

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	17BP.14.R.169	1	7

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

**STRUCTURE**  
**SUBSURFACE INVESTIGATION**

COUNTY CLAY  
 PROJECT DESCRIPTION BRIDGE NO. 99 ON SR 1168  
(E. VINEYARD RD.) OVER VINEYARD CREEK

**REFERENCE: SF-210099**

**PROJECT: 17BP.14.R.169**

**CONTENTS**

<u>SHEET NO.</u>	<u>DESCRIPTION</u>
1	TITLE SHEET
2, 2A	LEGEND
3	BORING LOCATION PLAN
4-7	BORING LOGS

PERSONNEL
<u>TRIGON</u>
<u>GOODNIGHT, D.J.</u>
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_____
_____

INVESTIGATED BY GOODNIGHT, D.J.  
 DRAWN BY HILL, M.J.  
 CHECKED BY HUNSBERGER, W.S.  
 SUBMITTED BY FALCON ENG.  
 DATE NOVEMBER 2017

**CAUTION NOTICE**

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE 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 ENGINEERING UNIT AT (919) 707-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

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- THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT.
  - BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.



DocuSigned by:  
Jeremy R Hamm 4/8/2021  
 462202304BBC46A...  
 SIGNATURE DATE

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

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

# SUBSURFACE INVESTIGATION


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

SOIL DESCRIPTION					GRADATION																																																																																																																																												
SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, <i>VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</i>					WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.																																																																																																																																												
SOIL LEGEND AND AASHTO CLASSIFICATION					ANGULARITY OF GRAINS																																																																																																																																												
GRANULAR MATERIALS (< 35% PASSING #200) SILT-CLAY MATERIALS (> 35% PASSING #200) ORGANIC MATERIALS					THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.																																																																																																																																												
<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th>GENERAL CLASS.</th> <th colspan="4">A-1</th> <th colspan="4">A-2</th> <th colspan="4">A-3</th> <th colspan="4">A-4, A-5</th> </tr> <tr> <th>GROUP CLASS.</th> <th>A-1-a</th><th>A-1-b</th><th>A-1-c</th><th>A-1-d</th> <th>A-2-4</th><th>A-2-5</th><th>A-2-6</th><th>A-2-7</th> <th>A-3-1</th><th>A-3-2</th><th>A-3-3</th><th>A-3-4</th> <th>A-4-1</th><th>A-4-2</th><th>A-4-3</th><th>A-4-4</th> </tr> <tr> <th>SYMBOL</th> <td colspan="4">[Pattern]</td> <td colspan="4">[Pattern]</td> <td colspan="4">[Pattern]</td> <td colspan="4">[Pattern]</td> </tr> <tr> <th>% PASSING #10 #40 #200</th> <td colspan="4">50 MX 30 MX 15 MX</td> <td colspan="4">51 MN 35 MX 35 MX 35 MX 35 MX</td> <td colspan="4">36 MN 36 MN 36 MN 36 MN</td> <td colspan="4">GRANULAR SOILS</td> </tr> <tr> <th>MATERIAL PASSING #40 LL PI</th> <td colspan="4">-</td> <td colspan="4">40 MX 41 MN 40 MX 41 MN 40 MX 41 MN 40 MX 41 MN</td> <td colspan="4">40 MX 41 MN 40 MX 41 MN 40 MX 41 MN</td> <td colspan="4">SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER</td> </tr> <tr> <th>GROUP INDEX</th> <td colspan="4">0</td> <td colspan="4">0</td> <td colspan="4">0</td> <td colspan="4">NO MX</td> </tr> <tr> <th>USUAL TYPES OF MAJOR MATERIALS</th> <td colspan="4">STONE FRAGS, GRAVEL, AND SAND</td> <td colspan="4">FINE SAND</td> <td colspan="4">SILTY OR CLAYEY GRAVEL AND SAND</td> <td colspan="4">SILTY SOILS</td> </tr> <tr> <th>GEN. RATING AS SUBGRADE</th> <td colspan="4">EXCELLENT TO GOOD</td> <td colspan="4">FAIR TO POOR</td> <td colspan="4">FAIR TO POOR</td> <td colspan="4">POOR</td> </tr> </table>					GENERAL CLASS.	A-1				A-2				A-3				A-4, A-5				GROUP CLASS.	A-1-a	A-1-b	A-1-c	A-1-d	A-2-4	A-2-5	A-2-6	A-2-7	A-3-1	A-3-2	A-3-3	A-3-4	A-4-1	A-4-2	A-4-3	A-4-4	SYMBOL	[Pattern]				[Pattern]				[Pattern]				[Pattern]				% PASSING #10 #40 #200	50 MX 30 MX 15 MX				51 MN 35 MX 35 MX 35 MX 35 MX				36 MN 36 MN 36 MN 36 MN				GRANULAR SOILS				MATERIAL PASSING #40 LL PI	-				40 MX 41 MN 40 MX 41 MN 40 MX 41 MN 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				GROUP INDEX	0				0				0				NO MX				USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS, GRAVEL, AND SAND				FINE SAND				SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS				GEN. RATING AS SUBGRADE	EXCELLENT TO GOOD				FAIR TO POOR				FAIR TO POOR				POOR				MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.				
GENERAL CLASS.	A-1				A-2				A-3				A-4, A-5																																																																																																																																				
GROUP CLASS.	A-1-a	A-1-b	A-1-c	A-1-d	A-2-4	A-2-5	A-2-6	A-2-7	A-3-1	A-3-2	A-3-3	A-3-4	A-4-1	A-4-2	A-4-3	A-4-4																																																																																																																																	
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PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30					MINERALOGICAL COMPOSITION																																																																																																																																												
COMPRESSIBILITY SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50					PERCENTAGE OF MATERIAL																																																																																																																																												
ORGANIC MATERIAL TRACE OF ORGANIC MATTER 2 - 3% LITTLE ORGANIC MATTER 3 - 5% MODERATELY ORGANIC 5 - 10% HIGHLY ORGANIC > 10%					GRANULAR SOILS 2 - 3% SILT - CLAY SOILS 3 - 5% 5 - 12% 12 - 20% > 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 PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA SPRING OR SEEP					MISCELLANEOUS SYMBOLS																																																																																																																																												
ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION SOIL SYMBOL ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT INFERRED SOIL BOUNDARY INFERRED ROCK LINE ALLUVIAL SOIL BOUNDARY					25/025 DIP & DIP DIRECTION OF ROCK STRUCTURES SPT DMT VST PMT TEST BORING AUGER BORING CORE BORING MONITORING WELL PIEZOMETER INSTALLATION SLOPE INDICATOR INSTALLATION CONE PENETROMETER TEST SOUNDING ROD TEST BORING WITH CORE SPT N-VALUE																																																																																																																																												
CONSISTENCY OR DENSENESS					RECOMMENDATION SYMBOLS																																																																																																																																												
PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT <sup>2</sup> )					UNDERCUT UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL SHALLOW UNDERCUT UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK																																																																																																																																												
GENERALLY GRANULAR MATERIAL (NON-COHESIVE) VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE					< 4 4 TO 10 10 TO 30 30 TO 50 > 50																																																																																																																																												
GENERALLY SILT-CLAY MATERIAL (COHESIVE) VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD					< 2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 > 30																																																																																																																																												
< 0.25 0.25 TO 0.5 0.5 TO 1.0 1 TO 2 2 TO 4 > 4					ABBREVIATIONS																																																																																																																																												
U.S. STD. SIEVE SIZE OPENING (MM) 4 10 40 60 200 270 4.76 2.00 0.42 0.25 0.075 0.053					AR - AUGER REFUSAL BT - BORING TERMINATED CL - CLAY CPT - CONE PENETRATION TEST CSE. - COARSE DMT - DILATOMETER TEST DPT - DYNAMIC PENETRATION TEST e - VOID RATIO F - FINE FOSS. - FOSSILIFEROUS FRAC. - FRACTURED, FRACTURES FRAGS. - FRAGMENTS HI. - HIGHLY																																																																																																																																												
BOULDER (BLDR.) COBBLE (COB.) GRAVEL (GR.) COARSE SAND (CSE. SD.) FINE SAND (F SD.) SILT (SL.) CLAY (CL.)					MED. - MEDIUM MICA - MICACEOUS MOD. - MODERATELY NP - NON PLASTIC ORG. - ORGANIC PMT - PRESSUREMETER TEST SAP. - SAPROLITIC SD. - SAND, SANDY SL. - SILT, SILTY SLI. - SLIGHTLY TCR - TRICONE REFUSAL w - MOISTURE CONTENT v - VERY																																																																																																																																												
GRAIN SIZE MM 305 75 2.0 0.25 0.05 0.005 IN. 12 3					EQUIPMENT USED ON SUBJECT PROJECT																																																																																																																																												
SOIL MOISTURE - CORRELATION OF TERMS					DRILL UNITS: <input type="checkbox"/> CME-45C <input checked="" type="checkbox"/> CME-55 <input type="checkbox"/> CME-550 <input type="checkbox"/> VANE SHEAR TEST <input type="checkbox"/> PORTABLE HOIST																																																																																																																																												
SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION					ADVANCING TOOLS: <input type="checkbox"/> CLAY BITS <input type="checkbox"/> 6' CONTINUOUS FLIGHT AUGER <input checked="" type="checkbox"/> 8' HOLLOW AUGERS <input type="checkbox"/> HARD FACED FINGER BITS <input type="checkbox"/> TUNG-CARBIDE INSERTS <input type="checkbox"/> CASING <input type="checkbox"/> W/ ADVANCER <input type="checkbox"/> TRICONE _____ * STEEL TEETH <input type="checkbox"/> TRICONE _____ * TUNG-CARB. <input type="checkbox"/> CORE BIT																																																																																																																																												
LL - LIQUID LIMIT PL - PLASTIC LIMIT OM - OPTIMUM MOISTURE SHRINKAGE LIMIT					HAMMER TYPE: <input checked="" type="checkbox"/> AUTOMATIC <input type="checkbox"/> MANUAL CORE SIZE: <input type="checkbox"/> -B _____ <input type="checkbox"/> -H _____ <input type="checkbox"/> -N _____																																																																																																																																												
- SATURATED - (SAT.) - WET - (W) - MOIST - (M) - DRY - (D)					SAMPLE ABBREVIATIONS S - BULK SS - SPLIT SPOON ST - SHELBY TUBE RS - ROCK RT - RECOMPACTED TRIAXIAL CBR - CALIFORNIA BEARING RATIO																																																																																																																																												
PLASTICITY					DRILL UNITS: <input type="checkbox"/> CME-45C <input checked="" type="checkbox"/> CME-55 <input type="checkbox"/> CME-550 <input type="checkbox"/> VANE SHEAR TEST <input type="checkbox"/> PORTABLE HOIST																																																																																																																																												
PLASTICITY INDEX (PI) NON PLASTIC 0-5 SLIGHTLY PLASTIC 6-15 MODERATELY PLASTIC 16-25 HIGHLY PLASTIC 26 OR MORE					DRILL UNITS: <input type="checkbox"/> CME-45C <input checked="" type="checkbox"/> CME-55 <input type="checkbox"/> CME-550 <input type="checkbox"/> VANE SHEAR TEST <input type="checkbox"/> PORTABLE HOIST																																																																																																																																												
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DRY STRENGTH VERY LOW SLIGHT MEDIUM HIGH					DRILL UNITS: <input type="checkbox"/> CME-45C <input checked="" type="checkbox"/> CME-55 <input type="checkbox"/> CME-550 <input type="checkbox"/> VANE SHEAR TEST <input type="checkbox"/> PORTABLE HOIST																																																																																																																																												
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.					DRILL UNITS: <input type="checkbox"/> CME-45C <input checked="" type="checkbox"/> CME-55 <input type="checkbox"/> CME-550 <input type="checkbox"/> VANE SHEAR TEST <input type="checkbox"/> PORTABLE HOIST																																																																																																																																												

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**SUBSURFACE INVESTIGATION**

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

ROCK DESCRIPTION	
HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:	
WEATHERED ROCK (WR)	 NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.
CRYSTALLINE ROCK (CR)	FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.
NON-CRYSTALLINE ROCK (NCR)	FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.
COASTAL PLAIN SEDIMENTARY ROCK (CP)	COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.

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

WEATHERING	
FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
VERY SLIGHT (V SL.)	ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN. CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.
SLIGHT (SL.)	ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.
MODERATE (MOD.)	SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.
MODERATELY SEVERE (MOD. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. <u>IF TESTED, WOULD YIELD SPT REFUSAL</u>
SEVERE (SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. <u>IF TESTED, WOULD YIELD SPT N VALUES &gt; 100 BPF</u>
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <u>IF TESTED, WOULD YIELD SPT N VALUES &lt; 100 BPF</u>
COMPLETE	ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

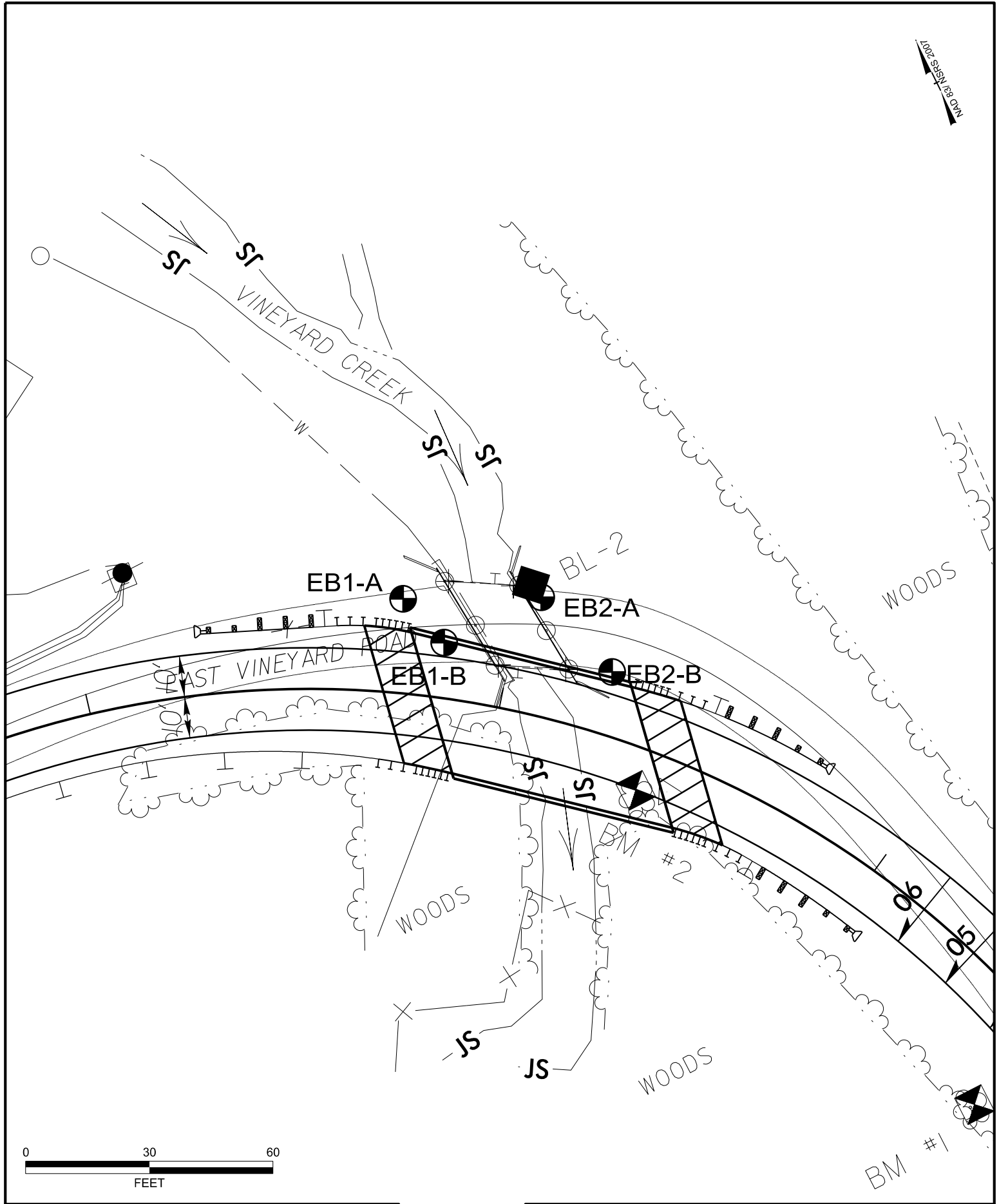
ROCK HARDNESS	
VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
MODERATELY HARD	CAN BE SCRATCHED BY KNIFE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

FRACTURE SPACING		BEDDING	
TERM	SPACING	TERM	THICKNESS
VERY WIDE	MORE THAN 10 FEET	VERY THICKLY BEDDED	4 FEET
WIDE	3 TO 10 FEET	THICKLY BEDDED	1.5 - 4 FEET
MODERATELY CLOSE	1 TO 3 FEET	THINLY BEDDED	0.16 - 1.5 FEET
CLOSE	0.16 TO 1 FOOT	VERY THINLY BEDDED	0.03 - 0.16 FEET
VERY CLOSE	LESS THAN 0.16 FEET	THICKLY LAMINATED	0.008 - 0.03 FEET
		THINLY LAMINATED	< 0.008 FEET

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

<b>BENCH MARK: BL-2:</b>
N: 503095.8 E: 605083.12
STA. 13+03.69 OFFSET: 9.53' RT -EL- ELEVATION: 2304.19 FEET

**NOTES:**  
FIAD - FILLED IMMEDIATELY AFTER DRILLING



**NOTES:**

- PLANS ADOPTED FROM ELECTRONIC SURVEY FILES RECEIVED FROM WSP DATED FEBRUARY 2017
- BRIDGE SKEW: 60°



FALCON ENGINEERING, INC.  
 1210 TRINITY ROAD, SUITE 110  
 RALEIGH, NC 27607  
 PHONE: 919.871.0800  
 FAX: 919.871.0803

**BORING LOCATION PLAN**

BRIDGE NO. 99 ON SR 1168 (E. VINEYARD RD.)  
 OVER VINEYARD CREEK  
 CLAY COUNTY, NORTH CAROLINA  
 WBS NO.: 17BP.14.R.169  
 FALCON PROJECT NO.: G16038.03



# GEOTECHNICAL BORING REPORT BORE LOG

<b>WBS</b> 17BP.14.R.169		<b>TIP</b> G16038.03		<b>COUNTY</b> CLAY		<b>GEOLOGIST</b> Goodnight, D. J.	
<b>SITE DESCRIPTION</b> Bridge No. 99 on SR 1168 (East Vineyard Rd.) over Vineyard Creek							<b>GROUND WTR (ft)</b>
<b>BORING NO.</b> EB1-B		<b>STATION</b> 12+87		<b>OFFSET</b> 13 ft LT		<b>ALIGNMENT</b> -L-	
<b>COLLAR ELEV.</b> 2,304.5 ft		<b>TOTAL DEPTH</b> 43.9 ft		<b>NORTHING</b> 503,093		<b>EASTING</b> 605,058	
<b>DRILL RIG/HAMMER EFF./DATE</b> TRI9435 CME-55 85% 02/22/2016				<b>DRILL METHOD</b> H.S. Augers		<b>HAMMER TYPE</b> Automatic	
<b>DRILLER</b> Contract Driller		<b>START DATE</b> 08/15/16		<b>COMP. DATE</b> 08/15/16		<b>SURFACE WATER DEPTH</b> N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2305																
2303.5	2,303.5	1.0	3	3	2									0.1' BITUMINOUS CONCRETE	0.0	
2300	2,301.0	3.5	20	7	2									ROADWAY EMBANKMENT BROWN, CSE. TO F. SANDY SILT (A-4) WITH TRACE GRAVEL AND ROOTS		
	2,298.5	6.0	2	1	2											
2295	2,296.0	8.5	2	4	2											
2290	2,291.0	13.5	6	100/0.5										WEATHERED ROCK BROWN, BIOTITE GNEISS	14.0	
2285	2,286.0	18.5	7	10	13									RESIDUAL BROWN, SILTY CSE. TO F. SAND (A-2-4) SAPROLITIC		
2280	2,281.0	23.5	8	27	45											
2275	2,276.0	28.5	23	32	67											
2270	2,271.0	33.5	9	20	35											
2265	2,266.0	38.5	21	79/0.4										WEATHERED ROCK GRAY, BIOTITE GNEISS	39.0	
	2,261.0	43.5	100/0.4													
															Boring Terminated at Elevation 2,260.6 ft in WR: BIOTITE GNEISS	43.5

NCDOT BORE SINGLE G16038.03 BRIDGE 99.GPJ NC\_DOT.GDT 11/30/17

# GEOTECHNICAL BORING REPORT

## BORE LOG

<b>WBS</b> 17BP.14.R.169		<b>TIP</b> G16038.03		<b>COUNTY</b> CLAY		<b>GEOLOGIST</b> Goodnight, D. J.	
<b>SITE DESCRIPTION</b> Bridge No. 99 on SR 1168 (East Vineyard Rd.) over Vineyard Creek							<b>GROUND WTR (ft)</b>
<b>BORING NO.</b> EB2-A		<b>STATION</b> 13+03		<b>OFFSET</b> 28 ft LT		<b>ALIGNMENT</b> -L-	0 HR. 14.5
<b>COLLAR ELEV.</b> 2,304.7 ft		<b>TOTAL DEPTH</b> 38.2 ft		<b>NORTHING</b> 503,092		<b>EASTING</b> 605,084	24 HR. FIAD
<b>DRILL RIG/HAMMER EFF./DATE</b> TRI9435 CME-55 85% 02/22/2016				<b>DRILL METHOD</b> H.S. Augers		<b>HAMMER TYPE</b> Automatic	
<b>DRILLER</b> Contract Driller		<b>START DATE</b> 08/15/16		<b>COMP. DATE</b> 08/15/16		<b>SURFACE WATER DEPTH</b> N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2305															0.0	
	2,303.7	1.0	4	6	9								M	0.3' GRAVEL	0.3	
	2,301.2	3.5	11	23	11								M	ROADWAY EMBANKMENT BROWN, CSE. TO F. SANDY SILT (A-4) WITH TRACE GRAVEL AND ROOTS		
2300	2,298.7	6.0	6	3	6								M	BROWN, SILTY CSE. TO F. SAND (A-2-4) WITH TRACE GRAVEL	5.5	
	2,296.2	8.5	7	10	16								M			
2295	2,291.2	13.5	35	65/0.4									W	WEATHERED ROCK BROWN AND GRAY, BOULDERS COBBLES AND GRAVEL	10.5	
2290	2,286.2	18.5	4	5	4								M	RESIDUAL ORANGE AND BROWN, SILTY CSE. TO F. SAND (A-2-4) SAPROLITIC	16.5	
2285	2,281.2	23.5	2	3	6								M			
2280	2,276.2	28.5	8	11	25								M			
2275	2,271.2	33.5	9	18	50								M			
2270	2,266.5	38.2	60/0.0										M	WEATHERED ROCK GRAY AND BROWN, BIOTITE GNEISS	35.0	
															Boring Terminated with Standard Penetration Test Refusal at Elevation 2,266.5 ft on CR: BIOTITE GNEISS	38.2

NCDOT BORE SINGLE G16038.03 BRIDGE 99.GPJ NC\_DOT.GDT 11/30/17

# GEOTECHNICAL BORING REPORT

## BORE LOG

<b>WBS</b> 17BP.14.R.169		<b>TIP</b> G16038.03		<b>COUNTY</b> CLAY		<b>GEOLOGIST</b> Goodnight, D. J.	
<b>SITE DESCRIPTION</b> Bridge No. 99 on SR 1168 (East Vineyard Rd.) over Vineyard Creek							<b>GROUND WTR (ft)</b>
<b>BORING NO.</b> EB2-B		<b>STATION</b> 13+23		<b>OFFSET</b> 15 ft LT		<b>ALIGNMENT</b> -L-	<b>0 HR.</b> 14.5
<b>COLLAR ELEV.</b> 2,304.3 ft		<b>TOTAL DEPTH</b> 43.6 ft		<b>NORTHING</b> 503,068		<b>EASTING</b> 605,091	<b>24 HR.</b> FIAD
<b>DRILL RIG/HAMMER EFF./DATE</b> TRI9435 CME-55 85% 02/22/2016				<b>DRILL METHOD</b> H.S. Augers		<b>HAMMER TYPE</b> Automatic	
<b>DRILLER</b> Contract Driller		<b>START DATE</b> 08/11/16		<b>COMP. DATE</b> 08/11/16		<b>SURFACE WATER DEPTH</b> N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
2305															0.0
	2,303.3	1.0	4	5	11									0.1' BITUMINOUS CONCRETE 0.9' AGGREGATE BASE COURSE	1.0
	2,300.8	3.5	2	3	5									<b>ROADWAY EMBANKMENT</b> TAN AND BROWN, CSE. TO F. SANDY SILT (A-4) WITH TRACE GRAVEL AND MICA	
2300	2,298.3	6.0	3	3	4										
	2,295.8	8.5	2	2	3									TAN, SILTY CSE. TO F. SAND (A-2-4) WITH TRACE GRAVEL AND MICA	8.0
2295	2,290.8	13.5	32	51	25									<b>COLLUVIAL</b> TAN AND LT. GRAY, SILTY CSE. TO F. SAND (A-2-4) WITH TRACE ROCK FRAGMENTS SAPROLITIC	13.0
2290	2,285.8	18.5	2	3	3									<b>RESIDUAL</b> ORANGE AND TAN, SILTY CSE. TO F. SAND (A-2-4) SAPROLITIC	16.5
2285	2,280.8	23.5	3	6	10										
2280	2,275.8	28.5	7	7	5										
2275	2,270.8	33.5	12	24	43										
2270	2,265.8	38.5	27	37	63/0.4									<b>WEATHERED ROCK</b> GRAY AND WHITE, BIOTITE GNEISS	36.0
2265	2,260.8	43.5	60/0.1											<b>CRYSTALLINE ROCK</b> GRAY, BIOTITE GNEISS	43.5
	2,260.7													Boring Terminated with Standard Penetration Test Refusal at Elevation 2,260.7 ft in CR: BIOTITE GNEISS	43.6

NCDOT BORE SINGLE G16038.03 BRIDGE 99.GPJ NC\_DOT.GDT 11/30/17