

PROJECT: 33549.1.1 ID: B-4202

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

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	33549.1.1	1	13

**CONTENTS**

<u>SHEET</u>	<u>DESCRIPTION</u>
1	TITLE SHEET
2	LEGEND
3	GEOTECHNICAL REPORT
4	SITE PLAN
5&6	CROSS SECTIONS
7-9	BORE LOG & CORE REPORTS
10	SCOUR REPORT
11	SAMPLE RESULTS
12&13	CORE PHOTOGRAPHS

**STRUCTURE**  
**SUBSURFACE INVESTIGATION**

PROJ. REFERENCE NO. 33549.1.1 F.A. PROJ. BRZ-1002(9)  
 COUNTY MITCHELL  
 PROJECT DESCRIPTION BRIDGE NOS. 109 & 110 ON SR 1002 (CRABTREE CREEK ROAD) OVER CRABTREE CREEK

SITE DESCRIPTION BRIDGE NO. 109

**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 FUTURE BY CONTACTING THE N.C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE PART OF THE CONTRACT.

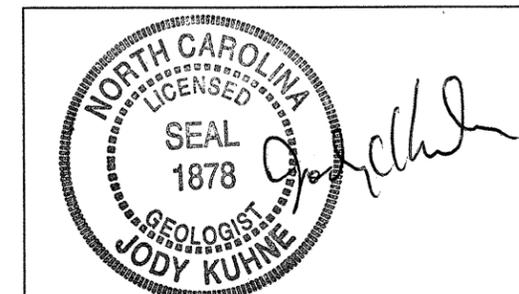
GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND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

**PERSONNEL**

- MM HAGER
- DO CHEEK
- GK ROSE
- C COFFEY
- R CHILDERS

INVESTIGATED BY JC KUHNE  
 CHECKED BY WD FRYE  
 SUBMITTED BY JC KUHNE  
 DATE 9/14/06



DRAWN BY: JC KUHNE

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.

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

PROJECT REFERENCE NO. **B-4202 33549.11** BR. NO. 109 SHEET NO. **2/13**

**SUBSURFACE INVESTIGATION**

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

SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS
SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE: <i>VERY STIFF, GRAY, SILTY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HIGH PLASTIC, A-7-6</i>	WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED) GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES. <b>ANGULARITY OF GRAINS</b> THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED. <b>MINERALOGICAL COMPOSITION</b> MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.	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: 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.	<b>ALLUVIUM (ALLUV.)</b> - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. <b>AQUIFER</b> - A WATER BEARING FORMATION OR STRATA. <b>ARENACEOUS</b> - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. <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. <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. <b>CALCAREOUS (CALC.)</b> - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. <b>COLLUVIUM</b> - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. <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. <b>DIKE</b> - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. <b>DIP</b> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. <b>DIP DIRECTION (DIP AZIMUTH)</b> - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. <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. <b>FISSILE</b> - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. <b>FLOAT</b> - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOGGED FROM PARENT MATERIAL. <b>FLOOD PLAIN (FP)</b> - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. <b>FORMATION (FM)</b> - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. <b>JOINT</b> - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. <b>LEDGE</b> - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. <b>LENS</b> - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. <b>MOTTLED (MOT.)</b> - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. <b>PERCHED WATER</b> - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. <b>RESIDUAL (RES.) SOIL</b> - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. <b>ROCK QUALITY DESIGNATION (RQD)</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. <b>SAPROLITE (SAP.)</b> - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. <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 INTRODUCED ROCKS. <b>SLICKENSIDE</b> - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. <b>STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT)</b> - 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. <b>STRATA CORE RECOVERY (SREC.)</b> - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. <b>STRATA ROCK QUALITY DESIGNATION (SRQD)</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. <b>TOPSOIL (TS.)</b> - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
<b>SOIL LEGEND AND AASHTO CLASSIFICATION</b>	<b>COMPRESSION</b> SLIGHTLY COMPRESSIBLE LIQUID LIMIT LESS THAN 31 MODERATELY COMPRESSIBLE LIQUID LIMIT EQUAL TO 31-50 HIGHLY COMPRESSIBLE LIQUID LIMIT GREATER THAN 50	<b>WEATHERING</b> <b>FRESH</b> - ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE. <b>VERY SLIGHT (V SL.)</b> - 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. <b>SLIGHT (SL.)</b> - 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. <b>MODERATE (MOD.)</b> - 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. <b>MODERATELY SEVERE (MOD. SEV.)</b> - 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> <b>SEVERE (SEV.)</b> - ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. <i>IF TESTED, YIELDS SPT N VALUES &gt; 100 BPF</i> <b>VERY SEVERE (V SEV.)</b> - ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. <i>IF TESTED, YIELDS SPT N VALUES &lt; 100 BPF</i> <b>COMPLETE</b> - 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.	<b>SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER</b> <b>HIGHLY ORGANIC SOILS</b>
<b>GENERAL CLASS.</b> GROUP CLASS. A-1, A-1-b, A-3, A-2, A-2-4, A-2-5, A-2-6, A-2-7, A-4, A-5, A-6, A-7, A-1, A-2, A-4, A-5, A-6, A-7 SYMBOL % PASSING: 10, 40, 200 LIQUID LIMIT PLASTIC INDEX GROUP INDEX 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, UNSUITABLE PI OF A-7-5 SUBGROUP IS ≤ LL - 30; PI OF A-7-6 SUBGROUP IS > LL - 30	<b>PERCENTAGE OF MATERIAL</b> <b>ORGANIC MATERIAL</b> TRACE OF ORGANIC MATTER 2 - 3% LITTLE ORGANIC MATTER 3 - 5% MODERATELY ORGANIC 5 - 10% HIGHLY ORGANIC >10% <b>GRANULAR SOILS</b> SILT - CLAY SOILS OTHER MATERIAL TRACE 1 - 10% LITTLE 10 - 20% SOME 20 - 35% HIGHLY 35% AND ABOVE	<b>GROUND WATER</b> 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	
<b>CONSISTENCY OR DENSENESS</b>	<b>MISCELLANEOUS SYMBOLS</b>		
<b>PRIMARY SOIL TYPE</b> COMPACTNESS OR CONSISTENCY RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT <sup>2</sup> )	ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION SOIL SYMBOL ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT INFERRED SOIL BOUNDARY INFERRED ROCK LINE ALLUVIAL SOIL BOUNDARY DIP & DIP DIRECTION OF ROCK STRUCTURES SOUNDING ROD	SPT TEST BORING AUGER BORING CORE BORING MONITORING WELL PIEZOMETER INSTALLATION SLOPE INDICATOR INSTALLATION SPT N-VALUE SPT REFUSAL	SAMPLE DESIGNATIONS S - BULK SAMPLE SS - SPLIT SPOON SAMPLE ST - SHELBY TUBE SAMPLE RS - ROCK SAMPLE RT - RECOMPACTED TRIAXIAL SAMPLE CBR - CALIFORNIA BEARING RATIO SAMPLE
<b>TEXTURE OR GRAIN SIZE</b> U.S. STD. SIEVE SIZE OPENING (MM): 4, 10, 40, 60, 200, 270 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	<b>ABBREVIATIONS</b> AR - AUGER REFUSAL BT - BORING TERMINATED CL - CLAY CPT - CONE PENETRATION TEST CSE - COARSE DMT - DILATOMETER TEST DPT - DYNAMIC PENETRATION TEST e - VOID RATIO FOSS. - FOSSILIFEROUS FRAC. - FRACTURED, FRACTURES FRAGS. - FRAGMENTS HI. - HIGHLY MED. - MEDIUM MIC. - MICACEOUS MOD. - MODERATELY NP - NON PLASTIC ORG. - ORGANIC PMT - PRESSUREMETER TEST SAP. - SAPROLITIC SD. - SAND, SANDY SL. - SILT, SILTY SLI. - SLIGHTLY TCR - TRICONE REFUSAL w - MOISTURE CONTENT v - VERY VST - VANE SHEAR TEST WEA. - WEATHERED γ - UNIT WEIGHT γ <sub>d</sub> - DRY UNIT WEIGHT		
<b>SOIL MOISTURE - CORRELATION OF TERMS</b>	<b>EQUIPMENT USED ON SUBJECT PROJECT</b>	<b>ROCK HARDNESS</b>	<b>ROCK QUALITY DESIGNATION (RQD)</b>
SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE GUIDE FOR FIELD MOISTURE DESCRIPTION	DRILL UNITS: MOBILE B- BK-51 CME-45C CME-550 PORTABLE HOIST	<b>VERY HARD</b> - CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK. <b>HARD</b> - CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN. <b>MODERATELY HARD</b> - 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. <b>MEDIUM HARD</b> - CAN BE GROUVED 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. <b>SOFT</b> - 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. <b>VERY SOFT</b> - 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.	<b>SAPROLITE (SAP.)</b> - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. <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 INTRODUCED ROCKS. <b>SLICKENSIDE</b> - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. <b>STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT)</b> - 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. <b>STRATA CORE RECOVERY (SREC.)</b> - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. <b>STRATA ROCK QUALITY DESIGNATION (SRQD)</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. <b>TOPSOIL (TS.)</b> - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
LL - LIQUID LIMIT PL - PLASTIC LIMIT OM - OPTIMUM MOISTURE SL - SHRINKAGE LIMIT	ADVANCING TOOLS: CLAY BITS 6" CONTINUOUS FLIGHT AUGER 8" HOLLOW AUGERS HARD FACED FINGER BITS TUNG-CARBIDE INSERTS CASING w/ ADVANCER TRICONE * STEEL TEETH TRICONE * TUNG-CARB. CORE BIT	<b>FRACTURE SPACING</b> TERM SPACING VERY WIDE MORE THAN 10 FEET WIDE 3 TO 10 FEET MODERATELY CLOSE 1 TO 3 FEET CLOSE 0.16 TO 1 FEET VERY CLOSE LESS THAN 0.16 FEET	<b>BEDDING</b> TERM THICKNESS VERY THICKLY BEDDED > 4 FEET THICKLY BEDDED 1.5 - 4 FEET THINLY BEDDED 0.16 - 1.5 FEET VERY THINLY BEDDED 0.03 - 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET THINLY LAMINATED < 0.008 FEET
<b>PLASTICITY</b> NONPLASTIC LOW PLASTICITY MED. PLASTICITY HIGH PLASTICITY	HAMMER TYPE: AUTOMATIC MANUAL CORE SIZE: B N H HAND TOOLS: POST HOLE DIGGER HAND AUGER SOUNDING ROD VANE SHEAR TEST	<b>INDURATION</b> FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. <b>FRIABLE</b> - RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. <b>MODERATELY INDURATED</b> - GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. <b>INDURATED</b> - GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. <b>EXTREMELY INDURATED</b> - SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.	<b>BENCH MARK:</b> NCDOT #4 -BL-- STA 25+87.48 (20.11' LT) ELEVATION: 2935.91 FT. <b>NOTES:</b>
<b>COLOR</b> 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.			



STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY  
GOVERNOR

LYNDO TIPPETT  
SECRETARY

7 September, 2006

STATE PROJECT: 33549.1.1 (B-4042)  
F. A. PROJECT: BRZ-1002(9)  
COUNTY: Mitchell  
  
DESCRIPTION: Bridge No. 109 on SR 1002, Crabtree Creek Road  
  
SUBJECT: Geotechnical Report – Foundation Investigation

**Introduction**

This project is located in southwestern Mitchell County, approximately 4 miles south of the intersection of SR 1002 and US 19E. The existing single span bridge is to be replaced with a single span structure. The length will be 60.0 feet; the skew is 90 degrees.

The subsurface investigation was conducted using a CME-550 drill machine with -N- casing and advancer. Standard Penetration Tests were performed at intervals of 5.0 feet using an automatic drop hammer. Soil samples were collected and submitted for testing of quality.

**Geology and Rock Characteristics**

Underlying rock types from the Geologic Map of North Carolina (1985) are Zaba and Zabg, both gneiss units which are well foliated to equigranular and range from micaceous muscovite and biotite gneiss to dark amphibolite gneiss. As depicted on the cross sections, rock is shallow at End Bent 1, left, but drops off sharply to End Bent 1, right, and is not practically present at End Bent 2. Bearing material, rock or weathered rock, is shallow along both End Bents.

**Foundation Materials**

End Bent One

3/13  
The existing embankment averages 4.5' of sandy silt placed on 2.0' of alluvium. Rock is shallow at el. 2927.0 in boring EB1-A and steeply drops off to the left side of the abutment. Boring EB1-B shows dense to very dense saprolite beginning at el. 2927 to 2922.8. This quickly grades into weathered rock with the top of rock at el. 2915.2

Static groundwater levels were measured at 7.4' (elevation 2925.4) in EB1-A, and 6.0' (elevation 1084.1) in EB1-B.

End Bent Two

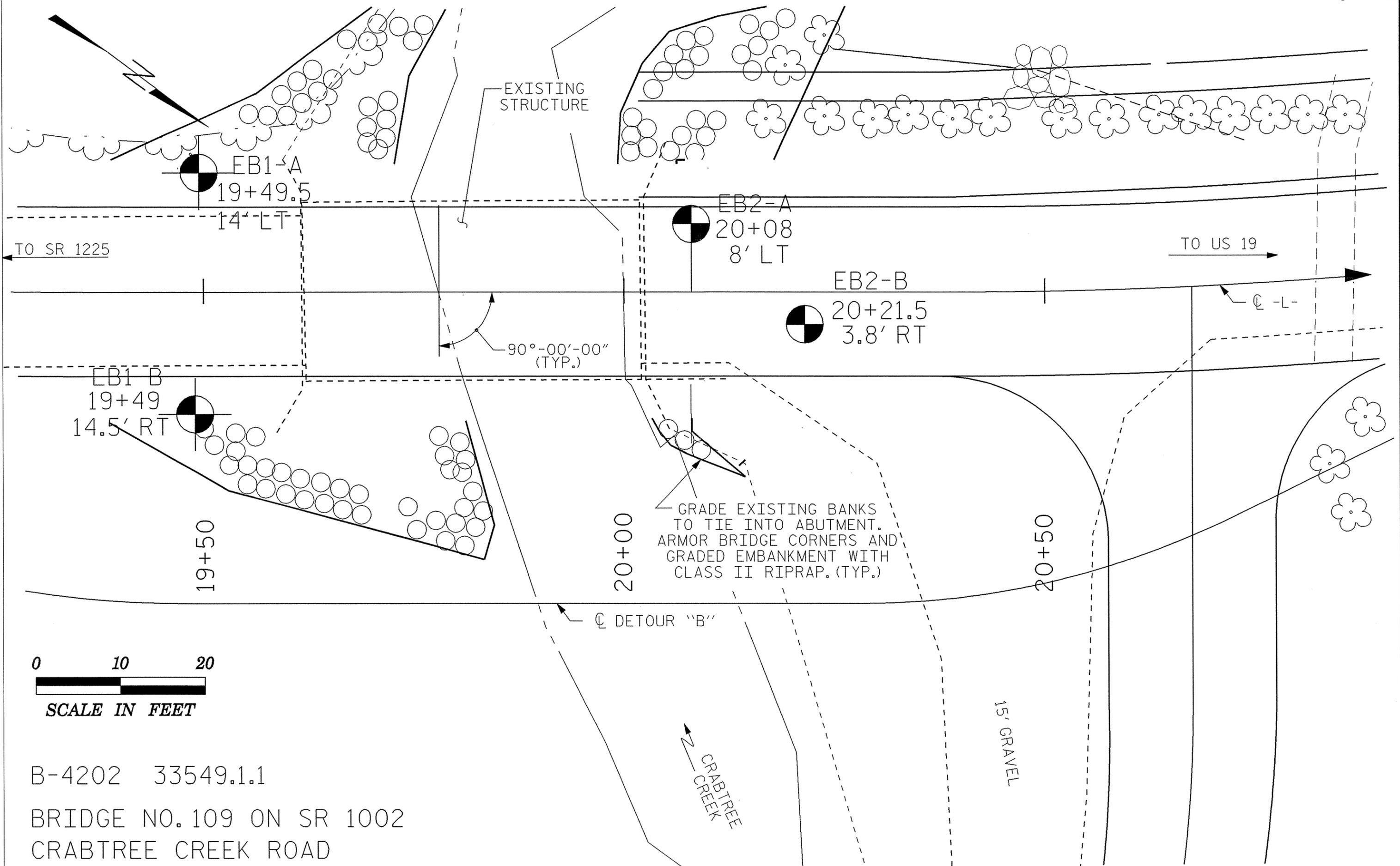
The existing embankment across this abutment consists of about 6.0 feet of loose sandy silt. The embankment was placed upon alluvium. Alluvium is composed of 5.0 to 6.0 feet of medium dense to dense gravel with cobbles.

Weathered rock starts at el. 2920.5 and was established 10- 15' below.

Static groundwater was measured in EB2-A at 6.7'(elevation 2925.5) and in EB2-B at 9.0' (elevation 2923.5).

Respectfully Submitted,

Jody C. Kuhne, PG, PE  
Project Geological Engineer



EXISTING  
STRUCTURE

TO SR 1225

TO US 19

EB1-A  
19+49.5  
14' LT

EB2-A  
20+08  
8' LT

EB2-B  
20+21.5  
3.8' RT

EB1-B  
19+49  
14.5' RT

90°-00'-00"  
(TYP.)

GRADE EXISTING BANKS  
TO TIE INTO ABUTMENT.  
ARMOR BRIDGE CORNERS AND  
GRADED EMBANKMENT WITH  
CLASS II RIPRAP. (TYP.)

☉ DETOUR "B"

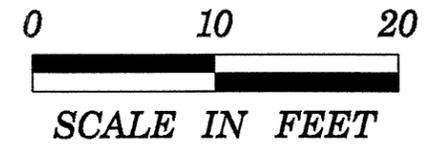
19+50

20+00

20+50

15' GRAVEL

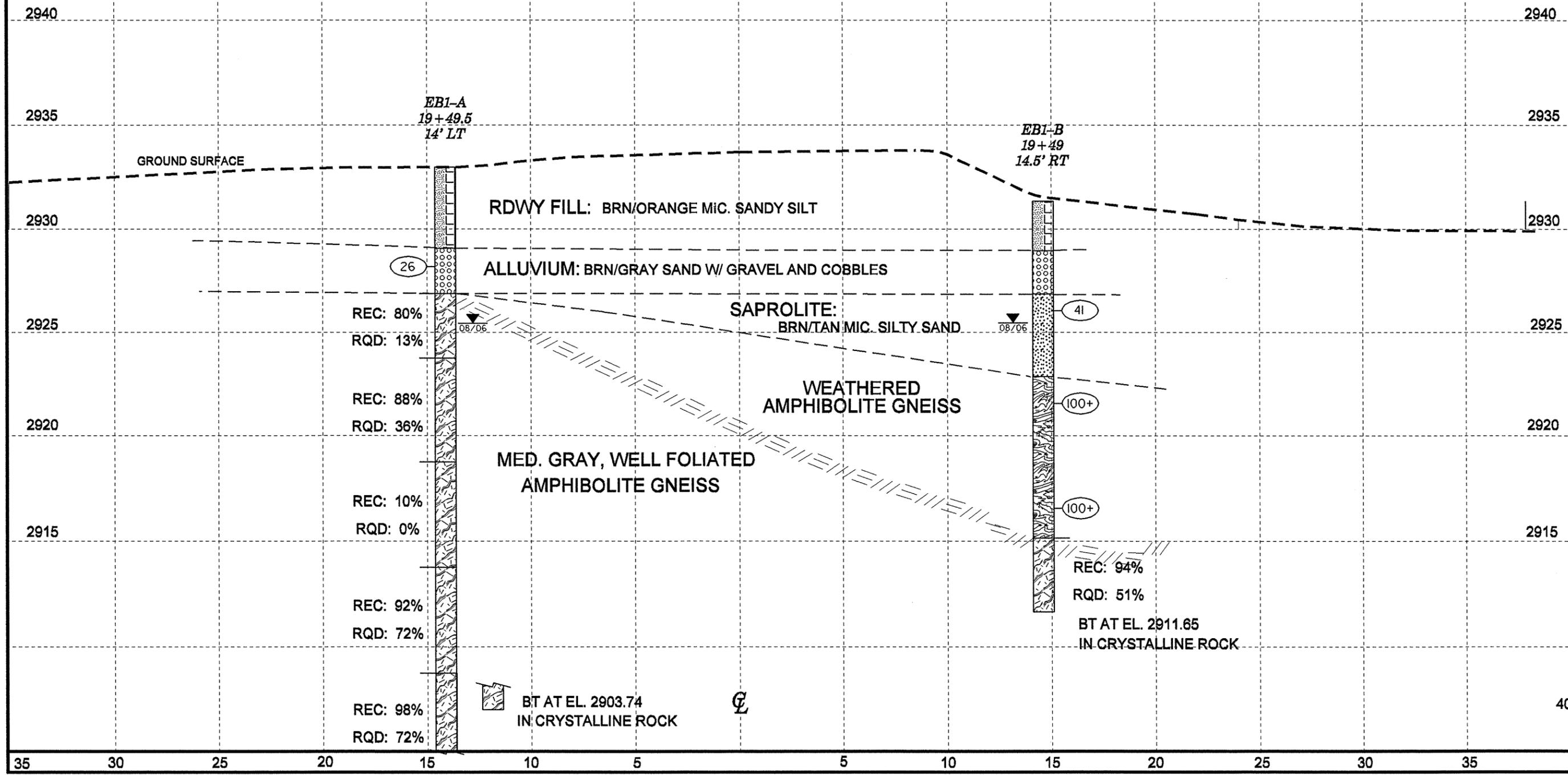
CRABTREE  
CREEK



B-4202 33549.1.1  
BRIDGE NO. 109 ON SR 1002  
CRABTREE CREEK ROAD

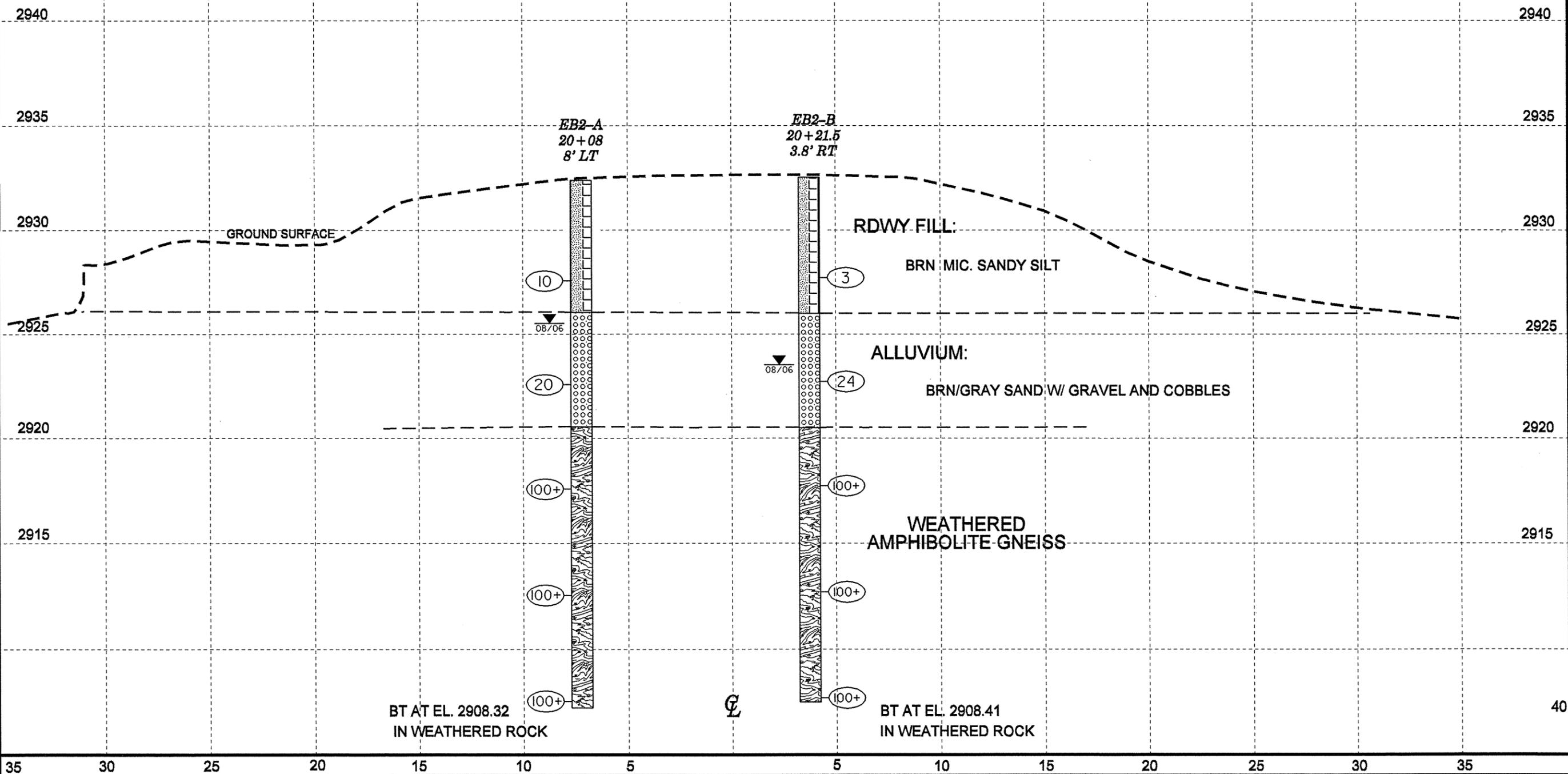
33549.1.1 B-4202  
 BRIDGE NO. 109 ON SR 1002  
 CRABTREE CREEK ROAD  
 MITCHELL CO.  
 SECTION THROUGH EB-1

<p>0 5 10 FEET VE = 1 SKEW = 90</p>	PROJECT REFERENCE NO.	SHEET
	33549.1.1	5/13
B-4202		



33549.1.1 B-4202  
 BRIDGE NO. 109 ON SR 1002  
 CRABTREE CREEK ROAD  
 MITCHELL CO.  
 SECTION THROUGH EB-2

 FEET VE = 1 SKEW = 90	PROJECT REFERENCE NO.	SHEET
	33549.1.1	6/13
B-4202		



NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
 GEOTECHNICAL UNIT BORING LOG

PROJECT NO 33549.1.1		ID B-4202		COUNTY MITCHELL		GEOLOGIST MM HAGER						
SITE DESCRIPTION BRIDGE NO. 109 ON SR 1002, CRABTREE CREEK ROAD						GND WATER						
BORING NO EB1A		NORTHING 779843.00		EASTING 1071937.00		0 HR N/A						
ALIGNMENT -L-		BORING LOCATION 19+49.500		OFFSET 14.00ft LT		24 HR 7.50ft						
COLLAR ELEV 2932.94ft		TOTAL DEPTH 29.20ft		START DATE 8/16/06		COMPLETION DATE 08/16/06						
DRILL MACHINE CME-550			DRILL METHOD SPT CORE BORING			HAMMER TYPE AUTOMATIC						
SURFACE WATER DEPTH			DEPTH TO ROCK 6.10ft			Log EB1A, Page 1 of 1						
ELEV	DEPTH	BLOW CT			PEN (ft)	BLOWS PER FOOT				SAMPLE NO	LOG	SOIL AND ROCK DESCRIPTION
		6in	6in	6in		0	25	50	75			
2932.94												Ground Surface
2930.00	4.30	10	12	14	1.0							RDWY FILL: BRN/ORANGE MIC. SANDY SILT
												ALLUVIUM: BRN/GRAY SAND W/ GRAVEL AND COBBLES
												CRYSTALLINE ROCK: LT./MED. GRAY, WELL FOLIATED MUSC/BIOTITE GNEISS REC: 80% RQD: 13%
												MED. GRAY, FRESH BIOTITE/MUSC GNEISS REC: 88% RQD: 36%
												MED. GRAY, MOD. WEATHERED BIOTITE GNEISS REC: 10% RQD: 0%
												MED. GRAY, FRESH MUSC/AMPHIBOLITE GNEISS REC: 92% RQD: 72%
												SAME AS ABOVE REC: 98% RQD: 72%
												BORING TERMINATED AT 29.2' IN CRYSTALLINE ROCK

SHEET 7 OF 13

DATE 3-Sep-06

CORE BORING REPORT

PROJECT: 33549.1.1 I. D. NO: B-4202 BORING NO: EB1A GEOLOGIST: MM HAGER  
 DESCRIPTION: BRIDGE NO. 109 ON SR 1002, CRABTREE CREEK ROAD  
 COUNTY: MITCHELL COLLAR ELEVATION: 0.0 FT. TOTAL DEPTH: 29.2 FT.

ELEV. (FEET)	DEPTH (FEET)	DRILL RATE MIN./FT.	RUN (FEET)	REC. FEET %	RQD. FEET %	SAMP. #	FIELD CLASSIFICATION AND REMARKS
-6.1	6.1			2.5	0.4		LT. TO MED. GRAY, MOD. WEATHERED, WELL FOLIATED BIOTITE MUSCOVITE GNEISS
		3:37	3.1	81	13		
-9.2	9.2			4.4	1.8		MED. GRAY, FRESH BIOTITE/MUSCOVITE GNEISS
-9.2	9.2		5.0	88	36		
-14.2	14.2			0.5	0.0		MED. GRAY, MOD. WEATHERED, BIOTITE GNEISS
-14.2	14.2	5:52	5.0	10	0		
-19.2	19.2			4.6	3.6		MED. GRAY, FRESH MUSCOVITE/AMPHIBOLITE GNEISS
-19.2	19.2	4:42	5.0	92	72		
-24.2	24.2			4.9	3.6		MED. GRAY, FRESH MUSCOVITE/AMPHIBOLITE GNEISS
-24.2	24.2	8:37	5.0	98	72		
-29.2	29.2						

CORING TERMINATED AT ELEVATION -29.2 FT.

DRILLER: GK ROSE CORE SIZE: NXWL EQUIPMENT: CME-550

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
 GEOTECHNICAL UNIT BORING LOG

8/13

PROJECT NO 33549.1.1		ID B-4202		COUNTY MITCHELL		GEOLOGIST MM HAGER									
SITE DESCRIPTION BRIDGE NO. 109 ON SR 1002, CRABTREE CREEK ROAD							GND WATER								
BORING NO EB1B		NORTHING 780478.00		EASTING 1071904.00		0 HR N/A									
ALIGNMENT -L-		BORING LOCATION 19+49.000		OFFSET 14.50ft RT		24 HR 5.90ft									
COLLAR ELEV 2931.35ft		TOTAL DEPTH 19.70ft		START DATE 8/09/06		COMPLETION DATE 08/09/06									
DRILL MACHINE CME-550			DRILL METHOD SPT CORE BORING			HAMMER TYPE AUTOMATIC									
SURFACE WATER DEPTH			DEPTH TO ROCK 16.20ft			Log EB1B, Page 1 of 1									
ELEV	DEPTH	BLOW CT			PEN (ft)	BLOWS PER FOOT					SAMPLE NO	MOI	LOG	SOIL AND ROCK DESCRIPTION	
		6in	6in	6in		0	25	50	75	100					
2931.35															
	4.80	6	13	28	1.0										RDWY FILL: BRN/ORANGE MIC. SANDY SILT
	9.80	95	5		0.5										ALLUVIUM: BRN/GRAY SAND W/ GRAVEL AND GOBBLES
2920.00	14.80	44	56		0.9										SAPROLITE: BRN/TAN MIC. SILTY SAND
															WEATHERED ROCK: WEATHERED AMPHIBOLITE GNEISS
2911.65															CRYSTALLINE ROCK: MED. GRAY WELL FOLIATED AMPHIBOLITE GNEISS REC: 94% RQD: 51%
						BORING TERMINATED AT 19.7 IN CRYSTALLINE ROCK									

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
 GEOTECHNICAL UNIT BORING LOG

PROJECT NO 33549.1.1		ID B-4202		COUNTY MITCHELL		GEOLOGIST MM HAGER								
SITE DESCRIPTION BRIDGE NO. 109 ON SR 1002, CRABTREE CREEK ROAD							GND WATER							
BORING NO EB2A		NORTHING 780512.00		EASTING 1071849.00		0 HR N/A								
ALIGNMENT -L-		BORING LOCATION 20+08.000		OFFSET 8.00ft LT		24 HR 6.80ft								
COLLAR ELEV 2933.42ft		TOTAL DEPTH 25.10ft		START DATE 8/15/06		COMPLETION DATE 08/15/06								
DRILL MACHINE CME-550			DRILL METHOD SPT CORE BORING			HAMMER TYPE AUTOMATIC								
SURFACE WATER DEPTH			DEPTH TO ROCK N/A			Log EB2A, Page 1 of 1								
ELEV	DEPTH	BLOW CT			PEN	BLOWS PER FOOT				SAMPLE NO	LOG	SOIL AND ROCK DESCRIPTION		
		6in	6in	6in	(ft)	0	25	50	75	100				
2933.42						Ground Surface								
2930.00	4.80	1	6	4	1.0								RDWY FILL: BRN MIC. SANDY SILT	
	9.80	6	8	12	1.0								ALLUVIUM: BRN/GRAY SAND W/ GRAVEL AND COBBLES	
2920.00	14.80	100			0.4					100			WEATHERED ROCK: WEATHERED MUSC. GARNET SCHIST	
	19.80	100			0.3					100				
2910.00	24.80	100			0.3					100				
2908.32						TERMINATED IN WEATHERED MUSC. GARNET SCHIST								

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
 GEOTECHNICAL UNIT BORING LOG

9/13

PROJECT NO 33549.1.1		ID B-4202		COUNTY MITCHELL		GEOLOGIST MM HAGER								
SITE DESCRIPTION BRIDGE NO. 109 ON SR 1002, CRABTREE CREEK ROAD							GND WATER							
BORING NO EB2B		NORTHING 780529.00		EASTING 1071851.00		0 HR N/A								
ALIGNMENT -L-		BORING LOCATION 20+21.500		OFFSET 3.80ft RT		24 HR 9.00ft								
COLLAR ELEV 2933.41ft		TOTAL DEPTH 25.00ft		START DATE 8/15/06		COMPLETION DATE 08/15/06								
DRILL MACHINE CME-550			DRILL METHOD SPT CORE BORING			HAMMER TYPE AUTOMATIC								
SURFACE WATER DEPTH N/A			DEPTH TO ROCK N/A			Log EB2B, Page 1 of 1								
ELEV	DEPTH	BLOW CT			PEN	BLOWS PER FOOT				SAMPLE NO	LOG	SOIL AND ROCK DESCRIPTION		
		6in	6in	6in	(ft)	0	25	50	75	100				
2933.41						Ground Surface								
2930.00	4.80	2	1	2	1.0								RDWY FILL: BRN MIC. SANDY SILT	
	9.80	11	12	12	1.0								ALLUVIUM: BRN/GRAY SAND W/ GRAVEL AND COBBLES	
2920.00	14.80	100			0.3					100			WEATHERED ROCK: MOD. WEATHERED TO FRESH SCHIST IN AMPHIBOLITE GNEISS	
	19.80	100			0.5					100				
2910.00	24.80	100			0.2					100				
2908.41						TERMINATED IN MODERATELY WEATHERED TO FRESH MUSC. GARNET SCHIST LAYERED IN AMPHIBOLITE GNEISS								



**FIELD  
 SCOUR REPORT**

WBS: 33549.1.1 TIP: B-4202 COUNTY: MITCHELL

DESCRIPTION(1): BRIDGE NO. 109 ON SR 1002, CRABTREE CREEK ROAD

**EXISTING BRIDGE**

Information from: Field Inspection  Microfilm (reel \_\_\_\_\_ pos: \_\_\_\_\_ )  
 Other (explain) HYDRO REPT

Bridge No.: 109 Length: 40' Total Bents: 2 Bents in Channel: 2 Bents in Floodplain: \_\_\_\_\_  
 Foundation Type: \_\_\_\_\_

**EVIDENCE OF SCOUR(2)**

Abutments or End Bent Slopes: MATERIAL SCoured FROM TOE OF NORTH ABUTMENT SPREAD  
 FOOTING = 1-2"

Interior Bents: NA  
 NA

Channel Bed: NA

Channel Bank: NORTH BANK RIP RAP PROTECTED, WANTS TO SCOUR

**EXISTING SCOUR PROTECTION**

Type(3): RIP RAP ON NORTH BANK, WING WALLS

Extent(4): 100' ALONG NORTH BANK UPSTREAM

Effectiveness(5): EFFECTIVE FOR MODERATE FLOODING

Obstructions(6): NONE

**INSTRUCTIONS**

- 1 Describe the specific site's location, including route number and body of water crossed.
- 2 Note scour evidence at existing end bents or abutments (e.g. undermining, sloughing, degradations).
- 3 Note existing scour protection (e.g. rip rap).
- 4 Describe extent of existing scour protection.
- 5 Describe whether or not the scour protection appears to be working.
- 6 Note obstructions such as dams, fallen trees, debris at bents, etc.
- 7 Describe the channel bed material based on observation and/or samples. Include any lab results with report.
- 8 Describe the channel bank material based on observation and/or samples. Include any lab results with report.
- 9 Describe the material covering the banks (e.g. grass, trees, rip rap, none).
- 10 Determine the approximate floodplain width from field observation or a topographic map.
- 11 Describe the material covering the floodplain (e.g. grass, trees, crops).
- 12 Use professional judgement to specify if the stream is degrading, aggrading, or static.
- 13 Describe potential and direction of the stream to migrate laterally during the bridge's life (approx. 100 years).
- 14 Give the design scour elevation (DSE) expected over the life of the bridge (approx. 100 years). This elevation can be given as a range across the site, or for each bent. Discuss the relationship between the Hydraulics Unit theoretical scour and the DSE. If the DSE is dependent on scour counter measures, explain (e.g. rip rap armoring on slopes). The DSE is based on the erodability of materials, giving consideration to the influence of joints, foliation, bedding characteristics, % core recovery, % RQD, differential weathering, shear strength, observations at existing structures, other tests deemed appropriate, and overall geologic conditions at the site.

**DESIGN INFORMATION**

Channel Bed Material(7): SILTY SAND W/ GRAVEL AND COBBLES

Channel Bank Material(8): SAME AS CHANNEL BED

Channel Bank Cover(9): RIP RAP, SHRUBS, TREES

Floodplain Width(10): 300'

Floodplain Cover(11): GRASS, SHRUBS

Stream is(12): Aggrading  Degrading \_\_\_\_\_ Static \_\_\_\_\_

Channel Migration Tendency(13): MIGRATE TO THE NORTH AT STRUCTURE, EASILY JUMP CHANNEL

Observations and Other Comments: RIP RAP OR HEAVIER BANK PROTECTION UPSTREAM FROM EB2

**DESIGN SCOUR ELEVATIONS(14)**

Feet  Meters

ALL LANES	BENTS									
	EB2									
	2917									

Comparison of DSE to Hydraulics Unit theoretical scour:  
 DSE APPROX. 10' HIGHER THAN HYDRO, WEATHERED ROCK AT 2920.5'

**SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL**

Bed or Bank							
Sample No.							
Retained #4							
Passed #10							
Passed #40							
Passed #200							
Coarse Sand							
Fine Sand							
Silt							
Clay							
LL							
PI							
AASHTO							
Station							
Offset							
Depth							

Reported by: *Jody [Signature]* Date: 9/13/06

JCS  
**NORTH CAROLINA DEPARTMENT OF TRANSPORTATION**  
**DIVISION OF HIGHWAYS-MATERIALS AND TESTS UNIT**  
**SOILS TEST REPORT-SOILS LABORATORY**

11/13

<b>T.I.P. ID #:</b>	--
---------------------	----

<b>REPORT ON SAMPLES OF:</b> Soils for Quality
--

<b>PROJECT:</b>	33549.1.1	<b>COUNTY:</b>		<b>Owner:</b>	--
<b>DATE SAMPLED:</b>	8.10.06	<b>DATE RECEIVED:</b>	9.5.06	<b>DATE REPORTED:</b>	9.8.06
<b>SAMPLED FROM:</b>		<b>SAMPLED BY:</b>	J. C. Kuhne		
<b>SUBMITTED BY:</b>	W. D. Frye		2002	<b>STANDARD SPECIFICATION</b>	
<b>LABORATORY:</b>	Asheville				

**TEST RESULTS**

Project Sample No.	SS-1	SS-2	SS-3	SS-5	SS-6
Lab Sample No. A	153547	153548	153549	153551	153552
HiCAMS Sample #	--	--	--	--	--
Retained #4 Sieve %	0.0	0.0	0.0	0.0	0.0
Passing #10 Sieve %	95	85	96	99	42
Passing #40 Sieve %	90	77	67	92	30
Passing #200 Sieve %	31	19	15	22	11

**MINUS #10 FRACTION**

Soil Mortar - 100%					
Coarse Sand -Ret. #60	19	30	55	25	44
Fine Sand - Ret. #270	56	55	34	58	36
Silt 0.05-0.005 mm %	21	13	11	15	16
Clay < 0.005 mm %	4	2	0	2	4
Passing # 40 Sieve %	--	--	--	--	--
Passing # 200 Sieve %	--	--	--	--	--

Liquid Limit	35	40	40	37	38
Plastic Index	NP	NP	NP	NP	NP
AASHTO Classification	A-2-4 (0)	A-2-4 (0)	A-2-4 (0)	A-2-4 (0)	A-1-a (0)
Quantity					
Texture					
Station	13+12	13+12	19+49	20+21.5	19+49.5
Hole No.					
Depth (ft) From:	5.0	10.0	5.3	5.3	4.8
To:					

**Remarks:**

A-153547 - 153554
-------------------

**CC:**

J. C. Kuhne	
File	

<b>SOILS ENGINEER:</b>	
------------------------	--

B-4202, 33549.1.1  
BRIDGE NO. 109, SR 1002 OVER CRABTREE CREEK  
BORING EB1-A

DEPTH: 6.1' - 21.2'

33549.1.1 B-4202 MITCHELL Co.  
BRIDGE NO. 109 SR 1002 OVER CRABTREE CREEK

EB1-A  
RUN-5:24.2-29.2  
REC-98% RAD-72%

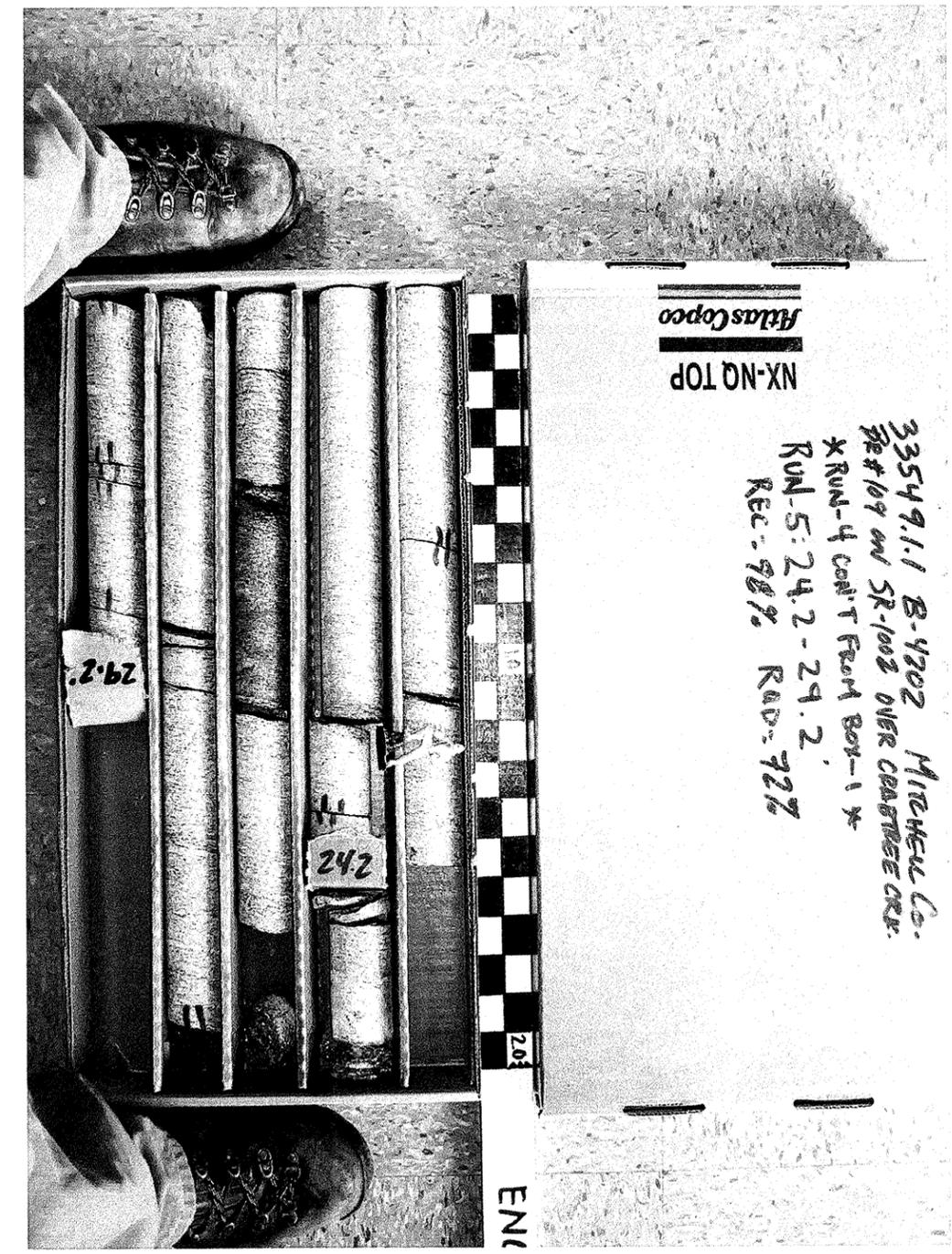
NX-NQ TOP  
Atlas Copco

ENGLISH



B-4202, 33549.1.1  
BRIDGE NO. 109, SR 1002 OVER CRABTREE CREEK  
BORING EB1-A

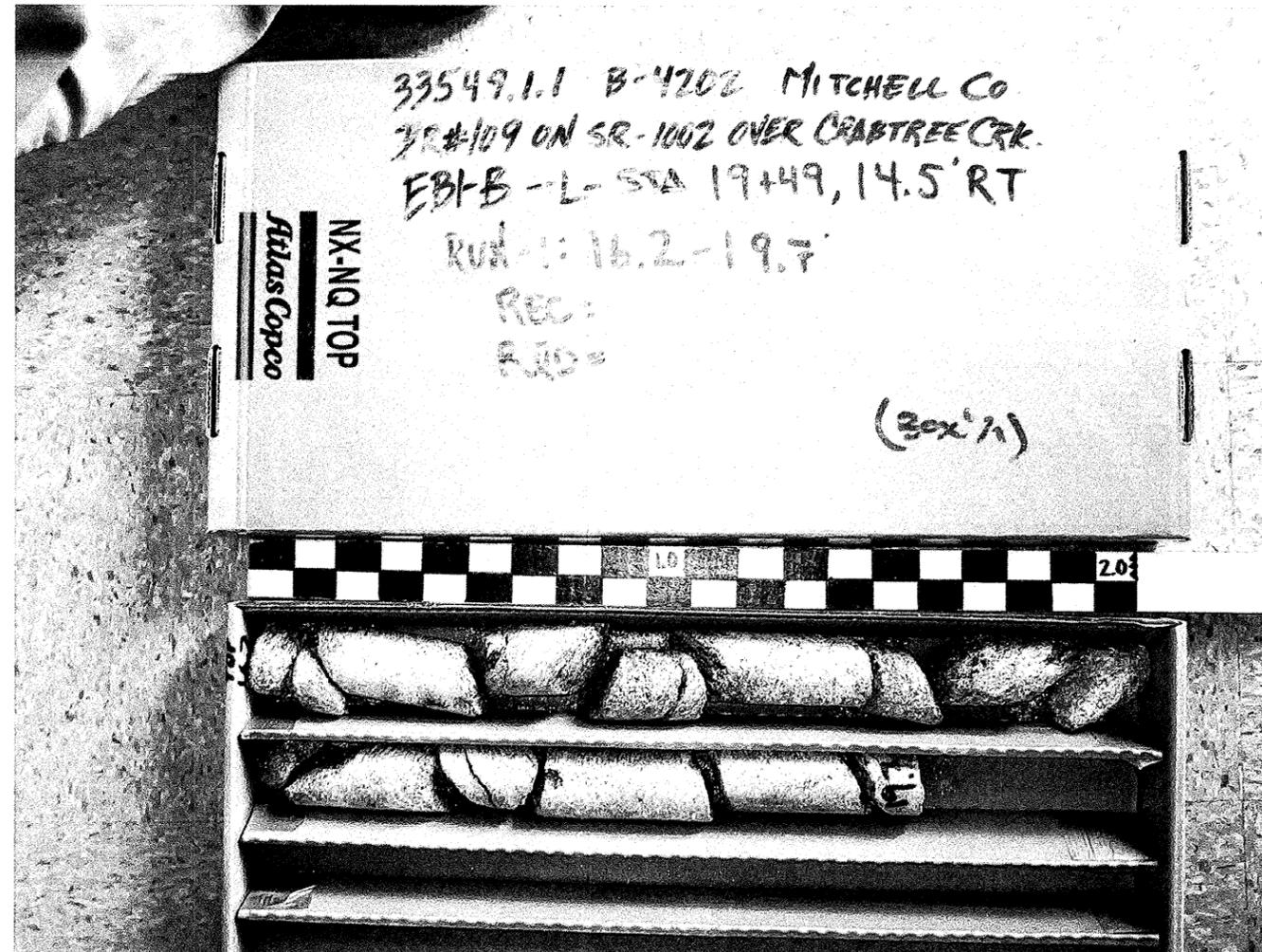
DEPTH: 21.2' - 29.2'



ENGLISH

B-4202, 33549.1.1  
BRIDGE NO. 109, SR 1002 OVER CRABTREE CREEK  
BORING EB1-B

DEPTH: 16.2' - 19.7'



STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	33549.1.1	1	14

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

**STRUCTURE**  
**SUBSURFACE INVESTIGATION**

PROJ. REFERENCE NO. 33549.1.1 F.A. PROJ. BRZ-1002(9)  
COUNTY MITCHELL  
PROJECT DESCRIPTION BRIDGE NOS. 109 & 110 ON SR 1002 (CRABTREE CREEK ROAD) OVER CRABTREE CREEK

SITE DESCRIPTION BRIDGE NO. 110

**CONTENTS**

<u>SHEET</u>	<u>DESCRIPTION</u>
1	TITLE SHEET
2	LEGEND
3	GEOTECHNICAL REPORT
4	SITE PLAN
5&6	CROSS SECTIONS
7-10	BORE LOG & CORE REPORT(S)
11	SCOUR REPORT
12	SAMPLE RESULTS
13, 14	CORE PHOTOGRAPHS

**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) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE PART OF THE CONTRACT.

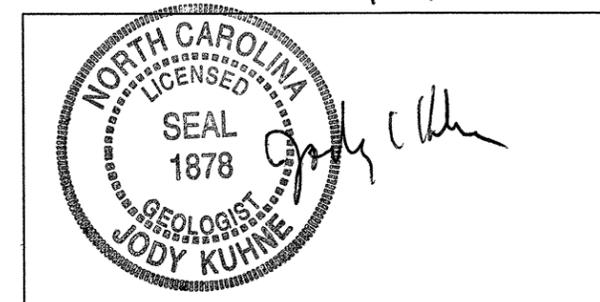
GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND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

**PERSONNEL**

- MM HAGER
- DO CHEEK
- GK ROSE
- C COFFEY
- R CHILDERS

INVESTIGATED BY JC KUHNE  
CHECKED BY WD FRYE  
SUBMITTED BY JC KUHNE  
DATE 9/14/06



**PROJECT: 33549.1.1 ID: B-4202**

DRAWN BY: JC KUHNE

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IT IS CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

NOTE - BY HAVING REQUESTED THIS INFORMATION THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS  
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

PROJECT REFERENCE NO.	SHEET NO.
B-4202 33549.1.I BR. NO. IIO	2/14

SOIL DESCRIPTION		GRADATION		ROCK DESCRIPTION		TERMS AND DEFINITIONS																																																																																																																
<p>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:</p> <p>VERY STIFF, GRAY, SILTY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HARD PLASTIC, A-7-6</p>		<p>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)</p> <p>GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.</p> <p>THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.</p>		<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 (SCREC) - 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>																																																																																																																
SOIL LEGEND AND AASHTO CLASSIFICATION		MINERALOGICAL COMPOSITION		WEATHERING																																																																																																																		
<table border="1"> <tr> <th>GENERAL CLASS.</th> <th colspan="4">GRANULAR MATERIALS (&lt;= 35% PASSING #200)</th> <th colspan="4">SILT-CLAY MATERIALS (&gt; 35% PASSING #200)</th> <th colspan="4">ORGANIC MATERIALS</th> </tr> <tr> <th>GROUP CLASS.</th> <th>A-1</th> <th>A-3</th> <th>A-2</th> <th>A-4</th> <th>A-5</th> <th>A-6</th> <th>A-7</th> <th>A-1, A-2</th> <th>A-3</th> <th>A-4, A-5</th> <th>A-6, A-7</th> <th></th> <th></th> </tr> <tr> <th>SYMBOL</th> <td></td> </tr> <tr> <th>% PASSING</th> <td>10 40 200</td> <td></td> <td></td> </tr> <tr> <th>LIQUID LIMIT</th> <td>6 MX</td> <td>NP</td> <td>10 MX</td> <td>11 MX</td> <td>12 MX</td> <td>13 MX</td> <td>14 MX</td> <td>15 MX</td> <td>16 MX</td> <td>17 MX</td> <td>18 MX</td> <td></td> <td></td> </tr> <tr> <th>GROUP INDEX</th> <td>0</td> <td>0</td> <td>0</td> <td>1 MX</td> <td>2 MX</td> <td>3 MX</td> <td>4 MX</td> <td>5 MX</td> <td>6 MX</td> <td>7 MX</td> <td>8 MX</td> <td></td> <td></td> </tr> <tr> <th>USUAL TYPES OF MAJOR MATERIALS</th> <td>STONE FRAGS. GRAVEL AND SAND</td> <td>FINE SAND</td> <td>SILTY OR CLAYEY GRAVEL AND SAND</td> <td>SILTY</td> <td>SILTY</td> <td>CLAYEY SILTS</td> <td>CLAYEY SILTS</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <th>GEN. RATING AS A SUBGRADE</th> <td colspan="4">EXCELLENT TO GOOD</td> <td colspan="4">FAIR TO POOR</td> <td>FAIR TO POOR</td> <td>POOR</td> <td>UNSATISFACTORY</td> <td></td> <td></td> </tr> </table>		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-3	A-4, A-5	A-6, A-7			SYMBOL														% PASSING	10 40 200			LIQUID LIMIT	6 MX	NP	10 MX	11 MX	12 MX	13 MX	14 MX	15 MX	16 MX	17 MX	18 MX			GROUP INDEX	0	0	0	1 MX	2 MX	3 MX	4 MX	5 MX	6 MX	7 MX	8 MX			USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL AND SAND	FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND	SILTY	SILTY	CLAYEY SILTS	CLAYEY SILTS							GEN. RATING AS A SUBGRADE	EXCELLENT TO GOOD				FAIR TO POOR				FAIR TO POOR	POOR	UNSATISFACTORY			<p>MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.</p>		<p>WEATHERING</p> <p>FRESH - ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER HAMMER IF CRYSTALLINE.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>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. IF TESTED, WOULD YIELD SPT REFUSAL.</p> <p>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. IF TESTED, YIELDS SPT N VALUES &gt; 100 BPF.</p> <p>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. IF TESTED, YIELDS SPT N VALUES &lt; 100 BPF.</p> <p>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.</p>		<p>COMPRESSION</p> <p>SLIGHTLY COMPRESSIBLE</p> <p>MODERATELY COMPRESSIBLE</p> <p>HIGHLY COMPRESSIBLE</p> <p>LIQUID LIMIT LESS THAN 31</p> <p>LIQUID LIMIT EQUAL TO 31-50</p> <p>LIQUID LIMIT GREATER THAN 50</p>											
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-3	A-4, A-5	A-6, A-7																																																																																																											
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	10 40 200																																																																																																											
LIQUID LIMIT	6 MX	NP	10 MX	11 MX	12 MX	13 MX	14 MX	15 MX	16 MX	17 MX	18 MX																																																																																																											
GROUP INDEX	0	0	0	1 MX	2 MX	3 MX	4 MX	5 MX	6 MX	7 MX	8 MX																																																																																																											
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL AND SAND	FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND	SILTY	SILTY	CLAYEY SILTS	CLAYEY SILTS																																																																																																															
GEN. RATING AS A SUBGRADE	EXCELLENT TO GOOD				FAIR TO POOR				FAIR TO POOR	POOR	UNSATISFACTORY																																																																																																											
PERCENTAGE OF MATERIAL		GROUND WATER		ROCK HARDNESS																																																																																																																		
<table border="1"> <tr> <th>ORGANIC MATERIAL</th> <th>GRANULAR SOILS</th> <th>SILT-CLAY SOILS</th> <th>OTHER MATERIAL</th> </tr> <tr> <td>TRACE OF ORGANIC MATTER</td> <td>2 - 3%</td> <td>3 - 5%</td> <td>TRACE</td> </tr> <tr> <td>LITTLE ORGANIC MATTER</td> <td>3 - 5%</td> <td>5 - 12%</td> <td>LITTLE</td> </tr> <tr> <td>MODERATELY ORGANIC</td> <td>5 - 10%</td> <td>12 - 20%</td> <td>SOME</td> </tr> <tr> <td>HIGHLY ORGANIC</td> <td>&gt;10%</td> <td>&gt;20%</td> <td>HIGHLY</td> </tr> <tr> <td></td> <td></td> <td></td> <td>35% AND ABOVE</td> </tr> </table>		ORGANIC MATERIAL	GRANULAR SOILS	SILT-CLAY SOILS	OTHER 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				35% AND ABOVE	<p>WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING</p> <p>STATIC WATER LEVEL AFTER 24 HOURS</p> <p>PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA</p> <p>SPRING OR SEEP</p>		<p>VERY HARD - CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.</p> <p>HARD - CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.</p> <p>MODERATELY HARD - CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.</p> <p>MEDIUM HARD - CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.</p> <p>SOFT - CAN BE GROOVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.</p> <p>VERY SOFT - 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.</p>																																																																																										
ORGANIC MATERIAL	GRANULAR SOILS	SILT-CLAY SOILS	OTHER 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																																																																																																																			
			35% AND ABOVE																																																																																																																			
CONSISTENCY OR DENSENESS		MISCELLANEOUS SYMBOLS		ROCK HARDNESS																																																																																																																		
<table border="1"> <tr> <th>PRIMARY SOIL TYPE</th> <th>COMPACTNESS OR CONSISTENCY</th> <th>RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)</th> <th>RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT<sup>2</sup>)</th> </tr> <tr> <td>GENERALLY GRANULAR MATERIAL (NON-COHESIVE)</td> <td>VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE</td> <td>&lt;4 4 TO 10 10 TO 30 30 TO 50 &gt;50</td> <td>N/A</td> </tr> <tr> <td>GENERALLY SILT-CLAY MATERIAL (COHESIVE)</td> <td>VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD</td> <td>&lt;2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 &gt;30</td> <td>&lt;0.25 0.25 TO 0.50 0.5 TO 1.0 1 TO 2 2 TO 4 &gt;4</td> </tr> </table>		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	<p>ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION</p> <p>SOIL SYMBOL</p> <p>ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT</p> <p>INFERRED SOIL BOUNDARY</p> <p>INFERRED ROCK LINE</p> <p>ALLUVIAL SOIL BOUNDARY</p> <p>DIP &amp; DIP DIRECTION OF ROCK STRUCTURES</p> <p>SOUNDING ROD</p> <p>SPT TEST BORING</p> <p>AUGER BORING</p> <p>CORE BORING</p> <p>MONITORING WELL</p> <p>PIEZOMETER INSTALLATION</p> <p>SLOPE INDICATOR INSTALLATION</p> <p>SPT N-VALUE</p> <p>SPT REFUSAL</p>		<p>VERY HARD - CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.</p> <p>HARD - CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.</p> <p>MODERATELY HARD - CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.</p> <p>MEDIUM HARD - CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.</p> <p>SOFT - CAN BE GROOVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.</p> <p>VERY SOFT - 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.</p>																																																																																																						
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		ABBREVIATIONS		EQUIPMENT USED ON SUBJECT PROJECT		FRACTURE SPACING																																																																																																																
<table border="1"> <tr> <th>U.S. STD. SIEVE SIZE OPENING (MM)</th> <th>4</th> <th>10</th> <th>40</th> <th>60</th> <th>200</th> <th>270</th> </tr> <tr> <td></td> <td>4.76</td> <td>2.00</td> <td>0.42</td> <td>0.25</td> <td>0.075</td> <td>0.053</td> </tr> </table>		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	<p>AR - AUGER REFUSAL</p> <p>BT - BORING TERMINATED</p> <p>CL - CLAY</p> <p>CPT - CONE PENETRATION TEST</p> <p>CSE - COARSE</p> <p>DMT - DILATOMETER TEST</p> <p>DPT - DYNAMIC PENETRATION TEST</p> <p>e - VOID RATIO</p> <p>F - FINE</p> <p>FOSS. - FOSSILIFEROUS</p> <p>FRAC. - FRACTURED, FRACTURES</p> <p>FRAGS. - FRAGMENTS</p> <p>HI. - HIGHLY</p> <p>MED. - MEDIUM</p> <p>MIC. - MICACEOUS</p> <p>MOD. - MODERATELY</p> <p>NP - NON PLASTIC</p> <p>ORG. - ORGANIC</p> <p>PMT - PRESSUREMETER TEST</p> <p>SAP. - SAPROLITIC</p> <p>SD. - SAND, SANDY</p> <p>SL. - SILT, SILTY</p> <p>SLI. - SLIGHTLY</p> <p>TCR - TRICONE REFUSAL</p> <p>w - MOISTURE CONTENT</p> <p>v - VERY</p> <p>VST - VANE SHEAR TEST</p> <p>WEA. - WEATHERED</p> <p>γ - UNIT WEIGHT</p> <p>γ<sub>d</sub> - DRY UNIT WEIGHT</p>		<p>DRILL UNITS:</p> <p>MOBILE B- _____</p> <p>BK-51 _____</p> <p>CME-45C _____</p> <p>CME-550 _____</p> <p>PORTABLE HOIST _____</p> <p>_____</p> <p>_____</p> <p>_____</p>		<p>ADVANCING TOOLS:</p> <p>CLAY BITS _____</p> <p>6" CONTINUOUS FLIGHT AUGER _____</p> <p>8" HOLLOW AUGERS _____</p> <p>HARD FACED FINGER BITS _____</p> <p>TUNG-CARBIDE INSERTS _____</p> <p>CASING w/ ADVANCER _____</p> <p>TRICONE _____ STEEL TEETH _____</p> <p>TRICONE _____ TUNG-CARB. _____</p> <p>CORE BIT _____</p> <p>_____</p> <p>_____</p>		<p>HAMMER TYPE:</p> <p>AUTOMATIC _____</p> <p>MANUAL _____</p> <p>CORE SIZE:</p> <p>B- _____</p> <p>N- _____</p> <p>H- _____</p> <p>HAND TOOLS:</p> <p>POST HOLE DIGGER _____</p> <p>HAND AUGER _____</p> <p>SOUNDING ROD _____</p> <p>VANE SHEAR TEST _____</p> <p>_____</p> <p>_____</p>		<p>VERY WIDE - MORE THAN 10 FEET</p> <p>WIDE - 3 TO 10 FEET</p> <p>MODERATELY CLOSE - 1 TO 3 FEET</p> <p>CLOSE - 0.16 TO 1 FEET</p> <p>VERY CLOSE - LESS THAN 0.16 FEET</p>																																																																																														
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																																																																																																																
SOIL MOISTURE - CORRELATION OF TERMS		EQUIPMENT USED ON SUBJECT PROJECT		FRACTURE SPACING		BEDDING																																																																																																																
<table border="1"> <tr> <th>SOIL MOISTURE SCALE (ATTERBERG LIMITS)</th> <th>FIELD MOISTURE DESCRIPTION</th> <th>GUIDE FOR FIELD MOISTURE DESCRIPTION</th> </tr> <tr> <td>LL - LIQUID LIMIT</td> <td>- SATURATED - (SAT.)</td> <td>USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE</td> </tr> <tr> <td>PL - PLASTIC LIMIT</td> <td>- WET - (W)</td> <td>SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE</td> </tr> <tr> <td>OM - OPTIMUM MOISTURE</td> <td>- MOIST - (M)</td> <td>SOLID; AT OR NEAR OPTIMUM MOISTURE</td> </tr> <tr> <td>SL - SHRINKAGE LIMIT</td> <td>- DRY - (D)</td> <td>REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE</td> </tr> </table>		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	<p>DRILL UNITS:</p> <p>MOBILE B- _____</p> <p>BK-51 _____</p> <p>CME-45C _____</p> <p>CME-550 _____</p> <p>PORTABLE HOIST _____</p> <p>_____</p> <p>_____</p> <p>_____</p>		<p>ADVANCING TOOLS:</p> <p>CLAY BITS _____</p> <p>6" CONTINUOUS FLIGHT AUGER _____</p> <p>8" HOLLOW AUGERS _____</p> <p>HARD FACED FINGER BITS _____</p> <p>TUNG-CARBIDE INSERTS _____</p> <p>CASING w/ ADVANCER _____</p> <p>TRICONE _____ STEEL TEETH _____</p> <p>TRICONE _____ TUNG-CARB. _____</p> <p>CORE BIT _____</p> <p>_____</p> <p>_____</p>		<p>HAMMER TYPE:</p> <p>AUTOMATIC _____</p> <p>MANUAL _____</p> <p>CORE SIZE:</p> <p>B- _____</p> <p>N- _____</p> <p>H- _____</p> <p>HAND TOOLS:</p> <p>POST HOLE DIGGER _____</p> <p>HAND AUGER _____</p> <p>SOUNDING ROD _____</p> <p>VANE SHEAR TEST _____</p> <p>_____</p> <p>_____</p>		<p>TERM</p> <p>VERY WIDE - MORE THAN 10 FEET</p> <p>WIDE - 3 TO 10 FEET</p> <p>MODERATELY CLOSE - 1 TO 3 FEET</p> <p>CLOSE - 0.16 TO 1 FEET</p> <p>VERY CLOSE - LESS THAN 0.16 FEET</p>																																																																																															
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		EQUIPMENT USED ON SUBJECT PROJECT		FRACTURE SPACING		BEDDING																																																																																																																
<table border="1"> <tr> <th>NONPLASTIC</th> <th>LOW PLASTICITY</th> <th>MED. PLASTICITY</th> <th>HIGH PLASTICITY</th> </tr> <tr> <td>0-5</td> <td>6-15</td> <td>16-25</td> <td>26 OR MORE</td> </tr> <tr> <th>PLASTICITY INDEX (PI)</th> <th colspan="3">DRY STRENGTH</th> </tr> <tr> <td></td> <td>VERY LOW</td> <td>SLIGHT</td> <td>MEDIUM</td> </tr> <tr> <td></td> <td>SLIGHT</td> <td>MEDIUM</td> <td>HIGH</td> </tr> </table>		NONPLASTIC	LOW PLASTICITY	MED. PLASTICITY	HIGH PLASTICITY	0-5	6-15	16-25	26 OR MORE	PLASTICITY INDEX (PI)	DRY STRENGTH				VERY LOW	SLIGHT	MEDIUM		SLIGHT	MEDIUM	HIGH	<p>DRILL UNITS:</p> <p>MOBILE B- _____</p> <p>BK-51 _____</p> <p>CME-45C _____</p> <p>CME-550 _____</p> <p>PORTABLE HOIST _____</p> <p>_____</p> <p>_____</p> <p>_____</p>		<p>ADVANCING TOOLS:</p> <p>CLAY BITS _____</p> <p>6" CONTINUOUS FLIGHT AUGER _____</p> <p>8" HOLLOW AUGERS _____</p> <p>HARD FACED FINGER BITS _____</p> <p>TUNG-CARBIDE INSERTS _____</p> <p>CASING w/ ADVANCER _____</p> <p>TRICONE _____ STEEL TEETH _____</p> <p>TRICONE _____ TUNG-CARB. _____</p> <p>CORE BIT _____</p> <p>_____</p> <p>_____</p>		<p>HAMMER TYPE:</p> <p>AUTOMATIC _____</p> <p>MANUAL _____</p> <p>CORE SIZE:</p> <p>B- _____</p> <p>N- _____</p> <p>H- _____</p> <p>HAND TOOLS:</p> <p>POST HOLE DIGGER _____</p> <p>HAND AUGER _____</p> <p>SOUNDING ROD _____</p> <p>VANE SHEAR TEST _____</p> <p>_____</p> <p>_____</p>		<p>TERM</p> <p>VERY WIDE - MORE THAN 10 FEET</p> <p>WIDE - 3 TO 10 FEET</p> <p>MODERATELY CLOSE - 1 TO 3 FEET</p> <p>CLOSE - 0.16 TO 1 FEET</p> <p>VERY CLOSE - LESS THAN 0.16 FEET</p>																																																																																										
NONPLASTIC	LOW PLASTICITY	MED. PLASTICITY	HIGH PLASTICITY																																																																																																																			
0-5	6-15	16-25	26 OR MORE																																																																																																																			
PLASTICITY INDEX (PI)	DRY STRENGTH																																																																																																																					
	VERY LOW	SLIGHT	MEDIUM																																																																																																																			
	SLIGHT	MEDIUM	HIGH																																																																																																																			
COLOR		EQUIPMENT USED ON SUBJECT PROJECT		FRACTURE SPACING		BEDDING																																																																																																																
<p>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.</p>		<p>DRILL UNITS:</p> <p>MOBILE B- _____</p> <p>BK-51 _____</p> <p>CME-45C _____</p> <p>CME-550 _____</p> <p>PORTABLE HOIST _____</p> <p>_____</p> <p>_____</p> <p>_____</p>		<p>ADVANCING TOOLS:</p> <p>CLAY BITS _____</p> <p>6" CONTINUOUS FLIGHT AUGER _____</p> <p>8" HOLLOW AUGERS _____</p> <p>HARD FACED FINGER BITS _____</p> <p>TUNG-CARBIDE INSERTS _____</p> <p>CASING w/ ADVANCER _____</p> <p>TRICONE _____ STEEL TEETH _____</p> <p>TRICONE _____ TUNG-CARB. _____</p> <p>CORE BIT _____</p> <p>_____</p> <p>_____</p>		<p>HAMMER TYPE:</p> <p>AUTOMATIC _____</p> <p>MANUAL _____</p> <p>CORE SIZE:</p> <p>B- _____</p> <p>N- _____</p> <p>H- _____</p> <p>HAND TOOLS:</p> <p>POST HOLE DIGGER _____</p> <p>HAND AUGER _____</p> <p>SOUNDING ROD _____</p> <p>VANE SHEAR TEST _____</p> <p>_____</p> <p>_____</p>		<p>TERM</p> <p>VERY WIDE - MORE THAN 10 FEET</p> <p>WIDE - 3 TO 10 FEET</p> <p>MODERATELY CLOSE - 1 TO 3 FEET</p> <p>CLOSE - 0.16 TO 1 FEET</p> <p>VERY CLOSE - LESS THAN 0.16 FEET</p>																																																																																																														
SOIL MOISTURE - CORRELATION OF TERMS		EQUIPMENT USED ON SUBJECT PROJECT		FRACTURE SPACING		BEDDING																																																																																																																
<table border="1"> <tr> <th>SOIL MOISTURE SCALE (ATTERBERG LIMITS)</th> <th>FIELD MOISTURE DESCRIPTION</th> <th>GUIDE FOR FIELD MOISTURE DESCRIPTION</th> </tr> <tr> <td>LL - LIQUID LIMIT</td> <td>- SATURATED - (SAT.)</td> <td>USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE</td> </tr> <tr> <td>PL - PLASTIC LIMIT</td> <td>- WET - (W)</td> <td>SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE</td> </tr> <tr> <td>OM - OPTIMUM MOISTURE</td> <td>- MOIST - (M)</td> <td>SOLID; AT OR NEAR OPTIMUM MOISTURE</td> </tr> <tr> <td>SL - SHRINKAGE LIMIT</td> <td>- DRY - (D)</td> <td>REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE</td> </tr> </table>		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	<p>DRILL UNITS:</p> <p>MOBILE B- _____</p> <p>BK-51 _____</p> <p>CME-45C _____</p> <p>CME-550 _____</p> <p>PORTABLE HOIST _____</p> <p>_____</p> <p>_____</p> <p>_____</p>		<p>ADVANCING TOOLS:</p> <p>CLAY BITS _____</p> <p>6" CONTINUOUS FLIGHT AUGER _____</p> <p>8" HOLLOW AUGERS _____</p> <p>HARD FACED FINGER BITS _____</p> <p>TUNG-CARBIDE INSERTS _____</p> <p>CASING w/ ADVANCER _____</p> <p>TRICONE _____ STEEL TEETH _____</p> <p>TRICONE _____ TUNG-CARB. _____</p> <p>CORE BIT _____</p> <p>_____</p> <p>_____</p>		<p>HAMMER TYPE:</p> <p>AUTOMATIC _____</p> <p>MANUAL _____</p> <p>CORE SIZE:</p> <p>B- _____</p> <p>N- _____</p> <p>H- _____</p> <p>HAND TOOLS:</p> <p>POST HOLE DIGGER _____</p> <p>HAND AUGER _____</p> <p>SOUNDING ROD _____</p> <p>VANE SHEAR TEST _____</p> <p>_____</p> <p>_____</p>		<p>TERM</p> <p>VERY WIDE - MORE THAN 10 FEET</p> <p>WIDE - 3 TO 10 FEET</p> <p>MODERATELY CLOSE - 1 TO 3 FEET</p> <p>CLOSE - 0.16 TO 1 FEET</p> <p>VERY CLOSE - LESS THAN 0.16 FEET</p>																																																																																															
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		EQUIPMENT USED ON SUBJECT PROJECT		FRACTURE SPACING		BEDDING																																																																																																																
<table border="1"> <tr> <th>NONPLASTIC</th> <th>LOW PLASTICITY</th> <th>MED. PLASTICITY</th> <th>HIGH PLASTICITY</th> </tr> <tr> <td>0-5</td> <td>6-15</td> <td>16-25</td> <td>26 OR MORE</td> </tr> <tr> <th>PLASTICITY INDEX (PI)</th> <th colspan="3">DRY STRENGTH</th> </tr> <tr> <td></td> <td>VERY LOW</td> <td>SLIGHT</td> <td>MEDIUM</td> </tr> <tr> <td></td> <td>SLIGHT</td> <td>MEDIUM</td> <td>HIGH</td> </tr> </table>		NONPLASTIC	LOW PLASTICITY	MED. PLASTICITY	HIGH PLASTICITY	0-5	6-15	16-25	26 OR MORE	PLASTICITY INDEX (PI)	DRY STRENGTH				VERY LOW	SLIGHT	MEDIUM		SLIGHT	MEDIUM	HIGH	<p>DRILL UNITS:</p> <p>MOBILE B- _____</p> <p>BK-51 _____</p> <p>CME-45C _____</p> <p>CME-550 _____</p> <p>PORTABLE HOIST _____</p> <p>_____</p> <p>_____</p> <p>_____</p>		<p>ADVANCING TOOLS:</p> <p>CLAY BITS _____</p> <p>6" CONTINUOUS FLIGHT AUGER _____</p> <p>8" HOLLOW AUGERS _____</p> <p>HARD FACED FINGER BITS _____</p> <p>TUNG-CARBIDE INSERTS _____</p> <p>CASING w/ ADVANCER _____</p> <p>TRICONE _____ STEEL TEETH _____</p> <p>TRICONE _____ TUNG-CARB. _____</p> <p>CORE BIT _____</p> <p>_____</p> <p>_____</p>		<p>HAMMER TYPE:</p> <p>AUTOMATIC _____</p> <p>MANUAL _____</p> <p>CORE SIZE:</p> <p>B- _____</p> <p>N- _____</p> <p>H- _____</p> <p>HAND TOOLS:</p> <p>POST HOLE DIGGER _____</p> <p>HAND AUGER _____</p> <p>SOUNDING ROD _____</p> <p>VANE SHEAR TEST _____</p> <p>_____</p> <p>_____</p>		<p>TERM</p> <p>VERY WIDE - MORE THAN 10 FEET</p> <p>WIDE - 3 TO 10 FEET</p> <p>MODERATELY CLOSE - 1 TO 3 FEET</p> <p>CLOSE - 0.16 TO 1 FEET</p> <p>VERY CLOSE - LESS THAN 0.16 FEET</p>																																																																																										
NONPLASTIC	LOW PLASTICITY	MED. PLASTICITY	HIGH PLASTICITY																																																																																																																			
0-5	6-15	16-25	26 OR MORE																																																																																																																			
PLASTICITY INDEX (PI)	DRY STRENGTH																																																																																																																					
	VERY LOW	SLIGHT	MEDIUM																																																																																																																			
	SLIGHT	MEDIUM	HIGH																																																																																																																			
COLOR		EQUIPMENT USED ON SUBJECT PROJECT		FRACTURE SPACING		BEDDING																																																																																																																
<p>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.</p>		<p>DRILL UNITS:</p> <p>MOBILE B- _____</p> <p>BK-51 _____</p> <p>CME-45C _____</p> <p>CME-550 _____</p> <p>PORTABLE HOIST _____</p> <p>_____</p> <p>_____</p> <p>_____</p>		<p>ADVANCING TOOLS:</p> <p>CLAY BITS _____</p> <p>6" CONTINUOUS FLIGHT AUGER _____</p> <p>8" HOLLOW AUGERS _____</p> <p>HARD FACED FINGER BITS _____</p> <p>TUNG-CARBIDE INSERTS _____</p> <p>CASING w/ ADVANCER _____</p> <p>TRICONE _____ STEEL TEETH _____</p> <p>TRICONE _____ TUNG-CARB. _____</p> <p>CORE BIT _____</p> <p>_____</p> <p>_____</p>		<p>HAMMER TYPE:</p> <p>AUTOMATIC _____</p> <p>MANUAL _____</p> <p>CORE SIZE:</p> <p>B- _____</p> <p>N- _____</p> <p>H- _____</p> <p>HAND TOOLS:</p> <p>POST HOLE DIGGER _____</p> <p>HAND AUGER _____</p> <p>SOUNDING ROD _____</p> <p>VANE SHEAR TEST _____</p> <p>_____</p> <p>_____</p>		<p>TERM</p> <p>VERY WIDE - MORE THAN 10 FEET</p> <p>WIDE - 3 TO 10 FEET</p> <p>MODERATELY CLOSE - 1 TO 3 FEET</p> <p>CLOSE - 0.16 TO 1 FEET</p> <p>VERY CLOSE - LESS THAN 0.16 FEET</p>																																																																																																														
SOIL MOISTURE - CORRELATION OF TERMS		EQUIPMENT USED ON SUBJECT PROJECT		FRACTURE SPACING		BEDDING																																																																																																																
<table border="1"> <tr> <th>SOIL MOISTURE SCALE (ATTERBERG LIMITS)</th> <th>FIELD MOISTURE DESCRIPTION</th> <th>GUIDE FOR FIELD MOISTURE DESCRIPTION</th> </tr> <tr> <td>LL - LIQUID LIMIT</td> <td>- SATURATED - (SAT.)</td> <td>USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE</td> </tr> <tr> <td>PL - PLASTIC LIMIT</td> <td>- WET - (W)</td> <td>SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE</td> </tr> <tr> <td>OM - OPTIMUM MOISTURE</td> <td>- MOIST - (M)</td> <td>SOLID; AT OR NEAR OPTIMUM MOISTURE</td> </tr> <tr> <td>SL - SHRINKAGE LIMIT</td> <td>- DRY - (D)</td> <td>REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE</td> </tr> </table>		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	<p>DRILL UNITS:</p> <p>MOBILE B- _____</p> <p>BK-51 _____</p> <p>CME-45C _____</p> <p>CME-550 _____</p> <p>PORTABLE HOIST _____</p> <p>_____</p> <p>_____</p> <p>_____</p>		<p>ADVANCING TOOLS:</p> <p>CLAY BITS _____</p> <p>6" CONTINUOUS FLIGHT AUGER _____</p> <p>8" HOLLOW AUGERS _____</p> <p>HARD FACED FINGER BITS _____</p> <p>TUNG-CARBIDE INSERTS _____</p> <p>CASING w/ ADVANCER _____</p> <p>TRICONE _____ STEEL TEETH _____</p> <p>TRICONE _____ TUNG-CARB. _____</p> <p>CORE BIT _____</p> <p>_____</p> <p>_____</p>		<p>HAMMER TYPE:</p> <p>AUTOMATIC _____</p> <p>MANUAL _____</p> <p>CORE SIZE:</p> <p>B- _____</p> <p>N- _____</p> <p>H- _____</p> <p>HAND TOOLS:</p> <p>POST HOLE DIGGER _____</p>																																																																																																	
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																																																																																																																				



STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY  
GOVERNOR

LYNDO TIPPETT  
SECRETARY

7 September, 2006

STATE PROJECT: 33549.1.1 (B-4042)  
F. A. PROJECT: BRZ-1002(9)  
COUNTY: Mitchell

DESCRIPTION: Bridge No. 110 on SR 1002, Crabtree Creek Road

SUBJECT: Geotechnical Report – Foundation Investigation

**Introduction**

This project is located in southwestern Mitchell County, approximately 4.2 miles south of the intersection of SR 1002 and US 19E. The existing single span bridge is to be replaced with a single span structure. The length will be 70.0 feet; the skew is 60 degrees.

The subsurface investigation was conducted using a CME-550 drill machine with -N- casing and advancer. Standard Penetration Tests were performed at intervals of 5.0 feet using an automatic drop hammer. Soil samples were collected and submitted for testing of quality.

**Geology and Rock Characteristics**

Underlying rock types from the Geologic Map of North Carolina (1985) are Zaba and Zabg, both gneiss units which are well foliated to equigranular and range from micaceous muscovite and biotite gneiss to dark amphibolite gneiss.

**Foundation Materials**

End Bent One

The existing embankment on the left consists of 7 – 8' of very loose silty sand placed on 2.5' of alluvium. A thin veneer, 0.8', of weathered rock grades quickly into fresh rock. Alluvium pinches out across the abutment with the right side consisting of 6 – 7' of silty sand embankment resting on 1.5' of weathered rock, then grading quickly into fresh rock.

3/14

Static groundwater levels were measured at 8.6' (elevation 2937) in EB1-A, and 4.5' (elevation 2940.9) in EB1-B.

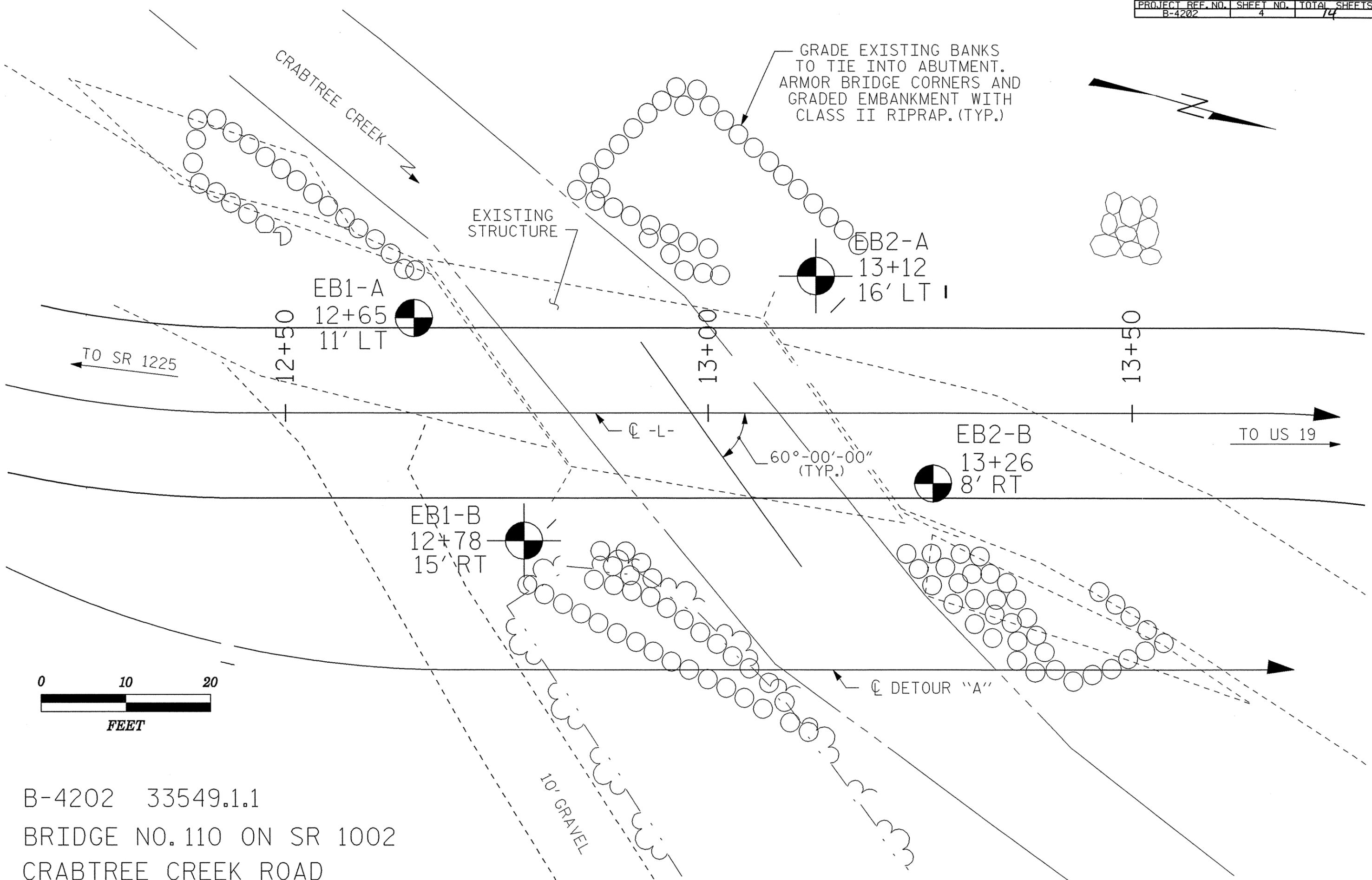
End Bent Two

The existing embankment across this abutment consists of about 6.5 feet, left, to 8.0', right of loose silty sand. Boring EB2-A shows embankment over silty sand saprolite to el. 2931.8. This grades immediately into fresh rock with very little to no weathered rock horizon. Boring EB2-B shows silty sand resting on alluvium at el. 2937.5. Alluvium is 4.0' thick and pinches out from right to left across the abutment. Alluvium rests abruptly on rock at depth 11.6' (el. 2933.5)

Static groundwater was measured in EB2-A at 5.8'(elevation 2940) and in EB2-B at 9.0' (elevation 2936.3).

Respectfully Submitted,

Jody C. Kuhne, PG, PE  
Project Geological Engineer

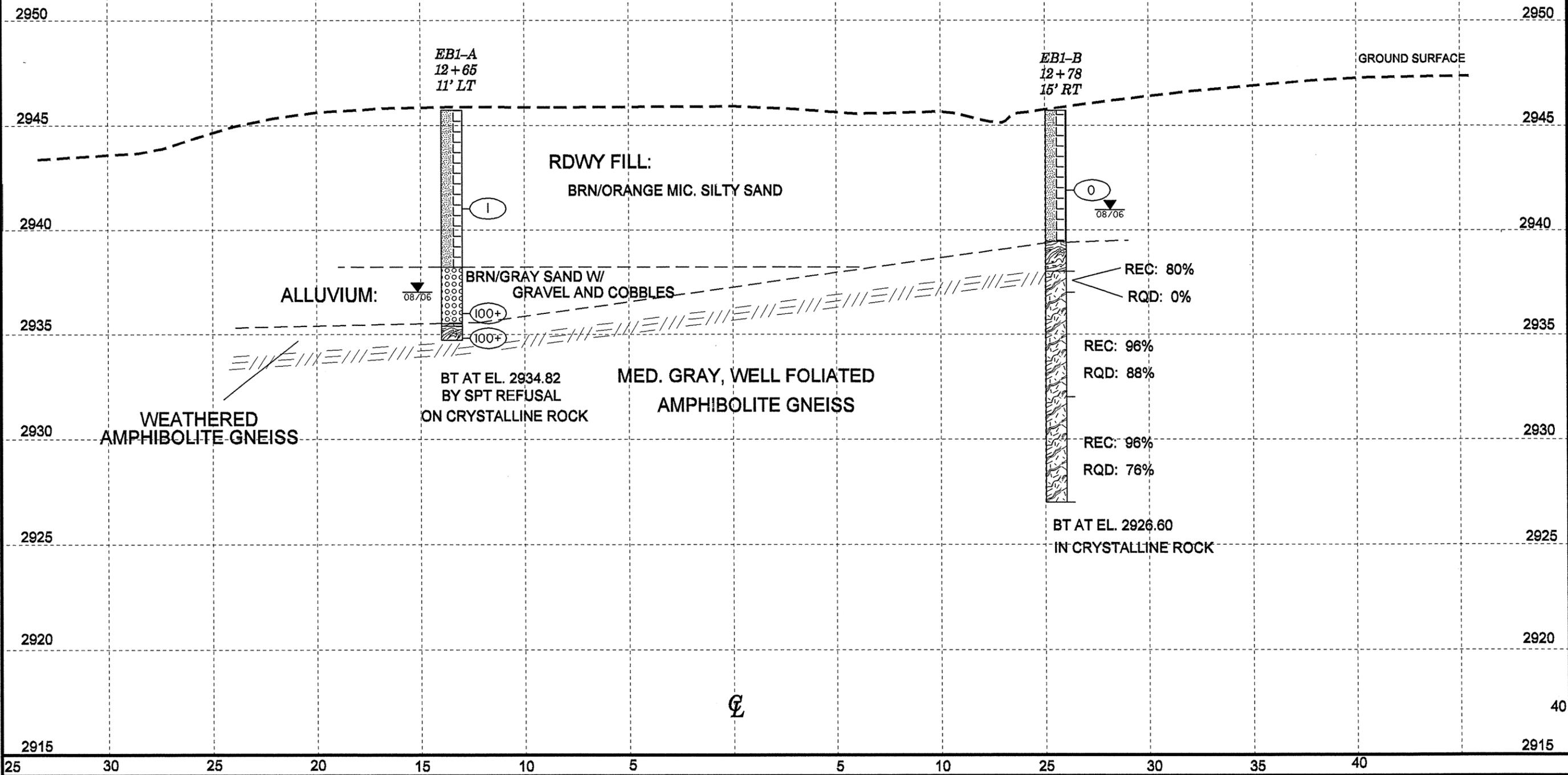


B-4202 33549.1.1  
 BRIDGE NO. 110 ON SR 1002  
 CRABTREE CREEK ROAD

33549.1.1 B-4202  
 BRIDGE NO. 110 ON SR 1002  
 CRABTREE CREEK ROAD  
 MITCHELL CO.  
 SECTION THROUGH EB-1

 FEET VE = 1	PROJECT REFERENCE NO.	SHEET
	33549.1.1	5   14
B-4202		

SKEW = 90

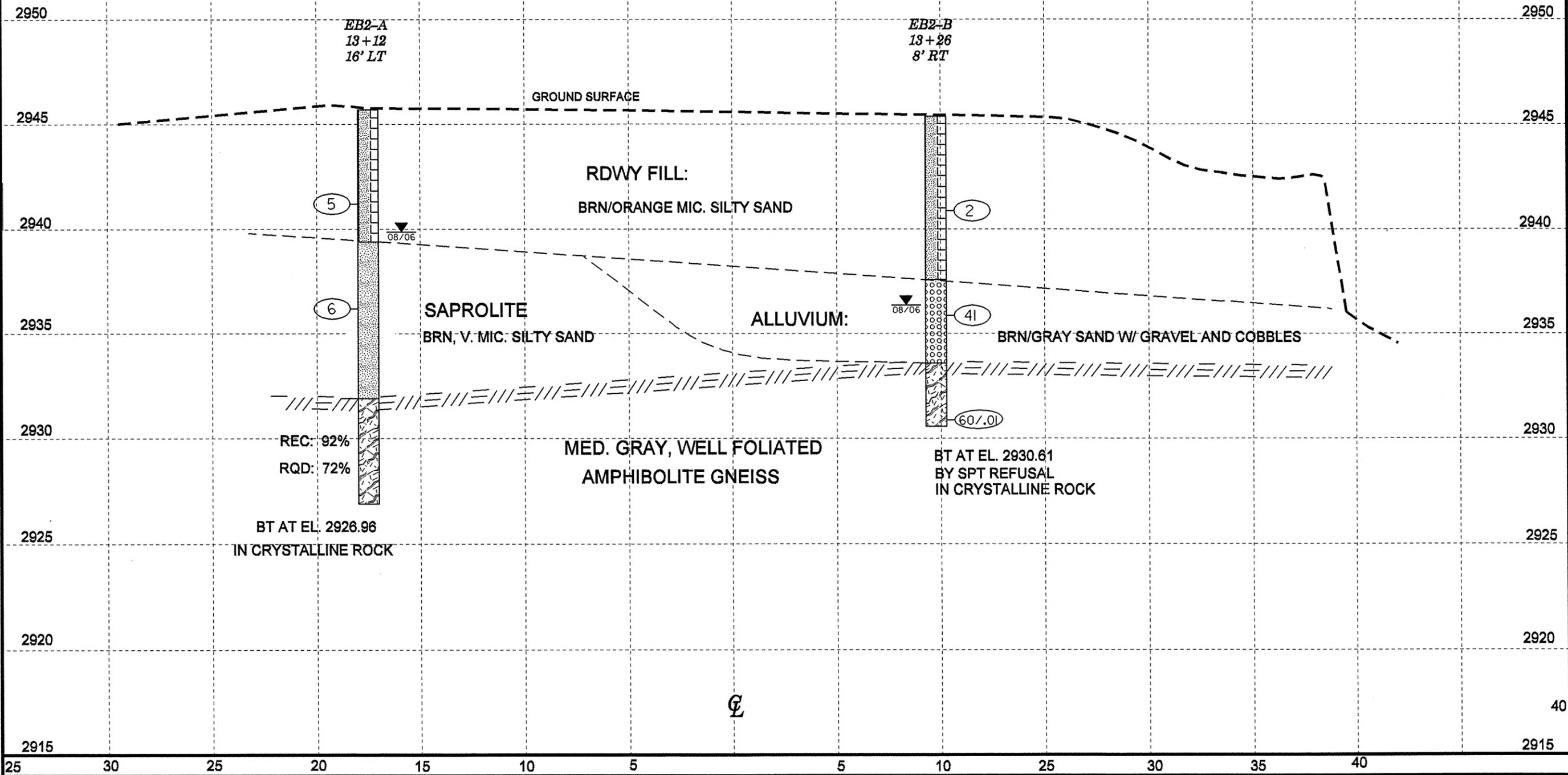


Ⓢ

33549.1.1 B-4202  
 BRIDGE NO. 110 ON SR 1002  
 CRABTREE CREEK ROAD  
 MITCHELL CO.  
 SECTION THROUGH EB-2

	PROJECT REFERENCE NO.	SHEET
	33549.1.1	6/14
B-4202		

SKEW = 90



Ⓢ



**NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
GEOTECHNICAL UNIT BORING LOG**

SHEET 8 OF 14

DATE 3-Sep-06

PROJECT NO 33549.1.1	ID B-4202	COUNTY MITCHELL	GEOLOGIST MM HAGER
SITE DESCRIPTION BRIDGE NO. 110 ON SR 1002, CRABTREE CR. ROAD			GND WATER
BORING NO EB1B	NORTHING 779867.00	EASTING 1071958.00	0 HR N/A
ALIGNMENT -L-	BORING LOCATION 12+78.000	OFFSET 15.00ft RT	24 HR 4.60ft
COLLAR ELEV 2945.30ft	TOTAL DEPTH 18.70ft	START DATE 8/09/06	COMPLETION DATE 08/09/06
DRILL MACHINE CME-550	DRILL METHOD SPT CORE BORING	HAMMER TYPE AUTOMATIC	
SURFACE WATER DEPTH		DEPTH TO ROCK 7.70ft	Log EB1B, Page 1 of 1

ELEV	DEPTH	BLOW CT			PEN (ft)	BLOWS PER FOOT					SAMPLE NO	LOG	SOIL AND ROCK DESCRIPTION	
		6in	6in	6in		0	25	50	75	100				
2945.30														Ground Surface
2940.00	3.80	0	0	0	1.0	0								RDWY FILL: BRN/ORANGE MIC. SILTY SAND
2930.00														WEATHERED ROCK: WEATHERED AMPHIBOLITE GNEISS
2926.60														CRYSTALLINE ROCK: MED. GRAY WELL FOLIATED AMPHIBOLITE GNEISS REC: 80% RQD: 0%
														AS ABOVE: MED. GRAY, WELL FOLIATED AMPHIBOLITE GNEISS REC: 96% RQD: 88%
														AS ABOVE: MED. GRAY, WELL FOLIATED AMPHIBOLITE GNEISS REC: 96% RQD: 76%
														TERMINATED IN CRYSTALLINE ROCK AT 18.7'

**CORE BORING REPORT**

PROJECT: 33549.1.1 I. D. NO: B-4202 BORING NO: EB1-B GEOLOGIST: MM HAGER

DESCRIPTION: BRIDGE NO. 110 ON SR 1002, CRABTREE CREEK ROAD

COUNTY: MITCHELL COLLAR ELEVATION: 0.0 FT. TOTAL DEPTH: 18.7 FT.

ELEV. (FEET)	DEPTH (FEET)	DRILL RATE MIN./FT.	RUN (FEET)	REC. FEET %	RQD. FEET %	SAMP. #	FIELD CLASSIFICATION AND REMARKS
-7.7	7.7		1.0	0.8	0.0		MED. TO DK. GRAY, WELL FOLIATED, FINE GRAINED AMPHIBOLITE GNEISS
-8.7	8.7			80	0		
-8.7	8.7		5.0	4.8	4.4		MED. TO DK. GRAY, WELL FOLIATED, FINE GRAINED AMPHIBOLITE GNEISS
-13.7	13.7			96	88		
-13.7	13.7		5.0	4.8	3.8		MED. TO DK. GRAY, WELL FOLIATED, FINE GRAINED AMPHIBOLITE GNEISS
-18.7	18.7			96	76		

CORING TERMINATED AT ELEVATION -18.7 FT.

DRILLER: GK ROSE CORE SIZE: NXWL EQUIPMENT: CME-550







**FIELD  
 SCOUR REPORT**

WBS: 33549.1.1 TIP: B-4202 COUNTY: MITCHELL

DESCRIPTION(1): B-4202 BRIDGE NO. 110 ON SR 1002, CRABTREE CREEK ROAD

**EXISTING BRIDGE**

Information from: Field Inspection XX Microfilm \_\_\_\_\_ (reel \_\_\_\_\_ pos: \_\_\_\_\_)  
 Other (explain) HYDRO REPT

Bridge No.: 110 Length: 40' Total Bents: 2 Bents in Channel: 2 Bents in Floodplain: \_\_\_\_\_  
 Foundation Type: WINGWALL ABUTMENTS ON SPREAD FOOTINGS

**EVIDENCE OF SCOUR(2)**

Abutments or End Bent Slopes: MILD ALLUVIAL SCOUR, TOE HAS BEEN REPAIRED RECENTLY

Interior Bents: NA  
NA

Channel Bed: NA

Channel Bank: NA

**EXISTING SCOUR PROTECTION**

Type(3): WINGWALLS

Extent(4): \_\_\_\_\_

Effectiveness(5): APPEARS EFFECTIVE

Obstructions(6): NONE

**INSTRUCTIONS**

- 1 Describe the specific site's location, including route number and body of water crossed.
- 2 Note scour evidence at existing end bents or abutments (e.g. undermining, sloughing, degradations).
- 3 Note existing scour protection (e.g. rip rap).
- 4 Describe extent of existing scour protection.
- 5 Describe whether or not the scour protection appears to be working.
- 6 Note obstructions such as dams, fallen trees, debris at bents, etc.
- 7 Describe the channel bed material based on observation and/or samples. Include any lab results with report.
- 8 Describe the channel bank material based on observation and/or samples. Include any lab results with report.
- 9 Describe the material covering the banks (e.g. grass, trees, rip rap, none).
- 10 Determine the approximate floodplain width from field observation or a topographic map.
- 11 Describe the material covering the floodplain (e.g. grass, trees, crops).
- 12 Use professional judgement to specify if the stream is degrading, aggrading, or static.
- 13 Describe potential and direction of the stream to migrate laterally during the bridge's life (approx. 100 years).
- 14 Give the design scour elevation (DSE) expected over the life of the bridge (approx. 100 years). This elevation can be given as a range across the site, or for each bent. Discuss the relationship between the Hydraulics Unit theoretical scour and the DSE. If the DSE is dependent on scour counter measures, explain (e.g. rip rap armoring on slopes). The DSE is based on the erodability of materials, giving consideration to the influence of joints, foliation, bedding characteristics, % core recovery, % RQD, differential weathering, shear strength, observations at existing structures, other tests deemed appropriate, and overall geologic conditions at the site.

**DESIGN INFORMATION**

Channel Bed Material(7): SILTY SAND W/ GRAVEL AND COBBLES

Channel Bank Material(8): SAME AS CHANNEL BED

Channel Bank Cover(9): TREES, SHRUBS

Floodplain Width(10): 50'

Floodplain Cover(11): TREES, SHRUBS

Stream is(12): Aggrading \_\_\_\_\_ Degrading \_\_\_\_\_ Static XX

Channel Migration Tendency(13): 15' TO THE WEST

Observations and Other Comments: \_\_\_\_\_

**DESIGN SCOUR ELEVATIONS(14)**

Feet XX Meters \_\_\_\_\_

		BENTS											
		EB1	EB2										
LEFT	2934.3	2931.6											
RIGHT	2937.6	2933.1											

Comparison of DSE to Hydraulics Unit theoretical scour:

EB1 DSE 23' HIGHER THAN HYDRO - ROCK ENCOUNTERED

EB2 DSE 26' HIGHER THAN HYDRO - ROCK ENCOUNTERED

**SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL**

Bed or Bank										
Sample No.										
Retained #4										
Passed #10										
Passed #40										
Passed #200										
Coarse Sand										
Fine Sand										
Silt										
Clay										
LL										
PI										
AASHTO										
Station										
Offset										
Depth										

Template Revised 02/07/06

Reported by: Jody [Signature]

Date: 9/13/06

JCS  
**NORTH CAROLINA DEPARTMENT OF TRANSPORTATION**  
**DIVISION OF HIGHWAYS-MATERIALS AND TESTS UNIT**  
**SOILS TEST REPORT-SOILS LABORATORY**

T.I.P. ID #: --

REPORT ON SAMPLES OF: Soils for Quality

PROJECT:	33549.1.1	COUNTY:		Owner:	--
DATE SAMPLED:	8.10.06	DATE RECEIVED:	9.5.06	DATE REPORTED:	9.8.06
SAMPLED FROM:		SAMPLED BY:	J. C. Kuhne		
SUBMITTED BY:	W. D. Frye	2002	STANDARD SPECIFICATION		
LABORATORY:	Asheville				

**TEST RESULTS**

Project Sample No.	SS-1	SS-2	SS-3	SS-5	SS-6
Lab Sample No. A	153547	153548	153549	153551	153552
HiCAMS Sample #	--	--	--	--	--
Retained #4 Sieve %	0.0	0.0	0.0	0.0	0.0
Passing #10 Sieve %	95	85	96	99	42
Passing #40 Sieve %	90	77	67	92	30
Passing #200 Sieve %	31	19	15	22	11

**MINUS #10 FRACTION**

Soil Mortar - 100%					
Coarse Sand -Ret. #60	19	30	55	25	44
Fine Sand - Ret. #270	56	55	34	58	36
Silt 0.05-0.005 mm %	21	13	11	15	16
Clay < 0.005 mm %	4	2	0	2	4
Passing # 40 Sieve %	--	--	--	--	--
Passing # 200 Sieve %	--	--	--	--	--

Liquid Limit	35	40	40	37	38
Plastic Index	NP	NP	NP	NP	NP
AASHTO Classification	A-2-4 (0)	A-2-4 (0)	A-2-4 (0)	A-2-4 (0)	A-1-a (0)
Quantity					
Texture					
Station	13+12	13+12	19+49	20+21.5	19+49.5
Hole No.					
Depth (ft) From:	5.0	10.0	5.3	5.3	4.8
To:					

**Remarks:**

A-153547 - 153554

**CC:**

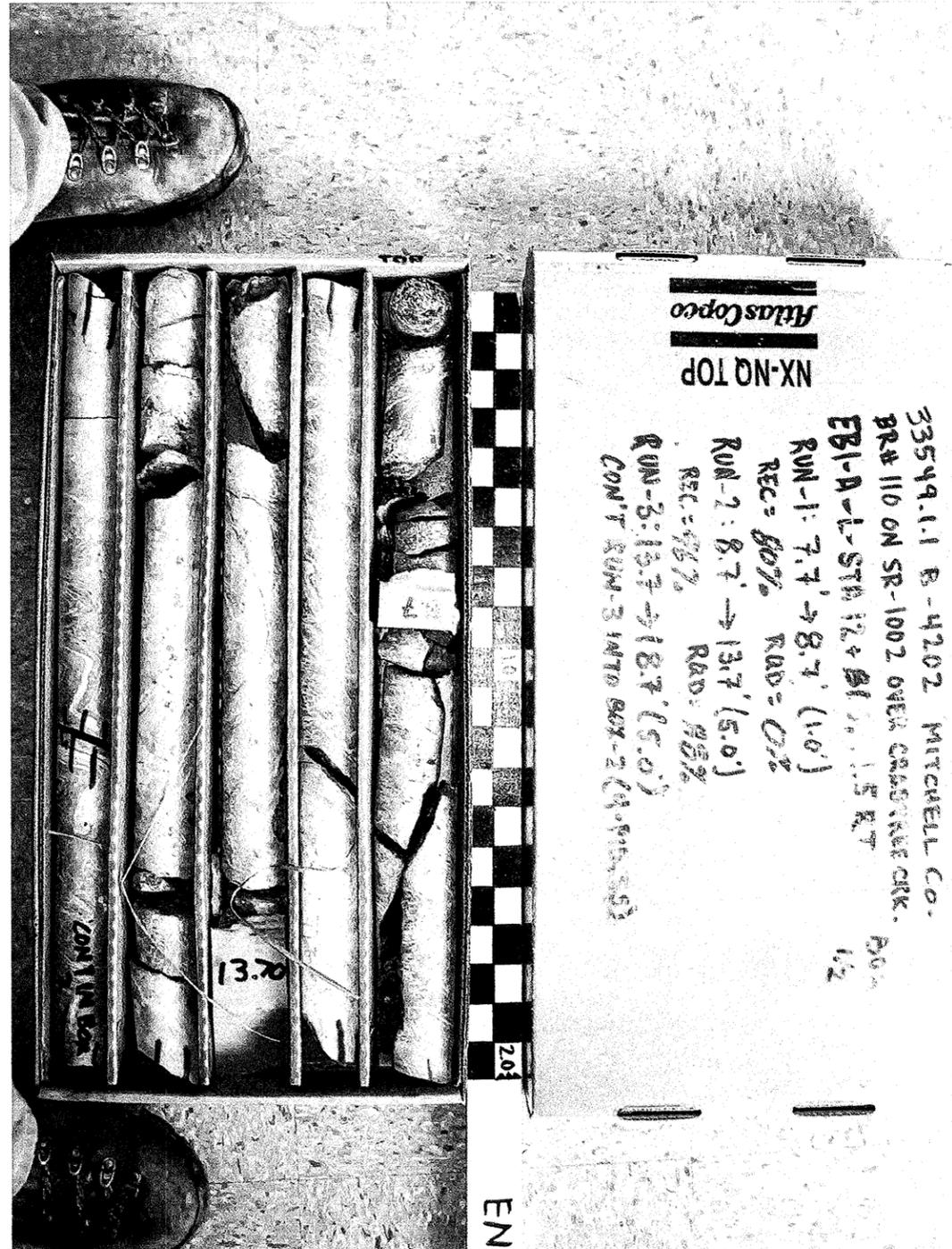
J. C. Kuhne

File

SOILS ENGINEER:

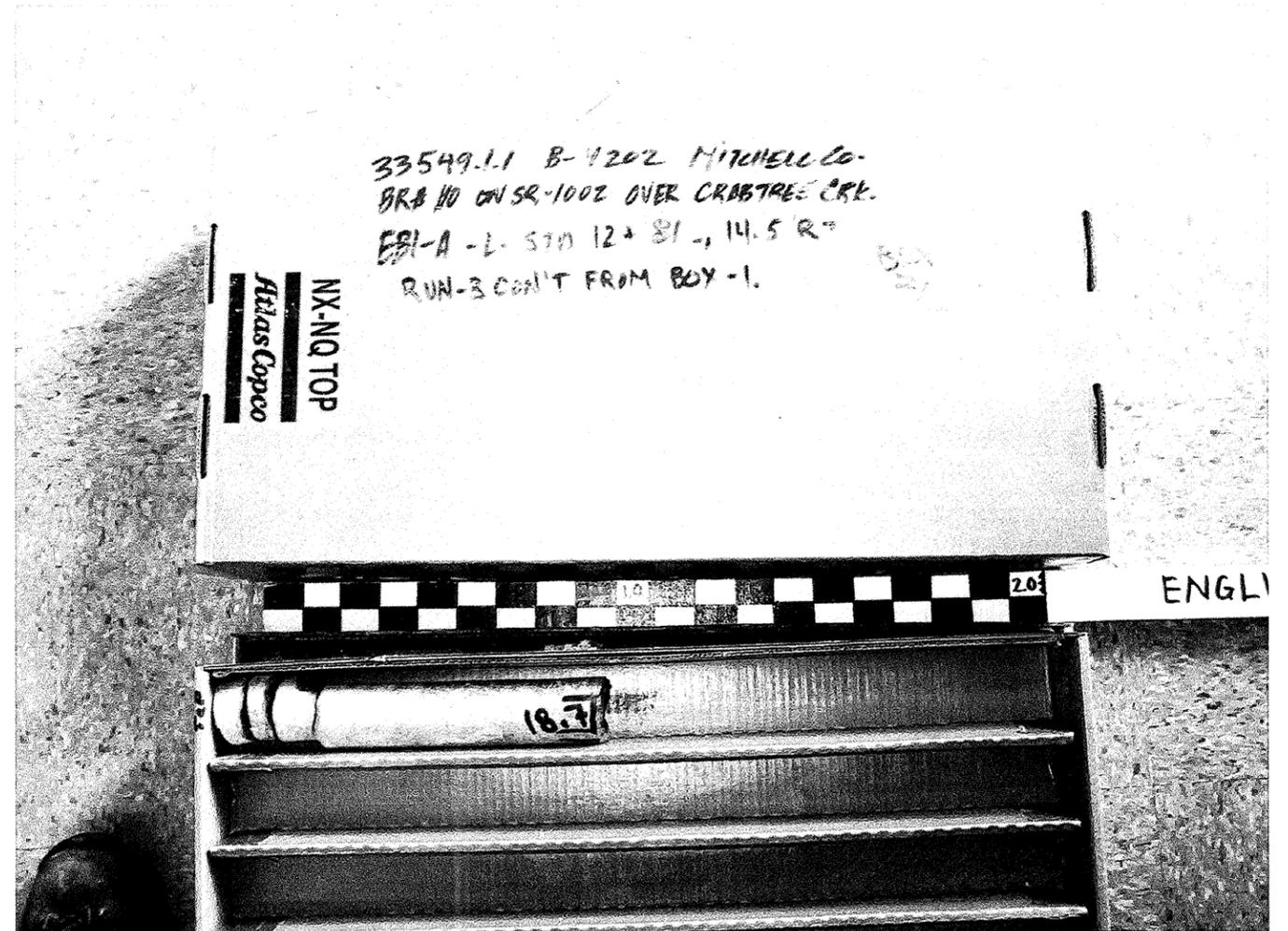
B-4202, 33549.1.1  
BRIDGE NO. 110, SR 1002 OVER CRABTREE CREEK  
BORING EB1-A

DEPTH: 7.7' - 17.7'



B-4202, 33549.1.1  
BRIDGE NO. 110, SR 1002 OVER CRABTREE CREEK  
BORING EB1-A

DEPTH: 17.7' - 18.7'



B-4202, 33549.1.1  
BRIDGE NO. 110, SR 1002 OVER CRABTREE CREEK  
BORING EB2-A

DEPTH: 13.8' - 18.8'

