

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	17BP.9.R.5	1	7

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

**STRUCTURE  
SUBSURFACE INVESTIGATION**

PROJ. REFERENCE NO. 17BP.9.R.5 F.A. PROJ. NA  
 COUNTY STOKES  
 PROJECT DESCRIPTION DIVISION 9 EXPRESS DESIGN BUILD  
BRIDGE REPLACEMENT  
 SITE DESCRIPTION BRIDGE NO. 58 OVER RICKERS BRANCH  
ON US-311

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PERSONNEL  
A.F. RIGGS, JR.  
F. WRIGHT  
S. HARDEE  
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INVESTIGATED BY S&ME, INC.  
 CHECKED BY A.F. RIGGS, JR.  
 SUBMITTED BY S&ME, INC.  
 DATE OCTOBER, 2014

**CAUTION NOTICE**

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF PREPARING THE SCOPE OF WORK TO BE INCLUDED IN THE REQUEST FOR PROPOSAL. THE VARIOUS FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALIGH BY CONTACTING THE N.C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 707-6950. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

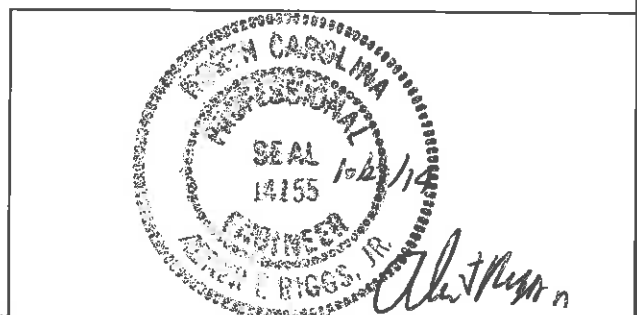
SOIL AND ROCK BOUNDARIES WITHIN A BOREHOLE ARE BASED ON GEOTECHNICAL INTERPRETATION UNLESS ENCOUNTERED IN A SAMPLE. INTERPRETED BOUNDARIES MAY NOT NECESSARILY REFLECT ACTUAL SUBSURFACE CONDITIONS BETWEEN SAMPLED STRATA, AND BOREHOLE INFORMATION MAY NOT NECESSARILY REFLECT ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS. 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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NOTE - 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.

DRAWN BY: B. RATTI



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

**SOIL DESCRIPTION**

SOIL IS CONSIDERED TO BE THE 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 STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:  
*VERY STIFF, GRAY SILTY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-1-6*

**GRADATION**

**WELL GRADED** - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. **UNIFORM** - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED) **GAP-GRADED** - INDICATES A MIXTURE OF UNIFORM PARTICLES 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**.

**SOIL LEGEND AND AASHTO CLASSIFICATION**

GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)							SILT-CLAY MATERIALS (> 35% PASSING #200)							ORGANIC MATERIALS		
	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-2	A-3	A-4, A-5	A-6, A-7	
GROUP CLASS.	A-1-a	A-1-b	A-2-4	A-2-5	A-2-6	A-2-7	A-4	A-5	A-6	A-7	A-1, A-2	A-3	A-4, A-5	A-6, A-7			
SYMBOL																	
% PASSING	50 MK	38 MK	50 MK	51 MK	35 MK	35 MK	35 MK	35 MK	36 MK	36 MK	36 MK	36 MK	36 MK	36 MK			
LIQUID LIMIT	50 MK	38 MK	50 MK	51 MK	35 MK	35 MK	35 MK	36 MK	36 MK	36 MK	36 MK	36 MK	36 MK				
PLASTIC INDEX	6 MK	NP	10 MK	10 MK	11 MK	11 MK	10 MK	10 MK	11 MK	11 MK	11 MK	11 MK	11 MK				
GROUP INDEX	0	0	0	4 MK	8 MK	12 MK	16 MK	16 MK	16 MK	16 MK	16 MK	16 MK	16 MK				
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS, GRAVEL, AND SAND	FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND		SILTY SOILS		CLAYEY SOILS		SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER			HIGHLY ORGANIC SOILS					
GEN. RATING AS A SUBGRADE	EXCELLENT TO GOOD						FAIR TO POOR				FAIR TO POOR	POOR	UNSATURABLE				

**MINERALOGICAL COMPOSITION**

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

**COMPRESSIBILITY**

SLIGHTLY COMPRESSIBLE  
MODERATELY COMPRESSIBLE  
HIGHLY COMPRESSIBLE

LIQUID LIMIT LESS THAN 31  
LIQUID LIMIT EQUAL TO 31-50  
LIQUID LIMIT GREATER THAN 50

**PERCENTAGE OF MATERIAL**

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

**GROUND WATER**

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

**CONSISTENCY OR DENSENESS**

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TDNS/F <sup>2</sup> )
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 0.50 0.5 TO 1.0 1 TO 2 2 TO 4 >4

**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
- DIP & DIP DIRECTION OF ROCK STRUCTURES
- SPT TEST BORING
- AUGER BORING
- CORE BORING
- MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING W/ CORE
- SPT N-VALUE
- SPT REFUSAL

**TEXTURE OR GRAIN SIZE**

U.S. STD. SIEVE SIZE OPENING (MM)	4	10	40	60	200	270
	4.75	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.)						

**ABBREVIATIONS**

- AR - AUGER REFUSAL
- BT - BORING TERMINATED
- CL - CLAY
- CPT - CONE PENETRATION TEST
- CSE - COARSE
- DMT - DILATOMETER TEST
- DPT - DYNAMIC PENETRATION TEST
- F - VOID RATIO
- F - FINE
- FOSS - FOSSILIFEROUS
- FRAC. - FRACTURED, FRACTURES
- FRAGS. - FRAGMENTS
- HL - HIGHLY
- MED. - MEDIUM
- MICA - MICACEDOUS
- 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
- w - UNIT WEIGHT
- w<sub>d</sub> - DRY UNIT WEIGHT
- S - BULK
- SS - SPLIT SPOON
- ST - SHELBY TUBE
- RS - ROCK
- RT - RECOMPACTED TRIAXIAL
- CBR - CALIFORNIA BEARING RATIO

**SOIL MOISTURE - CORRELATION OF TERMS**

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

**PLASTICITY**

NONPLASTIC	PLASTICITY INDEX (PI)	DRY STRENGTH
LOW PLASTICITY	0-5	VERY LOW
MED. PLASTICITY	6-15	SLIGHT
HIGH PLASTICITY	16-25	MEDIUM
	25 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.

**EQUIPMENT USED ON SUBJECT PROJECT**

DRILL UNITS:	ADVANCING TOOLS:	HAMMER TYPE:
<input type="checkbox"/> MOBILE B-	<input type="checkbox"/> CLAY BITS	<input checked="" type="checkbox"/> AUTOMATIC <input type="checkbox"/> MANUAL
<input type="checkbox"/> BK-51	<input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER	CORE SIZE:
<input type="checkbox"/> CME-45C	<input type="checkbox"/> 8" HOLLOW AUGERS	
<input type="checkbox"/> CME-550	<input type="checkbox"/> HARD FACED FINGER BITS	<input type="checkbox"/> -N
<input type="checkbox"/> PORTABLE HOIST	<input type="checkbox"/> TUNG-CARBIDE INSERTS	<input type="checkbox"/> -H
<input checked="" type="checkbox"/> CME-45B	<input type="checkbox"/> CASING <input type="checkbox"/> W/ ADVANCER	HAND TOOLS:
	<input type="checkbox"/> TRICONE _____ * STEEL TEETH	
	<input type="checkbox"/> TRICONE _____ * TUNG-CARB.	<input type="checkbox"/> HAND AUGER
	<input type="checkbox"/> CORE BIT	<input checked="" type="checkbox"/> SOUNDING ROD
	<input checked="" type="checkbox"/> 3 1/2" HOLLOW AUGER	<input type="checkbox"/> VANE SHEAR TEST

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ROCK DESCRIPTION		TERMS AND DEFINITIONS	
<p>HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. 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:</p>		<p><b>ALLUVIUM (ALLUV.)</b> - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.  <b>AQUIFER</b> - A WATER BEARING FORMATION OR STRATA.  <b>ARENACEOUS</b> - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.  <b>ARGILLACEOUS</b> - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC.  <b>ARTESIAN</b> - 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.  <b>CALCAREOUS (CALC.)</b> - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.  <b>COLLUVIUM</b> - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.  <b>CORE RECOVERY (REC.)</b> - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.  <b>DIKE</b> - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.  <b>DIP</b> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.  <b>DIP DIRECTION (DIP AZIMUTH)</b> - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.  <b>FAULT</b> - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.  <b>FISSILE</b> - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.  <b>FLOAT</b> - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.  <b>FLOOD PLAIN (FP)</b> - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.  <b>FORMATION (FM.)</b> - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.  <b>JOINT</b> - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.  <b>LEDGE</b> - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.  <b>LENS</b> - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.  <b>MOTTLED (MOT.)</b> - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.  <b>PERCHED WATER</b> - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.  <b>RESIDUAL (RES.) SOIL</b> - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.  <b>ROCK QUALITY DESIGNATION (RQD)</b> - 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.  <b>SAPROLITE (SAP.)</b> - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.  <b>SILL</b> - 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.  <b>SLICKENSIDE</b> - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.  <b>STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT)</b> - NUMBER OF BLOWS (IN 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.  <b>STRATA CORE RECOVERY (SREC.)</b> - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.  <b>STRATA ROCK QUALITY DESIGNATION (SROQ)</b> - 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.  <b>TOPSOIL (TS.)</b> - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p>	
<b>WEATHERED ROCK (WR)</b>		NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.	
<b>CRYSTALLINE ROCK (CR)</b>		FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.	
<b>NON-CRYSTALLINE ROCK (NCR)</b>		FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.	
<b>COASTAL PLAIN SEDIMENTARY ROCK (CP)</b>		COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.	
WEATHERING			
<b>FRESH</b>		ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER HAMMER IF CRYSTALLINE.	
<b>VERY SLIGHT (V SL.)</b>		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.	
<b>SLIGHT (SL.)</b>		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.	
<b>MODERATE (MOD.)</b>		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.	
<b>MODERATELY SEVERE (MOD. SEV.)</b>		ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. <i>IF TESTED, WOULD YIELD SPT REFUSAL</i>	
<b>SEVERE (SEV.)</b>		ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. <i>IF TESTED, YIELDS SPT N VALUES &gt; 100 BPF</i>	
<b>VERY SEVERE (V SEV.)</b>		ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. <i>IF TESTED, YIELDS SPT N VALUES &lt; 100 BPF</i>	
<b>COMPLETE</b>		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			
<b>VERY HARD</b>		CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.	
<b>HARD</b>		CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.	
<b>MODERATELY HARD</b>		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.	
<b>MEDIUM HARD</b>		CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.	
<b>SOFT</b>		CAN BE GROOVED 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.	
<b>VERY SOFT</b>		CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGER NAIL.	
FRACTURE SPACING		BEDDING	
<b>TERM</b>	<b>SPACING</b>	<b>TERM</b>	<b>THICKNESS</b>
VERY WIDE	MORE THAN 10 FEET	VERY THICKLY BEDDED	> 4 FEET
WIDE	3 TO 10 FEET	THICKLY BEDDED	1.5 - 4 FEET
MODERATELY CLOSE	1 TO 3 FEET	THINLY BEDDED	0.16 - 1.5 FEET
CLOSE	0.16 TO 1 FEET	VERY THINLY BEDDED	0.03 - 0.16 FEET
VERY CLOSE	LESS THAN 0.16 FEET	THICKLY LAMINATED	0.008 - 0.03 FEET
		THINLY LAMINATED	< 0.008 FEET
INDURATION			
FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.			
<b>FRIABLE</b>		RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.	
<b>MODERATELY INDURATED</b>		GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.	
<b>INDURATED</b>		GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.	
<b>EXTREMELY INDURATED</b>		SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.	
		<p><b>BENCH MARK: 84-0058 BL-2 NCDOT TRAVERSE STATION REBAR AND CAP</b>  <b>STA I2+51.87 13.92 FT RT -EL-</b>  <b>ELEVATION: 585.63 FT.</b></p>	
		<p><b>NOTES:</b>  <b>FIAD - FILLED IN AFTER DRILLING</b>  <b>BM - BENCH MARK</b></p>	



BM#1

BEGIN PROJECT

-L- Sta.11+00.00

END PROJECT

Sta.13+50.00

NGS MON.  
"10-69"

EB1-A

SR-2

-L-

US HWY 311 N

BRIDGE#58

BL-2

23' BST

N 89° 51' 55.9" E

SR-1

EB2-B

4' STEEL

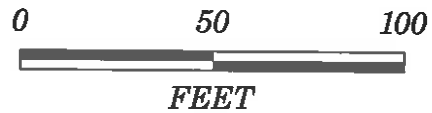
4' STEEL

RICKERS BRANCH

END UNKNOWN

8" PVC

5SBW



SKEW ANGLE FOR BENTS 90° TYPICAL

SCALE: 1" = 50'  
DATE: OCT. 2014  
DRAWN BY: BTR  
PROJECT NO: 1051-11-343B



**S&ME**  
WWW.SMEINC.COM

NC ENGINEER LICENSE #F-0176  
3201 SPRING FOREST RD, RALEIGH, NC 27616

**BORING LOCATION MAP**  
BRIDGE NO. 58  
OVER RICKERS BRANCH  
STATE PROJ NO. 17BP.9.R.5  
STOKES COUNTY, NORTH CAROLINA

FIGURE NO.  
**3**



# NCDOT GEOTECHNICAL ENGINEERING UNIT

## BORELOG REPORT

WBS 17BP.9.R.5	TIP 84-0058	COUNTY STOKES	GEOLOGIST Wright, F.
SITE DESCRIPTION Bridge No. 58 over Rickers Branch on NC 311			GROUND WTR (ft)
BORING NO. EB1-A	STATION 12+54	OFFSET 12 ft LT	ALIGNMENT -L-
COLLAR ELEV. 586.0 ft	TOTAL DEPTH 23.6 ft	NORTHING 947,670	EASTING 1,694,324
DRILL RIG/HAMMER EFF./DATE SME1524 CME-45B 86% 01/02/2014		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER Norwood, R.	START DATE 09/25/14	COMP. DATE 09/25/14	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
590																
585	584.9	1.1	1	2	4									586.0	GROUND SURFACE	0.0
	582.7	3.3	2	3	3										<b>ROADWAY EMBANKMENT</b> Brown Orange Fine Sandy CLAY with Little Silt and Trace of Organic Material	
580	579.3	6.7	2	2	2											
	577.5	8.5	2	2	2											
575															<b>ALLUVIAL</b> Tan Brown Fine Sandy SILT with Trace of Gravel	8.2
	572.5	13.5	2	4	2									573.0	Brown Tan Fine Sandy SILT with Little Clay and Trace of Mica	13.0
570																
	567.5	18.5	24	76/0.4										569.0	<b>TRIASSIC RESIDUAL</b> Red-Brown and Gray Fine Sandy SILT with Little Rock Fragments	17.0
565														567.0	<b>WEATHERED ROCK</b> Triassic (Red-Brown Siltstone)	19.0
	562.8	23.2	100/0.4											562.8	Triassic (Gray Siltstone)	23.2
														562.4	Triassic (Gray Siltstone)	23.6
															Boring Terminated at Elevation 562.4 ft in Weathered Rock (Triassic Siltstone)	
															1) Advanced 3-1/4" H.S.A. to 23.2 feet.	

NCDOT BORE SINGLE 0648000\_GEO\_BRD00011\_GINT.GPJ NC\_DOT.GDT 10/17/14



# NCDOT GEOTECHNICAL ENGINEERING UNIT

## BORELOG REPORT

WBS 17BP.9.R.5	TIP 84-0058	COUNTY STOKES	GEOLOGIST Wright, F.
SITE DESCRIPTION Bridge No. 58 over Rickers Branch on NC 311			GROUND WTR (ft)
BORING NO. SR-1	STATION 12+54	OFFSET 34 ft RT	ALIGNMENT -L-
COLLAR ELEV. 576.6 ft	TOTAL DEPTH 12.5 ft	NORTHING 947,624	EASTING 1,694,324
DRILL RIG/HAMMER EFF./DATE N/A		DRILL METHOD Rod Sounding	HAMMER TYPE N/A
DRILLER N/A	START DATE 09/18/14	COMP. DATE 09/18/14	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
590															
585															
580															
575	575.6	1.0												576.6	0.0
	574.6	2.0	N/A	2	2										
	573.6	3.0	N/A	3	2										
	572.6	4.0	N/A	3	4										
	571.6	5.0	N/A	2	3										
	570.6	6.0	N/A	5	3										
	569.6	7.0	N/A	4	3										
	568.6	8.0	N/A	4	4										
	567.6	9.0	N/A	4	4										
	566.6	10.0	N/A	5	4										
	565.6	11.0	N/A	6	5									565.6	11.0
	564.6	12.0	N/A	6	6									564.1	12.5
			N/A	10	12										
			N/A	60											

NCDOT BORE SINGLE\_0846000\_GEO\_BRDG0011\_GINT.GPJ NC\_DOT.GDT 10/17/14



# NCDOT GEOTECHNICAL ENGINEERING UNIT BORELOG REPORT

WBS 17BP.9.R.5	TIP 84-0058	COUNTY STOKES	GEOLOGIST Wright, F.
SITE DESCRIPTION Bridge No. 58 over Rickers Branch on NC 311			GROUND WTR (ft)
BORING NO. EB2-B	STATION 12+83	OFFSET 10 ft RT	ALIGNMENT -L-
COLLAR ELEV. 585.9 ft	TOTAL DEPTH 24.8 ft	NORTHING 947,649	EASTING 1,694,353
DRILL RIG/HAMMER EFF./DATE SME1524 CME-45B 86% 01/02/2014		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER Norwood, R.	START DATE 09/25/14	COMP. DATE 09/25/14	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
590														
585	584.7	1.2	2	2	2								PAVEMENT ASPHALT(0.4')	0.0
	582.6	3.3	4	3	4								ROADWAY EMBANKMENT	
	579.5	6.4	2	3	5								Brown Tan Fine Sandy Silty CLAY with Trace of Mica	
	577.6	8.3	2	3	4									
575	572.6	13.3	1	2	3								ALLUVIAL	8.9
	567.6	18.3	2	3	4								Brown Tan Fine Sandy CLAY with Trace of Mica	
565	562.6	23.3	2	17	51								Gray and Brown Silty Fine to Coarse SAND with Some Gravel and Trace of Mica	17.5
													Brown and Red Silty Fine SAND with Trace of Gravel and Mica	20.5
													TRIASSIC RESIDUAL	23.8
													Gray Fine Sandy SILT with Trace of Mica	24.8
													Boring Terminated at Elevation 561.1 ft in Hard Triassic Residual SILT	
													1) Advanced 3-1/4" H.S.A. to 23.4 feet	

NCDOT BORE SINGLE 0848000\_GEO\_BRD00011\_GINT.GPJ NC\_DOT.GDT 10/17/14



# NCDOT GEOTECHNICAL ENGINEERING UNIT BORELOG REPORT

WBS 17BP.9.R.5	TIP 84-0058	COUNTY STOKES	GEOLOGIST Wright, F.
SITE DESCRIPTION Bridge No. 58 over Rickers Branch on NC 311			GROUND WTR (ft)
BORING NO. SR-2	STATION 12+81	OFFSET 35 ft LT	ALIGNMENT -L-
COLLAR ELEV. 574.3 ft	TOTAL DEPTH 7.9 ft	NORTHING 947,694	EASTING 1,694,351
DRILL RIG/HAMMER EFF./DATE N/A		DRILL METHOD Rod Sounding	HAMMER TYPE N/A
DRILLER N/A	START DATE 09/18/14	COMP. DATE 09/18/14	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
590																
585																
580																
575																
	573.3	1.0												574.3	GROUND SURFACE	0.0
	572.3	2.0	N/A	1	2											
	571.3	3.0	N/A	2	3											
	570.3	4.0	N/A	3	3											
	569.3	5.0	N/A	3	5											
	568.3	6.0	N/A	4	7											
	567.3	7.0	N/A	8	10									567.3		7.0
			N/A	60/0.9										566.4		7.9

**ALLUVIAL**  
Tan-Brown Fine Sandy SILT with Trace of Gravel

**TRIASSIC RESIDUAL**  
Red-Brown Fine Sandy SILT

Boring Terminated at Elevation 566.4 ft in Very Stiff to Hard Triassic Residual SILT

1) Advanced 1/2 inch dia. steel rod with 16 pound hammer