

REFERENCE: BR-0095

PROJECT: 67095

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

STRUCTURE
SUBSURFACE INVESTIGATION

COUNTY ROCKINGHAM
PROJECT DESCRIPTION REPLACE BRIDGE 780170 ON
SR 1360 OVER US 220

SITE DESCRIPTION STA. 16 + 91.66 -L-

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STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	BR-0095	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.

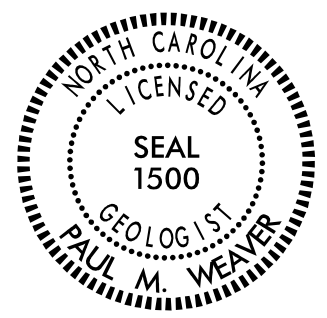
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- NOTES:
- THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT.
 - BY HAVING REQUESTED THIS INFORMATION, 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. O'TOOLE
C.R. PASTRANA
TRIGON EXPLORATION

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.**
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DocuSigned by:
Paul Weaver 03/31/2023
01847D3739AD18C SIGNATURE DATE

**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

SOIL DESCRIPTION: SOIL IS CONSIDERED 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. SOIL LEGEND AND AASHTO CLASSIFICATION table with columns for general class, group class, symbol, and consistency.

GRADATION: WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. ANGULARITY OF GRAINS: THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED. MINERALOGICAL COMPRESSION, COMPRESSIBILITY, PERCENTAGE OF MATERIAL, GROUND WATER, MISCELLANEOUS SYMBOLS, and RECOMMENDATION SYMBOLS.

ROCK DESCRIPTION: HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. WEATHERING: FRESH, VERY SLIGHT (IV SLI), SLIGHT (SLI), MODERATE (MOD.), MODERATELY SEVERE (MOD. SEV.), SEVERE (SEV.), VERY SEVERE (IV SEV.), COMPLETE. ROCK HARDNESS: VERY HARD, HARD, MODERATELY HARD, MEDIUM HARD, SOFT, VERY SOFT. FRACTURE SPACING and BEDDING tables. INDURATION: FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.

TERMS AND DEFINITIONS: ALLUVIUM (ALLUV.), AQUIFER, ARENACEOUS, ARGILLACEOUS, ARTESIAN, CALCAREOUS (CALC.), COLLUVIUM, CORE RECOVERY (REC.), DIKE, DIP, DIP DIRECTION (DIP AZIMUTH), FAULT, FISSILE, FLOAT, FLOOD PLAIN (FP), FORMATION (FM), JOINT, LEDGE, LENS, MOTTLED (MOT.), PERCHED WATER, RESIDUAL (RES.) SOIL, ROCK QUALITY DESIGNATION (ROD), SAPROLITE (SAP.), SILL, SLICKENSIDE, STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT), STRATA CORE RECOVERY (SREC.), STRATA ROCK QUALITY DESIGNATION (SROD), TOPSOIL (TS.). BENCH MARK: BL-4; N 1003061.2149, E 1729353.2186, -BL- STA. 20+23.34. ELEVATION: 992.15 FEET. NOTES: F.I.A.D. FILLED IN AFTER DRILLING.

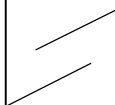
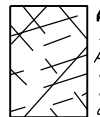
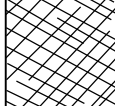

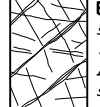



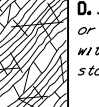

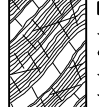

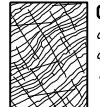

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES
FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS

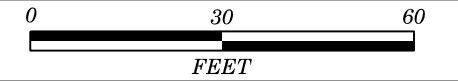
AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jointed Rock Mass (Marinos and Hoek, 2000)

AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonically Deformed Heterogeneous Rock Masses (Marinos and Hoek, 2000)

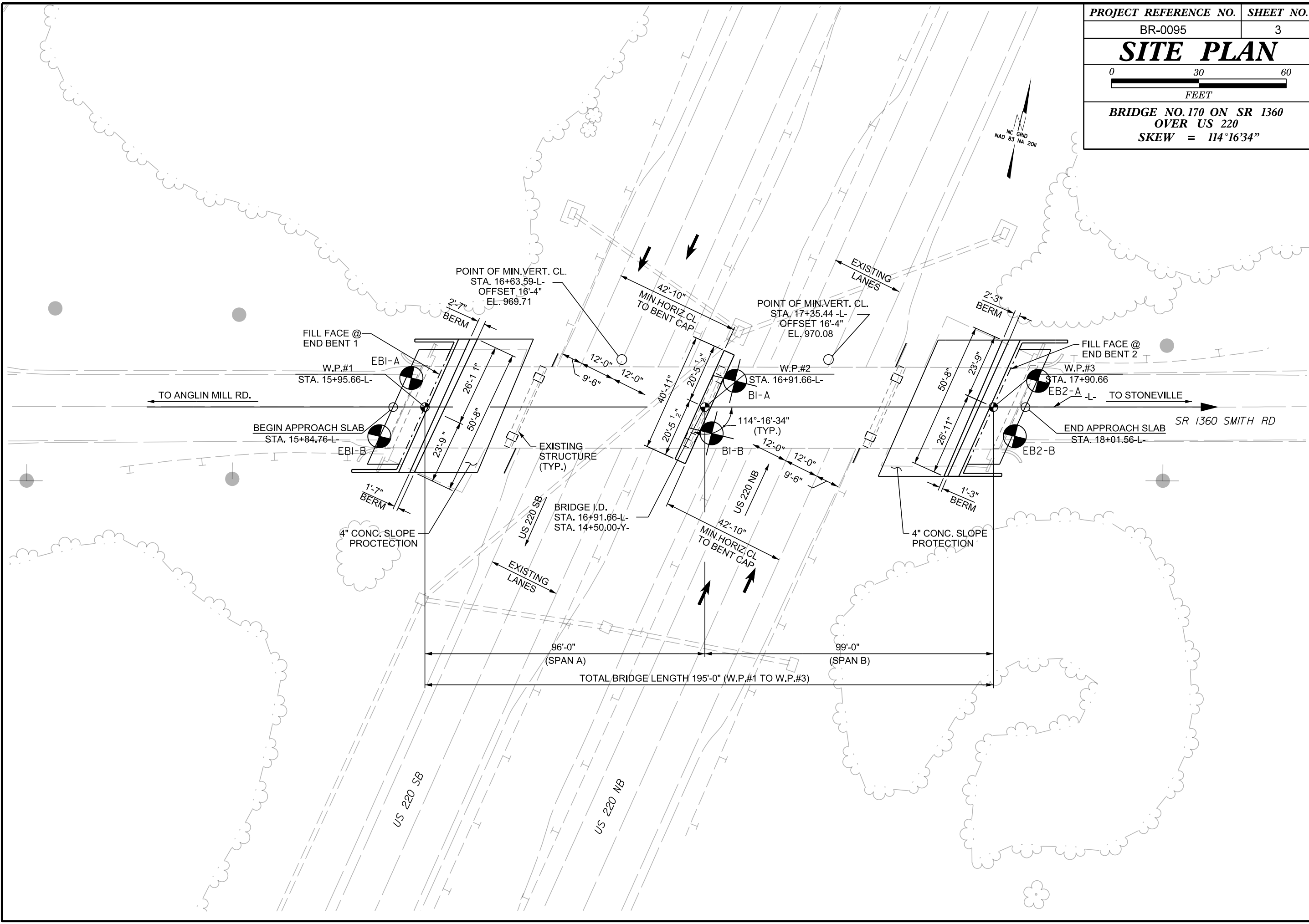
GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000)		SURFACE CONDITIONS					GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos, P and Hoek E., 2000)		SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)					
From the lithology, structure and surface conditions of the discontinuities, estimate the average value of GSI. Do not try to be too precise. Quoting a range from 33 to 37 is more realistic than stating that GSI = 35. Note that the table does not apply to structurally controlled failures. Where weak planar structural planes are present in an unfavorable orientation with respect to the excavation face, these will dominate the rock mass behaviour. The shear strength of surfaces in rocks that are prone to deterioration as a result of changes in moisture content will be reduced if water is present. When working with rocks in the fair to very poor categories, a shift to the right may be made for wet conditions. Water pressure is dealt with by effective stress analysis.		VERY GOOD	GOOD	FAIR	POOR	VERY POOR	From a description of the lithology, structure and surface conditions (particularly of the bedding planes), choose a box in the chart. Locate the position in the box that corresponds to the condition of the discontinuities and estimate the average value of GSI from the contours. Do not attempt to be too precise. Quoting a range from 33 to 37 is more realistic than giving GSI = 35. Note that the Hoek-Brown criterion does not apply to structurally controlled failures. Where unfavourably oriented continuous weak planar discontinuities are present, these will dominate the behaviour of the rock mass. The strength of some rock masses is reduced by the presence of groundwater and this can be allowed for by a slight shift to the right in the columns for fair, poor and very poor conditions. Water pressure does not change the value of GSI and it is dealt with by using effective stress analysis.		VERY GOOD	GOOD	FAIR	POOR	VERY POOR	
STRUCTURE		DECREASING SURFACE QUALITY →					COMPOSITION AND STRUCTURE							
	INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities	90			N/A	N/A		70						
	BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets	80					<i>A. Thick bedded, very blocky sandstone</i> The effect of pelitic coatings on the bedding planes is minimized by the confinement of the rock mass. In shallow tunnels or slopes these bedding planes may cause structurally controlled instability.	60						
	VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets		70						50					
	BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity		60							40				
	DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces			50							30			
	LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes				40							20		
					30		<i>C, D, E, and G - may be more or less folded than illustrated but this does not change the strength. Tectonic deformation, faulting and loss of continuity moves these categories to F and H.</i>						10	
					20									
					10									
		N/A	N/A											

→ Means deformation after tectonic disturbance

SITE PLAN



BRIDGE NO. 170 ON SR 1360
OVER US 220
SKEW = 114°16'34"



POINT OF MIN. VERT. CL.
STA. 16+63.59-L
OFFSET 16'-4"
EL. 969.71

POINT OF MIN. VERT. CL.
STA. 17+35.44-L
OFFSET 16'-4"
EL. 970.08

FILL FACE @
END BENT 1
W.P.#1
STA. 15+95.66-L

FILL FACE @
END BENT 2
W.P.#3
STA. 17+90.66

BEGIN APPROACH SLAB
STA. 15+84.76-L

END APPROACH SLAB
STA. 18+01.56-L

BRIDGE I.D.
STA. 16+91.66-L
STA. 14+50.00-Y-

96'-0"
(SPAN A)

99'-0"
(SPAN B)

TOTAL BRIDGE LENGTH 195'-0" (W.P.#1 TO W.P.#3)

TO ANGLIN MILL RD.

TO STONEVILLE

SR 1360 SMITH RD

4" CONC. SLOPE PROTECTION

4" CONC. SLOPE PROTECTION

EXISTING LANES

EXISTING LANES

EXISTING STRUCTURE (TYP.)

BERM

BERM

BERM

BERM

US 220 SB

US 220 NB

US 220 NB

US 220 SB

MIN. HORIZ. CL TO BENT CAP

MIN. HORIZ. CL TO BENT CAP

EBI-A

EBI-B

BI-A

BI-B

EB2-A

EB2-B

2'-7"

26'-11"

50'-8"

23'-9"

1'-7"

2'-3"

23'-9"

50'-8"

26'-11"

1'-3"

12'-0"

9'-6"

40'-11"

20'-5 1/2"

20'-5 1/2"

12'-0"

9'-6"

42'-10"

114°-16'-34" (TYP.)

12'-0"

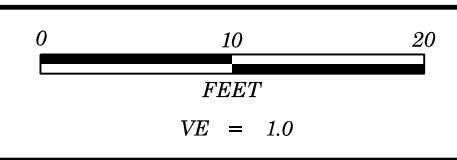
12'-0"

9'-6"

96'-0"

99'-0"

TOTAL BRIDGE LENGTH 195'-0" (W.P.#1 TO W.P.#3)



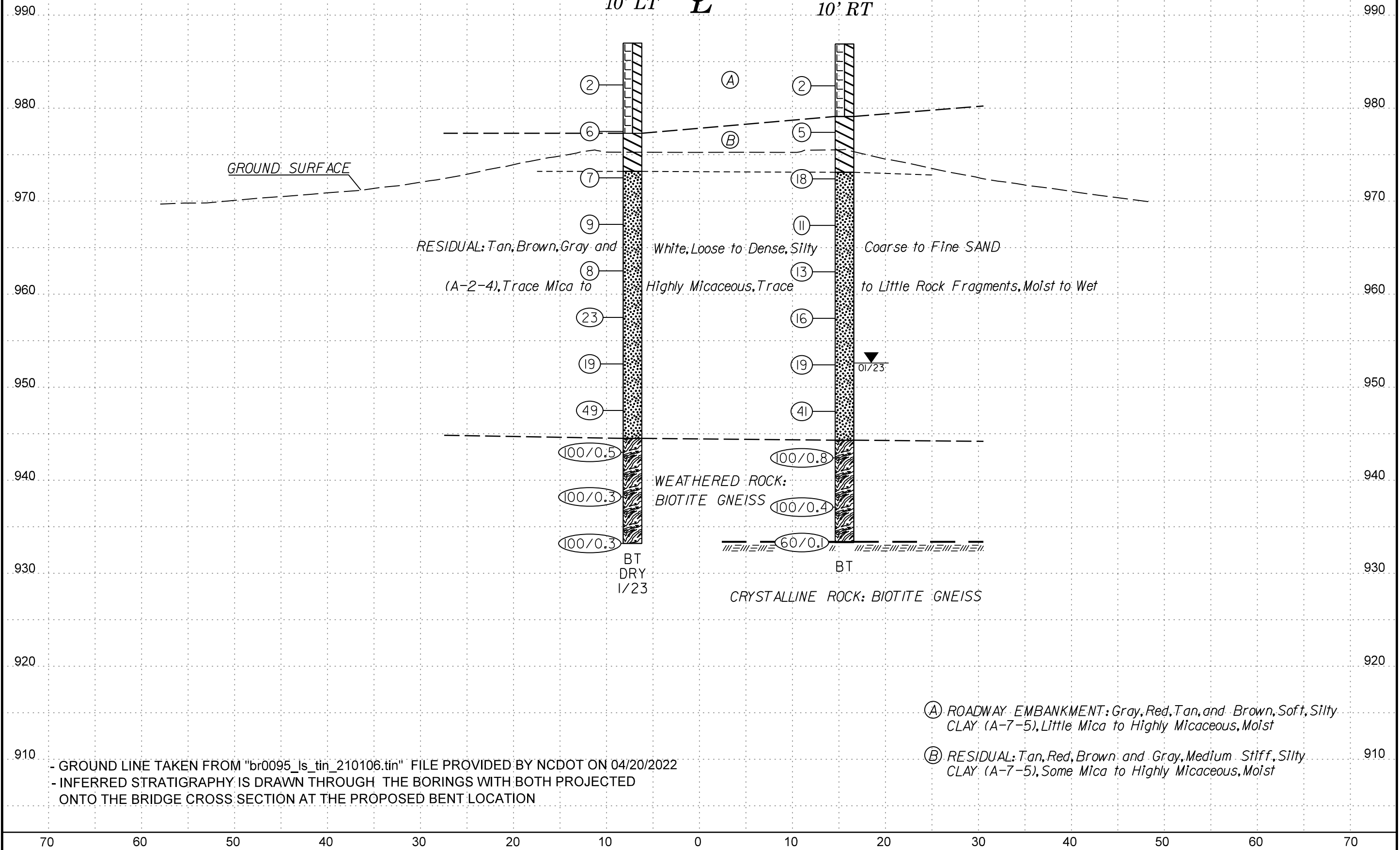
PROJECT REFERENCE NO.	SHEET NO.
BR-0095	4
CROSS SECTION AT END BENT 1	
-L- STATION 15+95.66	
SKEW = 114° 16' 34"	

-L- STA. 15+95.66

EB1-A
15+91
10' LT

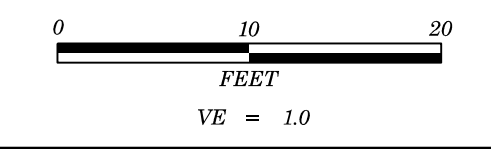


EB1-B
15+80
10' RT



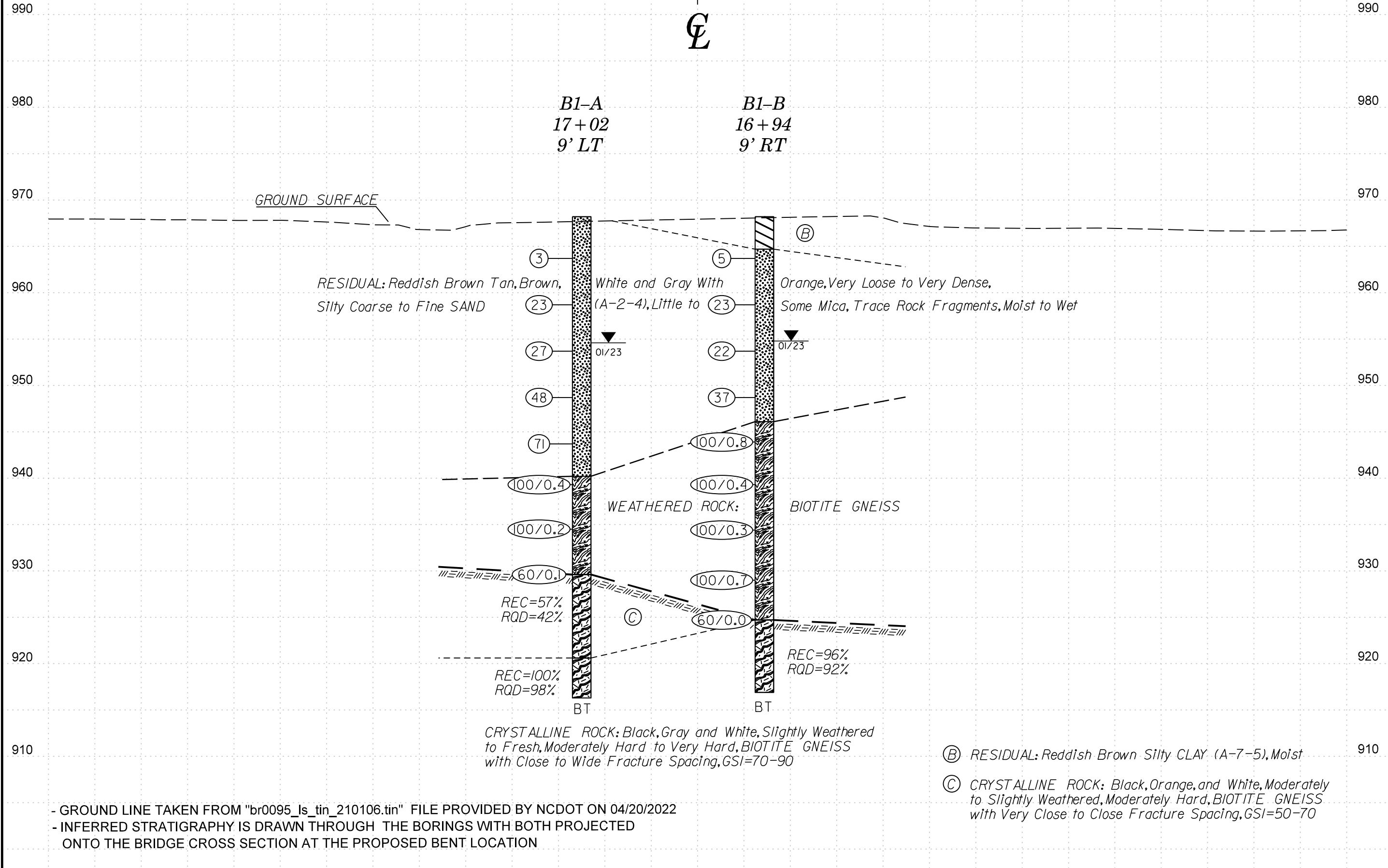
- GROUND LINE TAKEN FROM "br0095_ls_tin_210106.tin" FILE PROVIDED BY NCDOT ON 04/20/2022
 - INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED
 ONTO THE BRIDGE CROSS SECTION AT THE PROPOSED BENT LOCATION

- (A) ROADWAY EMBANKMENT: Gray, Red, Tan, and Brown, Soft, Silty CLAY (A-7-5), Little Mica to Highly Micaceous, Moist
- (B) RESIDUAL: Tan, Red, Brown and Gray, Medium Stiff, Silty CLAY (A-7-5), Some Mica to Highly Micaceous, Moist



PROJECT REFERENCE NO.	SHEET NO.
BR-0095	5
CROSS SECTION AT BENT 1	
-L- STATION 16+91.66	
SKEW = 114° 16' 34"	

-L- STA. 16+91.66



B1-A
17+02
9' LT

B1-B
16+94
9' RT

GROUND SURFACE

RESIDUAL: Reddish Brown Tan, Brown, Silty Coarse to Fine SAND

White and Gray With (A-2-4), Little to

Orange, Very Loose to Very Dense, Some Mica, Trace Rock Fragments, Moist to Wet

WEATHERED ROCK:

BIOTITE GNEISS

REC=57%
RQD=42%

REC=96%
RQD=92%

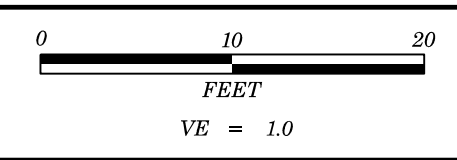
CRYSTALLINE ROCK: Black, Gray and White, Slightly Weathered to Fresh, Moderately Hard to Very Hard, BIOTITE GNEISS with Close to Wide Fracture Spacing, GSI=70-90

ⓑ RESIDUAL: Reddish Brown Silty CLAY (A-7-5), Moist

ⓒ CRYSTALLINE ROCK: Black, Orange, and White, Moderately to Slightly Weathered, Moderately Hard, BIOTITE GNEISS with Very Close to Close Fracture Spacing, GSI=50-70

- GROUND LINE TAKEN FROM "br0095_ls_tin_210106.tin" FILE PROVIDED BY NCDOT ON 04/20/2022
- INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE BRIDGE CROSS SECTION AT THE PROPOSED BENT LOCATION

70 60 50 40 30 20 10 0 10 20 30 40 50 60 70



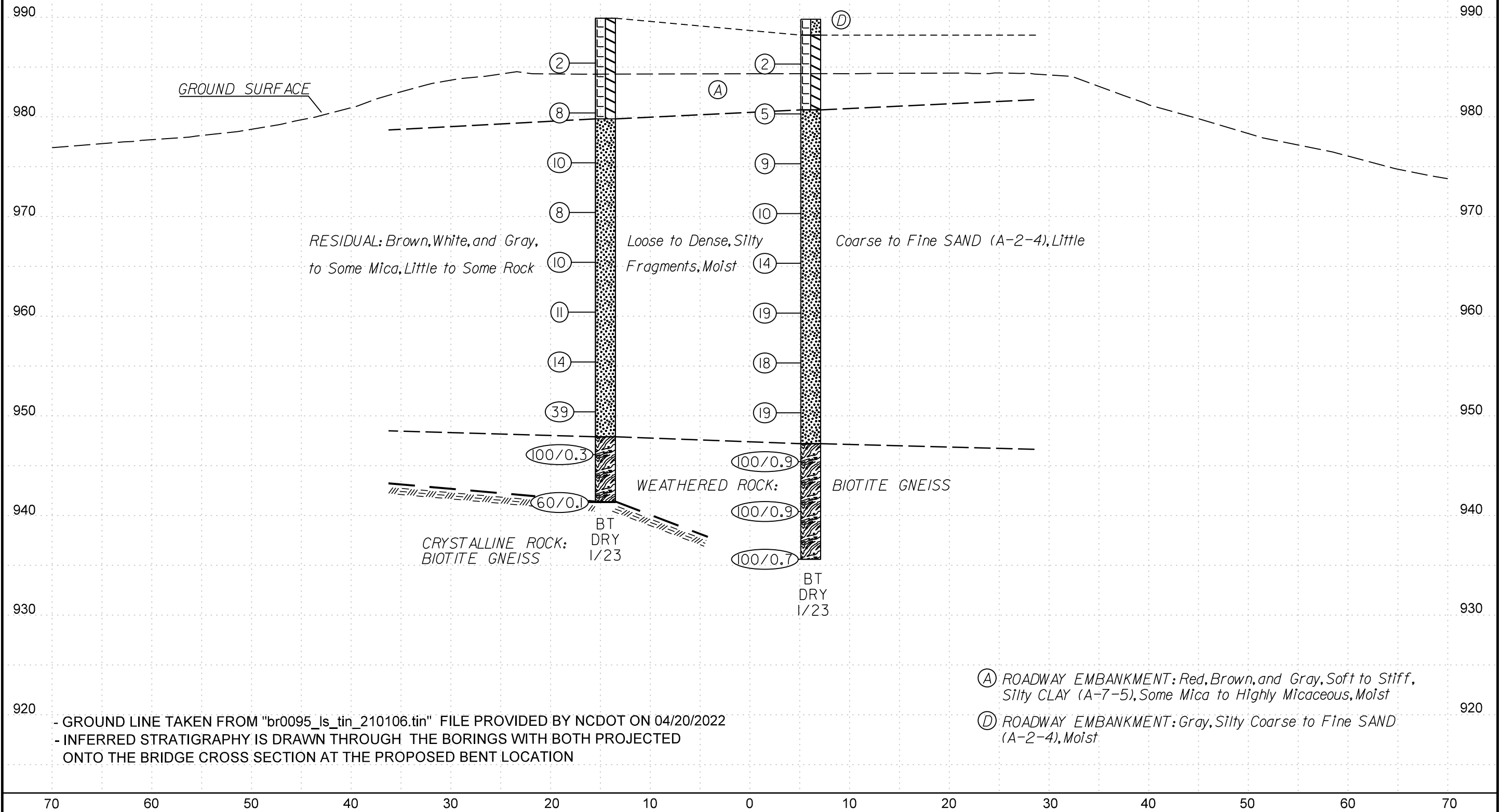
PROJECT REFERENCE NO.	SHEET NO.
BR-0095	6
CROSS SECTION AT END BENT 2	
<i>-L- STATION 17+90.66</i>	
<i>SKEW = 114° 16' 34"</i>	

-L- STA. 17+90.66



EB2-A
18+06
9' LT

EB2-B
17+98
10' RT



- GROUND LINE TAKEN FROM "br0095_ls_tin_210106.tin" FILE PROVIDED BY NCDOT ON 04/20/2022
 - INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE BRIDGE CROSS SECTION AT THE PROPOSED BENT LOCATION

70 60 50 40 30 20 10 0 10 20 30 40 50 60 70

GEOTECHNICAL BORING REPORT BORE LOG

SHEET 7

WBS 67095.1.1		TIP BR-0095		COUNTY ROCKINGHAM		GEOLOGIST O'Toole, C.										
SITE DESCRIPTION Replace Bridge 780170 on SR 1360 (Smith Road) over US 220							GROUND WTR (ft)									
BORING NO. EB1-A		STATION 15+91		OFFSET 10 ft LT		ALIGNMENT -L-										
COLLAR ELEV. 987.0 ft		TOTAL DEPTH 53.8 ft		NORTHING 1,002,959		EASTING 1,729,005										
DRILL RIG/HAMMER EFF./DATE TRI8016 MOBILE B-57 84% 05/09/2022				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER Estep, E.		START DATE 01/05/23		COMP. DATE 01/06/23		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	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
990														987.0	0.0	GROUND SURFACE
985	983.5	3.5	WOH	1	1							M				ROADWAY EMBANKMENT Tan, Red, Brown, and Gray, Silty CLAY, Little Mica to Highly Micaceous
980	978.5	8.5		3	3							M		977.3	9.7	RESIDUAL Tan, Brown, and Gray, Silty CLAY, Highly Micaceous
975	973.5	13.5		2	3	4						M		973.2	13.8	Tan, Brown, Gray, and White, Silty Coarse to Fine SAND, Trace Mica to Highly Micaceous, Trace to Little Rock Fragments
970	968.5	18.5		3	4	5						M				
965	963.5	23.5		3	3	5						M				
960	958.5	28.5		11	10	13						M				
955	953.5	33.5		7	9	10						M				
950	948.5	38.5		7	19	30						W				
945	943.5	43.5		100/0.5										944.5	42.5	WEATHERED ROCK BIOTITE GNEISS
940	938.5	48.5		100/0.3												
935	933.5	53.5		100/0.3										933.2	53.8	Boring Terminated at Elevation 933.2 ft in Weathered Rock: BIOTITE GNEISS

NCDOT BORE SINGLE BR-0095_GEO_BRDG_GINT.GPJ NC_DOT.GDT 3/31/23

GEOTECHNICAL BORING REPORT BORE LOG

SHEET 7

WBS 67095.1.1		TIP BR-0095		COUNTY ROCKINGHAM		GEOLOGIST O'Toole, C.										
SITE DESCRIPTION Replace Bridge 780170 on SR 1360 (Smith Road) over US 220							GROUND WTR (ft)									
BORING NO. EB1-B		STATION 15+80		OFFSET 10 ft RT		ALIGNMENT -L-										
COLLAR ELEV. 986.9 ft		TOTAL DEPTH 53.6 ft		NORTHING 1,002,937		EASTING 1,728,999										
DRILL RIG/HAMMER EFF./DATE TRI8016 MOBILE B-57 84% 05/09/2022				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER Estep, E.		START DATE 01/03/23		COMP. DATE 01/03/23		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	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
990														986.9	0.0	GROUND SURFACE
985	983.4	3.5	WOH	1	1							M				ROADWAY EMBANKMENT Gray and Reddish Brown, Silty CLAY, Little Mica
980	978.4	8.5		2	2	3						M		979.1	7.8	RESIDUAL Red and Brown, Silty CLAY, Some Mica
975	973.4	13.5		3	7	11						M		973.1	13.8	White, Brown, and Gray Silty Coarse to Fine SAND, Little to Some Mica, Trace Rock Fragments
970	968.4	18.5		4	5	6						M				
965	963.4	23.5		4	5	8						M				
960	958.4	28.5		7	9	7						M				
955	953.4	33.5		6	8	11						M				
950	948.4	38.5		11	17	24						W				
945	943.4	43.5		21	50	50/0.3								944.3	42.6	WEATHERED ROCK BIOTITE GNEISS
940	938.4	48.5		100/0.4												
935	933.4	53.5		60/0.1										933.4	53.5	CRYSTALLINE ROCK BIOTITE GNEISS Boring Terminated with Standard Penetration Test Refusal at Elevation 933.3 ft in Crystalline Rock: BIOTITE GNEISS

NCDOT BORE SINGLE BR-0095_GEO_BRDG_GINT.GPJ NC_DOT.GDT 3/31/23

GEOTECHNICAL BORING REPORT BORE LOG

WBS 67095.1.1		TIP BR-0095		COUNTY ROCKINGHAM		GEOLOGIST O'Toole, C.								
SITE DESCRIPTION Replace Bridge 780170 on SR 1360 (Smith Road) over US 220							GROUND WTR (ft)							
BORING NO. B1-A		STATION 17+02		OFFSET 9 ft LT		ALIGNMENT -L-								
COLLAR ELEV. 968.2 ft		TOTAL DEPTH 51.9 ft		NORTHING 1,002,985		EASTING 1,729,113								
DRILL RIG/HAMMER EFF./DATE TRI8016 MOBILE B-57 84% 05/09/2022		DRILL METHOD Core Boring		HAMMER TYPE Automatic										
DRILLER Estep, E.		START DATE 01/05/23		COMP. DATE 01/09/23		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					
970													968.2 GROUND SURFACE	0.0
965	964.7	3.5	1	2	1							W	RESIDUAL Reddish Brown, Tan, Brown, White, and Gray, Silty Coarse to Fine SAND, Little to Some Mica, Trace Rock Fragments	
960	959.7	8.5	7	10	13							M		
955	954.7	13.5	6	11	16							W		
950	949.7	18.5	17	22	26							M		
945	944.7	23.5	24	35	36							M		
940	939.7	28.5	100/0.4										940.2 WEATHERED ROCK BIOTITE GNEISS	28.0
935	934.7	33.5	100/0.2											
930	929.7	38.5	60/0.1										929.6 CRYSTALLINE ROCK Black, Orange, and White, Moderately to Slightly Weathered, Moderately Hard, BIOTITE GNEISS with Very Close to Close Fracture Spacing	38.6
925												RS-1		
920													920.6 CRYSTALLINE ROCK Black, Gray, and White, Very Slightly Weathered to Fresh, Moderately Hard to Very Hard, BIOTITE GNEISS with Close to Moderately Close Fracture Spacing	47.6
													916.3 Boring Terminated at Elevation 916.3 ft in Crystalline Rock: BIOTITE GNEISS	51.9

NCDOT BORE SINGLE BR-0095_GEO_BRDG_GINT.GPJ NC_DOT.GDT 1/23/23

GEOTECHNICAL BORING REPORT CORE LOG

WBS 67095.1.1		TIP BR-0095		COUNTY ROCKINGHAM		GEOLOGIST O'Toole, C.						
SITE DESCRIPTION Replace Bridge 780170 on SR 1360 (Smith Road) over US 220							GROUND WTR (ft)					
BORING NO. B1-A		STATION 17+02		OFFSET 9 ft LT		ALIGNMENT -L-						
COLLAR ELEV. 968.2 ft		TOTAL DEPTH 51.9 ft		NORTHING 1,002,985		EASTING 1,729,113						
DRILL RIG/HAMMER EFF./DATE TRI8016 MOBILE B-57 84% 05/09/2022		DRILL METHOD Core Boring		HAMMER TYPE Automatic								
DRILLER Estep, E.		START DATE 01/05/23		COMP. DATE 01/09/23		SURFACE WATER DEPTH N/A						
CORE SIZE NQ			TOTAL RUN 13.3 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)			
929.6	929.6	38.6	3.3	0:26/0.3 1:43/1.0 1:42/1.0 2:46/1.0	(0.4) 12%	(0.0) 0%		(5.1) 57%	(3.8) 42%		Begin Coring @ 38.6 ft	
925	926.3	41.9	5.0	1:43/1.0 1:37/1.0 1:36/1.0 1:47/1.0 3:01/1.0	(4.3) 86%	(3.8) 76%	RS-1				CRYSTALLINE ROCK Black, Orange, and White, Moderately to Slightly Weathered, Moderately Hard, BIOTITE GNEISS with Very Close to Close Fracture Spacing Foliation at 10 degrees to 30 degrees Fractures at 10 degrees to 45 degrees with moderate to heavy iron staining GSI = 50-70	38.6
920	921.3	46.9	5.0	4:04/1.0 2:24/1.0 3:08/1.0 3:40/1.0 3:52/1.0	(4.7) 94%	(4.2) 84%		(4.3) 100%	(4.2) 98%		CRYSTALLINE ROCK Black, Gray, and White, Very Slightly Weathered to Fresh, Moderately Hard to Very Hard, BIOTITE GNEISS with Close to Moderately Close Fracture Spacing Foliation at 10 degrees to 30 degrees 4 fractures at 20 degrees to 30 degrees parallel to foliation GSI = 70-90 Boring Terminated at Elevation 916.3 ft in Crystalline Rock: BIOTITE GNEISS	47.6
	916.3	51.9										51.9

NCDOT BORE SINGLE BR-0095_GEO_BRDG_GINT.GPJ NC_DOT.GDT 1/23/23

CORE PHOTOGRAPHS

B1-A

BOX 1: 38.6 FEET - 46.9 FEET



BOX 2: 46.9 FEET - 51.9 FEET



GEOTECHNICAL BORING REPORT BORE LOG

WBS 67095.1.1		TIP BR-0095		COUNTY ROCKINGHAM		GEOLOGIST O'Toole, C.									
SITE DESCRIPTION Replace Bridge 780170 on SR 1360 (Smith Road) over US 220							GROUND WTR (ft)								
BORING NO. B1-B		STATION 16+94		OFFSET 9 ft RT		ALIGNMENT -L-									
COLLAR ELEV. 968.2 ft		TOTAL DEPTH 51.3 ft		NORTHING 1,002,966		EASTING 1,729,109									
DRILL RIG/HAMMER EFF./DATE TRI8016 MOBILE B-57 84% 05/09/2022		DRILL METHOD Core Boring		HAMMER TYPE Automatic											
DRILLER Estep, E.		START DATE 01/09/23		COMP. DATE 01/10/23		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)
970													968.2	GROUND SURFACE	0.0
													964.7	RESIDUAL Reddish Brown, Silty CLAY	3.5
965	964.7	3.5	2	2	3							M		Brown and White with Orange, Silty Coarse to Fine SAND, Some Mica, Trace Rock Fragments	
960	959.7	8.5	8	9	14							M			
955	954.7	13.5	10	11	11							W			
950	949.7	18.5	15	17	20							M			
945	944.7	23.5	44	66/0.3					100/0.8				946.1	WEATHERED ROCK BIOTITE GNEISS	22.1
940	939.7	28.5	100/0.4						100/0.4						
935	934.7	33.5	100/0.3						100/0.3						
930	929.7	38.5	40	60/0.2					100/0.7						
925	924.7	43.5	60/0.0						60/0.0				924.7	CRYSTALLINE ROCK Black, Gray, and White, Slightly Weathered to Fresh, Hard to Very Hard, BIOTITE GNEISS with Close to Wide Fracture Spacing	43.5
920													916.9	Boring Terminated at Elevation 916.9 ft in Crystalline Rock: BIOTITE GNEISS	51.3

NCDOT BORE SINGLE BR-0095_GEO_BRDG_GINT.GPJ NC_DOT.GDT 1/23/23

GEOTECHNICAL BORING REPORT CORE LOG

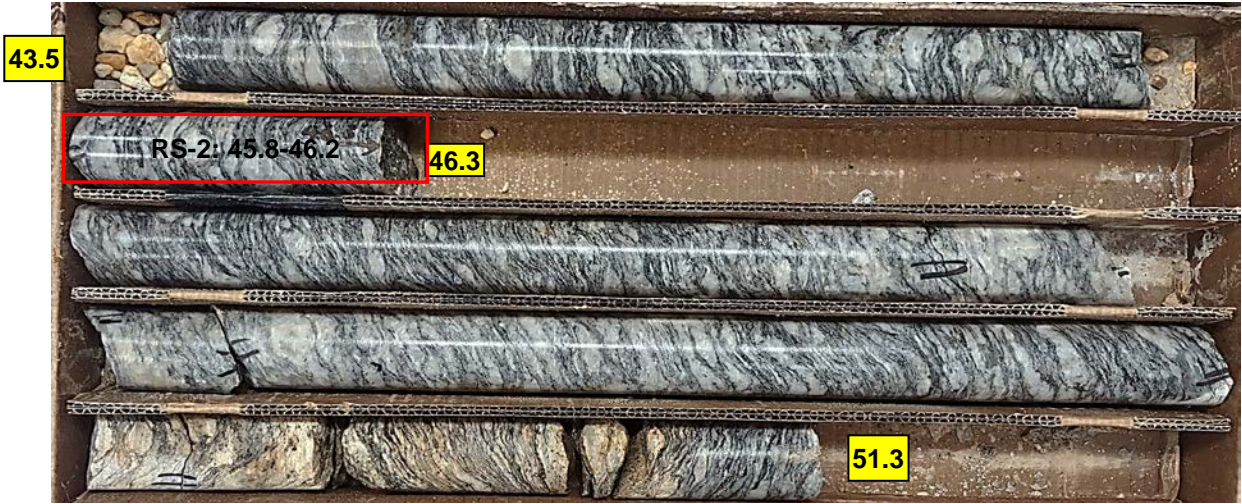
WBS 67095.1.1		TIP BR-0095		COUNTY ROCKINGHAM		GEOLOGIST O'Toole, C.					
SITE DESCRIPTION Replace Bridge 780170 on SR 1360 (Smith Road) over US 220							GROUND WTR (ft)				
BORING NO. B1-B		STATION 16+94		OFFSET 9 ft RT		ALIGNMENT -L-					
COLLAR ELEV. 968.2 ft		TOTAL DEPTH 51.3 ft		NORTHING 1,002,966		EASTING 1,729,109					
DRILL RIG/HAMMER EFF./DATE TRI8016 MOBILE B-57 84% 05/09/2022		DRILL METHOD Core Boring		HAMMER TYPE Automatic							
DRILLER Estep, E.		START DATE 01/09/23		COMP. DATE 01/10/23		SURFACE WATER DEPTH N/A					
CORE SIZE NQ			TOTAL RUN 7.8 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) %			
924.7	924.7	43.5	2.8	4:21/0.8 4:49/1.0 4:14/1.0	(2.5) 89%	(2.5) 89%	(7.5) 96%	(7.2) 92%		Begin Coring @ 43.5 ft	
	921.9	46.3		4:15/1.0 3:22/1.0 3:38/1.0 3:06/1.0 2:18/1.0	(5.0) 100%	(4.7) 94%				Black, Gray, and White, Slightly Weathered to Fresh, Hard to Very Hard, BIOTITE GNEISS with Close to Wide Fracture Spacing Foliation at 10 degrees to 30 degrees 4 fractures at 10 degrees to 20 degrees with light iron staining GSI = 70-90	43.5
920	916.9	51.3	5.0							Boring Terminated at Elevation 916.9 ft in Crystalline Rock: BIOTITE GNEISS	51.3

NCDOT BORE SINGLE BR-0095_GEO_BRDG_GINT.GPJ NC_DOT.GDT 1/23/23

CORE PHOTOGRAPHS

B1-B

BOX 1: 43.5 FEET - 51.3 FEET



GEOTECHNICAL BORING REPORT

BORE LOG

WBS 67095.1.1	TIP BR-0095	COUNTY ROCKINGHAM	GEOLOGIST O'Toole, C.
SITE DESCRIPTION Replace Bridge 780170 on SR 1360 (Smith Road) over US 220			GROUND WTR (ft)
BORING NO. EB2-A	STATION 18+06	OFFSET 9 ft LT	ALIGNMENT -L-
COLLAR ELEV. 989.9 ft	TOTAL DEPTH 48.6 ft	NORTHING 1,003,010	EASTING 1,729,214
DRILL RIG/HAMMER EFF./DATE TRI8016 MOBILE B-57 84% 05/09/2022		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER Estep, E.	START DATE 01/03/23	COMP. DATE 01/03/23	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
990														989.9 GROUND SURFACE 0.0
985	986.4	3.5	WOH	1	1								M	ROADWAY EMBANKMENT Red, Brown, and Gray, Silty CLAY, Some Mica to Highly Micaceous
980	981.4	8.5		5	4	4							M	979.8 RESIDUAL 10.1 Brown, White, and Gray, Silty Coarse to Fine SAND, Little to Some Mica, Little to Some Rock Fragments
975	976.4	13.5		3	5	5							M	
970	971.4	18.5		4	3	5							M	
965	966.4	23.5		4	5	5							M	
960	961.4	28.5		5	5	6							M	
955	956.4	33.5		6	7	7							M	
950	951.4	38.5		18	20	19							M	
945	946.4	43.5	100/0.3										M	947.9 WEATHERED ROCK 42.0 BIOTITE GNEISS
	941.4	48.5	60/0.1										M	941.4 CRYSTALLINE ROCK 48.5 BIOTITE GNEISS Boring Terminated with Standard Penetration Test Refusal at Elevation 941.3 ft in Crystalline Rock: BIOTITE GNEISS

WBS 67095.1.1	TIP BR-0095	COUNTY ROCKINGHAM	GEOLOGIST O'Toole, C.
SITE DESCRIPTION Replace Bridge 780170 on SR 1360 (Smith Road) over US 220			GROUND WTR (ft)
BORING NO. EB2-B	STATION 17+98	OFFSET 10 ft RT	ALIGNMENT -L-
COLLAR ELEV. 989.8 ft	TOTAL DEPTH 54.2 ft	NORTHING 1,002,990	EASTING 1,729,211
DRILL RIG/HAMMER EFF./DATE TRI8016 MOBILE B-57 84% 05/09/2022		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER Estep, E.	START DATE 01/03/23	COMP. DATE 01/03/23	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
990														989.8 GROUND SURFACE 0.0
985	986.3	3.5	WOH	1	1								M	ROADWAY EMBANKMENT Gray, Silty Coarse to Fine SAND, Moist Red and Brown, Silty CLAY, Some Mica
980	981.3	8.5		2	2	3							M	980.7 RESIDUAL 9.1 Brown, White, and Gray, Silty Coarse to Fine SAND, Little to Some Mica, Little to Some Rock Fragments
975	976.3	13.5		3	4	5							M	
970	971.3	18.5		4	5	5							M	
965	966.3	23.5		4	6	8							M	
960	961.3	28.5		6	8	11							M	
955	956.3	33.5		7	7	11							M	
950	951.3	38.5		7	9	10							M	
945	946.3	43.5		45	55/0.4								M	947.2 WEATHERED ROCK 42.6 BIOTITE GNEISS
940	941.3	48.5		37	63/0.4								M	941.4 CRYSTALLINE ROCK 48.5 BIOTITE GNEISS Boring Terminated at Elevation 935.6 ft in Weathered Rock: BIOTITE GNEISS
	936.3	53.5		66	34/0.2								M	935.6 Boring Terminated at Elevation 935.6 ft in Weathered Rock: BIOTITE GNEISS

NCDOT BORE DOUBLE BR-0095_GEO_BRDG_GINT.GPJ_NC_DOT.GDT 1/23/23



UNCONFINED COMPRESSIVE STRENGTH of INTACT ROCK CORE SPECIMENS

ASTM D 7012-14 Method C

This method does not report strain rate or deformation

Client: ESP Associates Boring No.: B1-A
 Client Project: IS14.329.000 Depth (ft): 44.3-44.7
 Project No.: R-2023-035-001 Sample ID: RS-1
 Lab ID No.: R-2023-035-001-001 Moisture Condition: As received

Specimen Weight (g): 585.16

SPECIMEN LENGTH (in)

Reading 1: 4.52
 Reading 2: 4.52
 Reading 3: 4.53
Average: 4.53

SPECIMEN DIAMETER (in):

Reading 1: 1.98
 Reading 2: 1.98
 Average: **1.98**
 Area (in²): 3.08
 L/D: 2.28

MOISTURE CONTENT

Tare Number: SS-3
 Wt. of Tare & Wet Sample (g): 683.60
 Wt. of Tare & Dry Sample (g): 682.06
 Weight of Tare (g): 100.66
 Weight of Wet Sample (g): 582.94
 Sample Volume (cm³): 228.70
 Moisture Content (%): 0.26
 Unit Wet Weight (g/cm³): 2.559
 Unit Wet Weight (pcf): 159.7
Unit Dry Weight (g/cm³): 2.552
Unit Dry Weight (pcf): 159.2

Total Load (lb): 4,410
Uniaxial Compressive Strength (psi): 1,430

Fracture Type: **Shear**

Rate of Loading (lb/sec): 96
 Time to Break (min:sec): 0:45.81
 Deviation From Straightness²: Pass

AXIAL: Pass TOP: Pass BOTTOM: Pass

UNCONFINED COMPRESSIVE STRENGTH of INTACT ROCK CORE SPECIMENS

ASTM D 7012-14 Method C

This method does not report strain rate or deformation

Client: ESP Associates Boring No.: B1-B
 Client Project: IS14.329.000 Depth (ft): 45.8-46.2
 Project No.: R-2023-035-001 Sample ID: RS-2
 Lab ID No.: R-2023-035-001-002 Moisture Condition: As received

Specimen Weight (g): 611.47

SPECIMEN LENGTH (in)

Reading 1: 4.51
 Reading 2: 4.50
 Reading 3: 4.51
Average: 4.50

SPECIMEN DIAMETER (in):

Reading 1: 1.99
 Reading 2: 1.99
 Average: **1.99**
 Area (in²): 3.10
 L/D: 2.27

MOISTURE CONTENT

Tare Number: SS-5
 Wt. of Tare & Wet Sample (g): 710.85
 Wt. of Tare & Dry Sample (g): 710.31
 Weight of Tare (g): 99.79
 Weight of Wet Sample (g): 611.06
 Sample Volume (cm³): 228.45
 Moisture Content (%): 0.09
 Unit Wet Weight (g/cm³): 2.677
 Unit Wet Weight (pcf): 167.0
Unit Dry Weight (g/cm³): 2.674
Unit Dry Weight (pcf): 166.9

Total Load (lb): 23,770
Uniaxial Compressive Strength (psi): 7,680

Fracture Type: **Shear**

Rate of Loading (lb/sec): 185
 Time to Break (min:sec): 2:08.78
 Deviation From Straightness²: Pass

AXIAL: Pass TOP: Pass BOTTOM: Pass

Physical Description: Beige Gneiss

Notes:

- 1) Moisture conditions at time of the test are: As received
- 2) Sample prep conforms to ASTM D4543-08 "best effort" if applicable
- 3) Deviation from straightness, Procedure A of ASTM D 4543-08
 Pass/Fail criteria: gap < 0.02 = Pass, gap > 0.02 = Fail
- 4) Temperature is laboratory room temperature.
- 5) D4543 Prep and D7012 Testing Equipment Used:
 R176 Compression Machine,
 R525 Digital Calipers,
 R148 Feeler Gauge, R419 Scale
 R512 Rock Saw
 R148 Straight Edge
 R582 V-Block, R585 Dial Gauge



Tested By: DO Date: 1/24/23 Checked By: GEM Date: 1/26/23

Physical Description: Light Gray Gneiss

Notes:

- 1) Moisture conditions at time of the test are: As received
- 2) Sample prep conforms to ASTM D4543-08 "best effort" if applicable
- 3) Deviation from straightness, Procedure A of ASTM D 4543-08
 Pass/Fail criteria: gap < 0.02 = Pass, gap > 0.02 = Fail
- 4) Temperature is laboratory room temperature.
- 5) D4543 Prep and D7012 Testing Equipment Used:
 R176 Compression Machine,
 R525 Digital Calipers,
 R148 Feeler Gauge, R419 Scale
 R512 Rock Saw
 R148 Straight Edge
 R582 V-Block, R585 Dial Gauge



Tested By: DO Date: 1/24/23 Checked By: GEM Date: 1/26/23

SITE PHOTOGRAPHS
Bridge No. 780170 on SR 1360 (Smith Road) Over US 220

View Along Bridge 170 Looking Upstation



View Looking Left to Right Along -Y- (US 220)



View of Along Bridge 170 Looking Downstation



View Looking Right to Left Along -Y- (US 220)

