

| STATE | STATE PROJECT REFERENCE NO. | SHEET NO. | TOTAL SHEETS |
|-------|-----------------------------|-----------|--------------|
| N.C.  | 17BP.11.R.95 (SF-940046)    | 1         | 7            |

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

**STRUCTURE**  
**SUBSURFACE INVESTIGATION**

PROJ. REFERENCE NO. 17BP.11.R.95 (SF-940046) F.A. PROJ. \_\_\_\_\_

COUNTY WATAUGA

PROJECT DESCRIPTION BRIDGE 046 ON SR 1351 (CASTLEFORD RD.)  
OVER GRASSY CREEK

SITE DESCRIPTION 24'x5' BOTTOMLESS CULVERT

**CONTENTS**

| <u>SHEET</u> | <u>DESCRIPTION</u> |
|--------------|--------------------|
| 1            | TITLE SHEET        |
| 2-2A         | LEGEND             |
| 3            | SITE PLAN          |
| 4-7          | BORE LOGS          |

PERSONNEL

**C.C. MURRAY**

**J.E. ESTEP**

**M.R. MOORE**

INVESTIGATED BY **J.P. ROGERS**

CHECKED BY **C.B. LITTLE**

SUBMITTED BY **C.B. LITTLE**

DATE **JULY 2014**

**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) 250-4088. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

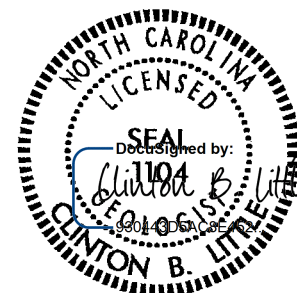
SOIL AND ROCK BOUNDARIES WITHIN A BOREHOLE ARE BASED ON GEOTECHNICAL INTERPRETATION UNLESS ENCOUNTERED IN A SAMPLE. INTERPRETED BOUNDARIES MAY NOT NECESSARILY REFLECT ACTUAL SUBSURFACE CONDITIONS BETWEEN SAMPLED STRATA, AND BOREHOLE INFORMATION MAY NOT NECESSARILY REFLECT ACTUAL SUBSURFACE CONDITIONS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

THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

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

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

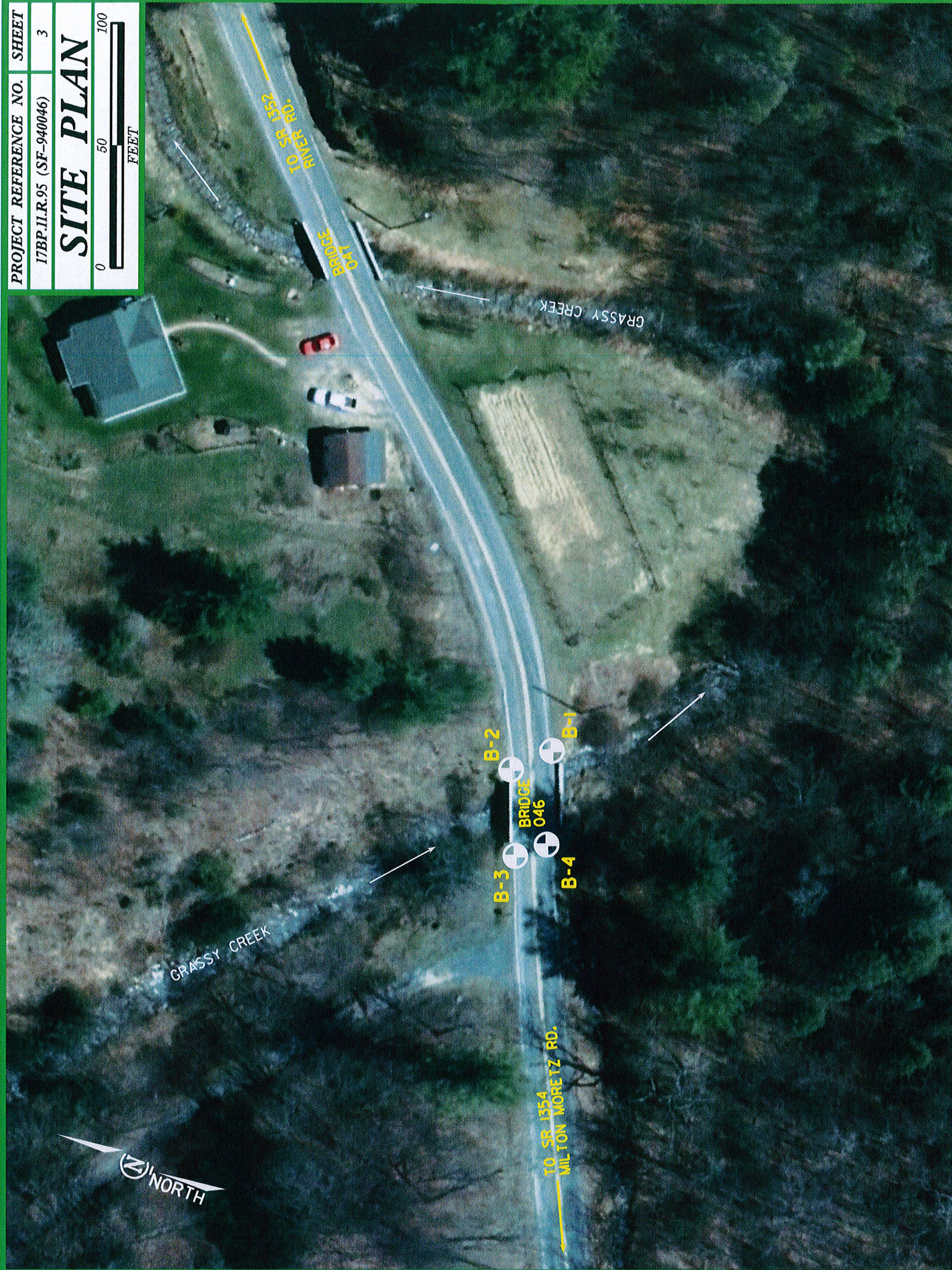
DRAWN BY: **J.K. McCLURE**



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

| SOIL DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |  |  |  |  |  |  |  |  | GRADATION                                                                                                                                                                                                                                                                                       |  |  |  |  |  |  |  |  |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|--|--|--|--|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|--|--|--|--|--|
| 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:<br><i>VERY STIFF, GRAY, SILTY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</i> |  |  |  |  |  |  |  |  |  | WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.<br>UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)<br>GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.                        |  |  |  |  |  |  |  |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |  |  |  |  |  |  |  |  | ANGULARITY OF GRAINS                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |  |  |  |  |  |  |  |  | THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS <u>ANGULAR</u> , <u>SUBANGULAR</u> , <u>SUBROUNDED</u> , OR <u>ROUNDED</u> .                                                                                                                                              |  |  |  |  |  |  |  |  |  |
| SOIL LEGEND AND AASHTO CLASSIFICATION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |  |  |  |  |  |  |  |  | MINERALOGICAL COMPOSITION                                                                                                                                                                                                                                                                       |  |  |  |  |  |  |  |  |  |
| MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |  |  |  |  |  |  |  |  | COMPRESSION                                                                                                                                                                                                                                                                                     |  |  |  |  |  |  |  |  |  |
| SLIGHTLY COMPRESSIBLE<br>MODERATELY COMPRESSIBLE<br>HIGHLY COMPRESSIBLE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |  |  |  |  |  |  |  |  | LIQUID LIMIT LESS THAN 31<br>LIQUID LIMIT EQUAL TO 31-50<br>LIQUID LIMIT GREATER THAN 50                                                                                                                                                                                                        |  |  |  |  |  |  |  |  |  |
| PERCENTAGE OF MATERIAL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |  |  |  |  |  |  |  |  | GROUND WATER                                                                                                                                                                                                                                                                                    |  |  |  |  |  |  |  |  |  |
| ORGANIC MATERIAL<br>TRACE OF ORGANIC MATTER<br>LITTLE ORGANIC MATTER<br>MODERATELY ORGANIC<br>HIGHLY ORGANIC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |  |  |  |  |  |  |  |  | WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING<br>STATIC WATER LEVEL AFTER 24 HOURS<br>PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA<br>SPRING OR SEEP                                                                                                                            |  |  |  |  |  |  |  |  |  |
| GRANULAR MATERIAL<br>2 - 3%<br>3 - 5%<br>5 - 10%<br>>10%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |  |  |  |  |  |  |  |  | TRACE<br>LITTLE<br>SOME<br>HIGHLY                                                                                                                                                                                                                                                               |  |  |  |  |  |  |  |  |  |
| TRACE<br>LITTLE<br>SOME<br>HIGHLY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |  |  |  |  |  |  |  |  | 1 - 10%<br>10 - 20%<br>20 - 35%<br>35% AND ABOVE                                                                                                                                                                                                                                                |  |  |  |  |  |  |  |  |  |
| CONSISTENCY OR DENSENESS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |  |  |  |  |  |  |  |  | MISCELLANEOUS SYMBOLS                                                                                                                                                                                                                                                                           |  |  |  |  |  |  |  |  |  |
| PRIMARY SOIL TYPE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |  |  |  |  |  |  |  |  | ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION<br>SOIL SYMBOL<br>ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT<br>INFERRED SOIL BOUNDARY<br>INFERRED ROCK LINE<br>ALLUVIAL SOIL BOUNDARY<br>DIP & DIP DIRECTION OF ROCK STRUCTURES                                                          |  |  |  |  |  |  |  |  |  |
| COMPACTNESS OR CONSISTENCY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |  |  |  |  |  |  |  |  | TEST BORING<br>AUGER BORING<br>CORE BORING<br>MONITORING WELL<br>PIEZOMETER INSTALLATION<br>SLOPE INDICATOR INSTALLATION<br>CONE PENETROMETER TEST<br>SOUNDING ROD                                                                                                                              |  |  |  |  |  |  |  |  |  |
| RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |  |  |  |  |  |  |  | TEST BORING W/ CORE<br>SPT N-VALUE<br>SPT REFUSAL                                                                                                                                                                                                                                               |  |  |  |  |  |  |  |  |  |
| RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT <sup>2</sup> )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |  |  |  |  |  |  |  |  |                                                                                                                                                                                                                                                                                                 |  |  |  |  |  |  |  |  |  |
| GENERAL SOIL TYPE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |  |  |  |  |  |  |  |  |                                                                                                                                                                                                                                                                                                 |  |  |  |  |  |  |  |  |  |
| GENERAL SOIL TYPE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |  |  |  |  |  |  |  |  |                                                                                                                                                                                                                                                                                                 |  |  |  |  |  |  |  |  |  |
| TEXTURE OR GRAIN SIZE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |  |  |  |  |  |  |  |  |                                                                                                                                                                                                                                                                                                 |  |  |  |  |  |  |  |  |  |
| U.S. STD. SIEVE SIZE<br>OPENING (MM)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |  |  |  |  |  |  |  |                                                                                                                                                                                                                                                                                                 |  |  |  |  |  |  |  |  |  |
| BOULDER (BLOR.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |  |  |  |  |  |  |  |  |                                                                                                                                                                                                                                                                                                 |  |  |  |  |  |  |  |  |  |
| COBBLE (COB.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |  |  |  |  |  |  |  |  |                                                                                                                                                                                                                                                                                                 |  |  |  |  |  |  |  |  |  |
| GRAVEL (GR.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |  |  |  |  |  |  |  |  |                                                                                                                                                                                                                                                                                                 |  |  |  |  |  |  |  |  |  |
| COARSE SAND (CSE. SD.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |  |  |  |  |  |  |  |  |                                                                                                                                                                                                                                                                                                 |  |  |  |  |  |  |  |  |  |
| FINE SAND (F SD.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |  |  |  |  |  |  |  |  |                                                                                                                                                                                                                                                                                                 |  |  |  |  |  |  |  |  |  |
| SILT (SL.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |  |  |  |  |  |  |  |  |                                                                                                                                                                                                                                                                                                 |  |  |  |  |  |  |  |  |  |
| CLAY (CL.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |  |  |  |  |  |  |  |  |                                                                                                                                                                                                                                                                                                 |  |  |  |  |  |  |  |  |  |
| GRAIN SIZE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |  |  |  |  |  |  |  |  |                                                                                                                                                                                                                                                                                                 |  |  |  |  |  |  |  |  |  |
| SOIL MOISTURE - CORRELATION OF TERMS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |  |  |  |  |  |  |  | ABBREVIATIONS                                                                                                                                                                                                                                                                                   |  |  |  |  |  |  |  |  |  |
| SOIL MOISTURE SCALE (ATTERBERG LIMITS)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |  |  |  |  |  |  |  |  | AR - AUGER REFUSAL<br>BT - BORING TERMINATED<br>CL - CLAY<br>CPT - CONE PENETRATION TEST<br>CSE - COARSE<br>DMT - DILATOMETER TEST<br>DPT - DYNAMIC PENETRATION TEST<br>e - VOID RATIO<br>F - FINE<br>FOSS - FOSSILIFEROUS<br>FRAC. - FRACTURED, FRACTURES<br>FRAGS. - FRAGMENTS<br>HL - HIGHLY |  |  |  |  |  |  |  |  |  |
| FIELD MOISTURE DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |  |  |  |  |  |  |  |  | MED. - MEDIUM<br>MICA - MICACEOUS<br>MOD. - MODERATELY<br>NP - NON PLASTIC<br>ORG. - ORGANIC<br>PMT - PRESSUREMETER TEST<br>SAP. - SAPROLITIC<br>SD. - SAND, SANDY<br>SL. - SILT, SILTY<br>SLI. - SLIGHTLY<br>TCR - TRICONE REFUSAL<br>w - MOISTURE CONTENT<br>V - VERY                         |  |  |  |  |  |  |  |  |  |
| GUIDE FOR FIELD MOISTURE DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |  |  |  |  |  |  |  | VST - VANE SHEAR TEST<br>WEA. - WEATHERED<br>γ - UNIT WEIGHT<br>γ <sub>d</sub> - DRY UNIT WEIGHT<br>SAMPLE ABBREVIATIONS<br>S - BULK<br>SS - SPLIT SPOON<br>ST - SHELBY TUBE<br>RS - ROCK<br>RT - RECOMPACTED TRIAXIAL<br>CBR - CALIFORNIA BEARING RATIO                                        |  |  |  |  |  |  |  |  |  |
| LL - LIQUID LIMIT<br>PL - PLASTIC LIMIT<br>OM - OPTIMUM MOISTURE<br>SL - SHRINKAGE LIMIT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |  |  |  |  |  |  |  |  | EQUIPMENT USED ON SUBJECT PROJECT                                                                                                                                                                                                                                                               |  |  |  |  |  |  |  |  |  |
| - SATURATED - (SAT.)<br>- WET - (W)<br>- MOIST - (M)<br>- DRY - (D)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |  |  |  |  |  |  |  |  | DRILL UNITS:<br>MOBILE B-<br>BK-51<br>CME-45C<br>CME-550<br>PORTABLE HOIST                                                                                                                                                                                                                      |  |  |  |  |  |  |  |  |  |
| USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE<br>SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE<br>SOLID; AT OR NEAR OPTIMUM MOISTURE<br>REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE                                                                                                                                                                                                                                                                                                                                                                                                                             |  |  |  |  |  |  |  |  |  | ADVANCING TOOLS:<br>CLAY BITS<br>6" CONTINUOUS FLIGHT AUGER<br>8" HOLLOW AUGERS<br>HARD FACED FINGER BITS<br>TUNG.-CARBIDE INSERTS<br>CASING w/ ADVANCER<br>TRICONE 2 1/8" STEEL TEETH<br>TRICONE TUNG.-CARB.<br>CORE BIT                                                                       |  |  |  |  |  |  |  |  |  |
| PLASTICITY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |  |  |  |  |  |  |  |  | HAMMER TYPE:<br>AUTOMATIC<br>MANUAL<br>CORE SIZE:<br>-B<br>-N<br>-H<br>HAND TOOLS:<br>POST HOLE DIGGER<br>HAND AUGER<br>SOUNDING ROD<br>VANE SHEAR TEST                                                                                                                                         |  |  |  |  |  |  |  |  |  |
| NONPLASTIC<br>LOW PLASTICITY<br>MED. PLASTICITY<br>HIGH PLASTICITY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |  |  |  |  |  |  |  |                                                                                                                                                                                                                                                                                                 |  |  |  |  |  |  |  |  |  |
| 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.                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |  |  |  |  |  |  |  |  |                                                                                                                                                                                                                                                                                                 |  |  |  |  |  |  |  |  |  |

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| NORTH CAROLINA DEPARTMENT OF TRANSPORTATION<br>DIVISION OF HIGHWAYS<br>GEOTECHNICAL ENGINEERING UNIT<br>SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                   |
| ROCK DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                        | TERMS AND DEFINITIONS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                   |
| 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: |                                                                                                                                                                                                                                                                                                                                                        | ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.<br>AQUIFER - A WATER BEARING FORMATION OR STRATA.<br>ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.<br>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.<br>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.<br>CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.<br>COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.<br>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.<br>DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.<br>DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.<br>DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.<br>FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.<br>FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.<br>FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.<br>FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.<br>JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.<br>LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.<br>LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.<br>MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.<br>PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.<br>RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.<br>ROCK QUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.<br>SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.<br>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.<br>SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.<br>STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS IN OR BPF OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.<br>STRATA CORE RECOVERY (ISRC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.<br>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.<br>TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER. |                   |
| WEATHERED ROCK (WR)                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                       | NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                   |
| CRYSTALLINE ROCK (CR)                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                       | FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                   |
| NON-CRYSTALLINE ROCK (NCR)                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                       | 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 SEDIMENTARY ROCK (CP)                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                       | 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. IF TESTED, WOULD YIELD SPT REFUSAL.                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                   |
| 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. IF TESTED, YIELDS SPT N VALUES > 100 BPF.                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                   |
| 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. IF TESTED, YIELDS SPT N VALUES < 100 BPF. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                   |
| 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 PIECES 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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                   |
| TERM                                                                                                                                                                                                                                                                                                                                                                                                                                                            | SPACING                                                                                                                                                                                                                                                                                                                                                | TERM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | THICKNESS         |
| 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: BL-46-1                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                        | (ASSUMED)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                        | ELEVATION: 100.00 FT.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                   |
| NOTES:                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                   |





| <b>WBS</b> 17BP.11.R.95                                                          |                       |               |            |       |       | <b>TIP</b> SF-940046       |    |    |    |     |              | <b>COUNTY</b> WATAUGA                     |     |                           |                                                                                                                                                          |  |  | <b>GEOLOGIST</b> Murray, C. C. |  |  |  |  |  |                  |  |  |  |  |  |
|----------------------------------------------------------------------------------|-----------------------|---------------|------------|-------|-------|----------------------------|----|----|----|-----|--------------|-------------------------------------------|-----|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--------------------------------|--|--|--|--|--|------------------|--|--|--|--|--|
| <b>SITE DESCRIPTION</b> BRIDGE 046 ON SR 1351 (CASTLEFORD RD.) OVER GRASSY CREEK |                       |               |            |       |       |                            |    |    |    |     |              |                                           |     |                           |                                                                                                                                                          |  |  | <b>GROUND WTR (ft)</b>         |  |  |  |  |  |                  |  |  |  |  |  |
| <b>BORING NO.</b> B-1                                                            |                       |               |            |       |       | <b>STATION</b> N/A         |    |    |    |     |              | <b>OFFSET</b> N/A                         |     |                           |                                                                                                                                                          |  |  | <b>ALIGNMENT</b> N/A           |  |  |  |  |  | 0 HR. Caved @ 3' |  |  |  |  |  |
| <b>COLLAR ELEV.</b> 101.3 ft                                                     |                       |               |            |       |       | <b>TOTAL DEPTH</b> 8.4 ft  |    |    |    |     |              | <b>NORTHING</b> 925,377                   |     |                           |                                                                                                                                                          |  |  | <b>EASTING</b> 1,233,694       |  |  |  |  |  | 24 HR. FIAD      |  |  |  |  |  |
| <b>DRILL RIG/HAMMER EFF./DATE</b> HFO0066 CME-550 81% 03/19/2014                 |                       |               |            |       |       |                            |    |    |    |     |              | <b>DRILL METHOD</b> NW Casing w/ Advancer |     |                           |                                                                                                                                                          |  |  | <b>HAMMER TYPE</b> Automatic   |  |  |  |  |  |                  |  |  |  |  |  |
| <b>DRILLER</b> Estep, J. E.                                                      |                       |               |            |       |       | <b>START DATE</b> 07/08/14 |    |    |    |     |              | <b>COMP. DATE</b> 07/08/14                |     |                           |                                                                                                                                                          |  |  | <b>SURFACE WATER DEPTH</b> 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 |                                                                                                                                                          |  |  |                                |  |  |  |  |  |                  |  |  |  |  |  |
|                                                                                  |                       |               | 0.5ft      | 0.5ft | 0.5ft | 0                          | 25 | 50 | 75 | 100 |              |                                           |     | ELEV. (ft)                | DEPTH (ft)                                                                                                                                               |  |  |                                |  |  |  |  |  |                  |  |  |  |  |  |
| 105                                                                              |                       |               |            |       |       |                            |    |    |    |     |              |                                           |     |                           |                                                                                                                                                          |  |  |                                |  |  |  |  |  |                  |  |  |  |  |  |
| 100                                                                              |                       |               |            |       |       |                            |    |    |    |     |              |                                           |     |                           | 101.3 GROUND SURFACE 0.0                                                                                                                                 |  |  |                                |  |  |  |  |  |                  |  |  |  |  |  |
|                                                                                  |                       |               |            |       |       |                            |    |    |    |     |              |                                           |     |                           | ROADWAY EMBANKMENT                                                                                                                                       |  |  |                                |  |  |  |  |  |                  |  |  |  |  |  |
|                                                                                  |                       |               |            |       |       |                            |    |    |    |     |              |                                           |     |                           | BASE GRAVEL W/ BOULDERS @ 3.0                                                                                                                            |  |  |                                |  |  |  |  |  |                  |  |  |  |  |  |
|                                                                                  | 96.4                  | 4.9           | 2          | 3     | 4     |                            |    |    |    |     |              |                                           |     |                           | 97.6 3.7                                                                                                                                                 |  |  |                                |  |  |  |  |  |                  |  |  |  |  |  |
| 95                                                                               |                       |               |            |       |       |                            |    |    |    |     |              |                                           |     |                           | RESIDUAL                                                                                                                                                 |  |  |                                |  |  |  |  |  |                  |  |  |  |  |  |
|                                                                                  |                       |               |            |       |       |                            |    |    |    |     |              |                                           |     |                           | GRAY-TAN MED. STIFF WET SANDY                                                                                                                            |  |  |                                |  |  |  |  |  |                  |  |  |  |  |  |
|                                                                                  |                       |               |            |       |       |                            |    |    |    |     |              |                                           |     |                           | SILTY CLAY (A-7) W/ ROCK FRAGS.                                                                                                                          |  |  |                                |  |  |  |  |  |                  |  |  |  |  |  |
|                                                                                  |                       |               |            |       |       |                            |    |    |    |     |              |                                           |     |                           | 93.9 7.4                                                                                                                                                 |  |  |                                |  |  |  |  |  |                  |  |  |  |  |  |
|                                                                                  |                       |               |            |       |       |                            |    |    |    |     |              |                                           |     |                           | WEATHERED ROCK                                                                                                                                           |  |  |                                |  |  |  |  |  |                  |  |  |  |  |  |
|                                                                                  |                       |               |            |       |       |                            |    |    |    |     |              |                                           |     |                           | SEV. WEATH. CRYSTALLINE ROCK                                                                                                                             |  |  |                                |  |  |  |  |  |                  |  |  |  |  |  |
|                                                                                  |                       |               |            |       |       |                            |    |    |    |     |              |                                           |     |                           | Boring Terminated WITH CASING                                                                                                                            |  |  |                                |  |  |  |  |  |                  |  |  |  |  |  |
|                                                                                  |                       |               |            |       |       |                            |    |    |    |     |              |                                           |     |                           | ADVANCER REFUSAL at Elevation 92.9 ft                                                                                                                    |  |  |                                |  |  |  |  |  |                  |  |  |  |  |  |
|                                                                                  |                       |               |            |       |       |                            |    |    |    |     |              |                                           |     |                           | ON CRYSTALLINE ROCK                                                                                                                                      |  |  |                                |  |  |  |  |  |                  |  |  |  |  |  |
|                                                                                  |                       |               |            |       |       |                            |    |    |    |     |              |                                           |     |                           | NOTE: NORTHING'S & EASTING'S FOR THIS BORLOG WERE OBTAINED FROM FIELD MEASUREMENTS, FROM THE EXISTING BRIDGE, MAPPED IN THE 94_GEO_map_CULV0046.DGN FILE |  |  |                                |  |  |  |  |  |                  |  |  |  |  |  |

[illegible]



| WBS 17BP.11.R.95                                                                                                                                         |                       |               |            |       |       | TIP SF-940046       |    |    |      |              |     | COUNTY WATAUGA                     |                                                                                         |                                                              |            |  |  | GEOLOGIST Murray, C. C. |  |  |  |  |  |                  |  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------------|------------|-------|-------|---------------------|----|----|------|--------------|-----|------------------------------------|-----------------------------------------------------------------------------------------|--------------------------------------------------------------|------------|--|--|-------------------------|--|--|--|--|--|------------------|--|
| SITE DESCRIPTION BRIDGE 046 ON SR 1351 (CASTLEFORD RD.) OVER GRASSY CREEK                                                                                |                       |               |            |       |       |                     |    |    |      |              |     |                                    |                                                                                         |                                                              |            |  |  | GROUND WTR (ft)         |  |  |  |  |  |                  |  |
| BORING NO. B-3                                                                                                                                           |                       |               |            |       |       | STATION N/A         |    |    |      |              |     | OFFSET N/A                         |                                                                                         |                                                              |            |  |  | ALIGNMENT N/A           |  |  |  |  |  | 0 HR. Caved @ 4' |  |
| COLLAR ELEV. 103.1 ft                                                                                                                                    |                       |               |            |       |       | TOTAL DEPTH 9.6 ft  |    |    |      |              |     | NORTHING 925,376                   |                                                                                         |                                                              |            |  |  | EASTING 1,233,648       |  |  |  |  |  | 24 HR. FIAD      |  |
| DRILL RIG/HAMMER EFF./DATE HFO0066 CME-550 81% 03/19/2014                                                                                                |                       |               |            |       |       |                     |    |    |      |              |     | DRILL METHOD NW Casing w/ Advancer |                                                                                         |                                                              |            |  |  | HAMMER TYPE Automatic   |  |  |  |  |  |                  |  |
| DRILLER Estep, J. E.                                                                                                                                     |                       |               |            |       |       | START DATE 07/08/14 |    |    |      |              |     | COMP. DATE 07/08/14                |                                                                                         |                                                              |            |  |  | 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                                                               |                                                              |            |  |  |                         |  |  |  |  |  |                  |  |
|                                                                                                                                                          |                       |               | 0.5ft      | 0.5ft | 0.5ft | 0                   | 25 | 50 | 75   |              |     |                                    | 100                                                                                     | ELEV. (ft)                                                   | DEPTH (ft) |  |  |                         |  |  |  |  |  |                  |  |
| 105                                                                                                                                                      |                       |               |            |       |       |                     |    |    |      |              |     |                                    |                                                                                         |                                                              |            |  |  |                         |  |  |  |  |  |                  |  |
|                                                                                                                                                          |                       |               |            |       |       |                     |    |    |      |              |     |                                    | 103.1                                                                                   | GROUND SURFACE 0.0                                           |            |  |  |                         |  |  |  |  |  |                  |  |
|                                                                                                                                                          |                       |               |            |       |       |                     |    |    |      |              |     |                                    | 101.1                                                                                   | ROADWAY EMBANKMENT BASE GRAVEL 2.0                           |            |  |  |                         |  |  |  |  |  |                  |  |
| 100                                                                                                                                                      |                       |               |            |       |       |                     |    |    |      |              |     |                                    |                                                                                         | ROADWAY EMBANKMENT                                           |            |  |  |                         |  |  |  |  |  |                  |  |
|                                                                                                                                                          | 98.8                  | 4.3           |            |       |       |                     |    |    |      |              |     |                                    | 98.8                                                                                    | TAN LOOSE MOIST CLAYEY SILTY SAND (A-2) 4.3                  |            |  |  |                         |  |  |  |  |  |                  |  |
|                                                                                                                                                          |                       |               | 0          | 0     | 3     |                     |    |    |      |              |     |                                    | 97.1                                                                                    | ALLUVIAL TAN & GRAY V. LOOSE WET CLAYEY SILTY SAND (A-2) 6.0 |            |  |  |                         |  |  |  |  |  |                  |  |
| 95                                                                                                                                                       |                       |               |            |       |       |                     |    |    |      |              |     |                                    | 94.7                                                                                    | WEATHERED ROCK 8.4                                           |            |  |  |                         |  |  |  |  |  |                  |  |
|                                                                                                                                                          | 93.8                  | 9.3           |            |       |       |                     |    |    |      |              |     |                                    | 93.5                                                                                    | GRAY SEV. WEATH. CRYSTALLINE ROCK 9.6                        |            |  |  |                         |  |  |  |  |  |                  |  |
|                                                                                                                                                          |                       |               | 60/0.1     |       |       |                     |    |    | 60/1 |              |     |                                    |                                                                                         | CRYSTALLINE ROCK                                             |            |  |  |                         |  |  |  |  |  |                  |  |
|                                                                                                                                                          |                       |               |            |       |       |                     |    |    |      |              |     |                                    | Boring Terminated WITH CASING ADVANCER REFUSAL at Elevation 93.5 ft IN CRYSTALLINE ROCK |                                                              |            |  |  |                         |  |  |  |  |  |                  |  |
| NOTE: NORTHING'S & EASTING'S FOR THIS BORLOG WERE OBTAINED FROM FIELD MEASUREMENTS, FROM THE EXISTING BRIDGE, MAPPED IN THE 94_GEO_map_CULV0046.DGN FILE |                       |               |            |       |       |                     |    |    |      |              |     |                                    |                                                                                         |                                                              |            |  |  |                         |  |  |  |  |  |                  |  |



| <b>WBS</b> 17BP.11.R.95                                                          |                       |               |            |       |       | <b>TIP</b> SF-940046       |    |    |    |     |              | <b>COUNTY</b> WATAUGA                     |     |                           |                                                                                                                                                          |  |  | <b>GEOLOGIST</b> Murray, C. C. |  |  |  |  |  |                         |  |  |  |  |  |
|----------------------------------------------------------------------------------|-----------------------|---------------|------------|-------|-------|----------------------------|----|----|----|-----|--------------|-------------------------------------------|-----|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--------------------------------|--|--|--|--|--|-------------------------|--|--|--|--|--|
| <b>SITE DESCRIPTION</b> BRIDGE 046 ON SR 1351 (CASTLEFORD RD.) OVER GRASSY CREEK |                       |               |            |       |       |                            |    |    |    |     |              |                                           |     |                           |                                                                                                                                                          |  |  | <b>GROUND WTR (ft)</b>         |  |  |  |  |  |                         |  |  |  |  |  |
| <b>BORING NO.</b> B-4                                                            |                       |               |            |       |       | <b>STATION</b> N/A         |    |    |    |     |              | <b>OFFSET</b> N/A                         |     |                           |                                                                                                                                                          |  |  | <b>ALIGNMENT</b> N/A           |  |  |  |  |  | <b>0 HR. Caved @ 4'</b> |  |  |  |  |  |
| <b>COLLAR ELEV.</b> 103.0 ft                                                     |                       |               |            |       |       | <b>TOTAL DEPTH</b> 9.2 ft  |    |    |    |     |              | <b>NORTHING</b> 925,365                   |     |                           |                                                                                                                                                          |  |  | <b>EASTING</b> 1,233,657       |  |  |  |  |  | <b>24 HR. FIAD</b>      |  |  |  |  |  |
| <b>DRILL RIG/HAMMER EFF./DATE</b> HFO0066 CME-550 81% 03/19/2014                 |                       |               |            |       |       |                            |    |    |    |     |              | <b>DRILL METHOD</b> NW Casing w/ Advancer |     |                           |                                                                                                                                                          |  |  | <b>HAMMER TYPE</b> Automatic   |  |  |  |  |  |                         |  |  |  |  |  |
| <b>DRILLER</b> Estep, J. E.                                                      |                       |               |            |       |       | <b>START DATE</b> 07/08/14 |    |    |    |     |              | <b>COMP. DATE</b> 07/08/14                |     |                           |                                                                                                                                                          |  |  | <b>SURFACE WATER DEPTH</b> 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 |                                                                                                                                                          |  |  |                                |  |  |  |  |  |                         |  |  |  |  |  |
|                                                                                  |                       |               | 0.5ft      | 0.5ft | 0.5ft | 0                          | 25 | 50 | 75 | 100 |              |                                           |     | ELEV. (ft)                | DEPTH (ft)                                                                                                                                               |  |  |                                |  |  |  |  |  |                         |  |  |  |  |  |
| 105                                                                              |                       |               |            |       |       |                            |    |    |    |     |              |                                           |     |                           | 103.0 GROUND SURFACE 0.0                                                                                                                                 |  |  |                                |  |  |  |  |  |                         |  |  |  |  |  |
|                                                                                  |                       |               |            |       |       |                            |    |    |    |     |              |                                           |     |                           | ROADWAY EMBANKMENT BLACK TOP & BASE GRAVEL 2.0                                                                                                           |  |  |                                |  |  |  |  |  |                         |  |  |  |  |  |
| 100                                                                              |                       |               |            |       |       |                            |    |    |    |     |              |                                           |     |                           | 101.0 ROADWAY EMBANKMENT 4.0                                                                                                                             |  |  |                                |  |  |  |  |  |                         |  |  |  |  |  |
|                                                                                  | 98.5                  | 4.5           | 6          | 12    | 7     |                            |    |    |    |     |              |                                           |     |                           | 99.0 TAN LOOSE MOIST CLAYEY SILTY SAND (A-2) 6.0                                                                                                         |  |  |                                |  |  |  |  |  |                         |  |  |  |  |  |
|                                                                                  |                       |               |            |       |       |                            |    |    |    |     |              |                                           |     |                           | 97.0 ALLUVIAL GRAY MED. DENSE WET SILTY SAND (A-2) W/ TRACE MICA 9.2                                                                                     |  |  |                                |  |  |  |  |  |                         |  |  |  |  |  |
| 95                                                                               | 94.5                  | 8.5           | 100/0.5    |       |       |                            |    |    |    |     |              |                                           |     |                           | 93.8 WEATHERED ROCK GRAY SEV. WEATH. CRYSTALLINE ROCK W/ TRACE MICA                                                                                      |  |  |                                |  |  |  |  |  |                         |  |  |  |  |  |
|                                                                                  |                       |               |            |       |       |                            |    |    |    |     |              |                                           |     |                           | Boring Terminated WITH CASING ADVANCER REFUSAL at Elevation 93.8 ft ON CRYSTALLINE ROCK                                                                  |  |  |                                |  |  |  |  |  |                         |  |  |  |  |  |
|                                                                                  |                       |               |            |       |       |                            |    |    |    |     |              |                                           |     |                           | NOTE: NORTHING'S & EASTING'S FOR THIS BORLOG WERE OBTAINED FROM FIELD MEASUREMENTS, FROM THE EXISTING BRIDGE, MAPPED IN THE 94_GEO_map_CULV0046.DGN FILE |  |  |                                |  |  |  |  |  |                         |  |  |  |  |  |