

PROJECT: 32877.1.1 ID: B-3119

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STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL UNIT

STRUCTURE SUBSURFACE INVESTIGATION

STATE PROJECT 32877.1.1 I.D. NO. B-3119
 F.A. PROJECT BRZ-2804(I)
 COUNTY BUNCOMBE
 PROJECT DESCRIPTION RETAINING WALL
AT BRIDGE 653 OVER THE BROAD RIVER ON SR 2804

STATE	STATE PROJECT REFERENCE NO.	SHEET	TOTAL SHEETS
N.C.	B-3119	1	15
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
32877.1.1	BRZ-2804(I)	P.E. CONST.	



Roadway Design

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WAS MADE FOR THE PURPOSE OF STUDY, PLANNING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL UNIT @ (919) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA IS PART OF THE CONTRACT.

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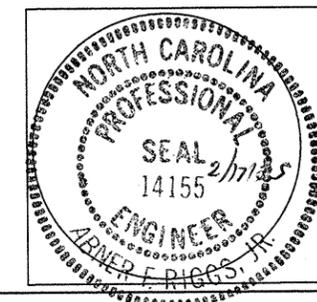
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INVESTIGATED BY S&ME, INC. PERSONNEL S. JOHNSON
 CHECKED BY A.F. RIGGS, JR. D. BENTS
 SUBMITTED BY S&ME, INC. T. TANSKY
 DATE JANUARY 27, 2005 R. NORWOOD
A. CROWE
P. PHELPS
T. PEREZ

DRAWN BY: T. PEREZ

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.



Arner F. Riggs, Jr.
SIGNATURE

**NORTH CAROLINA DIVISION OF HIGHWAYS
GEOTECHNICAL UNIT
SOIL AND ROCK CLASSIFICATION, LEGEND, AND ABBREVIATIONS**

**NORTH CAROLINA DIVISION OF HIGHWAYS
GEOTECHNICAL UNIT**



SOIL LEGEND AND AASHTO CLASSIFICATION										CONSISTENCY OR DENSENESS								
GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)				SILT-CLAY MATERIALS (> 35% PASSING #200)				ORGANIC MATERIALS		PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTANCE (IN - VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (q _u) (kN / m ²)				
GROUP CLASS.	A-1	A-3	A-2		A-4	A-5	A-6	A-7	A-1,A-2	A-4,A-5	A-3	A-6,A-7						
SYMBOL	[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]	GENERALLY GRANULAR MATERIAL	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	< 4 4 TO 10 10 TO 30 30 TO 50 > 50	N/A		
% PASSING	#10 #40 #200	50 MX 30 MX 15 MX	50 MN 30 MN 15 MN	50 MN 30 MN 15 MN	50 MN 30 MN 15 MN	50 MN 30 MN 15 MN	50 MN 30 MN 15 MN	50 MN 30 MN 15 MN	50 MN 30 MN 15 MN	50 MN 30 MN 15 MN	50 MN 30 MN 15 MN	50 MN 30 MN 15 MN	GENERALLY SILT-CLAY MATERIAL	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	< 2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 > 30	< 25 25 TO 50 50 TO 100 100 TO 200 200 TO 400 > 400		
(PASSING #40)	PI	6 MX	N.P.	40 MX 10 MX	41 MN 10 MN	40 MX 10 MX	41 MN 11 MN	40 MX 10 MX	41 MN 11 MN	40 MX 10 MX	41 MN 11 MN	40 MX 10 MX	41 MN 11 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER				
GROUP INDEX	0	0	0	4 MX	8 MX	12 MX	16 MX	ND MX						HIGHLY ORGANIC SOILS				
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS GRAVEL & SAND	FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND	SILTY SOILS	CLAYEY SOILS													
* PI OF A-7-5 ≤ (LL-30); PI OF A-7-6 > (LL-30)																		
TEXTURE OR GRAIN SIZE																		
BOULDER	COBBLE	GRAVEL	COARSE SAND	FINE SAND	SILT	CLAY												
GRAIN (mm)	305	75	2	0.25	0.075	0.0075												
SIZE (IN)	12	3																
SOIL MOISTURE - CORRELATION OF TERMS																		
SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION																
LL	LIQUID LIMIT	-SATURATED- (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE															
PL	PLASTIC LIMIT	-WET- (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE															
OM	OPTIMUM MOISTURE	-MOIST- (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE															
SL	SHRINKAGE LIMIT	-DRY- (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE															
ROCK DESCRIPTION																		
IN THE BROADEST MEANING, HARD ROCK IS CONSIDERED TO BE THAT INDURATED EARTH MATERIAL WHICH CANNOT BE SAMPLED BY CONVENTIONAL SOIL SAMPLING TOOLS OR TECHNIQUES. THE BOUNDARY BETWEEN SOIL AND ROCK IS ARBITRARY. TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF "WEATHERED ROCK". FOR THE PURPOSE OF THIS INVESTIGATION, THESE MATERIALS ARE DIVIDED AS FOLLOWS:																		
TERM	SYMBOLS	DESCRIPTION																
HARD ROCK (HR)	CORED ROCK	INFERRED ROCK LINE	MATERIAL THAT CANNOT BE PENETRATED BY POWER AUGERS, EXCEPT IN THIN LEDGES, AND REQUIRES ROCK CORING TOOLS FOR OBTAINING A SAMPLE															
WEATHERED ROCK (WR)	HARD WEATHERED ROCK (HWR)	SOFT WEATHERED ROCK (SWR)	MATERIAL THAT CAN BE PENETRATED WITH GREAT DIFFICULTY USING POWER AUGERS AND YIELDS SPT REFUSAL															
			MATERIAL THAT CAN BE PENETRATED WITH SOME DIFFICULTY USING POWER AUGERS AND YIELDS SPT VALUES > 100 BLOWS BUT < SPT REFUSAL															
¹ SPT REFUSAL ≤ 2.5 cm OF PENETRATION PER 50 BLOWS IN SPT. ² AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH AUGERS COULD NO LONGER PENETRATE. THE HARD ROCK SYMBOL IS SHOWN WHEN ROCK IS CORED AND ONLY TO THAT DEPTH CORED. A DESCRIPTION OF ROCK IS GIVEN, INCLUDING: CORE RECOVERY (REC.) - TOTAL LENGTH OF ROCK RECOVERED IN THE CORE BARREL DIVIDED BY THE TOTAL LENGTH OF THE CORE RUN TIMES 100%. ROCK QUALITY DESIGNATION (ROD) - TOTAL LENGTH OF SOUND ROCK SEGMENTS RECOVERED THAT ARE LONGER THAN OR EQUAL TO 0.1 m DIVIDED BY THE TOTAL LENGTH OF THE CORE RUN TIMES 100%.																		
Signature: <i>A. F. Riggs, Jr.</i>																		
GROUND WATER																		
<input type="checkbox"/> WATER LEVEL IN BORE HOLE [IMMEDIATELY AFTER DRILLING (I.A.D.) SOON AFTER DRILLING (S.A.D.)]																		
<input type="checkbox"/> STATIC WATER LEVEL (AFTER 24 HRS.)																		
<input type="checkbox"/> PERCHED WATER (PW), SATURATED ZONE, OR WATER BEARING STRATA																		
<input type="checkbox"/> SPRING OR SEEPAGE																		
MISCELLANEOUS SYMBOLS AND ABBREVIATIONS																		
ROADWAY EMBANKMENT WITH SOIL DESCRIPTION	SOIL SYMBOL	ARTIFICIAL FILL OTHER THAN ROADWAY EMBANKMENTS	INFERRED SOIL BOUNDARIES	(SEISMIC REFRACTION LINE)	STRIKE AND DIP	APPARENT DIP (NORMAL TO)	ROD SOUNDING	SPT TEST BORING	AUGER BORING	CORE BORING	PIEZOMETER INSTALLATION	SLOPE INDICATOR INSTALLATION	SPT N-VALUE	MONITORING WELL	SAMPLE DESIGNATIONS			
															S-BULK SAMPLE	SS-SPLIT SPOON SAMPLE	ST-SHELBY TUBE SAMPLE	RS-ROCK SAMPLE
ABBREVIATIONS																		
ALLUV.	ALLUVIUM	MIC.	MICACEOUS															
AR	AUGER REFUSAL	MOT.	MOTTLED															
BLDR.	BOULDER	N	BLOWS / 30 CM															
BT	BORING TERMINATED	NS	NO SAMPLE TAKEN															
CALC.	CALCAREOUS	ORG.	ORGANIC															
CL.	CLAY	P.P.	POCKET PENETROMETER															
CLY.	CLAYEY	REF.	REFER TO															
COB.	COBBLE	RES.	RESIDUAL															
CSE.	COARSE	S.	SOFT															
DPT	DYNAMIC PENETRATION TEST	SAT.	SATURATED															
EST.	ESTIMATED	SD.	SAND															
F.	FINE	SDY.	SANDY															
FIAD	FILLED (NAMED) AFTER DRILLING	SED(S).	SEDIMENT(S)															
FOSS.	FOSSILIFEROUS	SL.	SILT, SILTY															
FRAC.	FRACTURED	SLI.	SLIGHTLY															
FRAG(S).	FRAGMENT(S)	SPT	STANDARD PENETRATION TEST															
GR.	GRAVEL	TS.	TOPSOIL															
GS	SPECIFIC GRAVITY	VST	VANE SHEAR TEST															
GW	GROUND WATER	V.	VERY															
MED.	MEDIUM	W/	WITH															
BENCH MARK: NCDOT TRAVERSE STATION REBAR AND CAP																		
STAMPED BY-3, LOCATED AT STATION 6+60.860																		
ELEV. 619.821m																		
STATE PROJECT NO. 32877.1.1																		
T.I.P. NO. B-3119 F.A. NO. BRZ-2804(1)																		
COUNTY BUNCOMBE ROUTE SR2804																		
SITE DESCRIPTION RETAINING WALL AT BRIDGE 653																		
OVER THE BROAD RIVER ON SR2804																		
PROJECT ENGINEER A.F. RIGGS, JR. SUBMITTED BY S&ME, INC.																		
PERSONNEL S. JOHNSON A. CROWE																		
D. BENTS P. PHELPS																		
T. TANSKY T. PEREZ																		
R. NORWOOD DATE SUBMITTED JAN. 27, 2005																		
REV. 8/11/98																		

LEGEND SUPPLEMENT

In addition to the terms and abbreviations listed on the Legend Sheet, the following will be used to further describe rock quality on this project. Because of limited space on the logs, abbreviations are in parenthesis.

WEATHERING

Fresh	Rock fresh, crystals bright, few joints may show slight staining. Rock rings under hammer in 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 0.025 m (1 in.). Open joints may contain clay. In granitoid rocks some occasional feldspar crystals are dull and discolored.
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 show 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 & can be excavated with geologist's pick. Rock gives "clunk" sound when struck. <u>Comparable to hard weathered rock.</u>
Severe (SEV.)	All rocks except quartz discolored or stained. Rock "fabric" clear and evident but reduced in strength to strong soil. In granitoid rocks all feldspars are kaolinized to some extent. Some fragments of strong rock usually remain. <u>Comparable to soft weathered rock.</u>
Very Severe (V. SEV.)	All rock except quartz discolored or stained. Rock fabric elements are discernible but the mass is effectively reduced to soil status, with only fragments of strong rock remaining. Saprolite is an example of rock weathered to a degree such that only minor vestiges of the original rock fabric remain. <u>Comparable to soil.</u>
Complete	Rock reduced to soil. Rock fabric not discernible only in small and scattered concentrations. Quartz may be present as dikes or stringers. Saprolite is also an example. <u>Comparable to soil.</u>

ROCK CONTINUITY

Sound	Core pieces larger than 0.20 m.
Slightly Fractured (SLI. FRAC.)-	Core pieces between 0.10 m and 0.20m.
Moderately Fractured (MOD. FRAC.)-	Core pieces between 0.025 m and 0.10 m.
Extremely Fractured (EXT. FRAC.)-	Core pieces less than 0.025 m.

JOINT SPACING

Average Discontinuity Spacing (ADS)
The average measured distance (in meters) between joints in the same set. Will not apply to individual joints.

JOINT THICKNESS

Average Discontinuity Thickness (ADT)
The average thickness or width of gap in the joint (in meters).

STATE PROJECT NO.: 32877.1.1
 I.D. NO.: B-3119
 FEDERAL PROJECT NO.: BRZ-2804(1)
 COUNTY: Buncombe

DESCRIPTION: Retaining Wall at Bridge No. 653 over the Broad River on SR 2804

SUBJECT: Structure Subsurface Investigation – Inventory Report

Project Description

The project site is located on Nesbitt's Chapel Road (SR 2786) –Y1- just west of its intersection with SR 2804 in Buncombe County, North Carolina (see Site Vicinity Map, Sheet 5). The proposed project consists of a retaining wall structure on the north side of SR 2786. Based on the structural drawings prepared by NCDOT, the retaining wall will be constructed from station 11+70 to station 12+00 approximately 5 meters left (north) of the –Y1- survey line. The retaining wall structure will be approximately 30 meters long and approximately 2 to 3 meters high.

Based upon the structural drawings provided by NCDOT, the finished grade elevations for the retaining wall structure, will range from approximately 618.3 to 619.0 meters. This will require excavation depths of approximately 1.5 to 2.5 meters along the length of the wall.

A geotechnical investigation was conducted between January 17 and January 20, 2005. Due to the slope, soil borings R-1 through R-4 were performed along the bottom of the slope along the existing roadway. Drilling consisted of advancing 8.26 centimeter diameter hollow stem augers with standard penetration tests at four (4) locations with a CME-550x drill rig mounted on an all terrain vehicle. Representative soil samples were collected for visual classification in the field and for laboratory classification analysis by the NCDOT accredited S&ME soil testing laboratory.

In addition, six (6) rod soundings were performed along the slope. Rod sounding RS-1 through RS-4 were performed at stations 11+70, 11+80, 11+90, 12+00 approximately 5.0 meters left of –Y1- along the length of the proposed retaining wall and rod soundings RS-5 and RS-6 were performed approximately 12.0 meters left of –Y1- as shown on the boring location plan (Sheet 6). The sounding rods were performed by driving a 1.27 cm diameter steel rod in 0.91 meters lengths with a 73.40 Newton pipe hammer. The blow counts were recorded in 15 centimeter intervals as shown on the field logs attached in the Supportive Documents.

In addition, an approximately 44 meter seismic refraction line was performed along the proposed retaining wall location and an approximately 18 meter seismic refraction line was performed along the cross section at station 11+90. The refraction method consists of measuring travel times of generated compression (P) waves to estimate, in this particular case, the depth to rock along a perpendicular to the proposed wall. The testing was conducted using a 24 channel GeoMetrics Geode seismograph. Each channel was connected to a 14 Hz geophone placed at 2 meter spacing along the array. Each geophone, which was placed in direct contact with the ground, recorded the arrival times of the generated waves. For this survey, the energy source consisted of a sledgehammer striking a metal plate. Travel times evaluated using the intercept-time method with the OYO Corporation's SeisImager software. The results of refraction survey are presented on the attached profiles and

cross sections. In addition, the surface of the refractor (interpreted to be hard rock) has been included on the profiles and cross sections. The top of rock, indicated by auger refusal conditions or seismic refraction velocities in excess of approximately 1500 meters per second (m/s) are shown on the attached profiles and cross sections. Material exhibiting seismic refraction velocities of approximately 1500 m/s typically require very hard ripping or blasting prior to removal.¹

Physiography and Geology

The project site is located on Nesbitt's Chapel Road (SR 2786) –Y1- west of its intersection with SR 2804, in Buncombe County, North Carolina. The area surrounding the site consists of residential and wooded area. The Broad River is located to the immediate south. Overhead power lines are located to the northwest of the proposed wall and an underground phone line is located near the toe of the slope along SR 2786 parallel to the (-Y4- survey line).

The proposed project site is located in the Chauga Physiographic Province of North Carolina as part of the Appalachian Mountain system. The Chauga Province is characterized by high mountain ridges with broad and rounded summits, with steep slopes, dissected by alluvial valleys and swiftly flowing streams. The Chauga Belt consists of a series of thrust sheets stacked one on another. Locally, the thrust faults bounding sheets can be mapped at the surface. The oldest rocks of the Chauga belt are Middle Proterozoic-age, massive to layered, granitic gneisses. Intrusive into these basement complex gneisses are younger, more massive diabase and metamorphic granitic rocks. More specifically, the project is located in the Henderson Gneiss Formation. Based on previous mapping and our knowledge of the local geology, the parent rock is interpreted to be biotite gneiss. This unit is competent and relatively resistant to weathering. Outcrops are common in this area.

Foundation Materials

The borings were advanced to depths ranging from 1.60 to 4.60 meters (elevations 616.41 to 612.92 meters) at collar elevations ranging from 618.01 to 617.36 meters.

Roadway embankment fill materials were encountered in all of the soil test borings to depths ranging from about 0.90 to 4.00 meters (elevations 617.11 to 613.52 meters) below the collar elevation. The fill material encountered in these borings consists of medium dense to dense brown, tan and gray slightly clayey silty coarse to fine sand (A-2-4) with trace of rock fragments and organic matter and very soft to very stiff brown and gray clayey coarse to fine sandy silt (A-4) with trace of rock fragments. Standard penetration tests (SPT) N-values in the fill materials ranged from 1 to 42.

Residual soils derived from in-place weathering are the most prevalent soil type and are common to this physiographic region. Residual soils exist beneath the roadway embankment fill in borings R-1 and R-4 to depths ranging from about 1.60 to 3.60 meters (elevations 616.41 to 613.76 meters) beneath the collar elevation. The residuum consists of medium dense to very dense brown to light gray silty fine to coarse sand (A-2-4). Standard penetration test (SPT) N-values in the residual soils ranged from 19 to 88.

Soft weathered rock was encountered in borings R-2 and R-3 at depths ranging from about 2.40 to 4.00 meters (elevations 615.27 to 613.52 meters) beneath collar elevations. Standard penetration test (SPT) N-values in

¹ Church, Horace K., (1981) Excavation Handbook, McGraw-Hill Companies, Inc., New York City, NY, sec. 7-32.

the weathered rock ranged from 100 blows with 17 centimeters of penetration to 100 blows with 14 centimeter of penetration.

The soft weathered rock transitions to hard rock (auger refusal material) in borings R-2 and R-3 consisting of gray gneiss. Borings R-2 and R-3 were terminated on hard rock at elevations ranging from 614.87 to 612.92 meters beneath collar elevations. Hard rock (auger refusal material) was encountered in borings R-1 and R-4 beneath the residual soils and extends to boring termination depths ranging from about 616.41 and 613.76 meters beneath collar elevation.

Notes to Designer

The CME-550x drill rig is equipped with a hydraulic automatic hammer. Standard Penetration tests were performed with the attached Autohammer and not with a traditional rope, cathead and Safety Hammer. Research has shown that the Standard Penetration resistance (N-value) determined by the Autohammer is different than the N-value determined by the Safety Hammer method. Most correlations that are published in the technical literature are based on the N-value determined by the Safety Hammer method. This is commonly termed N_{60} as the rope and cathead with a Safety Hammer delivers about 60 percent of the theoretical energy delivered by a 140 pound hammer falling 30 inches. Several researchers have proposed correction factors for the use of hammers other than the Safety Hammer. The correction is made by the following equation:

$$N_{60} = N_{\text{field}} * C_E$$

Where N_{field} is the value recorded in the field and N_{60} is the value to be used in correlation. C_E is the energy correction factor for the hammer used. A correction factor of 1.3 should be used for the Autohammer used during drilling.

The N-values reported on the field boring logs are the actual, field derived blow counts (N_{field}). However, only corrected results should be used for analysis.

Groundwater

Groundwater depths were measured at the time of drilling operations. A groundwater depth of about 2.10 meters (elevation 615.26 meters) was measured in boring R-1 at the time of drilling operations. The remaining boreholes were observed to be dry at the time of boring termination. Stabilized groundwater depths were not measured in the borings due to borings being performed in the existing roadway. The borings were backfilled at the time of boring termination due to safety concerns.

QUALIFICATIONS OF REPORT

This report has been prepared in accordance with generally accepted geotechnical engineering practice for specific application to this project. The conclusions contained in this report were based on the applicable standards of our profession at the time this report was prepared. No other warranty, expressed or implied, is made.

The conclusions submitted in this report are based, in part, upon the data obtained from the subsurface exploration. The nature and extent of subsurface variations between the borings may not become evident until

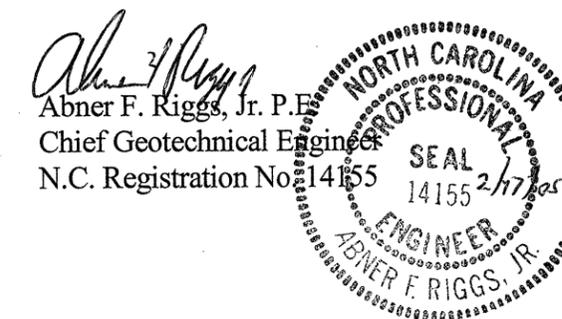
construction. If variations appear evident, then the conclusions contained in this report may need to be re-evaluated. In the event that any changes in the nature, design, or location of the structure are planned, the conclusions contained in this report will not be considered valid unless the changes are reviewed by S&ME, and the conclusions of the report are modified or verified in writing.

S&ME appreciates the opportunity to be your geotechnical consultant on this project. If you have any questions or need additional information in regard to this report, please contact us.

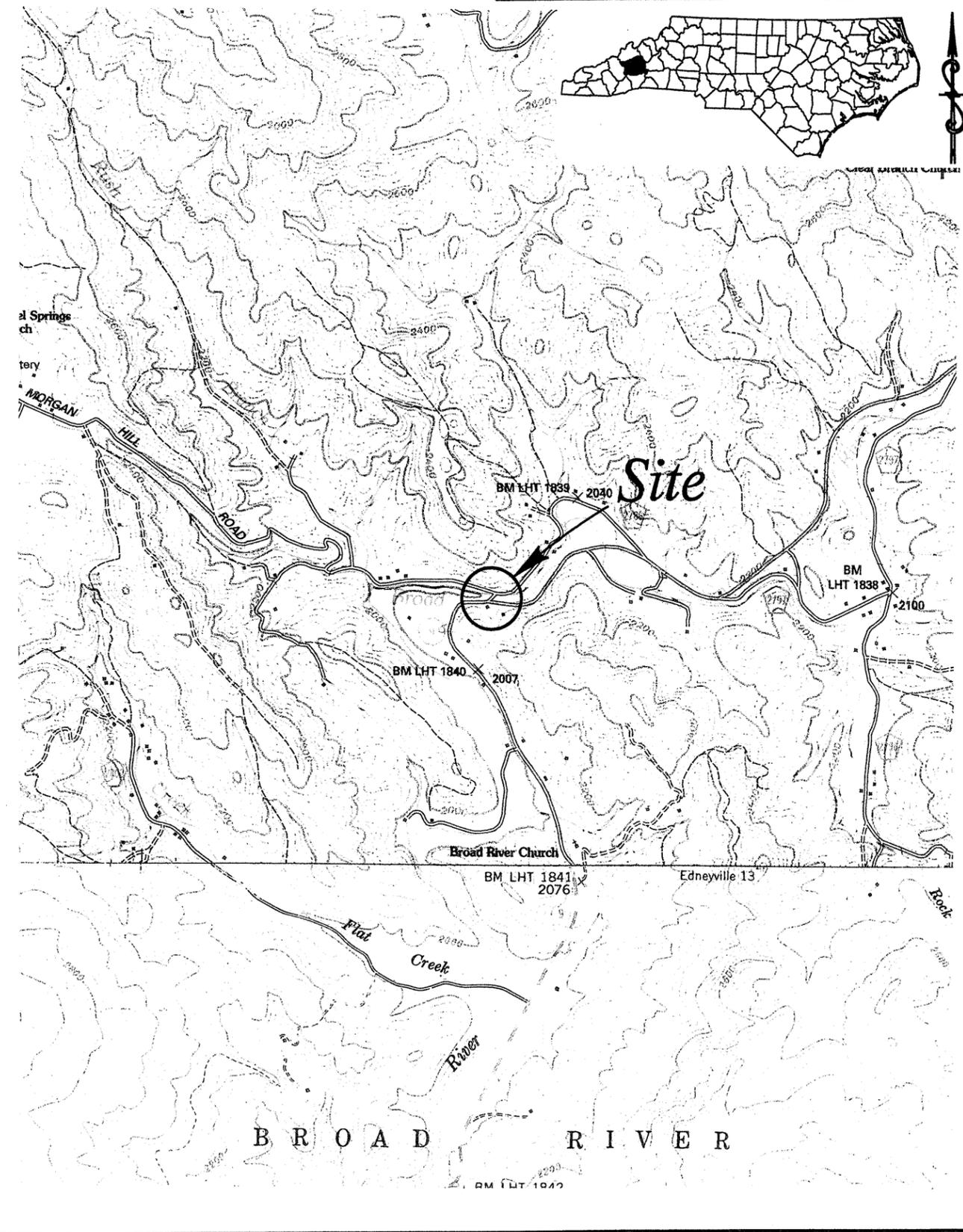
Very truly yours,
S&ME, Inc.


J. Shane Johnson, P.G.
Project Geologist
N.C. Registration No. 1753

Attachments



ID	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
B-3119	32877.1.1	5	15

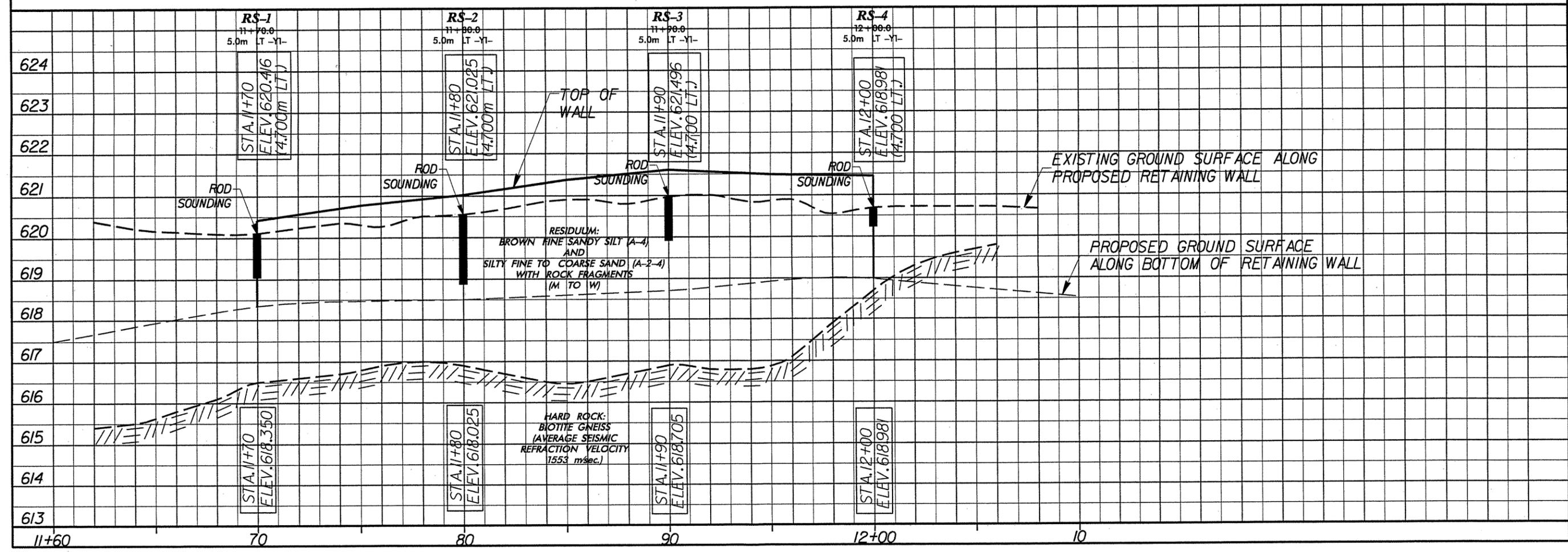
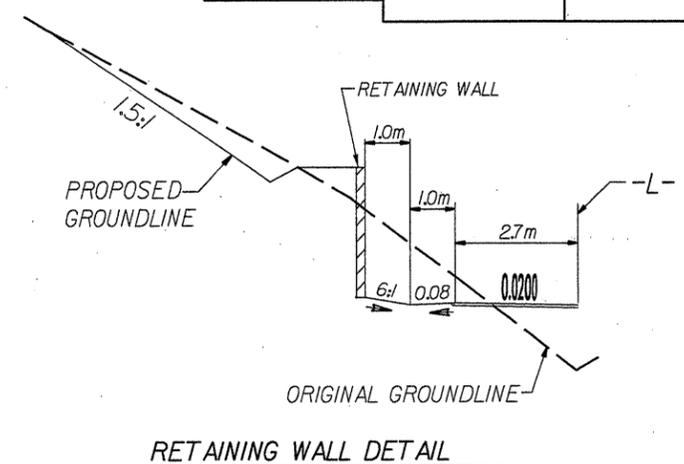
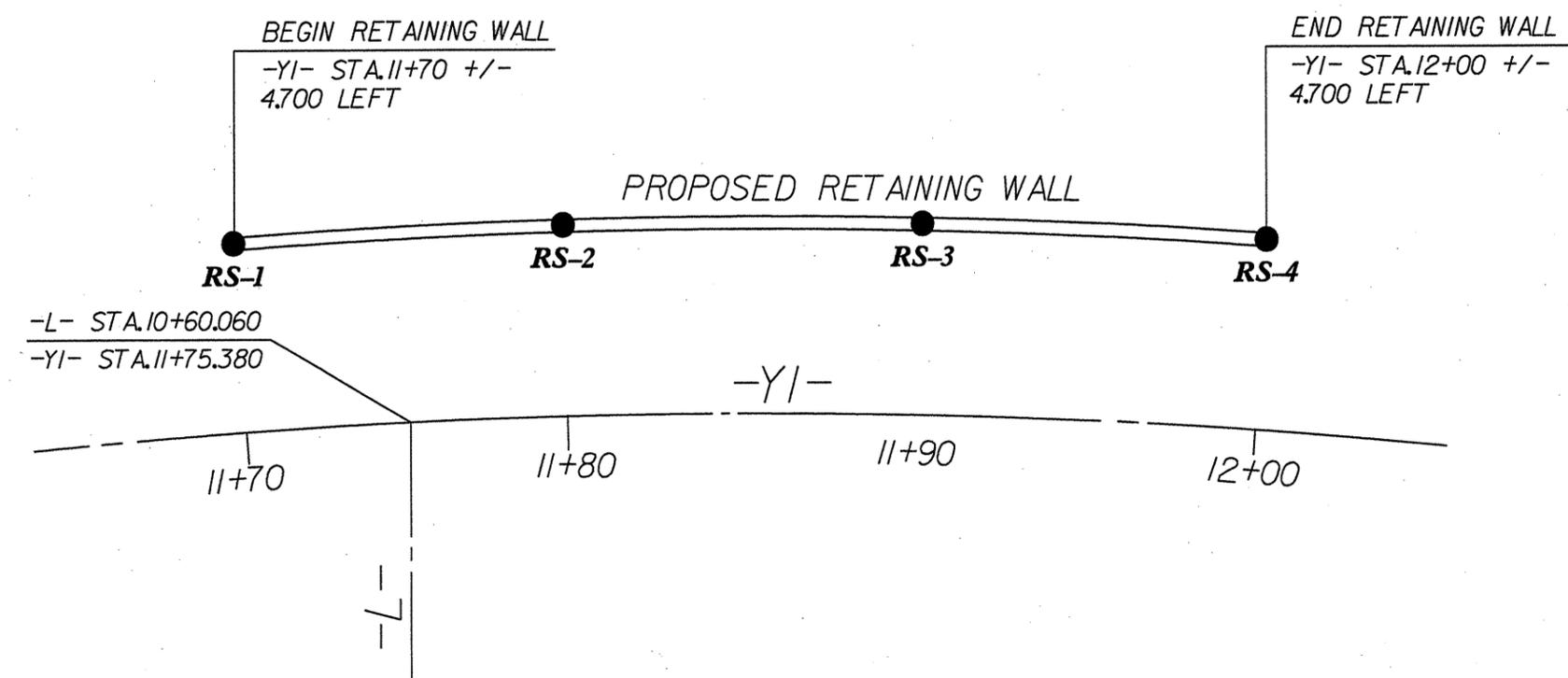


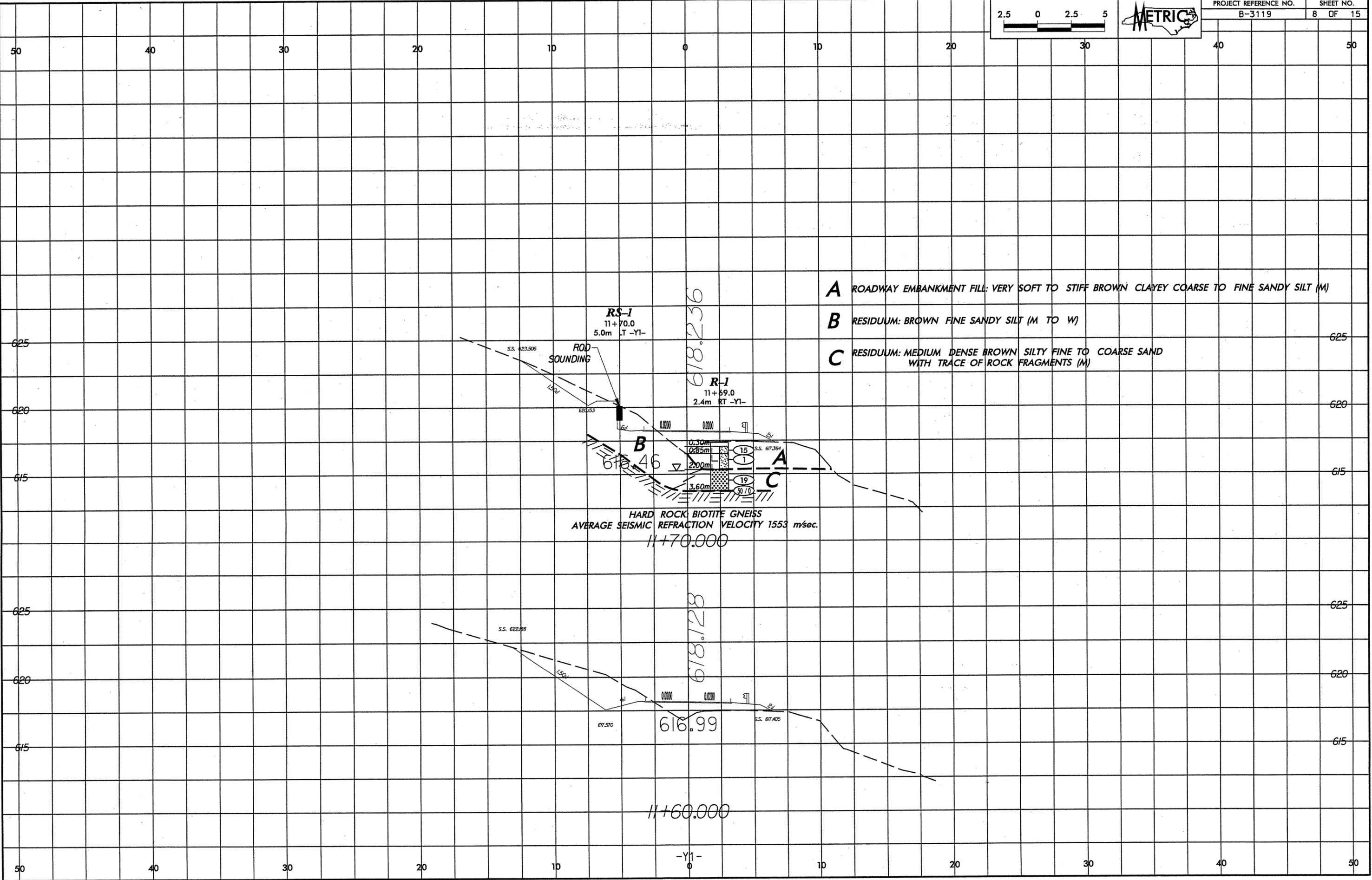
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SCALE:	1:24,000
CHECKED BY:	AFR
DRAWN BY:	TRP
DATE:	JANUARY 2005
JOB NO.	1051-05-018



SITE VICINITY MAP
 RETAINING WALL AT BRIDGE 653
 OVER THE BROAD RIVER ON SR 2804
 STATE PROJECT NO. 32877.1.1 TIP NO. B-3119
 FEDERAL I.D. NO. BRZ-2804(I)
 BUNCOMBE COUNTY, NORTH CAROLINA





- A** ROADWAY EMBANKMENT FILL: VERY SOFT TO STIFF BROWN CLAYEY COARSE TO FINE SANDY SILT (M)
- B** RESIDUUM: BROWN FINE SANDY SILT (M TO W)
- C** RESIDUUM: MEDIUM DENSE BROWN SILTY FINE TO COARSE SAND WITH TRACE OF ROCK FRAGMENTS (M)

RS-1
11+70.0
5.0m LT -Y1-

R-1
11+69.0
2.4m RT -Y1-

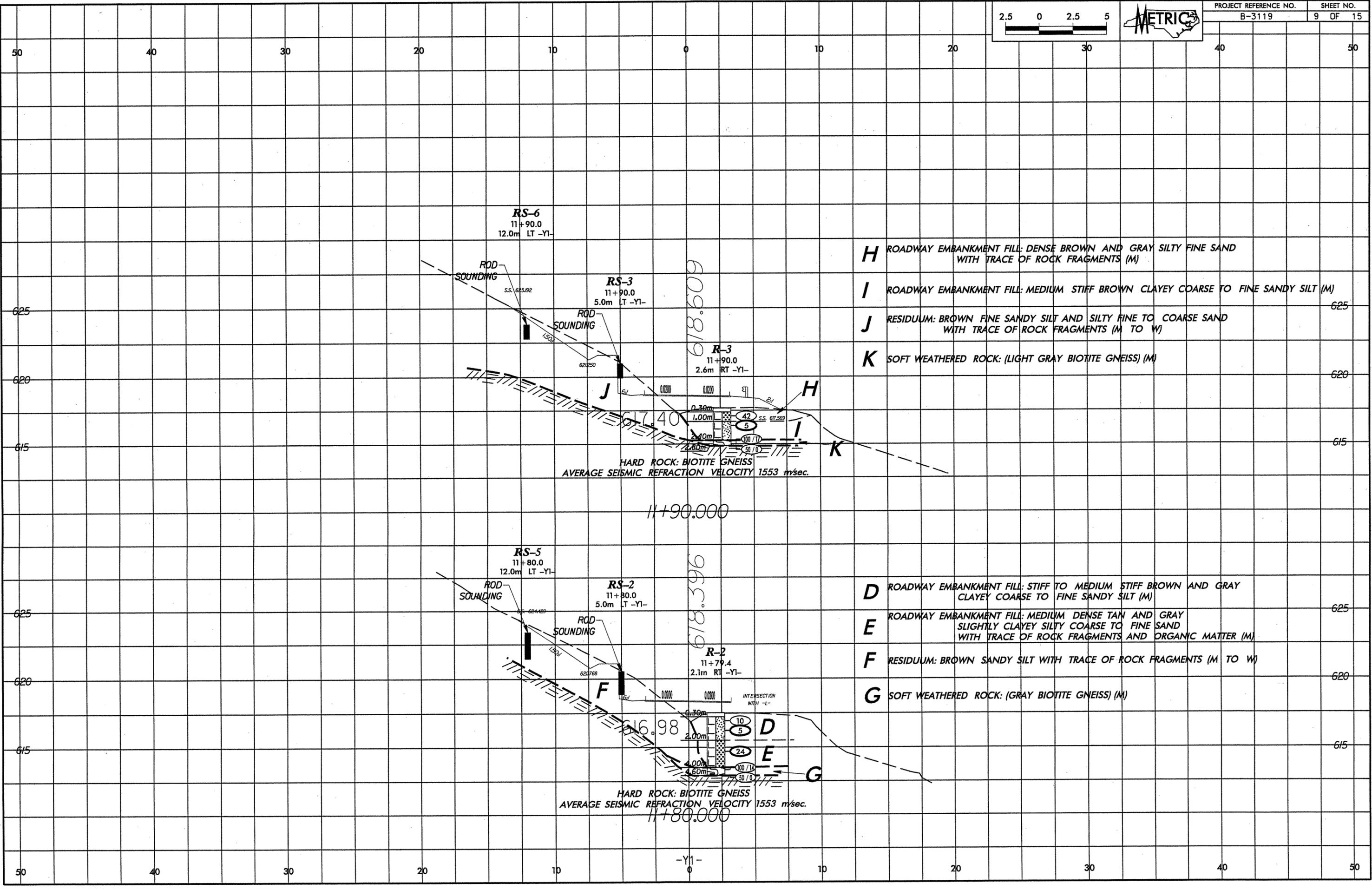
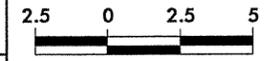
HARD ROCK BIOTITE GNEISS
AVERAGE SEISMIC REFRACTION VELOCITY 1553 m/sec.

11+70.000

618.99

11+60.000

-Y1-



- H** ROADWAY EMBANKMENT FILL: DENSE BROWN AND GRAY SILTY FINE SAND WITH TRACE OF ROCK FRAGMENTS (M)
- I** ROADWAY EMBANKMENT FILL: MEDIUM STIFF BROWN CLAYEY COARSE TO FINE SANDY SILT (M)
- J** RESIDUUM: BROWN FINE SANDY SILT AND SILTY FINE TO COARSE SAND WITH TRACE OF ROCK FRAGMENTS (M TO W)
- K** SOFT WEATHERED ROCK: (LIGHT GRAY BIOTITE GNEISS) (M)

- D** ROADWAY EMBANKMENT FILL: STIFF TO MEDIUM STIFF BROWN AND GRAY CLAYEY COARSE TO FINE SANDY SILT (M)
- E** ROADWAY EMBANKMENT FILL: MEDIUM DENSE TAN AND GRAY SLIGHTLY CLAYEY SILTY COARSE TO FINE SAND WITH TRACE OF ROCK FRAGMENTS AND ORGANIC MATTER (M)
- F** RESIDUUM: BROWN SANDY SILT WITH TRACE OF ROCK FRAGMENTS (M TO W)
- G** SOFT WEATHERED ROCK: (GRAY BIOTITE GNEISS) (M)

HARD ROCK: BIOTITE GNEISS
AVERAGE SEISMIC REFRACTION VELOCITY 1553 m/sec.

HARD ROCK: BIOTITE GNEISS
AVERAGE SEISMIC REFRACTION VELOCITY 1553 m/sec.

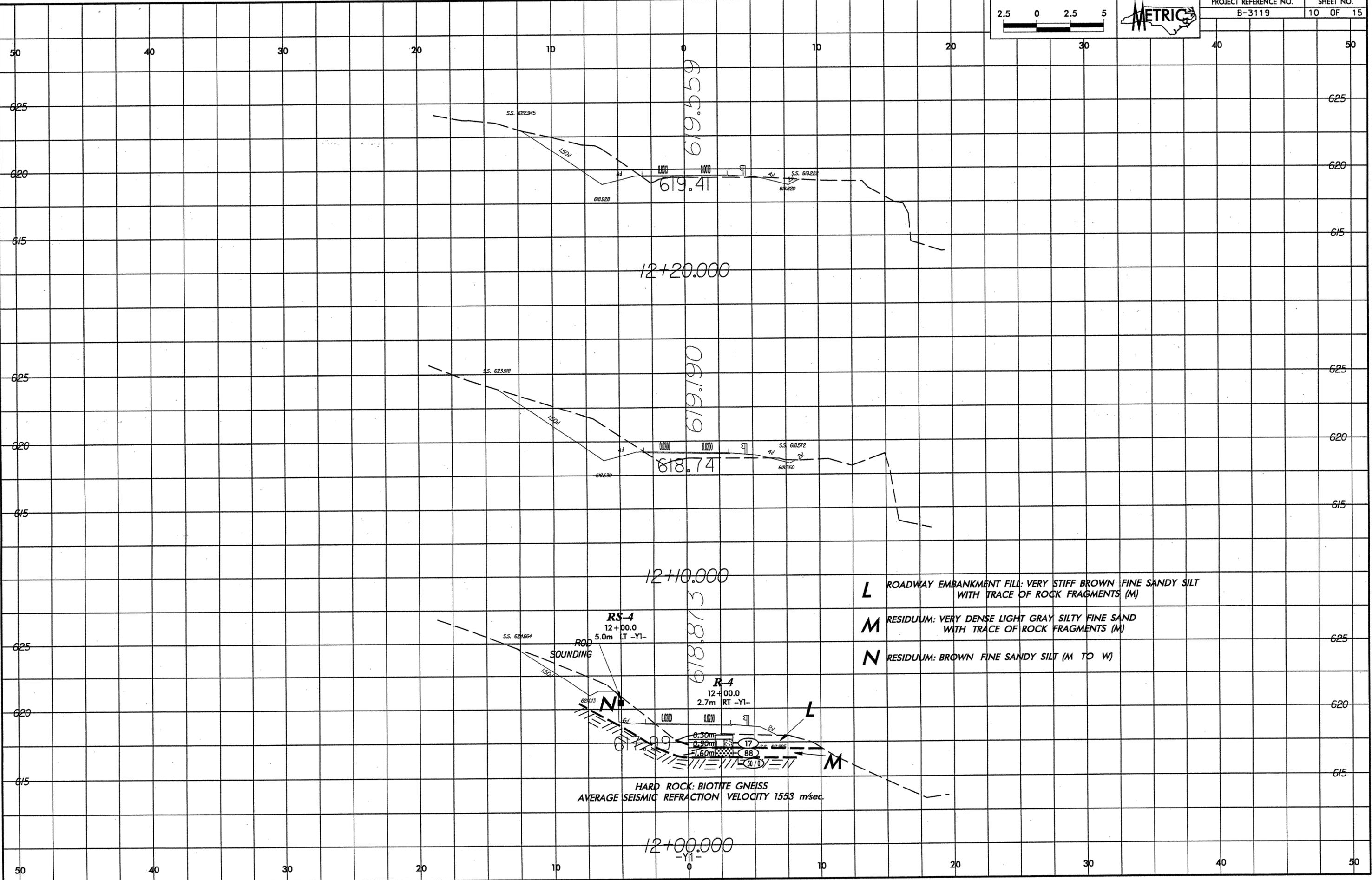
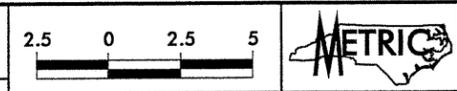
618.810

618.596

11+90.000

11+80.000

-Y1-



619.559
619.41

12+20.000

619.190
618.74

12+10.000

RS-4
12+00.0
5.0m LT -Y1-

ROD SOUNDING

R-4
12+00.0
2.7m RT -Y1-

HARD ROCK: BIOTITE GNEISS
AVERAGE SEISMIC REFRACTION VELOCITY 1553 m/sec.

12+00.000

- L** ROADWAY EMBANKMENT FILL: VERY STIFF BROWN FINE SANDY SILT WITH TRACE OF ROCK FRAGMENTS (M)
- M** RESIDUUM: VERY DENSE LIGHT GRAY SILTY FINE SAND WITH TRACE OF ROCK FRAGMENTS (M)
- N** RESIDUUM: BROWN FINE SANDY SILT (M TO W)





PROJECT NO. 32877.1.1		ID. B-3119		COUNTY Buncombe		GEOLOGIST T. TANSKY							
SITE DESCRIPTION Retaining Wall at Bridge 653 over the Broad River on SR 2804							GROUND WATER (m)						
BORING NO. R-1		BORING LOCATION 11+69.0		OFFSET 2.4 m RT	ALIGNMENT -Y1-		0 HR. 2.10						
COLLAR ELEV. 617.36 m		NORTHING 200,247.90		EASTING 312,629.83			24 HR. N/M						
TOTAL DEPTH 3.60 m		DRILL MACHINE CME-550x	DRILL METHOD 8.26 cm HSA		HAMMER TYPE AUTOMATIC								
DATE STARTED 1/20/05		COMPLETED 1/20/05		SURFACE WATER DEPTH N/A									
ELEV. (m)	DEPTH (m)	BLOW COUNT			BLOWS PER 30 CM					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	
		15cm	15cm	15cm	0	20	40	60	80				100
617.36													ASPHALT PAVEMENT SURFACE
617.06	0.30											M	ASPHALT (7cm) / ABC STONE (23cm)
616.36	1.00	12	8	7								M	ROADWAY EMBANKMENT FILL: STIFF BROWN CLAYEY COARSE TO FINE SANDY SILT (A-4)
614.84	2.52	1	0	1								M	VERY SOFT BROWN CLAYEY COARSE TO FINE SANDY SILT (A-4)
613.76	3.60	30	9	10								M	RESIDUUM: MEDIUM DENSE BROWN SILTY FINE TO COARSE SAND (A-2-4) WITH TRACE OF ROCK FRAGMENTS
		50/0										No Rec.	1) ADVANCED 8.26 cm H.S.A. TO 3.60 METERS.
													AUGER REFUSAL AT ELEV. 613.76 METERS ON HARD ROCK: HARD BIOTITE GNEISS

NCDOT BORE DOUBLE 51-018.GPJ NCDOT.GDT 1/27/05



PROJECT NO. 32877.1.1		ID. B-3119		COUNTY Buncombe		GEOLOGIST T. TANSKY								
SITE DESCRIPTION Retaining Wall at Bridge 653 over the Broad River on SR 2804							GROUND WATER (m)							
BORING NO. R-2		BORING LOCATION 11+79.4		OFFSET 2.1 m RT	ALIGNMENT -Y1-		0 HR. DRY							
COLLAR ELEV. 617.52 m		NORTHING 200,245.91		EASTING 312,640.31			24 HR. N/M							
TOTAL DEPTH 4.60 m		DRILL MACHINE CME-550x	DRILL METHOD 8.26 cm HSA		HAMMER TYPE AUTOMATIC									
DATE STARTED 1/20/05		COMPLETED 1/20/05		SURFACE WATER DEPTH N/A										
ELEV. (m)	DEPTH (m)	BLOW COUNT			BLOWS PER 30 CM					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION		
		15cm	15cm	15cm	0	20	40	60	80				100	
617.52													ASPHALT PAVEMENT SURFACE	
617.22	0.30											M	ASPHALT (10cm) / ABC STONE (20cm)	
616.52	1.00	5	5	5								M	ROADWAY EMBANKMENT FILL: STIFF TO MEDIUM STIFF BROWN AND GRAY CLAYEY COARSE TO FINE SANDY SILT (A-4)	
615.52	2.00	2	2	3								SS-1	21.3%	
615.00	2.52	6	7	17								SS-2	M	
613.52	4.00											D	MEDIUM DENSE TAN AND GRAY SLIGHTLY CLAYEY SILTY COARSE TO FINE SAND (A-2-4) WITH TRACE OF ROCK FRAGMENTS AND ORGANIC MATTER	
612.92	4.60												D	SOFT WEATHERED ROCK: (GRAY BIOTITE GNEISS)
		50/0										No Rec.	1) ADVANCED 8.26 cm H.S.A. TO 4.60 METERS.	
													AUGER REFUSAL AT ELEV. 612.92 METERS ON HARD ROCK: HARD BIOTITE GNEISS	

SUMMARY OF LABORATORY TEST DATA

Soil Classification and Gradation

Boring No.	Sample No.	Sample Depth Meter	AASHTO Classification	% Passing Sieve #			Coarse Sand	Fine Sand	Silt	Clay	LL	PL	PI	Organic Content %	Moisture Content %
				10	40	60									
R-2	SS-1	1.00-1.45	A-4(2)	97	91	85	57	39	23	26	30	22	8	--	21.3
R-2	SS-2	2.52-2.97	A-2-4(0)	80	67	58	29	45	18	10	8	N.P.	N.P.	--	--
R-3	SS-3	1.00-1.45	A-4(4)	99	93	87	59	39	24	25	32	22	10	--	27.1

Project Name: Retaining Wall B-3119

State Project No.: 32877.1.1

Federal ID No.: BRZ-2804(1)

Checked By: JSJ & AFR

S&ME Project No.: 1051-05-018

County: Buncombe

TIP No.: B-3119



Photograph No. 1:
This photograph was taken from the right side of the -Y1- alignment, looking northwest at the proposed location of the retaining wall.



Photograph No. 3:
This photograph was taken from the left side of the -Y1- alignment, looking east along the proposed retaining wall.



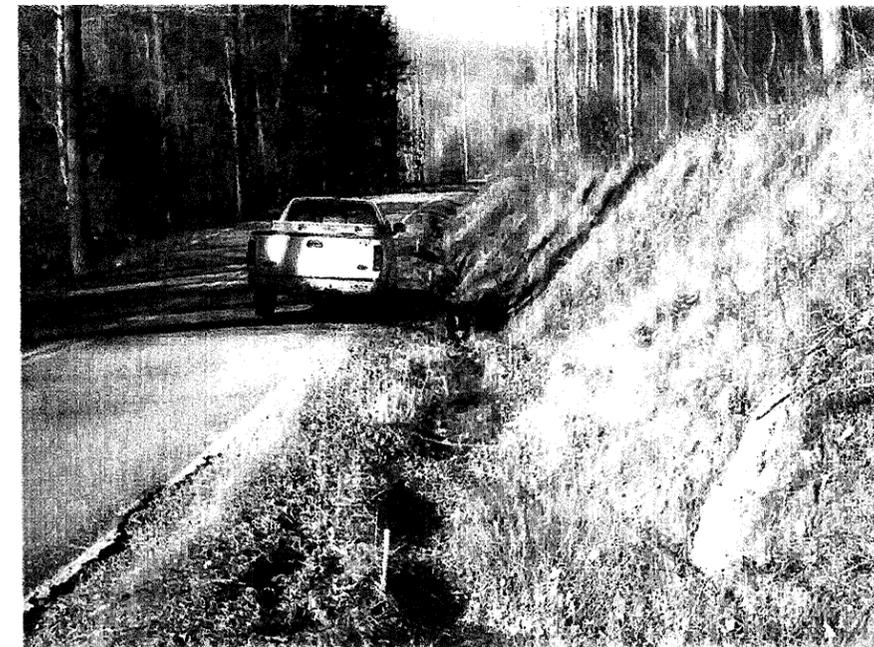
Photograph No. 2:
This photograph was taken from the right side of the -Y1- alignment, looking north at the proposed location of the retaining wall.



Photograph No. 4:
This photograph was taken from the left side of the -Y1- alignment, looking west along the proposed retaining wall.



Photograph No. 5:
This photograph was taken along the -Y1- alignment, looking east.



Photograph No. 6:
This photograph was taken along the -Y1- alignment, looking west.

PROJECT: 8.2843501 ID: B-3119

CONTENTS: -L2-

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL UNIT

STRUCTURE SUBSURFACE INVESTIGATION

STATE PROJECT 8.2843501 I.D. NO. B-3119
F.A. PROJECT _____
COUNTY BUNCOMBE
PROJECT DESCRIPTION _____

SITE DESCRIPTION BRIDGE NO. 654 ON SR 2786
OVER SAND BRANCH

	STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
	N.C.	B-3119	1	7
	STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
	8.2843501		P.E.	
			CONST.	

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WAS MADE FOR THE PURPOSE OF STUDY, PLANNING AND DESIGN AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N.C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL UNIT @ (919) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA IS PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THIS PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

INVESTIGATED BY PO LOCKAMY PERSONNEL TB DANIEL
CHECKED BY W.D. FRYE JT WILLIAMS
SUBMITTED BY W.D. FRYE L.E. LANKFORD
DATE 05/03



W. David Frye, Jr.
SIGNATURE

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

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

DRAWN BY: PO LOCKAMY

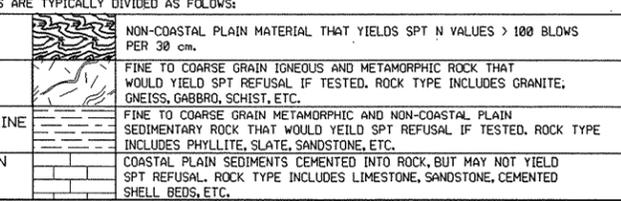
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL UNIT

ID	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
B-3119	8.2843501	2	7



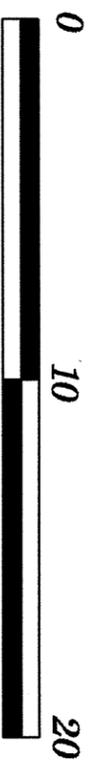
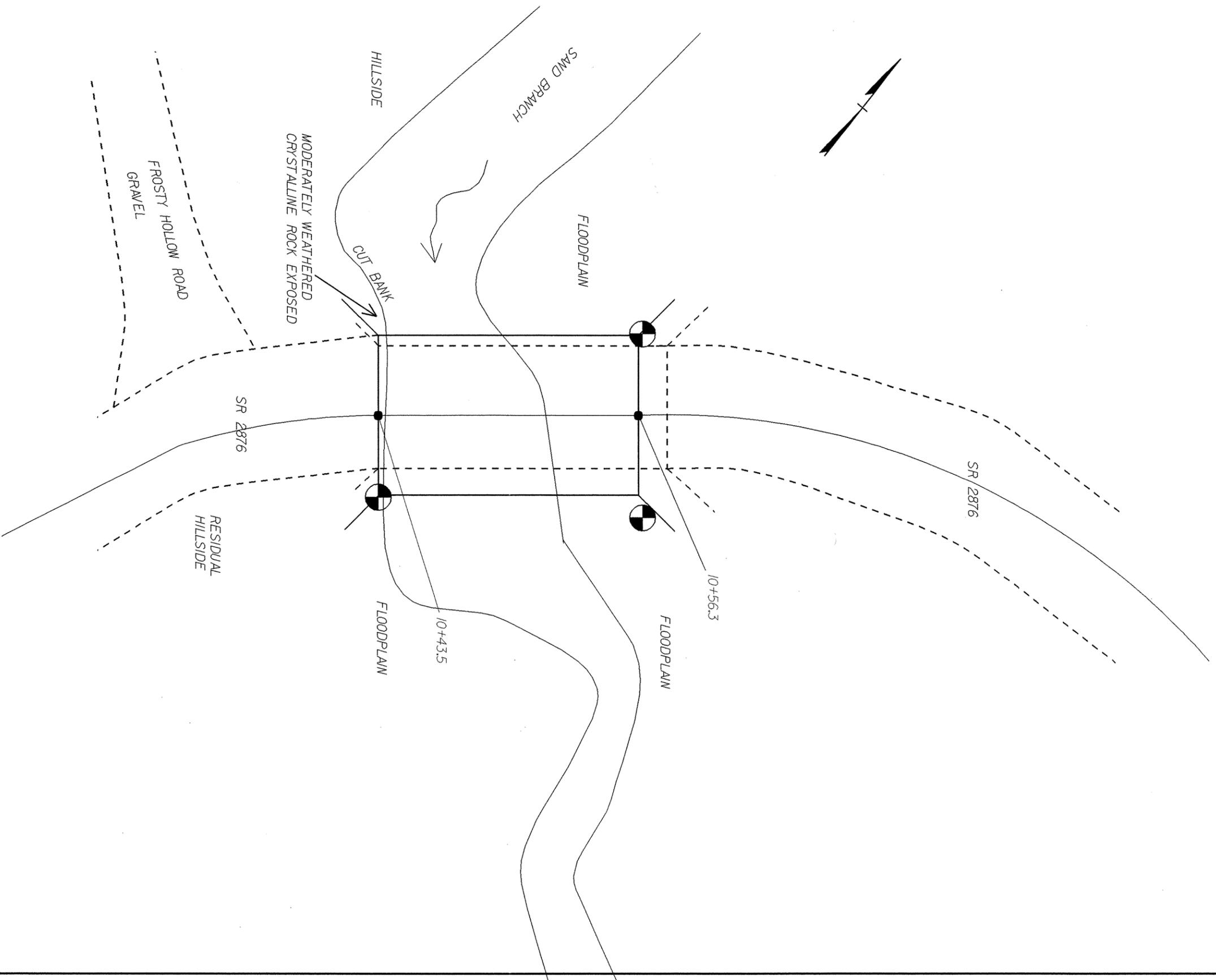
SUBSURFACE INVESTIGATION

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 WHICH CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND WHICH YIELDS LESS THAN 100 BLOWS PER 30 cm ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM AND BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE: <i>VERY STIFF, GRN SILTY CLAY, MOIST 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.				HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WHEN TESTED, WOULD YIELD SPT REFUSAL, AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 2.5 cm PER 50 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS: 				ALLUVIUM (ALLUV.) - SOILS WHICH 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 IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. CALCAREOUS (CALC.) - SOILS WHICH 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. FLOOD - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOGGED FROM PARENT MATERIAL. FLOOD PLAIN (F.P.) - 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 SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. ROCK QUALITY DESIGNATION (R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY: TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 10 CENTIMETERS DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP.) - RESIDUAL SOIL WHICH 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, WHICH HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.							
SOIL LEGEND AND AASHTO CLASSIFICATION				MINERALOGICAL COMPOSITION				WEATHERING				ROCK HARDNESS							
GENERAL CLASS. GRANULAR MATERIALS (<5% PASSING #200) SILT-CLAY MATERIALS (>85% 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. SL.) ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE. SLIGHT (SL.) ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 2.5 cm. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. MODERATE (MOD.) SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK. MODERATELY SEVERE (MOD. SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES 'CLUNK' SOUND WHEN STRUCK. <i>IF TESTED, WOULD YIELD SPT REFUSAL</i> SEVERE (SEV.) ALL ROCKS 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 BLOWS PER 30 cm</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 BLOWS PER 30 cm</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.				COMPRESSIBILITY SLIGHTLY COMPRESSIBLE LIQUID LIMIT LESS THAN 30 MODERATELY COMPRESSIBLE LIQUID LIMIT 31-50 HIGHLY COMPRESSIBLE LIQUID LIMIT GREATER THAN 50				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 6 mm 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 1 mm DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 25 mm 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 CENTIMETERS 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 25 mm OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGER NAIL.			
ANGULARITY OF GRAINS THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS ARE DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.				PERCENTAGE OF MATERIAL ORGANIC MATERIAL GRANULAR SOILS SILT-CLAY SOILS OTHER MATERIAL TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10% LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20% MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35% HIGHLY ORGANIC >10% >20% HIGHLY 35% AND ABOVE				WEATHERING FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE. VERY SLIGHT (V. SL.) ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE. SLIGHT (SL.) ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 2.5 cm. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. MODERATE (MOD.) SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK. MODERATELY SEVERE (MOD. SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES 'CLUNK' SOUND WHEN STRUCK. <i>IF TESTED, WOULD YIELD SPT REFUSAL</i> SEVERE (SEV.) ALL ROCKS 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 BLOWS PER 30 cm</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 BLOWS PER 30 cm</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.											
SOIL LEGEND AND AASHTO CLASSIFICATION				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 SEEPAGE				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 6 mm 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 1 mm DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 25 mm 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 CENTIMETERS 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 25 mm OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGER NAIL.											
CONSISTENCY OR DENSENESS				MISCELLANEOUS SYMBOLS				ROCK HARDNESS				TERMS AND DEFINITIONS							
PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) RANGE OF UNCONFINED COMPRESSIVE STRENGTH (kN/m ²)				ROADWAY EMBANKMENT WITH SOIL DESCRIPTION SOIL SYMBOL ARTIFICIAL FILL OTHER THAN ROADWAY EMBANKMENTS INFERRED SOIL BOUNDARIES INFERRED ROCK LINE ALLUVIAL SOIL BOUNDARY DIP/DIP DIRECTION OF ROCK STRUCTURES SOUNDING ROD				SPT OBT. TEST BORING AUGER BORING CORE BORING MONITORING WELL PIEZOMETER INSTALLATION SLOPE INDICATOR INSTALLATION SPT N-VALUE SPT REFUSAL				STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N) OF A 63.5 kg HAMMER FALLING 0.76 METERS REQUIRED TO PRODUCE A PENETRATION OF 30 cm INTO SOIL WITH A 5 cm OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS LESS THAN 2.5 cm PENETRATION WITH 50 BLOWS. STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (S.R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY: TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 10 CENTIMETERS DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. TOPSOIL (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.							
TEXTURE OR GRAIN SIZE				ABBREVIATIONS				ROCK HARDNESS				TERMS AND DEFINITIONS							
U.S. STD. SIEVE SIZE OPENING (MM) 4 10 40 60 200 270 4.76 2.0 0.42 0.25 0.075 0.053				AR - AUGER REFUSAL BT - BORING TERMINATED CL - CLAY CPT - CONE PENETRATION TEST CSE - COARSE DMT - DILATOMETER TEST DPT - DYNAMIC PENETRATION TEST e - VOID RATIO F - FINE FOSS. - FOSSILIFEROUS FRAC. - FRACTURED FRAGS. - FRAGMENTS MED. - MEDIUM PMT - PRESSUREMETER TEST SD. - SAND, SANDY SL. - SILT, SILTY SLI. - SLIGHTLY TCR - TRICONE REFUSAL U - UNIT WEIGHT W - MOISTURE CONTENT V. - VERY VST - VANE SHEAR TEST				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 6 mm 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 1 mm DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 25 mm 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 CENTIMETERS 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 25 mm OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGER NAIL.				ALLUVIUM (ALLUV.) - SOILS WHICH 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 IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. CALCAREOUS (CALC.) - SOILS WHICH 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. FLOOD - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOGGED FROM PARENT MATERIAL. FLOOD PLAIN (F.P.) - 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 SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. ROCK QUALITY DESIGNATION (R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY: TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 10 CENTIMETERS DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP.) - RESIDUAL SOIL WHICH 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, WHICH HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.							
SOIL MOISTURE - CORRELATION OF TERMS				EQUIPMENT USED ON SUBJECT PROJECT				ROCK HARDNESS				TERMS AND DEFINITIONS							
SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION				DRILL UNITS: MOBILE B- BK-51 CME-45 CME-550 PORTABLE HOIST OTHER OTHER				ADVANCING TOOLS: CLAY BITS 152 mm CONTINUOUS FLIGHT AUGER 203 mm HOLLOW AUGERS HARD FACED FINGER BITS TUNG.-CARBIDE INSERTS CASING w/ ADVANCER TRICONE mm STEEL TEETH TRICONE mm TUNG.-CARB. CORE BIT OTHER				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.							
LL - LIQUID LIMIT PL - PLASTIC LIMIT OM - OPTIMUM MOISTURE SL - SHRINKAGE LIMIT				HAMMER TYPE: AUTOMATIC MANUAL CORE SIZE: B N H HAND TOOLS: POST HOLE DIGGER HAND AUGER SOUNDING ROD VANE SHEAR TEST OTHER				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 6 mm 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 1 mm DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 25 mm 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 CENTIMETERS 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 25 mm OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGER NAIL.				BENCH MARK: TBM-7 RAILROAD SPIKE SET IN 24' TREE -L2- STA. 10+37.351 25.618 m RT. ELEVATION: 620.565 m							
PLASTICITY				INDURATION				ROCK HARDNESS				TERMS AND DEFINITIONS							
NONPLASTIC LOW PLASTICITY MED. PLASTICITY HIGH PLASTICITY				FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.				VERY WIDE MORE THAN 3 m WIDE 1 TO 3 m MODERATELY CLOSE 30 TO 100 cm CLOSE 5 TO 30 cm VERY CLOSE LESS THAN 5 cm				VERY THICKLY BEDDED > 1 m THICKLY BEDDED 0.5 - 1 m THINLY BEDDED 0.05 - 0.5 m VERY THINLY BEDDED 10 - 50 mm THICKLY LAMINATED 2.5 - 10 mm THINLY LAMINATED < 2.5 mm							
COLOR				INDURATION				ROCK HARDNESS				TERMS AND DEFINITIONS							
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YEL.-BRN, BLUE-GRAY) MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.				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.				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 6 mm 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 1 mm DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 25 mm 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 CENTIMETERS 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 25 mm OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGER NAIL.				ALLUVIUM (ALLUV.) - SOILS WHICH 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 IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. CALCAREOUS (CALC.) - SOILS WHICH 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. FLOOD - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOGGED FROM PARENT MATERIAL. FLOOD PLAIN (F.P.) - 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 SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. ROCK QUALITY DESIGNATION (R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY: TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 10 CENTIMETERS DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP.) - RESIDUAL SOIL WHICH 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, WHICH HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.							

BORING LOCATIONS

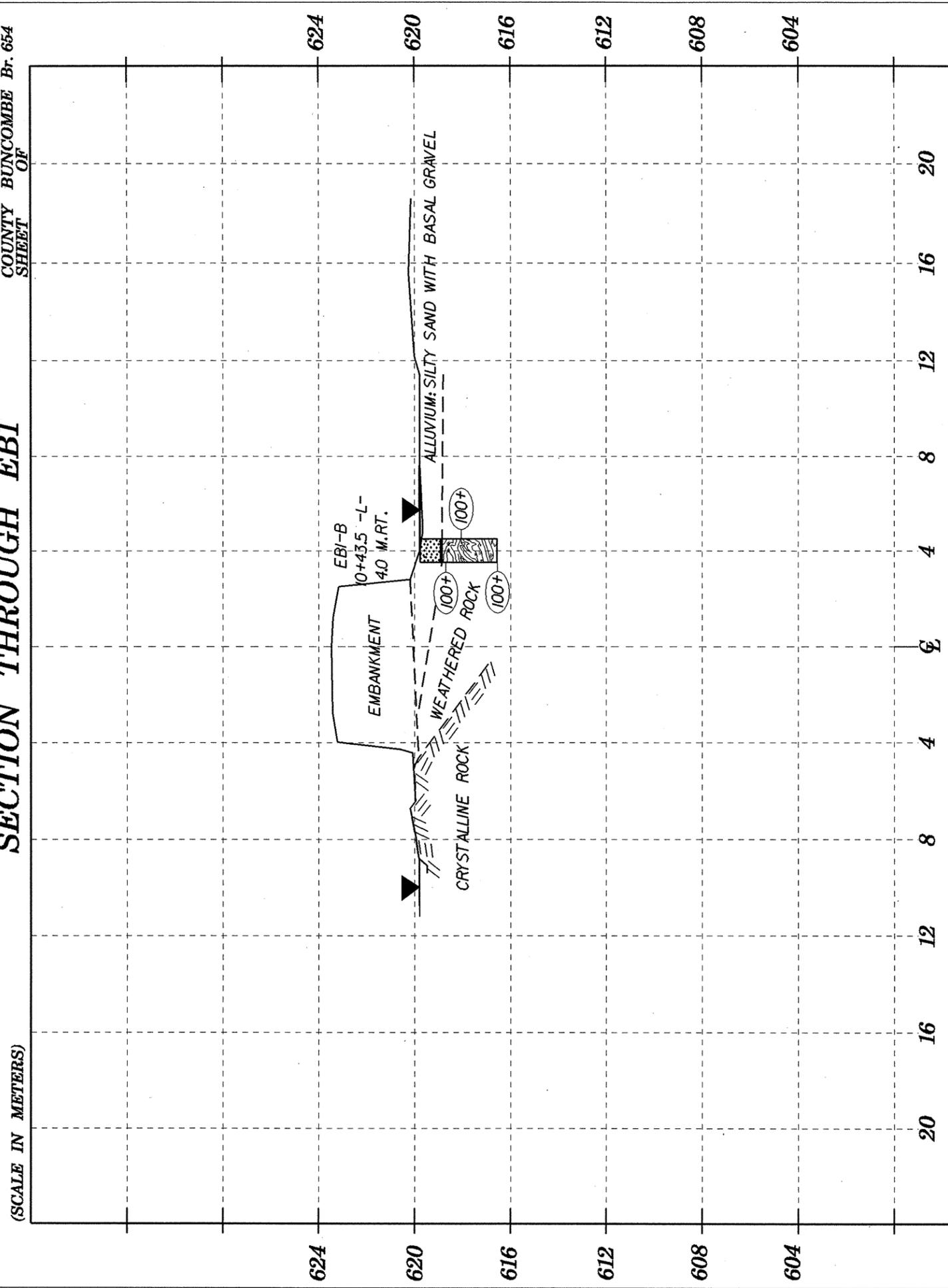
PROJECT 8.2843501 - P-3119
COUNTY HUNCOMBE Br. 654
SHEET 3 OF 7



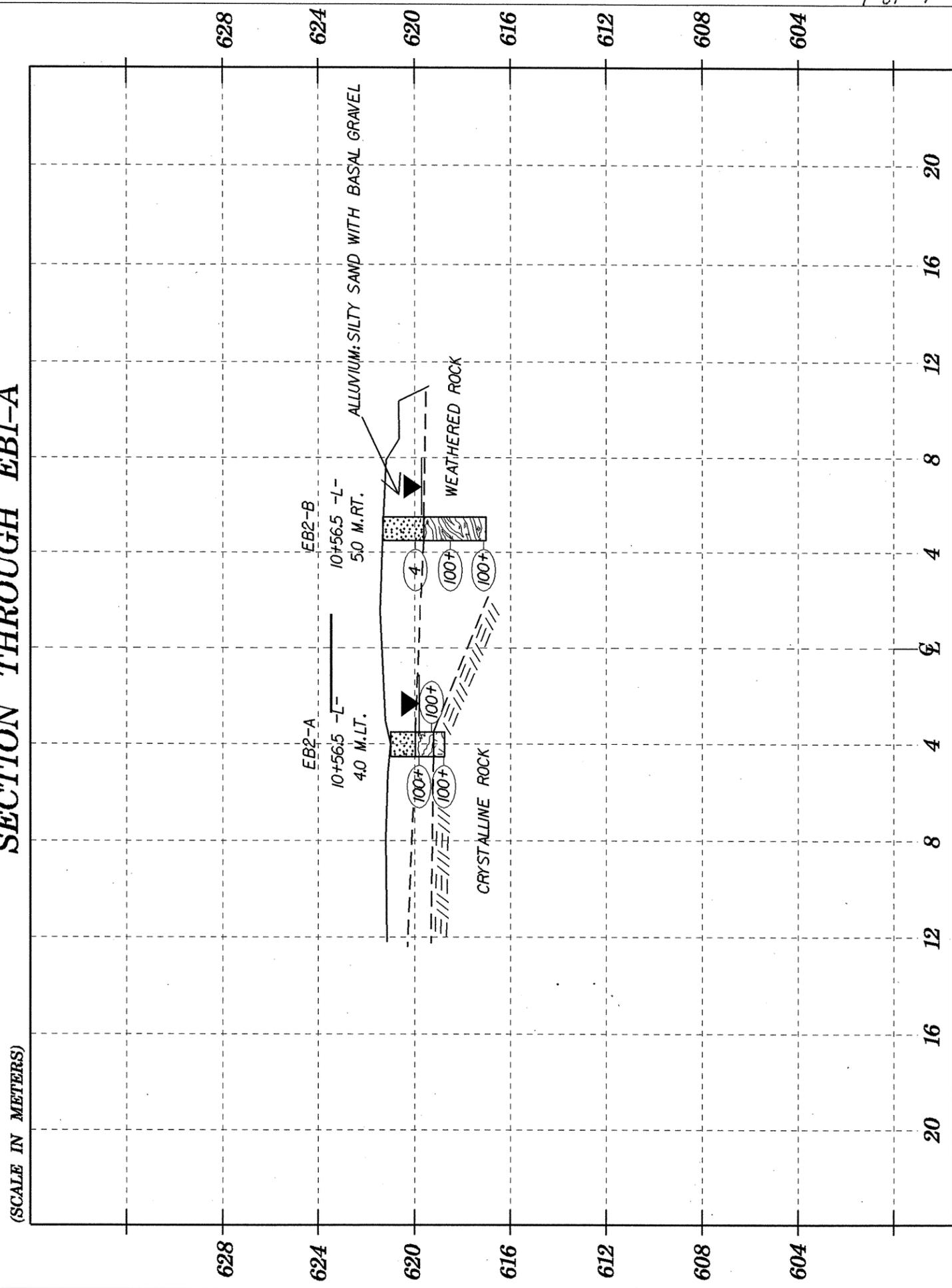
SCALE IN METERS

SECTION THROUGH EB1

PROJECT 8.2843501 B-3119
COUNTY BUNCOMBE Br. 654
SHEET OF



SECTION THROUGH EB1-A



NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO 8.2843501		ID B-3119		COUNTY BUNCOMBE		GEOLOGIST PQ LOCKAMY								
SITE DESCRIPTION BR. NO. 654 ON SR-2786 OVER SAND BRANCH							GND WATER							
BORING NO EB1-B		NORTHING 0.00		EASTING 0.00		0 HR 0.00m	24 HR 0.00m							
ALIGNMENT -L2-		BORING LOCATION 10+43.500		OFFSET 4.00m RT										
COLLAR ELEV 619.78m		TOTAL DEPTH 3.21m		START DATE 4/08/03		COMPLETION DATE 04/08/03								
DRILL MACHINE CME-550X			DRILL METHOD SPT CORE BORING			HAMMER TYPE AUTOMATIC								
SURFACE WATER DEPTH			DEPTH TO ROCK 0.00m			Log EB1-B, Page 1 of 1								
ELEV	DEPTH	BLOW CT			PEN (m)	BLOWS PER 30cm				SAMPLE NO	MOI	LOG	SOIL AND ROCK DESCRIPTION	
		15cm	15cm	15cm		0	25	50	75					100
619.78														
619.00	0.93				0.08									ALLUVIUM: SILTY SAND WITH BASAL GRAVEL
	1.57				0.10									WEATHERED ROCK
617.00														
616.57	3.09				0.12									
						BORING TERMINATED IN WEATHERED ROCK AT A DEPTH OF 3.21 METERS								

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
 GEOTECHNICAL UNIT BORING LOG

PROJECT NO 8.2843501		ID B-3119		COUNTY BUNCOMBE		GEOLOGIST PQ LOCKAMY								
SITE DESCRIPTION BR. NO. 654 ON SR-2786 OVER SAND BRANCH							GND WATER							
BORING NO EB2-A		NORTHING 0.00		EASTING 0.00		0 HR 1.20m								
ALIGNMENT -L2-		BORING LOCATION 10+56.500		OFFSET 4.00m LT		24 HR 1.20m								
COLLAR ELEV 621.00m		TOTAL DEPTH 2.25m		START DATE 4/01/03		COMPLETION DATE 04/01/03								
DRILL MACHINE CME-550X			DRILL METHOD SPT CORE BORING			HAMMER TYPE AUTOMATIC								
SURFACE WATER DEPTH			DEPTH TO ROCK N/A			Log EB2-A, Page 1 of 1								
ELEV	DEPTH	BLOW CT			PEN (m)	BLOWS PER 30cm					SAMPLE NO	LOG MOI	SOIL AND ROCK DESCRIPTION	
		15cm	15cm	15cm		0	25	50	75	100				
621.00														Ground Surface
620.00	1.04	36	64	0.25										ALLUVIUM: BROWN SILTY SAND WITH BASAL GRAVEL
	1.56	100		0.07										WEATHERED ROCK
618.75	2.22	100		0.03										CRYSTALLINE ROCK
BORING TERMINATED AT A DEPTH OF 2.25 METERS														

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
 GEOTECHNICAL UNIT BORING LOG

PROJECT NO 8.2843501		ID B-3119		COUNTY BUNCOMBE		GEOLOGIST PQ LOCKAMY								
SITE DESCRIPTION BR. NO. 654 ON SR-2786 OVER SAND BRANCH							GND WATER							
BORING NO EB2-B		NORTHING 0.00		EASTING 0.00		0 HR 1.60m								
ALIGNMENT -L2-		BORING LOCATION 10+56.500		OFFSET 5.00m RT		24 HR 1.60m								
COLLAR ELEV 623.46m		TOTAL DEPTH 4.30m		START DATE 3/28/03		COMPLETION DATE 03/28/03								
DRILL MACHINE CME-550X			DRILL METHOD SPT CORE BORING			HAMMER TYPE AUTOMATIC								
SURFACE WATER DEPTH			DEPTH TO ROCK N/A			Log EB2-B, Page 1 of 1								
ELEV	DEPTH	BLOW CT			PEN (m)	BLOWS PER 30cm					SAMPLE NO	LOG MOI	SOIL AND ROCK DESCRIPTION	
		15cm	15cm	15cm		0	25	50	75	100				
623.46														Ground Surface
623.00														ALLUVIUM: BROWN SILTY SAND WITH BASAL GRAVEL
	1.20	0	1	3	0.30									WEATHERED ROCK
621.00	2.70	42	58	0.24										WEATHERED ROCK
619.16	4.20	100		0.11										CRYSTALLINE ROCK
BORING TERMINATED AT A DEPTH OF 4.3 METERS														

GEOTECHNICAL UNIT FIELD SCOUR REPORT

PROJECT: 8.2843501 B-3119 COUNTY: BUNCOMBE

DESCRIPTION(1): Bridge No. 654 on SR-2786 over the Sand Branch

INFORMATION ON EXISTING BRIDGES Information obtained from: XXX field inspection microfilm(Reel: Pos:) other

COUNTY BRIDGE NO. 654 BRIDGE LENGTH 13.3m NO. BENTS IN: CHANNEL 0 FLOOD PLAIN 2

FOUNDATION TYPE: concrete footing

EVIDENCE OF SCOUR(2):

ABUTMENTS OR END BENT SLOPES: Upstream nw corner is subject to cut bank effects - is resisting well.

INTERIOR BENTS: None

CHANNEL BED: None visible - river has a considerable sand load and all scour holes are filled.

CHANNEL BANKS: West bank upstream of exiting bridge is cut bank side.

EXISTING SCOUR PROTECTION:

TYPE(3): concrete abutment and wings

EXTENT(4): From weathered rock in creek bed to bridge deck.

EFFECTIVENESS(5): Very good

OBSTRUCTIONS(6) (DAMS, DEBRIS, ETC.): None

DESIGN INFORMATION

CHANNEL BED MATERIAL(7) (SAMPLE RESULTS ATTACHED): silty sand over shallow rock

CHANNEL BANK MATERIAL(8) (SAMPLE RESULTS ATTACHED): silty sand

FOUNDATION BEARING MATERIAL(9): weathered rock to moderately weathered crystalline rock

CHANNEL BANK COVER(10): Weeds and trees

FLOOD PLAIN WIDTH(11): Varies considerably up and downstream - is approximately 300 feet wide at bridge.

FLOOD PLAIN COVER(12): Mostly old pasture with lost of weeds and some trees.

DESIGN INFORMATION CONT.

STREAM IS XXX DEGRADING AGGRADING (13)

OTHER OBSERVATIONS AND COMMENTS: This section of creek is flatter than upstream and recieves a considerable coarse sediment input.

CHANNEL MIGRATION TENDENCY (14): to the northwest (Proposed End Bent 1)

GEOTECHNICALLY ADJUSTED SCOUR ELEVATION (15): is basically controlled by depth of shallow weathered rock.

EB1-A 620.0 m EB1-B 618.8 m

EB2-A 620.2 m EB2-B 619.6 m

REPORTED BY: P. Q. Lockamy DATE: 5/1/03

INSTRUCTIONS

- (1) GIVE THE DESCRIPTION OF THE SPECIFIC SITE GIVING ROUTE NUMBER AND BODY OF WATER CROSSED.
(2) NOTE ANY EVIDENCE OF SCOUR AT THE EXISTING END BENTS OR ABUTMENTS (UNDERMINING, SLOUGHING, SCOUR LOCATIONS, DEGRADATIONS, ETC.)
(3) NOTE ANY EXISTING SCOUR PROTECTION (RIP RAP, ETC.)
(4) DESCRIBE THE EXTENT OF ANY EXISTING SCOUR PROTECTION.
(5) DESCRIBE WHETHER OR NOT THE SCOUR PROTECTION APPEARS TO BE WORKING.
(6) NOTE ANY DAMS, FALLEN TREES, DEBRIS AT BENTS, ETC.
(7) DESCRIBE THE CHANNEL BED MATERIAL: A SAMPLE SHOULD BE TAKEN FOR GRAIN SIZE DISTRIBUTION, ATTACH LAB RESULTS.
(8) DESCRIBE THE CHANNEL BANK MATERIAL: A SAMPLE SHOULD BE TAKEN FOR GRAIN SIZE DISTRIBUTION, ATTACH LAB RESULTS.
(9) DESCRIBE THE FOUNDATION BEARING MATERIAL,
(10) DESCRIBE THE BANK COVERING (GRASS, TREES, RIP RAP, NONE, ETC.
(11) GIVE THE APPROXIMATE FLOOD PLAIN WIDTH (ESTIMATE).
(12) DESCRIBE THE FLOOD PLAIN COVERING (GRASS, TREES, CROPS, ETC.)
(13) CHECK THE APPROPRIATE SPACE AS TO WHETHER THE STREAM IS DEGRADING OR AGGRADING
(14) DESCRIBE THE POTENTIAL OF THE BODY OF WATER TO MIGRATE Laterally DURING THE LIFE OF THE BRIDGE (APPROXIMATELY 100 YEARS).
(15) GIVE THE GEOTECHNICALLY ADJUSTED SCOUR ELEVATION EXPECTED OVER THE LIFE OF THE BRIDGE (APPROXIMATELY 100 YEARS). THIS CAN BE GIVEN AS AN ELEVATION RANGE ACROSS THE SITE, OR ON A BENT BY BENT BASIS WHERE VARIATIONS EXIST. DISCUSS RELATIONSHIP BETWEEN THE HYDRAULICS THEORETICAL SCOUR AND THE GEOTECHNICALLY ADJUSTED SCOUR ELEVATION. THE GEOTECHNICALLY ADJUSTED SCOUR ELEVATION IS BASED ON THE ERODABILITY OF MATERIALS WITH CONSIDERATION FOR JOINTING, FOLIATION, BEDDING ORIENTATION AND FREQUENCY; CORE RECOVERY PERCENTAGE; PERCENTAGE RQD; DIFFERENTIAL WEATHERING, SHEAR STRENGTH; OBSERVATIONS AT EXISTING STRUCTURES; OTHER TESTS DEEMED APPROPRIATE; AND OVERALL GEOLOGIC CONDITIONS AT THE SITE.

PROJECT: 32877.1.1 ID: B-3119

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-3119	1	15
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
32877.1.1	BRZ-2804(I)	P.E. CONST.	



STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL UNIT

STRUCTURE SUBSURFACE INVESTIGATION

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Site Vicinity Map	Sheet 5
Boring Location Plan	Sheet 6
Generalized Subsurface Profile 5.0m Left of -YI-	Sheet 7
Generalized Subsurface Cross Sections	Sheets 8 - 10
Test Boring Logs	Sheets 11 - 12
Summary of Laboratory Test Data	Sheet 13
Site Photographs	Sheets 14 - 15

For Letting

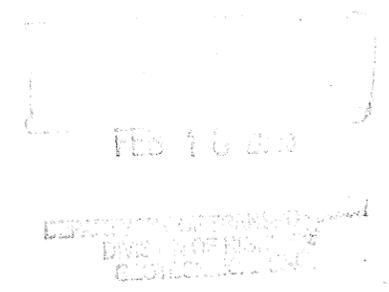
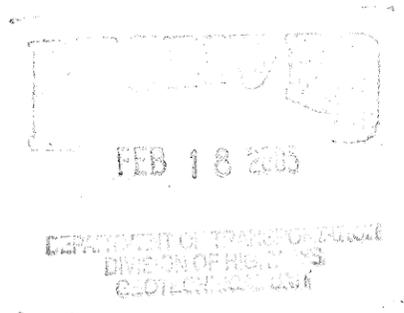
CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WAS MADE FOR THE PURPOSE OF STUDY, PLANNING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N.C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL UNIT @ (919) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA IS PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THIS PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

STATE PROJECT 32877.1.1 I.D. NO. B-3119
 F.A. PROJECT BRZ-2804(I)
 COUNTY BUNCOMBE
 PROJECT DESCRIPTION RETAINING WALL
AT BRIDGE 653 OVER THE BROAD RIVER ON SR 2804

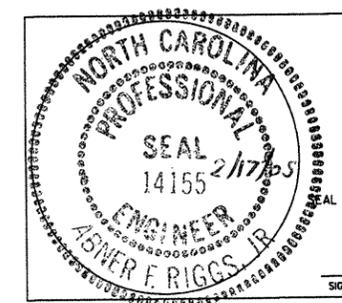


INVESTIGATED BY	<u>S&ME, INC.</u>	PERSONNEL	<u>S. JOHNSON</u>
CHECKED BY	<u>A.F. RIGGS, JR.</u>		<u>D. BENTS</u>
SUBMITTED BY	<u>S&ME, INC.</u>		<u>T. TANSKY</u>
DATE	<u>JANUARY 27, 2005</u>		<u>R. NORWOOD</u>
			<u>A. CROWE</u>
			<u>P. PHELPS</u>
			<u>T. PEREZ</u>

DRAWN BY: T. PEREZ

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.



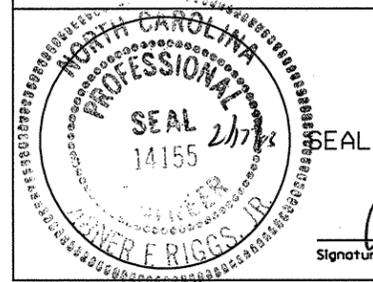
Alvin Riggs, Jr.
 SIGNATURE

NORTH CAROLINA DIVISION OF HIGHWAYS
GEOTECHNICAL UNIT
SOIL AND ROCK CLASSIFICATION, LEGEND, AND ABBREVIATIONS

NORTH CAROLINA DIVISION OF HIGHWAYS
GEOTECHNICAL UNIT



SOIL LEGEND AND AASHTO CLASSIFICATION										CONSISTENCY OR DENSENESS						
GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)					SILT-CLAY MATERIALS (> 35% PASSING #200)					ORGANIC MATERIALS	PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTANCE (N - VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (q _u) (kN / m ²)	
GROUP CLASS.	A-1	A-1-b	A-3	A-2	A-4	A-5	A-6	A-7	A-1-A-2	A-1-A-5	A-1-A-3	A-4-A-5	A-6-A-7			
SYMBOL	[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]			
% PASSING	50 MX	30 MX	50 MX	51 MN	35 MX	35 MX	35 MX	35 MN	36 MN	36 MN	36 MN	36 MN	36 MN			
(PASSING #40)	LL	PI														
GROUP INDEX	0	0	0	4 MX												
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL & SAND	FINE SAND	SILT OR CLAYEY GRAVEL AND SAND		SILTY OR CLAYEY SILTS		CLAYEY SILTS									
* PI OF A-7-5 ≤ (LL-30); PI OF A-7-6 > (LL-30)																
TEXTURE OR GRAIN SIZE																
BOULDER	COBBLE	GRAVEL	COARSE SAND	FINE SAND	SILT	CLAY										
GRAIN (mm)	305	75	2	0.25	0.05	0.005										
SIZE (IN)	12	3														
SOIL MOISTURE - CORRELATION OF TERMS																
SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION														
LL LIQUID LIMIT	-SATURATED- (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE														
PLASTIC RANGE (PI) PL	-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														
ROCK DESCRIPTION																
IN THE BROADEST MEANING, HARD ROCK IS CONSIDERED TO BE THAT INDURATED EARTH MATERIAL WHICH CANNOT BE SAMPLED BY CONVENTIONAL SOIL SAMPLING TOOLS OR TECHNIQUES. THE BOUNDARY BETWEEN SOIL AND ROCK IS ARBITRARY. TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF "WEATHERED ROCK". FOR THE PURPOSE OF THIS INVESTIGATION, THESE MATERIALS ARE DIVIDED AS FOLLOWS:																
TERM	SYMBOLS		DESCRIPTION													
HARD ROCK (HR)	CORED ROCK	INFERRED ROCK LINE	MATERIAL THAT CANNOT BE PENETRATED BY POWER AUGERS, EXCEPT IN THIN LEDGES, AND REQUIRES ROCK CORING TOOLS FOR OBTAINING A SAMPLE													
WEATHERED ROCK (WR)	HARD WEATHERED ROCK (HWR)		MATERIAL THAT CAN BE PENETRATED WITH GREAT DIFFICULTY USING POWER AUGERS AND YIELDS SPT REFUSAL													
	SOFT WEATHERED ROCK (SWR)		MATERIAL THAT CAN BE PENETRATED WITH SOME DIFFICULTY USING POWER AUGERS AND YIELDS SPT VALUES > 100 BLOWS BUT < SPT REFUSAL													
¹ SPT REFUSAL ≤ 2.5 cm OF PENETRATION PER 50 BLOWS IN SPT. ² AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH AUGERS COULD NO LONGER PENETRATE. THE HARD ROCK SYMBOL IS SHOWN WHEN ROCK IS CORED AND ONLY TO THAT DEPTH CORED. A DESCRIPTION OF ROCK IS GIVEN, INCLUDING: CORE RECOVERY (REC.) - TOTAL LENGTH OF ROCK RECOVERED IN THE CORE BARREL DIVIDED BY THE TOTAL LENGTH OF THE CORE RUN TIMES 100%. ROCK QUALITY DESIGNATION (ROD) - TOTAL LENGTH OF SOUND ROCK SEGMENTS RECOVERED THAT ARE LONGER THAN OR EQUAL TO 0.1 m DIVIDED BY THE TOTAL LENGTH OF THE CORE RUN TIMES 100%.																
BENCH MARK: NCDOT TRAVERSE STATION REBAR AND CAP STAMPED BY: -3, LOCATED AT STATION 6+60.860 ELEV. 619.821m STATE PROJECT NO. 32877.1.1 T.I.P. NO. B-3119 F.A. NO. BRZ-2804(1) COUNTY BUNCOMBE ROUTE SR2804 SITE DESCRIPTION RETAINING WALL AT BRIDGE 653 OVER THE BROAD RIVER ON SR2804 PROJECT ENGINEER A.F. RIGGS, JR. SUBMITTED BY S&ME, INC. PERSONNEL S. JOHNSON A. CROWE D. BENTS P. PHELPS T. TANSKY T. PEREZ R. NORWOOD DATE SUBMITTED JAN. 27, 2005 REV. 8/11/98																



Signature: *Albert F. Riggs, Jr.*

LEGEND SUPPLEMENT

In addition to the terms and abbreviations listed on the Legend Sheet, the following will be used to further describe rock quality on this project. Because of limited space on the logs, abbreviations are in parenthesis.

WEATHERING

- Fresh** Rock fresh, crystals bright, few joints may show slight staining. Rock rings under hammer in 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 0.025 m (1 in.). Open joints may contain clay. In granitoid rocks some occasional feldspar crystals are dull and discolored.
- 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 show 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 & can be excavated with geologist's pick. Rock gives "clunk" sound when struck. Comparable to hard weathered rock.
- Severe (SEV.)** All rocks 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. Comparable to soft weathered rock.
- 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. Comparable to soil.
- Complete** Rock reduced to soil. Rock fabric not discernible only in small and scattered concentrations. Quartz may be present as dikes or stringers. Saprolite is also an example. Comparable to soil.

ROCK CONTINUITY

- Sound** Core pieces larger than 0.20 m.
- Slightly Fractured (SLI. FRAC.)** Core pieces between 0.10 m and 0.20m.
- Moderately Fractured (MOD. FRAC.)** Core pieces between 0.025 m and 0.10 m.
- Extremely Fractured (EXT. FRAC.)** Core pieces less than 0.025 m.

JOINT SPACING

Average Discontinuity Spacing (ADS)
 The average measured distance (in meters) between joints in the same set. Will not apply to individual joints.

JOINT THICKNESS

Average Discontinuity Thickness (ADT)
 The average thickness or width of gap in the joint (in meters).

STATE PROJECT NO.: 32877.1.1
 I.D. NO.: B-3119
 FEDERAL PROJECT NO.: BRZ-2804(1)
 COUNTY: Buncombe

DESCRIPTION: Retaining Wall at Bridge No. 653 over the Broad River on SR 2804

SUBJECT: Structure Subsurface Investigation – Inventory Report

Project Description

The project site is located on Nesbitt's Chapel Road (SR 2786) –Y1- just west of its intersection with SR 2804 in Buncombe County, North Carolina (see Site Vicinity Map, Sheet 5). The proposed project consists of a retaining wall structure on the north side of SR 2786. Based on the structural drawings prepared by NCDOT, the retaining wall will be constructed from station 11+70 to station 12+00 approximately 5 meters left (north) of the –Y1- survey line. The retaining wall structure will be approximately 30 meters long and approximately 2 to 3 meters high.

Based upon the structural drawings provided by NCDOT, the finished grade elevations for the retaining wall structure, will range from approximately 618.3 to 619.0 meters. This will require excavation depths of approximately 1.5 to 2.5 meters along the length of the wall.

A geotechnical investigation was conducted between January 17 and January 20, 2005. Due to the slope, soil borings R-1 through R-4 were performed along the bottom of the slope along the existing roadway. Drilling consisted of advancing 8.26 centimeter diameter hollow stem augers with standard penetration tests at four (4) locations with a CME-550x drill rig mounted on an all terrain vehicle. Representative soil samples were collected for visual classification in the field and for laboratory classification analysis by the NCDOT accredited S&ME soil testing laboratory.

In addition, six (6) rod soundings were performed along the slope. Rod sounding RS-1 through RS-4 were performed at stations 11+70, 11+80, 11+90, 12+00 approximately 5.0 meters left of –Y1- along the length of the proposed retaining wall and rod soundings RS-5 and RS-6 were performed approximately 12.0 meters left of –Y1- as shown on the boring location plan (Sheet 6). The sounding rods were performed by driving a 1.27 cm diameter steel rod in 0.91 meters lengths with a 73.40 Newton pipe hammer. The blow counts were recorded in 15 centimeter intervals as shown on the field logs attached in the Supportive Documents.

In addition, an approximately 44 meter seismic refraction line was performed along the proposed retaining wall location and an approximately 18 meter seismic refraction line was performed along the cross section at station 11+90. The refraction method consists of measuring travel times of generated compression (P) waves to estimate, in this particular case, the depth to rock along a perpendicular to the proposed wall. The testing was conducted using a 24 channel GeoMetrics Geode seismograph. Each channel was connected to a 14 Hz geophone placed at 2 meter spacing along the array. Each geophone, which was placed in direct contact with the ground, recorded the arrival times of the generated waves. For this survey, the energy source consisted of a sledgehammer striking a metal plate. Travel times evaluated using the intercept-time method with the OYO Corporation's SeisImager software. The results of refraction survey are presented on the attached profiles and

cross sections. In addition, the surface of the refractor (interpreted to be hard rock) has been included on the profiles and cross sections. The top of rock, indicated by auger refusal conditions or seismic refraction velocities in excess of approximately 1500 meters per second (m/s) are shown on the attached profiles and cross sections. Material exhibiting seismic refraction velocities of approximately 1500 m/s typically require very hard ripping or blasting prior to removal.¹

Physiography and Geology

The project site is located on Nesbitt's Chapel Road (SR 2786) –Y1- west of its intersection with SR 2804, in Buncombe County, North Carolina. The area surrounding the site consists of residential and wooded area. The Broad River is located to the immediate south. Overhead power lines are located to the northwest of the proposed wall and an underground phone line is located near the toe of the slope along SR 2786 parallel to the (-Y4- survey line).

The proposed project site is located in the Chauga Physiographic Province of North Carolina as part of the Appalachian Mountain system. The Chauga Province is characterized by high mountain ridges with broad and rounded summits, with steep slopes, dissected by alluvial valleys and swiftly flowing streams. The Chauga Belt consists of a series of thrust sheets stacked one on another. Locally, the thrust faults bounding sheets can be mapped at the surface. The oldest rocks of the Chauga belt are Middle Proterozoic-age, massive to layered, granitic gneisses. Intrusive into these basement complex gneisses are younger, more massive diabase and metamorphic granitic rocks. More specifically, the project is located in the Henderson Gneiss Formation. Based on previous mapping and our knowledge of the local geology, the parent rock is interpreted to be biotite gneiss. This unit is competent and relatively resistant to weathering. Outcrops are common in this area.

Foundation Materials

The borings were advanced to depths ranging from 1.60 to 4.60 meters (elevations 616.41 to 612.92 meters) at collar elevations ranging from 618.01 to 617.36 meters.

Roadway embankment fill materials were encountered in all of the soil test borings to depths ranging from about 0.90 to 4.00 meters (elevations 617.11 to 613.52 meters) below the collar elevation. The fill material encountered in these borings consists of medium dense to dense brown, tan and gray slightly clayey silty coarse to fine sand (A-2-4) with trace of rock fragments and organic matter and very soft to very stiff brown and gray clayey coarse to fine sandy silt (A-4) with trace of rock fragments. Standard penetration tests (SPT) N-values in the fill materials ranged from 1 to 42.

Residual soils derived from in-place weathering are the most prevalent soil type and are common to this physiographic region. Residual soils exist beneath the roadway embankment fill in borings R-1 and R-4 to depths ranging from about 1.60 to 3.60 meters (elevations 616.41 to 613.76 meters) beneath the collar elevation. The residuum consists of medium dense to very dense brown to light gray silty fine to coarse sand (A-2-4). Standard penetration test (SPT) N-values in the residual soils ranged from 19 to 88.

Soft weathered rock was encountered in borings R-2 and R-3 at depths ranging from about 2.40 to 4.00 meters (elevations 615.27 to 613.52 meters) beneath collar elevations. Standard penetration test (SPT) N-values in

¹ Church, Horace K., (1981) Excavation Handbook, McGraw-Hill Companies, Inc., New York City, NY, sec. 7-32.

the weathered rock ranged from 100 blows with 17 centimeters of penetration to 100 blows with 14 centimeter of penetration.

The soft weathered rock transitions to hard rock (auger refusal material) in borings R-2 and R-3 consisting of gray gneiss. Borings R-2 and R-3 were terminated on hard rock at elevations ranging from 614.87 to 612.92 meters beneath collar elevations. Hard rock (auger refusal material) was encountered in borings R-1 and R-4 beneath the residual soils and extends to boring termination depths ranging from about 616.41 and 613.76 meters beneath collar elevation.

Notes to Designer

The CME-550x drill rig is equipped with a hydraulic automatic hammer. Standard Penetration tests were performed with the attached Autohammer and not with a traditional rope, cathead and Safety Hammer. Research has shown that the Standard Penetration resistance (N-value) determined by the Autohammer is different than the N-value determined by the Safety Hammer method. Most correlations that are published in the technical literature are based on the N-value determined by the Safety Hammer method. This is commonly termed N_{60} as the rope and cathead with a Safety Hammer delivers about 60 percent of the theoretical energy delivered by a 140 pound hammer falling 30 inches. Several researchers have proposed correction factors for the use of hammers other than the Safety Hammer. The correction is made by the following equation:

$$N_{60} = N_{\text{field}} * C_E$$

Where N_{field} is the value recorded in the field and N_{60} is the value to be used in correlation. C_E is the energy correction factor for the hammer used. A correction factor of 1.3 should be used for the Autohammer used during drilling.

The N-values reported on the field boring logs are the actual, field derived blow counts (N_{field}). However, only corrected results should be used for analysis.

Groundwater

Groundwater depths were measured at the time of drilling operations. A groundwater depth of about 2.10 meters (elevation 615.26 meters) was measured in boring R-1 at the time of drilling operations. The remaining boreholes were observed to be dry at the time of boring termination. Stabilized groundwater depths were not measured in the borings due to borings being performed in the existing roadway. The borings were backfilled at the time of boring termination due to safety concerns.

QUALIFICATIONS OF REPORT

This report has been prepared in accordance with generally accepted geotechnical engineering practice for specific application to this project. The conclusions contained in this report were based on the applicable standards of our profession at the time this report was prepared. No other warranty, expressed or implied, is made.

The conclusions submitted in this report are based, in part, upon the data obtained from the subsurface exploration. The nature and extent of subsurface variations between the borings may not become evident until

construction. If variations appear evident, then the conclusions contained in this report may need to be re-evaluated. In the event that any changes in the nature, design, or location of the structure are planned, the conclusions contained in this report will not be considered valid unless the changes are reviewed by S&ME, and the conclusions of the report are modified or verified in writing.

S&ME appreciates the opportunity to be your geotechnical consultant on this project. If you have any questions or need additional information in regard to this report, please contact us.

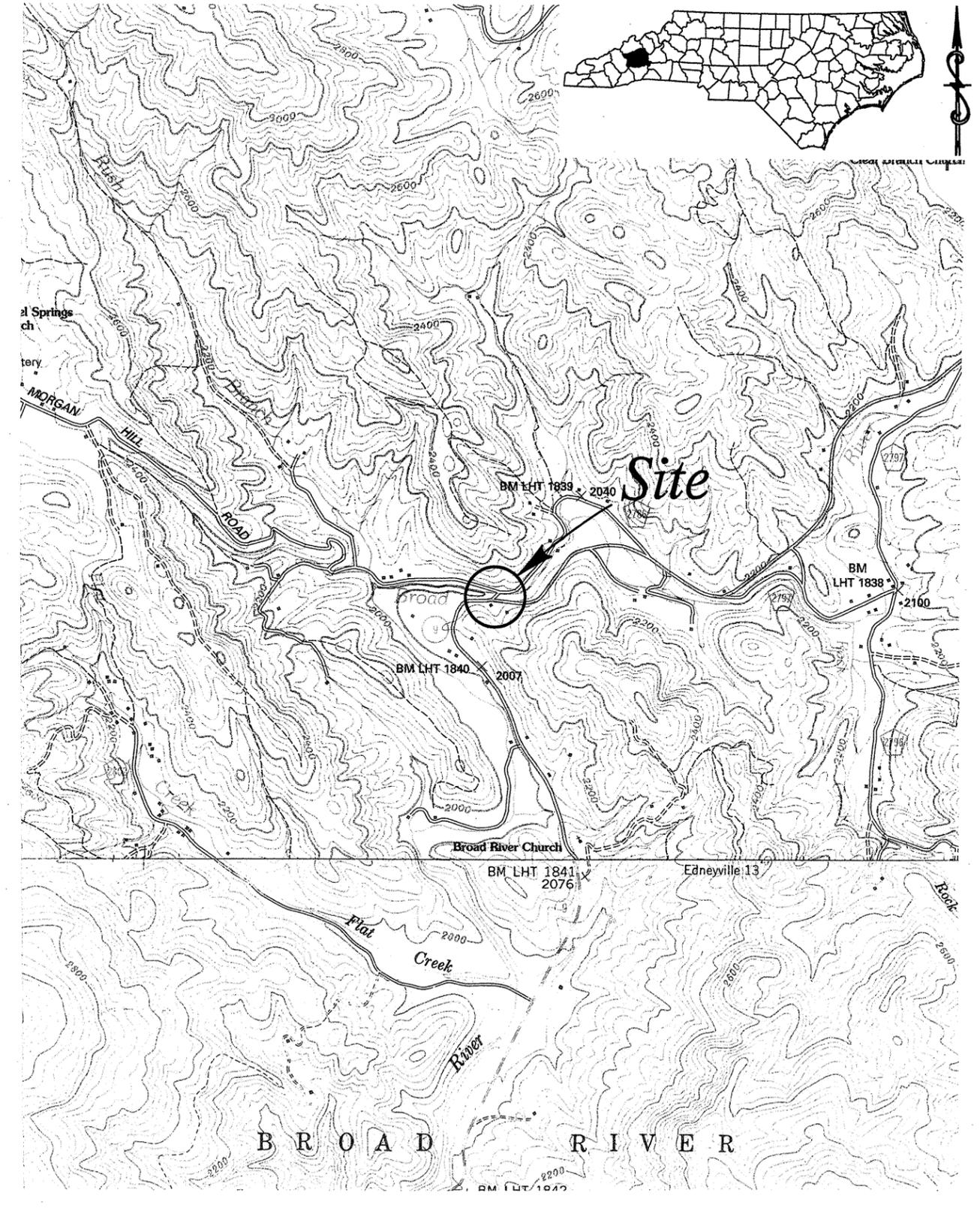
Very truly yours,
S&ME, Inc.


J. Shane Johnson, P.G.
Project Geologist
N.C. Registration No. 1753

Attachments


Abner F. Riggs, Jr. P.E.
Chief Geotechnical Engineer
N.C. Registration No. 14155





S:\GEOTECH\2004\04 BRIDGES\B-3119 BRG 653 RETAINING WALL\CADD\B-3119 SITEVIC

SCALE:	1:24,000
CHECKED BY:	AFR
DRAWN BY:	TRP
DATE:	JANUARY 2005
JOB NO.	1051-05-018



SITE VICINITY MAP
 RETAINING WALL AT BRIDGE 653
 OVER THE BROAD RIVER ON SR 2804
 STATE PROJECT NO. 32877.1.1 TIP NO. B-3119
 FEDERAL I.D. NO. BRZ-2804(1)
 BUNCOMBE COUNTY, NORTH CAROLINA



-L- STA.10+54.500
END BRIDGE

-BY1- 2 POT Sta.5+90.522
(-Y1- Sta.11+5.581 3.800 RT.)
-Y1- PRC Sta.11+47.539

-L- STA.10+63.060 END CONSTRUCTION
-Y1- STA.11+76.255

-Y1- PRC Sta.12+20.654

END APPROACH SLAB
-L- STA.10+56.328

RETAINING WALL

MESBITT'S CHAPEL ROAD
SR 2786 6.2m BST
20.6 R

TEMPORARY WORK PAD

SITE 1

-L- STA.10+14.500
BEGIN BRIDGE

END CONSTRUCTION
-Y1- POC Sta.12+20.000

-Y- PT Sta.11+46.044

-BL- 1 POT Sta.5+00.000

(-Y- Sta.11+46.718 0.136 RT.)

-BL- POT Sta.5+04.413

(-L- Sta.10+02.930 8.177 LT.)

BEGIN APPROACH SLAB

-L- POT Sta.10+07.185

BEGIN STATE PROJECT B-3119

-L- STA.10+00.000 / -Y- POT Sta.11+58.069

BENCHMARK:

NCDOT TRAVERSE STATION REBAR AND CAP STAMPED BY-3
LOCATED AT STATION 6+60.860
ELEV. 619.821m

-BY-3 POT Sta.6+60.860

(-Y- Sta.11+67.160 5.328 LT.)

WOODS

WOODS

SCALE IN METER
0 10 20

BORING LOCATION PLAN

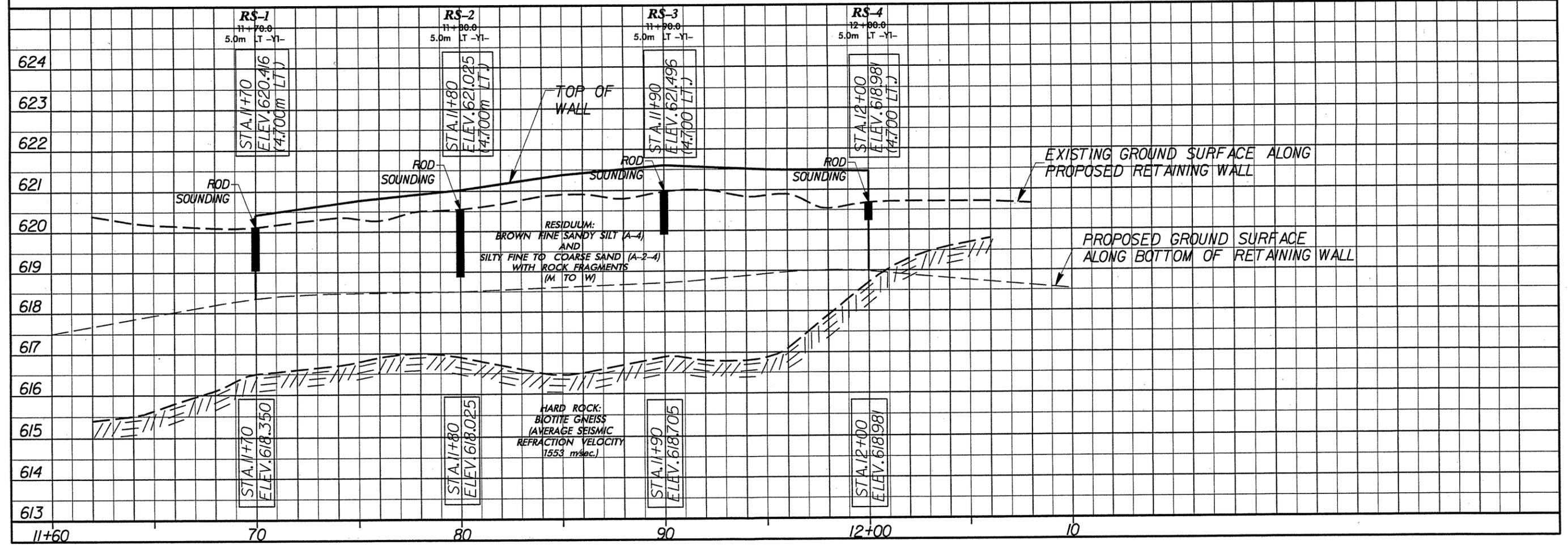
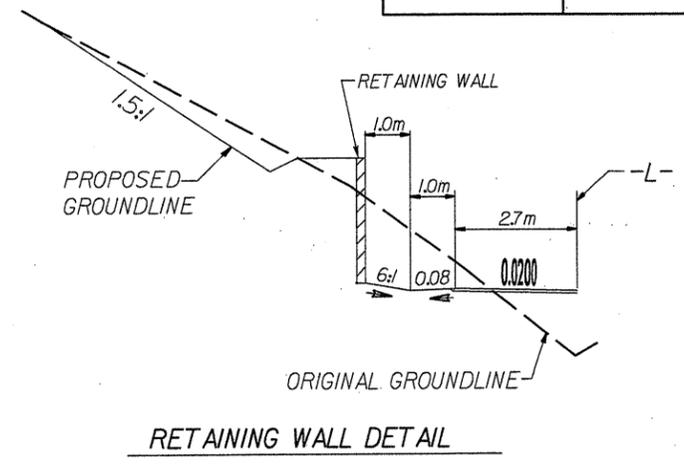
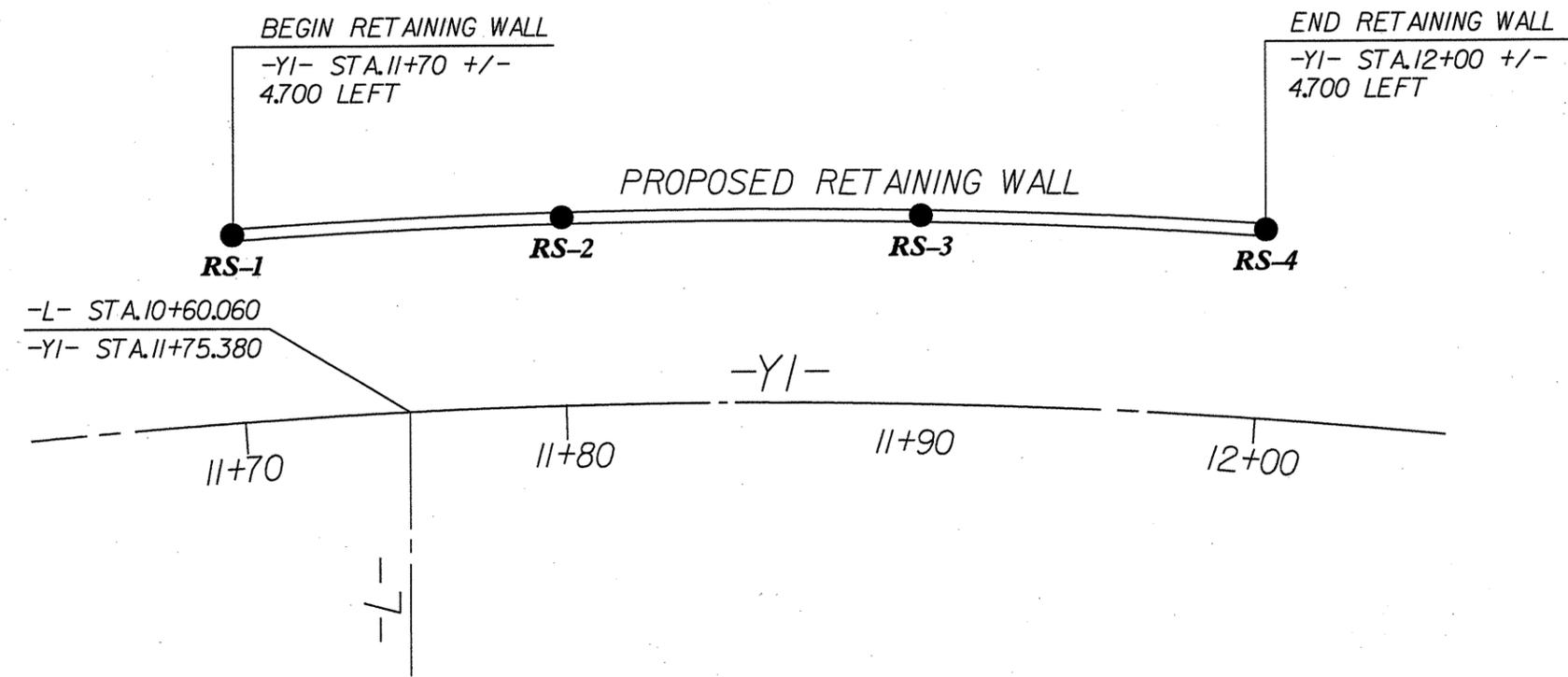
RETAINING WALL AT BRIDGE 653
OVER THE BROAD RIVER ON SR 2804
TIP No. B-3119 STATE PROJECT No. 32877.1.1 FEDERAL I.D. BRZ-2804(1)
BUNCOMBE COUNTY, NORTH CAROLINA

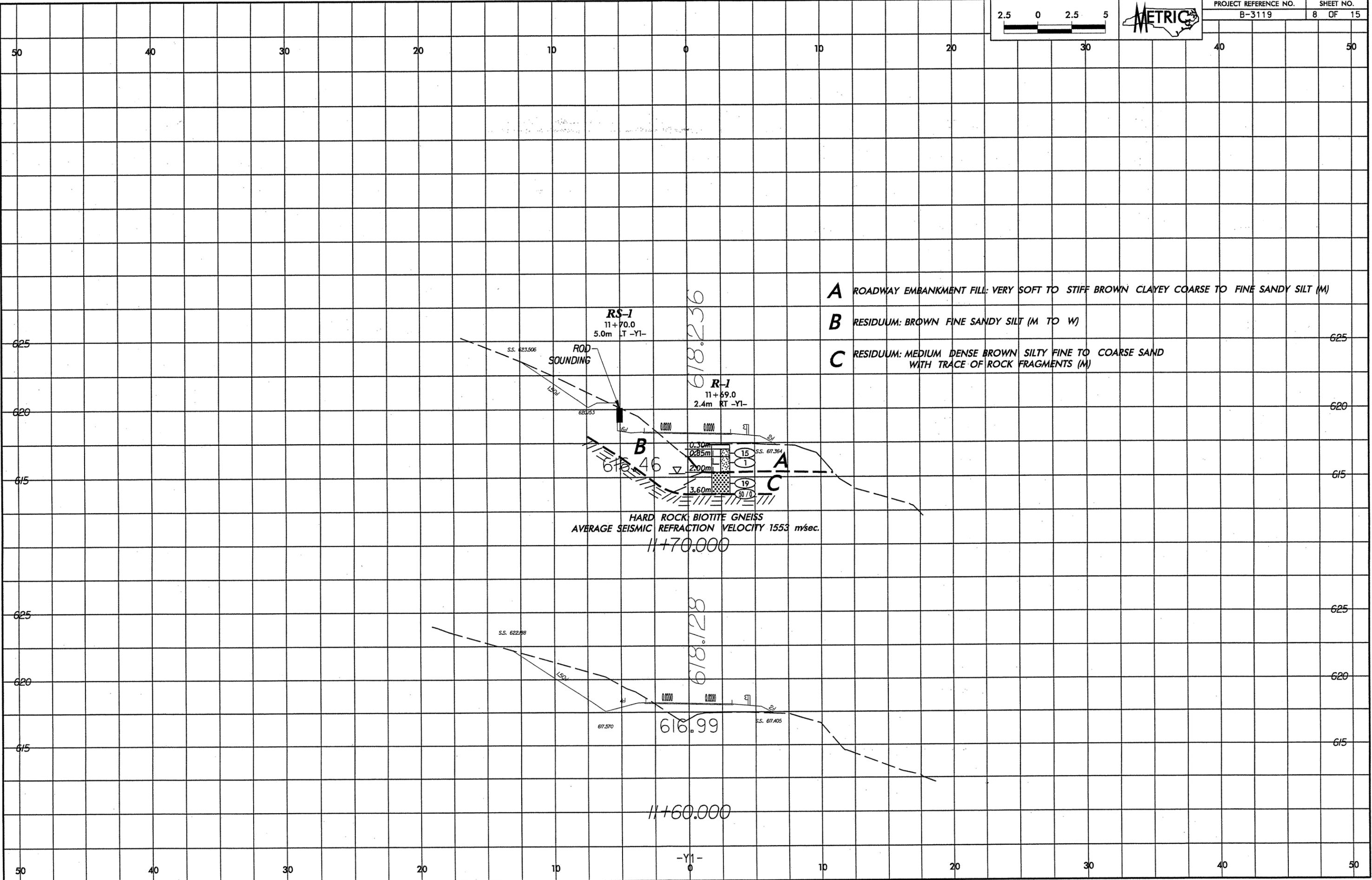
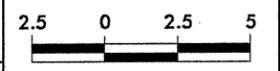


SCALE: 1:500 APPROVED BY: AFR

DATE: JANUARY 2005 DRAWN BY: TRP

JOB NO. 1051-05-018 SHEET 6 OF 15



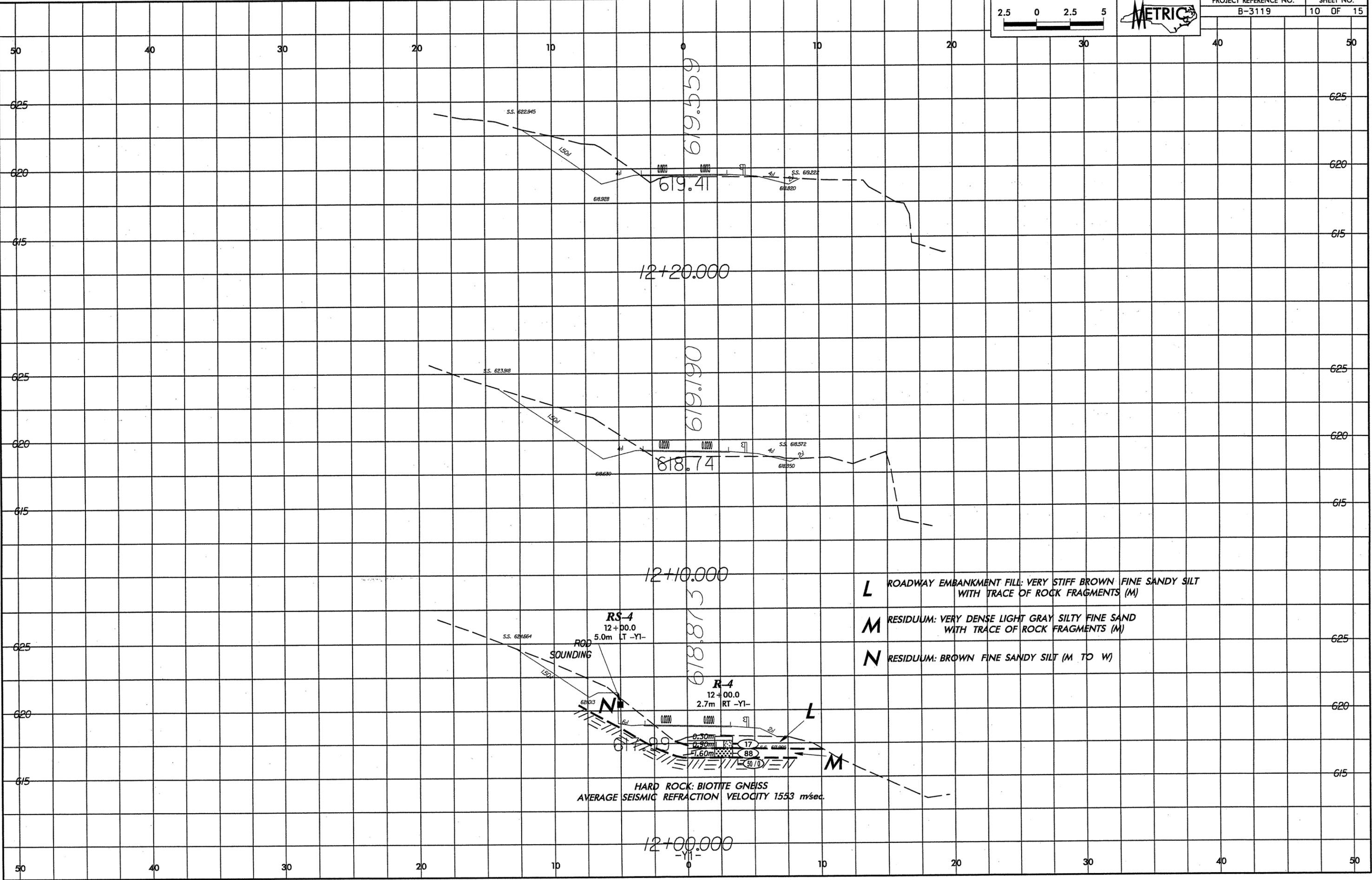
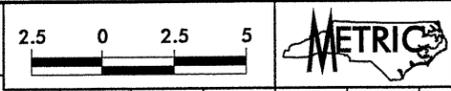


- A** ROADWAY EMBANKMENT FILL: VERY SOFT TO STIFF BROWN CLAYEY COARSE TO FINE SANDY SILT (M)
- B** RESIDUUM: BROWN FINE SANDY SILT (M TO W)
- C** RESIDUUM: MEDIUM DENSE BROWN SILTY FINE TO COARSE SAND WITH TRACE OF ROCK FRAGMENTS (M)

HARD ROCK BIOTITE GNEISS
 AVERAGE SEISMIC REFRACTION VELOCITY 1553 m/sec.
 11+70.000

11+60.000

-Y11-
0



- L** ROADWAY EMBANKMENT FILL: VERY STIFF BROWN FINE SANDY SILT WITH TRACE OF ROCK FRAGMENTS (M)
- M** RESIDUUM: VERY DENSE LIGHT GRAY SILTY FINE SAND WITH TRACE OF ROCK FRAGMENTS (M)
- N** RESIDUUM: BROWN FINE SANDY SILT (M TO W)

HARD ROCK: BIOTITE GNEISS
AVERAGE SEISMIC REFRACTION VELOCITY 1553 m/sec.

PROJECT NO. 32877.1.1		ID. B-3119		COUNTY Buncombe		GEOLOGIST T. TANSKY							
SITE DESCRIPTION Retaining Wall at Bridge 653 over the Broad River on SR 2804							GROUND WATER (m)						
BORING NO. R-1		BORING LOCATION 11+69.0		OFFSET 2.4 m RT	ALIGNMENT -Y1-		0 HR. 2.10						
COLLAR ELEV. 617.36 m		NORTHING 200,247.90		EASTING 312,629.83		24 HR. N/M							
TOTAL DEPTH 3.60 m		DRILL MACHINE CME-550x	DRILL METHOD 8.26 cm HSA		HAMMER TYPE AUTOMATIC								
DATE STARTED 1/20/05		COMPLETED 1/20/05		SURFACE WATER DEPTH N/A									
ELEV. (m)	DEPTH (m)	BLOW COUNT			BLOWS PER 30 CM					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	
		15cm	15cm	15cm	0	20	40	60	80				100
617.36													ASPHALT PAVEMENT SURFACE
617.06	0.30												ASPHALT (7cm) / ABC STONE (23cm)
616.36	1.00	12	8	7									ROADWAY EMBANKMENT FILL: STIFF BROWN CLAYEY COARSE TO FINE SANDY SILT (A-4)
		1	0	1									VERY SOFT BROWN CLAYEY COARSE TO FINE SANDY SILT (A-4)
614.84	2.52	30	9	10									RESIDUUM: MEDIUM DENSE BROWN SILTY FINE TO COARSE SAND (A-2-4)
613.76	3.60												WITH TRACE OF ROCK FRAGMENTS
		50/0											1) ADVANCED 8.26 cm H.S.A. TO 3.60 METERS.
													AUGER REFUSAL AT ELEV. 613.76 METERS ON HARD ROCK: HARD BIOTITE GNEISS

NCDOT BORE DOUBLE 51-018.GPJ NCDOT.GDT 1/27/05

PROJECT NO. 32877.1.1		ID. B-3119		COUNTY Buncombe		GEOLOGIST T. TANSKY							
SITE DESCRIPTION Retaining Wall at Bridge 653 over the Broad River on SR 2804							GROUND WATER (m)						
BORING NO. R-2		BORING LOCATION 11+79.4		OFFSET 2.1 m RT	ALIGNMENT -Y1-		0 HR. DRY						
COLLAR ELEV. 617.52 m		NORTHING 200,245.91		EASTING 312,640.31		24 HR. N/M							
TOTAL DEPTH 4.60 m		DRILL MACHINE CME-550x	DRILL METHOD 8.26 cm HSA		HAMMER TYPE AUTOMATIC								
DATE STARTED 1/20/05		COMPLETED 1/20/05		SURFACE WATER DEPTH N/A									
ELEV. (m)	DEPTH (m)	BLOW COUNT			BLOWS PER 30 CM					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	
		15cm	15cm	15cm	0	20	40	60	80				100
617.52													ASPHALT PAVEMENT SURFACE
617.22	0.30												ASPHALT (10cm) / ABC STONE (20cm)
616.52	1.00	5	5	5									ROADWAY EMBANKMENT FILL: STIFF TO MEDIUM STIFF BROWN AND GRAY CLAYEY COARSE TO FINE SANDY SILT (A-4)
		2	2	3									
615.00	2.52	6	7	17									MEDIUM DENSE TAN AND GRAY SLIGHTLY CLAYEY SILTY COARSE TO FINE SAND (A-2-4)
													WITH TRACE OF ROCK FRAGMENTS AND ORGANIC MATTER
613.48	4.04												SOFT WEATHERED ROCK: (GRAY BIOTITE GNEISS)
612.92	4.60												1) ADVANCED 8.26 cm H.S.A. TO 4.60 METERS.
		50/0											AUGER REFUSAL AT ELEV. 612.92 METERS ON HARD ROCK: HARD BIOTITE GNEISS



PROJECT NO. 32877.1.1		ID. B-3119		COUNTY Buncombe		GEOLOGIST T. TANSKY							
SITE DESCRIPTION Retaining Wall at Bridge 653 over the Broad River on SR 2804							GROUND WATER (m)						
BORING NO. R-3		BORING LOCATION 11+90.0		OFFSET 2.6 m RT		ALIGNMENT -Y1-							
COLLAR ELEV. 617.67 m		NORTHING 200,242.45		EASTING 312,650.39		0 HR. DRY							
TOTAL DEPTH 2.80 m		DRILL MACHINE CME-550x		DRILL METHOD 8.26 cm HSA		24 HR. N/M							
DATE STARTED 1/20/05		COMPLETED 1/20/05		SURFACE WATER DEPTH N/A									
ELEV. (m)	DEPTH (m)	BLOW COUNT			BLOWS PER 30 CM					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	
		15cm	15cm	15cm	0	20	40	60	80				100
617.67													ASPHALT PAVEMENT SURFACE
617.37	0.30												ASPHALT (10cm) / ABC STONE (20cm)
616.67	1.00	32	22	20							M		ROADWAY EMBANKMENT FILL: DENSE BROWN AND GRAY SILTY FINE SAND (A-2-4) WITH TRACE OF ROCK FRAGMENTS
615.15	2.52	2	3	2							SS-3	27.1%	MEDIUM STIFF BROWN CLAYEY COARSE TO FINE SANDY SILT (A-4)
614.87	2.80	78	22/2		100/17						M		SOFT WEATHERED ROCK: (LIGHT GRAY BIOTITE GNEISS) 1) ADVANCED 8.26 cm H.S.A. TO 2.80 METERS.
					50/0						No Rec.		AUGER REFUSAL AT ELEV. 614.87 METERS ON HARD ROCK: HARD BIOTITE GNEISS

NCDOT BORE DOUBLE 51-018.GPJ NCDOT.GDT 1/27/05



PROJECT NO. 32877.1.1		ID. B-3119		COUNTY Buncombe		GEOLOGIST T. TANSKY							
SITE DESCRIPTION Retaining Wall at Bridge 653 over the Broad River on SR 2804							GROUND WATER (m)						
BORING NO. R-4		BORING LOCATION 12+00.0		OFFSET 2.7 m RT		ALIGNMENT -Y1-							
COLLAR ELEV. 618.01 m		NORTHING 200,239.15		EASTING 312,659.97		0 HR. DRY							
TOTAL DEPTH 1.60 m		DRILL MACHINE CME-550x		DRILL METHOD 8.26 cm HSA		24 HR. N/M							
DATE STARTED 1/20/05		COMPLETED 1/20/05		SURFACE WATER DEPTH N/A									
ELEV. (m)	DEPTH (m)	BLOW COUNT			BLOWS PER 30 CM					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	
		15cm	15cm	15cm	0	20	40	60	80				100
618.01													ASPHALT PAVEMENT SURFACE
617.71	0.30												ASPHALT (10cm) / ABC STONE (20cm)
617.01	1.00	17	7	10							M		ROADWAY EMBANKMENT FILL: VERY STIFF BROWN FINE SANDY SILT (A-4) WITH TRACE OF ROCK FRAGMENTS
616.41	1.60	12	10	78							M		RESIDUUM: VERY DENSE LIGHT GRAY SILTY FINE SAND (A-2-4) WITH TRACE OF ROCK FRAGMENTS 1) ADVANCED 8.26 cm H.S.A. TO 1.60 METERS.
					50/0						No Rec.		AUGER REFUSAL AT ELEV. 616.41 METERS ON HARD ROCK: HARD BIOTITE GNEISS

SUMMARY OF LABORATORY TEST DATA
Soil Classification and Gradation

Boring No.	Sample No.	Sample Depth Meter	AASHTO Classification	% Passing Sieve #			Coarse Sand	Fine Sand	Silt	Clay	LL	PL	PI	Organic Content %	Moisture Content %	
				10	40	60										200
R-2	SS-1	1.00-1.45	A-4 (2)	97	91	85	57	12	39	23	26	30	22	8	--	21.3
R-2	SS-2	2.52-2.97	A-2-4 (0)	80	67	58	29	27	45	18	10	8	N.P.	N.P.	--	--
R-3	SS-3	1.00-1.45	A-4 (4)	99	93	87	59	12	39	24	25	32	22	10	--	27.1

Project Name: Retaining Wall B-3119

State Project No.: 32877.1.1

Federal ID No.: BRZ-2804(1)

Checked By: ISJ & AFR

S&ME Project No.: 1051-05-018

County: Buncombe

TIP No.: B-3119



Photograph No. 1:
This photograph was taken from the right side of the -Y1- alignment, looking northwest at the proposed location of the retaining wall.



Photograph No. 3:
This photograph was taken from the left side of the -Y1- alignment, looking east along the proposed retaining wall.



Photograph No. 2:
This photograph was taken from the right side of the -Y1- alignment, looking north at the proposed location of the retaining wall.



Photograph No. 4:
This photograph was taken from the left side of the -Y1- alignment, looking west along the proposed retaining wall.



Photograph No. 5:
This photograph was taken along the -Y1- alignment, looking east.



Photograph No. 6:
This photograph was taken along the -Y1- alignment, looking west.