

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-4261	1	10

*J. Faragher*

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

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**STRUCTURE**  
**SUBSURFACE INVESTIGATION**

PROJ. REFERENCE NO. 33603.1.1 F.A. PROJ. BRZ-1520(4)  
COUNTY RUTHERFORD  
PROJECT DESCRIPTION BRIDGE NO. 37 OVER CATHEY'S CREEK  
AND BRIDGE NO. 39 OVER THE FORK OF CATHEY'S CREEK  
ON SR 1520  
SITE DESCRIPTION BRIDGE NO. 39 OVER FORK OF CATHEY'S  
CREEK ON SR 1520

**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.

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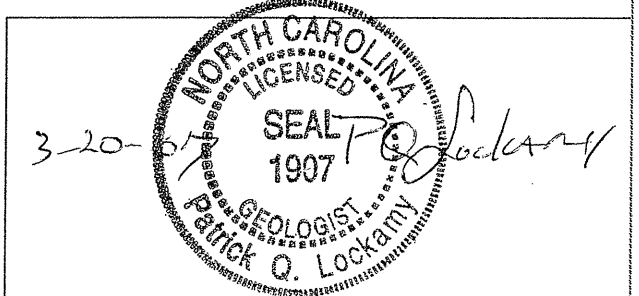
G.K. ROSE

INVESTIGATED BY P.Q. LOCKAMY

CHECKED BY W.D. FRYE

SUBMITTED BY W.D. FRYE

DATE 3.21.07



**PROJECT: 33603.1.1 ID: B-4261**

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

PROJECT REFERENCE NO.  
B-4261  
SHEET NO.  
2

## SUBSURFACE INVESTIGATION

### SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS
SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, 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: <i>VERY STIFF, GRAY, SILTY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HIGH PLASTIC, A-7-6</i>	WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED) GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.  ANGULARITY OF GRAINS THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.	HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF 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:  WEATHERED ROCK (WR)  NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.  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.  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.  COASTAL PLAIN SEDIMENTARY ROCK (CPS)  COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. AQUIFER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. CALCAREOUS (CALC.) - SOILS THAT 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 (FP) - 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 (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. 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. SAPROLITE (SAP) - RESIDUAL SOIL THAT 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, THAT 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 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. STRATA CORE RECOVERY (SCRC) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (SRQD) - 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 (TS) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
<b>SOIL LEGEND AND AASHTO CLASSIFICATION</b>	<b>MINERALOGICAL COMPOSITION</b>	<b>WEATHERING</b>	
GENERAL CLASS. GRANULAR MATERIALS (<= 35% PASSING #200) SILT-CLAY MATERIALS (> 35% PASSING #200) ORGANIC MATERIALS	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE. VERY SLIGHT (V SL) ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN. CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE. SLIGHT (SL) ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. MODERATE (MOD) SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK. MODERATELY SEVERE (MOD. SEV) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. <i>IF TESTED, WOULD YIELD SPT REFUSAL</i> SEVERE (SEV) ALL 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 &gt; 100 BPF</i> VERY SEVERE (V SEV) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. <i>IF TESTED, YIELDS SPT N VALUES &lt; 100 BPF</i> COMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.	
<b>COMPRESSION</b>	<b>PERCENTAGE OF MATERIAL</b>	<b>GROUND WATER</b>	
SLIGHTLY COMPRESSIBLE LIQUID LIMIT LESS THAN 31 MODERATELY COMPRESSIBLE LIQUID LIMIT EQUAL TO 31-50 HIGHLY COMPRESSIBLE LIQUID LIMIT GREATER THAN 50	ORGANIC MATERIAL GRANULAR SOILS SILT-CLAY SOILS OTHER MATERIAL TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10% LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20% MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35% HIGHLY ORGANIC >10% >20% HIGHLY 35% AND ABOVE	WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING STATIC WATER LEVEL AFTER 24 HOURS PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA SPRING OR SEEP	
<b>CONSISTENCY OR DENSENESS</b>	<b>MISCELLANEOUS SYMBOLS</b>	<b>ROCK HARDNESS</b>	
PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT <sup>2</sup> )	ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION SOIL SYMBOL ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT INFERRED SOIL BOUNDARY INFERRED ROCK LINE ALLUVIAL SOIL BOUNDARY DIP & DIP DIRECTION OF ROCK STRUCTURES SOUNDING ROD	VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK. HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN. MODERATELY HARD CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS. MEDIUM HARD CAN BE GROVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK. SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE. VERY SOFT CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGER NAIL.	
<b>TEXTURE OR GRAIN SIZE</b>	<b>ABBREVIATIONS</b>	<b>FRACTURE SPACING</b>	<b>BEDDING</b>
U.S. STD. SIEVE SIZE OPENING (MM) 4 10 40 60 200 270 4.76 2.00 0.42 0.25 0.075 0.053	AR - AUGER REFUSAL BT - BORING TERMINATED CL - CLAY CPT - CONE PENETRATION TEST CSE - COARSE DMT - DILATOMETER TEST DPT - DYNAMIC PENETRATION TEST e - VOID RATIO F - FINE FOSS - FOSSILIFEROUS FRAC. - FRACTURED, FRACTURES FRAGS. - FRAGMENTS HL - HIGHLY MED. - MEDIUM MICA - MICACEOUS MOD. - MODERATELY NP - NON PLASTIC ORG. - ORGANIC PMT - PRESSUREMETER TEST SAP. - SAPROLITIC SD. - SAND, SANDY SL. - SILT, SILTY SLI. - SLIGHTLY TCR - TRICONE REFUSAL # - MOISTURE CONTENT v - VERY VST - VANE SHEAR TEST WEA. - WEATHERED γ - UNIT WEIGHT γ <sub>s</sub> - DRY UNIT WEIGHT	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	VERY THICKLY BEDDED > 4 FEET THICKLY BEDDED 1.5 - 4 FEET THINLY BEDDED 0.16 - 1.5 FEET VERY THINLY BEDDED 0.03 - 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET THINLY LAMINATED < 0.008 FEET
<b>SOIL MOISTURE - CORRELATION OF TERMS</b>	<b>EQUIPMENT USED ON SUBJECT PROJECT</b>	<b>INDURATION</b>	
SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION	DRILL UNITS: MOBILE B- BK-51 OE-45C OE-550 PORTABLE HOIST ADVANCING TOOLS: CLAY BITS 6" CONTINUOUS FLIGHT AUGER 8" HOLLOW AUGERS HARD FACED FINGER BITS TUNG-CARBIDE INSERTS CASING w/ ADVANCER TRICONE * STEEL TEETH TRICONE * TUNG-CARB. CORE BIT HAMMER TYPE: AUTOMATIC MANUAL CORE SIZE: B H HAND TOOLS: POST HOLE DIGGER HAND AUGER SOUNDING ROD VANE SHEAR TEST	FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.	TERMS THICKNESS BENCH MARK: BL-4 -L- STA. 29+46.51 I3 LT ELEVATION: 884.85 FT.
<b>PLASTICITY</b>			<b>NOTES:</b>  = EXPOSED CRYSTALLINE ROCK
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			
<b>COLOR</b>			
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.			



STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY  
GOVERNOR

LYNDO TIPPETT  
SECRETARY

March 21, 2007

STATE PROJECT: 33603.1.1 (B-4261)  
F. A. PROJECT: BRZ-1520(4)  
COUNTY: Rutherford  
  
DESCRIPTION: Bridge No. 39 on SR 1520 over Fork of Cathey's Creek  
  
SUBJECT: Geotechnical Report – Foundation Investigation

**Introduction**

This project is located on Rock Road north of Gilberttown. An existing 60 foot long, 2-span bridge is proposed to be replaced by 2 @ 9'x8' RCBC with beveled inlets at -L- Station 28+92.66, on a 140 degree skew and has a total length of 112 feet.

The subsurface investigation was conducted during early February of 2007. The bridge is bounded by a wooded slope and pastures. Two borings were advanced using a CME-550 drill; both by casing with advancer, one was cored. The first boring was made for a PDEA study in early 2006 and is included in this report. Nine bridge rod soundings were made to determine the top of crystalline rock. Rock core and exposures in the creek bed were utilized to characterize the nature of the bedrock. One soil sample was taken, results for that sample are not available.

Driving bridge rods indicated the depths of the crystalline rock contact but did not differentiate between soil types. Stratigraphy shown along proposed culvert foundations on cross sections in this investigation features the contact with crystalline rock.

**Physiography and Geology**

Differential weathering of variably resistant bedrock has produced a ridge on the north side of the big valley of Cathey's Creek. This high ground is incised by a small branch which tumbles gently along patches of bedrock. This was the site of a water powered mill and small quarry for building stone. It has the only exposure of rock along Rock Road.

Here, crystalline rock is a massive (thickly layered) salt and pepper looking rock called diorite gneiss that retains relict igneous texture. Exposures upstream display some sheared layering. Downstream, this rock has more amphibole, mica and light layers, and is decidedly gneissic.

A rare placement of red sediments on crystalline rock at creek level is seen at this site. The red alluvium is a young soil representing deposition of transported residuum. It is backfilling the valley, raising the valley floor. The alluvium is vaguely layered with thin sandy lenses indicating its origin. Approximately 4 feet of fine grained alluvium rests on crystalline rock upstream at the northwest corner while about 5 to 7 feet of alluvium with basal sand and gravel rest on sandy saprolite layered with weathered rock downstream.

**Soils and Foundation Materials**

To the left of centerline, crystalline rock is either exposed or within 6 feet of the water level.

To the right of centerline alluvium increases in depth slightly and is underlain by weathered rock with layers of medium dense saprolitic sand which grade downward within a few feet to crystalline rock.

Weathering along a weakly expressed, subhorizontal foliation is responsible for the layering of weathered rock with saprolite. Crystalline rock cored revealed such weathering. It went from moderately weathered and moderately hard to hard and fresh within 2 feet. Total recovery equals 85 percent with the missing material most likely being weathered rock. Total RQD equals 68 percent. RQD increased slightly with depth.

**Groundwater**

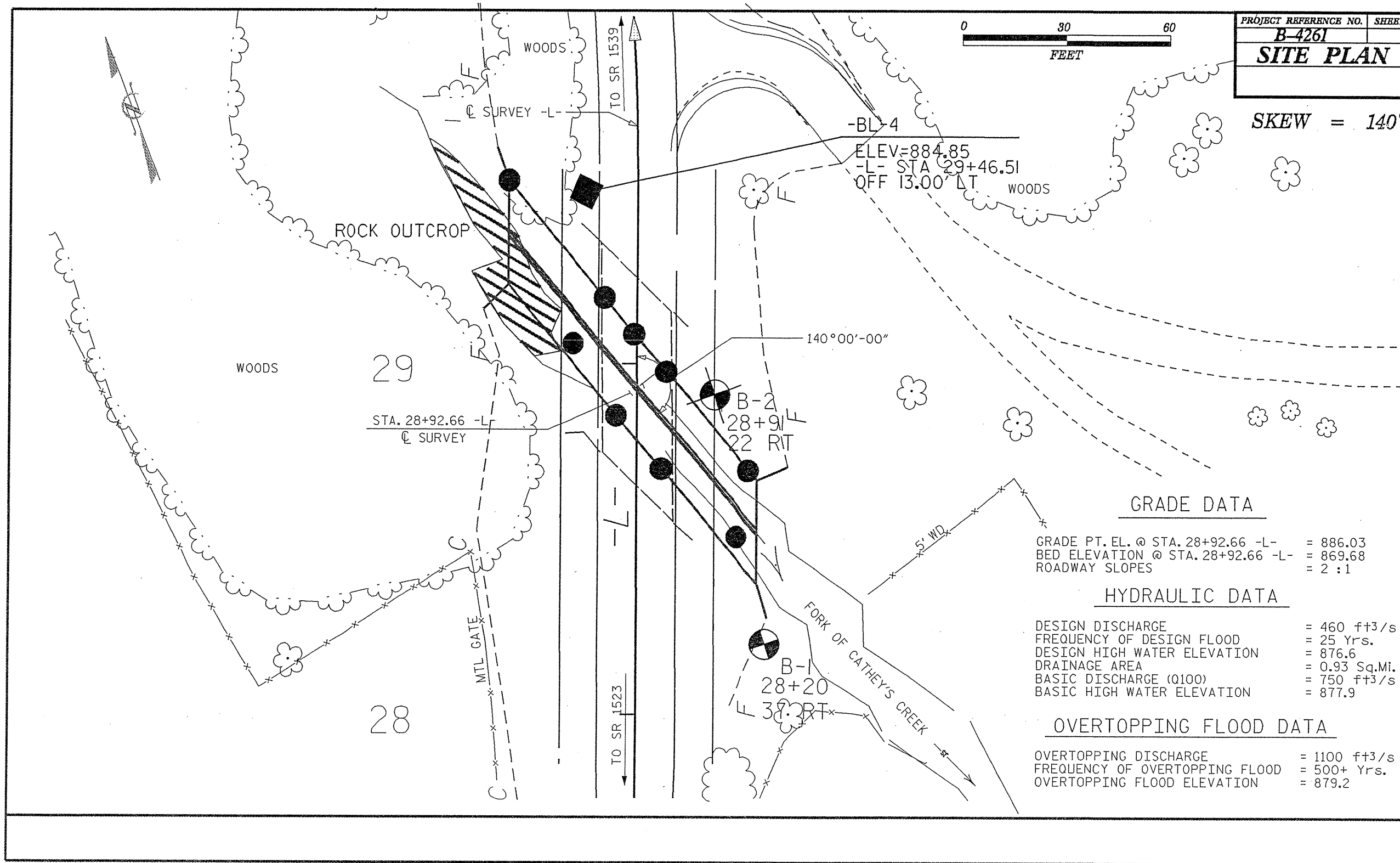
Groundwater descends from left to right. Elevations range from 872 to 870 feet.

**Closing**

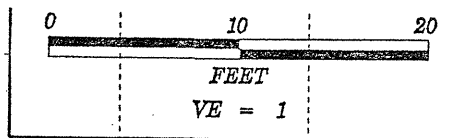
This investigation is based on the Culvert Survey and Hydraulic Design Report dated 5-3-06. If any significant changes are made, the subsurface information will have to be reviewed and modified as necessary.

Respectfully Submitted,

PQ Lockamy, PG





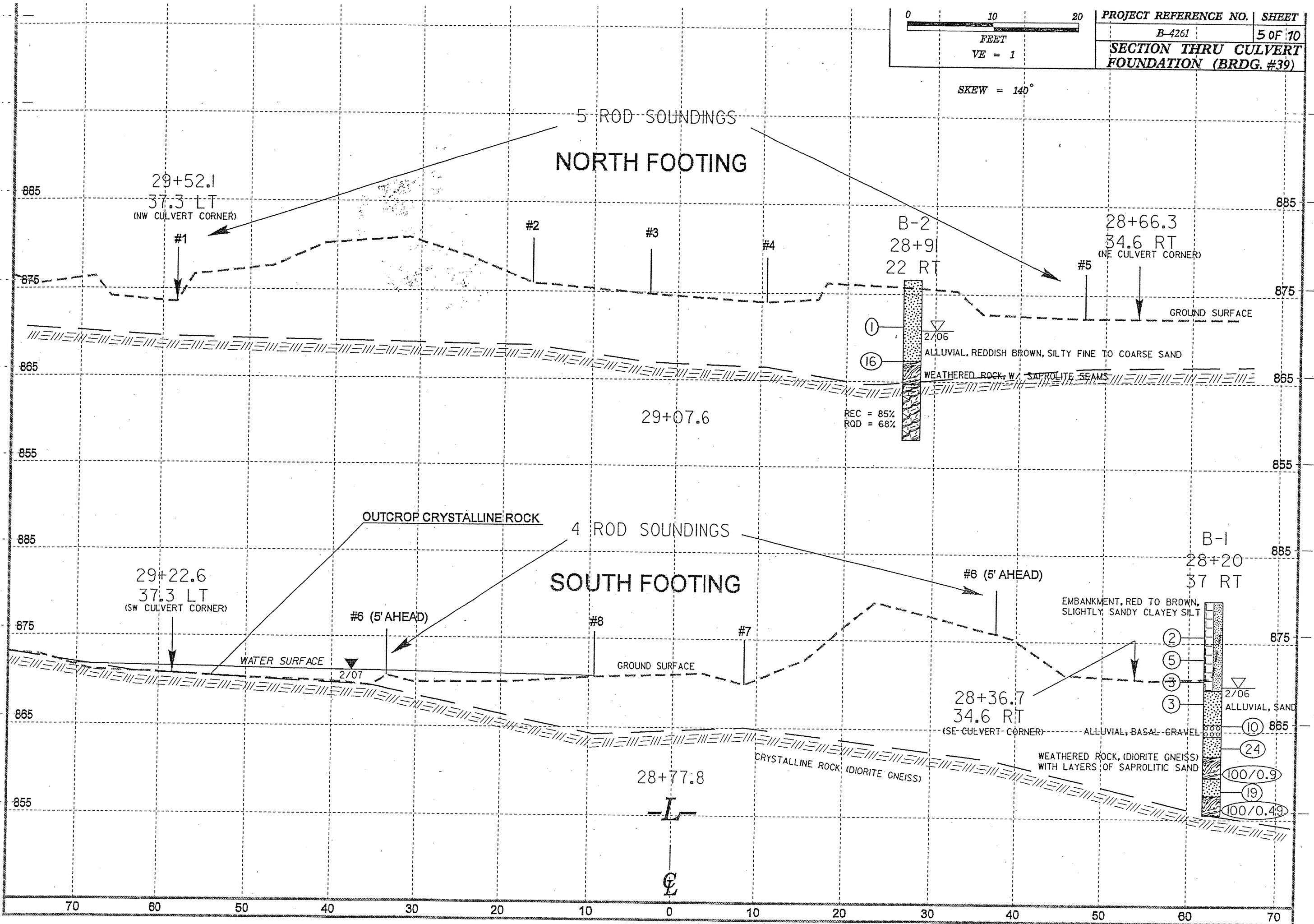


PROJECT REFERENCE NO.	SHEET
B-4261	5 OF 10
SECTION THRU CULVERT FOUNDATION (BRDG. #39)	

SKEW = 140°

5 ROD SOUNDINGS  
NORTH FOOTING

4 ROD SOUNDINGS  
SOUTH FOOTING



29+52.1  
37.3 LT  
(NW CULVERT CORNER)

28+66.3  
34.6 RT  
(NE CULVERT CORNER)

B-2  
28+91  
22 RT

B-1  
28+20  
37 RT

29+22.6  
37.3 LT  
(SW CULVERT CORNER)

28+36.7  
34.6 RT  
(SE CULVERT CORNER)

28+77.8

-L-



①  
⑩  
REC = 85%  
ROD = 68%

②  
⑤  
③  
③  
2/06  
ALLUVIAL SAND  
⑩  
865  
⑩  
24  
⑩  
100/0.9  
⑩  
19  
⑩  
100/0.49

ALLUVIAL, REDDISH BROWN, SILTY FINE TO COARSE SAND  
WEATHERED ROCK, W. SAPROLITE SEAMS

EMBANKMENT, RED TO BROWN, SLIGHTLY SANDY CLAYEY SILT

WEATHERED ROCK, (DIORITE GNEISS) WITH LAYERS OF SAPROLITIC SAND

CRYSTALLINE ROCK, (DIORITE GNEISS)

OUTCROP CRYSTALLINE ROCK

WATER SURFACE

GROUND SURFACE

GROUND SURFACE

70 60 50 40 30 20 10 0 10 20 30 40 50 60 70

PROJECT NO. 33603.1.1		ID. B-4261		COUNTY RUTHERFORD		GEOLOGIST Lockamy, P. Q.									
SITE DESCRIPTION BRIDGE NO. 39 ON SR 1520 (ROCK ROAD) OVER A TRIBUTARY OF CATHEY'S CREEK							GROUND WTR (ft)								
BORING NO. B-1		STATION 28+20		OFFSET 37ft RT		ALIGNMENT -L-									
COLLAR ELEV. 879.7 ft		TOTAL DEPTH 24.2 ft		NORTHING 617,893		EASTING 1,124,618									
DRILL MACHINE CME-550		DRILL METHOD NW Casing w/ Advancer			HAMMER TYPE Automatic										
START DATE 02/07/07		COMP. DATE 02/08/07		SURFACE WATER DEPTH N/A		DEPTH TO ROCK N/A									
ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	L O G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
		0.5ft	0.5ft	0.5ft	0	25	50	75	100						
880													879.7	GROUND SURFACE	0.0
876.7	3.0	0	0	2										ROADWAY EMBANKMENT RED TO BROWN, SLIGHTLY SANDY CLAYEY SILT	
874.2	5.5	1	2	3											
871.7	8.0	1	2	1											
869.2	10.5	1	2	1											
866.7	13.0	2	2	8										ALLUVIAL SAND	10.0
864.2	15.5	21	17	7										ALLUVIAL SAND	10.0
861.7	18.0	21	61	39/0.4										ALLUVIAL BASAL GRAVEL	15.2
859.2	20.5	2	7	12										SAPROLITE BLACK AND WHITE SILTY SAND	17.5
856.7	23.0	100/0.49												WEATHERED ROCK (DIORITE GNEISS)	20.0
														SAPROLITE SILTY SAND	22.0
														WEATHERED ROCK (DIORITE GNEISS)	24.2
Boring Terminated with Casing Advancer Refusal at Elevation 855.5 ft CRYSTALLINE ROCK (HORNBLLENDE BIOTITE GNEISS)															

PROJECT NO. 33603.1.1		ID. B-4261		COUNTY RUTHERFORD		GEOLOGIST Daniel, T. B.										
SITE DESCRIPTION BRIDGE NO. 39 ON SR 1520 (ROCK ROAD) OVER A TRIBUTARY OF CATHEY'S CREEK							GROUND WTR (ft)									
BORING NO. B-2		STATION 28+91		OFFSET 22ft RT		ALIGNMENT -L-										
COLLAR ELEV. 876.6 ft		TOTAL DEPTH 18.4 ft		NORTHING 617,965		EASTING 1,124,626										
DRILL MACHINE CME-550		DRILL METHOD NW Casing w/ Advancer			HAMMER TYPE Automatic											
START DATE 02/15/06		COMP. DATE 02/15/06		SURFACE WATER DEPTH N/A		DEPTH TO ROCK 11.9 ft										
ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	L O G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)			
		0.5ft	0.5ft	0.5ft	0	25	50	75	100							
880														876.6	GROUND SURFACE	0.0
872.3	4.3														ALLUVIAL BROWN, SILTY W/ ALLUVIAL BOULDERS	4.3
		1	1	0											ALLUVIAL REDDISH BROWN, SILTY FINE TO COARSE SAND	4.3
867.3	9.3	15	8	8										ALLUVIAL GRAVEL	10.8	
															WEATHERED ROCK W/ SAPROLITE SEAMS	11.9
															CRYSTALLINE ROCK	18.4
Boring Terminated at Elevation 858.2 ft IN CRYSTALLINE ROCK (HORNBLLENDE BIOTITE GNEISS)																

SHEET \_\_\_\_ OF \_\_\_\_

DATE 2/15/2006

**CORE BORING REPORT**

PROJECT: 33603.1.1 I. D. NO: B-4261 BORING NO: B2 GEOLOGIST: TB DANIEL  
 DESCRIPTION: BRIDGE NO.39 ON SR-1520 OVER TRIBUTARY TO CATHEY'S CREEK 28+91 22' RT. -L-  
 COUNTY: RUTHERFORD COLLAR ELEVATION: 876.6 FT. TOTAL DEPTH: 18.4 FT.

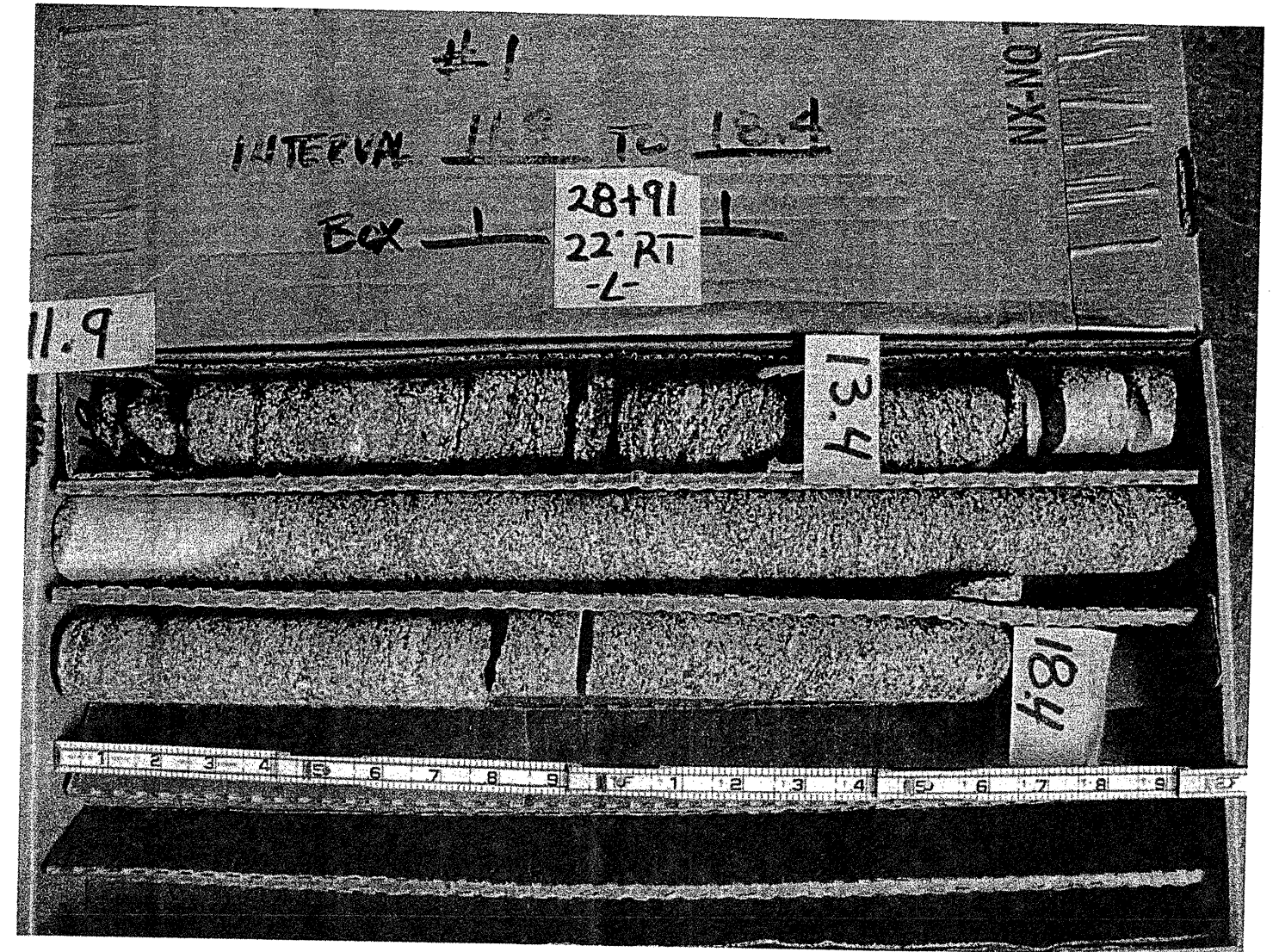
ELEV. (FEET)	DEPTH (FEET)	DRILL RATE MIN./FT.	RUN (FEET)	REC. FEET %	RQD. FEET %	SAMP. #	FIELD CLASSIFICATION AND REMARKS
864.7	11.9			1.3	0.9		DIORITE GNEISS 11.9 - 13.9 - MODERATELY WEATHERED AND MODERATELY HARD. 3 BREAKS ARE ON WEAK SUBHORIZONTAL FOLIATION. 13.9 - 18.4 - HARD AND FRESH.
			1.5	87	60		
863.2	13.4						
863.2	13.4			4.2	3.5		
			5.0	96	70		
858.2	18.4						

CORING TERMINATED AT  
ELEVATION 858.2 FT.

DRILLER: GK ROSE CORE SIZE: NXWL EQUIPMENT: CME-550

RUTHERFORD CO. BRIDGE 39 ON  
SR-1520 (ROCK ROAD) OVER TRIBUTARY OF CATHEY'S CREEK

B-4261 33603.1.1  
E B2-B

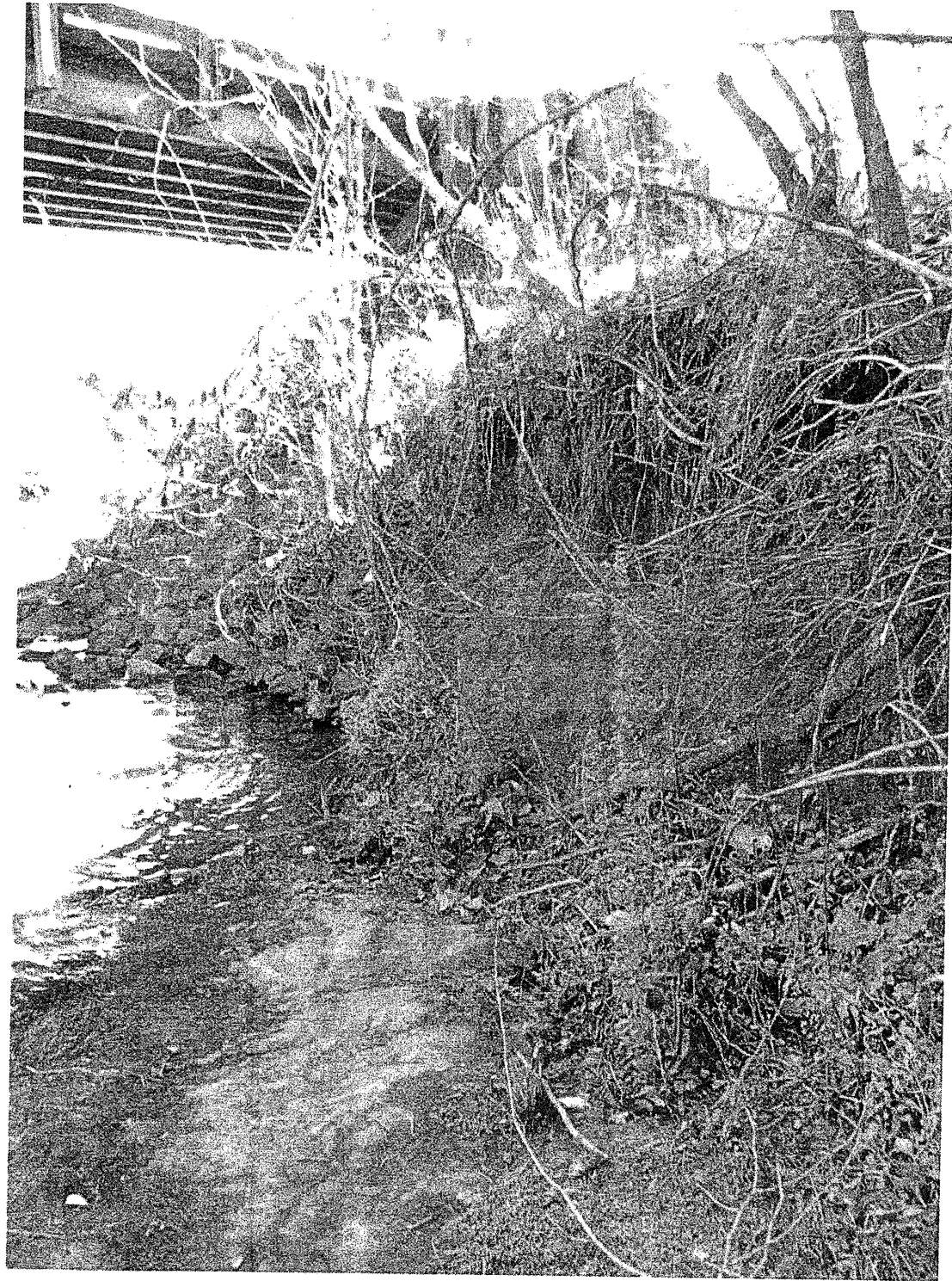






RUTHERFORD CO. BRIDGE 39 ON SR 1520  
RED ALLUVIUM ON BEDROCK - SCOUR REPAIRS

B-4261 33603.1.1



RUTHERFORD CO. BRIDGE 39 ON SR 1520  
SW CORNER - UPSTREAM SOUTH SIDE. ORANGE ROCK IS THE CORNER.

B-4261 33603.1.1





*J. Fargher*

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

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**STRUCTURE**  
**SUBSURFACE INVESTIGATION**

PROJ. REFERENCE NO. 33603.1.1 F.A. PROJ. BRZ-1520(4)  
 COUNTY RUTHERFORD  
 PROJECT DESCRIPTION BRIDGE NO. 37 OVER CATHEY'S CREEK  
AND BRIDGE NO. 39 OVER THE FORK OF CATHEY'S CREEK  
ON SR 1520  
 SITE DESCRIPTION BRIDGE NO. 37 OVER CATHEY'S CREEK ON SR  
1520

**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.

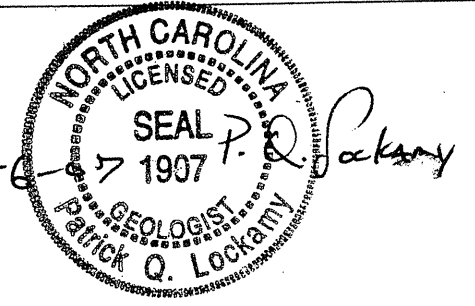
GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE, THE LABORATORY SAMPLE DATA AND THE IN SITU UN-PLACED 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.

PERSONNEL

- P.Q. LOCKAMY
- T.B. DANIEL
- M.M. HAGER
- D.O. CHEEK
- R.D. CHILDERS
- C.J. COFFEY
- G.K. ROSE

INVESTIGATED BY P.Q. LOCKAMY  
 CHECKED BY W.D. FRYE  
 SUBMITTED BY W.D. FRYE  
 DATE 3.6.07



**PROJECT: 33603.1.1 ID: B-4261**

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 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.

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
DIVISION OF HIGHWAYS  
GEOTECHNICAL ENGINEERING UNIT

PROJECT REFERENCE NO.  
B-4261

SHEET NO.  
2/23

**SUBSURFACE INVESTIGATION**

**SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS**

SOIL DESCRIPTION				GRADATION				ROCK DESCRIPTION				TERMS AND DEFINITIONS																																																																																																																																																																			
SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS 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:  VERY STIFF, GRN, SILTY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6				WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED) GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.  ANGULARITY OF GRAINS  THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.				HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF 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:  WEATHERED ROCK (WR)  NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.  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.  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.  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.				ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. AQUIFER - A WATER BEARING FORMATION OR STRATA. ARENEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL. FLOOD PLAIN (FP) - 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 (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. 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. SAPROLITE (SAP.) - RESIDUAL SOIL THAT 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, THAT 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 (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. STRATA CORE RECOVERY (SCRC) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (SRQD) - 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 (TS) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.																																																																																																																																																																			
SOIL LEGEND AND AASHTO CLASSIFICATION				MINERALOGICAL COMPOSITION				WEATHERING				MISCELLANEOUS SYMBOLS																																																																																																																																																																			
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>GENERAL CLASS.</th> <th colspan="5">GRANULAR MATERIALS (≤ 35% PASSING #200)</th> <th colspan="5">SILT-CLAY MATERIALS (&gt; 35% PASSING #200)</th> <th colspan="3">ORGANIC MATERIALS</th> </tr> <tr> <td>GROUP CLASS.</td> <td colspan="2">A-1</td> <td colspan="2">A-3</td> <td colspan="2">A-2</td> <td colspan="2">A-4</td> <td colspan="2">A-5</td> <td colspan="2">A-6</td> <td colspan="2">A-7</td> <td colspan="3">A-1, A-2</td> </tr> <tr> <td>SYMBOL</td> <td colspan="2"></td> <td colspan="2"></td> <td colspan="2"></td> <td colspan="2"></td> <td colspan="2"></td> <td colspan="2"></td> <td colspan="2"></td> <td colspan="3"></td> </tr> <tr> <td>% PASSING</td> <td colspan="2">10</td> <td colspan="2">30</td> <td colspan="2">40</td> <td colspan="2">60</td> <td colspan="2">70</td> <td colspan="2">80</td> <td colspan="2">90</td> <td colspan="3">100</td> </tr> <tr> <td>LIQUID LIMIT</td> <td colspan="2">≤ 4</td> <td colspan="2">4-10</td> <td colspan="2">10-15</td> <td colspan="2">15-20</td> <td colspan="2">20-25</td> <td colspan="2">25-30</td> <td colspan="2">30-40</td> <td colspan="3">≥ 40</td> </tr> <tr> <td>PLASTIC INDEX</td> <td colspan="2">≤ 4</td> <td colspan="2">4-7</td> <td colspan="2">7-10</td> <td colspan="2">10-15</td> <td colspan="2">15-20</td> <td colspan="2">20-25</td> <td colspan="2">25-30</td> <td colspan="3">≥ 30</td> </tr> <tr> <td>GROUP INDEX</td> <td colspan="2">0</td> <td colspan="2">0-1</td> <td colspan="2">1-2</td> <td colspan="2">2-3</td> <td colspan="2">3-4</td> <td colspan="2">4-5</td> <td colspan="2">5-6</td> <td colspan="3">6-10</td> </tr> <tr> <td>USUAL TYPES OF MAJOR MATERIALS</td> <td colspan="2">FINE SAND</td> <td colspan="2">SANDY SILT</td> <td colspan="2">SILT</td> <td colspan="2">SILT-CLAY</td> <td colspan="2">CLAY</td> <td colspan="2">CLAYEY SILT</td> <td colspan="2">CLAYEY SILT</td> <td colspan="3">CLAYEY SILT</td> </tr> <tr> <td>GENERATING 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">FAIR TO POOR</td> <td colspan="2">POOR</td> <td colspan="2">UNSATURABLE</td> <td colspan="3">UNSATURABLE</td> </tr> </table>				GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)					SILT-CLAY MATERIALS (> 35% PASSING #200)					ORGANIC MATERIALS			GROUP CLASS.	A-1		A-3		A-2		A-4		A-5		A-6		A-7		A-1, A-2			SYMBOL																		% PASSING	10		30		40		60		70		80		90		100			LIQUID LIMIT	≤ 4		4-10		10-15		15-20		20-25		25-30		30-40		≥ 40			PLASTIC INDEX	≤ 4		4-7		7-10		10-15		15-20		20-25		25-30		≥ 30			GROUP INDEX	0		0-1		1-2		2-3		3-4		4-5		5-6		6-10			USUAL TYPES OF MAJOR MATERIALS	FINE SAND		SANDY SILT		SILT		SILT-CLAY		CLAY		CLAYEY SILT		CLAYEY SILT		CLAYEY SILT			GENERATING AS A SUBGRADE	EXCELLENT TO GOOD		FAIR TO POOR		FAIR TO POOR		FAIR TO POOR		POOR		UNSATURABLE		UNSATURABLE			MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.				COMPRESSIBILITY  SLIGHTLY COMPRESSIBLE MODERATELY COMPRESSIBLE HIGHLY COMPRESSIBLE  LIQUID LIMIT LESS THAN 31 LIQUID LIMIT EQUAL TO 31-50 LIQUID LIMIT GREATER THAN 50				FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.  VERY SLIGHT (V SL.) ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN. CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.  SLIGHT (SL.) ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.  MODERATE (MOD.) SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED. SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.  MODERATELY SEVERE (MOD. SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. IF TESTED, WOULD YIELD SPT REFUSAL.  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. IF TESTED, YIELDS SPT N VALUES > 100 BPF.  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. IF TESTED, YIELDS SPT N VALUES < 100 BPF.  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.				PERCENTAGE OF MATERIAL  ORGANIC MATERIAL TRACE OF ORGANIC MATTER 2 - 3% LITTLE ORGANIC MATTER 3 - 5% MODERATELY ORGANIC 5 - 10% HIGHLY ORGANIC > 10%  GRANULAR SOILS 2 - 3% SILT - CLAY SOILS 3 - 5% OTHER MATERIAL TRACE 1 - 10% LITTLE 10 - 20% SOME 20 - 35% HIGHLY 35% AND ABOVE			
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STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY  
GOVERNOR

LYNDO TIPPETT  
SECRETARY

28 February, 2007

STATE PROJECT: 33603.1.1 (B-4261)  
F. A. PROJECT: BRZ-1520(4)  
COUNTY: Rutherford

DESCRIPTION: Bridge No. 37 on SR 1520 over Cathey's Creek

SUBJECT: Geotechnical Report – Foundation Investigation

**Introduction**

This project is located at Gilberttown, the first county seat of Rutherford County, which was abandoned 10 years after formation due to excessive mud and epidemic disease. An existing 157 foot long, 5-span bridge is proposed to be replaced by a 2-lane, 180 foot long, 4-span structure on a skew of 90°.

The subsurface investigation was conducted during late January and early February of 2007. The bridge is bound on three sides by soggy pastures, and on the fourth side, by a wooded cane patch. Ten SPT borings were advanced using a CME-550 drill; 3 by hollow stem and 7 by casing with advancer. Two borings made for a PDEA study in early 2006 are included in this report. Rock core was taken on three interior bent borings to characterize the nature of the bedrock. Seventeen soil samples were taken and several unsuccessful attempts were made to get a Shelby Tube sample for the Erosion Function Apparatus.

**Physiography and Geology**

Upstream of the bridge, Cathey's Creek watershed contains approximately 25 square miles of highly weathered residuum with deep saprolites on moderate to steep slopes. Gradient at the site is low. This combination has produced a deep, fine-grained alluvium with an unusual red hue, which is testament to the deposition of transported residuum.

3a/23

No exposures of bedrock were observed along the creek but coring revealed a high grade metamorphic rock - hornblende biotite gneiss. The amphibole rich gneiss is layered with dark schist and felsic gneiss. The alternating light and dark layers define foliation. The transition from weathered rock to crystalline rock is gradual and facilitated by differential weathering of mica rich layers within the more resistant gneissic portions. This rock unit is mapped as CZab on the State Geologic Map and may be the a more recently described suite of migmatitic amphibole rich gneissic rocks contained in the Mill Spring Thrust Sheet called the Lower Mill Spring Complex; it is in the Eastern Inner Piedmont Geologic Province.

**Soils and Foundation Materials**

Low embankments over alluvium and thick saprolite underlain by weathered rock grading to crystalline rock were encountered. Embankment consistencies vary from silty sand to silty clay. Blow counts range from 2 to 11 blows per foot. Embankment has a red hue similar to that of the upper alluvium. The transition between the two is somewhat obscured.

The Rutherford County Soil Survey has identified the valley soils here as Chewacla loam, which forms on floodplains that frequently flood and pond water. Alluvium averages 17 feet in thickness. Its contact elevation with saprolite ranges from 848.0 to 856.9 feet and averages 852 feet. The wide range of elevations for the basal alluvium and the occurrence of beds of fresh angular sand mixed with the typically well rounded (mature) sand indicate intense scour coupled with large inputs of fresh material into the bed load.

This is a generalized alluvial profile: 4.5 feet of red brown, soft, fine sandy silt with clay  
1.5 feet of tan, soft fine sandy silt with clay  
3-4 feet of very soft gleyed silty clay with fine sand  
6-10 feet of sand with basal gravel

Alluvium encountered at B1-A differed from the rest of the alluvium where the upper fine grained soils have been removed and replaced by sand (recent flood deposit).

Saprolitic soils consist of silty sand to fine to coarse sand from 13.6 feet to 25.8 feet thick and averages 19.7 feet. Blow counts range from loose to dense at the top of the saprolite and generally become dense to very dense in the bottom 5 to 10 feet till saprolite grades to weathered rock.

Weathered rock ranges in thickness from 0 to 10.9 feet. Its transition to crystalline rock goes back and forth, saprolite layers are present throughout the strata and the bottom of weathered rock may have some crystalline rock layers. Crystalline rock also shows alternate weathering but generally becomes hard and fresh after a few feet.

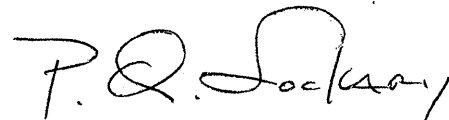
**Groundwater**

Groundwater was measured by placing a weighted tape measure down the borings after enough time passed after completion of drilling operations to allow the water level to stabilize to undisturbed levels; it is present across the site at elevations ranging from 862.8 to 864.3.

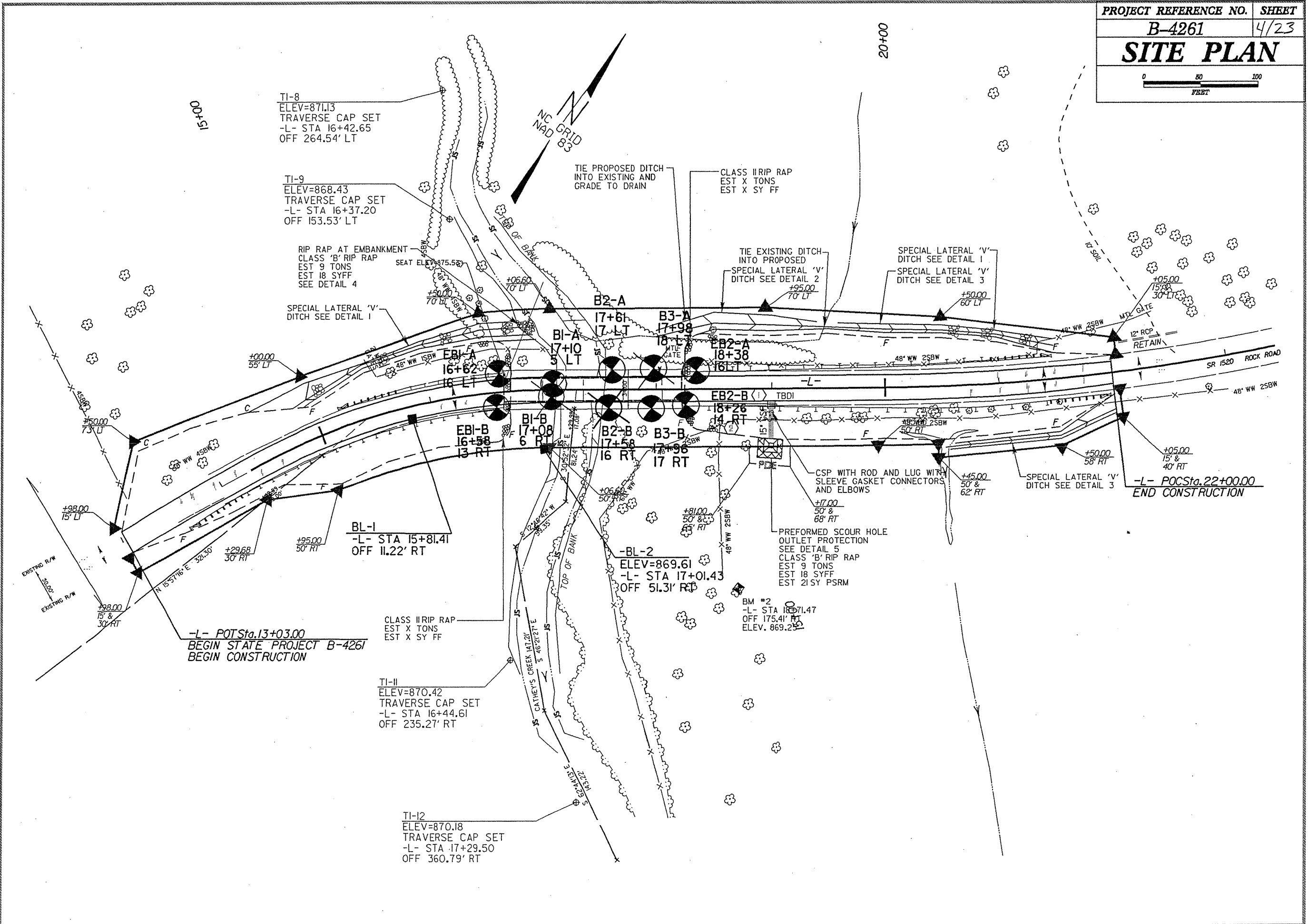
This investigation is based on a Bridge Survey and Hydraulic Design Report dated 3-27-06.

If any significant changes are made to the design or location of the proposed structure the subsurface information will have to be reviewed and modified as necessary.

Respectfully Submitted,

A handwritten signature in black ink, appearing to read "P. Q. Lockamy". The signature is written in a cursive style with a large, looped initial "P".

PQ Lockamy, PG



TI-8  
ELEV=871.13  
TRAVERSE CAP SET  
-L- STA 16+42.65  
OFF 264.54' LT

TI-9  
ELEV=868.43  
TRAVERSE CAP SET  
-L- STA 16+37.20  
OFF 153.53' LT

RIP RAP AT EMBANKMENT  
CLASS 'B' RIP RAP  
EST 9 TONS  
EST 18 SYFF  
SEE DETAIL 4

SPECIAL LATERAL 'V'  
DITCH SEE DETAIL 1

TIE PROPOSED DITCH  
INTO EXISTING AND  
GRADE TO DRAIN

CLASS II RIP RAP  
EST X TONS  
EST X SY FF

TIE EXISTING DITCH  
INTO PROPOSED  
SPECIAL LATERAL 'V'  
DITCH SEE DETAIL 2

SPECIAL LATERAL 'V'  
DITCH SEE DETAIL 1

SPECIAL LATERAL 'V'  
DITCH SEE DETAIL 3

BL-1  
-L- STA 15+81.41  
OFF 11.22' RT

BL-2  
ELEV=869.61  
-L- STA 17+01.43  
OFF 51.31' RT

CLASS II RIP RAP  
EST X TONS  
EST X SY FF

TI-11  
ELEV=870.42  
TRAVERSE CAP SET  
-L- STA 16+44.61  
OFF 235.27' RT

TI-12  
ELEV=870.18  
TRAVERSE CAP SET  
-L- STA 17+29.50  
OFF 360.79' RT

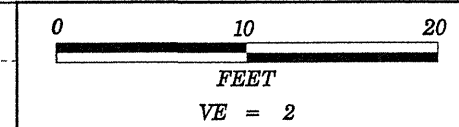
CSP WITH ROD AND LUG WITH  
SLEEVE GASKET CONNECTORS  
AND ELBOWS

PERFORMED SCOUR HOLE  
OUTLET PROTECTION  
SEE DETAIL 5  
CLASS 'B' RIP RAP  
EST 9 TONS  
EST 18 SYFF  
EST 21 SY PSRM

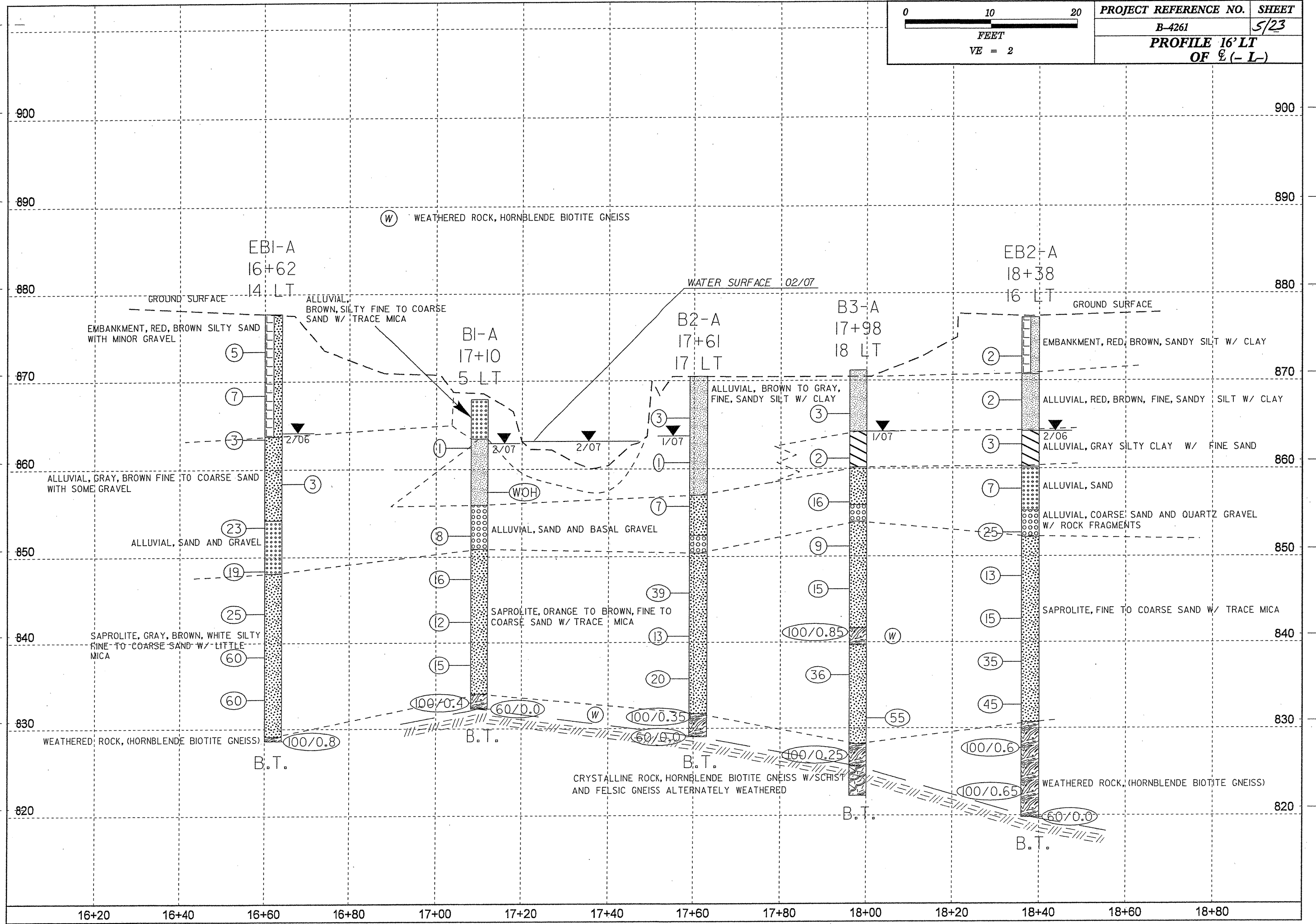
BM #2  
-L- STA 18+71.47  
OFF 175.41' RT  
ELEV. 869.25

-L- POT Sta. 13+03.00  
BEGIN STATE PROJECT B-4261  
BEGIN CONSTRUCTION

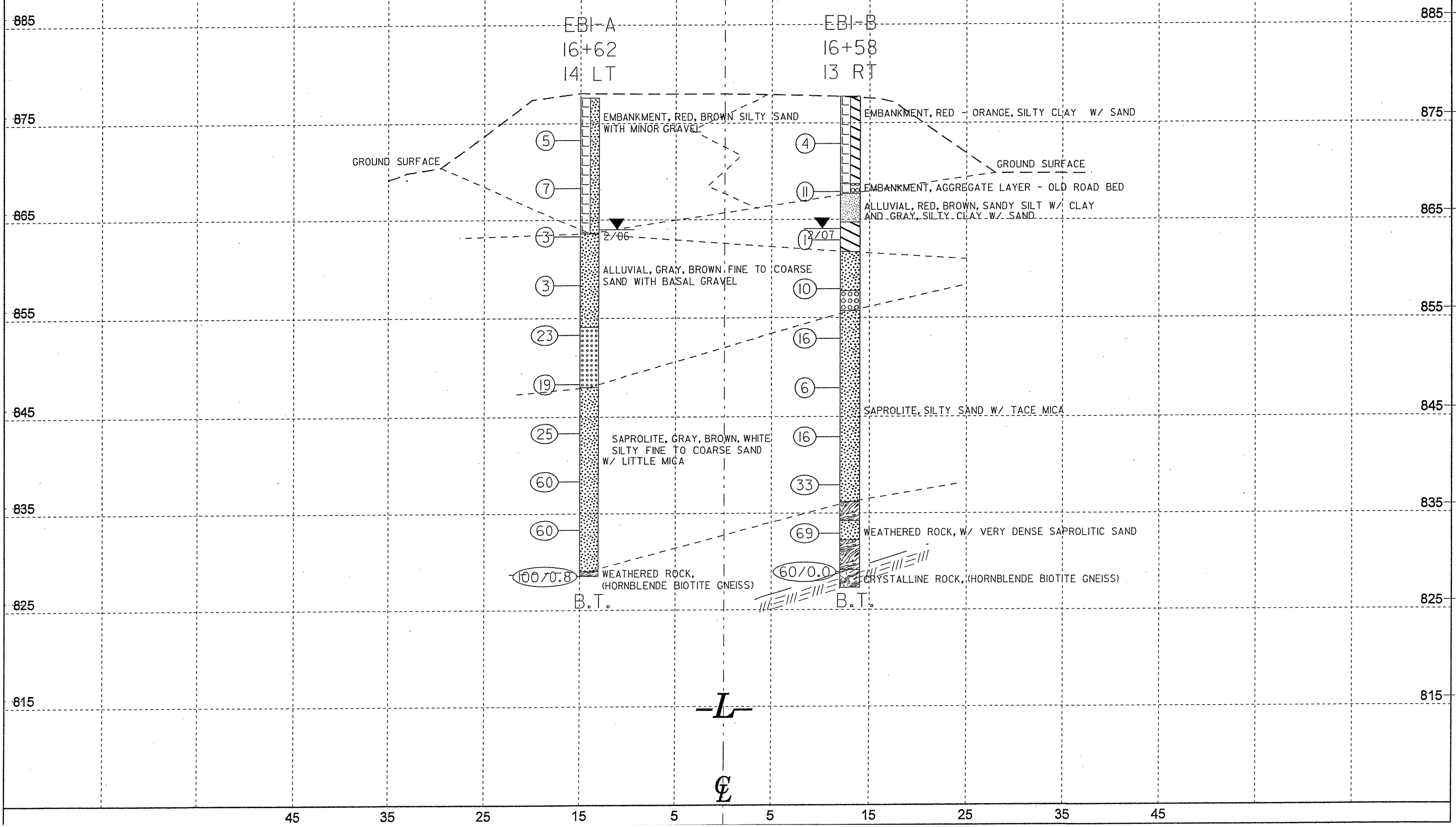
-L- POC Sta. 22+00.00  
END CONSTRUCTION

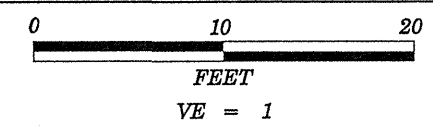


PROJECT REFERENCE NO.	SHEET
B-4261	5/23
PROFILE 16' LT OF E (- L-)	









### SOIL TEST RESULTS

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-14	6 RT	17+08	4.6 - 6.1	A-2-4(0)	29	NP	27	53	12	8	99	92	24		
SS-15	6 RT	17+08	19.6 - 21.1	A-2-4(0)	31	NP	43	42	13	2	89	66	19		
SS-16	5 LT	17+10	10.0 - 11.5	A-4(3)	30	NP	13	44	27	16	100	98	52		
SS-17	5 LT	17+10	20.0 - 21.5	A-2-4(0)	30	NP	53	35	10	2	90	59	16		

885

885

875

875

865

865

855

855

845

845

835

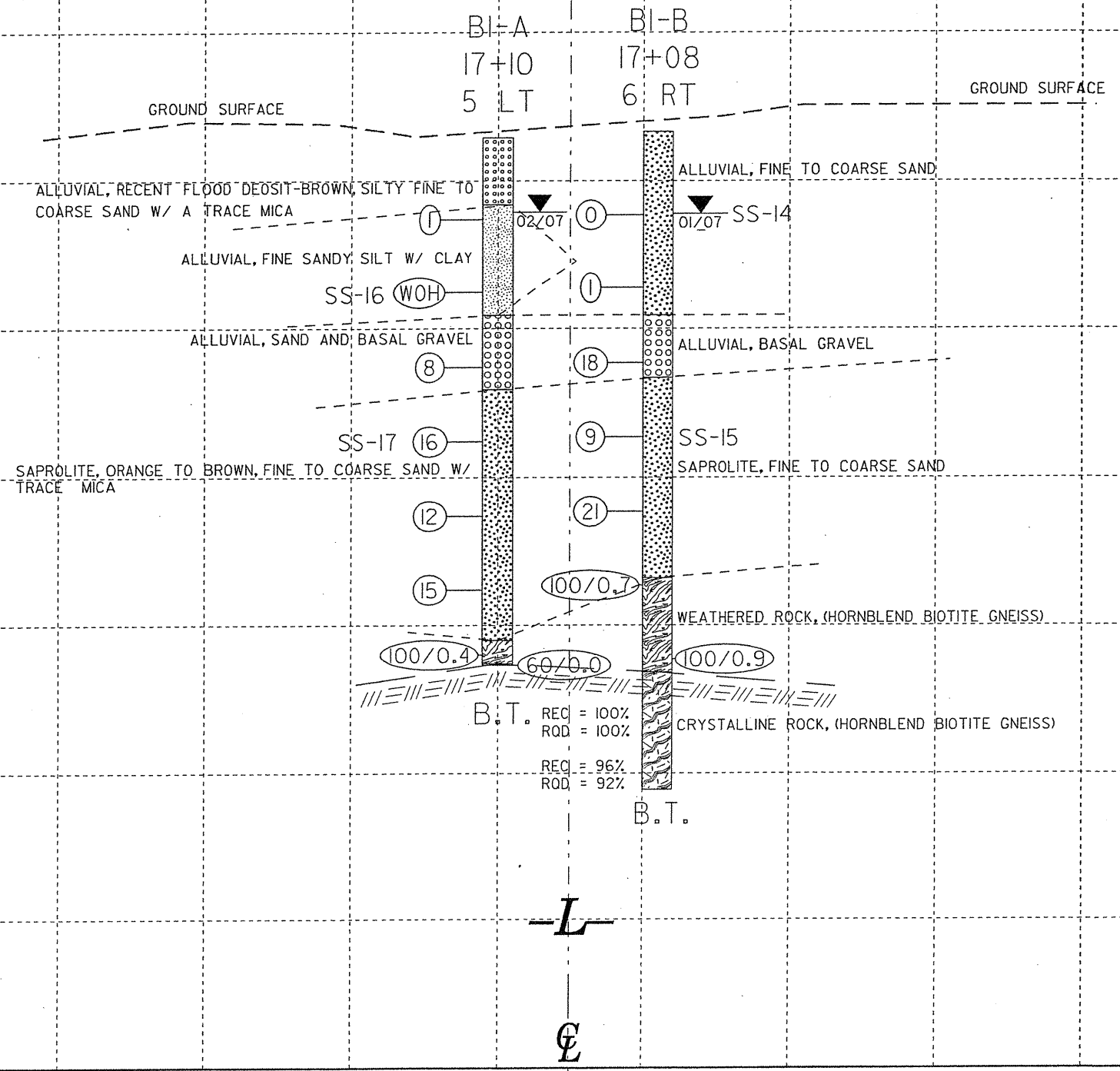
835

825

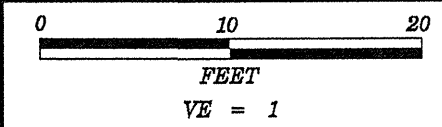
825

815

815

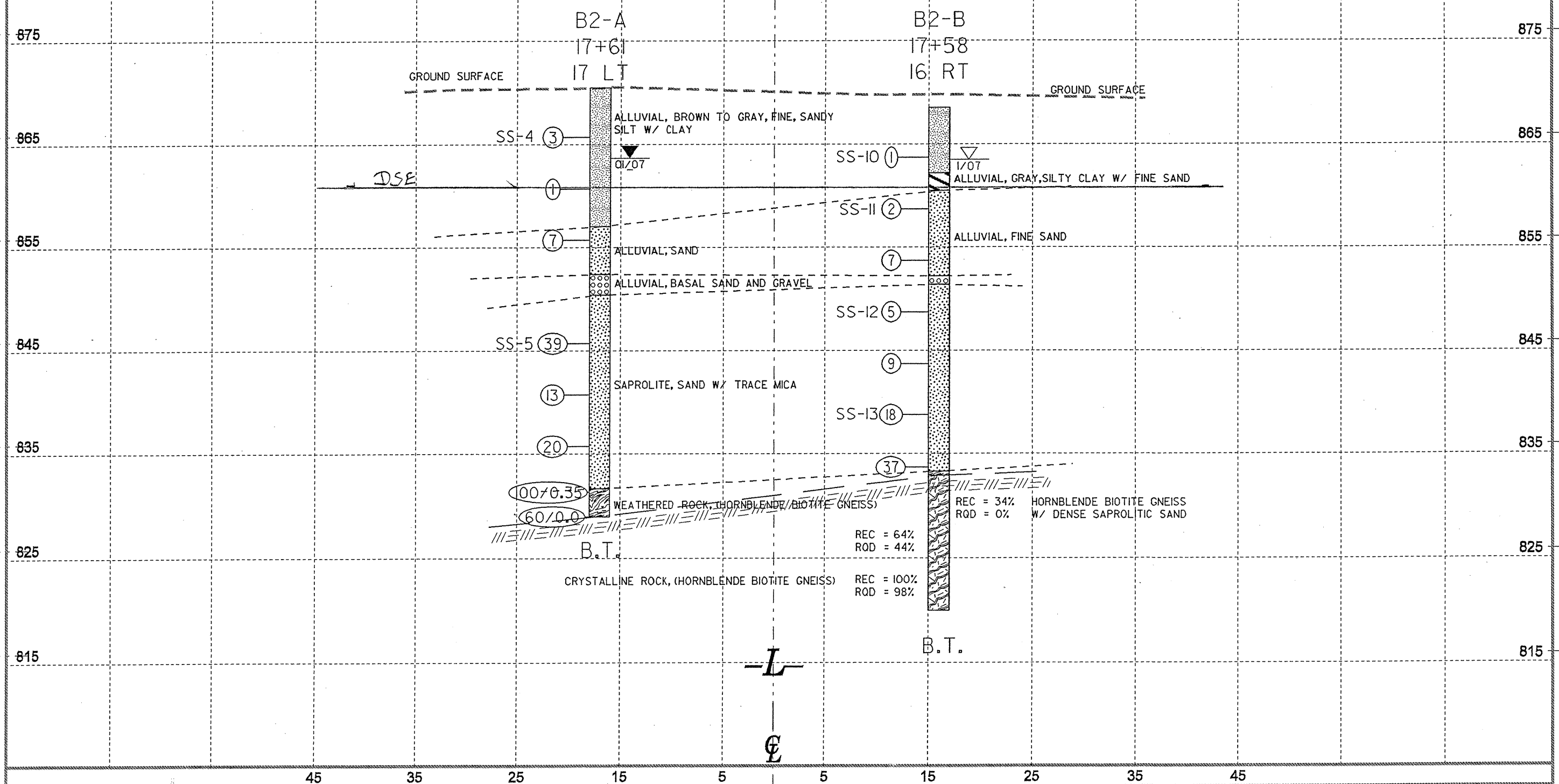


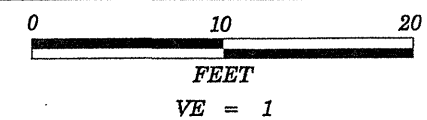
45 35 25 15 5 5 15 25 35 45



SOIL TEST RESULTS															
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-4	17 LT	17+61	3.8 - 5.3	A-4(5)	29	NP	7	44	31	18	100	98	58		
SS-5	17 LT	17+61	23.8 - 25.3	A-2-4(0)	20	NP	48	39	11	2	87	63	15		

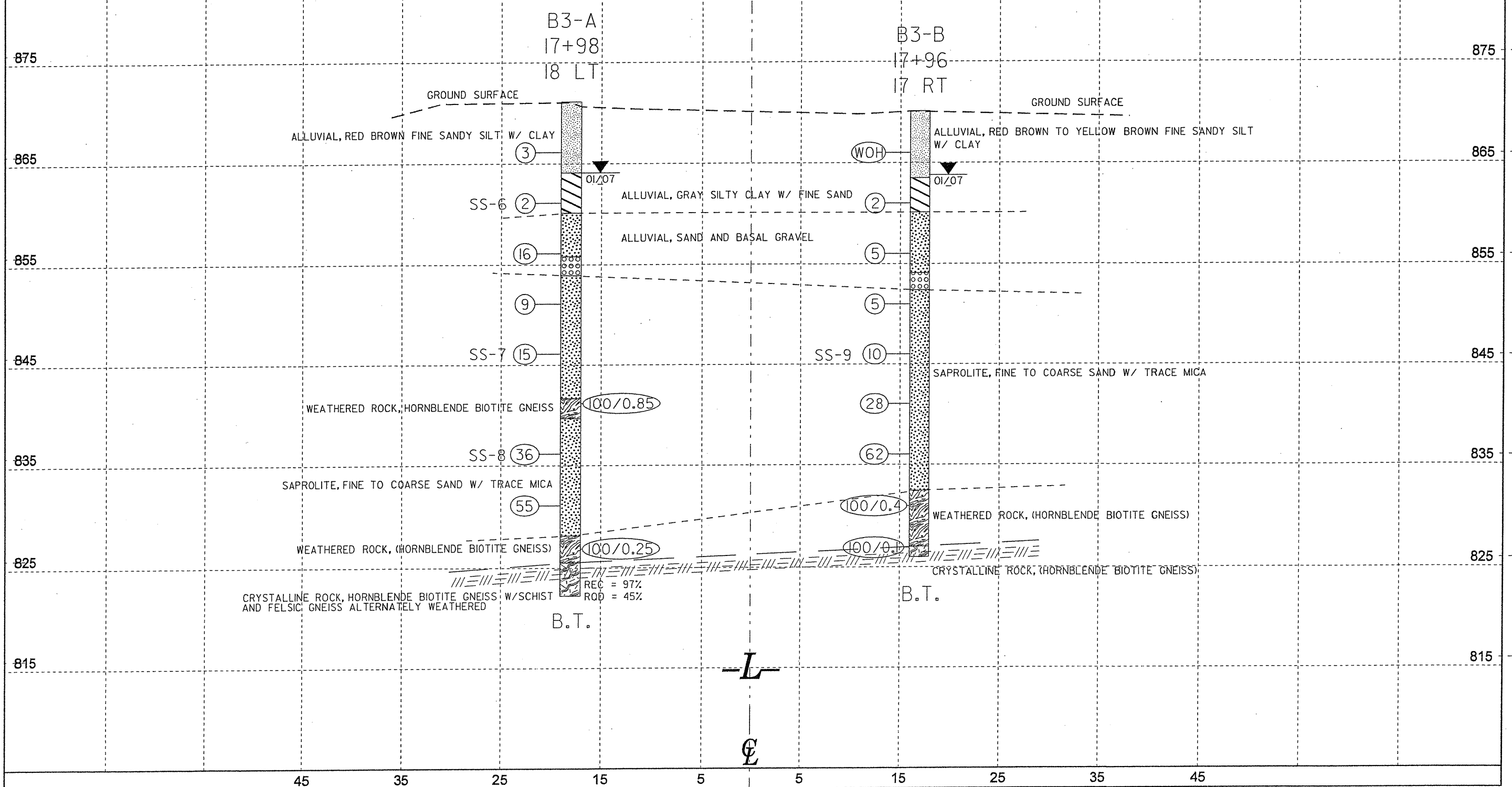
SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	LL	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	4	10	40		
SS-10	16 RT	17+58	3.8 - 5.3	A-4(3)	36	NP	9	46	23	22	3.4	94	91	49	
SS-11	16 RT	17+58	8.8 - 10.3	A-2-4(0)	24	NP	10	74	10	6	0	100	100	22	
SS-12	16 RT	17+58	18.8 - 20.3	A-2-4(0)	24	NP	40	44	12	4	0	99	78	23	
SS-13	16 RT	17+58	28.8 - 30.3	A-2-4(0)	31	NP	45	42	11	2	0	95	72	18	

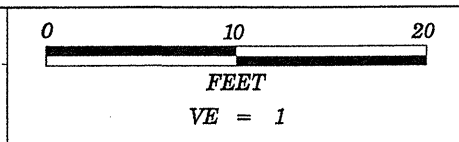




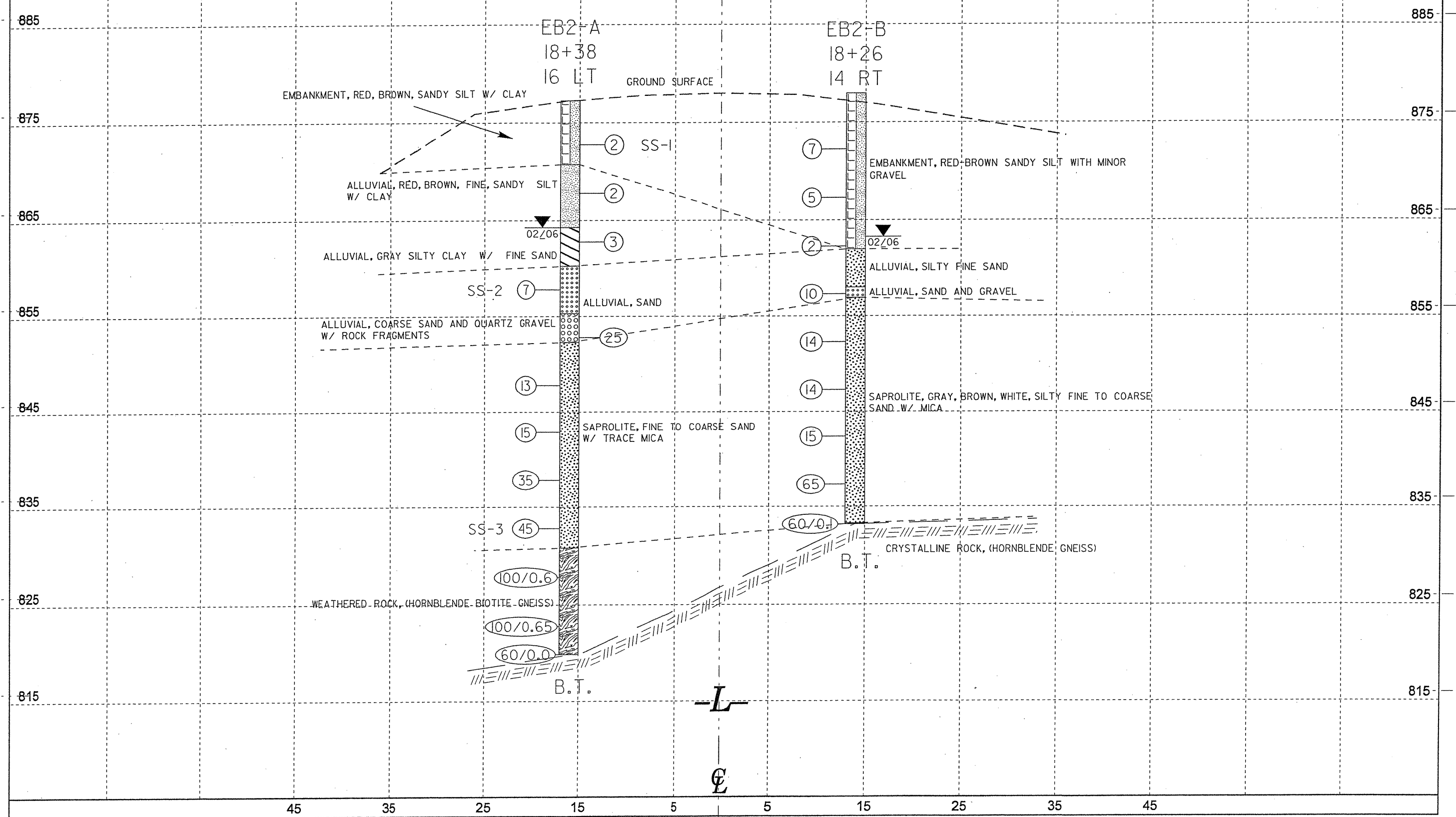
### SOIL TEST RESULTS

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-6	18 LT	17+98	9.0 - 10.5	A-7-6(9)	43	13	1	40	33	26	100	97	70		
SS-7	18 LT	17+98	24.5 - 26.0	A-2-4(0)	27	NP	40	45	13	2	97	78	21		
SS-8	18 LT	17+98	34.0 - 35.5	A-2-4(0)	24	NP	45	40	13	2	95	71	19		
SS-9	17 RT	17+96	23.1 - 24.6	A-2-4(0)	33	NP	43	40	15	2	94	71	21		





SOIL TEST RESULTS															
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	16 LT	18+38	3.5 - 5.0	A-4(0)	35	NP	31	35	18	16	92	76	37		
SS-2	16 LT	18+38	18.5 - 20.0	A-3(0)	21	NP	77	21	2	0	95	51	3		
SS-3	16 LT	18+38	43.5 - 45.0	A-2-4(0)	20	NP	40	42	14	4	95	73	25		



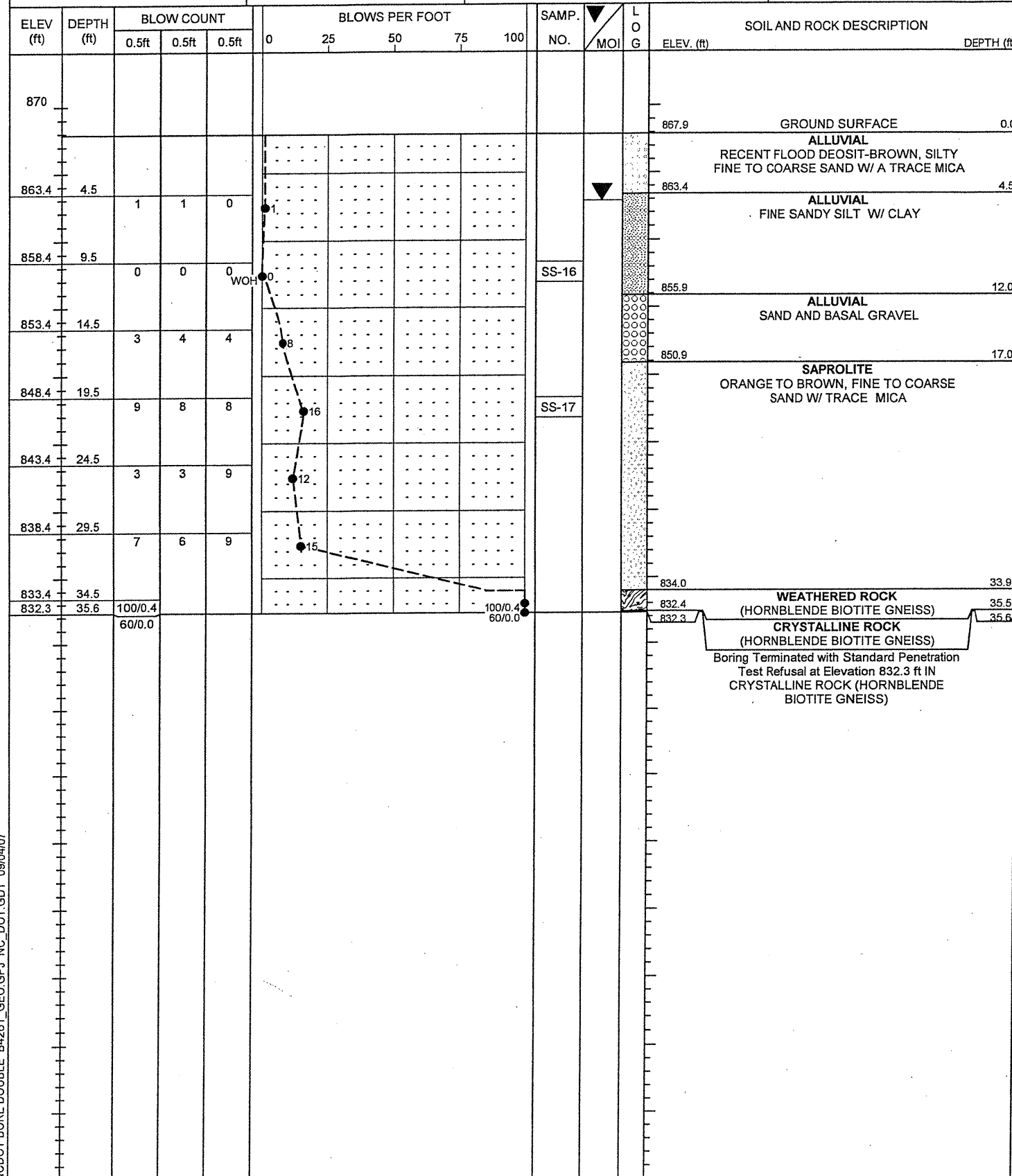




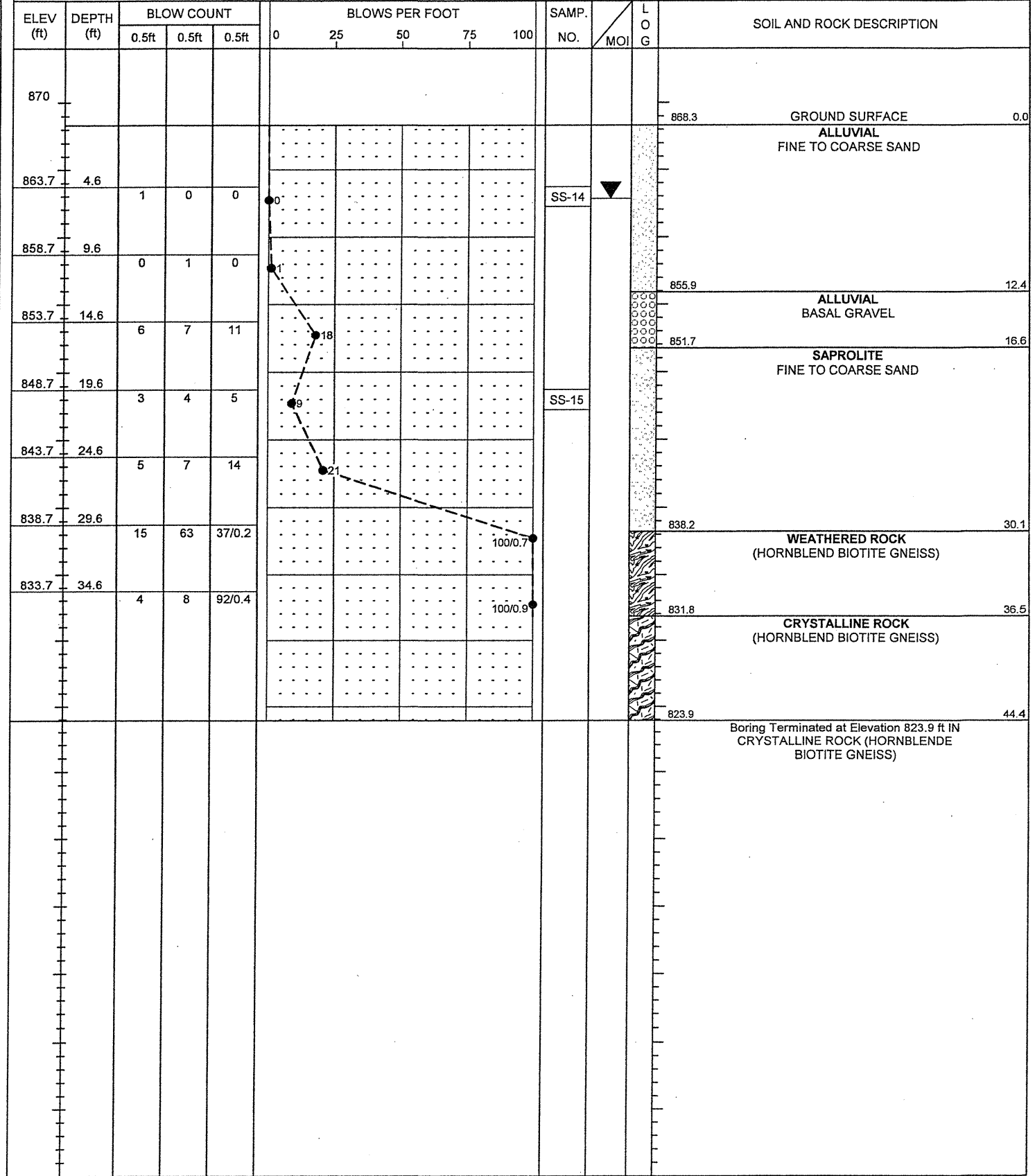


**NCDOT GEOTECHNICAL ENGINEERING UNIT**  
**BORELOG REPORT**

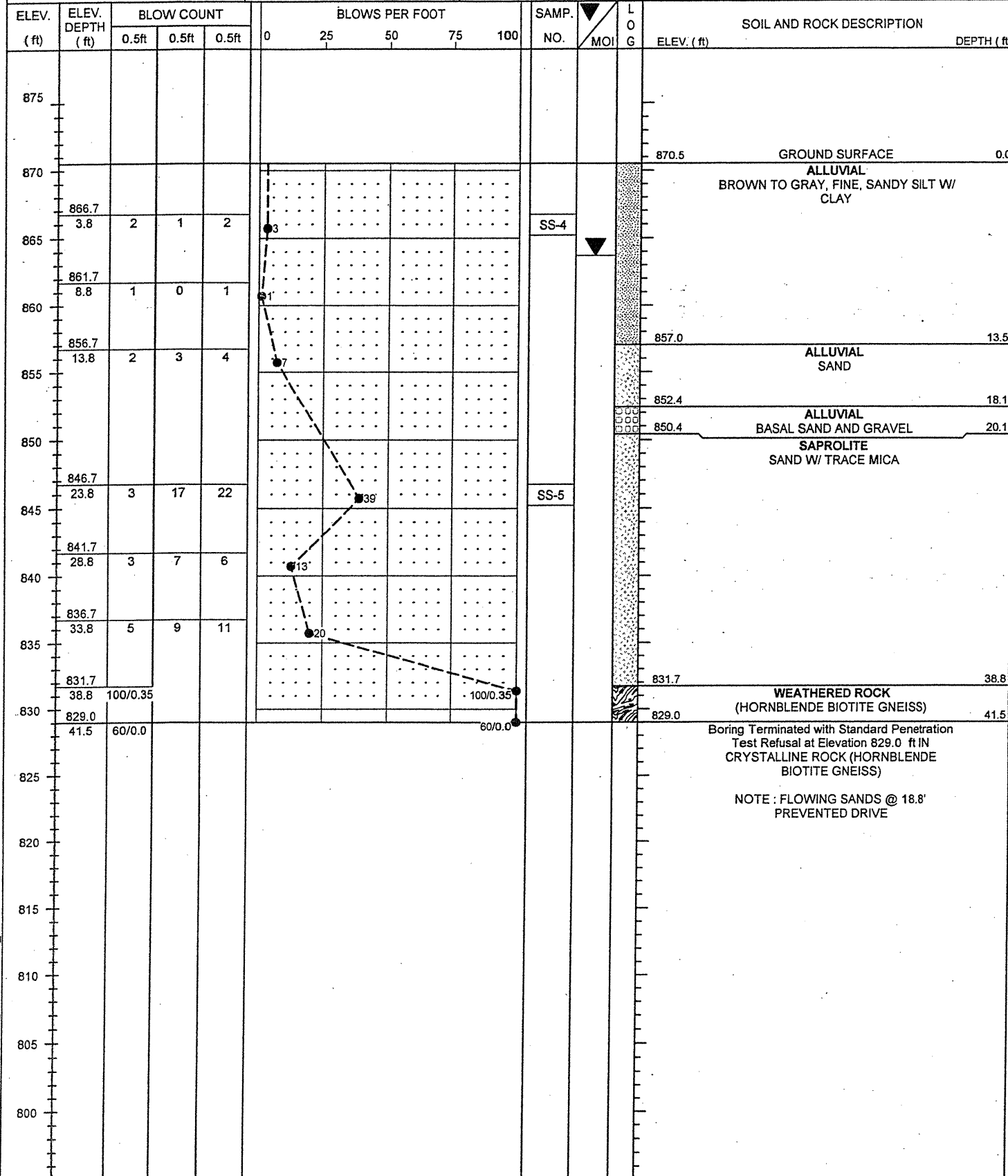
PROJECT NO. 33603.1.1	ID. B-4261	COUNTY RUTHERFORD	GEOLOGIST Hager, M. M.
SITE DESCRIPTION BRIDGE NO. 37 ON SR 1520 (ROCK ROAD) OVER CATHEY'S CREEK			GROUND WTR (ft)
BORING NO. B1-A	STATION 17+10	OFFSET 5ft LT	ALIGNMENT -L-
COLLAR ELEV. 867.9 ft	TOTAL DEPTH 35.6 ft	NORTHING 617,080	EASTING 1,123,889
DRILL MACHINE CME-550	DRILL METHOD NW Casing w/ Advancer	HAMMER TYPE Automatic	
START DATE 01/31/07	COMP. DATE 01/31/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 35.5 ft



PROJECT NO. 33603.1.1	ID. B-4261	COUNTY RUTHERFORD	GEOLOGIST Hager, M. M.
SITE DESCRIPTION BRIDGE NO. 37 ON SR 1520 (ROCK ROAD) OVER CATHEY'S CREEK			GROUND WTR (ft)
BORING NO. B1-B	STATION 17+08	OFFSET 6ft RT	ALIGNMENT -L-
COLLAR ELEV. 868.3 ft	TOTAL DEPTH 44.4 ft	NORTHING 617,070	EASTING 1,123,894
DRILL MACHINE CME-550	DRILL METHOD SPT Core Boring	HAMMER TYPE Automatic	
START DATE 01/30/07	COMP. DATE 01/30/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 36.5 ft

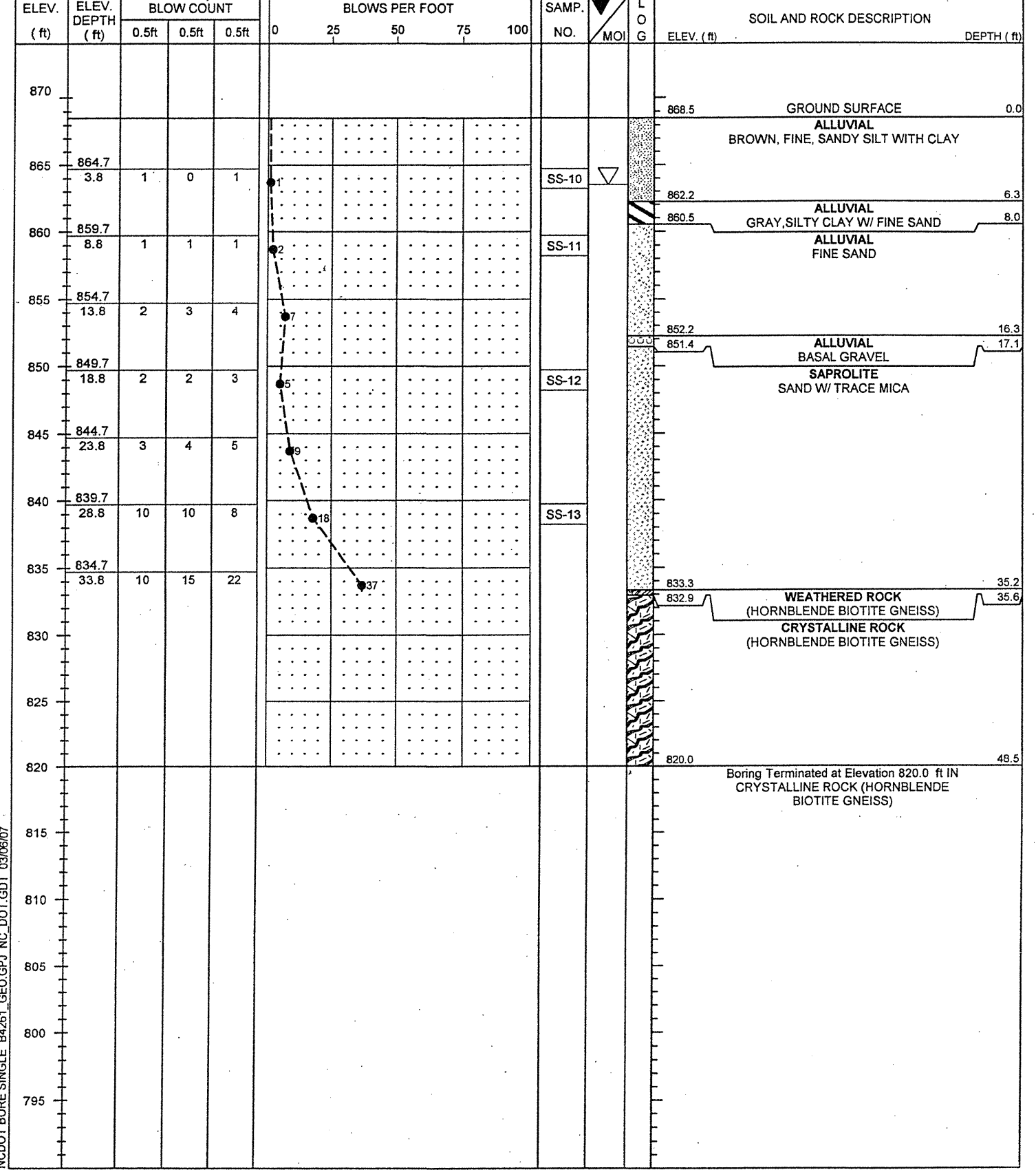


PROJECT NO. 33603.1.1	ID. B-4261	COUNTY RUTHERFORD	GEOLOGIST Hager, M. M.
SITE DESCRIPTION BRIDGE NO. 37 ON SR 1520 (ROCK ROAD) OVER CATHEY'S CREEK			GROUND WTR (ft)
BORING NO. B2-A	STATION 17+61	OFFSET 17 ft LT	ALIGNMENT -L-
COLLAR ELEV. 870.5 ft	TOTAL DEPTH 41.5 ft	NORTHING 617,120	EASTING 1,123,923
DRILL MACHINE CME-550	DRILL METHOD NW Casing w/ Advancer	HAMMER TYPE Automatic	
START DATE 01/17/07	COMP. DATE 01/17/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A



NCDOT BORE SINGLE B4261\_GEO.GPJ NC\_DOT.GDT 02/23/07

PROJECT NO. 33603.1.1	ID. B-4261	COUNTY RUTHERFORD	GEOLOGIST Hager, M. M.
SITE DESCRIPTION BRIDGE NO. 37 ON SR 1520 (ROCK ROAD) OVER CATHEY'S CREEK			GROUND WTR (ft)
BORING NO. B2-B	STATION 17+58	OFFSET 16 ft RT	ALIGNMENT -L-
COLLAR ELEV. 868.5 ft	TOTAL DEPTH 48.5 ft	NORTHING 617,092	EASTING 1,123,941
DRILL MACHINE CME-550	DRILL METHOD SPT Core Boring	HAMMER TYPE Automatic	
START DATE 01/26/07	COMP. DATE 01/26/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 35.6 ft



NCDOT BORE SINGLE B4261\_GEO.GPJ NC\_DOT.GDT 03/06/07



**NCDOT GEOTECHNICAL ENGINEERING UNIT**  
**BORELOG REPORT**

PROJECT NO. 33603.1.1	ID. B-4261	COUNTY RUTHERFORD	GEOLOGIST Hager, M. M.
SITE DESCRIPTION BRIDGE NO. 37 ON SR 1520 (ROCK ROAD) OVER CATHEY'S CREEK			GROUND WTR (ft)
BORING NO. B3-A	STATION 17+98	OFFSET 18ft LT	ALIGNMENT -L-
COLLAR ELEV. 871.1 ft	TOTAL DEPTH 48.9 ft	NORTHING 617,143	EASTING 1,123,953
DRILL MACHINE CME-550	DRILL METHOD SPT Core Boring	HAMMER TYPE Automatic	
START DATE 01/17/07	COMP. DATE 01/17/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 45.6 ft

PROJECT NO. 33603.1.1	ID. B-4261	COUNTY RUTHERFORD	GEOLOGIST Hager, M. M.
SITE DESCRIPTION BRIDGE NO. 37 ON SR 1520 (ROCK ROAD) OVER CATHEY'S CREEK			GROUND WTR (ft)
BORING NO. B3-B	STATION 17+96	OFFSET 17ft RT	ALIGNMENT -L-
COLLAR ELEV. 870.1 ft	TOTAL DEPTH 44.1 ft	NORTHING 617,114	EASTING 1,123,972
DRILL MACHINE CME-550	DRILL METHOD NW Casing w/ Advancer	HAMMER TYPE Automatic	
START DATE 01/22/07	COMP. DATE 01/22/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 43.1 ft

ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
		0.5ft	0.5ft	0.5ft	0	25	50	75	100				
875												GROUND SURFACE	0.0
867.1	4.0	0	1	2								ALLUVIAL RED BROWN FINE SANDY SILT W/ CLAY	7.0
862.1	9.0	1	0	2						SS-6	W	ALLUVIAL GRAY SILTY CLAY W/ FINE SAND	11.0
857.1	14.0	3	6	10								ALLUVIAL SAND	15.3
852.1	19.0	2	5	4							Sat.	ALLUVIAL SAND AND BASAL GRAVEL	17.2
847.1	24.0	1	7	8								SAPROLITE FINE TO COARSE SAND W/ TRACE MICA	29.5
842.1	29.0	27	58	42/0.35							SS-7	WEATHERED ROCK HORNBLende BIOTITE GNEISS	31.5
837.1	34.0	5	17	19							SS-8	SAPROLITE FINE TO COARSE SAND W/ TRACE MICA	43.0
832.1	39.0	8	21	34								WEATHERED ROCK HORNBLende BIOTITE GNEISS	45.6
827.1	44.0	100/0.25										CRYSTALLINE ROCK HORNBLende BIOTITE GNEISS W/SCHIST AND FELSIC GNEISS ALTERNATELY WEATHERED	48.9

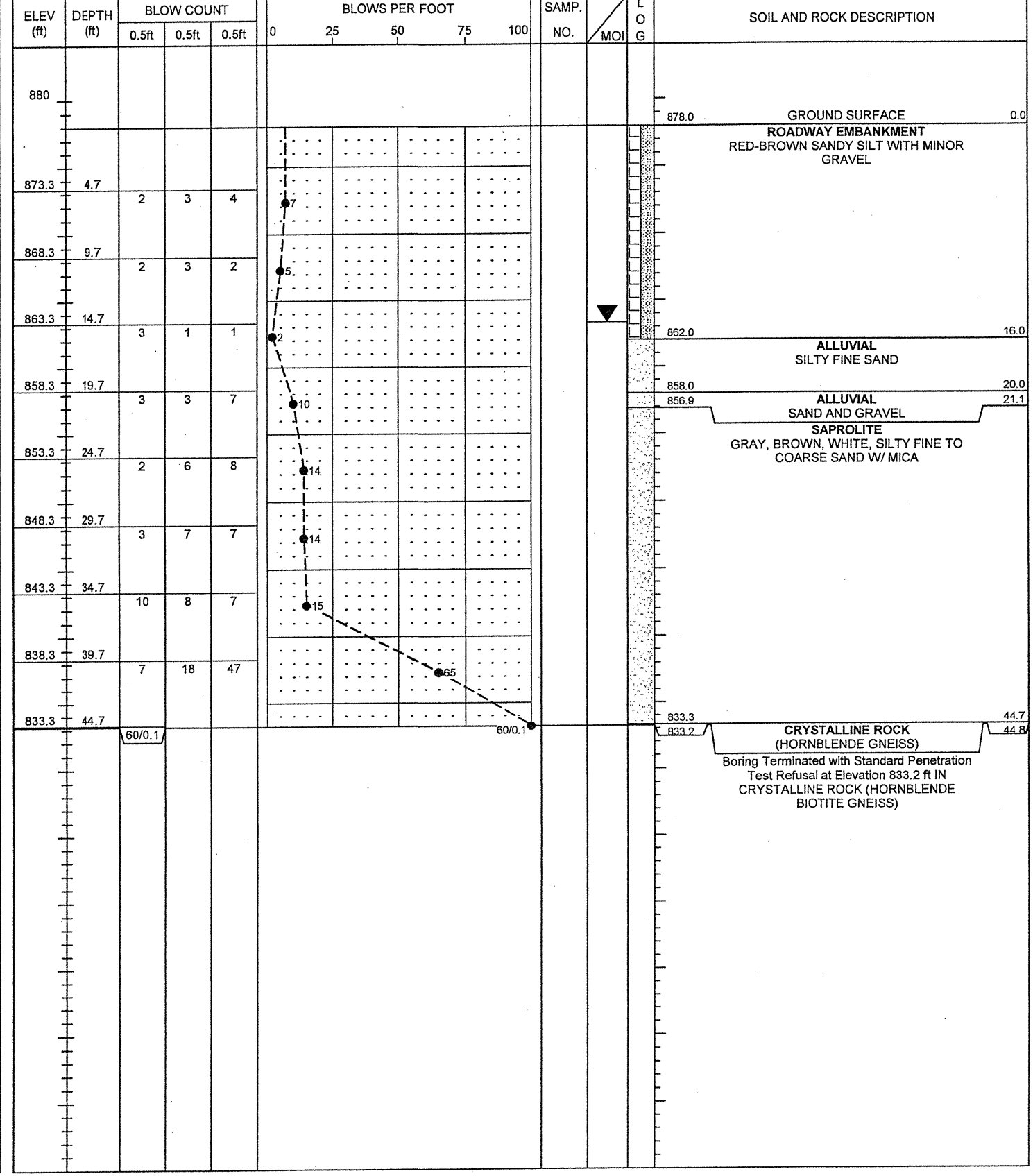
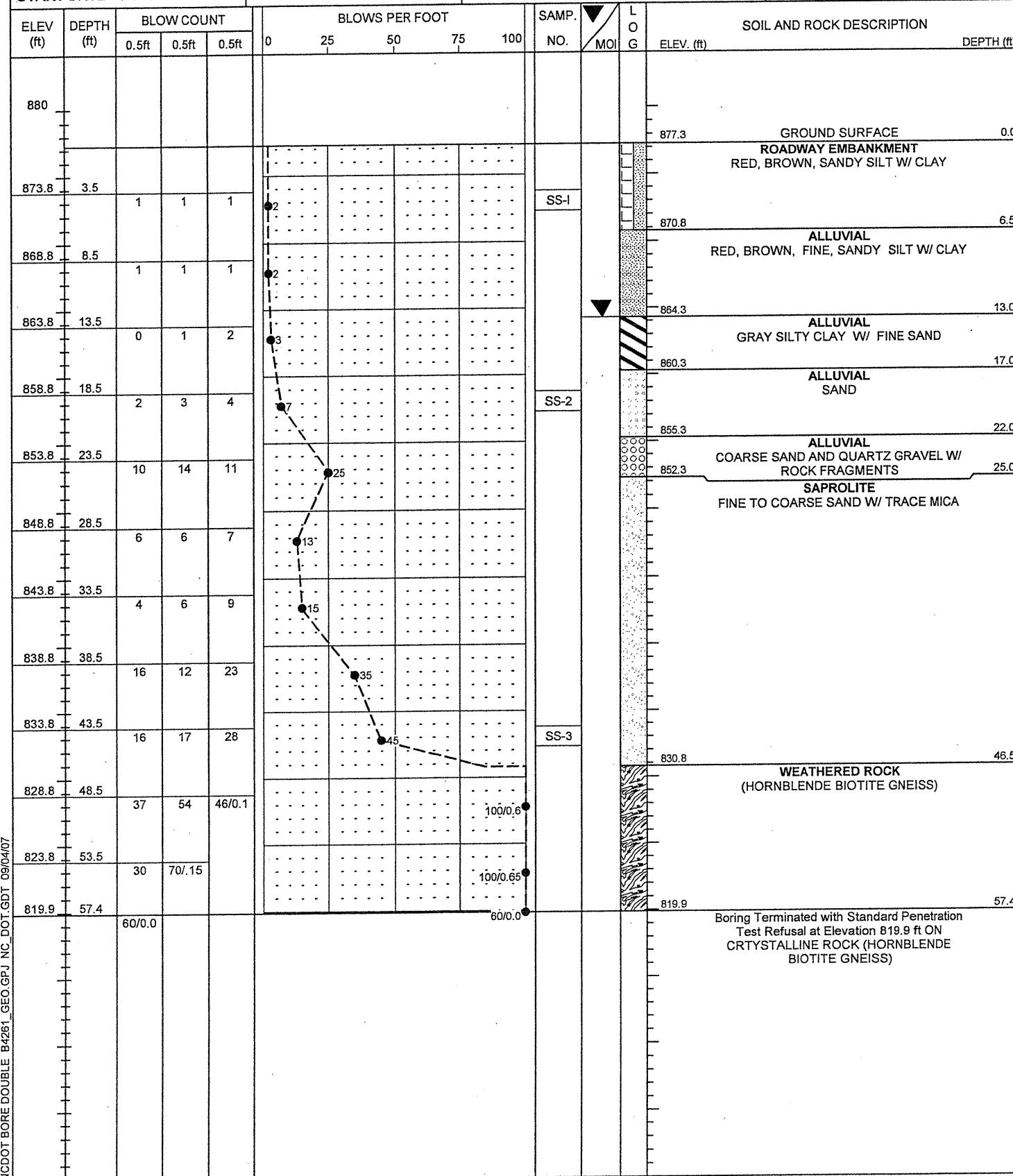
ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
		0.5ft	0.5ft	0.5ft	0	25	50	75	100				
875												GROUND SURFACE	0.0
867.0	3.1	0	0	0							W	ALLUVIAL RED BROWN TO YELLOW BROWN FINE SANDY SILT W/ CLAY	6.6
862.0	8.1	0	1	1							W	ALLUVIAL GRAY, SILTY CLAY W/ FINE SAND	10.0
857.0	13.1	1	2	3								ALLUVIAL SAND	16.0
852.0	18.1	2	3	2							Sat.	ALLUVIAL BASAL GRAVEL	17.7
847.0	23.1	2	4	6								SAPROLITE FINE TO COARSE SAND W/ TRACE MICA	29.5
842.0	28.1	9	13	15							SS-9	WEATHERED ROCK HORNBLende BIOTITE GNEISS	37.6
837.0	33.1	5	14	48								WEATHERED ROCK (HORNBLende BIOTITE GNEISS)	43.1
832.0	38.1	100/0.4										CRYSTALLINE ROCK (HORNBLende BIOTITE GNEISS)	44.1
827.0	43.1	100/0.1										Boring Terminated with Casing Advancer Refusal at Elevation 826.0 ft IN CRYSTALLINE ROCK (HORNBLende BIOTITE GNEISS)	

NCDOT BORE DOUBLE B4261\_GEO.GPJ NC\_DOT.GDT 09/04/07

**NCDOT GEOTECHNICAL ENGINEERING UNIT**  
**BORELOG REPORT**

PROJECT NO. 33603.1.1	ID. B-4261	COUNTY RUTHERFORD	GEOLOGIST Lockamy, P. Q.
SITE DESCRIPTION BRIDGE NO. 37 ON SR 1520 (ROCK ROAD) OVER CATHEY'S CREEK			GROUND WTR (ft)
BORING NO. EB2-A	STATION 18+38	OFFSET 16ft LT	ALIGNMENT -L-
COLLAR ELEV. 877.3 ft	TOTAL DEPTH 57.4 ft	NORTHING 617,163	EASTING 1,123,984
DRILL MACHINE CME-550	DRILL METHOD H.S. Augers	HAMMER TYPE Automatic	
START DATE 02/16/06	COMP. DATE 02/16/06	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

PROJECT NO. 33603.1.1	ID. B-4261	COUNTY RUTHERFORD	GEOLOGIST Daniel, T. B.
SITE DESCRIPTION BRIDGE NO. 37 ON SR 1520 (ROCK ROAD) OVER CATHEY'S CREEK			GROUND WTR (ft)
BORING NO. EB2-B	STATION 18+26	OFFSET 14ft RT	ALIGNMENT -L-
COLLAR ELEV. 878.0 ft	TOTAL DEPTH 44.8 ft	NORTHING 617,134	EASTING 1,123,994
DRILL MACHINE CME-550	DRILL METHOD H.S. Augers	HAMMER TYPE Automatic	
START DATE 02/15/06	COMP. DATE 02/15/06	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 44.7 ft



NCDOT BORE DOUBLE B4261\_GEO.GPJ NC\_DOT.GDT 09/04/07

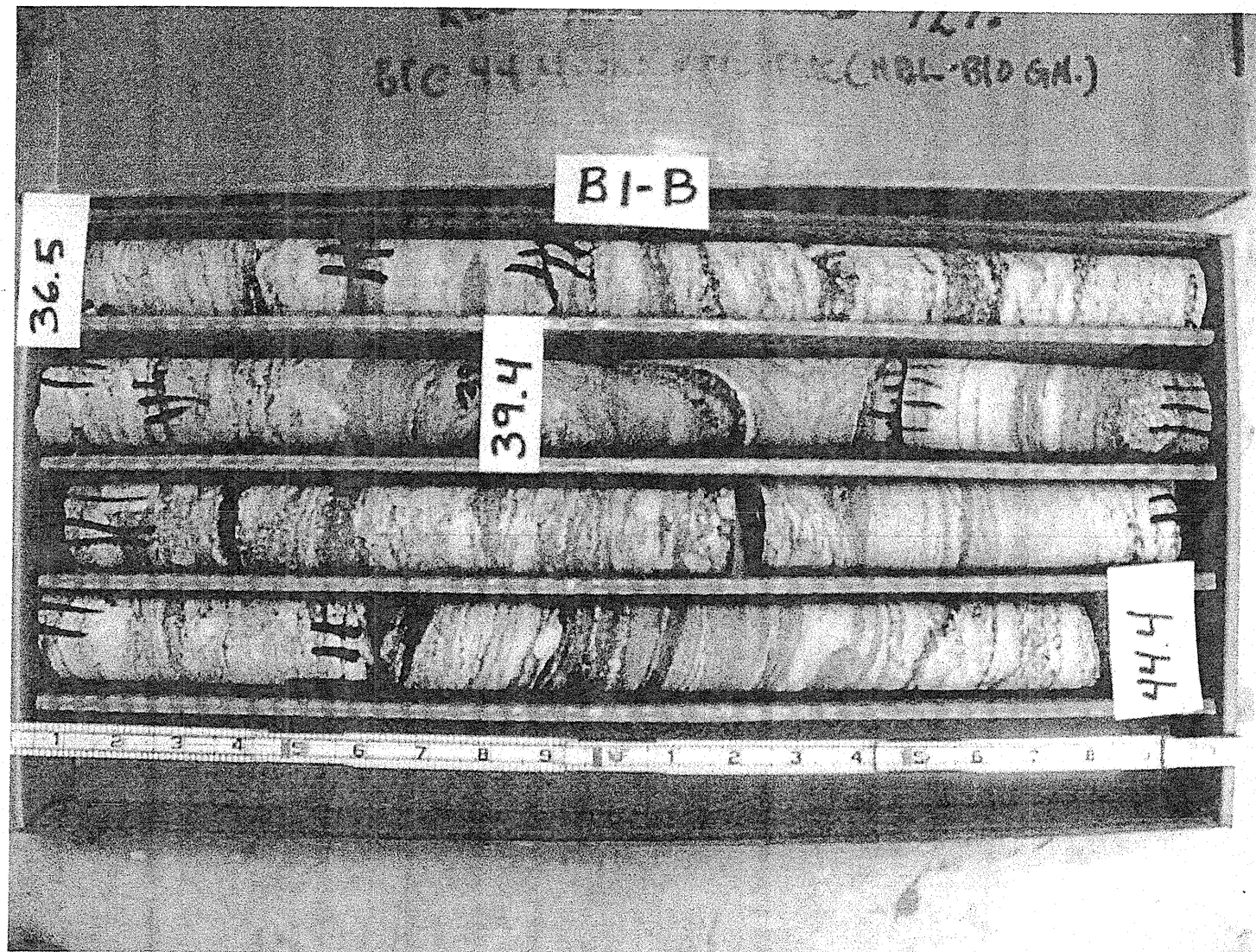






RUTHERFORD CO. BRIDGE 37 ON  
SR-1520 (ROCK ROAD) OVER CATHEY'S CREEK

B-4261 33603.1.1  
B1-B



RUTHERFORD CO. BRIDGE 37 ON  
SR-1520 (ROCK ROAD) OVER CATHEY'S CREEK

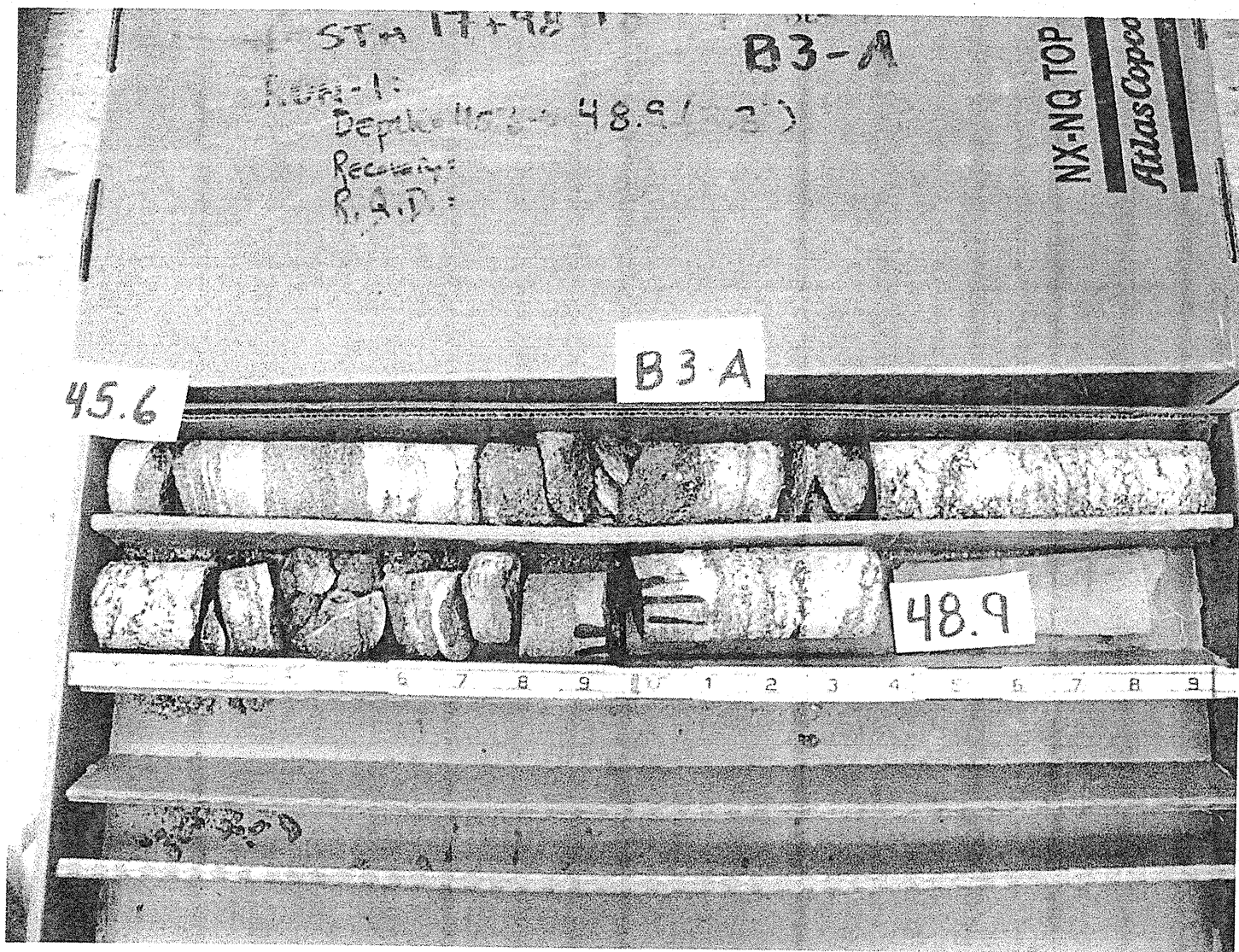
B-4261 33603.1.1  
B2-B





RUTHERFORD CO. BRIDGE 37 ON  
SR-1520 (ROCK ROAD) OVER CATHEY'S CREEK

B-4261 33603.1.1  
B3-A



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

T.I.P. ID #: B-4261

REPORT ON SAMPLES OF: Soils for Quality

PROJECT:	33603.1.1	COUNTY:	Rutherford	Owner:	NCDOT
DATE SAMPLED:	1.07	DATE RECEIVED:	2.2.07	DATE REPORTED:	2.8.07
SAMPLED FROM:	Bridge	SAMPLED BY:	P. Q. Lockamy		
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	SS-8
Lab Sample No. A	154470	154471	154472	154473	154474	154475	154476	154477
HiCAMS Sample #	--	--	--	--	--	--	--	--
Retained #4 Sieve %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Passing #10 Sieve %	92	95	95	100	87	100	97	95
Passing #40 Sieve %	76	51	73	98	63	99	78	71
Passing #200 Sieve %	37	3	25	58	15	70	21	19

MINUS #10 FRACTION

Soil Mortar - 100%								
Coarse Sand - Ret. #60	31	77	40	7	48	1	40	45
Fine Sand - Ret. #270	35	21	42	44	39	40	45	40
Silt 0.05-0.005 mm %	18	2	14	31	11	33	13	13
Clay < 0.005 mm %	16	0	4	18	2	26	2	2
Passing # 40 Sieve %	--	--	--	--	--	--	--	--
Passing # 200 Sieve %	--	--	--	--	--	--	--	--

Liquid Limit	35	21	20	29	20	43	27	24
Plastic Index	NP	NP	NP	NP	NP	13	NP	NP
AASHTO Classification	A-4 (0)	A-3 (0)	A-2-4 (0)	A-4 (5)	A-2-4 (0)	A-7-5 (9)	A-2-4 (0)	A-2-4 (0)
Quantity								
Texture								
Station	18+38	18+38	18+38	17+61	17+61	17+98	17+98	17+98
Hole No.								
Depth (ft) From:	3.5	18.5	43.5	3.8	23.8	9.0	24.0	34.0
To:	5.0	20.0	45.0	5.3	25.3	10.5	25.5	35.5

Remarks:  
 A-154470 - 154477

CC:  
 P. Q. Lockamy  
 File

SOILS ENGINEER:

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

T.I.P. ID #: B-4261

REPORT ON SAMPLES OF: Soils for Quality

PROJECT:	33603.1.1 ( cont. )	COUNTY:	Rutherford	Owner:	NCDOT
DATE SAMPLED:	1.07	DATE RECEIVED:	2.2.07	DATE REPORTED:	2.8.07
SAMPLED FROM:	Bridge	SAMPLED BY:	P. Q. Lockamy		
SUBMITTED BY:	W. D. Frye	2002	STANDARD SPECIFICATION		
LABORATORY:	Asheville				

TEST RESULTS

Project Sample No.	SS-9	SS-10	SS-11	SS-12	SS-13	SS-14	SS-15	SS-16
Lab Sample No. A	154478	154479	154480	154481	154482	154483	154484	154485
HiCAMS Sample #	--	--	--	--	--	--	--	--
Retained #4 Sieve %	0.0	3.4	0.0	0.0	0.0	0.0	0.0	0.0
Passing #10 Sieve %	94	94	100	99	95	99	89	100
Passing #40 Sieve %	71	91	100	78	72	92	66	98
Passing #200 Sieve %	21	49	22	23	18	24	19	52

MINUS #10 FRACTION

Soil Mortar - 100%								
Coarse Sand - Ret. #60	43	9	10	40	45	27	43	13
Fine Sand - Ret. #270	40	46	74	44	42	53	42	44
Silt 0.05-0.005 mm %	15	23	10	12	11	12	13	27
Clay < 0.005 mm %	2	22	6	4	2	8	2	16
Passing # 40 Sieve %	--	--	--	--	--	--	--	--
Passing # 200 Sieve %	--	--	--	--	--	--	--	--

Liquid Limit	33	36	24	24	31	29	31	30
Plastic Index	NP	NP	NP	NP	NP	NP	NP	NP
AASHTO Classification	A-2-4 (0)	A-4 (3)	A-2-4 (0)	A-2-4 (0)	A-2-4 (0)	A-2-4 (0)	A-2-4 (0)	A-4 (3)
Quantity								
Texture								
Station	17+96	17+58	17+58	17+58	17+58	17+08	17+08	17+10
Hole No.								
Depth (ft) From:	23.1	3.8	8.8	18.8	28.8	4.6	19.6	9.5
To:	24.6	5.3	10.3	20.3	30.3	6.1	21.1	11.0

Remarks:  
 A-154478 - 154485

CC:  
 P. Q. Lockamy  
 File

SOILS ENGINEER:

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

T.I.P. ID #: B-4261

REPORT ON SAMPLES OF: Soils for Quality

PROJECT:	33603.1.1 (cont.)	COUNTY:	Rutherford	Owner:	NCDOT
DATE SAMPLED:	1.07	DATE RECEIVED:	2.2.07	DATE REPORTED:	2.8.07
SAMPLED FROM:	Bridge	SAMPLED BY:	P. Q. Lockamy		
SUBMITTED BY:	W. D. Frye	2002	STANDARD SPECIFICATION		
LABORATORY:	Asheville				

**TEST RESULTS**

Project Sample No.	SS-17						
Lab Sample No.	A 154486						
HiCAMS Sample #	--						
Retained #4 Sieve %	0.0						
Passing #10 Sieve %	90						
Passing #40 Sieve %	59						
Passing #200 Sieve %	16						

**MINUS #10 FRACTION**

Soil Mortar - 100%							
Coarse Sand -Ret. #60	53						
Fine Sand - Ret. #270	35						
Silt 0.05-0.005 mm %	10						
Clay < 0.005 mm %	2						
Passing # 40 Sieve %	--						
Passing # 200 Sieve %	--						

Liquid Limit	30						
Plastic Index	NP						
AASHTO Classification	A-2-4 (0)						
Quantity							
Texture							
Station	17+10						
Hole No.							
Depth (ft) From:	19.5						
To:	21.0						

**Remarks:**

A-154486

**CC:**

P. Q. Lockamy	
File	

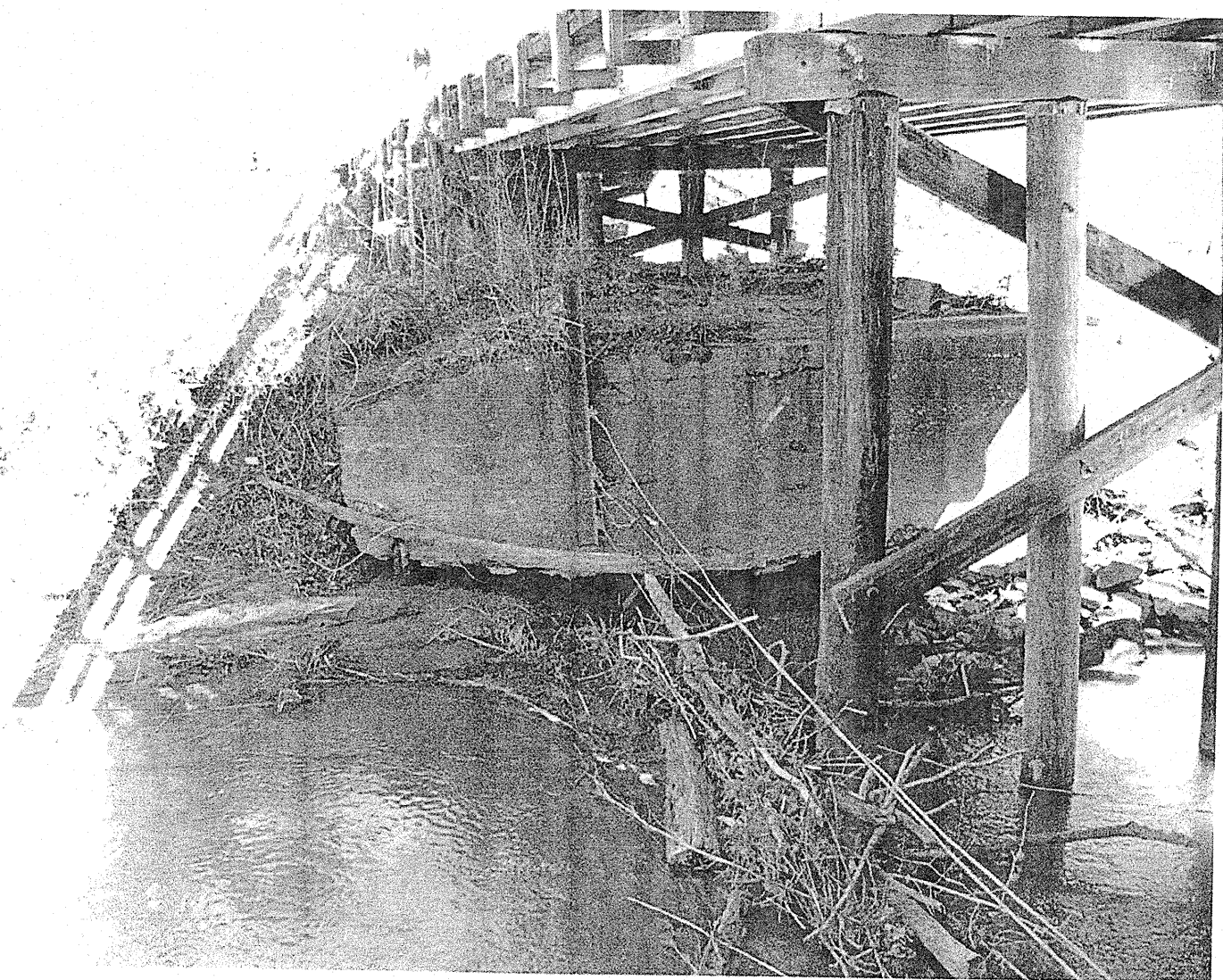
SOILS ENGINEER:



RUTHERFORD CO. BRIDGE 37 ON SR-1520

B-4261 33603.1.1

OLD PILE FOUNDED ABUTMENT AND DEBRIS CAUGHT ON CATTLE FENCING ALSO CONTRIBUTED TO SCOUR TROUGH.



RUTHERFORD CO. BRIDGE 37 ON SR 1520

B-4261 33603.1.1

SCOUR TROUGH ALONG EXISTING TIMBER PILES IN CREEK. WITH ERODED MATERIAL FORMING GRAVEL BAR DOWNSTREAM.

