REFERENCE: B-3186/B-5898

PROJECT: 38332/48030

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-3186/B-5898	1	17

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. 168 ON -YIRT- (US 19) OVER -L-, -L_LT- AND -L_RT- (US 74 /US 23) BETWEEN US 276 AND NC 209*

CONTENTS

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.

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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.
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CHECKED BY *K. BUSSEY*

SUBMITTED BY *HDR*

DATE *NOVEMBER 2021*

NORTH CAROLINA PROFESSIONAL SEAL 038206 ENGINEER KENNETH R. BUSSEY, JR.

SIGNATURE DATE

PROJECT REFERENCE NO.	SHEET NO.
B-3186 /B-5898	2

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		
GROUP CLASS.	A-1		A-3	A-2				A-4	A-5	A-6	A-7	A-1, A-2 A-3	A-4, A-5 A-6, A-7	
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5, A-7-6			
SYMBOL														
% PASSING #10 #40 #200	50 MX 30 MX 15 MX	50 MX 25 MX	51 MN 10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
MATERIAL PASSING #40 LL PI	— 6 MX		— NP	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	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	UNSUITABLE

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 RESISTENCE (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	4	10	40	60	200	270
OPENING (MM)	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	MM	305	75	2.0	0.25	0.05	0.005
	IN.	12	3				

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NON PLASTIC	0-5	VERY LOW
SLIGHTLY PLASTIC	6-15	SLIGHT
MODERATELY PLASTIC	16-25	MEDIUM
HIGHLY PLASTIC	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
- PW — PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA
- SPRING OR SEEP

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 — DIP & DIP DIRECTION OF ROCK STRUCTURES
- SPT, DPT, DMT, VST, PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING WITH CORE
- SPT N-VALUE

RECOMMENDATION SYMBOLS

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

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
γ - UNIT WEIGHT
γ_d - 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:
- [ ] CME-45C
- [ ] CME-55
- [X] CME-550X
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [X] CME-75
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [X] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [ ] CASING [ ] W/ ADVANCER
- [ ] TRICONE _____" STEEL TEETH
- [ ] TRICONE _____" TUNG.-CARB.
- [X] CORE BIT
- [X] MUD ROTARY

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B _____ [ ] -H _____
- [X] -N Q2

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [ ] HAND AUGER
- [ ] SOUNDING ROD
- [ ] VANE SHEAR TEST
- [ ] _____

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 YEILD 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 (V 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. *IF TESTED, WOULD YIELD SPT REFUSAL*
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. *IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF*
VERY SEVERE (V 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. *IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF*
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 GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
SOFT	CAN BE GROVED 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 FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 10 FEET
WIDE	3 TO 10 FEET
MODERATELY CLOSE	1 TO 3 FEET
CLOSE	0.16 TO 1 FOOT
VERY CLOSE	LESS THAN 0.16 FEET

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	4 FEET
THICKLY BEDDED	1.5 - 4 FEET
THINLY BEDDED	0.16 - 1.5 FEET
VERY THINLY BEDDED	0.03 - 0.16 FEET
THICKLY LAMINATED	0.008 - 0.03 FEET
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 DISLODGED 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 (RQD) - 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 (SRQD) - 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.

BENCH MARK: N/A

ELEVATION: FEET

NOTES:

BORING ELEVATIONS OBTAINED FROM GPS UNIT

FIAD - FILLED IMMEDIATELY AFTER DRILLING

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
B-3186/B-5898	2A

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

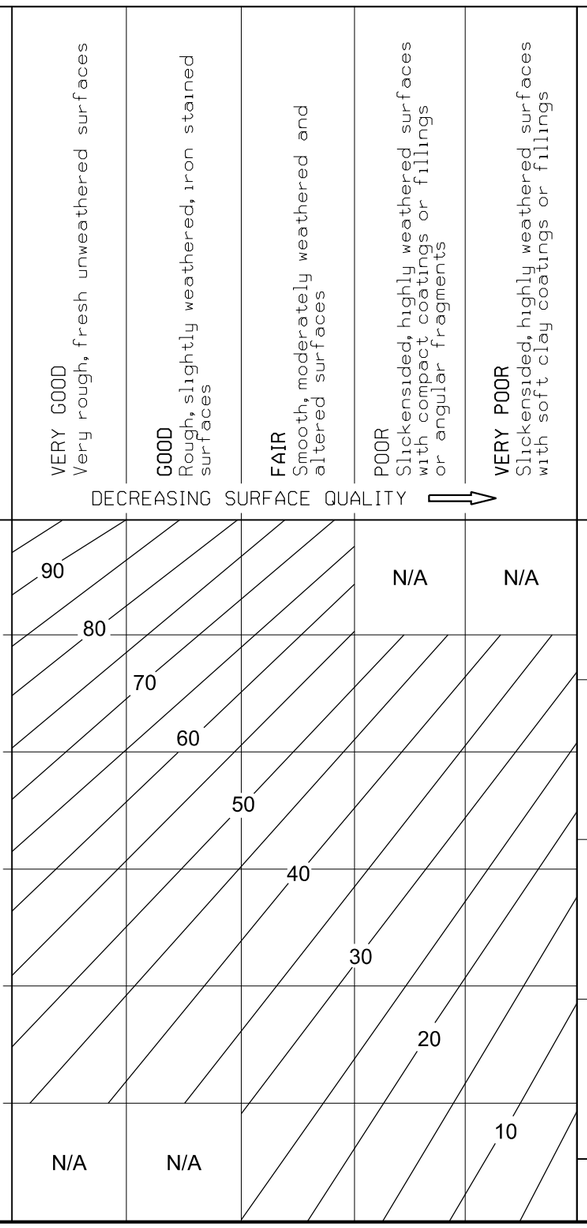
AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jointed Rock Mass (Marinos and Hoek, 2000)

GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000)

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.

STRUCTURE

- INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities
- BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets
- VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets
- BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity
- DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces
- LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes

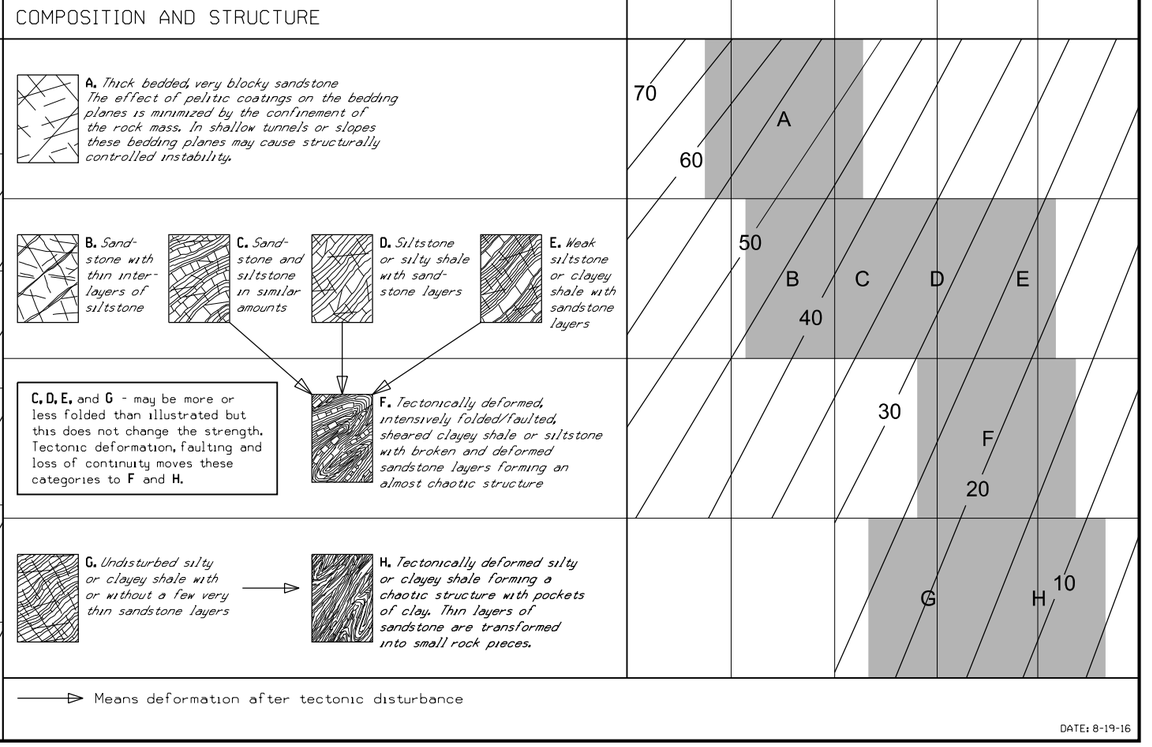


AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonically Deformed Heterogeneous Rock Masses (Marinos and Hoek, 2000)

GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos. P and Hoek E., 2000)

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.

COMPOSITION AND STRUCTURE



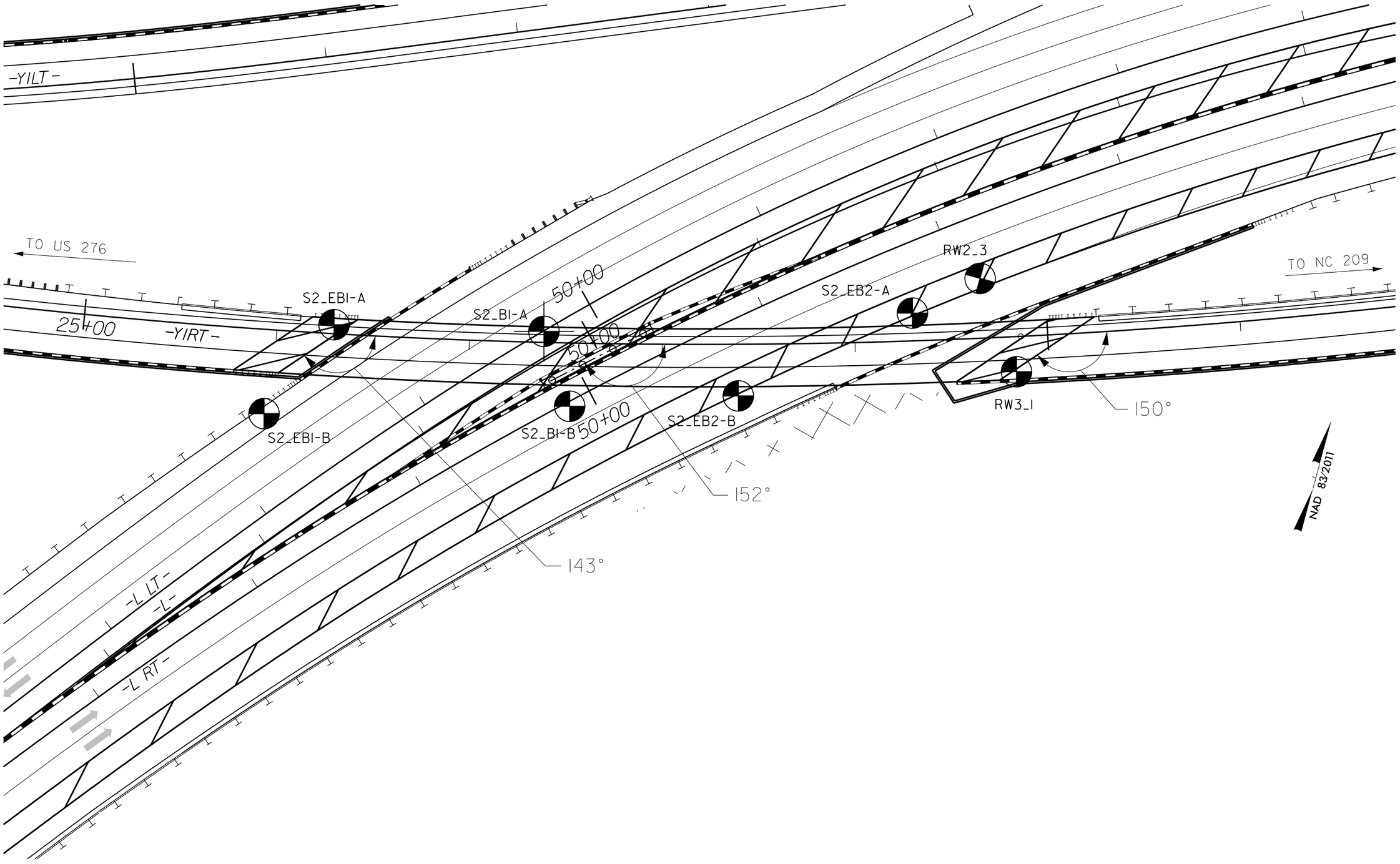
DATE: 8-19-16

PROJECT REFERENCE NO.	SHEET NO.
B-3186/B-5898	3

SITE PLAN

0 50 100

FEET



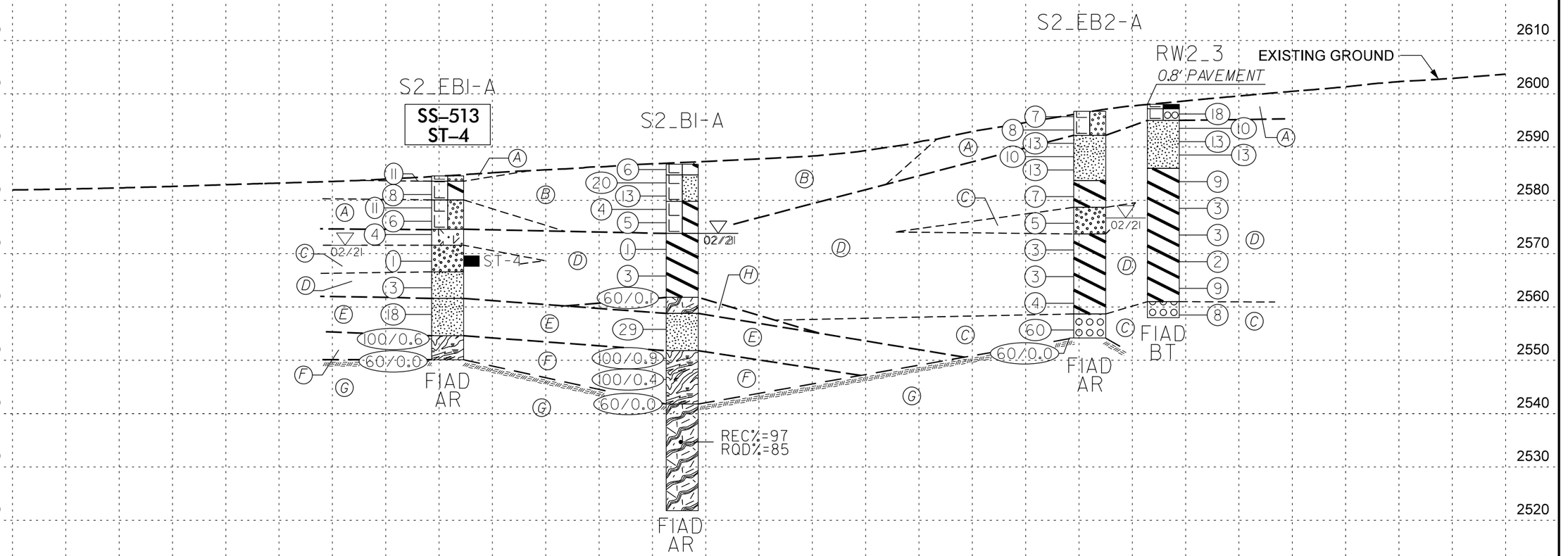
SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C.SAND	% BY WEIGHT F.SAND	% BY WEIGHT SILT	% BY WEIGHT CLAY	% PASSING (SIEVES) 10	% PASSING (SIEVES) 40	% PASSING (SIEVES) 200	% MOISTURE	% ORGANIC
SS-513	5' LT	26+29	10.0' - 11.5'	A-5 (9)	48	10	4.1	32.5	49.9	13.5	100.0	98.0	74.1	51	-
ST-4	5' LT	26+29	15.0' - 17.0'	A-2-4	27	6	41.2	30.8	7.0	21.0	94.4	66.3	31.2	28	-

0 50 100
FEET
VE = 1:2.5

PROJECT REFERENCE NO.	SHEET NO.
B-3816/B-5898	4

BRIDGE NO. 2 PROFILE
8' LT OF -YIRT-



Ⓐ **ROADWAY EMBANKMENT:** *Loose to medium dense, brown, orange, and gray, f-c SAND (A-2-4), with trace to little gravel, moist to saturated*

Ⓑ **ROADWAY EMBANKMENT:** *Soft to very stiff, brown, orange, and gray, f sandy SILT (A-4) and f sandy CLAY (A-7), with trace gravel, micaceous, mottled, moist*

Ⓒ **ALLUVIAL:** *Very loose to very dense, brown and gray, f-c silty SAND (A-2-4) and SAND and GRAVEL (A-1-b), micaceous, wet to saturated*

Ⓓ **ALLUVIAL:** *Very soft to stiff, gray, orange, and brown, f sandy SILT (A-4, A-5) and f sandy CLAY (A-7), contains trace wood fragments, micaceous, wet*

Ⓔ **RESIDUAL:** *Very stiff, brown, tan, white, and orange, sandy SILT (A-4), micaceous, saprolitic, moist to wet*

Ⓕ **WEATHERED ROCK:** *Brown, orange, and white, GNEISS*

Ⓖ **CRYSTALLINE ROCK:** *Light gray, black, and white, Migmatitic Biotite GNEISS*

Ⓗ **NON-CRYSTALLINE ROCK:** *Light gray, BOULDER (Quartz fragments)*

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

25+00 26+00 27+00 28+00 29+00 30+00 31+00

SOIL TEST RESULTS

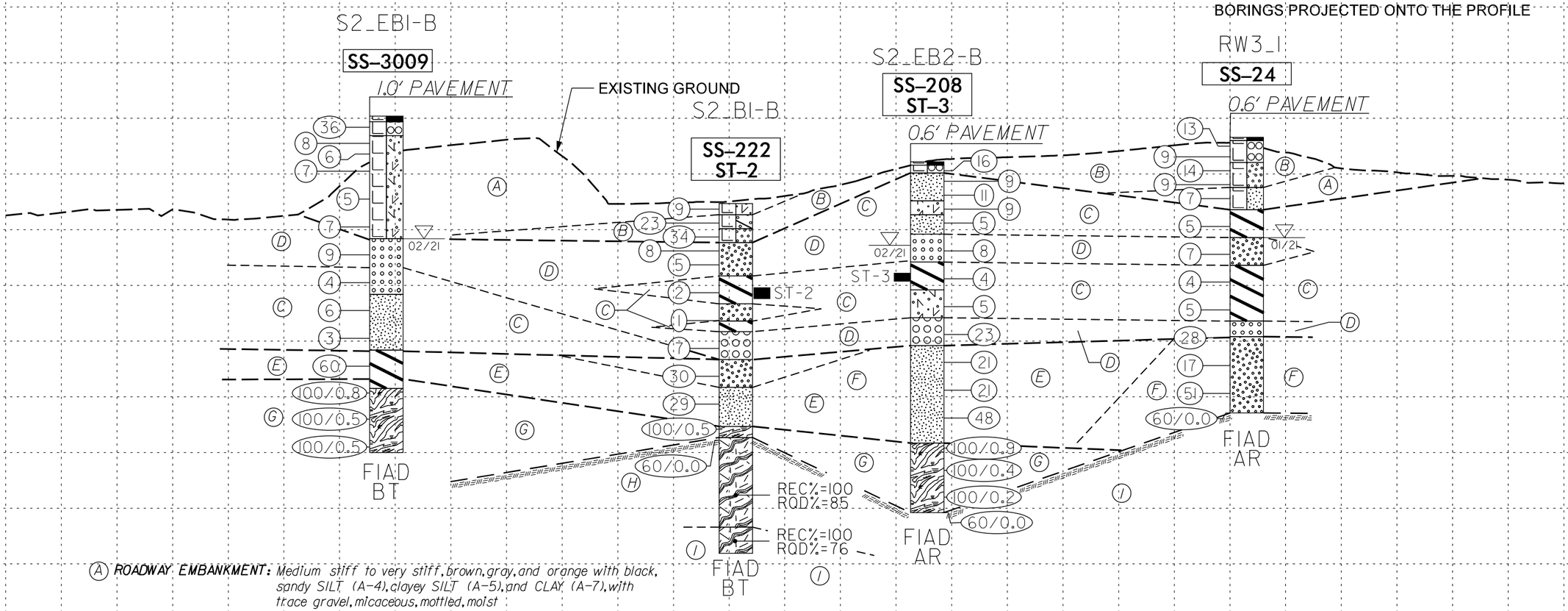
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C.SAND	% BY WEIGHT F.SAND	% BY WEIGHT SILT	% BY WEIGHT CLAY	% PASSING (SIEVES) 10	% PASSING (SIEVES) 40	% PASSING (SIEVES) 200	% MOISTURE	% ORGANIC
SS-3009	44' RT	25+96	38.9' - 40.4	A-4	37	8	26.8	36.0	25.4	11.8	86.6	72.3	36.7	43	-
SS-222	33' RT	27+53	15.0' - 16.5'	A-5 (13)	51	10	1.1	21.2	59.5	18.2	100.0	99.5	85.8	62	-
ST-2	33' RT	27+53	15.0' - 17.0'	A-7-5 (16)	57	11	1.3	14.3	66.8	17.6	100.0	99.6	87.3	68	-
SS-208	27' RT	28+39	20.0' - 21.5'	A-7-5 (29)	77	21	2.5	13.1	70.9	13.5	100.0	98.9	89.2	73	-
ST-3	27' RT	28+39	20.0' - 21.5'	A-4	NP	NP	6.7	33.0	38.9	21.4	100	97.2	69.0	46	-
SS-24	7' LT	29+84	15.0' - 16.1'	A-7-6 (11)	47	23	20.8	20.5	23.6	35.1	92.0	79.1	58.5	26	-

0 50 100
FEET
VE = 1:2.5

PROJECT REFERENCE NO.	SHEET NO.
B-3816/B-5898	5

BRIDGE NO. 2 PROFILE
22' RT OF -YIRT-

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



(A) **ROADWAY EMBANKMENT:** Medium stiff to very stiff, brown, gray, and orange with black, sandy SILT (A-4), clayey SILT (A-5), and CLAY (A-7), with trace gravel, micaceous, mottled, moist

(B) **ROADWAY EMBANKMENT:** Loose to dense, brown, tan, and orange, silty SAND (A-2-4), clayey SAND (A-2-6) and SAND and GRAVEL (A-1-b), micaceous, dry

(C) **ALLUVIAL:** Very soft to stiff, gray, brown, and orange, sandy SILT (A-4), clayey SILT (A-5) and sandy CLAY (A-7-6), contains trace wood fragments, with little gravel, micaceous, organic odor, wet

(D) **ALLUVIAL:** Very loose to medium dense, gray and brown, SAND (A-3), and SAND and GRAVEL (A-1-b), micaceous, wet to saturated

(E) **RESIDUAL:** Very stiff to hard, brown, tan, and white, sandy SILT (A-4) and sandy CLAY (A-7), contains trace to little rock fragments, micaceous, saprolitic, dry to wet

(F) **RESIDUAL:** Medium dense to very dense, brown, orange, and tan, silty SAND (A-2-4), contains trace rock fragments, micaceous, saprolitic, moist

(G) **WEATHERED ROCK:** Brown, gray, tan, and white, GNEISS, micaceous

(H) **CRYSTALLINE ROCK:** Light gray, black, and white, Migmatitic Biotite GNEISS, with interlayered micaceous SILT (A-4) seams

(I) **CRYSTALLINE ROCK:** Gray and white, METAGRAYWACKE and QUARTZITE

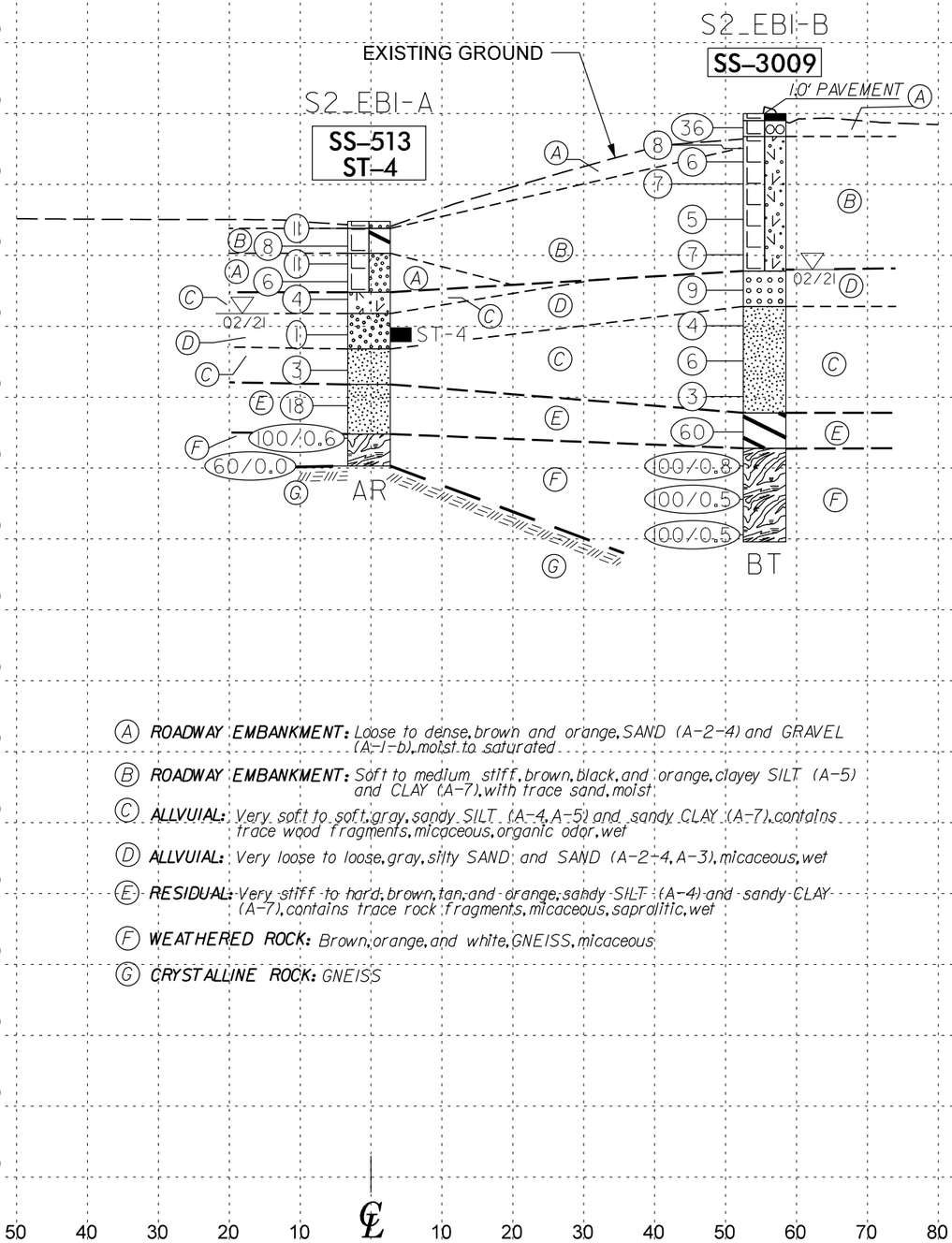
25+00 26+00 27+00 28+00 29+00 30+00 31+00

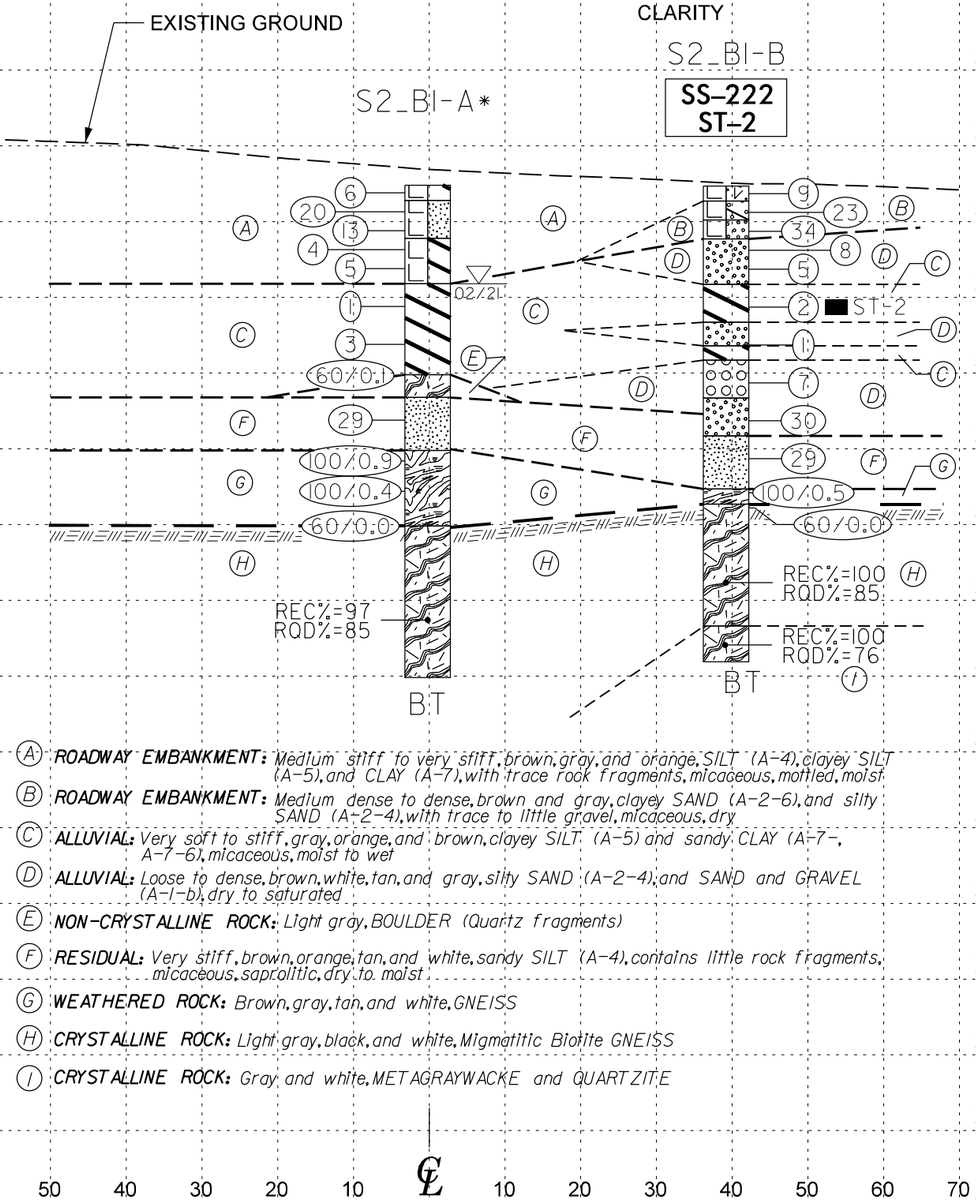
PROJECT REFERENCE NO.	SHEET NO.
B-3186/B-5898	6

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C.SAND	% BY WEIGHT F.SAND	% BY WEIGHT SILT	% BY WEIGHT CLAY	% PASSING (SIEVES) 10	% PASSING (SIEVES) 40	% PASSING (SIEVES) 200	% MOISTURE	% ORGANIC
SS-513	5' LT	26+29	10.0' - 11.5'	A-5 (9)	48	10	4.1	32.5	49.9	13.5	100.0	98.0	74.1	51	-
ST-4	5' LT	26+29	15.0' - 17.0'	A-2-4	27	6	41.2	30.8	7.0	21.0	94.4	66.3	31.2	28	-
SS-3009	44' RT	25+96	38.9' - 40.4	A-4	37	8	26.8	36.0	25.4	11.8	86.6	72.3	36.7	43	-
SS-222	33' RT	27+53	15.0' - 16.5'	A-5 (13)	51	10	1.1	21.2	59.5	18.2	100.0	99.5	85.8	62	-
ST-2	33' RT	27+53	15.0' - 17.0'	A-7-5 (16)	57	11	1.3	14.3	66.8	17.6	100.0	99.6	87.3	68	-

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
*BORING PROJECTED ONTO CENTERLINE FOR VISUAL CLARITY





(A) **ROADWAY EMBANKMENT:** Loose to dense, brown and orange, SAND (A-2-4) and GRAVEL (A-1-b), moist to saturated

(B) **ROADWAY EMBANKMENT:** Soft to medium stiff, brown, black, and orange, clayey SILT (A-5) and CLAY (A-7), with trace sand, moist

(C) **ALLVUIAL:** Very soft to soft, gray, sandy SILT (A-4, A-5) and sandy CLAY (A-7), contains trace wood fragments, micaceous, organic odor, wet

(D) **ALLVUIAL:** Very loose to loose, gray, silty SAND and SAND (A-2-4, A-3), micaceous, wet

(E) **RESIDUAL:** Very stiff to hard, brown, tan, and orange, sandy SILT (A-4) and sandy CLAY (A-7), contains trace rock fragments, micaceous, saprolitic, wet

(F) **WEATHERED ROCK:** Brown, orange, and white, GNEISS, micaceous

(G) **CRYSTALLINE ROCK:** GNEISS

HORIZ. SCALE (FEET)	VE = 1:1	BRIDGE NO. 2 – END BENT 1 –YIRT– STA. 26+32.66 143° SKEW

(A) **ROADWAY EMBANKMENT:** Medium stiff to very stiff, brown, gray, and orange, SILT (A-4), clayey SILT (A-5), and CLAY (A-7), with trace rock fragments, micaceous, mottled, moist

(B) **ROADWAY EMBANKMENT:** Medium dense to dense, brown and gray, clayey SAND (A-2-6), and silty SAND (A-2-4), with trace to little gravel, micaceous, dry

(C) **ALLUVIAL:** Very soft to stiff, gray, orange, and brown, clayey SILT (A-5) and sandy CLAY (A-7-6), micaceous, moist to wet

(D) **ALLUVIAL:** Loose to dense, brown, white, tan, and gray, silty SAND (A-2-4), and SAND and GRAVEL (A-1-b), dry to saturated

(E) **NON-CRYSTALLINE ROCK:** Light gray, BOULDER (Quartz fragments)

(F) **RESIDUAL:** Very stiff, brown, orange, tan, and white, sandy SILT (A-4), contains little rock fragments, micaceous, saprolitic, dry to moist

(G) **WEATHERED ROCK:** Brown, gray, tan, and white, GNEISS

(H) **CRYSTALLINE ROCK:** Light gray, black, and white, Migmatitic Biotite GNEISS

(I) **CRYSTALLINE ROCK:** Gray and white, METAGRAYWACKE and QUARTZITE

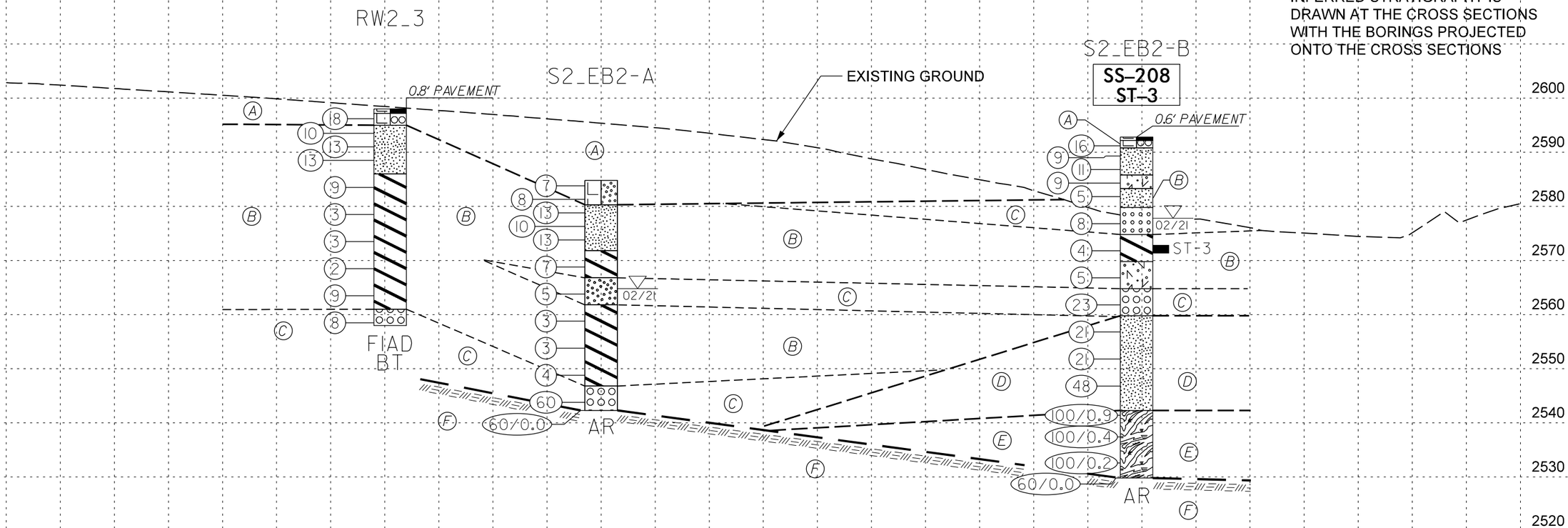
HORIZ. SCALE (FEET)	VE = 1:1	BRIDGE NO. 2 – BENT 1 –YIRT– STA. 27+79.50 152° SKEW

PROJECT REFERENCE NO.	SHEET NO.
B-3186/B-5898	7

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		
SS-208	27' RT	28+39	20.0' - 21.5'	A-7-5 (29)	77	21	2.5	13.1	70.9	13.5	100.0	98.9	89.2	73	-
ST-3	27' RT	28+39	20.0' - 21.5'	A-4	NP	NP	6.7	33.0	38.9	21.4	100	97.2	69.0	46	-

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 medium dense, brown and orange, silty SAND (A-2-4) and SAND and GRAVEL (A-1-b), dry to moist

(B) **ALLVUIAL:** Soft to stiff, brown, orange, and gray, SILT (A-4), clayey SILT (A-5), and silty CLAY (A-7-5, A-7-6), contains trace wood fragments, with little rock fragments and sand, micaceous, dry to wet

(C) **ALLVUIAL:** Loose to very dense, brown, orange, and gray, silty SAND (A-2-4), SAND (A-3), and SAND and GRAVEL (A-1-b), wet to saturated

(D) **RESIDUAL:** Very stiff to hard, brown, orange and tan, SILT (A-4), contains little rock fragments, micaceous, saprolitic, dry

(E) **WEATHERED ROCK:** Brown, orange, and gray, GNEISS

(F) **CRYSTALLINE ROCK:** GNEISS

HORIZ. SCALE (FEET) 0 20 40

VE = 1:1

BRIDGE NO. 2 – END BENT 2 – –YIRT– STA. 29+86.05 149° SKEW

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. S2_EB1-A	**STATION** 26+29	**OFFSET** 5 ft LT	**ALIGNMENT** -Y1RT-	**0 HR.** 13.0
COLLAR ELEV. 2,584.6 ft	**TOTAL DEPTH** 34.5 ft	**NORTHING** 666,917	**EASTING** 819,274	**24 HR.** FIAD
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** 02/25/21	**COMP. DATE** 02/25/21	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
2585											
	2,584.6	0.0	5	7	4	11		M		2,584.6 GROUND SURFACE	0.0
	2,582.1	2.5								2,583.6 **ROADWAY EMBANKMENT**	1.0
			3	4	4	8		M		Medium dense, brown, f SAND (A-2-4), with trace gravel	
2580	2,579.6	5.0								2,580.1 Soft, brown and orange, CLAY (A-7)	4.5
			6	5	6	11		M		Loose to medium dense, gray, f-c SAND (A-2-4)	
	2,577.1	7.5									
			3	3	3	6		Sat.			
2575	2,574.6	10.0								2,574.6 **ALLUVIAL**	10.0
			3	2	2	4	SS-513	51%		Soft, gray, SILT (A-5)(9), micaceous	
										2,571.6 Very loose, gray, f silty SAND (A-2-4), micaceous	13.0
2570	2,569.6	15.0									
			1	WOH	1	1		W			
								28%			
2565	2,564.6	20.0								2,566.6 Soft, gray, f sandy SILT (A-4), micaceous	18.0
			1	1	2	3		W			
										2,561.6 **RESIDUAL**	23.0
2560	2,559.6	25.0								Very stiff, brown and orange, f sandy SILT (A-4), micaceous, saprolitic	
			4	7	11	18		W			
2555	2,554.6	30.0	90	10/0.1		100/0.6				2,554.6 **WEATHERED ROCK**	30.0
	2,550.1	34.5	60/0.0			60/0.0				Brown, orange, and white, GNEISS	
										2,550.1 Boring Terminated with Standard Penetration Test Refusal at Elevation 2,550.1 ft on Crystalline Rock (GNEISS)	34.5

Other Samples:
ST-4 (15.0 - 17.0)

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. S2_EB1-B	**STATION** 25+96	**OFFSET** 44 ft RT	**ALIGNMENT** -Y1RT-	**0 HR.** 22.0
COLLAR ELEV. 2,600.4 ft	**TOTAL DEPTH** 60.4 ft	**NORTHING** 666,863	**EASTING** 819,251	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE GTC3277 CME-75 83% (09/15/2020)		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER K. Boone	**START DATE** 02/27/21	**COMP. DATE** 02/27/21	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
2605										
										2,600.4 GROUND SURFACE 0.0
2600	2,599.4	1.0	11	20	16	36		M		2,599.4 **ROADWAY EMBANKMENT** 1.0
										1.0' PAVEMENT
	2,596.5	3.9	6	4	4	8		M		2,596.9 **ROADWAY EMBANKMENT** 3.5
2595	2,594.6	5.8								Dense, brown, GRAVEL (A-1-b)
			6	3	3	6		M		Medium stiff, orange and brown with black, clayey SILT (A-5), with trace sand
	2,591.5	8.9								
2590			4	3	4	7		M		
	2,586.5	13.9								
2585			3	2	3	5		M		
	2,581.5	18.9								
2580			3	3	4	7		M		
										2,578.4 **ALLUVIAL** 22.0
	2,576.5	23.9	4	4	5	9		W		Very loose to loose, gray, SAND (A-3), micaceous
2575										2,573.4 27.0
	2,571.5	28.9	3	3	1	4		W		Soft to medium stiff, gray, sandy SILT (A-4), contains trace wood fragments, micaceous, organic odor
2570										
	2,566.5	33.9	1	3	3	6		W		
2565										
	2,561.5	38.9	WOH	1	2	3	SS-3009	43%		2,558.4 **RESIDUAL** 42.0
2560										Hard, tan and brown, sandy CLAY (A-7), contains trace rock fragments, micaceous, saprolitic
	2,556.5	43.9	18	27	33	60		W		
2555										2,551.5 **WEATHERED ROCK** 48.9
	2,551.5	48.9	32	68/0.3		100/0.8				Brown, GNEISS, micaceous
2550										
	2,546.5	53.9	86	14/0.0		100/0.5				
2545										
	2,541.5	58.9	79	21/0.0		100/0.5				
2540										2,540.0 Boring Terminated at Elevation 2,540.0 ft in Weathered Rock (GNEISS) 60.4

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. S2_B1-A	**STATION** 27+39	**OFFSET** 6 ft LT	**ALIGNMENT** -Y1RT-	**0 HR.** 13.0
COLLAR ELEV. 2,586.8 ft	**TOTAL DEPTH** 65.0 ft	**NORTHING** 666,942	**EASTING** 819,380	**24 HR.** FIAD
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** 02/26/21	**COMP. DATE** 02/27/21	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
2590											
	2,586.8	0.0								2,586.8 GROUND SURFACE	0.0
2585	2,584.3	2.5	3	3	3	6		M		**ROADWAY EMBANKMENT** Medium stiff, brown and orange, CLAY (A-7), micaceous	2.0
	2,581.8	5.0	5	10	10	20		M		Stiff to very stiff, brown and gray, sandy SILT (A-4) with trace clay and gravel, micaceous, mottled	
2580	2,579.3	7.5	10	6	7	13		M			
	2,576.8	10.0	2	1	3	4		M		2,579.8 Medium stiff, orange, CLAY (A-7) with trace sand, mottled	7.0
2575	2,571.8	15.0	1	2	3	5		M		2,573.8 **ALLUVIAL** Very soft to soft, gray and brown, sandy CLAY (A-7), micaceous	13.0
2570	2,566.8	20.0	1	WOH	1	1		W			
2565	2,561.8	25.0	1	1	2	3		W		2,561.8 **NON-CRYSTALLINE ROCK** Light gray, BOULDER (Quartz fragments)	25.0
2560	2,556.8	30.0	60/0.1			60/0.1				2,558.8 **RESIDUAL** Very stiff, brown, tan, and white, sandy SILT (A-4), micaceous, saprolitic	28.0
2555	2,551.8	35.0	11	13	16	29		M		2,551.8 **WEATHERED ROCK** Brown, tan, and white, GNEISS	35.0
2550	2,546.8	40.0	14	40	60/0.4	100/0.9					
2545	2,541.8	45.0	100/0.4			100/0.4				2,541.8 **CRYSTALLINE ROCK** Light gray, black, and white, Migmatitic Biotite GNEISS	45.0
2540			60/0.0			60/0.0					
2535											
2530							RS-14				
2525										2,521.8 Boring Terminated at Elevation 2,521.8 ft in Crystalline Rock (Migmatitic Biotite GNEISS)	65.0

NOTES
0.5' topsoil

GEOTECHNICAL BORING REPORT
CORE 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. S2_B1-A	**STATION** 27+39	**OFFSET** 6 ft LT	**ALIGNMENT** -Y1RT-	**0 HR.** 13.0
COLLAR ELEV. 2,586.8 ft	**TOTAL DEPTH** 65.0 ft	**NORTHING** 666,942	**EASTING** 819,380	**24 HR.** FIAD
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** 02/26/21	**COMP. DATE** 02/27/21	**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 REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
2541.8											Begin Coring @ 45.0 ft	
2540	2,541.8	45.0	4.0	2:07	(3.4)	(2.6)		(19.4)	(17.0)		2,541.8 **CRYSTALLINE ROCK** Light gray, black and white, Migmatitic Biotite GNEISS, slight weathering, hard, very close to close fracture spacing	45.0
	2,537.8	49.0		1:47	85%	65%		97%	85%		Very severe weathering, highly micaceous; 0.6' core loss at 48.0'	
	2,537.8	49.0	5.0	2:06							Slight weathering, close fracture spacing at 49.0'	
2535				2:00	(5.0)	(4.3)						
				1:39	100%	86%						
	2,532.8	54.0		4:00								
			5.0	1:44	(5.0)	(4.8)	RS-14				RS-14 54.6' - 55.2' GSI= 75 - 85 Qu= 16,778 psi	
2530				2:36	100%	96%						
	2,527.8	59.0		2:03								
			5.0	1:53	(5.0)	(4.3)						
				2:05	100%	86%						
2525				2:16								
				2:20								
	2,522.8	64.0		2:22								
			5.0	1:46	(5.0)	(4.3)						
				2:15	100%	86%						
				2:24								
				1:55								
	2,521.8	65.0		1:54								
			1.0	2:10	(1.0)	(1.0)					2,521.8 Boring Terminated at Elevation 2,521.8 ft in Crystalline Rock (Migmatitic Biotite GNEISS)	65.0
					100%	100%						

NOTES
0.5' topsoil

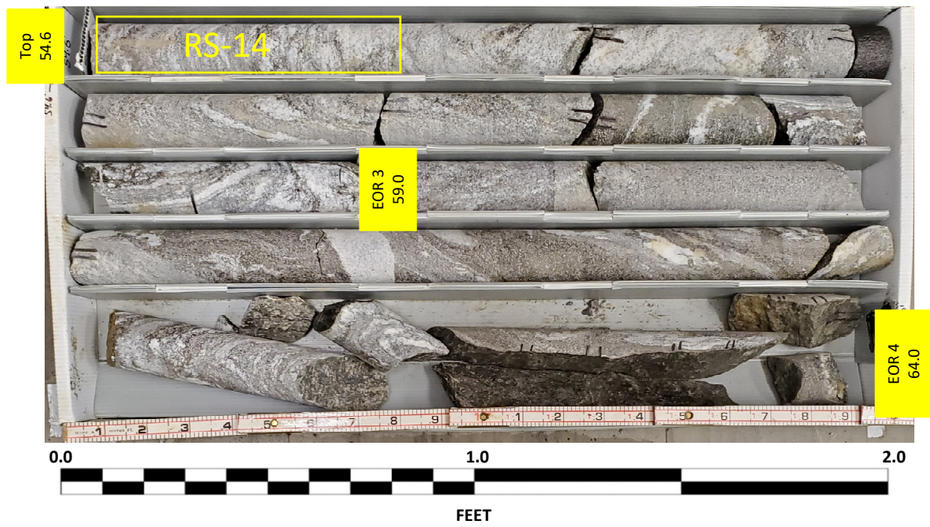
CORE PHOTOGRAPHIC RECORD

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

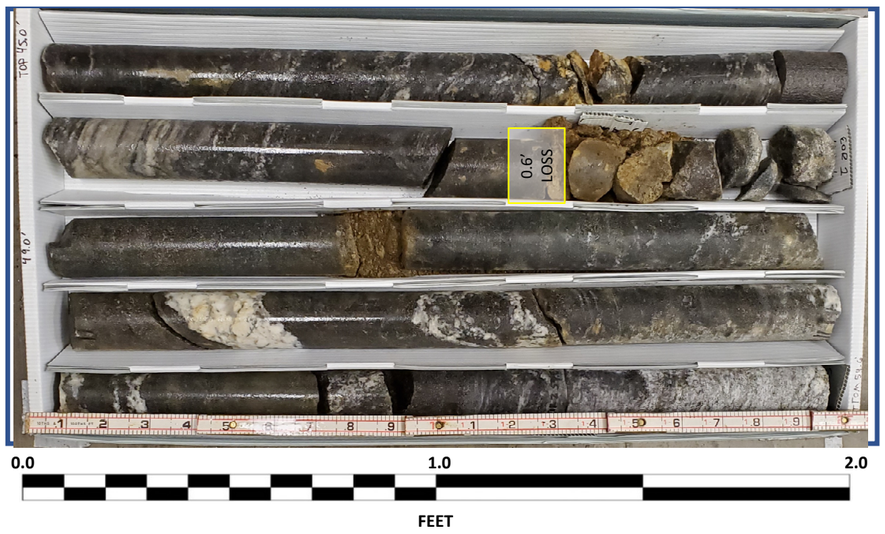
US 23/ US 74 Great Smokey Mountain Highway

S2_B1-A
Box 1 of 3: 45.0 – 54.6 FEET
DRY

S2_B1-A
Box 2 of 3: 54.6 – 64.0 FEET
DRY



S2_B1-A
Box 1 of 3: 45.0 – 54.6 FEET
WET



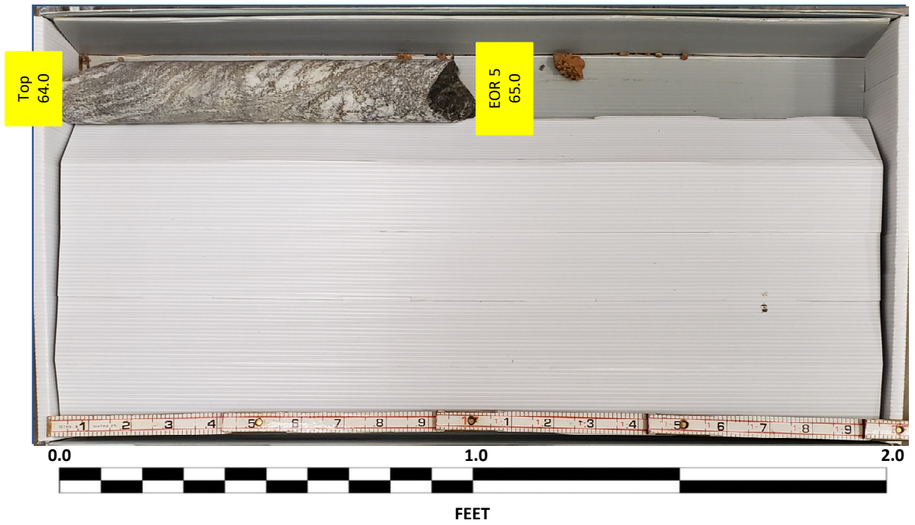
S2_B1-A
Box 2 of 3: 54.6 – 64.0 FEET
WET

CORE PHOTOGRAPHIC RECORD

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

US 23/ US 74 Great Smokey Mountain Highway

S2_B1-A
Box 3 of 3: 64.0 – 65.0 FEET
DRY



S2_B1-A
Box 3 of 3: 64.0 – 65.0 FEET
WET

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. S2_B1-B	**STATION** 27+53	**OFFSET** 33 ft RT	**ALIGNMENT** -Y1RT-	**0 HR.** N/A
COLLAR ELEV. 2,584.7 ft	**TOTAL DEPTH** 62.8 ft	**NORTHING** 666,908	**EASTING** 819,403	**24 HR.** FIAD
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** 02/10/21	**COMP. DATE** 02/27/21	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
2585											
	2,584.7	0.0	2	4	5	9		M		2,584.7 GROUND SURFACE	0.0
	2,582.2	2.5								**ROADWAY EMBANKMENT** Stiff, brown and orange, clayey SILT (A-5), micaceous	2.0
2580			7	12	11	23		D		2,580.2 Medium dense, brown, clayey SAND (A-2-6) with trace gravel	4.5
	2,579.7	5.0									
			18	18	16	34		D		2,577.7 Dense, brown and gray, silty SAND (A-2-4) with little gravel, micaceous	7.0
	2,577.2	7.5								**ALLUVIAL** Loose, brown and gray, silty SAND (A-2-4), micaceous	
2575			4	4	4	8		D			
	2,574.7	10.0									
			2	2	3	5		M		2,571.7	13.0
2570	2,569.7	15.0								Very soft, gray, silty CLAY (A-7-5)(16) and SILT (A-5)(13), micaceous	
			1	1	1	2	SS-222	62% 68%			
2565	2,564.7	20.0								2,566.7 Very loose, brown and gray, silty SAND (A-2-4)	18.0
			WOH	WOH	1	1		W		2,563.6 Very soft, brown and gray, CLAY (A-7-6)	21.1
2560	2,559.7	25.0								2,561.7 Loose, gray, SAND and GRAVEL (A-1-b)	23.0
			7	5	2	7		Sat.			
										2,556.7 **RESIDUAL** Medium dense to dense, brown, white, and tan, silty SAND (A-2-4) with little rock fragments	28.0
2555	2,554.7	30.0	9	16	14	30		D			
										2,551.7 Very stiff, brown, orange, and tan, sandy SILT (A-4) with little rock fragments, micaceous, saprolitic	33.0
2550	2,549.7	35.0	15	15	14	29		D			
										2,544.7 **WEATHERED ROCK**	40.0
2545	2,544.7	40.0	100/0.5			100/0.5				2,542.7 Brown, gray, and white, GNEISS	42.0
	2,542.2	42.5	60/0.0			60/0.0				**CRYSTALLINE ROCK** No Recovery, begin rock coring at 42.0' Light to dark gray and white with trace pink, Migmatic Biotite GNEISS	
2540											
2535							RS-13				
2530											
2525										2,526.6 Grey and white, METAGRAYWACKE and QUARTZITE	58.1
										2,521.9 Boring Terminated at Elevation 2,521.9 ft in Crystalline Rock (METAGRAYWACKE and QUARTZITE)	62.8

NOTES
15.0- 17.0': ST-2 lab classified as (A-7-5)(16) in offset hole ~3' upstation
15.0 - 16.5': SS-222 lab classified as (A-5)(13)

Other Samples:
ST-2 (15.0 - 17.0)

NCDOT BORE DOUBLE B3186_GEO_SITE 2.GPJ NC_DOT.GDT 11/23/21

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. S2_B1-B	**STATION** 27+53	**OFFSET** 33 ft RT	**ALIGNMENT** -Y1RT-	**0 HR.** N/A
COLLAR ELEV. 2,584.7 ft	**TOTAL DEPTH** 62.8 ft	**NORTHING** 666,908	**EASTING** 819,403	**24 HR.** FIAD
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** 02/10/21	**COMP. DATE** 02/27/21	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ2	**TOTAL RUN** 20.8 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
2542.7											Begin Coring @ 42.0 ft	
	2,542.7	42.0	2.8	0:36/0.8 *N=60/0.0*	(2.8) 100%	(2.6) 93%		(16.1) 100%	(13.7) 85%		2,542.7 **CRYSTALLINE ROCK** Light to dark grey and white with trace pink, Migmatitic Biotite GNEISS, with trace garnet porphyroblasts, slight to very slight weathering, hard, moderately close to close fracture spacing	42.0
2540	2,539.9	44.8	5.0	1:43/1.0 2:21/1.0 1:41/1.0 1:30/1.0 1:39/1.0 1:29/1.0 2:20/1.0	(5.0) 100%	(5.0) 100%						
2535	2,534.9	49.8	5.0	1:55/1.0 1:52/1.0 1:45/1.0 2:14/1.0 2:20/1.0	(5.0) 100%	(2.8) 56%	RS-13				RS-13 49.5' - 50.2' GSI= 75 - 85 Qu= 17,889 psi Moderately severe to severe weathering, very close fracture spacing (80-90° joint), with trace epidote along fracture plane Very slight to slight weathering, wide fracture spacing	
2530	2,529.9	54.8	5.0	1:44/1.0 2:04/1.0 2:22/1.0 2:38/1.0 2:46/1.0	(5.0) 100%	(4.5) 90%					2,526.6	58.1
2525	2,524.9	59.8	3.0	3:16/1.0 3:15/1.0 2:30/1.0	(3.0) 100%	(2.4) 80%		(4.5) 100%	(3.4) 76%		Grey and white, METAGRAYWACKE and QUARTZITE (eye fold), slight weathering, hard, close to moderately close fracture spacing, with few healed fractures (variable orientations), foliations oriented 55-65°	
	2,521.9	62.8									2,521.9 Boring Terminated at Elevation 2,521.9 ft In Crystalline Rock (METAGRAYWACKE and QUARTZITE)	62.8

NOTES
15.0- 17.0': ST-2 lab classified as (A-7-5)(16) in offset hole ~3' upstation
15.0 - 16.5': SS-222 lab classified as (A-5)(13)

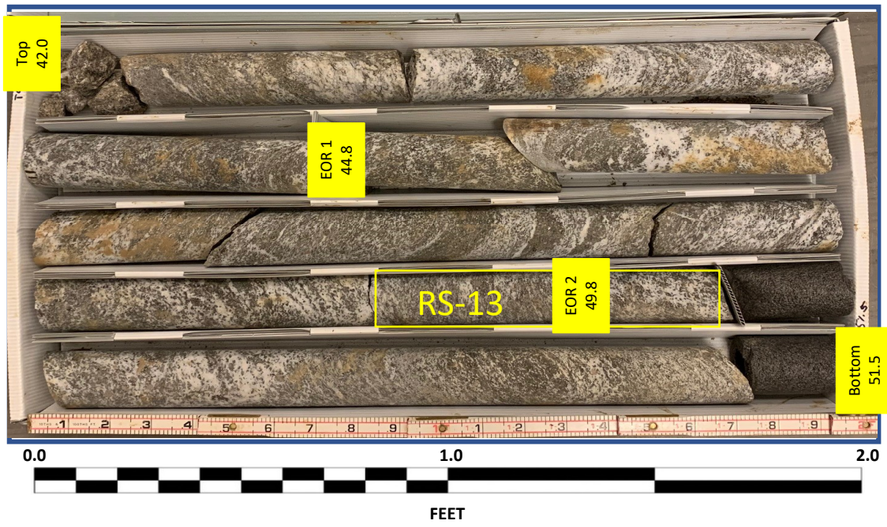
Other Samples:
ST-2 (15.0 - 17.0)

CORE PHOTOGRAPHIC RECORD

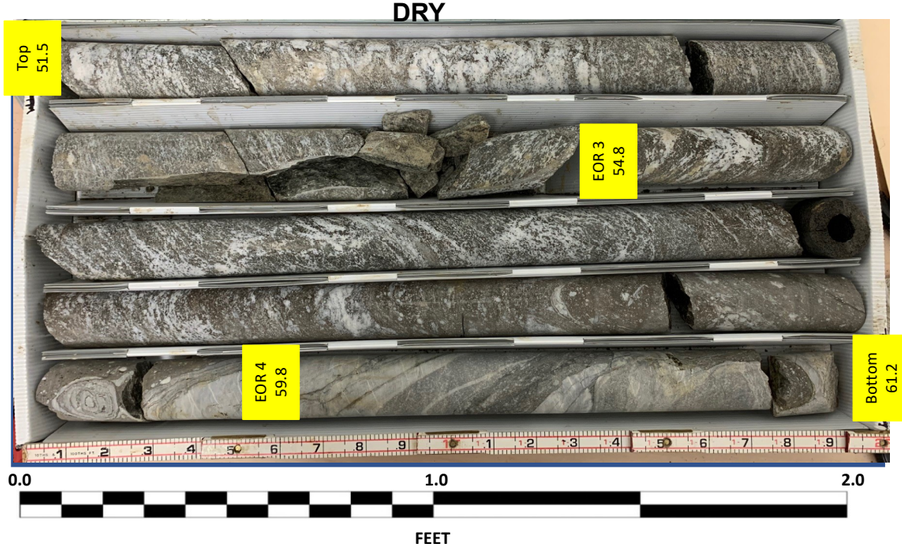
38330.1.FS1 (B-3186/B-5898)

US 23/ US 74 Great Smokey Mountain Highway

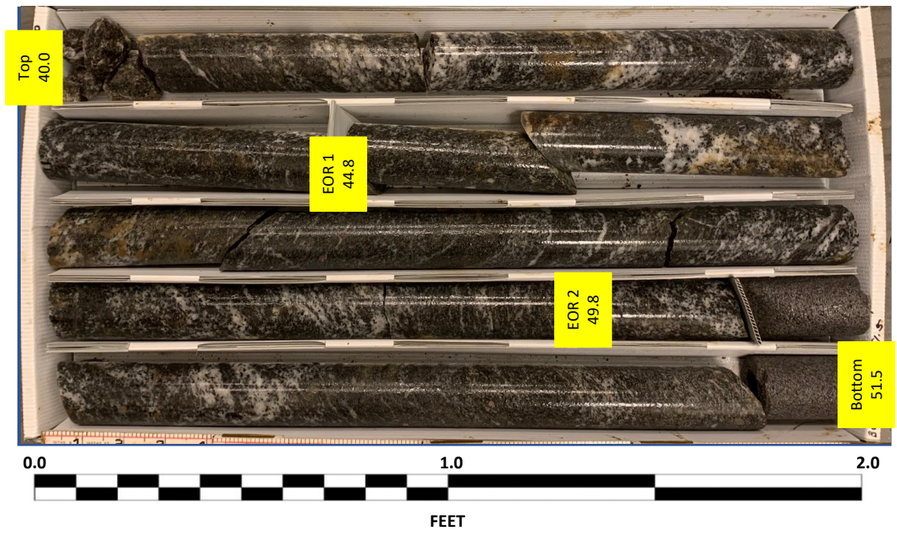
S2_B1-B
Box 1 of 3: 42.0 – 51.5 FEET
DRY



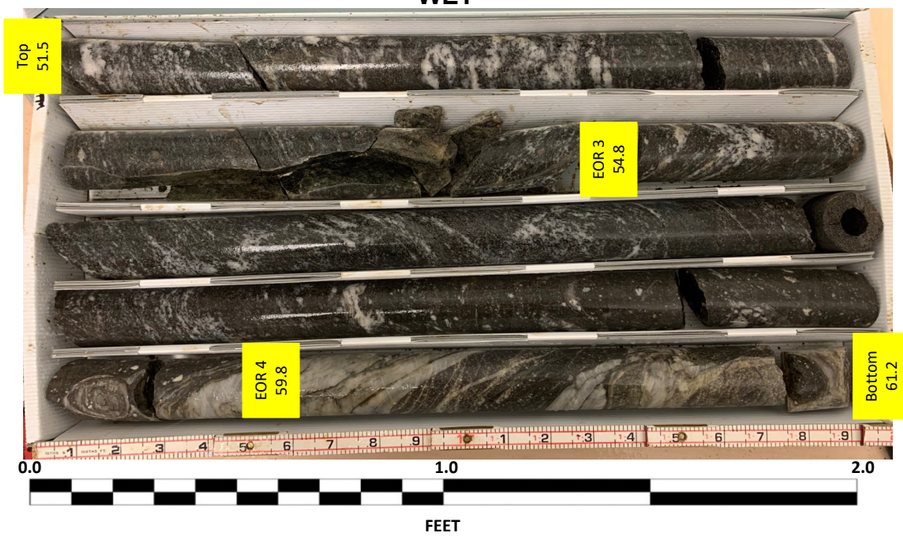
S2_B1-B
Box 2 of 3: 51.5 – 61.2 FEET
DRY



S2_B1-B
Box 1 of 3: 42.0 – 51.5 FEET
WET



S2_B1-B
Box 2 of 3: 51.5 – 61.2 FEET
WET

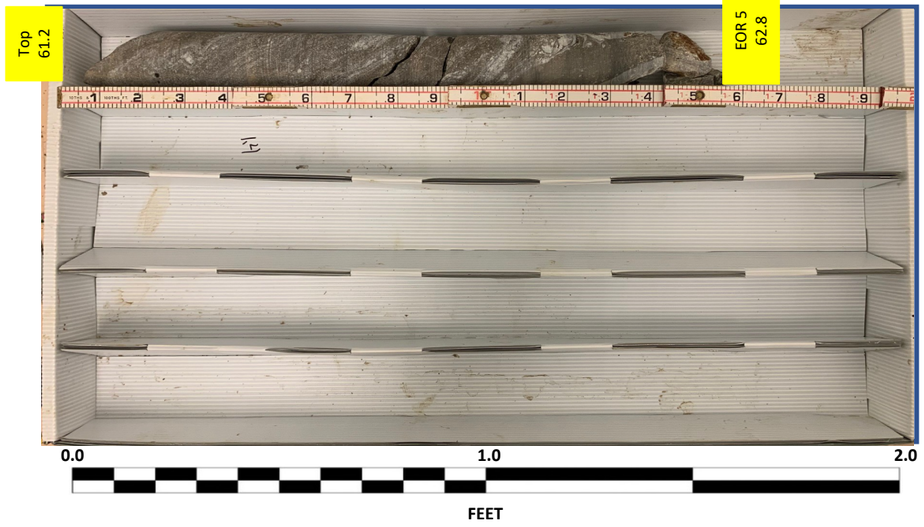


CORE PHOTOGRAPHIC RECORD

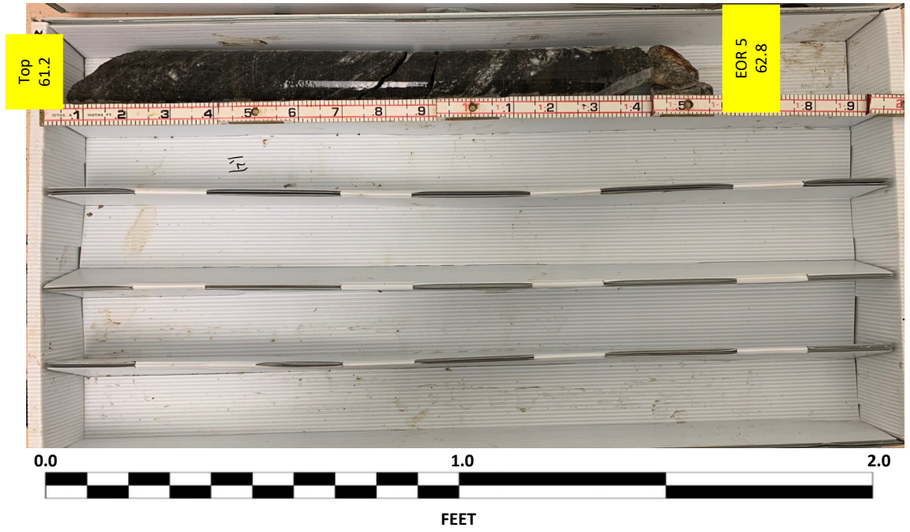
38330.1.FS1 (B-3186/B-5898)

US 23/ US 74 Great Smokey Mountain Highway

S2_B1-B
Box 3 of 3: 61.2 – 62.8 FEET
DRY



S2_B1-B
Box 3 of 3: 61.2 – 62.8 FEET
WET



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. S2_EB2-A	**STATION** 29+30	**OFFSET** 14 ft LT	**ALIGNMENT** -Y1RT-	**0 HR.** 20.0
COLLAR ELEV. 2,596.7 ft	**TOTAL DEPTH** 42.5 ft	**NORTHING** 667,001	**EASTING** 819,562	**24 HR.** FIAD
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** 02/10/21	**COMP. DATE** 02/10/21	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION — ELEV. (ft)	DEPTH (ft)
2600											
	2,596.7	0.0						M		2,596.7 GROUND SURFACE	0.0
2595			2	3	4	7		D		**ROADWAY EMBANKMENT** Loose, brown and orange, f-c silty SAND (A-2-4), with little gravel	
	2,594.2	2.5								2,592.2 **ALLUVIAL**	4.5
			3	4	4	8		D		Stiff, brown and orange, SILT (A-4), micaceous	
	2,591.7	5.0									
2590			3	6	7	13		D			
	2,589.2	7.5									
			4	4	6	10		D			
	2,586.7	10.0									
2585			7	6	7	13		D			
										2,583.7 Medium stiff, brown and gray, f silty CLAY (A-7-6), micaceous	13.0
	2,581.7	15.0									
			3	3	4	7		M			
2580											
										2,578.7 Loose, brown and gray, f-c silty SAND (A-2-4), micaceous	18.0
	2,576.7	20.0						▽			
			3	3	2	5		M			
2575											
	2,571.7	25.0								2,573.7 Soft to medium stiff, gray, CLAY (A-7-6), contains trace wood fragments, micaceous	23.0
			1	1	2	3		M			
2570											
	2,566.7	30.0									
			1	1	2	3		M			
2565											
	2,561.7	35.0									
			1	2	2	4		M			
2560											
										2,558.7 Very dense, gray, SAND and GRAVEL (A-1-b)	38.0
	2,556.7	40.0									
			9	25	35	60		W			
2555											
	2,554.2	42.5	60/0.0			60/0.0				2,554.2 Boring Terminated with Standard Penetration Test Refusal at Elevation 2,554.2 ft on Crystalline Rock (GNEISS). A.R. at a depth of 42.5'.	42.5

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. S2_EB2-B	**STATION** 28+39	**OFFSET** 27 ft RT	**ALIGNMENT** -Y1RT-	**0 HR.** 15.0
COLLAR ELEV. 2,592.2 ft	**TOTAL DEPTH** 63.0 ft	**NORTHING** 666,936	**EASTING** 819,486	**24 HR.** FIAD
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** 02/09/21	**COMP. DATE** 02/09/21	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION — ELEV. (ft)	DEPTH (ft)
2595											
	2,591.6	0.6								2,592.2 GROUND SURFACE	0.0
			12	10	6	16		D		2,591.6 0.6" PAVEMENT	0.6
2590	2,589.7	2.5	3	5	4	9		D		2,590.2 **ROADWAY EMBANKMENT** Medium dense, brown and orange, SAND and GRAVEL (A-1-b)	2.0
	2,587.2	5.0	3	5	6	11		D		**ALLUVIAL**	
2585	2,584.7	7.5	2	4	5	9		D		2,585.2 Stiff, brown and orange, SILT (A-4), micaceous	7.0
	2,582.2	10.0	2	2	3	5		D		2,582.7 Stiff, brown and orange, clayey SILT (A-5) with little gravel, micaceous	9.5
2580										Medium stiff, brown, orange and white, SILT (A-4) with little gravel and sand, micaceous	
	2,577.2	15.0	2	4	4	8		▽ W		2,579.2 Loose, gray, SAND (A-3)	13.0
2575											
	2,572.2	20.0	1	2	2	4	SS-208	73%		2,574.2 Soft, gray, CLAY (A-7-5)(29), micaceous	18.0
2570								46%			
	2,567.2	25.0	2	2	3	5		W		2,569.2 Medium stiff, gray and brown, clayey SILT (A-5), micaceous	23.0
2565											
	2,562.2	30.0	13	12	11	23		Sat.		2,564.2 Medium dense, brown and gray, SAND and GRAVEL (A-1-b)	28.0
2560											
	2,557.2	35.0	5	9	12	21		D		2,559.2 **RESIDUAL** Very stiff to hard, brown, orange and tan, SILT (A-4) with little rock fragments, micaceous, saprolitic	33.0
2555											
	2,552.2	40.0	11	10	11	21		D			
2550											
	2,547.2	45.0	12	13	35	48		D			
2545											
	2,542.2	50.0	37	48	52/0.4	100/0.9	SS-214	14%		2,541.7 **WEATHERED ROCK** Brown, orange, and gray, GNEISS	50.5
2540											
	2,537.2	55.0	100/0.4			100/0.4		13%			
2535											
	2,532.2	60.0	100/0.2			100/0.2					
2530											
	2,529.2	63.0	60/0.0			60/0.0				2,529.2 Boring Terminated by Auger Refusal at Elevation 2,529.2 ft on Crystalline Rock (GNEISS)	63.0

NOTES

ST-3 was classified as gray, sandy SILT (A-4)

Other Samples:
ST-3 (20.0 - 21.5)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 38332.1.FS1	**TIP** B-3186 / B-5898	**COUNTY** HAYWOOD	**GEOLOGIST** N. Yacobi	
SITE DESCRIPTION Retaining Wall No. 2 from -L_RT- STA 51+63 to 53+56				**GROUND WTR (ft)**
BORING NO. RW2_3	**STATION** 54+92	**OFFSET** 28 ft RT	**ALIGNMENT** -RW2-	**0 HR.** Dry
COLLAR ELEV. 2,598.0 ft	**TOTAL DEPTH** 40.0 ft	**NORTHING** 667,028	**EASTING** 819,591	**24 HR.** FIAD
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** 02/10/21	**COMP. DATE** 02/10/21	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (ft) / DEPTH (ft))
2600										
	2,597.2	0.8	9	12	6	18		D		2,598.0 GROUND SURFACE 0.0
2595	2,594.5	3.5	5	5	5	10		D		2,597.2 0.8' PAVEMENT 0.8
	2,592.0	6.0	5	6	7	13		D		**ROADWAY EMBANKMENT**
2590	2,589.5	8.5	7	6	7	13		D		2,595.0 Medium dense, brown, SAND and GRAVEL (A-1-b), micaceous 3.0
										ALLUVIAL
2585	2,584.5	13.5	4	4	5	9		M		Stiff, brown and tan, SILT (A-4), with trace sand and gravel, micaceous
2580	2,579.5	18.5	2	1	2	3		M		2,586.0 12.0
2575	2,574.5	23.5	1	1	2	3		M		Soft to stiff, gray, silty CLAY (A-7-6), with trace sand, micaceous
2570	2,569.5	28.5	1	1	1	2		M		
2565	2,564.5	33.5	0	4	5	9		M		2,561.0 37.0
2560	2,559.5	38.5	0	3	5	8		W		Loose, brown, orange, and red, SAND and GRAVEL (A-1-b)
										2,558.0 40.0
										Boring Terminated at Elevation 2,558.0 ft in SAND and GRAVEL

WBS 38332.1.FS1	**TIP** B-3186 / B-5898	**COUNTY** HAYWOOD	**GEOLOGIST** R. Dugger	
SITE DESCRIPTION Retaining Wall No. 3 from -Y1RT- STA 29+35 to 40+54				**GROUND WTR (ft)**
BORING NO. RW3_1	**STATION** 29+84	**OFFSET** 7 ft LT	**ALIGNMENT** -RW3-	**0 HR.** 18.0
COLLAR ELEV. 2,596.6 ft	**TOTAL DEPTH** 49.5 ft	**NORTHING** 666,986	**EASTING** 819,622	**24 HR.** FIAD
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** 01/28/21	**COMP. DATE** 01/28/21	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
2600										
	2,596.0	0.6	8	7	6	13		D		2,596.6 GROUND SURFACE 0.0
2595	2,594.1	2.5	3	4	5	9		D		2,596.0 0.6' PAVEMENT 0.6
	2,591.6	5.0	7	7	7	14		D		**ROADWAY EMBANKMENT**
2590	2,589.1	7.5	6	5	4	9		D		Loose to medium dense, brown and orange, SAND and GRAVEL (A-1-b), micaceous
	2,586.6	10.0	3	3	4	7		D		2,592.1 4.5
2585										Loose to medium dense, brown, tan and orange, silty SAND (A-2-4), with trace gravel, micaceous
	2,581.6	15.0	3	2	3	5	SS-24	26%	▽	2,587.6 9.0
2580										Medium stiff to stiff, brown and tan, SILT (A-4), with trace sand, micaceous
	2,576.6	20.0	3	3	4	7		W		2,583.6 13.0
2575										**ALLUVIAL**
	2,571.6	25.0	1	2	2	4		W		Medium stiff, tan and gray, sandy CLAY (A-7-6)(11)
2570										2,578.6 18.0
	2,566.6	30.0	WOH	2	3	5		W		Loose, brown and gray, silty SAND (A-2-4), micaceous
2565										2,573.6 23.0
	2,561.6	35.0	4	15	13	28		W		Soft to medium stiff, brown, CLAY (A-7-6), micaceous
2560										2,563.6 33.0
	2,556.6	40.0	5	7	10	17		M		Medium dense, gray, SAND (A-3)
2555										2,560.8 35.8
	2,551.6	45.0	18	19	32	51		M		**RESIDUAL**
2550										Medium dense to very dense, brown, orange, and tan, silty SAND (A-2-4), contains trace rock fragments, micaceous, saprolitic
	2,547.1	49.5	60/0.0			60/0.0		M		2,547.1 49.5
										Boring Terminated with Standard Penetration Test Refusal at Elevation 2,547.1 ft on Crystalline Rock (GNEISS). A.R. at a depth of 49.5'.

REPORT ON SAMPLES OF: Rock For Quality

PROJECT:	B-3186 / B-5898	COUNTY:	Haywood
DATE SAMPLED:	05/11/2021	RECEIVED:	5/11/2021
SAMPLED FROM:	Test Borings	REPORTED:	5/12/2021
SUBMITTED BY:	HDR	BY / CERT NO:	Kevin E. Walker

BORING NO	SAMPLE NO	DEPTH (FT)	ROCK TYPE	LENGTH (IN)	DIAMETER (IN)	UNIT WEIGHT (PCF)	UNCONFINED COMPRESSIVE STRENGTH (PSI)
S2_B1-A	RS-13	49.5-50.2	Migmatitic Biotite Gneiss	4.20	1.86	177.20	17,889
S2_B1-B	RS-14	54.6-55.2	Migmatitic Biotite Gneiss	4.22	1.86	171.90	16,778