

PROJECT: 33300.1.1 ID: B-3853

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL UNIT

STRUCTURE SUBSURFACE INVESTIGATION

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-3853	1	39
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
33300.1.1	BRSTP-561(I)	P.E. CONST.	

For Letting

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.

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 THIS 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.

STATE PROJECT 33300.1.1 I.D. NO. B-3853

F.A. PROJECT BRSTP-561(I)

COUNTY HALIFAX

PROJECT DESCRIPTION BRIDGE NO. 82 OVER
MARSH SWAMP ON NC 561

SITE DESCRIPTION _____

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- 2) GEOTECHNICAL REPORT OF SUBSURFACE EXPLORATION (SHEETS 3-8)
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- 12) SCOUR REPORT, CHANNEL BED AND BANK MATERIAL LABORATORY TEST DATA AND GRAIN SIZE DISTRIBUTION GRAPHS (SHEET 31-34)
- 13) SITE PHOTOGRAPHS (SHEET 35-39)

DRAWN BY: DRK

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

NOTE - 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.

INVESTIGATED BY G. LICAYAN / P. ALTON PERSONNEL D. KITCHEN

CHECKED BY J. VINSON S. WILLARD

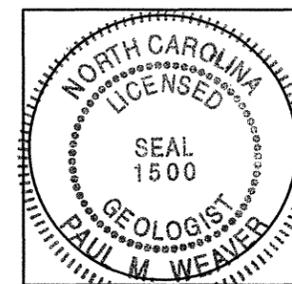
SUBMITTED BY P. WEAVER W. WHICHARD

DATE 11/8/05 R. TOOTHMAN

B. FOSTER

B. SMALLWOOD

ESPOSITO



11/14/05

Paul M. Weaver
SIGNATURE

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

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SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION				GRADATION				ROCK DESCRIPTION				TERMS AND DEFINITIONS																																																																																																																																																																																																													
<p>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:</p> <p align="center"><i>VERY STIFF, GRN SILTY CLAY, MOST MIN INTERMEDIATE FINE SAND LAYERS, HIGH PLASTIC, A-6</i></p>				<p>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)</p> <p>POORLY GRADED: INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.</p> <p align="center">ANGULARITY OF GRAINS</p> <p>THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS ARE DESIGNATED BY THE TERMS: <u>ANGULAR</u>, <u>SUBANGULAR</u>, <u>SUBROUNDED</u>, OR <u>ROUNDED</u>.</p>				<p>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.</p> <p>ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:</p> <p>WEATHERED ROCK (WR)</p> <p>CRYSTALLINE ROCK (CR)</p> <p>NON-CRYSTALLINE ROCK (NCR)</p> <p>COASTAL PLAIN SEDIMENTARY ROCK (CP)</p>				<p>ALLUVIUM (ALLUV.) - SOILS WHICH HAVE BEEN TRANSPORTED BY WATER.</p> <p>AQUIFER - A WATER BEARING FORMATION OR STRATA.</p> <p>ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.</p> <p>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.</p> <p>ARIESIAN - 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.</p> <p>CALCAREOUS (CALC.) - SOILS WHICH CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.</p> <p>COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.</p> <p>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.</p> <p>DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.</p> <p>DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.</p> <p>DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.</p> <p>FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.</p> <p>FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.</p> <p>FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.</p> <p>FLOOD PLAIN (F.P.) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.</p> <p>FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.</p> <p>JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.</p> <p>LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.</p> <p>LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.</p> <p>MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.</p> <p>PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.</p> <p>RESIDUAL SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.</p> <p>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.</p> <p>SAPROLITE (SAP.) - RESIDUAL SOIL WHICH RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.</p> <p>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.</p> <p>SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.</p> <p>STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS IN 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.</p> <p>STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.</p> <p>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.</p> <p>TOPSOIL (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p>																																																																																																																																																																																																													
<p align="center">SOIL LEGEND AND AASHTO CLASSIFICATION</p> <table border="1"> <tr> <th rowspan="2">GENERAL CLASS.</th> <th colspan="4">GRANULAR MATERIALS (5% PASSING #200)</th> <th colspan="4">SILT-CLAY MATERIALS (5% PASSING #200)</th> <th colspan="4">ORGANIC MATERIALS</th> </tr> <tr> <th>A-1</th> <th>A-3</th> <th>A-2</th> <th>A-2</th> <th>A-4</th> <th>A-5</th> <th>A-6</th> <th>A-7</th> <th>A-1, A-2</th> <th>A-4, A-5</th> <th>A-6, A-7</th> <th>A-1, A-2</th> <th>A-4, A-5</th> </tr> <tr> <th>GROUP CLASS.</th> <td>A-1-a</td> <td>A-1-b</td> <td>A-2-1</td> <td>A-2-2</td> <td>A-2-3</td> <td>A-2-4</td> <td>A-2-5</td> <td>A-2-6</td> <td>A-2-7</td> <td>A-4</td> <td>A-5</td> <td>A-6</td> <td>A-7</td> <td>A-1, A-2</td> <td>A-4, A-5</td> <td>A-6, A-7</td> </tr> <tr> <th>SYMBOL</th> <td></td> </tr> <tr> <th>% PASSING</th> <td>10</td> <td>40</td> <td>200</td> <td>10</td> </tr> <tr> <th>LIQ. LIMIT</th> <td>5</td> <td>10</td> <td>15</td> <td>20</td> <td>25</td> <td>30</td> <td>35</td> <td>40</td> <td>45</td> <td>50</td> <td>55</td> <td>60</td> <td>65</td> <td>70</td> <td>75</td> <td>80</td> </tr> <tr> <th>PLASTIC INDEX</th> <td>0</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> <td>7</td> <td>8</td> <td>9</td> <td>10</td> <td>11</td> <td>12</td> <td>13</td> <td>14</td> <td>15</td> </tr> <tr> <th>GROUP INDEX</th> <td>0</td> </tr> <tr> <th>USUAL TYPES OF MAJOR MATERIALS</th> <td colspan="2">FINE SAND</td> <td colspan="2">SILTY OR CLAYEY GRAVEL AND SAND</td> <td colspan="2">SILTY SOILS</td> <td colspan="2">CLAYEY SOILS</td> <td colspan="2">SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER</td> <td colspan="2">HIGHLY ORGANIC SOILS</td> <td colspan="2">MUCK, PEAT</td> <td colspan="2"></td> </tr> <tr> <th>GENERATING AS A 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> <tr> <td colspan="4">P.I. OF A-7-5 ≤ L.L. - 30 ; P.I. OF A-7-6 > L.L. - 30</td> <td colspan="4"></td> <td colspan="4"></td> <td colspan="4"></td> </tr> </table>				GENERAL CLASS.	GRANULAR MATERIALS (5% PASSING #200)				SILT-CLAY MATERIALS (5% PASSING #200)				ORGANIC MATERIALS				A-1	A-3	A-2	A-2	A-4	A-5	A-6	A-7	A-1, A-2	A-4, A-5	A-6, A-7	A-1, A-2	A-4, A-5	GROUP CLASS.	A-1-a	A-1-b	A-2-1	A-2-2	A-2-3	A-2-4	A-2-5	A-2-6	A-2-7	A-4	A-5	A-6	A-7	A-1, A-2	A-4, A-5	A-6, A-7	SYMBOL																	% PASSING	10	40	200	10	40	200	10	40	200	10	40	200	10	40	200	10	LIQ. LIMIT	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	PLASTIC INDEX	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	GROUP INDEX	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	USUAL TYPES OF MAJOR MATERIALS	FINE SAND		SILTY OR CLAYEY GRAVEL AND SAND		SILTY SOILS		CLAYEY SOILS		SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS		MUCK, PEAT				GENERATING AS A SUBGRADE	EXCELLENT TO GOOD				FAIR TO POOR				FAIR TO POOR				POOR				P.I. OF A-7-5 ≤ L.L. - 30 ; P.I. OF A-7-6 > L.L. - 30																<p>MINERALOGICAL COMPOSITION</p> <p>MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.</p>				<p>COMPRESSION</p> <p>SLIGHTLY COMPRESSIBLE LIQUID LIMIT LESS THAN 30</p> <p>MODERATELY COMPRESSIBLE LIQUID LIMIT 31-50</p> <p>HIGHLY COMPRESSIBLE LIQUID LIMIT GREATER THAN 50</p>				<p>PERCENTAGE OF MATERIAL</p> <table border="1"> <tr> <th>ORGANIC MATERIAL</th> <th>GRANULAR SOILS</th> <th>SILT-CLAY SOILS</th> <th>OTHER MATERIAL</th> </tr> <tr> <td>TRACE OF ORGANIC MATTER</td> <td>2 - 3%</td> <td>3 - 5%</td> <td>TRACE</td> </tr> <tr> <td>LITTLE ORGANIC MATTER</td> <td>3 - 5%</td> <td>5 - 12%</td> <td>LITTLE</td> </tr> <tr> <td>MODERATELY ORGANIC</td> <td>5 - 10%</td> <td>12 - 20%</td> <td>SOME</td> </tr> <tr> <td>HIGHLY ORGANIC</td> <td>>10%</td> <td>>20%</td> <td>HIGHLY</td> </tr> </table>				ORGANIC MATERIAL	GRANULAR SOILS	SILT-CLAY SOILS	OTHER MATERIAL	TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE	LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE	MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME	HIGHLY ORGANIC	>10%	>20%	HIGHLY	<p>WEATHERING</p> <p>FRESH - ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER HAMMER IF CRYSTALLINE.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p>			
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<p>INDURATION</p> <p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.</p> <p>FRIABLE - RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.</p> <p>MODERATELY INDURATED - GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.</p> <p>INDURATED - GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.</p> <p>EXTREMELY INDURATED - SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</p>				<p>NOTES:</p> <p>BENCH MARK: BM #2 RR Spike in Tree at L- STA. 17+99.1, 36.7' RT</p> <p align="right">ELEVATION: 102.86'</p>																																																																																																																																																																																																																					



ENGINEERING CONSULTANTS, INC.



www.trigoneng.com

P.O. Box 18846 • Zip 27419-8846 • 313 Gallimore Dairy Road • Greensboro, NC 27409 • p 336.668.0093 • f 336.668.3868

SUBMITTED TO: North Carolina Department of Transportation
1589 Mail Service Center
Raleigh, North Carolina 27699-1589

ATTENTION: Mr. Njoroge W. Wainaina, P.E.
State Geotechnical Engineer

SUBMITTED BY: Trigon Engineering Consultants, Inc.
Post Office Box 18846
Greensboro, North Carolina 27419-8846
Trigon Project No. 071-05-025

DATE: November 8, 2005

STATE PROJECT: 33300.1.1

TIP : B-3853

FEDERAL PROJECT: BRSTP-561(1)

COUNTY: Halifax

DESCRIPTION: Bridge No. 82 Over Marsh Swamp on NC 561

SUBJECT: Geotechnical Report of Structure Subsurface Investigation

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Appendices

Appendix A (Issued Under Separate Cover)

- 1. Laboratory Results of Rock Tests

Appendix B (Issued Under Separate Cover)

- 1. FHWA Geotechnical Report Review Checklist
- 2. Boring Quantity Summation Sheet
- 3. Field Boring and Coring Logs
- 4. Survey Notes
- 5. Property Owner Contact Report Sheet



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COUNTY: Halifax
DESCRIPTION: Bridge No. 82 Over Marsh Swamp on NC 561
SUBJECT: Geotechnical Report of Structure Subsurface Investigation

Trigon Engineering Consultants, Inc. has completed the authorized geotechnical investigation for the above referenced project in Halifax County, North Carolina. The purpose of this exploration was to investigate the subsurface conditions at the proposed bridge bent locations and to provide general construction considerations based on the subsurface conditions.

1.0 SITE DESCRIPTION

The project site is located in the central portion of Halifax County, approximately 4 miles west of the town of Halifax, at the approximate location shown on the Site Vicinity Map (Drawing No. 1) located behind this report. The site and project description of the proposed project is "Bridge No. 82 over Marsh Swamp on NC 561". Topographically, the site slopes moderately down towards Marsh Swamp with relatively steep slopes down to the floodplain from the existing roadway embankment. The floodplain at the location of the

existing bridge appears to be greater than 1,000 feet wide. The topography of the general site vicinity is relatively flat.

At the time of this investigation, a four-span bridge (existing Bridge No. 82) was present at the site of the proposed bridge. The existing bridge consists of asphalt over timber deck supported by timber cap and piles. The existing Bent-1 has been shored with steel I-beams supported by steel piles. The existing bridge is approximately 71 feet in length and approximately 24 feet in width.

The water surface elevation surveyed by Trigon on November 2, 2005 was ± 100 feet. According to the Bridge Survey and Hydraulic Report, the 10-year floodwater surface elevation is approximately 102.3 feet, the 50-year floodwater surface elevation is approximately 103.4 feet, the 100-year flood elevation is approximately 104.0 feet, and the 500-year flood elevation is approximately 105.6 feet.

2.0 PROJECT DESCRIPTION

Proposed for construction is a new, three-span structure (bridge on -L-) to replace the existing Bridge No. 82 on NC 561 over Marsh Swamp, and a temporary detour bridge (bridge on -DET-) to convey traffic along NC 561 during demolition of the existing bridge and construction of the replacement bridge. The proposed bridge on -L- will be a replacement-in-place of the existing bridge. Information for the proposed bridge on -L- structure was obtained from the Bridge Survey & Hydraulic Design Report dated July 11, 2005 and the Preliminary General Drawing dated July 21, 2005, while information for the proposed bridge on -DET- structure was obtained from the Bridge Survey & Hydraulic Design Report dated August 8, 2005. The Bridge Survey & Hydraulic Design Reports and the Preliminary General Drawing were provided to Trigon by the NCDOT. The proposed bridge on -L- will be 82 feet in length and approximately 42 feet in width (out to out) with a skew angle of $90^{\circ}00'00''$ at each bent, while the proposed bridge on -DET- will be 68 feet in length and approximately 30 feet in width (clear roadway) with a skew angle of $90^{\circ}00'00''$ at each bent.

The proposed grade along the centerline of the proposed bridge on -L- will remain essentially unchanged from the existing grade, but excavation of the End Bent-1 and End Bent-2 embankment slopes is proposed between the old and new abutments. This excavation will involve both horizontal and vertical excavation, with vertical excavation extending to between approximately 4 and 5 feet below the existing top-of-soil at the -L- centerline. Slopes on the order of 1.5(H):1(V) are proposed for the new embankment slopes.

The proposed grade along the centerline of the proposed bridge on -DET- will require new embankments to be constructed extending downstation and upstation of the temporary bridge abutments. The depth of the fill material required to construct the new embankments will be approximately 6 feet adjacent to the proposed abutments. This approximately 6 feet depth of fill will extend downstation from the End Bent-1 abutment for a distance of approximately 90 feet, and will extend upstation from the End Bent-2 abutment for a distance of approximately 150 feet. From these points, the fill depth will gradually decrease away from the abutments to the grade points located approximately 240 feet downstation and upstation of the abutments is encountered. Slopes on the order of 1.5(H):1(V) are proposed for the new embankment slopes at the temporary detour bridge.

The Bridge Survey & Hydraulic Design Reports and the Preliminary General Drawing are in English units with feet as the primary unit of length.

3.0 SCOPE OF INVESTIGATION

3.1 FIELD TESTING

The as-drilled locations for the soil test borings were located by personnel from Trigon using the existing bridge for reference. Elevations at the as-drilled boring locations, along the existing ground surface at the bent locations, and along the structure profiles were surveyed by personnel from Trigon using the BM #2 benchmark elevation (Elevation 102.86 feet) established by an NCDOT survey crew as a reference point.

Trigon's subsurface investigation for the proposed bridge was conducted between October 25 and November 1, 2005. This exploration consisted of ten soil test borings: two at each proposed bent location for the bridge on -L- (EB1-A, EB1-B, B1-A, B1-B, B2-A, B2-B, EB2-A, and EB2-B), and one at each of the two bents for the proposed temporary detour bridge (EB1-DET and EB2-DET). In addition, one boring (B2-ST) was extended to a depth of 6 feet by collecting undisturbed samples for possible E.F.A. testing. The end bent borings for the bridge on -L- required offsetting in towards the centerline of -L- due to the proposed boring locations at these bents falling on the side of the existing roadway embankment slopes. The boring for the left side of Bent-2 (B2-A) required offsetting downstation of the proposed location due to the existing abutment wall in the immediate vicinity of the proposed boring location, and the boring for the right side of Bent-2 (B2-B) required offsetting upstation of the proposed location due to the existing abutment wall and stream bank in the immediate vicinity of the proposed boring location. As-drilled soil test boring locations are shown on the Boring Identification Diagram (Drawing No. 2) following this report.

Borings B1-A, B1-B, and B2-A were drilled within the stream channel using a CME 45 skid-rig drilling machine mounted on a barge. The remaining borings were drilled on land using an ATV-mounted Mobile B-57 drilling machine. Both drilling machines were equipped with a 140-pound manual hammer. The soil test borings on land were advanced through soil utilizing 0.33-foot tricone/wash-drilling techniques with creek water plus bentonite as the drilling fluid. The mud density ranged from 63.8 to 68.0 pounds per cubic foot. The water borings (B1-A, B1-B, and B2-A) were also advanced through soil utilizing 0.33-foot tricone/wash-drilling techniques, but creek water alone was used as the drilling fluid. Boring Logs and coring logs are located following this report.

Standard Penetration Tests were performed in the soil and weathered rock materials in the soil test borings in general accordance with NCDOT guidelines. In conjunction with this testing, split-barrel soil and weathered rock samples were recovered for visual classification and potential laboratory testing.

Rock coring was performed at the interior bent borings in order to evaluate the nature of the weathered rock/crystalline rock. The cored weathered rock/crystalline rock was returned to our laboratory for further classification and possible testing. The rock coring performed at Borings B1-A, B1-B, and B2-A utilized an NQ size hollow double-tube core barrel, while the rock coring performed at Boring B2-B utilized an HQ size hollow double-tube core barrel. Creek water alone was used as the drilling fluid during the rock coring.

3.2 LABORATORY TESTING

Laboratory soil testing was performed on sixteen representative split-barrel samples to aid in the assessment of AASHTO soil classification and to provide data for evaluation of engineering properties. The laboratory testing on the samples consisted of Natural Moisture Content, Atterberg Limit, and grain size analysis with hydrometer. In addition, two Unconfined Compressive Strength (Qu only) tests were performed on selected samples of the recovered rock core. Laboratory tests were performed in general accordance with AASHTO and NCDOT specifications. The results of the soil and rock laboratory tests are included on Sheet 30 located behind this report. Laboratory results of the rock testing are also included under separate cover in Appendix A.

3.3 SITE GEOLOGY

The site of the proposed project is located at the juncture of the Eastern Slate Belt of the Piedmont Physiographic Province of North Carolina and the Coastal Plain Physiographic Province of North Carolina. According to The Geology of the Carolinas published by the Carolina Geological Society in 1991, the Eastern Slate Belt is "composed dominantly of greenschist-facies metavolcanic rocks and associated metaplutonic rocks, metasedimentary rocks, and several post-metamorphic plutons". The rocks of the of the Eastern Slate Belt are of a lower metamorphic grade than the rocks of the Raleigh Belt to the west, and the metamorphic grade increases through the Eastern Slate Belt towards the west. A sizeable igneous complex, informally known as the Halifax County Complex, is present within the Eastern Slate Belt in the vicinity of the subject site. This complex consists of an association of metamorphosed ultramafic, gabbroic, and basaltic igneous rocks that has been interpreted as part of an ophiolite complex that may represent "oceanic" basement upon which the Eastern Slate Belt volcanics were deposited (Horton, J.W., and Zullo, V.A., *The Geology of the Carolinas*, 1991).

According to the 1985 Geologic Map of North Carolina, the site is located at the confluence of an area generally consisting of metamorphosed quartz diorite, and of an area generally consisting of tertiary coastal plain deposits. The coastal plain deposits, according to the geologic map, are part of the Yorktown Formation and generally consists of fossiliferous clay with varying amounts of fine grained sand and with shell material that is commonly concentrated in lenses. The borings drilled for this project encountered coastal plain materials of the Yorktown Formation overlying weathered rock/crystalline rock of the Eastern Slate Belt. The crystalline rock encountered in our test borings generally consisted of moderately severely weathered to fresh, metamorphosed diabase, metamorphosed diorite, and metamorphosed quartz diorite ranging in quality from very poor to very good. The majority of the crystalline rock encountered was very poor to poor in quality.

3.4 FOUNDATION MATERIALS

The generalized subsurface conditions indicated by the borings are described below. For soil descriptions and general stratification at a particular boring location, the respective Boring Log should be reviewed. For rock descriptions and stratification at a particular boring location, the respective Coring Log should be reviewed. The Boring Identification Diagram, Boring Logs, Coring Logs, and Core Photographs are located behind this report. Representative subsurface cross-sections at each bent

location for the bridge on -L-, a subsurface profile along the structure on -L-, and a subsurface profile along the structure on -DET- are also included behind this report. The subsurface properties for the project site are described below.

Bridge on -L- (Permanent Replacement-In-Place Bridge)

Foundation materials encountered at the bridge on -L- site included roadway embankment fill, alluvial soils, coastal plain material, weathered rock, and crystalline rock.

Roadway embankment fill was encountered beginning at the existing ground surface at the End Bent-1 and End Bent-2 borings, and at Boring B2-B. The fill extends to depths of between ± 6 and ± 3 feet (Elevations ± 100 feet to ± 103 feet) at the End Bent-1 borings, and a depth of ± 6 (Elevation ± 100 feet) at Boring B2-B and at the End Bent-1 borings. The roadway embankment fill encountered generally consists of loose to medium dense, clayey, silty, coarse to fine sand (A-2-4); and soft to stiff, clayey, coarse to fine sandy silt (A-4), and silty, coarse to fine sandy clay (A-6). Traces of organic material in the form of root fragments were common within the roadway embankment fill material. Standard Penetration Resistance values of 3 to 13 blows per foot (bpf) were encountered within the roadway embankment fill.

Alluvial soil was encountered underlying the roadway embankment fill at the End Bent-1 borings, at Boring B2-B, and at the End Bent-2 borings, and beginning at the existing ground surface at Boring B1-B. Alluvium was not encountered at Boring B1-A or B2-A. The alluvial soil extends to depths of ± 11 feet to ± 15 feet (Elevations ± 91 feet to ± 95 feet) at the End Bent-1 borings, to a depth of ± 3 feet (Elevation ± 90 feet) at Boring B1-B, and to a depth of ± 16 feet (Elevation ± 90 feet) at Borings B2-B, EB2-A, and EB2-B. The alluvial soil generally consists of very loose to medium dense, variably silty, variably clayey, coarse to fine sand (A-1-b, A-2-4, and A-3); and soft to medium stiff, silty, coarse to fine sandy clay (A-7-6). Traces of organic material in the form of root and wood fragments were common within the alluvial material. Standard Penetration Resistance values within the alluvial soil ranged from 2 to 12 bpf.

Coastal plain material was encountered beginning at the existing bottom-of-marsh surface at Borings B1-A and B2-A, and underlying the alluvial soils at the remaining borings drilled for the bridge on -L-. The coastal plain material extends to a depth of ± 26 feet (Elevation ± 80 feet) at the End Bent-1 borings, to

depths of between ± 12 feet and ± 14 feet (Elevations ± 80 feet and ± 79 feet) at the Bent-1 borings, to depths of between ± 14 feet and ± 27 feet (Elevations ± 77 feet and ± 79 feet) at the Bent-2 borings, and to a depth of ± 27 feet (Elevation ± 79 feet) at the End Bent-2 borings. The coastal plain material generally consists soft to very stiff, clayey, coarse to fine sandy silt (A-4), and silty, coarse to fine sandy clay (A-7-5). Traces to a little shell fragments were encountered throughout the coastal plain material. Standard Penetration Resistance values within the coastal plain material ranged from 3 to 25 bpf.

Weathered rock was encountered underlying the coastal plain soils at all of the borings drilled for this project. The weathered rock generally consists of metamorphosed quartz diorite, metamorphosed diorite, and metamorphosed diabase. The weathered rock was encountered between the following depths and elevations: ± 26 feet to ± 44 feet (Elevations ± 80 feet to ± 63 feet) at Boring EB1-A; ± 26 feet (Elevation ± 80 feet) to at least the boring termination depth of ± 44 feet (Elevation ± 62 feet) at Boring EB1-B; ± 11 feet to ± 33 feet (Elevations ± 80 feet to ± 58 feet) at Boring B1-A; ± 14 feet to ± 29 feet (Elevations ± 79 feet to ± 64 feet), and ± 32 feet to ± 38 feet (Elevations ± 61 feet to ± 55 feet) at Boring B1-B; ± 14 feet to ± 22 feet (Elevations ± 77 feet to ± 69 feet) at Boring B2-A; ± 27 feet to ± 29 feet (Elevations ± 79 feet to ± 77 feet), and ± 36 feet to ± 39 feet (Elevations ± 70 feet to ± 67 feet) at the Boring B2-B; ± 26 feet to ± 36 feet (Elevations ± 80 feet to ± 70 feet) at Boring EB2-A; and ± 28 feet to ± 33 feet (Elevations ± 78 feet to ± 73 feet) at Boring EB2-B. Boring EB1-B was terminated within weathered rock.

Crystalline rock was encountered as a zone within the weathered rock at Boring B2-B, and underlying the weathered rock at the remaining borings for the bridge on -L- with the exception of Boring EB1-B which was terminated before crystalline rock was encountered. The crystalline rock generally consists of metamorphosed quartz diorite, metamorphosed diorite, and metamorphosed diabase. The top of the crystalline rock was encountered at the following depths and elevations: ± 44 feet (Elevation ± 63 feet) at Boring EB1-A, ± 33 feet (Elevation ± 58 feet) at Boring B1-A, ± 29 feet (Elevation ± 64 feet) at Boring B1-B, ± 22 feet (Elevation ± 69 feet) at Boring B2-A, ± 29 feet (Elevation ± 77 feet) at Boring B2-B, ± 36 feet (Elevation ± 70 feet) at Boring EB2-A, and ± 33 feet (Elevation ± 73 feet) at Boring EB1-B. It should be noted that the crystalline rock encountered between depths of ± 29 feet and ± 36 feet (Elevations ± 77 feet and ± 70 feet) at Boring B2-B is a zone of diabase within weathered rock, and that the continuous crystalline rock in this boring was not encountered until a depth of ± 39 feet (Elevation ± 67 feet). It should also be noted that a zone of weathered rock approximately 5 feet thick was encountered within the crystalline rock at Boring B1-B

Between ± 32 and ± 33 feet of weathered rock/crystalline rock was cored at the interior bent borings. Rock coring was not performed at the remaining borings. In general, the cored weathered rock is severely weathered, soft to medium hard metamorphosed quartz diorite and metamorphosed diabase with very close to close fracture spacing. Strata recovery (REC) values within the weathered rock ranged from 0 to 23 percent. In general, the cored crystalline rock is moderately severely weathered to fresh, medium hard to very hard metamorphosed quartz diorite, metamorphosed diorite, and metamorphosed diabase with very close to moderately close fracture spacing. Strata (REC) values within the crystalline rock ranged from 33 to 100 percent and strata Rock Quality Designation (RQD) values ranged from 0 to 100 percent. The majority of the crystalline rock cored was very poor to poor in quality.

Bridge on -DET- (Temporary Detour Bridge)

Foundation materials encountered at the bridge on -L- site included alluvial soils, coastal plain material, residual soils, weathered rock, and crystalline rock.

Alluvial soil was encountered beginning at the existing ground surface at both borings drilled for the detour bridge. The alluvium soil extends to a depth of ± 8 feet (Elevation ± 93 feet) at Boring EB1-DET, and to a depth of ± 9 feet (Elevation ± 92 feet) at Boring EB2-DET. The alluvial soil generally consists of loose, coarse to fine sand (A-3); and very soft to stiff, clayey, coarse to fine sandy silty (A-4) and silty, coarse to fine sandy clay (A-6). Traces of organic material in the form of root and wood fragments were common within the alluvial material. Standard Penetration Resistance values within the alluvial soil ranged from Weight-of-Hammer to 10 blows per foot (bpf).

Coastal plain material was encountered directly underlying the alluvium at the detour bridge borings. The coastal plain material extends to a depth of ± 21 feet (Elevation ± 80 feet) at Boring EB1-DET, and to a depth of ± 24 feet (Elevation ± 77 feet) at Boring EB2-DET. The coastal plain material generally consists soft to stiff, variably clayey, coarse to fine sandy silt (A-4). Traces of shell fragments were encountered throughout the coastal plain material. Standard Penetration Resistance values within the coastal plain material ranged from 3 to 10 bpf.

Weathered rock was encountered underlying the coastal plain soils coastal plain material at the borings for the bridge on -DET-. The weathered rock generally consists of metamorphosed quartz diorite and

metamorphosed diabase. The weathered rock was encountered between the following depths and elevations: ± 21 feet to ± 30 feet (Elevations ± 80 feet to ± 70 feet) at Boring EB1-DET, and ± 24 feet to ± 26 feet (Elevations ± 77 feet to ± 75 feet), and ± 31 feet (Elevation ± 70 feet) to at least the boring termination depth of ± 44 feet (Elevation ± 57 feet) at Boring EB2-DET. Boring EB2-DET was terminated within weathered rock.

Residual soil was encountered as a zone within the weathered rock at Boring EB2-DET. The residual soil extended between depths of ± 26 feet and ± 31 feet (Elevations ± 75 feet and ± 70 feet). The residual soil consisted of hard, coarse to fine sandy silt (A-4) with rock fragments, and had a Standard Penetration Resistance value of 93 bpf.

Crystalline rock was encountered underlying the weathered rock at Boring EB1-DET. Crystalline rock was not encountered at Boring EB2-DET. The crystalline rock, based on the overlying weathered rock, most likely consists of metamorphosed diabase. The top of the crystalline rock at Boring EB1-DET was encountered at a depth of ± 30 feet (Elevation ± 70 feet). Rock coring was not performed at the borings for the detour bridge.

3.5 GROUNDWATER

Groundwater was encountered at all of the borings drilled on land for this project. The groundwater elevation was ± 100 feet at all of the borings. The water surface elevation of Marsh Swamp measured during the survey portion of our investigation on November 2, 2005 was ± 100 feet. Fluctuation of groundwater and creek water surface levels can occur with seasonal and climatic variations. According to the Bridge Survey and Hydraulic Report, the 10-year floodwater surface elevation is approximately 102.3 feet, the 50-year floodwater surface elevation is approximately 103.4 feet, the 100-year flood elevation is approximately 104.0 feet, and the 500-year flood elevation is approximately 105.6 feet.

4.0 CLOSURE

The geotechnical investigation, analysis, and general construction considerations included in this report are based on the Bridge Survey & Hydraulic Design Reports, the Preliminary General Drawing, and the data obtained from our field and laboratory-testing program. If the proposed location and geometry, or finished grades are changed or are different from those outlined above, or if subsurface conditions are encountered during construction which differ from those indicated by our borings, we will require the

opportunity to review these changed conditions and make any necessary modifications to the general conditions presented in this report.

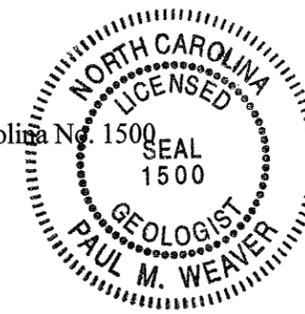
Cross-sections and profiles are a generalized interpretation of soil conditions between borings and should not be considered accurate other than at the boring locations. Subsurface conditions between boring locations or elsewhere on the site may vary, and subsurface anomalies may exist which were not detected.

Trigon Engineering Consultants, Inc. appreciates the opportunity to be of service to the NCDOT on this project. Should you have any questions concerning this report, please feel free to contact the undersigned.

Respectfully submitted,

TRIGON ENGINEERING CONSULTANTS, INC.


Paul M. Weaver, P.G.
Registered North Carolina No. 1500

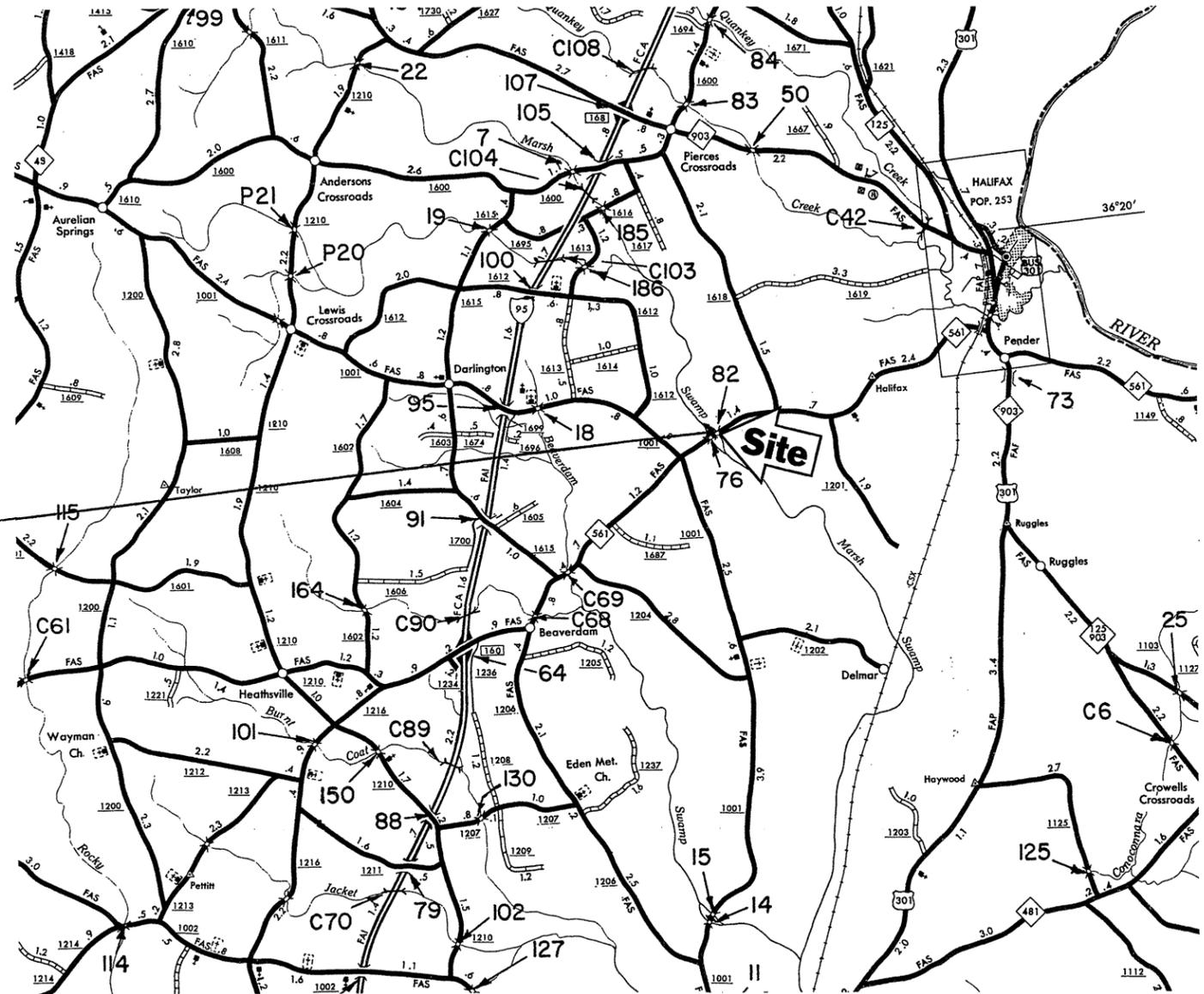
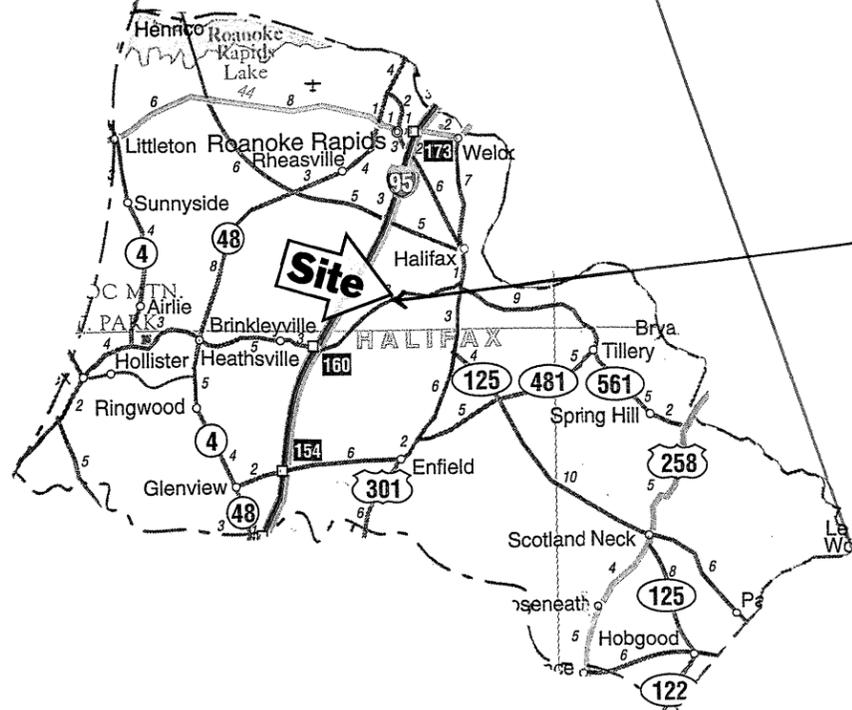



Jeffrey R. Vinson, P.G.
Senior Project Manager

PMW/JRV:pkb

Attachments

s:\0710\projectss\2005\Bridge No. 82 over Marsh Swamp Report.doc



Trigon Engineering Consultants, Inc.
Greensboro North Carolina

SCALE:
Not to Scale

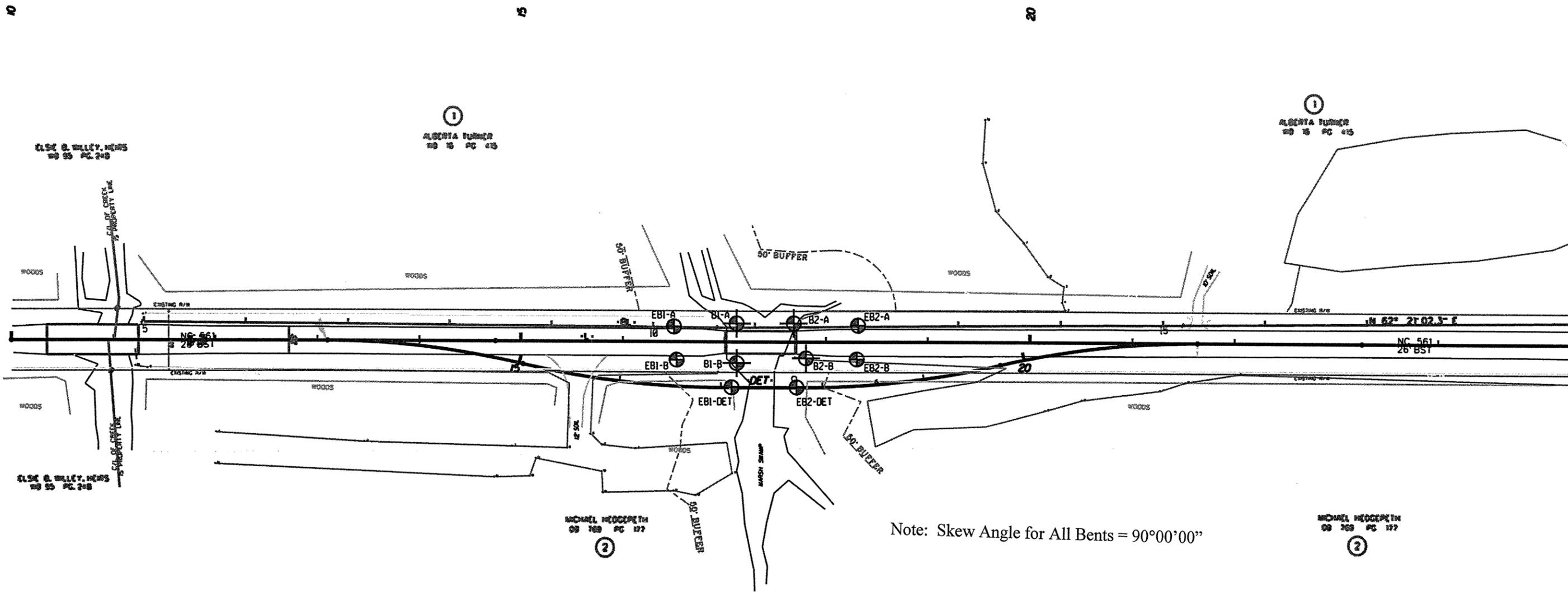
DATE:
11/7/05

STATE PROJECT NO.
33300.1.1

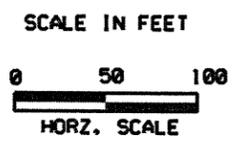
TIP NO.:
B-3853

SITE VICINITY MAP
Bridge No. 82 Over Marsh Swamp on NC 561, Halifax County, North Carolina

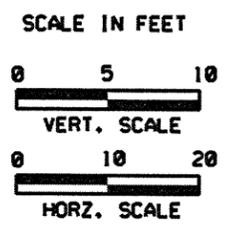
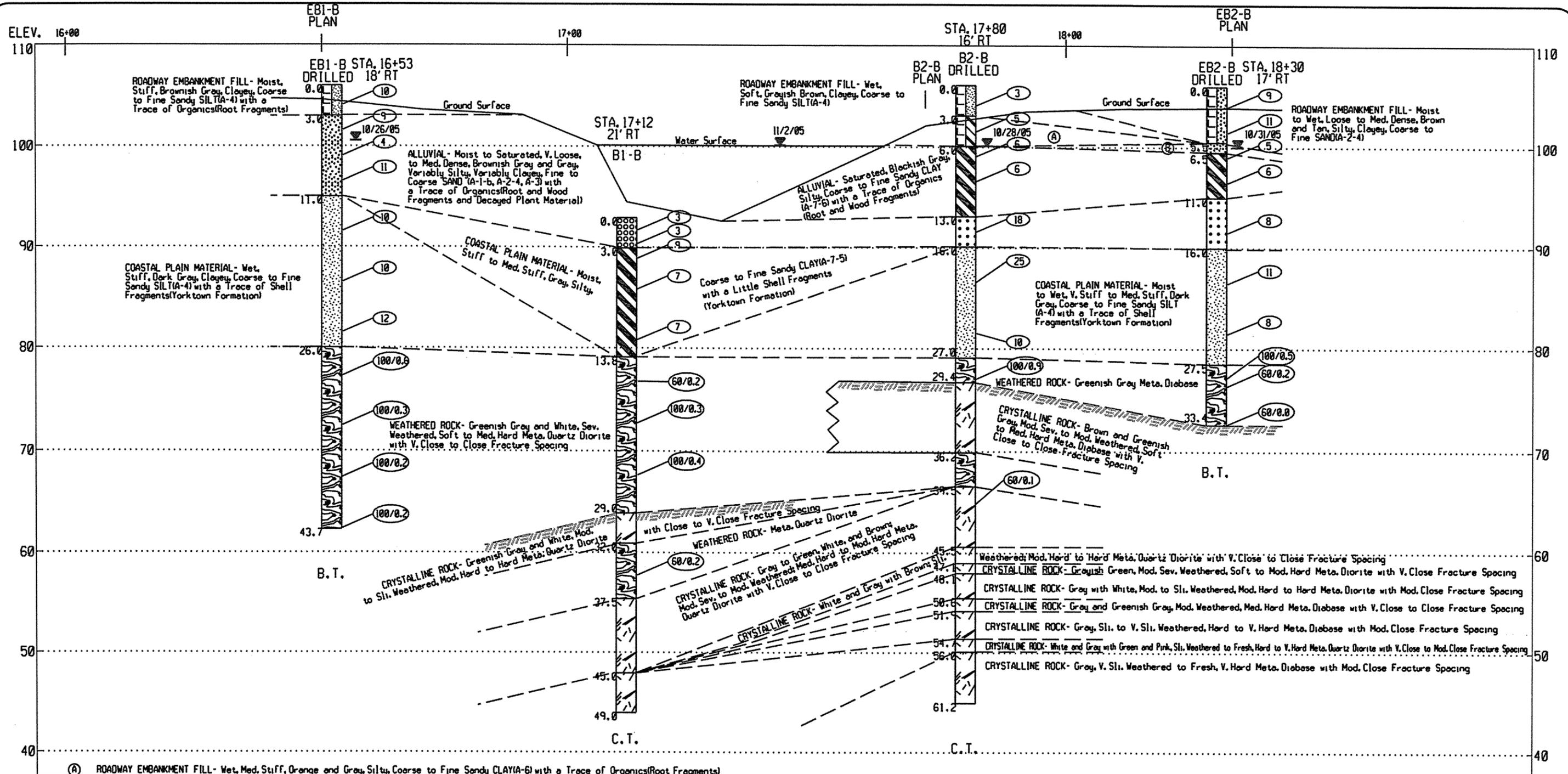
DRAWING NUMBER:
1



Note: Skew Angle for All Bents = 90°00'00"



BORING IDENTIFICATION DIAGRAM	
Bridge No. 82 Over Marsh Swamp on NC 561	
Halifax County, North Carolina	
Project No. 33300.1.1	TIP No. B-3853
Federal No. BRSTP-561(1)	Vert. Scale N/A
Date 11/8/05	Horiz. Scale 1" = 100'
Drawn by DRK	Drawing No. 2

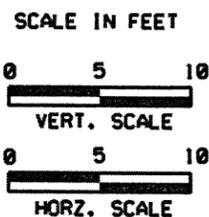
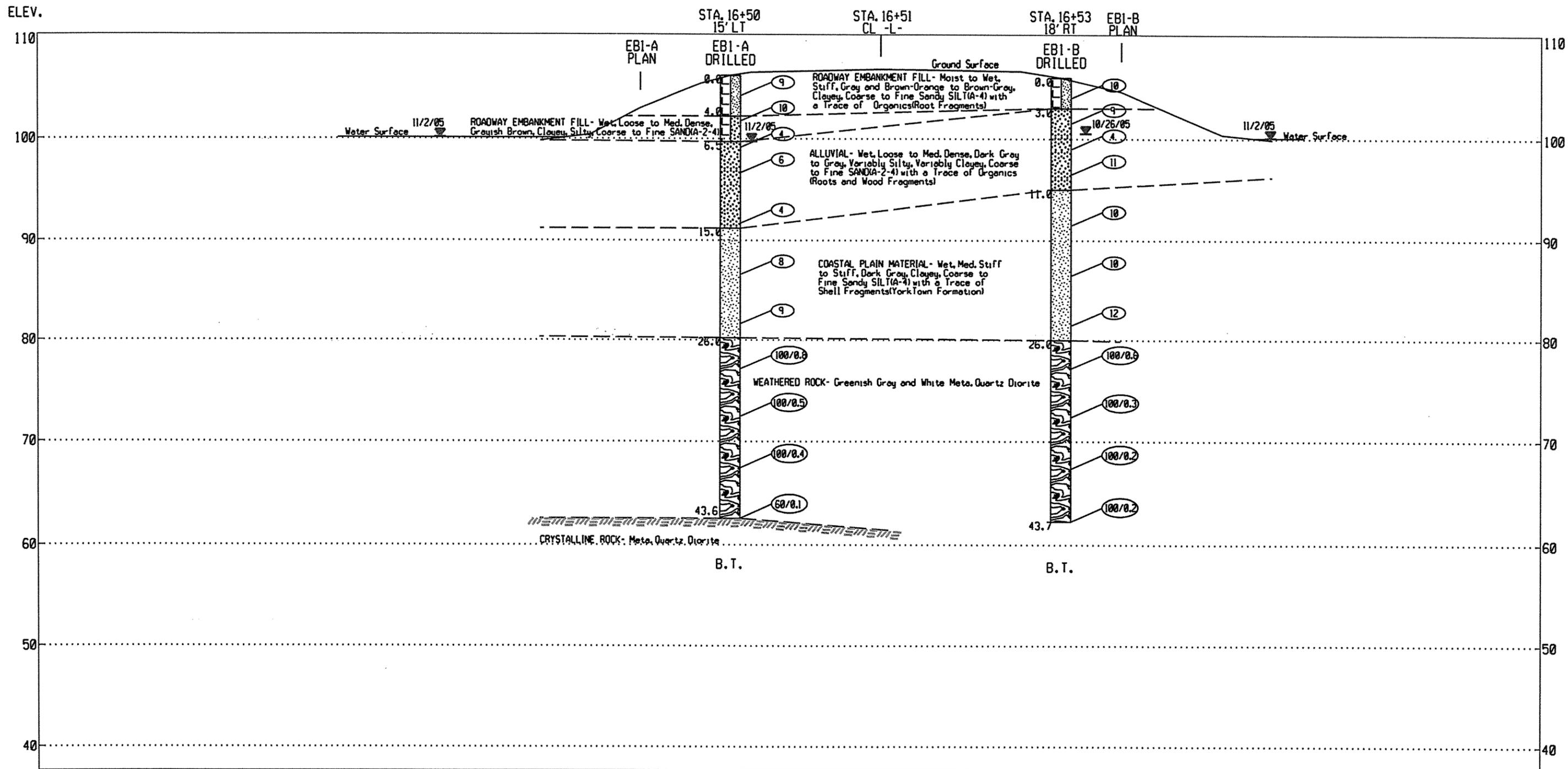


PROFILE 24' RIGHT OF -L-

Bridge No. 82 Over Marsh Swamp on NC 561

Halifax County, North Carolina

Project No. 33300.1.1	TIP No. B-3853
Federal No. BRSTP-56(1)	Vert. Scale 1" = 10'
Date 11/8/05	Horiz. Scale 1" = 20'
Drawn by DRK	Drawing No. 3

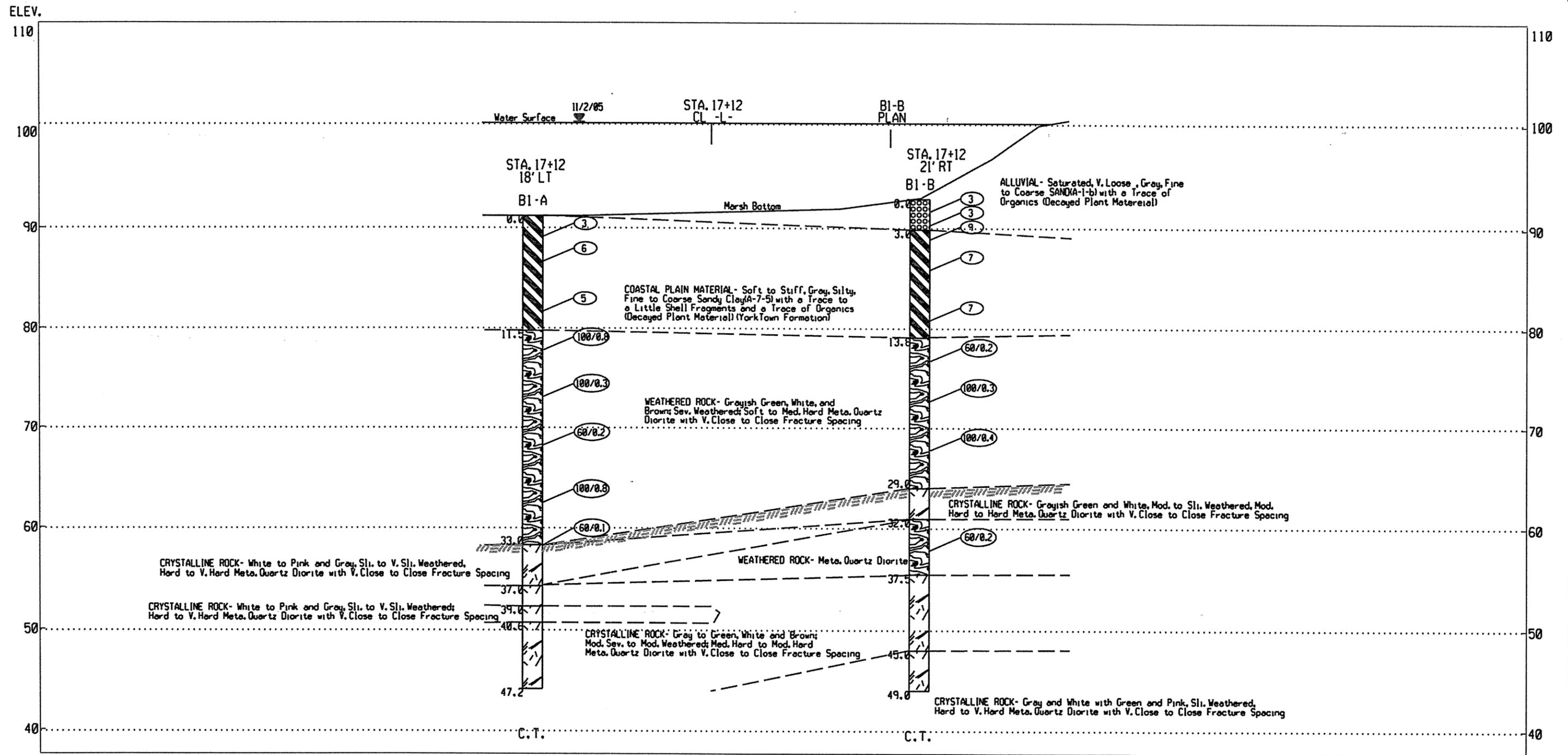


CROSS-SECTION ALONG END BENT-1

Bridge No. 82 Over Marsh Swamp on NC 561

Halifax County, North Carolina

Project No. 33300.1.1	TIP No. B-3853
Federal No. BRSTP-561(1)	Vert. Scale 1" = 10'
Date 11/8/05	Horiz. Scale 1" = 10'
Drawn by DRK	Drawing No. 4



SCALE IN FEET



VERT. SCALE



HORZ. SCALE



ENGINEERING CONSULTANTS, INC.

CROSS-SECTION ALONG BENT-1

Bridge No. 82 Over Marsh Swamp on NC 561

Halifax County, North Carolina

Project No. 33300.1.1

TIP No. B-3853

Federal No. BRSTP-561(1)

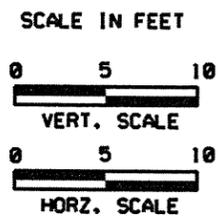
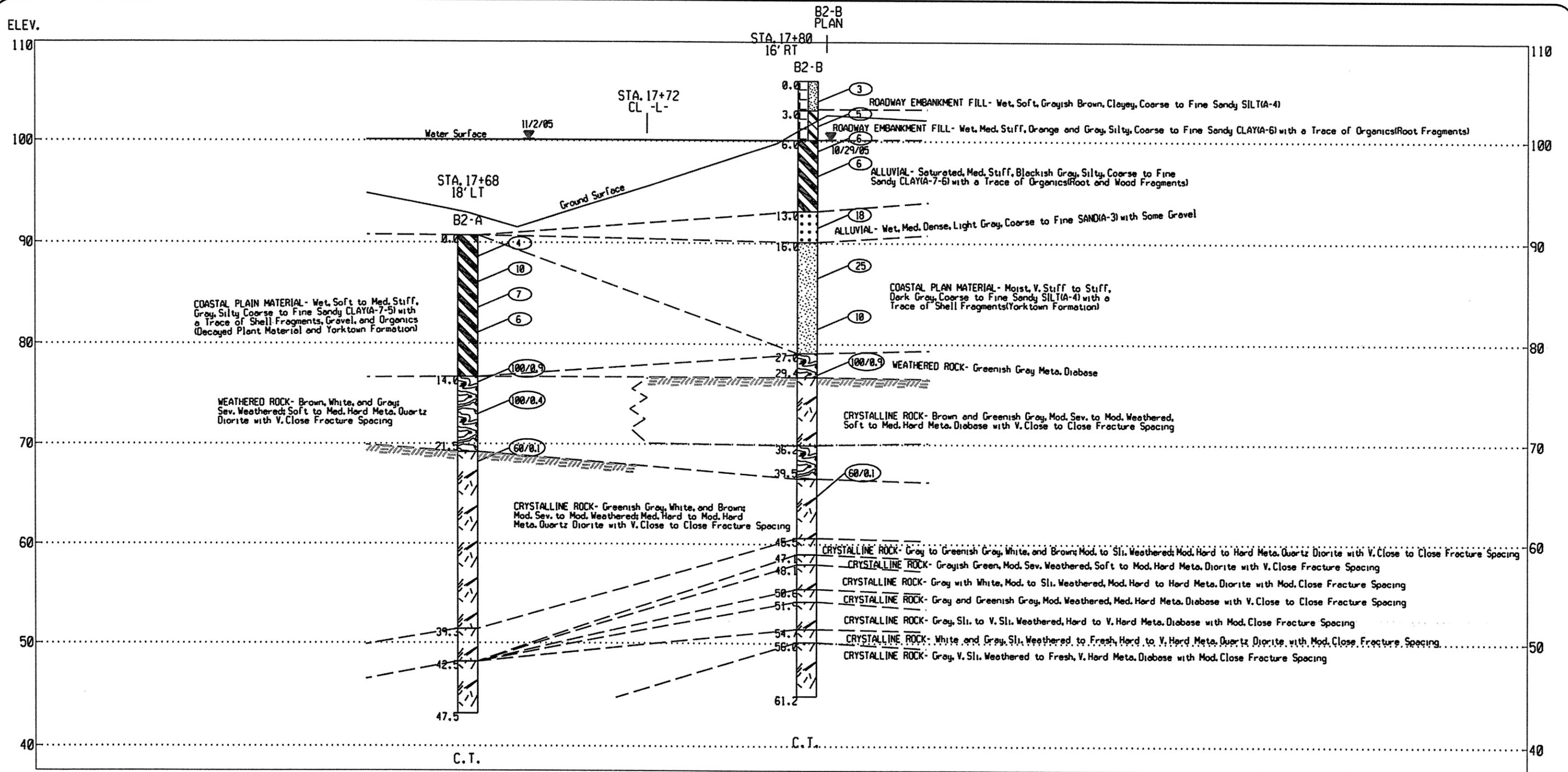
Vert. Scale 1" = 10'

Date 11/8/05

Horiz. Scale 1" = 10'

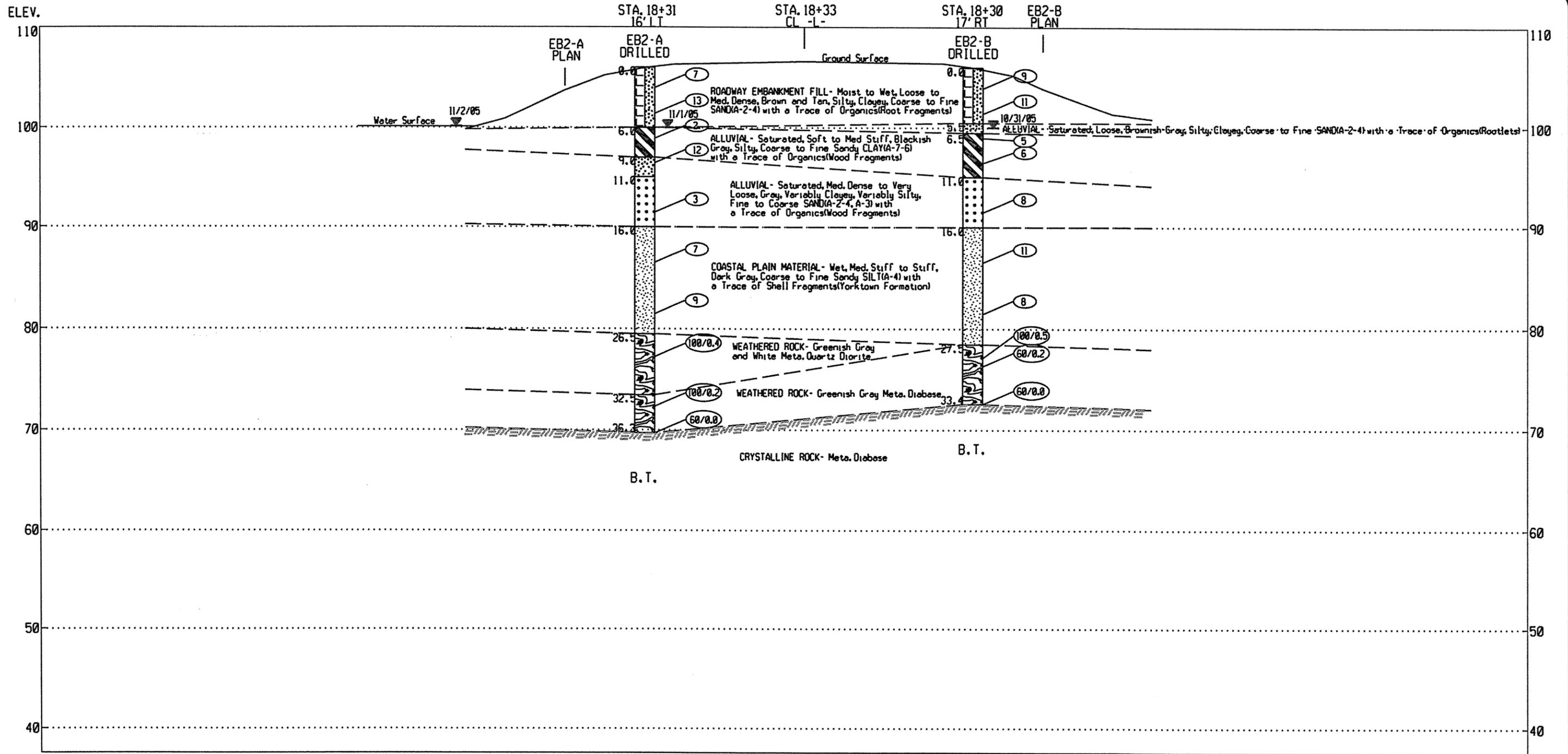
Drawn by DRK

Drawing No. 5



CROSS-SECTION ALONG BENT-2

Bridge No. 82 Over Marsh Swamp on NC 561	
Halifax County, North Carolina	
Project No. 33300.1.1	TIP No. B-3853
Federal No. BRSTP-561(1)	Vert. Scale 1" = 10'
Date 11/8/05	Horiz. Scale 1" = 10'
Drawn by DRK	Drawing No. 6



SCALE IN FEET



VERT. SCALE



HORZ. SCALE



ENGINEERING CONSULTANTS, INC.

CROSS-SECTION ALONG END BENT-2

Bridge No. 82 Over Marsh Swamp on NC 561

Halifax County, North Carolina

Project No. 33300.1.1

TIP No. B-3853

Federal No. BRSTP-561(1)

Vert. Scale 1" = 10'

Date 11/8/05

Horiz. Scale 1" = 10'

Drawn by DRK

Drawing No. 7



PROJECT NO. 33300.1.1		ID No. B-3853		COUNTY Halifax		GEOLOGIST P.Alton/P.Weaver									
SITE DESCRIPTION Bridge No. 82 Over Marsh Swamp On NC 561							GROUND WATER (ft)								
BORING NO. EB1-A		BORING LOCATION 16+50		OFFSET 15ft LT	ALIGNMENT -L-		0 HR. NM								
COLLAR ELEV. 106.2 ft		NORTHING 931812		EASTING 2395288		24 HR. 6.5									
TOTAL DEPTH 43.6 ft		DRILL MACHINE B-57 ATV		DRILL METHOD Wash Rotary		HAMMER TYPE 140lb Manual									
DATE STARTED 11/1/05		COMPLETED 11/1/05		SURFACE WATER DEPTH NA											
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION			
		0.5ft	0.5ft	0.5ft	0	20	40	60	80				100		
106.2													106.2	0.00	
105.2	1.0	5	4	5								W	102.2	4.0	ROADWAY EMBANKMENT FILL: Stiff, Grey And Brown Orange, Clayey, Coarse To Fine Sandy SILT
102.7	3.5	3	4	6								W	102.2	4.0	ROADWAY EMBANKMENT FILL: Loose To Medium Dense, Greyish Brown, Clayey, Silty, Coarse To Fine SAND
100.2	6.0	3	2	2								W	99.7	6.5	ALLUVIAL: Loose, Grey And Blackish Grey, Variably Silty, Variably Clayey, Coarse To Fine SAND With A Trace Of Organics (Root And Wood Fragments)
97.7	8.5	2	2	4								W			
92.7	13.5	2	2	2								SS-1 SAT	91.2	15.0	COASTAL PLAIN MATERIAL: Medium Stiff To Stiff, Dark Grey, Clayey, Coarse To Fine Sandy SILT With A Trace Of Shell Fragments (Yorktown Formation)
87.7	18.5	4	3	5								W			
82.7	23.5	4	4	5								W			
77.7	28.5	54	46/3										80.2	26.0	WEATHERED ROCK: Greenish Grey And White To Pink And Brown METAMORPHOSED QUARTZ DIORITE
72.7	33.5	100/5													
67.7	38.5	100/4													
62.7	43.5	60/1											62.6	43.6	Boring Terminated With SPT Refusal At Elevation 62.6ft On CRYSTALLINE ROCK: METAMORPHOSED QUARTZ DIORITE

NCDOT BORE SINGLE 07105025.GPJ NC DOT.GDT 11/8/05

Note: Drilling Fluid = 20lbs Bentonite To 100gals Water; Mud Density = 65.5lbs/cu.ft. at 13.5ft



PROJECT NO. 33300.1.1		ID No. B-3853		COUNTY Halifax		GEOLOGIST P.Alton/P.Weaver									
SITE DESCRIPTION Bridge No. 82 Over Marsh Swamp On NC 561							GROUND WATER (ft)								
BORING NO. EB1-B		BORING LOCATION 16+53		OFFSET 18ft RT	ALIGNMENT -L-		0 HR. NM								
COLLAR ELEV. 106.0 ft		NORTHING 931784		EASTING 2395305		24 HR. 5.5									
TOTAL DEPTH 43.7 ft		DRILL MACHINE B-57 ATV		DRILL METHOD Wash Rotary		HAMMER TYPE 140lb Manual									
DATE STARTED 10/25/05		COMPLETED 10/25/05		SURFACE WATER DEPTH NA											
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION			
		0.5ft	0.5ft	0.5ft	0	20	40	60	80				100		
106.0													106.0	0.00	
105.0	1.0	5	4	6								SS-2	103.0	3.0	ROADWAY EMBANKMENT FILL: Stiff, Brownish Grey, Clayey, Coarse To Fine Sandy SILT With A Trace Of Organics (Root Fragments)
102.5	3.5	4	4	5								SS-3			ALLUVIAL: Loose To Medium Dense, Brownish Grey And Dark Grey, Silty, Clayey Coarse To Fine SAND With A Trace Of Organics (Root Fragments)
100.0	6.0	2	2	2								W			
97.5	8.5	2	6	5								SS-4			
92.5	13.5	2	2	8								W			COASTAL PLAIN MATERIAL: Stiff, Dark Grey, Clayey, Coarse To Fine Sandy SILT With A Trace Of Shell Fragments (Yorktown Formation)
87.5	18.5	4	4	6								SS-5			
82.5	23.5	4	5	7								W			
77.5	28.5	85	15/1										80.0	26.0	WEATHERED ROCK: Greenish Grey And White METAMORPHOSED QUARTZ DIORITE
72.5	33.5	100/3													
67.5	38.5	100/2													
62.5	43.5	100/2											62.3	43.7	Boring Terminated At Elevation 62.3ft In WEATHERED ROCK: METAMORPHOSED QUARTZ DIORITE

NCDOT BORE SINGLE 07105025.GPJ NC DOT.GDT 11/8/05

Note: Drilling Fluid = 30lbs Bentonite To 100gals Water; Mud Density = 63.8lbs/cu.ft. At 3.5ft



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

PROJECT NO. 33300.1.1		ID No. B-3853		COUNTY Halifax		GEOLOGIST G.Licayan/P.Weaver							
SITE DESCRIPTION Bridge No. 82 Over Marsh Swamp On NC 561							GROUND WATER (ft)						
BORING NO. B1-A		BORING LOCATION 17+12		OFFSET 18ft LT	ALIGNMENT -L-		0 HR. NA						
COLLAR ELEV. 91.2 ft		NORTHING 931843		EASTING 2395342		24 HR. NA							
TOTAL DEPTH 47.2 ft		DRILL MACHINE CME 45 Barge		DRILL METHOD Wash Rotary/NQ Core		HAMMER TYPE 140lb Manual							
DATE STARTED 10/25/05		COMPLETED 10/26/05		SURFACE WATER DEPTH 9.0 ft.									
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	
		0.5ft	0.5ft	0.5ft	0	20	40	60	80				100
100.2													Water Line
													Marsh Bottom
90.2	1.0	WOH	1	2									COASTAL PLAIN MATERIAL: Soft To Medium Stiff, Grey, Silty, Coarse To Fine Sandy CLAY With A Little Shell Fragments And A Trace Organics (Decayed Plant Material) (Yorktown Formation)
87.7	3.5		3	3									
82.7	8.5		2	2									
77.7	13.5		52	48/3									WEATHERED ROCK: Grey, White And Brown; Severely Weathered; Soft To Medium Hard METAMORPHOSED QUARTZ DIORITE With Very Close To Close Fracture Spacing
73.2	18.0		100/3										
68.2	23.0		60/2										
63.2	28.0		30	45	55/3								
58.2	33.0		60/1										CRYSTALLINE ROCK: White To Pink And Grey, Slightly To Very Slightly Weathered, Hard To Very Hard METAMORPHOSED QUARTZ DIORITE With Very Close To Close Fracture Spacing
													CRYSTALLINE ROCK: White And Greenish Grey, Moderately Severely To Moderately Weathered, Medium Hard To Moderately Hard METAMORPHOSED QUARTZ DIORITE With Very Close Fracture Spacing
													CRYSTALLINE ROCK: White To Pink And Grey, Slightly To Very Slightly Weathered, Hard To Very Hard METAMORPHOSED QUARTZ DIORITE With Very Close Fracture Spacing
													CRYSTALLINE ROCK: White And Brown, Moderately Severely To Moderately Weathered, Medium Hard To Moderately Hard METAMORPHOSED QUARTZ DIORITE With Very Close Fracture Spacing
													CRYSTALLINE ROCK: METAMORPHOSED QUARTZ DIORITE

NCDOT BORE SINGLE 07105025.GPJ NC_DOT_GDT 11/8/05



CORE BORING REPORT
SHEET 17 OF 39

PROJECT NO. 33300.1.1		ID No. B-3853		COUNTY Halifax		GEOLOGIST G.Licayan/P.Weaver				
SITE DESCRIPTION Bridge No. 82 Over Marsh Swamp On NC 561							GROUND WATER (ft)			
BORING NO. B1-A		BORING LOCATION 17+12		OFFSET 18ft LT	ALIGNMENT -L-		0 HR. NA			
COLLAR ELEV. 91.2 ft		NORTHING 931843		EASTING 2395342		24 HR. NA				
TOTAL DEPTH 47.2 ft		DRILL MACHINE CME 45 Barge		DRILL METHOD Wash Rotary/NQ Core		HAMMER TYPE 140lb Manual				
DATE STARTED 10/25/05		COMPLETED 10/26/05		SURFACE WATER DEPTH 9.0 ft.						
CORE SIZE NQ				TOTAL RUN 31.0 ft		DRILLER W.Whichard				
ELEV. (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS
				REC. (ft) %	RQD (ft) %		REC. (ft) %	RQD (ft) %		
										Begin Coring @ 14.3 ft
76.9	14.3	3.7	:38/0.7 .47	(0.0)	(na)		(3.9)	(NA)		WEATHERED ROCK: Grey, White And Brown; Severely Weathered; Soft To Medium Hard METAMORPHOSED QUARTZ DIORITE With Very Close To Close Fracture Spacing
73.2	18.0		1:03 2:34							
72.9	18.3	4.7	N=100/3 2:00/0.7	(1.7)	(NA)					
68.2	23.0		1:52 1:47							
68.0	23.2	4.8	2:36 3:05	(0.7)	(0.0)					
63.2	28.0		N=60/2 2:49/0.8	15%	0%					
61.9	29.3	3.7	2:49 3:30							
58.2	33.0		3:08 2:06	(1.5)	(0.0)					
58.1	33.1	4.9	N=100/8 3:26/0.7	(4.6)	(1.5)		(4.0)	(1.5)		CRYSTALLINE ROCK: White To Pink And Grey, Slightly To Very Slightly Weathered, Hard To Very Hard METAMORPHOSED QUARTZ DIORITE With Very Close To Close Fracture Spacing
53.2	38.0		5:01 6:59 5:35	94%	31%		100%	38%		
		5.0	N=60/1 4:34/0.9	(2.3)	(0.4)		(0.9)	(0.0)		Moderately Weathered, Medium Hard, Greenish Grey From 33.0ft to 33.7ft
			6:32 6:00	46%	8%		(1.6)	(0.4)		
			5:28 3:54				100%	25%		Majority Of Joints At 10°-20° 3 Joints At 50°-60° 1 Vertical Joint 0.4ft Long With Heavy Iron Staining
48.2	43.0		4:32 6:06 5:52				(2.2)	(0.7)		CRYSTALLINE ROCK: White And Greenish Grey, Moderately Severely To Moderately Weathered, Medium Hard To Moderately Hard METAMORPHOSED QUARTZ DIORITE With Very Close Fracture Spacing
		4.2	5:09 3:35	(1.8)	(0.7)		33%	11%		
44.0	47.2		5:02 4:06 5:19 9:34 2:54/0.2	43%	17%					Numerous High Angle Fractures CRYSTALLINE ROCK: White To Pink And Grey, Slightly To Very Slightly Weathered, Hard To Very Hard METAMORPHOSED QUARTZ DIORITE With Very Close To Close Fracture Spacing
										Numerous Low To High Angle Fractures CRYSTALLINE ROCK: White And Brown, Moderately Severely To Moderately Weathered, Medium Hard To Moderately Hard METAMORPHOSED QUARTZ DIORITE With Very Close To Close Fracture Spacing
										Numerous Low To High Angle Fractures Heavy Iron Staining Of Fabric And Joints Coring Terminated At Elevation 44.0ft In CRYSTALLINE ROCK: METAMORPHOSED QUARTZ DIORITE

NCDOT BORE SINGLE 07105025.GPJ NC_DOT_GDT 11/8/05

Note: Run #7 Terminated Short Of 5.0ft Due To Core Block

CORE PHOTOGRAPHS

Bridge No. 82 over Marsh Swamp on NC 561

Halifax County, North Carolina

NCDOT Project No. 33300.1.1 (B-3853)

B1-A



Box 1 of 2
Scale = 1:4

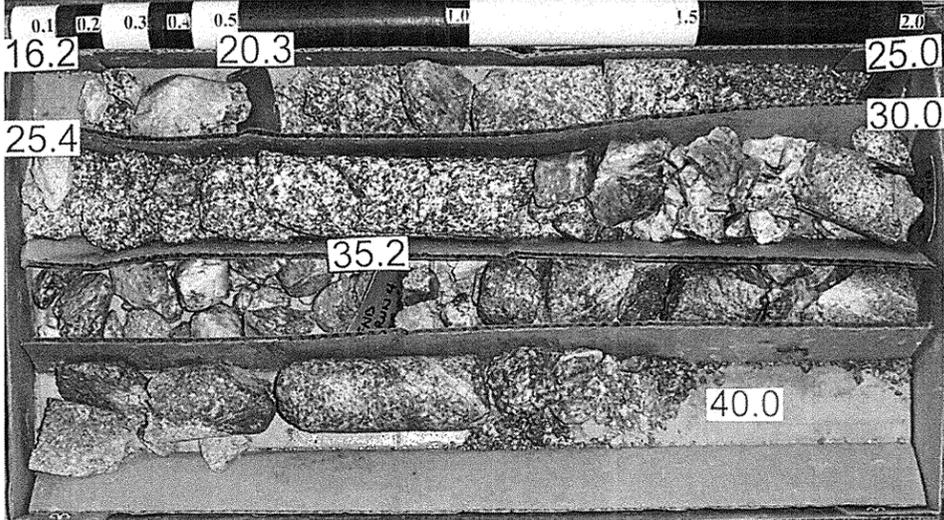


Box 2 of 2

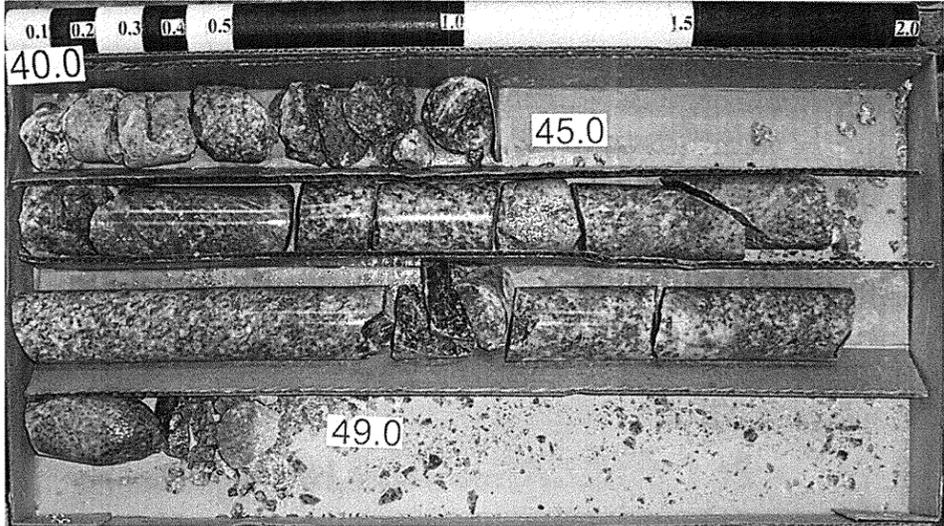
CORE PHOTOGRAPHS

Bridge No. 82 over Marsh Swamp on NC 561
Halifax County, North Carolina
NCDOT Project No. 33300.1.1 (B-3853)

B1-B



Box 1 of 2
Scale = 1:4



Box 2 of 2



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

PROJECT NO. 33300.1.1		ID No. B-3853	COUNTY Halifax		GEOLOGIST G.Licayan/P.Weaver								
SITE DESCRIPTION Bridge No. 82 Over Marsh Swamp On NC 561						GROUND WATER (ft)							
BORING NO. B2-A		BORING LOCATION 17+68		OFFSET 18ft LT	ALIGNMENT -L-	0 HR. NA							
COLLAR ELEV. 90.7 ft		NORTHING 931868		EASTING 2395391		24 HR. NA							
TOTAL DEPTH 47.5 ft		DRILL MACHINE CME 45 Barge		DRILL METHOD Wash Rotary/NQ Core		HAMMER TYPE 140lb Manual							
DATE STARTED 10/26/05		COMPLETED 10/28/05		SURFACE WATER DEPTH 9.4 ft.									
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	
		0.5ft	0.5ft	0.5ft	0	20	40	60	80				100
100.1													Water Line
90.7	0.0	WOH	1	3									Marsh Bottom
87.2	3.5		14	7									COASTAL PLAIN MATERIAL: Soft To Medium Stiff, Grey, Silty, Coarse To Fine Sandy CLAY With A Trace Of Shell Fragments, Gravel And Organics (Decayed Plant Material) (Yorktown Formation)
84.7	6.0		4	3									
82.2	8.5		3	3									
77.2	13.5		16	23									
73.2	17.5	100/4											WEATHERED ROCK: Brown, White And Grey; Severely Weathered; Soft To Medium Hard METAMORPHOSED QUARTZ DIORITE With Very Close Fracture Spacing
68.2	22.5	60/1											CRYSTALLINE ROCK: Greenish Grey, White And Brown; Moderately Severely To Moderately Hard METAMORPHOSED QUARTZ DIORITE With Very Close To Close Fracture Spacing
													CRYSTALLINE ROCK: Grey To Greenish Grey And White, Moderately To Slightly Weathered, Moderately Hard To Hard METAMORPHOSED QUARTZ DIORITE With Very Close To Close Fracture Spacing
													CRYSTALLINE ROCK: Grey With White, Slightly To Very Slightly Weathered, Hard METAMORPHOSED DIORITE And METAMORPHOSED QUARTZ DIORITE With Moderately Close Fracture Spacing
													CRISTALLINE ROCK: METAMORPHOSED DIORITE OR METAMORPHOSED QUARTZ DIORITE

NCDOT BORE SINGLE 07105025.GPJ NC_DOT_GDT 11/8/05



CORE BORING REPORT
SHEET 21 OF 39

PROJECT NO. 33300.1.1		ID No. B-3853	COUNTY Halifax		GEOLOGIST G.Licayan/P.Weaver					
SITE DESCRIPTION Bridge No. 82 Over Marsh Swamp On NC 561						GROUND WATER (ft)				
BORING NO. B2-A		BORING LOCATION 17+68		OFFSET 18ft LT	ALIGNMENT -L-	0 HR. NA				
COLLAR ELEV. 90.7 ft		NORTHING 931868		EASTING 2395391		24 HR. NA				
TOTAL DEPTH 47.5 ft		DRILL MACHINE CME 45 Barge		DRILL METHOD Wash Rotary/NQ Core		HAMMER TYPE 140lb Manual				
DATE STARTED 10/26/05		COMPLETED 10/28/05		SURFACE WATER DEPTH 9.4 ft.						
CORE SIZE NQ		TOTAL RUN 32.1 ft		DRILLER W.Whichard						
ELEV. (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS
				REC. (%)	RQD (%)		REC. (%)	RQD (%)		
										Begin Coring @ 14.9 ft
75.8	14.9	2.6	1:03/0.6	(0.0)	(NA)		(0.8)	(NA)		WEATHERED ROCK: Brown, White And Grey; Severely Weathered; Soft To Medium Hard METAMORPHOSED QUARTZ DIORITE With Very Close Fracture Spacing
73.2	17.5		1:58				13%			
			1:33							
72.8	17.9	4.6	N=100/4	(0.8)	(0.0)					
			1:43/0.6	17%	0%					
			2:32							
68.2	22.5		3:06				(11.6)	(1.0)		CRYSTALLINE ROCK: Greenish Grey, White And Brown; Moderately Severely To Moderately Weathered; Medium Hard To Moderately Hard METAMORPHOSED QUARTZ DIORITE With Very Close To Close Fracture Spacing
68.1	22.6	4.9	4:33	(4.3)	(0.0)		65%	6%		
			5:01	88%	0%					
			N=60/1							
			7:48/0.9							
63.2	27.5	5.0	14:02	(3.0)	(0.6)					Majority Of Joints At 10°-20° Numerous High Angle To Vertical Fractures, Especially Between 21.5ft And 27.5ft Very Slightly Weathered, Hard From 31.3ft To 31.9ft And 36.7ft To 37.5ft
			8:28	60%	12%					
			6:29							
			2:58							
58.2	32.5	5.0	2:19	(3.1)	(0.0)					
			4:25	62%	0%					
			3:57							
			4:50							
			6:31							
53.2	37.5	5.0	4:44	(4.4)	(2.1)	RS-2	(3.2)	(1.7)		CRYSTALLINE ROCK: Grey To Greenish Grey And White, Moderately To Slightly Weathered, Moderately Hard To Hard METAMORPHOSED QUARTZ DIORITE With Very Close To Close Fracture Spacing
			5:40	88%	42%		100%	53%		
			4:15							
48.2	42.5	5.0	4:00	(5.0)	(4.8)		(5.0)	(4.8)		Majority Of Joints At 10°-20° 1 Joint At 60° With Iron Staining
			3:30	100%	96%		100%	96%		CRYSTALLINE ROCK: Grey With White, Slightly To Very Slightly Weathered, Hard METAMORPHOSED DIORITE And METAMORPHOSED QUARTZ DIORITE With Moderately Close Fracture Spacing
			4:40							
			5:00							
			3:00							
			3:30							
43.2	47.5		4:30							Becomes Quartz Diorite At 45.7ft Moderately Weathered, Very Close Fracture Spacing From 42.5ft To 42.7ft 1 Joint At 10°
			4:45							
			4:20							
			3:30							
			5:00							

NCDOT BORE SINGLE 07105025.GPJ NC_DOT_GDT 11/8/05

Note: Lifter Could Not Retrieve The Lower 1.2ft Of Core From Run #7, REC And RQD Quantities Assume That Unretrieved Rock Is The Same As The Retrieved Rock
Coring Terminated At Elevation 43.2ft In CRYSTALLINE ROCK: DIORITE OR METAMORPHOSED QUARTZ DIORITE

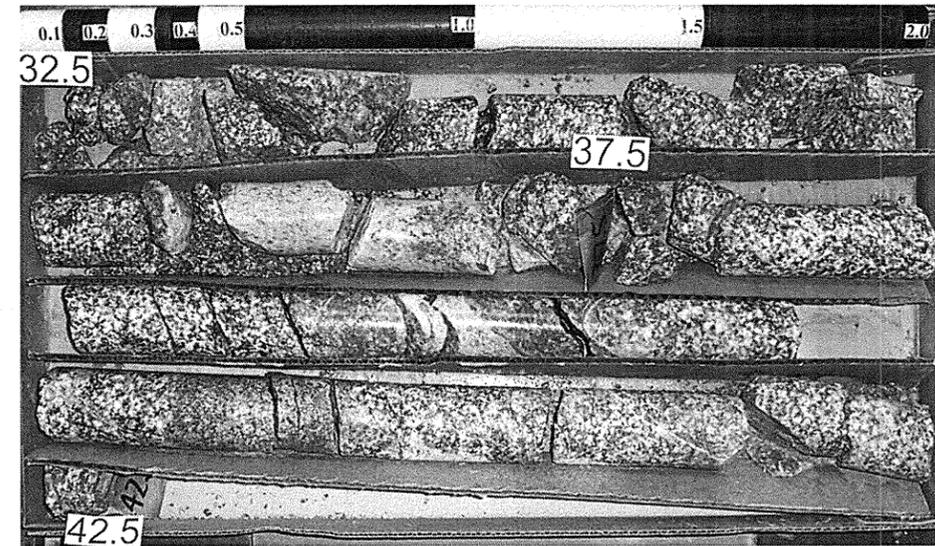
CORE PHOTOGRAPHS

Bridge No. 82 over Marsh Swamp on NC 561
Halifax County, North Carolina
NCDOT Project No. 33300.1.1 (B-3853)

B2-A



Box 1 of 3
Scale = 1:4

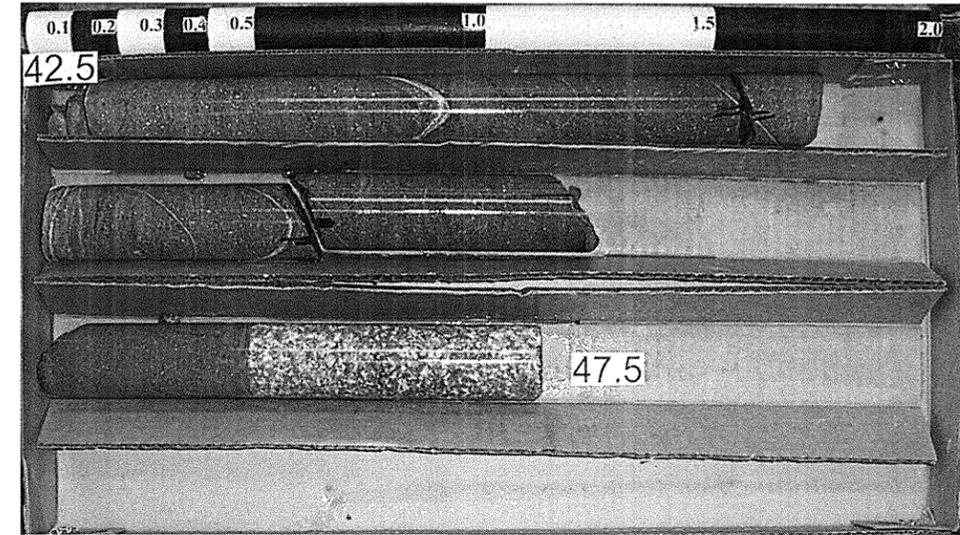


Box 2 of 3
Scale = 1:4

CORE PHOTOGRAPHS

Bridge No. 82 over Marsh Swamp on NC 561
Halifax County, North Carolina
NCDOT Project No. 33300.1.1 (B-3853)

B2-A



Box 3 of 3
Scale = 1:4



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

Table with columns for PROJECT NO., SITE DESCRIPTION, BORING NO., COLLAR ELEV., TOTAL DEPTH, DATE STARTED, ELEV., DEPTH, BLOW COUNT, SOIL AND ROCK DESCRIPTION, and LOG. Includes detailed blow count data and soil descriptions for Boring B2-B.

NCDOT BORE SINGLE 07105025.GPJ NC_DOT.GDT 11/8/05

Note: Drilling Fluid = 20lbs Bentonite To 100gals Water; Mud Density = 68.0lbs/cu.ft. At 6.0ft



CORE BORING REPORT SHEET 23 OF 39

Table with columns for PROJECT NO., SITE DESCRIPTION, BORING NO., COLLAR ELEV., TOTAL DEPTH, DATE STARTED, CORE SIZE, RUN, DRILL RATE, REC., RQD, STRATA, L O G, and DESCRIPTION AND REMARKS. Includes detailed core data and descriptions for Boring B2-B.

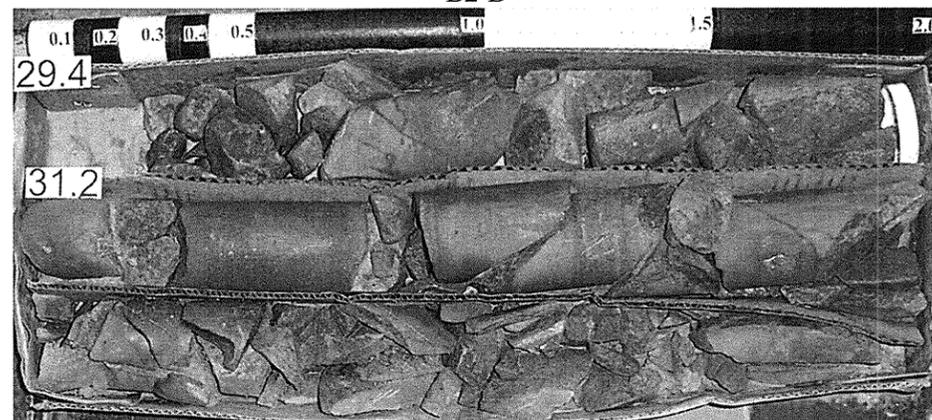
NCDOT BORE SINGLE 07105025.GPJ NC_DOT.GDT 11/8/05

Note: Last 0.3ft Of Rock From Run #7 Could Not Be Retrieved From Hole. REC And RQD Quantities Assume Unretrieved Rock Is The Same As The Retrieved Rock

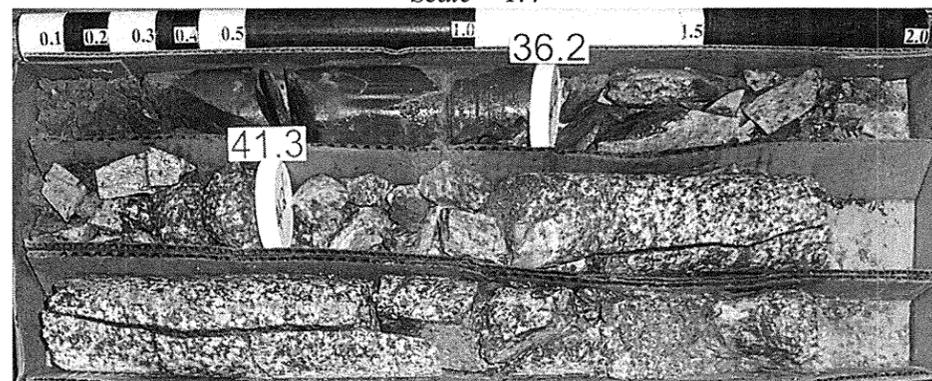
CORE PHOTOGRAPHS

Bridge No. 82 over Marsh Swamp on NC 561
Halifax County, North Carolina
NCDOT Project No. 33300.1.1 (B-3853)

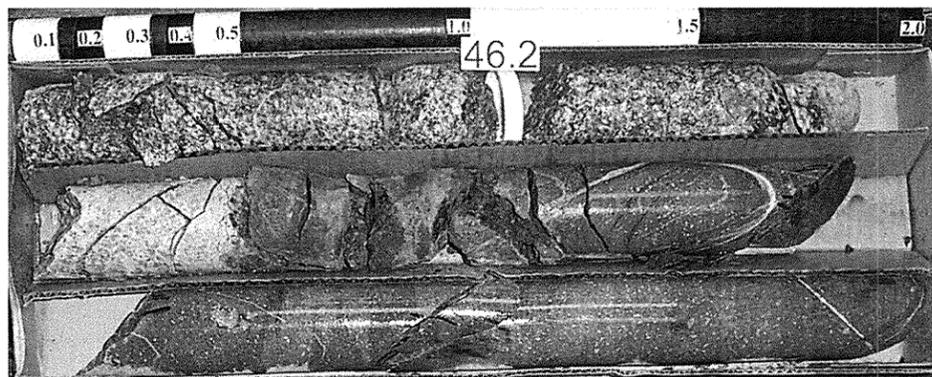
B2-B



Box 1 of 5
Scale = 1:4



Box 2 of 5
Scale = 1:4

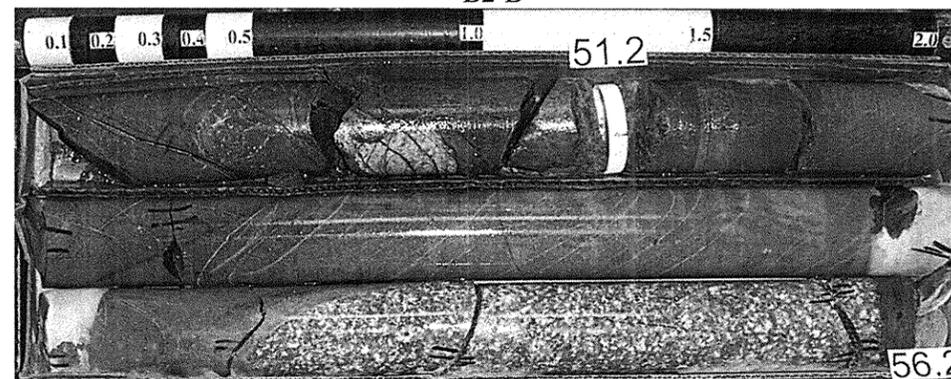


Box 3 of 5
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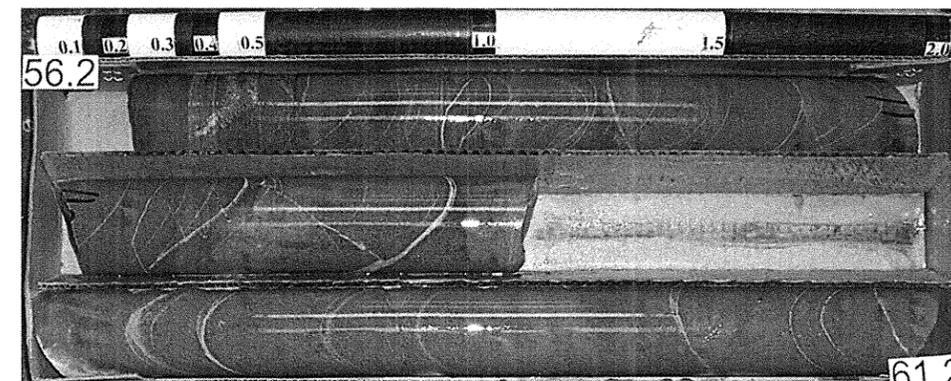
CORE PHOTOGRAPHS

Bridge No. 82 over Marsh Swamp on NC 561
Halifax County, North Carolina
NCDOT Project No. 33300.1.1 (B-3853)

B2-B



Box 4 of 5
Scale = 1:4



Box 5 of 5
Scale = 1:4



PROJECT NO. 33300.1.1		ID No. B-3853		COUNTY Halifax		GEOLOGIST P.Alton/P.Weaver							
SITE DESCRIPTION Bridge No. 82 Over Marsh Swamp On NC 561							GROUND WATER (ft)						
BORING NO. B2-ST		BORING LOCATION 17+68		OFFSET 36ft RT	ALIGNMENT -L-	0 HR. NM	24 HR. NM						
COLLAR ELEV. 100.8 ft		NORTHING 931820		EASTING 2395417									
TOTAL DEPTH 6.0 ft		DRILL MACHINE B-57 ATV		DRILL METHOD Shelby Tube		HAMMER TYPE 140lb Manual							
DATE STARTED 11/1/05		COMPLETED 11/1/05		SURFACE WATER DEPTH NA									
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	
		0.5ft	0.5ft	0.5ft	0	20	40	60	80				100
100.8													100.8 0.00
100.8	0.0										ST-1		98.8 ALLUVIAL: Most Likely Slightly Clayey, Coarse To Fine SAND 2.0
98.8	2.0										ST-2		97.8 ±2 To ±3 ALLUVIAL: Most Likely Silty, Coarse To Fine Sandy CLAY 3.0
											ST-3		94.8 ±3 To ±6 ALLUVIAL: Most Likely Clayey, Coarse To Fine Sandy SILT 6.0
													Boring Terminated At Elevation 94.8ft In ALLUVIAL SOIL

NCDOT BORE SINGLE 07105025.GPJ NC_DOT.GDT 11/8/05



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

PROJECT NO. 33300.1.1		ID No. B-3853		COUNTY Halifax		GEOLOGIST P.Alton/P.Weaver									
SITE DESCRIPTION Bridge No. 82 Over Marsh Swamp On NC 561							GROUND WATER (ft)								
BORING NO. EB2-A		BORING LOCATION 18+31		OFFSET 16ft LT	ALIGNMENT -L-		0 HR. NM								
COLLAR ELEV. 106.0 ft		NORTHING 931895		EASTING 2395448			24 HR. 6.0								
TOTAL DEPTH 36.3 ft		DRILL MACHINE B-57 ATV		DRILL METHOD Wash Rotary		HAMMER TYPE 140lb Manual									
DATE STARTED 10/31/05		COMPLETED 10/31/05		SURFACE WATER DEPTH NA											
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION			
		0.5ft	0.5ft	0.5ft	0	20	40	60	80				100		
106.0													106.0	0.00	
105.0	1.0	4	4	3								M			ROADWAY EMBANKMENT FILL: Loose To Medium Dense, Tannish Brown, Silty, Clayey, Coarse To Fine SAND With A Trace Of Organics (Root Fragments)
102.5	3.5	5	7	6								W			
100.0	6.0	2	1	1								SAT			ALLUVIAL: Soft, Blackish Grey, Silty, Coarse To Fine SANDY CLAY With A Trace Of Organics (Wood Fragments)
97.5	8.5	3	6	6								W			ALLUVIAL: Medium Dense, Dark Grey, Clayey, Silty, Coarse To Fine SAND
92.5	13.5	4	1	2								SAT			ALLUVIAL: Very Loose, Grey, Coarse To Fine SAND With A Trace Of Organics (Wood Fragments)
87.5	18.5	3	3	4								W			COASTAL PLAIN MATERIAL: Medium Stiff To Stiff, Dark Grey, Coarse To Fine SANDY SILT With A Trace Of Shell Fragments (Yorktown Formation)
82.5	23.5	6	5	4								W			
77.5	28.5	100/4													WEATHERED ROCK: Greenish Grey And White METAMORPHOSED QUARTZ DIORITE
72.5	33.5	100/2													WEATHERED ROCK: Greenish Grey METAMORPHOSED DIABASE
69.7	36.3	60/0													Boring Terminated With SPT Refusal At Elevation 69.7ft On CRYSTALLINE ROCK: METAMORPHOSED DIABASE Note: Drilling Fluid = 20lbs Bentonite To 100gals Water; Mud Density = 67.2lbs/cu.ft. At 6.0ft

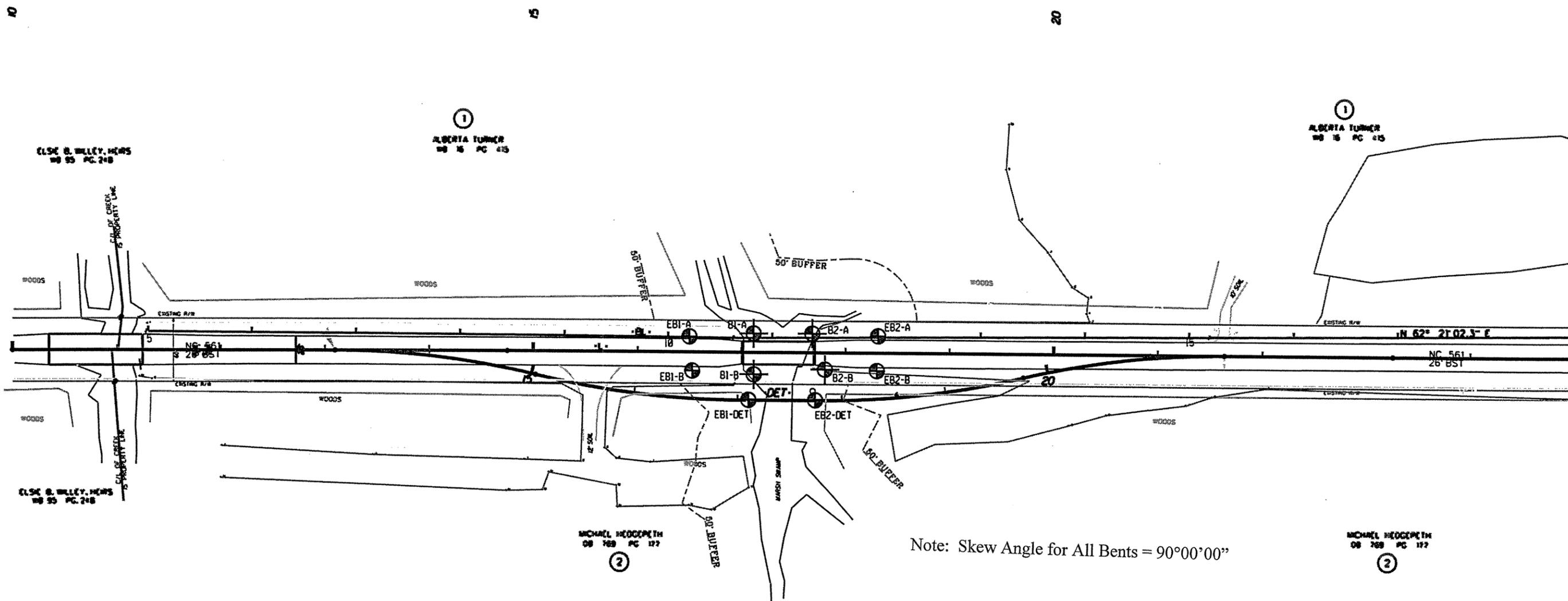
NCDOT BORE SINGLE 07105025.GPJ NC_DOT.GDT 11/8/05



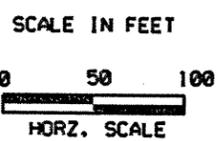
N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

PROJECT NO. 33300.1.1		ID No. B-3853		COUNTY Halifax		GEOLOGIST P.Alton/P.Weaver									
SITE DESCRIPTION Bridge No. 82 Over Marsh Swamp On NC 561							GROUND WATER (ft)								
BORING NO. EB2-B		BORING LOCATION 18+30		OFFSET 17ft RT	ALIGNMENT -L-		0 HR. NM								
COLLAR ELEV. 106.0 ft		NORTHING 931865		EASTING 2395462			24 HR. 6.0								
TOTAL DEPTH 33.4 ft		DRILL MACHINE B-57 ATV		DRILL METHOD Wash Rotary		HAMMER TYPE 140lb Manual									
DATE STARTED 10/28/05		COMPLETED 10/28/05		SURFACE WATER DEPTH NA											
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION			
		0.5ft	0.5ft	0.5ft	0	20	40	60	80				100		
106.0													106.0	0.00	
105.0	1.0	5	4	5								M			ROADWAY EMBANKMENT FILL: Loose To Medium Dense, Brown Tan, Silty, Clayey, Coarse To Fine SAND
102.5	3.5	4	7	4								SS-11			
100.0	6.0	5	3	2								W			ALLUVIAL: Loose, Brownish Grey, Silty, Clayey, Coarse To Fine SAND With A Trace Of Organics (Rootlets)
97.5	8.5	2	3	3								SS-12	50.3%		ALLUVIAL: Medium Stiff, Blackish Grey, Silty, Coarse To Fine SANDY CLAY With A Trace Of Organics (Wood Fragments)
92.5	13.5	3	5	3								W			ALLUVIAL: Loose, Grey, Silty, Coarse To Fine SAND With A Trace Of Organics (Wood Fragments)
87.5	18.5	2	3	8								SS-13	40.9%		COASTAL PLAIN MATERIAL: Stiff To Medium Stiff, Dark Grey, Coarse To Fine SANDY SILT With A Trace Of Shell Fragments (Yorktown Formation)
82.5	23.5	3	4	4								W			
77.5	28.5	100/5													WEATHERED ROCK: Greenish Grey METAMORPHOSED DIABASE
76.5	29.5	60/2													
72.6	33.4	60/0													Boring Terminated With SPT Refusal At Elevation 72.6ft On CRYSTALLINE ROCK: METAMORPHOSED DIABASE Note: Drilling Fluid = 20lbs Bentonite To 100gals Water; Mud Density = 65.5lbs/cu.ft. At 8.5ft

NCDOT BORE SINGLE 07105025.GPJ NC_DOT.GDT 11/8/05

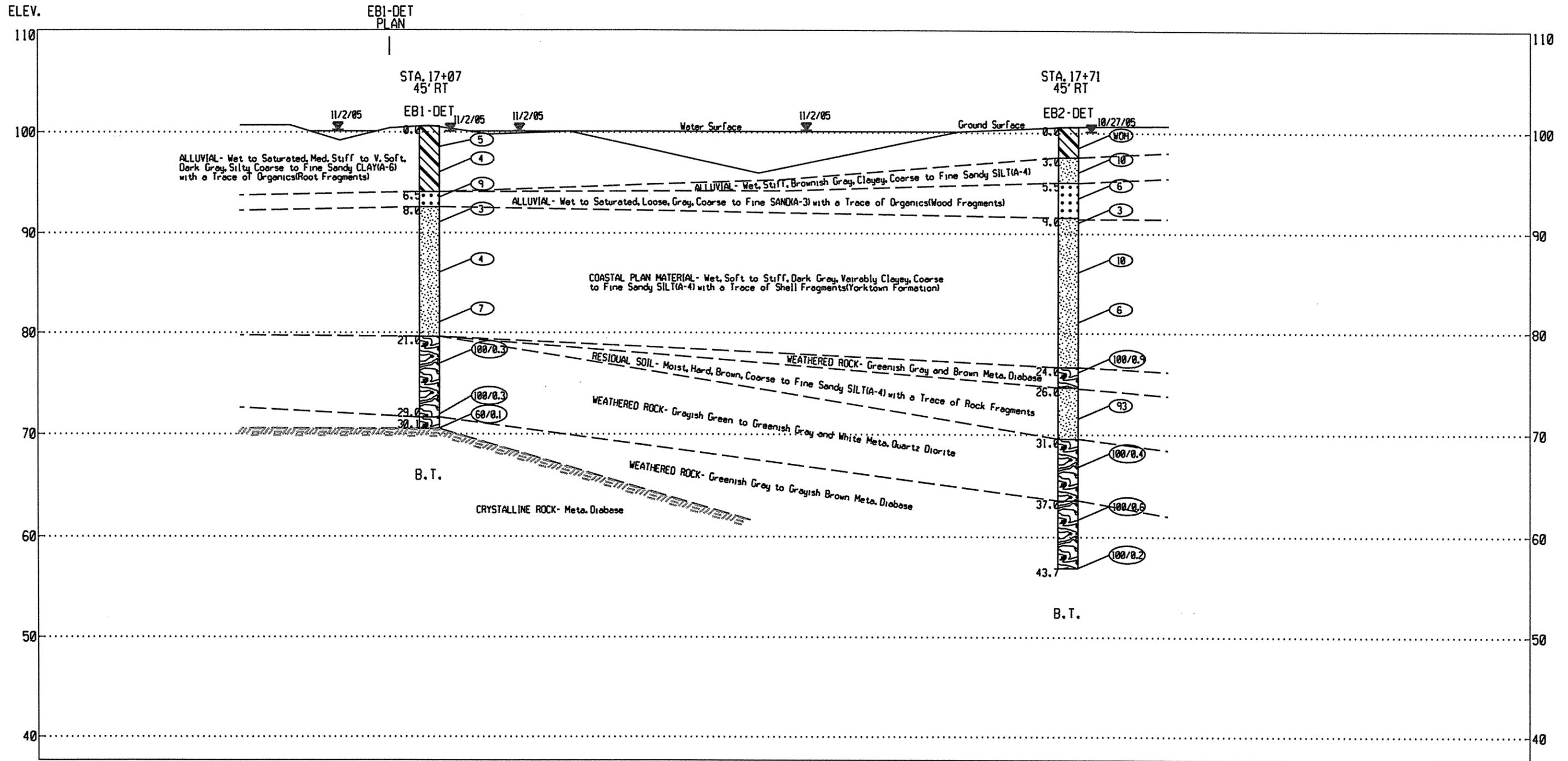


Note: Skew Angle for All Bents = 90°00'00"

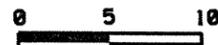


BORING IDENTIFICATION DIAGRAM

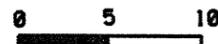
Bridge No. 82 Over Marsh Swamp on NC 561	
Halifax County, North Carolina	
Project No. 33300.1.1	TIP No. B-3853
Federal No. BRSTP-561(1)	Vert. Scale N/A
Date 11/8/05	Horiz. Scale 1" = 100'
Drawn by DRK	Drawing No. 2



SCALE IN FEET



VERT. SCALE



HORZ. SCALE



ENGINEERING CONSULTANTS, INC.

PROFILE 45' RIGHT OF -L-

Bridge No. 82 Over Marsh Swamp on NC 561

Halifax County, North Carolina

Project No. 33300.1.1

TIP No. B-3853

Federal No. BRSTP-561(1)

Vert. Scale 1" = 10'

Date 11/8/05

Horiz. Scale 1" = 10'

Drawn by DRK

Drawing No. 8



PROJECT NO. 33300.1.1		ID No. B-3853		COUNTY Halifax		GEOLOGIST P.Alton/P.Weaver									
SITE DESCRIPTION Bridge No. 82 Over Marsh Swamp On NC 561						GROUND WATER (ft)									
BORING NO. EB1-DET		BORING LOCATION 17+07		OFFSET 45ft RT		ALIGNMENT -L-									
COLLAR ELEV. 100.6 ft		NORTHING 931785		EASTING 2395366		0 HR. NM									
TOTAL DEPTH 30.1 ft		DRILL MACHINE B-57 ATV		DRILL METHOD Wash Rotary		HAMMER TYPE 140lb Manual									
DATE STARTED 11/1/05		COMPLETED 11/1/05		SURFACE WATER DEPTH NA											
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION			
		0.5ft	0.5ft	0.5ft	0	20	40	60	80				100		
100.6													100.6	0.00	
99.6	1.0	1	2	3								W		ALLUVIAL: Medium Stiff to Soft, Blackish Grey, Silty, Coarse To Fine Sandy CLAY With A Trace Of Organics (Wood And Root Fragments)	
97.1	3.5	1	2	2								W			
94.6	6.0	3	4	5								SAT			
92.1	8.5	1	1	2								W		ALLUVIAL: Loose, Grey, Coarse To Fine SAND COASTAL PLAIN MATERIAL: Soft To Medium Stiff Dark Grey, Clayey, Coarse To Fine Sandy SILT With A Trace Of Shell Fragments (Yorktown Formation)	
87.1	13.5	3	2	2								W			
82.1	18.5	3	4	3								W			
77.1	23.5	100/3												79.6	21.0
															WEATHERED ROCK: Greyish Green And White METAMORPHOSED QUARTZ DIORITE
72.1	28.5	100/3												71.6	29.0
70.6	30.0	100/3												70.5	30.1
		60/1													WEATHERED ROCK: Greenish Grey METAMORPHOSED DIABASE Boring Terminated With SPT Refusal At Elevation 70.5ft On CRYSTALLINE ROCK: METAMORPHOSED DIABASE Note: Drilling Fluid = 20lbs Bentonite To 100gals Water; Mud Density = 64.0lbs/cu.ft. At 13.5ft

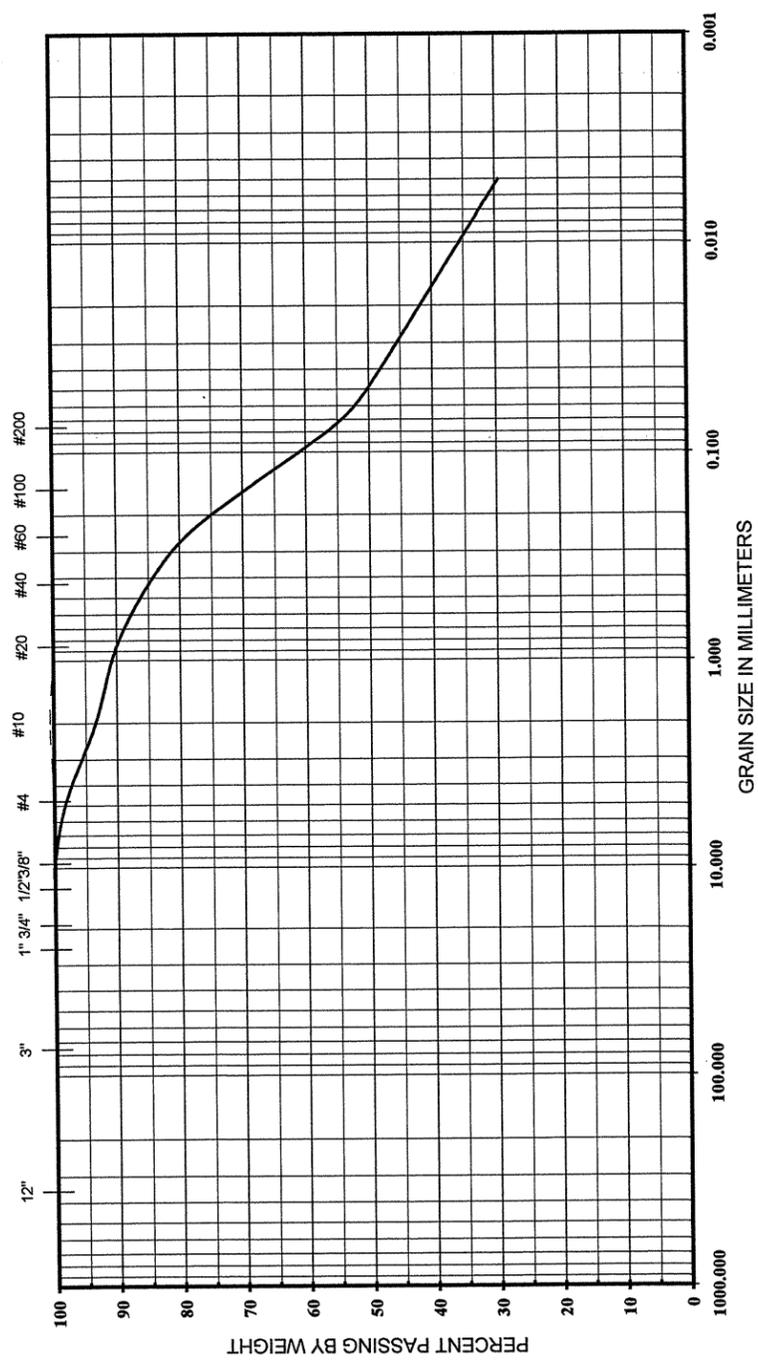
NCDOT BORE SINGLE 07105025.GPJ NC_DOT.GDT 11/8/05



PROJECT NO. 33300.1.1		ID No. B-3853		COUNTY Halifax		GEOLOGIST P.Alton/P.Weaver										
SITE DESCRIPTION Bridge No. 82 Over Marsh Swamp On NC 561						GROUND WATER (ft)										
BORING NO. EB2-DET		BORING LOCATION 17+71		OFFSET 45ft RT		ALIGNMENT -L-										
COLLAR ELEV. 100.6 ft		NORTHING 931814		EASTING 2395423		0 HR. NM										
TOTAL DEPTH 43.7 ft		DRILL MACHINE B-57 ATV		DRILL METHOD Wash Rotary		HAMMER TYPE 140lb Manual										
DATE STARTED 10/25/05		COMPLETED 10/26/05		SURFACE WATER DEPTH NA												
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION				
		0.5ft	0.5ft	0.5ft	0	20	40	60	80				100			
100.6													100.6	0.00		
99.6	1.0				WOH	WOH	WOH						SS-14	37.7%	ALLUVIAL: Very Soft, Dark Grey, Silty, Coarse To Fine Sandy CLAY With A Trace Of Organics (Rootlets)	
97.1	3.5				2	5	5						SS-15	25.8%	ALLUVIAL: Stiff, Brownish Grey, Clayey, Coarse To Fine Sandy SILT	
94.6	6.0				4	2	4						SS-16	W	ALLUVIAL: Loose, Grey, Coarse To Fine SAND With A Trace Of Organics (Wood Fragments)	
92.1	8.5				2	2	1						W	W	COASTAL PLAIN MATERIAL: Soft To Stiff, Dark Grey, Coarse To Fine Sandy SILT With A Trace Of Shell Fragments (Yorktown Formation)	
87.1	13.5				3	5	5						W	W		
82.1	18.5				2	2	4						W	W		
77.1	23.5				32	42	58/4								78.6	24.0
															74.6	26.0
72.1	28.5				37	44	49									WEATHERED ROCK: Greenish Grey And Brown METAMORPHOSED DIABASE RESIDUAL: Hard, Brown, Coarse To Fine Sandy SILT With A Trace Of Rock Fragments
67.1	33.5				100/4										69.6	31.0
62.1	38.5				77	23/1									63.6	37.0
57.1	43.5														56.9	43.7
					100/2											Boring Terminated At Elevation 56.9ft In WEATHERED ROCK: METAMORPHOSED DIABASE Note: Drilling Fluid = 25lbs Bentonite To 100gals Water; Mud Density = 64.9lbs/cu.ft. At 6.0ft

NCDOT BORE SINGLE 07105025.GPJ NC_DOT.GDT 11/8/05

U S STANDARD SIEVE SIZES



BOULDERS	COBBLES	GRAVEL COARSE	FINE	SAND COARSE	FINE	SILT	CLAY
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GRAIN SIZE DISTRIBUTION

Bridge 82 (B-3853)

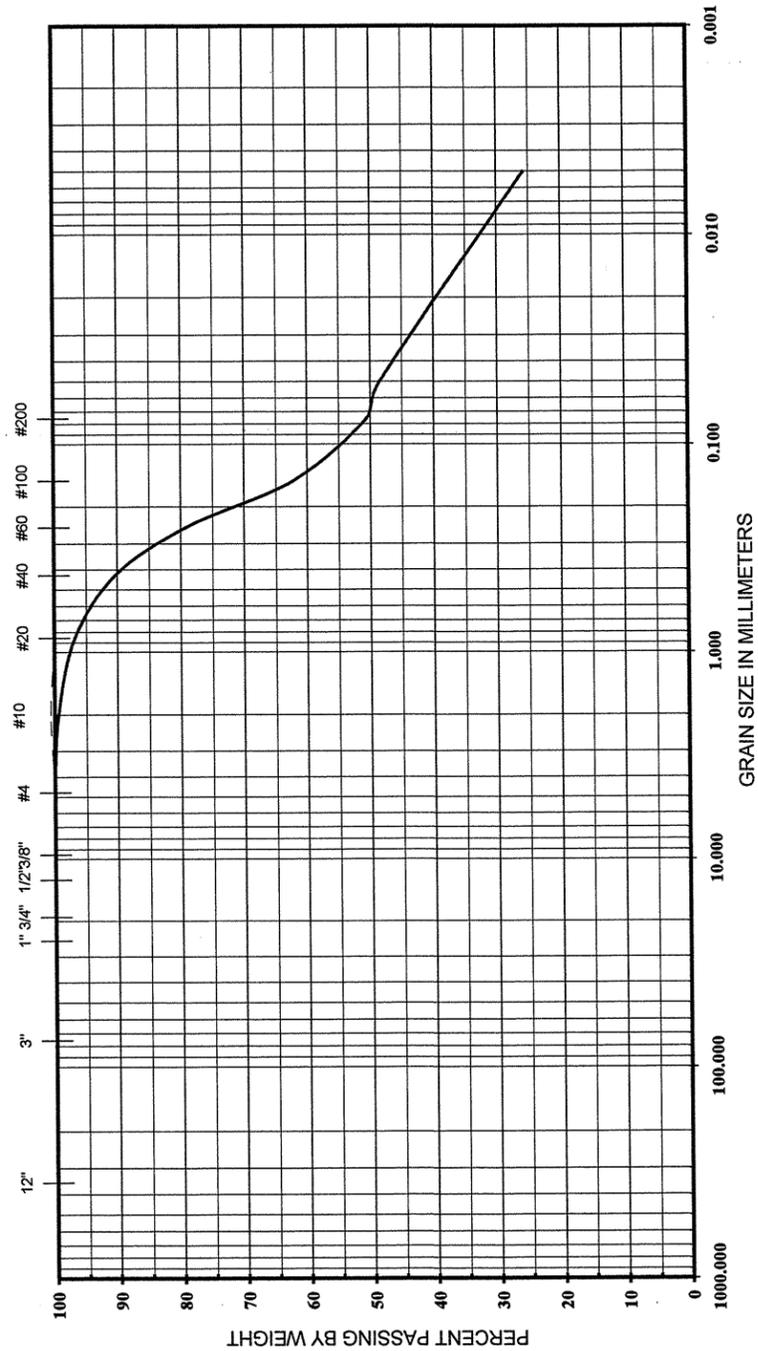
071-05-025

11/5/2005



BORING NO.	SAMPLE NO.	ELEVATION OR DEPTH	NMC %	LL	PL	PI	CLASSIFICATION
B2-B	SS-9	3.5-5.0	27.1	32	16	16	ROADWAY EMBANKMENT FILL: Silty, Coarse to Fine Sandy CLAY (A-6)

U S STANDARD SIEVE SIZES



BOULDERS	COBBLES	GRAVEL COARSE	FINE	SAND COARSE	FINE	SILT	CLAY
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GRAIN SIZE DISTRIBUTION

Bridge 82 (B-3853)

071-05-025

11/5/2005



BORING NO.	SAMPLE NO.	ELEVATION OR DEPTH	NMC %	LL	PL	PI	CLASSIFICATION
EB2-DETOUR	SS-14	1.0-2.5	37.7	30	18	12	ALLUVIAL: Silty, Coarse to Fine Sandy CLAY (A-6)

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Photograph 1 – View of Bridge Site Looking Upstation

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Photograph 2 – View 24' Right of -L- Looking Upstation from End Bent-1



Photograph 2 – View ±24' Left of -L- Looking Upstation from End Bent-1



Photograph 3 – View Left to Right Across End Bent-1 from EB1-A Plan

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Photograph 5 – View Left to Right Across End Bent-1 from Top of Embankment



Photograph 6 – View Left to Right Across Bent-1 from Left Side of Existing Bridge

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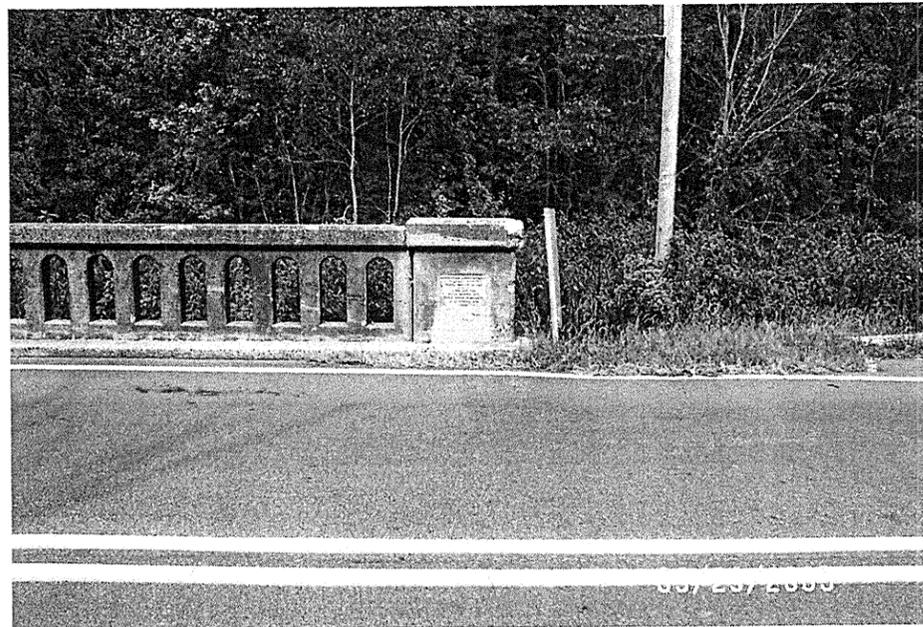
Photograph 7 – View Right to Left Across Bent-1 from Right Side of Existing Bridge



Photograph 8 – View Left of Existing Bridge in Vicinity of B2-A Plan



Photograph 9 – View Left to Right Across Bent-2
from Left Side of Existing Bridge



Photograph 10 – View Right to Left Across Bent-2
From Right Side of Existing Bridge

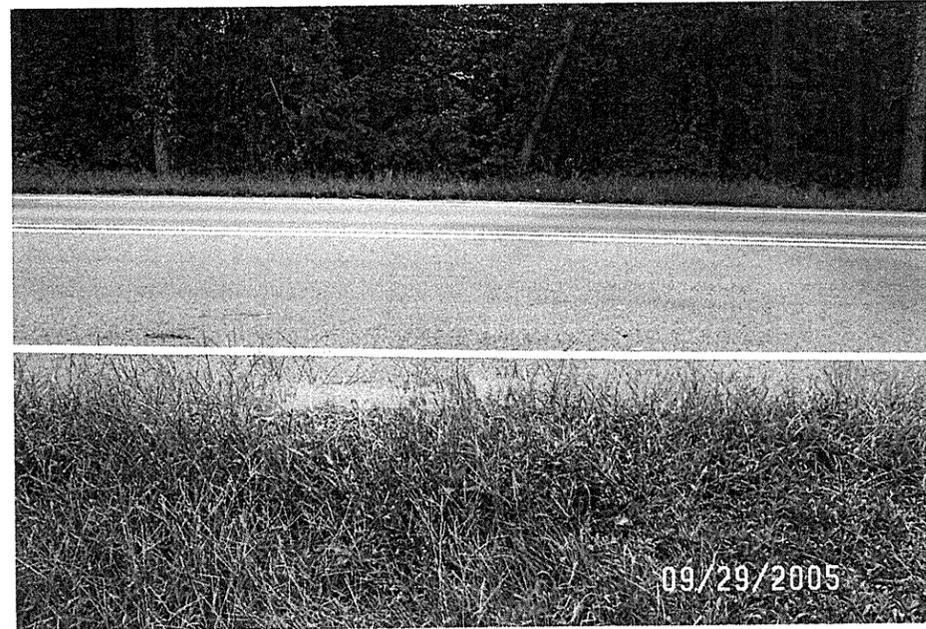


Photograph 11 – View Right of Bent-2 Showing Flagged
EB2-Detour Boring Location



Photograph 12 – View Left to Right Across End Bent-2 from EB2-A Plan

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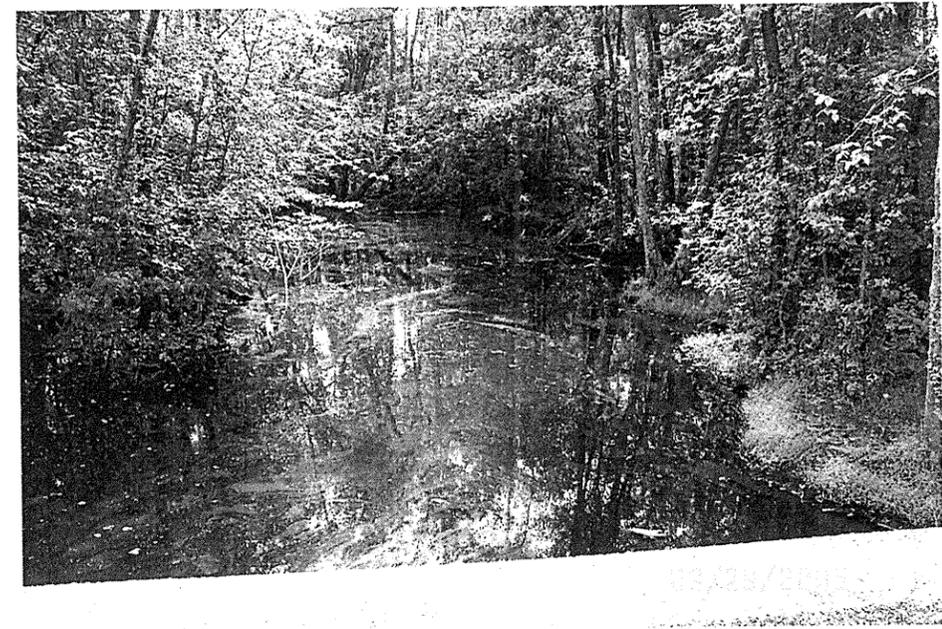


Photograph 13 – View Left to Right Across End Bent-2 from Top of Embankment



Photograph 14 – View Upstream from Bridge Along Main Channel

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Photograph 15 – View Downstream from Center of Existing Bridge



Photograph 16 – View Along Detour CL Looking Upstation from EB1-Detour

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Photograph 17 – View Along Detour CL Looking Downstation from EB2-Detour



Photograph 18 – View Along Detour CL Looking Downstation from EB1-Detour

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Photograph 19 – View of Right Side of Existing End Bent-1 Abutment



Photograph 20 – View Showing Supports on Right Side of Existing Bridge