

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

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	33002.1.1 (B-3343)	1	

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STRUCTURE
SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 33002.1.1 (B-3343) F.A. PROJ. BRZ-1318(8)
 COUNTY HAYWOOD
 PROJECT DESCRIPTION BRIDGE NO. 48 ON SR-1318 (HEMPHILL RD.)
OVER HEMPHILL CREEK

SITE DESCRIPTION _____

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PERSONNEL
M.M. HAGER

D.O. CHEEK

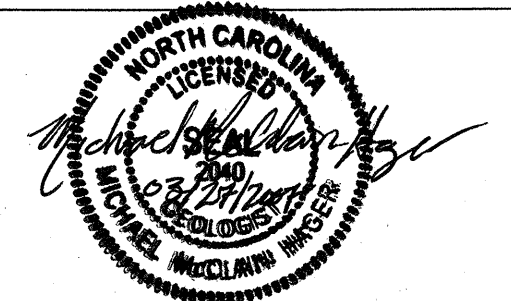
G.K. ROSE

INVESTIGATED BY **M.M. HAGER**

CHECKED BY **W.D. FRYE JR.**

SUBMITTED BY **W.D. FRYE, JR.**

DATE **03/27/2007**



PROJECT: 33002.1.1 ID: B-3343

DRAWN BY: **M.M. HAGER**

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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION





DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

PROJECT REFERENCE NO. 33002.11(B-3343)	SHEET NO. 2
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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 (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, HEAVY 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. ANGULARITY OF GRAINS THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.		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.		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 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 (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 REPLACED 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 (SPEC) - 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.					
SOIL LEGEND AND AASHTO CLASSIFICATION		MINERALOGICAL COMPOSITION		WEATHERING							
GENERAL CLASS. GRANULAR MATERIALS (<= 35% PASSING #200) SILT-CLAY MATERIALS (> 35% PASSING #200) ORGANIC MATERIALS		MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.		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. <i>IF TESTED, YIELDS SPT N VALUES > 100 BPF</i> SEVERE (SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. <i>IF TESTED, YIELDS SPT N VALUES > 100 BPF</i> VERY SEVERE (V SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. <i>IF TESTED, YIELDS SPT N VALUES < 100 BPF</i> COMPLETE ROCK REDUCED TO SOIL, ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.		COMPRESSION 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			
GROUP CLASS. A-1, A-1-b, A-2, A-2-4, A-2-5, A-2-6, A-2-7, A-4, A-5, A-6, A-7, A-7-5, A-7-6, A-3, A-4, A-5, A-6, A-7		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							
SYMBOL		SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		MISCELLANEOUS SYMBOLS							
% PASSING # 10 # 40 # 200		GROUP INDEX		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					
LIQUID LIMIT PLASTIC INDEX		USUAL TYPES OF MAJOR MATERIALS		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							
GROUP INDEX		GEN. RATING AS A SUBGRADE		ABBREVIATIONS							
PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		EXCELLENT TO GOOD FAIR TO POOR FAIR TO POOR POOR UNSUITABLE		AR - AUGER REFUSAL BT - BORING TERMINATED CL - CLAY CPT - CONE PENETRATION TEST CSE - COARSE DMT - DILATOMETER TEST DPT - DYNAMIC PENETRATION TEST e - VOID RATIO F - FINE FOSS. - FOSSILIFEROUS FRAC. - FRACTURED, FRACTURES FRAGS. - FRAGMENTS HL - HIGHLY MED. - MEDIUM MICA - MICACEOUS MOD. - MODERATELY NP - NON PLASTIC ORG. - ORGANIC PMT - PRESSUREMETER TEST SAP. - SAPROLITIC SD. - SAND, SANDY SL. - SILT, SILTY SLI. - SLIGHTLY TCR - TRICONE REFUSAL w - MOISTURE CONTENT v - VERY VST - VANE SHEAR TEST WEA. - WEATHERED % - UNIT WEIGHT %d - DRY UNIT WEIGHT							
CONSISTENCY OR DENSENESS		TEXTURE OR GRAIN SIZE		EQUIPMENT USED ON SUBJECT PROJECT		INDURATION					
PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²)		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		DRILL UNITS: <input type="checkbox"/> MOBILE B- <input type="checkbox"/> BK-51 <input type="checkbox"/> CME-45C <input checked="" type="checkbox"/> CME-550 <input type="checkbox"/> PORTABLE MOIST		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.					
GENERALLY GRANULAR MATERIAL (NON-COHESIVE) VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE		BOULDER (BLDR.) COBBLE (COB.) GRAVEL (GR.) COARSE SAND (CSE, SD.) FINE SAND (F SD.) SILT (SL.) CLAY (CL.)		<input type="checkbox"/> ADVANCING TOOLS: <input type="checkbox"/> CLAY BITS <input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER <input type="checkbox"/> 6" HOLLOW AUGERS <input type="checkbox"/> HARD FACED FINGER BITS <input type="checkbox"/> TUNG-CARBIDE INSERTS <input checked="" type="checkbox"/> CASING <input checked="" type="checkbox"/> w/ ADVANCER <input type="checkbox"/> TRICONE " " STEEL TEETH <input type="checkbox"/> TRICONE " " TUNG-CARB. <input type="checkbox"/> CORE BIT		ROCK HARDNESS VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK, BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK. HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY, HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN. MODERATELY HARD CAN BE SCRATCHED BY KNIFE OR PICK, GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS. MEDIUM HARD CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK. SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE. VERY SOFT CAN BE CARVED WITH KNIFE, CAN BE EXCAVATED READILY WITH POINT OF PICK, PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGER NAIL.					
GENERALLY SILT-CLAY MATERIAL (COHESIVE) VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD		GRAIN SIZE MM 305 75 2.0 0.25 0.05 0.005 IN. 12 3		<input type="checkbox"/> HAMMER TYPE: <input checked="" type="checkbox"/> AUTOMATIC <input type="checkbox"/> MANUAL <input type="checkbox"/> -B <input type="checkbox"/> -N <input type="checkbox"/> -H <input type="checkbox"/> HAND TOOLS: <input type="checkbox"/> POST HOLE DIGGER <input type="checkbox"/> HAND AUGER <input type="checkbox"/> SOUNDING ROD <input type="checkbox"/> VANE SHEAR TEST		FRACURE SPACING 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 BEDDING 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					
SOIL MOISTURE - CORRELATION OF TERMS		SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION		INDURATION							
LL LIQUID LIMIT - SATURATED - (SAT.) USUALLY LIQUID, VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE		PLASTIC RANGE (PI) 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		NONPLASTIC LOW PLASTICITY MED. PLASTICITY HIGH PLASTICITY									
PLASTICITY INDEX (PI) DRY STRENGTH		0-5 VERY LOW 6-15 SLIGHT 16-25 MEDIUM 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.									
						BENCH MARK: BM #2- CHISEL SQUARE ON NE WINGWALL 35.94' RT OF -BL- STA 13+23.12 ELEVATION: 2797.93' FT.					
						NOTES:					



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY
GOVERNOR

LYNDO TIPPETT
SECRETARY

March 27, 2007

STATE PROJECT: 33002.1.1 (B-3343)
FA PROJECT: BRZ-1318 (8)

COUNTY: Haywood

DESCRIPTION: Replace Bridge No. 48 over Hemphill Creek on SR 1318
at -L- Station 14+92.5

SUBJECT: Geotechnical Report- Inventory

Project Description

A full subsurface investigation for the purpose of replacing Haywood County bridge number 48 was conducted by the Asheville Geotechnical Engineering Unit Field Office March 5th through the 9th, 2007. The project is located on SR-1318 (Hemphill Rd.), 1.7 miles west of the intersection with US-276 (Jonathan Creek Rd.), and approximately 4 miles northeast of the town of Maggie Valley, NC in Haywood County. Four test borings were drilled at the approximate proposed end bent corner locations for the purpose of preliminary foundation design investigation.

The proposed structure, according to the Preliminary General Drawing dated November, 2006, is to be a single span cored slab measuring 65'-0" long (fill face to fill face) and 33'-0" wide (out to out), built on a proposed 115° skew.

All borings drilled on this project utilized a CME 550 powered drill rig, N-Casing with tri-cone advancers, and an automatic drive hammer for Standard Penetration Testing (SPT). SPT tests were performed on 5' intervals until the completion of each boring. Twelve soil samples were collected and submitted to the NCDOT Materials and Tests Unit for quality analysis.

Physiography and Geology

The project area falls within the Pre-Cambrian aged basement rocks (igneous or metamorphic bedrock that which directly underlies sedimentary rocks and forms the earth's crust) that lie stratigraphically below the Great Smoky Group.

Surrounding the project area, the geography is precipitous to gently rolling to flat as Hemphill Creek drains the Cataloochee Divide, and flows toward confluence with Jonathan Creek, 1.5 miles to the east of the project area. Hemphill Creek's flood plain grows to nearly 2500' at its confluence with Jonathan Creek over a distance of nearly 4 miles. A loss of 2200' in elevation occurs over this distance. The boulder alluvium associated with the Hemphill Creek floodplain have been disrupted and placed into artificial levees by local farmers, armoring the channel and banks of the creek in places.

At the site specifically, the boulder alluvium persists to an average depth across the site of 8'. These boulders, cobbles, and gravel-sized clasts are infilled with silty fine to coarse sand. The unit as a whole yields n-values ranging greatly from 13 blows per foot to as much as 90 blows per foot depending upon if a boulder or cobble sized clast was in the drive or not.

Directly underlying the alluvium across the site, an interstratified unit of very extremely weathered biotite-gneiss (saprolite) is found to occur. This unit is generally comprised of saturated to moist sandy silts atop wet to dry silty sands. However, much variability in the weathering of the saprolite has created a large range in n-values, highlighting differing strengths dependent upon the percent of saturation and the soil classification. The saprolite thickness ranges from 26' to 53', reflecting this variability.

In three of the four borings weathered rock derivative of biotite-gneiss was encountered underlying the saprolite. This extremely weathered biotite-gneiss was found to occur at varying depths, emerging at elevations 2725.3', 2751.2' and 2735.0' in borings EB1-A, EB2-A, and EB2-B respectively. In boring EB1-B, no weathered rock was encountered before the boring was terminated in very dense silty sand, saprolite. Crystalline rock was not encountered at depth or noticed to outcrop at the surface within the project area.

Groundwater

Groundwater level measurements were made at least 24 hours after the completion of each boring (except for EB2-B, which was filled in after drilling because of its location in the west bound lane of SR-1318). In EB1-A and EB1-B the borings caved to elevations of 2784.4' and 2786.8' respectively. Groundwater was measured in EB2-A to an elevation of 2781.6'.

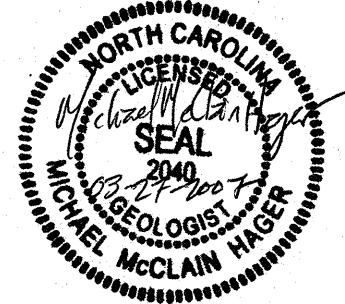
Construction Considerations

The boulder-levees lining the banks of Hemphill Creek and the persistence of the boulder-alluvium to an average depth of approximately 8' may pose some issue to the construction of the endbents. The persistence of very soft, saturated interstratified saprolite may also be of some concern.

Closing Statement

The geotechnical foundation investigation carried out and presented in this report was based on the Preliminary General Drawing dated November, 2006. If any significant changes are made in the design or location of the proposed structure, the subsurface information will have to be modified as necessary.

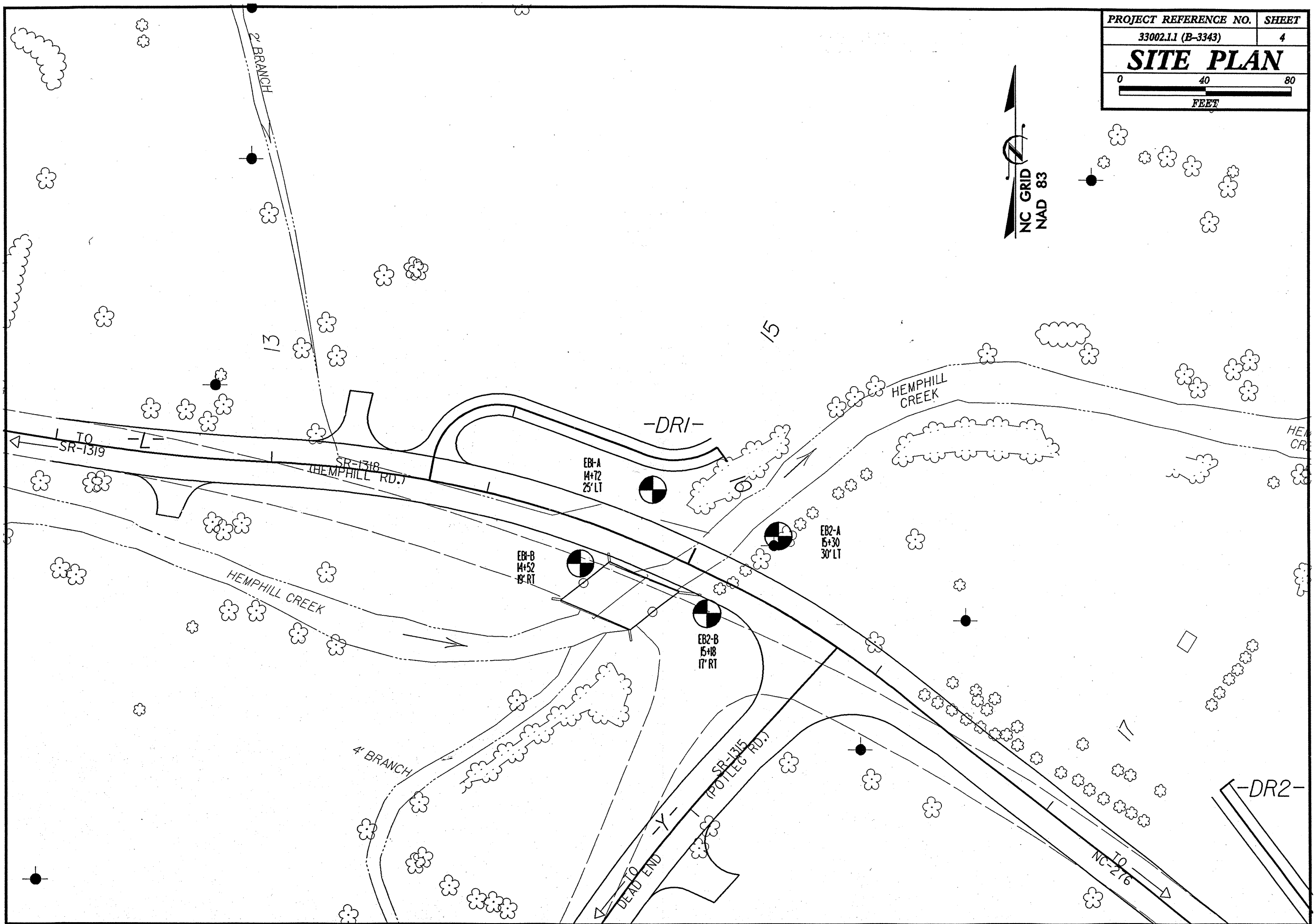
Respectfully Submitted,

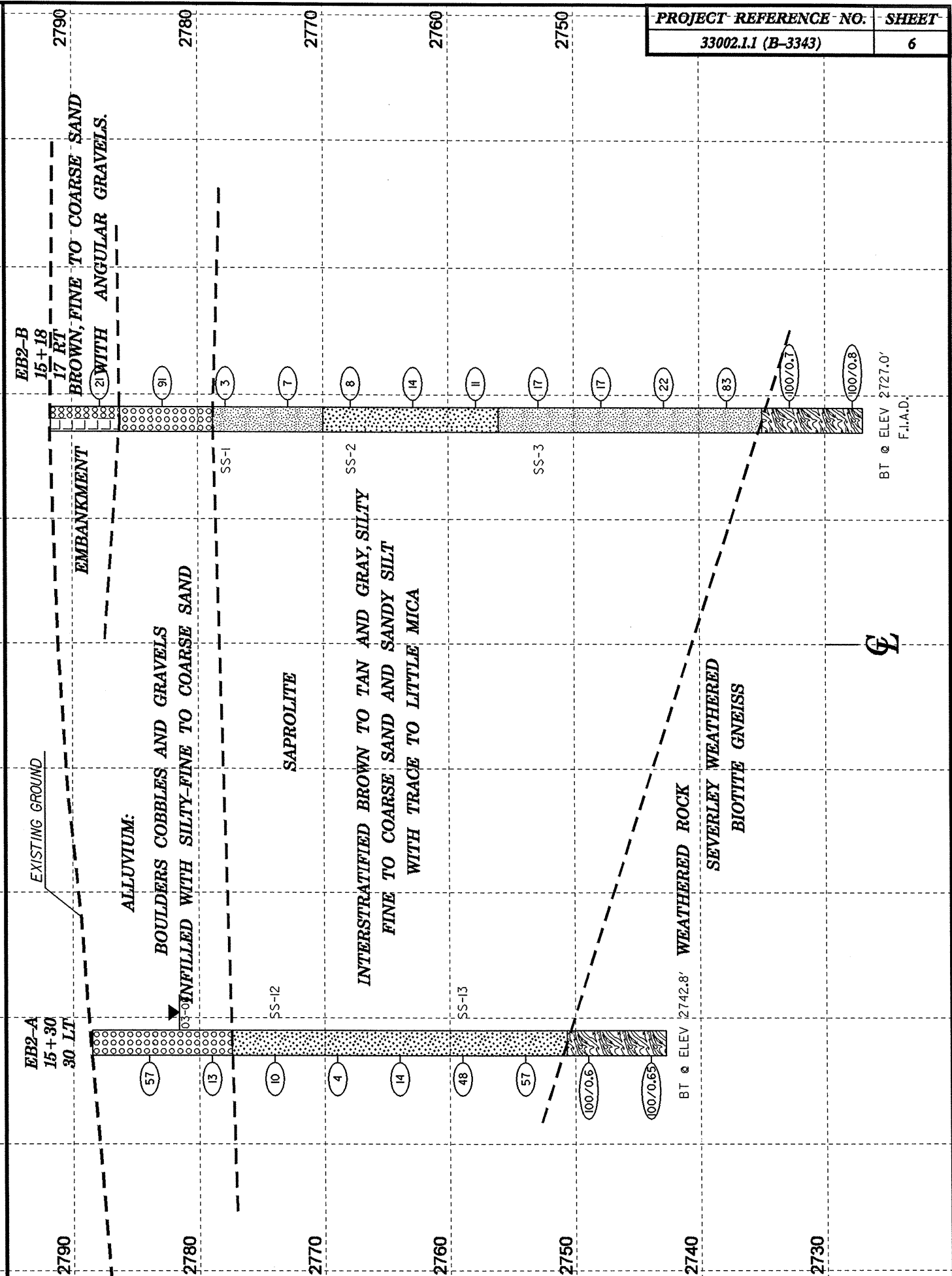
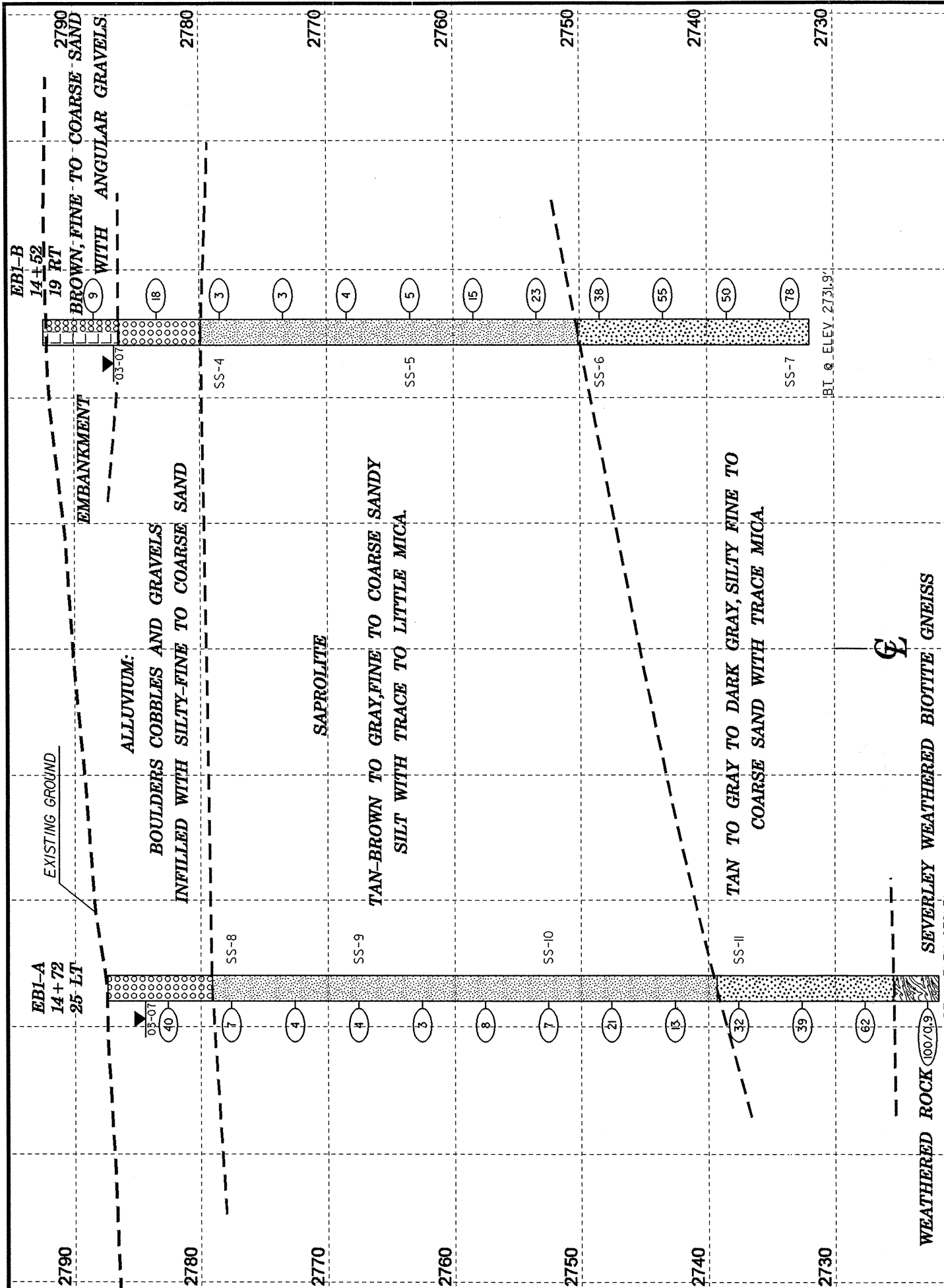


Michael McClain Hager, PG

PROJECT REFERENCE NO.	SHEET
33002.1.1 (B-3343)	4
SITE PLAN	
FEET	

NC GRID
NAD 83





HORIZ. SCALE 0 10 20 (FEET)

VE = 1

CROSS SECTION THRU EBI, 115° SKEW

HORIZ. SCALE 0 10 20 (FEET)

VE = 1

CROSS SECTION THRU EB2, 115° SKEW



NCDOT GEOTECHNICAL ENGINEERING UNIT

BORELOG REPORT

PROJECT NO. 33002.1.1	ID. B-3343	COUNTY Haywood	GEOLOGIST Hager, M. M.
SITE DESCRIPTION BRIDGE NUMBER 48 ON SR-1318 OVER HEMPHILL CREEK			GROUND WTR (ft)
BORING NO. EB2-A	STATION 15+30	OFFSET 30ft LT	ALIGNMENT -L-
COLLAR ELEV. 2,788.5 ft	TOTAL DEPTH 45.7 ft	NORTHING 685,011	EASTING 797,078
DRILL MACHINE CME-550	DRILL METHOD NW Casing w/ Advancer	HAMMER TYPE Automatic	
START DATE 03/08/07	COMP. DATE 03/08/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

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						
2795														2788.5	0.0
2784.0	4.5		15	45	12										
2779.0	9.5		11	8	5										
2774.0	14.5		3	4	6										
2769.0	19.5		1	1	3										
2764.0	24.5		4	4	10										
2759.0	29.5		17	23	25										
2754.0	34.5		13	21	36										
2749.0	39.5		78	221											
2744.0	44.5		18	75	25/15										

PROJECT NO. 33002.1.1	ID. B-3343	COUNTY Haywood	GEOLOGIST Hager, M. M.
SITE DESCRIPTION BRIDGE NUMBER 48 ON SR-1318 OVER HEMPHILL CREEK			GROUND WTR (ft)
BORING NO. EB2-B	STATION 15+18	OFFSET 17ft RT	ALIGNMENT -L-
COLLAR ELEV. 2,791.7 ft	TOTAL DEPTH 64.7 ft	NORTHING 684,976	EASTING 797,046
DRILL MACHINE CME-550	DRILL METHOD NW Casing w/ Advancer	HAMMER TYPE Automatic	
START DATE 03/05/07	COMP. DATE 03/05/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

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						
2795														2791.7	0.0
2787.8	3.9		1	12	9										
2782.8	8.9		8	49	42										
2777.8	13.9		1	1	2										
2772.8	18.9		2	3	4										
2767.8	23.9		1	4	4										
2762.8	28.9		3	5	9										
2757.8	33.9		3	5	6										
2752.8	38.9		4	6	11										
2747.8	43.9		4	7	10										
2742.8	48.9		4	9	13										
2737.8	53.9		27	43	40										
2732.8	58.9		27	55	45/2										
2727.8	63.9		50	50/3											

NCDOT BORE DOUBLE B3343_GEO_BH.GPJ NC_DOT.GDT 03/27/07

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

JCS
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T.I.P. ID #: B-3343

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REPORT ON SAMPLES OF: Soils for Quality

REPORT ON SAMPLES OF: Soils for Quality

PROJECT:	33002.1.1	COUNTY:	Haywood	Owner:	NCDOT
DATE SAMPLED:	3.07	DATE RECEIVED:	3.9.07	DATE REPORTED:	3.19.07
SAMPLED FROM:	Bridge	SAMPLED BY:	M. M. Hager		
SUBMITTED BY:	W. D. Frye	2002	STANDARD SPECIFICATION		
LABORATORY:	Asheville				

PROJECT:	33002.1.1 (cont.)	COUNTY:	Haywood	Owner:	NCDOT
DATE SAMPLED:	3.07	DATE RECEIVED:	3.9.07	DATE REPORTED:	3.19.07
SAMPLED FROM:	Bridge	SAMPLED BY:	M. M. Hager		
SUBMITTED BY:	W. D. Frye	2002	STANDARD SPECIFICATION		
LABORATORY:	Asheville				

TEST RESULTS

Project Sample No.	SS-1	SS-2	SS-3	SS-4	SS-5	SS-6	SS-7	SS-8
Lab Sample No. A	154720	154721	154722	154723	154724	154725	154726	154727
HiCAMS Sample #	--	--	--	--	--	--	--	--
Retained #4 Sieve %	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0
Passing #10 Sieve %	97	98	97	97	96	95	97	100
Passing #40 Sieve %	85	88	86	85	79	72	83	97
Passing #200 Sieve %	36	33	43	44	37	30	30	44

TEST RESULTS

Project Sample No.	SS-9	SS-10	SS-11	SS-12	SS-13
Lab Sample No. A	154728	154729	154730	154731	154732
HiCAMS Sample #	--	--	--	--	--
Retained #4 Sieve %	0.0	0.0	0.0	0.0	0.0
Passing #10 Sieve %	95	100	96	95	95
Passing #40 Sieve %	79	93	88	71	75
Passing #200 Sieve %	45	48	35	27	35

MINUS #10 FRACTION

Soil Mortar - 100%								
Coarse Sand -Ret. #60	25	23	20	21	26	35	27	12
Fine Sand - Ret. #270	46	52	47	43	45	40	50	56
Silt 0.05-0.005 mm %	25	19	27	28	23	21	21	24
Clay < 0.005 mm %	4	6	6	8	6	4	2	8
Passing # 40 Sieve %	--	--	--	--	--	--	--	--
Passing # 200 Sieve %	--	--	--	--	--	--	--	--

MINUS #10 FRACTION

Soil Mortar - 100%					
Coarse Sand -Ret. #60	28	19	21	38	30
Fine Sand - Ret. #270	31	43	51	41	42
Silt 0.05-0.005 mm %	33	28	20	17	22
Clay < 0.005 mm %	8	10	8	4	6
Passing # 40 Sieve %	--	--	--	--	--
Passing # 200 Sieve %	--	--	--	--	--

Liquid Limit	38	32	30	39	33	26	23	38
Plastic Index	NP	NP	NP	NP	NP	NP	NP	NP
AASHTO Classification	A-4 (0)	A-2-4 (0)	A-4 (2)	A-4 (2)	A-4 (2)	A-2-4 (0)	A-2-4 (0)	A-4 (2)
Quantity								
Texture								
Station	15+18	15+18	15+18	15+00	14+52	14+52	14+52	14+72
Hole No.								
Depth (ft) From:	14.4	24.4	39.4	15.5	29.5	44.5	59.5	10.3
To:	15.4	25.4	40.4	16.5	30.5	45.5	60.5	11.3

Liquid Limit	30	35	29	31	29
Plastic Index	NP	NP	NP	NP	NP
AASHTO Classification	A-4 (2)	A-4 (3)	A-2-4 (0)	A-2-4 (0)	A-2-4 (0)
Quantity					
Texture					
Station	14+72	14+72	14+72	15+30	15+30
Hole No.					
Depth (ft) From:	20.3	35.3	50.3	15.0	30.0
To:	21.3	36.3	51.3	16.0	31.0

Remarks:

A-154720 - 154727

CC:

M. M. Hager	
File	

Remarks:

A-154728 - 154732

CC:

M. M. Hager	
File	

SOILS ENGINEER:

SOILS ENGINEER:



**FIELD
SCOUR REPORT**

WBS: 33002.1.1 TIP: B-3343 COUNTY: Haywood

DESCRIPTION(1): Bridge No. 48 on SR 1318 (Hemphill Rd.) over Hemphill Creek

EXISTING BRIDGE

Information from: Field Inspection Microfilm _____ (reel _____ pos: _____)
Other (explain) Hydraulics Report, Bridge Maintenance Inspection Repo

Bridge No.: 48 Length: 36' Total Bents: 2 Bents in Channel: 0 Bents in Floodplain: 2
Foundation Type: Abutments on piles

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: None Noted

Interior Bents: None Noted

Channel Bed: None Noted

Channel Bank: None Noted

EXISTING SCOUR PROTECTION

Type(3): Concrete wingwalls

Extent(4): extending approximately 5' from each corner

Effectiveness(5): good

Obstructions(6): none noted

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): Boulders, cobbles, and gravels with silty, fine to coarse sand

Channel Bank Material(8): Boulders, cobbles, and gravels with silty, fine to coarse sand

Channel Bank Cover(9): Grass, shrubs, and boulders

Floodplain Width(10): up to 200'+/-

Floodplain Cover(11): pastures, trees, and grass

Stream is(12): Aggrading _____ Degrading Static _____

Channel Migration Tendency(13): East

Observations and Other Comments: Scour potential looks low on site inspection due to boulder-alluvium and levees lining the banks of the creek

DESIGN SCOUR ELEVATIONS(14)

Feet Meters _____

**BENTS
EB1 EB2**

A																			
B																			

Comparison of DSE to Hydraulics Unit theoretical scour:

Contraction scour calculated by Hydraulics Unit on 9/8/2006 BSR does not effect end bents

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: M.M. Hager

Date: 3/20/2007

33002.1.1 (B-3343) HAYWOOD COUNTY BRIDGE NO. 48 ON SR-1318 OVER HEMPHILL CREEK



Photo-1: Looking downstation at -L- proposed from approximate EB2-C



Photo-2: Looking upstation at -L- proposed from approximate EB1-C



Photo-3: Looking at existing structure. The black arrow indicates the approximate location and orientation of -L- as it passes through the project area from right to left.