

REFERENCE: BR-0094

PROJECT: 67094

SEE SHEET 3 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.	BR-0094	1	21

ROADWAY
SUBSURFACE INVESTIGATION

COUNTY ROCKINGHAM
PROJECT DESCRIPTION BRIDGE 780069 ON NC 770
OVER US 220

INVENTORY

CONTENTS

LINE	STATION	PLAN	PROFILE
-L-	15+50-26+00	4	N/A
-RPA-	15+25-16+29	4	N/A
-RPB-	10+00-11+25	4	N/A
-RPC-	10+00-12+00	4	N/A
-RPD-	12+08-14+07	4	N/A

CROSS SECTIONS

LINE	STATION	SHEETS
-L-	18+00-25+00	5-9
-RPA-	15+50	10
-RPB-	10+50	11
-RPC-	11+00	12
-RPD-	13+00	13

APPENDICES

APPENDIX	TITLE	SHEETS
A	LAB RESULTS	14-17
B	BORE LOG	18-19

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 707-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

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

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

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

PERSONNEL

BRECCIA
R. WESSINGER
D. HARRIS

INVESTIGATED BY F&ME CONSULTANTS
DRAWN BY R. LAWRENCE, P.E.
CHECKED BY A. SHANNON, P.E.
SUBMITTED BY A. SHANNON, P.E.
DATE MAY 2022

Prepared in the Office of:



F&ME CONSULTANTS, INC.
1825 BLANDING STREET
COLUMBIA, SC 29201



DocuSigned by:
Adam J. Shannon 06/13/2022
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SIGNATURE DATE

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

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SUBSURFACE INVESTIGATION
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION										GRADATION										ROCK DESCRIPTION										TERMS AND DEFINITIONS																																																																									
<p>SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 208, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, 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. UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.</p>										<p>HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED, AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:</p>										<p>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, SUCH 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 DISLOADED 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 (ROD) - 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.</p>																																																																									
SOIL LEGEND AND AASHTO CLASSIFICATION										ANGULARITY OF GRAINS										WEATHERED ROCK (WR)										NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.																																																																									
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<p>MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.</p>										<p>SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50</p>										<p>FRESH - ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.</p>										<p>VERY SLIGHT (IV SLI.) - ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN. CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.</p>																																																																									
PERCENTAGE OF MATERIAL										GROUND WATER										MODERATE (MOD.)										NON-COASTAL PLAIN SEDIMENTARY ROCK (CPI)																																																																									
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<p>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.</p>										<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>TERM</th> <th>SPACING</th> </tr> <tr> <td>VERY WIDE</td> <td>MORE THAN 10 FEET</td> </tr> <tr> <td>WIDE</td> <td>3 TO 10 FEET</td> </tr> <tr> <td>MODERATELY CLOSE</td> <td>1 TO 3 FEET</td> </tr> <tr> <td>CLOSE</td> <td>0.16 TO 1 FOOT</td> </tr> <tr> <td>VERY CLOSE</td> <td>LESS THAN 0.16 FEET</td> </tr> </table>										TERM	SPACING	VERY WIDE	MORE THAN 10 FEET	WIDE	3 TO 10 FEET	MODERATELY CLOSE	1 TO 3 FEET	CLOSE	0.16 TO 1 FOOT	VERY CLOSE	LESS THAN 0.16 FEET	<p>SOFT - CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.</p>										<p>VERY SOFT - CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGER NAIL.</p>																																																													
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																				<p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF 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>br0094_ls.tin.210106.tin Apr 11, 2022</p>																																																																									

June 10, 2022

Mr. John L. Pilipchuk, L.G., P.E.
 Geotechnical Engineering Unit (GEU)
 1589 Mail Service Center
 Raleigh, NC. 27699 -1589

Re.: WBS ELEMENT: 67094.1.1
 T.I.P. NO.: BR-0094
 PROJECT ID: 39074
 COUNTY: Rockingham
 DESCRIPTION: Replace Bridge 78069 on NC 770 over US 220
 FME Project No.: G6300.001

SUBJECT: Roadway Inventory Report

Dear Mr. Pilipchuk:

F&ME Consultants, Inc (FME) has completed the roadway investigation and submit the following recommendations for the above referenced project.

Project Description

The project is located in Rockingham County just west of the city of Stoneville, North Carolina. The project is identified by the NCDOT as TIP Project No. BR-0094 and will consist of replacing the existing four-span steel girder bridge with a new two-span precast/prestressed (PC/PC) concrete AASHTO girder bridge and raise profile approximately six (6) to eight (8) feet along centerline. The project will also realign the two existing at-grade intersections on either end of the bridge.

The preliminary project plans show that fills will all be associated with a raising of the mainline (-L-) profile and maximum fill heights will be on the order of ten (10) to fifteen (15) feet. Cuts are associated with creating new roadside drainage ditches and will have a maximum cut height of ten (10) feet approximately fifty (50) feet long near Station 10+25.00 on the -RPB- line.

A geotechnical investigation consisting of soil test borings was performed by F&ME Consultants, Inc. (FME) between April 13 and April 19, 2022. During this time, a total of fourteen (14) soil borings were advanced with an ATV-mounted CME-550 drill rig equipped with an automatic hammer. Six of the borings were drilled for the proposed bridge replacement and ten (10) borings were drilled for the associated roadway work (-L-). The remaining four borings were drilled at the intersections on each side of the bridge. Disturbed representative soil samples were recovered from the borings as they were advanced, visually classified in the field, and brought to FME’s soil laboratory for laboratory testing.

As part of this study, the following alignments were investigated as part of this study:

<u>LINE</u>	<u>STATIONS (±)</u>	<u>OFFSETS</u>
-L-	15+50.00 to 26+00.00	LT to RT
-RPA-	15+25.00 to 16+79.78	LT to RT
-RPB-	10+00.00 to 11+25.00	LT to RT
-RPC-	10+00.11 to 12+00.00	LT to RT
-RPD-	12+00.00 to 14+07.24	LT to RT

Physiography and Geography

The project site lies within the region known as the Piedmont Physiographic Providence. Based upon the Geologic Map of North Carolina, 1985, the project site is mapped as at/near the contact of Late Proterzoic Metamorphosed Granitic Rock and Meta-Graywacke and Muscovite-Biotite Schist. The virgin site soils are residual soil (saprolite) derived from weathering in place of the parent bedrock.

The project corridor is a rural portion of the county with thick vegetation and few commercial businesses outside the project limits. The existing topography is gently rolling hills with the majority of the site relief being the bridge approach embankments. The preliminary project plans show that fills will all be associated with a raising of the mainline (-L-) profile and maximum fill heights will be on the order of ten (10) to fifteen (15) feet. Cuts are associated with creating new roadside drainage ditches and will have a maximum cut height of ten (10) feet approximately fifty (50) feet long near Station 10+25.00 on the -RPB- line.

Soil Properties

The subsurface conditions discussed below are based upon the soils identified in the borings, observations made of the surficial soils, where exposed, and using normally excepted geotechnical engineering judgements. The transitions between soil strata are generally less defined than those presented on the Bore Logs. As soil sampling only obtains a small representation of the actual soil conditions, at times it may not be sufficient to accurately determine the origins of the soil strata. Even though individual soil test borings are representative of the overall subsurface conditions at the location of the test boring, it should be noted that there may be differences in the soils at other locations.

Soils within the overall area of this project have been divided into three categories: roadway embankment, residual soil, and weathered bedrock.

Roadway Embankment:

Roadway Embankment (RE) soils embankment soils were encountered along the following alignments at the approximate stationing:

<u>LINE</u>	<u>STATIONS (±)</u>	<u>OFFSETS</u>
-L-	17+50.00 to 18+75.00	LT to RT

The RE materials identified in the test borings generally consisted of loose to very dense,

brownish- yellow/brown/red/yellowish-red, moist silty fine sand (A-2-4), stiff, yellowish-red, moist fine sandy clay (A-7-5/A-7-6), and firm to stiff, red to brown, moist fine sandy silt (A-4). Laboratory testing of the indicates the PI's range from 18 to 38 for the A-7-5/A-7-6 soils and 9 for the A-4 materials.

Residual Soils:

Residual Soils (RS) throughout the project limits were derived from the in-place weathering of the parent bedrock. The majority of the of the RS materials identified in the test borings consisted of loose to very dense, brownish- yellow/brown/red/yellowish-red, moist silty fine sand (A-2-4), stiff, yellowish-red, moist fine sandy clay (A-7-5/A-7-6), and firm to stiff, red to brown, moist fine sandy silt (A-4). Laboratory testing of the indicates the PI's range from 18 to 38 for the A-7-5/A-7-6 soils and 9 for the A-4 materials.

<u>LINE</u>	<u>STATIONS (±)</u>	<u>OFFSETS</u>
-L-	15+50.00 to 26+00.00	LT to RT
-RPA-	15+25.00 to 16+79.78	LT to RT
-RPB-	10+00.00 to 11+25.00	LT to RT
-RPC-	10+00.11 to 12+00.00	LT to RT
-RPD-	12+00.00 to 14+07.24	LT to RT

Weathered Rock:

Weathered Rock (WR) was identified in the bridge test borings along the -L- alignments indicated below. WR is defined as residual geomaterials with a Standard Penetration Test (SPT) blow count (N-value) of greater than 100 blows per foot of drive. WR was identified within the project limits between Elevations 763 feet and 782 feet (msl) between the following stations.

<u>LINE</u>	<u>STATIONS (±)</u>	<u>OFFSETS</u>
-L-	24+60.00 to 25+60.00	LT to RT

Groundwater:

Groundwater levels were measured in the test boring immediately after completion of the test boring and, where the bore hole remained open, 24 hours after completion. At the time of drilling, groundwater was not observed in any of the borings performed for this study. It should be noted that perched or transient groundwater can be encountered after recent precipitation at or upgradient of the project site and in the wetter months of the year.

Areas of Special Geotechnical Interest

High Plastic Soils:

The following areas were identified to have potentially high plastic soils with Plastic Indices (PI) of greater than 25 but less than 35, and high plastic soils with a PI greater than 35 within the project limits. High plasticity soils have the potential to cause subgrade issues during construction and can lead to embankment stabilities especially if exposed to free water and can require undercutting to provide a stable subgrade:

<u>LINE</u>	<u>STATIONS (±)</u>	<u>OFFSETS</u>
-L-	18+50.00 to 25+50.00	LT to RT

Soil/Very Loose Soils:

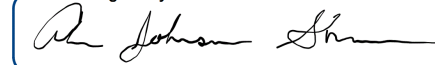
The following areas were identified to have soils which are in a soft or very loose state. Soft/very loose soils have the potential to cause subgrade stability problems, embankment stability issues, and long-term settlement problems. The borings for the new bridge will not impact the roadway construction but are still identified as an area of special geotechnical interest for this study.


<u>LINE</u>	<u>STATIONS (±)</u>	<u>OFFSETS</u>
-L-	16+40.00 to 22+30.00	LT to RT
-RPA-	15+25.00 to 16+79.78	LT to RT
-RPB-	10+00.00 to 11+25.00	LT to RT
-RPC-	10+00.11 to 12+00.00	LT to RT
-RPD-	12+00.00 to 14+07.24	LT to RT

We thank you for the opportunity to prepare this study for this project and look forward to providing continued support of this and future projects.

Sincerely,

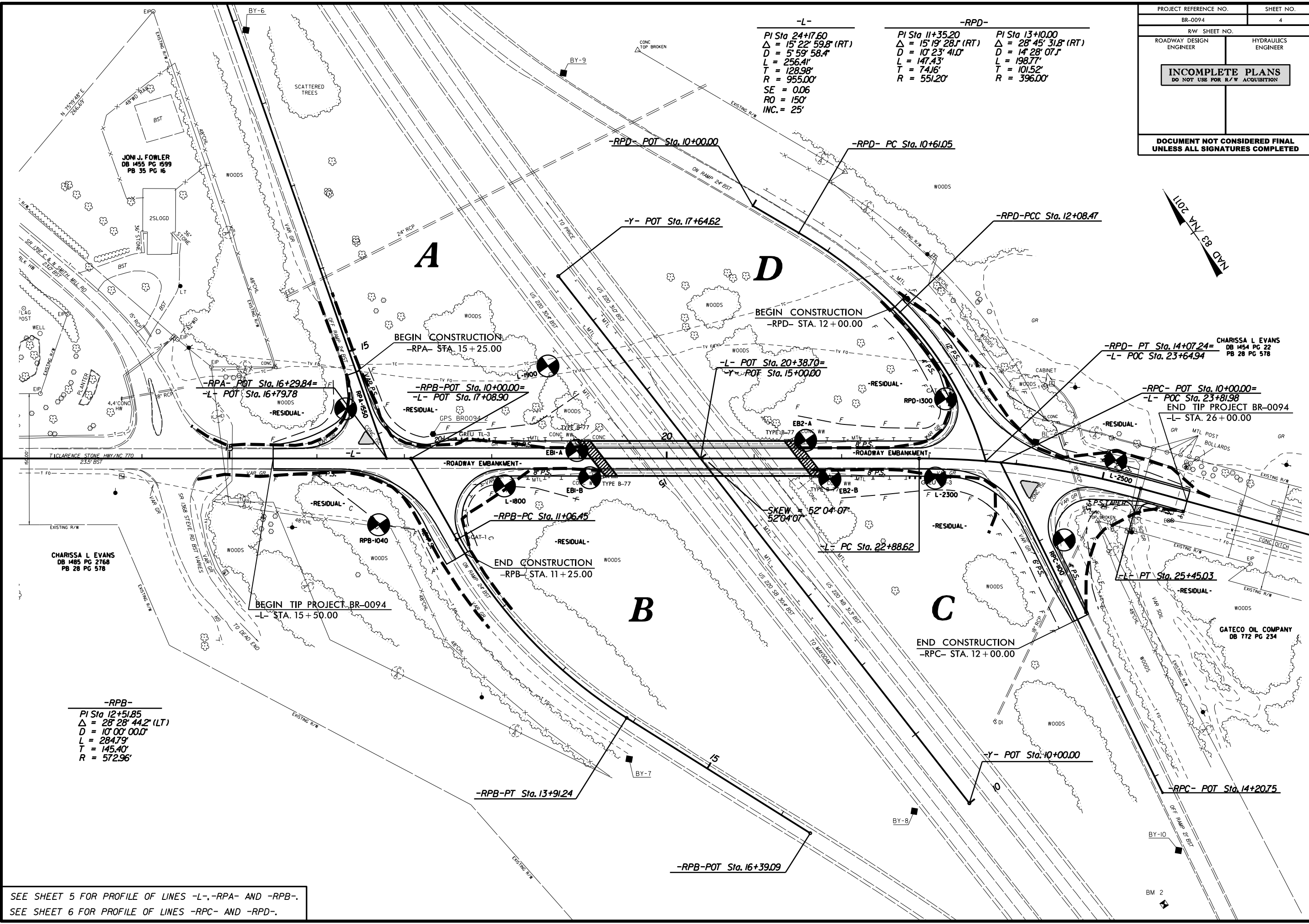
F&ME Consultants, Inc.

DocuSigned by:

 1A41AB989658497...
Adam Shannon, PE
 Senior Vice President

DocuSigned by:

 6FC3554635DF436...
Robert Lawrence, PE GE
 Senior Geotechnical Engineer

PROJECT REFERENCE NO. BR-0094	SHEET NO. 4
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION	
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	

-L-	-RPD-	-RPD-
PI Sta 24+17.60	PI Sta 11+35.20	PI Sta 13+10.00
$\Delta = 15^\circ 22' 59.8''$ (RT)	$\Delta = 15^\circ 19' 28.1''$ (RT)	$\Delta = 28^\circ 45' 31.8''$ (RT)
D = 5' 59' 58.4"	D = 10' 23' 41.0"	D = 14' 28' 07.1"
L = 256.41'	L = 147.43'	L = 198.77'
T = 128.98'	T = 74.16'	T = 101.52'
R = 955.00'	R = 551.20'	R = 396.00'
SE = 0.06		
RO = 150'		
INC. = 25'		



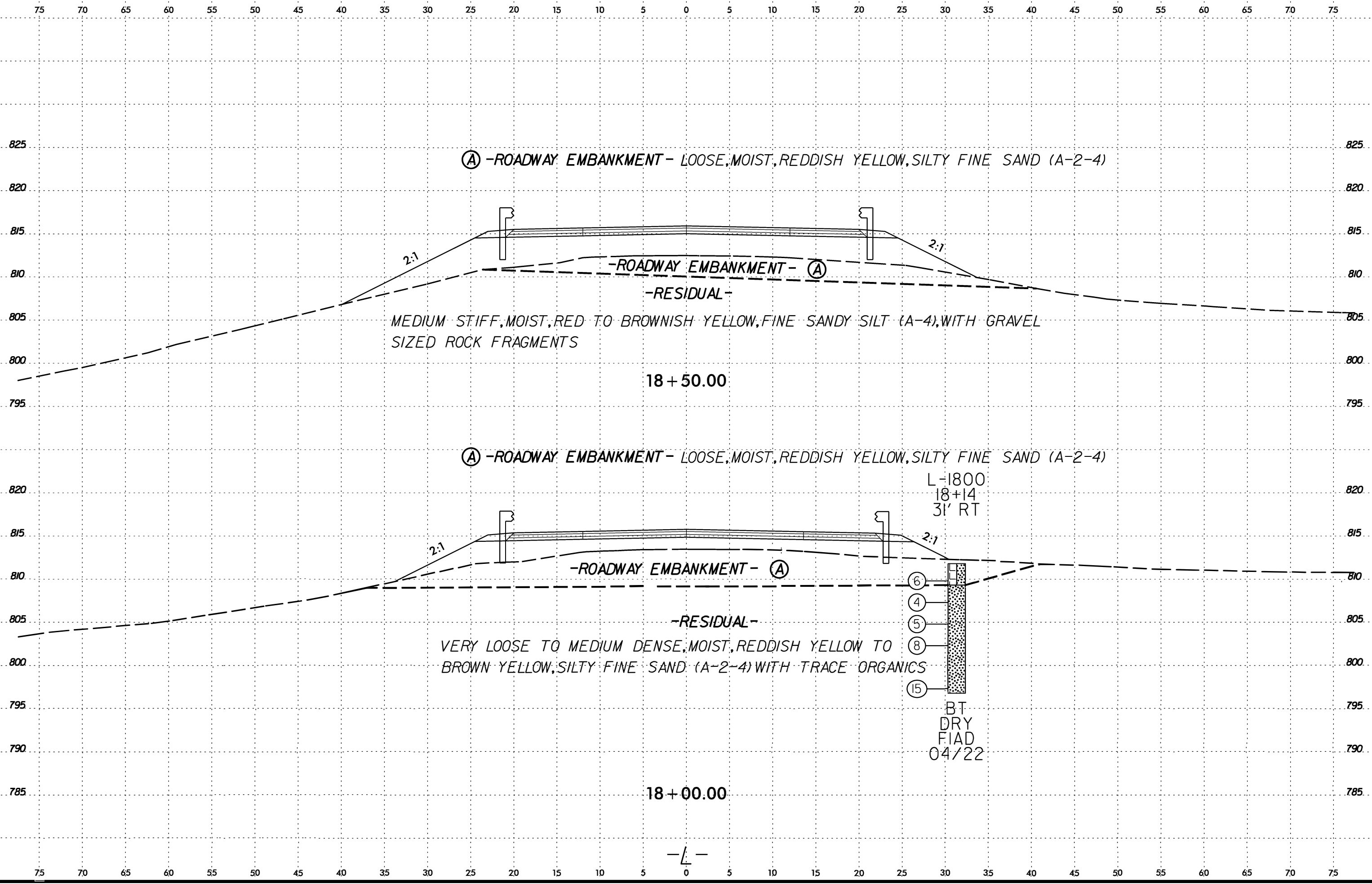
-RPB-
PI Sta 12+51.85
$\Delta = 28^\circ 28' 44.2''$ (LT)
D = 10' 00' 00.0"
L = 284.79'
T = 145.40'
R = 572.96'

SEE SHEET 5 FOR PROFILE OF LINES -L-, -RPA- AND -RPB-.
SEE SHEET 6 FOR PROFILE OF LINES -RPC- AND -RPD-.

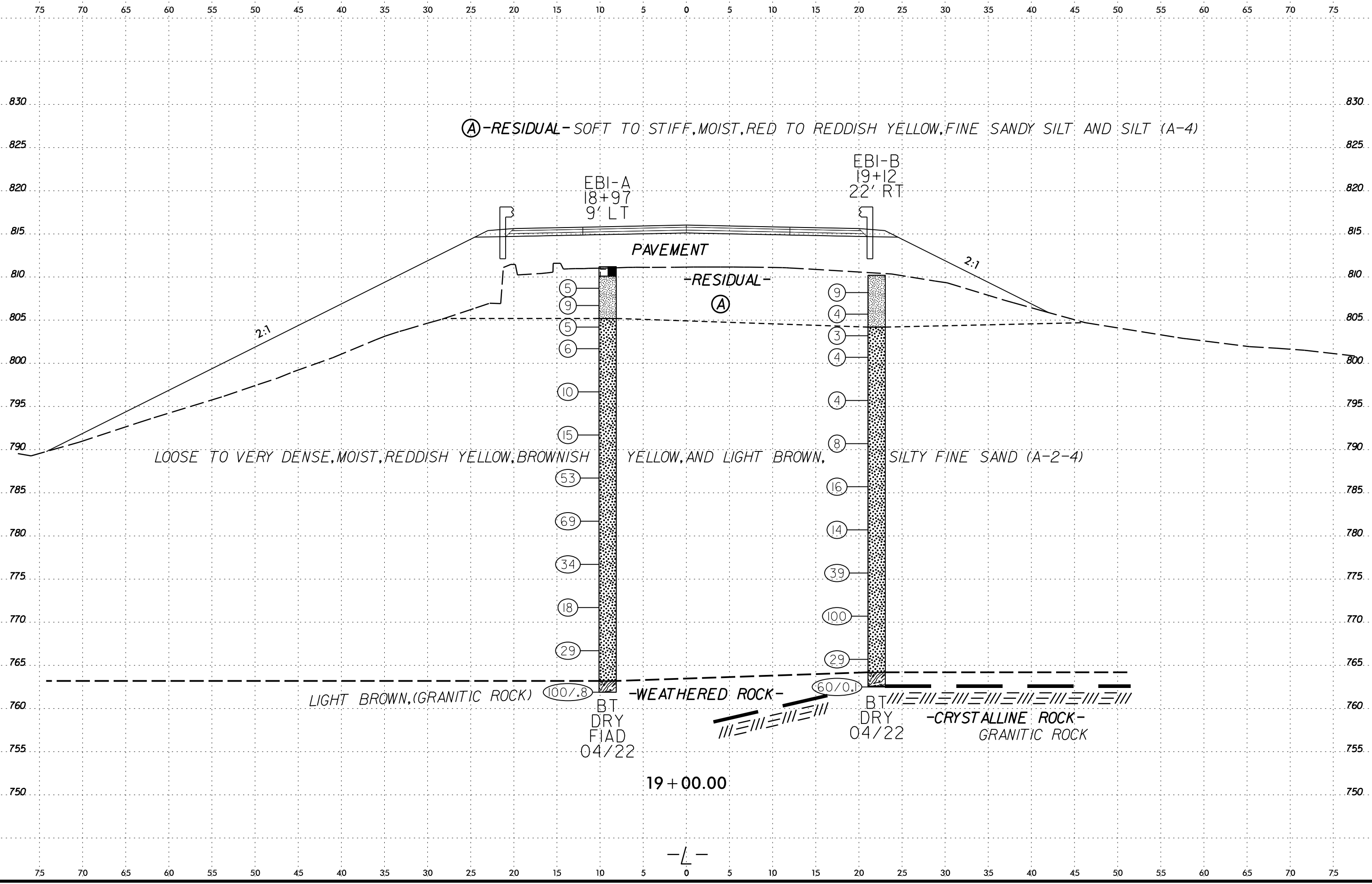
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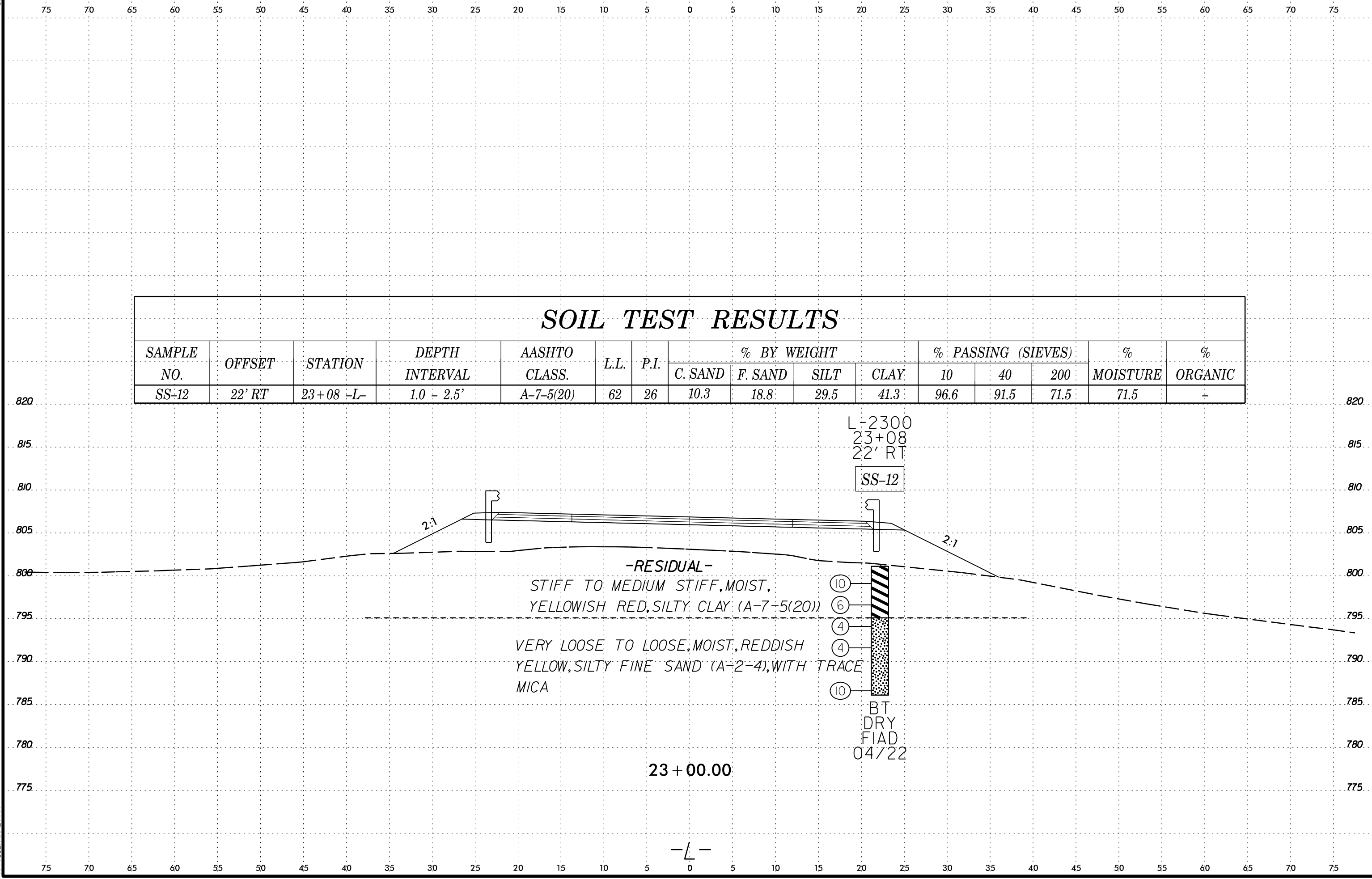
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 \$\$\$SUBSTRATE\$\$\$



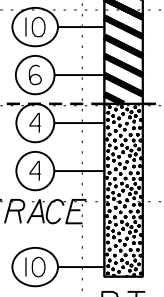
SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-12	22' RT	23+08 -L-	1.0 - 2.5'	A-7-5(20)	62	26	10.3	18.8	29.5	41.3	96.6	91.5	71.5	71.5	-

-RESIDUAL-

STIFF TO MEDIUM STIFF, MOIST,
YELLOWISH RED, SILTY CLAY (A-7-5(20))

VERY LOOSE TO LOOSE, MOIST, REDDISH
YELLOW, SILTY FINE SAND (A-2-4), WITH TRACE
MICA

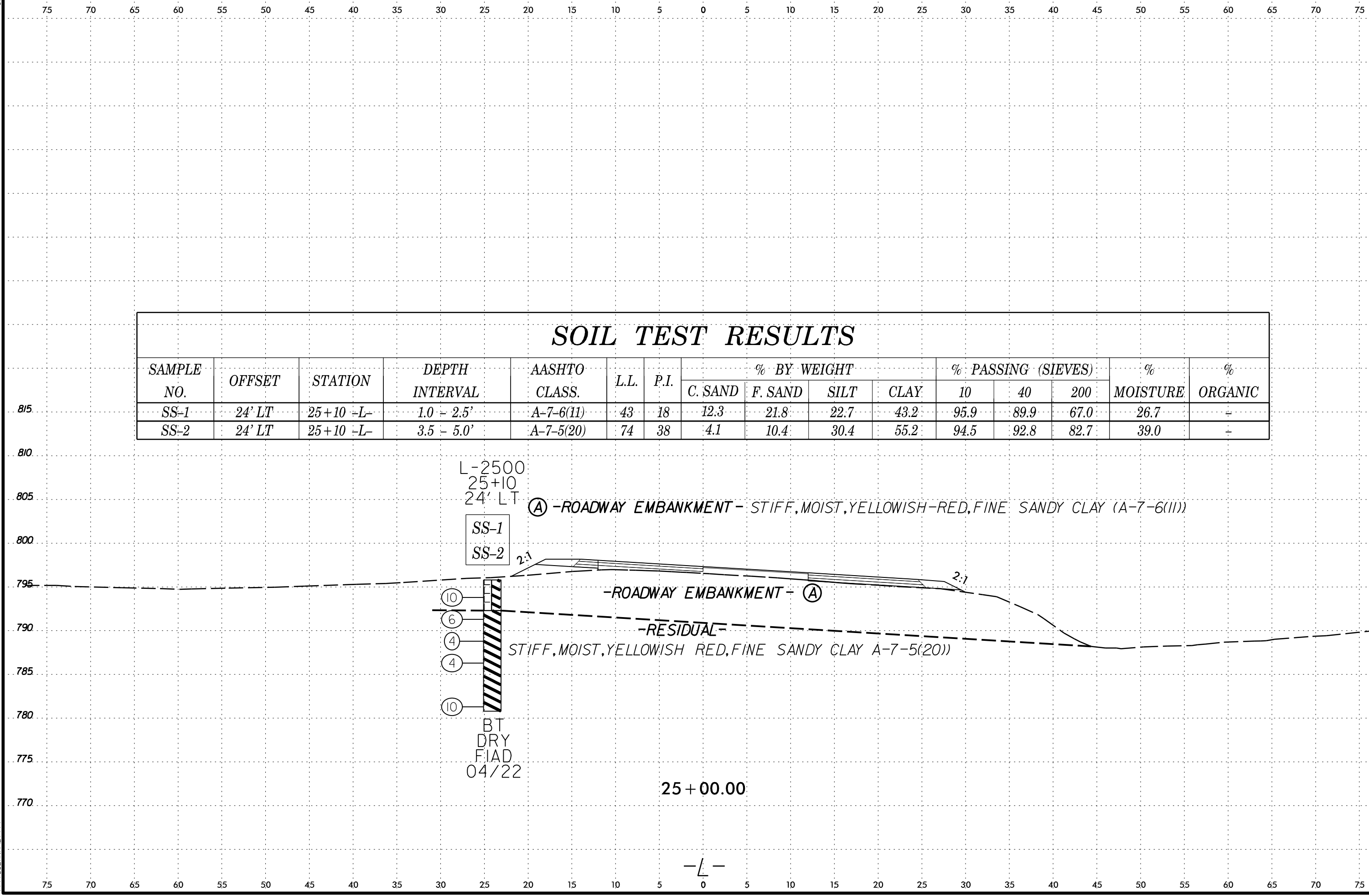


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DRY
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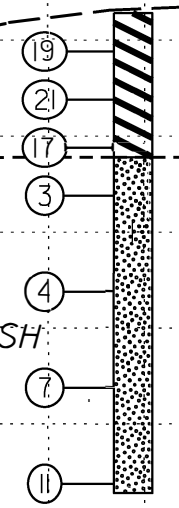
SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-32	69' RT	10+48 -RPA-	1.0 - 2.5'	A-7-5(20)	71	31	7.5	18.1	19.2	55.3	99.7	97.3	76.9	26.5	-

Ⓐ -RESIDUAL- VERY STIFF, MOIST, RED, FINE SANDY CLAY (A-7-5(20))

Ⓐ -RESIDUAL-

-RESIDUAL- VERY LOOSE TO MEDIUM DENSE, MOIST, REDDISH YELLOW TO BROWNISH YELLOW, SILTY FINE TO COARSE SAND (A-2-4), WITH GRAVEL SIZED ROCK FRAGMENTS



BT
DRY
04/22

10 + 50.00

-RPB-

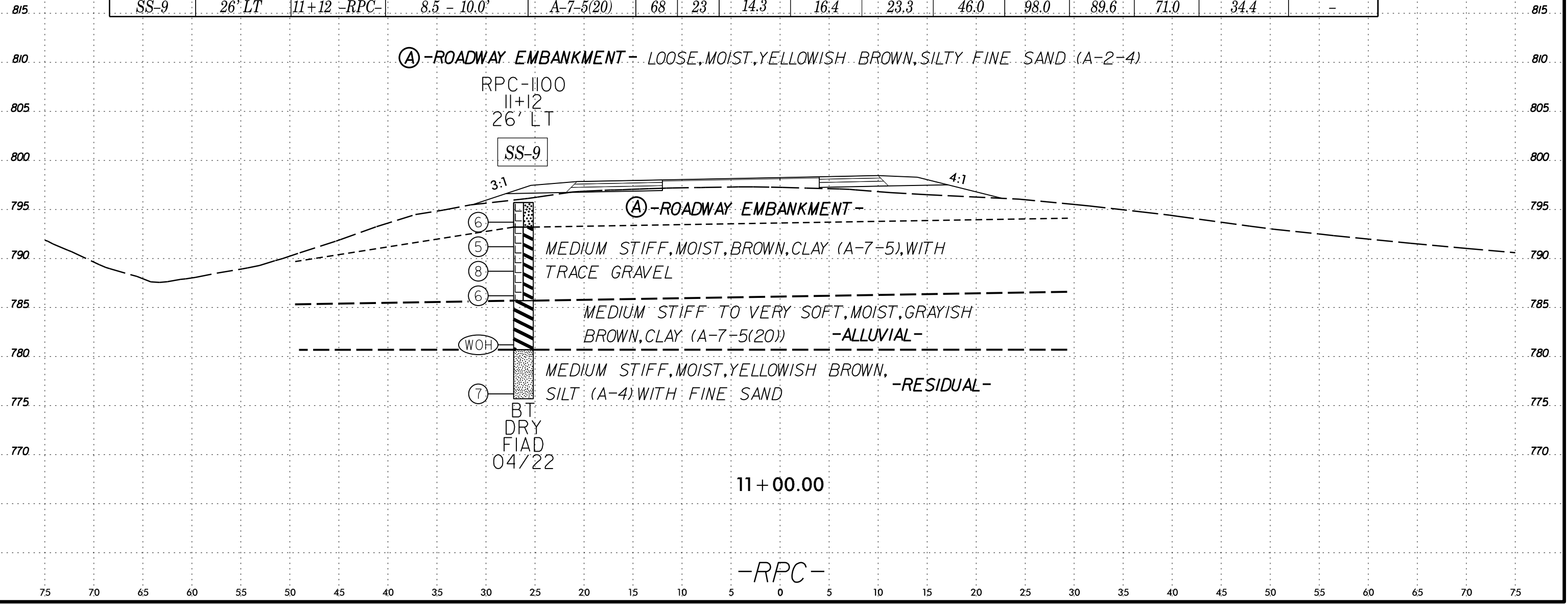
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6/23/16
 I:\JUN-2022\13452
 P:\Geotechnical\66300\66300.dwg - NCDOT Geotechnical Dr-Cell\66300\66300.dwg - NC 770 Over US 220\From CG2\BR-0094\CADD\GEO\TECH\sec\BR0094_GEO_ROY_XSI.dgn
 \$\$\$SUBSERIALNAME\$\$\$

75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-9	26' LT	11+12 -RPC-	8.5 - 10.0'	A-7-5(20)	68	23	14.3	16.4	23.3	46.0	98.0	89.6	71.0	34.4	-



NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SUBSURFACE INVESTIGATION
APPENDIX A
LAB RESULTS

REFERENCE: BR-0094

PROJECT: 67094

Prepared in the Office of:

F&ME CONSULTANTS, INC.
1613 PARIS AVE, STE A
PORT ROYAL, SC 29935
CONSULTANTS

F&ME CONSULTANTS, INC.
3112 DEVINE STREET, COLUMBIA SC 29205
(CERT No.: 130-0212)

Project Replace Bridge 78069 on NC 770
 over US 220 T.I.P. No. BR-0094 County Rockingham F&ME Job No. G6300.01
 Date Received 4/25/2022 Date Reported 5/2/2022 Tested By J. Hiers CERT No.: 130-04-0212

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL (ft.)	AASHTO CLASS	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-1	24 ft LT	25+10	1.0 - 2.5	A-7-6(11)	43	18	12.3%	21.8%	22.7%	43.2%	95.9%	89.9%	67.0%	26.7%	ND
SS-2	24 ft LT	25+10	3.5 - 5.0	A-7-5(20)	74	38	4.1%	10.4%	30.4%	55.2%	94.5%	92.8%	82.7%	39.0%	ND
SS-9	26 ft LT	11+12	8.5 - 10.0	A-7-5(20)	68	23	14.3%	16.4%	23.3%	46.0%	98.0%	89.6%	71.0%	34.4%	ND
SS-12	22 ft RT	23+08	1.5 - 3.0	A-7-5(20)	62	26	10.3%	18.8%	29.5%	41.3%	96.6%	91.5%	71.5%	26.1%	ND
SS-32	69 ft RT	10+48	1.5 - 3.0	A-7-5(20)	71	31	7.5%	18.1%	19.2%	55.3%	99.7%	97.3%	76.9%	26.5%	ND
SS-40	106 ft LT	18+64	3.5 - 5.0	A-4(4)	36	9	20.2%	26.4%	31.0%	22.4%	98.8%	89.0%	57.3%	18.1%	ND

REV 05/2022

M & T Form 503

F&ME CONSULTANTS, INC.
 3112 DEVINE STREET, COLUMBIA SC 29205
 (CERT No.: 130-0212)

Project	Replace Bridge 78069 on NC 770 over US 220	T.I.P. No.	BR-0094
County	Rockingham	F&ME Job No.	G6300.01
Date Received	4/25/2022	Date Reported	5/2/2022
Tested By	J. Hiers	CERT No.:	130-04-0212

TEST RESULTS

Proj. Sample No.		Bulk-1				
Lab. Sample No.		22-1286				
Retained #4 Sieve	%	0%				
Passing #10 Sieve	%	99%				
Passing #40 Sieve	%	93%				
Passing #200 Sieve	%	63.1%				

MINUS NO. 10 FRACTION

SOIL MORTAR - 100%						
Coarse Sand Ret - #60	%	14.5%				
Fine Sand Ret - #270	%	27.2%				
Silt 0.05 - 0.005 mm	%	34.0%				
Clay < 0.005 mm	%	24.3%				
Passing #40 Sieve	%	93.8%				
Passing #200 Sieve	%	63.7%				

L. L.		41				
P. I.		8				
AASHTO Classification		A-5(5)				
Natural Moisture Content	%	25.7%				
Organic Impurities	%	ND				
Boring No.		Bulk-1				
Depth (ft.)		1.0				
	to	3.0				

Jerry P. Davis

 Laboratory Manager



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REV 08/2021

**CALIFORNIA BEARING RATIO (CBR)
AASHTO T193**

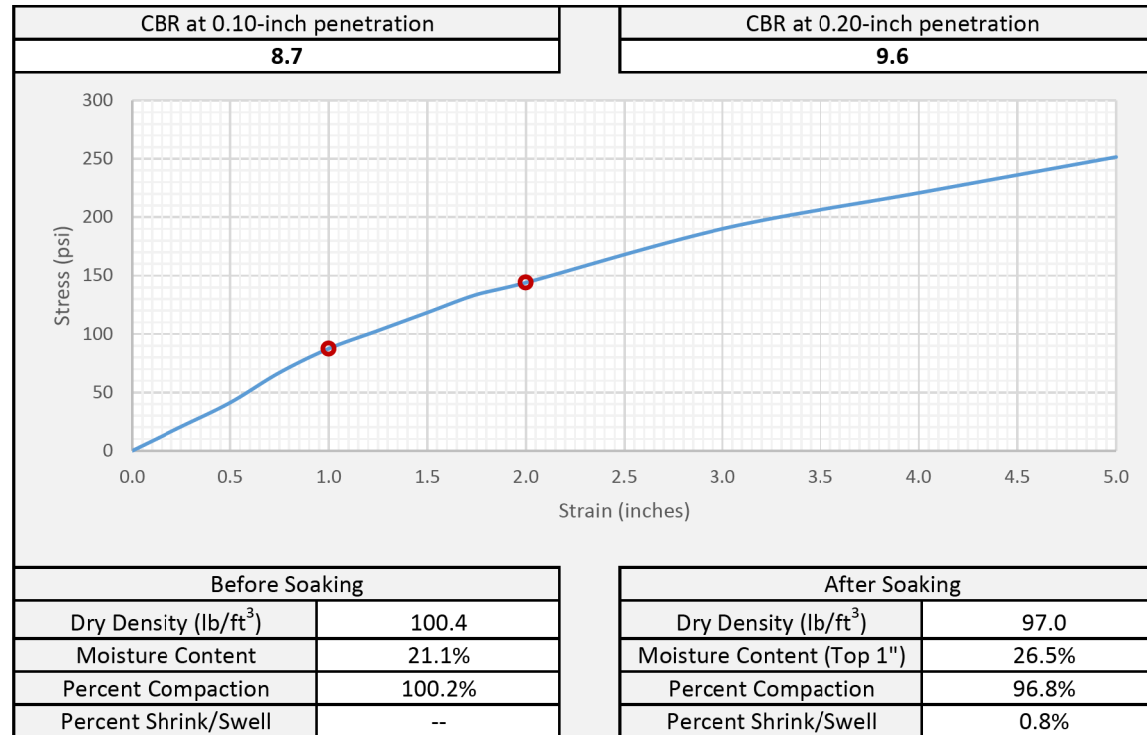
SAMPLE INFORMATION

Project Name	Replace Bridge 78069 on NC 770 over US 200		Project No.	BR-0094	
Sample Location	Bulk-1 (Specimen B)		FME Lab ID	22-0430	
Soil Description	A-5(5)		Depth/Elev.	1.0 - 3.0 ft.	
Date Sampled	--	Sampled By:	FME	Date Received	4/25/22
Date Test Began	4/28/22	Date Completed	5/2/22	Tested By	JWW

MOLDING CHARACTERISTICS

Method	AASHTO T99 - Method A	% Retained on 3/4" Sieve	0%
Max Dry Density (lb/ft ³)	100.2	Optimum Moisture Content (%)	21.4
Soak Time (hr)	96	Surcharge Weight (lb)	10.0

TESTING RESULTS



ADDITIONAL COMMENTS

Desired Percent Compaction = 100%

	F&ME Consultants, Inc. <small>3112 Devine Street, Columbia, SC 29205</small>		5/3/22 <small>Date</small>
	Reviewed By		Date

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REV 08/2021

**CALIFORNIA BEARING RATIO (CBR)
AASHTO T193**

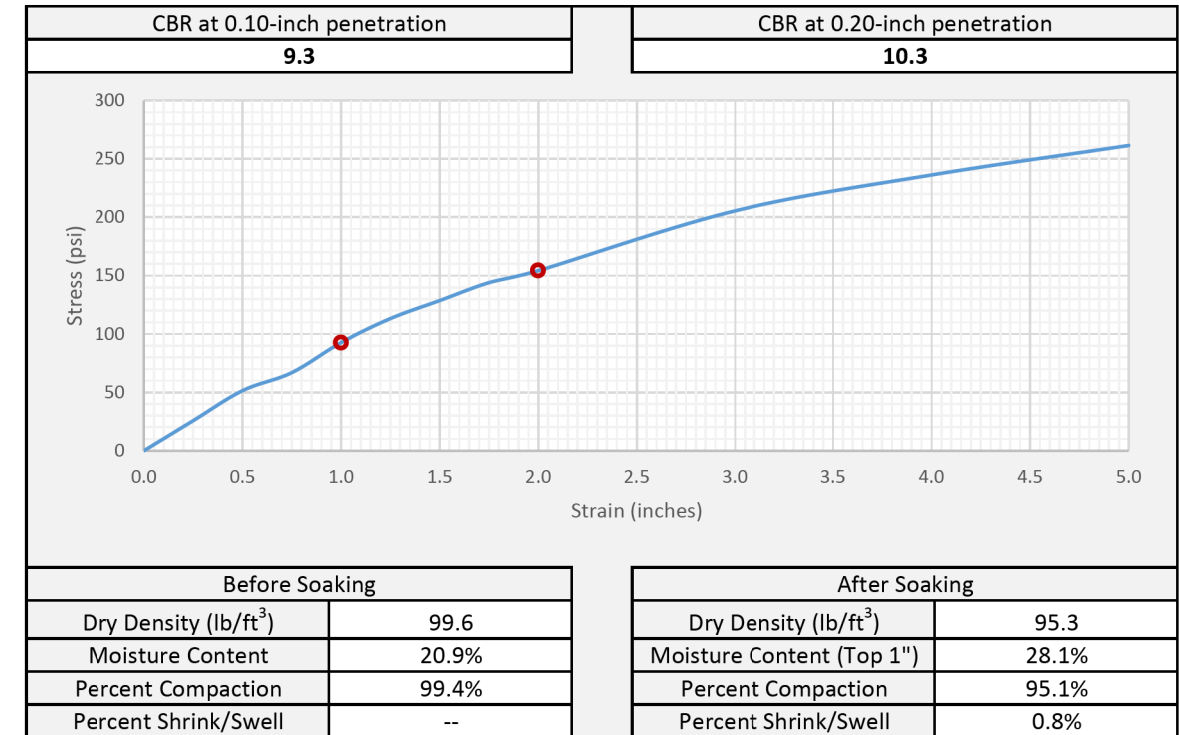
SAMPLE INFORMATION

Project Name	Replace Bridge 78069 on NC 770 over US 200		Project No.	BR-0094	
Sample Location	Bulk-1 (Specimen A)		FME Lab ID	22-1286	
Soil Description	A-5(5)		Depth/Elev.	1.0 - 3.0 ft.	
Date Sampled	--	Sampled By:	FME	Date Received	4/25/22
Date Test Began	4/28/22	Date Completed	5/2/22	Tested By	JWW

MOLDING CHARACTERISTICS

Method	AASHTO T99 - Method A	% Retained on 3/4" Sieve	0%
Max Dry Density (lb/ft ³)	100.2	Optimum Moisture Content (%)	21.4
Soak Time (hr)	96	Surcharge Weight (lb)	10.0

TESTING RESULTS



ADDITIONAL COMMENTS

Desired Percent Compaction = 100%

	F&ME Consultants, Inc. <small>3112 Devine Street, Columbia, SC 29205</small>		5/3/22 <small>Date</small>
	Reviewed By		Date

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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SUBSURFACE INVESTIGATION
APPENDIX B
BORE LOG

REFERENCE: BR-0094

PROJECT: 67094

Prepared in the Office of:

F&ME CONSULTANTS, INC.
1613 PARIS AVE, STE A
PORT ROYAL, SC 29935
CONSULTANTS

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 67094.1.1		TIP BR-0094		COUNTY ROCKINGHAM		GEOLOGIST R. Wessinger										
SITE DESCRIPTION Bridge 780069 on NC 770 over US 220							GROUND WTR (ft)									
BORING NO. L-1900		STATION 18+64		OFFSET 106 ft LT		ALIGNMENT L										
COLLAR ELEV. 791.2 ft		TOTAL DEPTH 10.0 ft		NORTHING 990,527		EASTING 1,727,412										
DRILL RIG/HAMMER EFF./DATE BRE9553 CME-550X 85% 03/11/2022				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER D. Harris		START DATE 04/13/22		COMP. DATE 04/13/22		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						ELEV. (ft)
795																
790	790.2	1.0	3	4	3										791.2	GROUND SURFACE 0.0
	787.7	3.5	2	2	3											RESIDUAL
	785.2	6.0	1	2	4						SS-40	18%				Medium Stiff, Red, Sandy SILT (A-4(4))
785	782.7	8.5	2	3	3											=> Yellowish Red
																=> Brownish Yellow
																=> with Gravel Sized Rock Fragments
															781.2	Boring Terminated at Elevation 781.2 ft In Residual Sandy Silt (A-4)

NCDOT BORE DOUBLE BR0094_GEO_RDY_BL.GPJ_NC_DOT.GDT 6/2/22