

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

**STRUCTURE**  
**SUBSURFACE INVESTIGATION**

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PROJ. REFERENCE NO. 38580.1.1 (B-4810) F.A. PROJ. BRZ-1547(7)  
 COUNTY ROWAN  
 PROJECT DESCRIPTION BRIDGE NO. 12 OVER BACK CREEK  
ON SR 1547 (GRAHAM RD.) BETWEEN NC 801 AND SR 1765

SITE DESCRIPTION \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**CAUTION NOTICE**

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

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

PERSONNEL

J.K. STICKNEY

M.L. SMITH

C.L. SMITH

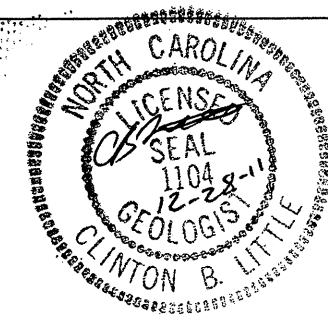
A.G. SMITH

INVESTIGATED BY J.E. BEVERLY

CHECKED BY C.B. LITTLE

SUBMITTED BY C.B. LITTLE

DATE DECEMBER 2011



**PROJECT: 38580.1.1**  
**ID: B-4810**

DRAWN BY: J.K. McCLURE

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.

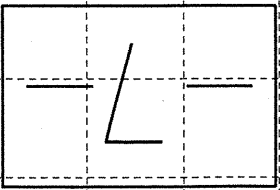
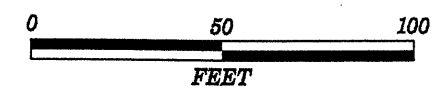
**NORTH CAROLINA DEPARTMENT OF TRANSPORTATION**  
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## SUBSURFACE INVESTIGATION

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

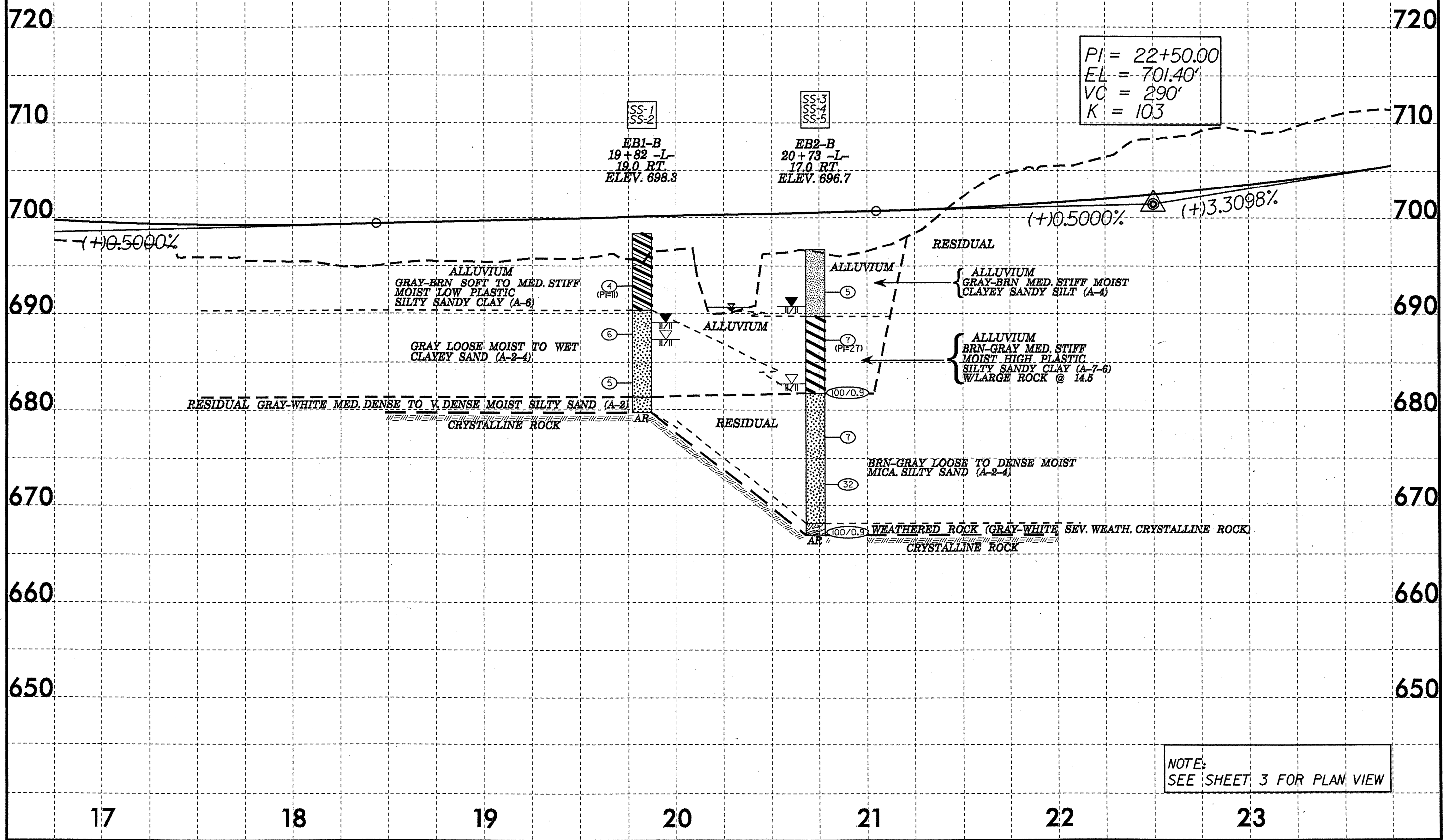
SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS																																																																																																																																					
<p>SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLES:</p> <p style="text-align: center;"><i>VERY STIFF, GRANULY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</i></p>	<p><b>WELL GRADED</b> - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. <b>UNIFORM</b> - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)</p> <p><b>POORLY GRADED</b></p> <p><b>GAP-GRADED</b> - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.</p> <p style="text-align: center;"><b>ANGULARITY OF GRAINS</b></p> <p>THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: <b>ANGULAR</b>, <b>SUBANGULAR</b>, <b>SUBROUNDED</b>, OR <b>ROUNDED</b>.</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.</p> <p>ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:</p> <p><b>WEATHERED ROCK (WR)</b></p> <p><b>CRYSTALLINE ROCK (CR)</b></p> <p><b>NON-CRYSTALLINE ROCK (NCR)</b></p> <p><b>COASTAL PLAIN SEDIMENTARY ROCK (CP)</b></p>	<p><b>ALLUVIUM (ALLUV.)</b> - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.</p> <p><b>AQUIFER</b> - A WATER BEARING FORMATION OR STRATA.</p> <p><b>ARENACEOUS</b> - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.</p> <p><b>ARGILLACEOUS</b> - 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><b>ARTESIAN</b> - 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><b>CALCAREOUS (CALC.)</b> - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.</p> <p><b>COLLUVIUM</b> - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.</p> <p><b>CORE RECOVERY (REC.)</b> - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.</p> <p><b>DIKE</b> - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.</p> <p><b>DIP</b> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.</p> <p><b>DIP DIRECTION (DIP AZIMUTH)</b> - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.</p> <p><b>FAULT</b> - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.</p> <p><b>FISSILE</b> - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.</p> <p><b>FLOAT</b> - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.</p> <p><b>FLOOD PLAIN (FP)</b> - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.</p> <p><b>FORMATION (FM)</b> - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.</p> <p><b>JOINT</b> - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.</p> <p><b>LEDGE</b> - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.</p> <p><b>LENS</b> - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.</p> <p><b>MOTTLED (MOT.)</b> - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.</p> <p><b>PERCHED WATER</b> - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIORUS STRATUM.</p> <p><b>RESIDUAL (RES.) SOIL</b> - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.</p> <p><b>ROCK QUALITY DESIGNATION (RQD)</b> - 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><b>SAPROLITE (SAP.)</b> - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.</p> <p><b>SILL</b> - 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.</p> <p><b>SLICKENSIDE</b> - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.</p> <p><b>STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT)</b> - 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><b>STRATA CORE RECOVERY (SCRC)</b> - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.</p> <p><b>STRATA ROCK QUALITY DESIGNATION (SRQD)</b> - 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><b>TOPSOIL (TS.)</b> - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p>																																																																																																																																					
<p style="text-align: center;"><b>SOIL LEGEND AND AASHTO CLASSIFICATION</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>GENERAL CLASS.</th> <th>GRANULAR MATERIALS (&lt;= 35% PASSING #200)</th> <th>SILT-CLAY MATERIALS (&gt; 35% PASSING #200)</th> <th>ORGANIC MATERIALS</th> </tr> <tr> <td>GROUP CLASS.</td> <td>A-1, A-1-b, A-3, A-2-4, A-2-5, A-2-6, A-2-7</td> <td>A-4, A-5, A-6, A-7, A-7-a, A-7-b</td> <td>A-1, A-2, A-3, A-4, A-5, A-6, A-7</td> </tr> <tr> <td>SYMBOL</td> <td></td> <td></td> <td></td> </tr> <tr> <td>% PASSING</td> <td>50 MX, 30 MX, 15 MX, 10 MX, 5 MM, 15 MM, 30 MM, 60 MM, 100 MM, 200 MM</td> <td>40 MX, 41 MN, 10 MX, 10 MN, 11 MN, 12 MN, 13 MN, 14 MN, 15 MN, 16 MN, 17 MN, 18 MN, 19 MN, 20 MN, 21 MN, 22 MN, 23 MN, 24 MN, 25 MN, 26 MN, 27 MN, 28 MN, 29 MN, 30 MN, 31 MN, 32 MN, 33 MN, 34 MN, 35 MN, 36 MN, 37 MN, 38 MN, 39 MN, 40 MN, 41 MN, 42 MN, 43 MN, 44 MN, 45 MN, 46 MN, 47 MN, 48 MN, 49 MN, 50 MN, 51 MN, 52 MN, 53 MN, 54 MN, 55 MN, 56 MN, 57 MN, 58 MN, 59 MN, 60 MN, 61 MN, 62 MN, 63 MN, 64 MN, 65 MN, 66 MN, 67 MN, 68 MN, 69 MN, 70 MN, 71 MN, 72 MN, 73 MN, 74 MN, 75 MN, 76 MN, 77 MN, 78 MN, 79 MN, 80 MN, 81 MN, 82 MN, 83 MN, 84 MN, 85 MN, 86 MN, 87 MN, 88 MN, 89 MN, 90 MN, 91 MN, 92 MN, 93 MN, 94 MN, 95 MN, 96 MN, 97 MN, 98 MN, 99 MN, 100 MN</td> <td>GRANULAR SOILS, SILT-CLAY SOILS, MUCK, PEAT</td> </tr> <tr> <td>LIQUID LIMIT PLASTIC INDEX</td> <td>6 MX</td> <td>NP, 10 MX, 11 MN, 12 MN, 13 MN, 14 MN, 15 MN, 16 MN, 17 MN, 18 MN, 19 MN, 20 MN, 21 MN, 22 MN, 23 MN, 24 MN, 25 MN, 26 MN, 27 MN, 28 MN, 29 MN, 30 MN, 31 MN, 32 MN, 33 MN, 34 MN, 35 MN, 36 MN, 37 MN, 38 MN, 39 MN, 40 MN, 41 MN, 42 MN, 43 MN, 44 MN, 45 MN, 46 MN, 47 MN, 48 MN, 49 MN, 50 MN, 51 MN, 52 MN, 53 MN, 54 MN, 55 MN, 56 MN, 57 MN, 58 MN, 59 MN, 60 MN, 61 MN, 62 MN, 63 MN, 64 MN, 65 MN, 66 MN, 67 MN, 68 MN, 69 MN, 70 MN, 71 MN, 72 MN, 73 MN, 74 MN, 75 MN, 76 MN, 77 MN, 78 MN, 79 MN, 80 MN, 81 MN, 82 MN, 83 MN, 84 MN, 85 MN, 86 MN, 87 MN, 88 MN, 89 MN, 90 MN, 91 MN, 92 MN, 93 MN, 94 MN, 95 MN, 96 MN, 97 MN, 98 MN, 99 MN, 100 MN</td> <td>SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER, HIGHLY ORGANIC SOILS</td> </tr> <tr> <td>GROUP INDEX</td> <td>0</td> <td>0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100</td> <td></td> </tr> <tr> <td>USUAL TYPES OF MAJOR MATERIALS</td> <td>STONE FRAGS, GRAVEL, SAND</td> <td>FINE SAND, SILTY OR CLAYEY GRAVEL AND SAND</td> <td>SILTY SOILS, CLAYEY SOILS</td> </tr> <tr> <td>GEN. RATING AS A SUBGRADE</td> <td>EXCELLENT TO GOOD</td> <td>FAIR TO POOR</td> <td>FAIR TO POOR, POOR, UNSUITABLE</td> </tr> </table> <p style="text-align: center;">PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS &gt; LL - 30</p>	GENERAL CLASS.	GRANULAR MATERIALS (<= 35% PASSING #200)	SILT-CLAY MATERIALS (> 35% PASSING #200)	ORGANIC MATERIALS	GROUP CLASS.	A-1, A-1-b, A-3, A-2-4, A-2-5, A-2-6, A-2-7	A-4, A-5, A-6, A-7, A-7-a, A-7-b	A-1, A-2, A-3, A-4, A-5, A-6, A-7	SYMBOL				% PASSING	50 MX, 30 MX, 15 MX, 10 MX, 5 MM, 15 MM, 30 MM, 60 MM, 100 MM, 200 MM	40 MX, 41 MN, 10 MX, 10 MN, 11 MN, 12 MN, 13 MN, 14 MN, 15 MN, 16 MN, 17 MN, 18 MN, 19 MN, 20 MN, 21 MN, 22 MN, 23 MN, 24 MN, 25 MN, 26 MN, 27 MN, 28 MN, 29 MN, 30 MN, 31 MN, 32 MN, 33 MN, 34 MN, 35 MN, 36 MN, 37 MN, 38 MN, 39 MN, 40 MN, 41 MN, 42 MN, 43 MN, 44 MN, 45 MN, 46 MN, 47 MN, 48 MN, 49 MN, 50 MN, 51 MN, 52 MN, 53 MN, 54 MN, 55 MN, 56 MN, 57 MN, 58 MN, 59 MN, 60 MN, 61 MN, 62 MN, 63 MN, 64 MN, 65 MN, 66 MN, 67 MN, 68 MN, 69 MN, 70 MN, 71 MN, 72 MN, 73 MN, 74 MN, 75 MN, 76 MN, 77 MN, 78 MN, 79 MN, 80 MN, 81 MN, 82 MN, 83 MN, 84 MN, 85 MN, 86 MN, 87 MN, 88 MN, 89 MN, 90 MN, 91 MN, 92 MN, 93 MN, 94 MN, 95 MN, 96 MN, 97 MN, 98 MN, 99 MN, 100 MN	GRANULAR SOILS, SILT-CLAY SOILS, MUCK, PEAT	LIQUID LIMIT PLASTIC INDEX	6 MX	NP, 10 MX, 11 MN, 12 MN, 13 MN, 14 MN, 15 MN, 16 MN, 17 MN, 18 MN, 19 MN, 20 MN, 21 MN, 22 MN, 23 MN, 24 MN, 25 MN, 26 MN, 27 MN, 28 MN, 29 MN, 30 MN, 31 MN, 32 MN, 33 MN, 34 MN, 35 MN, 36 MN, 37 MN, 38 MN, 39 MN, 40 MN, 41 MN, 42 MN, 43 MN, 44 MN, 45 MN, 46 MN, 47 MN, 48 MN, 49 MN, 50 MN, 51 MN, 52 MN, 53 MN, 54 MN, 55 MN, 56 MN, 57 MN, 58 MN, 59 MN, 60 MN, 61 MN, 62 MN, 63 MN, 64 MN, 65 MN, 66 MN, 67 MN, 68 MN, 69 MN, 70 MN, 71 MN, 72 MN, 73 MN, 74 MN, 75 MN, 76 MN, 77 MN, 78 MN, 79 MN, 80 MN, 81 MN, 82 MN, 83 MN, 84 MN, 85 MN, 86 MN, 87 MN, 88 MN, 89 MN, 90 MN, 91 MN, 92 MN, 93 MN, 94 MN, 95 MN, 96 MN, 97 MN, 98 MN, 99 MN, 100 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER, HIGHLY ORGANIC SOILS	GROUP INDEX	0	0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100		USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS, GRAVEL, SAND	FINE SAND, SILTY OR CLAYEY GRAVEL AND SAND	SILTY SOILS, CLAYEY SOILS	GEN. RATING AS A SUBGRADE	EXCELLENT TO GOOD	FAIR TO POOR	FAIR TO POOR, POOR, UNSUITABLE	<p style="text-align: center;"><b>MINERALOGICAL COMPOSITION</b></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;"><b>COMPRESSIBILITY</b></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;"><b>PERCENTAGE OF MATERIAL</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>ORGANIC MATERIAL</th> <th>GRANULAR SOILS</th> <th>SILT - CLAY SOILS</th> <th>OTHER MATERIAL</th> </tr> <tr> <td>TRACE OF ORGANIC MATTER</td> <td>2 - 3%</td> <td>3 - 5%</td> <td>TRACE</td> </tr> <tr> <td>LITTLE ORGANIC MATTER</td> <td>3 - 5%</td> <td>5 - 12%</td> <td>LITTLE</td> </tr> <tr> <td>MODERATELY ORGANIC</td> <td>5 - 10%</td> <td>12 - 20%</td> <td>SOME</td> </tr> <tr> <td>HIGHLY ORGANIC</td> <td>&gt;10%</td> <td>&gt;20%</td> <td>HIGHLY</td> </tr> <tr> <td></td> <td></td> <td></td> <td>35% AND ABOVE</td> </tr> </table> <p style="text-align: center;"><b>GROUND WATER</b></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>	ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL	TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE	LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE	MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME	HIGHLY ORGANIC	>10%	>20%	HIGHLY				35% AND ABOVE	<p style="text-align: center;"><b>WEATHERING</b></p> <p><b>FRESH</b> ROCK FRESH, CRYSTALLINE BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.</p> <p><b>VERY SLIGHT (V SL.)</b> 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><b>SLIGHT (SL.)</b> 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><b>MODERATE (MOD.)</b> 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><b>MODERATELY SEVERE (MOD. SEV.)</b> 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><b>SEVERE (SEV.)</b> ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. <i>IF TESTED, YIELDS SPT N VALUES &gt; 100 BPF</i></p> <p><b>VERY SEVERE (V SEV.)</b> ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. <i>IF TESTED, YIELDS SPT N VALUES &lt; 100 BPF</i></p> <p><b>COMPLETE</b> 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;"><b>ROCK HARDNESS</b></p> <p><b>VERY HARD</b> CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.</p> <p><b>HARD</b> CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.</p> <p><b>MODERATELY HARD</b> 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><b>MEDIUM HARD</b> 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.</p> <p><b>SOFT</b> 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.</p> <p><b>VERY SOFT</b> 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.</p>	<p style="text-align: center;"><b>CONSISTENCY OR DENSENESS</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>PRIMARY SOIL TYPE</th> <th>COMPACTNESS OR CONSISTENCY</th> <th>RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)</th> <th>RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT<sup>2</sup>)</th> </tr> <tr> <td>GENERALLY GRANULAR MATERIAL (NON-COHESIVE)</td> <td>VERY LOOSE, LOOSE, MEDIUM DENSE, DENSE, VERY DENSE</td> <td>&lt;4, 4 TO 10, 10 TO 30, 30 TO 50, &gt;50</td> <td>N/A</td> </tr> <tr> <td>GENERALLY SILT-CLAY MATERIAL (COHESIVE)</td> <td>VERY SOFT, SOFT, MEDIUM STIFF, STIFF, VERY STIFF, HARD</td> <td>&lt;2, 2 TO 4, 4 TO 8, 8 TO 15, 15 TO 30, &gt;30</td> <td>&lt;0.25, 0.25 TO 0.50, 0.5 TO 1.0, 1 TO 2, 2 TO 4, &gt;4</td> </tr> </table> <p style="text-align: center;"><b>TEXTURE OR GRAIN SIZE</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>U.S. STD. 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GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.</p> <p><b>MODERATELY INDURATED</b> GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.</p> <p><b>INDURATED</b> GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.</p> <p><b>EXTREMELY INDURATED</b> SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</p>	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	<p style="text-align: center;"><b>NOTES:</b></p> <p>Profile &amp; Cross-Section stratigraphy is through the borings.</p>																																																																																																										
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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																																																																																																																																							



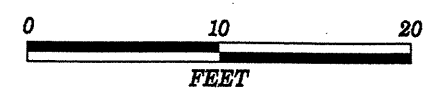


BM#1  
-L- Sta. 20+45.49, 143.99'  
ELEV = 700.05'

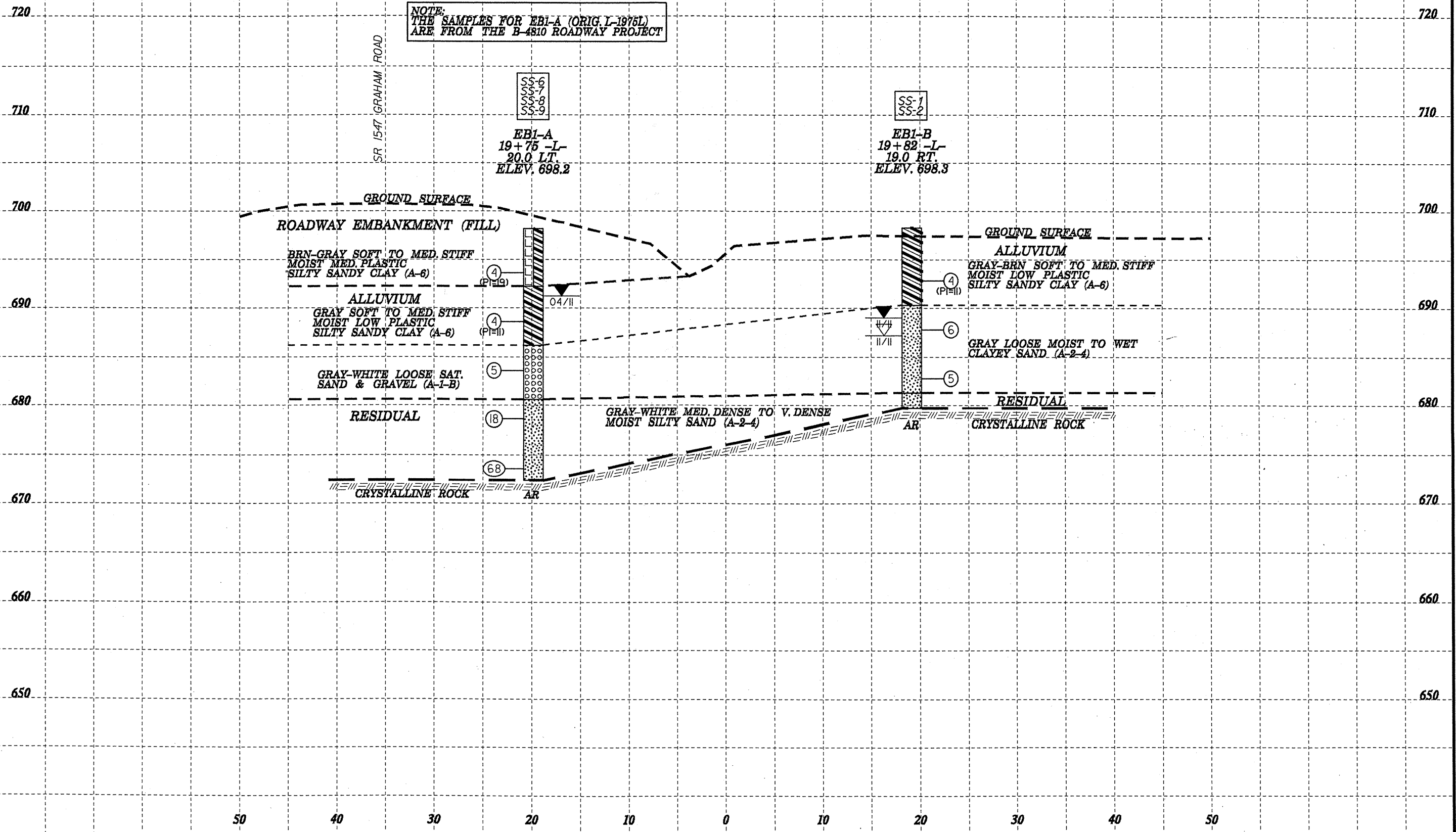
PI = 22+50.00  
EL = 701.40'  
VC = 290'  
K = 103

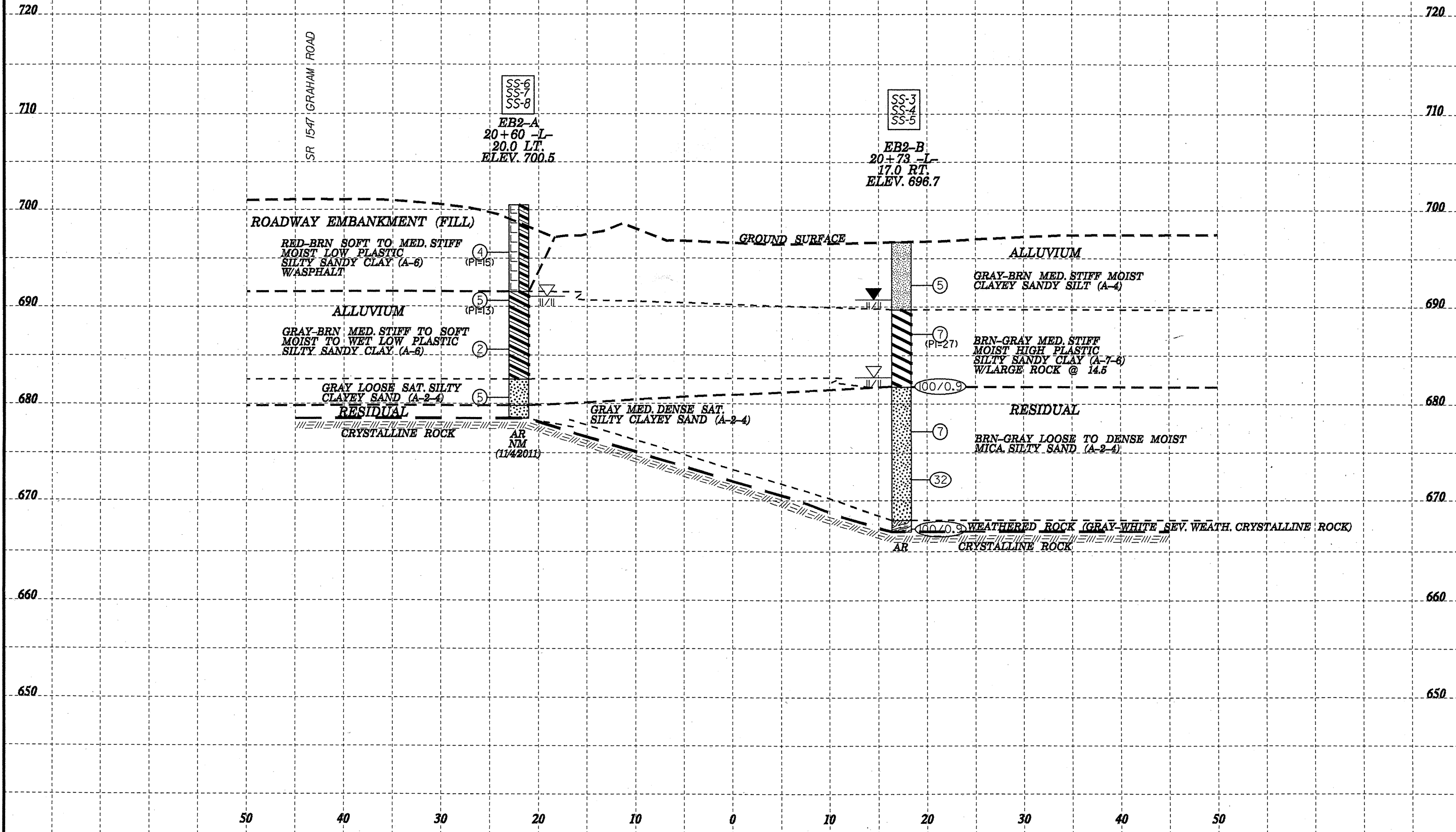


NOTE:  
SEE SHEET 3 FOR PLAN VIEW



NOTE:  
THE SAMPLES FOR EB1-A (ORIG. L-1975L)  
ARE FROM THE B-4810 ROADWAY PROJECT









# NCDOT GEOTECHNICAL ENGINEERING UNIT

## BORELOG REPORT

WBS 38580.1.1	TIP B-4810	COUNTY ROWAN	GEOLOGIST Stickney, J. K.	
SITE DESCRIPTION BRIDGE NO. 12 OVER BACK CREEK ON SR 1547 (GRAHAM RD.) BETWEEN NC 801 AND SR 1765.				GROUND WTR (ft)
BORING NO. EB1-A	STATION 19+75	OFFSET 20 ft LT	ALIGNMENT -L-	0 HR. Dry
COLLAR ELEV. 698.2 ft	TOTAL DEPTH 25.8 ft	NORTHING 701,858	EASTING 1,499,107	24 HR. 7.0
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550 89% 09/02/2009		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic	
DRILLER Smith, M. L.	START DATE 04/26/11	COMP. DATE 04/26/11	SURFACE WATER DEPTH N/A	

WBS 38580.1.1	TIP B-4810	COUNTY ROWAN	GEOLOGIST Stickney, J. K.	
SITE DESCRIPTION BRIDGE NO. 12 OVER BACK CREEK ON SR 1547 (GRAHAM RD.) BETWEEN NC 801 AND SR 1765.				GROUND WTR (ft)
BORING NO. EB1-B	STATION 19+82	OFFSET 19 ft RT	ALIGNMENT -L-	0 HR. 11.1
COLLAR ELEV. 698.3 ft	TOTAL DEPTH 18.6 ft	NORTHING 701,836	EASTING 1,499,075	24 HR. 9.3
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550 89% 09/02/2009		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic	
DRILLER Smith, C. L.	START DATE 11/01/11	COMP. DATE 11/01/11	SURFACE WATER DEPTH N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
700														GROUND SURFACE	0.0
695	694.6	3.6	1	2	2						SS-6	M		ROADWAY EMBANKMENT BRN-GRAY SOFT TO MED. STIFF MOIST MED. (PI=19) PLASTIC SILTY SANDY CLAY (A-6)	6.0
690	689.6	8.6	2	2	2						SS-7	M		ALLUVIAL GRAY SOFT TO MED. STIFF MOIST LOW (PI=11) PLASTIC SILTY SANDY CLAY (A-6)	12.0
685	684.6	13.6	1	2	3						SS-8	Sat.		ALLUVIAL GRAY-WHITE LOOSE SAT. SAND & GRAVEL (A-1-B)	17.6
680	679.6	18.6	8	10	8						SS-9	M		RESIDUAL GRAY-WHITE MED. DENSE TO V. DENSE MOIST SILTY SAND (A-2-4)	25.8
675	674.6	23.6	14	24	44									Boring Terminated BY AUGER REFUSAL at Elevation 672.4 ft ON CRYSTALLINE ROCK	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
700														GROUND SURFACE	0.0
695	693.8	4.5	2	2	2						SS-1	M		ALLUVIAL GRAY-BRN SOFT TO MED. STIFF MOIST LOW (PI=11) PLASTIC SILTY SANDY CLAY (A-6)	8.0
690	688.8	9.5	1	2	4						SS-2			ALLUVIAL GRAY LOOSE MOIST TO WET CLAYEY SAND (A-2-4)	17.0
685	683.8	14.5	1	2	3							M/W		RESIDUAL GRAY-WHITE MED. DENSE TO V. DENSE MOIST SILTY SAND (A-2)	18.6
680														Boring Terminated BY AUGER REFUSAL at Elevation 679.7 ft ON CRYSTALLINE ROCK	

NCDOT BORE DOUBLE B4810\_GEO\_BH\_BRD0012\_ROWAN.GPJ\_NC\_DOT.GDT 12/16/11

NOTE: THIS BORING IS "L-1975L" FROM THE B-4810 ROADWAY INVESTIGATION. THE ORIGINAL BOREHOLE ELEVATION OF 699.7' WAS OBTAINED FROM THE PROJECT .DTM FILE. THE PRESENT BOREHOLE ELEVATION OF 698.21' WAS OBTAINED FROM LEVELS RUN ON NOV. 3, 2011.



# NCDOT GEOTECHNICAL ENGINEERING UNIT

## BORELOG REPORT

WBS 38580.1.1	TIP B-4810	COUNTY ROWAN	GEOLOGIST Stickney, J. K.
SITE DESCRIPTION BRIDGE NO. 12 OVER BACK CREEK ON SR 1547 (GRAHAM RD.) BETWEEN NC 801 AND SR 1765.			GROUND WTR (ft)
BORING NO. EB2-A	STATION 20+60	OFFSET 20 ft LT	ALIGNMENT -L-
COLLAR ELEV. 700.5 ft	TOTAL DEPTH 22.0 ft	NORTHING 701,778	EASTING 1,499,140
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550 89% 09/02/2009		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER Smith, C. L.	START DATE 11/03/11	COMP. DATE 11/03/11	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
705																
700																
696.6	696.6	3.9	1	2	2											
695																
691.6	691.6	8.9	1	2	3											
690																
686.6	686.6	13.9	2	1	1											
685																
681.6	681.6	18.9	1	2	3											
680																

WBS 38580.1.1	TIP B-4810	COUNTY ROWAN	GEOLOGIST Stickney, J. K.
SITE DESCRIPTION BRIDGE NO. 12 OVER BACK CREEK ON SR 1547 (GRAHAM RD.) BETWEEN NC 801 AND SR 1765.			GROUND WTR (ft)
BORING NO. EB2-B	STATION 20+73	OFFSET 17 ft RT	ALIGNMENT -L-
COLLAR ELEV. 696.7 ft	TOTAL DEPTH 29.7 ft	NORTHING 701,753	EASTING 1,499,110
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550 89% 09/02/2009		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER Smith, C. L.	START DATE 11/02/11	COMP. DATE 11/02/11	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
700																
696.7																
695																
693.2	693.2	3.5	2	2	3											
690																
688.2	688.2	8.5	2	3	4											
685																
683.2	683.2	13.5	7	8	92/0.4											
680																
678.2	678.2	18.5	2	3	4											
675																
673.2	673.2	23.5	3	14	18											
670																
668.2	668.2	28.5	23	77/0.4												

NCDOT BORE DOUBLE B4810 GEO BH BRDG0012 ROWAN.GPJ NC\_DOT\_GDT 12/16/11



TEST RESULTS

PROJECT: 38580.1.1 (B-4810)

COUNTY: ROWAN

SITE DESCRIPTION: BRIDGE NO. 12 OVER BACK CREEK SR 1547 (GRAHAM RD.) BETWEEN NC 801 AND SR 1765

SHEET

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SOIL SAMPLE RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS	N	L.L.	P.I.	% BY WEIGHT				% PASSING SIEVES			% MOISTURE	% ORGANIC	UNIT WT. (d)	VOID RATIO
								C. SAND	F. SAND	SILT	CLAY	10	40	200				
<b>EB1-B</b>																		
SS-1	19.0 RT.	19+82 -L-	5.0-6.0	A-6(2)	4	31	11	26.4	31.7	15.6	26.2	99	84	46				
SS-2			10.0-11.0	A-2-4(0)	6	24	5	55.5	24.6	7.8	12.1	96	62	22				
<b>EB2-B</b>																		
SS-6	20.0 LT.	20+60 -L-	4.4-5.4	A-6(6)	4	38	15	28.9	19.4	17.5	34.3	97	77	54				
SS-7			9.4-10.4	A-6(1)	5	32	13	41.4	22.2	12.2	24.2	93	65	37				
SS-8			19.4-20.4	A-2-4(0)	5	29	10	40.8	26.8	10.2	22.2	89	64	32				
<b>EB2-B</b>																		
SS-3	17.0 RT.	20+73 -L-	4.0-5.0	A-4(0)	5	24	4	22.4	44.8	12.6	20.2	100	97	37				
SS4			9.0-10.0	A-7-6(21)	7	54	27	10.3	19.6	19.7	50.5	100	94	74				
SS-5			19.0-20.0	A-2-4(0)	7	34	NP	46.8	35.3	11.8	6.1	97	70	22				
<b>SAMPLES FROM B-4810 ROADWAY BORING L-1975L</b>																		
<b>USE AS EB1-A FOR BRIDGE 12</b>																		
SS-6	20 LT	19+75 -L-	4.1-5.1	A-6(4)	4	35	19	36.0	20.8	14.9	28.3	97	77	45				
SS-7			9.1-10.1	A-6(3)	4	27	11	10.3	46.3	17.1	26.3	100	99	51				
SS-8			14.1-15.1	A-1-b(0)	5	23	NP	65.0	22.3	5.6	7.1	77	41	12				
SS-9			19.1-20.1	A-2-4(0)	18	28	NP	43.0	35.6	16.4	5.1	92	67	26				

ROCK SAMPLE RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	RQD	UNIT WT (pcf)	Q(ksf)	E(MPsi)
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