

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 17BP.14.R.158 F.A. PROJ. N/A

COUNTY MACON

PROJECT DESCRIPTION DIVISION 14 - LOW IMPACT BRIDGE
REPLACEMENT PROGRAM

SITE DESCRIPTION BRIDGE NO. 550009 ON SR 1001
ELLIJAY ROAD) OVER ELLIJAY CREEK.

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DATE JUNE, 2016

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DRAWN BY: J. SKYTТА, P.E.



NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

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

| SOIL LEGEND AND AASHTO CLASSIFICATION | | | | | | | | | | | | | | | | | | | | | |
|---------------------------------------|---|--|-----------|--|---------------------------------|--|--|--|--------------|--|---|--|----------------|--------------------|-----------|-----------|-----------|-----------|---------------|--------------------|----|
| GENERAL CLASS. | GRANULAR MATERIALS (≤ 35% PASSING #200) | | | | | | SILT-CLAY MATERIALS (> 35% PASSING #200) | | | | ORGANIC MATERIALS | | | | | | | | | | |
| | A-1 | | A-3 | | A-2 | | A-4 | | A-5 | | A-7 | | A-1, A-2, A-3 | A-4, A-5, A-6, A-7 | | | | | | | |
| GROUP CLASS. | A-1-a | | A-1-b | | A-2-4 | | A-2-5 | | A-2-6 | | A-2-7 | | A-4 | | A-5 | | A-7 | | A-1, A-2, A-3 | A-4, A-5, A-6, A-7 | |
| SYMBOL | [Pattern] | | [Pattern] | | [Pattern] | | [Pattern] | | [Pattern] | | [Pattern] | | [Pattern] | [Pattern] | [Pattern] | [Pattern] | [Pattern] | [Pattern] | [Pattern] | [Pattern] | |
| % PASSING | 100 | | 75 | | 50 | | 40 | | 30 | | 20 | | 15 | 10 | 5 | - | - | - | - | - | |
| LIQUID LIMIT PLASTIC LIMIT | 0-5 | | 6-10 | | 11-15 | | 16-20 | | 21-25 | | 26-30 | | 31-40 | 41-50 | 51-60 | 61-70 | 71-80 | 81-90 | 91-100 | - | - |
| GROUP INDEX | 0 | | 0 | | 0 | | 1 | | 2 | | 3 | | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| USUAL TYPES OF MAJOR MATERIALS | STONE FRAG. GRAVEL AND SAND | | FINE SAND | | SILTY OR CLAYEY GRAVEL AND SAND | | SILTY SOILS | | CLAYEY SOILS | | SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER | | GRANULAR SOILS | SILT-CLAY SOILS | MUCK | PEAT | - | - | - | - | - |
| BEARING AS A SUBGRADE | EXCELLENT TO GOOD | | | | | | FAIR TO POOR | | | | FAIR TO POOR | | POOR | UNSATURABLE | - | - | - | - | - | - | - |

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

| PRIMARY SOIL TYPE | COMPACTNESS OR CONSISTENCY | RANGE OF STANDARD PENETRATION RESISTANCE (blows) | | RANGE OF UNCONFINED COMPRESSIVE STRENGTH (tons/ft ²) | |
|--|----------------------------|--|----|--|--------------|
| | | 4 | 10 | 4 | 10 |
| GENERALLY GRANULAR MATERIAL (NON-COHESIVE) | VERY LOOSE | 4 | 10 | < 4 | N/A |
| | LOOSE | 4 | 10 | 4 | 10 |
| | MEDIUM DENSE | 10 | 30 | 10 | 30 |
| | DENSE | 30 | 50 | 30 | 50 |
| GENERALLY SILT-CLAY MATERIAL (COHESIVE) | VERY SOFT | 2 | 4 | < 0.25 | 0.25 TO 0.50 |
| | SOFT | 4 | 8 | 0.5 | 1.0 |
| | MEDIUM STIFF | 8 | 15 | 1 | 2 |
| | STIFF | 15 | 30 | 2 | 4 |

TEXTURE OR GRAIN SIZE

| | | | | | | |
|----------------------|------|------|------|------|-------|-------|
| U.S. STD. SIEVE SIZE | 4 | 10 | 40 | 60 | 200 | 270 |
| OPENING DIA. | 4.75 | 2.00 | 0.42 | 0.25 | 0.075 | 0.053 |

| BOULDER (BLD) | COBBLE (COB) | GRAVEL (GRL) | COARSE SAND (CS.SD) | FINE SAND (F.SD) | SILT (SL) | CLAY (CL) |
|----------------|--------------|--------------|---------------------|------------------|-----------|-----------|
| GRAIN SIZE IN. | 300 | 75 | 2.0 | 0.25 | 0.05 | 0.002 |

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

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

COLOR

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

GRADATION

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

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE - LIQUID LIMIT LESS THAN 31
MODERATELY COMPRESSIBLE - LIQUID LIMIT EQUAL TO 31-50
HIGHLY COMPRESSIBLE - LIQUID LIMIT GREATER THAN 50

PERCENTAGE OF MATERIAL

| ORGANIC MATERIAL | GRANULAR SOILS | | SILT - CLAY SOILS | | OTHER MATERIAL | |
|-----------------------|-------------------------|---------|-------------------|----------|----------------|---------------|
| | TRACE OF ORGANIC MATTER | 2 - 3% | 3 - 5% | 5 - 12% | TRACE | 1 - 10% |
| LITTLE ORGANIC MATTER | 3 - 5% | 5 - 12% | 5 - 12% | 12 - 20% | LITTLE | 10 - 20% |
| MODERATELY ORGANIC | 5 - 10% | > 10% | > 10% | > 20% | SOME | 20 - 30% |
| HIGHLY ORGANIC | > 10% | > 20% | > 20% | > 20% | HIGHLY | 30% AND ABOVE |

GROUND WATER

- WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING
- STATIC WATER LEVEL AFTER 24 HOURS
- PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA
- SPRING OR SEEP

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRERD SOIL BOUNDARY
- INFERRERD ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- DIP & DIP DIRECTION OF ROCK STRUCTURES
- TEST BORING
- AUGER BORING
- CORE BORING
- MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING W/ CORE
- SPT N-VALUE
- SPT REFUSAL

ABBREVIATIONS

- AR - AUGER REFUSAL
- BT - BORING TERMINATED
- CL - CLAY
- CPT - CONE PENETRATION TEST
- CSE - COARSE
- DMT - DILATOMETER TEST
- DPT - DYNAMIC PENETRATION TEST
- o - VOID RATIO
- F - FINE
- FOSS - FOSSILIFEROUS
- FRAC - FRACTURED, FRACTURES
- FRAG. - FRAGMENTS
- HI - HIGHLY
- MED. - MEDIUM
- MICA - MICACEOUS
- MOD. - MODERATELY
- MP - NON PLASTIC
- ORG. - ORGANIC
- PMT - PRESSUREMETER TEST
- SAP. - SAPROLITIC
- SD. - SAND, SANDY
- SL. - SILT, SILTY
- SLI. - SLIGHTLY
- TRC. - TRICONE REFUSAL
- w - MOISTURE CONTENT
- v - VERY
- VST - VANE SHEAR TEST
- WEA. - WEATHERED
- W - UNIT WEIGHT
- W - DRY UNIT WEIGHT





- #### SAMPLE ABBREVIATIONS
- S - BULK
 - SS - SPLIT SPOON
 - ST - SHELBY TUBE
 - RS - ROCK
 - RT - RECOMPACTED TRIAXIAL
 - CBR - CALIFORNIA BEARING RATIO

EQUIPMENT USED ON SUBJECT PROJECT

- | DRILL UNITS: | ADVANCING TOOLS: | HAMMER TYPE: |
|---|--|---|
| <input type="checkbox"/> MOBILE B-___ | <input type="checkbox"/> CLAY BITS | <input checked="" type="checkbox"/> AUTOMATIC <input type="checkbox"/> MANUAL |
| <input type="checkbox"/> BK-SI | <input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER | |
| <input type="checkbox"/> CME-45C | <input type="checkbox"/> 6" MELLOW AUGERS | |
| <input checked="" type="checkbox"/> CME-55B | <input type="checkbox"/> HARD FACED FINGER BITS | |
| <input type="checkbox"/> PORTABLE MOIST | <input type="checkbox"/> TUNG-CARBIDE INSERTS | |
| | <input type="checkbox"/> CASING <input type="checkbox"/> W/ ADVANCER | |
| | <input type="checkbox"/> TRICONE ___ " STEEL TEETH | |
| | <input type="checkbox"/> TRICONE ___ " TUNG-CARB. | |
| | <input type="checkbox"/> CORE BIT | |
| | <input checked="" type="checkbox"/> 3-1/4" HSA | |
| | | HAND TOOLS: |
| | | <input type="checkbox"/> POST HOLE DIGGER |
| | | <input type="checkbox"/> HAND AUGER |
| | | <input type="checkbox"/> SOUNDING ROD |
| | | <input type="checkbox"/> VANE SHEAR TEST |

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ROCK DESCRIPTION

| | |
|---|---|
| HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL, AN IMPERFECT 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 6.1 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: | |
| 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 IGDIOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC. |
| NON-CRYSTALLINE ROCK (NR) |  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 (MO) | 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 (MOO, 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. <i>IF TESTED, WOULD YIELD SPT REFUSAL.</i> |
| 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. <i>IF TESTED, YIELDS SPT N VALUES > 100 BPF.</i> |
| 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. <i>IF TESTED, YIELDS SPT N VALUES < 100 BPF.</i> |
| COMPLETE | ROCK REDUCED TO SOIL, ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DINKS 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, HAND HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN. |
| MODERATELY HARD | CAN BE SCRATCHED BY KNIFE OR PICK, COUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HAND BLOW OF A GEOLOGIST'S PICK, HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS. |
| MEDIUM HARD | CAN BE GROVED OR GROUED 0.45 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 GROUED 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

| TERM | SPACING |
|------------------|--------------------|
| VERY WIDE | MORE THAN 10 FEET |
| WIDE | 3 TO 10 FEET |
| MODERATELY CLOSE | 1 TO 3 FEET |
| CLOSE | 0.6 TO 1 FEET |
| VERY CLOSE | LESS THAN 0.6 FEET |

BEDDING

| TERM | THICKNESS |
|--------------------|-------------------|
| VERY THICK BEDDED | > 4 FEET |
| THICKLY BEDDED | 1.5 - 4 FEET |
| THINLY BEDDED | 0.75 - 1.5 FEET |
| VERY THINLY BEDDED | 0.45 - 0.75 FEET |
| THICKLY LAMINATED | 0.000 - 0.45 FEET |
| THINLY LAMINATED | < 0.000 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. |

TERMS AND DEFINITIONS

| |
|---|
| ALLUVIUM (ALLOY) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. |
| AQUIFER - A WATER BEARING FORMATION OR STRATA. |
| ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. |
| ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC. |
| ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. |
| CALCAREOUS (CALC) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. |
| COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. |
| CORE RECOVERY (REC) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. |
| DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. |
| DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLAINAR FEATURE IS INCLINED FROM THE HORIZONTAL. |
| DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. |
| FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. |
| FIBRILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. |
| FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOGGED FROM PARENT MATERIAL. |
| FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. |
| FORMATION (FL) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. |
| JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. |
| LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. |
| LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. |
| MOTTLED (MOT) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. |
| PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. |
| RESIDUAL (RES) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. |
| ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. |
| SAPROLITE (SAP) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. |
| SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. |
| SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. |
| STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS IN OR BPF OF A 148 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 6.1 FOOT PER 60 BLOWS. |
| STRATA CORE RECOVERY (REC) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. |
| 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. |
| TOPSOIL (TS) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER. |

BENCH MARK: BL-2

ELEVATION: 2277.37 feet

NOTES:

Boring elevations determined by normal surveying techniques with reference to BL-2, Elev. 2277.37 feet.



Date of Aerial Photograph: April 2014
Obtained from Google Earth

Boring Locations

Bridge No. 550009
over Ellijay Creek
on SR 1001 (Ellijay Rd.)
Macon Co., North Carolina

State Project No. 17BP.14.R.158



STV Engineers, Inc.

Scale: 1"= 40' (approx.)
Date: August 2016
Project: 4017927-1004

SHEET 3



NCDOT GEOTECHNICAL ENGINEERING UNIT BORELOG REPORT

| | | | |
|---|---------------------|--------------------------|-------------------------|
| WBS 17BP.14.R.158 | TIP N/A | COUNTY Macon | GEOLOGIST J. Skytta, PE |
| SITE DESCRIPTION Bridge 550009 on SR 1001 (Ellijay Road) over Ellijay Creek | | | GROUND WTR (ft) |
| BORING NO. EB1-A | STATION 16+82 | OFFSET CL | ALIGNMENT -L- |
| COLLAR ELEV. 2,275.5 ft | TOTAL DEPTH 8.5 ft | NORTHING 725,447 | EASTING 556,822 |
| DRILL RIG/HAMMER EFF/DATE CME-55/93%/2-22-15 | | DRILL METHOD H.S. Augers | HAMMER TYPE Automatic |
| DRILLER AmeriDrill | START DATE 06/22/16 | COMP. DATE 06/22/16 | SURFACE WATER DEPTH N/A |

| ELEV (ft) | DRIVE ELEV (ft) | DEPTH (ft) | BLOW COUNT | | | BLOWS PER FOOT | | | | | SAMP. NO. | MOI | LOG | SOIL AND ROCK DESCRIPTION | | |
|-----------|-----------------|------------|------------|-------|-------|----------------|----|----|----|-----|-----------|-----|-----|---------------------------|------------|-----|
| | | | 0.5ft | 0.5ft | 0.5ft | 0 | 25 | 50 | 75 | 100 | | | | ELEV. (ft) | DEPTH (ft) | |
| 2280 | | | | | | | | | | | | | | | | |
| 2275 | 2,274.8 | 1.0 | | | | | | | | | | | | | 2,275.5 | 0.0 |
| | | | | | | | | | | | | | | | 2,275.0 | 0.5 |
| | 2,272.0 | 3.5 | 2 | 3 | 2 | 5 | 11 | | | | | | | | | |
| 2270 | 2,269.5 | 6.0 | 2 | 3 | 8 | | | | | | | | | | 2,271.0 | 4.5 |
| | 2,267.0 | 8.5 | 16 | 20 | 21 | | | | | | | | | | 2,267.0 | 8.5 |
| | | 50/0.0 | | | | | | | | | | | | | | |

GROUND SURFACE 0.0

PAVEMENT 3 inches asphalt on 3 inches stone

ROADWAY EMBANKMENT Very soft orange brown slightly clayey fine to medium sandy SILT, trace organics, fine gravel 4.5

ROADWAY EMBANKMENT Soft dark brown fine to coarse sandy clayey SILT, with organics, fine gravel 8.5

Boring Terminated by Auger Refusal at Elevation 2,267.0 ft

NCDOT BORE SINGLE DIV 14 BR 009 GPJ NC_DOT_GDT 9/7/16



NCDOT GEOTECHNICAL ENGINEERING UNIT

BORELOG REPORT

| | | | |
|---|---------------------|--------------------------|-------------------------|
| WBS 17BP.14.R.158 | TIP N/A | COUNTY Macon | GEOLOGIST J. Skytta, PE |
| SITE DESCRIPTION Bridge 550009 on SR 1001 (Elijay Road) over Elijay Creek | | | GROUND WTR (ft) |
| BORING NO. EB1-B | STATION 16+99 | OFFSET 15 ft RT | ALIGNMENT -L- |
| COLLAR ELEV. 2,276.3 ft | TOTAL DEPTH 7.8 ft | NORTHING 725,458 | EASTING 556,846 |
| DRILL RIG/HAMMER EFF./DATE CME-55/93%/2-22-15 | | DRILL METHOD H.S. Augers | HAMMER TYPE Automatic |
| DRILLER AmeriDrill | START DATE 06/22/16 | COMP. DATE 06/22/16 | SURFACE WATER DEPTH N/A |

| ELEV (ft) | DRIVE ELEV (ft) | DEPTH (ft) | BLOW COUNT | | | BLOWS PER FOOT | | | | | SAMP. NO. | MOI | LOG | SOIL AND ROCK DESCRIPTION | | | |
|-----------|-----------------|------------|------------|-------|-------|----------------|----|----|----|-----|-----------|-----|-----|---------------------------|------------|---|-----|
| | | | 0.5ft | 0.5ft | 0.5ft | 0 | 25 | 50 | 75 | 100 | | | | ELEV. (ft) | DEPTH (ft) | | |
| 2280 | | | | | | | | | | | | | | | | | |
| 2275 | 2,275.3 | 1.0 | 6 | 10 | 4 | | | | | | | | | | 2,276.3 | GROUND SURFACE | 0.0 |
| | | | | | | | | | | | | | | | 2,273.7 | PAVEMENT | 0.6 |
| | 2,272.8 | 3.5 | 2 | 2 | 2 | | | | | | SS-1 | M | | | 2,272.3 | 4 inches asphalt on 3 inches stone | |
| | | | | | | | | | | | | | | | | ROADWAY EMBANKMENT | |
| 2270 | 2,270.3 | 6.0 | 11 | 19 | 17 | | | | | | SS-2 | M | | | 2,270.3 | Stiff orange brown fine to medium sandy SILT | 4.0 |
| | | | | | | | | | | | | | | | | ROADWAY EMBANKMENT | 6.0 |
| | 2,268.5 | 7.8 | 50/0.0 | | | | | | | | SS-3 | D | | | 2,268.5 | Very loose dark brown silty fine to coarse SAND | 7.8 |
| | | | | | | | | | | | | | | | | RESIDUAL | |
| | | | | | | | | | | | | | | | | Dense orange brown slightly silty fine to coarse SAND, with fragmented rock | |
| | | | | | | | | | | | | | | | | Boring Terminated by Auger Refusal at Elevation 2,268.5 ft | |



NCDOT GEOTECHNICAL ENGINEERING UNIT BORELOG REPORT

| | | | |
|---|---------------------|--------------------------|-------------------------|
| WBS 17BP.14.R.158 | TIP N/A | COUNTY Macon | GEOLOGIST J. Skytta, PE |
| SITE DESCRIPTION Bridge 550009 on SR 1001 (Ellijay Road) over Ellijay Creek | | | GROUND WTR (ft) |
| BORING NO. EB2-A | STATION 17+40 | OFFSET 2 ft RT | ALIGNMENT -L- |
| COLLAR ELEV. 2,277.8 ft | TOTAL DEPTH 12.2 ft | NORTHING 725,438 | EASTING 556,868 |
| DRILL RIG/HAMMER EFF/DATE CME-55/93%/2-22-15 | | DRILL METHOD H.S. Augers | HAMMER TYPE Automatic |
| DRILLER AmeriDrill | START DATE 06/22/16 | COMP. DATE 06/22/16 | SURFACE WATER DEPTH N/A |

| ELEV (ft) | DRIVE ELEV (ft) | DEPTH (ft) | BLOW COUNT | | | BLOWS PER FOOT | | | | | SAMP. NO. | MOI | LOG | SOIL AND ROCK DESCRIPTION | | |
|-----------|-----------------|------------|------------|-------|-------|----------------|----|----|----|-----|-----------|------|-----|---------------------------|------------|---|
| | | | 0.5ft | 0.5ft | 0.5ft | 0 | 25 | 50 | 75 | 100 | | | | ELEV. (ft) | DEPTH (ft) | |
| 2280 | | | | | | | | | | | | | | | | |
| | 2,276.8 | 1.0 | | | | | | | | | | | | | 2,277.8 | GROUND SURFACE |
| | | | | | | | | | | | | | | | | PAVEMENT |
| 2275 | 2,274.3 | 3.5 | WOH | 1 | 1 | | | | | | SS-1 | M | | | | 2 inches asphalt on 2 inches stone |
| | | | | | | | | | | | | | | | | ROADWAY EMBANKMENT |
| | 2,271.8 | 6.0 | | 1 | 1 | | | | | | SS-2 | M | | | | Very soft orange brown fine to medium sandy SILT |
| 2270 | 2,269.3 | 8.5 | WOH | 2 | 2 | | | | | | SS-3 | Sat. | | | 2,271.8 | ROADWAY EMBANKMENT |
| | | | | | | | | | | | | | | | | Very loose to medium dense orange brown silty fine to coarse SAND, with rock pieces |
| | 2,267.6 | | | 10 | 9 | 12 | | | | | SS-4 | W | | | 2,267.6 | |
| | | | | | | | | | | | | | | | | WEATHERED ROCK |
| | 2,265.6 | 12.2 | | | | | | | | | | | | | 2,265.6 | Medium dense light gray brown FRAGMENTED WEATHERED ROCK (classification based on observing degree of drilling difficulty) |
| | | | 50/0.0 | | | | | | | | | | | | | Boring Terminated by Auger Refusal at Elevation 2,265.6 ft |



NCDOT GEOTECHNICAL ENGINEERING UNIT BORELOG REPORT

| | | | |
|---|---------------------|--------------------------|-------------------------|
| WBS 17BP.14.R.158 | TIP N/A | COUNTY Macon | GEOLOGIST J. Skytta, PE |
| SITE DESCRIPTION Bridge 550009 on SR 1001 (Elijay Road) over Elijay Creek | | | GROUND WTR (ft) |
| BORING NO. EB2-B | STATION 17+56 | OFFSET 12 ft RT | ALIGNMENT -L- |
| COLLAR ELEV. 2,278.4 ft | TOTAL DEPTH 10.0 ft | NORTHING 725,451 | EASTING 556,895 |
| DRILL RIG/HAMMER EFF./DATE CME-55/93%/2-22-15 | | DRILL METHOD H.S. Augers | HAMMER TYPE Automatic |
| DRILLER AmeriDrill | START DATE 06/22/16 | COMP. DATE 06/22/16 | SURFACE WATER DEPTH N/A |

| ELEV (ft) | DRIVE ELEV (ft) | DEPTH (ft) | BLOW COUNT | | | BLOWS PER FOOT | | | | | SAMP. NO. | MOI | LOG | SOIL AND ROCK DESCRIPTION | DEPTH (ft) | |
|-----------|-----------------|------------|------------|-------|--------|----------------|----|----|----|-----|-----------|-----|-----|---------------------------|------------|--|
| | | | 0.5ft | 0.5ft | 0.5ft | 0 | 25 | 50 | 75 | 100 | | | | | | |
| 2280 | | | | | | | | | | | | | | | | |
| | 2,277.4 | 1.0 | | | | | | | | | | | | | | |
| | 2,274.9 | 3.5 | 4 | 9 | 15 | | | | | | | | | | | |
| 2275 | 2,274.9 | 3.5 | | | | | | | | | | | | | | |
| | 2,272.4 | 6.0 | 14 | 19 | 12 | | | | | | | | | | | |
| | 2,272.4 | 6.0 | | | | | | | | | | | | | | |
| 2270 | 2,269.9 | 8.5 | 8 | 5 | 6 | | | | | | | | | | | |
| | 2,269.9 | 8.5 | 5 | 15 | 85/0.3 | | | | | | | | | | | |
| | 2,268.4 | 10.0 | | | | | | | | | | | | | | |
| | | | 50/0.0 | | | | | | | | | | | | | |

GROUND SURFACE 0.0

PAVEMENT 0.6

4 inches asphalt on 3 inches stone

ROADWAY EMBANKMENT

Very dense green gray fine to medium SAND and FRAGMENTED ROCK 5.0

RESIDUAL

Medium dense orange brown slightly silty medium to coarse SAND and FRAGMENTED ROCK 9.5

WEATHERED ROCK 10.0

Sampled as brown orange gray FRAGMENTED ROCK

Boring Terminated by Auger Refusal at Elevation 2,268.4 ft

NCDOT BORE SINGLE DIV 14 BR 008.GPJ NC_DOT.GDT 9/7/16