

PROJECT: 33404.1.1 ID: B-4038

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

STRUCTURE SUBSURFACE INVESTIGATION

STATE PROJECT 33404.1.1 I.D. NO. B-4038
F.A. PROJECT BRSTP-0183(1)
COUNTY BURKE
PROJECT DESCRIPTION N/A

SITE DESCRIPTION BRIDGE NO. 26 OVER
LINVILLE RIVER ON NC 183

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STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-4038	1	19
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
33404.1.1	BRSTP-0183(1)	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 ENGINEERING UNIT @ 1991 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.

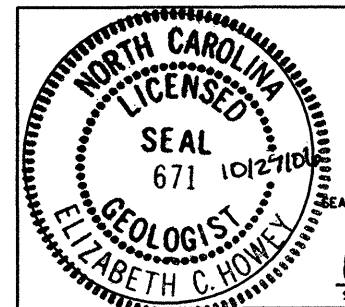
INVESTIGATED BY <u>F&R, Inc.</u>	PERSONNEL <u>C. BALDWIN</u>
CHECKED BY <u>E. HOWEY, P.E., L.G.</u>	<u>J. GILCHRIST</u>
SUBMITTED BY <u>F&R, Inc.</u>	<u>J. SEHULSTER</u>
DATE <u>9/2006</u>	<u>M. RENZA</u>
	<u>D. RACEY</u>
	<u>D. JENKS</u>

For Letting

DRAWN BY: D. RACEY

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.



Elizabeth C. Howey
SIGNATURE - ELIZABETH C. HOWEY, P.E., L.G.

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

ID	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
B-4038	33404.1.1	2	19

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS																																																																																																																																																																																																																																											
<p>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 FOOT 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:</p> <p style="text-align: center;"><i>VERY STIFF, GRAY SILTY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</i></p>	<p>WELL GRADED- INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE UNIFORM- INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED) POORLY GRADED- INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.</p> <p style="text-align: center;">ANGULARITY OF GRAINS</p> <p>THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS ARE DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.</p>	<p>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 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:</p>	<p>ALLUVIUM (ALLUV.) - SOILS 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 IT 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. FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED 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 4 INCHES 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. STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS IN OR B.P.F. OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS LESS THAN 0.1 FOOT PENETRATION WITH 60 BLOWS. STRATA CORE RECOVERY (ISREC.) - 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 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. TOPSOIL (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p>																																																																																																																																																																																																																																											
<p style="text-align: center;">SOIL LEGEND AND AASHTO CLASSIFICATION</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>GENERAL CLASS.</th> <th colspan="4">GRANULAR MATERIALS (>85% PASSING #200)</th> <th colspan="4">SILT-CLAY MATERIALS (>85% PASSING #200)</th> <th colspan="4">ORGANIC MATERIALS</th> </tr> <tr> <td>GROUP CLASS.</td> <td>A-1-a</td><td>A-1-b</td><td>A-2</td><td>A-3</td> <td>A-4</td><td>A-5</td><td>A-6</td><td>A-7</td> <td>A-1, A-2</td><td>A-3</td><td>A-4, A-5</td><td>A-6, A-7</td> <td></td><td></td><td></td><td></td> </tr> <tr> <td>SYMBOL</td> <td></td><td></td><td></td><td></td> <td></td><td></td><td></td><td></td> <td></td><td></td><td></td><td></td> <td></td><td></td><td></td><td></td> </tr> <tr> <td>% PASSING</td> <td>10</td><td>10</td><td>10</td><td>10</td> <td>10</td><td>10</td><td>10</td><td>10</td> <td>10</td><td>10</td><td>10</td><td>10</td> <td></td><td></td><td></td><td></td> </tr> <tr> <td>LIQUID LIMIT</td> <td>50</td><td>50</td><td>50</td><td>50</td> <td>50</td><td>50</td><td>50</td><td>50</td> <td>50</td><td>50</td><td>50</td><td>50</td> <td></td><td></td><td></td><td></td> </tr> <tr> <td>PLASTIC INDEX</td> <td>6</td><td>6</td><td>6</td><td>6</td> <td>6</td><td>6</td><td>6</td><td>6</td> <td>6</td><td>6</td><td>6</td><td>6</td> <td></td><td></td><td></td><td></td> </tr> <tr> <td>GROUP INDEX</td> <td>0</td><td>0</td><td>0</td><td>0</td> <td>0</td><td>0</td><td>0</td><td>0</td> <td>0</td><td>0</td><td>0</td><td>0</td> <td></td><td></td><td></td><td></td> </tr> <tr> <td>USUAL TYPES OF MAJOR MATERIALS</td> <td>STONE FRAGS. GRAVEL AND SAND</td><td>FINE SAND</td><td>SILTY OR CLAYEY GRAVEL AND SAND</td><td>SILTY CLAYEY SOILS</td> <td>SILTY SOILS</td><td>CLAYEY SOILS</td><td></td><td></td> <td>SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER</td><td></td><td></td><td></td> <td></td><td></td><td></td><td></td> </tr> <tr> <td>GEN. RATING AS A SUBGRADE</td> <td colspan="4">EXCELLENT TO GOOD</td> <td colspan="4">FAIR TO POOR</td> <td>FAIR TO POOR</td> <td>POOR</td> <td>UNSATURABLE</td> <td></td><td></td><td></td><td></td> </tr> </table> <p style="text-align: center;">P.I. OF A-7-5 ≤ L.L. - 30 + P.I. OF A-7-6 > L.L. - 30</p>	GENERAL CLASS.	GRANULAR MATERIALS (>85% PASSING #200)				SILT-CLAY MATERIALS (>85% PASSING #200)				ORGANIC MATERIALS				GROUP CLASS.	A-1-a	A-1-b	A-2	A-3	A-4	A-5	A-6	A-7	A-1, A-2	A-3	A-4, A-5	A-6, A-7					SYMBOL																	% PASSING	10	10	10	10	10	10	10	10	10	10	10	10					LIQUID LIMIT	50	50	50	50	50	50	50	50	50	50	50	50					PLASTIC INDEX	6	6	6	6	6	6	6	6	6	6	6	6					GROUP INDEX	0	0	0	0	0	0	0	0	0	0	0	0					USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL AND SAND	FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND	SILTY CLAYEY SOILS	SILTY SOILS	CLAYEY SOILS			SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER								GEN. RATING AS A SUBGRADE	EXCELLENT TO GOOD				FAIR TO POOR				FAIR TO POOR	POOR	UNSATURABLE					<p style="text-align: center;">MINERALOGICAL COMPOSITION</p> <p>MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.</p> <p style="text-align: center;">COMPRESSIBILITY</p> <p>SLIGHTLY COMPRESSIBLE LIQUID LIMIT LESS THAN 30 MODERATELY COMPRESSIBLE LIQUID LIMIT 31-50 HIGHLY COMPRESSIBLE LIQUID LIMIT GREATER THAN 50</p> <p style="text-align: center;">PERCENTAGE OF MATERIAL</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>ORGANIC MATERIAL</th> <th>GRANULAR SOILS</th> <th>SILT-CLAY SOILS</th> <th>OTHER MATERIAL</th> </tr> <tr> <td>TRACE OF ORGANIC MATTER</td> <td>2 - 3%</td> <td>3 - 5%</td> <td>TRACE</td> </tr> <tr> <td>LITTLE ORGANIC MATTER</td> <td>3 - 5%</td> <td>5 - 12%</td> <td>LITTLE</td> </tr> <tr> <td>MODERATELY ORGANIC</td> <td>5 - 10%</td> <td>12 - 20%</td> <td>SOME</td> </tr> <tr> <td>HIGHLY ORGANIC</td> <td>>10%</td> <td>>20%</td> <td>HIGHLY</td> </tr> </table> <p style="text-align: center;">GROUND WATER</p> <p> 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</p> <p style="text-align: center;">MISCELLANEOUS SYMBOLS</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>ROADWAY EMBANKMENT WITH SOIL DESCRIPTION</td> <td>SOIL SYMBOL</td> <td>ARTIFICIAL FILL OTHER THAN ROADWAY EMBANKMENTS</td> <td>INFERRED SOIL BOUNDARIES</td> <td>INFERRED ROCK LINE</td> <td>ALLUVIAL SOIL BOUNDARY</td> <td>DIP/DIP DIRECTION OF ROCK STRUCTURES</td> <td>SOUNDING ROD</td> <td>TEST BORING</td> <td>AUGER BORING</td> <td>CORE BORING</td> <td>MONITORING WELL</td> <td>PIEZOMETER INSTALLATION</td> <td>SLOPE INDICATOR INSTALLATION</td> <td>SPT N-VALUE</td> <td>SPT REFUSAL</td> </tr> </table>	ORGANIC MATERIAL	GRANULAR SOILS	SILT-CLAY SOILS	OTHER MATERIAL	TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE	LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE	MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME	HIGHLY ORGANIC	>10%	>20%	HIGHLY																	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	TEST BORING	AUGER BORING	CORE BORING	MONITORING WELL	PIEZOMETER INSTALLATION	SLOPE INDICATOR INSTALLATION	SPT N-VALUE	SPT REFUSAL	<p style="text-align: center;">ROCK HARDNESS</p> <p>VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGISTS PICK. HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN. MODERATELY HARD CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGISTS PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS. MEDIUM HARD CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGISTS PICK. SOFT CAN BE GROOVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE. VERY SOFT CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGER NAIL.</p> <p style="text-align: center;">ROCK HARDNESS</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>TERM</th> <th>SPACING</th> <th>TERM</th> <th>THICKNESS</th> </tr> <tr> <td>VERY WIDE</td> <td>MORE THAN 10 FEET</td> <td>VERY THICKLY BEDDED</td> <td>> 4 FEET</td> </tr> <tr> <td>WIDE</td> <td>3 TO 10 FEET</td> <td>THICKLY BEDDED</td> <td>1.5 - 4 FEET</td> </tr> <tr> <td>MODERATELY CLOSE</td> <td>1 TO 3 FEET</td> <td>THINLY BEDDED</td> <td>0.16 - 1.5 FEET</td> </tr> <tr> <td>CLOSE</td> <td>0.16 TO 1 FEET</td> <td>VERY THINLY BEDDED</td> <td>0.03 - 0.16 FEET</td> </tr> <tr> <td>VERY CLOSE</td> <td>LESS THAN 0.16 FEET</td> <td>THICKLY LAMINATED</td> <td>0.008 - 0.03 FEET</td> </tr> <tr> <td></td> <td></td> <td>THINLY LAMINATED</td> <td>< 0.008 FEET</td> </tr> </table> <p style="text-align: center;">INDURATION</p> <p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>FRIABLE</td> <td>RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.</td> </tr> <tr> <td>MODERATELY INDURATED</td> <td>GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.</td> </tr> <tr> <td>INDURATED</td> <td>GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.</td> </tr> <tr> <td>EXTREMELY INDURATED</td> <td>SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</td> </tr> </table>	TERM	SPACING	TERM	THICKNESS	VERY WIDE	MORE THAN 10 FEET	VERY THICKLY BEDDED	> 4 FEET	WIDE	3 TO 10 FEET	THICKLY BEDDED	1.5 - 4 FEET	MODERATELY CLOSE	1 TO 3 FEET	THINLY BEDDED	0.16 - 1.5 FEET	CLOSE	0.16 TO 1 FEET	VERY THINLY BEDDED	0.03 - 0.16 FEET	VERY CLOSE	LESS THAN 0.16 FEET	THICKLY LAMINATED	0.008 - 0.03 FEET			THINLY LAMINATED	< 0.008 FEET	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.
GENERAL CLASS.	GRANULAR MATERIALS (>85% PASSING #200)				SILT-CLAY MATERIALS (>85% PASSING #200)				ORGANIC MATERIALS																																																																																																																																																																																																																																					
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LIQUID LIMIT	50	50	50	50	50	50	50	50	50	50	50	50																																																																																																																																																																																																																																		
PLASTIC INDEX	6	6	6	6	6	6	6	6	6	6	6	6																																																																																																																																																																																																																																		
GROUP INDEX	0	0	0	0	0	0	0	0	0	0	0	0																																																																																																																																																																																																																																		
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<p style="text-align: center;">SOIL MOISTURE - CORRELATION OF TERMS</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>SOIL MOISTURE SCALE (ATTERBERG LIMITS)</th> <th>FIELD MOISTURE DESCRIPTION</th> <th>GUIDE FOR FIELD MOISTURE DESCRIPTION</th> </tr> <tr> <td rowspan="3">LL PLASTIC RANGE (PI) PL</td> <td>- SATURATED - (SAT.)</td> <td>USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE</td> </tr> <tr> <td>- WET - (W)</td> <td>SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE</td> </tr> <tr> <td>- MOIST - (M)</td> <td>SOLID; AT OR NEAR OPTIMUM MOISTURE</td> </tr> <tr> <td>OM SL</td> <td>- DRY - (D)</td> <td>REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE</td> </tr> </table> <p style="text-align: center;">PLASTICITY</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>NONPLASTIC</th> <th>PLASTICITY INDEX (PI)</th> <th>DRY STRENGTH</th> </tr> <tr> <td>LOW PLASTICITY</td> <td>0-5</td> <td>VERY LOW</td> </tr> <tr> <td>MED. PLASTICITY</td> <td>6-15</td> <td>SLIGHT</td> </tr> <tr> <td>HIGH PLASTICITY</td> <td>16-25</td> <td>MEDIUM</td> </tr> <tr> <td></td> <td>26 OR MORE</td> <td>HIGH</td> </tr> </table> <p style="text-align: center;">COLOR</p> <p>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.</p>	SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION	LL PLASTIC RANGE (PI) PL	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE	OM SL	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE	NONPLASTIC	PLASTICITY INDEX (PI)	DRY STRENGTH	LOW PLASTICITY	0-5	VERY LOW	MED. PLASTICITY	6-15	SLIGHT	HIGH PLASTICITY	16-25	MEDIUM		26 OR MORE	HIGH	<p style="text-align: center;">FRACURE SPACING</p>																																																																																																																																																																																																																	
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October 12, 2006

Mr. Njoroge Wainaina, P.E.
 State Geotechnical Engineer
 NCDOT-Geotechnical Engineering Unit
 1589 Mail Service Center
 Raleigh, NC 27699-1589

Re: Bridge Foundation Investigation
 Project No.: 33404.1.1
 TIP No.: B-4038
 FA No.: BRSTP-0183(1)
 County: Burke
 Description: Bridge No. 26 over Linville River on NC 183
 F&R Project: G66-175G

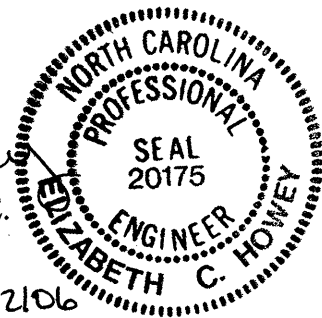
Dear Mr. Wainaina:

The Raleigh, North Carolina office of Froehling & Robertson, Inc. (F&R) is pleased to submit the accompanying Bridge Foundation Investigation Report. The work was performed in general accordance with F&R's Proposal 0766-042G dated June 28, 2006, Revised June 30, 2006. Please contact us at your earliest convenience to discuss any comments regarding this report or our services in general.

Sincerely,

Christopher R. Baldwin
 Staff Geologist

Elizabeth C. Howey, L.G., P.E.
 Project Geotechnical Engineer



SITE DESCRIPTION

The proposed construction will involve a new single span bridge to replace an existing five-span bridge on NC 183 over the Linville River. The existing bridge is 212.5 feet long supported by concrete piers on spread footings. The proposed replacement bridge will contain a single span of 185 feet. The proposed skew angle is 125 degrees. The replacement bridge will be located just upstream of the existing structure.

METHOD OF EXPLORATION

A subsurface investigation was conducted in September, 2006. F&R proposed to advance 4 borings at the site, two borings at each proposed end bent location. However, the borings on the left side of the end bents are located on land owned by the U.S. Park Service and permission to access these areas could not be obtained in a timely manner. Therefore, F&R advanced borings only on the NCDOT Right of Way, along the right side of the proposed bridge.

EB1-B (SPT/core boring) was advanced near its proposed location while auger probe boring B-1 was advanced 9 feet away to determine the depth to top of rock (defined by SPT refusal at the bottom of the boring). Boring EB2-B could not be accessed at its proposed location due to the steep slope present and need utilize a bulldozer to provide an access road. This access road would impact the U.S. Park Service land. Therefore, after on site discussions between Mr. Henry Riggs of F&R, NCDOT Geotechnical Engineering Unit and Maintenance personnel, it was decided to advance the borings at End Bent 2 along the shoulder of NC 183, with the NCDOT Maintenance Unit providing traffic control. EB2-B was an SPT/core boring while B-2 was again an offset auger probe boring to determine the depth to the top of rock (defined by SPT refusal at the bottom of the boring).

The drilled borings were advanced with a CME-55 track-mounted drill rig with a 140-pound automatic hammer, utilizing 3-1/4 inch inside diameter hollow stem augers. Standard Penetration Tests (SPT) were performed, in general accordance with ASTM D-1586, at borings EB1-B and EB2-B to aid in foundation analysis. After auger refusal was obtained in offset borings B-1 and B-2, Standard Penetration Tests were performed to define the top of rock. Representative soil samples were obtained for visual classification in the field and returned to our office for potential laboratory analysis. Four



samples of alluvial soil, anticipated to be involved with the proposed construction, were selected and subjected to grain size, Atterberg Limits, and natural moisture content testing in accordance with AASHTO T-87, T-88, T-89, and T-90 as modified by NCDOT. Due to the channel bed consisting of exposed rock, samples could not be collected for grain size analysis or Erosion Function Apparatus (EFA) testing. Samples of the alluvial soil obtained from the channel banks were tested as described above. Those results are included on the attached Field Scour Report.

Benchmark No. 2 could not be located in the field so boring collar elevations, cross sections, and the profile were surveyed using baseline point 3 (BL-3) located at baseline station 17+89.84 at an elevation of 3197.90 feet. This baseline point is shown on the attached plan view.

GEOLOGY

Based on review of the *Geologic Map of North Carolina* (1985), the project site is situated in an area mapped as Biotite Granitic Gneiss (Ybgg). The rock recovered from our borings exhibits the characteristics of the mapped unit. The recovered core is described in more detail below.

STRATIGRAPHY

Existing roadway embankment was encountered at the ground surface in the offset borings advanced on the shoulder of NC 183. SPT boring EB2-B encountered existing roadway embankment to a depth of 9.5 feet (Elevation 3187.4) consisting of very loose to loose silty fine sand (A-2-4) with some gravel. Beneath the embankment at EB2-B and at the ground surface at End Bent 1, alluvial soil was encountered consisting of very soft to medium stiff, fine to coarse sandy silt (A-4). In the SPT borings, the alluvium extended to depths of 7.0 to 21.5 feet (elevation 3175.4 to 3176.8 feet). Boring EB2-B encountered a zone of residual soil from a depth of 21.5 to 24.0 feet. The residual soil consists of very stiff, fine sandy silt (A-4). Beneath the residual soil in boring EB2-B and directly beneath the alluvium in boring EB1-B, weathered rock was encountered consisting of biotite granitic gneiss. Shortly after the weathered rock was encountered, borings EB1-B and EB2-B were advanced with NQ3 coring equipment to their termination depths of 26.0 feet (elevation 3157.8 feet) to 40.4 feet (elevation 3156.5 feet), respectively. The rock properties of the recovered core are discussed below. Offset auger probe borings B-1 and B-2 were terminated by auger refusal and SPT refusal at depths of 11.0 feet (elevation



3172.3 feet) and 24.2 feet (elevation 3172.5 feet). The top of rock was defined by SPT refusal in the auger probe borings. The top of rock was relatively consistent in borings advanced at the site, ranging from elevation 3172.4 feet to 3174.6 feet.

ROCK PROPERTIES

Borings EB1-B and EB2-B were advanced through crystalline rock consisting of gray and brown, moderately severely to slightly weathered, medium hard to hard, biotite granitic gneiss. Several zones of weathered rock were encountered within the cored rock. The core recovery (REC) ranged from 52% to 100% while the Rock Quality Designation (RQD) ranged from 0% to 52%. Two samples of the recovered core were trimmed and subjected to unconfined compressive strength testing. Their tested strengths were 2,854 psi and 10,114 psi. The results are included with the laboratory test results.

Measurements taken in the stream bed near the center of the proposed bridge indicate that the rock is dipping to the west at an angle of approximately 18 degrees. The majority of the joints observed in the recovered core were measured at an angle of approximately 20 degrees.

GROUND WATER

Ground water was not measured in borings EB1-B and EB2-B due to the water introduced for coring. However, boring EB2-B was measured before introducing water for coring and was dry at that time. Offset borings B-1 and B-2 were dry immediately after drilling and were then backfilled. The normal water surface elevation of Linville River was shown as 3174.45 feet on the hydraulics report dated 3/15/06. The water surface was measured at elevation 3173.7 feet during our field investigation

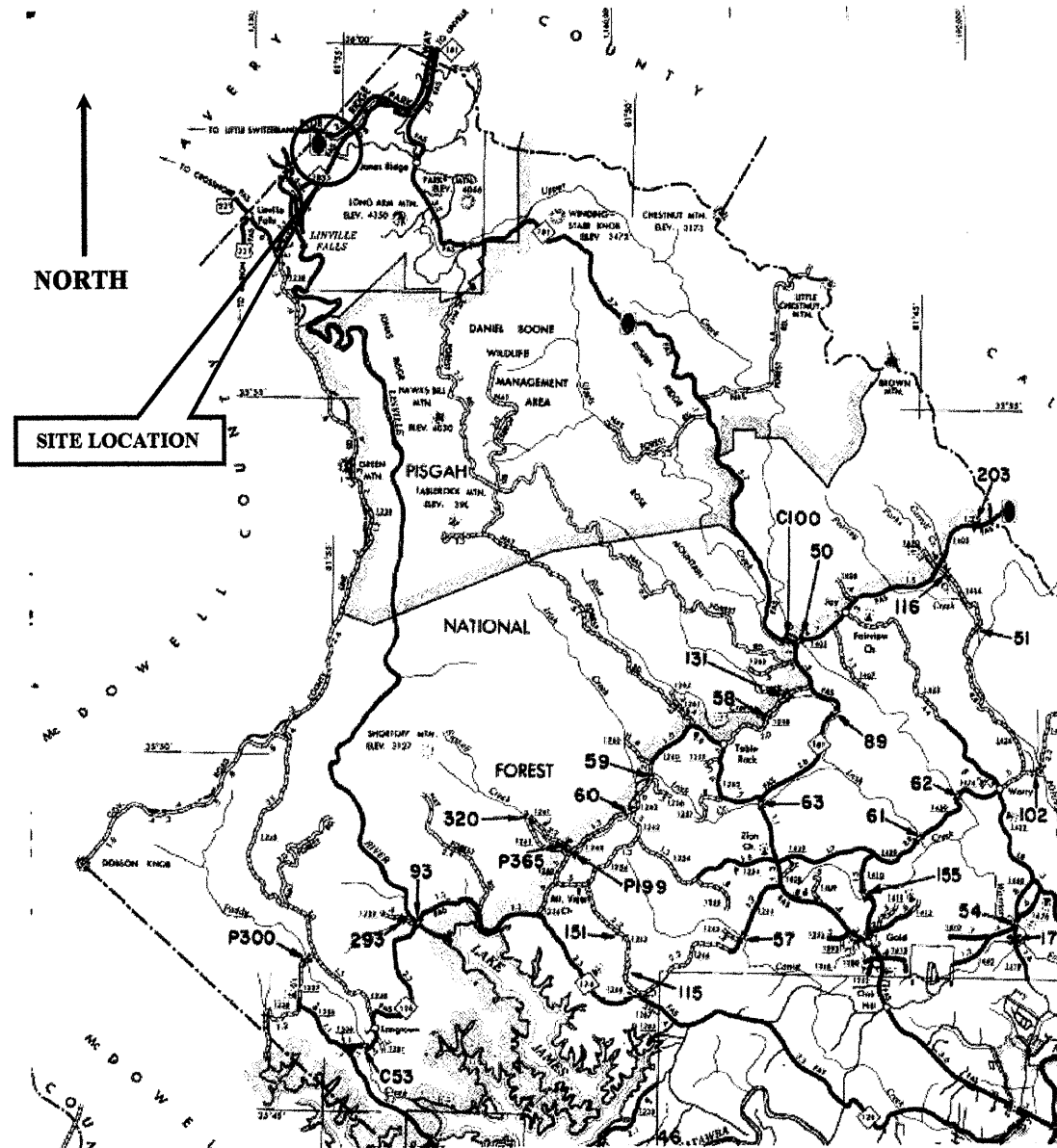


QUALIFICATIONS OF REPORT

This report has been prepared for the exclusive use of the North Carolina Department of Transportation and their assignees for specific application to the referenced property in accordance with generally accepted soil and foundation engineering practices. No other warranty, expressed or implied, is made. The conclusions provided in this report do not reflect variations in subsurface conditions, which could exist intermediate of the boring locations, or in unexplored areas of the site. Should such variations become apparent during construction, we reserve the right to re-evaluate our conclusions based upon an on-site observation of the conditions. In the event that changes are made in the proposed construction plans, the findings presented in this report shall not be considered valid unless reviewed by our firm and conclusions of this report modified or verified in writing.



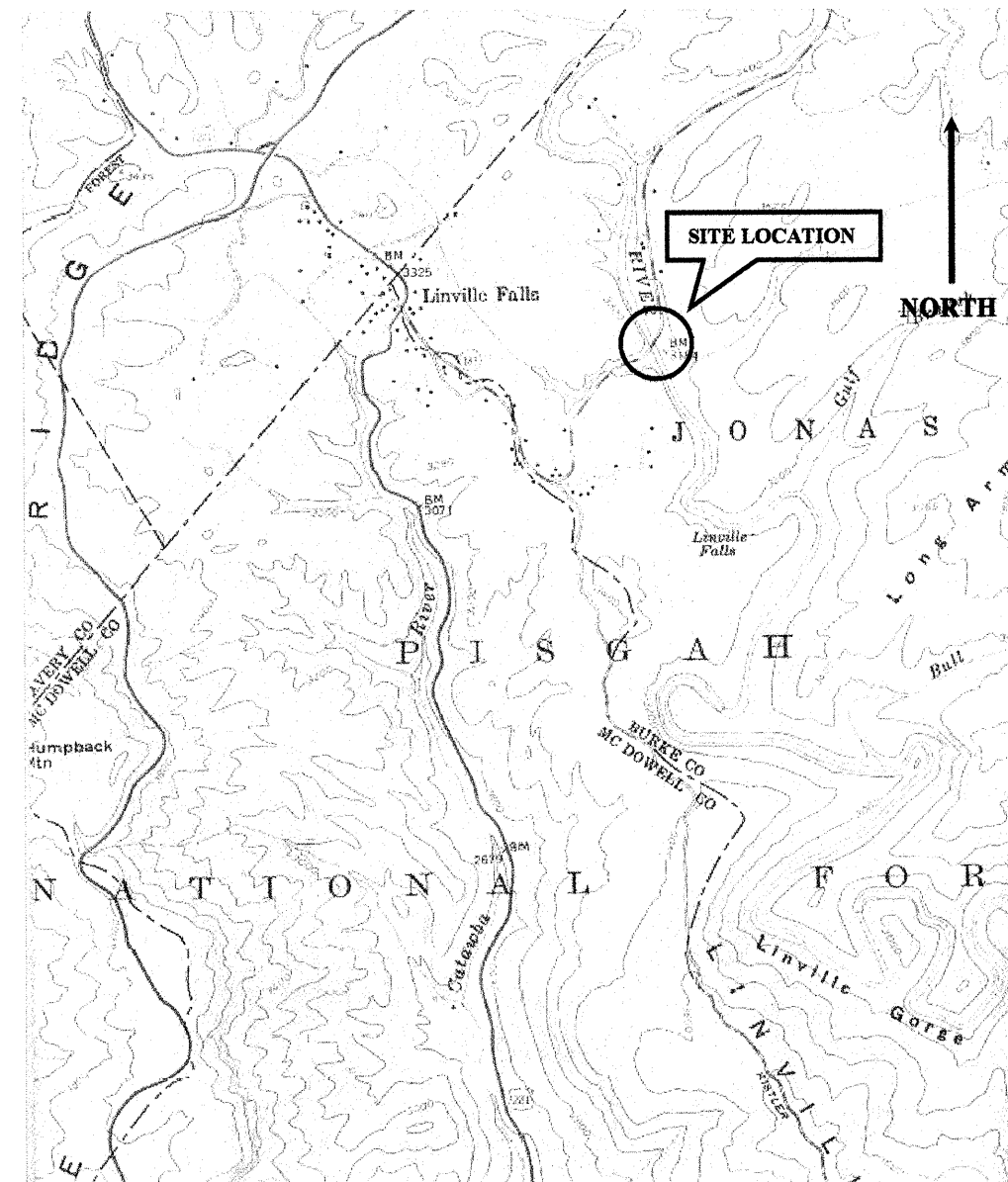
FIGURE 1



SITE VICINITY MAP

Adapted from an NCDOT Bridge Location Map of Burke County, North Carolina, dated January 1, 1990.
Scale 1"=2.5 mi. (approx.)

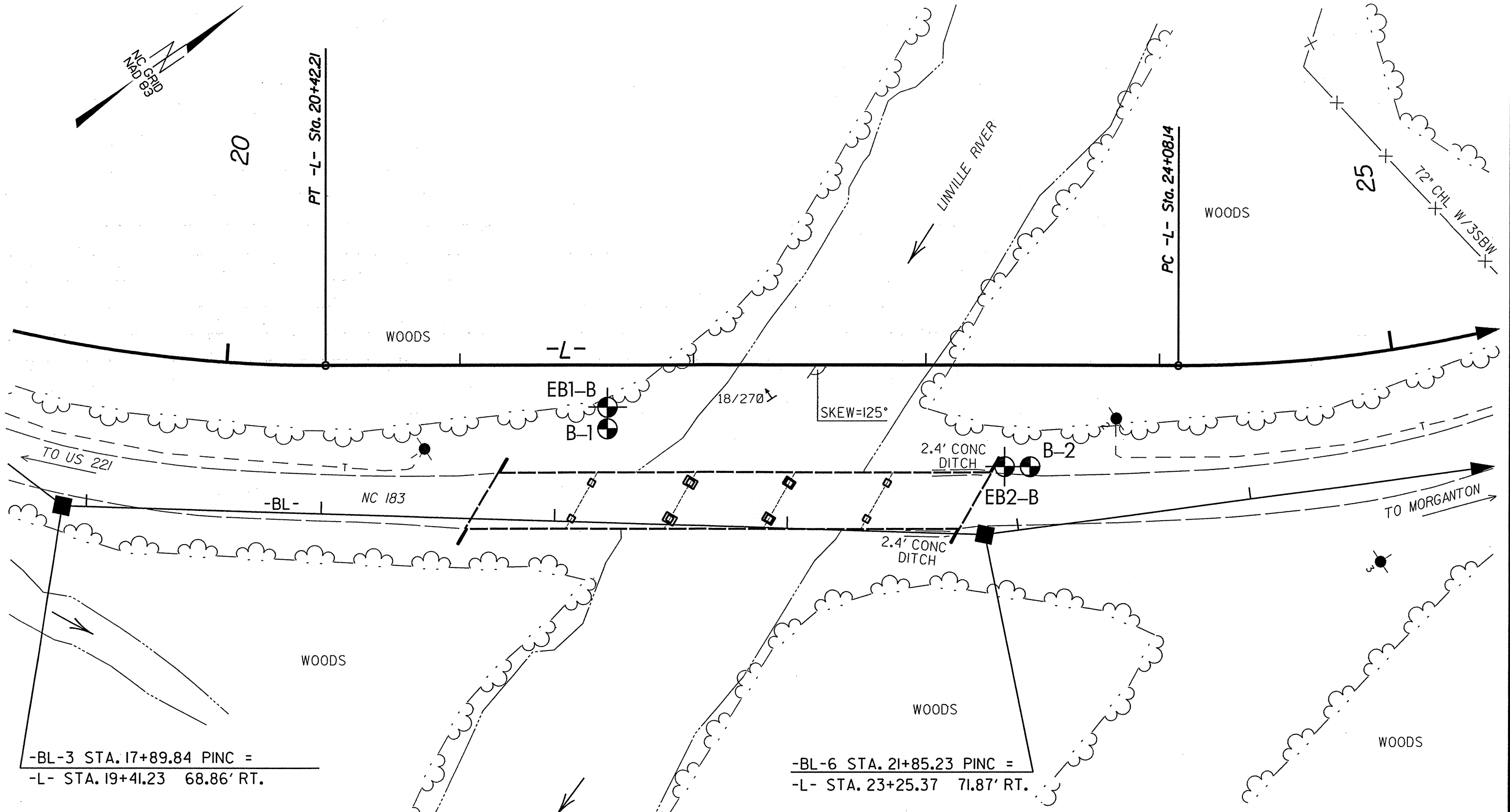
FIGURE 2



SITE LOCATION PLAN

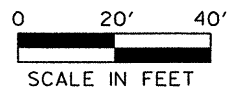
Adapted from a USGS Quadrangle 7.5 min. Topographic Map of Linville Falls, North Carolina, dated 1956.
Scale 1"=2000' (approx.)

TEST SITE PLAN



-BL-3 STA. 17+89.84 PINC =
 -L- STA. 19+41.23 68.86' RT.

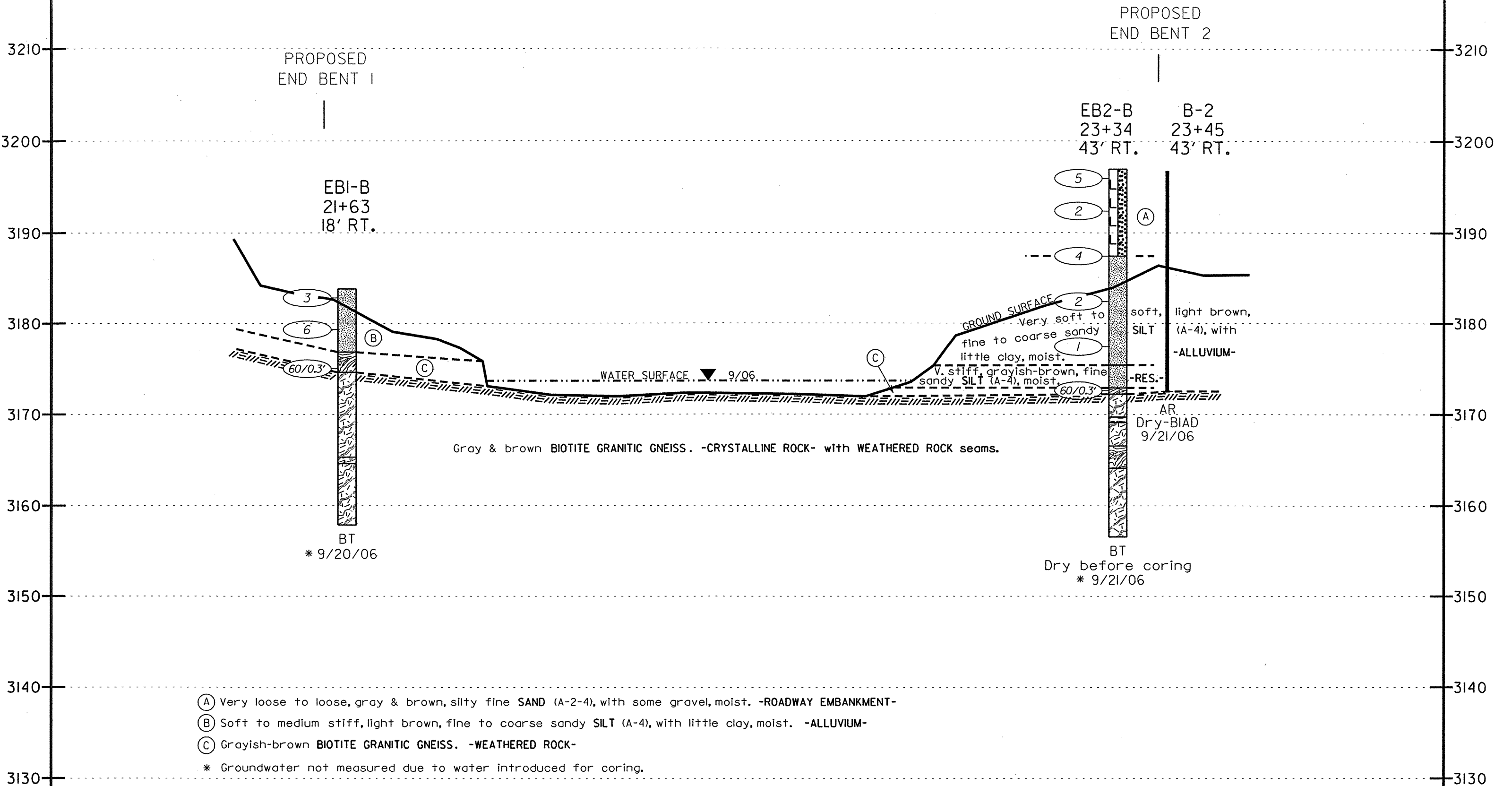
-BL-6 STA. 21+85.23 PINC =
 -L- STA. 23+25.37 71.87' RT.



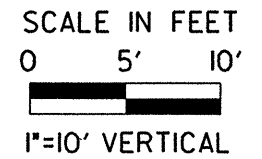
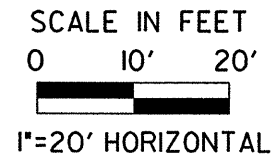
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CLIENT: N.C. Department of Transportation		
LOCATION: Bridge No. 26 over Linville River on NC 183		
PROJECT No.: 33404.1.I	COUNTY: Burke	
TIP No.: B-4038	FA No.: BRSTP-0183(I)	
DATE: 10/06	SCALE: 1"=40'	DRAWING No.: 1

PROFILE 17' RIGHT OF -L-

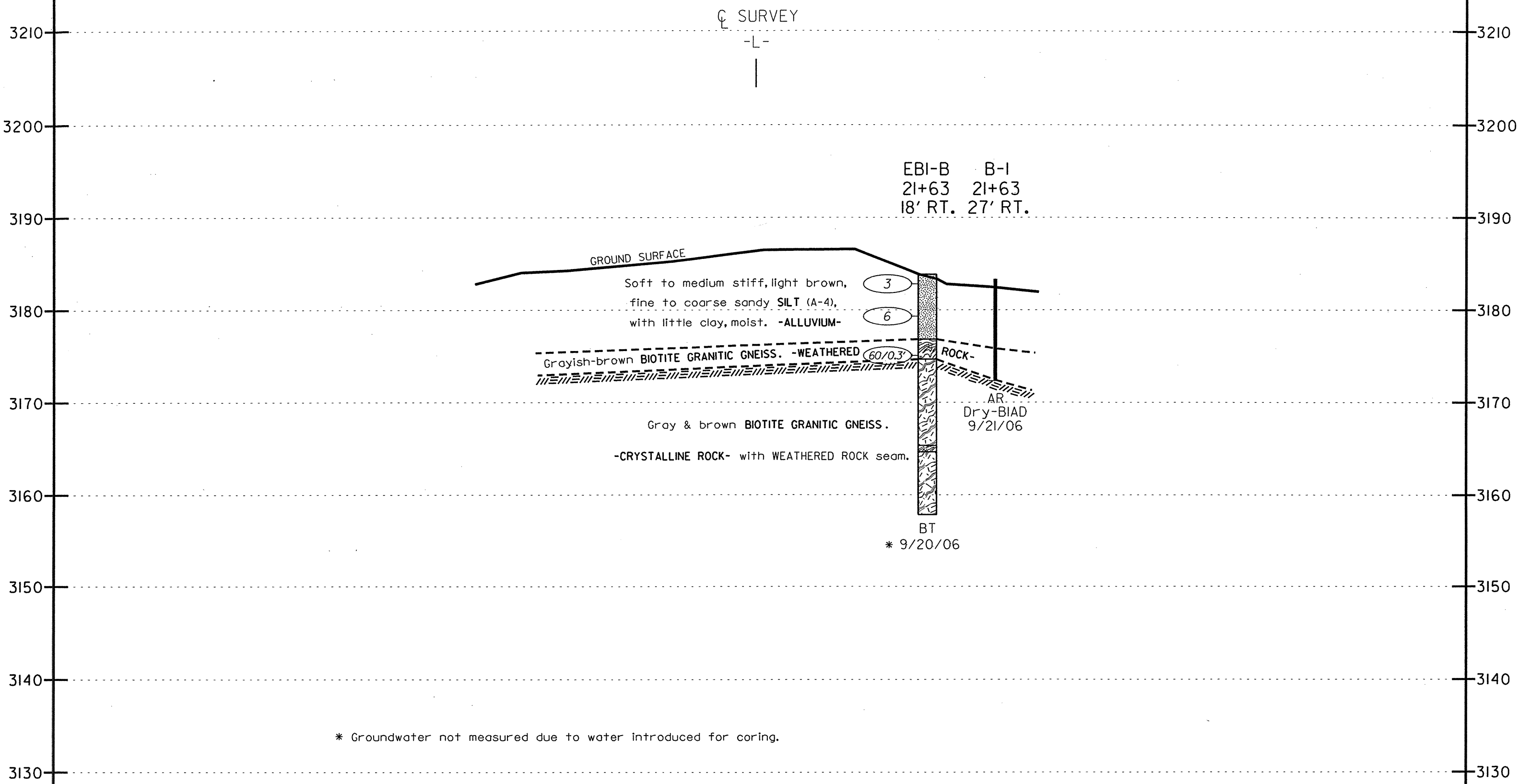


- (A) Very loose to loose, gray & brown, silty fine SAND (A-2-4), with some gravel, moist. -ROADWAY EMBANKMENT-
- (B) Soft to medium stiff, light brown, fine to coarse sandy SILT (A-4), with little clay, moist. -ALLUVIUM-
- (C) Grayish-brown BIOTITE GRANITIC GNEISS. -WEATHERED ROCK-
- * Groundwater not measured due to water introduced for coring.

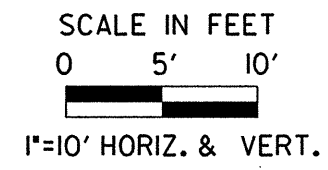


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			PROJECT No.: 33404.I.I	COUNTY: Burke	
			TIP No.: B-4038	FA No.: BRSTP-0183(I)	
			DATE: 10/06	SCALE: 1"=20' HORIZ.; 1"=10' VERT.	DRAWING No.: 2

SECTION THROUGH PROPOSED END BENT 1

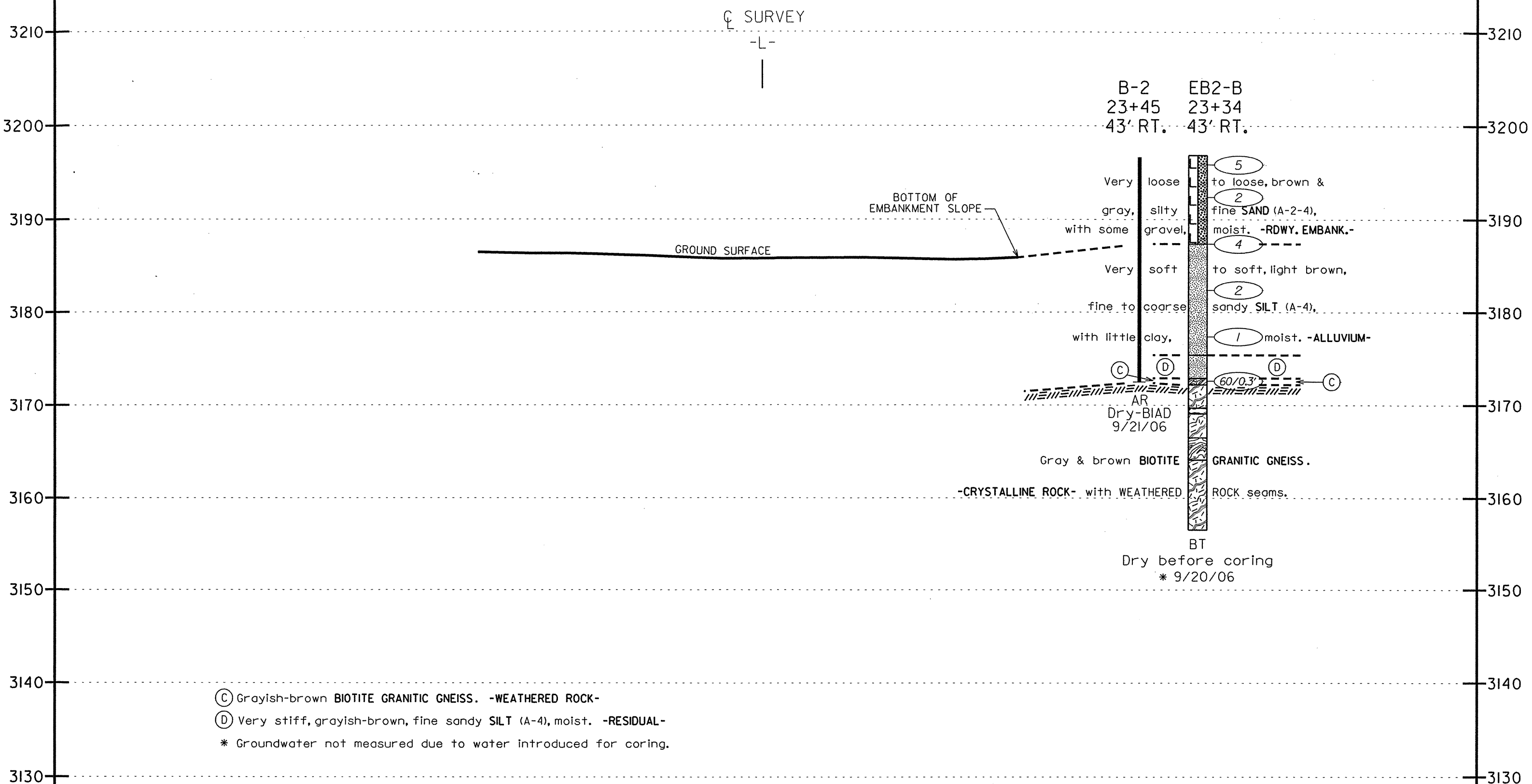


* Groundwater not measured due to water introduced for coring.

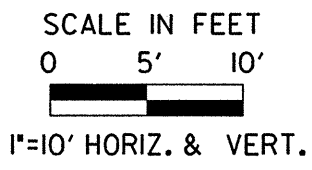


	FROEHLING & ROBERTSON, INC.		CLIENT: N.C. Department of Transportation	
	GEOTECHNICAL • ENVIRONMENTAL • MATERIALS ENGINEERS • LABORATORIES		LOCATION: Bridge No. 26 over Linville River on NC 183	
	"OVER ONE HUNDRED YEARS OF SERVICE" 310 Hubert Street Raleigh, North Carolina 27603 (919) 828-3441; Fax: (919) 828-5751 www.FandR.com		PROJECT No.: 33404.I.I	COUNTY: Burke
			TIP No.: B-4038	FA No.: BRSTP-0183(I)
			DATE: 9/06	SCALE: 1"=10' HORIZ. & VERT.

SECTION THROUGH PROPOSED END BENT 2



(C) Grayish-brown BIOTITE GRANITIC GNEISS. -WEATHERED ROCK-
 (D) Very stiff, grayish-brown, fine sandy SILT (A-4), moist. -RESIDUAL-
 * Groundwater not measured due to water introduced for coring.



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	LOCATION: Bridge No. 26 over Linville River on NC 183		
	PROJECT No.: 33404.1.1	COUNTY: Burke	
	TIP No.: B-4038	FA No.: BRSTP-0183(I)	
	DATE: 9/06	SCALE: 1"=10' HORIZ. & VERT.	DRAWING No.: 4



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N.C.D.O.T. GEOTECHNICAL UNIT
 BORING LOG

SHEET 1 OF 1

11 OF 19

PROJECT NO. 33404.1.1		ID. B-4038		COUNTY Burke		GEOLOGIST C. Baldwin								
SITE DESCRIPTION Bridge No. 26 over Linville River on NC 183						GROUND WATER (ft)								
BORING NO. EB1-B		BORING LOCATION 21+63		OFFSET 18ft RT		ALIGNMENT -L-								
COLLAR ELEV. 3,183.8 ft		NORTHING 816,070		EASTING 1,132,995		0 HR. N/A*								
TOTAL DEPTH 26.0 ft		DRILL MACHINE CME 55 Track		DRILL METHOD 3.25" ID HSA/NQ3 Core		HAMMER TYPE Automatic								
DATE STARTED 9/20/06		COMPLETED 9/20/06		SURFACE WATER DEPTH N/A										
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	
		0.5ft	0.5ft	0.5ft	0	20	40	60	80					100
3,183.8	0.0	1	2	1	Ground Surface					SS-1	24.7%		3,183.8	0.0
3,183.8	0.0	1	2	1						SS-2	22.6%		-ALLUVIAL- Light brown, fine to coarse sandy SILT (A-4(0)), with little clay.	
3,180.3	3.5	2	3	3										
3,175.3	8.5	60/0.3'			60/0.3'					RS-1			-WEATHERED ROCK- Grayish-brown BIOTITE GRANITIC GNEISS.	
														3,174.6
													3,176.8	7.0
													3,157.8	26.0

Boring Terminated at Elevation 3,157.8 ft in CRYSTALLINE ROCK (BIOTITE GRANITIC GNEISS)

NOTES:
 1) Driller indicates harder drilling at a depth of 7.0'.
 2) Auger refusal at a depth of 9.2'.
 3) Coring began at a depth of 9.2'.
 * Groundwater not measured due to water introduced for coring.

Sheet 1 of 1

DATE: 09/20/2006

CORE BORING REPORT

PROJECT: 33404.1.1 I.D. NO.: B-4038 BORING NO.: EB1-B GEOLOGIST: Chris Baldwin
 DESCRIPTION: Bridge No. 26 over Linville River on NC 183 SENIOR DRILLER: Jim Gilchrist
 COUNTY: Burke COLLAR ELEVATION: 3183.8 ft TOTAL DEPTH: 26.0 ft DRILLING ASSISTANT: Jason Schulster

Elev. (ft)	Depth (ft)	Drill Rate min./ft	Run Length (ft)	REC (%)	RQD (%)	Sample #	FIELD CLASSIFICATION AND REMARKS
3174.6	9.2	4:10/0.8	1.8	1.8/1.8	0.0/1.8		CR - 9.2 - 18.5 Gray and Brown, Moderately Severely Weathered, Medium Hard, Biotite Granitic Gneiss Close fracture spacing 2 joints at 45° STRATA REC = 100% 2 joints at 40° STRATA RQD = 37%
3172.8	11.0	5:29	5.0	5.0/5.0	2.6/5.0	RS-1	RS-1 12.7 - 13.0 feet, qu = 2,854 psi 1 joint at 75° 4 joints at 30° 2 joints at 20°
3167.8	16.0	5:27	5.0	4.3/5.0	0.8/5.0		5 joints at 10° 3 joints at 0° Strata Break WR - 18.5 - 19.2 Gray and Brown, Severely Weathered, Soft, Biotite Granitic Gneiss Strata Break Very close fracture spacing STRATA REC = 0% STRATA RQD = N/A CR - 19.2 - 26.0 Gray and Brown, Moderately Severely Weathered, Medium Hard, Biotite Granitic Gneiss 1 joint at 90° Very close to close fracture spacing. 1 joint at 30°
3162.8	21.0	5:17	5.0	3.2/5.0	0.0/5.0		1 joint at 70° 1 joint at 60° 1 joint at 30° STRATA REC = 74% 3 joints at 20° STRATA RQD = 0%
3157.8	26.0	5:46		64%	0%		Note: Core from 24.2 to 26.0 was lost down hole and could not be recovered

Coring Terminated at Elevation 3157.8 ft

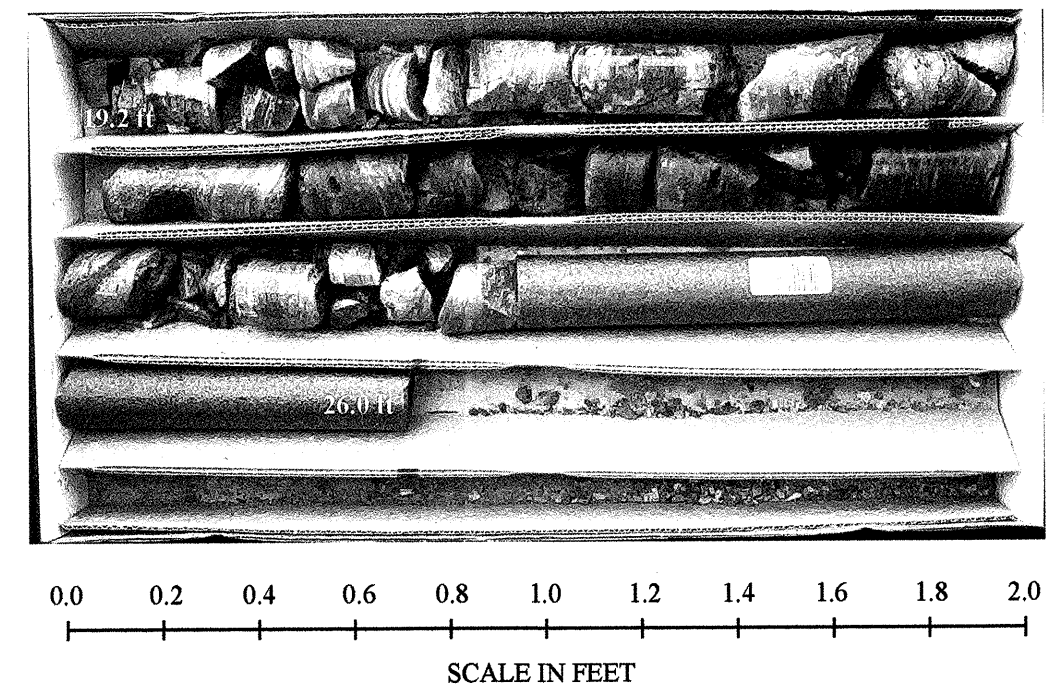
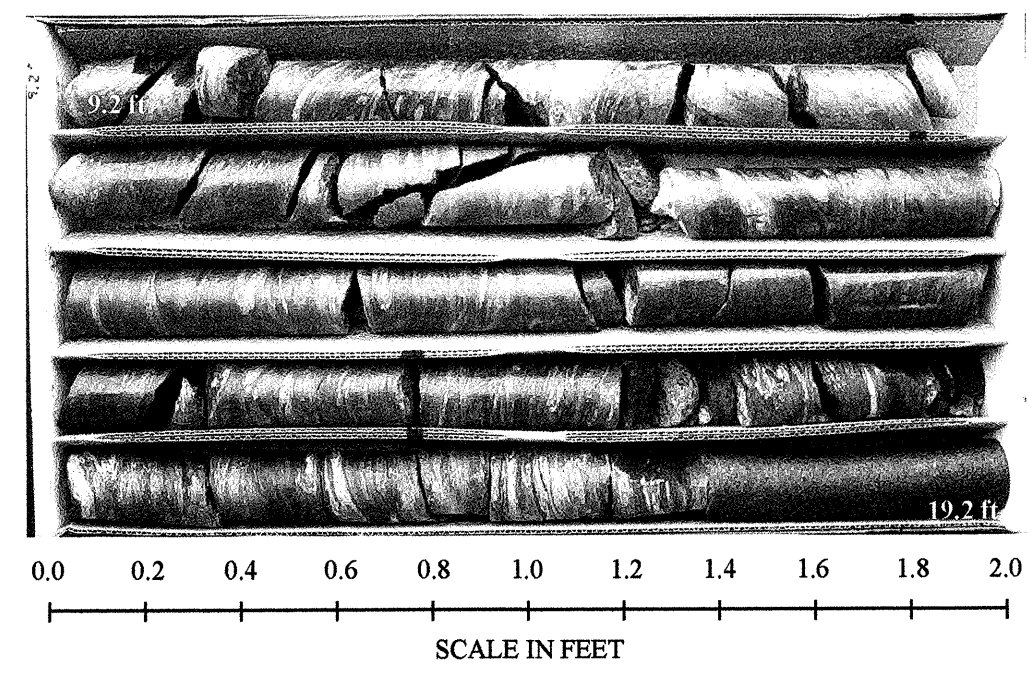
DRILLING EQUIPMENT:
 CME - 55 Track Drill with automatic hammer.
 HOLE ADVANCEMENT:
 1. HSA from 0.0 - 9.2 feet using 3.25" hollow stem augers.
 2. Cored using NQ3 w/SICB and a Series 6 diamond impregnated bit from 9.2 - 26.0 feet.

NOTES:

NCDOT BORE SINGLE 666-175.GPJ NC DOT.GDT 10/9/06



CORE PHOTOGRAPHS: EB1-B Station 21+63, 18 Feet Right





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 BORING LOG
 13 OF 19

SHEET 1 OF 1

PROJECT NO. 33404.1.1		ID. B-4038		COUNTY Burke		GEOLOGIST C. Baldwin									
SITE DESCRIPTION Bridge No. 26 over Linville River on NC 183							GROUND WATER (ft)								
BORING NO. B-1		BORING LOCATION 21+63		OFFSET 27ft RT	ALIGNMENT -L-		0 HR. Dry								
COLLAR ELEV. 3,183.3 ft		NORTHING 816,065		EASTING 1,133,002			24 HR. BIAD								
TOTAL DEPTH 11.0 ft		DRILL MACHINE CME 55 Track		DRILL METHOD 2.25" ID HSA		HAMMER TYPE Automatic									
DATE STARTED 9/20/06		COMPLETED 9/20/06		SURFACE WATER DEPTH N/A											
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION			
		0.5ft	0.5ft	0.5ft	0	20	40	60	80				100		
3,183.3													Ground Surface	3,183.3	0.0
													Augering to rock.	3,175.8	7.5
													-WEATHERED ROCK- Grayish-brown BIOTITE GRANITIC GNEISS.	3,172.4	10.9
	10.9												-CRYSTALLINE ROCK- Gray BIOTITE GRANITIC GNEISS.	3,172.3	11.0
													Boring Terminated with Standard Penetration Test Refusal at Elevation 3,172.3 ft in CRYSTALLINE ROCK (BIOTITE GRANITIC GNEISS).		
													NOTES: 1) Driller indicates harder drilling at a depth of 7.5'. 2) Auger refusal at a depth of 10.9'.		

NCDOT BORE SINGLE G66-175.GPJ NC DOT.GDT 10/9/06



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N.C.D.O.T. GEOTECHNICAL UNIT
 BORING LOG

SHEET 1 OF 1

14 OF 19

PROJECT NO. 33404.1.1		ID. B-4038		COUNTY Burke		GEOLOGIST C. Baldwin						
SITE DESCRIPTION Bridge No. 26 over Linville River on NC 183							GROUND WATER (ft)					
BORING NO. EB2-B		BORING LOCATION 23+34		OFFSET 43ft RT		ALIGNMENT -L-						
COLLAR ELEV. 3,196.9 ft		NORTHING 816,199		EASTING 1,133,110		0 HR. N/A*						
TOTAL DEPTH 40.4 ft		DRILL MACHINE CME 55 Track		DRILL METHOD 3.25" ID HSA/NQ3 Core		HAMMER TYPE Automatic						
DATE STARTED 9/21/06		COMPLETED 9/21/06		SURFACE WATER DEPTH N/A								
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION
		0.5ft	0.5ft	0.5ft	0	20	40	60	80			
3,196.9	0.0	1	2	3	Ground Surface					M		3,196.9 0.0
3,193.4	3.5	2	1	1	-ROADWAY EMBANKMENT- Brown & gray to light brown, silty fine SAND (A-2-4), with some gravel.					M		
3,188.4	8.5	3	3	1						M		3,187.4 9.5
3,183.4	13.5	1	1	1	-ALLUVIAL- Light brown, fine to coarse sandy SILT (A-4(0)), with little clay.					SS-8	31.0%	
3,178.4	18.5	1	WOH	1						SS-9	32.3%	
3,173.4	23.5	18	60/0.3'		-RESIDUAL- Grayish-brown, fine sandy SILT (A-4).							3,175.4 21.5
					-WEATHERED ROCK- Gray & brown BIOTITE GRANITIC GNEISS.							3,172.9 24.0
					-CRYSTALLINE ROCK- Gray & brown BIOTITE GRANITIC GNEISS.							3,172.2 24.7
					-WEATHERED ROCK- Gray & brown BIOTITE GRANITIC GNEISS.							3,166.5 30.4
					-CRYSTALLINE ROCK- Gray & brown BIOTITE GRANITIC GNEISS.					RS-2		3,164.1 32.8
					Boring Terminated at Elevation 3,156.5 ft in CRYSTALLINE ROCK (BIOTITE GRANITIC GNEISS)							3,156.5 40.4

NOTES:
 1) Geologist indicates strata breaks in split spoon at depths of 9.5' & 24.0'.
 2) Driller indicates harder drilling at a depth of 21.5'.
 3) Coring began at a depth of 24.7'.
 4) Boring was dry before introducing water for coring.
 * Groundwater not measured due to water introduced for coring.

CORE BORING REPORT							Sheet 1 of 1	
PROJECT: 33404.1.1							I.D. NO.: B-4038	
DESCRIPTION: Bridge No. 26 over Linville River on NC 183							BORING NO.: EB2-B	
COUNTY: Burke							GEOLOGIST: Chris Baldwin	
COLLAR ELEVATION: 3196.9 ft							DATE: 09/21/2006	
TOTAL DEPTH: 40.4 ft							SENIOR DRILLER: Jim Gilchrist	
							DRILLING ASSISTANT: Jason Schulster	
Elev. (ft)	Depth (ft)	Drill Rate min./ft	Run Length (ft)	REC (%)	RQD (%)	Sample #	FIELD CLASSIFICATION AND REMARKS	
3172.2	24.7	3:27/0.7	0.7	0.7/0.7	0.0/0.7		CR - 24.7 - 27.2 Gray and Brown, Moderately Severely Weathered, Medium Hard, Biotite Granitic Gneiss	
3171.5	25.4			100%	0%		Very close to close fracture spacing. 9 joints at 20°	
3171.5	25.4	4:59	5.0	4.4/5.0	0.0/5.0		1 joint at 80° STRATA REC = 100%	
		5:07		88%	0%		6 joints at 20° STRATA RQD = 0%	
		5:15					Strata Break 3169.7 ft (27.2 ft)	
		5:21					WR - 27.2 - 27.8 Gray and Brown, Severely Weathered, Soft, Biotite Granitic Gneiss	
		5:20					Strata Break Very close fracture spacing. STRATA REC = 0% STRATA RQD = N/A 3169.1 ft (27.8 ft)	
3166.5	30.4						CR - 37.8 - 30.4 Gray and Brown, Moderately Severely Weathered, Medium Hard, Biotite Granitic Gneiss	
							Very close to close fracture spacing. 1 joint at 90° 1 joint at 30°	
							STRATA REC = 100% 1 joint at 80° 5 joints at 20°	
							Strata Break STRATA RQD = 0% 1 joint at 50° 3166.5 ft (30.4 ft)	
3166.5	30.4	5:05	5.0	2.6/5.0	0.0/5.0		WR - 30.4 - 32.8 Gray and Brown, Severely Weathered, Soft, Biotite Granitic Gneiss	
							Very close fracture spacing. STRATA REC = 0%	
				52%	0%		STRATA RQD = N/A 3164.1 ft (32.8 ft)	
							Strata Break	
							CR - 32.8 - 40.4 Gray and Brown, Moderately Severely to Slightly Weathered, Moderately Hard to Hard, Biotite Granitic Gneiss	
							Very close to close fracture spacing. 1 joint at 90° 1 joint at 60°	
							1 joint at 80° 1 joint at 40°	
							1 joint at 70°	
3161.5	35.4						RS-2 35.7 - 36.0 feet, qu = 10,114 psi	
3161.5	35.4	5:50	5.0	5.0/5.0	2.5/5.0	RS-2	1 joint at 80° STRATA REC = 100%	
				100%	50%		3 joints at 30° STRATA RQD = 33%	
							3 joints at 20°	
							3156.5 ft (40.4 ft)	
3156.5	40.4						Coring Terminated at Elevation 3156.5 ft	

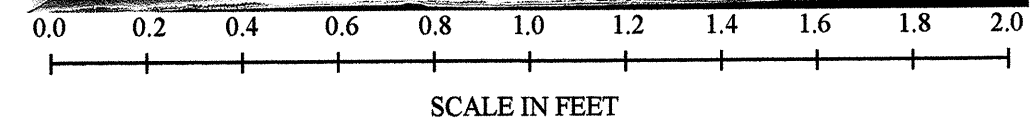
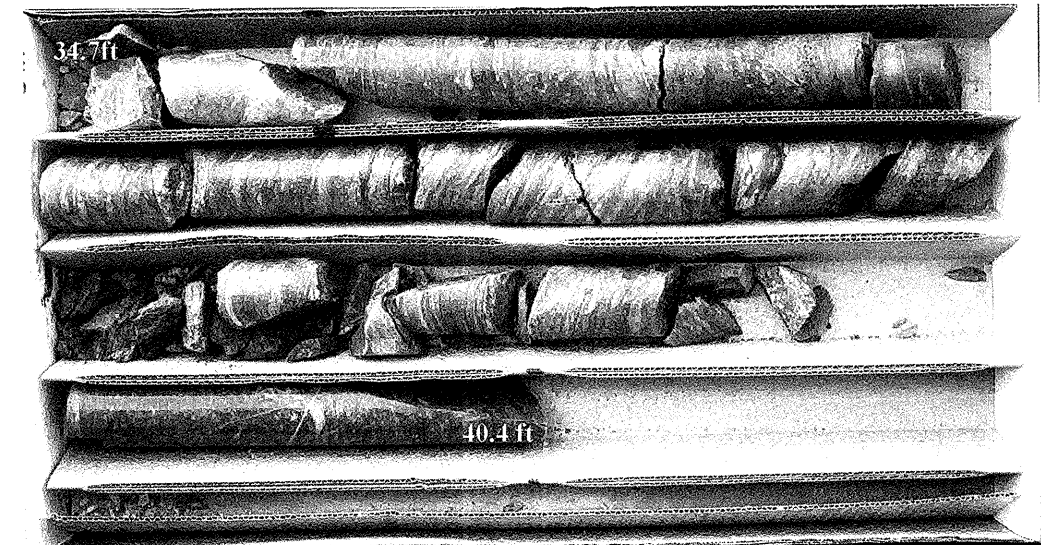
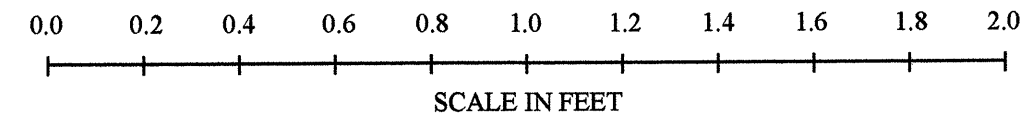
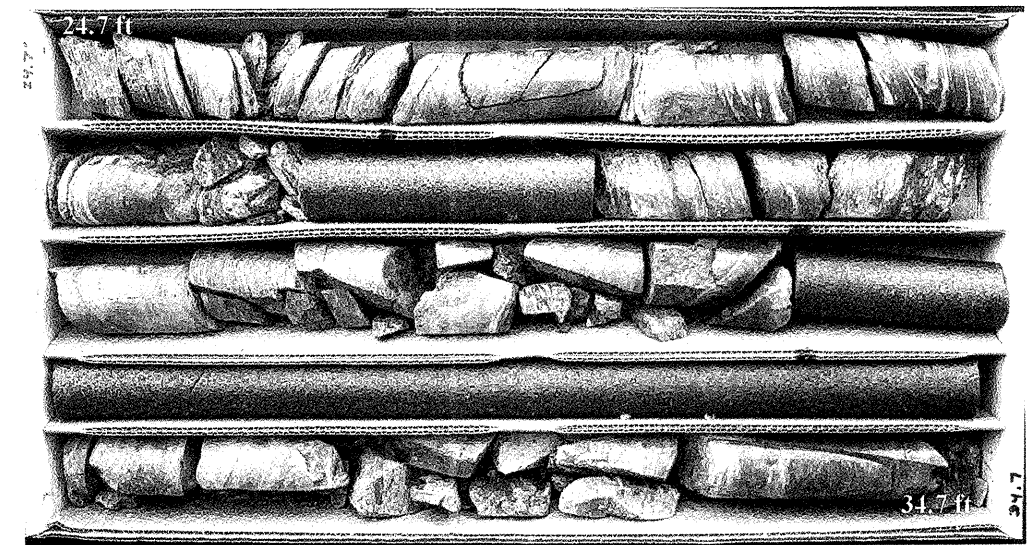
DRILLING EQUIPMENT:
 CME - 55 Track Drill with automatic hammer.
 HOLE ADVANCEMENT:
 1. HSA from 0.0 - 24.7 feet using 3.25" hollow stem augers.
 2. Cored using NQ3 w/SICB and a Series 6 diamond impregnated bit from 24.7 - 40.4 feet.

NOTES:

NCDOT BORE SINGLE G66-175.GPJ NC_DOT_GDT_10/9/06



CORE PHOTOGRAPHS: EB2-B Station 23+34, 43 Feet Right





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 BORING LOG

SHEET 1 OF 1

PROJECT NO. 33404.1.1		ID. B-4038		COUNTY Burke		GEOLOGIST C. Baldwin							
SITE DESCRIPTION Bridge No. 26 over Linville River on NC 183						GROUND WATER (ft)							
BORING NO. B-2		BORING LOCATION 23+45		OFFSET 43ft RT		ALIGNMENT -L-							
COLLAR ELEV. 3,196.7 ft		NORTHING 816,208		EASTING 1,133,116		0 HR. Dry							
TOTAL DEPTH 24.2 ft		DRILL MACHINE CME 55 Track		DRILL METHOD 2.25" ID HSA		HAMMER TYPE Automatic							
DATE STARTED 9/21/06		COMPLETED 9/21/06		SURFACE WATER DEPTH N/A									
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	
		0.5ft	0.5ft	0.5ft	0	20	40	60	80				100
3,196.7													Ground Surface
													Augering to rock.
3,172.5	24.2												Boring Terminated with Standard Penetration Test Refusal and Auger Refusal at Elevation 3,172.5 ft on CRYSTALLINE ROCK (BIOTITE GRANITIC GNEISS)
													NOTES: 1) Auger refusal at a depth of 24.2'.



North Carolina Department of Transportation
 Division of Highways
 Materials and Test Unit
 Soils Laboratory

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 M&T Form 503

T.I.P. ID NO.: B-4038

REPORT ON SAMPLES OF: SOIL FOR QUALITY

PROJECT: 33404.1.1
 DATE SAMPLED: 9/06
 SAMPLED FROM: -L-
 SUBMITTED BY: Beth Howey

COUNTY: Burke
 RECEIVED: 9/06
 REPORTED: 10/3/06
 BY: Dave Jenks

TEST RESULTS

PROJ. SAMPLE NO.	EB1-B	EB1-B	EB2-B	EB2-B		
LAB SAMPLE NO.	SS-1	SS-2	SS-8	SS-9		
Retained #4 Sieve %	2.4	10.7	0.0	0.0		
Passing #10 Sieve %	96.5	82.6	100.0	99.9		
Passing #40 Sieve %	90.4	71.6	98.4	96.3		
Passing #200 Sieve %	60.5	53.3	56.4	49.4		

MINUS #10 FRACS #10 FRACTION

SOIL MORTAR - 100%				
Coarse Sand Ret - #60 %	10.6	17.2	6.5	11.8
Fine Sand Ret - #270 %	37.4	28.8	50.9	51.1
Silt 0.053 - 0.010 mm %	32.8	38.3	27.3	24.1
Clay < 0.010 mm %	19.2	15.7	15.3	13.0
L.L.	25	30	25	25
P.L.	NP	NP	NP	NP
P.I.	NP	NP	NP	NP
AASHTO Classification	A-4 (0)	A-4 (0)	A-4(0)	A-4 (0)
Station	21+63	21+63	23+34	23+34
Offset	18' Rt.	18' Rt.	43' Rt.	43' Rt.
Depth (ft)	0.0	3.5	13.5	18.5
to	1.5	5.0	15.0	20.0
Moisture Content (%)	24.7	22.6	31.0	32.3
Organic Content (%)				

NT = Not Tested
 NP = Not Plastic
 NA = Not Applicable

E.C. Howey, L.G., P.E.
 Soils Engineer

NCDOT BORE SINGLE 666-175.GPJ NC DOT.GDT 10/9/06



**FIELD
 SCOUR REPORT**

WBS: 33404.1.1 TIP: B-4038 COUNTY: Burke

DESCRIPTION(1): Bridge No. 26 over Linville River on NC 183

EXISTING BRIDGE

Information from: Field Inspection Microfilm _____ (reel _____ pos: _____)
 Other (explain) _____

Bridge No.: 26 Length: 212.5 Total Bents: 6 Bents in Channel: 2 Bents in Floodplain: 6
 Foundation Type: Spread Footings

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: Minor scour at toe of slopes - channel banks

Interior Bents: None

Channel Bed: None - exposed rock

Channel Bank: Minor scour

EXISTING SCOUR PROTECTION

Type(3): Concrete Wing Walls at End Bents with some rip rap

Extent(4): To the limits of the embankment

Effectiveness(5): Good

Obstructions(6): Fallen trees around bridge

INSTRUCTIONS

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

DESIGN INFORMATION

0F19

Channel Bed Material(7): Exposed rock

Channel Bank Material(8): Fine sandy silt

Channel Bank Cover(9): Trees, shrubs, grasses

Floodplain Width(10): Approximately 400 feet

Floodplain Cover(11): Trees, shrubs, grasses

Stream is(12): Aggrading _____ Degrading _____ Static

Channel Migration Tendency(13): East

Observations and Other Comments: _____

Reported by: Elizabeth C. Howey Date: 10/12/2006
 E.C. Howey, F&R

DESIGN SCOUR ELEVATIONS(14)

Feet _____ Meters _____

		BENTS																
		EB1	EB2															
Left																		
Right																		

Comparison of DSE to Hydraulics Unit theoretical scour:
 The Bridge Survey and Hydraulic Report (dated 3-15-06) lists no contractional or local scour for piers. Therefore no Design Scour Elevation calculations are needed.

[Signature] 10/24/2006

SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL

Bed or Bank	Bank	Bank	Bank	Bank		
Sample No.	SS-1	SS-2	SS-8	SS-9		
Retained #4	2.4	10.7	0	0		
Passed #10	96.5	82.6	100	99.9		
Passed #40	90.4	71.6	98.4	96.3		
Passed #200	60.5	53.3	56.4	49.4		
Coarse Sand	10.6	17.2	6.5	11.8		
Fine Sand	37.4	28.8	50.9	51.1		
Silt	32.8	38.3	27.3	24.1		
Clay	19.2	15.7	15.3	13		
LL	25	30	25	25		
PI	NP	NP	NP	NP		
AASHTO	A-4(0)	A-4(0)	A-4(0)	A-4(0)		
Station	21+63	21+63	23+34	23+34		
Offset	18' Rt.	18' Rt.	43' Rt.	43' Rt.		
Depth	0.0-1.5	3.5-5.0	13.5-15.0	18.5-20.0		



SITE PHOTOGRAPHS



Photograph No. 1: Profile view right of -L-, looking east.



Photograph No. 3: Cross-section view of End Bent 2, looking north.



Photograph No. 2: Cross-section view of End Bent 1, looking north.



Photograph No. 4: View upstream, looking north.