

PROJECT: 41903

REFERENCE: U-5105

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<u>LINE</u>	<u>STATION</u>	<u>PLAN</u>	<u>PROFILE</u>
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STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

ROADWAY

SUBSURFACE INVESTIGATION

COUNTY HENDERSON

PROJECT DESCRIPTION NC 225 INTERSECTION

IMPROVEMENTS FROM SR 1164 TO SR 1779

INVENTORY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-5105	1	20

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

TRIGON EXP

GOODNIGHT, D. J.

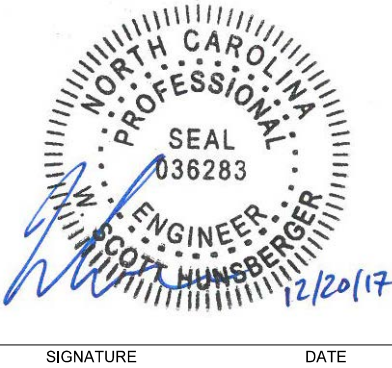
INVESTIGATED BY DJG

DRAWN BY HUNSBERGER, W. S.

CHECKED BY HAMM, J. R.

SUBMITTED BY FALCON

DATE DECEMBER 2017



SIGNATUREDATE

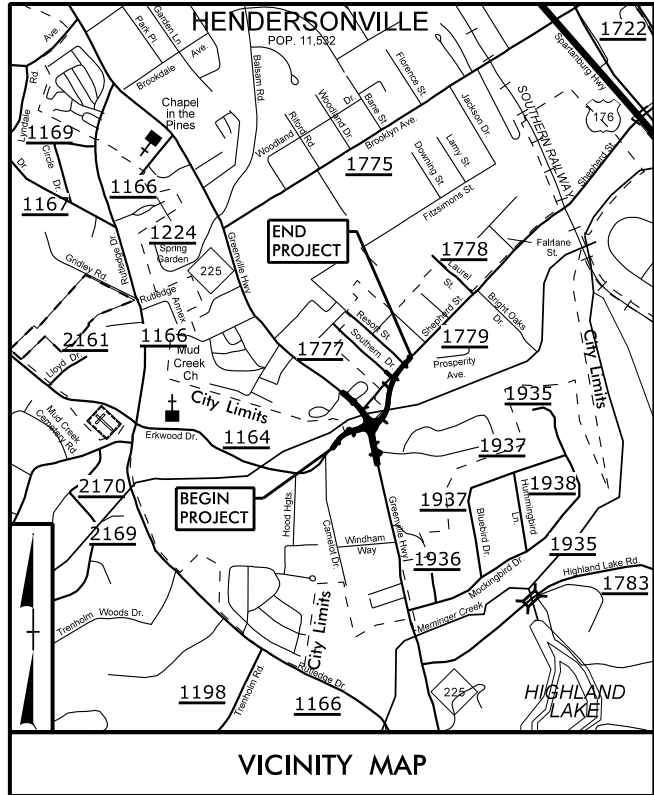
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09/28/99

TIP PROJECT: U-5105

CONTRACT: 41903

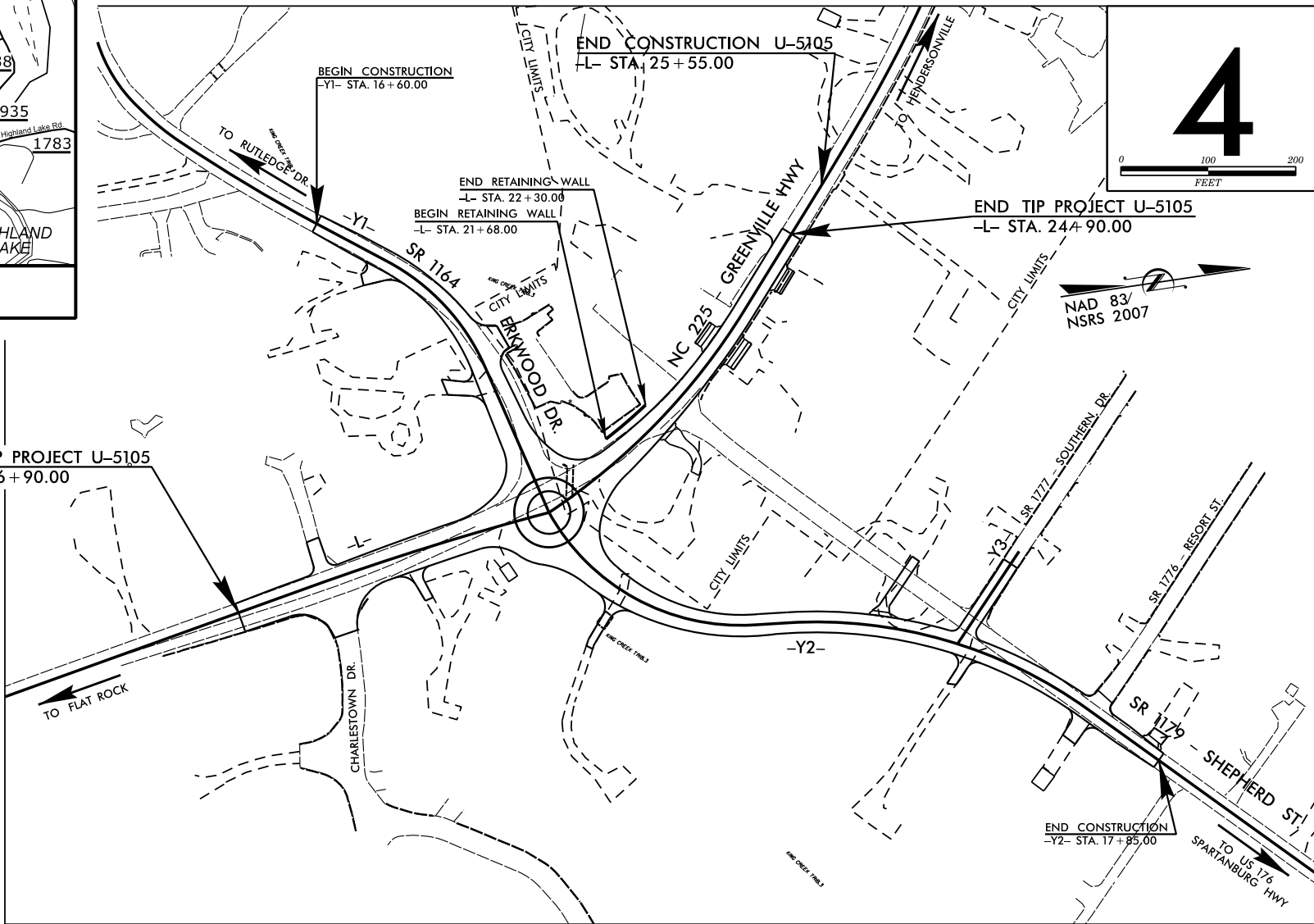


VICINITY MAP

STATE OF NORTH CAROLINA  
DIVISION OF HIGHWAYS

HENDERSON COUNTY

LOCATION: NC 225 (GREENVILLE HWY) INTERSECTION IMPROVEMENTS  
FROM SR 1164 (ERKWOOD DR) TO SR 1779 (SHEPHERD ST)  
TYPE OF WORK: GRADING, PAVING, DRAINAGE, CULVERT & ROUNDABOUT



4

0 100 200  
FEET

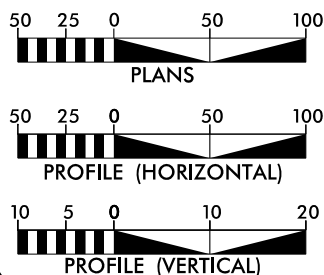
NAD 83/  
NSRS 2007

THERE IS NO CONTROL OF ACCESS ON THIS PROJECT.

A PORTION OF THIS PROJECT IS WITHIN THE MUNICIPAL BOUNDARIES OF HENDERSONVILLE.

CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD II.

GRAPHIC SCALES



DESIGN DATA

ADT 2017 = 9,800  
ADT 2035 = 11,600  
K = 55 %  
D = 9 %  
T = 5 % \*  
V = 40 MPH  
\* TTST = 1% + DUAL 4%  
FUNC CLASS =  
URBAN COLLECTOR  
STATEWIDE TIER

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT U-5105 = 0.151 MILES

Prepared for:  
**HIGHWAY  
DIVISION 14**  
253 Webster Rd.  
Sylva, NC 28779

2012 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:  
AUGUST 15, 2016

LETTING DATE:  
AUGUST 15, 2017

Prepared by:  
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NCE License # E-1333

JOHNNY BANKS  
PROJECT MANAGER

STEPHEN C. BROWDE, PE  
ROADWAY PROJECT DESIGN ENGINEER

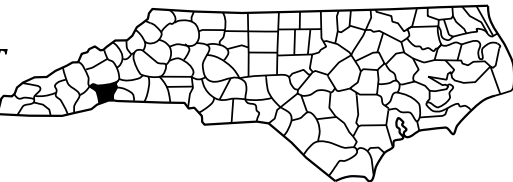
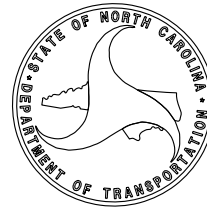
STEVE WILLIAMS  
NCDOT CONTACT  
DIVISION 14 DESIGN CONSTRUCTION ENGINEER

HYDRAULICS ENGINEER

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

ROADWAY DESIGN  
ENGINEER

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



75% PLANS

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-5105	3	20
STATE PROJ. NO.	P.A. PROJ. NO.	DESCRIPTION	
41903.1.1		P.E.	
41903.1.1		R/W, UTL.	

DOCUMENT NOT CONSIDERED FINAL  
UNLESS ALL SIGNATURES COMPLETED



**TIP:** U-5105  
**COUNTY:** Henderson  
**DESCRIPTION:** NC 225 Intersection Improvements  
**SUBJECT:** Roadway Subsurface Investigation – Inventory

## Roadway Subsurface Investigation Report - Inventory

**NC 225 Intersection Improvements from SR 1164 to SR 1779**  
**Henderson County, North Carolina**  
**TIP: U-5105 WBS: 41903.1.1**  
**Falcon Project No.: G16011.00**

**Prepared for:**  
Mr. Johnny Banks  
Calyx Engineers & Consultants  
6750 Tryon Road  
Cary, NC 27518

Submitted by:  
Falcon Engineering, Inc.  
1210 Trinity Road, Suite 110  
Cary, North Carolina 27513  
(919) 871-0800  
www.falconengineers.com

December 20, 2017

## PROJECT DESCRIPTION

This project consists of the construction of a new roundabout at the intersection of Erkwood Drive and NC 225 (Greenville Highway) with minor widening, realigning and grade changes along the existing roads to accommodate the new roundabout. Shepherd Street will be relocated to intersect NC 225 opposite Erkwood Drive.

Included in this project is a retaining wall along NC 225 (alignment -L-). The retaining wall was investigated as a part of this project and structure borings are presented herein. The Retaining Wall Investigation will be provided under separate cover.

The investigation was conducted between July 28<sup>th</sup> and August 5<sup>th</sup>, 2016 in general accordance with our Proposal to Provide Geotechnical Engineering Services, dated September 30<sup>th</sup>, 2015. The recommendations provided in this report are based solely on our site reconnaissance, soil test borings and laboratory test data, engineering evaluation of these data, and generally accepted soil and foundation engineering practices and principles.

A total of nine (9) borings (both Standard Penetration Test (SPT) and Hand Auger borings) were drilled for the proposed roadway alignments. All SPT borings were drilled using a Mobil B-57 ATV drill rig equipped with 2 ¼-inch inside diameter hollow-stem augers and an automatic hammer. Representative soil samples, collected with a split-barrel sampler or hand auger, were selected for laboratory testing to verify visual field classifications. In addition, bulk samples were collected for standard Proctor compaction and laboratory soaked California Bearing Ratio (CBR) testing. Four (4) locations near tie-in areas along the existing roadway were cored, measured and Dual Mass Dynamic Cone Penetrometer (DCP) testing completed to correlate in-situ CBR values for the existing subgrade to depths of up to three feet below subgrade. The dual mass DCP used is manufactured by Kessler Soils Engineering Products, Inc. CBR values were estimated using software provided by the manufacturer which utilizes correlations established by the Army Corps of Engineers Waterways Experiment Station.





The following alignments, totaling approximately 1,900 feet were explicitly investigated.

<u>Alignment</u>	<u>Station (ft)</u>
-L- (NC 225)	16+90.00 - 24+90.00
-Y1- (Erkwood Dr)	16+60.00 - 20+40.90
-Y2- (Shepherd St)	10+60.14 - 17+85.00

## AREAS OF SPECIAL GEOTECHNICAL INTEREST

- I. The following locations contain very soft to soft/very loose soils with an N-value less than 4 near the ground surface:

<u>Station (ft)</u>	<u>Alignment</u>
21+76	-L-
22+32	-L-
11+11	-Y2-
13+00	-Y2-
15+26	-Y2-

- II. The following locations contain organic soils near the ground surface:

<u>Station (ft)</u>	<u>Alignment</u>
18+89	-L-
22+32	-Y1-
13+00	-Y2-

- III. Shallow ground water was measured within the following areas and may cause groundwater related stability problems during construction:

<u>Station (ft)</u>	<u>Alignment</u>
20+11	-Y1-
13+00	-Y2-

- IV. Alluvial soils were encountered at the following locations. The potential for wet, soft or organic soils should be anticipated at these locations:

<u>Station (ft)</u>	<u>Alignment</u>
21+76	-L-
22+32	-L-
11+11	-Y2-
13+00	-Y2-

- V. Artificial fill was encountered at the following locations:

<u>Station (ft)</u>	<u>Alignment</u>
17+99	-Y1-
20+11	-Y1-
15+26	-Y2-

- VI. Roadway Embankment was encountered at the following locations:

<u>Station (ft)</u>	<u>Alignment</u>
18+89	-L-
21+76	-L-





## PHYSIOGRAPHY AND GEOLOGY

According to the *Geologic Map of North Carolina* (1985), the site is located in the Blue Ridge Belt geologic formation. Specifically, rocks at the site are noted as the Henderson Gneiss (**Chg**), consisting of Henderson Gneiss, monzonitic to granodioritic; inequigranular.

Project topography is relatively flat given the mountainous terrain of the geographic area. Portions of the project traverse two existing intersections, existing wooded areas, open grassy yards, existing residences, and grassy roadway rights-of-way. The alignment crosses one small stream, to the south of the proposed intersection. Existing roadways in the immediate vicinity are constructed predominantly at grade, with some of the cuts on the order of 5 to 7 feet and limited fill sections.

## SOIL PROPERTIES

A variety of soils were encountered along the project, including existing roadway embankments, artificial fills not associated with roadway construction, cultivated soils, alluvial and residual soils, and weathered rock. Areas where soils at the ground surface are of a unique geologic origin (i.e. not residual) are approximately delineated on the boring location plans based on subsurface conditions encountered in nearby borings, and various topographical, vegetative, or other visual surface features.

Roadway Embankment soils were encountered at the ground surface beneath and adjacent to existing roadways. These consist of 3 to 4 feet of moist to wet, very loose, silty sand (A-2-4) and sandy clay (A-6).

Artificial Fill soils were encountered at the ground surface beneath and adjacent to existing roadways. These consist of 3 to 5 feet of moist, very loose, silty and clayey sand (A-2-4 and A-2-5).

Alluvial soils were encountered at the ground surface near the historic floodplains of natural waterways. These soils extended to depths of up to approximately 3 to 6 feet and consist of moist to wet, very loose, silty and clayey sand (A-1-b, A-2-4 and A-2-6) and wet, soft sandy clay (A-6) with trace amounts of organic material.

Residual soils were encountered at the ground surface or beneath fills, roadway embankments, or alluvial soils. Residual soils encountered consist predominantly of fine silty clays (A-7) with occurrences of silty and clayey sands (A-1-b, A-2-4, and A-2-5).

Weathered Rock (WR) is a very hard, material with properties intermediate of soil and rock. For this project, WR is classified by having an N-value of 100 blows per one foot or less. WR was encountered at B-7 at a depth of 19 feet below ground surface.

Topsoil and garden soil were encountered ranging in thickness from 0.3 to 1.0 feet.







GROUNDWATER PROPERTIES

Groundwater levels were measured at the time of boring completion, and in some cases after a waiting period of at least 24 hours. Borings drilled within and in close proximity to existing roadways, and within residential areas were backfilled immediately after completion due to safety considerations.

The project crosses a small stream in the eastern portion of the project area. Detailed groundwater measurements are included in the attached subsurface profiles, and noted areas of shallow groundwater are included in the Areas of Special Geotechnical Interest earlier in this report.

ADDITIONAL LABORATORY TESTING

The following bulk samples were obtained:

<u>Sample</u>	<u>Location</u>	<u>Depth (ft)</u>	<u>Test</u>
BS-1	17+30, 41 ft LT, -L-	1.0 - 8.0	Lab Soaked CBR, Standard Proctor
BS-2	17+99, 30 ft RT, -Y1-	1.0 - 6.0	Lab Soaked CBR, Standard Proctor

Classification test results for bulk samples are included in the subsurface profiles and cross sections and Standard Proctor and California Bearing Ratio (CBR) data is attached in Appendix B.

CLOSING

Falcon appreciates the opportunity to have provided our geotechnical engineering services for the above referenced project. If you have any questions concerning the contents of this report or need additional information, please do not hesitate to contact our office.

FALCON ENGINEERING, INC.

Report Prepared By:

Report Reviewed By:

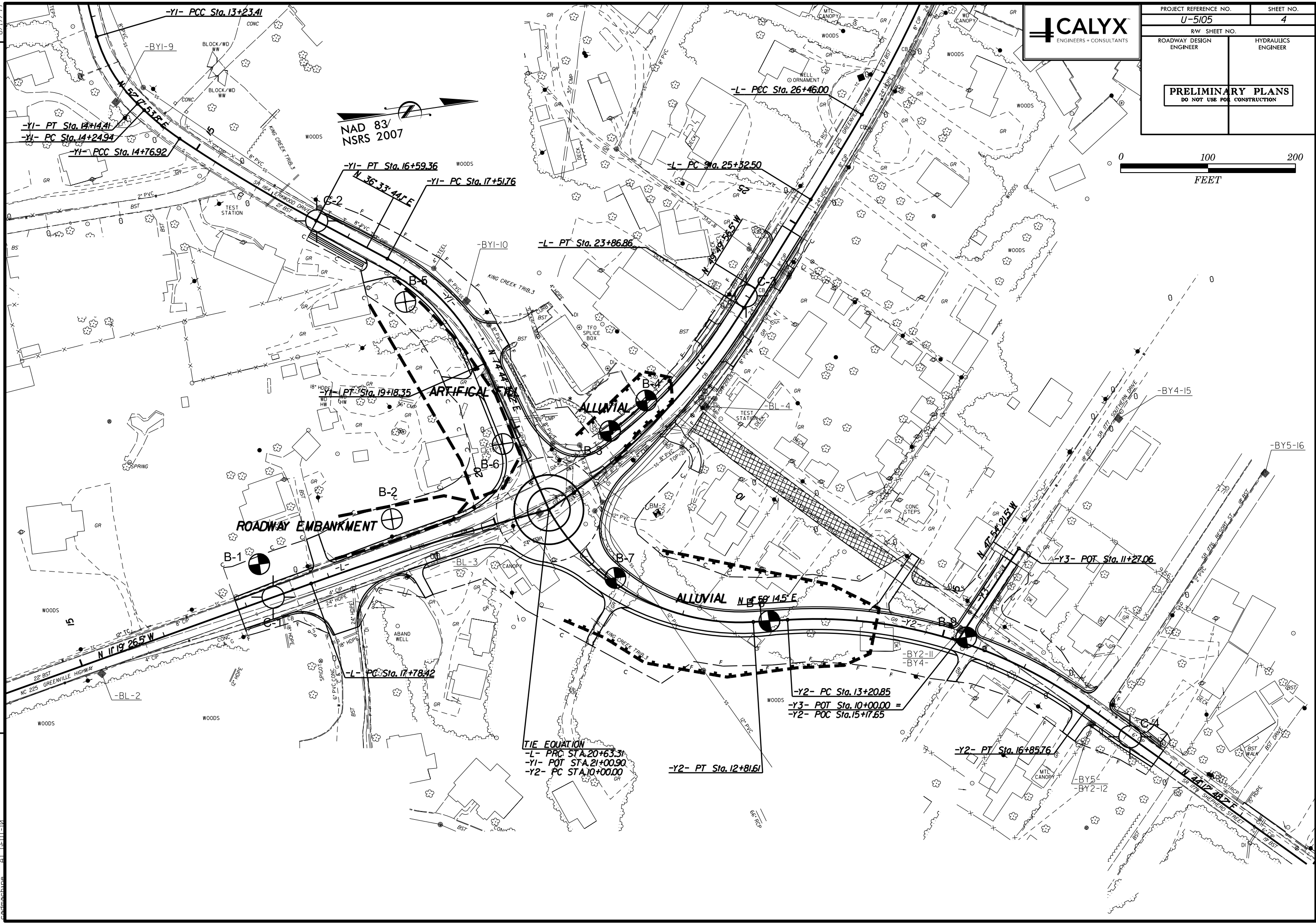
W. Scott Hunsberger, PE  
*Geotechnical Engineer*


Jeremy R. Hamm, PE  
*Geotechnical Engineering Manager*



20-DEC-2017 08:08  
11-15-2016 01:00 U-5105 NC 225 Intersection Improvements\U5105\_NCDOT\_Electronic\_File\_Tree\Geotech\Investigation\Design\U5105\_GEO\_RDWY\CADD\_GEO\Tech\Plan\Prof\U5105\_rdy.psh.dgn  
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REVISIONS





ENGINEERS + CONSULTANTS

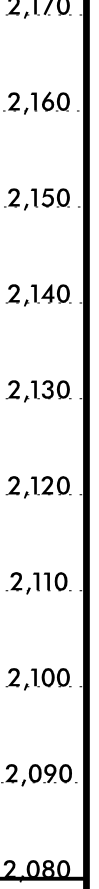
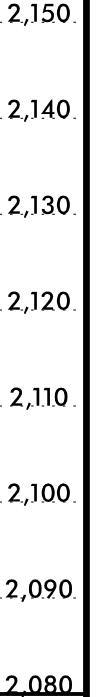
PROJECT REFERENCE NO. <b>U-5105</b>		SHEET NO. <b>4</b>	
RW SHEET NO.		HYDRAULICS ENGINEER	
ROADWAY DESIGN ENGINEER		HYDRAULICS ENGINEER	

**PRELIMINARY PLANS**  
DO NOT USE FOR CONSTRUCTION

0 100 200  
FEET

TIE EQUATION  
-L- PRC STA. 20+63.31  
-Y1- POT STA. 21+00.90  
-Y2- PC STA. 10+00.00






PROJECT: 41903

REFERENCE: U-5105

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
DIVISION OF HIGHWAYS  
GEOTECHNICAL ENGINEERING UNIT  
**SUBSURFACE INVESTIGATION**  
APPENDIX A  
BORING LOGS

PROJECT REFERENCE NO.	SHEET NO.
U-5105	6

 12/20/17  
INITIALS DATE





GEOTECHNICAL BORING REPORT  
BORE LOG

WBS 41903.1.1				TIP U-5105		COUNTY HENDERSON		GEOLOGIST Contract Geologist									
SITE DESCRIPTION NC 225 INTERSECTION IMPROVEMENTS FROM SR 1164 TO SR 1779										GROUND WTR (ft)							
BORING NO. B-5			STATION 17+99			OFFSET 30 ft RT			ALIGNMENT -Y1-		0 HR. Dry						
COLLAR ELEV. 2,124.2 ft			TOTAL DEPTH 6.0 ft			NORTHING 578,303			EASTING 971,911		24 HR. FIAD						
DRILL RIGHAMMER EFF./DATE N/A						DRILL METHOD Hand Auger				HAMMER TYPE N/A							
DRILLER Contract Driller			START DATE 07/29/16			COMP. DATE 07/29/16			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							
2125																	
2120												M		2,124.2		0.0	
														2,123.2	1.0' tAN, SILTY SAND (TOPSOIL)		1.0
														2,121.2	ARTIFICIAL FILL TAN, CLAYEY SILTY SAND (A-2-5) WITH TRACE ROOTS		3.0
														2,119.2	TAN, SILTY SAND (A-2-4) WITH TRACE ROOTS		5.0
												W		2,118.2	ALLUVIAL TAN AND GRAY, SLIGHTLY SILTY F. TO CSE. SAND (A-1-b) WITH TRACE GRAVEL		6.0
Boring Terminated at Elevation 2,118.2 ft in ALLUVIAL: SILTY SAND																	

WBS 41903.1.1				TIP U-5105		COUNTY HENDERSON		GEOLOGIST Contract Geologist									
SITE DESCRIPTION NC 225 INTERSECTION IMPROVEMENTS FROM SR 1164 TO SR 1779										GROUND WTR (ft)							
BORING NO. B-6				STATION 20+11		OFFSET 18 ft RT		ALIGNMENT -Y1-		0 HR.	3.7						
COLLAR ELEV. 2,118.5 ft				TOTAL DEPTH 6.0 ft		NORTHING 578,389		EASTING 972,088		24 HR.	FIAD						
DRILL RIGHAMMER EFF./DATE N/A						DRILL METHOD Hand Auger			HAMMER TYPE N/A								
DRILLER Contract Driller				START DATE 08/05/16		COMP. DATE 08/05/16		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	<div>MOI</div>	<div>LOG</div>	SOIL AND ROCK DESCRIPTION			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100							
2120																	
2115												<div>M</div>	<div>⊠</div>	2,118.5	0.2' TOPSOIL		0.0
														2,116.5	ARTIFICIAL FILL		
														2,115.0	GRAY AND TAN, SILTY CSE. TO F. SAND (A-2-4) WITH TRACE GRAVEL		2.0
														2,113.5	LT. GRAY AND TAN, SILTY CLAYEY SAND (A-2-5)		3.5
												<div>W</div>	<div>⊠</div>	2,112.5	ALLUVIAL		5.0
												<div>W</div>	<div>⊠</div>		TAN, SLI. SILTY F. TO CSE. SAND (A-1-b) WITH TRACE GRAVEL		6.0
															RESIDUAL		
															TAN, SLI. SILTY F. TO CSE. SAND (A-1-b) WITH TRACE MICA AND SAPROLITIC		
															Boring Terminated at Elevation 2,112.5 ft in RES: SLI. SILTY F. TO CSE. SAND		

NCDOT BORE DOUBLE U5105\_GEO\_BORINGS.GPJ NC\_DOT.GDT 12/20/17



GEOTECHNICAL BORING REPORT  
BORE LOG

WBS 41903.1.1			TIP U-5105			COUNTY HENDERSON			GEOLOGIST Contract Geologist						
SITE DESCRIPTION NC 225 INTERSECTION IMPROVEMENTS FROM SR 1164 TO SR 1779											GROUND WTR (ft)				
BORING NO. B-7			STATION 11+11			OFFSET 5 ft LT			ALIGNMENT -Y2-			0 HR.	6.0		
COLLAR ELEV. 2,115.2 ft			TOTAL DEPTH 19.7 ft			NORTHING 578,494			EASTING 972,258			24 HR.	6.0		
DRILL RIGHAMMER EFF./DATE TRI8016 MOBILE B-57 90% 02/22/2016						DRILL METHOD H.S. Augers				HAMMER TYPE Automatic					
DRILLER Contract Driller			START DATE 07/28/16			COMP. DATE 07/28/16			SURFACE WATER DEPTH N/A						
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100			ELEV. (ft)	DEPTH (ft)	
2120															
2115															
2110	2,114.2	1.0				1					M M ▼ W W  M		2,115.2	0.4' TOPSOIL	0.0
	2,111.7	3.5	1	1	2	3	2	2	4	2,110.2			TAN AND GRAY, SILTY F. SAND (A-2-4) WITH MORE CSE. TO F. SAND WITH TRACE GRAVEL AT 3.5 TO 5 FT.	5.0	
	2,109.2	6.0	1	1	1	2				2			2,101.8	ORANGE AND TAN, SLI. SILTY F. TO CSE. SAND (A-1-b) WITH TRACE ROCK FRAGMENTS	13.4
2105	2,106.7	8.5				2							2,096.2	19.0	
			1	1	1	2							2,095.5	19.7	
2100	2,101.7	13.5	30	30	29										
	2,096.7	18.5	18	55	45/2										
						100/0.7									

WBS 41903.1.1			TIP U-5105			COUNTY HENDERSON			GEOLOGIST Contract Geologist				
SITE DESCRIPTION NC 225 INTERSECTION IMPROVEMENTS FROM SR 1164 TO SR 1779									GROUND WTR (ft)				
BORING NO. B-8			STATION 13+00			OFFSET CL			ALIGNMENT -Y2-			0 HR. 4.0	
COLLAR ELEV. 2,116.4 ft			TOTAL DEPTH 10.0 ft			NORTHING 578,661			EASTING 972,333			24 HR. 2.8	
DRILL RIGHAMMER EFF./DATE TRI8016 MOBILE B-57 90% 02/22/2016						DRILL METHOD H.S. Augers			HAMMER TYPE Automatic				
DRILLER Contract Driller			START DATE 07/28/16			COMP. DATE 07/28/16			SURFACE WATER DEPTH N/A				
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION
			0.5ft	0.5ft	0.5ft	0	25	50	75	100			
2120													
2115	2,115.4	1.0											2,116.4 0.3' TOPSOIL 0.0
2110	2,112.9	3.5	WOH	WOH	1						M	▲	ALLUVIAL GRAY, CLAYEY CSE TO F. SAND (A-2-6) WITH TRACE ORGANICS
	2,110.4	6.0	3	2	2						M		RESIDUAL GRAY WHITE ORANGE AND TAN, SILTY CSE. TO F. SAND (A-2-4) WITH TRACE MICA AND SAPROLITIC
	2,107.9	8.5	4	6	10						M		
			10	16	23						M		
													2,106.4 10.0
													Boring Terminated at Elevation 2,106.4 ft in RES: SILTY SAND

NCDOT BORE DOUBLE U5105\_GEO\_BORINGS.GPJ NC\_DOT.GDT 12/20/17

GEOTECHNICAL BORING REPORT  
BORE LOG

WBS 41903.1.1			TIP U-5105		COUNTY HENDERSON		GEOLOGIST Contract Geologist								
SITE DESCRIPTION NC 225 INTERSECTION IMPROVEMENTS FROM SR 1164 TO SR 1779							GROUND WTR (ft)								
BORING NO. B-9			STATION 15+26		OFFSET 7 ft LT		ALIGNMENT -Y2-		0 HR. Dry						
COLLAR ELEV. 2,124.3 ft			TOTAL DEPTH 10.0 ft		NORTHING 578,881		EASTING 972,385		24 HR. FIAD						
DRILL RIG/HAMMER EFF./DATE TRI8016 MOBILE B-57 90% 02/22/2016					DRILL METHOD H.S. Augers			HAMMER TYPE Automatic							
DRILLER Contract Driller			START DATE 07/28/16		COMP. DATE 07/28/16		SURFACE WATER DEPTH N/A								
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	L O G	SOIL AND ROCK DESCRIPTION	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)
2125														2,124.3	0.0
2120	2,123.3	1.0	1	WOH	1							M		2,124.3	
	2,120.8	3.5	1	2	3						SS-4	22%		2,121.3	3.0
	2,118.3	6.0	3	2	2							M		2,118.8	5.5
2115	2,115.8	8.5	2	1	2							W		2,114.3	10.0
														Boring Terminated at Elevation 2,114.3 ft in RES: SILTY SAND	

NCDOT BORE DOUBLE U5105\_GEO\_BORINGS.GPJ NC\_DOT.GDT 12/20/17

PROJECT: 41903

REFERENCE: U-5105


NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
DIVISION OF HIGHWAYS  
GEOTECHNICAL ENGINEERING UNIT  
**SUBSURFACE INVESTIGATION**  
APPENDIX B  
LABORATORY RESULTS

PROJECT REFERENCE NO.

U-5105

SHEET NO.

12

 12/20/17  
INITIALS DATE

AASHTO SOIL CLASSIFICATION AND GRADATION SHEET  
NC 225 INTERSECTION IMPROVEMENTS FROM SR 1164 TO SR 1779  
WBS NO.: 41903.1.1; TIP NO.: U-5105  
HENDERSON COUNTY, NORTH CAROLINA  
FALCON ENGINEERING, INC. PROJECT NO: G16011.00

BORING		SAMPLE	TOTAL SAMPLE			Atterberg Limit Test Results			Natural Moisture Content
AASHTO Classification			PERCENT PASSING						
STATION	OFFSET (FEET)	DEPTH (FEET)	#10	#40	#200	LL	PL	PI	%
B-1		BS-1	99	81	40	35	29	6	20.5
A-4									
17+30 -L-	41 ft LT	1.0-8.0							
B-2		SS-1	92	80	51	32	21	11	20.5
A-6									
18+89 -L-	40 ft LT	1.0-2.0							
B-3		SS-2	83	59	21	37	26	11	26.0
A-2-6									
21+76 -L-	28 ft RT	3.5-5.0							
B-4		SS-3	98	87	52	33	17	16	21.1
A-6									
22+32	24 ft RT	1.0-2.5							
B-5		BS-2	95	81	31	34	21	13	17.9
A-2-6									
17+99 -Y1-	30 ft RT	1.0-6.0							
B-9		SS-4	97	83	50	40	19	21	21.6
A-6									
15+26 -Y2-	7 ft LT	3.5-5.0							

SIGNATURE

*[Handwritten Signature]*

105-03-0803

Notes:      LL        =      Liquid Limit  
                 PL        =      Plastic Limit  
                 PI        =      Plasticity Index = LL-PL

PAVEMENT SECTION AND SUBGRADE CONDITION SUMMARY

NC 225 INTERSECTION IMPROVEMENTS FROM SR 1164 TO SR 1779

HENDERSON COUNTY, NORTH CAROLINA

WBS No.: 41903.1.1 ; TIP: U-5105

Falcon Project No.: G16011.00

TEST LOCATION			PAVEMENT SECTION THICKNESS (INCHES)			SUBGRADE	NOTES
STATION	OFFSET	LANE	HMA	AGGREGATE BASE	TOTAL	IN-SITU CBR	
17+32 -L-	CL	CENTER	10.00	8	18.00	7	Alligator cracking/distress evident in NB lane at apparent narrow widening location
24+00 -L-	5 ft LT	SOUTH	9.00	9	18.00	6	-
16+60 -Y1-	CL	NORTH	8.00	12	20.00	2	Evidence of previous subgrade improvements
17+45 -Y2-	CL	NORTH	5.00	10	15.00	6	-
REPRESENTATIVE AVERAGE			8.00	10	17.75	N/A	-





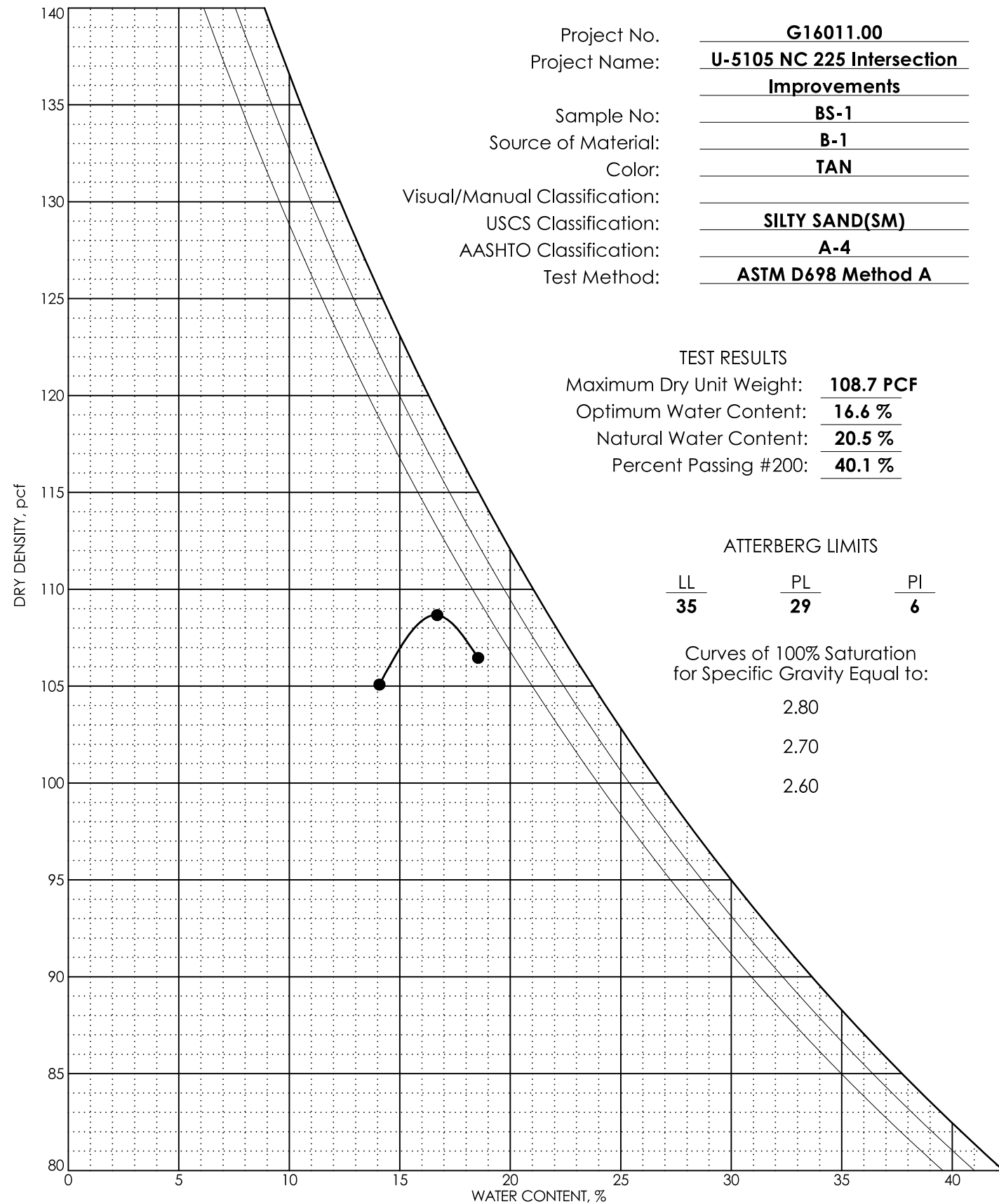
FALCON ENGINEERING, INC.  
1210 TRINITY ROAD, SUITE 110  
RALEIGH, NC 27607

PHONE: 919.871.0800  
FAX: 919.871.0803

## LABORATORY COMPACTION TEST RESULTS

9/2/2016

SHEET 15



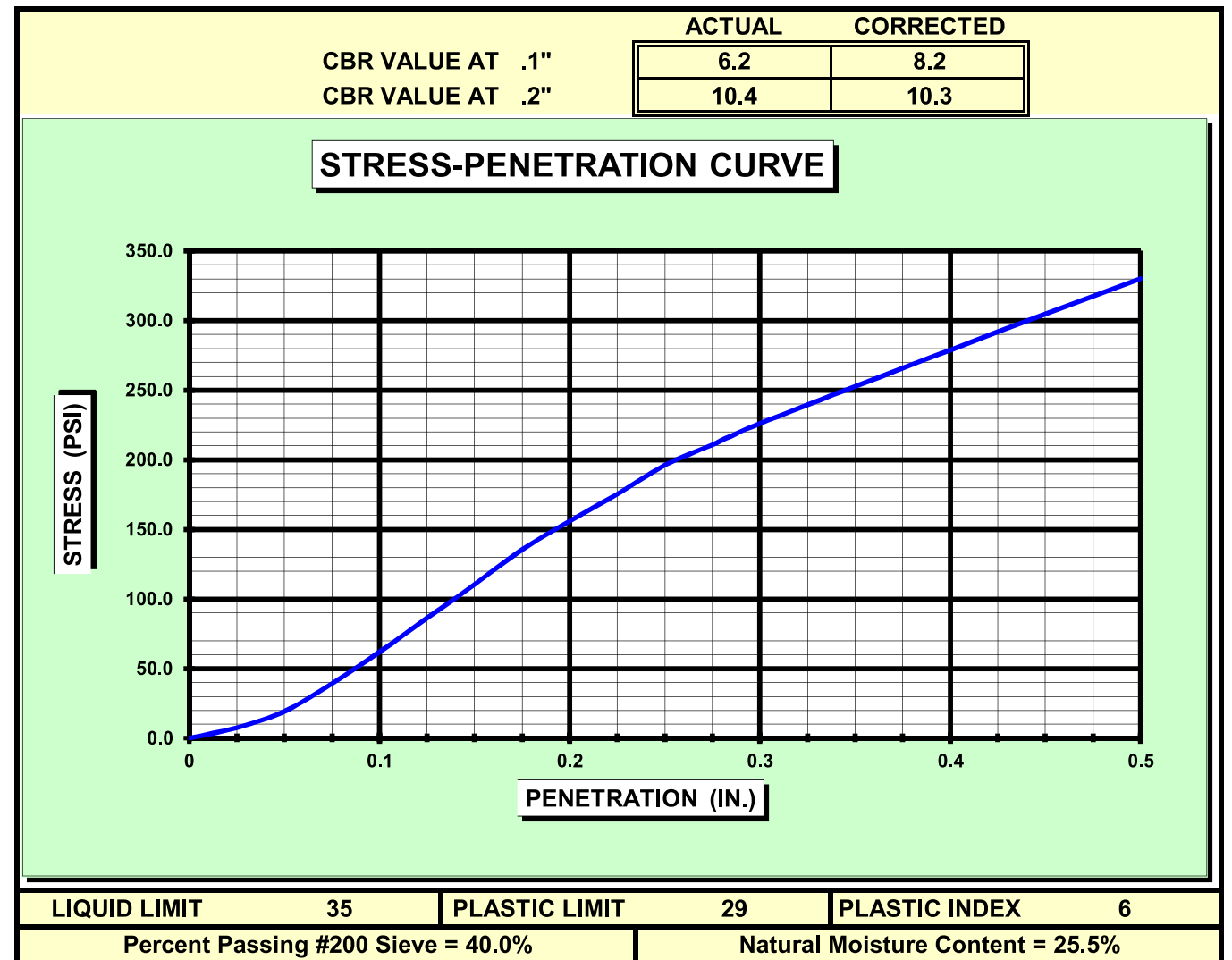
## FALCON ENGINEERING

1210 TRINITY RD., SUITE 110, RALEIGH, NC 27607

### CBR (CALIFORNIA BEARING RATIO) OF LABORATORY COMPACTED SOIL

AASHTO T-193 \ ASTM D-1883

PROJECT #:	G16011.00	DATE:	8/23/2016
PROJECT NAME:	U-5105 NC 225 Improvements		
BORING:	B-1	SAMPLE:	BS-1
DEPTH:	1-8'		
SOIL DESCRIPTION:	A-4		
COMPACTION METHOD	ASTM D698	SOAK	96 HRS.
MAXIMUM DRY DENSITY	109.1 PCF	STRAIN RATE	.05 IN / MIN.
OPTIMUM MOISTURE CONTENT	17.1%	LOAD CELL	2500lb
TEST DATA		SURCHARGE WEIGHT	10 lb.
DRY DENSITY	106.5 PCF	SURCHARGE PER SQUARE FOOT	51 lbs/sq.ft.
MOISTURE CONTENT	17.2%	FINAL MOISTURE CONTENT	22.7%
PERCENT COMPACTION	97.6%	SWELL	1.58%





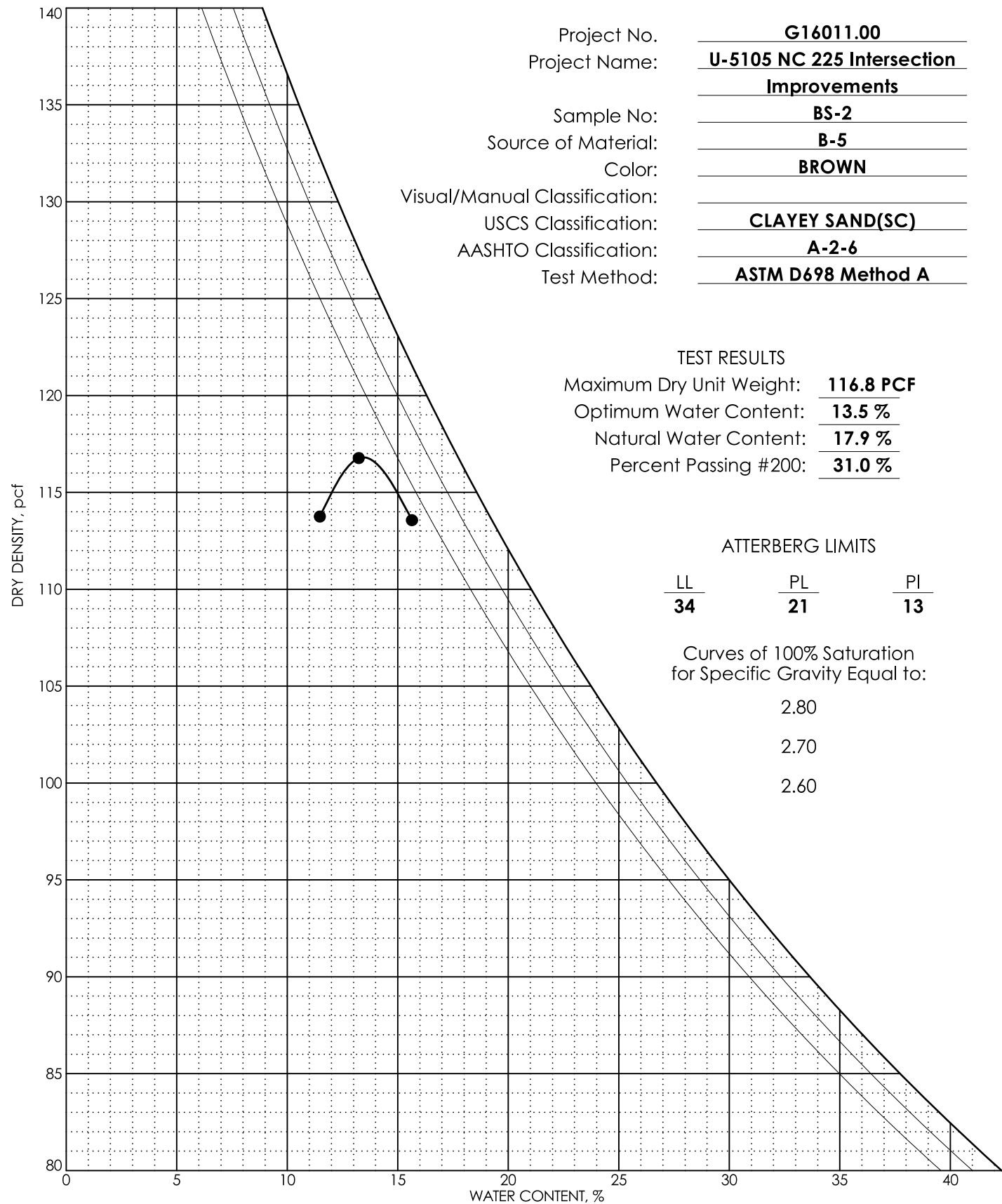
FALCON ENGINEERING, INC.  
1210 TRINITY ROAD, SUITE 110  
RALEIGH, NC 27607

PHONE: 919.871.0800  
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## LABORATORY COMPACTION TEST RESULTS

9/2/2016

SHEET 16



## FALCON ENGINEERING

1210 TRINITY RD., SUITE 110, RALEIGH, NC 27607

### CBR (CALIFORNIA BEARING RATIO) OF LABORATORY COMPACTED SOIL

AASHTO T-193 \ ASTM D-1883

PROJECT #:	G16011.00	DATE:	8/23/2016
PROJECT NAME:	U-5105 NC 225 Improvements		
BORING:	B-5	SAMPLE:	BS-2
DEPTH:	1-6'		
SOIL DESCRIPTION:	A-2-6		
COMPACTION METHOD	ASTM D698	SOAK	96 HRS.
MAXIMUM DRY DENSITY	109.1 PCF	STRAIN RATE	.05 IN / MIN.
OPTIMUM MOISTURE CONTENT	17.1%	LOAD CELL	2500lb
TEST DATA		SURCHARGE WEIGHT	10 lb.
DRY DENSITY	106.5 PCF	SURCHARGE PER SQUARE FOOT	51 lbs/sq.ft.
MOISTURE CONTENT	17.2%	FINAL MOISTURE CONTENT	22.7%
PERCENT COMPACTION	97.6%	SWELL	1.58%

