

NOTE: SEE SHEET 1A FOR PLAN SHEET LAYOUT AT TIME OF INVESTIGATION

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-5163	1	16
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
42338.1.1	BRZ-1354(2)	PE	
42338.2.1	BRZ-1354(2)	RW & UTILITIES	
42338.3.1	BRZ-1354(2)	CONST.	

CONTENTS

LINE	STATION	PLAN	PROFILE	XSECT
-L-	12+50 - 15+00	4	-	5-9
-L-	18+50 - 20+00	4	-	10-13
SUMMARY OF LAB TEST RESULTS				14

**ROADWAY  
SUBSURFACE INVESTIGATION**

PROJ. REFERENCE NO. 42338.1.1 (B-5163) F.A. PROJ. BRZ-1354 (2)  
COUNTY ROCKINGHAM  
PROJECT DESCRIPTION BRIDGE NO. 160 OVER BUFFALO CREEK ON  
SR 1354 (BENNETT ROAD)

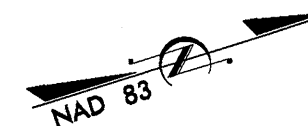
**INVENTORY**

**CAUTION NOTICE**

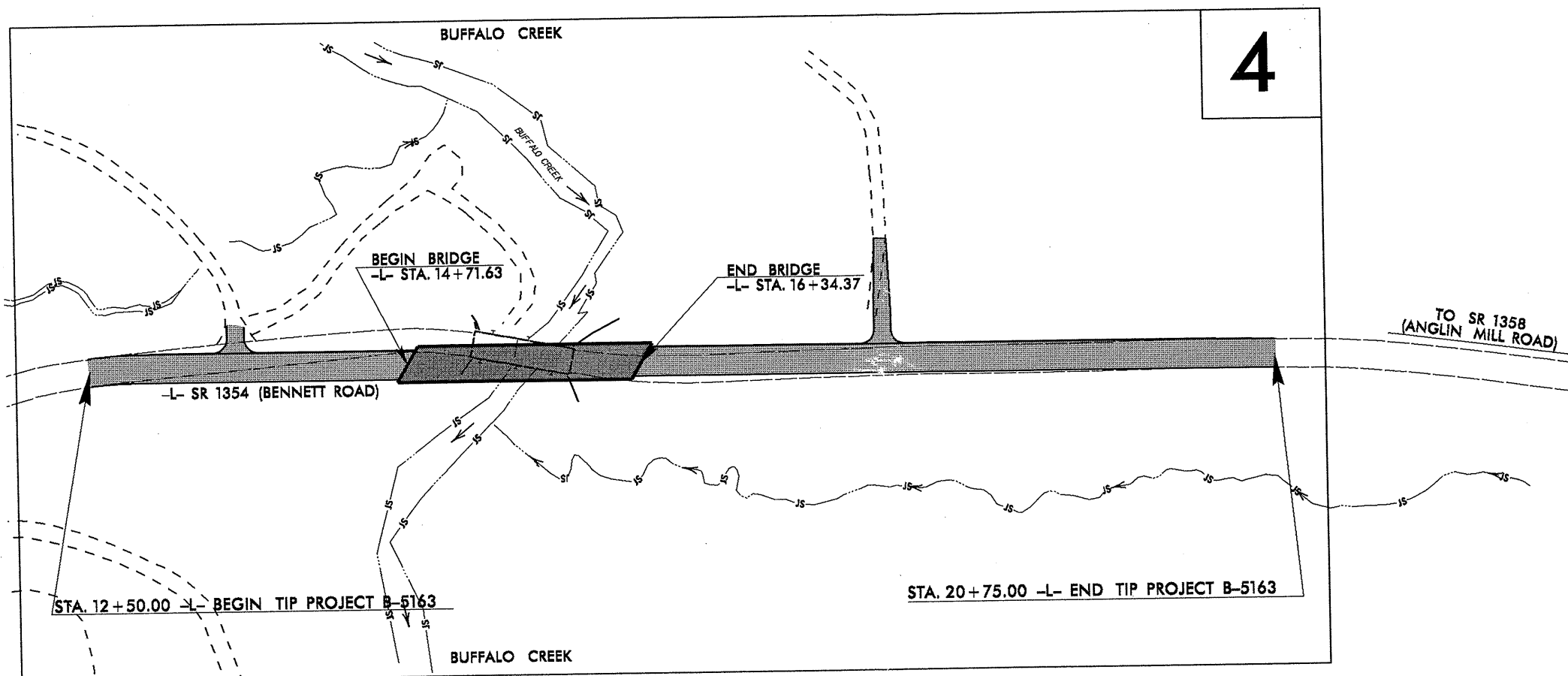
THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING, AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N.C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 707-6850. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE 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 (ON-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.



CONTRACT: C203307 ID: B-5163



PERSONNEL

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INVESTIGATED BY AMEC E&I, Inc.

CHECKED BY B. Deobald, L.G.

SUBMITTED BY M. Lear, L.G.

DATE August, 2012

REVISION DATE September, 2012

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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.

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

PROJECT REFERENCE NO. B-5163  
 SHEET NO. 2

**SUBSURFACE INVESTIGATION**

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

SOIL DESCRIPTION		GRADATION		ROCK DESCRIPTION		TERMS AND DEFINITIONS			
SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (ASHTO T208, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE: <i>VERY STIFF, GRAY, SILTY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</i>		WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED) GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES. ANGULARITY OF GRAINS THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.		HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF 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: WEATHERED ROCK (WR) CRYSTALLINE ROCK (ICR) NON-CRYSTALLINE ROCK (NCR) COASTAL PLAIN SEDIMENTARY ROCK (CPS)		ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. AQUIFER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL. FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. FORMATION (FM) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS IN OR BPF OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.			
SOIL LEGEND AND AASHTO CLASSIFICATION		MINERALOGICAL COMPOSITION		WEATHERING					
GENERAL CLASS. GRANULAR MATERIALS (<= 35% PASSING #200) SILT-CLAY MATERIALS (> 35% PASSING #200) ORGANIC MATERIALS		MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.		ROCK FRESH, CRYSTALLINE BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE. 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. 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. 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. 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. ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. IF TESTED, YIELDS SPT N VALUES > 100 BPF. 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. 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.		WEATHERING			
COMPRESSION		PERCENTAGE OF MATERIAL		GROUND WATER		MISCELLANEOUS SYMBOLS			
SLIGHTLY COMPRESSIBLE MODERATELY COMPRESSIBLE HIGHLY COMPRESSIBLE		LIQUID LIMIT LESS THAN 31 LIQUID LIMIT EQUAL TO 31-50 LIQUID LIMIT GREATER THAN 50		WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING STATIC WATER LEVEL AFTER 24 HOURS PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA SPRING OR SEEP		ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION SOIL SYMBOL ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT INFERRED SOIL BOUNDARY INFERRED ROCK LINE ALLUVIAL SOIL BOUNDARY DIP & DIP DIRECTION OF ROCK STRUCTURES TEST BORING AUGER BORING CORE BORING MONITORING WELL PIEZOMETER INSTALLATION SLOPE INDICATOR INSTALLATION CONE PENETROMETER TEST SOUNDING ROD			
TEXTURE OR GRAIN SIZE		CONSISTENCY OR DENSENESS		ABBREVIATIONS		EQUIPMENT USED ON SUBJECT PROJECT			
U.S. STD. SIEVE SIZE OPENING (MM) 4 10 40 60 200 270 4.76 2.00 0.42 0.25 0.075 0.053		PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT <sup>2</sup> )		AR - AUGER REFUSAL BT - BORING TERMINATED CL - CLAY CPT - CONE PENETRATION TEST CSE - COARSE DMT - DILATOMETER TEST DPT - DYNAMIC PENETRATION TEST e - VOID RATIO F - FINE FOSS. - FOSSILIFEROUS FRAC. - FRACTURED, FRACTURES FRAGS. - FRAGMENTS HI. - HIGHLY MED. - MEDIUM MICA. - MICACEOUS MOD. - MODERATELY NP - NON PLASTIC ORG. - ORGANIC PMT - PRESSUREMETER TEST SAP. - SAPROLITIC SD. - SAND, SANDY SL. - SILT, SILTY SLI. - SLIGHTLY TCR - TRICONE REFUSAL w - MOISTURE CONTENT v - VERY VST - VANE SHEAR TEST WEA. - WEATHERED UNIT WEIGHT UNIT WEIGHT SAMPLE ABBREVIATIONS S - BULK SS - SPLIT SPOON ST - SHELBY TUBE RS - ROCK RT - RECOMPACTED TRIAXIAL CBR - CALIFORNIA BEARING RATIO		DRILL UNITS: MOBILE B- CME-55 CME-45C CME-55 LC PORTABLE HOIST ADVANCING TOOLS: CLAY BITS 6" CONTINUOUS FLIGHT AUGER 6" HOLLOW AUGERS HARD FACED FINGER BITS TUNG-CARBIDE INSERTS TRICONE *STEEL TEETH TRICONE *TUNG-CARB. CORE BIT HAMMER TYPE: AUTOMATIC MANUAL CORE SIZE: B N H HAND TOOLS: POST HOLE DIGGER HAND AUGER SOUNDING ROD VANE SHEAR TEST			
SOIL MOISTURE - CORRELATION OF TERMS		ROCK HARDNESS		FRACTURE SPACING		BEDDING			
SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION		VERY HARD HARD MODERATELY HARD MEDIUM HARD SOFT VERY SOFT		TERM SPACING VERY WIDE MORE THAN 10 FEET WIDE 3 TO 10 FEET MODERATELY CLOSE 1 TO 3 FEET CLOSE 0.16 TO 1 FEET VERY CLOSE LESS THAN 0.16 FEET		TERM THICKNESS VERY THICKLY BEDDED > 4 FEET THICKLY BEDDED 1.5 - 4 FEET THINLY BEDDED 0.16 - 1.5 FEET VERY THINLY BEDDED 0.03 - 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET THINLY LAMINATED < 0.008 FEET			
PLASTICITY		INDURATION		BENCH MARK:		NOTES:			
NONPLASTIC LOW PLASTICITY MED. PLASTICITY HIGH PLASTICITY		FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.		ELEVATION: FT.		ND NOT DETERMINED FIAD FILLED IMMEDIATELY AFTER DRILLING			
COLOR									
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.									

See Sheet 1-A For Index of Sheets  
 See Sheet 1-B For Conventional Plan Sheet Symbols  
 See Sheet 1-C for Survey Control Sheet

STATE OF NORTH CAROLINA  
 DIVISION OF HIGHWAYS

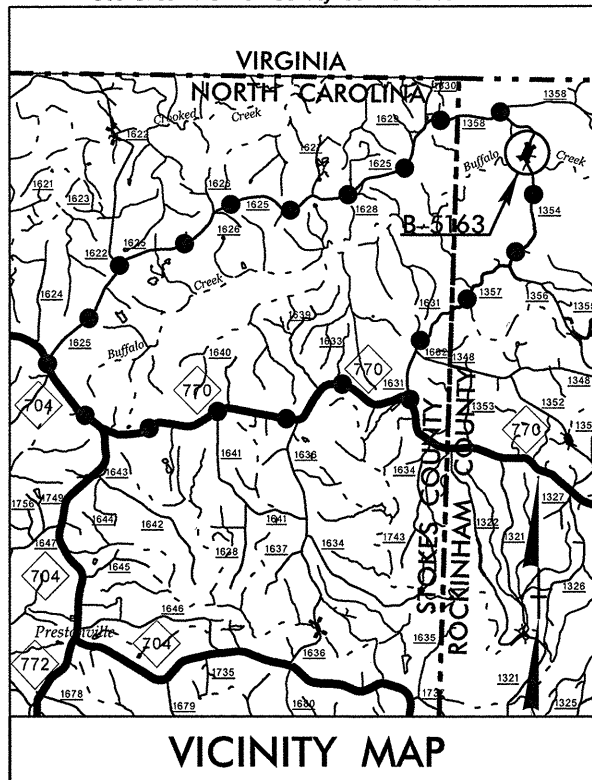
**ROCKINGHAM COUNTY**

LOCATION: BRIDGE NO. 160 ON SR 1354 (BENNETT ROAD)  
 OVER BUFFALO CREEK

TYPE OF WORK: GRADING, DRAINAGE, PAVING, AND STRUCTURE

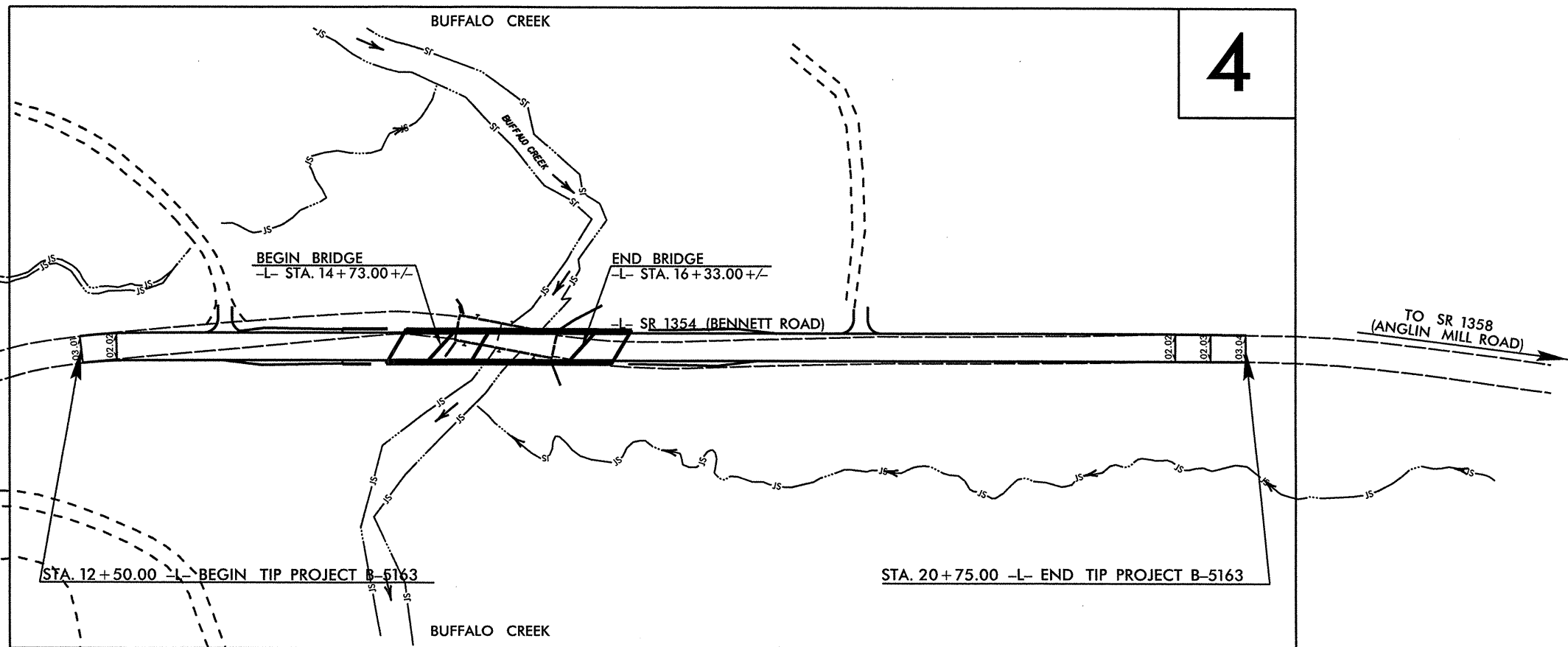
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42338.1.1	BRZ-1354(2)	PE	

TIP PROJECT: B-5163



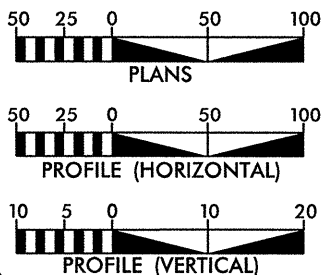
VICINITY MAP

● ● OFFSITE DETOUR



DESIGN EXCEPTION REQUIRED FOR SAG VERTICAL CURVES AND ASSOCIATED STOPPING SIGHT DISTANCES.  
 THIS PROJECT IS NOT WITHIN ANY MUNICIPAL BOUNDARIES.  
 CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD \_\_\_\_\_

GRAPHIC SCALES



DESIGN DATA

ADT 2017 = 130  
 ADT 2035 = 200  
 DHV = 10 %  
 D = 60 %  
 T = 5 % \*  
 V = 55 MPH  
 \* TTST = 2% DUAL = 3%  
 FUNC CLASS =  
 RURAL LOCAL  
 SUB-REGIONAL TIER

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT B-5163 = 0.126 MILES  
 LENGTH STRUCTURE TIP PROJECT B-5163 = 0.030 MILES  
 TOTAL LENGTH OF TIP PROJECT B-5163 = 0.156 MILES

Prepared in the Office of:  
**DIVISION OF HIGHWAYS**  
 1000 Birch Ridge Dr., Raleigh NC, 27610

2012 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:  
 FEBRUARY 15, 2013

LETTING DATE:  
 FEBRUARY 18, 2014

JAMES A. SPEER, PE  
 PROJECT ENGINEER

DANIEL W. GARDNER, JR., PE  
 PROJECT DESIGN ENGINEER

HYDRAULICS ENGINEER

SIGNATURE: \_\_\_\_\_ P.E.

ROADWAY DESIGN  
 ENGINEER

SIGNATURE: \_\_\_\_\_ P.E.



18-SEP-2012 10:45 C:\Users\royar\OneDrive\B5163\_GEO\_Br'dge\_160\CADD\_GEO\TECH\PlanProf\B5163\_Geo\_tsh.dgn royar.dwg AT D6035142

CONTRACT:



September 19, 2012

STATE PROJECT: 42338.1.1 (B-5163)  
 F.A. NUMBER: BRZ-1354 (2)  
 COUNTY: Rockingham  
 DESCRIPTION: Bridge 160 over Buffalo Creek on SR 1354 (Bennett Road)  
 SUBJECT: Revised Geotechnical Report - Inventory

#### Project Description

The project consists of realignment of the existing two lane roadway approaches to Bridge 160 over Buffalo Creek on SR 1354 (Bennet Road). The project is approximately 800 feet long and is located approximately 3 miles north of Ayersville, North Carolina in the northwest portion of Rockingham County. The new alignment will replace the existing road with a straighter and wider roadway in conjunction with a 2-lane replacement bridge, drilled prior to our investigation.

The geotechnical field investigation was conducted during August of 2012. A CME-55LC drill machine equipped with an automatic hammer was used to complete the investigation. Five Standard Penetration Tests borings were performed at selected locations and ranged in depth from 9.4 to 30.2 feet. An additional boring was advanced using a hand auger to supplement the Standard Penetration Test borings to a depth of 6.0 feet.

The following alignments were investigated for this project:

<u>Line</u>	<u>Stations(±)</u>
-L-	12+50 to 15+00
-L-	18+50 to 20+00

#### Areas of Special Geotechnical Interest

- 1) Crystalline Rock: The crystalline rock on this project consists of metamorphic rock and was not encountered within 6 feet of the proposed grade along the investigated alignments. Crystalline rock outcrops consisting of mica gneiss were observed along the northern banks and in the stream bed of Buffalo Creek.

#### Physiography, Geology and Surface Water

The project is located in the central Piedmont Physiographic Province. The topography is gently to moderately rolling. The elevation along the project corridor ranges from 720± to 805± feet. Surface water

in the area generally drains to the east-southeast. The project corridor is a mixture of existing roadway embankment, moderately to thickly forested hillsides and floodplain.

Geologically, the project is located within the Sauratown Mountains Anticlinorium which is composed of variably metamorphosed rock types. At the project site, rock consists of mica gneiss.

Surface water is drained from the corridor by Buffalo Creek which trends generally east-southeast across the project.

#### Soil Properties

Soils encountered during this investigation are separated into three categories based on origin, including roadway embankment, alluvial and residual soils.

Roadway embankment soils are present along existing Bennett Road (SR 1354). These soils, where encountered, consist of very loose to loose, moist, tan and brown, micaceous, silty sand (A-2-4).

Alluvial soils were identified in association with Buffalo Creek and tributary drainages. Alluvial soils consist of sands, gravels, and cobbles observed in and along the streambed of Buffalo Creek, along with medium stiff, moist, brown, sandy clay (A-6) and loose, moist, orange and brown, silty fine sand (A-2-4) with gravel and cobbles, encountered in the associated floodplain.

Residual soils comprise the majority of the soils identified along the investigated proposed alignment. Residual soils mostly consist of medium dense to very dense, dry to moist, red, brown, tan, orange, white and gray, clayey and silty sands (A-2-6, A-2-4); with minor occurrences of stiff, dry, red, brown, tan, and orange, sandy silts (A-4). Laboratory testing was conducted on selected samples and results are presented with this report. At depth, the residual soils are micaceous and saprolitic.


#### Rock Properties

Weathered rock and crystalline rock was encountered along the investigated portions of the alignment at depths ranging from 3.7 to 18 feet below ground surface. Crystalline rock was typically encountered below the weathered rock in most borings. The top of crystalline rock, where encountered, ranged in depth from 9.4 to 26.0 feet below ground surface. Crystalline bedrock consists of gray, mica gneiss.

#### Groundwater

No groundwater was encountered in the borings performed at the time of our investigation. It is anticipated to be at similar elevation to Buffalo Creek.

Respectfully Submitted,

  
 Michael B. Lear, L.G.  
 Senior Geologist

STATE OF NORTH CAROLINA  
 DIVISION OF HIGHWAYS

3A

**SUMMARY OF EARTHWORK**  
 IN CUBIC YARDS

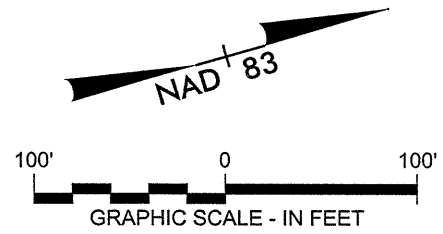
LOCATION	EXCAVATION					EMBANKMENT				BORROW	WASTE			
	TOTAL UNCL.	ROCK	UNDERCUT	UNSUIT. UNCL.	SUITABLE UNCL.	TOTAL	ROCK	EARTH	EMBANK (+) 20%		ROCK	SUITABLE	UNSUIT.	TOTAL
SUMMARY NO. 1														
-L- STA. 12+50.00 TO STA. 14+71.63 BB	457				457	111		111	134				323	323
SUMMARY NO. 1 TOTALS	457				457	111		111	134				323	323
SUMMARY NO. 2														
-L- STA. 16+34.37 EB TO STA. 20+75.00	395				395	350		350	420	25				
SUMMARY NO. 2 TOTALS	395				395	350		350	420	25				
SUMMARY TOTALS	852				852	461		461	554	25			323	323
LOSS DUE TO C & G	-160				-160								-160	-160
WASTE IN LIEU OF BORROW										-25			-25	-25
PROJECT TOTALS	692				692	461		461	554				138	138
PROJECT GRAND TOTALS	692				692	461		461	554				138	138
SAY	750													
EST. UNDERCUT CONTINGENCY = 200 CY														
SELECT GRANULAR MATERIAL = 200 CY														
GEOTEXTILE FOR SOIL STABILIZATION = 200 SY														

Earthwork quantities are calculated by the Roadway Design Unit. These earthwork quantities are based in part on subsurface data provided by the Geotechnical Engineering Unit.

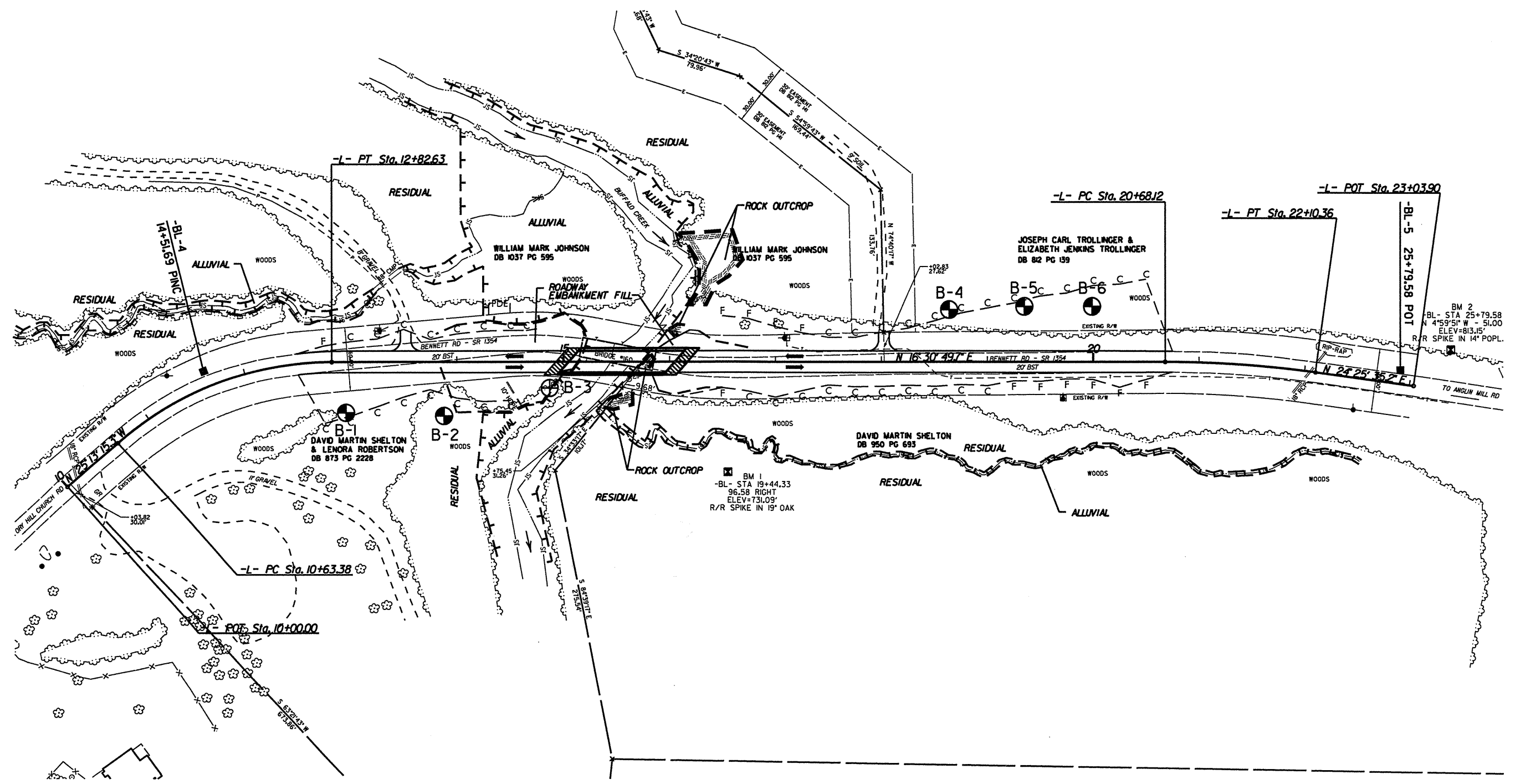
Note: Approximate quantities only. Unclassified Excavation, Fine Grading, Clearing and Grubbing, and Removal of Existing Pavement will be paid for at the contract lump sum price for "Grading."

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PROJECT REFERENCE NO.	SHEET NO.
B-5163	4
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>INCOMPLETE PLANS</b> DO NOT USE FOR R/W ACQUISITION <b>PRELIMINARY PLANS</b> DO NOT USE FOR CONSTRUCTION	



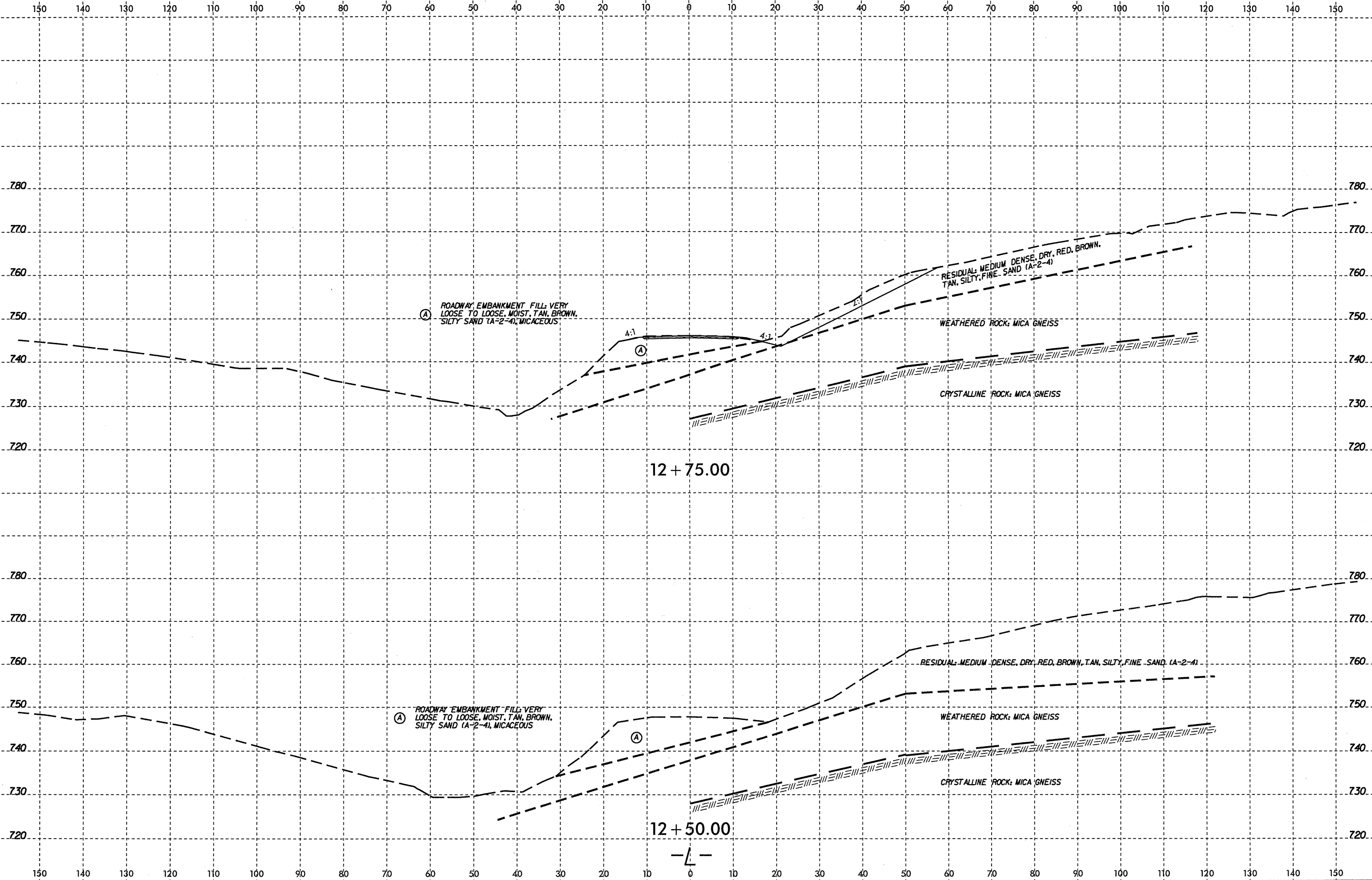
-L-	
PI Sta 11+78.12	PI Sta 21+39.36
$\Delta = 41^{\circ} 44' 05.0''$ (RT)	$\Delta = 7^{\circ} 54' 45.4''$ (RT)
D = 19' 02' 06.5"	D = 5' 33' 45.7"
L = 219.25'	L = 142.24'
T = 114.74'	T = 71.24'
R = 301.00'	R = 1030.00'
SE = SEE PLANS	SE = SEE PLANS

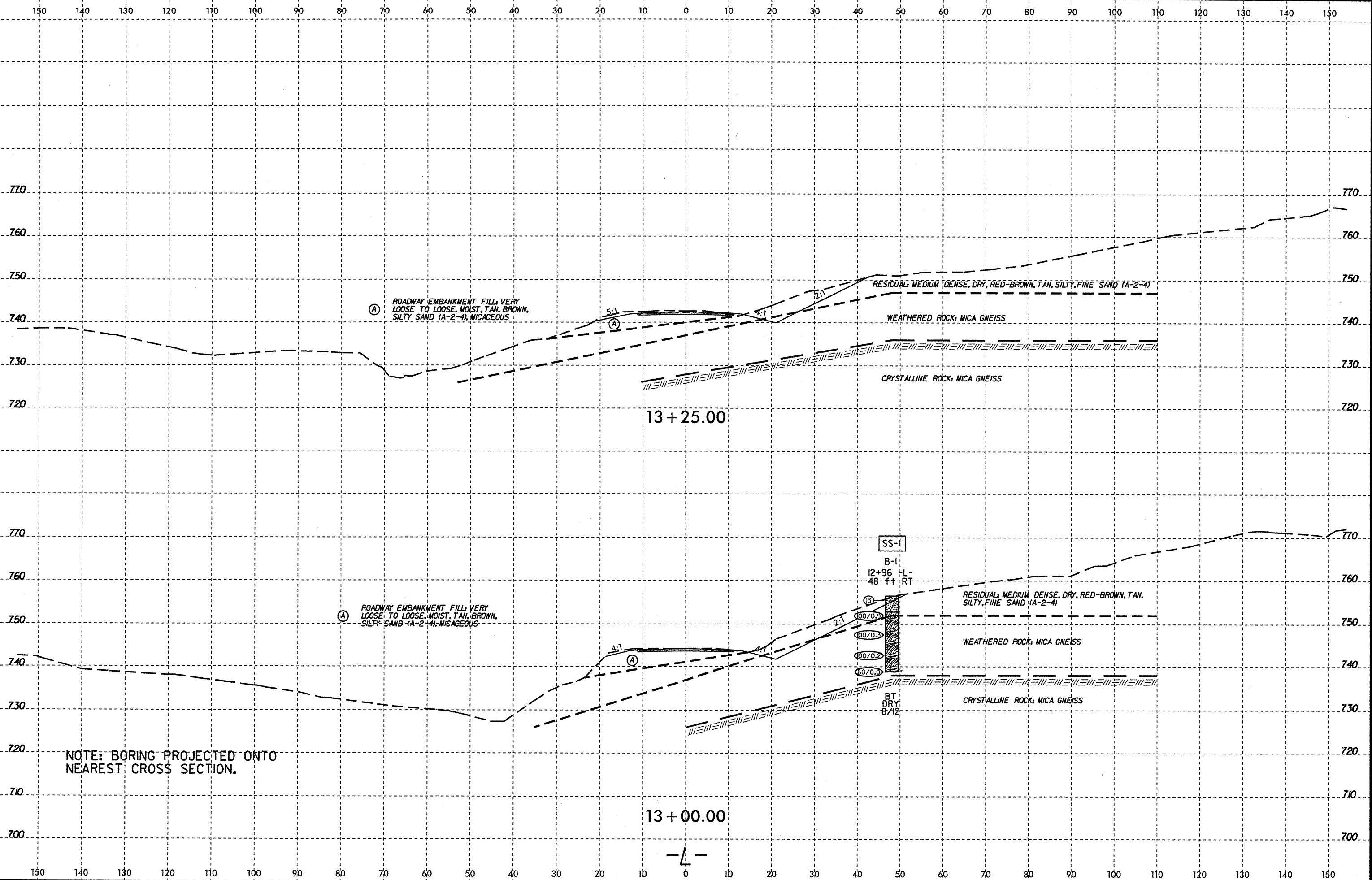


REVISIONS

8/17/99

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 60\CADD\_GEO\TECH\Plan\B-5163\_Geo.rvt.dgn





(A) ROADWAY EMBANKMENT FILL: VERY LOOSE TO LOOSE, MOIST, TAN, BROWN, SILTY SAND (A-2-4), MICACEOUS

RESIDUAL: MEDIUM DENSE, DRY, RED-BROWN, TAN, SILTY, FINE SAND (A-2-4)

WEATHERED ROCK: MICA GNEISS

CRYSTALLINE ROCK: MICA GNEISS

13 + 25.00

(A) ROADWAY EMBANKMENT FILL: VERY LOOSE TO LOOSE, MOIST, TAN, BROWN, SILTY SAND (A-2-4), MICACEOUS

RESIDUAL: MEDIUM DENSE, DRY, RED-BROWN, TAN, SILTY, FINE SAND (A-2-4)

WEATHERED ROCK: MICA GNEISS

CRYSTALLINE ROCK: MICA GNEISS

13 + 00.00

NOTE: BORING PROJECTED ONTO NEAREST CROSS SECTION.

SS-f

B-1  
12+96 L-  
48' RT

13

00/0.9

00/0.3

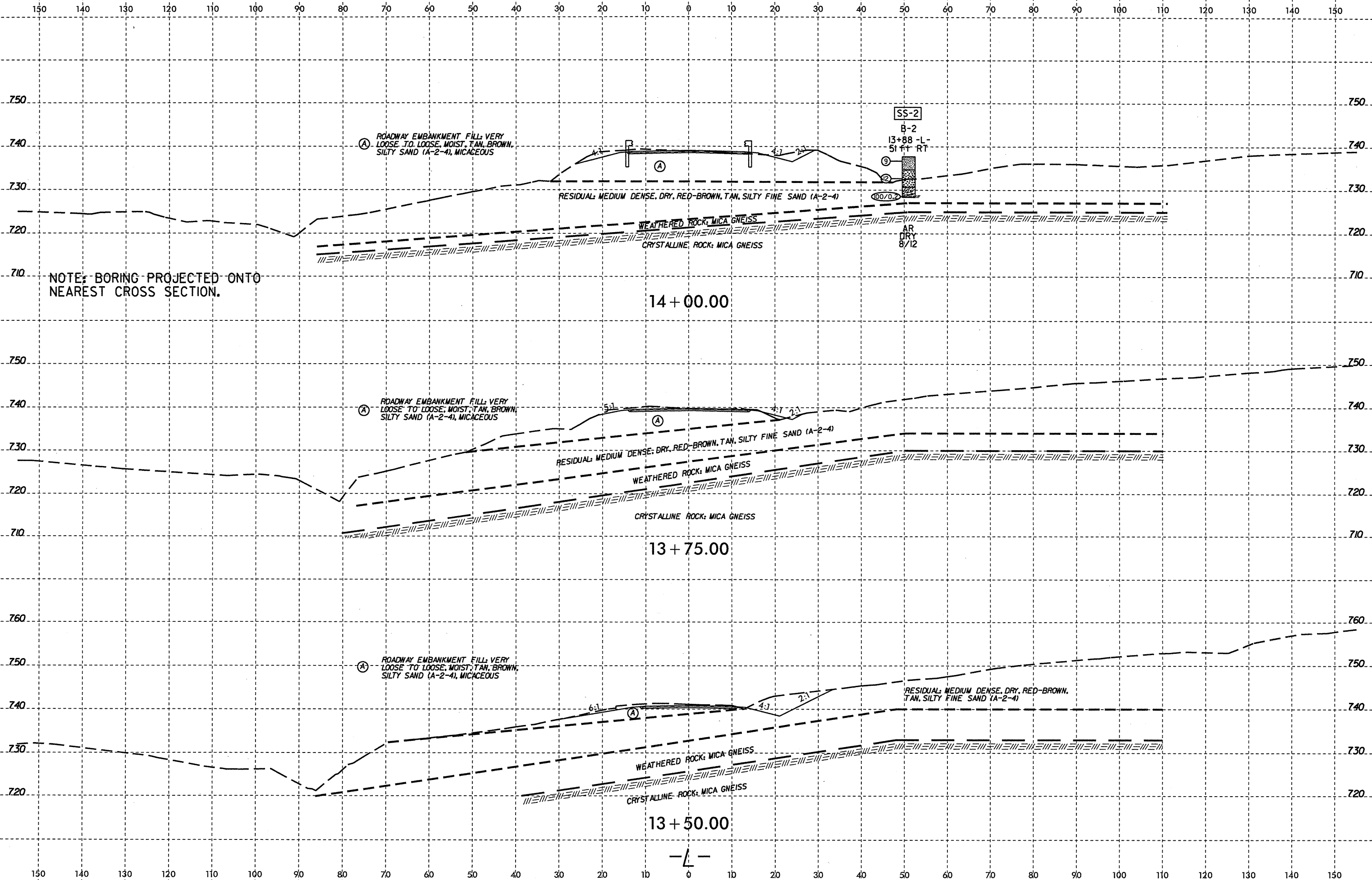
00/0.2

00/0.0

BT  
DRY  
8/12



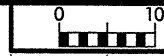
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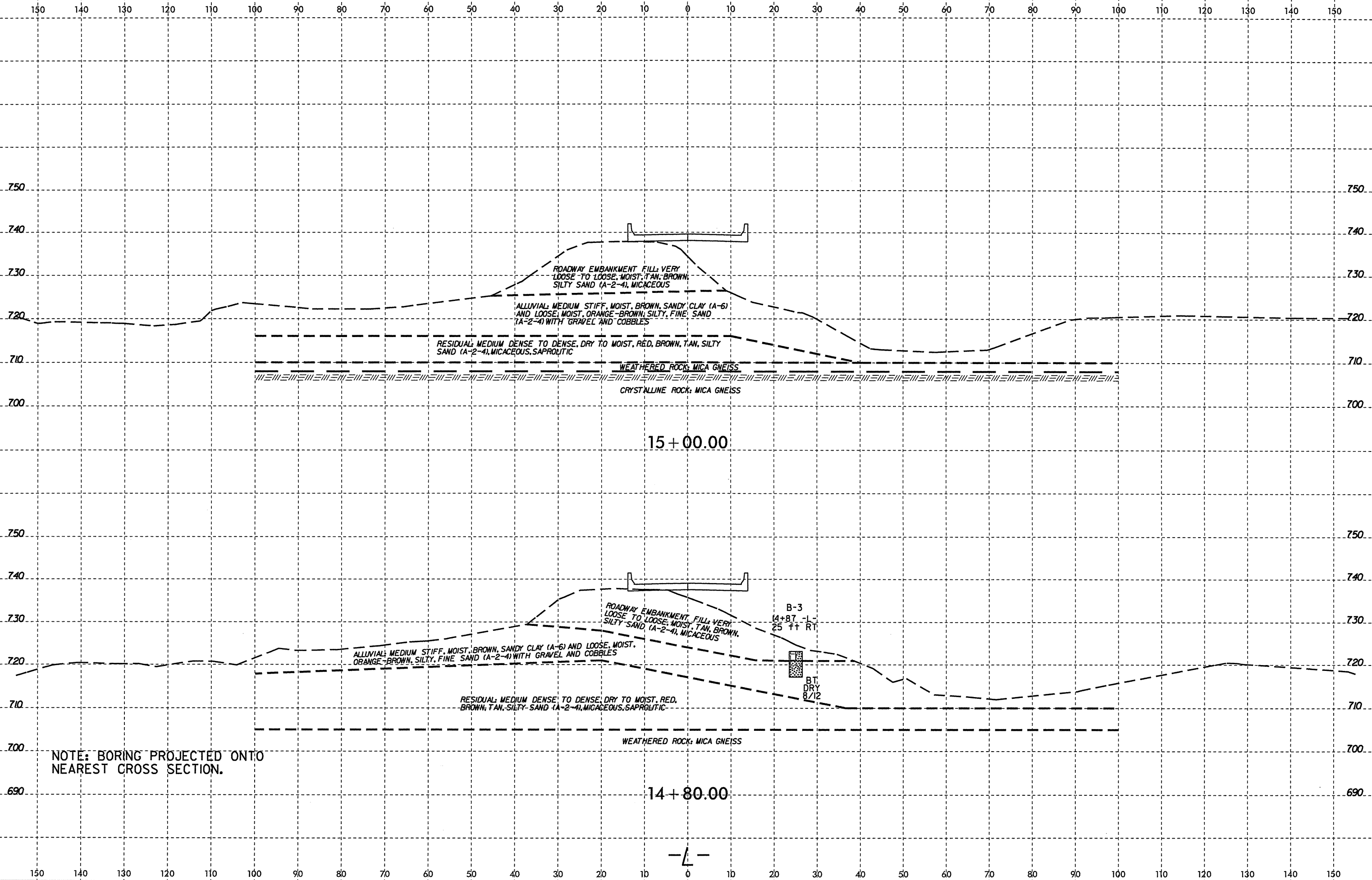
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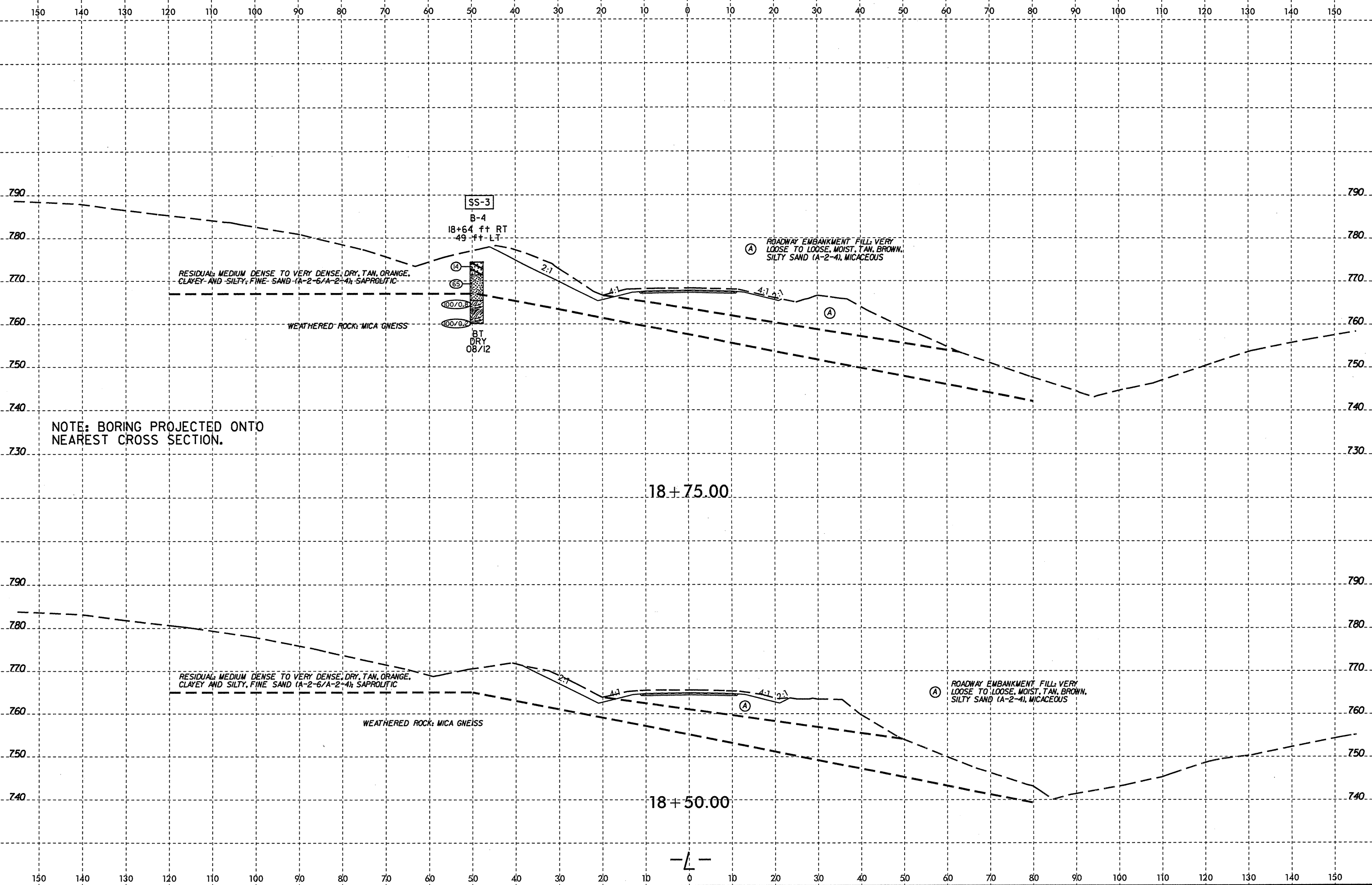
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PROJ. REFERENCE NO.	SHEET NO.
B-5163	9



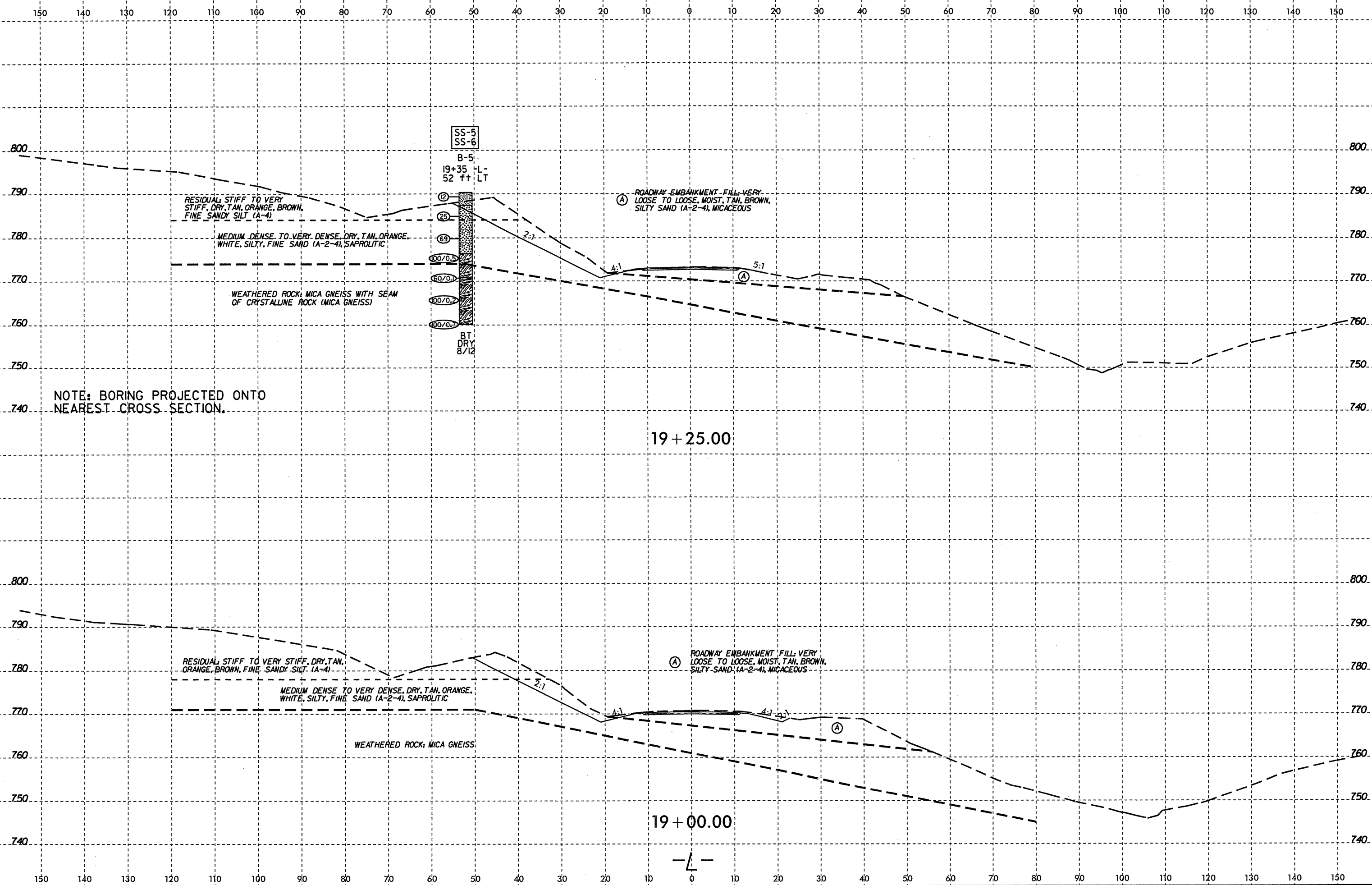
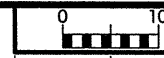
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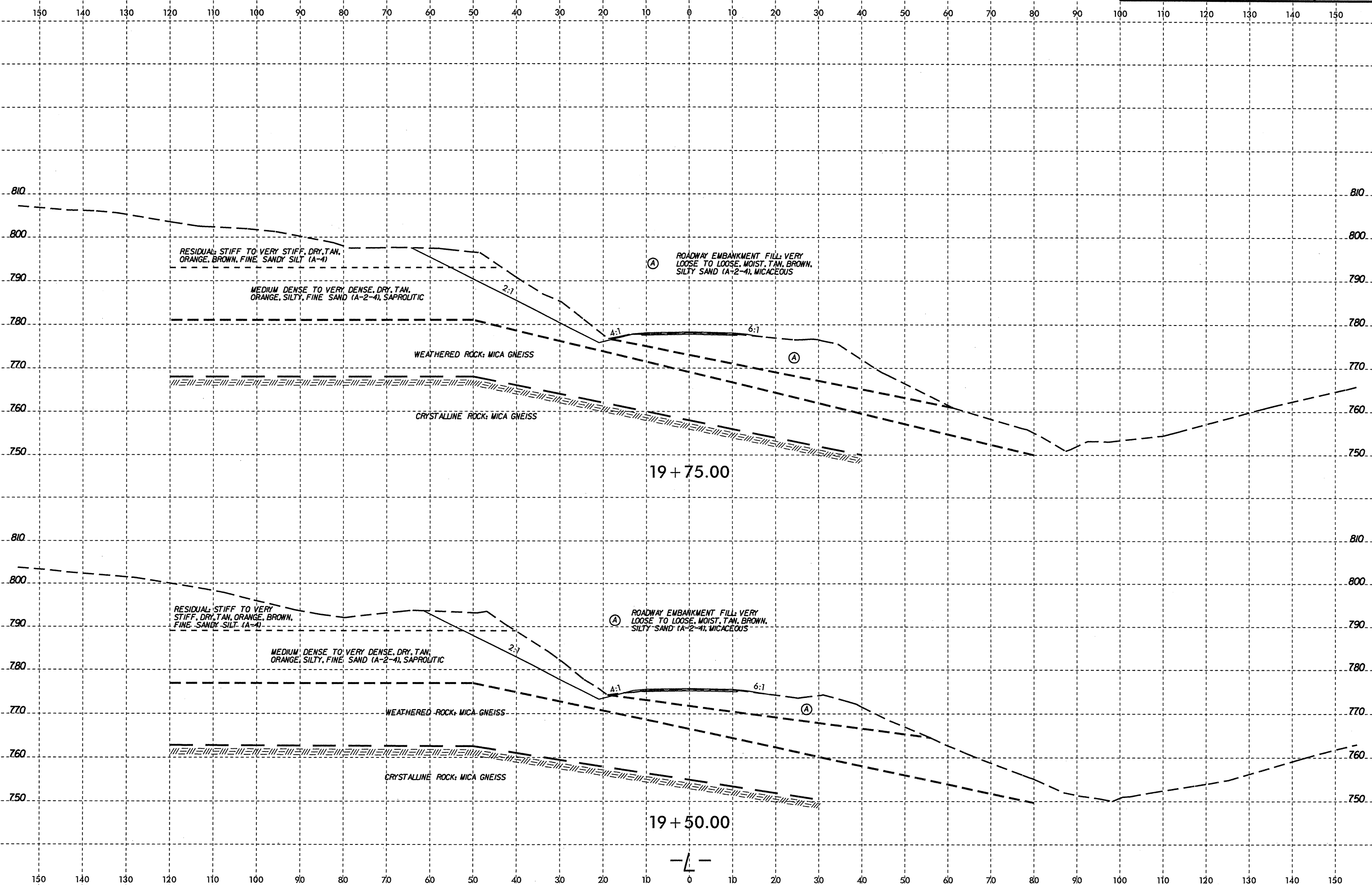
NOTE: BORING PROJECTED ONTO NEAREST CROSS SECTION.

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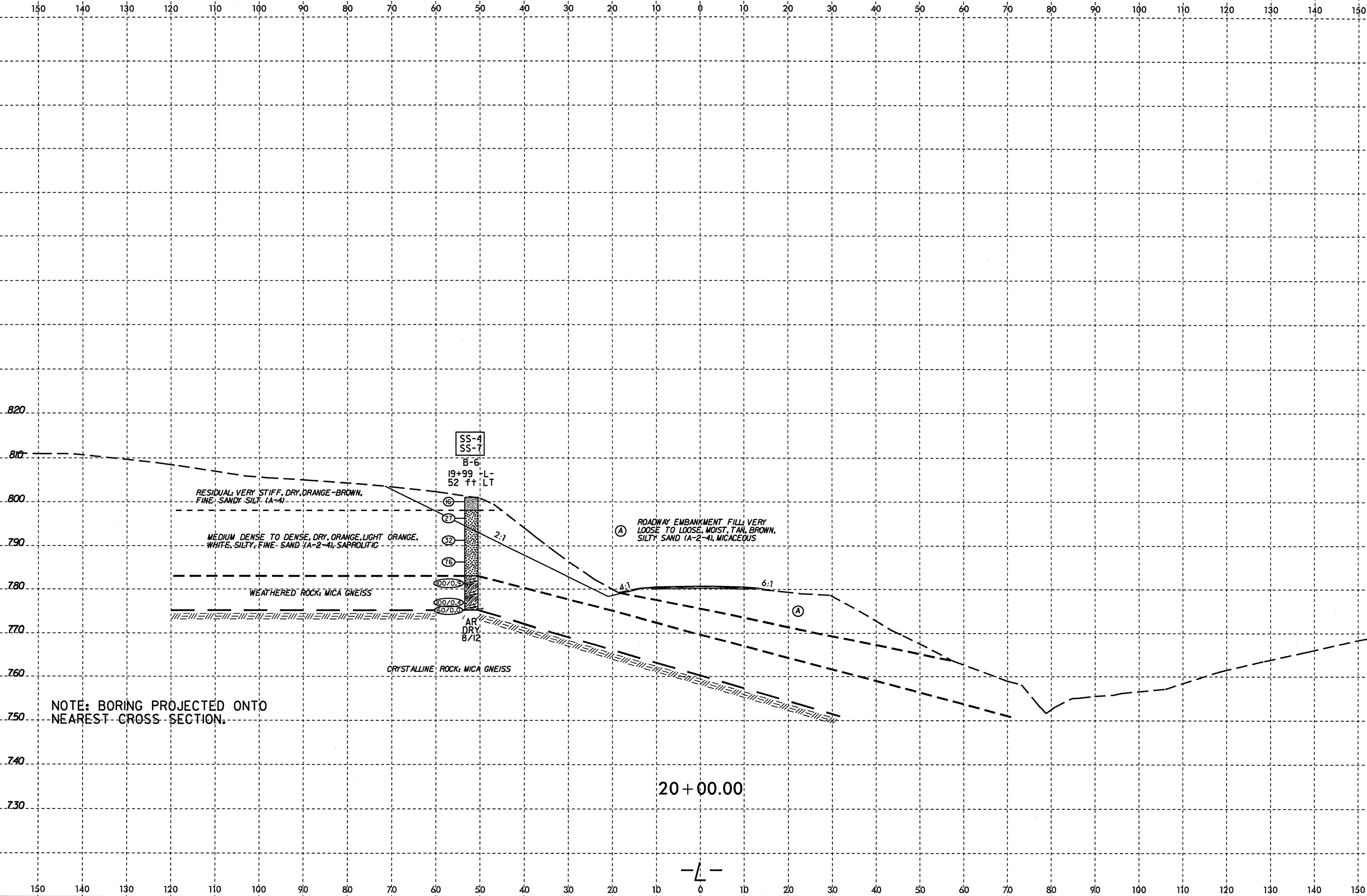
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PROJ. REFERENCE NO.	SHEET NO.
B-5163	12



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AMEC ENVIRONMENT & INFRASTRUCTURE, INC.  
4021 STIRRUP CREEK DRIVE, SUITE 100  
DURHAM, NORTH CAROLINA 27703

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

**REPORT ON SAMPLES OF: SOILS FOR QUALITY**

AMEC PROJECT NAME/NUMBER: Bridge No. 160 over Buffalo Creek on SR 1354 (Bennet Rd) / 6468-12-1174  
NCDOT PROJ. NO.: 42338.1.1 (B-5163) COUNTY: Rockingham OWNER: N.C.D.O.T.  
DATES SAMPLED: 8/10/12 - 8/15/12 RECEIVED: 8/20/2012 REPORTED BY: AMEC  
SAMPLED FROM: B-1, B-2, B-4, B-5, B-6  
SUBMITTED BY: AMEC Environment & Infrastructure, INC.

1992 STANDARD SPECIFICATIONS

**TEST RESULTS**

Lab Sample No.		SS-1	SS-2	SS-3	SS-4	SS-5	SS-6
Retained No. 4 Sieve (%)		ND	ND	ND	ND	0.3	2.1
Passing No. 10 Sieve (%)		ND	ND	ND	ND	99.3	96.1
Passing No. 40 Sieve (%)		ND	ND	ND	ND	89.1	76.3
Passing No. 200 Sieve (%)		ND	ND	ND	ND	41.3	26.1

**MINUS 2.00mm FRACTION**

SOIL MORTAR - 100%							
Coarse Sand (%)		ND	ND	ND	ND	19.5	35.9
Fine Sand (%)		ND	ND	ND	ND	45.1	43.7
Silt (%)		ND	ND	ND	ND	13.0	20.4
Clay (%)		ND	ND	ND	ND	22.4	ND

Moisture Content (%)		ND	ND	ND	ND	14.5	ND
Liquid Limit, L.L.		31	NV	38	28	22	ND
Plasticity Index, P.I.		2	NP	18	3	3	NP
AASHTO Classification		A-2-4	A-2-4	A-2-6	A-2-4	A-4(0)	A-2-4

Boring No.		B-1	B-2	B-4	B-6	B-5	B-5
Station		12+96	13+88	18+64	19+99	19+35	19+35
Offset (FT)		48 ft RT	51 ft RT	49 ft LT	52 ft LT	52 ft LT	52 ft LT
Alignment		-L-	-L-	-L-	-L-	-L-	-L-
Depth (FT)	From	0.0	4.0	0.0	8.8	0.0	9.5
	to	1.5	5.5	1.5	10.3	1.5	11.0

REMARKS: ND=Not Determined, NP=Non-Plastic, NV=No Value

Tested By Chana Savanapridi; Cert. No. 104-04-0504

*Chana Savanapridi*  
Signature



AMEC ENVIRONMENT & INFRASTRUCTURE, INC.  
4021 STIRRUP CREEK DRIVE, SUITE 100  
DURHAM, NORTH CAROLINA 27703

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

**REPORT ON SAMPLES OF: SOILS FOR QUALITY**

AMEC PROJECT NAME/NUMBER: Bridge No. 160 over Buffalo Creek on SR 1354 (Bennet Rd) / 6468-12-1174  
NCDOT PROJ. NO.: 42338.1.1 (B-5163) COUNTY: Rockingham OWNER: N.C.D.O.T.  
DATES SAMPLED: 8/10/12 - 8/15/12 RECEIVED: 8/20/2012 REPORTED BY: AMEC  
SAMPLED FROM: B-1, B-2, B-4, B-5, B-6  
SUBMITTED BY: AMEC Environment & Infrastructure, INC.

1992 STANDARD SPECIFICATIONS

**TEST RESULTS**

Lab Sample No.		SS-7				
Retained No. 4 Sieve (%)		0.0				
Passing No. 10 Sieve (%)		99.9				
Passing No. 40 Sieve (%)		90.9				
Passing No. 200 Sieve (%)		49.9				

**MINUS 2.00mm FRACTION**

SOIL MORTAR - 100%							
Coarse Sand (%)		16.5					
Fine Sand (%)		39.9					
Silt (%)		18.3					
Clay (%)		25.2					

Moisture Content (%)		12.6					
Liquid Limit, L.L.		26					
Plasticity Index, P.I.		9					
AASHTO Classification		A-4(2)					

Boring No.		B-6				
Station		19+99				
Offset (FT)		52 ft LT				
Alignment		-L-				
Depth (FT)	From	0.0				
	to	1.5				

REMARKS: ND=Not Determined, NP=Non-Plastic, NV=No Value

Tested By Chana Savanapridi; Cert. No. 104-04-0504

*Chana Savanapridi*  
Signature