

REFERENCE: 17BP.8.R.135

PROJECT: N/A

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

STRUCTURE
SUBSURFACE INVESTIGATION

COUNTY MONTGOMERY
SITE DESCRIPTION REPLACE BRIDGE NO. 190 ON
SR 1110 (LILLY'S BRIDGE ROAD) OVER CLARKS
CREEK

CONTENTS

SHEET NO.	DESCRIPTION
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2	LEGEND (SOIL & ROCK)
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3	SITE PLAN
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5 - 8	CROSS SECTIONS
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STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	17BP.8.R.135	1	20

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) 707-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT 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.

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NOTES:

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- 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.

PERSONNEL

J. A. BLYTHE

J. A. LITTLE

Z. J. RODRIGUEZ

F. JOHNSON

INVESTIGATED BY S&ME, INC.

DRAWN BY M. L. HARTMAN

CHECKED BY K. H. HILL

SUBMITTED BY L. A. CAMPOS

DATE DECEMBER 2019

Prepared in the Office of:



3201 SPRING FOREST ROAD
RALEIGH, NC 27616
(919) 872-2660



DocuSigned by:

Luis Campos

12/19/2019

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SIGNATURE

DATE

DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SUBSURFACE INVESTIGATION
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

| SOIL DESCRIPTION
 | | | | | | | | | | GRADATION | | | | | | | | | | ROCK DESCRIPTION | | | | | | | | | | TERMS AND DEFINITIONS
 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| <p>SOIL IS CONSIDERED 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 THE STANDARD PENETRATION TEST (AASHTO T 208, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, <i>VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</i></p>
 | | | | | | | | | | <p>WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.
 UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.
 GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.</p> | | | | | | | | | | <p>HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED, 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>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, SUCH AS SHALE, SLATE, ETC.
 ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE
ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.
 CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
 COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.
 CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
 DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.
 DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.
 DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
 FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
 FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
 FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOGGED FROM PARENT MATERIAL.
 FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.
 FORMATION (FM) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.
 JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
 LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.
 LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.
 MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
 PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.
 RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
 ROCK QUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
 SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.
 SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
 SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.
 STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.
 STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
 STRATA ROCK QUALITY DESIGNATION (SROD) - 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.</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| <p style="text-align: center;">SOIL LEGEND AND AASHTO CLASSIFICATION</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>GENERAL CLASS.</th> <th colspan="5">GRANULAR MATERIALS (≤ 35% PASSING #200)</th> <th colspan="5">SILT-CLAY MATERIALS (> 35% PASSING #200)</th> <th colspan="5">ORGANIC MATERIALS</th> </tr> <tr> <th>GROUP CLASS.</th> <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-3</th> <th>A-4, A-5</th> <th>A-6, A-7</th> <th colspan="5"></th> </tr> <tr> <th>SYMBOL</th> <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></td> <td></td> </tr> <tr> <th>% PASSING #10 #40 #200</th> <td>50 MX 30 MX 15 MX</td> <td>50 MX 25 MX 10 MX</td> <td>51 MN 35 MX 35 MX</td> <td>35 MX 35 MX 35 MX</td> <td>36 MN 36 MN 36 MN</td> <td>36 MN 36 MN 36 MN</td> <td>36 MN 36 MN 36 MN</td> <td>36 MN 36 MN 36 MN</td> <td>36 MN 36 MN 36 MN</td> <td>36 MN 36 MN 36 MN</td> <td>36 MN 36 MN 36 MN</td> <td>36 MN 36 MN 36 MN</td> <td>36 MN 36 MN 36 MN</td> <td>36 MN 36 MN 36 MN</td> <td>36 MN 36 MN 36 MN</td> <td>36 MN 36 MN 36 MN</td> <td>36 MN 36 MN 36 MN</td> <td>36 MN 36 MN 36 MN</td> <td>36 MN 36 MN 36 MN</td> <td>36 MN 36 MN 36 MN</td> <td>36 MN 36 MN 36 MN</td> </tr> <tr> <th>MATERIAL PASSING #40 LL PI</th> <td colspan="2">-</td> <td>40 MX 10 MX</td> <td>41 MN 10 MX</td> <td>41 MN 11 MN</td> <td>41 MN 11 MN</td> <td>41 MN 11 MN</td> <td>41 MN 11 MN</td> <td>41 MN 11 MN</td> <td>41 MN 11 MN</td> <td>41 MN 11 MN</td> <td>41 MN 11 MN</td> <td>41 MN 11 MN</td> <td>41 MN 11 MN</td> <td>41 MN 11 MN</td> <td>41 MN 11 MN</td> <td>41 MN 11 MN</td> <td>41 MN 11 MN</td> <td>41 MN 11 MN</td> <td>41 MN 11 MN</td> </tr> <tr> <th>GROUP INDEX</th> <td>0</td> <td>0</td> <td>0</td> <td>4 MX</td> <td>8 MX</td> <td>12 MX</td> <td>16 MX</td> <td>NO MX</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> <th>USUAL TYPES OF MAJOR MATERIALS</th> <td colspan="2">STONE FRAGS. GRAVEL, AND SAND</td> <td>FINE SAND</td> <td colspan="2">SILTY OR CLAYEY GRAVEL AND SAND</td> <td>SILTY SOILS</td> <td>CLAYEY SOILS</td> <td colspan="5">SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER</td> <td colspan="5">HIGHLY ORGANIC SOILS</td> </tr> <tr> <th>GEN. RATING AS SUBGRADE</th> <td colspan="5">EXCELLENT TO GOOD</td> <td colspan="5">FAIR TO POOR</td> <td>FAIR TO POOR</td> <td>POOR</td> <td colspan="4">UNSATURABLE</td> </tr> <tr> <td colspan="10">PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30</td> <td colspan="10"></td> <td colspan="10"></td> </tr> <tr> <td colspan="10"> <p style="text-align: center;">CONSISTENCY OR DENSENESS</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/FT²)</th> </tr> <tr> <td>GENERALLY GRANULAR MATERIAL (NON-COHESSIVE)</td> <td>VERY LOOSE
LOOSE
MEDIUM DENSE
DENSE
VERY DENSE</td> <td>< 4
4 TO 10
10 TO 30
30 TO 50
> 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>< 2
2 TO 4
4 TO 8
8 TO 15
15 TO 30
> 30</td> <td>< 0.25
0.25 TO 0.5
0.5 TO 1.0
1 TO 2
2 TO 4
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SD.)</th> <th>FINE SAND (F SD.)</th> <th>SILT (SL.)</th> <th>CLAY (CL.)</th> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <th>GRAIN SIZE</th> <td>MM 305</td> <td>75</td> <td>2.0</td> <td>0.25</td> <td>0.05</td> <td>0.005</td> </tr> <tr> <td></td> <td>IN. 12</td> <td>3</td> <td></td> <td></td> <td></td> <td></td> </tr> </table> </td> </tr> <tr> <td colspan="10"> <p style="text-align: center;">SOIL MOISTURE - CORRELATION OF TERMS</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>SOIL MOISTURE SCALE (ATTERBERG LIMITS)</th> <th>FIELD MOISTURE DESCRIPTION</th> <th>GUIDE FOR FIELD MOISTURE DESCRIPTION</th> </tr> <tr> <td>LL - LIQUID LIMIT</td> <td>- SATURATED - (SAT.)</td> <td>USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE</td> </tr> <tr> <td>PLASTIC RANGE (PI)</td> <td>- WET - (W)</td> <td>SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE</td> </tr> <tr> <td>OM - OPTIMUM MOISTURE</td> <td>- MOIST - (M)</td> <td>SOLID; AT OR NEAR OPTIMUM MOISTURE</td> </tr> <tr> <td>SL - SHRINKAGE LIMIT</td> <td>- DRY - (D)</td> <td>REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE</td> </tr> </table> </td> <td colspan="10"> <p style="text-align: center;">EQUIPMENT USED ON SUBJECT PROJECT</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td><input type="checkbox"/> CME-45C</td> <td><input type="checkbox"/> ADVANCING TOOLS:</td> <td><input checked="" type="checkbox"/> AUTOMATIC</td> <td><input type="checkbox"/> MANUAL</td> </tr> <tr> <td><input type="checkbox"/> CME-55</td> <td><input type="checkbox"/> CLAY BITS</td> <td colspan="2">CORE SIZE:</td> </tr> <tr> <td><input type="checkbox"/> CME-550</td> <td><input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER</td> <td><input type="checkbox"/> -B</td> <td><input type="checkbox"/> -H</td> </tr> <tr> <td><input type="checkbox"/> VANE SHEAR TEST</td> <td><input checked="" type="checkbox"/> 8" HOLLOW AUGERS</td> <td colspan="2"><input checked="" type="checkbox"/> -N Q2</td> </tr> <tr> <td><input type="checkbox"/> PORTABLE HOIST</td> <td><input type="checkbox"/> HARD FACED FINGER BITS</td> <td colspan="2">HAND TOOLS:</td> </tr> <tr> <td><input checked="" type="checkbox"/> CME-550X</td> <td><input type="checkbox"/> TUNG-CARBIDE INSERTS</td> <td><input type="checkbox"/> POST HOLE DIGGER</td> <td><input type="checkbox"/> HAND AUGER</td> </tr> <tr> <td><input type="checkbox"/></td> <td><input checked="" type="checkbox"/> CASING <input type="checkbox"/> W/ ADVANCER</td> <td><input type="checkbox"/> SOUNDING ROD</td> <td><input type="checkbox"/> VANE SHEAR TEST</td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/> TRICONE _____ *STEEL TEETH</td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/> TRICONE _____ *TUNG-CARB.</td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td><input type="checkbox"/></td>
<td><input checked="" type="checkbox"/> CORE BIT</td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> </table> </td> <td colspan="10"> <p style="text-align: center;">ROCK HARDNESS</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>VERY HARD</th> <td>CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.</td> </tr> <tr> <th>HARD</th> <td>CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.</td> </tr> <tr> <th>MODERATELY HARD</th> <td>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.</td> </tr> <tr> <th>MEDIUM HARD</th> <td>CAN BE GROUDED 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.</td> </tr> <tr> <th>SOFT</th> <td>CAN BE GROUDED 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.</td> </tr> <tr> <th>VERY SOFT</th> <td>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.</td> </tr> </table> </td> <td colspan="10"> <p style="text-align: center;">FRACTURE SPACING</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>TERM</th> <th>SPACING</th> </tr> <tr> <td>VERY WIDE</td> <td>MORE THAN 10 FEET</td> </tr> <tr> <td>WIDE</td> <td>3 TO 10 FEET</td> </tr> <tr> <td>MODERATELY CLOSE</td> <td>1 TO 3 FEET</td> </tr> <tr> <td>CLOSE</td> <td>0.16 TO 1 FOOT</td> </tr> <tr> <td>VERY CLOSE</td> <td>LESS THAN 0.16 FEET</td> </tr> </table> </td> <td colspan="10"> <p style="text-align: center;">BEDDING</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>TERM</th> <th>THICKNESS</th> </tr> <tr> <td>VERY THICKLY BEDDED</td> <td>4 FEET</td> </tr> <tr> <td>THICKLY BEDDED</td> <td>1.5 - 4 FEET</td> </tr> <tr> <td>THINLY BEDDED</td> <td>0.16 - 1.5 FEET</td> </tr> <tr> <td>VERY THINLY BEDDED</td> <td>0.03 - 0.16 FEET</td> </tr> <tr> <td>THICKLY LAMINATED</td> <td>0.008 - 0.03 FEET</td> </tr> <tr> <td>THINLY LAMINATED</td> <td>< 0.008 FEET</td> </tr> </table> </td> </tr> <tr> <td colspan="10"> <p style="text-align: center;">PLASTICITY</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>NON PLASTIC</th> <th colspan="2">PLASTICITY INDEX (PI)</th> <th>DRY STRENGTH</th> </tr> <tr> <td></td> <td>0-5</td> <td></td> <td>VERY LOW</td> </tr> <tr> <td>SLIGHTLY PLASTIC</td> <td>6-15</td> <td></td> <td>SLIGHT</td> </tr> <tr> <td>MODERATELY PLASTIC</td> <td>16-25</td> <td></td> <td>MEDIUM</td> </tr> <tr> <td>HIGHLY PLASTIC</td> <td>26 OR MORE</td> <td></td> <td>HIGH</td> </tr> </table> </td> <td colspan="10"> <p style="text-align: center;">INDURATION</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.</th> </tr> <tr> <td>FRIABLE</td> <td>RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.</td> </tr> <tr> <td>MODERATELY INDURATED</td> <td>GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.</td> </tr> <tr> <td>INDURATED</td> <td>GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.</td> </tr> <tr> <td>EXTREMELY INDURATED</td> <td>SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</td> </tr> </table> </td> </tr> <tr> <td colspan="10"> <p style="text-align: center;">COLOR</p> <p>DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-BROWN). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.</p> </td> <td colspan="10"> <p style="text-align: center;">NOTES:</p> <p>FIAD - FILLED IMMEDIATELY AFTER DRILLING</p> </td> <td colspan="10"> <p style="text-align: center;">BENCH MARK: BM #1, N: 532580.69, E: 1689104.33</p> <p style="text-align: center;">BENCH TIE NAIL IN 8" OAK</p> <p style="text-align: right;">ELEVATION: 236.12 FEET</p> </td> </tr> </table> | | | | | | | | | | 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 | 50 MX 30 MX 15 MX | 50 MX 25 MX 10 MX | 51 MN 35 MX 35 MX | 35 MX 35 MX 35 MX | 36 MN 36 MN 36 MN | 36 MN 36 MN 36 MN | 36 MN 36 MN 36 MN | 36 MN 36 MN 36 MN | 36 MN 36 MN 36 MN | 36 MN 36 MN 36 MN | 36 MN 36 MN 36 MN | 36 MN 36 MN 36 MN | 36 MN 36 MN 36 MN | 36 MN 36 MN 36 MN | 36 MN 36 MN 36 MN | 36 MN 36 MN 36 MN | 36 MN 36 MN 36 MN | 36 MN 36 MN 36 MN | 36 MN 36 MN 36 MN | 36 MN 36 MN 36 MN | 36 MN 36 MN 36 MN | MATERIAL PASSING #40 LL PI | - | | 40 MX 10 MX | 41 MN 10 MX | 41 MN 11 MN | 41 MN 11 MN | 41 MN 11 MN | 41 MN 11 MN | 41 MN 11 MN | 41 MN 11 MN | 41 MN 11 MN
 | 41 MN 11 MN | 41 MN 11 MN | 41 MN 11 MN | 41 MN 11 MN | 41 MN 11 MN | 41 MN 11 MN | 41 MN 11 MN | 41 MN 11 MN | 41 MN 11 MN | GROUP INDEX | 0 | 0 | 0 | 4 MX | 8 MX | 12 MX | 16 MX | NO MX | | | | | | | | | | | | | 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 | | | | | HIGHLY ORGANIC SOILS | | | | | GEN. RATING AS SUBGRADE | EXCELLENT TO GOOD | | | | | FAIR TO POOR | | | | | FAIR TO POOR | POOR | UNSATURABLE | | | | PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | <p style="text-align: center;">CONSISTENCY OR DENSENESS</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/FT²)</th> </tr> <tr> <td>GENERALLY GRANULAR MATERIAL (NON-COHESSIVE)</td> <td>VERY LOOSE
LOOSE
MEDIUM DENSE
DENSE
VERY DENSE</td> <td>< 4
4 TO 10
10 TO 30
30 TO 50
> 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>< 2
2 TO 4
4 TO 8
8 TO 15
15 TO 30
> 30</td> <td>< 0.25
0.25 TO 0.5
0.5 TO 1.0
1 TO 2
2 TO 4
> 4</td> </tr> </table> | | | | | | | | | | PRIMARY SOIL TYPE | COMPACTNESS OR CONSISTENCY | RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) | RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²) | GENERALLY GRANULAR MATERIAL (NON-COHESSIVE) | VERY LOOSE
LOOSE
MEDIUM DENSE
DENSE
VERY DENSE | < 4
4 TO 10
10 TO 30
30 TO 50
> 50 | N/A | GENERALLY SILT-CLAY MATERIAL (COHESIVE) | VERY SOFT
SOFT
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SIEVE SIZE OPENING (MM)</th> <td>4</td> <td>10</td> <td>40</td> <td>60</td> <td>200</td> <td>270</td> </tr> <tr> <td></td> <td>4.75</td> <td>2.00</td> <td>0.42</td> <td>0.25</td> <td>0.075</td> <td>0.053</td> </tr> <tr> <th>BOULDER (BLDR.)</th> <th>COBBLE (COB.)</th> <th>GRAVEL (GR.)</th> <th>COARSE SAND (CSE. SD.)</th> <th>FINE SAND (F SD.)</th> <th>SILT (SL.)</th> <th>CLAY (CL.)</th> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <th>GRAIN SIZE</th> <td>MM 305</td> <td>75</td> <td>2.0</td> <td>0.25</td> <td>0.05</td> <td>0.005</td> </tr> <tr> <td></td> <td>IN. 12</td> <td>3</td> <td></td> <td></td> <td></td> <td></td> </tr> </table> | | | | | | | | | | U.S. STD. SIEVE SIZE OPENING (MM) | 4 | 10 | 40 | 60 | 200 | 270 | | 4.75 | 2.00 | 0.42 | 0.25 | 0.075 | 0.053 | 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 | 0.05 | 0.005 | | IN. 12 | 3 | | | | | <p style="text-align: center;">SOIL MOISTURE - CORRELATION OF TERMS</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>SOIL MOISTURE SCALE (ATTERBERG LIMITS)</th> <th>FIELD MOISTURE DESCRIPTION</th> <th>GUIDE FOR FIELD MOISTURE DESCRIPTION</th> </tr> <tr> <td>LL - LIQUID
LIMIT</td> <td>- SATURATED - (SAT.)</td> <td>USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE</td> </tr> <tr> <td>PLASTIC RANGE (PI)</td> <td>- WET - (W)</td> <td>SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE</td> </tr> <tr> <td>OM - OPTIMUM MOISTURE</td> <td>- MOIST - (M)</td> <td>SOLID; AT OR NEAR OPTIMUM MOISTURE</td> </tr> <tr> <td>SL - SHRINKAGE LIMIT</td> <td>- DRY - (D)</td> <td>REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE</td> </tr> </table> | | | | | | | | | | 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 | PLASTIC RANGE (PI) | - 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 | <p style="text-align: center;">EQUIPMENT USED ON SUBJECT PROJECT</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td><input type="checkbox"/> CME-45C</td> <td><input type="checkbox"/> ADVANCING TOOLS:</td> <td><input checked="" type="checkbox"/> AUTOMATIC</td> <td><input type="checkbox"/> MANUAL</td> </tr> <tr> <td><input type="checkbox"/> CME-55</td> <td><input type="checkbox"/> CLAY BITS</td> <td colspan="2">CORE SIZE:</td> </tr> <tr> <td><input type="checkbox"/> CME-550</td> <td><input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER</td> <td><input type="checkbox"/> -B</td> <td><input type="checkbox"/> -H</td> </tr> <tr> <td><input type="checkbox"/> VANE SHEAR TEST</td> <td><input checked="" type="checkbox"/> 8" HOLLOW AUGERS</td> <td colspan="2"><input checked="" type="checkbox"/> -N Q2</td> </tr> <tr> <td><input type="checkbox"/> PORTABLE HOIST</td> <td><input type="checkbox"/> HARD FACED FINGER BITS</td> <td colspan="2">HAND TOOLS:</td> </tr> <tr> <td><input checked="" type="checkbox"/> CME-550X</td> <td><input type="checkbox"/> TUNG-CARBIDE INSERTS</td> <td><input type="checkbox"/> POST HOLE DIGGER</td> <td><input type="checkbox"/> HAND AUGER</td> </tr> <tr> <td><input type="checkbox"/></td> <td><input checked="" type="checkbox"/> CASING <input type="checkbox"/> W/ ADVANCER</td> <td><input type="checkbox"/> SOUNDING ROD</td> <td><input type="checkbox"/> VANE SHEAR TEST</td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/> TRICONE _____ *STEEL TEETH</td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/> TRICONE _____ *TUNG-CARB.</td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td><input type="checkbox"/></td> <td><input checked="" type="checkbox"/> CORE BIT</td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> </table> | | | | | | | | | | <input type="checkbox"/> CME-45C | <input type="checkbox"/> ADVANCING TOOLS: | <input checked="" type="checkbox"/> AUTOMATIC | <input type="checkbox"/> MANUAL | <input type="checkbox"/> CME-55 | <input type="checkbox"/> CLAY BITS | CORE SIZE: | | <input type="checkbox"/> CME-550 | <input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER | <input type="checkbox"/> -B | <input type="checkbox"/> -H | <input type="checkbox"/> VANE SHEAR TEST | <input checked="" type="checkbox"/> 8" HOLLOW AUGERS | <input checked="" type="checkbox"/> -N Q2 | | <input type="checkbox"/> PORTABLE HOIST | <input type="checkbox"/> HARD FACED FINGER BITS | HAND TOOLS: | | <input checked="" type="checkbox"/> CME-550X | <input type="checkbox"/> TUNG-CARBIDE INSERTS | <input type="checkbox"/> POST HOLE DIGGER | <input type="checkbox"/> HAND AUGER | <input type="checkbox"/> | <input checked="" type="checkbox"/> CASING <input type="checkbox"/> W/ ADVANCER | <input type="checkbox"/> SOUNDING ROD | <input type="checkbox"/> VANE SHEAR TEST | <input type="checkbox"/> | <input type="checkbox"/> TRICONE _____ *STEEL TEETH | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> TRICONE _____ *TUNG-CARB. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> CORE BIT | <input type="checkbox"/> | <input type="checkbox"/> | <p style="text-align: center;">ROCK HARDNESS</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>VERY HARD</th> <td>CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. 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| GENERAL CLASS.
 | GRANULAR MATERIALS (≤ 35% PASSING #200) | | | | | SILT-CLAY MATERIALS (> 35% PASSING #200) | | | | | ORGANIC MATERIALS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| 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 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| <p style="text-align: center;">CONSISTENCY OR DENSENESS</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/FT²)</th> </tr> <tr> <td>GENERALLY GRANULAR MATERIAL (NON-COHESSIVE)</td> <td>VERY LOOSE
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 | | | | | | | | | | PRIMARY SOIL TYPE | COMPACTNESS OR CONSISTENCY | RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) | RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²) | GENERALLY GRANULAR MATERIAL (NON-COHESSIVE) | VERY LOOSE
LOOSE
MEDIUM DENSE
DENSE
VERY DENSE | < 4
4 TO 10
10 TO 30
30 TO 50
> 50 | N/A | GENERALLY SILT-CLAY MATERIAL (COHESIVE) | VERY SOFT
SOFT
MEDIUM STIFF
STIFF
VERY STIFF
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2 TO 4
4 TO 8
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0.5 TO 1.0
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> 4 | <p style="text-align: center;">MISCELLANEOUS SYMBOLS</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td></td> <td>ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION</td> <td></td> <td>DIP & DIP DIRECTION OF ROCK STRUCTURES</td> <td></td> <td>SOIL SYMBOL</td> <td></td> <td>TEST BORING</td> <td></td> <td>SLOPE INDICATOR INSTALLATION</td> </tr> <tr> <td></td> <td>ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT</td> <td></td> <td>AUGER BORING</td> <td></td> <td>CONE PENETROMETER TEST</td> <td></td> <td>CORE BORING</td> <td></td> <td>SOUNDING ROD</td> </tr> <tr> <td></td> <td>INFERRED SOIL BOUNDARY</td> <td></td> <td>MONITORING WELL</td> <td></td> <td>TEST BORING WITH CORE</td> <td></td> <td>PIEZOMETER INSTALLATION</td> <td></td> <td>SPT N-VALUE</td> </tr> <tr> <td></td> <td>INFERRED ROCK LINE</td> <td></td> <td>ALLUVIAL SOIL BOUNDARY</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
 | | | ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION | | DIP & DIP DIRECTION OF ROCK STRUCTURES | | SOIL SYMBOL | | TEST BORING | | SLOPE INDICATOR INSTALLATION | | ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT | | AUGER BORING | | CONE PENETROMETER TEST | | CORE BORING | | SOUNDING ROD | | INFERRED SOIL BOUNDARY | | MONITORING WELL | | TEST BORING WITH CORE | | PIEZOMETER INSTALLATION | | SPT N-VALUE | | INFERRED ROCK LINE | | ALLUVIAL SOIL BOUNDARY | | | | | | | <p style="text-align: center;">RECOMMENDATION SYMBOLS</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td></td> <td>UNDERCUT</td> <td></td> <td>UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE</td> <td></td> <td>UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL</td> </tr> <tr> <td></td> <td>SHALLOW UNDERCUT</td> <td></td> <td>UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK</td> <td></td> <td></td> </tr> </table> | | | | | | | | | | | UNDERCUT | | UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE | | UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL | | SHALLOW UNDERCUT | | UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK | | | <p style="text-align: center;">ABBREVIATIONS</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>AR - AUGER REFUSAL</td> <td>CL. - CLAY</td> <td>CPT - COARSE PENETRATION TEST</td> <td>CSE. - COARSE</td> <td>DPT - DILATOMETER TEST</td> <td>DMT - DYNAMIC PENETRATION TEST</td> <td>e - VOID RATIO</td> <td>F - FINE</td> <td>FOSS. - FOSSILIFEROUS</td> <td>FRAC. - FRACTURED, FRACTURES</td> <td>FRAGS. - FRAGMENTS</td> <td>HI. - HIGHLY</td> <td>MED. - MEDIUM</td> <td>MICA. - MICACEOUS</td> <td>MOD. - MODERATELY</td> <td>NP - NON PLASTIC</td> <td>ORG. - ORGANIC</td> <td>PMT - PRESSUREMETER TEST</td> <td>SAP. - SAPROLITIC</td> <td>SD. - SAND, SANDY</td> <td>SL. - SILT, SILTY</td> <td>SLI. - SLIGHTLY</td> <td>TCR - TRICONE REFUSAL</td> <td>w - MOISTURE CONTENT</td> <td>V - VERY</td> <td>VST - VANE SHEAR TEST</td> <td>WEA. - WEATHERED</td> <td>UNIT WEIGHT</td> <td>DRY UNIT WEIGHT</td> </tr> <tr> <td>BT - BORING TERMINATED</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> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table> | | |
 | | | | | | | AR - AUGER REFUSAL | CL. - CLAY | CPT - COARSE PENETRATION TEST | CSE. - COARSE | DPT - DILATOMETER TEST | DMT - 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 | BT - BORING TERMINATED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | <p style="text-align: center;">TEXTURE OR GRAIN SIZE</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>U.S. STD. SIEVE SIZE OPENING (MM)</th> <td>4</td> <td>10</td> <td>40</td> <td>60</td> <td>200</td> <td>270</td> </tr> <tr> <td></td> <td>4.75</td> <td>2.00</td> <td>0.42</td> <td>0.25</td> <td>0.075</td> <td>0.053</td> </tr> <tr> <th>BOULDER (BLDR.)</th> <th>COBBLE (COB.)</th> <th>GRAVEL (GR.)</th> <th>COARSE SAND (CSE. SD.)</th> <th>FINE SAND (F SD.)</th> <th>SILT (SL.)</th> <th>CLAY (CL.)</th> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <th>GRAIN SIZE</th> <td>MM 305</td> <td>75</td> <td>2.0</td> <td>0.25</td> <td>0.05</td> <td>0.005</td> </tr> <tr> <td></td> <td>IN. 12</td> <td>3</td> <td></td> <td></td> <td></td> <td></td> </tr> </table> | | | | | | | | | | U.S. STD. SIEVE SIZE OPENING (MM) | 4 | 10 | 40 | 60 | 200 | 270 | | 4.75 | 2.00 | 0.42 | 0.25 | 0.075 | 0.053 | 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 | 0.05 | 0.005 | | IN. 12 | 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| <p style="text-align: center;">SOIL MOISTURE - CORRELATION OF TERMS</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>SOIL MOISTURE SCALE (ATTERBERG LIMITS)</th> <th>FIELD MOISTURE DESCRIPTION</th> <th>GUIDE FOR FIELD MOISTURE DESCRIPTION</th> </tr> <tr> <td>LL - LIQUID LIMIT</td> <td>- SATURATED - (SAT.)</td> <td>USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE</td> </tr> <tr> <td>PLASTIC RANGE (PI)</td> <td>- WET - (W)</td> <td>SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE</td> </tr> <tr> <td>OM - OPTIMUM MOISTURE</td> <td>- MOIST - (M)</td> <td>SOLID; AT OR NEAR OPTIMUM MOISTURE</td> </tr> <tr> <td>SL - SHRINKAGE LIMIT</td> <td>- DRY - (D)</td> <td>REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE</td> </tr> </table>
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| LL - LIQUID LIMIT
 | - SATURATED - (SAT.) | USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| PLASTIC RANGE (PI)
 | - WET - (W) | SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| OM - OPTIMUM MOISTURE
 | - MOIST - (M) | SOLID; AT OR NEAR OPTIMUM MOISTURE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| SL - SHRINKAGE LIMIT
 | - DRY - (D) | REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| <input type="checkbox"/> CME-45C
 | <input type="checkbox"/> ADVANCING TOOLS: | <input checked="" type="checkbox"/> AUTOMATIC | <input type="checkbox"/> MANUAL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| <p style="text-align: center;">PLASTICITY</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>NON PLASTIC</th> <th colspan="2">PLASTICITY INDEX (PI)</th> <th>DRY STRENGTH</th> </tr> <tr> <td></td> <td>0-5</td> <td></td> <td>VERY LOW</td> </tr> <tr> <td>SLIGHTLY PLASTIC</td> <td>6-15</td> <td></td> <td>SLIGHT</td> </tr> <tr> <td>MODERATELY PLASTIC</td> <td>16-25</td> <td></td> <td>MEDIUM</td> </tr> <tr> <td>HIGHLY PLASTIC</td> <td>26 OR MORE</td> <td></td> <td>HIGH</td> </tr> </table>
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HAMMER.</td> </tr> <tr> <td>INDURATED</td> <td>GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.</td> </tr> <tr> <td>EXTREMELY INDURATED</td> <td>SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</td> </tr> </table> | | | | | | | | | | FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. | FRIABLE | RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. | MODERATELY INDURATED | GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. | INDURATED | GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. | EXTREMELY INDURATED | SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.
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| FRIABLE
 | RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| MODERATELY INDURATED
 | GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| INDURATED
 | GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| EXTREMELY INDURATED
 | SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| <p style="text-align: center;">COLOR</p> <p>DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-BROWN). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.</p>
 | | | | | | | | | | <p style="text-align: center;">NOTES:</p> <p>FIAD - FILLED IMMEDIATELY AFTER DRILLING</p> | | | | | | | | | | <p style="text-align: center;">BENCH MARK: BM #1, N: 532580.69, E: 1689104.33</p> <p style="text-align: center;">BENCH TIE NAIL IN 8" OAK</p> <p style="text-align: right;">ELEVATION: 236.12 FEET</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

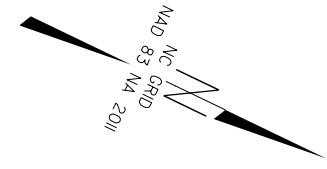
SUBSURFACE INVESTIGATION

SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES
FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS

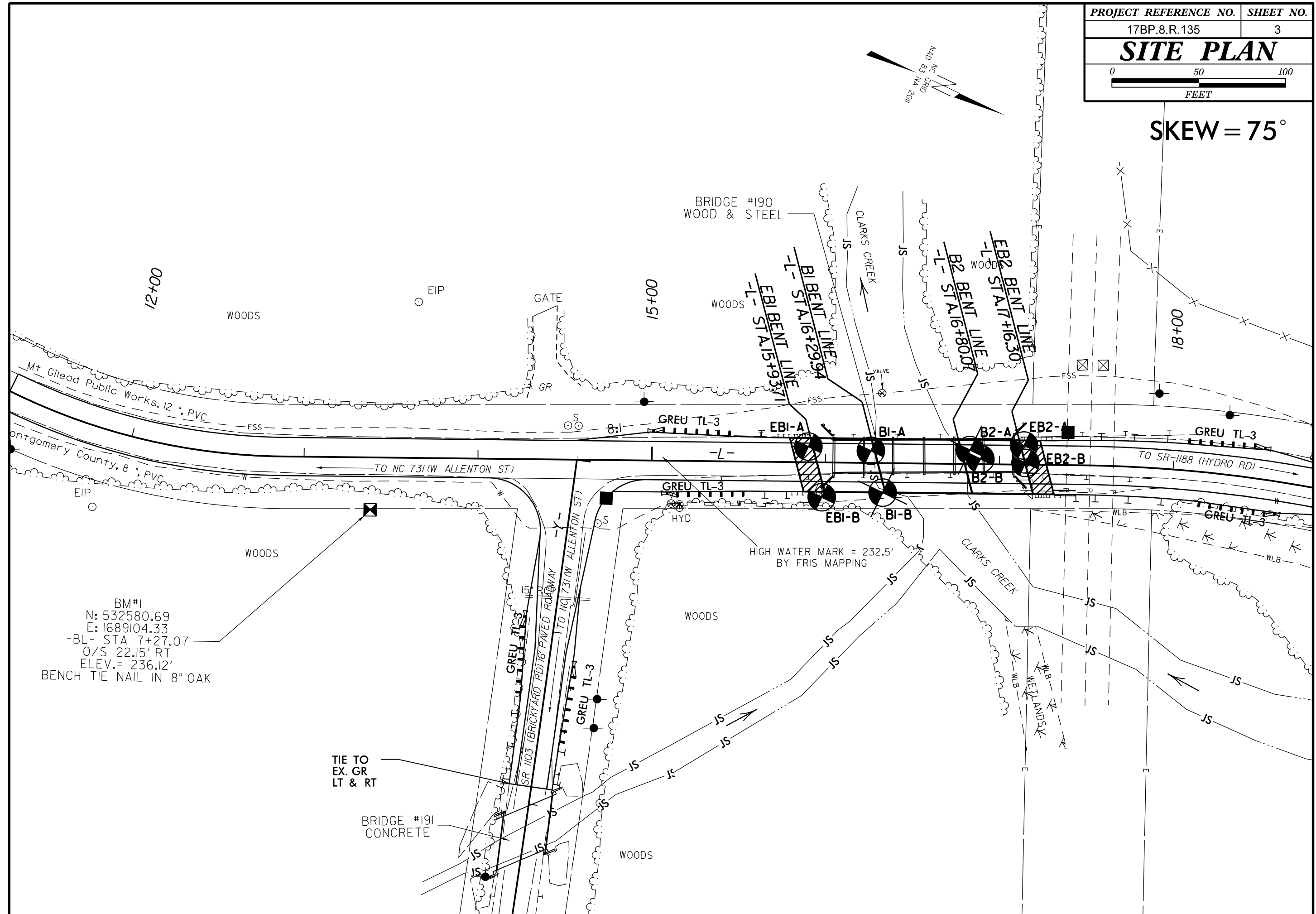
AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jointed Rock Mass (Marinos and Hoek, 2000)

AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonically Deformed Heterogeneous Rock Masses (Marinos and Hoek, 2000)

GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000)		SURFACE CONDITIONS					GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos, P and Hoek E., 2000)												
<p>From the lithology, structure and surface conditions of the discontinuities, estimate the average value of GSI. Do not try to be too precise. Quoting a range from 33 to 37 is more realistic than stating that GSI = 35. Note that the table does not apply to structurally controlled failures. Where weak planar structural planes are present in an unfavorable orientation with respect to the excavation face, these will dominate the rock mass behaviour. The shear strength of surfaces in rocks that are prone to deterioration as a result of changes in moisture content will be reduced if water is present. When working with rocks in the fair to very poor categories, a shift to the right may be made for wet conditions. Water pressure is dealt with by effective stress analysis.</p>		VERY GOOD Very rough, fresh unweathered surfaces	GOOD Rough, slightly weathered, iron stained surfaces	FAIR Smooth, moderately weathered and altered surfaces	POOR Slickensided, highly weathered surfaces with compact coatings or fillings or angular fragments	VERY POOR Slickensided, highly weathered surfaces with soft clay coatings or fillings	<p>From a description of the lithology, structure and surface conditions (particularly of the bedding planes), choose a box in the chart. Locate the position in the box that corresponds to the condition of the discontinuities and estimate the average value of GSI from the contours. Do not attempt to be too precise. Quoting a range from 33 to 37 is more realistic than giving GSI = 35. Note that the Hoek-Brown criterion does not apply to structurally controlled failures. Where unfavourably oriented continuous weak planar discontinuities are present, these will dominate the behaviour of the rock mass. The strength of some rock masses is reduced by the presence of groundwater and this can be allowed for by a slight shift to the right in the columns for fair, poor and very poor conditions. Water pressure does not change the value of GSI and it is dealt with by using effective stress analysis.</p>												
		DECREASING SURFACE QUALITY →																	
STRUCTURE		SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)					COMPOSITION AND STRUCTURE												
<p>INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities</p> <p>BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets</p> <p>VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets</p> <p>BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity</p> <p>DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces</p> <p>LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes</p>		DECREASING INTERLOCKING OF ROCK PIECES ↓					<p>A. Thick bedded, very blocky sandstone. The effect of pelitic coatings on the bedding planes is minimized by the confinement of the rock mass. In shallow tunnels or slopes these bedding planes may cause structurally controlled instability.</p> <p>B. Sandstone with thin inter-layers of siltstone</p> <p>C. Sandstone and siltstone in similar amounts</p> <p>D. Siltstone or silty shale with sandstone layers</p> <p>E. Weak siltstone or clayey shale with sandstone layers</p> <p>F. Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure</p> <p>G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers</p> <p>H. Tectonically deformed silty or clayey shale forming a chaotic structure with pockets of clay. Thin layers of sandstone are transformed into small rock pieces.</p> <p>→ Means deformation after tectonic disturbance</p>												
		90	80	70	60	50			40	30	20	10	70	60	50	40	30	20	10
		N/A	N/A	N/A	N/A	N/A			N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		N/A	N/A	N/A	N/A	N/A			N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
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		N/A	N/A	N/A	N/A	N/A			N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A



SKEW = 75°



BM#1
 N: 532580.69
 E: 1689104.33
 -BL- STA 7+27.07
 O/S 22.15' RT
 ELEV.= 236.12'
 BENCH TIE NAIL IN 8" OAK

TIE TO
 EX. GR
 LT & RT

BRIDGE #191
 CONCRETE

HIGH WATER MARK = 232.5'
 BY FRIS MAPPING

Mt Gilead Public Works, 12" PVC

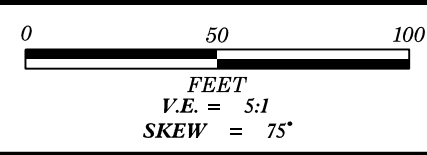
Montgomery County, 8" PVC

TO NC 731(W ALLENTON ST)

TO SR-1188 (HYDRO RD)

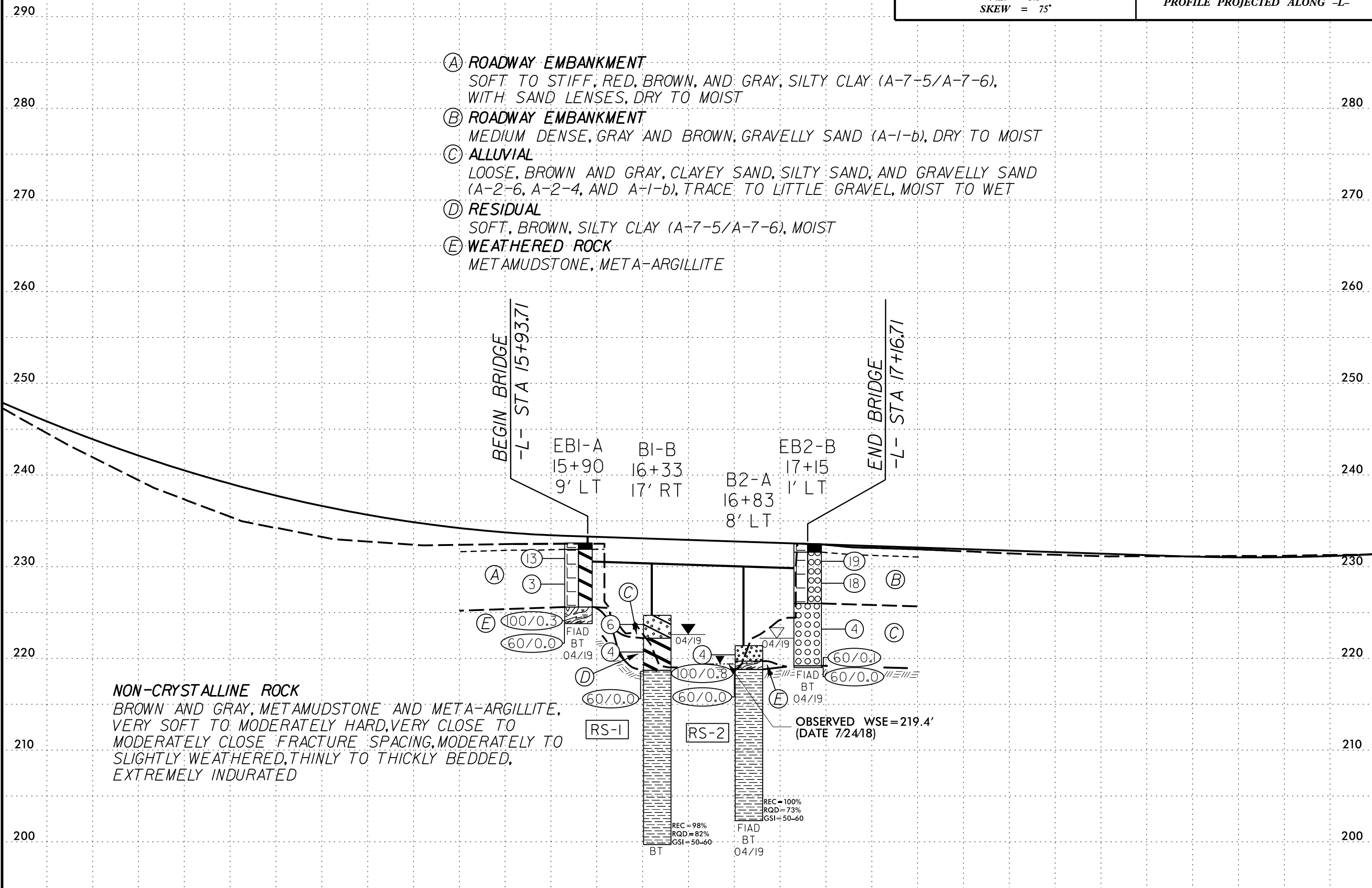
SR 1103 (BRICKYARD RD) 16' PAVED ROWWAY
 TO NC 731(W ALLENTON ST)

5/14/99



PROJECT REFERENCE NO.	SHEET NO.
17BP.8.R.135	4
PROFILE PROJECTED ALONG -L-	

- (A) **ROADWAY EMBANKMENT**
SOFT TO STIFF, RED, BROWN, AND GRAY, SILTY CLAY (A-7-5/A-7-6), WITH SAND LENSES, DRY TO MOIST
- (B) **ROADWAY EMBANKMENT**
MEDIUM DENSE, GRAY AND BROWN, GRAVELLY SAND (A-1-b), DRY TO MOIST
- (C) **ALLUVIAL**
LOOSE, BROWN AND GRAY, CLAYEY SAND, SILTY SAND, AND GRAVELLY SAND (A-2-6, A-2-4, AND A-1-b), TRACE TO LITTLE GRAVEL, MOIST TO WET
- (D) **RESIDUAL**
SOFT, BROWN, SILTY CLAY (A-7-5/A-7-6), MOIST
- (E) **WEATHERED ROCK**
METAMUDSTONE, META-ARGILLITE

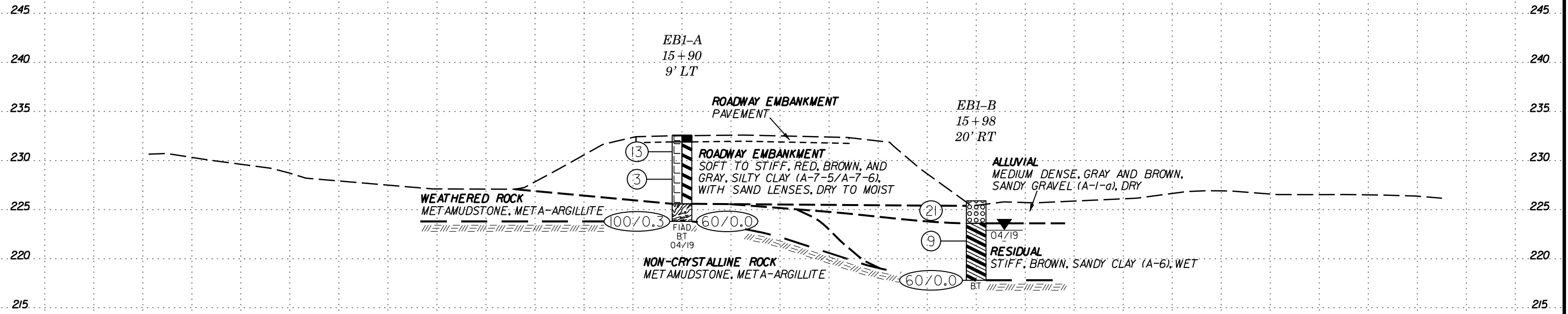


NON-CRYSTALLINE ROCK
BROWN AND GRAY, METAMUDSTONE AND META-ARGILLITE,
VERY SOFT TO MODERATELY HARD, VERY CLOSE TO
MODERATELY CLOSE FRACTURE SPACING, MODERATELY TO
SLIGHTLY WEATHERED, THINLY TO THICKLY BEDDED,
EXTREMELY INDURATED

13+00 14+00 15+00 16+00 17+00 18+00 19+00

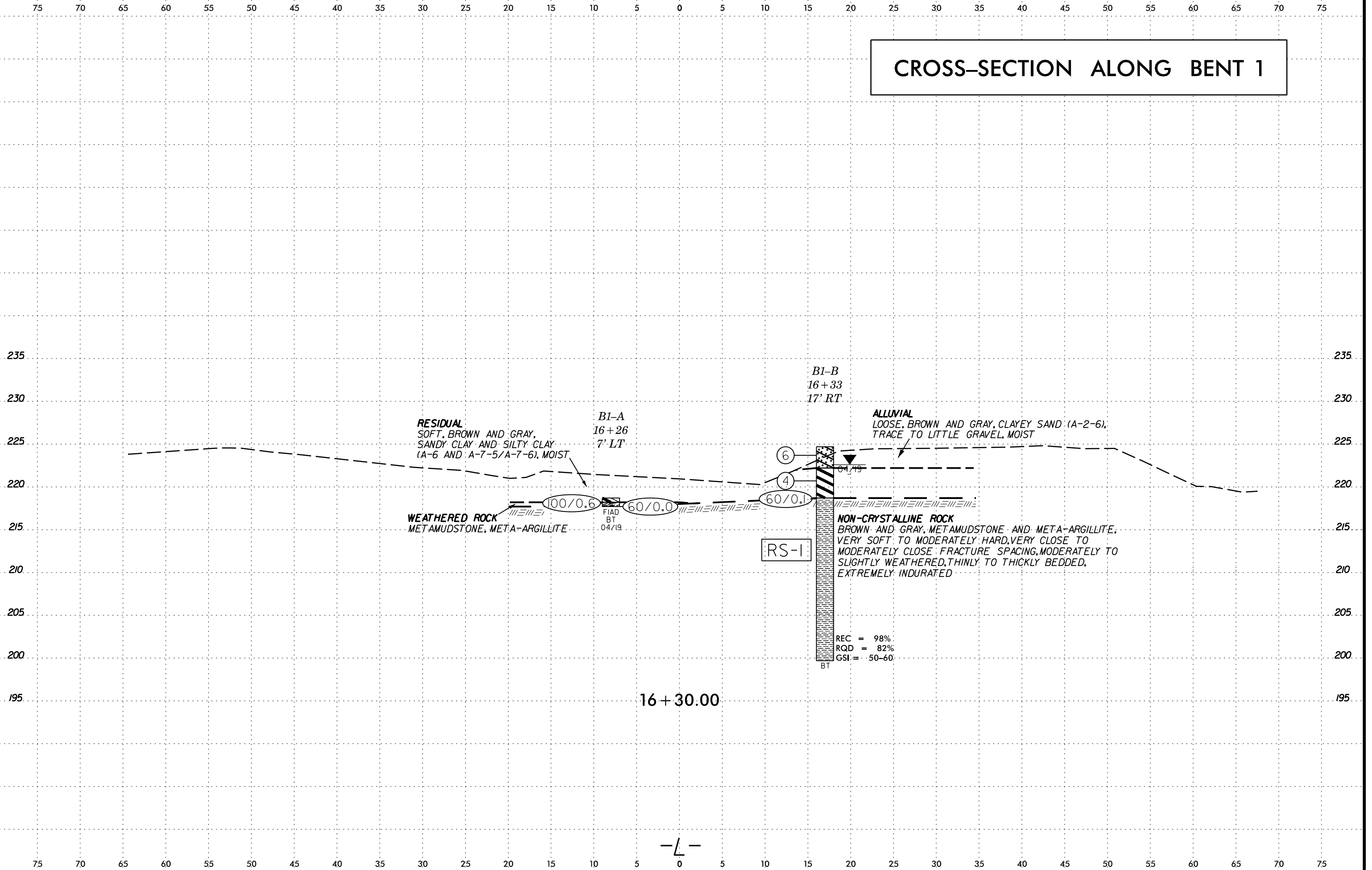
75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

CROSS-SECTION ALONG END BENT 1



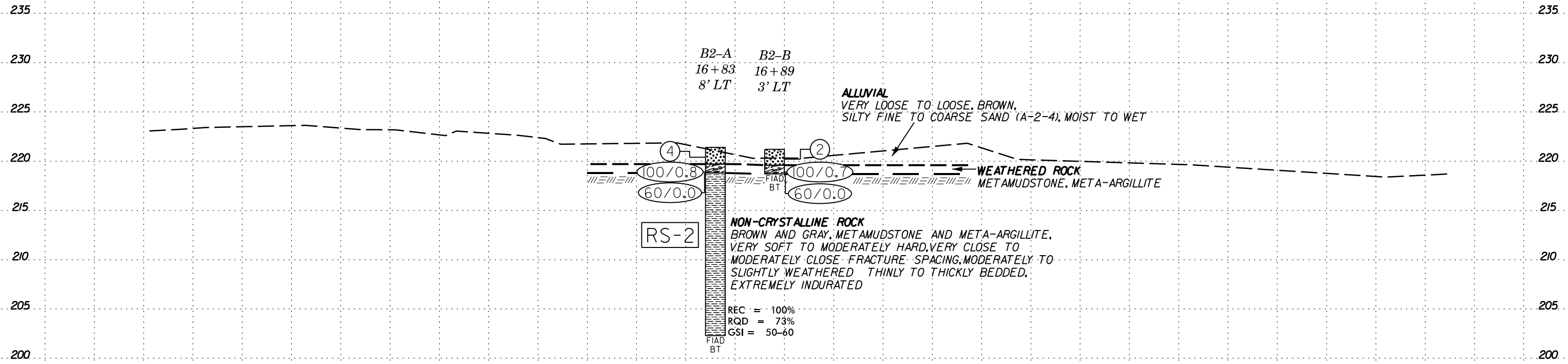


CROSS-SECTION ALONG BENT 1



75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

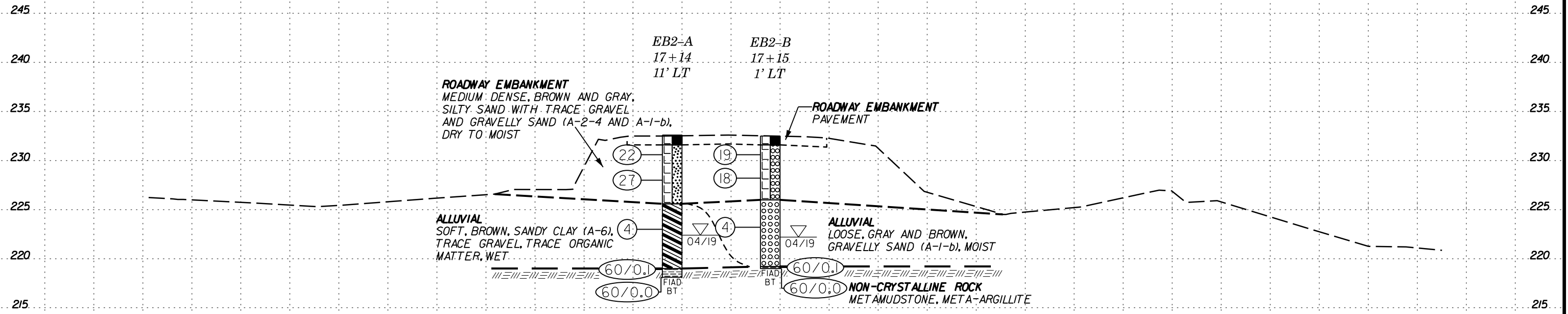
CROSS-SECTION ALONG BENT 2



6/23/16

75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

CROSS-SECTION ALONG END BENT 2



17 + 15.00

-L-

6/23/16
 17BP.8.R.135
 SHEET NO. 8

75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

GEOTECHNICAL BORING REPORT BORE LOG

WBS 17BP.8.R.135			TIP N/A			COUNTY MONTGOMERY			GEOLOGIST J. A. BLYTHE						
SITE DESCRIPTION REPLACE BRIDGE 610190 ON SR 1110 (LILLY'S BRIDGE ROAD) OVER CLARKS CREEK								GROUND WTR (ft)							
BORING NO. EB1-A		STATION 15+90		OFFSET 9 ft LT		ALIGNMENT -L-		0 HR. Dry							
COLLAR ELEV. 232.5 ft		TOTAL DEPTH 8.8 ft		NORTHING 532,792		EASTING 1,688,962		24 HR. FIAD							
DRILL RIGHAMMER EFF./DATE SME0593 CME-550X 85% 04/16/2018						DRILL METHOD H.S. Augers			HAMMER TYPE Automatic						
DRILLER J. LITTLE			START DATE 04/26/19		COMP. DATE 04/26/19		SURFACE WATER DEPTH N/A								
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
235															
	231.8	0.7	11	8	5								D	GROUND SURFACE ROADWAY EMBANKMENT PAVEMENT SOFT TO STIFF, RED, BROWN, AND GRAY, SILTY CLAY (A-7-5/A-7-6), WITH SAND LENSES	0.0 0.7
230															
	229.0	3.5	2	1	2								M		
225															
	224.0	8.5	100/0.3											WEATHERED ROCK METAMUDSTONE, META-ARGILLITE	7.0
	223.7	8.8	60/0.0											Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 223.7 ft IN NON-CRYSTALLINE ROCK (METAMUDSTONE, META-ARGILLITE)	8.8

WBS 17BP.8.R.135			TIP N/A			COUNTY MONTGOMERY			GEOLOGIST J. A. BLYTHE						
SITE DESCRIPTION REPLACE BRIDGE 610190 ON SR 1110 (LILLY'S BRIDGE ROAD) OVER CLARKS CREEK								GROUND WTR (ft)							
BORING NO. EB1-B		STATION 15+98		OFFSET 20 ft RT		ALIGNMENT -L-		0 HR. 3.2							
COLLAR ELEV. 225.6 ft		TOTAL DEPTH 8.1 ft		NORTHING 532,812		EASTING 1,688,985		24 HR. 3.0							
DRILL RIGHAMMER EFF./DATE SME0593 CME-550X 85% 04/16/2018						DRILL METHOD H.S. Augers			HAMMER TYPE Automatic						
DRILLER J. LITTLE			START DATE 04/25/19		COMP. DATE 04/25/19		SURFACE WATER DEPTH N/A								
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
230															
	225.6	0.0	4	12	9								D	GROUND SURFACE ROADWAY EMBANKMENT MEDIUM DENSE, GRAY AND BROWN, SANDY GRAVEL (A-1-a)	0.0
225															
	222.5	3.1	3	4	5								W	RESIDUAL STIFF, BROWN, SANDY CLAY (A-6)	2.3
220															
	217.5	8.1	60/0.0											Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 217.5 ft ON NON-CRYSTALLINE ROCK (METAMUDSTONE, META-ARGILLITE)	8.1

NCDOT BORE DOUBLE 610190_GEO_BRDG.GPJ NC_DOT.GDT 12/19/19

GEOTECHNICAL BORING REPORT

BORE LOG

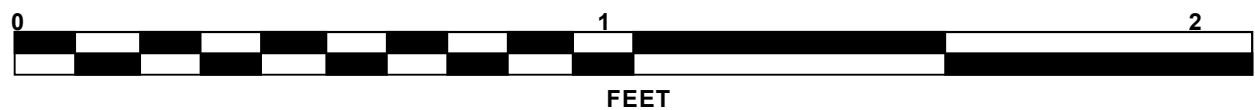
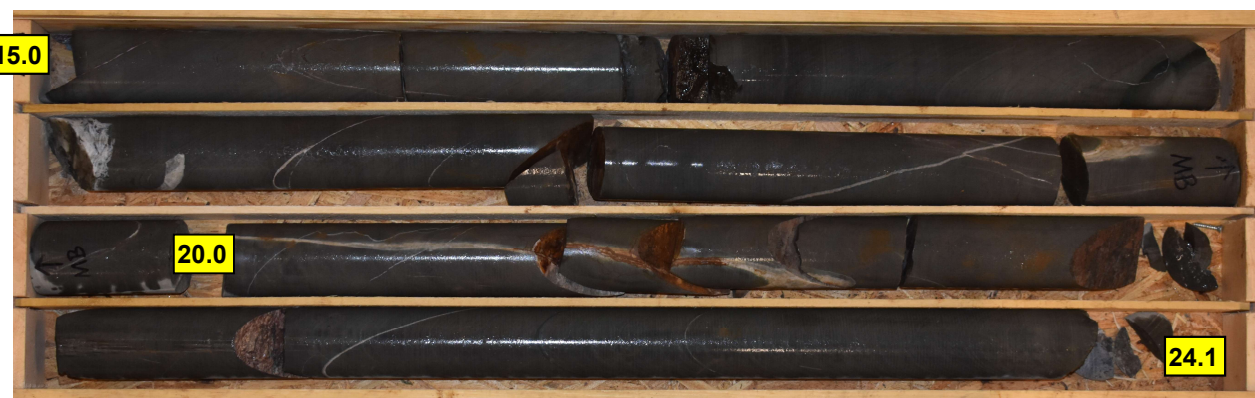
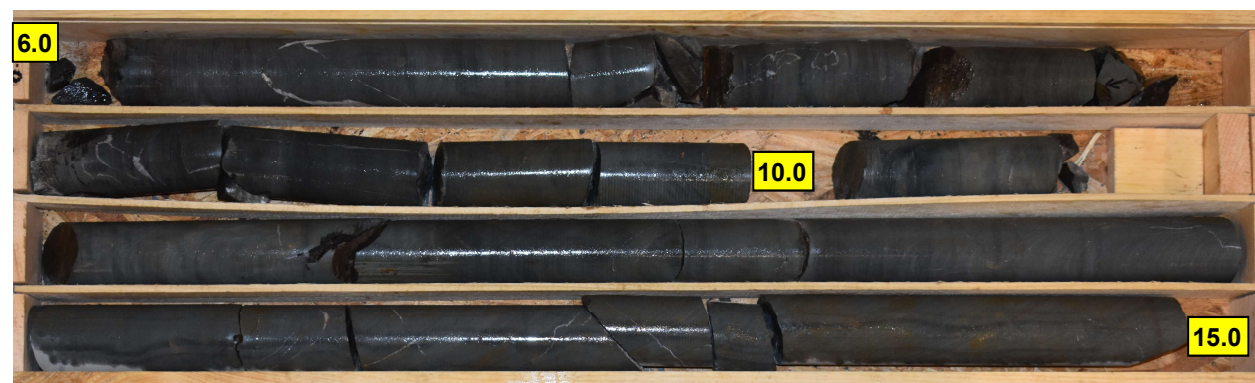
WBS 17BP.8.R.135		TIP N/A		COUNTY MONTGOMERY		GEOLOGIST J. A. BLYTHE								
SITE DESCRIPTION REPLACE BRIDGE 610190 ON SR 1110 (LILLY'S BRIDGE ROAD) OVER CLARKS CREEK							GROUND WTR (ft)							
BORING NO. B1-A		STATION 16+26		OFFSET 7 ft LT		ALIGNMENT -L-								
COLLAR ELEV. 222.0 ft		TOTAL DEPTH 1.0 ft		NORTHING 532,826		EASTING 1,688,949								
DRILL RIGHAMMER EFF./DATE SVE0593 CME-550X 85% 04/16/2018				DRILL METHOD Mud Rotary		HAMMER TYPE Automatic								
DRILLER J. LITTLE		START DATE 04/29/19		COMP. DATE 04/29/19		SURFACE WATER DEPTH N/A								
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	L O G	SOIL AND ROCK DESCRIPTION	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)
225														
	222.0	0.0												222.0 GROUND SURFACE 0.0
			3											221.5 RESIDUAL 0.5
	221.0	1.0								100/0.6				221.0 SOFT, BROWN AND GRAY, SANDY CLAY (A-6) 1.0
			60/0.0							60/0.0				WEATHERED ROCK METAMUDSTONE, META-ARGILLITE
														Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 221.0 ft ON NON-CRYSTALLINE ROCK (METAMUDSTONE, META-ARGILLITE)

NCDOT BORE DOUBLE 610190_GEO_BRDG.GPJ NC_DOT.GDT 12/19/19

CORE PHOTOGRAPHS

B1-B

BOXES 1 & 2: 6.0 - 24.1 FEET



B1-B

BOX 3: 24.1 - 25.0 FEET



CORE PHOTOGRAPHS

B2-A

BOXES 1 & 2: 2.6 - 19.1 FEET



GEOTECHNICAL BORING REPORT

BORE LOG

WBS 17BP.8.R.135		TIP N/A		COUNTY MONTGOMERY		GEOLOGIST J. A. BLYTHE								
SITE DESCRIPTION REPLACE BRIDGE 610190 ON SR 1110 (LILLY'S BRIDGE ROAD) OVER CLARKS CREEK								GROUND WTR (ft)						
BORING NO. B2-B		STATION 16+89		OFFSET 3 ft LT		ALIGNMENT -L-		0 HR.	N/A					
COLLAR ELEV. 221.7 ft		TOTAL DEPTH 2.5 ft		NORTHING 532,884		EASTING 1,688,926		24 HR.	FIAD					
DRILL RIGHAMMER EFF./DATE SVE0593 CME-550X 85% 04/16/2018				DRILL METHOD Mud Rotary		HAMMER TYPE Automatic								
DRILLER J. LITTLE		START DATE 04/29/19		COMP. DATE 04/29/19		SURFACE WATER DEPTH N/A								
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	L O G	SOIL AND ROCK DESCRIPTION ELEV. (ft) DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
225														
	221.7	0.0				1	1	1						221.7 GROUND SURFACE 0.0
	220.1	1.6				---					W		220.1 ALLUVIAL VERY LOOSE, BROWN SILTY SAND (A-2-4) 1.6	
220	219.2	2.5	60/0.0	76/0.2		---							219.2 WEATHERED ROCK METAMUDSTONE, META-ARGILLITE 2.5	
						---							Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 219.2 ft ON NON-CRYSTALLINE ROCK (METAMUDSTONE, META-ARGILLITE)	

NCDOT BORE DOUBLE 610190_GEO_BRDG.GPJ NC_DOT.GDT 12/19/19

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 17BP.8.R.135		TIP N/A		COUNTY MONTGOMERY		GEOLOGIST J. A. BLYTHE										
SITE DESCRIPTION REPLACE BRIDGE 610190 ON SR 1110 (LILLY'S BRIDGE ROAD) OVER CLARKS CREEK							GROUND WTR (ft)									
BORING NO. EB2-A		STATION 17+14		OFFSET 11 ft LT		ALIGNMENT -L-										
COLLAR ELEV. 232.5 ft		TOTAL DEPTH 14.5 ft		NORTHING 532,904		EASTING 1,688,908										
DRILL RIG/HAMMER EFF./DATE SME0593 CME-550X 85%/04/16/2018				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER J. LITTLE		START DATE 04/26/19		COMP. DATE 04/26/19		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
235																
231.5		1.0				10	10	12								
230																
228.9		3.6				11	14	13								
225																
223.9		8.6				4	2	2								
220																
218.9		13.6														
218.0		14.5														

WBS 17BP.8.R.135		TIP N/A		COUNTY MONTGOMERY		GEOLOGIST J. A. BLYTHE										
SITE DESCRIPTION REPLACE BRIDGE 610190 ON SR 1110 (LILLY'S BRIDGE ROAD) OVER CLARKS CREEK							GROUND WTR (ft)									
BORING NO. EB2-B		STATION 17+15		OFFSET 1 ft LT		ALIGNMENT -L-										
COLLAR ELEV. 232.5 ft		TOTAL DEPTH 13.5 ft		NORTHING 532,909		EASTING 1,688,916										
DRILL RIG/HAMMER EFF./DATE SME0593 CME-550X 85%/04/16/2018				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER J. LITTLE		START DATE 04/26/19		COMP. DATE 04/26/19		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
235																
231.6		0.9				7	8	11								
230																
229.2		3.3				7	8	10								
225																
224.2		8.3				6	2	2								
220																
219.2		13.3														
219.0		13.5														

NCDOT BORE DOUBLE 610190_GEO_BRDG.GPJ NC_DOT.GDT 12/19/19

17BP.8.R.135
Montgomery County

SITE PHOTOGRAPH

Bridge No. 190 on -L- (SR 1110) over Clarks Creek



Looking South towards End Bent 1

UNCONFINED COMPRESSION
(ASTM D7012 Method C)



S&ME, Inc. - Knoxville 1413 Topside Road, Louisville, TN 37777

Project Name: Montgomery Bridge 190

WBS: 17BP.8.R.135

Report Date: May 24, 2019

Reviewed By: John B. Pearson

S&ME Project Number: 6235-18-032

Boring No.	Sample No.	Depth (ft)	Dimensions, in.		Shape (See Key)	Area (in ²)	Unit Weight (lbs/ft ³)	Loading Rate (psi/sec)	Maximum Load (lbs)	Strength (psi)	Moisture (%)
			Length	Diameter							
B1-B	RS-1	12.4 - 12.8	4.36	1.97	A	3.05	174.8	92	50,797	16,655	0.1
B2-A	RS-2	9.3 - 9.7	4.29	1.98	A	3.08	173.6	78	34,945	11,346	0.1

NOTES: Effective (as received) unit weight as determined by RTH 109-93.
Loading rates were selected to target reaching failure between 2 and 15 minutes.
Test results for specimens not meeting the requirements of ASTM D4543 may differ from a test specimen that meets the requirements of ASTM D4543.

SHAPE KEY

ASTM D4543-08^{E1} *Standard Practice for Preparing Rock Core as Cylindrical Test Specimens and Verifying Conformance to Dimensional and Shape Tolerance* Section 1.2 - "Rock is a complex engineering material that can vary greatly as a function of lithology, stress history, weathering, moisture content and chemistry, and other natural geologic processes. As such, it is not always possible to obtain or prepare rock core specimens that satisfy the desirable tolerances given in this practice. Most commonly, this situation presents itself with weaker, more porous, and poorly cemented rock types and rock types containing significant or weak (or both) structural features. For these and other rock types which are difficult to prepare, all reasonable efforts shall be made to prepare a specimen in accordance with this practice and for the intended test procedure. However, when it has been determined by trial that this is not possible, prepare the rock specimen to the closest tolerances practicable and consider this to be the best effort and report it as such and if allowable or necessary for the intended test, capping the ends of the specimen as discussed in this practice is permitted."

- A Test specimen measurements met the desired shape tolerances of ASTM D4543-08^{E1} (side straightness, end flatness & parallelism, and end perpendicularity to axis)
- B Test specimen measurements met the desired shape tolerances of ASTM D4543-08^{E1} for end flatness & parallelism, and end perpendicularity to axis. Specimen did not meet the desired tolerance for side straightness. Specimen prepared to closest tolerances practicable.
- C Test specimen measurements met the desired shape tolerances of ASTM D4543-08^{E1} for end flatness & parallelism. Specimen did not meet the desired tolerances for side straightness and end perpendicularity to axis. Specimen prepared to closest tolerances practicable.
- D Test specimen measurements met the desired shape tolerances of ASTM D4543-08^{E1} for end flatness. Specimen did not meet the desired tolerances for side straightness, parallelism and end perpendicularity to axis. Specimen prepared to closest tolerances practicable.
- E Test specimen measurements met the desired shape tolerances of ASTM D4543-08^{E1} for end flatness and end perpendicularity to axis. Specimen did not meet the desired tolerance for side straightness and parallelism. Specimen prepared to closest tolerances practicable.



1413 Topside Road, Louisville, TN 37777

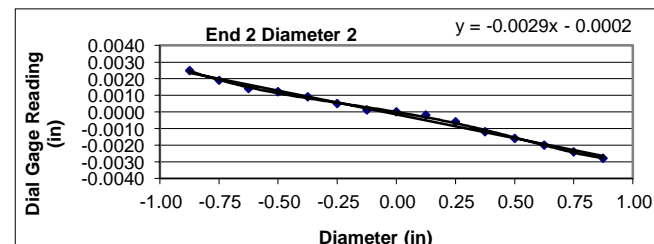
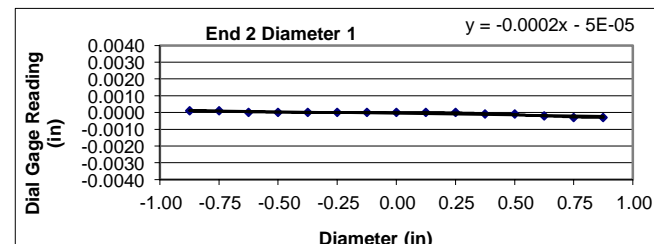
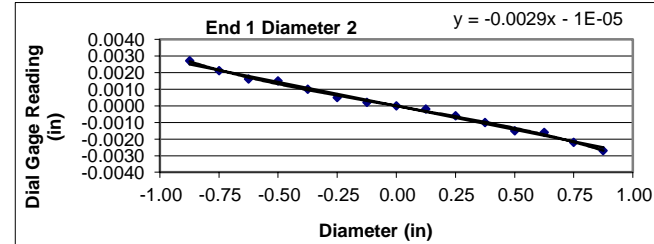
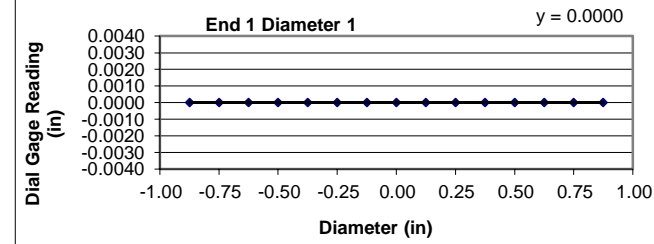
Project:	Montgomery Bridge 190	Diameter (in):	1.97	Date:	5/23/2019
WBS:	17BP.8.R.135	Length (in):	4.36	Tested by:	TI
Boring Id:	B1-B	Unit Weight (pcf):	174.8	Reviewed by:	MDK
Sample No.:	RS-1	Moisture Content (%):	0.1		
Depth (ft):	12.4 - 12.8				

Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? YES Straightness Tolerance Met? YES

End Flatness and Parallelism Readings (Procedure FP1)

Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	0.0000	0.0027	0.0001	0.0025
- 6/8	0.0000	0.0021	0.0001	0.0019
- 5/8	0.0000	0.0016	0.0000	0.0014
- 4/8	0.0000	0.0015	0.0000	0.0012
- 3/8	0.0000	0.0010	0.0000	0.0009
- 2/8	0.0000	0.0005	0.0000	0.0005
- 1/8	0.0000	0.0002	0.0000	0.0001
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0000	-0.0002	0.0000	-0.0002
2/8	0.0000	-0.0006	0.0000	-0.0006
3/8	0.0000	-0.0010	-0.0001	-0.0012
4/8	0.0000	-0.0015	-0.0001	-0.0016
5/8	0.0000	-0.0016	-0.0002	-0.0020
6/8	0.0000	-0.0022	-0.0003	-0.0024
7/8	0.0000	-0.0027	-0.0003	-0.0028



Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? YES

Parallelism is met when the angular difference between best fit lines on opposing ends is $\leq 0.25^\circ$.

Parallelism Diameter 1

End 1:	Slope of Best Fit Line:	0.00000
	Angle of Best Fit Line:	0.00000
End 2:	Slope of Best Fit Line:	-0.00020
	Angle of Best Fit Line:	-0.01130
	Max Angular Difference:	0.01

Parallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00286
	Angle of Best Fit Line:	-0.16403
End 2:	Slope of Best Fit Line:	-0.00285
	Angle of Best Fit Line:	-0.16354
	Max Angular Difference:	0.00

Parallelism Tolerance Met? YES

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043 .

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0000	0.0000	YES
End 1 Diam 2	0.0054	0.0027	YES
End 2 Diam 1	0.0004	0.0002	YES
End 2 Diam 2	0.0053	0.0027	YES

Perpendicularity Tolerance Met? YES

1413 Topside Road, Louisville, TN 37777

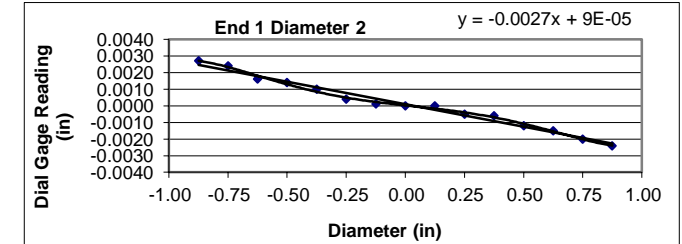
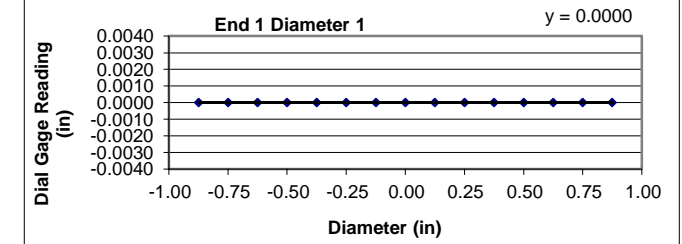
Project:	Montgomery Bridge 190	Diameter (in):	1.98	Date:	5/23/2019
WBS:	17BP.8.R.135	Length (in):	4.29	Tested by:	TI
Boring Id:	B2-A	Unit Weight (pcf):	173.6	Reviewed by:	MDK
Sample No.:	RS-2	Moisture Content (%):	0.1		
Depth (ft):	9.3 - 9.7				

Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? YES Straightness Tolerance Met? YES

End Flatness and Parallelism Readings (Procedure FP1)

Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	0.0000	0.0027	0.0000	0.0024
- 6/8	0.0000	0.0024	0.0000	0.0023
- 5/8	0.0000	0.0016	0.0000	0.0017
- 4/8	0.0000	0.0014	0.0000	0.0010
- 3/8	0.0000	0.0010	0.0000	0.0007
- 2/8	0.0000	0.0004	0.0000	0.0004
- 1/8	0.0000	0.0001	0.0000	0.0001
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0000	0.0000	0.0000	0.0000
2/8	0.0000	-0.0005	0.0000	0.0000
3/8	0.0000	-0.0006	0.0000	-0.0002
4/8	0.0000	-0.0012	0.0000	-0.0008
5/8	0.0000	-0.0015	0.0000	-0.0010
6/8	0.0000	-0.0020	0.0000	-0.0016
7/8	0.0000	-0.0024	0.0000	-0.0022



Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? YES

Parallelism is met when the angular difference between best fit lines on opposing ends is $\leq 0.25^\circ$.

Parallelism Diameter 1

End 1:	Slope of Best Fit Line:	0.00000
	Angle of Best Fit Line:	0.00000
End 2:	Slope of Best Fit Line:	0.00000
	Angle of Best Fit Line:	0.00000
	Max Angular Difference:	0.00

Parallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00271
	Angle of Best Fit Line:	-0.15503
End 2:	Slope of Best Fit Line:	-0.00228
	Angle of Best Fit Line:	-0.13080
	Max Angular Difference:	-0.02

Parallelism Tolerance Met? YES

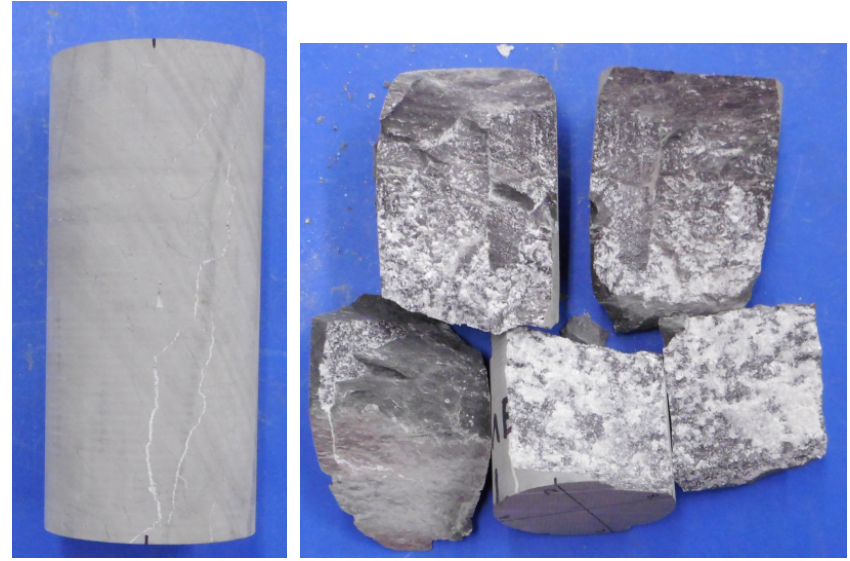
Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043 .

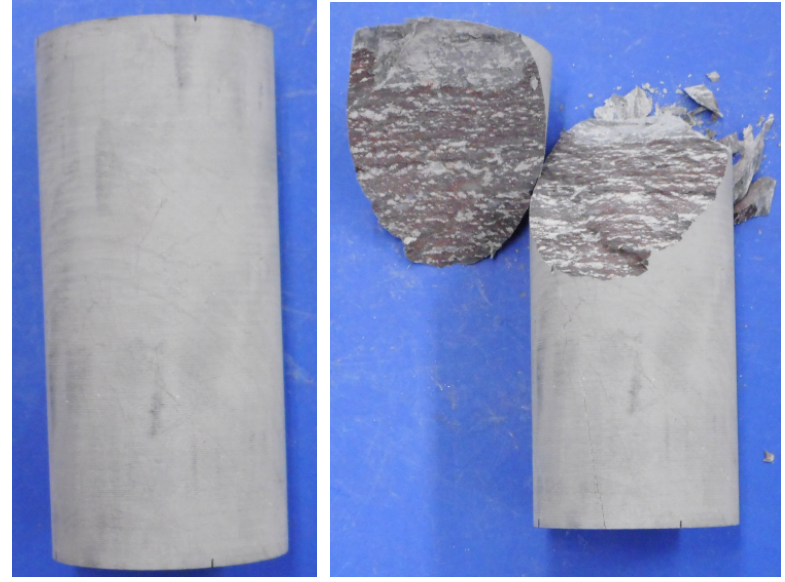
	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0000	0.0000	YES
End 1 Diam 2	0.0051	0.0026	YES
End 2 Diam 1	0.0000	0.0000	YES
End 2 Diam 2	0.0046	0.0023	YES

Perpendicularity Tolerance Met? YES



Bridge 190 Montgomery County
 17BP.8.R.135
 S&ME Project No. 6235-18-032

		Date: 5/23/2019
		Photographer: Tori Igoe
1	Location / Orientation	RS- 1 : B1-B (12.4' – 12.8')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012)

		Date: 5/23/2019
		Photographer: Tori Igoe
2	Location / Orientation	RS-2 : B2-A (9.3' – 9.7')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012)