

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	17BP.13.R.78	1	13

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

STRUCTURE
SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 17BP.13.R.78 F.A. PROJ. N/A
COUNTY Yancey
PROJECT DESCRIPTION Structure No. 990133 on SR 1146 over Cane Branch

MAP 1 YANCEY 133

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DATE April 2013

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.

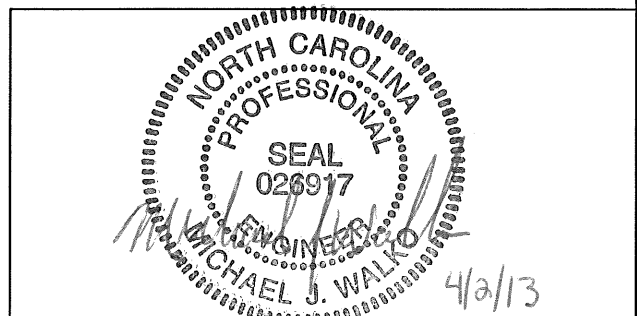
GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND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

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

GRADATION

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 **ANGULAR**, **SUBANGULAR**, **SUBROUNDED**, OR **ROUNDED**.

SOIL LEGEND AND AASHTO CLASSIFICATION

GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)							SILT-CLAY MATERIALS (> 35% PASSING #200)				ORGANIC MATERIALS		
GROUP CLASS.	A-1	A-3	A-2		A-4	A-5	A-6	A-7	A-1, A-2	A-4, A-5				
SYMBOL														
% PASSING	# 10 # 40 # 200													
LIQUID LIMIT	50 MX 30 MX 15 MX	50 MX 25 MX	51 MN	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN			
PLASTIC INDEX	6 MX	NP	40 MX 10 MX	41 MN 10 MN	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 11 MN	40 MX 10 MX	41 MN 11 MN				
GROUP INDEX	0	0	0	4 MX	8 MX	12 MX	16 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		SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER			HIGHLY ORGANIC 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

MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE LIQUID LIMIT LESS THAN 31
MODERATELY COMPRESSIBLE LIQUID LIMIT EQUAL TO 31-50
HIGHLY COMPRESSIBLE LIQUID LIMIT GREATER THAN 50

PERCENTAGE OF MATERIAL

	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL
ORGANIC MATERIAL			
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE
MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME
HIGHLY ORGANIC	>10%	>20%	HIGHLY
			1 - 10% 10 - 20% 20 - 35% 35% AND ABOVE

GROUND WATER

- WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING
- STATIC WATER LEVEL AFTER 24 HOURS
- PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA
- SPRING OR SEEP

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²)
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

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- DIP & DIP DIRECTION OF ROCK STRUCTURES
- SPT DMT VST PMT TEST BORING
- AUGER BORING
- CORE BORING
- MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING W/ CORE
- SPT N-VALUE
- SPT REFUSAL

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 305 IN. 12	75 3	2.0	0.25	0.05	0.005

SOIL MOISTURE - CORRELATION OF TERMS

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
LL - LIQUID LIMIT	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE
PL - PLASTIC LIMIT	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
OM - OPTIMUM MOISTURE	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
SL - SHRINKAGE LIMIT	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

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.

ABBREVIATIONS

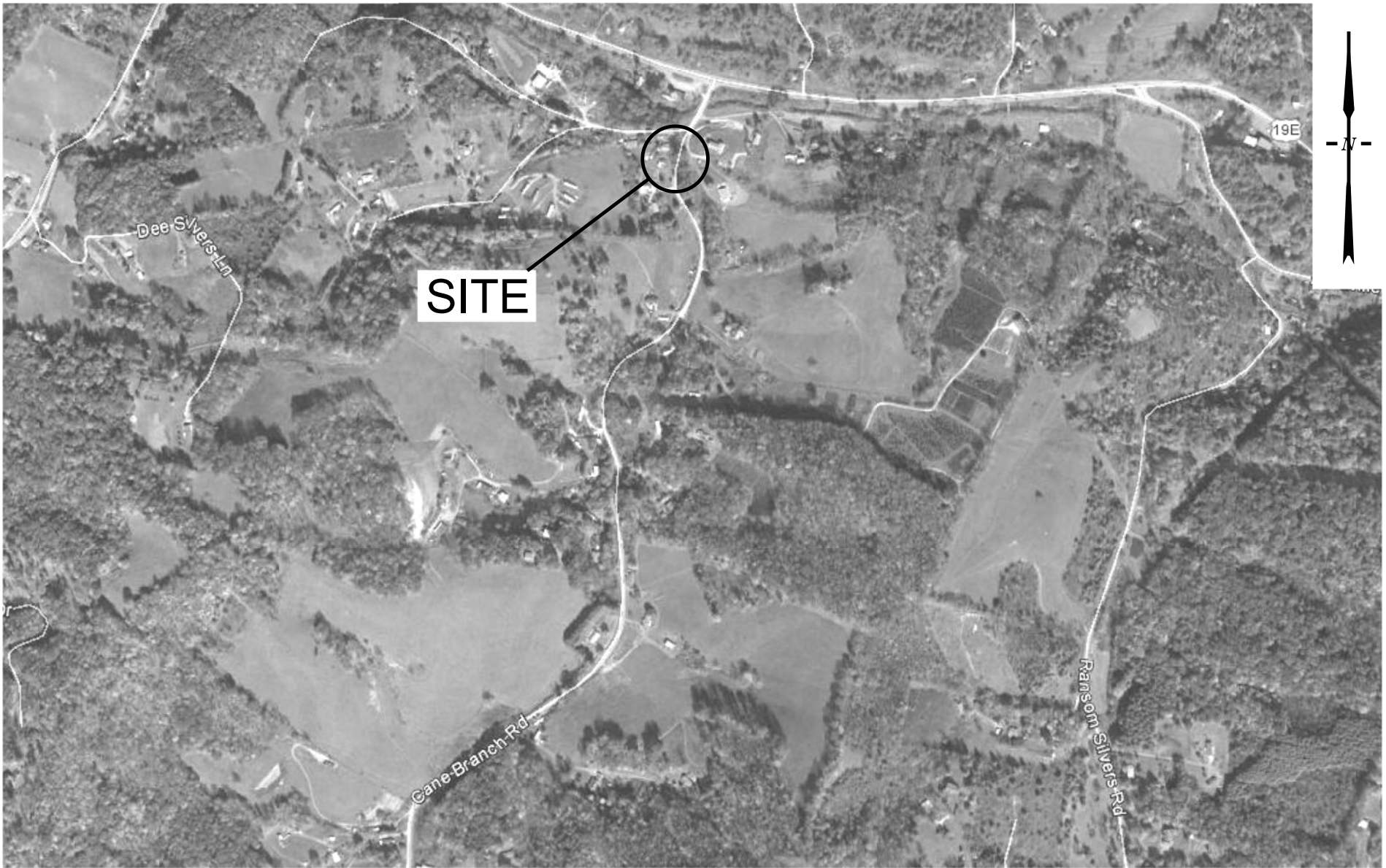
- AR - AUGER REFUSAL
 - BT - BORING TERMINATED
 - CL - CLAY
 - CPT - CONE PENETRATION TEST
 - CSE. - COARSE
 - CT - CORING TERMINATED
 - DMT - DILATOMETER TEST
 - DPT - DYNAMIC PENETRATION TEST
 - e - VOID RATIO
 - EMBANK. - EMBANKMENT
 - F - FINE
 - FOSS. - FOSSILIFEROUS
 - FRAC. - FRACTURED, FRACTURES
 - FRAGS. - FRAGMENTS
 - HI. - HIGHLY
 - MED. - MEDIUM
 - MICA. - MICACEOUS
 - MOD. - MODERATELY
 - NP - NON PLASTIC
 - ORG. - ORGANIC
 - PMT - PRESSUREMETER TEST
 - SAP. - SAPROLITIC
 - SDY. - SANDY
 - SL. - SILT, SILTY
 - SLI. - SLIGHTLY
 - TCR - TRICONE REFUSAL
 - w - MOISTURE CONTENT
 - v - VERY
 - WEA. - WEATHERED
 - γ - UNIT WEIGHT
 - γ_d - DRY UNIT WEIGHT
- SAMPLE ABBREVIATIONS**
- S - BULK
 - SS - SPLIT SPOON
 - ST - SHELBY TUBE
 - RS - ROCK
 - RT - RECOMPACTED TRIAXIAL
 - CBR - CALIFORNIA BEARING RATIO

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:	ADVANCING TOOLS:	HAMMER TYPE:
<input type="checkbox"/> MOBILE B- _____	<input type="checkbox"/> CLAY BITS	<input checked="" type="checkbox"/> AUTOMATIC <input type="checkbox"/> MANUAL
<input type="checkbox"/> BK-51	<input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER	CORE SIZE:
<input checked="" type="checkbox"/> CME-550X	<input checked="" type="checkbox"/> 8" HOLLOW AUGERS	<input type="checkbox"/> -B _____
<input type="checkbox"/> CME-75	<input type="checkbox"/> HARD FACED FINGER BITS	<input checked="" type="checkbox"/> -N 02
<input type="checkbox"/> PORTABLE HOIST	<input type="checkbox"/> TUNG.-CARBIDE INSERTS	<input type="checkbox"/> -H _____
<input type="checkbox"/> _____	<input type="checkbox"/> CASING <input type="checkbox"/> W/ ADVANCER	HAND TOOLS:
<input type="checkbox"/> _____	<input type="checkbox"/> TRICONE _____ * STEEL TEETH	<input type="checkbox"/> POST HOLE DIGGER
<input type="checkbox"/> _____	<input type="checkbox"/> TRICONE _____ * TUNG.-CARB.	<input type="checkbox"/> HAND AUGER
<input type="checkbox"/> _____	<input checked="" type="checkbox"/> CORE BIT	<input type="checkbox"/> SOUNDING ROD
<input type="checkbox"/> _____	<input type="checkbox"/> _____	<input type="checkbox"/> VANE SHEAR TEST

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ROCK DESCRIPTION		TERMS AND DEFINITIONS	
<p>HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:</p>		<p>ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. AQUIFER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND 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 (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. 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 DIKES OR STRINGERS. 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 GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.</p>		
<p>VERY SOFT</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	
<p>TERM</p>	<p>SPACING</p>	<p>TERM</p>	<p>THICKNESS</p>
<p>VERY WIDE</p>	<p>MORE THAN 10 FEET</p>	<p>VERY THICKLY BEDDED</p>	<p>> 4 FEET</p>
<p>WIDE</p>	<p>3 TO 10 FEET</p>	<p>THICKLY BEDDED</p>	<p>1.5 - 4 FEET</p>
<p>MODERATELY CLOSE</p>	<p>1 TO 3 FEET</p>	<p>THINLY BEDDED</p>	<p>0.16 - 1.5 FEET</p>
<p>CLOSE</p>	<p>0.16 TO 1 FEET</p>	<p>VERY THINLY BEDDED</p>	<p>0.03 - 0.16 FEET</p>
<p>VERY CLOSE</p>	<p>LESS THAN 0.16 FEET</p>	<p>THICKLY LAMINATED</p>	<p>0.008 - 0.03 FEET</p>
		<p>THINLY LAMINATED</p>	<p>< 0.008 FEET</p>
INDURATION			
<p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.</p>			
<p>FRIABLE</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>		
		<p>BENCH MARK: Survey information provided by KCI Associates of NC.</p> <p style="text-align: right;">ELEVATION: _____ FT.</p>	
<p>NOTES:</p>			



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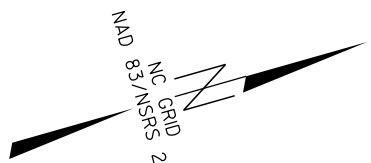
SITE LOCATION PLAN

PROJECT REFERENCE NO.: 17BP.13.R.78		F&R PROJECT NO.: 63N-0266
I.D. NO.: N/A	F.A. PROJECT NO.: N/A	COUNTY: Yancey
PROJECT DESCRIPTION: Bridge #133 on SR 1146 over Cane Branch		
SITE DESCRIPTION: Bridge #133 on SR 1146 over Cane Branch		
DRAWN BY: R. Kral	CHECKED BY: M. Walko, P.E.	
DATE: March 2013		

DRAWING
 No.: **1**

CHELL
526

NAD 83/NSRS 2007
GRID



6'
W/D

18.50'

JS
JS

P=50

B-1

B-3

B-2

B-4

20'

EXISTING R/W

MTL R=3'

13' CONC

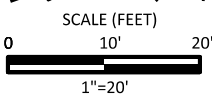
DRIVE

CURB

Super
RT

JS
JS

DPE



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UPDATED SITE PLAN

PROJECT REFERENCE NO.: 17BP.13.R.78		F&R PROJECT NO.: 63N-0266
I.D. NO.: N/A	F.A. PROJECT NO.: N/A	COUNTY: Yancey
PROJECT DESCRIPTION: Bridge #133 on SR 1146 over Cane Branch		
SITE DESCRIPTION: Bridge #133 on SR 1146 over Cane Branch		
DRAWN BY: R. Kral	CHECKED BY: M. Walko, P.E.	
DATE: March 2013	SCALE: 1"=20'	
		DRAWING No.: 2



NCDOT GEOTECHNICAL ENGINEERING UNIT

BORELOG REPORT

WBS 17BP.13.R.78		TIP N/A		COUNTY Yancey		GEOLOGIST R. Kral / J. Harris											
SITE DESCRIPTION Bridge 990133 on SR 1146 over Cane Branch							GROUND WTR (ft)										
BORING NO. B-1		STATION 12+89		OFFSET 19 ft LT		ALIGNMENT -L-	0 HR. 4.0										
COLLAR ELEV. 2,488.2 ft		TOTAL DEPTH 28.5 ft		NORTHING 801,629		EASTING 1,043,154	24 HR. FIAD										
DRILL RIG/HAMMER EFF./DATE F&R3763 CME-550X 82% 10/5/2012				DRILL METHOD NW Casing W/SPT & Core		HAMMER TYPE Automatic											
DRILLER C. Boyce		START DATE 01/10/13		COMP. DATE 01/10/13		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			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)		
2490															2,488.2	GROUND SURFACE	0.0
	2,488.2	0.0	5	4	5						M		2,488.2	ROADWAY EMBANKMENT Brown and tan silty fine to coarse SAND (A-2-4), trace rock fragments	3.0		
2485	2,484.7	3.5	3	6	14						SS-1	10%	2,485.2	ALLUVIAL Brown, tan, and yellow sandy GRAVEL (A-1-a (0))			
	2,479.7	8.5	18	20	31			2,476.7	CRYSTALLINE ROCK Tan and gray BIOTITE GNEISS	11.5							
2475	2,476.7	11.5	60/0.0					2,470.7	WEATHERED ROCK Brown, black, and tan BIOTITE GNEISS	17.5							
2470	2,469.7	18.5	100/0.7					2,464.7	CRYSTALLINE ROCK Gray and brown BIOTITE GNEISS	23.5							
2465	2,464.7	23.5	60/0.0					2,459.7	Boring Terminated at Elevation 2,459.7 ft In CRYSTALLINE ROCK (BIOTITE GNEISS)								
2460									1) Driller measured approximately 7" of asphalt and 3" of stone base at the surface. 2) Higher N-values in the alluvial layers are indicative of the cobbles/gravel encountered during sampling.								

NCDOT BORE SINGLE 63N-0266-0004 GROUP R BRIDGE 133.GPJ NC_DOT.GDT 1/13/13



NCDOT GEOTECHNICAL ENGINEERING UNIT CORE BORING REPORT

WBS 17BP.13.R.78		TIP N/A		COUNTY Yancey			GEOLOGIST R. Kral / J. Harris				
SITE DESCRIPTION Bridge 990133 on SR 1146 over Cane Branch									GROUND WTR (ft)		
BORING NO. B-1		STATION 12+89		OFFSET 19 ft LT		ALIGNMENT -L-		0 HR. 4.0			
COLLAR ELEV. 2,488.2 ft		TOTAL DEPTH 28.5 ft		NORTHING 801,629		EASTING 1,043,154		24 HR. FIAD			
DRILL RIG/HAMMER EFF./DATE F&R3763 CME-550X 82% 10/5/2012					DRILL METHOD NW Casing W/SPT & Core		HAMMER TYPE Automatic				
DRILLER C. Boyce		START DATE 01/10/13		COMP. DATE 01/10/13		SURFACE WATER DEPTH N/A					
CORE SIZE NQ2		TOTAL RUN 11.0 ft									
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		STRATA		L O G	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (ft)	RQD (%)	REC. (ft)	RQD (%)			
2476.7										Begin Coring @ 11.5 ft	
2475	2,476.7	11.5	6.0	N=60/0.0 1:36/1.0 1:55/1.0 1:48/1.0 0:42/1.0 2:53/1.0 2:18/1.0	(4.8) 80%	(0.5) 8%	(4.8) 80%	(0.5) 8%	2476.7	CRYSTALLINE ROCK Tan and gray, moderately hard to hard, slightly to moderately weathered, very close to closely spaced fractured BIOTITE GNEISS	11.5
2470	2,470.7	17.5		N=100/0.7					2470.7	WEATHERED ROCK Brown, black, and tan BIOTITE GNEISS	17.5
2465	2,464.7	23.5							2464.7		23.5
2460	2,459.7	28.5	5.0	N=60/0.0 2:09/1.0 2:50/1.0 2:07/1.0 2:28/1.0 3:04/1.0	(2.4) 48%	(1.2) 24%	(2.4) 48%	(1.2) 24%	2459.7	CRYSTALLINE ROCK Gray and brown, moderately hard to hard, slightly to moderately weathered, very close to closely spaced fractured BIOTITE GNEISS	28.5
Boring Terminated at Elevation 2,459.7 ft in CRYSTALLINE ROCK (BIOTITE GNEISS)											
<p>1) Driller measured approximately 7" of asphalt and 3" of stone base at the surface.</p> <p>2) Higher N-values in the alluvial layers are indicative of the cobbles/gravel encountered during sampling.</p>											

NCDOT CORE SINGLE 63N-0266-0004 GROUP R BRIDGE 133.GPJ NC_DOT.GDT 11/13/13



**NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT**

WBS 17BP.13.R.78	TIP N/A	COUNTY Yancey	GEOLOGIST R. Kral	
SITE DESCRIPTION Bridge 990133 on SR 1146 over Cane Branch				GROUND WTR (ft)
BORING NO. B-2	STATION 12+70	OFFSET 5 ft RT	ALIGNMENT -L-	0 HR. 8.0
COLLAR ELEV. 2,488.3 ft	TOTAL DEPTH 23.0 ft	NORTHING 801,604	EASTING 1,043,171	24 HR. FIAD
DRILL RIG/HAMMER EFF./DATE F&R3763 CME-550X 82% 10/5/2012		DRILL METHOD H.S. Augers		HAMMER TYPE Automatic
DRILLER C. Boyce		START DATE 01/09/13	COMP. DATE 01/09/13	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	LOG SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
														2,488.3	0.0
2490	2,488.3	0.0	3	3	3								M	GROUND SURFACE ROADWAY EMBANKMENT Orange and brown sandy CLAY (A-6), little rock fragments	
2485	2,484.8	3.5	5	10	13								W	ALLUVIAL Brown, tan, and yellow silty coarse SAND (A-1-b)	3.0
2480	2,479.8	8.5	3	2	3									RESIDUAL Brown, black, and tan fine sandy SILT (A-4(0))	8.0
2475	2,474.8	13.5	5	5	7									WEATHERED ROCK Yellow and tan BIOTITE GNEISS	19.0
2470	2,469.8	18.5	6	20	80/0.2								SS-2		
	2,465.3	23.0													60/0.0

Boring Terminated with Standard Penetration Test Refusal at Elevation 2,465.3 ft On CRYSTALLINE ROCK (BIOTITE GNEISS)

1) Higher N-values in the alluvial layers are indicative of the cobbles/rock fragments encountered during sampling.



NCDOT GEOTECHNICAL ENGINEERING UNIT BORELOG REPORT

WBS 17BP.13.R.78		TIP N/A		COUNTY Yancey		GEOLOGIST R. Kral											
SITE DESCRIPTION Bridge 990133 on SR 1146 over Cane Branch							GROUND WTR (ft)										
BORING NO. B-3		STATION 13+33		OFFSET 13 ft LT		ALIGNMENT -L-	0 HR. 4.0										
COLLAR ELEV. 2,488.5 ft		TOTAL DEPTH 5.0 ft		NORTHING 801,669		EASTING 1,043,171	24 HR. FIAD										
DRILL RIG/HAMMER EFF./DATE F&R3763 CME-550X 82% 10/5/2012				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic											
DRILLER C. Boyce		START DATE 01/09/13		COMP. DATE 01/09/13		SURFACE WATER DEPTH N/A											
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	LOG G	SOIL AND ROCK DESCRIPTION			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)		
2490																	
	2,488.5	0.0	13	4	4									2,488.5		GROUND SURFACE	0.0
																ROADWAY EMBANKMENT	
2485	2,485.0	3.5	20	80/0.3										2,485.0		Brown silty clayey fine to coarse SAND (A-2-6), trace rock fragments	3.5
	2,483.5	5.0	60/0.0							100/0.8				2,483.5		WEATHERED ROCK	5.0
										60/0.0						Gray BIOTITE GNEISS	
																Boring Terminated with Standard Penetration Test Refusal at Elevation 2,483.5 ft On CRYSTALLINE ROCK (BIOTITE GNEISS)	
																1) Driller measured approximately 4.5" of asphalt and 4" of stone base at the surface.	



NCDOT GEOTECHNICAL ENGINEERING UNIT

BORELOG REPORT

WBS 17BP.13.R.78		TIP N/A		COUNTY Yancey		GEOLOGIST R. Kral / J. Harris										
SITE DESCRIPTION Bridge 990133 on SR 1146 over Cane Branch									GROUND WTR (ft)							
BORING NO. B-4		STATION 13+15		OFFSET 4 ft LT		ALIGNMENT -L-		0 HR. 4.0								
COLLAR ELEV. 2,488.4 ft		TOTAL DEPTH 15.0 ft		NORTHING 801,649		EASTING 1,043,175		24 HR. FIAD								
DRILL RIG/HAMMER EFF./DATE F&R3763 CME-550X 82% 10/5/2012					DRILL METHOD NW Casing W/SPT & Core			HAMMER TYPE Automatic								
DRILLER C. Boyce		START DATE 01/10/13		COMP. DATE 01/10/13		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	LOG G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2490																
	2,488.4	0.0	5	3	3									2,488.4	GROUND SURFACE	0.0
2485	2,484.9	3.5	20	80/0.3										2,484.9	ROADWAY EMBANKMENT Red clayey silty fine to coarse SAND (A-2-4), little rock fragments	3.5
	2,483.4	5.0	60/0.0							100/0.8 60/0.0				2,483.4	WEATHERED ROCK Brown BIOTITE GNEISS	5.0
2480															CRYSTALLINE ROCK Gray and white BIOTITE GNEISS	
2475																
														2,473.4	Boring Terminated at Elevation 2,473.4 ft In CRYSTALLINE ROCK (BIOTITE GNEISS)	15.0
<p>1) Driller measured approximately 7" of asphalt and 3.5" of stone base at the surface.</p>																



NCDOT GEOTECHNICAL ENGINEERING UNIT CORE BORING REPORT

WBS 17BP.13.R.78		TIP N/A		COUNTY Yancey			GEOLOGIST R. Kral / J. Harris					
SITE DESCRIPTION Bridge 990133 on SR 1146 over Cane Branch									GROUND WTR (ft)			
BORING NO. B-4		STATION 13+15		OFFSET 4 ft LT		ALIGNMENT -L-		0 HR. 4.0				
COLLAR ELEV. 2,488.4 ft		TOTAL DEPTH 15.0 ft		NORTHING 801,649		EASTING 1,043,175		24 HR. FIAD				
DRILL RIG/HAMMER EFF./DATE F&R3763 CME-550X 82% 10/5/2012					DRILL METHOD NW Casing W/SPT & Core		HAMMER TYPE Automatic					
DRILLER C. Boyce			START DATE 01/10/13		COMP. DATE 01/10/13		SURFACE WATER DEPTH N/A					
CORE SIZE NQ2			TOTAL RUN 10.0 ft									
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		STRATA		L O G	DESCRIPTION AND REMARKS	DEPTH (ft)	
					REC. (ft)	RQD (%)	REC. (ft)	RQD (%)				
2483.4												
	2,483.4	5.0	5.0	N=60/0.0 1:24/1.0 1:34/1.0 1:34/1.0 1:37/1.0 1:25/1.0	(4.4) 88%	(3.0) 60%	(9.0) 90%	(7.0) 70%		2,483.4	5.0	
2480										Begin Coring @ 5.0 ft CRYSTALLINE ROCK Gray and white, hard, very slightly to moderately weathered, very closely to moderately spaced fractured BIOTITE GNEISS		
	2,478.4	10.0										
2475			5.0	2:15/1.0 2:12/1.0 2:09/1.0 1:37/1.0 1:30/1.0	(4.6) 92%	(4.0) 80%						
	2,473.4	15.0								2,473.4	15.0	
Boring Terminated at Elevation 2,473.4 ft In CRYSTALLINE ROCK (BIOTITE GNEISS)												
1) Driller measured approximately 7" of asphalt and 3.5" of stone base at the surface.												

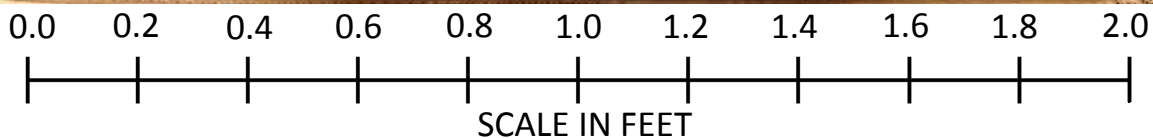
NCDOT CORE SINGLE 63N-0266-0004 GROUP R BRIDGE 133.GPJ NC_DOT.GDT 11/13/13



Bridge 990133 – SR 1146 across Cane Branch

CORE PHOTOGRAPHS: B-1: Station 12+89

11.5 feet

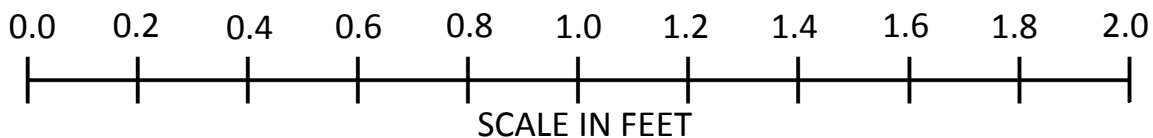




Bridge 990133 – SR 1146 across Cane Branch

CORE PHOTOGRAPHS: B-4: Station 13+15

5.0 feet





MAP 2 YANCEY145

APPENDIX B

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

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

SOIL DESCRIPTION

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 T208, 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, GRN, SILTY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HIGH PLASTIC, A-7-6

GRADATION

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 ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.

SOIL LEGEND AND AASHTO CLASSIFICATION

GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)				SILT-CLAY MATERIALS (> 35% PASSING #200)				ORGANIC MATERIALS			
GROUP CLASS.	A-1	A-3	A-2		A-4	A-5	A-6	A-7	A-1, A-2	A-4, A-5		
SYMBOL												
% PASSING	10 40 200	10 40 200	10 40 200	10 40 200	10 40 200	10 40 200	10 40 200	10 40 200	10 40 200	10 40 200		
LIQUID LIMIT PLASTIC INDEX	6 HX		NP	40 HX 41 HX 10 HX 11 HX	40 HX 41 HX 10 HX 11 HX	40 HX 41 HX 10 HX 11 HX	40 HX 41 HX 10 HX 11 HX	40 HX 41 HX 10 HX 11 HX	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS	
GROUP INDEX	0		0	4 HX	8 HX 12 HX	16 HX	No HX					
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

MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE LIQUID LIMIT LESS THAN 31
 MODERATELY COMPRESSIBLE LIQUID LIMIT EQUAL TO 31-50
 HIGHLY COMPRESSIBLE LIQUID LIMIT GREATER THAN 50

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL	
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE	1 - 10%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE	10 - 20%
MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME	20 - 35%
HIGHLY ORGANIC	>10%	>20%	HIGHLY	35% AND ABOVE

GROUND WATER

WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING

STATIC WATER LEVEL AFTER 24 HOURS

PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA

SPRING OR SEEP

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²)
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

MISCELLANEOUS SYMBOLS

	ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION		SOIL SYMBOL		SPT TEST BORING		SAMPLE DESIGNATIONS
	ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT		CORE BORING		ST - SHELBY TUBE SAMPLE		RS - ROCK SAMPLE
	INFERRED SOIL BOUNDARY		MONITORING WELL		RT - RECOMPACTED TRIAXIAL SAMPLE		CBR - CALIFORNIA BEARING RATIO SAMPLE
	INFERRED ROCK LINE		PIEZOMETER INSTALLATION		SLOPE INDICATOR INSTALLATION		
	ALLUVIAL SOIL BOUNDARY		SPT N-VALUE		SPT REFUSAL		
	DIP & DIP DIRECTION OF ROCK STRUCTURES						
	SOUNDING ROD						

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	305	75	2.0	0.25	0.05	0.005
IN.	12	3				

SOIL MOISTURE - CORRELATION OF TERMS

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
LL - LIQUID LIMIT	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE
PL - PLASTIC LIMIT	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
OM - OPTIMUM MOISTURE	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
SL - SHRINKAGE LIMIT	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

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.

ABBREVIATIONS





AR - AUGER REFUSAL	HI. - HIGHLY	W - MOISTURE CONTENT
BT - BORING TERMINATED	MED. - MEDIUM	V - VERY
CL - CLAY	NICA. - MICACEOUS	VST - VANE SHEAR TEST
CPT - CONE PENETRATION TEST	MOD. - MODERATELY	WEA. - WEATHERED
CSE. - COARSE	NP - NON PLASTIC	W - UNIT WEIGHT
DMT - DILATOMETER TEST	ORG. - ORGANIC	W _d - DRY UNIT WEIGHT
DPT - DYNAMIC PENETRATION TEST	PMT - PRESSUREMETER TEST	
e - VOID RATIO	SAP. - SAPROLITIC	
F - FINE	SD. - SAND, SANDY	
FOSS. - FOSSILIFEROUS	SL. - SILT, SILTY	
FRAC. - FRACTURED, FRACTURES	SLI. - SLIGHTLY	
FRAGS. - FRAGMENTS	TCR - TRICONE REFUSAL	

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:	ADVANCING TOOLS:	HAMMER TYPE:
<input type="checkbox"/> MOBILE B-___	<input type="checkbox"/> CLAY BITS	<input checked="" type="checkbox"/> AUTOMATIC <input type="checkbox"/> MANUAL
<input type="checkbox"/> BK-51	<input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER	CORE SIZE:
<input type="checkbox"/> CME-45C	<input checked="" type="checkbox"/> 8" HOLLOW AUGERS	<input type="checkbox"/> -B-___
<input checked="" type="checkbox"/> CME-550X	<input type="checkbox"/> HARD FACED FINGER BITS	<input checked="" type="checkbox"/> -N-02
<input type="checkbox"/> PORTABLE MOIST	<input type="checkbox"/> TUNG.-CARBIDE INSERTS	<input type="checkbox"/> -H-___
<input type="checkbox"/>	<input type="checkbox"/> CASING <input type="checkbox"/> W/ ADVANCER	HAND TOOLS:
<input type="checkbox"/>	<input checked="" type="checkbox"/> TRICONE 2 1/8" * STEEL TEETH	<input type="checkbox"/> POST HOLE DIGGER
<input type="checkbox"/>	<input type="checkbox"/> TRICONE ___ * TUNG.-CARB.	<input type="checkbox"/> HAND AUGER
<input type="checkbox"/>	<input checked="" type="checkbox"/> CORE BIT	<input type="checkbox"/> SOUNDING ROD
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> VANE SHEAR TEST

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

ROCK DESCRIPTION	TERMS AND DEFINITIONS
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:	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. AQUIFER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SLICES 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 DISLOGGED 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 (ROD) - 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 (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. 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 (SROD) - 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.

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 (ICR)		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.

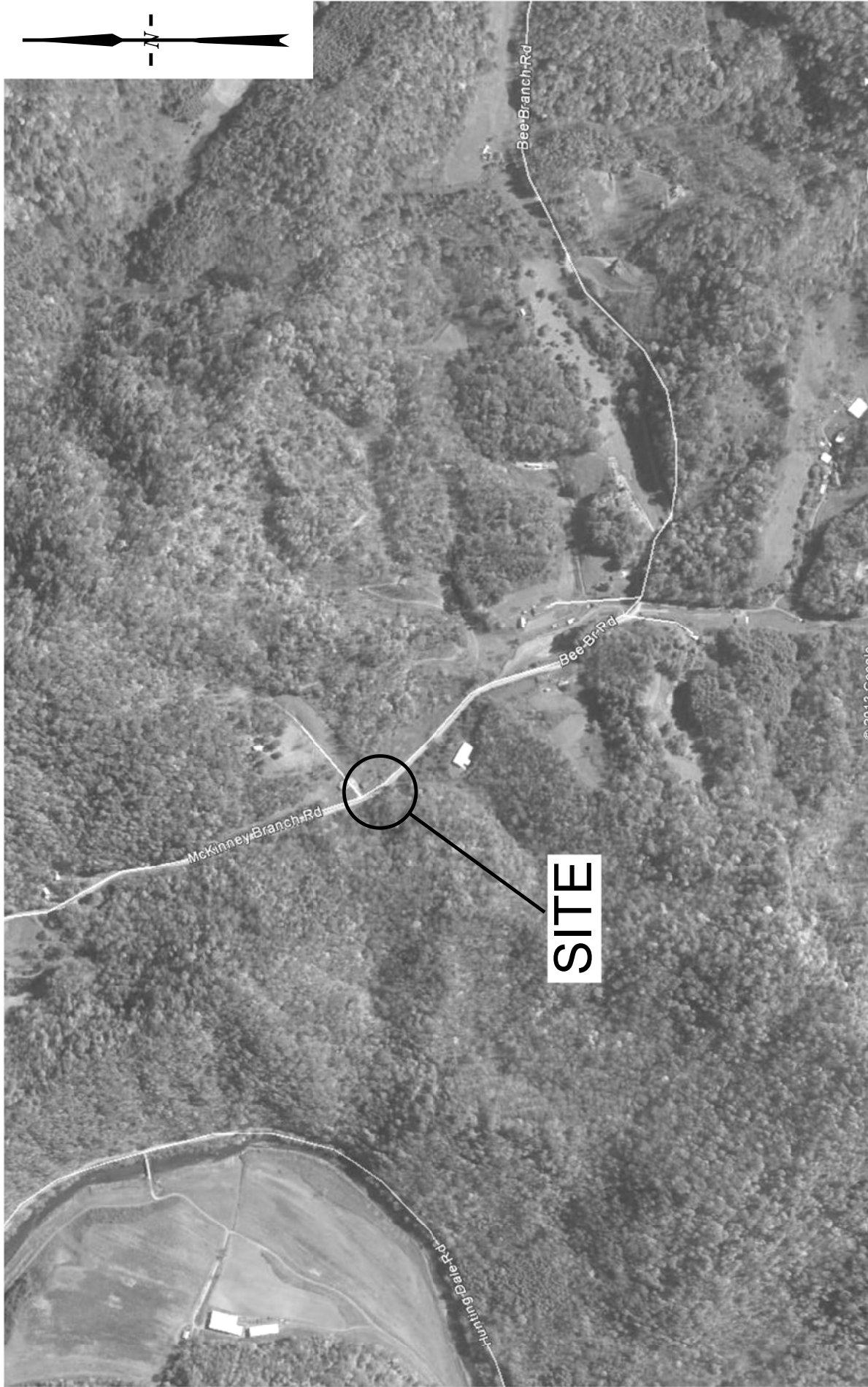
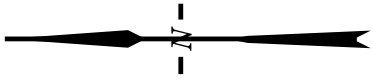
WEATHERING	
FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
VERY SLIGHT (V SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN. CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.
SLIGHT (SLI.)	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 > 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 < 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 GROUVED 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 GROUVED 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 KCI	
-	ELEVATION: <u> </u> FT.
NOTES:	
-	



SITE LOCATION PLAN

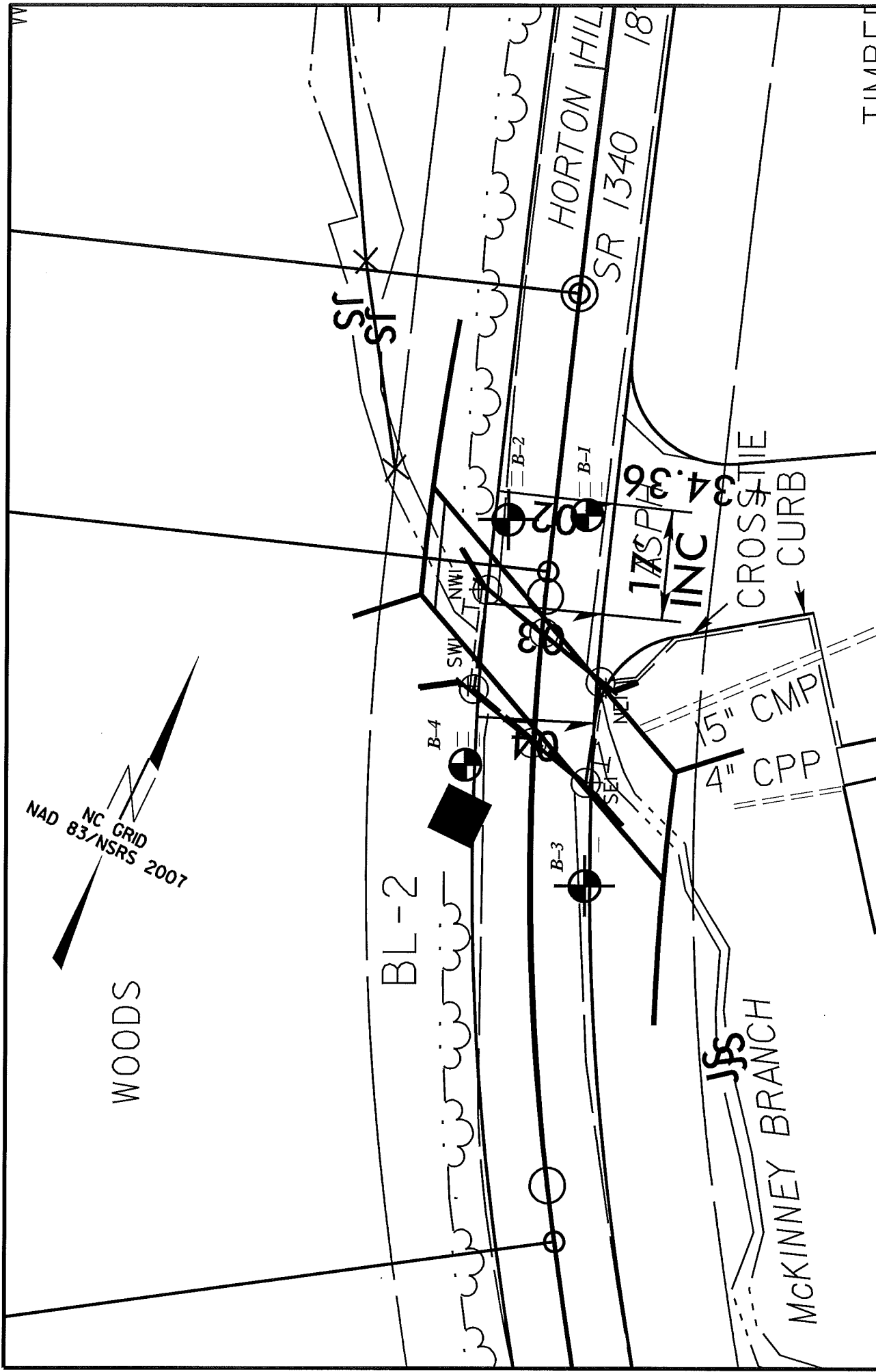
PROJECT REFERENCE NO.: 17BP.13.R.80	F&R PROJECT NO.: 63N-0266
I.D. NO.: N/A	F.A. PROJECT NO.: N/A
COUNTY: Yancey	
PROJECT DESCRIPTION: Bridge #145 on SR 1340 over McKinney Branch	
SITE DESCRIPTION: Bridge #145 on SR 1340 over McKinney Branch	
DRAWN BY: R. Kral	CHECKED BY: M. Walko, P.E.
DATE: April 2013	DRAWING No.: 1

FROEHLING & ROBERTSON, INC.

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BORING LOCATION PLAN	
PROJECT REFERENCE NO.: 17BP.13.R.80	F&R PROJECT NO.: 63N-0266
I.D. NO.: N/A	F.A. PROJECT NO.: N/A
COUNTY: Yancey	
PROJECT DESCRIPTION: Bridge #145 on SR 1340 over McKinney Branch	
SITE DESCRIPTION: Bridge #145 on SR 1340 over McKinney Branch	
DRAWN BY: R. Kral	CHECKED BY: M. Walko, P.E.
DATE: April 2013	SCALE: 1" = 20'
DRAWING No.: 2	

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CONC



NCDOT GEOTECHNICAL ENGINEERING UNIT

BORELOG REPORT

WBS 17BP.13.R.80	TIP N/A	COUNTY Yancey	GEOLOGIST R. Kral
SITE DESCRIPTION Bridge 990145 on SR 1340 across McKinney Branch			GROUND WTR (ft)
BORING NO. B-1	STATION 13+32	OFFSET 5 ft RT	ALIGNMENT -L-
COLLAR ELEV. 2,347.0 ft	TOTAL DEPTH 11.5 ft	NORTHING 840,987	EASTING 1,018,560
DRILL RIG/HAMMER EFF./DATE F&R3763 CME-550X 81% 12/15/2011		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER C. Boyce	START DATE 12/18/12	COMP. DATE 12/18/12	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					ELEV. (ft)
2350															
	2,347.0	0.0												2,347.0	0.0
2345	2,347.0	0.0	6	5	8	13					SS-1	18%		2,346.4	0.5
	2,343.5	3.5												2,345.5	1.5
	2,343.5	3.5	17	83/0.2						100/0.7					
2340	2,338.5	8.5												2,338.5	8.5
	2,338.5	8.5	100/0.4							100/0.4					
	2,335.5	11.5												2,335.5	11.5
	2,335.5	11.5	60/0.0							60/0.0					

NCDOT BORE SINGLE 63N-0286-0005 - GROUP R BRIDGE 145.GPJ NC_DOT.GDT 4/24/13



NCDOT GEOTECHNICAL ENGINEERING UNIT

BORELOG REPORT

WBS 17BP.13.R.80	TIP N/A	COUNTY Yancey	GEOLOGIST R. Kral / J. Harris
SITE DESCRIPTION Bridge 990145 on SR 1340 across McKinney Branch			GROUND WTR (ft)
BORING NO. B-2	STATION 13+30	OFFSET 7 ft LT	ALIGNMENT -L-
COLLAR ELEV. 2,346.9 ft	TOTAL DEPTH 23.5 ft	NORTHING 840,981	EASTING 1,018,549
DRILL RIG/HAMMER EFF./DATE F&R3763 CME-550X 81% 12/15/2011		DRILL METHOD NW Casing W/SPT & Core	HAMMER TYPE Automatic
DRILLER C. Boyce	START DATE 12/18/12	COMP. DATE 12/18/12	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						
2350																
	2,346.9	0.0												2,346.9	GROUND SURFACE	0.0
2345	2,343.4	3.5	12	6	2	•8	•••••	•••••	•••••	•••••			M	2,345.4	Asphalt (2")	1.5
	2,341.9	7.5	12	7	36	•••••	•••••	•••••	•••••	•••••			M	2,341.9	Dark brown fine to coarse sandy CLAY (A-6) little rock fragments	5.0
2340	2,339.4	12.0	60/0.0			•••••	•••••	•••••	•••••	•••••				2,339.9	Brown and gray silty fine to coarse SAND (A-2-4)	7.0
	2,334.4	18.5	60/0.0			•••••	•••••	•••••	•••••	•••••				2,334.9	COLLUVIAL Brown and gray silty fine to coarse SAND (A-2-4) with cobbles	12.0
2335	2,331.4	21.0	20	23	29	•••••	•••••	•••••	•••••	•••••			W	2,331.4	Intermittent Boulders	15.5
2330	2,328.4	24.0	60/0.0			•••••	•••••	•••••	•••••	•••••				2,328.4	Intermittent Boulders	18.5
2325						•••••	•••••	•••••	•••••	•••••				2,323.4	CRYSTALLINE ROCK Gray, black, tan and white BIOTITE GNEISS	23.5
Boring Terminated at Elevation 2,323.4 ft In CRYSTALLINE ROCK (BIOTITE GNEISS)																
1) Drillers used coring equipment (NQ-2) and roller cone to penetrate boulders in the colluvial layers.																

NCDOT BORE SINGLE 63N-0266-0005 - GROUP R BRIDGE 145.GPJ NC_DOT.GDT 4/26/13



NCDOT GEOTECHNICAL ENGINEERING UNIT CORE BORING REPORT

WBS 17BP.13.R.80			TIP N/A			COUNTY Yancey			GEOLOGIST R. Kral / J. Harris			
SITE DESCRIPTION Bridge 990145 on SR 1340 across McKinney Branch										GROUND WTR (ft)		
BORING NO. B-2			STATION 13+30			OFFSET 7 ft LT			ALIGNMENT -L-			
COLLAR ELEV. 2,346.9 ft			TOTAL DEPTH 23.5 ft			NORTHING 840,981			EASTING 1,018,549			
DRILL RIG/HAMMER EFF./DATE F&R3763 CME-550X 81% 12/15/2011						DRILL METHOD NW Casing W/SPT & Core			HAMMER TYPE Automatic			
DRILLER C. Boyce			START DATE 12/18/12			COMP. DATE 12/18/12			SURFACE WATER DEPTH N/A			
CORE SIZE NQ-2			TOTAL RUN 5.0 ft									
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (ft) %	RQD (ft) %		REC. (ft) %	RQD (ft) %			
2328.4											Begin Coring @ 18.5 ft	
	2,328.4	18.5	5.0	N=60/0.0 10:42/1.0 7:30/1.0 7:51/1.0 12:05/1.0 12:00/1.0	(4.5) 90%	(3.4) 68%		(4.5) 90%	(3.4) 68%	[Hand-drawn log sketch]	2,328.4 CRYSTALLINE ROCK Gray, black, tan and white, very slightly to slightly weathered, hard, very close to closely spaced fractured BIOTITE GNEISS	18.5
2325	2,323.4	23.5								[Hand-drawn log sketch]	2,323.4 Boring Terminated at Elevation 2,323.4 ft In CRYSTALLINE ROCK (BIOTITE GNEISS) 1) Drillers used coring equipment (NQ-2) and roller cone to penetrate boulders in the colluvial layers.	23.5



NCDOT GEOTECHNICAL ENGINEERING UNIT

BORELOG REPORT

WBS 17BP.13.R.80	TIP N/A	COUNTY Yancey	GEOLOGIST R. Kral / J. Harris
SITE DESCRIPTION Bridge 990145 on SR 1340 across McKinney Branch			GROUND WTR (ft)
BORING NO. B-3	STATION 12+75	OFFSET 8 ft RT	ALIGNMENT -L-
COLLAR ELEV. 2,348.8 ft	TOTAL DEPTH 15.0 ft	NORTHING 840,936	EASTING 1,018,584
DRILL RIG/HAMMER EFF./DATE F&R3763 CME-550X 81% 12/15/2011		DRILL METHOD NW Casing W/SPT & Core	HAMMER TYPE Automatic
DRILLER C. Boyce	START DATE 12/19/12	COMP. DATE 12/19/12	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
2350	2,348.8	0.0												GROUND SURFACE	0.0
			5	4	3									ROADWAY EMBANKMENT	
														Dark brown silty fine to coarse SAND (A-2-4)	
2345	2,345.3	3.5												little rock fragments	3.5
			18	40	60/0.2									COLLUVIAL	
														Brown and black sandy GRAVEL (A-1-a(0))	5.0
														Intermittent Boulders	
2340	2,340.3	8.5													8.0
			100/0.5											WEATHERED ROCK	
														Brown and gray BIOTITE GNEISS	10.0
														CRYSTALLINE ROCK	
														Gray, black, tan and white BIOTITE GNEISS	
2335															15.0
<p>Boring Terminated at Elevation 2,333.8 ft In CRYSTALLINE ROCK (BIOTITE GNEISS)</p> <p>1) Drillers used coring equipment (NQ-2) and roller cone to penetrate boulders in the colluvial layers.</p>															

NCDOT BORE SINGLE 63N-0286-0005 - GROUP R BRIDGE 145.GPJ NC_DOT.GDT 4/26/13



NCDOT GEOTECHNICAL ENGINEERING UNIT CORE BORING REPORT

WBS 17BP.13.R.80				TIP N/A		COUNTY Yancey				GEOLOGIST R. Kral / J. Harris			
SITE DESCRIPTION Bridge 990145 on SR 1340 across McKinney Branch										GROUND WTR (ft)			
BORING NO. B-3				STATION 12+75		OFFSET 8 ft RT		ALIGNMENT -L-		0 HR. N/A			
COLLAR ELEV. 2,348.8 ft				TOTAL DEPTH 15.0 ft		NORTHING 840,936		EASTING 1,018,584		24 HR. 4.0			
DRILL RIG/HAMMER EFF./DATE F&R3763 CME-550X 81% 12/15/2011						DRILL METHOD NW Casing W/SPT & Core			HAMMER TYPE Automatic				
DRILLER C. Boyce				START DATE 12/19/12		COMP. DATE 12/19/12		SURFACE WATER DEPTH N/A					
CORE SIZE NQ-2				TOTAL RUN 5.0 ft									
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)	
					REC. (ft) %	RQD (ft) %		REC. (ft) %	RQD (ft) %				
2338.82													
	2,338.8	10.0	5.0	3:52/1.0 3:52/1.0 4:48/1.0 5:21/1.0 3:25/1.0	(4.9) 98%	(3.6) 72%		(4.9) 98%	(3.6) 72%		2,338.8	10.0	
2335	2,333.8	15.0									2,333.8	15.0	
<p>Begin Coring @ 10.0 ft</p> <p>CRYSTALLINE ROCK</p> <p>Gray, black, tan and white, very slightly to slightly weathered, hard, very close to moderately closely spaced fractured BIOTITE GNEISS</p> <p>Boring Terminated at Elevation 2,333.8 ft In CRYSTALLINE ROCK (BIOTITE GNEISS)</p> <p>1) Drillers used coring equipment (NQ-2) and roller cone to penetrate boulders in the colluvial layers.</p>													



NCDOT GEOTECHNICAL ENGINEERING UNIT

BORELOG REPORT

WBS 17BP.13.R.80		TIP N/A		COUNTY Yancey		GEOLOGIST R. Kral											
SITE DESCRIPTION Bridge 990145 on SR 1340 across McKinney Branch							GROUND WTR (ft)										
BORING NO. B-4		STATION 12+93		OFFSET 10 ft LT		ALIGNMENT -L-	0 HR. N/A										
COLLAR ELEV. 2,348.5 ft		TOTAL DEPTH 7.5 ft		NORTHING 840,945		EASTING 1,018,560	24 HR. 2.8										
DRILL RIG/HAMMER EFF./DATE F&R3763 CME-550X 81% 12/15/2011				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic											
DRILLER C. Boyce		START DATE 12/19/12		COMP. DATE 12/19/12		SURFACE WATER DEPTH N/A											
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	LOG	SOIL AND ROCK DESCRIPTION			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)		
2350																	
	2,348.5	0.0													2,348.5		GROUND SURFACE
			4	2	3	5											ROADWAY EMBANKMENT
2345	2,345.0	3.5															Brown and orange silty fine to coarse SAND (A-2-4) some rock fragments
			19	14	12												Cobbles from 5 to 7.5 feet
	2,341.0	7.5													2,341.0		Boring Terminated with Standard Penetration Test Refusal at Elevation 2,341.0 ft On CRYSTALLINE ROCK (BIOTITE GNEISS)
			60/0.0														

NCDOT BORE SINGLE 63N-0266-0005 - GROUP R BRIDGE 145.GPJ NC_DOT.GDT 4/24/13