

PROJECT: 33356.1.1 ID: B-3922

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STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
STRUCTURE
SUBSURFACE INVESTIGATION

Table with 4 columns: STATE, STATE PROJECT REFERENCE NO., SHEET NO., TOTAL SHEETS. Values: N.C., B-3922, 1, 17.

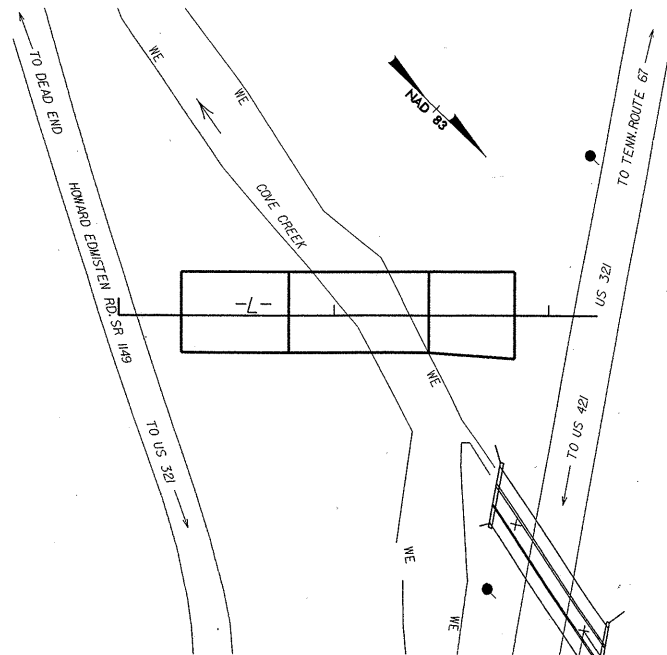
CAUTION NOTICE

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.

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 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.

STATE PROJECT 33356.1.1 I.D. NO. B-3922
F.A. PROJECT
COUNTY WATAUGA
DESCRIPTION BRIDGE NO. 316 ON SR-1149 OVER COVE CREEK



INVESTIGATED BY L.L. ACKER PERSONNEL L.L. ACKER
CHECKED BY W.D. FRYE D.O. CHEEK
SUBMITTED BY W.D. FRYE C.J. COFFEY
DATE JUNE 2004 G.K. ROSE

DRAWN BY: PO LOCKAMY

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.

Professional seal for Louis L. Acker, North Carolina Licensed Geologist, Seal 1007, with a handwritten signature.

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

ID	PROJECT NO.	SHEET NO.	TOTAL SHEETS
B-3922	33356.1.1	2	17

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION			GRADATION			ROCK DESCRIPTION			TERMS AND DEFINITIONS																																																																																													
<p>SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED OR WEATHERED EARTH MATERIALS WHICH CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND WHICH YIELDS LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM AND BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:</p> <p align="center"><i>VERY STIFF, GRAY SILTY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</i></p>			<p><u>WELL GRADED</u>- INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE <u>UNIFORM</u>- INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED) <u>GAP-GRADED</u>- INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.</p>			<p>HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WHEN TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:</p>			<p>ALLUVIUM (ALLUV.)- SOILS WHICH HAVE BEEN TRANSPORTED BY WATER. AQUIFER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH 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.) 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 (SREC) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (S.R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY: TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 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>SOIL LEGEND AND AASHTO CLASSIFICATION</p> <table border="1"> <tr> <th rowspan="2">GENERAL CLASS.</th> <th colspan="3">GRANULAR MATERIALS (< 75% PASSING #200)</th> <th colspan="3">SILT-CLAY MATERIALS (> 75% PASSING #200)</th> <th colspan="3">ORGANIC MATERIALS</th> </tr> <tr> <th>A-1</th> <th>A-3</th> <th>A-2</th> <th>A-4</th> <th>A-5</th> <th>A-6</th> <th>A-7</th> <th>A-1, A-2</th> <th>A-4, A-5</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></td> <td>A-7-5</td> <td>A-7-6</td> </tr> <tr> <td>SYMBOL</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 colspan="2">50 MX 30 MX50 15 MX25</td> <td colspan="2">35 MX35 10 MX10</td> <td colspan="2">35 MX35 10 MX10</td> <td colspan="2">35 MX35 10 MX10</td> <td colspan="2">35 MX35 10 MX10</td> </tr> <tr> <td>LIQUID LIMIT PLASTIC INDEX</td> <td colspan="2">6 MX</td> <td colspan="2">N.P.</td> <td colspan="2">40 MX41 MN 10 MX10</td> <td colspan="2">40 MX41 MN 10 MX10</td> <td colspan="2">40 MX41 MN 10 MX10</td> </tr> <tr> <td>GROUP INDEX</td> <td colspan="2">0</td> <td colspan="2">0</td> <td colspan="2">4 MX</td> <td colspan="2">8 MX12 MX</td> <td colspan="2">16 MX16 MX</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> </tr> <tr> <td>GEN. RATING AS A SUBGRADE</td> <td colspan="2">EXCELLENT TO GOOD</td> <td colspan="2">FAIR TO POOR</td> <td colspan="2">FAIR TO POOR</td> <td colspan="2">POOR</td> <td colspan="2">UNSUITABLE</td> </tr> </table> <p align="center">P.I. OF A-7-5 ≤ L.L. - 30 : P.I. OF A-7-6 > L.L. - 30</p>			GENERAL CLASS.	GRANULAR MATERIALS (< 75% PASSING #200)			SILT-CLAY MATERIALS (> 75% PASSING #200)			ORGANIC MATERIALS			A-1	A-3	A-2	A-4	A-5	A-6	A-7	A-1, A-2	A-4, A-5	GROUP CLASS.	A-1-a	A-1-b	A-2-4	A-2-5	A-2-6	A-2-7		A-7-5	A-7-6	SYMBOL										% PASSING	50 MX 30 MX50 15 MX25		35 MX35 10 MX10		35 MX35 10 MX10		35 MX35 10 MX10		35 MX35 10 MX10		LIQUID LIMIT PLASTIC INDEX	6 MX		N.P.		40 MX41 MN 10 MX10		40 MX41 MN 10 MX10		40 MX41 MN 10 MX10		GROUP INDEX	0		0		4 MX		8 MX12 MX		16 MX16 MX		USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL AND SAND		FINE SAND		SILTY OR CLAYEY GRAVEL AND SAND		SILTY SOILS		CLAYEY SOILS		GEN. RATING AS A SUBGRADE	EXCELLENT TO GOOD		FAIR TO POOR		FAIR TO POOR		POOR		UNSUITABLE		<p>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>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. SLI.) ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.</p> <p>SLIGHT (SLI.) ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.</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 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></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>		
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STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY
GOVERNOR

LYNDO TIPPETT
SECRETARY

June 3, 2004

STATE PROJECT: 33356.1.1
TIP NO: B-3922
COUNTY: Watauga

DESCRIPTION: Bridge No. 316 on SR 1149 over Cove Creek

SUBJECT: Geotechnical Report – Foundation Investigation

Site Description

Bridge number 316 is located in western Watauga County, approximately 7 miles west of Boone and 2.5 miles west of the junction of US 321 and US 421. The bridge is on SR 1149 at its intersection with US 321.

The existing bridge is to be replaced with a new structure on alignment -L- approximately 370 feet downstream. The new crossing is on a bend in the stream. A small tributary enters Cove Creek on the west bank about 100 feet upstream of -L-, flowing from the mouth of a 3-barrel concrete culvert beneath US 321.

Plans call for a new bridge constructed of pre-stressed girders in three spans of 50 feet, 65 feet and 40 feet, respectively, with a skew of 90 degrees.

Cove Creek is a major tributary of the Watauga River, with its headwaters on the flank of Rich Mountain, a 5000 foot ridge running north from the town of Boone to the Tennessee State Line. It is a turbulent, mountain stream 30 to 40 feet wide flowing on a bed of coarse sand, gravel and boulders, within banks 3 to 5 feet high. The flood plain at that point is 150 feet wide between the embankments of SR 1149 on one side and US 321 on the other side. An additional 100 feet of flood plain has been cut off by the US 321 roadway embankment. The floodplain is covered in grass and hay meadow, with a few scattered trees.

Cove Creek and the surrounding region experienced a moderate flood in the Fall of 2003, leaving evidence of its effects on the site of this project. The west bank of the creek on the proposed alignment was undercut and freshly eroded, as was the base of the

embankment on US 321 about 150 to 200 feet upstream of the proposed new crossing. The surface of the floodplain was eroded at new Bent Two and fresh deposits of gravel and small boulders were left. The edge of the channel migrated over the Right Side of Bent Two.

The Geotechnical Engineering Unit conducted a Foundation Investigation in April, 2004. Borings were made with a CME 550 all-terrain power drilling machine equipped with a rotary casing advancer and NXWL diamond coring tools. Two borings were made at each bent, including one core boring at each interior bent. Standard Penetration Tests (SPT's) were made at 2.5 or 5 foot intervals in soil and weathered rock, and quality samples were taken from soil strata. Six rock core samples were submitted for compression tests and 2 samples for splitting tensile tests. All tests were conducted by a DOT laboratory.

Soil and Rock Materials

Borings at the site found embankment soils, alluvium, saprolite, weathered rock and hard rock. Alluvial soils on the floodplain directly overlie weathered rock and hard rock. Saprolite was found underlying weathered rock and hard rock in one boring.

Alluvial soils are 7 to 9 feet thick and are typically composed of a few feet of dark brown, very soft silt (A-4) or clay (A-7) overlying loose sand and gravel with cobbles and boulders (A-1-b). Alluvium on the west bank around Bent Two is all loose sand and gravel (A-1-b) or silty sand (A-2-4) with suspended gravel.

Embankment soil is found only at End Bent One, where an old roadway embankment gives access to the floodplain from SR 1149. The soil is very soft, yellow-brown sandy silt (A-4) with suspended rock fragments and a few boulders.

The rock at this site comprises a variety of hard, crystalline lithologies, the most abundant of which are layered biotite gneiss and massive biotite gneiss. The layered biotite gneiss is composed of dark gray, biotite-rich layers alternating with light gray feldspar-rich layers .05 to .80 feet thick. Those biotite gneisses display moderately well-developed foliation that dips 25 degrees, parallel with the layering where present. Four additional lithologies are part of the stratified sequence found at Bent Two. They are light gray feldspathic gneiss; very coarse, white crystalline pegmatite; a feldspathic transition between the pegmatite and biotite gneiss with a well-developed shear foliation; and metagabbro composed chiefly of hornblende partially altered to chlorite and moderately well foliated. The foliation in those lithologies dips 10 to 20 degrees. Rock quality among all those lithologies varies from very poor to very good.

Bent Descriptions

End Bent One (EB1): This bent lies across an embankment beside the shoulder of SR 1149. The embankment is part of an old soil road from SR 1149 to the floodplain surface. The Left Side of the bent is on the surface of the floodplain and the Right Side is on the embankment.

MAILING ADDRESS:
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1589 MAIL SERVICE CENTER
RALEIGH NC 27699-1589

TELEPHONE: 919-250-4088
FAX: 919-250-4237
WEBSITE: WWW.DOH.DOT.STATE.NC.US

LOCATION:
CENTURY CENTER COMPLEX
BUILDING B
1020 BIRCH RIDGE DRIVE
RALEIGH NC 27610

A boring on the Left Side (EB1-A) penetrated alluvial soil consisting of 5.3 feet of very soft, sandy silt (A-4) overlying 2.9 feet of gravel with boulders or cobbles (A-1-b). Weathered rock was encountered at the base of the gravel at a depth of 8.2 feet. The bit continued through weathered rock to hard rock at 15.6 feet and then to termination with SPT spoon refusal at 19.0 feet. Static groundwater was found in this boring at elevation 2631.5 feet.

A boring on the Right Side (EB1-B) penetrated 8.0 feet of embankment soil consisting of very soft, sandy silt (A-4) with suspended rock fragments and a few boulders near the base. The embankment overlay alluvium composed of 4.0 feet of dark gray, very soft clay (A-7-5) grading downward to silt and sand near the base, then 2 feet of basal, loose, coarse sand and gravel (A-1-b). Weathered rock was encountered at the base of the gravel at 14.0 feet. The bit passed into hard rock at 15.2 feet. At 17.0 feet the bit broke out of hard rock into hard, silty saprolite (A-4) and continued in saprolite to a depth of 24.7 feet, where it entered weathered rock again. The boring was terminated in weathered rock at 25.0 feet. The hole caved before the static water table could be identified.

Bent One (B1): This bent lies on the floodplain and is centered about 30 feet east of the stream bank. A large willow tree is located on the Right Side of the bent. A boring on the Left Side (B1-A) penetrated 5.0 feet of alluvial, very soft, sandy silt (A-4) and 2 feet of basal gravel (A-1-b) to encounter weathered rock at a depth of 7.0 feet. The boring passed into hard rock at 7.8 feet and was terminated with SPT spoon refusal in hard rock at a depth of 9.9 feet. Static groundwater was found at elevation 2629.9 feet.

A boring on the Right Side (B1-B) penetrated 3.2 feet of alluvial, very soft, sandy silt (A-4) and 4.0 feet of alluvial gravel (A-1-b) to encounter weathered rock at a depth of 7.2 feet. The boring was carried through weathered rock with hard seams to hard rock at 9.2 feet, and continued. The core barrel was inserted at 10.9 feet and hard rock was cored from that point to termination at 25.7 feet. Coring recovered two lithologic strata of fresh, hard rock: an upper unit of layered biotite gneiss 6.7 feet thick (REC=94% RQD=87%) and a lower unit of massive biotite gneiss (REC=98% RQD=96%). Static groundwater was found in this boring at elevation 2631.2 feet.

Bent Two (B2): This bent is located on the west bank of the stream, with its Left Side on the floodplain and its Right Side in the stream channel. A boring on the Left Side (B2-A) found 9.0 feet of alluvial coarse sand and gravel (A-1-b), with boulders near the base, overlying weathered rock. The boring continued in weathered rock to 11.0 feet, at which point the core barrel was inserted, and hard rock was cored from that point to a final depth of 38.7 feet. A variety of hard, crystalline lithologies was penetrated, as given in the following table with depths and rock quality:

11.0- 13.7	moderately hard meta-gabbro, good quality
13.7 – 16.6	hard, slightly weathered, sheared pegmatite, very poor
16.6 – 21.2	hard, fresh pegmatite, very good
21.2 – 31.2	hard, slightly weathered, feldspathized transition from pegmatite to layered biotite gneiss, sheared, very poor (loss to core barrel malfunction)

31.2 – 33.2	hard, fresh felsic gneiss, good
33.2 – 35.9	moderately hard, fresh meta-gabbro, very good
35.9 – 38.7	hard, fresh layered biotite gneiss, very good

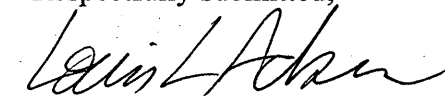
The boring caved at a shallow depth before the static groundwater table could be identified.

A boring on the Right Side (B2-B) found 11.2 feet of alluvium composed of 2.5 feet of surficial sand, gravel and cobbles (A-1-b) overlying 7.7 feet of loose to medium dense, silty sand with suspended pebbles (A-2-4) and 1.5 feet of basal gravel and boulders (A-1-b). The boring penetrated weathered rock with hard rock seams from the base of alluvium at 11.2 feet to continuous hard rock beginning at 19.0 feet, and the boring continued in hard rock to a termination depth of 23.1 feet. The static groundwater table was found at an elevation of 2631.1 feet.

End Bent Two (EB2)

This bent lies on the floodplain at the base of the US 321 embankment. Borings on the Left Side (EB2-A) and Right Side (EB2-B) recorded similar results. Alluvial soils were 7 to 8 feet thick composed of 1 to 2.5 feet of very loose, sandy silt (A-4) overlying 5 to 6 feet of gravel (A-1-b). Beneath the alluvium, the borings encountered a thin layer of weathered rock 1 to 2.5 feet thick, with hard rock seams. Reliable hard rock was found at approximately 9.5 feet in both borings, and the borings were terminated in hard rock at 11.7 and 11.3 feet, respectively. The static ground water table was found at 1.2 feet in EB2-A and at 2.0 feet in EB2-B.

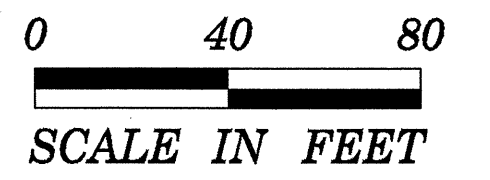
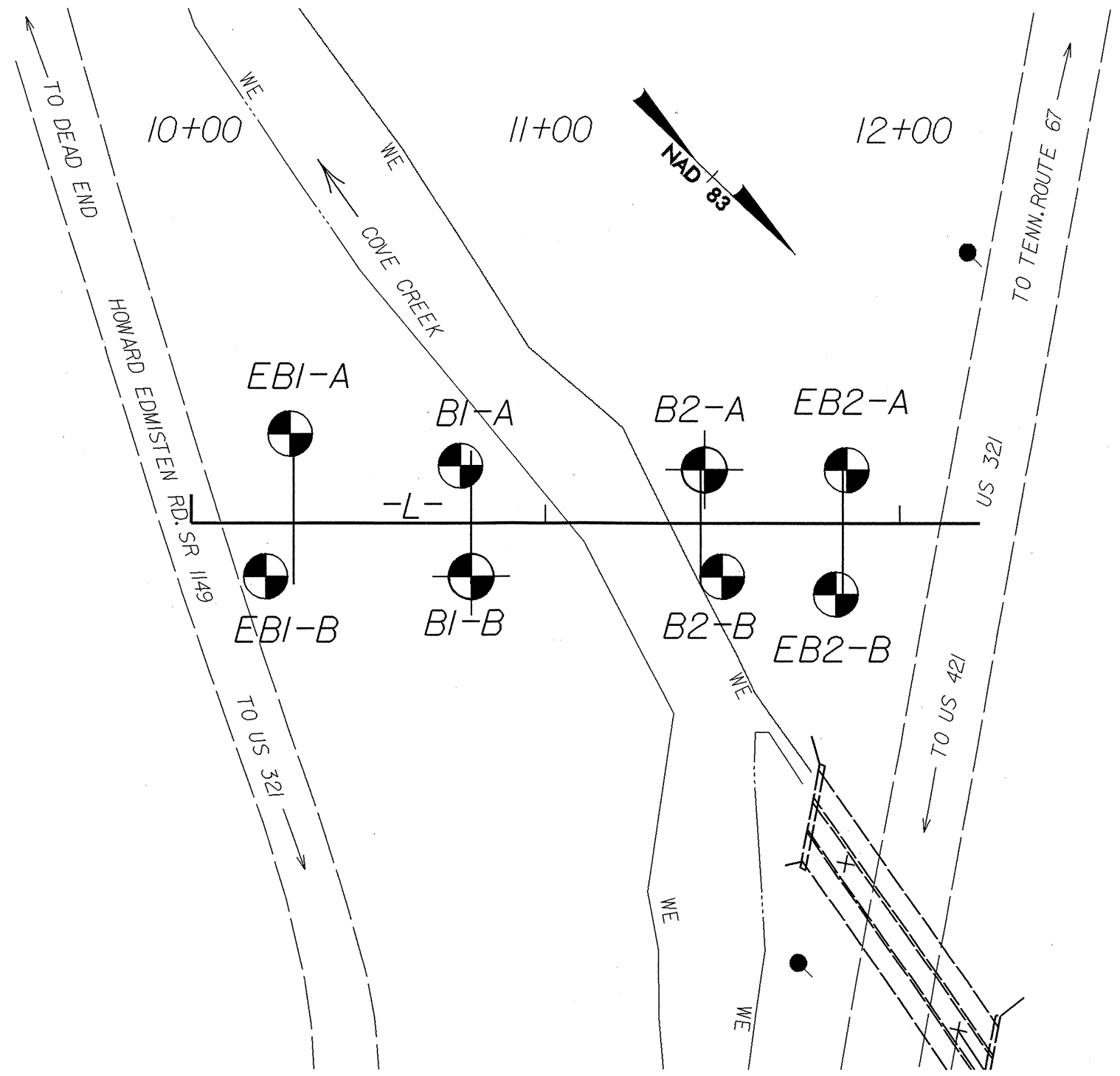
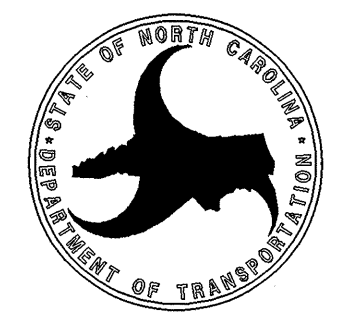
Respectfully submitted,



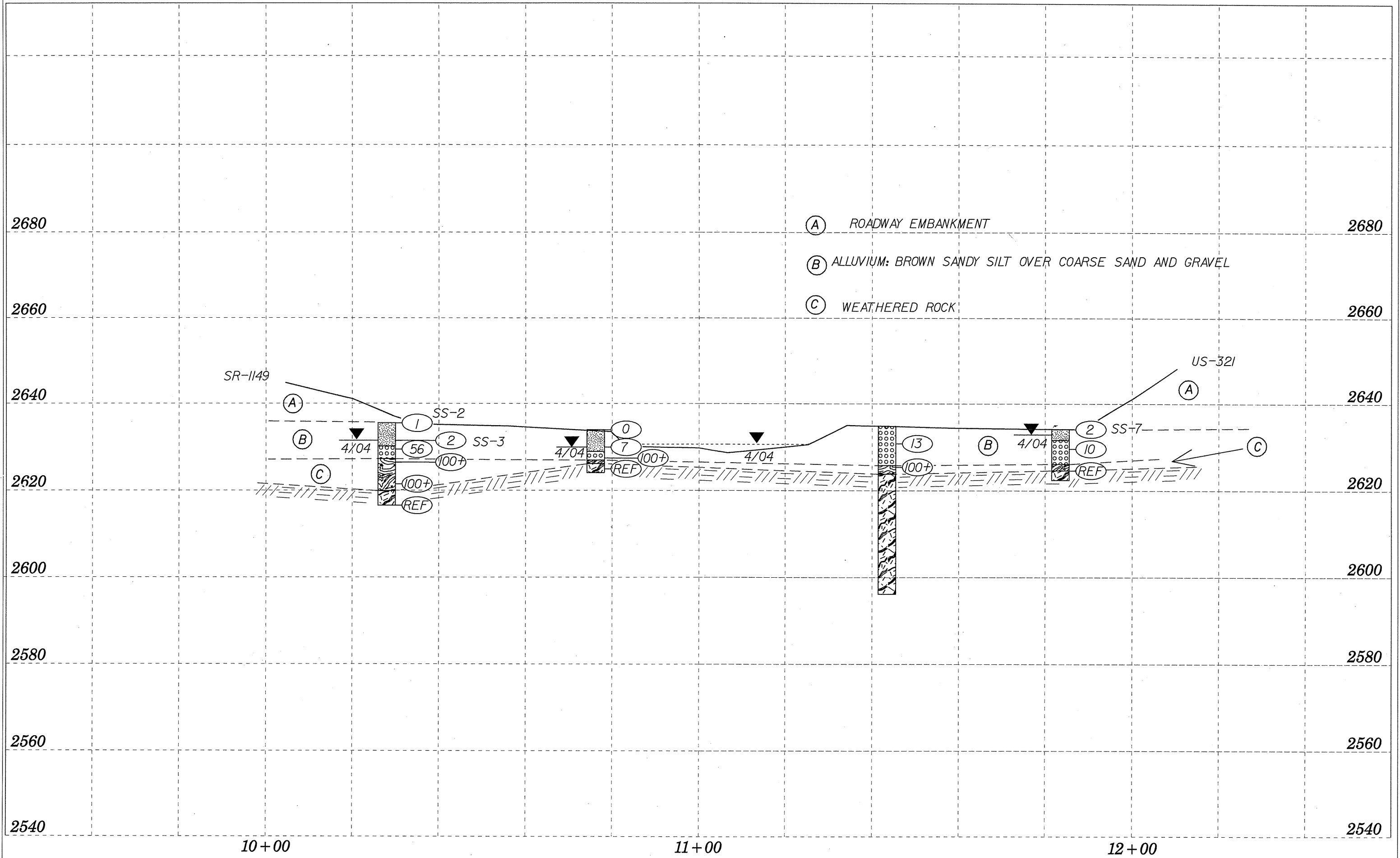
Louis L. Acker, LG
Project Geologist

BORING LOCATIONS

WATAUGA COUNTY BRIDGE 316 ON SR 1149 OVER COVE CREEK

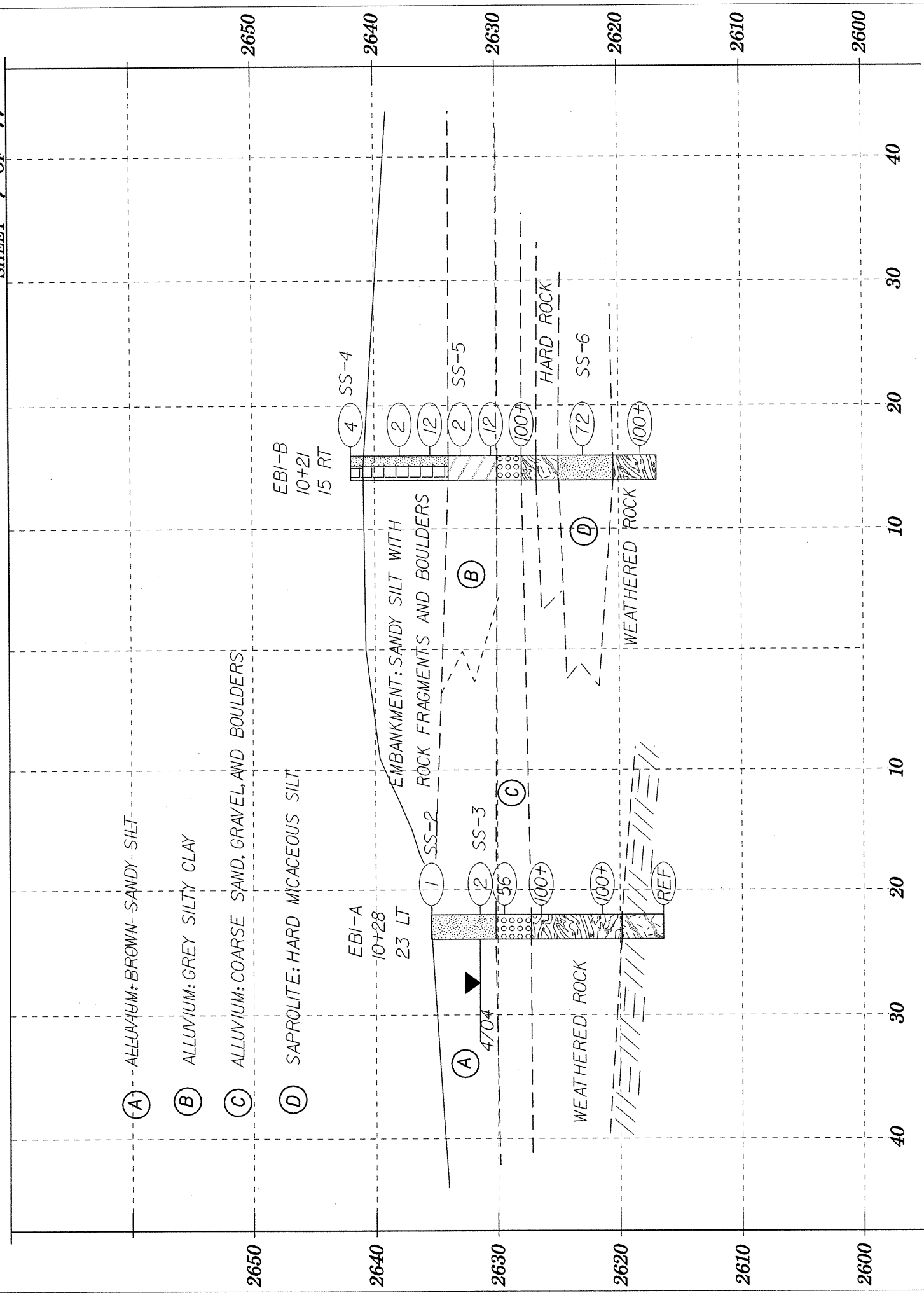


PROFILE 15 FEET LEFT



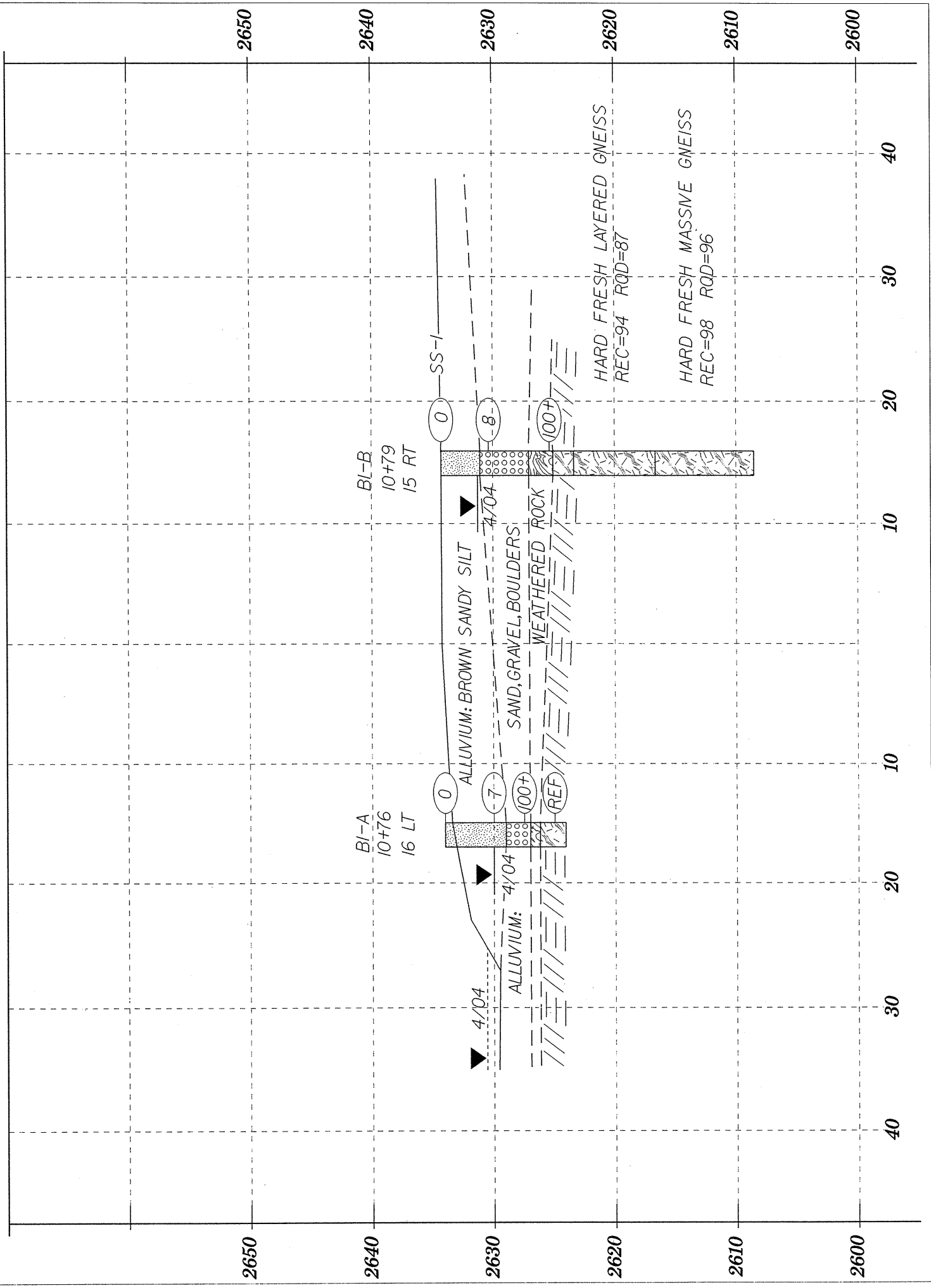
SECTION THROUGH EB1

PROJECT 33356.1.1
 COUNTY WATAUGA
 SHEET 7 OF 17



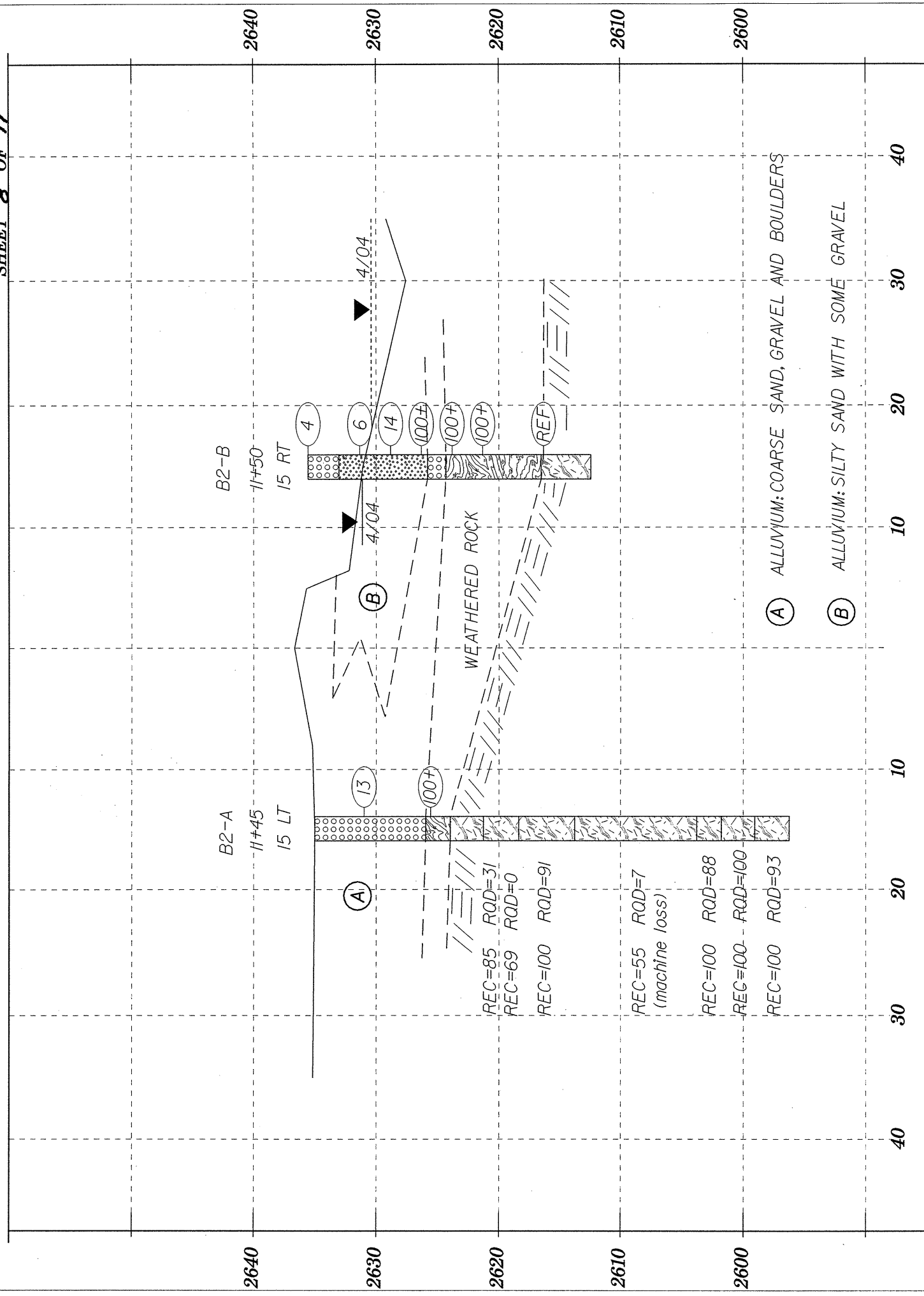
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PROJECT 33356.1.1
 COUNTY WATAUGA



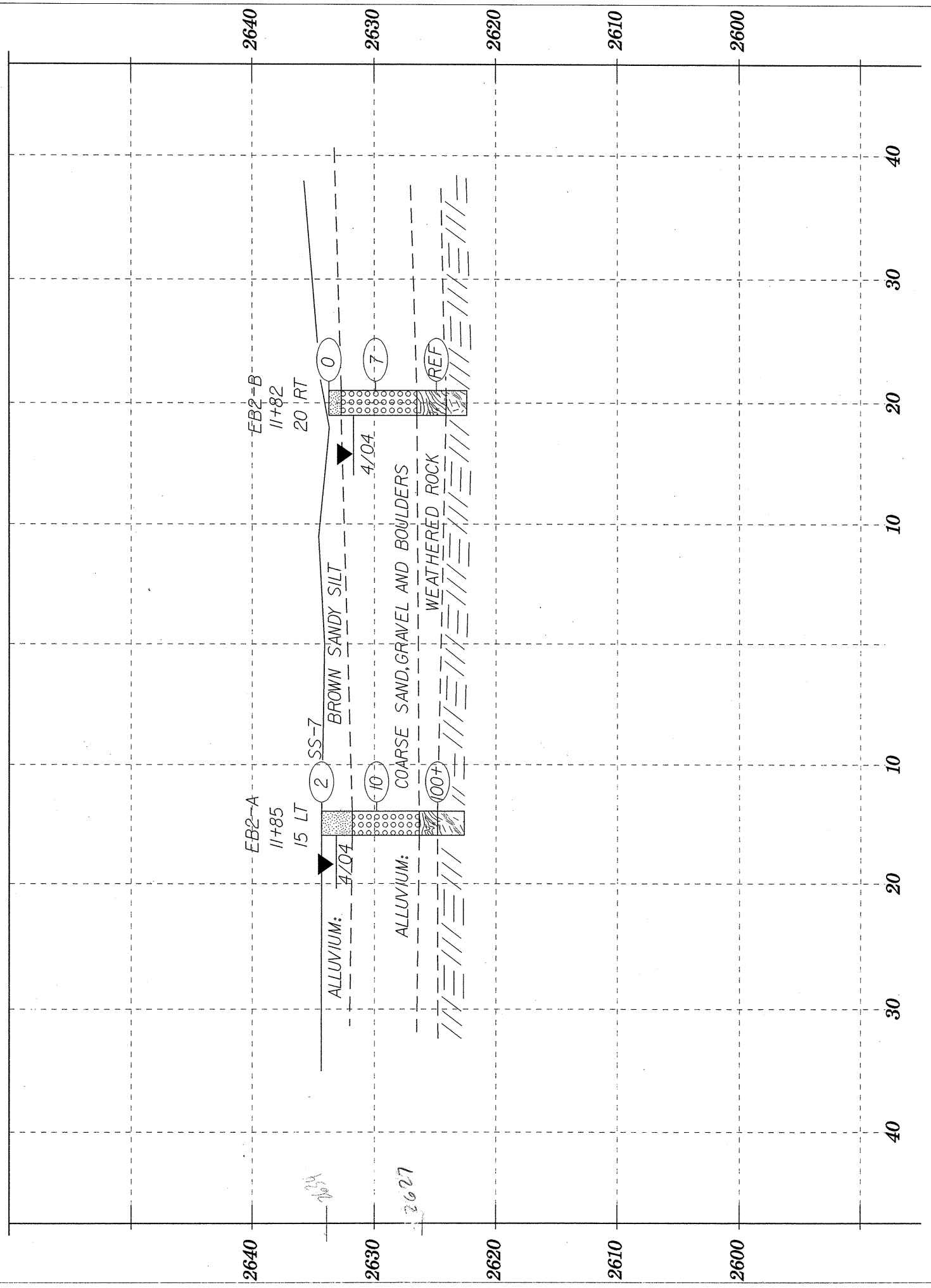
SECTION THROUGH B2

PROJECT 33356.1.1
 COUNTY WATAUGA
 SHEET 8 OF 17



SECTION THROUGH EB2

PROJECT 33356.1.1
 COUNTY WATAUGA



NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
 GEOTECHNICAL UNIT BORING LOG

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
 GEOTECHNICAL UNIT BORING LOG

PROJECT NO 33356.1.1		ID B-3922		COUNTY WATAUGA		GEOLOGIST L. L. ACKER						
SITE DESCRIPTION BRIDGE NO. 316 ON SR 1149 OVER COVE CREEK							GND WATER					
BORING NO EB1-A		NORTHING 0.00		EASTING 0.00		0 HR N/A						
ALIGNMENT -L-		BORING LOCATION 10+28.000		OFFSET 23.00ft LT		24 HR 4.00ft						
COLLAR ELEV 2635.50ft		TOTAL DEPTH 19.00ft		START DATE 4/20/04		COMPLETION DATE 04/20/04						
DRILL MACHINE CME 550			DRILL METHOD ROTARY W/O MUD			HAMMER TYPE AUTOMATIC						
SURFACE WATER DEPTH				DEPTH TO ROCK 15.60ft								
Log EB1-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			
2635.50	0.00	0	0	1	1.0	Ground Surface						
	4.00	0	0	2	1.0	1				SS-2	M	ALLUVIUM: BROWN SANDY SILT
2630.00	6.50	18	12	44	1.0	2				SS-3	W	ALLUVIUM: COARSE SAND, GRAVEL AND BOULDERS
	9.00	100			0.4	56						WEATHERED ROCK: BIOTITE GNEISS
	14.00	58	42		0.9	100						WEATHERED ROCK: BIOTITE GNEISS
2620.00						100						HARD ROCK: BIOTITE GNEISS
2616.50	19.00	100			0.0	100						TERMINATED BORING IN HARD ROCK AT ELEVATION 2616.5 FEET

PROJECT NO 33356.1.1		ID B-3922		COUNTY WATAUGA		GEOLOGIST L. L. ACKER						
SITE DESCRIPTION BRIDGE NO. 316 ON SR 1149 OVER COVE CREEK							GND WATER					
BORING NO EB1-B		NORTHING 0.00		EASTING 0.00		0 HR N/A						
ALIGNMENT -L-		BORING LOCATION 10+21.000		OFFSET 15.00ft RT		24 HR N/A						
COLLAR ELEV 2641.90ft		TOTAL DEPTH 25.00ft		START DATE 4/20/04		COMPLETION DATE 04/20/04						
DRILL MACHINE CME 550			DRILL METHOD ROTARY W/O MUD			HAMMER TYPE AUTOMATIC						
SURFACE WATER DEPTH N/A				DEPTH TO ROCK N/A								
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			
2641.90	0.00	1	3	1	1.0	Ground Surface						
2640.00						4				SS-4	M	EMBANKMENT: YELLOW-BROWN SANDY SILT WITH FEW ROCK FRAGMENTS TO BOULDERS
	4.00	1	1	1	1.0	2						
	6.50	9	9	3	1.0	12						
	9.00	1	1	1	1.0	2				SS-5	W	ALLUVIUM: DARK GRAY SILTY CLAY
2630.00	11.50	0	6	6	1.0	12						
	14.00	71	29		0.9	100						ALLUVIUM: COARSE SAND, GRAVEL AND BOULDERS
	19.00	47	40	32	1.0	72				SS-6	M	WEATHERED ROCK HARD ROCK
2620.00						100						SAPROLITE: GRAY-BROWN, MICACEOUS SILT
2616.90	23.70	27	30	70	0.7	100						WEATHERED ROCK
TERMINATED BORING IN WEATHERED ROCK AT ELEVATION 2616.9 FEET.												

**NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG**

PROJECT NO 33356.1.1		ID B-3922		COUNTY WATAUGA		GEOLOGIST L. L. ACKER							
SITE DESCRIPTION BRIDGE NO. 316 ON SR 1149 OVER COVE CREEK							GND WATER						
BORING NO B1-A		NORTHING 0.00		EASTING 0.00		0 HR N/A							
ALIGNMENT -L-		BORING LOCATION 10+76.000		OFFSET 16.00ft LT		24 HR 4.00ft							
COLLAR ELEV 2634.00ft		TOTAL DEPTH 9.90ft		START DATE 4/20/04		COMPLETION DATE 04/20/04							
DRILL MACHINE CME 550			DRILL METHOD ROTARY W/O MUD			HAMMER TYPE AUTOMATIC							
SURFACE WATER DEPTH			DEPTH TO ROCK 7.80ft			Log B1-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				100
2634.00	0.00	0	0	0	1.0								
2630.00	4.00	1	2	5	1.0								ALLUVIUM: DARK BROWN, SANDY SILT
	6.50	22	78		0.5								ALLUVIUM: COARSE SAND, GRAVEL AND BOULDERS
2624.10	9.00	100			0.1								WEATHERED ROCK
						TERMINATED BORING IN HARD ROCK AT ELEVATION 2624.1 FEET.							HARD ROCK: BIOTITE GNEISS

**NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG**

PROJECT NO 33356.1.1		ID B-3922		COUNTY WATAUGA		GEOLOGIST L. L. ACKER						
SITE DESCRIPTION BRIDGE NO. 316 ON SR 1149 OVER COVE CREEK							GND WATER					
BORING NO B1-B		NORTHING 0.00		EASTING 0.00		0 HR N/A						
ALIGNMENT -L-		BORING LOCATION 10+79.000		OFFSET 15.00ft RT		24 HR 3.00ft						
COLLAR ELEV 2634.20ft		TOTAL DEPTH 25.70ft		START DATE 4/19/04		COMPLETION DATE 04/19/04						
DRILL MACHINE CME 550			DRILL METHOD SPT CORE BORING			HAMMER TYPE AUTOMATIC						
SURFACE WATER DEPTH			DEPTH TO ROCK 9.20ft			Log B1-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			
2634.20	0.00	0	0	0	1.0							
						Ground Surface						
2630.00	3.90	3	3	5	1.0	0	8			SS-1	M	ALLUVIUM: BROWN SANDY SILT
												ALLUVIUM: SILTY SAND, GRAVEL AND BOULDERS
	8.90	100			0.5				100			WEATHERED ROCK WITH HARD ROCK SEAMS
2620.00										CORE 1		HARD ROCK: NOT CORED
										CORE 2		HARD ROCK: HARD, FRESH, LAYERED BIOTITE GNEISS REC=94 RQD=87
										CORE 3		HARD ROCK: HARD, FRESH, MASSIVE BIOTITE GNEISS REC=98 RQD=96
2610.00										CORE 4		
2608.50						TERMINATED BORING IN HARD ROCK AT ELEVATION 2608.5 FEET.						

PROJECT NO: 33356.1.1 (B-3922)
WATAUGA COUNTY

CORE BORING REPORT
B1-B

CORE 1: 10.9 – 13.2 REC=91% RQD=70%
 CORE 2: 13.2 – 18.2 REC=94% RQD=87%
 CORE 3: 18.2 – 23.2 REC=100% RQD=100%
 CORE 4: 23.2 – 25.7 REC=96% RQD=92%

LAYER 1: 10.9 – 17.6 Hard, fresh, layered biotite gneiss with mylonitic texture. Layers are dark, biotite-rich and light, feldspar-rich 0.05 to 0.8 feet thick. 13 pieces, longest piece 1.3 feet. Well foliated. Layering and foliation are parallel, dipping 25 degrees. 8 joints on foliation, smooth to moderately rough, coated with mica. 2 joints at 10-20 degrees opposite to foliation, rough, clean. 2 joints at 60 degrees, rough, clean.
REC=94% RQD=87%

LAYER 2: 17.6 – 25.7 Hard, fresh, massive biotite gneiss with porphyroclastic mylonitic texture. 9 pieces, longest piece 2.0 feet. Foliated at 20 degrees. 6 joints on foliation, moderately rough, coated with a little mica. 1 joint at 40 degrees, rough, clean.
REC=98% RQD=96%

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO 33356.1.1		ID B-3922		COUNTY WATAUGA		GEOLOGIST L. L. ACKER							
SITE DESCRIPTION BRIDGE NO. 316 ON SR 1149 OVER COVE CREEK							GND WATER						
BORING NO B2-A		NORTHING 0.00		EASTING 0.00		0 HR N/A	24 HR N/A						
ALIGNMENT -L-		BORING LOCATION 11+45.000		OFFSET 15.00ft LT									
COLLAR ELEV 2635.00ft		TOTAL DEPTH 38.70ft		START DATE 4/20/04		COMPLETION DATE 04/20/04							
DRILL MACHINE CME 550			DRILL METHOD H.S. AUGERS			HAMMER TYPE AUTOMATIC							
SURFACE WATER DEPTH			DEPTH TO ROCK 11.00ft			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				100
2635.00													
2630.00	4.00	18	6	7	1.0								ALLUVIUM: SAND AND GRAVEL TO BOULDERS
	9.40	100			0.2								WEATHERED ROCK
2620.00													HARD ROCK: MOD. HARD, SLI. WEATHERED META-GABBRO REC=85 RQD=31
													HARD ROCK: HARD, SLI. WEATHERED PEGMATITE REC=69 RQD=0
													HARD ROCK: HARD, FRESH PEGMATITE REC=100 RQD=91
2610.00													HARD ROCK: HARD, SLI. WEATHERED, SHEARED TRANSITION FROM PEGMATITE TO BIOTITE GNEISS REC=55 RQD=7 (MACHINE LOSS)
2600.00													HARD ROCK: HARD, FRESH FELSIC GNEISS REC=100 RQD=88
													HARD ROCK: HARD, FRESH META-GABBRO REC=100 RQD=100
2596.30													HARD ROCK: HARD, FRESH, LAYERED BIOTITE GNEISS REC=100 RQD=93
													TERMINATED BORING IN HARD ROCK AT ELEVATION 2596.3 FEET.

PROJECT NO: 33356.1.1 (B-3922)
WATAUGA COUNTY

CORE BORING REPORT
B2-A

CORE 1: 11.0 – 13.7 REC=85% RQD=31%
 CORE 2: 13.7 – 18.7 REC=82% RQD=42%
 CORE 3: 18.7 – 23.7 REC=82% RQD=56%
 CORE 4: 23.7 – 28.7 REC=33% RQD=0%
 CORE 5: 28.7 – 33.7 REC=95% RQD=58%
 CORE 6: 33.7 – 38.7 REC=100% RQD=97%

LAYER 1: 11.0 – 13.7 Moderately hard, slightly weathered, hornblende-chlorite meta-gabbro, massive, highly fractured, well-foliated at 20 degrees. Severely weathered at base. >20 pieces, longest piece 0.9 feet. Joints indeterminate, most at 20 degrees or 70 degrees, clean or coated with Fe-oxide. REC=85% RQD=31%

LAYER 2: 13.7 – 16.6 Hard, slightly weathered, fractured white pegmatite. Poorly developed micaceous shear cleavage at 20 degrees. 30 pieces, longest piece 0.3 feet. Joints indeterminate and numerous due to weathering on shear cleavage, mica coated. REC=69% RQD=0%

LAYER 3: 16.6 – 21.2 Hard, fresh, white pegmatite. 5 pieces, longest piece 1.5 feet. Thin, micaceous shear planes dipping 20 degrees, most not open. 5 joints at 20 degrees on shear planes, smooth to moderately rough, coated with mica. REC=100% RQD=91%

LAYER 4: 21.2 – 31.2 Hard, slightly weathered transition from sheared pegmatite to layered biotite gneiss. 33 pieces, longest piece 0.45 feet. Poorly foliated and more or less layered, dipping about 20-25 degrees. 14 joints on foliation, moderately rough, clean or with a little Fe-oxide. 8 joints at 0-10 degrees, moderately rough, clean. One joint at 80-90 degrees, rough, coated with chlorite. Severely weathered seam at basal 0.1 foot. Most core loss due to core barrel malfunction. REC=55% RQD=6.5%

LAYER 5: 31.2 – 33.2 Hard, fresh felsic gneiss. 3 pieces, longest piece 1.75 feet. Very poorly foliated at 10 degrees. 3 joints on foliation close together, smooth, clean. REC=100% RQD=88%

LAYER 6: 33.2 – 35.9 Moderately hard, fresh, hornblende-chlorite meta-gabbro. 2 pieces, longer piece 2.2 feet. Well foliated at 10 degrees. REC=100% RQD=100%

LAYER 7: 35.9 – 38.7 Hard, fresh, layered biotite gneiss. 8 pieces, longest piece 0.9 feet. Foliated parallel with layering at 10 degrees. Layers are 0.05 to 0.5 feet thick. 7 joints on foliation, smooth, clean. REC=100% RQD=93%

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
 GEOTECHNICAL UNIT BORING LOG

13 OF 17

PROJECT NO 33356.1.1	ID B-3922	COUNTY WATAUGA	GEOLOGIST L. L. ACKER
SITE DESCRIPTION BRIDGE NO. 316 ON SR 1149 OVER COVE CREEK			GND WATER
BORING NO B2-B	NORTHING 0.00	EASTING 0.00	0 HR N/A
ALIGNMENT -L-	BORING LOCATION 11+50.000	OFFSET 15.00ft RT	24 HR 4.40ft
COLLAR ELEV 2635.50ft	TOTAL DEPTH 23.10ft	START DATE 4/21/04	COMPLETION DATE 04/21/04
DRILL MACHINE CME 550	DRILL METHOD ROTARY W/O MUD	HAMMER TYPE AUTOMATIC	
SURFACE WATER DEPTH N/A	DEPTH TO ROCK 19.00ft	Log B2-B, Page 1 of 1	

ELEV	DEPTH	BLOW CT			PEN (ft)	BLOWS PER FOOT					SAMPLE NO	LOG MOI	SOIL AND ROCK DESCRIPTION
		6in	6in	6in		0	25	50	75	100			
2635.50	0.00	1	1	3	1.0	Ground Surface							
	4.20	8	3	3	1.0	4							ALLUVIUM: SAND AND GRAVEL TO BOULDERS
2630.00	6.70	11	8	6	1.0	6							ALLUVIUM: SILTY SAND WITH A LITTLE GRAVEL
	9.20	16	100		0.2	14							
	11.70	70	31	69	0.9	100							ALLUVIAL: BOULDERS
2620.00	14.20	100			0.2	100							WEATHERED ROCK AND HARD ROCK SEAMS
	19.20	100			0.1	100							HARD ROCK
2612.40						TERMINATED BORING IN HARD ROCK AT ELEVATION 2612.4 FEET.							

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO 33356.1.1		ID B-3922		COUNTY WATAUGA		GEOLOGIST L. L. ACKER							
SITE DESCRIPTION BRIDGE NO. 316 ON SR 1149 OVER COVE CREEK							GND WATER						
BORING NO EB2-A		NORTHING 0.00		EASTING 0.00		0 HR N/A							
ALIGNMENT -L-		BORING LOCATION 11+85.000		OFFSET 15.00ft LT		24 HR 1.20ft							
COLLAR ELEV 2634.30ft		TOTAL DEPTH 11.70ft		START DATE 4/21/04		COMPLETION DATE 04/21/04							
DRILL MACHINE CME 550			DRILL METHOD ROTARY W/O MUD			HAMMER TYPE AUTOMATIC							
SURFACE WATER DEPTH			DEPTH TO ROCK 9.50ft			Log EB2-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				100
2634.30	0.00	0	0	2	1.0								Ground Surface
2630.00	4.50	4	3	7	1.0								ALLUVIUM: DARK BROWN, SANDY SILT
	9.50	100			0.1								ALLUVIUM: SAND, GRAVEL AND COBBLES WITH BASAL BOULDERS
2622.60													WEATHERED ROCK
													HARD ROCK
TERMINATED BORING IN HARD ROCK AT ELEVATION 2622.6 FEET.													

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO 33356.1.1		ID B-3922		COUNTY WATAUGA		GEOLOGIST L. L. ACKER							
SITE DESCRIPTION BRIDGE NO. 316 ON SR 1149 OVER COVE CREEK							GND WATER						
BORING NO EB2-B		NORTHING 0.00		EASTING 0.00		0 HR N/A							
ALIGNMENT -L-		BORING LOCATION 11+82.000		OFFSET 20.00ft RT		24 HR 2.00ft							
COLLAR ELEV 2633.70ft		TOTAL DEPTH 11.30ft		START DATE 4/21/04		COMPLETION DATE 04/21/04							
DRILL MACHINE CME 550			DRILL METHOD ROTARY W/O MUD			HAMMER TYPE AUTOMATIC							
SURFACE WATER DEPTH			DEPTH TO ROCK 9.60ft			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
2633.70	0.00	0	0	0	1.0								Ground Surface
2630.00	3.80	1	2	5	1.0								ALLUVIUM: DARK BROWN, SANDY SILT
	8.80	100			0.3								ALLUVIUM: SAND, GRAVEL AND COBBLES
2622.40													WEATHERED ROCK
													HARD ROCK
TERMINATED BORING IN HARD ROCK AT ELEVATION 2622.4 FEET.													

GEOTECHNICAL ENGINEERING UNIT FIELD SCOUR REPORT

PROJECT: 33356.1.1 ID: B-3922 COUNTY: WATAUGA

DESCRIPTION(1): BRIDGE NO. 316 ON SR 1149 OVER COVE CREEK

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

COUNTY BRIDGE NO. 316 BRIDGE LENGTH 60 FT NO. BENTS IN: CHANNEL 3 FLOOD PLAIN 2

FOUNDATION TYPE: _____

EVIDENCE OF SCOUR(2):

ABUTMENTS OR END BENT SLOPES: NONE

INTERIOR BENTS: SCOUR ON WEST BANK AT NEW B2

CHANNEL BED: SCOUR POOL IN CHANNEL BED

CHANNEL BANKS: SCOUR ON WEST BANK AND ALONG BASE OF US321 EMB. UPSTR. OF NEW BRIDGE

EXISTING SCOUR PROTECTION:

TYPE(3): NONE

EXTENT(4) N/A

EFFECTIVENESS(5): N/A

OBSTRUCTIONS(6) (DAMS, DEBRIS, ETC.): 3 BARREL CULVERT AT MOUTH OF TRIBUTARY 100 FT UPSTR.

DESIGN INFORMATION

CHANNEL BED MATERIAL(7) (SAMPLE RESULTS ATTACHED): FINE TO COARSE SAND AND GRAVEL

CHANNEL BANK MATERIAL(8) (SAMPLE RESULTS ATTACHED): SANDY SILT (SE SS-1)

FOUNDATION BEARING MATERIAL(9): WEATHERED ROCK AND HARD ROCK

CHANNEL BANK COVER(10) GRASS

FLOOD PLAIN WIDTH(11): 200 FEET

FLOOD PLAIN COVER(12): GRASS AND FEW TREES

DESIGN INFORMATION CONT.

STREAM IS DEGRADING AGGRADING (13)

OTHER OBSERVATIONS AND COMMENTS: RECENT FLOOD ERODED BANK AT NEW B2-B SITE

AND AT BASE OF US 321 EMBANKMENT

CHANNEL MIGRATION TENDENCY (14): HARD CURRENT AGAINST WEST BANK AT NEW B2

GEOTECHNICALLY ADJUSTED SCOUR ELEVATION (15):

EB1-A	2626.3 FT	EB1-B	2626.9 FT
B1-A	2626.2 FT	B1-B	2626.0 FT
B2-A	2625.0 FT	B2-B	2623.3 FT
EB2-A	2625.3 FT	EB2-B	2625.5 FT

REPORTED BY: L. L. ACKER DATE: 6/9/04

INSTRUCTIONS

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

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

PROJECT NO: 33356.1.1 (B-3922)
 WATAUGA COUNTY

T.I.P. ID #: 8-3922

REPORT ON SAMPLES OF: Soil for Classification

PROJECT:	33356.1.1	COUNTY:	Watauga	Owner:	--
DATE SAMPLED:	4-19-04	DATE RECEIVED:	5-3-04	DATE REPORTED:	5-20-04
SAMPLED FROM:	Rdw - Foundation	SAMPLED BY:	L L Acker		
SUBMITTED BY:	W D Frye	2002	STANDARD SPECIFICATION		
LABORATORY:	Asheville				

TEST RESULTS

Project Sample No.	SS-1	SS-2	SS-3	SS-4	SS-5	SS-6	SS-7
Lab Sample No. A-	145275	145276	145277	145278	145279	145280	145281
HiCAMS Sample #	--	--	--	--	--	--	--
Retained #4 Sieve %	--	--	--	--	--	--	--
Passing #10 Sieve %	99	88	100	73	100	100	100
Passing #40 Sieve %	91	80	99	60	99	88	97
Passing #200 Sieve %	42	59	77	41	89	60	64

MINUS #10 FRACTION

Soil Mortar - 100%							
Coarse Sand -Ret. #60	23	13	3	26	1	21	10
Fine Sand - Ret. #270	48	34	34	26	23	33	39
Silt 0.05-0.005 mm %	19	37	47	32	54	38	35
Clay < 0.005 mm %	10	16	16	16	22	8	16
Passing # 40 Sieve %	--	--	--	--	--	--	--
Passing # 200 Sieve %	--	--	--	--	--	--	--

Liquid Limit	27	29	38	31	51	32	34
Plastic Index	NP	9	8	5	16	5	7
AASHTO Classification	A-4 (1)	A-4 (5)	A-4 (8)	A-4 (1)	A-7-5 (13)	A-4 (5)	A-4 (6)
Quantity							
Texture							
Station	10+79 Rt	10+28 Lt	10+28 Lt	10+21 Rt	10+21 Rt	10+121 Rt	11+85 Lt
Hole No.	B1-B	EB1-A	EB1-A	EB1-B	EB1-B	EB1-A	EB2-A
Depth (ft) From:	0.5	0.5	4.5	0.5	9.5	19.5	0.5
To:	1.5	1.5	5.5	1.5	10.5	20.5	1.5

Remarks:

CC:

W D Frye	
J J Lail	
File	

SOILS ENGINEER:

CORE PHOTOGRAPHS
B1-B



B2-A



PROJECT NO: 33356.1.1 (B-3922)
WATAUGA COUNTY



Figure 1. Bridge 316 on SR 1149. View looking upstream.



Figure 2. Looking downstream from Bridge 316 toward new bridge site on -L-. Willow tree is on Bent One. US 321 is on right side of photo.

PROJECT NO: 33356.1.1 (B-3922)
WATAUGA COUNTY



Figure 3. Drilling on B1-A. View looking back along -L- from shoulder of US 321.



Figure 4. View looking upstream across -L-. Drilling on B1-A. Note fresh erosion on stream bank at B2 and at base of US 321 embankment.