STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	SF-960436	1	14

REFERENCE: SF-960436

PROJECT: 17BP.11.R.155

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *WILKES*

SITE DESCRIPTION *BRIDGE NO. 436 ON SR 1943 (BREWER MILL RD.) OVER EAST PRONG ROARING RIVER*

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.

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

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

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

PERSONNEL

C. Ranieri, GIT

D. Tignor

W. Shenberger

T. Beard

INVESTIGATED BY *F&R, Inc.*

DRAWN BY *T.T. Walker*

CHECKED BY *P. Alton, P.E.*

SUBMITTED BY *C. Wang, P.E.*

DATE *January 2023*

SINCE 1881

Prepared in the Office of:

FROEHLING & ROBERTSON, INC.

Engineering Stability Since 1881

310 Hubert Street
Raleigh, North Carolina 27603-2302 | USA
T 919.828.3441 | F 919.828.5751
www.fandr.com

NORTH CAROLINA PROFESSIONAL SEAL 048123 ENGINEER CHENG WANG, P.E.

cwang@fandr.com
2023-01-09
13:18-05:00

SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
SF-960436	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	< 4	
	LOOSE	4 TO 10	
	MEDIUM DENSE	10 TO 30	
	DENSE	30 TO 50	
	VERY DENSE	> 50	N/A
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT	< 2	< 0.25
	SOFT	2 TO 4	0.25 TO 0.5
	MEDIUM STIFF	4 TO 8	0.5 TO 1.0
	STIFF	8 TO 15	1 TO 2
	VERY STIFF	15 TO 30	2 TO 4
	HARD	> 30	> 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	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
SL — SHRINKAGE LIMIT		
	- 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
- 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
- [X] CME-55
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

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

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B _____ [ ] -H _____
- [X] -N 03

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: BM #1: -L- STATION 13+95.17, 49.05' RT
NORTHING: 940,839.58, EASTING: 1,395,929.24
ELEVATION: 1115.72 FEET

NOTES:

FIAD= FILLED IMMEDIATELY AFTER DRILLING

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
SF–960436	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

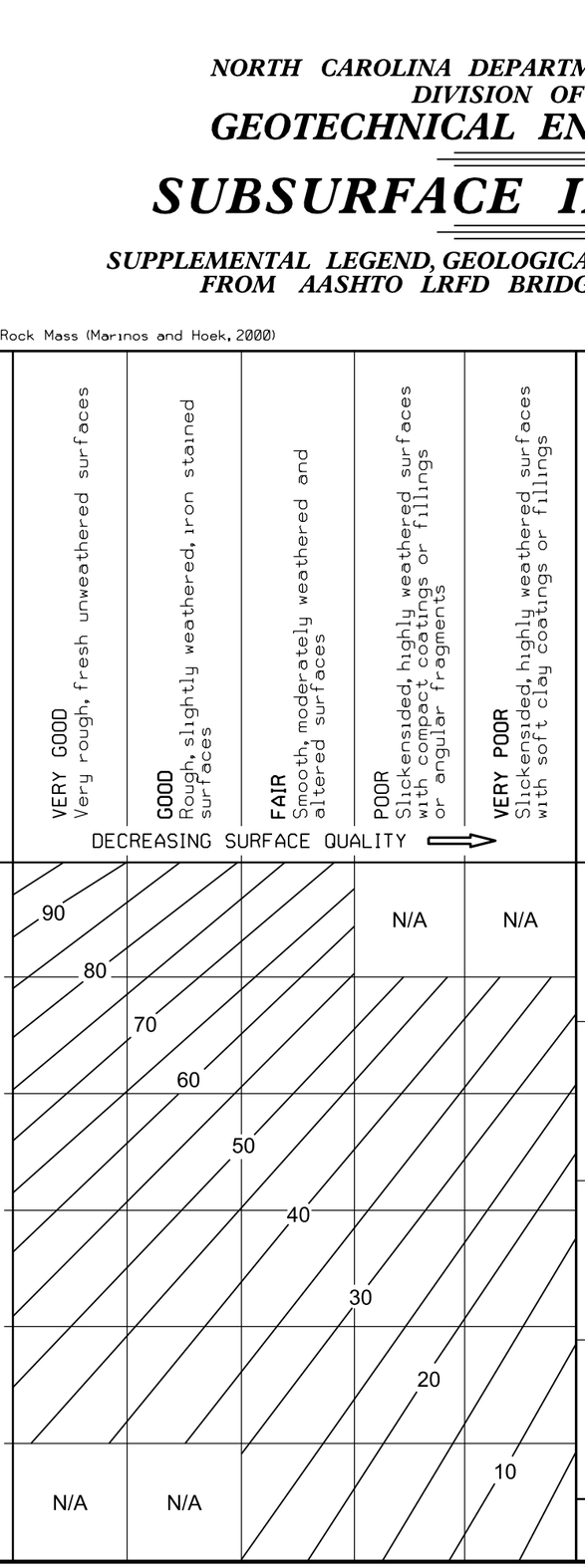
AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jointed Rock Mass (Marinos and Hoek, 2000)

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

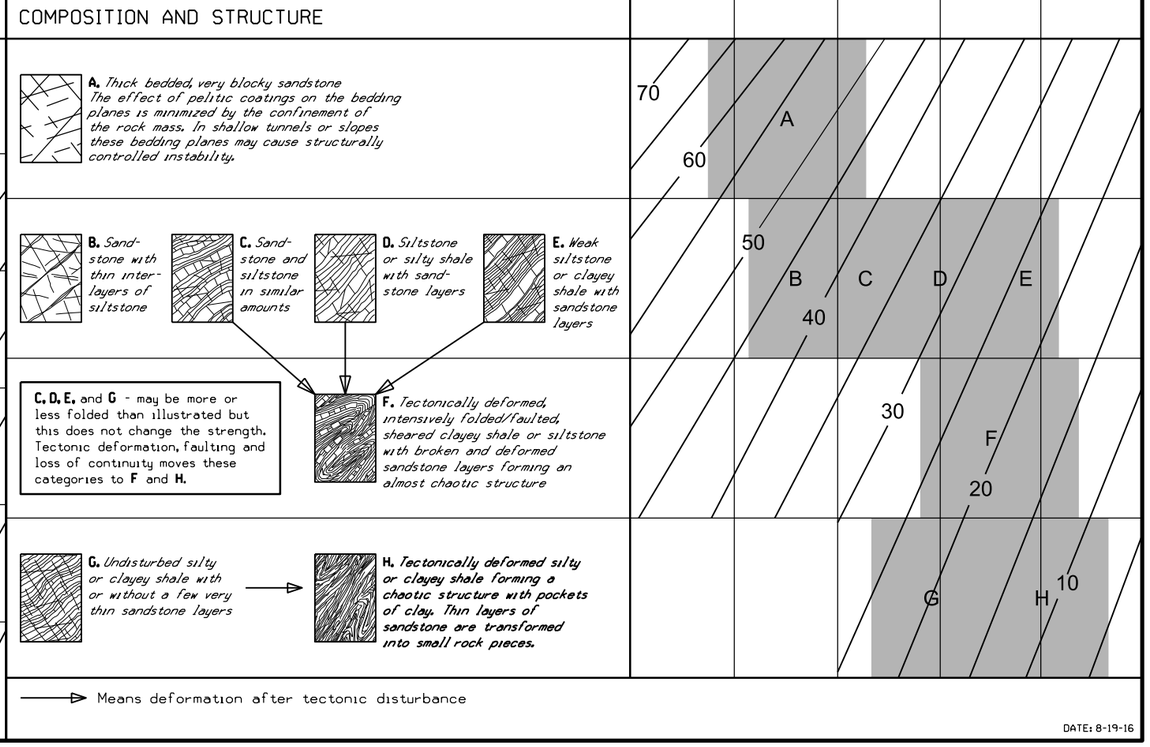


AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonically Deformed Heterogeneous Rock Masses (Marinos and Hoek, 2000)

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



→ Means deformation after tectonic disturbance

DATE: 8-19-16

PROJECT REFERENCE NO.	SHEET NO.
SF-960436	3

SITE PLAN

0 50 100

FEET

NC GRID
NAD 83 NA 2011

THE LODGINGS AT ROARING RIVER VINEYARDS, LLC

BEGIN BRIDGE
-L- STA 12+95.81

OLD MILL RUINS

EAST PRONG ROARING RIVER

THE LODGINGS AT ROARING RIVER VINEYARDS, LLC

TIMBER

ROCK

VAR WD WALL

CONC

GR

STEPS

IS F BUS

VAR BLK WALL

CONC

72" CONC WALL

ROARING RIVER VINEYARDS, LLC
DB 1243 PG 70
ROARING RIVER VINEYARDS, LLC

IS FD

WOOD

DO NOT DISTURB STRUCTURE

ROCKS

30" CMP

CABLE

MTL

SR 1943 BREWER MILL ROAD

To SR 1002 (Traphill Rd)

EB1-A

EB1-B

Bridge #436
-L-
PUTL

B1-A

B1-B

NCDOT GPS B-5225

EB2-A

EB2-B

CABLE GATE

15" HDPE

24" HDPE

POND

T/O

36" CMP

To SR 1941 (Reynolds Church Rd.)

WOOD FOOT BRIDGE

RELOCATE FOOT BRIDGE

WOODS

BM#1

SPRING

END BRIDGE
-L- STA 14+28.19

END PROJECT
-L- STA 16+35.00

EDWARD M. MARTIN
VANESSA J. MARTIN

BEGIN PROJECT
-L- STA 11+30.00

EAST PRONG ROARING RIVER

GRAY EDWARD HUBBARD
MARY LOVETTE HUBBARD

GRAY EDWARD HUBBARD
MARY LOVETTE HUBBARD

3 4 5 6 7 8 11 13 15

PROJECT REFERENCE NO.	SHEET NO.
SF-960436	4

PROFILE BORINGS PROJECTED ALONG CENTERLINE OF –L–

0 20 40
FEET
VE = 2:1

EB1–A
12+87
15' LT

B1–A
13+69
14' LT

EB2–A
14+30
10' LT

1140 1130 1120 1110 1100 1090 1080 1070 1060

ASPHALT
ABC
Ground Surface
EAST PRONG RIVER
WATER SURFACE 06/21
Residual:
Medium Dense to Very Dense, Moist to Saturated, Brown-Tan-Gray, Silty Fine to Coarse SAND and Trace Gravel
(A-2-4) with Trace Mica
Weathered Rock:
Grayish White (QUARTZ-DIORITE)
Weathered Rock:
Whitish Orange (QUARTZ-DIORITE)
Weathered Rock:
Brown-Light Gray (QUARTZ-DIORITE)
REC=88%
ROD=56%
GSI=35-65
REC=100%
ROD=88%
GSI=55-75
RS-1
RS-2
09/22
BT
FIAD

Ⓐ **Roadway Embankment:** Very Stiff, Moist, Brown-Gray, Fine Sandy CLAY (A-6) with Trace Mica

Ⓑ **Roadway Embankment:** Soft to Very Stiff, Moist to Wet, Brown-Gray-Orange, Fine to Coarse Sandy Clayey SILT (A-5) with Trace Mica, Gravel, and Roots

Ⓒ **Alluvial:** Loose, Tan, Gravelly Fine to Coarse SAND (A-3)

Ⓓ **Roadway Embankment:** Medium Stiff to Stiff, Moist, Gray-Orange-Brown, Fine to Coarse Sandy SILT (A-4) with Trace Mica and Gravel

Ⓔ **Residual:** Stiff, Moist, Tan-Brown, Fine Sandy SILT (A-4) with Trace Mica and Gravel

Ⓕ **Crystalline Rock:** Brown-White-Light Gray, Fresh to Moderate Weathering, Very Hard to Moderately Hard, (QUARTZ-DIORITE) with Moderately Close to Very Close Fracture Spacing

Ⓖ **Crystalline Rock:** Light Gray to Dark Gray, Fresh to Slight Weathering, Very Hard to Hard (QUARTZ-DIORITE) with Moderately Close to Close Fracture Spacing

GROUNDLINE TAKEN FROM .TIN FILE RECEIVED FROM KCA ON 09232022. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE

13+00 14+00

PROJECT REFERENCE NO.	SHEET NO.
SF-960436	5

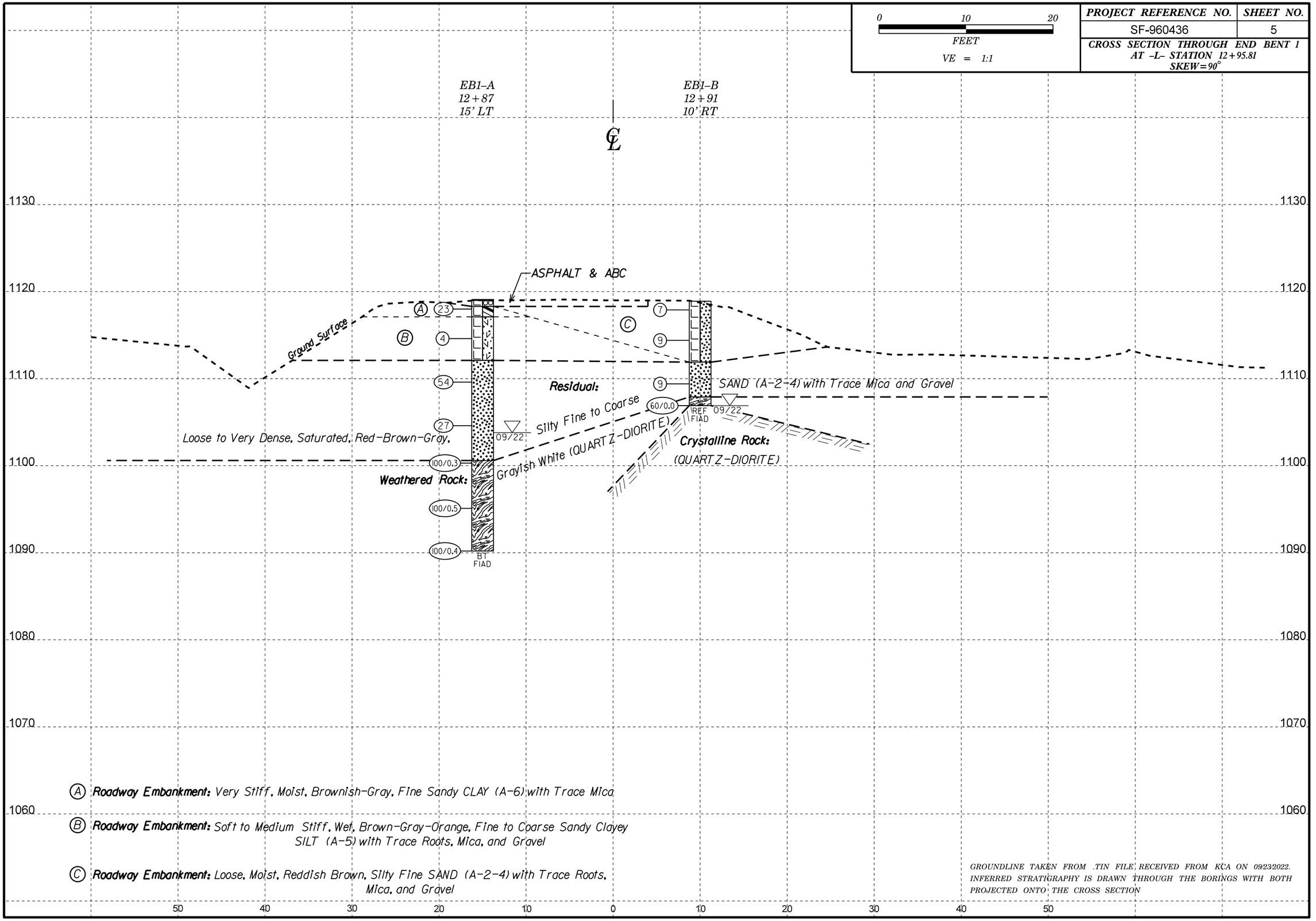
CROSS SECTION THROUGH END BENT 1
AT –L– STATION 12+95.81
SKEW=90°

0 10 20
FEET
VE = 1:1

EB1–A
12+87
15' LT

EB1–B
12+91
10' RT

℄



Ⓐ **Roadway Embankment:** Very Stiff, Moist, Brownish-Gray, Fine Sandy CLAY (A-6) with Trace Mica

Ⓑ **Roadway Embankment:** Soft to Medium Stiff, Wet, Brown-Gray-Orange, Fine to Coarse Sandy Clayey SILT (A-5) with Trace Roots, Mica, and Gravel

Ⓒ **Roadway Embankment:** Loose, Moist, Reddish Brown, Silty Fine SAND (A-2-4) with Trace Roots, Mica, and Gravel

GROUNDLINE TAKEN FROM .TIN FILE RECEIVED FROM KCA ON 09232022.
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION

PROJECT REFERENCE NO.	SHEET NO.
SF-960436	6

CROSS SECTION THROUGH BENT 1
AT –L– STATION 13+67.00
SKEW=90°

0 10 20
FEET
VE = 1:1

B1–A
13+69
14' LT

B1–B
13+69
2' LT

℄

RS-1
RS-2

RS-3
RS-4

1130
1120
1110
1100
1090
1080
1070
1060

Ⓐ Ground Surface

4 10/22 4 10/22

Residual:
Dense to Very Dense, Saturated, Tan-Gray, Silty Fine to Coarse SAND (A-2-4) with Trace Mica and Gravel

93 38

60/0.1 60/0.1

Ⓑ

Crystalline Rock:
Brown-White-Light Gray, Fresh to Moderate Weathering, Very Hard to Moderately Hard (QUARTZ-DIORITE) with Moderately Close to Very Close Fracture Spacing

RS-1 REC=88% RQD=56% GSI=35-65

RS-3

RS-4 REC=91% RQD=69% GSI=55-75

REC=88% RQD=17% GSI=45-65

Ⓒ BT FIAD

Weathered Rock:
Brown-Light Gray (QUARTZ-DIORITE)

RS-2 REC=100% RQD=88% GSI=55-75

BT FIAD

50 40 30 20 10 0 10 20 30 40 50

Ⓐ **Alluvial:** Loose, Saturated, Reddish Tan, Gravelly Fine to Coarse SAND (A-3) and GRAVEL (A-1-a) with Trace Organics

Ⓑ **Weathered Rock:** (QUARTZ-DIORITE)

Ⓒ **Crystalline Rock:** Gray, Moderate to Moderately Severe Weathering, Very Hard to Hard (GRANO-DIORITE) with Close to Very Close Fracture Spacing

GROUNDLINE TAKEN FROM .TIN FILE RECEIVED FROM KCA ON 09232022.
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION

PROJECT REFERENCE NO.	SHEET NO.
SF-960436	7

CROSS SECTION THROUGH END BENT 2
AT –L– STATION 14+28.19
SKEW=90°

0 10 20
FEET
VE = 1:1

EB2–A
14+30
10' LT

EB2–B
14+30
11' RT

℄

ASPHALT & ABC

Ground Surface

Residual:
Stiff, Moist, Tan-Brown, Fine Sandy SILT (A-4) with Trace Mica and Trace Gravel

Medium Dense to Very Dense, Wet to Saturated, Orange-Whitish Orange

Weathered Rock:

Roadway Embankment:
Loose,

Embankment:
Moist, Yellow-Brown, Silty Fine SAND (A-2-4) with Trace Gravel and Mica

Tan-Brown, Silty Fine to Coarse SAND (A-2-4) with Trace Mica and Gravel

(QUARTZ DIORITE)

Crystalline Rock:
(QUARTZ-DIORITE)

22
8
9
09/22
28
100/0.7
100/0.8
100/0.2
BT
FIAD

8
5
21
09/22
52
60/0.0
REF
FIAD

1130
1120
1110
1100
1090
1080
1070
1060

50 40 30 20 10 0 10 20 30 40 50

Ⓐ **Roadway Embankment:** Medium Stiff to Very Stiff, Moist, Whitish Red-Brown, Fine to Coarse Sandy Clayey SILT (A-5) with Trace Mica, Roots, and Gravel

Ⓑ **Roadway Embankment:** Medium Stiff to Stiff, Moist, Gray-Orange-Brown, Fine to Coarse Sandy SILT (A-4) with Trace Mica, Gravel, and Roots

GROUNDLINE TAKEN FROM .TIN FILE RECEIVED FROM KCA ON 09232022.
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 17BP.11.R.155	**TIP** SF-960436	**COUNTY** WILKES	**GEOLOGIST** C. Ranieri	
SITE DESCRIPTION Bridge No. 436 on SR 1943 (Brewer Mill Rd.) over East Prong Roaring River				**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 12+87	**OFFSET** 15 ft LT	**ALIGNMENT** -L-	**0 HR.** 15.3
COLLAR ELEV. 1,119.1 ft	**TOTAL DEPTH** 28.9 ft	**NORTHING** 940,873	**EASTING** 1,395,808	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 92% 05/20/2022		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER D. Tignor	**START DATE** 09/28/22	**COMP. DATE** 09/28/22	**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)
1120											
	1,119.0	0.1	16	15	8	23		M		1,119.0 GROUND SURFACE	0.0
										1,118.3 **ASPHALT**	0.8
										1,117.1 **ABC**	2.0
1115	1,115.6	3.5	4	2	2	4		W		**ROADWAY EMBANKMENT** Browinsh Gray, Fine Sandy CLAY (A-6) with Trace Mica	
										1,112.1 Brown-Gray-Orange, Fine to Coarse Sandy Clayey SILT (A-5) with Trace Roots, Mica, and Gravel	7.0
1110	1,110.6	8.5	5	5	49	54		Sat.		**RESIDUAL** Brownish Gray, Silty Fine to Coarse SAND (A-2-4) with Trace Mica and Gravel	
1105	1,105.6	13.5	14	13	14	27		Sat.			
1100	1,100.6	18.5	100/0.3			100/0.3				1,100.6 **WEATHERED ROCK** Grayish White (QUARTZ-DIORITE)	18.5
1095	1,095.6	23.5	100/0.5			100/0.5					
	1,090.6	28.5	100/0.4			100/0.4				1,090.3 Boring Terminated at Elevation 1,090.2 ft in Weathered Rock (QUARTZ-DIORITE)	28.8

WBS 17BP.11.R.155	**TIP** SF-960436	**COUNTY** WILKES	**GEOLOGIST** C. Ranieri	
SITE DESCRIPTION Bridge No. 436 on SR 1943 (Brewer Mill Rd.) over East Prong Roaring River				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 12+91	**OFFSET** 10 ft RT	**ALIGNMENT** -L-	**0 HR.** 11.9
COLLAR ELEV. 1,118.9 ft	**TOTAL DEPTH** 12.0 ft	**NORTHING** 940,849	**EASTING** 1,395,819	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 92% 05/20/2022		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER D. Tignor	**START DATE** 09/29/22	**COMP. DATE** 09/29/22	**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
1120										
	1,118.9	0.0	2	4	3	7		M		1,118.9 GROUND SURFACE 0.0
										ROADWAY EMBANKMENT Reddish Brown, Silty Fine SAND (A-2-4) with Trace Roots, Mica, and Gravel
1115	1,115.4	3.5	3	4	5	9		M		
										1,111.9 **RESIDUAL** Red-Brown, Silty Fine to Coarse SAND (A-2-4) with Trace Mica and Gravel 7.0
1110	1,110.4	8.5	4	4	5	9		Sat.		
	1,106.9	12.0	60/0.0			60/0.0				1,107.9 11.0
										1,106.9 **WEATHERED ROCK** (QUARTZ-DIORITE) 12.0
										Boring Terminated with Standard Penetration Test Refusal at Elevation 1,106.9 ft on Crystalline Rock (QUARTZ-DIORITE)
										Notes: 1. Surficial Organic Soil: 0.0'-0.2' 2. Harder Drilling Indicated br Driller at 11.0' 3. Auger Refusal at 12.0'

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 17BP.11.R.155	**TIP** SF-960436	**COUNTY** WILKES	**GEOLOGIST** C. Ranieri	
SITE DESCRIPTION Bridge No. 436 on SR 1943 (Brewer Mill Rd.) over East Prong Roaring River				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 13+69	**OFFSET** 14 ft LT	**ALIGNMENT** -L-	**0 HR.** 0.0
COLLAR ELEV. 1,108.8 ft	**TOTAL DEPTH** 31.6 ft	**NORTHING** 940,893	**EASTING** 1,395,887	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 92% 05/20/2022		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER D. Tignor	**START DATE** 10/03/22	**COMP. DATE** 10/04/22	**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)
1110											
	1,108.8	0.0	WOH	2	6	8		Sat.		1,108.8 GROUND SURFACE	0.0
										1,106.8 **ALLUVIAL** Tan, Gravelly Fine to Coarse SAND (A-3)	2.0
1105	1,105.3	3.5	13	23	70	93		Sat.		**RESIDUAL** Gray-Tan, Silty Fine to Coarse SAND (A-2-4) with Trace Gravel and Mica	
1100	1,100.3	8.5	60/0.1			60/0.1				1,100.3	8.5
										1,100.2 **CRYSTALLINE ROCK** Brown-White-Light Gray (QUARTZ-DIORITE)	8.6
1095							RS-1				
1090										1,090.8 **WEATHERED ROCK** Brown-Light Gray (QUARTZ DIORITE)	18.0
1085										1,086.3 **CRYSTALLINE ROCK** Light Gray to Dark Gray (QUARTZ-DIORITE)	22.5
							RS-2				
1080										1,077.2	31.6
										Boring Terminated at Elevation 1,077.2 ft in Crystalline Rock (QUARTZ-DIORITE)	

Notes:
1. Auger Refusal andStart Coring Rock at 8.6'

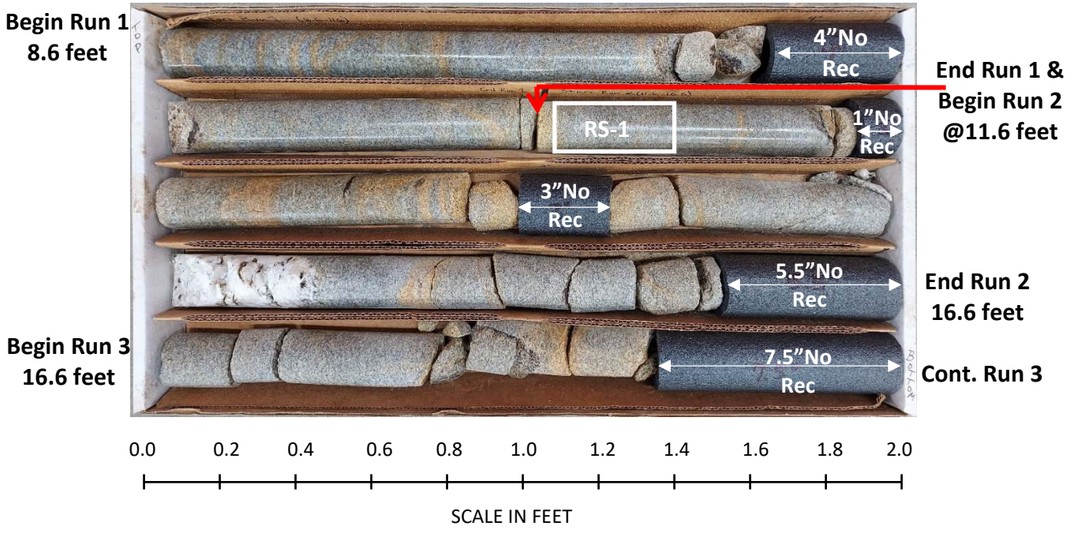
GEOTECHNICAL BORING REPORT
CORE LOG

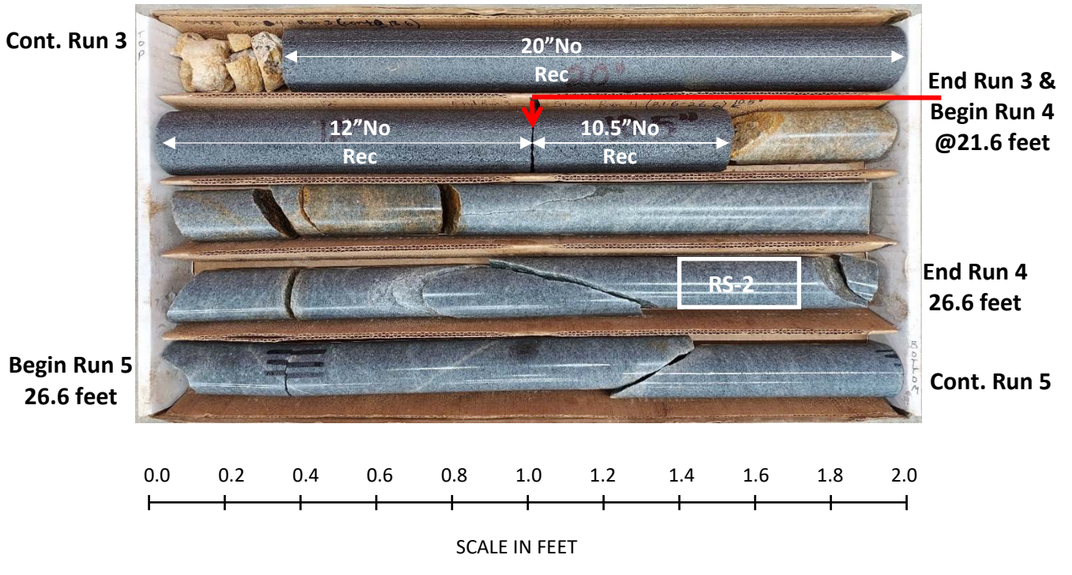
WBS 17BP.11.R.155	**TIP** SF-960436	**COUNTY** WILKES	**GEOLOGIST** C. Ranieri	
SITE DESCRIPTION Bridge No. 436 on SR 1943 (Brewer Mill Rd.) over East Prong Roaring River				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 13+69	**OFFSET** 14 ft LT	**ALIGNMENT** -L-	**0 HR.** 0.0
COLLAR ELEV. 1,108.8 ft	**TOTAL DEPTH** 31.6 ft	**NORTHING** 940,893	**EASTING** 1,395,887	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 92% 05/20/2022		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER D. Tignor	**START DATE** 10/03/22	**COMP. DATE** 10/04/22	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ3	**TOTAL RUN** 23.0 ft			

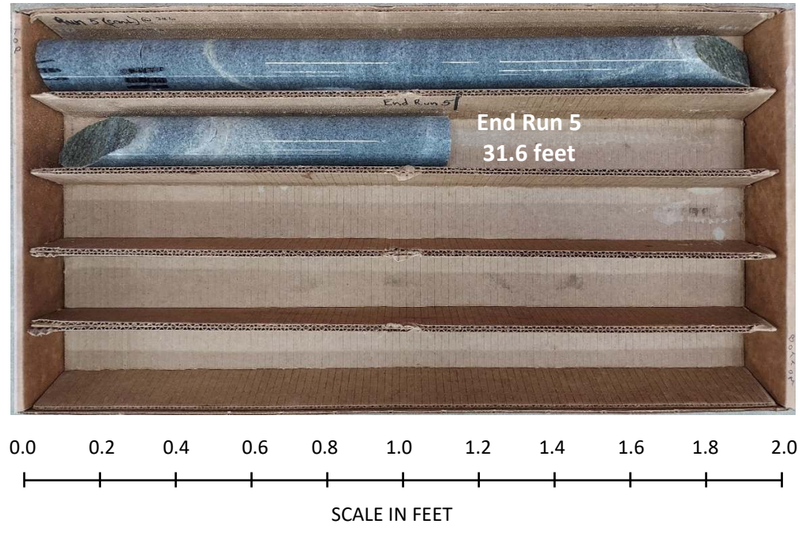
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
1100											Begin Coring @ 8.6 ft	
	1,100.2	8.6	3.0	3:21/1.0 2:32/1.0 2:30/1.0	(2.7) 90%	(2.3) 77%		(8.3) 88%	(5.3) 56%		1,100.2 **CRYSTALLINE ROCK** Brown-White-Light Gray, Fresh to Moderate Weathering, Very Hard to Moderately Hard (QUARTZ-DIORITE) with Moderately Close to Very Close Fracture Spacing RS-1: 11.7'-12.0', qu= 8,960 psi, GSI=35-65	8.6
	1,097.2	11.6										
1095			5.0	2:22/1.0 2:11/1.0 2:08/1.0 2:13/1.0 2:01/1.0	(4.2) 84%	(2.6) 52%	RS-1					
	1,092.2	16.6									1,090.8	18.0
1090			5.0	2:37/1.0 2:46/1.0 3:13/1.0 2:35/1.0 2:04/1.0	(1.7) 34%	(0.4) 8%					**WEATHERED ROCK** Brown-Light Gray (QUARTZ DIORITE)	
	1,087.2	21.6									1,086.3	22.5
1085			5.0	2:04/1.0 2:08/1.0 2:57/1.0 2:30/1.0 3:28/1.0	(4.1) 82%	(3.0) 60%		(9.1) 100%	(8.0) 88%		**CRYSTALLINE ROCK** Light Gray to Dark Gray, Fresh to Slight Weathering, Very Hard to Hard (QUARTZ-DIORITE) with Moderately Close to Close Fracturing Spacing RS-2: 26.1'-26.4', qu= 17,270 psi, GSI=55-75	
	1,082.2	26.6					RS-2					
1080			5.0	3:36/1.0 2:32/1.0 3:01/1.0 3:28/1.0 4:30/1.0	(5.0) 100%	(5.0) 100%						
	1,077.2	31.6									1,077.2	31.6
											Boring Terminated at Elevation 1,077.2 ft in Crystalline Rock (QUARTZ-DIORITE)	

Notes:
1. Auger Refusal andStart Coring Rock at 8.6'

CORE PHOTOGRAPHS:
SF-960436 I 17BP.11.R.155
B1-A: -L- 13+69, 14’ LT







GEOTECHNICAL BORING REPORT
BORE LOG

WBS 17BP.11.R.155	**TIP** SF-960436	**COUNTY** WILKES	**GEOLOGIST** C. Ranieri	
SITE DESCRIPTION Bridge No. 436 on SR 1943 (Brewer Mill Rd.) over East Prong Roaring River				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 13+69	**OFFSET** 2 ft LT	**ALIGNMENT** -L-	**0 HR.** 0.0
COLLAR ELEV. 1,109.3 ft	**TOTAL DEPTH** 27.0 ft	**NORTHING** 940,882	**EASTING** 1,395,891	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 92% 05/20/2022		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER D. Tignor	**START DATE** 10/05/22	**COMP. DATE** 10/05/22	**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)
1110											
	1,109.3	0.0	1	2	2	4		W		1,109.3 GROUND SURFACE	0.0
										ALLUVIAL	
										1,107.3 Reddish Tan, GRAVEL (A-1-a) with Trace Organics	2.0
1105	1,105.8	3.5	6	15	23	38		Sat.		**RESIDUAL** Tan-Gray, Silty Coarse SAND (A-2-4) with Trace Mica and Gravel	
										1,101.8	7.5
1100	1,100.8	8.5	60/0.1			60/0.1				1,100.8 **WEATHERED ROCK** (QUARTZ-DIORITE)	8.5
										1,100.3 **CRYSTALLINE ROCK** (QUARTZ-DIORITE)	9.0
1095							RS-3				
1090							RS-4				
1085										1,084.7	24.6
										Gray (GRANO-DIORITE)	
										1,082.3	27.0
										Boring Terminated at Elevation 1,082.3 ft in Crystalline Rock (GRANO-DIORITE)	

Notes:
1. Harder Drilling Indicated by Driller at 7.5'
2. Auger Refusal and Start Coring at Rock at 9.0'

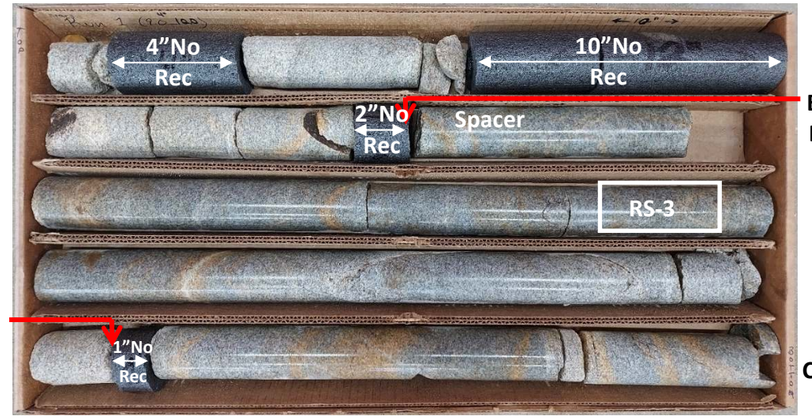
GEOTECHNICAL BORING REPORT
CORE LOG

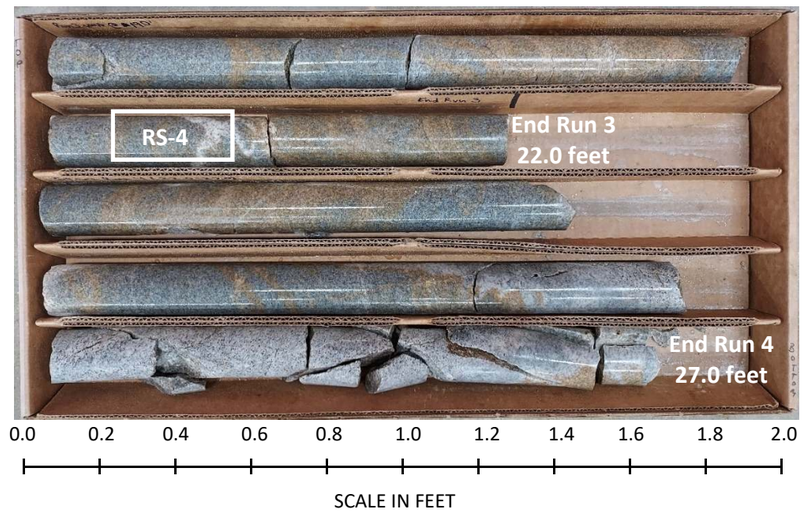
WBS 17BP.11.R.155	**TIP** SF-960436	**COUNTY** WILKES	**GEOLOGIST** C. Ranieri	
SITE DESCRIPTION Bridge No. 436 on SR 1943 (Brewer Mill Rd.) over East Prong Roaring River				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 13+69	**OFFSET** 2 ft LT	**ALIGNMENT** -L-	**0 HR.** 0.0
COLLAR ELEV. 1,109.3 ft	**TOTAL DEPTH** 27.0 ft	**NORTHING** 940,882	**EASTING** 1,395,891	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 92% 05/20/2022		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER D. Tignor	**START DATE** 10/05/22	**COMP. DATE** 10/05/22	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ3	**TOTAL RUN** 18.0 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)
1110	1,109.3										Begin Coring @ 9.0 ft	
	1,100.3	9.0	3.0	2:45/1.0 1:59/1.0 3:08/1.0	(1.7) 57%	(0.4) 13%		(14.2) 91%	(10.8) 69%		1,100.3 White-Light Gray, Very Slight to Moderate Weathering, Very Hard to Moderately Hard (QUARTZ-DIORITE) with Moderate Close to Very Close Fracture Spacing RS-3: 14.3'-14.6', qu=13, 630 psi, GSI=55-75	9.0
	1,097.3	12.0	5.0	3:45/1.0 3:05/1.0 3:24/1.0 2:58/1.0 2:35/1.0	(5.0) 100%	(3.8) 76%						
1095							RS-3					
	1,092.3	17.0	5.0	2:59/1.0 2:22/1.0 2:51/1.0 3:00/1.0 3:54/1.0	(4.9) 98%	(4.0) 80%						
1090							RS-4					
	1,087.3	22.0	5.0	3:19/1.0 2:51/1.0 3:18/1.0 2:20/1.0 3:10/1.0	(4.7) 94%	(3.0) 60%					1,084.7	24.6
1085								(2.1) 88%	(0.4) 17%		1,082.3 Gray, Moderate to Moderately Severe Weathering, Very Hard to Hard (GRANO-DIORITE) with Close to Very Close Fracture Spacing RS-4: 20.9'-21.2', qu=13,670 psi, GS=45-65	27.0
	1,082.3	27.0									Boring Terminated at Elevation 1,082.3 ft in Crystalline Rock (GRANO-DIORITE)	

Notes:
1. Harder Drilling Indicated by Driller at 7.5'
2. Auger Refusal and Start Coring at Rock at 9.0'

CORE PHOTOGRAPHS:
SF-960436 I 17BP.11.R.155
B1-B: -L- 13+69, 2’ LT





GEOTECHNICAL BORING REPORT
BORE LOG

WBS 17BP.11.R.155	**TIP** SF-960436	**COUNTY** WILKES	**GEOLOGIST** C. Ranieri	
SITE DESCRIPTION Bridge No. 436 on SR 1943 (Brewer Mill Rd.) over East Prong Roaring River				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 14+30	**OFFSET** 10 ft LT	**ALIGNMENT** -L-	**0 HR.** 11.2
COLLAR ELEV. 1,119.3 ft	**TOTAL DEPTH** 28.7 ft	**NORTHING** 940,906	**EASTING** 1,395,947	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 92% 05/20/2022		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER D. Tignor	**START DATE** 09/28/22	**COMP. DATE** 09/28/22	**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)
1120											
	1,119.3	0.0	23	16	6	22		M		1,119.3 GROUND SURFACE	0.0
										1,118.0 **ASPHALT**	1.3
										1,117.3 ABC	2.0
										ROADWAY EMBANKMENT Whitish Brown, Fine to Coarse Sandy Clayey SILT (A-5) with Trace Mica and Gravel	
1115	1,115.8	3.5	5	4	4	8		M			
										1,112.3 Gray-Orange-Brown, Fine to Coarse Sandy SILT (A-4) with Trace Mica, Gravel, and Roots	7.0
1110	1,110.8	8.5	6	4	5	9		M		**RESIDUAL** Tan-Brown, Fine Sandy SILT (A-4) with Trace Mica and Gravel	
										1,107.3	12.0
1105	1,105.8	13.5	13	9	19	28		Sat.		Orange-Tan-Brown, Silty Fine to Coarse SAND (A-2-4) with Trace Mica and Gravel	
										1,103.8	15.5
1100	1,100.8	18.5	50	40	60/0.2	100/0.7				**WEATHERED ROCK** Whitish Orange (QUARTZ-DIORITE)	
1095	1,095.8	23.5	27	60	40/0.3	100/0.8					
	1,090.8	28.5	100/0.2			100/0.2				1,090.6	28.7

Boring Terminated at Elevation 1,090.6 ft in Weathered Rock (QUARTZ-DIORITE)

Note:
1. Harder Drilling Indicated by Driller at 15.5'

WBS 17BP.11.R.155	**TIP** SF-960436	**COUNTY** WILKES	**GEOLOGIST** C. Ranieri	
SITE DESCRIPTION Bridge No. 436 on SR 1943 (Brewer Mill Rd.) over East Prong Roaring River				**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 14+30	**OFFSET** 11 ft RT	**ALIGNMENT** -L-	**0 HR.** 10.0
COLLAR ELEV. 1,118.5 ft	**TOTAL DEPTH** 15.9 ft	**NORTHING** 940,886	**EASTING** 1,395,952	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 92% 05/20/2022		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER D. Tignor	**START DATE** 09/29/22	**COMP. DATE** 09/29/22	**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
1120										
	1,118.5	0.0	3	3	5	8		M		1,118.5 GROUND SURFACE 0.0
										ROADWAY EMBANKMENT
										1,116.5 Red-Brown, Fine Sandy SILT (A-5) with Trace Roots and Gravel 2.0
1115	1,115.0	3.5	3	3	2	5		M		Yellow-Brown, Silty Fine SAND (A-2-4) with Trace Gravel and Mica
										1,111.5 7.0
1110	1,110.0	8.5	12	11	10	21		M		**RESIDUAL** Orange-Brown, Silty Fine to Coarse SAND (A-2-4) with Trace Gravel and Mica
1105	1,105.0	13.5	15	25	27	52		W		
	1,102.6	15.9	60/0.0			60/0.0				1,103.0 15.5
										1,102.6 **WEATHERED ROCK** (QUARTZ-DIORITE) 15.9
										Boring Terminated with Standard Penetration Test Refusal at Elevation 1,102.6 ft on Crystalline Rock (QUARTZ-DIORITE)

Notes:
1. Harder Drilling Indicated br Driller at 15.5'
2. Auger Refusal at 15.9'

PROJECT REFERENCE NO.	SHEET NO.
17BP.11.R.155	14

County: Wilkes
Description: Bridge No. 436 on SR 1943 between SR 1002 and SR 1941

ROCK TEST RESULTS

SAMPLE NO.	BORING NO.	ALIGNMENT	STATION	OFFSET	DEPTH INTERVAL	ROCK TYPE	Geologic Map Unit	Run RQD	Length (in)	Diameter (in)	Unit Weight (pcf)	Unconfined Compressive Strength (psi)	GSI
RS-1	B1-A	-L-	13+69	14' Lt.	11.7'- 12.0'	Quartz Diorite	Dqd	52%	3.58	1.77	160.5	8,960	35-65
RS-2	B1-A	-L-	13+69	14' Lt.	26.1'- 26.4'	Quartz Diorite	Dqd	60%	3.99	1.77	164.1	17,270	55-75
RS-3	B1-B	-L-	13+69	2' Lt.	14.3'- 14.6'	Quartz Diorite	Dqd	76%	3.77	1.77	163.4	13,630	55-75
RS-4	B1-B	-L-	13+69	2' Lt.	20.9'- 21.2'	Granodiorite	Dqd	80%	3.81	1.77	163.8	13,670	45-65

D. Council
Lab Manager, Certification No. 101-02-0603

C.Wang, P.E.
Soils Engineer