

PROJECT: 33519.1.1 ID: B-4172

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

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-4172	1	17
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
33519.1.1	BRSTP-55 (21)	P.E. CONST.	

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STRUCTURE
SUBSURFACE INVESTIGATION

STATE PROJECT 33519.1.1 I.D. NO. B-4172
F.A. PROJECT BRSTP-55 (21)
COUNTY LENOIR
PROJECT DESCRIPTION BRIDGE #9 OVER
JERICO RUN ON NC 55

SITE DESCRIPTION _____

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.

For Letting

INVESTIGATED BY C. BRUINSMA PERSONNEL P. ZHANG
CHECKED BY G. LANG, P.E.
SUBMITTED BY TIERRA, INC.
DATE JUNE, 2006



SEAL
SIGNATURE *[Signature]* 7/10/06

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IT IS 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.

DRAWN BY: P. ZHANG

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

ID	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
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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>VERY STIFF, GRAY SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</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>GAP-GRADED: INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.</p> <p>THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS ARE DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.</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. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:</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>ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH 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 DISLOGGED 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>SOIL LEGEND AND AASHTO CLASSIFICATION</p> <table border="1"> <tr> <th>GENERAL CLASS.</th> <th colspan="7">GRANULAR MATERIALS (< 75% PASSING #200)</th> <th colspan="7">SILT-CLAY MATERIALS (> 75% PASSING #200)</th> <th colspan="3">ORGANIC MATERIALS</th> </tr> <tr> <th>GROUP CLASS.</th> <th colspan="2">A-1</th> <th colspan="2">A-3</th> <th colspan="3">A-2</th> <th colspan="2">A-4</th> <th colspan="2">A-5</th> <th colspan="3">A-6</th> <th colspan="2">A-7</th> <th colspan="2">A-1, A-2</th> <th colspan="2">A-4, A-5</th> </tr> <tr> <th>SYMBOL</th> <td colspan="2">[Symbol]</td> <td colspan="2">[Symbol]</td> <td colspan="3">[Symbol]</td> <td colspan="2">[Symbol]</td> <td colspan="2">[Symbol]</td> <td colspan="3">[Symbol]</td> <td colspan="2">[Symbol]</td> <td colspan="2">[Symbol]</td> <td colspan="2">[Symbol]</td> </tr> <tr> <th>% PASSING</th> <td colspan="2">10</td> <td colspan="2">40</td> <td colspan="3">20</td> <td colspan="2">60</td> <td colspan="2">100</td> <td colspan="3">100</td> <td colspan="2">100</td> <td colspan="2">100</td> <td colspan="2">100</td> </tr> <tr> <th>LIQUID LIMIT PLASTIC INDEX</th> <td colspan="2">6</td> <td colspan="2">N.P.</td> <td colspan="3">40</td> <td colspan="2">40</td> <td colspan="2">40</td> <td colspan="3">40</td> <td colspan="2">40</td> <td colspan="2">40</td> <td colspan="2">40</td> </tr> <tr> <th>GROUP INDEX</th> <td colspan="2">0</td> <td colspan="2">0</td> <td colspan="3">4</td> <td colspan="2">8</td> <td colspan="2">12</td> <td colspan="3">16</td> <td colspan="2">20</td> <td colspan="2">24</td> <td colspan="2">28</td> </tr> <tr> <th>USUAL TYPES OF MAJOR MATERIALS</th> <td colspan="2">STONE FRAGS. 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ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.</p>		<p>COMPRESSIBILITY</p> <p>SLIGHTLY COMPRESSIBLE MODERATELY COMPRESSIBLE HIGHLY COMPRESSIBLE</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>GROUND WATER</p> <p>▽ WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING.</p> <p>▽ STATIC WATER LEVEL AFTER 24 HOURS.</p> <p>▽ PW PERCHED WATER, SATURATED ZONE OR WATER BEARING STRATA</p> <p>○ SPRING OR SEEPAGE</p>		<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 CHIPS. 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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July 10, 2006

N.C. Department of Transportation
Geotechnical Engineering Unit
1589 Mail Service Center
Raleigh, North Carolina 27699-1589

Attn: Mr. Njoroge W. Wainaina, P.E.

Ref: Geotechnical Structure Subsurface Investigation Report

State Project No.: 33519.1.1
TIP No.: B-4172
County: Lenoir County
Description: Bridge # 9 over Jericho Run on NC 55
Tierra, Inc. Project No.: 6211-06-014

Dear Mr. Wainaina,

As authorized, Tierra, Inc. has completed the geotechnical subsurface investigation for the proposed replacement structure along NC 55 over Jericho Run located in Lenoir County, North Carolina. The purpose of this report is to present subsurface conditions and general notes to the designer for consideration during design of the planned structure. Field and laboratory test results, site and boring location plans, and profile/cross sections depicting subsurface conditions may be found in the appendix of this report.

Our professional services for this project have been performed in accordance with generally accepted engineering practices. No other warranty expressed or implied is made. Tierra, Inc. appreciates this opportunity to provide you with geotechnical engineering services for this project. If you have any questions regarding this report, please contact our office.

Sincerely,
TIERRA, INC.

Christina M. Bruinsma, L.G.
Project Geologist

Gabriel W. Lang, P.E.
Sr. Geotechnical Engineer/Manager

1.0 PROJECT DESCRIPTION

Based on information obtained from the North Carolina Department of Transportation (NCDOT) Bridge Survey & Hydraulic Design Report dated February 16, 2006, a single span, 2-bent structure is proposed to replace the existing single span, concrete deck bridge with concrete abutments. The proposed structure will be a 95 feet long by 36 feet wide bridge. The new structure will replace the existing structure over Jericho Run. The proposed skew angle for all bents is 90 degrees.

2.0 SITE DESCRIPTION AND GEOLOGY

The project site is located along NC 55 in a rural to residential area 3.0 miles north of Kinston North Carolina in Lenoir County. Jericho Run flows generally north into Stonyton Creek. Stonyton Creek flows directly into the Neuse River, approximately 2.5 miles to the northeast.

Topographically, the site is generally flat in association with Jericho Run. Jericho Run was approximately 20 to 25 feet wide and 0.3 to 0.5 feet deep during our investigation. The existing floodplain is approximately 400 feet wide. Floodplain cover consists of brush, grasses, and young to moderately aged trees and is generally very thick.

The project site is located in the Coastal Plain Physiographic Province of North Carolina, outside Kinston, North Carolina. According to *The Geology of the Carolinas* (1991), the site is located within the Pee Dee Formation (Kc), which is Cretaceous in age. The Pee Dee Formation consists of massive sands, clayey sands and sandy clays. Material is periodically glauconitic and occasionally shelly depending on facies. Calcareous cemented sand occurs in zones and continuous layers throughout the formation. Some molded limestone can be found in upper portions of the formation, but are restricted to areas near the Cape Fear River.

3.0 FIELD EVALUATION PROCEDURE

Subsurface conditions were evaluated for the proposed structure by soil test borings. A total of (4) soil test borings were drilled near proposed bent centerlines in May of 2006. Soil test borings were drilled utilizing a trailer-mounted CME 45 rig with a manual hammer. Borings were drilled using a 3-inch tricone bit with mud rotary methods. Standard penetration tests were performed at regular intervals, in accordance with American Association of State Highway Transportation Officials (AASHTO T-206-03), and North Carolina Department of Transportation (NCDOT) latest Geotechnical Guidelines and Procedures Manual.

In addition to our subsurface investigation, a visual scour evaluation was performed along the channel and banks of Jericho Run to determine scour impact for foundation design purposes. The field scour report was electronically submitted June 23, 2006.

Groundwater measurements were recorded within each borehole utilizing a weighted 100-foot tape from a survey reference location at the top of each boring. Readings were recorded immediately after boring termination and after a 24-hour waiting period.

4.0 LABORATORY TESTING

Representative split-barrel sampler samples were selected from soil test borings to verify visual field classification and determine soil index properties. Fourteen split-barrel sampler samples and two grab samples were analyzed in our laboratory for Atterberg limits and grain size with hydrometer analysis. Five samples were tested to determine natural moisture. Two alluvial samples were analyzed for grain size determination to assist the NCDOT in theoretical scour elevations. All testing was performed in accordance with the following American Society for Testing and Materials (ASTM), NCDOT Modified and/or AASHTO procedures:

- AASHTO T-88-00 (As Modified) "Particle Size Analysis of Soil"
- AASHTO T-89-02 (As Modified) "Determining the Liquid Limits of Soil"
- AASHTO T-90-00 "Determining the Plastic Limit and Plasticity of Soils"
- AASHTO T-265-93 (2000) "Laboratory Determination of Moisture Content of Soils"
- ASTM D 1140-97 "Amount of Material in Soils Finer than the #200 Sieve"

5.0 SUBSURFACE AND GROUNDWATER CONDITIONS

Soils beneath End Bent 1 consist of roadway embankment, alluvium and Coastal Plain material. Roadway embankment soils consist of 4.5 to 4.7 feet of very loose to loose silty sand (A-2-4). Alluvial deposits encountered beneath the roadway embankment consist of 4.8 to 7.5 feet of very loose to medium dense sand, silty sand (A-1-b, A-2-4) and soft sandy clay (A-6). Alluvium deposits directly overlie Coastal Plain soils at an elevation between 23 and 20 feet mean sea level (MSL). These soils consist of stiff to hard sandy clay (A-6, A-7-5, A-7-6) and medium dense to very dense sand, clayey sand, and silty sand (A-3, A-2-4, A-2-6). No rock was penetrated; however, cemented layers ranging from 0.3 to 1.0 feet thick were encountered from 10.6 to -20.0 feet MSL.

Soils beneath End Bent 2 consist of roadway embankment, alluvium and Coastal Plain material. Roadway embankment soils consist of 3.0 to 5.0 feet of loose to medium dense sand and silty sand (A-3, A-2-4, A-2-6) with a 0.5 layer of rounded gravel at EB2B. Alluvial deposits encountered beneath the roadway embankment consist of 7.0 to 9.0 feet of very loose to loose sand and silty sand (A-3, A-1-b, A-2-4) with wood fragments and soft sandy clay (A-6). Alluvium deposits directly overlie Coastal Plain soils at an elevation between 20.2 and 20.4 feet (MSL). These soils consist of very stiff to hard sandy clay (A-6, A-7-5, A-7-6) and medium dense to very dense sand, clayey sand, and silty sand (A-3, A-2-4, A-2-6). No rock was penetrated; however, cemented layers ranging from 0.2 to 1.1 feet thick were encountered from 13.3 to -24.1 feet MSL.

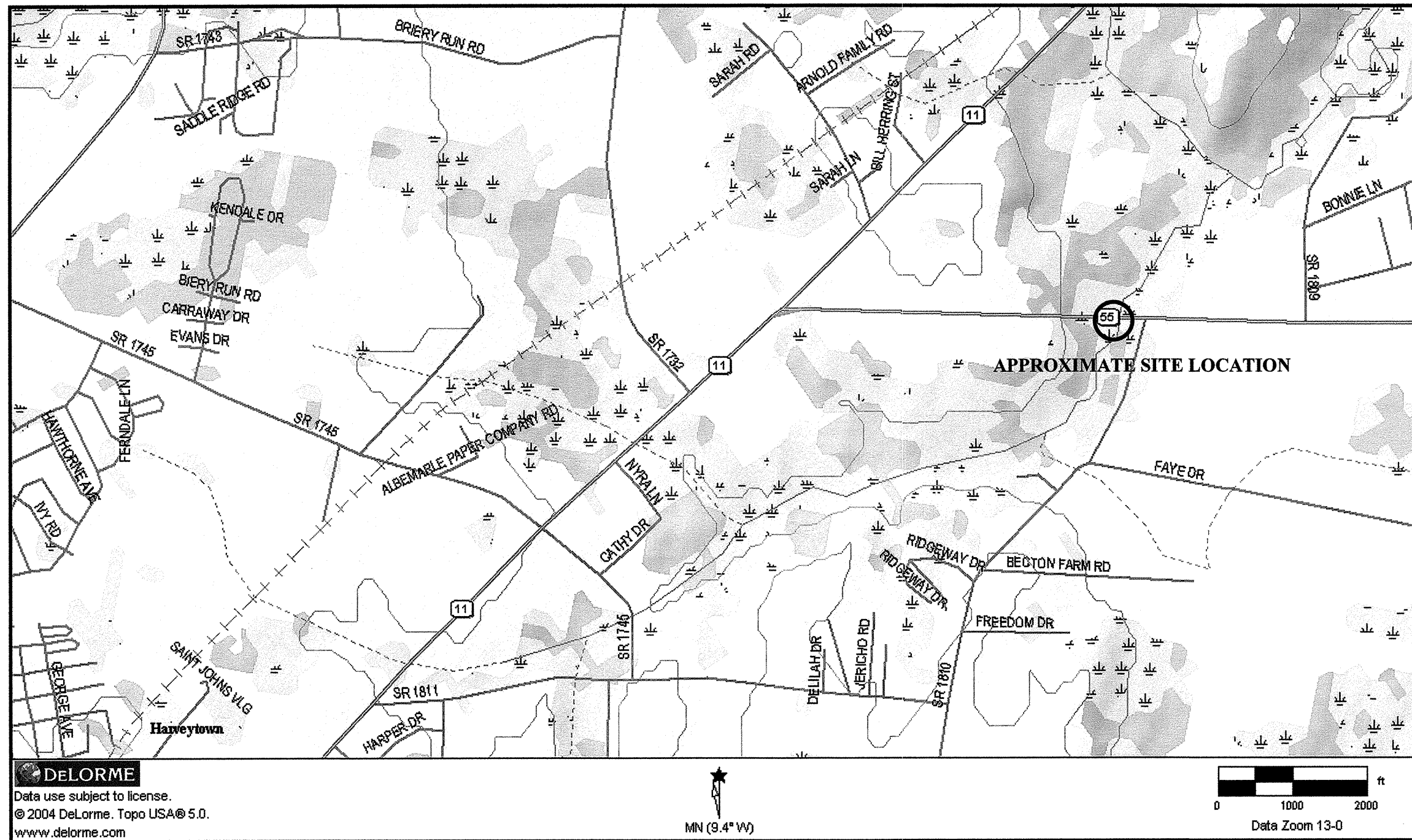
6.0 NOTES TO DESIGNER

Based on our field exploration the following conditions may impact design and construction of the proposed structure. Therefore the designer should be aware of the following subsurface conditions:

- At EB2B, an approximately 0.5-foot thick layer of rounded gravel was located approximately 2.5 feet below the surface. The gravel layer appeared to extend upstation at least 10 feet from the bent line based upon probe rod soundings.
- Cemented layers indicated by hard drilling were encountered at elevations ranging from 13.3 feet to -24.1 feet MSL. These layers ranged in thickness from 0.2 to 1.1 feet. Exact depths of each layer encountered can be found on boring logs.
- Static groundwater was measured approximately 6 to 7.2 feet below existing ground surface across the site, at elevations ranging from approximately 26.4 to 25.0 feet (MSL).

7.0 CLOSURE

Notes to the designer and evaluations provided by Tierra, Inc. are based on the Hydraulic Design Report dated February 16, 2006, provided by NCDOT. Modifications to our report may be required if there are changes to the design or location of the proposed structure. Notes to the designer in this report are based on data obtained from soil borings. The nature and extent of variations between borings may not become evident until construction.

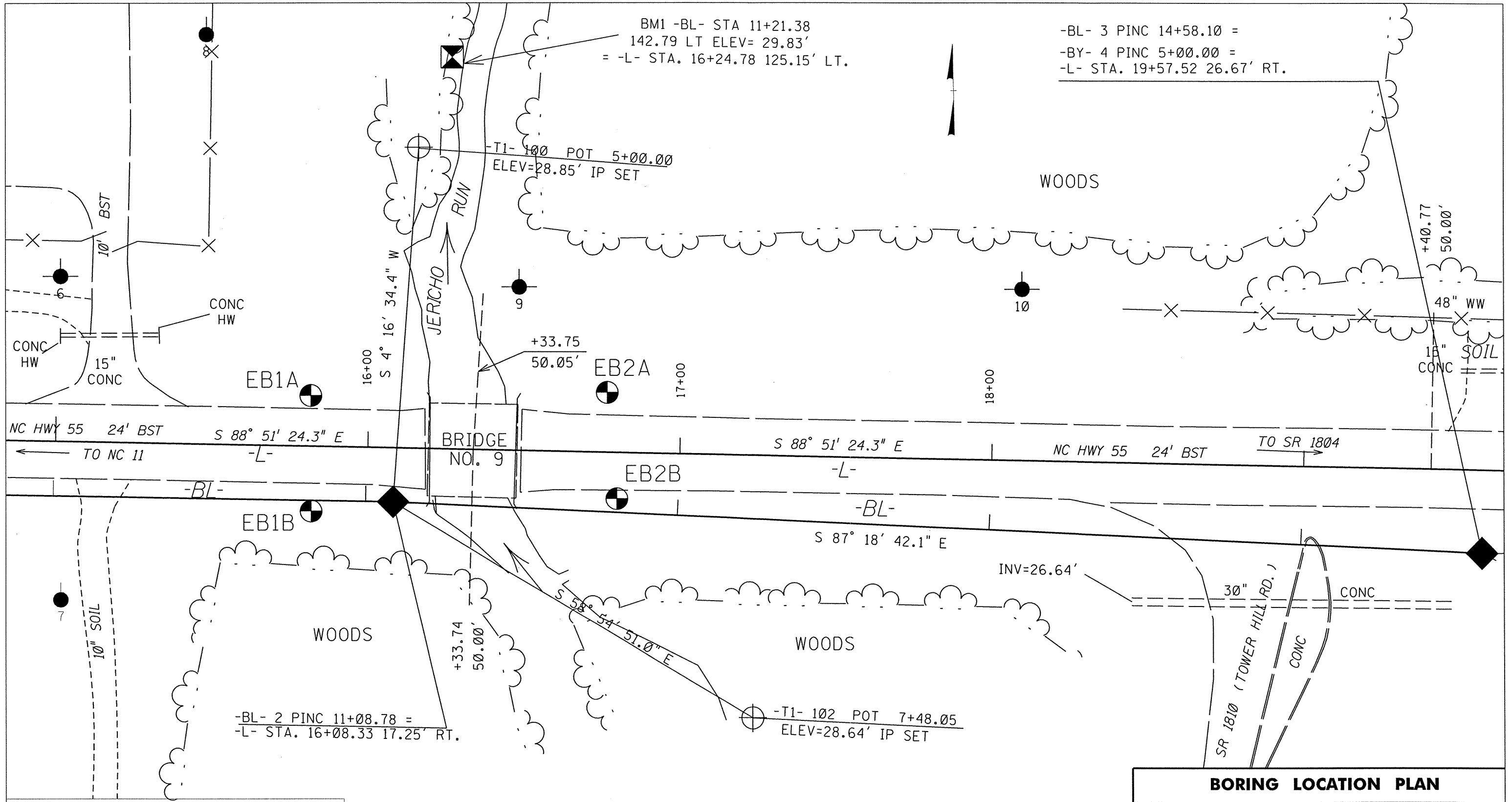


SITE VICINITY MAP
BRIDGE #9 OVER JERICHO RUN
ON NC 55
LENOIR COUNTY, NORTH CAROLINA
TIP NO: B-4172, STATE PROJECT NO: 33519.1.1

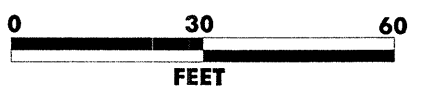



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 2736 ROWLAND RD.
 RALEIGH, NC 27615
 PHONE (919) 871-0800
 FAX (919) 871-0803

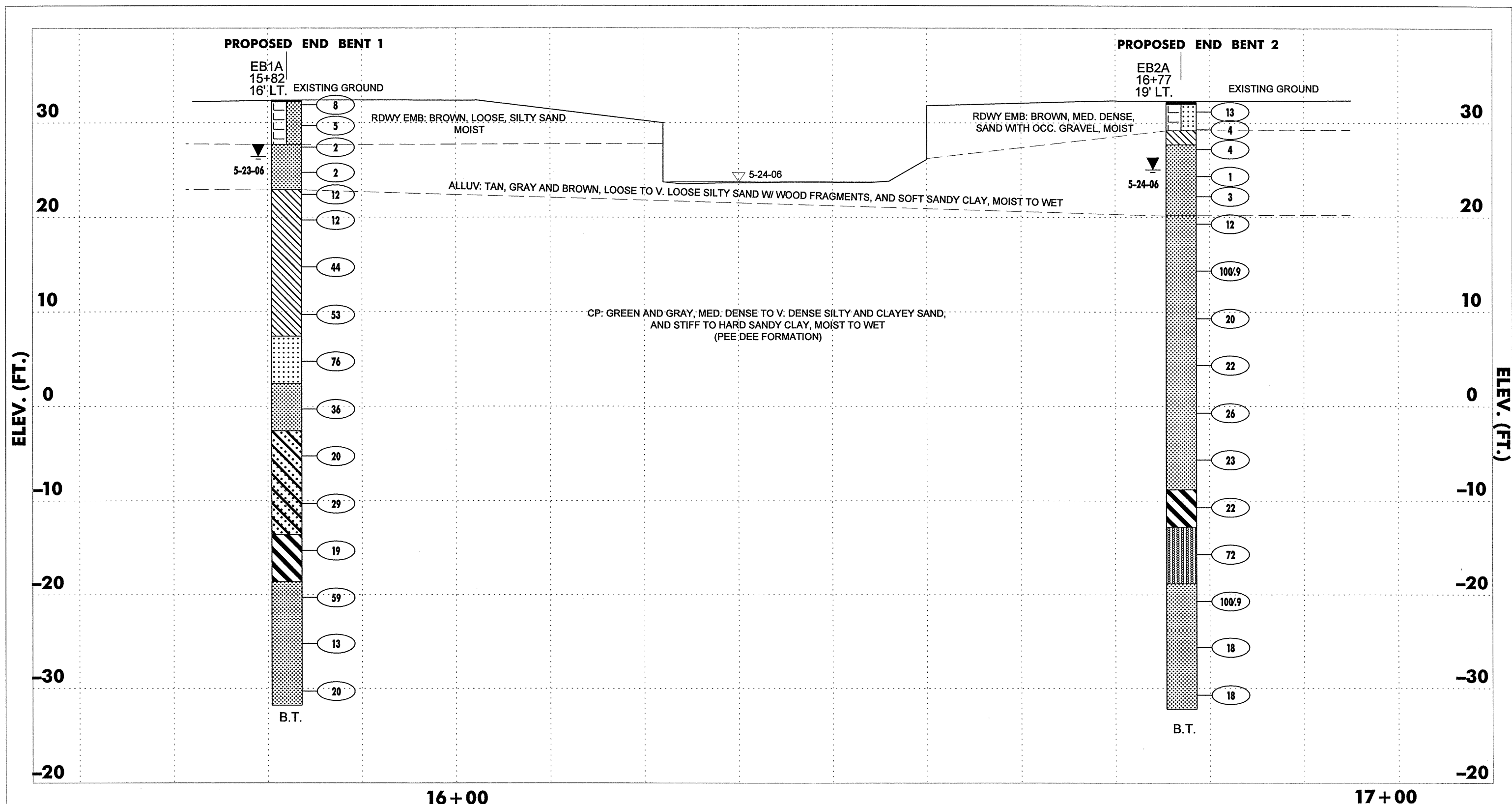
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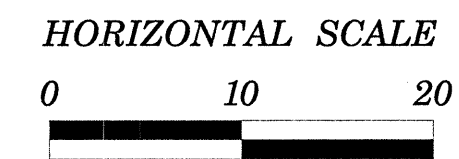
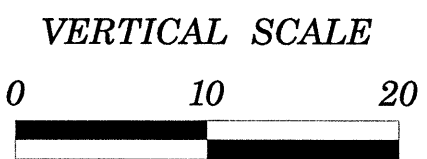
NOTES:
 BENCH MARK: TBM -BL-3, STA. 14+58.10, -BL-, ELEVATION 32.87'
 PLANS ADOPTED FROM ELECTRONIC FILES RECEIVED FROM NCDOT, DATED APRIL, 2006
 PROPOSED BRIDGE SKEW: 90°



BORING LOCATION PLAN	
BRIDGE #9 OVER JERICO RUN ON NC 55 LENOIR COUNTY, NORTH CAROLINA TIP NO: B-4172, STATE PROJECT NO: 33519.1.1	
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BENCH MARK: TBM -BL-3, STA. 14+58.10, -BL-, ELEVATION 32.87'

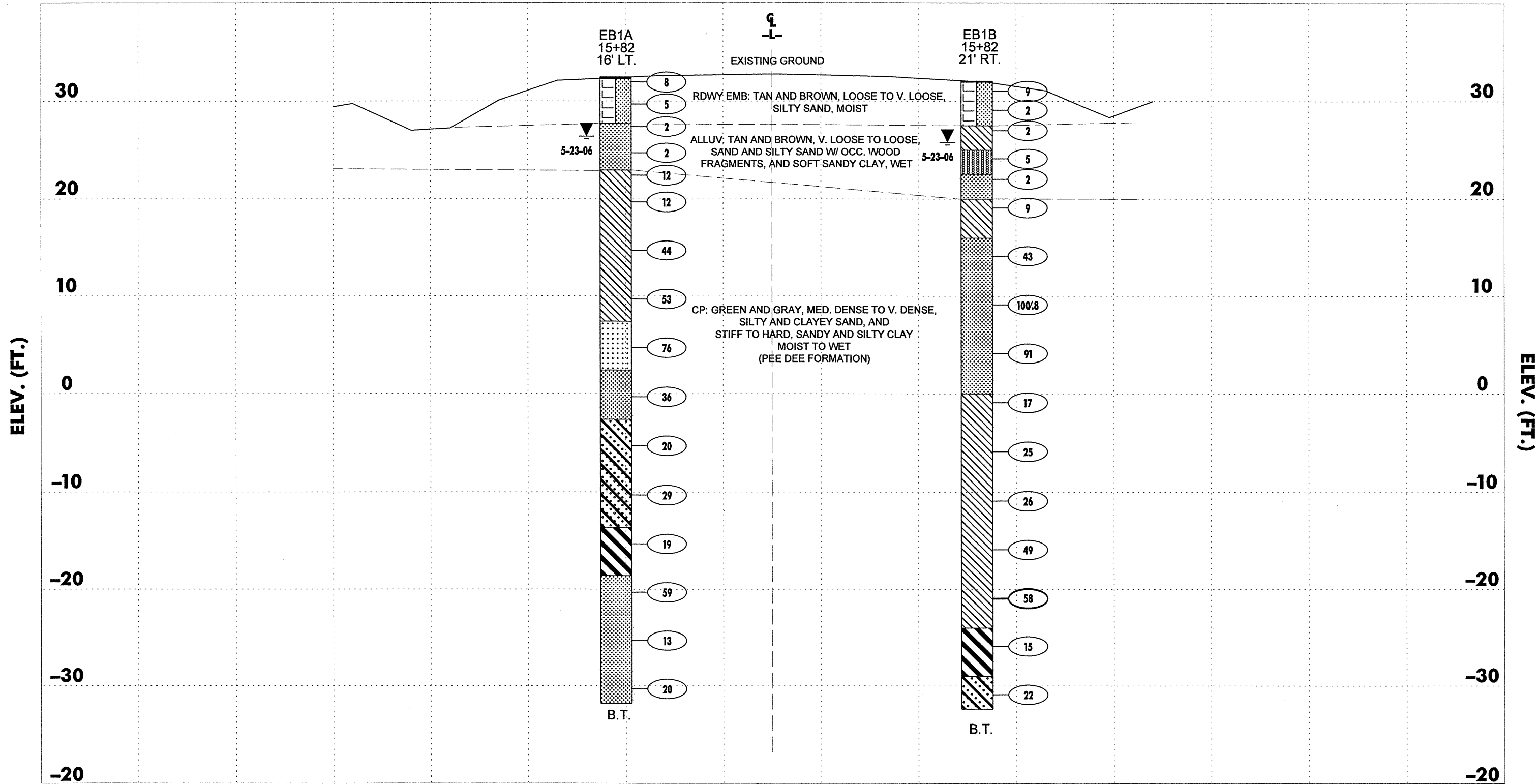


PROFILE 15' LEFT OF -L-

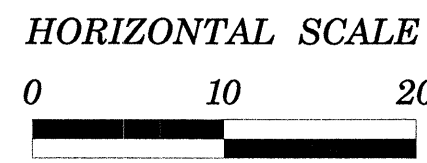
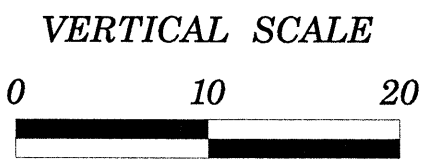
BRIDGE #9 OVER JERICO RUN
 ON NC 55
 LENOIR COUNTY, NORTH CAROLINA
 TIP NO: B-4172, STATE PROJECT NO: 335 19.1.1

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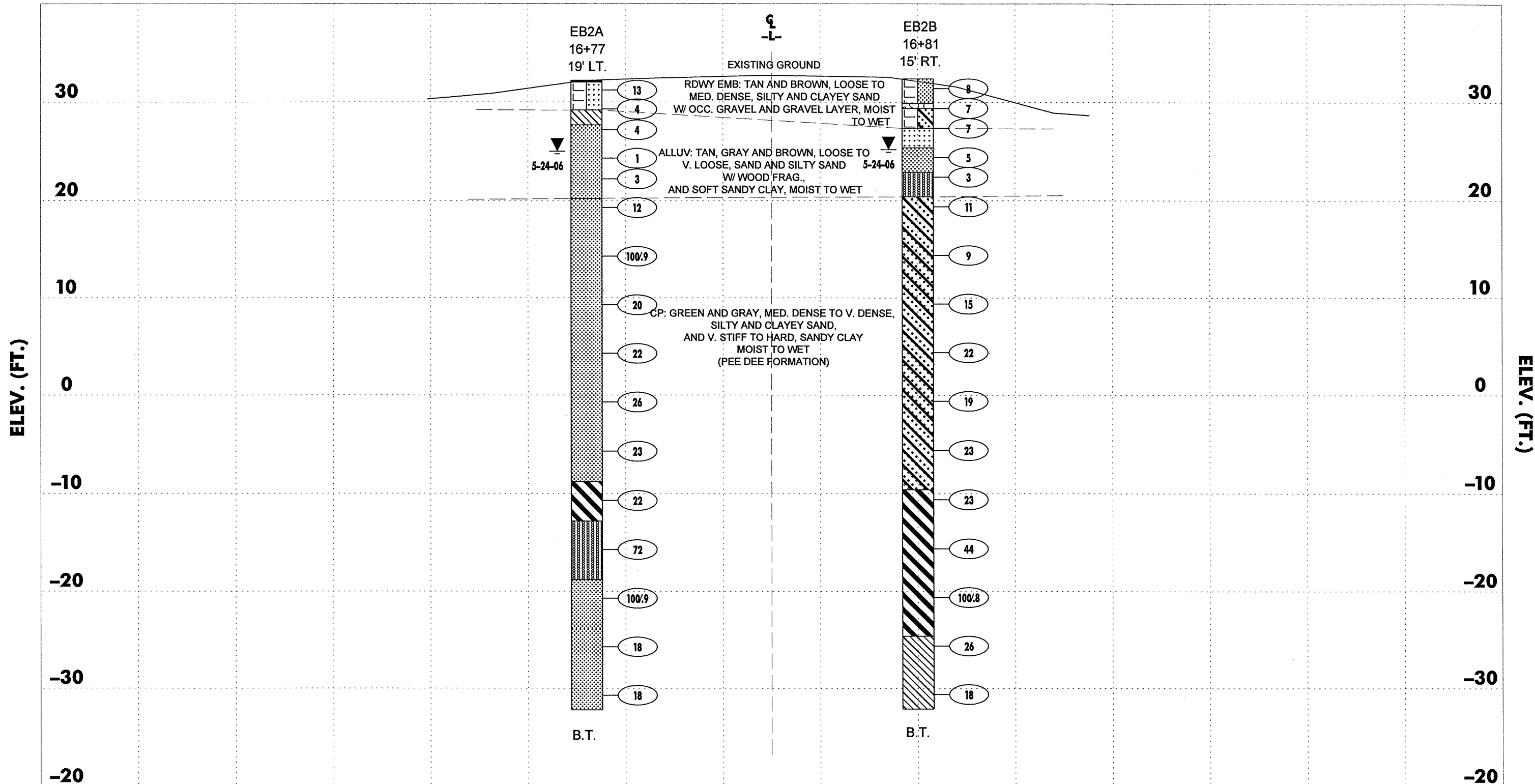
BENCH MARK: TBM -BL-3, STA. 14+58.10, -BL-, ELEVATION 32.87'



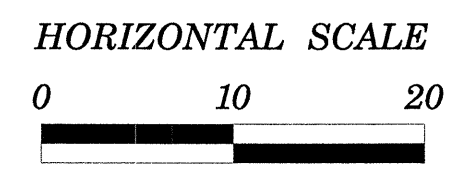
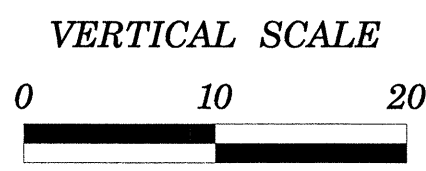
CROSS SECTION END BENT 1

BRIDGE #9 OVER JERICO RUN
ON NC 55
LENOIR COUNTY, NORTH CAROLINA
TIP NO: B-4172, STATE PROJECT NO: 335 19.1.1





BENCH MARK: TBM -BL-3, STA. 14+58.10, -BL-, ELEVATION 32.87'



CROSS SECTION END BENT 2

BRIDGE #9 OVER JERICO RUN
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**FIELD
 SCOUR REPORT**

WBS: 33519.1.1 TIP: B-4172 COUNTY: LENOIR

DESCRIPTION(1): BRIDGE #9 OVER JERICOH RUN ON NC 55

EXISTING BRIDGE

Information from: Field Inspection Microfilm _____ (reel _____ pos: _____)
 Other (explain) HYDRO REPORT

Bridge No.: 9 Length: 25 Total Bents: 2 Bents in Channel: 0 Bents in Floodplain: 2
 Foundation Type: CONCRETE ABUTMENTS (FOUNDATIONS UNKNOWN)

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: NONE

Interior Bents: N/A

Channel Bed: SOME EVIDENT ON WESTERN CHANNEL DOWNSTREAM AND EASTERN CHANNEL UPSTREAM

Channel Bank: SOME EVIDENT ON WEST BANK DOWNSTREAM AND EAST BANK UPSTREAM

EXISTING SCOUR PROTECTION

Type(3): NONE

Extent(4): N/A

Effectiveness(5): N/A

Obstructions(6): NONE

INSTRUCTIONS

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

DESIGN INFORMATION

Channel Bed Material(7): MEDIUM SAND WITH COARSER SAND BELOW

Channel Bank Material(8): SAND WITH SOME MUCK OCCASIONALLY

Channel Bank Cover(9): GRASS NEAR BRIDGE, HEAVILY WOODED UPSTREAM AND DOWNSTREAM

Floodplain Width(10): 400 FEET

Floodplain Cover(11): GRASS, SHRUBS, AND TREES (YOUNG TO MODERATE IN AGE)

Stream is(12): Aggrading _____ Degrading Static _____

Channel Migration Tendency(13): TO THE WEST

Observations and Other Comments: LARGE DRAINAGE DITCH ON NORTH WESTERN SIDE OF BRIDGE CAUSING SOME BANK SCOUR, BUT IS NOT EFFECTING CHANNEL

Reported by: *[Signature]* Date: 5/24/2006
 TERRA, INC.

DESIGN SCOUR ELEVATIONS(14)

Feet Meters _____

BENTS														
16+30														
100 yr	17.6'													

Comparison of DSE to Hydraulics Unit theoretical scour:
 The DSE is approximately 3.5' higher than the Theoretical scour elevation at the midpoint of the bridge due to the presence of Coastal Plain soils.

DSE determined by: *Chad M. Wally* Date: 6/30/2006

SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL

Bed or Bank	CHANNEL	BANK				
Sample No.	S-1	S-2				
Retained #4	100	100				
Passed #10	99	100				
Passed #40	39	90				
Passed #200	2	7				
Coarse Sand	1	0				
Fine Sand	37	83				
Silt	-	-				
Clay	-	-				
LL	-	-				
PI	NP	NP				
AASHTO	A-1-b	A-3				
Station	16+25	16+35				
Offset	15 LT	15 LT				
Depth	0.0-0.5	0-5.0				

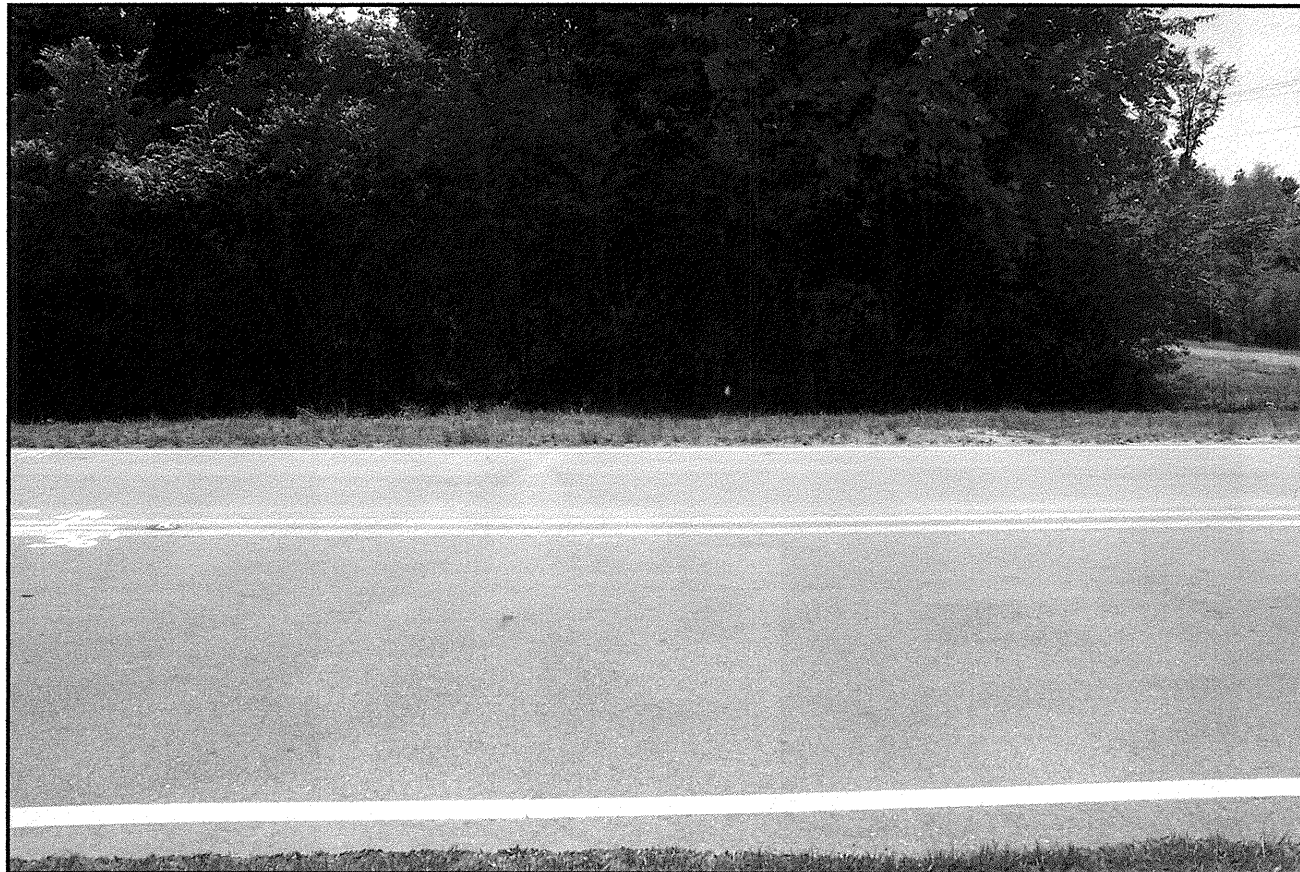


CENTERLINE PROFILE (-L-), LOOKING UPSTATION.



JERICO RUN, LOOKING DOWNSTREAM.

SITE PHOTOGRAPHS	
BRIDGE #9 OVER JERICO RUN ON NC 55 LENOIR COUNTY, NORTH CAROLINA TIP NO: B-4172, STATE PROJECT NO: 33519.1.1	
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END BENT 1, LOOKING FROM LEFT TO RIGHT.



END BENT 2, LOOKING FROM LEFT TO RIGHT.

SITE PHOTOGRAPHS

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JERICO RUN, LOOKING UPSTREAM.

SITE PHOTOGRAPHS

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