



PAT McCrory  
Governor

NICHOLAS J. TENNYSON  
Secretary

March 29, 2016

MEMORANDUM TO: Jamie J. Lancaster, P.E.  
Priority Projects Unit

FROM:

DS  
KK

John L. Pilipchuk, LG, PE  
State Geotechnical Engineer

DocuSigned by:

*John Pilipchuk*

52C44B94B8BE444...

STATE PROJECT: 45654.1.1 (B-5691)  
FEDERAL PROJECT: N/A  
COUNTY: Cumberland

DESCRIPTION: Bridge No. 52 on SR 1006 (Maxwell Rd.) over  
South River

SUBJECT: Express Design-Build Inventory

The Geotechnical Engineering Unit has reviewed the subsurface investigation and inventory report for the above project as provided by Stewart Engineering and submits the accompanying Structure Subsurface Inventory.

Please call Neil T. Roberson, LG. at (919) 662-3576 if there are any questions concerning this memorandum.

Attachment



REFERENCE: B-5691

PROJECT: 45645

| STATE | STATE PROJECT REFERENCE NO. | SHEET NO. | TOTAL SHEETS |
|-------|-----------------------------|-----------|--------------|
| N.C.  | B-5691                      | 1         | 7            |

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

---

**STRUCTURE**  
**SUBSURFACE INVESTIGATION**

---

COUNTY CUMBERLAND

PROJECT DESCRIPTION BRIDGE NO. 52 ON SR 1006  
(MAXWELL ROAD) OVER SOUTH RIVER

**CONTENTS**

| <u>SHEET NO.</u> | <u>DESCRIPTION</u> |
|------------------|--------------------|
| 1                | TITLE SHEET        |
| 2, 2A            | LEGEND             |
| 3                | SITE PLAN          |
| 4-6              | BORE LOGS          |

PERSONNEL

N. MOHS, LG

TRIGON

E. ESTEP

T. PRESTON

INVESTIGATED BY N. MOHS, LG

DRAWN BY N. MOHS, LG

CHECKED BY D. BROWN, PE

SUBMITTED BY N. MOHS, LG

DATE MARCH 2016

**CAUTION NOTICE**

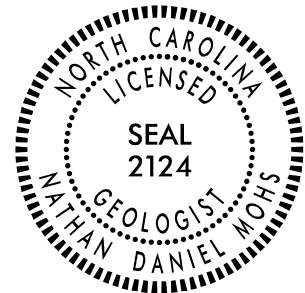
THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF PREPARING THE SCOPE OF WORK TO BE INCLUDED IN THE REQUEST FOR PROPOSAL. THE VARIOUS FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N.C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 707-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

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 BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS 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.

NOTES:

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

*Nathan Mohs*

3/31/2016

95B48AF191F3448

SIGNATURE

DATE

**DOCUMENT NOT CONSIDERED FINAL  
UNLESS ALL SIGNATURES COMPLETED**



B-5691

2A

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

# 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 (CPI) |  | 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.<br><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.<br><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 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 FINGERNAIL.                          |

**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 FOOT      | 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 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**

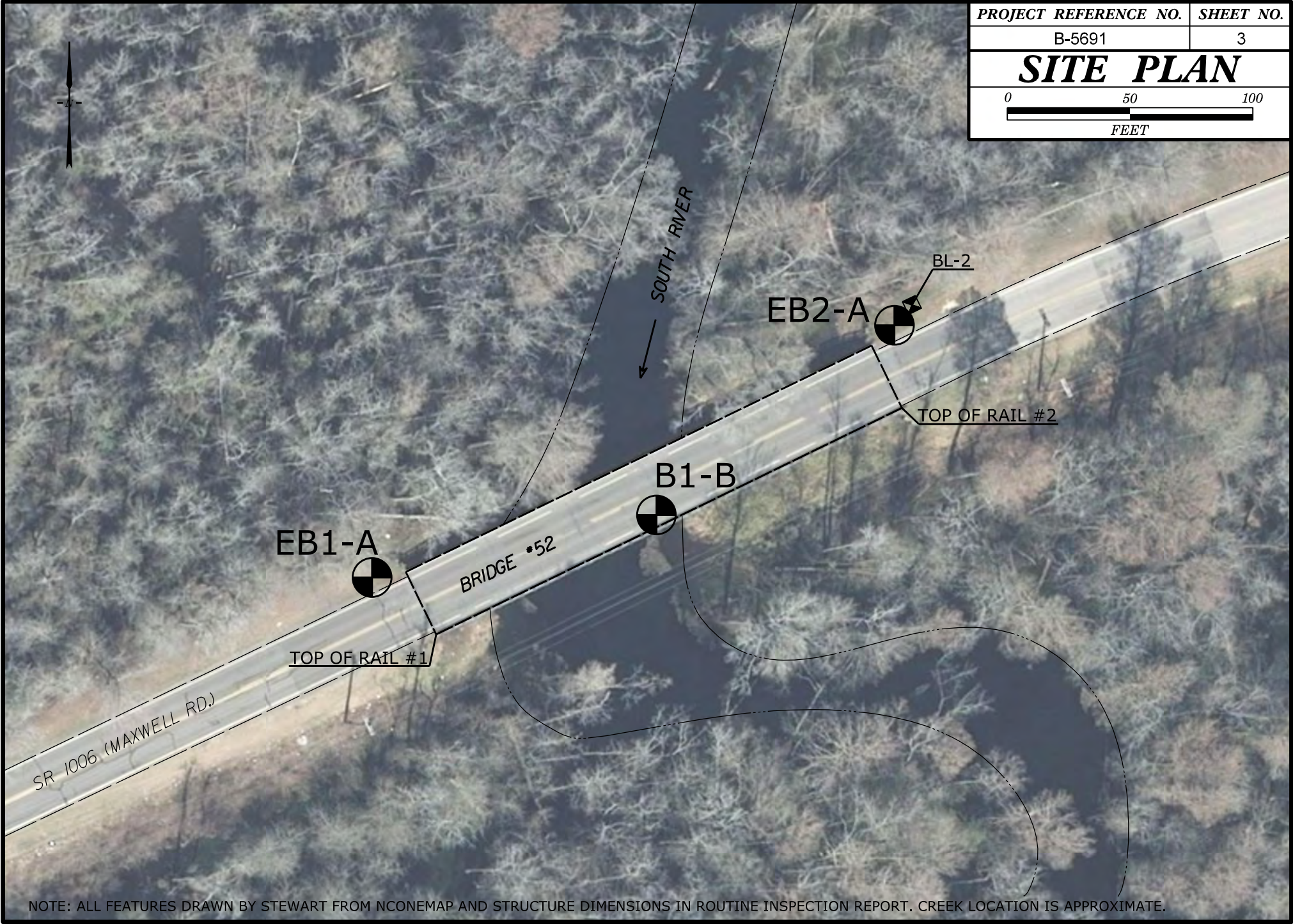
|                                                                                                                                                                                                                                                                                                                     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <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 (RQD)</b> - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.                                                                                               |
| <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 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. |
| <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 (SRQD)</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: BL-2; N: 486220.39, E: 2098167.98

ELEVATION: 100.00 FEET

**NOTES:**

BL-2 ELEVATION IS ASSUMED AND WAS ESTABLISHED BY NCDOT.  
SOUTH RIVER SURFACE ELEV.= 90.9 FEET (3/7/16)  
TOP OF RAIL #1 ELEV.= 103.4 FEET  
TOP OF RAIL #2 ELEV.= 103.3 FEET



# GEOTECHNICAL BORING REPORT

## BORE LOG

SHEET 4

|                                                                           |                 |            |                     |       |       |                         |    |    |                         |     |           |      |     |                                                                              |            |
|---------------------------------------------------------------------------|-----------------|------------|---------------------|-------|-------|-------------------------|----|----|-------------------------|-----|-----------|------|-----|------------------------------------------------------------------------------|------------|
| WBS 45645.1.1                                                             |                 |            | TIP B-5691          |       |       | COUNTY CUMBERLAND       |    |    | GEOLOGIST N. Mohs, LG   |     |           |      |     |                                                                              |            |
| SITE DESCRIPTION Bridge No. 52 on SR 1006 (Maxwell Road) over South River |                 |            |                     |       |       |                         |    |    | GROUND WTR (ft)         |     |           |      |     |                                                                              |            |
| BORING NO. EB1-A                                                          |                 |            | STATION N/A         |       |       | OFFSET N/A              |    |    | ALIGNMENT N/A           |     |           |      |     |                                                                              |            |
| COLLAR ELEV. 100.5 ft                                                     |                 |            | TOTAL DEPTH 65.0 ft |       |       | NORTHING 486,109        |    |    | EASTING 2,097,948       |     |           |      |     |                                                                              |            |
| DRILL RIG/HAMMER EFF./DATE TRI8016 MOBILE B-57 90% 02/20/2015             |                 |            |                     |       |       | DRILL METHOD Mud Rotary |    |    | HAMMER TYPE Automatic   |     |           |      |     |                                                                              |            |
| DRILLER E. Estep                                                          |                 |            | START DATE 03/08/16 |       |       | COMP. DATE 03/08/16     |    |    | 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) |
| 105                                                                       |                 |            |                     |       |       |                         |    |    |                         |     |           |      |     |                                                                              |            |
| 100                                                                       |                 |            |                     |       |       |                         |    |    |                         |     |           |      |     | 100.5                                                                        | 0.0        |
|                                                                           |                 |            |                     |       |       |                         |    |    |                         |     |           |      |     | GROUND SURFACE                                                               |            |
|                                                                           |                 |            |                     |       |       |                         |    |    |                         |     |           |      |     | ROADWAY EMBANKMENT                                                           |            |
|                                                                           |                 |            |                     |       |       |                         |    |    |                         |     |           |      |     | Brown, Silty Sand                                                            |            |
| 95                                                                        | 97.0            | 3.5        | 2                   | 0     | 1     |                         |    |    |                         |     |           | M    |     |                                                                              |            |
|                                                                           |                 |            |                     |       |       |                         |    |    |                         |     |           |      |     |                                                                              |            |
| 90                                                                        | 92.0            | 8.5        | 1                   | 0     | WOH   |                         |    |    |                         |     |           | Sat. |     | 93.0                                                                         | 7.5        |
|                                                                           |                 |            |                     |       |       |                         |    |    |                         |     |           |      |     | ALLUVIAL                                                                     |            |
|                                                                           |                 |            |                     |       |       |                         |    |    |                         |     |           |      |     | Brown and Tan, Silty Sand with Trace                                         |            |
|                                                                           |                 |            |                     |       |       |                         |    |    |                         |     |           |      |     | Rounded Gravel and Trace Wood Fragments                                      |            |
| 85                                                                        | 87.0            | 13.5       | 7                   | 3     | 5     |                         |    |    |                         |     |           | Sat. |     |                                                                              |            |
|                                                                           |                 |            |                     |       |       |                         |    |    |                         |     |           |      |     |                                                                              |            |
| 80                                                                        | 82.0            | 18.5       | 5                   | 6     | 6     |                         |    |    |                         |     |           | Sat. |     |                                                                              |            |
|                                                                           |                 |            |                     |       |       |                         |    |    |                         |     |           |      |     |                                                                              |            |
| 75                                                                        | 77.0            | 23.5       | 3                   | 4     | 3     |                         |    |    |                         |     |           | M    |     | 76.5                                                                         | 24.0       |
|                                                                           |                 |            |                     |       |       |                         |    |    |                         |     |           |      |     | COASTAL PLAIN                                                                |            |
|                                                                           |                 |            |                     |       |       |                         |    |    |                         |     |           |      |     | Gray, Silty Clay (Black Creek Formation)                                     |            |
| 70                                                                        | 72.0            | 28.5       | 5                   | 9     | 11    |                         |    |    |                         |     |           | M    |     |                                                                              |            |
|                                                                           |                 |            |                     |       |       |                         |    |    |                         |     |           |      |     |                                                                              |            |
| 65                                                                        | 67.0            | 33.5       | 11                  | 19    | 27    |                         |    |    |                         |     |           | M    |     | 69.0                                                                         | 31.5       |
|                                                                           |                 |            |                     |       |       |                         |    |    |                         |     |           |      |     | Gray, Clayey Sand (Black Creek Formation)                                    |            |
| 60                                                                        | 62.0            | 38.5       | 13                  | 17    | 26    |                         |    |    |                         |     |           | M    |     | 64.0                                                                         | 36.5       |
|                                                                           |                 |            |                     |       |       |                         |    |    |                         |     |           |      |     | Gray, Sandy Clay (Black Creek Formation)                                     |            |
| 55                                                                        | 57.0            | 43.5       | 7                   | 8     | 11    |                         |    |    |                         |     |           | M    |     |                                                                              |            |
|                                                                           |                 |            |                     |       |       |                         |    |    |                         |     |           |      |     |                                                                              |            |
| 50                                                                        | 52.0            | 48.5       | 10                  | 17    | 21    |                         |    |    |                         |     |           | M    |     |                                                                              |            |
|                                                                           |                 |            |                     |       |       |                         |    |    |                         |     |           |      |     |                                                                              |            |
| 45                                                                        | 47.0            | 53.5       | 8                   | 14    | 17    |                         |    |    |                         |     |           | M    |     |                                                                              |            |
|                                                                           |                 |            |                     |       |       |                         |    |    |                         |     |           |      |     |                                                                              |            |
| 40                                                                        | 42.0            | 58.5       | 11                  | 17    | 18    |                         |    |    |                         |     |           | M    |     | 44.0                                                                         | 56.5       |
|                                                                           |                 |            |                     |       |       |                         |    |    |                         |     |           |      |     | Gray and Brown, Silty Clay (Black Creek Formation)                           |            |
|                                                                           |                 |            |                     |       |       |                         |    |    |                         |     |           |      |     |                                                                              |            |
|                                                                           | 37.0            | 63.5       | 11                  | 14    | 17    |                         |    |    |                         |     |           | M    |     | 35.5                                                                         | 65.0       |
|                                                                           |                 |            |                     |       |       |                         |    |    |                         |     |           |      |     | Boring Terminated at Elevation 35.5 ft in Silty Clay (Black Creek Formation) |            |
|                                                                           |                 |            |                     |       |       |                         |    |    |                         |     |           |      |     | Elevation is based on the assumed elevation of BL-2.                         |            |

NCDOT BORE SINGLE B5691 GEO\_BRDG0052\_BH.GPJ NC\_DOT.GDT 3/22/16

# GEOTECHNICAL BORING REPORT

## BORE LOG

SHEET 5

|                                                                           |                 |            |                     |       |       |                         |    |    |                           |     |           |            |                                                                              |            |
|---------------------------------------------------------------------------|-----------------|------------|---------------------|-------|-------|-------------------------|----|----|---------------------------|-----|-----------|------------|------------------------------------------------------------------------------|------------|
| WBS 45645.1.1                                                             |                 |            | TIP B-5691          |       |       | COUNTY CUMBERLAND       |    |    | GEOLOGIST N. Mohs, LG     |     |           |            |                                                                              |            |
| SITE DESCRIPTION Bridge No. 52 on SR 1006 (Maxwell Road) over South River |                 |            |                     |       |       |                         |    |    | GROUND WTR (ft)           |     |           |            |                                                                              |            |
| BORING NO. B1-B                                                           |                 |            | STATION N/A         |       |       | OFFSET N/A              |    |    | ALIGNMENT N/A             |     |           | 0 HR. N/A  |                                                                              |            |
| COLLAR ELEV. 86.0 ft                                                      |                 |            | TOTAL DEPTH 59.9 ft |       |       | NORTHING 486,135        |    |    | EASTING 2,098,064         |     |           | 24 HR. N/A |                                                                              |            |
| DRILL RIG/HAMMER EFF./DATE TRI8016 MOBILE B-57 90% 02/20/2015             |                 |            |                     |       |       | DRILL METHOD Mud Rotary |    |    | HAMMER TYPE Automatic     |     |           |            |                                                                              |            |
| DRILLER E. Estep                                                          |                 |            | START DATE 03/07/16 |       |       | COMP. DATE 03/07/16     |    |    | SURFACE WATER DEPTH 4.9ft |     |           |            |                                                                              |            |
| ELEV (ft)                                                                 | DRIVE ELEV (ft) | DEPTH (ft) | BLOW COUNT          |       |       | BLOWS PER FOOT          |    |    |                           |     | SAMP. NO. | LOG        | SOIL AND ROCK DESCRIPTION                                                    |            |
|                                                                           |                 |            | 0.5ft               | 0.5ft | 0.5ft | 0                       | 25 | 50 | 75                        | 100 |           | MOI        | ELEV. (ft)                                                                   | DEPTH (ft) |
| 90                                                                        |                 |            |                     |       |       |                         |    |    |                           |     |           |            |                                                                              |            |
|                                                                           |                 |            |                     |       |       |                         |    |    |                           |     |           |            |                                                                              |            |
|                                                                           | 86.0            | 0.0        |                     |       |       |                         |    |    |                           |     |           |            |                                                                              |            |
| 85                                                                        |                 |            | WOR                 | 6     | 1     |                         |    |    |                           |     |           |            | 86.0                                                                         | 0.0        |
|                                                                           | 84.0            | 2.0        |                     |       |       |                         |    |    |                           |     |           |            |                                                                              |            |
|                                                                           |                 |            | 1                   | 1     | WOH   |                         |    |    |                           |     |           |            |                                                                              |            |
| 80                                                                        |                 |            |                     |       |       |                         |    |    |                           |     |           |            |                                                                              |            |
|                                                                           | 77.6            | 8.4        |                     |       |       |                         |    |    |                           |     |           |            |                                                                              |            |
| 75                                                                        |                 |            | 4                   | 2     | 6     |                         |    |    |                           |     |           |            | 75.0                                                                         | 11.0       |
|                                                                           | 72.6            | 13.4       |                     |       |       |                         |    |    |                           |     |           |            |                                                                              |            |
| 70                                                                        |                 |            | 3                   | 6     | 9     |                         |    |    |                           |     |           |            |                                                                              |            |
|                                                                           | 67.6            | 18.4       |                     |       |       |                         |    |    |                           |     |           |            | 69.5                                                                         | 16.5       |
| 65                                                                        |                 |            | 8                   | 16    | 21    |                         |    |    |                           |     |           |            |                                                                              |            |
|                                                                           | 62.6            | 23.4       |                     |       |       |                         |    |    |                           |     |           |            | 64.5                                                                         | 21.5       |
| 60                                                                        |                 |            | 9                   | 12    | 15    |                         |    |    |                           |     |           |            |                                                                              |            |
|                                                                           | 57.6            | 28.4       |                     |       |       |                         |    |    |                           |     |           |            | 60.0                                                                         | 26.0       |
| 55                                                                        |                 |            | 7                   | 9     | 13    |                         |    |    |                           |     |           |            |                                                                              |            |
|                                                                           | 52.6            | 33.4       |                     |       |       |                         |    |    |                           |     |           |            |                                                                              |            |
| 50                                                                        |                 |            | 12                  | 16    | 26    |                         |    |    |                           |     |           |            | 49.5                                                                         | 36.5       |
|                                                                           | 47.6            | 38.4       |                     |       |       |                         |    |    |                           |     |           |            |                                                                              |            |
| 45                                                                        |                 |            | 9                   | 17    | 26    |                         |    |    |                           |     |           |            |                                                                              |            |
|                                                                           | 42.6            | 43.4       |                     |       |       |                         |    |    |                           |     |           |            |                                                                              |            |
| 40                                                                        |                 |            | 9                   | 14    | 17    |                         |    |    |                           |     |           |            |                                                                              |            |
|                                                                           | 37.6            | 48.4       |                     |       |       |                         |    |    |                           |     |           |            |                                                                              |            |
| 35                                                                        |                 |            | 16                  | 18    | 29    |                         |    |    |                           |     |           |            | 34.5                                                                         | 51.5       |
|                                                                           | 32.6            | 53.4       |                     |       |       |                         |    |    |                           |     |           |            |                                                                              |            |
| 30                                                                        |                 |            | 12                  | 19    | 24    |                         |    |    |                           |     |           |            |                                                                              |            |
|                                                                           | 27.6            | 58.4       |                     |       |       |                         |    |    |                           |     |           |            |                                                                              |            |
|                                                                           |                 |            | 11                  | 17    | 22    |                         |    |    |                           |     |           |            | 26.1                                                                         | 59.9       |
|                                                                           |                 |            |                     |       |       |                         |    |    |                           |     |           |            | Boring Terminated at Elevation 26.1 ft in Sandy Clay (Black Creek Formation) |            |
|                                                                           |                 |            |                     |       |       |                         |    |    |                           |     |           |            | Elevation is based on the assumed elevation of BL-2.                         |            |

NCDOT BORE SINGLE B5691\_GEO\_BRDG0052\_BH.GPJ NC\_DOT.GDT 3/22/16

## SHEET 6

NC DOT BORE SINGLE B5691 GEO BRDG0052 BH.GPJ NC\_DOT.GDT 3/22/16