

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

W.D. Frye Jr.

STATE	STATE PROJECT REFERENCE NO.	SHEET No.	TOTAL
N.C.	B-2515	1	27

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STRUCTURE
SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. B-2515 F.A. PROJ. BRSTP-81(1)
 COUNTY BUNCOMBE
 PROJECT DESCRIPTION BRIDGE NO. 39 ON N.C. 81 (BILTMORE AVE.)
OVER SWANNANOVA RIVER

SITE DESCRIPTION _____

CAUTION NOTICE

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

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

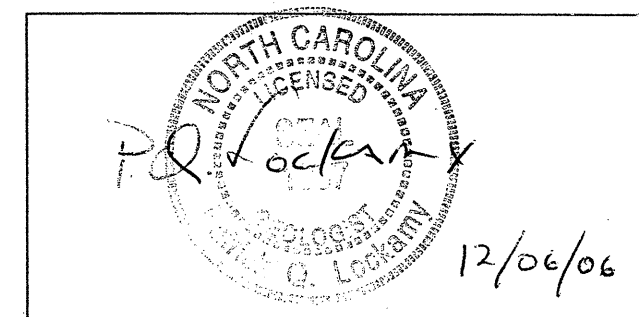
THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT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

PROJECT: 32643.1.1 ID: B-2515

PERSONNEL

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- L.A. MANN
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INVESTIGATED BY P. Q. LOCKAMY
 CHECKED BY W.D. FRYE
 SUBMITTED BY W.D. FRYE
 DATE 12/06



DRAWN BY: J.T. WILLIAMS

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

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

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS																																																			
<p>SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:</p> <p style="text-align: center;"><i>VERY STIFF, GRN. SILTY CL. MSH WITH INTERBEDDED FINE SAND UNDRS. HRAU 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)</p> <p>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 IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.</p>	<p>HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN IMPLIED 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.</p> <p>ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:</p> <p>WEATHERED ROCK (WR) NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.</p> <p>CRYSTALLINE ROCK (CR) FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.</p> <p>NON-CRYSTALLINE ROCK (NCR) FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.</p> <p>COASTAL PLAIN SEDIMENTARY ROCK (CP) COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.</p>	<p>ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.</p> <p>AQUIFER - A WATER BEARING FORMATION OR STRATA.</p> <p>ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.</p> <p>ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC.</p> <p>ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.</p> <p>CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.</p> <p>COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.</p> <p>CORE RECOVERY (REC) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.</p> <p>DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.</p> <p>DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.</p> <p>DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.</p> <p>FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.</p> <p>FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.</p> <p>FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOGGED FROM PARENT MATERIAL.</p> <p>FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.</p> <p>FORMATION (FM) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.</p> <p>JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.</p> <p>LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.</p> <p>LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.</p> <p>MOTTLED (MOT) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.</p> <p>PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.</p> <p>RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.</p> <p>ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.</p> <p>SAPROLITE (SAP) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.</p> <p>SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.</p> <p>SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.</p> <p>STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.</p> <p>STRATA CORE RECOVERY (SCRC) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.</p> <p>STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.</p> <p>TOPSOIL (TS) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p>																																																			
<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>GRANULAR MATERIALS (≤ 35% PASSING #200)</th> <th>SILT-CLAY MATERIALS (> 35% PASSING #200)</th> <th>ORGANIC MATERIALS</th> </tr> <tr> <td>GROUP CLASS.</td> <td>A-1, A-3, A-4, A-5, A-6, A-7</td> <td>A-2, A-2.5, A-2.6, A-2.7, A-4, A-5, A-6, A-7</td> <td>A-1, A-2, A-3, A-4, A-5, A-6, A-7</td> </tr> <tr> <td>SYMBOL</td> <td></td> <td></td> <td></td> </tr> <tr> <td>% PASSING</td> <td>50 MM, 100 MM, 200 MM</td> <td>40 MM, 60 MM, 75 MM, 100 MM, 150 MM, 200 MM</td> <td>GRANULAR SOILS, SILT-CLAY SOILS, MUCK, PEAT</td> </tr> <tr> <td>LIQUID LIMIT</td> <td>6 MAX</td> <td>40 MAX, 41 MAX, 42 MAX, 43 MAX, 44 MAX, 45 MAX, 46 MAX, 47 MAX, 48 MAX, 49 MAX, 50 MAX, 51 MAX, 52 MAX, 53 MAX, 54 MAX, 55 MAX, 56 MAX, 57 MAX, 58 MAX, 59 MAX, 60 MAX, 61 MAX, 62 MAX, 63 MAX, 64 MAX, 65 MAX, 66 MAX, 67 MAX, 68 MAX, 69 MAX, 70 MAX, 71 MAX, 72 MAX, 73 MAX, 74 MAX, 75 MAX, 76 MAX, 77 MAX, 78 MAX, 79 MAX, 80 MAX, 81 MAX, 82 MAX, 83 MAX, 84 MAX, 85 MAX, 86 MAX, 87 MAX, 88 MAX, 89 MAX, 90 MAX, 91 MAX, 92 MAX, 93 MAX, 94 MAX, 95 MAX, 96 MAX, 97 MAX, 98 MAX, 99 MAX, 100 MAX</td> <td>SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER, HIGHLY ORGANIC SOILS</td> </tr> <tr> <td>GROUP INDEX</td> <td>0</td> <td>0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100</td> <td></td> </tr> <tr> <td>USUAL TYPES OF MAJOR MATERIALS</td> <td>STONE FRAGS., GRAVEL, SAND</td> <td>FINE SAND, SILTY OR CLAYEY GRAVEL AND SAND</td> <td>SILT-CLAY SOILS, CLAYEY SOILS</td> </tr> <tr> <td>GENERATING AS A SUBGRADE</td> <td>EXCELLENT TO GOOD</td> <td>FAIR TO POOR</td> <td>FAIR TO POOR, POOR, UNSUITABLE</td> </tr> </table> <p>PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30</p>	GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)	SILT-CLAY MATERIALS (> 35% PASSING #200)	ORGANIC MATERIALS	GROUP CLASS.	A-1, A-3, A-4, A-5, A-6, A-7	A-2, A-2.5, A-2.6, A-2.7, A-4, A-5, A-6, A-7	A-1, A-2, A-3, A-4, A-5, A-6, A-7	SYMBOL				% PASSING	50 MM, 100 MM, 200 MM	40 MM, 60 MM, 75 MM, 100 MM, 150 MM, 200 MM	GRANULAR SOILS, SILT-CLAY SOILS, MUCK, PEAT	LIQUID LIMIT	6 MAX	40 MAX, 41 MAX, 42 MAX, 43 MAX, 44 MAX, 45 MAX, 46 MAX, 47 MAX, 48 MAX, 49 MAX, 50 MAX, 51 MAX, 52 MAX, 53 MAX, 54 MAX, 55 MAX, 56 MAX, 57 MAX, 58 MAX, 59 MAX, 60 MAX, 61 MAX, 62 MAX, 63 MAX, 64 MAX, 65 MAX, 66 MAX, 67 MAX, 68 MAX, 69 MAX, 70 MAX, 71 MAX, 72 MAX, 73 MAX, 74 MAX, 75 MAX, 76 MAX, 77 MAX, 78 MAX, 79 MAX, 80 MAX, 81 MAX, 82 MAX, 83 MAX, 84 MAX, 85 MAX, 86 MAX, 87 MAX, 88 MAX, 89 MAX, 90 MAX, 91 MAX, 92 MAX, 93 MAX, 94 MAX, 95 MAX, 96 MAX, 97 MAX, 98 MAX, 99 MAX, 100 MAX	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER, HIGHLY ORGANIC SOILS	GROUP INDEX	0	0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100		USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS., GRAVEL, SAND	FINE SAND, SILTY OR CLAYEY GRAVEL AND SAND	SILT-CLAY SOILS, CLAYEY SOILS	GENERATING AS A SUBGRADE	EXCELLENT TO GOOD	FAIR TO POOR	FAIR TO POOR, POOR, UNSUITABLE	<p style="text-align: center;">COMPRESSIBILITY</p> <p>SLIGHTLY COMPRESSIBLE MODERATELY COMPRESSIBLE HIGHLY COMPRESSIBLE</p> <p>LIQUID LIMIT LESS THAN 31 LIQUID LIMIT EQUAL TO 31-50 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</p> <p> STATIC WATER LEVEL AFTER 24 HOURS</p> <p> PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA</p> <p> SPRING OR SEEP</p>	ORGANIC MATERIAL	GRANULAR SOILS	SILT-CLAY SOILS	OTHER MATERIAL	TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE	LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE	MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME	HIGHLY ORGANIC	>10%	>20%	HIGHLY	<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.</p> <p>VERY SLIGHT (V SL) - ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN. CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.</p> <p>SLIGHT (SL) - ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.</p> <p>MODERATE (MOD) - SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.</p> <p>MODERATELY SEVERE (MOD. SEV.) - ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. <i>IF TESTED, WOULD YIELD SPT REFUSAL.</i></p> <p>SEVERE (SEV.) - ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. <i>IF TESTED, YIELDS SPT N VALUES < 100 BPF.</i></p> <p>VERY SEVERE (V SEV.) - ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. <i>IF TESTED, YIELDS SPT N VALUES < 100 BPF.</i></p> <p>COMPLETE - ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.</p> <p 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.</p> <p>HARD - CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.</p> <p>MODERATELY HARD - CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.</p> <p>MEDIUM HARD - CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.</p> <p>SOFT - CAN BE GROOVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.</p> <p>VERY SOFT - CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGER NAIL.</p>
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GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.</p> <p>MODERATELY INDURATED - GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.</p> <p>INDURATED - GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.</p> <p>EXTREMELY INDURATED - SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</p>	TERM	SPACING	VERY WIDE	MORE THAN 10 FEET	WIDE	3 TO 10 FEET	MODERATELY CLOSE	1 TO 3 FEET	CLOSE	0.16 TO 1 FEET	VERY CLOSE	LESS THAN 0.16 FEET	TERM	THICKNESS	VERY THICKLY BEDDED	> 4 FEET	THICKLY BEDDED	1.5 - 4 FEET	THINLY BEDDED	0.15 - 1.5 FEET	VERY THINLY BEDDED	0.03 - 0.15 FEET	THICKLY LAMINATED	0.008 - 0.03 FEET	THINLY LAMINATED	< 0.008 FEET												
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OM - OPTIMUM MOISTURE SHRINKAGE LIMIT	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE																																																				
SL - SHRINKAGE LIMIT	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE																																																				
<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, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.</p>	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;">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.</p> <p>HARD - CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.</p> <p>MODERATE</p>																																						
NONPLASTIC	PLASTICITY INDEX (PI)	DRY STRENGTH																																																				
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	26 OR MORE	HIGH																																																				



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY
GOVERNOR

LYNDO TIPPETT
SECRETARY

December 5, 2006

STATE PROJECT: 32643.1.1 (B-2515)
COUNTY: Buncombe
DESCRIPTION: Bridge No. 39 on Biltmore Avenue over Swannanoa River
SUBJECT: Geotechnical Report – Foundation Investigation

Site Description

This report is a revision of a Foundation Investigation of March 1997. Bridge No. 39 is a reinforced concrete structure in three spans, with a total length of 127.3 feet. The proposed new structure was originally to be in three spans, and has now been redesigned as a single span of 126 feet, centered at -L- Station 13+90, with a 90° skew.

The project was originally metric and now has been converted to English. No new borings were made. Nomenclature is similar to the 1997 inventory report with the notable exception of the term hard rock, which has been replaced with the more definitive term of crystalline rock and termination remarks formerly described as casing advancer refusal are now described as terminated on or in crystalline rock of gneiss. Revised boring logs and core photos made for the previous investigation are included in this inventory however, core logs for borings not used on cross sections or the profile are not included.

The site is located in the Biltmore Village area of Asheville. It is in an urban area with high daily traffic flow, numerous retail establishments, a railroad switching yard and main line in close proximity. Bridge No. 39 crosses the Swannanoa River, which at this site is approximately 40 feet wide and 2 to 4 feet deep. The valley floor here has been completely altered with widespread fills and the river appears to have been channelized.

The Geotechnical Engineering Unit conducted a subsurface investigation in February and March, 1997. Thirteen borings were made using a CME 550 power drilling machine equipped with a rotary NX casing advancer and NXWL diamond bit coring tools.

Borings had to be located so as to avoid overhead power lines and underground telephone, gas, water and sanitary sewer lines. Six of those borings were located on interior bents that were proposed at the time. Standard Penetration Tests (SPT's) were performed through the casing advancer at 5-foot intervals. Twelve soil samples were submitted to a DOT laboratory for quality tests, and 17 rock core samples were tested at a DOT facility for strength.

Soils and Materials

Subsurface materials on this site comprise embankment and fill, alluvium, saprolite, weathered rock of gneiss and crystalline rock of gneiss. The properties of each will be discussed below with its occurrence at each respective bent location.

Standing groundwater was found at elevations between 1979 feet and 1981 feet. Groundwater measurements were not made immediately after drilling due to the presence of water pumped into the borings during casing advancement and coring operations. Twenty-four hour groundwater measurements were taken in those borings which did not have to be filled immediately because of safety concerns related to their locations.

Rock Characteristics

Bedrock at the site consists predominantly of polydeformed granoblastic gneissic crystalline rock with porphyroclastic layers, metamorphosed granite-like intrusions and some mylonite, all belonging to the Ashe Formation. Polydeformed means that the rock has been metamorphosed more than once. Granoblastic is a metamorphic texture describing uniform sized crystals that rarely show crystal edges. Porphyroclastic is a metamorphic texture with large, deformed crystals that have grown in a rock that is composed of much smaller crystals. Porphyroclasts are the large crystals that are somewhat rounded. Mylonite is fault gouge or rock dust typically having been hardened back to rock.

Granitic intrusions appear to be melted Ashe Formation gneissic rock which has migrated along breaks in the bedrock and recrystallized to resemble pegmatites. Some granitic intrusions show signs of brittle deformation including fracturing. Occasional ruptures in the gneissic rock show various stages of healing from open to completely filled, some with sheared quartz crystals. Some secondary pyrite was observed in the breaks of recovered core.

The small crystal size of the dominant rock type here, granoblastic gneiss, weathers to a silty sand material - either weathered rock or saprolite - with approximately 50 percent fine sand.

Avenues for weathering along both mylonite and fractures or ruptures may explain the variations in saprolite consistency and layering with weathered rock of gneiss observed along the former Bent Two and for the change in elevation of the inferred rock line along the proposed bridge. Overall the bedrock has numerous changes in rock texture with variable weathering and some indications of recurring brittle deformation and healing.

Bent Descriptions

End Bent One

This bent is located on the south side of the river approximately 25 feet south of the channel bank and about 7.5 feet back station from the end bent of the existing bridge. The left side is in a paved parking area and the right side lies on the grassy shoulder beside the intersection of Biltmore Avenue and Thompson Street.

A layer of asphalt and concrete pavement is approximately 1.5 feet thick at the surface in the central part (EB1-C, EB1-D) of this bent. Fill occurs at the surface at the extremities of the bent, comprising 6 feet of loose silty sand on the left (EB1-A) and less than a foot of loose sand and gravel on the right (EB1-B).

Alluvial soils below the fill/embankment materials are 12 to 18 feet thick. They are comprised of a variety of materials: silty sand (A-2-4), clayey sand and sandy silt (A-2-4, A-4), intermittent gravel and basal alluvial gravel that includes wood (A-1-b) and over 12 feet of fine sandy clay with suspended gravel (A-6) at EB1-D. The base of alluvium is found at elevations between 1974 feet and 1976 feet in all borings on this bent.

A layer 1 to 4 feet thick of weathered rock and/or thin discontinuous saprolite is found between the base of alluvium and the crystalline rock line. The saprolite, where present, is composed of medium to very dense, silty sand (A-2-4).

The inferred rock line occurs at elevations between 1971 and 1975 feet. Nine to 12 feet of crystalline rock was cored in each of the 3 borings. Boring EB1-C was terminated at the inferred rock line, without coring. Bedrock is composed of predominantly very hard and fresh to severely weathered and soft, poorly foliated gneiss, granitic intrusions and some mylonite. One noticeable loss of core occurred in a suspected zone of very severely weathered mylonite in boring EB1-B. Most joints are iron-stained, and minor amounts of pyrite occur on some joints.

End Bent Two

This bent is located on the north side of the river approximately 40 feet from the channel bank and 8 feet back station from the end bent of the existing bridge. The center of the bent is on a low flood plain beneath the existing bridge. The left side is located at the base of a terrace slope between the existing bridge and a parking lot, and the right side is located midway up a similar terrace slope in which alluvium was drilled at boring EB2-B.

A thin fill is present on the extreme right side of the cross section. Some pavement is present on the left side.

Alluvium consisting of 1 to 19 feet of silty sand, sandy silt, some with rock fragments or gravel and basal sand and gravel (A-2-4, A-4, A-1-b) is present across most of the bent. Some sort of fill or back fill that looks like asphalt millings was encountered in boring

EB2-D. It consists of 6+ feet of black sand and gravel. The base of the alluvium is found from elevations 1973 to 1975+ feet.

Saprolite consisting of silty fine sand to fine sandy silt (A-2-4, A-4) from 2 to 10 feet in thickness overlies a thick zone of weathered rock of gneiss. Below elevations 1973 to 1965+ feet 12 to 19 feet of weathered rock of gneiss was encountered.

Crystalline rock of gneiss was encountered in only one boring, EB2-B, at an elevation of 1952.9 feet.

Respectfully Submitted,

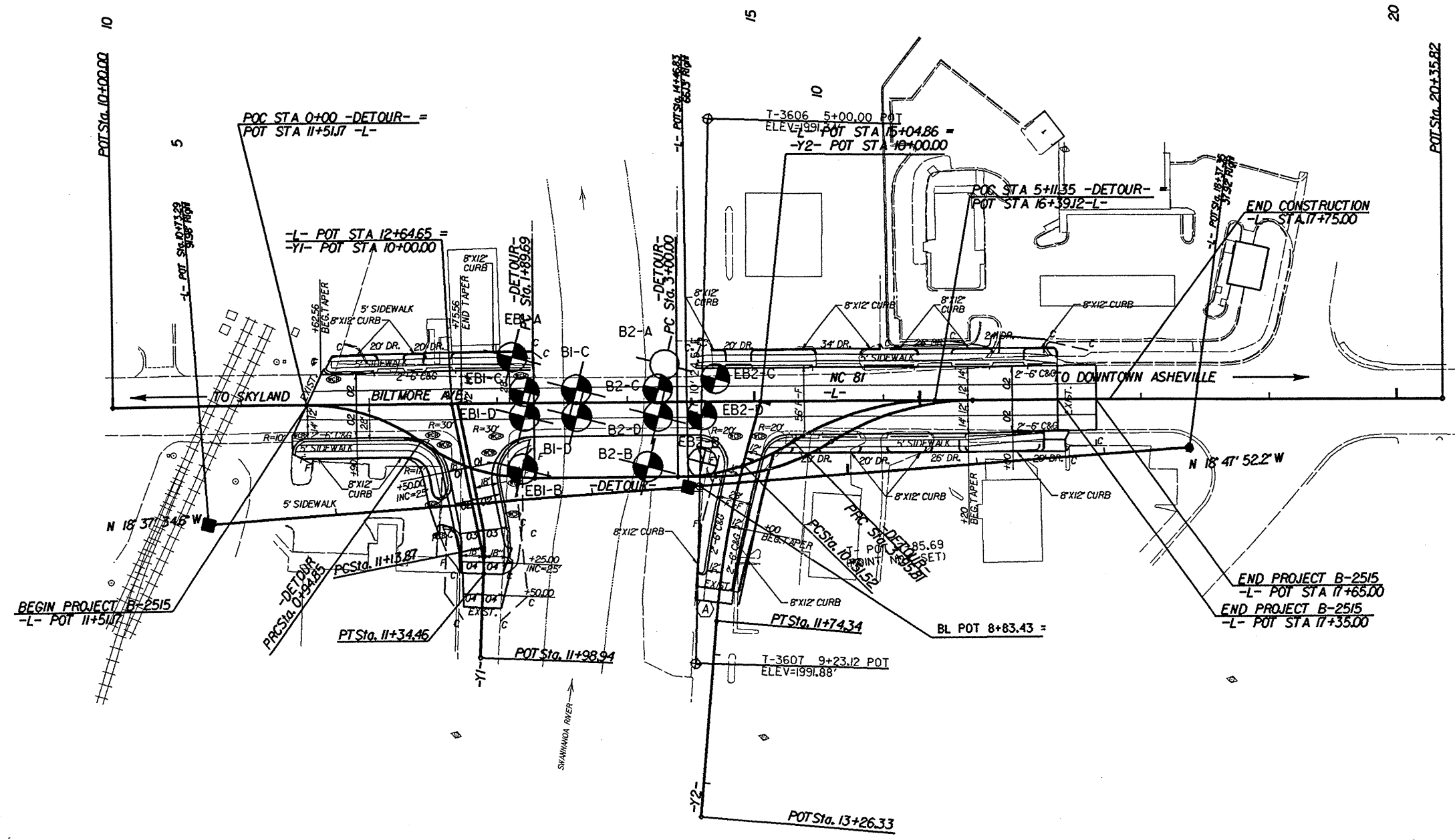
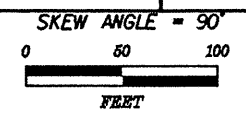
PQ Lockamy

PQ Lockamy, PG

8/17/99

AN-2007 1337 15 GEO_BRDC0039\CADD\GEO TECH Site&Sub\B2515_GEO_inv_01.dgn

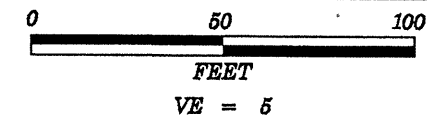
PROJECT REFERENCE NO. B-2515	SHEET NO. 4/27
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR ACQUISITION PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	



BEGIN PROJECT B-2515
-L- POT Sta. 11+51.7

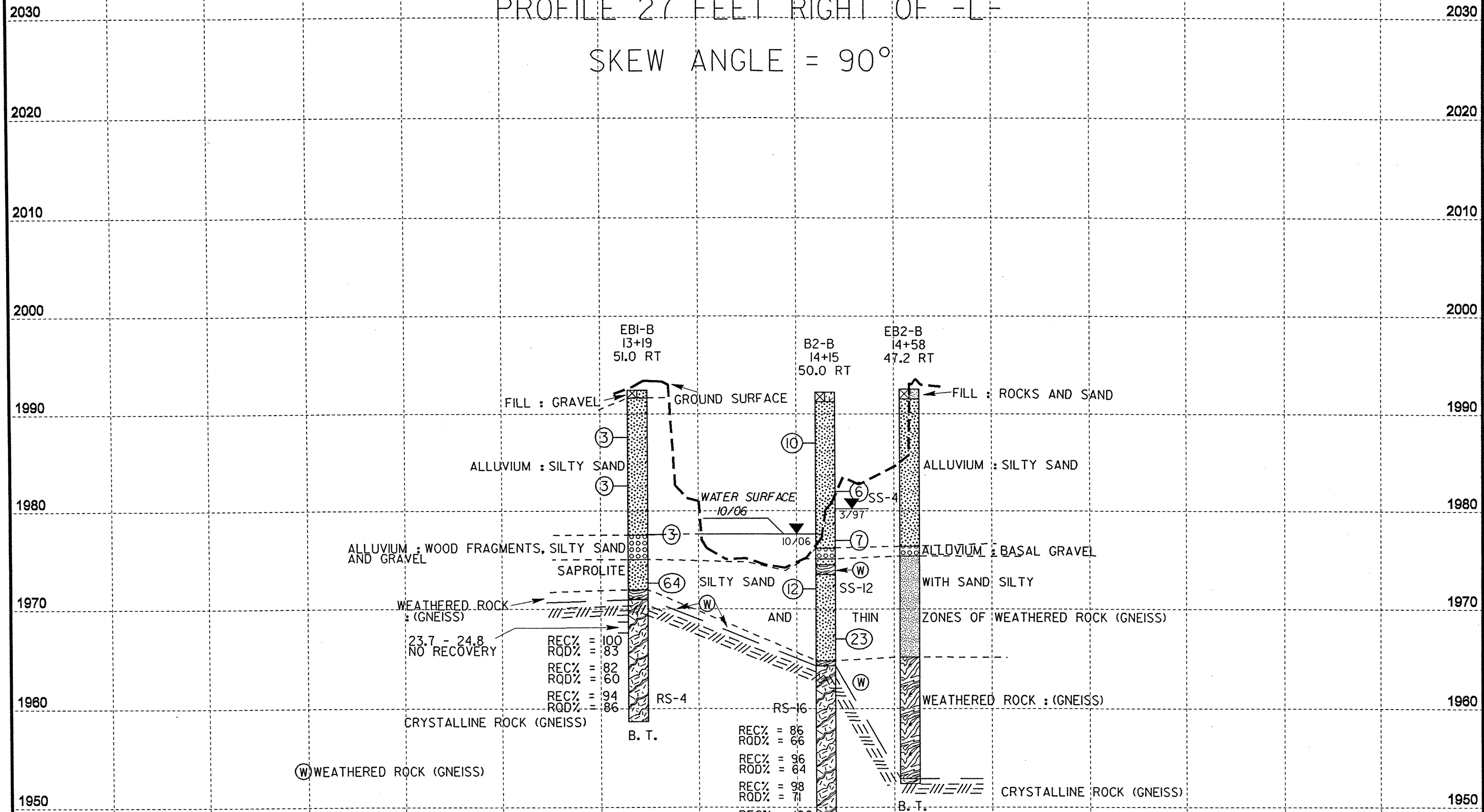
END PROJECT B-2515
-L- POT Sta. 17+35.00

SWANANDA RIVER



PROJECT REFERENCE NO.	SHEET
B-2515	5/27
PROFILE 27 FEET RIGHT OF CENTERLINE	

PROFILE 27 FEET RIGHT OF -L-
 SKEW ANGLE = 90°



(W) WEATHERED ROCK (GNEISS)

2030
2020
2010
2000
1990
1980
1970
1960
1950

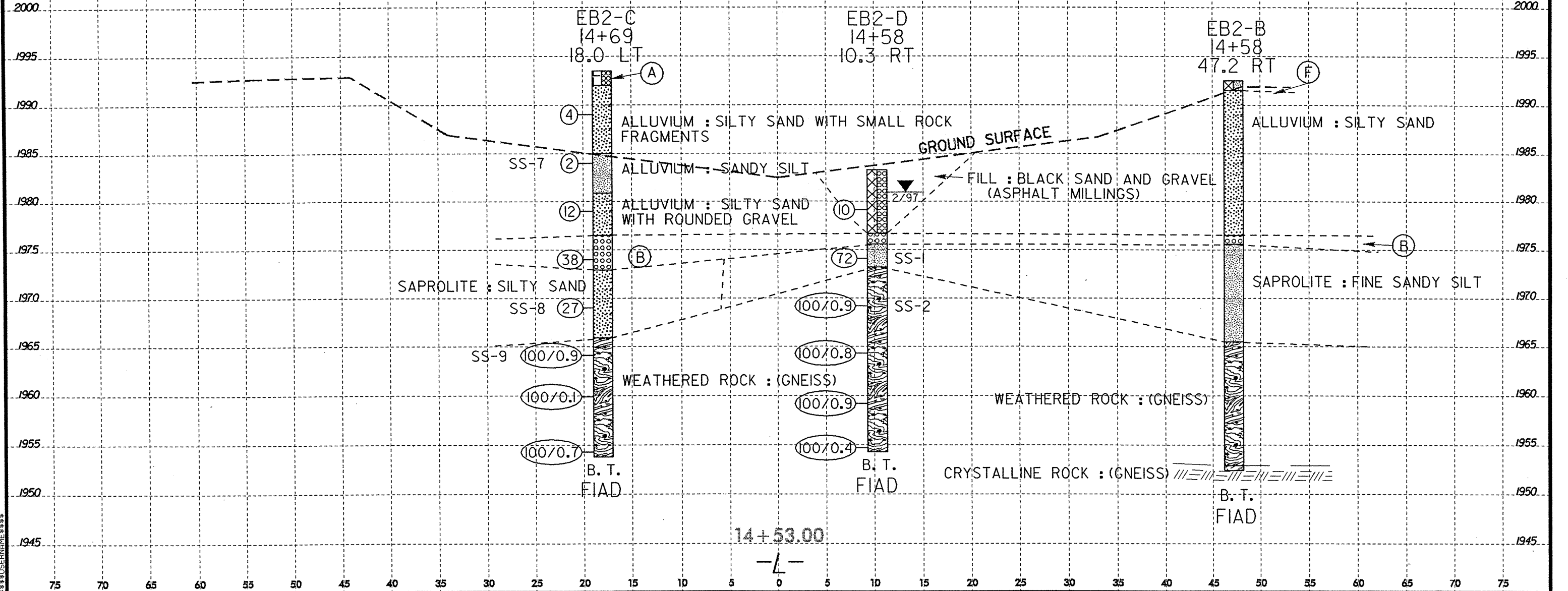
2030
2020
2010
2000
1990
1980
1970
1960
1950

8/23/99

SECTION THRU EB2
 SKEW ANGLE = 90°
 VE = 1

- (A) EMBANKMENT : ASPHALT AND CONCRETE
- (B) ALLUVIUM : BASAL SAND AND GRAVEL
- (F) FILL : ROCKS AND SAND

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	LL	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-1	10.3 RT	14+58	8.2 - 9.7	A-4 (0)	23	NP	23.1	46.6	22.2	8.0	97	88	36		
SS-2	10.3 RT	14+58	13.2 - 14.6	A-2-4 (0)	31	NP	26.1	46.8	23.0	4.0	100	86	34		
SS-7	18 LT	14+69	8.5 - 10.0	A-4 (0)	31	6	14.1	48.4	19.4	18.1	100	99	42		
SS-8	18 LT	14+69	23.5 - 25.0	A-2-4 (0)	31	NP	29.1	52.7	14.2	4.0	100	87	26		
SS-9	18 LT	14+69	28.5 - 29.9	A-2-4 (0)	25	NP	20.7	58.3	17.0	4.0	100	94	29		



SYSTEMS
 DGN
 SHEET

14+53.00
 -L-

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
 GEOTECHNICAL UNIT BORING LOG

SHEET 9 OF 27

DATE 3/4/1997

CORE BORING REPORT

PROJECT: 32643.1.1 I. D. NO: B-2515 BORING NO: EB1-B GEOLOGIST: T.P. Shelton

DESCRIPTION: Bridge 39 on Biltmore Ave. (NC-81) over Swannanoa River 13+19 -L- 51 Rt.

COUNTY: Buncombe COLLAR ELEVATION: 1992.4 FT. TOTAL DEPTH: 33.7 FT.

ELEV. (FEET)	DEPTH (FEET)	DRILL RATE MIN./FT.	RUN (FEET)	REC. FEET %	RQD. FEET %	SAMP. #	FIELD CLASSIFICATION AND REMARKS
1971.0	21.4		2.3	2.3	1.9		GREY GRANOBLASTIC GNEISS AND 0.2 FEET OF MYLONITE AT END OF RUN. VERY HARD AND FRESH GNEISS, MYLONITE IS MOD. WEATHERED AND SOFT. Foliation gneiss 5 to 10 degrees - mylonite 27 degrees.
			100	83			
1968.7	23.7			4.1	3.0		23.7 - 24.8 WEATHERED MYLONITE W/ FRACTURED GRANITIC INTRUSION. 0.9 FEET NOT RECOVERED. - SEE PHOTO. 24.8 - 26.2 MOD. HARD, VERY SLIGHTLY WEATHERED GNEISS 26.2 - 28.7 VERY HARD AND FRESH GNEISS. STAINS ON BREAKS.
1968.7	23.7		5.0	82	60		
1963.7	28.7			4.7	4.3	RC-4	VERY HARD AND FRESH GRANOBLASTIC GNEISS.
1963.7	28.7		5.0	94	86		
1958.7	33.7						NOTE: CORE PHOTO SHOWS RUNS 1 AND 2 (THIS CORE REPORT) AS RUN 1 FROM 21.4 TO 28.7.

CORING TERMINATED AT
 ELEVATION 1958.7 FT.

DRILLER: TP SHELTON CORE SIZE: NXWL EQUIPMENT: CME-550

PROJECT NO 32643.1.1		ID B-2515		COUNTY BUNCOMBE		GEOLOGIST L.A. MANN							
SITE DESCRIPTION BRIDGE NO.39 ON N.C. 81 (BILTMORE AVE.) OVER SWANNANOA RIVER							GND WATER						
BORING NO EB1-B		NORTHING 680683.95		EASTING 946281.23		0 HR N/A							
ALIGNMENT L		BORING LOCATION 13+19.000		OFFSET 51.00ft RT		24 HR N/A							
COLLAR ELEV 1992.40ft		TOTAL DEPTH 33.70ft		START DATE 2/27/97		COMPLETION DATE 02/27/97							
DRILL MACHINE CME-550X			DRILL METHOD SPT CORE BORING			HAMMER TYPE AUTOMATIC							
SURFACE WATER DEPTH			DEPTH TO ROCK 21.40ft			Log EB1-B, Page 1 of 1							
ELEV	DEPTH	BLOW CT			PEN (ft)	BLOWS PER FOOT				SAMPLE NO	LOG	SOIL AND ROCK DESCRIPTION	
		6in	6in	6in		0	25	50	75				100
1992.40													Ground Surface
1990.00	3.80	1	1	2	1.0	3							FILL : GRAVEL
													ALLUVIUM : ORANGE - BROWN, MOIST TO SAT., SILTY SAND
	8.80	1	1	2	1.0	3							
1980.00	13.80	2	1	2	1.0	3							ALLUVIUM : WOOD FRAGMENTS, GREY . SILTY SAND AND GRAVEL, SAT.
	18.80	15	21	43	1.0	64							SAPROLITE : GREY, SAT. SILTY SAND
1970.00													WEATHERED ROCK(GNEISS)
													CRYSTALLINE ROCK (GNEISS) : GREY, GRANOBLASTIC GNEISS WITH MYLONITE. NO RECOVERY 23.7 - 24.8'
1960.00													
1958.70													BORING TERMINATED AT ELEVATION 1958.7 FEET IN CRYSTALLINE ROCK(GNEISS)

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
 GEOTECHNICAL UNIT BORING LOG

PROJECT NO 32643.1.1		ID B-2515		COUNTY BUNCOMBE		GEOLOGIST L.A. MANN								
SITE DESCRIPTION BRIDGE NO.39 ON N.C. 81 (BILTMORE AVE.) OVER SWANNANOVA RIVER						GND WATER								
BORING NO EB1-D		NORTHING 680675.51		EASTING 946240.06		0 HR N/A								
ALIGNMENT L		BORING LOCATION 13+21.000		OFFSET 10.00ft RT		24 HR N/A								
COLLAR ELEV 1993.80ft		TOTAL DEPTH 28.70ft		START DATE 2/25/97		COMPLETION DATE 02/25/97								
DRILL MACHINE CME-550X			DRILL METHOD SPT CORE BORING			HAMMER TYPE AUTOMATIC								
SURFACE WATER DEPTH			DEPTH TO ROCK 18.20ft			Log EB1-D, Page 1 of 1								
ELEV	DEPTH	BLOW CT			PEN (ft)	BLOWS PER FOOT					SAMPLE NO	LOG	SOIL AND ROCK DESCRIPTION	
		6in	6in	6in		0	25	50	75	100				
1993.80														Ground Surface
1990.00	3.90	2	2	2	1.0	4								EMBANKMENT : PAVEMENT AND CONCRETE
	8.90	0	0	1	1.0	1					SS-3	W		ALLUVIUM : GREY, MOIST TO WET, FINE SANDY CLAY WITH ROUNDED GRAVELS
1980.00	13.90	0	2	2	1.0	4					SS-4			ALLUVIUM : GREY, FINE SAND, SAT.
	18.90	50			0.3				50					ALLUVIAL GRAVEL, SAT.
														WEATHERED ROCK : (GNEISS)
1970.00														CRYSTALLINE ROCK (GNEISS) : GREY, GRANOBLASTIC AND PORPHYROCLASTIC GNEISS, VERY HARD AND FRESH.
1965.10														BORING TERMINATED AT ELEVATION 1965.1 FEET IN CRYSTALLINE ROCK (GNEISS)

CORE BORING REPORT							DATE 2/25/1997
PROJECT: 32643.1.1		I. D. NO: B-2515		BORING NO: EB1-D		GEOLOGIST: LA MANN	
DESCRIPTION: Bridge 39 on Biltmore Ave. (NC-81) over Swannanoa River 13+21 -L- 10 Rt							
COUNTY: Buncombe		COLLAR ELEVATION: 1993.8 FT.		TOTAL DEPTH: 28.7 FT.			
ELEV. (FEET)	DEPTH (FEET)	DRILL RATE MIN./FT.	RUN (FEET)	REC. FEET %	RQD. FEET %	SAMP. #	FIELD CLASSIFICATION AND REMARKS
1974.8	19.0		4.7	4.7	3.8		GREY GRANOBLASTIC GNEISS WITH PORPHYROCLASTIC GNEISS FOLIATION 30 TO 45 DEGREES. FRACTURES AT 30 TO 70 DEGREES
1970.1	23.7			100	81		MOSTLY VERY HARD AND FRESH
1970.1	23.7		5.0	4.9	4.0	RC-3	GREY GRANOBLASTIC GNEISS WITH PORPHYROCLASTIC GNEISS VERY HARD AND FRESH
1965.1	28.7			98	79		
CORING TERMINATED AT ELEVATION 1965.1 FT.							
DRILLER: WA GOSNELL		CORE SIZE: NXWL		EQUIPMENT: CME-550			

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
 GEOTECHNICAL UNIT BORING LOG

PROJECT NO 32643.1.1		ID B-2515		COUNTY BUNCOMBE		GEOLOGIST L.A. MANN						
SITE DESCRIPTION BRIDGE NO.39 ON N.C. 81 (BILTMORE AVE.) OVER SWANNANOVA RIVER							GND WATER					
BORING NO B2-A		NORTHING 680770.60		EASTING 946174.79		0 HR N/A						
ALIGNMENT L		BORING LOCATION 14+29.000		OFFSET 29.20ft LT		24 HR 3.10ft						
COLLAR ELEV 1984.30ft		TOTAL DEPTH 43.50ft		START DATE 3/05/97		COMPLETION DATE 03/05/97						
DRILL MACHINE CME-550X			DRILL METHOD CORE BORING			HAMMER TYPE AUTOMATIC						
SURFACE WATER DEPTH N/A			DEPTH TO ROCK 19.90ft			Log B2-A, Page 1 of 1						
ELEV	DEPTH	BLOW CT			PEN (ft)	BLOWS PER FOOT				SAMPLE NO	LOG	SOIL AND ROCK DESCRIPTION
		6in	6in	6in		0	25	50	75			
1984.30												Ground Surface
1980.00												ALLUVIUM : BROWN, SILTY SAND AND SMALL ROCK FRAGMENTS, MOI. TO SAT.
	4.20											ALLUVIUM : GRAVEL AND SAND, SAT.
	9.20											SAPROLITE : WHITE AND GREY SILTY SAND AND VERY COARSE SAND, SAT.
1970.00												WEATHERED ROCK : (GNEISS) CRYSTALLINE ROCK (GNEISS) NOT CORED
	14.20											CRYSTALLINE ROCK (GNEISS) W/ GRANITIC INTRUSIONS : WHITE, VERY CSE., GRAINED, VERY CRUMBLY CAN BE BROKEN BY HAND
1960.00												RS-12
	19.20											RS-13
1950.00												
	24.20											
1940.80												BORING TERMINATED AT ELEVATION OF 1940.8 FEET IN CRYSTALLINE ROCK (GNEISS)

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
 GEOTECHNICAL UNIT BORING LOG

PROJECT NO 32643.1.1		ID B-2515		COUNTY BUNCOMBE		GEOLOGIST L.A. MANN						
SITE DESCRIPTION BRIDGE NO.39 ON N.C. 81 (BILTMORE AVE.) OVER SWANNANOVA RIVER							GND WATER					
BORING NO B2-B		NORTHING 680776.59		EASTING 946254.95		0 HR N/A						
ALIGNMENT L		BORING LOCATION 14+15.000		OFFSET 50.00ft RT		24 HR 11.60ft						
COLLAR ELEV 1992.20ft		TOTAL DEPTH 49.00ft		START DATE 3/04/97		COMPLETION DATE 03/04/97						
DRILL MACHINE CME-550X			DRILL METHOD CASING ADV			HAMMER TYPE AUTOMATIC						
SURFACE WATER DEPTH N/A			DEPTH TO ROCK 27.90ft			Log B2-B, Page 1 of 2						
ELEV	DEPTH	BLOW CT			PEN (ft)	BLOWS PER FOOT				SAMPLE NO	LOG	SOIL AND ROCK DESCRIPTION
		6in	6in	6in		0	25	50	75			
1992.20												Ground Surface
1990.00	4.20	3	6	4	1.0							ARTIFICIAL FILL : ROCKS, PAVEMENT CHUNKS, AND SANDS
	9.20	1	1	5	1.0							ALLUVIUM : BROWN, MOI. TO SAT., SAND TO ROUNDED GRAVEL
1980.00	14.20	1	3	4	1.0							SS-11
	19.20	2	2	10	1.0							ALLUVIUM GRAVEL AND SAND, SAT.
1970.00	24.20	4	8	15	1.0							SS-12
												SAPROLITE : ORANGE - BROWN, SAT. SILTY FINE SAND WITH INTERMITTENT QUARTZ SEAMS
1960.00												WEATHERED ROCK : (GNEISS)
												SAPROLITE: SILTY SAND, SAT.
1950.00												WEATHERED ROCK : (GNEISS)
												CRYSTALLINE ROCK (GNEISS) : GREEN AND GREY CONTORTED FOLIATION, MYLONTIC IN PLACES, MINOR PYRITE ON SOME JOINTS
1943.20												RS-16
												RS-17
												BORING TERMINATED AT ELEVATION 1943.2 FEET IN CRYSTALLINE ROCK (GNEISS)

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
 GEOTECHNICAL UNIT BORING LOG

PROJECT NO 32643.1.1		ID B-2515		COUNTY BUNCOMBE		GEOLOGIST L.A. MANN							
SITE DESCRIPTION BRIDGE NO.39 ON N.C. 81 (BILTMORE AVE.) OVER SWANNANOVA RIVER							GND WATER						
BORING NO B2-C		NORTHING 680769.46		EASTING 946194.50		0 HR N/A							
ALIGNMENT L		BORING LOCATION 14+23.500		OFFSET 10.30ft LT		24 HR 1.80ft							
COLLAR ELEV 1981.80ft		TOTAL DEPTH 30.60ft		START DATE 2/27/97		COMPLETION DATE 02/27/97							
DRILL MACHINE CME-550X			DRILL METHOD CASING ADV			HAMMER TYPE AUTOMATIC							
SURFACE WATER DEPTH			DEPTH TO ROCK 27.20ft			Log B2-C, Page 1 of 1							
ELEV	DEPTH	BLOW CT			PEN (ft)	BLOWS PER FOOT				SAMPLE NO	LOG	SOIL AND ROCK DESCRIPTION	
		6in	6in	6in		0	25	50	75				100
1981.80													
1980.00	1.60				1.0								Ground Surface
	6.60	38	100		1.0								ALLUVIUM : GREY, MOIST TO WET, FINE SANDY SILT AND SANDY GRAVEL
	11.60	12	47	47	1.0					94	SS-10		ALLUVIUM: SAND AND GRAVEL, SAT
	16.60	11	13	87	1.0					100			WEATHERED ROCK : (GNEISS)
	21.60	17	24	50	1.0					74			SAPROLITE : WHITE, SAT., SAND WITH INTERMITTENT SEAMS OF WEATHERED ROCK
	26.60	100			0.2					180			WEATHERED ROCK : (GNEISS)
1951.20													CRYSTALLINE ROCK (GNEISS)
BORING TERMINATED AT ELEVATION 1951.2 FEET IN CRYSTALLINE ROCK (GNEISS)													

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
 GEOTECHNICAL UNIT BORING LOG

PROJECT NO 32643.1.1		ID B-2515		COUNTY BUNCOMBE		GEOLOGIST L.A. MANN							
SITE DESCRIPTION BRIDGE NO.39 ON N.C. 81 (BILTMORE AVE.) OVER SWANNANOVA RIVER							GND WATER						
BORING NO B2-D		NORTHING 680774.92		EASTING 946215.07		0 HR N/A							
ALIGNMENT L		BORING LOCATION 14+23.500		OFFSET 11.00ft RT		24 HR 0.80ft							
COLLAR ELEV 1980.70ft		TOTAL DEPTH 40.40ft		START DATE 2/25/97		COMPLETION DATE 02/25/97							
DRILL MACHINE CME-550X			DRILL METHOD SPT CORE BORING			HAMMER TYPE AUTOMATIC							
SURFACE WATER DEPTH N/A			DEPTH TO ROCK 18.00ft			Log B2-D, Page 1 of 1							
ELEV	DEPTH	BLOW CT			PEN (ft)	BLOWS PER FOOT				SAMPLE NO	LOG	SOIL AND ROCK DESCRIPTION	
		6in	6in	6in		0	25	50	75				100
1980.70													
	5.50	12	14	28	1.0								Ground Surface
	10.50	77	100		0.5								ALLUVIUM : BROWN, MOIST SILTY SAND, MOI. TO SAT.
	15.50	47	100		0.4								ALLUVIAL GRAVEL AND SAND, SAT
													SAPROLITE : ORANGE-BROWN AND GREY, MOIST, SILTY FINE SAND, SAT.
													WEATHERED ROCK : (GNEISS)
													CRYSTALLINE ROCK NOT CORED
													CRYSTALLINE ROCK (GNEISS) : MED. GREY, MOD. FOLIAT. 5 DEG. TO CONTORTED, INTERMITTENTLY SEVERE TO ONLY SLI. WEA.
1950.00													
1940.30													
BORING TERMINATED AT ELEVATION 1940.4 FEET IN CRYSTALLINE ROCK (GNEISS)													

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO 32643.1.1		ID B-2515		COUNTY BUNCOMBE		GEOLOGIST L.A. MANN							
SITE DESCRIPTION BRIDGE NO.39 ON N.C. 81 (BILTMORE AVE.) OVER SWANNANOVA RIVER							GND WATER						
BORING NO EB2-C		NORTHING 680811.60		EASTING 946175.49		0 HR N/A	24 HR N/A						
ALIGNMENT L		BORING LOCATION 14+69.000		OFFSET 18.00ft LT									
COLLAR ELEV 1993.50ft		TOTAL DEPTH 39.70ft		START DATE 2/26/97		COMPLETION DATE 02/27/97							
DRILL MACHINE CME-550X			DRILL METHOD CASING ADV			HAMMER TYPE AUTOMATIC							
SURFACE WATER DEPTH			DEPTH TO ROCK N/A			Log EB2-C, Page 1 of 1							
ELEV	DEPTH	BLOW CT			PEN (ft)	BLOWS PER FOOT				SAMPLE NO	LOG	SOIL AND ROCK DESCRIPTION	
		6in	6in	6in		0	25	50	75				100
1993.50													
													Ground Surface
1990.00	3.50	3	1	3	1.0		4						EMBANKMENT : PAVEMENT AND CONCRETE
	8.50	1	1	1	1.0		2						ALLUVIUM : ORANGE - BROWN, MOI., SILTY SAND WITH SMALL ROCK FRAGMENTS
1980.00	13.50	3	5	7	1.0		12						ALLUVIUM : DARK BROWN, MOIST, SANDY SILT
	18.50	23	18	20	1.0		38						ALLUVIUM : GREY AND ORANGE - BROWN, SAT, SILTY SAND WITH ROUNDED GRAVEL
1970.00	23.50	8	12	15	1.0		27						ALLUVIUM : GREY, SATURATED SAND, VERY COARSE SAND AND ROUNDED GRAVEL
	28.50	26	60	40	0.9								SAPROLITE : BROWN, WET, SAND, WET
1960.00	33.50	100			0.1								WEATHERED ROCK : (GNEISS)
1953.80	38.50	22	42	58	0.7								WEATHERED ROCK (OF GNEISS)
													BORING TERMINATED AT ELEVATION 1953.8 FEET IN WEATHERED ROCK (GNEISS)

PROJECT NO 32643.1.1		ID B-2515		COUNTY BUNCOMBE		GEOLOGIST L.A. MANN							
SITE DESCRIPTION BRIDGE NO.39 ON N.C. 81 (BILTMORE AVE.) OVER SWANNANOVA RIVER							GND WATER						
BORING NO EB2-B		NORTHING 680817.46		EASTING 946241.46		0 HR N/A	24 HR N/A						
ALIGNMENT L		BORING LOCATION 14+58.000		OFFSET 47.20ft RT									
COLLAR ELEV 1992.50ft		TOTAL DEPTH 40.10ft		START DATE 3/04/97		COMPLETION DATE 03/04/97							
DRILL MACHINE CME-550X			DRILL METHOD CASING ADV			HAMMER TYPE AUTOMATIC							
SURFACE WATER DEPTH			DEPTH TO ROCK 39.60ft			Log EB2-B, Page 1 of 1							
ELEV	DEPTH	BLOW CT			PEN (ft)	BLOWS PER FOOT				SAMPLE NO	LOG	SOIL AND ROCK DESCRIPTION	
		6in	6in	6in		0	25	50	75				100
1992.50													
													Ground Surface
1990.00													ARTIFICIAL FILL : ROCKS AND SAND
													ALLUVIUM : BROWN, SILTY SAND, MOI. TO SAT.
1980.00													ALLUVIUM: GRAVEL, SAT.
													SAPROLITE : BROWN FINE SANDY SILT, WET
1970.00													WEATHERED ROCK (OF GNEISS)
1960.00													WEATHERED ROCK (OF GNEISS)
1952.40													CRYSTALLINE ROCK (GNEISS)
													BORING TERMINATED AT ELEVATION 1952.4 FEET IN CRYSTALLINE ROCK (GNEISS)

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
 GEOTECHNICAL UNIT BORING LOG

16/27

PROJECT NO 32643.1.1		ID B-2515		COUNTY BUNCOMBE		GEOLOGIST L.A. MANN									
SITE DESCRIPTION BRIDGE NO.39 ON N.C. 81 (BILTMORE AVE.) OVER SWANNANOVA RIVER							GND WATER								
BORING NO EB2-D		NORTHING 680808.12		EASTING 946205.66		0 HR N/A									
ALIGNMENT L		BORING LOCATION 14+58.000		OFFSET 10.30ft RT		24 HR 2.30ft									
COLLAR ELEV 1983.30ft		TOTAL DEPTH 29.00ft		START DATE 2/24/97		COMPLETION DATE 02/25/97									
DRILL MACHINE CME-550X			DRILL METHOD CASING ADV			HAMMER TYPE AUTOMATIC									
SURFACE WATER DEPTH N/A			DEPTH TO ROCK N/A			Log EB2-D, Page 1 of 1									
ELEV	DEPTH	BLOW CT			PEN (ft)	BLOWS PER FOOT					SAMPLE NO	MOI	LOG	SOIL AND ROCK DESCRIPTION	
		6in	6in	6in		0	25	50	75	100					
1983.30															
1980.00	3.20	5	5	5	1.0	10									FILL : BLACK SILTY SAND AND GRAVEL- LOOKS LIKE GROUND UP ASPHALT
	8.20	56	38	34	1.0		72				SS-1				ALLUVIUM : SAND, VERY COARSE SAND AND GRAVEL, SAT.
1970.00	13.20	56	62	38	0.9					100	SS-2				SAPROLITE : GREY, WET, FINE SANDY SILT
	18.20	27	49	51	0.8					100					WEATHERED ROCK : (GNEISS)
1960.00	23.20	28	15	85	0.9					100					
1954.30	28.20	75	100		0.4					100					
BORING TERMINATED AT ELEVATION 1954.3 FEET IN WEATHERED ROCK (GNEISS)															

ROCK CORE TEST RESULTS
 PROJECT# 8.1843001
 TIP ID B-2515

LAB #	SAMPLE	STR	BORING	DEPTH METERS	ROCK DESCRIP.	UNIT WT #/FT^3	Qu KSI	E MPsi
219659	RS-1	2	EB1-A	6.71-7.05	ALL SAMPLES	169.3	14.6	0.464
"	SR-2	2	"	9.92-10.14	ARE	166.6	11.0	2.00
"	RS-3	2	EB1-D	7.85-8.02	MICA GNEISS OR	174.1	5.7	1.971
"	RS-4	2	EB1-B	8.98-9.27	GRANITE GNEISS	165.7	15.9	0.259
"	RS-5	3	B1-C	3.36-3.52		171.7	14.2	3.11
"	RS-6		"	9.85-9.92	SPLIT TENSILE		0.8	
"	RS-7	2	"	10.78-10.93		165.4	7.0	1.143
"	RS-8	2	B1-D	1.92-2.14		170.0	9.8	1.677
"	RS-9	2	"	5.52-5.66		169.2	7.4	1.411
"	RS-10	2		8.32-8.46		168.3	15.8	0.464
"	RS-11		11A	8.46-8.55	SPLIT TENSILE	11-11A	1.2	1.3
"	RS-12	2	B2-A	6.32-6.50		160.9	6.1	0.492
"	RS-13	2	"	9.63-9.82		164.5	6.7	0.465
"	RS-14	2	B2-D	8.47-8.64		175.2	8.6	3.05
"	RS-15	2	"	11.68-11.85		169.0	11.8	2.94
"	RS-16	2	B2-B	10.19-10.38		170.6	12.6	0.384
"	RS-17	2	"	13.67-13.85		173.6	27.9	0.916

RUN BY S F BURKE

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
 DIVISION OF HIGHWAY
 MATERIALS & TESTS UNIT
 SOILS LABORATORY

T. I. P. No. B-2515

REPORT ON SAMPLES OF SOILS FOR QUALITY

Project 8.1843001 County BUNCOMBE Owner _____
 Date: Sampled 2/24/97 Received 3/10/97 Reported 3/12/97
 Sampled from -L- By L. A. MANN
 Submitted by W. L. MOORE 1995 Standard Specifications

626858 TO 626869
 3/13/97

TEST RESULTS

Proj. Sample No.	SS-1	SS-2	SS-3	SS-4	SS-5	SS-6
Lab. Sample No.	626858	626859	626860	626861	626862	626863
Retained 4.75 mm Sieve %	-	-	27	-	-	45
Passing 2.00 mm Sieve %	97	100	70	100	100	46
Passing 425 µm Sieve %	88	86	67	98	92	29
Passing 75 µm Sieve %	36	34	36	27	28	8

MINUS 2.00 mm FRACTION

SOIL MORTAR - 100%						
Coarse Sand Ret - 250 µm %	23.1	26.1	19.7	13.5	25.5	57.1
Fine Sand Ret - 53 µm %	46.6	46.8	33.0	65.9	53.7	28.1
Silt 0.05 - 0.005 mm %	22.2	23.0	17.2	14.6	16.8	10.8
Clay < 0.005 mm %	8.0	4.0	30.2	6.0	4.0	4.0
Passing 425 µm Sieve %	-	-	-	-	-	-
Passing 75 µm Sieve %	-	-	-	-	-	-

L. L.	23	31	32	28	21	21
P. I.	NP	NP	12	NP	NP	NP
AASHTO Classification	A-4(0)	A-2-4(0)	A-6(1)	A-2-4(0)	A-2-4(0)	A-1-a(0)
Station	11+38	11+38	10+97.78	10+97.78	11+29	11+10
	3.15M RT	3.15M RT	3.03M RT	3.03M RT	3.2M RT	3.18M LT
Hole No.	-L-	-L-	-L-	-L-	-L-	-L-
Depth (M)	2.63	4.15	2.85	4.37	3.35	0.78
to	2.93	4.45	3.15	4.67	3.65	1.08

cc: L. A. MANN
 Soils File

L. A. Mann
 Soils Engineer

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
 DIVISION OF HIGHWAY
 MATERIALS & TESTS UNIT
 SOILS LABORATORY

T. I. P. No. B-2515

REPORT ON SAMPLES OF SOILS FOR QUALITY

Project 8.1843001 County BUNCOMBE Owner _____
 Date: Sampled 2/24/97 Received 3/10/97 Reported 3/12/97
 Sampled from -L- By L. A. MANN
 Submitted by W. L. MOORE 1995 Standard Specifications

626858 TO 626869
 3/13/97

TEST RESULTS

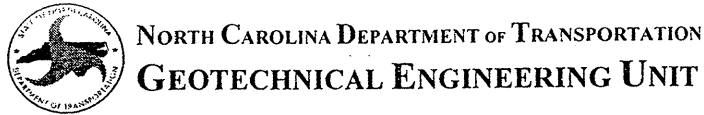
Proj. Sample No.	SS-7	SS-8	SS-9	SS-10	SS-11	SS-12
Lab. Sample No.	626864	626865	626866	626867	626868	626869
Retained 4.75 mm Sieve %	-	-	-	9	21	-
Passing 2.00 mm Sieve %	100	100	100	81	74	98
Passing 425 µm Sieve %	99	87	94	56	70	88
Passing 75 µm Sieve %	42	26	29	18	24	35

MINUS 2.00 mm FRACTION

SOIL MORTAR - 100%						
Coarse Sand Ret - 250 µm %	14.1	29.1	20.7	46.0	24.7	20.7
Fine Sand Ret - 53 µm %	48.4	52.7	58.3	36.4	47.2	52.5
Silt 0.05 - 0.005 mm %	19.4	14.2	17.0	13.6	14.0	20.8
Clay < 0.005 mm %	18.1	4.0	4.0	4.0	14.1	6.0
Passing 425 µm Sieve %	-	-	-	-	-	-
Passing 75 µm Sieve %	-	-	-	-	-	-

L. L.	31	31	25	21	22	50
P. I.	5	NP	NP	NP	NP	NP
AASHTO Classification	A-4(0)	A-2-4(0)	A-2-4(0)	A-2-4(0)	A-2-4(0)	A-2-5(0)
Station	11+43.2	11+43.2	11+43.2	11+29	11+26.4	11+26.4
	5.5M LT	5.5M LT	5.5M LT	3.15M LT	15.2M RT	15.2M RT
Hole No.	-L-	-L-	-L-	-L-	-L-	-L-
Depth (M)	2.75	7.32	8.84	3.67	2.94	5.99
to	3.05	7.62	9.14	3.97	3.24	6.29

Soils Engineer



FIELD SCOUR REPORT

WBS: 32643.1.1 TIP: B-2515 COUNTY: BUNCOMBE

DESCRIPTION(1): BR 39 ON NC-81 OVER SWANNANOVA RIVER

EXISTING BRIDGE

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

Bridge No.: 39 Length: 127.3 Total Bents: 4 Bents in Channel: 1 Bents in Floodplain: 3
Foundation Type: NOT APPARENT

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: Partial removal of recent sand bar at base of south abutment wall

Interior Bents: none visible

Channel Bed: none visible

Channel Bank: not much, most banks are armored somewhat.

EXISTING SCOUR PROTECTION

Type(3): concrete abutment walls with stone wings on all 4 corners

Extent(4): wings approximately 15 feet long, abutment walls from stream bed to road elevation.

Effectiveness(5): very good

Obstructions(6): some trees and brush on upstreram end of interior bent in river.

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): Mostly sand with small amounts of gravel with occasional man placed boulders.

Channel Bank Material(8): Variable: fine sandy clay to silty sand.

Channel Bank Cover(9): Brush and weeds with small trees

Floodplain Width(10): APPROXIMATELY 700 FEET WIDE

Floodplain Cover(11): Mostly asphalt - some vegetation

Stream is(12): Aggrading Degrading Static

Channel Migration Tendency(13): To the north.

Observations and Other Comments: The river appears to be channelized, most of the floodplain is filled over.
Not much gravel in stream bed.

DESIGN SCOUR ELEVATIONS(14)

Feet _____ Meters _____

BENTS

EB1 EB2

	EB1	EB2							

Comparison of DSE to Hydraulics Unit theoretical scour:
Preliminary Hydraulics Report received 2-16-06 shows 0.0 general, 0.0 contraction and N/A local.

SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL

Bed or Bank	BANK	BANK	BED				
Sample No.	SS-3	SS-11	SS-4				
Retained #4	27	21					
Passed #10	70	74	100				
Passed #40	67	70	98				
Passed #200	36	24	27				
Coarse Sand	19.7	24.7	13.5				
Fine Sand	33	47.2	65.9				
Silt	17.2	14	14.6				
Clay	30.2	14.1	6				
LL	32	22	28				
PI	12	NP	NP				
AASHTO	A-6(1)	A-2-4(0)	A-2-4(0)				
Station	13+21	14+15	13+21				
Offset	10 RT	50 RT	10 RT				
Depth	8.9-10.4	9.2-10.7	13.9-15.4				

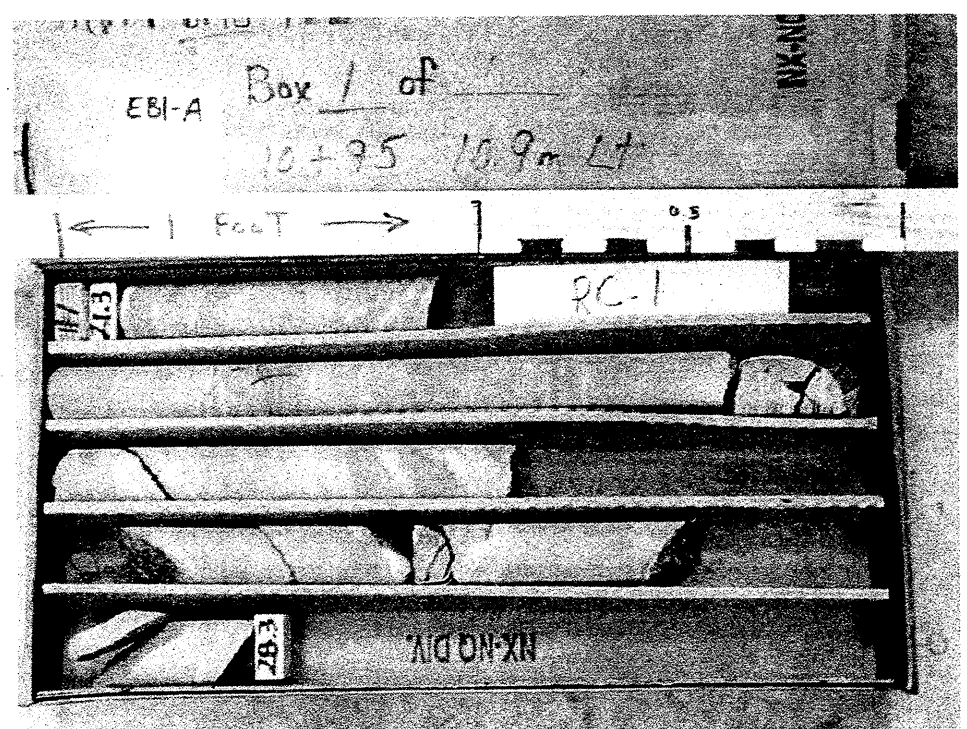
Template Revised 02/07/06

Reported by:

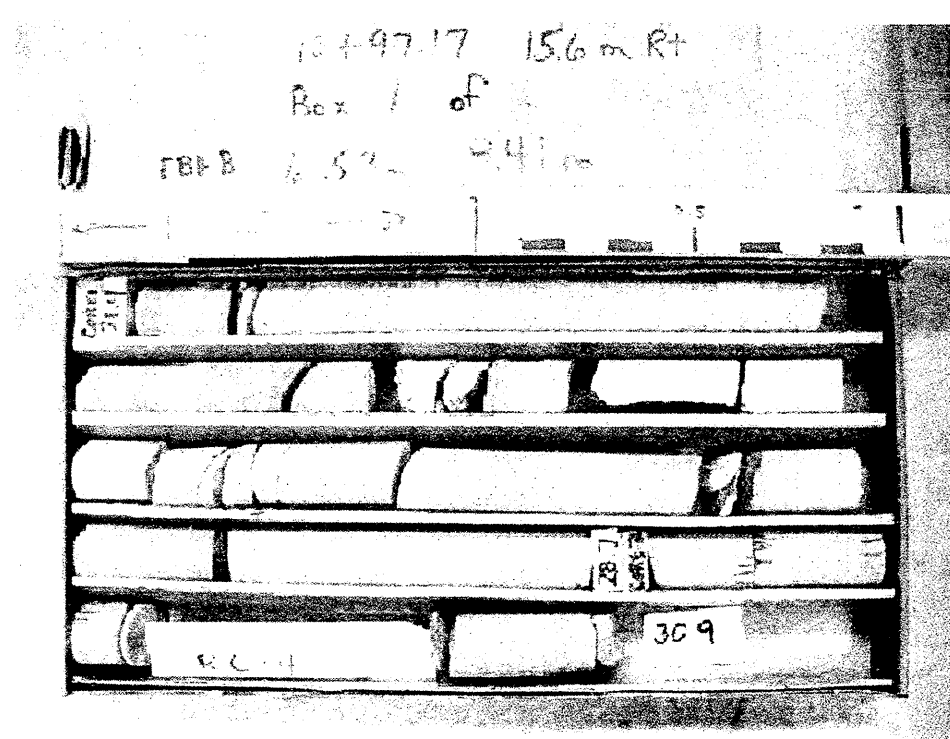
P. Q. Lockamy
PQ LOCKAMY

Date: 10/25/2006

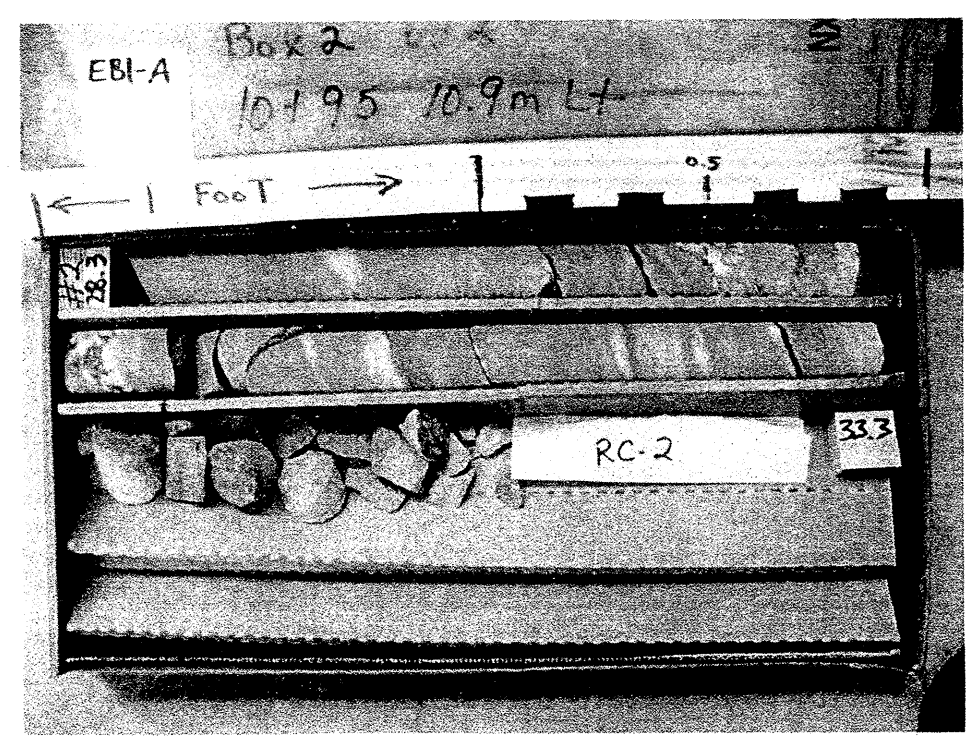
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OVER SWANANOVA RIVER IN ASHEVILLE EBI-A BOX 1
REVISED STATION 13+12 36 LT -L-



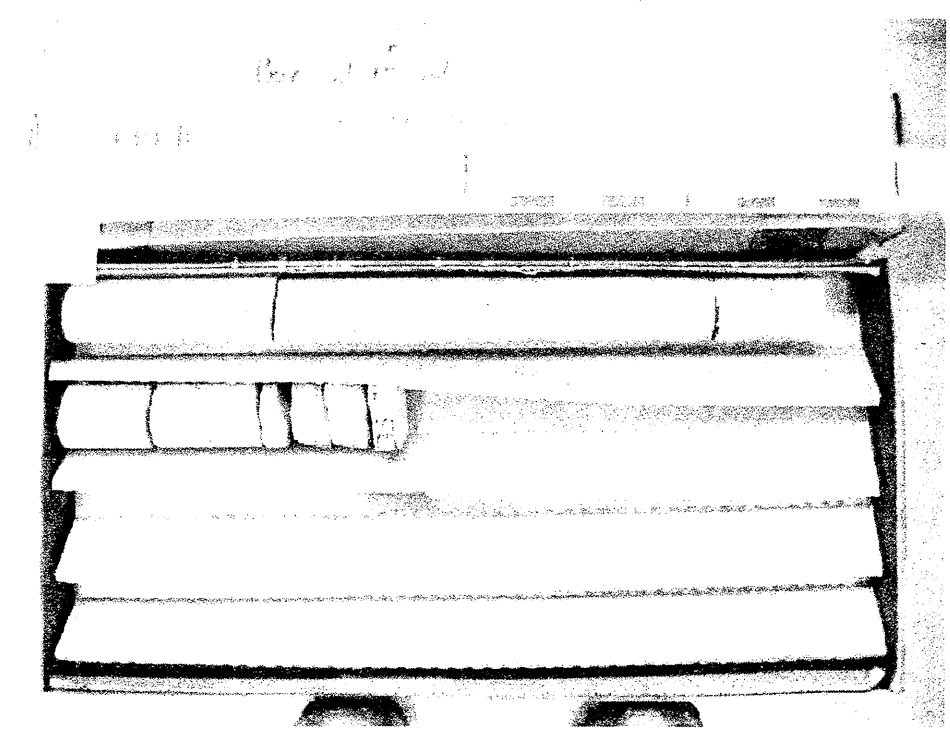
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OVER SWANANOVA RIVER IN ASHEVILLE EBI-B BOX 1
REVISED STATION 13+19 51 RT -L-



PROJECT: 32643.1.1 (B-2515) BUNCOMBE CO. Br. 39 ON N.C. 81
OVER SWANANOVA RIVER IN ASHEVILLE EBI-A BOX 2
REVISED STATION 13+12 36 LT -L-



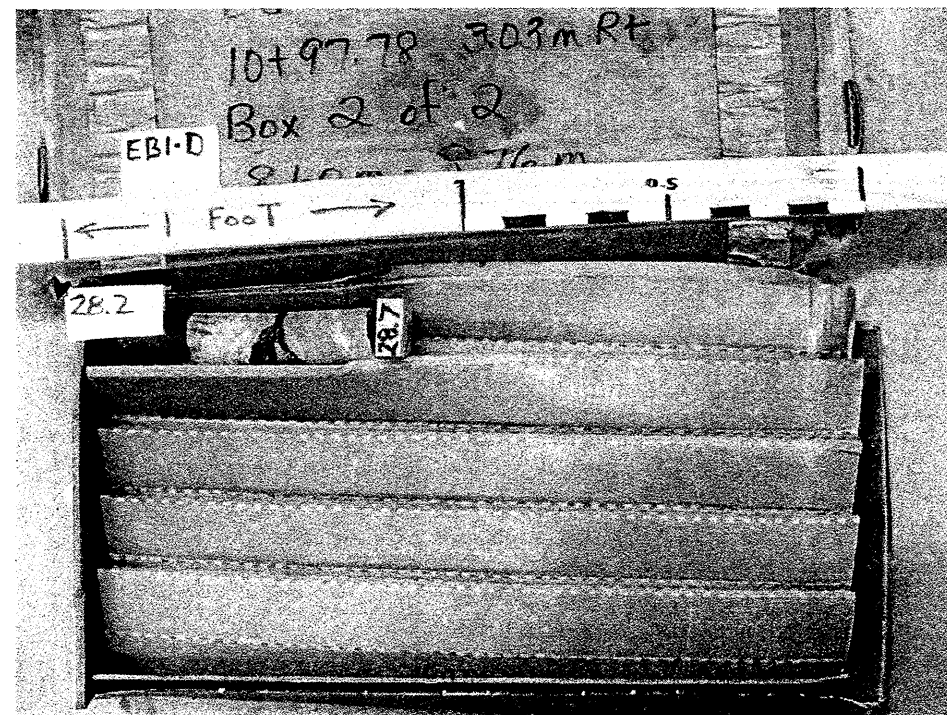
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OVER SWANANOVA RIVER IN ASHEVILLE EBI-B BOX 2
REVISED STATION 13+19 51 RT -L-



PROJECT: 32643.1.1 (B-2515) BUNCOMBE CO. Br. 39 ON N.C. 81
OVER SWANANOVA RIVER IN ASHEVILLE EBI-D BOX 1
REVISED STATION 13+21 10 RT -L-



PROJECT: 32643.1.1 (B-2515) BUNCOMBE CO. Br. 39 ON N.C. 81
OVER SWANANOVA RIVER IN ASHEVILLE EBI-D BOX 2
REVISED STATION 13+21 10 RT -L-

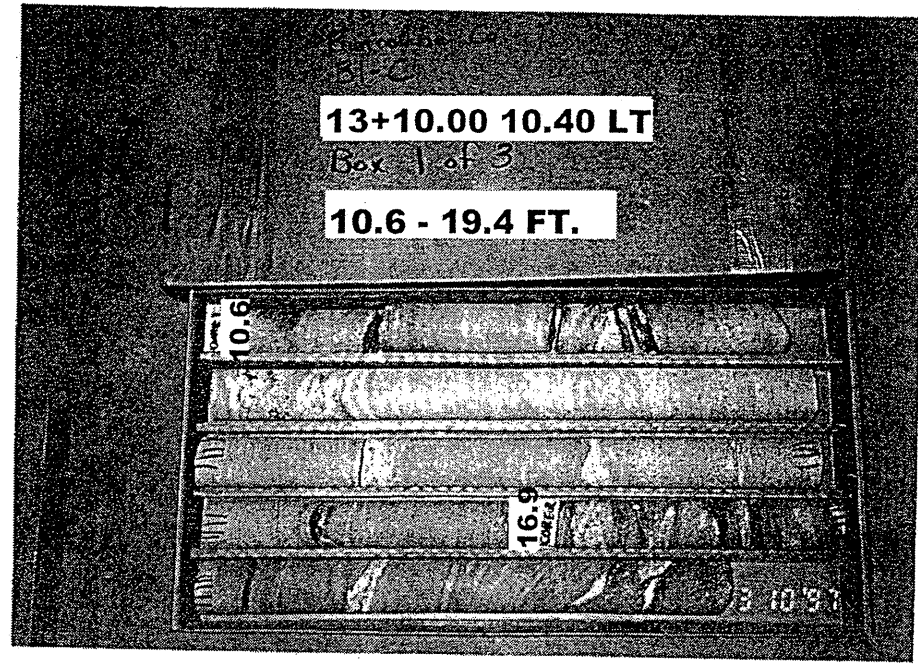


PROJECT NO.: **32643.1.1**

I.D. NO.: B-2515

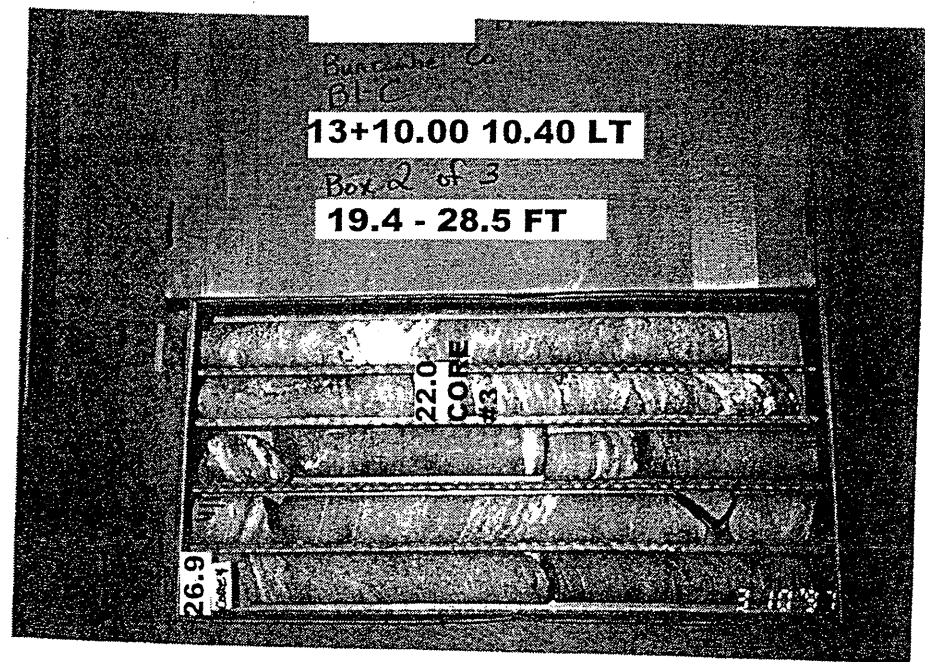
COUNTY: BUNCOMBE

BORING NO: **B1-C**



DEPTH: **10.6 - 19.4 FT**

BOX **1** OF **3**



DEPTH: **19.4 - 28.5 FT**

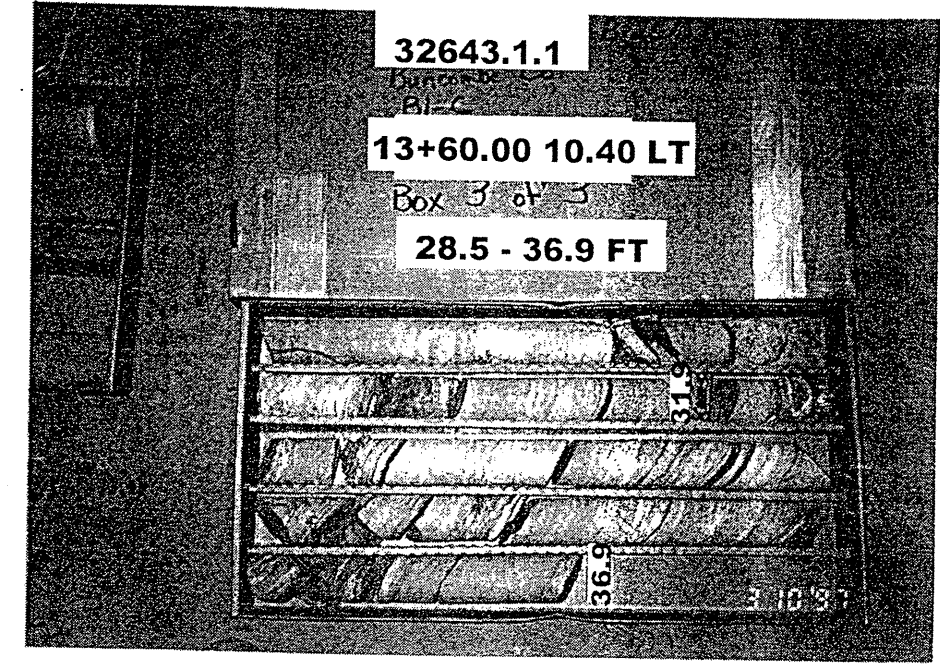
BOX **2** OF **3**

PROJECT NO.: **32643.1.1**

I.D. NO.: B-2515

COUNTY: BUNCOMBE

BORING NO: **B1-C**



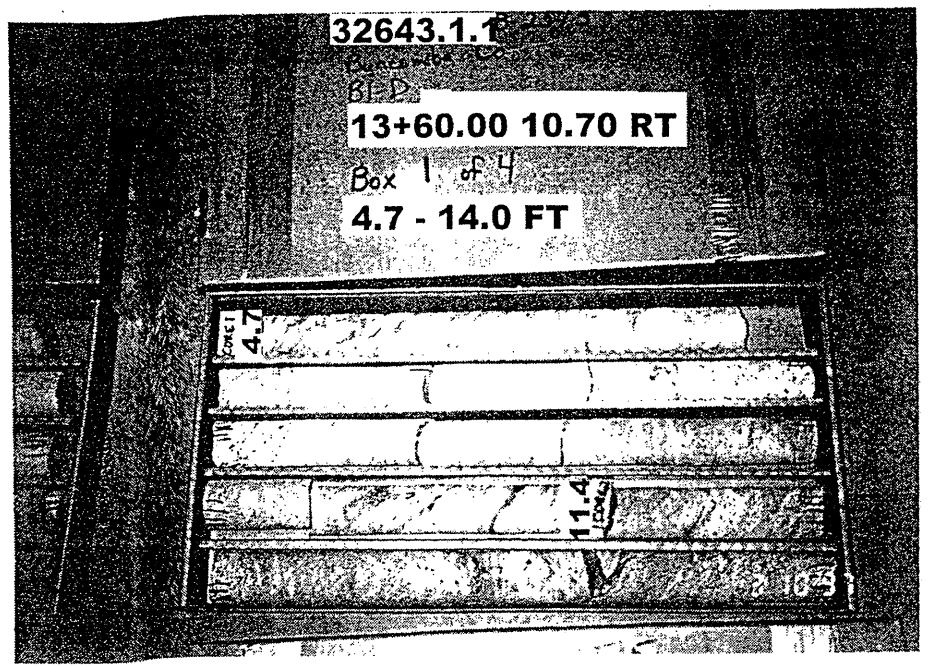
DEPTH: **28.5 - 36.9 FT**

BOX **3** OF **3**

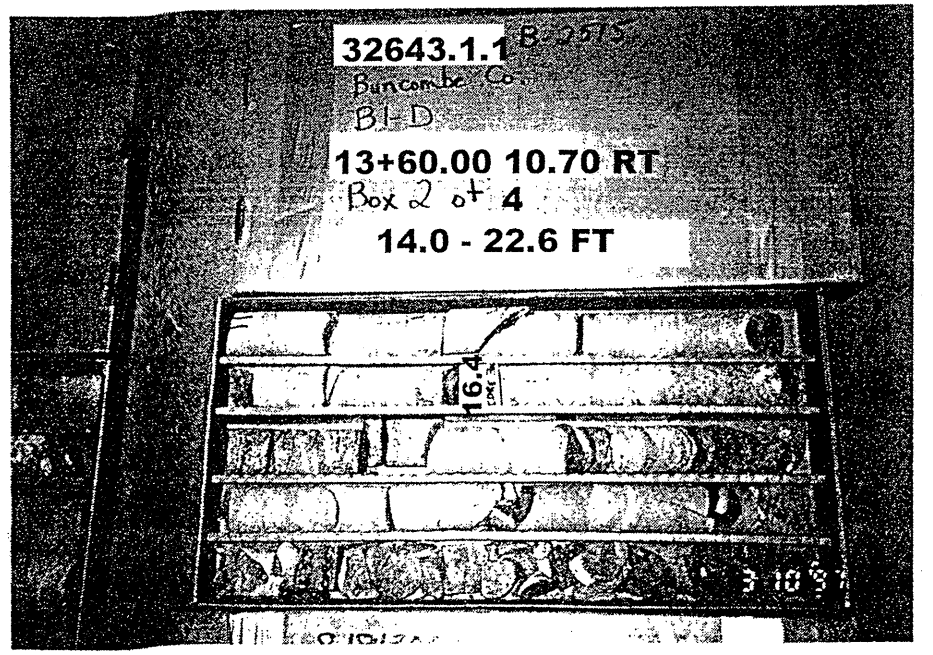
DEPTH:

BOX OF

PROJECT NO. : 32643.1.1	I.D. NO. : B-2515
COUNTY: BUNCOMBE	BORING NO: B-1D



DEPTH: 4.7 - 14.0 FT	BOX 1 OF 4
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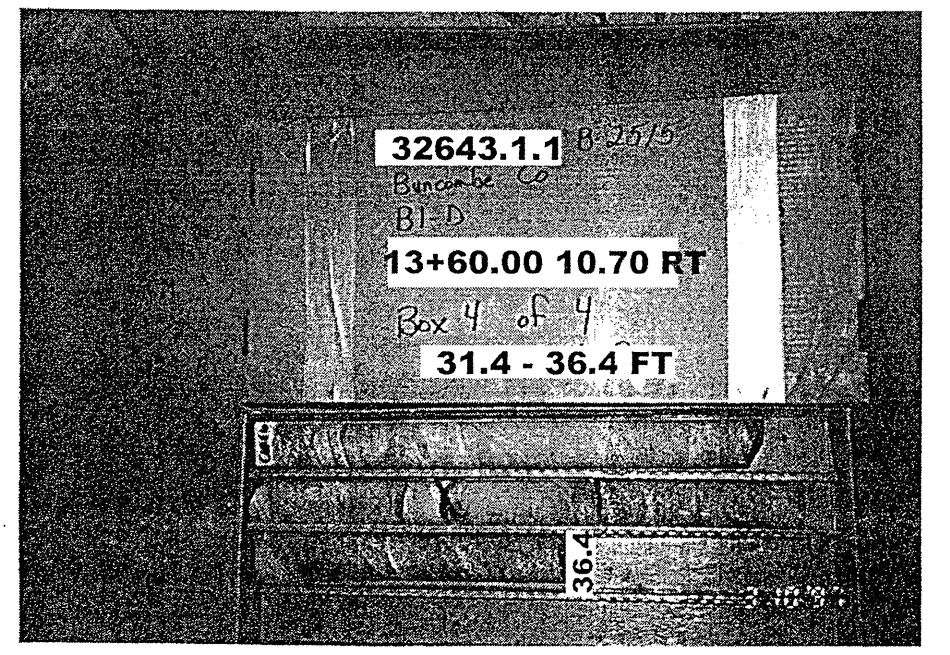


DEPTH: 14.0 - 22.6 FT	BOX 2 OF 4
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PROJECT NO. : 32643.1.1	I.D. NO. : B-2515
COUNTY: BUNCOMBE	BORING NO: B-1D

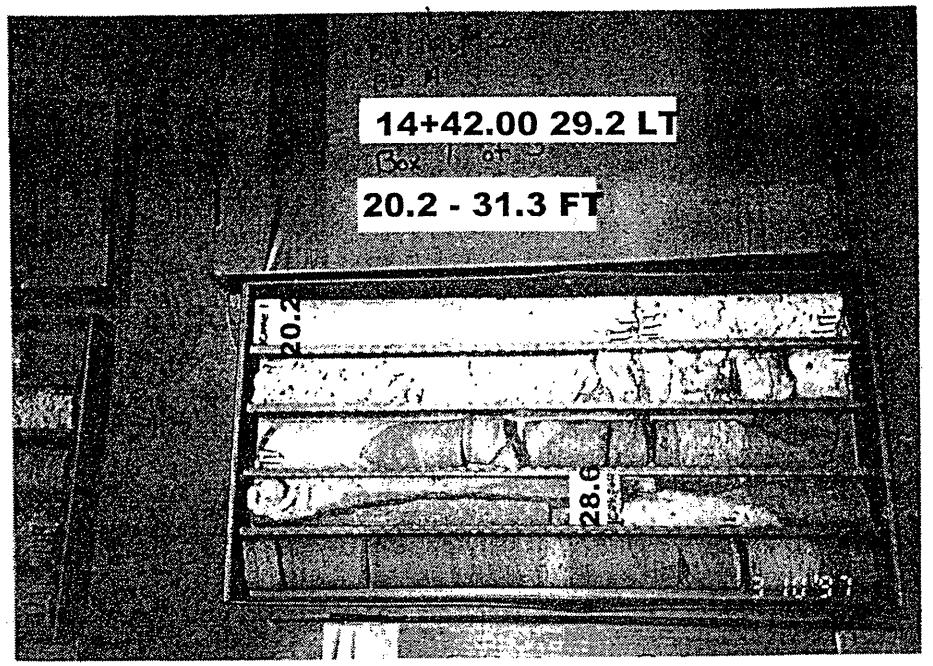


DEPTH: 22.6 - 31.4 FT	BOX 3 OF 4
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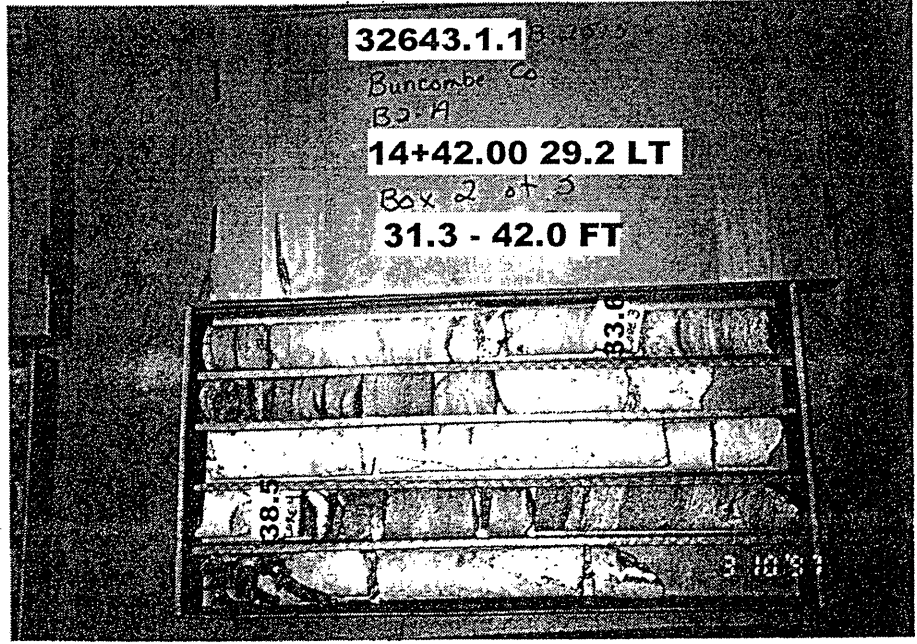


DEPTH: 31.4 - 36.4 FT	BOX 4 OF 4
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PROJECT NO.: 32643.1.1	I.D. NO.: B-2515
COUNTY: BUNCOMBE	BORING NO: B2-A

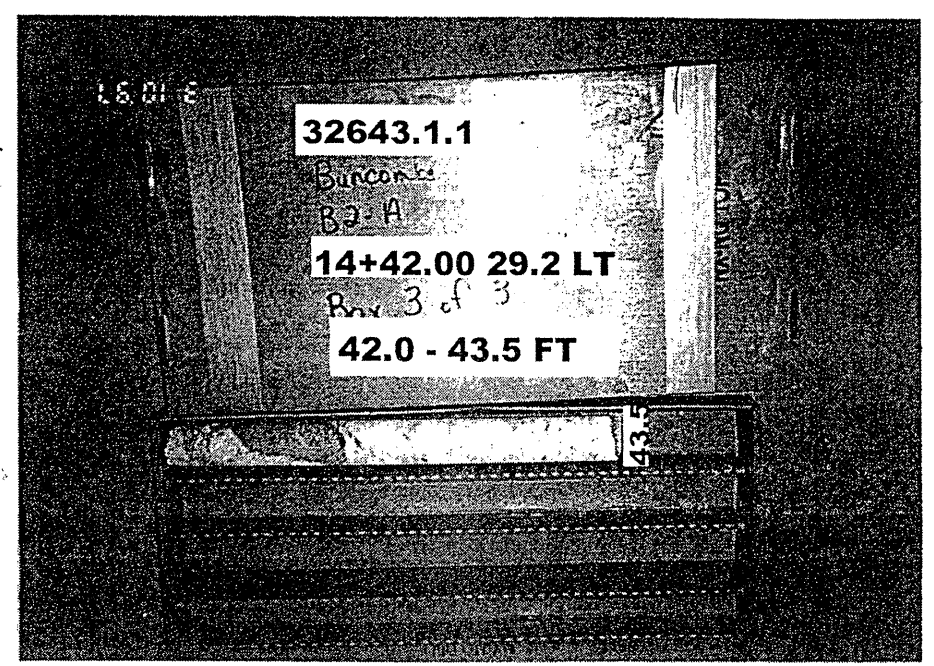


DEPTH: 20.2 - 31.3 FT	BOX 1 OF 3
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DEPTH: 31.3 - 42.0 FT	BOX 2 OF 3
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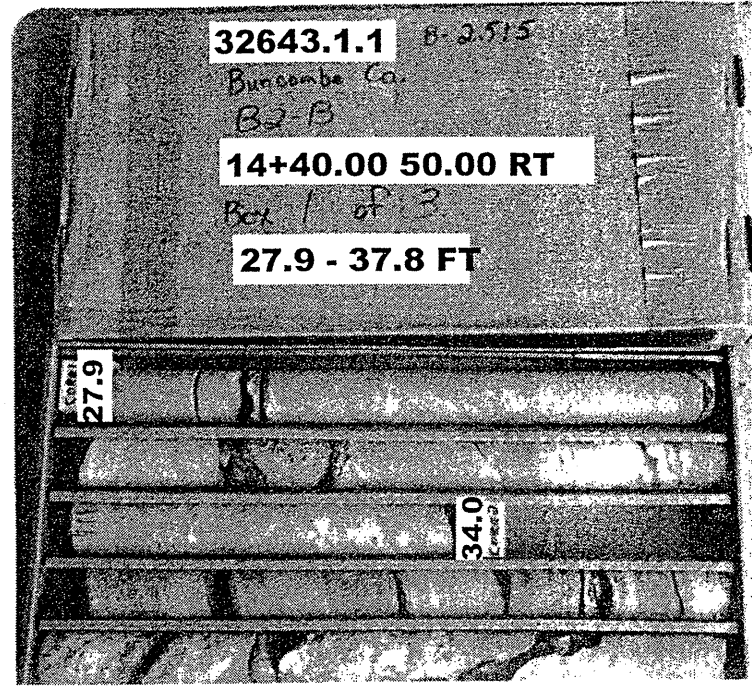
PROJECT NO.: 32643.1.1	I.D. NO.: B-2515
COUNTY: BUNCOMBE	BORING NO: B2-A



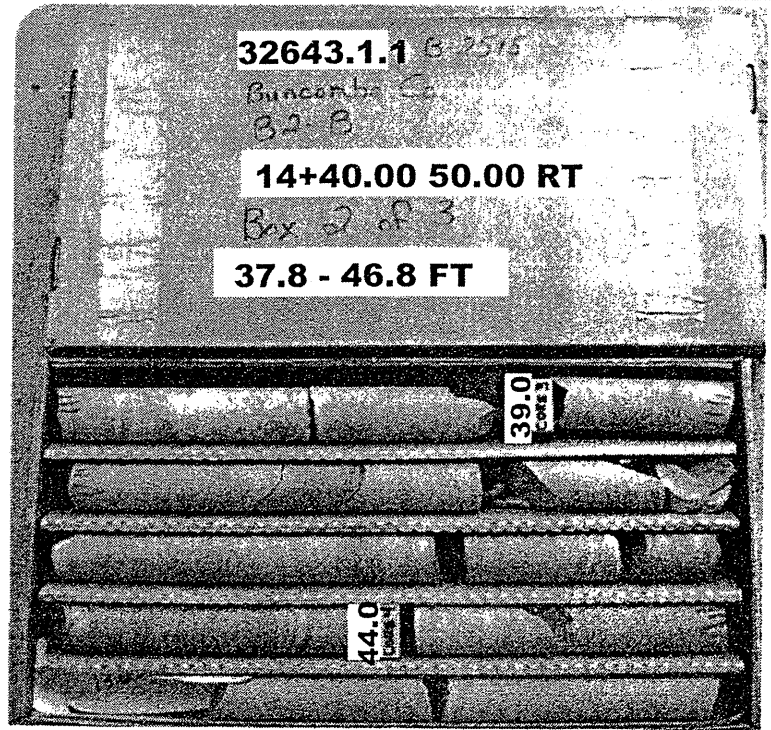
DEPTH: 42.0 - 43.5 FT	BOX 3 OF 3
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DEPTH:	BOX OF
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PROJECT NO.: 32643.1.1	I.D. NO.: B-2515
COUNTY: BUNCOMBE	BORING NO: B2-B

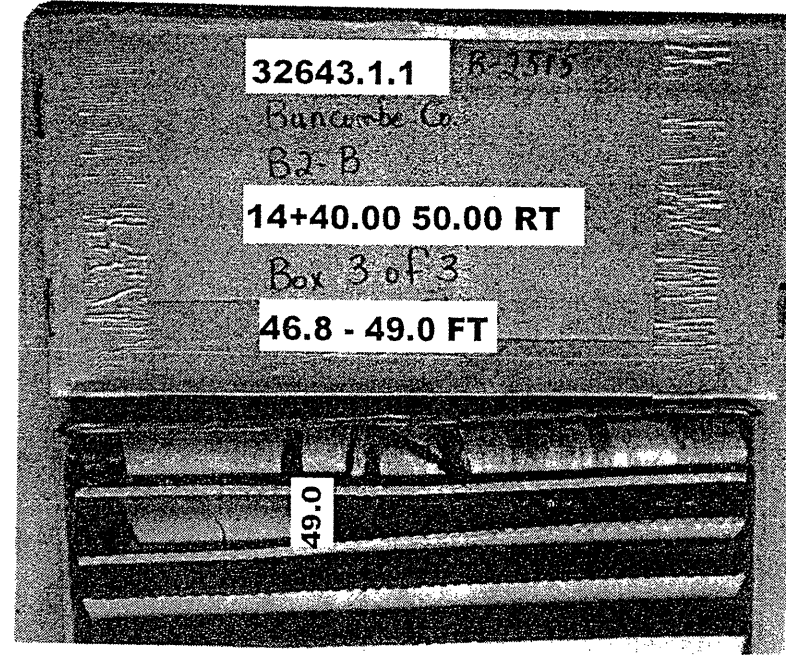


DEPTH: 27.9 - 37.8 FT	BOX 1 OF 3
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DEPTH: 37.8 - 46.8 FT	BOX 2 OF 3
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PROJECT NO.: 32643.1.1	I.D. NO.: B-2515
COUNTY: BUNCOMBE	BORING NO: B2-B



DEPTH: 46.8 - 49.0 FT	BOX 3 OF 3
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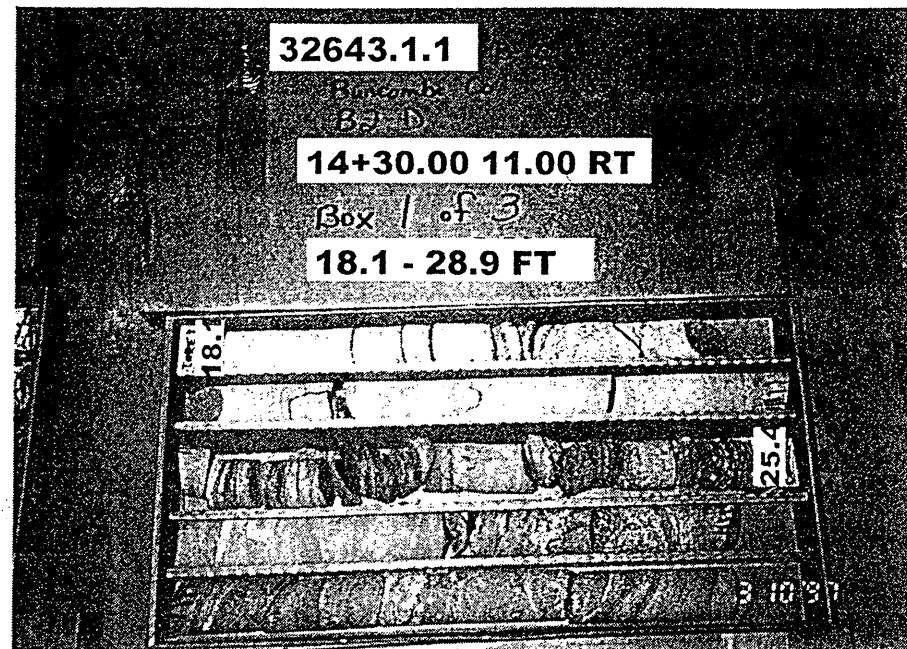
DEPTH:	BOX OF
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PROJECT NO.: 32643.1.1

I.D. NO.: B-2515

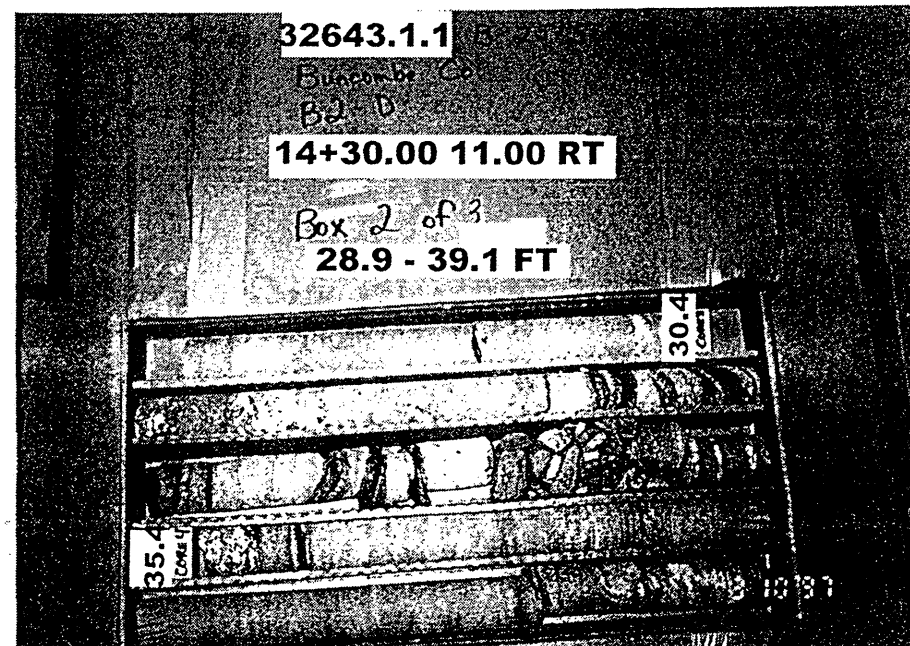
COUNTY: BUNCOMBE

BORING NO: B2-D



DEPTH: 18.1 - 28.9 FT

BOX 1 OF 3



DEPTH: 28.9 - 39.1 FT

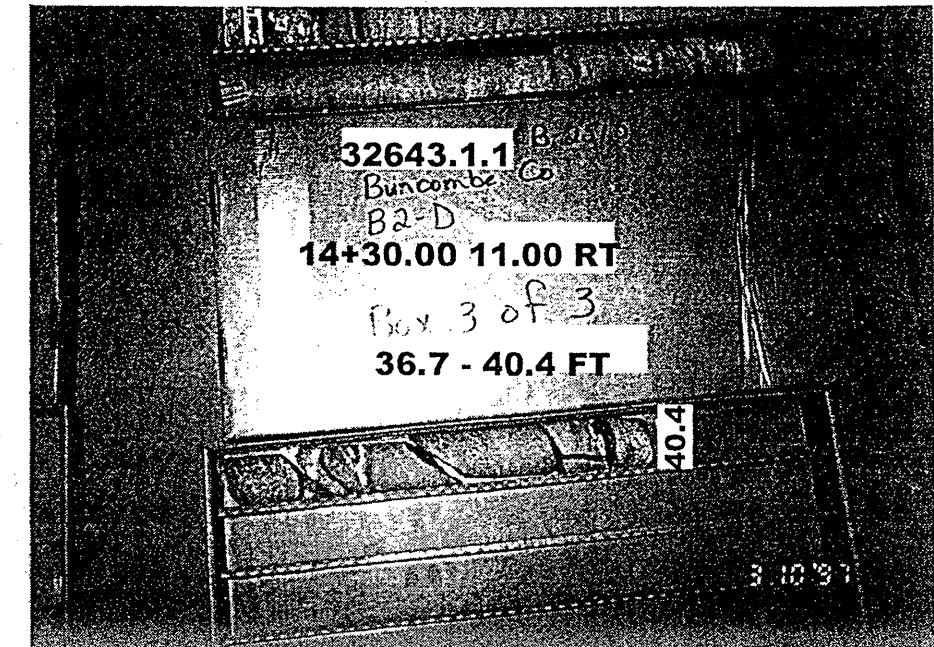
BOX 2 OF 3

PROJECT NO.: 32643.1.1

I.D. NO.: B-2515

COUNTY: BUNCOMBE

BORING NO: B2-D

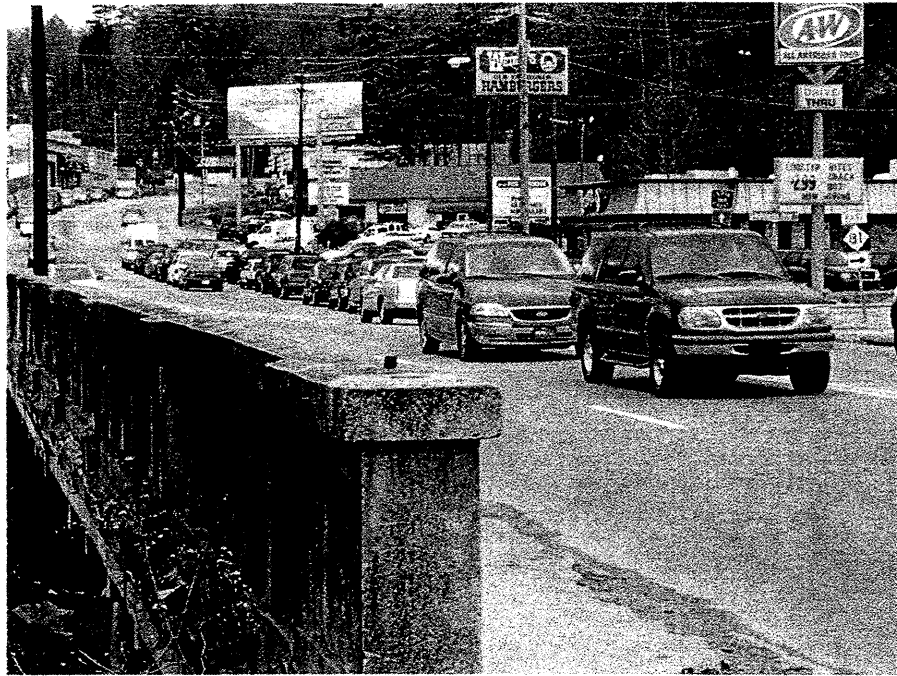


DEPTH: 36.7- 40.4 FT

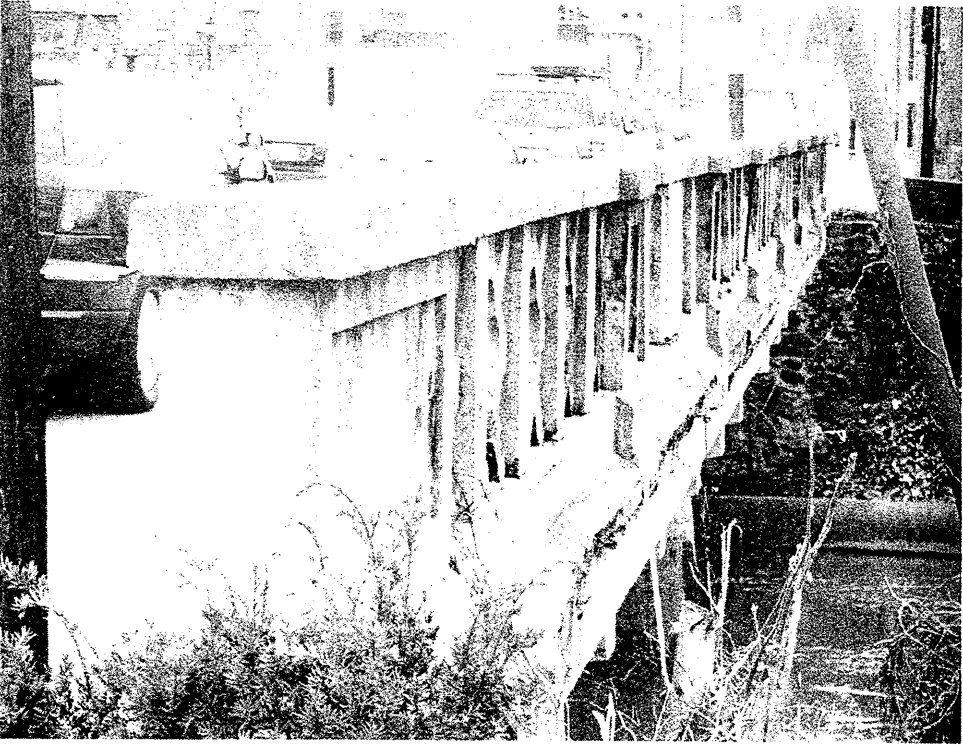
BOX 3 OF 3

DEPTH:

BOX OF



Looking north from EB1-A



Looking south from EB2-A



Looking north from EB1-B



Looking south from EB2-B. RR track is visible.