



## **APPENDIX B**

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

# **MAP 1 MCDOWELL 126**

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

## DIVISION OF HIGHWAYS

### GEOTECHNICAL ENGINEERING UNIT

## SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

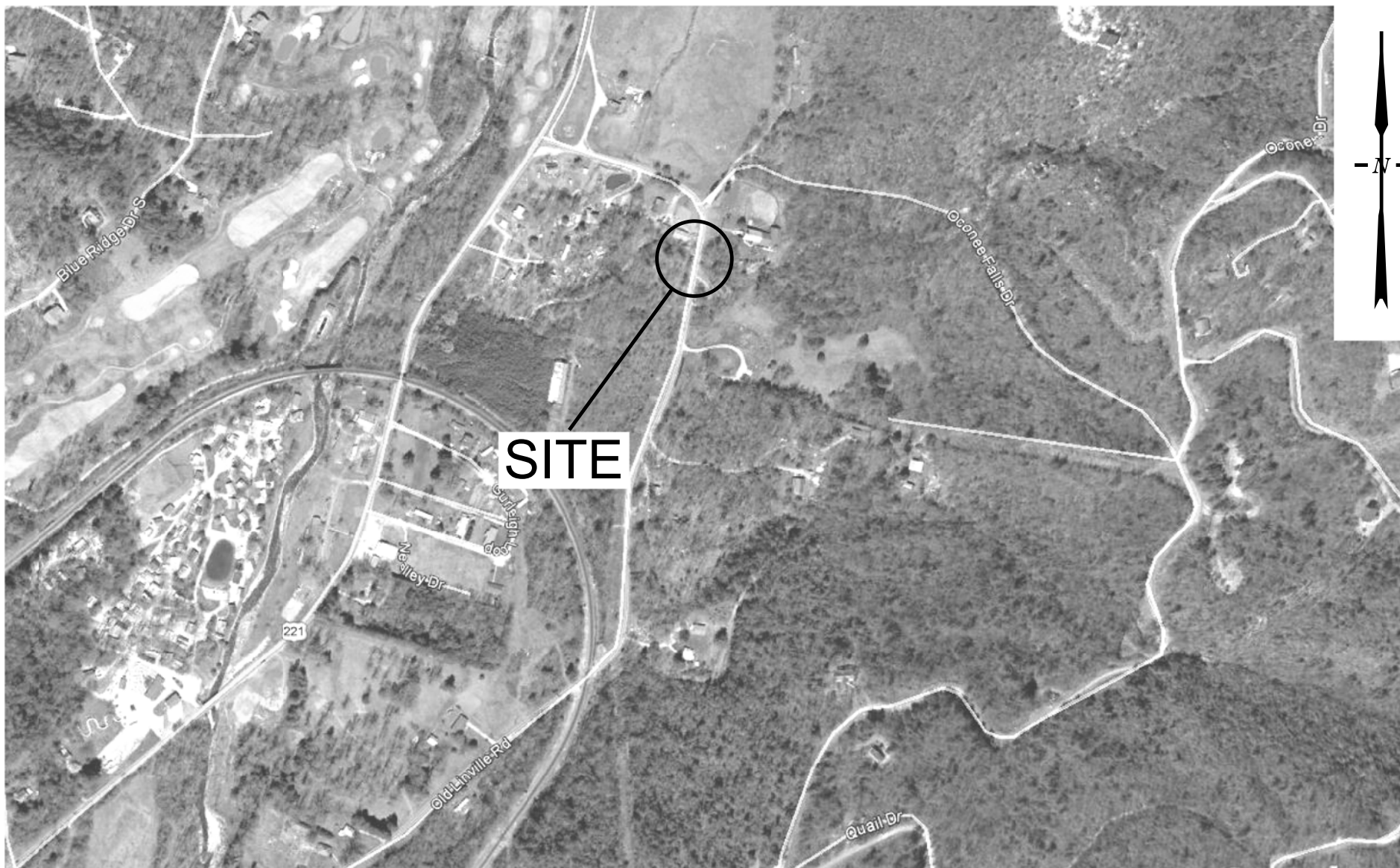
SOIL DESCRIPTION										GRADATION																																																																																																																								
SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER 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, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</i>										<b>WELL GRADED</b> - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. <b>UNIFORM</b> - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED) <b>GAP-GRADED</b> - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.																																																																																																																								
<b>SOIL LEGEND AND AASHTO CLASSIFICATION</b>										<b>ANGULARITY OF GRAINS</b> 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> .																																																																																																																								
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17BP.13.R.II-Structure 580126	1A

**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><b>ALLUVIUM (ALLUV.)</b> - SOILS THAT 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 IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.</p> <p><b>CALCAREOUS (CALC.)</b> - SOILS THAT 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 (FP)</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 (RES.) SOIL</b> - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.</p> <p><b>ROCK QUALITY DESIGNATION (ROD)</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 THAT 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, THAT 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 (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.</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 (SROD)</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 (TS.)</b> - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p>	
<p><b>WEATHERED ROCK (WR)</b></p>  <p>NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES &gt; 100 BLOWS PER FOOT IF TESTED.</p>	<p><b>CRYSTALLINE ROCK (CR)</b></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><b>NON-CRYSTALLINE ROCK (NCR)</b></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><b>COASTAL PLAIN SEDIMENTARY ROCK (CP)</b></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			
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. <u>IF TESTED, WOULD YIELD SPT REFUSAL</u>		
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. <u>IF TESTED, YIELDS SPT N VALUES &gt; 100 BPF</u>		
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. <u>IF TESTED, YIELDS SPT N VALUES &lt; 100 BPF</u>		
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 FINGER NAIL.		
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.		

<b>BENCH MARK: SURVEY INFORMATION PROVIDED BY MATTERN &amp; CRAIG</b>	
—	—
ELEVATION: _	FT.
NOTES:	
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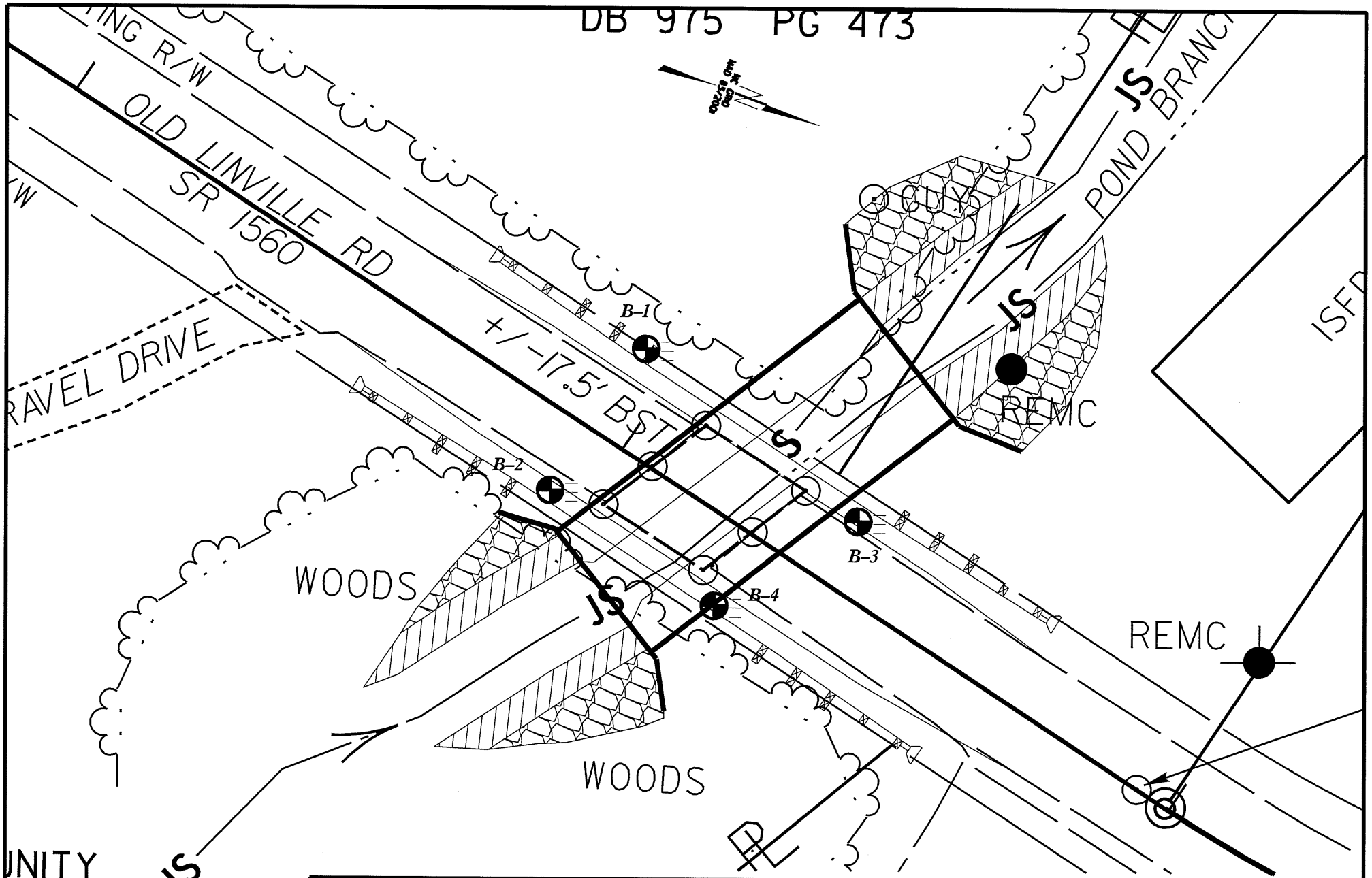
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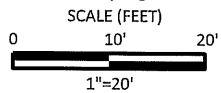
## SITE LOCATION PLAN

PROJECT REFERENCE NO.: 17BP.13.R.11		F&R PROJECT NO.: 63P-0198
I.D. NO.: N/A	F.A. PROJECT NO.: N/A	COUNTY: McDowell
PROJECT DESCRIPTION: Bridge #126 on SR 1560 over Pond Branch		
SITE DESCRIPTION: Bridge #126 on SR 1560 over Pond Branch		
DRAWN BY: R. Kral	CHECKED BY: M. Walko, P.E.	
DATE: June 2013		
		DRAWING No.: 1

DB 975 PG 473



UNITY  
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### BORING LOCATION PLAN

PROJECT REFERENCE NO.: 17BP.13.R.11		F&R PROJECT NO.: 63P-0198
I.D. NO.: N/A	F.A. PROJECT NO.: N/A	COUNTY: McDowell
PROJECT DESCRIPTION: Bridge #126 on SR 1560 over Pond Branch		
SITE DESCRIPTION: Bridge #126 on SR 1560 over Pond Branch		
DRAWN BY: R. Kral	CHECKED BY: M. Walko, P.E.	
DATE: June 2013	SCALE: 1" = 20'	
DRAWING No.: 2		



# NCDOT GEOTECHNICAL ENGINEERING UNIT

## BORELOG REPORT

SHEET 1 OF 4

WBS 17BP.13.R.11		TIP N/A		COUNTY McDowell		GEOLOGIST R. Kral	
SITE DESCRIPTION Bridge 580126 on SR 1560 over Pond Branch							GROUND WTR (ft)
BORING NO. B-1		STATION 11+95		OFFSET 15 ft LT		ALIGNMENT -L-	
COLLAR ELEV. 1,789.4 ft		TOTAL DEPTH 15.0 ft		NORTHING 787,896		EASTING 1,130,188	
							0 HR. 7.0 24 HR. 8.6
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 11/29/12		COMP. DATE 11/29/12		SURFACE WATER DEPTH N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
1790	1,789.4	0.0	2	2	3								GROUND SURFACE	0.0
1785	1,785.9	3.5	2	22	20							M	ROADWAY EMBANKMENT Red-orange and brown silty CLAY (A-7-5)	3.5
	1,783.9											M	Tan and brown silty fine to coarse SAND (A-2-4)	5.5
1780	1,782.4												COLLUVIAL Intermittent Boulders	7.0
	1,780.9	8.5	4	8	8							W	Tan and brown silty fine to coarse SAND (A-2-4)	10.0
1775	1,779.4												Cobbles and gravel throughout Intermittent Boulders	12.5
	1,775.9	13.5	3	10	90/0.1								Tan and brown silty fine to coarse SAND (A-2-4)	15.0
	1,774.4	15.0											Cobbles and gravel throughout Boring Terminated at Elevation 1,774.4 ft In COLLUVIAL SOILS	

1) Drillers used coring equipment (NQ-2) and roller cone to penetrate boulders in the colluvial layers.

2) Higher N-values in the colluvial soils are indicative of the cobbles/gravel encountered during sampling.



# NCDOT GEOTECHNICAL ENGINEERING UNIT

## BORELOG REPORT

SHEET 2 OF 4

WBS 17BP.13.R.11		TIP N/A		COUNTY McDowell		GEOLOGIST R. Kral	
SITE DESCRIPTION Bridge 580126 on SR 1560 over Pond Branch							GROUND WTR (ft)
BORING NO. B-2		STATION 11+94		OFFSET 11 ft RT		ALIGNMENT -L-	
COLLAR ELEV. 1,789.4 ft		TOTAL DEPTH 19.7 ft		NORTHING 787,890		EASTING 1,130,214	
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 12/05/12		COMP. DATE 12/05/12		SURFACE WATER DEPTH N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
1790	1,789.4	0.0	4	3	3								GROUND SURFACE	0.0
1785	1,785.9	3.5	5	8	6								ROADWAY EMBANKMENT Red-brown silty CLAY (A-7-5)	3.5
1780	1,780.9	8.5	3	7	38								Dark brown silty fine to coarse SAND (A-2-4), little rock fragments	5.5
1775	1,777.9	11.5											COLLUVIAL Intermittent Boulders	8.5
1770	1,770.9	18.5	25	48	52/0.2								Tan and gray silty fine to coarse SAND (A-2-4)	11.5
													Cobbles and gravel throughout Intermittent Boulders	18.5
													WEATHERED ROCK	19.7
													Tan and orange (BIOTITE GNEISS)	
													Boring Terminated at Elevation 1,769.7 ft In WEATHERED ROCK (BIOTITE GNEISS)	
													1) Drillers used coring equipment (NQ-2) and roller cone to penetrate boulders in the colluvial layers.	
													2) Higher N-values in the colluvial soils are indicative of the cobbles/gravel encountered during sampling.	



# NCDOT GEOTECHNICAL ENGINEERING UNIT BORELOG REPORT

SHEET 3 OF 4

WBS 17BP.13.R.11		TIP N/A		COUNTY McDowell		GEOLOGIST R. Kral										
SITE DESCRIPTION Bridge 580126 on SR 1560 over Pond Branch						GROUND WTR (ft)										
BORING NO. B-3		STATION 12+36		OFFSET 11 ft LT		ALIGNMENT -L-										
COLLAR ELEV. 1,789.9 ft		TOTAL DEPTH 20.0 ft		NORTHING 787,936		EASTING 1,130,201										
DRILL RIG/HAMMER EFF./DATE F&R5785 CME-55 82% 10/5/2012						DRILL METHOD H.S. Augers										
DRILLER C. Boyce						HAMMER TYPE Automatic										
START DATE 12/03/12		COMP. DATE 12/04/12		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)					
1790	1,789.9	0.0	2	3	3						M	1,789.9	GROUND SURFACE	0.0		
1785	1,786.4	3.5	8	9	13							M	1,784.4	ROADWAY EMBANKMENT Red-brown silty CLAY (A-7-5)	5.5	
	1,781.4	8.5	15	17	7								W	1,781.9	COLLUVIAL Intermittent Boulders	8.0
1780	1,776.4	13.5	60/0.0	Tan, white and yellow silty fine to coarse SAND (A-2-4)								1,779.4		10.5		
1775	1,771.4	18.5	60/0.0	Cobbles and gravel throughout Intermittent Boulders								1,769.9	20.0			
1770												Boring Terminated at Elevation 1,769.9 ft In COLLUVIAL SOILS				
1) Drillers used coring equipment (NQ-2) and roller cone to penetrate boulders in the colluvial layers.																





# NCDOT GEOTECHNICAL ENGINEERING UNIT

## BORELOG REPORT

SHEET 4 OF 4

WBS 17BP.13.R.11		TIP N/A		COUNTY McDowell		GEOLOGIST R. Kral	
SITE DESCRIPTION Bridge 580126 on SR 1560 over Pond Branch							GROUND WTR (ft)
BORING NO. B-4		STATION 12+25		OFFSET 12 ft RT		ALIGNMENT -L-	
COLLAR ELEV. 1,789.7 ft		TOTAL DEPTH 20.0 ft		NORTHING 787,920		EASTING 1,130,221	
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 11/29/12		COMP. DATE 11/29/12		SURFACE WATER DEPTH N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
1790	1,789.7	0.0	2	3	4								GROUND SURFACE	0.0
1785	1,786.2	3.5	8	28	32								ROADWAY EMBANKMENT Red-brown silty CLAY (A-7-5)	3.5
1780	1,781.2	8.5	10	17	23								Dark brown silty fine to coarse SAND (A-2-4), little rock fragments	5.0
1775	1,776.2	13.5	41	59	0.3								COLLUVIAL Intermittent Boulders	8.0
1770													Brown and white silty fine to coarse SAND (A-2-4)	10.0
													Cobbles and gravel throughout	13.5
													Intermittent Boulders	15.0
													Brown and white silty fine to coarse SAND (A-2-4)	20.0
													Cobbles and gravel throughout	
													Intermittent Boulders	
													Boring Terminated at Elevation 1,769.7 ft In COLLUVIAL SOILS	

1) Drillers used coring equipment (NQ-2) and roller cone to penetrate boulders in the colluvial layers.

2) Higher N-values in the colluvial soils are indicative of the cobbles/gravel encountered during sampling.



**APPENDIX C**

**SUPPORTING DOCUMENTATION**



# NCDOT GEOTECHNICAL ENGINEERING UNIT BORELOG REPORT

SHEET 1 OF 4

WBS 17BP.13.R.11		TIP N/A		COUNTY McDowell		GEOLOGIST R. Kral													
SITE DESCRIPTION Bridge 580126 on SR 1560 over Pond Branch							GROUND WTR (ft)												
BORING NO. B-1		STATION 11+95		OFFSET 15 ft LT		ALIGNMENT -L-		0 HR. 7.0											
COLLAR ELEV. 1,789.4 ft		TOTAL DEPTH 15.0 ft		NORTHING 787,896		EASTING 1,130,188		24 HR. 8.6											
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 11/29/12		COMP. DATE 11/29/12		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		MOI	ELEV. (ft)	DEPTH (ft)					
1790	1,789.4	0.0	2	2	3								1,789.4	0.0					
1785	1,785.9	3.5	2	22	20											M		1,785.9	3.5
	1,783.9															M		1,783.9	5.5
1780	1,780.9	8.5	4	8	8													1,782.4	7.0
	1,779.4											W		1,779.4	10.0				
1775	1,775.9	13.5	3	10	90/0.1								1,776.9	12.5					
	1,774.4	15.0											1,774.4	15.0					
			60/0.0			100/0.6 60/0.0													
<p>Ⓢ Invert. Excavation into cobbles/boulders should be anticipated.</p>																			
<p>1) Drillers used coring equipment (NQ-2) and roller cone to penetrate boulders in the colluvial layers.</p> <p>2) Higher N-values in the colluvial soils are indicative of the cobbles/gravel encountered during sampling.</p>																			



# NCDOT GEOTECHNICAL ENGINEERING UNIT BORELOG REPORT

SHEET 2 OF 4

WBS 17BP.13.R.11		TIP N/A		COUNTY McDowell		GEOLOGIST R. Kral						
SITE DESCRIPTION Bridge 580126 on SR 1560 over Pond Branch						GROUND WTR (ft)						
BORING NO. B-2		STATION 11+94		OFFSET 11 ft RT		ALIGNMENT -L-						
COLLAR ELEV. 1,789.4 ft		TOTAL DEPTH 19.7 ft		NORTHING 787,890		EASTING 1,130,214						
DRILL RIG/HAMMER EFF./DATE F&R5785 CME-55 82% 10/5/2012						DRILL METHOD H.S. Augers						
DRILLER C. Boyce						HAMMER TYPE Automatic						
START DATE 12/05/12		COMP. DATE 12/05/12		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)	
1790	1,789.4	0.0	4	3	3							1,789.4 GROUND SURFACE 0.0
1785	1,785.9	3.5	5	8	6						M	ROADWAY EMBANKMENT Red-brown silty CLAY (A-7-5) 3.5
1780.2	1,780.9	8.5	3	7	38						M	Dark brown silty fine to coarse SAND (A-2-4), little rock fragments 5.5
1780	1,780.9	8.5	3	7	38						W	COLLUVIAL Intermittent Boulders 8.5
1775	1,777.9	11.5										Tan and gray silty fine to coarse SAND (A-2-4) 11.5
1770	1,770.9	18.5	25	48	52/0.2							Cobbles and gravel throughout Intermittent Boulders 18.5
												WEATHERED ROCK 19.7
												Tan and orange (BIOTITE GNEISS)
												Boring Terminated at Elevation 1,769.7 ft In WEATHERED ROCK (BIOTITE GNEISS)
												1) Drillers used coring equipment (NQ-2) and roller cone to penetrate boulders in the colluvial layers.
												2) Higher N-values in the colluvial soils are indicative of the cobbles/gravel encountered during sampling.

1780.2

100/0.7

Excavation into  
Cobbles/boulders should  
be Anticipated.



# NCDOT GEOTECHNICAL ENGINEERING UNIT BORELOG REPORT

SHEET 3 OF 4

WBS 17BP.13.R.11			TIP N/A			COUNTY McDowell			GEOLOGIST R. Kral							
SITE DESCRIPTION Bridge 580126 on SR 1560 over Pond Branch										GROUND WTR (ft)						
BORING NO. B-3			STATION 12+36			OFFSET 11 ft LT			ALIGNMENT -L-							
COLLAR ELEV. 1,789.9 ft			TOTAL DEPTH 20.0 ft			NORTHING 787,936			EASTING 1,130,201							
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 12/03/12			COMP. DATE 12/04/12			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						
1790														1,789.9	GROUND SURFACE	0.0
	1,789.9	0.0	2	3	3										ROADWAY EMBANKMENT Red-brown silty CLAY (A-7-5)	
1785	1,786.4	3.5	8	9	13									1,784.4		5.5
	1,781.4	8.5												1,781.9	COLLUVIAL Intermittent Boulders	8.0
1780	1,778.4	10.5	15	17	7									1,779.4	Tan, white and yellow silty fine to coarse SAND (A-2-4)	10.5
	1,776.4	13.5													Cobbles and gravel throughout Intermittent Boulders	
1775	1,771.4	18.5														
1770														1,769.9	Boring Terminated at Elevation 1,769.9 ft In COLLUVIAL SOILS	20.0
<p>1) Drillers used coring equipment (NQ-2) and roller cone to penetrate boulders in the colluvial layers.</p>																

€ Invert. Excavation  
into cobbles/boulders  
should be anticipated.



# NCDOT GEOTECHNICAL ENGINEERING UNIT BORELOG REPORT

SHEET 4 OF 4

WBS 17BP.13.R.11			TIP N/A			COUNTY McDowell			GEOLOGIST R. Kral						
SITE DESCRIPTION Bridge 580126 on SR 1560 over Pond Branch										GROUND WTR (ft)					
BORING NO. B-4			STATION 12+25			OFFSET 12 ft RT			ALIGNMENT -L-						
COLLAR ELEV. 1,789.7 ft			TOTAL DEPTH 20.0 ft			NORTHING 787,920			EASTING 1,130,221						
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 11/29/12			COMP. DATE 11/29/12			SURFACE WATER DEPTH N/A						
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
1790															
	1,789.7	0.0	2	3	4									GROUND SURFACE	0.0
	1,788.2	3.5	8	28	32									ROADWAY EMBANKMENT Red-brown silty CLAY (A-7-5)	3.5
	1,786.2													Dark brown silty fine to coarse SAND (A-2-4), little rock fragments	5.0
	1,781.2	8.5	10	17	23									COLLUVIAL Intermittent Boulders	8.0
	1,779.7													Brown and white silty fine to coarse SAND (A-2-4)	10.0
	1,776.2	13.5	41	59/0.3										Cobbles and gravel throughout Intermittent Boulders	13.5
	1,774.7													Brown and white silty fine to coarse SAND (A-2-4)	15.0
	1,769.7													Cobbles and gravel throughout Intermittent Boulders	20.0
<p>Boring Terminated at Elevation 1,769.7 ft In COLLUVIAL SOILS</p> <p>1) Drillers used coring equipment (NQ-2) and roller cone to penetrate boulders in the colluvial layers.</p> <p>2) Higher N-values in the colluvial soils are indicative of the cobbles/gravel encountered during sampling.</p>															

Excavation  
Into cobbles/boulders  
Should be anticipated.

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	17BP.13.R.119	1	9

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

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# STRUCTURE SUBSURFACE INVESTIGATION

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PROJ. REFERENCE NO. 17BP.13.R.119 F.A. PROJ. NA  
COUNTY McDowell  
PROJECT DESCRIPTION Structure No. 580011 on SR 1798 (Tater Town Loop)  
over Katy Creek

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## MAP 2 MCDOWELL 11

### CONTENTS

<u>SHEET</u>	<u>DESCRIPTION</u>
1	TITLE SHEET
2, 2A	LEGEND
3	SITE PLAN
4	BORING LOCATION PLAN
5-7	BORE LOG AND CORE REPORTS
8	ROCK CORE PHOTOS

### PERSONNEL

<u>J. Fowler</u>
<u>J. Hoyle</u>
<u>M. Hosseini</u>
<u>M. Brewer, E.I.</u>

INVESTIGATED BY F&R, Inc.  
CHECKED BY M. Walko, P.E.  
SUBMITTED BY F&R, Inc.  
DATE May 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.

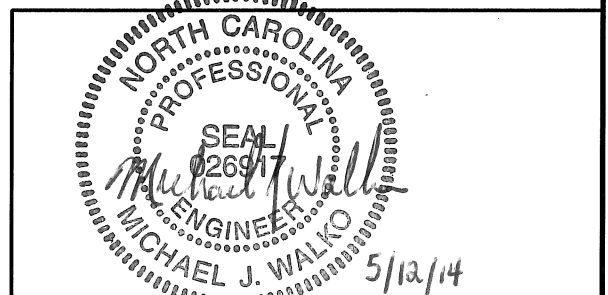
GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND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

DRAWN BY: M. Brewer, E.I.



NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

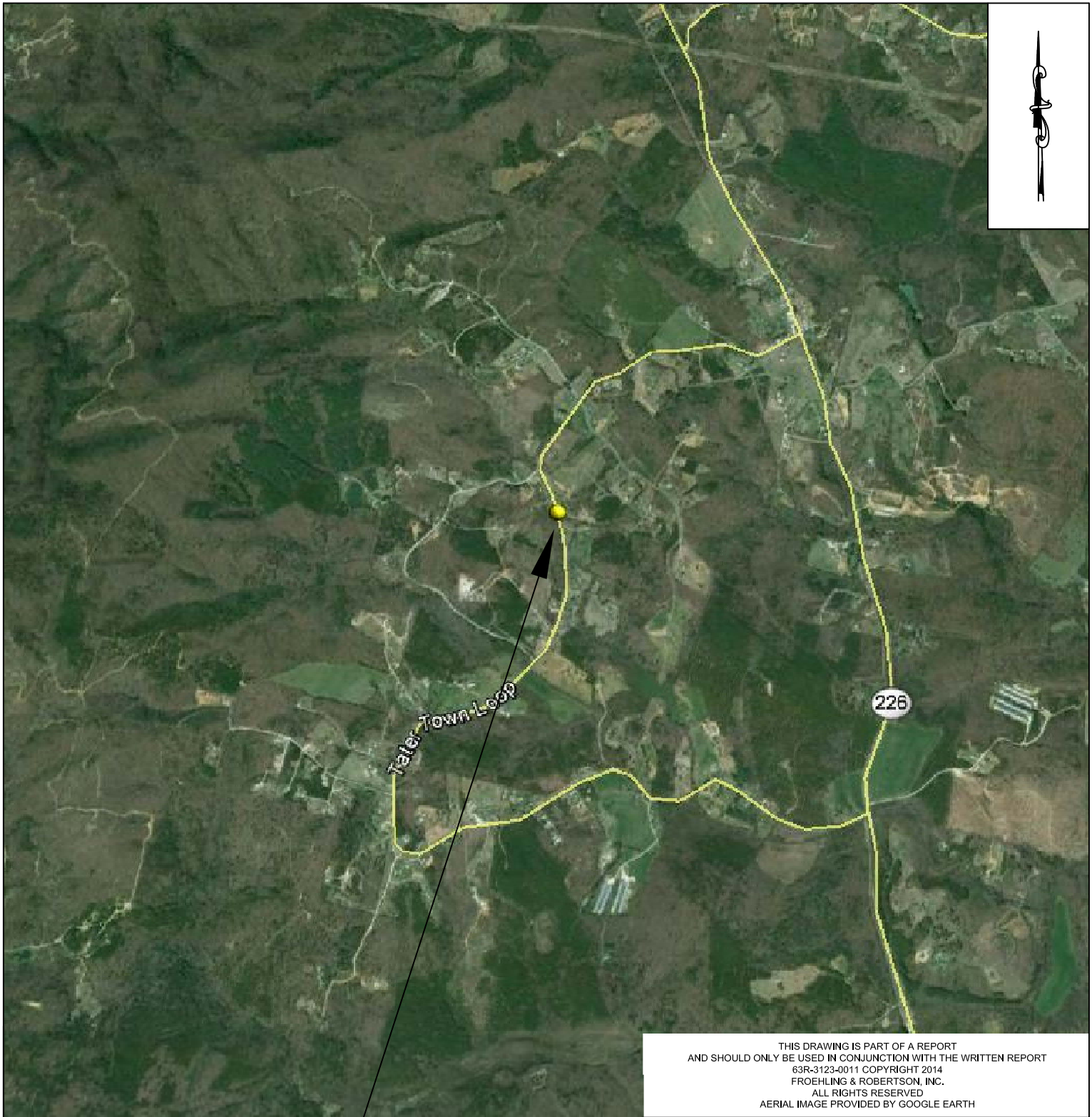
GEOTECHNICAL ENGINEERING UNIT

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:  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.																															
															ANGULARITY OF GRAINS																															
															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> .																															
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-2	A-3	A-4, A-5	A-6, A-7																																		
SYMBOL																																														
% PASSING # 10 # 40 # 200	50 MX 30 MX 15 MX	50 MX 25 MX	51 MN 10 MX	35 MX 35 MX	35 MX 35 MX	35 MX 35 MX	36 MN 36 MN	36 MN 36 MN	41 MN 41 MN	41 MN 41 MN	41 MN 41 MN	41 MN 41 MN	41 MN 41 MN	41 MN 41 MN	GRANULAR SOILS		SILT-CLAY SOILS		MUCK, PEAT																											
LIQUID LIMIT PLASTIC INDEX	6 MX	NP	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 11 MN	40 MX 10 MX	41 MN 11 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS																													
GROUP INDEX	0	0	0	0	4 MX	8 MX	12 MX	16 MX	No MX	No MX																																				
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS, GRAVEL, AND SAND		FINE SAND		SILTY OR CLAYEY GRAVEL AND SAND			SILTY SOILS		CLAYEY SOILS																																				
GEN. RATING AS A SUBGRADE	EXCELLENT TO GOOD					FAIR TO POOR					FAIR TO POOR	POOR	UNSATURABLE																																	
PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30																																														
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> )																																							
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE			<4 4 TO 10 10 TO 30 30 TO 50 >50			N/A																																							
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																																														
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																																						
BOULDER (BLDR.)	COBBLE (COB.)	GRAVEL (GR.)	COARSE SAND (CSE, SD.)	FINE SAND (F SD.)	SILT (SL.)	CLAY (CL.)																																								
GRAIN SIZE	MM IN.	305 12	75 3	2.0	0.25	0.05	0.005																																							
12	3																																													
SOIL MOISTURE - CORRELATION OF TERMS																																														
SOIL MOISTURE SCALE (ATTERBERG LIMITS)			FIELD MOISTURE DESCRIPTION			GUIDE FOR FIELD MOISTURE DESCRIPTION																																								
LL PLASTIC RANGE (PI) PL	LIQUID LIMIT		- SATURATED - (SAT.)			USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE																																								
			- WET - (W)			SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE																																								
	PLASTIC LIMIT																																													
OM SL	OPTIMUM MOISTURE		- MOIST - (M)			SOLID; AT OR NEAR OPTIMUM MOISTURE																																								
	SHRINKAGE LIMIT																																													
PLASTICITY																																														
			PLASTICITY INDEX (PI)			DRY STRENGTH																																								
NONPLASTIC			0-5			VERY LOW																																								
LOW PLASTICITY			6-15			SLIGHT																																								
MED. PLASTICITY			16-25			MEDIUM																																								
HIGH PLASTICITY			26 OR MORE			HIGH																																								
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.	
		I7BP.I3.R.II9		2A	
<div>NORTH CAROLINA DEPARTMENT OF TRANSPORTATION</div> <div>DIVISION OF HIGHWAYS</div> <div>GEOTECHNICAL ENGINEERING UNIT</div> <div>SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS</div>					
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 DISLODGED 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 INTRUDED 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. <u>IF TESTED, WOULD YIELD SPT REFUSAL</u>				
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. <u>IF TESTED, YIELDS SPT N VALUES &gt; 100 BPF</u>				
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. <u>IF TESTED, YIELDS SPT N VALUES &lt; 100 BPF</u>				
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 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.				
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: Survey information provided by Mattern & Craig.					
ELEVATION: FT.					
NOTES:					




SITE

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**SITE LOCATION PLAN**  
Structure No. 580011  
on SR 1798 (Tater Town Loop)  
over Katy Creek

Scale: N.T.S.	DR: DMB	CHK: MJW	REV:
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Prepared For:  
NCDOT WBS No.: 17BP.13.R.119

	Froehling & Robertson, Inc.
	2505 Hutchison-McDonald Road
	Charlotte, North Carolina

Proj.: 63R-3123-0011	Date: May 2014	Sheet No. 3
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SHEET 5

NC DOT BORE SINGLE 63R-3123-0011 MATTERN & CRAIG MCDOWELL 580011 BORINGS LOGS.GPJ NC DOT.GDT 5/6/14



WBS 17BP.13.R.119				TIP N/A				COUNTY McDowell				GEOLOGIST M. Brewer							
SITE DESCRIPTION Structure No. 11 on SR 1798 (Tater Town Loop) over Katy Creek												GROUND WTR (ft)							
BORING NO. B-2				STATION 13+00				OFFSET 9 ft LT				ALIGNMENT -L-							
COLLAR ELEV. 1,309.0 ft				TOTAL DEPTH 15.8 ft				NORTHING 693,901				EASTING 1,139,457							
DRILL RIG/HAMMER EFF./DATE F&R4637 CME-75 86% 10/05/2012												DRILL METHOD SPT Core Boring				HAMMER TYPE Automatic			
DRILLER J. Fowler				START DATE 01/16/14				COMP. DATE 01/16/14				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 ELEV. (ft) DEPTH (ft)					
			0.5ft	0.5ft	0.5ft	0	25	50	75	100									
1310																			
	1,308.0	1.0													1,308.9 GROUND SURFACE 8.9				
															Asphalt (4")				
1305	1,305.5	3.5	2	1	1										1,307.0 ROADWAY EMBANKMENT 2.0				
			0	0	0										Brown-red, silty fine to coarse SAND (A-2-4).				
															ALLUVIAL				
															Brown, silty fine SAND (A-2-4(0)), with little clay and trace mica.				
1300	1,300.5	8.5													1,300.5 8.5				
			100/0.2												WEATHERED ROCK				
	1,298.2	10.8													1,298.2 10.8				
			60/0.0												Black & white, (MIGMATITIC GRANITIC GNEISS).				
															CRYSTALLINE ROCK				
1295															1,293.2 15.8				
															Dark gray, black & white, (MIGMATITIC GRANITIC GNEISS).				
															Boring Terminated at Elevation 1,293.2 ft IN CRYSTALLINE ROCK (MIGMATITIC GRANITIC GNEISS)				



# NCDOT GEOTECHNICAL ENGINEERING UNIT CORE BORING REPORT

SHEET 7

WBS 17BP.13.R.119		TIP N/A		COUNTY McDowell		GEOLOGIST M. Brewer						
SITE DESCRIPTION Structure No. 11 on SR 1798 (Tater Town Loop) over Katy Creek							GROUND WTR (ft)					
BORING NO. B-2		STATION 13+00		OFFSET 9 ft LT		ALIGNMENT -L-						
COLLAR ELEV. 1,309.0 ft		TOTAL DEPTH 15.8 ft		NORTHING 693,901		EASTING 1,139,457						
DRILL RIG/HAMMER EFF./DATE F&R4637 CME-75 86% 10/05/2012		DRILL METHOD SPT Core Boring		HAMMER TYPE Automatic		0 HR. N/A 24 HR. FIAD						
DRILLER J. Fowler		START DATE 01/16/14		COMP. DATE 01/16/14		SURFACE WATER DEPTH N/A						
CORE SIZE NQ2		TOTAL RUN 5.0 ft										
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	REC. (ft) %	ROD (ft) %	SAMP. NO.	STRATA REC. (ft) %	ROD (ft) %	LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
1298.2	1,298.2	10.8	5.0	N=60/0.0 3:24/1.0 2:40/1.0 3:07/1.0 4:18/1.0 11:48/1.0	(4.3) 86%	(2.2) 44%		(4.3) 86%	(2.2) 44%		Begin Coring @ 10.8 ft	
1295											CRYSTALLINE ROCK	10.8
											Fresh, hard to very hard, dark gray, black & white, (MIGMATITIC GRANITIC GNEISS), with close and very close fracture spacing.	
	1,293.2	15.8									Boring Terminated at Elevation 1,293.2 ft IN CRYSTALLINE ROCK (MIGMATITIC GRANITIC GNEISS)	15.8

NCDOT CORE SINGLE 63R-3123-0011 MATTERN &amp; CRAIG MCDOWELL 580011 BORINGS LOGS.GPJ NC\_DOT.GDT 5/12/14





# Structure No. 580011 on SR 1798 (Tater Town Loop)

## CORE PHOTOGRAPHS: B-2: Station 13+00, 9' LT

Begin Run 1  
10.8 feet



End Run 2  
15.8 feet

