

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34488.1.1 (B-4090)	1	17

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

STRUCTURE
SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 34488.1.1 (B-4090) F.A. PROJ. BRSTP-0024(17)
COUNTY CUMBERLAND
PROJECT DESCRIPTION BRIDGE NO. 125 OVER CROSS CREEK ON
NC 24-210 IN FAYETTEVILLE AT -L- STA. 18+55

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CAUTION NOTICE

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

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

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PROJECT: 34488.1.1
ID: B-4090

PERSONNEL

N.D. MOHS

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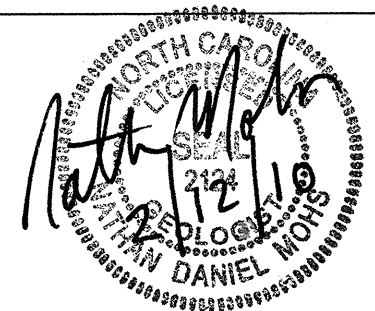
D.W. DIXON

INVESTIGATED BY N.D. MOHS

CHECKED BY N.T. ROBERSON

SUBMITTED BY N.T. ROBERSON

DATE FEBRUARY 2010



DRAWN BY: N.D. MOHS

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

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

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

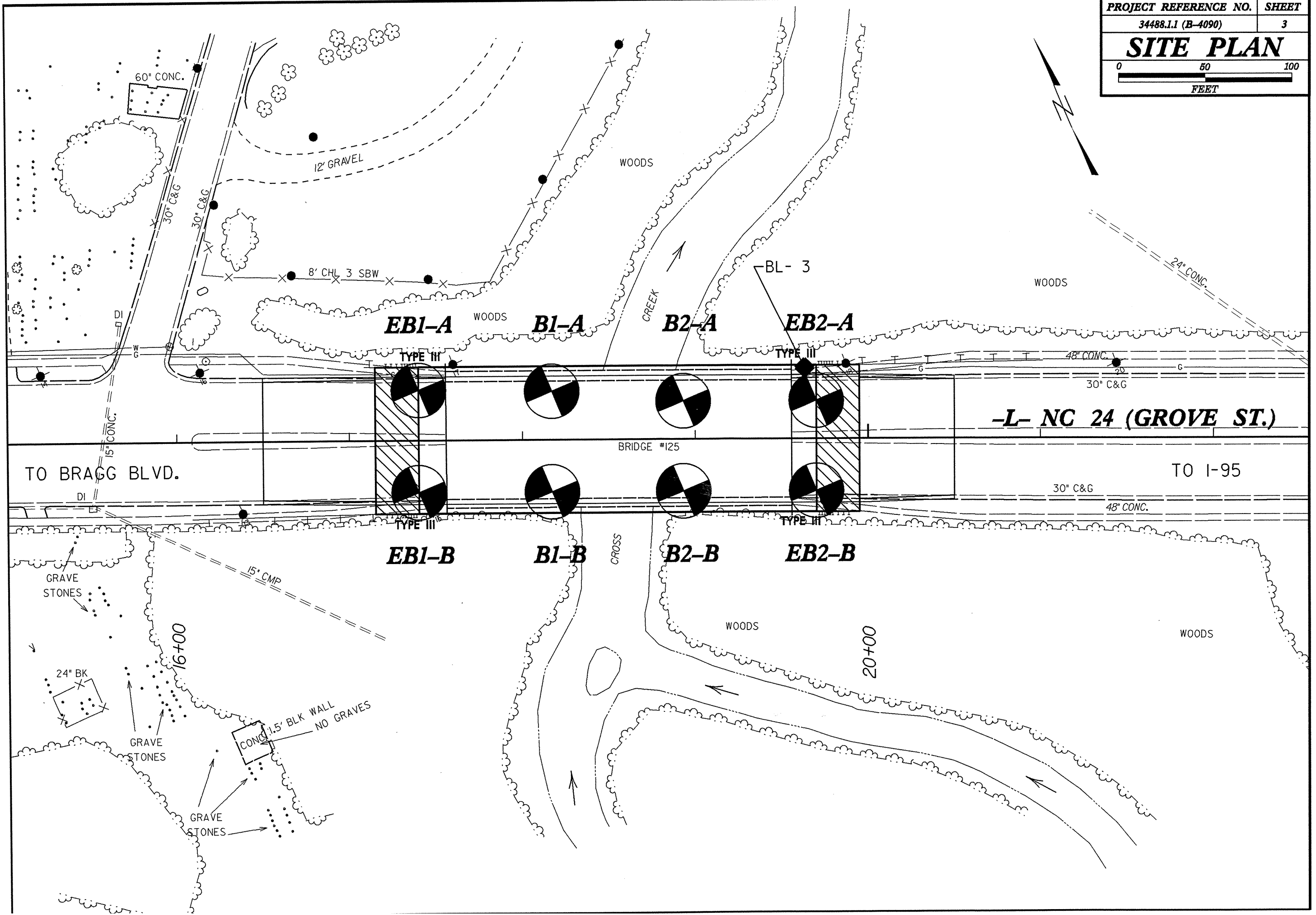
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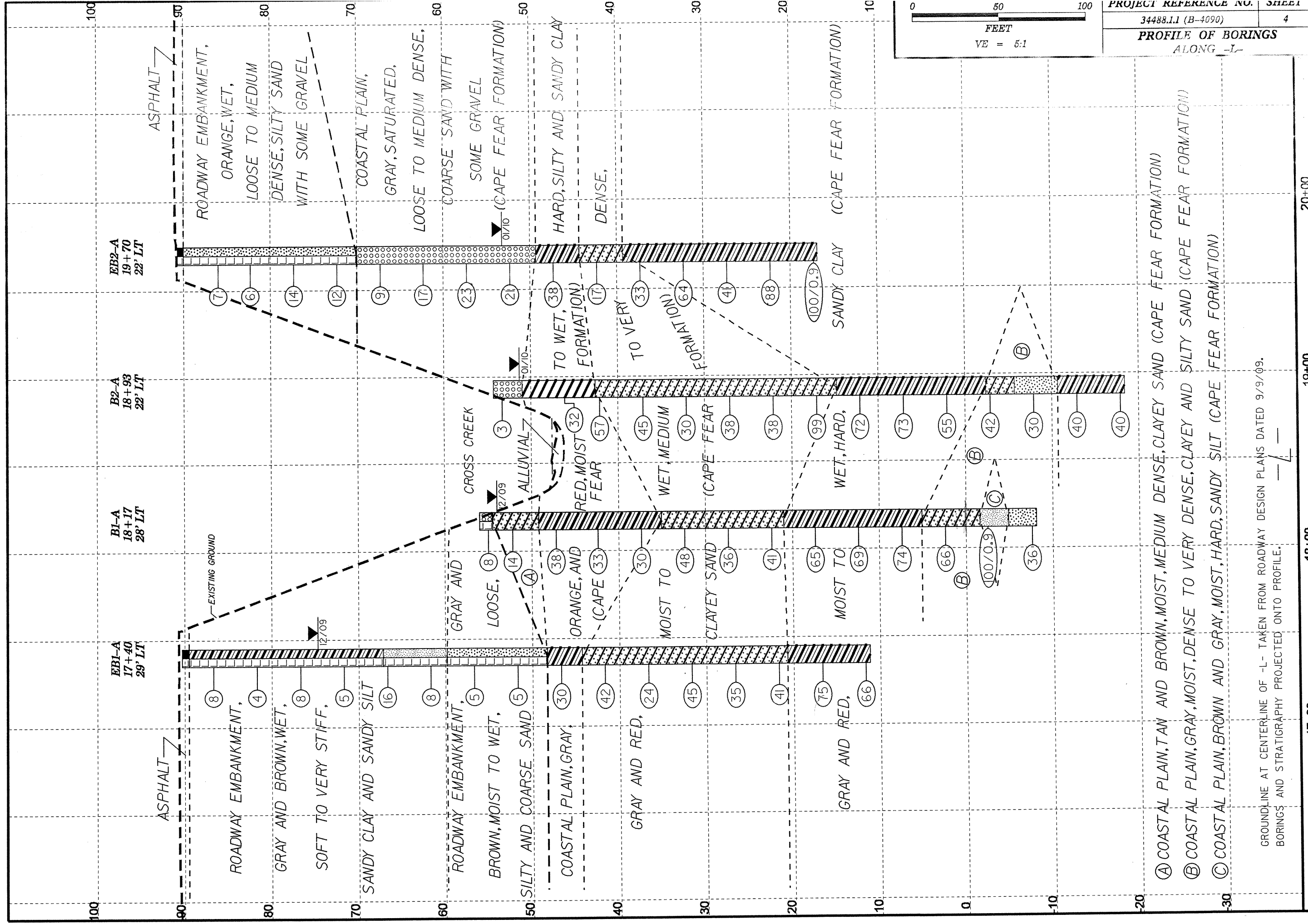
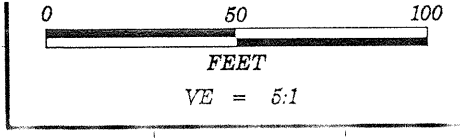
SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS																																																																																																																																																																																																																																											
<p>SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:</p> <p style="text-align: center;"><i>VERY STIFF, GRAY-SILTY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HEAVY PLASTIC, A-7-6</i></p>	<p>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)</p> <p>GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.</p> <p style="text-align: center;">ANGULARITY OF GRAINS</p> <p>THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.</p>	<p>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:</p> <p>WEATHERED ROCK (WR) </p> <p>CRYSTALLINE ROCK (CR) </p> <p>NON-CRYSTALLINE ROCK (NCR) </p> <p>COASTAL PLAIN SEDIMENTARY ROCK (CP) </p>	<p>ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.</p> <p>AQUIFER - A WATER BEARING FORMATION OR STRATA.</p> <p>ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.</p> <p>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.</p> <p>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.</p> <p>CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.</p> <p>COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.</p> <p>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.</p> <p>DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.</p> <p>DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.</p> <p>DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.</p> <p>FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.</p> <p>FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.</p> <p>FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.</p> <p>FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.</p> <p>FORMATION (FM) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.</p> <p>JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.</p> <p>LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.</p> <p>LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.</p> <p>MOTTLED (MOT) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.</p> <p>PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.</p> <p>RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.</p> <p>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.</p> <p>SAPROLITE (SAP) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.</p> <p>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 INTRODUCED ROCKS.</p> <p>SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.</p> <p>STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (IN OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.</p> <p>STRATA CORE RECOVERY (SREC) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.</p> <p>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.</p> <p>TOPSOIL (TS) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p>																																																																																																																																																																																																																																											
<p style="text-align: center;">SOIL LEGEND AND AASHTO CLASSIFICATION</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">GENERAL CLASS.</th> <th colspan="7">GRANULAR MATERIALS (<= 35% PASSING #200)</th> <th colspan="7">SILT-CLAY MATERIALS (> 35% PASSING #200)</th> <th colspan="3">ORGANIC MATERIALS</th> </tr> <tr> <th>A-1</th><th>A-3</th><th>A-2</th><th>A-4</th><th>A-5</th><th>A-6</th><th>A-7</th> <th>A-1, A-2</th><th>A-4, A-5</th><th>A-6, A-7</th><th>A-2, A-3</th><th>A-4, A-5</th><th>A-6, A-7</th> <th>A-1, A-2</th><th>A-4, A-5</th><th>A-6, A-7</th> </tr> </thead> <tbody> <tr> <td>GROUP CLASS.</td> <td>A-1-a</td><td>A-1-b</td><td>A-2-4</td><td>A-2-5</td><td>A-2-6</td><td>A-2-7</td><td>A-4-1</td><td>A-4-2</td><td>A-4-3</td><td>A-5-1</td><td>A-5-2</td><td>A-5-3</td><td>A-6-1</td><td>A-6-2</td><td>A-6-3</td><td>A-7-1</td><td>A-7-2</td><td>A-7-3</td> </tr> <tr> <td>SYMBOL</td> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td>% PASSING</td> <td>10</td><td>10</td><td>10</td><td>10</td><td>10</td><td>10</td><td>10</td><td>10</td><td>10</td><td>10</td><td>10</td><td>10</td><td>10</td><td>10</td><td>10</td><td>10</td><td>10</td><td>10</td> </tr> <tr> <td>LIQUID LIMIT</td> <td>6</td><td>6</td><td>10</td><td>10</td><td>10</td><td>10</td><td>10</td><td>10</td><td>10</td><td>10</td><td>10</td><td>10</td><td>10</td><td>10</td><td>10</td><td>10</td><td>10</td><td>10</td> </tr> <tr> <td>PLASTIC INDEX</td> <td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td> </tr> <tr> <td>USUAL TYPES OF MAJOR MATERIALS</td> <td>STONE FRAGS. GRAVEL AND SAND</td><td>FINE SAND</td><td>SILTY OR CLAYEY GRAVEL AND SAND</td><td>SILTY SOILS</td><td>CLAYEY SOILS</td><td>SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER</td><td>GRANULAR SOILS</td><td>SILT-CLAY SOILS</td><td>MUCK, PEAT</td><td colspan="9"></td><td>HIGHLY ORGANIC SOILS</td> </tr> <tr> <td>GEN. RATING AS A SUBGRADE</td> <td colspan="3">EXCELLENT TO GOOD</td><td colspan="3">FAIR TO POOR</td><td>FAIR TO POOR</td><td>POOR</td><td>UNSATURABLE</td><td colspan="9"></td> </tr> </tbody> </table> <p style="text-align: center;">PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30</p>	GENERAL CLASS.	GRANULAR MATERIALS (<= 35% PASSING #200)							SILT-CLAY MATERIALS (> 35% PASSING #200)							ORGANIC MATERIALS			A-1	A-3	A-2	A-4	A-5	A-6	A-7	A-1, A-2	A-4, A-5	A-6, A-7	A-2, A-3	A-4, A-5	A-6, A-7	A-1, A-2	A-4, A-5	A-6, A-7	GROUP CLASS.	A-1-a	A-1-b	A-2-4	A-2-5	A-2-6	A-2-7	A-4-1	A-4-2	A-4-3	A-5-1	A-5-2	A-5-3	A-6-1	A-6-2	A-6-3	A-7-1	A-7-2	A-7-3	SYMBOL																			% PASSING	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	LIQUID LIMIT	6	6	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	PLASTIC INDEX	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL AND SAND	FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND	SILTY SOILS	CLAYEY SOILS	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT										HIGHLY ORGANIC SOILS	GEN. RATING AS A SUBGRADE	EXCELLENT TO GOOD			FAIR TO POOR			FAIR TO POOR	POOR	UNSATURABLE										<p style="text-align: center;">MINERALOGICAL COMPOSITION</p> <p>MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.</p> <p style="text-align: center;">COMPRESSIBILITY</p> <p>SLIGHTLY COMPRESSIBLE LIQUID LIMIT LESS THAN 31 MODERATELY COMPRESSIBLE LIQUID LIMIT EQUAL TO 31-50 HIGHLY COMPRESSIBLE LIQUID LIMIT GREATER THAN 50</p> <p style="text-align: center;">PERCENTAGE OF MATERIAL</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>GRANULAR SOILS</th> <th>SILT - CLAY SOILS</th> <th>OTHER MATERIAL</th> </tr> </thead> <tbody> <tr> <td>TRACE OF ORGANIC MATTER</td> <td>2 - 3%</td> <td>3 - 5%</td> <td>TRACE 1 - 10%</td> </tr> <tr> <td>LITTLE ORGANIC MATTER</td> <td>3 - 5%</td> <td>5 - 12%</td> <td>LITTLE 10 - 20%</td> </tr> <tr> <td>MODERATELY ORGANIC</td> <td>5 - 10%</td> <td>12 - 20%</td> <td>SOME 20 - 35%</td> </tr> <tr> <td>HIGHLY ORGANIC</td> <td>>10%</td> <td>>20%</td> <td>HIGHLY 35% AND ABOVE</td> </tr> </tbody> </table> <p style="text-align: center;">GROUND WATER</p> <p> WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING</p> <p> STATIC WATER LEVEL AFTER 24 HOURS</p> <p> PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA</p> <p> SPRING OR SEEP</p> <p style="text-align: center;">MISCELLANEOUS SYMBOLS</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tbody> <tr> <td></td> <td>ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION</td> <td></td> <td>SPT TEST BORING</td> <td></td> <td>SAMPLE DESIGNATIONS</td> </tr> <tr> <td></td> <td>ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT</td> <td></td> <td>AUGER BORING</td> <td>S - BULK SAMPLE</td> <td></td> </tr> <tr> <td></td> <td>INFERRED SOIL BOUNDARY</td> <td></td> <td>CORE BORING</td> <td>SS - SPLIT SPOON SAMPLE</td> <td></td> </tr> <tr> <td></td> <td>INFERRED ROCK LINE</td> <td></td> <td>MONITORING WELL</td> <td>ST - SHELBY TUBE SAMPLE</td> <td></td> </tr> <tr> <td></td> <td>ALLUVIAL SOIL BOUNDARY</td> <td></td> <td>PIEZOMETER INSTALLATION</td> <td>RS - ROCK SAMPLE</td> <td></td> </tr> <tr> <td></td> <td>DIP & DIP DIRECTION OF ROCK STRUCTURES</td> <td></td> <td>SLOPE INDICATOR INSTALLATION</td> <td>RT - RECOMPACTED TRIAXIAL SAMPLE</td> <td></td> </tr> <tr> <td></td> <td>SOUNDING ROD</td> <td></td> <td>SPT N-VALUE</td> <td>CBR - CALIFORNIA BEARING RATIO SAMPLE</td> <td></td> </tr> <tr> <td></td> <td>SPT REFUSAL</td> <td></td> <td>SPT REFUSAL</td> <td></td> <td></td> </tr> </tbody> </table>		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		ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION		SPT TEST BORING		SAMPLE DESIGNATIONS		ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT		AUGER BORING	S - BULK SAMPLE			INFERRED SOIL BOUNDARY		CORE BORING	SS - SPLIT SPOON SAMPLE			INFERRED ROCK LINE		MONITORING WELL	ST - SHELBY TUBE SAMPLE			ALLUVIAL SOIL BOUNDARY		PIEZOMETER INSTALLATION	RS - ROCK SAMPLE			DIP & DIP DIRECTION OF ROCK STRUCTURES		SLOPE INDICATOR INSTALLATION	RT - RECOMPACTED TRIAXIAL SAMPLE			SOUNDING ROD		SPT N-VALUE	CBR - CALIFORNIA BEARING RATIO SAMPLE			SPT REFUSAL		SPT REFUSAL			<p>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.</p> <p>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.</p> <p>MODERATE (MOD) SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.</p> <p>MODERATELY SEVERE (MOD. SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. <i>IF TESTED, WOULD YIELD SPT REFUSAL</i></p> <p>SEVERE (SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. <i>IF TESTED, YIELDS SPT N VALUES > 100 BPF</i></p> <p>VERY SEVERE (V SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. <i>IF TESTED, YIELDS SPT N VALUES < 100 BPF</i></p> <p>COMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.</p> <p style="text-align: center;">ROCK HARDNESS</p> <p>VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.</p> <p>HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.</p> <p>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.</p> <p>MEDIUM HARD CAN BE GROUVED 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.</p> <p>SOFT CAN BE GROUVED 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.</p> <p>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 FINGERNAIL.</p>
GENERAL CLASS.		GRANULAR MATERIALS (<= 35% PASSING #200)							SILT-CLAY MATERIALS (> 35% PASSING #200)							ORGANIC MATERIALS																																																																																																																																																																																																																														
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WIDE	3 TO 10 FEET	THICKLY BEDDED	1.5 - 4 FEET																																																																																																																																																																																																																																											
MODERATELY CLOSE	1 TO 3 FEET	THINLY BEDDED	0.16 - 1.5 FEET																																																																																																																																																																																																																																											
CLOSE	0.16 TO 1 FEET	VERY THINLY BEDDED	0.03 - 0.16 FEET																																																																																																																																																																																																																																											
VERY CLOSE	LESS THAN 0.16 FEET	THICKLY LAMINATED	0.008 - 0.03 FEET																																																																																																																																																																																																																																											
		THINLY LAMINATED	< 0.008 FEET																																																																																																																																																																																																																																											
<p style="text-align: center;">PLASTICITY</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>NONPLASTIC</th> <th>PLASTICITY INDEX (PI)</th> <th>DRY STRENGTH</th> </tr> </thead> <tbody> <tr> <td>LOW PLASTICITY</td> <td>0-5</td> <td>VERY LOW</td> </tr> <tr> <td>MED. PLASTICITY</td> <td>6-15</td> <td>SLIGHT</td> </tr> <tr> <td>HIGH PLASTICITY</td> <td>16-25</td> <td>MEDIUM</td> </tr> <tr> <td></td> <td>26 OR MORE</td> <td>HIGH</td> </tr> </tbody> </table> <p style="text-align: center;">COLOR</p> <p>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.</p>	NONPLASTIC	PLASTICITY INDEX (PI)	DRY STRENGTH	LOW PLASTICITY	0-5	VERY LOW	MED. PLASTICITY	6-15	SLIGHT	HIGH PLASTICITY	16-25	MEDIUM		26 OR MORE	HIGH	<p style="text-align: center;">FRACURE SPACING</p> <p style="text-align: center;">BEDDING</p> <p style="text-align: center;">INDURATION</p> <p>FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.</p> <p>MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.</p> <p>INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.</p> <p>EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</p>																																																																																																																																																																																																																														
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	26 OR MORE	HIGH																																																																																																																																																																																																																																												
<p style="text-align: center;">BENCH MARK: BL-3, -L- STA. 19+63, 4' LT</p> <p style="text-align: right;">ELEVATION: 90.44 FT.</p>			<p>NOTES:</p>																																																																																																																																																																																																																																											

PROJECT REFERENCE NO.	SHEET
34488.1.1 (B-4090)	3
SITE PLAN	

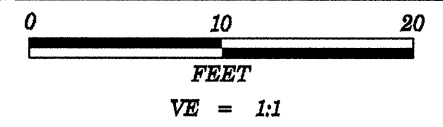




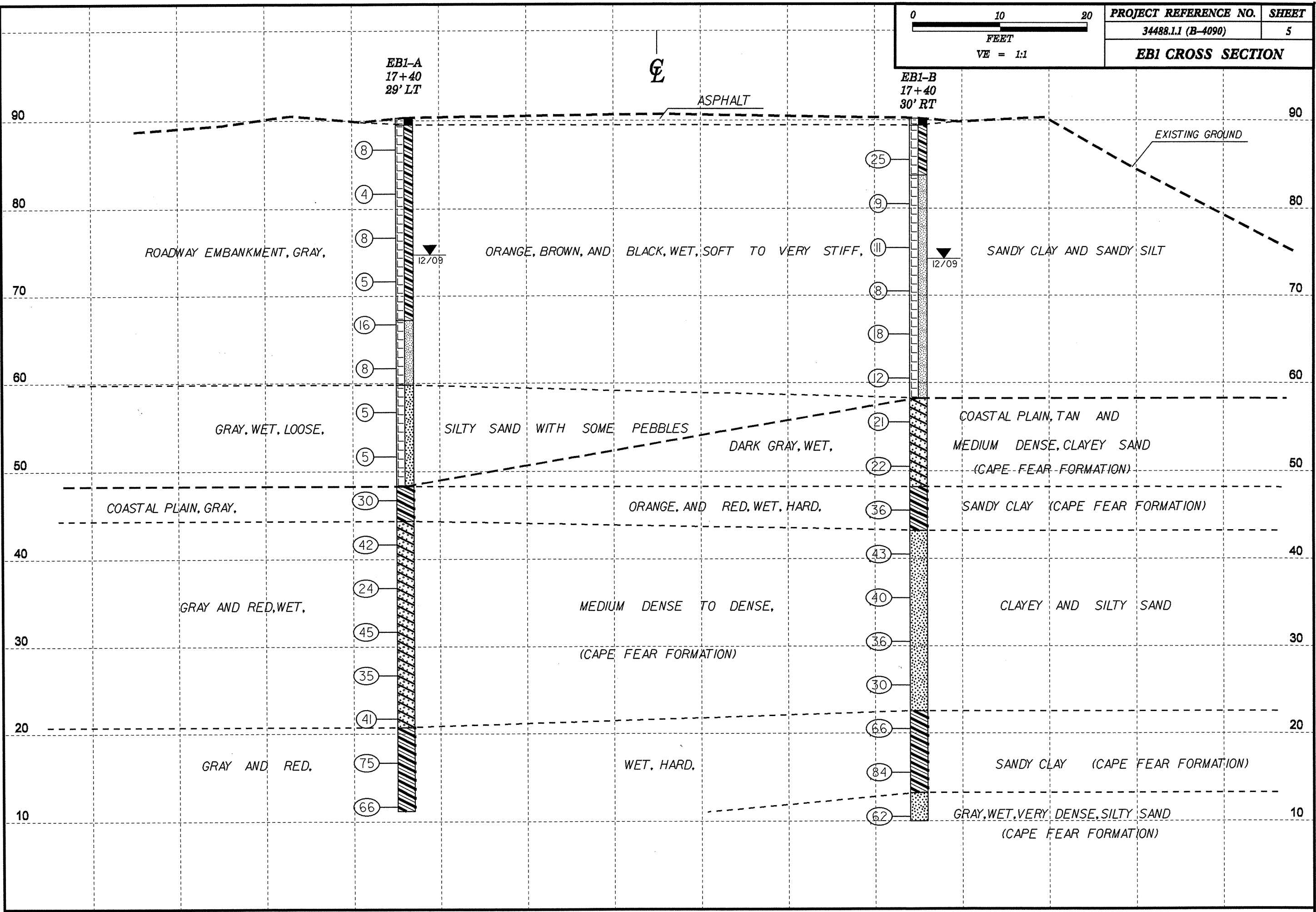
- Ⓐ COASTAL PLAIN, TAN AND BROWN, MOIST, MEDIUM DENSE, CLAYEY SAND (CAPE FEAR FORMATION)
- Ⓑ COASTAL PLAIN, GRAY, MOIST, DENSE TO VERY DENSE, CLAYEY AND SILTY SAND (CAPE FEAR FORMATION)
- Ⓒ COASTAL PLAIN, BROWN AND GRAY, MOIST, HARD, SANDY SILT (CAPE FEAR FORMATION)

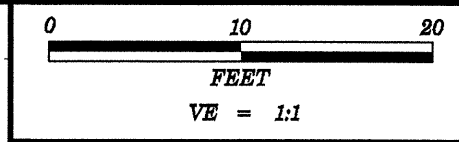
GROUNDLINE AT CENTERLINE OF -L- TAKEN FROM ROADWAY DESIGN PLANS DATED 9/9/09.
 BORINGS AND STRATIGRAPHY PROJECTED ONTO PROFILE.

17+00 18+00 19+00 20+00

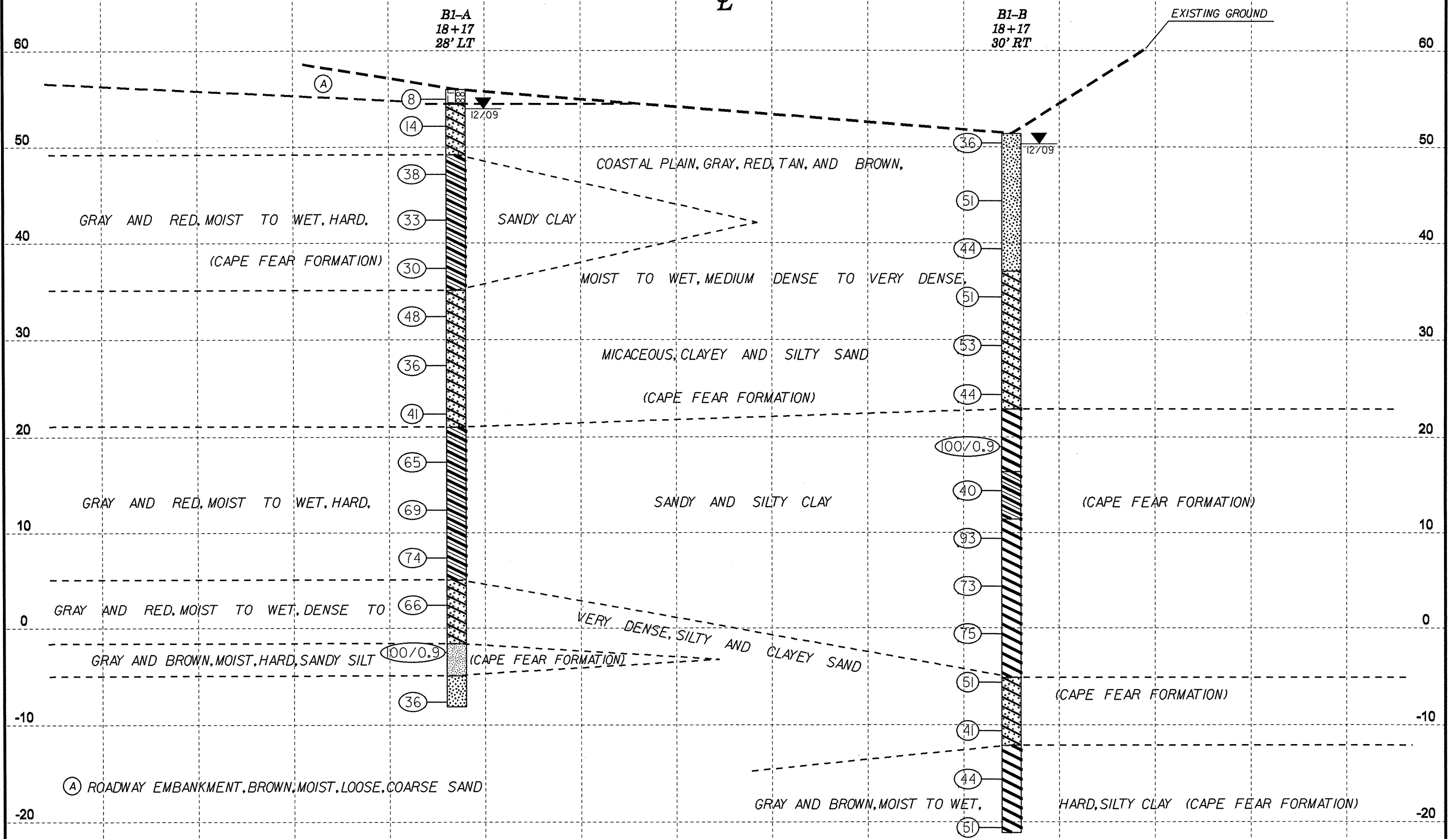


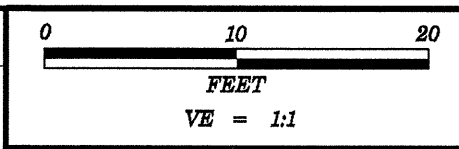
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34488.1.1 (B-4090)	5
EB1 CROSS SECTION	



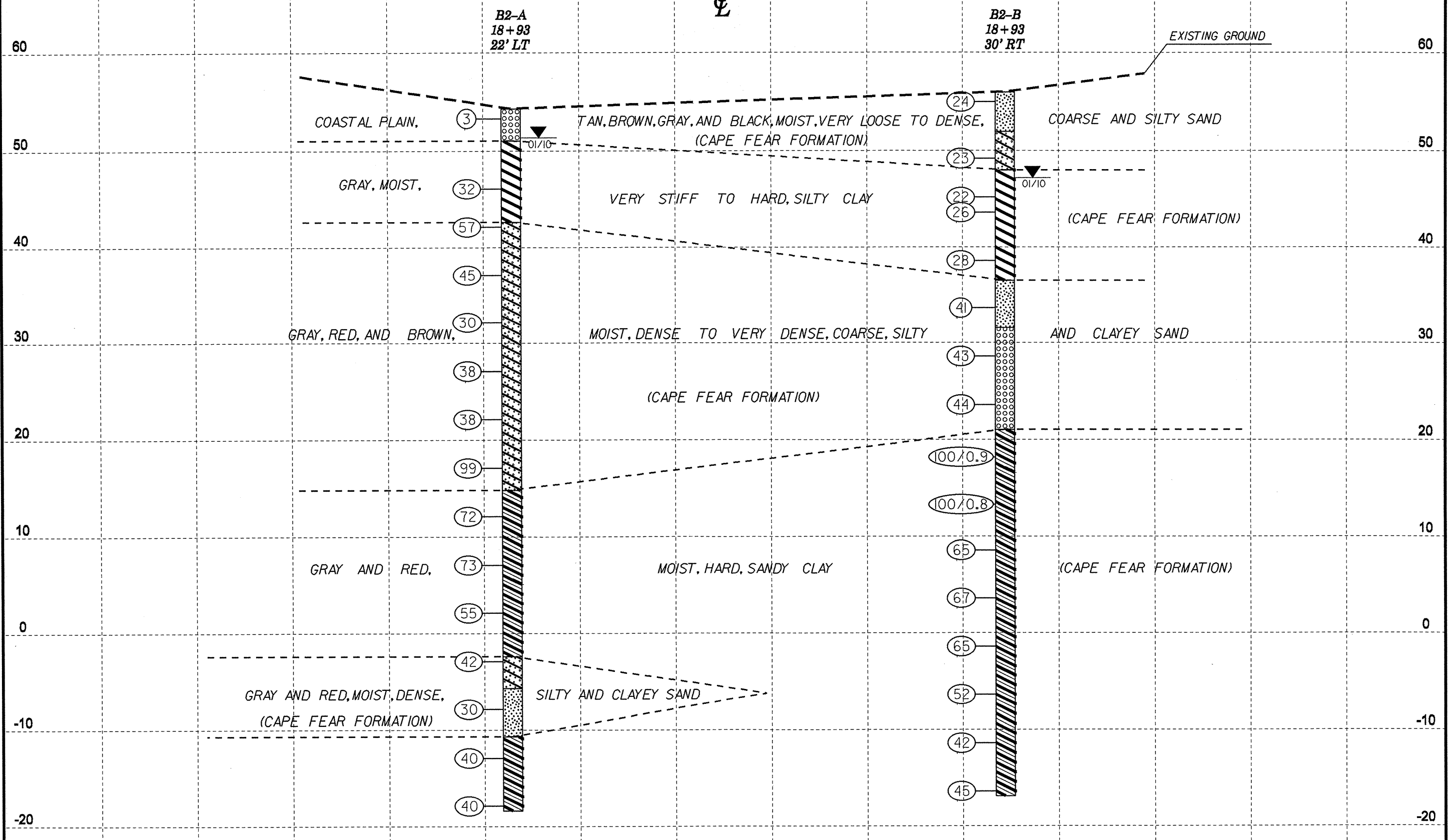


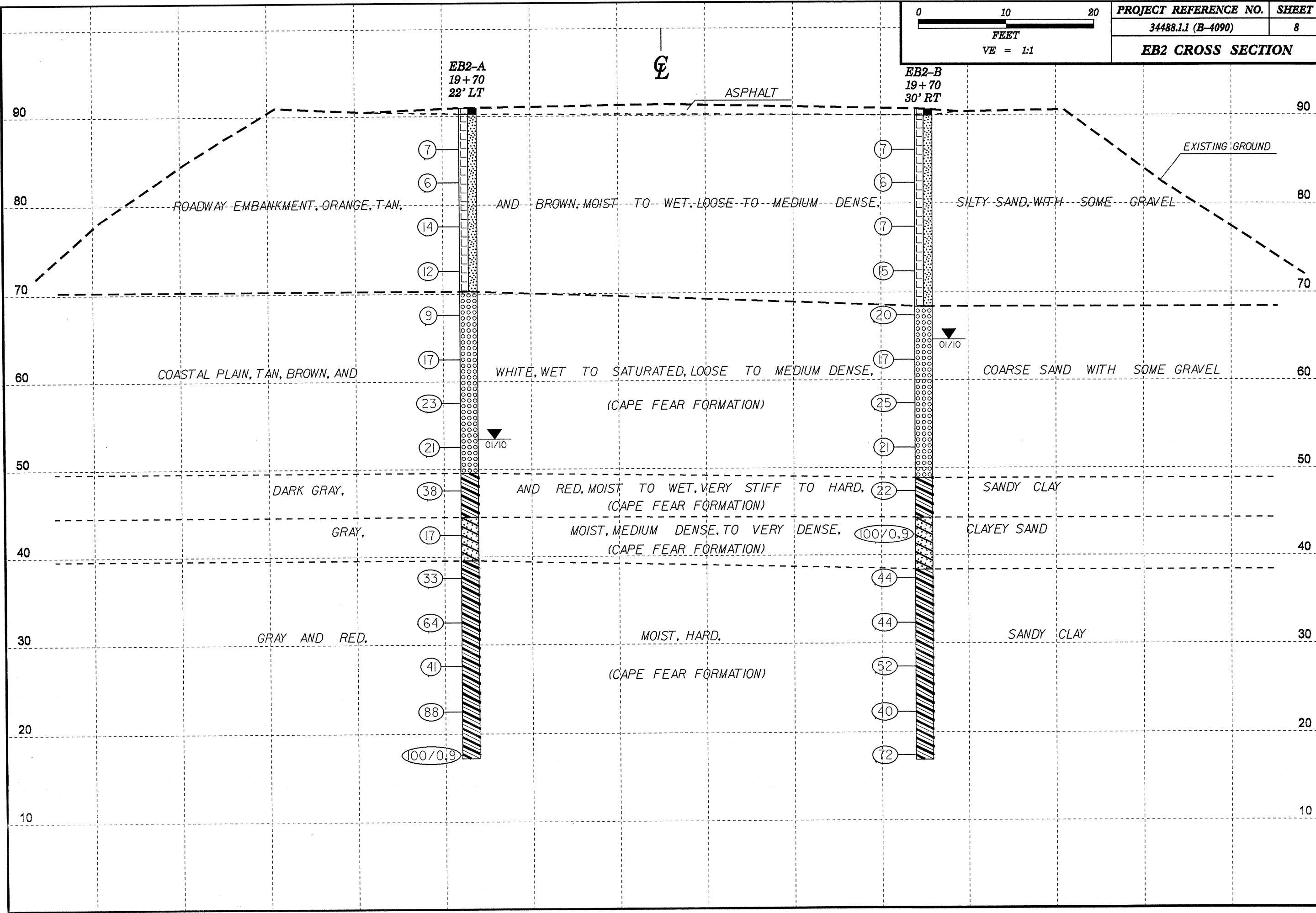
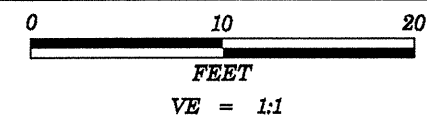
PROJECT REFERENCE NO.	SHEET
34488.1.1 (B-4090)	6
B1 CROSS SECTION	





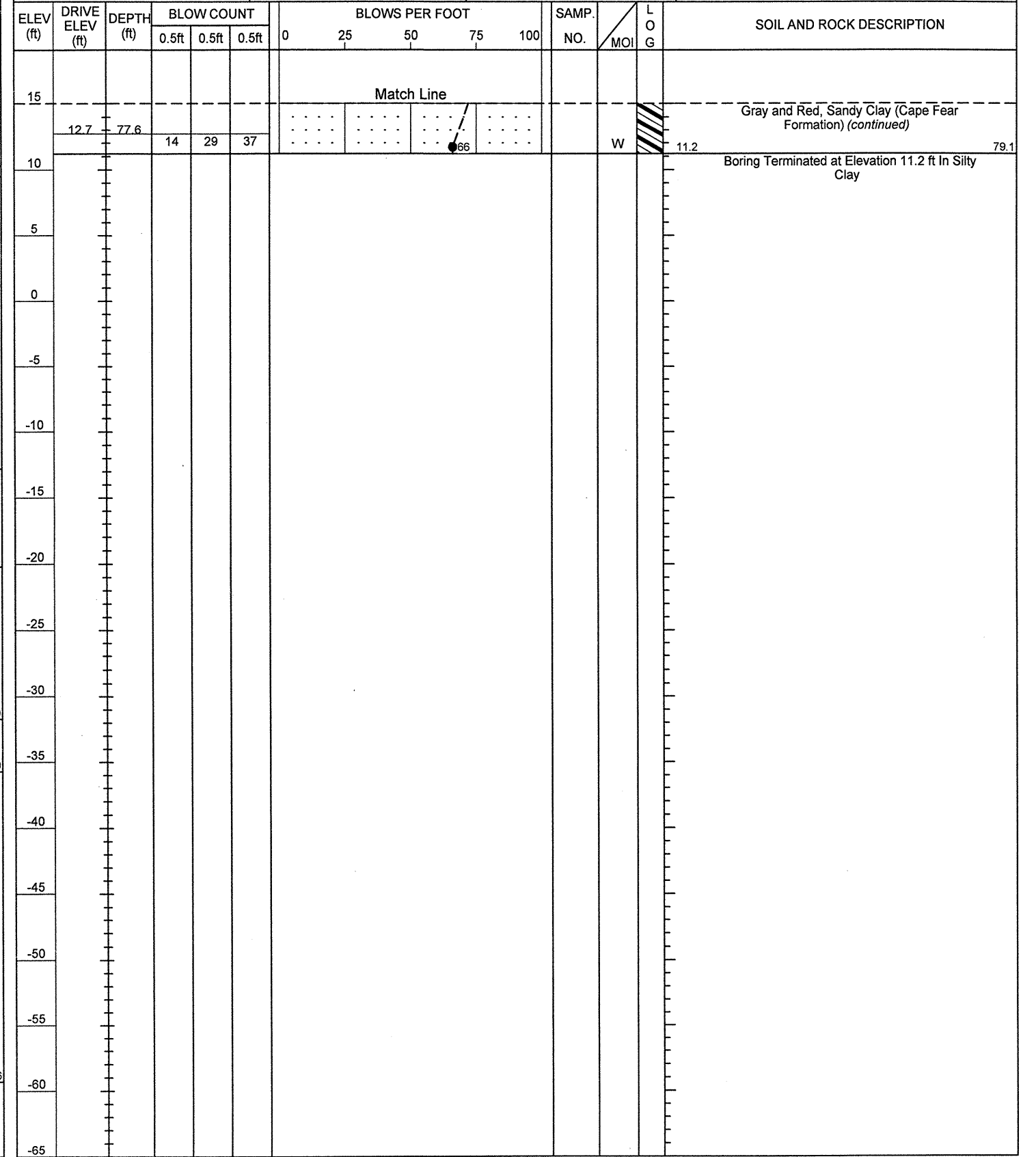
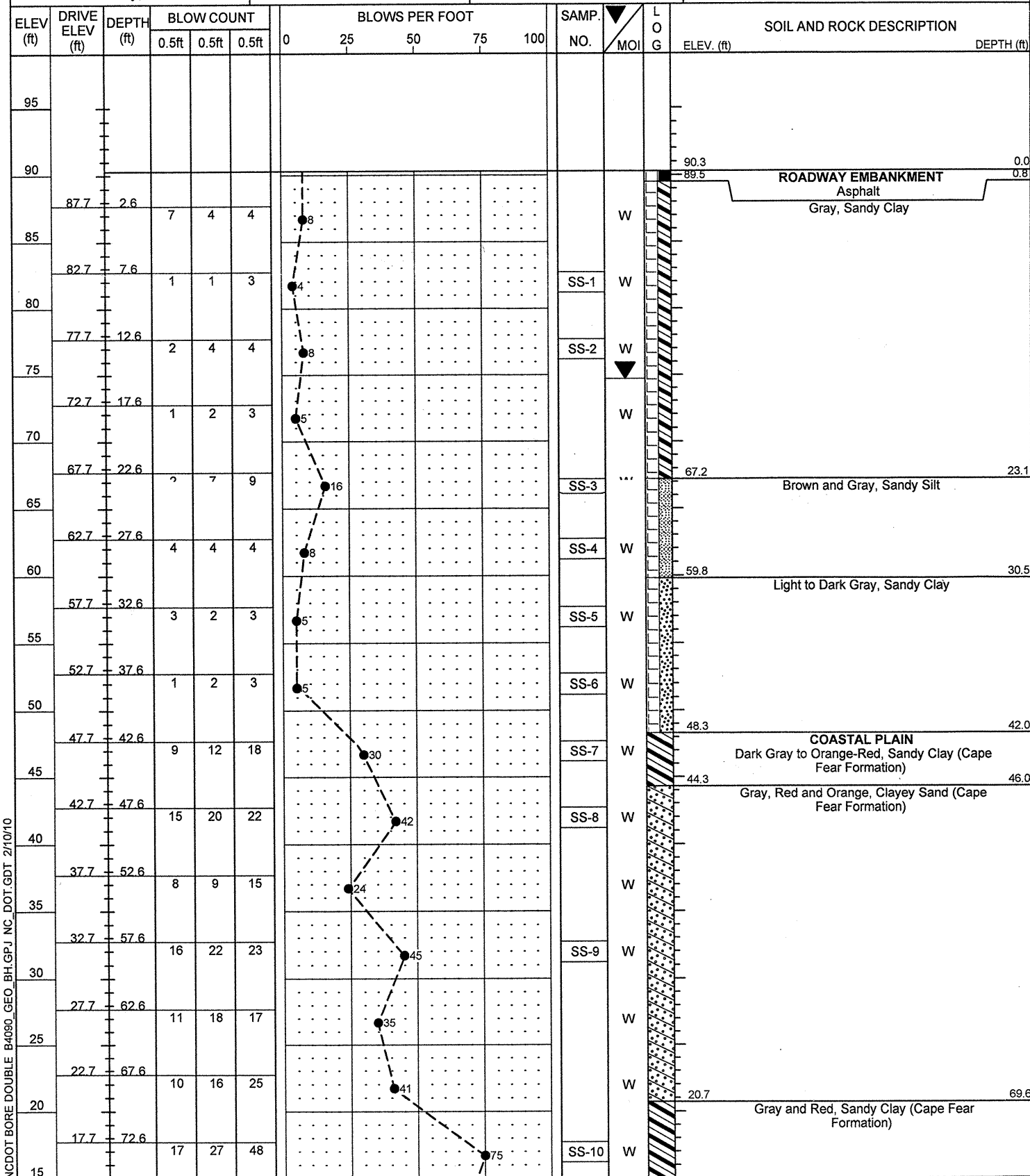
PROJECT REFERENCE NO.	SHEET
34488.1.1 (B-4090)	7
B2 CROSS SECTION	





PROJECT NO. 33448.1.1	ID. B-4090	COUNTY Cumberland	GEOLOGIST Milkovits, J. I.
SITE DESCRIPTION Bridge No. 125 on NC 24-210 over Cross Creek in Fayetteville at -L- Station 18+55			GROUND WTR (ft) 0 HR. N/A
BORING NO. EB1-A	STATION 17+40	OFFSET 29 ft LT	ALIGNMENT -L-
COLLAR ELEV. 90.3 ft	TOTAL DEPTH 79.1 ft	NORTHING 475,241	EASTING 2,038,221
DRILL MACHINE CME-550X		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic
DRILLER Conley, H. R.	START DATE 12/03/09	COMP. DATE 12/04/09	SURFACE WATER DEPTH N/A

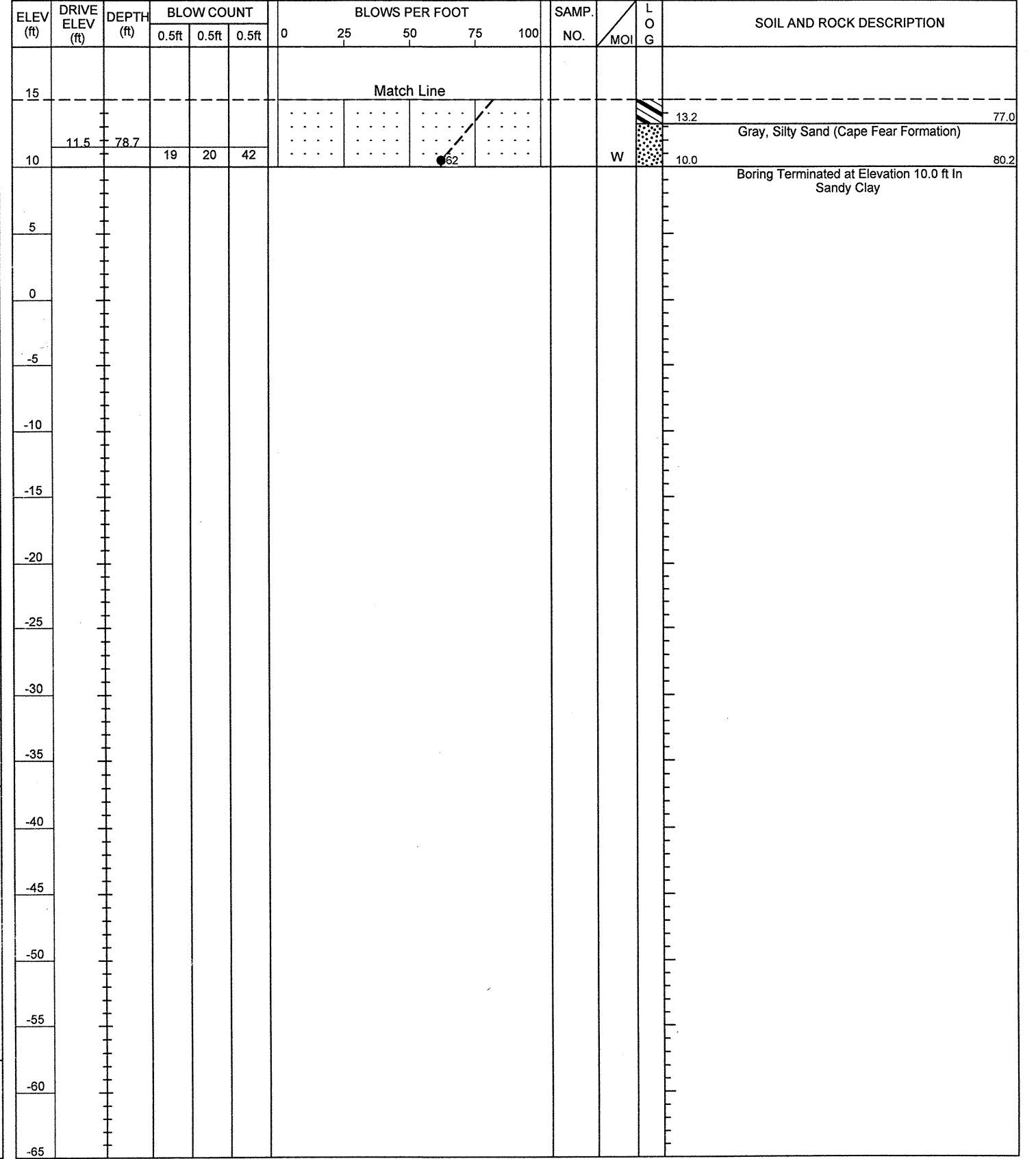
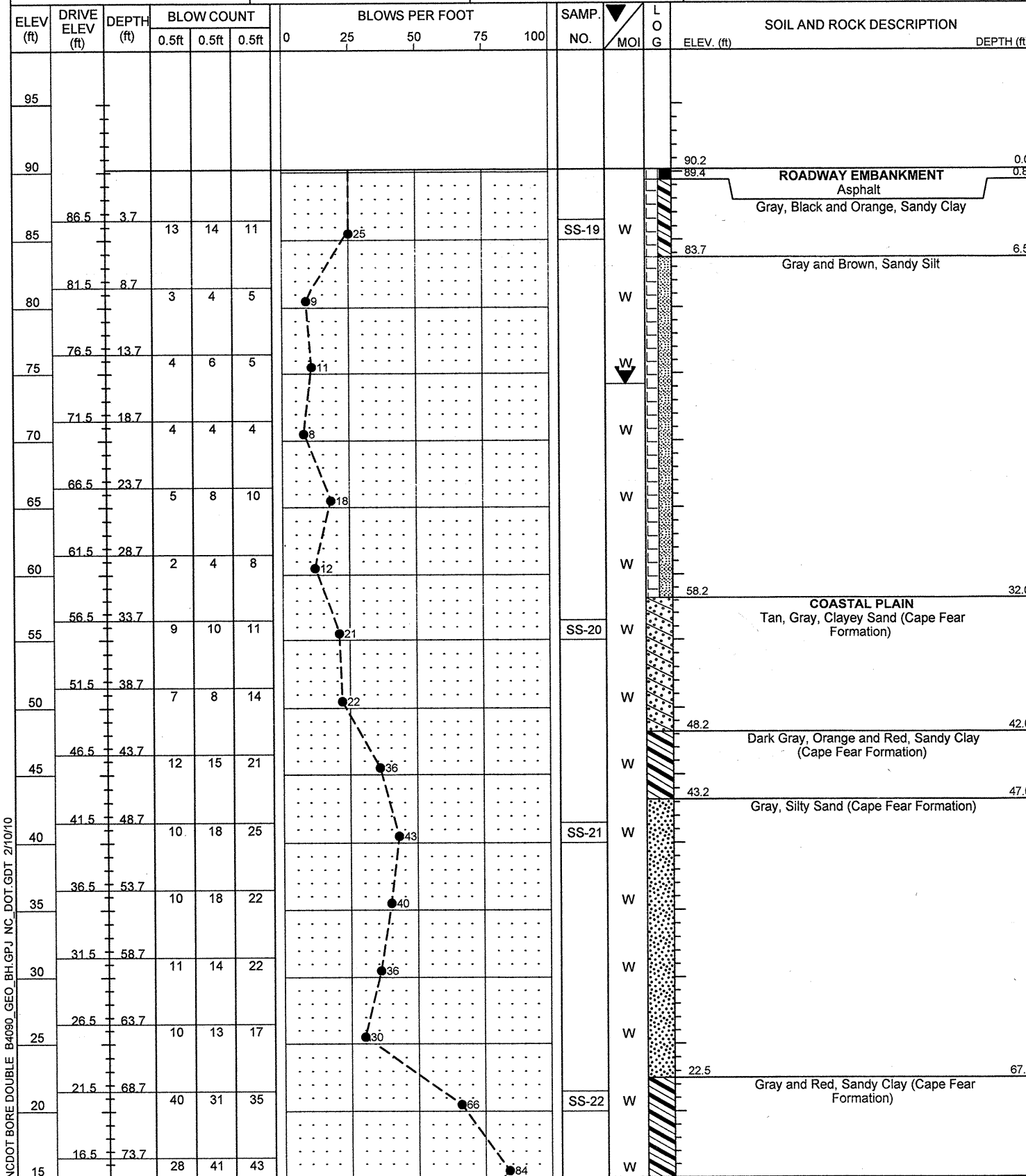
PROJECT NO. 33448.1.1	ID. B-4090	COUNTY Cumberland	GEOLOGIST Milkovits, J. I.
SITE DESCRIPTION Bridge No. 125 on NC 24-210 over Cross Creek in Fayetteville at -L- Station 18+55			GROUND WTR (ft) 0 HR. N/A
BORING NO. EB1-A	STATION 17+40	OFFSET 29 ft LT	ALIGNMENT -L-
COLLAR ELEV. 90.3 ft	TOTAL DEPTH 79.1 ft	NORTHING 475,241	EASTING 2,038,221
DRILL MACHINE CME-550X		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic
DRILLER Conley, H. R.	START DATE 12/03/09	COMP. DATE 12/04/09	SURFACE WATER DEPTH N/A



NCDOT BORE DOUBLE B4090_GEO_BH.GPJ NC DOT.GDT 2/10/10

PROJECT NO. 33448.1.1	ID. B-4090	COUNTY Cumberland	GEOLOGIST Milkovits, J. I.
SITE DESCRIPTION Bridge No. 125 on NC 24-210 over Cross Creek in Fayetteville at -L- Station 18+55			GROUND WTR (ft) 0 HR. N/A
BORING NO. EB1-B	STATION 17+40	OFFSET 30 ft RT	ALIGNMENT -L-
COLLAR ELEV. 90.2 ft	TOTAL DEPTH 80.2 ft	NORTHING 475,187	EASTING 2,038,198
DRILL MACHINE CME-550X		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic
DRILLER Conley, H. R.	START DATE 12/10/09	COMP. DATE 12/10/09	SURFACE WATER DEPTH N/A

PROJECT NO. 33448.1.1	ID. B-4090	COUNTY Cumberland	GEOLOGIST Milkovits, J. I.
SITE DESCRIPTION Bridge No. 125 on NC 24-210 over Cross Creek in Fayetteville at -L- Station 18+55			GROUND WTR (ft) 0 HR. N/A
BORING NO. EB1-B	STATION 17+40	OFFSET 30 ft RT	ALIGNMENT -L-
COLLAR ELEV. 90.2 ft	TOTAL DEPTH 80.2 ft	NORTHING 475,187	EASTING 2,038,198
DRILL MACHINE CME-550X		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic
DRILLER Conley, H. R.	START DATE 12/10/09	COMP. DATE 12/10/09	SURFACE WATER DEPTH N/A



NCDOT BORE DOUBLE B4090_GEO BH.GPJ NC DOT.GDT 2/10/10

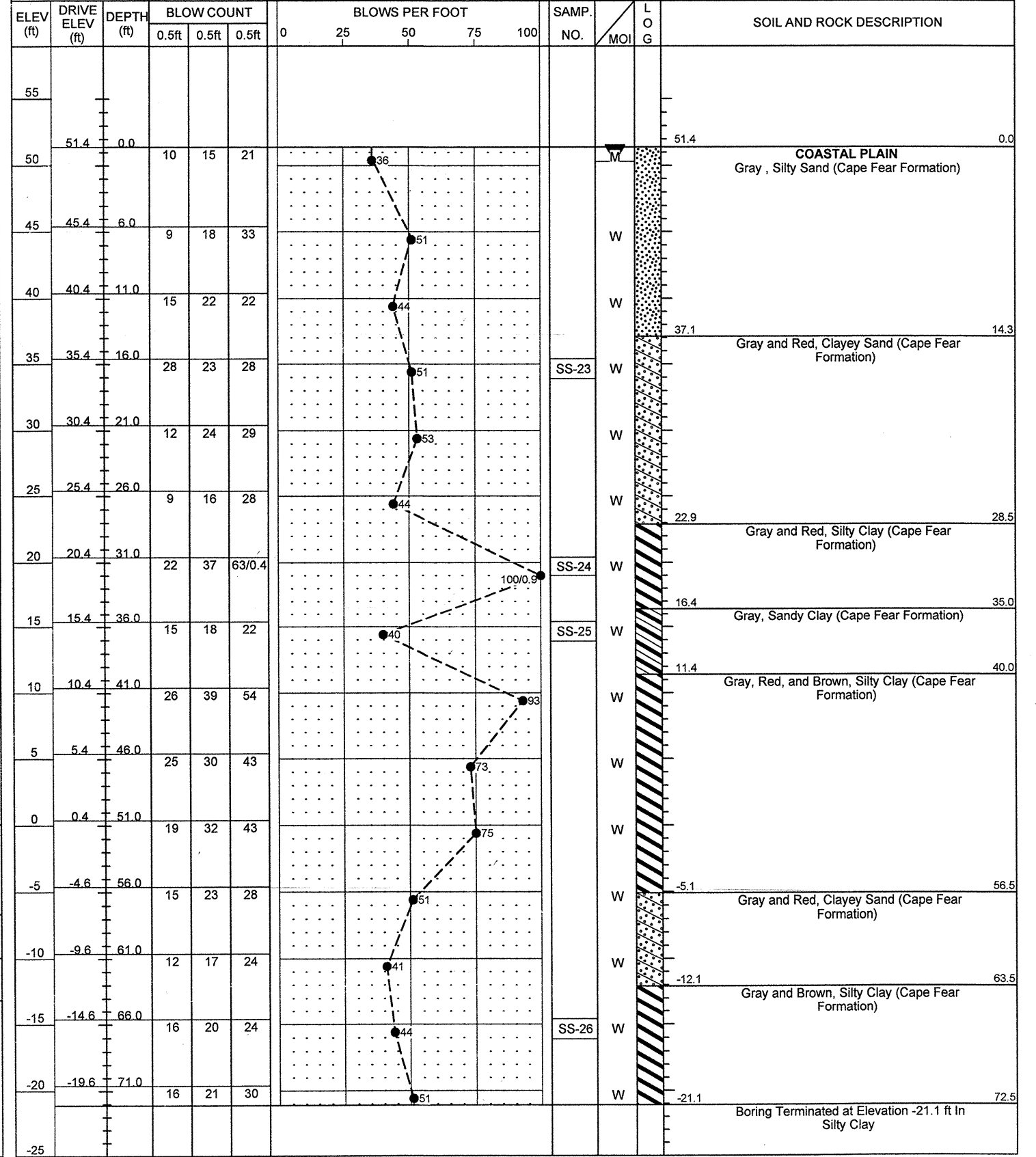
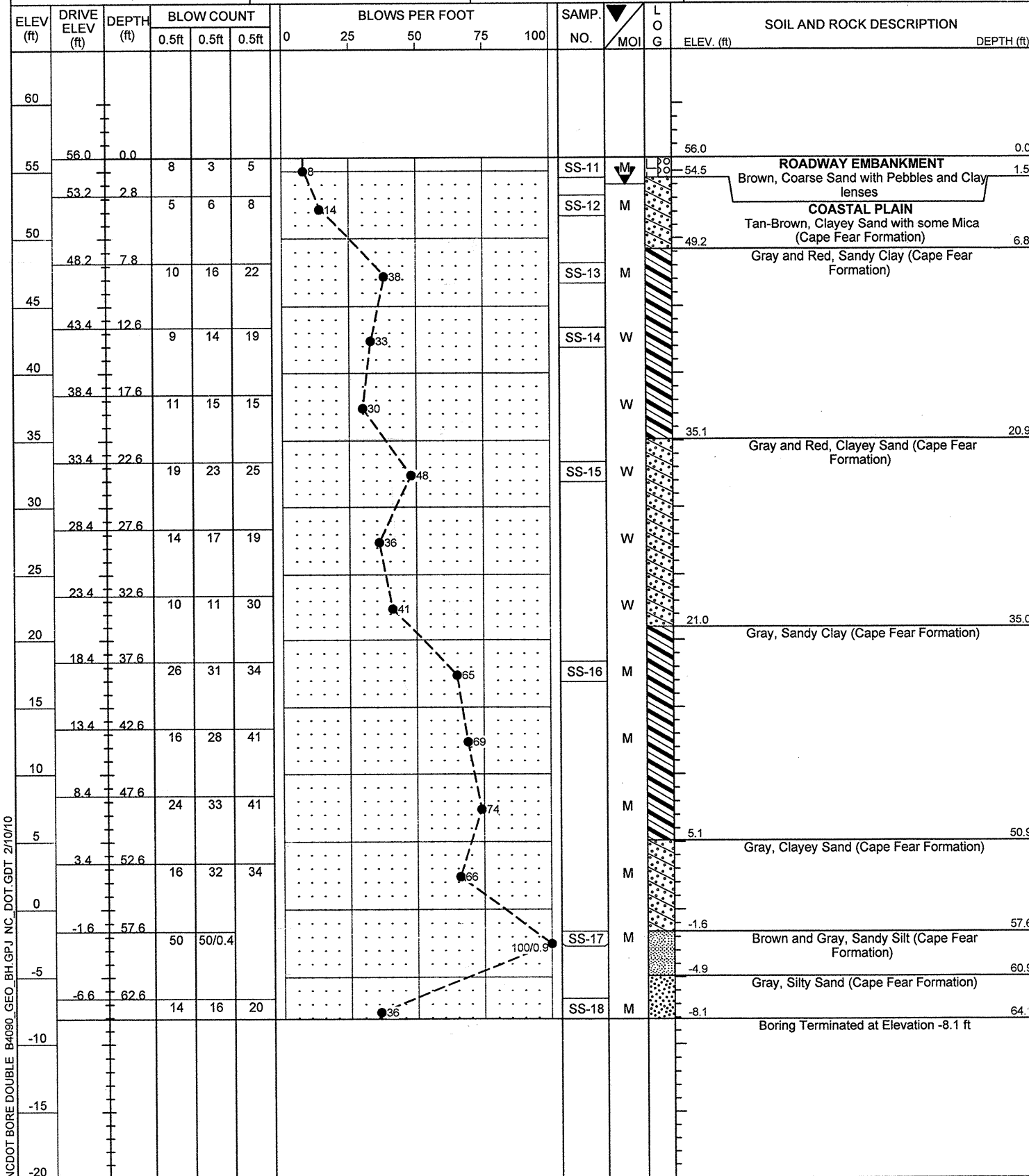


NCDOT GEOTECHNICAL ENGINEERING UNIT

BORELOG REPORT

PROJECT NO. 33448.1.1	ID. B-4090	COUNTY Cumberland	GEOLOGIST Milkovits, J. I.
SITE DESCRIPTION Bridge No. 125 on NC 24-210 over Cross Creek in Fayetteville at -L- Station 18+55			GROUND WTR (ft) 0 HR. N/A 24 HR. 2.0
BORING NO. B1-A	STATION 18+17	OFFSET 28 ft LT	ALIGNMENT -L-
COLLAR ELEV. 56.0 ft	TOTAL DEPTH 64.1 ft	NORTHING 475,212	EASTING 2,038,292
DRILL MACHINE CME-550X	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
DRILLER Conley, H. R.	START DATE 12/07/09	COMP. DATE 12/08/09	SURFACE WATER DEPTH N/A

PROJECT NO. 33448.1.1	ID. B-4090	COUNTY Cumberland	GEOLOGIST Milkovits, J. I.
SITE DESCRIPTION Bridge No. 125 on NC 24-210 over Cross Creek in Fayetteville at -L- Station 18+55			GROUND WTR (ft) 0 HR. N/A 24 HR. 1.1
BORING NO. B1-B	STATION 18+17	OFFSET 30 ft RT	ALIGNMENT -L-
COLLAR ELEV. 51.4 ft	TOTAL DEPTH 72.5 ft	NORTHING 475,157	EASTING 2,038,269
DRILL MACHINE CME-550X	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
DRILLER Conley, H. R.	START DATE 12/11/09	COMP. DATE 12/17/09	SURFACE WATER DEPTH N/A



VCDOT BORE DOUBLE B4090_GEO_BH.GPJ NC_DOT_GDT 2/10/10

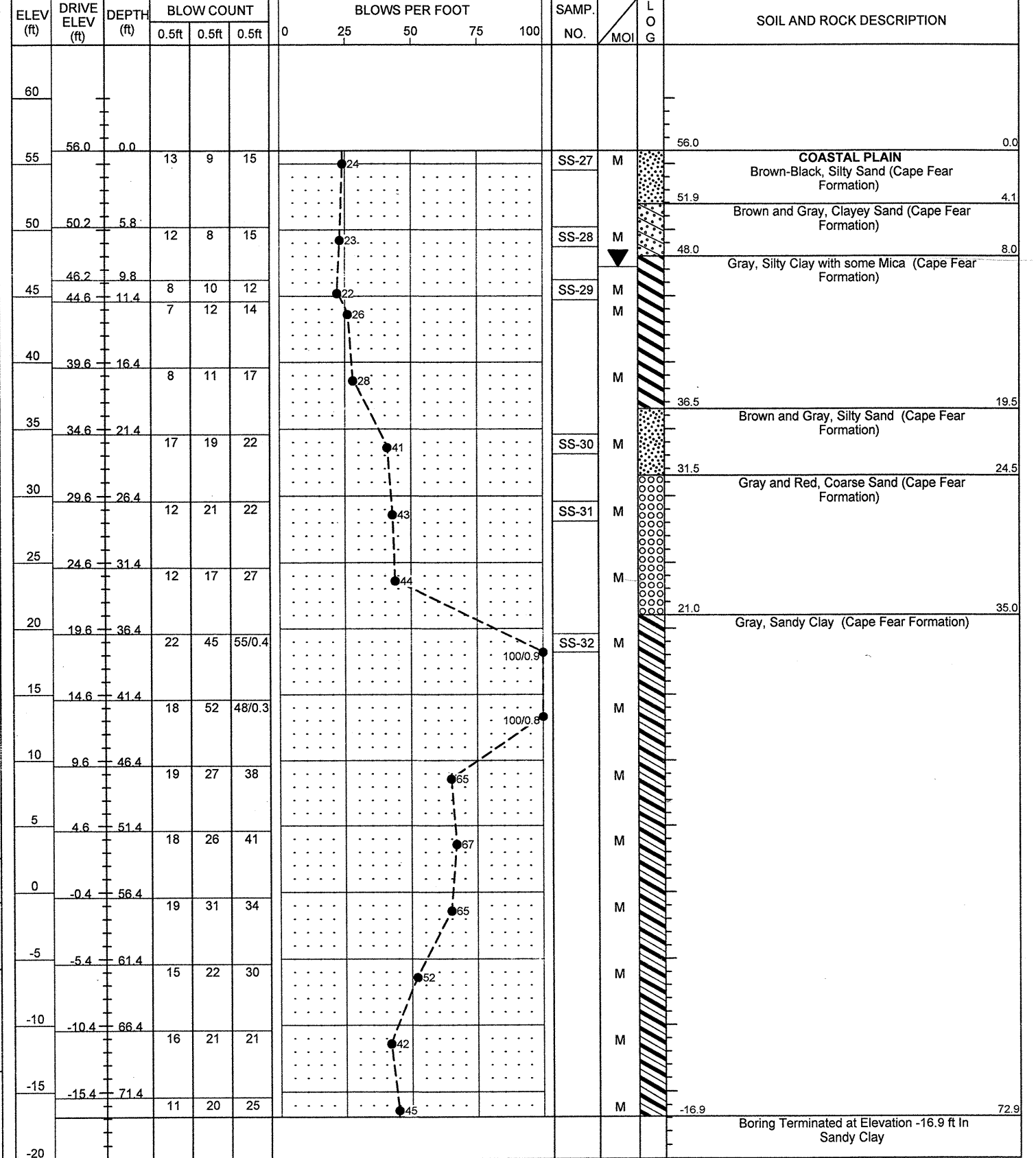
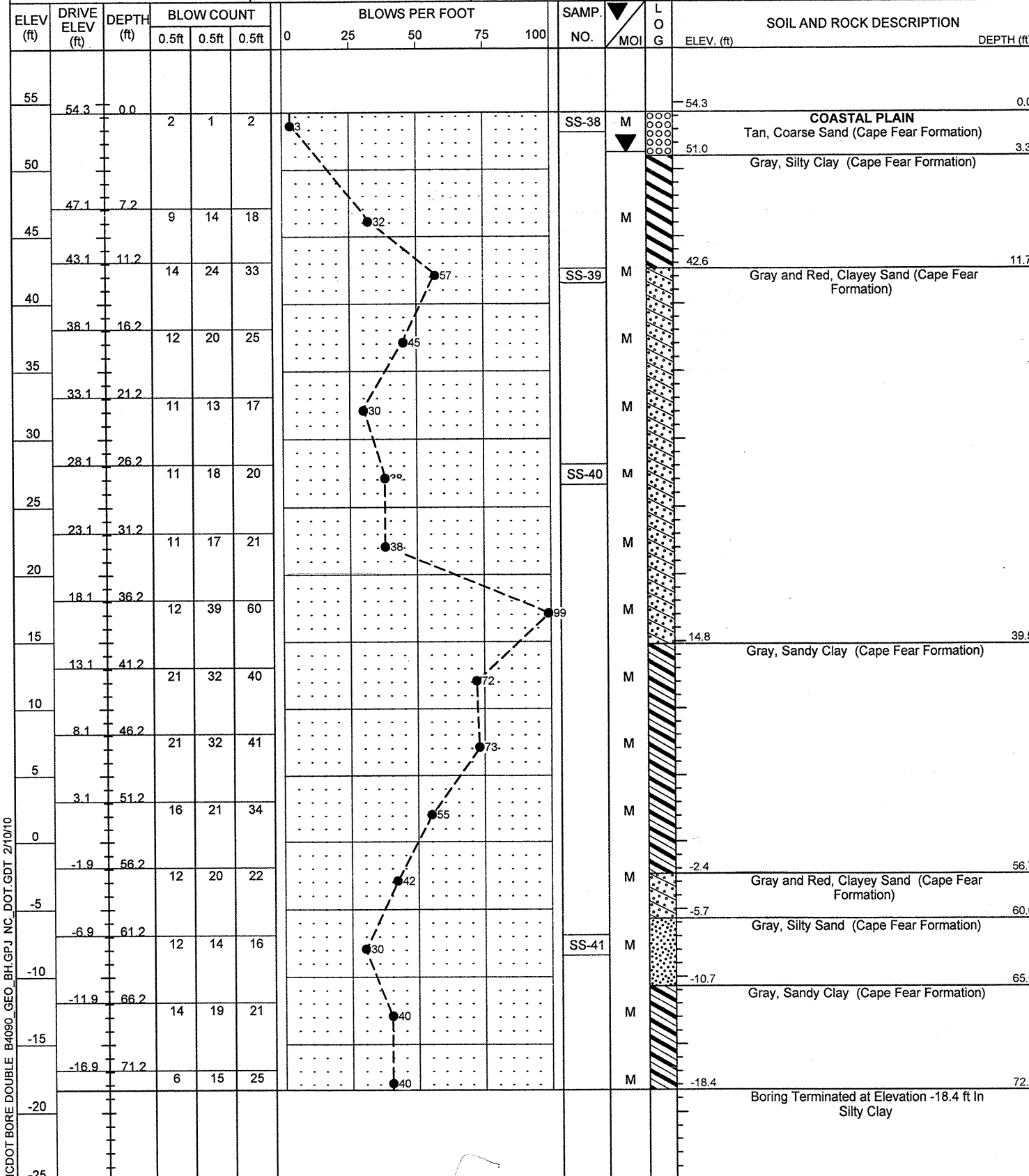


NCDOT GEOTECHNICAL ENGINEERING UNIT

BORELOG REPORT

PROJECT NO. 33448.1.1	ID. B-4090	COUNTY Cumberland	GEOLOGIST Milkovits, J. I.
SITE DESCRIPTION Bridge No. 125 on NC 24-210 over Cross Creek in Fayetteville at -L- Station 18+55			GROUND WTR (ft)
BORING NO. B2-A	STATION 18+93	OFFSET 22 ft LT	ALIGNMENT -L-
COLLAR ELEV. 54.3 ft	TOTAL DEPTH 72.7 ft	NORTHING 475,176	EASTING 2,038,359
DRILL MACHINE CME-550X	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
DRILLER Conley, H. R.	START DATE 01/14/10	COMP. DATE 01/15/10	SURFACE WATER DEPTH N/A

PROJECT NO. 33448.1.1	ID. B-4090	COUNTY Cumberland	GEOLOGIST Milkovits, J. I.
SITE DESCRIPTION Bridge No. 125 on NC 24-210 over Cross Creek in Fayetteville at -L- Station 18+55			GROUND WTR (ft)
BORING NO. B2-B	STATION 18+93	OFFSET 30 ft RT	ALIGNMENT -L-
COLLAR ELEV. 56.0 ft	TOTAL DEPTH 72.9 ft	NORTHING 475,128	EASTING 2,038,339
DRILL MACHINE CME-550X	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
DRILLER Conley, H. R.	START DATE 01/04/10	COMP. DATE 01/06/10	SURFACE WATER DEPTH N/A



ICDOT BORE DOUBLE B4090_GEO_BH.GPJ NC_DOT_GDT 2/10/10

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

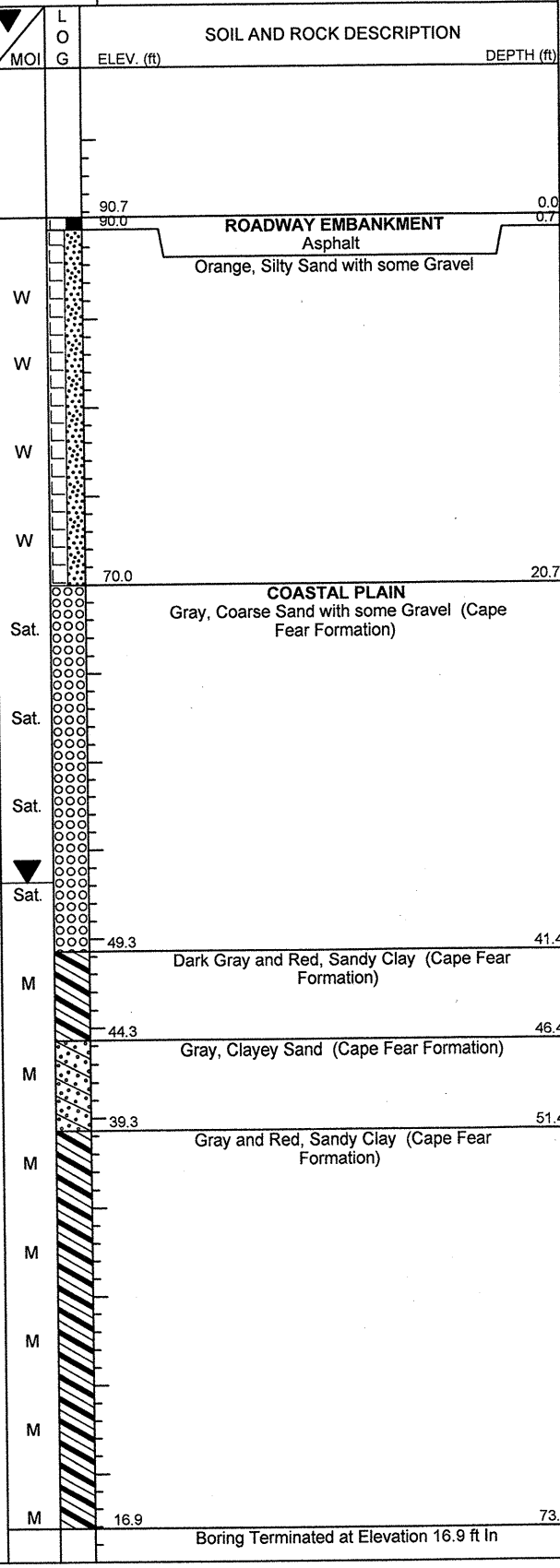
PROJECT NO. 33448.1.1	ID. B-4090	COUNTY Cumberland	GEOLOGIST Mohs, N. D.
SITE DESCRIPTION Bridge No. 125 on NC 24-210 over Cross Creek in Fayetteville at -L- Station 18+55			GROUND WTR (ft)
BORING NO. EB2-A	STATION 19+70	OFFSET 22 ft LT	ALIGNMENT -L-
COLLAR ELEV. 90.7 ft	TOTAL DEPTH 73.8 ft	NORTHING 475,146	EASTING 2,038,430
DRILL MACHINE CME-550X		DRILL METHOD Mud Rotary	
DRILLER Turnage, J. R.		START DATE 01/19/10	
COMP. DATE 01/19/10		SURFACE WATER DEPTH N/A	

PROJECT NO. 33448.1.1	ID. B-4090	COUNTY Cumberland	GEOLOGIST Mohs, N. D.
SITE DESCRIPTION Bridge No. 125 on NC 24-210 over Cross Creek in Fayetteville at -L- Station 18+55			GROUND WTR (ft)
BORING NO. EB2-A	STATION 19+70	OFFSET 22 ft LT	ALIGNMENT -L-
COLLAR ELEV. 90.7 ft	TOTAL DEPTH 73.8 ft	NORTHING 475,146	EASTING 2,038,430
DRILL MACHINE CME-550X		DRILL METHOD Mud Rotary	
DRILLER Turnage, J. R.		START DATE 01/19/10	
COMP. DATE 01/19/10		SURFACE WATER DEPTH N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
95														
90														
87.0	87.0	3.7	3	3	4									
85	83.3	7.4	3	3	3									
80	78.3	12.4	5	7	7									
75	73.3	17.4	3	4	8									
70	68.3	22.4	4	5	4									
65	63.3	27.4	7	9	8									
60	58.3	32.4	6	10	13									
55	53.3	37.4	9	9	12									
50	48.3	42.4	8	14	24									
45	43.3	47.4	7	7	10									
40	38.3	52.4	11	10	23									
35	33.3	57.4	27	31	33									
30	28.3	62.4	17	16	25									
25	23.3	67.4	14	34	54									
20	18.3	72.4	33	47	53/0.4									
15														

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
15														
10														
5														
0														
-5														
-10														
-15														
-20														
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-30														
-35														
-40														
-45														
-50														
-55														
-60														
-65														

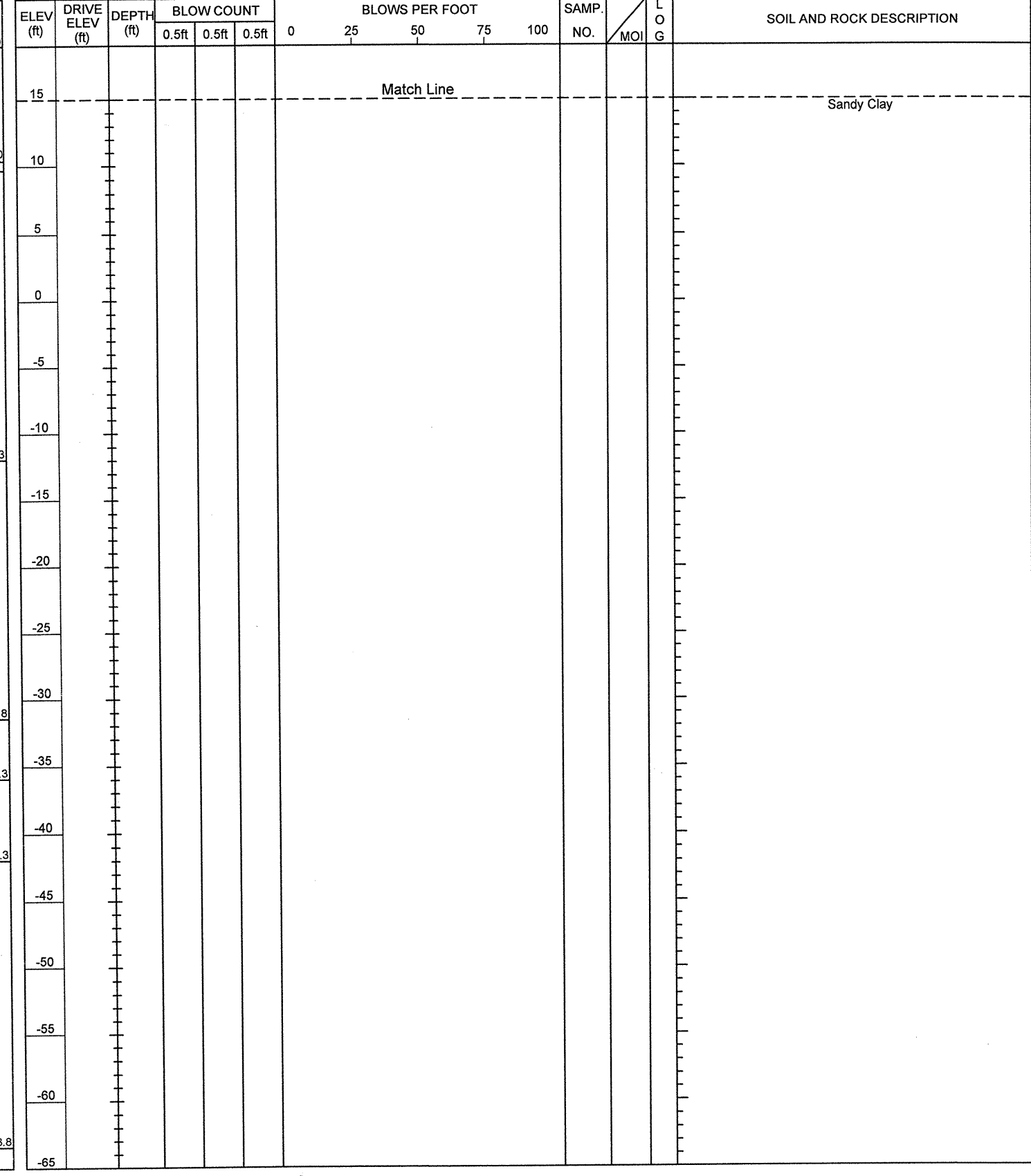
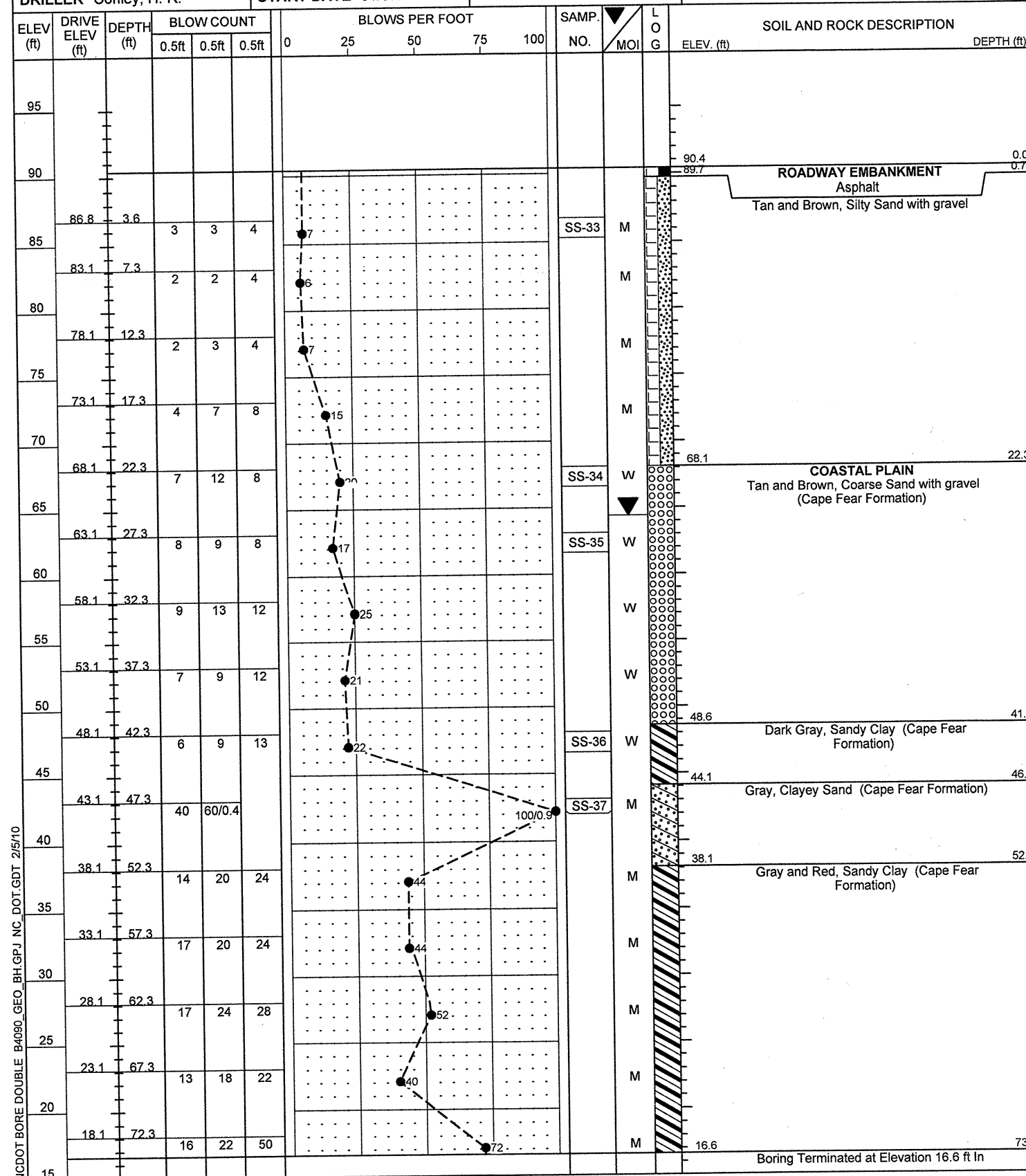
NCDOT BORE DOUBLE B4090_GEO_BH.GPJ NC_DOT.GDT 2/5/10



NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 33448.1.1	ID. B-4090	COUNTY Cumberland	GEOLOGIST Milkovits, J. I.
SITE DESCRIPTION Bridge No. 125 on NC 24-210 over Cross Creek in Fayetteville at -L- Station 18+55			GROUND WTR (ft) 0 HR. N/A 24 HR. 26.0
BORING NO. EB2-B	STATION 19+70	OFFSET 30 ft RT	ALIGNMENT -L-
COLLAR ELEV. 90.4 ft	TOTAL DEPTH 73.8 ft	NORTHING 475,098	EASTING 2,038,410
DRILL MACHINE CME-550X	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
DRILLER Conley, H. R.	START DATE 01/07/10	COMP. DATE 01/07/10	SURFACE WATER DEPTH N/A

PROJECT NO. 33448.1.1	ID. B-4090	COUNTY Cumberland	GEOLOGIST Milkovits, J. I.
SITE DESCRIPTION Bridge No. 125 on NC 24-210 over Cross Creek in Fayetteville at -L- Station 18+55			GROUND WTR (ft) 0 HR. N/A 24 HR. 26.0
BORING NO. EB2-B	STATION 19+70	OFFSET 30 ft RT	ALIGNMENT -L-
COLLAR ELEV. 90.4 ft	TOTAL DEPTH 73.8 ft	NORTHING 475,098	EASTING 2,038,410
DRILL MACHINE CME-550X	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
DRILLER Conley, H. R.	START DATE 01/07/10	COMP. DATE 01/07/10	SURFACE WATER DEPTH N/A



NCDOT BORE DOUBLE B4090 GEO BH.GPJ NC DOT.GDT 2/5/10

EB1-A

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-1	29 RT	17+40	7.6-9.1	A-6(16)	38	21	2.8	22.8	38.0	36.3	100	99	82	-	-
SS-2	29 RT	17+40	12.6-14.1	A-6(8)	35	19	12.6	32.8	20.5	34.0	98	92	60	-	-
SS-3	29 LT	17+40	23.1-24.1	A-4(0)	24	5	17.4	51.7	14.9	16.0	100	98	37	-	-
SS-4	29 LT	17+40	27.6-29.1	A-4(1)	24	8	8.0	44.6	23.3	24.0	97	96	53	-	-
SS-5	29 LT	17+40	32.6-34.1	A-2-4(0)	21	NP	10.2	61.4	14.4	14.0	100	99	35	-	-
SS-6	29 LT	17+40	37.6-39.1	A-2-4(0)	25	7	43.6	31.9	10.4	14.0	80	60	23	-	-
SS-7	29 LT	17+40	42.6-44.1	A-6(7)	40	15	18.0	33.6	38.3	10.0	100	91	57	-	-
SS-8	29 LT	17+40	47.6-49.1	A-2-6(1)	33	16	56.5	17.9	15.6	10.0	98	66	28	-	-
SS-9	29 LT	17+40	57.6-59.1	A-2-6(0)	32	13	51.0	24.4	16.5	8.1	97	72	28	-	-
SS-10	29 LT	17+40	72.6-74.1	A-6(7)	40	22	16.8	39.4	25.7	18.2	100	94	50	-	-

EB1-B

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-19	30 RT	17+40	3.7-5.2	A-6(11)	36	19	12.9	19.4	31.4	36.3	95	88	69	-	-
SS-20	30 RT	17+40	33.7-35.2	A-2-7(2)	43	25	62.7	12.2	2.9	22.2	96	55	25	-	-
SS-21	30 RT	17+40	48.7-50.2	A-2-4(0)	33	3	49.9	29.8	14.2	6.1	99	70	24	-	-
SS-22	30 RT	17+40	68.7-70.2	A-6(10)	37	19	9.7	35.1	41.1	14.1	100	95	66	-	-

B1-A

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-11	28 LT	18+17	0.0-1.5	A-1-b(0)	22	5	54.3	26.8	8.8	10.1	81	49	18	-	-
SS-12	28 LT	18+17	2.8-4.3	A-2-7(2)	45	27	55.4	20.3	3.1	21.2	95	65	24	-	-
SS-13	28 LT	18+17	7.8-9.3	A-6(6)	39	15	19.6	30.7	35.6	14.1	98	86	57	-	-
SS-14	28 LT	18+17	12.6-14.1	A-6(2)	35	14	32.2	35.2	22.5	10.1	99	81	39	-	-
SS-15	28 LT	18+17	22.6-24.1	A-2-6(1)	40	20	59.4	19.3	14.2	7.1	97	56	24	-	-
SS-16	28 LT	18+17	37.6-39.1	A-6(8)	40	16	10.9	37.5	37.4	14.1	95	90	60	-	-
SS-17	28 LT	18+17	57.6-58.5	A-4(2)	26	6	10.9	33.3	47.7	8.1	97	92	63	-	-
SS-18	28 LT	18+17	62.6-64.1	A-2-4(0)	25	NP	25.8	49.7	17.4	7.1	100	93	28	-	-

B1-B

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-23	30 RT	18+17	16.0-17.5	A-2-6(1)	36	15	37.8	32.2	21.9	8.1	97	75	35	-	-
SS-24	30 RT	18+17	31.0-32.5	A-7-6(18)	41	24	3.0	30.3	44.5	22.2	100	98	78	-	-
SS-25	30 RT	18+17	36.0-37.5	A-6(2)	37	13	3.0	63.4	23.5	10.1	100	99	41	-	-
SS-26	30 RT	18+17	66.0-67.5	A-7-6(13)	42	20	3.4	36.3	28.0	32.3	100	98	72	-	-

B2-A

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-38	22 LT	18+93	0.0-1.5	A-1-b(0)	19	NP	78.6	12.8	5.5	3.1	78	29	8	-	-
SS-39	22 LT	18+93	11.7-12.7	A-2-6(0)	30	12	48.4	19.7	18.7	13.3	97	70	34	-	-
SS-40	22 LT	18+93	26.2-27.7	A-2-5(0)	42	NP	55.2	27.5	13.1	4.1	94	57	20	-	-
SS-41	22 LT	18+93	61.2-62.7	A-2-4(0)	28	NP	53.6	23.9	16.4	6.1	100	77	27	-	-

B2-B

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-27	30 RT	18+93	0.0-1.5	A-2-4(0)	23	NP	43.4	38.9	9.5	8.2	72	55	15	-	-
SS-28	30 RT	18+93	5.8-7.3	A-2-7(1)	48	30	67.7	13.3	7.8	11.2	94	45	20	-	-
SS-29	30 RT	18+93	9.8-11.3	A-7-6(15)	45	21	8.2	25.5	48.0	18.3	100	96	74	-	-
SS-30	30 RT	18+93	21.4-22.9	A-2-4(0)	34	NP	60.8	25.2	10.0	4.1	100	74	17	-	-
SS-31	30 RT	18+93	26.4-27.9	A-1-b(0)	41	NP	61.7	20.2	14.1	4.1	86	46	19	-	-
SS-32	30 RT	18+93	36.4-37.9	A-6(9)	35	20	17.3	29.8	40.7	12.2	100	93	59	-	-

EB2-B

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-33	30 RT	19+70	3.6-5.1	A-2-4(0)	23	7	43.3	28.2	12.1	16.3	78	59	24	-	-
SS-34	30 RT	19+70	22.3-23.8	A-1-b(0)	20	NP	77.1	14.3	2.5	6.1	67	29	7	-	-
SS-35	30 RT	19+70	27.3-28.8	A-1-b(0)	19	NP	72.7	16.2	7.0	4.1	84	39	11	-	-
SS-36	30 RT	19+70	42.3-43.8	A-6(6)	31	15	22.0	26.1	39.7	12.2	96	83	57	-	-
SS-37	30 RT	19+70	47.3-48.8	A-2-6(0)	31	11	43.8	22.9	19.0	14.3	97	69	35	-	-



FIELD SCOUR REPORT

WBS: 33448.1.1 TIP: B-4090 COUNTY: Cumberland

DESCRIPTION(1): Bridge No. 125 on NC 24-210 over Cross Creek in Fayetteville at -L- Sta. 18+55

EXISTING BRIDGE

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

Bridge No.: 125 Length: 201' Total Bents: 6 Bents in Channel: 2 Bents in Floodplain: 4
 Foundation Type: End Bents #1 & #2 and Bents #1 & #4 are piles, Bents #2 & #3 are footings.

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: None

Interior Bents: Local scour at all piers in channel.

Channel Bed: None observed.

Channel Bank: Some erosion of banks during high water.

EXISTING SCOUR PROTECTION

Type(3): Abutment walls

Extent(4): Walls at end bents.

Effectiveness(5): Effective

Obstructions(6): None

INSTRUCTIONS

- Describe the specific site's location, including route number and body of water crossed.
- Note scour evidence at existing end bents or abutments (e.g. undermining, sloughing, degradations).
- Note existing scour protection (e.g. rip rap).
- Describe extent of existing scour protection.
- Describe whether or not the scour protection appears to be working.
- Note obstructions such as dams, fallen trees, debris at bents, etc.
- Describe the channel bed material based on observation and/or samples. Include any lab results with report.
- Describe the channel bank material based on observation and/or samples. Include any lab results with report.
- Describe the material covering the banks (e.g. grass, trees, rip rap, none).
- Determine the approximate floodplain width from field observation or a topographic map.
- Describe the material covering the floodplain (e.g. grass, trees, crops).
- Use professional judgement to specify if the stream is degrading, aggrading, or static.
- Describe potential and direction of the stream to migrate laterally during the bridge's life (approx. 100 years).
- 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): See Sample SS-38

Channel Bank Material(8): See Samples SS-1-5, 11, 12, 19, 33, 38

Channel Bank Cover(9): Grass, brush, large and small trees.

Floodplain Width(10): Approximately 100 feet

Floodplain Cover(11): Wetland forest

Stream is(12): Aggrading Degrading _____ Static _____

Channel Migration Tendency(13): To the southeast, EB2.

Observations and Other Comments: Current creek channel was excavated in 1950. A large amount of trash is present under the bridge deck, near the end bent walls from former and current homeless population.

DESIGN SCOUR ELEVATIONS(14)

Feet Meters _____

BENTS

B1	B2												
48.4	46.6												

Comparison of DSE to Hydraulics Unit theoretical scour:
 Based on the geologic conditions at the site, the Geotechnical Engineering Unit and the Hydraulics Unit agree that the DSE should be raised from the theoretical scour elevation proposed in the Hydraulics Report dated 9/9/09.

SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL

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

Reported by:

Joseph J. Milkovits, Jr.
 J. Milkovits, Jr., Nathan Mohs

Date: 1/15/2010

Site Photograph

Bridge No. 125 over Cross Creek on NC 24-210 in Fayetteville at -L- Station 18+55



Looking East toward End Bent 2

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	33448.1.1 (B-4090)	1	4

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

STRUCTURE
SUBSURFACE INVESTIGATION

CONTENTS

<u>SHEET</u>	<u>DESCRIPTION</u>
1	TITLE SHEET
2	LEGEND
3	WALL 1 & WALL 2 SITE PLAN & PROFILE
4	WALL 3 SITE PLAN & PROFILE

PROJ. REFERENCE NO. 33448.1.1 F.A. PROJ. BRSTP-24(17)
COUNTY CUMBERLAND
PROJECT DESCRIPTION REPLACEMENT OF BRIDGE NO. 125
ON NC 24 (GROVE ST.) OVER CROSS CREEK

SITE DESCRIPTION RETAINING WALL 1 RIGHT OF -L- STA. 16+50
RETAINING WALL 2 RIGHT OF -L- STA. 20+00
RETAINING WALL 3 LEFT OF -L- STA. 20+00
RETAINING WALL

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING, AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT 1919 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE PART OF THE CONTRACT.

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

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

PROJECT: 33448.1.1 ID: B-4090

PERSONNEL

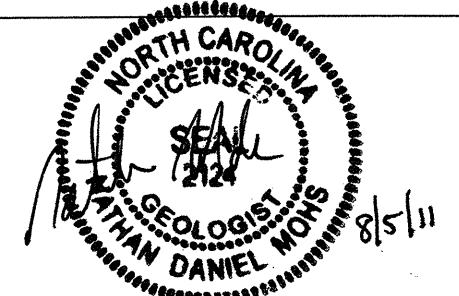
N.D. MOHS
J.I. MILKOVITS
H.R. CONLEY
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J.R. MATULA
J.R. TURNAGE
D.W. DIXON

INVESTIGATED BY N.D. MOHS

CHECKED BY N.T. ROBERSON

SUBMITTED BY N.T. ROBERSON

DATE AUGUST 2011



DRAWN BY: N.D. MOHS

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

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





NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

PROJECT REFERENCE NO. 33448.11(B-4090) SHEET NO. 2

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, ANGLULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE: <i>VERY STIFF, GRAY SILTY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HIGH PLASTIC, A-7-6</i>	WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED) GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES. ANGULARITY OF GRAINS THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: <u>ANGULAR</u> , <u>SUBANGULAR</u> , <u>SUBROUNDED</u> , OR <u>ROUNDED</u> .	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:  NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.  FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.  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 SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. AQUIFER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL. FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS IN OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. STRATA CORE RECOVERY (SREC.) - 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-3, A-2, A-4, A-5, A-6, A-7, A-1, A-2, A-3, A-4, A-5, A-6, A-7 SYMBOL % PASSING: 10, 40, 200 LIQUID LIMIT PLASTIC INDEX GROUP INDEX USUAL TYPES OF MAJOR MATERIALS GEN. RATING AS A SUBGRADE	MINERALOGICAL COMPOSITION MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE. COMPRESSIBILITY SLIGHTLY COMPRESSIBLE MODERATELY COMPRESSIBLE HIGHLY COMPRESSIBLE 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	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. <i>IF TESTED, WOULD YIELD SPT REFUSAL</i> SEVERE (SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. <i>IF TESTED, YIELDS SPT N VALUES > 100 BPF</i> VERY SEVERE (V SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. <i>IF TESTED, YIELDS SPT N VALUES < 100 BPF</i> COMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.	WEATHERED ROCK (WR) CRYSTALLINE ROCK (CR) NON-CRYSTALLINE ROCK (NCR) COASTAL PLAIN SEDIMENTARY ROCK (CPS)
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-COHESIVE) VERY LOOSE, LOOSE, MEDIUM DENSE, DENSE, VERY DENSE GENERALLY SILT-CLAY MATERIAL (COHESIVE) 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 TEST BORING WITH CORE AUGER BORING CORE BORING MONITORING WELL PIEZOMETER INSTALLATION SLOPE INDICATOR INSTALLATION CONE PENETROMETER TEST SOUNDING ROD	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 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 FINGERNAIL.	FORMATION (FM.) JOINT LEDGE LENS MOTTLED (MOT.) PERCHED WATER RESIDUAL (RES.) SOIL ROCK QUALITY DESIGNATION (RQD) SAPROLITE (SAP.) SILL SLICKENSIDE STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) STRATA CORE RECOVERY (SREC.) STRATA ROCK QUALITY DESIGNATION (SRQD) TOPSOIL (TS.)
TEXTURE OR GRAIN SIZE U.S. STD. SIEVE SIZE OPENING (MM) 4, 10, 40, 60, 200, 270 BOULDER (BLDR.), COBBLE (COB.), GRAVEL (GR.), COARSE SAND (CSE. SD.), FINE SAND (F. SD.), SILT (SL.), CLAY (CL.) GRAIN SIZE MM 305, 75, 2.0, 0.25, 0.075, 0.005	ABBREVIATIONS AR - AUGER REFUSAL BT - BORING TERMINATED CL - CLAY CPT - CONE PENETRATION TEST CSE - COARSE DMT - DILATOMETER TEST DPT - DYNAMIC PENETRATION TEST e - VOID RATIO F - FINE FOSS. - FOSSILIFEROUS FRAC. - FRACTURED, FRACTURES FRAGS. - FRAGMENTS HI. - HIGHLY MED. - MEDIUM MICA - MICACEOUS MOD. - MODERATELY NP - NON PLASTIC ORG. - ORGANIC PMT - PRESSUREMETER TEST SAP. - SAPROLITIC SD. - SAND, SANDY SL. - SILT, SILTY SLI. - SLIGHTLY TCR - TRICONE REFUSAL w - MOISTURE CONTENT V - VERY VST - VANE SHEAR TEST WEA. - WEATHERED UNIT WEIGHT DRY UNIT WEIGHT SAMPLE ABBREVIATIONS S - BULK SS - SPLIT SPOON ST - SHELBY TUBE RS - ROCK RT - RECOMPACTED TRIAXIAL CBR - CALIFORNIA BEARING RATIO	ROCK HARDNESS VERY HARD HARD MODERATELY HARD MEDIUM HARD SOFT VERY SOFT	FORMATION (FM.) JOINT LEDGE LENS MOTTLED (MOT.) PERCHED WATER RESIDUAL (RES.) SOIL ROCK QUALITY DESIGNATION (RQD) SAPROLITE (SAP.) SILL SLICKENSIDE STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) STRATA CORE RECOVERY (SREC.) STRATA ROCK QUALITY DESIGNATION (SRQD) TOPSOIL (TS.)
SOIL MOISTURE - CORRELATION OF TERMS SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION LL - LIQUID LIMIT - SATURATED - (SAT.) USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE PL - PLASTIC LIMIT - WET - (W) SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE OM - OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE SL - SHRINKAGE LIMIT - DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE	EQUIPMENT USED ON SUBJECT PROJECT DRILL UNITS: MOBILE B-51, BK-51, CME-45C, CME-550, PORTABLE HOIST ADVANCING TOOLS: CLAY BITS, 6" CONTINUOUS FLIGHT AUGER, 8" HOLLOW AUGERS, HARD FACED FINGER BITS, TUNG-CARBIDE INSERTS, CASING w/ ADVANCER, TRICONE STEEL TEETH, TRICONE TUNG-CARB., CORE BIT HAMMER TYPE: AUTOMATIC, MANUAL CORE SIZE: B, N, H HAND TOOLS: POST HOLE DIGGER, HAND AUGER, SOUNDING ROD, VANE SHEAR TEST	ROCK HARDNESS VERY HARD HARD MODERATELY HARD MEDIUM HARD SOFT VERY SOFT	FORMATION (FM.) JOINT LEDGE LENS MOTTLED (MOT.) PERCHED WATER RESIDUAL (RES.) SOIL ROCK QUALITY DESIGNATION (RQD) SAPROLITE (SAP.) SILL SLICKENSIDE STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) STRATA CORE RECOVERY (SREC.) STRATA ROCK QUALITY DESIGNATION (SRQD) TOPSOIL (TS.)
PLASTICITY NONPLASTIC, LOW PLASTICITY, MED. PLASTICITY, HIGH PLASTICITY PLASTICITY INDEX (PI) DRY STRENGTH VERY LOW, SLIGHT, MEDIUM, HIGH	FRACTURE SPACING TERM SPACING VERY WIDE MORE THAN 10 FEET WIDE 3 TO 10 FEET MODERATELY CLOSE 1 TO 3 FEET CLOSE 0.6 TO 1 FEET VERY CLOSE LESS THAN 0.6 FEET	ROCK HARDNESS VERY HARD HARD MODERATELY HARD MEDIUM HARD SOFT VERY SOFT	FORMATION (FM.) JOINT LEDGE LENS MOTTLED (MOT.) PERCHED WATER RESIDUAL (RES.) SOIL ROCK QUALITY DESIGNATION (RQD) SAPROLITE (SAP.) SILL SLICKENSIDE STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) STRATA CORE RECOVERY (SREC.) STRATA ROCK QUALITY DESIGNATION (SRQD) TOPSOIL (TS.)
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.	FRACTURE SPACING VERY WIDE WIDE MODERATELY CLOSE CLOSE VERY CLOSE	ROCK HARDNESS VERY HARD HARD MODERATELY HARD MEDIUM HARD SOFT VERY SOFT	FORMATION (FM.) JOINT LEDGE LENS MOTTLED (MOT.) PERCHED WATER RESIDUAL (RES.) SOIL ROCK QUALITY DESIGNATION (RQD) SAPROLITE (SAP.) SILL SLICKENSIDE STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) STRATA CORE RECOVERY (SREC.) STRATA ROCK QUALITY DESIGNATION (SRQD) TOPSOIL (TS.)
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