

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

**STRUCTURE
SUBSURFACE INVESTIGATION**

PROJ. REFERENCE NO. 45354.1.9(BD-5108H) F.A. PROJ. _____
 COUNTY RANDOLPH
 PROJECT DESCRIPTION BRIDGE NO. 194 ON SR 2876
(PLEASANT GROVE CHURCH RD.) OVER FLAT CREEK

 SITE DESCRIPTION _____

CONTENTS

<u>SHEET</u>	<u>DESCRIPTION</u>
1	TITLE SHEET
2 & 2A	LEGEND
3	SITE PLAN
4-9	BORE LOG & CORE REPORT(S)
10-11	FIELD SCOUR REPORT
12	ROCK TEST RESULTS

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DATE JUNE 2011

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.

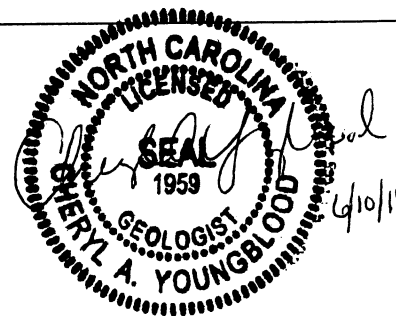
SOIL AND ROCK BOUNDARIES WITHIN A BOREHOLE ARE BASED ON GEOTECHNICAL INTERPRETATION UNLESS ENCOUNTERED IN A SAMPLE. INTERPRETED BOUNDARIES MAY NOT NECESSARILY REFLECT ACTUAL SUBSURFACE CONDITIONS BETWEEN SAMPLED STRATA, AND BOREHOLE INFORMATION MAY NOT NECESSARILY REFLECT ACTUAL SUBSURFACE CONDITIONS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

THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION 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 THE 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: T. T. WALKER AND K. B. MILLER



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

SOIL DESCRIPTION					GRADATION				
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: <i>VERY STIFF, GRAY SILTY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</i>					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.				
SOIL LEGEND AND AASHTO CLASSIFICATION					MINERALOGICAL COMPOSITION				
GENERAL CLASS. GRANULAR MATERIALS (≤ 35% PASSING #200) SILT-CLAY MATERIALS (> 35% PASSING #200) ORGANIC MATERIALS					MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.				
GROUP CLASS. A-1, A-1-b, A-2, A-2-4, A-2-5, A-2-6, A-2-7, A-4, A-5, A-6, A-7, A-7-5, A-7-6, A-3, A-4, A-5, A-6, A-7					COMPRESSIBILITY				
SYMBOL					SLIGHTLY COMPRESSIBLE LIQUID LIMIT LESS THAN 31 MODERATELY COMPRESSIBLE LIQUID LIMIT EQUAL TO 31-50 HIGHLY COMPRESSIBLE LIQUID LIMIT GREATER THAN 50				
% PASSING # 10 50 MX 100 MX 200 # 40 30 MX 50 MX 100 MX 200 # 200 15 MX 25 MX 50 MX 100 MX 200					PERCENTAGE OF MATERIAL				
LIQUID LIMIT PLASTIC INDEX					ORGANIC MATERIAL GRANULAR SILT - CLAY OTHER MATERIAL 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				
GROUP INDEX					GROUND WATER				
USUAL TYPES OF MAJOR MATERIALS									
GEN. RATING AS A SUBGRADE					MISCELLANEOUS SYMBOLS				
PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30									
CONSISTENCY OR DENSENESS					TEXTURE OR GRAIN SIZE				
PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²)					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				
GENERALLY GRANULAR MATERIAL (NON-COHESIVE) VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE					< 4 4 TO 10 10 TO 30 30 TO 50 > 50				
GENERALLY SILT-CLAY MATERIAL (COHESIVE) VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD					< 0.25 0.25 TO 0.50 0.5 TO 1.0 1 TO 2 2 TO 4 > 4				
BOULDER (BLDR.) COBBLE (COB.) GRAVEL (GR.) COARSE SAND (CSE, SD.) FINE SAND (F SD.) SILT (SL.) CLAY (CL.)					ABBREVIATIONS				
GRAIN SIZE MM 305 75 2.0 0.25 0.05 0.005 IN. 12 3					AR - AUGER REFUSAL MED. - MEDIUM VST - VANE SHEAR TEST BT - BORING TERMINATED MICA - MICACEOUS WE. - WEATHERED CL. - CLAY MOD. - MODERATELY Y - DRY WEIGHT CPT - CONE PENETRATION TEST NP - NON PLASTIC W _d - DRY UNIT WEIGHT CSE. - COARSE ORG. - ORGANIC DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST DPT - DYNAMIC PENETRATION TEST SAP. - SAPROLITIC e - VOID RATIO SD. - SAND, SANDY F - FINE SL. - SILT, SILTY FOSS. - FOSSILIFEROUS SLL - SLIGHTLY FRAC. - FRACTURED, FRACTURES TCR - TRICONE REFUSAL FRAGS. - FRAGMENTS M - MOISTURE CONTENT HL - HIGHLY V - VERY				
SOIL MOISTURE - CORRELATION OF TERMS					EQUIPMENT USED ON SUBJECT PROJECT				
SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION					DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE: <input type="checkbox"/> MOBILE B- <input type="checkbox"/> CLAY BITS <input checked="" type="checkbox"/> AUTOMATIC <input type="checkbox"/> MANUAL <input type="checkbox"/> BK-51 <input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER <input type="checkbox"/> CME-45C <input checked="" type="checkbox"/> 8" HOLLOW AUGERS <input type="checkbox"/> CME-550 <input type="checkbox"/> HARD FACED FINGER BITS <input type="checkbox"/> PORTABLE HOIST <input checked="" type="checkbox"/> TUNG-CARB. INSERTS <input checked="" type="checkbox"/> DIETRICH D-50 <input checked="" type="checkbox"/> CASING <input type="checkbox"/> W/ ADVANCER <input type="checkbox"/> <input checked="" type="checkbox"/> TRICONE 2 1/8" STEEL TEETH <input type="checkbox"/> <input checked="" type="checkbox"/> TRICONE " TUNG-CARB. <input type="checkbox"/> <input checked="" type="checkbox"/> CORE BIT <input type="checkbox"/> <input type="checkbox"/> CORE BIT				
LL - LIQUID LIMIT PL - PLASTIC LIMIT OM - OPTIMUM MOISTURE SL - SHRINKAGE LIMIT					CORE SIZE: <input type="checkbox"/> -B <input checked="" type="checkbox"/> -N NXWL <input type="checkbox"/> -H				
PLASTICITY					HAND TOOLS:				
NONPLASTIC LOW PLASTICITY MED. PLASTICITY HIGH PLASTICITY					<input type="checkbox"/> POST HOLE DIGGER <input type="checkbox"/> HAND AUGER <input type="checkbox"/> SOUNDING ROD <input type="checkbox"/> VANE SHEAR TEST				
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.				

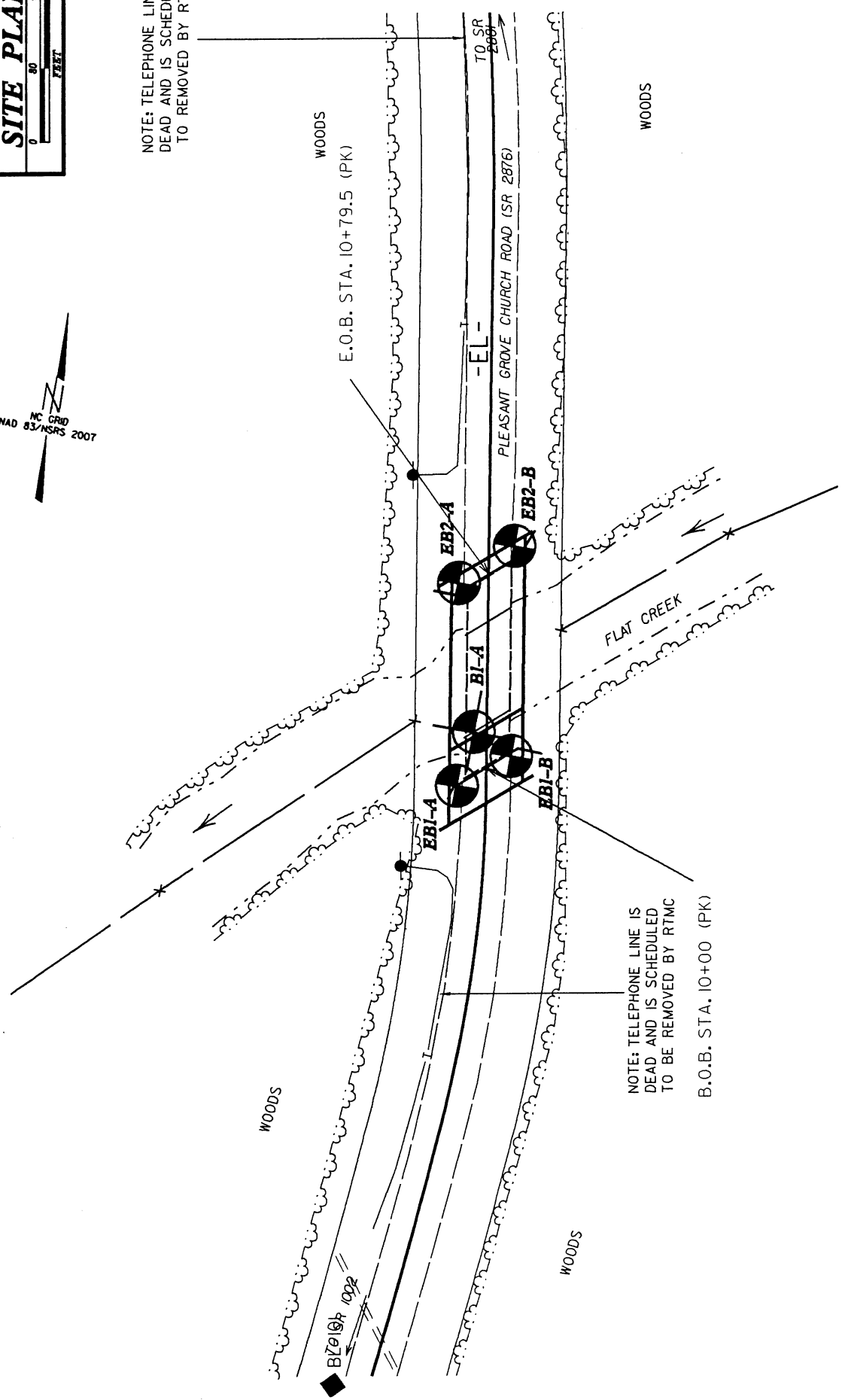
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
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SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

ROCK DESCRIPTION		TERMS AND DEFINITIONS	
<p>HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:</p>		<p>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 DISLOGGED 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 INTRODUCED 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 (N 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>TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p>	
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 (CP)		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. <i>IF TESTED, WOULD YIELD SPT REFUSAL.</i>		
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, YIELDS SPT N VALUES > 100 BPF.</i>		
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. <i>IF TESTED, YIELDS SPT N VALUES < 100 BPF.</i>		
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 0.05 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 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 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	0.16 - 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.		
		BENCH MARK: BL-101N657994.5190 E1828961.4770	
		ELEVATION: 365.17 FT.	
NOTES:			
EB1-A, EB1-B, EB2-A and EB2-B borings originally drilled by Summit Consulting under TIP M-0423 in March 2010.			

PROJECT REFERENCE NO.	43354.19(BD-ST02H)
NO.	3
SITE PLAN	
0	40
80	160
FEET	



NOTE: TELEPHONE LINE IS DEAD AND IS SCHEDULED TO BE REMOVED BY RTMC



NOTE: TELEPHONE LINE IS DEAD AND IS SCHEDULED TO BE REMOVED BY RTMC

B.O.B. STA. 10+00 (PK)

E.O.B. STA. 10+79.5 (PK)

PLEASANT GROVE CHURCH ROAD (SR 2876)

WOODS

WOODS

WOODS

TO SR 2807

B12101



NCDOT GEOTECHNICAL ENGINEERING UNIT BORELOG REPORT

WBS 45354.1.9	TIP BD-5108H	COUNTY RANDOLPH	GEOLOGIST Nash, A. A.
SITE DESCRIPTION Bridge No. 194 on -L- SR 2876 (Pleasant Grove Church Road) over flat creek			GROUND WTR (ft)
BORING NO. EB1-A	STATION N/A	OFFSET N/A	ALIGNMENT -L-
COLLAR ELEV. 359.5 ft	TOTAL DEPTH 12.5 ft	NORTHING 658,247	EASTING 1,828,968
DRILL RIG/HAMMER EFF./DATE Diedrich D-50		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic
DRILLER Duggins, W. T.	START DATE 03/15/10	COMP. DATE 03/15/10	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					
360														GROUND SURFACE	0.0
														ROADWAY EMBANKMENT Orange Medium Stiff Silty Highly Plastic CLAY (A-7-5) with Little Gravel	
355	355.8	3.7	1	5	2								W	Cobbles & Boulders between 5.5 to 6.5 feet	6.5
														RESIDUAL Tan Medium Stiff Clayey SILT (A-5) with Trace Rock Fragments	
350	350.9	8.6	2	3	3								W		
														WEATHERED ROCK (Tan & Light Gray Metavolcanic Rock)	
	347.1	12.4	60/0.1			60/0.1								12.0	
														Boring Terminated with Standard Penetration Test Refusal at Elevation 347.0 ft on Tan & Light Gray Metavolcanic Rock	12.5

NCDOT BORE SINGLE BD5108H_GEO_BRDG0194.GPJ NC_DOT_GDT_06/10/11

- 1) Advanced 2-15/16" tri-cone bit to a depth of 12.4 feet.
- 2) Set HW casing to 3.0 feet below the existing ground surface.
- 3) Used creek water with bentonite added as drilling fluid.



NCDOT GEOTECHNICAL ENGINEERING UNIT

BORELOG REPORT

WBS 45354.1.9		TIP BD-5108H		COUNTY RANDOLPH		GEOLOGIST Nash, A. A.											
SITE DESCRIPTION Bridge No. 194 on -L- SR 2876 (Pleasant Grove Church Road) over flat creek							GROUND WTR (ft)										
BORING NO. EB1-B		STATION N/A		OFFSET N/A		ALIGNMENT -L-		0 HR. 5.0									
COLLAR ELEV. 360.5 ft		TOTAL DEPTH 12.6 ft		NORTHING 658,263		EASTING 1,828,988		24 HR. 7.0									
DRILL RIG/HAMMER EFF./DATE Diedrich D-50				DRILL METHOD Mud Rotary		HAMMER TYPE Automatic											
DRILLER Duggins, W. T.		START DATE 03/15/10		COMP. DATE 03/15/10		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)			
365																	
360														360.5	0.0	GROUND SURFACE	
																ROADWAY EMBANKMENT	
																Orange Medium Stiff Silty Highly Plastic CLAY (A-7-5) with Little Gravel	
355	357.1	3.4	2	4	4												
	352.1	8.4	7	19	19											RESIDUAL	
350																Tan Hard Clayey SILT (A-5) with Trace Rock Fragments	
	347.9	12.6	60/0.0			60/0.0											WEATHERED ROCK
																	(Tan & Light Gray Metavolcanic Rock)
																	Boring Terminated by Tri-cone Refusal at Elevation 347.9 ft on Tan & Light Gray Metavolcanic Rock
																	1) Advanced 2-15/16" tri-cone bit to a depth of 12.6 feet.
																	2) Set HW casing to 3.5 feet below the existing ground surface.
																	3) Used creek water with bentonite added as drilling fluid.

NCDOT BORE SINGLE BD5108H_GEO_BRDG0194.GPJ_NC_DOT_GDT_06/10/11



NCDOT GEOTECHNICAL ENGINEERING UNIT BORELOG REPORT

WBS 45354.1.9	TIP BD-5108H	COUNTY RANDOLPH	GEOLOGIST Stickney, J. K.
SITE DESCRIPTION Bridge No. 194 on -L- SR 2876 (Pleasant Grove Church Road) over flat creek			GROUND WTR (ft)
BORING NO. B1-A	STATION N/A	OFFSET N/A	ALIGNMENT -L-
COLLAR ELEV. 351.2 ft	TOTAL DEPTH 23.2 ft	NORTHING 658,270	EASTING 1,828,971
DRILL RIG/HAMMER EFF./DATE HFO0064 CME-550 88% 09/02/2009		DRILL METHOD NW Casing W/SPT & Core	HAMMER TYPE Automatic
DRILLER Contract Driller	START DATE 05/25/11	COMP. DATE 05/25/11	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					ELEV. (ft)	
355																
														351.2	GROUND SURFACE	0.0
350														348.4	ALLUVIAL GRAY, SILTY SAND WITH COBBLES AND GRAVEL	2.8
	346.3	4.9												346.2	RESIDUAL TAN, STIFF, CLAYEY SILT	5.0
345		60/0.1			10									344.5	CRYSTALLINE ROCK (METAVOLCANIC)	6.7
														342.2		9.0
340														339.1		12.1
														333.3		17.9
335														328.0	Boring Terminated by Tri-cone Refusal at Elevation 328.0 ft in CRYSTALLINE ROCK (METAVOLCANIC)	23.2
330																

NCDOT BORE SINGLE BD5108H_GEO_BRDG0194.GPJ_NC_DOT_GDT_06/10/11



NCDOT GEOTECHNICAL ENGINEERING UNIT CORE BORING REPORT

WBS 45354.1.9		TIP BD-5108H		COUNTY RANDOLPH		GEOLOGIST Stickney, J. K.							
SITE DESCRIPTION Bridge No. 194 on -L- SR 2876 (Pleasant Grove Church Road) over flat creek							GROUND WTR (ft)						
BORING NO. B1-A		STATION N/A		OFFSET N/A		ALIGNMENT -L-	0 HR. 0.3						
COLLAR ELEV. 351.2 ft		TOTAL DEPTH 23.2 ft		NORTHING 658,270		EASTING 1,828,971	24 HR. N/M						
DRILL RIG/HAMMER EFF./DATE HFO0064 CME-550 88% 09/02/2009				DRILL METHOD NW Casing W/SPT & Core		HAMMER TYPE Automatic							
DRILLER Contract Driller		START DATE 05/25/11		COMP. DATE 05/25/11		SURFACE WATER DEPTH N/A							
CORE SIZE NWXL		TOTAL RUN 16.5 ft											
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)	
					REC. (ft) %	RQD (ft) %		REC. (ft) %	RQD (ft) %				
344.5											Begin Coring @ 6.7 ft		
	344.5	6.7	3.8	3:10/0.8 3:20/1.0 3:10/1.0 3:00/1.0	(3.6) 95%	(1.1) 29%		(2.1) 91%	(0.0) 0%	METAVOLCANIC	344.5 342.2	6.7 9.0	
340	340.7	10.5	5.0	2:40/1.0 2:50/1.0 2:50/1.0 3:00/1.0 2:40/1.0	(5.0) 100%	(1.3) 26%	RS-1	(3.1) 100%	(2.2) 71%		339.1	12.1	
335	335.7	15.5	5.0	2:30/1.0 2:30/1.0 2:20/1.0 2:30/1.0 2:30/1.0	(5.0) 100%	(5.0) 100%		(5.8) 100%	(1.5) 26%				
330	330.7	20.5	2.7	2:40/1.0 2:30/1.0 2:30/1.0	(2.7) 100%	(2.7) 100%		(5.3) 100%	(5.2) 98%			333.3	17.9
	328.0	23.2		2:40/1.0 2:30/1.0 2:30/0.7	(2.7) 100%	(2.7) 100%						328.0	23.2
Boring Terminated by Tri-cone Refusal at Elevation 328.0 ft in CRYSTALLINE ROCK (METAVOLCANIC)													

NCDOT CORE SINGLE_BD5108H_GEO_BRDG0194.GPJ NC_DOT_GDT 06/10/11



NCDOT GEOTECHNICAL ENGINEERING UNIT

BORELOG REPORT

WBS 45354.1.9	TIP BD-5108H	COUNTY RANDOLPH	GEOLOGIST Nash, A. A.
SITE DESCRIPTION Bridge No. 194 on -L- SR 2876 (Pleasant Grove Church Road) over flat creek			GROUND WTR (ft)
BORING NO. EB2-A	STATION N/A	OFFSET N/A	ALIGNMENT -L-
COLLAR ELEV. 360.4 ft	TOTAL DEPTH 11.7 ft	NORTHING 658,329	EASTING 1,828,954
DRILL RIG/HAMMER EFF./DATE Diedrich D-50		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic
DRILLER Duggins, W. T.	START DATE 03/15/10	COMP. DATE 03/15/10	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)		
365																
360														360.4	0.0	GROUND SURFACE
																ROADWAY EMBANKMENT
																Brown Soft Fine Sandy Silty Highly Plastic CLAY (A-7-5) with Little Gravel
355	356.6	3.8	2	2	1								W	354.9	5.5	RESIDUAL
																Tan Very Stiff Clayey SILT (A-5) with Trace Rock Fragments
350	351.6	8.8	4	11	14								W	349.9	10.5	WEATHERED ROCK
																(Tan & Light Gray Metavolcanic Rock)
	348.8	11.6	60/0.1			60/0.1								348.7	11.7	Boring Terminated with Standard Penetration Test Refusal at Elevation 348.7 ft on Tan & Light Gray Metavolcanic Rock
																1) Advanced 2-15/16" tri-cone bit to a depth of 11.6 feet. 2) Set HW casing to 3.0 feet below the existing ground surface. 3) Used creek water with bentonite added as drilling fluid.

NCDOT BORE SINGLE BD5108H_GEO_BRDG0194.GPJ NC_DOT.GDT 06/10/11



NCDOT GEOTECHNICAL ENGINEERING UNIT

BORELOG REPORT

WBS 45354.1.9	TIP BD-5108H	COUNTY RANDOLPH	GEOLOGIST Nash, A. A.
SITE DESCRIPTION Bridge No. 194 on -L- SR 2876 (Pleasant Grove Church Road) over flat creek			GROUND WTR (ft)
BORING NO. EB2-B	STATION N/A	OFFSET N/A	ALIGNMENT -L-
COLLAR ELEV. 360.4 ft	TOTAL DEPTH 15.1 ft	NORTHING 658,348	EASTING 1,828,974
DRILL RIG/HAMMER EFF./DATE Diedrich D-50		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic
DRILLER Duggins, W. T.	START DATE 03/15/10	COMP. DATE 03/15/10	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)		
365																
360														360.4	0.0	GROUND SURFACE
																ROADWAY EMBANKMENT
																Red & Orange Soft Fine Silty Highly Plastic CLAY (A-7-5) with Little Gravel
355	356.7	3.7	2	2	2									354.4	6.0	RESIDUAL
																Tan & Light Gray Stiff Clayey SILT (A-5) with Trace Rock Fragments
350	351.7	8.7	3	5	10									350.4	10.0	WEATHERED ROCK
																(Tan & Light Gray Metavolcanic Rock)
	348.4	12.0												346.7	13.7	NON-CRYSTALLINE ROCK
	346.7	13.7												345.3	15.1	Tan & Light Gray Metavolcanic Rock
	345.4	15.0														Boring Terminated with Standard Penetration Test Refusal at Elevation 345.3 ft in Tan & Light Gray Metavolcanic Rock
																1) Advanced 2-15/16" tri-cone bit to a depth of 15.0 feet.
																2) Set HW casing to 3.0 feet below the existing ground surface.
																3) Used creek water with bentonite added as drilling fluid.

NCDOT BORE SINGLE BD5108H GEO BRDGG0194.GPJ NC_DOT.GDT 06/10/11



FIELD
SCOUR REPORT

WBS: 45354.1.9 TIP: BD-5108H COUNTY: Randolph

DESCRIPTION(1): Bridge No. 194 on SR 2876 (Pleasant Grove Church Road) over Flat Creek

EXISTING BRIDGE

Information from: Field Inspection _____ Microfilm _____ (reel _____ pos: _____)
Other (explain) 2009 Routine Inspection Report _____

Bridge No.: 194 Length: 80 Total Bents: 3 Bents in Channel: 0 Bents in Floodplain: _____
Foundation Type: End Bents: Timber caps and piles. Interior Bent: Encased concrete piles

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: Undercutting of bank _____

Interior Bents: None Observed _____

Channel Bed: None Observed _____

Channel Bank: None Observed _____

EXISTING SCOUR PROTECTION

Type(3): Riprap _____

Extent(4): around existing end bents _____

Effectiveness(5): Some erosion evident around end bents _____

Obstructions(6): None _____

INSTRUCTIONS

- 1 Describe the specific site's location, including route number and body of water crossed.
- 2 Note scour evidence at existing end bents or abutments (e.g. undermining, sloughing, degradations).
- 3 Note existing scour protection (e.g. rip rap).
- 4 Describe extent of existing scour protection.
- 5 Describe whether or not the scour protection appears to be working.
- 6 Note obstructions such as dams, fallen trees, debris at bents, etc.
- 7 Describe the channel bed material based on observation and/or samples. Include any lab results with report.
- 8 Describe the channel bank material based on observation and/or samples. Include any lab results with report.
- 9 Describe the material covering the banks (e.g. grass, trees, rip rap, none).
- 10 Determine the approximate floodplain width from field observation or a topographic map.
- 11 Describe the material covering the floodplain (e.g. grass, trees, crops).
- 12 Use professional judgement to specify if the stream is degrading, aggrading, or static.
- 13 Describe potential and direction of the stream to migrate laterally during the bridge's life (approx. 100 years).
- 14 Give the design scour elevation (DSE) expected over the life of the bridge (approx. 100 years). This elevation can be given as a range across the site, or for each bent. Discuss the relationship between the Hydraulics Unit theoretical scour and the DSE. If the DSE is dependent on scour counter measures, explain (e.g. rip rap armoring on slopes). The DSE is based on the erodability of materials, giving consideration to the influence of joints, foliation, bedding characteristics, % core recovery, % RQD, differential weathering, shear strength, observations at existing structures, other tests deemed appropriate, and overall geologic conditions at the site.

DESIGN INFORMATION

Channel Bed Material(7): Silty sand with cobbles and gravel

Channel Bank Material(8): Silty sand with cobbles and gravel

Channel Bank Cover(9): trees, bushes and grasses

Floodplain Width(10): Approximately 150'

Floodplain Cover(11): trees, bushes and grasses

Stream is(12): Aggrading Degrading Static

Channel Migration Tendency(13): None Observed

Observations and Other Comments: Trees have fallen into the creek up and downstream from the bridge

DESIGN SCOUR ELEVATIONS(14) Feet Meters

BENTS

B1

346.2'													

Comparison of DSE to Hydraulics Unit theoretical scour:
 The DSE is approximately 2 feet higher than the Hydraulics Unit theoretical scour.

SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL

Bed or Bank													
Sample No.	No soil samples were lab tested during this investigation.												
Retained #4	Soils were visually classified in the field.												
Passed #10													
Passed #40													
Passed #200													
Coarse Sand													
Fine Sand													
Silt													
Clay													
LL													
PI													
AASHTO													
Station													
Offset													
Depth													

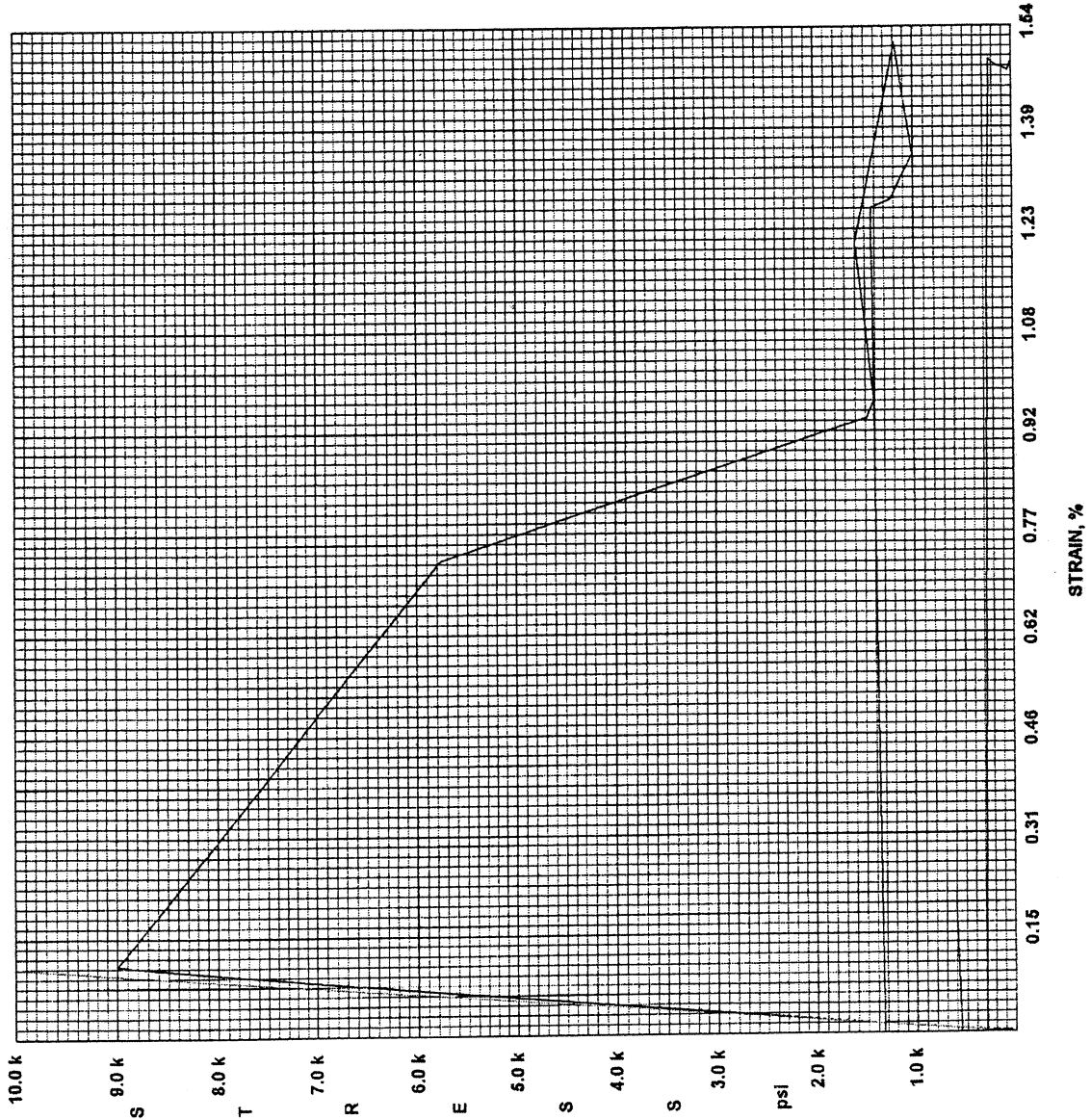
Reported by: Cheryl A. Grunwald Date: 6/10/11

Rock Test Results

North Carolina Dept. of Transportatic
 Division of Highways
 Materials and Tests
 Physical Testing Laboratory

Rock Compression

Lab Number	366955	Structure Description	Bridge 194 over SR2876
Project #	45354.1.9	Test Date	06/09/2011
County	BD-5108H	Sample No.:	1
Tip ID		Diameter, in:	1.8670
		Area, in ² :	2.7377
		Specimen, in:	3.48
		H/D Ratio:	1.863
		Weight, lbf:	0.9500
		Unit Weight, lbf/ft ³ :	172.4
		Ultimate, lbf:	24600
		Ultimate, ksi:	8.99
		Ultimate, ksi:	8.92
		40% Ult. Load, lbf:	9850
		Sec Mod @ 40%, Mpsi:	8.02



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