

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
NC	17BP.14.R.49	1A	15

# STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION  
 DIVISION OF HIGHWAYS  
 GEOTECHNICAL ENGINEERING UNIT

## STRUCTURE SUBSURFACE INVESTIGATION

PROJECT 17BP.14.R.49  
 COUNTY TRANSYLVANIA  
 PROJECT DESCRIPTION REPLACE STRUCTURE  
NO. 870072 ON SR 1143 OVER FROZEN  
CREEK  
 SITE DESCRIPTION PROPOSED BOTTOMLESS  
CONCRETE CULVERT ON SR 1143 OVER  
FROZEN CREEK

### CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WAS 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 UNIT @ (919) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA IS PART OF THE CONTRACT.

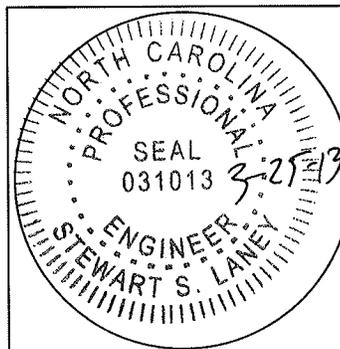
GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND 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 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.

INVESTIGATED BY S&ME, INC. PERSONNEL J. WILLIAMSON  
 CHECKED BY STEWART S. LANEY N. PAGE  
 SUBMITTED BY S&ME, INC. L. CAMPOS  
 DATE 3/25/2013 K. HILL  
C. ODOM  
J. JACKSON  
R. OSWALD



SEAL  
 SIGNATURE

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
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# *STATE OF NORTH CAROLINA*

*DEPARTMENT OF TRANSPORTATION*

*DIVISION OF HIGHWAYS*

*GEOTECHNICAL ENGINEERING UNIT*

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## *STRUCTURE*

# *SUBSURFACE INVESTIGATION*

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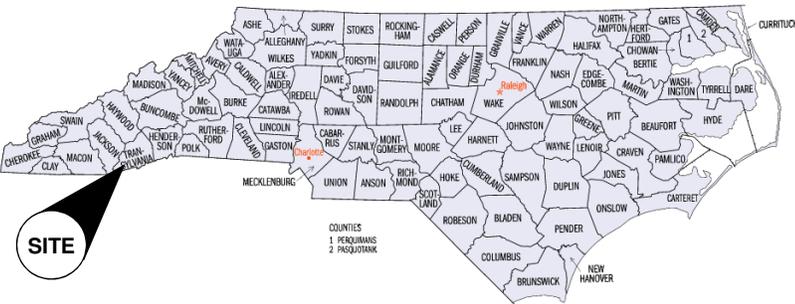
# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL UNIT SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION										GRADATION									
SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED OR WEATHERED EARTH MATERIALS WHICH CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND WHICH YIELDS LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM AND BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:  VERY STIFF, GRAY SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6										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 ARE DESIGNATED BY THE TERMS; <u>ANGULAR</u> , <u>SUBANGULAR</u> , <u>SUBROUNDED</u> , OR <u>ROUNDED</u> .									
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-3, A-2, A-4, A-5, A-6, A-7, A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-4, A-5, A-6, A-7, A-7-8, A-7-8										COMPRESSIBILITY									
SYMBOL										SLIGHTLY COMPRESSIBLE LIQUID LIMIT LESS THAN 30 MODERATELY COMPRESSIBLE LIQUID LIMIT 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 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									
USUAL TYPES OF MAJOR MATERIALS										GROUND WATER									
GEN. RATING AS A SUBGRADE										WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING. STATIC WATER LEVEL AFTER 24 HOURS. PERCHED WATER, SATURATED ZONE OR WATER BEARING STRATA HOLE CAVE SPRING OR SEEPAGE									
P.I. OF A-7-5 ≤ L.L. - 30 : P.I. OF A-7-6 > L.L. - 30										MISCELLANEOUS SYMBOLS									
CONSISTENCY OR DENSENESS										MISCELLANEOUS SYMBOLS									
PRIMARY SOIL TYPE, COMPACTNESS OR CONSISTENCY, RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE), RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT <sup>2</sup> )										ROADWAY EMBANKMENT WITH SOIL DESCRIPTION, SOIL SYMBOL, ARTIFICIAL FILL OTHER THAN ROADWAY EMBANKMENTS, INFERRED SOIL BOUNDARIES, INFERRED ROCK LINE, ALLUVIAL SOIL BOUNDARY, DIP/DIP DIRECTION OF ROCK STRUCTURES, SOUNDING ROD, SPT DPT DMT VST TEST BORING, AUGER BORING, CORE BORING, MONITORING WELL, PIEZOMETER INSTALLATION, SLOPE INDICATOR INSTALLATION, SAMPLE DESIGNATIONS (S, SS, ST, RS, RT, CBR)									
TEXTURE OR GRAIN SIZE										ABBREVIATIONS									
U.S. STD. SIEVE SIZE OPENING (MM): 4, 10, 40, 60, 200, 270; 4.76, 2.0, 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, FRAGS - FRAGMENTS, MED - MEDIUM, PMT - PRESSUREMETER TEST, SD - SAND, SANDY, SL - SILT, SILTY, SLI - SLIGHTLY, TCR - TRICONE REFUSAL, γ - UNIT WEIGHT, γ <sub>d</sub> - DRY UNIT WEIGHT, W - MOISTURE CONTENT, V - VERY, VST - VANE SHEAR TEST									
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: MOBILE B-___, DIEDRICH D-50, CME-550x, CME-750, PORTABLE HOIST, OTHER CME-45B, OTHER ___; ADVANCING TOOLS: 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, OTHER 3-1/4" H.S.A., OTHER ___; HAMMER TYPE: AUTOMATIC, MANUAL; CORE SIZE: B, N, H; HAND TOOLS: POST HOLE DIGGER, HAND AUGER, SOUNDING ROD, VANE SHEAR TEST, OTHER ___									
PLASTICITY										COLOR									
NONPLASTIC, LOW PLASTICITY, MED. PLASTICITY, HIGH PLASTICITY; PLASTICITY INDEX (PI), DRY STRENGTH, VERY LOW, SLIGHT, MEDIUM, HIGH										DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YEL.-BRN, 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 WHEN 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><b>ALLUVIUM (ALLUV.)</b> – SOILS WHICH HAVE BEEN TRANSPORTED BY WATER.</p> <p><b>AQUIFER</b> – A WATER BEARING FORMATION OR STRATA.</p> <p><b>ARENACEOUS</b> – APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.</p> <p><b>ARGILLACEOUS</b> – 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><b>ARTESIAN</b> – GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.</p> <p><b>CALCAREOUS (CALC.)</b> – SOILS WHICH CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.</p> <p><b>COLLUVIUM</b> – ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.</p> <p><b>CORE RECOVERY (REC.)</b> – TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.</p> <p><b>DIKE</b> – A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.</p> <p><b>DIP</b> – THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.</p> <p><b>DIP DIRECTION (DIP AZIMUTH)</b> – THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.</p> <p><b>FAULT</b> – A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.</p> <p><b>FISSILE</b> – A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.</p> <p><b>FLOAT</b> – ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.</p> <p><b>FLOOD PLAIN (F.P.)</b> – LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.</p> <p><b>FORMATION (FM.)</b> – A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.</p> <p><b>JOINT</b> – FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.</p> <p><b>LEDGE</b> – A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.</p> <p><b>LENS</b> – A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.</p> <p><b>MOTTLED (MOT.)</b> – IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.</p> <p><b>PERCHED WATER</b> – WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.</p> <p><b>RESIDUAL SOIL</b> – SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.</p> <p><b>ROCK QUALITY DESIGNATION (R.Q.D.)</b> – 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><b>SAPROLITE (SAP.)</b> – RESIDUAL SOIL WHICH RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.</p> <p><b>SILL</b> – AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, WHICH HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.</p> <p><b>SLICKENSIDE</b> – POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.</p> <p><b>STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT)</b> – NUMBER OF BLOWS (N OR B.P.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 LESS THAN 0.1 FOOT PENETRATION WITH 60 BLOWS.</p> <p><b>STRATA CORE RECOVERY (SREC.)</b> – TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.</p> <p><b>STRATA ROCK QUALITY DESIGNATION (S.R.Q.D.)</b> – 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><b>TOPSOIL (T.S.)</b> – SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p>	
<b>WEATHERED ROCK (WR)</b>		NON-COASTAL PLAIN MATERIAL THAT YIELDS SPT N VALUES > 100 BLOWS PER FOOT.	
<b>CRYSTALLINE ROCK (CR)</b>		FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.	
<b>NON-CRYSTALLINE ROCK (NCR)</b>		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.	
<b>COASTAL PLAIN SEDIMENTARY ROCK (CP)</b>		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 &gt; 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 &lt; 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 PIECES 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	
<b>TERM</b>	<b>SPACING</b>	<b>TERM</b>	<b>THICKNESS</b>
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: BM#1 RR SPIKE IN 7" POPLAR TREE	
		ELEVATION: 2027.83'	
NOTES:			



SCALE: AS SHOWN

DRAWN BY: LAC

CHECKED BY: SSL

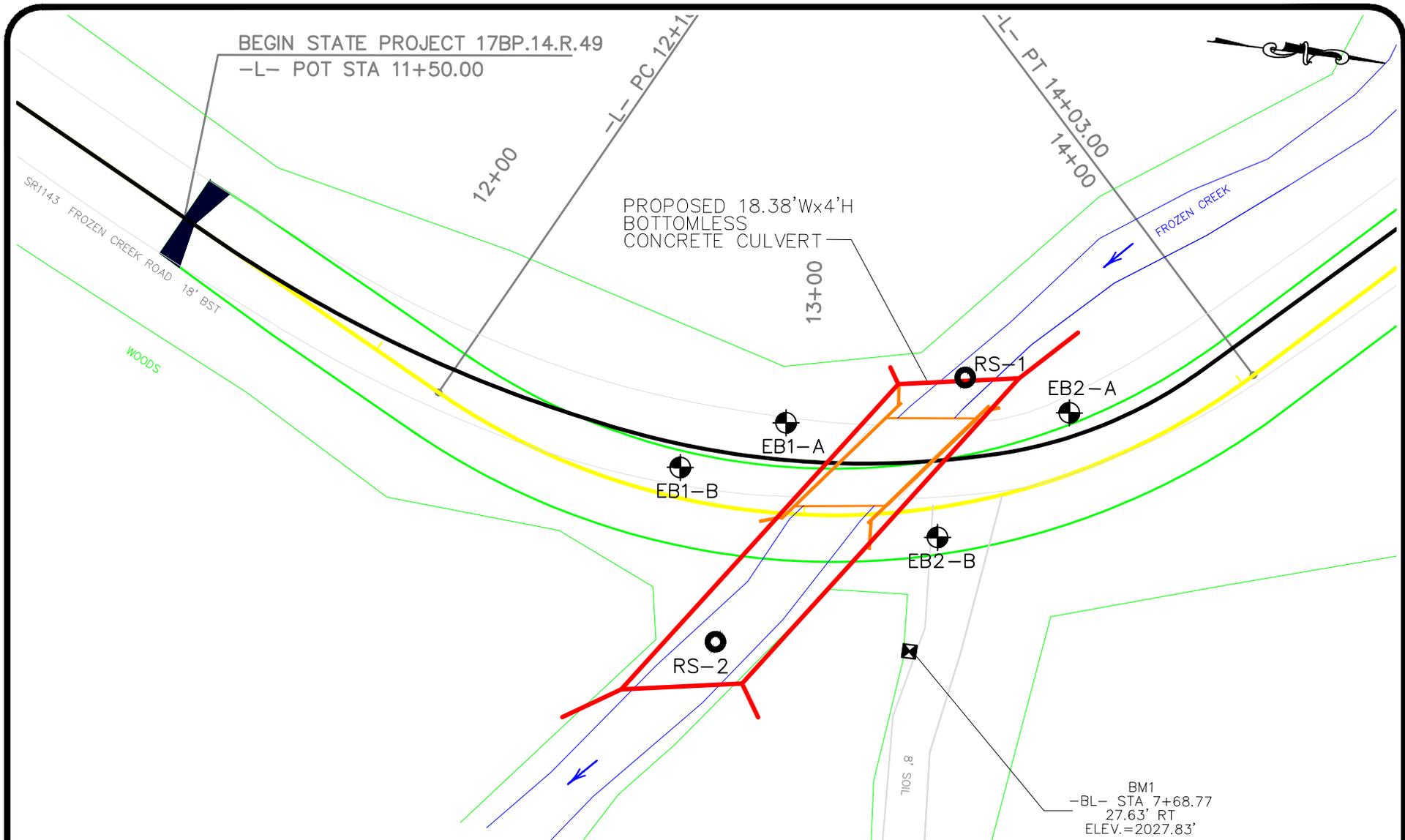
DATE: 3/25/2013



**SITE VICINITY MAP**  
**REPLACE STRUCTURE NO. 870072**  
**ON SR 1143 OVER FROZEN CREEK**  
 TRANSYLVANIA COUNTY, NORTH CAROLINA

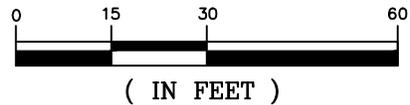
PROJECT NO.: 17BP.14.R.49

SHEET NO.  
**3**

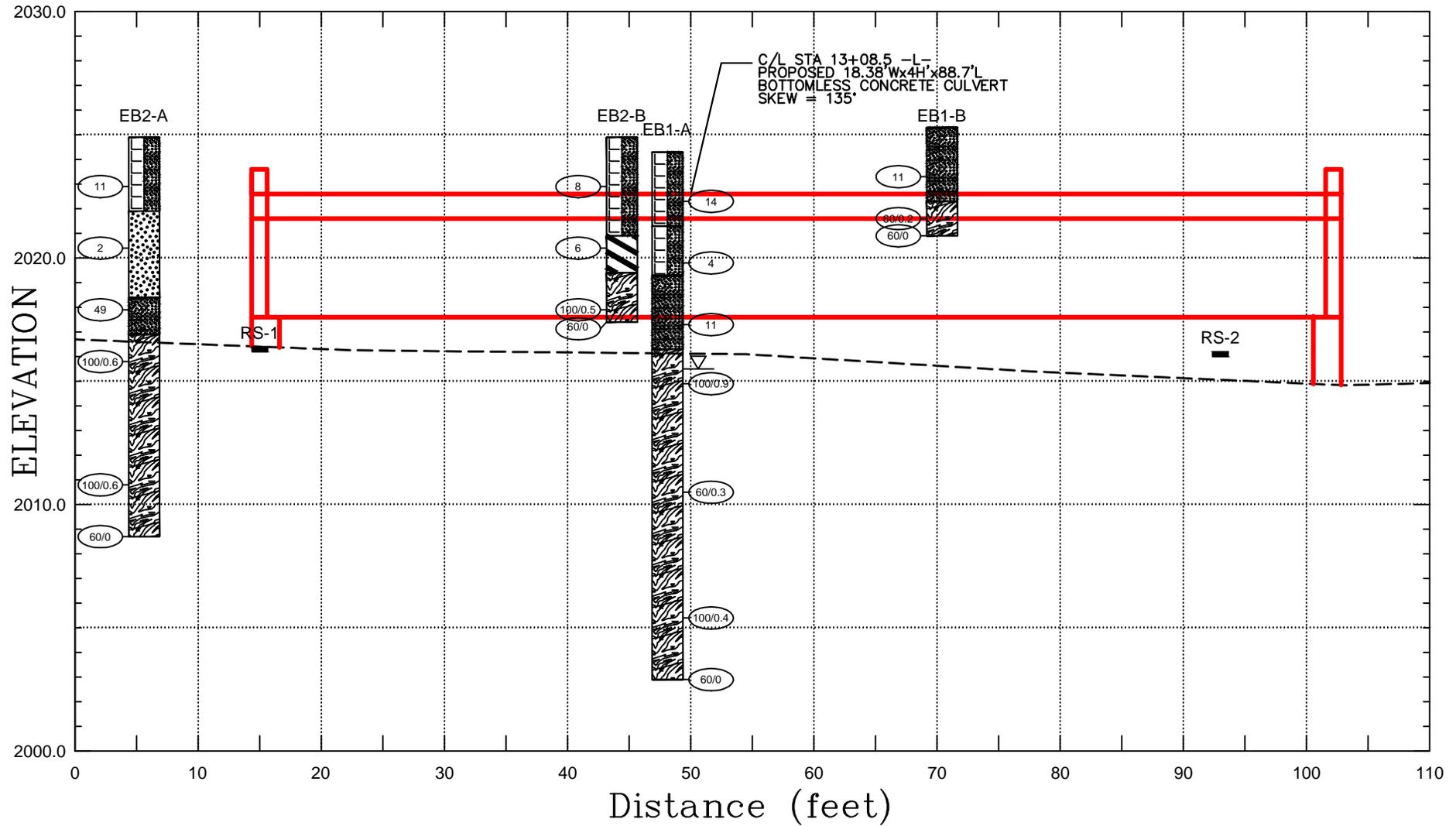


**LEGEND**

-  APPROXIMATE BORING LOCATION
-  APPROXIMATE ROD SOUNDING LOCATION



SCALE: 1" = 30'	DATE: 3/25/2013	 <b>S&amp;ME</b> WWW.SMEINC.COM ENGINEERING LICENSE NO: F-0176	<b>FIELD EXPLORATION PLAN</b>  REPLACE BRIDGE 870072 ON SR 1143 OVER FROZEN CREEK TRANSYLVANIA COUNTY, NORTH CAROLINA	SHEET NO. <b>4</b>
PROJECT NO. 17BP.14.R.49	DRAWN BY: LAC			
CHECKED BY: SSL				



SCALE:	AS SHOWN	DATE:	3/25/2013
PROJECT NO.	17BP.14.R.49	DRAWN BY:	LAC
CHECKED BY:	SSL		

**S&ME**  
 WWW.SMEINC.COM  
 ENGINEERING LICENSE NO: F-0176

**GENERALIZED SUBSURFACE CROSS SECTION**  
**STA 13+08.5 -L-**  
 REPLACE BRIDGE 870072  
 ON SR 1143 OVER FROZEN CREEK  
 TRANSYLVANIA COUNTY, NORTH CAROLINA

SHEET NO.  
**5**



# NCDOT GEOTECHNICAL ENGINEERING UNIT

## BORELOG REPORT

WBS N/A	TIP 17BP.14.R.49	COUNTY Transylvania	GEOLOGIST N. Page
SITE DESCRIPTION Proposed Bottomless Concrete Culvert on SR 1143 Over Frozen Creek			GROUND WTR (ft)
BORING NO. EB1-A	STATION 12+95	OFFSET 19 ft LT	ALIGNMENT -L-
COLLAR ELEV. 2,024.3 ft	TOTAL DEPTH 21.4 ft	NORTHING 513,956	EASTING 840,570
DRILL RIG/HAMMER EFF./DATE CME-45B 87% 10/7/2011		DRILL METHOD 3 1/4" HSA	HAMMER TYPE Automatic
DRILLER C. Odom	START DATE 05/03/12	COMP. DATE 05/03/12	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						
2025														2,024.3	GROUND SURFACE	0.0
	2,023.3	1.0	5	7	7								M	ROADWAY EMBANKMENT Brown Sandy SILT (A-4), little gravel		
2020	2,020.8	3.5	4	3	1								M	ROADWAY EMBANKMENT Brown Sandy SILT (A-4)	3.0	
	2,018.3	6.0	3	4	7								M	RESIDUUM Red Brown Sandy SILT (A-4)	5.0	
2015	2,015.8	8.5	38	62/0.4									M			
	2,010.8	13.5	60/0.3										D	WEATHERED ROCK (Gneiss)	8.0	
2010	2,005.8	18.5	100/0.4										W			
2005	2,002.9	21.4	60/0										M			
																21.4
Boring Terminated with Standard Penetration Test Refusal at Elevation 2,002.9 ft On Crystalline Rock (Gneiss) 1) 3 1/4" HSA Advanced to 21.4 Feet 2) Standard Penetration Test Refusal at 21.4 Feet																

NCDOT BORE SINGLE 072.GPJ NC\_DOT.GDT 3/20/13



# NCDOT GEOTECHNICAL ENGINEERING UNIT

## BORELOG REPORT

WBS N/A	TIP 17BP.14.R.49	COUNTY Transylvania	GEOLOGIST N. Page
SITE DESCRIPTION Proposed Bottomless Concrete Culvert on SR 1143 Over Frozen Creek			GROUND WTR (ft)
BORING NO. EB1-B	STATION 12+72	OFFSET 6 ft LT	ALIGNMENT -L-
COLLAR ELEV. 2,025.3 ft	TOTAL DEPTH 4.4 ft	NORTHING 513,935	EASTING 840,582
DRILL RIG/HAMMER EFF./DATE CME-45B 87% 10/7/2011		DRILL METHOD 3 1/4" HSA	HAMMER TYPE Automatic
DRILLER C. Odom	START DATE 05/03/12	COMP. DATE 05/03/12	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	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						ELEV. (ft)	
2030																	
2025																	
	2,024.3	1.0	8	7	4										2,025.3	GROUND SURFACE	0.0
	2,021.8	3.5	60/0.2												2,022.3	RESIDUUM Brown Sandy SILT (A-4)	3.0
	2,020.9	4.4	60/0												2,020.9	WEATHERED ROCK (Gneiss)	4.4
																Boring Terminated with Standard Penetration Test Refusal at Elevation 2,020.9 ft On Crystalline Rock (Gneiss)  1) 3 1/4" HSA Advanced to 4.4 Feet 2) Standard Penetration Test Refusal at 4.4 Feet	

NCDOT BORE SINGLE 072.GPJ NC\_DOT.GDT 3/20/13



# NCDOT GEOTECHNICAL ENGINEERING UNIT

## BORELOG REPORT

WBS N/A	TIP 17BP.14.R.49	COUNTY Transylvania	GEOLOGIST N. Page
SITE DESCRIPTION Proposed Bottomless Concrete Culvert on SR 1143 Over Frozen Creek			GROUND WTR (ft)
BORING NO. EB2-A	STATION 13+28	OFFSET 12 ft LT	ALIGNMENT -L-
COLLAR ELEV. 2,024.9 ft	TOTAL DEPTH 16.2 ft	NORTHING 514,016	EASTING 840,560
DRILL RIG/HAMMER EFF./DATE CME-45B 87% 10/7/2011		DRILL METHOD 3 1/4" HSA	HAMMER TYPE Automatic
DRILLER C. Odom	START DATE 05/03/12	COMP. DATE 05/03/12	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)	
2025													2,024.9	0.0	GROUND SURFACE	
	2,023.9	1.0	6	5	6										<b>ROADWAY EMBANKMENT</b> Brown Sandy SILT (A-4)	
	2,021.4	3.5	WOH 1 1											2,021.9	3.0	<b>ALLUVIAL</b> Brown Black Silty SAND (A-2-4)
2020	2,018.9	6.0	6	13	36											
	2,016.4	8.5	54	46/0.1										2,018.4	6.5	<b>RESIDUUM</b> Brown Tan Sandy SILT (A-4)
2015														2,016.9	8.0	<b>WEATHERED ROCK</b> (Gneiss)
	2,011.4	13.5	32	68/0.1												
2010																
	2,008.7	16.2	60/0											2,008.7	16.2	Boring Terminated with Standard Penetration Test Refusal at Elevation 2,008.7 ft On Crystalline Rock (Gneiss)
																1) 3 1/4" HSA Advanced to 16.2 Feet 2) Standard Penetration Test Refusal at 16.2 Feet

NCDOT BORE SINGLE 072.GPJ NC\_DOT.GDT 3/20/13



# NCDOT GEOTECHNICAL ENGINEERING UNIT

## BORELOG REPORT

WBS N/A	TIP 17BP.14.R.49	COUNTY Transylvania	GEOLOGIST N. Page
SITE DESCRIPTION Proposed Bottomless Concrete Culvert on SR 1143 Over Frozen Creek			GROUND WTR (ft)
BORING NO. EB2-B	STATION 13+63	OFFSET 6 ft RT	ALIGNMENT -L-
COLLAR ELEV. 2,024.9 ft	TOTAL DEPTH 7.5 ft	NORTHING 513,991	EASTING 840,590
DRILL RIG/HAMMER EFF./DATE CME-45B 87% 10/7/2011		DRILL METHOD 3 1/4" HSA	HAMMER TYPE Automatic
DRILLER C. Odom	START DATE 05/03/12	COMP. DATE 05/03/12	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							
2025														2,024.9	0.0	GROUND SURFACE	
	2,023.9	1.0	4	5	3								M			<b>ROADWAY EMBANKMENT</b> Red Brown Sandy SILT (A-4), little gravel	
	2,021.4	3.5	5	4	2								M	2,020.9	4.0	<b>ALLUVIAL</b> Red Brown Black Silty CLAY (A-7-5)	
2020	2,018.9	6.0	5	79	21/0								M	2,019.4	5.5	<b>WEATHERED ROCK</b> (Gneiss)	
	2,017.4	7.5	60/0							100/0.5			M	2,017.4	7.5	Boring Terminated with Standard Penetration Test Refusal at Elevation 2,017.4 ft On Crystalline Rock (Gneiss)	
										60/0							1) 3 1/4" HSA Advanced to 7.5 Feet 2) Standard Penetration Test Refusal at 7.5 Feet

NCDOT BORE SINGLE 072.GPJ NC\_DOT.GDT 3/20/13



**NCDOT GEOTECHNICAL ENGINEERING UNIT  
FIELD PENETROMETER LOG (ENGLISH)**

PROJECT NUMBER	ID 17.BP.14.R.49	CO TRANSYLVANIA	GEO J. WILLIAMSON
SITE DESC PROPOSED BOTTOMLESS CONCRETE CULVERT ON SR 1143 OVER FROZEN CREEK			
BORING NUMBER RS-1	STA 13+41	OFFSET 26 FT LT	ALIGNMENT -L-
ELEVATION 2016.4 FT	TOTAL DEPTH 0.0 FT	NORTH 513,993	EAST 840,555
DRILL METHOD ROD SOUNDING			DRILLER J. WILLIAMSON
START DATE 05/03/12	COMP DATE 05/03/12	SURFACE WTR DEPTH N/A FT	DEPTH TO ROCK 0.0 FT

DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT				SAMPLE NO. & INTERVAL	MOI	ORIGIN	SOIL & ROCK DESCRIPTION <small>(SOIL or ROCK NAME (w/ color, density/consistency, texture, plasticity, organics, other))</small>
	0.5 ft	0.5 ft	TOTAL	0	25	50	75				
5											Rod Sounding Refusal at Elevation 2016.4 (Ground Surface)
10											
15											
20											
25											
30											
35											

NOTES Refusal at 0 Feet

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DECK TO DATUM DISTANCE \_\_\_\_\_ FT

SIGNATURE \_\_\_\_\_ DATE \_\_\_\_\_

NOTES \_\_\_\_\_

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\_\_\_\_\_

RED LINE



**NCDOT GEOTECHNICAL ENGINEERING UNIT**  
**FIELD PENETROMETER LOG (ENGLISH)**

PROJECT NUMBER	ID 17.BP.14.R.49	CO TRANSYLVANIA	GEO J. WILLIAMSON
SITE DESC PROPOSED BOTTOMLESS CONCRETE CULVERT ON SR 1143 OVER FROZEN CREEK			
BORING NUMBER RS-2	STA 12+85	OFFSET 29 FT RT	ALIGNMENT -L-
ELEVATION 2016.2 FT	TOTAL DEPTH 0.0 FT	NORTH 513,947	EAST 840,618
DRILL METHOD ROD SOUNDING			DRILLER J. WILLIAMSON
START DATE 05/03/12	COMP DATE 05/03/12	SURFACE WTR DEPTH N/A FT	DEPTH TO ROCK 0.0 FT

DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT				SAMPLE NO. & INTERVAL	MOI	ORIGIN	SOIL & ROCK DESCRIPTION <small>SOIL or ROCK NAME (w/ color, density/consistency, texture, plasticity, organics, other)</small>
	0.5 ft	0.5 ft	TOTAL	0	25	50	75				
5											Rod Sounding Refusal at Elevation 2016.2 (Ground Surface)
10											
15											
20											
25											
30											
35											

NOTES Refusal at 0 Feet

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DECK TO DATUM DISTANCE \_\_\_\_\_ FT

SIGNATURE \_\_\_\_\_ DATE \_\_\_\_\_

NOTES \_\_\_\_\_

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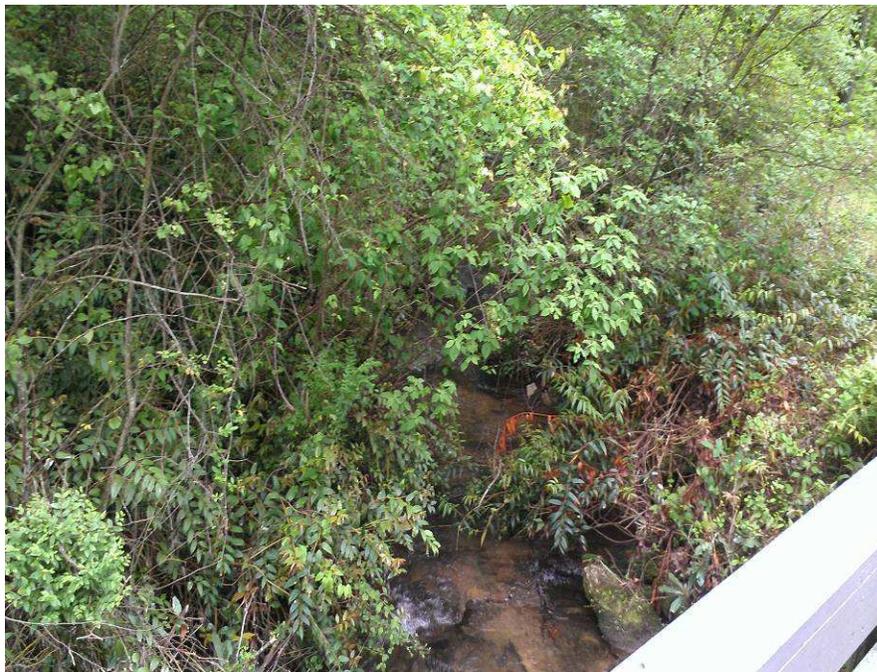
**Photograph No. 1:**  
View looking south down-station from north approach



**Photograph No. 2:**  
View looking north up-station from south approach



**Photograph No. 3:**  
View looking west upstream from bridge deck



**Photograph No. 4:**  
View looking east downstream from bridge deck



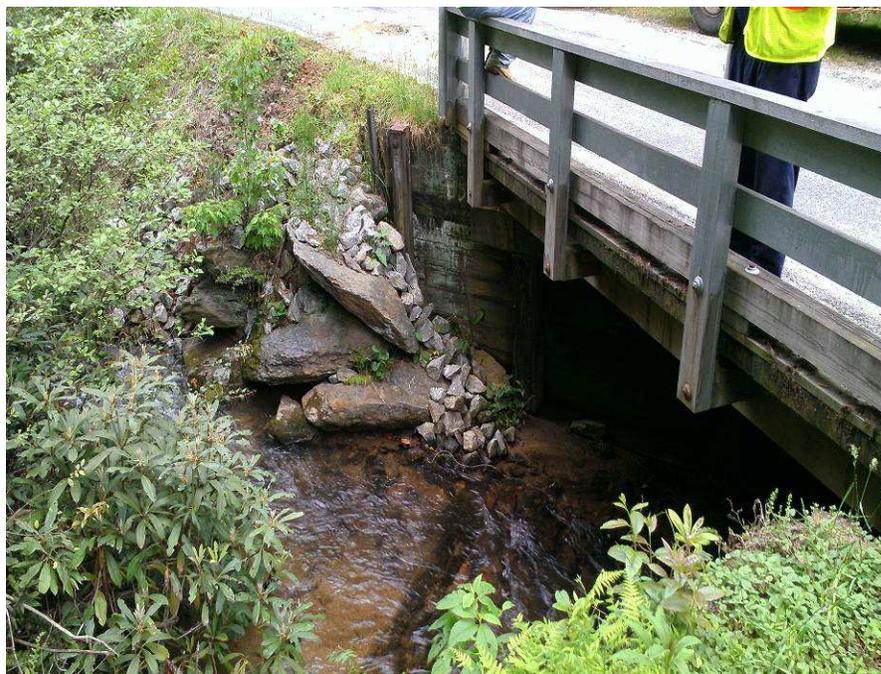
**Photograph No. 5:**  
View looking south across End Bent 1A



**Photograph No. 6:**  
View looking south across End Bent 1B



**Photograph No. 7:**  
View looking north across End Bent 2B



**Photograph No. 8:**  
View looking north across End Bent 2A