

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	17BP.13.R.138	1	15

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

**STRUCTURE
SUBSURFACE INVESTIGATION**

PROJ. REFERENCE NO. 17BP.13.R.138 F.A. PROJ. NA
 COUNTY BUNCOMBE
 PROJECT DESCRIPTION BRIDGE NO. 26 ON SR 1384 (SOUTH
 TURKEY CREEK RD) OVER SOUTH TURKEY CREEK

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PERSONNEL
NORVILLE, C. V.
HAMM, J. R.
HUNSBERGER, W. S.

INVESTIGATED BY HUNSBERGER, W. S.
 CHECKED BY HAMM, J. R.
 SUBMITTED BY FALCON ENG
 DATE AUGUST 2014

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING, AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. 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) 707-6850. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE PART OF THE CONTRACT.

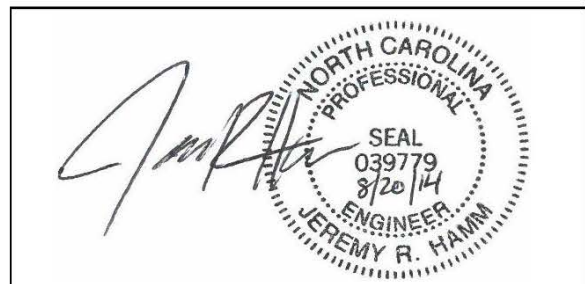
GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION, AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS 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 THIS 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 IT IS 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: HUNSBERGER, W. S.



PROJECT REFERENCE NO. 17BP.13.R.138	SHEET NO. 2
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**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 T205, 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. EXAMPLES: <i>VERY STIFF, GRW, SILTY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HIGH 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) CAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES 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				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-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				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, #40, #200				PERCENTAGE OF MATERIAL			
LIQUID LIMIT, PLASTIC INDEX, GROUP INDEX				ORGANIC MATERIAL, GRANULAR SOILS, SILT-CLAY SOILS, OTHER MATERIAL			
USUAL TYPES OF MAJOR MATERIALS				GROUND WATER			
GEN. RATING AS A SUBGRADE				MISCELLANEOUS SYMBOLS			
CONSISTENCY OR DENSENESS				ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION			
PRIMARY SOIL TYPE, COMPACTNESS OR CONSISTENCY, RANGE OF STANDARD PENETRATION RESISTANCE, RANGE OF UNCONFINED COMPRESSIVE STRENGTH				SPT, AUGER BORING, CORE BORING, MONITORING WELL, PIEZOMETER INSTALLATION, SLOPE INDICATOR INSTALLATION, CONE PENETROMETER TEST, SOUNDING ROD			
TEXTURE OR GRAIN SIZE				ABBREVIATIONS			
U.S. STD. SIEVE SIZE, SPACING (MM)				AR - AUGER REFUSAL, BT - BORING TERMINATED, CL - CLAY, CPT - CONE PENETRATION TEST, CSE - COARSE, DMT - DILATOMETER TEST, DPT - DYNAMIC PENETRATION TEST, F - FINE, FOSS - FOSSILIFEROUS, FRAC. - FRACTURED, FRAGMENTS, HI - HIGHLY			
BOULDER, COBBLE, GRAVEL, COARSE SAND, FINE SAND, SILT, CLAY				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			
SOIL MOISTURE - CORRELATION OF TERMS				EQUIPMENT USED ON SUBJECT PROJECT			
SOIL MOISTURE SCALE, FIELD MOISTURE DESCRIPTION, GUIDE FOR FIELD MOISTURE DESCRIPTION				DRILL UNITS, ADVANCING TOOLS, HAMMER TYPE, CORE SIZE, HAND TOOLS			
PLASTICITY				NONPLASTIC, LOW PLASTICITY, MED. PLASTICITY, HIGH PLASTICITY			
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.			

PROJECT REFERENCE NO.	SHEET NO.
17BP.1R.138	2A

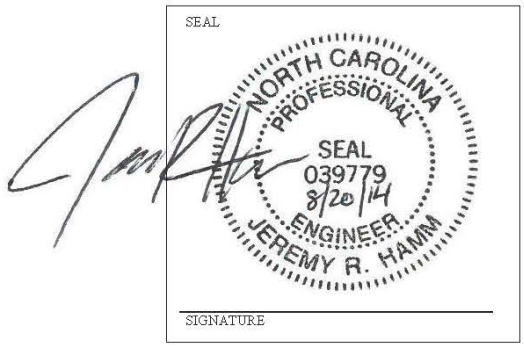
**NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS**

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>ALUVIUM (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 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 (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 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>NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.</p>	
<p>CRYSTALLINE ROCK (CR)</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>NON-CRYSTALLINE ROCK (NCR)</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 SEDIMENTARY ROCK (CP)</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>ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.</p>		
<p>VERY SLIGHT (V SL.)</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>SLIGHT (SL.)</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>MODERATE (MOD.)</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>MODERATELY SEVERE (MOD. SEV.)</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>SEVERE (SEV.)</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>VERY SEVERE (V SEV.)</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>COMPLETE</p>	<p>ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIXES OR STRINDERS. SAPROLITE IS ALSO AN EXAMPLE.</p>		
ROCK HARDNESS			
<p>VERY HARD</p>	<p>CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.</p>		
<p>HARD</p>	<p>CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.</p>		
<p>MODERATELY HARD</p>	<p>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</p>	<p>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</p>	<p>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</p>	<p>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	
TERM	SPACING	TERM	THICKNESS
VERY WIDE	MORE THAN 18 FEET	VERY THICKLY BEDDED	> 4 FEET
WIDE	3 TO 18 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.			
<p>FRIABLE</p>	<p>RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.</p>		
<p>MODERATELY INDURATED</p>	<p>GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.</p>		
<p>INDURATED</p>	<p>GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.</p>		
<p>EXTREMELY INDURATED</p>	<p>SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</p>		
BENCH MARK:		ELEVATION: _____ FT.	
NOTES:			
F.I.A.D. - FILLED IMMEDIATELY AFTER DRILLING			

FOUNDATION RECOMMENDATIONS

WBS # 17BP.13.R.138 DESCRIPTION Bridge No. 26 on SR 1384
 T.I.P. NO. SF-100026 over South Turkey Creek
 COUNTY Buncombe
 STATION 12+71.80

	INITIALS	DATE
DESIGN	JRH	08/20/14
CHECK	CVN	08/20/14
APPROVAL		



CULVERT SIZE	STATION	FOUNDATION TYPE	FACTORED RESISTANCE	MISCELLANEOUS DETAILS
20' x 10' Bottomless Precast Concrete Box Culvert	-L- 12+71.80	Spread Footings on Crystalline Rock	5 tsf	Culvert Length = 50 ft, 0 in Culvert Skew = 69 degrees Minimum Bottom of Footing Elevation = 2336 ft (LT), 2332 ft (RT)

FOUNDATION RECOMMENDATION SPECIAL NOTES ON PLANS

1. THE SPREAD FOOTINGS FOR THE BOTTOMLESS PRECAST CONCRETE CULVERT AT STATION 12+71.80 ARE DESIGNED FOR A FACTORED RESISTANCE OF 5 TSF. CHECK FIELD CONDITIONS FOR THE REQUIRED RESISTANCE OF 12 TSF JUST BEFORE PLACING CONCRETE.
2. KEY IN FOOTINGS FOR THE BOTTOMLESS PRECAST CONCRETE CULVERT AT STATION 12+71.80 AT LEAST 12" INTO ROCK WITH A MINIMUM THICKNESS AS SHOWN ON THE PLANS.
3. THE SCOUR CRITICAL ELEVATION FOR THE BOTTOMLESS PRECAST CONCRETE CULVERT AT STATION 12+71.80 IS THE BOTTOM OF FOOTING ELEVATION. SCOUR CRITICAL ELEVATIONS ARE USED TO MONITOR POSSIBLE SCOUR PROBLEMS DURING THE LIFE OF THE STRUCTURE.
4. FOR BLASTING ADJACENT TO HIGHWAY STRUCTURES, SEE ARTICLE 410-9 OF THE STANDARD SPECIFICATIONS.

FOUNDATION RECOMMENDATION COMMENTS

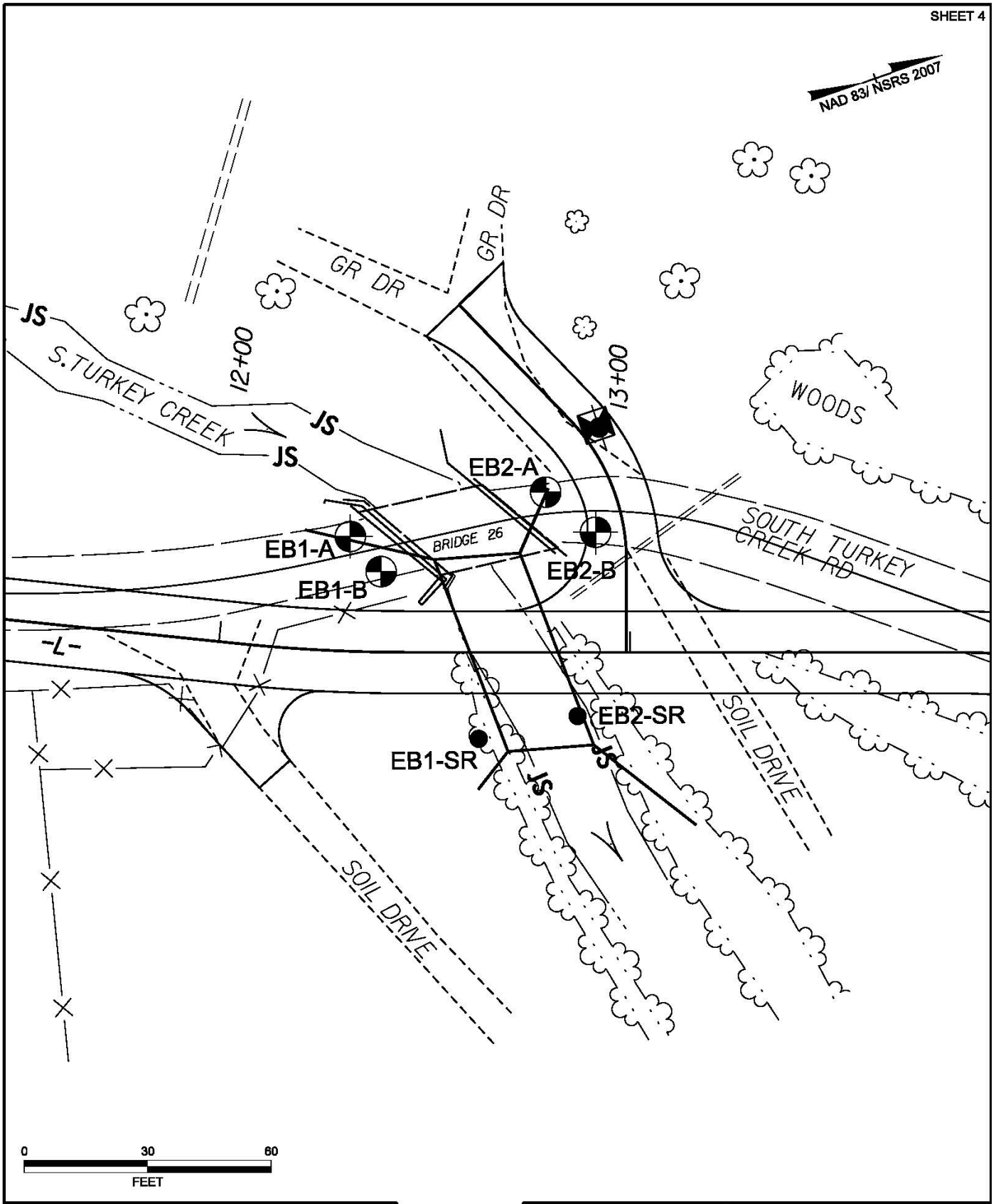
1. THE BOTTOM OF FOOTING ELEVATION SHOULD BE FIELD ADJUSTED TO SATISFY REQUIRED BEARING RESISTANCE AND EMBEDMENT INTO ROCK.

**N.C. DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENG. UNIT-WRO**

ACCEPTED
 ACCEPTED AS NOTED
 RETURNED FOR CORRECTIONS
 SEE LETTER

BY: Dean Hardister, PE

DATE: 09/03/2014



NOTES:

- PLANS ADOPTED FROM ELECTRONIC SURVEY FILES RECEIVED FROM RK&K DATED JULY 2014
- APPROXIMATE BRIDGE SKEW: 69°



FALCON ENGINEERING, INC.
 1210 TRINITY ROAD, SUITE 110
 RALEIGH, NC 27607
 PHONE: 919.871.0800
 FAX: 919.871.5200

BORING LOCATION PLAN

BRIDGE NO. 26 ON SR 1384
 OVER SOUTH TURKEY CREEK
 BUNCOMBE COUNTY, NORTH CAROLINA
 TIP: 3F-100026, WBS: 17BP.13.R.138



**NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT**

WBS 17BP.13.R.138		TIP N/A		COUNTY Buncombe		GEOLOGIST Hunsberger, W. S.											
SITE DESCRIPTION Bridge No. 26 on SR 1384 over S. Turkey Creek							GROUND WTR (ft)										
BORING NO. EB1-A		STATION 12+31		OFFSET 28 ft LT		ALIGNMENT -L-	0 HR. DRY										
COLLAR ELEV. 2,349.3 ft		TOTAL DEPTH 12.5 ft		NORTHING 704,326		EASTING 882,459	24 HR. FIAD										
DRILL RIG/HAMMER EFF./DATE TRI9435 CME-55 93% 12/08/2011				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic											
DRILLER Gower, S.		START DATE 02/18/14		COMP. DATE 02/18/14		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)			
2350																	
	2,348.3	1.0		16	7	5									2,349.3	0.0	EXISTING PAVEMENT
	2,345.8	3.5		5	3	2									2,348.4	0.9	0.4' BITUMINOUS CONCRETE 0.5' AGGREGATE BASE COURSE
2345	2,343.3	6.0		100/0.4											2,346.3	3.0	ROADWAY EMBANKMENT BROWN RED AND ORANGE, F. SAND (A-2-6) W/ GRAVEL AND TRACE MICA
	2,341.6	7.7		60/0.0											2,343.3	6.0	RESIDUAL BROWN, F. SANDY SILT (A-4) W/ GRAVEL AND TRACE MICA
2340															2,341.6	7.7	WEATHERED ROCK ORANGE GRAY AND WHITE, BIOTITE GNEISS
															2,336.8	12.5	CRYSTALLINE ROCK DK. TO LT. GRAY, BIOTITE GNEISS
Boring Terminated by Auger Refusal at Elevation 2,336.8 ft in CR: Biotite Gneiss																	

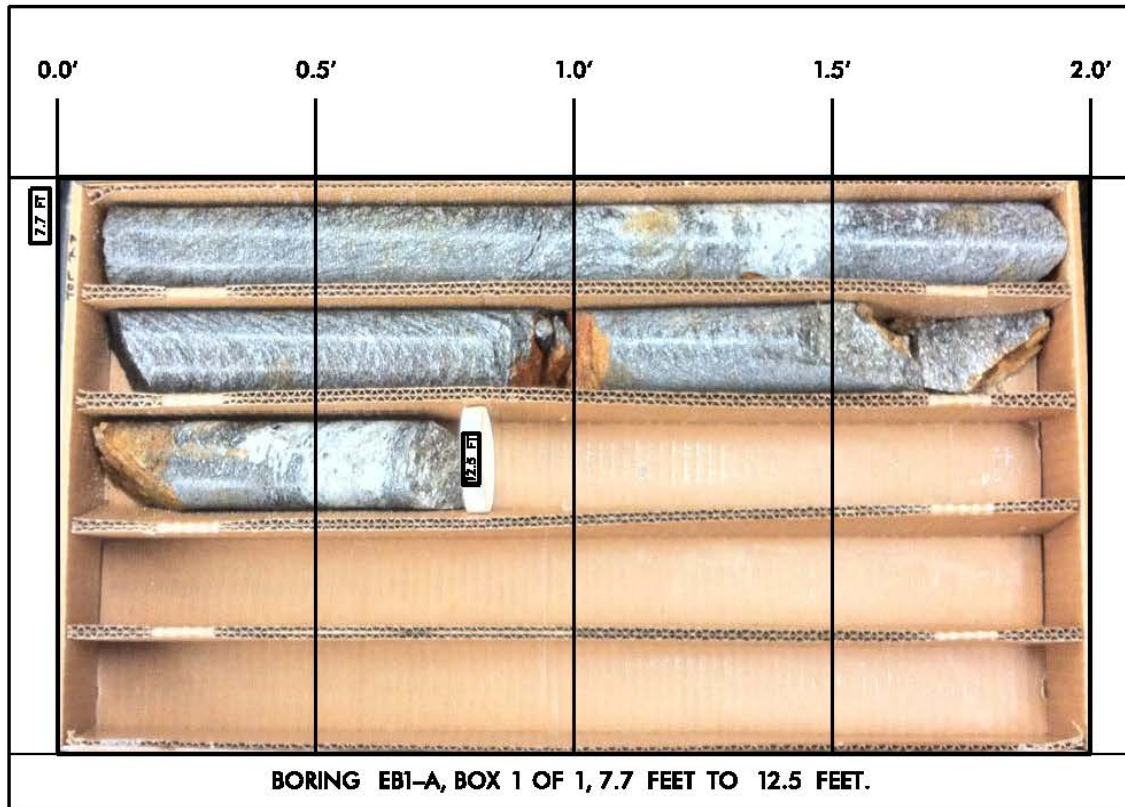
NCDOT BORE SINGLE_GEO_BRDG0026.GPJ NC_DOT_GDT 7/30/14



**NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT**

WBS 17BP.13.R.138		TIP N/A		COUNTY Buncombe		GEOLOGIST Hunsberger, W. S.					
SITE DESCRIPTION Bridge No. 26 on SR 1384 over S. Turkey Creek							GROUND WTR (ft)				
BORING NO. EB1-A		STATION 12+31		OFFSET 28 ft LT		ALIGNMENT -L-					
0 HR. DRY											
COLLAR ELEV. 2,349.3 ft		TOTAL DEPTH 12.5 ft		NORTHING 704,326		EASTING 882,459					
24 HR. FIAD											
DRILL RIGHAMMER EFF./DATE TRI9435 CME-55 93% 12/08/2011				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic					
DRILLER Gower, S.		START DATE 02/18/14		COMP. DATE 02/18/14		SURFACE WATER DEPTH N/A					
CORE SIZE NQ2		TOTAL RUN 4.8 ft									
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (ft) %	RQD (ft) %	SAMP. NO.	REC. (ft) %			
2341.6										Begin Coring @ 7.7 ft	
2340	2,341.6	7.7	4.8	9:50/1.0 7:48/1.0 7:58/1.0 7:16/1.0 6:25/0.8	(4.7) 98%	(4.3) 90%				CRYSTALLINE ROCK DK. TO LT. GRAY, SLI. WEATHERED, HARD, V. TO MED. CLOSELY FRACTURED BIOTITE GNEISS	7.7
	2,336.8	12.5								Boring Terminated by Auger Refusal at Elevation 2,336.8 ft in CR: Biotite Gniess	12.5

NCDOT CORE SINGLE_GEO_BRDG0026.GPJ NC_DOT.GDT 7/30/14



BRIDGE NO. 16 ON SR 1384
OVER SOUTH TURKEY CREEK
BUNCOMBE COUNTY, NORTH CAROLINA
TP: 8F-100024, WBS: 17BP.13.R.138



**NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT**

WBS 17BP.13.R.138		TIP N/A		COUNTY Buncombe		GEOLOGIST Hunsberger, W. S.									
SITE DESCRIPTION Bridge No. 26 on SR 1384 over S. Turkey Creek							GROUND WTR (ft)								
BORING NO. EB1-B		STATION 12+39		OFFSET 20 ft LT		ALIGNMENT -L-	0 HR. DRY								
COLLAR ELEV. 2,349.2 ft		TOTAL DEPTH 8.2 ft		NORTHING 704,330		EASTING 882,470	24 HR. FIAD								
DRILL RIG/HAMMER EFF./DATE TRI9435 CME-55 93% 12/08/2011				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic									
DRILLER Gower, S.		START DATE 02/18/14		COMP. DATE 02/18/14		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	L O G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					ELEV. (ft)
2350															
	2,348.2	1.0	2	3	2							M		EXISTING PAVEMENT	0.0
														0.3' BITUMINOUS CONCRETE	0.8
														0.5' AGGREGATE BASE COURSE	
2345	2,345.7	3.5	1	1	WOH							M		ROADWAY EMBANKMENT	3.0
														RED AND ORANGE, F. SANDY SILT (A-4) W/ GRAVEL AND TRACE MICA	5.5
	2,343.2	6.0	1	4	84							D		RED AND ORANGE, SILTY F. TO MED. SAND (A-2-4) W/ GRAVEL AND TRACE MICA	7.3
	2,341.0	8.2												SAND (A-2-4) W/ GRAVEL AND TRACE MICA	8.2
														ALLUVIAL	
														BROWN, SILTY F. SAND (A-2-4) W/ TRACE ORGANICS AND TRACE MICA	
														RESIDUAL	
														BROWN TAN AND ORANGE, SILTY SAND (A-2-4) W/ TRACE MICA	
														Boring Terminated by Auger Refusal at Elevation 2,341.0 ft on CR: Biotite Gneiss	

NCDOT BORE SINGLE_GEO_BRDG0026.GPJ NC_DOT_GDT 7/30/14



**NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT**

WBS 17BP.13.R.138		TIP N/A		COUNTY Buncombe		GEOLOGIST Hunsberger, W. S.										
SITE DESCRIPTION Bridge No. 26 on SR 1384 over S. Turkey Creek							GROUND WTR (ft)									
BORING NO. EB2-B		STATION 12+92		OFFSET 29 ft LT		ALIGNMENT -L-										
COLLAR ELEV. 2,349.8 ft		TOTAL DEPTH 12.4 ft		NORTHING 704,382		EASTING 882,477										
DRILL RIG/HAMMER EFF./DATE TRI9435 CME-55 93% 12/08/2011				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER Gower, S.		START DATE 02/18/14		COMP. DATE 02/18/14		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)	
2350																
	2,348.8	1.0	9	9	5									2,349.8	EXISTING PAVEMENT	0.0
	2,348.9													2,348.9	0.4' BITUMINOUS CONCRETE	0.9
	2,346.3	3.5	2	WOH	WOH									2,346.8	0.5' AGGREGATE BASE COURSE	
2345	2,344.1	5.7												2,346.8	ROADWAY EMBANKMENT	3.0
														2,344.1	BROWN, SILTY F. SAND (A-2-4) W/ TRACE MICA	5.7
2340															BROWN, F. SANDY SILT (A-4) W/ TRACE MICA	
															CRYSTALLINE ROCK	
															ORANGE AND LT. TO DK. GRAY, BIOTITE GNEISS	
														2,337.4		12.4
Boring Terminated by Auger Refusal at Elevation 2,337.4 ft in CR: Biotite Gneiss																

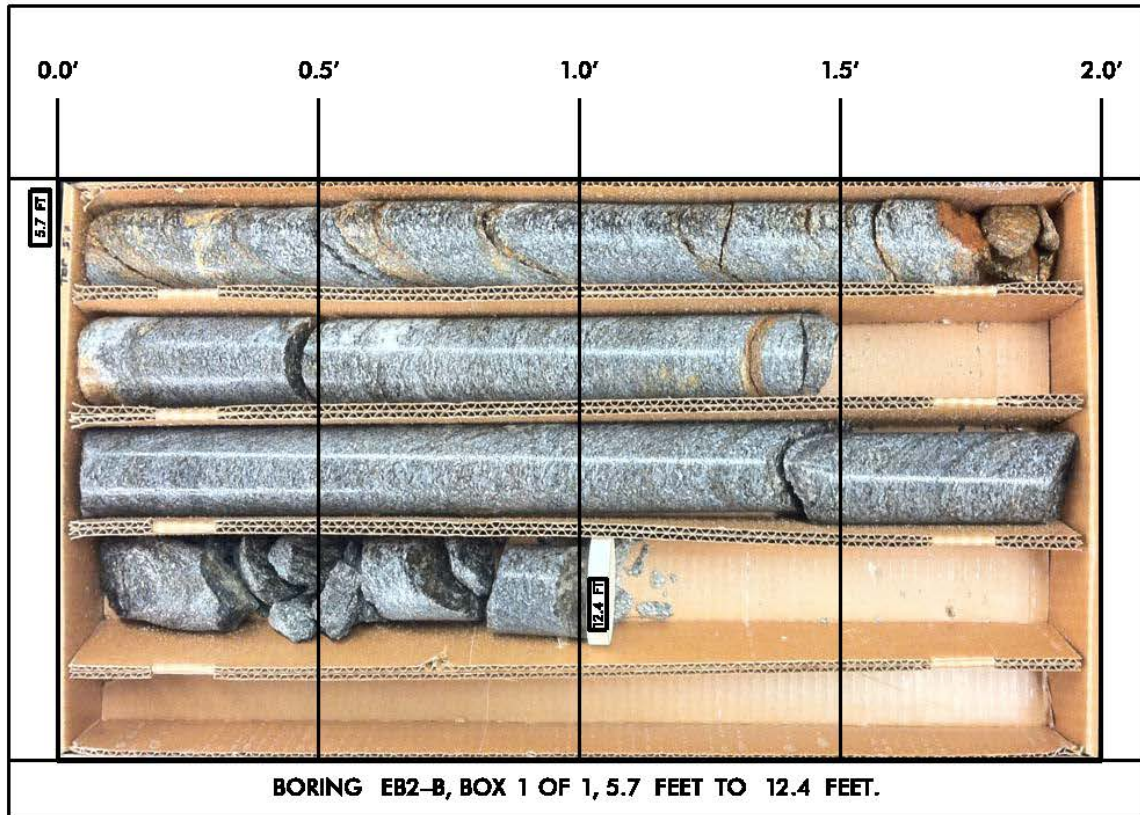
NCDOT BORE SINGLE_GEO_BRDG0026.GPJ NC_DOT_GDT 7/30/14



**NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT**

WBS 17BP.13.R.138		TIP N/A		COUNTY Buncombe		GEOLOGIST Hunsberger, W. S.					
SITE DESCRIPTION Bridge No. 26 on SR 1384 over S. Turkey Creek							GROUND WTR (ft)				
BORING NO. EB2-B		STATION 12+92		OFFSET 29 ft LT		ALIGNMENT -L-					
COLLAR ELEV. 2,349.8 ft		TOTAL DEPTH 12.4 ft		NORTHING 704,382		EASTING 882,477					
DRILL RIG/HAMMER EFF./DATE TRI9435 CME-55 93% 12/08/2011				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic					
DRILLER Gower, S.		START DATE 02/18/14		COMP. DATE 02/18/14		SURFACE WATER DEPTH N/A					
CORE SIZE NQ2		TOTAL RUN 6.7 ft									
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (ft) %	RQD (ft) %	SAMP. NO.	REC. (ft) %			
2344.1										Begin Coring @ 5.7 ft	
	2,344.1	5.7	6.7	3:30/1.0 4:20/1.0 4:07/1.0 5:01/1.0 3:20/0.7 4:24/1.0 4:20/1.0	(6.6) 99%	(4.8) 72%				CRYSTALLINE ROCK ORANGE AND LT. TO DK. GRAY, MED. TO SLI. WEATHERED, HARD, V. TO MED. CLOSELY FRACTURED BIOTITE GNEISS	5.7
2340											
	2,337.4	12.4								Boring Terminated by Auger Refusal at Elevation 2,337.4 ft in CR: Biotite Gniess	12.4

NCDOT CORE SINGLE_GEO_BRDG0026.GPJ NC_DOT_GDT 7/30/14



FALCON
ENGINEERING

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ROCK CORE PHOTOS

BRIDGE NO. 26 ON SR 1384
OVER SOUTH TURKEY CREEK
BUNCOMBE COUNTY, NORTH CAROLINA
TP: 5F-300076, WBS: 17BP-13.R.138