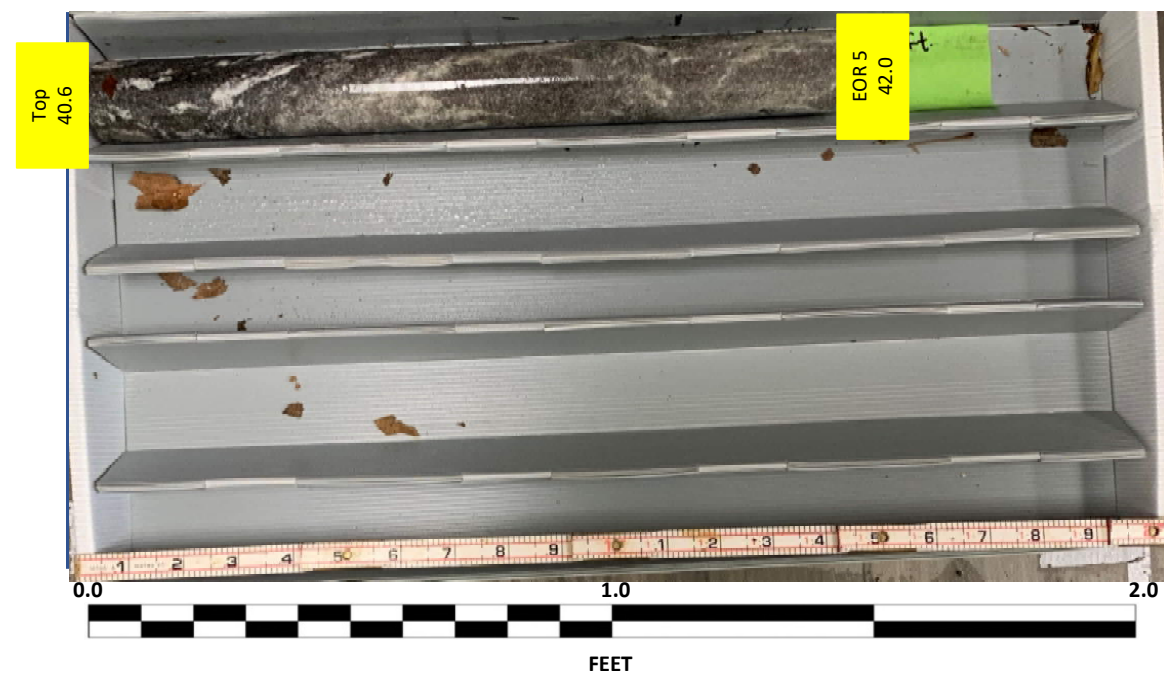
38330.1.FS1 (B-3186/B-5898)

US 23/ US 74 Great Smokey Mountain Highway

DET-B1
Box 3 of 3: 40.6 – FEET
DRY

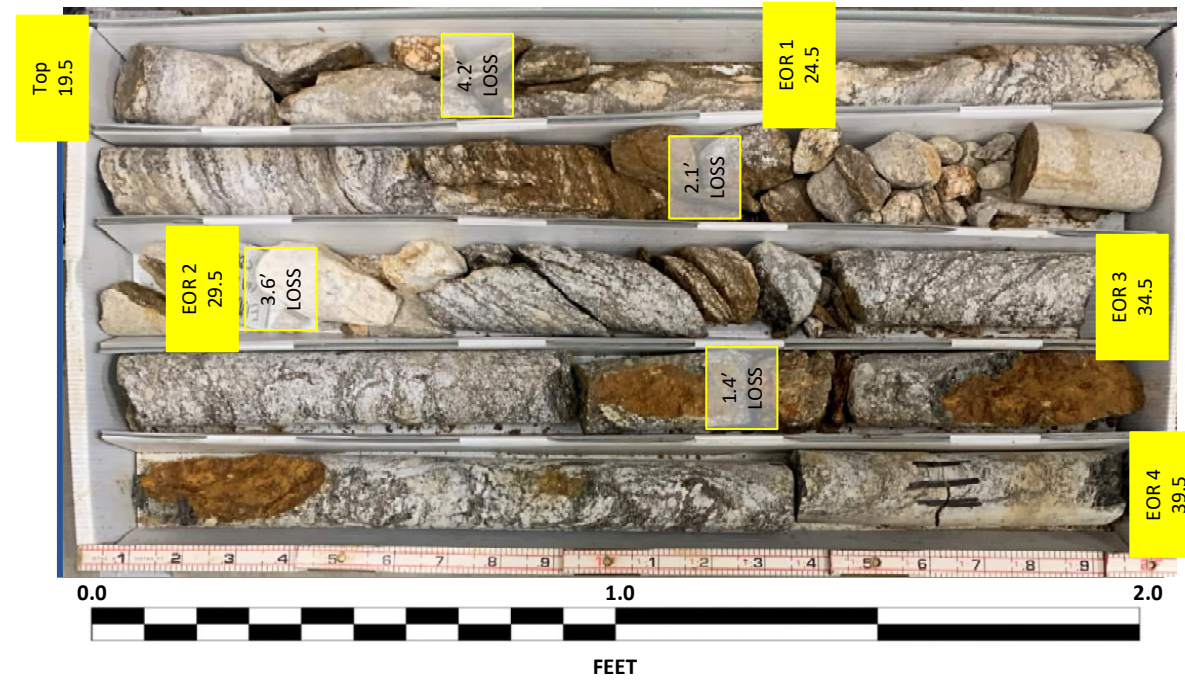


DET-B1
Box 3 of 3: 40.6 – 42.0 FEET
WET

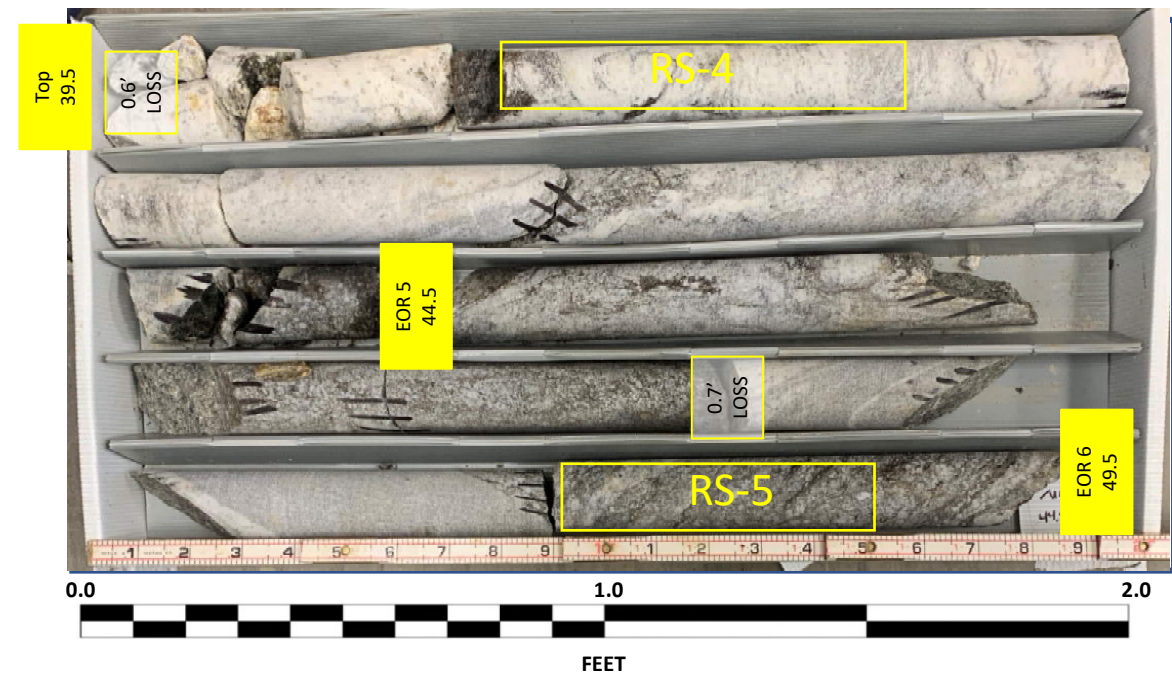


CORE PHOTOGRAPHIC RECORD
38330.1.FS1 (B-3186/B-5898)
US 23/ US 74 Great Smokey Mountain Highway

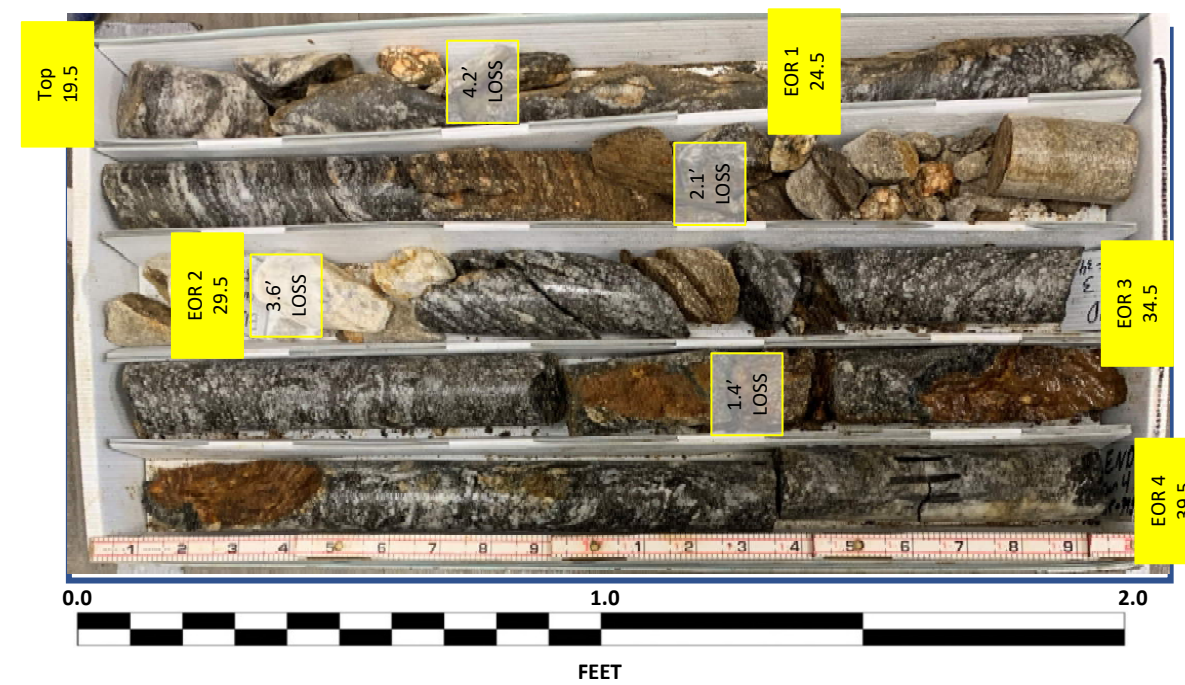
DET-B2
Box 1 of 2: 19.5 – 39.5 FEET
DRY



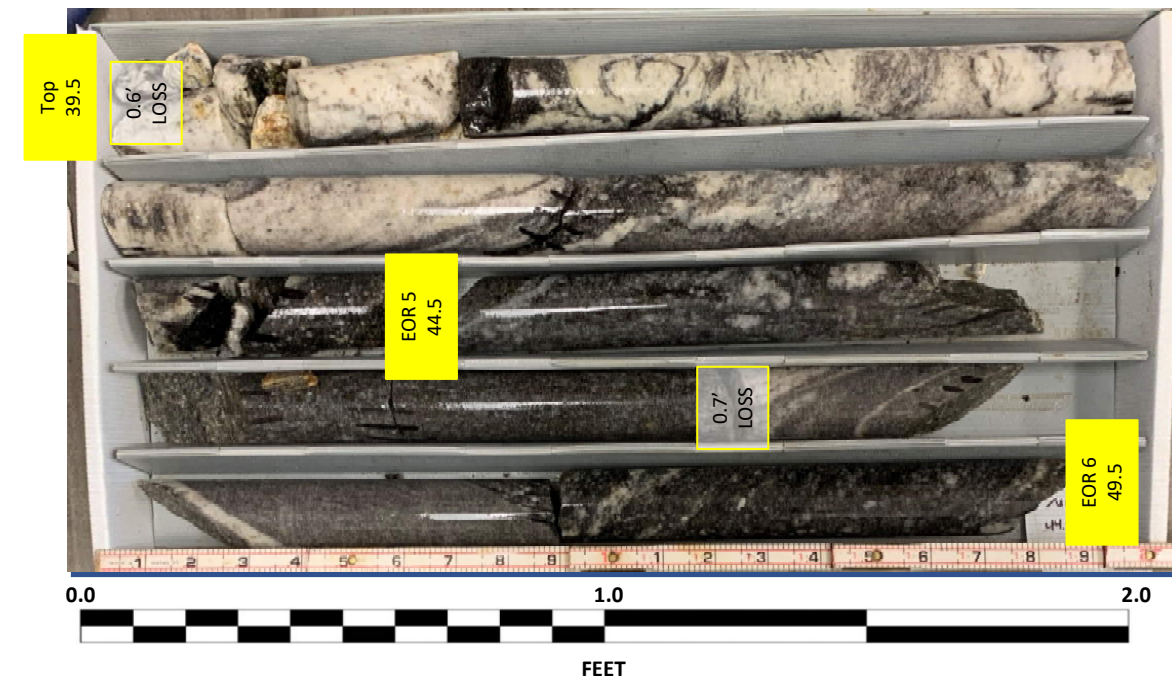
DET-B2
Box 2 of 2: 39.5 – 49.5 FEET
DRY



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

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. Det_EB2	STATION 43+52	OFFSET 121 ft RT	ALIGNMENT -L-
COLLAR ELEV. 2,584.5 ft	TOTAL DEPTH 43.3 ft	NORTHING 666,370	EASTING 819,092
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 03/11/21	COMP. DATE 03/11/21	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100			ELEV. (ft)	DEPTH (ft)	
2585	2,584.5	0.0											2,584.5	0.0	GROUND SURFACE
	2,582.0	2.5	3	2	2	•	•	•	•	•		D	2,582.5	2.0	ARTIFICIAL FILL Soft, red and brown, sandy CLAY (A-6), micaceous
2580	2,579.5	5.0	1	1	2	•	•	•	•	•		D			Very loose to loose, red, brown, and gray, clayey SAND (A-2-6), micaceous
	2,577.0	7.5	2	3	4	•	•	•	•	•		D	2,577.5	7.0	
2575	2,574.5	10.0	4	3	3	•	•	•	•	•		D			Loose, red, brown, and gray, silty SAND (A-2-4), micaceous
	2,571.5	13.0	2	2	2	•	•	•	•	•		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	•	•	•	•	•			2,559.0	25.5	
2555	2,554.5	30.0				•	•	•	•	•			2,556.5	28.0	WEATHERED ROCK Gray, white, and tan, GNEISS
2550	2,549.5	35.0	15	9	11	•	•	•	•	•					RESIDUAL Very stiff to hard, white, gray, tan and brown, SILT (A-4), micaceous, saprolitic
2545	2,544.5	40.0	8	15	16	•	•	•	•	•					
	2,541.3	43.2	6	7	25	•	•	•	•	•			2,541.3	43.2	CRYSTALLINE ROCK Gray, white, and brown, GNEISS
													2,541.2	43.3	Boring Terminated with Standard Penetration Test Refusal at Elevation 2,541.2 ft in Crystalline Rock (GNEISS)

NOTES
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