STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	SF-400224	1	19

PROJECT: 17BP.7.R.116 REFERENCE: SF-400224

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *GUILFORD*

PROJECT DESCRIPTION *BRIDGE NO. 224 ON SR 3000 (MCCONNELL ROAD) OVER SOUTH BUFFALO CREEK*

CONTENTS

PERSONNEL

TRIGON EXP.

CROCKETT, S.C.

WEIS, J.M.

HILL, M.J.

INVESTIGATED BY *WEIS, J.M.*

DRAWN BY *CROCKETT, S.C.*

CHECKED BY *HAMM, J.R.*

SUBMITTED BY *FALCON ENG.*

DATE *SEPTEMBER 2018*

CAUTION NOTICE

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

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

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NOTES:
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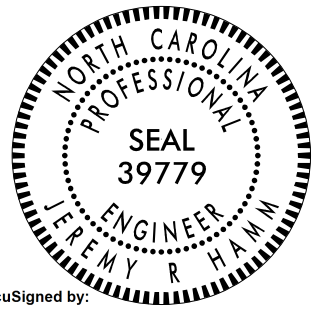
2. BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.



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SIGNATURE DATE

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PROJECT REFERENCE NO.	SHEET NO.
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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS
(PAGE 1 OF 2)

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) PL — PLASTIC LIMIT	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
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
- 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
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [X] B-57 MOBILE
- [ ] _____

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
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

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

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

PROJECT REFERENCE NO.	SHEET NO.
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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS
(PAGE 2 OF 2)

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 ORIG,NAL 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: BMI - RR SPIKE SET IN 20" SWEETGUM TREE
N: 841574 E: 1785714
STA. 17+24 OFFSET: 152' LT, -L- ELEVATION: 706.40 FEET

NOTES:

FIAD - FILLED IMMEDIATELY AFTER DRILLING

DATE: 8-15-14

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SF–400224	2B

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 (PAGE 1 OF 2)

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

SURFACE CONDITIONS

VERY GOOD Very rough, fresh unweathered surfaces

GOOD Rough, slightly weathered, iron stained surfaces

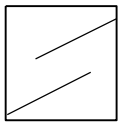
FAIR Smooth, moderately weathered and altered surfaces

POOR Slickensided, highly weathered surfaces with compact coatings or fillings or angular fragments

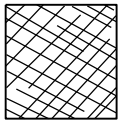
VERY POOR Slickensided, highly weathered surfaces with soft clay coatings or fillings

DECREASING SURFACE QUALITY ⇨

DECREASING INTERLOCKING OF ROCK PIECES ⇩



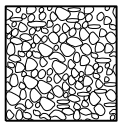
INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities



BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets

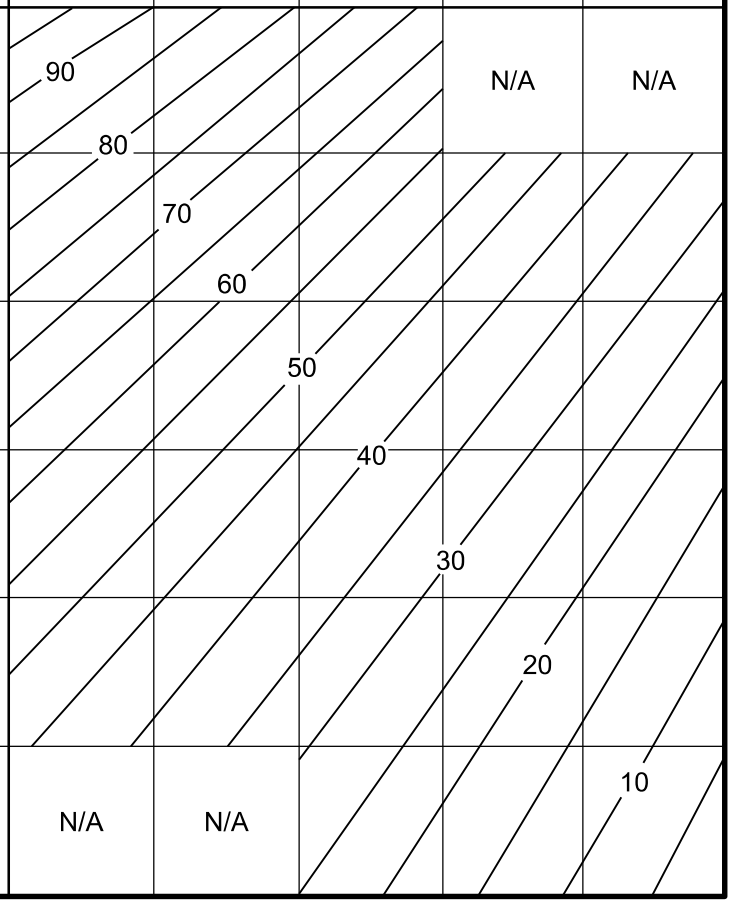
VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets

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



PROJECT REFERENCE NO.	SHEET NO.
SF–400224	2C

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 (PAGE 2 OF 2)

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

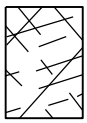
GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos. P and Hoek E., 2000)

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

SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)

VERY GOOD - Very Rough, fresh unweathered surfaces	GOOD - Rough, slightly weathered surfaces	FAIR - Smooth, moderately weathered and altered surfaces	POOR - Very smooth, occasionally slickensided surfaces with compact coatings or fillings with angular fragments	VERY POOR - Very smooth, slickensided or highly weathered surfaces with soft clay coatings or fillings

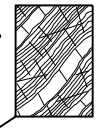


A. *Thick bedded, very blocky sandstone The effect of pelitic coatings on the bedding planes is minimized by the confinement of the rock mass. In shallow tunnels or slopes these bedding planes may cause structurally controlled instability.*

B. *Sandstone with thin interlayers of siltstone*

C. *Sandstone and siltstone in similar amounts*

D. *Siltstone or silty shale with sandstone layers*



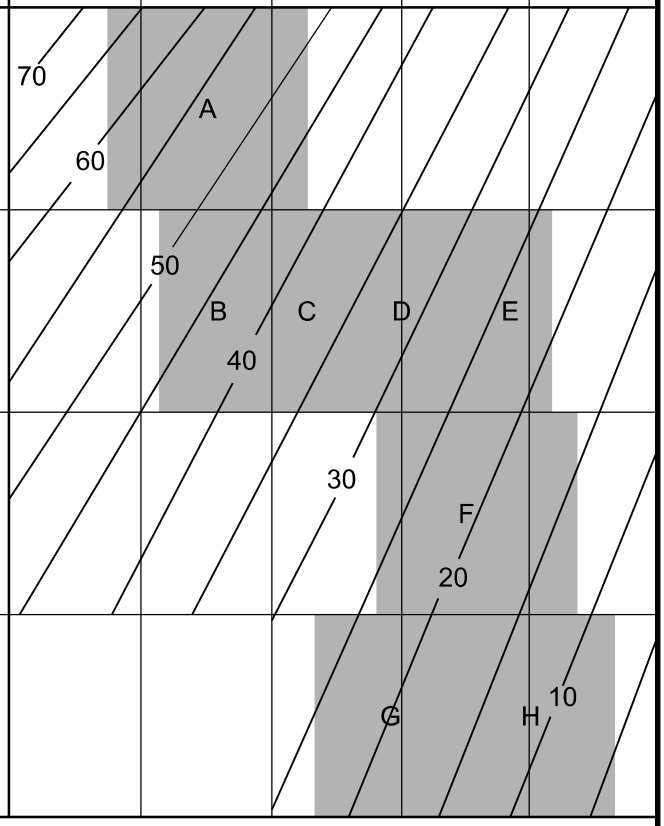
E. *Weak siltstone or clayey shale with sandstone layers*

C, D, E, and **G** - may be more or less folded than illustrated but this does not change the strength. Tectonic deformation, faulting and loss of continuity moves these categories to **F** and **H.**

F. *Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure*

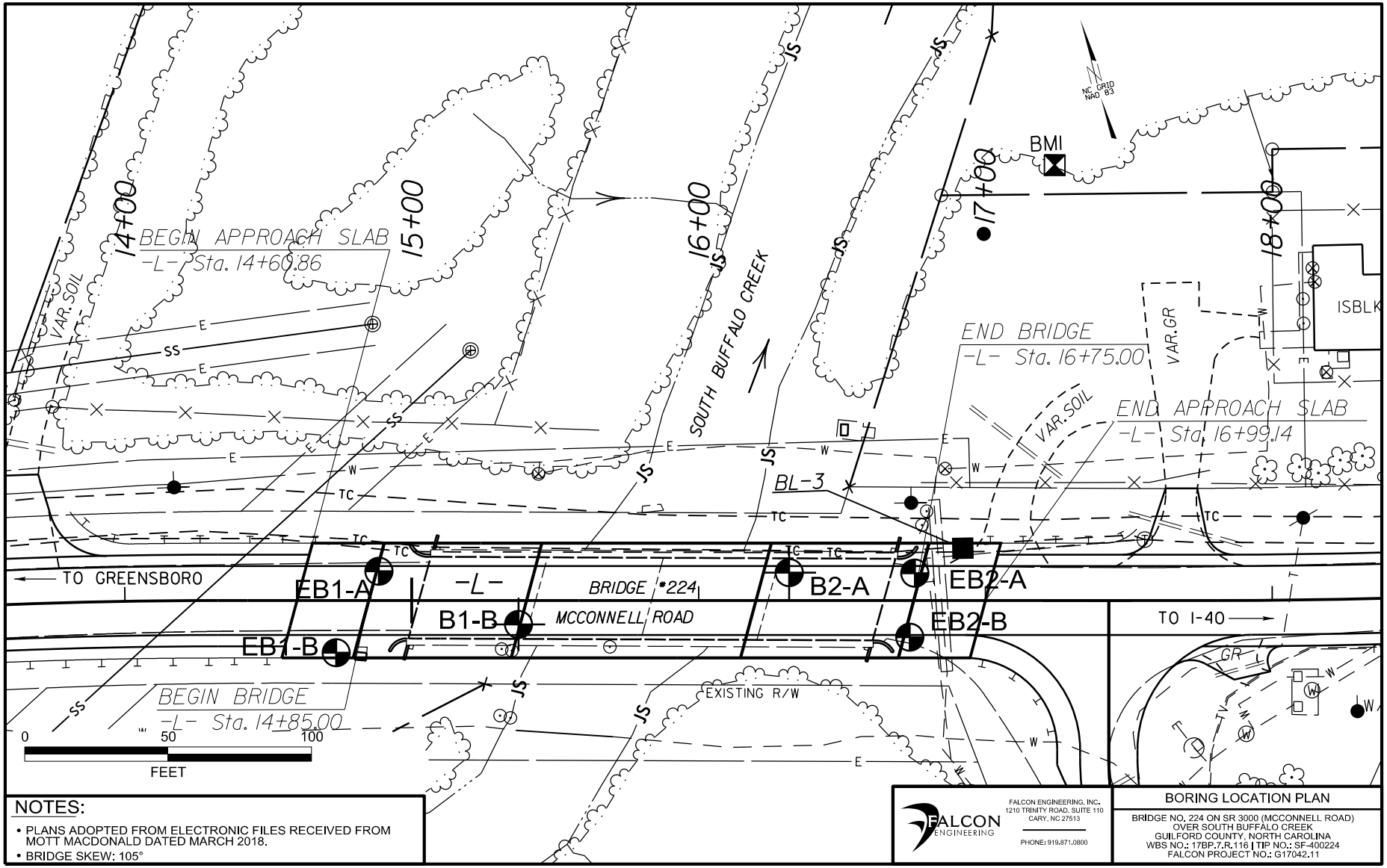
G. *Undisturbed silty or clayey shale with or without a few very thin sandstone layers*

H. ***Tectonically deformed silty or clayey shale forming a chaotic structure with pockets of clay. Thin layers of sandstone are transformed into small rock pieces.***



→ Means deformation after tectonic disturbance

DATE: 8-19-16



NOTES:

- PLANS ADOPTED FROM ELECTRONIC FILES RECEIVED FROM MOTT MACDONALD DATED MARCH 2018.
- BRIDGE SKEW: 105°

FALCON ENGINEERING, INC.
1210 TRINITY ROAD, SUITE 110
CARY, NC 27513
PHONE: 919.871.0800

BORING LOCATION PLAN

BRIDGE NO. 224 ON SR 3000 (MCCONNELL ROAD)
OVER SOUTH BUFFALO CREEK
GUILFORD COUNTY, NORTH CAROLINA
WBS NO.: 17BP.7.R.116 | TIP NO.: SF-400224
FALCON PROJECT NO.: G17042.11

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 17BP.7.R.116	**TIP** SF-400224	**COUNTY** GUILFORD	**GEOLOGIST** Crockett, S. C.	
SITE DESCRIPTION Bridge No. 224 on SR 3000 (McConnell Rd.) over South Buffalo Creek				**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 14+89	**OFFSET** 10 ft LT	**ALIGNMENT** -L-	**0 HR.** 14.2
COLLAR ELEV. 710.7 ft	**TOTAL DEPTH** 34.0 ft	**NORTHING** 841,497	**EASTING** 1,785,450	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TRI8016 MOBILE B-57 95% 03/19/2018		**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
DRILLER Estep, J. E.	**START DATE** 03/16/18	**COMP. DATE** 03/16/18	**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)
715												
710										GROUND SURFACE	710.7	0.0
										ROADWAY EMBANKMENT		
										0.4' ASPHALT, 1.6' AGGREGATE	708.7	2.0
	707.2	3.5	4	2	4	6		M		GRAY, CLAYEY SAND (A-2-6)		
705	704.7	6.0	1	1	5	6		M				
	702.2	8.5	1	1	1	2		M			701.7	9.0
700										**ALLUVIAL** ORANGE, SANDY CLAY (A-6) WITH TRACE GRAVEL		
	697.2	13.5	3	1	2	3		▽				
695										GRAY, SILTY COARSE SAND (A-2-4)	694.7	16.0
	692.2	18.5	6	4	1	5		W				
690										GRAY, CLAYEY SAND (A-2-6)	689.7	21.0
	687.2	23.5	2	3	3	6		W				
685										**RESIDUAL** BROWN, SILTY SAND (A-2-4)	685.1	25.6
	682.2	28.5	1	19	31	50		M				
680										**WEATHERED ROCK** DARK GRAY AND WHITE, GRANITE	679.7	31.0
	677.2	33.5										
	676.7	34.0	100/0.2 60/0.0			100/0.2 60/0.0				Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 676.7 ft ON CRYSTALLINE ROCK: GRANITE	676.7	34.0

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 17BP.7.R.116	**TIP** SF-400224	**COUNTY** GUILFORD	**GEOLOGIST** Weis, J. M.
SITE DESCRIPTION Bridge No. 224 on SR 3000 (McConnell Rd.) over South Buffalo Creek			**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 14+74	**OFFSET** 18 ft RT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 709.7 ft	**TOTAL DEPTH** 32.8 ft	**NORTHING** 841,473	**EASTING** 1,785,429	**24 HR.** 8.6
DRILL RIG/HAMMER EFF./DATE TRI8016 MOBILE B-57 95% 03/19/2018		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic
DRILLER Estep, J. E.	**START DATE** 03/27/18	**COMP. DATE** 03/27/18	**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)
710										709.7 TOPSOIL 6" 0.0
	708.7	1.0	2	1	3	4		M		**ROADWAY EMBANKMENT** RED-BROWN, SILTY CLAY (A-7)
	706.2	3.5								705.7 4.0
705			2	3	3	6		M		GRAY, CLAYEY SAND (A-2-6) WITH TRACE GRAVEL
	703.7	6.0								
			2	2	1	3		M		
	701.2	8.5								701.7 8.0
700			1	1	2	3		M		**ALLUVIAL** GRAY, SANDY CLAY (A-6)
	696.2	13.5								
695			1	1	2	3		M		
	691.2	18.5								
690			WOH	WOH	2	2		M		
	686.2	23.5								686.7 23.0
685			2	2	2	4		W		GRAY, CLAYEY SAND (A-2-6)
	681.2	28.5								681.7 28.0
680			15	11	12	23		M		**RESIDUAL** BROWN, SANDY SILT (A-4) WITH ROCK FRAGMENTS
	676.9	32.8								677.7 32.0
			60/0.0			60/0.0				676.9 **WEATHERED ROCK** 32.8 GRANITE
										Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 676.9 ft ON CRYSTALLINE ROCK: GRANITE

GEOTECHNICAL BORING REPORT
BORE LOG

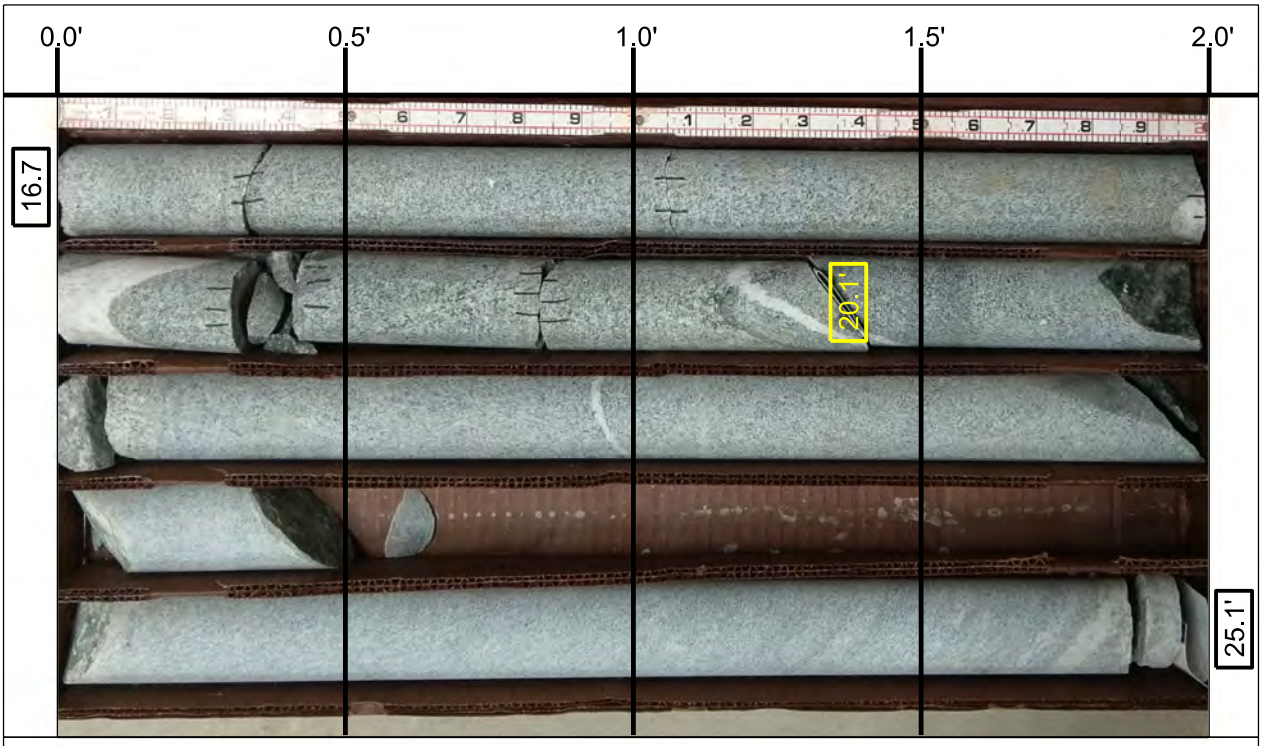
WBS 17BP.7.R.116	**TIP** SF-400224	**COUNTY** GUILFORD	**GEOLOGIST** Weis, J. M.	
SITE DESCRIPTION Bridge No. 224 on SR 3000 (McConnell Rd.) over South Buffalo Creek				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 15+37	**OFFSET** 8 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 699.3 ft	**TOTAL DEPTH** 30.1 ft	**NORTHING** 841,466	**EASTING** 1,785,493	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TRI8016 MOBILE B-57 95% 03/19/2018		**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
DRILLER Estep, J. E.	**START DATE** 03/28/18	**COMP. DATE** 03/29/18	**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)
700										699.3 GROUND SURFACE 0.0
	698.3	1.0	1	1	WOH	1		W		**ALLUVIAL** BROWN, SILTY SAND (A-2-4)
	695.8	3.5	4	3	3	6		W		696.3 3.0 GRAY, CLAYEY SAND (A-2-6)
695	693.3	6.0	3	2	3	5		W		693.8 5.5 GRAY, SAND (A-3)
	690.8	8.5	2	1	1	2		W		
690	687.1	12.2	1	1	1	2		W		
685	682.6	16.7	60/0.0			60/0.0				682.6 16.7 **CRYSTALLINE ROCK** GRAY, WHITE, AND BLUE, GRANITE GSI = 70-80
680										
675										
670							RS-1			669.2 30.1 Boring Terminated at Elevation 669.2 ft IN CRYSTALLINE ROCK: GRANITE

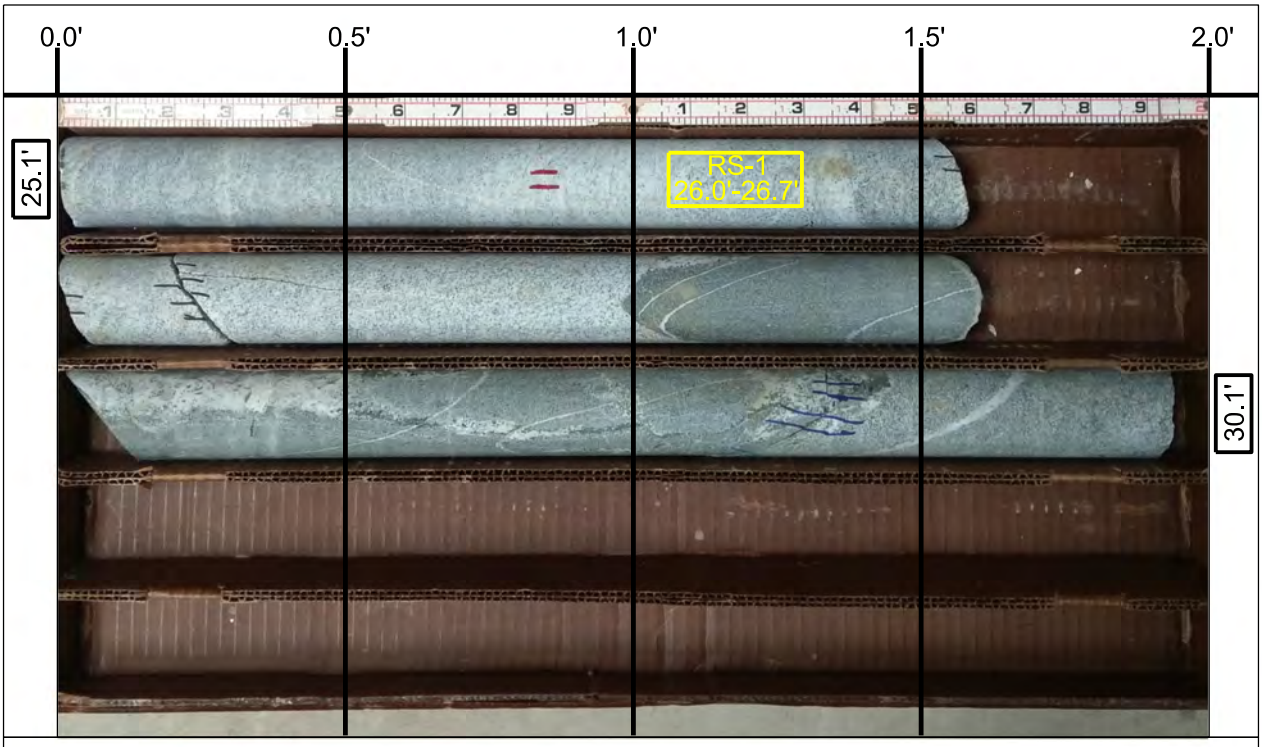
GEOTECHNICAL BORING REPORT
CORE LOG

WBS 17BP.7.R.116	**TIP** SF-400224	**COUNTY** GUILFORD	**GEOLOGIST** Weis, J. M.	
SITE DESCRIPTION Bridge No. 224 on SR 3000 (McConnell Rd.) over South Buffalo Creek				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 15+37	**OFFSET** 8 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 699.3 ft	**TOTAL DEPTH** 30.1 ft	**NORTHING** 841,466	**EASTING** 1,785,493	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TRI8016 MOBILE B-57 95% 03/19/2018		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Estep, J. E.	**START DATE** 03/28/18	**COMP. DATE** 03/29/18	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ	**TOTAL RUN** 13.4 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
682.63											Begin Coring @ 16.7 ft
	682.6	16.7	3.4	9:47/1.0 5:52/1.0 *-/1.0 *-/0.4	(3.4) 100%	(3.4) 100%		(13.4) 100%	(12.5) 93%		682.6 **CRYSTALLINE ROCK** 16.7 GRAY, WHITE, AND BLUE, FRESHLY WEATHERED, MODERATELY HARD TO HARD, MODERATELY CLOSELY TO WIDELY FRACTURED, GRANITE GSI = 70-80
680	679.2	20.1	5.0	4:22/1.0 5:24/1.0 6:33/1.0 10:18/1.0 10:56/1.0	(5.0) 100%	(4.3) 86%					
675	674.2	25.1	5.0	4:40/1.0 4:24/1.0 3:53/1.0 3:44/1.0 4:04/1.0	(5.0) 100%	(4.8) 96%	RS-1				
670	669.2	30.1									669.2 30.1 Boring Terminated at Elevation 669.2 ft IN CRYSTALLINE ROCK: GRANITE * Coring rates not collected due to rig running out of fuel during coring run.



BORING B1-B, BOX 1 OF 2, 16.7 FEET TO 25.1 FEET.



BORING B1-B, BOX 2 OF 2, 25.1 FEET TO 30.1 FEET.

0 0.5' 1.0'

FEET

FALCON ENGINEERING, INC.
1210 TRINITY ROAD, SUITE 110
CARY, NC 27513
PHONE: 919.871.0800

ROCK CORE PHOTOS

BRIDGE NO. 224 ON SR 3000 (MCCONNEL RD.)
OVER SOUTH BUFFALO CREEK
GUILFORD COUNTY, NORTH CAROLINA
WBS NO.: 17BP.7.R.116 | TIP NO.: SF-400224
FALCON PROJECT NO.: G17042.11

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 17BP.7.R.116	**TIP** SF-400224	**COUNTY** GUILFORD	**GEOLOGIST** Hill, M. J.	
SITE DESCRIPTION Bridge No. 224 on SR 3000 (McConnell Rd.) over South Buffalo Creek				**GROUND WTR (ft)**
BORING NO. B2-A	**STATION** 16+32	**OFFSET** 10 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 700.7 ft	**TOTAL DEPTH** 20.7 ft	**NORTHING** 841,460	**EASTING** 1,785,589	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TRI8016 MOBILE B-57 95% 03/19/2018		**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
DRILLER Estep, J. E.	**START DATE** 03/29/18	**COMP. DATE** 03/29/18	**SURFACE WATER DEPTH** N/A	

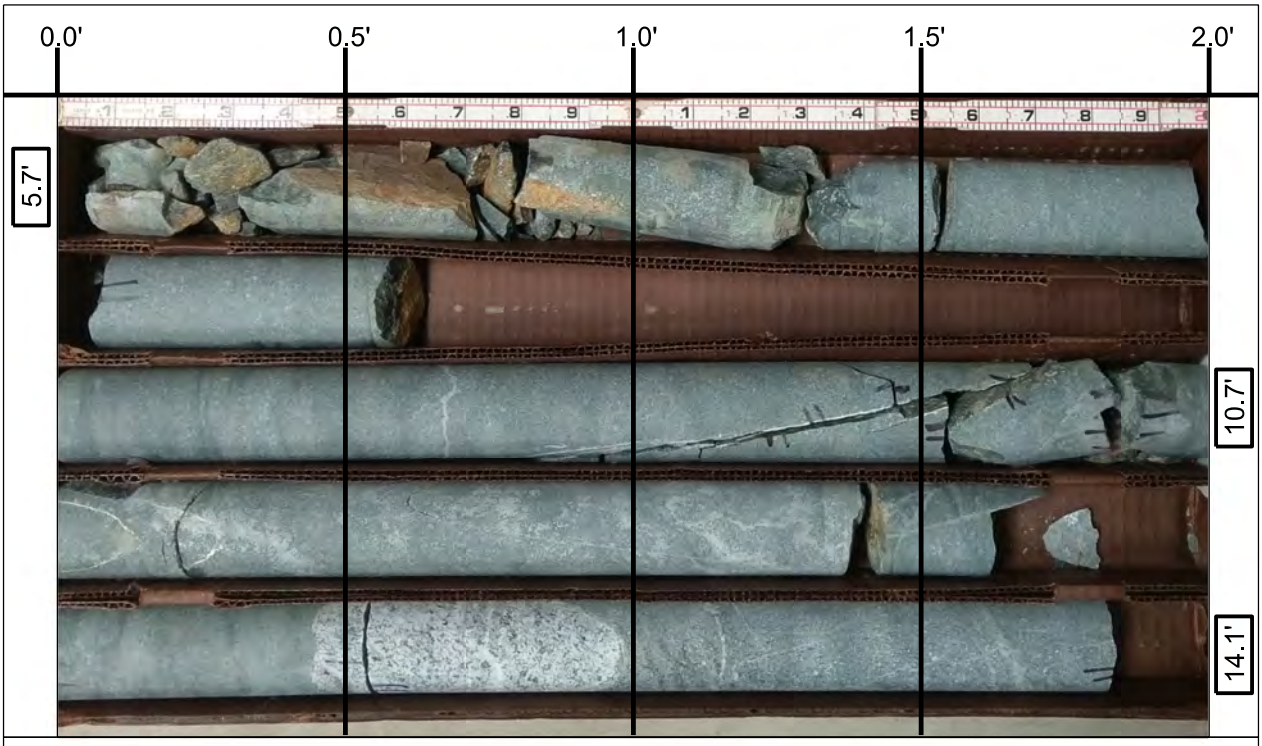
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
										ELEV. (ft) DEPTH (ft)
705										
										700.7 GROUND SURFACE 0.0
700	699.7	1.0	1	2	4	6 15		W		**ALLUVIAL** GRAY, GREEN, AND BROWN, SANDY CLAY (A-6)
	697.2	3.5	2	8	7					
695	695.1	5.6	60/0.1			60/0.1				695.1 5.6
										695.0 5.7 **CRYSTALLINE ROCK** GRANITE
690										**CRYSTALLINE ROCK** BLUE-GRAY AND WHITE, GRANITE GSI = 60-70
685							RS-2			
680										680.0 20.7
										Boring Terminated at Elevation 680.0 ft IN CRYSTALLINE ROCK: GRANITE

GEOTECHNICAL BORING REPORT
CORE LOG

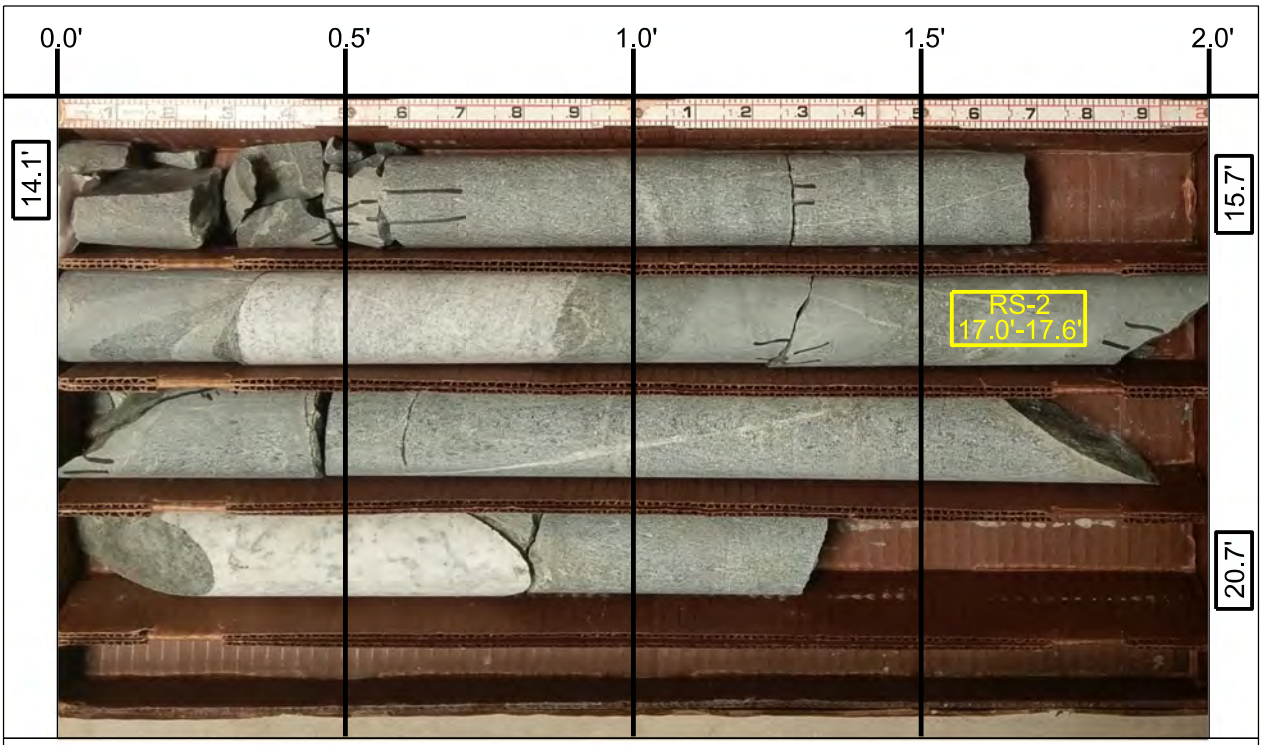
WBS 17BP.7.R.116	**TIP** SF-400224	**COUNTY** GUILFORD	**GEOLOGIST** Hill, M. J.	
SITE DESCRIPTION Bridge No. 224 on SR 3000 (McConnell Rd.) over South Buffalo Creek				**GROUND WTR (ft)**
BORING NO. B2-A	**STATION** 16+32	**OFFSET** 10 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 700.7 ft	**TOTAL DEPTH** 20.7 ft	**NORTHING** 841,460	**EASTING** 1,785,589	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TRI8016 MOBILE B-57 95% 03/19/2018		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Estep, J. E.	**START DATE** 03/29/18	**COMP. DATE** 03/29/18	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ	**TOTAL RUN** 15.0 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. %	STRATA RQD %	LOG	DESCRIPTION AND REMARKS
695											Begin Coring @ 5.7 ft
	695.0	5.7	5.0	6:26/1.0 6:40/1.0 2:59/1.0 3:07/1.0 3:28/1.0	(4.8) 96%	(3.9) 78%		(14.7) 98%	(13.3) 89%		695.0 **CRYSTALLINE ROCK** 5.7 BLUE-GRAY AND WHITE, FRESH TO SLIGHTLY WEATHERED, VERY HARD, VERY CLOSELY TO WIDELY FRACTURED, GRANITE GSI = 60-70
690	690.0	10.7	5.0	3:27/1.0 3:45/1.0 3:16/1.0 3:48/1.0 3:44/1.0	(5.0) 100%	(4.8) 96%					
685	685.0	15.7	5.0	3:06/1.0 3:47/1.0 3:20/1.0 3:24/1.0 4:23/1.0	(4.9) 98%	(4.6) 92%	RS-2				
680	680.0	20.7									680.0 20.7 Boring Terminated at Elevation 680.0 ft IN CRYSTALLINE ROCK: GRANITE

NCDOT CORE SINGLE SF400224_BORINGS.GPJ NC_DOT.GDT 9/18/18



BORING B2-A, BOX 1 OF 2, 5.7 FEET TO 14.1 FEET.



BORING B2-A, BOX 2 OF 2, 14.1 FEET TO 20.7 FEET.

0 0.5' 1.0'

FEET

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1210 TRINITY ROAD, SUITE 110
CARY, NC 27513
PHONE: 919.871.0800

ROCK CORE PHOTOS

BRIDGE NO. 224 ON SR 3000 (MCCONNELL RD.)
OVER SOUTH BUFFALO CREEK
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WBS NO.: 17BP.7.R.116 | TIP NO.: SF-400224
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GEOTECHNICAL BORING REPORT
BORE LOG

WBS 17BP.7.R.116	**TIP** SF-400224	**COUNTY** GUILFORD	**GEOLOGIST** Crockett, S. C.	
SITE DESCRIPTION Bridge No. 224 on SR 3000 (McConnell Rd.) over South Buffalo Creek				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 16+75	**OFFSET** 10 ft LT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 710.9 ft	**TOTAL DEPTH** 19.9 ft	**NORTHING** 841,449	**EASTING** 1,785,631	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TRI8016 MOBILE B-57 95% 03/19/2018		**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
DRILLER Estep, J. E.	**START DATE** 03/16/18	**COMP. DATE** 03/16/18	**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)
715												
										GROUND SURFACE	710.9	0.0
710	709.9	1.0	3	4	6	10		D		**ROADWAY EMBANKMENT** 0.7' ASPHALT, 0.3' AGGREGATE BROWN, CLAYEY SAND (A-2-6)	709.9	1.0
	707.4	3.5	3	2	3	5		M				
705	704.9	6.0	1	1	2	3		M		RED-BROWN, SANDY CLAY (A-6) WITH TRACE GRAVEL	704.9 702.9	6.0 8.0
	702.4	8.5	2	3	4	7		M		**RESIDUAL** ORANGE, SANDY CLAY (A-6)		
700											699.9	11.0
	697.4	13.5	16	14	8	22		D		TAN, SILTY SAND (A-2-4)		
695												
	692.4	18.5										
	691.9	19.0	17 60/0.0	55	45/0.1	60/0.0 100/0.6					691.9	19.0
										WEATHERED ROCK GRAY, GRANITE Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 691.0 ft ON CRYSTALLINE ROCK: GRANITE	691.0	19.9

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 17BP.7.R.116	**TIP** SF-400224	**COUNTY** GUILFORD	**GEOLOGIST** Crockett, S. C.	
SITE DESCRIPTION Bridge No. 224 on SR 3000 (McConnell Rd.) over South Buffalo Creek				**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 16+74	**OFFSET** 13 ft RT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 710.8 ft	**TOTAL DEPTH** 19.0 ft	**NORTHING** 841,427	**EASTING** 1,785,623	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TRI8016 MOBILE B-57 95% 03/19/2018		**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
DRILLER Estep, J. E.	**START DATE** 03/16/18	**COMP. DATE** 03/16/18	**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)
715											
										710.8 GROUND SURFACE	0.0
710	709.8	1.0	4	3	6	9		D		710.0 **ROADWAY EMBANKMENT** 0.3' ASPHALT, 0.5' AGGREGATE GRAY, ORANGE, AND BROWN, CLAYEY SAND (A-2-6)	0.8
	707.3	3.5	3	5	6	11		M			
705	704.8	6.0	2	1	1	2		M		702.8	8.0
	702.3	8.5	3	4	5	9		M		701.3 **RESIDUAL** ORANGE, SANDY CLAY (A-6)	9.5
700										699.8 ORANGE, CLAYEY SAND (A-2-6)	11.0
	697.3	13.5	6	11	17	28		D		ORANGE AND WHITE, SILTY SAND (A-2-4)	
695											
	692.3	18.5								692.8	18.0
	691.8	19.0	100/0.4 60/0.0			100/0.4 60/0.0				691.8 **WEATHERED ROCK** ORANGE AND WHITE, GRANITE Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 691.8 ft ON CRYSTALLINE ROCK: GRANITE	19.0

SUMMARY OF ROCK CORE TEST RESULTS

BRIDGE NO. 224 ON SR 3000 (MCCONNELL RD.) OVER SOUTH BUFFALO CREEK

WBS NO.: 17BP.7.R.116, TIP NO.: SF-400224

GUILFORD COUNTY, NORTH CAROLINA

FALCON ENGINEERING, INC. PROJECT NO: G17042.11

Sample No.	Boring	Depth (ft)	Rock Type	Geologic Map Unit	Run RQD	Length (ft)	Diameter (ft)	Unit Weight (PCF)	Unconfined Compressive Strength (PSI)	Young's Modulus (PSI)	Rock Mass Rating (RMR)
RS-1	B1-B	26.0-26.7	GRANITE	CZg	96%	0.70	0.16	166.9	32,197	3,280,092	80
RS-2	B2-A	17.5-18.1	GRANITE	CZg	92%	0.60	0.17	183.4	32,973	2,690,625	67

ROCK CORE UNIAXIAL COMPRESSIVE STRENGTH TEST

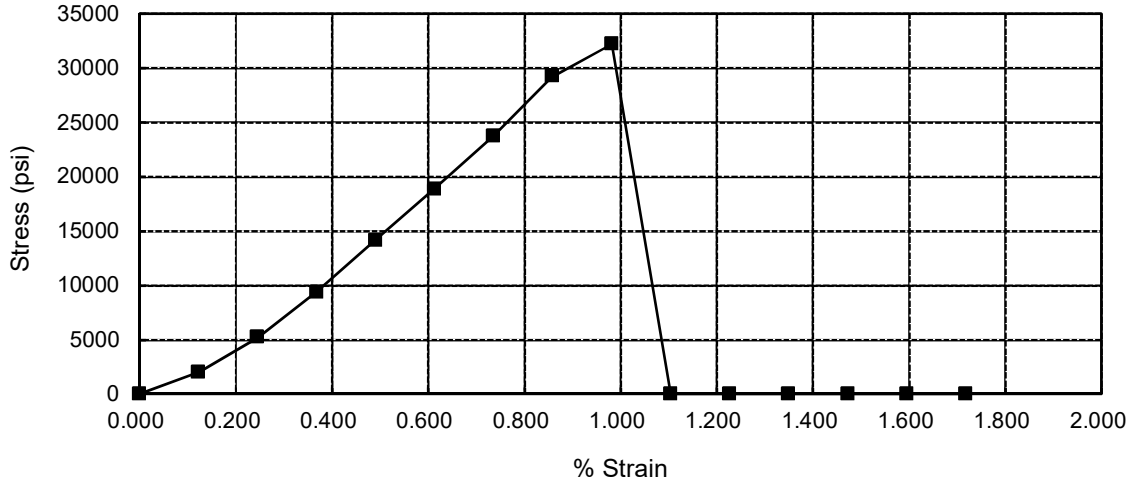
ASTM D-7012-10 METHOD C

Job No.:	G17042.11	Job Name:	Bridge 224 Over S. Buffalo Creek
Date:	8/22/2018	TIP:	SF-400224
Boring No.:	B1-B	WBS:	17BP.7.R.116
Description:		Sample No.:	RS-1
		Depth (ft):	26.0 - 26.7

Length (in.):	4.075	Volume (in^3):	12.23238152
Diameter (in.):	1.955	Volume (cf):	0.007078924
Area (sq. in.):	3.002	Unit Weight (pcf):	166.8773

Compressive Strength (psi): 32197

Deflection (in.)	Strain (%)	Load (lbf)	Compressive Strength (psi)	Young's Modulus (psi)
0.000	0.000	0	0.0	
0.005	0.123	6020	2005.5	1,634,446
0.010	0.245	15720	5236.8	2,134,011
0.015	0.368	28160	9381.0	2,548,506
0.020	0.491	42520	14164.8	2,886,074
0.025	0.613	56570	18845.3	3,071,782
0.030	0.736	71300	23752.3	3,226,357
0.035	0.859	87820	29255.7	3,406,196
0.040	0.982	96650	32197.2	3,280,092
0.045	1.104		0.0	0
0.050	1.227		0.0	0
0.055	1.350		0.0	0
0.060	1.472		0.0	0
0.065	1.595		0.0	0
0.070	1.718		0.0	0



ROCK CORE UNIAXIAL COMPRESSIVE STRENGTH TEST

ASTM D-7012-10 METHOD C

Job No.:	G17042.11	Job Name:	Bridge 224 Over S. Buffalo Creek
Date:	8/22/2018	TIP:	SF-400224
		WBS:	17BP.7.R.116
Boring No.:	B2-A	Sample No.:	RS-2
Description:		Depth (ft):	17.5 - 18.1

Length (in.):	4.080	Volume (in^3):	12.57531856
Diameter (in.):	1.981	Volume (cf):	0.007277383
Area (sq. in.):	3.082	Unit Weight (pcf):	183.3851

Compressive Strength (psi): 32973

Deflection (in.)	Strain (%)	Load (lbf)	Compressive Strength (psi)	Young's Modulus (psi)
0.000	0.000	0	0.0	
0.005	0.123	2300	746.2	608,918
0.010	0.245	7740	2511.2	1,024,572
0.015	0.368	14450	4688.2	1,275,199
0.020	0.490	22490	7296.8	1,488,541
0.025	0.613	32780	10635.3	1,735,682
0.030	0.735	45130	14642.2	1,991,340
0.035	0.858	58570	19002.7	2,215,177
0.040	0.980	76730	24894.7	2,539,256
0.045	1.103	88580	28739.3	2,605,700
0.050	1.225	101630	32973.4	2,690,625
0.055	1.348		0.0	0
0.060	1.471		0.0	0
0.065	1.593		0.0	0
0.070	1.716		0.0	0