



**CULVERT FOUNDATION RECOMMENDATIONS REPORT (REV. 1)
REPLACEMENT OF BRIDGE 890204 WITH
PRECAST REINFORCED THREE-SIDED CULVERT ON SR 1158
(CORINTH CHURCH ROAD) OVER BEAVER DAM CREEK**

**WBS No.: 17BP.10.R.4
Tip No.: NA
County: UNION**

Prepared by:

**AMEC Environment and Infrastructure, Inc.
4021 Stirrup Creek Drive, Suite 100
Durham, North Carolina 27703
(Project No. 6469-12-1040)**

Prepared for:

NCDOT

June 27, 2012



June 27, 2012

Mr. Joel Gregory Jones, P.E.
Division Bridge Program Manager
NCDOT Division 10 Office
716 W. Main Street
Albemarle, North Carolina 28001

Attention: Mr. Joel Gregory Jones, P.E.:

Subject: **Culvert Foundation Recommendation Report (Rev. 1)
Replacement of Bridge 890204 with
Precast Reinforced Three-Sided Culvert on SR 1158
(Corinth Church Road) Over Beaver Dam Creek
WBS No.: 17BP.10.R.4
TIP No.: NA
Federal Aid No.: NA
County: Union
AMEC Project Number: 6469-12-1040**

Dear Mr. Jones:


AMEC Environment and Infrastructure, Inc. (AMEC) is pleased to transmit the attached Culvert Foundation Recommendations Report associated with the Replacement of Bridge No. 890204 on SR 1158 (Corinth Church Road) over Beaver Dam Creek. The Structure Subsurface Investigation Report provided by NCDOT and the additional Structure Subsurface Exploration Report performed by AMEC are provided in the Appendix.


This Foundation Recommendations Report has been prepared using boring data obtained by AMEC and others. The recommendations for the Three-Sided Culvert are based upon AASHTO LRFD bridge design procedures as required by the NCDOT.

If you have any questions regarding recommendations contained in this report, please contact us at 919-381-9900.

Sincerely,

AMEC Environment and Infrastructure, INC.


J. Shane Johnson, P.E., P.G.
Senior Geotechnical Engineer
Registered, North Carolina 037422


Gary R. Taylor, P.E.
Geotechnical Department Manager
Registered, North Carolina 18580

Correspondence:
AMEC Environment & Infrastructure, Inc.
4021 Stirrup Creek Drive, Suite 100
Durham, North Carolina 27703
Tel (919) 381-9900
Fax (919) 381-9901
License: NC Engineering F-1253 NC Geology C-247

CULVERT FOUNDATION RECOMMENDATIONS

STATE NO. 17BP.10.R.4 DESCRIPTION Precast Reinforced Concrete Three-Sided Culvert on SR 1158
 T.L.P. NO. NA (Corinth Church Road) Over Beaver Dam Creek
 COUNTY Union
 STATION 15+02.44 -L-

	INITIALS	DATE
DESIGN	JSJ	6/6/2012
CHECK		
APPROVAL		

**N.C. DEPT. OF TRANSPORTATION
 DIVISION OF HIGHWAYS
 GEOTECHNICAL ENG. UNIT-WRO**

- ACCEPTED
- ACCEPTED AS NOTED
- RETURNED FOR CORRECTIONS
- SEE LETTER

BY: Dean Hardister, PE

DATE: 06/20/2012



BENT	STATION	FOUNDATION TYPE	FACTORED RESISTANCE	MISCELLANEOUS DETAILS
END BENT 1	14+84.85 -L-	Spread Footings	4 TSF	Bottom of Footing Elevation = 583 feet
END BENT 2	15+20.01 -L-	Spread Footings	4 TSF	Bottom of Footing Elevation = 583 feet

FOUNDATION RECOMMENDATION NOTES ON PLANS

1. THE SCOUR CRITICAL ELEVATION ~~FOR END BENT NO. 1 AND END BENT NO. 2~~ IS THE BOTTOM OF FOOTING ELEVATION. SCOUR CRITICAL ELEVATIONS ARE USED TO MONITOR POSSIBLE SCOUR PROBLEMS DURING THE LIFE OF THE STRUCTURE.
2. THE SPREAD FOOTINGS ~~AT END BENT NO. 1 AND END BENT NO. 2~~ ARE DESIGNED FOR A FACTORED RESISTANCE OF 4 TSF. CHECK FIELD CONDITIONS FOR THE REQUIRED RESISTANCE OF 9 TSF JUST BEFORE PLACING CONCRETE.
3. KEY IN SPREAD FOOTINGS ~~AT END BENT NO. 1 AND END BENT NO. 2~~ AT LEAST 12 INCHES INTO WEATHERED ROCK OR ~~NON-CRYSTALLINE~~ ROCK WITH MINIMUM THICKNESS AS SHOWN ON THE PLANS.

FOUNDATION RECOMMENDATION COMMENTS

1. THE BOTTOM OF THE FOOTING ELEVATIONS MAY BE LOWERED IN ORDER TO SATISFY THE REQUIRED BEARING RESISTANCE AND MINIMUM ROCK EMBEDMENT REQUIREMENTS

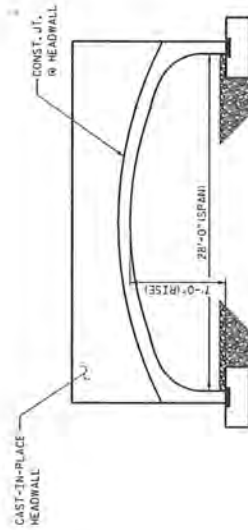
APPENDIX

PROVIDED INFORMATION

BM BL-1, N. 441855.517, E. 1518191.485, EL. 594.43, STA. 14+67.50, 15+49 LT.



LOCATION SKETCH



ARCH. SECTION

RIGHT ANGLE SECTION OF PRECAST CONCRETE THREE-SIDED CULVERT

HYDRAULIC DATA

- DESIGN DISCHARGE : 746 CFS
- FREQUENCY OF DESIGN FLOOD : 25 YRS.
- DESIGN HIGH WATER ELEVATION : 594.8
- DRAINAGE AREA : 1.72 SQ. MI.
- BASIC DISCHARGE (1000) : 1070 CFS
- BASIC HIGH WATER ELEVATION : 595.7

OVERTOPPING FLOOD DATA

- FREQUENCY OF DISCHARGE : 1070 CFS
- FREQUENCY OF OVERTOPPING FLOOD : 100 YRS.
- OVERTOPPING FLOOD ELEVATION : 595.7

GRADE DATA

- GRADE POINT ELEVATION : 595.39
- @ STA. 15+02.44 -L-
- BED ELEVATION @ : XX
- STA. 15+02.44 -L-
- ROADWAY SLOPES : 2:1

NOTES:

- ASSUMED LIVE LOAD HL93 OR ALTERNATE LOADING.
- REPLACES BRIDGE NO. 890204
- MAXIMUM DESIGN FILL "X"
- MINIMUM DESIGN FILL "O"
- FOR CULVERT DIVERSION DETAILS AND PAY ITEM, SEE EROSION CONTROL PLANS.
- A 3 FOOT STRIP OF FILTER FABRIC SHALL BE ATTACHED TO THE FILL FACE OF THE WING COVERING THE ENTIRE LENGTH OF THE EXPANSION JOINT.
- THE REQUIRED BEARING CAPACITY OF THE STRIP FOOTINGS IS XX TSP. THE REQUIRED BEARING CAPACITY SHALL BE VERIFIED.
- KEY FOOTINGS FOR THE THREE-SIDED CULVERT AT STATION 15+02.44 -L- AT LEAST 12 INCHES INTO THE ROCK WITH A MINIMUM THICKNESS AS SHOWN ON THE PRECAST REINFORCED CONCRETE THREE-SIDED CULVERT PLANS.
- TO PROVIDE PROTECTION FROM POSSIBLE SCOUR, THE FOOTINGS SHALL NOT BE CONSTRUCTED AT AN ELEVATION HIGHER THAN SHOWN ON THE PLANS.
- SCOUR PROTECTION SHALL BE REQUIRED. RIP RAP NOT TO BE PLACED ABOVE THE STREAMBED.
- THE SCOUR CRITICAL ELEVATION IS THE AS BUILT BOTTOM OF FOOTING ELEVATION. THE SCOUR CRITICAL ELEVATIONS ARE FOR USE BY MAINTENANCE FORCES TO MONITOR POSSIBLE SCOUR PROBLEMS DURING THE LIFE OF THE STRUCTURE.
- THE BOTTOM OF THE FOOTING ELEVATIONS MAY BE LOWERED IN ORDER TO SATISFY BEARING CAPACITY AND MINIMUM ROCK EMBEDMENT REQUIREMENTS.
- THIS STRUCTURE HAS BEEN DESIGNED IN ACCORDANCE WITH HEC 18 EVALUATION SCOUR AT BRIDGES, MAY 2001.
- FOR PRECAST REINFORCED CONCRETE THREE SIDED CULVERT, SEE SPECIAL PROVISIONS.
- THE EXISTING STRUCTURE CONSISTING OF A 20'-11" LONG SINGLE SPAN 19'-2" CLEAR ROADWAY WIDTH WITH A TIMBER JOIST SUPPORTED TIMBER DECK ON TEN ABUTMENTS WITH CONCRETE SILL, BULKHEADS AND CONCRETE SILLS AT THE PROPOSED STRUCTURE SITE, SHALL BE REMOVED.
- REMOVAL OF THE EXISTING BRIDGE SHALL BE PERFORMED SO AS NOT TO ALLOW DEBRIS TO FALL INTO THE WATER. THE CONTRACTOR SHALL REMOVE THE BRIDGE AND SUBMIT TO AN EROSION DEMOLITION IN ACCORDANCE WITH ARTICLE 402-2 OF THE STANDARD SPECIFICATION.
- FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.
- FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.
- FOR EROSION CONTROL MEASURES, SEE EROSION CONTROL PLANS.
- FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.
- FOR EROSION CONTROL MEASURES, SEE EROSION CONTROL PLANS.
- THE CONTRACTOR SHALL PROVIDE INDEPENDENT ASSURANCE SAMPLES OF REINFORCING STEEL AS SAMPLES FOR EACH BAR SIZE AND FOR EACH BAR USED FOR PROTECTIVE COATING. REINFORCING STEEL, TWO 30 INCH SAMPLES OF EACH SIZE BAR USED, THE BARS FROM WHICH THE SAMPLES ARE TAKEN MUST THEN BE SPLICED WITH REPLACEMENT BARS OF THE SAME SIZE AND LENGTH OF THE SAMPLE. REINFORCING STEEL SHALL BE CONSIDERED INCIDENTAL TO VARIOUS PAY ITEMS.
- THE CAST-IN-PLACE HEADWALL/BARRIER RAILS SHALL BE DESIGNED FOR THE 45RH LRFD TEST LEVEL 2 (11-2) CRASH TEST CRITERIA.
- ALL REINFORCING STEEL FOR THE HEADWALL/BARRIER RAILS SHALL BE EPOXY COATED.
- CONCRETE USED FOR THE HEADWALL/BARRIER RAILS SHALL MEET THE MINIMUM REQUIREMENTS OF CLASS AA CONCRETE.

TOTAL STRUCTURE QUANTITIES	
REMOVAL OF EXISTING STRUCTURE	LUMP SUM
PRECAST REINFORCED CONCRETE THREE-SIDED CULVERT @ STA. 15+02.44 -L-	LUMP SUM
CLASS A CONCRETE	XX.X CU. YDS.
PLAIN RIP RAP	XX TONS
CLASS J	

PROJECT NO. _____ COUNTY _____
 UNION _____
 STATION: 15+02.44 -L-
 SHEET 1 OF 3

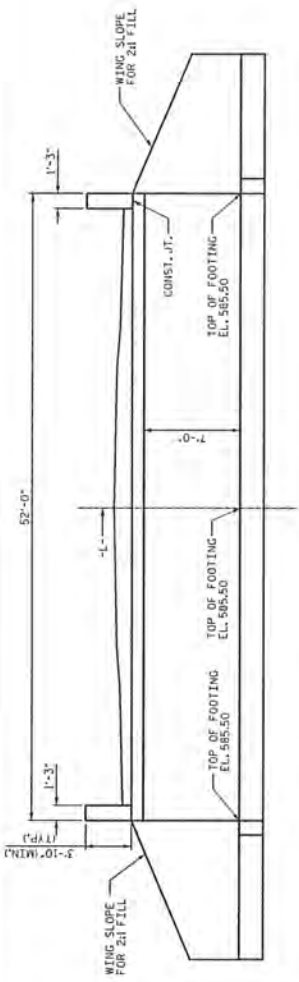
STATE OF MISSOURI
 DEPARTMENT OF TRANSPORTATION
 GENERAL DRAWING
 PRECAST REINFORCED CONCRETE
 THREE-SIDED CULVERT
 SR 1158 (CORINTH CHURCH ROAD)
 OVER BEAVER DAM CREEK
 120° SKEW

DATE	BY	CHECKED	DATE

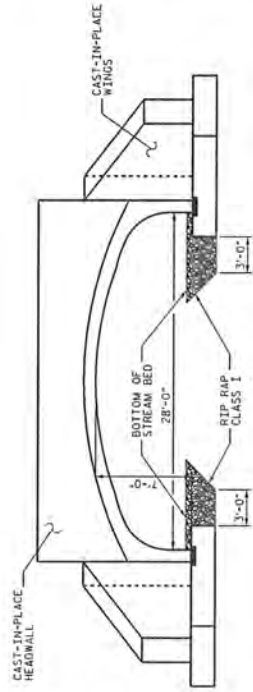
RESISTANCE

NO.	DATE	BY	DATE

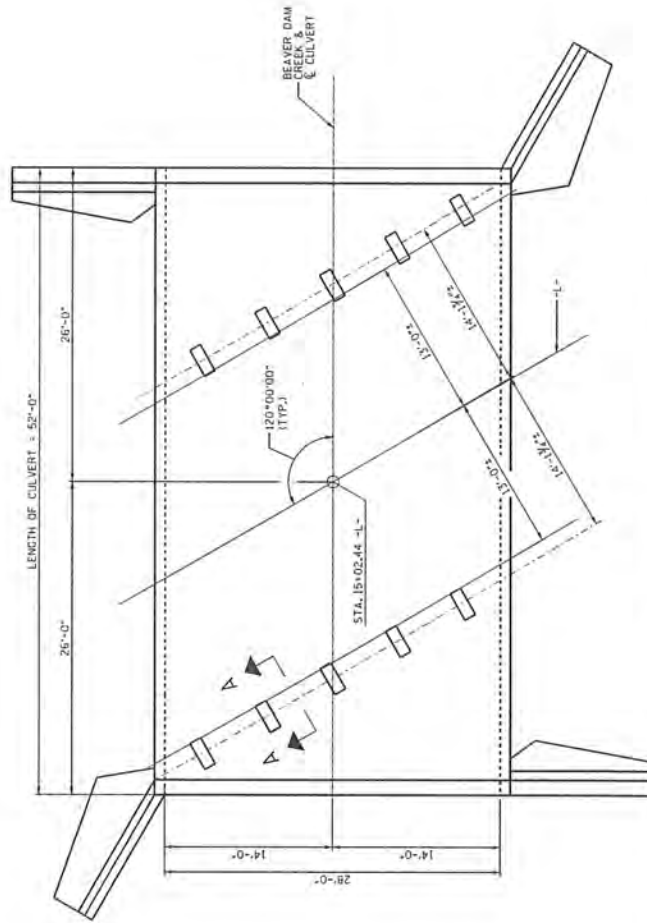
SHEET NO. 5874



CULVERT SECTION NORMAL TO ROADWAY



END ELEVATION



LENGTH FOR PRECAST THREE-SIDED CULVERT

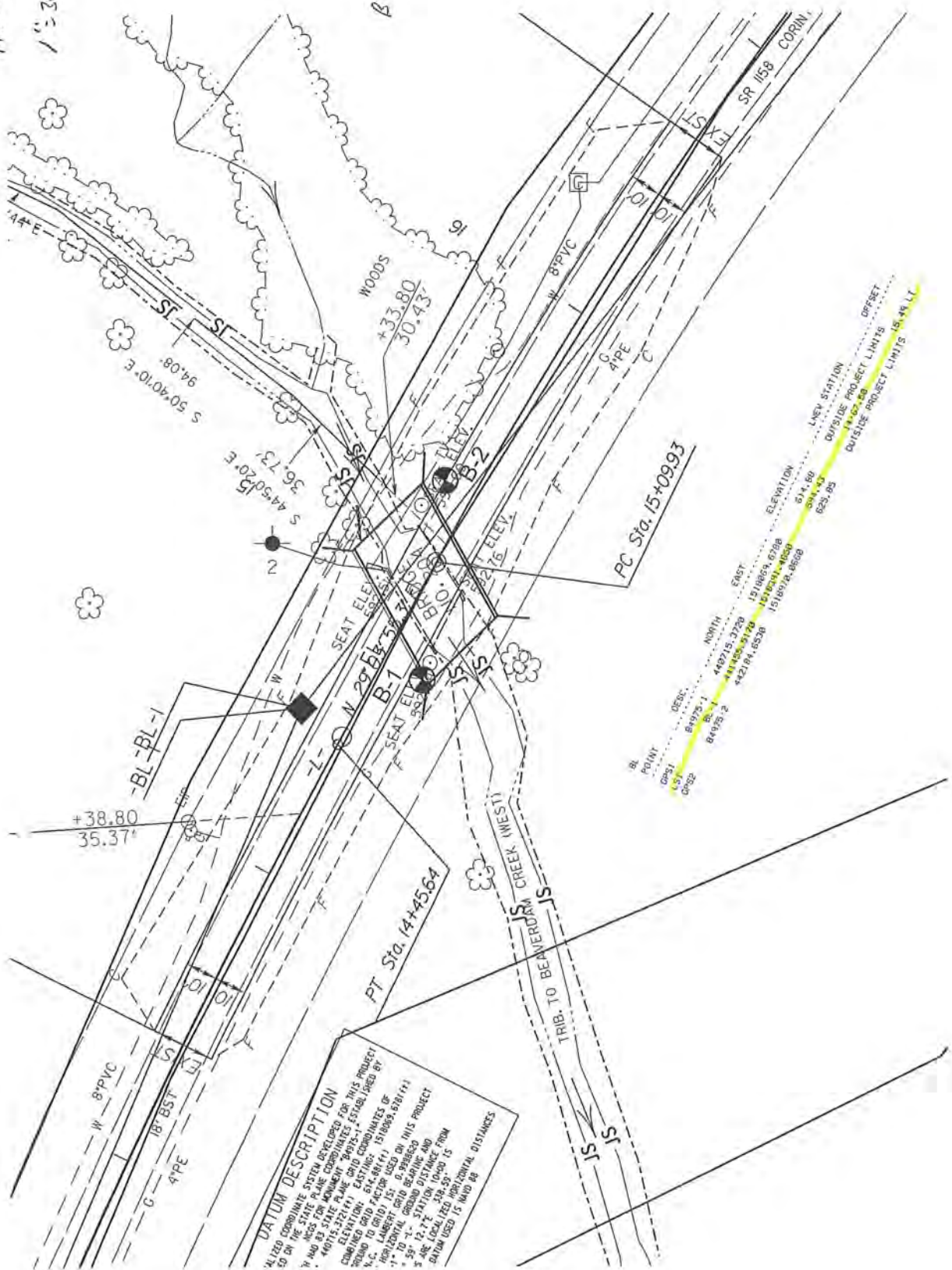
PROJECT NO. _____
 UNION _____ COUNTY _____
 STATION: 15+02.44 -1-
 SHEET 2 OF 3

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 PLAN, SECTION & ELEVATION
 PRECAST REINFORCED CONCRETE
 THREE-SIDED CULVERT
 SR 1158 (GORINTH CHURCH ROAD)
 OVER BEAVER DAM CREEK
 120° SKEW

NO.	BY	DATE	REV.	DATE	REVISIONS
1			1		
2			2		
3			3		
4			4		

DRAWN BY _____ DATE _____
 CHECKED BY _____ DATE _____

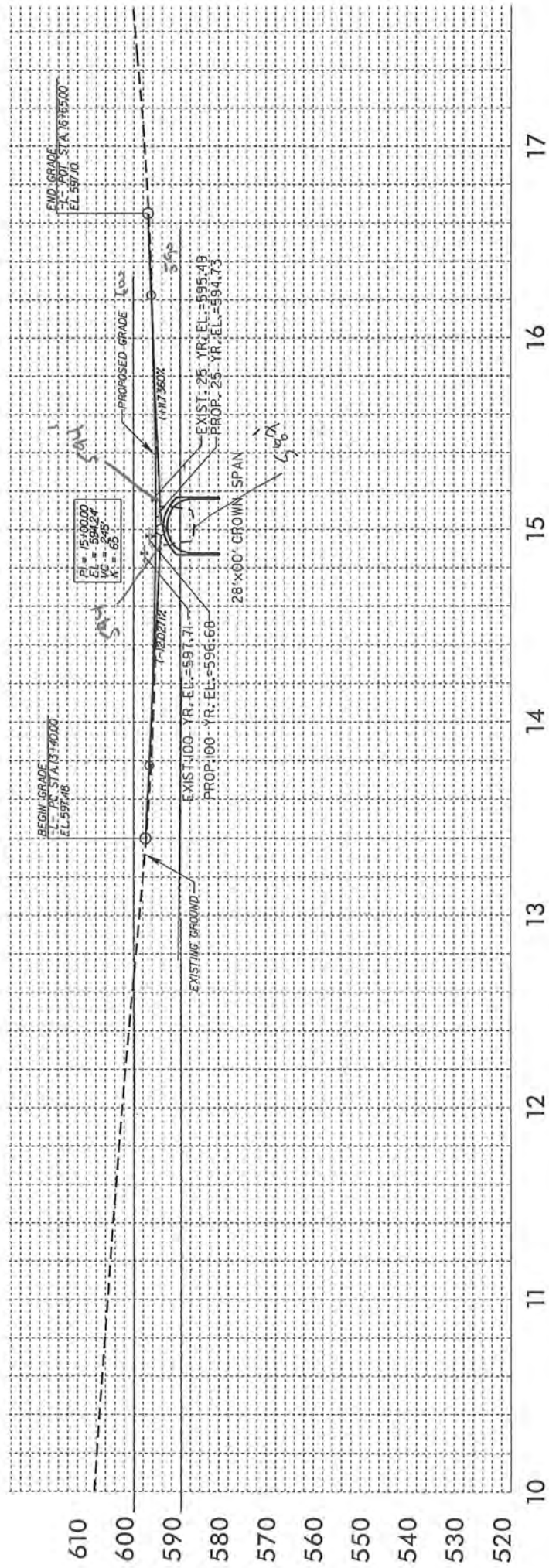
Apr. 2004
1:30'

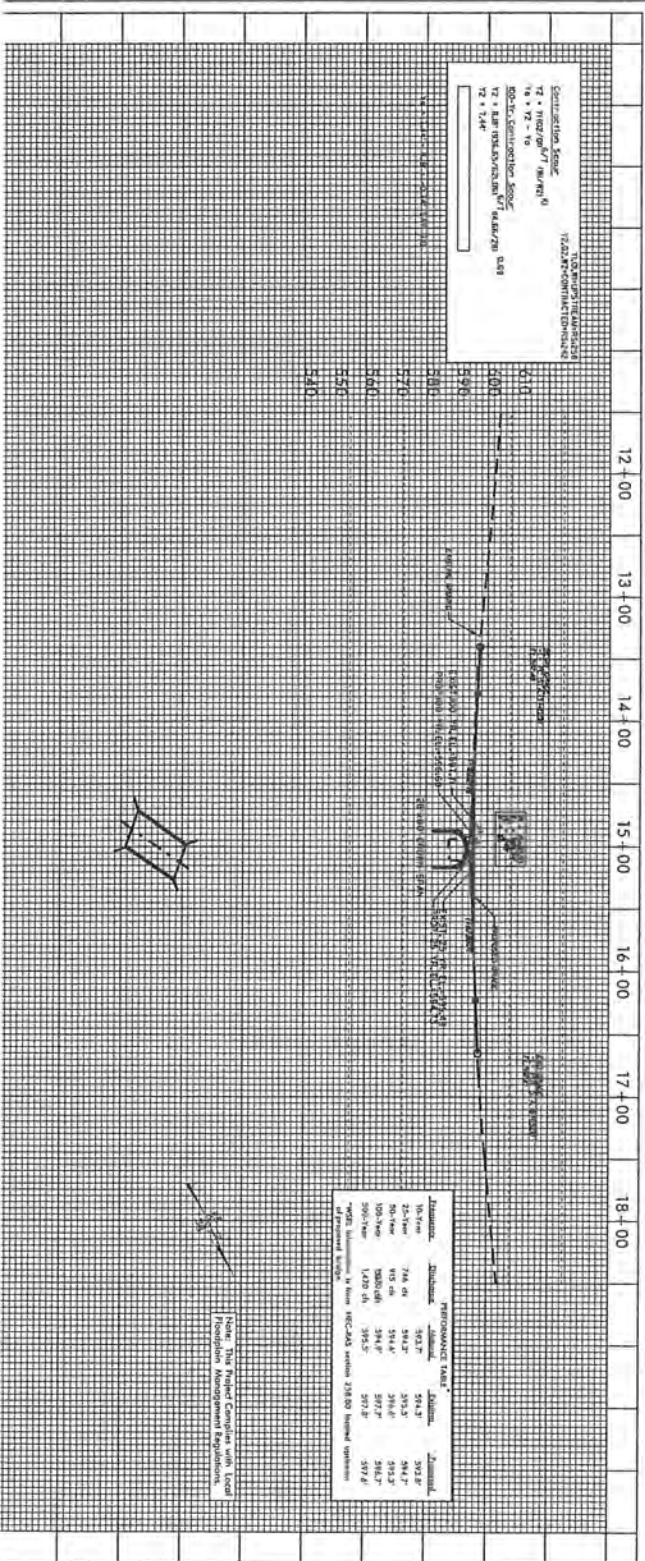


DATUM DESCRIPTION
 ALL ELEVATIONS ON THIS PLAN ARE REFERENCED TO THE STATE PLANE DATUM FOR THIS PROJECT
 AND NOT TO THE NATIONAL DATUM. THE DATUM POINT FOR THIS PROJECT IS THE
 POINT OF BEGINNING OF THE PROJECT, WHICH IS THE POINT OF BEGINNING OF
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BL POINT	CRS	NORTH	EAST	ELEVATION	LEVEE STATION	OFFSET
CRS1	84975.1	449715.3728	1518863.6788	511.50	1147.25	
CRS2	84975.2	449715.3728	1518863.6788	511.50	1147.25	
CRS3	84975.3	449715.3728	1518863.6788	511.50	1147.25	
CRS4	84975.4	449715.3728	1518863.6788	511.50	1147.25	
CRS5	84975.5	449715.3728	1518863.6788	511.50	1147.25	

Br. 204





Construction Year
 12 + 12 - 10
 12 + 12 - 10
 12 + 12 - 10
 12 + 12 - 10

PERFORMANCE TABLE

Station	Discharge	Velocity	Depth
12+00	3837	58.13	39.37
13+00	714.01	54.17	39.47
14+00	915.01	54.44	39.57
15+00	1083.01	54.47	39.67
16+00	1293.01	54.57	39.77
17+00	1478.01	54.67	39.87

Note: The Project Complies with Local
 Floodplain Management Regulations.

BRIDGE SURVEY & HYDRAULIC DESIGN REPORT

PROJECT NO. 123456789
 COUNTY OF ...
 PROJECT ENGINEER ...
 DATE ...



DESIGNED BY ...
 CHECKED BY ...
 PROJECT ENGINEER ...
 DATE ...

SITE DATA

Bridge Area ...
 River Name ...
 Stream Description ...
 Date of Survey ...
 Bridge Structure ...
 Foundation ...
 Abutment ...
 Pier ...
 Deck ...
 Spacing ...
 Material ...
 Construction ...
 Condition ...
 Inspection ...
 Recommendations ...

DESIGN DATA

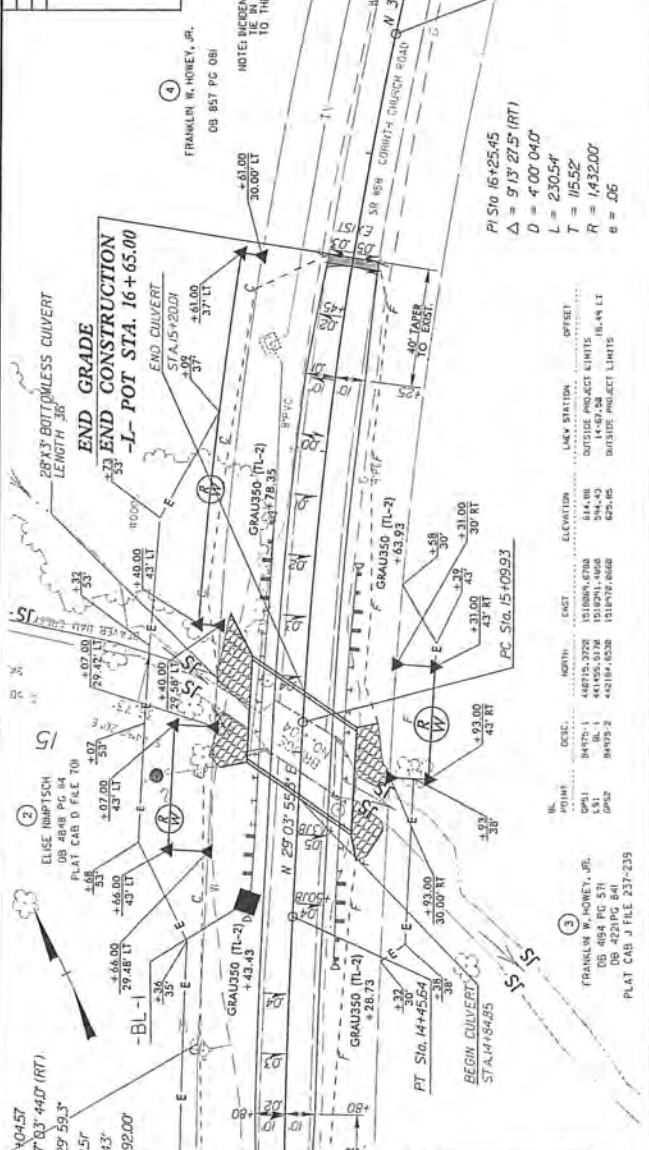
Hydraulic Method ...
 Hydraulic Study Method ...
 Flood Protection ...
 Design Flood ...
 Return Period ...
 Velocity ...
 Depth ...
 Discharge ...
 Bridge Design Velocity ...
 Average Channel Velocity Design ...
 Average Overbank Velocity Design ...
 Construction ...
 Local ...

ADDITIONAL INFORMATION AND COMPUTATIONS

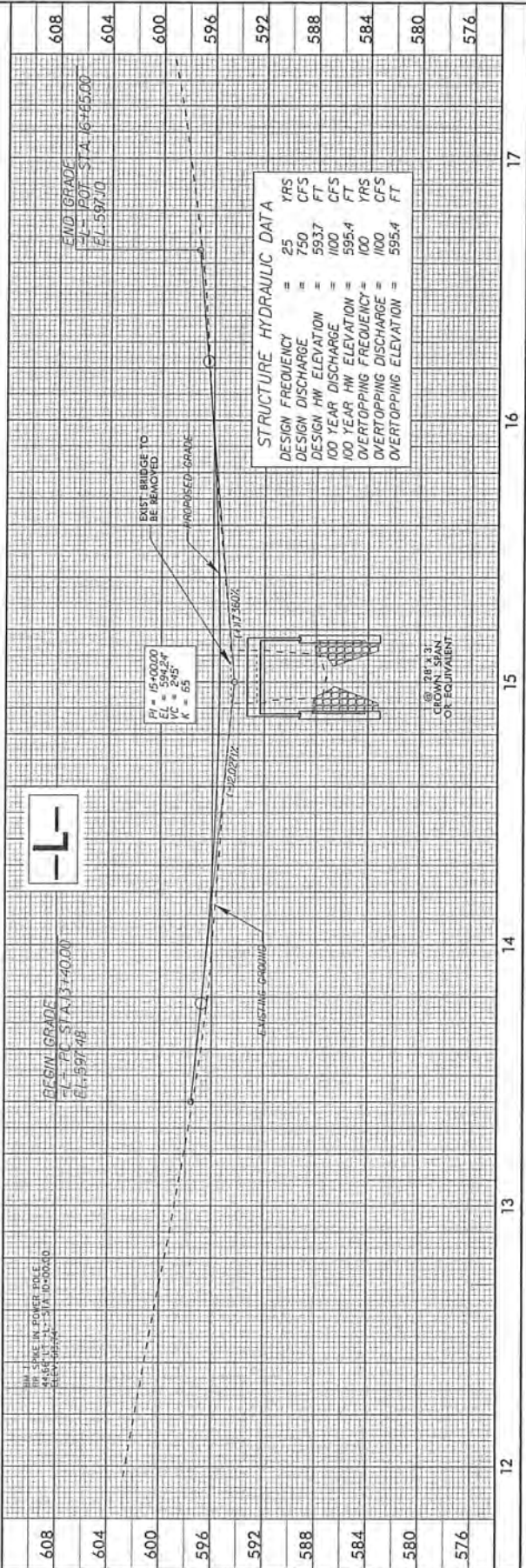
Information to be shown on plans ...
 Computations ...
 Additional notes ...

FRANKLIN W. HOWEY, JR.
 DB 857 PC 081

NOTES: INCIDENTAL MILL APPROX. 25' AT EACH END TO PROVIDE SMOOTH TRANSITION TO THE EXISTING ASPHALT PAVEMENT.



DATUM DESCRIPTION
 THE DATA FOR THE VERTICAL ALIGNMENT IS BASED ON THE STATE PLANE COORDINATE SYSTEM OF 1983. THE DATUM POINT FOR THE VERTICAL ALIGNMENT IS THE INTERSECTION OF THE STATE PLANE COORDINATE SYSTEM OF 1983 AND THE STATE PLANE COORDINATE SYSTEM OF 1983. THE DATUM POINT IS LOCATED AT STATION 13+40.00. THE DATUM POINT IS LOCATED AT STATION 13+40.00. THE DATUM POINT IS LOCATED AT STATION 13+40.00.



FOUNDATION CALCULATIONS
FOR END BENT NO. 1
AND
END BENT NO. 2



AMEC E&I, Inc.
4021 Stirrup Creek Drive, Suite 100
Durham, NC 27703

JOB NO. 6469-12-1040 SHEET 1 OF X
PHASE Br. 204 TASK X
JOB NAME Group N ; Div 10 Bridges X
BY JSJ DATE 6/5/12 X
CHECKED BY NBR DATE 6/6/12 X

Br. 204

- Recommended structure = 3-52000 CULVERT (See provided Plans)
- Replacement of Bridge 204
- Footings for Bottomless Culverts shall be founded on "non-scourable Rock". Therefore concrete footings must be keyed 1-foot into scourable Rock. (50% or Harder).
- NCDOT Provided a structure Inventory Report dated 2-20-04. This Report has 2 Borings per Bent w/ No Rock Core, Collar Elevations are relative to an assumed datum (100.00'). AMEC assigned elevations to borings by using the provided ground surface profile (-L-). The Borings are located along the road shoulder.
- AMEC Provided 1 Boring per Bent which included coring approx 10 feet of rock to confirm returned material is Rock & not a boulder. AMEC Collar Elev. are referenced to NCDOT Benchmarks (BG-1).
- Existing Grade on -L- @ culvert = 594'
- Proposed Grade on -L- @ culverts = 595.5' @ EA1 & EA2
- Amount of fill @ EA1 = $595.5 - 594 = 1.5'$
EA2 = $595.5 - 594 = 1.5'$



AMEC E&I, Inc.
4021 Stirrup Creek Drive, Suite 100
Durham, NC 27703

JOB NO. 6469-12-1040 SHEET 2 OF X
PHASE Pr. 204 TASK X
JOB NAME Group N; Drw to Bridge X
BY JSJ DATE 6/5/12 X
CHECKED BY NBR DATE 6/6/12 X

End Report 1

- U.S.G. Borings EBI-A, EBI-B From NC&ST REPORT
AND B-1 FROM AMEC Report.

<u>BORING</u>	<u>Collor Elev.</u>	<u>WR Elev.</u>	<u>NCR Elev.</u>
EBI-A	594'	585.2'	584.7'
EBI-B	594'	585.4'	584.4'
B-1	593.4'	584.4'	582.8'

→ Recommends Btm. of footing 584-1 = 583.6'

→ Recommend $R_R = 4 \text{ TSF}$

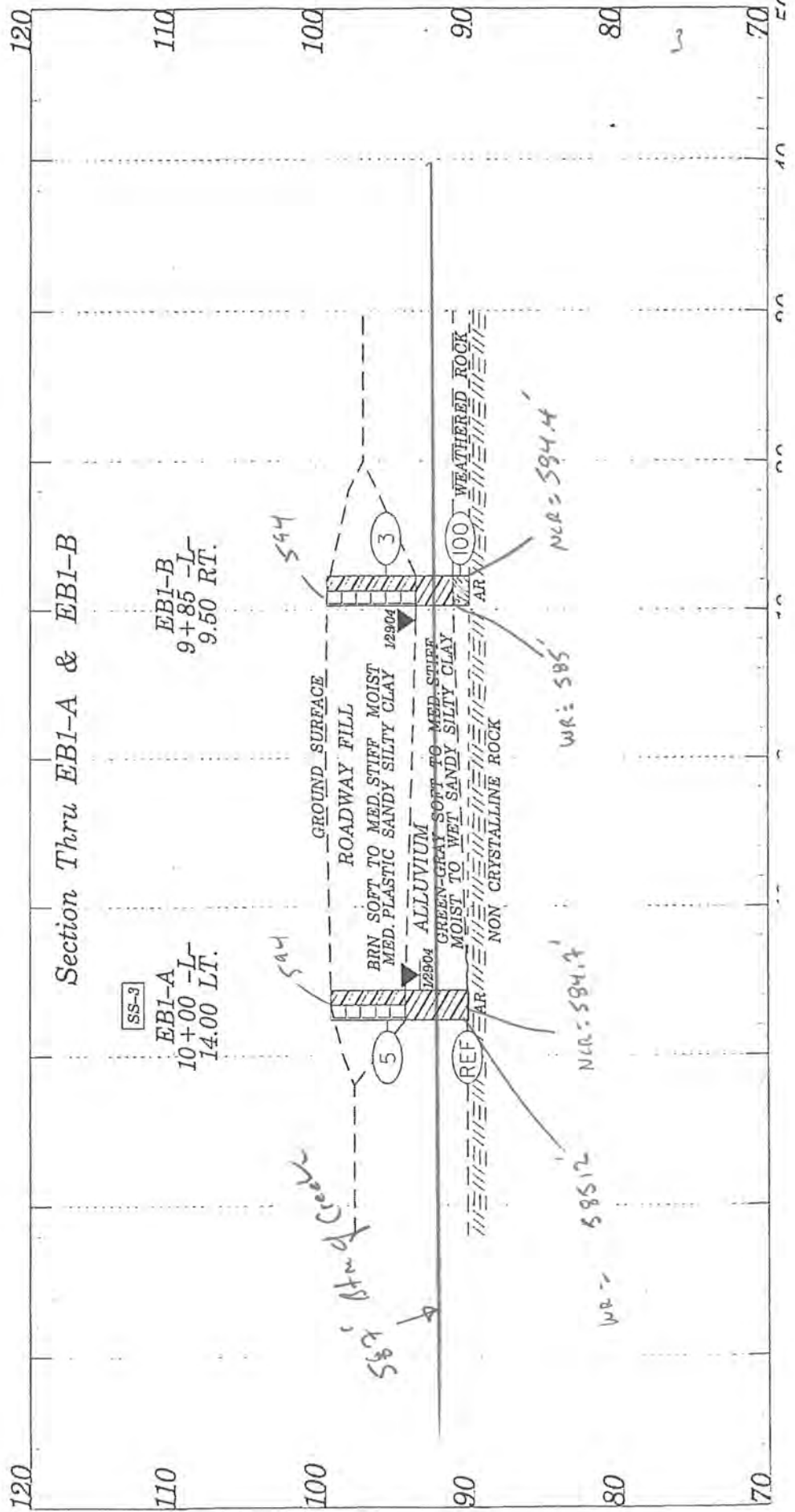
$$R_n = 4 \text{ TSF} / 0.45 = 8.89 = 9 \text{ TSF}$$

- BASED ON Inspection, A Factored Bearing Resistance of 4 TSF Is Recommended for Footings Bearing IN WR/NCR.

- Footings must be "keyed in" 12" into WR/NCR.

- By Inspection, Settlement of structure should be negligible due to footings bearing in WR/NCR.

10B-209011 (MAINT.)
UNION COUNTY
BRIDGE NO. 204 ON SR 1158
OVER BRANCH OF BEAVER DAM CREEK



1 fec = 0.5268

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION GEOTECHNICAL UNIT BORING LOG

4

PROJECT NO 10B.209011		ID (MAINT.)		COUNTY UNION		GEOLOGIST C.C. MURRAY							
SITE DESCRIPTION BRIDGE NO. 204 ON SR 1158 OVER BRANCH OF BEAVER DAM CREEK							GND WATER						
BORING NO EB1-A		NORTHING 0.00		EASTING 0.00		0 HR N/A							
ALIGNMENT L		BORING LOCATION 10+00.000		OFFSET 14.00ft LT		24 HR 6.00ft							
COLLAR ELEV 99.52ft		TOTAL DEPTH 9.30ft		START DATE 1/29/04		COMPLETION DATE 01/29/04							
DRILL MACHINE CME-550X			DRILL METHOD H.S. AUGERS			HAMMER TYPE AUTOMATIC							
SURFACE WATER DEPTH			DEPTH TO ROCK 9.30ft			Log EB1-A, Page 1 of 1							
ELEV	DEPTH	BLOW CT			PEN (ft)	BLOWS PER FOOT					SAMPLE NO	LOG	SOIL AND ROCK DESCRIPTION
		6in	6in	6in		0	25	50	75	100			
99.52						----- Ground Surface -----							594 0.0
	3.80	2	2	3	1.0	5					SS-3	M	(ROADWAY FILL) BRN MED. STIFF MOIST MED. PLASTIC CSE. SANDY SILTY CLAY
90.22	8.80	100			0.5				100			W	(ALLUVIUM) GREEN-GRAY MED. STIFF MOIST TO WET SANDY SILTY CLAY 585.2 8.8
						AUGER REFUSAL AT ELEV. 90.22 ON HARD ROCK							NON CRYSTALLINE ROCK 9.3 584.7

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
 GEOTECHNICAL UNIT BORING LOG

5

PROJECT NO 10B.209011		ID (MAINT.)		COUNTY UNION		GEOLOGIST C.C. MURRAY							
SITE DESCRIPTION BRIDGE NO. 204 ON SR 1158 OVER BRANCH OF BEAVER DAM CREEK							GND WATER						
BORING NO EB1-B		NORTHING 0.00		EASTING 0.00		0 HR N/A							
ALIGNMENT L		BORING LOCATION 9+85.000		OFFSET 9.50ft RT		24 HR 6.00ft							
COLLAR ELEV 99.74ft		TOTAL DEPTH 9.60ft		START DATE 1/29/04		COMPLETION DATE 01/29/04							
DRILL MACHINE CME-550X			DRILL METHOD H.S. AUGERS			HAMMER TYPE AUTOMATIC							
SURFACE WATER DEPTH			DEPTH TO ROCK 9.60ft			Log EB1-B, Page 1 of 1							
ELEV	DEPTH	BLOW CT			PEN (ft)	BLOWS PER FOOT					SAMPLE NO	LOG	SOIL AND ROCK DESCRIPTION
		6in	6in	6in		0	25	50	75	100			
99.74						Ground Surface							594 0.0
	4.00	2	2	1	1.0	3							(ROADWAY FILL) BRN SOFT MOIST SANDY SILTY CLAY
90.14	9.00	100			0.4								(ALLUVIUM) GREEN-GRAY SOFT SANDY SILTY CLAY 9.0
						AUGER REFUSAL AT ELEV: 90.14 ON HARD ROCK							WEATHERED ROCK 504.4 9.6



NCDOT GEOTECHNICAL ENGINEERING UNIT

BORELOG REPORT

WBS 17BP.10.R.4	TIP 17BP.10.R.4	COUNTY UNION	GEOLOGIST R. Clark
SITE DESCRIPTION Bridge 890204 on SR 1158 over Branch of Beaver Dam Creek			GROUND WTR (ft)
BORING NO. B-1	STATION 14+76	OFFSET 14 ft RT	ALIGNMENT -L-
COLLAR ELEV. 593.4 ft	TOTAL DEPTH 19.6 ft	NORTHING 441,464	EASTING 1,518,430
DRILL RIG/HAMMER EFF./DATE MAC9354 CME-45C 86% 10/3/2010		DRILL METHOD SPT Core Boring	HAMMER TYPE Automatic
DRILLER F. Cox	START DATE 05/22/12	COMP. DATE 05/22/12	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					
595	593.4	0.0												GROUND SURFACE	0.0
590	589.9	3.5	2	9	8									ROADWAY EMBANKMENT Brown to reddish brown, moist, very stiff to soft, silty, fine to coarse sandy, clayey SILT (A-4) with trace to few gravel	5.0
585	584.9	8.5	1	2	2									ALLUVIAL Yellowish gray, moist to wet, medium stiff, fine sandy, silty CLAY (A-6) with trace organics	9.0
580	582.8	10.6	7	100/0.2						100/0.2				WEATHERED ROCK Tan, METAVOLCANIC	10.6
575			60/0.0							60/0.0				NON-CRYSTALLINE ROCK Light gray, METAVOLCANIC	19.6
Boring Terminated at Elevation 573.8 ft in Non-Crystalline Rock: METAVOLCANIC															



NCDOT GEOTECHNICAL ENGINEERING UNIT

CORE BORING REPORT

7

WBS 17BP.10.R.4		TIP 17BP.10.R.4		COUNTY UNION		GEOLOGIST R. Clark					
SITE DESCRIPTION Bridge 890204 on SR 1158 over Branch of Beaver Dam Creek							GROUND WTR (ft)				
BORING NO. B-1		STATION 14+76		OFFSET 14 ft RT		ALIGNMENT -L-					
COLLAR ELEV. 593.4 ft		TOTAL DEPTH 19.6 ft		NORTHING 441,464		EASTING 1,518,430					
DRILL RIG/HAMMER EFF./DATE MAC9354 CME-45C 86% 10/3/2010		DRILL METHOD SPT Core Boring		HAMMER TYPE Automatic							
DRILLER F. Cox		START DATE 05/22/12		COMP. DATE 05/22/12		SURFACE WATER DEPTH N/A					
CORE SIZE NQ		TOTAL RUN 9.0 ft									
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (ft) %	RQD (ft) %	REC. (ft) %	RQD (ft) %			
582.8	582.8	10.6	4.0	2:45/1.0	(3.5)	(1.8)	(8.5)	(6.5)		582.8 NON-CRYSTALLINE ROCK Light gray, slightly weathered, closely to moderately closely fractured, moderately hard, METAVOLCANIC	10.6
580	578.8	14.6	5.0	3:08 3:05 3:31	(3.5) 88%	(1.8) 45%	(8.5) 94%	(6.5) 72%			
575	573.8	19.6		3:28 3:55 4:01 3:57 4:05	(5.0) 100%	(4.7) 94%					
										Boring Terminated at Elevation 573.8 ft in Non-Crystalline Rock: METAVOLCANIC	

NCDOT CORE SINGLE BRIDGE 204 LOGS.GPJ NC_DOT_GDT_6/6/12



AMEC E&I, Inc.
4021 Stirrup Creek Drive, Suite 100
Durham, NC 27703

JOB NO. 6469-12-1040 SHEET 8 OF X
 PHASE Rc 204 TASK X
 JOB NAME Group 'N' ; Div 10 X
 BY JSJ DATE 6/5/12 X
 CHECKED BY MPA DATE 6/6/12 X

END BENT No 2

- USE BORINGS EB2-A and EB2-B FROM MOST REPORT
- USE BORING B-2 FROM AMEC REPORT

<u>BORING</u>	<u>COLLAR ELEV.</u>	<u>WR ELEV.</u>	<u>NCR ELEV.</u>
EB2-A	594'	585.1'	584.7'
EB2-B	594'	584.3'	583.7'
B-2	594.3'	584.8'	582.7'

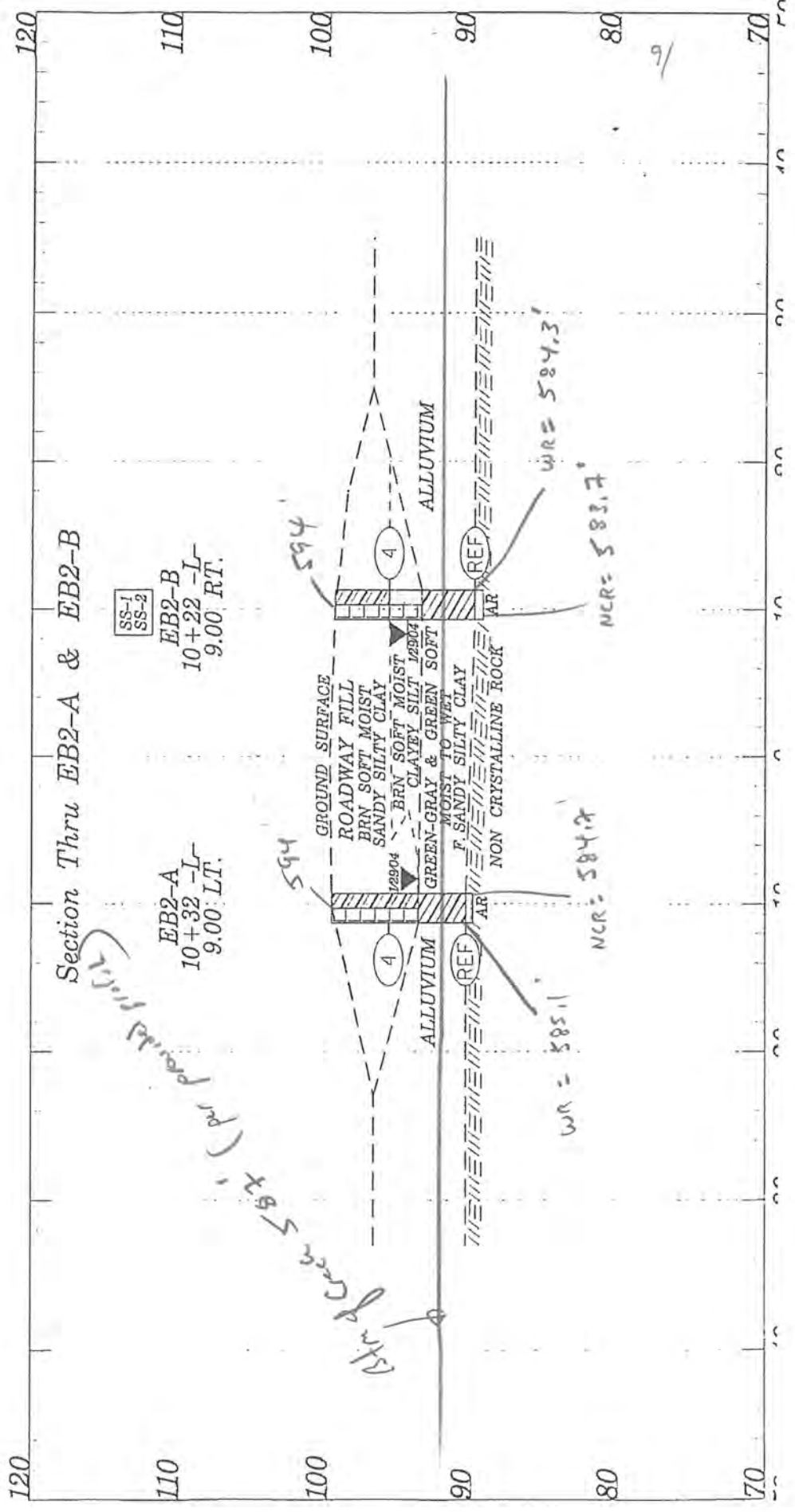
→ RECOMMEND Btm. of Footing @ Elev. 584 - 1 = 583.0'

→ RECOMMEND = $R_R = 4 \text{ TSF}$

$$R_n = 4 \text{ TSF} / 0.45 = 8.89 \text{ TIF} \approx 9 \text{ TSF}$$

- BASED ON INSPECTION, A Factored Bearing Resistance of 4 TSF is recommended for footings bearing in WR/NCR.
- Footings must be keyed in 12" into WR/NCR.
- By inspection, settlement of structure should be negligible if footing bears in WR/NCR.

10B-209011 (MAINT.)
UNION COUNTY
BRIDGE NO. 204 ON SR 1158
OVER BRANCH OF BEAVER DAM CREEK



NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
 GEOTECHNICAL UNIT BORING LOG

10

PROJECT NO 10B.209011	ID (MAINT.)	COUNTY UNION	GEOLOGIST C.C. MURRAY
SITE DESCRIPTION BRIDGE NO. 204 ON SR 1158 OVER BRANCH OF BEAVER DAM CREEK			GND WATER
BORING NO EB2-A	NORTHING 0.00	EASTING 0.00	0 HR 9.00ft
ALIGNMENT L	BORING LOCATION 10+32.000	OFFSET 9.00ft LT	24 HR 6.00ft
COLLAR ELEV 99.70ft	TOTAL DEPTH 9.80ft	START DATE 1/29/04	COMPLETION DATE 01/29/04
DRILL MACHINE CME-550X	DRILL METHOD H.S. AUGERS	HAMMER TYPE AUTOMATIC	
SURFACE WATER DEPTH		DEPTH TO ROCK 9.30ft	Log EB2-A, Page 1 of 1

ELEV	DEPTH	BLOW CT			PEN (ft)	BLOWS PER FOOT					SAMPLE NO	LOG	SOIL AND ROCK DESCRIPTION	
		6in	6in	6in		0	25	50	75	100				
99.70														
	3.90	2	2	2	1.0							M		(ROADWAY FILL) BRN SOFT MOIST SANDY SILTY CLAY
	8.90	100			0.5							W		(ALLUVIUM) GREEN-GRAY SOFT WET F. SANDY SILTY CLAY
						AUGER REFUSAL AT ELEV. 89.90 ON HARD ROCK							NON CRYSTALLINE ROCK	

594.0 0.0

585.1

584.7

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

11/

PROJECT NO 10B.209011	ID (MAINT.)	COUNTY UNION	GEOLOGIST C.C. MURRAY
SITE DESCRIPTION BRIDGE NO. 204 ON SR 1158 OVER BRANCH OF BEAVER DAM CREEK			GND WATER
BORING NO EB2-B	NORTHING 0.00	EASTING 0.00	0 HR 5.00ft
ALIGNMENT L	BORING LOCATION 10+22.000	OFFSET 9.00ft RT	24 HR 5.00ft
COLLAR ELEV 99.50ft	TOTAL DEPTH 10.30ft	START DATE 1/29/04	COMPLETION DATE 01/29/04
DRILL MACHINE CME-55OX	DRILL METHOD H.S. AUGERS		HAMMER TYPE AUTOMATIC
SURFACE WATER DEPTH	DEPTH TO ROCK 9.70ft		Log EB2-B, Page 1 of 1

ELEV	DEPTH	BLOW CT			PEN (ft)	BLOWS PER FOOT					SAMPLE NO	MOI	LOG	SOIL AND ROCK DESCRIPTION	
		6in	6in	6in		0	25	50	75	100					
99.50														594.0	0.0
	3.70	2	2	2	1.0	4						SS-1	M	(ROADWAY FILL) BRN SOFT MOIST SANDY SILTY CLAY	
	8.70	1	2	100	0.6					100		SS-2	W	BRN SOFT MOIST CLAYEY SILT (ALLUVIUM) GREEN SOFT MOIST TO WET F. SANDY SILTY CLAY 9.7	
89.20														NON CRYSTALLINE ROCK 10.3	
														583.7	
														584.3	

AUGER REFUSAL AT ELEV: 89.20 ON HARD ROCK



NCDOT GEOTECHNICAL ENGINEERING UNIT

BORELOG REPORT

WBS 17BP.10.R.4		TIP 17BP.10.R.4		COUNTY UNION		GEOLOGIST R. Clark											
SITE DESCRIPTION Bridge 890204 on SR 1158 over Branch of Beaver Dam Creek							GROUND WTR (ft)										
BORING NO. B-2		STATION 15+33		OFFSET 10 ft LT		ALIGNMENT -L-											
COLLAR ELEV. 594.3 ft		TOTAL DEPTH 19.6 ft		NORTHING 441,526		EASTING 1,518,437											
DRILL RIG/HAMMER EFF./DATE MAC9354 CME-45C 86% 10/3/2010				DRILL METHOD SPT Core Boring		HAMMER TYPE Automatic											
DRILLER F. Cox		START DATE 05/22/12		COMP. DATE 05/22/12		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)		
595															594.3	0.0	GROUND SURFACE
	594.3	0.0	4	4	4	•	•	•	•	•				M			ROADWAY EMBANKMENT Brown to reddish brown, moist, medium stiff, fine sandy SILT (A-4) with trace roots and gravel
590	590.8	3.5	2	3	3	•	•	•	•	•				M	589.3	5.0	ALLUVIAL Greenish gray, wet, stiff, fine sandy, silty CLAY (A-6)
585	585.8	8.5	4	8	100/0.3	•	•	•	•	•				W	584.8	9.5	WEATHERED ROCK METAVOLCANIC
	582.7	11.6	60/0.0			•	•	•	•	•					582.7	11.6	NON-CRYSTALLINE ROCK Light gray, METAVOLCANIC
580						•	•	•	•	•							
575						•	•	•	•	•					574.7	19.6	Boring Terminated at Elevation 574.7 ft in Non-Crystalline Rock: METAVOLCANIC

NCDOT BORE SINGLE BRIDGE 204 LOGS.GPJ NC_DOT.GDT 6/6/12



NCDOT GEOTECHNICAL ENGINEERING UNIT

CORE BORING REPORT

WBS 17BP.10.R.4		TIP 17BP.10.R.4		COUNTY UNION		GEOLOGIST R. Clark					
SITE DESCRIPTION Bridge 890204 on SR 1158 over Branch of Beaver Dam Creek							GROUND WTR (ft)				
BORING NO. B-2		STATION 15+33		OFFSET 10 ft LT		ALIGNMENT -L-					
COLLAR ELEV. 594.3 ft		TOTAL DEPTH 19.6 ft		NORTHING 441,526		EASTING 1,518,437					
DRILL RIG/HAMMER EFF./DATE MAC9354 CME-45C 86% 10/3/2010				DRILL METHOD SPT Core Boring		HAMMER TYPE Automatic					
DRILLER F. Cox		START DATE 05/22/12		COMP. DATE 05/22/12		SURFACE WATER DEPTH N/A					
CORE SIZE NQ		TOTAL RUN 8.0 ft									
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		STRATA		L O G	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (ft) %	RQD (ft) %	REC. (ft) %	RQD (ft) %			
582.7										Begin Coring @ 11.6 ft	
	582.7	11.6	3.0	3:59 3:48 4:15	(2.9) 97%	(1.9) 63%	(7.9) 99%	(4.9) 61%		NON-CRYSTALLINE ROCK	11.6
580	579.7	14.6								Light gray, slightly weathered, closely fractured, moderately hard, METAVOLCANIC	
			5.0	3:55 4:05 4:22 4:35 4:45	(5.0) 100%	(3.0) 60%					
575	574.7	19.6								Boring Terminated at Elevation 574.7 ft in Non-Crystalline Rock: METAVOLCANIC	19.6

NCDOT CORE SINGLE BRIDGE 204 LOGS.GPJ NC_DOT.GDT 6/6/12



AMEC E&I, Inc.
4021 Stirrup Creek Drive, Suite 100
Durham, NC 27703

JOB NO. 6469-12-1040 SHEET 14 OF X
PHASE Br. 204 TASK X
JOB NAME Group N, Div 10 X
BY JSJ DATE 6/5/12 X
CHECKED BY MBR DATE 6/6/12 X

EMBANKMENT SETTLEMENT

- Minimal Grade Change ($\approx 1.5'$ @ approaches)
- Based on minimal grade changes at the approaches, significant long term settlements are not anticipated.

**STRUCTURE SUBSURFACE
INVESTIGATION PROVIDED BY
NCDOT**

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	(MAINT.)	1	12
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
JOB 209011		P.E.	
		CONST.	

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL UNIT

STRUCTURE

SUBSURFACE INVESTIGATION

STATE PROJECT 10B.209011 I.D. NO. (MAINT.)
 F.A. PROJECT _____
 COUNTY UNION
 PROJECT DESCRIPTION BRIDGE NO. 204 ON SR 1158
OVER BRANCH OF BEAVER DAM CREEK

 SITE DESCRIPTION _____

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WAS 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 UNIT @ (919) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA IS 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.

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N.C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IT IS CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

NOTE - 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.

INVESTIGATED BY R.Q. CALLAWAY PERSONNEL C.C. MURRAY
 CHECKED BY C.B. LITTLE J.E. ESTEP
 SUBMITTED BY C.B. LITTLE D.K. BRATTON
 DATE FEBRUARY 2004



2-20-04

 SIGNATURE

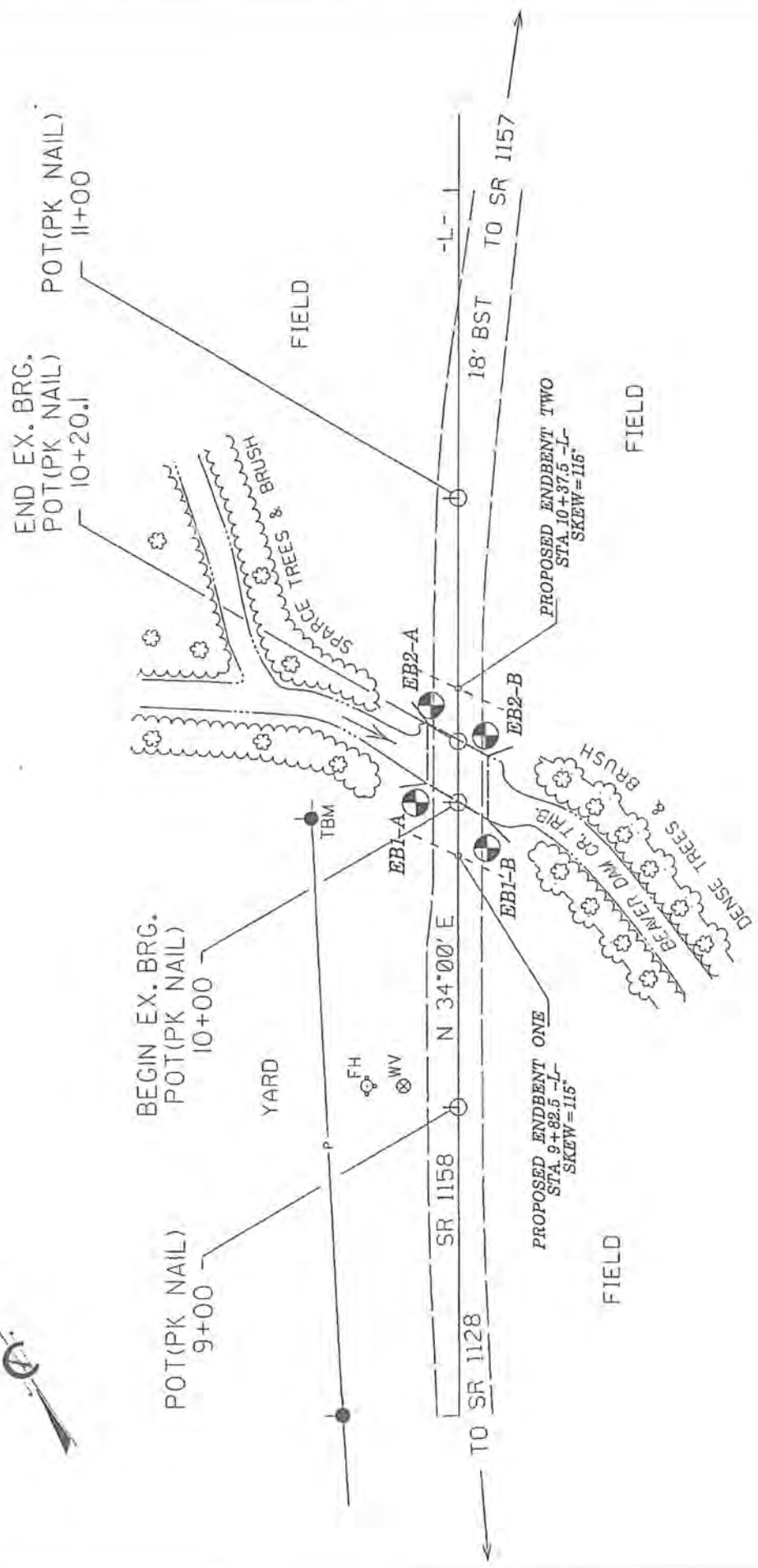
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL UNIT
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION				GRADATION																																																																																											
SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED OR WEATHERED EARTH MATERIALS WHICH CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND WHICH YIELDS LESS THAN 100 BLOW PER FOOT ACCORDING TO STANDARD PENETRATION TEST (ASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM AND BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE: VELY STIFF, GRAY SILT CLAY, MOST WITH INTERBEDDED FINE SAND LENSING, HIGH PLASTIC, A-7-6				WELL-GRADED: INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE UNIFORM: INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED) GAP-GRADED: INDICATES A Mixture OF UNIFORM PARTICLES OF TWO OR MORE SIZES.																																																																																											
SOIL LEGEND AND AASHTO CLASSIFICATION				ANGULARITY OF GRAINS THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS ARE DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUND, OR ROUNDED.																																																																																											
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>GENERAL CLASS.</th> <th colspan="2">GRANULAR MATERIALS (75% PASSING #200)</th> <th colspan="4">SILT-CLAY MATERIALS (75% PASSING #200)</th> <th colspan="2">ORGANIC MATERIALS</th> </tr> <tr> <td>GROUP CLASS.</td> <td>A-1</td> <td>A-3</td> <td>A-2</td> <td>A-4</td> <td>A-5</td> <td>A-6</td> <td>A-7</td> <td>A-1, A-2</td> <td>A-4, A-5</td> </tr> <tr> <td>SYMBOL</td> <td>A-1-a</td> <td>A-1-b</td> <td>A-2-4</td> <td>A-2-5</td> <td>A-2-6</td> <td>A-2-7</td> <td>A-2-8</td> <td>A-3</td> <td>A-6, A-7</td> </tr> <tr> <td>PERCENT PASSING</td> <td>100</td> <td>100</td> <td>100</td> <td>100</td> <td>100</td> <td>100</td> <td>100</td> <td>100</td> <td>100</td> </tr> <tr> <td>LIQUID LIMIT</td> <td>≤ 5</td> <td>≤ 10</td> <td>≤ 15</td> <td>≤ 25</td> <td>≤ 40</td> <td>≤ 60</td> <td>≤ 75</td> <td>≤ 75</td> <td>≤ 75</td> </tr> <tr> <td>PLASTIC INDEX</td> <td>≤ 4</td> <td>≤ 7</td> <td>≤ 7</td> <td>≤ 7</td> <td>≤ 10</td> <td>≤ 15</td> <td>≤ 20</td> <td>≤ 20</td> <td>≤ 20</td> </tr> <tr> <td>GROUP INDEX</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> </table>				GENERAL CLASS.	GRANULAR MATERIALS (75% PASSING #200)		SILT-CLAY MATERIALS (75% PASSING #200)				ORGANIC MATERIALS		GROUP CLASS.	A-1	A-3	A-2	A-4	A-5	A-6	A-7	A-1, A-2	A-4, A-5	SYMBOL	A-1-a	A-1-b	A-2-4	A-2-5	A-2-6	A-2-7	A-2-8	A-3	A-6, A-7	PERCENT PASSING	100	100	100	100	100	100	100	100	100	LIQUID LIMIT	≤ 5	≤ 10	≤ 15	≤ 25	≤ 40	≤ 60	≤ 75	≤ 75	≤ 75	PLASTIC INDEX	≤ 4	≤ 7	≤ 7	≤ 7	≤ 10	≤ 15	≤ 20	≤ 20	≤ 20	GROUP INDEX	0	0	0	0	0	0	0	0	0	MINERALOGICAL COMPOSITION MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.																						
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PLASTICITY <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>NONPLASTIC</th> <th>PLASTICITY INDEX (PI)</th> <th>DRY STRENGTH</th> </tr> <tr> <td>LOW PLASTICITY</td> <td>0-5</td> <td>VERY LOW</td> </tr> <tr> <td>MED. PLASTICITY</td> <td>6-15</td> <td>SLIGHT</td> </tr> <tr> <td>HIGH PLASTICITY</td> <td>16-25</td> <td>MEDIUM</td> </tr> <tr> <td></td> <td>26 OR MORE</td> <td>HIGH</td> </tr> </table>				NONPLASTIC	PLASTICITY INDEX (PI)	DRY STRENGTH	LOW PLASTICITY	0-5	VERY LOW	MED. PLASTICITY	6-15	SLIGHT	HIGH PLASTICITY	16-25	MEDIUM		26 OR MORE	HIGH	COLOR DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YEL-BRN, BLUE-GRAY) MODIFIERS SUCH AS LIGHT, DRY, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.																																																																												
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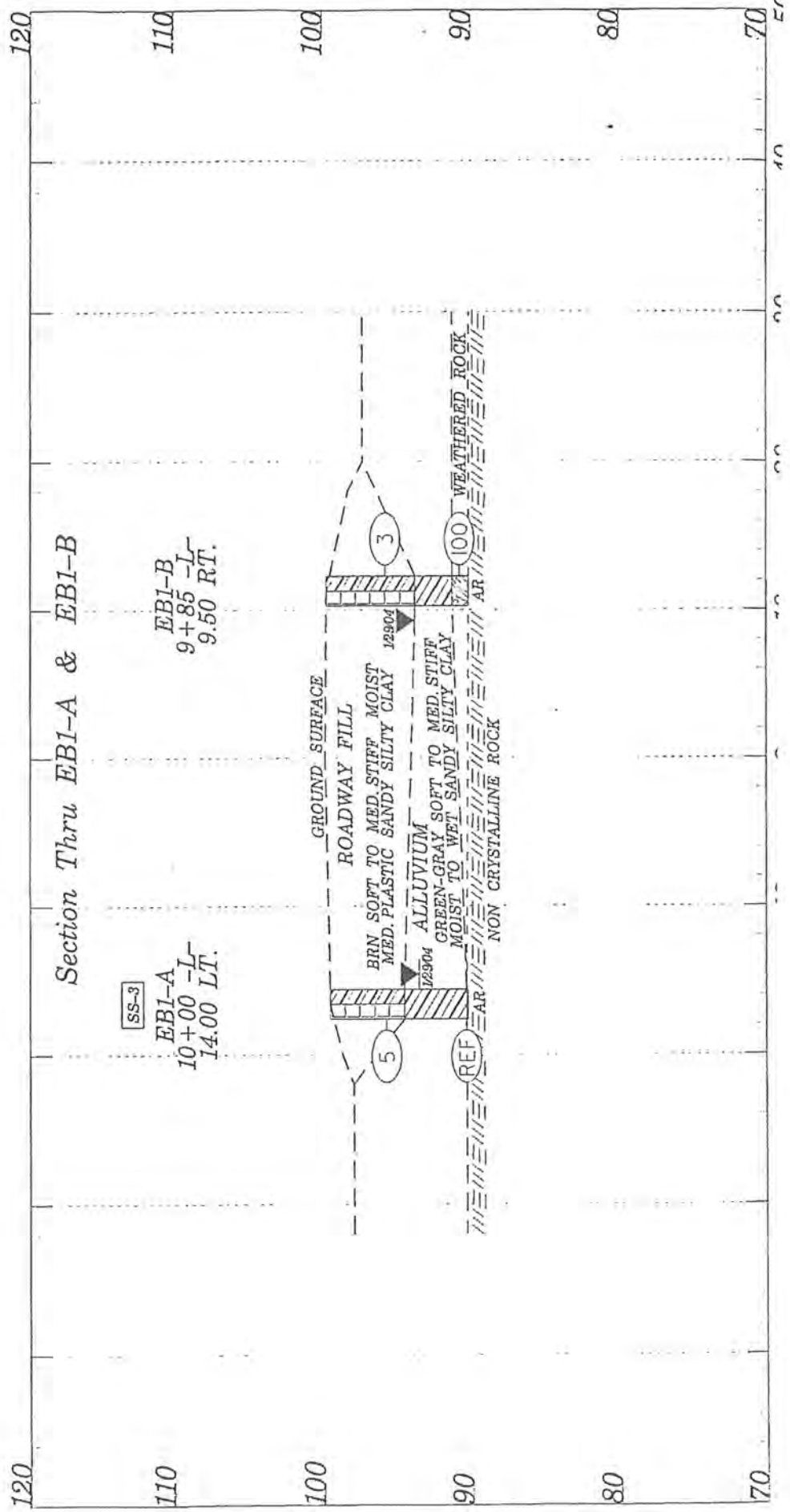
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL UNIT
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

ROCK DESCRIPTION		TERMS AND DEFINITIONS
<p>Hard rock is non-coastal plain material that when tested, would yield SPT refusal. An inferred rock line indicates the level at which non-coastal plain material would yield SPT refusal. SPT refusal is penetration by a split spoon sampler equal to or less than 0.1 foot per 60 blows. In non-coastal plain material, the transition between soil and rock is often represented by a zone of weathered rock. Rock materials are typically divided as follows:</p>		<p>ALLUVIUM (ALLOUV.) - SOILS WHICH HAVE BEEN TRANSPORTED BY WATER.</p> <p>AQUIFER - A WATER BEARING FORMATION OR STRATA.</p> <p>ARGILLACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.</p> <p>ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC.</p> <p>ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.</p> <p>CALCAREOUS (CALC.) - SOILS WHICH CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.</p> <p>COLLUMBIA - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.</p> <p>CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.</p> <p>DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.</p> <p>DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.</p> <p>DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.</p> <p>FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.</p> <p>FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.</p> <p>FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOADED FROM PARENT MATERIAL.</p> <p>FLOOD PLAIN (F.P.) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.</p> <p>FORMATION (FN.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.</p> <p>JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.</p> <p>LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.</p> <p>LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.</p> <p>MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.</p> <p>PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.</p> <p>RESIDUAL SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.</p> <p>ROCK QUALITY DESIGNATION (R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.</p> <p>SAPROLITE (SAP.) - RESIDUAL SOIL WHICH RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.</p> <p>SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, WHICH HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.</p> <p>SLIP SURFACE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.</p> <p>STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS IN OR EQUIVALENT OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS LESS THAN 0.1 FOOT PENETRATION WITH 60 BLOWS.</p> <p>STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.</p> <p>STRATA ROCK QUALITY DESIGNATION (S.R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 10 CENTIMETERS DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.</p> <p>TOPSOIL (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p>
<p>WEATHERED ROCK (WR) </p> <p>CRYSTALLINE ROCK (CR) </p> <p>NON-CRYSTALLINE ROCK (NCR) </p> <p>COASTAL PLAIN SEDIMENTARY ROCK (CPS) </p>		<p>NON-COASTAL PLAIN MATERIAL THAT YIELDS SPT N VALUES > 100 BLOWS PER FOOT.</p> <p>FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.</p> <p>FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLITE, SLATE, SANDSTONE, ETC.</p> <p>COASTAL PLAIN SEDIMENTS cemented into rock, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, cemented SHELL BEDS, ETC.</p>
WEATHERING		
FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.	
VERY SLIGHT (V. SLL)	ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN. CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.	
SLIGHT (SLL)	ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.	
MODERATE (MOD.)	SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED. SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.	
MODERATELY SEVERE (MOD. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KALINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. <i>IF TESTED, WOULD YIELD SPT REFUSAL</i>	
SEVERE (SEV.)	ALL ROCKS EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KALINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. <i>IF TESTED, YIELDS SPT N VALUES < 100 BPF</i>	
VERY SEVERE (V. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. <i>IF TESTED, YIELDS SPT N VALUES < 50 SPT</i>	
COMPLETE	ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIVES OF STAINERS. SAPROLITE IS ALSO AN EXAMPLE.	
ROCK HARDNESS		
VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.	
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.	
MODERATELY HARD	CAN BE SCRATCHED BY KNIFE OR PICK. COUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.	
MEDIUM HARD	CAN BE GROOVED OR GROUGED 0.25 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.	
SOFT	CAN BE GROOVED OR GROUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.	
VERY SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.	
FRACTURE SPACING		BEDDING
TERM	SPACING	TERM
VERY WIDE	MORE THAN 10 FEET	THICKLY BEDDED
WIDE	3 TO 10 FEET	THICKLY BEDDED
MODERATELY CLOSE	1 TO 3 FEET	THINLY BEDDED
CLOSE	0.16 TO 1 FEET	VERY THINLY BEDDED
VERY CLOSE	LESS THAN 0.16 FEET	THICKLY LAMINATED
		THINLY LAMINATED
		THICKNESS
		> 4 FEET
		1.5 - 4 FEET
		0.16 - 1.5 FEET
		0.03 - 0.16 FEET
		0.008 - 0.03 FEET
		< 0.008 FEET
INDURATION		
FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.		
FRIABLE	RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.	
MODERATELY INDURATED	GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL FROBE; BREAKS EASILY WHEN HIT WITH HAMMER.	
INDURATED	GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL FROBE; DIFFICULT TO BREAK WITH HAMMER.	
EXTREMELY INDURATED	SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.	
		BENCH MARK: NAIL IN BASE OF POWER POLE
		48' LT. OF STA. 9+95 -L-
		ELEVATION: 100.00 (ASSUMED)
NOTES:		

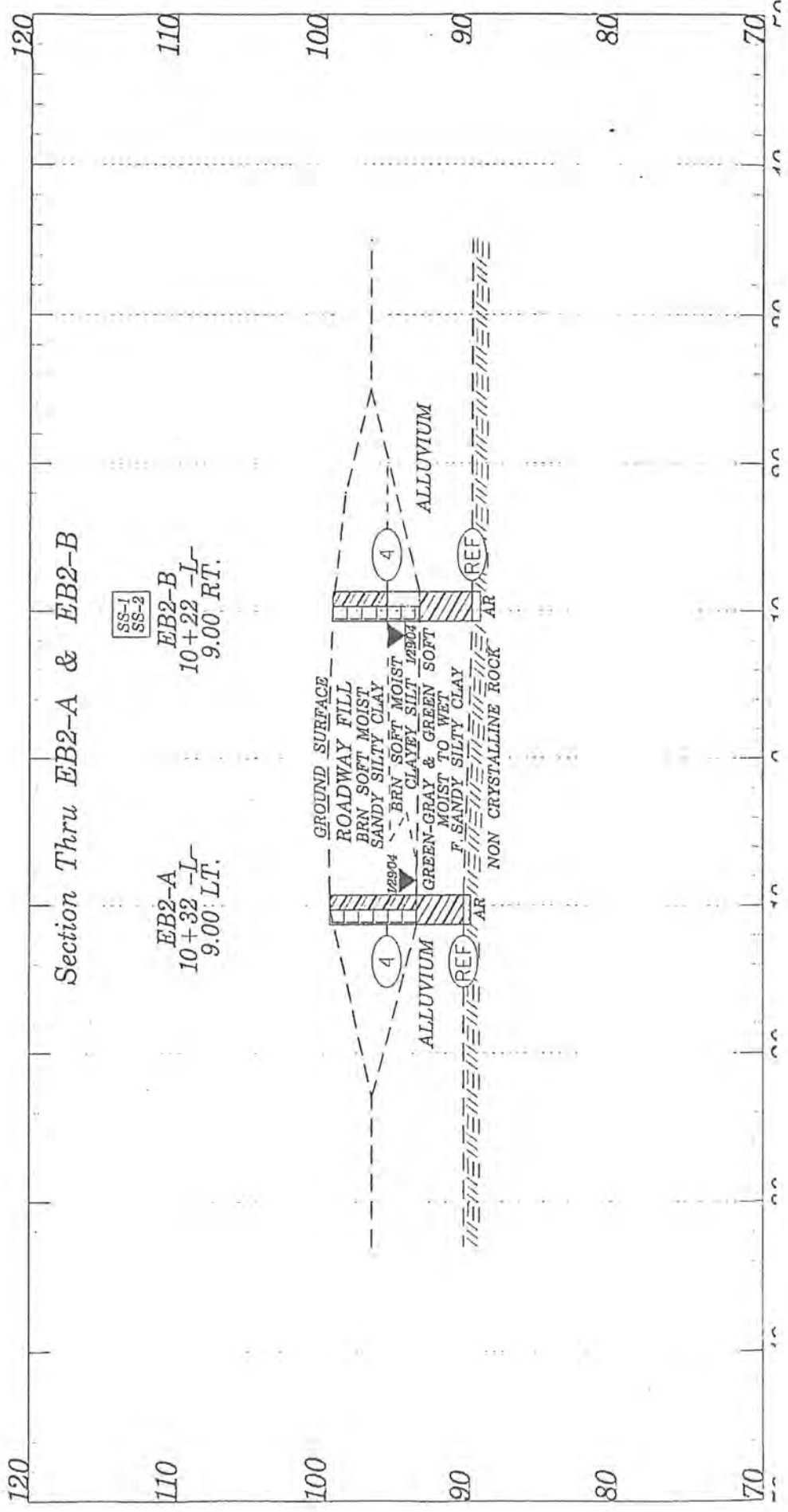
10B.209011 (MAINT.)
UNION COUNTY
BRIDGE NO. 204 ON SR 1158
OVER TRIBUTARY TO BEAVER DAM CREEK



10B.209011 (MAINT.)
UNION COUNTY
BRIDGE NO. 204 ON SR 1158
OVER BRANCH OF BEAVER DAM CREEK



10B.209011 (MAINT.)
UNION COUNTY
BRIDGE NO. 204 ON SR 1158
OVER BRANCH OF BEAVER DAM CREEK



Section Thru EB2-A & EB2-B

SS-1
SS-2

EB2-B
10+22 -L-
9.00 RT.

EB2-A
10+32 -L-
9.00 LT.

GROUND SURFACE
ROADWAY FILL
BRN SOFT MOIST SANDY SILTY CLAY
BRN SOFT MOIST CLAYEY SILT
GREEN-GRAY & GREEN SOFT MOIST TO WET F. SANDY SILTY CLAY
NON CRYSTALLINE ROCK

ALLUVIUM

ALLUVIUM

4

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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO 10B.209011		ID (MAINT.)		COUNTY UNION		GEOLOGIST C.C. MURRAY							
SITE DESCRIPTION BRIDGE NO. 204 ON SR 1158 OVER BRANCH OF BEAVER DAM CREEK							GND WATER						
BORING NO EB1-A		NORTHING 0.00		EASTING 0.00		0 HR N/A							
ALIGNMENT L		BORING LOCATION 10+00.000		OFFSET 14.00ft LT		24 HR 6.00ft							
COLLAR ELEV 99.52ft		TOTAL DEPTH 9.30ft		START DATE 1/29/04		COMPLETION DATE 01/29/04							
DRILL MACHINE CME-550X			DRILL METHOD H.S. AUGERS			HAMMER TYPE AUTOMATIC							
SURFACE WATER DEPTH			DEPTH TO ROCK 9.30ft			Log EB1-A, Page 1 of 1							
ELEV	DEPTH	BLOW CT			PEN (ft)	BLOWS PER FOOT				SAMPLE NO	MOI	LOG	SOIL AND ROCK DESCRIPTION
		6in	6in	6in		0	25	50	75				
99.52													
	3.80	2	2	3	1.0								(ROADWAY FILL) BRN MED. STIFF MOIST MED. PLASTIC CSE. SANDY SILTY CLAY
90.22	8.80	100			0.5								(ALLUVIUM) GREEN-GRAY MED. STIFF MOIST TO WET SANDY SILTY CLAY
						AUGER REFUSAL AT ELEV. 90.22 ON HARD ROCK							NON CRYSTALLINE ROCK

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO 10B.209011		ID (MAINT.)		COUNTY UNION		GEOLOGIST C.C. MURRAY								
SITE DESCRIPTION BRIDGE NO. 204 ON SR 1158 OVER BRANCH OF BEAVER DAM CREEK							GND WATER							
BORING NO EB1-B		NORTHING 0.00			EASTING 0.00		0 HR N/A							
ALIGNMENT L		BORING LOCATION 9+85.000			OFFSET 9.50ft RT		24 HR 6.00ft							
COLLAR ELEV 99.74ft		TOTAL DEPTH 9.60ft		START DATE 1/29/04		COMPLETION DATE 01/29/04								
DRILL MACHINE CME-550X				DRILL METHOD H.S. AUGERS		HAMMER TYPE AUTOMATIC								
SURFACE WATER DEPTH				DEPTH TO ROCK 9.60ft		Log EB1-B, Page 1 of 1								
ELEV	DEPTH	BLOW CT			PEN (ft)	BLOWS PER FOOT				SAMPLE NO	MOI	LOG	SOIL AND ROCK DESCRIPTION	
		6in	6in	6in		0	25	50	75					100
99.74														
	4.00	2	2	1	1.0	3								(ROADWAY FILL) BRN SOFT MOIST SANDY SILTY CLAY
90.14	9.00	100			0.4				100					(ALLUVIUM) GREEN-GRAY SOFT SANDY SILTY CLAY
						AUGER REFUSAL AT ELEV. 90.14 ON HARD ROCK							WEATHERED ROCK	

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO 10B.209011		ID (MAINT.)		COUNTY UNION		GEOLOGIST C.C. MURRAY								
SITE DESCRIPTION BRIDGE NO. 204 ON SR 1158 OVER BRANCH OF BEAVER DAM CREEK							GND WATER							
BORING NO EB2-A		NORTHING 0.00			EASTING 0.00		0 HR 9.00ft							
ALIGNMENT L		BORING LOCATION 10+32.000			OFFSET 9.00ft LT		24 HR 6.00ft							
COLLAR ELEV 99.70ft		TOTAL DEPTH 9.80ft		START DATE 1/29/04		COMPLETION DATE 01/29/04								
DRILL MACHINE CME-55OX				DRILL METHOD H.S. AUGERS		HAMMER TYPE AUTOMATIC								
SURFACE WATER DEPTH				DEPTH TO ROCK 9.30ft		Log EB2-A, Page 1 of 1								
ELEV	DEPTH	BLOW CT			PEN (ft)	BLOWS PER FOOT					SAMPLE NO	LOG	SOIL AND ROCK DESCRIPTION	
		6in	6in	6in		0	25	50	75	100				
99.70														
	3.90	2	2	2	1.0	4						M	(ROADWAY FILL) BRN SOFT MOIST SANDY SILTY CLAY	
89.90	8.90	100			0.5				100			W	(ALLUVIUM) GREEN-GRAY SOFT WET F. SANDY SILTY CLAY	
						AUGER REFUSAL AT ELEV. 89.90 ON HARD ROCK							NON CRYSTALLINE ROCK	

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO 10B.209011		ID (MAINT.)		COUNTY UNION		GEOLOGIST C.C. MURRAY									
SITE DESCRIPTION BRIDGE NO. 204 ON SR 1158 OVER BRANCH OF BEAVER DAM CREEK							GND WATER								
BORING NO EB2-B		NORTHING 0.00			EASTING 0.00		0 HR 5.00ft								
ALIGNMENT L		BORING LOCATION 10+22.000			OFFSET 9.00ft RT		24 HR 5.00ft								
COLLAR ELEV 99.50ft		TOTAL DEPTH 10.30ft		START DATE 1/29/04		COMPLETION DATE 01/29/04									
DRILL MACHINE CME-550X				DRILL METHOD H.S. AUGERS			HAMMER TYPE AUTOMATIC								
SURFACE WATER DEPTH				DEPTH TO ROCK 9.70ft			Log EB2-B, Page 1 of 1								
ELEV	DEPTH	BLOW CT			PEN (ft)	BLOWS PER FOOT					SAMPLE NO	MOI	LOG	SOIL AND ROCK DESCRIPTION	
		6in	6in	6in		0	25	50	75	100					
99.50															
	3.70	2	2	2	1.0	4							M		(ROADWAY FILL) BRN SOFT MOIST SANDY SILTY CLAY
	8.70	1	2	100	0.6								W		BRN SOFT MOIST CLAYEY SILT
90.00															(ALLUVIUM) GREEN SOFT MOIST TO WET F. SANDY SILTY CLAY
89.20															NON CRYSTALLINE ROCK
						AUGER REFUSAL AT ELEV. 89.20 ON HARD ROCK									

GEOTECHNICAL UNIT FIELD SCOUR REPORT

PROJECT: 10b.209011 ID: MAINT. COUNTY: UNION

DESCRIPTION(1): BRIDGE 204 ON SR 1158 OVER BRANCH OF BEAVERDAM CREEK

INFORMATION ON EXISTING BRIDGES Information obtained from: X field inspection
microfilm(Reel: Pos:)
other

COUNTY BRIDGE NO. 204 BRIDGE LENGTH 20' NO. BENTS IN: CHANNEL 2 FLOOD PLAIN

FOUNDATION TYPE: unknown, timber abutments

EVIDENCE OF SCOUR(2):

ABUTMENTS OR END BENT SLOPES: minor scour occurring downstream on left, upstream on right

INTERIOR BENTS: N/A

CHANNEL BED: NO

CHANNEL BANKS: minor scour coincident with abutment scour as noted above

EXISTING SCOUR PROTECTION:

TYPE(3): timber abutments, some rip-rap around utility crossings, some asphalt debris dumped around upstream abut

EXTENT(4) minimal, as noted above

EFFECTIVENESS(5): poor

OBSTRUCTIONS(6) (DAMS,DEBRIS,ETC.): very minor, brush & trash

DESIGN INFORMATION

CHANNEL BED MATERIAL(7) (SAMPLE RESULTS ATTACHED): thin layer of sandy clay as SS-2 over rock

CHANNEL BANK MATERIAL(8) (SAMPLE RESULTS ATTACHED): sandy clay as SS-2

CHANNEL BANK COVER (9) brush, grass, few small trees

FLOOD PLAIN WIDTH(10): 250'

FLOOD PLAIN COVER(11): grass, light woods, cultivated field

DESIGN INFORMATION CONT.

STREAM IS ____ x ____ DEGRADING _____ AGGRADING (12)

OTHER OBSERVATIONS AND COMMENTS: _____

CHANNEL MIGRATION TENDENCY (13): moderate due to low streambanks and soft soil.

GEOTECHNICALLY ADJUSTED SCOUR ELEVATION (14): _____

The theoretical contraction scour is 3.8' or Elev. 87.5.

Hard rock occurs across the site near Elev. 90.

We propose to limit the potential scour to one foot in hard rock.

The Geotechnically Adjusted Scour Elevation is 89.

REPORTED BY: Clint Little DATE: 2/20/04

INSTRUCTIONS

- (1) GIVE THE DESCRIPTION OF THE SPECIFIC SITE GIVING ROUTE NUMBER AND BODY OF WATER CROSSED.
- (2) NOTE ANY EVIDENCE OF SCOUR AT THE EXISTING END BENTS OR ABUTMENTS (UNDERMINING, SLOUGHING, SCOUR LOCATIONS, DEGRADATIONS, ETC.)
- (3) NOTE ANY EXISTING SCOUR PROTECTION (RIP RAP, ETC.)
- (4) DESCRIBE THE EXTENT OF ANY EXISTING SCOUR PROTECTION.
- (5) DESCRIBE WHETHER OR NOT THE SCOUR PROTECTION APPEARS TO BE WORKING.
- (6) NOTE ANY DAMS, FALLEN TREES, DEBRIS AT BENTS, ETC.
- (7) DESCRIBE THE CHANNEL BED MATERIAL: A SAMPLE SHOULD BE TAKEN FOR GRAIN SIZE DISTRIBUTION, ATTACH LAB RESULTS.
- (8) DESCRIBE THE CHANNEL BANK MATERIAL: A SAMPLE SHOULD BE TAKEN FOR GRAIN SIZE DISTRIBUTION, ATTACH LAB RESULTS.
- (9) DESCRIBE THE BANK COVERING (GRASS, TREES, RIP RAP, NONE, ETC.)
- (10) GIVE THE APPROXIMATE FLOOD PLAIN WIDTH (ESTIMATE).
- (11) DESCRIBE THE FLOOD PLAIN COVERING (GRASS, TREES, CROPS, ETC.)
- (12) CHECK THE APPROPRIATE SPACE AS TO WHETHER THE STREAM IS DEGRADING OR AGGRADING
- (13) DESCRIBE THE POTENTIAL OF THE BODY OF WATER TO MIGRATE laterally during the life of the bridge (APPROXIMATELY 100 YEARS).
- (14) GIVE THE GEOTECHNICALLY ADJUSTED SCOUR ELEVATION EXPECTED OVER THE LIFE OF THE BRIDGE (APPROXIMATELY 100 YEARS). THIS CAN BE GIVEN AS AN ELEVATION RANGE ACROSS THE SITE, OR ON A BENT BY BENT BASIS WHERE VARIATIONS EXIST. DISCUSS RELATIONSHIP BETWEEN THE HYDRAULICS THEORETICAL SCOUR AND THE GEOTECHNICALLY ADJUSTED SCOUR ELEVATION. THE GEOTECHNICALLY ADJUSTED SCOUR ELEVATION IS BASED ON THE ERODABILITY OF MATERIALS WITH CONSIDERATION FOR JOINTING, FOLIATION, BEDDING ORIENTATION AND FREQUENCY; CORE RECOVERY PERCENTAGE; PERCENTAGE RQD; DIFFERENTIAL WEATHERING, SHEAR STRENGTH; OBSERVATIONS AT EXISTING STRUCTURES; OTHER TESTS DEEMED APPROPRIATE; AND OVERALL GEOLOGIC CONDITIONS AT THE SITE.

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
 DIVISION OF HIGHWAY
 MATERIALS & TESTS UNIT
 SOILS LABORATORY

T. I. P. No. MAINT. UNION BRIDGE # 204

REPORT ON SAMPLES OF SOILS FOR QUALITY

Project 5.692 County UNION Owner _____
 Date: Sampled 1/4/04 Received 2/9/04 Reported 2/11/04
 Sampled from EB2-B By C.C. MURRAY
 Submitted by N.W. WAINAINA _____ 1995 Standard Specifications

711210 TO 711212
 2/12/04

TEST RESULTS

Proj. Sample No.	SS-1	SS-2	SS-3			
Lab. Sample No.	711210	711211	711212			
Retained #4 Sieve %	-	1	1			
Passing #10 Sieve %	95	90	95			
Passing #40 Sieve %	89	85	86			
Passing #200 Sieve %	86	73	81			

MINUS NO. 10 FRACTION

SOIL MORTAR - 100%						
Coarse Sand Ret - #60 %	7.4	7.6	11.1			
Fine Sand Ret - #270 %	4.4	18.1	5.4			
Silt 0.05 - 0.005 mm %	47.9	38.1	33.3			
Clay < 0.005 mm %	40.2	36.2	50.3			
Passing #40 Sieve %	-	-	-			
Passing #200 Sieve %	-	-	-			

L. L.	34	32	40			
P. I.	9	11	17			
AASHTO Classification	A-4(8)	A-6(7)	A-6(14)			
Station	10+22	10+22	10+00			
	9 RT	9 RT	14 RT/LT			
Hole No.	EB2-B	EB2-B	EB1-A			
Depth (Ft)	3.70	8.70	3.80			
	to	5.20	10.20	5.30		

cc: C.C. MURRAY
 Soils File

 Soils Engineer

**SUPPLEMENTAL STRUCTURE
SUBSURFACE INVESTIGATION
PROVIDED BY AMEC**

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	17BP.10.R.4	1	10

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

STRUCTURE
SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 17BP.10.R.4 F.A. PROJ. NA
COUNTY UNION
PROJECT DESCRIPTION DIVISION 10 GROUP N BRIDGE
REPLACEMENT
SITE DESCRIPTION REPLACE STRUCTURE 890204 - PRECAST
REINFORCED CONCRETE THREE-SIDED CULVERT ON SR 1158
(CORINTH CHURCH ROAD) OVER BEAVER DAM CREEK

CONTENTS

<u>SHEET</u>	<u>DESCRIPTION</u>
1	TITLE SHEET
2-2A	LEGEND SHEETS
3	SITE PLAN
4-9	BORING LOGS

PERSONNEL

F. Cox

D. Rhodes

R. Clark

INVESTIGATED BY AMEC E&I, Inc.

CHECKED BY S. Johnson, P.G. P.E.

SUBMITTED BY M. Lear, P.G.

DATE June 2012

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF PREPARING THE SCOPE OF WORK TO BE INCLUDED IN THE REQUEST FOR PROPOSAL. 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) 707-6950. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

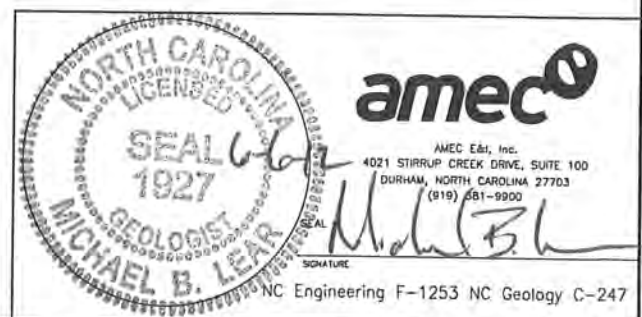
SOIL AND ROCK BOUNDARIES WITHIN A BOREHOLE ARE BASED ON GEOTECHNICAL INTERPRETATION UNLESS ENCOUNTERED IN A SAMPLE. INTERPRETED BOUNDARIES MAY NOT NECESSARILY REFLECT ACTUAL SUBSURFACE CONDITIONS BETWEEN SAMPLED STRATA, AND BOREHOLE INFORMATION MAY NOT NECESSARILY REFLECT ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS. 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 DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION 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.

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IS IT CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

NOTE - 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.

DRAWN BY: R. Rahie



NC Engineering F-1253 NC Geology C-247

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

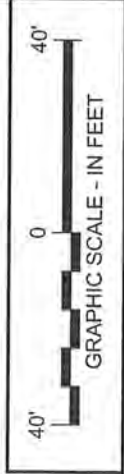
SOIL DESCRIPTION					GRADATION								
SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE: <i>VERY STIFF, GRN, SILTY CLN, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</i>					WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED) GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.								
SOIL LEGEND AND AASHTO CLASSIFICATION					MINERALOGICAL COMPOSITION								
GENERAL CLASS. GRANULAR MATERIALS (<= 35% PASSING #200) SILT-CLAY MATERIALS (> 35% PASSING #200) ORGANIC MATERIALS					MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.								
GROUP CLASS. A-1, A-3, A-2, A-4, A-5, A-7, A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-4, A-5, A-7-5, A-7-6, A-1, A-2, A-3, A-4, A-5, A-6, A-7					COMPRESSIBILITY								
SYMBOL					SLIGHTLY COMPRESSIBLE LIQUID LIMIT LESS THAN 31 MODERATELY COMPRESSIBLE LIQUID LIMIT EQUAL TO 31-50 HIGHLY COMPRESSIBLE LIQUID LIMIT GREATER THAN 50								
% PASSING # 10 # 40 # 200					PERCENTAGE OF MATERIAL								
LIQUID LIMIT PLASTIC INDEX					ORGANIC MATERIAL GRANULAR SILT - CLAY SOILS OTHER MATERIAL TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10% LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20% MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35% HIGHLY ORGANIC >10% >20% HIGHLY 35% AND ABOVE								
GROUP INDEX					GROUND WATER								
USUAL TYPES OF MAJOR MATERIALS					WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING STATIC WATER LEVEL AFTER 24 HOURS PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA SPRING OR SEEP								
GEN. RATING AS A SUBGRADE					PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30								
CONSISTENCY OR DENSENESS					MISCELLANEOUS SYMBOLS								
PRIMARY SOIL TYPE		COMPACTNESS OR CONSISTENCY		RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)		RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²)			SPT DMT VST PHT TEST BORING W/ CORE				
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)		VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE		<4 4 TO 10 10 TO 30 30 TO 50 >50		N/A			AUGER BORING CORE BORING MONITORING WELL PIEZOMETER INSTALLATION SLOPE INDICATOR INSTALLATION CONE PENETROMETER TEST SOUNDING ROD				
GENERALLY SILT-CLAY MATERIAL (COHESIVE)		VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD		<2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 >30		<0.25 0.25 TO 0.50 0.5 TO 1.0 1 TO 2 2 TO 4 >4			ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION SOIL SYMBOL ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT INFERRED SOIL BOUNDARY INFERRED ROCK LINE ALLUVIAL SOIL BOUNDARY DIP & DIP DIRECTION OF ROCK STRUCTURES				
TEXTURE OR GRAIN SIZE					ABBREVIATIONS								
U.S. STD. SIEVE SIZE OPENING (MM)		4 10 40 60 200 270		4.75 2.00 0.42 0.25 0.075 0.053		AR - AUGER REFUSAL MED. - MEDIUM VST - VANE SHEAR TEST BT - BORING TERMINATED MICA - MICACEOUS WEA. - WEATHERED CL - CLAY MOO. - MODERATELY 7 - UNIT WEIGHT CPT - CONE PENETRATION TEST NP - NON PLASTIC 7/16 - DRY UNIT WEIGHT CSE - COARSE ORG. - ORGANIC PMT - PRESSUREMETER TEST SAMPLE ABBREVIATIONS DMT - DILATOMETER TEST SAP. - SAPROLITIC S - BULK DPT - DYNAMIC PENETRATION TEST SO. - SAND, SANDY SS - SPLIT SPOON e - VOID RATIO SL. - SILT, SILTY ST - SHELBY TUBE F - FINE SLI. - SLIGHTLY RS - ROCK FOSS. - FOSSILIFEROUS TCR - TRICONE REFUSAL RT - RECOMPACTED TRIAXIAL FRAG. - FRACTURED, FRACTURES SLI. - SLIGHTLY CBR - CALIFORNIA BEARING RATIO FRAGS. - FRAGMENTS ** - MOISTURE CONTENT V - VERY HL - HIGHLY							
BOULDER (BLDR.)		COBBLE (COB.)		GRAVEL (GR.)		COARSE SAND (CSE, SD.)		FINE SAND (F SD.)		SILT (SL.)		CLAY (CL.)	
GRAIN MM 305 75 2.0 0.25 0.05 0.005		SIZE IN. 12 3		2.0 0.25 0.05 0.005		2.0 0.25 0.05 0.005		0.25 0.05 0.005		0.05 0.005		0.005	
SOIL MOISTURE - CORRELATION OF TERMS													
SOIL MOISTURE SCALE (ATTERBERG LIMITS)			FIELD MOISTURE DESCRIPTION			GUIDE FOR FIELD MOISTURE DESCRIPTION			EQUIPMENT USED ON SUBJECT PROJECT				
LL - LIQUID LIMIT			- SATURATED - (SAT.)			USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE			DRILL UNITS: <input type="checkbox"/> MOBILE B- <input type="checkbox"/> BK-51 <input checked="" type="checkbox"/> CME-45C <input type="checkbox"/> CME-550 <input type="checkbox"/> PORTABLE MOIST <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>				
PL - PLASTIC LIMIT			- WET - (W)			SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE							
OM - OPTIMUM MOISTURE			- MOIST - (M)			SOLID; AT OR NEAR OPTIMUM MOISTURE							
SL - SHRINKAGE LIMIT			- DRY - (D)			REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE							
PLASTICITY													
NONPLASTIC			PLASTICITY INDEX (PI)			DRY STRENGTH			ADVANCING TOOLS: <input type="checkbox"/> CLAY BITS <input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER <input type="checkbox"/> 8" HOLLOW AUGERS <input type="checkbox"/> HARD FACED FINGER BITS <input type="checkbox"/> TUNG.-CARBIDE INSERTS <input checked="" type="checkbox"/> CASING <input type="checkbox"/> W/ ADVANCER <input checked="" type="checkbox"/> TRICONE <input type="checkbox"/> 2 3/8" STEEL TEETH <input type="checkbox"/> TRICONE <input type="checkbox"/> TUNG.-CARB. <input type="checkbox"/> CORE BIT <input type="checkbox"/>				
LOW PLASTICITY			0-5			VERY LOW							
MED. PLASTICITY			6-15			SLIGHT							
HIGH PLASTICITY			16-25 26 OR MORE			MEDIUM HIGH							
COLOR													
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.													

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

ROCK DESCRIPTION		TERMS AND DEFINITIONS	
<p>HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 6.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:</p>		<p>ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. AQUIFER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOGGED FROM PARENT MATERIAL. FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. FORMATION (FM) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS IN OR BPF) OF A 148 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 6.1 FOOT PER 60 BLOWS. STRATA CORE RECOVERY (SPEC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p>	
<p>WEATHERED ROCK (WR)</p> 	<p>NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.</p>		
<p>CRYSTALLINE ROCK (CR)</p> 	<p>FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.</p>		
<p>NON-CRYSTALLINE ROCK (NCR)</p> 	<p>FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.</p>		
<p>COASTAL PLAIN SEDIMENTARY ROCK (CP)</p> 	<p>COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.</p>		
WEATHERING			
FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER HAMMER IF CRYSTALLINE.		
VERY SLIGHT (V SL.)	ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.		
SLIGHT (SL.)	ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.		
MODERATE (MOD.)	SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.		
MODERATELY SEVERE (MOD. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. <i>IF TESTED, WOULD YIELD SPT REFUSAL</i>		
SEVERE (SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT, SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. <i>IF TESTED, YIELDS SPT N VALUES > 100 BPF</i>		
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. <i>IF TESTED, YIELDS SPT N VALUES < 100 BPF</i>		
COMPLETE	ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.		
ROCK HARDNESS			
VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.		
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.		
MODERATELY HARD	CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.		
MEDIUM HARD	CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.		
SOFT	CAN BE GROOVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.		
VERY SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.		
FRACTURE SPACING		BEDDING	
TERM	SPACING	TERM	THICKNESS
VERY WIDE	MORE THAN 10 FEET	VERY THICKLY BEDDED	> 4 FEET
WIDE	3 TO 10 FEET	THICKLY BEDDED	1.5 - 4 FEET
MODERATELY CLOSE	1 TO 3 FEET	THINLY BEDDED	0.16 - 1.5 FEET
CLOSE	0.16 TO 1 FEET	VERY THINLY BEDDED	0.03 - 0.16 FEET
VERY CLOSE	LESS THAN 0.16 FEET	THICKLY LAMINATED	0.008 - 0.03 FEET
		THINLY LAMINATED	< 0.008 FEET
INDURATION			
FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.			
FRIABLE	RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.		
MODERATELY INDURATED	GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.		
INDURATED	GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.		
EXTREMELY INDURATED	SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.		
		<p>BENCH MARK: NCDOT REBAR & CAP STAMPED BL-1 LOCATED AT STATION 14+67.50 (-LNEW-), 15.49 LT</p> <p style="text-align: right;">ELEVATION: 594.43 FT.</p>	
NOTES:			

DESCRIPTION:
 REPLACEMENT STRUCTURE 890204 -
 PRECAST REINFORCED CONCRETE
 THREE-SIDED CULVERT ON SR 1158
 (CORNITH CURCH RD) OVER BEAVER
 DAM CREEK

SHEET NO. 3
 W.B.S. NO.: 17BP, 10.R.4
 T.I.P. NO.: N/A
 COUNTY: UNION





NCDOT GEOTECHNICAL ENGINEERING UNIT

BORELOG REPORT

WBS 17BP.10.R.4		TIP 17BP.10.R.4		COUNTY UNION		GEOLOGIST R. Clark										
SITE DESCRIPTION Bridge 890204 on SR 1158 over Branch of Beaver Dam Creek								GROUND WTR (ft)								
BORING NO. B-1		STATION 14+76		OFFSET 14 ft RT		ALIGNMENT -L-		0 HR. 2.5								
COLLAR ELEV. 593.4 ft		TOTAL DEPTH 19.6 ft		NORTHING 441,464		EASTING 1,518,430		24 HR. 6.0								
DRILL RIG/HAMMER EFF./DATE MAC9354 CME-45C 86% 10/3/2010				DRILL METHOD SPT Core Boring			HAMMER TYPE Automatic									
DRILLER F. Cox		START DATE 05/22/12		COMP. DATE 05/22/12		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)	
595																
	593.4	0.0	2	9	8								593.4	0.0	GROUND SURFACE	
590	589.9	3.5	1	2	2						M		588.4	5.0	ROADWAY EMBANKMENT Brown to reddish brown, moist, very stiff to soft, silty, fine to coarse sandy, clayey SILT (A-4) with trace to few gravel	
585	584.9	8.5	7	100/0.2				584.4	9.0	ALLUVIAL Yellowish gray, moist to wet, medium stiff, fine sandy, silty CLAY (A-6) with trace organics						
	582.8	10.6	60/0.0					582.8	10.6	WEATHERED ROCK Tan, METAVOLCANIC						
580										NON-CRYSTALLINE ROCK Light gray, METAVOLCANIC						
575																
														573.8	19.6	Boring Terminated at Elevation 573.8 ft in Non-Crystalline Rock: METAVOLCANIC

NCDOT BORE SINGLE BRIDGE 204 LOGS.GPJ NC DOT.GDT 6/6/12



NCDOT GEOTECHNICAL ENGINEERING UNIT

CORE BORING REPORT

WBS 17BP.10.R.4		TIP 17BP.10.R.4		COUNTY UNION			GEOLOGIST R. Clark					
SITE DESCRIPTION Bridge 890204 on SR 1158 over Branch of Beaver Dam Creek									GROUND WTR (ft)			
BORING NO. B-1		STATION 14+76		OFFSET 14 ft RT		ALIGNMENT -L-		0 HR. 2.5				
COLLAR ELEV. 593.4 ft		TOTAL DEPTH 19.6 ft		NORTHING 441,464		EASTING 1,518,430		24 HR. 6.0				
DRILL RIG/HAMMER EFF./DATE MAC9354 CME-45C 86% 10/3/2010					DRILL METHOD SPT Core Boring			HAMMER TYPE Automatic				
DRILLER F. Cox		START DATE 05/22/12		COMP. DATE 05/22/12		SURFACE WATER DEPTH N/A						
CORE SIZE NQ				TOTAL RUN 9.0 ft								
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (ft) %	RQD (ft) %		REC. (ft) %	RQD (ft) %			
582.8	582.8	10.6	4.0	2:45/1.0 3:08 3:05 3:31	(3.5) 88%	(1.8) 45%		(8.5) 94%	(6.5) 72%		582.8	10.6
580	578.8	14.6	5.0	3:28 3:55 4:01 3:57 4:05	(5.0) 100%	(4.7) 94%					Light gray, slightly weathered, closely to moderately closely fractured, moderately hard, METAVOLCANIC	
575	573.8	19.6									Boring Terminated at Elevation 573.8 ft in Non-Crystalline Rock: METAVOLCANIC	19.6

NCDOT CORE SINGLE BRIDGE 204 LOGS.GPJ NC_DOT.GDT 6/6/12

CORE PHOTOGRAPHS

B-1

BOX 1: 10.6 - 19.6 FEET





NCDOT GEOTECHNICAL ENGINEERING UNIT

BORELOG REPORT

WBS 17BP.10.R.4		TIP 17BP.10.R.4		COUNTY UNION		GEOLOGIST R. Clark											
SITE DESCRIPTION Bridge 890204 on SR 1158 over Branch of Beaver Dam Creek							GROUND WTR (ft)										
BORING NO. B-2		STATION 15+33		OFFSET 10 ft LT		ALIGNMENT -L-	0 HR. 2.5										
COLLAR ELEV. 594.3 ft		TOTAL DEPTH 19.6 ft		NORTHING 441,526		EASTING 1,518,437	24 HR. 5.8										
DRILL RIG/HAMMER EFF./DATE MAC9354 CME-45C 86% 10/3/2010				DRILL METHOD SPT Core Boring		HAMMER TYPE Automatic											
DRILLER F. Cox		START DATE 05/22/12		COMP. DATE 05/22/12		SURFACE WATER DEPTH N/A											
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION				
			0.5ft	0.5ft	0.5ft	0	25	50	75	100			ELEV. (ft)	DEPTH (ft)			
595	594.3	0.0												594.3	0.0	GROUND SURFACE	
			4	4	4												ROADWAY EMBANKMENT
																	Brown to reddish brown, moist, medium stiff, fine sandy SILT (A-4) with trace roots and gravel
590	590.8	3.5	2	3	3									589.3	5.0	ALLUVIAL	
																	Greenish gray, wet, stiff, fine sandy, silty CLAY (A-6)
585	585.8	8.5	4	8	100/0.3									584.8	9.5	WEATHERED ROCK	
																	METAVOLCANIC
	582.7	11.6								100/0.3				582.7	11.6	NON-CRYSTALLINE ROCK	
																	Light gray, METAVOLCANIC
580																	
575														574.7	19.6		Boring Terminated at Elevation 574.7 ft in Non-Crystalline Rock: METAVOLCANIC

NCDOT BORE SINGLE BRIDGE 204 LOGS.GPJ NC_DOT.GDT 6/6/12



NCDOT GEOTECHNICAL ENGINEERING UNIT CORE BORING REPORT

WBS 17BP.10.R.4			TIP 17BP.10.R.4			COUNTY UNION			GEOLOGIST R. Clark			
SITE DESCRIPTION Bridge 890204 on SR 1158 over Branch of Beaver Dam Creek										GROUND WTR (ft)		
BORING NO. B-2			STATION 15+33			OFFSET 10 ft LT			ALIGNMENT -L-		0 HR. 2.5	
COLLAR ELEV. 594.3 ft			TOTAL DEPTH 19.6 ft			NORTHING 441,526			EASTING 1,518,437		24 HR. 5.8	
DRILL RIG/HAMMER EFF./DATE MAC9354 CME-45C 86% 10/3/2010						DRILL METHOD SPT Core Boring			HAMMER TYPE Automatic			
DRILLER F. Cox			START DATE 05/22/12			COMP. DATE 05/22/12			SURFACE WATER DEPTH N/A			
CORE SIZE NQ			TOTAL RUN 8.0 ft									
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (ft) %	ROD (ft) %		REC. (ft) %	ROD (ft) %			
582.7												
	582.7	11.6	3.0	3:59 3:48 4:15	(2.9) 97%	(1.9) 63%		(7.9) 99%	(4.9) 61%		Begin Coring @ 11.6 ft NON-CRYSTALLINE ROCK	11.6
580	579.7	14.6	5.0	3:55 4:05 4:22 4:35 4:45	(5.0) 100%	(3.0) 60%					Light gray, slightly weathered, closely fractured, moderately hard, METAVOLCANIC	
575	574.7	19.6									Boring Terminated at Elevation 574.7 ft in Non-Crystalline Rock: METAVOLCANIC	19.6

NCDOT CORE SINGLE BRIDGE 204 LOGS.GPJ NC_DOT.GDT 6/6/12

CORE PHOTOGRAPHS

B-2

BOX 1: 11.6 - 19.6 FEET

