

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-4281	1	21

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

STRUCTURE
SUBSURFACE INVESTIGATION

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PROJ. REFERENCE NO. B-4281 F.A. PROJ. BRSTP-008(4)
COUNTY STOKES
PROJECT DESCRIPTION BRIDGE #60 ON NC 889 OVER DAN RIVER
(-L- STATION 19+60)

SITE DESCRIPTION _____

CAUTION NOTICE

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

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

ID: B-4281

PROJECT: 33621.1.1

PERSONNEL

J.K. STICKNEY

C.L. SMITH

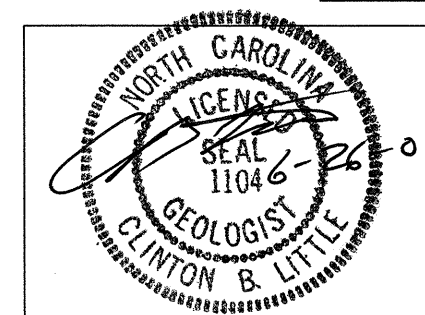
K. WISE

INVESTIGATED BY J.E. BEVERLY

CHECKED BY C.B. LITTLE

SUBMITTED BY C.B. LITTLE

DATE JUNE 2006



DRAWN BY: J.E. BEVERLY

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

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

PROJECT REFERENCE NO. B-4281	SHEET NO. 2
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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, HIGHLY 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. 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 (OCR)  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. 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 DISLOADED 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 (ROQ) - 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 (SCREC.) - 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							
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 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. 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. 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 > 100 BPF</i> VERY SEVERE (V SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. <i>IF TESTED, YIELDS SPT N VALUES < 100 BPF</i> COMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.		COMPRESSIONSIBILITY SLIGHTLY COMPRESSIBLE LIQUID LIMIT LESS THAN 31 MODERATELY COMPRESSIBLE LIQUID LIMIT EQUAL TO 31-50 HIGHLY COMPRESSIBLE LIQUID LIMIT GREATER THAN 50		FRESH VERY SLIGHT (V SLI.) SLIGHT (SLI.) MODERATE (MOD.) MODERATELY SEVERE (MOD. SEV.) SEVERE (SEV.) VERY SEVERE (V SEV.) COMPLETE			
PERCENTAGE OF MATERIAL		GROUND WATER		ROCK HARDNESS							
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		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 GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK. 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.							
CONSISTENCY OR DENSENESS		MISCELLANEOUS SYMBOLS		ROCK HARDNESS							
PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²)		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		SPT TEST BORING AUGER BORING CORE BORING MONITORING WELL PIEZOMETER INSTALLATION SLOPE INDICATOR INSTALLATION SPT N-VALUE SPT REFUSAL							
TEXTURE OR GRAIN SIZE		ABBREVIATIONS		ROCK HARDNESS							
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 HI. - 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 - VEIST VST - VANE SHEAR TEST WEA. - WEATHERED γ _w - UNIT WEIGHT γ _d - DRY UNIT WEIGHT		VERY HARD HARD MODERATELY HARD MEDIUM HARD SOFT VERY SOFT							
SOIL MOISTURE - CORRELATION OF TERMS		EQUIPMENT USED ON SUBJECT PROJECT		FRACTURE SPACING		BEDDING					
SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION		DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE: CORE SIZE: HAND TOOLS:		TERM SPACING TERM THICKNESS		TERM THICKNESS					
LL - LIQUID LIMIT - SATURATED - (SAT.) USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE PL - PLASTIC LIMIT - WET - (W) SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE OM - OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE SL - SHRINKAGE LIMIT - DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE		<input type="checkbox"/> MOBILE B- <input type="checkbox"/> BK-51 <input type="checkbox"/> CME-45C <input checked="" type="checkbox"/> CME-550 <input type="checkbox"/> PORTABLE HOIST <input type="checkbox"/> <input type="checkbox"/>		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					
PLASTICITY				INDURATION							
NONPLASTIC 0-5 VERY LOW LOW PLASTICITY 6-15 SLIGHT MED. PLASTICITY 16-25 MEDIUM HIGH PLASTICITY 26 OR MORE HIGH				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.							
COLOR											
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.											

Groundwater

Based on 24 hour groundwater measurements taken at boring locations, and the water surface elevation of the creek, we determined that natural groundwater should be in the vicinity of elevation 705 - 708 feet.

Respectfully submitted,

J.E. Beverly, Project Geologist

A handwritten signature in cursive script, appearing to read "J.E. Beverly". The signature is written in black ink and is positioned below the typed name.

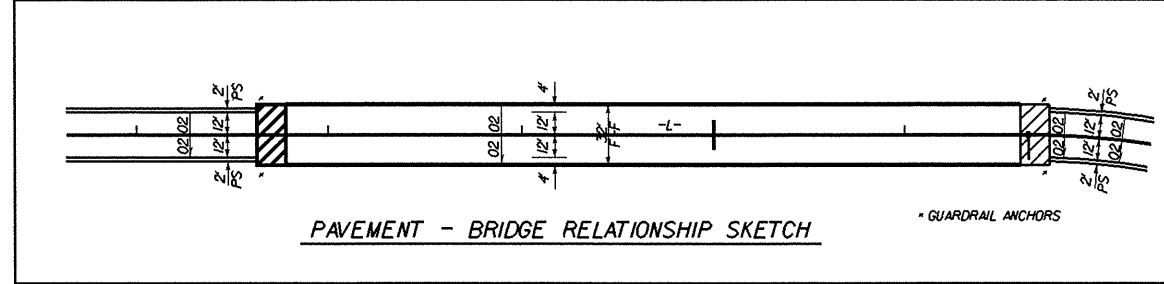
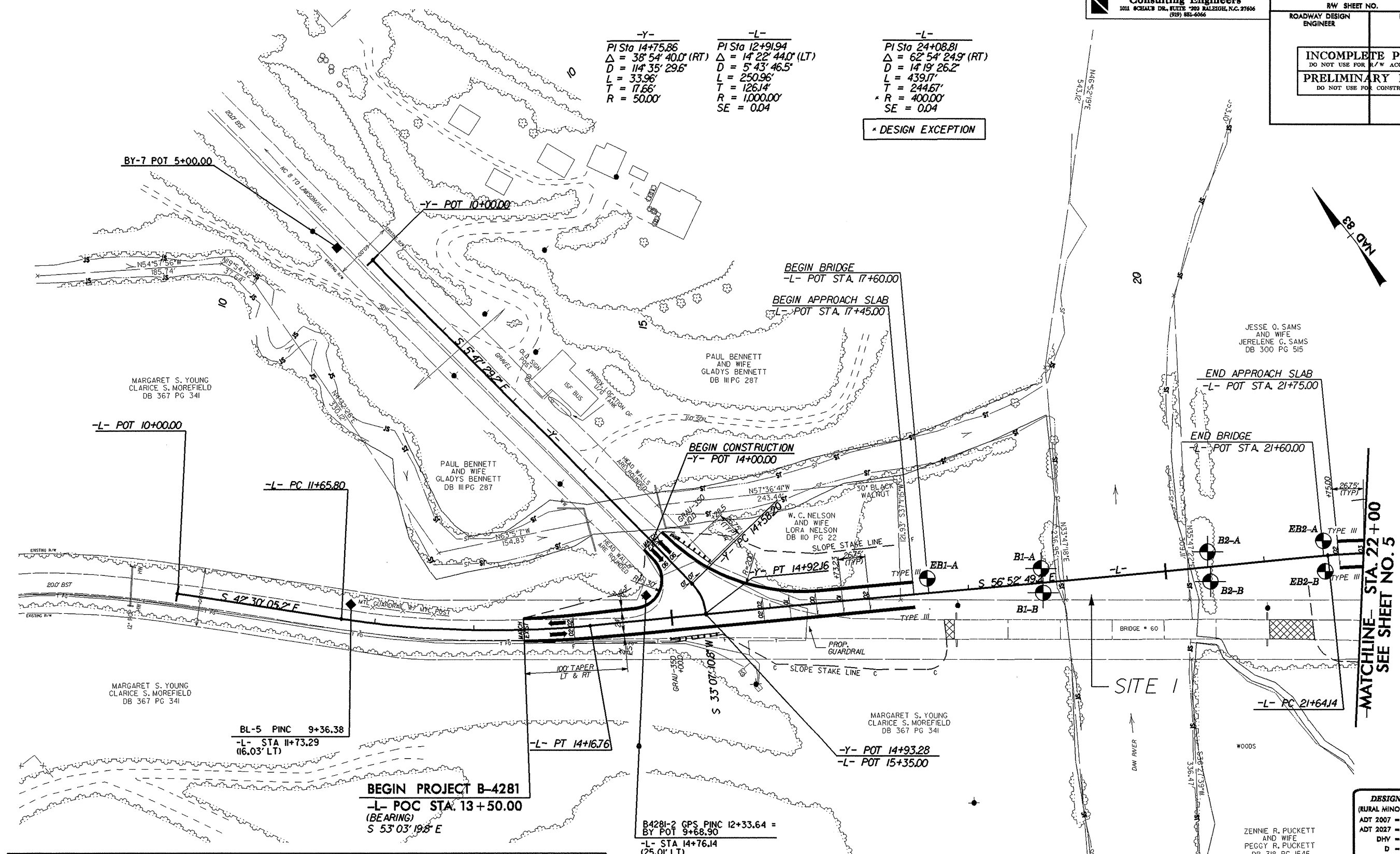
5/14/99

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Consulting Engineers
1011 CHASE DR. SUITE 202 RALEIGH, N.C. 27606
(919) 881-6066

PROJECT REFERENCE NO. B-4281	SHEET NO. SPR-4
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

-Y-	-L-	-L-
PI Sta 14+75.86	PI Sta 12+91.94	PI Sta 24+08.81
$\Delta = 38^\circ 54' 40.0''$ (RT)	$\Delta = 14^\circ 22' 44.0''$ (LT)	$\Delta = 62^\circ 54' 24.9''$ (RT)
D = 114' 35' 29.6"	D = 5' 43' 46.5"	D = 14' 19' 26.2"
L = 33.96'	L = 250.96'	L = 439.17'
T = 17.66'	T = 126.14'	T = 244.67'
R = 50.00'	R = 1,000.00'	R = 400.00'
	SE = 0.04	SE = 0.04

* DESIGN EXCEPTION



2007 ADT	?	?	?	?	?
2027 ADT	?	?	?	?	?
?	NC 89	?	NC 8/89	3180	4980

PROJECTED TRAFFIC VOLUMES

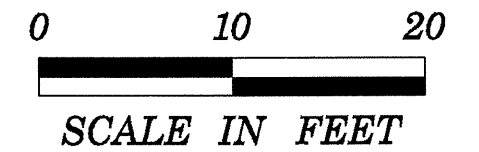
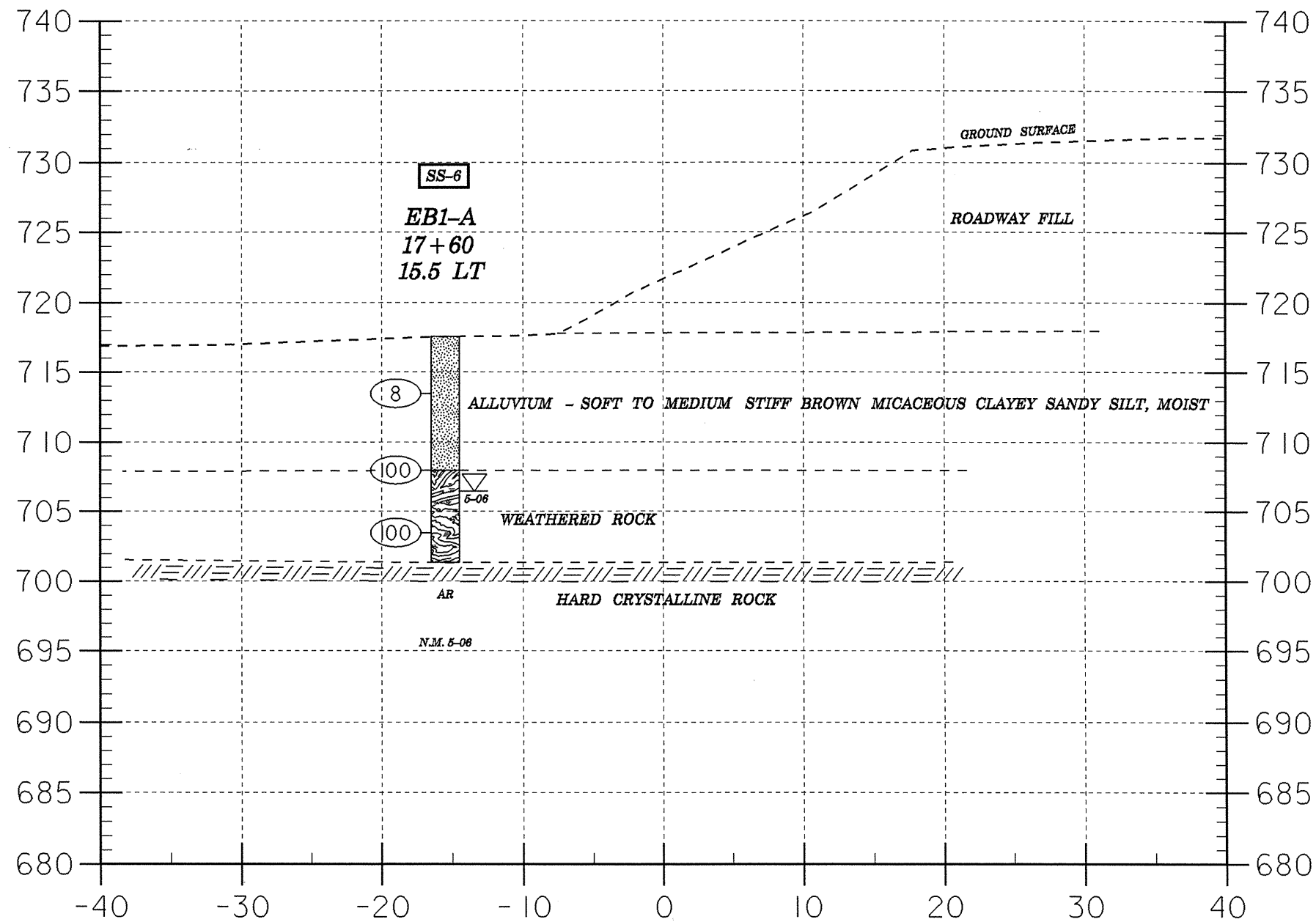
DESIGN DATA	
(RURAL MINOR ARTERIAL)	
ADT 2007	= 3180
ADT 2027	= 4980
DHYP	= 10 %
D	= 65 %
T	= 3 %
V	= 60 MPH
* TTST 1% DUAL 2%	

LEGEND	
	PAVED SHOULDER
	APPROACH SLAB

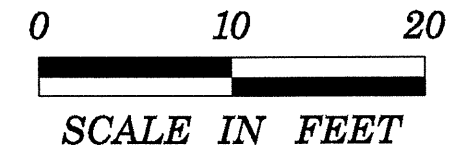
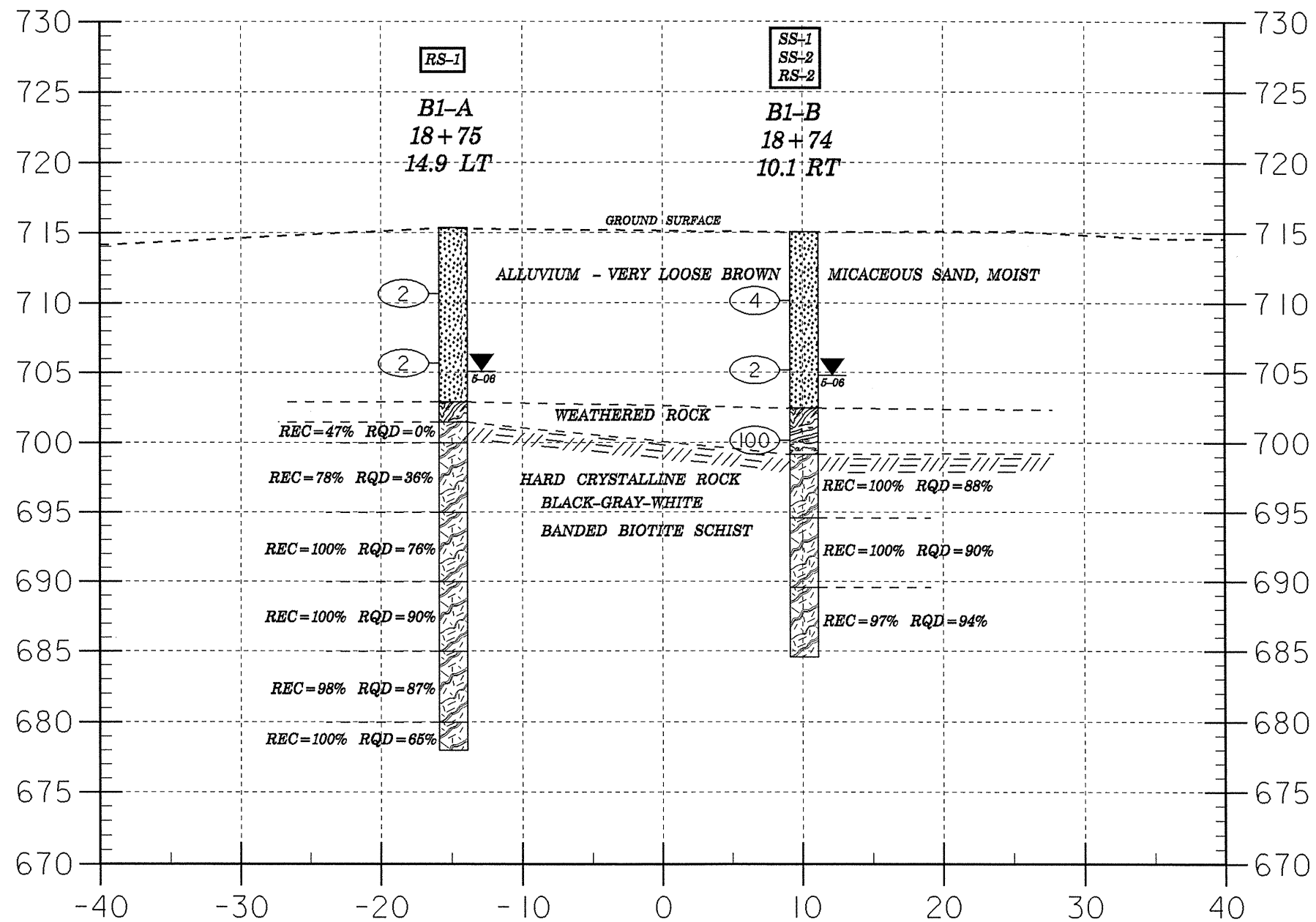
FOR -L- PROFILE, SEE SHEET NO. 6
FOR -Y- PROFILE, SEE SHEET NO. 6

20-JUN-2006 09:25
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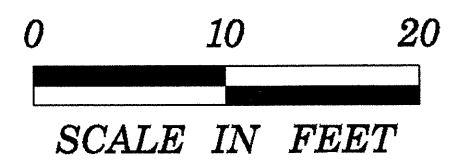
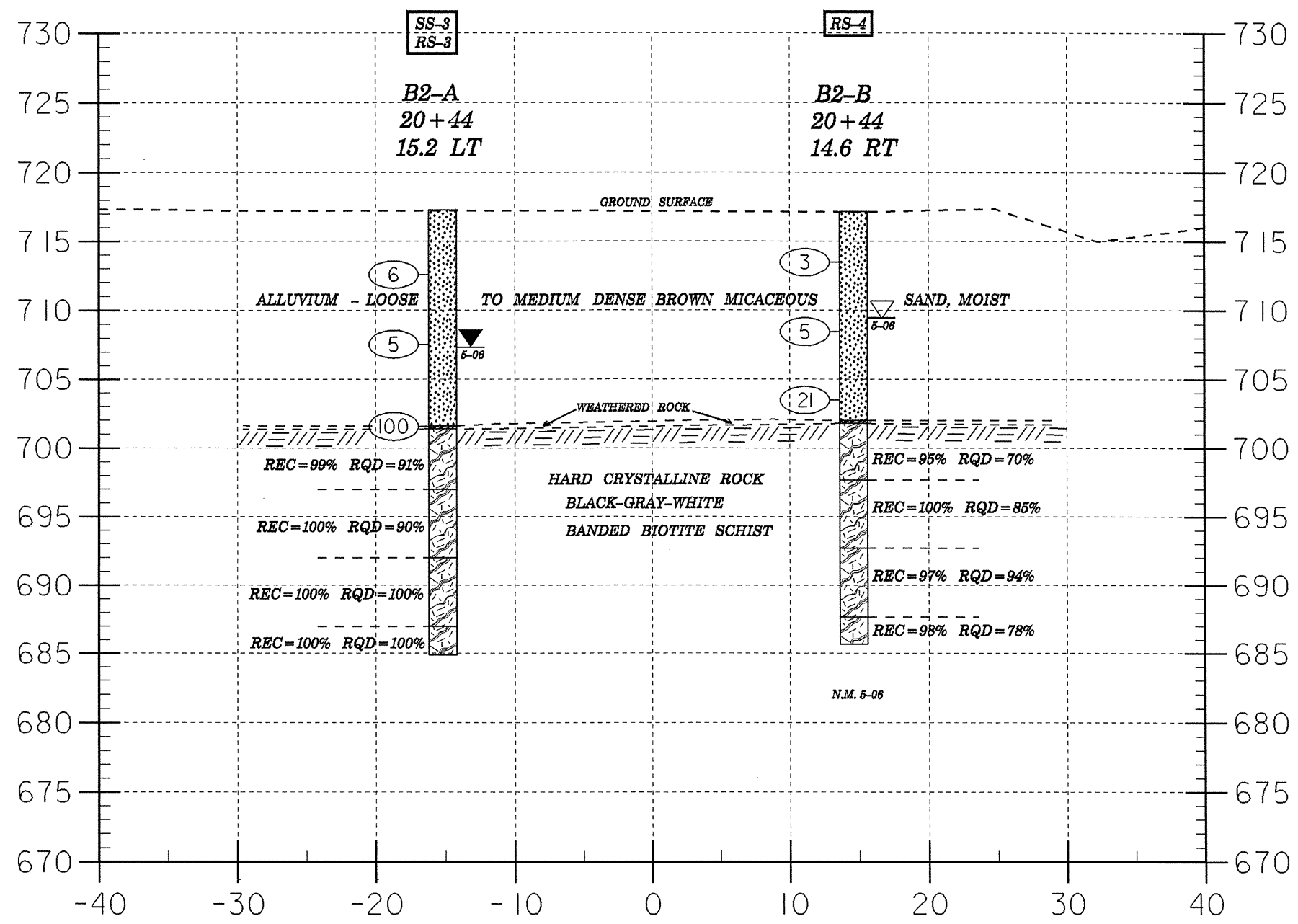
SECTION THROUGH END BENT 1



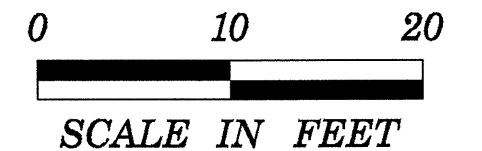
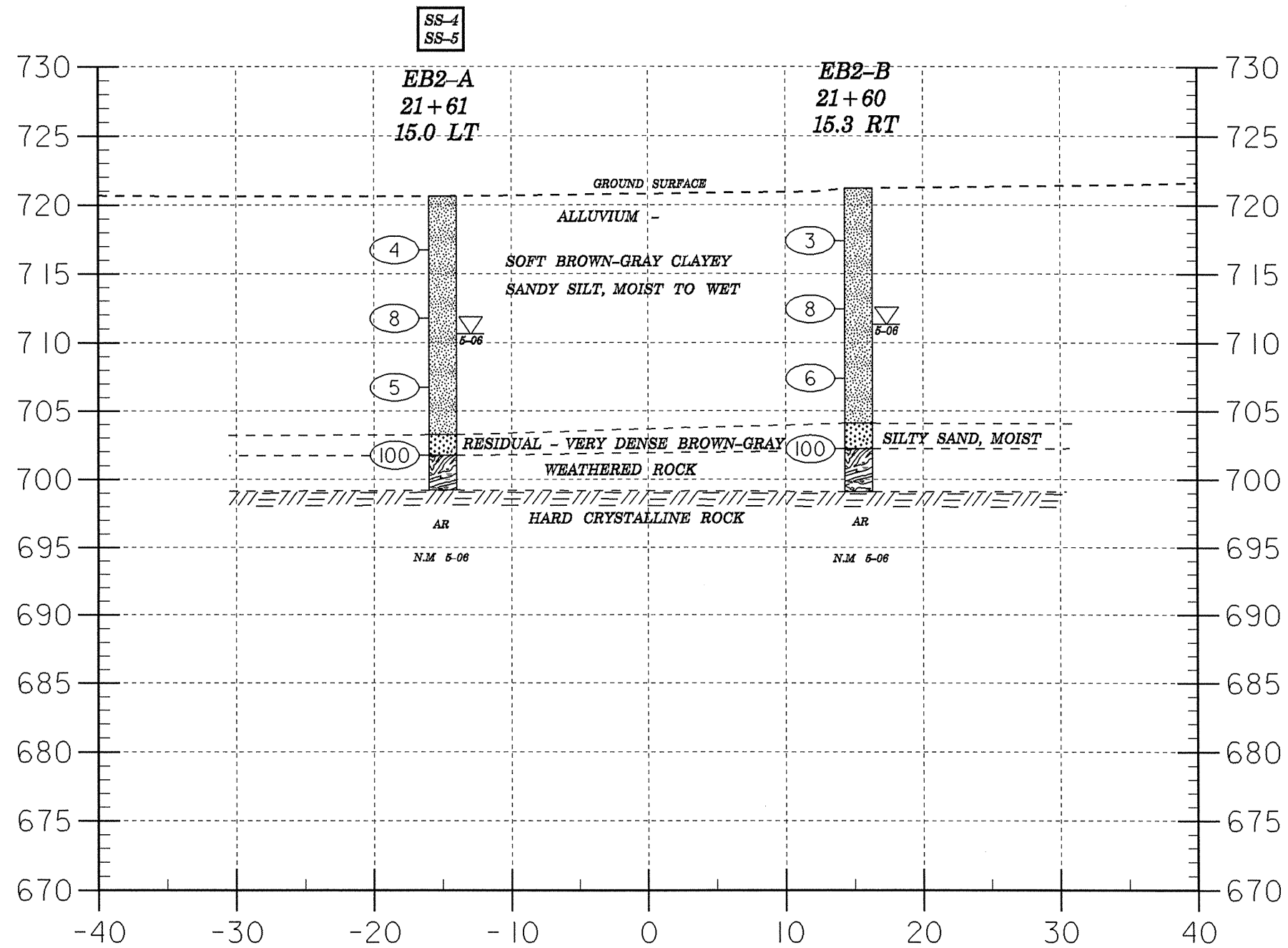
SECTION THROUGH B1-A AND B1-B



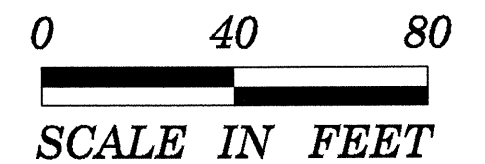
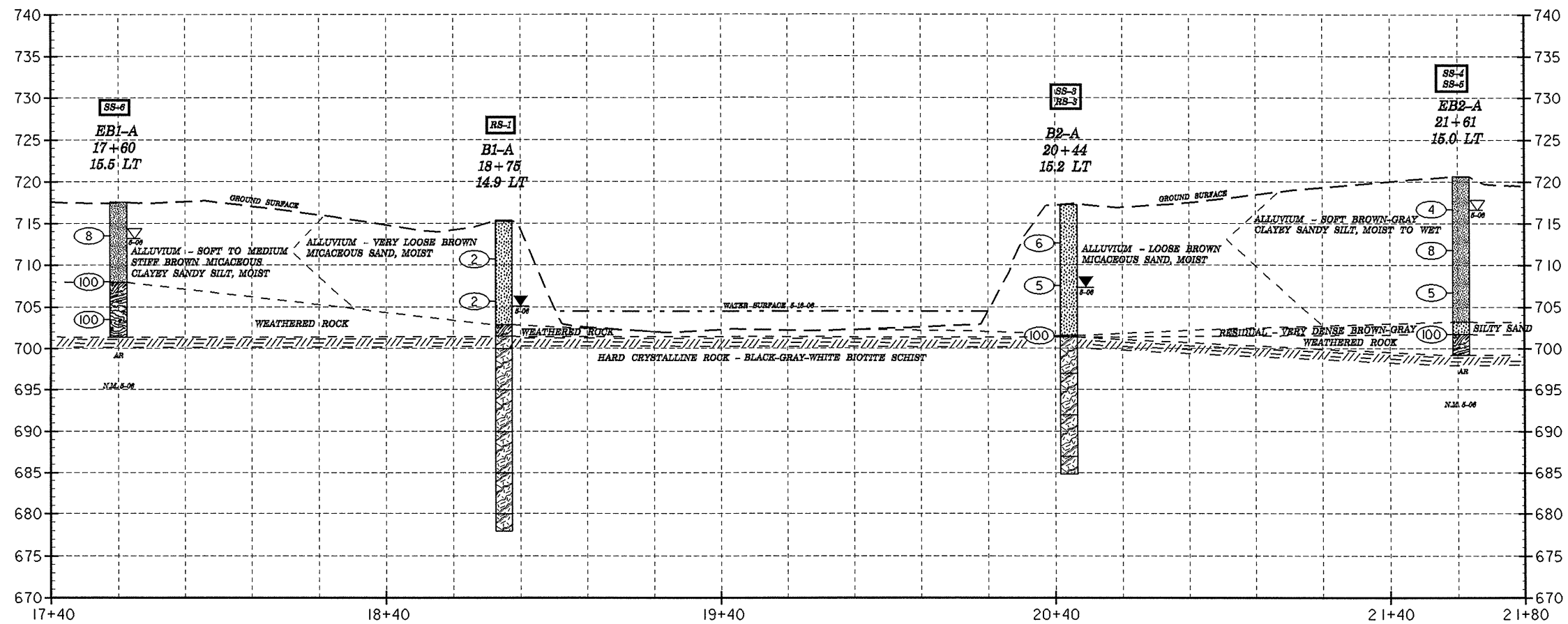
SECTION THROUGH B2-A AND B2-B



SECTION THROUGH EB2-A AND EB2-B



PROFILE 15 FEET LEFT OF -L-



NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL UNIT CORE BORING REPORT

PROJECT NO: 33621.1.1 PROJECT ID: B-4281 COUNTY: STOKES GEOLOGIST: J.K. STICKNEY
 SITE DESCRIPTION: BRIDGE #60 ON NC 8/89 OVER THE DAN RIVER DRILLER: C.L. SMITH
 BORING NO: B1-A BORING LOCATION (STA): 18+75 OFFSET: 14.9 LT
 COLLAR ELEV: 715.37 PERSONNEL: HKW, TM CORE SIZE: NXWL
 TOTAL DEPTH: 37.4 DRILL MACHINE: CME-550 DATE STARTED: 05/15/06
 TOTAL RUN: 23.5 DRILL EQUIP: NX-CASING, TRICONE DATE COMPLETED: 05/15/06

PROJECT NO 33621.1.1		ID B-4281		COUNTY STOKES		GEOLOGIST J.K. STICKNEY								
SITE DESCRIPTION BRIDGE #60 ON NC 8/89 OVER THE DAN RIVER							GND WATER							
BORING NO B1-A		NORTHING 0.00		EASTING 0.00		0 HR 8.00ft								
ALIGNMENT L		BORING LOCATION 18+75.000		OFFSET 14.90ft LT		24 HR 10.30ft								
COLLAR ELEV 715.37ft		TOTAL DEPTH 37.40ft		START DATE 5/15/06		COMPLETION DATE 05/15/06								
DRILL MACHINE CME-550X			DRILL METHOD NW CASING			HAMMER TYPE AUTOMATIC								
SURFACE WATER DEPTH			DEPTH TO ROCK 13.90ft			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				
715.37														Ground Surface
710.00	4.70	0	1	1	1.0									ALLUVIUM - VERY LOOSE BROWN MICACEOUS SAND
	9.70	1	1	1	1.0									WEATHERED ROCK
700.00														HARD ROCK - BLACK-GRAY-WHITE BIOTITE SCHIST, REC=47% RQD=0%
														BLACK-GRAY-WHITE BANDED BIOTITE SCHIST, REC=78% RQD=36%
														BLACK-GRAY-WHITE BANDED BIOTITE SCHIST, REC=100% RQD=76%
														BLACK-GRAY-WHITE BANDED BIOTITE SCHIST, REC=100% RQD=90%
														BLACK-GRAY-WHITE BANDED BIOTITE SCHIST, REC=98% RQD=87%
680.00														BLACK-GRAY-WHITE BANDED BIOTITE SCHIST, REC=100% RQD=65%
677.97														CORING TERMINATED AT ELEVATION 677.97 FEET IN VERY HARD BIOTITE SCHIST

ELEV. (FT)	DEPTH (FT)	DRILL RATE (MIN/1.0 FT)	RUN NO.	REC % (FT)	RQD % (FT)	SAMPLE NO.	FIELD CLASSIFICATION AND REMARKS
701.47	13.9		1	47	0		BLACK-GRAY-WHITE BANDED, SLIGHTLY WEATHERED TO VERY SLIGHTLY WEATHERED, HARD, BIOTITE SCHIST WITH VERY CLOSE FRACTURE SPACING
699.97	15.4		2	78	36		BLACK-GRAY-WHITE BANDED, SLIGHTLY WEATHERED TO FRESH, HARD TO VERY HARD, BIOTITE SCHIST WITH VERY CLOSE TO MODERATELY CLOSE FRACTURE SPACING
694.97	20.4		3	100	76	RS-1	BLACK-GRAY-WHITE BANDED, FRESH, VERY HARD, BIOTITE SCHIST WITH CLOSE TO WIDE FRACTURE SPACING
689.97	25.4		4	100	90		AS ABOVE
684.97	30.4		5	98	87		AS ABOVE BUT FRACTURE SPACING IS VERY CLOSE TO CLOSE
679.97	35.4		6	100	65		AS ABOVE
677.97	37.4						
NOTES							

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



**NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT**

**ROCK CORE
TRANSMITTAL**

WBS: 33621.1.1 TIP: B-4281
COUNTY: Stokes
DESCRIPTION: Bridge #060 on NC 8/89 over Dan River

SUBMITTED BY: J.E. Beverly
DATE: 06/15/06

T. I. P. No. B-4281

REPORT ON SAMPLES OF SOILS FOR QUALITY

Project 33621.1.1 **County** STOKES **Owner** _____
Date: Sampled _____ **Received** 5/25/06 **Reported** 5/30/06
Sampled from BRIDGE **By** J E BEVERLY
Submitted by N WAINAINA **1995 Standard Specifications**

730032 TO 730037
6/23/06

TEST RESULTS

Proj. Sample No.	SS-1	SS-2	SS-3	SS-4	SS-5	SS-6
Lab. Sample No.	730032	730033	730034	730035	730036	730037
Retained #4 Sieve	% -	-	-	-	-	-
Passing #10 Sieve	% 100	100	100	100	100	100
Passing #40 Sieve	% 96	97	98	100	99	99
Passing #200 Sieve	% 17	18	26	71	58	44

MINUS NO. 10 FRACTION

SOIL MORTAR - 100%						
Coarse Sand Ret - #60	% 23.2	47.5	15.5	2.0	3.8	8.5
Fine Sand Ret - #270	% 65.3	37.7	66.3	40.5	50.4	56.0
Silt 0.05 - 0.005 mm	% 5.5	8.8	10.2	29.3	23.7	15.3
Clay < 0.005 mm	% 6.0	6.0	8.1	28.2	22.2	20.2
Passing #40 Sieve	% -	-	-	-	-	-
LOCATION	% B1-B	B1-B	B2-A	EB2-A	EB2-A	EB1-A

L. L.	25	26	24	35	30	24
P. I.	NP	NP	NP	9	5	1
AASHTO Classification	A-2-4(0)	A-2-4(0)	A-2-4(0)	A-4(6)	A-4(1)	A-4(0)
Station	18+74.5	18+74.5	20+44	21+61	21+61	17+60
LOCATION	10.1 RT	10.1 RT	15.2 LT	15 LT	15 LT	15.5 LT
ALIGNMENT	L	L	L	L	L	L
Depth (Ft)	5.40	10.40	5.20	4.40	14.40	4.60
to	6.40	11.40	6.20	5.40	15.40	5.60

cc: J E BEVERLY
Soils File

PLEASE TEST THESE ROCK SAMPLES FOR:

- Unit Weight Compressive Strength (Q_u, ASTM D2938) Young's Modulus (E, ASTM D3148)
 Other Other

Lab No.	Samp. No.	Strength	Loc: Line, Sta, Offset, Northing & Easting	Depth (feet)	Formation, NCGS State Map Abbrev., and Simple Description	RQD (%)	Unit Wt.	Q (MPsi)	E (MPsi)
	RS-1	1	B1-A	23.5-23.9	Sauratown, CZmg, Biotite Schist	76%			
	RS-2	2	B1-B	21.5-22.0	As above	90%			
	RS-3	1	B2-A	17.8-18.3	As above	91%			
	RS-4	2	B2-B	21.7-22.1	As above	85%			

REMIT RESULTS TO:

J.E. Beverly
N. W. Wainaina, Geotechnical Engineering Unit (Attn. Steve Wirth)

Template Revised 04/25/06



**FIELD
 SCOUR REPORT**

WBS: 33621.1.1 TIP: B-4281 COUNTY: STOKES

DESCRIPTION(1): BRIDGE 60 ON NC 8/89 OVER THE DAN RIVER

EXISTING BRIDGE

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

Bridge No.: 60 Length: 315 Total Bents: 7 Bents in Channel: 2 Bents in Floodplain: 5
 Foundation Type: FOOTINGS ON ROCK

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: NONE OBSERVED

Interior Bents: NOT VISIBLE. BRIDGE INSPECTION REPORT SHOWED NONE.
THERE WAS EROSION ON THE STREAMBANKS NEAR BENTS 3 & 6

Channel Bed: NONE VISIBLE

Channel Bank: EROSION AROUND BENTS 3 & 6. BANKS ARE STEEP AND UNSTABLE DOWNSTREAM,
TREES LEANING AND FALLING INTO CHANNEL, UNDERCUT BANKS.

EXISTING SCOUR PROTECTION

Type(3): RIP-RAP

Extent(4): FILL SLOPES AT EACH END BENT FROM 25' BACK & UNDER BRIDGE.

Effectiveness(5): GOOD

Obstructions(6): TREE & LIMB DEBRIS AT BENTS 4 & 5.

INSTRUCTIONS

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

DESIGN INFORMATION

Channel Bed Material(7): ROCK,BOULDERS,COBBLES,CLAY,SILT,GRAVEL

Channel Bank Material(8): SAND (A-2-4) REFERENCE SS-2

Channel Bank Cover(9): GRASS & TREES

Floodplain Width(10): 600'

Floodplain Cover(11): TREES, SHRUBS, CROPS

Stream is(12): Aggrading _____ Degrading Static _____

Channel Migration Tendency(13): SLIGHT

Observations and Other Comments: _____

DESIGN SCOUR ELEVATIONS(14)

Feet _____ Meters _____

BENTS

B1	B2									
702	701									

Comparison of DSE to Hydraulics Unit theoretical scour:

THEORETICAL SCOUR ELEVATIONS WERE REPLOTTED FROM THE CHANNEL ELEVATION (DUE TO PROXIMITY TO THE CHANNEL), THEN ADJUSTED UPWARD DUE TO PRESENCE OF ROCK.

SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL

Bed or Bank										
Sample No.	SEE	PAGE	16							
Retained #4										
Passed #10										
Passed #40										
Passed #200										
Coarse Sand										
Fine Sand										
Silt										
Clay										
LL										
PI										
AASHTO										
Station										
Offset										
Depth										

Reported by:
 JKS/CBL

Date: 10/26/2006

33621.1.1 (B-4281)
STOKES COUNTY
BRIDGE # 60 ON NC 8/89 OVER THE DAN RIVER

CORE PHOTOS



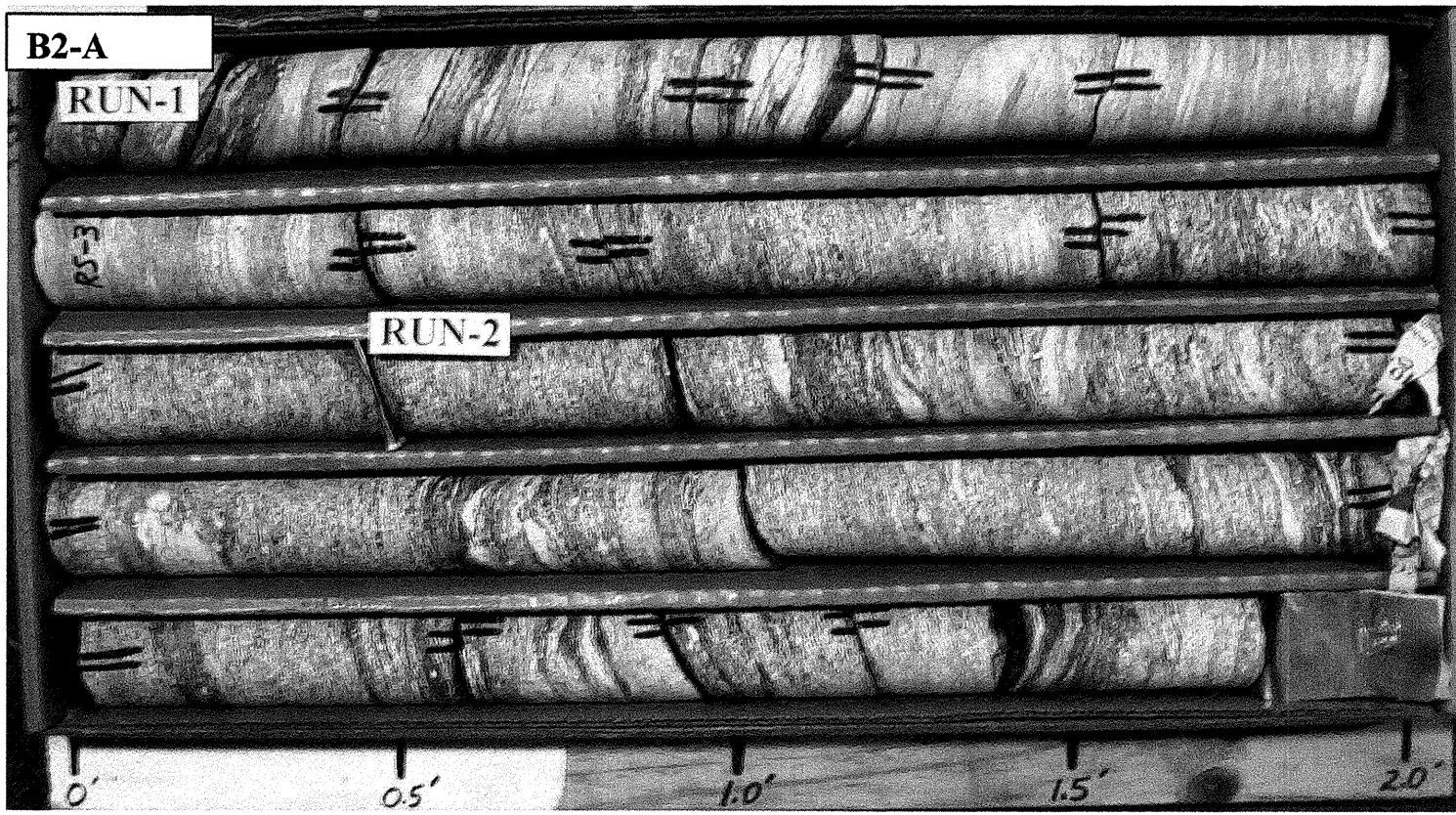
33621.1.1 (B-4281)
STOKES COUNTY
BRIDGE # 60 ON NC 8/89 OVER THE DAN RIVER

CORE PHOTOS



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CORE PHOTOS

