

Mr. Robbie Kirk, PE Roadway Department Manager SEPI Engineering & Construction 11020 David Taylor Drive, Suite 115 Charlotte, NC 28262

October 1, 2018

RE: TIP U-5738, WBS 50163.1.1

Rowan County, North Carolina

Structure Subsurface Investigation for Bridge over Town Creek on SR 2528 between SR 2540 and

US 601

Dear Mr. Kirk,

HDR Engineering, Inc. has completed the structure subsurface investigation for the proposed Structure on -L- of SR 2528 (Julian Rd.) between SR 2540 and US 601. Borings were taken by HDR in accordance with Geotechnical Engineering Unit requirements and are shown within the attached report for the following bent locations: End Bent 1, Bent 1, and End Bent 2.

The following information is included within this structure subsurface investigation report:

- 1. Title sheet
- 2. Soil and rock legends
- 3. Site plan with boring locations
- 4. Subsurface profile
- 5. Subsurface cross sections at each bent location
- 6. Soil boring and rock coring logs
- 7. Rock core photos
- 8. Soil and rock laboratory test results
- 9. Site photos

Please contact me if you have any questions.

Sincerely,

HDR ENGINEERING, INC.



Michael G. Batten, PE Senior Geotechnical Engineer Professional Associate

Attachments

Bridge over Town Creek Structure Subsurface Investigation

-5738
ENCE: U
REFER

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**DESCRIPTION** 

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BORE LOGS & CORE REPORTS

ROCK CORE TEST RESULTS

LEGEND (SOIL & ROCK)

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CROSS SECTIONS

CORE PHOTOGRAPHS SOIL TEST RESULTS

SITE PHOTOGRAPHS

SHEET NO.

2A

5-6

7-14

15-20

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# 5016

#### STATE OF NORTH CAROLINA

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

#### **STRUCTURE** SUBSURFACE INVESTIGATION

COUNTY **ROWAN** 

PROJECT DESCRIPTION BRIDGE NO. 201 ON SR 2528 (IULIAN ROAD) OVER TOWN CREEK

SITE DESCRIPTION SR 2528 (JULIAN ROAD) FROM SR 2667 (SUMMIT PARK DRIVE) TO US 601 (JAKE ALEXANDER BLVD.) IN SALISBURY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-5738	1	23

#### **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 1999 707-680. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

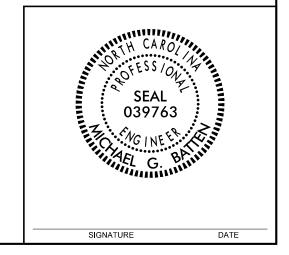
GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND 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 INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC 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 CUARANTEE 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 FOR ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

- TES:
  THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N.C. DEPARTMENT
  OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS
  OR CONTRACT FOR THE PROJECT.
  BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS
  FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE
  CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

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<i>O.F.</i>	WOODARD
INVESTIGATED BY <u>J.</u>	K. CRENSHAW
DRAWN BYW. SHO	UECRAFT
CHECKED BY M.G.	BATTEN
SUBMITTED BY M.C	G. BATTEN
DATE OCTOBER	2018

**PERSONNEL** J.K. CRENSHAW



PROJECT REFERENCE NO. SHEET NO.

U-5738
2

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

#### SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

COLL DECCRIPTION	CDARATION	DOOK DECEDIATION	TERMS AND DEFINITIONS
SOIL DESCRIPTION  SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN	GRADATION <u>WELL GRADED</u> - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.	ROCK DESCRIPTION  HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. AN INFERRED	TERMS AND DEFINITIONS  ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.
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	UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.	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	AQUIFER - A WATER BEARING FORMATION OR STRATA.
IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING; CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH	GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.  ANGULARITY OF GRAINS	BLOWS IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.	ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.
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	THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS:	ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:	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.
SOIL LEGEND AND AASHTO CLASSIFICATION	ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.	WEATHERED VILLE NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > ROCK (WR) 100 BLOWS PER FOOT IF TESTED.	ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT
GENERAL GRANULAR MATERIALS SILT-CLAY MATERIALS ORGANIC MATERIALS	MINERALOGICAL COMPOSITION  MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAQLIN, ETC.	CRYSTALLINE CRYSTA	WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.
CLASS. (≤ 35% PASSING *200) (> 35% PASSING *200) CROUP 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.	ROCK (CR) WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.	CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
CLASS. A-1-0 A-1-b A-2-4 A-2-5 A-2-6 A-2-7 A-7-6 A-3 A-6, A-7	COMPRESSIBILITY	NON-CRYSTALLINE FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YELL SATEROUSE IT TESTED.	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM
SYMBOL DOCOGOOOO	SLIGHTLY COMPRESSIBLE LL $<$ 31 MODERATELY COMPRESSIBLE LL $=$ 31 - 50	COASTAL PLAIN COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD	OF SLOPE.  CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED
7. PASSING   GRANULAR SILT- MUCK,	HIGHLY COMPRESSIBLE LL > 50  PERCENTAGE OF MATERIAL	SEDIMENTARY ROCK SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.	BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
*40 30 MX 50 MX 51 MN SOILS SOILS PEAT	GRANULAR SILT - CLAY	- WEATHERING	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.
#200   15 MX   25 MX   10 MX   35 MX   35 MX   35 MX   36 MN   36 MN	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.	DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE
PASSING *40 SOUS WITH	LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20% MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35%	VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN,	HORIZONTAL.  DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE
LL 40 MX 41 MN LITTLE OR LITTLE OR HIGHLY PI 6 MX NP 10 MX 10 MX 11 MN 11 MN 10 MX 10 MX 11 MN 11 MN MODERATE	HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE	(V SLI.) CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.	LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
GROUP INDEX 0 0 0 4 MX 8 MX 12 MX 16 MX NO MX AMOUNTS OF SOILS	GROUND WATER	SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
USUAL TYPES STONE FRAGS.  OF MAJOR GRAVEL AND FINE SILTY OR CLAYEY SILTY CLAYEY MATTER	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.	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
MATERIALS SAND GRAVEL AND SAND SOILS SOILS	STATIC WATER LEVEL AFTER 24 HOURS	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	FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM
GEN. RATING EXCELLENT TO GOOD FAIR TO POOR POOR POOR UNSUITABLE	<u>VPW</u> PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA	DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED	PARENT MATERIAL.  FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.
P1 OF A-7-5 SUBGROUP IS ≤ LL - 30 ; P1 OF A-7-6 SUBGROUP IS > LL - 30	- OMM- SPRING OR SEEP	WITH FRESH ROCK.  MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL	FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE
CONSISTENCY OR DENSENESS	MISCELLANEOUS SYMBOLS	SEVERE AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH	FIELD.
PRIMARY SOIL TYPE  COMPACTNESS OR RANGE OF STANDARD RANGE OF UNCONFINED PENETRATION RESISTENCE COMPRESSIVE STRENGTH	ROADWAY EMBANKMENT (RE) 25/025 DIP & DIP DIRECTION	(MOD, SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK, ROCK GIVES "CLUNK" SOUND WHEN STRUCK,  IF TESTED, WOULD YIELD SPT REFUSAL	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
CUNSISTENCY (N-VALUE) (TONS/FT <sup>2</sup> )	WITH SOIL DESCRIPTION → OF ROCK STRUCTURES	SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT (SEV.) REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED	ITS LATERAL EXTENT.
GENERALLY VERY LOOSE	SOIL SYMBOL  Opt DMT TEST BORING  SLOPE INDICATOR INSTALLATION	TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN.	LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.
MATERIAL MEDIUM DENSE 10 10 30 N/A	ARTIFICIAL FILL (AF) OTHER AUGER BORING CONE PENETROMETER	IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF  VERY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC ELEMENTS ARE DISCERNIBLE	MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
(NUN-CUHESIVE) VERY DENSE > 50	THE TOPONE ENDRICHENT OF TEST	SEVERE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.
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. <u>IF TESTED, WOULD YIELD SPT N VALUES &lt; 100 BPF</u>	RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
SILT-CLAY         MEDIUM STIFF         4 TO 8         0.5 TO 1.0           MATERIAL         STIFF         8 TO 15         1 TO 2	INFERRED ROCK LINE MONITORING WELL TEST BORING WITH CORE	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	ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF
(COHESIVE) VERY STIFF 15 TO 30 2 TO 4 HARD > 30 > 4	TTTTT ALLUVIAL SOIL BOUNDARY A PIEZOMETER INSTALLATION - SPT N-VALUE	ALSO AN EXAMPLE.	ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
TEXTURE OR GRAIN SIZE	RECOMMENDATION SYMBOLS	ROCK HARDNESS	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.
U.S. STD. SIEVE SIZE 4 10 40 60 200 270	UNCLASSIFIED EXCAVATION - TAN UNCLASSIFIED EXCAVATION -	VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.	SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND
OPENING (MM) 4.76 2.00 0.42 0.25 0.075 0.053	SHALLOW SHALLOW USED IN THE TOP 3 FEET OF	HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED	RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
BOULDER COBBLE GRAVEL COARSE FINE SILT CLAY (BLDR.) (COB.) (GR.) (GR.) (GR.) (GR.) (GR.)	UNDERCUT ACCEPTABLE DEGRADABLE ROCK EMBANKMENT UR BACKFILL	TO DETACH HAND SPECIMEN.  MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK, GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE	SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT
(USE, SU.) (F SU.)	ABBREVIATIONS	HARD EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK, HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.	OR SLIP PLANE.
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	MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT.	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
SOIL MOISTURE - CORRELATION OF TERMS	CL CLAY  MOD MODERATELY  7 - UNIT WEIGHT  CPT - CONE PENETRATION TEST  NP - NON PLASTIC  7 - DRY UNIT WEIGHT	HARD CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.	WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.
SOIL MOISTURE SCALE FIELD MOISTURE GUIDE FOR FIELD MOISTURE DESCRIPTION	CSE COARSE ORG ORGANIC DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST SAMPLE ABBREVIATIONS	SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK, CAN BE EXCAVATED IN FRAGMENTS	STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY
	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.	TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.  STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL
- 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 SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE, CAN BE SCRATCHED READILY BY	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.
PLASTIC SEMISOLIDA PEDILIPES DEVINC TO	FOSS FOSSILIFEROUS SLI SLIGHTLY RS - ROCK FRAC FRACTURED, FRACTURES TCR - TRICONE REFUSAL RT - RECOMPACTED TRIAXIAL	FINGERNALL.	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
RANGE < - WET - (W) SEMISULID; REGULARS DATING TO ATTAIN OPTIMUM MOISTURE	FRAGS FRAGMENTS $w$ - MOISTURE CONTENT CBR - CALIFORNIA BEARING	FRACTURE SPACING BEDDING	BENCH MARK:
	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	BM-3 N: 69335 E: 15559 8 ELEVATION: 717.28 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	X CME-45C CLAY BITS X AUTOMATIC MANUAL	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	NOTES:
- DRY - (D) ATTAIN OPTIMUM MOISTURE	G'CONTINUOUS FLIGHT AUGER  CORE SIZE:	THINLY LAMINATED < 0.008 FEET	FIAD - FILLED IMMEDIATELY AFTER DRILLING
PLASTICITY	X 8"HULLUW AUGERS   L -B L -H	INDURATION	BORING AND GROUND SURFACE ELEVATIONS AQUIRED FROM 'U5738_DOC.tin' RECEIVED ON 1/20/2018
PLASTICITY INDEX (PI)  DRY STRENGTH	CME-550 HARD FACED FINGER BITS X -N Q2	FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.  RUBBING WITH FINGER FREES NUMEROUS GRAINS;	
NON PLASTIC 0-5 VERY LOW SLIGHTLY PLASTIC 6-15 SLIGHT	VANE SHEAR TEST VACABILITY OF THE ADVANCED HAND TOOLS:	FRIABLE GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.	
MODERATELY PLASTIC 16-25 MEDIUM HIGHLY PLASTIC 26 OR MORE HIGH	X CASING W/ ADVANCER POST HOLE DIGGER  POST HOLE DIGGER  POST HOLE DIGGER	MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.	
COLOR	TOTAL TOTAL OF THE PARTY AND ADDRESS OF THE PARTY A	CDAING ADE DIEEICH I TO CEDADATE WITH CTEEL DDODE.	
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY).		INDURATED DIFFICULT TO BREAK WITH HAMMER.	
MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.		EXTREMELY INDURATED  SHAPP HAMMER BLOWS REQUIRED TO BREAK SAMPLE;  SAMPLE BREAKS ACROSS GRAINS.	DATE: 8-15-1
		STATE CONCINCO BOTTOSO	DATE: 0-13-1-

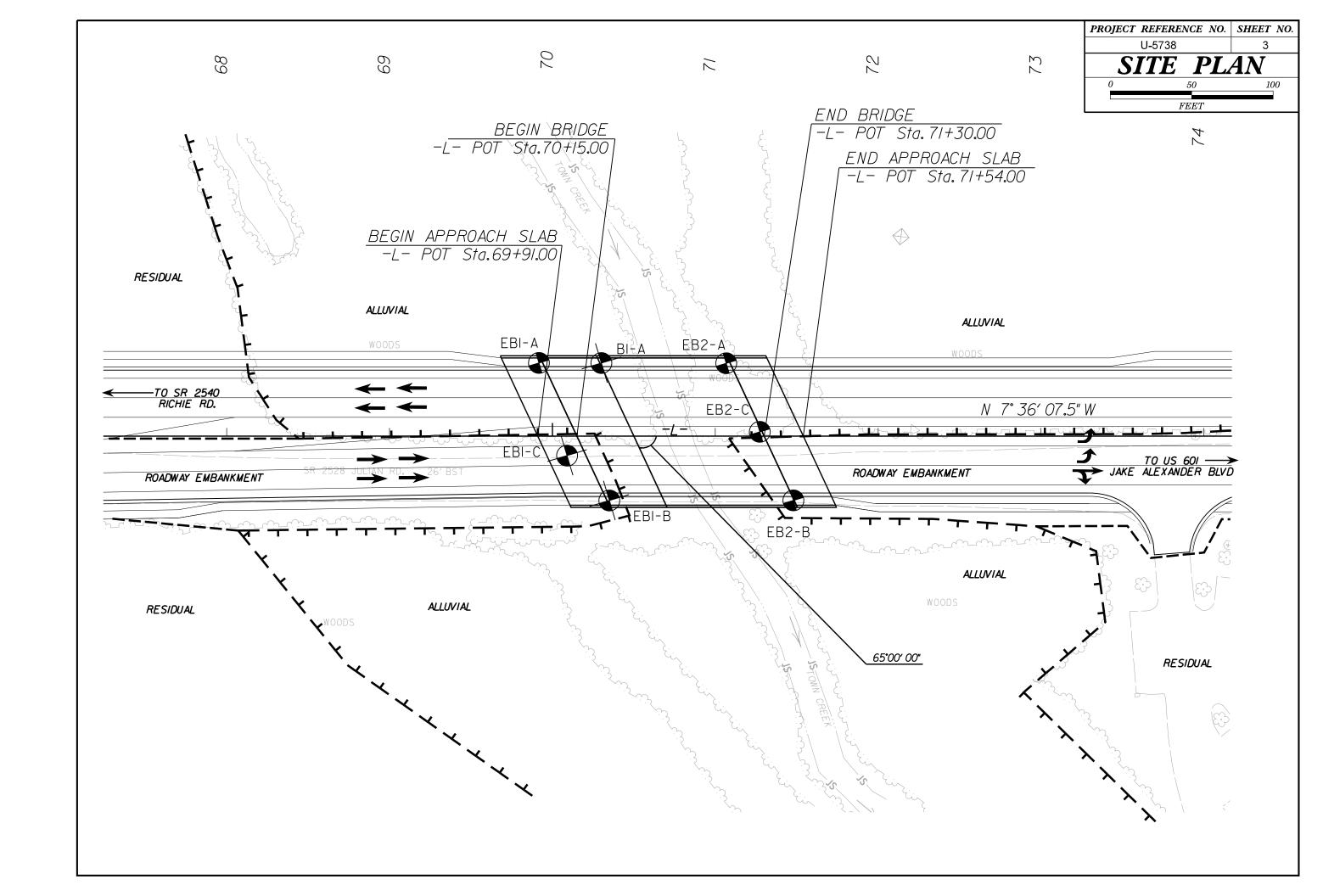
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J_5738	2A

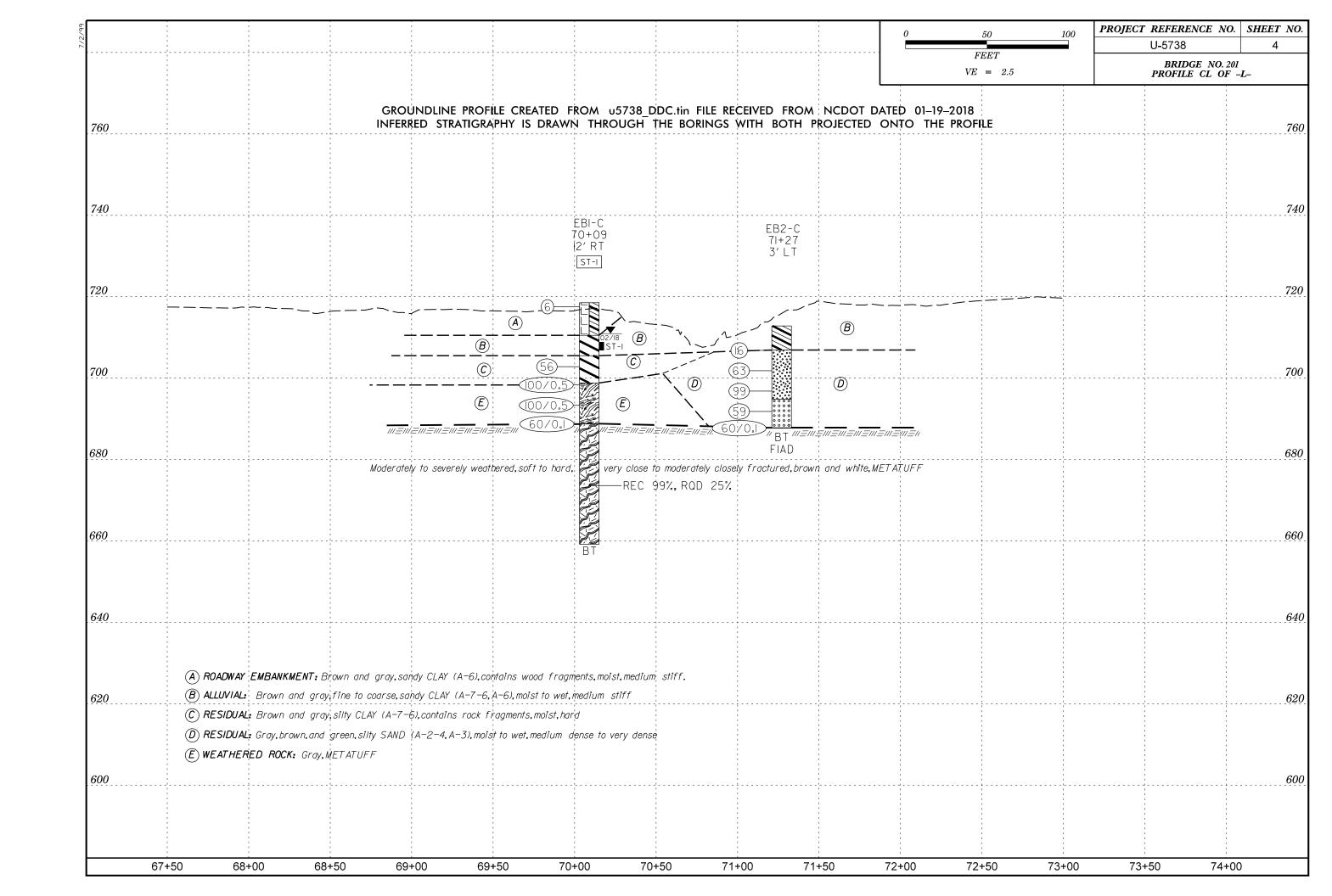
#### NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT

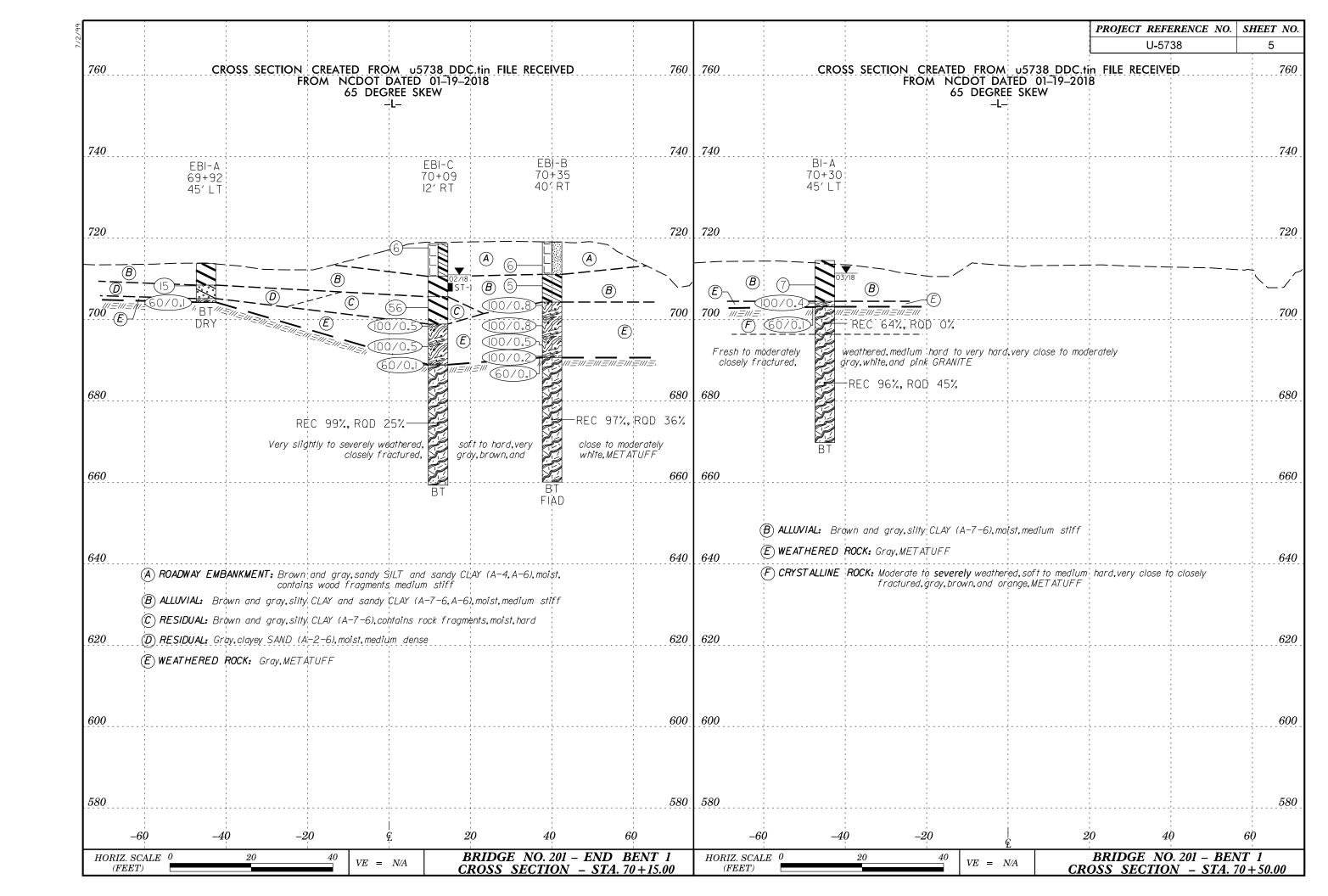
### SUBSURFACE INVESTIGATION

#### SUPPLEMENTAL LEGEND GEOLOGICAL STRENGTH INDEX (GSI) TARLES

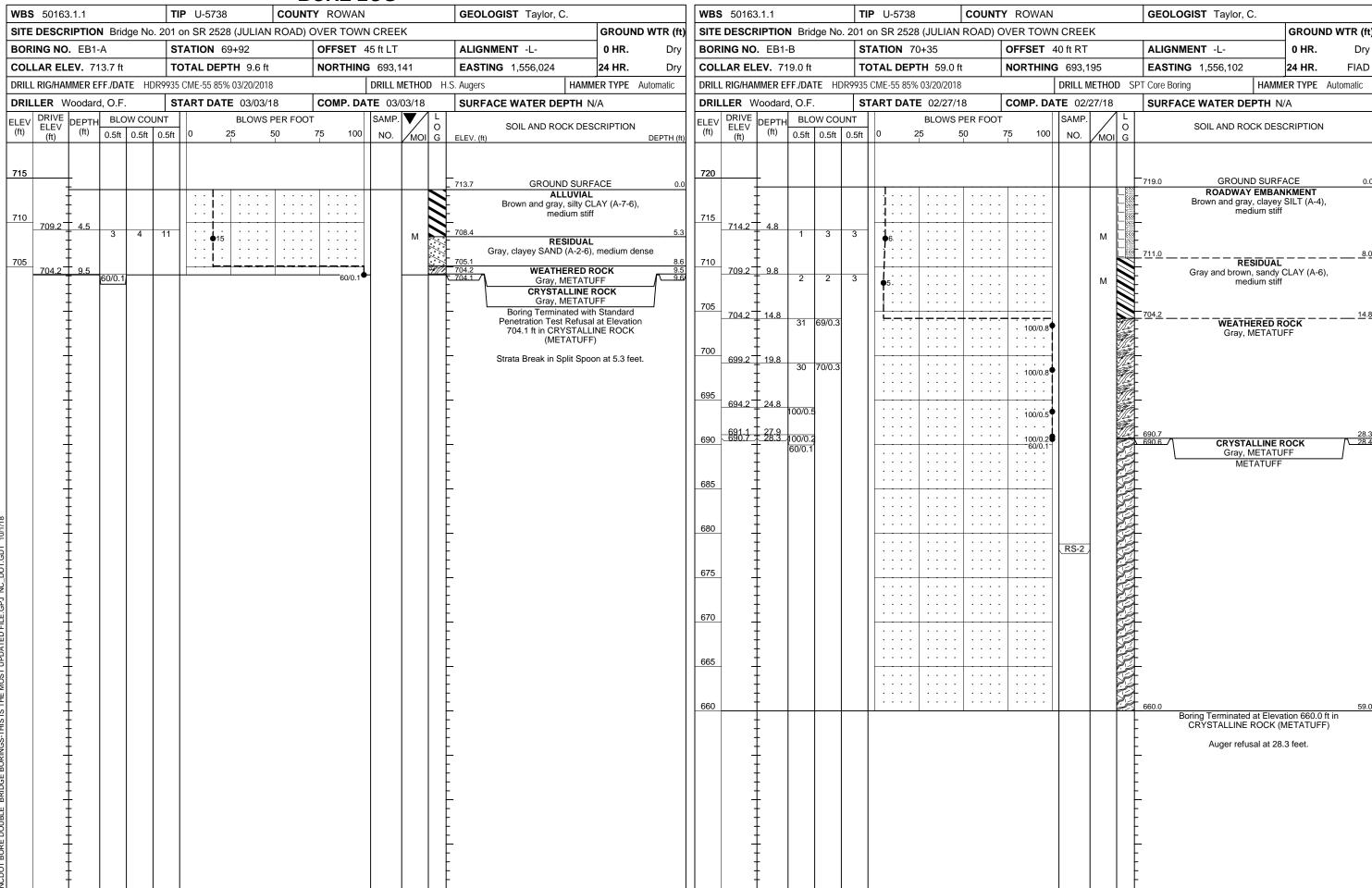
AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Join	ted Roc			HTO LRFD BRI	CAL STRENGTH INDEX (GSI) TABLES DGE DESIGN SPECIFICATIONS  AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonically Deformed Heterogeneous Rock Masses (Marinos and Hoek, 2000)
GEOLOGICAL STRENGTH INDEX (GSI)FOR JOINTED ROCKS (Hoek and Marinos, 2000)		s p		S S S S S S S S S S S S S S S S S S S	GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos.P and Hoek E., 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 surface:  COOD  Rough, slightly weathered, iron stained surfaces	FAIR Smooth, moderately weathered and altered surfaces	POOR Slickensided, highly weathered surf with compact coatings or fillings or angular fragments  VERY POOR Slickensided, highly weathered surf with soft clay coatings or fillings	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 pox that corresponds to the condition of the discontinuities and estimate the average value of GSI from the controlled failures. Where negative controlled failures. Where negative continuous weak planar discontinuities are present, these will dominate the personal decomposition of continuities are bressure does unty solid weather and this can be allowed for phy a slight shift to the right in the columns for tolled weather and this can be allowed for phy a slight shift to the right in the columns for tolled controlled to the role was to the columns of tolled controlled to the right in the columns for tolled controlled to the right in the columns for tolled controlled to the right in the columns for tolled controlled to the right in the columns for tolled controlled to the right in the columns for tolled controlled to the right in the columns for tolled controlled to the right in the columns for tolled controlled to the right in the columns for tolled controlled to the right in the columns for tolled controlled to the right in the columns for tolled controlled to the right in the columns for tolled controlled to the right in the columns for tolled controlled to the right in the columns for tolled controlled to the right in the columns for tolled controlled to the right in the columns for tolled controlled to the right in the columns for tolled to the right in the columns for tolled to the right in the columns for the right in the columns for the right in the controlled to the right in the controlled to the right in the controlled to the right in the columns for the right in the controlled to the right in the co
STRUCTURE		DECREASING S	URFACE QU	ALITY -	COMPOSITION AND STRUCTURE
INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities  BLOCKY - well interlocked un-	PIECES	90 80		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	OF ROCK	70 60			B. Sand- stone with thin inter-  C. Sand- stone and siltstone with sand- with sand-  B. Weak siltstone or silty shale or clayey  B C D E
VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets	OCKING	/// <u>!</u>	50		thin inter- layers of siltstone in similar amounts amounts  State with sand- stone layers  State with sand- stone layers  B C D E  40
BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity	ASING INTERL		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.  F. Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure
DISINTEGRATED - poorly inter- locked, heavily broken rock mass with mixture of angular and rounded rock pieces	DECRE			20	G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers  H. Tectonically deformed silty or clayey shale with por clayey shale forming a chaotic structure with pockets of clay. Thin layers of sandstone are transformed unto small rock pieces.
LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes	V	N/A N/A		10	Means deformation after tectonic disturbance  DATE: 8-19-1







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WBS	5010	3.1.1			TIP	U-573	38	C	OUNT	YR	OWAN	GEOLOGIST Taylor, C.	
SITE	DESC	RIPTIO	<b>N</b> Brid	dge No. 2	01 on	SR 25	28 (JULI	AN RO	DAD) (	OVE	R TOWN CREEK		GROUND WTR (ft)
BOR	RING N	<b>O</b> . EB1	-B		STA	TION	70+35			OF	FSET 40 ft RT	ALIGNMENT -L-	<b>0 HR.</b> Dry
COL	LAR E	<b>LEV.</b> 7	19.0 ft		тот	AL DE	<b>PTH</b> 59	.0 ft		NO	<b>RTHING</b> 693,195	<b>EASTING</b> 1,556,102	24 HR. FIAD
DRILI	L RIG/H	AMMER E	FF./DA	TE HDR9	935 CN	1E-55 8	5% 03/20/2	2018			DRILL METHOD SPT	Core Boring HAMM	ER TYPE Automatic
DRIL	LER	Woodar	d, O.F		STA	RT DA	<b>TE</b> 02/2	27/18		СО	<b>MP. DATE</b> 02/27/18	SURFACE WATER DEPTH N	/A
COR	E SIZI	NQ2			тот	AL RU	<b>IN</b> 30.6						
WBS 50163.1.1         TIP U-5738         COUNTY ROWAN         GEOLOGIST Taylor, C.           SITE DESCRIPTION Bridge No. 201 on SR 2528 (JULIAN ROAD) OVER TOWN CREEK         GROUND WTR (ft)           BORING NO. EB1-B         STATION 70+35         OFFSET 40 ft RT         ALIGNMENT -L-         0 HR. Dry													
SITE DESCRIPTION Bridge No. 201 on SR 2528 (JULIAN ROAD) OVER TOWN CREEK   GROUND WTR (ft)													
690.6	690.6	28.4	0.6	1:25/0.6	(0.6)	(0.0)		(20.2)	(10.7)	لارجع	600.6	Begin Coring @ 28.4 ft	20.4
	690.0	7 29.0 T		1:58 2:38	100%	0%			35%		<ul> <li>Very slight to modera</li> </ul>	ately severely weathered, moderately	y hard to hard,
		Ŧ		3:01 3:56							- Very close to ci	osely fractured, gray and brown, ME	TATUFF
685	685.0	34.0	5.0	2:07	(4.6)	(3.3)					<del>-</del>		
		Ŧ		2:18		66%					• •		
680	680.0	39.0		2:12							•		
		Ŧ	5.0	2:19			RS-2				-		
		Ŧ		2:55		,	110-2	1			<del>-</del> <del>-</del>		
675	675.0	44.0	5.0	2:35	(4.9)	(0.9)					<del>-</del>		
		Ŧ	0.0	4:19		18%					<u>.</u>		
670	670.0	‡ <sub>49.0</sub>		2:18							<del>-</del> -		
		7	5.0	1:37	(4.4)	(3.4)					<del>-</del> -		
		‡		1:48	0078	00%					- -		
665	665.0	54.0	5.0	1:50	(5.0)	(2.2)					- <del>-</del>		
		‡	3.0	2:44	100%	44%					- -		
660	660.0	± 59.0		1:57							- - 660 0		59.0
000	000.0	+ 00.0		2.10								d at Elevation 660.0 ft in CRYSTALL	
		Ŧ									<u>-</u> -		
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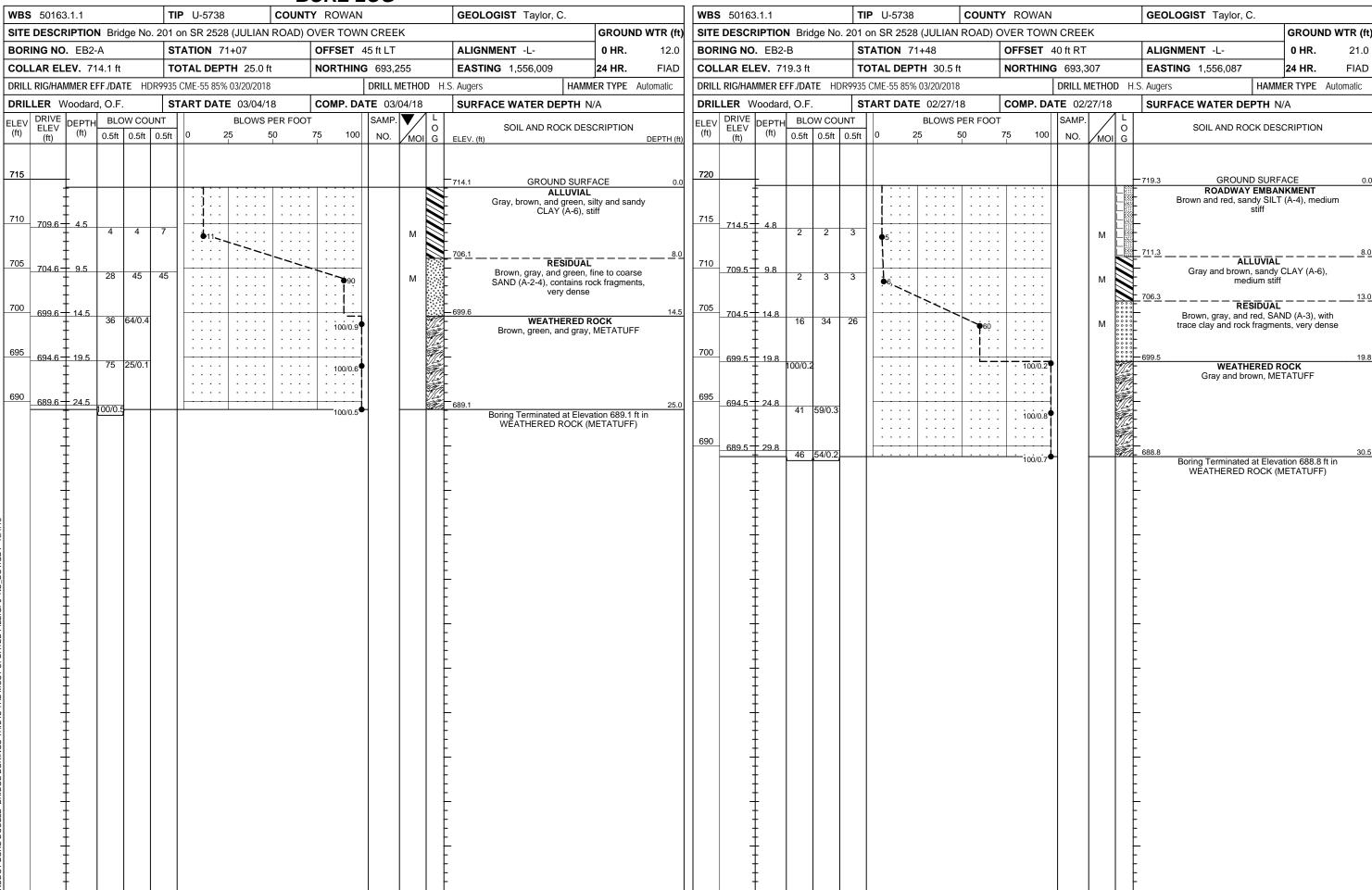
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WBS	50163	3.1.1			TI	<b>P</b> U-57	738		COUNT	Y RO	OWAN				GEOLOGIST Taylor, C.		
SITE	DESCR	RIPTIO	N Brid	lge No	o. 201 d	on SR 2	2528 (	(JULIAN	ROAD)	OVER	1WOT	N CREE	K			GROUND	WTR (ft
BOR	ING NO	. EB1	-C		SI	ATION	l 70+	<b>+</b> 09		OFF	SET	12 ft RT			ALIGNMENT -L-	0 HR.	9.9
COL	LAR EL	<b>EV.</b> 7	18.5 ft		т	TAL D	EPTI	<b>H</b> 59.3 f	t	NOR	THING	693,1	66		<b>EASTING</b> 1,556,078	24 HR.	7.6
DRILL	RIG/HAN	MMER E	FF./DA	TE HI	DR9935	CME-55	85% 0	3/20/2018	3	1		DRILL N	ИЕТНО	<b>D</b> SF	PT Core Boring HAMM	ER TYPE A	utomatic
DRIL	LER V	/oodar	d, O.F.		ST	ART D	ATE	02/28/1	8	CON	IP. DA	TE 02/	28/18		SURFACE WATER DEPTH N	/A	
ELEV	DRIVE	DEPTH	_	w co					PER FOO			SAMP.	<b>V</b> /	L			
(ft)	ELEV (ft)	(ft)		0.5ft	0.5ft	0	25		50	75	100	NO.	моі	O G	SOIL AND ROCK DESC	CRIPTION	DEPTH (ft
720																	
120	-	<u> </u>													– - 718.5 GROUND SURFA	ACE	0.0
	-					1 .									ROADWAY EMBAN Brown and gray, sandy (		
715	-	Ł				<u>i : </u>									contains wood fragments,		
	713.8 -	4.7	3	3	3					.			١,,		-		
	-	ļ.				•6.				.			M		•		
710	-	ļ.				· · `	/.						_		- 710.5 - ALLUVIAL		
	-	‡					::`\			.			37%		Brown and gray, fine to co CLAY (A-7-6(13)), me	oarse, sandy	
	-	Ł								.   : :			37 /6		· 705.5	alam sun	12
705		14.7												3	RESIDUAL		<u>13</u> .
	703.6 -	14.7	12	19	37				<b>5</b> 56	.   : :			М		Brown and gray, silty CL contains rock fragmer	AY (A-7-6), nts, hard	
700	-	ţ					: :		1 : :	.   : :							
700	698.8 -	19.7							<u> </u>						_ . 698.8		19.
	-	L	100/0.5	1						1	100/0.5	)			. WEATHERED R Gray, brown, and orange,		
195	_	F								.					-	WIE TYTTOT T	
	693.8 -	24.7	100/0 5											9/2	_ ·		
	_	‡	100/0.5	]			: :			·   · 1 ·   · .	100/0.5	'			• •		
590	_	<u> </u>													_		
	688.8 -	29.7	60/0.1							.	60/0.1	,			. 688.8 . 688.7_/\ CRYSTALLINE R	OCK	29. \[\bigcap_29.
	-	F	00,011							.   : :					Gray, brown, and orange,		
685	_	ţ.													METATUFF		
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60		ţ .										RS-3	1		- -650 2		EO
		<u> </u>							1						659.2 Boring Terminated at Eleva	tion 659.2 ft	59 in
	-	+												F	CRYSTALLINE ROCK (N	/IETATUFF)	
	-	F													Other Samples: ST-1 (9.7 - 11.7)		
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WBS	50163	3.1.1			TIP	U-573	88	C	OUNT	ΥF	VAN	GE	OLOG	IST Taylor	, C.				
				ge No. 2				AN RC	OAD) (	_	OWN CREEK					-	ND WTR (ft)		
BORII	NG NO	. EB1-	·C		STA	TION	70+09			OF	T 12 ft RT	AL	IGNME	NT -L-		0 HR.	9.9		
COLL	AR EL	<b>EV</b> . 71	8.5 ft		TOT	AL DE	<b>PTH</b> 59	.3 ft		NO	HING 693,166	EA	STING	1,556,078	3	24 HR.	7.6		
DRILL	RIG/HAI	MMER E	FF./DA	re HDR9	935 CN	1E-55 8	5% 03/20/2	2018			<b>DRILL METHOD</b> S	PT Cor	e Boring		HAMN	IER TYPE	Automatic		
DRILL	LER V	/oodard	d, O.F.		STAI	RT DA	<b>TE</b> 02/2	8/18		СО	. DATE 02/28/18	SU	IRFACE	WATER D	DEPTH N	I/A			
CORE	SIZE	NQ2		2011			<b>N</b> 29.5 f		Λ <b>Τ</b> Λ	ļ.,									
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	REC. (ft)	JN RQD (ft) %	SAMP. NO.	STR REC. (ft) %	RQD (ft) %	L O G	.EV. (ft)	DESCI	RIPTION	I AND REMA	RKS		DEPTH (ft)		
688.7	688.7 _	29.8	4.5	2:54/0.5	(4.4)	(0.0)		(29.2)	(7.3)		9.7			ng @ 29.8			29.8		
685	684.2	-	5.0	2:54/0.5 1:58 3:29 2:05 2:23 1:52	98%	0%		99%	(7.3) 25%		688.7 CRYSTALLINE ROCK  Moderately to severely weathered, soft to hard, very close to moderately closely fractured, brown and white, METATUFF								
680	679.2	39.3	5.0	1:54 1:56 2:19 2:56															
675	-	39.5	5.0	2:16 2:20 1:56 1:58	(5.0) 100%	(2.6) 52%													
073	674.2	44.3	5.0	2:05 1:55 2:06 2:01	(5.0) (0.6) 100% 12% (5.0) (2.6) 100% 52% (4.8) (1.1) 96% 22% (5.0) (1.2) 100% 24%	(1.1) 22%													
670	669.2	49.3	5.0	2:10 2:19 1:58 2:07 2:20		(1.2) 24%													
665	664.2	54.3	5.0	2:18 2:24 2:03 2:19		(1.8) 36%													
660	-			2:07 2:04			RS-3												
	659.2	59.3		2:21							9.2 Boring Termina	ated at	Elevatio	n 659.2 ft in ( TATUFF)	CRYSTALI	INE ROC	59.3 K		
											Other Samples: ST-1 (9.7 - 11.7)								

WBS	50163	.1.1			TI	<b>P</b> U-5738	COUNT	Y ROWAN				GEOLOGIST Taylor, C.		
SITE	DESCR	IPTIO	<b>N</b> Bric	lge No	. 201	on SR 2528 (JULIAN	ROAD) (	OVER TOWN	CREE	K		· · · · · · · · · · · · · · · · · · ·	GROUN	ID WTR (ft)
BOR	ING NO	. B1-A	١		S	<b>TATION</b> 70+30		OFFSET 4	5 ft LT			ALIGNMENT -L-	0 HR.	2.2
COL	LAR ELI	<b>EV.</b> 71	14.4 ft		TO	OTAL DEPTH 44.7	t	NORTHING	693,1	79		<b>EASTING</b> 1,556,019	24 HR.	3.1
DRILI	_ RIG/HAN	MER E	FF./DA	TE HE	R9935	CME-55 85% 03/20/2018	}		DRILL N	METHOD	) SF	PT Core Boring HAMM	ER TYPE	Automatic
DRIL	LER W	oodar	d, O.F.		S	TART DATE 03/03/	8	COMP. DA	<b>TE</b> 03/	03/18		SURFACE WATER DEPTH N	/A	
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	<b>├</b>	0.5ft		<b>!</b>	PER FOOT 50	75 100	SAMP. NO.	MOI	L O G	SOIL AND ROCK DES	CRIPTION	DEPTH (ft)
715	-	- - - -								•	////	-714.4 GROUND SURF - ALLUVIAL - Gray and brown, silty CLAY - medium stiff	(A-7-6), m	0.0 oist,
710	709.4	-	2 100/0.4 60/0.1		4	7		100/0.4		М			TATUFF	10.0 11.3 11.4
700	-	-										Gray, brown, and orange METATUFF - 696.3	METATUR	FF 18.1
695	-											GRANITE		
690	- - - -	-												
680	-								RS-1	-				
675												- - - - - -		
670	-	- - -										- <u></u>	ition 669.7 METATUFF	44.7 ft in
670												Auger refusal at 11  Auger refusal at 11  Auger refusal at 11	.3 feet.	



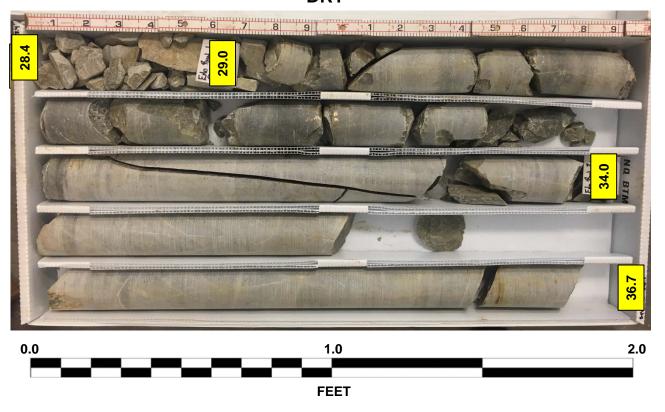
											KE LUG			
	50163				L	U-573					OWAN	GEOLOGIST Taylor, C.	T	
SITE	DESCF	RIPTIO	<b>N</b> Brid	dge No. 2	01 on	SR 25	28 (JULI	IAN RO	DAD)	OVE	R TOWN CREEK		GROUND WTR	(ft)
BOR	ING NO	. B1-A	١		STA	TION	70+30			OF	FSET 45 ft LT	ALIGNMENT -L-	0 HR. 2	2.2
COL	LAR EL	<b>EV.</b> 71	14.4 ft		тот	AL DE	<b>PTH</b> 44	.7 ft		NC	<b>RTHING</b> 693,179	<b>EASTING</b> 1,556,019	<b>24 HR.</b> 3	3.1
DRILL	. RIG/HAI	MMER E	FF./DA	TE HDR9	935 CN	ЛЕ-55 8	5% 03/20/2	2018			DRILL METHOD SP	T Core Boring HAMM	ER TYPE Automatic	iC
DRIL	LER V	Voodard	d, O.F		STA	RT DA	TE 03/0	)3/18		СС	MP. DATE 03/03/18	SURFACE WATER DEPTH N	/A	
COR	E SIZE	NQ2			тот	AL RU	IN 33.3	ft						
ELEV	RUN ELEV	DEPTH	RUN	DRILL	REC.	UN L BOD	SAMP.	STR REC.	RATA	Ļ	_			
(ft)	ELEV (ft)	(ft)	(ft)	RATE (Min/ft)	(ft) %	RQD (ft) %	NO.	(ft) %	(ft) %	Ö G	ELEV. (ft)	ESCRIPTION AND REMARKS	DEPTH	H (ft)
703												Begin Coring @ 11.4 ft		
	703.0	11.4	3.3	0:35/0.3 1:45 2:30 2:17	(3.3) 100%	(0.0) 0%		(4.3) 64%	(0.0) 0%		703.0 Moderately to seve	CRYSTALLINE ROCK rely weathered, soft to medium hard,		11.4
700	699.7	14.7		2:30 2:17	(0.0)			0170	0,0			ured, gray, brown, and orange, META		
	-	‡	5.0	1:15 1:22	(2.6) 52%	(1.1) 22%								
695		‡		2:08 2:27				(25.6)	(11.9)		696.3 Fresh to moderately	weathered, medium hard to very hard		18.1
093	694.7	19.7	5.0	2:01 1:31	(4.9)	(1.8)		96%	45%			sely fractured, gray, white, and pink, (		
		‡		1:43 1:53	98%	36%								
690	689.7	24.7		2:05 2:16							<del>-</del>			
	•		5.0	2:00 2:41	(4.7) 94%	(1.3) 26%								
		ł		2:29 2:18	3470	2070								
685	684.7	29.7	5.0	2:07 2:26	(5.0)	(2.2)					<u>-</u>			
	-	Ŧ	3.0	2:11		44%								
680	679.7 <u>-</u>	24.7		3:50 2:42			RS-1	7						
-	6/9./-	34.7	5.0	2:40 1:59	(4.9)	(1.3)	-				-			
	-	ţ		2:10 2:21	98%	26%								
675	674.7	39.7		2:36 3:22							<del>-</del>			
	-	‡	5.0	2:27 3:01	(5.0) 100%	(4.2) 84%								
		ł		2:52 2:56										
670	669.7	44.7	-	3:18							- 669.7 Boring Terminate	ed at Elevation 669.7 ft in CRYSTALL		44.7
	-	+									Boning Formina.	(METATUFF)		
	-	Ŧ										Auger refusal at 11.3 feet.		
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								ORE L	UG					
WBS	50163	3.1.1			TI	<b>P</b> U-5738	COUNT	TY ROWAN				GEOLOGIST Taylor, C.		
SITE	DESCF	RIPTIO	<b>N</b> Brid	dge No	o. 201 (	on SR 2528 (JULIA	N ROAD)	OVER TOWN	I CREE	K			GROU	ND WTR (ft
BORI	NG NO	. EB2	-C		S	<b>FATION</b> 71+27		OFFSET 3	3 ft LT			ALIGNMENT -L-	0 HR.	13.8
COLL	AR EL	<b>EV.</b> 7	12.8 ft		TO	OTAL DEPTH 25.	l ft	NORTHING	693,2	81		<b>EASTING</b> 1,556,048	24 HR.	FIAD
DRILL	RIG/HAI	MMER E	FF./DA	TE H	DR9935	CME-55 85% 03/20/20	18		DRILL M	1ETHO	D H.	S. Augers HAN	IMER TYPE	Automatic
DRILI	LER V	Voodar	d, O.F		S	TART DATE 03/04	/18	COMP. DA	<b>TE</b> 03/	04/18		SURFACE WATER DEPTH	N/A	
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	0.5ft	0.5ft	_	0 25	S PER FOO	T 75 100	SAMP. NO.	MOI	L O G	SOIL AND ROCK DI	SCRIPTION	N DEPTH (ft
715	- - -											712.8 GROUND SUI		0.
710	-	-				1						Gray and brown, sand medium s	y CLAY (A-6	6),
	707.8 -	5.0	2	4	12							706.9		5.9
705	-	‡		"	12	16				М		RESIDUA Gray, brown, and gre		
	702.8 -	100										(A-2-4), medium dens	to very den	se
İ	702.8 -	10.0	23	30	33					М				
700	_	‡										<del>-</del>		
	697.8 -	15.0	23	48	51									
695	-	‡	23	46	51				99 	М				40
033		‡						. /			0000	694.8Gray, brown, and green,	silty SAND (	A-3), 18.
	692.8 -	20.0	12	29	30					W	0000	very den	e	
690	_	‡									0000	<del>-</del>		
	- 687.8 -	25.0					·   ·  - · <u>·   ·  </u>	· · · · · · · ·			0000	687.8		25.
	-	‡	60/0.1	1				60/0.1				GRYSTALLIN Gray, META		
	-	<u> </u>										Boring Terminated v Penetration Test Refu 687.7 ft in CRYSTAI (METATU	al at Elevati LINE ROCK	on
	-	İ										Strata Break in Split Sp	•	eet.
	-	-												
	_	‡										<del>-</del>		
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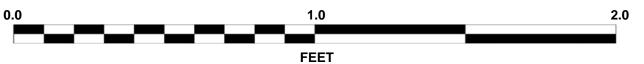
SR2526 (Julian Road) widening- Bridge over Town Creek

U-5738 – EB1-B STA. 27+53 @ 27' Rt. Box 1 of 4: 8.3 FEET DRY

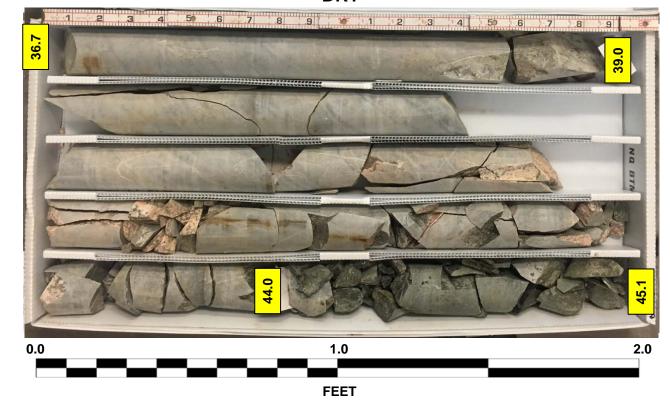


U-5738 – EB1-B STA. 27+53 @ 27' Rt. Box 1 of 4: 8.3 FEET WET

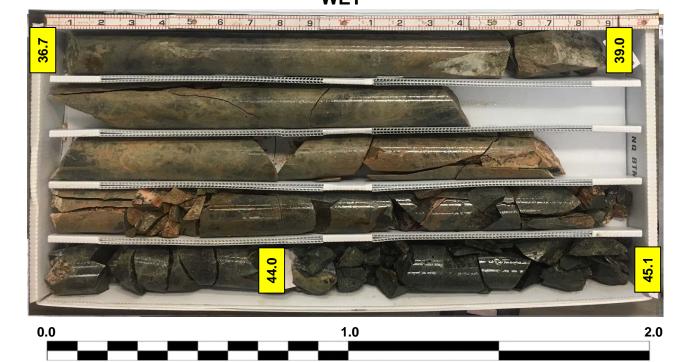




U-5738 – EB1-B STA. 27+53 @ 27' Rt. Box 2 of 4: 8.4 FEET DRY

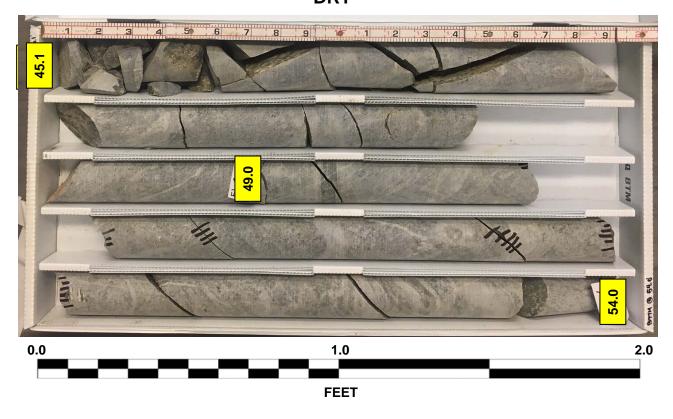


U-5738 – EB1-B STA. 27+53 @ 27' Rt. Box 2 of 4: 8.4 FEET WET

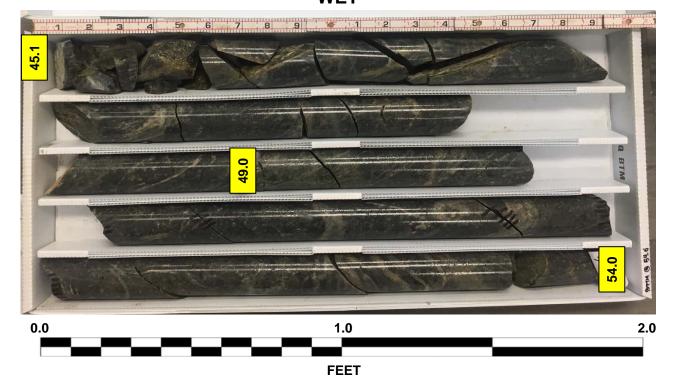


**FEET** 

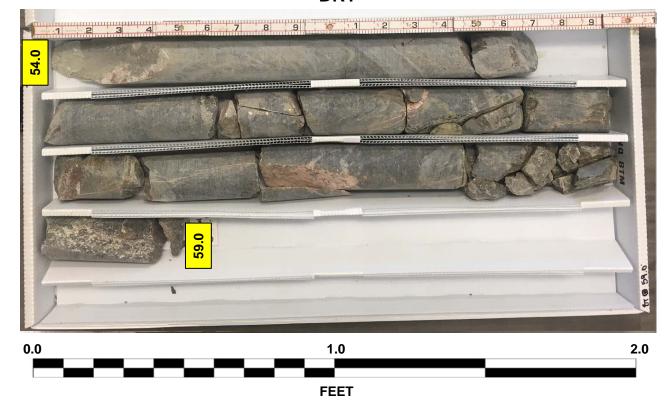
U-5738 – EB1-B STA. 27+53 @ 27' Rt. Box 3 of 4: 8.9 FEET DRY



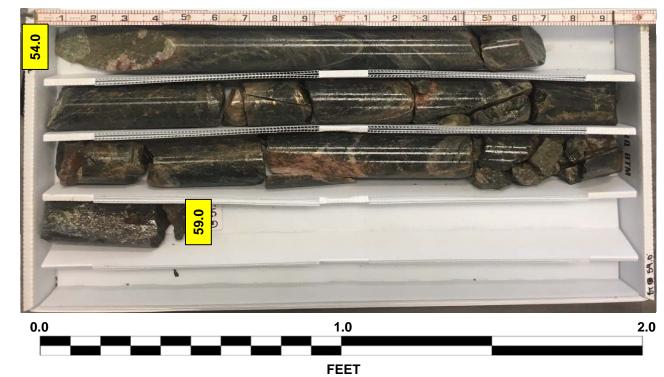
U-5738 – EB1-B STA. 27+53 @ 27' Rt. Box 3 of 4: 8.9 FEET WET



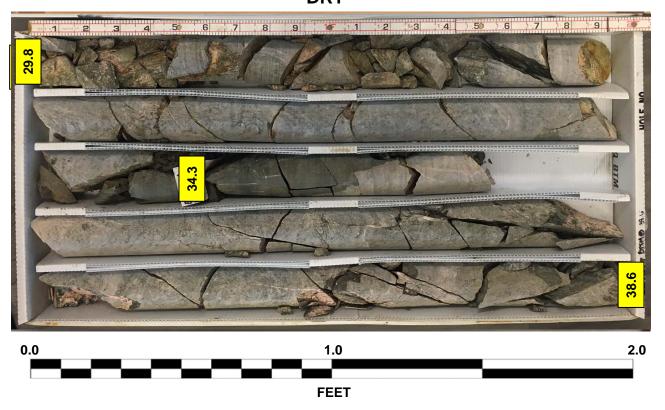
U-5738 – EB1-B STA. 27+53 @ 27' Rt. Box 4 of 4: 5.0 FEET DRY



U-5738 – EB1-B STA. 27+53 @ 27' Rt. Box 4 of 4: 5.0 FEET WET



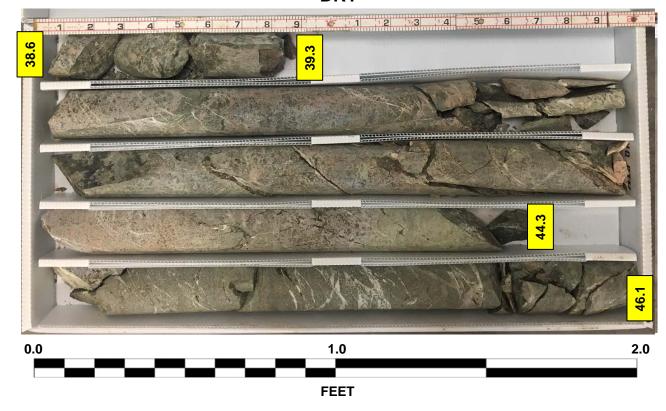
U-5738 – EB1-C STA. 27+53 @ 27' Rt. Box 1 of 4: 8.8 FEET DRY



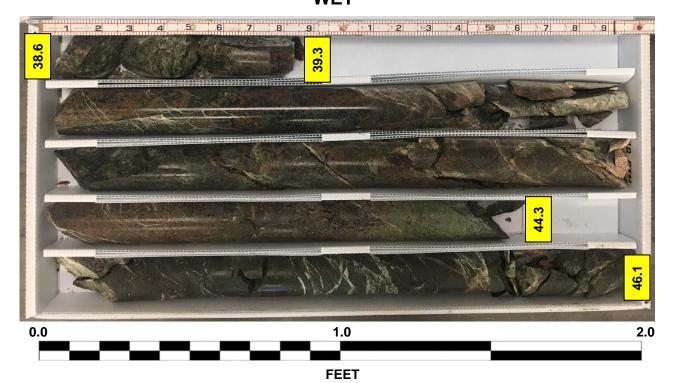
U-5738 – EB1-C STA. 27+53 @ 27' Rt. Box 1 of 4: 8.8 FEET WET



U-5738 – EB1-C STA. 27+53 @ 27' Rt. Box 2 of 4: 7.5 FEET DRY

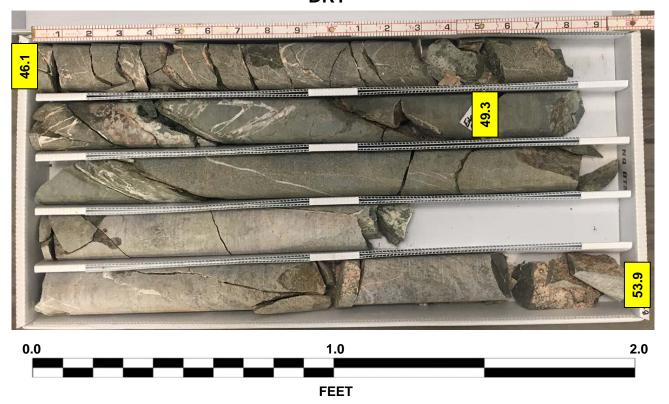


U-5738 – EB1-C STA. 27+53 @ 27' Rt. Box 2 of 4: 7.5 FEET WET



SR2526 (Julian Road) widening- Bridge over Town Creek

U-5738 – EB1-C STA. 27+53 @ 27' Rt. Box 3 of 4: 7.8 FEET DRY

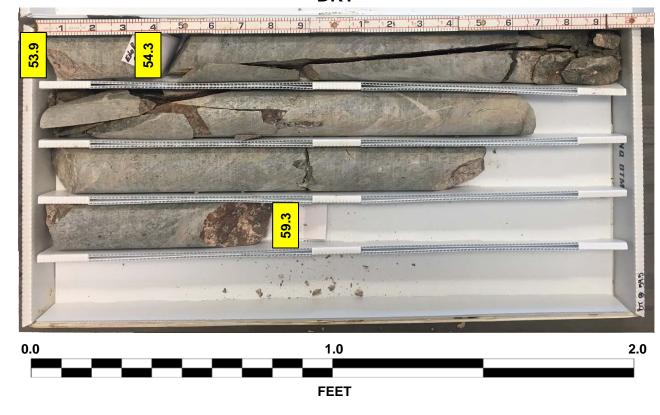


U-5738 – EB1-C STA. 27+53 @ 27' Rt. Box 3 of 4: 7.8 FEET WET

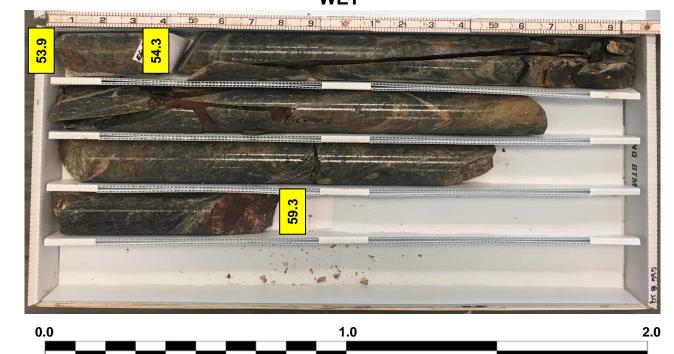


0.0 1.0 2.0 FEET

U-5738 – EB1-C STA. 27+53 @ 27' Rt. Box 4 of 4: 5.4 FEET DRY

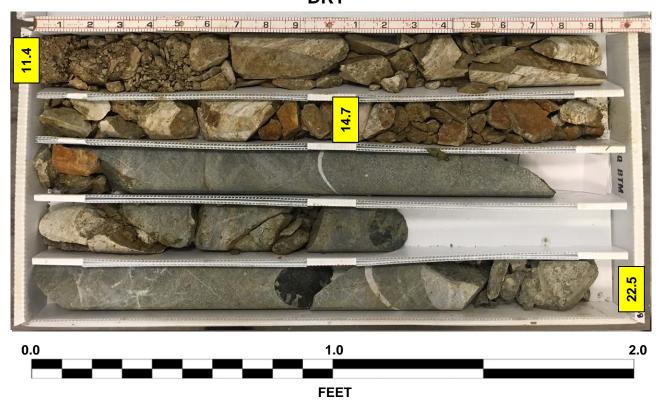


U-5738 – EB1-C STA. 27+53 @ 27' Rt. Box 4 of 4: 5.4 FEET WET

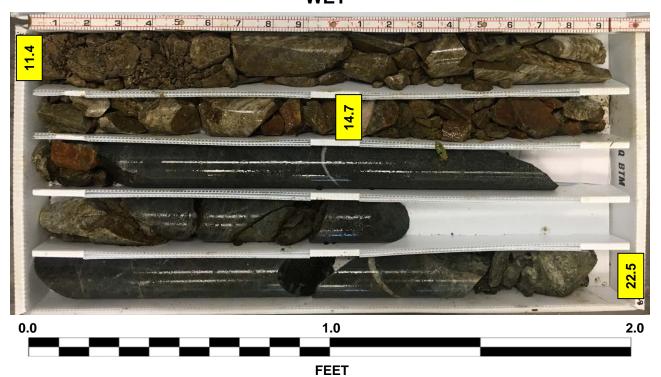


**FEET** 

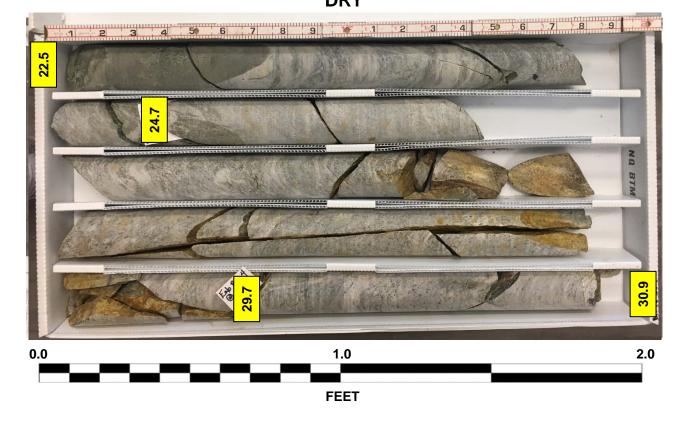
U-5738 – B1-A STA. 27+53 @ 27' Rt. Box 1 of 4: 11.1 FEET DRY



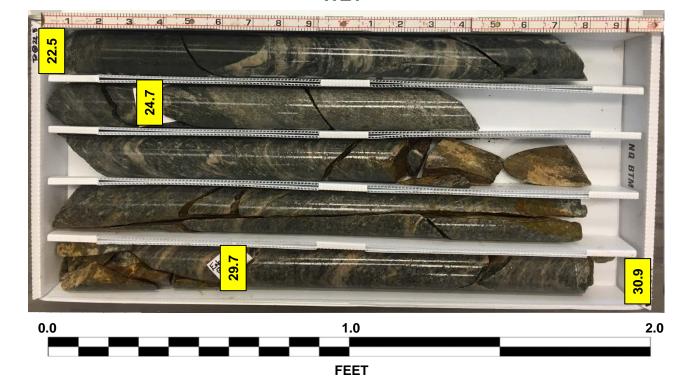
U-5738 – B1-A STA. 27+53 @ 27' Rt. Box 1 of 4: 11.1 FEET WET



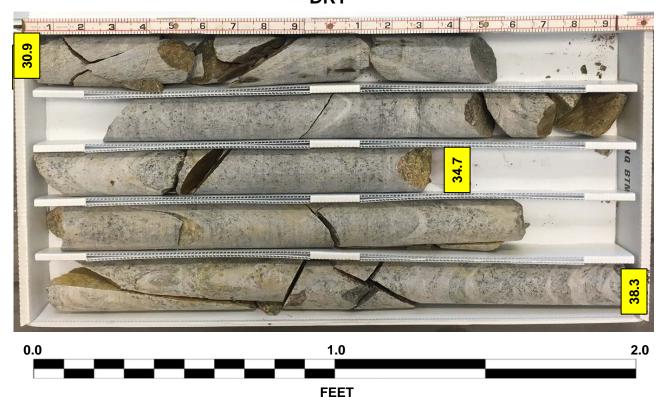
U-5738 – B1-A STA. 27+53 @ 27' Rt. Box 2 of 4: 8.4 FEET DRY



U-5738 – B1-A STA. 27+53 @ 27' Rt. Box 2 of 4: 8.4 FEET WET



U-5738 – B1-A STA. 27+53 @ 27' Rt. Box 3 of 4: 7.4 FEET DRY



U-5738 – B1-A STA. 27+53 @ 27' Rt. Box 3 of 4: 7.4 FEET WET



U-5738 – B1-A STA. 27+53 @ 27' Rt. Box 4 of 4: 8.4 FEET DRY



U-5738 – B1-A STA. 27+53 @ 27' Rt. Box 4 of 4: 8.4 FEET WET



PROJECT	REFERENCE	NO.	SHEET NO
	U-5738		21

SOIL TEST RESULTS															
SAMPLE	OFFSET	STATION	DEPTH	AASHTO	1.1	PI	% BY WEIGHT				% PASSING (SIEVES)			%	%
NO.	OTTODI	DIMITON	INTERVAL	CLASS.	L.L.	1 .1.	C.SAND	F.SAND	SILT	CLAY	10	40	200	MOISTURE	ORGANIC
ST- 1	12 RT	70+09	9.7-11.7	A-7-6(13)	49	22	16	19	41.3	23.7	93.4	85. 2	<i>63.2</i>	37.0	-

PROJECT	REFERENCE	NO.	SHEET NO.
	U-5738		22

	LABORATORY SUMMARY SHEET FOR ROCK CORE SAMPLES											
SAMPLE NO.	BORING NO.	DEPTH (FT.)	ROCK TYPE	GEOLOGIC MAP UNIT	RUN RQD	LENGTH (FT)	DIAMETER (FT)	UNIT WEIGHT (PCF)	UNCONFINED COMPRESSIVE STRENTH (PSI)	YOUNG'S MODULUS (PSI)		REMARKS
RS- 1	B1- A	<i>32. 3- 32. 95</i>	GRANITE	DSg	44%	0. 358	0. 166	168	18390	-	-	-
RS- 2	L- EB 1- B	40. 2- 40. 85	METATUFF	CVz	18%	0. 355	0. 166	170	3492	-	-	_
RS- 3	L- EB1- C	57. 3- 58. 1	METATUFF	CVz	36%	0.378	0. 166	17 1	10336	-	-	-



Photo 1: Looking upstream Town Creek



Photo 3: Looking South (Down-Station) along SR 2526 (Julian Road)



Photo 2: Looking downstream Town Creek