

PROJECT: 33730.1.1 ID: B-4494

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

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	33730.1.1	1	18
STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION	
B-4494	BRZ-1232(4)	P.E. CONST.	

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STRUCTURE
SUBSURFACE INVESTIGATION

STATE PROJECT 33730.1.1 I.D. NO. B-4494
F.A. PROJECT BRZ-1232(4)
COUNTY CURRITUCK
PROJECT DESCRIPTION BRIDGE NO. 3 ON
SR 1232 OVER TULLS CREEK

For Letting

CAUTION NOTICE

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

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

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

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

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

DRAWN BY: R. RAHIE

INVESTIGATED BY	<u>MACTEC ENGINEERING & CONSULTING, INC.</u>	PERSONNEL	<u>B. DEOBALD</u>
CHECKED BY	<u>J. VIETH</u>		<u>J. HOWARD</u>
SUBMITTED BY	<u>S. JOHNSON</u>		<u>D. WHITE</u>
DATE	<u>06/12/09</u>		<u>D. RHODES</u>
REVISED	<u>06/24/09</u>		

NORTH CAROLINA
LICENSED
SEAL 6/24/09
1753
GEOLOGIST
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J. Shane Johnson
SIGNATURE

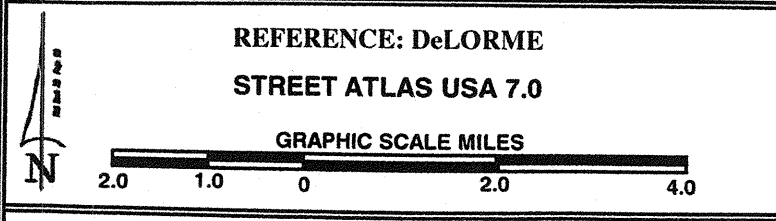
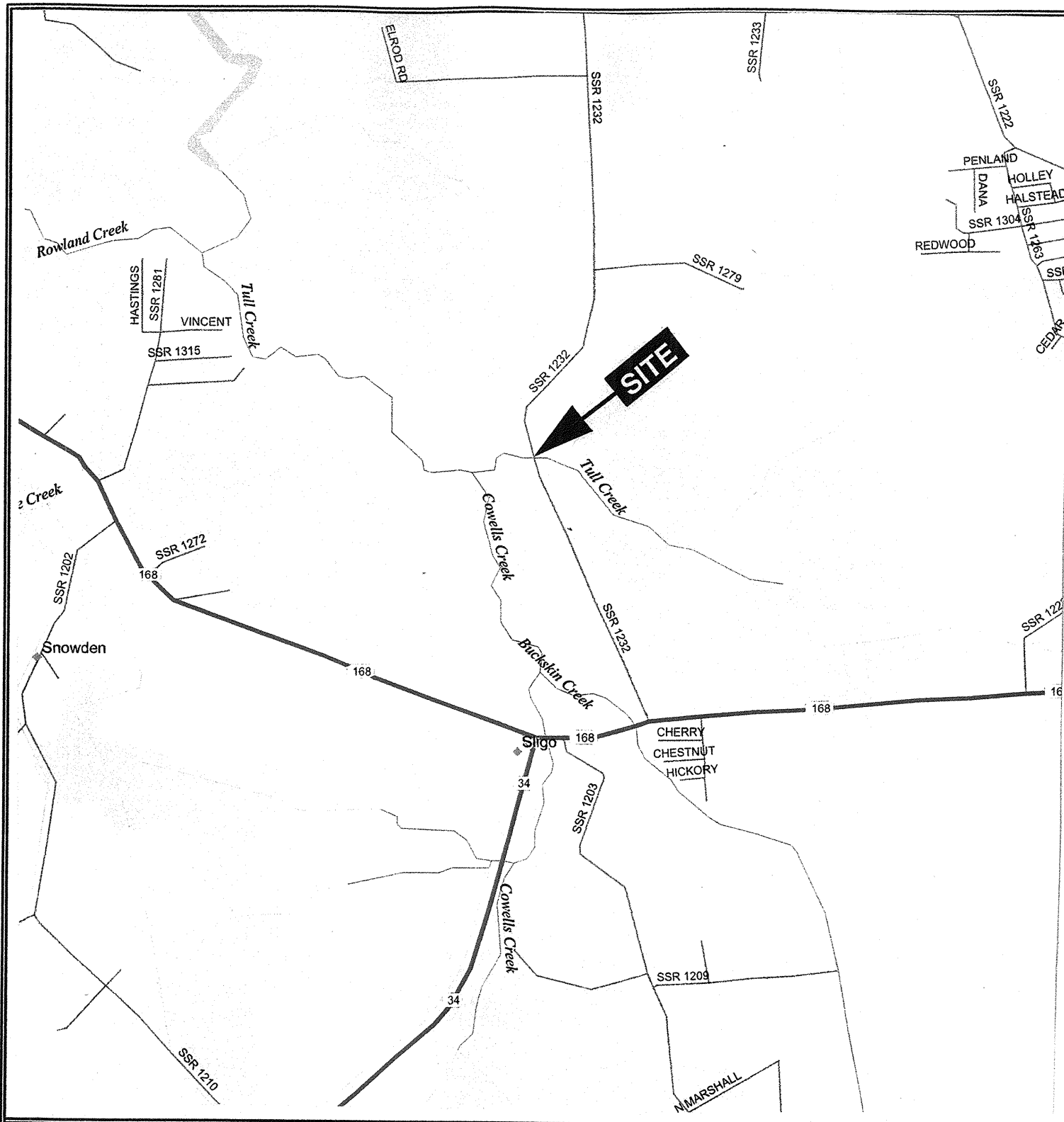
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

PROJECT REFERENCE NO. 33730.I.I
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 (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. EXAMPLES: <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. 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) CRYSTALLINE ROCK (CR) NON-CRYSTALLINE ROCK (NCR) COASTAL PLAIN SEDIMENTARY ROCK (CP)		ALLOVIUM (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 (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 GENERAL CLASS. GRANULAR MATERIALS (<= 35% PASSING #200) SILT-CLAY MATERIALS (> 35% PASSING #200) ORGANIC MATERIALS GROUP CLASS. A-1, A-2, A-3, A-4, A-5, A-6, A-7, A-1, A-2, A-3, A-4, A-5, A-6, A-7 SYMBOL [Diagrams showing soil textures and patterns]		MINERALOGICAL COMPOSITION MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.		WEATHERING 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.		COMPRESSION SLIGHTLY COMPRESSIBLE: LIQUID LIMIT LESS THAN 31 MODERATELY COMPRESSIBLE: LIQUID LIMIT EQUAL TO 31-50 HIGHLY COMPRESSIBLE: LIQUID LIMIT GREATER THAN 50 PERCENTAGE OF MATERIAL ORGANIC MATERIAL GRANULAR SILT-CLAY 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	
CONSISTENCY OR DENSENESS PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²) GENERALLY GRANULAR MATERIAL (NON-COHESSIVE) VERY LOOSE, LOOSE, MEDIUM DENSE, DENSE, VERY DENSE GENERALLY SILT-CLAY MATERIAL (COHESSIVE) VERY SOFT, SOFT, MEDIUM STIFF, STIFF, VERY STIFF, HARD		MISCELLANEOUS SYMBOLS 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 SAMPLE DESIGNATIONS S - BULK SAMPLE SS - SPLIT SPOON SAMPLE ST - SHELBY TUBE SAMPLE RS - ROCK SAMPLE RT - RECOMPACTED TRIAXIAL SAMPLE CBR - CALIFORNIA BEARING RATIO SAMPLE		ROCK HARDNESS 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 GROOVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE. VERY SOFT: CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGER NAIL.			
TEXTURE OR GRAIN SIZE U.S. STD. SIEVE SIZE OPENING (MM) 4, 10, 40, 60, 200, 270 BOULDER (BLOR.), COBBLE (COB.), GRAVEL (GR.), COARSE SAND (CSE. SD.), FINE SAND (F. SD.), SILT (SL.), CLAY (CL.) GRAIN SIZE (MM, IN.)		ABBREVIATIONS AR - AUGER REFUSAL BT - BORING TERMINATED CL - CLAY CPT - CONE PENETRATION TEST CSE - COARSE DMT - DILATOMETER TEST DPT - DYNAMIC PENETRATION TEST F - VOID RATIO 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 W - MOISTURE CONTENT V - VERY VST - VANE SHEAR TEST WEA. - WEATHERED UW - UNIT WEIGHT DUW - DRY UNIT WEIGHT		EQUIPMENT USED ON SUBJECT PROJECT DRILL UNITS: MOBILE B-, BK-51, CME-45C, CME-55 LC, PORTABLE HOIST ADVANCING TOOLS: CLAY BITS, 6' CONTINUOUS FLIGHT AUGER, 8' HOLLOW AUGERS, HARD FACED FINGER BITS, TUNG-CARBIDE INSERTS, CASING w/ ADVANCER, TRICONE 2 7/8" STEEL TEETH, TRICONE 3 7/8" STEEL TEETH HAMMER TYPE: AUTOMATIC, MANUAL CORE SIZE: B-, N-, H- HAND TOOLS: POST HOLE DIGGER, HAND AUGER, SOUNDING ROD, VANE SHEAR TEST			
SOIL MOISTURE - CORRELATION OF TERMS SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION LL - LIQUID LIMIT PL - PLASTIC LIMIT OM - OPTIMUM MOISTURE SL - SHRINKAGE LIMIT SATURATED - USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE WET - (W) SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE		FRACTURE SPACING TERM SPACING VERY WIDE: MORE THAN 10 FEET WIDE: 3 TO 10 FEET MODERATELY CLOSE: 1 TO 3 FEET CLOSE: 0.16 TO 1 FEET VERY CLOSE: LESS THAN 0.16 FEET TERM THICKNESS VERY THICKLY BEDDED: > 4 FEET THICKLY BEDDED: 1.5 - 4 FEET THINLY BEDDED: 0.16 - 1.5 FEET VERY THINLY BEDDED: 0.03 - 0.16 FEET THICKLY LAMINATED: 0.008 - 0.03 FEET THINLY LAMINATED: < 0.008 FEET		INDURATION 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.			
PLASTICITY NONPLASTIC LOW PLASTICITY MED. PLASTICITY HIGH PLASTICITY PLASTICITY INDEX (PI) DRY STRENGTH 0-5 VERY LOW 6-15 SLIGHT 16-25 MEDIUM 26 OR MORE HIGH		INDURATION (continued)		BENCH MARK: NCDOT REBAR AND CAP STAMPED B4494-1 LOCATED AT STATION 14+97.15 -BL- ELEVATION: 1.27 FT.			
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.		INDURATION (continued)		NOTES: Geotechnical Exploration Performed By: MACTEC MACTEC ENGINEERING AND CONSULTING, INC. 3301 ATLANTIC AVENUE RALEIGH, NORTH CAROLINA 27604 (919) 876-0416			



NOTE: SITE LOCATION IS APPROXIMATE

MACTEC ENGINEERING AND CONSULTING, INC.
RALEIGH, NORTH CAROLINA

SITE LOCATION MAP
BRIDGE NO. 3 ON SR 1232 OVER TULLS CREEK
NCDOT PROJECT NO. 33730.1.1 (B-4494)
CURRITUCK COUNTY, NORTH CAROLINA

DRAWN: JPH	DATE: MAY 2009	DRAWING 1
APPROVAL:	SCALE: 1" = 2 miles	
REVISED:	JOB: 6468-09-2413	



CURRITUCK, N.C.
NE/4 ELIZABETH CITY 15' QUARDANGLE
N3622.5-W7600/7.5
1982
DNA 5756 I NE - SERIES V8420

CONTOUR INTERVAL 5 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

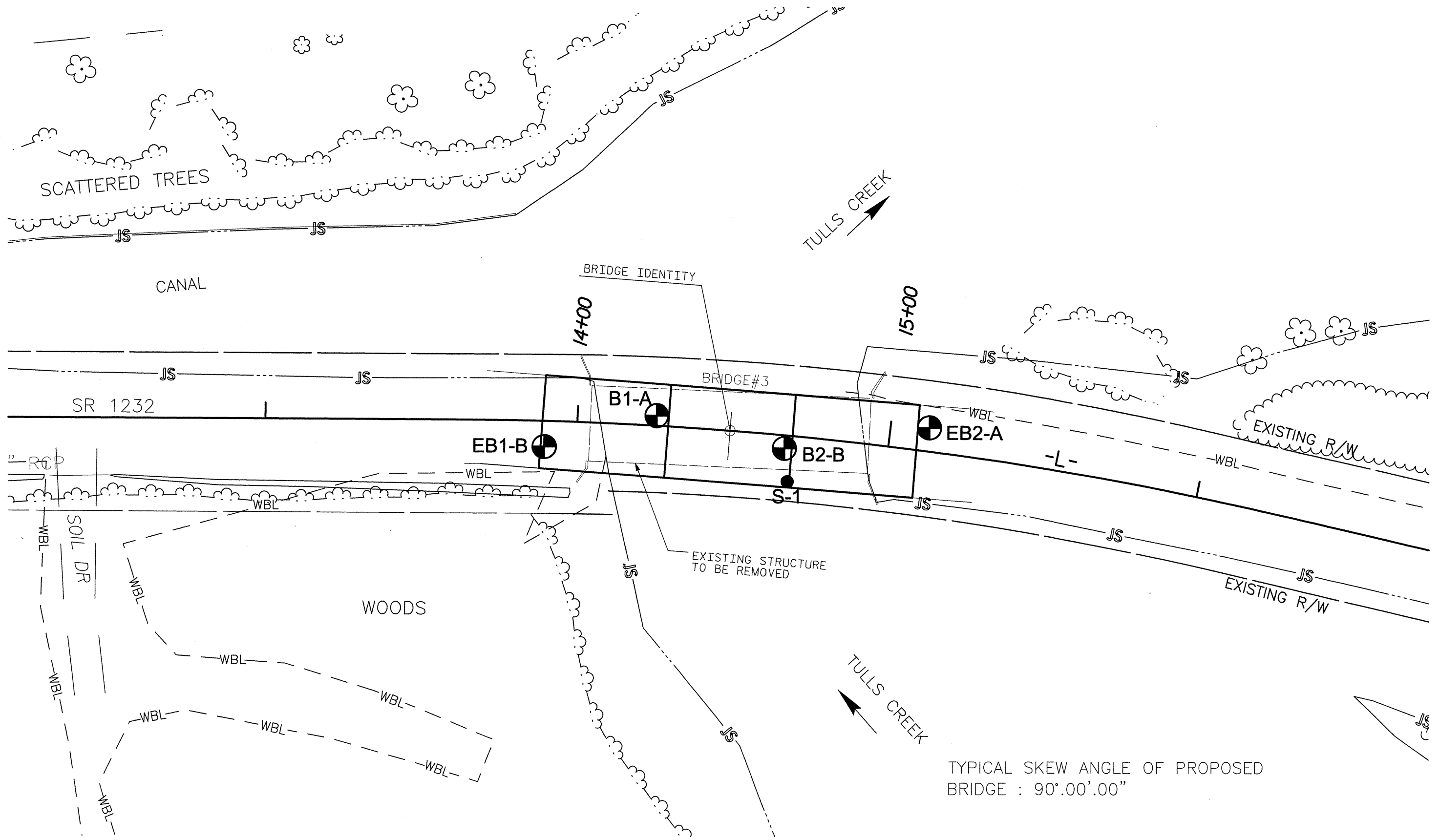
GRAPHIC SCALE FEET

NOTE: SITE LOCATION IS APPROXIMATE

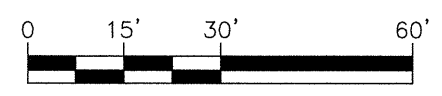
MACTEC ENGINEERING AND CONSULTING, INC.
RALEIGH, NORTH CAROLINA

TOPOGRAPHIC SITE MAP
BRIDGE NO. 3 ON SR 1232 OVER TULLS CREEK
NCDOT PROJECT NO. 33730.1.1 (B-4494)
CURRITUCK COUNTY, NORTH CAROLINA

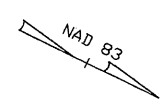
DRAWN: JPH	DATE: MAY 2009	DRAWING 2
APPROVAL:	SCALE: 1: 24000	
REVISED:	JOB: 6468-09-2413	



TYPICAL SKEW ANGLE OF PROPOSED BRIDGE : 90°.00'.00"



SCALE (FEET)
1" : 30'



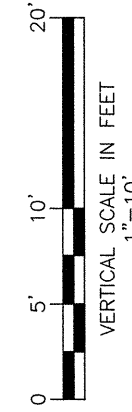
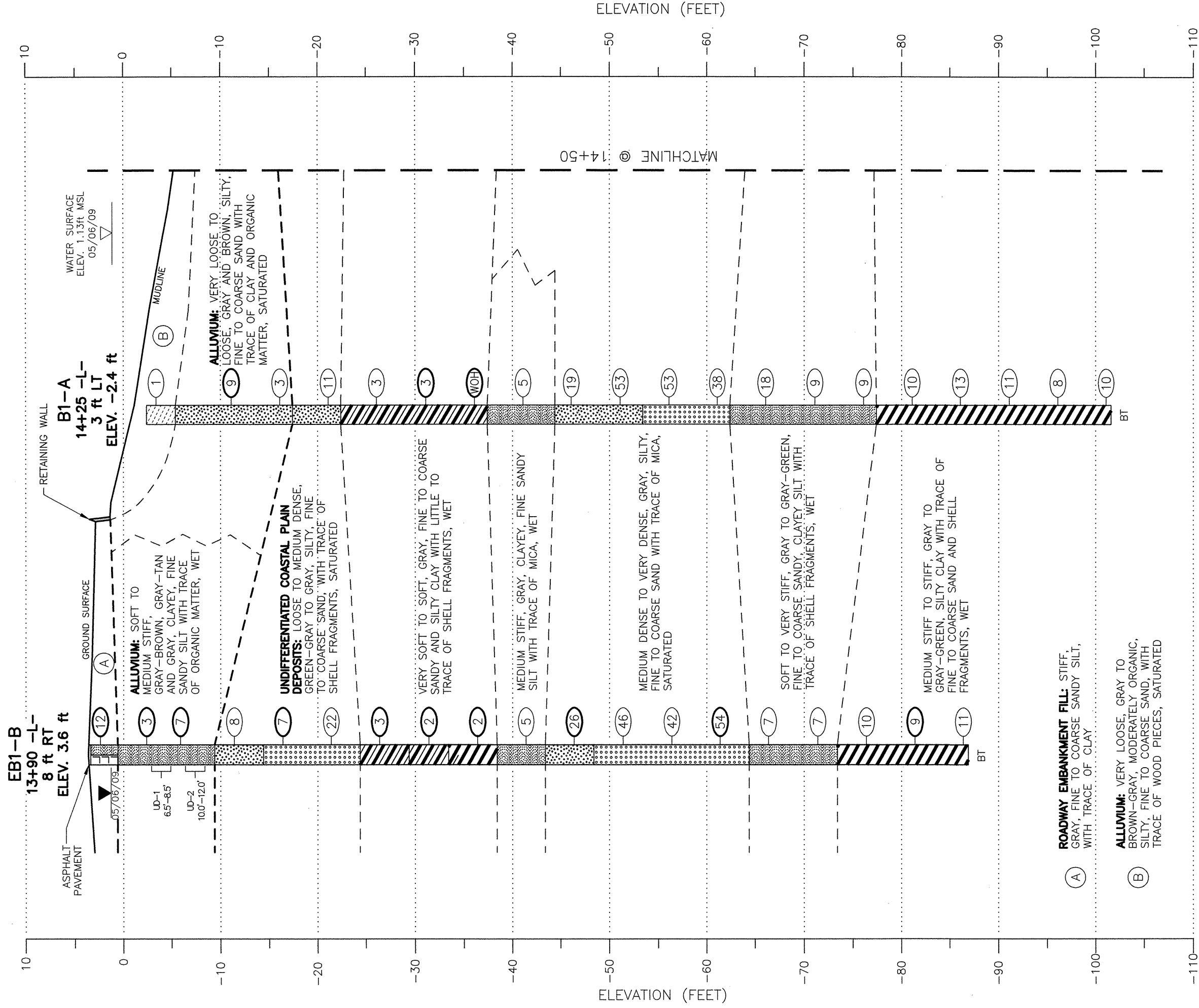
REFERENCE: NCDOT BRIDGE SURVEY AND HYDRAULIC REPORT DATED OCTOBER 16, 2008.

BORING LOCATION PLAN BRIDGE NO. 3 ON SR 1232 OVER TULLS CREEK NCDOT PROJECT NO. 33730.1.1 (B-4494) F.A. No. BRZ-1232(4) CURRITUCK COUNTY, NORTH CAROLINA				MACTEC ENGINEERING AND CONSULTING, INC. RALEIGH, NORTH CAROLINA			
REVISIONS	DRAWN:	R.R.	DATE:	06/12/09			
06/24/09	DFT CHECK:	J.S.J.	JOB :	6468-09-2413			
	ENG CHECK:	J.E.V.	DWG:	3			

14+00

14+50

- GROUND LINE PROFILE SURVEYED BY MACTEC AT 15 ft RIGHT OF -L- ON 05/07/2009.
 - INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE.



PROFILE 15 ft RT OF -L-
 BRIDGE NO. 3 ON SR 1232 OVER TULLS CREEK
 NCDOT PROJECT NO. 33730.1.1 (B-4494)
 F.A. No. BRZ-1232(4)
 CURRITUCK COUNTY, NORTH CAROLINA

MACTEC ENGINEERING & CONSULTING, INC.
 RALEIGH, NORTH CAROLINA

REVISIONS	DRAWN:	R.R.	DATE:
06/24/09	J.S.J.		06/12/09

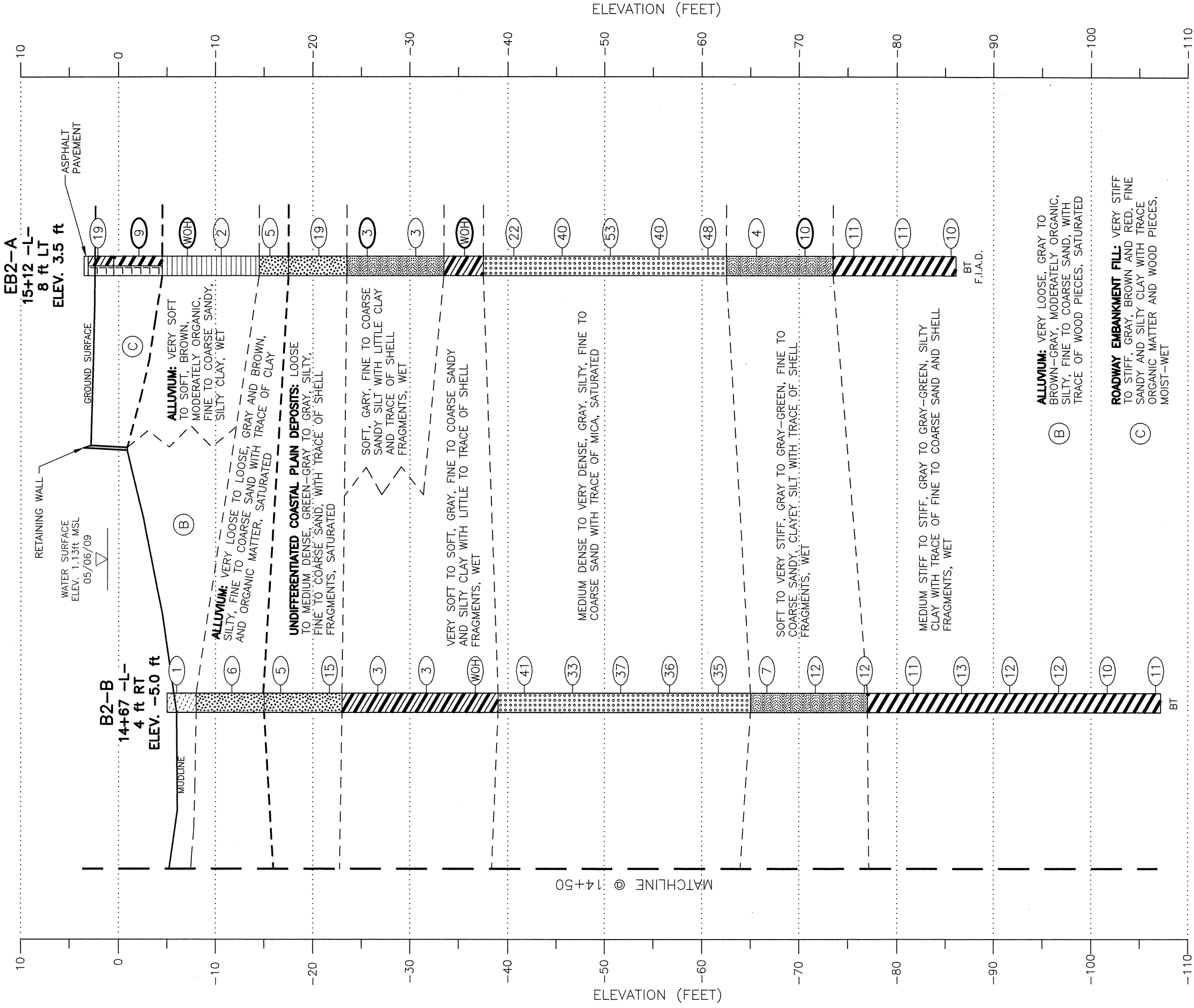
DFT CHECK:	J.E.V.	JOB:	DWG:
06/24/09	J.E.V.	6468-09-2413	4

14+50

15+00

- GROUND LINE PROFILE SURVEYED BY MACTEC AT 15 ft RIGHT OF -L- ON 05/07/2009.

- INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE.



MATCHLINE @ 14+50



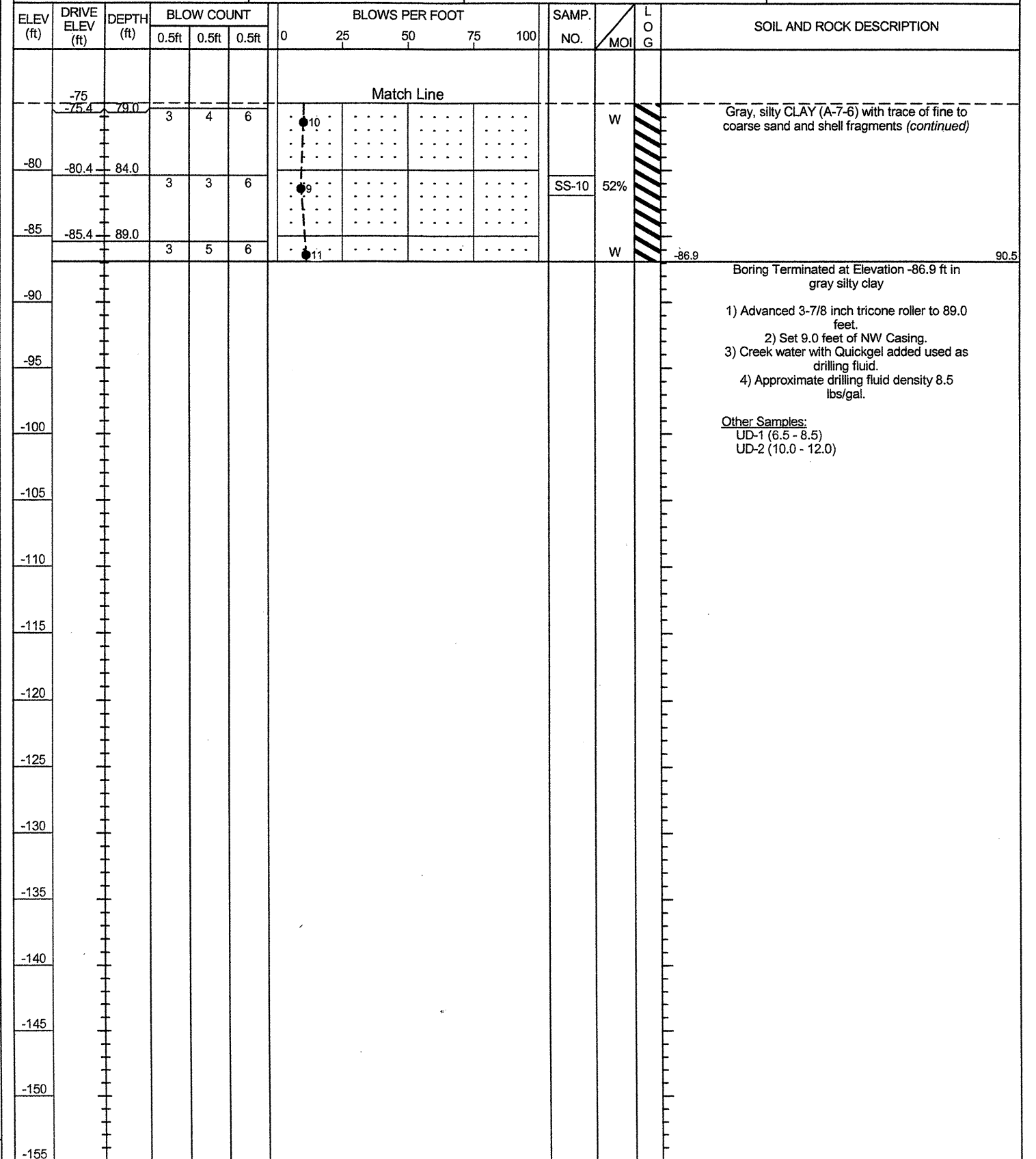
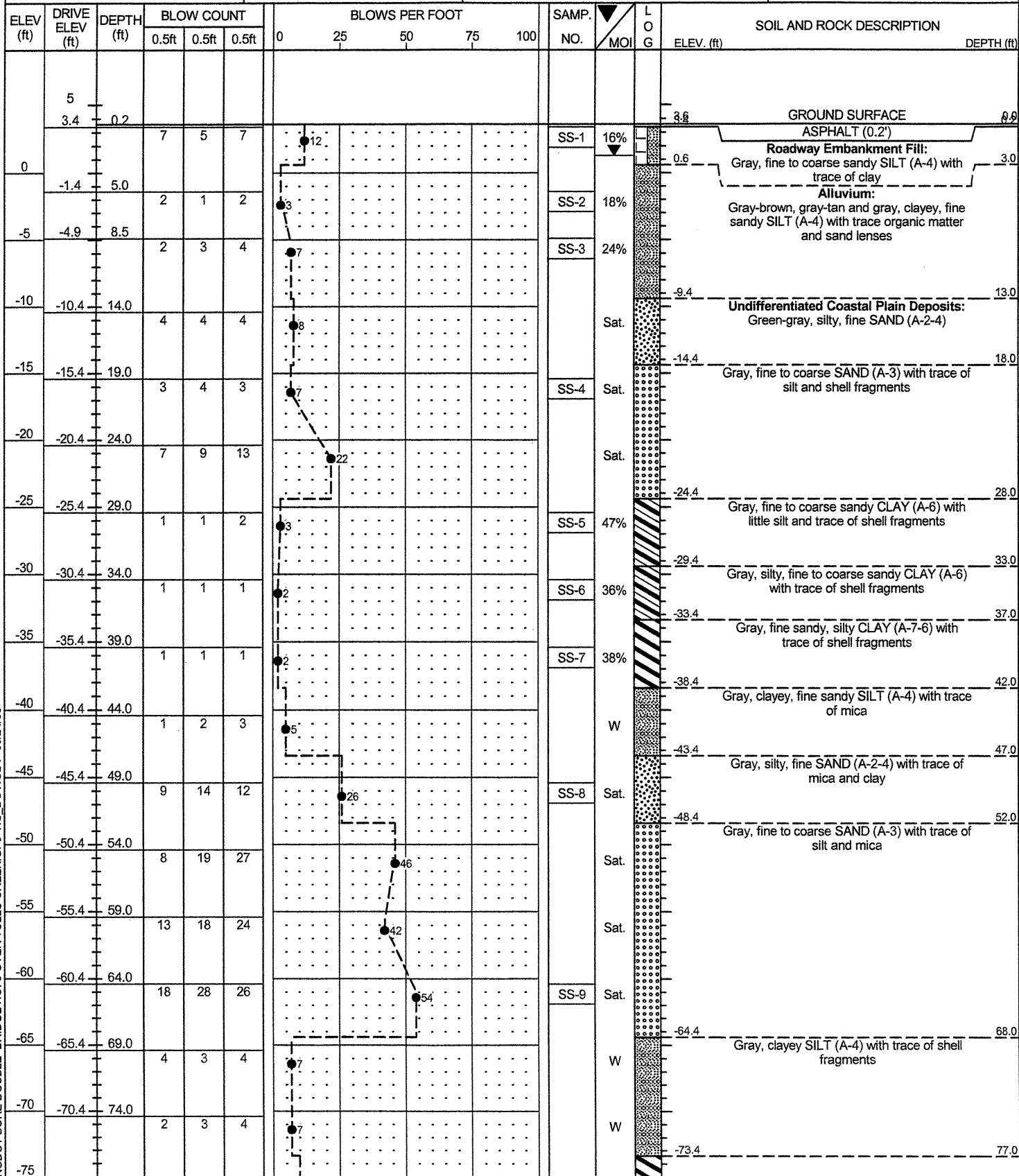
PROFILE 15 ft RT OF -L-
 BRIDGE NO. 3 ON SR 1232 OVER TULLS CREEK
 NCDOT PROJECT NO. 33730.1.1 (B-4494)
 F.A. No. BRZ-1232(4)
 CURRITUCK COUNTY, NORTH CAROLINA

MACTEC ENGINEERING & CONSULTING, INC. RALEIGH, NORTH CAROLINA			
REVISIONS	DRAWN:	R.R.	DATE: 06/12/09
	06/24/09	DFT CHECK: J.S.J.	JOB: 6488-09-2413
		ENG CHECK: J.E.V.	DWG: 5



PROJECT NO. 33730.1.1	ID. B-4494	COUNTY Currituck	GEOLOGIST J. Howard
SITE DESCRIPTION Bridge No. 3 on SR 1232 over Tulls Creek (MACTEC Project No. 6468-09-2413)			GROUND WTR (ft)
BORING NO. EB1-B	STATION 13+90	OFFSET 8ft RT	ALIGNMENT -L-
COLLAR ELEV. 3.6 ft	TOTAL DEPTH 90.5 ft	NORTHING 1,001,448	EASTING 2,859,830
DRILL MACHINE CME-55 LC	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
START DATE 05/04/09	COMP. DATE 05/06/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

PROJECT NO. 33730.1.1	ID. B-4494	COUNTY Currituck	GEOLOGIST J. Howard
SITE DESCRIPTION Bridge No. 3 on SR 1232 over Tulls Creek (MACTEC Project No. 6468-09-2413)			GROUND WTR (ft)
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START DATE 05/04/09	COMP. DATE 05/06/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A



NCDOT BORE DOUBLE BRIDGE NO. 3 OVER TULLS CREEK.GPJ NC_DOT.GDT 06/24/09



PROJECT NO. 33730.1.1	ID. B-4494	COUNTY Currituck	GEOLOGIST J. Howard
SITE DESCRIPTION Bridge No. 3 on SR 1232 over Tulls Creek (MACTEC Project No. 6468-09-2413)			GROUND WTR (ft)
BORING NO. B1-A	STATION 14+25	OFFSET 3ft LT	ALIGNMENT -L-
COLLAR ELEV. -2.4 ft	TOTAL DEPTH 99.2 ft	NORTHING 1,001,476	EASTING 2,859,805
DRILL MACHINE CME-55 LC	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
START DATE 05/06/09	COMP. DATE 05/06/09	SURFACE WATER DEPTH 3.9ft	DEPTH TO ROCK N/A

PROJECT NO. 33730.1.1	ID. B-4494	COUNTY Currituck	GEOLOGIST J. Howard
SITE DESCRIPTION Bridge No. 3 on SR 1232 over Tulls Creek (MACTEC Project No. 6468-09-2413)			GROUND WTR (ft)
BORING NO. B1-A	STATION 14+25	OFFSET 3ft LT	ALIGNMENT -L-
COLLAR ELEV. -2.4 ft	TOTAL DEPTH 99.2 ft	NORTHING 1,001,476	EASTING 2,859,805
DRILL MACHINE CME-55 LC	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
START DATE 05/06/09	COMP. DATE 05/06/09	SURFACE WATER DEPTH 3.9ft	DEPTH TO ROCK N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	LOG G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
0																
-2.4	0.0															
-5			WOH	WOH	1											
-10	-10.1	7.7														
-15	-15.1	12.7														
-20	-20.1	17.7														
-25	-25.1	22.7														
-30	-30.1	27.7														
-35	-35.1	32.7														
-40	-40.1	37.7	WOH	WOH	WOH											
-45	-45.1	42.7														
-50	-50.1	47.7														
-55	-55.1	52.7														
-60	-60.1	57.7														
-65	-65.1	62.7														
-70	-70.1	67.7														
-75	-75.1	72.7														
-80	-80.1	77.7														

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	LOG G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
-80																
-85	-85.1	82.7														
-90	-90.1	87.7														
-95	-95.1	92.7														
-100	-100.1	97.7														
-105																
-110																
-115																
-120																
-125																
-130																
-135																
-140																
-145																
-150																
-155																
-160																

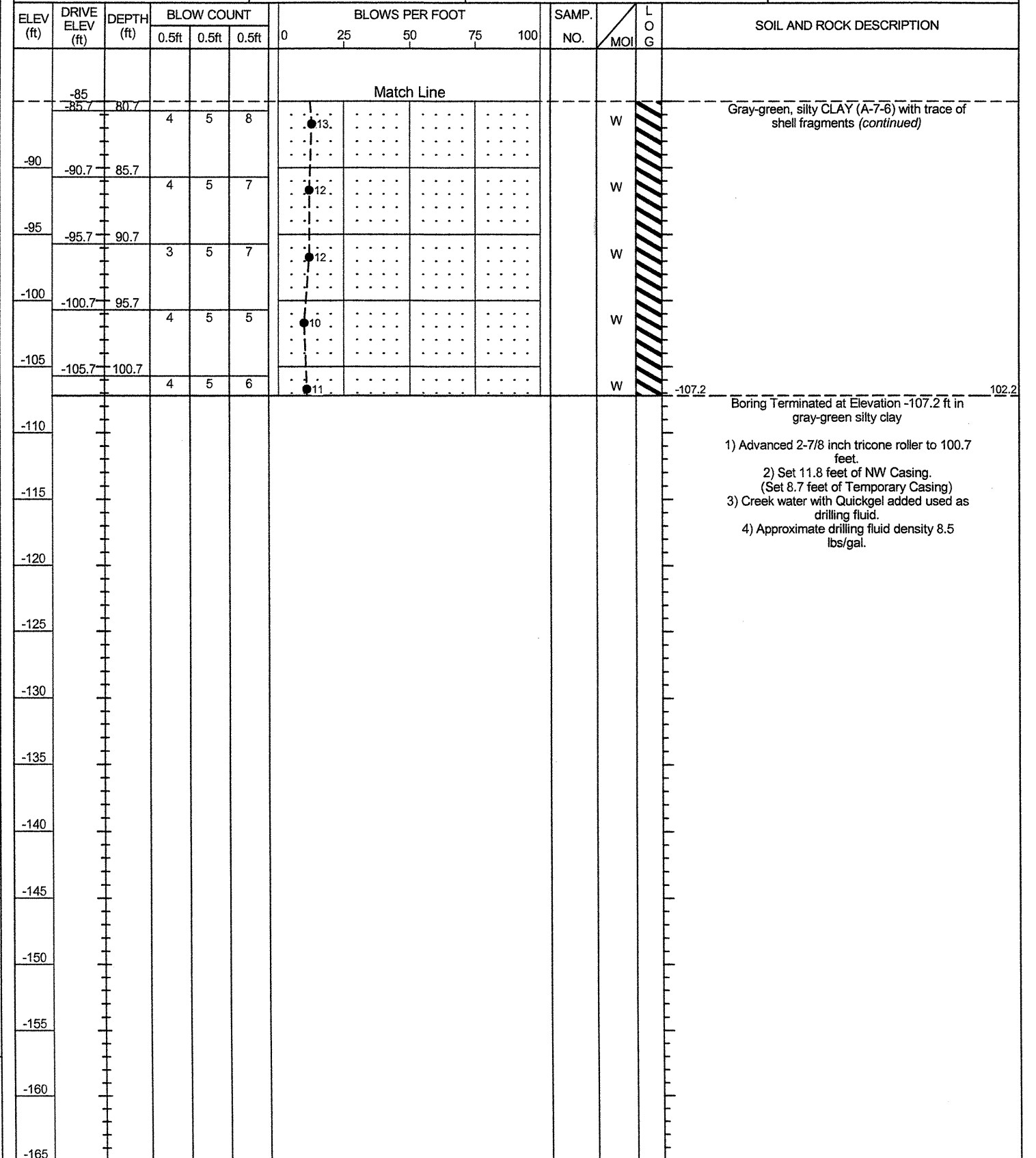
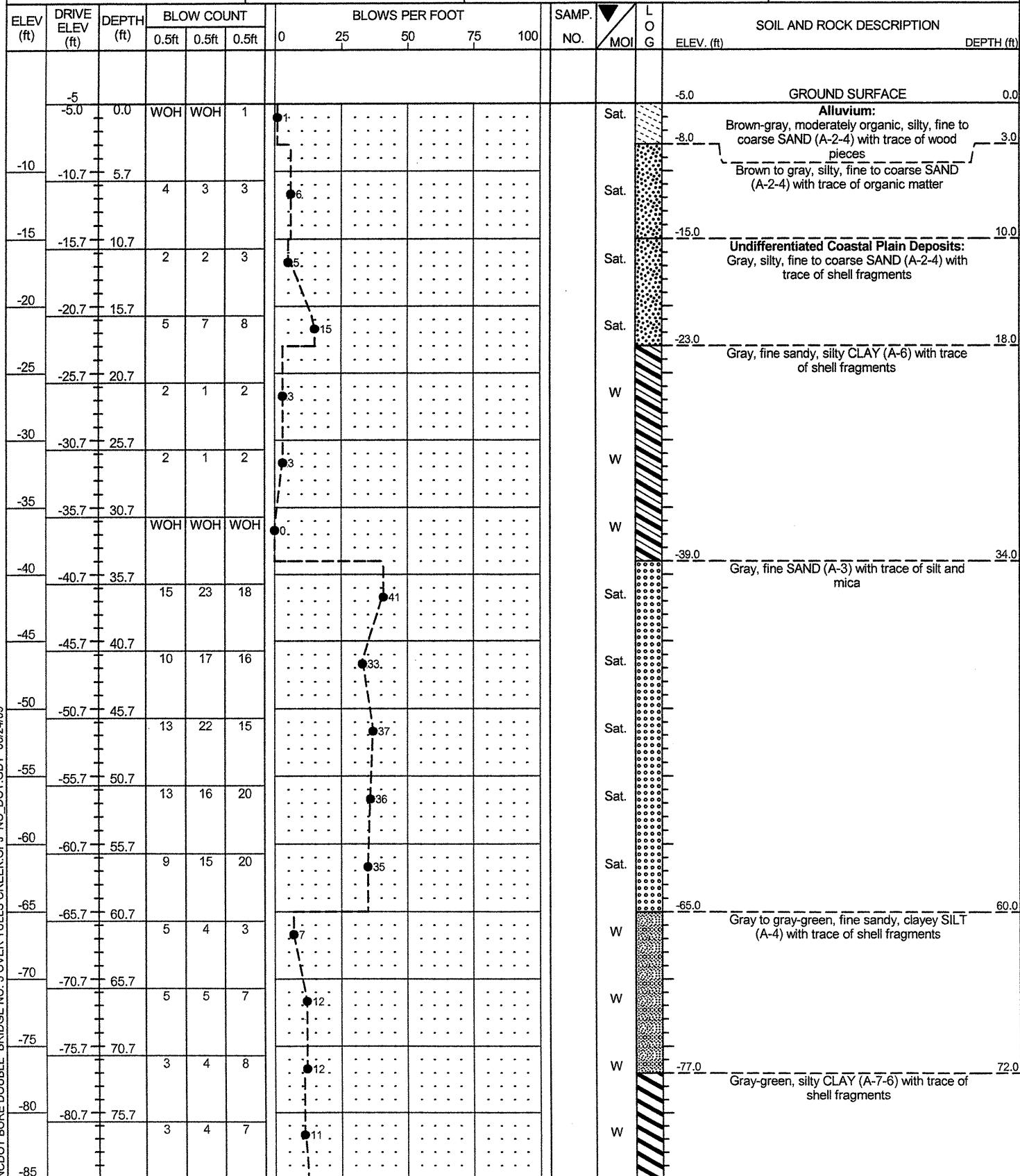
NCDOT BORE DOUBLE BRIDGE NO. 3 OVER TULLS CREEK.GPJ NC_DOT_GDT_06/24/09

Gray to gray green, silty CLAY (A-7-6), with trace of shell fragments (continued)

- Boring Terminated at Elevation -101.6 ft in gray-green silty clay
- 1) Advanced 2-7/8 inch tricone roller to 97.7 feet.
 - 2) Set 14.3 feet of NW Casing. (Set 6.2 feet of Temporary Casing)
 - 3) Creek water with Quickgel added used as drilling fluid.
 - 4) Approximate drilling fluid density 8.5 lbs/gal.

PROJECT NO. 33730.1.1	ID. B-4494	COUNTY Currituck	GEOLOGIST J. Howard
SITE DESCRIPTION Bridge No. 3 on SR 1232 over Tulls Creek (MACTEC Project No. 6468-09-2413)			GROUND WTR (ft)
BORING NO. B2-B	STATION 14+67	OFFSET 4ft RT	ALIGNMENT -L-
COLLAR ELEV. -5.0 ft	TOTAL DEPTH 102.2 ft	NORTHING 1,001,517	EASTING 2,859,797
DRILL MACHINE CME-55 LC	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
START DATE 05/06/09	COMP. DATE 05/07/09	SURFACE WATER DEPTH 5.8ft	DEPTH TO ROCK N/A

PROJECT NO. 33730.1.1	ID. B-4494	COUNTY Currituck	GEOLOGIST J. Howard
SITE DESCRIPTION Bridge No. 3 on SR 1232 over Tulls Creek (MACTEC Project No. 6468-09-2413)			GROUND WTR (ft)
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DRILL MACHINE CME-55 LC	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
START DATE 05/06/09	COMP. DATE 05/07/09	SURFACE WATER DEPTH 5.8ft	DEPTH TO ROCK N/A



NCDOT BORE DOUBLE BRIDGE NO. 3 OVER TULLS CREEK.GPJ NC_DOT_GDT_06/24/09



PROJECT NO. 33730.1.1		ID. B-4494		COUNTY Currituck		GEOLOGIST J. Howard									
SITE DESCRIPTION Bridge No. 3 on SR 1232 over Tulls Creek (MACTEC Project No. 6468-09-2413)							GROUND WTR (ft)								
BORING NO. EB2-A	STATION 15+12	OFFSET 8ft LT	ALIGNMENT -L-			0 HR. N/A									
COLLAR ELEV. 3.5 ft	TOTAL DEPTH 89.6 ft	NORTHING 1,001,556	EASTING 2,859,770			24 HR. FIAD									
DRILL MACHINE CME-55 LC	DRILL METHOD Mud Rotary			HAMMER TYPE Automatic											
START DATE 05/07/09	COMP. DATE 05/08/09	SURFACE WATER DEPTH N/A		DEPTH TO ROCK N/A											
ELEV (ft)	DRIVE 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					
5	3.1	0.4												GROUND SURFACE	0.0
			11	11	8							M	Asphalt (0.4')	0.0	
0	-1.1	4.6	2	4	5							SS-11	47%	Roadway Embankment Fill: Gray, brown and red, fine sandy CLAY (A-6) Gray, silty CLAY (A-7-6) with trace of fine to coarse sand and wood and organic matter	3.0
-5	-6.1	9.6	WOH	WOH	WOH							SS-12	132%	Alluvium: Brown, moderately organic, fine to coarse sandy, silty clay (A-7-5) Organic Content = 17.0%	8.0
-10	-9.6	13.1	WOH	1	1							W			
-15	-14.6	18.1	2	3	2							Sat.		Gray, silty, fine to coarse SAND (A-2-4)	18.0
-20	-19.6	23.1	6	8	11							Sat.		Undifferentiated Coastal Plain Deposits: Gray, silty, fine to coarse SAND (A-2-4) with trace of shell fragments	21.0
-25	-24.6	28.1	1	2	1							SS-13	28%	Gray, fine to coarse sandy SILT (A-4) with little clay and trace of shell fragments	27.0
-30	-29.6	33.1	WOH	1	2							W			
-35	-34.6	38.1	WOH	WOH	WOH							SS-14	52%	Gray, fine sandy, silty CLAY (A-6) with trace of shell fragments	37.0
-40	-39.6	43.1	6	10	12							Sat.		Gray, fine to coarse SAND (A-3) with trace of silt and mica	41.0
-45	-44.6	48.1	10	19	21							Sat.			
-50	-49.6	53.1	6	22	31							Sat.			
-55	-54.6	58.1	16	18	22							Sat.			
-60	-59.6	63.1	13	24	24							Sat.			
-65	-64.6	68.1	2	2	2							W		Gray to gray-green, fine to coarse sandy SILT (A-4) with little clay and trace of shell fragments	66.0
-70	-69.6	73.1	3	4	6							SS-15	22%		
-75	-74.6	78.1													77.0

PROJECT NO. 33730.1.1		ID. B-4494		COUNTY Currituck		GEOLOGIST J. Howard									
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BORING NO. EB2-A	STATION 15+12	OFFSET 8ft LT	ALIGNMENT -L-			0 HR. N/A									
COLLAR ELEV. 3.5 ft	TOTAL DEPTH 89.6 ft	NORTHING 1,001,556	EASTING 2,859,770			24 HR. FIAD									
DRILL MACHINE CME-55 LC	DRILL METHOD Mud Rotary			HAMMER TYPE Automatic											
START DATE 05/07/09	COMP. DATE 05/08/09	SURFACE WATER DEPTH N/A		DEPTH TO ROCK N/A											
ELEV (ft)	DRIVE 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					
	-75		3	5	6							W		Gray-green, silty CLAY (A-7-6) with trace of shell fragments (continued)	
	-80	-79.6	83.1	3	5	6						W			
	-85	-84.6	88.1	3	5	5						W			
														Boring Terminated at Elevation -86.1 ft in gray-green silty clay	89.6
														1) Advanced 2-7/8 inch tricone roller to 88.1 feet.	
														2) Set 14.0 feet of NW Casing.	
														3) Creek water with Quickgel added used as drilling fluid.	
														4) Approximate drilling fluid density 8.5 lbs/gal.	

NCDOT BORE DOUBLE BRIDGE NO. 3 OVER TULLS CREEK.GPJ NC_DOT_GDT_06/24/09

N.C.D.O.T./AASHTO CLASSIFICATIONS

REPORT ON SAMPLES OF: SOILS FOR QUALITY

MACTEC PROJECT NAME/ NUMBER: Bridge No. 3 on SR 1232 over Tulls Creek (MACTEC Job No.: 6468-09-2413)
 NCDOT PROJ. NO.: 33730.1.1 (B-4494) COUNTY: Currituck OWNER: N.C.D.O.T.
 DATE SAMPLED: May 2009 RECEIVED: 5/14/2009 REPORTED BY: MACTEC
 SAMPLED FROM: EB1-B
 SUBMITTED BY: MACTEC ENGINEERING AND CONSULTING, INC.

1992 STANDARD SPECIFICATIONS

TEST RESULTS

Lab Sample No.		SS-1	SS-2	SS-3	SS-4	SS-5	SS-6
Retained No. 4 Sieve (%)		0.0	0.4	0.0	0.1	9.8	0.1
Passing No. 10 Sieve (%)		99.8	99.5	100.0	99.7	88.5	99.9
Passing No. 40 Sieve (%)		91.6	98.9	99.8	82.9	84.5	99.3
Passing No. 200 Sieve (%)		37.8	62.4	46.4	4.9	43.3	56.0

MINUS 2.00mm FRACTION

SOIL MORTAR - 100%							
Coarse Sand (%)		19.6	2.5	1.7	34.9	8.5	2.4
Fine Sand (%)		49.0	43.9	63.6	61.1	47.9	46.6
Silt (%)		21.6	34.0	24.6	3.7	15.9	36.7
Clay (%)		9.6	19.6	10.1	0.3	27.7	14.2

Moisture Content (%)		15.8	17.6	24.3	ND	46.7	36.4
Liquid Limit, L.L.		18	21	20	NV	29	28
Plasticity Index, P.I.		2	9	4	NP	16	11
AASHTO Classification		A-4(0)	A-4(2)	A-4(0)	A-3(0)	A-6(3)	A-6(3)
Organic Content (%)		ND	ND	ND	ND	ND	ND

Boring No.		EB1-B	EB1-B	EB1-B	EB1-B	EB1-B	EB1-B
Station		13+90	13+90	13+90	13+90	13+90	13+90
Offset		8 RT	8 RT	8 RT	8 RT	8 RT	8 RT
Alignment		-L-	-L-	-L-	-L-	-L-	-L-
Depth (FT)	From	0.2	5.0	8.5	19.0	29.0	34.0
	to	1.7	6.5	10.0	20.5	30.5	35.5

REMARKS: ND=Not Determined, NP=Non-Plastic, NV=No Value

Tested By Chana Savanapridi; Cert. No. 104-04-0504

Chana Savanapridi
 Signature

N.C.D.O.T./AASHTO CLASSIFICATIONS

REPORT ON SAMPLES OF: SOILS FOR QUALITY

MACTEC PROJECT NAME/ NUMBER: Bridge No. 3 on SR 1232 over Tulls Creek (MACTEC Job No.: 6468-09-2413)
 NCDOT PROJ. NO.: 33730.1.1 (B-4494) COUNTY: Currituck OWNER: N.C.D.O.T.
 DATE SAMPLED: May 2009 RECEIVED: 5/14/2009 REPORTED BY: MACTEC
 SAMPLED FROM: EB1-B and EB2-A
 SUBMITTED BY: MACTEC ENGINEERING AND CONSULTING, INC.

1992 STANDARD SPECIFICATIONS

TEST RESULTS

Lab Sample No.		SS-7	SS-8	SS-9	SS-10	SS-11	SS-12
Retained No. 4 Sieve (%)		2.3	0.0	0.0	0.4	0.0	0.0
Passing No. 10 Sieve (%)		97.3	100.0	100.0	99.0	100.0	100.0
Passing No. 40 Sieve (%)		96.8	99.9	99.6	97.9	98.9	87.9
Passing No. 200 Sieve (%)		85.3	16.0	5.8	96.0	95.6	77.0

MINUS 2.00mm FRACTION

SOIL MORTAR - 100%							
Coarse Sand (%)		0.9	0.4	48.9	1.5	1.8	15.9
Fine Sand (%)		21.2	90.5	46.6	3.1	7.3	10.2
Silt (%)		49.4	7.8	4.5	60.8	63.7	53.5
Clay (%)		28.5	1.3	0.0	34.5	27.2	20.4

Moisture Content (%)		38.0	ND	ND	52.4	46.6	132.0
Liquid Limit, L.L.		43	NV	NV	53	49	74
Plasticity Index, P.I.		21	NP	NP	31	27	26
AASHTO Classification		A-7-6(18)	A-2-4(0)	A-3(0)	A-7-6(33)	A-7-6(29)	A-7-5(25)
Organic Content (%)		ND	ND	ND	ND	ND	17.0

Boring No.		EB1-B	EB1-B	EB1-B	EB1-B	EB2-A	EB2-A
Station		13+90	13+90	13+90	13+90	15+12	15+12
Offset		8 RT	8 RT	8 RT	8 RT	8 LT	8 LT
Alignment		-L-	-L-	-L-	-L-	-L-	-L-
Depth (FT)	From	39.0	49.0	64.0	84.0	4.6	9.6
	to	40.5	50.5	65.5	85.5	6.1	11.1

REMARKS: ND=Not Determined, NP=Non-Plastic, NV=No Value

Tested By Chana Savanapridi; Cert. No. 104-04-0504

Chana Savanapridi
 Signature



MACTEC ENGINEERING AND CONSULTING, INC.
 3301 ATLANTIC AVENUE
 RALEIGH, NORTH CAROLINA 27604

N.C.D.O.T./AASHTO CLASSIFICATIONS

REPORT ON SAMPLES OF: SOILS FOR QUALITY

MACTEC PROJECT NAME/ NUMBER: Bridge No. 3 on SR 1232 over Tulls Creek (MACTEC Job No.: 6468-09-2413)
 NCDOT PROJ. NO.: 33730.1.1 (B-4494) COUNTY: Currituck OWNER: N.C.D.O.T.
 DATE SAMPLED: May 2009 RECEIVED: 5/14/2009 REPORTED BY: MACTEC
 SAMPLED FROM: EB2-A, B1-A, Channel
 SUBMITTED BY: MACTEC ENGINEERING AND CONSULTING, INC.
 1992 STANDARD SPECIFICATIONS

TEST RESULTS

Lab Sample No.		SS-13	SS-14	SS-15	SS-16	SS-17	S-1
Retained No. 4 Sieve	(%)	0.0	1.3	1.3	0.0	0.0	3.9
Passing No. 10 Sieve	(%)	100.0	98.6	98.6	100.0	100.0	94.2
Passing No. 40 Sieve	(%)	98.4	98.2	96.9	99.9	99.8	79.2
Passing No. 200 Sieve	(%)	39.8	83.9	72.8	18.9	89.2	2.7

MINUS 2.00mm FRACTION

SOIL MORTAR - 100%							
Coarse Sand	(%)	7.2	0.9	6.4	0.5	0.8	44.6
Fine Sand	(%)	58.4	26.8	30.4	90.9	22.6	52.9
Silt	(%)	20.0	51.4	47.5	7.3	52.5	2.2
Clay	(%)	14.4	20.9	15.7	1.3	24.1	0.3

Moisture Content	(%)	28.2	52.2	21.8	ND	58.8	ND
Liquid Limit, L.L.		24	36	20	NV	40	NV
Plasticity Index, P.I.		10	17	8	NP	19	NP
AASHTO Classification		A-4(1)	A-6(14)	A-4(3)	A-2-4(0)	A-6(17)	A-3(0)
Organic Content	(%)	ND	ND	ND	ND	ND	6.1

Boring No.		EB2-A	EB2-A	EB2-A	B1-A	B1-A	Channel
Station		15+12	15+12	15+12	14+25	14+25	14+69
Offset		8 LT	8 LT	8 LT	3 LT	3 LT	15 RT
Alignment		-L-	-L-	-L-	-L-	-L-	-L-
Depth (FT)	From	28.1	38.1	73.1	7.7	32.7	0.0
	to	29.9	39.6	74.6	9.2	34.2	1.0

REMARKS: ND=Not Determined, NP=Non-Plastic, NV=No Value

Tested By Chana Savanapridi; Cert. No. 104-04-0504

Chana Savanapridi
 Signature



FIELD
SCOUR REPORT

WBS: 33730.1.1 TIP: B-4494 COUNTY: Currituck

DESCRIPTION(1): Bridge No. 3 on SR 1232 over Tulls Creek

EXISTING BRIDGE

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

Bridge No.: 3 Length: 89.7' Total Bents: 4 Bents in Channel: 2 Bents in Floodplain: 2
Foundation Type: Timber piles with concrete caps and girders

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: None observed

Interior Bents: None observed due to interior bents being located in the creek.

Channel Bed: None observed due to dark water.

Channel Bank: None observed.

EXISTING SCOUR PROTECTION

Type(3): Timber abutments and timber wingwalls at each end bent.

Extent(4): Timber wingwalls extend approximately 5 to 15 feet laterally from the existing abutments.

Effectiveness(5): The abutments and wingwalls appear to be effective.

Obstructions(6): None observed.

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): Gray to brown-gray, moderately organic, silty, fine to coarse sand.
Gray and Brown, silty, fine to coarse sand with trace of clay and organic matter.

Channel Bank Material(8): Gray-brown, clayey, fine sandy silt, gray and brown, silty, fine to coarse sand and brown, moderately organic, fine to coarse sandy, silty clay

Channel Bank Cover(9): Grass and underbrush

Floodplain Width(10): Approximatley 1800 feet.

Floodplain Cover(11): Grass, underbrush and trees

Stream is(12): Aggrading _____ Degrading _____ Static

Channel Migration Tendency(13): South

Observations and Other Comments: A canal runs parallel to SR 1232 south of the existing bridge. The canal extends into Tulls Creek immediately downstream of End Bent No. 1.

Reported by: James Howard for James Howard w/ permission Date: 5/7/2009

DESIGN SCOUR ELEVATIONS(14) Feet Meters _____

BENTS

B1	B2										
-11	-11										

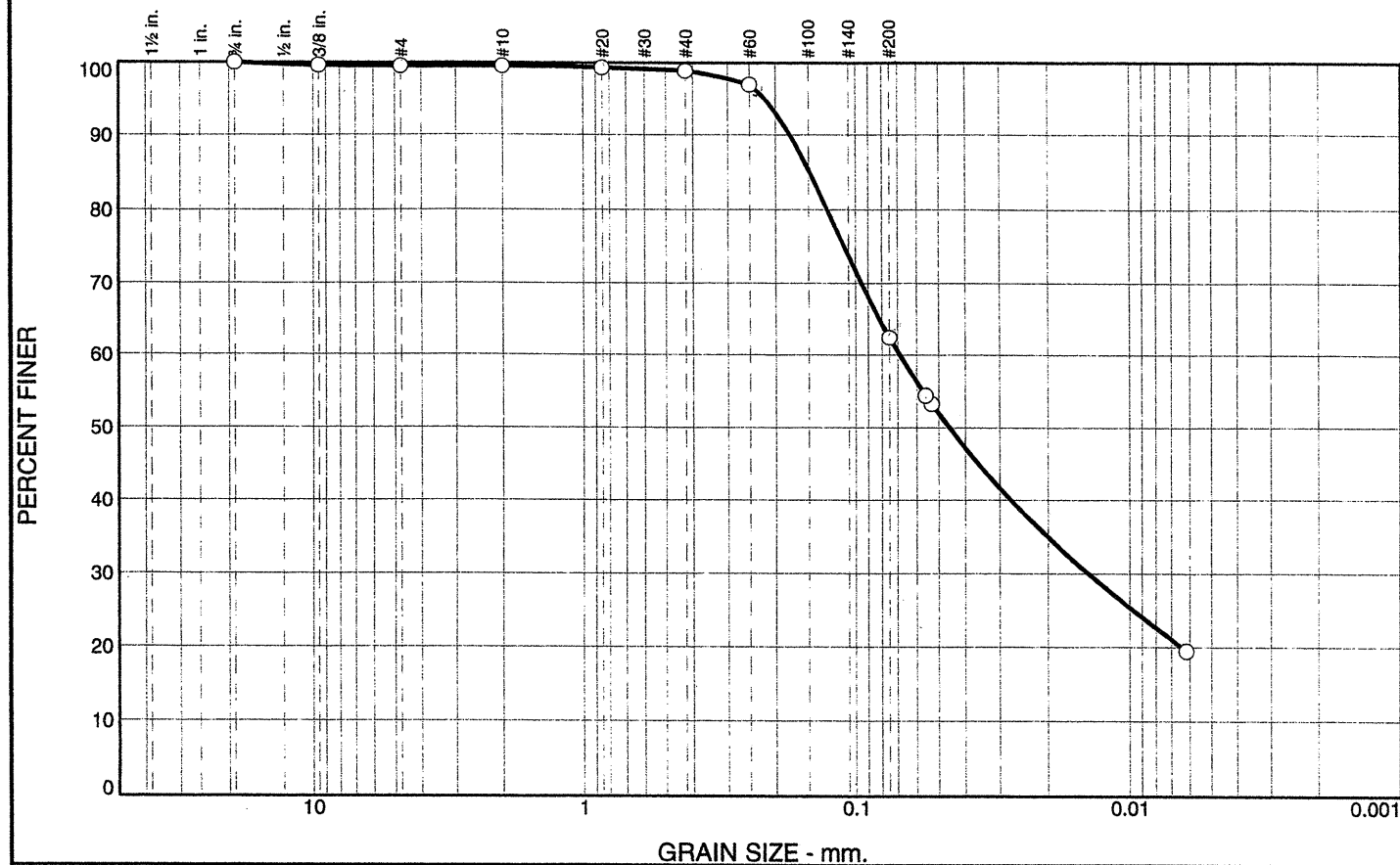
Comparison of DSE to Hydraulics Unit theoretical scour:
Geotechnical Engineering Unit agrees with Hydraulics Unit theoretical scour.

DSE determined by: Cheryl A. Youngblood Date: 6/22/2009
Cheryl A. Youngblood, L.G.

SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL

Bed or Bank	Bank	Bank	Bank	Bed	Bed		
Sample No.	SS-2	SS-3	SS-12	SS-16	S-1		
Retained #4	0.4	0	0	0	3.9		
Passed #10	99.5	100	100	100	94.2		
Passed #40	98.9	99.8	87.9	99.9	79.2		
Passed #200	62.4	46.4	77	18.9	2.7		
Coarse Sand	2.5	1.7	15.9	0.5	44.6		
Fine Sand	43.9	63.6	10.2	90.9	52.9		
Silt	34	24.6	53.5	7.3	2.2		
Clay	19.6	10.1	20.4	1.3	0.3		
LL	21	20	74	NV	NV		
PI	9	4	26	NP	NP		
AASHTO	A-4(2)	A-4(0)	A-7-5(25)	A-2-4(0)	A-3(0)		
Station	13+90	13+90	15+12	14+25	14+69		
Offset	8 ft RT	8 ft RT	8 ft LT	3 ft LT	15 RT		
Depth	5.0-6.5	8.5-10.0	9.6-11.1	7.7-9.2	0.0-1.0		

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.4	0.1	0.6	36.5		62.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
3/8	99.6		
#4	99.6		
#10	99.5		
#20	99.3		
#40	98.9		
#60	97.0		
#200	62.4		
#270	53.3		

Material Description
Gray-Brown, Clayey, Fine Sandy SILT

Atterberg Limits
PL= 12 LL= 21 PI= 9

Coefficients
D₉₀= 0.1769 D₈₅= 0.1489 D₆₀= 0.0689
D₅₀= 0.0458 D₃₀= 0.0143 D₁₅=
D₁₀= C_u= C_c=

Classification
USCS= CL AASHTO= A-4(2)

Remarks
Specific Gravity is assumed

* (no specification provided)

Source of Sample: Boring EB1-B Depth: 5.0-6.5'
Sample Number: SS-2

Date: 5/14/09

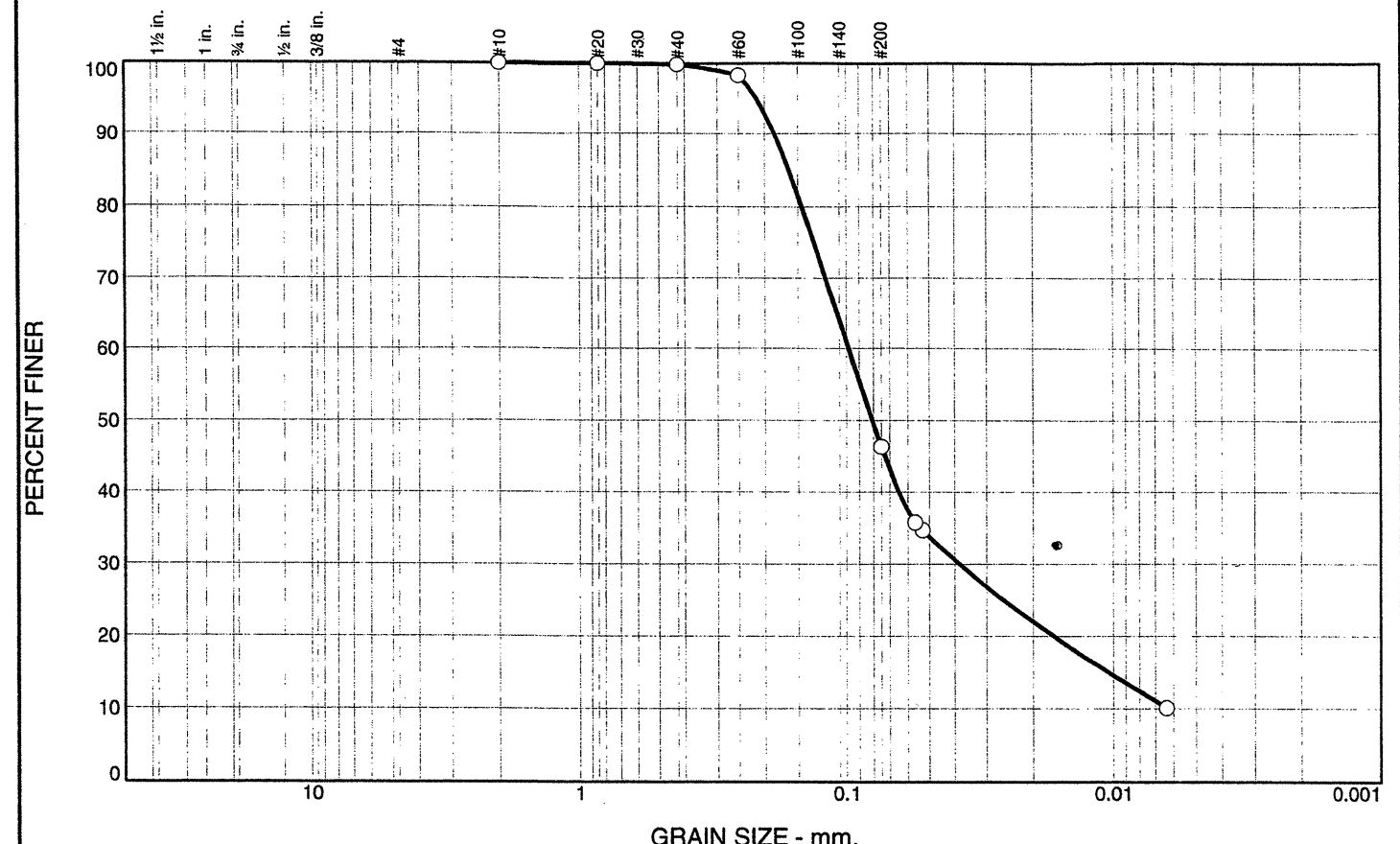
MACTEC Engineering and Consulting, Inc.
Raleigh, North Carolina

Client: NCDOT
Project: Bridge No. 3 on SR 1232 Over Tulls Creek
Project No: 6468092413

Figure

Tested By: CS (Cert# 104-04-0504) Checked By: MDC (Lab Manager) *MDC*

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.2	53.4		46.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	99.9		
#40	99.8		
#60	98.3		
#200	46.4		
#270	34.7		

Material Description
Gray, Clayey, Fine Sandy SILT

Atterberg Limits
PL= 16 LL= 20 PI= 4

Coefficients
D₉₀= 0.1842 D₈₅= 0.1626 D₆₀= 0.0982
D₅₀= 0.0808 D₃₀= 0.0382 D₁₅= 0.0104
D₁₀= C_u= C_c=

Classification
USCS= SC-SM AASHTO= A-4(0)

Remarks
Specific Gravity is assumed

* (no specification provided)

Source of Sample: Boring EB1-B Depth: 8.5-10.0'
Sample Number: SS-3

Date: 5/14/09

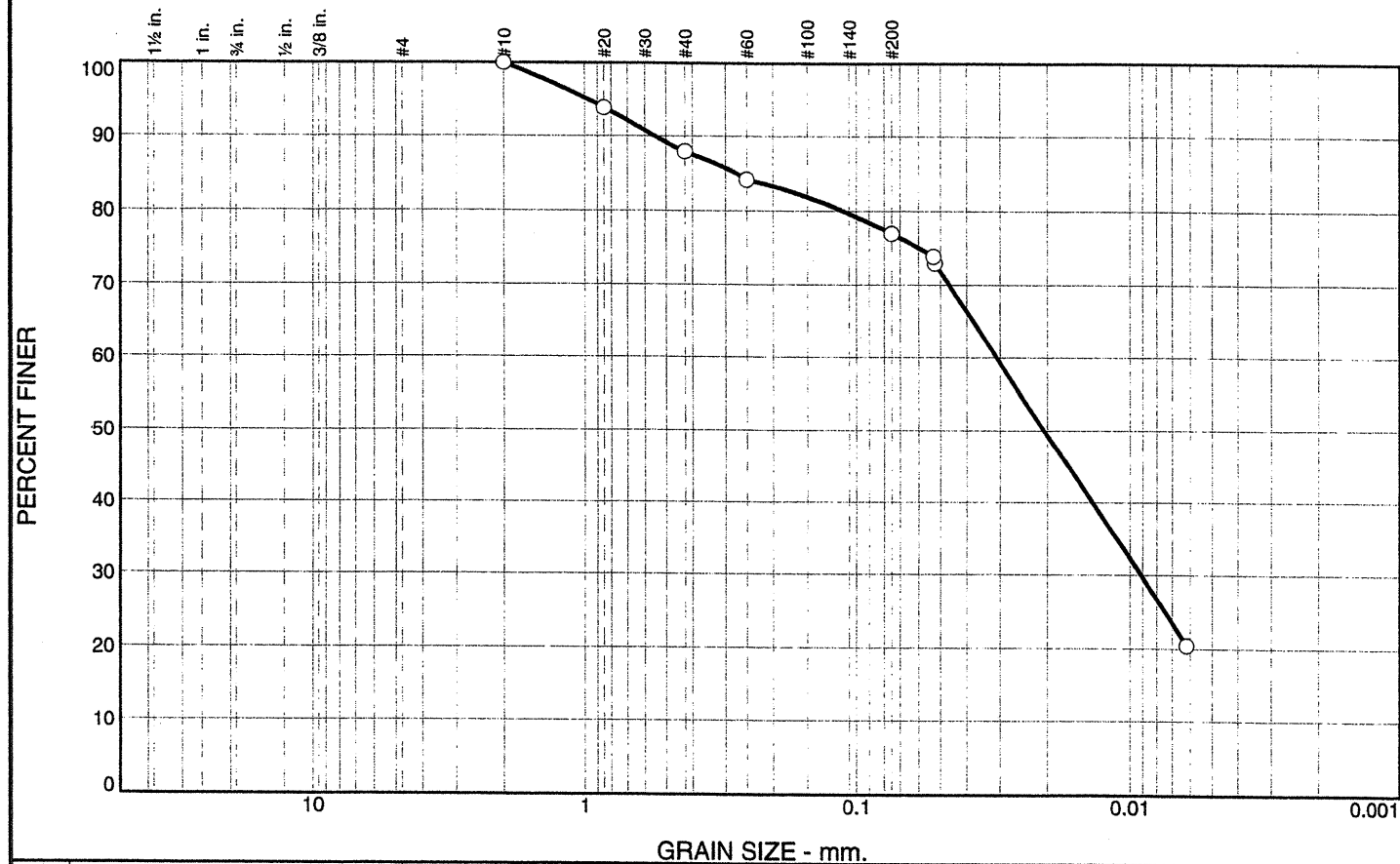
MACTEC Engineering and Consulting, Inc.
Raleigh, North Carolina

Client: NCDOT
Project: Bridge No. 3 on SR 1232 Over Tulls Creek
Project No: 6468092413

Figure

Tested By: CS (Cert# 104-04-0504) Checked By: MDC (Lab Manager) *MDC*

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	12.1	10.9	77.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	93.9		
#40	87.9		
#60	84.1		
#200	77.0		
#270	73.9		

Material Description
Brown, Moderately Organic, Fine to Coarse Sandy, Silty CLAY

Atterberg Limits
PL= 48 LL= 74 PI= 26

Coefficients
D₉₀= 0.5532 D₈₅= 0.2741 D₆₀= 0.0309
D₅₀= 0.0206 D₃₀= 0.0091 D₁₅=
D₁₀= C_u= C_c=

Classification
USCS= MH AASHTO= A-7-5(25)

Remarks
Specific Gravity is assumed
Organic Content = 17.0% as Per NCDOT T267-86

* (no specification provided)

Source of Sample: Boring EB2-A Depth: 9.6-11.1'
Sample Number: SS-12

Date: 5/14/09

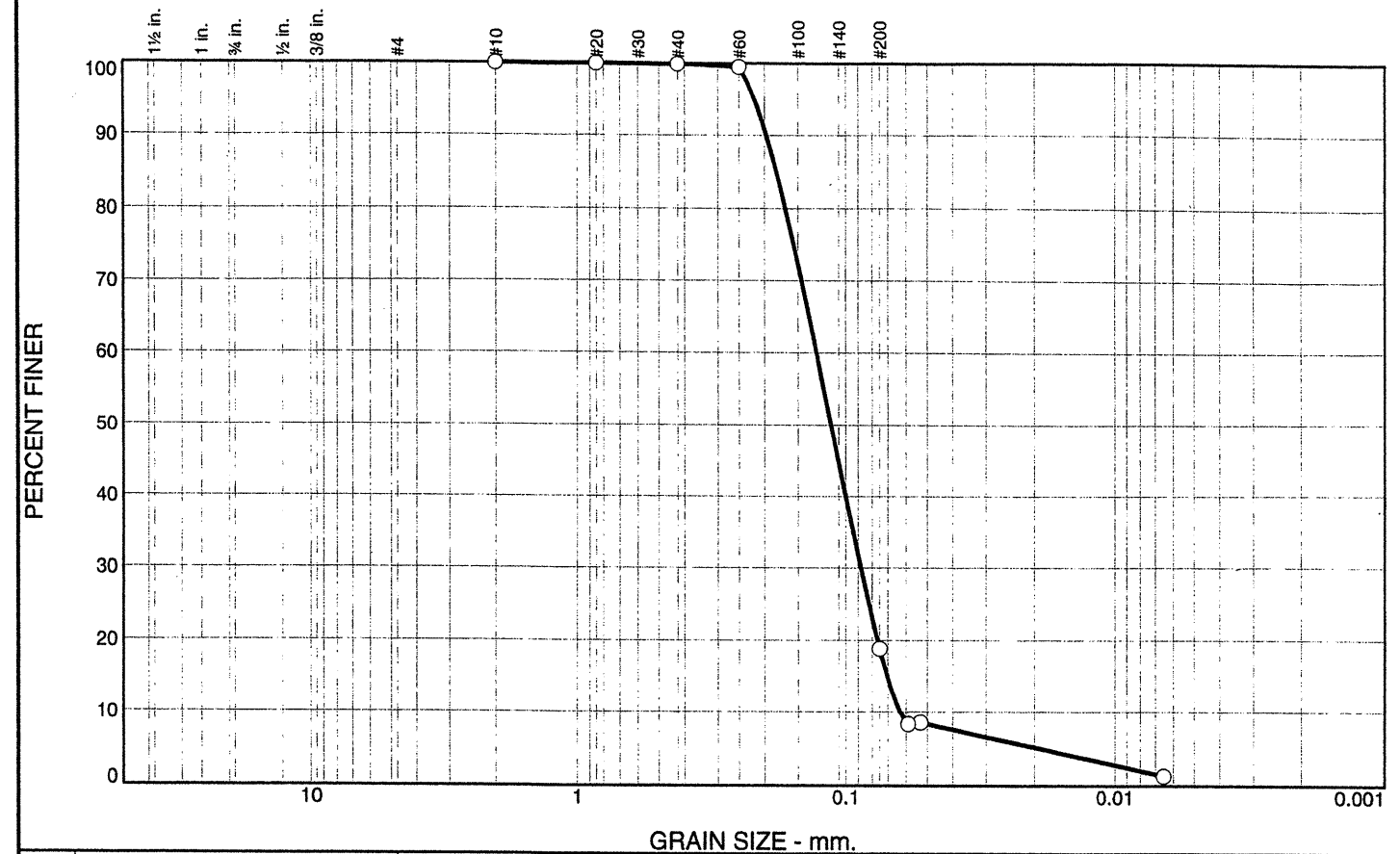
MACTEC Engineering and Consulting, Inc.
Raleigh, North Carolina

Client: NCDOT
Project: Bridge No. 3 on SR 1232 Over Tulls Creek
Project No: 6468092413

Figure

Tested By: CS (Cert# 104-04-0504) *CS* Checked By: MDC (Lab Manager) *MDC*

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.1	81.0	18.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	100.0		
#40	99.9		
#60	99.5		
#200	18.9		
#270	8.6		

Material Description
Gray, Silty, Fine SAND w/Trace of Clay

Atterberg Limits
PL= NP LL= NV PI= NP

Coefficients
D₉₀= 0.1970 D₈₅= 0.1807 D₆₀= 0.1282
D₅₀= 0.1133 D₃₀= 0.0880 D₁₅= 0.0704
D₁₀= 0.0632 C_u= 2.03 C_c= 0.95

Classification
USCS= SM AASHTO= A-2-4(0)

Remarks
ND = Not Determined
Atterburg Limits as Per Spatula Method
Specific Gravity is assumed

* (no specification provided)

Source of Sample: Boring B1-A Depth: 7.7-9.2'
Sample Number: SS-16

Date: 5/14/09

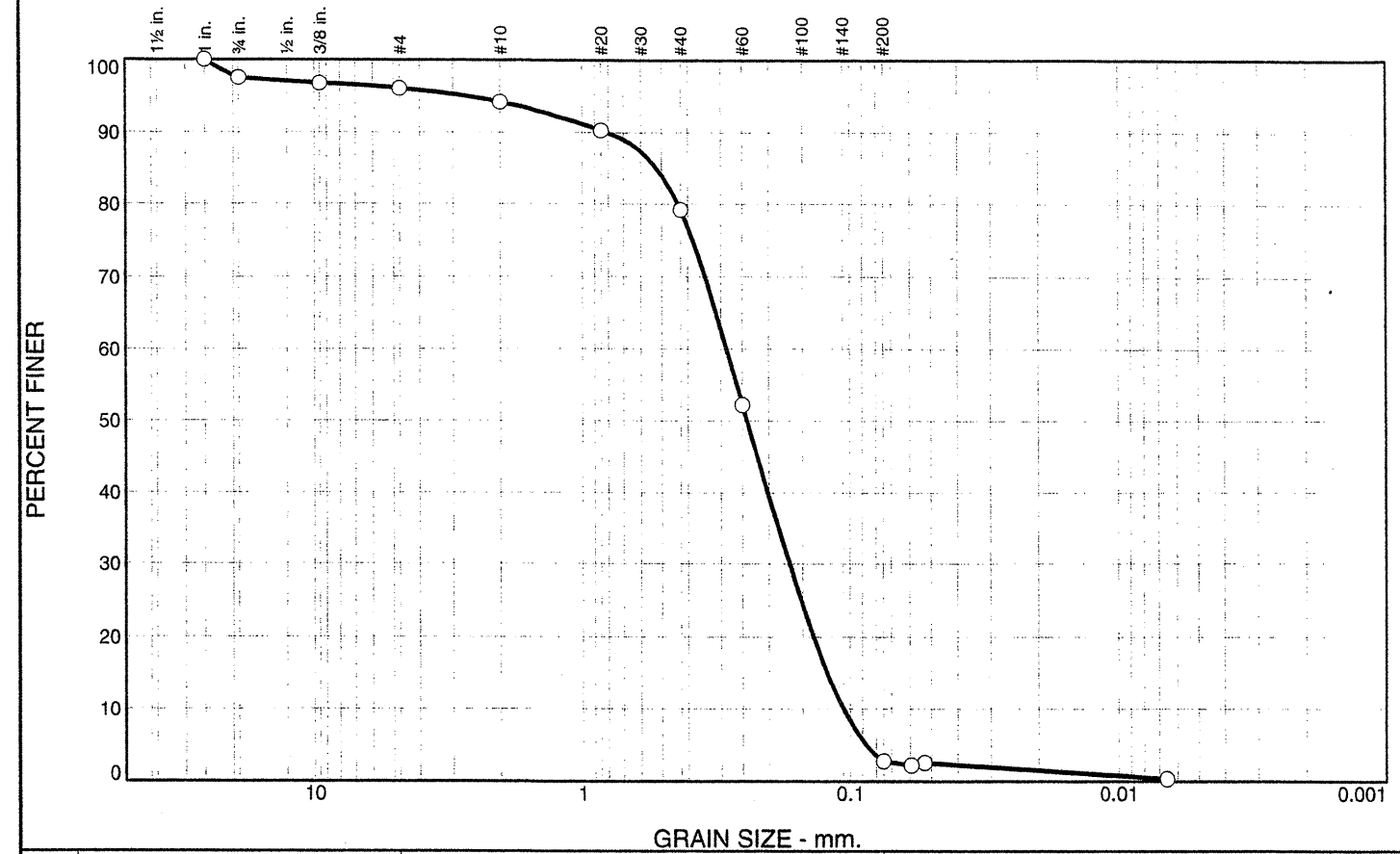
MACTEC Engineering and Consulting, Inc.
Raleigh, North Carolina

Client: NCDOT
Project: Bridge No. 3 on SR 1232 Over Tulls Creek
Project No: 6468092413

Figure

Tested By: CS (Cert# 104-04-0504) *CS* Checked By: MDC (Lab Manager) *MDC*

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	2.5	1.4	1.9	15.0	76.5	2.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
3/4	97.5		
3/8	96.7		
#4	96.1		
#10	94.2		
#20	90.3		
#40	79.2		
#60	52.2		
#200	2.7		
#270	2.4		

Material Description
Brown-Gray, Moderately Organic, Silty, Fine to Coarse SAND

Atterberg Limits
 PL= NP LL= NV PI= NP

Coefficients
 D₉₀= 0.8078 D₈₅= 0.5220 D₆₀= 0.2864
 D₅₀= 0.2409 D₃₀= 0.1680 D₁₅= 0.1215
 D₁₀= 0.1057 C_u= 2.71 C_c= 0.93

Classification
 USCS= SP AASHTO= A-3

Remarks
 ND = Not Determined
 Specific Gravity is assumed

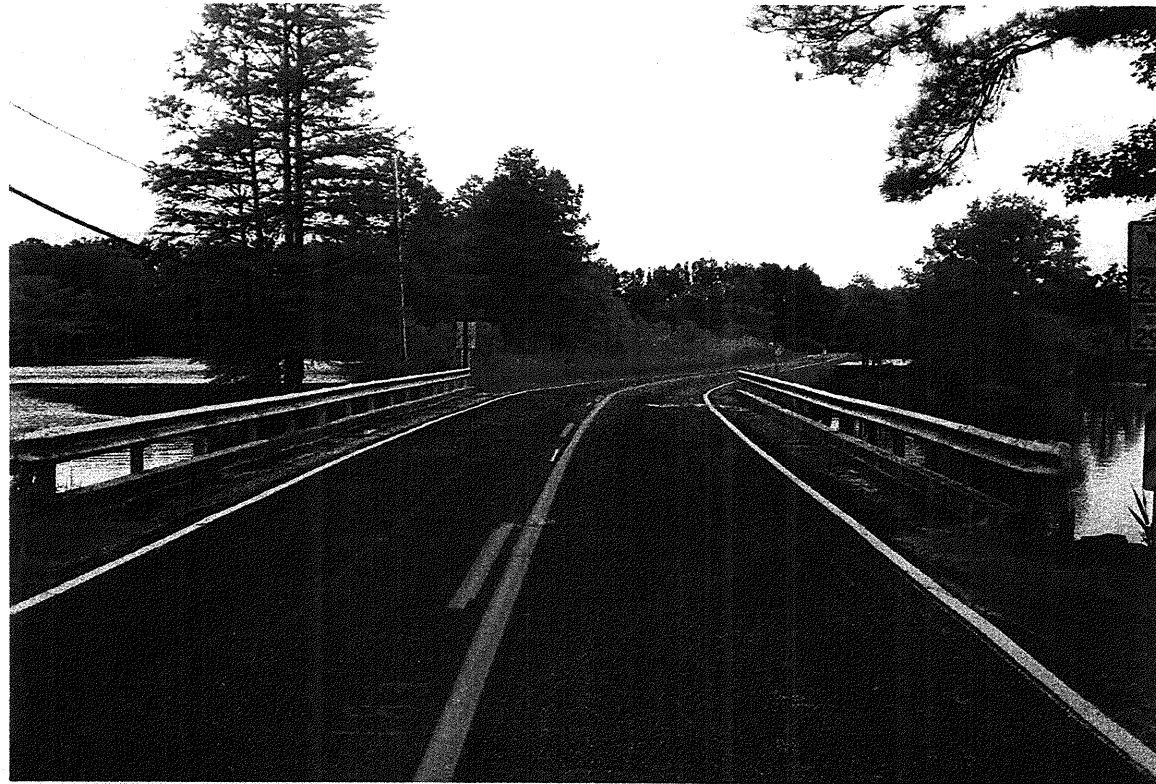
* (no specification provided)

Source of Sample: Channel Bed Depth: 0.0-1.0'
 Sample Number: S-1

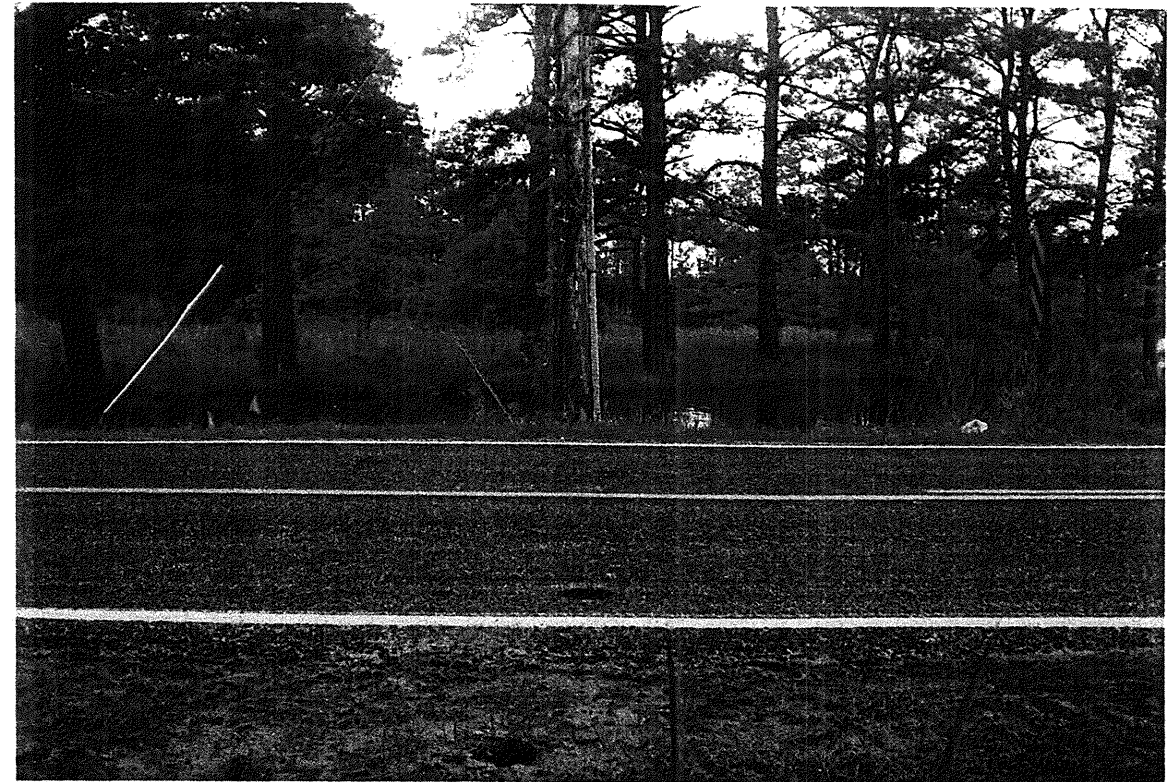
Date: 5/14/09

MACTEC Engineering and Consulting, Inc. Raleigh, North Carolina	Client: NCDOT Project: Bridge No. 3 on SR 1232 Over Tulls Creek Project No: 6468092413	Figure
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Tested By: CS (Cert# 104-04-0504) *CS* Checked By: MDC (Lab Manager) *MDC*



View Looking Up Station from End Bent No. 1



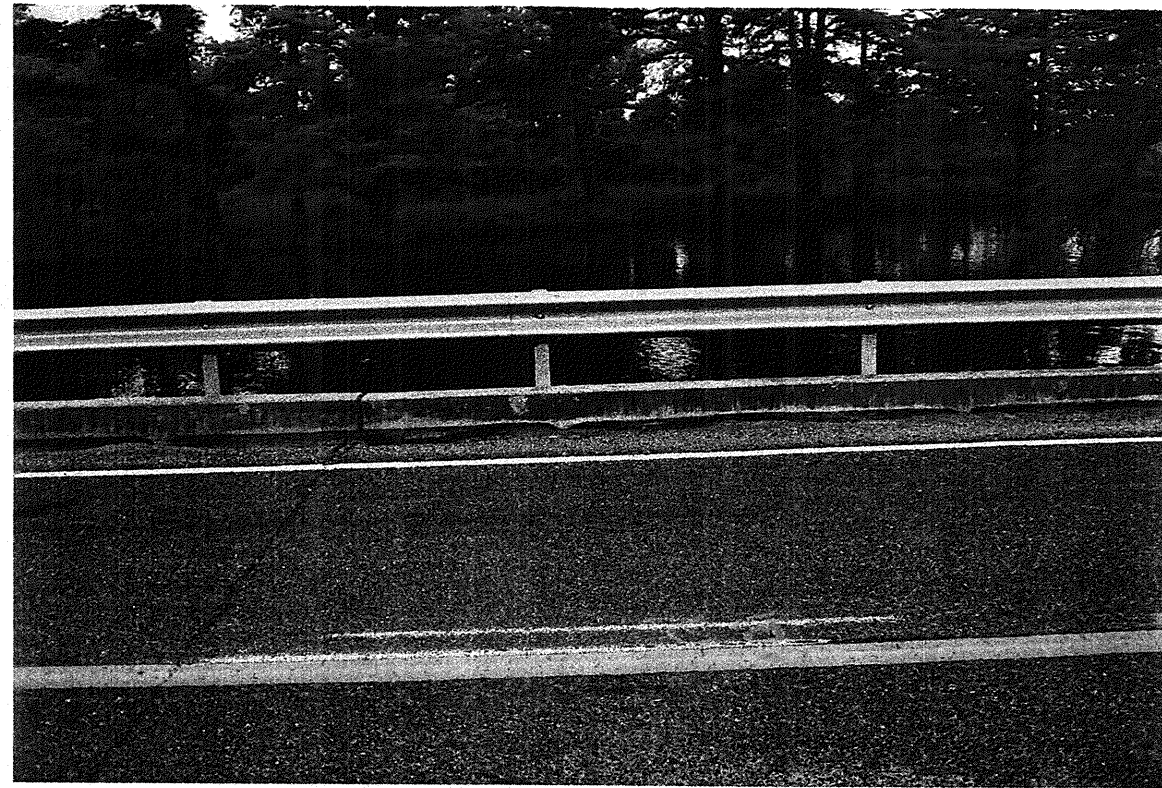
End Bent No. 1: View Looking Right to Left.



View Looking Down Station from End Bent No. 2



Interior Bent No. 1: View Looking Right to Left.



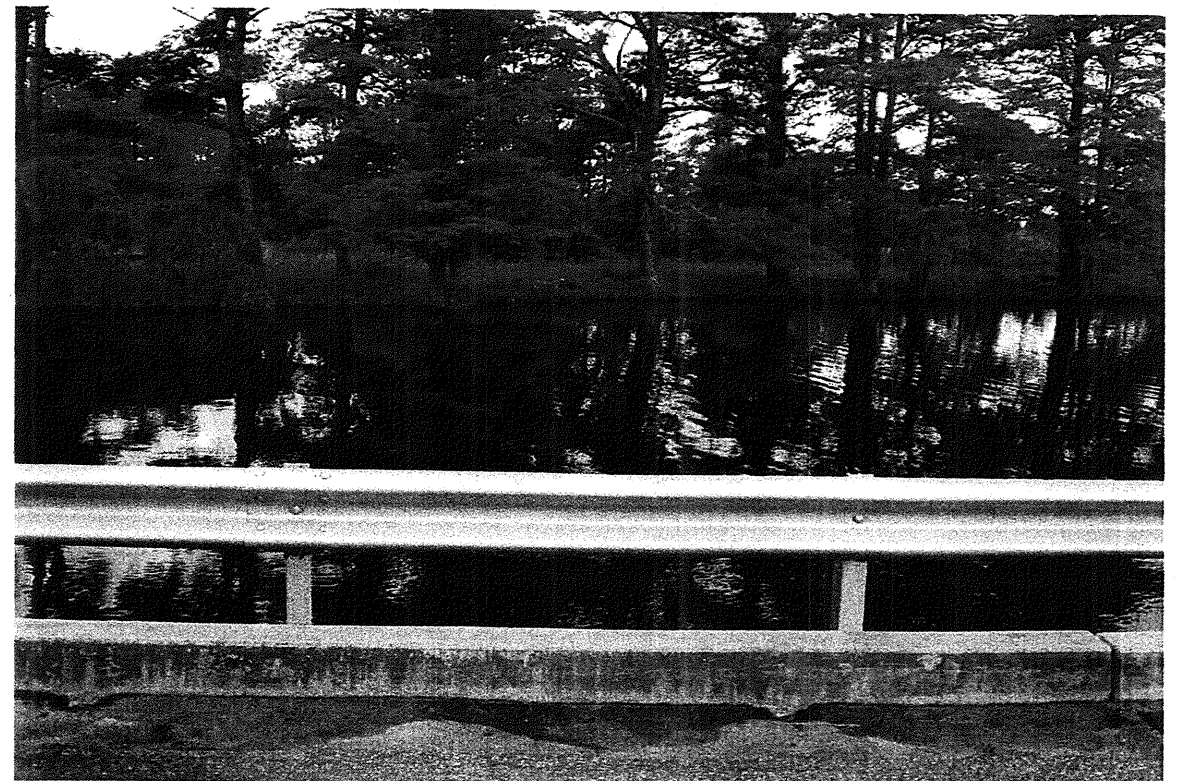
Interior Bent No. 2: View Looking Right to Left.



View From Existing Bridge Looking Upstream



End Bent No. 2: View Looking Right to Left.



View From Existing Bridge Looking Downstream