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STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-4833	1	9

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

**ROADWAY
SUBSURFACE INVESTIGATION**

COUNTY WAKE
PROJECT DESCRIPTION BRIDGE NO. 376 ON SR 2761
(WIMBERLY RD) OVER LITTLE BLACK CREEK

PROJECT: 17BP.5.R.96

REFERENCE: B-4833

CONTENTS

<u>SHEET NO.</u>	<u>DESCRIPTION</u>
1	TITLE SHEET
2, 2A	LEGEND
3, 3A	INVENTORY REPORT
4-9	BORING LOGS

PERSONNEL

C.T. TING, EI
CAROLINA DRILLING
G. EISTER
W. HAMILL

INVESTIGATED BY C.T. TING, EI
DRAWN BY D. BROWN, PE
CHECKED BY C.T. TANG, EI
SUBMITTED BY D. BROWN, PE
DATE OCTOBER 2017

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DocuSigned by:
Donald W. Brown, Jr.
C06817F5F770411
SIGNATURE

10-18-17
DATE

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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

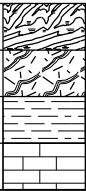
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS
(PAGE 1 OF 2)

SOIL DESCRIPTION										GRADATION									
SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6										WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.									
SOIL LEGEND AND AASHTO CLASSIFICATION										ANGULARITY OF GRAINS									
GENERAL CLASS. GRANULAR MATERIALS (<= 35% PASSING #200) SILT-CLAY MATERIALS (> 35% PASSING #200) ORGANIC MATERIALS										THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.									
GROUP CLASS. A-1, A-3, A-2, A-4, A-5, A-6, A-7, A-1-A2, A-3, A-4, A-5, A-6, A-7										MINERALOGICAL COMPOSITION									
SYMBOL										MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.									
% PASSING #10, #40, #200										COMPRESSIBILITY									
MATERIAL PASSING #40 LL, PI										SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50									
GROUP INDEX										PERCENTAGE OF MATERIAL									
USUAL TYPES OF MAJOR MATERIALS										ORGANIC MATERIAL GRANULAR SOILS SILT - CLAY SOILS OTHER MATERIAL									
GEN. RATING AS SUBGRADE										TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10% LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20% MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35% HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE									
CONSISTENCY OR DENSENESS										GROUND WATER									
PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²)										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									
TEXTURE OR GRAIN SIZE										MISCELLANEOUS SYMBOLS									
U.S. STD. SIEVE SIZE OPENING (MM)										ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION SOIL SYMBOL ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT INFERRED SOIL BOUNDARY INFERRED ROCK LINE ALLUVIAL SOIL BOUNDARY									
BOULDER (BLDR.) COBBLE (COB.) GRAVEL (GR.) COARSE SAND (CSE. SD.) FINE SAND (F SD.) SILT (SL.) CLAY (CL.)										DIP & DIP DIRECTION OF ROCK STRUCTURES TEST BORING AUGER BORING CORE BORING MONITORING WELL PIEZOMETER INSTALLATION SLOPE INDICATOR INSTALLATION CONE PENETROMETER TEST SOUNDING ROD TEST BORING WITH CORE SPT N-VALUE									
GRAIN SIZE										RECOMMENDATION SYMBOLS									
SOIL MOISTURE - CORRELATION OF TERMS										UNDERCUT UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL SHALLOW UNDERCUT UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK									
SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION										ABBREVIATIONS									
LL LIQUID LIMIT PLASTIC RANGE (PI) PL PLASTIC LIMIT OM OPTIMUM MOISTURE SHRINKAGE LIMIT SL										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 u - UNIT WEIGHT u _d - DRY UNIT WEIGHT SAMPLE ABBREVIATIONS S - BULK SS - SAND SPOON ST - SHELBY TUBE RS - ROCK RT - RECOMPACTED TRIAXIAL CBR - CALIFORNIA BEARING RATIO									
PLASTICITY										EQUIPMENT USED ON SUBJECT PROJECT									
NON PLASTIC SLIGHTLY PLASTIC MODERATELY PLASTIC HIGHLY PLASTIC										DRILL UNITS: [X] CME-45C [] CME-55 [] CME-550 [] VANE SHEAR TEST [] PORTABLE HOIST [] [] []									
COLOR										ADVANCING TOOLS: [] CLAY BITS [] 6' CONTINUOUS FLIGHT AUGER [] 8" HOLLOW AUGERS [] HARD FACED FINGER BITS [] TUNG-CARBIDE INSERTS [] CASING [] w/ ADVANCER [X] TRICONE 2 1/8" STEEL TEETH [] TRICONE " TUNG-CARB. [] CORE BIT [] [] []									
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.										HAMMER TYPE: [X] AUTOMATIC [] MANUAL CORE SIZE: [] -B [] -H [] -N HAND TOOLS: [] POST HOLE DIGGER [X] HAND AUGER [] SOUNDING ROD [] VANE SHEAR TEST [] [] []									

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

SUBSURFACE INVESTIGATION

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

ROCK DESCRIPTION		TERMS AND DEFINITIONS																												
<p>HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:</p>		<p>ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. AQUIFER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL. FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. ROCK QUALITY DESIGNATION (ROD) - 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 SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (SROD) - 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.</p>																												
		<p>WEATHERED ROCK (WR) - NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.</p> <p>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.</p> <p>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.</p> <p>COASTAL PLAIN SEDIMENTARY ROCK (CP) - COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.</p>																												
WEATHERING																														
		<p>FRESH - ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>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. <i>IF TESTED, WOULD YIELD SPT REFUSAL</i></p> <p>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. <i>IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF</i></p> <p>VERY SEVERE (V SEV.) - ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <i>IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF</i></p> <p>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.</p>																												
ROCK HARDNESS																														
		<p>VERY HARD - CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.</p> <p>HARD - CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.</p> <p>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.</p> <p>MEDIUM HARD - CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.</p> <p>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.</p> <p>VERY SOFT - CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.</p>																												
FRACTURE SPACING		BEDDING																												
		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">TERM</th> <th style="width: 15%;">SPACING</th> <th style="width: 15%;">TERM</th> <th style="width: 15%;">THICKNESS</th> </tr> </thead> <tbody> <tr> <td>VERY WIDE</td> <td>MORE THAN 10 FEET</td> <td>VERY THICKLY BEDDED</td> <td>4 FEET</td> </tr> <tr> <td>WIDE</td> <td>3 TO 10 FEET</td> <td>THICKLY BEDDED</td> <td>1.5 - 4 FEET</td> </tr> <tr> <td>MODERATELY CLOSE</td> <td>1 TO 3 FEET</td> <td>THINLY BEDDED</td> <td>0.16 - 1.5 FEET</td> </tr> <tr> <td>CLOSE</td> <td>0.16 TO 1 FOOT</td> <td>VERY THINLY BEDDED</td> <td>0.03 - 0.16 FEET</td> </tr> <tr> <td>VERY CLOSE</td> <td>LESS THAN 0.16 FEET</td> <td>THICKLY LAMINATED</td> <td>0.008 - 0.03 FEET</td> </tr> <tr> <td></td> <td></td> <td>THINLY LAMINATED</td> <td>< 0.008 FEET</td> </tr> </tbody> </table>	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 FOOT	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
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		THINLY LAMINATED	< 0.008 FEET																											
INDURATION																														
		<p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.</p> <p>FRIABLE - RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.</p> <p>MODERATELY INDURATED - GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.</p> <p>INDURATED - GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.</p> <p>EXTREMELY INDURATED - SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</p>																												
		BENCH MARK: BL-104																												
		ELEVATION: 234.74 FEET																												
NOTES:																														
DATE: 8-15-14																														



October 18, 2017

STATE PROJECT: 17BP.R.5.96 (B-4833)
COUNTY: Wake
DESCRIPTION: Bridge No. 376 on SR 2761 (Wimberly Rd) over Little Black Creek
SUBJECT: Geotechnical Report – Inventory

Project Description

This project consists of the construction of a new single-span bridge over Little Black Creek. The project also includes improvements and partial realignment of the existing two-lane roadway (-L-). Roadway improvements will entail grade adjustment to the roadway and adjacent slopes/ditches with cuts and fill up to 5 feet and 3 feet, respectively.

The geotechnical fieldwork was conducted in September 2017. The drilling activities were conducted by Carolina Drilling based in Wilmington, North Carolina, and overseen by Stewart. A trailer-mounted CME-45B drill machine with an automatic hammer was used during the subsurface exploration. In total, four soil test borings with Standard Penetration Tests (SPT) - two borings at each end bent. Split spoon soil samples were collected and visually classified in the field by a geotechnical engineer from Stewart. To supplement the soil test borings and to gather soil data for the roadway, two hand auger borings were also performed. No laboratory testing was performed.

The following alignment, totaling 0.24± miles was investigated:

Alignment

-L-

Stations

10+36.46 to 23+18.17

Physiography & Geology

The project is located in southern Wake County, near its border with Johnston and Harnett Counties. The surrounding land is primarily wooded.

Geologically, the site is underlain by Eastern Slate Belt of the Piedmont Geologic Province of North Carolina. This area is characterized by phyllite and schist from the Late Proterozoic-Cambrian Period.

Soil Properties

Soils encountered at the site include roadway embankment, alluvial, and Piedmont residual soils. The roadway embankment primarily consists of moist, very loose to loose, clayey sand (A-2-6) and silty sand (A-2-4). This material is associated with the construction of Wimberly Rd. Alluvial soils related to Little Black Creek were encountered at the bridge crossing. The alluvium consists of saturated, very loose to loose, silty sand (A-2-4) and moist, soft, sandy clay (A-6). The native residual soil consists of moist to wet, medium stiff to hard, silty clay (A-7) with lesser amounts of sandy clay (A-6) and clayey sand (A-2-6).

Rock Properties

Three of the four deeper bridge borings encountered weathered rock (schist) at depths ranging from 23.5 feet to 43.5 feet below the current grade. The weathered rock stratum on the End Bent No. 1 side is relatively thin (less than 1 foot) as compared to the End Bent No. 2 side (5.2 feet and 10.8 feet). Both End Bent No. 2 borings were terminated in weathered rock (schist) at depth of 39.2 feet and 34.3 feet.

Both End Bent No. 1 borings were terminated by split spoon refusal on crystalline rock (schist) at depths of 44.4 feet and 29.5 feet below the existing ground surface.

The weathered rock and rock are not expected to impact the construction of the roadway.

Groundwater

Groundwater was encountered in each of the bridge borings at depths ranging from 7.5 feet to 8.1 feet below the current ground surface. Groundwater is not expected to impact construction of the new roadway.

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 17BP.5.R.96			TIP B-4833			COUNTY WAKE			GEOLOGIST C.T. Tang, EI						
SITE DESCRIPTION Bridge No. 376 on SR 2761 (Wimberly Rd) over Little Black Creek									GROUND WTR (ft)						
BORING NO. RDWY-1			STATION 13+95			OFFSET 14 ft LT			ALIGNMENT -L-						
COLLAR ELEV. 237.0 ft			TOTAL DEPTH 4.0 ft			NORTHING 646,525			EASTING 2,088,033						
DRILL RIG/HAMMER EFF./DATE N/A						DRILL METHOD Hand Auger			HAMMER TYPE N/A						
DRILLER N/A			START DATE 09/08/17			COMP. DATE 09/08/17			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					
240															
														237.0	GROUND SURFACE 0.0
235										234.0	ROADWAY EMBANKMENT 3.0
										233.0	RESIDUAL 4.0
															Boring Terminated at Elevation 233.0 ft in Residual Soil

NCDOT BORE SINGLE B4883_GEO_RDWY_BH.GPJ NC_DOT.GDT 11/16/17

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 17BP.5.R.96			TIP B-4833			COUNTY WAKE			GEOLOGIST C.T. Tang								
SITE DESCRIPTION Bridge No. 376 on SR 2761 (Wimberly Road) over Little Black Creek									GROUND WTR (ft)								
BORING NO. EB1-A			STATION 18+24			OFFSET 10 ft LT			ALIGNMENT -L-								
COLLAR ELEV. 234.5 ft			TOTAL DEPTH 44.4 ft			NORTHING 646,893			EASTING 2,088,234								
DRILL RIG/HAMMER EFF./DATE BRI0674 CME-45C 89% 05/04/2016						DRILL METHOD Mud Rotary			HAMMER TYPE Automatic								
DRILLER G. Eister			START DATE 09/07/17			COMP. DATE 09/07/17			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)	DEPTH (ft)
235																234.5	0.0
	233.5	1.0	1	2	1	3							M		ROADWAY EMBANKMENT		
	231.0	3.5	2	4	4	8							M		Brown and Tan, Clayey Sand		
230																227.5	7.0
	226.0	8.5	1	1	2	3							M		ALLUVIAL		
225															Gray and Brown, Sandy Clay		
	221.0	13.5	4	9	13	22							M		RESIDUAL	12.0	
220															Dark Gray, Silty Clay		
	216.0	18.5	6	10	11	21							M				
215																	
	211.0	23.5	8	14	14	28							M				
210																	
	206.0	28.5	11	15	15	30							M				
205																	
	201.0	33.5	12	35	27	62							M				
200																	
	196.0	38.5	16	22	26	48							M				
195																	
	191.0	43.5	41	59/0.4		100/0.9									WEATHERED ROCK	43.5	
	190.1	44.4	60/0.0			60/0.0									Dark Gray, Schist	44.4	
															Boring Terminated with Standard Penetration Test Refusal at Elevation 190.1 ft On Crystalline Rock (Schist)		

NCDOT BORE SINGLE B4883_GEO_RDWY_BH.GPJ NC_DOT.GDT 11/16/17

GEOTECHNICAL BORING REPORT

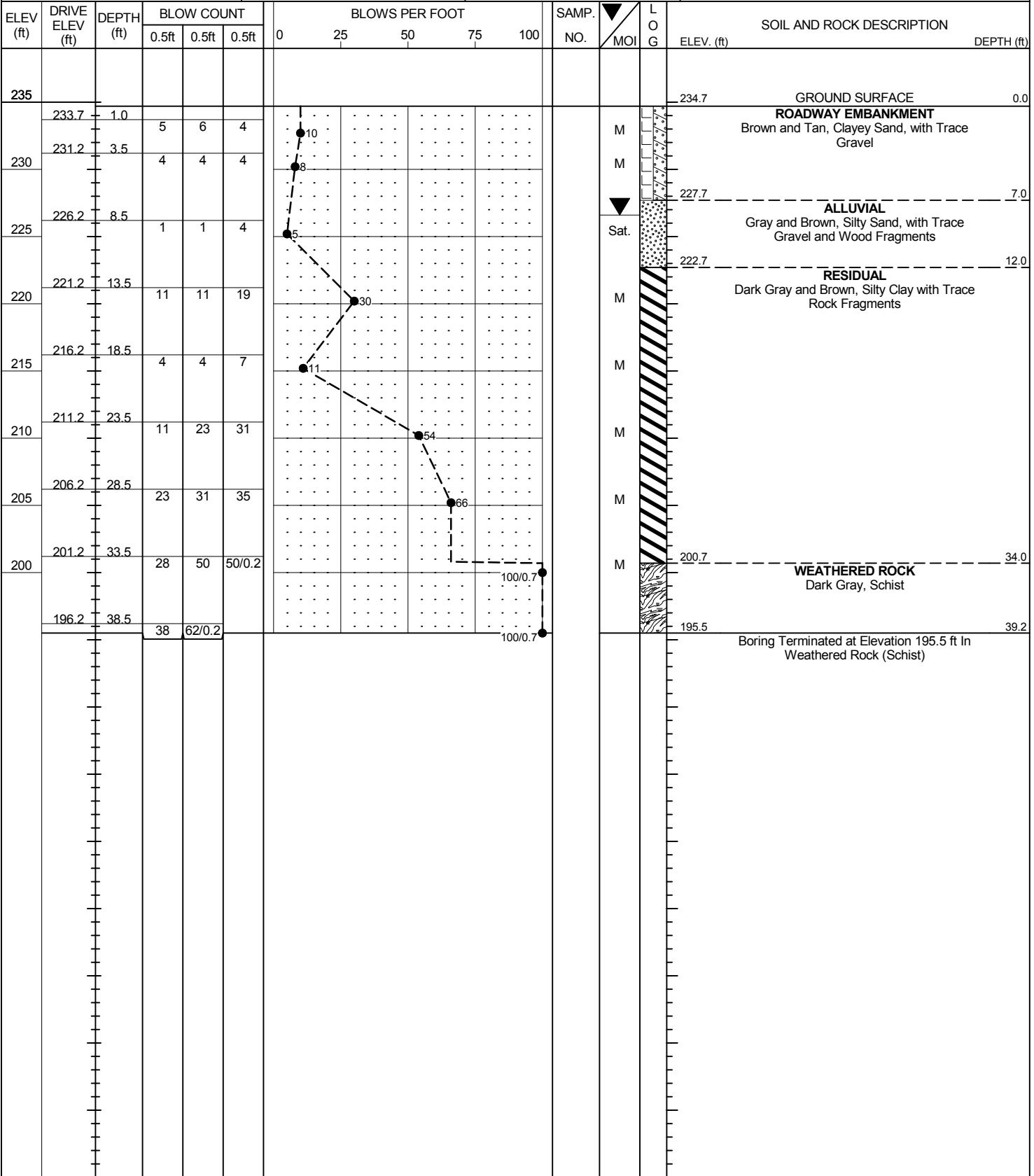
BORE LOG

WBS 17BP.5.R.96		TIP B-4833		COUNTY WAKE			GEOLOGIST C.T. Tang									
SITE DESCRIPTION Bridge No. 376 on SR 2761 (Wimberly Road) over Little Black Creek								GROUND WTR (ft)								
BORING NO. EB1-B		STATION 18+24		OFFSET 13 ft RT		ALIGNMENT -L-		0 HR. N/A								
COLLAR ELEV. 234.8 ft		TOTAL DEPTH 29.5 ft		NORTHING 646,887		EASTING 2,088,256		24 HR. 8.1								
DRILL RIG/HAMMER EFF./DATE BRI0674 CME-45C 89% 05/04/2016				DRILL METHOD Mud Rotary		HAMMER TYPE Automatic										
DRILLER G. Eister		START DATE 09/07/17		COMP. DATE 09/07/17		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	L O G	SOIL AND ROCK DESCRIPTION		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)	
235														234.8	0.0	GROUND SURFACE
	233.8	1.0	1	1	1	2							M			ROADWAY EMBANKMENT Brown and Gray, Clayey Sand
230	231.3	3.5	1	2	3	5							M			
	226.3	8.5	1	1	2	3							M	227.8	7.0	ALLUVIAL Gray and Tan, Sandy Clay
225	221.3	13.5	3	3	4	7							M	222.8	12.0	RESIDUAL Dark Gray, Silty Clay
220	216.3	18.5	6	8	9	17							M			
215	211.3	23.5	21	24	23	47							M			
210	206.3	28.5	26	36	60/0.0	60/0.0							M	205.3	29.5	Boring Terminated with Standard Penetration Test Refusal at Elevation 205.3 ft On Crystalline Rock (Schist)

NCDOT BORE SINGLE B4883 GEO_RDWY_BH.GPJ NC_DOT.GDT 11/16/17

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 17BP.5.R.96		TIP B-4833		COUNTY WAKE		GEOLOGIST C.T. Tang	
SITE DESCRIPTION Bridge No. 376 on SR 2761 (Wimberly Road) over Little Black Creek							GROUND WTR (ft)
BORING NO. EB2-A		STATION 19+09		OFFSET 9 ft LT		ALIGNMENT -L-	0 HR. N/A
COLLAR ELEV. 234.7 ft		TOTAL DEPTH 39.2 ft		NORTHING 646,975		EASTING 2,088,258	24 HR. 8.1
DRILL RIG/HAMMER EFF./DATE BR10674 CME-45C 89% 05/04/2016				DRILL METHOD Mud Rotary		HAMMER TYPE Automatic	
DRILLER G. Eister		START DATE 09/07/17		COMP. DATE 09/07/17		SURFACE WATER DEPTH N/A	



NCDOT BORE SINGLE B4883 GEO_RDWY_BH.GPJ NC_DOT.GDT 11/16/17

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 17BP.5.R.96			TIP B-4833			COUNTY WAKE			GEOLOGIST C.T. Tang, EI						
SITE DESCRIPTION Bridge No. 376 on SR 2761 (Wimberly Rd) over Little Black Creek										GROUND WTR (ft)					
BORING NO. RDWY-2			STATION 21+98			OFFSET 11 ft LT			ALIGNMENT -L-						
COLLAR ELEV. 236.0 ft			TOTAL DEPTH 4.0 ft			NORTHING 6,477,255			EASTING 2,088,330						
DRILL RIG/HAMMER EFF./DATE N/A						DRILL METHOD Hand Auger			HAMMER TYPE N/A						
DRILLER N/A			START DATE 09/08/17			COMP. DATE 09/08/17			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					
240															
235														236.0	GROUND SURFACE 0.0
														234.5	ROADWAY EMBANKMENT 1.5 Brown and Black, Silty Sand
														232.0	RESIDUAL 4.0 Brown, Sandy Clay
															Boring Terminated at Elevation 232.0 ft in Residual Soil

NCDOT BORE SINGLE B4883_GEO_RDWY_BH.GPJ NC_DOT.GDT 11/16/17