

REFERENCE: 17BP.8.R.121

PROJECT: N/A

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

**STRUCTURE**  
**SUBSURFACE INVESTIGATION**

COUNTY MOORE  
 PROJECT DESCRIPTION REPLACE BRIDGE NO. 63 OVER  
BUFFALO CREEK ON NC 22

SITE DESCRIPTION STA. 14+02 -L-

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	17BP.8.R.121	1	22

**CAUTION NOTICE**

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 707-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

NOTES:

1. 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.
2. 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

Z. BRUCE

W. SMITH

INVESTIGATED BY A. NIEHOFF

DRAWN BY W. SHUECRAFT

CHECKED BY K. BUSSEY

SUBMITTED BY HDR|ICA

DATE JANUARY, 2018

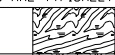


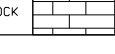





















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DocuSigned by:  
Kenneth R. Bussey 5/4/2018  
 SIGNATURE DATE

**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										GRADATION										ROCK DESCRIPTION										TERMS AND DEFINITIONS																													
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, <i>VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</i>										WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. 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.										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:										ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. AQUIFER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOADED FROM PARENT MATERIAL. FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. FORMATION (FM) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. ROCK QUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N 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. STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.																													
<b>SOIL LEGEND AND AASHTO CLASSIFICATION</b>										<b>ANGULARITY OF GRAINS</b> THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.										<b>WEATHERED ROCK (WR)</b>  NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.										<b>CRYSTALLINE ROCK (CR)</b>  FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.										<b>NON-CRYSTALLINE ROCK (NCR)</b>  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.										<b>COASTAL PLAIN SEDIMENTARY ROCK (CP)</b>  COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.									
<b>MINERALOGICAL COMPOSITION</b> MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.										<b>COMPRESSION</b> SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50										<b>PERCENTAGE OF MATERIAL</b>										<b>WEATHERING</b>																													
<b>COMPRESSIBILITY</b>										<b>ORGANIC MATERIAL</b> TRACE OF ORGANIC MATTER 2 - 3% LITTLE ORGANIC MATTER 3 - 5% MODERATELY ORGANIC 5 - 10% HIGHLY ORGANIC > 10%										<b>SILT - CLAY SOILS</b> 3 - 5% 5 - 12% 12 - 20% > 20%										<b>OTHER MATERIAL</b> TRACE 1 - 10% LITTLE 10 - 20% SOME 20 - 35% HIGHLY 35% AND ABOVE																													
<b>GROUND WATER</b>										 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										<b>MISCELLANEOUS SYMBOLS</b>										<b>RECOMMENDATION SYMBOLS</b>																													
<b>CONSISTENCY OR DENSENESS</b>										 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										 UNDERCUT  SHALLOW UNDERCUT  UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE  UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK  UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL										<b>ABBREVIATIONS</b> AR - AUGER REFUSAL BT - BORING TERMINATED CL. - CLAY CPT - CONE PENETRATION TEST CSE. - COARSE DMT - DILATOMETER TEST DPT - DYNAMIC PENETRATION TEST e - VOID RATIO F - FINE FOSS. - FOSSILIFEROUS FRAC. - FRACTURED, FRACTURES FRAGS. - FRAGMENTS HI. - HIGHLY MED. - MEDIUM MICA. - MICACEOUS MOD. - MODERATELY NP - NON PLASTIC ORG. - ORGANIC PMT - PRESSUREMETER TEST SAP. - SAPROLITIC SD. - SAND, SANDY SL. - SILT, SILTY SLI. - SLIGHTLY TCR - TRICONE REFUSAL w - MOISTURE CONTENT V - VERY VST - VANE SHEAR TEST WEA. - WEATHERED W - UNIT WEIGHT Wg - DRY UNIT WEIGHT <b>SAMPLE ABBREVIATIONS</b> S - BULK SS - SPLIT SPOON ST - SHELBY TUBE RS - ROCK RT - RECOMPACTED TRIAXIAL CBR - CALIFORNIA BEARING RATIO																			
<b>TEXTURE OR GRAIN SIZE</b>										<b>TEXTURE OR GRAIN SIZE</b>										<b>TEXTURE OR GRAIN SIZE</b>										<b>TEXTURE OR GRAIN SIZE</b>																													
U.S. STD. SIEVE SIZE OPENING (MM) 4 10 40 60 200 270 0.075 0.25 0.85 0.075 0.075										BOULDER (BLDR.) COBBLE (COB.) GRAVEL (GR.) COARSE SAND (CSE. SD.) FINE SAND (F SD.) SILT (SL.) CLAY (CL.)										GRAIN SIZE MM IN. 305 75 2.0 0.25 0.05 0.005										GRAIN SIZE MM IN. 305 75 2.0 0.25 0.05 0.005										GRAIN SIZE MM IN. 305 75 2.0 0.25 0.05 0.005																			
<b>SOIL MOISTURE - CORRELATION OF TERMS</b>										<b>SOIL MOISTURE - CORRELATION OF TERMS</b>										<b>SOIL MOISTURE - CORRELATION OF TERMS</b>										<b>SOIL MOISTURE - CORRELATION OF TERMS</b>																													
SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION										SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION										SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION										SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION																													
LL - LIQUID LIMIT PL - PLASTIC LIMIT OM - OPTIMUM MOISTURE SHRINKAGE LIMIT										LL - LIQUID LIMIT PL - PLASTIC LIMIT OM - OPTIMUM MOISTURE SHRINKAGE LIMIT										LL - LIQUID LIMIT PL - PLASTIC LIMIT OM - OPTIMUM MOISTURE SHRINKAGE LIMIT										LL - LIQUID LIMIT PL - PLASTIC LIMIT OM - OPTIMUM MOISTURE SHRINKAGE LIMIT																													
<b>PLASTICITY</b>										<b>PLASTICITY</b>										<b>PLASTICITY</b>										<b>PLASTICITY</b>																													
NON PLASTIC SLIGHTLY PLASTIC MODERATELY PLASTIC HIGHLY PLASTIC										PLASTICITY INDEX (PI) 0-5 6-15 16-25 26 OR MORE										DRY STRENGTH VERY LOW SLIGHT MEDIUM HIGH										PLASTICITY INDEX (PI) 0-5 6-15 16-25 26 OR MORE																													
<b>COLOR</b>										<b>COLOR</b>										<b>COLOR</b>										<b>COLOR</b>																													
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.										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.										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.										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.																													
<b>EQUIPMENT USED ON SUBJECT PROJECT</b>										<b>EQUIPMENT USED ON SUBJECT PROJECT</b>										<b>EQUIPMENT USED ON SUBJECT PROJECT</b>										<b>EQUIPMENT USED ON SUBJECT PROJECT</b>																													
DRILL UNITS: <input checked="" type="checkbox"/> CME-45C <input type="checkbox"/> CME-55 <input type="checkbox"/> CME-550 <input type="checkbox"/> VANE SHEAR TEST <input type="checkbox"/> PORTABLE HOIST										ADVANCING TOOLS: <input type="checkbox"/> CLAY BITS <input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER <input checked="" type="checkbox"/> 8" HOLLOW AUGERS <input type="checkbox"/> HARD FACED FINGER BITS <input type="checkbox"/> TUNG-CARBIDE INSERTS <input type="checkbox"/> CASING <input type="checkbox"/> W/ ADVANCER <input type="checkbox"/> TRICONE * STEEL TEETH <input type="checkbox"/> TRICONE * TUNG-CARB. <input checked="" type="checkbox"/> CORE BIT										HAMMER TYPE: <input checked="" type="checkbox"/> AUTOMATIC <input type="checkbox"/> MANUAL CORE SIZE: <input type="checkbox"/> -B <input type="checkbox"/> -H <input checked="" type="checkbox"/> -N Q2 HAND TOOLS: <input type="checkbox"/> POST HOLE DIGGER <input type="checkbox"/> HAND AUGER <input type="checkbox"/> SOUNDING ROD <input type="checkbox"/> VANE SHEAR TEST										FRACTURE SPACING TERM SPACING VERY WIDE MORE THAN 10 FEET WIDE 3 TO 10 FEET MODERATELY CLOSE 1 TO 3 FEET CLOSE 0.16 TO 1 FOOT VERY CLOSE LESS THAN 0.16 FEET										BEDDING TERM THICKNESS VERY THICKLY BEDDED 4 FEET THICKLY BEDDED 1.5 - 4 FEET THINLY BEDDED 0.16 - 1.5 FEET VERY THINLY BEDDED 0.03 - 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET THINLY LAMINATED < 0.008 FEET																			
<b>INDURATION</b>										<b>INDURATION</b>										<b>INDURATION</b>										<b>INDURATION</b>																													
FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.										FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.										FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.										FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.																													
FRIABLE MODERATELY INDURATED INDURATED EXTREMELY INDURATED										RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.										RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.										RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.																													
<b>BENCH MARK: NA</b>										<b>BENCH MARK: NA</b>										<b>BENCH MARK: NA</b>										<b>BENCH MARK: NA</b>																													
<b>ELEVATION: NA FEET</b>										<b>ELEVATION: NA FEET</b>										<b>ELEVATION: NA FEET</b>										<b>ELEVATION: NA FEET</b>																													
<b>NOTES:</b> BORING ELEVATIONS OBTAINED USING 620063.Is_tnl.tin DATED 6-13-2017										<b>NOTES:</b> BORING ELEVATIONS OBTAINED USING 620063.Is_tnl.tin DATED 6-13-2017										<b>NOTES:</b> BORING ELEVATIONS OBTAINED USING 620063.Is_tnl.tin DATED 6-13-2017										<b>NOTES:</b> BORING ELEVATIONS OBTAINED USING 620063.Is_tnl.tin DATED 6-13-2017																													

**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)

<p><b>GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000)</b></p> <p>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.</p> <p><b>STRUCTURE</b></p>	SURFACE CONDITIONS					<p><b>GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos, P and Hoek E., 2000)</b></p> <p>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.</p> <p><b>COMPOSITION AND STRUCTURE</b></p>										
	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		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					
	DECREASING SURFACE QUALITY →						SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)									
<p>DECREASING INTERLOCKING OF ROCK PIECES</p> <p style="text-align: center;">↓</p>	90	80	70	60	50	40	30	20	10	N/A	N/A					
<p> INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities</p> <p> BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets</p> <p> VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets</p> <p> BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity</p> <p> DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces</p> <p> LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes</p>	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A						
	DECREASING INTERLOCKING OF ROCK PIECES ↓						70	60	50	40	30	20	10			
	DECREASING INTERLOCKING OF ROCK PIECES ↓						A	B	C	D	E	F	G	H		
	DECREASING INTERLOCKING OF ROCK PIECES ↓						<p><b>A. Thick bedded, very blocky sandstone</b> 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.</p> <p><b>B. Sandstone with thin inter-layers of siltstone</b>    <b>C. Sandstone and siltstone in similar amounts</b>    <b>D. Siltstone or silty shale with sandstone layers</b>    <b>E. Weak siltstone or clayey shale with sandstone layers</b></p> <p><b>C, D, E, and G</b> - 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 <b>F</b> and <b>H</b>.</p> <p><b>F. Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure</b></p> <p><b>G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers</b>    <b>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.</b></p> <p>→ Means deformation after tectonic disturbance</p>					N/A	N/A	N/A	N/A	N/A

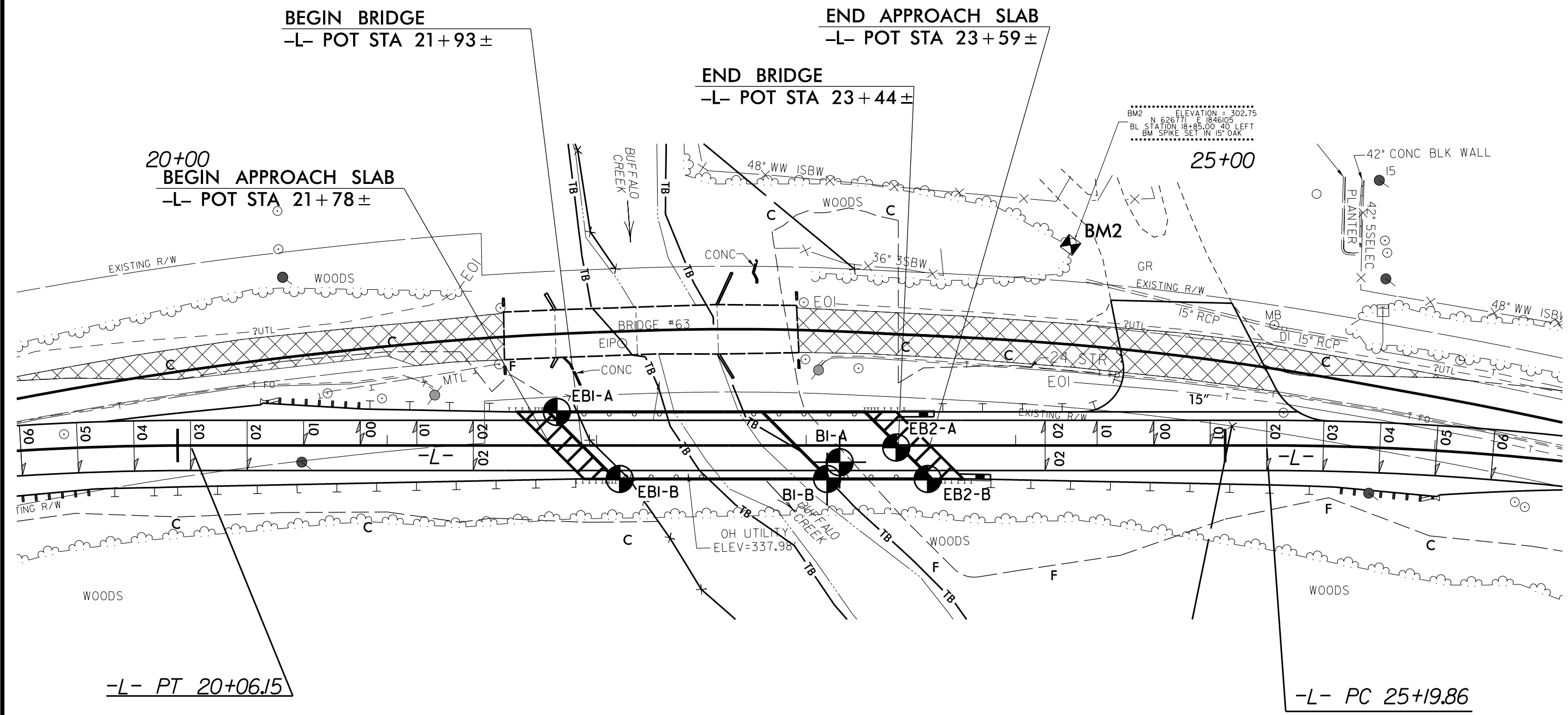
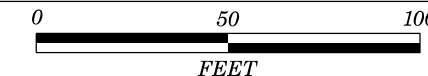


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NC License No: F-0258

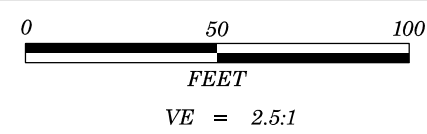
PROJECT REFERENCE NO. SHEET NO.

17BP.8.R.121 3

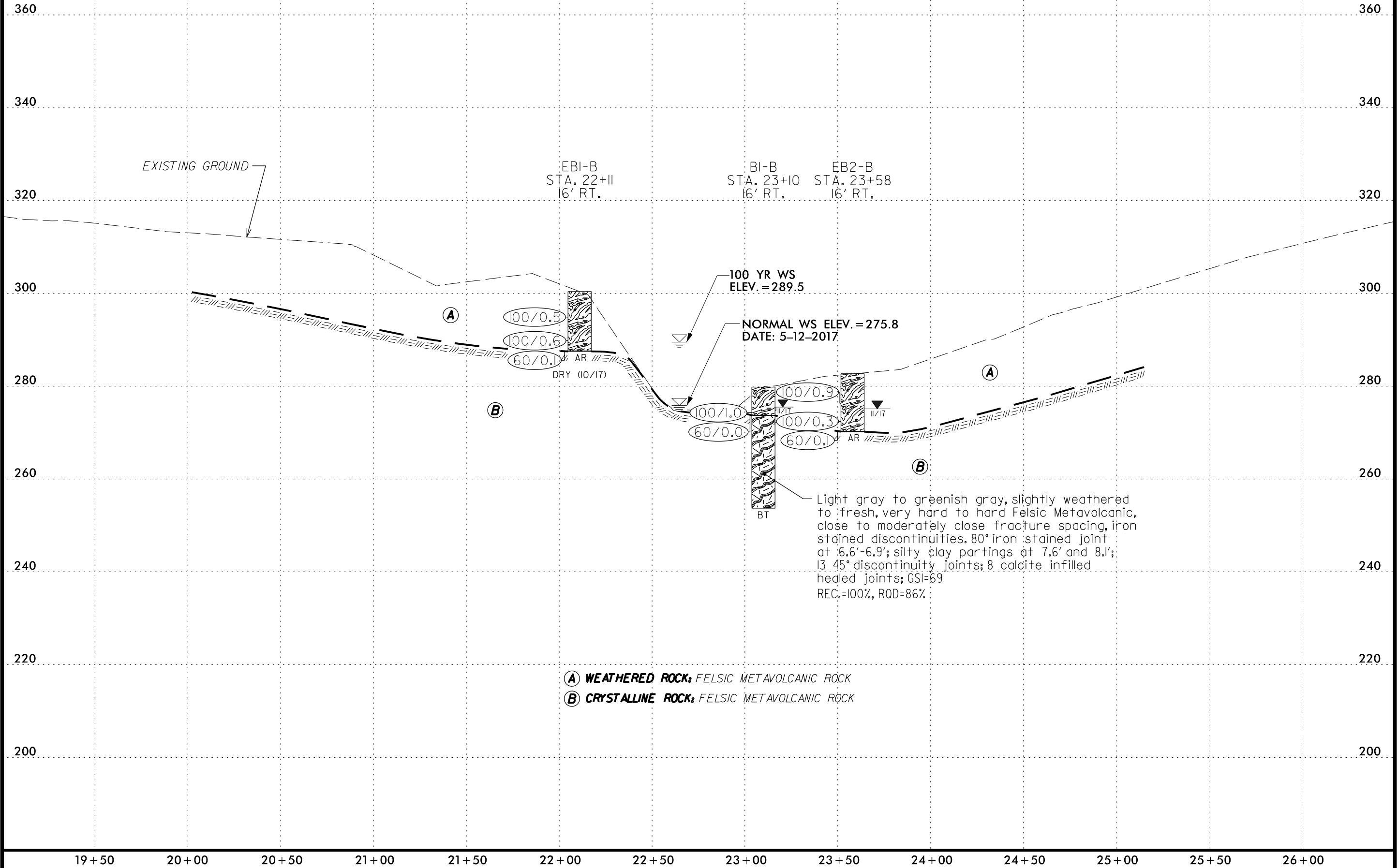
# SITE PLAN



GROUNDLINE PROFILE CREATED FROM 620063\_ls\_tnl.tin FILE DATED 6-13-2017  
 INFERRED STRATIGRAPHY IS DRAWN AT THE PROFILE OFFSET WITH THE BORINGS PROJECTED ONTO THE PROFILE

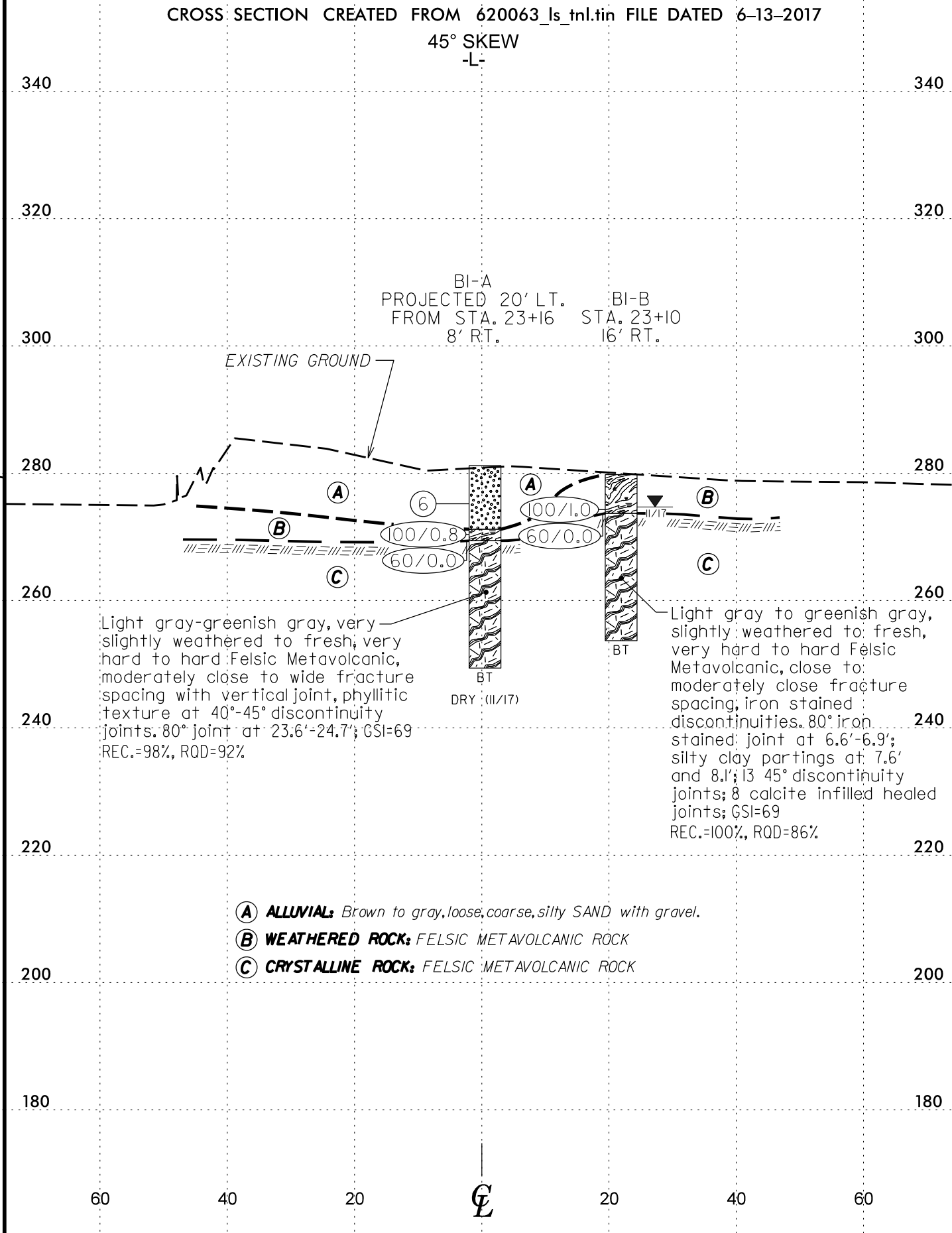
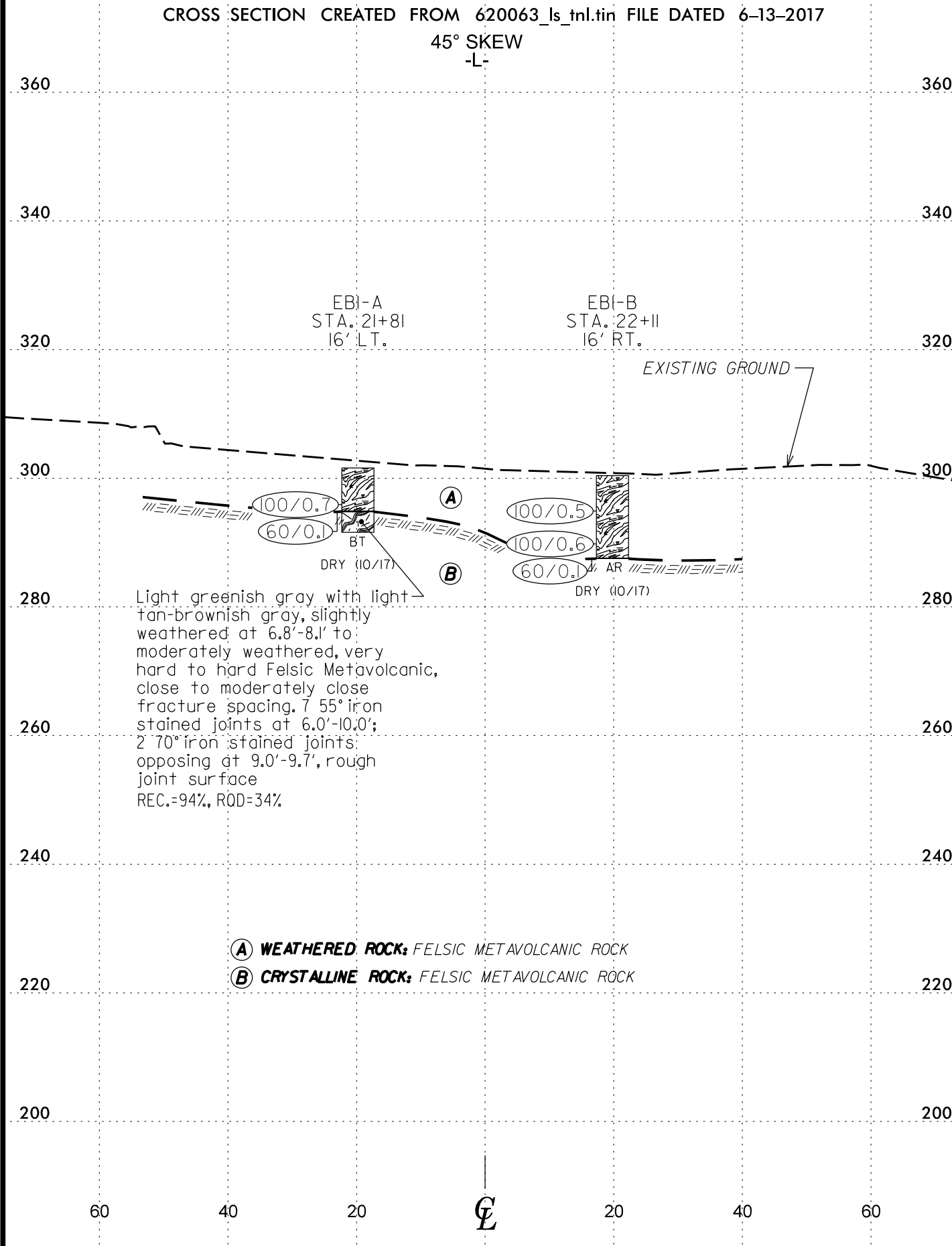


PROJECT REFERENCE NO.	SHEET NO.
17BP.8.R.121	4
BRIDGE NO. 63 PROFILE 16' RT. OF -L-	

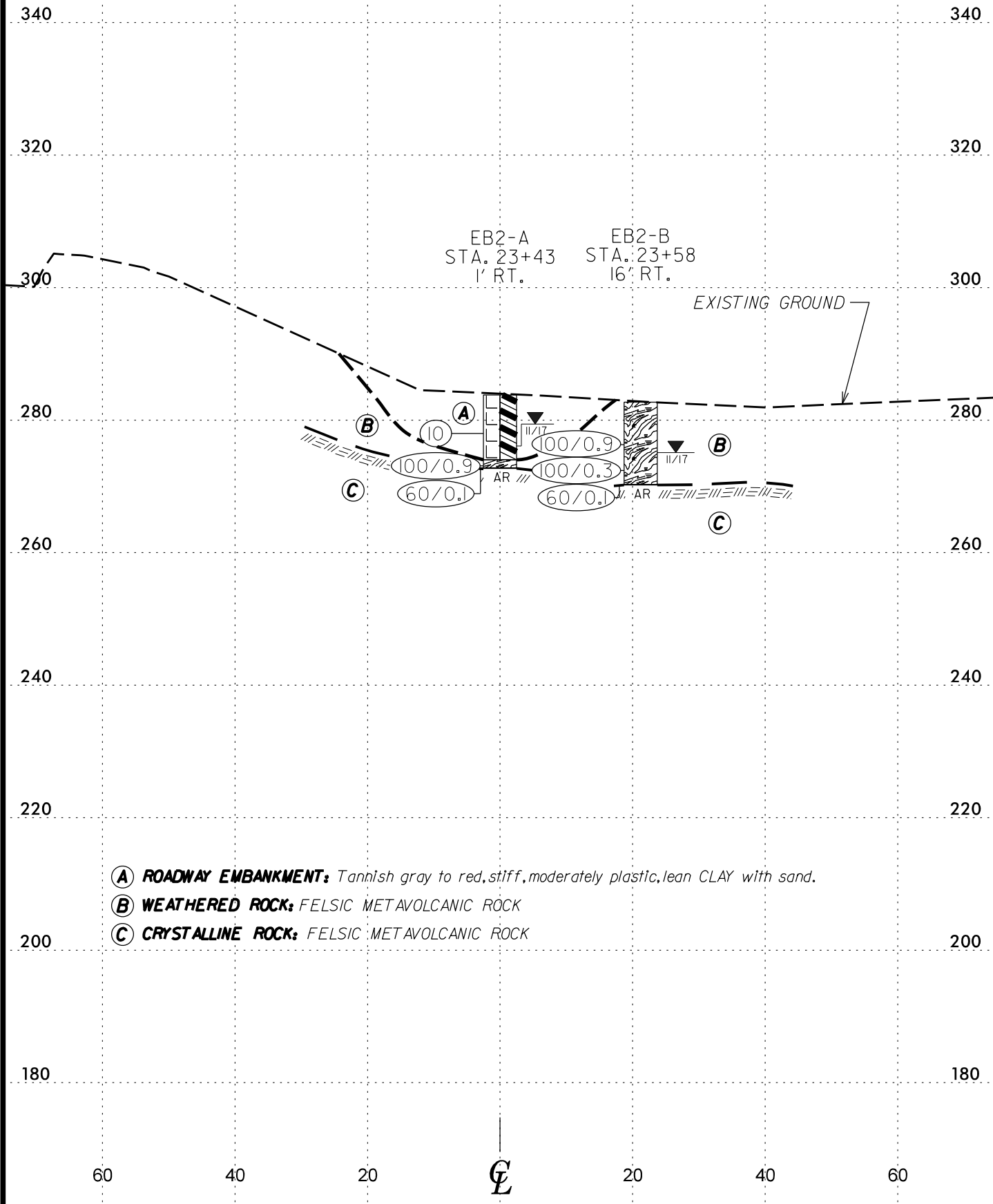


- (A) WEATHERED ROCK: FELSIC METAVOLCANIC ROCK
- (B) CRYSTALLINE ROCK: FELSIC METAVOLCANIC ROCK

Light gray to greenish gray, slightly weathered to fresh, very hard to hard Felsic Metavolcanic, close to moderately close fracture spacing, iron stained discontinuities. 80° iron stained joint at 6.6'-6.9'; silty clay partings at 7.6' and 8.1'; 13 45° discontinuity joints; 8 calcite infilled healed joints; GSI=69  
 REC.=100%, RQD=86%



CROSS SECTION CREATED FROM 620063\_Is\_tnl.tin FILE DATED 6-13-2017  
 45° SKEW  
 -L-



- (A) **ROADWAY EMBANKMENT:** Tannish gray to red, stiff, moderately plastic, lean CLAY with sand.
- (B) **WEATHERED ROCK:** FELSIC METAVOLCANIC ROCK
- (C) **CRYSTALLINE ROCK:** FELSIC METAVOLCANIC ROCK



VE = NA

**BRIDGE NO. 63 - END BENT 2**  
**CROSS SECTION - STA. 23+44.00**



VE = NA

# GEOTECHNICAL BORING REPORT

## BORE LOG

<b>WBS</b> 17BP.8.R.121		<b>TIP</b> 17BP.8.R.121		<b>COUNTY</b> MOORE		<b>GEOLOGIST</b> Z. Bruce									
<b>SITE DESCRIPTION</b> Replace Bridge No. 63 Over Buffalo Creek on NC 22							<b>GROUND WTR (ft)</b>								
<b>BORING NO.</b> EB1-A		<b>STATION</b> 21+81		<b>OFFSET</b> 16 ft LT		<b>ALIGNMENT</b> -L-									
<b>COLLAR ELEV.</b> 301.6 ft		<b>TOTAL DEPTH</b> 10.0 ft		<b>NORTHING</b> 626,622		<b>EASTING</b> 1,846,315									
<b>DRILL RIG/HAMMER EFF./DATE</b> ICA5794 CME-45C 87% 05/22/2017				<b>DRILL METHOD</b> H.S. Augers		<b>HAMMER TYPE</b> Automatic									
<b>DRILLER</b> Smith, W.		<b>START DATE</b> 10/31/17		<b>COMP. DATE</b> 10/31/17		<b>SURFACE WATER DEPTH</b> 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			ELEV. (ft)	DEPTH (ft)	
305															
300														301.6	GROUND SURFACE
															<b>WEATHERED ROCK</b> Felsic Metavolcanic
	297.1	4.5													
	294.9	6.7	25	60	40/0.2										
295	294.9	6.7	60/0.1							100/0.7				294.9	6.7
										60/0.1				294.8	6.8
														291.6	10.0
															<b>CRYSTALLINE ROCK</b> Felsic Metavolcanic
															<b>CRYSTALLINE ROCK</b> Felsic Metavolcanic
															Boring Terminated at Elevation 291.6 ft in Crystalline Rock (Felsic Metavolcanic).
															1) Boring relocated due to accessibility.

NCDOT BORE DOUBLE 17BP.8.R121\_GEO\_BRDG0063.GPJ NC\_DOT.GDT 12/22/17



# GEOTECHNICAL BORING REPORT

## CORE LOG

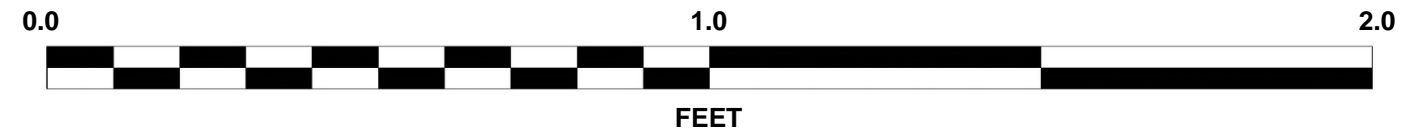
WBS 17BP.8.R.121		TIP 17BP.8.R.121		COUNTY MOORE		GEOLOGIST Z. Bruce					
SITE DESCRIPTION Replace Bridge No. 63 Over Buffalo Creek on NC 22							GROUND WTR (ft)				
BORING NO. EB1-A		STATION 21+81		OFFSET 16 ft LT		ALIGNMENT -L-					
COLLAR ELEV. 301.6 ft		TOTAL DEPTH 10.0 ft		NORTHING 626,622		EASTING 1,846,315					
DRILL RIG/HAMMER EFF./DATE ICA5794 CME-45C 87% 05/22/2017				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic					
DRILLER Smith, W.		START DATE 10/31/17		COMP. DATE 10/31/17		SURFACE WATER DEPTH N/A					
CORE SIZE NQ2		TOTAL RUN 3.2 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) %			
294.8	294.8	6.8	3.2	0:30/0.2	(3.0)	(1.1)	(3.0)	(1.1)		Begin Coring @ 6.8 ft	6.8
	291.6	10.0		1:23 1:06 1:09	94%	34%	94%	34%		<p><b>CRYSTALLINE ROCK</b></p> <p>Light greenish gray with light tan-brownish gray, slightly weathered at 6.8'-8.1' to moderately weathered, very hard to hard Felsic Metavolcanic, close to moderately close fracture spacing.</p> <p>7 55° iron stained joints at 6.0'-10.0'; 2 70° iron stained joints opposing at 9.0'-9.7', rough joint surface</p> <p>Boring Terminated at Elevation 291.6 ft in Crystalline Rock (Felsic Metavolcanic).</p> <p>1) Boring relocated due to accessibility.</p>	10.0

NCDOT CORE DOUBLE 17BP.8.R121\_GEO\_BRDG0063.GPJ NC\_DOT.GDT 1/25/18

# CORE PHOTOGRAPHIC RECORD

Replace Bridge No. 63 Over Buffalo Creek on NC 22

EB1-A Box 1 of 1



# GEOTECHNICAL BORING REPORT

## BORE LOG

<b>WBS</b> 17BP.8.R.121		<b>TIP</b> 17BP.8.R.121		<b>COUNTY</b> MOORE		<b>GEOLOGIST</b> Z. Bruce										
<b>SITE DESCRIPTION</b> Replace Bridge No. 63 Over Buffalo Creek on NC 22							<b>GROUND WTR (ft)</b>									
<b>BORING NO.</b> EB1-B		<b>STATION</b> 22+11		<b>OFFSET</b> 16 ft RT		<b>ALIGNMENT</b> -L-	0 HR. Dry									
<b>COLLAR ELEV.</b> 300.4 ft		<b>TOTAL DEPTH</b> 12.9 ft		<b>NORTHING</b> 626,665		<b>EASTING</b> 1,846,323	24 HR. Dry									
<b>DRILL RIG/HAMMER EFF./DATE</b> ICA5794 CME-45C 87% 05/22/2017				<b>DRILL METHOD</b> H.S. Augers		<b>HAMMER TYPE</b> Automatic										
<b>DRILLER</b> Smith, W.		<b>START DATE</b> 10/31/17		<b>COMP. DATE</b> 10/31/17		<b>SURFACE WATER DEPTH</b> 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			ELEV. (ft)	DEPTH (ft)		
305																
300														300.4		GROUND SURFACE
																<b>WEATHERED ROCK</b> Felsic Metavolcanic
295	295.4	5.0														
290	290.4	10.0														
	287.6	12.8												287.6		12.8
														287.5		12.9
																<b>CRYSTALLINE ROCK</b> Felsic Metavolcanic Boring Terminated with Standard Penetration Test Refusal at Elevation 287.5 ft in Crystalline Rock (Felsic Metavolcanic). 1) Boring relocated due to accessibility.

NCDOT BORE DOUBLE 17BP.8.R121\_GEO\_BRDG0063.GPJ NC\_DOT.GDT 1/25/18

# GEOTECHNICAL BORING REPORT

## BORE LOG

<b>WBS</b> 17BP.8.R.121		<b>TIP</b> 17BP.8.R.121		<b>COUNTY</b> MOORE		<b>GEOLOGIST</b> Z. Bruce										
<b>SITE DESCRIPTION</b> Replace Bridge No. 63 Over Buffalo Creek on NC 22							<b>GROUND WTR (ft)</b>									
<b>BORING NO.</b> B1-A		<b>STATION</b> 23+16		<b>OFFSET</b> 8 ft RT		<b>ALIGNMENT</b> -L-	0 HR. Dry									
<b>COLLAR ELEV.</b> 281.2 ft		<b>TOTAL DEPTH</b> 31.8 ft		<b>NORTHING</b> 626,745		<b>EASTING</b> 1,846,254	24 HR. Dry									
<b>DRILL RIG/HAMMER EFF./DATE</b> ICA5794 CME-45C 87% 05/22/2017				<b>DRILL METHOD</b> H.S. Augers		<b>HAMMER TYPE</b> Automatic										
<b>DRILLER</b> Smith, W.		<b>START DATE</b> 11/02/17		<b>COMP. DATE</b> 11/02/17		<b>SURFACE WATER DEPTH</b> 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			ELEV. (ft)	DEPTH (ft)		
285																
280														281.2	GROUND SURFACE	0.0
275	276.2	5.0	4	4	2							M				
270	271.2	10.0	45	55/0.3										271.2	WEATHERED ROCK Felsic Metavolcanic	10.0
265	269.4	11.8	60/0.0											269.4	CRYSTALLINE ROCK Felsic Metavolcanic	11.8
260																
255												RS-1				
250														249.4	Boring Terminated at Elevation 249.4 ft in Crystalline Rock (Felsic Metavolcanic). 1) Boring relocated due to accessibility.	31.8

NCDOT BORE DOUBLE 17BP.8.R121\_GEO\_BRDG0063.GPJ NC\_DOT.GDT 1/25/18

# GEOTECHNICAL BORING REPORT

## CORE LOG

WBS 17BP.8.R.121		TIP 17BP.8.R.121		COUNTY MOORE		GEOLOGIST Z. Bruce						
SITE DESCRIPTION Replace Bridge No. 63 Over Buffalo Creek on NC 22							GROUND WTR (ft)					
BORING NO. B1-A		STATION 23+16		OFFSET 8 ft RT		ALIGNMENT -L-						
COLLAR ELEV. 281.2 ft		TOTAL DEPTH 31.8 ft		NORTHING 626,745		EASTING 1,846,254						
DRILL RIG/HAMMER EFF./DATE ICA5794 CME-45C 87% 05/22/2017				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic						
DRILLER Smith, W.		START DATE 11/02/17		COMP. DATE 11/02/17		SURFACE WATER DEPTH N/A						
CORE SIZE NQ2		TOTAL RUN 20.0 ft										
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)	
					REC. (ft) %	RQD (ft) %	REC. (ft) %	RQD (ft) %				
269.4	269.4	11.8	3.3	N=60/0.0 0:30/0.3 1:49 2:06 1:31	(3.1) 94%	(2.5) 76%	(19.6) 98%	(18.3) 92%		Begin Coring @ 11.8 ft <b>CRYSTALLINE ROCK</b> Light gray-greenish gray, very slightly weathered to fresh, very hard to hard Felsic Metavolcanic, moderately close to wide fracture spacing with vertical joint, phyllitic texture at 40°-45° discontinuity joints. 80° joint at 23.6'-24.7'; GSI=69	11.8	
265	266.1	15.1	5.0	1:40 1:25 1:17 1:26 1:34	(4.9) 98%	(4.2) 84%						
260	261.1	20.1	5.0	1:34 1:24 1:24 1:26 1:34	(5.0) 100%	(5.0) 100%						
255	256.1	25.1	5.0	1:36 1:35 1:27 1:28 1:41	(5.0) 100%	(5.0) 100%						
250	251.1	30.1	1.7	1:22 0:57/0.7	(1.6) 94%	(1.6) 94%						
	249.4	31.8	1.7									249.4
Boring Terminated at Elevation 249.4 ft in Crystalline Rock (Felsic Metavolcanic). 1) Boring relocated due to accessibility.												

NCDOT CORE DOUBLE 17BP.8.R121\_GEO\_BRDG0063.GPJ NC\_DOT.GDT 1/25/18

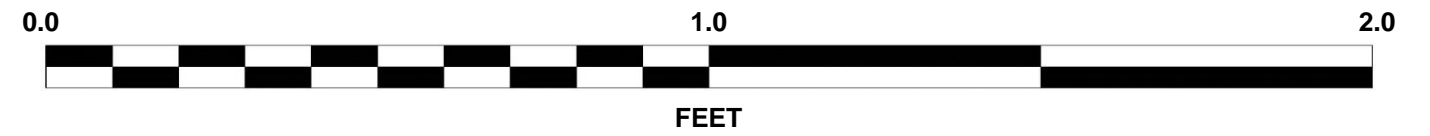
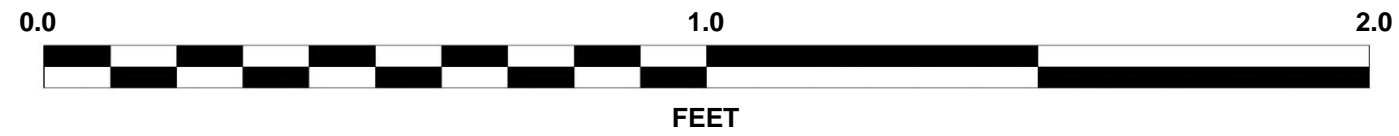


# CORE PHOTOGRAPHIC RECORD

## Replace Bridge No. 63 Over Buffalo Creek on NC 22

B1-A Box 1 of 3

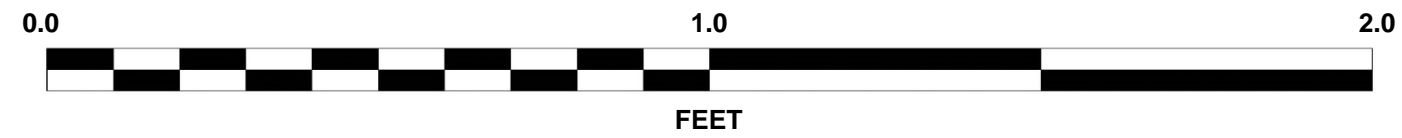
B1-A Box 2 of 3



# CORE PHOTOGRAPHIC RECORD

Replace Bridge No. 63 Over Buffalo Creek on NC 22

## B1-A Box 3 of 3



# GEOTECHNICAL BORING REPORT

## BORE LOG

<b>WBS</b> 17BP.8.R.121		<b>TIP</b> 17BP.8.R.121		<b>COUNTY</b> MOORE		<b>GEOLOGIST</b> Z. Bruce										
<b>SITE DESCRIPTION</b> Replace Bridge No. 63 Over Buffalo Creek on NC 22							<b>GROUND WTR (ft)</b>									
<b>BORING NO.</b> B1-B		<b>STATION</b> 23+10		<b>OFFSET</b> 16 ft RT		<b>ALIGNMENT</b> -L-										
<b>COLLAR ELEV.</b> 279.8 ft		<b>TOTAL DEPTH</b> 26.1 ft		<b>NORTHING</b> 626,745		<b>EASTING</b> 1,846,264										
<b>DRILL RIG/HAMMER EFF./DATE</b> ICA5794 CME-45C 87% 05/22/2017				<b>DRILL METHOD</b> H.S. Augers		<b>HAMMER TYPE</b> Automatic										
<b>DRILLER</b> Smith, W.		<b>START DATE</b> 11/01/17		<b>COMP. DATE</b> 11/02/17		<b>SURFACE WATER DEPTH</b> 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			ELEV. (ft)	DEPTH (ft)		
280														279.8	GROUND SURFACE	0.0
															<b>WEATHERED ROCK</b> Felsic Metavolcanic	
275	275.3	4.5												273.7	<b>CRYSTALLINE ROCK</b> Felsic Metavolcanic	6.1
	273.7	6.1	11	19	81					100/1.0 60/0.0						
270																
265																
260																
255																
														253.7	Boring Terminated at Elevation 253.7 ft in Crystalline Rock (Felsic Metavolcanic).	26.1

NCDOT BORE DOUBLE 17BP.8.R121\_GEO\_BRDG0063.GPJ NC\_DOT.GDT 12/22/17



# GEOTECHNICAL BORING REPORT

## CORE LOG

WBS 17BP.8.R.121		TIP 17BP.8.R.121		COUNTY MOORE		GEOLOGIST Z. Bruce					
SITE DESCRIPTION Replace Bridge No. 63 Over Buffalo Creek on NC 22							GROUND WTR (ft)				
BORING NO. B1-B		STATION 23+10		OFFSET 16 ft RT		ALIGNMENT -L-					
COLLAR ELEV. 279.8 ft		TOTAL DEPTH 26.1 ft		NORTHING 626,745		EASTING 1,846,264					
DRILL RIG/HAMMER EFF./DATE ICA5794 CME-45C 87% 05/22/2017				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic					
DRILLER Smith, W.		START DATE 11/01/17		COMP. DATE 11/02/17		SURFACE WATER DEPTH N/A					
CORE SIZE NQ2		TOTAL RUN 20.0 ft									
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (ft) %	RQD (ft) %	REC. (ft) %	RQD (ft) %			
273.7	273.7	6.1	4.4	N=60/0.0 1:02/0.4 1:33 1:25 2:12 1:54	(4.3) 98%	(2.3) 52%	(19.9) 100%	(17.2) 86%		Begin Coring @ 6.1 ft	6.1
270	269.3	10.5	5.0	1:54 1:42 1:09 1:58 2:06	(5.0) 100%	(4.7) 94%			RS-2	Light gray to greenish gray, slightly weathered to fresh, very hard to hard Felsic Metavolcanic, close to moderately close fracture spacing, iron stained discontinuities. 80° iron stained joint at 6.6'-6.9'; silty clay partings at 7.6' and 8.1'; 13 45° discontinuity joints; 8 calcite infilled healed joints; GSI=69	
265	264.3	15.5	5.0	2:51 2:48 3:09 2:56 3:08	(5.0) 100%	(4.8) 96%					
260	259.3	20.5	5.0	2:29 1:54 1:39 1:31 1:54	(5.0) 100%	(4.8) 96%					
255	254.3 253.7	25.5 26.1	0.6	1:04/0.6	(0.6) 100%	(0.6) 100%				Boring Terminated at Elevation 253.7 ft in Crystalline Rock (Felsic Metavolcanic).	26.1

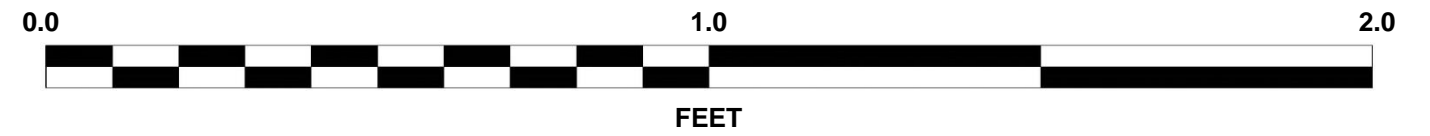
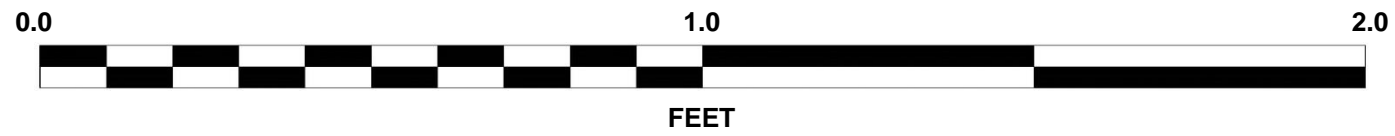
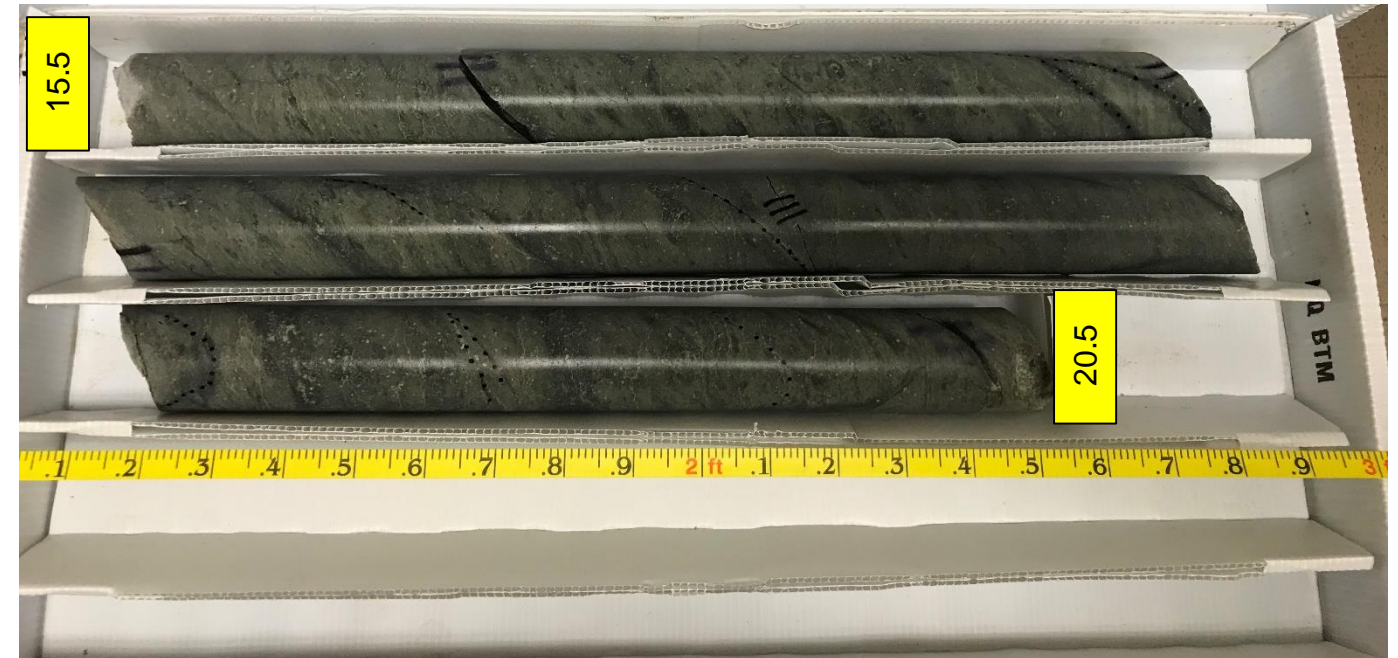
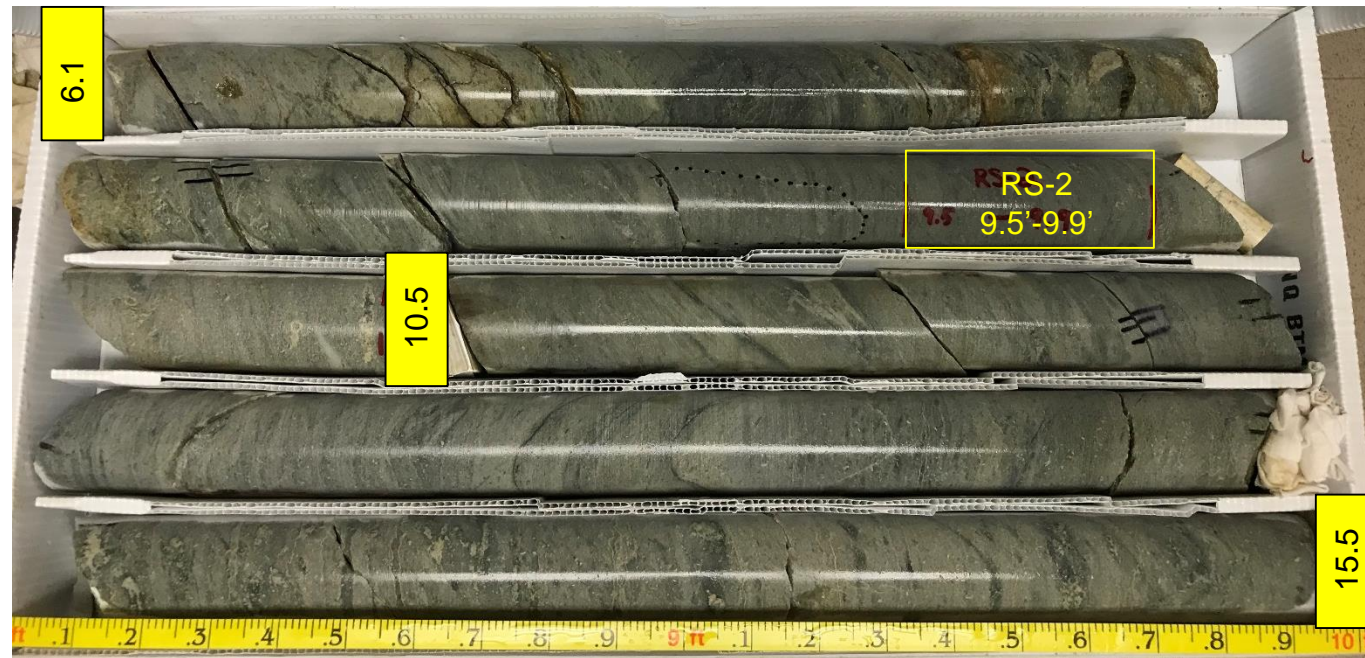
NCDOT CORE DOUBLE 17BP.8.R121\_GEO\_BRDG0063.GPJ NC\_DOT.GDT 1/25/18

# CORE PHOTOGRAPHIC RECORD

Replace Bridge No. 63 Over Buffalo Creek on NC 22

B1-B Box 1 of 3

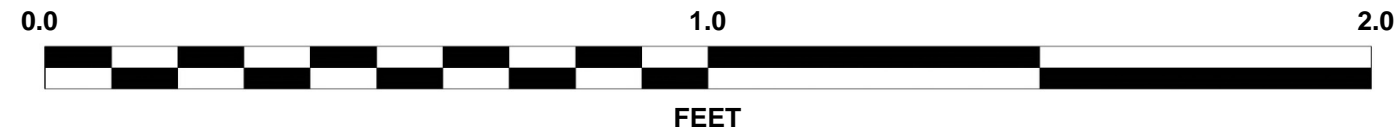
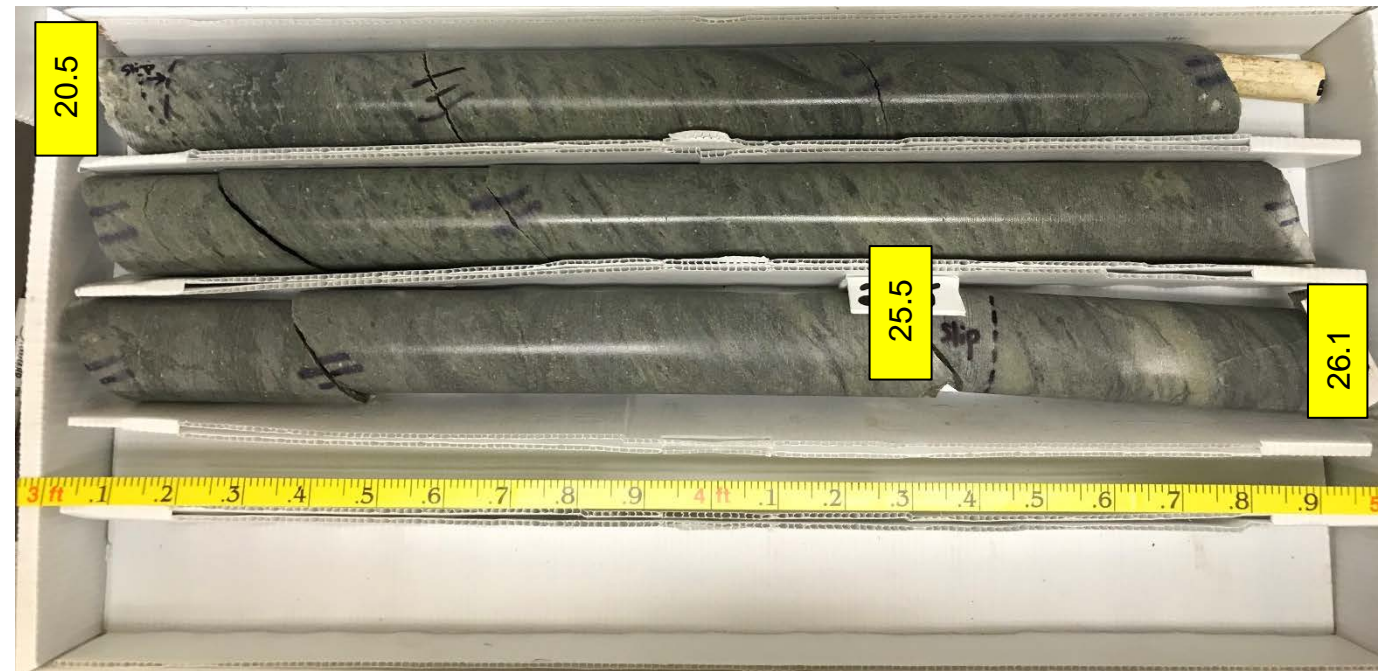
B1-B Box 2 of 3



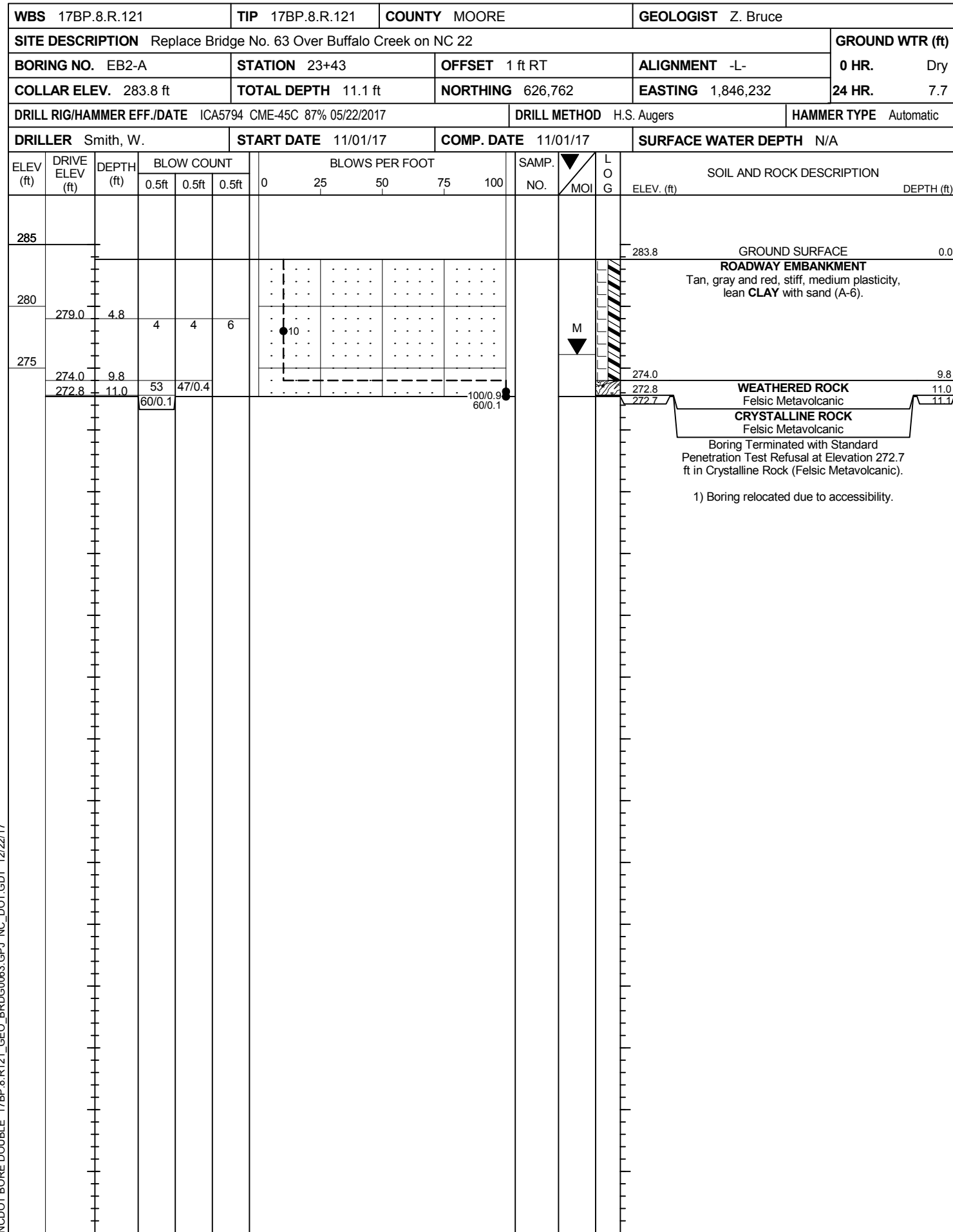
# CORE PHOTOGRAPHIC RECORD

Replace Bridge No. 63 Over Buffalo Creek on NC 22

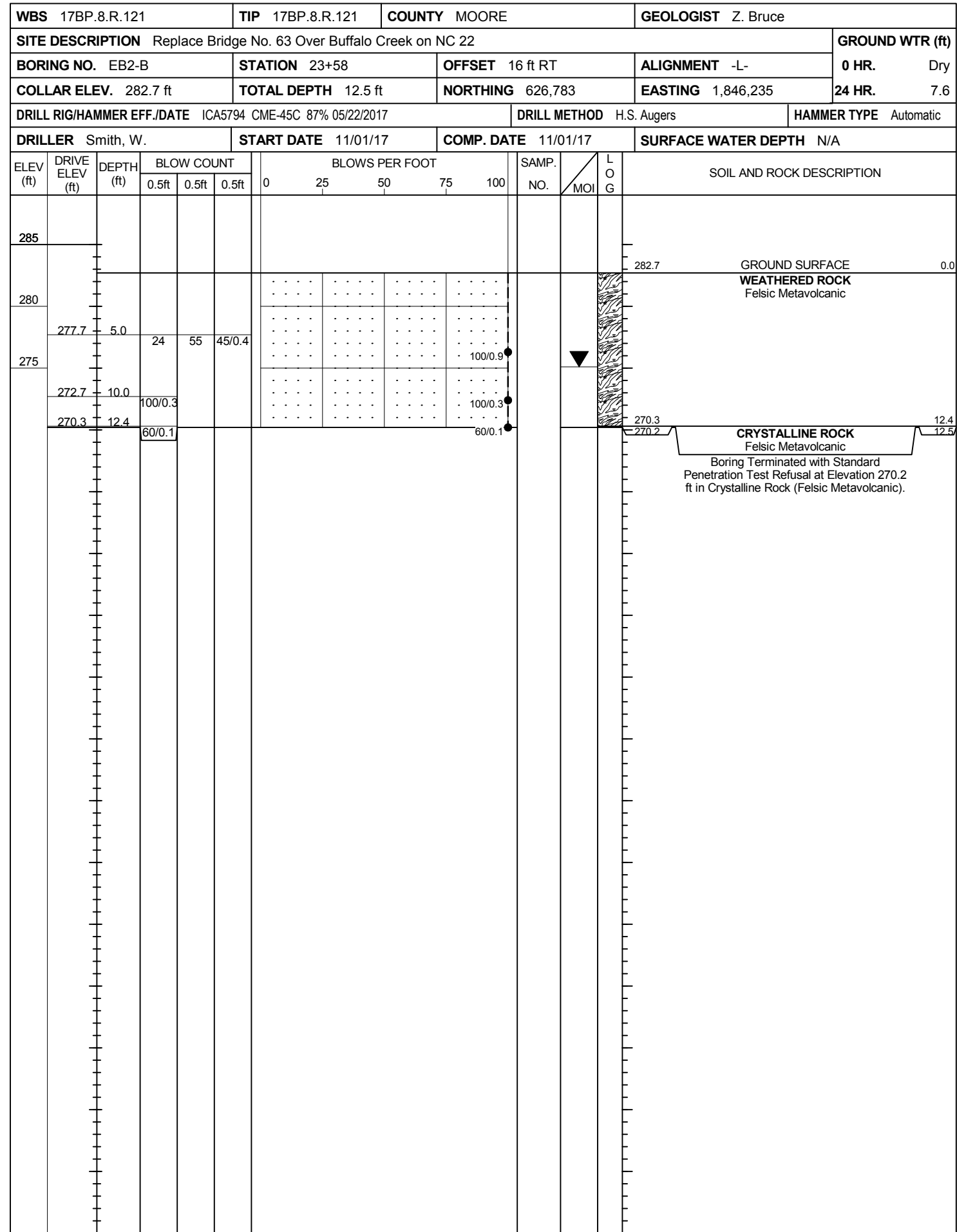
## B1-B Box 3 of 3



## GEOTECHNICAL BORING REPORT BORE LOG



NCDOT BORE DOUBLE 17BP.8.R121\_GEO\_BRDG0063.GPJ NC\_DOT.GDT 12/22/17



## LABORATORY SUMMARY SHEET FOR ROCK CORE SAMPLES

SHEET 20

WBS NO.:

TIP NO.: 17BP.8.R.121

ProjectID:

COUNTY: Moore

Replace Bridge No. 63 Over Buffalo Creek on NC 22

Sample #	Boring #	Depth (ft)	Rock Type	Geologic Map Unit	Run RQD	Length (ft)	Diameter (ft)	Unit Weight (PCF)	Unconfined Compressive Strength (PSI)	Young's Modulus (PSI)	Splitting Tensile Strength (PSI)	Remarks
RS-1	B1-A	22.3-22.7	Felsic Metavolcanic	CZfv	100%	4.76	1.98	169.05	16,662	N/A	N/A	fresh
RS-2	B1-B	9.5-9.9	Felsic Metavolcanic	CZfv	52%	4.63	1.97	168.18	6,868	N/A	N/A	sli. weathered to fresh

HDR, CERT. No. 102-0603

Don Schmidt, CERT. No. 102-03-0603

Michael Garrison, CERT. No. 102-02-0603



# SITE PHOTOGRAPHIC RECORD

## Replace Bridge No. 63 Over Buffalo Creek on NC 22

Looking Northwest



Looking Southeast along NC 22



Looking Northwest Along NC 22



Looking Upstream Buffalo Creek

