

REFERENCE: SF-120292

PROJECT: 17BP.10.R.108

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	SF-120292	1	13

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

STRUCTURE
SUBSURFACE INVESTIGATION

COUNTY CABARRUS
SITE DESCRIPTION BRIDGE NO. 292 ON SR 2625
(MAUNEY RD.) OVER LITTLE MEADOW CREEK

CONTENTS

<u>SHEET NO.</u>	<u>DESCRIPTION</u>
1	TITLE SHEET
2, 2A	LEGEND (SOIL & ROCK)
2B, 2C	SUPPLEMENTAL LEGEND (GSI)
3	SITE PLAN
4-5	CROSS SECTION(S)
6-13	BORE LOG(S), CORE LOG(S), & CORE PHOTOGRAPH(S)

PERSONNEL
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DATE JANUARY 2020

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DocuSigned by:

8EEA8D1BBA2E438... 2/3/2020

SIGNATURE DATE

**DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED**

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
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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									
THE ANGLARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.										MINERALOGICAL COMPOSITION									
MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.										COMPRESSIBILITY									
SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50										PERCENTAGE OF MATERIAL									
ORGANIC MATERIAL GRANULAR SOILS 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										GROUND WATER									
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										MISCELLANEOUS SYMBOLS									
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 TEST BORING AUGER BORING CORE BORING MONITORING WELL PIEZOMETER INSTALLATION SLOPE INDICATOR INSTALLATION CONE PENETROMETER TEST SOUNDING ROD TEST BORING WITH CORE SPT N-VALUE									
CONSISTENCY OR DENSENESS										RECOMMENDATION SYMBOLS									
PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²) 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 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 0.5 0.5 TO 1.0 1 TO 2 2 TO 4 > 4										UNDERCUT UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL SHALLOW UNDERCUT UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK									
TEXTURE OR GRAIN SIZE										ABBREVIATIONS									
U.S. STD. SIEVE SIZE OPENING (MM) 4 10 40 60 200 270 4.76 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 MOD. - MODERATELY UNIT WEIGHT CPT - CONE PENETRATION TEST NP - NON PLASTIC DRY UNIT WEIGHT CSE. - COARSE ORG. - ORGANIC DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST SAMPLE ABBREVIATIONS DPT - DYNAMIC PENETRATION TEST SAP. - SAPROLITIC S - BULK e - VOID RATIO SD. - SAND, SANDY S - SAND F - FINE SL. - SILT, SILTY SLI. - SLIGHTLY ST - SHELBY TUBE FOSS. - FOSSILIFEROUS TCR - TRICONE REFUSAL RS - ROCK FRAC. - FRACTURED, FRACTURES w - MOISTURE CONTENT RT - RECOMPACTED TRIAXIAL FRAGS. - FRAGMENTS V - VEGETATION CBR - CALIFORNIA BEARING RATIO HI. - HIGHLY									
SOIL MOISTURE - CORRELATION OF TERMS										EQUIPMENT USED ON SUBJECT PROJECT									
SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION LL LIQUID LIMIT - SATURATED - (SAT.) USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE PLASTIC RANGE (PI) PL PLASTIC LIMIT - WET - (W) SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE OM OPTIMUM MOISTURE SHRINKAGE LIMIT - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE SL - DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE										DRILL UNITS: CME-45C CME-55 CME-550 VANE SHEAR TEST PORTABLE HOIST CME-550X 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 HAMMER TYPE: AUTOMATIC MANUAL CORE SIZE: -B -H -N X HAND TOOLS: POST HOLE DIGGER HAND AUGER SOUNDING ROD VANE SHEAR TEST									
PLASTICITY										COLOR									
PLASTICITY INDEX (PI) DRY STRENGTH NON PLASTIC 0-5 VERY LOW SLIGHTLY PLASTIC 6-15 SLIGHT MODERATELY PLASTIC 16-25 MEDIUM HIGHLY PLASTIC 26 OR MORE HIGH										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.									

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SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS (PAGE 2 OF 2)

ROCK DESCRIPTION		TERMS AND DEFINITIONS	
<p>HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. 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 (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.</p> <p>AQUIFER - A WATER BEARING FORMATION OR STRATA.</p> <p>ARENACEOUS - 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, SUCH AS SHALE, SLATE, ETC.</p> <p>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.</p> <p>CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.</p> <p>COLLUVIUM - 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 DISLODGED FROM PARENT MATERIAL.</p> <p>FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.</p> <p>FORMATION (FM) - 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 (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.</p> <p>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.</p> <p>SAPROLITE (SAP.) - RESIDUAL SOIL THAT 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, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.</p> <p>SLICKENSIDE - 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 BPF 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 PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 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 (SRQD) - 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.</p> <p>TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p>	
<p>WEATHERED ROCK (WR)  NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.</p> <p>CRYSTALLINE ROCK (CR)  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)  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)  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. <u>IF TESTED, WOULD YIELD SPT REFUSAL.</u>		
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. <u>IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF</u>		
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <u>IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF</u>		
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 GROVED 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 FOOT	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 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: TBM NAIL IN POWER POLE AT -L- STATION 14.75, 46' RT</p> <p>BM#1: BL STATION 10+26.00, 32' RT IN 10" MAPLE</p> <p>TBM ELEVATION: 583.37 FEET BM#1 ELEVATION: 583.98 FEET</p>	
		<p>NOTES:</p> <p>ESTABLISHED ELEVATION OF TBM FROM BM-1</p>	
		<p>FIAD= FILLED IMMEDIATELY AFTER DRILLING</p>	
DATE: 8-15-14			

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**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

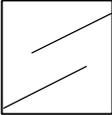
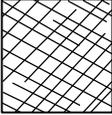
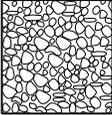
FAIR
Smooth, moderately weathered and altered surfaces

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

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

STRUCTURE

DECREASING SURFACE QUALITY →

	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				

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 (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

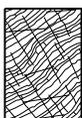


E. Weak siltstone or clayey shale with sandstone layers

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

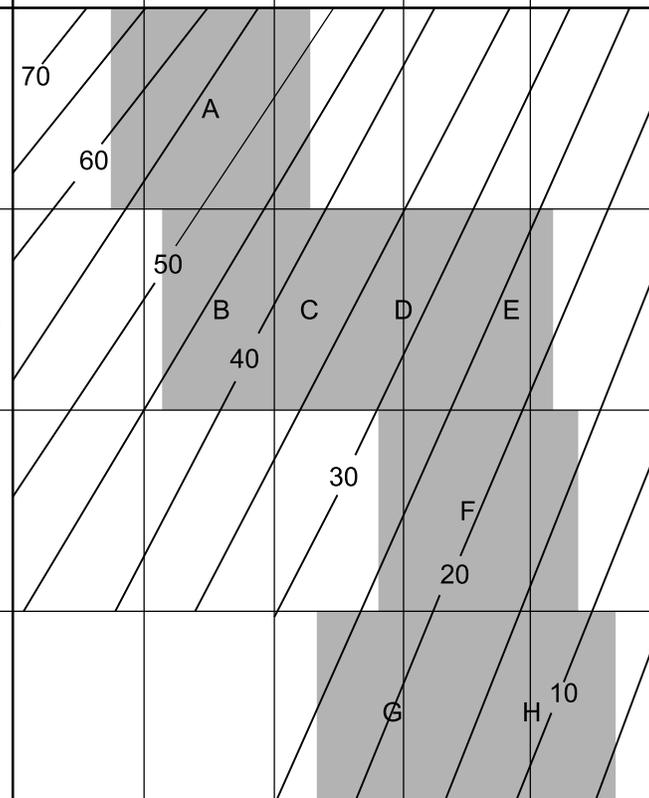


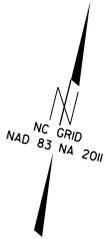
G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers



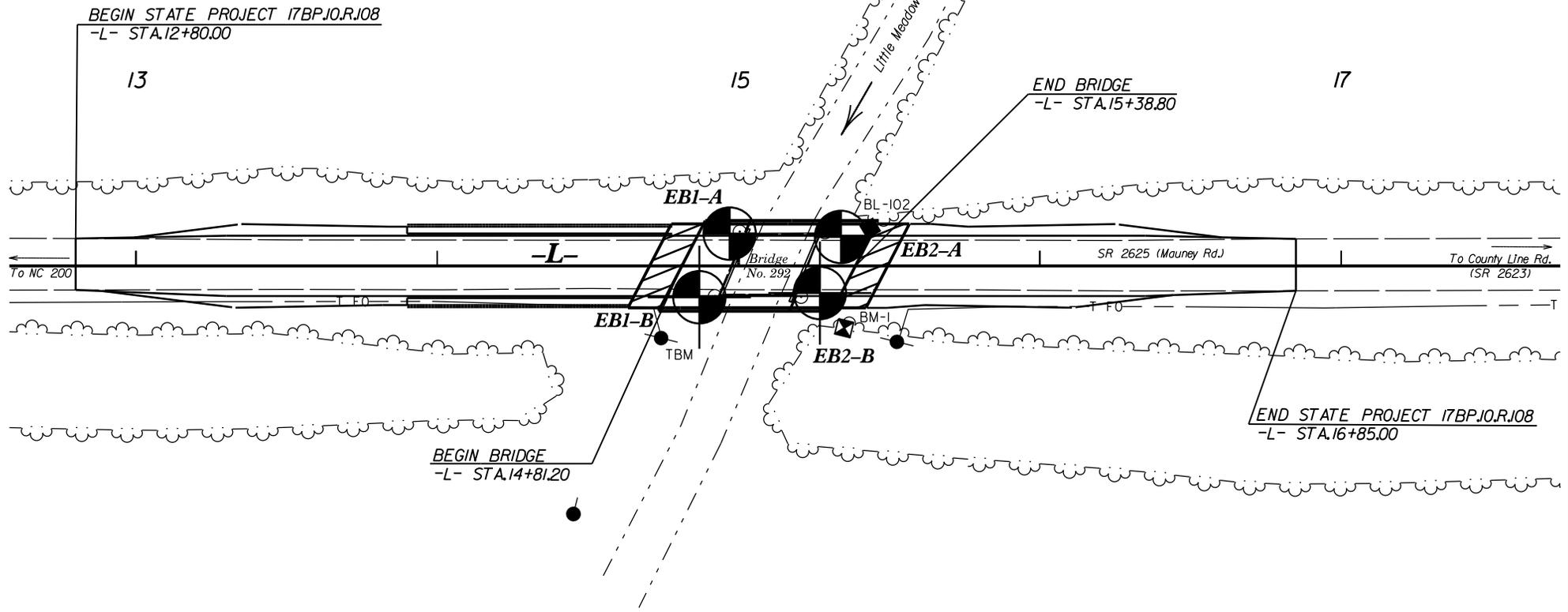
H. Tectonically deformed silty or clayey shale forming a chaotic structure with pockets of clay. Thin layers of sandstone are transformed into small rock pieces.

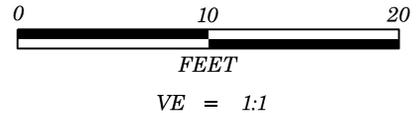
➡ Means deformation after tectonic disturbance



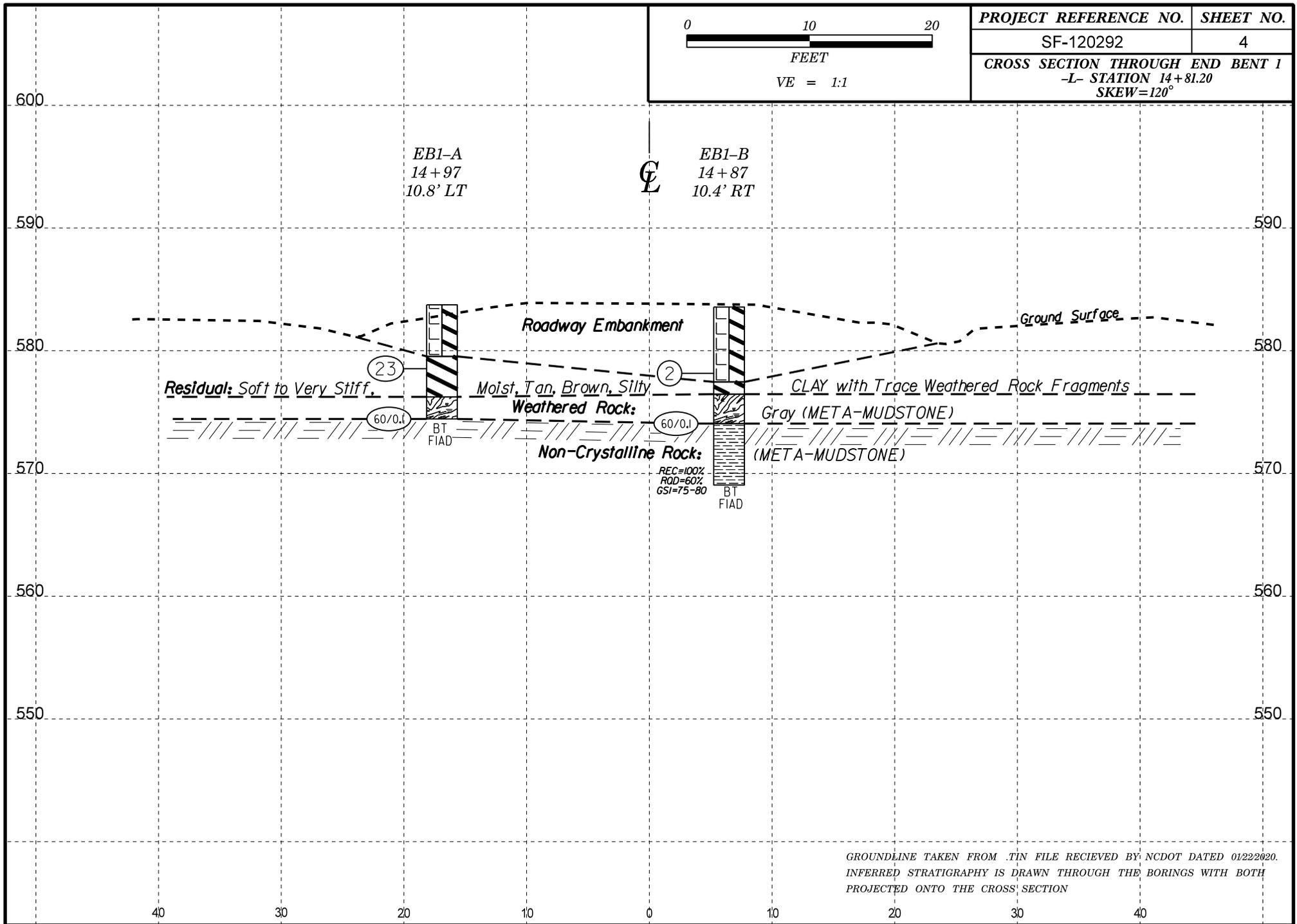


PROJECT REFERENCE NO.	SHEET NO.
SF-120292	3
SITE PLAN	
0 50 100 ————— FEET	
SKEW=120 DEGREES	

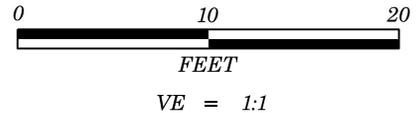




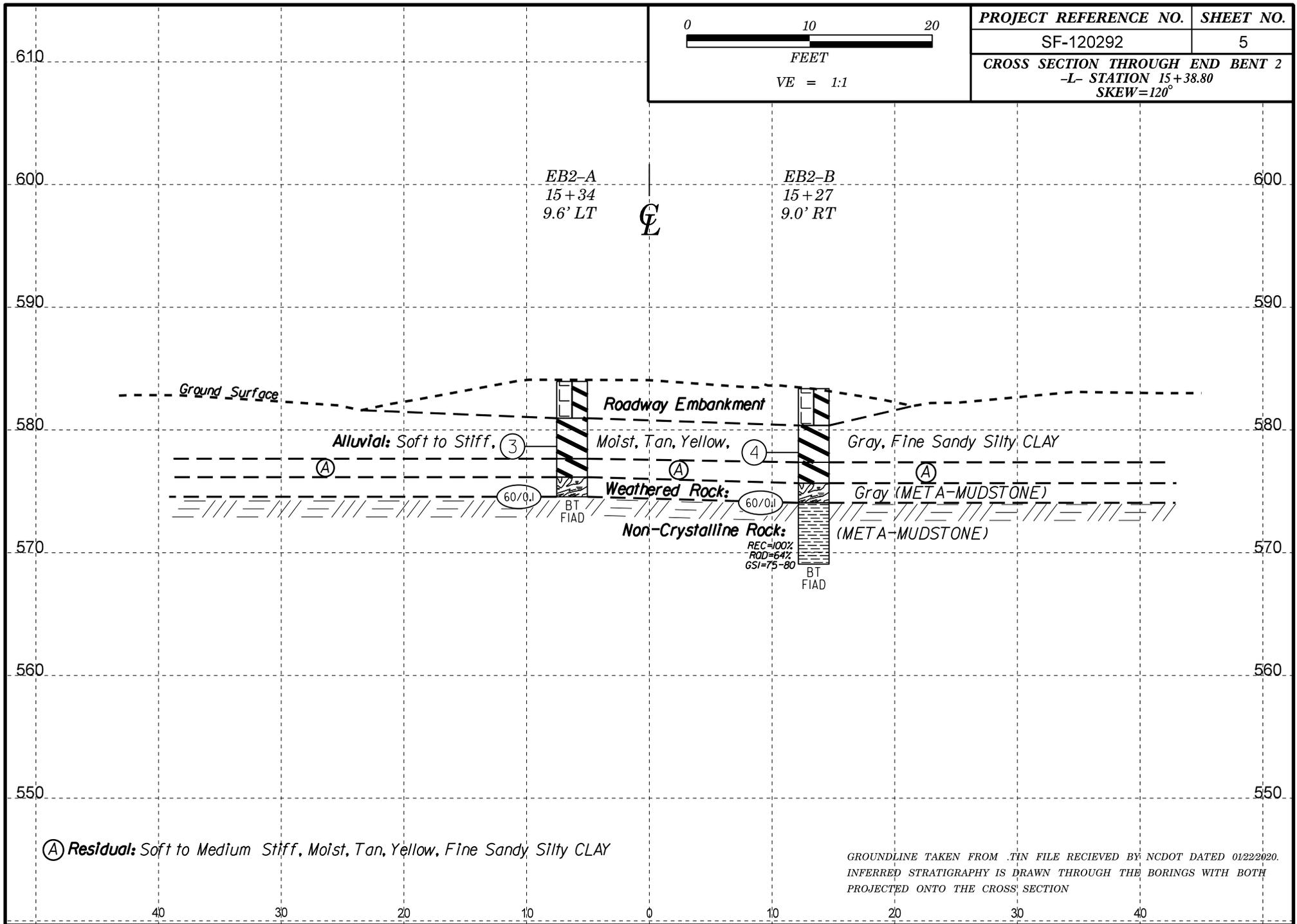
PROJECT REFERENCE NO.	SHEET NO.
SF-120292	4
CROSS SECTION THROUGH END BENT 1	
-L- STATION 14+81.20	
SKEW=120°	



GROUNDLINE TAKEN FROM .TIN FILE RECEIVED BY NCDOT DATED 01/22/2020.
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH
PROJECTED ONTO THE CROSS SECTION



PROJECT REFERENCE NO.	SHEET NO.
SF-120292	5
CROSS SECTION THROUGH END BENT 2 -L- STATION 15+38.80 SKEW=120°	



GEOTECHNICAL BORING REPORT

BORE LOG

WBS 17BP.10.R.108		TIP SF-120292		COUNTY CABARRUS		GEOLOGIST Stickney, J. K.										
SITE DESCRIPTION Bridge No. 292 on SR-2625 (Mauney Road) over Little Meadow Creek							GROUND WTR (ft)									
BORING NO. EB1-A		STATION 14+97		OFFSET 11 ft LT		ALIGNMENT -L-										
COLLAR ELEV. 583.7 ft		TOTAL DEPTH 9.3 ft		NORTHING 572,249		EASTING 1,571,106										
DRILL RIG/HAMMER EFF./DATE HFC0072 CME-550X 90% 05/23/2017				DRILL METHOD NW Casing w/ SPT		HAMMER TYPE Automatic										
DRILLER Smith, C. L.		START DATE 06/07/17		COMP. DATE 06/07/17		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	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
585																
580	579.5	4.2	12	8	15											
575	574.5	9.2	60/0.1													

583.7 GROUND SURFACE 0.0

ROADWAY EMBANKMENT
SOIL NOT DESCRIBED ON FIELD LOG

579.5 4.2

RESIDUAL
TAN, BROWN, SILTY CLAY WITH TRACE
WEATHERED ROCK FRAGMENTS 7.5

576.2

WEATHERED ROCK
GRAY (META-MUDSTONE) 9.3

574.4

Boring Terminated WITH STANDARD
PENETRATION TEST REFUSAL at
Elevation 574.4 ft ON NON-CRYSTALLINE
ROCK (META-MUDSTONE)

NCDOT BORE SINGLE SF120292_GEO_BRD00292.GPJ NC_DOT.GDT 1/30/20

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 17BP.10.R.108	TIP SF-120292	COUNTY CABARRUS	GEOLOGIST Stickney, J. K.
SITE DESCRIPTION Bridge No. 292 on SR-2625 (Mauney Road) over Little Meadow Creek			GROUND WTR (ft)
BORING NO. EB1-B	STATION 14+87	OFFSET 10 ft RT	ALIGNMENT -L-
COLLAR ELEV. 583.6 ft	TOTAL DEPTH 14.5 ft	NORTHING 572,226	EASTING 1,571,102
DRILL RIG/HAMMER EFF./DATE HFC0072 CME-550X 90% 05/23/2017		DRILL METHOD NW Casing WSPT & Core	HAMMER TYPE Automatic
DRILLER Smith, C. L.	START DATE 06/07/17	COMP. DATE 06/07/17	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						
585														583.6	GROUND SURFACE	0.0
580	579.2	4.4	WOH	WOH	2										ROADWAY EMBANKMENT SOIL NOT DESCRIBED ON FIELD LOG	
575	574.2	9.4												577.5 576.5	RESIDUAL TAN BROWN SILTY CLAY WITH TRACE WEATHERED ROCK FRAGMENTS	6.1 7.1
570														574.1	WEATHERED ROCK GRAY (META-MUDSTONE) NON-CRYSTALLINE ROCK (META-MUDSTONE)	9.5
														569.1	Boring Terminated at Elevation 569.1 ft IN NON-CRYSTALLINE ROCK (META-MUDSTONE)	14.5

NCDOT BORE SINGLE_SF120292_GEO_BRD00292.GPJ_NC_DOT.GDT 1/30/20

GEOTECHNICAL BORING REPORT

CORE LOG

WBS 17BP.10.R.108		TIP SF-120292		COUNTY CABARRUS		GEOLOGIST Stickney, J. K.					
SITE DESCRIPTION Bridge No. 292 on SR-2625 (Mauney Road) over Little Meadow Creek							GROUND WTR (ft)				
BORING NO. EB1-B		STATION 14+87		OFFSET 10 ft RT		ALIGNMENT -L-					
COLLAR ELEV. 583.6 ft		TOTAL DEPTH 14.5 ft		NORTHING 572,226		EASTING 1,571,102					
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550X 90% 05/23/2017				DRILL METHOD NW Casing W/SPT & Core		HAMMER TYPE Automatic					
DRILLER Smith, C. L.		START DATE 06/07/17		COMP. DATE 06/07/17		SURFACE WATER DEPTH N/A					
CORE SIZE NX		TOTAL RUN 5.0 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) %			
574.06	574.1	9.5	5.0		(5.0) 100%	(3.0) 60%	(5.0) 100%	(3.0) 60%		Begin Coring @ 9.5 ft	9.5
570	569.1	14.5								NON-CRYSTALLINE ROCK GRAY, FRESH, MEDIUM HARD, META-MUDSTONE, CLOSE FRACTURE SPACING, THINLY LAMINATED. GSI 75 - 80%	14.5
										Boring Terminated at Elevation 569.1 ft IN NON-CRYSTALLINE ROCK (META-MUDSTONE)	

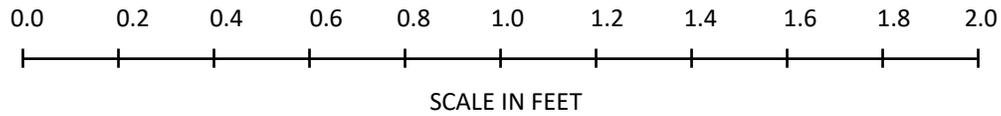
NCDOT CORE SINGLE SF120292_GEO_BRD00292.GPJ NC_DOT.GDT 1/30/20

CORE PHOTOGRAPH:
Bridge No. 292 on SR 2625 (Mauney Rd.) over Little
Meadow Creek
EB1-B: -L- Station 14+87, 10.4 ft RT

Begin
9.5 feet



End
14.5 feet



GEOTECHNICAL BORING REPORT

BORE LOG

WBS 17BP.10.R.108		TIP SF-120292		COUNTY CABARRUS		GEOLOGIST Stickney, J. K.											
SITE DESCRIPTION Bridge No. 292 on SR-2625 (Mauney Road) over Little Meadow Creek							GROUND WTR (ft)										
BORING NO. EB2-A		STATION 15+34		OFFSET 10 ft LT		ALIGNMENT -L-											
COLLAR ELEV. 584.0 ft		TOTAL DEPTH 9.4 ft		NORTHING 572,256		EASTING 1,571,143											
DRILL RIG/HAMMER EFF./DATE HFC0072 CME-550X 90% 05/23/2017				DRILL METHOD NW Casing w/ SPT		HAMMER TYPE Automatic											
DRILLER Smith, C. L.		START DATE 06/07/17		COMP. DATE 06/07/17		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	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100							
585															584.0	GROUND SURFACE	0.0
															581.0	ROADWAY EMBANKMENT SOIL NOT DESCRIBED ON FIELD LOG	3.0
580	579.7	4.3													577.7	ALLUVIAL TAN, YELLOW, BROWN, FINE SANDY SILTY CLAY	6.3
			WOH	1	2										576.2	RESIDUAL FINE SANDY SILTY CLAY	7.8
575	574.7	9.3													574.6	WEATHERED ROCK GRAY (META-MUDSTONE)	9.4
			60/0.1													Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 574.6 ft ON NON-CRYSTALLINE ROCK (META-MUDSTONE)	

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GEOTECHNICAL BORING REPORT

BORE LOG

WBS 17BP.10.R.108		TIP SF-120292		COUNTY CABARRUS		GEOLOGIST Stickney, J. K.										
SITE DESCRIPTION Bridge No. 292 on SR-2625 (Mauney Road) over Little Meadow Creek							GROUND WTR (ft)									
BORING NO. EB2-B		STATION 15+27		OFFSET 9 ft RT		ALIGNMENT -L-	0 HR. N/A									
COLLAR ELEV. 583.4 ft		TOTAL DEPTH 14.3 ft		NORTHING 572,237		EASTING 1,571,140	24 HR. FIAD									
DRILL RIG/HAMMER EFF./DATE HFC0072 CME-550X 90% 05/23/2017				DRILL METHOD NW Casing W/SPT & Core		HAMMER TYPE Automatic										
DRILLER Smith, C. L.		START DATE 06/07/17		COMP. DATE 06/07/17		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						
585														583.4	GROUND SURFACE	0.0
580														580.4	ROADWAY EMBANKMENT SOIL NOT DESCRIBED ON FIELD LOG	3.0
	579.2	4.2		2	2	2								577.4	ALLUVIAL TAN, YELLOW, GRAY, FINE SANDY SILTY CLAY	6.0
575														575.7	RESIDUAL TAN, YELLOW, GRAY, FINE SANDY SILTY CLAY	7.7
	574.2	9.2												574.1	WEATHERED ROCK Gray (META-MUDSTONE)	9.3
570														569.1	NON-CRYSTALLINE ROCK (META-MUDSTONE)	14.3
															Boring Terminated at Elevation 569.1 ft IN NON-CRYSTALLINE ROCK (META-MUDSTONE)	

NCDOT BORE SINGLE SF120292_GEO_BRD00292.GPJ NC_DOT.GDT 1/30/20

GEOTECHNICAL BORING REPORT

CORE LOG

WBS 17BP.10.R.108				TIP SF-120292		COUNTY CABARRUS			GEOLOGIST Stickney, J. K.			
SITE DESCRIPTION Bridge No. 292 on SR-2625 (Mauney Road) over Little Meadow Creek										GROUND WTR (ft)		
BORING NO. EB2-B				STATION 15+27		OFFSET 9 ft RT		ALIGNMENT -L-			0 HR. N/A	
COLLAR ELEV. 583.4 ft				TOTAL DEPTH 14.3 ft		NORTHING 572,237		EASTING 1,571,140			24 HR. FIAD	
DRILL RIG/HAMMER EFF/DATE HFO0072 CME-550X 90% 05/23/2017						DRILL METHOD NW Casing W/SPT & Core			HAMMER TYPE Automatic			
DRILLER Smith, C. L.				START DATE 06/07/17		COMP. DATE 06/07/17		SURFACE WATER DEPTH N/A				
CORE SIZE NX				TOTAL RUN 5.0 ft								
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		STRATA		L O G	ELEV. (ft)	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (ft) %	RQD (ft) %	REC. (ft) %	RQD (ft) %				
574.07	574.1	9.3	5.0		(5.0) 100%	(3.2) 64%	(5.0) 100%	(3.2) 64%		574.1	Begin Coring @ 9.3 ft NON-CRYSTALLINE ROCK GRAY FRESH, MEDIUM HARD, META-MUDSTONE, CLOSE FRACTURE SPACING, THINLY LAMINATED. GSI 75 - 80%	9.3
570	569.1	14.3								569.1	Boring Terminated at Elevation 569.1 ft IN NON-CRYSTALLINE ROCK (META-MUDSTONE)	14.3

NCDOT CORE SINGLE SF120292_GEO_BRD00292.GPJ NC_DOT.GDT 1/30/20

CORE PHOTOGRAPH:
Bridge No. 292 on SR 2625 (Mauney Rd.) over Little
Meadow Creek
EB2-B: -L- Station 15+27, 9.0 ft RT

Begin
9.3 feet



End
14.3 feet

