February 22, 2017

STATE PROJECT: **17BP.8.R.114 (SF-520016)**
PROJECT ID: **29447**
COUNTY: **Lee**
DESCRIPTION: **Bridge No. 16 on SR 1509 (San-Lee Dr.) over Lick Creek**

SUBJECT: **GEOTECHNICAL REPORT - INVENTORY**

PROJECT DESCRIPTION

This project consists of the reconstruction of SR 1509 (-L-) which is a two-lane roadway as part of the replacement of Bridge No. 16 over Lick Creek.

The geotechnical investigation was conducted in January of 2017. Standard Penetration Test borings were advanced with a CME 55 utilizing an automatic hammer. Hand auger borings were also completed. Representative soil samples were collected for visual classification in the field.

The following alignment, totaling 1,070 feet, was investigated.

LINE	STATIONS
-L-	12+15 to 22+85

PHYSIOGRAPHY AND GEOLOGY

The project is located in the Piedmont Physiographic Province. The project corridor is comprised primarily of undeveloped properties. The general topography along the project consists of moderate slopes.

Geologically, the site is located within the Triassic Basin. Soils are derived from the underlying sedimentary rocks. The bedrock primarily consists of Triassic mudstone.

SOIL PROPERTIES

Materials encountered during this investigation are separated into three categories based on origin. They consist of roadway embankment, alluvial, and residual.

Roadway Embankment soils are present along the existing roadway (-L-) on the project. These soils consist of dry to moist, very loose to medium dense, non-plastic to potentially highly plastic, fine to coarse sands and clayey, fine to coarse sands (A-3, A-2-6, A-2-7), and moist, soft to medium stiff, slightly to potentially highly plastic, fine sandy clays, and silty clays (A-6, A-7).

Soils identified as alluvial consist of moist to wet, very loose to medium dense, non-plastic to potentially highly plastic, silty, fine to coarse sands, fine to coarse sands, clayey, fine to coarse sands (A-1, A-2-4, A-3, A-2-7), moist to wet, soft to medium stiff, non-platic, fine to coarse sandy

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silts (A-4), and moist to wet, medium stiff to hard, slightly to potentially highly plastic, fine sandy clays, and silty clays (A-6, A-7).

Soils identified as residual consist of moist, hard, moderately to potentially highly plastic, silty clays (A-7).

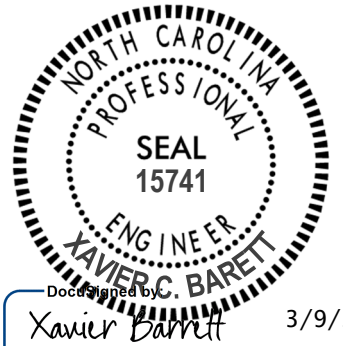
ROCK PROPERTIES

Weathered rock was encountered along the existing roadway (-L-) at elevations ranging from 235.1 to 243.8 feet (MSL). The weathered rock consists of brown and reddish brown mudstone. Non-crystalline rock was encountered along the existing roadway (-L-) at elevations ranging from 229.7 to 235.2 feet (MSL). The non-crystalline rock consists of mudstone.

GROUNDWATER

Groundwater was encountered at elevations ranging from 243.3 to 253.3 feet MSL along the proposed roadway of the project. Some fluctuation in groundwater levels can occur with climatic and seasonal variations. Therefore, subsurface water conditions at other times may be different from those described in this report.

Prepared by,



Benjamin A. Johnson, EI
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BAJ/XCB:cas
Attachment

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 17BP.8.R.114	**TIP** SF-520016	**COUNTY** LEE	**GEOLOGIST** D. Kubinski	
SITE DESCRIPTION Bridge No. 16 on SR 1509 (San-Lee Drive) over Lick Creek				**GROUND WTR (ft)**
BORING NO. L_1325	**STATION** 13+25	**OFFSET** 35 ft LT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 260.7 ft	**TOTAL DEPTH** 14.9 ft	**NORTHING** 633,850	**EASTING** 1,962,311	**24 HR.** 4.5
DRILL RIG/HAMMER EFF./DATE F&R3495 CME-55 80% 02/16/2016		**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
DRILLER D. Tignor	**START DATE** 01/05/17	**COMP. DATE** 01/06/17	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
265											
260	260.7	0.0								260.7 GROUND SURFACE	0.0
			2	3	3	6	SS-1	M		**ALLUVIAL** Yellowish Brown, Fine to Coarse Sandy SILT	
	257.0	3.7									
255			2	1	3	4		M		253.7	7.0
	252.0	8.7								**TRIASSIC RESIDUAL** Reddish Brown, Fine to Coarse, Sandy, Silty CLAY	
250			14	23	21	44		M			
	247.0	13.7								246.5	14.2
			19	65	35/0.2	100/0.7				245.8 **WEATHERED ROCK** Reddish Brown TRIASSIC MUDSTONE	14.9

Boring Terminated at Elevation 245.8 ft in WEATHERED ROCK: TRIASSIC MUDSTONE

Topsoil (0.0 to 0.1 foot)

NCDOT BORE SINGLE SF520016_GEO_BRDG_GINT.GPJ NC_DOT.GDT 2/22/17

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 17BP.8.R.114	**TIP** SF-520016	**COUNTY** LEE	**GEOLOGIST** D. Kubinski	
SITE DESCRIPTION Bridge No. 16 on SR 1509 (San-Lee Drive) over Lick Creek				**GROUND WTR (ft)**
BORING NO. L_1800	**STATION** 18+00	**OFFSET** 20 ft LT	**ALIGNMENT** -L-	**0 HR.** 4.0
COLLAR ELEV. 248.3 ft	**TOTAL DEPTH** 6.0 ft	**NORTHING** 633,694	**EASTING** 1,962,756	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE N/A		**DRILL METHOD** Hand Auger		**HAMMER TYPE** N/A
DRILLER N/A	**START DATE** 01/05/17	**COMP. DATE** 01/05/17	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
										ELEV. (ft) DEPTH (ft)
250										248.3 GROUND SURFACE 0.0
								M		**ALLUVIAL** Medium Stiff, Yellowish Brown to Orangish Brown, Fine Sandy CLAY
245								M W		242.3 6.0
										Boring Terminated at Elevation 242.3 ft in ALLUVIUM: Silty CLAY
										Topsoil (0.0 to 0.4 foot)

NCDOT BORE SINGLE SF520016_GEO_BRDG_GINT.GPJ NC_DOT.GDT 2/22/17

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 17BP.8.R.114	**TIP** SF-520016	**COUNTY** LEE	**GEOLOGIST** D. Kubinski	
SITE DESCRIPTION Bridge No. 16 on SR 1509 (San-Lee Drive) over Lick Creek				**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 18+64	**OFFSET** 4 ft LT	**ALIGNMENT** -L-	**0 HR.** 11.0
COLLAR ELEV. 254.2 ft	**TOTAL DEPTH** 29.3 ft	**NORTHING** 633,660	**EASTING** 1,962,813	**24 HR.** 9.5
DRILL RIG/HAMMER EFF./DATE F&R3495 CME-55 80% 02/16/2016		**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
DRILLER D. Tignor	**START DATE** 01/05/17	**COMP. DATE** 01/06/17	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
255											
	254.2	0.0	5	2	4	6		D		254.2 GROUND SURFACE	0.0
250	250.3	3.9	1	1	2	3		M		**ROADWAY EMBANKMENT** Yellowish Brown, Clayey, Fine to Coarse SAND	
										247.2	7.0
245	245.3	8.9	2	2	4	6		▼		**ALLUVIAL** Yellowish Brown, Fine Sandy, Silty CLAY	
										242.2	12.0
240	240.3	13.9	20	51	44	95		M		**TRIASSIC RESIDUAL** Reddish Brown, Fine Sandy, Silty CLAY	
										236.7	17.5
235	235.3	18.9	33	67/0.3		100/0.8				**WEATHERED ROCK** Reddish Brown TRIASSIC MUDSTONE	
230	230.3	23.9	41	59/0.3		100/0.8					
225	225.3	28.9	100/0.4			100/0.4				224.9	29.3
										Boring Terminated at Elevation 224.9 ft in WEATHERED ROCK: TRIASSIC MUDSTONE	

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 17BP.8.R.114	**TIP** SF-520016	**COUNTY** LEE	**GEOLOGIST** D. Kubinski	
SITE DESCRIPTION Bridge No. 16 on SR 1509 (San-Lee Drive) over Lick Creek				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 18+65	**OFFSET** 17 ft RT	**ALIGNMENT** -L-	**0 HR.** 11.0
COLLAR ELEV. 254.4 ft	**TOTAL DEPTH** 29.7 ft	**NORTHING** 633,640	**EASTING** 1,962,807	**24 HR.** 9.5
DRILL RIG/HAMMER EFF./DATE F&R3495 CME-55 80% 02/16/2016		**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
DRILLER D. Tignor	**START DATE** 01/05/17	**COMP. DATE** 01/06/17	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
255											
	254.4	0.0	1	2	4	6		M		254.4 GROUND SURFACE	0.0
										ROADWAY EMBANKMENT	
										Yellowish Brown, Brown, and Black, Clayey, Fine to Coarse SAND with Trace Gravel	
										251.9	2.5
250	250.6	3.8	WOH	2	3	5		M		Yellowish Brown, Fine Sandy CLAY	
										246.9	7.5
										ALLUVIAL	
245	245.6	8.8	1	3	4	7				Yellowish Brown, Fine Sandy, Silty CLAY	
										242.4	12.0
										Brown, Silty, Fine to Coarse SAND	
240	240.6	13.8	12	21	74	95		M		240.1	14.3
										TRIASSIC RESIDUAL	
										Reddish Brown, Fine Sandy, Silty CLAY	
235	235.6	18.8	12	34	66/0.2	100/0.7				235.1	19.3
										WEATHERED ROCK	
										Reddish Brown TRIASSIC MUDSTONE	
230	230.6	23.8	60/0.1			60/0.1				230.6	23.8
										NON-CRYSTALLINE ROCK	
										Reddish Brown TRIASSIC MUDSTONE	
										227.4	27.0
225	225.6	28.8	15	85/0.4		100/0.9				**WEATHERED ROCK**	
										Dark Reddish Brown to Reddish Brown TRIASSIC MUDSTONE	
										224.7	29.7
										Boring Terminated at Elevation 224.7 ft in WEATHERED ROCK: TRIASSIC MUDSTONE	
										Topsoil (0.0 to 0.2 foot)	

NCDOT BORE SINGLE SF520016_GEO_BRDG_GINT.GPJ NC_DOT.GDT 2/22/17

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 17BP.8.R.114	**TIP** SF-520016	**COUNTY** LEE	**GEOLOGIST** D. Kubinski	
SITE DESCRIPTION Bridge No. 16 on SR 1509 (San-Lee Drive) over Lick Creek				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 19+45	**OFFSET** 4 ft LT	**ALIGNMENT** -L-	**0 HR.** 11.0
COLLAR ELEV. 253.7 ft	**TOTAL DEPTH** 28.7 ft	**NORTHING** 633,635	**EASTING** 1,962,890	**24 HR.** 10.0
DRILL RIG/HAMMER EFF./DATE F&R3495 CME-55 80% 02/16/2016		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER D. Tignor	**START DATE** 01/04/17	**COMP. DATE** 01/05/17	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
255											
	253.7	0.0								253.7 GROUND SURFACE	0.0
			14	6	5	11		D		**ROADWAY EMBANKMENT** Yellowish Brown, Clayey, Fine to Coarse SAND	
250	250.0	3.7	WOH	WOH	WOH	0		M			
					WOH					246.7	7.0
245	245.0	8.7	WOH	WOH	WOH	0				**ALLUVIAL** Yellowish Brown, Silty, Clayey, Fine to Coarse SAND	
					WOH					242.2	11.5
240	240.0	13.7								Gray, Silty, Fine to Coarse SAND with Trace Wood Chips and Gravel	
			2	4	37	41		W		239.0	14.7
										TRIASSIC RESIDUAL Reddish Brown, Fine Sandy, Silty CLAY	17.0
235	235.0	18.7	100/0.5			100/0.5				**WEATHERED ROCK** Reddish Brown TRIASSIC MUDSTONE	
230	230.0	23.7	100/0.2			100/0.2					
225	225.0	28.7	60/0.0			60/0.0				225.0	28.7
										Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 225.0 ft on NON-CRYSTALLINE ROCK: TRIASSIC MUDSTONE	

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 17BP.8.R.114	**TIP** SF-520016	**COUNTY** LEE	**GEOLOGIST** D. Kubinski	
SITE DESCRIPTION Bridge No. 16 on SR 1509 (San-Lee Drive) over Lick Creek				**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 19+46	**OFFSET** 18 ft RT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 253.3 ft	**TOTAL DEPTH** 28.7 ft	**NORTHING** 633,614	**EASTING** 1,962,884	**24 HR.** 18.5
DRILL RIG/HAMMER EFF./DATE F&R3495 CME-55 80% 02/16/2016		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER D. Tignor	**START DATE** 01/05/17	**COMP. DATE** 01/06/17	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	ELEV. (ft)	DEPTH (ft)
255												
	253.3	0.0								GROUND SURFACE	253.3	0.0
			1	2	3	5		M		**ROADWAY EMBANKMENT** Yellowish Brown and Brown, Silty, Fine to Coarse SAND with Trace Gravel	250.8	2.5
250	249.7	3.6	1	1	2	3		M		Brown and Reddish Brown, Fine to Coarse Sandy, Silty CLAY	245.8	7.5
245	244.7	8.6	1	2	1	3		W		**ALLUVIAL** Brown, Fine to Coarse SAND	238.5	14.8
240	239.7	13.6	1	2	3	5		W		**TRIASSIC RESIDUAL** Reddish Brown, Fine Sandy, Silty CLAY	236.3	17.0
235	234.7	18.6	100/0.4			100/0.4				**WEATHERED ROCK** Reddish Brown TRIASSIC MUDSTONE	229.7	23.6
230	229.7	23.6	60/0.1			60/0.1				**NON-CRYSTALLINE ROCK** Reddish Brown TRIASSIC MUDSTONE	224.6	28.7
225	224.7	28.6	60/0.1			60/0.1				Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 224.6 ft in NON-CRYSTALLINE ROCK: TRIASSIC MUDSTONE		

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 17BP.8.R.114	**TIP** SF-520016	**COUNTY** LEE	**GEOLOGIST** D. Kubinski	
SITE DESCRIPTION Bridge No. 16 on SR 1509 (San-Lee Drive) over Lick Creek				**GROUND WTR (ft)**
BORING NO. L_1975	**STATION** 19+75	**OFFSET** 15 ft RT	**ALIGNMENT** -L-	**0 HR.** 13.0
COLLAR ELEV. 253.3 ft	**TOTAL DEPTH** 18.9 ft	**NORTHING** 633,608	**EASTING** 1,962,913	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE F&R3495 CME-55 80% 02/16/2016		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER D. Tignor	**START DATE** 01/06/17	**COMP. DATE** 01/06/17	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
255											
	252.8	0.5	7	7	6	13		M		253.3 GROUND SURFACE	0.0
250	249.5	3.8	3	2	4	6		M		252.8 **ROADWAY EMBANKMENT** Asphalt (0.0 to 0.5 foot)	0.5
										251.8 Brown, Silty, Fine to Coarse SAND with Trace Gravel	1.5
										Reddish Brown to Yellowish Brown, Fine Sandy, Silty CLAY	
245	244.5	8.8	1	1	1	2	SS-2	W		246.3 **ALLUVIAL** Brown and Gray, Fine Sandy SILT	7.0
										241.3 Gray Coarse SAND	12.0
240	239.5	13.8	1	5	95/0.3	100/0.8				239.0	14.3
										238.5 **TRIASSIC RESIDUAL** Reddish Brown, Fine Sandy, Silty CLAY	14.8
235	234.5	18.8	60/0.1			60/0.1				**WEATHERED ROCK** Reddish Brown TRIASSIC MUDSTONE 234.5	18.8
										234.4 **NON-CRYSTALLINE ROCK** TRIASSIC MUDSTONE	18.9
										Boring Terminated at Elevation 234.4 ft in NON-CRYSTALLINE ROCK: TRIASSIC MUDSTONE	

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 17BP.8.R.114	**TIP** SF-520016	**COUNTY** LEE	**GEOLOGIST** D. Kubinski	
SITE DESCRIPTION Bridge No. 16 on SR 1509 (San-Lee Drive) over Lick Creek				**GROUND WTR (ft)**
BORING NO. L_2100	**STATION** 21+00	**OFFSET** 25 ft LT	**ALIGNMENT** -L-	**0 HR.** 5.5
COLLAR ELEV. 252.6 ft	**TOTAL DEPTH** 6.2 ft	**NORTHING** 633,601	**EASTING** 1,963,045	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE N/A		**DRILL METHOD** Hand Auger		**HAMMER TYPE** N/A
DRILLER N/A	**START DATE** 01/05/17	**COMP. DATE** 01/05/17	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
255											
										252.6 GROUND SURFACE	0.0
								M		**ROADWAY EMBANKMENT** Soft to Medium Stiff, Yellowish Brown to Brown, Fine to Coarse Sandy CLAY with Little Gravel	
250										248.6	4.0
								M		247.1 **ALLUVIAL** Loose, Yellowish Brown, Silty, Clayey, Fine to Coarse SAND	5.5
								W		246.4 Soft, Yellowish Brown, Fine Sandy, Silty CLAY	6.2
										Boring Terminated at Elevation 246.4 ft in ALLUVIUM: Silty CLAY	
										Topsoil (0.0 to 0.1 foot)	

SUMMARY OF LABORATORY TEST DATA

PROJECT NO. 17BP.8.R.114 (SF-520016)
COUNTY: LEE
BRIDGE NO. 16 ON SR 1509 (SAN-LEE DRIVE) OVER LICK CREEK

									Atterberg Limits		Gradation Results							
Sample No.	Boring Number	Station	Offset	Alignment	Sample Depth (ft.)	AASHTO Class (Group Index)	N-Value (blows/ ft.)	L.L.	P.L.	P.I.	Pass #10 Sieve	Pass #40 Sieve	Pass #200 Sieve	Retained #270 Sieve	Coarse Sand (%)	Fine Sand (%)	Silt (%)	Clay (%)
SS-1	L_1325	13+25	35' LT	-L-	0.0-1.5	A-4 (0)	6	20	17	3	87	78	59	6.2	14.8	23.6	45.6	16.0
SS-2	L_1975	19+75	15' RT	-L-	8.8-10.3	A-4 (0)	2	22	18	4	100	98	67	7.8	7.0	33.5	42.5	17.1

SS = Split-Barrel Sample (ASTM-D-1586) ST = Shelby Tube (Undisturbed) Sample
S = Grab Sample
NP -- Non Plastic NA-- Non Applicable

Lab Technician: NCDOT Certification No.: 129-01-0411 – Geotechnics, Raleigh, NC

Michael P. Smith
Regional Manager