

PROJECT: 17BP.8.R.134

REFERENCE: N/A

SEE SHEET 3 FOR PLAN SHEET LAYOUT
AT TIME OF INVESTIGATION

CONTENTS

<u>LINE</u>	<u>STATION</u>	<u>PLAN</u>	<u>CROSS SECTION</u>
-L-	12+00 TO 19+50	4	5-7

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

ROADWAY

SUBSURFACE INVESTIGATION

COUNTY LEE

PROJECT DESCRIPTION REPLACE BRIDGE NO. 34 ON
SR 1146 (ST. ANDREWS CHURCH) OVER UPPER
LITTLE RIVER

INVENTORY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	17BP.8.R.134	1	7

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PERSONNEL

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INVESTIGATED BY F&R, Inc.

DRAWN BY T.T. WALKER

CHECKED BY M. ARNOLD

SUBMITTED BY R. RIVENBARK, P.E.

DATE JANUARY 2019

SINCE



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Prepared in the Office of:

FROEHLING & ROBERTSON, INC.

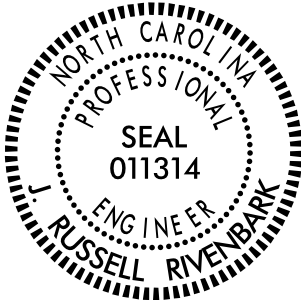
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SIGNATURE

DATE

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

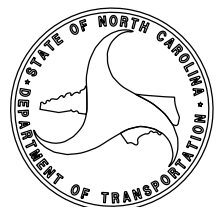
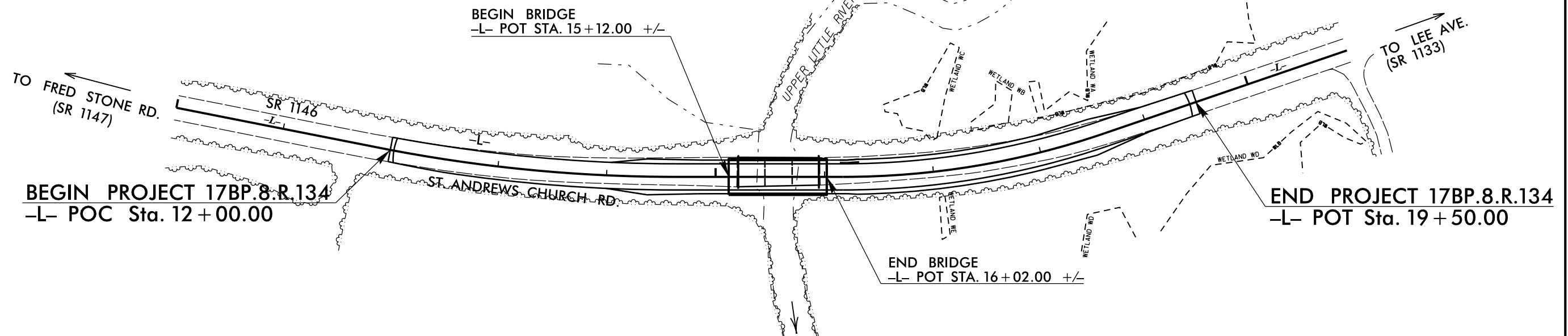
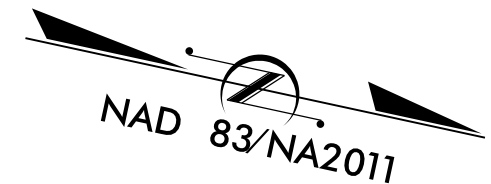
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CONTRACT:

LEE COUNTY

TYPE OF WORK: GRADING, DRAINAGE, STRUCTURE AND PAVING

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November 16, 2018
Revised December 21, 2018

State Project No.: 17BP.8.R.134 (SF-520034)
F.A. Number: N/A
County: Lee
Description: Replace Bridge #34 on SR 1146 (St. Andrews Church Road) Over Upper Little River

SUBJECT: Geotechnical Report – Inventory

Project Description

This project involves the replacement of the existing bridge #34 on SR 1146 (St. Andrews Church Road) over the Upper Little River in Lee County, North Carolina. The existing two-lane, single-span bridge will be replaced with a higher, single-span, 33-ft. wide box beam structure, approximately 90 feet in length. The alignment of the proposed bridge will generally coincide with the existing bridge and will be lengthened approximately 12 feet at each end. North of the existing bridge, the existing floodplain is relatively low and flat with areas near the existing roadway embankment shown as wetlands on the plans. An existing 72” corrugated metal pipe located beneath the road at approximately -L- station 17+05 will be removed and the area backfilled.

The geotechnical field investigation was performed on October 8 and 9 of 2018. During this time period, a total of 4 Standard Penetration Test (SPT) borings were advanced with an ATV-mounted CME-55 drill rig with an automatic hammer. In addition, eight hand auger borings (HA-1 to HA-8) were performed using a 3-in diameter bucket auger. Representative soil samples were collected from the split spoon and hand auger cuttings for visual classification in the field and for analysis by F&R’s testing laboratory.

The existing roadway alignment in the area of this project generally runs in a north-south direction, with stationing increasing from south to north. The existing grade along the centerline of the road generally slopes downward from an elevation (EL) of 300.89 feet at the beginning of the project (-L- station 12+00.00) to EL 284.55 feet at -L- station 19+50.00 at the end of the project. The low point of the proposed alignment is EL 284.45 at -L- station 19+07.82. The northern portion of the site is composed of flat land containing delineated wetlands, whereas the southern portion of the site slopes upward in elevation towards the Coastal Plain landscape.

Based upon the provided cross sections, the proposed grade will be raised a maximum of approximately 3 feet near the south abutment (End Bent 1), which results in a maximum embankment fill height of approximately 7 feet on the right side of -L- station 17+00, just north of the bridge. The only cut proposed for the project is associated with installing a rip-rap lined, lateral base ditch just beyond the right shoulder of the roadway from -L- station 12+50 to approximately -L- station 15+28, where the ditch dumps into the Upper Little River.

The following alignment was investigated within the approximate limits specified:

Alignment	Station (±)
-L-	14+00 to 17+50

Areas of Special Geotechnical Interest

- 1) Wet or Saturated Soils: The following areas contain wet or saturated soils that have the potential to cause subgrade problems during construction:

Alignment	Station (±)
-L-	14+90 to 15+12, left
-L-	16+02 to 18+00

- 2) Cohesive Soils: The following areas contain cohesive soils (AASHTO A-5, A-6 & A-7 soils) at, or near, existing subgrade. Due to their fine-grained properties with up to 82% passing the #200 sieve, these soils have the potential to be unstable for construction equipment during construction:

Alignment	Station (±)
-L-	14+00 to 14+50, left
-L-	15+00 to 15+25, right
-L-	16+00 to 17+25

- 3) Groundwater: The following areas exhibited groundwater within six feet of the proposed grade, which has the potential to cause subgrade problems during construction:

Alignment	Station (±)
-L-	16+50 to 17+50

Physiography and Geology

The project site is located southeast of Sanford and geologically located near the border of the Piedmont and Coastal Plain physiographic provinces of North Carolina. This zone represents the elevation break between the resistant rocks of the Piedmont and the more easily eroded sediments of the Coastal Plain. The project is located within the Eastern Slate Belt in an area mapped as phyllite (CZph), with the Coastal Plain Middendorf Formation (Km) mapped to the south.

The land surrounding the project site is primarily agricultural and forested land, with some residential areas nearby. According the Lee County Geographic Information Systems website, the soils surrounding the project site are classified as Chewacla Series (silt loam), Pacolet Series (fine sandy loam), and Durham Series (loamy sand). The U.S. Department of Agriculture classifies these soil series as having land use and vegetation concerning cultivation/crop land, pasture land, and forested land.

Soil Properties

Soils within the area of this project have been divided into three categories: roadway embankment fill, alluvial soils, and residual soils:

Roadway Embankment: Roadway embankment (RE) soils were encountered at the surface of 4 SPT borings and 4 hand auger borings. The RE was likely associated with previous construction of St. Andrews Church Road and the bridge embankments. The RE extended to depths ranging from 2 to 7 feet in the SPT borings and 1.6 to 4.6 feet in the hand auger borings. In the SPT borings, the fill was generally described as moist, medium stiff to stiff, sandy, clayey SILT (A-4) and loose to medium dense, silty and clayey SAND (A-2-4 & A-2-6). In the hand auger borings, the fill was generally described as moist, silty SAND (A-2-4), sandy SILT (A-4), and silty CLAY (A-7-5). A majority of the samples contained trace organic matter and/or gravel.

Alluvial Soils: Alluvial soils were encountered under roadway embankment soils in two SPT borings and two hand auger borings, and found at the surface of three hand auger borings. The alluvial soils extended to a depth of approximately 12 feet in the SPT borings and 2 to 5.3 feet in the hand auger borings. In the SPT borings, the alluvial soils typically consisted of moist to wet, soft, sandy, clayey SILT (A-4). In the hand auger borings, the alluvial soils typically consisted of moist to saturated, sandy, clayey SILT (A-4 & A-5). A majority of the samples contained trace organic matter.

Residual Soils: Residual soils were encountered below roadway embankment soils in the two SPT borings at End Bent 1, and below alluvial soils in the two SPT borings at End Bent 2. In the hand auger borings, residual soils were encountered below roadway embankment in two borings, below alluvial soils in two borings, and at the surface of one boring. In the SPT borings, the residual soils were typically described as: wet to saturated, medium dense to dense, silty SAND (A-1-b); moist to wet, stiff to very hard, sandy, clayey SILT (A-4); and moist, medium stiff to stiff, silty CLAY (A-7-5). In the hand auger borings, the residual soils

were typically described as wet, silty SAND (A-2-4) and moist, sandy, clayey SILT (A-4). A majority of the samples contained trace mica and rock fragments, and two hand auger borings contained trace organics.

Rock Properties

Weathered Rock (WR) was encountered in all four SPT borings. Of these 4 borings, 2 terminated in WR and 2 terminated in Crystalline Rock (CR). WR was encountered at initial depths ranging from about 27 to 47 feet and elevations ranging from about 239.4 to 259.6 feet. A 5-foot intermediate layer of weathered rock was encountered in boring EB1-A from about 27 to 32 feet and a 10 foot intermediate layer was encountered in boring EB1-B from about 27 to 37 feet. Weathered rock was not encountered within the depths investigated in the hand auger borings.

CR was encountered in borings EB1-B and EB2-B as indicated by auger and/or SPT refusal. The CR was encountered at depths of 47.6 and 57.5 feet, respectively, or elevations of 237.9 and 228.9 feet. The rock consisted of phyllite. Crystalline rock was not encountered in the hand auger borings.


Groundwater Properties

Generally, groundwater measurements were measured in a majority of the SPT and hand auger borings immediately upon their completion. Groundwater measurements were measured in four hand auger borings after a stabilization period of approximately 24 hours. All four (4) SPT borings were backfilled immediately upon their completion due to three of the four being located in the existing roadway of St. Andrews Church Road. Groundwater was observed at the termination of all four SPT borings at depths ranging from 10.2 to 20.9 feet (EL ±265.7 to EL ±276.2) and in two hand auger borings (HA-1 and HA-2) at depths ranging from 1.1 to 1.2 feet (EL ±280.1 to EL ±280.2). Stabilized groundwater was encountered in one hand auger boring (HA-6) at a depth of 3.1 feet (EL ±278.0). Stabilized groundwater was not encountered in the remaining hand auger borings that were left open. The recovered soil samples were generally described as moist above the groundwater level and moist, wet, or saturated below the groundwater level. It should be noted that the groundwater levels fluctuate depending upon seasonal factors such as precipitation and temperature. As such, soil moisture and groundwater conditions at other times may vary or be different from those described in this report.

We appreciate the opportunity to work with you on this project. Please contact us if you have any questions regarding this report or if we may be of further service.

Sincerely,
FROEHLING & ROBERTSON, INC.


J. Russell Rivenbark, P.E.
Geotechnical Project Manager

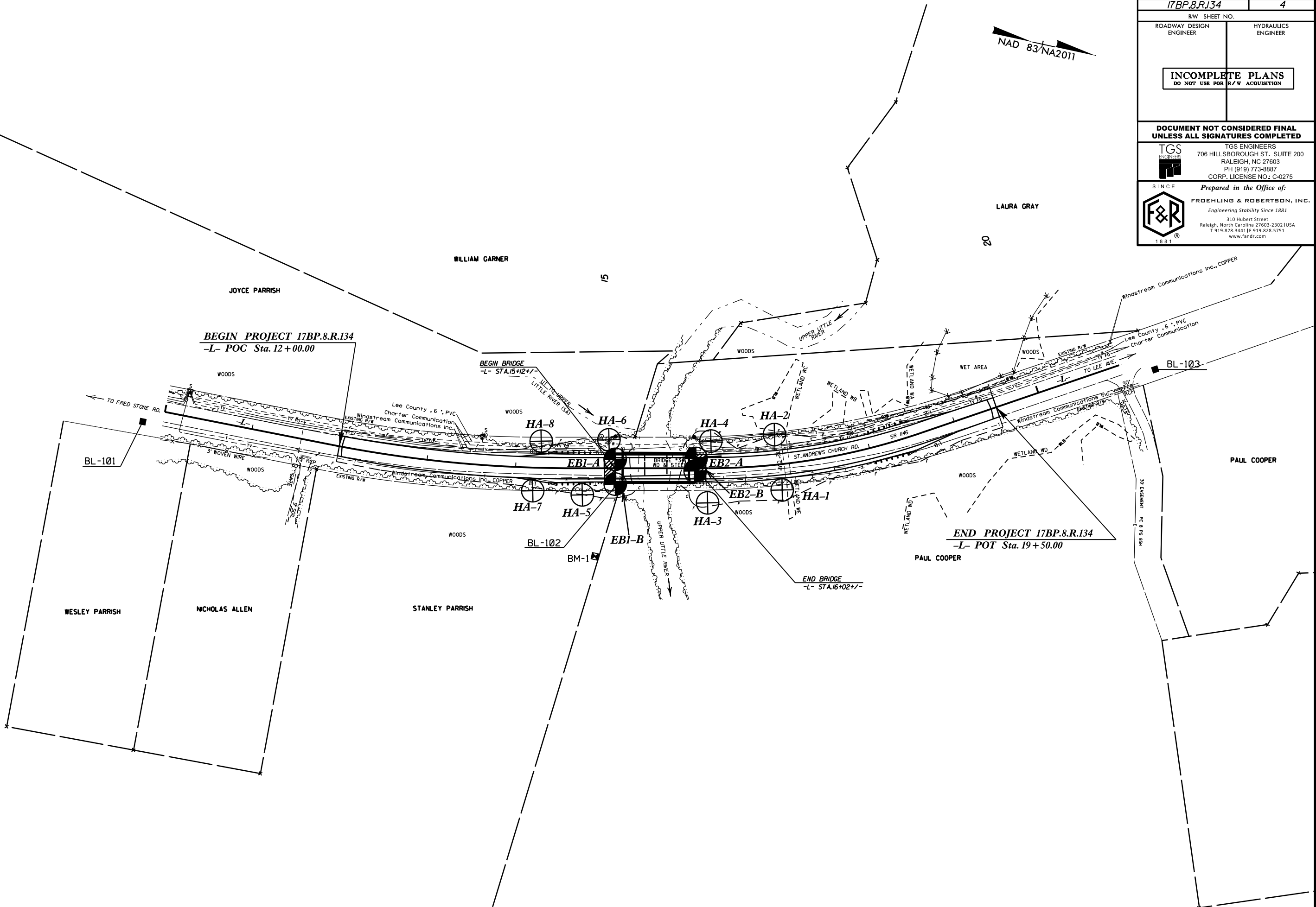

Meredith Arnold
Staff Geologist

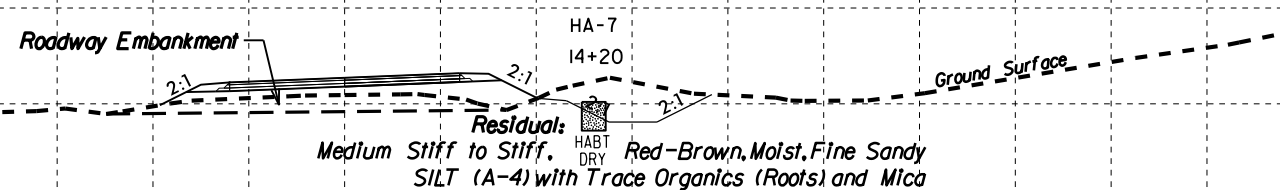
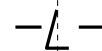
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REVISIONS

NAD 83/NA2011

PROJECT REFERENCE NO. 17BP.8.R.134		SHEET NO. 4	
R/W SHEET NO.			
ROADWAY DESIGN ENGINEER		HYDRAULICS ENGINEER	
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250

6/23/16

140

120

100

80

60

40

20

0

20

40

60

80

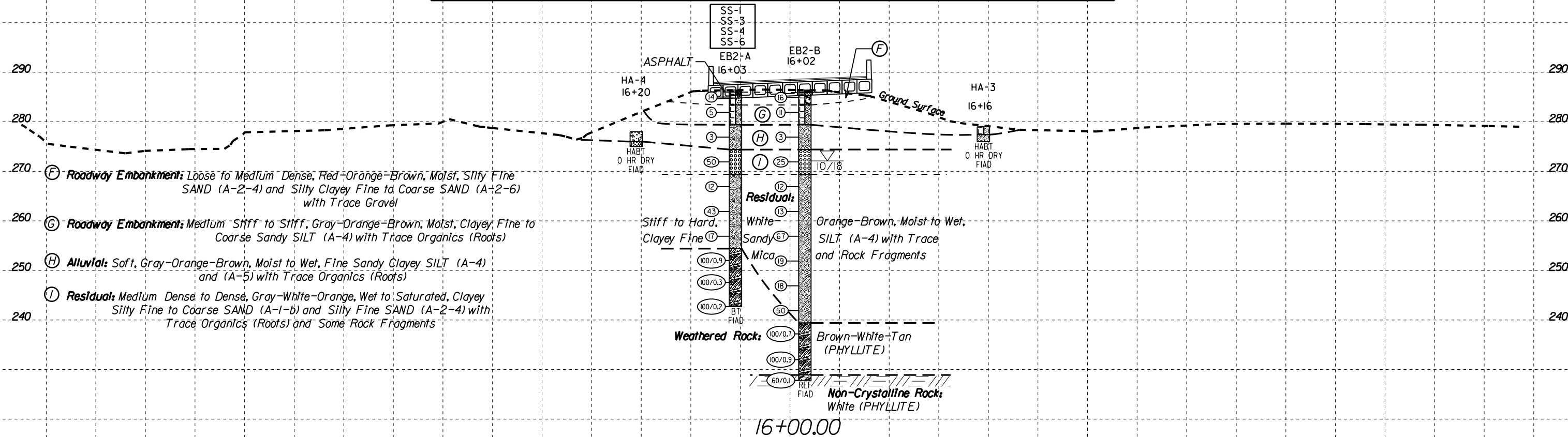


PROJ. REFERENCE NO.
17BP.8.R.134

SHEET NO.
6

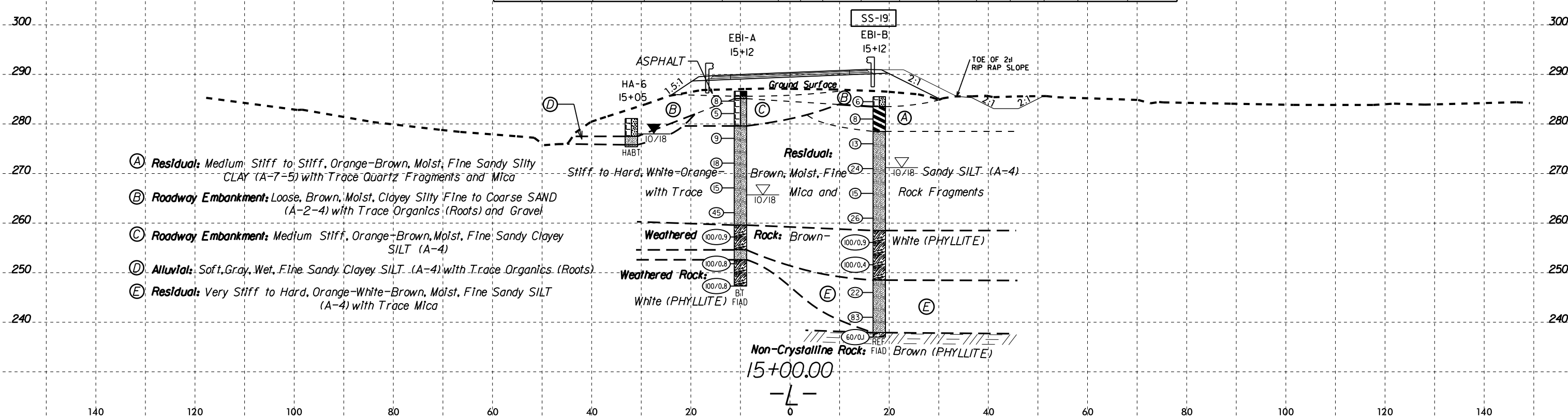
SOIL TEST RESULTS

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-1	11' LT	16+03	0.4-1.0	A-2-6(0)	36	16	54.4	19.3	3.6	22.7	80.3	47.8	23.1	9.3	-
SS-3	11' LT	16+03	3.5-5.0	A-4(5)	34	8	12.1	25.9	29.5	32.5	98.4	91.7	70.4	19.7	-
SS-4	11' LT	16+03	8.5-10.0	A-4(5)	30	5	0.6	12.0	52.9	34.5	100.0	99.7	93.7	33.3	-
SS-6	11' LT	16+03	18.5-20.0	A-4(3)	37	1	4.5	19.3	59.4	16.8	100.0	98.3	83.9	25.8	-



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-19	18' RT	15+12	3.5-5.0	A-7-5(6)	51	11	6.5	31.2	20.6	41.7	84.5	81.6	58.7	22.5	-



6/23/16

140

120

100

80

60

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20

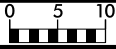
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20

40

60

80



PROJ. REFERENCE NO.
17BP.8.R.134

SHEET NO.
7

300

290

280

270

260

250

240

300

290

280

270

260

250

240

HA-2

16+95



2:1

Roadway Embankment

Alluvials

Soft to Medium Stiff, Gray, Saturated,
Fine Sandy, Clayey SILT (A-4) with
Trace Organics (Roots)

HA-1

16+97



2:1

Ground Surface

17+00.00

-L-

140

120

100

80

60

40

20

0

20

40

60

80

100

120

140