PROJECT: 33480.1.1 ID: B-4127

| STATE | STATE PROJECT REFERENCE NO. | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|
| N.C. | 33480.1.1 | 1 | 29 |
| STATE PROJ. NO. | F.A. PROJ. NO. | DESCRIPTION | |
| B-4127 | BRZ-1438(5) | P.E. | |
| | | CONST. | |

**For Letting**

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

# STRUCTURE SUBSURFACE INVESTIGATION

STATE PROJECT 33480.1.1 I.D. NO. B-4127

F.A. NO. BRZ-1438(5)

COUNTY GREENE

PROJECT DESCRIPTION BRIDGE NO. 43 OVER RAINBOW CREEK ON SR 1438

SITE DESCRIPTION

CONTENTS:



## CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WAS MADE FOR THE PURPOSE OF STUDY, PLANNING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. 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 UNIT @ (919) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA IS PART OF THE CONTRACT.

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DRAWN BY: R.RAHIE

INVESTIGATED BY MACTEC ENGINEERING AND CONSULTING, INC.

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DATE 12/22/05

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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

| ID | PROJECT NO. | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|
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# SUBSURFACE INVESTIGATION

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

## SOIL DESCRIPTION

SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED OR WEATHERED EARTH MATERIALS WHICH CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND WHICH YIELDS LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM AND BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:

*VERY STIFF, 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, A-3 | A-4, A-5, 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, A-7-6 | | | |
| SYMBOL | | | | | | | | | | | | | | |
| % PASSING # 10 | 50 MX | | | | | | | | | | | | | |
| # 40 | 30 MX | 50 MX | 51 MN | | | | | | | | | | | |
| # 200 | 15 MX | 25 MX | 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 |
| LIQUID LIMIT | | | | 40 MX | 41 MN | 40 MX | 41 MN | 40 MX | 41 MN | 40 MX | 41 MN | SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER | | HIGHLY ORGANIC SOILS |
| PLASTIC INDEX | 6 MX | | N.P. | 10 MX | 10 MX | 11 MN | 11 MN | 10 MX | 10 MX | 11 MN | 11 MN | | | |
| 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 A SUBGRADE | EXCELLENT TO GOOD | | | | | | | FAIR TO POOR | | | | FAIR TO POOR | POOR | UNSUITABLE |

P.I. OF A-7-5 ≤L.L. - 30 : P.I. OF A-7-6 >L.L. - 30

## CONSISTENCY OR DENSENESS

| PRIMARY SOIL TYPE | COMPACTNESS OR CONSISTENCY | RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE) | RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT²) |
|---|---|---|---|
| GENERALLY GRANULAR MATERIAL (NON-COHESIVE) | VERY LOOSE | <4 | N/A |
| | LOOSE | 4 TO 10 | |
| | MEDIUM DENSE | 10 TO 30 | |
| | 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 |
| | 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 | 2.0 | 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 | - WET - (W) | SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE |
| PLASTIC RANGE (PI) | | |
| PL — PLASTIC LIMIT | - MOIST - (M) | SOLID; AT OR NEAR OPTIMUM MOISTURE |
| OM — OPTIMUM MOISTURE | | |
| SL — SHRINKAGE LIMIT | - DRY - (D) | REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE |

## PLASTICITY

| | PLASTICITY INDEX (PI) | DRY STRENGTH |
|---|---|---|
| NONPLASTIC | 0-5 | VERY LOW |
| LOW PLASTICITY | 6-15 | SLIGHT |
| MED. PLASTICITY | 16-25 | MEDIUM |
| HIGH PLASTICITY | 26 OR MORE | HIGH |

## COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YEL-BRN, 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

UNIFORM- INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)

GAP-GRADED- INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.

## ANGULARITY OF GRAINS

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

## MINERALOGICAL COMPOSITION

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

## COMPRESSIBILITY

| | |
|---|---|
| SLIGHTLY COMPRESSIBLE | LIQUID LIMIT LESS THAN 30 |
| MODERATELY COMPRESSIBLE | LIQUID LIMIT 31-50 |
| HIGHLY COMPRESSIBLE | LIQUID LIMIT GREATER THAN 50 |

## PERCENTAGE OF MATERIAL

| ORGANIC MATERIAL | GRANULAR SOILS | SILT- CLAY SOILS |
|---|---|---|
| TRACE OF ORGANIC MATTER | 2 - 3% | 3 - 5% |
| LITTLE ORGANIC MATTER | 3 - 5% | 5 - 12% |
| MODERATELY ORGANIC | 5 - 10% | 12 - 20% |
| HIGHLY ORGANIC | >10% | >20% |

| OTHER MATERIAL | |
|---|---|
| TRACE | 1 - 10% |
| LITTLE | 10 - 20% |
| SOME | 20 - 35% |
| 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 SEEPAGE

## MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL OTHER THAN ROADWAY EMBANKMENTS
- INFERRED SOIL BOUNDARIES
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 — DIP/DIP DIRECTION OF ROCK STRUCTURES
- SOUNDING ROD
- SPT CPT DPT DMT VST PMT — TEST BORING
- AUGER BORING
- BULK SAMPLE LOCATION
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- SPT N-VALUE
- REF — SPT REFUSAL

SAMPLE DESIGNATIONS

S - BULK SAMPLE
SS - SPLIT SPOON SAMPLE
ST - SHELBY TUBE SAMPLE
RS - ROCK SAMPLE
RT - RECOMPACTED TRIAXIAL SAMPLE
CBR - CBR SAMPLE

## ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
C.I. - CAVE IN
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e -VOID RATIO
F. - FINE
FIAD - FILLED IMMEDIATELY AFTER DRILLING
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED
FRAGS. - FRAGMENTS
MED. - MEDIUM
PMT - PRESSUREMETER TEST
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
$\gamma$ - UNIT WEIGHT
$\gamma_d$ - DRY UNIT WEIGHT
V. - VERY
VST - VANE SHEAR TEST
W - MOISTURE CONTENT

## EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] MOBILE B- ___
- [ ] BK-51
- [ ] CME-45
- [ ] CME-550
- [ ] PORTABLE HOIST
- [X] OTHER CME-45C
- [X] OTHER D-50

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [ ] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [ ] W/ ADVANCER
- [X] TRICONE 3" STEEL TEETH
- [ ] TRICONE ____" TUNG.-CARB.
- [X] CORE BIT SERIES 2&6
- [ ] OTHER ____

HAMMER TYPE:
- [ ] AUTOMATIC [X] MANUAL

CORE SIZE:
- [ ] -B ____
- [ ] -N ____
- [X] -H Q

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

## ROCK DESCRIPTION

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

| | |
|---|---|
| WEATHERED ROCK (WR) | NON-COASTAL PLAIN MATERIAL THAT YIELDS SPT N VALUES > 100 BLOWS PER FOOT. |
| 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 ROCKS EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, YIELDS SPT N VALUES > 100 BPF* |
| VERY SEVERE (V. SEV.) | ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS SPT N VALUES < 100 BPF* |
| COMPLETE | ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE. |

## ROCK HARDNESS

| | |
|---|---|
| VERY HARD | CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGISTS 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 GEOLOGISTS 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 GEOLOGISTS 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 FEET |
| 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 THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.

| | |
|---|---|
| FRIABLE | RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. |
| MODERATELY INDURATED | GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. |
| INDURATED | GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. |
| EXTREMELY INDURATED | SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS. |

## TERMS AND DEFINITIONS

ALLUVIUM (ALLUV.) - SOILS WHICH HAVE BEEN TRANSPORTED BY WATER.

AQUIFER - A WATER BEARING FORMATION OR STRATA.

ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.

ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC.

ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IS IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.

CALCAREOUS (CALC.) - SOILS WHICH 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 (F.P.) - 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 SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

ROCK QUALITY DESIGNATION (R.Q.D.) - 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 WHICH 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, WHICH 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 B.P.F.) 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 LESS THAN 0.1 FOOT PENETRATION WITH 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 (S.R.Q.D.) - 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 (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK: NCDOT BASELINE REFERENCE POINT BL-3, ELEV. 31.02 ft MSL

NOTES:
Geotechnical Exploration
Performed By:

MACTEC
MACTEC ENGINEERING AND CONSULTING, INC.
3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604
(919) 876-0416

**Subject:** **Revised Geotechnical Report**

**Description:** **Bridge No. 43 over Rainbow Creek on SR 1438**
**Project Number: 33480.1.1**
**Tip Number: B-4127**
**F.A. Number: BRZ-1438(5)**
**MACTEC Project Number: 6468-05-1240**

## Project Information

The purpose of this investigation was to obtain geotechnical information for foundation design and construction of the proposed replacement bridge over Rainbow Creek on SR 1438, Greene County, North Carolina (Drawings 1 and 2). Our understanding of this project comes from a site visit by MACTEC personnel; conversations with NCDOT Geotechnical Engineering Unit personnel; and from documents and drawings provided by the Geotechnical Engineering Unit, including a Request for Proposal dated October 21, 2005, Bridge Survey and Hydraulic Design Report dated August 17, 2005, a boring log of a preliminary boring completed at the site by NCDOT, and electronic files of site plan drawings obtained via the NCDOT file transfer website.

The proposed structure is approximately 180 feet in length, 40 feet wide, and constructed at the approximate grade of the existing bridge. The proposed structure will consist of four spans (five bents), including two at 47.5 feet and two at 42.5 feet. The bents are skewed 90° to the alignment (-L-).

## Field Testing

During November and December, 2005, MACTEC advanced 8 borings at the locations shown on the Boring Location Plan (Drawing 3). The borings were drilled with a CME 45C trailer-mounted drill rig or a D-50 ATV-mounted drill rig. All borings were advanced using rotary wash drilling techniques. HQ-size rock/soil coring techniques were also used to core selected intervals at interior bent borings. All borings were drilled to depths that satisfy the minimum criteria for the NCDOT Ultimate Pile Capacity Chart for 12-inch steel piles. Interior bent borings were drilled to depths that also satisfy the minimum criteria for drilled shaft foundations.

Proposed boring locations were established at the project site utilizing GPS equipment and existing site features. Boring location coordinates were determined from the provided electronic files. Two borings were drilled at each of the end bents and bent 3. These borings were drilled at the edge of pavement along SR 1438. Offsets from proposed boring locations to the edge of pavement were required due to buried utilities. One boring was drilled at each of bents 1 and 2. These two borings were drilled through the deck of the existing bridge. The bridge deck was patched upon completion of the borings. Actual boring location coordinates were captured with GPS equipment.

Conventional survey techniques were used to establish the collar elevations at all boring locations and selected ground surface points depicted on the subsurface profile and cross section drawings included with this report (Drawings 4 to 9). Reference Survey point BL-3, established at the project site by NCDOT personnel, was used as a benchmark.

Standard penetration tests (SPT) were conducted and soil samples collected at approximately five foot intervals or 2.5 foot intervals, as directed by NCDOT. Samples were collected from within the soil profile using a split-barrel sampler and a 140 lb. manual hammer. SPT's were also performed between core runs.

In September 2002, NCDOT advanced one preliminary boring at the site. The location of NCDOT's preliminary boring is shown on the Boring Location Plan (Drawing 3).

## Laboratory Testing

Laboratory testing consisting of AASHTO classification and grain-size distribution tests were performed on split-barrel samples SS-1 through SS-16, and bulk samples S-1 and S-2, collected from Rainbow Creek's channel bank and channel bed, respectively. The natural moisture content was determined for cohesive soils.

Laboratory testing was performed in accordance with applicable ASTM/AASHTO/NCDOT specifications. Test results for AASHTO classification, grain-size distribution, and moisture content are included with this report.

## Physiography

The project site is located in the North Carolina Coastal Plain Physiographic Province. The roadway surface at the existing bridge is at elevation 32± feet mean sea level (msl). The ground surface adjacent to the roadway embankment is 4 to 10 below the roadway grade at the existing bridge. The creek bed is at elevation 20± feet msl. Rainbow Creek flows through a series of curves both up- and down-stream from the project site, and nearly parallels SR 1438 approaching the existing bridge from the south. The creek banks are moderately sloped to steep and are wooded with small to large trees both up- and down-stream. The ground surface slopes gradually upward to elevation 60± feet msl one-quarter mile to the east and west of the project site.

## Geology

The 1985 Geologic Map of North Carolina, compiled by the N.C. Geological Survey, indicates that the Yorktown, Peedee and Black Creek Formations may be at or near the surface at the project site. Our investigation identified surficial soils consisting of roadway embankment fill and/or alluvium, underlain by marine soil interlayered with sedimentary rock. Without additional evidence to distinguish marine soil/sedimentary rock as part of one formation or another, we have grouped the marine soil and sedimentary rock and referred to them as the Yorktown Formation.

Boring and coring logs describing subsurface conditions at each of the boring locations, including NCDOT's preliminary boring, are included with this report. A generalized profile, Drawing 4, depicts subsurface conditions 11 feet left of alignment -L-. Generalized cross-sections, Drawings 5 to 9, depict subsurface conditions along each bent.

**Soils**

Roadway Embankment Fill was encountered at the surface and extends to elevations 28 to 22± feet msl. Fill consists of loose to medium dense, silty, fine to coarse sand and gravel (A-3/A-2-4). A surficial layer of rip-rap covers embankment slopes to the creek.

Alluvium was encountered at the surface and beneath roadway embankment fill at elevations 28 to 22± feet msl, and extends to elevations 20 to 17± feet msl. Alluvium consists of very loose to medium dense, clayey, silty, fine to coarse sand and gravel (A-1-b/A-3/A-2-4) with trace organics.

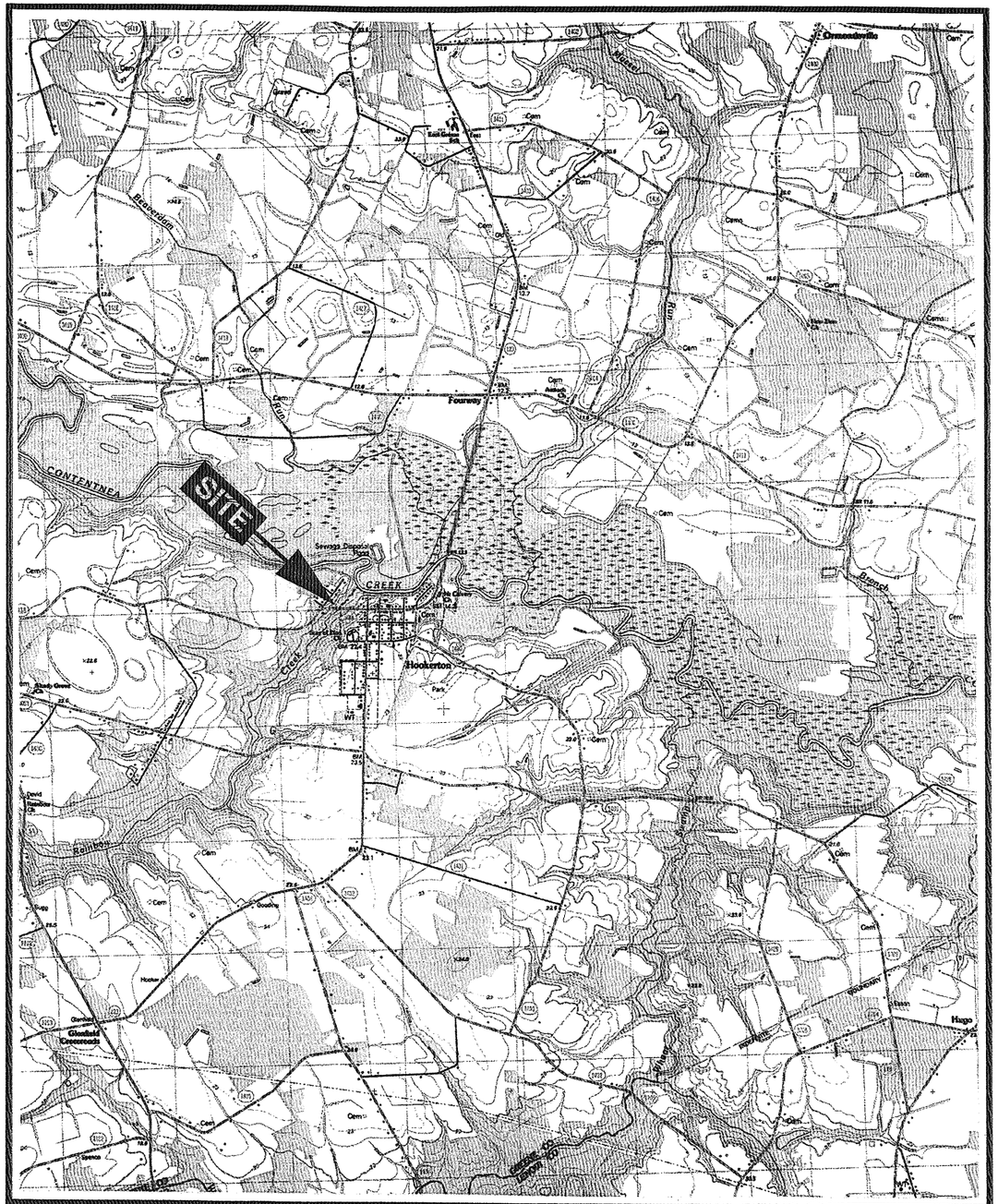
Yorktown Formation was encountered at elevations 20 to 17± feet msl. All borings were terminated in the Yorktown Formation, with the deepest boring extending to elevation -41± feet msl. Yorktown Formation above elevation 12± feet msl primarily consists of loose to dense, silty, fine to coarse sand (A-2-4), interlayered with stiff to very stiff, fine sandy, silty clay (A-6/A-7-6) and a discontinuous layer of sedimentary rock. Yorktown Formation below elevation 12± feet msl primarily consists of stiff to hard, fine sandy, silty clay (A-6/A-7-5/A-7-6) with a 5± foot thick layer of very dense, silty, fine sand (A-2-4) at elevation 0± feet msl. All Yorktown Formation soils contain trace amounts of organics and shell fragments.

**Rock**

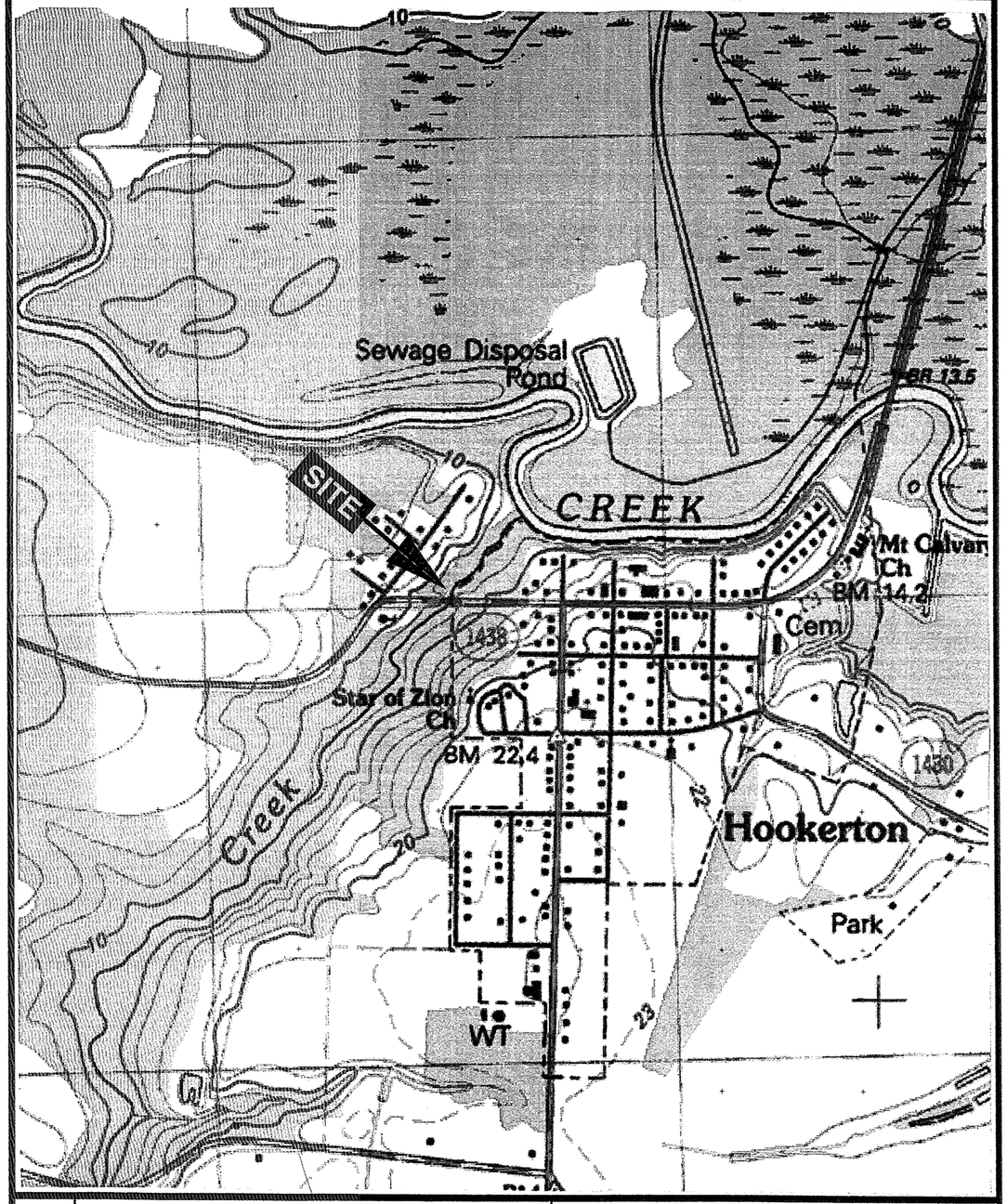
A sedimentary rock layer consisting of thinly bedded, friable to moderately indurated, fossiliferous sandstone was encountered within the Yorktown Formation at 12± feet msl. The sandstone layer is discontinuous, encountered only at end bent 1, bent 3, and in one boring at end bent 2 (EB2-B).

**Groundwater**

24-hour groundwater levels were measured at elevation 28± feet msl in borings at both end bents and bent 3. Artesian groundwater flow was observed from boring B1-B. The flow rate was measured at approximately one-half gallon per minute. We estimated the artesian head at 22.5± feet msl. A 24-hour groundwater measurement was not obtained at boring B2-A. B2-A was the last boring drilled for the project and was filled immediately after drilling. The 0-hour groundwater level elevation in boring B2-A was 22± feet msl. Surface water in Rainbow Creek was measured at elevation 22.1 feet msl on November 23, 2005.




| | | | |
|---|---|---|---|
| N | **SITE LOCATION MAP**<br>Bridge No. 43 Over Rainbow Creek on SR 1438<br>N.C. DOT Project No. 33480.1.1 (B-4127)<br>F.A. No. BRZ-1438(5)<br>Greene County, North Carolina | MACTEC<br>ENGINEERING AND CONSULTING, INC.<br>RALEIGH, NORTH CAROLINA | |
| | | DWG: 1 | DATE: December 2005 |
| | REF: USGS QUAD.: Hookerton, NC | SCALE: 1"= 4000' | MACTEC JOB NO: 6468-05-1240 |




| | | | |
|---|---|---|---|
| N | **TOPOGRAPHIC SITE MAP**<br>Bridge No. 43 Over Rainbow Creek on SR 1438<br>N.C. DOT Project No. 33480.1.1 (B-4127)<br>F.A. No. BRZ-1438(5)<br>Greene County, North Carolina | MACTEC<br>ENGINEERING AND CONSULTING, INC.<br>RALEIGH, NORTH CAROLINA | |
| | | DWG: 2 | DATE: December 2005 |
| | REF: USGS QUAD.: Hookerton, NC | SCALE: 1"= 1000' | MACTEC JOB NO: 6468-05-1240 |

SR 1439 FAITH HOPE RD. 20' B.

-BY- 6 POT 5+00.00

RUINS

RUINS

WOODS

S 10^ 42' 52.9" W

Duct

ISPD

GRASS DRIVE

10+00

RAINBOW CREEK

-L- POT STA 14+11.86
(14.66 RT)=
-BL- 3 PINC 13+40.40 =
-T- 102 PINC 7+02.33

SWAMP

15+00

RIPRAP

S-1

S-2

B2-A

B3-A

EB2-A

S 85^ 45' 00.5" E

-L-

EB1-A

B1-B

NCDOT PRELIM

EB2-B

-L-

EB1-B

RIPRAP

RIPRAP

B3-B

S 86^ 55' 19.7" E

BRUSH

BRUSH

BRUSH

BRUSH

BRUSH

GRAVEL DR

GR/SOIL PARKING

48" CHL

-BL- 2 PINC 9+01.63=
-BY- 7 POT 6+51.46=
-BY1- 9 POT 7+15.84=
GPS B4127-1

WOODS

WOODS

BRUSH

RAINBOW CREEK

SKEW=90°

0 25' 50' 100'

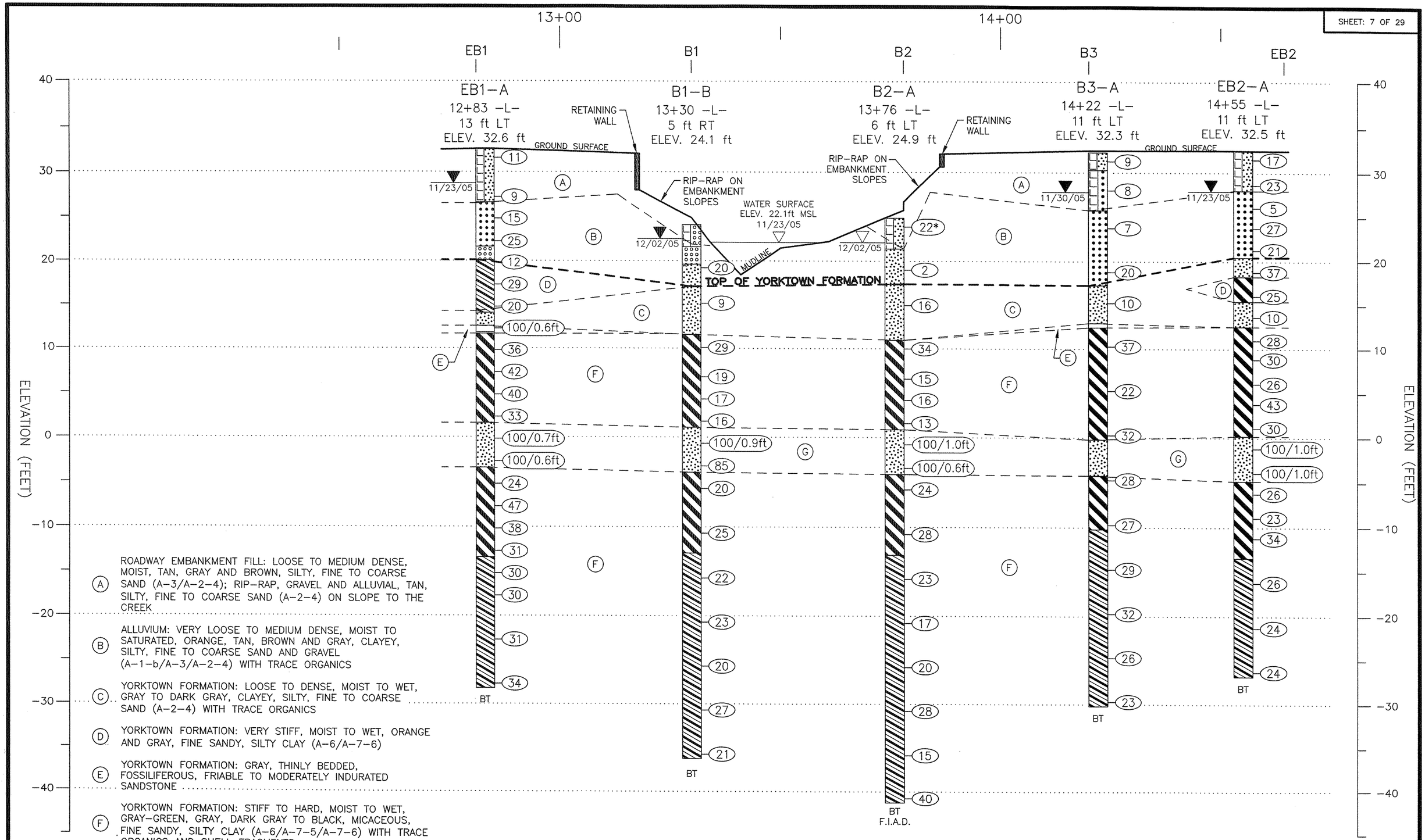
SCALE (FEET)
1" : 50'

NAD 83

BORING LOCATION PLAN
BRIDGE NO. 43 OVER RAINBOW CREEK ON SR 1438
NCDOT PROJECT NO. 33480.1.1(B-4127)
F.A. No. BRZ-1438(5)
GREENE COUNTY, NORTH CAROLINA

MACTEC ENGINEERING AND CONSULTING, INC.
RALEIGH, NORTH CAROLINA

| REVISIONS | DRAWN: R.R. | DATE: 12/22/05 |
|---|---|---|
| 01/23/06 | DFT CHECK: W.B.D. | JOB : 6468-05-1240 |
| | ENG CHECK: J.E.V. | DWG: 3 |




(A) ROADWAY EMBANKMENT FILL: LOOSE TO MEDIUM DENSE, MOIST, TAN, GRAY AND BROWN, SILTY, FINE TO COARSE SAND (A–3/A–2–4); RIP–RAP, GRAVEL AND ALLUVIAL, TAN, SILTY, FINE TO COARSE SAND (A–2–4) ON SLOPE TO THE CREEK

(B) ALLUVIUM: VERY LOOSE TO MEDIUM DENSE, MOIST TO SATURATED, ORANGE, TAN, BROWN AND GRAY, CLAYEY, SILTY, FINE TO COARSE SAND AND GRAVEL (A–1–b/A–3/A–2–4) WITH TRACE ORGANICS

(C) YORKTOWN FORMATION: LOOSE TO DENSE, MOIST TO WET, GRAY TO DARK GRAY, CLAYEY, SILTY, FINE TO COARSE SAND (A–2–4) WITH TRACE ORGANICS

(D) YORKTOWN FORMATION: VERY STIFF, MOIST TO WET, ORANGE AND GRAY, FINE SANDY, SILTY CLAY (A–6/A–7–6)

(E) YORKTOWN FORMATION: GRAY, THINLY BEDDED, FOSSILIFEROUS, FRIABLE TO MODERATELY INDURATED SANDSTONE

(F) YORKTOWN FORMATION: STIFF TO HARD, MOIST TO WET, GRAY–GREEN, GRAY, DARK GRAY TO BLACK, MICACEOUS, FINE SANDY, SILTY CLAY (A–6/A–7–5/A–7–6) WITH TRACE ORGANICS AND SHELL FRAGMENTS

(G) YORKTOWN FORMATION: VERY DENSE, MOIST TO WET, GREEN–GRAY, SILTY, FINE SAND (A–2–4) WITH TRACE SHELL FRAGMENTS

* NOTE : BLOW COUNT INVALID DUE TO GRAVEL

0 10' 20' 40'

SCALE IN FEET
1"=20'

# PROFILE 11 ft LT OF –L–

BRIDGE NO. 43 OVER RAINBOW CREEK ON SR 1438
NCDOT PROJECT NO. 33480.1.1(B–4127)
F.A. No. BRZ–1438(5)
GREENE COUNTY, NORTH CAROLINA

MACTEC ENGINEERING AND CONSULTING, INC.
RALEIGH, NORTH CAROLINA

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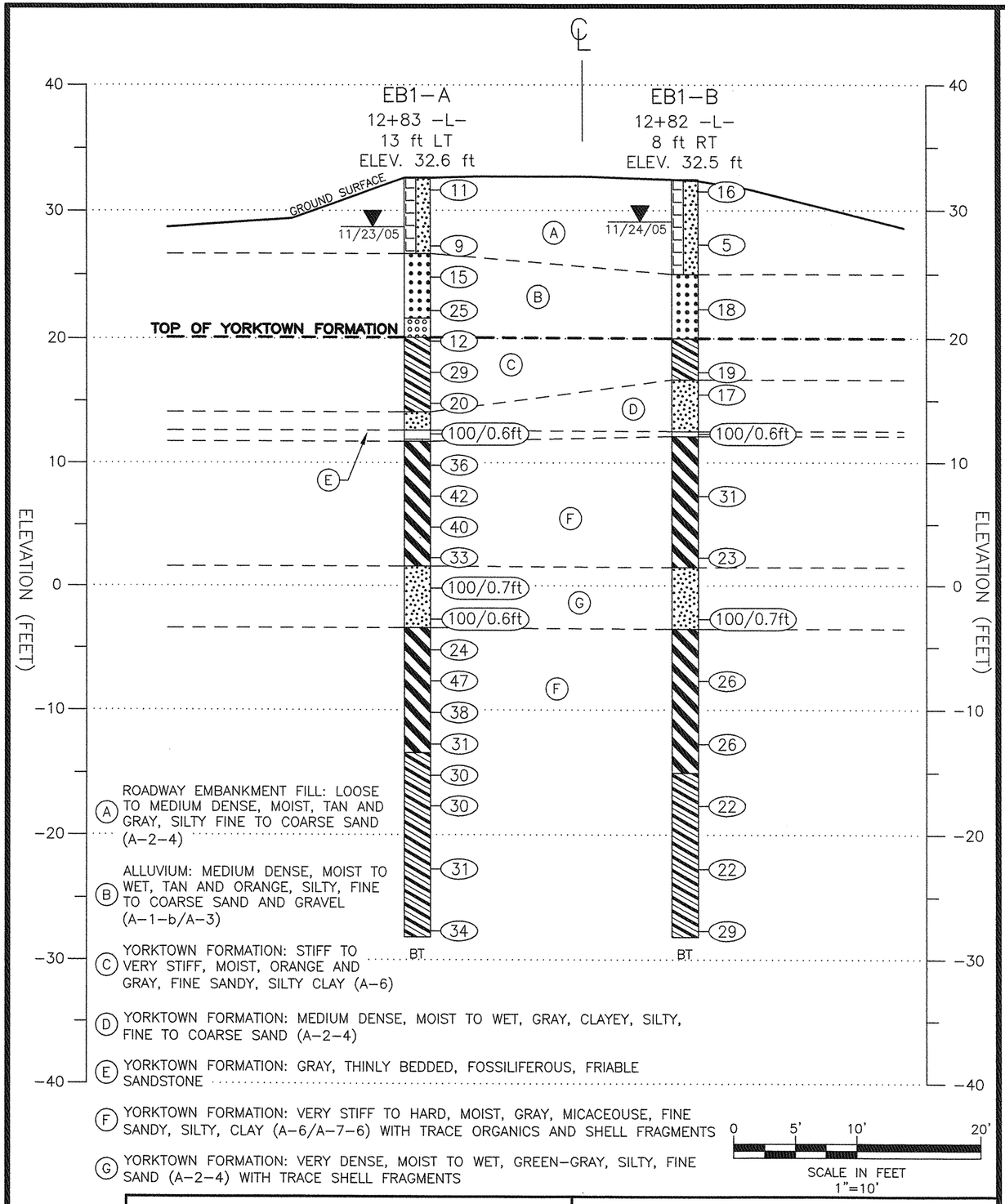


(A) ROADWAY EMBANKMENT FILL: LOOSE TO MEDIUM DENSE, MOIST, TAN AND GRAY, SILTY FINE TO COARSE SAND (A–2–4)

(B) ALLUVIUM: MEDIUM DENSE, MOIST TO WET, TAN AND ORANGE, SILTY, FINE TO COARSE SAND AND GRAVEL (A–1–b/A–3)

(C) YORKTOWN FORMATION: STIFF TO VERY STIFF, MOIST, ORANGE AND GRAY, FINE SANDY, SILTY CLAY (A–6)

(D) YORKTOWN FORMATION: MEDIUM DENSE, MOIST TO WET, GRAY, CLAYEY, SILTY, FINE TO COARSE SAND (A–2–4)

(E) YORKTOWN FORMATION: GRAY, THINLY BEDDED, FOSSILIFEROUS, FRIABLE SANDSTONE

(F) YORKTOWN FORMATION: VERY STIFF TO HARD, MOIST, GRAY, MICACEOUSE, FINE SANDY, SILTY, CLAY (A–6/A–7–6) WITH TRACE ORGANICS AND SHELL FRAGMENTS

(G) YORKTOWN FORMATION: VERY DENSE, MOIST TO WET, GREEN–GRAY, SILTY, FINE SAND (A–2–4) WITH TRACE SHELL FRAGMENTS

## CROSS SECTION ALONG END BENT 1
BRIDGE NO. 43 OVER RAINBOW CREEK ON SR 1438
NCDOT PROJECT NO. 33480.1.1(B–4127)
F.A. No. BRZ–1438(5)
GREENE COUNTY, NORTH CAROLINA

**MACTEC ENGINEERING AND CONSULTING, INC.**
**RALEIGH, NORTH CAROLINA**

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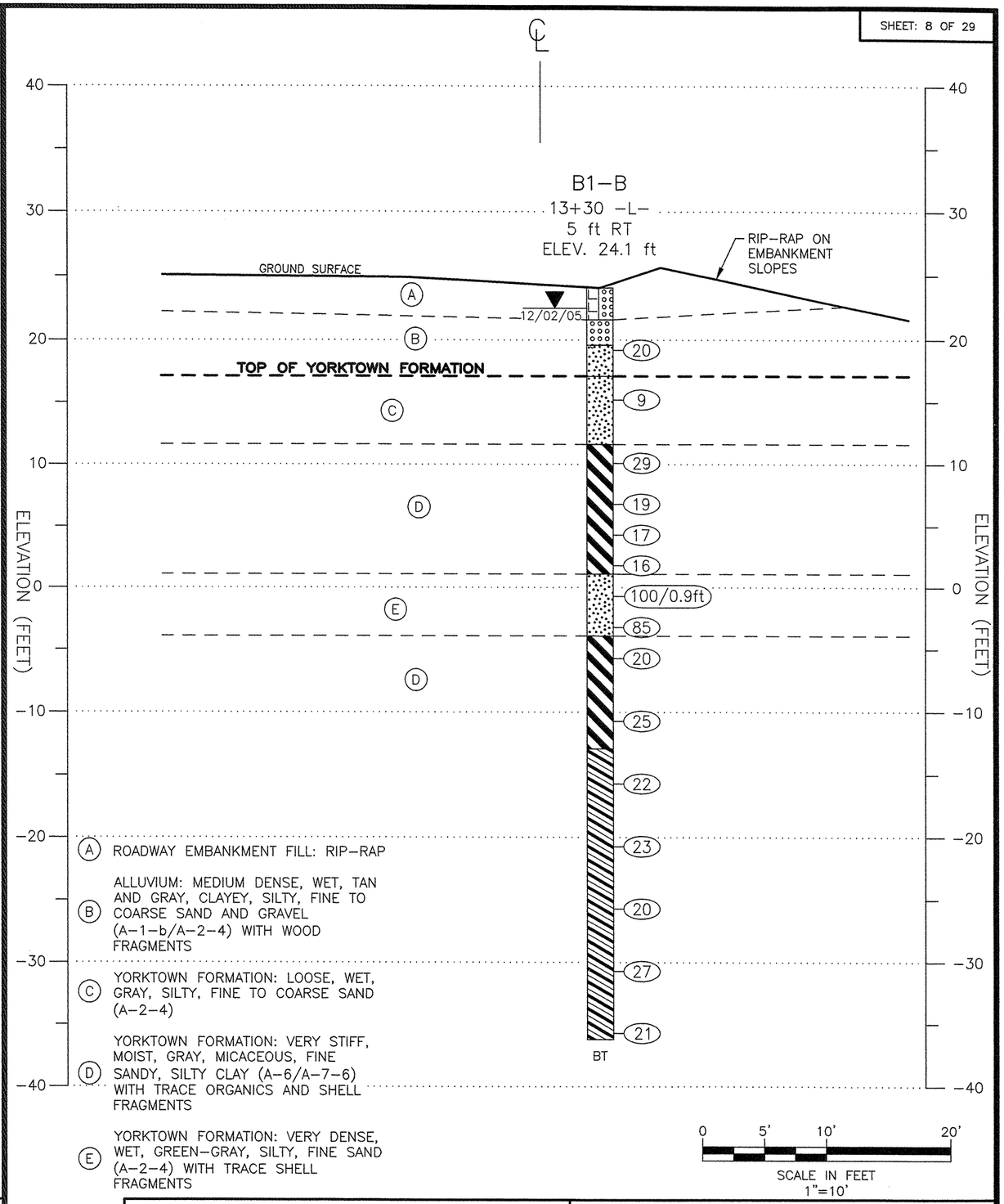


(A) ROADWAY EMBANKMENT FILL: RIP–RAP

(B) ALLUVIUM: MEDIUM DENSE, WET, TAN AND GRAY, CLAYEY, SILTY, FINE TO COARSE SAND AND GRAVEL (A–1–b/A–2–4) WITH WOOD FRAGMENTS

(C) YORKTOWN FORMATION: LOOSE, WET, GRAY, SILTY, FINE TO COARSE SAND (A–2–4)

(D) YORKTOWN FORMATION: VERY STIFF, MOIST, GRAY, MICACEOUS, FINE SANDY, SILTY CLAY (A–6/A–7–6) WITH TRACE ORGANICS AND SHELL FRAGMENTS

(E) YORKTOWN FORMATION: VERY DENSE, WET, GREEN–GRAY, SILTY, FINE SAND (A–2–4) WITH TRACE SHELL FRAGMENTS

## CROSS SECTION ALONG BENT 1
BRIDGE NO. 43 OVER RAINBOW CREEK ON SR 1438
NCDOT PROJECT NO. 33480.1.1(B–4127)
F.A. No. BRZ–1438(5)
GREENE COUNTY, NORTH CAROLINA

**MACTEC ENGINEERING AND CONSULTING, INC.**
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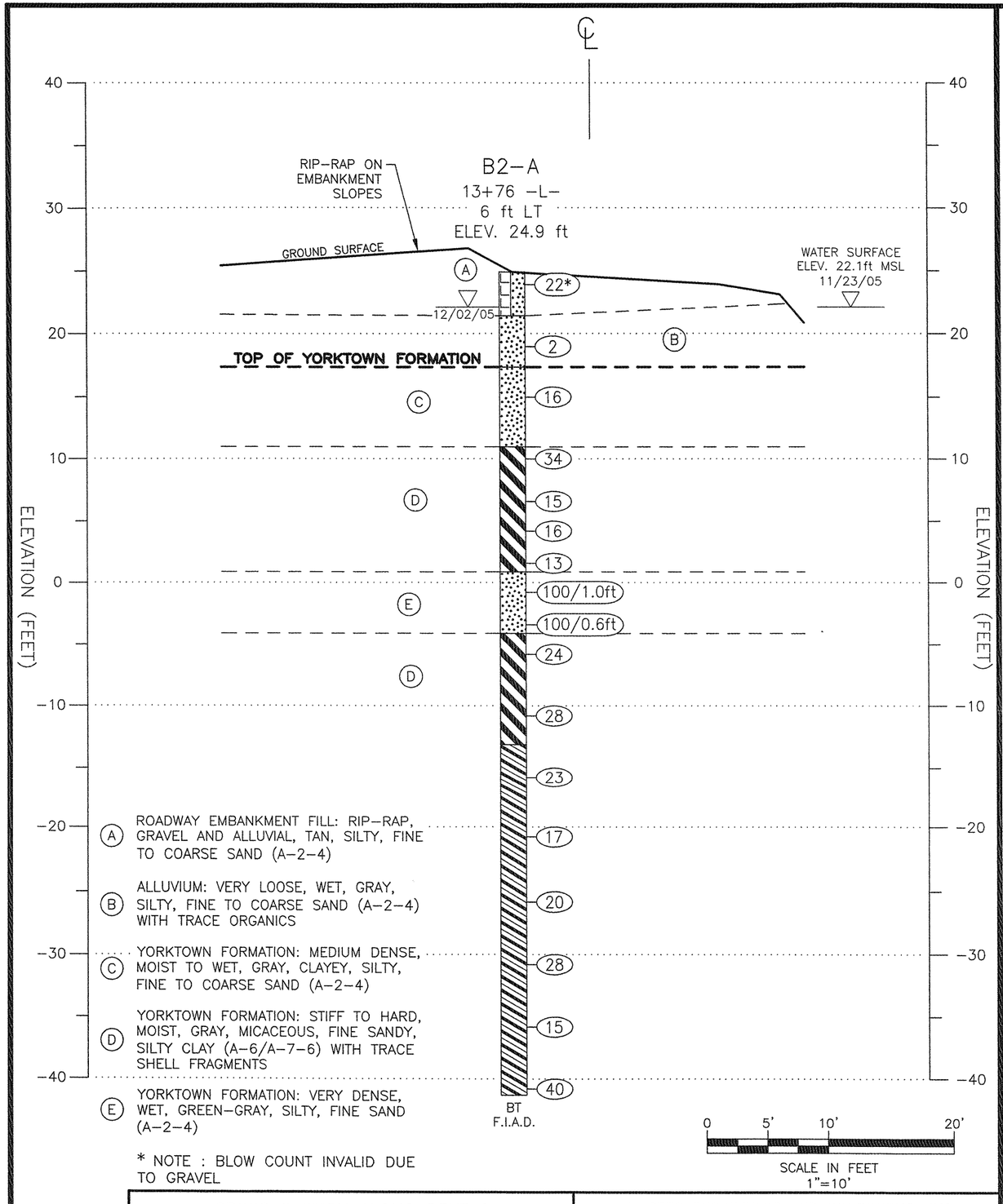


A ROADWAY EMBANKMENT FILL: RIP-RAP, GRAVEL AND ALLUVIAL, TAN, SILTY, FINE TO COARSE SAND (A-2-4)

B ALLUVIUM: VERY LOOSE, WET, GRAY, SILTY, FINE TO COARSE SAND (A-2-4) WITH TRACE ORGANICS

C YORKTOWN FORMATION: MEDIUM DENSE, MOIST TO WET, GRAY, CLAYEY, SILTY, FINE TO COARSE SAND (A-2-4)

D YORKTOWN FORMATION: STIFF TO HARD, MOIST, GRAY, MICACEOUS, FINE SANDY, SILTY CLAY (A-6/A-7-6) WITH TRACE SHELL FRAGMENTS

E YORKTOWN FORMATION: VERY DENSE, WET, GREEN-GRAY, SILTY, FINE SAND (A-2-4)

* NOTE : BLOW COUNT INVALID DUE TO GRAVEL

## CROSS SECTION ALONG BENT 2
BRIDGE NO. 43 OVER RAINBOW CREEK ON SR 1438
NCDOT PROJECT NO. 33480.1.1(B-4127)
F.A. No. BRZ-1438(5)
GREENE COUNTY, NORTH CAROLINA

**MACTEC ENGINEERING AND CONSULTING, INC.**
**RALEIGH, NORTH CAROLINA**

| REVISIONS | DRAWN: R.R. | DATE: 12/22/05 |
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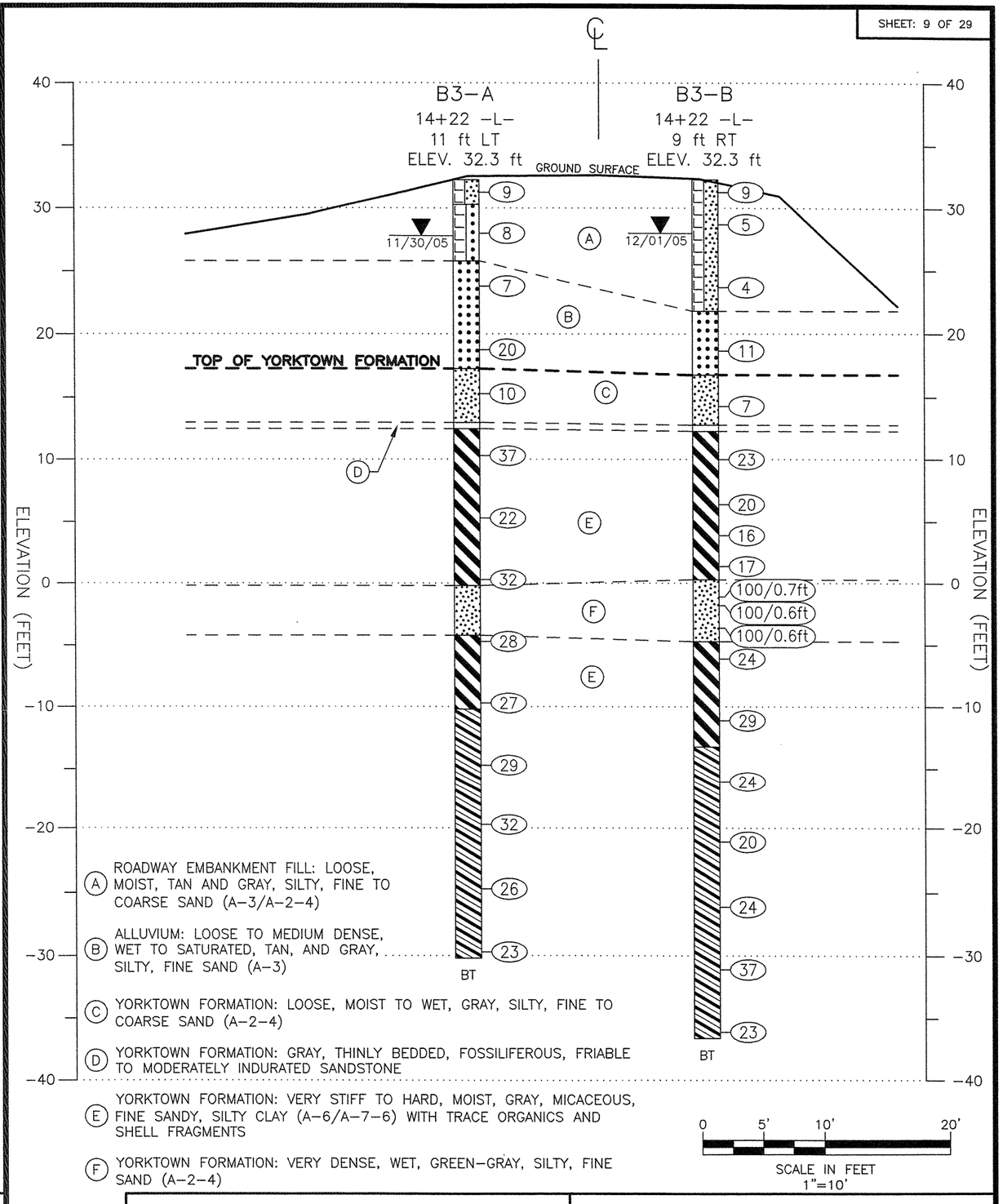


A ROADWAY EMBANKMENT FILL: LOOSE, MOIST, TAN AND GRAY, SILTY, FINE TO COARSE SAND (A-3/A-2-4)

B ALLUVIUM: LOOSE TO MEDIUM DENSE, WET TO SATURATED, TAN, AND GRAY, SILTY, FINE SAND (A-3)

C YORKTOWN FORMATION: LOOSE, MOIST TO WET, GRAY, SILTY, FINE TO COARSE SAND (A-2-4)

D YORKTOWN FORMATION: GRAY, THINLY BEDDED, FOSSILIFEROUS, FRIABLE TO MODERATELY INDURATED SANDSTONE

E YORKTOWN FORMATION: VERY STIFF TO HARD, MOIST, GRAY, MICACEOUS, FINE SANDY, SILTY CLAY (A-6/A-7-6) WITH TRACE ORGANICS AND SHELL FRAGMENTS

F YORKTOWN FORMATION: VERY DENSE, WET, GREEN-GRAY, SILTY, FINE SAND (A-2-4)

## CROSS SECTION ALONG BENT 3
BRIDGE NO. 43 OVER RAINBOW CREEK ON SR 1438
NCDOT PROJECT NO. 33480.1.1(B-4127)
F.A. No. BRZ-1438(5)
GREENE COUNTY, NORTH CAROLINA

**MACTEC ENGINEERING AND CONSULTING, INC.**
**RALEIGH, NORTH CAROLINA**

| REVISIONS | DRAWN: R.R. | DATE: 12/22/05 |
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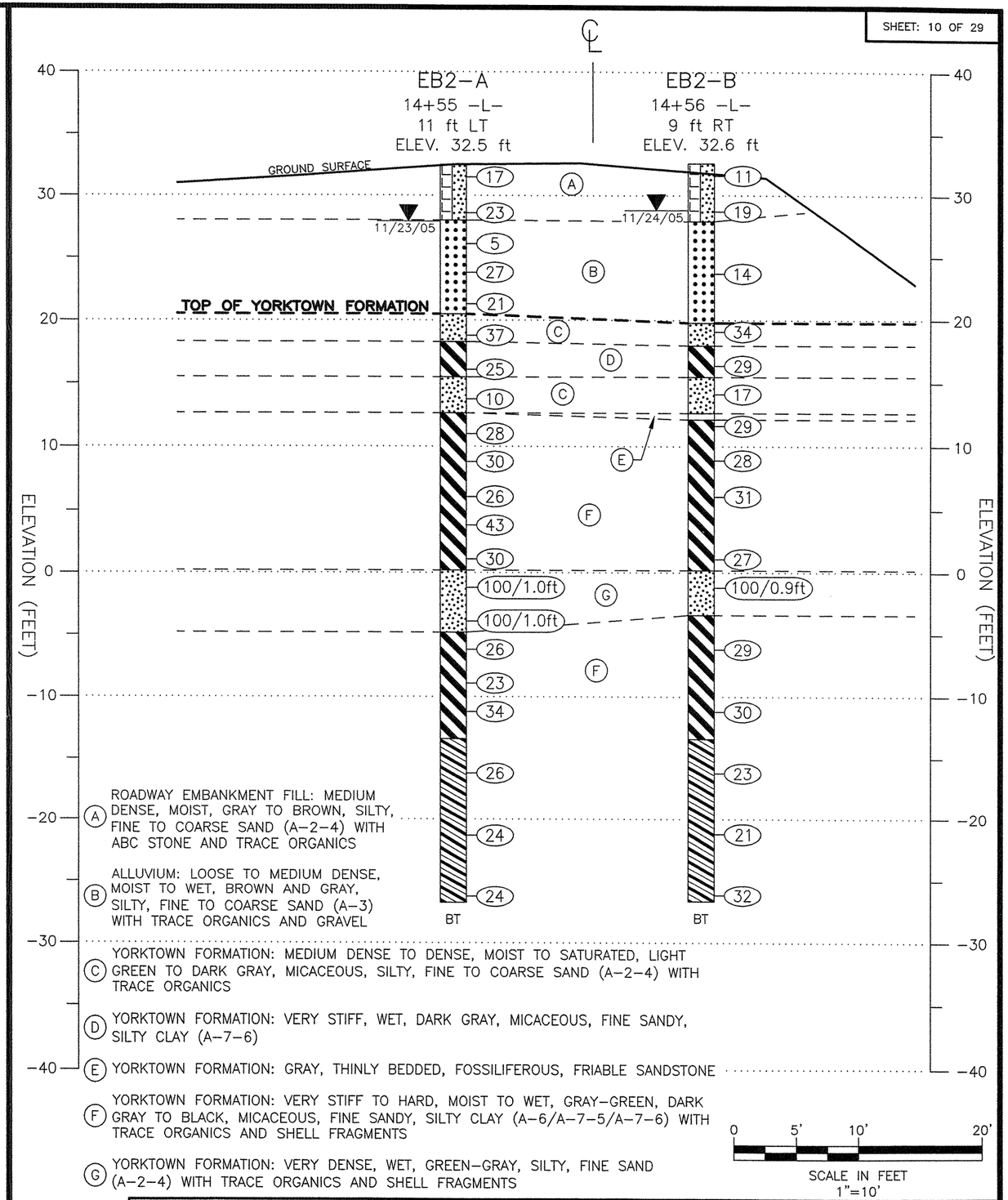


(A) ROADWAY EMBANKMENT FILL: MEDIUM DENSE, MOIST, GRAY TO BROWN, SILTY, FINE TO COARSE SAND (A-2-4) WITH ABC STONE AND TRACE ORGANICS

(B) ALLUVIUM: LOOSE TO MEDIUM DENSE, MOIST TO WET, BROWN AND GRAY, SILTY, FINE TO COARSE SAND (A-3) WITH TRACE ORGANICS AND GRAVEL

(C) YORKTOWN FORMATION: MEDIUM DENSE TO DENSE, MOIST TO SATURATED, LIGHT GREEN TO DARK GRAY, MICACEOUS, SILTY, FINE TO COARSE SAND (A-2-4) WITH TRACE ORGANICS

(D) YORKTOWN FORMATION: VERY STIFF, WET, DARK GRAY, MICACEOUS, FINE SANDY, SILTY CLAY (A-7-6)

(E) YORKTOWN FORMATION: GRAY, THINLY BEDDED, FOSSILIFEROUS, FRIABLE SANDSTONE

(F) YORKTOWN FORMATION: VERY STIFF TO HARD, MOIST TO WET, GRAY-GREEN, DARK GRAY TO BLACK, MICACEOUS, FINE SANDY, SILTY CLAY (A-6/A-7-5/A-7-6) WITH TRACE ORGANICS AND SHELL FRAGMENTS

(G) YORKTOWN FORMATION: VERY DENSE, WET, GREEN-GRAY, SILTY, FINE SAND (A-2-4) WITH TRACE ORGANICS AND SHELL FRAGMENTS

0 5' 10' 20'

SCALE IN FEET
1"=10'

# CROSS SECTION ALONG END BENT 2

BRIDGE NO. 43 OVER RAINBOW CREEK ON SR 1438
NCDOT PROJECT NO. 33480.1.1(B-4127)
F.A. No. BRZ-1438(5)
GREENE COUNTY, NORTH CAROLINA

MACTEC ENGINEERING AND CONSULTING, INC.
RALEIGH, NORTH CAROLINA

| REVISIONS | DRAWN: R.R. | DATE: 12/22/05 |
|---|---|---|
| | DFT CHECK: W.B.D. | JOB: 6468-05-1240 |
| | ENG CHECK: J.E.V. | DWG: 9 |

MACTEC

N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

SHEET 1 OF 1

| | | | |
|---|---|---|---|
| **PROJECT NO.** 33480.1.1 | **ID.** B-4127 | **COUNTY** Greene | **GEOLOGIST** B. Deobald |
| **SITE DESCRIPTION** Bridge No. 43 Over Rainbow Creek on SR 1438 (MACTEC Proj. No. 6468-05-1240) | | | **GROUND WATER (ft)** |
| **BORING NO.** EB1-A | **BORING LOCATION** 12+83 | **OFFSET** 13 ft LT | **ALIGNMENT** -L- | **0 HR.** 6.5 |
| **COLLAR ELEV.** 32.6 ft | **NORTHING** 612,461 **US ft** | **EASTING** 2,418,972 **US ft** | | **24 HR.** 3.9 |
| **TOTAL DEPTH** 60.8 ft | **DRILL MACHINE** D-50 ATV | **DRILL METHOD** Mud Rotary | **HAMMER TYPE** 140-lb Manual | |
| **DATE STARTED** 11/22/05 | **COMPLETED** 11/22/05 | **SURFACE WATER DEPTH** N/A | | |

| ELEV. (ft) | DEPTH (ft) | BLOW COUNT 0.5ft | 0.5ft | 0.5ft | BLOWS PER FOOT 0 20 40 60 80 100 | SAMP. NO. | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 32.6 | | | | | Ground Surface | | | | 32.6 / 0.0 |
| 32.6 | 0.0 | 3 | 3 | 8 | 11 | | M | | Roadway Embankment Fill: Tan and gray, silty, f. to cse. SAND (A-2-4) |
| 28.2 | 4.4 | | | | | SS-1 | M | | 26.6 / 6.0 |
| 25.8 | 6.8 | 6 | 5 | 4 | 9 | | | | Alluvium: Tan and orange, f. to cse. SAND (A-3) |
| 23.2 | 9.4 | 3 | 6 | 9 | 15 | SS-2 | M | | |
| 20.8 | 11.8 | 8 | 10 | 15 | 25 | | W | | 21.6 / 11.0 |
| 18.3 | 14.3 | 8 | 6 | 6 | 12 | SS-3 | W | | 20.1 / 12.5 Alluvium: Tan, f. to cse. SAND and GRAVEL (A-1-b) |
| 15.8 | 16.8 | 7 | 11 | 18 | 29 | SS-4 | 31.6% | | Yorktown Fm: Orange and gray, f. sandy, silty CLAY (A-6) |
| 13.3 | 19.3 | 6 | 10 | 10 | 20 | | M | | 14.1 / 18.5 |
| 10.8 | 21.8 | 2 | 70 | 30/0.1' | 100/0.6 | SS-5 | W | | 12.6 / 20.0 Yorktown Fm: Gray, silty, f. to cse. SAND (A-2-4) |
| 8.3 | 24.3 | 11 | 16 | 20 | 36 | | M | | 11.7 / 20.9 Yorktown Fm: Gray, thinly bedded, fossiliferous, friable, SANDSTONE |
| 5.8 | 26.8 | 12 | 20 | 22 | 42 | SS-6 | 25.5% | | Yorktown Fm: Gray, micaceous, f. sandy, silty CLAY (A-7-6) w/ trace shell fragments |
| 3.3 | 29.3 | 10 | 20 | 20 | 40 | | M | | |
| 0.8 | 31.8 | 8 | 13 | 20 | 33 | | M | | 1.6 / 31.0 |
| -1.7 | 34.3 | 40 | 60/0.2' | | 100/0.7 | SS-7 | M | | Yorktown Fm: Green-gray, silty, f. SAND (A-2-4) |
| -4.2 | 36.8 | 88 | 12/0.1' | | 100/0.6 | | M | | -3.4 / 36.0 |
| -6.7 | 39.3 | 9 | 9 | 15 | 24 | | M | | Yorktown Fm: Gray, micaceous, f. sandy, silty, CLAY (A-7-6) w/ trace shell fragments |
| -9.2 | 41.8 | 9 | 17 | 30 | 47 | | M | | |
| -11.7 | 44.3 | 13 | 19 | 19 | 38 | | M | | |
| -14.2 | 46.8 | 11 | 15 | 16 | 31 | SS-8 | 32.6% | | -13.4 / 46.0 |
| -16.7 | 49.3 | 9 | 15 | 15 | 30 | | M | | Yorktown Fm: Gray, micaceous, f. sandy, silty, CLAY (A-6) w/ trace shell fragments |
| -21.7 | 54.3 | 9 | 13 | 17 | 30 | | M | | |
| -26.7 | 59.3 | 13 | 15 | 16 | 31 | | M | | |
| | | 12 | 14 | 20 | 34 | SS-9 | 26.0% | | -28.2 / 60.8 Boring terminated at 60.8 ft (Elev. -28.2 ft) in Yorktown Fm: Hard, micaceous, f. sandy, silty, CLAY (A-6) w/ trace shell fragments and organics |

Bits Used: 3" Roller Cone

Drilling Fluid Properties: 8.2 lbs/gal

NCDOT BORE SINGLE BRIDGE 43.GPJ NC_DOT.GDT 1/23/06

MACTEC

N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

SHEET 1 OF 1

| | | | |
|---|---|---|---|
| **PROJECT NO.** 33480.1.1 | **ID.** B-4127 | **COUNTY** Greene | **GEOLOGIST** B. Deobald |
| **SITE DESCRIPTION** Bridge No. 43 Over Rainbow Creek on SR 1438 (MACTEC Proj. No. 6468-05-1240) | | | **GROUND WATER (ft)** |
| **BORING NO.** EB1-B | **BORING LOCATION** 12+82 | **OFFSET** 8 ft RT | **ALIGNMENT** -L- | **0 HR.** 3.5 |
| **COLLAR ELEV.** 32.5 ft | **NORTHING** 612,439 **US ft** | **EASTING** 2,418,971 **US ft** | | **24 HR.** 3.4 |
| **TOTAL DEPTH** 60.7 ft | **DRILL MACHINE** D-50 ATV | **DRILL METHOD** Mud Rotary | **HAMMER TYPE** 140-lb Manual | |
| **DATE STARTED** 11/23/05 | **COMPLETED** 11/23/05 | **SURFACE WATER DEPTH** N/A | | |

| ELEV. (ft) | DEPTH (ft) | BLOW COUNT 0.5ft | 0.5ft | 0.5ft | BLOWS PER FOOT 0 20 40 60 80 100 | SAMP. NO. | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 32.5 | | | | | Ground Surface | | | | 32.5 / 0.0 |
| 32.5 | 0.0 | 10 | 8 | 8 | 16 | | M | | Roadway Embankment Fill: Tan, silty, f. to cse. SAND (A-2-4) |
| 28.3 | 4.2 | | | | | | M | | 25.0 / 7.5 |
| 23.3 | 9.2 | 3 | 2 | 3 | 5 | | | | Alluvium: Tan and orange, silty, f. to cse. SAND (A-3) |
| 18.3 | 14.2 | 7 | 9 | 9 | 18 | | W | | 20.0 / 12.5 Yorktown Fm: Gray, f. sandy, silty CLAY (A-6) |
| 16.5 | 16.0 | 7 | 9 | 10 | 19 | | M | | 16.7 / 15.8 |
| 13.3 | 19.2 | 6 | 8 | 9 | 17 | | M/W | | Yorktown Fm: Gray, clayey, silty, f. to cse. SAND (A-2-4) |
| 8.3 | 24.2 | 3 | 14 | 86/0.1' | 100/0.6 | | M/W | | 12.5 / 20.0 |
| 3.3 | 29.2 | 11 | 14 | 17 | 31 | | M | | 12.1 / 20.4 Yorktown Fm: Gray, thinly bedded, fossiliferous, friable, SANDSTONE |
| -1.7 | 34.2 | 7 | 10 | 13 | 23 | | M | | Yorktown Fm: Gray, micaceous, f. sandy, silty CLAY (A-7-6) w/ trace organics and shell fragments |
| -6.7 | 39.2 | 63 | 37/0.2' | | 100/0.7 | | W | | 1.5 / 31.0 |
| -11.7 | 44.2 | 8 | 11 | 15 | 26 | | M | | Yorktown Fm: Green-gray, silty, f. SAND (A-2-4) w/ trace shell fragments |
| -16.7 | 49.2 | 8 | 12 | 14 | 26 | | M | | -3.5 / 36.0 |
| -21.7 | 54.2 | 7 | 10 | 12 | 22 | | M | | Yorktown Fm: Gray, micaceous, silty, CLAY (A-7-6) w/ trace shell fragments |
| -26.7 | 59.2 | 8 | 10 | 12 | 22 | | M | | |
| | | 8 | 12 | 17 | 29 | | M | | -15.0 / 47.5 Yorktown Fm: Gray, micaceous, f. sandy, silty CLAY (A-6) w/ trace shell fragments |
| | | | | | | | | | -28.2 / 60.7 Boring terminated at 60.7 ft (Elev. -28.2 ft) in Yorktown Fm: V. stiff, micaceous, f. sandy, silty CLAY (A-6) w/ trace shell fragments |

Bits Used: 3" Roller Cone

Drilling Fluid Properties: 8.5 lbs/gal

NCDOT BORE SINGLE BRIDGE 43.GPJ NC_DOT.GDT 1/23/06

MACTEC

N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

SHEET 1 OF 1

| | | | |
|---|---|---|---|
| **PROJECT NO.** 33480.1.1 | **ID.** B-4127 | **COUNTY** Greene | **GEOLOGIST** B. Deobald |
| **SITE DESCRIPTION** Bridge No. 43 Over Rainbow Creek on SR 1438 (MACTEC Proj. No. 6468-05-1240) | | | **GROUND WATER (ft)** |
| **BORING NO.** B1-B | **BORING LOCATION** 13+30 | **OFFSET** 5 ft RT | **ALIGNMENT** -L- | **0 HR.** 2.5 |
| **COLLAR ELEV.** 24.1 ft | **NORTHING** 612,443 **US ft** | **EASTING** 2,419,019 **US ft** | **24 HR.** 1.6 |
| **TOTAL DEPTH** 60.3 ft | **DRILL MACHINE** CME-45C Trailer | **DRILL METHOD** Mud Rotary/Core | **HAMMER TYPE** 140-lb Manual |
| **DATE STARTED** 12/1/05 | **COMPLETED** 12/1/05 | **SURFACE WATER DEPTH** N/A | |

| ELEV. (ft) | DEPTH (ft) | BLOW COUNT 0.5ft | 0.5ft | 0.5ft | BLOWS PER FOOT 0 20 40 60 80 100 | SAMP. NO. | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 24.1 | | | | | Ground Surface | | | | |
| | | | | | | | | | 24.1 — 0.0 |
| 20.2 | 3.9 | | | | | | | | Roadway Embankment Fill: Rip Rap |
| | | | | | | | | | 21.6 — 2.5 |
| | | | | | | | | | Alluvium: Tan, f. to cse. SAND and GRAVEL (A-1-b) |
| | | | | | | | | | 19.6 — 4.5 |
| | | 5 | 9 | 11 | 20 | | W | | Alluvium: Gray, clayey, silty, f. to cse. SAND (A-2-4) w/ wood fragments |
| 16.2 | 7.9 | | | | | | | | 17.1 — 7.0 |
| | | 3 | 4 | 5 | 9 | | W | | Yorktown Fm: Gray, silty, f. to cse. SAND (A-2-4) |
| 11.1 | 13.0 | | | | | | | | 11.6 — 12.5 |
| | | 12 | 12 | 17 | 29 | | M | | Yorktown Fm: Gray, micaceous, f. sandy, silty CLAY (A-7-6) w/ trace shell fragments |
| 7.8 | 16.3 | | | | | | | | |
| | | 6 | 8 | 11 | 19 | | M | | |
| 5.3 | 18.8 | | | | | | | | |
| | | 5 | 7 | 10 | 17 | | M | | |
| 2.8 | 21.3 | | | | | | | | |
| | | 4 | 7 | 9 | 16 | | M | | |
| 0.3 | 23.8 | | | | | | | | 1.1 — 23.0 |
| | | 40 | 60/0.4' | | 100/0.9 | | W | | Yorktown Fm: Green-gray, silty, f. SAND (A-2-4) w/ trace shells |
| -2.2 | 26.3 | | | | | | | | |
| | | 32 | 43 | 42 | 85 | | W | | -3.9 — 28.0 |
| -4.7 | 28.8 | | | | | | | | Yorktown Fm: Gray, micaceous, silty, CLAY (A-7-6) w/ trace shell fragments |
| | | 5 | 9 | 11 | 20 | | M | | |
| -9.7 | 33.8 | | | | | | | | |
| | | 7 | 11 | 14 | 25 | | M | | |
| -14.7 | 38.8 | | | | | | | | -12.9 — 37.0 |
| | | 5 | 10 | 12 | 22 | | M | | Yorktown Fm: Gray, micaceous, f. sandy, silty CLAY (A-6) w/ trace shell fragments and organics |
| -19.7 | 43.8 | | | | | | | | |
| | | 6 | 9 | 14 | 23 | | M | | |
| -24.7 | 48.8 | | | | | | | | |
| | | 6 | 9 | 11 | 20 | | M | | |
| -29.7 | 53.8 | | | | | | | | |
| | | 7 | 12 | 15 | 27 | | M | | |
| -34.7 | 58.8 | | | | | | | | |
| | | 8 | 10 | 11 | 21 | | M | | -36.2 — 60.3 |
| | | | | | | | | | Boring terminated at 60.3 ft (Elev. -36.2 ft) in Yorktown Fm: V. stiff, micaceous, f. sandy, silty CLAY (A-6) |

Bits Used: 3" Roller Cone; HQ Surface set core bit

Drilling Fluid Properties: 8.5 lbs/gal

-Artesian condition observed after drilling. Flow estimated at 0.5 gpm

NCDOT BORE SINGLE BRIDGE 43.GPJ NC_DOT.GDT 1/23/06

MACTEC

N.C.D.O.T. GEOTECHNICAL UNIT
CORE BORING REPORT

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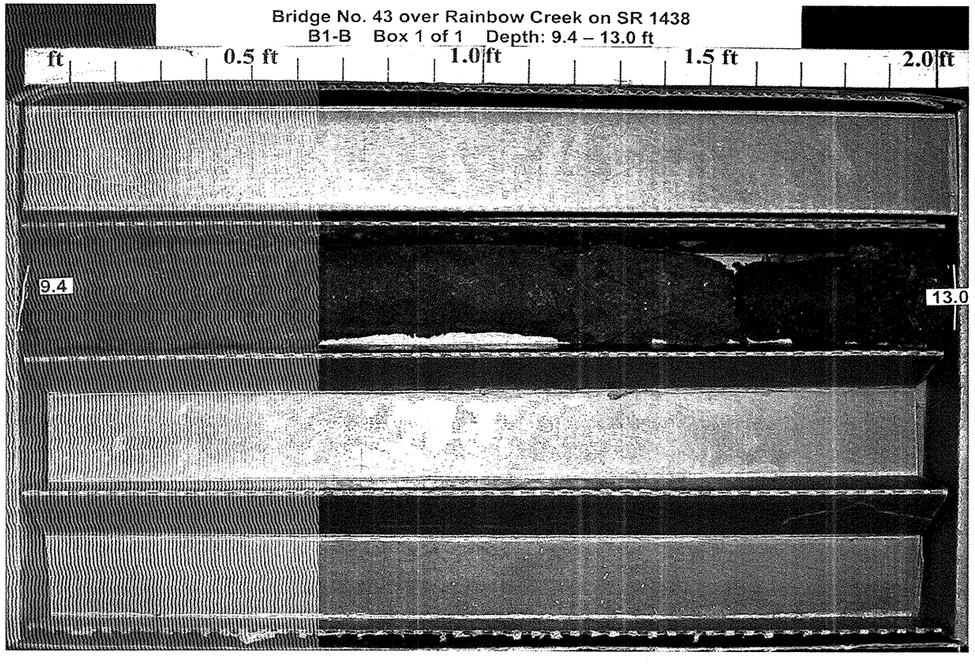
SHEET 1 OF 1

| | | | |
|---|---|---|---|
| **PROJECT NO.** 33480.1.1 | **ID.** B-4127 | **COUNTY** Greene | **GEOLOGIST** B. Deobald |
| **SITE DESCRIPTION** Bridge No. 43 Over Rainbow Creek on SR 1438 (MACTEC Proj. No. 6468-05-1240) | | | **GROUND WATER (ft)** |
| **BORING NO.** B1-B | **BORING LOCATION** 13+30 | **OFFSET** 5 ft RT | **ALIGNMENT** -L- | **0 HR.** 2.5 |
| **COLLAR ELEV.** 24.1 ft | **NORTHING** 612,443 **US ft** | **EASTING** 2,419,019 **US ft** | **24 HR.** 1.6 |
| **TOTAL DEPTH** 60.3 ft | **DRILL MACHINE** CME-45C Trailer | **DRILL METHOD** Mud Rotary/Core | **HAMMER TYPE** 140-lb Manual |
| **DATE STARTED** 12/1/05 | **COMPLETED** 12/1/05 | **SURFACE WATER DEPTH** N/A | |
| **CORE SIZE** HQ | **TOTAL RUN** 3.6 ft | **DRILLER** T. Hahn | |

| ELEV. (ft) | DEPTH (ft) | RUN (ft) | DRILL RATE (Min/ft) | RUN REC. (ft) % | RUN RQD (ft) % | SAMP. NO. | STRATA REC. (ft) % | STRATA RQD (ft) % | LOG | DESCRIPTION AND REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Begin Coring @ 9.4 ft |
| 14.7 | 9.4 | 3.6 | 0:10 | (2.0) | (N/A) | | (1.5) | (N/A) | | Yorktown Fm: Gray, silty, f. to cse. SAND (A-2-4) *(continued)* |
| | | | 0:10 | 56% | | | 48% | | | 11.6 — 12.5 |
| 11.1 | 13.0 | | 0:20 1:05/0.6 | | | | (0.5) 100% | (N/A) | | Yorktown Fm: Gray, micaceous, f. sandy, silty CLAY (A-7-6) w/ trace shell fragments |
| | | | | | | | | | | Coring terminated at 13.0 ft (Elev. 11.1 ft) in Yorktown Fm: V. stiff, f. sandy, silty CLAY (A-7-6) |

NCDOT CORE SINGLE BRIDGE 43.GPJ NC_DOT.GDT 1/23/06


Bridge No. 43 over Rainbow Creek on SR 1438
B1-B Box 1 of 1 Depth: 9.4 – 13.0 ft
ft
0.5 ft
1.0 ft
1.5 ft
2.0 ft
9.4
13.0

MACTEC

N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

SHEET 1 OF 1

| | | | |
|---|---|---|---|
| **PROJECT NO.** 33480.1.1 | **ID.** B-4127 | **COUNTY** Greene | **GEOLOGIST** B. Deobald |
| **SITE DESCRIPTION** Bridge No. 43 Over Rainbow Creek on SR 1438 (MACTEC Proj. No. 6468-05-1240) | | | **GROUND WATER (ft)** |
| **BORING NO.** B2-A | **BORING LOCATION** 13+76 | **OFFSET** 6 ft LT | **ALIGNMENT** -L- | **0 HR.** 2.8 |
| **COLLAR ELEV.** 24.9 ft | **NORTHING** 612,454 **US ft** | **EASTING** 2,419,065 **US ft** | | **24 HR.** FIAD |
| **TOTAL DEPTH** 66.2 ft | **DRILL MACHINE** CME-45C Trailer | **DRILL METHOD** Mud Rotary/Core | **HAMMER TYPE** 140-lb Manual | |
| **DATE STARTED** 12/2/05 | **COMPLETED** 12/2/05 | **SURFACE WATER DEPTH** N/A | | |

| ELEV. (ft) | DEPTH (ft) | BLOW COUNT 0.5ft | 0.5ft | 0.5ft | BLOWS PER FOOT 0 20 40 60 80 100 | SAMP. NO. | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 24.9 | | | | | Ground Surface | | | | |
| 24.9 | 0.0 | WOH | 2 | 20 | 22 (Invalid due to gravel) | | M | | Roadway Embankment Fill: Rip-rap, gravel; and Alluvial: tan, silty, f. to cse. SAND (A-2-4) |
| 21.4 | 3.5 | | | | | | | | |
| 20.0 | 4.9 | 1 | 0 | 2 | 2 | | W | | Alluvium: Gray, silty, f. to cse. SAND (A-2-4) w/ trace organics |
| 17.4 | 7.5 | | | | | | | | |
| 16.0 | 8.9 | 9 | 7 | 9 | 16 | | W/M | | Yorktown Fm: Gray, clayey, silty, f. to cse. SAND (A-2-4) |
| 11.0 | 13.9 | | | | | | | | |
| 11.0 | 13.9 | 15 | 16 | 18 | 34 | | M | | Yorktown Fm: Gray, micaceous, f. sandy, silty CLAY (A-7-6) w/ trace shell fragments |
| 7.6 | 17.3 | 7 | 7 | 8 | 15 | | M | | |
| 5.2 | 19.7 | 6 | 7 | 9 | 16 | | M | | |
| 2.6 | 22.3 | 4 | 5 | 8 | 13 | | M | | |
| 0.9 | 24.0 | | | | | | | | |
| 0.2 | 24.7 | 21 | 79/0.5' | | 100/1.0' | | W | | Yorktown Fm: Green-gray, silty, f. SAND (A-2-4) |
| -2.4 | 27.3 | 78 | 22/0.1' | | 100/0.6' | | W | | |
| -4.1 | 29.0 | | | | | | | | |
| -4.8 | 29.7 | 6 | 11 | 13 | 24 | | M | | Yorktown Fm: Gray, micaceous, f. sandy, silty CLAY (A-7-6) w/ trace shell fragments |
| -9.8 | 34.7 | 8 | 12 | 16 | 28 | | M | | |
| -13.1 | 38.0 | | | | | | | | |
| -14.8 | 39.7 | 8 | 10 | 13 | 23 | | M | | Yorktown Fm: Gray, micaceous, f. sandy, silty CLAY (A-6) w/ trace shell fragments |
| -19.8 | 44.7 | 6 | 8 | 9 | 17 | | M | | |
| -24.8 | 49.7 | 7 | 8 | 12 | 20 | | M | | |
| -29.8 | 54.7 | 8 | 13 | 15 | 28 | | M | | |
| -34.8 | 59.7 | 8 | 8 | 7 | 15 | | M | | |
| -39.8 | 64.7 | 7 | 10 | 30 | 40 | | M | | |
| -41.3 | 66.2 | | | | | | | | Boring terminated at 66.2 ft (Elev. -41.3 ft) in Yorktown Fm: Hard, f. sandy, silty CLAY (A-6) |

Bits Used: 3" Roller Cone; HQ Surface set core bit

Drilling Fluid Properties: 8.4 lbs/gal

NCDOT BORE SINGLE BRIDGE 43.GPJ NC_DOT.GDT 1/23/06

MACTEC

N.C.D.O.T. GEOTECHNICAL UNIT
CORE BORING REPORT

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SHEET 1 OF 1

| | | | |
|---|---|---|---|
| **PROJECT NO.** 33480.1.1 | **ID.** B-4127 | **COUNTY** Greene | **GEOLOGIST** B. Deobald |
| **SITE DESCRIPTION** Bridge No. 43 Over Rainbow Creek on SR 1438 (MACTEC Proj. No. 6468-05-1240) | | | **GROUND WATER (ft)** |
| **BORING NO.** B2-A | **BORING LOCATION** 13+76 | **OFFSET** 6 ft LT | **ALIGNMENT** -L- | **0 HR.** 2.8 |
| **COLLAR ELEV.** 24.9 ft | **NORTHING** 612,454 **US ft** | **EASTING** 2,419,065 **US ft** | | **24 HR.** FIAD |
| **TOTAL DEPTH** 66.2 ft | **DRILL MACHINE** CME-45C Trailer | **DRILL METHOD** Mud Rotary/Core | **HAMMER TYPE** 140-lb Manual | |
| **DATE STARTED** 12/2/05 | **COMPLETED** 12/2/05 | **SURFACE WATER DEPTH** N/A | | |
| **CORE SIZE** HQ | **TOTAL RUN** 3.5 ft | **DRILLER** T. Hahn | | |

| ELEV. (ft) | DEPTH (ft) | RUN (ft) | DRILL RATE (Min/ft) | RUN REC. (ft) % | RUN RQD (ft) % | SAMP. NO. | STRATA REC. (ft) % | STRATA RQD (ft) % | LOG | DESCRIPTION AND REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Begin Coring @ 10.4 ft |
| 14.5 | 10.4 | 3.5 | 2:00<br>1:35<br>1:00<br>1:10/0.5 | (0.0)<br>0% | (N/A) | | (0.0) | (N/A) | | Yorktown Fm: Gray, clayey, silty, f. to cse. SAND (A-2-4) *(continued)* |
| 11.0 | 13.9 | | | | | | | | | Coring terminated at 13.9 ft (Elev. 11.0 ft) in Yorktown Fm: Hard, f. sandy, silty CLAY (A-7-6) |

NCDOT CORE SINGLE BRIDGE 43.GPJ NC_DOT.GDT 1/23/06

N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

15

SHEET 1 OF 1

| | | | |
|---|---|---|---|
| **PROJECT NO.** 33480.1.1 | **ID.** B-4127 | **COUNTY** Greene | **GEOLOGIST** R.L.E. |
| **SITE DESCRIPTION** Bridge No. 43 on SR 1438 Over Rainbow Creek | | | **GROUND WATER (ft)** |
| **BORING NO.** NCDOT Prelim | **BORING LOCATION** 14+03 | **OFFSET** 14 ft RT | **ALIGNMENT** -L- | **0 HR.** NM |
| **COLLAR ELEV.** | **NORTHING** 612,434 **US ft** | **EASTING** 2,419,092 **US ft** | | **24 HR.** |
| **TOTAL DEPTH** 70.2 ft | **DRILL MACHINE** CME 45B | **DRILL METHOD** Rotary-Mud | **HAMMER TYPE** AUTO |
| **DATE STARTED** 9/13/02 | **COMPLETED** | **SURFACE WATER DEPTH** N/A | |

| ELEV. (ft) | DEPTH (ft) | BLOW COUNT 0.5ft | 0.5ft | 0.5ft | BLOWS PER FOOT 0 20 40 60 80 100 | SAMP. NO. | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Ground Surface | | | | 0.0 |
| | 0.0 | 1 | 1 | 2 | 3 | | M | | Roadway Embankment Fill: Tan-brown, silty, fine to coarse SAND (A-2-4) |
| | 4.0 | 1 | 1 | 2 | 3 | | M | | |
| | 8.7 | 1 | 2 | 2 | 4 | | M | | |
| | 13.7 | 1 | 2 | 1 | 3 | | Sat. | | 12.0 Alluvium: Dark brown, slightly organic, silty, fine to coarse SAND (A-2-4) |
| | 18.7 | 1 | 2 | 3 | 5 | | Sat. | | 17.0 Yorktown Formation: Gray, clayey, silty, fine to coarse SAND (A-2-4) with trace shell fragments |
| | 23.7 | 6 | 8 | 12 | 20 | | W | | 22.0 Yorktown Formation: Dark gray, micaceous, clayey, fine sandy SILT (A-4) |
| | 28.7 | 4 | 6 | 9 | 15 | | W | | |
| | 33.7 | 47 | 53/0.3' | | 100/0.8' | | | | 33.0 Yorktown Formation: Green-gray, silty, fine SAND (A-2-4) |
| | 38.7 | 5 | 7 | 10 | 17 | | W | | 36.0 Yorktown Formation: Dark gray, micaceous, slightly organic, silty clay (A-7-5) |
| | 43.7 | 6 | 9 | 10 | 19 | | W | | |
| | 48.7 | 6 | 5 | 8 | 13 | | W | | |
| | 53.7 | 5 | 6 | 7 | 13 | | W | | |
| | 58.7 | 6 | 8 | 9 | 17 | | M/W | | 57.0 Yorktown Formation: Dark gray, silty, sandy CLAY (A-6) with shell fragments |
| | 63.7 | 6 | 7 | 10 | 17 | | M/W | | |
| | 68.7 | 4 | 7 | 8 | 15 | | M/W | | 70.2 Boring terminated at 70.2 ft Note: Boring collar elevation, completion date and 24-hr groundwater measurement information not provided. |

NCDOT BORE SINGLE BRIDGE 43.GPJ NC_DOT.GDT 1/20/06

MACTEC

N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

SHEET 1 OF 1

| | | | |
|---|---|---|---|
| **PROJECT NO.** 33480.1.1 | **ID.** B-4127 | **COUNTY** Greene | **GEOLOGIST** B. Deobald |
| **SITE DESCRIPTION** Bridge No. 43 Over Rainbow Creek on SR 1438 (MACTEC Proj. No. 6468-05-1240) | | | **GROUND WATER (ft)** |
| **BORING NO.** B3-A | **BORING LOCATION** 14+22 | **OFFSET** 11 ft LT | **ALIGNMENT** -L- | **0 HR.** 0.4 |
| **COLLAR ELEV.** 32.3 ft | **NORTHING** 612,459 **US ft** | **EASTING** 2,419,112 **US ft** | | **24 HR.** 4.5 |
| **TOTAL DEPTH** 62.5 ft | **DRILL MACHINE** CME-45C Trailer | **DRILL METHOD** Mud Rotary/Core | **HAMMER TYPE** 140-lb Manual | |
| **DATE STARTED** 11/28/05 | **COMPLETED** 11/29/05 | **SURFACE WATER DEPTH** N/A | | |

| ELEV. (ft) | DEPTH (ft) | BLOW COUNT 0.5ft | 0.5ft | 0.5ft | BLOWS PER FOOT 0 20 40 60 80 100 | SAMP. NO. | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 32.3 | | | | | Ground Surface | | | | 32.3 |
| 32.3 | 0.0 | 3 | 5 | 4 | 9 | | M | | Roadway Embankment Fill: Tan and gray, silty, f. to cse. SAND (A-2-4) |
| 29.0 | 3.3 | | | | | | | | 30.3 2.0 Roadway Embankment Fill: Tan, silty, f. SAND (A-3) |
| | | 6 | 4 | 4 | 8 | | | | |
| 24.8 | 7.5 | | | | | | W | | 25.8 6.5 Alluvium: Tan, silty, f. SAND (A-3) |
| | | 4 | 4 | 3 | 7 | | | | |
| 19.8 | 12.5 | | | | | | Sat. | | |
| | | 9 | 11 | 9 | 20 | | | | 17.3 15.0 Yorktown Fm: Gray, silty f. SAND (A-2-4) |
| 16.3 | 16.0 | | | | | | M | | |
| | | 5 | 5 | 5 | 10 | | | | 13.0 19.3 |
| 11.3 | 21.0 | | | | | | | | 12.5 19.8 Yorktown Fm: Gray, thinly bedded, fossiliferous, mod. indurated, SANDSTONE |
| | | 18 | 19 | 18 | 37 | | M | | Yorktown Fm: Gray, micaceous, f. sandy, silty CLAY (A-7-6) w/ trace shell fragments |
| 6.3 | 26.0 | | | | | | | | |
| | | 8 | 9 | 13 | 22 | | M | | |
| 1.3 | 31.0 | | | | | | | | |
| | | 7 | 11 | 21 | 32 | | M | | -0.2 32.5 Yorktown Fm: Green-gray, silty, f. SAND (A-2-4) |
| -3.7 | 36.0 | | | | | | | | -4.2 36.5 |
| | | 14 | 13 | 15 | 28 | | W | | Yorktown Fm: Gray, micaceous, f. sandy, silty, CLAY (A-7-6) w/ trace shell fragments |
| -8.7 | 41.0 | | | | | | | | |
| | | 7 | 11 | 16 | 27 | | M | | -10.2 42.5 Yorktown Fm: Gray, micaceous, f. sandy, silty CLAY (A-6) w/ trace shell fragments |
| -13.7 | 46.0 | | | | | | | | |
| | | 11 | 12 | 17 | 29 | | M | | |
| -18.7 | 51.0 | | | | | | | | |
| | | 9 | 12 | 20 | 32 | | M | | |
| -23.7 | 56.0 | | | | | | | | |
| | | 10 | 13 | 13 | 26 | | M | | |
| -28.7 | 61.0 | | | | | | | | |
| | | 10 | 11 | 12 | 23 | | M | | -30.2 62.5 Boring terminated at 62.5 ft (Elev. -30.2 ft) in Yorktown Fm: V. stiff, f. sandy, silty CLAY (A-6) |

Bits Used: 3" Roller Cone; HQ Surface set core bit

Drilling Fluid Properties: 8.5 lbs/gal

NCDOT BORE SINGLE BRIDGE 43.GPJ NC_DOT.GDT 1/23/06

MACTEC

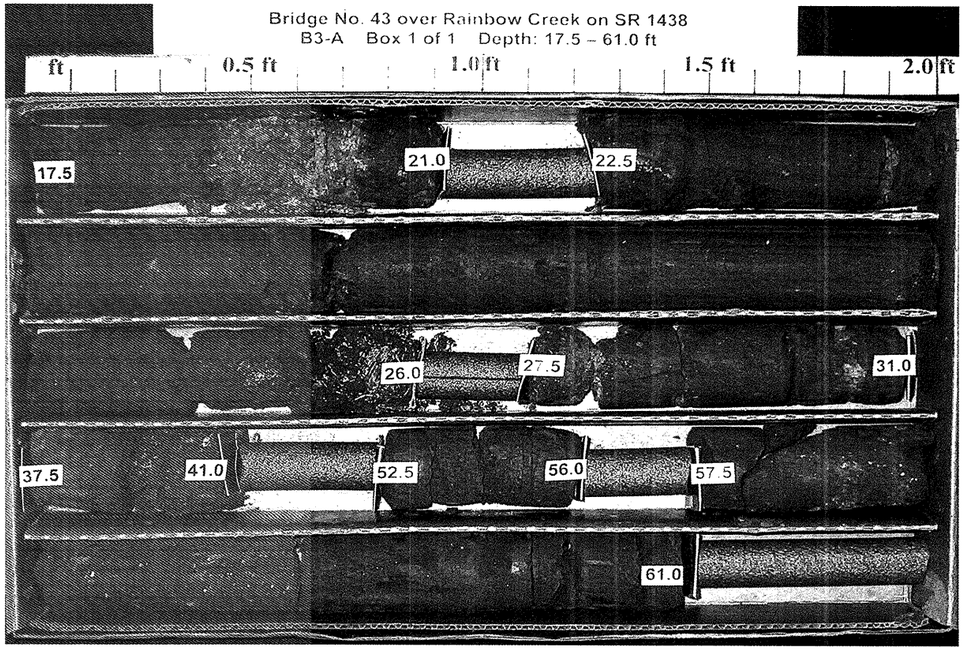
N.C.D.O.T. GEOTECHNICAL UNIT
CORE BORING REPORT 16

SHEET 1 OF 1

| | | | |
|---|---|---|---|
| **PROJECT NO.** 33480.1.1 | **ID.** B-4127 | **COUNTY** Greene | **GEOLOGIST** B. Deobald |
| **SITE DESCRIPTION** Bridge No. 43 Over Rainbow Creek on SR 1438 (MACTEC Proj. No. 6468-05-1240) | | | **GROUND WATER (ft)** |
| **BORING NO.** B3-A | **BORING LOCATION** 14+22 | **OFFSET** 11 ft LT | **ALIGNMENT** -L- | **0 HR.** 0.4 |
| **COLLAR ELEV.** 32.3 ft | **NORTHING** 612,459 **US ft** | **EASTING** 2,419,112 **US ft** | | **24 HR.** 4.5 |
| **TOTAL DEPTH** 62.5 ft | **DRILL MACHINE** CME-45C Trailer | **DRILL METHOD** Mud Rotary/Core | **HAMMER TYPE** 140-lb Manual | |
| **DATE STARTED** 11/28/05 | **COMPLETED** 11/29/05 | **SURFACE WATER DEPTH** N/A | | |
| **CORE SIZE** HQ | **TOTAL RUN** 31.5 ft | **DRILLER** T. Hahn | | |

| ELEV. (ft) | DEPTH (ft) | RUN (ft) | DRILL RATE (Min/ft) | RUN REC. (ft) % | RUN RQD (ft) % | SAMP. NO. | STRATA REC. (ft) % | STRATA RQD (ft) % | LOG | DESCRIPTION AND REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Begin Coring @ 17.5 ft |
| 14.8 | 17.5 | 3.5 | 0:18 3:10 0:30 0:20/0.5 N=37 | (1.0) 29% | (N/A) | | (0.5) 28% | (N/A) | | 13.0 18.3 Yorktown Fm: Gray, silty f. SAND (A-2-4) *(continued)* |
| 11.3 | 21.0 | | | | | | (0.5) 100% | (N/A) | | 12.5 18.8 Yorktown Fm: Gray, thinly bedded, fossiliferous, mod. indurated, SANDSTONE |
| 9.8 | 22.5 | 3.5 | 1:00 1:25 0:40 0:30/0.5 N=22 | (3.5) 100% | (N/A) | | (4.3) 52% | (N/A) | | Yorktown Fm: Gray, micaceous, f. sandy, silty CLAY (A-7-6) w/ trace shell fragments |
| 6.3 | 26.0 | | | | | | | | | |
| 4.8 | 27.5 | 3.5 | 0:15 0:17 0:17 0:09/0.5 N=32 | (0.8) 23% | (N/A) | | | | | |
| 1.3 | 31.0 | | | | | | | | | |
| -0.2 | 32.5 | 3.5 | 0:25 0:21 0:20 0:07/0.5 N=28 | (0.0) 0% | (N/A) | | (0.0) 0% | (N/A) | | -0.2 32.5 Yorktown Fm: Green-gray, silty, f. SAND (A-2-4) |
| -3.7 | 36.0 | | | | | | | | | -4.2 36.5 |
| -5.2 | 37.5 | 3.5 | 0:30 0:13 0:15 0:12/0.5 N=27 | (0.4) 11% | (N/A) | | (0.4) 11% | (N/A) | | Yorktown Fm: Gray, micaceous, f. sandy, silty, CLAY (A-7-6) w/ trace shell fragments |
| -8.7 | 41.0 | | | | | | | | | -10.2 42.5 |
| -10.2 | 42.5 | 3.5 | 1:10 2:00 1:15 0:20/0.5 N=29 | (0.0) 0% | (N/A) | | (2.3) 16% | (N/A) | | Yorktown Fm: Gray, micaceous, f. sandy, silty CLAY (A-6) w/ trace shell fragments |
| -13.7 | 46.0 | | | | | | | | | |
| -15.2 | 47.5 | 3.5 | 0:38 0:30 0:25 0:15/0.5 N=32 | (0.0) 0% | (N/A) | | | | | |
| -18.7 | 51.0 | | | | | | | | | |
| -20.2 | 52.5 | 3.5 | 0:23 0:25 1:00 0:25/0.5 N=26 | (0.4) 11% | (N/A) | | | | | |
| -23.7 | 56.0 | | | | | | | | | |
| -25.2 | 57.5 | 3.5 | 0:25 0:45 0:25 0:15/0.5 | (1.9) 54% | (N/A) | | | | | |
| -28.7 | 61.0 | | | | | | | | | -28.7 61.0 Coring terminated at 61.0 ft (Elev. -28.7 ft) in Yorktown Fm: V. stiff, f. sandy, silty CLAY (A-6) |

NCDOT CORE SINGLE BRIDGE 43.GPJ NC_DOT.GDT 1/23/06


Bridge No. 43 over Rainbow Creek on SR 1438
B3-A Box 1 of 1 Depth: 17.5 – 61.0 ft
ft
0.5 ft
1.0 ft
1.5 ft
2.0 ft
17.5
21.0
22.5
26.0
27.5
31.0
37.5
41.0
52.5
56.0
57.5
61.0

MACTEC

N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

SHEET 1 OF 1

| | | | |
|---|---|---|---|
| **PROJECT NO.** 33480.1.1 | **ID.** B-4127 | **COUNTY** Greene | **GEOLOGIST** B. Deobald |
| **SITE DESCRIPTION** Bridge No. 43 Over Rainbow Creek on SR 1438 (MACTEC Proj. No. 6468-05-1240) | | | **GROUND WATER (ft)** |
| **BORING NO.** B3-B | **BORING LOCATION** 14+22 | **OFFSET** 9 ft RT | **ALIGNMENT** -L- | **0 HR.** 4.4 |
| **COLLAR ELEV.** 32.3 ft | **NORTHING** 612,439 **US ft** | **EASTING** 2,419,112 **US ft** | | **24 HR.** 4.3 |
| **TOTAL DEPTH** 68.9 ft | **DRILL MACHINE** CME-45C Trailer | **DRILL METHOD** Mud Rotary/Core | **HAMMER TYPE** 140-lb Manual | |
| **DATE STARTED** 11/30/05 | **COMPLETED** 11/30/05 | **SURFACE WATER DEPTH** N/A | | |

| ELEV. (ft) | DEPTH (ft) | BLOW COUNT 0.5ft | 0.5ft | 0.5ft | BLOWS PER FOOT 0 20 40 60 80 100 | SAMP. NO. | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 32.3 | | | | | Ground Surface | | | | |
| 32.3 | 0.0 | 4 | 5 | 4 | 9 | | M | | Roadway Embankment Fill: Tan, silty, f. to cse. SAND (A-2-4) |
| 29.7 | 2.6 | | | | | | | | |
| 24.7 | 7.6 | 3 | 2 | 3 | 5 | | | | |
| 19.7 | 12.6 | 2 | 2 | 2 | 4 | | W | | |
| 15.3 | 17.0 | 5 | 5 | 6 | 11 | | W | | |
| 11.0 | 21.3 | 4 | 4 | 3 | 7 | | W | | 21.8 10.5 Alluvium: Tan and gray, silty, f. SAND (A-3) |
| 7.4 | 24.9 | 6 | 9 | 14 | 23 | | M | | 16.8 15.5 Yorktown Fm: Gray, silty, f. to cse. SAND (A-2-4) |
| 4.9 | 27.4 | 7 | 8 | 12 | 20 | | M | | 12.8 19.5 Yorktown Fm: Gray, thinly bedded, fossiliferous, friable to mod. indurated, SANDSTONE |
| 2.4 | 29.9 | 5 | 7 | 9 | 16 | | M | | 12.3 20.0 Yorktown Fm: Gray, micaceous, f. sandy,silty CLAY (A-7-6) w/ trace shell fragments and organics |
| -0.1 | 32.4 | 6 | 7 | 10 | 17 | | M | | |
| -0.6 | 33.1 | 54 | 46/0.2' | | | | W | | 0.3 32.0 Yorktown Fm: Green-gray, silty, f. SAND (A-2-4) |
| -2.6 | 34.9 | 90 | 10/0.1' | | 100/0.7 100/0.6 | | W | | |
| -5.1 | 37.4 | 76 | 24/0.1' | | 100/0.6 | | W | | -4.7 37.0 Yorktown Fm: Gray, micaceous, f. sandy, silty, CLAY (A-7-6) w/ trace shell fragments |
| -10.1 | 42.4 | 7 | 10 | 14 | 24 | | M | | |
| -15.1 | 47.4 | 8 | 12 | 17 | 29 | | M | | -13.2 45.5 Yorktown Fm: Gray, micaceous, f. sandy, silty CLAY (A-6) w/ trace shell fragments |
| -20.1 | 52.4 | 6 | 10 | 14 | 24 | | M | | |
| -25.1 | 57.4 | 6 | 8 | 12 | 20 | | M | | |
| -30.1 | 62.4 | 6 | 10 | 14 | 24 | | M | | |
| -35.1 | 67.4 | 8 | 12 | 25 | 37 | | M | | |
| | | 7 | 10 | 13 | 23 | | M | | -36.6 68.9 Boring terminated at 68.9 ft (Elev. -36.6 ft) in Yorktown Fm: V. stiff, f. sandy, silty CLAY (A-6) |

Bits Used: 3" Roller Cone; HQ Surface set core bit

Drilling Fluid Properties: 8.4 lbs/gal

NCDOT BORE SINGLE BRIDGE 43.GPJ NC_DOT.GDT 1/23/06

MACTEC

N.C.D.O.T. GEOTECHNICAL UNIT
CORE BORING REPORT

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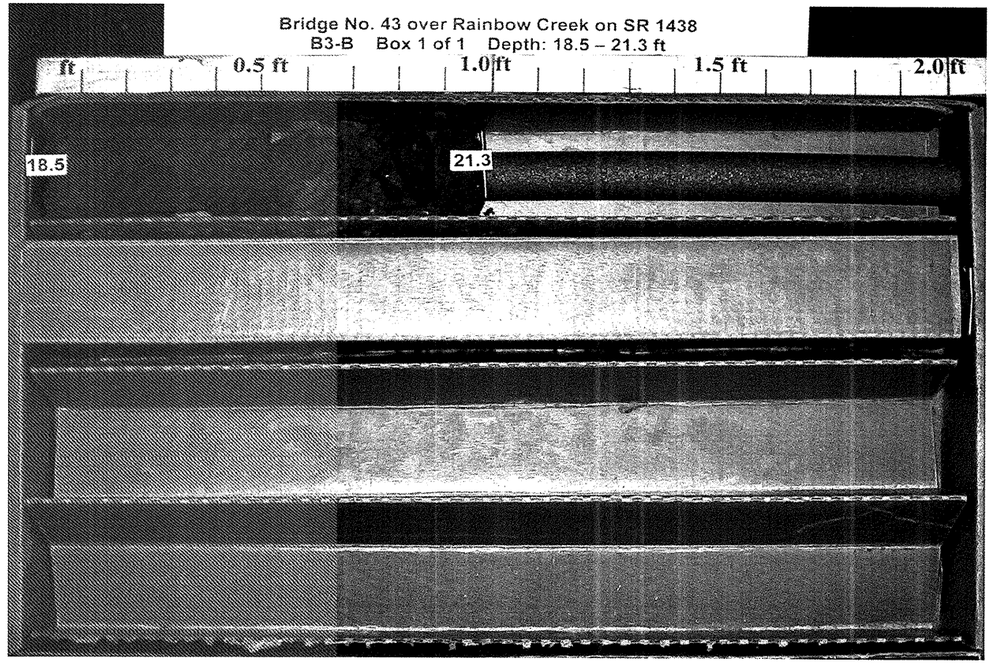
SHEET 1 OF 1

| | | | |
|---|---|---|---|
| **PROJECT NO.** 33480.1.1 | **ID.** B-4127 | **COUNTY** Greene | **GEOLOGIST** B. Deobald |
| **SITE DESCRIPTION** Bridge No. 43 Over Rainbow Creek on SR 1438 (MACTEC Proj. No. 6468-05-1240) | | | **GROUND WATER (ft)** |
| **BORING NO.** B3-B | **BORING LOCATION** 14+22 | **OFFSET** 9 ft RT | **ALIGNMENT** -L- | **0 HR.** 4.4 |
| **COLLAR ELEV.** 32.3 ft | **NORTHING** 612,439 **US ft** | **EASTING** 2,419,112 **US ft** | | **24 HR.** 4.3 |
| **TOTAL DEPTH** 68.9 ft | **DRILL MACHINE** CME-45C Trailer | **DRILL METHOD** Mud Rotary/Core | **HAMMER TYPE** 140-lb Manual | |
| **DATE STARTED** 11/30/05 | **COMPLETED** 11/30/05 | **SURFACE WATER DEPTH** N/A | | |
| **CORE SIZE** HQ | **TOTAL RUN** 2.8 ft | **DRILLER** T. Hahn | | |

| ELEV. (ft) | DEPTH (ft) | RUN (ft) | DRILL RATE (Min/ft) | RUN REC. (ft) % | RUN RQD (ft) % | SAMP. NO. | STRATA REC. (ft) % | STRATA RQD (ft) % | LOG | DESCRIPTION AND REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Begin Coring @ 18.5 ft |
| 13.8 | 18.5 | 2.8 | 0:12 | (1.0) | (N/A) | | (0.5) | (N/A) | | 12.8 18.5 Yorktown Fm: Gray, silty, f. to cse. SAND (A-2-4) *(continued)* |
| 11.0 | 21.3 | | 5:00 | 36% | | | 50% | (N/A) | | 12.3 20.0 Yorktown Fm: Gray, thinly bedded, fossiliferous, friable to mod. indurated, |
| | | | 0:10/0.8 | | | | (0.5) | (N/A) | | 11.0 21.3 SANDSTONE |
| | | | | | | | 100% | | | Yorktown Fm: Gray, micaceous, f. sandy,silty CLAY (A-7-6) w/ trace shell fragments and organics |
| | | | | | | | (0.0) | | | Coring terminated at 21.3 ft (Elev. 11.0 ft) in Yorktown Fm: V. stiff, f. sandy, silty CLAY (A-7-6) |
| | | | | | | | 0% | | | |

NCDOT CORE SINGLE BRIDGE 43.GPJ NC_DOT.GDT 1/23/06


Bridge No. 43 over Rainbow Creek on SR 1438
B3-B Box 1 of 1 Depth: 18.5 – 21.3 ft
ft
0.5 ft
1.0 ft
1.5 ft
2.0 ft
18.5
21.3

N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

MACTEC

SHEET 1 OF 1

| | | | |
|---|---|---|---|
| **PROJECT NO.** 33480.1.1 | **ID.** B-4127 | **COUNTY** Greene | **GEOLOGIST** W. Grimes |
| **SITE DESCRIPTION** Bridge No. 43 Over Rainbow Creek on SR 1438 (MACTEC Proj. No. 6468-05-1240) | | | **GROUND WATER (ft)** |
| **BORING NO.** EB2-A | **BORING LOCATION** 14+55 | **OFFSET** 11 ft LT | **ALIGNMENT** -L- | **0 HR.** 3.2 |
| **COLLAR ELEV.** 32.5 ft | **NORTHING** 612,459 **US ft** | **EASTING** 2,419,144 **US ft** | **24 HR.** 4.6 |
| **TOTAL DEPTH** 59.3 ft | **DRILL MACHINE** CME-45C Trailer | **DRILL METHOD** Mud Rotary | **HAMMER TYPE** 140-lb Manual |
| **DATE STARTED** 11/22/05 | **COMPLETED** 11/22/05 | **SURFACE WATER DEPTH** N/A | |

| ELEV. (ft) | DEPTH (ft) | BLOW COUNT 0.5ft | 0.5ft | 0.5ft | BLOWS PER FOOT 0 20 40 60 80 100 | SAMP. NO. | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 32.5 | | | | | Ground Surface | | | | |
| 32.5 | 0.0 | 5 | 6 | 11 | 17 | SS-10 | M | | Roadway Embankment Fill: Gray to light brown and brown, silty, f. to cse. SAND (A-2-4) w/ trace organics |
| 29.6 | 2.9 | | | | | | | | 32.5 0.0 |
| 27.1 | 5.4 | 5 | 12 | 11 | 23 | | | | 28.0 4.5 |
| 24.8 | 7.7 | 3 | 2 | 3 | 5 | SS-11 | M | | Alluvium: Brown and gray, silty, f. to cse. SAND (A-3) w/ trace organics and gravel |
| 22.3 | 10.2 | 12 | 11 | 16 | 27 | | M | | |
| 19.8 | 12.7 | 10 | 11 | 10 | 21 | | W | | 20.5 12.0 |
| 17.1 | 15.4 | 10 | 22 | 15 | 37 | | W | | 18.3 14.2 Yorktown Fm: Gray to dark gray, clayey, silty, f. to cse. SAND (A-2-4) w/ trace organics |
| 14.7 | 17.8 | 9 | 12 | 13 | 25 | SS-12 | W | | Yorktown Fm: Dark gray, f. sandy, silty CLAY (A-7-6) |
| 12.0 | 20.5 | 4 | 5 | 5 | 10 | | W | | 15.5 17.0 Yorktown Fm: Dark gray, clayey, silty, f. to cse. SAND (A-2-4) |
| 9.8 | 22.7 | 6 | 13 | 15 | 28 | | M | | 12.6 19.9 Yorktown Fm: Dark gray-green and dark gray to black, micaceous, f. sandy, silty CLAY (A-7-5) w/ trace shell fragments and lignite |
| 7.1 | 25.4 | 8 | 13 | 17 | 30 | SS-13 | 49.1% | | |
| 4.8 | 27.7 | 7 | 12 | 14 | 26 | | M | | |
| 2.1 | 30.4 | 7 | 20 | 23 | 43 | | M | | |
| -0.2 | 32.7 | 8 | 14 | 16 | 30 | | M | | 0.2 32.3 |
| -2.9 | 35.4 | 26 | 74/0.5' | | 100/1.0 | SS-14 | W | | Yorktown Fm: Gray-green, silty, f. SAND (A-2-4) w/ trace shell fragments |
| -5.2 | 37.7 | 43 | 57/0.5' | | 100/1.0 | | W | | -4.8 37.3 |
| -7.9 | 40.4 | 8 | 12 | 14 | 26 | SS-15 | 28.3% | | Yorktown Fm: Dark gray, micaceous, silty, CLAY (A-7-6) w/ trace shells and lignite |
| -10.2 | 42.7 | 8 | 10 | 13 | 23 | | W | | |
| -15.2 | 47.7 | 11 | 16 | 18 | 34 | SS-16 | 32.6% | | -13.4 45.9 |
| -20.3 | 52.8 | 6 | 11 | 15 | 26 | | M | | Yorktown Fm: Dark gray, sandy, silty CLAY (A-6) w/ trace shell fragments |
| -25.3 | 57.8 | 7 | 11 | 13 | 24 | | M | | |
| | | 8 | 11 | 13 | 24 | | M | | -26.8 59.3 |
| | | | | | | | | | Boring terminated at 59.3 ft (Elev. -26.8 ft) in Yorktown Fm: V. stiff, sandy, silty CLAY (A-6) |
| | | | | | | | | | Bits Used: 3" Roller Cone |
| | | | | | | | | | Drilling Fluid Properties: 8.1 lbs/gal |

NCDOT BORE SINGLE BRIDGE 43.GPJ NC_DOT.GDT 1/23/06

N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

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MACTEC

SHEET 1 OF 1

| | | | |
|---|---|---|---|
| **PROJECT NO.** 33480.1.1 | **ID.** B-4127 | **COUNTY** Greene | **GEOLOGIST** W. Grimes |
| **SITE DESCRIPTION** Bridge No. 43 Over Rainbow Creek on SR 1438 (MACTEC Proj. No. 6468-05-1240) | | | **GROUND WATER (ft)** |
| **BORING NO.** EB2-B | **BORING LOCATION** 14+56 | **OFFSET** 9 ft RT | **ALIGNMENT** -L- | **0 HR.** 5.5 |
| **COLLAR ELEV.** 32.6 ft | **NORTHING** 612,439 **US ft** | **EASTING** 2,419,145 **US ft** | **24 HR.** 3.8 |
| **TOTAL DEPTH** 59.3 ft | **DRILL MACHINE** CME-45C Trailer | **DRILL METHOD** Mud Rotary | **HAMMER TYPE** 140-lb Manual |
| **DATE STARTED** 11/23/05 | **COMPLETED** 11/23/05 | **SURFACE WATER DEPTH** N/A | |

| ELEV. (ft) | DEPTH (ft) | BLOW COUNT 0.5ft | 0.5ft | 0.5ft | BLOWS PER FOOT 0 20 40 60 80 100 | SAMP. NO. | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 32.6 | | | | | Ground Surface | | | | |
| 32.6 | 0.0 | 6 | 5 | 6 | 11 | | M | | Roadway Embankment Fill: Gray to brown, silty, f. to cse. SAND (A-2-4) w/ ABC stone and trace organics |
| 29.7 | 2.9 | | | | | | | | 32.6 0.0 |
| 27.9 | 4.7 | | | | | | ▽ | | Alluvium: Brown and light brown, silty, f. to cse. SAND (A-3) w/ trace organics and gravel |
| 24.7 | 7.9 | 12 | 11 | 8 | 19 | | | | |
| 20.1 | 12.5 | 6 | 6 | 8 | 14 | | M | | |
| 19.8 | 12.8 | 9 | 15 | 19 | 34 | | Sat. | | Yorktown Fm: Light green, silty, f. to cse. SAND (A-2-4) |
| 18.0 | 14.6 | 8 | 13 | 16 | 29 | | W | | Yorktown Fm: Dark gray, micaceous, sandy, silty CLAY (A-7-6) |
| 15.5 | 17.1 | 7 | 8 | 9 | 17 | | M | | Yorktown Fm: Dark gray, micaceous, silty, f. SAND (A-2-4) |
| 12.6 | 20.0 | 60 | 16 | 13 | 29 | | M | | 12.6 20.0 Yorktown Fm: Gray, thinly bedded, fossiliferous, friable, SANDSTONE |
| 12.1 | 20.5 | | | | | | | | Yorktown Fm: Dark gray, micaceous, sandy, silty CLAY (A-7-5) w/ trace to little shell fragments and trace organics |
| 9.9 | 22.7 | 8 | 12 | 16 | 28 | | M | | |
| 7.1 | 25.5 | 9 | 13 | 18 | 31 | | M | | |
| 2.1 | 30.5 | 7 | 11 | 16 | 27 | | M | | 0.2 32.4 |
| -0.2 | 32.8 | 18 | 82/0.4' | | 100/0.9 | | M | | Yorktown Fm: Green and gray, silty, f. SAND (A-2-4) w/ trace organics and shell fragments |
| -3.4 | 36.0 | | | | | | | | -3.4 36.0 Yorktown Fm: Dark gray, micaceous, sandy, silty CLAY (A-7-6) w/ trace organics and shell fragments |
| -5.2 | 37.8 | 8 | 12 | 17 | 29 | | M | | |
| -10.2 | 42.8 | 8 | 12 | 18 | 30 | | M | | |
| -13.4 | 46.0 | | | | | | | | -13.4 46.0 Yorktown Fm: Dark gray, micaceous, sandy, silty CLAY (A-6) w/ trace organics and shell fragments |
| -15.2 | 47.8 | 7 | 10 | 13 | 23 | | M | | |
| -20.2 | 52.8 | 6 | 9 | 12 | 21 | | M | | |
| -25.2 | 57.8 | 9 | 13 | 19 | 32 | | M | | -26.7 59.3 |
| | | | | | | | | | Boring terminated at 59.3 ft (Elev. -26.7 ft) in Yorktown Fm: Hard, sandy, silty CLAY (A-6) |
| | | | | | | | | | Bits Used: 3" Roller Cone |
| | | | | | | | | | Drilling Fluid Properties: 8.2 lbs/gal |

NCDOT BORE SINGLE BRIDGE 43.GPJ NC_DOT.GDT 1/23/06

# MACTEC

## MACTEC ENGINEERING AND CONSULTING, INC.

3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

## N.C.D.O.T./AASHTO CLASSIFICATIONS

### REPORT ON SAMPLES OF: SOILS FOR QUALITY

**MACTEC PROJECT NAME AND NUMBER:** BRIDGE N0. 43 OVER RAINBOW CREEK ON SR 1438 (6468-05-1240)

**PROJECT:** 33480.1.1 (B-4127) **COUNTY:** GREENE **OWNER:** N.C.D.O.T.

**DATE SAMPLED:** November, 2005 **RECEIVED:** 11/28/2005 **REPORTED BY:** MACTEC

**SAMPLED FROM:** EB1-A

**SUBMITTED BY:** MACTEC ENGINEERING AND CONSULTING, INC.

**1992 STANDARD SPECIFICATIONS**

**TEST RESULTS**

| Lab Sample No. | | SS-1 | SS-2 | SS-3 | SS-4 | SS-5 | SS-6 |
|---|---|---|---|---|---|---|---|
| Retained 4.75 mm Sieve | (%) | 0.0 | 0.0 | 2.9 | 0.0 | 0.0 | 0.0 |
| Passing 2.00 mm Sieve | (%) | 99.5 | 100.0 | 94.1 | 100.0 | 100.0 | 100.0 |
| Passing 425 µm Sieve | (%) | 89.1 | 93.5 | 47.8 | 98.9 | 79.4 | 99.4 |
| Passing 75 µm Sieve | (%) | 16.8 | 6.1 | 4.1 | 36.0 | 17.9 | 73.2 |

**MINUS 2.00mm FRACTION**

| SOIL MORTAR - 100% | | | | | | | |
|---|---|---|---|---|---|---|---|
| Coarse Sand Ret - 250 µm | (%) | 26.1 | 33.8 | 81.2 | 4.6 | 41.1 | 12.9 |
| Fine Sand Ret - 53 µm | (%) | 60.1 | 61.4 | 14.8 | 61.9 | 43.5 | 16.5 |
| Silt 0.05 - 0.005 mm | (%) | 5.6 | 0.5 | 0.3 | 8.0 | 3.9 | 31.9 |
| Clay < 0.005 mm | (%) | 8.1 | 4.3 | 3.7 | 25.5 | 11.5 | 38.7 |

| Moisture Content | (%) | ND | ND | ND | 31.6 | ND | 25.5 |
|---|---|---|---|---|---|---|---|
| Liquid Limit, L.L. | | 19 | 19 | 18 | 39 | 21 | 54 |
| Plasticity Index, P.I. | | NP | NP | NP | 17 | NP | 30 |
| AASHTO Classification | | A-2-4(0) | A-3 | A-1-b | A-6(2) | A-2-4(0) | A-7-6(22) |
| Organic Content | (%) | ND | ND | ND | ND | ND | ND |

| Boring No. | | EB1-A | EB1-A | EB1-A | EB1-A | EB1-A | EB1-A |
|---|---|---|---|---|---|---|---|
| Station | | 12+83 | 12+83 | 12+83 | 12+83 | 12+83 | 12+83 |
| Offset | | 13 LT | 13 LT | 13 LT | 13 LT | 13 LT | 13 LT |
| Alignment | | -L- | -L- | -L- | -L- | -L- | -L- |
| Depth (ft) | From | 4.4' | 6.8' | 11.8' | 14.3' | 19.3' | 24.3' |
| | to | 5.9' | 8.3' | 13.3' | 15.8' | 20.4' | 25.8' |

REMARKS: ND=Not Determined, NP=Non-Plastic

Submitted by: DZUNG NGUYEN


# MACTEC

## MACTEC ENGINEERING AND CONSULTING, INC.

3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

## N.C.D.O.T./AASHTO CLASSIFICATIONS

### REPORT ON SAMPLES OF: SOILS FOR QUALITY


**MACTEC PROJECT NAME AND NUMBER:** BRIDGE N0. 43 OVER RAINBOW CREEK ON SR 1438 (6468-05-1240)

**PROJECT:** 33480.1.1 (B-4127) **COUNTY:** GREENE **OWNER:** N.C.D.O.T.

**DATE SAMPLED:** November, 2005 **RECEIVED:** 11/28/2005 **REPORTED BY:** MACTEC

**SAMPLED FROM:** EB1-A AND EB2-A


**SUBMITTED BY:** MACTEC ENGINEERING AND CONSULTING, INC.

**1992 STANDARD SPECIFICATIONS**

**TEST RESULTS**


| Lab Sample No. | | SS-7 | SS-8 | SS-9 | SS-10 | SS-11 | SS-12 |
|---|---|---|---|---|---|---|---|
| Retained 4.75 mm Sieve | (%) | 0.0 | 0.0 | 0.0 | 1.9 | 0.0 | 0.0 |
| Passing 2.00 mm Sieve | (%) | 100.0 | 100.0 | 100.0 | 93.3 | 100.0 | 99.5 |
| Passing 425 µm Sieve | (%) | 99.8 | 99.8 | 97.2 | 52.4 | 95.7 | 97.1 |
| Passing 75 µm Sieve | (%) | 23.4 | 88.8 | 61.0 | 11.6 | 7.8 | 41.7 |


**MINUS 2.00mm FRACTION**


| SOIL MORTAR - 100% | | | | | | | |
|---|---|---|---|---|---|---|---|
| Coarse Sand Ret - 250 µm | (%) | 1.5 | 0.4 | 8.7 | 57.6 | 23.1 | 6.7 |
| Fine Sand Ret - 53 µm | (%) | 83.5 | 21.4 | 51.4 | 32.6 | 70.9 | 54.3 |
| Silt 0.05 - 0.005 mm | (%) | 6.4 | 37.0 | 15.4 | 4.2 | 0.7 | 10.4 |
| Clay < 0.005 mm | (%) | 8.6 | 41.2 | 24.5 | 5.7 | 5.3 | 28.6 |

| Moisture Content | (%) | ND | 32.6 | 26.0 | ND | ND | ND |
|---|---|---|---|---|---|---|---|
| Liquid Limit, L.L. | | 27 | 65 | 37 | 21 | 19 | 47 |
| Plasticity Index, P.I. | | NP | 41 | 16 | NP | NP | 25 |
| AASHTO Classification | | A-2-4(0) | A-7-6(40) | A-6(8) | A-2-4(0) | A-3 | A-7-6(6) |
| Organic Content | (%) | ND | ND | ND | ND | ND | ND |

| Boring No. | | EB1-A | EB1-A | EB1-A | EB2-A | EB2-A | EB2-A |
|---|---|---|---|---|---|---|---|
| Station | | 12+83 | 12+83 | 12+83 | 14+55 | 14+55 | 14+55 |
| Offset | | 13 LT | 13 LT | 13 LT | 11 LT | 11 LT | 11 LT |
| Alignment | | -L- | -L- | -L- | -L- | -L- | -L- |
| Depth (ft) | From | 31.8' | 44.3' | 59.3' | 0.0' | 5.4' | 15.4' |
| | to | 32.5' | 45.8' | 60.8' | 1.5' | 6.9' | 16.9' |


REMARKS: ND=Not Determined, NP=Non-Plastic


Submitted by: DZUNG NGUYEN

MACTEC

MACTEC ENGINEERING AND CONSULTING, INC.
3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

# N.C.D.O.T./AASHTO CLASSIFICATIONS

## REPORT ON SAMPLES OF: SOILS FOR QUALITY

**MACTEC PROJECT NAME AND NUMBER:** BRIDGE N0. 43 OVER RAINBOW CREEK ON SR 1438 (6468-05-1240)

**PROJECT:** 33480.1.1 (B-4127) **COUNTY:** GREENE **OWNER:** N.C.D.O.T.

**DATE SAMPLED:** November, 2005 **RECEIVED:** 11/28/2005 **REPORTED BY:** MACTEC

**SAMPLED FROM:** EB2-A, CHANNEL BANK AND CHANNEL BED

**SUBMITTED BY:** MACTEC ENGINEERING AND CONSULTING, INC.

**1992 STANDARD SPECIFICATIONS**

**TEST RESULTS**

| Lab Sample No. | | SS-13 | SS-14 | SS-15 | SS-16 | S-1 | S-2 |
|---|---|---|---|---|---|---|---|
| Retained 4.75 mm Sieve | (%) | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 |
| Passing 2.00 mm Sieve | (%) | 100.0 | 100.0 | 100.0 | 100.0 | 99.6 | 100.0 |
| Passing 425 µm Sieve | (%) | 99.3 | 99.7 | 98.1 | 99.6 | 80.4 | 99.7 |
| Passing 75 µm Sieve | (%) | 83.2 | 17.7 | 66.3 | 91.1 | 8.3 | 4.1 |

**MINUS 2.00mm FRACTION**

| SOIL MORTAR - 100% | | | | | | | |
|---|---|---|---|---|---|---|---|
| Coarse Sand Ret - 250 µm | (%) | 1.1 | 4.3 | 3.0 | 0.7 | 48.6 | 10.4 |
| Fine Sand Ret - 53 µm | (%) | 25.7 | 84.5 | 48.3 | 21.3 | 43.9 | 86.9 |
| Silt 0.05 - 0.005 mm | (%) | 29.8 | 3.7 | 21.1 | 41.0 | 3.0 | 0.3 |
| Clay < 0.005 mm | (%) | 43.4 | 7.5 | 27.6 | 37.0 | 4.5 | 2.4 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Moisture Content | (%) | 49.1 | ND | 28.3 | 32.6 | ND | ND |
| Liquid Limit, L.L. | | 60 | 24 | 41 | 59 | 19 | 22 |
| Plasticity Index, P.I. | | 30 | NP | 19 | 33 | NP | NP |
| AASHTO Classification | | A-7-5(28) | A-2-4(0) | A-7-6(11) | A-7-6(34) | A-3 | A-3 |
| Organic Content | (%) | ND | ND | ND | ND | ND | ND |

| Boring No. | | EB2-A | EB2-A | EB2-A | EB2-A | Channel Bank | Channel Bed |
|---|---|---|---|---|---|---|---|
| Station | | 14+55 | 14+55 | 14+55 | 14+55 | 13+33 | 13+41 |
| Offset | | 11 LT | 11 LT | 11 LT | 11 LT | 24 LT | 23 LT |
| Alignment | | -L- | -L- | -L- | -L- | -L- | -L- |
| Depth (ft) | From | 22.7' | 32.7' | 37.7' | 42.7' | 0.0' | 0.0' |
| | to | 24.2' | 33.7' | 39.2' | 44.2' | 0.5' | 0.5' |

REMARKS: ND=Not Determined, NP=Non-Plastic

Submitted by: DZUNG NGUYEN

# Particle Size Distribution Report


| % COBBLES | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|
| 0.0 | 0.0 | 95.2 | 4.8 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| #10 | 100.0 | | |
| #20 | 99.6 | | |
| #40 | 93.5 | | |
| #60 | 66.2 | | |
| #200 | 6.1 | | |
| #270 | 4.8 | | |

* (no specification provided)

**Soil Description**

**Atterberg Limits**

PL= ND LL= 19 PI= NP

**Coefficients**

$D_{85}$= 0.357 $D_{60}$= 0.225 $D_{50}$= 0.191
$D_{30}$= 0.137 $D_{15}$= 0.102 $D_{10}$= 0.0886
$C_u$= 2.54 $C_c$= 0.95

**Classification**

USCS= AASHTO= A-3

**Remarks**

**Sample No.:** SS-2 **Source of Sample:** **Date:** 12/20/2005
**Location:** EB1-A **Elev./Depth:** 6.8' - 8.3'

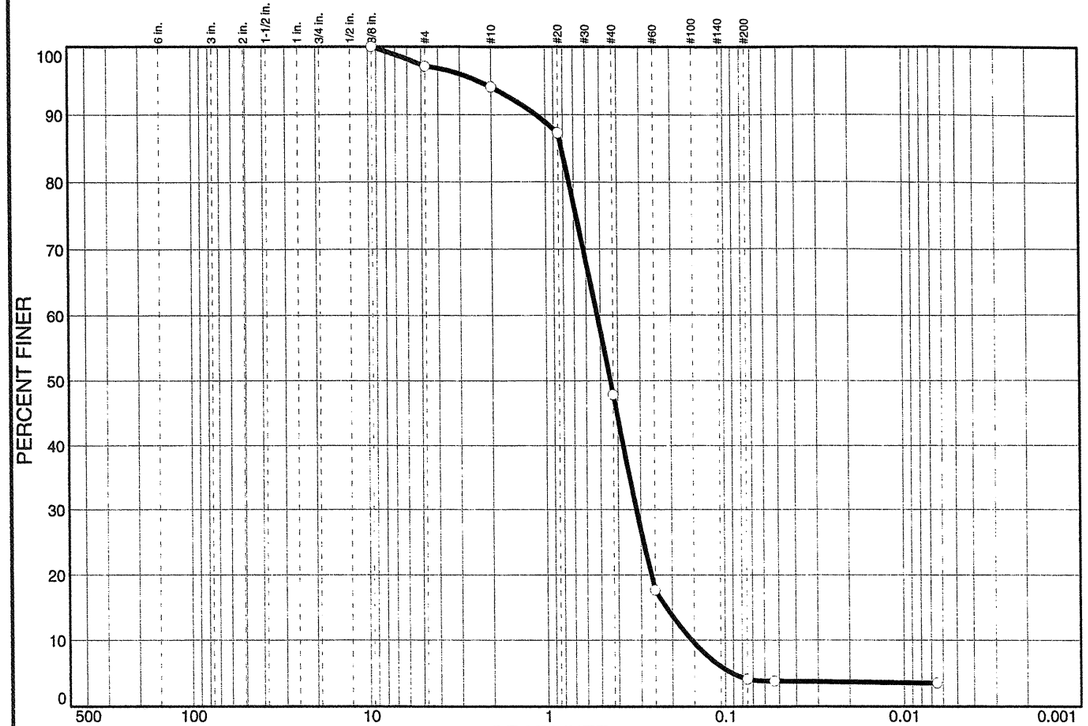
**MACTEC**

**ENGINEERING & CONSULTING, INC.**

**Client:** NCDOT
**Project:** Bridge No. 43 Over Rainbow Creek on SR 1438

**Project No:** 6468-05-1240

# Particle Size Distribution Report




| % COBBLES | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|
| 0.0 | 5.9 | 90.3 | 3.8 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| .375 in. | 100.0 | | |
| #4 | 97.1 | | |
| #10 | 94.1 | | |
| #20 | 87.3 | | |
| #40 | 47.8 | | |
| #60 | 17.7 | | |
| #200 | 4.1 | | |
| #270 | 3.8 | | |

* (no specification provided)

**Soil Description**

**Atterberg Limits**

PL= ND LL= 18 PI= NP

**Coefficients**

$D_{85}$= 0.815 $D_{60}$= 0.521 $D_{50}$= 0.441
$D_{30}$= 0.318 $D_{15}$= 0.216 $D_{10}$= 0.155
$C_u$= 3.35 $C_c$= 1.25

**Classification**

USCS= AASHTO= A-1-b

**Remarks**

**Sample No.:** SS-3 **Source of Sample:** **Date:** 12/20/2005
**Location:** EB1-A **Elev./Depth:** 11.8' - 13.3'

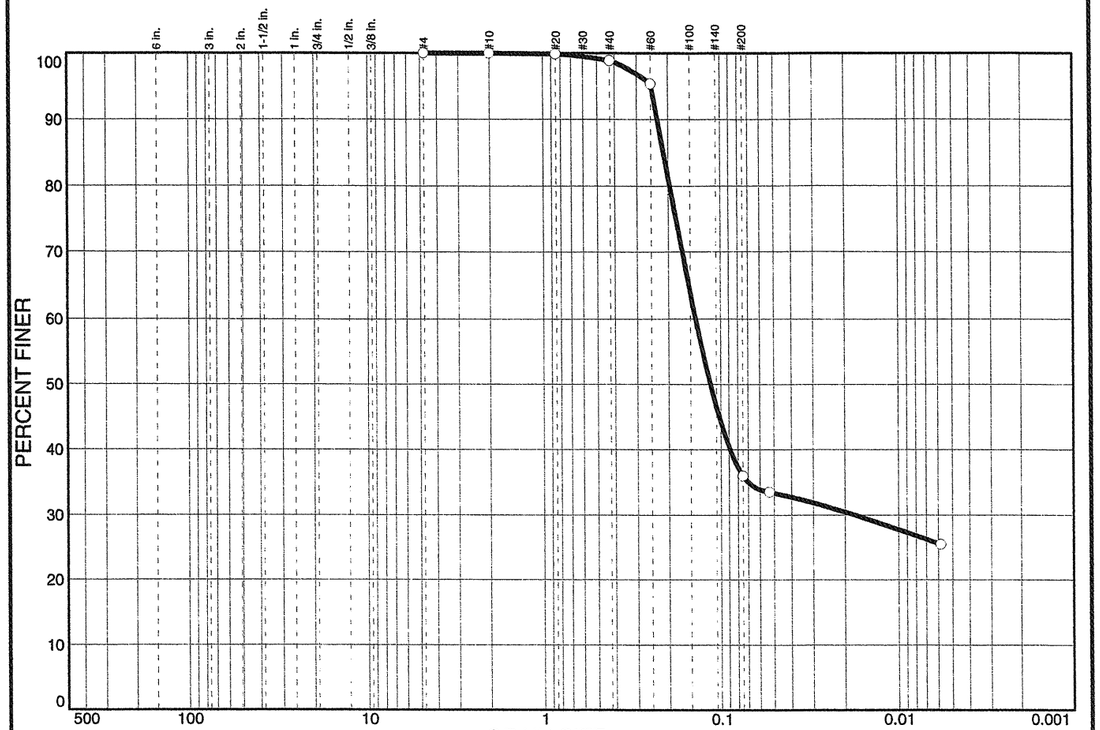
**MACTEC**

**ENGINEERING & CONSULTING, INC.**

**Client:** NCDOT
**Project:** Bridge No. 43 Over Rainbow Creek on SR 1438

**Project No:** 6468-05-1240

# Particle Size Distribution Report




| % COBBLES | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|
| 0.0 | 0.0 | 66.5 | 33.5 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| #4 | 100.0 | | |
| #10 | 100.0 | | |
| #20 | 99.9 | | |
| #40 | 98.9 | | |
| #60 | 95.4 | | |
| #200 | 36.0 | | |
| #270 | 33.5 | | |

* (no specification provided)

**Soil Description**

**Atterberg Limits**

PL= 22 LL= 39 PI= 17

**Coefficients**

$D_{85}$= 0.212 $D_{60}$= 0.140 $D_{50}$= 0.115
$D_{30}$= 0.0177 $D_{15}$= $D_{10}$=
$C_u$= $C_c$=

**Classification**

USCS= AASHTO= A-6(2)

**Remarks**

**Sample No.:** SS-4 **Source of Sample:** **Date:** 12/20/2005
**Location:** EB1-A **Elev./Depth:** 14.3' - 15.8'

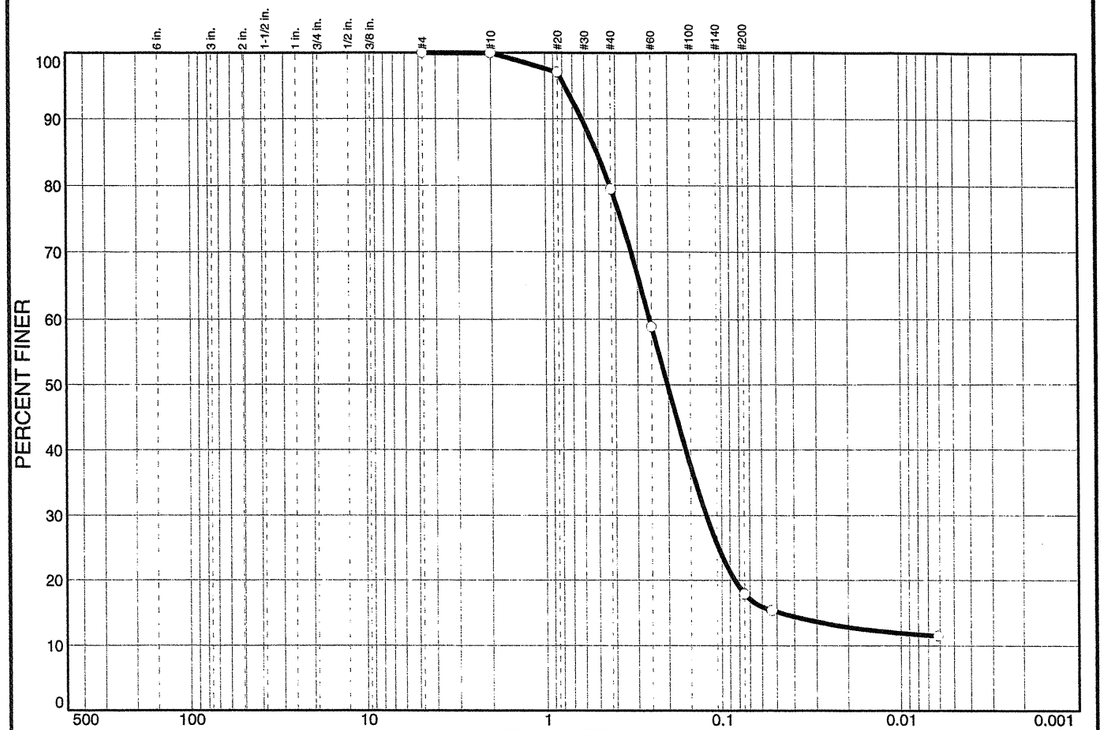
**MACTEC**

**ENGINEERING & CONSULTING, INC.**

**Client:** NCDOT
**Project:** Bridge No. 43 Over Rainbow Creek on SR 1438

**Project No:** 6468-05-1240

# Particle Size Distribution Report




| % COBBLES | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|
| 0.0 | 0.0 | 84.6 | 15.4 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| #4 | 100.0 | | |
| #10 | 100.0 | | |
| #20 | 97.1 | | |
| #40 | 79.4 | | |
| #60 | 58.9 | | |
| #200 | 17.9 | | |
| #270 | 15.4 | | |

* (no specification provided)

**Soil Description**

**Atterberg Limits**

PL= ND LL= 21 PI= NP

**Coefficients**

$D_{85}$= 0.512 $D_{60}$= 0.257 $D_{50}$= 0.203
$D_{30}$= 0.122 $D_{15}$= 0.0474 $D_{10}$=
$C_u$= $C_c$=

**Classification**

USCS= AASHTO= A-2-4(0)

**Remarks**

**Sample No.:** SS-5 **Source of Sample:** **Date:** 12/20/2005
**Location:** EB1-A **Elev./Depth:** 19.3' - 20.4'

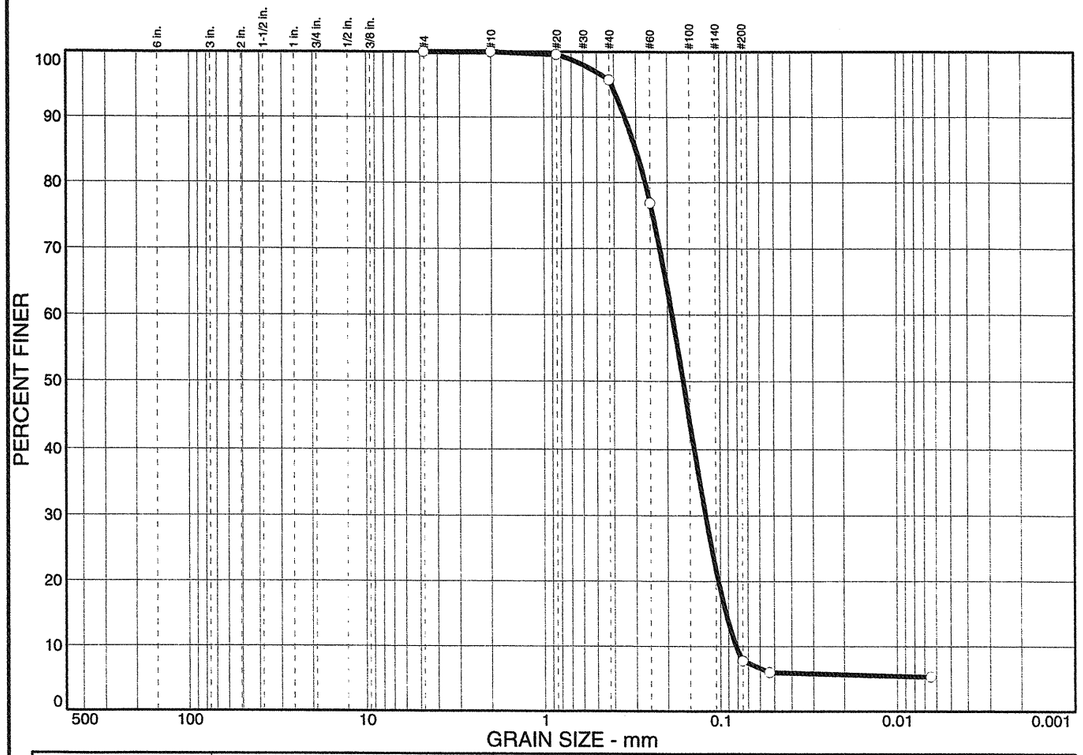
**MACTEC**

**ENGINEERING & CONSULTING, INC.**

**Client:** NCDOT
**Project:** Bridge No. 43 Over Rainbow Creek on SR 1438

**Project No:** 6468-05-1240

# Particle Size Distribution Report




| % COBBLES | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|
| 0.0 | 0.0 | 94.0 | 6.0 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| #4 | 100.0 | | |
| #10 | 100.0 | | |
| #20 | 99.6 | | |
| #40 | 95.7 | | |
| #60 | 76.9 | | |
| #200 | 7.8 | | |
| #270 | 6.0 | | |

* (no specification provided)

**Soil Description**

**Atterberg Limits**

PL= ND LL= 19 PI= NP

**Coefficients**

$D_{85}$= 0.301 $D_{60}$= 0.189 $D_{50}$= 0.163
$D_{30}$= 0.122 $D_{15}$= 0.0930 $D_{10}$= 0.0816
$C_u$= 2.31 $C_c$= 0.96

**Classification**

USCS= AASHTO= A-3

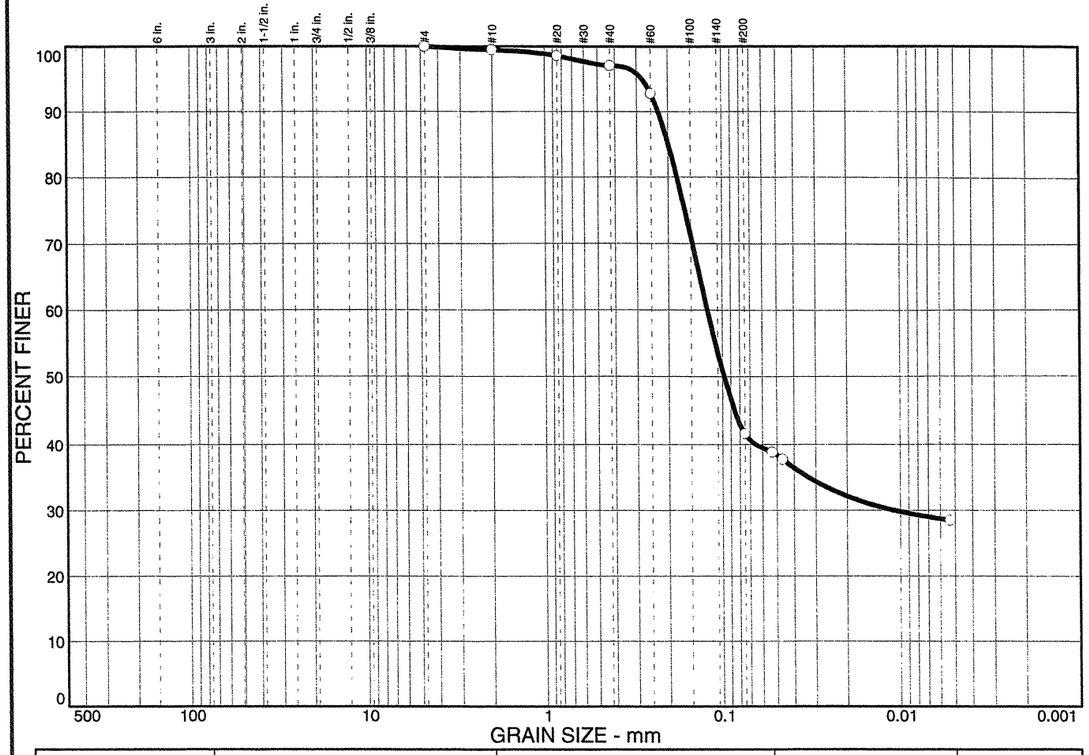
**Remarks**

**Sample No.:** SS-11 **Source of Sample:** **Date:** 12/20/2005
**Location:** EB2-A **Elev./Depth:** 5.4' - 6.9'

**MACTEC**
**ENGINEERING & CONSULTING, INC.**

**Client:** NCDOT
**Project:** Bridge No. 43 Over Rainbow Creek on SR 1438
**Project No:** 6468-05-1240

# Particle Size Distribution Report




| % COBBLES | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|
| 0.0 | 0.5 | 60.7 | 38.8 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| #4 | 100.0 | | |
| #10 | 99.5 | | |
| #20 | 98.6 | | |
| #40 | 97.1 | | |
| #60 | 92.8 | | |
| #200 | 41.7 | | |
| #270 | 38.8 | | |

* (no specification provided)

**Soil Description**

**Atterberg Limits**

PL= 22 LL= 47 PI= 25

**Coefficients**

$D_{85}$= 0.199 $D_{60}$= 0.121 $D_{50}$= 0.0980
$D_{30}$= 0.0108 $D_{15}$= $D_{10}$=
$C_u$= $C_c$=

**Classification**

USCS= AASHTO= A-7-6(6)

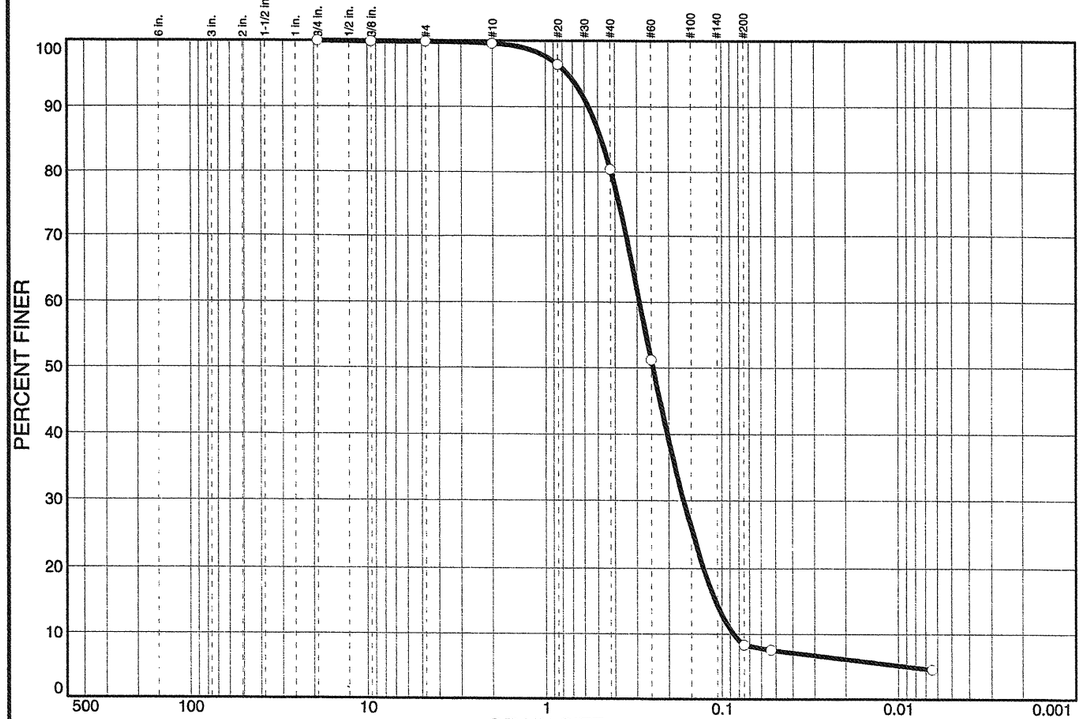
**Remarks**

**Sample No.:** SS-12 **Source of Sample:** **Date:** 12/20/2005
**Location:** EB2-A **Elev./Depth:** 15.4' - 16.9'

**MACTEC**
**ENGINEERING & CONSULTING, INC.**

**Client:** NCDOT
**Project:** Bridge No. 43 Over Rainbow Creek on SR 1438
**Project No:** 6468-05-1240

# Particle Size Distribution Report




| % COBBLES | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|
| 0.0 | 0.4 | 92.1 | 7.5 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3/4 in. | 100.0 | | |
| 3/8 in. | 99.9 | | |
| #4 | 99.9 | | |
| #10 | 99.6 | | |
| #20 | 96.3 | | |
| #40 | 80.4 | | |
| #60 | 51.2 | | |
| #200 | 8.3 | | |
| #270 | 7.5 | | |

* (no specification provided)

**Soil Description**

**Atterberg Limits**

PL= ND LL= 19 PI= NP

**Coefficients**

$D_{85}$= 0.478 $D_{60}$= 0.291 $D_{50}$= 0.245
$D_{30}$= 0.165 $D_{15}$= 0.109 $D_{10}$= 0.0863
$C_u$= 3.37 $C_c$= 1.09

**Classification**

USCS= AASHTO= A-3

**Remarks**

**Sample No.:** S-1 **Source of Sample:** **Date:** 12/20/2005
**Location:** CHANNEL BANK **Elev./Depth:** 0.0' - 0.5'

**MACTEC**

**ENGINEERING & CONSULTING, INC.**

**Client:** NCDOT
**Project:** Bridge No. 43 Over Rainbow Creek on SR 1438
**Project No:** 6468-05-1240

# Particle Size Distribution Report


| % COBBLES | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|
| 0.0 | 0.0 | 97.3 | 2.7 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| #10 | 100.0 | | |
| #20 | 100.0 | | |
| #40 | 99.7 | | |
| #60 | 89.6 | | |
| #200 | 4.1 | | |
| #270 | 2.7 | | |

* (no specification provided)

**Soil Description**

**Atterberg Limits**

PL= ND LL= 22 PI= NP

**Coefficients**

$D_{85}$= 0.229 $D_{60}$= 0.165 $D_{50}$= 0.147
$D_{30}$= 0.117 $D_{15}$= 0.0952 $D_{10}$= 0.0872
$C_u$= 1.89 $C_c$= 0.95

**Classification**

USCS= AASHTO= A-3

**Remarks**

**Sample No.:** S-2 **Source of Sample:** **Date:** 12/20/2005
**Location:** CHANNEL BED **Elev./Depth:** 0.0' - 0.5'

**MACTEC**

**ENGINEERING & CONSULTING, INC.**

**Client:** NCDOT
**Project:** Bridge No. 43 Over Rainbow Creek on SR 1438
**Project No:** 6468-05-1240

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT

# FIELD SCOUR REPORT

WBS: 33480.1.1 TIP: B-4127 COUNTY: Greene

DESCRIPTION(1): Bridge No. 43 over Rainbow Creek on SR 1438

## EXISTING BRIDGE

Information from: Field Inspection X Microfilm ____ (reel ____ pos: ____)
Other (explain) ____

Bridge No.: 43 Length: 70 ft Total Bents: 7 Bents in Channel: 2 Bents in Floodplain: 5
Foundation Type: Timber piles and caps

**EVIDENCE OF SCOUR(2)**

Abutments or End Bent Slopes: Degradation observed directly under bridge between end bent 1 and bent 2

Interior Bents: Not apparent

Channel Bed: Not apparent

Channel Bank: Not apparent

**EXISTING SCOUR PROTECTION**

Type(3): Wooden wing walls, large stone rip-rap on embankment slopes

Extent(4): At both end bent abutments. Rip-rap does not extend completely under the bridge

Effectiveness(5): Satisfactory, though some scour of bank evident from end bent 1 to bent 2

Obstructions(6): Tree limbs and debris accumulating at bent 3

**INSTRUCTIONS**

1 Describe the specific site's location, including route number and body of water crossed.
2 Note scour evidence at existing end bents or abutments (e.g. undermining, sloughing, degradations).
3 Note existing scour protection (e.g. rip rap).
4 Describe extent of existing scour protection.
5 Describe whether or not the scour protection appears to be working.
6 Note obstructions such as dams, fallen trees, debris at bents, etc.
7 Describe the channel bed material based on observation and/or samples. Include any lab results with report.
8 Describe the channel bank material based on observation and/or samples. Include any lab results with report.
9 Describe the material covering the banks (e.g. grass, trees, rip rap, none).
10 Determine the approximate floodplain width from field observation or a topographic map.
11 Describe the material covering the floodplain (e.g. grass, trees, crops).
12 Use professional judgement to specify if the stream is degrading, aggrading, or static.
13 Describe potential and direction of the stream to migrate laterally during the bridge's life (approx. 100 years).
14 Give the geotechnically adjusted scour elevation (GASE) expected over the life of the bridge (approx. 100 years). This elevation can be given as a range across the site, or for each bent. Discuss the relationship between the Hydraulics Unit theoritical scour and the GASE. If the GASE is dependent on scour counter measures, explain (e.g. rip rap armoring on slopes). The GASE is based on the erodability of materials, giving consideration to the influence of joints, foliation, bedding characteristics, % core recovery, % RQD, differential weathering, shear strength, observations at existing structures, other tests deemed appropriate, and overall geologic conditions at the site.

## DESIGN INFORMATION

Channel Bed Material(7): Alluvium: Sand (A-3)

Channel Bank Material(8): Alluvium: Sand (A-3)

Channel Bank Cover(9): Small to large trees, brush and grasses

Floodplain Width(10): Approximately 400 ft

Floodplain Cover(11): Small to large trees, brush and grassess

Stream is(12): Aggrading ____ Degrading X Static ____

Channel Migration Tendency(13): Westward; bridge crosses over westward bend in creek

Observations and Other Comments: Channel meanders both up- and down-stream of site

**Reported by:** Bill Seabrook **Date:** 11/23/2005
MACTEC Engineering and Consulting, Inc.

**GEOTECHNICALLY ADJUSTED SCOUR ELEVATIONS(14)** Feet X Meters ____

| | BENTS B1 | B2 | B3 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| GASE | 17.1 | 17.4 | 25.8 | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

Comparison of GASE to Hydraulics Unit theoretical scour:

**GASE determined by:** Michael Valliquette **Date:** 1/10/06
NCDOT Geotechnical Engineering Unit

**SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL**

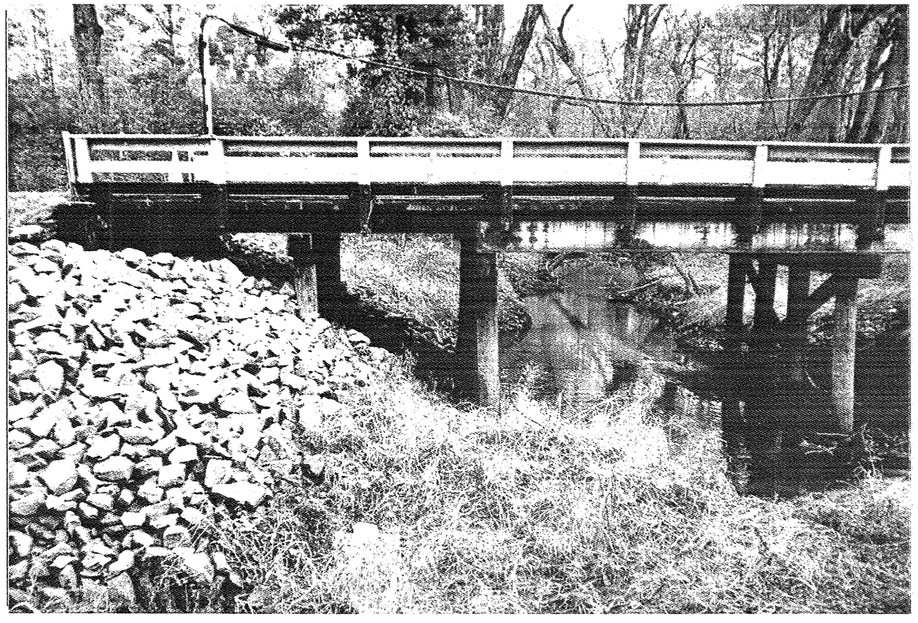
| Bed or Bank | Bank | Bed | | | | | |
|---|---|---|---|---|---|---|---|
| Sample No. | S-1 | S-2 | | | | | |
| Retained #4 | 0.1 | 0 | | | | | |
| Passed #10 | 99.6 | 100 | | | | | |
| Passed #40 | 80.4 | 99.7 | | | | | |
| Passed #200 | 8.3 | 4.1 | | | | | |
| Coarse Sand | 48.6 | 10.4 | | | | | |
| Fine Sand | 43.9 | 86.9 | | | | | |
| Silt | 3 | 0.3 | | | | | |
| Clay | 4.5 | 2.4 | | | | | |
| LL | 19 | 22 | | | | | |
| PI | NP | NP | | | | | |
| AASHTO | A-3 | A-3 | | | | | |
| Station | 13+33 | 13+41 | | | | | |
| Offset | 24 ft LT | 23 ft LT | | | | | |
| Depth | 0-0.5 ft | 0-0.5 ft | | | | | |

Photograph No. 1: Looking northwest, downstream to the existing bridge.

Photograph No. 2: Looking east toward Hookerton along SR 1438. End bent 1 at first cone in foreground.

Photograph No. 3: Looking west along SR 1438. End bent 2 at first cone in center of road. People standing at bent 3.

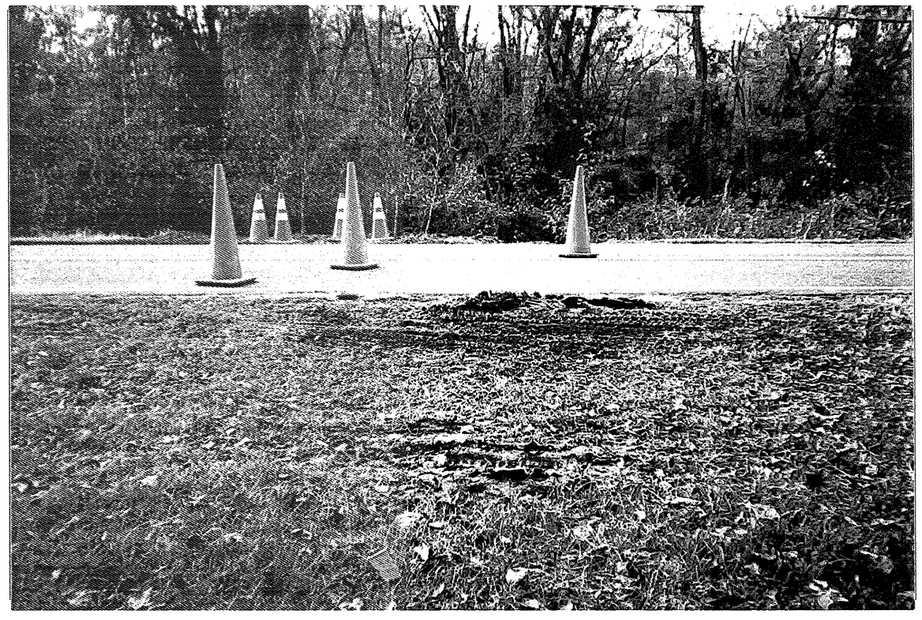
Photograph No. 4: Looking north along end bent 1.



Photograph No. 5: Looking north along bent 1, located at the third guardrail post from left.

Photograph No. 7: Looking north along bent 3, located just right of the red traverse marker BL-3.

Photograph No. 6: Looking north along bent 2, located at the third guardrail post from right.



Photograph No. 8: Looking south along end bent 2.