



March 6, 2023

Jason Lawing, PE
Kimley-Horn
200 South Tryon Street
Suite 200
Charlotte, NC 28202

Reference: **GEOTECHNICAL SUBSURFACE EXPLORATION AND FOUNDATION
DESIGN RECOMMENDATIONS REPORT-REVISED
Proposed Culverts for SR 2415 (Bailey Road) From Poole Place Drive to US 21
(Statesville Road) – Construct Roadway on New Location**
Mecklenburg County, North Carolina
State Project No. 48173.1.1
State TIP No. U-6105
ESP Project No. GV20.300

Dear Mr. Lawing:

ESP Associates, Inc. has completed the subsurface investigation for the above referenced project and submits the following report with subsurface data and geotechnical recommendations. Attached to this report is the NCDOT “Structure Subsurface Investigation” graphics report for the project culverts. The “Geotechnical Report-Roadway Inventory” and the “Geotechnical Report-Roadway Design and Construction Recommendations” have been submitted to Kimley-Horn separate from this report.

GEOTECHNICAL SUBSURFACE EXPLORATION

Project Description

This proposed project is located in Cornelius, North Carolina. The project begins at -L- Station 10+00.00, which is at the east side of US 21 (Statesville Road), and continues to -L- Station 34+66.65, which is approximately 644 feet east of the intersection of -L-, -Y2- (Existing Bailey Road), and -Y3- (Poole Place Drive). The total length of the project is approximately 0.469 mile. As part of the project on new location, the construction of two culverts is planned as follows:

- The construction of a concrete reinforced double-barrel box culvert with each barrel measuring 14 feet wide and 7 feet high for the Unnamed Tributary to Caldwell Station Creek that will be approximately 130 feet in length and will cross -L- at approximately Station 22+02.
- The construction of an approximately 80-foot-long, 10 feet by 10 feet reinforced concrete pedestrian box culvert crossing -L- at approximately Station 21+05 for the Caldwell Station Creek Greenway (-G1-) to cross under -L-.

Geology

The project corridor is located in the Kings Mountain Belt of the Piedmont physiographic province. “The Kings Mountain Belt includes metasedimentary sequences with interlayered quartzite, metaconglomerate, marble, and schists derived from both sedimentary and volcanic protoliths” (*The*

Geology of the Carolinas, Horton and Zullo, 1991). Rocks of the Kings Mountain Belt are intensely deformed, and it is dominated by steeply dipping units striking northeast to north-northeast. The age of the rocks are Paleozoic to late Proterozoic, and the deformation on the leading edge of the Carolina terrane as it collided with North America may be recorded in the deformation of the rocks in the Kings Mountain Belt. Coring of the bedrock was outside the scope of this project, but according to the Geologic Map of North Carolina, 1985, the rock underlying the project corridor consists of metamorphosed quartz diorite.

Soil Properties

Tributary to Caldwell Station Creek Culvert

Alluvial soils were encountered beginning at the existing ground surface in the soil test borings drilled in the vicinity of the proposed creek culvert. The alluvium extends to depths below the existing ground surface ranging from approximately 7 feet to approximately 18 feet which correspond to elevations ranging from approximately 711 feet to approximately 700 feet (MSL). The alluvium consists of soft, silty clay (A-7-5) and very loose to loose silty sand (A-2-4) and clayey sand (A-2-6). The moisture levels of the alluvial soils encountered were wet to saturated.

The residual soils were encountered underlying the alluvium in the vicinity of the proposed creek culvert. The residual soils consist of loose to very dense silty sand (A-2-4). The moisture levels of the residual soils encountered were moist to saturated.

Pedestrian Culvert for Caldwell Station Creek Greenway

Residual soils were encountered beginning at the existing ground surface in the vicinity of the proposed pedestrian culvert. The residual soils consist of soft to very stiff, silty clay (A-7-6) overlying loose to medium dense silty sand (A-2-4). The moisture levels of the residual soils encountered were moist to wet.

Rock Properties

Tributary to Caldwell Station Creek Culvert

Weathered rock was encountered underlying the residual soils in vicinity of the proposed creek culvert at depths below the existing ground surface ranging from approximately 29 feet to approximately 33 feet which correspond to elevations ranging from approximately 689 feet to approximately 685 feet (MSL). The weathered rock classifies as a Metamorphosed Quartz Diorite.

Crystalline rock was encountered underlying the weathered rock in the vicinity of the proposed creek culvert at depths below the existing ground surface ranging from approximately 33 feet to approximately 38 feet which correspond with elevations ranging from approximately 685 feet to approximately 680 feet (MSL). The crystalline rock classifies as a Metamorphosed Quartz Diorite.

Pedestrian Culvert for Caldwell Station Creek Greenway

Weathered rock was encountered underlying the residual soils in 2 of the 3 borings drilling in the vicinity of the proposed pedestrian culvert. The weathered rock was encountered at depths below the existing ground surface ranging from approximately 19 feet to approximately 26 feet which correspond to elevations ranging from approximately 704 feet to approximately 700 feet (MSL). The weathered rock classifies as a Metamorphosed Quartz Diorite.

Crystalline rock was encountered underlying the weathered rock in 2 of the borings drilled in the vicinity of the proposed pedestrian culvert. The crystalline rock was encountered at depths below the existing ground surface ranging from approximately 20 feet to approximately 26 feet which correspond with elevations ranging from approximately 703 feet to approximately 700 feet (MSL). The crystalline rock classifies as a Metamorphosed Quartz Diorite.

Ground Water Properties

Tributary to Caldwell Station Creek Culvert

Ground water data was collected in January 2022. Twenty-four-hour ground water depths in the vicinity of the proposed creek culvert ranged from approximately 1 foot to approximately 2 feet which correspond with elevations ranging from approximately 717 feet to approximately 716 feet (MSL).

Pedestrian Culvert for Caldwell Station Creek Greenway

Ground water data was collected in January 2022. Twenty-four-hour ground water depths in the vicinity of the proposed pedestrian culvert were approximately 8 feet which correspond with elevations ranging from approximately 718 feet to approximately 714 feet (MSL).

GEOTECHNICAL RECOMMENDATIONS

Slope and Embankment Stability and Settlement

Slope Designs

We generally recommend that all embankment slopes be constructed at a ratio of 2:1 (H:V) or flatter. Please verify that Roadside Environmental Unit addresses proper erosion control measures for the embankment slopes.

Rock Embankments (Creek Culvert)

Soft and/or wet to saturated alluvial material is present at the base of proposed embankment, within the flood plain area.

Standing water was not observed during the field investigation beyond the limits of the existing creek. If standing water is present in these areas at the time that construction will take place, then Rock Embankments in Water may be required to stabilize the embankment basal areas in order to provide a base for the placement of the new embankment fill.

Borrow Specifications

Borrow Criteria

Common borrow for embankment construction to subgrade shall meet Piedmont and Western Area specifications outlined in the NCDOT Standard Specifications, Article 1018-2(A).

Shrinkage Factor

A shrinkage factor of 15 percent is recommended for calculation of earthwork on this project.

Tributary to Caldwell Station Creek Culvert Foundations

Culvert Base Foundations Excavation

Based on the borings from our geotechnical subsurface exploration, we assume that the base of the culvert and associated wing walls will be founded on the existing near-surface soils stabilized with geotextile fabric and NCDOT No. 57 stone. The soil types that may be encountered in the excavation are soft, silty clay (A-7-5) and very loose to loose silty sand (A-2-4) and clayey sand (A-2-6). It should be expected that the existing near-surface soils will be saturated. We expect that the excavated slopes will have seeping water and that groundwater will be encountered above the bottom of excavations.

As required by OSHA, temporary spoil from the excavation must be placed at least 2 feet away from the surface edge of the excavation. This distance is measured from the edge of the spoil, not from its crown. ESP recommends that temporary spoil should be placed so that it channels rainwater and other runoff away from the excavation and also it does not fall into the excavation.

The culvert base foundations should be excavated approximately 2 feet below the planned bottom of culvert.

Surface water control is important during and after the excavation. ESP recommends that the Contractor take necessary steps to enhance surface flow and promote rapid clearing of rainfall and runoff water following rain events. In such event, plastic sheets may be placed for slope protection.

ESP expects that the water table will be encountered above the base of excavation. We recommend that the Contractor plan the suitable dewatering operations to ensure that the base of excavation remain dry throughout the construction operations.

ESP recommends that the Excavation Plan includes the plan and section view details to show the limits of the excavation. Provide the plan notes in accordance with the NCDOT 2018 Standard Specifications for Roads and Structures, Section 410: Foundation Excavation.

Culvert Base Foundations Construction

ESP recommends that following the excavation of the culvert and associated wing walls foundations, the basal area of the culvert be raised to the proposed base elevation using NCDOT No. 57 stone placed over geotextile stabilization fabric and in turn covered with Class A and Class B Riprap.

The following geotechnical notes should be placed on the structural plans for the proposed culvert extension:

BACKFILL WITH SELECT MATERIAL, CLASS VI MEETING THE REQUIREMENTS OF SECTION 1016 OF THE STANDARD SPECIFICATIONS.

CARRY IN FOOTINGS FOR THE REINFORCED BOX CULVERT AT STATION 22+02 -L- AT LEAST 12" INTO NCDOT NO 57 STONE WITH A MINIMUM THICKNESS AS SHOWN ON THE PLANS.

Pedestrian Culvert for Caldwell Station Creek Greenway Culvert Foundations**Culvert Base Foundations Excavation**

Based on the borings from our geotechnical subsurface exploration, we assume that the base of the culvert will be founded on the existing near-surface soils. The soil types that may be encountered in the excavation are soft to very stiff, silty clay (A-7-6) overlying loose to medium dense silty sand (A-2-4). Plasticity indexes within the tested A-7-6 material were 34 and 37. It should be expected that the existing near-surface soils will be moist near the existing ground surface becoming wet approaching the ground water table which is at approximately 4 to 8 feet below the proposed grade.

As required by OSHA, temporary spoil from the excavation must be placed at least 2 feet away from the surface edge of the excavation. This distance is measured from the edge of the spoil, not from its crown. ESP recommends that temporary spoil should be placed so that it channels rainwater and other runoff away from the excavation and also it does not fall into the excavation.

The culvert foundations should bear in the existing residual soils. If soft and/or saturated soils and/or otherwise unsatisfactory materials are encountered at the base of excavation, notify the Geotechnical Engineer for changes in dimensions or elevations of the foundation as necessary to secure a satisfactory foundation.

Surface water control is important during and after the excavation. ESP recommends that the Contractor take necessary steps to enhance surface flow and promote rapid clearing of rainfall and runoff water following rain events. In such event, plastic sheets may be placed for slope protection.

ESP does not expect that the water table will be encountered above the base of excavation. However, we do recommend that the Contractor plan suitable dewatering operations to ensure that the base of excavation remain dry throughout the construction operations should construction take place at a time when the water table is higher than that encountered during our subsurface exploration.

ESP recommends that the Excavation Plan includes the plan and section view details to show the limits of the excavation. Provide the plan notes in accordance with the NCDOT 2018 Standard Specifications for Roads and Structures, Section 410: Foundation Excavation.

Culvert Base Foundations Construction

ESP recommends that following the excavation of the culvert foundations, if needed, the basal area of the culvert be raised to the proposed base elevation using NCDOT No. 57 stone.

The following geotechnical notes should be placed on the structural plans for the proposed culvert extension:

BACKFILL WITH SELECT MATERIAL, CLASS VI MEETING THE REQUIREMENTS OF SECTION 1016 OF THE STANDARD SPECIFICATIONS.

CARRY IN FOOTINGS FOR THE REINFORCED BOX CULVERT AT STATION 21+05 -L- AT LEAST 12" INTO SUITABLE RESIDUAL SOIL WITH A MINIMUM THICKNESS AS SHOWN ON THE PLANS.

Prepared by,

Prepared by,



Matthew M. Lattin, PE
Senior Geotechnical Engineer



Paul M. Weaver, LG
Senior Geologist

Pablo Barrera Gonzalez, EI
Geotechnical Engineer

MML/PMW/PBG

Attachment: Structure Subsurface Investigation (Inventory Report)

PROJECT: 48173

REFERENCE: U-6105

CONTENTS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	LEGEND (SOIL & ROCK)
3	SITE PLAN
4-5	PROFILES
6-8	BORE LOGS
9	SOILS LABORATORY TESTS RESULTS
10-11	CONSOLIDATION & TRIAXIAL TEST RESULTS

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

STRUCTURE

SUBSURFACE INVESTIGATION

COUNTY MECKLENBURG

PROJECT DESCRIPTION SR 2415 (BAILEY ROAD) FROM

POOLE PLACE DRIVE TO US 21 (STATESVILLE

ROAD) – CONSTRUCT ROADWAY ON NEW LOCATION

SITE DESCRIPTION CULVERT OVER UNNAMED

TRIBUTARY TO CALDWELL STATION CREEK AT

-L- STATION 22+02

PEDESTRIAN TUNNEL 10’X10’ RCBC AT

-L- STATION 21+05.48

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-6105	1	

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 PERFORM INDEPENDENT SUBSURFACE INVESTIGATIONS AND MAKE INTERPRETATIONS AS NECESSARY TO CONFIRM CONDITIONS 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

P.M. WEAVER

C.R. PASTRANA

P. BARRERA

M.M. LATTIN

M.S. ULMER

CG2 Exploration, LLC

INVESTIGATED BY ESP Associates, Inc.

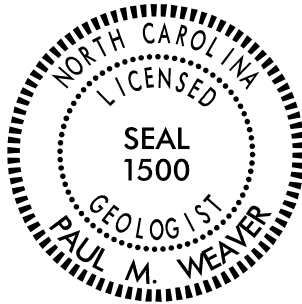
DRAWN BY C.R. PASTRANA

CHECKED BY P.M. WEAVER

SUBMITTED BY ESP Associates, Inc.

DATE March 2023

ESP ASSOCIATES, INC.
7011 ALBERT PICK RD
SUITE E
GREENSBORO, NC 27409
FIRM # C-0587
WWW.ESPASSOCIATES.COM



SIGNATUREDATE

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

[illegible]

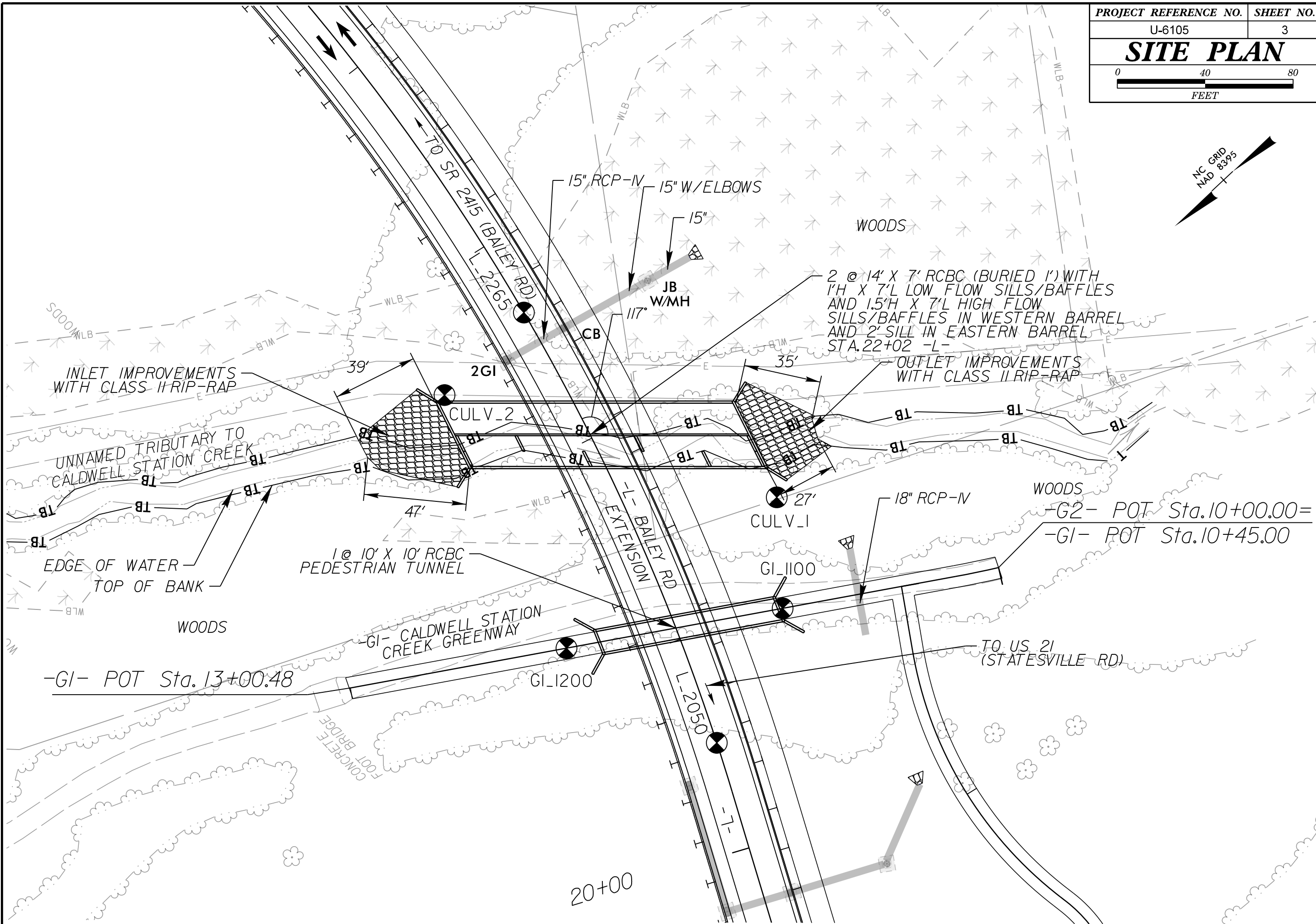
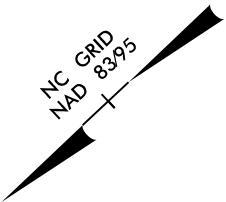
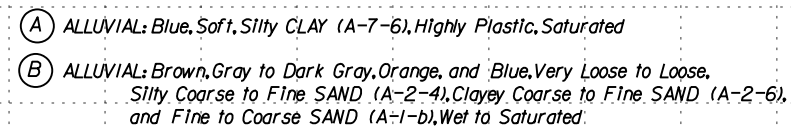


Diagram illustrating a beam of length 40 feet, divided into two equal segments of 20 feet each. The beam is labeled "FEET" and "VE = 1:1".

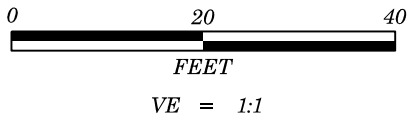
PROJECT REFERENCE NO.	SHEET NO.
U-6105	4
CULVERT OVER UNNAMED TRIBUTARY TO CALDWELL STATION CREEK -L- STA. 22+02 SKEW = 117°	



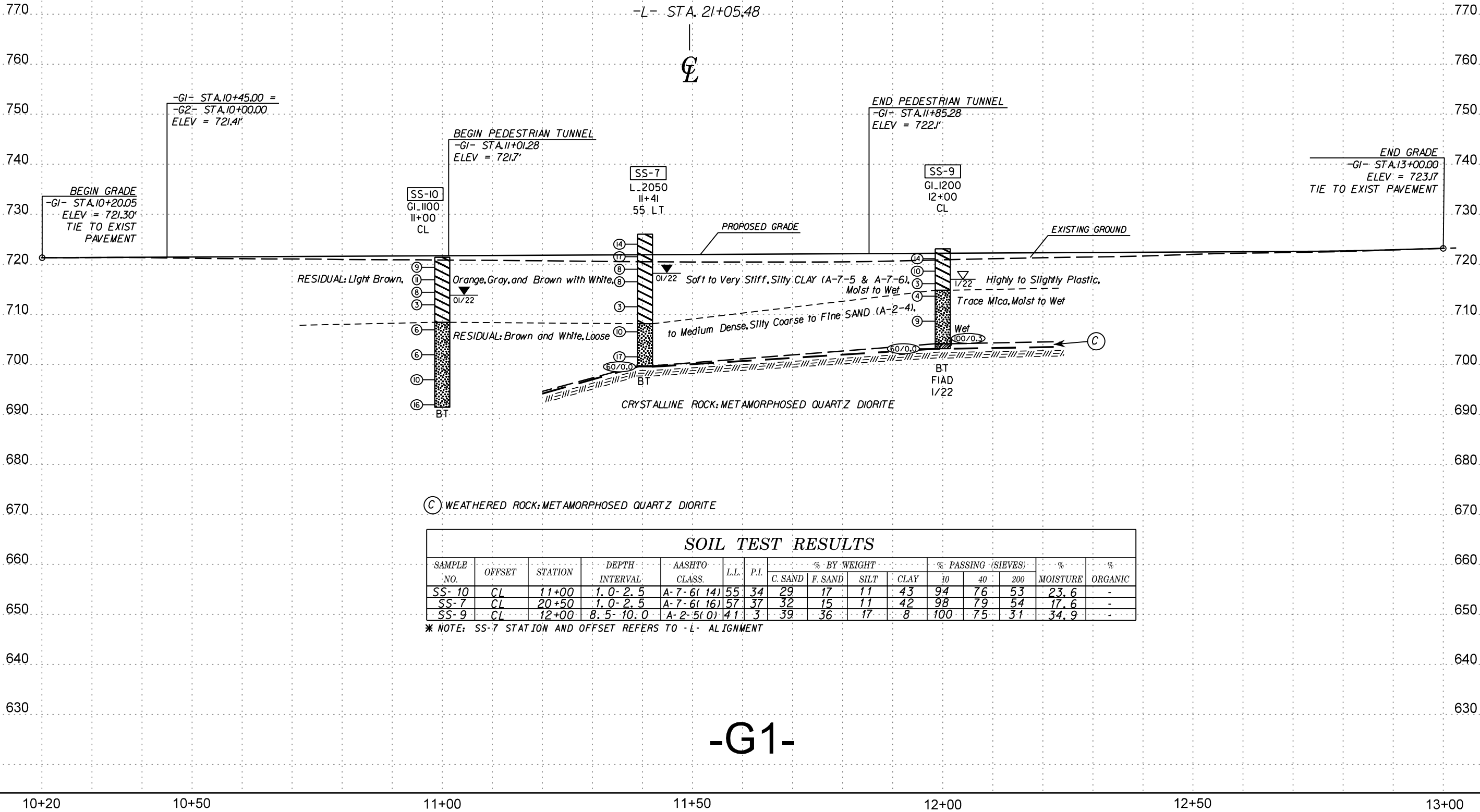
SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			%	%
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
ST- 2	65' RT	21+42	3.0- 5.0	A- 2- 4(0)	NP	NP	58	27	5	10	100	63	18	29.1	-
SS- 11	65' RT	21+42	1.0- 2.5	A- 2- 4(0)	37	10	47	22	15	16	100	69	34	21.0	-
SS- 12	65' RT	21+42	8.5- 10.0	A- 2- 4(0)	40	3	40	38	16	6	100	75	28	31.5	-
SS- 13	50' LT	22+50	1.0- 2.5	A- 2- 4(0)	22	2	60	22	6	12	100	60	20	24.1	-
ST- 1	50' LT	22+50	3.0- 5.0	A- 7- 6(27)	54	31	4	17	27	52	100	99	83	21.6	-
SS- 14	50' LT	22+50	8.5- 10.0	A- 1- b(0)	NP	NP	72	20	2	6	100	49	10	-	-
SS- 15	CI	22+65	3.5- 5.0	A- 2- 6(1)	33	16	52	18	10	20	100	64	32	30.8	-

130	120	110	100	90	80	70	60	50	40	30	20	10	0	10	20	30	40	50	60	70	80	90	100	110	120	130
-----	-----	-----	-----	----	----	----	----	----	----	----	----	----	---	----	----	----	----	----	----	----	----	----	-----	-----	-----	-----

- PROFILE TAKEN FROM "U-6105_rdy_wpfl.dgn" FILE PROVIDED BY KIMLEY-HORN ON 02/14/22



PROJECT REFERENCE NO.	SHEET NO.
U-6105	5
PEDESTRIAN TUNNEL 10'X10' RCBC -L- STA. 21+05.48 SKEW ±101°	



(C) WEATHERED ROCK: METAMORPHOSED QUARTZ DIORITE

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	LL	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-10	CL	11+00	1.0-2.5	A-7-6(14)	55	34	29	17	11	43	94	76	53	23.6	-
SS-7	CL	20+50	1.0-2.5	A-7-6(16)	57	37	32	15	11	42	98	79	54	17.6	-
SS-9	CL	12+00	8.5-10.0	A-2-5(0)	41	3	39	36	17	8	100	75	31	34.9	-

* NOTE: SS-7 STATION AND OFFSET REFERS TO -L- ALIGNMENT

-G1-

GEOTECHNICAL BORING REPORT




BORE LOG

WBS 48173.1.1			TIP U-6105			COUNTY MECKLENBURG			GEOLOGIST Gonzales, P.B.						
SITE DESCRIPTION SR 2415 (Bailey Rd) from Poole Place Dr to US 21 Statesville Rd - Construct Roadway on New Location										GROUND WTR (ft)					
BORING NO. L_2050			STATION 20+50			OFFSET CL			ALIGNMENT -L-			0 HR. 8.3			
COLLAR ELEV. 726.0 ft			TOTAL DEPTH 26.5 ft			NORTHING 625,320			EASTING 1,444,937			24 HR. 7.8			
DRILL RIG/HAMMER EFF./DATE CG20446 Diedrich D50 76% 06/14/2021						DRILL METHOD H.S. Augers				HAMMER TYPE Automatic					
DRILLER Odom, C.			START DATE 01/07/22			COMP. DATE 01/07/22			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	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)
730															
725	725.0	1.0	5	6	8									726.0	GROUND SURFACE 0.0
720	722.5	3.5	4	6	11						SS-7	18%	M	RESIDUAL Light Brown, Orange, Gray, and Brown, Silty CLAY, Highly to Slightly Plastic	
	720.0	6.0	2	4	4										
715	717.5	8.5	3	4	4								W		
	712.5	13.5	2	1	2								W		
710	707.5	18.5	3	4	6								M	708.1	17.9
705	702.5	23.5	5	6	11								M	Brown with White, Silty Coarse to Fine SAND, Trace Mica	
700	699.5	26.5	60/0.0			60/0.0									699.7
														699.5	26.5
WEATHERED ROCK METAMORPHOSED QUARTZ DIORITE Boring Terminated with Standard Penetration Test Refusal at Elevation 699.5 ft on Crystalline Rock: METAMORPHOSED QUARTZ DIORITE															

[illegible]

NC DOT BORE DOUBLE U6105_GINT_LOGS.GPJ NC_DOT.GDT 3/12/22

NC DOT BORE DOUBLE U6105_GINT_LOGS.GPJ NC_DOT.GDT 3/12/22

WBS		48173.1.1		TIP		U-6105		COUNTY		MECKLENBURG		GEOLOGIST		Gonzales, P.B.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
SITE DESCRIPTION													SR 2415 (Bailey Rd) from Poole Place Dr to US 21 Statesville Rd - Construct Roadway on New Location			GROUND WTR (ft)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
BORING NO.		G1_1200		STATION		12+00		OFFSET		CL		ALIGNMENT		-G1-		0 HR.	6.1																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
COLLAR ELEV.		723.1 ft		TOTAL DEPTH		20.0 ft		NORTHING		625,340		EASTING		1,445,015		24 HR.	FIAD																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
DRILL RIG/HAMMER EFF./DATE								CG20446 Diedrich D50 76% 06/14/2021				DRILL METHOD				H.S. Augers		HAMMER TYPE		Automatic																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
DRILLER				Odom, C.				START DATE				01/07/22		COMP. DATE				01/07/22		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																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
			0.5ft	0.5ft	0.5ft	0	25	50	75	100																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
725														723.1 GROUND SURFACE 0.0																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
	722.1	1.0		3	6	8																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
720	719.6	3.5		5	5	5							M		RESIDUAL Orange and Brown with White, Silty CLAY, Highly to Slightly Plastic																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
	717.1	6.0		2	1	2							M W																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
715	714.6	8.5		1	2	2							SS-9	35%		714.8 8.3 Brown with White, Silty Coarse to Fine SAND, Trace Mica																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
	709.6	13.5		2	4	5								W																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
710	704.6	18.5		7	100/0.3											704.1 19.0 703.1 20.0 WEATHERED ROCK METAMORPHOSED QUARTZ DIORITE Boring Terminated with Standard Penetration Test Refusal at Elevation 703.1 ft on Crystalline Rock: METAMORPHOSED QUARTZ DIORITE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
705	703.1	20.0																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
			60/0.0																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									

SOILS LABORATORY TESTS RESULTS

WBS NO.: 48173.1.1

TIP NO.: U-6105

COUNTY: Mecklenburg

SITE DESCRIPTION: SR 2415 (Bailey Road) From Poole Place Drive to US 21 (Statesville Road) - Construct Roadway on New Location

BORING	SAMPLE	BORING	DEPTH	AASHTO	N	L.L	P.I.	% BY WEIGHT				% PASSING SIEVES			%	%
NO.	NO.	LOCATION	INTERVAL (FT)	CLASS				CSE. SAND	F. SAND	SILT	CLAY	10	40	200	MOISTURE	ORGANIC
L_2050	SS-7	-L- STA. 20+50, CL	1.0-2.5	A-7-6 (16)	14	57	37	32	15	11	42	98	79	54	17.6	-
G1_1200	SS-9	-G1- STA. 12+00, CL	8.5-10.0	A-2-5 (0)	4	41	3	39	36	17	8	100	75	31	34.9	-
G1_1100	SS-10	-G1- STA. 11+00, CL	1.0-2.5	A-7-6 (14)	9	55	34	29	17	11	43	94	76	53	23.6	-
CULV-1	ST-2	-L- STA. 21+42, 65' RT	3.0-5.0	A-2-4 (0)	2	NP	NP	58	27	5	10	100	63	18	29.1	-
CULV-1	SS-11	-L- STA. 21+42, 65' RT	1.0-2.5	A-2-4 (0)	8	37	10	47	22	15	16	100	69	34	21.0	-
CULV-1	SS-12	-L- STA. 21+42, 65' RT	8.5-10.0	A-2-4 (0)	6	40	3	40	38	16	6	100	75	28	31.5	-
CULV-2	SS-13	-L- STA. 22+50, 50' LT	1.0-2.5	A-2-4 (0)	4	22	2	60	22	6	12	100	60	20	24.1	-
CULV-2	ST-1	-L- STA. 22+50, 50' LT	3.0-5.0	A-7-6 (27)	3	54	31	4	17	27	52	100	99	83	21.6	-
CULV-2	SS-14	-L- STA. 22+50, 50' LT	8.5-10.0	A-1-b (0)	3	NP	NP	72	20	2	6	100	49	10	-	-
L_2265	SS-15	-L- STA. 22+65, CL	3.5-5.0	A-2-6 (1)	2	33	16	52	18	10	20	100	64	32	30.8	-

Certification No. 121-01-1108

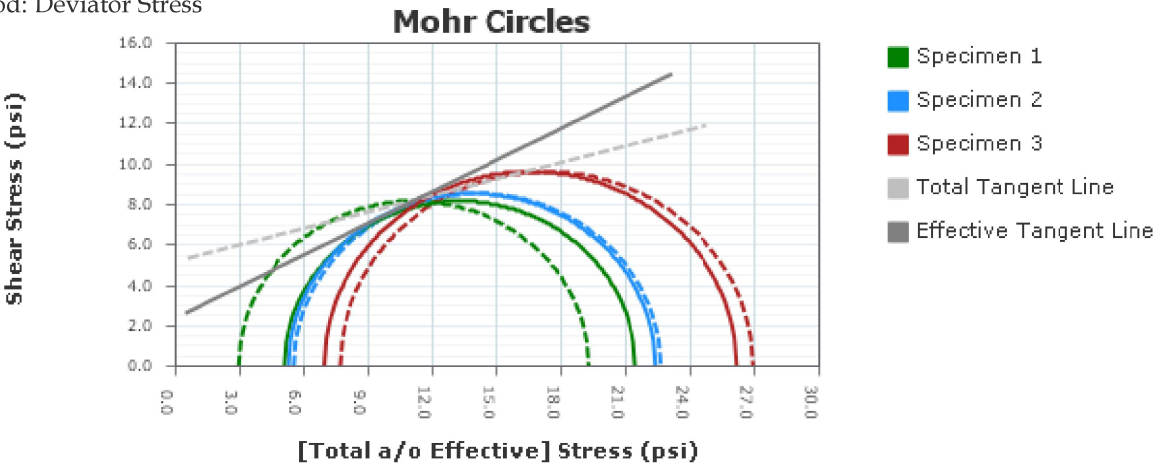


ESP Associates Inc.
3475 Lakemont Boulevard
Fort Mill, South Carolina 29708
803-802-2440

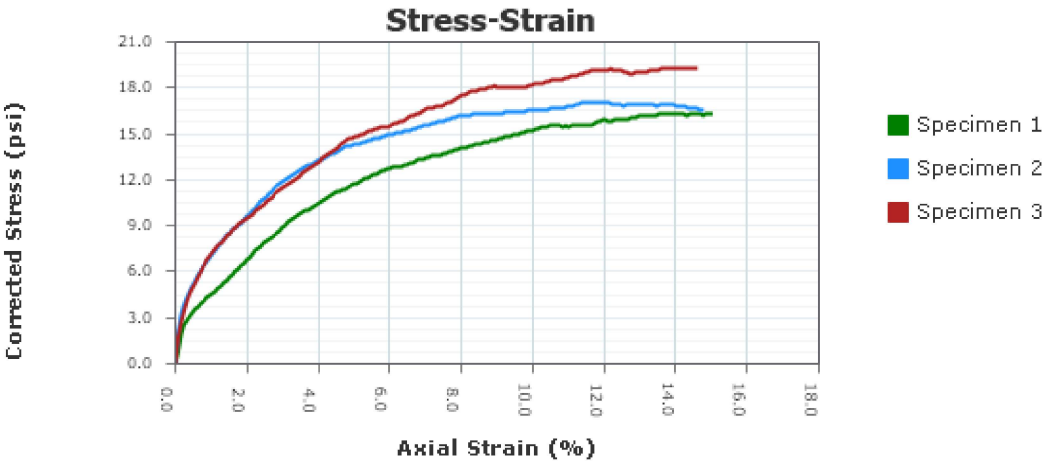
Consolidated Undrained Test

AASHTO T-297

Calculation Method: Deviator Stress



Total Strength Intercept (psi):	5.2	Effective Strength Intercept (psi):	2.4
Total Friction Angle (°):	15.2	Effective Friction Angle (°):	27.6



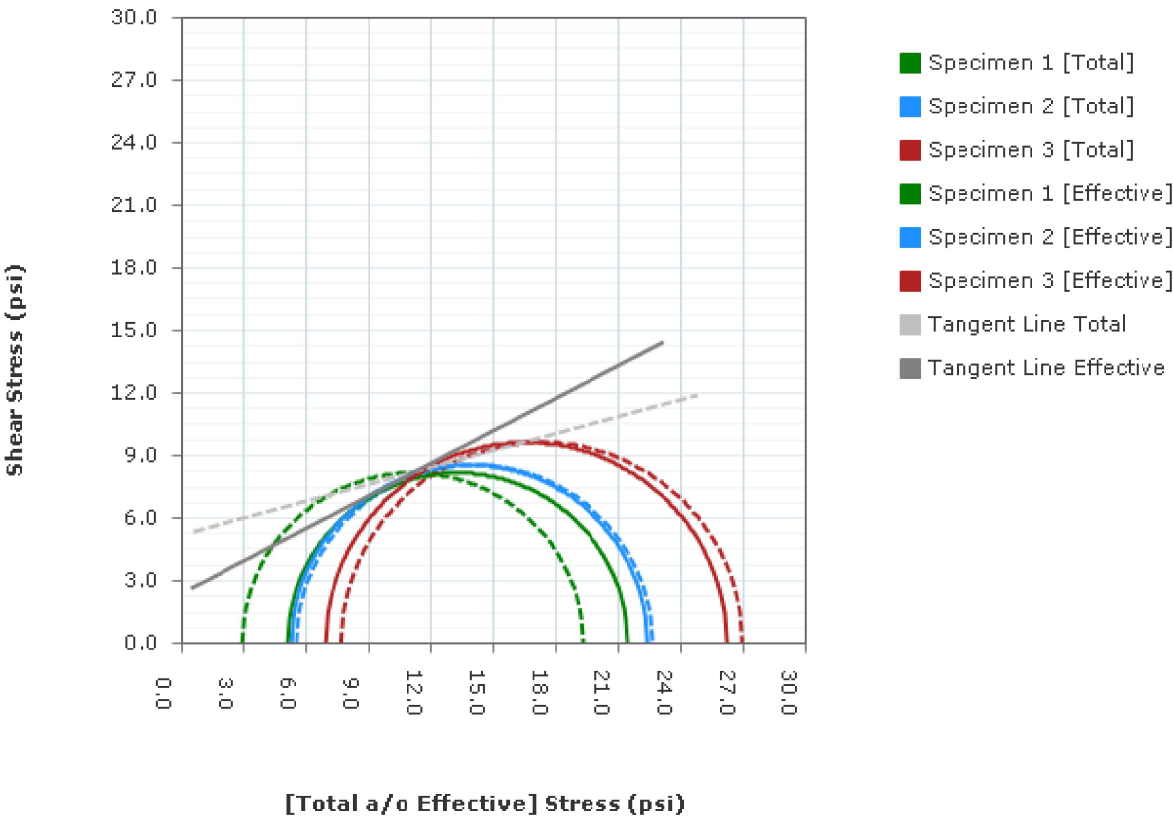
After Shear		Specimen Number							
		1	2	3	4	5	6	7	8
σ'1 at Failure (psi)		21.4	22.4	26.2					
σ'3 at Failure (psi)		5.1	5.3	6.9					
Project:	U-6105								
Project Number:	GV20.300								
Sampling Date:	1/14/2022								
Sample Number:	ST-3								
Sample Depth:	6-8 ft								
Location:	L-1050 ST-3 (6-8 ft)								
Remarks:	Shelby Tube								



ESP Associates Inc.
3475 Lakemont Boulevard
Fort Mill, South Carolina 29708
803-802-2440

Graph - Mohr Circle

AASHTO T-297



Tangent Line Results		
	TOTAL	EFFECTIVE
Strength Intercept (psi)	5.2	2.4
Friction Angle (°)	15.188	27.577
Calculation Method: Deviator Stress		