REFERENCE: W-5518

PROJECT: 43741.1.FS1

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215007

**SHEET NO.:** **CONTENTS:**



# *STATE OF NORTH CAROLINA*

## *DEPARTMENT OF TRANSPORTATION*
## *DIVISION OF HIGHWAYS*
## *GEOTECHNICAL ENGINEERING UNIT*

# *STRUCTURE SUBSURFACE INVESTIGATION*

COUNTY: COLUMBUS

PROJECT DESCRIPTION: CONSTRUCT OVERPASS OF SR 1574 (OLD US 74) OVER US 74

SITE DESCRIPTION: BRIDGE NO. 412 ON SR 1574 (OLD US 74) OVER US 74 AT -L- STATION 24+06.36

| STATE | STATE PROJECT REFERENCE NO. | SHEET NO. | TOTAL SHEETS |
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| N.C. | W-5518 (43741.1.FS1) | 01 | 13 |

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**PERSONNEL:**

| | |
|---|---|
| | Jacob C. Wessell, PE |
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| **INVESTIGATED BY:** | CATLIN ENGINEERS AND SCIENTISTS |
| **DRAWN BY:** | Steven V. Hudson, L.G., CWC |
| **CHECKED BY:** | Steven V. Hudson, L.G., CWC |
| **SUBMITTED BY:** | Steven V. Hudson, L.G., CWC |
| **DATE:** | APRIL 2015 |

NORTH CAROLINA LICENSED SEAL 1583 GEOLOGIST Steven V. Hudson

DocuSigned by:
Steven V. Hudson 5/27/2015
82ED8881E445F... SIGNATURE DATE

| PROJECT REFERENCE NO. | SHEET NO. |
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*NORTH CAROLINA DEPARTMENT OF TRANSPORTATION*
*DIVISION OF HIGHWAYS*
*GEOTECHNICAL ENGINEERING UNIT*

# *SUBSURFACE INVESTIGATION*

## *SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS*

## SOIL DESCRIPTION

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*

## SOIL LEGEND AND AASHTO CLASSIFICATION

| GENERAL CLASS. | GRANULAR MATERIALS (≤ 35% PASSING #200) | | | | | | | SILT-CLAY MATERIALS (> 35% PASSING #200) | | | | ORGANIC MATERIALS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUP CLASS. | A-1 | | A-3 | A-2 | | | | A-4 | A-5 | A-6 | A-7 | A-1, A-2<br>A-3 | A-4, A-5<br>A-6, A-7 | |
| | A-1-a | A-1-b | | A-2-4 | A-2-5 | A-2-6 | A-2-7 | | | | A-7-5,<br>A-7-6 | | | |
| SYMBOL | | | | | | | | | | | | | | |
| % PASSING<br>#10<br>#40<br>#200 | 50 MX<br>30 MX<br>15 MX | | 50 MX<br>25 MX | 51 MN<br>10 MX | 35 MX | 35 MX | 35 MX | 35 MX | 36 MN | 36 MN | 36 MN | 36 MN | GRANULAR SOILS | SILT-CLAY SOILS | MUCK, PEAT |
| MATERIAL PASSING #40<br>LL<br>PI | 6 MX | | NP | 40 MX<br>10 MX | 41 MN<br>10 MX | 40 MX<br>11 MN | 41 MN<br>11 MN | 40 MX<br>10 MX | 41 MN<br>10 MX | 40 MX<br>11 MN | 41 MN<br>11 MN | SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER | | HIGHLY ORGANIC SOILS |
| GROUP INDEX | 0 | | 0 | 0 | | 4 MX | | 8 MX | 12 MX | 16 MX | NO MX | | | |
| USUAL TYPES OF MAJOR MATERIALS | STONE FRAGS. GRAVEL, AND SAND | | FINE SAND | SILTY OR CLAYEY GRAVEL AND SAND | | | | SILTY SOILS | | CLAYEY SOILS | | | | |
| GEN. RATING AS SUBGRADE | EXCELLENT TO GOOD | | | | | | | FAIR TO POOR | | | | FAIR TO POOR | POOR | UNSUITABLE |

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

## CONSISTENCY OR DENSENESS

| PRIMARY SOIL TYPE | COMPACTNESS OR CONSISTENCY | RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE) | RANGE OF UNCONFINED COMPRESSIVE STRENGTH ($TONS/FT^2$) |
|---|---|---|---|
| GENERALLY GRANULAR MATERIAL (NON-COHESIVE) | VERY LOOSE | < 4 | |
| | LOOSE | 4 TO 10 | |
| | MEDIUM DENSE | 10 TO 30 | N/A |
| | DENSE | 30 TO 50 | |
| | VERY DENSE | > 50 | |
| GENERALLY SILT-CLAY MATERIAL (COHESIVE) | VERY SOFT | < 2 | < 0.25 |
| | SOFT | 2 TO 4 | 0.25 TO 0.5 |
| | MEDIUM STIFF | 4 TO 8 | 0.5 TO 1.0 |
| | STIFF | 8 TO 15 | 1 TO 2 |
| | VERY STIFF | 15 TO 30 | 2 TO 4 |
| | HARD | > 30 | > 4 |

## TEXTURE OR GRAIN SIZE

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

| BOULDER (BLDR.) | COBBLE (COB.) | GRAVEL (GR.) | COARSE SAND (CSE. SD.) | FINE SAND (F SD.) | SILT (SL.) | CLAY (CL.) |
|---|---|---|---|---|---|---|

| GRAIN SIZE | MM | 305 | 75 | 2.0 | 0.25 | 0.05 | 0.005 |
|---|---|---|---|---|---|---|---|
| | IN. | 12 | 3 | | | | |

## SOIL MOISTURE - CORRELATION OF TERMS

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

## PLASTICITY

| | PLASTICITY INDEX (PI) | DRY STRENGTH |
|---|---|---|
| NON PLASTIC | 0-5 | VERY LOW |
| SLIGHTLY PLASTIC | 6-15 | SLIGHT |
| MODERATELY PLASTIC | 16-25 | MEDIUM |
| HIGHLY PLASTIC | 26 OR MORE | HIGH |

## COLOR

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

## GRADATION

WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.
UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES 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 WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.

## COMPRESSIBILITY

| | |
|---|---|
| SLIGHTLY COMPRESSIBLE | LL < 31 |
| MODERATELY COMPRESSIBLE | LL = 31 - 50 |
| HIGHLY COMPRESSIBLE | LL > 50 |

## PERCENTAGE OF MATERIAL

| ORGANIC MATERIAL | GRANULAR SOILS | SILT - CLAY SOILS | OTHER MATERIAL | |
|---|---|---|---|---|
| TRACE OF ORGANIC MATTER | 2 - 3% | 3 - 5% | TRACE | 1 - 10% |
| LITTLE ORGANIC MATTER | 3 - 5% | 5 - 12% | LITTLE | 10 - 20% |
| MODERATELY ORGANIC | 5 - 10% | 12 - 20% | SOME | 20 - 35% |
| HIGHLY ORGANIC | > 10% | > 20% | HIGHLY | 35% AND ABOVE |

## GROUND WATER

- WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING
- STATIC WATER LEVEL AFTER 24 HOURS
- PW — 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
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 — DIP & DIP DIRECTION OF ROCK STRUCTURES
- SPT, CPT, DMT, VST, PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING WITH CORE
- SPT N-VALUE

## RECOMMENDATION SYMBOLS

- UNDERCUT EXCAVATION
- SHALLOW UNDERCUT
- UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE
- UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK
- UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL

## ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED, FRACTURES
FRAGS. - FRAGMENTS
HI. - HIGHLY
MED. - MEDIUM
MICA. - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
$w$ - MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
$\gamma$ - UNIT WEIGHT
$\gamma_d$ - 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:
- [ ] CME-45C
- [ ] CME-55
- [X] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [X] CME-45B
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [ ] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [ ] CASING [ ] W/ ADVANCER
- [X] TRICONE 2 7/8 " STEEL TEETH
- [ ] TRICONE _____ " TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B _____ [ ] -H _____
- [ ] -N _____

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [ ] HAND AUGER
- [ ] SOUNDING ROD
- [ ] VANE SHEAR TEST
- [ ] _____

## 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 YEILD 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 SLI.) | 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 (SLI.) | ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. |
| MODERATE (MOD.) | SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK. |
| MODERATELY SEVERE (MOD. SEV.) | ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL* |
| SEVERE (SEV.) | ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF* |
| 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. *IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF* |
| COMPLETE | ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE. |

## ROCK HARDNESS

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

## 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

ALLUVIUM (ALLUV.) - 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, SUCH 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 PLANAR 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.

FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.

FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.

FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.

FORMATION (FM.) - 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 (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.

STRATA CORE RECOVERY (SREC.) - 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: SURVEY CONDUCTED WITH TRIMBLE 5800 GPS AND TRIMBLE TSC2 DATA COLLECTOR.

ELEVATION: _____ FEET

NOTES:

Coordinate System = North Carolina State Plane 1983
Project Datum = North American Datum 1983 (Conus)
Zone = North Carolina 3200
Geoid Model = GEOID03 (Conus)
Vertical Datum = NGVD88
All Units = US Feet

DATE: 8-15-14

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| W-5518 (43741.1.FS2) | 03 |

# SITE PLAN

0 50 100
FEET

22+00
24+00
26+00
ANDREW JACKSON HWY
TO LUMBERTON
TO WHITEVILLE
OLD US 74
BRIDGE I.D. &
WORK POINT 2
STA. 24+06.36 -L- POT =
STA. 24+54.05 -Y- POT
BEGIN BRIDGE
-L- STA. 22+98.27
BEGIN APPROACH SLAB
-L- STA. 22+74.41
END BRIDGE
-L- STA. 25+14.46
END APPROACH SLAB
-L- STA. 25+38.32
EB1-A
B1-A
EB2-A
EB1-B
B1-B
EB2-B
-L-
CONC.
118°-41'-15"
(TYP.)
WORK POINT 1
STA. 22+98.27 -L-
WORK POINT 3
STA. 25+14.46 -L-
18" RCP
15" RCP
14" SOIL
SOIL
F
T FO
W
BM#81
BL STA 16+38
177' RIGHT
ELEV 107.89
-L- 21+16.49
162.22' RT
-L- POT Sta. 24+06.36 =
-Y- POT Sta. 24+54.05
25

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# PROFILE
# CENTERLINE -L-

20 0 10 20
FEET
VE = 1.0

| PROJECT REFERENCE NO. | SHEET |
|---|---|
| W-5518 (43741.1.FS1) | 04 |

BRIDGE NO. 412 ON SR 1574 (OLD US 74) OVER US 74 AT -L- STATION 24+06.36

**EB1-A**
**23+20**
**39ft LT**

EB1_WORKPOINT
22+98
CL

**B1-A**
**24+25**
**34ft LT**

B1_WORKPOINT
24+06
CL

EB2_WORKPOINT
25+14
CL

**EB2-A**
**25+35**
**41ft LT**

SS-18
SS-19
SS-20
SS-22
SS-21
SS-23

EXISTING LAND SURFACE

ROADWAY EMBANKMENT. ORANGE GRAY, SOFT TO STIFF, F. SANDY SILT, MOIST TO WET, AND BROWN, LOOSE TO MED. DENSE, SILTY, F. SAND, MOIST.

03/15

UNDIVIDED COASTAL PLAIN
TAN AND ORANGE GRAY, CLAY, SILTY TO SANDY CLAY, TO CLAYEY SILT.
DRY TO SAT., MOD. TO HIGHLY PLASTIC. SOFT TO STIFF.

GRAY, SILTY TO CLAYEY SAND. SAT. V. LOOSE.

LENSE OF DARK BROWN, SAND W/LITTLE ORG. AT BASE OF STRATUM.

COASTAL PLAIN
TAN TO GRAY, FINE SAND. MOIST TO SAT. LOOSE TO DENSE.
DUPLIN FORMATION

TAN, CLAYEY SAND W/SILT. SAT. LOOSE.

GRAY, SILTY TO SANDY CLAY TO SANDY SILT. MOIST TO WET.
MOD. TO SLIGHTLY PLASTIC. V. SOFT TO MED. STIFF.

DARK GRAY, F. SAND TO SILTY/CLAYEY, F. SAND W/SOME LIMESTONE AND SHELL.
MOIST TO SAT. V. LOOSE TO MED. DENSE.

OLIVE GRAY, GRAY, AND DARK GRAY, F. SANDY CLAY W/SILT. HIGHLY PLASTIC.
MOIST, V. STIFF TO HARD.
PEEDEE FORMATION

GREEN GRAY TO GRAY, F. SAND TO CLAYEY, F. SAND.
SAT., V. DENSE.

GRAY, SILTY CLAY W/SAND.
WET. HIGHLY PLASTIC. V. STIFF.

GRAY TO OLIVE GRAY, CALCAREOUS SILTY CLAY W/MICA. MOIST,
HIGHLY PLASTIC. V. STIFF.

GROUNDLINE PROFILE AT CENTERLINE OF -L- GENERATED FROM DATA PROVIDED BY NCDOT GEU IN FILE "w5518_ls_tin.tin " DATED 1/14/2015.
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE.

140 120 100 80 60 40 20 0 -20 -40

22+60 23+00 24+00 25+00

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# CROSS SECTION
# END BENT 1
# SKEW = 118°41'15"

20 0 10 20
FEET
VE = 1.0

EB1-A
23+20
39ft LT

EB1
22+98
CL

EB1-B
22+71
52ft RT

SS-13
ST-02
ST-03
SS-14
O-02
SS-15
SS-16
SS-17

CONCRETE ISLAND
EXISTING LAND SURFACE
PAVEMENT
PAVEMENT

ROADWAY EMBANKMENT. BROWN TO ORANGE GRAY, SANDY SILT. DRY TO MOIST. SOFT TO STIFF.

03/15
03/15

UNDIVIDED COASTAL PLAIN
ORANGE GRAY, SILTY CLAY TO CLAY. MOD. TO HIGHLY PLASTIC.
MOIST. SOFT TO STIFF.

GRAY, SILTY TO CLAYEY SAND. MOIST TO SAT. V. LOOSE TO LOOSE.
LENSE OF DARK BROWN, SAND W/LITTLE ORG. AT BASE OF STRATUM.

COASTAL PLAIN
GRAY AND TAN TO DARK BROWN, FINE SAND. MOIST TO SAT. MED. DENSE.
DUPLIN FORMATION

GRAY, SILTY TO SANDY CLAY TO SANDY SILT. MOIST TO SAT.
MED. TO LOW PLAST. V. SOFT TO MED. STIFF.

GRAY TO DARK GRAY, F. SAND TO SILTY/CLAYEY, F. SAND
W/SOME LIMESTONE AND SHELL FRAGS.
SAT. LOOSE TO MED. DENSE.

DARK GRAY, OLIVE GRAY, AND GREEN GRAY, F. SANDY CLAY W/SILT.
HIGHLY PLASTIC. MOIST. V. STIFF TO HARD.
PEEDEE FORMATION

GREEN GRAY TO GRAY, F. SAND TO CLAYEY, F. SAND. SAT. V. DENSE.

GRAY, SILTY CLAY W/SAND.
SAT. HIGHLY PLASTIC. V. STIFF.

GROUNDLINE ALONG BENTS OF -L- GENERATED FROM DATA PROVIDED BY NCDOT GEU IN FILE "w5518_ls_tin.tin " DATED 1/14/2015.

60 40 20 ℄ 20 40 60

140 120 100 80 60 40 20 0 -20 -40

20 0 10 20
FEET
VE = 1.0

# CROSS SECTION
# BENT 1
# SKEW = 118°41'15"

| PROJECT REFERENCE NO. | SHEET |
|---|---|
| W-5518 (43741.1.FS1) | 05 |

BRIDGE NO. 412 ON SR 1574 (OLD US 74) OVER US 74 AT -L- STATION 24+06.36

B1-A
24+25
34ft LT

B1
24+06
CL

B1-B
23+79
49ft RT

EXISTING LAND SURFACE
PAVEMENT

ROADWAY EMBANKMENT.
BROWN TO ORANGE GRAY, CLAYEY SILT. DRY. STIFF TO V. STIFF.

03/15
03/15

GRAY, SILTY TO CLAYEY SAND. SAT. V. LOOSE.
LENSE OF DARK BROWN SAND W/LITTLE ORG.
AT BASE OF STRATUM.

UNDIVIDED COASTAL PLAIN
ORANGE GRAY, SILTY SANDY CLAY TO CLAY. MOD. TO HIGHLY PLASTIC.
MOIST TO SAT. SOFT TO MED. STIFF.

TAN, CLAYEY SAND W/SILT.
SAT. V. LOOSE.

COASTAL PLAIN
TAN, CSE. SAND. SAT. MED. DENSE TO DENSE.
DUPLIN FORMATION

GRAY, SILTY TO SANDY CLAY.
SAT. MOD. TO SLIGHTLY PLASTIC. V. SOFT.

DARK GRAY TO GRAY, F. SAND TO SILTY/CLAYEY, F. SAND W/SOME
LIMESTONE AND SHELL FRAGS. SAT. V. LOOSE TO LOOSE.

DARK GRAY, F. SANDY CLAY W/SILT. MOD. TO HIGHLY PLASTIC.
MOIST TO SAT. V. STIFF TO HARD.
PEEDEE FORMATION

GRAY TO DARK GRAY, F. TO CSE. SAND
TO CLAYEY, F. SAND. SAT.
DENSE TO V. DENSE.

GRAY, SANDY CLAY. HIGHLY PLASTIC.
SAT. V. STIFF.

GROUNDLINE ALONG BENTS OF -L- GENERATED FROM DATA PROVIDED BY NCDOT GEU IN FILE "w5518_ls_tin.tin " DATED 1/14/2015.

60 40 20 ℄ 20 40 60

140 120 100 80 60 40 20 0 -20 -40

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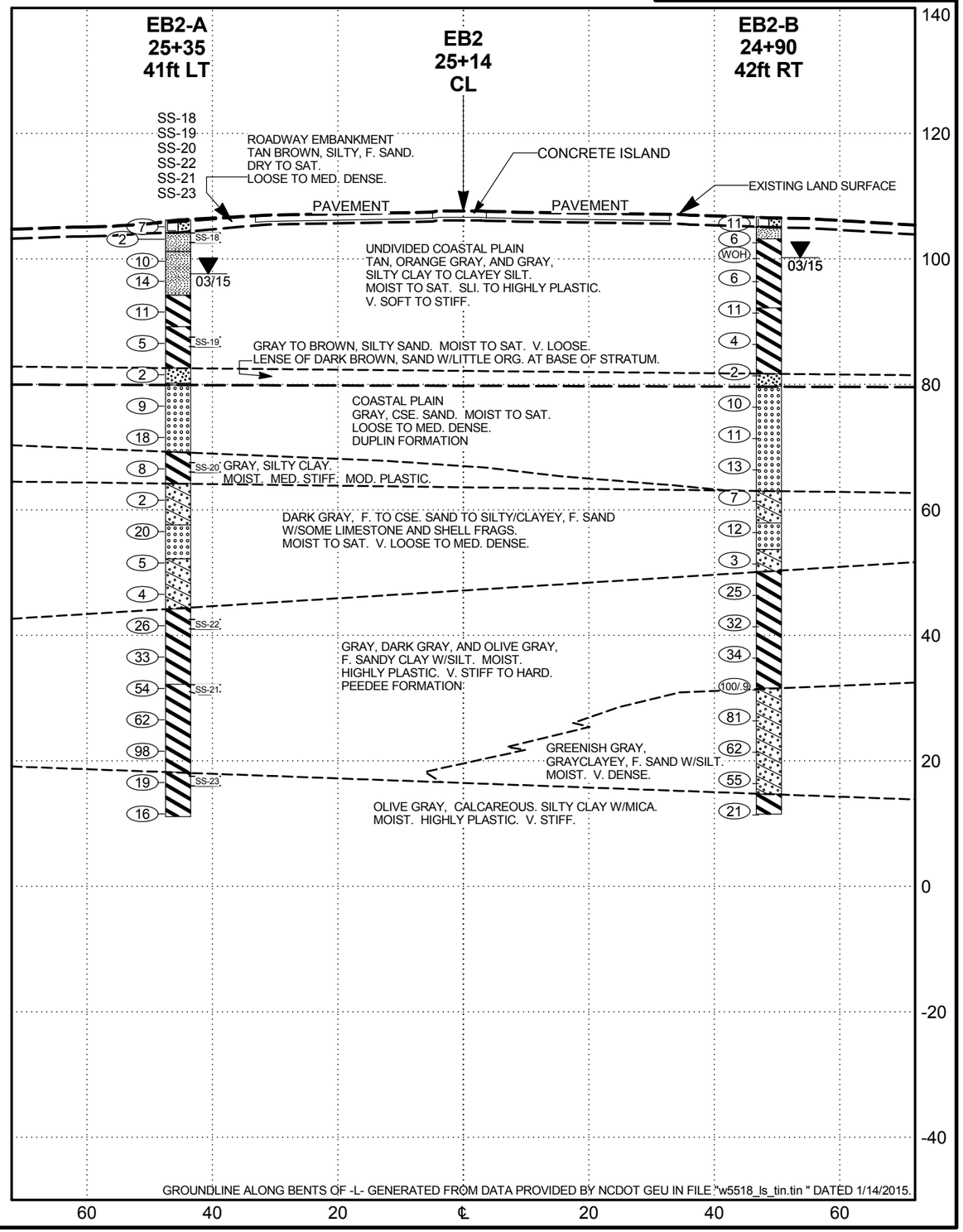
PAGE
INTENTIONALLY
BLANK

20 0 10 20
FEET
VE = 1.0

**CROSS SECTION**
**END BENT 2**
**SKEW = 118°41'15"**

| PROJECT REFERENCE NO. | SHEET |
|---|---|
| W-5518 (43741.1.FS1) | 06 |
| BRIDGE NO. 412 ON SR 1574 (OLD US 74) OVER US 74 AT -L- STATION 24+06.36 | |




GROUNDLINE ALONG BENTS OF -L- GENERATED FROM DATA PROVIDED BY NCDOT GEU IN FILE "w5518_ls_tin.tin " DATED 1/14/2015.

# NCDOT GEOTECHNICAL ENGINEERING UNIT
# BOREHOLE REPORT

CATLIN Engineers and Scientists
215007 220 Old Dairy Road Wilmington, NC 28405
Corporate Licensure No. for Engineering Services C-0585

| PROJECT REFERENCE NO. | SHEET |
|---|---|
| W-5518 (43741.1.FS1) | 07 |

| | | | |
|---|---|---|---|
| **WBS** 43741.1.FS1 | **TIP** W-5518 | **COUNTY** COLUMBUS | **GEOLOGIST** Shawn McGuire |
| **SITE DESCRIPTION** BRIDGE NO. 412 ON SR 1574 (OLD US 74) OVER US 74 AT -L- STATION 24+06.36 | | | **GROUND WTR (ft)** |
| **BORING NO.** EB1-A | **STATION** 23+20 | **OFFSET** 39ft LT | **ALIGNMENT** -L- / **0 HR.** 3.0 |
| **COLLAR ELEV.** 106.8 ft | **TOTAL DEPTH** 94.6 ft | **NORTHING** 231,447 | **EASTING** 2,039,203 / **24 HR.** 3.2 |
| **DRILL RIG/HAMMER EFF./DATE** CAT1303 CME-550 77.0% 01/27/2015 | | **DRILL METHOD** Mud Rotary | **HAMMER TYPE** Automatic |
| **DRILLER** William J. Miller | **START DATE** 03/10/15 | **COMP. DATE** 03/10/15 | **SURFACE WATER DEPTH** N/A |

| ELEV (ft) | DRIVE ELEV (ft) | DEPTH (ft) | BLOW COUNT 0.5ft | 0.5ft | 0.5ft | BLOWS PER FOOT 0 25 50 75 100 | SAMP. NO. | MOI | LOG | SOIL AND ROCK DESCRIPTION — ELEV. (ft) | DEPTH (ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 110 | | | | | | | | | | | |
| | 106.8 | 0.0 | | | | | | D | | 106.8 GROUND SURFACE | 0.0 |
| 105 | 105.3 | 1.5 | 4 | 4 | 7 | 11 11 | | D | | ROADWAY EMBANKMENT<br>Brown, Sandy SILT | |
| | 103.7 | 3.1 | 7 | 6 | 5 | | | D | | 102.8 | 4.0 |
| | | | 1 | 1 | 2 | 3 | | D | | UNDIVIDED COASTAL PLAIN<br>Orange gray, Silty CLAY. Mod. plastic. | |
| 100 | 98.7 | 8.1 | | | | | | | | | |
| | | | 1 | 5 | 8 | 13 | | M | | | |
| 95 | 93.7 | 13.1 | | | | | | | | | |
| | | | 2 | 3 | 4 | 7 | | M | | | |
| 90 | 88.7 | 18.1 | | | | | | | | 90.8 | 16.0 |
| | | | 2 | 2 | 3 | 5 | | M | | Orange gray, CLAY. Highly plastic. | |
| 85 | 83.7 | 23.1 | | | | | | | | | |
| | | | 1 | 2 | 2 | 4 | | Sat. | | | |
| 80 | 78.7 | 28.1 | | | | | | | | 82.8 | 24.0 |
| | | | 5 | 11 | 12 | 23 | | Sat. | | Gray, Clayey SAND.<br>Lense of dark brown SAND w/little org. at base of stratum. | |
| 75 | 73.7 | 33.1 | | | | | | | | 78.0 | 28.8 |
| | | | 9 | 8 | 11 | 19 | | Sat. | | 77.8 COASTAL PLAIN | 29.0 |
| 70 | 68.7 | 38.1 | | | | | | | | Brown, f. SAND w/dark brown leaching.<br>DUPLIN FORMATION | |
| | | | WOH | WOH | 1 | 1 | | Sat. | | 72.8 | 34.0 |
| 65 | 63.7 | 43.1 | | | | | | | | Gray, f. SAND | |
| | | | WOH | WOH | 1 | 1 | | Sat. | | 69.8 | 37.0 |
| 60 | 58.7 | 48.1 | | | | | | | | Gray, Silty CLAY. Mod. plastic. | |
| | | | 2 | 1 | 3 | 4 | | M | | 60.8 | 46.0 |
| 55 | 53.7 | 53.1 | | | | | | | | Gray, Sandy SILT | |
| | | | 4 | 4 | 6 | 10 | | Sat. | | 54.8 | 52.0 |
| 50 | 48.7 | 58.1 | | | | | | | | Gray, f. SAND w/few shells. Calcareous. | |
| | | | 4 | 4 | 5 | 9 | | Sat. | | 50.8 | 56.0 |
| 45 | 43.7 | 63.1 | | | | | | | | Gray, SAND w/Limestone frags.<br>(Sev. Weathered. Limestone) | |
| | | | 9 | 15 | 19 | 34 | | M | | 43.6 | 63.2 |
| 40 | 38.7 | 68.1 | | | | | | | | Dark gray, Silty, Sandy, CLAY w/laminations of clay, sand, and silt. Mod. plastic.<br>PEEDEE FORMATION | |
| | | | 13 | 15 | 19 | 34 | | M | | | |
| 35 | 33.7 | 73.1 | | | | | | | | 35.8 | 71.0 |
| | | | 11 | 20 | 37 | 57 | | M | | Olive gray, Clayey SILT w/mica | |
| 30 | | | | | | | | | | 30.3 | 76.5 |

| ELEV (ft) | DRIVE ELEV (ft) | DEPTH (ft) | BLOW COUNT 0.5ft | 0.5ft | 0.5ft | BLOWS PER FOOT 0 25 50 75 100 | SAMP. NO. | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 30 | | | | | | Match Line | | | | |
| | 28.7 | 78.1 | 8 | 10 | 10 | 20 | | | | Olive gray, Silty CLAY. Mod. plastic.<br>*(continued)* |
| 25 | 23.7 | 83.1 | 9 | 27 | 15 | 42 | | | | |
| 20 | 18.7 | 88.1 | 33 | 42 | 38 | 80 | | | | 18.8 88.0<br>Green gray, Clayey, f. SAND |
| 15 | 13.7 | 93.1 | 29 | 36 | 40 | 76 | | | | 12.2 94.6<br>Boring Terminated at Elevation 12.2 ft in Clayey, f. SAND.<br>PEEDEE FORMATION |

NCDOT BORE DOUBLE 215007_W5518_COLUMBUS-CO_CATLIN.GPJ CATLIN.GDT 04/17/15

# NCDOT GEOTECHNICAL ENGINEERING UNIT
# BORELOG REPORT

215007 CATLIN Engineers and Scientists
220 Old Dairy Road
Wilmington, NC 28405
Corporate Licensure No. for Engineering Services C-0585

| PROJECT REFERENCE NO. | SHEET |
|---|---|
| W-5518 (43741.1.FS1) | 08 |

| | | | |
|---|---|---|---|
| **WBS** 43741.1.FS1 | **TIP** W-5518 | **COUNTY** COLUMBUS | **GEOLOGIST** Shawn McGuire |
| **SITE DESCRIPTION** BRIDGE NO. 412 ON SR 1574 (OLD US 74) OVER US 74 AT -L- STATION 24+06.36 | | | **GROUND WTR (ft)** |
| **BORING NO.** EB1-B | **STATION** 22+71 | **OFFSET** 52ft RT | **ALIGNMENT** -L- | **0 HR.** 5.5 |
| **COLLAR ELEV.** 105.4 ft | **TOTAL DEPTH** 94.8 ft | **NORTHING** 231,408 | **EASTING** 2,039,299 | **24 HR.** FIAD |
| **DRILL RIG/HAMMER EFF./DATE** CAT1314 CME-45B 75.2% 01/27/2015 | | **DRILL METHOD** Mud Rotary | **HAMMER TYPE** Automatic |
| **DRILLER** D.T. Chalmers, Jr. | **START DATE** 03/04/15 | **COMP. DATE** 03/04/15 | **SURFACE WATER DEPTH** N/A |

| ELEV (ft) | DRIVE ELEV (ft) | DEPTH (ft) | BLOW COUNT 0.5ft | 0.5ft | 0.5ft | BLOWS PER FOOT 0 25 50 75 100 | SAMP. NO. | MOI | LOG | SOIL AND ROCK DESCRIPTION — ELEV. (ft) | DEPTH (ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 110 | | | | | | | | | | | |
| 105 | 105.4 | 0.0 | 1 | 2 | 2 | 4 | SS-13 | 20% | | 105.4 GROUND SURFACE | 0.0 |
| | 102.9 | 2.5 | 2 | 1 | 2 | 3 | | M | | ROADWAY EMBANKMENT<br>Orange gray, Sandy SILT w/Clay. Slightly plastic. | |
| 100 | 100.4 | 5.0 | 3 | 3 | 4 | 7 | | M | | 97.9 UNDIVIDED COASTAL PLAIN | 7.5 |
| | 97.1 | 8.3 | 2 | 4 | 4 | 8 | | M | | Orange gray, CLAY. Highly plastic.<br>(Swelling clay)<br>NOTE: Artesian conditions noted during drilling (overflow of mud pan) at elevation 87.4ft for approximately 3-4ft. | |
| 95 | 92.1 | 13.3 | 2 | 2 | 4 | 6 | | M | | | |
| 90 | 87.1 | 18.3 | 2 | 2 | 2 | 4 | SS-14 | 43% | | | |
| 85 | 82.1 | 23.3 | WOH | WOH | 1 | 1 | | M | | 81.4 | 24.0 |
| 80 | 77.1 | 28.3 | 5 | 7 | 13 | 20 | | M | | Gray, Clayey, f. SAND w/silt. Slightly plastic. Distinct lense of dark brown SAND w/little org. (Organic Content = 3.6%) at base of stratum. | |
| 75 | 72.1 | 33.3 | 5 | 8 | 12 | 20 | | M | | 76.9 | 28.5 |
| 70 | 67.1 | 38.3 | WOH | WOH | 6 | 6 | SS-15 | M | | 76.6 COASTAL PLAIN<br>Tan, cse. SAND w/dark brown org. leaching.<br>DUPLIN FORMATION | 28.8 |
| 65 | 62.1 | 43.3 | WOH | WOH | WOH | 0 | | M | | 67.0 Gray, Sandy CLAY w/Silt. Mod. plastic. | 38.4 |
| 60 | 57.1 | 48.3 | 2 | 2 | 3 | 5 | | Sat. | | 55.8 Dark gray, Silty, f. to cse. SAND. Sev. Weathered Limestone w/few shells. | 49.6 |
| 55 | 52.1 | 53.3 | 2 | 2 | 3 | 5 | SS-16 | Sat. | | | |
| 50 | 47.1 | 58.3 | 3 | 3 | 14 | 17 | | Sat. | | 46.1 Green gray, Silty CLAY w/f. Sand. Clay and sand laminations. Calcareous.<br>PEEDEE FORMATION | 59.3 |
| 45 | 42.1 | 63.3 | 10 | 16 | 26 | 42 | | M | | | |
| 40 | 37.1 | 68.3 | 10 | 14 | 18 | 32 | | M | | | |
| 35 | 32.1 | 73.3 | 8 | 9 | 13 | 22 | | M | | | |
| 30 | | | | | | | | | | | |

| ELEV (ft) | DRIVE ELEV (ft) | DEPTH (ft) | BLOW COUNT 0.5ft | 0.5ft | 0.5ft | BLOWS PER FOOT 0 25 50 75 100 | SAMP. NO. | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 30 | | | | | | Match Line | | | | |
| 25 | 27.1 | 78.3 | 7 | 8 | 12 | 20 | | M | | Green gray, Silty CLAY w/f. Sand. Clay and sand laminations. Calcareous.<br>PEEDEE FORMATION *(continued)* |
| 20 | 22.1 | 83.3 | 13 | 15 | 28 | 43 | | M | | 20.4 Gray, cse. SAND 85.0 |
| 15 | 17.1 | 88.3 | 23 | 34 | 31 | 65 | | Sat. | | 13.9 Gray, Silty CLAY w/Sand. HIghly plastic. 91.5 |
| | 12.1 | 93.3 | 10 | 12 | 13 | 25 | SS-17 | Sat. | | 10.7 Boring Terminated at Elevation 10.6 ft in Silty CLAY.<br>PEEDEE FORMATION 94.7 |

Other Samples:
ST-02 (1.5 - 4.0)
ST-03 (8.0 - 10.5)
O-02 (28.5 - 28.8)

# NCDOT GEOTECHNICAL ENGINEERING UNIT
# BOREHOLE REPORT

CATLIN Engineers and Scientists
215007 220 Old Dairy Road Wilmington, NC 28405
Corporate Licensure No. for Engineering Services C-0585

| PROJECT REFERENCE NO. | SHEET |
|---|---|
| W-5518 (43741.1.FS1) | 09 |

| | | | |
|---|---|---|---|
| **WBS** 43741.1.FS1 | **TIP** W-5518 | **COUNTY** COLUMBUS | **GEOLOGIST** Shawn McGuire |
| **SITE DESCRIPTION** BRIDGE NO. 412 ON SR 1574 (OLD US 74) OVER US 74 AT -L- STATION 24+06.36 | | | **GROUND WTR (ft)** |
| **BORING NO.** B1-A | **STATION** 24+25 | **OFFSET** 34ft LT | **ALIGNMENT** -L- **0 HR.** 0.3 |
| **COLLAR ELEV.** 107.1 ft | **TOTAL DEPTH** 94.5 ft | **NORTHING** 231,552 | **EASTING** 2,039,197 **24 HR.** 3.2 |
| **DRILL RIG/HAMMER EFF./DATE** CAT1303 CME-550 77.0% 01/27/2015 | | **DRILL METHOD** Mud Rotary | **HAMMER TYPE** Automatic |
| **DRILLER** William J. Miller | **START DATE** 03/11/15 | **COMP. DATE** 03/11/15 | **SURFACE WATER DEPTH** N/A |

| ELEV (ft) | DRIVE ELEV (ft) | DEPTH (ft) | BLOW COUNT 0.5ft | 0.5ft | 0.5ft | BLOWS PER FOOT 0 25 50 75 100 | SAMP. NO. | MOI | LOG | SOIL AND ROCK DESCRIPTION (ELEV. (ft) / DEPTH (ft)) |
|---|---|---|---|---|---|---|---|---|---|---|
| 110 | | | | | | | | | | |
| | 107.1 | 0.0 | 3 | 5 | 8 | 13 | | D | | 107.1 / 0.0 GROUND SURFACE |
| 105 | 105.1 | 2.0 | 8 | 6 | 7 | 13 | | D | | 106.6 / 0.5 ROADWAY EMBANKMENT<br>Brown, Silty, f. SAND w/gravel |
| | 102.1 | 5.0 | 3 | 1 | 2 | 3 | | D | | 103.1 / 4.0 ROADWAY EMBANKMENT<br>Orange gray, Clayey SILT. Slightly plastic.<br>UNDIVIDED COASTAL PLAIN<br>Orange gray, Clayey SILT. |
| 100 | 99.1 | 8.0 | 1 | 3 | 3 | 6 | | Sat. | | 97.1 / 10.0 |
| 95 | 94.1 | 13.0 | 1 | 2 | 2 | 4 | | M | | Orange gray, Silty, Sandy, CLAY. Mod. plastic. |
| 90 | 89.1 | 18.0 | 2 | 3 | 3 | 6 | | | | 89.1 / 18.0 Orange gray, CLAY. Highly plastic. |
| 85 | 84.1 | 23.0 | WOH | 2 | 2 | 4 | | | | 82.1 / 25.0 Gray, Clayey SAND w/silt.<br>Lense of dark brown SAND w/little org. at base of stratum. |
| 80 | 79.1 | 28.0 | 7 | 12 | 16 | 28 | | | | 79.1 / 28.0<br>79.0 / 28.1 COASTAL PLAIN<br>Tan, cse. SAND<br>DUPLIN FORMATION |
| 75 | 74.1 | 33.0 | 11 | 13 | 23 | 36 | | | | |
| 70 | 69.1 | 38.0 | 2 | 2 | 2 | 4 | | Sat. | | 70.1 / 37.0 Tan, Clayey SAND w/silt. Slightly to non plastic. |
| 65 | 64.1 | 43.0 | WOH | WOH | 1 | 1 | | Sat. | | 67.1 / 40.0 Gray, CLAY. Mod. plastic. |
| 60 | 59.1 | 48.0 | WOH | 1 | 1 | 2 | | Sat. | | 58.1 / 49.0 Dark gray, Clayey SAND w/silt |
| 55 | 54.1 | 53.0 | WOH | 1 | 1 | 2 | | Sat. | | |
| 50 | 49.1 | 58.0 | 2 | 4 | 5 | 9 | | Sat. | | 49.0 / 58.1 Gray, SAND w/Limestone and Shell frags.<br>(Sev. Weathered Sandy Limestone) |
| 45 | 44.1 | 63.0 | 9 | 10 | 14 | 24 | | M | | 45.1 / 62.0 Dark gray, Sandy CLAY w/Silt. Laminations of sand and clay. Mod. plastic.<br>PEEDEE FORMATION |
| 40 | 39.1 | 68.0 | 9 | 14 | 16 | 30 | | M | | |
| 35 | 34.1 | 73.0 | 6 | 16 | 15 | 31 | | M | | |
| 30 | | | | | | | | | | |


| | | | |
|---|---|---|---|
| **WBS** 43741.1.FS1 | **TIP** W-5518 | **COUNTY** COLUMBUS | **GEOLOGIST** Shawn McGuire |
| **SITE DESCRIPTION** BRIDGE NO. 412 ON SR 1574 (OLD US 74) OVER US 74 AT -L- STATION 24+06.36 | | | **GROUND WTR (ft)** |
| **BORING NO.** B1-A | **STATION** 24+25 | **OFFSET** 34ft LT | **ALIGNMENT** -L- **0 HR.** 0.3 |
| **COLLAR ELEV.** 107.1 ft | **TOTAL DEPTH** 94.5 ft | **NORTHING** 231,552 | **EASTING** 2,039,197 **24 HR.** 3.2 |
| **DRILL RIG/HAMMER EFF./DATE** CAT1303 CME-550 77.0% 01/27/2015 | | **DRILL METHOD** Mud Rotary | **HAMMER TYPE** Automatic |
| **DRILLER** William J. Miller | **START DATE** 03/11/15 | **COMP. DATE** 03/11/15 | **SURFACE WATER DEPTH** N/A |


| ELEV (ft) | DRIVE ELEV (ft) | DEPTH (ft) | BLOW COUNT 0.5ft | 0.5ft | 0.5ft | BLOWS PER FOOT 0 25 50 75 100 | SAMP. NO. | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 30 | | | | | | Match Line | | | | |
| | 29.1 | 78.0 | 9 | 14 | 13 | 27 | | M | | Dark gray, Sandy CLAY w/Silt. Laminations of sand and clay. Mod. plastic.<br>PEEDEE FORMATION *(continued)* |
| 25 | 24.1 | 83.0 | 10 | 20 | 60/.1 | 60/0.1 | | Sat. | | 23.6 / 83.5 Gray, cse. SAND |
| 20 | 19.1 | 88.0 | 18 | 33 | 39 | 72 | | Sat. | | 15.1 / 92.0 Gray, Sandy CLAY |
| 15 | 14.1 | 93.0 | 5 | 7 | 9 | 16 | | Sat. | | 12.6 / 94.5 Boring Terminated at Elevation 12.6 ft in Sandy CLAY.<br>PEEDEE FORMATION |

NCDOT BORE DOUBLE 215007_W5518_COLUMBUS CO_CATLIN.GPJ CATLIN.GDT 04/17/15

# NCDOT GEOTECHNICAL ENGINEERING UNIT
# BOREHOLE REPORT

CATLIN Engineers and Scientists
215007 220 Old Dairy Road Wilmington, NC 28405
Corporate Licensure No. for Engineering Services C-0585

| PROJECT REFERENCE NO. | SHEET |
|---|---|
| W-5518 (43741.1.FS1) | 10 |

| | | | |
|---|---|---|---|
| **WBS** 43741.1.FS1 | **TIP** W-5518 | **COUNTY** COLUMBUS | **GEOLOGIST** Shawn McGuire |
| **SITE DESCRIPTION** BRIDGE NO. 412 ON SR 1574 (OLD US 74) OVER US 74 AT -L- STATION 24+06.36 | | | **GROUND WTR (ft)** |
| **BORING NO.** B1-B | **STATION** 23+79 | **OFFSET** 49ft RT | **ALIGNMENT** -L- **0 HR.** 8.3 |
| **COLLAR ELEV.** 107.3 ft | **TOTAL DEPTH** 99.5 ft | **NORTHING** 231,515 | **EASTING** 2,039,285 **24 HR.** FIAD |
| **DRILL RIG/HAMMER EFF./DATE** CAT1303 CME-550 77.0% 01/27/2015 | | **DRILL METHOD** Mud Rotary | **HAMMER TYPE** Automatic |
| **DRILLER** William J. Miller | **START DATE** 03/12/15 | **COMP. DATE** 03/12/15 | **SURFACE WATER DEPTH** N/A |

| ELEV (ft) | DRIVE ELEV (ft) | DEPTH (ft) | BLOW COUNT 0.5ft | 0.5ft | 0.5ft | BLOWS PER FOOT 0 25 50 75 100 | SAMP. NO. | MOI | LOG | SOIL AND ROCK DESCRIPTION<br>ELEV. (ft) DEPTH (ft) |
|---|---|---|---|---|---|---|---|---|---|---|
| 110 | | | | | | | | | | |
| | 107.3 | 0.0 | 4 | 17 | 10 | 27 | | D | | 107.1 107.3 GROUND SURFACE 0.0 0.2 |
| 105 | 105.3 | 2.0 | 4 | 4 | 5 | 9 | | D | | 106.7 Surficial soil 0.6<br>ASPHALT<br>ROADWAY EMBANKMENT |
| | 102.3 | 5.0 | 2 | 2 | 2 | 4 | | Sat. | | 103.3 Brown, Clayey SILT w/tr. org. Slightly plastic. 4.0 |
| 100 | 99.3 | 8.0 | 2 | 4 | 4 | 8 | | Sat. | | UNDIVIDED COASTAL PLAIN<br>Orange gray, Silty CLAY. Mod. plastic. |
| 95 | 94.3 | 13.0 | WOH | 2 | 2 | 4 | | Sat. | | |
| 90 | 89.3 | 18.0 | 2 | 3 | 4 | 7 | | | | 91.3 16.0<br>Orange gray, CLAY. Highly plastic. |
| 85 | 84.3 | 23.0 | 2 | 3 | 2 | 5 | | | | |
| 80 | 79.3 | 28.0 | 1 | 4 | 6 | 10 | | | | 78.3 29.0<br>COASTAL PLAIN<br>Tan, cse. SAND<br>DUPLIN FORMATION |
| 75 | 74.3 | 33.0 | 11 | 14 | 15 | 29 | | | | |
| 70 | 69.3 | 38.0 | 7 | 8 | 9 | 17 | | Sat. | | |
| 65 | 64.3 | 43.0 | WOH | WOH | 1 | 1 | | Sat. | | 66.3 41.0<br>Gray, Silty CLAY. Mod. plastic. |
| 60 | 59.3 | 48.0 | WOH | 1 | 1 | 2 | | Sat. | | 61.3 46.0<br>Dark gray, Clayey, f. SAND |
| 55 | 54.3 | 53.0 | 1 | 1 | 1 | 2 | | Sat. | | |
| 50 | 49.3 | 58.0 | WOH | WOH | WOH | 0 | | Sat. | | |
| 45 | 44.3 | 63.0 | 8 | 13 | 16 | 29 | | Sat. | | 45.3 62.0<br>Dark gray, Sandy CLAY w/Silt. Laminations of sand and clay<br>PEEDEE FORMATION |
| 40 | 39.3 | 68.0 | 10 | 13 | 17 | 30 | | Sat. | | |
| 35 | 34.3 | 73.0 | 10 | 10 | 13 | 23 | | Sat. | | |
| 30 | | | | | | | | | | |

| | | | |
|---|---|---|---|
| **WBS** 43741.1.FS1 | **TIP** W-5518 | **COUNTY** COLUMBUS | **GEOLOGIST** Shawn McGuire |
| **SITE DESCRIPTION** BRIDGE NO. 412 ON SR 1574 (OLD US 74) OVER US 74 AT -L- STATION 24+06.36 | | | **GROUND WTR (ft)** |
| **BORING NO.** B1-B | **STATION** 23+79 | **OFFSET** 49ft RT | **ALIGNMENT** -L- **0 HR.** 8.3 |
| **COLLAR ELEV.** 107.3 ft | **TOTAL DEPTH** 99.5 ft | **NORTHING** 231,515 | **EASTING** 2,039,285 **24 HR.** FIAD |
| **DRILL RIG/HAMMER EFF./DATE** CAT1303 CME-550 77.0% 01/27/2015 | | **DRILL METHOD** Mud Rotary | **HAMMER TYPE** Automatic |
| **DRILLER** William J. Miller | **START DATE** 03/12/15 | **COMP. DATE** 03/12/15 | **SURFACE WATER DEPTH** N/A |

| ELEV (ft) | DRIVE ELEV (ft) | DEPTH (ft) | BLOW COUNT 0.5ft | 0.5ft | 0.5ft | BLOWS PER FOOT 0 25 50 75 100 | SAMP. NO. | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 30 | | | | | | Match Line | | | | |
| | 29.3 | 78.0 | 9 | 12 | 19 | 31 | | | | 28.8 78.5<br>Dark gray, Clayey SAND |
| 25 | 24.3 | 83.0 | 11 | 21 | 43 | 64 | | | | |
| 20 | 19.3 | 88.0 | 27 | 28 | 23 | 51 | | | | 15.3 92.0<br>Gray, cse. SAND |
| 15 | 14.3 | 93.0 | 35 | 42 | 31 | 73 | | | | 11.3 96.0<br>Gray, f. SAND w/tr. wood frags. |
| 10 | 9.3 | 98.0 | 8 | 14 | 20 | 34 | | | | 7.8 99.5<br>Boring Terminated at Elevation 7.8 ft in f. SAND w/tr. wood.<br>PEEDEE FORMATION |

# NCDOT GEOTECHNICAL ENGINEERING UNIT
# BOREHOLE REPORT

215007 — CATLIN Engineers and Scientists, 220 Old Dairy Road, Wilmington, NC 28405, Corporate Licensure No. for Engineering Services C-0585

| PROJECT REFERENCE NO. | SHEET |
|---|---|
| W-5518 (43741.1.FS1) | 11 |

| | | | |
|---|---|---|---|
| **WBS** 43741.1.FS1 | **TIP** W-5518 | **COUNTY** COLUMBUS | **GEOLOGIST** Shawn McGuire |
| **SITE DESCRIPTION** BRIDGE NO. 412 ON SR 1574 (OLD US 74) OVER US 74 AT -L- STATION 24+06.36 | | | **GROUND WTR (ft)** |
| **BORING NO.** EB2-A | **STATION** 25+35 | **OFFSET** 41ft LT | **ALIGNMENT** -L- — **0 HR.** 8.1 |
| **COLLAR ELEV.** 106.2 ft | **TOTAL DEPTH** 95.1 ft | **NORTHING** 231,661 | **EASTING** 2,039,179 — **24 HR.** 8.5 |
| **DRILL RIG/HAMMER EFF./DATE** CAT1314 CME-45B 75.2% 01/27/2015 | | **DRILL METHOD** Mud Rotary | **HAMMER TYPE** Automatic |
| **DRILLER** D.T. Chalmers, Jr. | **START DATE** 03/02/15 | **COMP. DATE** 03/02/15 | **SURFACE WATER DEPTH** N/A |

| ELEV (ft) | DRIVE ELEV (ft) | DEPTH (ft) | BLOW COUNT 0.5ft | 0.5ft | 0.5ft | BLOWS PER FOOT 0 25 50 75 100 | SAMP. NO. | MOI | LOG | SOIL AND ROCK DESCRIPTION — ELEV. (ft) | DEPTH (ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 110 | | | | | | | | | | | |
| | 106.2 | 0.0 | 4 | 4 | 3 | 7 | | Sat. | | 106.2 GROUND SURFACE | 0.0 |
| 105 | 104.2 | 2.0 | WOH | WOH | 2 | 2 | SS-18 | 27% | | ROADWAY EMBANKMENT<br>Brown, Silty SAND w/tr. org. 104.2 | 2.0 |
| | 100.7 | 5.5 | 3 | 5 | 5 | 10 | | M | | UNDIVIDED COASTAL PLAIN<br>Orange gray, Sandy SILT w/Clay 101.2 | 5.0 |
| 100 | 97.5 | 8.7 | 7 | 8 | 6 | 14 | | M | | Orange gray, Clayey SILT | |
| 95 | 92.6 | 13.6 | 3 | 5 | 6 | 11 | | M | | 94.2 | 12.0 |
| 90 | 87.6 | 18.6 | 2 | 2 | 3 | 5 | SS-19 | 38% | | Orange and tan, Silty CLAY. Mod. plastic. | |
| 85 | 82.6 | 23.6 | 2 | 1 | 1 | 2 | | M | | 89.2 | 17.0 |
| 80 | 77.6 | 28.6 | 1 | 3 | 6 | 9 | | M | | Gray w/red-brown mottling, CLAY. Highly plastic. | |
| 75 | 72.6 | 33.6 | 2 | 8 | 10 | 18 | | M | | 82.6 | 23.6 |
| 70 | 67.6 | 38.6 | 6 | 4 | 4 | 8 | SS-20 | 61% | | Gray, Silty, f. SAND.<br>Distinct lense of dark brown SAND w/little org. at base of stratum. 80.2 | 26.0 |
| 65 | 62.6 | 43.6 | WOH | WOH | 2 | 2 | | M | | 79.9 | 26.3 |
| 60 | 57.6 | 48.6 | 8 | 9 | 11 | 20 | | M | | COASTAL PLAIN<br>Gray, cse. SAND.<br>DUPLIN FORMATION | |
| 55 | 52.6 | 53.6 | 3 | 3 | 2 | 5 | | M | | 69.2 | 37.0 |
| 50 | 47.6 | 58.6 | 2 | 1 | 3 | 4 | | M | | Gray, CLAY. Mod. plastic. | |
| 45 | 42.6 | 63.6 | 8 | 11 | 15 | 26 | SS-22 | M | | 64.2 | 42.0 |
| 40 | 37.6 | 68.6 | 14 | 14 | 19 | 33 | | M | | Dark gray, Clayey SAND | |
| 35 | 32.6 | 73.6 | 15 | 29 | 25 | 54 | SS-21 | M | | 57.6 | 48.6 |
| 30 | | | | | | | | | | Dark gray, SAND | |
| | | | | | | | | | | 52.2 | 54.0 |
| | | | | | | | | | | Dark gray, Clayey SAND w/Silt. Laminations of silt and clay | |
| | | | | | | | | | | 44.2 | 62.0 |
| | | | | | | | | | | Gray, f. Sandy CLAY w/little Silt and tr. cse. Highly plastic.<br>PEEDEE FORMATION | |
| | | | | | | | | | | 32.2 | 74.0 |
| | | | | | | | | | | Olive gray, S.A.A. w/0.1'-0.2' thick laminations of sand/silt | |

| | | | |
|---|---|---|---|
| **WBS** 43741.1.FS1 | **TIP** W-5518 | **COUNTY** COLUMBUS | **GEOLOGIST** Shawn McGuire |
| **SITE DESCRIPTION** BRIDGE NO. 412 ON SR 1574 (OLD US 74) OVER US 74 AT -L- STATION 24+06.36 | | | **GROUND WTR (ft)** |
| **BORING NO.** EB2-A | **STATION** 25+35 | **OFFSET** 41ft LT | **ALIGNMENT** -L- — **0 HR.** 8.1 |
| **COLLAR ELEV.** 106.2 ft | **TOTAL DEPTH** 95.1 ft | **NORTHING** 231,661 | **EASTING** 2,039,179 — **24 HR.** 8.5 |
| **DRILL RIG/HAMMER EFF./DATE** CAT1314 CME-45B 75.2% 01/27/2015 | | **DRILL METHOD** Mud Rotary | **HAMMER TYPE** Automatic |
| **DRILLER** D.T. Chalmers, Jr. | **START DATE** 03/02/15 | **COMP. DATE** 03/02/15 | **SURFACE WATER DEPTH** N/A |

| ELEV (ft) | DRIVE ELEV (ft) | DEPTH (ft) | BLOW COUNT 0.5ft | 0.5ft | 0.5ft | BLOWS PER FOOT 0 25 50 75 100 | SAMP. NO. | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 30 | | | | | | Match Line | | | | Olive gray, S.A.A. w/0.1'-0.2' thick laminations of sand/silt *(continued)* |
| 25 | 27.6 | 78.6 | 18 | 27 | 35 | 62 | | M | | |
| 20 | 22.6 | 83.6 | 52 | 40 | 58 | 98 | | M | | 18.2 88.0 |
| 15 | 17.6 | 88.6 | 10 | 8 | 11 | 19 | SS-23 | M | | Olive gray, Silty CLAY w/mica and calc. Tr. f.-cse. sand. Highly plastic. |
| | 12.6 | 93.6 | 6 | 7 | 9 | 16 | | M | | 11.1 95.1 |
| | | | | | | | | | | Boring Terminated at Elevation 11.1 ft in calc. Silty CLAY.<br>PEEDEE FORMATION |

NCDOT BORE DOUBLE 215007_W5518_COLUMBUS.CO_CATLIN.GPJ CATLIN.GDT 04/17/15

# NCDOT GEOTECHNICAL ENGINEERING UNIT
# BOREHOLE REPORT

CATLIN Engineers and Scientists
215007 220 Old Dairy Road Wilmington, NC 28405
Corporate Licensure No. for Engineering Services C-0585

| PROJECT REFERENCE NO. | SHEET |
|---|---|
| W-5518 (43741.1.FS1) | 12 |

| | | | |
|---|---|---|---|
| **WBS** 43741.1.FS1 | **TIP** W-5518 | **COUNTY** COLUMBUS | **GEOLOGIST** Shawn McGuire |
| **SITE DESCRIPTION** BRIDGE NO. 412 ON SR 1574 (OLD US 74) OVER US 74 AT -L- STATION 24+06.36 | | | **GROUND WTR (ft)** |
| **BORING NO.** EB2-B | **STATION** 24+90 | **OFFSET** 42ft RT | **ALIGNMENT** -L- **0 HR.** 6.7 |
| **COLLAR ELEV.** 106.7 ft | **TOTAL DEPTH** 95.2 ft | **NORTHING** 231,625 | **EASTING** 2,039,266 **24 HR.** 6.5 |
| **DRILL RIG/HAMMER EFF./DATE** CAT1314 CME-45B 75.2% 01/27/2015 | | **DRILL METHOD** Mud Rotary | **HAMMER TYPE** Automatic |
| **DRILLER** D.T. Chalmers, Jr. | **START DATE** 03/03/15 | **COMP. DATE** 03/03/15 | **SURFACE WATER DEPTH** N/A |

| ELEV (ft) | DRIVE ELEV (ft) | DEPTH (ft) | BLOW COUNT 0.5ft | 0.5ft | 0.5ft | BLOWS PER FOOT 0 25 50 75 100 | SAMP. NO. | MOI | LOG | SOIL AND ROCK DESCRIPTION — ELEV. (ft) | DEPTH (ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 110 | | | | | | | | | | | |
| | 106.7 | 0.0 | 2 | 5 | 6 | 11 | | D | | 106.7 GROUND SURFACE | 0.0 |
| 105 | 104.2 | 2.5 | 3 | 3 | 3 | 6 | | D | | 105.2 ROADWAY EMBANKMENT<br>Tan, Silty SAND w/some root frags. | 1.5 |
| | 101.7 | 5.0 | WOH | WOH | WOH | 0 | | Sat. | | 103.2 UNDIVIDED COASTAL PLAIN<br>Orange gray, Clayey SILT<br>Orange gray, Silty CLAY. Mod. plastic. | 3.5 |
| 100 | 98.0 | 8.7 | 2 | 3 | 3 | 6 | | Sat. | | | |
| 95 | 93.0 | 13.7 | 4 | 6 | 5 | 11 | | Sat. | | 92.2 Orange gray, CLAY. Highly plastic. | 14.5 |
| 90 | 88.0 | 18.7 | 2 | 2 | 2 | 4 | | Sat. | | | |
| 85 | 83.0 | 23.7 | 1 | 1 | 1 | 2 | | Sat. | | 81.7 Brown, Silty SAND | 25.0 |
| 80 | 78.0 | 28.7 | 1 | 3 | 7 | 10 | | Sat. | | 79.7 COASTAL PLAIN<br>Gray, cse. SAND.<br>DUPLIN FORMATION | 27.0 |
| 75 | 73.0 | 33.7 | 3 | 5 | 6 | 11 | | Sat. | | | |
| 70 | 68.0 | 38.7 | 6 | 7 | 6 | 13 | | Sat. | | | |
| 65 | 63.0 | 43.7 | 4 | 3 | 4 | 7 | | Sat. | | 63.0 Dark gray, Clayey SAND | 43.7 |
| 60 | 58.0 | 48.7 | 3 | 5 | 7 | 12 | | Sat. | | 57.9 Dark gray, cse. SAND | 48.8 |
| 55 | 53.0 | 53.7 | 1 | 1 | 2 | 3 | | M | | 53.7 Dark gray, Clayey SAND w/Silt. Lenses of silt and clay | 53.0 |
| 50 | 48.0 | 58.7 | 7 | 12 | 13 | 25 | | M | | 50.2 Dark gray, Sandy CLAY w/silt. Laminations of sand and clay. Highly plastic.<br>PEEDEE FORMATION | 56.5 |
| 45 | 43.0 | 63.7 | 9 | 17 | 15 | 32 | | M | | | |
| 40 | 38.0 | 68.7 | 15 | 19 | 15 | 34 | | M | | | |
| 35 | 32.9 | 73.8 | 16 | 47 | 53/.4 | 100/0.9 | | M | | 31.6 | 75.1 |
| 30 | | | | | | | | | | | |



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|---|---|---|---|
| **WBS** 43741.1.FS1 | **TIP** W-5518 | **COUNTY** COLUMBUS | **GEOLOGIST** Shawn McGuire |
| **SITE DESCRIPTION** BRIDGE NO. 412 ON SR 1574 (OLD US 74) OVER US 74 AT -L- STATION 24+06.36 | | | **GROUND WTR (ft)** |
| **BORING NO.** EB2-B | **STATION** 24+90 | **OFFSET** 42ft RT | **ALIGNMENT** -L- **0 HR.** 6.7 |
| **COLLAR ELEV.** 106.7 ft | **TOTAL DEPTH** 95.2 ft | **NORTHING** 231,625 | **EASTING** 2,039,266 **24 HR.** 6.5 |
| **DRILL RIG/HAMMER EFF./DATE** CAT1314 CME-45B 75.2% 01/27/2015 | | **DRILL METHOD** Mud Rotary | **HAMMER TYPE** Automatic |
| **DRILLER** D.T. Chalmers, Jr. | **START DATE** 03/03/15 | **COMP. DATE** 03/03/15 | **SURFACE WATER DEPTH** N/A |



| ELEV (ft) | DRIVE ELEV (ft) | DEPTH (ft) | BLOW COUNT 0.5ft | 0.5ft | 0.5ft | BLOWS PER FOOT 0 25 50 75 100 | SAMP. NO. | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 30 | | | | | | Match Line | | | | |
| | 28.0 | 78.7 | 28 | 29 | 52 | 81 | | M | | Greenish gray, Clayey, f. SAND w/Silt and tr. glauconite *(continued)* |
| 25 | 23.0 | 83.7 | 17 | 24 | 38 | 62 | | M | | |
| 20 | 18.0 | 88.7 | 23 | 31 | 24 | 55 | | M | | 14.7 Olive gray, Silty CLAY, calcareous w/mica. Highly plastic. 92.0 |
| 15 | 13.0 | 93.7 | 8 | 9 | 12 | 21 | | M | | 11.5 Boring Terminated at Elevation 11.5 ft in calc. Silty CLAY.<br>PEEDEE FORMATION 95.2 |

NCDOT BORE DOUBLE 215007_W5518_COLUMBUS-CO_CATLIN.GPJ CATLIN.GDT 04/17/15

CATLIN Engineers and Scientists
220 Old Dairy Road
Wilmington, NC 28405
Corporate Licensure No. for Engineering Services C-0585
215007

| PROJECT REFERENCE NO. | SHEET |
|---|---|
| W-5518 (43741.1.FS1) | 13 |
| BRIDGE NO. 412 ON SR 1574 (OLD US 74) OVER US 74 AT -L- STATION 24+06.36 | |

# NCDOT LABORATORY SUMMARY SHEET

## AASHTO Standard Specifications

(As modified by NCDOT, Material and Tests Unit, 2004.)

### TEST RESULTS

| Field Sample Number | | **SS-13** | **SS-14** | **O-02** | **SS-15** | **SS-16** | **SS-17** | **SS-18** | **SS-19** | **SS-20** | **SS-22** | **SS-21** | **SS-23** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lab Sample Number | | SS-13 | SS-14 | O-02 | SS-15 | SS-16 | SS-17 | SS-18 | SS-19 | SS-20 | SS-22 | SS-21 | SS-23 | | | |
| Retained #4 Sieve | % | 0 | 0 | N/A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| Passing #10 Sieve | % | 100 | 98.4 | N/A | 100 | 99.8 | 99.7 | 100 | 100 | 100 | 98.3 | 100 | 100 | | | |
| Passing #40 Sieve | % | 99 | 100 | N/A | 97 | 97 | 97 | 99 | 100 | 92 | 95 | 97 | 98 | | | |
| Passing #200 Sieve | % | 56 | 93 | N/A | 89 | 18 | 94 | 61 | 91 | 84 | 65 | 75 | 89 | | | |
| **MINUS NUMBER 10 FRACTION** | | | | | | | | | | | | | | | | |
| **SOIL MORTAR - 100%** | | | | | | | | | | | | | | | | |
| Coarse Sand Ret.-#60 | % | 2.0 | 0.7 | N/A | 5.3 | 16.0 | 3.7 | 3.0 | 1.0 | 10.6 | 7.0 | 8.5 | 4.6 | | | |
| Fine Sand Ret.-#270 | % | 49.1 | 7.7 | N/A | 7.7 | 67.5 | 3.0 | 41.9 | 9.8 | 7.5 | 32.7 | 19.1 | 8.1 | | | |
| Silt 0.05 - 0.005mm | % | 24.7 | 48.1 | N/A | 64.5 | 6.1 | 28.7 | 22.8 | 32.5 | 42.6 | 16.7 | 15.3 | 27.6 | | | |
| Clay <0.005mm | % | 24.2 | 43.5 | N/A | 22.6 | 10.5 | 64.6 | 32.3 | 56.7 | 39.3 | 43.7 | 57.2 | 59.7 | | | |
| Liquid Limit | (LL) | 23 | 69 | N/A | 42 | 30 | 123 | 28 | 66 | 46 | 52 | 64 | 88 | | | |
| Plasticity Index | (PI) | 7 | 47 | N/A | 19 | NP | 86 | 9 | 45 | 17 | 28 | 38 | 56 | | | |
| Organic Content | % | N/A | N/A | **3.6** | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | | | |
| AASHTO Classification /Group Index | | **A-4(1)** | **A-7-6(49)** | N/A | **A-7-6(18)** | **A-2-4(0)** | **A-7-5(96)** | **A-4(3)** | **A-7-6(45)** | **A-7-6(16)** | **A-7-6(17)** | **A-7-6(30)** | **A-7-5(58)** | | | |
| Station | | 22+71 | 22+71 | 22+71 | 22+71 | 22+71 | 22+71 | 25+35 | 25+35 | 25+35 | 25+35 | 25+35 | 25+35 | | | |
| Offset | | 52ft RT | 52ft RT | 52ft RT | 52ft RT | 52ft RT | 52ft RT | 41ft LT | 41ft LT | 41ft LT | 41ft LT | 41ft LT | 41ft LT | | | |
| Alignment | | -L- | -L- | -L- | -L- | -L- | -L- | -L- | -L- | -L- | -L- | -L- | -L- | | | |
| Boring Identification | | **EB1-B** | **EB1-B** | **EB1-B** | **EB1-B** | **EB1-B** | **EB1-B** | **EB2-A** | **EB2-A** | **EB2-A** | **EB2-A** | **EB2-A** | **EB2-A** | | | |
| Depth (ft) | | 0.0 | 18.3 | 28.5 | 38.3 | 53.3 | 93.3 | 2.0 | 18.6 | 38.6 | 63.6 | 74.0 | 88.6 | | | |
| | to | 1.5 | 19.8 | 28.8 | 39.8 | 54.8 | 94.8 | 3.5 | 20.1 | 40.1 | 65.1 | 75.1 | 90.1 | | | |
| Field Moisture Content | | 20 | 43 | N/A | N/A | N/A | N/A | 27 | 38 | 61 | N/A | N/A | N/A | | | |
| Tested By | | MD Mason | MD Mason | MD Mason | MD Mason | MD Mason | MD Mason | MD Mason | MD Mason | MD Mason | MD Mason | MD Mason | MD Mason | | | |
| Submitted By | | S. McGuire | S. McGuire | S. McGuire | S. McGuire | S. McGuire | S. McGuire | S. McGuire | S. McGuire | S. McGuire | S. McGuire | S. McGuire | S. McGuire | | | |
| Date Submitted | | 03/09/15 | 03/09/15 | 03/09/15 | 03/09/15 | 03/09/15 | 03/09/15 | 03/09/15 | 03/09/15 | 03/09/15 | 03/09/15 | 03/09/15 | 03/09/15 | | | |

NP = Non-Plastic

MICHAEL D. MASON
Laboratory Manager

Report Date: 3/31/2015