

| STATE | STATE PROJECT REFERENCE NO. | SHEET NO. | TOTAL SHEETS |
|-------|-----------------------------|-----------|--------------|
| N.C.  | 17BP.11.R.67                | 1         | 9            |

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

# STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 17BP.11.R.67 F.A. PROJ. N/A  
COUNTY ASHE  
PROJECT DESCRIPTION BRIDGE NO. 263 ON SR 1317  
OVER RICH HILL CREEK

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DATE NOVEMBER, 2013

## CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF PREPARING THE SCOPE OF WORK TO BE INCLUDED IN THE REQUEST FOR PROPOSAL. 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.

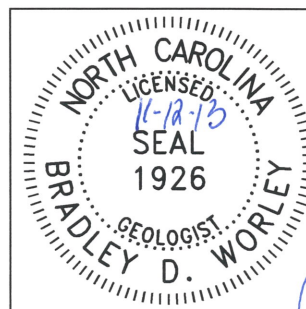
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NOTE - BY HAVING REQUESTED THIS INFORMATION THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

DRAWN BY: M. BRANDON, PLS and B. WORLEY, PG



*[Handwritten Signature]*

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:  
*VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6*

GRADATION

WELL-GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.  
UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)  
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.

ANGULARITY OF GRAINS

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.

SOIL LEGEND AND AASHTO CLASSIFICATION

| GENERAL CLASS.                 | GRANULAR MATERIALS<br>(≤ 35% PASSING #200)                                                       | SILT-CLAY MATERIALS<br>(> 35% PASSING #200)                       | ORGANIC MATERIALS                                                            |
|--------------------------------|--------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|------------------------------------------------------------------------------|
| GROUP CLASS.                   | A-1-a A-1-b                                                                                      | 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                         |                                                                                                  |                                                                   |                                                                              |
| % PASSING                      | 50 MX 30 MX 50 MX 51 MN 15 MX 25 MX 10 MX 35 MX 35 MX 35 MX 36 MN 36 MN 36 MN 36 MN              |                                                                   | GRANULAR SOILS SILT-CLAY SOILS MUCK, PEAT                                    |
| LIQUID LIMIT PLASTIC INDEX     | 6 MX NP                                                                                          | 40 MX 41 MN 40 MX 41 MN 10 MX 11 MN 11 MN 10 MX 10 MX 11 MN 11 MN | SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER HIGHLY ORGANIC SOILS |
| 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 |                                                                   |                                                                              |
| GEN. RATING AS A SUBGRADE      | EXCELLENT TO GOOD                                                                                | FAIR TO POOR                                                      | FAIR TO POOR POOR UNSUITABLE                                                 |

PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30

CONSISTENCY OR DENSENESS

| 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 0.50<br>0.5 TO 1.0<br>1 TO 2<br>2 TO 4<br>>4    |

TEXTURE OR GRAIN SIZE

| U.S. STD. SIEVE SIZE<br>OPENING (MM) | 4<br>4.76 | 10<br>2.00 | 40<br>0.42 | 60<br>0.25 | 200<br>0.075 | 270<br>0.053 |
|--------------------------------------|-----------|------------|------------|------------|--------------|--------------|
|--------------------------------------|-----------|------------|------------|------------|--------------|--------------|

| BOULDER (BLDR.) | COBBLE (COB.)    | GRAVEL (GR.) | COARSE SAND (CSE, SD.) | FINE SAND (F SD.) | SILT (SL.) | CLAY (CL.) |
|-----------------|------------------|--------------|------------------------|-------------------|------------|------------|
| GRAIN SIZE      | MM 305<br>IN. 12 | 75<br>3      | 2.0                    | 0.25              | 0.05       | 0.005      |

SOIL MOISTURE - CORRELATION OF TERMS

| SOIL MOISTURE SCALE (ATTERBERG LIMITS)     | FIELD MOISTURE DESCRIPTION | GUIDE FOR FIELD MOISTURE DESCRIPTION                                                        |
|--------------------------------------------|----------------------------|---------------------------------------------------------------------------------------------|
| LL<br>PLASTIC RANGE (PI)<br>PL<br>OM<br>SL | LIQUID LIMIT               | - SATURATED - (SAT.)<br>USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE |
|                                            | PLASTIC LIMIT              | - WET - (W)<br>SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE                        |
|                                            | OPTIMUM MOISTURE           | - MOIST - (M)<br>SOLID; AT OR NEAR OPTIMUM MOISTURE                                         |
|                                            | SHRINKAGE LIMIT            | - DRY - (D)<br>REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE                         |

PLASTICITY

|                 | PLASTICITY INDEX (PI) | DRY STRENGTH |
|-----------------|-----------------------|--------------|
| NONPLASTIC      | 0-5                   | VERY LOW     |
| LOW PLASTICITY  | 6-15                  | SLIGHT       |
| MED. PLASTICITY | 16-25                 | MEDIUM       |
| HIGH PLASTICITY | 26 OR MORE            | HIGH         |

COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.

MISCELLANEOUS SYMBOLS

ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION  
 SOIL SYMBOL  
 ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT  
 INFERRED SOIL BOUNDARY  
 INFERRED ROCK LINE  
 ALLUVIAL SOIL BOUNDARY  
 DIP & DIP DIRECTION OF ROCK STRUCTURES

SPT TEST BORING  
 AUGER BORING  
 CORE BORING  
 MONITORING WELL  
 PIEZOMETER INSTALLATION  
 SLOPE INDICATOR INSTALLATION  
 CONE PENETROMETER TEST  
 SOUNDING ROD

TEST BORING W/ CORE  
 SPT N-VALUE  
 SPT REFUSAL

ABBREVIATIONS

|                                |                          |                                  |
|--------------------------------|--------------------------|----------------------------------|
| AR - AUGER REFUSAL             | MED. - MEDIUM            | VST - VANE SHEAR TEST            |
| BT - BORING TERMINATED         | MICA. - MICACEOUS        | WEA. - WEATHERED                 |
| CL. - CLAY                     | MOD. - MODERATELY        | γ - UNIT WEIGHT                  |
| CPT - CONE PENETRATION TEST    | NP - NON PLASTIC         | γ <sub>d</sub> - DRY UNIT WEIGHT |
| CSE. - COARSE                  | ORG. - ORGANIC           |                                  |
| DMT - DILATOMETER TEST         | PMT - PRESSUREMETER TEST | SAMPLE ABBREVIATIONS             |
| DPT - DYNAMIC PENETRATION TEST | SAP. - SAPROLITIC        | S - BULK                         |
| e - VOID RATIO                 | SD. - SAND, SANDY        | SS - SPLIT SPOON                 |
| F - FINE                       | SL. - SILT, SILTY        | ST - SHELBY TUBE                 |
| FOSS. - FOSSILIFEROUS          | SLI. - SLIGHTLY          | RS - ROCK                        |
| FRAC. - FRACTURED, FRACTURES   | TCR - TRICONE REFUSAL    | RT - RECOMPACTED TRIAXIAL        |
| FRAGS. - FRAGMENTS             | w - MOISTURE CONTENT     | CBR - CALIFORNIA BEARING RATIO   |
| HI. - HIGHLY                   | V - VERY                 |                                  |

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:

☐ MOBILE B-  
☐ BK-51  
☐ CME-45C  
☒ CME-55  
☐ PORTABLE HOIST  
☐  
☐

ADVANCING TOOLS:

☐ CLAY BITS  
☐ 6" CONTINUOUS FLIGHT AUGER  
☒ 6" HOLLOW AUGERS  
☐ HARD FACED FINGER BITS  
☐ TUNG.-CARBIDE INSERTS  
☐ CASING ☐ W/ ADVANCER  
☐ TRICONE \_\_\_\_\_ \* STEEL TEETH  
☐ TRICONE \_\_\_\_\_ \* TUNG.-CARB.  
☐ CORE BIT  
☐

HAMMER TYPE:

☒ AUTOMATIC ☐ MANUAL

CORE SIZE:

☐ -B  
☐ -N  
☐ -H

HAND TOOLS:

☐ POST HOLE DIGGER  
☐ HAND AUGER  
☒ SOUNDING ROD  
☐ VANE SHEAR TEST  
☐

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| ROCK DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                 | TERMS AND DEFINITIONS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| <p>HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:</p> |                                                                                                                                                                                                                                                                                                                                                                 | <p>ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.</p> <p>AQUIFER - A WATER BEARING FORMATION OR STRATA.</p> <p>ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.</p> <p>ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC.</p> <p>ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.</p> <p>CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.</p> <p>COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.</p> <p>CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.</p> <p>DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.</p> <p>DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.</p> <p>DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.</p> <p>FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.</p> <p>FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.</p> <p>FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.</p> <p>FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.</p> <p>FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.</p> <p>JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.</p> <p>LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.</p> <p>LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.</p> <p>MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.</p> <p>PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.</p> <p>RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.</p> <p>ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.</p> <p>SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.</p> <p>SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.</p> <p>SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.</p> <p>STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (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.</p> <p>STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.</p> <p>STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.</p> <p>TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p> |                   |
|                                                                                                                                                                                                                                                                                                                                                                                       | NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |
|                                                                                                                                                                                                                                                                                                                                                                                       | FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |
|                                                                                                                                                                                                                                                                                                                                                                                       | FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |
|                                                                                                                                                                                                                                                                                                                                                                                       | COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |
| WEATHERING                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |
| FRESH                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |
| VERY SLIGHT (V SL.)                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN. CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |
| SLIGHT (SL.)                                                                                                                                                                                                                                                                                                                                                                                                                                                           | ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |
| MODERATE (MOD.)                                                                                                                                                                                                                                                                                                                                                                                                                                                        | SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |
| MODERATELY SEVERE (MOD. SEV.)                                                                                                                                                                                                                                                                                                                                                                                                                                          | ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. <u>IF TESTED, WOULD YIELD SPT REFUSAL</u>                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |
| SEVERE (SEV.)                                                                                                                                                                                                                                                                                                                                                                                                                                                          | ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. <u>IF TESTED, YIELDS SPT N VALUES &gt; 100 BPF</u>                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |
| VERY SEVERE (V SEV.)                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. <u>IF TESTED, YIELDS SPT N VALUES &lt; 100 BPF</u> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |
| COMPLETE                                                                                                                                                                                                                                                                                                                                                                                                                                                               | ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |
| ROCK HARDNESS                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |
| VERY HARD                                                                                                                                                                                                                                                                                                                                                                                                                                                              | CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |
| HARD                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |
| MODERATELY HARD                                                                                                                                                                                                                                                                                                                                                                                                                                                        | CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |
| MEDIUM HARD                                                                                                                                                                                                                                                                                                                                                                                                                                                            | CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |
| SOFT                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |
| VERY SOFT                                                                                                                                                                                                                                                                                                                                                                                                                                                              | CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGER NAIL.                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |
| FRACTURE SPACING                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                 | BEDDING                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                   |
| <u>TERM</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <u>SPACING</u>                                                                                                                                                                                                                                                                                                                                                  | <u>TERM</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <u>THICKNESS</u>  |
| VERY WIDE                                                                                                                                                                                                                                                                                                                                                                                                                                                              | MORE THAN 10 FEET                                                                                                                                                                                                                                                                                                                                               | VERY THICKLY BEDDED                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | > 4 FEET          |
| WIDE                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 3 TO 10 FEET                                                                                                                                                                                                                                                                                                                                                    | THICKLY BEDDED                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1.5 - 4 FEET      |
| MODERATELY CLOSE                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 1 TO 3 FEET                                                                                                                                                                                                                                                                                                                                                     | THINLY BEDDED                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 0.16 - 1.5 FEET   |
| CLOSE                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0.16 TO 1 FEET                                                                                                                                                                                                                                                                                                                                                  | VERY THINLY BEDDED                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 0.03 - 0.16 FEET  |
| VERY CLOSE                                                                                                                                                                                                                                                                                                                                                                                                                                                             | LESS THAN 0.16 FEET                                                                                                                                                                                                                                                                                                                                             | THICKLY LAMINATED                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 0.008 - 0.03 FEET |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                 | THINLY LAMINATED                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | < 0.008 FEET      |
| INDURATION                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |
| FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |
| FRIABLE                                                                                                                                                                                                                                                                                                                                                                                                                                                                | RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |
| MODERATELY INDURATED                                                                                                                                                                                                                                                                                                                                                                                                                                                   | GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |
| INDURATED                                                                                                                                                                                                                                                                                                                                                                                                                                                              | GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |
| EXTREMELY INDURATED                                                                                                                                                                                                                                                                                                                                                                                                                                                    | SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                 | BENCH MARK: Established TBM "G" on NE corner existing bridge.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                 | ELEVATION: 100 FT.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                   |
| NOTES:                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |



EBI-A  
EBI-B  
PN-I  
EB2-A  
EB2-B

SR 1317  
RICH HILL RD

BORING LOCATION DIAGRAM  
BRIDGE #263 ON SR 1317  
OVER RICH HILL CR  
ASHE COUNTY, NC

PROJECT: I7BP.II.R.67

DRAWN BY: MTB

CHECKED BY: BW

DATE: OCTOBER 2013

SCALE: 30:1



FIRM NO. P-0339 and C-487  
504 Meadowland Drive  
Hillsborough, NC 27278-8551  
Voice: (919) 732-3883 Fax: (919) 732-6776  
www.summitde.net



# NCDOT GEOTECHNICAL ENGINEERING UNIT

## BORELOG REPORT

SHEET 4

| WBS 17BP.11.R.67                                                                         |                       |               | TIP N/A             |        |       | COUNTY ASHE              |    |    | GEOLOGIST Racey, D.     |                 |              |     |     |                                                                                    |            |
|------------------------------------------------------------------------------------------|-----------------------|---------------|---------------------|--------|-------|--------------------------|----|----|-------------------------|-----------------|--------------|-----|-----|------------------------------------------------------------------------------------|------------|
| SITE DESCRIPTION Bridge # 263 on SR 1317 over Rich Hill Creek                            |                       |               |                     |        |       |                          |    |    |                         | GROUND WTR (ft) |              |     |     |                                                                                    |            |
| BORING NO. EB1-A                                                                         |                       |               | STATION N/A         |        |       | OFFSET N/A               |    |    | ALIGNMENT N/A           |                 |              |     |     |                                                                                    |            |
| COLLAR ELEV. 99.8 ft                                                                     |                       |               | TOTAL DEPTH 18.8 ft |        |       | NORTHING 1,000,758       |    |    | EASTING 1,230,160       |                 |              |     |     |                                                                                    |            |
| DRILL RIG/HAMMER EFF./DATE F&R3495 CME-55 84% 12/14/2012                                 |                       |               |                     |        |       | DRILL METHOD H.S. Augers |    |    | HAMMER TYPE Automatic   |                 |              |     |     |                                                                                    |            |
| DRILLER Tignor, D                                                                        |                       |               | START DATE 10/02/13 |        |       | COMP. DATE 10/02/13      |    |    | SURFACE WATER DEPTH N/A |                 |              |     |     |                                                                                    |            |
| ELEV<br>(ft)                                                                             | DRIVE<br>ELEV<br>(ft) | DEPTH<br>(ft) | BLOW COUNT          |        |       | BLOWS PER FOOT           |    |    |                         |                 | SAMP.<br>NO. | MOI | LOG | SOIL AND ROCK DESCRIPTION                                                          | DEPTH (ft) |
|                                                                                          |                       |               | 0.5ft               | 0.5ft  | 0.5ft | 0                        | 25 | 50 | 75                      | 100             |              |     |     |                                                                                    |            |
| 100                                                                                      | 99.8                  | 0.0           | 2                   | 5      | 7     |                          |    |    |                         |                 |              |     |     | GROUND SURFACE                                                                     | 0.0        |
| 95                                                                                       | 96.3                  | 3.5           | 43                  | 21     | 13    |                          |    |    |                         |                 |              | M   |     | ROADWAY EMBANKMENT<br>Gray-brown, SILTY SAND with high amount<br>of gravel (A-2-4) | 4.8        |
|                                                                                          | 91.3                  | 8.5           | 9                   | 15     | 16    |                          |    |    |                         |                 |              | M   |     | RESIDUAL<br>Brown, CLAYEY SILT (A-5)                                               | 12.0       |
| 85                                                                                       | 86.3                  | 13.5          | 43                  | 57/0.2 |       |                          |    |    |                         |                 |              |     |     | WEATHERED ROCK<br>(Amphibolite Gneiss)                                             | 18.8       |
|                                                                                          | 81.3                  | 18.5          | 100/0.3             |        |       |                          |    |    |                         |                 |              |     |     | Boring Terminated at Elevation 81.0 ft in<br>Weathered Rock (Amphibolite Gneiss)   |            |
| 0.0-0.2 ft = Surficial organic soils. Boulders<br>encountered 0.5-3.5 ft and 3.5-4.8 ft. |                       |               |                     |        |       |                          |    |    |                         |                 |              |     |     |                                                                                    |            |

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[illegible]



# NCDOT GEOTECHNICAL ENGINEERING UNIT BORELOG REPORT

SHEET 7

|                                                               |                 |                     |            |                          |        |                         |    |    |           |     |                           |                                                                                                                                                                                                                                                            |                    |  |  |   |                                                                                         |
|---------------------------------------------------------------|-----------------|---------------------|------------|--------------------------|--------|-------------------------|----|----|-----------|-----|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|--|--|---|-----------------------------------------------------------------------------------------|
| WBS 17BP.11.R.67                                              |                 | TIP N/A             |            | COUNTY ASHE              |        | GEOLOGIST Racey, D.     |    |    |           |     |                           |                                                                                                                                                                                                                                                            |                    |  |  |   |                                                                                         |
| SITE DESCRIPTION Bridge # 263 on SR 1317 over Rich Hill Creek |                 |                     |            |                          |        | GROUND WTR (ft)         |    |    |           |     |                           |                                                                                                                                                                                                                                                            |                    |  |  |   |                                                                                         |
| BORING NO. EB2-B                                              |                 | STATION N/A         |            | OFFSET N/A               |        | ALIGNMENT N/A           |    |    |           |     |                           |                                                                                                                                                                                                                                                            |                    |  |  |   |                                                                                         |
| COLLAR ELEV. 99.5 ft                                          |                 | TOTAL DEPTH 18.5 ft |            | NORTHING 1,000,741       |        | EASTING 1,230,196       |    |    |           |     |                           |                                                                                                                                                                                                                                                            |                    |  |  |   |                                                                                         |
| DRILL RIG/HAMMER EFF./DATE F&R3495 CME-55 84% 12/14/2012      |                 |                     |            | DRILL METHOD H.S. Augers |        | HAMMER TYPE Automatic   |    |    |           |     |                           |                                                                                                                                                                                                                                                            |                    |  |  |   |                                                                                         |
| DRILLER Tignor, D                                             |                 | START DATE 10/02/13 |            | COMP. DATE 10/02/13      |        | SURFACE WATER DEPTH N/A |    |    |           |     |                           |                                                                                                                                                                                                                                                            |                    |  |  |   |                                                                                         |
| ELEV (ft)                                                     | DRIVE ELEV (ft) | DEPTH (ft)          | BLOW COUNT |                          |        | BLOWS PER FOOT          |    |    | SAMP. NO. | LOG | SOIL AND ROCK DESCRIPTION |                                                                                                                                                                                                                                                            |                    |  |  |   |                                                                                         |
|                                                               |                 |                     | 0.5ft      | 0.5ft                    | 0.5ft  | 0                       | 25 | 50 | 75        | 100 |                           | ELEV. (ft) DEPTH (ft)                                                                                                                                                                                                                                      |                    |  |  |   |                                                                                         |
| 100                                                           | 99.5            | 0.0                 | 2          | 2                        | 2      |                         |    |    |           |     |                           |                                                                                                                                                                                                                                                            | GROUND SURFACE 0.0 |  |  |   |                                                                                         |
| 95                                                            | 96.0            | 3.5                 | 10         | 12                       | 20     |                         |    |    |           |     |                           |                                                                                                                                                                                                                                                            |                    |  |  | M | ROADWAY EMBANKMENT<br>Brown, SANDY SILT with some quartz gravel (A-4)                   |
| 90                                                            | 91.0            | 8.5                 | 14         | 15                       | 19     |                         |    |    |           |     |                           |                                                                                                                                                                                                                                                            |                    |  |  | M | ALLUVIAL<br>Dark brown, SILTY CLAY with trace coarse sand and rounded gravel (A-7-5)    |
| 85                                                            | 86.0            | 13.5                | 32         | 48                       | 52/0.2 |                         |    |    |           |     |                           |                                                                                                                                                                                                                                                            |                    |  |  | M | RESIDUAL<br>Brown and dark gray, highly micaceous CLAYEY SILT with some fine sand (A-5) |
|                                                               | 81.0            | 18.5                | 60/0.0     |                          |        |                         |    |    |           |     |                           |                                                                                                                                                                                                                                                            |                    |  |  |   | WEATHERED ROCK<br>(Amphibolite Gneiss)                                                  |
|                                                               |                 |                     |            |                          |        |                         |    |    |           |     |                           | CRYSTALLINE ROCK<br>(Amphibolite Gneiss)                                                                                                                                                                                                                   |                    |  |  |   |                                                                                         |
|                                                               |                 |                     |            |                          |        |                         |    |    |           |     |                           | Boring Terminated at Elevation 81.0 ft in Crystalline Rock (Amphibolite Gneiss)                                                                                                                                                                            |                    |  |  |   |                                                                                         |
|                                                               |                 |                     |            |                          |        |                         |    |    |           |     |                           | 0.0-0.2 ft = Surficial organic soils. Boulders encountered 1.0-4.8 ft. Driller indicates less resistance at 4.8 ft, this was interpreted as the top of Alluvium. Driller indicates harder drilling at 5.5 ft, this was interpreted as the top of Residual. |                    |  |  |   |                                                                                         |



# NCDOT GEOTECHNICAL ENGINEERING UNIT BORELOG REPORT

SHEET 8

|                                                               |                       |                     |            |                           |         |                         |                       |            |    |     |              |                    |                           |                                                     |
|---------------------------------------------------------------|-----------------------|---------------------|------------|---------------------------|---------|-------------------------|-----------------------|------------|----|-----|--------------|--------------------|---------------------------|-----------------------------------------------------|
| WBS 17BP.11.R.67                                              |                       | TIP N/A             |            | COUNTY ASHE               |         | GEOLOGIST Smith, B.     |                       |            |    |     |              |                    |                           |                                                     |
| SITE DESCRIPTION Bridge # 263 on SR 1317 over Rich Hill Creek |                       |                     |            |                           |         |                         | GROUND WTR (ft)       |            |    |     |              |                    |                           |                                                     |
| BORING NO. PN-1                                               |                       | STATION N/A         |            | OFFSET N/A                |         | ALIGNMENT N/A           |                       | 0 HR. N/A  |    |     |              |                    |                           |                                                     |
| COLLAR ELEV. 93.5 ft                                          |                       | TOTAL DEPTH 7.9 ft  |            | NORTHING 1,000,735        |         | EASTING 1,230,166       |                       | 24 HR. N/A |    |     |              |                    |                           |                                                     |
| DRILL RIG/HAMMER EFF./DATE N/A                                |                       |                     |            | DRILL METHOD Rod Sounding |         |                         | HAMMER TYPE Automatic |            |    |     |              |                    |                           |                                                     |
| DRILLER Bare. J                                               |                       | START DATE 10/22/13 |            | COMP. DATE 10/22/13       |         | SURFACE WATER DEPTH N/A |                       |            |    |     |              |                    |                           |                                                     |
| ELEV<br>(ft)                                                  | DRIVE<br>ELEV<br>(ft) | DEPTH<br>(ft)       | BLOW COUNT |                           |         | BLOWS PER FOOT          |                       |            |    |     | SAMP.<br>NO. | L<br>O<br>G<br>MOI | SOIL AND ROCK DESCRIPTION | DEPTH (ft)                                          |
|                                                               |                       |                     | 0.5ft      | 0.5ft                     | 0.5ft   | 0                       | 25                    | 50         | 75 | 100 |              |                    |                           |                                                     |
| 95                                                            |                       |                     |            |                           |         |                         |                       |            |    |     |              |                    |                           |                                                     |
|                                                               | 93.5                  | 0.0                 |            |                           |         |                         |                       |            |    |     |              |                    |                           | 93.5 CREEK BOTTOM 0.0                               |
|                                                               | 92.5                  | 1.0                 | N/A        | 6                         | 1       |                         |                       |            |    |     |              |                    |                           |                                                     |
|                                                               | 91.5                  | 2.0                 | N/A        | 4                         | 17      |                         |                       |            |    |     |              |                    |                           |                                                     |
|                                                               | 90.5                  | 3.0                 | N/A        | 24                        | 28      |                         |                       |            |    |     |              |                    |                           | 91.0 Brown, SILTY SAND with some gravel (A-2-4) 2.5 |
|                                                               | 89.5                  | 4.0                 | N/A        | 30                        | 40      |                         |                       |            |    |     |              |                    |                           |                                                     |
|                                                               | 88.5                  | 5.0                 | N/A        | 40                        | 35      |                         |                       |            |    |     |              |                    |                           |                                                     |
|                                                               | 87.5                  | 6.0                 | N/A        | 48                        | 52/0.4  |                         |                       |            |    |     |              |                    |                           |                                                     |
|                                                               | 87.0                  | 6.5                 | N/A        |                           | 100/0.4 |                         |                       |            |    |     |              |                    |                           |                                                     |
|                                                               | 86.5                  | 7.0                 | N/A        |                           | 100/0.4 |                         |                       |            |    |     |              |                    |                           |                                                     |
|                                                               | 86.0                  | 7.5                 | N/A        |                           | 100/0.4 |                         |                       |            |    |     |              |                    |                           | 86.0 WEATHERED ROCK 7.5                             |
|                                                               | 85.7                  | 7.8                 | N/A        |                           | 100/0.5 |                         |                       |            |    |     |              |                    |                           |                                                     |
|                                                               |                       |                     | N/A        |                           | 100/0.3 |                         |                       |            |    |     |              |                    |                           | 85.6 WEATHERED ROCK 7.9                             |
|                                                               |                       |                     | N/A        |                           | 100/0.4 |                         |                       |            |    |     |              |                    |                           |                                                     |
|                                                               |                       |                     | N/A        |                           | 100/0.3 |                         |                       |            |    |     |              |                    |                           |                                                     |
|                                                               |                       |                     | N/A        |                           | 60/0.1  |                         |                       |            |    |     |              |                    |                           |                                                     |