

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	17BP.13.R.15	1	15

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

STRUCTURE
SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 17BP.13.R.15 F.A. PROJ. N/A
COUNTY MITCHELL
PROJECT DESCRIPTION DIVISION 13 EXPRESS DESIGN BUILD
BRIDGE REPLACEMENT

SITE DESCRIPTION BRIDGE NO. 146 OVER CREEK
ON SR-1330 (HUGHES GAP ROAD)

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INVESTIGATED BY S&ME, INC.
CHECKED BY A.F. RIGGS, JR.
SUBMITTED BY S&ME, INC.
DATE JULY, 2012

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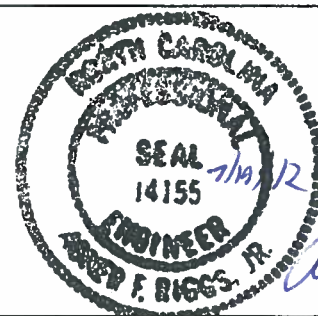
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DRAWN BY: B. RATTI



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 1206, 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, MOIST WITH INTERBEDDED FINE SAND LENSES, HIGH 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		
SYMBOL														
% PASSING	50 MX	51 MN	35 MX	35 MN	35 MX	35 MN	36 MN	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT	
• 10	50 MX	51 MN	35 MX	35 MN	35 MX	35 MN	36 MN	36 MN	36 MN	36 MN				
• 40	50 MX	51 MN	35 MX	35 MN	35 MX	35 MN	36 MN	36 MN	36 MN	36 MN				
• 200	15 MX	10 MX	35 MX	35 MN	35 MX	35 MN	36 MN	36 MN	36 MN	36 MN				
LIQUID LIMIT			40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS	
PLASTIC INDEX	6 MX	NP	10 MX	11 MN	10 MX	11 MN	10 MX	11 MN	10 MX	11 MN				
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 A SUBGRADE	EXCELLENT TO GOOD						FAIR TO POOR				FAIR TO POOR	POOR	UNSATISFACTORY	
PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS ≥ LL - 30														

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

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/F 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 0.50 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 (BLR)	COBBLE (COB.)	GRAVEL (GR.)	COARSE SAND (CSE. SO.)	FINE SAND (F. SO.)	SILT (SL.)	CLAY (CL.)
GRAIN SIZE	MM 305 IN. 12	75 3	2.0	0.25	0.05	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)	SEMI-SOLID; 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

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

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
	AUGER BORING
	CORE BORING
	MONITORING WELL
	PIEZOMETER INSTALLATION
	SLOPE INDICATOR INSTALLATION
	CONE PENETROMETER TEST
	SOUNDING ROD

ABBREVIATIONS

AR - AUGER REFUSAL	MED. - MEDIUM	VST - VANE SHEAR TEST
BT - BORING TERMINATED	MICA - MICACEOUS	WEA. - WEATHERED
CL - CLAY	MOD. - MODERATELY	γ - UNIT WEIGHT
CPT - CONE PENETRATION TEST	NP - NON PLASTIC	γ _d - DRY UNIT WEIGHT
CSE. - COARSE	ORG. - ORGANIC	
DMT - DILATOMETER TEST	PMT - PRESSUREMETER TEST	SAMPLE ABBREVIATIONS
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	w - MOISTURE CONTENT	CBR - CALIFORNIA BEARING RATIO
HL. - HIGHLY	V - VERY	

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:	ADVANCING TOOLS:	HAMMER TYPE:
☐ MOBILE B-___	☐ CLAY BITS	☒ AUTOMATIC ☐ MANUAL
☐ BK-51	☐ 6" CONTINUOUS FLIGHT AUGER	CORE SIZE:
☐ CME-45C	☐ 8" HOLLOW AUGERS	☐ B-___
☐ CME-55B	☐ HARD FACED FINGER BITS	☒ -N NWD4
☐ PORTABLE MOIST	☐ TUNG-CARBIDE INSERTS	☐ H-___
☒ CME-45B	☒ CASING ☒ W/ ADVANCER	HAND TOOLS:
☐	☒ TRICONE 2-1/16" STEEL TEETH	☐ POST HOLE DIGGER
☐	☐ TRICONE ___" TUNG-CARB.	☐ HAND AUGER
☐	☒ CORE BIT	☐ SOUNDING ROD
☐	☒ 3-1/4" HOLLOW AUGER	☐ 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 SPON 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 (WRI)		NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.
CRYSTALLINE ROCK (CRI)		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 (NCRI)		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 (CPI)		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 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 < 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 < 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 GROVED 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 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.

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 (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, 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 (JREC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.

DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.

DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.

FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.

FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.

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

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

FORMATION (FML) - 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 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 SPON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.

STRATA CORE RECOVERY (JREC.) - 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: REFERENCE "G" MARKED ON BRIDGE DECK IN N.E. CORNER

ELEVATION: 100.00 FT.

NOTES:

 **BM - BENCH MARK**



0 40 80
 FEET

SCALE: 1" = 40'

DATE: JULY 2012

DRAWN BY: BTR

PROJECT NO:
 1051-12-065G



S&ME
WWW.SMEINC.COM

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

BORING LOCATION MAP
 BRIDGE NO. 146
 OVER CREEK ON SR-1330
 STATE PROJ NO. 17BP.13.R.66
 MITCHELL COUNTY, NORTH CAROLINA

FIGURE NO.

3

[illegible]



NCDOT GEOTECHNICAL ENGINEERING UNIT CORE BORING REPORT

SHEET 5

WBS 17BP.13.R.15		TIP 17BP.13.R.15		COUNTY MITCHELL		GEOLOGIST Williamson, J.						
SITE DESCRIPTION Bridge No. 146 over Creek on SR-1330							GROUND WTR (ft)					
BORING NO. EB1-A		STATION N/A		OFFSET N/A		ALIGNMENT N/A						
COLLAR ELEV. 97.5 ft		TOTAL DEPTH 23.5 ft		NORTHING 881,432		EASTING 1,066,688						
DRILL RIG/HAMMER EFF./DATE SME CME-45B 77% 6/29/12		DRILL METHOD SPT Core Boring		HAMMER TYPE Automatic		0 HR. N/A						
DRILLER Low, S.		START DATE 05/31/12		COMP. DATE 05/31/12		SURFACE WATER DEPTH N/A						
CORE SIZE NWD4		TOTAL RUN 11.7 ft				24 HR. FIAD						
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	RQD (ft) %	L O G	DESCRIPTION AND REMARKS	DEPTH (ft)
94.5											Begin Coring @ 3.0 ft	
	94.5	3.0	6.7	0:30/1.0 0:15/1.0 0:15/1.0 1:30/1.0 0:30/1.0 1:00/0.0 0:45/0.7	(1.9) 28%			(4.6) 41%			94.5 Boulders, Cobbles (Up to 9 inches in Diameter) and Gravel	3.0
90												
	87.8	9.7										
85			5.0	0:45/1.0 1:30/1.0 1:00/1.0 1:00/1.0	(2.7) 54%							
	82.8	14.7						(0.5) 5%			83.3	14.2
80											WEATHERED ROCK Severely Weathered Soft to Medium Hard Weathered Rock Brown (Gneiss)	
				N=100/0.7								
75											74.0	23.5
				N=60/0.0							Boring Terminated with Standard Penetration Test Refusal at Elevation 74.0 ft on Crystalline Rock (Gneiss)	
											1) Advanced 2-15/16" Tricone to 3.0 feet and 14.2 to 23.5 feet. 2) Advanced NWD4 Core Barrel from 3.0 feet to 14.2 feet. 3) Advanced NW Casing to 3.0 feet and 15.0 feet. 4) Creek Water used as Drilling Fluid. 5) Some Drilling Fluid Loss Observed. 6) Approximate Drilling Fluid Density 62.4 PCF	

CORE PHOTOGRAPHS

EB1-A

BOX 1: 3.0-14.7 FEET





NCDOT GEOTECHNICAL ENGINEERING UNIT BORELOG REPORT

SHEET 7

WBS 17BP.13.R.15		TIP 17BP.13.R.15		COUNTY MITCHELL		GEOLOGIST Williamson, J.							
SITE DESCRIPTION Bridge No. 146 over Creek on SR-1330						GROUND WTR (ft)							
BORING NO. EB1-B		STATION N/A		OFFSET N/A		ALIGNMENT N/A							
COLLAR ELEV. 97.1 ft		TOTAL DEPTH 23.6 ft		NORTHING 881,406		EASTING 1,066,679							
DRILL RIG/HAMMER EFF/DATE SME CME-45B 77% 6/29/12		DRILL METHOD SPT Core Boring		HAMMER TYPE Automatic									
DRILLER Low, S.		START DATE 05/31/12		COMP. DATE 05/31/12		SURFACE WATER DEPTH N/A							
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT			SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100		ELEV. (ft)	DEPTH (ft)
100													
	97.1	0.0	4	9	39			48			M	97.1	0.0
95												96.2	0.9
												ROADWAY EMBANKMENT	
												Brown Silty Fine to Coarse SAND with Little Gravel	
90												COLLUVIAL	
												Boulders and Cobbles (Up to 2.1 feet in diameter)	
85													
												83.6	13.5
80												WEATHERED ROCK (Gneiss)	
	78.6	18.5											
75													
	73.6	23.5										73.6	23.5
												73.5	23.6
												CRYSTALLINE ROCK (Gneiss)	
												Boring Terminated at Elevation 73.5 ft in Crystalline Rock (Gneiss)	
												1) Advanced 2-15/16" Tricone to 0.9 feet and 14.3 to 23.5 feet.	
												2) Advanced NWD4 Core Barrel from 0.9 feet to 14.3 feet.	
												3) Advanced NW Casing to 0.9 feet and 14.3 feet.	
												4) Creek Water used as Drilling Fluid.	
												5) Some Drilling Fluid Loss Observed.	
												6) Approximate Drilling Fluid Density 62.4 PCF	



WBS 17BP.13.R.15				TIP 17BP.13.R.15				COUNTY MITCHELL				GEOLOGIST Williamson, J.			
SITE DESCRIPTION Bridge No. 146 over Creek on SR-1330												GROUND WTR (ft)			
BORING NO. EB1-B				STATION N/A				OFFSET N/A				ALIGNMENT N/A		0 HR. N/A	
COLLAR ELEV. 97.1 ft				TOTAL DEPTH 23.6 ft				NORTHING 881,406				EASTING 1,066,679		24 HR. FIAD	
DRILL RIG/HAMMER EFF./DATE SME CME-45B 77% 6/29/12								DRILL METHOD SPT Core Boring				HAMMER TYPE Automatic			
DRILLER Low, S.				START DATE 05/31/12				COMP. DATE 05/31/12				SURFACE WATER DEPTH N/A			
CORE SIZE NWD4				TOTAL RUN 13.4 ft											
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	REC. (ft) %	RQD (ft) %	SAMP. NO.	REC. (ft) %	RQD (ft) %	L O G	ELEV. (ft)	DESCRIPTION AND REMARKS	DEPTH (ft)		
96.2												Begin Coring @ 0.9 ft			
95	96.2 94.1	0.9 3.0	2.1	1:30/1.0 2:00/1.0	(2.1) 100%			(8.7) 69%		OO 					

CORE PHOTOGRAPHS

EB1-B BOX 1: 0.9-14.3 FEET





WBS 17BP.13.R.15				TIP 17BP.13.R.15				COUNTY MITCHELL				GEOLOGIST Brandsen, J.							
SITE DESCRIPTION Bridge No. 146 over Creek on SR-1330												GROUND WTR (ft)							
BORING NO. EB2-A				STATION N/A				OFFSET N/A				ALIGNMENT N/A							
COLLAR ELEV. 101.9 ft				TOTAL DEPTH 26.5 ft				NORTHING 881,447				EASTING 1,066,760							
DRILL RIG/HAMMER EFF./DATE SME CME-45B 77% 6/29/12												DRILL METHOD SPT Core Boring				HAMMER TYPE Automatic			
DRILLER Miller, T.				START DATE 05/17/12				COMP. DATE 05/17/12				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						ELEV. (ft)			
105																			
100	100.9	1.0	4	5	7	12									101.9	PAVEMENT			
	99.3	2.6	60/0.0												101.2	Asphalt and Stone Base			
95															99.3	COLLUVIAL			
																Brown Silty Fine to Coarse SAND			
																COLLUVIAL			
																Boulders			
90	90.0	11.9	60/0.0																
	88.4	13.5	60/0.0																
85																			
	83.4	18.5	60/0.0												83.4	CRYSTALLINE ROCK			
																(Gneiss)			
80																			
															75.4	26.5			
Boring Terminated at Elevation 75.4 ft in Crystalline Rock (Gneiss) 1) Advanced 3" Casing Advancer to 2.6 feet and 11.9 to 18.5 feet. 2) Advanced NWD4 Core Barrel from 2.6 feet to 11.9 feet and 18.5 feet to 26.5 feet. 3) Creek Water used as Drilling Fluid. 4) Some Drilling Fluid Loss Observed. 5) Approximate Drilling Fluid Density 62.4 PCF																			



NCDOT GEOTECHNICAL ENGINEERING UNIT CORE BORING REPORT

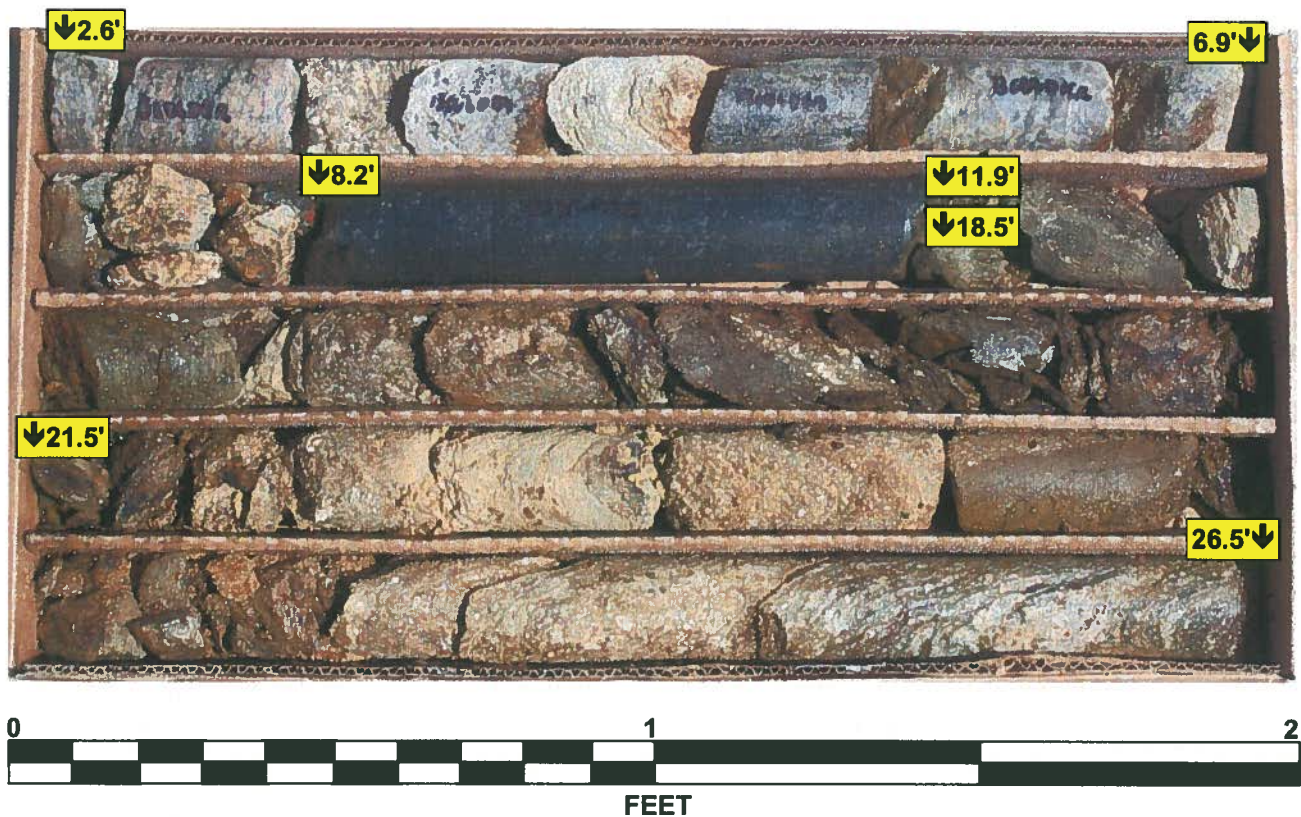
SHEET 11

WBS 17BP.13.R.15		TIP 17BP.13.R.15		COUNTY MITCHELL		GEOLOGIST Brandsen, J.						
SITE DESCRIPTION Bridge No. 146 over Creek on SR-1330							GROUND WTR (ft)					
BORING NO. EB2-A		STATION N/A		OFFSET N/A		ALIGNMENT N/A						
COLLAR ELEV. 101.9 ft		TOTAL DEPTH 26.5 ft		NORTHING 881,447		EASTING 1,066,760						
DRILL RIG/HAMMER EFF/DATE SME CME-45B 77% 6/29/12				DRILL METHOD SPT Core Boring		HAMMER TYPE Automatic						
DRILLER Miller, T.		START DATE 05/17/12		COMP. DATE 05/17/12		SURFACE WATER DEPTH N/A						
CORE SIZE NWD4		TOTAL RUN 17.3 ft										
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	REC. (ft) %	ROD (ft) %	SAMP. NO.	STRATA REC. (ft) %	ROD (ft) %	LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
99.3											Begin Coring @ 2.6 ft	
	99.3	2.6	4.3	N=60/0.0 1:15/1.0 1:30/1.0 1:45/1.0 0:45/1.0 0:15/0.3	(2.0) 47%			(3.8) 24%			99.3	2.6
95	95.0	6.9										
	93.7	8.2	1.3	0:15/0.3 1:15/1.0 0:20/0.3	(0.5) 38%							
			3.7	1:22/1.0 1:27/1.0 1:30/1.0 0:50/0.7	(1.3) 35%							
90	90.0	11.9										
				N=60/0.0 N=60/0.0								
85												
	83.4	18.5									83.4	18.5
			3.0	N=60/0.0 2:15/1.0 2:40/1.0 2:35/1.0	(2.4) 80%	(1.3) 43%		(6.8) 85%	(3.8) 48%			
80	80.4	21.5										
			5.0	2:33/1.0 2:20/1.0 2:42/1.0 2:50/1.0 2:55/1.0	(4.4) 88%	(2.5) 50%						
	75.4	26.5									75.4	26.5
Boring Terminated at Elevation 75.4 ft in Crystalline Rock (Gneiss)												
1) Advanced 3" Casing Advancer to 2.6 feet and 11.9 to 18.5 feet. 2) Advanced NWD4 Core Barrel from 2.6 feet to 11.9 feet and 18.5 feet to 26.5 feet. 3) Creek Water used as Drilling Fluid. 4) Some Drilling Fluid Loss Observed. 5) Approximate Drilling Fluid Density 82.4 PCF												

CORE PHOTOGRAPHS

EB2-A

BOX 1: 2.6-11.9 and 18.5-26.5 FEET





SHEET 13

NCDOT BORE SINGLE 061&000_GEO_BRDG0146_GINT.GPJ NC_DOT.GDT 7/18/12



NCDOT GEOTECHNICAL ENGINEERING UNIT CORE BORING REPORT

SHEET 14

WBS 17BP.13.R.15		TIP 17BP.13.R.15		COUNTY MITCHELL		GEOLOGIST Williamson, J.						
SITE DESCRIPTION Bridge No. 146 over Creek on SR-1330							GROUND WTR (ft)					
BORING NO. EB2-B		STATION N/A		OFFSET N/A		ALIGNMENT N/A	0 HR. N/A					
COLLAR ELEV. 101.8 ft		TOTAL DEPTH 15.1 ft		NORTHING 881,426		EASTING 1,066,756	24 HR. FIAD					
DRILL RIG/HAMMER EFF./DATE SME CME-45B 77% 6/29/12				DRILL METHOD SPT Core Boring		HAMMER TYPE Automatic						
DRILLER Low, S.		START DATE 06/01/12		COMP. DATE 06/01/12		SURFACE WATER DEPTH N/A						
CORE SIZE NWD4		TOTAL RUN 12.3 ft										
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	RQD (ft) %	L O G	DESCRIPTION AND REMARKS	DEPTH (ft)
99											Begin Coring @ 2.8 ft	
	99.0	2.8	7.3	1:15/1.0 0:45/1.0 1:15/1.0 0:30/1.0 1:15/1.0 0:30/1.0 0:30/1.0	(2.5) 34%			(4.0) 38%			99.0 COLLUVIAL Cobbles and Boulders	2.8
95												
	91.7	10.1	5.0	0:15/0.3 0:45/1.0 0:45/1.0 1:30/1.0 1:00/1.0 1:15/1.0	(3.3) 66%						88.4	13.4
90												
	86.7	15.1		N=60/0.0				(1.7) 100%	(1.7) 100%		86.7 CRYSTALLINE ROCK Moderately Severe Weathered Medium Hard Brown (Gneiss) With Close Fractured Spacing 2 Joints at 45° 2 Joints at 60°	15.1
Boring Terminated at Elevation 86.7 ft in Crystalline Rock (Gneiss)												
1) Advanced 2-15/16" Tricone to 2.8 feet and 15.1 feet. 2) Advanced NWD4 Core Barrel from 2.8 feet to 15.1 feet. 3) Advanced NW Casing to 10.0 feet. 4) Creek Water used as Drilling Fluid. 5) Some Drilling Fluid Loss Observed. 6) Approximate Drilling Fluid Density 62.4 PCF												

CORE PHOTOGRAPHS

EB2-B

BOX 1: 2.8-15.1 FEET

