

PROJECT: 8.2060201 I.D.: B-3640

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL UNIT

STATE	CITY PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	8.2060201	1	33
CITY PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION	
B-3640	BRZ-1400(4)	P.E.	
		CONST.	

CONTENTS:

- NCDOT GEOTECHNICAL UNIT SOIL AND ROCK CLASSIFICATION LEGEND
- SITE LOCATION MAP (DRAWING 1)
- TOPOGRAPHIC SITE MAP (DRAWING 2)
- BORING LOCATION PLAN (DRAWING 3)
- PROFILE 14ft RT OF -L- FROM STATION 10+69 TO 12+27 (DRAWING 4)
- CROSS SECTION THROUGH STATION 10+80 -L- (DRAWING 5)
- CROSS SECTION THROUGH STATION 11+32 -L- (DRAWING 6)
- CROSS SECTION THROUGH STATION 11+75 -L- (DRAWING 7)
- CROSS SECTION THROUGH STATION 12+17 -L- (DRAWING 8)
- PROFILE 50ft LT OF -L- FROM STATION 10+81 TO 12+24 (DRAWING 9)
- PROFILE 14ft LT OF -L- FROM STATION 9+17 TO 11+01 (DRAWING 10)
- PROFILE 12ft LT OF -L- FROM STATION 12+07 TO 14+36 (DRAWING 11)
- BORING LOGS
- SCOUR REPORT
- AASHTO/ASTM LABORATORY RESULTS
- GRAIN SIZE CURVES

STRUCTURE SUBSURFACE INVESTIGATION

STATE PROJECT 8.2060201 I.D. NO. B-3640

COUNTY GATES

PROJECT DESCRIPTION BRIDGE 16 OVER

MERCHANTS MILL POND ON SR 1400

SITE DESCRIPTION _____

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 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 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.

DRAWN BY: R.RAHIE

For Letting

INVESTIGATED BY	<u>MACTEC ENGINEERING AND CONSULTING OF GEORGIA, INC.</u>	PERSONNEL	<u>M. LEAR</u>
CHECKED BY	<u>A. TICE/S. CRISZENZO</u>		<u>J. BRYSON</u>
SUBMITTED BY	<u>B. BANKS</u>		<u>M. FRISCO</u>
DATE	<u>2/28/03</u>		
REVISED	<u>4/25/03</u>		

NORTH CAROLINA
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SIGNATURE

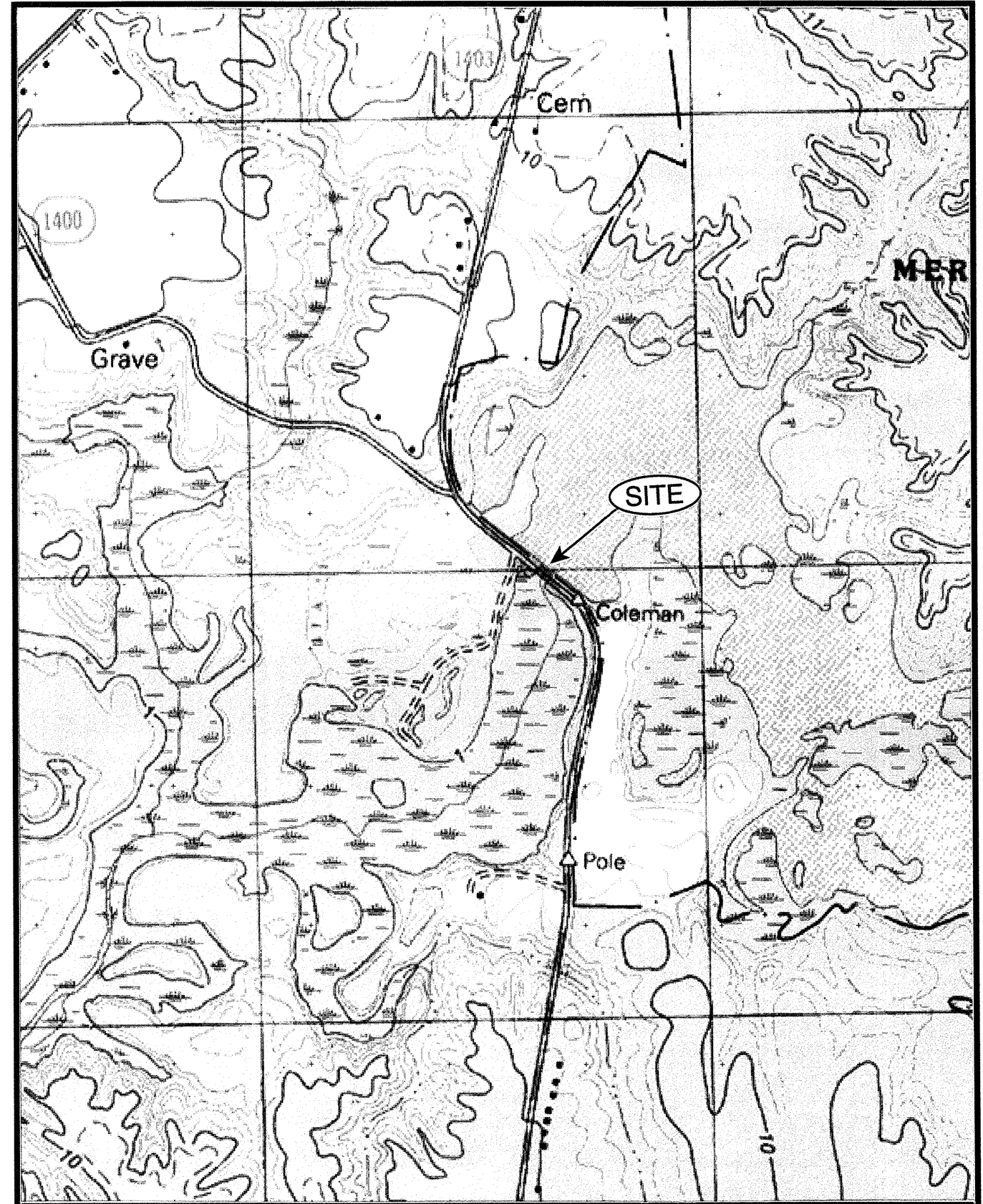
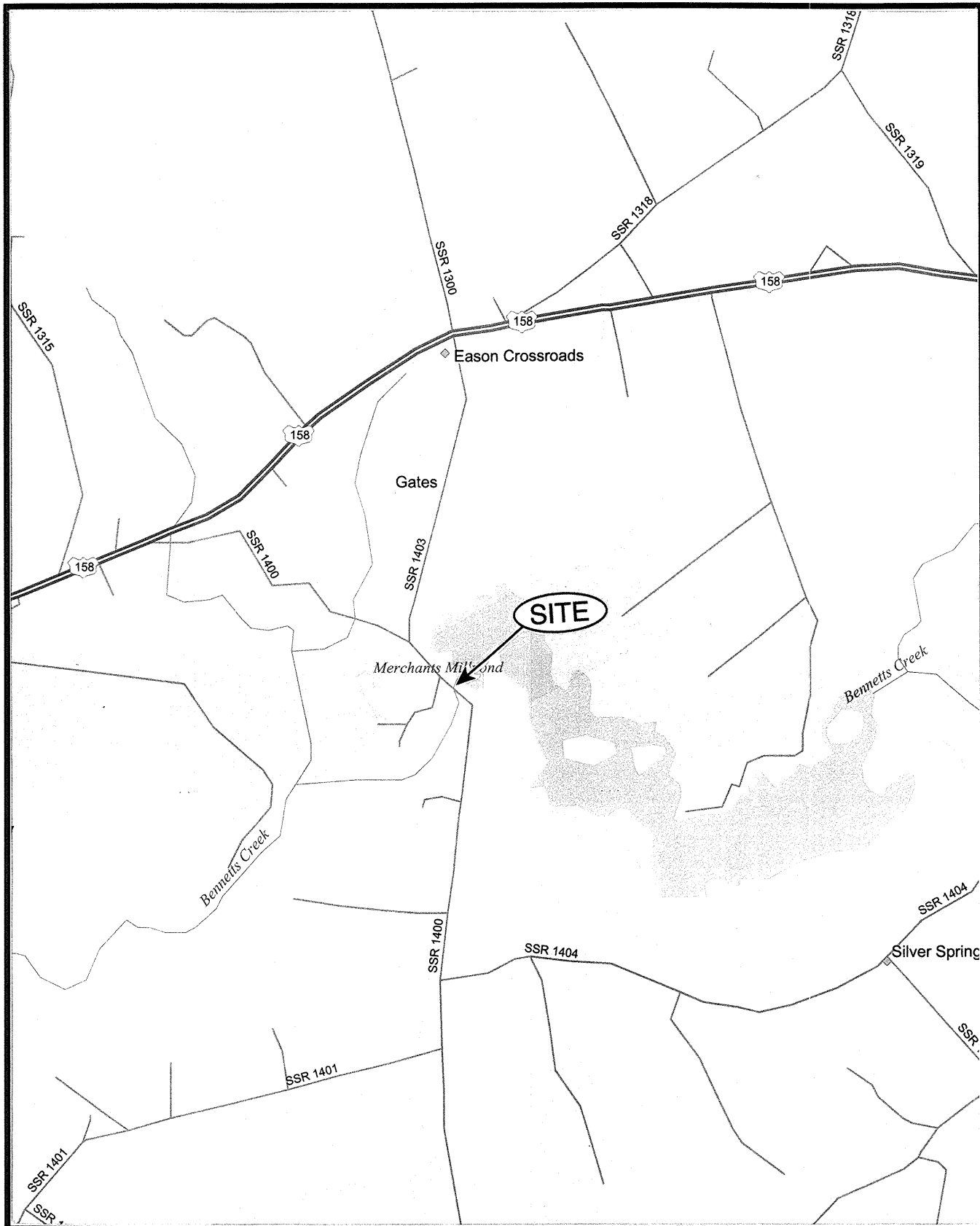
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
 DIVISION OF HIGHWAYS
 GEOTECHNICAL UNIT


ID	PROJECT NO.	SHEET NO.	TOTAL SHEETS
B-3640	8.2060201	2	33

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 WHICH CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND WHICH YIELDS LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM AND BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE: VERY STIFF, GRAY SILTY CLAY, MOIST 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 ARE DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.										HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WHEN TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS: WEATHERED ROCK (WR) - NON-COASTAL PLAIN MATERIAL THAT YIELDS SPT N VALUES > 100 BLOWS PER FOOT. 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 WHICH HAVE BEEN TRANSPORTED BY WATER. AQUIFER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. CALCAREOUS (CALC.) - SOILS WHICH CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL. FLOOD PLAIN (F.P.) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. RESIDUAL SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. ROCK QUALITY DESIGNATION (R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY: TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP.) - RESIDUAL SOIL WHICH RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, WHICH HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR B.P.F.) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS LESS THAN 0.1 FOOT PENETRATION WITH 60 BLOWS. STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (S.R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY: TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. TOPSOIL (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.																													
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. 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 ROCKS 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 ROCKS EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. 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.										COMPRESSIONIBILITY SLIGHTLY COMPRESSIBLE - LIQUID LIMIT LESS THAN 30 MODERATELY COMPRESSIBLE - LIQUID LIMIT 31-50 HIGHLY COMPRESSIBLE - LIQUID LIMIT GREATER THAN 50										PERCENTAGE OF MATERIAL 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																			
TEXTURE OR GRAIN SIZE										GROUND WATER										ROCK HARDNESS																																							
U.S. STD. SIEVE SIZE OPENING (MM) 4 10 40 60 200 270 4.76 2.0 0.42 0.25 0.075 0.053										WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING. STATIC WATER LEVEL AFTER 24 HOURS. PERCHED WATER, SATURATED ZONE OR WATER BEARING STRATA SPRING OR SEEPAGE										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 PIECES 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.																																							
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 WITH SOIL DESCRIPTION SOIL SYMBOL ARTIFICIAL FILL OTHER THAN ROADWAY EMBANKMENTS INFERRED SOIL BOUNDARIES INFERRED ROCK LINE ALLUVIAL SOIL BOUNDARY DIP/DIP DIRECTION OF ROCK STRUCTURES SOUNDING ROD										SPT CPT DMT VST PMT TEST BORING AUGER BORING BULK SAMPLE LOCATION CORE BORING MONITORING WELL PIEZOMETER INSTALLATION SLOPE INDICATOR INSTALLATION SPT N-VALUE										S - BULK SAMPLE SS - SPLIT SPOON SAMPLE ST - SHELBY TUBE SAMPLE RS - ROCK SAMPLE RT - RECOMPACTED TRIAXIAL SAMPLE CBR - CBR SAMPLE																													
GENERALY GRANULAR MATERIAL (NON-COHESIVE) VERY LOOSE 4 < 10 10 TO 30 30 TO 50 >50 GENERALY SILT-CLAY MATERIAL (COHESIVE) VERY SOFT 2 TO 4 4 TO 8 8 TO 15 15 TO 30 >30 SOFT 2 TO 4 4 TO 8 8 TO 15 15 TO 30 >30 MEDIUM STIFF 4 TO 8 8 TO 15 15 TO 30 >30 STIFF 8 TO 15 15 TO 30 >30 VERY STIFF 15 TO 30 >30 HARD >30										ROADWAY EMBANKMENT WITH SOIL DESCRIPTION SOIL SYMBOL ARTIFICIAL FILL OTHER THAN ROADWAY EMBANKMENTS INFERRED SOIL BOUNDARIES INFERRED ROCK LINE ALLUVIAL SOIL BOUNDARY DIP/DIP DIRECTION OF ROCK STRUCTURES SOUNDING ROD										SPT CPT DMT VST PMT TEST BORING AUGER BORING BULK SAMPLE LOCATION CORE BORING MONITORING WELL PIEZOMETER INSTALLATION SLOPE INDICATOR INSTALLATION SPT N-VALUE										S - BULK SAMPLE SS - SPLIT SPOON SAMPLE ST - SHELBY TUBE SAMPLE RS - ROCK SAMPLE RT - RECOMPACTED TRIAXIAL SAMPLE CBR - CBR SAMPLE																													
SOIL MOISTURE - CORRELATION OF TERMS										ABBREVIATIONS										ROCK HARDNESS																																							
SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION										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 FRAGS. - FRAGMENTS MED. - MEDIUM PMT - PRESSUREMETER TEST SD - SAND, SANDY SL - SILT, SILTY SPT - SLIGHTLY TCR - TRICONE REFUSAL U - UNIT WEIGHT U _d - DRY UNIT WEIGHT W - MOISTURE CONTENT V - VERY VST - VANE SHEAR TEST C.I. - CAVE IN FIAD - FILLED IMMEDIATELY AFTER DRILLING										S - BULK SAMPLE SS - SPLIT SPOON SAMPLE ST - SHELBY TUBE SAMPLE RS - ROCK SAMPLE RT - RECOMPACTED TRIAXIAL SAMPLE CBR - CBR SAMPLE										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 PIECES 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.																													
PLASTICITY										EQUIPMENT USED ON SUBJECT PROJECT										ROCK HARDNESS																																							
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										DRILL UNITS: MOBILE B- BK-51 CME-45 ON BARGE CME-550 PORTABLE HOIST OTHER OTHER ADVANCING TOOLS: CLAY BITS 6" CONTINUOUS FLIGHT AUGER 8" HOLLOW AUGERS HARD FACED FINGER BITS TUNG-CARBIDE INSERTS CASING W/ ADVANCER TRICONE 2.3, 3.4 * STEEL TEETH TRICONE * TUNG-CARB. CORE BIT OTHER HAMMER TYPE: AUTOMATIC MANUAL CORE SIZE: -B -N -H HAND TOOLS: POST HOLE DIGGER HAND AUGER SOUNDING ROD VANE SHEAR TEST OTHER										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 PIECES 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.																																							
COLOR										FRACTURE SPACING										ROCK HARDNESS																																							
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YEL-BRN, BLUE-GRAY) MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.										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										FRACTURE SPACING										ROCK HARDNESS																																							
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.																																																	
NOTES: Geotechnical Exploration Performed By:																																																											
																														 MACTEC ENGINEERING AND CONSULTING OF GEORGIA, INC. 3301 ATLANTIC AVENUE RALEIGH, NORTH CAROLINA 27604 (919) 876-0416																													

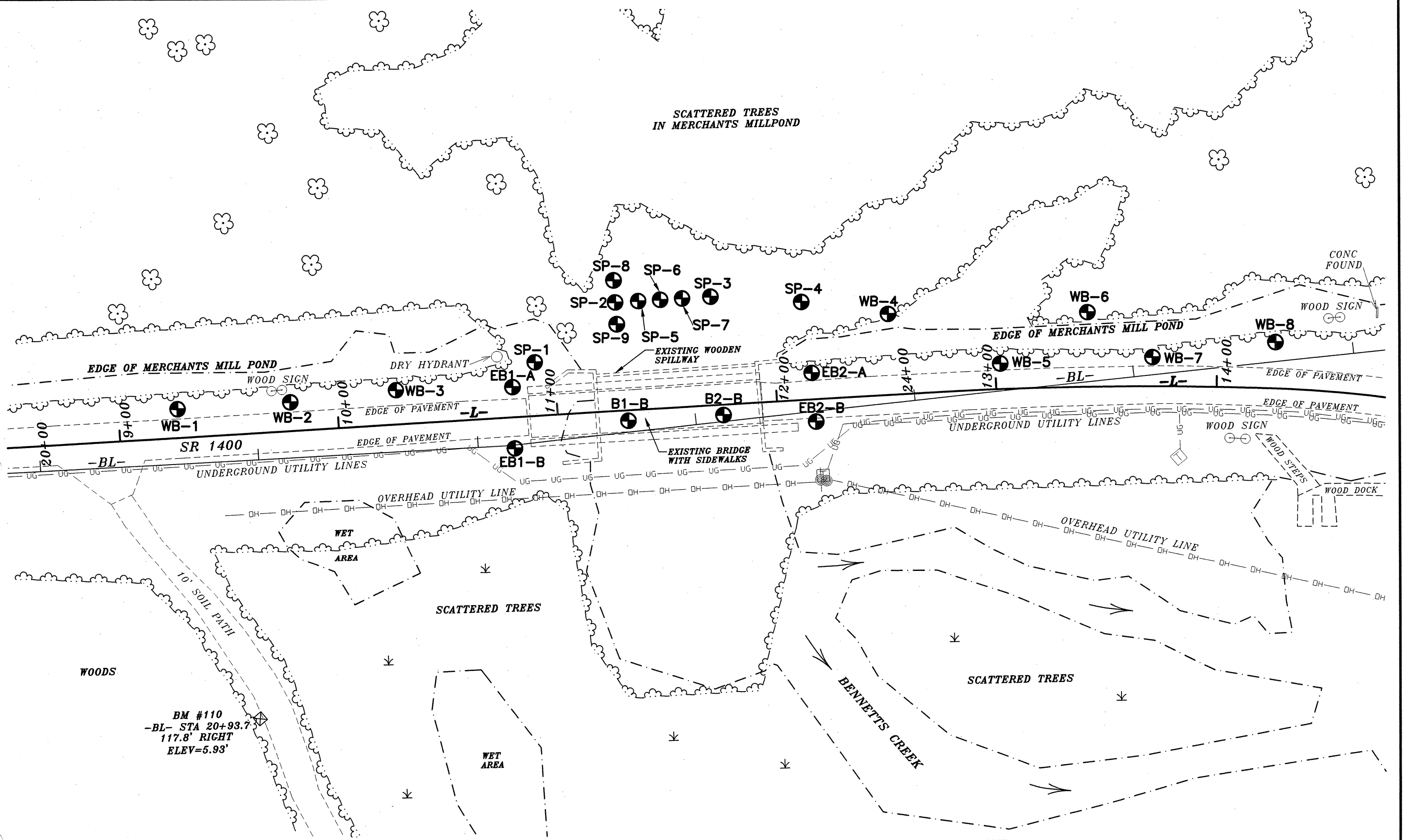


N

SITE LOCATION MAP
 Bridge 16 over Merchants Mill Pond
 on SR 1400
 N.C. DOT Project No. 8.2060201 (B-3640)
 F.A. No. BRZ-1400(4)
 Gates County, North Carolina
 REFERENCE: Street Atlas, DeLorme, 1999

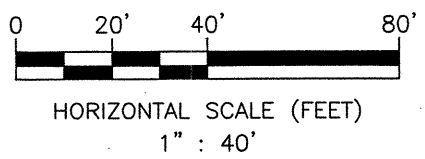
MACTEC
 ENGINEERING AND CONSULTING, INC.
 RALEIGH, NORTH CAROLINA
 DWG: 1 DATE: February, 2003
 LAW JOB NO: 30725-2-5435

N

TOPOGRAPHIC SITE MAP
 Bridge 16 over Merchants Mill Pond
 on SR 1400
 N.C. DOT Project No. 8.2060201 (B-3640)
 F.A. No. BRZ-1400(4)
 Gates County, North Carolina
 REF: USGS Quad - Merchants Millpond, NC SCALE: 1:12,000

MACTEC
 ENGINEERING AND CONSULTING, INC.
 RALEIGH, NORTH CAROLINA
 DWG: 2 DATE: February, 2003
 LAW JOB NO: 30725-2-5435

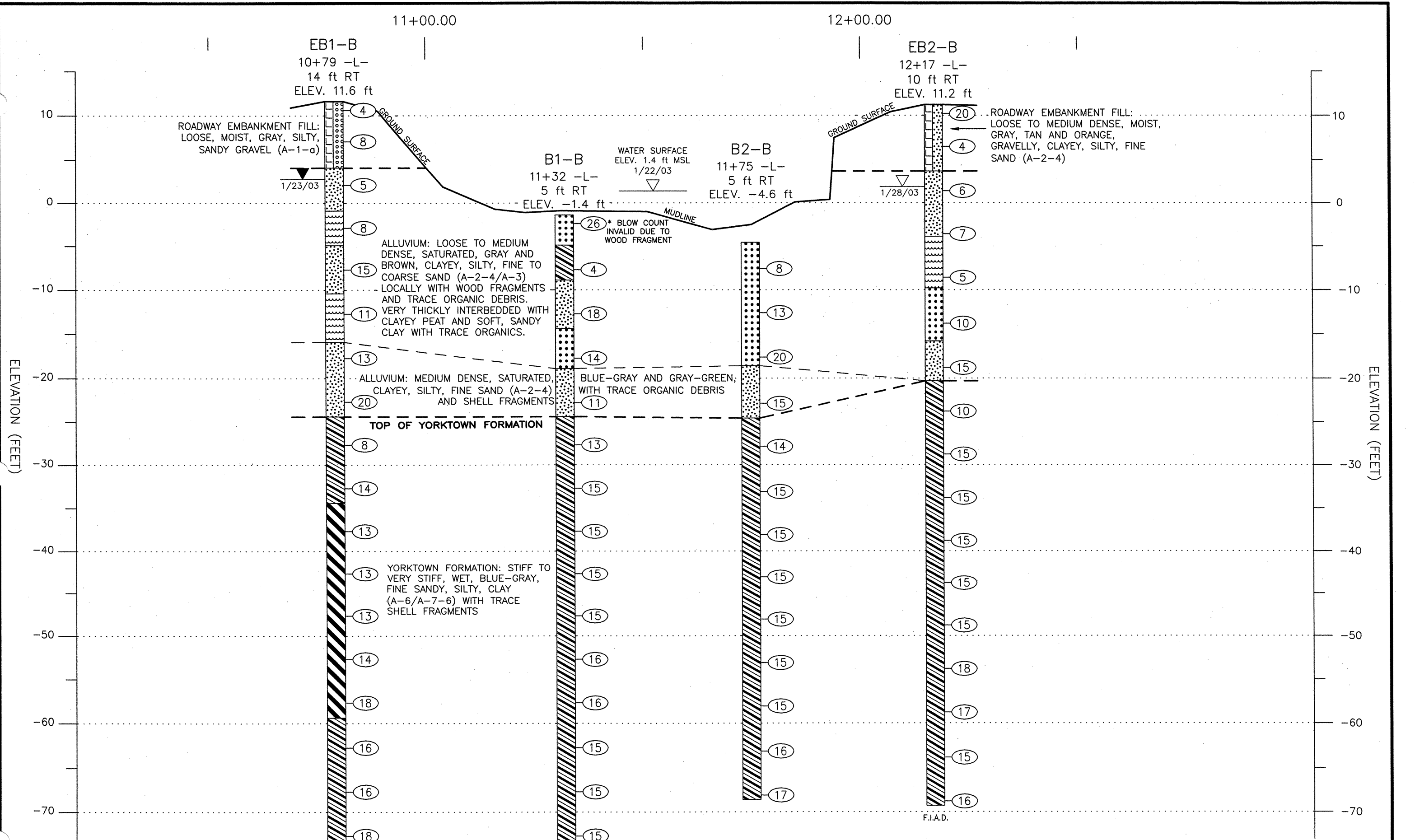


BM #110
 -BL- STA 20+93.7
 117.8' RIGHT
 ELEV=5.93'



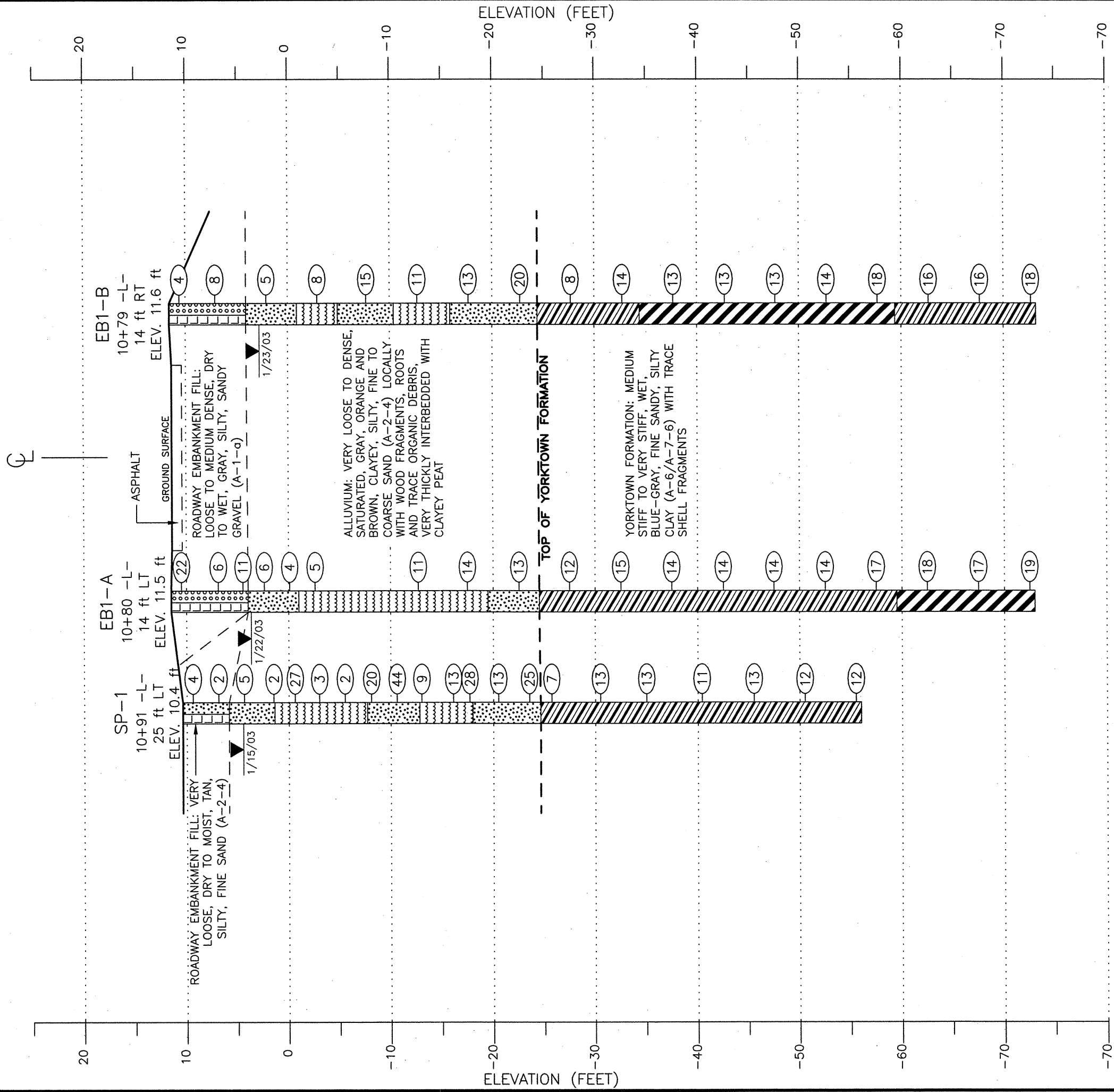
BORING LOCATION PLAN
 BRIDGE 16 OVER MERCHANTS MILL POND ON SR 1400
 NCDOT PROJECT NO. 8.2060201 (B-3640)
 F.A. No. BRZ-1400(4)
 GATES COUNTY, NORTH CAROLINA

MACTEC ENGINEERING AND CONSULTING OF GEORGIA, INC. RALEIGH, NORTH CAROLINA			
REVISIONS	DRAWN: R.R.	DATE: 2/28/03	
4/25/03	DFT CHECK: B.K.B.	JOB : 30725-2-5435	
	ENG CHECK: J.A.T.	DWG: 3	



PROFILE 14 ft RT OF -L-
FROM STATION 10+69 TO 12+27
BRIDGE 16 OVER MERCHANTS MILL POND ON SR 1400
NCDOT PROJECT NO. 8.2060201 (B-3640)
F.A. No. BRZ-1400(4)
GATES COUNTY, NORTH CAROLINA

MACTEC ENGINEERING AND CONSULTING OF GEORGIA, INC. RALEIGH, NORTH CAROLINA			
REVISIONS	DRAWN: R.R.	DATE: 2/28/03	
4/25/03	DFT CHECK: B.K.B.	JOB : 30725-2-5435	
	ENG CHECK: J.A.T.	DWG: 4	

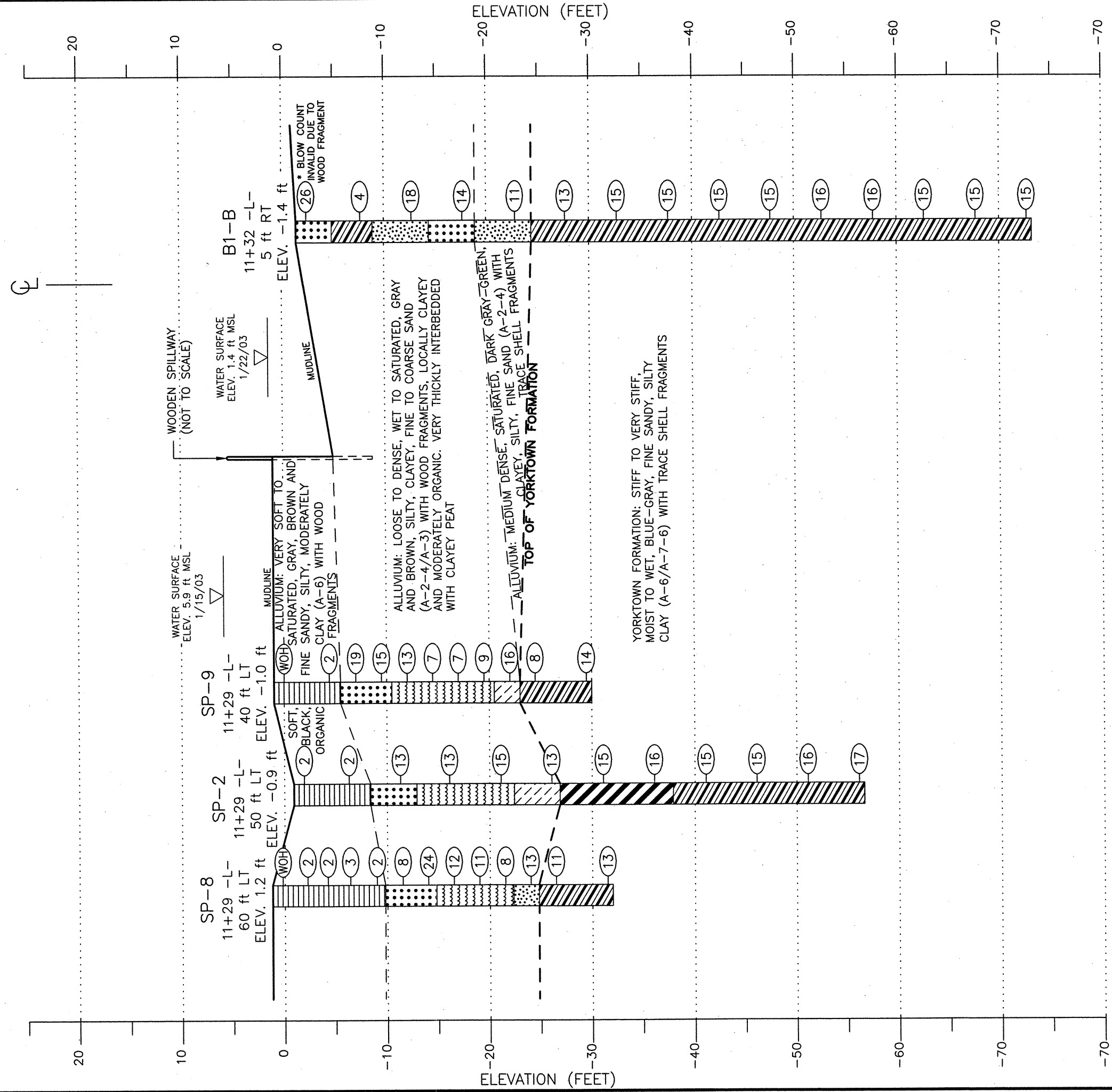


HORIZONTAL SCALE (FEET)
 1" : 10'

CROSS SECTION THROUGH STATION 10+80 -L-
 BRIDGE 16 OVER MERCHANTS MILL POND ON SR 1400
 NCDOT PROJECT NO. 8.2060201 (B-3640)
 F.A. No. BRZ-1400(4)
 GATES COUNTY, NORTH CAROLINA

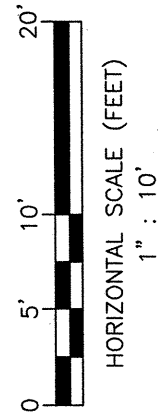
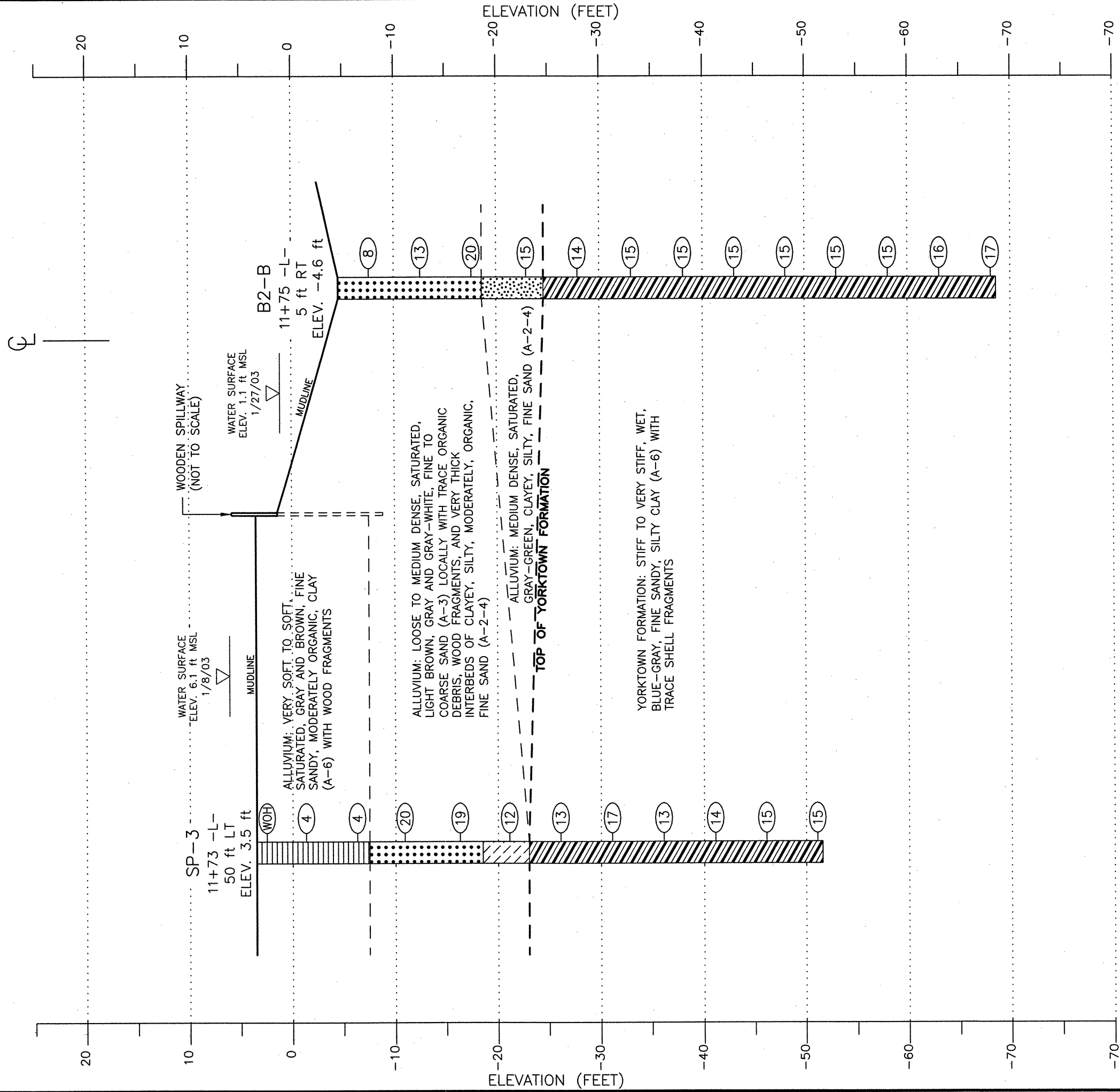
MACTEC ENGINEERING AND CONSULTING OF GEORGIA, INC.
 RALEIGH, NORTH CAROLINA

REVISIONS	DRAWN: R.R.	DATE: 2/28/03
4/25/03	DFT CHECK: B.K.B.	JOB : 30725-2-5435
	ENG CHECK: J.A.T.	DWG: 5



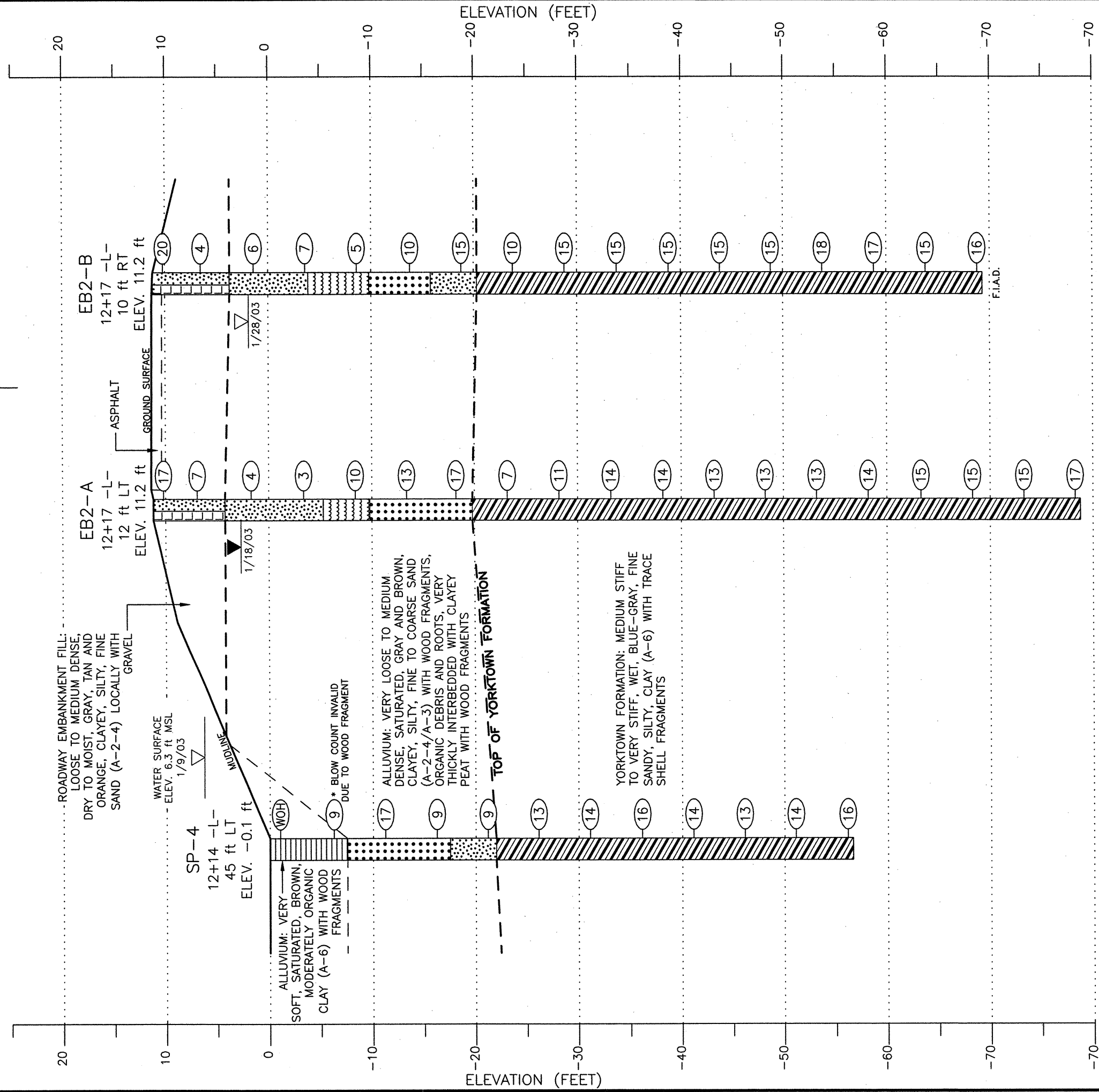
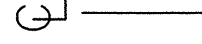
CROSS SECTION THROUGH STATION 11+32 -L-
BRIDGE 16 OVER MERCHANTS MILL POND ON SR 1400
NCDOT PROJECT NO. 8.2060201 (B-3640)
F.A. No. BRZ-1400(4)
GATES COUNTY, NORTH CAROLINA

MACTEC ENGINEERING AND CONSULTING OF GEORGIA, INC. RALEIGH, NORTH CAROLINA			
REVISIONS	DRAWN: R.R.	DATE: 2/28/03	
4/25/03	DFT CHECK: B.K.B.	JOB : 30725-2-5435	
	ENG CHECK: J.A.T.	DWG: 6	



CROSS SECTION THROUGH STATION 11+75 -L- BRIDGE 16 OVER MERCHANTS MILL POND ON SR 1400
 NCDOT PROJECT NO. 8.2060201 (B-3640)
 F.A. No. BRZ-1400(4)
 GATES COUNTY, NORTH CAROLINA

MACTEC ENGINEERING AND CONSULTING OF GEORGIA, INC. RALEIGH, NORTH CAROLINA			
REVISIONS	DATE	DRAWN: R.R.	DATE: 2/28/03
4/25/03		DFT CHECK: B.K.B.	JOB : 30725-2-5435
		ENG CHECK: J.A.T.	DWG: 7



CROSS SECTION THROUGH STATION 12+17 -L-
 BRIDGE 16 OVER MERCHANTS MILL POND ON SR 1400
 NCDOT PROJECT NO. 8.2060201 (B-3640)
 F.A. No. BRZ-1400(4)
 GATES COUNTY, NORTH CAROLINA

MACTEC ENGINEERING AND CONSULTING OF GEORGIA, INC. RALEIGH, NORTH CAROLINA			
REVISIONS	DRAWN: R.R.	DATE: 2/28/03	
4/25/03	DFT CHECK: B.K.B.	JOB: 30725-2-5435	
	ENG CHECK: J.A.T.	DWG: 8	

11+00.0

12+00.00

SP-1

10+91 -L-
25 ft LT
ELEV. 10.4 ft

ROADWAY EMBANKMENT
FILL: VERY LOOSE, DRY
TO MOIST, TAN, SILTY,
FINE SAND (A-2-4)

WATER SURFACE
ELEV. 6.1 ft MSL
1/8/03

ALLUVIUM: VERY LOOSE, SATURATED,
GRAY AND BROWNISH GRAY, CLAYEY,
SILTY, FINE SAND (A-2-4) WITH
ORGANIC DEBRIS AND WOOD FRAGMENTS

WATER SURFACE
ELEV. 6.1 ft MSL
1/9/03

SP-2

11+29 -L-
50 ft LT
ELEV. -0.9 ft

SP-5

11+40 -L-
50 ft LT
ELEV. 0.1 ft

SP-6

11+50 -L-
50 ft LT
ELEV. 1.4 ft

SP-7

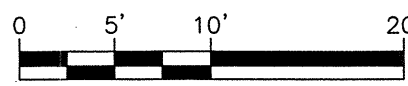
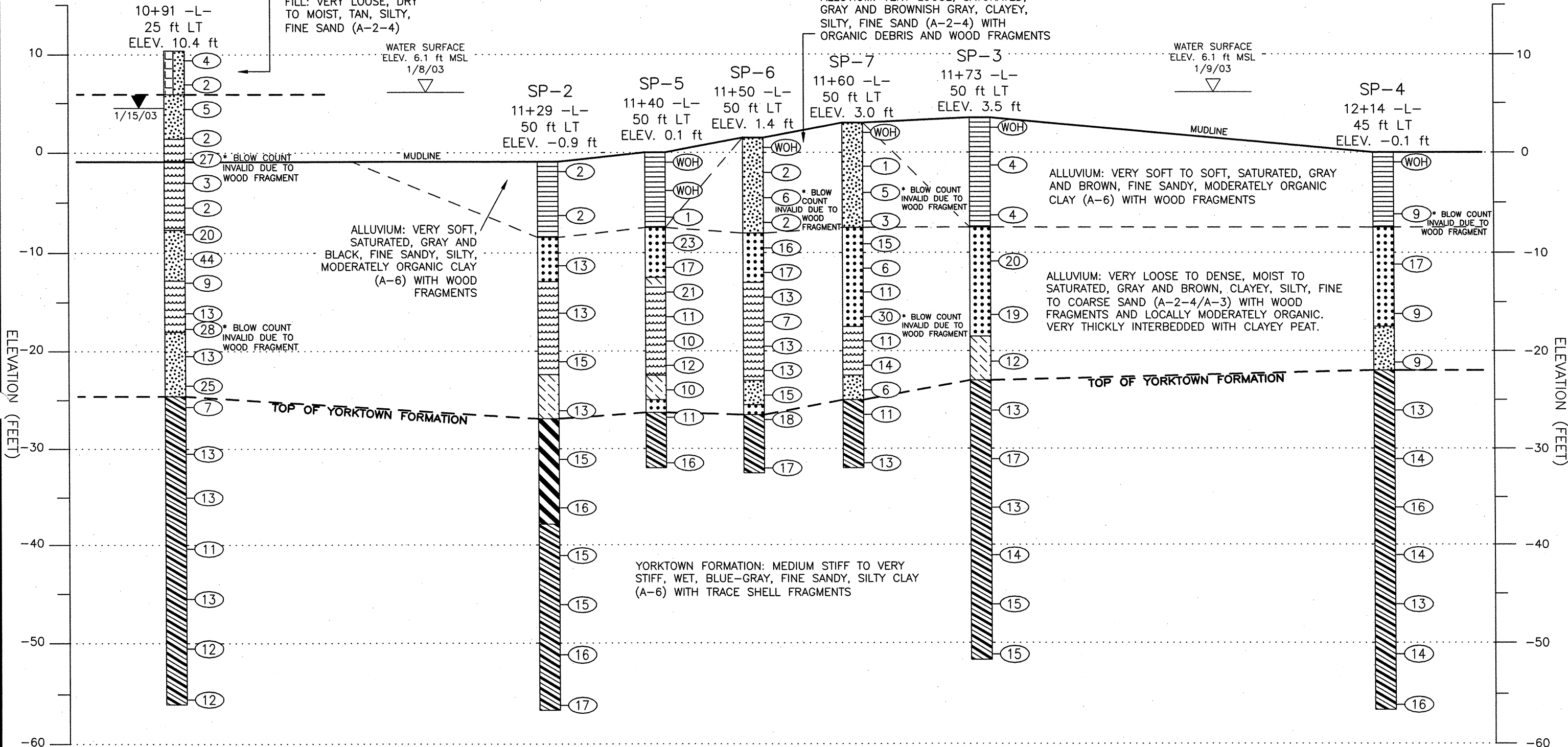
11+60 -L-
50 ft LT
ELEV. 3.0 ft

SP-3

11+73 -L-
50 ft LT
ELEV. 3.5 ft

SP-4

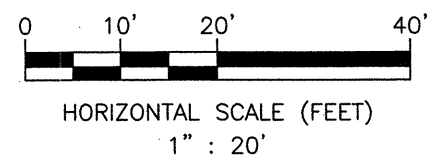
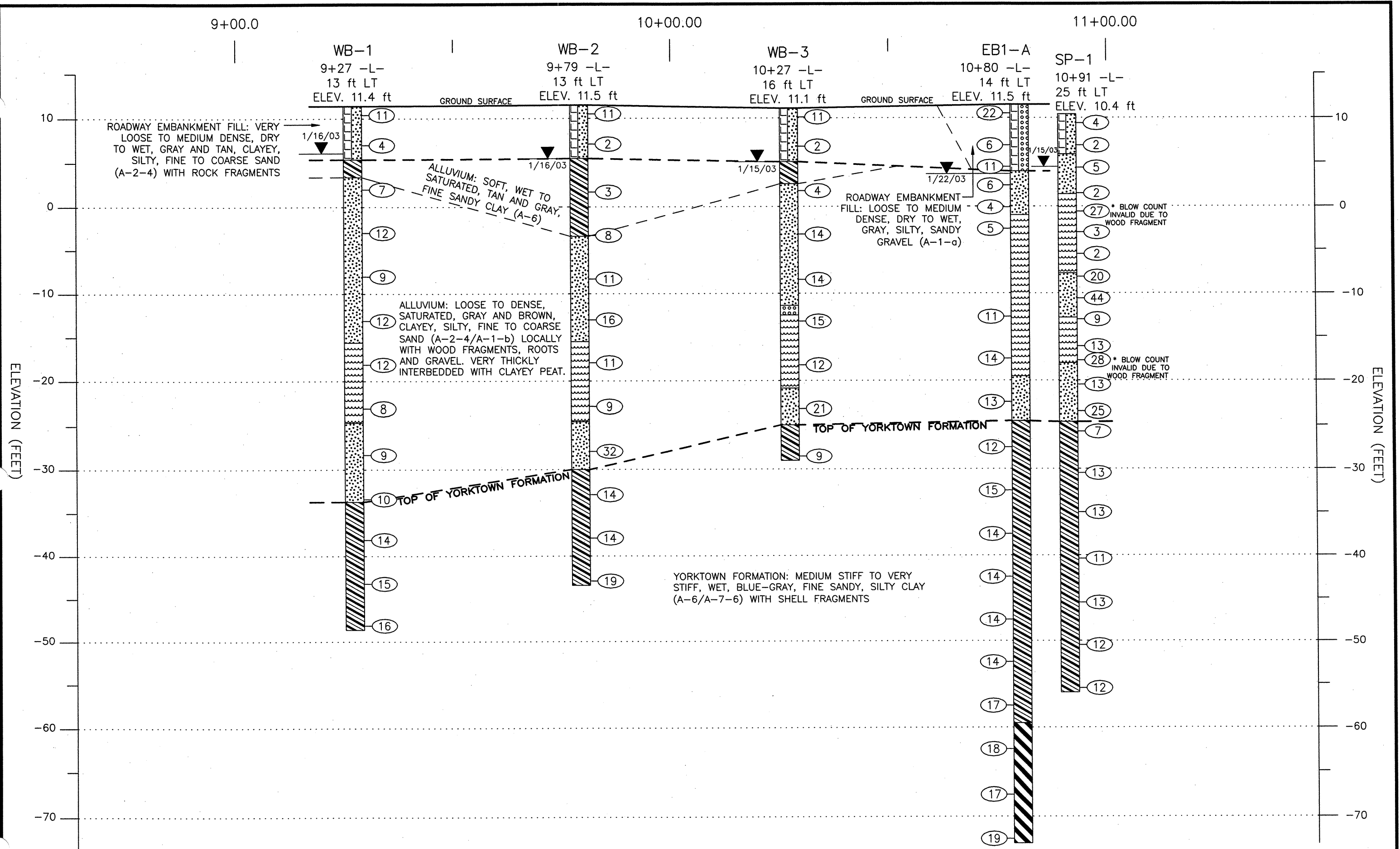
12+14 -L-
45 ft LT
ELEV. -0.1 ft



HORIZONTAL SCALE (FEET)
1" : 10'

PROFILE 50 ft LT OF -L-
FROM STATION 10+81 TO 12+24
BRIDGE 16 OVER MERCHANTS MILL POND ON SR 1400
NCDOT PROJECT NO. 8.2060201 (B-3640)
F.A. No. BRZ-1400(4)
GATES COUNTY, NORTH CAROLINA

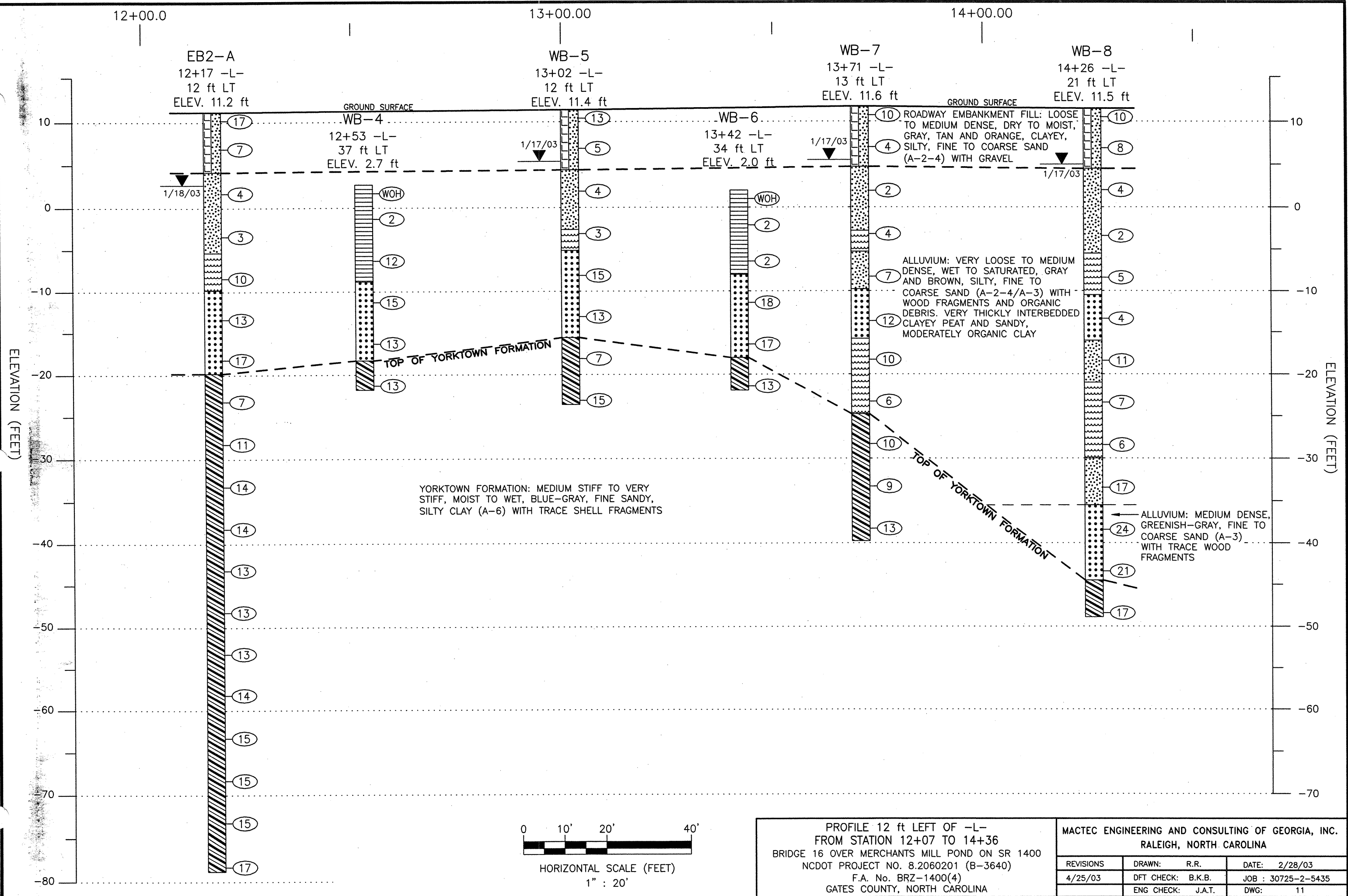
MACTEC ENGINEERING AND CONSULTING OF GEORGIA, INC. RALEIGH, NORTH CAROLINA			
REVISIONS	DRAWN:	R.R.	DATE: 2/28/03
4/25/03	DFT CHECK:	B.K.B.	JOB : 30725-2-5435
	ENG CHECK:	J.A.T.	DWG: 9



PROFILE 14 ft LT OF -L- FROM STATION 9+17 TO 11+01
 BRIDGE 16 OVER MERCHANTS MILL POND ON SR 1400
 NCDOT PROJECT NO. 8.2060201 (B-3640)
 F.A. No. BRZ-1400(4)
 GATES COUNTY, NORTH CAROLINA

MACTEC ENGINEERING AND CONSULTING OF GEORGIA, INC.
 RALEIGH, NORTH CAROLINA

REVISIONS	DRAWN:	R.R.	DATE:
4/25/03	DFT CHECK:	B.K.B.	2/28/03
	ENG CHECK:	J.A.T.	JOB : 30725-2-5435
			DWG: 10



PROFILE 12 ft LEFT OF -L-
FROM STATION 12+07 TO 14+36
BRIDGE 16 OVER MERCHANTS MILL POND ON SR 1400
NCDOT PROJECT NO. 8.2060201 (B-3640)
F.A. No. BRZ-1400(4)
GATES COUNTY, NORTH CAROLINA

MACTEC ENGINEERING AND CONSULTING OF GEORGIA, INC. RALEIGH, NORTH CAROLINA			
REVISIONS	DRAWN:	R.R.	DATE: 2/28/03
4/25/03	DFT CHECK:	B.K.B.	JOB : 30725-2-5435
	ENG CHECK:	J.A.T.	DWG: 11



PROJECT NO. 8.2060201		ID. B-3640		COUNTY Gates		GEOLOGIST M. Lear										
SITE DESCRIPTION Bridge #16 over Merchants Millpond on SR 1400 (MACTEC Project No. 30725-2-5435)						GROUND WATER (ft)										
BORING NO. EB2-A		BORING LOCATION 12+17		OFFSET 12R LT		ALIGNMENT -L-										
COLLAR ELEV. 11.2 ft		NORTHING 984,011		EASTING 2,676,827		0 HR. 8.3										
TOTAL DEPTH 90.0 ft		DRILL MACHINE CME-550		DRILL METHOD Mud Rotary		HAMMER TYPE 140 lb. Manual										
DATE STARTED 1/17/03		COMPLETED 1/17/03		SURFACE WATER DEPTH N/A												
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION				
		0.5ft	0.5ft	0.5ft	0	20	40	60	80				100			
11.2													Ground Surface			
11.2	0.0	9	9	8									11.2	0.0	D-M	Roadway Embankment Fill: Tan and orange, clayey, silty, f. SAND (A-2-4) w/ gravel in top 0.1'
7.9	3.3	4	3	4									4.2	7.0	D-M	Alluvium: Gray, silty, f. SAND (A-2-4) w/ wood frags.
2.7	8.5	2	2	2									5.3	16.5	Sat.	Alluvium: Dk. brown and gray, clayey PEAT w/ wood frags.
-2.4	13.6	2	1	2									9.8	21.0	Sat.	Alluvium: Gray, f. to cse. SAND (A-3) w/ trace wood frags. and organic debris
-7.4	18.6	2	4	6									19.8	31.0	Sat.	Yorktown Fm: Blue-gray, f. sandy, silty, CLAY (A-6) w/ trace shell frags.
-12.4	23.6	6	6	7											W	
-17.2	28.4	6	8	9											W	
-22.2	33.4	3	3	4											W	
-27.2	38.4	5	5	6											W	
-32.2	43.4	5	6	8											W	
-37.2	48.4	5	6	8											W	
-42.2	53.4	6	6	7											W	
-47.2	58.4	5	6	7											W	
-52.2	63.4	5	5	8											W	
-57.2	68.4	7	7	7											W	
-62.3	73.5	5	7	8											W	

NCDOT BC FILE 5435LOGS.GPI NC DOT.GDT 2/25/03



PROJECT NO. 8.2060201		ID. B-3640		COUNTY Gates		GEOLOGIST M. Lear										
SITE DESCRIPTION Bridge #16 over Merchants Millpond on SR 1400 (MACTEC Project No. 30725-2-5435)						GROUND WATER (ft)										
BORING NO. EB2-A		BORING LOCATION 12+17		OFFSET 12R LT		ALIGNMENT -L-										
COLLAR ELEV. 11.2 ft		NORTHING 984,011		EASTING 2,676,827		0 HR. 8.3										
TOTAL DEPTH 90.0 ft		DRILL MACHINE CME-550		DRILL METHOD Mud Rotary		HAMMER TYPE 140 lb. Manual										
DATE STARTED 1/17/03		COMPLETED 1/17/03		SURFACE WATER DEPTH N/A												
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION				
		0.5ft	0.5ft	0.5ft	0	20	40	60	80				100			
-63.6													Continued from previous page			
-67.3	78.5	5	7	8									15	78.5	W	Yorktown Fm: Blue-gray, f. sandy, silty, CLAY (A-6) w/ trace shell frags. (continued)
-72.3	83.5	6	6	9									15	83.5	W	
-77.3	88.5	7	8	9									17	88.5	W	
														-78.8		
													Boring Terminated at 90.0 ft (Elev. -78.8 ft MSL) in Yorktown Fm: v. stiff, f. sandy, silty CLAY (A-6) w/ trace shell frags.			
													Bits Used: 2.5" side-discharge finger bit and 4.0" roller cone			
													Drilling Fluid Properties: 8.9 lbs/gal			

NCDOT BORE SINGLE 5435LOGS.GPI NC DOT.GDT 2/25/03



PROJECT NO. 8.2060201		ID. B-3640		COUNTY Gates		GEOLOGIST M. Lear								
SITE DESCRIPTION Bridge #16 over Merchants Millpond on SR 1400 (MACTEC Project No. 30725-2-5435)							GROUND WATER (ft)							
BORING NO. EB2-B		BORING LOCATION 12+17		OFFSET 10ft RT		ALIGNMENT -L-		0 HR. 9.3						
COLLAR ELEV. 11.2 ft		NORTHING 983,993		EASTING 2,676,815				24 HR. FIAD						
TOTAL DEPTH 80.5 ft		DRILL MACHINE CME-550		DRILL METHOD Mud Rotary		HAMMER TYPE 140 lb. Manual								
DATE STARTED 1/28/03		COMPLETED 1/28/03		SURFACE WATER DEPTH N/A										
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION		
		0.5ft	0.5ft	0.5ft	0	20	40	60	80				100	
11.2					Ground Surface									
11.2	0.0	8	9	11								11.2	Roadway Embankment Fill: Gray, tan, and orange, gravelly, clayey, silty, f. SAND (A-2-4)	0.0
7.5	3.7	2	2	2								7.5		
2.4	8.8	3	3	3								3.7	Alluvium: Dk. gray and gray, clayey, silty, f. SAND (A-2-4) w/ roots, trace wood frags., and organic debris	7.5
-2.6	13.8	3	4	3								3.9	Alluvium: Gray-brown, clayey PEAT w/ wood frags.	15.1
-7.6	18.8	2	2	3								9.8	Alluvium: Gray, f. to cse. SAND (A-3)	21.0
-12.8	24.0	4	5	5								15.8	Alluvium: Dk. gray, clayey, silty, f. SAND (A-2-4) w/ trace wood frags. and organic debris	27.0
-17.8	29.0	5	7	8								20.3	Yorktown Fm: Blue-gray, f. sandy, silty, CLAY (A-6) w/ trace shell frags.	31.5
-22.8	34.0	4	5	5										
-27.8	39.0	6	7	8										
-32.8	44.0	6	7	8										
-37.8	49.0	5	7	8										
-42.8	54.0	5	7	8										
-47.8	59.0	5	6	9										
-52.8	64.0	6	8	10										
-57.8	69.0	6	8	9										
-62.8	74.0													

NCDOT BOR. FILE 5435LOGS.GPJ NC DOT.GDT 2/25/03



PROJECT NO. 8.2060201		ID. B-3640		COUNTY Gates		GEOLOGIST M. Lear								
SITE DESCRIPTION Bridge #16 over Merchants Millpond on SR 1400 (MACTEC Project No. 30725-2-5435)							GROUND WATER (ft)							
BORING NO. EB2-B		BORING LOCATION 12+17		OFFSET 10ft RT		ALIGNMENT -L-		0 HR. 9.3						
COLLAR ELEV. 11.2 ft		NORTHING 983,993		EASTING 2,676,815				24 HR. FIAD						
TOTAL DEPTH 80.5 ft		DRILL MACHINE CME-550		DRILL METHOD Mud Rotary		HAMMER TYPE 140 lb. Manual								
DATE STARTED 1/28/03		COMPLETED 1/28/03		SURFACE WATER DEPTH N/A										
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION		
		0.5ft	0.5ft	0.5ft	0	20	40	60	80				100	
-63.6					Continued from previous page									
-67.8	79.0	6	7	8								79.0	Yorktown Fm: Blue-gray, f. sandy, silty, CLAY (A-6) w/ trace shell frags. (continued)	
		6	7	9								80.5	Boring Terminated at 80.5 ft (Elev. -69.3 ft MSL) in Yorktown Fm: v. stiff, f. sandy, silty CLAY (A-6) w/ trace shell frags. Bits Used: 2.5" side-discharge finger bit and 4.0" & 3.0" roller cones Drilling Fluid Properties: 8.8 lbs/gal	80.5

NCDOT BORE SINGLE 5435LOGS.GPJ NC DOT.GDT 2/25/03



PROJECT NO. 8.2060201		ID. B-3640		COUNTY Gates		GEOLOGIST J. Bryson							
SITE DESCRIPTION Bridge #16 over Merchants Millpond on SR 1400 (MACTEC Project No. 30725-2-5435)							GROUND WATER (ft)						
BORING NO. SP-1		BORING LOCATION 10+91		OFFSET 25ft LT		ALIGNMENT -L-		0 HR. 4.0					
COLLAR ELEV. 10.4 ft		NORTHING 984,096		EASTING 2,676,734				24 HR. 5.9					
TOTAL DEPTH 66.4 ft		DRILL MACHINE CME 550		DRILL METHOD Mud Rotary		HAMMER TYPE 140 lb. Manual							
DATE STARTED 1/13/03		COMPLETED 1/14/03		SURFACE WATER DEPTH N/A									
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	
		0.5ft	0.5ft	0.5ft	0	20	40	60	80				100
10.4													Ground Surface
10.4	0.0	2	2	2								D	Roadway Embankment Fill: Tan, silty, f. SAND (A-2-4)
7.9	2.5	2	1	1								W	
5.4	5.0	2	3	2								W	Alluvium: Gray and orange, clayey, silty, f. SAND (A-2-4)
2.5	7.9	2	1	1								Sat	
-0.4	10.0	10	12	15								Sat	Alluvium: Dk. brown PEAT, locally clayey, with wood frags.
-2.0	12.4	1	1	2								Sat	
-4.5	14.9	1	1	1								Sat	
-7.1	17.5	5	10	10								Sat	
-9.6	20.0	20	25	19								Sat	Alluvium: Gray, silty, f. to cse. SAND (A-2-4)
-12.0	22.4	6	3	6								Sat	
-15.1	25.5	5	6	7								Sat	Alluvium: Dk. brown PEAT w/ wood frags. and w/ v. thinly to thinly bedded clay (A-6/A-7-6), locally sandy and organic
-16.7	27.1	6	10	18								Sat	
-19.5	29.9	10	6	7								Sat	Alluvium: Dark gray, silty, f. to cse. SAND (A-2-4) w/ roots
-22.5	32.9	11	12	13								Sat	
-24.7	35.1	2	3	4								W	Yorktown Fm: Blue-gray, f. sandy, silty CLAY (A-6) w/ shells
-29.5	39.9	4	5	8								W	
-34.0	44.4	5	6	7								W	
-39.4	49.8	4	4	7								W	
-44.5	54.9	5	6	7								W	
-49.5	59.9	4	5	7								W	
-54.5	64.9	5	5	7								W	
													Boring Terminated at 66.4 ft (Elev. -56.0 ft MSL) in Yorktown Fm: stiff, sandy, silty CLAY (A-6) w/ shells
													Bits Used: 2.3"/4.0" roller cone
													Drilling Fluid: Water

NCDOT BOR. LE 543SLOGS.GPJ NC DOT.GDT 2/25/03



PROJECT NO. 8.2060201		ID. B-3640		COUNTY Gates		GEOLOGIST M. Lear							
SITE DESCRIPTION Bridge #16 over Merchants Millpond on SR 1400 (MACTEC Project No. 30725-2-5435)							GROUND WATER (ft)						
BORING NO. SP-2		BORING LOCATION 11+29		OFFSET 50ft LT		ALIGNMENT -L-		0 HR. Water					
COLLAR ELEV. -0.9 ft		NORTHING 984,093		EASTING 2,676,780				24 HR. Boring					
TOTAL DEPTH 55.7 ft		DRILL MACHINE CME-45 on Barge		DRILL METHOD Mud Rotary		HAMMER TYPE 140 lb. Manual							
DATE STARTED 1/8/03		COMPLETED 1/8/03		SURFACE WATER DEPTH 7.0 ft									
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	
		0.5ft	0.5ft	0.5ft	0	20	40	60	80				100
-0.9	0.0	WOR	WOR	2									Mudline
-5.3	4.4	1	1	1								Sat	Alluvium: Gray and black, f. sandy, silty, mod. organic CLAY (A-6) w/ wood frags
												Sat	SS-9 Organic content=13.8%
-10.3	9.4	5	6	7								Sat	Alluvium: Whitish gray, f. to cse. SAND (A-3) w/ wood frags.
-15.1	14.2	6	6	7								Sat	Alluvium: Dk. brown PEAT w/ v. thinly to thinly bedded, mod. organic clay (A-6). Clay = 10-25%
-20.1	19.2	5	6	9								Sat	
-25.1	24.2	3	4	9								Sat	SS-10 Organic content=50.8%
-30.1	29.2	5	6	9								Sat	Alluvium: Dk. brown and dk. gray, clayey, silty, mod. organic, f. SAND (A-2-4)
-35.1	34.2	6	7	9								Sat	
-40.1	39.2	7	7	8								W	Yorktown: Blue-gray, f. sandy, silty CLAY (A-7-6) w/ trace shell frags.
-45.1	44.2	5	7	8								W	
-50.1	49.2	6	8	8								W	
-55.1	54.2	6	7	10								W	
													Boring Terminated at 55.7 ft (Elev. -56.6 ft MSL) in Yorktown Fm: v. stiff, f. sandy, silty CLAY (A-6) w/ trace shell frags.
													Bits Used: 3" roller cone
													Drilling Fluid Properties: 8.7 lbs/gal

NCDOT BORE SINGLE 543SLOGS.GPJ NC DOT.GDT 2/25/03



PROJECT NO. 8.2060201		ID. B-3640		COUNTY Gates		GEOLOGIST M. Lear									
SITE DESCRIPTION Bridge #16 over Merchants Millpond on SR 1400 (MACTEC Project No. 30725-2-5435)							GROUND WATER (ft)								
BORING NO. SP-5		BORING LOCATION 11+40		OFFSET 50ft LT		ALIGNMENT -L-		0 HR. Water							
COLLAR ELEV. 0.1 ft		NORTHING 984,087		EASTING 2,676,788				24 HR. Boring							
TOTAL DEPTH 32.0 ft		DRILL MACHINE CME-45 on Barge		DRILL METHOD Rotary Wash		HAMMER TYPE 140 lb. Manual									
DATE STARTED 1/13/03		COMPLETED 1/13/03		SURFACE WATER DEPTH 5.9 ft											
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION			
		0.5ft	0.5ft	0.5ft	0	20	40	60	80				100		
0.1	0.0	WOH	WOH	WOH									0.0		
-2.7	2.8	WOH	WOH	WOH									0.1	Alluvium: Gray, silty, mod. organic CLAY (A-6)	
-5.4	5.5	WOH	WOH	WOH									-7.4	Alluvium: Gray, f. SAND (A-3) w/ wood frags.	7.9
-7.9	8.0	WOH	WOH	1									-12.4	Alluvium: Dk. brown, mod. organic, f. to cse. SAND (A-3)	12.5
-10.4	10.5	10	10	13									-13.4	Alluvium: Dk. brown PEAT, locally clayey, w/ wood frags.	13.5
-12.9	13.0	9	8	9									-22.4	Alluvium: Dk. brownish gray, clayey, silty, mod. organic, f. SAND (A-2-4)	22.5
-15.4	15.5	7	10	11									-24.9	Alluvium: Gray, f. to cse. SAND (A-3) w/ wood frags.	25.0
-17.9	18.0	5	5	6									-26.2	Yorktown Fm: Blue-gray, f. sandy, silty CLAY (A-6) w/ trace shell frags.	26.3
-20.4	20.5	4	5	5									-31.9		32.0
-22.9	23.0	7	6	6											
-25.7	25.8	6	5	6											
-30.4	30.5	6	7	9											

NCDOT BOR LE 5435LOGS.GPJ NC_DOT.GDT 2/23/03



PROJECT NO. 8.2060201		ID. B-3640		COUNTY Gates		GEOLOGIST M. Lear									
SITE DESCRIPTION Bridge #16 over Merchants Millpond on SR 1400 (MACTEC Project No. 30725-2-5435)							GROUND WATER (ft)								
BORING NO. SP-6		BORING LOCATION 11+50		OFFSET 50ft LT		ALIGNMENT -L-		0 HR. Water							
COLLAR ELEV. 1.4 ft		NORTHING 984,081		EASTING 2,676,796				24 HR. Boring							
TOTAL DEPTH 34.0 ft		DRILL MACHINE CME-45 on Barge		DRILL METHOD Rotary Wash		HAMMER TYPE 140 lb. Manual									
DATE STARTED 1/14/03		COMPLETED 1/14/03		SURFACE WATER DEPTH 4.6 ft											
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION			
		0.5ft	0.5ft	0.5ft	0	20	40	60	80				100		
1.4	0.0	WOH	WOH	WOH									0.0		
-1.1	2.5	1	1	1									1.4	Alluvium: Gray and brownish gray, clayey, silty, f. SAND (A-2-4) w/ organic debris and wood frags.	
-3.6	5.0	2	2	4									-7.4	Alluvium: Gray, f. SAND (A-3) w/ wood frags.	7.9
-6.1	7.5	1	1	1									-12.4	Alluvium: Dk. brown, mod. organic, f. to cse. SAND (A-3)	12.5
-8.6	10.0	8	8	8									-13.4	Alluvium: Dk. brown PEAT, locally clayey, w/ wood frags.	13.5
-11.1	12.5	6	8	9									-22.4	Alluvium: Dk. brownish gray, clayey, silty, mod. organic, f. SAND (A-2-4)	22.5
-13.6	15.0	5	6	7									-24.9	Alluvium: Gray, f. to cse. SAND (A-3) w/ wood frags.	25.0
-16.1	17.5	3	3	4									-26.2	Yorktown Fm: Blue-gray, f. sandy, silty CLAY (A-6) w/ trace shell frags.	26.3
-18.6	20.0	6	6	7									-31.9		32.0
-21.1	22.5	6	6	7											
-23.6	25.0	7	8	7											
-26.1	27.5	6	8	10											
-31.1	32.5	7	8	9											

NCDOT BORE SINGLE 5435LOGS.GPJ NC_DOT.GDT 2/23/03



PROJECT NO. 8.2060201		ID. B-3640		COUNTY Gates		GEOLOGIST M. Lear							
SITE DESCRIPTION Bridge #16 over Merchants Millpond on SR 1400 (MACTEC Project No. 30725-2-5435)							GROUND WATER (ft)						
BORING NO. SP-9		BORING LOCATION 11+29		OFFSET 40ft LT		ALIGNMENT -L-							
COLLAR ELEV. -1.0 ft		NORTHING 984,085		EASTING 2,676,774		0 HR. Water							
TOTAL DEPTH 31.0 ft		DRILL MACHINE CME-45 on Barge		DRILL METHOD Rotary Wash		HAMMER TYPE 140 lb. Manual							
DATE STARTED 1/15/03		COMPLETED 1/15/03		SURFACE WATER DEPTH 6.9 ft									
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	
		0.5ft	0.5ft	0.5ft	0	20	40	60	80				100
-1.0	0.0	WOH	WOH	WOH	Mudline								
-5.4	4.4	WOH	1	1							Sat.	Alluvium: Black and dk. gray, mod. organic CLAY (A-6) w/ wood frags.	
-8.0	7.0	10	10	9							Sat.	Alluvium: Gray, f. to cse. SAND (A-3) w/ trace wood frags.	
-10.5	9.5	7	7	8							Sat.	Alluvium: Dk. brown PEAT w/ wood frags., locally clayey	
-13.0	12.0	7	6	7							W		
-15.5	14.5	3	3	4							W		
-18.0	17.0	3	3	4							W		
-20.5	19.5	3	4	5							W		
-23.0	22.0	4	5	11							W	Alluvium: Brown, clayey, silty, mod. organic, f. to cse. SAND (A-2-4)	
-25.5	24.5	3	3	5							M	Yorktown Fm: Blue-gray, f. sandy, silty CLAY (A-6) w/ trace shell frags.	
-30.5	29.5	6	6	8							M		
												Boring Terminated at 31.0 ft (Elev. -32.0 ft MSL) in Yorktown Fm: stiff, f. sandy, silty CLAY (A-6) w/ trace shell frags.	
												Bits Used: 3" roller cone	
												Drilling Fluid: Water	

NCDOT BORE SINGLE 3435LOGS.GPJ NC DOT.GDT 2/25/03



PROJECT NO. 8.2060201		ID. B-3640		COUNTY Gates		GEOLOGIST J. Bryson							
SITE DESCRIPTION Bridge #16 over Merchants Millpond on SR 1400 (MACTEC Project No. 30725-2-5435)						GROUND WATER (ft)							
BORING NO. WB-3		BORING LOCATION 10+27		OFFSET 16R LT		ALIGNMENT -L-							
COLLAR ELEV. 11.1 ft		NORTHING 984,127		EASTING 2,676,678		0 HR. 5.8							
TOTAL DEPTH 40.1 ft		DRILL MACHINE CME-550		DRILL METHOD Mud Rotary		HAMMER TYPE 140 lb. Manual							
DATE STARTED 1/14/03		COMPLETED 1/14/03		SURFACE WATER DEPTH N/A									
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	
		0.5ft	0.5ft	0.5ft	0	20	40	60	80				100
11.1													Ground Surface
11.1	0.0	8	7	4									11.1 Roadway Embankment Fill: Gray and tan, clayey, silty, f. to cse. SAND (A-2-4) w/ rock frags in top 0.2'
7.8	3.3	2	1	1									5.1 Alluvium: Gray CLAY (A-6)
2.8	8.3	4	2	2									2.6 Alluvium: Gray, silty, f. to cse. SAND (A-2-4)
-2.2	13.3	7	7	7									Sat. Alluvium: Gray, silty, f. to cse. SAND (A-2-4)
-7.4	18.5	8	7	7									Sat. Alluvium: Gray, silty, f. to cse. SAND (A-2-4)
-12.2	23.3	5	6	9									-11.4 Alluvium: Gray, silty, f. to cse. SAND (A-1-b) -12.5 Alluvium: Dk. brown PEAT w/ v. thinly bedded cse. sandy CLAY (A-6), a v. thin bed of rounded quartz gravel, and wood frags.
-17.2	28.3	6	6	6									Sat. Alluvium: Lt. gray, silty, f. SAND (A-2-4)
-22.2	33.3	11	11	10									-20.9 Alluvium: Lt. gray, silty, f. SAND (A-2-4)
-27.5	38.6	4	4	5									-24.9 Yorktown Fm: Blue-gray, f. sandy, silty, CLAY (A-6)
													-29.0 Boring Terminated at 40.1 ft (Elev. -29.0 ft MSL) in Yorktown Fm: stiff, f. sandy, silty CLAY (A-6) Bits Used: 2.3"/4.0" roller cone Drilling Fluid Properties: 9.5 lbs/gal

NCDOT BORING LOG FILE 5435LOGS.GPJ NC DOT.GDT 2/27/03



PROJECT NO. 8.2060201		ID. B-3640		COUNTY Gates		GEOLOGIST M. Lear							
SITE DESCRIPTION Bridge #16 over Merchants Millpond on SR 1400 (MACTEC Project No. 30725-2-5435)						GROUND WATER (ft)							
BORING NO. WB-4		BORING LOCATION 12+53		OFFSET 37ft LT		ALIGNMENT -L-							
COLLAR ELEV. 2.7 ft		NORTHING 984,009		EASTING 2,676,871		0 HR. Water							
TOTAL DEPTH 24.5 ft		DRILL MACHINE CME-45 on Barge		DRILL METHOD Rotary Wash		HAMMER TYPE 140 lb. Manual							
DATE STARTED 1/9/03		COMPLETED 1/9/03		SURFACE WATER DEPTH 3.4 ft									
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	
		0.5ft	0.5ft	0.5ft	0	20	40	60	80				100
2.7													Mudline
2.7	0.0	WOH	WOH	WOH									2.7 Alluvium: Brown, f. sandy, mod. organic CLAY (A-6) w/ wood frags. Organic content=15.7%
-0.3	3.0	WOH	WOH	2									Sat. Alluvium: Dk. gray and gray, f. to cse. SAND (A-3) w/ wood frags and trace organic debris
-5.3	8.0	8	8	4									Sat. Alluvium: Dk. gray and gray, f. to cse. SAND (A-3) w/ wood frags and trace organic debris
-10.3	13.0	4	6	9									Sat. Alluvium: Dk. gray and gray, f. to cse. SAND (A-3) w/ wood frags and trace organic debris
-15.3	18.0	4	7	6									SS-5 Sat. Alluvium: Dk. gray and gray, f. to cse. SAND (A-3) w/ wood frags and trace organic debris
-20.3	23.0	5	6	7									-18.3 Yorktown Fm: Blue-gray, f. sandy, silty, CLAY (A-6) w/ trace shell frags.
													-21.8 Boring Terminated at 24.5 ft (Elev. -21.8 ft MSL) in Yorktown Fm: stiff, f. sandy, silty CLAY (A-6) w/ trace to little shell frags. Bits Used: 3" roller cone Drilling Fluid: Water

NCDOT BORE SINGLE LOG FILE 5435LOGS.GPJ NC DOT.GDT 2/25/03

GEOTECHNICAL UNIT FIELD SCOUR REPORT

PROJECT: 8.2060201 ID: B-3640 COUNTY: Gates

DESCRIPTION(1): Bridge 16 over Merchants Mill Pond on SR 1400

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

COUNTY BRIDGE NO. 16 BRIDGE LENGTH 110' NO. BENTS IN: CHANNEL 7 FLOOD PLAIN 0

FOUNDATION TYPE: Driven Wooden Piles

EVIDENCE OF SCOUR(2):

ABUTMENTS OR END BENT SLOPES: ~250 ft² area scoured out at End Bent 1 w/ undermining and sloughing

INTERIOR BENTS: Minor scour around piles

CHANNEL BED: Possible scour and undermining immediately downstream of spillway

CHANNEL BANKS: Minor scouring and sloughing due to fluctuations in water surface elevation

EXISTING SCOUR PROTECTION:

TYPE(3): Rip Rap, Wooden Wing Walls, Asphalt cover

EXTENT(4): End Bent 1 slope covered w/ Rip Rap, Wing Walls at End Bents 1 and 2, Asphalt cover at End Bent 2

EFFECTIVENESS(5): Rip Rap effective at End Bent 1, Wing Wall at End Bent 1 and Asphalt at End Bent 2 not effective

OBSTRUCTIONS(6) (DAMS, DEBRIS, ETC.): Wooden spillway upstream of bridge, wood/bridge debris at interior bents

DESIGN INFORMATION

CHANNEL BED MATERIAL(7) (SAMPLE RESULTS ATTACHED): Alluvium: Mod. Organic CLAY (A-6), silty f. SAND (A-2-4) and f. to cse. SAND (A-3)

CHANNEL BANK MATERIAL(8) (SAMPLE RESULTS ATTACHED): Alluvium: CLAY (A-6) and silty f. SAND (A-2-4)

FOUNDATION BEARING MATERIAL(9): Yorktown Fm: f. sandy, silty CLAY (A-6/A-7-6) w/ shell frags.

CHANNEL BANK COVER(10): Small to large trees, minor underbrush of bushes and briars

FLOOD PLAIN WIDTH(11): >700 ft

FLOOD PLAIN COVER(12): Small to large trees, thin to thick underbrush of bushes, briars, and vines

DESIGN INFORMATION CONT.

STREAM IS X DEGRADING X AGGRADING (13)

OTHER OBSERVATIONS AND COMMENTS: Stream is aggrading upstream of spillway and degrading downstream of spillway. If the spillway is removed degrading conditions would be present across the site.

CHANNEL MIGRATION TENDENCY (14): None-confined by bridge and spillway location.

REPORTED BY: Michael B. [Signature] DATE: 2/17/2003 MACTEC Engineering & Consulting, Inc.

GEOTECHNICALLY ADJUSTED SCOUR ELEVATION (15):

A Bridge Survey and Hydraulic Design Report was not available at the time of investigation. Therefore, G.A.S.E. was not calculated.

REPORTED BY: [Signature] DATE: 4/28/03 NCBOT GEOTECHNICAL UNIT

INSTRUCTIONS

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

PROJECT #: 8.2060201 (B-3640)

COUNTY: Gates

DESCRIPTION: Bridge 16 over Merchants Mill Pond on SR 1400

SAMPLE #	CHANNEL BED MATERIAL			CHANNEL BANK MATERIAL		
	SS-18	SS-19	SS-20	SS-2	SS-7	
RETAINED #4	0.0	0.0	0.5	0.0	0.0	
PASSING #10	100.0	100.0	96.7	100.0	100.0	
PASSING #40	98.9	99.9	66.9	99.4	99.7	
PASSING #200	49.6	20.3	2.0	71.5	22.9	
COARSE SAND	2.7	2.3	74.4	2.9	3.6	
FINE SAND	54.4	83.1	23.9	30.0	80.0	
SILT	11.3	5.6	0.9	23.2	10.4	
CLAY	31.6	9.0	0.9	43.9	6.0	
LL	30	21	23	36	19	
PL	11	NP	NP	19	NP	
AASHTO CLASSIFICATION	A-6 (3)	A-2-4 (0)	A-3	A-6 (12)	A-2-4 (0)	
STATION	11+32	11+32	11+32	9+79	14+26	
OFFSET	5 ft RT	5 ft RT	5 ft RT	13 ft LT	21 ft LT	
DEPTH (ft)	5.3-6.8	10.3-11.8	15.3-16.8	8.8-9.3	8.5-10.0	



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 AND NUMBER: Bridge 16 over Merchants Mill Pond on SR 1400 (30725-2-5435)

PROJECT: 8.2060201 (B-3640) COUNTY: Gates OWNER: N.C.D.O.T.
DATE SAMPLED: January 2003 RECEIVED: 1/24/03 REPORTED: 2/5/2003
SAMPLED FROM: WB-1, WB-2, WB-3, WB-4, WB-8 BY: MACTEC ENGINEERING
SUBMITTED BY: MACTEC ENGINEERING & CONSULTING, INC.

1992 STANDARD SPECIFICATIONS

TEST RESULTS

Lab Sample No.		SS-1	SS-2	SS-3	SS-4	SS-5	SS-6
Retained 4.75 mm Sieve (%)		16.0	0.0	0.0	ND	0.0	0.3
Passing 2.00 mm Sieve (%)		73.0	100.0	84.6	ND	99.2	99.4
Passing 425 µm Sieve (%)		63.6	99.4	25.8	ND	76.4	97.7
Passing 75 µm Sieve (%)		27.9	71.5	2.5	ND	2.8	23.7

MINUS 2.00mm FRACTION

SOIL MORTAR - 100%							
Coarse Sand Ret - 250 µm (%)		17.5	2.9	83.0	ND	52.4	6.4
Fine Sand Ret - 53 µm (%)		50.1	30.0	14.7	ND	45.7	75.2
Silt 0.05 - 0.005 mm (%)		7.7	23.2	1.2	ND	1.0	11.5
Clay < 0.005 mm (%)		24.7	43.9	1.2	ND	1.0	6.9
		100.0	100.0	100.0	0.0	100.0	100.0

Moisture Content (%)		ND	31.3	ND	ND	ND	ND
Liquid Limit, L.L.		26	36	NP	ND	22	19
Plasticity Index, P.I.		8	19	NP	ND	NP	NP
AASHTO Classification		A-2-4(0)	A-6 (12)	A-1-b	ND	A-3	A-2-4(0)
Organic Content (%)		ND	ND	ND	15.7	ND	ND

Boring No.		WB-1	WB-2	WB-3	WB-4	WB-4	WB-8
Station		9+27	9+79	10+27	12+53	12+53	14+26
Offset		13 ft LT	13 ft LT	16 ft LT	37 ft LT	37 ft LT	21 ft LT
Alignment		-L-	-L-	-L-	-L-	-L-	-L-
Depth (ft)	From	3.4	8.8	23.3	0.0	18.0	3.6
	to	4.9	10.3	23.6	1.5	19.5	5.1

REMARKS: ND=NOT DETERMINED, NP=NON-PLASTIC



MACTEC ENGINEERING AND CONSULTING, INC.
3301 ATLANTIC AVENUE
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N.C.D.O.T./AASHTO CLASSIFICATIONS

REPORT ON SAMPLES OF: SOILS FOR QUALITY

MACTEC PROJECT NAME AND NUMBER: Bridge 16 over Merchants Mill Pond on SR 1400 (30725-2-5435)

PROJECT: 8.2060201 (B-3640) COUNTY: Gates OWNER: N.C.D.O.T.
DATE SAMPLED: January 2003 RECEIVED: 1/24/03 REPORTED: 2/5/2003
SAMPLED FROM: WB-8, SP-2 BY: MACTEC ENGINEERING
SUBMITTED BY: MACTEC ENGINEERING & CONSULTING, INC.

1992 STANDARD SPECIFICATIONS

TEST RESULTS

Lab Sample No.		SS-7	SS-8	SS-9	SS-10	SS-11	SS-12
Retained 4.75 mm Sieve (%)		0.0	1.0	ND	ND	0.0	3.9
Passing 2.00 mm Sieve (%)		100.0	96.5	ND	ND	100.0	89.2
Passing 425 µm Sieve (%)		99.7	56.4	ND	ND	99.0	85.1
Passing 75 µm Sieve (%)		22.9	9.8	ND	ND	77.8	49.7

MINUS 2.00mm FRACTION

SOIL MORTAR - 100%							
Coarse Sand Ret - 250 µm (%)		3.6	67.4	ND	ND	1.3	4.8
Fine Sand Ret - 53 µm (%)		80.0	24.1	ND	ND	33.5	49.4
Silt 0.05 - 0.005 mm (%)		10.4	2.5	ND	ND	31.4	19.6
Clay < 0.005 mm (%)		6.0	6.0	ND	ND	33.8	26.1
		100.0	100.0				

Moisture Content (%)		ND	ND	ND	ND	40.7	36.0
Liquid Limit, L.L.		19	18	ND	ND	47	37
Plasticity Index, P.I.		NP	NP	ND	ND	26	14
AASHTO Classification		A-2-4(0)	A-3	ND	ND	A-7-6(20)	A-6(4)
Organic Content (%)		ND	ND	13.8	50.8	ND	ND

Boring No.		WB-8	WB-8	SP-2	SP-2	SP-2	SP-2
Station		14+26	14+26	11+29	11+29	11+29	11+29
Offset		21 ft LT	21 ft LT	50 ft LT	50 ft LT	50 ft LT	50 ft LT
Alignment		-L-	-L-	-L-	-L-	-L-	-L-
Depth (ft)	From	8.5	53.9	0.0	19.2	29.2	44.2
	to	10.0	55.4	1.5	20.7	30.7	45.7

REMARKS: ND=NOT DETERMINED, NP=NON-PLASTIC



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 AND NUMBER: Bridge 16 over Merchants Mill Pond on SR 1400 (30725-2-5435)

PROJECT: 8.2060201 (B-3640)

COUNTY: Gates

OWNER: N.C.D.O.T.

DATE SAMPLED: January 2003

RECEIVED: 1/24/03

REPORTED: 2/5/2003

SAMPLED FROM: EB1-A, EB1-B, B1-B

BY: MACTEC ENGINEERING

SUBMITTED BY: MACTEC ENGINEERING & CONSULTING, INC.

1992 STANDARD SPECIFICATIONS

TEST RESULTS

Lab Sample No.	SS-13	SS-14	SS-15	SS-16	SS-17	SS-18
Retained 4.75 mm Sieve (%)	53.3	0.0	ND	0.0	0.2	0.0
Passing 2.00 mm Sieve (%)	37.4	99.9	ND	100.0	99.1	100.0
Passing 425 µm Sieve (%)	25.1	98.9	ND	99.8	98.5	98.9
Passing 75 µm Sieve (%)	12.4	93.8	ND	16.5	76.8	49.6

MINUS 2.00mm FRACTION

SOIL MORTAR - 100%						
Coarse Sand Ret - 250 µm (%)	44.4	1.4	ND	8.7	0.7	2.7
Fine Sand Ret - 53 µm (%)	26.7	10.7	ND	79.5	39.2	54.4
Silt 0.05 - 0.005 mm (%)	10.2	41.8	ND	3.3	32.8	11.3
Clay < 0.005 mm (%)	18.7	46.0	ND	8.5	27.3	31.6
	100.0	100.0		100.0	100.0	100.0

Moisture Content (%)	ND	47.5	ND	ND	37.7	32.3
Liquid Limit, L.L.	NP	63	ND	21	41	30
Plasticity Index, P.I.	NP	37	ND	NP	17	11
AASHTO Classification	A-1-a	A-7-6(40)	ND	A-2-4(0)	A-7-6(13)	A-6(3)
Organic Content (%)	ND	ND	43.3	ND	ND	ND

Boring No.	EB1-A	EB1-A	EB1-A	EB1-B	EB1-B	B1-B
Station	10+80	10+80	10+80	10+79	10+79	11+32
Offset	14 ft LT	14 ft LT	14 ft LT	14 ft RT	14 ft RT	5 ft RT
Alignment	-L-	-L-	-L-	-L-	-L-	-L-
Depth (ft) From	0.0	83.0	23.2	28.3	63.3	5.3
to	1.5	84.5	24.7	29.8	64.8	6.8

REMARKS: ND=NOT DETERMINED, NP=NON-PLASTIC



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 AND NUMBER: Bridge 16 over Merchants Mill Pond on SR 1400 (30725-2-5435)

PROJECT: 8.2060201 (B-3640)

COUNTY: Gates

OWNER: N.C.D.O.T.

DATE SAMPLED: January 2003

RECEIVED: 1/24/03

REPORTED: 2/5/2003

SAMPLED FROM: B1-B

BY: MACTEC ENGINEERING

SUBMITTED BY: MACTEC ENGINEERING & CONSULTING, INC.

1992 STANDARD SPECIFICATIONS

TEST RESULTS

Lab Sample No.	SS-19	SS-20			
Retained 4.75 mm Sieve (%)	0.0	0.5			
Passing 2.00 mm Sieve (%)	100.0	96.7			
Passing 425 µm Sieve (%)	99.9	66.9			
Passing 75 µm Sieve (%)	20.3	2.0			

MINUS 2.00mm FRACTION

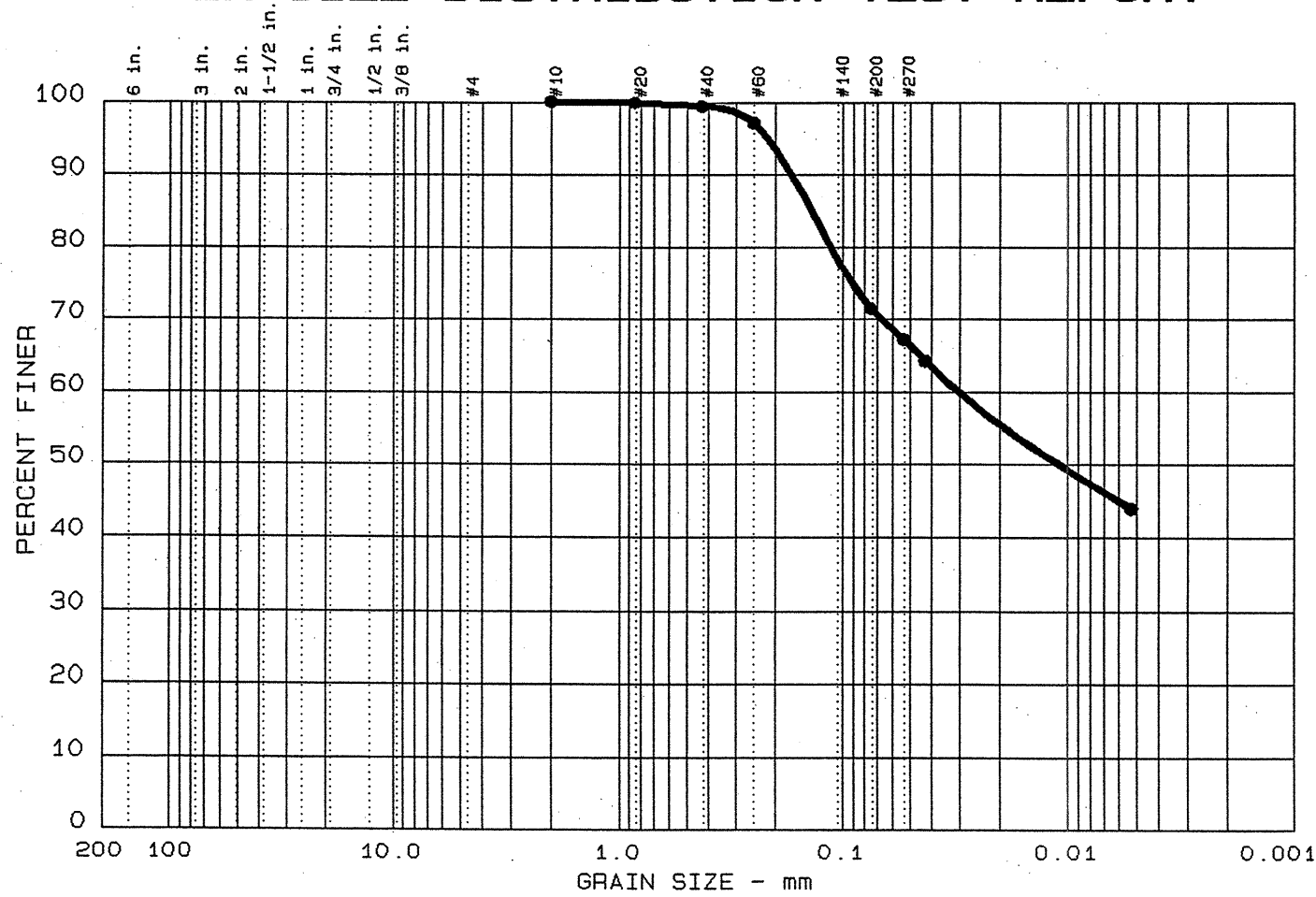
SOIL MORTAR - 100%						
Coarse Sand Ret - 250 µm (%)	2.3	74.4				
Fine Sand Ret - 53 µm (%)	83.1	23.9				
Silt 0.05 - 0.005 mm (%)	5.6	0.9				
Clay < 0.005 mm (%)	9.0	0.9				
	100.0	100.0				

Moisture Content (%)	ND	ND				
Liquid Limit, L.L.	21	23				
Plasticity Index, P.I.	NP	NP				
AASHTO Classification	A-2-4(0)	A-3				
Organic Content (%)	ND	ND				

Boring No.	B1-B	B1-B			
Station	11+32	11+32			
Offset	5 ft RT	5 ft RT			
Alignment	-L-	-L-			
Depth (ft) From	10.3	15.3			
to	11.8	16.8			

REMARKS: ND=NOT DETERMINED, NP=NON-PLASTIC

GRAIN SIZE DISTRIBUTION TEST REPORT



%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	32.9	67.1	

LL	PI	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
36	19	0.14	0.03	0.01					

MATERIAL DESCRIPTION	USCS	AASHTO
● SS-2	ND	A-6 (12)

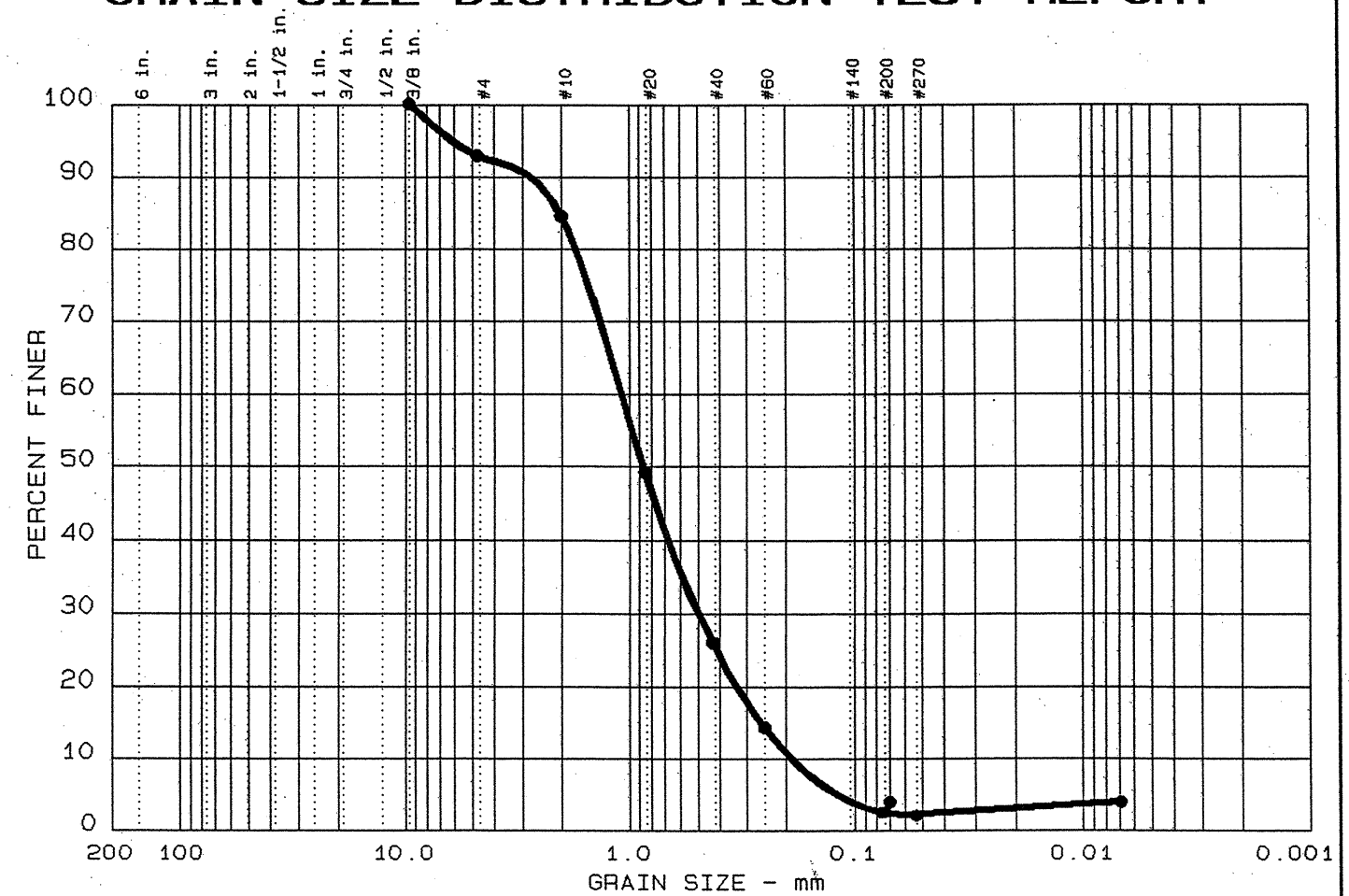
Project No.: 30725-2-5435
 Project: BRIDGE 16 OVER MERCHANTS MILLPOND
 ● Location: WB-2 8.8-9.3'
 Date: 2-5-03

Remarks:
 ND=NOT DETERMINED.
 SPECIFIC GRAVITY
 IS ASSUMED

GRAIN SIZE DISTRIBUTION TEST REPORT
MACTEC ENGINEERING

Figure No. 2

GRAIN SIZE DISTRIBUTION TEST REPORT



%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
0.0	15.4	82.6	2.0	

LL	PI	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
NP	NP	2.02	1.08	0.87	0.493	0.2559	0.1875	1.20	5.8

MATERIAL DESCRIPTION	USCS	AASHTO
● SS-3	ND	A-1-b

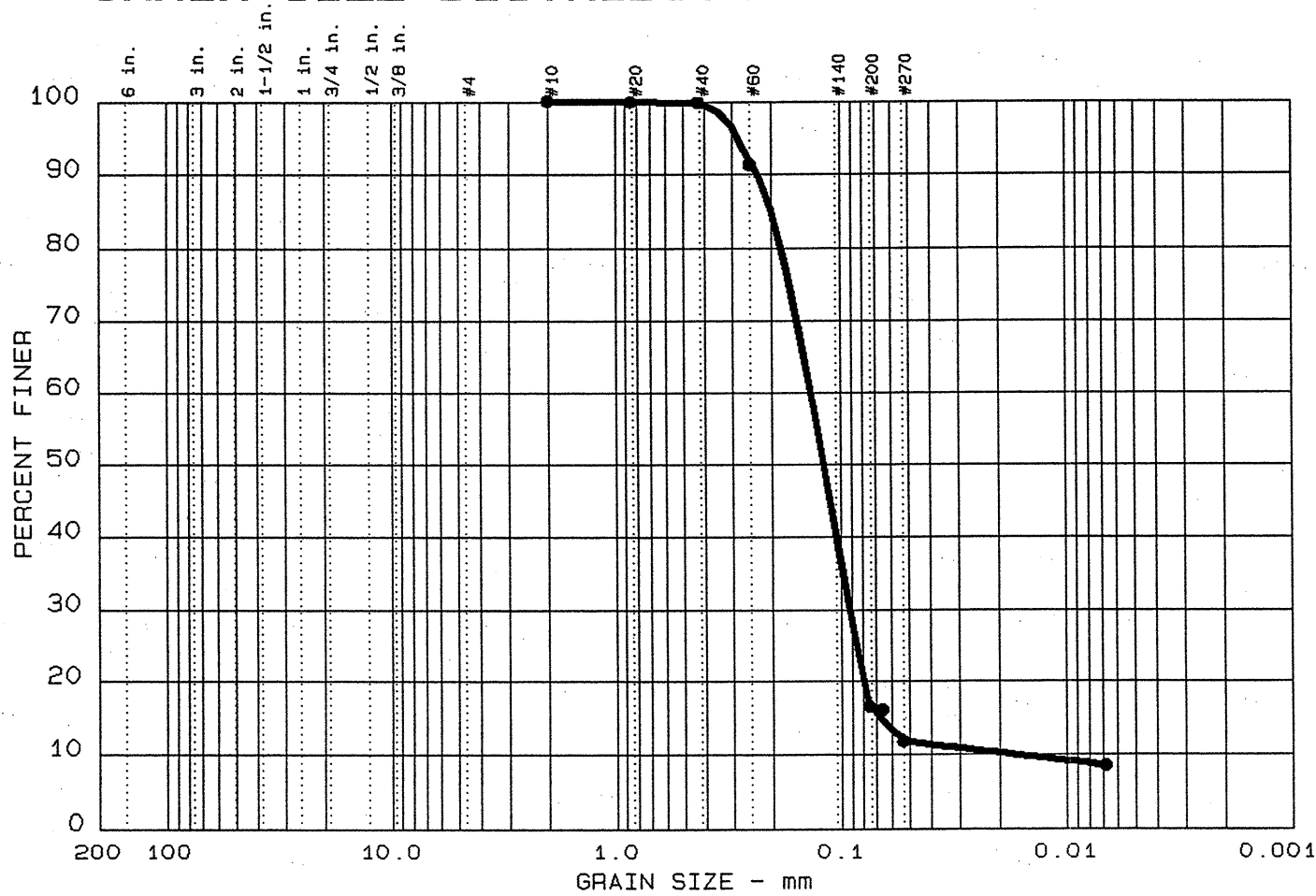
Project No.: 30725-2-5435
 Project: BRIDGE 16 OVER MERCHANTS MILLPOND
 ● Location: WB-3 23.3-23.6'
 Date: 2-5-03

Remarks:
 ND=NOT DETERMINED.
 SPECIFIC GRAVITY
 IS ASSUMED

GRAIN SIZE DISTRIBUTION TEST REPORT
MACTEC ENGINEERING

Figure No. 3

GRAIN SIZE DISTRIBUTION TEST REPORT



%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	88.2	11.8	

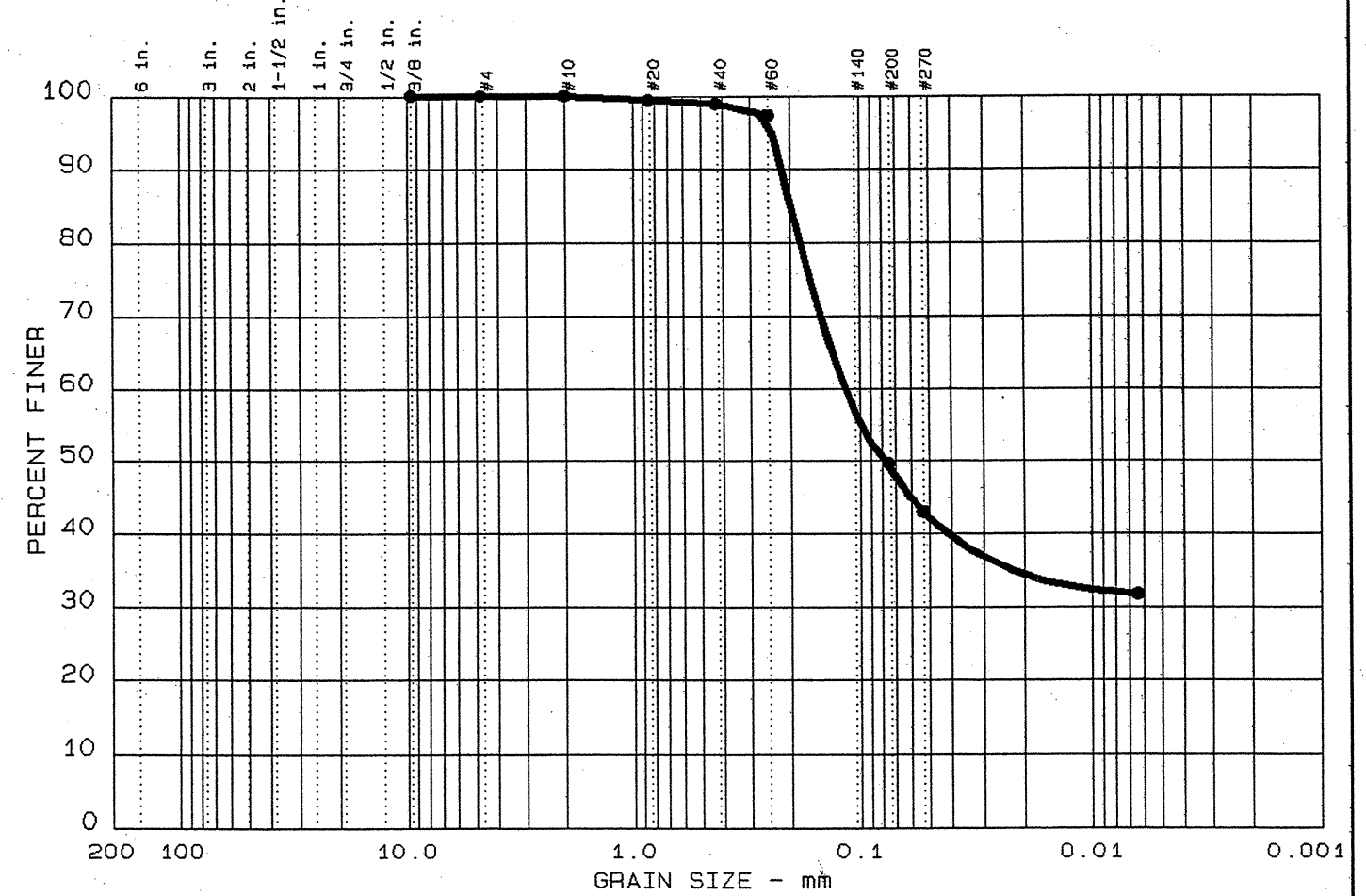
LL	PI	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
21	NP	0.20	0.13	0.12	0.092	0.0664	0.0167	3.74	8.1

MATERIAL DESCRIPTION	USCS	AASHTO
● SS-16	ND	A-2-4 (0)

Project No.: 30725-2-5435
 Project: BRIDGE 16 OVER MERCHANTS MILLPOND
 ● Location: EB1-B 28.3-29.8'
 Date: 2-5-03

Remarks:
 ND=NOT DETERMINED.
 SPECIFIC GRAVITY
 IS ASSUMED

GRAIN SIZE DISTRIBUTION TEST REPORT



%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	57.0	43.0	

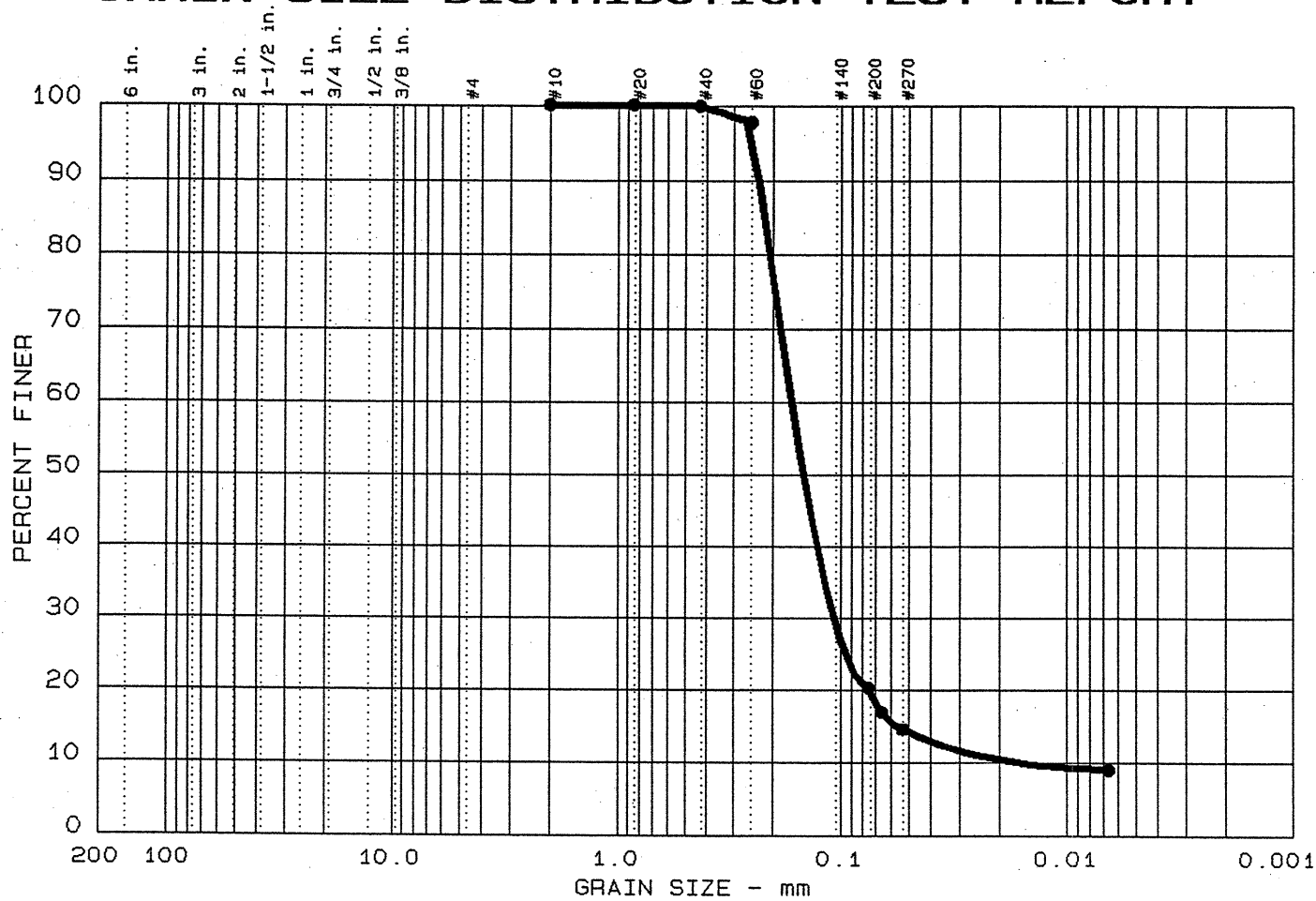
LL	PI	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
30	11	0.20	0.12	0.08					

MATERIAL DESCRIPTION	USCS	AASHTO
● SS-18	ND	A-6 (3)

Project No.: 30725-2-5435
 Project: BRIDGE 16 OVER MERCHANTS MILLPOND
 ● Location: B1-B 5.3-6.8'
 Date: 2-5-03

Remarks:
 ND=NOT DETERMINED.
 SPECIFIC GRAVITY
 IS ASSUMED

GRAIN SIZE DISTRIBUTION TEST REPORT



%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	85.4	14.6	

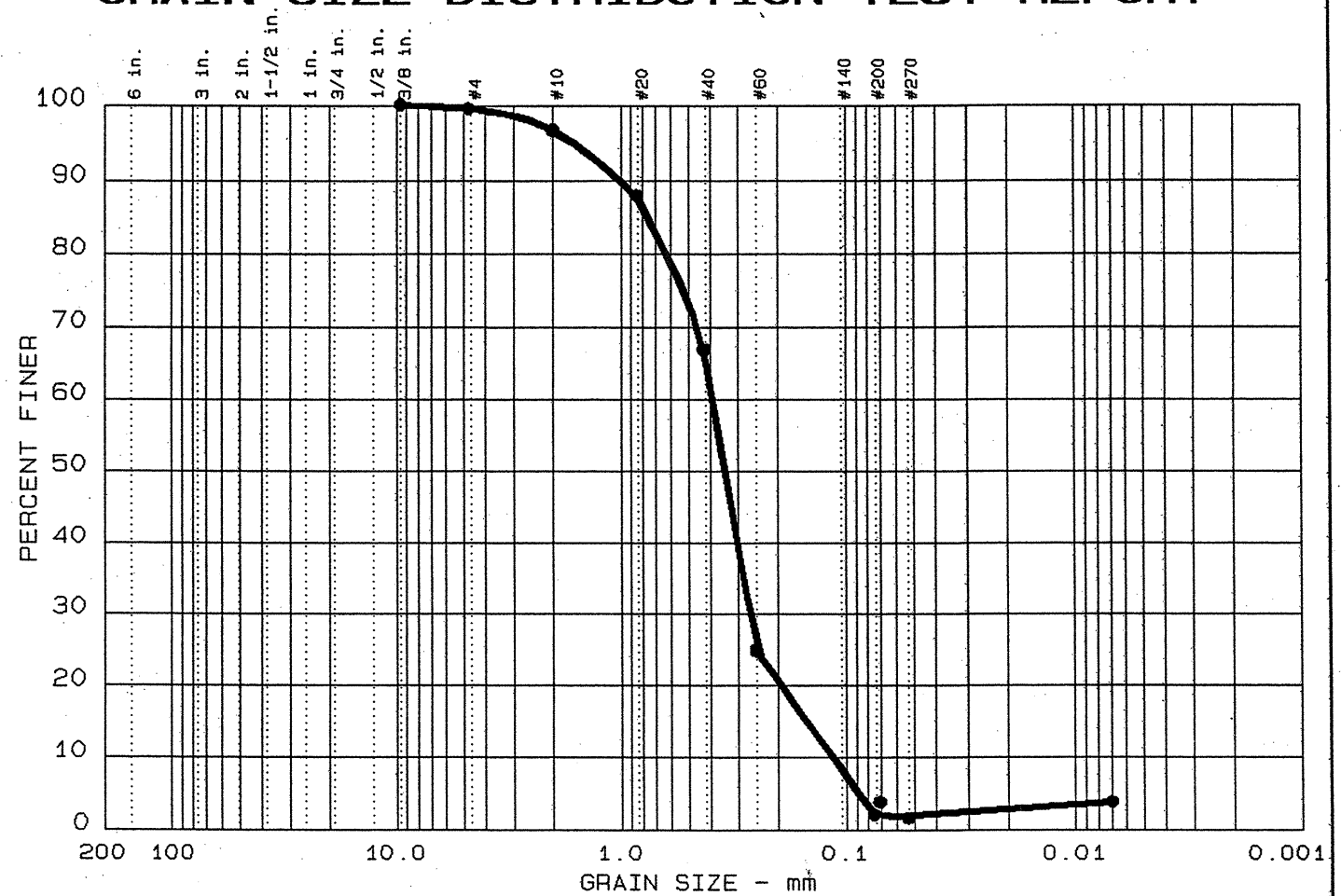
LL	PI	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
21	NP	0.22	0.17	0.15	0.107	0.0557	0.0148	4.69	11.2

MATERIAL DESCRIPTION	USCS	AASHTO
● SS-19	ND	A-2-4 (0)

Project No.: 30725-2-5435
 Project: BRIDGE 16 OVER MERCHANTS MILLPOND
 ● Location: B1-B 10.3-11.8'
 Date: 2-5-03

Remarks:
 ND=NOT DETERMINED.
 SPECIFIC GRAVITY
 IS ASSUMED

GRAIN SIZE DISTRIBUTION TEST REPORT



%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
0.0	3.3	95.1	1.6	

LL	PI	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
23	NP	0.76	0.39	0.34	0.267	0.1483	0.1138	1.61	3.4

MATERIAL DESCRIPTION	USCS	AASHTO
● SS-20	ND	A-3

Project No.: 30725-2-5435
 Project: BRIDGE 16 OVER MERCHANTS MILLPOND
 ● Location: B1-B 15.3-16.8'
 Date: 2-5-03

Remarks:
 ND=NOT DETERMINED.
 SPECIFIC GRAVITY
 IS ASSUMED