

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

# STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 17BP.14.R.161 F.A. PROJ. N/A  
 COUNTY MACON  
 PROJECT DESCRIPTION DIVISION 14 - LOW IMPACT BRIDGE  
REPLACEMENT PROGRAM  
 SITE DESCRIPTION BRIDGE NO. 550244 ON SR 1114  
(SHOPE ROAD) OVER N. FORK COWEETA CREEK.

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<u>PERSONNEL</u>
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 SUBMITTED BY STV ENGINEERS  
 DATE JUNE, 2016

### 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 RALEIGH BY CONTACTING THE N.C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 250-4088. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

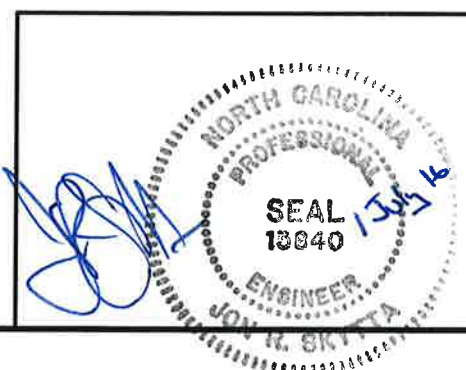
SOIL AND ROCK BOUNDARIES WITHIN A BOREHOLE ARE BASED ON GEOTECHNICAL INTERPRETATION UNLESS ENCOUNTERED IN A SAMPLE. INTERPRETED BOUNDARIES MAY NOT NECESSARILY REFLECT ACTUAL SUBSURFACE CONDITIONS BETWEEN SAMPLED STRATA, AND BOREHOLE INFORMATION MAY NOT NECESSARILY REFLECT ACTUAL SUBSURFACE CONDITIONS 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: J. SKYTTA, P.E.



**NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
DIVISION OF HIGHWAYS  
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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 (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-SILT CLAY, 60% WITH REFERRED FINE SAND UNDERNO PLASTIC*

**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)  
**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**, **SUBROUND**, OR **ROUND**.

**SOIL LEGEND AND AASHTO CLASSIFICATION**

GENERAL CLASS.	GRANULAR MATERIALS (≤ 30% PASSING #200)						SILT-CLAY MATERIALS (> 30% 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	
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	[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]	
% PASSING	100	100	100	100	100	100	100	100	100	100	100	100	100	100	
LIQUID LIMIT	≤ 5	≤ 10	≤ 15	≤ 20	≤ 25	≤ 30	≤ 40	≤ 45	≤ 50	≤ 60	≤ 70	≤ 80	≤ 90	≤ 100	
PLASTIC INDEX	≤ 4	≤ 7	≤ 10	≤ 15	≤ 20	≤ 25	≤ 30	≤ 40	≤ 50	≤ 60	≤ 70	≤ 80	≤ 90	≤ 100	
GROUP INDEX	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
USUAL TYPES OF MAJOR MATERIALS	STONE FRAG., GRAVEL, AND SAND	FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS		GRANULAR SOILS		SILT-CLAY SOILS		MUCK, PEAT
GENERAL RATING AS A SUBGRADE	EXCELLENT TO GOOD						FAIR TO POOR				FAIR TO POOR	POOR	UNSATURABLE		

PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30

**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%	MUCH
			1 - 10%
			10 - 20%
			20 - 30%
			30% 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 (TONS/FT <sup>2</sup> )
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE	< 4	N/A
	LOOSE	4 TO 10	
	MEDIUM DENSE	10 TO 30	
	DENSE	30 TO 50	
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT	< 2	0.25
	SOFT	2 TO 4	0.25 TO 0.50
	MEDIUM STIFF	4 TO 8	0.5 TO 1.0
	STIFF	8 TO 15	1 TO 2
	VERY STIFF	15 TO 30	2 TO 4

**MISCELLANEOUS SYMBOLS**

	ROADWAY EMBANKMENT (R) WITH SOIL DESCRIPTION		TEST BORING
	SOIL SYMBOL		AUGER BORING
	ARTIFICIAL FILL (A) OTHER THAN ROADWAY EMBANKMENT		CORE BORING
	INFERRED SOIL BOUNDARY		MONITORING WELL
	INFERRED ROCK LINE		PIEZOMETER INSTALLATION
	ALLUVIAL SOIL BOUNDARY		SLOPE INDICATOR INSTALLATION
	DIP & DIP DIRECTION OF ROCK STRUCTURES		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 (BLD.)	COBBLE (COB.)	GRAVEL (GR.)	COARSE SAND (CS. SO.)	FINE SAND (F. SO.)	SILT (SL.)	CLAY (CL.)
GRAIN SIZE IN.	300	75	2.0	0.25	0.075	0.005

**ABBREVIATIONS**

AR - AUGER REFUSAL	MED. - MEDIUM	YST - VANE SHEAR TEST
BT - BORING TERMINATED	NICA - MICACEOUS	WEA - WEATHERED
CL - CLAY	MOD. - MODERATELY	W - UNIT WEIGHT
CPT - CONE PENETRATION TEST	NP - NON PLASTIC	W <sub>d</sub> - DRY UNIT WEIGHT
CSE - COARSE	ORG. - ORGANIC	
DMT - DILATOMETER TEST	PMT - PRESSUREMETER TEST	<b>SAMPLE ABBREVIATIONS</b>
DPT - DYNAMIC PENETRATION TEST	SAP. - SAPROLITIC	S - BULK
e - VOID RATIO	SD. - SAND, SANDY	SS - SPLIT SPOON
F - FINE	SL. - SILT, SILTY	ST - SHELBY TUBE
FOSS. - FOSSILIFEROUS	SLI. - SLIGHTLY	RS - ROCK
FRAC. - FRACTURED, FRACTURES	TCR - TRICONE REFUSAL	RT - RECOMPACTED TRIAXIAL
FRAGS. - FRAGMENTS	v - MOISTURE CONTENT	CBR - CALIFORNIA BEARING RATIO
HL. - HIGHLY	V - VERY	

**SOIL MOISTURE - CORRELATION OF TERMS**

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

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.





**EQUIPMENT USED ON SUBJECT PROJECT**

DRILL UNITS:	ADVANCING TOOLS:	HAMMER TYPES:
<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	<b>CORE SIZE:</b>
<input type="checkbox"/> CE-45C	<input type="checkbox"/> 6" HOLLOW AUGERS	<input type="checkbox"/> 6
<input checked="" type="checkbox"/> CE-500	<input type="checkbox"/> HARD FACED FINGER BITS	<input type="checkbox"/> 10
<input type="checkbox"/> PORTABLE MOIST	<input type="checkbox"/> TUNG-CARBIDE INSERTS	<input type="checkbox"/> 14
<input type="checkbox"/> _____	<input type="checkbox"/> CASING <input type="checkbox"/> W/ ADVANCER	<b>HAND TOOLS:</b>
<input type="checkbox"/> _____	<input type="checkbox"/> TRICONE _____ STEEL TEETH	<input type="checkbox"/> POST HOLE DIGGER
<input type="checkbox"/> _____	<input type="checkbox"/> TRICONE _____ TUNG-CARB.	<input type="checkbox"/> HAND AUGER
<input type="checkbox"/> _____	<input type="checkbox"/> CORE BIT	<input type="checkbox"/> SOUNDING ROD
<input type="checkbox"/> _____	<input checked="" type="checkbox"/> 3-1/4" HSA	<input type="checkbox"/> VANE SHEAR TEST

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**ROCK DESCRIPTION****TERMS AND DEFINITIONS**

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 8.1 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 YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.
COASTAL PLAIN SEDIMENTARY ROCK (CPS)		COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES Limestone, SANDSTONE, CEMENTED SHELL BEGS, ETC.

**WEATHERING**

FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
VERY SLIGHT (V SLJ)	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 (SLJ)	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 (MODJ)	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. SEVJ)	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 (SEVJ)	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 SEVJ)	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. SAMPOLITE 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 DIMES OR STRINGERS. SAMPOLITE 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 0.60 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 CARRIED 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****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	0.15 - 1.5 FEET
CLOSE	0.6 TO 1 FEET	VERY THINLY BEDDED	0.03 - 0.15 FEET
VERY CLOSE	LESS THAN 0.15 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.

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.

**ALLUVIUM (ALLUVJ)** - 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, 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 (CALCJ)** - 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 (RECJ)** - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

**DISE** - 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.

**FIBRILE** - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.

**FLOAT** - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOOED FROM PARENT MATERIAL.

**FLOOD PLAIN (FPJ)** - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.

**FORMATION (FMJ)** - 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 (MOTJ)** - 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 (RESJ) SOIL** - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

**ROCK QUALITY DESIGNATION (RQDJ)** - 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.

**SAMPOLITE (SAPJ)** - 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 IN OR OFF 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 8.1 FOOT PER 60 BLOWS.

**STRATA CORE RECOVERY (SCRCJ)** - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.

**STRATA ROCK QUALITY DESIGNATION (SRQDJ)** - 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 (ITSJ)** - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

**BENCH MARK, BL-3**

**ELEVATION: 2195.98 feet**

**NOTES:**

Boring elevations determined by normal surveying techniques with reference to BL-3, Elev. 2195.98 feet.





**Date of Aerial Photograph: March 2013  
Obtained from Google Earth**

**Boring Locations**

Structure No. 550244  
over North Fork Coweeta Creek  
on SR 1114 (Shope Rd.)  
Macon Co., North Carolina

State Project No.: 17BP.14.R.161



**STV Engineers, Inc.**

Scale: 1"= 40' (approx.)  
Date: August 2016  
Project: 4017927-1007

SHEET 3



# NCDOT GEOTECHNICAL ENGINEERING UNIT BORELOG REPORT

<b>WBS</b> 17BP.14.R.161	<b>TIP</b> N/A	<b>COUNTY</b> Graham	<b>GEOLOGIST</b> J. Skytta, PE
<b>SITE DESCRIPTION</b> Bridge 550244 on SR 1114 (Shope Road) over N. Fork Coweeta Creek			<b>GROUND WTR (ft)</b>
<b>BORING NO.</b> EB1-A	<b>STATION</b> 13+71	<b>OFFSET</b> 8 ft LT	<b>ALIGNMENT</b> -L-
<b>COLLAR ELEV.</b> 2,196.0 ft	<b>TOTAL DEPTH</b> 30.0 ft	<b>NORTHING</b> 510,872	<b>EASTING</b> 678,776
<b>DRILL RIG/HAMMER EFF./DATE</b> CME-55/93%/2-22-15		<b>DRILL METHOD</b> H.S. Augers	<b>HAMMER TYPE</b> Automatic
<b>DRILLER</b> AmeriDrill	<b>START DATE</b> 06/20/16	<b>COMP. DATE</b> 06/20/16	<b>SURFACE WATER DEPTH</b> N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	LOG G	SOIL AND ROCK DESCRIPTION	ELEV. (ft)	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100							
2200																	
2195	2,195.0	1.0													2,196.0	0.0	GROUND SURFACE
															2,185.0	8.5	PAVEMENT 3 inches asphalt on 2 inches gravel base
	2,192.5	3.5	WOH	WOH	WOH												ROADWAY EMBANKMENT Very soft red orange fine to medium sandy SILT
2190	2,190.0	6.0													2,191.0	5.0	RESIDUAL Dense to loose brown slightly silty fine to coarse SAND, with rock pieces
	2,187.5	8.5															
2185															2,184.0	12.0	Loose gray white orange slightly silty medium to coarse SAND, with rock pieces
	2,182.5	13.5															
2180															2,179.0	17.0	Loose orange brown silty fine to medium SAND, micaceous
	2,177.5	18.5															
2175															2,174.0	22.0	Loose olive gray white slightly silty medium to coarse SAND, micaceous
	2,172.5	23.5															
2170																	
	2,167.5	28.5													2,166.0	30.0	Boring Terminated at Elevation 2,166.0 ft



# NCDOT GEOTECHNICAL ENGINEERING UNIT

## BORELOG REPORT

WBS 17BP.14.R.161	TIP N/A	COUNTY Graham	GEOLOGIST J. Skytta, PE
SITE DESCRIPTION Bridge 550244 on SR 1114 (Shope Road) over N. Fork Coweeta Creek			GROUND WTR (ft)
BORING NO. EB1-B	STATION 13+73	OFFSET 8 ft RT	ALIGNMENT -L-
COLLAR ELEV. 2,196.2 ft	TOTAL DEPTH 38.9 ft	NORTHING 510,853	EASTING 678,775
DRILL RIG/HAMMER EFF./DATE CME-55/93%/2-22-15		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER AmeriDrill	START DATE 06/20/16	COMP. DATE 06/20/16	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)
2200															
2195	2,195.2	1.0	2	3	3									2,196.2	0.0
	2,192.7	3.5	3	1	2									2,192.2	4.0
2190	2,190.2	6.0	50/0.4											2,190.7	5.5
	2,187.7	8.5	20	5	3								2,189.7	6.5	
2185															
	2,182.7	13.5	3	3	4										
2180														2,180.2	16.0
	2,177.7	18.5	5	3	6										
2175															
	2,172.7	23.5	1	4	8										
2170														2,169.2	27.0
	2,167.7	28.5	3	4	4										
2165															
	2,162.7	33.5	5	9	91/0.2									2,161.7	34.5
2160															
	2,157.7	38.5	62	38/0.2										2,157.3	38.9

NCDOT BORE SINGLE\_DIV 14 BR 244.GPJ\_NC\_DOT.GDT\_2/2/18



# NCDOT GEOTECHNICAL ENGINEERING UNIT

## BORELOG REPORT

WBS 17BP.14.R.161	TIP N/A	COUNTY Graham	GEOLOGIST J. Skytta, PE
SITE DESCRIPTION Bridge 550244 on SR 1114 (Shope Road) over N. Fork Coweeta Creek			GROUND WTR (ft)
BORING NO. EB2-A	STATION 14+29	OFFSET 8 ft LT	ALIGNMENT -L-
COLLAR ELEV. 2,196.4 ft	TOTAL DEPTH 47.5 ft	NORTHING 510,859	EASTING 678,828
DRILL RIG/HAMMER EFF./DATE CME-55/93%/2-22-15		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER AmeriDrill	START DATE 06/20/16	COMP. DATE 06/20/16	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)	
2200																
2195	2,195.4	1.0	3	1	5										2,196.4	0.0
	2,192.9	3.5	2	1	2										2,193.4	3.0
2190	2,190.4	6.0	6	8	9										2,190.4	6.0
	2,187.9	8.5	11	4	4										2,188.4	8.0
2185																
	2,182.9	13.5	3	2	4										2,184.4	12.0
2180																
	2,177.9	18.5	3	2	2										2,179.4	17.0
2175																
	2,172.9	23.5	7	10	11											
2170																
	2,167.9	28.5	8	6	10										2,169.4	27.0
2165																
	2,162.9	33.5	10	10	10											
2160																
	2,157.9	38.5	10	7	8											
2155																
	2,152.9	43.5	3	5	10											
2150																
	2,148.9	47.5	50/0.0												2,148.9	47.5

NCDOT BORE SINGLE DV 14 BR 244.GPJ NC\_DOT.GDT 2/2/18



# NCDOT GEOTECHNICAL ENGINEERING UNIT BORELOG REPORT

<b>WBS</b> 17BP.14.R.161		<b>TIP</b> N/A		<b>COUNTY</b> Graham		<b>GEOLOGIST</b> J. Skytta, PE	
<b>SITE DESCRIPTION</b> Bridge 550244 on SR 1114 (Shope Road) over N. Fork Coweeta Creek							<b>GROUND WTR (ft)</b>
<b>BORING NO.</b> EB2-B		<b>STATION</b> 14+27		<b>OFFSET</b> 8 ft RT		<b>ALIGNMENT</b> -L-	
<b>COLLAR ELEV.</b> 2,196.1 ft		<b>TOTAL DEPTH</b> 30.0 ft		<b>NORTHING</b> 510,841		<b>EASTING</b> 678,826	
<b>DRILL RIG/HAMMER EFF./DATE</b> CME-55/93%/2-22-15		<b>DRILL METHOD</b> H.S. Augers			<b>HAMMER TYPE</b> Automatic		
<b>DRILLER</b> AmeriDrill		<b>START DATE</b> 06/20/16		<b>COMP. DATE</b> 06/20/16		<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	DEPTH (ft)			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100								
2200																		
2195	2,195.1	1.0													2,196.1	GROUND SURFACE	0.0	
	2,192.6	3.5	3	2	2						SS-1	M	ROADWAY EMBANKMENT Soft to very soft red brown slightly clayey fine to medium sandy SILT					
	2,190.1	6.0	WOH	WOH	1						SS-2	M						
2190	2,190.1	6.0	9	8	5									2,190.1	6.0	ALLUVIAL		
	2,187.6	8.5	2	2	2									2,188.1	8.0	Medium dense brown medium to coarse SAND, with rock pieces		
2185																RESIDUAL		
	2,182.6	13.5	5	4	3											Very loose dark brown silty fine to medium SAND, micaceous		
2180																		
	2,177.6	18.5	1	2	3										2,179.1	17.0	Loose orange brown silty medium to coarse SAND, micaceous	
2175																		
	2,172.6	23.5	9	14	12										2,174.1	22.0	Medium dense brown silty fine to coarse SAND, micaceous	
2170																		
	2,167.6	28.5	2	9	9										2,166.1	30.0	Boring Terminated at Elevation 2,166.1 ft	