

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	17BP.14.R.15	1	7

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

# STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 17BP.14.R.67 F.A. PROJ. n/a  
COUNTY JACKSON  
PROJECT DESCRIPTION Bridge No. 322 on SR 1316 over  
E. Fork Savannah Creek

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2, 2A	LEGEND
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## PERSONNEL

B. Smith

J. Bare

J. Gentry

INVESTIGATED BY B. Worley, PG

CHECKED BY D. Dewey, PE

SUBMITTED BY Summit Design & Engineering

DATE AUGUST, 2012

## 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. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE 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 MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THIS 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.

NOTE THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N.C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IS IT CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

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. Worley, PG



*Bradley D. Worley*

**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 LENS, MOD. PLASTIC, A-7-6

**SOIL LEGEND AND AASHTO CLASSIFICATION**

GENERAL CLASS.	GRANULAR MATERIALS ( $\leq 35\%$ 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-4, A-5		
SYMBOL												
% PASSING	100	100	100		100	100	100	100	100	100		
LIQUID LIMIT	5	NP	40	41	40	41	40	41	40	41		
GROUP INDEX	0	0	0	4	0	0	12	15	0	0		
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS, GRAVEL, AND SAND	FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND		SILTY SOILS		CLAYEY SOILS					
GENERAL RATING AS A SUBGRADE	EXCELLENT TO GOOD				FAIR TO POOR				FAIR TO POOR	POOR	UNSATURABLE	

P: OF A 7-5 SUBGROUP IS  $\leq LL - 30$ ; P: OF A-7-6 SUBGROUP IS  $> LL - 30$

**CONSISTENCY OR DENSENESS**

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTANCE (IN-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT <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 $> 4$

**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 (CS, SD.)	FINE SAND (F, SD.)	SILT (SL.)	CLAY (CL.)
GRAIN SIZE	MM 305 IN. 12	75 3	2.0	0.25	0.075	0.005

**SOIL MOISTURE - CORRELATION OF TERMS**

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
LL - LIQUID LIMIT	SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE
PL - PLASTIC LIMIT	WET - (W)	SEMICOLID; 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
	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. 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.

**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

**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

**GROUND WATER**

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

**MISCELLANEOUS SYMBOLS**

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

**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  
 Y - UNIT WEIGHT  
 Y<sub>d</sub> - 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:**  
☐ MOBILE B-  
☐ BK 51  
☐ CME-45C  
☐ CME-550  
☐ PORTABLE MOIST  
☒ Diedrich D-50  
☐
- ADVANCING TOOLS:**  
☐ CLAY BITS  
☐ 6" CONTINUOUS FLIGHT AUGER  
☐ 8" HOLLOW AUGERS  
☐ HARD FACED FINGER BITS  
☐ TUNG-CARBIDE INSERTS  
☒ CASING ☒ W/ ADVANCER  
☐ TRICONE 'STEEL TEETH  
☒ TRICONE 2 1/8" TUNG-CARB.  
☐ CORE BIT  
☐
- HAMMER TYPE:**  
☒ AUTOMATIC ☐ MANUAL  
**CORE SIZE:**  
☐ 9  
☒ N 02  
☐ H  
**HAND TOOLS:**  
☐ POST HOLE DIGGER  
☐ HAND AUGER  
☐ SOUNDING ROD  
☐ 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 SPDM 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>ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.</p> <p>AQUIFER - A WATER BEARING FORMATION OR STRATA.</p> <p>ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.</p> <p>ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC.</p> <p>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.</p> <p>CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.</p> <p>COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.</p> <p>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.</p> <p>DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.</p> <p>DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.</p> <p>DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.</p> <p>FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.</p> <p>FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.</p> <p>FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.</p> <p>FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.</p> <p>FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.</p> <p>JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.</p> <p>LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.</p> <p>LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.</p> <p>MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.</p> <p>PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.</p> <p>RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.</p> <p>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.</p> <p>SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.</p> <p>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.</p> <p>SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.</p> <p>STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - 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.</p> <p>STRATA (CORE RECOVERY) (SREC) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.</p> <p>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.</p> <p>TCP SOIL (TS) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p>	
<p>WEATHERED ROCK (WR)</p> <p>CRYSTALLINE ROCK (CR)</p> <p>NON-CRYSTALLINE ROCK (NCR)</p> <p>COASTAL PLAIN SEDIMENTARY ROCK (CP)</p>		<p>NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES &gt; 100 BLOWS PER FOOT IF TESTED.</p> <p>FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.</p> <p>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.</p> <p>COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.</p>	
WEATHERING			
FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER HAMMER IF CRYSTALLINE.		
VERY SLIGHT (V SL.)	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 (SL.)	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. <u>IF TESTED, WOULD YIELD SPT REFUSAL.</u>		
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. <u>IF TESTED, YIELDS SPT N VALUES &gt; 100 BPF</u>		
VERY SEVERE (V SEV.)	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. <u>IF TESTED, YIELDS SPT N VALUES &lt; 100 BPF</u>		
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 0.25 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.		
SOFT	CAN BE 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.		
VERY SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGER NAIL.		
FRACTURE SPACING		BEDDING	
TERM	SPACING	TERM	THICKNESS
VERY WIDE	MORE THAN 10 FEET	VERY THICKLY BEDDED	> 4 FEET
WIDE	3 TO 10 FEET	THICKLY BEDDED	1.5 - 4 FEET
MODERATELY CLOSE	1 TO 3 FEET	THINLY BEDDED	0.16 - 1.5 FEET
CLOSE	0.16 TO 1 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.			
FRAGILE	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.		

BENCH MARK: BM "1	
N 594463	
E 733630	ELEVATION: 2283.01 FT.
NOTES:	

BENCH MARK: BM #1

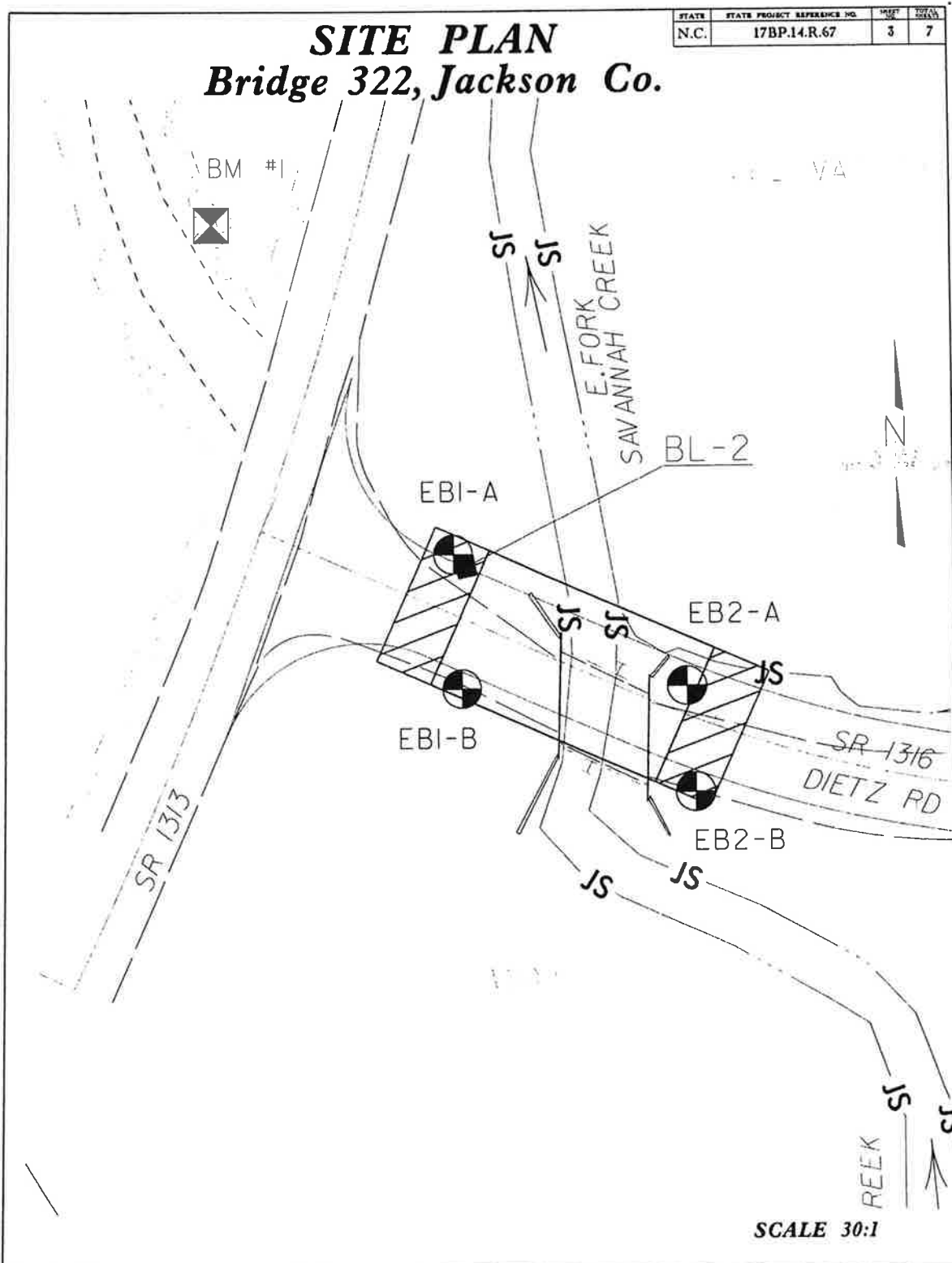
N 594463

E 733630

ELEVATION: 2283.01 FT.

NOTES:

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	17BP.14.R.67	3	7



**NCDOT GEOTECHNICAL ENGINEERING UNIT**  
**BORELOG REPORT**

<b>WBS</b> 17BP.14.R.67						<b>TIP</b> 490322						<b>COUNTY</b> JACKSON						<b>GEOLOGIST</b> Brett Smith							
<b>SITE DESCRIPTION</b> Bridge # 322 on SR 1316 across E. Fork Savannah Creek																		<b>GROUND WTR (ft)</b>							
<b>BORING NO.</b> EB1-A						<b>STATION</b> N/A						<b>OFFSET</b> N/A						<b>ALIGNMENT</b> -L-						<b>0 HR.</b> N/A	
<b>COLLAR ELEV.</b> 2,281.2 ft						<b>TOTAL DEPTH</b> 15.1 ft						<b>NORTHING</b> 591,395						<b>EASTING</b> 733,679						<b>24 HR.</b> Dry	
<b>DRILL RIG/HAMMER EFF/DATE</b> SUM0093 DIEDRICH D-50 82% 07/22/2011												<b>DRILL METHOD</b> NW Casing w/ Advancer						<b>HAMMER TYPE</b> Automatic							
<b>DRILLER</b> Jacob Bare						<b>START DATE</b> 04/10/12						<b>COMP. DATE</b> 04/10/12						<b>SURFACE WATER DEPTH</b> N/A							
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION											
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						ELEV (ft)	DEPTH (ft)								
2285																									
2280															2,281.2 GROUND SURFACE 0.0										
2275	2,276.6	4.6	0	4	15										ROADWAY EMBANKMENT red-brown, v. stiff, SANDY CLAY with trace rock fragments (A-6)										
2270	2,271.6	9.6	20	20	15										2,274.1 ALLUVIAL 7.1 brown to red-brown, dense, SANDY GRAVEL (A-1-a)										
	2,266.6	14.6	21	60/0.0											2,266.1 CRYSTALLINE ROCK 15.1 (Biotite Gneiss) Boring Terminated with Casing Advancer Refusal at Elevation 2,266.1 ft on Crystalline Rock (Biotite Gneiss)										



# NCDOT GEOTECHNICAL ENGINEERING UNIT BORELOG REPORT

SHEET 5

WBS 17BP.14.R.67		TIP 490322		COUNTY JACKSON		GEOLOGIST Brett Smith								
SITE DESCRIPTION Bridge # 322 on SR 1316 across E. Fork Savannah Creek						GROUND WTR (ft)								
BORING NO. EB1-B		STATION N/A		OFFSET N/A		ALIGNMENT -L-								
COLLAR ELEV. 2,281.7 ft		TOTAL DEPTH 14.0 ft		NORTHING 594,367		EASTING 733,681								
DRILL RIG/HAMMER EFF/DATE SUM0093 DIEDRICH D-50 82% 07/22/2011		DRILL METHOD NW Casing w/ Advancer		HAMMER TYPE Automatic										
DRILLER Jacob Bare		START DATE 04/10/12		COMP. DATE 04/10/12		SURFACE WATER DEPTH N/A								
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT			SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100			ELEV (ft)	DEPTH (ft)
2285														
													2,281.7	0.0
2280													ROADWAY EMBANKMENT	
													brown, med. dense, clayey, SILTY SAND with some rock fragments (A-2-5)	
	2,276.7	5.0	29	11	6								2,274.2	7.5
2275													ALLUVIAL	
													gray-brown to brown, med. dense, SANDY GRAVEL (A-1-a)	
	2,271.7	10.0	16	9	16								2,269.2	12.5
2270													2,267.7	14.0
	2,267.7	14.0	60/0.0										WEATHERED ROCK (Biotite Gneiss)	
													CRYSTALLINE ROCK (Biotite Gneiss)	
													Boring Terminated with Casing Advancer Refusal at Elevation 2,267.7 ft on Crystalline Rock (Biotite Gneiss)	



# NCDOT GEOTECHNICAL ENGINEERING UNIT BORELOG REPORT

SHEET 6

WBS 17BP.14.R.67		TIP 490322		COUNTY JACKSON		GEOLOGIST Brett Smith	
SITE DESCRIPTION Bridge # 322 on SR 1316 across E. Fork Savannah Creek							GROUND WTR (ft)
BORING NO. EB2-A		STATION N/A		OFFSET N/A		ALIGNMENT -L-	
COLLAR ELEV. 2,281.1 ft		TOTAL DEPTH 16.4 ft		NORTHING 594,368		EASTING 733,727	
DRILL RIG/HAMMER EFF./DATE SUM0093 DIEDRICH D-50 82% 07/22/2011		DRILL METHOD NW Casing w/ Advancer		HAMMER TYPE Automatic			
DRILLER Jacob Bare		START DATE 04/10/12		COMP. DATE 04/10/12		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					
2285															
2280														2,281.1	GROUND SURFACE 0.0
2275	2,276.7	4.4	4	5	2										
2270	2,271.7	9.4	5	11	12									2,272.6	ROADWAY EMBANKMENT brown to red-brown, loose, CLAYEY SAND with trace rock fragments (A-2-6) 8.5
2265	2,266.7	14.4	100/0.4											2,266.7	ALLUVIAL brown, med. dense, fine to coarse SAND with some gravel and little clay (A-1-b) 14.4
	2,264.7	16.4	60/0.0											2,264.7	WEATHERED ROCK (Biotite Gneiss) 16.4
															CRYSTALLINE ROCK (Biotite Gneiss) Boring Terminated with Casing Advancer Refusal at Elevation 2,264.7 ft on Crystalline Rock (Biotite Gneiss)



WBS 17BP.14.R.67				TIP 490322				COUNTY JACKSON				GEOLOGIST Brett Smith						
SITE DESCRIPTION Bridge # 322 on SR 1316 across E. Fork Savannah Creek												GROUND WTR (ft)						
BORING NO. EB2-B				STATION N/A				OFFSET N/A				ALIGNMENT -L-				0 HR. N/A		
COLLAR ELEV. 2,281.6 ft				TOTAL DEPTH 17.0 ft				NORTHING 594,346				EASTING 733,728				24 HR. Dry		
DRILL RIG/HAMMER EFF./DATE SUM0093 DIEDRICH D-50 82% 07/22/2011								DRILL METHOD NW Casing w/ Advancer				HAMMER TYPE Automatic						
DRILLER Jacob Bare				START DATE 04/10/12				COMP. DATE 04/10/12				SURFACE WATER DEPTH N/A						
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG			SOIL AND ROCK DESCRIPTION		DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75	100								
2285																		
2280																2,281.6	GROUND SURFACE	0.0
																	ROADWAY EMBANKMENT	
																	brown, med. dense, clayey, v. cse. SAND (A-1-a)	
2275	2,277.1	4.5	5	16	12													
2270	2,272.1	9.5	13	8	26												ALLUVIAL	8.0
																	gray-brown to brown, dense, fine to coarse SAND with some gravel (A-1-b)	
2265	2,267.1	14.5	4	16	13												RESIDUAL	12.0
																	brown, med. dense, saprolitic, micaceous CLAYEY SAND (A-2-6)	
	2,264.6	17.0	60/0.0							60/0.0							CRYSTALLINE ROCK (Biotite Gneiss)	17.0
																	Boring Terminated with Casing Advancer Refusal at Elevation 2,264.6 ft on Crystalline Rock (Biotite Gneiss)	