



APPENDIX B

**NCDOT LEGEND SHEET, SITE LOCATION PLAN
BORING LOCATION PLAN, BORELOG REPORTS**

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, HEAVY 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										ANGULARITY OF GRAINS									
MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.										THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS <u>ANGULAR</u> , <u>SUBANGULAR</u> , <u>SUBROUNDED</u> , OR <u>ROUNDED</u> .									
GENERAL CLASS. GRANULAR MATERIALS (<= 35% PASSING #200) SILT-CLAY MATERIALS (> 35% PASSING #200) ORGANIC MATERIALS										MINERALOGICAL COMPOSITION									
GROUP CLASS. A-1, A-1-b, A-3, A-2, A-2-5, A-2-6, A-2-7, A-4, A-5, A-6, A-7, A-7-5, A-7-6, A-1, A-2, A-3, A-4, A-5, A-6, A-7										COMPRESSIONIBILITY									
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 * 40 * 200										PERCENTAGE OF MATERIAL									
LIQUID LIMIT PLASTIC INDEX GROUP INDEX										ORGANIC MATERIAL GRANULAR SOILS SILT - CLAY SOILS 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 - 25% HIGHLY ORGANIC >10% >20% HIGHLY 25% AND ABOVE									
USUAL TYPES OF MAJOR MATERIALS										GROUND WATER									
GOL RATING AS A SUBGRADE										▽ WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING ▽ STATIC WATER LEVEL AFTER 24 HOURS ▽PW PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA ○ SPRING OR SEEP									
PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30										MISCELLANEOUS SYMBOLS									
CONSISTENCY OR DENSENESS										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 SOUNDING ROD									
PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/F ²)										SPT TEST BORING AUGER BORING CORE BORING MONITORING WELL PIEZOMETER INSTALLATION SLOPE INDICATOR INSTALLATION SPT N-VALUE SPT REFUSAL SAMPLE DESIGNATIONS S - BULK SAMPLE SS - SPLIT SPOON SAMPLE ST - SHELBY TUBE SAMPLE RS - ROCK SAMPLE RT - RECOMPACTED TRIAXIAL SAMPLE CBR - CALIFORNIA BEARING RATIO SAMPLE									
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 <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										ABBREVIATIONS									
U.S. STD. SIEVE SIZE OPENING (MM) 4 10 40 60 200 270 4.76 2.00 0.42 0.25 0.075 0.053										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 HL - 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 γ - UNIT WEIGHT γ _d - DRY UNIT WEIGHT									
BOULDER (BLDR.) COBBLE (COB.) GRAVEL (GR.) COARSE SAND (CSE, SD.) FINE SAND (F SD.) SILT (SL.) CLAY (CL.)										EQUIPMENT USED ON SUBJECT PROJECT									
GRAIN SIZE MM IN. 305 12 75 3 2.0 0.25 0.05 0.005										DRILL UNITS: MOBILE B- BK-51 CME-45C CME-550X PORTABLE HOIST ADVANCING TOOLS: CLAY BITS 6" CONTINUOUS FLIGHT AUGER 8" HOLLOW AUGERS HARD FACED FINGER BITS TUNG-CARBIDE INSERTS CASING W/ ADVANCER TRICONE STEEL TEETH TRICONE TUNG-CARB. CORE BIT HAMMER TYPE: AUTOMATIC MANUAL CORE SIZE: B N H HAND TOOLS: POST HOLE DIGGER HAND AUGER SOUNDING ROD VANE SHEAR TEST									
SOIL MOISTURE - CORRELATION OF TERMS										PLASTICITY									
SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION										NONPLASTIC LOW PLASTICITY MED. PLASTICITY HIGH PLASTICITY PLASTICITY INDEX (PI) DRY STRENGTH VERY LOW SLIGHT MEDIUM HIGH									
LL LIQUID LIMIT PLASTIC RANGE (PI) PL PLASTIC LIMIT OM OPTIMUM MOISTURE SHRINKAGE LIMIT SL										- SATURATED - (SAT.) USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE - WET - (W) SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE - DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE									
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.									

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ROCK DESCRIPTION		TERMS AND DEFINITIONS	
<p>HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT 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, 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 DISLOADED 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 (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 BP (F) 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 (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.</p>	
<p>WEATHERED ROCK (WR)</p> <p>CRYSTALLINE ROCK (CR)</p> <p>NON-CRYSTALLINE ROCK (NCR)</p> <p>COASTAL PLAIN SEDIMENTARY ROCK (CP)</p>		<p>NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.</p> <p>FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.</p> <p>FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.</p> <p>COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.</p>	
WEATHERING			
<p>FRESH</p> <p>VERY SLIGHT (V SL.)</p> <p>SLIGHT (SL.)</p> <p>MODERATE (MOD.)</p> <p>MODERATELY SEVERE (MOD. SEV.)</p> <p>SEVERE (SEV.)</p> <p>VERY SEVERE (V SEV.)</p> <p>COMPLETE</p>	<p>ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER HAMMER IF CRYSTALLINE.</p> <p>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>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>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>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>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></p> <p>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></p> <p>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>	<p>WEATHERING</p> <p>ROCK HARDNESS</p> <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 PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.</p> <p>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.</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	
<p>TERM</p> <p>VERY WIDE</p> <p>WIDE</p> <p>MODERATELY CLOSE</p> <p>CLOSE</p> <p>VERY CLOSE</p>	<p>SPACING</p> <p>MORE THAN 10 FEET</p> <p>3 TO 10 FEET</p> <p>1 TO 3 FEET</p> <p>0.16 TO 1 FEET</p> <p>LESS THAN 0.16 FEET</p>	<p>TERM</p> <p>VERY THICKLY BEDDED</p> <p>THICKLY BEDDED</p> <p>THINLY BEDDED</p> <p>VERY THINLY BEDDED</p> <p>THICKLY LAMINATED</p> <p>THINLY LAMINATED</p>	<p>THICKNESS</p> <p>> 4 FEET</p> <p>1.5 - 4 FEET</p> <p>0.16 - 1.5 FEET</p> <p>0.03 - 0.16 FEET</p> <p>0.008 - 0.03 FEET</p> <p>< 0.008 FEET</p>
INDURATION			
<p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE 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>			
<p>BENCH MARK: SURVEY INFORMATION OBTAINED BY F&R, INC.</p> <p style="text-align: right;">ELEVATION: _____ FT.</p> <p>NOTES:</p>			



SITE



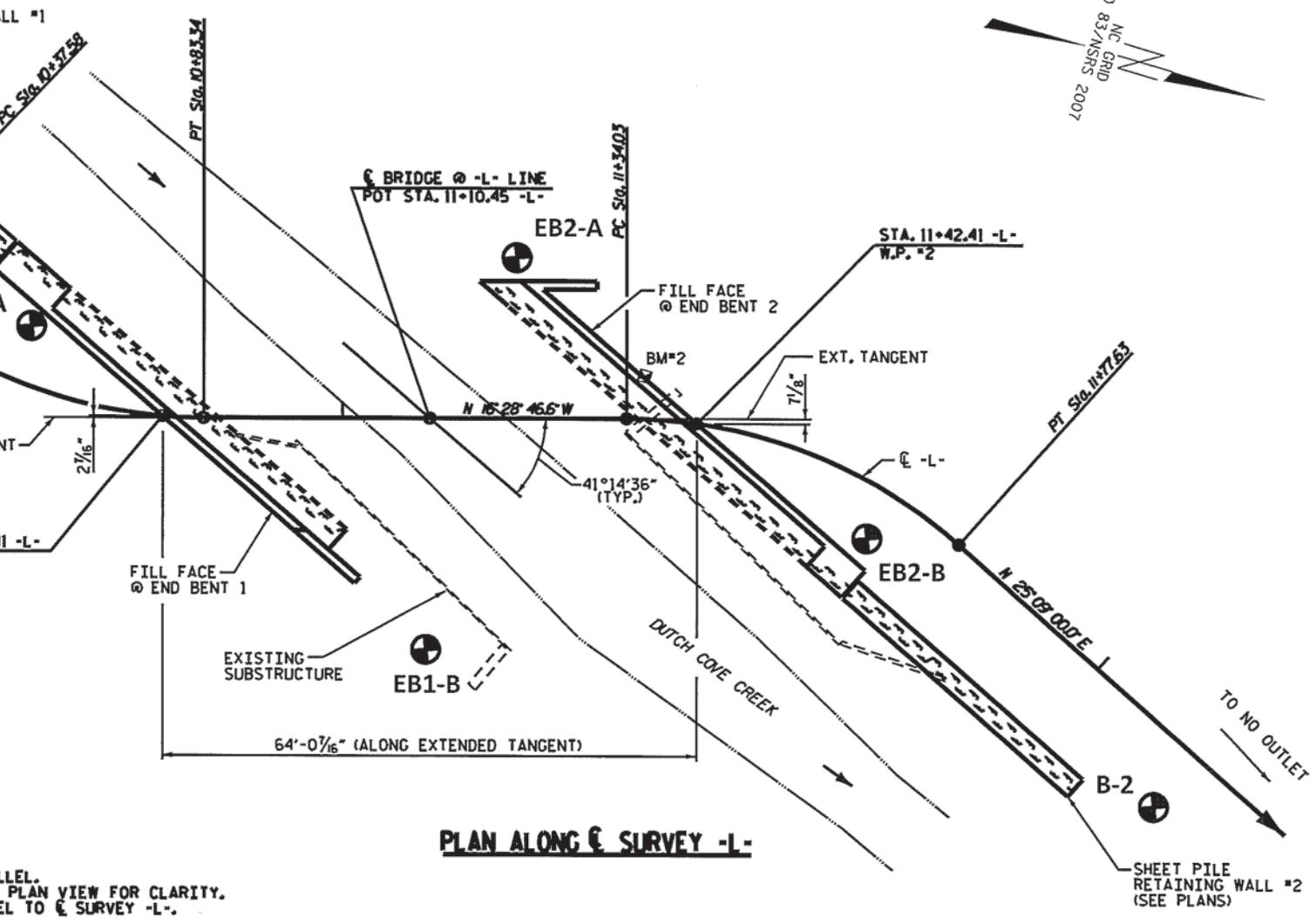
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SITE LOCATION PLAN

PROJECT REFERENCE NO.: 45360.1.24		F&R PROJECT NO.: 63P-0310
I.D. NO.: BD-5114X	F.A. PROJECT NO.: N/A	COUNTY: Haywood
PROJECT DESCRIPTION: Bridge #144 on SR 1836 over Dutch Cove Creek		
SITE DESCRIPTION: Bridge #144 on SR 1836 over Dutch Cove Creek		
DRAWN BY: R. Kral	CHECKED BY: M. Walko, P.E.	
DATE: June 2013		
		DRAWING No.: 1



LEVEL.
PLAN VIEW FOR CLARITY.
REL TO \hat{C} SURVEY -L-.

<p>SINCE 1881</p>  <p>FROEHLING & ROBERTSON, INC.</p> <p>Engineering Stability Since 1881</p> <p>2505 Hutchison-McDonald Road Charlotte, North Carolina 28269 USA T 704.596.2889 F 704.596.3784 www.fandr.com</p>	BORING LOCATION PLAN		
	PROJECT REFERENCE NO.: 45360.1.24		F&R PROJECT NO.: 63P-0310
	I.D. NO.: BD-5114X	F.A. PROJECT NO.: N/A	COUNTY: Haywood
	PROJECT DESCRIPTION: Bridge #144 on SR 1836 over Dutch Cove Creek		
	SITE DESCRIPTION: Bridge #144 on SR 1836 over Dutch Cove Creek		
DRAWN BY: R. Kral	CHECKED BY: M. Walko, P.E.		DRAWING No.: 2
DATE: June 2013	SCALE: 1" = 20'		



NCDOT GEOTECHNICAL ENGINEERING UNIT

BORELOG REPORT

WBS 45360.1.24	TIP BD-5114X	COUNTY Haywood	GEOLOGIST R. Kral
SITE DESCRIPTION Bridge No. 430144 on SR 1836 (Chestnut Mountain Road) over Dutch Cove Creek			GROUND WTR (ft)
BORING NO. EB1-A	STATION 10+59	OFFSET 7 ft LT	ALIGNMENT -L-
COLLAR ELEV. 2,424.0 ft	TOTAL DEPTH 21.0 ft	NORTHING 864,201	EASTING 670,508
DRILL RIG/HAMMER EFF./DATE F&R5785 CME-55 82% 10/5/2012		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER C. Boyce	START DATE 04/01/13	COMP. DATE 04/01/13	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					
2425	2,424.0	0.0												GROUND SURFACE	0.0
			16	14	11							M		Asphalt (5") Stone Base (2")	0.6
2420	2,420.5	3.5	9	11	10							M		ROADWAY EMBANKMENT	
														Tan, silty fine to coarse SAND (A-2-4), with little to some gravel.	
2415	2,415.5	8.5	19	26	50							M		ALLUVIAL	8.5
														Tan and gray, coarse sandy GRAVEL (A-1-a).	
2410	2,410.5	13.5	47	31	18							SS-1	12%	RESIDUAL	13.5
														Tan, white and brown, silty fine to coarse SAND (A-1-b(0)).	
2405	2,405.5	18.5	100/0.4											WEATHERED ROCK	18.5
														Tan, white and brown, (BIOTITE GNEISS)	21.0
	2,403.0	21.0	60/0.0											Boring Terminated with Standard Penetration Test Refusal at Elevation 2,403.0 ft On CRYSTALLINE ROCK (BIOTITE GNEISS)	

NCDOT BORE SINGLE 63P-0310-0144 - DIVISION 14 BRIDGE 144.GPJ NC_DOT.GDT 6/26/13



NCDOT GEOTECHNICAL ENGINEERING UNIT

BORELOG REPORT

WBS 45360.1.24		TIP BD-5114X		COUNTY Haywood		GEOLOGIST R. Kral									
SITE DESCRIPTION Bridge No. 430144 on SR 1836 (Chestnut Mountain Road) over Dutch Cove Creek							GROUND WTR (ft)								
BORING NO. EB1-B		STATION 11+10		OFFSET 28 ft RT		ALIGNMENT -L-	0 HR. 14.0								
COLLAR ELEV. 2,424.0 ft		TOTAL DEPTH 18.0 ft		NORTHING 864,225		EASTING 670,565	24 HR. FIAD								
DRILL RIG/HAMMER EFF./DATE F&R5785 CME-55 82% 10/5/2012				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic									
DRILLER C. Boyce		START DATE 03/29/13		COMP. DATE 03/29/13		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					
2425	2,424.0	0.0												GROUND SURFACE	0.0
2420	2,420.5	3.5	4	4	5						M	ROADWAY EMBANKMENT Brown, silty fine to coarse SAND (A-2-4), with some gravel.	3.0		
2415	2,415.5	8.5	34	38	40						M		Tan and white, fine to coarse sandy GRAVEL (A-1-a)		
2410	2,410.5	13.5	100/0.6								D				
	2,406.0	18.0	10	23	30						M	RESIDUAL Tan and brown, micaceous, silty fine to coarse SAND (A-2-4), with trace gravel-sized rock fragments	18.0		
			60/0.0										Boring Terminated with Standard Penetration Test Refusal at Elevation 2,406.0 ft On CRYSTALLINE ROCK (BIOTITE GNEISS) 1) Higher blow counts in the roadway embankment indicative of the rock fragments encountered during sampling.		



NCDOT GEOTECHNICAL ENGINEERING UNIT

BORELOG REPORT

WBS 45360.1.24	TIP BD-5114X	COUNTY Haywood	GEOLOGIST R. Kral
SITE DESCRIPTION Bridge No. 430144 on SR 1836 (Chestnut Mountain Road) over Dutch Cove Creek			GROUND WTR (ft)
BORING NO. EB2-A	STATION 11+21	OFFSET 19 ft LT	ALIGNMENT -L-
COLLAR ELEV. 2,424.0 ft	TOTAL DEPTH 23.0 ft	NORTHING 864,177	EASTING 670,562
DRILL RIG/HAMMER EFF./DATE F&R5785 CME-55 82% 10/5/2012		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER C. Boyce	START DATE 03/29/13	COMP. DATE 03/29/13	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)	
2425																
	2,424.0	0.0	2	1	2										2,424.0	0.0
2420	2,420.5	3.5	2	2	5										2,420.5	3.5
2415	2,415.5	8.5	5	28	60											
2410	2,410.5	13.5	12	11	13											
2405	2,405.5	18.5													2,405.5	18.5
	2,401.0	23.0													2,401.0	23.0

NCDOT BORE SINGLE 63P-0310-0144 - DIVISION 14 BRIDGE 144.GPJ NC_DOT.GDT 6/26/13



NCDOT GEOTECHNICAL ENGINEERING UNIT

BORELOG REPORT

WBS 45360.1.24	TIP BD-5114X	COUNTY Haywood	GEOLOGIST R. Kral
SITE DESCRIPTION Bridge No. 430144 on SR 1836 (Chestnut Mountain Road) over Dutch Cove Creek			GROUND WTR (ft)
BORING NO. EB2-B	STATION 11+68	OFFSET 6 ft RT	ALIGNMENT -L-
COLLAR ELEV. 2,424.0 ft	TOTAL DEPTH 21.5 ft	NORTHING 864,197	EASTING 670,612
DRILL RIG/HAMMER EFF./DATE F&R5785 CME-55 82% 10/5/2012		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER C. Boyce	START DATE 04/01/13	COMP. DATE 04/01/13	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					ELEV. (ft)
2425															
	2,424.0	0.0	6	7	6									2,424.0	0.0
														2,423.4	0.6
2420	2,420.5	3.5	5	3	4										
2415	2,415.5	8.5	17	12	12									2,415.5	8.5
2410	2,410.5	13.5	12	7	7										
2405	2,405.5	18.5	60/0.1											2,405.5	18.5
	2,402.5	21.5	60/0.0											2,402.5	21.5

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NCDOT GEOTECHNICAL ENGINEERING UNIT

BORELOG REPORT

WBS 45360.1.24		TIP BD-5114X		COUNTY Haywood		GEOLOGIST R. Kral															
SITE DESCRIPTION Bridge No. 430144 on SR 1836 (Chestnut Mountain Road) over Dutch Cove Creek							GROUND WTR (ft)														
BORING NO. B-1		STATION 10+06		OFFSET 16 ft LT		ALIGNMENT -L-															
COLLAR ELEV. 2,425.0 ft		TOTAL DEPTH 18.0 ft		NORTHING 864,173		EASTING 670,465															
DRILL RIG/HAMMER EFF./DATE F&R5785 CME-55 82% 10/5/2012		DRILL METHOD H.S. Augers		HAMMER TYPE Automatic																	
DRILLER C. Boyce		START DATE 04/01/13		COMP. DATE 04/01/13		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								
			0.5ft	0.5ft	0.5ft	0	25	50	75	100			ELEV. (ft)	DEPTH (ft)							
2425														2,425.0	0.0	GROUND SURFACE					
	2,425.0	0.0	10	15	10								2,424.4	0.6	Asphalt (6") Stone Base (1") ROADWAY EMBANKMENT						
	2,421.5	3.5	5	4	5															Brown, silty fine to coarse SAND (A-2-4), with little gravel.	
2420																					
	2,416.5	8.5	9	9	11														2,416.5	8.5	RESIDUAL
2415																	Tan and orange, micaceous silty fine to coarse SAND (A-2-4), with little gravel-sized rock fragments.				
	2,411.5	13.5	60/0.1											2,411.5	13.5	CRYSTALLINE ROCK					
2410																	Brown and gray, (BIOTITE GNEISS).				
	2,407.0	18.0	60/0.0											2,407.0	18.0	Boring Terminated with Standard Penetration Test Refusal at Elevation 2,407.0 ft In CRYSTALLINE ROCK (BIOTITE GNEISS)					



NCDOT GEOTECHNICAL ENGINEERING UNIT

BORELOG REPORT

WBS 45360.1.24	TIP BD-5114X	COUNTY Haywood	GEOLOGIST R. Kral
SITE DESCRIPTION Bridge No. 430144 on SR 1836 (Chestnut Mountain Road) over Dutch Cove Creek			GROUND WTR (ft)
BORING NO. B-2	STATION 12+13	OFFSET 8 ft RT	ALIGNMENT -L-
COLLAR ELEV. 2,423.0 ft	TOTAL DEPTH 25.0 ft	NORTHING 864,219	EASTING 670,654
DRILL RIG/HAMMER EFF./DATE F&R5785 CME-55 82% 10/5/2012		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER C. Boyce	START DATE 04/01/13	COMP. DATE 04/01/13	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)	
2425																	
	2,423.0	0.0	6	5	18										2,423.0	GROUND SURFACE	0.0
															2,422.3	Asphalt (7") Stone Base (1")	0.7
2420	2,419.5	3.5	5	5	16											ROADWAY EMBANKMENT	
																Brown and gray, silty fine to coarse SAND (A-2-4), with little gravel.	
2415	2,414.5	8.5	15	16	16										2,414.5	RESIDUAL	8.5
																Tan and brown, silty fine to coarse SAND (A-2-4), trace to little gravel-sized rock fragments.	
2410	2,409.5	13.5	15	28	27												
2405	2,404.5	18.5	36	20	17												
2400	2,399.5	23.5													2,399.5	WEATHERED ROCK	23.5
	2,398.0	25.0	100/0.8												2,398.0	Brown and orange, (BIOTITE GNEISS).	25.0
			60/0.0													Boring Terminated with Standard Penetration Test Refusal at Elevation 2,398.0 ft On CRYSTALLINE ROCK (BIOTITE GNEISS)	

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