

PROJECT: SF-790198 & 790199 REFERENCE: 17BP.9.R.85

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	17BP.9.R.85	1	26

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

STRUCTURE
SUBSURFACE INVESTIGATION

COUNTY ROWAN
 SITE DESCRIPTION BRIDGE NO. 198 AND 199 ON SR
2529 (ST. PAUL CHURCH ROAD) OVER CRANE
CREEK

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PERSONNEL
CG2 EXPLORATION

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SUBMITTED BY K. B. MILLER

DATE FEBRUARY 2022

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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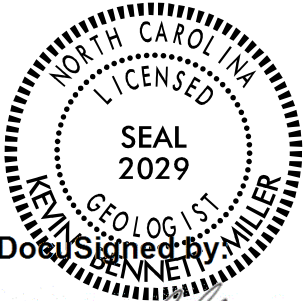
NOTES:

- 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.

CADD Work Prepared in the Office of:



**CAROLINAS
 GEOTECHNICAL
 GROUP**
 2400 CROWNPOINT EXECUTIVE DRIVE
 SUITE 800
 CHARLOTTE, NC 28227
 (980) 339-8684



Do Not Sign by _____

02/22/2022

957A789AED704CB

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
(PAGE 1 OF 2)

SOIL DESCRIPTION										GRADATION									
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 ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6										WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.									
SOIL LEGEND AND AASHTO CLASSIFICATION										ANGULARITY OF GRAINS									
GENERAL CLASS. GRANULAR MATERIALS (<= 35% PASSING #200) SILT-CLAY MATERIALS (> 35% PASSING #200) ORGANIC MATERIALS										MINERALOGICAL COMPOSITION									
GROUP CLASS. A-1, A-3, A-2, A-4, A-5, A-6, A-7, A-1-A2, A-3, A-4, A-5, A-6, A-7										MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.									
SYMBOL										COMPRESSIBILITY									
% PASSING #10, #40, #200										SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50									
MATERIAL PASSING #40 LL, PI										PERCENTAGE OF MATERIAL									
GROUP INDEX										ORGANIC MATERIAL GRANULAR SOILS SILT - CLAY SOILS OTHER MATERIAL									
USUAL TYPES OF MAJOR MATERIALS										GROUND WATER									
GEN. RATING AS SUBGRADE										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									
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)										ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION SOIL SYMBOL ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT INFERRED SOIL BOUNDARY INFERRED ROCK LINE ALLUVIAL SOIL BOUNDARY									
TEXTURE OR GRAIN SIZE										RECOMMENDATION SYMBOLS									
U.S. STD. SIEVE SIZE OPENING (MM)										UNDECUT UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL SHALLOW UNDECUT UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK									
GRAIN SIZE										ABBREVIATIONS									
SOIL MOISTURE - CORRELATION OF TERMS										EQUIPMENT USED ON SUBJECT PROJECT									
SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION										DRILL UNITS: CME-45C, CME-55, CME-550X, VANE SHEAR TEST, PORTABLE HOIST, DIEDRICH D-50									
PLASTICITY										ADVANCING TOOLS: CLAY BITS, 6' CONTINUOUS FLIGHT AUGER, 8" HOLLOW AUGERS, HARD FACED FINGER BITS, TUNG-CARBIDE INSERTS, CASING W/ ADVANCER, TRICONE STEEL TEETH, TRICONE TUNG-CARB., CORE BIT									
PLASTICITY INDEX (PI) DRY STRENGTH										HAMMER TYPE: AUTOMATIC, MANUAL CORE SIZE: B, H, N Q HAND TOOLS: POST HOLE DIGGER, HAND AUGER, SOUNDING ROD, VANE SHEAR TEST									
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
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GEOTECHNICAL ENGINEERING UNIT**

SUBSURFACE INVESTIGATION

**SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES
FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS (PAGE 1 OF 2)**

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

**GEOLOGICAL STRENGTH INDEX (GSI) FOR
JOINTED ROCKS (Hoek and Marinos, 2000)**

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.

SURFACE CONDITIONS

VERY GOOD
Very rough, fresh unweathered surfaces

GOOD
Rough, slightly weathered, iron stained surfaces

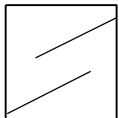
FAIR
Smooth, moderately weathered and altered surfaces

POOR
Slackensided, highly weathered surfaces with compact coatings or fillings or angular fragments

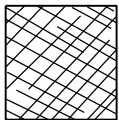
VERY POOR
Slackensided, highly weathered surfaces with soft clay coatings or fillings

DECREASING SURFACE QUALITY →

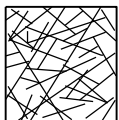
STRUCTURE



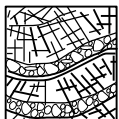
INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities



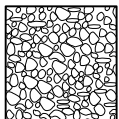
BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets



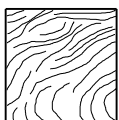
VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets



BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity



DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces



LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes

DECREASING INTERLOCKING OF ROCK PIECES ↓

90				N/A	N/A
80					
	70				
		60			
			50		
				40	
					30
					20
					10
N/A	N/A				

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**SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES
 FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS (PAGE 2 OF 2)**

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

**GSI FOR HETEROGENEOUS ROCK MASSES SUCH
 AS FLYSCH (Marinos, P and Hoek E., 2000)**

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.

**SURFACE CONDITIONS OF
 DISCONTINUITIES**
 (Predominantly bedding planes)

VERY GOOD - Very Rough, fresh unweathered surfaces

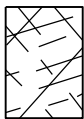
GOOD - Rough, slightly weathered surfaces

FAIR - Smooth, moderately weathered and altered surfaces

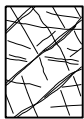
POOR - Very smooth, occasionally slickensided surfaces with compact coatings or fillings with angular fragments

VERY POOR - Very smooth, slickensided or highly weathered surfaces with soft clay coatings or fillings

COMPOSITION AND STRUCTURE



A. Thick bedded, very blocky sandstone
 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.



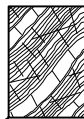
B. Sandstone with thin inter-layers of siltstone



C. Sandstone and siltstone in similar amounts



D. Siltstone or silty shale with sandstone layers



E. Weak siltstone or clayey shale with sandstone layers

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**.



F. Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure

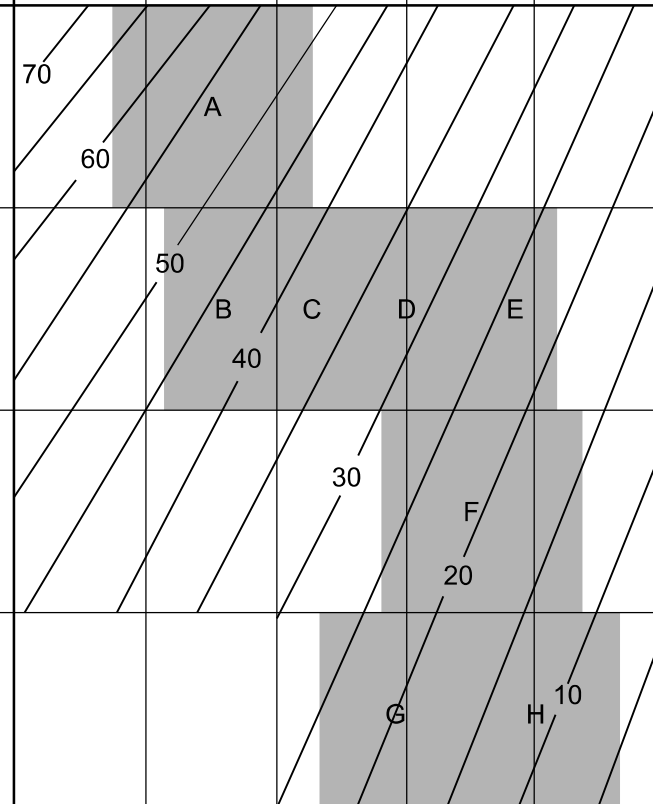


G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers



H. Tectonically deformed silty or clayey shale forming a chaotic structure with pockets of clay. Thin layers of sandstone are transformed into small rock pieces.

➔ Means deformation after tectonic disturbance

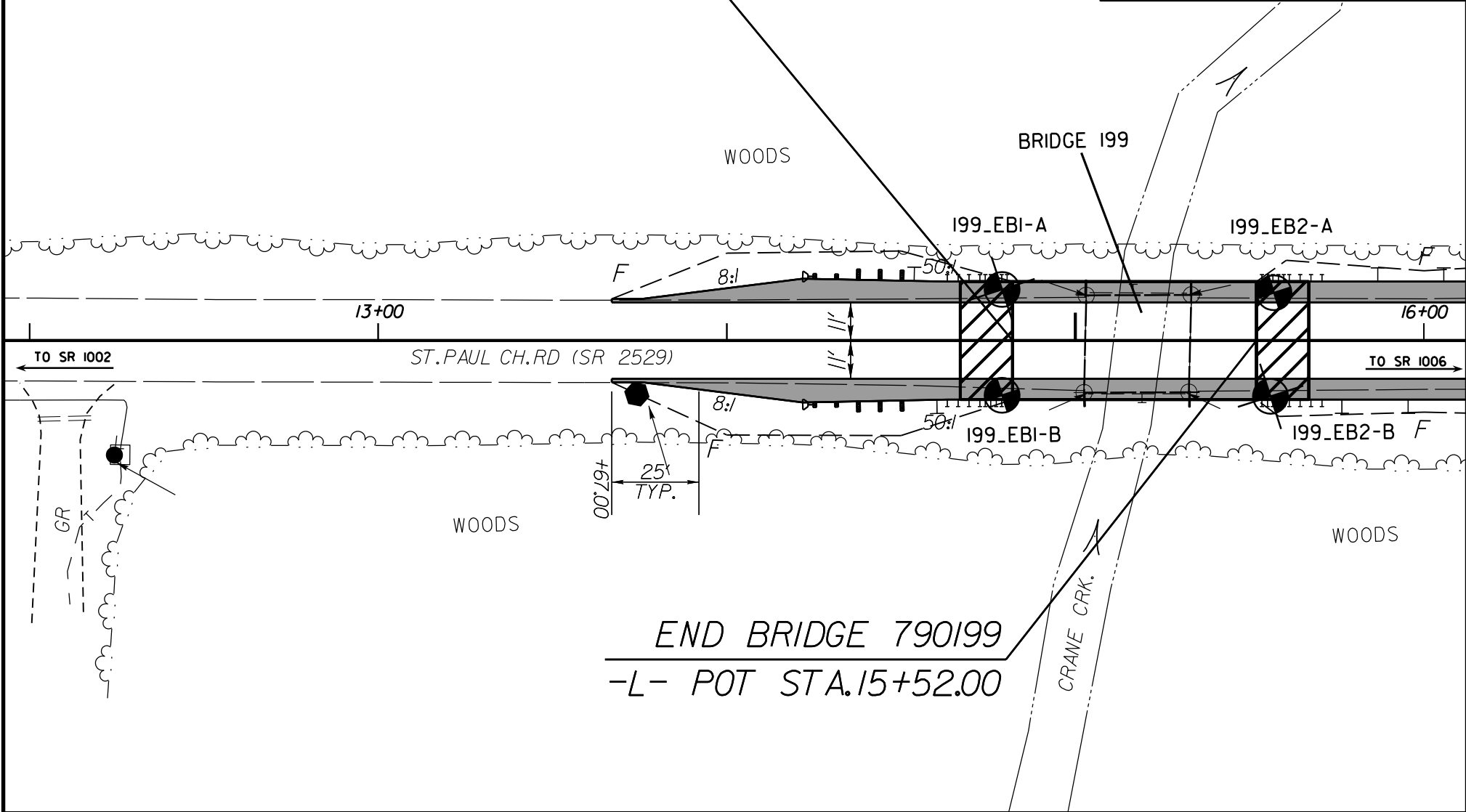




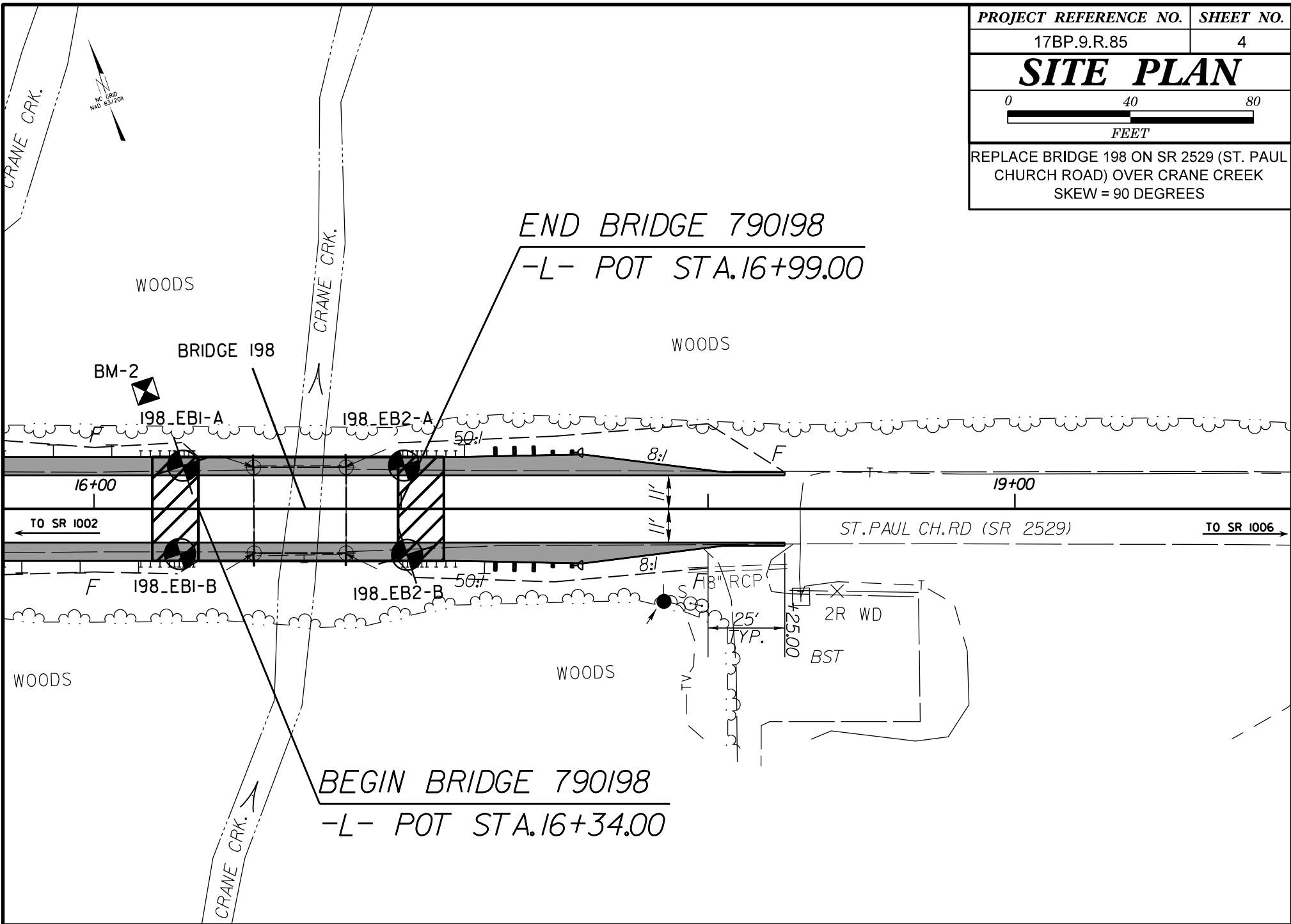
PROJECT REFERENCE NO.	SHEET NO.
17BP.9.R.85	3
SITE PLAN	
0 40 80 ————— FEET	
REPLACE BRIDGE 199 ON SR 2529 (ST. PAUL CHURCH ROAD) OVER CRANE CREEK SKEW = 90 DEGREES	

BEGIN BRIDGE 790199
-L- POT STA.14+82.00

END BRIDGE 790199
-L- POT STA.15+52.00



PROJECT REFERENCE NO.	SHEET NO.
17BP.9.R.85	4
SITE PLAN	
REPLACE BRIDGE 198 ON SR 2529 (ST. PAUL CHURCH ROAD) OVER CRANE CREEK SKEW = 90 DEGREES	

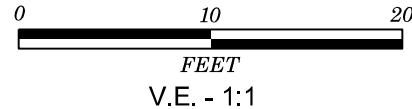


45 40 35 30

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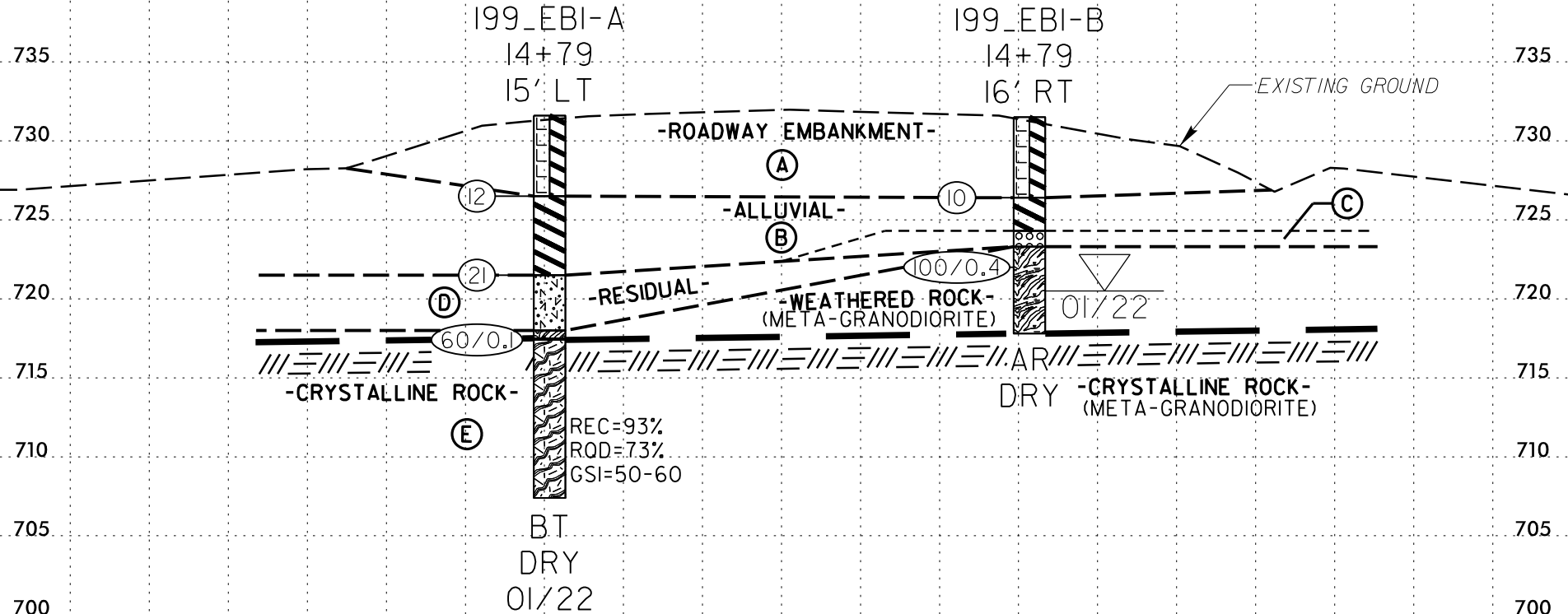


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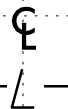
PROJECT REFERENCE NO.	SHEET NO.
17BP.9.R.85	5
REPLACE BRIDGE 199 ON SR 2529 (ST. PAUL CHURCH RD) OVER CRANE CREEK END BENT 1 SKEW = 90 DEGREES	

25 20 15 10 5 0 5 10 15 20 25 30 35 40 45



- ① -ROADWAY EMBANKMENT- STIFF, MOIST, RED-ORANGE, FINE SANDY, SILTY CLAY (A-7)
- ② -ALLUVIAL- STIFF, MOIST, BROWN-TAN, FINE SANDY, SILTY CLAY (A-7)
- ③ -ALLUVIAL- LOOSE, MOIST, BROWN-TAN, COARSE TO FINE SANDY, SILTY GRAVEL (A-I-A)
- ④ -RESIDUAL- VERY STIFF, MOIST, TAN-GRAY-BROWN, FINE SANDY, CLAYEY SILT (A-5)
- ⑤ -CRYSTALLINE ROCK- FRESH TO VERY SLIGHTLY WEATHERED, GRAY-WHITE, HARD TO MODERATELY HARD, (META-GRANODIORITE) WITH VERY CLOSE TO MODERATELY CLOSE FRACTURE SPACING AND WEAK FOLIATIONS

14 + 82.00



-L- EXISTING GROUND LINE ALONG END BENT 1 SKEW TAKEN FROM ROADWAY DESIGN PLANS PROVIDED BY NCDOT ON 1/22/22. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING WITH BOTH PROJECTED ONTO THE CROSS SECTION

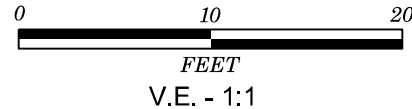
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45 40 35 30

CADD Prepared in the Office of:

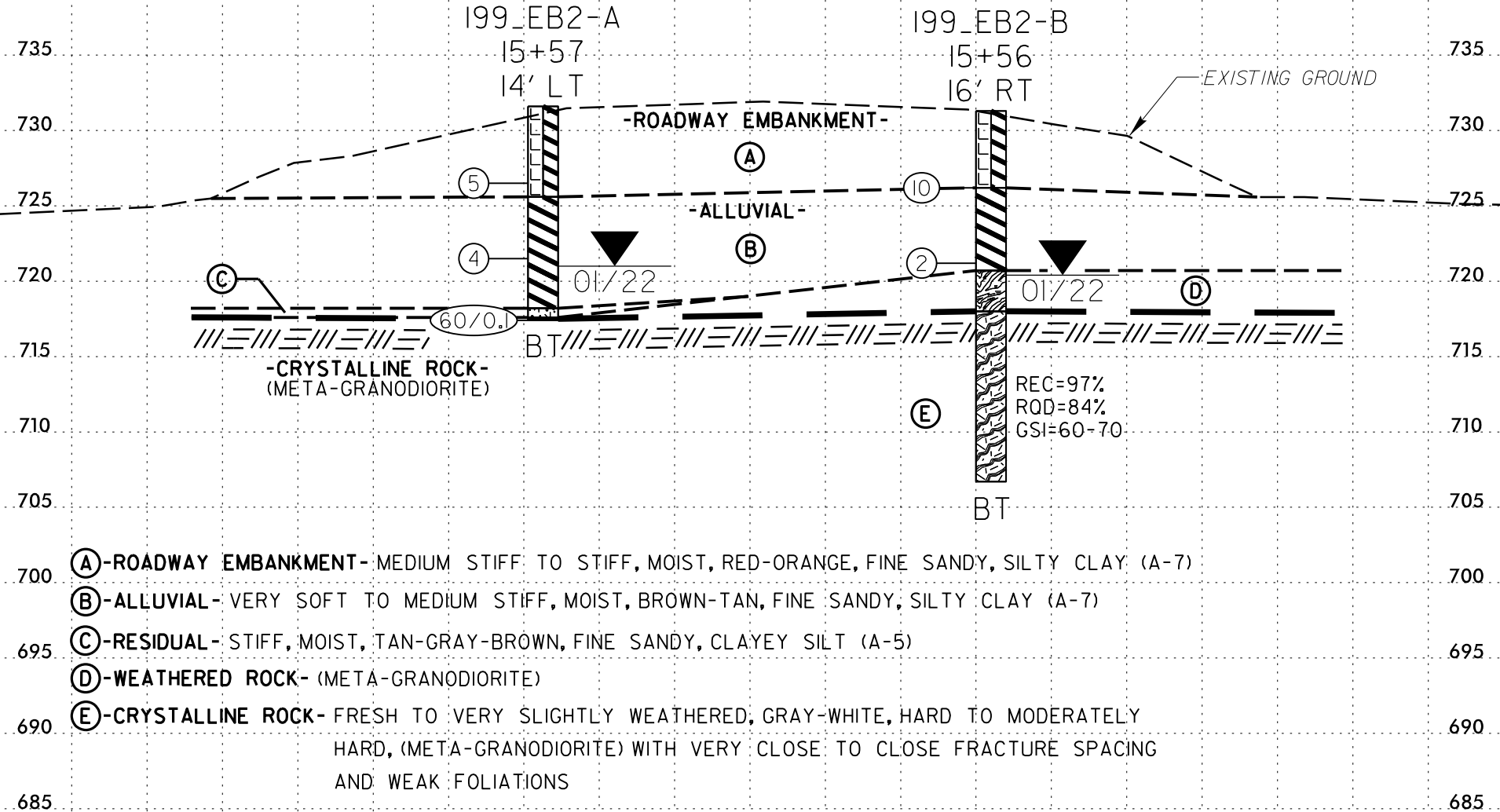


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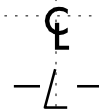
PROJECT REFERENCE NO.	SHEET NO.
17BP.9.R.85	6
REPLACE BRIDGE 199 ON SR 2529 (ST. PAUL CHURCH RD) OVER CRANE CREEK END BENT 2 SKEW = 90 DEGREES	

25 20 15 10 5 0 5 10 15 20 25 30 35 40 45



- ① -ROADWAY EMBANKMENT- MEDIUM STIFF TO STIFF, MOIST, RED-ORANGE, FINE SANDY, SILTY CLAY (A-7)
- ② -ALLUVIAL- VERY SOFT TO MEDIUM STIFF, MOIST, BROWN-TAN, FINE SANDY, SILTY CLAY (A-7)
- ③ -RESIDUAL- STIFF, MOIST, TAN-GRAY-BROWN, FINE SANDY, CLAYEY SILT (A-5)
- ④ -WEATHERED ROCK- (META-GRANODIORITE)
- ⑤ -CRYSTALLINE ROCK- FRESH TO VERY SLIGHTLY WEATHERED, GRAY-WHITE, HARD TO MODERATELY HARD, (META-GRANODIORITE) WITH VERY CLOSE TO CLOSE FRACTURE SPACING AND WEAK FOLIATIONS

15 + 52.00



-L- EXISTING GROUND LINE ALONG END BENT 2 SKEW TAKEN FROM ROADWAY DESIGN PLANS PROVIDED BY NCDOT ON 1/22/22. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING WITH BOTH PROJECTED ONTO THE CROSS SECTION

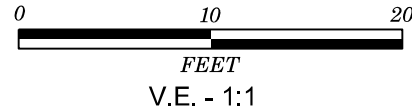
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45 40 35 30

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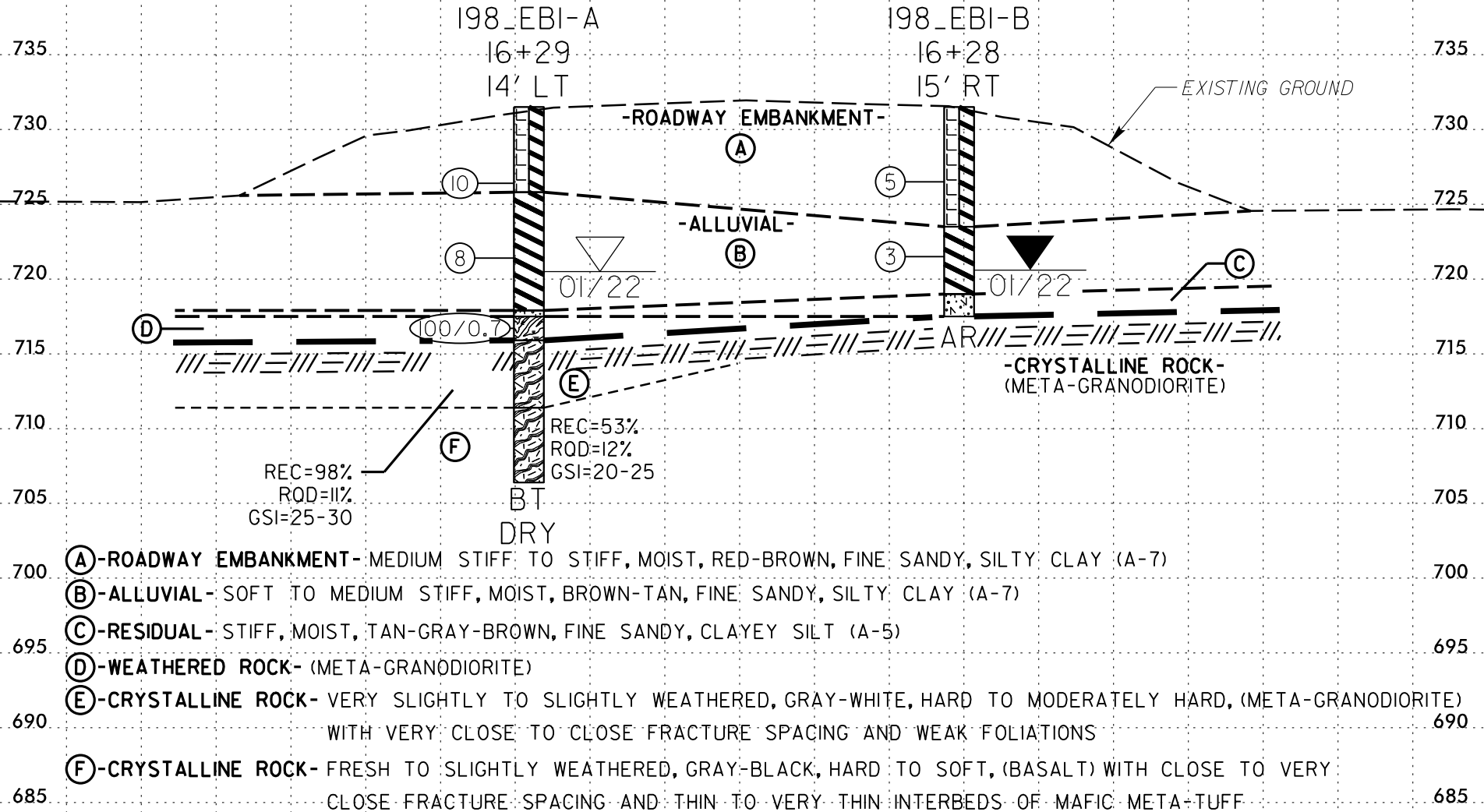


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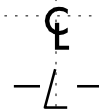


PROJECT REFERENCE NO.	SHEET NO.
17BP.9.R.85	7
REPLACE BRIDGE 198 ON SR 2529 (ST. PAUL CHURCH RD) OVER CRANE CREEK END BENT 1 SKEW = 90 DEGREES	

25 20 15 10 5 0 5 10 15 20 25 30 35 40 45



16 + 34.00



-L- EXISTING GROUND LINE ALONG END BENT 1 SKEW TAKEN FROM ROADWAY DESIGN PLANS PROVIDED BY NCDOT ON 1/2/2022. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING WITH BOTH PROJECTED ONTO THE CROSS SECTION

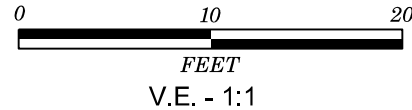
45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45

45 40 35 30

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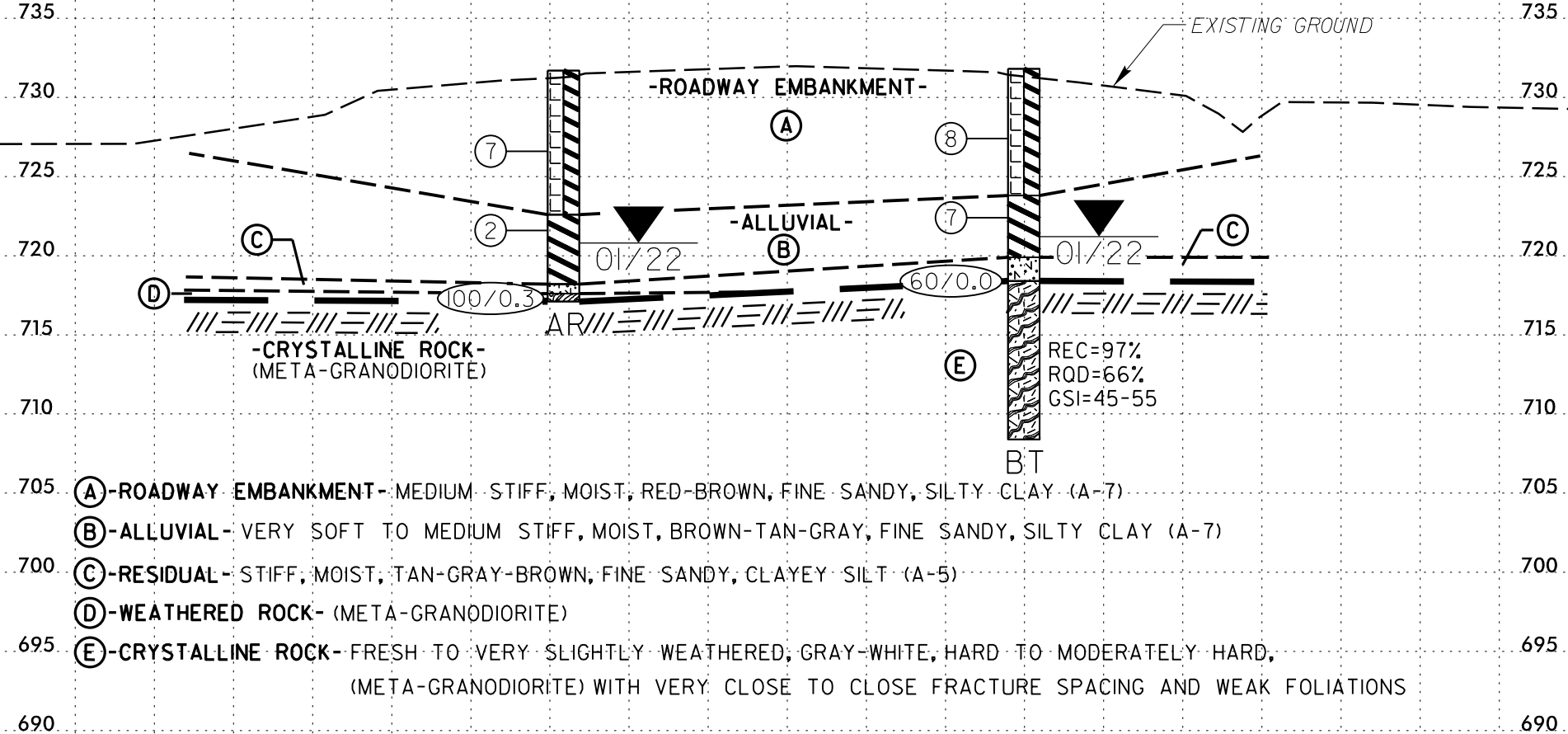


PROJECT REFERENCE NO.	SHEET NO.
17BP.9.R.85	8
REPLACE BRIDGE 198 ON SR 2529 (ST. PAUL CHURCH RD) OVER CRANE CREEK END BENT 2 SKEW = 90 DEGREES	

25 20 15 10 5 0 5 10 15 20 25 30 35 40 45

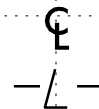
198_EB2-A
17+01
14' LT

198_EB2-B
17+02
15' RT



- 705 (A) -ROADWAY EMBANKMENT- MEDIUM STIFF, MOIST, RED-BROWN, FINE SANDY, SILTY CLAY (A-7)
- 700 (B) -ALLUVIAL- VERY SOFT TO MEDIUM STIFF, MOIST, BROWN-TAN-GRAY, FINE SANDY, SILTY CLAY (A-7)
- 700 (C) -RESIDUAL- STIFF, MOIST, TAN-GRAY-BROWN, FINE SANDY, CLAYEY SILT (A-5)
- 695 (D) -WEATHERED ROCK- (META-GRANODIORITE)
- 695 (E) -CRYSTALLINE ROCK- FRESH TO VERY SLIGHTLY WEATHERED, GRAY-WHITE, HARD TO MODERATELY HARD,
(META-GRANODIORITE) WITH VERY CLOSE TO CLOSE FRACTURE SPACING AND WEAK FOLIATIONS

16 + 99.00



-L- EXISTING GROUND LINE ALONG END BENT 2 SKEW TAKEN FROM ROADWAY DESIGN PLANS PROVIDED BY NCDOT ON 1/2/2022. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING WITH BOTH PROJECTED ONTO THE CROSS SECTION

45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45


GEOTECHNICAL BORING REPORT

BORE LOG

WBS 17BP.9.R.85		TIP SF-790199		COUNTY ROWAN		GEOLOGIST Stickney, J. K.											
SITE DESCRIPTION Bridge 199 on SR 2529 (St. Paul Church Road) Over Crane Creek							GROUND WTR (ft)										
BORING NO. 199_EB1-A		STATION 14+79		OFFSET 15 ft LT		ALIGNMENT -L-											
COLLAR ELEV. 731.6 ft		TOTAL DEPTH 24.2 ft		NORTHING 677,106		EASTING 1,560,066											
DRILL RIG/HAMMER EFF/DATE CG20446 Diedrich D50 76%/06/14/2021				DRILL METHOD SPT Core Boring		HAMMER TYPE Automatic											
DRILLER C. Odom		START DATE 01/11/22		COMP. DATE 01/12/22		SURFACE WATER DEPTH N/A											
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	L O G	SOIL AND ROCK DESCRIPTION			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)		
735															731.6	GROUND SURFACE	0.0
730																ROADWAY EMBANKMENT Stiff, Red-Orange, Fine Sandy, Silty CLAY (A-7)	
725	727.5	4.1	4	8	4								M		726.5	ALLUVIAL Stiff, Brown-Tan, Fine Sandy, Silty CLAY (A-7)	5.1
720	722.5	9.1	2	4	17								M		721.5	RESIDUAL Very Stiff, Tan-Gray-Brown, Fine Sandy, Clayey SILT (A-5)	10.1
715	717.5	14.1	60/0.1												718.0	WEATHERED ROCK Gray-White, (META-GRANODIORITE)	13.6
															717.5	CRYSTALLINE ROCK Gray-White, (META-GRANODIORITE)	14.1
															717.4		14.2
710																REC=93% RQD=73% GSI=50-60	
															707.4		24.2
Boring Terminated at Elevation 707.4 ft In Crystalline Rock (META-GRANODIORITE)																	

NCDOT BORE SINGLE CG2_0112.05 BRIDGE 199.GPJ NC_DOT.GDT 2/16/22

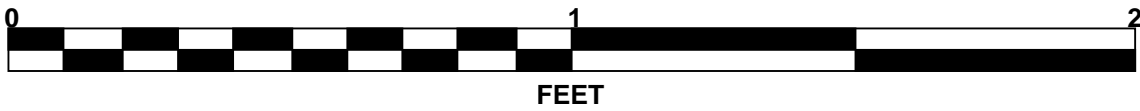
GEOTECHNICAL BORING REPORT CORE LOG

WBS 17BP.9.R.85				TIP SF-790199		COUNTY ROWAN			GEOLOGIST Stickney, J. K.		
SITE DESCRIPTION Bridge 199 on SR 2529 (St. Paul Church Road) Over Crane Creek										GROUND WTR (ft)	
BORING NO. 199_EB1-A				STATION 14+79		OFFSET 15 ft LT			ALIGNMENT -L-		0 HR. Dry
COLLAR ELEV. 731.6 ft				TOTAL DEPTH 24.2 ft		NORTHING 677,106			EASTING 1,560,066		24 HR. N/A
DRILL RIG/HAMMER EFF./DATE CG20446 Diedrich D50 76% 06/14/2021						DRILL METHOD SPT Core Boring			HAMMER TYPE Automatic		
DRILLER C. Odom				START DATE 01/11/22		COMP. DATE 01/12/22			SURFACE WATER DEPTH N/A		
CORE SIZE NQ				TOTAL RUN 10.0 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) %			
717.38										Begin Coring @ 14.2 ft	
715	717.4	14.2	5.0		(4.6) 92%	(3.2) 64%	(9.3) 93%	(7.3) 73%		717.4 CRYSTALLINE ROCK Fresh to Very Slightly Weathered, Gray-White, Hard to Moderately Hard, (Meta-Granodiorite) with very close fracture spacing to moderately close fracture spacing and weak foliations	14.2
710	712.4	19.2	5.0		(4.7) 94%	(4.1) 82%					
	707.4	24.2								707.4	Boring Terminated at Elevation 707.4 ft In Crystalline Rock (META-GRANODIORITE)

NCDOT CORE SINGLE CG2_0112-05 BRIDGE199.GPJ NC_DOT.GDT 2/16/22



Bridge 199 on SR 2529 Over Crane Creek
Rock Core Photographs
Boring: EB1-A
Box 1: 14.2 to 24.2 Feet



GEOTECHNICAL BORING REPORT BORE LOG

WBS 17BP.9.R.85		TIP SF-790199		COUNTY ROWAN		GEOLOGIST Stickney, J. K.											
SITE DESCRIPTION Bridge 199 on SR 2529 (St. Paul Church Road) Over Crane Creek							GROUND WTR (ft)										
BORING NO. 199_EB1-B		STATION 14+79		OFFSET 16 ft RT		ALIGNMENT -L-	0 HR. 11.0										
COLLAR ELEV. 731.5 ft		TOTAL DEPTH 13.7 ft		NORTHING 677,077		EASTING 1,560,057	24 HR. Dry										
DRILL RIG/HAMMER EFF./DATE CG20446 Diedrich D50 76%/06/14/2021				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic											
DRILLER C. Odom		START DATE 01/11/22		COMP. DATE 01/11/22		SURFACE WATER DEPTH N/A											
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	L O G	SOIL AND ROCK DESCRIPTION			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)		
735															731.5	GROUND SURFACE	0.0
730																ROADWAY EMBANKMENT Stiff, Red-Orange, Fine Sandy, Silty CLAY (A-7)	
725	727.4	4.1	2	4	6								M		726.4	ALLUVIAL Stiff, Brown-Tan, Fine Sandy, Silty CLAY (A-7)	5.1
	722.4	9.1	100/0.4												724.3	Loose, Brown-Tan, Fine to Coarse Sandy, Silty GRAVEL (A-1-A)	7.2
720															723.3		8.2
																WEATHERED ROCK Gray-White, (META-GRANODIORITE)	
															717.8	Boring Terminated by Auger Refusal at Elevation 717.8 ft On Crystalline Rock (META-GRANODIORITE)	13.7

NCDOT BORE SINGLE CG2_0112.05 BRIDGE 199.GPJ NC_DOT.GDT 2/3/22


GEOTECHNICAL BORING REPORT

BORE LOG

WBS 17BP.9.R.85		TIP SF-790199		COUNTY ROWAN		GEOLOGIST Stickney, J. K.											
SITE DESCRIPTION Bridge 199 on SR 2529 (St. Paul Church Road) Over Crane Creek							GROUND WTR (ft)										
BORING NO. 199_EB2-B		STATION 15+56		OFFSET 16 ft RT		ALIGNMENT -L-											
COLLAR ELEV. 731.3 ft		TOTAL DEPTH 24.6 ft		NORTHING 677,053		EASTING 1,560,130											
DRILL RIG/HAMMER EFF./DATE CG20446 Diedrich D50 76%/06/14/2021				DRILL METHOD SPT Core Boring		HAMMER TYPE Automatic											
DRILLER C. Odom		START DATE 01/11/22		COMP. DATE 01/12/22		SURFACE WATER DEPTH N/A											
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)		
735															731.3	GROUND SURFACE	0.0
730																ROADWAY EMBANKMENT Stiff, Red-Orange, Fine Sandy, Silty CLAY (A-7)	
725	727.2	4.1	4	4	6								M		726.2	ALLUVIAL Very Soft, Brown-Tan, Fine Sandy, Silty CLAY (A-7)	5.1
720	722.2	9.1	2	1	1								M		720.7	WEATHERED ROCK Gray-White, (META-GRANODIORITE)	10.6
715															718.0	CRYSTALLINE ROCK Gray-White, (META-GRANODIORITE)	13.3
710																REC=97% RQD=84% GSI=60-70	
															706.7	Boring Terminated at Elevation 706.7 ft In Crystalline Rock (META-GRANODIORITE)	24.6

NCDOT BORE SINGLE CG2_0112.05 BRIDGE 199.GPJ NC_DOT.GDT 2/16/22

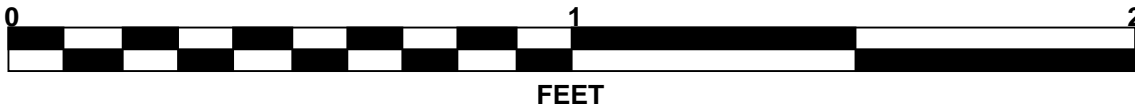
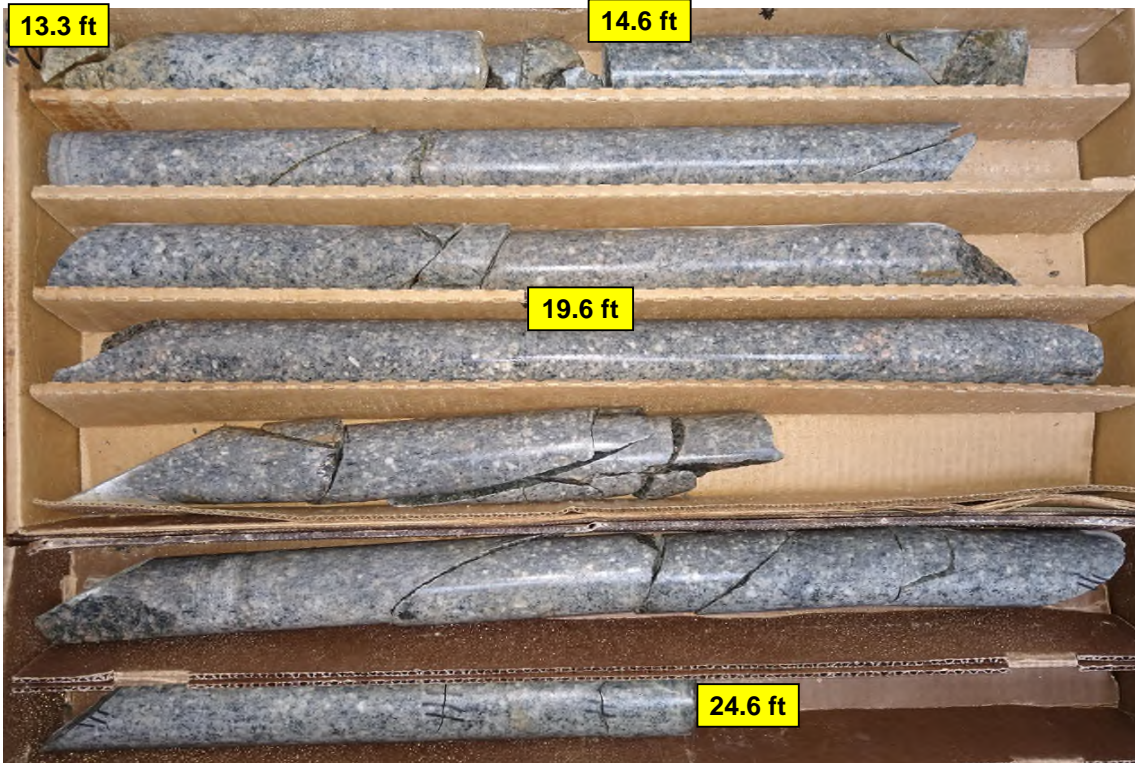
GEOTECHNICAL BORING REPORT CORE LOG

WBS 17BP.9.R.85		TIP SF-790199		COUNTY ROWAN		GEOLOGIST Stickney, J. K.						
SITE DESCRIPTION Bridge 199 on SR 2529 (St. Paul Church Road) Over Crane Creek									GROUND WTR (ft)			
BORING NO. 199_EB2-B		STATION 15+56		OFFSET 16 ft RT		ALIGNMENT -L-		0 HR. 11.0				
COLLAR ELEV. 731.3 ft		TOTAL DEPTH 24.6 ft		NORTHING 677,053		EASTING 1,560,130		24 HR. 10.9				
DRILL RIG/HAMMER EFF./DATE CG20446 Diedrich D50 76% 06/14/2021				DRILL METHOD SPT Core Boring			HAMMER TYPE Automatic					
DRILLER C. Odom		START DATE 01/11/22		COMP. DATE 01/12/22		SURFACE WATER DEPTH N/A						
CORE SIZE NQ		TOTAL RUN 11.3 ft										
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		L O G	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (ft)	RQD (%)		REC. (%)	RQD (%)			
717.98											Begin Coring @ 13.3 ft	
715	718.0 716.7	13.3 14.6	1.3 5.0		(1.0) 77%	(0.7) 54%		(11.0) 97%	(9.5) 84%		718.0	13.3
					(5.0) 100%	(4.3) 86%					Fresh to Very Slightly Weathered, Gray-White, Hard to Moderately Hard, (META-GRANODIORITE) with very close fracture spacing to close fracture spacing and weak foliations	
710	711.7	19.6	5.0		(5.0) 100%	(4.5) 90%						
	706.7	24.6									706.7	24.6
Boring Terminated at Elevation 706.7 ft In Crystalline Rock (META-GRANODIORITE)												

NCDOT CORE SINGLE CG2_0112-05 BRIDGE199.GPJ NC_DOT.GDT 2/16/22



Bridge 199 on SR 2529 Over Crane Creek
Rock Core Photographs
Boring: EB2-B
Box 1: 13.3 to 24.6 Feet



GEOTECHNICAL BORING REPORT

BORE LOG

WBS 17BP.9.R.85		TIP SF-790198		COUNTY ROWAN		GEOLOGIST M. Brewer; J. K. Stickney									
SITE DESCRIPTION Replace Bridge 198 on SR 2529 (St. Paul Church Road) Over Crane Creek							GROUND WTR (ft)								
BORING NO. 198_EB1-A		STATION 16+29		OFFSET 14 ft LT		ALIGNMENT -L-									
COLLAR ELEV. 731.5 ft		TOTAL DEPTH 25.1 ft		NORTHING 677,059		EASTING 1,560,209									
DRILL RIG/HAMMER EFF/DATE CG20446 Diedrich D50 76% 06/14/2021				DRILL METHOD SPT Core Boring		HAMMER TYPE Automatic									
DRILLER C. Odom		START DATE 01/11/22		COMP. DATE 01/12/22		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					
735															
730														731.5	0.0
	727.4	4.1	8	4	6										
725														725.8	5.7
	722.4	9.1	4	4	4										
720															
	717.4	14.1	58	42/0.2										717.9	13.6
715														717.5	14.0
														715.9	15.6
														711.4	20.1
710															
														706.4	25.1

NCDOT BORE SINGLE CG2_0112.05 BRIDGE 198.GPJ NC_DOT.GDT 2/16/22

GEOTECHNICAL BORING REPORT

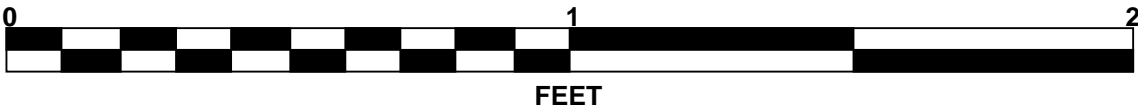
CORE LOG

WBS 17BP.9.R.85			TIP SF-790198			COUNTY ROWAN			GEOLOGIST M. Brewer; J. K. Stickney		
SITE DESCRIPTION Replace Bridge 198 on SR 2529 (St. Paul Church Road) Over Crane Creek										GROUND WTR (ft)	
BORING NO. 198_EB1-A			STATION 16+29			OFFSET 14 ft LT			ALIGNMENT -L-		0 HR. 11.0
COLLAR ELEV. 731.5 ft			TOTAL DEPTH 25.1 ft			NORTHING 677,059			EASTING 1,560,209		24 HR. Dry
DRILL RIG/HAMMER EFF./DATE CG20446 Diedrich D50 76%/06/14/2021						DRILL METHOD SPT Core Boring			HAMMER TYPE Automatic		
DRILLER C. Odom			START DATE 01/11/22			COMP. DATE 01/12/22			SURFACE WATER DEPTH N/A		
CORE SIZE NQ			TOTAL RUN 9.5 ft								
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS
					REC. (ft)	RQD (%)		REC. (%)	RQD (ft)		
715.91											Begin Coring @ 15.6 ft
715	715.9	15.6	4.5	09:03/0.5 03:29/1.0 03:45/1.0 07:51/1.0 03:15/1.0	(4.4) 98%	(0.5) 11%		(4.4) 98%	(0.5) 11%	715.9	CRYSTALLINE ROCK Very Slightly to Slightly Weathered, Gray-White, Hard to Moderately Hard, (META-GRANODIORITE) with very close to close fracture spacing and weak foliations
	711.4	20.1								711.4	
710			5.0	05:55/1.0 03:27/1.0 04:52/1.0 06:42/1.0 05:49/1.0	(2.7) 53%	(0.6) 12%		(2.7) 53%	(0.6) 12%	710	Fresh to Slightly Weathered, Gray-Black, Hard to Soft, (BASALT) with close to very close fracture spacing and thin to very thin interbeds of mafic Meta-Tuff
	706.4	25.1								706.4	Boring Terminated at Elevation 706.4 ft In Crystalline Rock (BASALT)

NCDOT CORE SINGLE CG2_0112-05 BRIDGE198.GPJ NC_DOT.GDT 2/16/22



Bridge 198 on SR 2529 Over Crane Creek
Rock Core Photographs
Boring: EB1-A
Box 1: 15.6 to 25.1 Feet



GEOTECHNICAL BORING REPORT

BORE LOG

WBS 17BP.9.R.85		TIP SF-790198		COUNTY ROWAN		GEOLOGIST Stickney, J. K.										
SITE DESCRIPTION Replace Bridge 198 on SR 2529 (St. Paul Church Road) Over Crane Creek							GROUND WTR (ft)									
BORING NO. 198_EB1-B		STATION 16+28		OFFSET 15 ft RT		ALIGNMENT -L-	0 HR. Dry									
COLLAR ELEV. 731.5 ft		TOTAL DEPTH 14.0 ft		NORTHING 677,032		EASTING 1,560,199	24 HR. 10.9									
DRILL RIG/HAMMER EFF/DATE CG20446 Diedrich D50 76%06/14/2021				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER C. Odom		START DATE 01/11/22		COMP. DATE 01/11/22		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	L O G	SOIL AND ROCK DESCRIPTION		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)	
735															731.5	GROUND SURFACE 0.0
730																ROADWAY EMBANKMENT Medium Stiff, Red-Brown-Gray-Tan, Fine Sandy, Silty CLAY (A-7)
	727.5	4.0		3	3	2							M			
725																
	722.5	9.0		1	1	2							M			ALLUVIAL Soft, Gray-Brown-Tan, Fine Sandy, Silty CLAY (A-7)
720																
															719.0	12.5
															717.5	14.0
																RESIDUAL Stiff, Tan-Gray-Brown, Fine Sandy, Clayey SILT (A-5) Boring Terminated by Auger Refusal at Elevation 717.5 ft On Crystalline Rock (META-GRANODIORITE)

NCDOT BORE SINGLE CG2_0112.05 BRIDGE 198.GPJ NC_DOT.GDT 2/3/22


GEOTECHNICAL BORING REPORT

BORE LOG

WBS 17BP.9.R.85		TIP SF-790198		COUNTY ROWAN		GEOLOGIST M. Brewer; J. K. Stickney											
SITE DESCRIPTION Replace Bridge 198 on SR 2529 (St. Paul Church Road) Over Crane Creek									GROUND WTR (ft)								
BORING NO. 198_EB2-B		STATION 17+02		OFFSET 15 ft RT		ALIGNMENT -L-		0 HR. Dry									
COLLAR ELEV. 731.8 ft		TOTAL DEPTH 23.4 ft		NORTHING 677,009		EASTING 1,560,269		24 HR. 10.6									
DRILL RIG/HAMMER EFF/DATE CG20446 Diedrich D50 76%06/14/2021					DRILL METHOD SPT Core Boring			HAMMER TYPE Automatic									
DRILLER C. Odom		START DATE 01/11/22		COMP. DATE 01/12/22		SURFACE WATER DEPTH N/A											
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	L O G	SOIL AND ROCK DESCRIPTION			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)		
735															731.8	0.0	GROUND SURFACE
730	728.4	3.4	3	3	5								M		723.8	8.0	ROADWAY EMBANKMENT Medium Stiff, Red-Orange, Fine Sandy, Silty CLAY (A-7)
725	723.4	8.4	2	3	4								M		719.9	11.9	ALLUVIAL Medium Stiff, Tan-Gray, Fine Sandy, Silty CLAY (A-7)
720	718.4	13.4	60/0.0												718.4	13.4	RESIDUAL Stiff, Tan-Gray-Brown, Fine Sandy, Clayey SILT (A-5)
715																	CRYSTALLINE ROCK Gray-White, (META-GRANODIORITE)
710																	REC=97% RQD=66% GSI=45-55
															708.4	23.4	Boring Terminated at Elevation 708.4 ft In Crystalline Rock (META-GRANODIORITE)

NCDOT BORE SINGLE CG2_0112.05 BRIDGE 198.GPJ NC_DOT.GDT 2/16/22

GEOTECHNICAL BORING REPORT CORE LOG

WBS 17BP.9.R.85			TIP SF-790198			COUNTY ROWAN			GEOLOGIST M. Brewer; J. K. Stickney			
SITE DESCRIPTION Replace Bridge 198 on SR 2529 (St. Paul Church Road) Over Crane Creek										GROUND WTR (ft)		
BORING NO. 198_EB2-B			STATION 17+02			OFFSET 15 ft RT			ALIGNMENT -L-		0 HR. Dry	
COLLAR ELEV. 731.8 ft			TOTAL DEPTH 23.4 ft			NORTHING 677,009			EASTING 1,560,269		24 HR. 10.6	
DRILL RIG/HAMMER EFF./DATE CG20446 Diedrich D50 76%/06/14/2021						DRILL METHOD SPT Core Boring			HAMMER TYPE Automatic			
DRILLER C. Odom			START DATE 01/11/22			COMP. DATE 01/12/22			SURFACE WATER DEPTH N/A			
CORE SIZE NQ			TOTAL RUN 10.0 ft									
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		L O G	DESCRIPTION AND REMARKS	
					REC. (ft)	RQD (%)		REC. (%)	RQD (ft)			ELEV. (ft)
718.38											Begin Coring @ 13.4 ft	
	718.4	13.4	1.0	N=60/0.0 06:00/1.0	(0.9) 90%	(0.8) 80%		(9.7) 97%	(6.6) 66%		718.4	
715	717.4	14.4	5.0	04:52/1.0 05:35/1.0 08:41/1.0	(4.8) 96%	(3.2) 64%					CRYSTALLINE ROCK Fresh to Very Slightly Weathered, Gray-White, Hard to Very Hard, (META-GRANODIORITE) with very close to close fracture spacing and weak foliations	13.4
	712.4	19.4		05:00/1.0 04:57/1.0								
710			4.0	02:11/1.0 03:49/1.0 03:53/1.0	(4.0) 100%	(2.6) 65%						
	708.4	23.4		06:36/1.0							708.4	
Boring Terminated at Elevation 708.4 ft In Crystalline Rock (META-GRANODIORITE)												

NCDOT CORE SINGLE CG2_0112-05 BRIDGE198.GPJ NC_DOT.GDT 2/16/22



Bridge 198 on SR 2529 Over Crane Creek
Rock Core Photographs
Boring: EB2-B
Box 1: 13.4 to 23.4 Feet

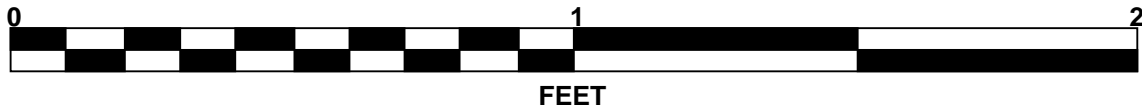




Photo #1: Bridge 199 End Bent 2 looking west (downstation) towards End Bent 1



Photo #2: Bridge 199 south side looking west (downstation)



Photo #3: Bridge 198 End Bent 2 looking west (downstation) towards End Bent 1



Photo #4: Bridge 198 south side looking west (downstation)