

B-4144

ID:

33493.1.1

PROJECT:

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

STRUCTURE SUBSURFACE INVESTIGATION

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-4144	1	28
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
33493.1.1	BRZ-1519(2)	P.E.	
CONST.			

STATE PROJECT 33493.1.1 I.D. NO. B-4144

F.A. PROJECT BRZ-1519(2)

COUNTY HAYWOOD

PROJECT DESCRIPTION BRIDGE NO. 211 OVER

RICHLAND CREEK ON SR 1519(RICHLAND CREEK RD.)

SITE DESCRIPTION _____

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.

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INVESTIGATED BY P. WEAVER PERSONNEL D. KITCHEN

CHECKED BY J. VINSON A. HAYES

SUBMITTED BY P. WEAVER W. DUGGINS

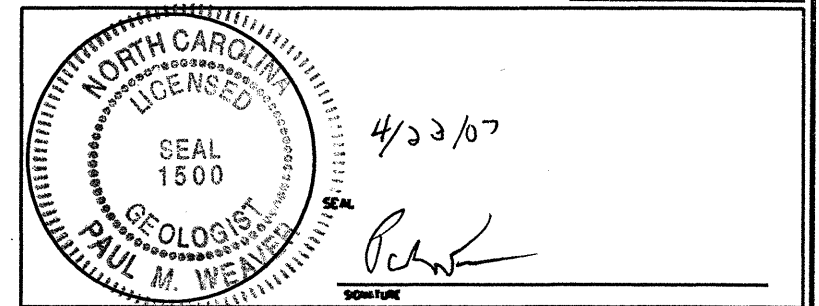
DATE 3/16/07 K. HICKS

For Letting

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: DRK



NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

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B-4144	33493.1.1	2	28

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 (ASTM 1286, 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. EXAMPLES:</p> <p style="font-size: small;">VERY STIFF, GRAY SILT CLAY, MOST WHEN INTERBEDDED FINE SAND LAYERS, MOIST PLASTIC, A-7-6</p>		<p>WELL GRADED- INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE UNIFORM- INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED) POORLY GRADED GAP-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: <u>ANGULAR</u>, <u>SUBANGULAR</u>, <u>SUBROUNDED</u>, OR <u>ROUNDED</u>.</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>WEATHERED ROCK (WR) </p> <p>CRYSTALLINE ROCK (CR) </p> <p>NON-CRYSTALLINE ROCK (NCR) </p> <p>COASTAL PLAIN SEDIMENTARY ROCK (CPS) </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 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 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.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 (SCREC.)- 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; font-size: x-small;"> <tr> <th rowspan="2">GENERAL CLASS.</th> <th colspan="4">GRANULAR MATERIALS (75% PASSING #200)</th> <th colspan="4">SILT-CLAY MATERIALS (75% PASSING #200)</th> <th colspan="2">ORGANIC MATERIALS</th> </tr> <tr> <th>A-1</th> <th>A-2</th> <th>A-3</th> <th>A-4</th> <th>A-5</th> <th>A-6</th> <th>A-7</th> <th>A-8</th> <th>A-9</th> <th>A-10</th> </tr> <tr> <td>GROUP CLASS.</td> <td>A-1-a</td> <td>A-1-b</td> <td>A-2-4</td> <td>A-2-5</td> <td>A-2-6</td> <td>A-2-7</td> <td>A-4</td> <td>A-5</td> <td>A-6</td> <td>A-7</td> <td>A-8</td> <td>A-9</td> <td>A-10</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> </tr> <tr> <td>% PASSING</td> <td>100</td> <td>100</td> <td>100</td> <td>100</td> <td>100</td> <td>100</td> <td>100</td> <td>100</td> <td>100</td> <td>100</td> <td>100</td> <td>100</td> <td>100</td> </tr> <tr> <td>LIQUID LIMIT</td> <td>≤ 5</td> <td>≤ 10</td> <td>≤ 15</td> <td>≤ 20</td> <td>≤ 25</td> <td>≤ 30</td> <td>≤ 40</td> <td>≤ 45</td> <td>≤ 50</td> <td>≤ 60</td> <td>≤ 70</td> <td>≤ 80</td> <td>≤ 90</td> </tr> <tr> <td>PLASTIC INDEX</td> <td>≤ 4</td> <td>≤ 7</td> <td>≤ 10</td> <td>≤ 15</td> <td>≤ 20</td> <td>≤ 25</td> <td>≤ 30</td> <td>≤ 35</td> <td>≤ 40</td> <td>≤ 45</td> <td>≤ 50</td> <td>≤ 55</td> <td>≤ 60</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>0</td> </tr> <tr> <td>USUAL TYPES OF MAJOR MATERIALS</td> <td colspan="2">STONE FRAGS. GRAVEL AND SAND</td> <td colspan="2">FINE SAND</td> <td colspan="2">SILTY OR CLAYEY GRAVEL AND SAND</td> <td colspan="2">SILTY SOILS</td> <td colspan="2">CLAYEY SOILS</td> <td colspan="2">ORGANIC MATERIALS</td> <td>MUCK, PEAT</td> </tr> <tr> <td>GENERATING AS A SURFACE</td> <td colspan="4">EXCELLENT TO GOOD</td> <td colspan="4">FAIR TO POOR</td> <td colspan="2">FAIR TO POOR</td> <td colspan="2">POOR</td> <td>UNSATURATED</td> </tr> </table> <p style="text-align: center; font-size: x-small;">P.I. OF A-7-5 ≤ L.L. - 30 & P.I. OF A-7-6 > L.L. - 30</p>		GENERAL CLASS.	GRANULAR MATERIALS (75% PASSING #200)				SILT-CLAY MATERIALS (75% PASSING #200)				ORGANIC MATERIALS		A-1	A-2	A-3	A-4	A-5	A-6	A-7	A-8	A-9	A-10	GROUP CLASS.	A-1-a	A-1-b	A-2-4	A-2-5	A-2-6	A-2-7	A-4	A-5	A-6	A-7	A-8	A-9	A-10	SYMBOL														% PASSING	100	100	100	100	100	100	100	100	100	100	100	100	100	LIQUID LIMIT	≤ 5	≤ 10	≤ 15	≤ 20	≤ 25	≤ 30	≤ 40	≤ 45	≤ 50	≤ 60	≤ 70	≤ 80	≤ 90	PLASTIC INDEX	≤ 4	≤ 7	≤ 10	≤ 15	≤ 20	≤ 25	≤ 30	≤ 35	≤ 40	≤ 45	≤ 50	≤ 55	≤ 60	GROUP INDEX	0	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 SOILS		CLAYEY SOILS		ORGANIC MATERIALS		MUCK, PEAT	GENERATING AS A SURFACE	EXCELLENT TO GOOD				FAIR TO POOR				FAIR TO POOR		POOR		UNSATURATED	<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; font-size: x-small;"> <tr> <th></th> <th>GRANULAR SOILS</th> <th>SILT-CLAY SOILS</th> <th>OTHER MATERIAL</th> </tr> <tr> <td>TRACE OF ORGANIC MATTER</td> <td>2 - 5%</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>			GRANULAR SOILS	SILT-CLAY SOILS	OTHER MATERIAL	TRACE OF ORGANIC MATTER	2 - 5%	3 - 5%	TRACE	LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE	MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME	HIGHLY ORGANIC	>10%	>20%	HIGHLY	<p style="text-align: center;">WEATHERING</p> <p>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 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. MODERATE (MOD.) SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK. MODERATELY SEVERE (MOD. SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. <i>IF TESTED, 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 BPF.</i> VERY SEVERE (V. SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. <i>IF TESTED, YIELDS SPT N VALUES < 100 BPF.</i> COMPLETE ROCK REDUCED TO SOIL, ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.</p> <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 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. COUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS. MEDIUM HARD CAN BE GROOVED OR GOUGED 0.5 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK. SOFT CAN BE 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>	
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ENGINEERING CONSULTANTS, INC.

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P.O. Box 18846 • Zip 27419-8846 • 313 Gallimore Dairy Road • Greensboro, NC 27409 • p 336.668.0093 • f 336.668.3868

Mr. Njoroge W. Wainaina, P.E., NCDOT
 Bridge No. 211 over Richland Creek on SR 1519 (Richland Creek Rd.), Haywood County, North Carolina

March 16, 2007
 Trigon Project No. 071-07-005

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Appendices

Appendix A (Issued Under Separate Cover)

1. Laboratory Results of Rock Tests

Appendix B (Issued Under Separate Cover)

1. FHWA Geotechnical Report Review Checklist
2. Boring Quantity Summation Sheet
3. Field Boring and Coring Logs
4. Survey Notes
5. Property Owner Contact Report Sheet

SUBMITTED TO: North Carolina Department of Transportation
 1589 Mail Service Center
 Raleigh, North Carolina 27699-1589

ATTENTION: Mr. Njoroge W. Wainaina, P.E.
 State Geotechnical Engineer

SUBMITTED BY: Trigon Engineering Consultants, Inc.
 Post Office Box 18846
 Greensboro, North Carolina 27419-8846
 Trigon Project No. 071-05-025

DATE: March 16, 2007

STATE PROJECT: 33493.1.1

TIP : B-4144

FEDERAL PROJECT: BRZ-1519(2)

COUNTY: Haywood

DESCRIPTION: Bridge No. 211 Over Richland Creek on SR 1519 (Richland Creek Road)

SUBJECT: Geotechnical Report of Structure Subsurface Investigation



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STATE PROJECT: 33493.1.1
TIP : B-4144
FEDERAL PROJECT: BRZ-1519(2)
COUNTY: Haywood
DESCRIPTION: Bridge No. 211 Over Richland Creek on SR 1519 (Richland Creek Road)
SUBJECT: Geotechnical Report of Structure Subsurface Investigation

Trigon Engineering Consultants, Inc. has completed the authorized geotechnical investigation for the above referenced project in Haywood County, North Carolina. The purpose of this exploration was to investigate the subsurface conditions at the proposed bridge bent locations and to provide general construction considerations based on the subsurface conditions.

1.0 SITE DESCRIPTION

The project site is located in the central portion of Haywood County northwest of the town of Clyde, North Carolina at the approximate location shown on the Site Vicinity Map (Drawing No. 1) attached behind this report. The site and project description of the proposed project is "Bridge No. 211 Over Richland Creek on SR 1519 (Richland Creek Road)". Topographically, the site is relatively level in the vicinity of the proposed End Bent-1 on the east side of Richland Creek. The creek bank slope is moderately steep on the

Thank you for our success.

east side of the creek and steep on the west side of the creek. The ground surface in the vicinity of the proposed End Bent-2 slopes moderately down towards the south. The floodplain at the location of the existing bridge appears to be approximately 500 feet wide. The topography of the general site vicinity consists of steep hills and mountains.

A large rock outcrop is present on the eastern bank of the creek extending from approximately the left side of the proposed bridge to right of the centerline of the proposed bridge. The strike of this outcrop was measured by Trigon personnel at north 40° east with a dip of 80 ° southeast. Boulders are present along the majority of the eastern bank of the creek extending from the proposed bridge to the existing bridge. In addition, large concrete blocks have been placed along the eastern creek bank approximately 80 feet south of the proposed bridge.

At the time of this investigation, a two-span bridge (existing Bridge No. 211) was present approximately 180 feet south of the proposed bridge location. The existing bridge consists of a timber deck, I-beams on timber piles, has a timber abutment at End Bent-1, and has a concrete abutment at End Bent-2. The existing bridge is approximately 70 feet in length and approximately 20 feet in width.

The water surface elevation of Richland Creek surveyed by Trigon on February 23, 2007 was ±2492 feet. According to the Bridge Survey and Hydraulic Report, the normal water surface elevation of the creek in the vicinity of the proposed bridge is ±2493 feet, the 10-year floodwater surface elevation is ±2501 feet, the 50-year floodwater surface elevation is ±2502 feet, the 100-year flood elevation is ±2503 feet, and the 500-year flood elevation is ±2504 feet.

2.0 PROJECT DESCRIPTION

Proposed for construction is a new, two-span structure to replace the existing Bridge No. 211 on Richland Creek Road over Richland Creek. The proposed bridge will be located approximately 180 feet north of the existing bridge. Information for the proposed bridge structure was obtained from the Preliminary General Drawing and the Bridge Survey & Hydraulic Design Report provided to Trigon by the NCDOT. The proposed bridge will be 160 feet in length and approximately 40 feet in width (out to out) with a skew angle of 90°00'00" at each bent.

The proposed grade along the centerline of the proposed bridge will be raised approximately 2 feet on the west (End Bent-1) end, while the proposed grade along the centerline on the east (End Bent-2) end will be lowered approximately 2 feet. A total of approximately 600 cubic yards of excavation is proposed in the vicinity of the End Bent-2 abutment for the bridge, embankment, and revised berm. This excavation will involve both horizontal and vertical excavation, with vertical excavation extending to approximately 14 feet below the existing top-of-soil at the -L- centerline.

The Preliminary General Drawing and Bridge Survey & Hydraulic Design Report are in English units with feet as the primary unit of length.

3.0 SCOPE OF INVESTIGATION

3.1 FIELD TESTING

Work points generally corresponding to the end of each proposed bent were surveyed-in by an NCDOT survey crew. The survey crew also placed a hub at each work point location and established an elevation for each hub. The as-drilled locations for the soil test borings were located by personnel from Trigon using the surveyed work points for reference. Elevations at the as-drilled boring locations, along the existing ground surface at the bent locations, and along the structure profile were surveyed by personnel from Trigon using the elevations established by the NCDOT survey crew for different work point hubs as reference points.

Trigon's subsurface investigation for the proposed bridge was conducted between February 19 and February 24, 2007. This exploration consisted of six soil test borings with two borings at each proposed bent location. As-drilled soil test boring locations are shown on the Boring Identification Diagram (Drawing No. 2) following this report, and boring Logs and coring logs are included following this report.

Boring B1-B was offset in towards the centerline of -L- due to the existing slope of the creek bank in the vicinity of the proposed boring location which prevented leveling of the drilling machine. Due to the presence of shallow crystalline rock in the creek bed, casing was not used in either of the Bent-1 borings. Blockage of the core barrel at approximately 7.5 feet during the coring of Boring B1-B required removing the entire core barrel assembly from the core hole. The swift current and abundant gravel and cobbles in the creek prevented the core barrel from reentering the core hole. Therefore, coring was restarted at the creek bottom adjacent to the original hole (the adjacent core hole was designated B1-B2). At a depth of

approximately 6 feet below the creek bottom, Boring B1-B2 reentered the original core hole (B1-B). Therefore, the boring at this location has been designated as B1-B/B1-B2.

All of the borings for this project were drilled using an ATV-mounted Mobile B-57 drilling machine equipped with a 140-pound manual hammer. The borings at End Bent-1 and Boring EB2-B were advanced utilizing 0.5-foot (O.D.) continuous-flight hollow-stem auger techniques, while the remaining borings (B1-A, B1-B/B1-B2, and EB2-A) were advanced utilizing an HQ size hollow double-tube core barrel with creek water alone used as the drilling fluid. The use of rock coring techniques at Boring EB2-A was necessitated by the presence of a boulder beginning at the existing ground surface in the immediate vicinity of the boring and the presence of large rock fragments interspersed throughout the residual soils. The rock coring at the interior bent borings and in the weathered rock/crystalline rock at EB2-A was performed in order to evaluate the nature of the weathered rock/crystalline rock at all three borings. The cored weathered rock/crystalline rock was returned to our laboratory for further classification and possible testing.

Standard Penetration Tests were performed in the soil and weathered rock materials in the soil test borings in general accordance with NCDOT guidelines. In conjunction with this testing, split-barrel soil and weathered rock samples were recovered for visual classification and potential laboratory testing.

3.2 LABORATORY TESTING

Laboratory soil testing was performed on five representative split-barrel samples and on one grab sample from the stream bank to aid in the assessment of AASHTO soil classification and to provide data for evaluation of engineering properties. The laboratory testing on the samples consisted of Natural Moisture Content, Atterberg Limit, and grain size analysis with hydrometer. In addition, two Unconfined Compressive Strength (Qu only) tests were performed on selected samples of the recovered rock core. Laboratory tests were performed in general accordance with AASHTO and NCDOT specifications. The results of the soil and rock laboratory tests are included on Sheet 22 located behind this report. Laboratory results of the rock testing are also included under separate cover in Appendix A.

3.3 SITE GEOLOGY

The site of the proposed project is located within the Blue Ridge Belt of the Blue Ridge physiographic province. Blue Ridge Belt rocks are comprised of metamorphosed sedimentary and volcanic rocks intruded by a variety of plutons, and contain "well-exposed Middle Proterozoic basement gneisses, Later Proterozoic plutons, Later Proterozoic metavolcanic and metasedimentary rift sequences, and thick early Paleozoic rifted continental margin and platform deposits. These rocks were involved in foreland thrusting along the western flank of the Appalachian orogen and are a record of multiple periods of Paleozoic deformation associated with development of the southern Appalachian orogen" (*Geology of the Carolinas*, Horton, Zullo, 1991).

According to the 1985 Geologic Map of North Carolina, the site is located in an area generally consisting of biotite gneiss interlayered and gradational with biotite-garnet gneiss and amphibolite. A large outcrop of biotite gneiss is present on the eastern bank of the creek extending from approximately the left side of the proposed bridge to right of the centerline of the proposed bridge. The strike of this outcrop was measured by Trigon personnel at north 40° east with a dip of 80° southeast. The crystalline rock encountered in our test borings generally consisted of moderately severely to very slightly weathered biotite gneiss, with the majority of the recovered crystalline rock being slightly to very slightly weathered. The crystalline rock cored ranged in quality from poor to very good, with the majority of the crystalline rock recovered being good to very good in quality. The overlying residual soils at the site are the product of the physical and chemical weathering of the underlying crystalline rock.

3.4 FOUNDATION MATERIALS

The generalized subsurface conditions indicated by the borings are described below. For soil descriptions and general stratification at a particular boring location, the respective Boring Log should be reviewed. For rock descriptions and stratification at a particular boring location, the respective Coring Log should be reviewed. The Boring Identification Diagram, Boring Logs, Coring Logs, and Core Photographs are located behind this report. Representative subsurface cross-sections at each bent location and a subsurface profile along the right side of the proposed structure are also included behind this report. The subsurface properties for the project site are described below.

Foundation materials encountered included alluvial soils, residual soils, weathered rock, and crystalline rock.

Alluvial soil was encountered beginning at the existing ground surface at the End Bent-1 borings and beginning at the creek bottom at the Bent-1 borings. Alluvium was not encountered at the End Bent-2 borings. The alluvial soil extends to depths of ±11 feet (Elevations ±2488 feet to ±2487 feet) at the End Bent-1 borings, and to a depth of less than one foot (Elevations ±2490 feet to ±2489 feet) at the Bent-1 borings. The alluvial materials at the End Bent-1 borings generally consists of very loose to loose, micaceous, silty, coarse to fine sand (A-2-4) extending to a depth ±8 feet (Elevation ±2491 feet) underlain by a ±3 feet thick zone of gravel and cobbles with fine to coarse sand (A-1-a). The upper ±3 feet of alluvium at End Bent-1 (to Elevation ±2496 feet) is moderately organic. The alluvial material at the Bent-1 borings consists of gravel and cobbles which serve as armor for the stream bed. Standard Penetration Resistance values within the alluvial soil ranged from 2 to 4 blows per foot (bpf) within the A-2-4 material and 23 to 40 bpf in the gravel/cobble zone.

Residual soil was encountered beginning at the existing ground surface at the End Bent-2 borings. The residual soil extends to a depths ranging from ±16 feet to ±22 feet (Elevations ±2493 feet to ±2490 feet) at these borings. The residuum generally consists loose to dense, variably micaceous, silty, clayey, coarse to fine sand (A-2-4), and stiff, micaceous, clayey, coarse to fine sandy silt (A-4). A 0.5-foot thick zone of residual soil was encountered within the weathered rock between depths of 17.5 feet and 18.0 feet (Elevations 2491.7 feet and 2491.2 feet) at Boring EB2-B. Standard Penetration Resistance values within the residual soil ranged from 8 to 38 bpf. Residual boulders and large rock fragments were present in intervals throughout the residuum at Boring EB2-A.

Weathered rock was encountered underlying the alluvium at the End Bent-1 borings and Boring B1-A, underlying the residual soil at the End Bent-2 borings, and as a zone within the crystalline rock at Boring B1-B. The weathered rock generally consists of biotite gneiss. The weathered rock was encountered between the following depths and elevations: 11.5 feet to 13.0 feet (Elevations 2487.4 feet to 2485.9 feet) at Boring EB1-A, 11.0 feet to 15.0 feet (Elevations 2488.1 feet to 2484.1 feet) at Boring EB1-B, 0.3 feet to 3.2 feet (Elevations 2489.4 feet to 2486.5 feet) at Boring B1-A, 7.5 feet to 16.2 feet (Elevations 2483.6 feet to 2474.9 feet) at Boring B1-B/B1-B2, 22.0 feet to 22.5 feet (Elevations 2490.5 feet to 2490.0 feet) at Boring EB2-A, and 16.0 feet to 18.9 feet (Elevations 2493.2 feet to 2490.3 feet) at Boring EB2-B.

Crystalline rock was encountered directly underlying the alluvium at Boring B1-B, and underlying the weathered rock at the remaining borings. The crystalline rock generally consists of biotite gneiss. The top of the crystalline rock was encountered at the following depths and elevations: ±13 feet to ±15 feet (Elevations ±2486 feet to ±2484 feet) at the End Bent-1 borings, ±3 feet to ±1 foot (Elevations ±2487 feet to ±2490 feet) at the Bent-1 borings, and ±22 feet to ±19 feet (Elevation ±2490 feet) at the End Bent-2 borings.

Approximately 15 feet of weathered rock/crystalline rock was cored at Boring B1-A and approximately 24 feet of weathered rock/crystalline rock was cored at Boring B1-B/B1-B2 to evaluate the nature of the refusal materials at Bent-1. A total of approximately 3 feet of weathered rock/crystalline rock was cored at Boring EB2-A to differentiate between the cored residual soil/residual boulders or large rock fragments and the weathered rock/crystalline rock. In general, the cored weathered rock is severely weathered, very soft to medium hard, biotite gneiss with very close fracture spacing. The strata recovery (REC) values within the weathered rock ranged from 0 to 36 percent. In general, the cored crystalline rock is moderately severely to very slightly weathered, moderately hard to very hard biotite gneiss with very close to wide fracture spacing. Strata (REC) values within the crystalline rock ranged from 76 to 100 percent and strata Rock Quality Designation (RQD) values ranged from 52 to 100 percent. The majority of the crystalline rock cored was good to very good in quality.

3.5 GROUNDWATER

Groundwater was encountered at all of the borings drilled on land for this project. The groundwater elevation at these borings was ±2491 feet at the End Bent-1 borings, and ±2496 feet to ±2494 at the End Bent-2 borings. The water surface elevation of Richland Creek surveyed by Trigon on February 23, 2007 was ±2492 feet. According to the Bridge Survey and Hydraulic Report, the normal water surface elevation of the creek in the vicinity of the proposed bridge is ±2493 feet, the 10-year floodwater surface elevation is ±2501 feet, the 50-year floodwater surface elevation is ±2502 feet, the 100-year flood elevation is ±2503 feet, and the 500-year flood elevation is ±2504 feet.

4.0 CONSTRUCTION CONSIDERATIONS

Gravel to cobble size material is common within the alluvium present at the site. In addition, large rock fragments and boulders are common within the residuum in the vicinity of the left side of the proposed

End Bent-2. Boulders are present along the majority of the eastern bank of the creek extending from the proposed bridge to the existing bridge, and large concrete blocks have been placed along the eastern creek bank approximately 80 feet south of the proposed bridge.

5.0 CLOSURE


The geotechnical investigation, analysis, and general construction considerations included in this report are based on the Bridge Survey & Hydraulic Design Reports, the Preliminary General Drawing, and the data obtained from our field and laboratory-testing program. If the proposed location and geometry, or finished grades are changed or are different from those outlined above, or if subsurface conditions are encountered during construction which differ from those indicated by our borings, we will require the opportunity to review these changed conditions and make any necessary modifications to the general conditions presented in this report.

Cross-sections and profiles are a generalized interpretation of soil conditions between borings and should not be considered accurate other than at the boring locations. Subsurface conditions between boring locations or elsewhere on the site may vary, and subsurface anomalies may exist which were not detected.

Trigon Engineering Consultants, Inc. appreciates the opportunity to be of service to the NCDOT on this project. Should you have any questions concerning this report, please feel free to contact the undersigned.

Respectfully submitted,

TRIGON ENGINEERING CONSULTANTS, INC.

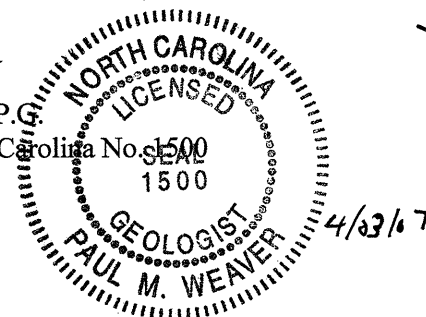

Paul M. Weaver, P.G.
Registered North Carolina No. 1500

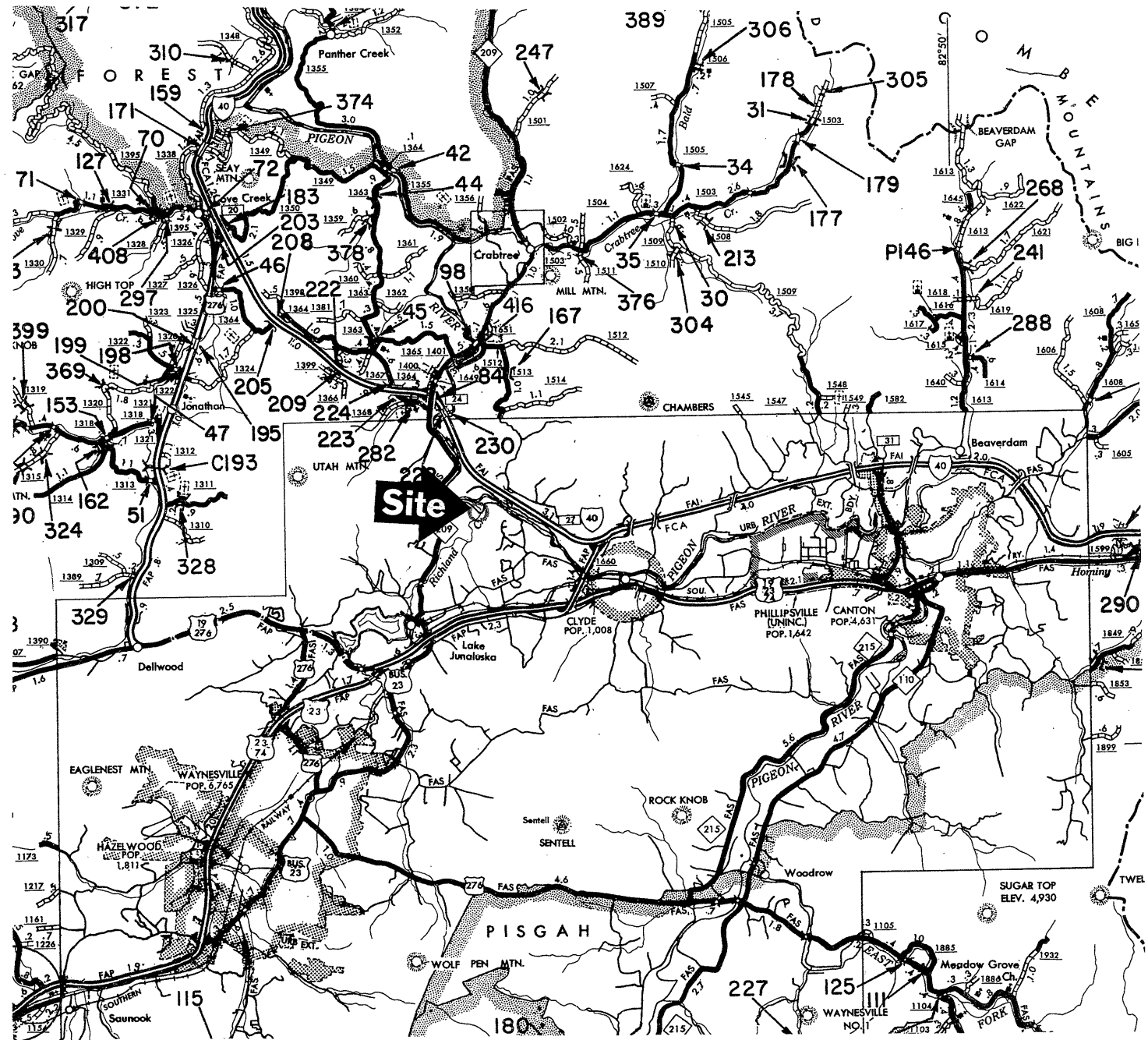
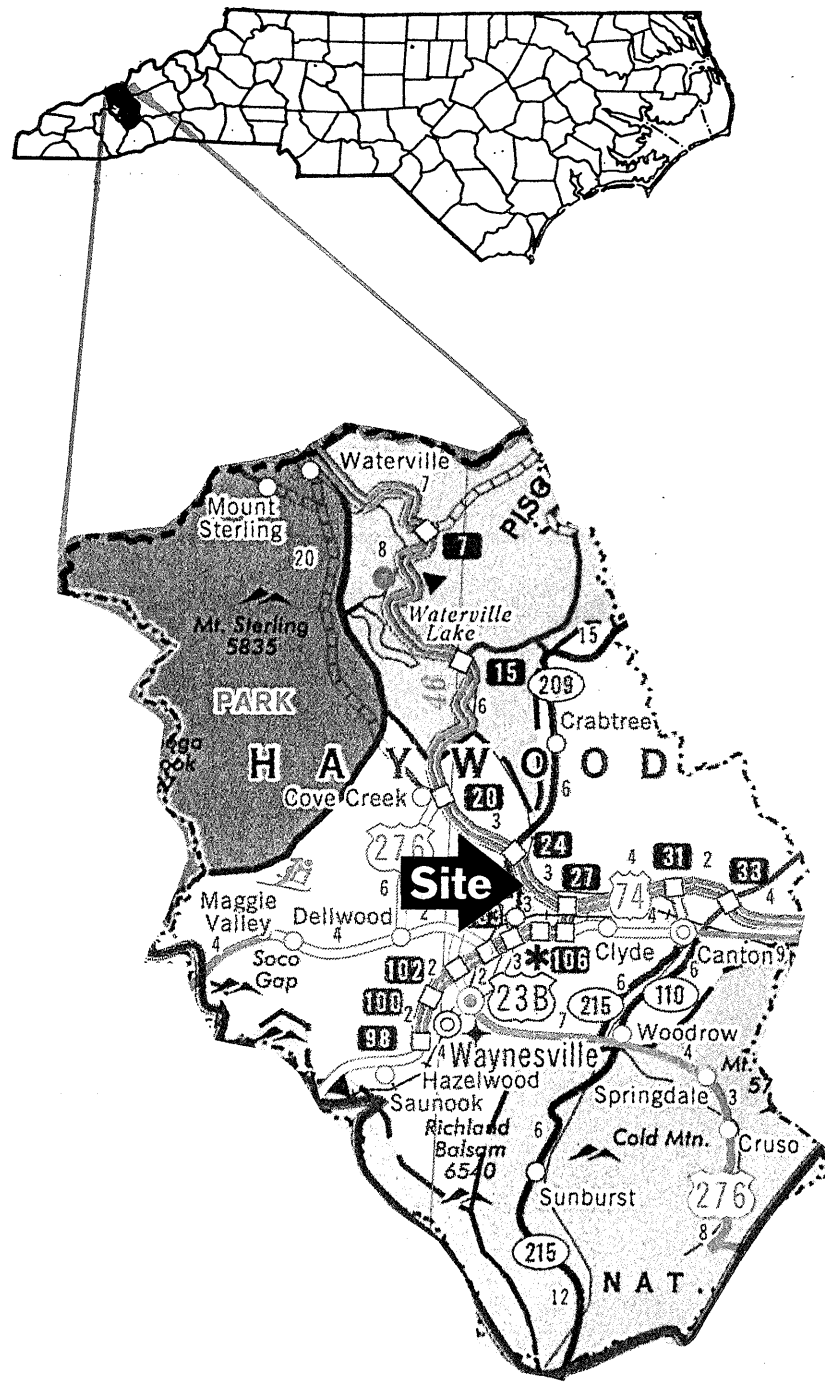

Jeffrey R. Vinson, P.G.
Senior Project Manager

PMW/JRV:pmw

Attachments

s:\0710\projectss\2007\B-4144 in Haywood County\Bridge 211 Report.doc





Trigon Engineering Consultants, Inc.
Greensboro North Carolina

SCALE:
Not to Scale

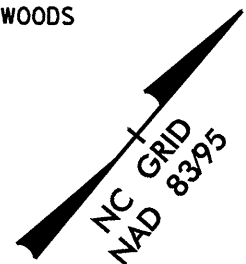
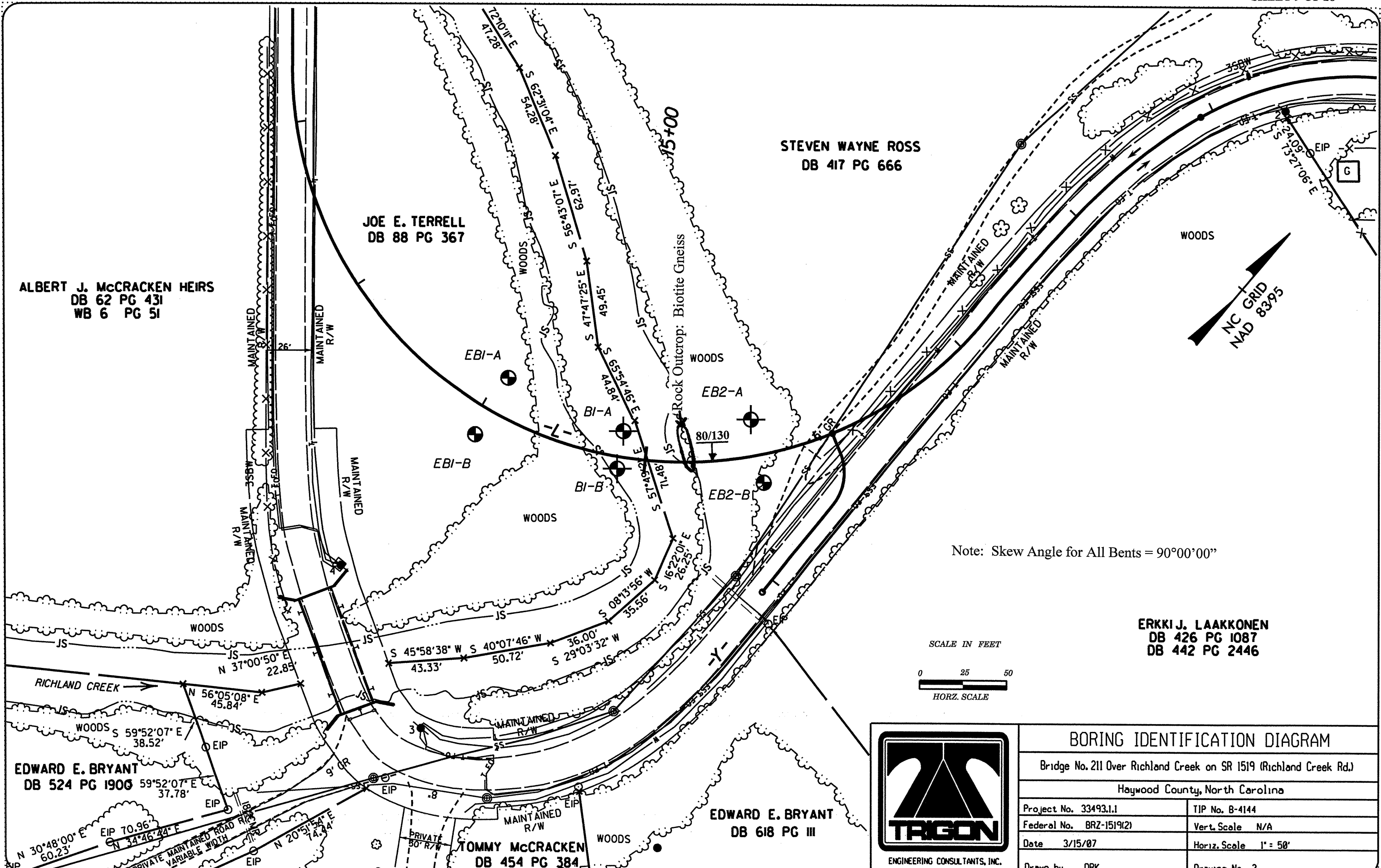
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3/13/07

STATE PROJECT NO.
33493.1.1

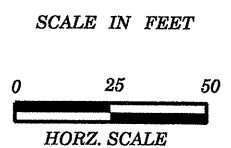
TIP NO.:
B-4144

SITE VICINITY MAP
Bridge No. 211 Over Richland Creek on SR 1519 (Richland Creek Road), Haywood County, North Carolina

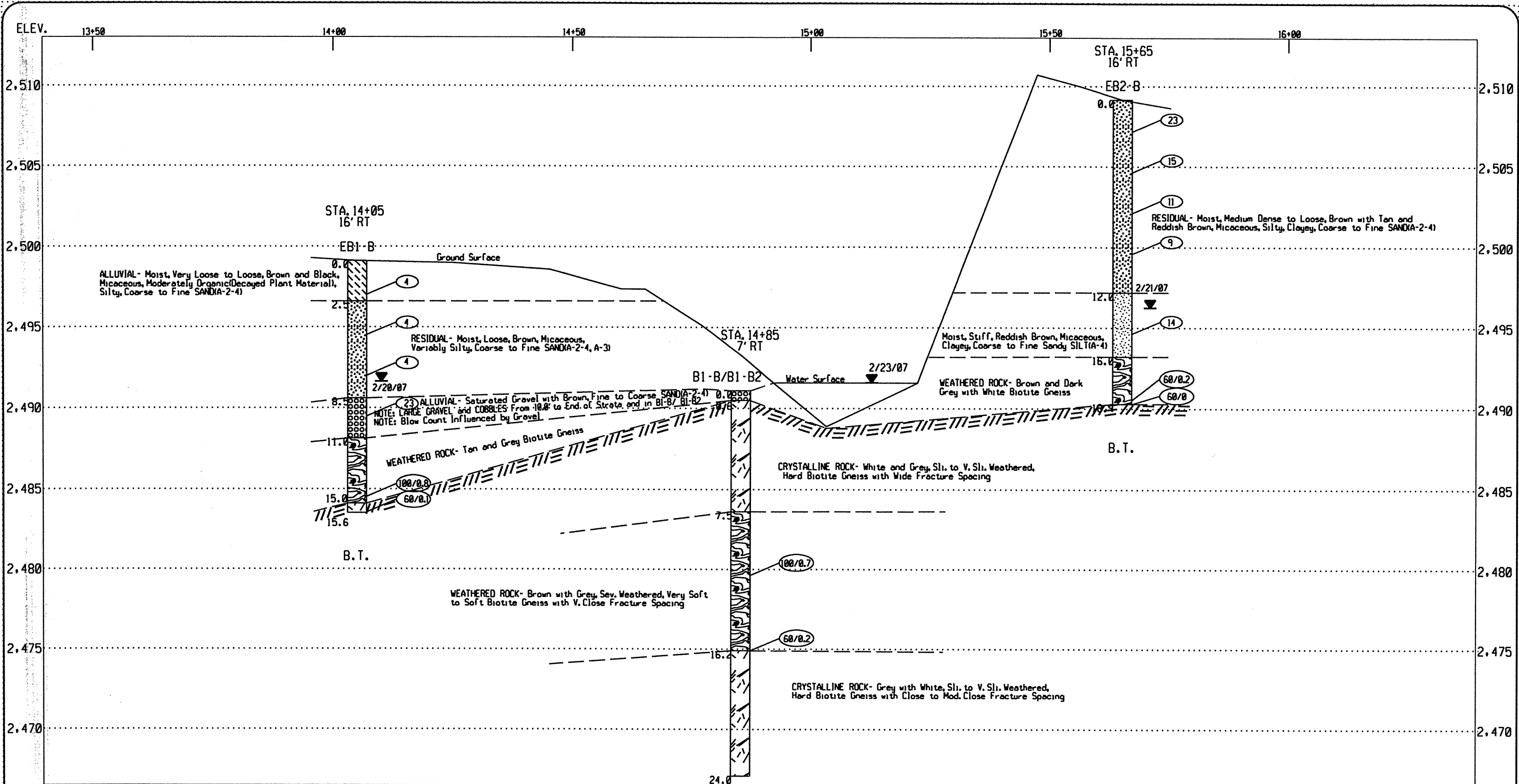
DRAWING NUMBER:
1



Note: Skew Angle for All Bents = 90°00'00"

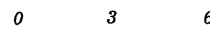


BORING IDENTIFICATION DIAGRAM	
Bridge No. 211 Over Richland Creek on SR 1519 (Richland Creek Rd.)	
Haywood County, North Carolina	
Project No. 33493.1.1	TIP No. B-4144
Federal No. BRZ-1519(2)	Vert. Scale N/A
Date 3/15/07	Horiz. Scale 1" = 50'
Drawn by DRK	Drawing No. 2

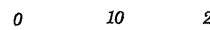


C.T.

SCALE IN FEET



VERT. SCALE



HORZ. SCALE



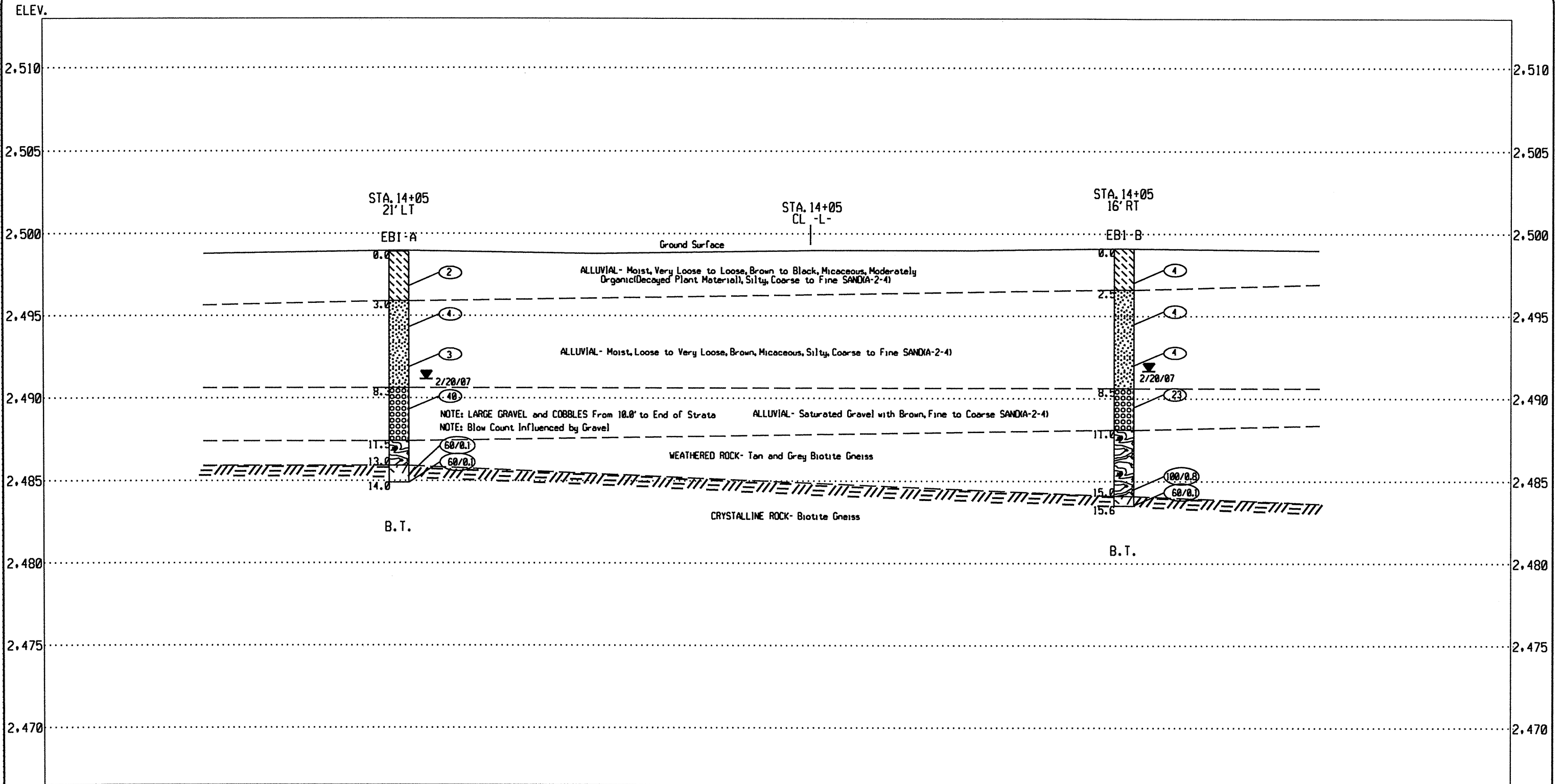
ENGINEERING CONSULTANTS, INC.

PROFILE 16' RIGHT OF -L-

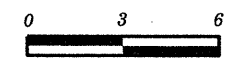
Bridge No. 211 Over Richland Creek on SR 1519 (Richland Creek Rd.)

Haywood County, North Carolina

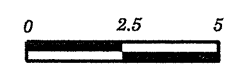
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Federal No. BRZ-1519(2)	Vert. Scale 1" = 6'
Date 3/15/07	Horiz. Scale 1" = 20'
Drawn by DRK	Drawing No. 3



SCALE IN FEET



VERT. SCALE



HORZ. SCALE

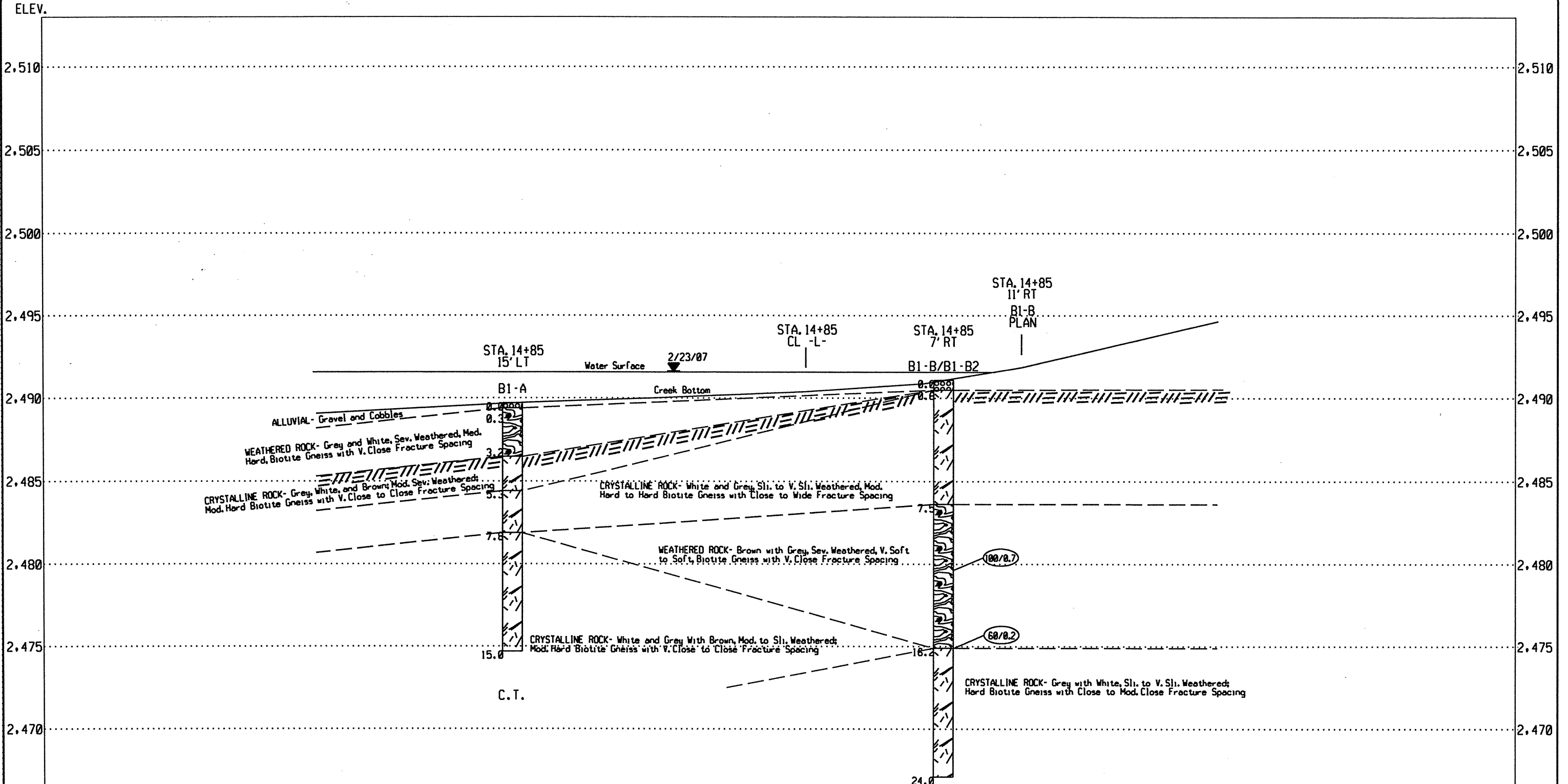


CROSS-SECTION ALONG END BENT-1

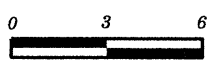
Bridge No. 211 Over Richland Creek on SR 1519 (Richland Creek Rd.)

Haywood County, North Carolina

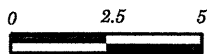
Project No. 33493.1.1	TIP No. B-4144
Federal No. BRZ-1519(2)	Vert. Scale 1" = 6'
Date 3/15/07	Horiz. Scale 1" = 5'
Drawn by DRK	Drawing No. 4



SCALE IN FEET



VERT. SCALE



HORZ. SCALE

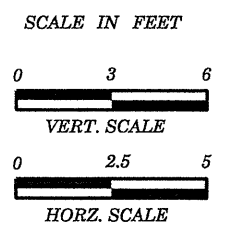
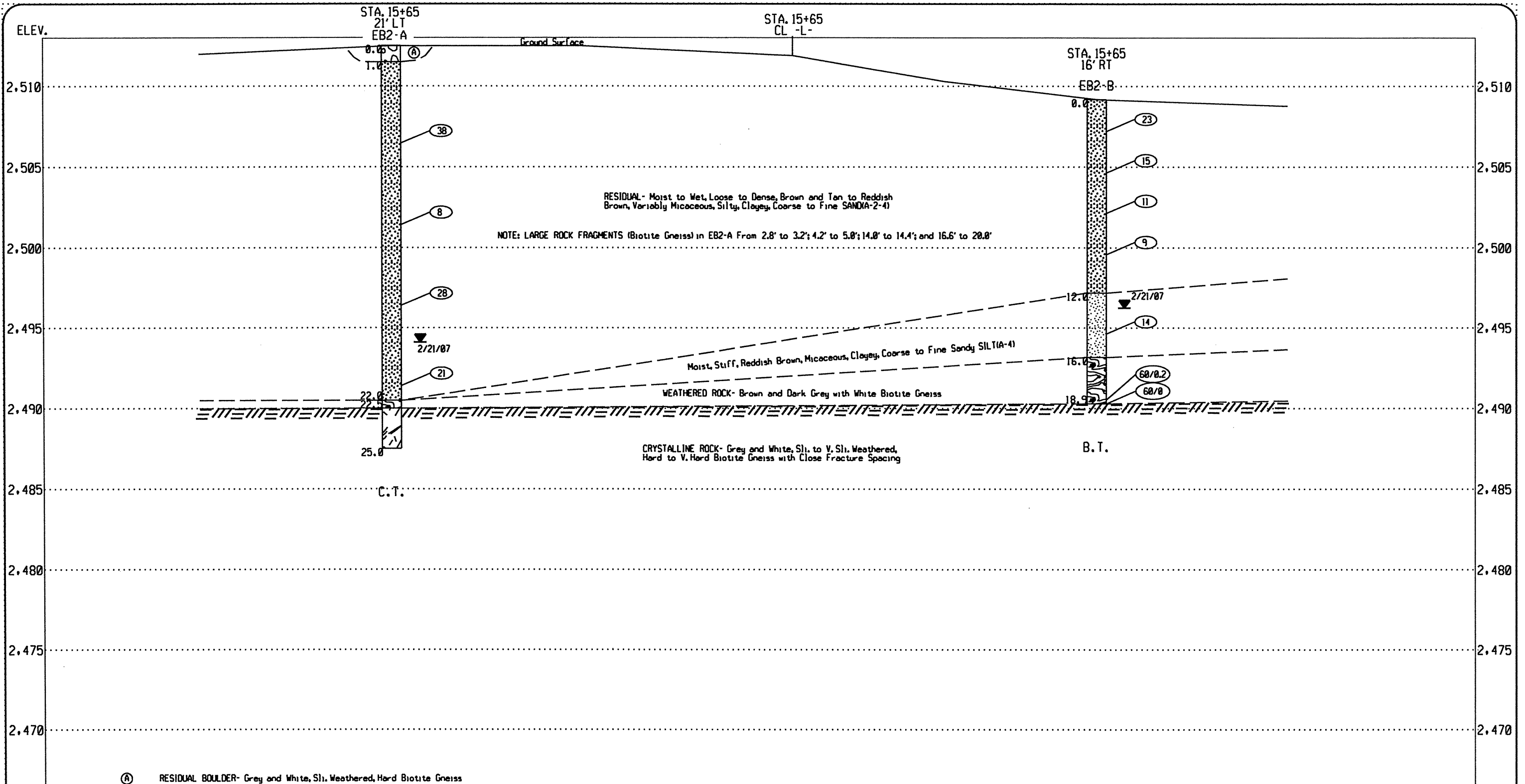


CROSS-SECTION ALONG BENT-1

Bridge No. 211 Over Richland Creek on SR 1519 (Richland Creek Rd.)

Haywood County, North Carolina

Project No. 33493.1.1	TIP No. B-4144
Federal No. BRZ-1519(2)	Vert. Scale 1" = 6'
Date 3/15/07	Horiz. Scale 1" = 5'
Drawn by DRK	Drawing No. 5



CROSS-SECTION ALONG END BENT-2	
Bridge No. 211 Over Richland Creek on SR 1519 (Richland Creek Rd.)	
Haywood County, North Carolina	
Project No. 33493.1.1	TIP No. B-4144
Federal No. BRZ-1519(2)	Vert. Scale 1" = 6'
Date 3/15/07	Horiz. Scale 1" = 5'
Drawn by DRK	Drawing No. 6



PROJECT NO. 33493.1.1		ID No. B-4144		COUNTY Haywood		GEOLOGIST P.Weaver								
SITE DESCRIPTION Bridge No. 211 over Richland Creek on SR1519 (Richland Creek Road)						GROUND WATER (ft)								
BORING NO. EB1-A		BORING LOCATION 14+05		OFFSET 21ft LT		ALIGNMENT -L-								
COLLAR ELEV. 2498.9 ft		NORTHING 677707		EASTING 826639		0 HR. 8.0								
TOTAL DEPTH 14.0 ft		DRILL MACHINE B-57 ATV		DRILL METHOD HSA		HAMMER TYPE 140 lb. Manual								
DATE STARTED 2/19/07		COMPLETED 2/19/07		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
2,498.9														2,498.9 0.00
2,497.9	1.0												SS-1 M	2,495.9 3.0
2,495.4	3.5	2	1	1									M	2,490.6 8.3
2,492.9	6.0	2	2	2									SS-2 S	2,487.4 11.5
2,490.4	8.5	12	15	25										2,485.9 13.0
2,485.4	13.5													2,484.9 14.0
2,485.0	13.9	60/1												
		60/1												



PROJECT NO. 33493.1.1		ID No. B-4144		COUNTY Haywood		GEOLOGIST P.Weaver								
SITE DESCRIPTION Bridge No. 211 over Richland Creek on SR1519 (Richland Creek Road)						GROUND WATER (ft)								
BORING NO. EB1-B		BORING LOCATION 14+05		OFFSET 16ft RT		ALIGNMENT -L-								
COLLAR ELEV. 2499.1 ft		NORTHING 677670		EASTING 826645		0 HR. 11.8								
TOTAL DEPTH 15.6 ft		DRILL MACHINE B-57 ATV		DRILL METHOD HSA		HAMMER TYPE 140 lb. Manual								
DATE STARTED 2/19/07		COMPLETED 2/19/07		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
2,499.1														2,499.1 0.00
2,498.1	1.0												M	2,496.6 2.5
2,495.6	3.5	2	2	2									SS-3 M	2,490.6 8.5
2,493.1	6.0	3	2	2									S	2,488.1 11.0
2,490.6	8.5	12	12	11										2,484.1 15.0
2,485.6	13.5													2,483.5 15.6
2,483.6	15.5	13	9	91/3										
		60/1												



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

PROJECT NO. 33493.1.1		ID No. B-4144		COUNTY Haywood		GEOLOGIST P.Weaver							
SITE DESCRIPTION Bridge No. 211 over Richland Creek on SR1519 (Richland Creek Road)							GROUND WATER (ft)						
BORING NO. B1-A		BORING LOCATION 14+85		OFFSET 15ft LT		ALIGNMENT -L-							
COLLAR ELEV. 2489.7 ft		NORTHING 677727		EASTING 826709		0 HR. N/A							
TOTAL DEPTH 15.0 ft		DRILL MACHINE B-57 ATV		DRILL METHOD HQ Core		HAMMER TYPE 140 lb. Manual							
DATE STARTED 2/23/07		COMPLETED 2/24/07		SURFACE WATER DEPTH 1.9 ft.									
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
2,491.6													Water Surface
													Creek Bottom
													2,489.7 ALLUVIAL: Gravel and Cobbles 0.3
													2,486.5 WEATHERED ROCK: Grey and White, Severely Weathered, Medium Hard Biotite Gneiss with Very Close Fracture Spacing 3.2
													2,484.4 CRYSTALLINE ROCK: Grey, White and Brown; Moderately Severely Weathered; Moderately Hard Biotite Gneiss with Very Close Fracture Spacing 5.3
2,483.6	6.1												2,481.9 CRYSTALLINE ROCK: White and Grey, Slightly to Very Slightly Weathered, Hard Biotite Gneiss with Close Fracture Spacing 7.8
													2,474.7 CRYSTALLINE ROCK: White and Grey with Brown, Moderately to Slightly Weathered, Moderately Hard Biotite Gneiss with Very Close to Close Fracture Spacing 15.0
Coring Terminated at 15.0ft. (Elevation 2474.7 ft.) in Crystalline Rock: Biotite Gneiss													
*Note: Creek Water Alone Used as Drilling Fluid													

NCDOT BORE SINGLE 071-07-005.GPJ NC_DOT_GDT 4/20/07



CORE BORING REPORT

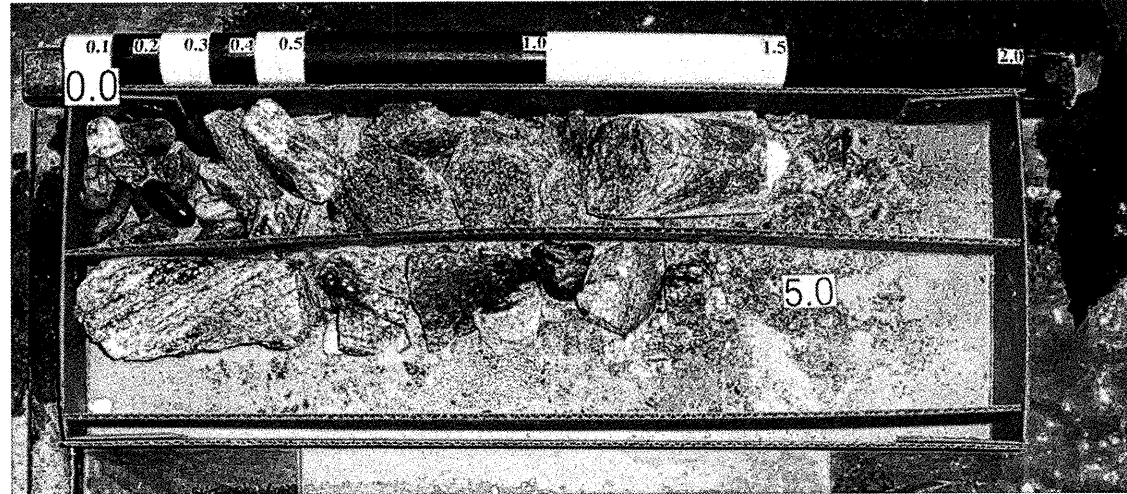
PROJECT NO. 33493.1.1		ID No. B-4144		COUNTY Haywood		GEOLOGIST P.Weaver				
SITE DESCRIPTION Bridge No. 211 over Richland Creek on SR1519 (Richland Creek Road)							GROUND WATER (ft)			
BORING NO. B1-A		BORING LOCATION 14+85		OFFSET 15ft LT		ALIGNMENT -L-				
COLLAR ELEV. 2489.7 ft		NORTHING 677727		EASTING 826709		0 HR. N/A				
TOTAL DEPTH 15.0 ft		DRILL MACHINE B-57 ATV		DRILL METHOD HQ Core		HAMMER TYPE 140 lb. Manual				
DATE STARTED 2/23/07		COMPLETED 2/24/07		SURFACE WATER DEPTH 1.9 ft.						
CORE SIZE HQ		TOTAL RUN 15.0 ft		DRILLER W. Duggins						
ELEV. (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS
				REC. (ft) %	RQD (ft) %		REC. (ft) %	RQD (ft) %		
2,489.7	0.0						(0.1) 33%	(N/A)		2,489.4 ALLUVIAL: Gravel and Cobbles 0.3
2,489.7	0.0	5.0	5:36 8:56 7:00 8:30 8:53	(2.7) 54%	(0.8) 16%		(0.6) 21%	(1.1) 52%		2,486.5 WEATHERED ROCK: Grey and White, Severely Weathered, Medium Hard Biotite Gneiss with Very Close Fracture Spacing 3.2
2,484.7	5.0	5.0	11:54 15:57 25:42	(4.8) 96%	(4.1) 82%	RS-1	(2.1) 100%	(2.5) 100%		2,484.4 Isolated Pieces of Crystalline Rock 5.3
2,479.7	10.0		8:45 12:29				(2.5) 100%	(2.4) 33%		2,481.9 CRYSTALLINE ROCK: Grey, White and Brown; Moderately Severely Weathered; Moderately Hard Biotite Gneiss with Very Close to Close Fracture Spacing 7.8
2,477.7	12.0	2.0	7:24 13:02	(1.8) 90%	(1.1) 55%		(7.0) 97%			3 Joints at 20° to 30° with Light to Moderate Iron Staining 1 Joint at 60° 1 Joint at 80°, 1 ft. Long with Heavy Iron Staining
2,474.7	15.0	3.0	8:57 18:23 11:52	(3.0) 100%	(0.0) 0%					2,474.7 CRYSTALLINE ROCK: White and Grey, Slightly to Very Slightly Weathered, Hard Biotite Gneiss with Close Fracture Spacing 15.0
Well Foliated 2 Joints at 20° to 30° Across Foliation with Moderate to Heavy Iron Staining 1 Joint at 70° Parallel to Foliation with Heavy Iron Staining CRYSTALLINE ROCK: White and Grey with Brown, Moderately to Slightly Weathered, Moderately Hard Biotite Gneiss with Very Close to Close Fracture Spacing										
Well Foliated 11 Joints at 70° Parallel to Foliation with Moderate to Heavy Iron Staining 15 Joints at 10° to 20° with Light to Heavy Iron Staining Very Broken with 0.2 ft. Core Loss from 8.4 ft. to 9.0 ft. Very Broken with 0.2 ft. Core Loss from 11.8 ft. to 12.5 ft. Coring Terminated at 15.0ft. (Elevation 2474.7 ft.) in Crystalline Rock: Biotite Gneiss										
*Note: Creek Water Alone Used as Drilling Fluid										

NCDOT BORE SINGLE 071-07-005.GPJ NC_DOT_GDT 4/20/07

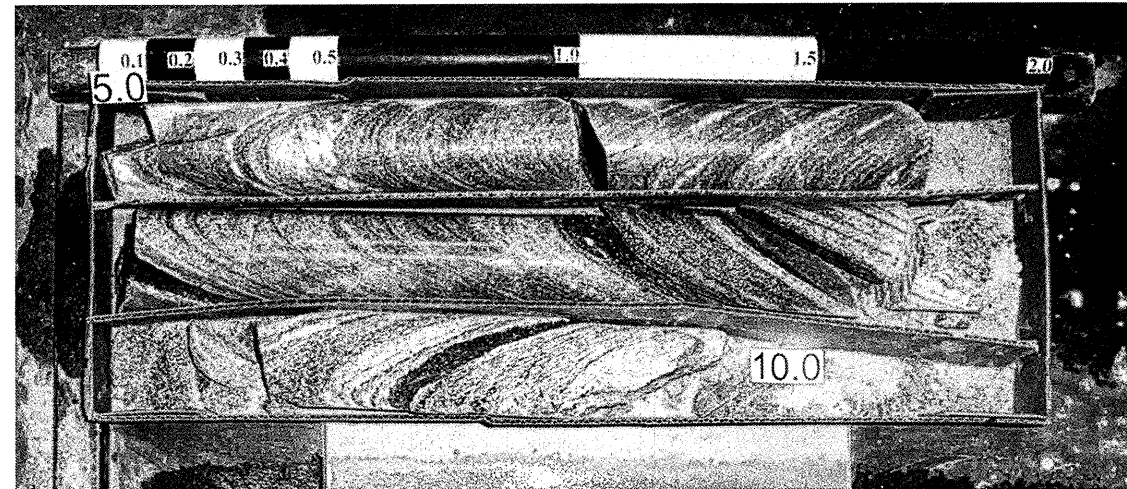
CORE PHOTOGRAPHS

NCDOT Project No. 33493.1.1 TIP No. B-4144
Bridge No. 211 over Richland Creek on SR 1519 (Richland Creek Road)

B1-A



Box 1 of 3

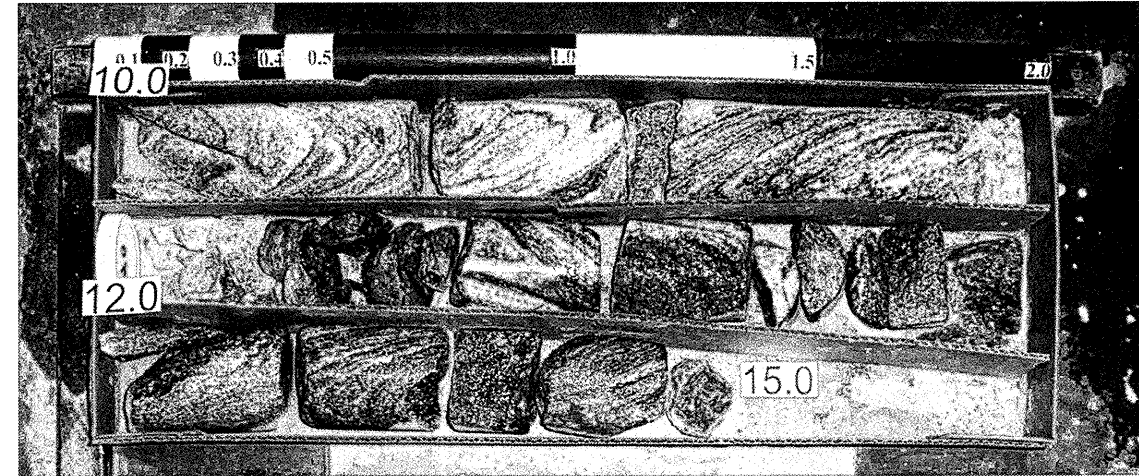


Box 2 of 3
(SCALE = 1:4)

CORE PHOTOGRAPHS

NCDOT Project No. 33493.1.1 TIP No. B-4144
Bridge No. 211 over Richland Creek on SR 1519 (Richland Creek Road)

B1-A



Box 3 of 3
(SCALE = 1:4)



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

PROJECT NO. 33493.1.1		ID No. B-4144		COUNTY Haywood		GEOLOGIST P.Weaver							
SITE DESCRIPTION Bridge No. 211 over Richland Creek on SR1519 (Richland Creek Road)						GROUND WATER (ft)							
BORING NO. B1-B/B1-B2		BORING LOCATION 14+85		OFFSET 7ft RT		ALIGNMENT -L-							
COLLAR ELEV. 2491.1 ft		NORTHING 677708		EASTING 826720		0 HR. N/A							
TOTAL DEPTH 24.0 ft		DRILL MACHINE B-57 ATV		DRILL METHOD HQ Core		HAMMER TYPE 140 lb. Manual							
DATE STARTED 2/15/07		COMPLETED 2/15/07		SURFACE WATER DEPTH 0.5 ft.									
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
2,491.6													Water Surface
													Creek Bottom
2,488.5	2.6												ALLUVIAL: Gravel and Cobbles
													CRYSTALLINE ROCK: White and Grey, Slightly to Very Slightly Weathered, Hard Biotite Gneiss with Wide Fracture Spacing
													WEATHERED ROCK: Brown with Grey, Severely Weathered, Very Soft to Soft Biotite Gneiss with Very Close Fracture Spacing
2,480.1	11.0	28	72.2										CRYSTALLINE ROCK: Grey with White, Slightly to Very Slightly Weathered, Hard Biotite Gneiss with Close to Moderately Close Fracture Spacing
2,475.1	16.0	60.2											CRYSTALLINE ROCK: Grey with White, Slightly to Very Slightly Weathered, Hard Biotite Gneiss with Close to Moderately Close Fracture Spacing
													Coring Terminated at 24.0 ft (Elevation 2467.1 ft.) in Crystalline Rock: Biotite Gneiss
													*Note: Creek Water Alone Used as Drilling Fluid

NCDOT BORE SINGLE 071-07-005.GPJ NC_DOT.GDT 4/20/07



CORE BORING REPORT

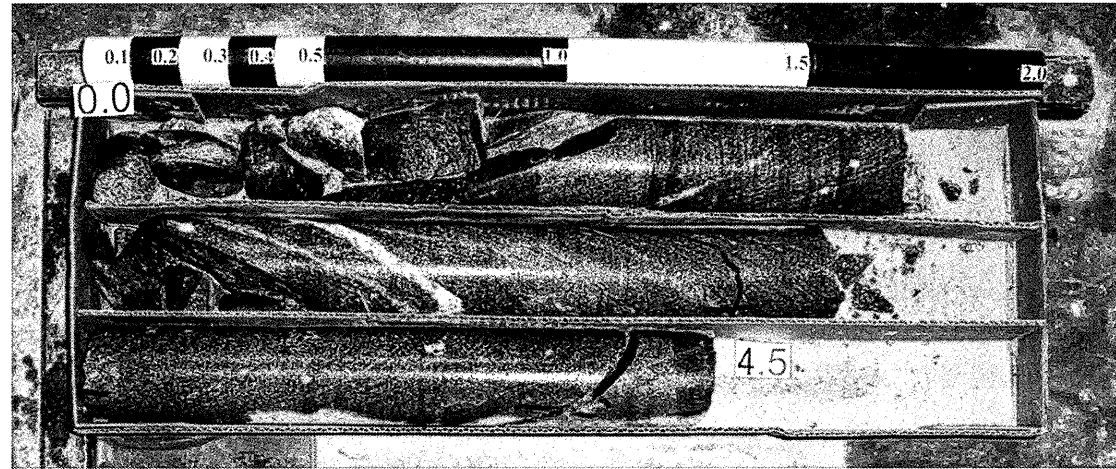
PROJECT NO. 33493.1.1		ID No. B-4144		COUNTY Haywood		GEOLOGIST P.Weaver				
SITE DESCRIPTION Bridge No. 211 over Richland Creek on SR1519 (Richland Creek Road)						GROUND WATER (ft)				
BORING NO. B1-B/B1-B2		BORING LOCATION 14+85		OFFSET 7ft RT		ALIGNMENT -L-				
COLLAR ELEV. 2491.1 ft		NORTHING 677708		EASTING 826720		0 HR. N/A				
TOTAL DEPTH 24.0 ft		DRILL MACHINE B-57 ATV		DRILL METHOD HQ Core		HAMMER TYPE 140 lb. Manual				
DATE STARTED 2/15/07		COMPLETED 2/15/07		SURFACE WATER DEPTH 0.5 ft.						
CORE SIZE HQ		TOTAL RUN 23.1 ft		DRILLER W. Duggins						
ELEV. (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS
				REC. (%)	ROD (%)		REC. (%)	ROD (%)		
2,491.1	0.0									Creek Bottom
2,491.1	0.0	4.5	11:12 7:05 8:49	(4.5) 100%	(3.6) 80%		(0.6) 100%	(N/A) (6.3) 91%		ALLUVIAL: Gravel and Cobbles
2,486.6	4.5		10:00 7:24/0.5	(3.0) 100%	(2.7) 90%					CRYSTALLINE ROCK: White and Grey, Slightly to Very Slightly Weathered, Hard Biotite Gneiss with Wide Fracture Spacing
2,483.6	7.5	3.0	8:15 7:48 7:11	(0.0) 0%	(N/A)		(3.1) 36%	(N/A)		Very Broken 0.6 ft. to 0.9 ft. 2 Joints at 70° Parallel to Foliation Vertical Fracture with Heavy Iron Staining 0.6 ft. to 1.7 ft. and 6.6 ft. to 7.5 ft.
2,480.1	11.0	3.5	2:30/0.5 1:11 2:40	(0.0) 0%	(N/A)					Had to remove entire core barrel at 7.5 ft. in B1-B, Couldn't Find Hole Again. Began B1-B2, Cored to 6.0 ft. Re Entered B1-B Hole
2,479.4	11.7	4.3	2:40 N=100/7	(3.1) 72%	(N/A)					WEATHERED ROCK: Brown with Grey, Severely Weathered, Very Soft to Soft Biotite Gneiss with Very Close Fracture Spacing
2,475.1	16.0		7:10/0.3 9:05							
2,474.9	16.2	4.8	6:55 9:00 4:50	(4.8) 100%	(4.3) 90%		(6.8) 87%	(6.0) 77%		CRYSTALLINE ROCK: Grey with White, Slightly to Very Slightly Weathered, Hard Biotite Gneiss with Close to Moderately Close Fracture Spacing
2,470.1	21.0		N=60/2 6:20/0.8							8 Joints at 20° to 30° with Some Iron Staining 4 Joints at 70° to 80° Parallel to Foliation
2,467.1	24.0	3.0	5:45 8:11 8:52 14:30 9:45 11:01 11:15	(2.0) 67%	(1.7) 57%					Very Close Fracture Spacing, Moderately Weathered 17.5 ft. to 17.6 ft., 19.3 ft. to 19.4 ft., 19.7 ft. to 19.9 ft. and 20.4 ft. to 20.5 ft.
										Lost Circulation at 24.0 ft., Must Likely Due to River Gravel Packing Outside of Core Barrel. Pulled Out of Hole and Couldn't Get Back in.
										*Lifter Failed to Retrieve Last One Foot of Rock Cored. Coring Terminated at 24.0 ft (Elevation 2467.1 ft.) in Crystalline Rock: Biotite Gneiss
										*Note: Creek Water Alone Used as Drilling Fluid

NCDOT BORE SINGLE 071-07-005C.GPJ NC_DOT.GDT 4/20/07

CORE PHOTOGRAPHS

NCDOT Project No. 33493.1.1 TIP No. B-4144
Bridge No. 211 over Richland Creek on SR 1519 (Richland Creek Road)

B1-B/B1-B2



Box 1 of 5



Box 2 of 5

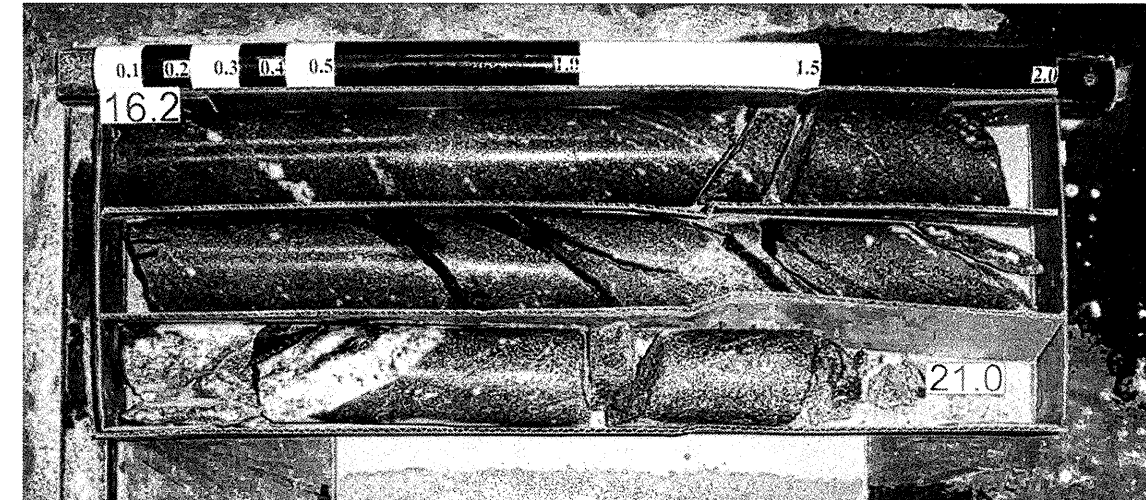


Box 3 of 5
(SCALE = 1:4)

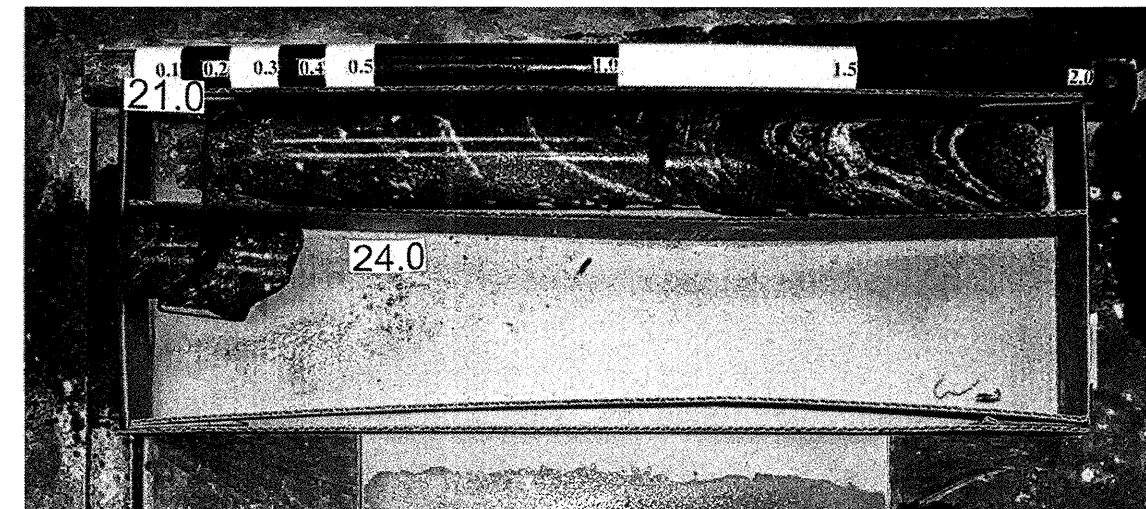
CORE PHOTOGRAPHS

NCDOT Project No. 33493.1.1 TIP No. B-4144
Bridge No. 211 over Richland Creek on SR 1519 (Richland Creek Road)

B1-B/B1-B2



Box 4 of 5



Box 5 of 5
(SCALE = 1:4)



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

PROJECT NO. 33493.1.1		ID No. B-4144		COUNTY Haywood		GEOLOGIST P.Weaver							
SITE DESCRIPTION Bridge No. 211 over Richland Creek on SR1519 (Richland Creek Road)						GROUND WATER (ft)							
BORING NO. EB2-A		BORING LOCATION 15+65		OFFSET 21ft LT		ALIGNMENT -L-							
COLLAR ELEV. 2512.5 ft		NORTHING 677779		EASTING 826761		0 HR. NM							
TOTAL DEPTH 25.0 ft		DRILL MACHINE B-57 ATV		DRILL METHOD HQ Core		HAMMER TYPE 140 lb. Manual							
DATE STARTED 2/20/07		COMPLETED 2/20/07		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
2,512.5													
2,507.5	5.0	11	20	18								M	RESIDUAL BOULDER: Grey and White, Slightly Weathered, Hard Biotite Gneiss RESIDUAL: Loose to Dense, Tan and Brown, Silty, Clayey, Coarse to Fine Sand with Some Rock Fragments and a Little Mica Large Rock Fragments (Biotite Gneiss) 2.8 ft. to 3.2 ft., 4.2 ft. to 5.0 ft., 14.0 ft. to 14.4 ft and 19.6 ft. to 20.0 ft.
2,502.5	10.0	11	4	4								W	
2,497.5	15.0	11	16	12								SS-4 M	
2,492.5	20.0	14	10	11								M	
													WEATHERED ROCK: Biotite Gneiss CRYSTALLINE ROCK: Grey and White, Slightly to Very Slightly Weathered, Hard to Very Hard Biotite Gneiss with Close Fracture Spacing Coring Terminated at 25.0 ft. (Elevation 2487.5 ft.) in Crystalline Rock: Biotite Gneiss *Note: Creek Water Alone Used as Drilling Fluid

NCDOT BORE SINGLE 071-07-005.GPJ NC_DOT.GDT 4/20/07



CORE BORING REPORT
SHEET 19 OF 28

PROJECT NO. 33493.1.1		ID No. B-4144		COUNTY Haywood		GEOLOGIST P.Weaver				
SITE DESCRIPTION Bridge No. 211 over Richland Creek on SR1519 (Richland Creek Road)						GROUND WATER (ft)				
BORING NO. EB2-A		BORING LOCATION 15+65		OFFSET 21ft LT		ALIGNMENT -L-				
COLLAR ELEV. 2512.5 ft		NORTHING 677779		EASTING 826761		0 HR. NM				
TOTAL DEPTH 25.0 ft		DRILL MACHINE B-57 ATV		DRILL METHOD HQ Core		HAMMER TYPE 140 lb. Manual				
DATE STARTED 2/20/07		COMPLETED 2/20/07		SURFACE WATER DEPTH N/A						
CORE SIZE HQ				TOTAL RUN 19.0 ft		DRILLER W. Duggins				
ELEV. (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS
				REC. (ft) %	RQD (ft) %		REC. (ft) %	RQD (ft) %		
2,512.5	0.0									
2,512.5	0.0	5.0	5:00 1:15 3:04 2:45 9:23 N=38	(1.4) 28%	(N/A)		(0.6) 60%	(N/A)		RESIDUAL BOULDER: Grey and White, Slightly Weathered; Hard Biotite Gneiss RESIDUAL: Loose to Dense, Tan and Brown, Silty, Clayey Coarse to Fine Sand with Some Rock Fragments and a Little Mica Large Rock Fragments (Biotite Gneiss) 2.8 ft. to 3.2 ft., 4.2 ft. to 5.0 ft., 14.0 ft. to 14.4 ft., and 19.6 ft. to 20 ft.
2,507.5	5.0						(1.4) 7%			
2,506.0	6.5	3.5	2:00/0.5 2:40	(0.0) 0%	(N/A)					
2,502.5	10.0		2:35 2:45 N=8							
2,501.0	11.5	3.5	6:25/0.5 2:30	(0.2) 6%	(N/A)					
2,497.5	15.0		4:43 2:14 N=28							
2,496.0	16.5	3.5	1:10/0.5 1:00	(0.4) 11%	(N/A)					
2,492.5	20.0		1:35 2:15 N=21				(0.0) 0%	(N/A)		
2,491.0	21.5	3.5	8:30 14:30 11:00	(1.9) 54%	(1.5) 43%		(1.5) 60%			WEATHERED ROCK: Biotite Gneiss CRYSTALLINE ROCK: Grey and White, Slightly to Very Slightly Weathered, Hard to Very Hard Biotite Gneiss with Close Fracture Spacing Very Quartz Rich Very Broken With Moderately Severe to Severe Weathering From 23.0 ft. to 23.5 ft. Foliation at 60° Coring Terminated at 25.0 ft. (Elevation 2487.5 ft.) in Crystalline Rock: Biotite Gneiss *Note: Creek Water Alone Used as Drilling Fluid
2,487.5	25.0						(1.9) 76%			

NCDOT CORE SINGLE 071-07-005C.GPJ NC_DOT.GDT 4/20/07

CORE PHOTOGRAPHS

NCDOT Project No. 33493.1.1 TIP No. B-4144

Bridge No. 211 over Richland Creek on SR 1519 (Richland Creek Road)

EB2-A



Box 1 of 1

(SCALE = 1:4)



PROJECT NO.	33493.1.1	ID No.	B-4144	COUNTY	Haywood	GEOLOGIST	P.Weaver
SITE DESCRIPTION							GROUND WATER (ft)
Bridge No. 211 over Richland Creek on SR1519 (Richland Creek Road)							0 HR. DRY
BORING NO.	EB2-B	BORING LOCATION	15+65	OFFSET	16ft RT	ALIGNMENT	-L-
COLLAR ELEV.	2509.2 ft	NORTHING	677756	EASTING	826790	24 HR. 13.0	
TOTAL DEPTH	18.9 ft	DRILL MACHINE	B-57 ATV	DRILL METHOD	HSA	HAMMER TYPE 140 lb. Manual	
DATE STARTED	2/20/07	COMPLETED	2/20/07	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						
2,509.2															2,509.2 0.00	
2,508.2	1.0															
2,505.7	3.5	12	13	10										M		RESIDUAL: Medium Dense to Loose, Brown with Tan to Reddish Brown, Micaceous, Silty, Clayey, Coarse to Fine Sand
2,503.2	6.0	6	7	8										M		
2,500.7	8.5	3	4	7										M		
2,495.7	13.5	5	5	4										M		
2,493.2	16.0	5	6	8										SS-5 17.7%		Stiff, Reddish Brown, Micaceous, Clayey, Coarse to Fine Sandy SILT
2,490.7	18.5															WEATHERED ROCK: Brown and Dark Grey with White Biotite Gneiss
2,490.3	18.9	60.2														* Note Residual Layer from 17.5 ft. to 18.0 ft. Boring Terminated with SPT Refusal at 18.9 ft. (Elevation 2490.3 ft.) on Crystalline Rock: Biotite Gneiss
		60.0														

NCDOT BORE SINGLE 071-07-005.GPJ NC_DOT.GDT 3/15/07



FIELD SCOUR REPORT

WBS: 33493.1.1 TIP: B-4144 COUNTY: Haywood

DESCRIPTION(1): Bridge No. 211 Over Richland Creek on SR 1519 (Richland Creek Road)

EXISTING BRIDGE

Information from: Field Inspection Microfilm _____ (reel _____ pos: _____)
 Other (explain) Bridge Survey & Hydraulic Design Report

Bridge No.: 211 Length: 70 Total Bents: 3 Bents in Channel: 1 Bents in Floodplain: 2
 Foundation Type: Timber Piles w/ concrete footing @ Bent-1, timber abutment @ EB-1, concrete abutment at EB-2

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: none evident

Interior Bents: none evident

Channel Bed: none evident

Channel Bank: some sloughing of stream banks and undermining of tree roots in vicinity of bridge

EXISTING SCOUR PROTECTION

Type(3): timber abutment at End Bent-1, concrete abutment at End Bent-2

Extent(4): adjacent to stream with short wrap around towards sides

Effectiveness(5): very

Obstructions(6): minor debris (small limbs) on End Bent-1 side of Bent-1

INSTRUCTIONS

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

DESIGN INFORMATION

Channel Bed Material(7): Fully armored with gravel, cobbles, and exposed crystalline rock

Channel Bank Material(8): silty, coarse to fine SAND (A-2-4), and fine to coarse SAND (A-3)

Channel Bank Cover(9): trees, weeds, and bamboo

Floodplain Width(10): approximately 500 feet

Floodplain Cover(11): mostly grassed fields

Stream is(12): Aggrading _____ Degrading Static _____

Channel Migration Tendency(13): towards the west

Observations and Other Comments: Rock outcrop is present along east bank in vicinity of proposed bridge, concrete blocks have been placed approx. 50' upstream along east bank

Reported by: Paul M. Weaver Date: 3/13/2007
 Paul M. Weaver, Trigon Engineering

DESIGN SCOUR ELEVATIONS(14)

Feet Meters _____

BENT 1

	Left	Right									
Overtopping	2487.3	2490									

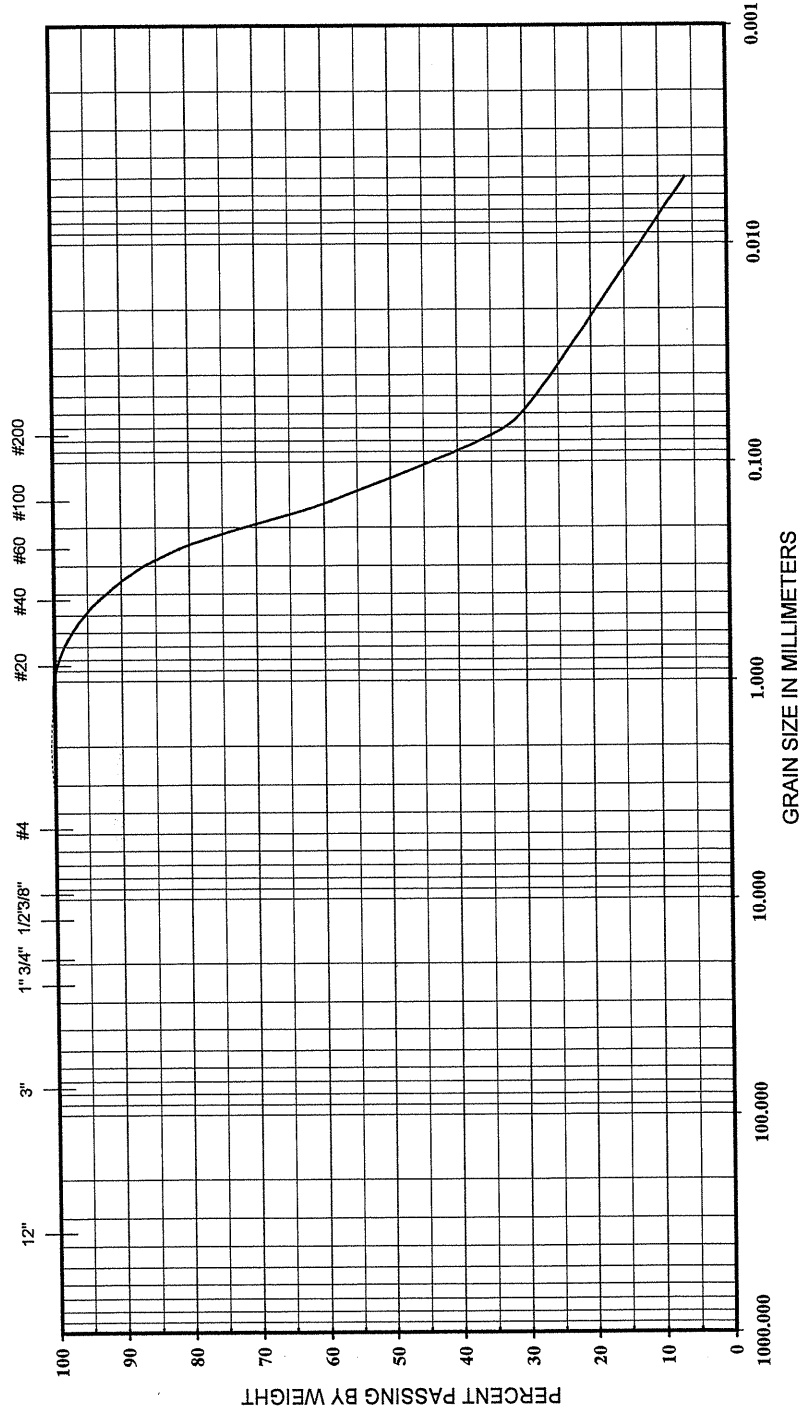
Comparison of DSE to Hydraulics Unit theoretical scour:
 DSE's are based on the scour calculated in the Bridge Survey & Hydraulic Design Report dated 4-11-06.

DSE determined by: Brad Worley Date: 3/29/2007
 Brad Worley

SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL

Bed or Bank	BANK	BANK	BANK				
Sample No.	SS-1	SS-3	G-1				
Retained #4	0	0	1				
Passed #10	100	100	98				
Passed #40	93	88	74				
Passed #200	35	15	2				
Coarse Sand	19	36	62				
Fine Sand	53	52	36				
Silt	22	5	2				
Clay	6	7	0				
LL	29	40	25				
PI	NP	NP	NP				
AASHTO	A-2-4	A-2-4	NP				
Station	14+05	14+05	14+80				
Offset	21' LT	16' RT	11' RT				
Depth	1.0-2.5	3.5-5.0	0.0-1.0				

U S STANDARD SIEVE SIZES



BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	FINE	SILT	CLAY	

BORING NO.	SAMPLE NO.	ELEVATION OR DEPTH	NMC %	LL	PL	PI
EB1-A	SS-1	1.0-2.5	NA	29	NP	NP

CLASSIFICATION
ALLUVIAL: Brown to Black, Micaceous, Moderately Organic, Silty, Coarse to Fine SAND (A-2-4)

GRAIN SIZE DISTRIBUTION

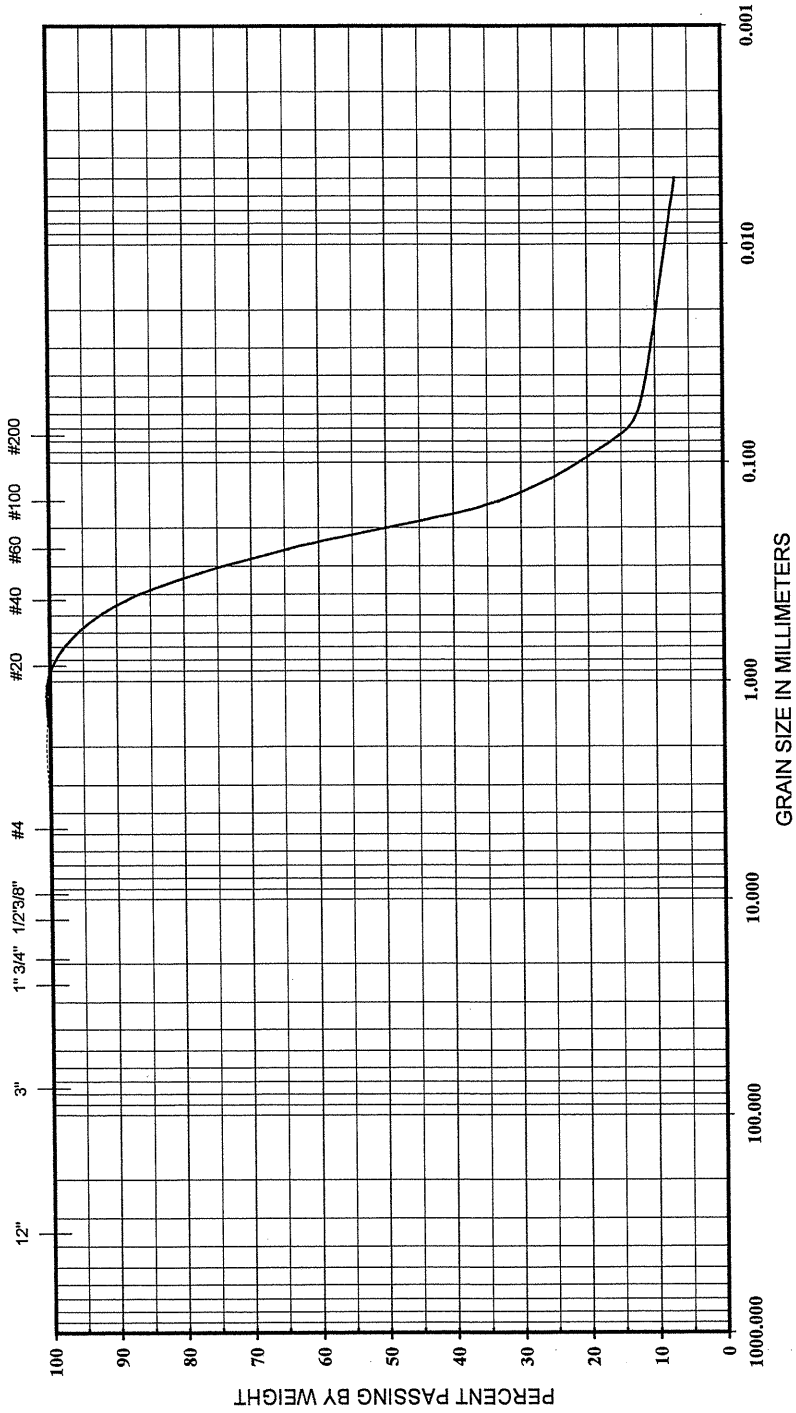
Bridge No. 211 (B-4144)

071-07-005

3/12/2007



U S STANDARD SIEVE SIZES



BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	FINE	SILT	CLAY	

BORING NO.	SAMPLE NO.	ELEVATION OR DEPTH	NMC %	LL	PL	PI
EB1-B	SS-3	3.5-5.0	NA	40	NP	NP

CLASSIFICATION
ALLUVIAL: Brown, Micaceous, Silty, Coarse to Fine SAND (A-2-4)

GRAIN SIZE DISTRIBUTION

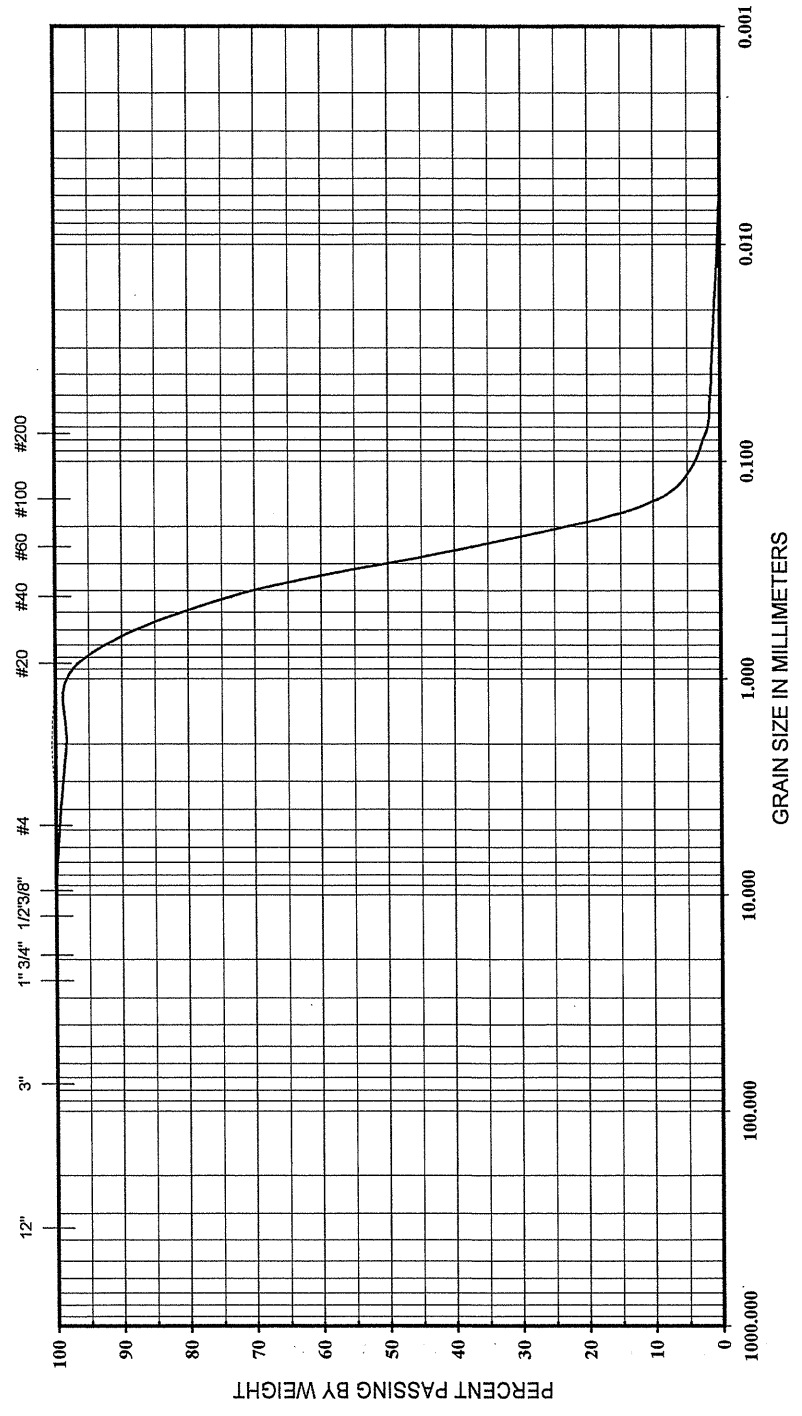
Bridge No. 211 (B-4144)

071-07-005

3/12/2007



U S STANDARD SIEVE SIZES



SITE PHOTOGRAPHS
State Project No. 33493.1.1 TIP No. B-4144
Bridge No. 211 Over Richland Creek on SR 1519 (Richland Creek Road)
Haywood County, North Carolina
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Photograph 1 – View of Proposed Bridge Site Looking North

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Photograph 3 – View Approximately 16' Right of -L-
Looking Upstation from South Bank of Creek



Photograph 2 – View Approximately 16' Right of -L-
Looking Upstation from EB1-B



Photograph 4 – View Approximately 16' Right of -L-
Looking Downstation from EB2-B

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Photograph 5 – View From EB1-A to EB1-B



Photograph 6 – View from B1-A to B1-B

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Photograph 7 – View From EB2-A to EB2-B



Photograph 8 – View of Rock Outcrop on North Bank at Proposed Location of New Bridge

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Photograph 9 – View Downstream from B1-B

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Photograph 11 – View of Existing Bridge Looking Upstream



Photograph 10 – View of Existing Bridge Looking Downstream