

REFERENCE: B-4766

PROJECT: 38538

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

| STATE | STATE PROJECT REFERENCE NO. | SHEET NO. | TOTAL SHEETS |
|-------|-----------------------------|-----------|--------------|
| N.C.  | B-4766                      | 1         | 6            |

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| 6         | CORE PHOTO(S) |

**STRUCTURE**  
**SUBSURFACE INVESTIGATION**

COUNTY IREDELL  
PROJECT DESCRIPTION BRIDGE NO. 69 OVER ROCKY CREEK ON NC 115

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

**ADDENDUM**

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.

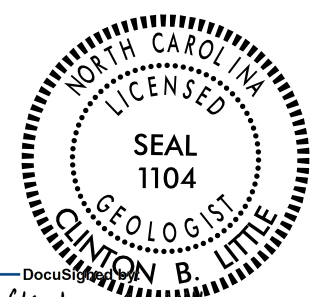
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  2. BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

PERSONNEL

J.K. STICKNEY  
C.L. SMITH  
M.R. MOORE

INVESTIGATED BY J.E. BEVERLY  
DRAWN BY J.E. BEVERLY  
CHECKED BY C.B. LITTLE  
SUBMITTED BY C.B. LITTLE  
DATE OCTOBER 2015



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Clinton B. Little

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11/23/2015

SIGNATURE

DATE

**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  |       |  |           |                     |           |                |                 |               |                 |  |   |   |   |  |   |  |     |    |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |                            |                                      |   |                      |  |             |   |   |               |                                    |             |  |  |  |  |  |  |  |  |  |  |  |  |  |
|---|---|---|--|---|--|------------|-------|-------|-----|---|----------------------------|--|--|--|--|--|---------------|---|--|--|--|---|------------|-----------------|---|----------------|-----------------------|-------------------|----------------------|--|-------|--|-----------|---------------------|-----------|----------------|-----------------|---------------|-----------------|--|---|---|---|--|---|--|-----|----|---|--|--|--|--|--|--|--|--|--|---|--|--|--|--|--|----------------------------|--------------------------------------|---|----------------------|--|-------------|---|---|---------------|------------------------------------|-------------|--|--|--|--|--|--|--|--|--|--|--|--|--|
| <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 (ASTM T 206, 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><b>WELL GRADED</b> - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.<br/> <b>UNIFORMLY GRADED</b> - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.<br/> <b>GAP-GRADED</b> - 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><b>ALLUVIUM (ALLUV.)</b> - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.<br/> <b>AQUIFER</b> - A WATER BEARING FORMATION OR STRATA.<br/> <b>ARENACEOUS</b> - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.<br/> <b>ARGILLACEOUS</b> - 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.<br/> <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.<br/> <b>CALCAREOUS (CALC.)</b> - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.<br/> <b>COLLUVIUM</b> - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.<br/> <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.<br/> <b>DIKE</b> - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.<br/> <b>DIP</b> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.<br/> <b>DIP DIRECTION (DIP AZIMUTH)</b> - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.<br/> <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.<br/> <b>FISSILE</b> - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.<br/> <b>FLOAT</b> - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOGGED FROM PARENT MATERIAL.<br/> <b>FLOOD PLAIN (FP)</b> - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.<br/> <b>FORMATION (FM)</b> - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.<br/> <b>JOINT</b> - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.<br/> <b>LEDGE</b> - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.<br/> <b>LENS</b> - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.<br/> <b>MOTTLED (MOT.)</b> - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.<br/> <b>PERCHED WATER</b> - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.<br/> <b>RESIDUAL (RES.) SOIL</b> - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.<br/> <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.<br/> <b>SAPROLITE (SAP.)</b> - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.<br/> <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.<br/> <b>SLICKENSIDE</b> - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.<br/> <b>STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT)</b> - 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.<br/> <b>STRATA CORE RECOVERY (SREC.)</b> - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.<br/> <b>STRATA ROCK QUALITY DESIGNATION (SROD)</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.<br/> <b>TOPSOIL (TS.)</b> - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p> |       |  |           |                     |           |                |                 |               |                 |  |   |   |   |  |   |  |     |    |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |                            |                                      |   |                      |  |             |   |   |               |                                    |             |  |  |  |  |  |  |  |  |  |  |  |  |  |
| SOIL LEGEND AND AASHTO CLASSIFICATION   |   |   |  |   |  |            |       |       |     | MINERALOGICAL COMPOSITION   |                            |  |  |  |  |  |               |   |  | WEATHERING   |  |   |            |                 |   |                |                       |                   |                      | WEATHERING   |       |  |           |                     |           |                |                 |               |                 |  |   |   |   |  |   |  |     |    |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |                            |                                      |   |                      |  |             |   |   |               |                                    |             |  |  |  |  |  |  |  |  |  |  |  |  |  |
| <p><b>GENERAL CLASS.</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="5">GRANULAR MATERIALS (≤ 35% PASSING #200)</th> <th colspan="5">SILT-CLAY MATERIALS (&gt; 35% PASSING #200)</th> <th colspan="5">ORGANIC MATERIALS</th> </tr> <tr> <th>GROUP CLASS.</th> <th>A-1</th> <th>A-1-b</th> <th>A-3</th> <th>A-2</th> <th>A-2-4</th> <th>A-2-5</th> <th>A-2-6</th> <th>A-2-7</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> </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> </tr> </table>   |   |   |  |   |  |            |       |       |     | GRANULAR MATERIALS (≤ 35% PASSING #200)   |                            |  |  |  | SILT-CLAY MATERIALS (> 35% PASSING #200)                   |  |               |   |  | ORGANIC MATERIALS  |  |   |            |                 | GROUP CLASS.  | A-1            | A-1-b                 | A-3               | A-2                  | A-2-4  | A-2-5 | A-2-6  | A-2-7     | A-4                 | A-5       | A-6            | A-7             | A-1, A-2      | A-3             | A-4, A-5   | A-6, A-7  | SYMBOL  |   |  |   |  |     |    |   |  |  |  |  |  |  |  |  |  | <p><b>MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.</b></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>FRESH</b> - ROCK FRESH, CRYSTALS 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, WOULD YIELD 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 MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <i>IF TESTED, WOULD YIELD 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> |  |  |  |  |  |  |  |  |  |
| GRANULAR MATERIALS (≤ 35% PASSING #200)   |   |   |  |   | SILT-CLAY MATERIALS (> 35% PASSING #200)   |            |       |       |     | ORGANIC MATERIALS   |                            |  |  |  |  |  |               |   |  |  |  |   |            |                 |   |                |                       |                   |                      |  |       |  |           |                     |           |                |                 |               |                 |  |   |   |   |  |   |  |     |    |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |                            |                                      |   |                      |  |             |   |   |               |                                    |             |  |  |  |  |  |  |  |  |  |  |  |  |  |
| GROUP CLASS.  | A-1   | A-1-b   | A-3  | A-2   | A-2-4  | A-2-5      | A-2-6 | A-2-7 | A-4 | A-5   | A-6                        | A-7  | A-1, A-2   | A-3  | A-4, A-5   | A-6, A-7                                       |               |   |  |  |  |   |            |                 |   |                |                       |                   |                      |  |       |  |           |                     |           |                |                 |               |                 |  |   |   |   |  |   |  |     |    |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |                            |                                      |   |                      |  |             |   |   |               |                                    |             |  |  |  |  |  |  |  |  |  |  |  |  |  |
| SYMBOL  |   |   |  |   |  |            |       |       |     |   |                            |  |  |  |  |  |               |   |  |  |  |   |            |                 |   |                |                       |                   |                      |  |       |  |           |                     |           |                |                 |               |                 |  |   |   |   |  |   |  |     |    |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |                            |                                      |   |                      |  |             |   |   |               |                                    |             |  |  |  |  |  |  |  |  |  |  |  |  |  |
| <p><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 1 - 10%</td> </tr> <tr> <td>LITTLE ORGANIC MATTER</td> <td>3 - 5%</td> <td>5 - 12%</td> <td>LITTLE 10 - 20%</td> </tr> <tr> <td>MODERATELY ORGANIC</td> <td>5 - 10%</td> <td>12 - 20%</td> <td>SOME 20 - 35%</td> </tr> <tr> <td>HIGHLY ORGANIC</td> <td>&gt; 10%</td> <td>&gt; 20%</td> <td>HIGHLY 35% AND ABOVE</td> </tr> </table>   |   |   |  |   |  |            |       |       |     | ORGANIC MATERIAL  | GRANULAR SOILS             | SILT - CLAY SOILS                                  | OTHER MATERIAL   | TRACE OF ORGANIC MATTER                    | 2 - 3%   | 3 - 5%   | TRACE 1 - 10% | LITTLE ORGANIC MATTER                   | 3 - 5%   | 5 - 12%  | LITTLE 10 - 20%  | MODERATELY ORGANIC  | 5 - 10%    | 12 - 20%        | SOME 20 - 35%   | HIGHLY ORGANIC | > 10%                 | > 20%             | HIGHLY 35% AND ABOVE | <p><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>   |       |  |           |                     |           |                |                 |               |                 | <p><b>MISCELLANEOUS SYMBOLS</b></p> <p> ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION</p> <p> SOIL SYMBOL</p> <p> ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT</p> <p> INFERRED SOIL BOUNDARY</p> <p> INFERRED ROCK LINE</p> <p> ALLUVIAL SOIL BOUNDARY</p> <p> DIP &amp; DIP DIRECTION OF ROCK STRUCTURES</p> <p> TEST BORING</p> <p> AUGER BORING</p> <p> CORE BORING</p> <p> MONITORING WELL</p> <p> PIEZOMETER INSTALLATION</p> <p> SLOPE INDICATOR INSTALLATION</p> <p> CONE PENETROMETER TEST</p> <p> SOUNDING ROD</p> <p> TEST BORING WITH CORE</p> <p> SPT N-VALUE</p> |   |   |   |  |   |  |     |    |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |                            |                                      |   |                      |  |             |   |   |               |                                    |             |  |  |  |  |  |  |  |  |  |  |  |  |  |
| ORGANIC MATERIAL  | GRANULAR SOILS  | SILT - CLAY SOILS   | OTHER MATERIAL   |   |  |            |       |       |     |   |                            |  |  |  |  |  |               |   |  |  |  |   |            |                 |   |                |                       |                   |                      |  |       |  |           |                     |           |                |                 |               |                 |  |   |   |   |  |   |  |     |    |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |                            |                                      |   |                      |  |             |   |   |               |                                    |             |  |  |  |  |  |  |  |  |  |  |  |  |  |
| TRACE OF ORGANIC MATTER   | 2 - 3%  | 3 - 5%  | TRACE 1 - 10%  |   |  |            |       |       |     |   |                            |  |  |  |  |  |               |   |  |  |  |   |            |                 |   |                |                       |                   |                      |  |       |  |           |                     |           |                |                 |               |                 |  |   |   |   |  |   |  |     |    |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |                            |                                      |   |                      |  |             |   |   |               |                                    |             |  |  |  |  |  |  |  |  |  |  |  |  |  |
| LITTLE ORGANIC MATTER   | 3 - 5%  | 5 - 12%   | LITTLE 10 - 20%  |   |  |            |       |       |     |   |                            |  |  |  |  |  |               |   |  |  |  |   |            |                 |   |                |                       |                   |                      |  |       |  |           |                     |           |                |                 |               |                 |  |   |   |   |  |   |  |     |    |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |                            |                                      |   |                      |  |             |   |   |               |                                    |             |  |  |  |  |  |  |  |  |  |  |  |  |  |
| MODERATELY ORGANIC  | 5 - 10%   | 12 - 20%  | SOME 20 - 35%  |   |  |            |       |       |     |   |                            |  |  |  |  |  |               |   |  |  |  |   |            |                 |   |                |                       |                   |                      |  |       |  |           |                     |           |                |                 |               |                 |  |   |   |   |  |   |  |     |    |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |                            |                                      |   |                      |  |             |   |   |               |                                    |             |  |  |  |  |  |  |  |  |  |  |  |  |  |
| HIGHLY ORGANIC  | > 10%   | > 20%   | HIGHLY 35% AND ABOVE   |   |  |            |       |       |     |   |                            |  |  |  |  |  |               |   |  |  |  |   |            |                 |   |                |                       |                   |                      |  |       |  |           |                     |           |                |                 |               |                 |  |   |   |   |  |   |  |     |    |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |                            |                                      |   |                      |  |             |   |   |               |                                    |             |  |  |  |  |  |  |  |  |  |  |  |  |  |
| <p><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<br/>LOOSE<br/>MEDIUM DENSE<br/>DENSE<br/>VERY DENSE</td> <td>&lt; 4<br/>4 TO 10<br/>10 TO 30<br/>30 TO 50<br/>&gt; 50</td> <td>N/A</td> </tr> <tr> <td>GENERALLY SILT-CLAY MATERIAL (COHESIVE)</td> <td>VERY SOFT<br/>SOFT<br/>MEDIUM STIFF<br/>STIFF<br/>VERY STIFF<br/>HARD</td> <td>&lt; 2<br/>2 TO 4<br/>4 TO 8<br/>8 TO 15<br/>15 TO 30<br/>&gt; 30</td> <td>&lt; 0.25<br/>0.25 TO 0.5<br/>0.5 TO 1.0<br/>1 TO 2<br/>2 TO 4<br/>&gt; 4</td> </tr> </table> |   |   |  |   |  |            |       |       |     | PRIMARY SOIL TYPE   | COMPACTNESS OR CONSISTENCY | RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) | RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT <sup>2</sup> ) | GENERALLY GRANULAR MATERIAL (NON-COHESIVE) | VERY LOOSE<br>LOOSE<br>MEDIUM DENSE<br>DENSE<br>VERY DENSE | < 4<br>4 TO 10<br>10 TO 30<br>30 TO 50<br>> 50 | N/A           | GENERALLY SILT-CLAY MATERIAL (COHESIVE) | VERY SOFT<br>SOFT<br>MEDIUM STIFF<br>STIFF<br>VERY STIFF<br>HARD | < 2<br>2 TO 4<br>4 TO 8<br>8 TO 15<br>15 TO 30<br>> 30   | < 0.25<br>0.25 TO 0.5<br>0.5 TO 1.0<br>1 TO 2<br>2 TO 4<br>> 4 | <p><b>RECOMMENDATION SYMBOLS</b></p> <p> UNDERCUT EXCAVATION</p> <p> UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE</p> <p> UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK</p> <p> SHALLOW UNDERCUT</p>   |            |                 |   |                |                       |                   |                      |  |       | <p><b>ABBREVIATIONS</b></p> <p>AR - AUGER REFUSAL<br/> BT - BORING TERMINATED<br/> CL - CLAY<br/> CPT - COARSE PENETRATION TEST<br/> CSE - COARSE<br/> DMT - DILATOMETER TEST<br/> DPT - DYNAMIC PENETRATION TEST<br/> e - VOID RATIO<br/> F - FINE<br/> FOSS. - FOSSILIFEROUS<br/> FRAC. - FRACTURED, FRACTURES<br/> FRAGS. - FRAGMENTS<br/> HI. - HIGHLY</p> <p>MED. - MEDIUM<br/> MICA. - MICACEOUS<br/> MOD. - MODERATELY<br/> NP - NON PLASTIC<br/> ORG. - ORGANIC<br/> PMT - PRESSUREMETER TEST<br/> SAP. - SAPROLITIC<br/> SD. - SAND, SANDY<br/> SL. - SILT, SILTY<br/> SLI. - SLIGHTLY<br/> TCR - TRICONE REFUSAL<br/> w - MOISTURE CONTENT<br/> V - VERY</p> <p>VST - VANE SHEAR TEST<br/> WEA. - WEATHERED<br/> W - UNIT WEIGHT<br/> W<sub>d</sub> - DRY UNIT WEIGHT</p> <p><b>SAMPLE ABBREVIATIONS</b></p> <p>S - BULK<br/> SS - SPLIT SPOON<br/> ST - SHELBY TUBE<br/> RS - ROCK<br/> RT - RECOMPACTED TRIAXIAL<br/> CBR - CALIFORNIA BEARING RATIO</p> |           |                     |           |                |                 |               |                 |  |   |   |   |  |   |  |     |    |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |                            |                                      |   |                      |  |             |   |   |               |                                    |             |  |  |  |  |  |  |  |  |  |  |  |  |  |
| PRIMARY SOIL TYPE   | COMPACTNESS OR CONSISTENCY  | RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)  | RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT <sup>2</sup> )   |   |  |            |       |       |     |   |                            |  |  |  |  |  |               |   |  |  |  |   |            |                 |   |                |                       |                   |                      |  |       |  |           |                     |           |                |                 |               |                 |  |   |   |   |  |   |  |     |    |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |                            |                                      |   |                      |  |             |   |   |               |                                    |             |  |  |  |  |  |  |  |  |  |  |  |  |  |
| GENERALLY GRANULAR MATERIAL (NON-COHESIVE)  | VERY LOOSE<br>LOOSE<br>MEDIUM DENSE<br>DENSE<br>VERY DENSE  | < 4<br>4 TO 10<br>10 TO 30<br>30 TO 50<br>> 50  | N/A  |   |  |            |       |       |     |   |                            |  |  |  |  |  |               |   |  |  |  |   |            |                 |   |                |                       |                   |                      |  |       |  |           |                     |           |                |                 |               |                 |  |   |   |   |  |   |  |     |    |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |                            |                                      |   |                      |  |             |   |   |               |                                    |             |  |  |  |  |  |  |  |  |  |  |  |  |  |
| GENERALLY SILT-CLAY MATERIAL (COHESIVE)   | VERY SOFT<br>SOFT<br>MEDIUM STIFF<br>STIFF<br>VERY STIFF<br>HARD  | < 2<br>2 TO 4<br>4 TO 8<br>8 TO 15<br>15 TO 30<br>> 30  | < 0.25<br>0.25 TO 0.5<br>0.5 TO 1.0<br>1 TO 2<br>2 TO 4<br>> 4   |   |  |            |       |       |     |   |                            |  |  |  |  |  |               |   |  |  |  |   |            |                 |   |                |                       |                   |                      |  |       |  |           |                     |           |                |                 |               |                 |  |   |   |   |  |   |  |     |    |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |                            |                                      |   |                      |  |             |   |   |               |                                    |             |  |  |  |  |  |  |  |  |  |  |  |  |  |
| <p><b>TEXTURE OR GRAIN SIZE</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>U.S. STD. SIEVE SIZE OPENING (MM)</th> <th>4</th> <th>10</th> <th>40</th> <th>60</th> <th>200</th> <th>270</th> </tr> <tr> <td></td> <td>4.76</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 (CS, 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> <th>MM</th> <th>305</th> <th>75</th> <th>2.0</th> <th>0.25</th> <th>0.05</th> <th>0.005</th> </tr> <tr> <td></td> <td>IN.</td> <td>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  |               | 4.76                                    | 2.00   | 0.42   | 0.25   | 0.075   | 0.053      | BOULDER (BLDR.) | COBBLE (COB.)   | GRAVEL (GR.)   | COARSE SAND (CS, 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><b>SOIL MOISTURE - CORRELATION OF TERMS</b></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 rowspan="2">LL - LIQUID LIMIT<br/>PL - PLASTIC LIMIT</td> <td>- SATURATED - (SAT.)</td> <td>USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE</td> </tr> <tr> <td>- WET - (W)</td> <td>SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE</td> </tr> <tr> <td rowspan="2">OM - OPTIMUM MOISTURE<br/>SL - SHRINKAGE LIMIT</td> <td>- MOIST - (M)</td> <td>SOLID; AT OR NEAR OPTIMUM MOISTURE</td> </tr> <tr> <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<br>PL - PLASTIC LIMIT | - SATURATED - (SAT.) | USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE  | - WET - (W) | SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE | OM - OPTIMUM MOISTURE<br>SL - SHRINKAGE LIMIT | - MOIST - (M) | SOLID; AT OR NEAR OPTIMUM MOISTURE | - DRY - (D) | REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE | <p><b>EQUIPMENT USED ON SUBJECT PROJECT</b></p> <p>DRILL UNITS:</p> <p><input type="checkbox"/> CME-45C</p> <p><input type="checkbox"/> CME-55</p> <p><input checked="" type="checkbox"/> CME-550</p> <p><input type="checkbox"/> VANE SHEAR TEST</p> <p><input type="checkbox"/> PORTABLE HOIST</p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p>ADVANCING TOOLS:</p> <p><input type="checkbox"/> CLAY BITS</p> <p><input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER</p> <p><input checked="" type="checkbox"/> 8" HOLLOW AUGERS</p> <p><input type="checkbox"/> HARD FACED FINGER BITS</p> <p><input checked="" type="checkbox"/> TUNG-CARBIDE INSERTS</p> <p><input checked="" type="checkbox"/> CASING <input checked="" type="checkbox"/> W/ ADVANCER</p> <p><input type="checkbox"/> TRICONE _____ * STEEL TEETH</p> <p><input type="checkbox"/> TRICONE _____ * TUNG-CARB.</p> <p><input checked="" type="checkbox"/> CORE BIT</p> <p><input type="checkbox"/></p> <p>HAMMER TYPE:</p> <p><input checked="" type="checkbox"/> AUTOMATIC <input type="checkbox"/> MANUAL</p> <p>CORE SIZE:</p> <p><input type="checkbox"/> -B _____ <input type="checkbox"/> -H _____</p> <p><input checked="" type="checkbox"/> -N NX _____</p> <p>HAND TOOLS:</p> <p><input type="checkbox"/> POST HOLE DIGGER</p> <p><input type="checkbox"/> HAND AUGER</p> <p><input type="checkbox"/> SOUNDING ROD</p> <p><input type="checkbox"/> VANE SHEAR TEST</p> |  |  |  |  |  |  |  |  |  |  |  |
| U.S. STD. SIEVE SIZE OPENING (MM)   | 4   | 10  | 40   | 60  | 200  | 270        |       |       |     |   |                            |  |  |  |  |  |               |   |  |  |  |   |            |                 |   |                |                       |                   |                      |  |       |  |           |                     |           |                |                 |               |                 |  |   |   |   |  |   |  |     |    |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |                            |                                      |   |                      |  |             |   |   |               |                                    |             |  |  |  |  |  |  |  |  |  |  |  |  |  |
|   | 4.76  | 2.00  | 0.42   | 0.25  | 0.075  | 0.053      |       |       |     |   |                            |  |  |  |  |  |               |   |  |  |  |   |            |                 |   |                |                       |                   |                      |  |       |  |           |                     |           |                |                 |               |                 |  |   |   |   |  |   |  |     |    |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |                            |                                      |   |                      |  |             |   |   |               |                                    |             |  |  |  |  |  |  |  |  |  |  |  |  |  |
| BOULDER (BLDR.)   | COBBLE (COB.)   | GRAVEL (GR.)  | COARSE SAND (CS, 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  |   |  |            |       |       |     |   |                            |  |  |  |  |  |               |   |  |  |  |   |            |                 |   |                |                       |                   |                      |  |       |  |           |                     |           |                |                 |               |                 |  |   |   |   |  |   |  |     |    |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |                            |                                      |   |                      |  |             |   |   |               |                                    |             |  |  |  |  |  |  |  |  |  |  |  |  |  |
| SOIL MOISTURE SCALE (ATTERBERG LIMITS)  | FIELD MOISTURE DESCRIPTION  | GUIDE FOR FIELD MOISTURE DESCRIPTION  |  |   |  |            |       |       |     |   |                            |  |  |  |  |  |               |   |  |  |  |   |            |                 |   |                |                       |                   |                      |  |       |  |           |                     |           |                |                 |               |                 |  |   |   |   |  |   |  |     |    |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |                            |                                      |   |                      |  |             |   |   |               |                                    |             |  |  |  |  |  |  |  |  |  |  |  |  |  |
| LL - LIQUID LIMIT<br>PL - PLASTIC LIMIT   | - SATURATED - (SAT.)  | USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE   |  |   |  |            |       |       |     |   |                            |  |  |  |  |  |               |   |  |  |  |   |            |                 |   |                |                       |                   |                      |  |       |  |           |                     |           |                |                 |               |                 |  |   |   |   |  |   |  |     |    |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |                            |                                      |   |                      |  |             |   |   |               |                                    |             |  |  |  |  |  |  |  |  |  |  |  |  |  |
|   | - WET - (W)   | SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE   |  |   |  |            |       |       |     |   |                            |  |  |  |  |  |               |   |  |  |  |   |            |                 |   |                |                       |                   |                      |  |       |  |           |                     |           |                |                 |               |                 |  |   |   |   |  |   |  |     |    |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |                            |                                      |   |                      |  |             |   |   |               |                                    |             |  |  |  |  |  |  |  |  |  |  |  |  |  |
| OM - OPTIMUM MOISTURE<br>SL - SHRINKAGE LIMIT   | - MOIST - (M)   | SOLID; AT OR NEAR OPTIMUM MOISTURE  |  |   |  |            |       |       |     |   |                            |  |  |  |  |  |               |   |  |  |  |   |            |                 |   |                |                       |                   |                      |  |       |  |           |                     |           |                |                 |               |                 |  |   |   |   |  |   |  |     |    |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |                            |                                      |   |                      |  |             |   |   |               |                                    |             |  |  |  |  |  |  |  |  |  |  |  |  |  |
|   | - DRY - (D)   | REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE  |  |   |  |            |       |       |     |   |                            |  |  |  |  |  |               |   |  |  |  |   |            |                 |   |                |                       |                   |                      |  |       |  |           |                     |           |                |                 |               |                 |  |   |   |   |  |   |  |     |    |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |                            |                                      |   |                      |  |             |   |   |               |                                    |             |  |  |  |  |  |  |  |  |  |  |  |  |  |
| <p><b>PLASTICITY</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>NON PLASTIC</th> <th>PLASTICITY INDEX (PI)</th> <th>DRY STRENGTH</th> </tr> <tr> <td></td> <td>0-5</td> <td>VERY LOW</td> </tr> <tr> <td>SLIGHTLY PLASTIC</td> <td>6-15</td> <td>SLIGHT</td> </tr> <tr> <td>MODERATELY PLASTIC</td> <td>16-25</td> <td>MEDIUM</td> </tr> <tr> <td>HIGHLY PLASTIC</td> <td>26 OR MORE</td> <td>HIGH</td> </tr> </table>   |   |   |  |   |  |            |       |       |     | NON PLASTIC   | PLASTICITY INDEX (PI)      | DRY STRENGTH                                       |  | 0-5  | VERY LOW   | SLIGHTLY PLASTIC                               | 6-15          | SLIGHT                                  | MODERATELY PLASTIC   | 16-25  | MEDIUM   | HIGHLY PLASTIC  | 26 OR MORE | HIGH            | <p><b>ROCK HARDNESS</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>VERY HARD</th> <th>HARD</th> <th>MODERATELY HARD</th> <th>MEDIUM HARD</th> <th>SOFT</th> <th>VERY SOFT</th> </tr> <tr> <td>CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.</td> <td>CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.</td> <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> <td>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.</td> <td>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.</td> <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> |                |                       |                   |                      |  |       |  |           |                     | VERY HARD | HARD           | MODERATELY HARD | MEDIUM HARD   | SOFT            | VERY SOFT  | CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK. | CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN. | 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. | 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. | 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. | 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. |     |    |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |                            |                                      |   |                      |  |             |   |   |               |                                    |             |  |  |  |  |  |  |  |  |  |  |  |  |  |
| NON PLASTIC   | PLASTICITY INDEX (PI)   | DRY STRENGTH  |  |   |  |            |       |       |     |   |                            |  |  |  |  |  |               |   |  |  |  |   |            |                 |   |                |                       |                   |                      |  |       |  |           |                     |           |                |                 |               |                 |  |   |   |   |  |   |  |     |    |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |                            |                                      |   |                      |  |             |   |   |               |                                    |             |  |  |  |  |  |  |  |  |  |  |  |  |  |
|   | 0-5   | VERY LOW  |  |   |  |            |       |       |     |   |                            |  |  |  |  |  |               |   |  |  |  |   |            |                 |   |                |                       |                   |                      |  |       |  |           |                     |           |                |                 |               |                 |  |   |   |   |  |   |  |     |    |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |                            |                                      |   |                      |  |             |   |   |               |                                    |             |  |  |  |  |  |  |  |  |  |  |  |  |  |
| SLIGHTLY PLASTIC  | 6-15  | SLIGHT  |  |   |  |            |       |       |     |   |                            |  |  |  |  |  |               |   |  |  |  |   |            |                 |   |                |                       |                   |                      |  |       |  |           |                     |           |                |                 |               |                 |  |   |   |   |  |   |  |     |    |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |                            |                                      |   |                      |  |             |   |   |               |                                    |             |  |  |  |  |  |  |  |  |  |  |  |  |  |
| MODERATELY PLASTIC  | 16-25   | MEDIUM  |  |   |  |            |       |       |     |   |                            |  |  |  |  |  |               |   |  |  |  |   |            |                 |   |                |                       |                   |                      |  |       |  |           |                     |           |                |                 |               |                 |  |   |   |   |  |   |  |     |    |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |                            |                                      |   |                      |  |             |   |   |               |                                    |             |  |  |  |  |  |  |  |  |  |  |  |  |  |
| HIGHLY PLASTIC  | 26 OR MORE  | HIGH  |  |   |  |            |       |       |     |   |                            |  |  |  |  |  |               |   |  |  |  |   |            |                 |   |                |                       |                   |                      |  |       |  |           |                     |           |                |                 |               |                 |  |   |   |   |  |   |  |     |    |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |                            |                                      |   |                      |  |             |   |   |               |                                    |             |  |  |  |  |  |  |  |  |  |  |  |  |  |
| VERY HARD   | HARD  | MODERATELY HARD   | MEDIUM HARD  | SOFT  | VERY SOFT  |            |       |       |     |   |                            |  |  |  |  |  |               |   |  |  |  |   |            |                 |   |                |                       |                   |                      |  |       |  |           |                     |           |                |                 |               |                 |  |   |   |   |  |   |  |     |    |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |                            |                                      |   |                      |  |             |   |   |               |                                    |             |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| <p><b>FRACTURE SPACING</b></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>  |   |   |  |   |  |            |       |       |     | TERM  | SPACING                    | VERY WIDE  | MORE THAN 10 FEET  | WIDE                                       | 3 TO 10 FEET   | MODERATELY CLOSE                               | 1 TO 3 FEET   | CLOSE                                   | 0.16 TO 1 FOOT   | VERY CLOSE   | LESS THAN 0.16 FEET  | <p><b>BEDDING</b></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>&lt; 0.008 FEET</td> </tr> </table> |            |                 |   |                |                       |                   |                      |  |       | 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  |  |     |    |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |                            |                                      |   |                      |  |             |   |   |               |                                    |             |  |  |  |  |  |  |  |  |  |  |  |  |  |
| TERM  | SPACING   |   |  |   |  |            |       |       |     |   |                            |  |  |  |  |  |               |   |  |  |  |   |            |                 |   |                |                       |                   |                      |  |       |  |           |                     |           |                |                 |               |                 |  |   |   |   |  |   |  |     |    |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |                            |                                      |   |                      |  |             |   |   |               |                                    |             |  |  |  |  |  |  |  |  |  |  |  |  |  |
| VERY WIDE   | MORE THAN 10 FEET   |   |  |   |  |            |       |       |     |   |                            |  |  |  |  |  |               |   |  |  |  |   |            |                 |   |                |                       |                   |                      |  |       |  |           |                     |           |                |                 |               |                 |  |   |   |   |  |   |  |     |    |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |                            |                                      |   |                      |  |             |   |   |               |                                    |             |  |  |  |  |  |  |  |  |  |  |  |  |  |
| WIDE  | 3 TO 10 FEET  |   |  |   |  |            |       |       |     |   |                            |  |  |  |  |  |               |   |  |  |  |   |            |                 |   |                |                       |                   |                      |  |       |  |           |                     |           |                |                 |               |                 |  |   |   |   |  |   |  |     |    |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |                            |                                      |   |                      |  |             |   |   |               |                                    |             |  |  |  |  |  |  |  |  |  |  |  |  |  |
| MODERATELY CLOSE  | 1 TO 3 FEET   |   |  |   |  |            |       |       |     |   |                            |  |  |  |  |  |               |   |  |  |  |   |            |                 |   |                |                       |                   |                      |  |       |  |           |                     |           |                |                 |               |                 |  |   |   |   |  |   |  |     |    |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |                            |                                      |   |                      |  |             |   |   |               |                                    |             |  |  |  |  |  |  |  |  |  |  |  |  |  |
| CLOSE   | 0.16 TO 1 FOOT  |   |  |   |  |            |       |       |     |   |                            |  |  |  |  |  |               |   |  |  |  |   |            |                 |   |                |                       |                   |                      |  |       |  |           |                     |           |                |                 |               |                 |  |   |   |   |  |   |  |     |    |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |                            |                                      |   |                      |  |             |   |   |               |                                    |             |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 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><b>INDURATION</b></p> <p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.</p> <p>FRIABLE - RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.</p> <p>MODERATELY INDURATED - GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.</p> <p>INDURATED - GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.</p> <p>EXTREMELY INDURATED - SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</p>  |   |   |  |   |  |            |       |       |     | <p><b>NOTES:</b></p> <p>BENCH MARK: BM#2 -BL- STA. 9+89, 152' RT.</p> <p>R/R SPIKE SET IN ROOT OF 28"x48" TRIFORKED BEECH TREE</p> <p style="text-align: right;">ELEVATION: 1008.63 FEET</p>  |                            |  |  |  |  |  |               |   |  |  |  |   |            |                 |   |                |                       |                   |                      |  |       |  |           |                     |           |                |                 |               |                 |  |   |   |   |  |   |  |     |    |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |                            |                                      |   |                      |  |             |   |   |               |                                    |             |  |  |  |  |  |  |  |  |  |  |  |  |  |
| <p><b>COLOR</b></p> <p>DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.</p>   |   |   |  |   |  |            |       |       |     | <p><b>DATE:</b> 8-15-14</p>   |                            |  |  |  |  |  |               |   |  |  |  |   |            |                 |   |                |                       |                   |                      |  |       |  |           |                     |           |                |                 |               |                 |  |   |   |   |  |   |  |     |    |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |                            |                                      |   |                      |  |             |   |   |               |                                    |             |  |  |  |  |  |  |  |  |  |  |  |  |  |





# GEOTECHNICAL BORING REPORT

## CORE LOG

| WBS 38538.1.2   |               | TIP B-4766          |          | COUNTY IREDELL                     |             | GEOLOGIST Stickney, J. K. |                 |            |     |  |   |
|---|---------------|---------------------|----------|------------------------------------|-------------|---------------------------|-----------------|------------|-----|--|---|
| SITE DESCRIPTION Bridge No. 69 over Rocky Creek on NC 115 |               |                     |          |                                    |             |                           | GROUND WTR (ft) |            |     |  |   |
| BORING NO. B1-B   |               | STATION 16+23       |          | OFFSET 6 ft RT                     |             | ALIGNMENT -L-             |                 |            |     |  |   |
| COLLAR ELEV. 988.8 ft                                     |               | TOTAL DEPTH 40.1 ft |          | NORTHING 830,205                   |             | EASTING 1,421,481         |                 |            |     |  |   |
| DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550 88% 03/19/2014 |               |                     |          | DRILL METHOD NW Casing w/ Advancer |             | HAMMER TYPE Automatic     |                 |            |     |  |   |
| DRILLER Smith, Chad                                       |               | START DATE 09/02/15 |          | COMP. DATE 09/02/15                |             | SURFACE WATER DEPTH N/A   |                 |            |     |  |   |
| CORE SIZE NX  |               | TOTAL RUN 18.0 ft   |          |                                    |             |                           |                 |            |     |  |   |
| ELEV (ft)   | RUN ELEV (ft) | DEPTH (ft)          | RUN (ft) | DRILL RATE (Min/ft)                | RUN         |                           | STRATA          |            | LOG | DESCRIPTION AND REMARKS  | DEPTH (ft)  |
|   |               |                     |          |                                    | REC. (ft) % | RQD (ft) %                | REC. (ft) %     | RQD (ft) % |     |  |   |
| 966.7   | 966.7         | 22.1                | 3.0      | 1:20/1.0                           | (3.0) 100%  | (1.5) 50%                 | (15.7) 87%      | (10.1) 56% |     | Begin Coring @ 22.1 ft   | 22.1  |
| 965   | 963.7         | 25.1                | 5.0      | 1:19/1.0                           | (4.4) 88%   | (1.3) 26%                 |                 |            |     | <b>CRYSTALLINE ROCK</b><br>PREDOMINATELY FRESH, HARD, GRAY-WHITE BIOTITE GNEISS WITH CLOSE TO WIDE FRACTURE SPACING. ZONE BWTWEEN 26.3' - 30.5' IS MODERATELY SEVERELY WEATHERED, SOFT TO MEDIUM HARD, WITH VERY CLOSE TO CLOSE FRACTURE SPACING<br>R1=1, R2=13, R3=15, R4=15, R5=7, RMR=51<br>ROCK TYPE = E |   |
| 960   | 958.7         | 30.1                | 5.0      | 1:15/1.0                           | (3.3) 66%   | (2.3) 46%                 |                 |            |     |  |   |
| 955   | 953.7         | 35.1                | 5.0      | 1:22/1.0                           | (5.0) 100%  | (5.0) 100%                |                 |            |     |  |   |
| 950   | 948.7         | 40.1                |          |                                    |             |                           |                 |            |     |  | Boring Terminated at Elevation 948.7 ft In Crystalline Rock |

NCDOT CORE DOUBLE B4766\_GEO\_BRDG0069.GPJ NC\_DOT.GDT 11/4/15

38538.1.2 (B-4766)  
IREDELL COUNTY  
REPLACE BRIDGE NO. 69 OVER ROCKY CREEK ON NC 115

CORE PHOTO(S)

B1-B

