

REFERENCE: B-4770

PROJECT: 38542

|       |                             |           |              |
|-------|-----------------------------|-----------|--------------|
| STATE | STATE PROJECT REFERENCE NO. | SHEET NO. | TOTAL SHEETS |
| N.C.  | B-4770                      | 1         | 8            |

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

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**ROADWAY**

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**SUBSURFACE INVESTIGATION**

COUNTY JOHNSTON

PROJECT DESCRIPTION BRIDGE NO. 32 ON -L-  
(SR 1185) OVER HANNAH CREEK

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PERSONNEL

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CHECKED BY N. T. ROBERSON

SUBMITTED BY N. T. ROBERSON

DATE JULY 2015

**CAUTION NOTICE**

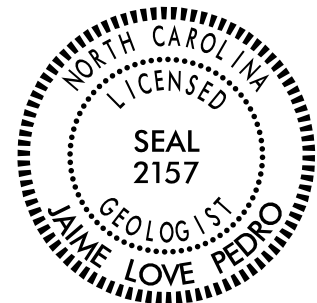
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NOTES:

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



DocuSigned by:

*Jaime Love Pedro* 7/13/2015

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DATE

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
 DIVISION OF HIGHWAYS  
 GEOTECHNICAL ENGINEERING UNIT

**SUBSURFACE INVESTIGATION**

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS  
 (PAGE 1 OF 2)

| SOIL DESCRIPTION   |  |  |  |  |  |  |  |  |  | GRADATION  |  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6 |  |  |  |  |  |  |  |  |  | WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.<br>UNFORMALLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.<br>GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.   |  |  |  |  |  |  |  |  |  |
| SOIL LEGEND AND AASHTO CLASSIFICATION  |  |  |  |  |  |  |  |  |  | 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 WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.  |  |  |  |  |  |  |  |  |  | COMPRESSIBILITY  |  |  |  |  |  |  |  |  |  |
| SLIGHTLY COMPRESSIBLE LL < 31<br>MODERATELY COMPRESSIBLE LL = 31 - 50<br>HIGHLY COMPRESSIBLE LL > 50   |  |  |  |  |  |  |  |  |  | PERCENTAGE OF MATERIAL   |  |  |  |  |  |  |  |  |  |
| ORGANIC MATERIAL GRANULAR SOILS SILT - CLAY SOILS OTHER MATERIAL<br>TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10%<br>LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20%<br>MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35%<br>HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE  |  |  |  |  |  |  |  |  |  | GROUND WATER   |  |  |  |  |  |  |  |  |  |
| 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   |  |  |  |  |  |  |  |  |  | MISCELLANEOUS SYMBOLS  |  |  |  |  |  |  |  |  |  |
| 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   |  |  |  |  |  |  |  |  |  | 25/025 DIP & DIP DIRECTION OF ROCK STRUCTURES<br>SPT DMT VST PMT 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<br>TEST BORING WITH CORE<br>SPT N-VALUE  |  |  |  |  |  |  |  |  |  |
| CONSISTENCY OR DENSENESS   |  |  |  |  |  |  |  |  |  | RECOMMENDATION SYMBOLS   |  |  |  |  |  |  |  |  |  |
| PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT <sup>2</sup> )<br>GENERALLY GRANULAR MATERIAL (NON-COHESIVE) VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE < 4 4 TO 10 10 TO 30 30 TO 50 > 50 N/A<br>GENERALLY SILT-CLAY MATERIAL (COHESIVE) VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD < 2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 > 30 < 0.25 0.25 TO 0.5 0.5 TO 1.0 1 TO 2 2 TO 4 > 4  |  |  |  |  |  |  |  |  |  | UNDERCUT EXCAVATION UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL<br>SHALLOW UNDERCUT UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK   |  |  |  |  |  |  |  |  |  |
| TEXTURE OR GRAIN SIZE  |  |  |  |  |  |  |  |  |  | ABBREVIATIONS  |  |  |  |  |  |  |  |  |  |
| U.S. STD. SIEVE SIZE OPENING (MM) 4 10 40 60 200 270 4.76 2.00 0.42 0.25 0.075 0.053   |  |  |  |  |  |  |  |  |  | AR - AUGER REFUSAL MED. - MEDIUM BT - BORING TERMINATED MICA - MICACEOUS CL. - CLAY MOD. - MODERATELY CPT - CONE PENETRATION TEST NP - NON PLASTIC CSE. - COARSE ORG. - ORGANIC DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST DPT - DYNAMIC PENETRATION TEST SAP. - SAPROLITIC e - VOID RATIO SD. - SAND, SANDY F - FINE SL. - SILT, SILTY FOSS. - FOSSILIFEROUS SILI. - SLIGHTLY FRAC. - FRACTURED, FRACTURES TCR - TRICONE REFUSAL FRAGS. - FRAGMENTS w - MOISTURE CONTENT HI. - HIGHLY v - VERY |  |  |  |  |  |  |  |  |  |
| SOIL MOISTURE - CORRELATION OF TERMS   |  |  |  |  |  |  |  |  |  | EQUIPMENT USED ON SUBJECT PROJECT  |  |  |  |  |  |  |  |  |  |
| SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION<br>LL LIQUID LIMIT - SATURATED - (SAT.) USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE<br>PLASTIC RANGE (PI) PL PLASTIC LIMIT - WET - (W) SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE<br>OM OPTIMUM MOISTURE SHRINKAGE LIMIT - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE<br>SL - DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE   |  |  |  |  |  |  |  |  |  | DRILL UNITS: CME-45C CME-55 CME-550 VANE SHEAR TEST PORTABLE HOIST<br>ADVANCING TOOLS: CLAY BITS 6' CONTINUOUS FLIGHT AUGER 8" HOLLOW AUGERS HARD FACED FINGER BITS TUNG-CARBIDE INSERTS CASING w/ ADVANCER TRICONE STEEL TEETH TRICONE TUNG-CARB. CORE BIT<br>HAMMER TOPICT: AUTOMATIC MANUAL<br>CORE SIZE: -B -H -N<br>HAND TOOLS: POST HOLE DIGGER HAND AUGER SOUNDING ROD VANE SHEAR TEST  |  |  |  |  |  |  |  |  |  |
| PLASTICITY   |  |  |  |  |  |  |  |  |  | DRILL UNITS: CME-45C CME-55 CME-550 VANE SHEAR TEST PORTABLE HOIST<br>ADVANCING TOOLS: CLAY BITS 6' CONTINUOUS FLIGHT AUGER 8" HOLLOW AUGERS HARD FACED FINGER BITS TUNG-CARBIDE INSERTS CASING w/ ADVANCER TRICONE STEEL TEETH TRICONE TUNG-CARB. CORE BIT<br>HAMMER TOPICT: AUTOMATIC MANUAL<br>CORE SIZE: -B -H -N<br>HAND TOOLS: POST HOLE DIGGER HAND AUGER SOUNDING ROD VANE SHEAR TEST  |  |  |  |  |  |  |  |  |  |
| PLASTICITY INDEX (PI) DRY STRENGTH   |  |  |  |  |  |  |  |  |  | DRILL UNITS: CME-45C CME-55 CME-550 VANE SHEAR TEST PORTABLE HOIST<br>ADVANCING TOOLS: CLAY BITS 6' CONTINUOUS FLIGHT AUGER 8" HOLLOW AUGERS HARD FACED FINGER BITS TUNG-CARBIDE INSERTS CASING w/ ADVANCER TRICONE STEEL TEETH TRICONE TUNG-CARB. CORE BIT<br>HAMMER TOPICT: AUTOMATIC MANUAL<br>CORE SIZE: -B -H -N<br>HAND TOOLS: POST HOLE DIGGER HAND AUGER SOUNDING ROD VANE SHEAR TEST  |  |  |  |  |  |  |  |  |  |
| COLOR  |  |  |  |  |  |  |  |  |  | DRILL UNITS: CME-45C CME-55 CME-550 VANE SHEAR TEST PORTABLE HOIST<br>ADVANCING TOOLS: CLAY BITS 6' CONTINUOUS FLIGHT AUGER 8" HOLLOW AUGERS HARD FACED FINGER BITS TUNG-CARBIDE INSERTS CASING w/ ADVANCER TRICONE STEEL TEETH TRICONE TUNG-CARB. CORE BIT<br>HAMMER TOPICT: AUTOMATIC MANUAL<br>CORE SIZE: -B -H -N<br>HAND TOOLS: POST HOLE DIGGER HAND AUGER SOUNDING ROD VANE SHEAR TEST  |  |  |  |  |  |  |  |  |  |
| 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.   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |





**NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
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# SUBSURFACE INVESTIGATION

## SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS (PAGE 2 OF 2)

### ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

|                                     |   |   |
|-------------------------------------|---|---|
| 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. <u>IF TESTED, WOULD YIELD SPT REFUSAL</u>   |
| SEVERE (SEV.)                 | ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. <u>IF TESTED, WOULD YIELD SPT N VALUES &gt; 100 BPF</u>   |
| VERY SEVERE (V SEV.)          | ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <u>IF TESTED, WOULD YIELD SPT N VALUES &lt; 100 BPF</u> |
| COMPLETE                      | ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.  |

### ROCK HARDNESS

|                 |   |
|-----------------|---|
| VERY HARD       | CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.   |
| HARD            | CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.   |
| MODERATELY HARD | CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.                               |
| MEDIUM HARD     | CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.            |
| SOFT            | CAN BE GROOVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE. |
| 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            | 0.16 TO 1 FOOT      |
| VERY CLOSE       | LESS THAN 0.16 FEET |

### BEDDING

| TERM                | THICKNESS         |
|---------------------|-------------------|
| VERY THICKLY BEDDED | 4 FEET            |
| THICKLY BEDDED      | 1.5 - 4 FEET      |
| THINLY BEDDED       | 0.16 - 1.5 FEET   |
| VERY THINLY BEDDED  | 0.03 - 0.16 FEET  |
| THICKLY LAMINATED   | 0.008 - 0.03 FEET |
| THINLY LAMINATED    | < 0.008 FEET      |

### INDURATION

|   |   |
|---|---|
| FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. |   |
| FRIABLE   | RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.    |
| MODERATELY INDURATED  | GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. |
| INDURATED   | GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.        |
| EXTREMELY INDURATED   | SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.                 |

### TERMS AND DEFINITIONS

|  |   |
|--|---|
| <b>ALLUVIUM (ALLUV.)</b> - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.  | <b>AQUIFER</b> - A WATER BEARING FORMATION OR STRATA.   |
| <b>ARENACEOUS</b> - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.  | <b>ARGILLACEOUS</b> - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC. |
| <b>ARTESIAN</b> - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.   | <b>CALCAREOUS (CALC.)</b> - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.  |
| <b>COLLUVIUM</b> - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.   | <b>CORE RECOVERY (REC.)</b> - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.                  |
| <b>DIKE</b> - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.  | <b>DIP</b> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.  |
| <b>DIP DIRECTION (DIP AZIMUTH)</b> - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.   | <b>FAULT</b> - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.                           |
| <b>FISSILE</b> - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.   | <b>FLOAT</b> - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.   |
| <b>FLOOD PLAIN (FP)</b> - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.   | <b>FORMATION (FM.)</b> - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.   |
| <b>JOINT</b> - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.  | <b>LEDGE</b> - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.  |
| <b>LENS</b> - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.   | <b>MOTTLED (MOT.)</b> - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.                     |
| <b>PERCHED WATER</b> - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.  | <b>RESIDUAL (RES.) SOIL</b> - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.   |
| <b>ROCK QUALITY DESIGNATION (ROD)</b> - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.  | <b>SAPROLITE (SAP.)</b> - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.  |
| <b>SILL</b> - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.  | <b>SLICKENSIDE</b> - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.  |
| <b>STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT)</b> - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. | <b>STRATA CORE RECOVERY (SREC.)</b> - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.                           |
| <b>STRATA ROCK QUALITY DESIGNATION (SROD)</b> - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.   | <b>TOPSOIL (TS.)</b> - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.   |

### BENCH MARK:

ELEVATION: FEET

### NOTES:



STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION

PAT MCCRORY  
GOVERNOR

ANTHONY J. TATA  
SECRETARY

July 13, 2015

STATE PROJECT: 38542.1.1 (B-4770)  
COUNTY: Johnston  
DESCRIPTION: Bridge No. 32 on -L- (SR 1185) over Hannah Creek  
SUBJECT: Geotechnical Report – Inventory

The Geotechnical Engineering Unit has completed a subsurface investigation for this project and presents the following inventory. No plans, profiles, or cross-sections will be submitted for this roadway project.

#### **Project Description**

The project consists of the replacement of Bridge No. 32 on SR 1185 (Joyner Bridge Rd.) over Hannah Creek. The total length of the roadway portion of the project is 0.16 miles. The proposed grade will be raised just slightly compared to the existing grade. Hand auger borings were performed in June 2015 along with a literature review of nearby projects. Representative soil samples were collected for visual classification in the field.

#### **Physiography & Geology**

The project is located 4.2 miles northwest of the town of Bentonville in the relatively flat, low-lying terrain of southern Johnston County. A mixture of woods, farmland, and single-family dwellings are located along the project corridor. Geologically the site is characterized by sands, silts, and clays associated with the Black Creek formation within the Coastal Plain Physiographic Province. Black Creek material consists of clays interbedded with thin laminae of micaceous sand and thick lenses of cross-bedded sand.

#### **Soil Properties**

Soils within the project are roadway embankment, alluvial, and Cretaceous-age Coastal Plain sediments that are derived from the Black Creek formation. The soils consist of granular and cohesive materials.

Roadway embankment soils consist of orange, tan, gray, and brown, very loose to medium dense, moist, silty and clayey sand (A-2-4, A-2-6) and some soft to medium stiff, silty and sandy clay (A-7-6 and A-6). This material varies in depth from 5.0 to 12.0 feet. Alluvial soils consist primarily of tan, brown, and white, very loose to medium dense, moist to saturated, silty and coarse sand (A-2-4 and A-1-b) with some gravel and very soft to medium stiff, sandy

**MAILING ADDRESS:**  
NC DEPARTMENT OF TRANSPORTATION  
GEOTECHNICAL ENGINEERING UNIT  
1589 MAIL SERVICE CENTER  
RALEIGH NC 27699-1589

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Fax: 919-250-4237

[connect.ncdot.gov/resources/Geological](http://connect.ncdot.gov/resources/Geological)

**LOCATION:**  
CENTURY CENTER COMPLEX  
ENTRANCE B-2  
1020 BIRCH RIDGE DRIVE  
RALEIGH NC 27610

silt and clay (A-4, A-6). Coastal Plain soils consist of light and dark gray and green-gray, stiff to hard, moist, Silty clay, sandy clay, and sandy silt (A-7-6, A-6, and A-4) with some interbedded medium dense to dense sand, silty sand, and clayey sand (A-3, A-2-4, and A-2-6).

#### **Groundwater**

The groundwater level is anticipated to be at elevations similar to Hannah Creek. Seasonal fluctuations in the water table can be expected. Groundwater is not anticipated to cause problems during construction.

JLP/NTR/jlp

# GEOTECHNICAL BORING REPORT BORE LOG

| WBS 38542.1.1   |                 | TIP B-4770          |            | COUNTY JOHNSTON         |       |                         | GEOLOGIST Oti, O. B. |                 |    |     |           |         |                           |            |     |
|---|-----------------|---------------------|------------|-------------------------|-------|-------------------------|----------------------|-----------------|----|-----|-----------|---------|---------------------------|------------|-----|
| SITE DESCRIPTION BRIDGE NO. 32 ON -L- (SR 1185) OVER HANNAH CREEK           |                 |                     |            |                         |       |                         |                      | GROUND WTR (ft) |    |     |           |         |                           |            |     |
| BORING NO. L_1050   |                 | STATION 10+50       |            | OFFSET 12 ft LT         |       | ALIGNMENT -L-           |                      | 0 HR. Dry       |    |     |           |         |                           |            |     |
| COLLAR ELEV. 107.6 ft   |                 | TOTAL DEPTH 5.0 ft  |            | NORTHING 596,055        |       | EASTING 2,196,893       |                      | 24 HR. FIAD     |    |     |           |         |                           |            |     |
| DRILL RIG/HAMMER EFF./DATE N/A  |                 |                     |            | DRILL METHOD Hand Auger |       |                         | HAMMER TYPE N/A      |                 |    |     |           |         |                           |            |     |
| DRILLER Pinter, D. G.   |                 | START DATE 06/30/15 |            | COMP. DATE 06/30/15     |       | SURFACE WATER DEPTH N/A |                      |                 |    |     |           |         |                           |            |     |
| ELEV (ft)   | DRIVE ELEV (ft) | DEPTH (ft)          | BLOW COUNT |                         |       | BLOWS PER FOOT          |                      |                 |    |     | SAMP. NO. | LOG MOI | SOIL AND ROCK DESCRIPTION | DEPTH (ft) |     |
|   |                 |                     | 0.5ft      | 0.5ft                   | 0.5ft | 0                       | 25                   | 50              | 75 | 100 |           |         |                           |            |     |
| 110   |                 |                     |            |                         |       |                         |                      |                 |    |     |           |         |                           |            |     |
|   |                 |                     |            |                         |       |                         |                      |                 |    |     |           |         |                           | 107.6      | 0.0 |
| 105   |                 |                     |            |                         |       |                         |                      |                 |    |     | M         |         |                           | 102.6      | 5.0 |
| Boring Terminated at Elevation 102.6 ft IN ROADWAY EMBANKMENT (CLAYEY SAND) |                 |                     |            |                         |       |                         |                      |                 |    |     |           |         |                           |            |     |

# GEOTECHNICAL BORING REPORT

## BORE LOG

| WBS 38542.1.1   |                 |            | TIP B-4770          |       |       | COUNTY JOHNSTON         |    |    | GEOLOGIST Oti, O. B.    |                 |           |     |     |                           |   |  |
|---|-----------------|------------|---------------------|-------|-------|-------------------------|----|----|-------------------------|-----------------|-----------|-----|-----|---------------------------|---|--|
| SITE DESCRIPTION BRIDGE NO. 32 ON -L- (SR 1185) OVER HANNAH CREEK |                 |            |                     |       |       |                         |    |    |                         | GROUND WTR (ft) |           |     |     |                           |   |  |
| BORING NO. L_1500   |                 |            | STATION 15+00       |       |       | OFFSET 15 ft RT         |    |    | ALIGNMENT -L-           |                 |           |     |     |                           |   |  |
| COLLAR ELEV. 107.2 ft   |                 |            | TOTAL DEPTH 5.0 ft  |       |       | NORTHING 596,461        |    |    | EASTING 2,197,090       |                 |           |     |     |                           |   |  |
| DRILL RIG/HAMMER EFF./DATE N/A                                    |                 |            |                     |       |       | DRILL METHOD Hand Auger |    |    | HAMMER TYPE N/A         |                 |           |     |     |                           |   |  |
| DRILLER Pinter, D. G.   |                 |            | START DATE 06/30/15 |       |       | COMP. DATE 06/30/15     |    |    | 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)  |  |
| 110   |                 |            |                     |       |       |                         |    |    |                         |                 |           |     |     |                           |   |  |
|   |                 |            |                     |       |       |                         |    |    |                         |                 |           |     |     | 107.2                     | GROUND SURFACE  |  |
| 105   |                 |            |                     |       |       |                         |    |    |                         |                 |           |     |     |                           | ROADWAY EMBANKMENT<br>TAN, ORANGE, AND BROWN,<br>CLAYEY SAND                      |  |
|   |                 |            |                     |       |       |                         |    |    |                         |                 |           |     |     | 102.2                     | Boring Terminated at Elevation 102.2 ft IN<br>ROADWAY EMBANKMENT (CLAYEY<br>SAND) |  |

NCDOT BORE SINGLE B4770\_GEO\_BH.GPJ NC\_DOT.GDT 7/13/15

# GEOTECHNICAL BORING REPORT

## BORE LOG

| WBS 38542.1.1   |                 | TIP B-4770          |            | COUNTY JOHNSTON         |       |                         | GEOLOGIST Oti, O. B. |                 |    |     |           |     |     |                           |            |  |   |
|---|-----------------|---------------------|------------|-------------------------|-------|-------------------------|----------------------|-----------------|----|-----|-----------|-----|-----|---------------------------|------------|--|---|
| SITE DESCRIPTION BRIDGE NO. 32 ON -L- (SR 1185) OVER HANNAH CREEK |                 |                     |            |                         |       |                         |                      | GROUND WTR (ft) |    |     |           |     |     |                           |            |  |   |
| BORING NO. L_1700   |                 | STATION 17+00       |            | OFFSET 13 ft LT         |       | ALIGNMENT -L-           |                      | 0 HR. Dry       |    |     |           |     |     |                           |            |  |   |
| COLLAR ELEV. 106.9 ft   |                 | TOTAL DEPTH 5.0 ft  |            | NORTHING 596,657        |       | EASTING 2,197,140       |                      | 24 HR. FIAD     |    |     |           |     |     |                           |            |  |   |
| DRILL RIG/HAMMER EFF./DATE N/A                                    |                 |                     |            | DRILL METHOD Hand Auger |       |                         | HAMMER TYPE N/A      |                 |    |     |           |     |     |                           |            |  |   |
| DRILLER Pinter, D. G.   |                 | START DATE 06/30/15 |            | COMP. DATE 06/30/15     |       | 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) |  |   |
| 110   |                 |                     |            |                         |       |                         |                      |                 |    |     |           |     |     |                           |            |  |   |
|   |                 |                     |            |                         |       |                         |                      |                 |    |     |           |     |     |                           | 106.9      |  | GROUND SURFACE  |
| 105   |                 |                     |            |                         |       |                         |                      |                 |    |     |           |     |     |                           |            |  | ROADWAY EMBANKMENT<br>TAN, ORANGE, AND BROWN,<br>CLAYEY SAND                      |
|   |                 |                     |            |                         |       |                         |                      |                 |    |     |           |     |     |                           | 101.9      |  | Boring Terminated at Elevation 101.9 ft IN<br>ROADWAY EMBANKMENT (CLAYEY<br>SAND) |

NCDOT BORE SINGLE B4770\_GEO\_BH.GPJ NC\_DOT.GDT 7/13/15



# GEOTECHNICAL BORING REPORT BORE LOG

| <b>WBS</b> 38542.1.1   |                       | <b>TIP</b> B-4770          |            | <b>COUNTY</b> JOHNSTON         |       |                                | <b>GEOLOGIST</b> Oti, O. B. |             |                        |     |              |             |  |   |      |
|--|-----------------------|----------------------------|------------|--------------------------------|-------|--------------------------------|-----------------------------|-------------|------------------------|-----|--------------|-------------|--|---|------|
| <b>SITE DESCRIPTION</b> BRIDGE NO. 32 ON -L- (SR 1185) OVER HANNAH CREEK |                       |                            |            |                                |       |                                |                             |             | <b>GROUND WTR (ft)</b> |     |              |             |  |   |      |
| <b>BORING NO.</b> L_1900   |                       | <b>STATION</b> 19+00       |            | <b>OFFSET</b> 25 ft LT         |       | <b>ALIGNMENT</b> -L-           |                             | 0 HR. Dry   |                        |     |              |             |  |   |      |
| <b>COLLAR ELEV.</b> 102.6 ft   |                       | <b>TOTAL DEPTH</b> 10.0 ft |            | <b>NORTHING</b> 596,846        |       | <b>EASTING</b> 2,197,205       |                             | 24 HR. FIAD |                        |     |              |             |  |   |      |
| <b>DRILL RIG/HAMMER EFF./DATE</b> N/A                                    |                       |                            |            | <b>DRILL METHOD</b> Hand Auger |       |                                | <b>HAMMER TYPE</b> N/A      |             |                        |     |              |             |  |   |      |
| <b>DRILLER</b> Pinter, D. G.   |                       | <b>START DATE</b> 06/30/15 |            | <b>COMP. DATE</b> 06/30/15     |       | <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. | L<br>O<br>G | SOIL AND ROCK DESCRIPTION<br>ELEV. (ft) DEPTH (ft) |   |      |
|  |                       |                            | 0.5ft      | 0.5ft                          | 0.5ft | 0                              | 25                          | 50          | 75                     | 100 |              |             |  |   |      |
| 105  |                       |                            |            |                                |       |                                |                             |             |                        |     |              |             |  |   |      |
| 100  |                       |                            |            |                                |       | .....                          | .....                       | .....       | .....                  |     |              |             | 102.6  | GROUND SURFACE<br>COASTAL PLAIN<br>DARK BROWN TO TAN-BROWN,<br>SILTY SAND | 0.0  |
| 95   |                       |                            |            |                                |       | .....                          | .....                       | .....       | .....                  |     | M            |             |  |   |      |
|  |                       |                            |            |                                |       | .....                          | .....                       | .....       | .....                  |     |              |             | 92.6   | Boring Terminated at Elevation 92.6 ft IN<br>COASTAL PLAIN (SILTY SAND)   | 10.0 |