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REFERENCE

**DESCRIPTION** TITLE SHEET LEGEND (SOIL & ROCK) SITE PLAN PROFILE CROSS SECTIONS BORE & CORE LOGS CORE PHOTOGRAPHS

### STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION **DIVISION OF HIGHWAYS** GEOTECHNICAL ENGINEERING UNIT

# **STRUCTURE** SUBSURFACE INVESTIGATION

RUTHERFORD

COUNTY \_

PROPOSED BRDG #0663 ON PROJECT DESCRIPTION US-64 (-Y3-) OVER PROPOSED US-22I BYPASS (-L3-)

# S 5 34400.1 PROJEC

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-2233BB	-	16

### **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 (99) 707-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA AVAIL

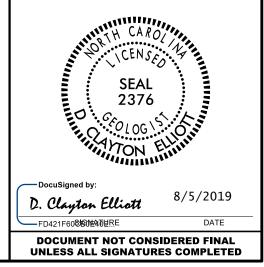
GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND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

THE BIDDER OR CONTRACTOR IS CALITORIED 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 OPHIONO OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONSTRUCTIONS 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 REVIENT OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL COMPENSATION OF FOR AN EXTENSION OF TIME FOR ANY REASON RESULTIONS FOR ACTUAL COMPENSATION.

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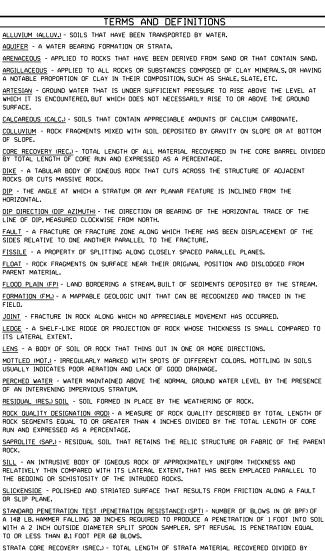


## NORTH CAROLINA DEPARTMENT OF TRANSPORTATION **DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT** SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION
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 (AGASHTO T 206, GATU DISB6). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM, BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AGASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH	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. ANGULARITY OF GRAINS	HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. AN INFERMED 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 WI.FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE,	THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS:	ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:
VERY STIFF.GRAY, SILTY CLAY, WOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6 SOIL LEGEND AND AASHTO CLASSIFICATION	ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.	WEATHERED NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > ROCK (WR) 100 BLOWS PER FOOT IF TESTED.
GENERAL GRANULAR MATERIALS SILT-CLAY MATERIALS CLASS. (<35/27 PASSING *200) (>35/2 PASSING *200)	MINERALOGICAL COMPOSITION MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC.	CRYSTALLINE FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT
GROUP A-1 A-3 A-2 A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5	ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.	EINE TO COADES CRAIN METAMORPHIC AND NON-COASTAL PLAIN
CLASS. A-1-a A-1-b A-2-4 A-2-5 A-2-6 A-2-7 A-7-5 A-3 A-6, A-7	COMPRESSIBILITY	NON-CRYSTALLINE SEDIMENTARY ROCK (NCR) SEDIMENTARY ROCK (NCR) SEDIMENTARY ROCK (NCR) SEDIMENTARY ROCK SEDIMENTARY SEDIMENT
SYMBOL COORDOOOD	MODERATELY COMPRESSIBLE LL = 31 - 50	COASTAL PLAIN COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD
2 PASSING 10 50 MX GRANULAR SILT- CONTRACTOR MUCK,	HIGHLY COMPRESSIBLE LL > 50 PERCENTAGE OF MATERIAL	SEDIMENTARY ROCK SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.
*40 30 MX 50 MX 51 MN SOILS SOILS SOILS SOILS	GRANULAR SILT - CLAY	WEATHERING
■200 15 MX 25 MX 10 MX 35 MX 35 MX 35 MX 35 MX 36 MN 36 MN 36 MN 36 MN 37 UNL 3	ORGANIC MATERIAL SOILS SOILS OTHER MATERIAL TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10%	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
PASSING =40 LL 48 MX 41 MN 48 MX 41 MN 48 MX 41 MN 48 MX 41 MN 501LS WITH CT £ MV MP 18 MV 18 MV 11 MM 11 MM 18 MV 18 MV 11 MM 11 MM 11 MM	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	VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, (V SLI.) CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.
OF THE         OF THE<	GROUND WATER	SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO
USUAL TYPES STONE FRAGS. FINE SILTY OR CLAYEY SILTY CLAYEY MATTER OF MAJOR GRAVEL AND SAND GRAVEL AND SAND SOLS SOLS	WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING	(SLI.) 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.
MATERIALS SANU	▼     STATIC WATER LEVEL AFTER 24     HOURS       ▽PW     PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA	MODERATE SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN (MOD.) GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY, ROCK HAS
GEN. RATING EXCELLENT TO GOOD FAIR TO POOR POOR UNSUITABL		DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.
PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL
CONSISTENCY OR DENSENESS	MISCELLANEOUS SYMBOLS	SEVERE AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH (MOD.SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES 'CLUNK' SOUND WHEN STRUCK.
PRIMARY SOIL TYPE COMPACTNESS OR PENETATION RESISTENCE COMPACTNESS OR CONSISTENCY (N-VALUE) (TONS/FT <sup>2</sup> )	U ROADWAY EMBANKMENT (RE) <sup>25/025</sup> DIP & DIP LIRECTION WITH SOIL DESCRIPTION → OF ROCK STRUCTURES	IF TESTED, WOULD YIELD SPT REFUSAL SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT
GENERALLY         VERY LOOSE         < 4           GRANULAR         LOOSE         4 TO 10           MEDIUM DENSE         10 TO 30         N/A	Soil Symbol	(SEV.) REDUCED IN STRENGTH TO STRONG SOLL. IN GRANITOLD ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. IF TESTED, WOULD YELD SPT IN VALUES > 100 BPF
MATERIAL DENSE 30 TO 50 (NDN-COHESIVE) VERY DENSE > 50	ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT	VERY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC ELEMENTS ARE DISCERNIBLE SEVERE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK
VERY SOFT         < 2         < 0.25           GENERALLY         SOFT         2 TO 4         0.25 TO 0.5	INFERRED SOIL BOUNDARY - CORE BORING SOUNDING ROD	(V SEV.) REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <i>IF TESTED, WOULD YIELD SPT N VALUES &lt; 100 BPF</i>
SILT-CLAY MEDIUM STIFF 4 TO 8 0.5 TO 1.0		COMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND
MATERIAL         STIFF         8 TO 15         1 TO 2           (COHESIVE)         VERY STIFF         15 TO 30         2 TO 4	TTTTTT ALLUVIAL SOIL BOUNDARY A PIEZOMETER T SPT N-VALUE	SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.
HARD > 30 > 4 TEXTURE OR GRAIN SIZE	RECOMMENDATION SYMBOLS	ROCK HARDNESS
U.S. STD. SIEVE SIZE 4 10 40 60 200 270		VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.
OPENING (MM)         4.76         2.00         0.42         0.25         0.075         0.053	UNUERCUT UNSUITABLE WASTE	HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED
BOULDER COBBLE GRAVEL COARSE FINE SILT CLAY	SHALLOW UNDERCUT UNCLASSIFIED EXCAVATION - USED IN THE TOP 3 FEET OF ACCEPTABLE DEGRADABLE ROCK EMBANKMENT OR BACKFILL	TO DETACH HAND SPECIMEN.
(BLDR.) (COB.) (GR.) (CSE. SD.) (F SD.) (CL.) (CL.)	ABBREVIATIONS	MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE HARD EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED
GRAIN MM 305 75 2.0 0.25 0.05 0.005 SIZE IN. 12 3	AR - AUGER REFUSAL MED MEDIUM VST - VANE SHEAR TEST BT - BORING TERMINATED MICA MICACEOUS WEA WEATHERED	BY MODERATE BLOWS. MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT.
SOIL MOISTURE - CORRELATION OF TERMS	_ CL CLAY MOD MODERATELY $\gamma$ - UNIT WEIGHT	HARD CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE
SOIL MOISTURE SCALE FIELD MOISTURE CUIDE FOR FIELD MOISTURE DESCRIPTION	CPT - CONE PENETRATION TEST NP - NON PLASTIC $\gamma_d$ - DRY UNIT WEIGHT CSE COARSE ORG ORGANIC	POINT OF A GEOLOGIST'S PICK. SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS
(ATTERBERG LIMITS) DESCRIPTION CONCLUSION DESCRIPTION	DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST <u>SAMPLE ABBREVIATIONS</u> DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK	FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.
- SATURATED - USUALLY LIQUID; VERY WET, USUALLY (SAT.) FROM BELOW THE GROUND WATER TABLE	e - VOID RATIO SD SAND, SANDY SS - SPLIT SPOON F - FINE SL SILT, SILTY ST - SHELBY TUBE	VERY CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH
	FOSS FOSSILIFEROUS SLI SLIGHTLY RS - ROCK	SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.
BANGE - WET - (W) SEMISULID; REQUIRES DRYING TO	FRAC FRACTURED, FRACTURES         TCR - TRICONE REFUSAL         RT - RECOMPACTED TRIAXIAL           FRAGS FRAGMENTS         w - MOISTURE CONTENT         CBR - CALIFORNIA BEARING	FRACTURE SPACING BEDDING
	HI HIGHLY V - VERY RATIO EQUIPMENT USED ON SUBJECT PROJECT	TERM         SPACING         TERM         THICKNESS           VERY WIDE         MORE THAN 10 FEET         VERY THICKLY BEDDED         4 FEET
OM _ OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE	DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE:	WIDE         3 TO 10 FEET         THICKLY BEDDED         1.5 - 4 FEET           MODERATELY CLOSE         1 TO 3 FEET         THINLY BEDDED         0.16 - 1.5 FEET
SL SHRINKAGE LIMIT		CLOSE 0.16 TO 1 FOOT VERY THINLY BEDDED 0.03 - 0.16 FEET
- DRY - (D) REDUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE	X CME-55 G' CONTINUOUS FLIGHT AUGER CORE SIZE:	VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET THINLY LAMINATED < 0.008 FEET
PLASTICITY		INDURATION
PLASTICITY INDEX (PI) DRY STRENGTH	X CME-550 HARD FACED FINGER BITS X-N NXWL	FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETH
NON PLASTIC         Ø-5         VERY LOW           SLIGHTLY PLASTIC         6-15         SLIGHT	VANE SHEAR TEST	FRIABLE GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.
MODERATELY PLASTIC 16-25 MEDIUM HIGHLY PLASTIC 26 OR MORE HIGH	X     CASING     X     AVADVANCER     POST HOLE DIGGER       PORTABLE HOIST     TRICONE     STEEL TEETH     DOST HOLE DIGGER	MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.
COLOR		GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE;
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY).	CORE BIT	DIFFICULT TO BREAK WITH HAMMER.
MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.		EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE: SAMPLE BREAKS ACROSS GRAINS.

### PROJECT REFERENCE NO. R2233BB



RINGS UNDER DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL . NATINGS IF OPEN. DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. AMMER BLOWS IF FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE ІСК ИР ТО SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FELDSPAR FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. BLOWS.  $\underline{\mathsf{FLOAT}}$  - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL. Y. ROCK HAS AS COMPARED 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. ELDSPARS DULL OSS OF STRENGTH WHEN STRUCK. 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. VIDENT BUT ARE KAOLINIZED 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. RE DISCERNIBLE PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE STRONG ROCK T ONLY MINOR VALUES < 100 BPF OF AN INTERVENING IMPERVIOUS STRATUM. RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. ROCK OUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SECMENTS EQUAL TO OR CREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE IN SMALL AND SAPROLITE IS RUN AND EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT S REQUIRES 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 LOWS REQUIRED THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.  $\underline{\text{SLICKENSIDE}}$  - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. EEP CAN BE ETACHED 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 R PICK POINT WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL BLOWS OF THE TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. FRAGMENTS  $\underline{STRATA CORE RECOVERY (SREC.)}$ - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. IT. SMALL. THIN 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. PIECES 1 INCH ED READILY BY TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER. BENCH MARK: BL-200 : SURVEY DISK IN GROUND THICKNESS @ -BL- STA 288+13.77 : N: 607298.958, E: 1120968.72 4 FEET ELEVATION: 1044.46 FEET .5 - 4 FEET 16 - 1.5 FEET NOTES: 3 - Ø.16 FEET 08 - 0.03 FEET 0.008 FEET FIAD - FILLED IMMEDIATELY AFTER DRILLING AT, PRESSURE, ETC. TEEL PROBE: DATE: 8-15-14

### 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 (Marı	nos and Hoek,2	2000)			AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for T
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.	VERY GOOD Very rough, fresh unweathered surfaces	<b>GOOD</b> Rough, slightly weathered, iron stained surfaces	<b>FAIR</b> Smooth, moderately weathered and altered surfaces	POOR Slickensided, highly weathered surfaces with compact coatings or fillings or angular fragments	<b>VERY POOR</b> Slickensided, highly weathered surfaces with soft clay coatings or fillings	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 fail poor and very poor conditions. Water pressure does not change the value of GSI and it is dealt with by using effective stress analysis.
STRUCTURE	DEC	REASING SU	JRFACE QUA		-	COMPOSITION AND STRUCTURE
INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities BLOCKY - well interlocked un-	90			N/A	N/A	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.
disturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets		70 <sup>°</sup> 60				B. Sand- stone with thin inter- layers of in similar book in single in the sand- single in similar book in the sand- single in the sand- stone in the sand- single in the sand- stone in the sand- single in the sand- stone in the sand- single in th
VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets		5	0			siltstone amounts
BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity DISINTEGRATED - poorly inter- locked, heavily broken rock mass			40	30		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.
DISINTEGRATED - poorly inter- locked, heavily broken rock mass with mixture of angular and rounded rock pieces				20		G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers
LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes	N/A	N/A			10	→ Means deformation after tectonic disturbance

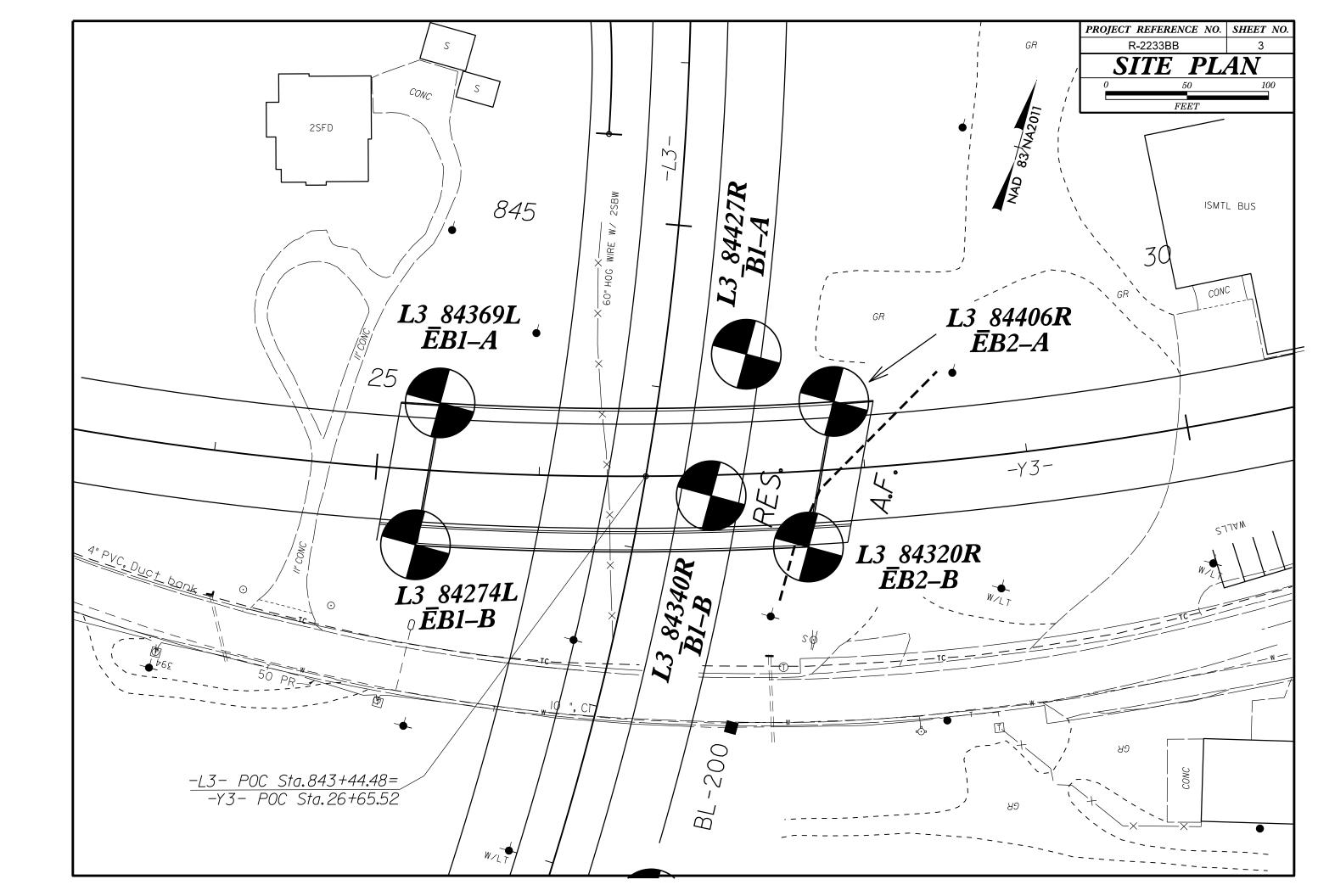
ectonically Defo	ormed Hetero <u>c</u>	geneous Rock	Masses (Marır	nos and Hoek	, 2000)
SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)	VERY GOOD - Very Rough, fresh unweathered surfaces	<b>GOOD -</b> Rough, slightly weathered surfaces	FAIR - Smooth, moderately weathered and altered surfaces	POOR - Very smooth, occasionally slickensided surfaces with compact coatings or fillings with angular fragments	<b>VERY POOR -</b> Very smooth, slicken- sided or highly weathered surfaces with soft clay coatings or fillings
E. Weak siltstone or clayey shale with sandstone layers	70 60	A 50 B 40	СЦ	DE	
formed, Vfaulted, ale or siltstone forming an ructure formed silty orming a with pockets rrs of ansformed teces.			30	F 20	+10 +/

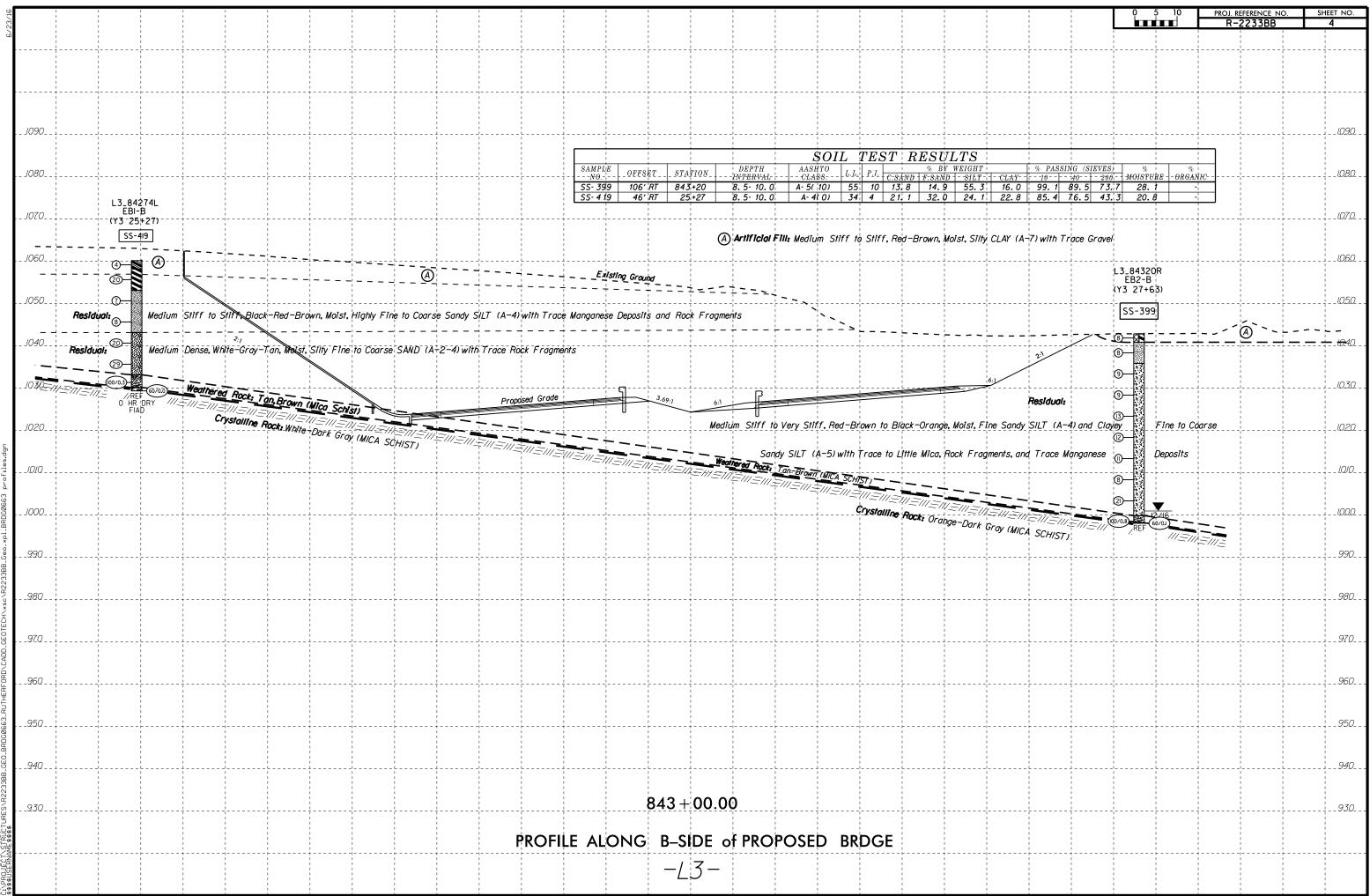
PROJECT REFERENCE NO.

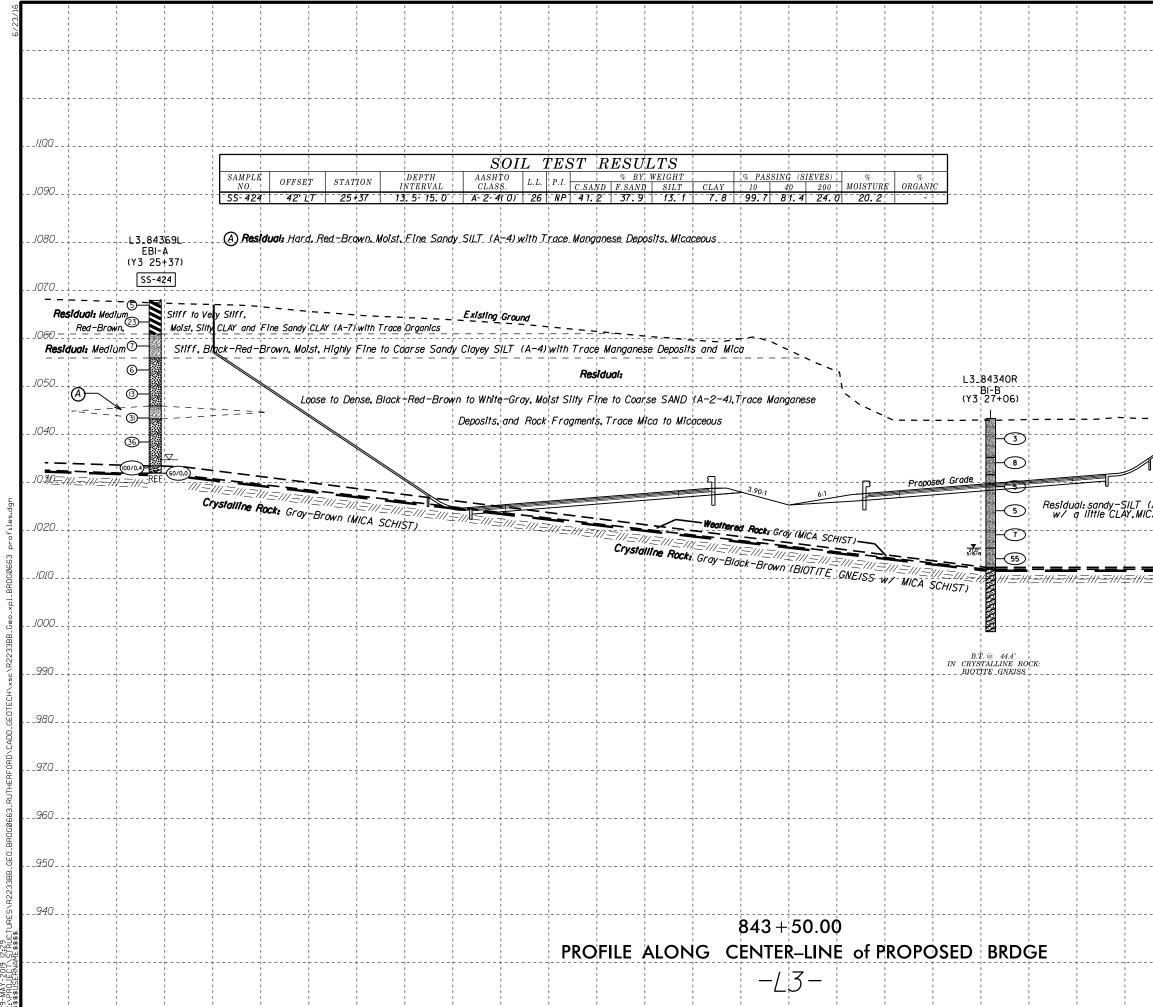
R-2233BB

SHEET NO.

2A

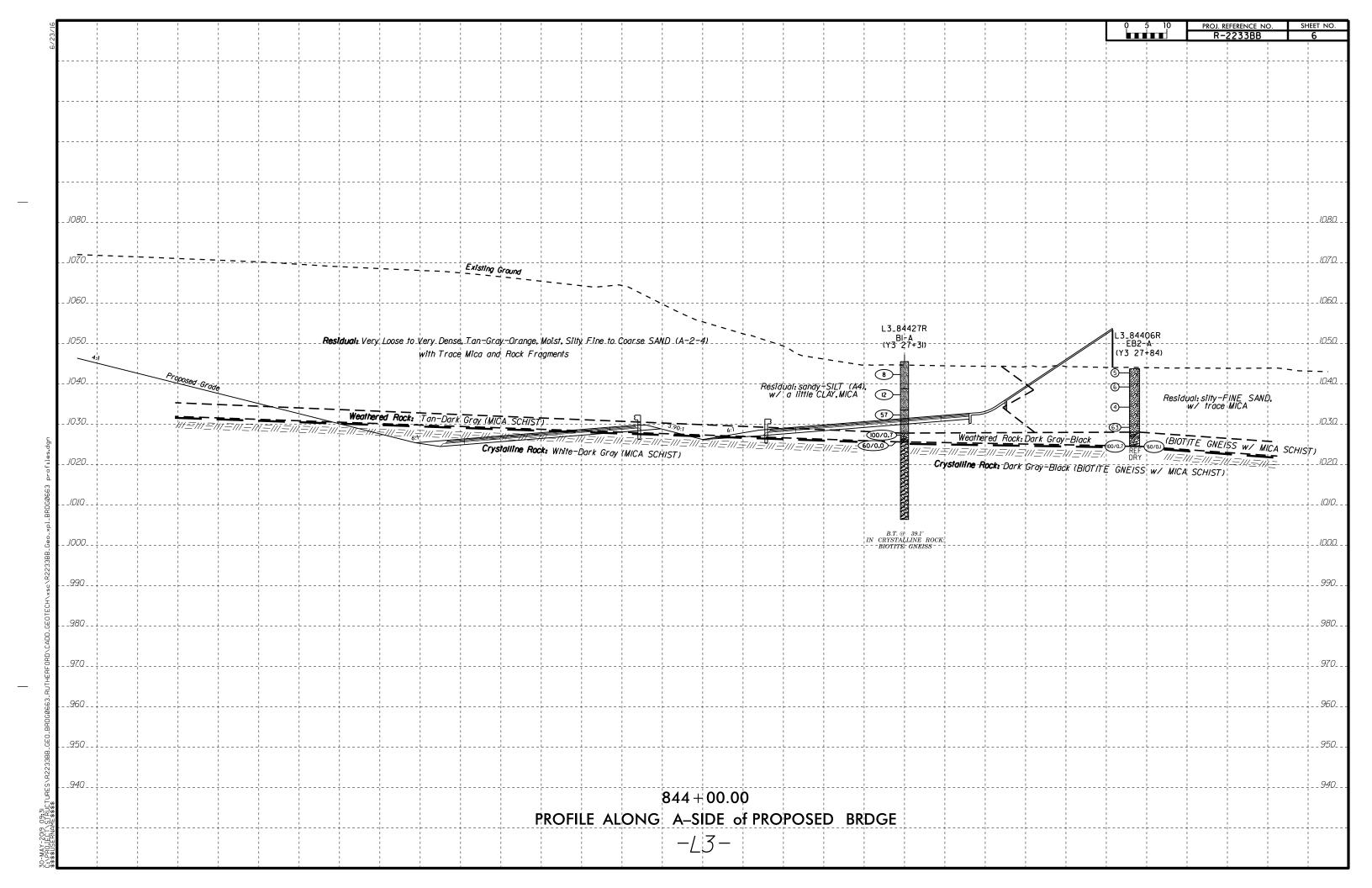






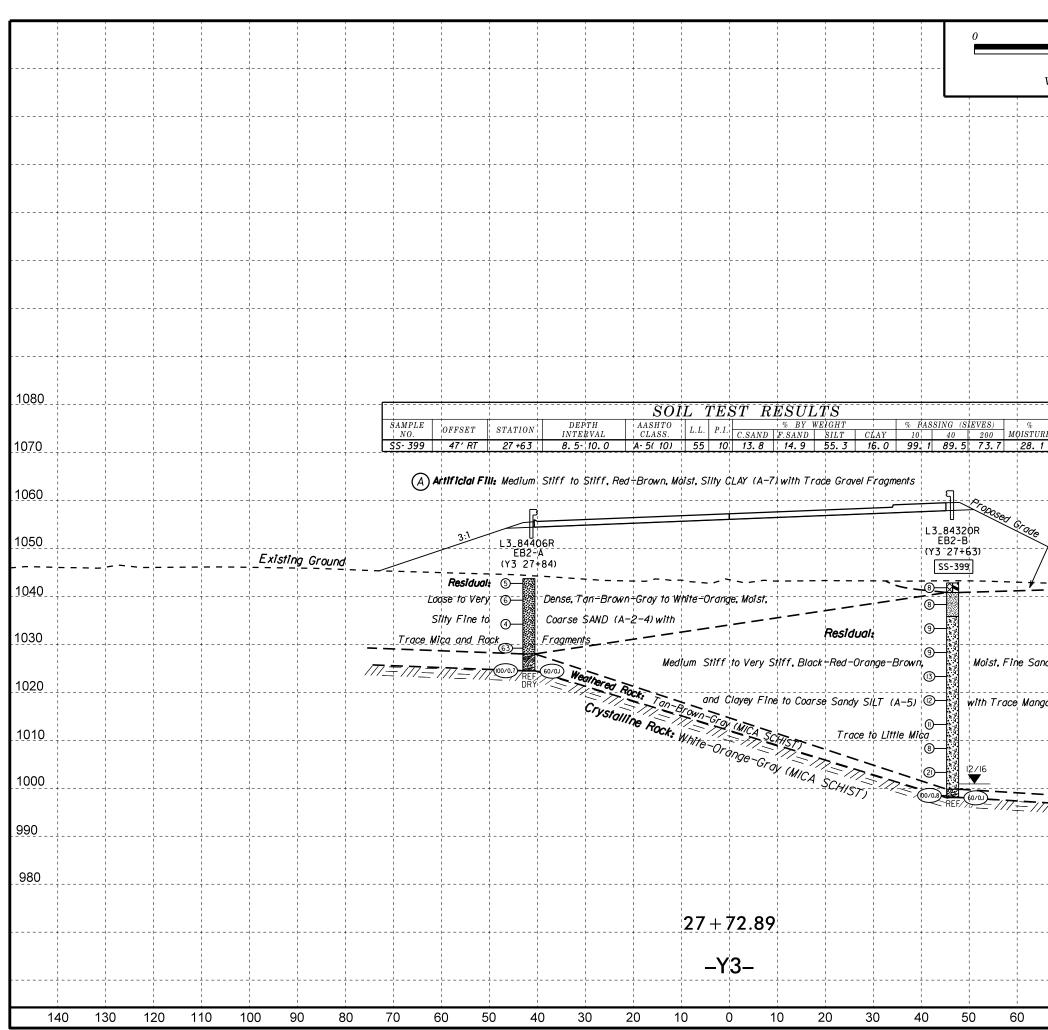
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		SAMPLE NO.	OFFSET	STATIO		EPTH ERVAL	AASHTO CLASS.		P.I. C.SANE	% BY	SILT	CLAY	PASSING           10         40	200	MOISTURE									
	 	SS- 424 SS- 4 19	42' LT 46' RT			5-15.0 5-10.0	A- 2- 4( 0)		NP 41.2 4 21.1	32.0	13. 1 24. 1			4 24.0 5 43.3			- <u>+</u>			- +		- <mark> </mark>		
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1080			; ;	       	L3_8436	69L	(A)	Weathered	i Rock: W	hite-Dark	Gray (M	ICA SCH			   /l	   		   				   	- <u>+</u>	10
				1	EBI-A (Y3 25+	37)			     			     	1	L3_8427 EBI-B (Y3 25+2	171	1 1 1								
1070		<u>Exi</u>	sting Groun	nd	SS-42	4			, , , , , , , , , , , , , , , , , , ,			¦ 		L SS-419	.,r <b>/</b> -]		   						1 1 - <del>1</del>	10
		Soft to V	stiing_Groun /ery Stiff, f  Dense, Bla , Silty Fine		<u>6</u>							1	1	์ ๆ		     	1			1				
060		·		Red-Brown		Moist, Fin	e Sandy s						<u> </u>	╞═╼╢┣╴	oposed	Grade								10
	     		·		0	Resi	dual: Medi	UM Stree	(A-6) and to Hard, E (th_Trace	Silty Fine	Sandy CL,	4Υ (A-7) μ	with Tra-			+ >			-	-+		-		
1050		Loose to	Dense Pla	ok-Dod D	<u> </u>	·	+	um Stiff	to Hard, E	Black-Red	Brown, M	oist. Hinhu	Eine t		rganics (F	Poots. Wood	Fragmen	its) and Pa						10
1050	   		, Silty Fine		irown,	and I an-	White-Gray	1	io Hard, E Wth_Trac <del>e</del>	Manganese	Deposits	Rock Fre	amost	0	Coarse-Sa	ndy Claye	SILT (A-	-4)	ck Fragm	ents	÷.=.=.=.	<u>+</u> . 		<u>+ 10</u>
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1040		+	SAND (A	-2-4)	- 36-		Trace Man	ganese_De	posits, and	Rock_Fr	gments, L	ittle Mica	 	@	' 	 	· <del> </del>	·				 -		<u>  10</u>
	Ø-											1	1 1 1	<b>29</b> –										
1030	, , , , ,		777			60/0.0 <u> </u>	T		+ <i>FF==</i> 77	//		777	+	00/0.3		+			¦ <u>+</u>			   -	-+	10
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	+			· · · · · · · · · · · · · · · · · · ·			-		<b>=</b> 1:1		CRO	SS-SECT	TION ALO	NG -Y3-
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1080	     									 				108
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1070	i   												; 	107
			(A) Weat	hered Rock: Biotite Gneiss		3	     	1 I 1 I 1 I 1 I						
1060	' ' +							  + 					· · · · · · · · · · · · · · · · · · ·	106
			L3_84427R											101
1050		Existing Ground	BI-A (Y3 27+31)	·	- <b>-</b>	3 84340R BI-B r3 27+06)								105
10.10			8-	RESIDUAL SOFT			Existing	Ground						
1040	1 1				o Med Stiff.Red/Orange/Brown. // a little Clay.Mica.Trace MnO		y=SILT_(A=4), ,Trace MnO	$\frac{1}{1}$		 I I I	<del>1</del> 1 1		$\frac{1}{1}$ = = = = = = $\frac{1}{1}$ = $\frac{1}{1}$ = $\frac{1}{1}$ = $\frac{1}{1}$ = $\frac{1}{1}$	104
1030				SAPROLITE: Med S	iff_to Very_Stiff.voriably_White/Tan/Brown		· <b></b> <del> </del> <b></b>	<b>-</b>						103
1000	+			-@	iff to Very Stiff,variably White/Tan/Brown ed/Orange/Black,sandy-SILT (A=4), a little Clay,Mica,Trace MnO			+         					· <u>j</u>	
1020		//////			In to very Shirt, variably while / I an/ Brown ed/Orange/Black, sondy-SILT (A-4), a little Clay, Mica, Trace MnO in = in = in = in = in = in = in = in te-to-Gray, Black, Biotite Mica Gnelss IN C B	-5								102
				Crystalline Rock: What										
1010	1 I 1 I 1 I 1 I				e-to-Groy. Black. Biotite									101
					mica Gheiss									
1000			B.T. @ 39.1' IN CRYSTALLINE ROC.	K:		er jsiuiiine Rock		, , , , , , , , , , , , , , , , , , ,					+-	100
	1 I 1 I 1 I 1 I					BiT. @ 44.4'		1 I I I I I						
990	,         	· · · · · · · · · · · · · · · · · · ·	·	·		BT. @ 44.4' YYSTALLINE ROCK: OTITE GNEISS							· · · · · · · · · · · · · · · · · · ·	990
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980	     					· · · · · · · · · · · · · · · · · · ·				       				980
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### GEOTECHNICAL BORING REPORT BORE LOG

									BOK		.00																L	JUR
WBS	34400	).1.S5			ТІ	P R-2233	BB	COU	NTY R	UTHEF	RFORD			GEOLO	GIST M	. Arnold			WBS	3440	0.1.S5			Т	P R-223	3BB	COUN	NTY RU
SITE	DESCR		I US	221 S	outh o	f Business	(Charlott	e Rd.) to	SR 13	66 (Ro	per Loo	p Rd.)					GROU	JND WTR (ft)	SITE	DESCR	RIPTION	US	221 S	outh o	f Busines	s (Charlot	te Rd.) to	SR 136
BOR	ING NO	. L3_84	1369L	(EB1	-A) <b>S</b>	TATION 8	43+69		OFF	SET	132 ft L	т		ALIGNN	IENT -L	3-	0 HR.	. 33.2	BOR		<b>).</b> L3_84	1274L	(EB1-	-B) <b>S</b>	TATION	842+74	,	OFF
COL	LAR ELI	<b>EV.</b> 1,0	067.9	ft	т	OTAL DEP	<b>TH</b> 36.0	ft	NOF	RTHING	<b>G</b> 607,4	444		EASTIN	<b>G</b> 1,120	,744	24 HR.	. FIAD	COL	LAR EL	<b>EV.</b> 1,0	060.1	ft	Т	OTAL DE	<b>PTH</b> 30.8	3 ft	NOF
					R2175	CME-55 86	% 02/16/2	016	I		DRILL	METHO	DD H	I.S. Augers				E Automatic	DRIL	L RIG/HA	MMER E	FF./DA	TE F8	R2175	CME-55 8	6% 02/16/2	2016	
DRII	LER S	Davis			S	TART DAT	<b>F</b> 12/19	/16	COM		TE 12/	/19/16		SURFAC			J/A		DRII	IFR S	5. Davis			S		<b>TE</b> 12/19	a/16	CON
ELEV	DRIVE	DEPTH	BLC	W CO				S PER FC			SAMP		1 L						ELEV	DRIVE							S PER FOO	
(ft)	ELEV (ft)	(ft)		0.5ft		0	25	50	75	100		мо	O I G	ELEV. (ft)	SOIL A	ND ROCK DES	SCRIPTIO	N DEPTH (ft)	(ft)	ELEV (ft)	(ft)		0.5ft	-	0	25	50	75
1070	1.067.9	0.0												1,067.9	C	GROUND SURF	FACE	0.0	1065									
1065	1,064.4	ŧ	2	2	3	• <u></u> 5····		 		· · ·		M		- R		RESIDUAL /N, MED STIFF CLAY w/ trace (	to VERY S		1060	_1,060.1	- - - 0.0	2	3	1			<del></del>	
1060	-	+	8	10	13			· · · ·	· · · · ·	· · · · · · · · ·		M		1,060.9		SAPROLITI	-	7.0	1055	1,056.6	- - <u>3.5</u>	4	9	11		•   • • • • •   • • •	· · · · · · · · · · · · · · · · · · ·	
1000	1,059.4	<u>8.5</u>	3	3	4	· · · · · ·	· · · · · · · · · · · · · · · · · · ·			· · · ·		м		L	FINE-to-CO	RED/BROWN, DURSE SANDY race MICA & M	MED STIF '-SILT, w/ s	some SE	1000	1,051.6	+ - - - 8.5					· · · · · · · · · · · · · · · · · · ·	· · · · ·	
1055	1,054.4	13.5	2	2	4	<b>•</b> 6 • •	· · · ·	· · ·		· · · ·		м		<u>1,055.9</u> _ L(	DOSE, SIL	ED/BROWN to TY, FINE-to-CC IANGANESE &	OURSE SA	HTE, ND, w/	1050	-	+ + +	2	4	3	• <u>•</u> 7 ·	· · · · · · · · · · · · · · · · · · ·	· · · · ·	
1050	1,049.4	18.5	4	5	8		· · · ·	  		· · · ·				-					1045	1,046.6	<u> </u>	5	4	4		· · · · · · · · · ·	· · · · ·	
1045	-				0	¶13.  		  	· ·   ·	· · · ·		M		<u>1,045.9</u> R	ED/BROW	N, DENSE, FIN		- <u></u>	1040	1,041.6	- - <u>18.5</u>	15	12	8		.   .   	· · · · ·	· ·   ·
	1,044.4	23.5	5	4	27		→31 →31 .↓	  	.	· · · · · · · ·		м			GRAY	CE MANGANES BROWN, DEN DURSE SANDY	SE, SILTY , w/ trace I	<u>,                                    </u>		1,036.6	- - 23.5	3	8	21		· \ · \ · \	· · · · · · · · · · · · · · · · · · ·	.   .
1040	1,039.4	28.5	7	10	26		36			· · · · · · · · · · · · · · · · · · ·		м		S6		ome ROCK FR ARD LAYERS b		- 33.5'	1035	1,031.6	- 28.5					· <b>●</b> 29 · I · · · · ·	· · · · ·	 
1035	1,034.4	33.5	15	13	100/0.4		·	·   · ·	· · · ·	· · · ·			-	- 			00%	34.5	1030		+	100/0.3 60/0.0			 	.   		
	1,031.9 - - -	36.0	60/0.0							100/0.4 60/0.0			<u> </u>	1,031.9    	G Boring Penetrati	VEATHERED R RAY (MICA SC Terminated wit ion Test Refusa ft ON CRYSTAI	HIST) h Standaro al at Elevat	ion		-								
.GDT 5/30/19	-	+ + +												- - - -							+ + + +							
NC_DOT.	-	+ + +												- - - -						-	+ + + +							
1663_Y3.GF	-	+ + +												- - - -							+ + + +							
BRDG		+ + +																		-	+ + + +							
BB_GEO_	-	-												-						-	- - -							
3LE R2233	-	+												-						-	-							
NCDOT BORE DOUBLE R2233BB_GEO_BH_BRDG0663_Y3.GPJ NC_DOT.GDT														- -  -						.	+							
NCDOT E	-	+												-							‡ -							

### GEOTECHNICAL BORING REPORT BORE LOG

RUTHER	FORD			GEOL	LOGIST M. A	rnold			
R 1366 (Rop	er Loop	Rd.)						GROUN	D WTR (ft)
OFFSET 1	31 ft LT	-		ALIG	NMENT -L3-			0 HR.	Dry
NORTHING	,			EAST	<b>ING</b> 1,120,7	52		24 HR.	FIAD
	DRILL	IETHO	рң	S. Augers	5		HAMME	ER TYPE	Automatic
COMP. DAT	<b>TE</b> 12/*	19/16		SURF	ACE WATER	DEPT	TH N//	4	
75 100	SAMP. NO.	моі	L O G		SOIL AND	D ROC	K DESC	RIPTION	
				1,060.1	GR		SURFA	CE	0.0
· · · · ·		М		1,058.1	BROWN, SOF	T, SILT	TY-CLAY	/, w/ little F	INE
· · · · ·		Μ		-	SAND, trac	FRA WN, V SAND	AGS. ERY ST Y-CLAY		<sup>I</sup> 7.0
		М		-	BLACK/RE FINE-to-COU CLAY, trace M F	ED/BRO IRSE S ANGAI	SANDY-S	SILT, w/ tra EPOSITS	ace
		M		- 1,043.1	WHITE/GR	SE SA	ND, w/ F	ROCK FRA	AGS:
		M		-	several V HAI	RD lay	ers b/twi	n 23.5' - 28	3.5'
			-	- 1,033.1					27.0
· · · · ·				1,030.1			<b>RED RO</b> AY/WH		30.0
60/0.0				- 1,029.3 - - - - -		GRAY/ erminat Test F	Refusal a	l Standard at Elevatio	

### **GEOTECHNICAL BORING REPORT** PODEIOC

							B	<u>ORE L</u>	OG			p		
WBS	34400	).1.S5			TI	IP R-2233BB	COUNT	<b>r</b> RUTHER	FORD			GEOLOGIST Johnson, C.	D.	
SITE	DESCR	IPTION	US	221 S	outh o	of Business (Charlotte	Rd.) to S	R 1366 (Rop	er Loop	Rd.)			GROUN	ND WTR (ft)
BOR	ING NO.	L3_8	844271	R (B1-	A) S	TATION 843+87		OFFSET 5	50 ft RT			ALIGNMENT -L3-	0 HR.	FIAD
	LAR EL					OTAL DEPTH 39.1 ft		NORTHING	607,5	23		EASTING 1,120,917	24 HR.	N/A
DRILL	RIG/HAI	VIMER E	FF./DA	TE A	-08963	3 CME-550X 77% 07/31/20	017		DRILL	IETHOD	NN	V Casing W/SPT & Core HA	MMER TYPE	Automatic
DRIL	LER C	heek, l	D. O.		S	TART DATE 05/14/1	9	COMP. DA	<b>FE</b> 05/	14/19		SURFACE WATER DEPTH	N/A	
ELEV	DRIVE ELEV	DEPTH	BLO	ow co	UNT	-	PER FOOT		SAMP.		L O	SOIL AND ROCK D	ESCRIPTION	
(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0 25 5	50 I	75 100	NO.		Ğ	ELEV. (ft)		DEPTH (f
1050		-										-		
1045	-	-				   - <del> </del>	· · · · ·	+			-	1,045.2 GROUND SU		0
1040	1,042.3	- - <u>3.2</u> -	3	3	5	$ \begin{vmatrix} & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ & \cdot & \cdot & \cdot &$		· · · · · · · · · · · · · · · · · · ·				LIGHT BROWN/ORAN SANDY-SILT, w/ little C MANGANESE, RC	GE/RED, STI LAY, MICA, tr	
	-	-									-		TE	6
1035	1,037.3	8.2 -	4	5	7	1 · · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·				SAPROL RED/ORANGE/BL SANDY-SILT, w/ trac	ACK, STIFF,	4
	1,032.3	- 13.2	10	24	33		· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·				1,033.5 BLACK/DARK BROWN HARD, SANDY-SILT,		
1030	-	-									-	-		
	1,027.3	18.2	54	46/0.2	-						77	1,027.8 WEATHERED	ROCK	17
025	1,025.6-	- 19.9	60/0.0					. 100/0.7				1,025.6 DARK GREY/		19
020	-	- - - -										DARK GREY/BLACK (BIOTITE Gr	to WHITE/TA	N
1015	-	-												
1013	-	-					· · · · · · · · · · · · · · · · · · ·	· · · · ·				-		
1010	-							· · · · ·				-		
	-	-							-		-	1,006.4 Boring Terminated at Ele CRYSTALLINI	vation 1,006.4 E ROCK	39 ft IN
												-		

											KE LÜĞ				
WBS	34400	).1.S5			TIP	R-223	3BB	C	OUNT	ΥF	UTHERFORD	GEOLOGIST Johnson	n, C. D.		
					-		-	otte Ro	I.) to S	-	66 (Roper Loop Rd.)	1			ID WTR (ft)
BORI	RING NO. L3_84427R (B1-A				STA	ΓΙΟΝ	843+87			OF	FSET 50 ft RT	ALIGNMENT -L3-		0 HR.	FIAD
	<b>AR ELEV.</b> 1,045.2 ft						<b>PTH</b> 39			NO	RTHING 607,523	EASTING 1,120,917	24 HR.	N/A	
DRILL	RIG/HAI	VIMER E	FF./DA	TE AFO8	3963 CIV	1E-550X	77% 07/	31/2017	,		DRILL METHOD	W Casing W/SPT & Core	HAMM	ER TYPE	Automatic
DRILL	<b>ER</b> C	heek, D	D. O.		STA	rt da'	<b>TE</b> 05/1	4/19		со	<b>MP. DATE</b> 05/14/19	SURFACE WATER DE	PTH N/	Ą	
CORE	E SIZE	NXWL			TOT	AL RUI	<b>N</b> 19.2	_							
LEV	RUN ELEV	DEPTH		DRILL RATE	REC.	JN RQD	SAMP.	REC.	ATA RQD	L O		DESCRIPTION AND REMARI	ks		
(ft)	(ft)	(ft)	(ft)	(Min/ft)	(ft) %	(ft) %	NO.	(ft) %	(ft) %	Ğ	ELEV. (ft)				DEPTH (ft
25.59 025	1,025.6	- 19.9	4.2	N=60/0 0	(3.7)	(0.5)					- 1,025.6	Begin Coring @ 19.9 ft CRYSTALLINE ROCK			19.9
	-	-		N=60/0.0 1:15/0.2 2:45/1.0 2:57/1.0 2:51/1.0 2:50/1.0 2:50/1.0	88%	12%									10.0
	1,021.4-	- 24.1	5.0	2:57/1.0 2:51/1.0 2:50/1.0	(5.0)	(4.5)									
020	-		5.0	2:41/1.0 3:14/1.0 2:16/1.0 2:01/1.0	100%	(4.3) 90%					-				
	- 1,016.4	- 29.1		2:16/1.0 2:01/1.0 1:43/1.0											
015			5.0	2:45/1.0	(5.0) 100%	(4.7) 94%					—				
	-			2:42/1.0 3:58/1.0 2:44/1.0	100 %	54 /0									
	1,011.4-	- 34.1	5.0	2:57/1.0	(5.0)	(5.0)				E					
010	-	-	0.0	3:07/1.0 3:11/1.0 3:20/1.0	100%	100%					_				
	- 1,006.4	- - 39.1		1:40/1.0 2:15/1.0							- 1,006.4				39.1
Γ	-	-										ed at Elevation 1,006.4 ft IN C (BIOTITE GNEISS)	RYSTALLI	NE ROCK	
	-	-										(,			
	-	-													
	-	-									_				
	-	-									GSI	19.1' - 21.9' : 45 - 55			
	-										-	21.9' - 29.1' : 75 - 85 29.1' - 39.1' : 80 - 90			
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### GEOTECHNICAL BORING REPORT CORE LOG

**GEOTECHNICAL BORING REPORT BORE LOG** 

SITE	34400.				ті	IP R-2233BB COUNTY	Y RUTHERFORD	GEOLOGIST Johnson, C. D.	
								GEOEOGIST Johnson, C. D.	
	DESCRI	PTION	US	221 So	outh o	f Business (Charlotte Rd.) to Sl	R 1366 (Roper Loop Rd.)		GROUND WTR (ft)
BORI	NG NO.	L3_8	4340F	R (B1-I	B) <b>S</b>	TATION 842+97	OFFSET 42 ft RT	ALIGNMENT -L3-	0 HR. N/A
COLL	AR ELE	<b>V.</b> 1,0	043.3	ft	т	OTAL DEPTH 44.4 ft	NORTHING 607,433	EASTING 1,120,919	<b>24 HR.</b> 27
DRILL	. RIG/HAM	IMER E	FF./DA	TE AF	08963	3 CME-550X 77% 07/31/2017	DRILL METHOD NW	Casing W/SPT & Core HAMM	ER TYPE Automatic
DRILL	L <b>ER</b> Ch	neek, D	). O.		S	TART DATE 05/15/19	COMP. DATE 05/15/19	SURFACE WATER DEPTH N/	A
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLC 0.5ft	0.5ft	JNT 0.5ft	BLOWS PER FOOT	75 100 100 100	SOIL AND ROCK DESC ELEV. (ft)	CRIPTION DEPTH (ft)
1045		-						1,043.3 GROUND SURFA	ACE 0.0
1040	1.039.1	4.2						RESIDUAL RED/ORANGE, SOFT, SAND CLAY, trace MIC	
1035			1	1	2		M	1,035.2	8.1
	1,034.1	9.2	4	4	4	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	М 1	SAPROLITE WHITE/TAN/BROWN, M <u>1,031.6</u> SANDY-SILT, w/ trace MIO FRAGS, trace MANGANES	CA&ROCK 117
<u>1030</u>	1,029.1	14.2	1	2	3	$\left[\begin{array}{c ccccccccccccccccccccccccccccccccccc$	м <u>_</u>	RED/BROWN/BLACK, M SANDY-SILT, w/ trace MANGANESE SE/	CLAY &
1025	1,024.1		2	2	3	$ \left  \begin{array}{c cccccccccccccccccccccccccccccccccc$			
1020	1,019.1	24.2	4	3	4				
1015	+ + 1.014.1	29.2		5				1,016.3	
	Ī		3	5 AUG RE	50 F @ 31	11 NO DRIVE; BEGIN CORE 55		1.012.3 1.012.2/ WEATHERED RC	
1010	+	-						CRYSTALLINE RO DARK GREY/BLACK to V (BIOTITE GNEIS	VHITE/TAN
1005									
1000		- -						998.9	44.4
								Boring Terminated at Elevat CRYSTALLINE ROCK (BIO	ion 998.9 ft IN TITE GNEISS)

						0			(	2
WBS	34400	.1.S5			TIP	R-223	33BB	C	OUNT	Y
SITE	DESCR	IPTION	US	221 Sout	h of Bı	usines	s (Charlo	tte Rd	l.) to S	R
BOR	ING NO.	L3_8	4340F	R (B1-B)		-	842+97			(
		,					PTH 44.			
				TE AFO8						Г
					1		TE 05/1			(
<u> </u>	E SIZE RUN	NXWL		DRILL	RL	AL RUI JN		STR	ATA	
ELEV (ft)	ELEV (ft)	DEPTH (ft)	RUN (ft)	RATE (Min/ft)	REC. (ft) %	RQD (ft) %	SAMP. NO.	REC. (ft) %	RQD (ft) %	
1012.19	•									
1010	1,012.2	- 31.1 -	3.3	0:45/0.3 1:37/1.0 2:30/1.0 2:12/1.0	(3.1) 94%	(2.7) 82%				
	1,008.9	34.4	5.0	2:12/1.0	(4.8)	(4.6)				
		-		1:45/1.0 2:09/1.0	96%	92%				1.00
1005	1,003.9	39.4	-	2:07/1.0 3:37/1.0						
		-	5.0	2:44/1.0 1:57/1.0	(4.9) 98%	(4.5) 90%				14:0
1000	998.9	- - 44.4		1:54/1.0 1:55/1.0 3:28/1.0						1.6.6.
		-		3.20/1.0						
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### **GEOTECHNICAL BORING REPORT** CORE LOG

RUTHERFORD GEOLOGIST Johnson, C. D. R 1366 (Roper Loop Rd.) GROUND WTR (ft) OFFSET 42 ft RT ALIGNMENT -L3-0 HR. N/A **NORTHING** 607,433 **EASTING** 1,120,919 24 HR. 27 DRILL METHOD NW Casing W/SPT & Core HAMMER TYPE Automatic COMP. DATE 05/15/19 SURFACE WATER DEPTH N/A L O G ELEV. (ft) DESCRIPTION AND REMARKS DEPTH (ft) Begin Coring @ 31.1 ft CRYSTALLINE ROCK 31.1 44.4 Boring Terminated at Elevation 998.9 ft IN CRYSTALLINE ROCK (BIOTITE GNEISS) GSI : 31.1' - 44.4 ' : 80 - 90

### GEOTECHNICAL BORING REPORT BORE LOG

### GEOTECHNICAL BORING REPORT BORE LOG

										E		KE		JG																								
WBS	<b>3</b> 3440	0.1.S5			Т	rip R-2	2233E	3B	C	COUN	TY	RUTH	ERF	ORD				GEOLO	GIST	M. Arı	nold					WB	<b>S</b> 344	00.1	.S5			Т	IP F	R-2233	BB		COUN	TY RU
ίΤЕ	DESCI	RIPTIO	N US	221 S	outh	of Busin	ness (	Charlo	tte R	d.) to	SR 1	366 (F	Rope	r Loop	o Rd.)	)							GROU	IND W	TR (ft)	SIT	E DESC	RIP	TION	US	221 S	outh c	of Bus	siness	(Charl	lotte F	Rd.) to	SR 136
30F	RING NO	<b>)</b> . L3_8	4406F	R (EB2	2-A) S	STATIO	<b>N</b> 84	4+06			OF	FSET	10	7 ft R	Т			ALIGNM	IENT	-L3-			0 HR.		Dry	BO	RING N	<b>O</b> . L	.3_84	320R	(EB2	2-B) <b>S</b>	TATI	<b>ON</b> 8	343+20	)		OFF
OL	LAR EL	<b>.EV.</b> 1	,043.7	ft	Т		DEPT	<b>H</b> 19.	3 ft		NC	ORTHI	NG	607,5	509			EASTIN	<b>G</b> 1,1	120,97	7	:	24 HR.		Dry	COL	LAR E	LEV	. 1,0	)42.8	ft	Т	ΟΤΑΙ	_ DEP	<b>TH</b> 44	4.8 ft		NOR
DRIL	l Rig/H/	AMMER B	eff./Da	TE Fa	&R217	5 CME-5	5 86%	6 02/16/	2016					RILL	METHO	OD	H.S	S. Augers			H	AMME	R TYPE	E Auto	omatic	DRIL	L RIG/H	AMN	<b>IER EF</b>	FF./DA	TE Fa	&R2175	5 CME	-55 86	% 02/10	6/2016	;	•
DRIL	LER	S. Davis	6		S	START I	DATE	12/1	5/16		CC	OMP. C	DATE	12/	15/16	6		SURFAC	E WA	TER D	DEPTH	I N/A	<b>۱</b>			DRI	LLER	S. C	Davis			s	TAR	r dat	<b>E</b> 12/	15/16	3	COM
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	· <b> </b>	OW CO 0.5ft	-	0	2		/S PE 50	R FOC	DT 75	1	20	Samp. No.	17	L O DI G			SO	IL AND	ROCK I	DESCI	RIPTIO			ELE\ (ft)	/ DRIVE ELEV (ft)	יטן /	EPTH (ft)		OW CO 0.5ft	-			BLO 25	OWS PE 50	ER FOC	DT 75
							I		I		I							ELEV. (ft)							EPTH (ft)											L		I
<u>1045</u>		/ <u> </u>	3	3	2				•		•				м		F	1,043.7					CE		0.0	1045	1.042.	8-	0.0									
1040	1,040.2	<u>3.5</u>	3	3	3	¶ <sup>2</sup> .   1 ·	· · · ·	· · · ·	· ·	· · ·		 					-	т. -	AN/BR(	OWN, L w	.OOSE, // trace l		-FINE S	SAND,		1040	1,039.	+	25	3	4	4		8 · · · · ·		· · · ·	· · ·	
		† †			3	●6. ↓ ↓ .	  	· · · · · · ·		· · · ·		· · · · · ·			M		-										1,039.	* -	3.5	2	4	4		8	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	· · · ·	· · · ·
035	1,035.2	2 8.5 -	3	2	2		•••	· · ·	•	· · ·	· -	· · ·	·		м		-	-								1035	1,034.	3	8.5	3	4	5		1 <del> </del> 		· · ·	· · ·	· · · ·
1030	1,030.2	+ + 					), , ,  		· .	· · · · · · ·		· · · · · ·	.				-	1,031.7			SAPRO			· <u> </u>	<u> </u>	1030								<b>P</b> <sup>9</sup> · · ·	· · · ·	· · · · · ·	· · · · · · ·	· · · · · · · · · · · · · · · · · · ·
1000		-	6	22	41			· · · ·	:	· · · ·		 			м	H	-		ILTY, F	DRANGE INE-to- AGS & a	COURS a few H	SE ŠAI IARD L	ND, w/ F .Ayers	ROCK	15.7	1000	1,029.	<u>3 -</u>	13.5	2	4	5	1	↓ ↓ ¶9	· · ·			· · ·
1025	1.025.2	<u>+</u> <u>+ 18.5</u>		55/0.2			· · · ·	· · ·		· · ·			· ]					- 1,024.5	TAN	I/DARK	GRAY (	(MICA	SCHIS	T)	19.2	1025	1,024.	3	18.5	3		7		$\frac{1}{1}$		· · ·	· · ·	· · ·
		÷	60/0.1									60/0	.1						Bor	E/DAR	K GRAY	Y (MIC)	A SCHIS	d		1020		ł		3	6			.•13. •1••	  	· · · · · · · · · · · · · · · · · · ·	· · · · · · ·	· · · ·
		+															F	-		4.4 ft IN						1020	1,019.	3 2	23.5	4	5	7			· · ·		· · ·	
		+															Ē	-								1015	1,014.	3	28.5			_		· ·· · ··		· · ·		
		Ī															Ē											Ŧ		4	4	7				· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	· · · ·
		+															F	-								1010	1,009.	3 3 3	33.5	3	3	5						· · ·
		‡ +															Ē	-								1005	1,004.	+ 3+ :	38.5					· · · · · · · ·	· ·   · ·	· · · ·	· · · · · ·	· · ·
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		Ŧ															E	-								1000	<u> </u>	3 <del>-</del> .	43.5 44.7	66	34/0.3			<b>L</b>				
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RUTHER	ORD			GEOLOGIST M. Arnold			
R 1366 (Rop	er Loop	Rd.)				GROUN	D WTR (ft)
OFFSET 1	06 ft RT	-		ALIGNMENT -L3-		0 HR.	43.0
NORTHING	607,4	18		EASTING 1,120,985		24 HR.	41.9
	DRILL N	IETHO	DH	S. Augers	HAMME	ER TYPE	Automatic
COMP. DAT	<b>E</b> 12/1	5/16		SURFACE WATER DEP	TH N//	٩	
75 100	SAMP. NO.	моі	L O G	SOIL AND ROC	K DESC	RIPTION	
		MOI M M M M M M M M M		- 1,042.8 GROUND 1,040.8 RED/BROWN, MED 3 - - RED/BROWN, 1 1,035.8 ROCK	RED RO (MICA S LINE K MICA S ROLLE FRAGS COLLE FRAGS COLLE CARCW CHICA S LINE RC DARK G LANE K COLLE CARCW	CE L ILTY-CLA' FF, FINE A & QUAR' (N, STIFF, E-to-COUR race MICA CHIST) CK CHIST) CK CHIST) CK Standard Ievation 95	

# **CORE PHOTOGRAPHS**

**B1-A** BOX 1 of 3: 19.9 - 29.1 FEET **B1-A** 



**GEOLOGICAL STRENGTH INDEX: GSI** 19.1' - 21.9' : 45 - 55 21.9' - 29.1' : 75 - 85



**GEOLOGICAL STRENGTH INDEX: GSI** 29.1' - 38.3' : 80 - 90

SHEET 14 R-2233BB / RUTHERFORD PROPOSED BRIDGE NO. 0663

BOX 2 of 3 : 29.1 - 38.3 FEET

# **CORE PHOTOGRAPHS**

**B1-A** BOX 3 of 3 : 38.3 - 39.1 FEET

38.3	39.1
	ALLER THE REAL PROPERTY OF
	'AIC N
0	1 2 FEET

GEOLOGICAL STRENGTH INDEX: GSI 38.3' - 39.1' : 80 - 90 SHEET 15 R-2233BB / RUTHERFORD PROPOSED BRIDGE NO. 0663

# **CORE PHOTOGRAPHS**

### **B1-B** BOX 1 of 2: 31.1 - 39.4 FEET

### **B1-B** BOX 2 of 2: 39.4 - 44.4 FEET



**GEOLOGICAL STRENGTH INDEX: GSI** 80 - 90



**GEOLOGICAL STRENGTH INDEX: GSI** 80 - 90

SHEET 16 R-2233BB / RUTHERFORD PROPOSED BRIDGE NO. 0663