ENCE: 410185
REFER
P.4.R.84
PROJECT: 17B

CONTENTS

DESCRIPTION

LEGEND (SOIL & ROCK)

CROSS SECTION(S)

CORE PHOTOGRAPH(S)

SITE PHOTOGRAPH(S)

SUPPLEMENTAL LEGEND (GSI)

BORE LOG(S) & CORE REPORT(S)

TITLE SHEET

SITE PLAN PROFILE(S)

SHEET NO.

2Α

5-6

7-10

П

STATE OF NORTH CAROLINA

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY HALIFAX

PROJECT DESCRIPTION BRIDGE NO. 185 ON -L-(SR 1616) OVER MARSH SWAMP AT STA. 15+19.5

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
V.C.	410185	1	12

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 1991 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 BORCHOLE. THE LABORATORY SAMPLE DATA AND THE IN STIU (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 NIDICATED 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.

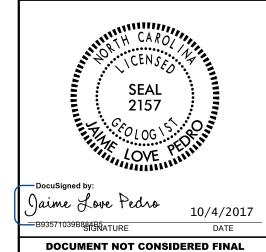
THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT, FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERRETATIONS 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 N. T. ROBERSON J. L. PEDRO P. V. MEFFERD D. G PINTER INVESTIGATED BY J. L. PEDRO DRAWN BY J. L. PEDRO CHECKED BY N. T. ROBERSON SUBMITTED BY N. T. ROBERSON DATE _SEPTEMBER 2017



UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO. SHEET NO. 2

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	<u>WELL GRADED</u> - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. <u>UNIFORMLY GRADED</u> - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.	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.	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.
ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM DI586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING:	GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.	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	AQUIFER - A WATER BEARING FORMATION OR STRATA.
CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH	ANGULARITY OF GRAINS	REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:	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:	50//20///2	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 VIELD 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 OPERANCE MATERIALS	MINERALOGICAL COMPOSITION	CRYSTALLINE CRYSTA	WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND
LLASS. (≤ 35% PASSING *200) (> 35% PASSING *200)	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. 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.	SURFACE. <u>CALCAREOUS (CALC.)</u> - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
GROUP A-1 A-3 A-2 A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5 CLASS. A-1-6 A-1-b A-2-4 A-2-5 A-2-6 A-2-7 B-2-5 A-3 A-6, A-7	COMPRESSIBILITY	NON-CRYSTALLINE FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YELLD SPT REFUSAL IF TESTED.	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM
SYMBOL 000000000000000000000000000000000000	SLIGHTLY COMPRESSIBLE LL < 31	ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.	OF SLOPE.
7. PASSING	MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50	COASTAL PLAIN COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SEDIMENTARY ROCK SPT REFUSAL, ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED	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.
*10 50 MX GRANULAR SIL1- MUCK,	PERCENTAGE OF MATERIAL	(CP) SHELL BEDS, ETC. WEATHERING	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT
*40 30 MX 50 MX 51 MN PEAT SOILS SOILS SOILS SOILS SOILS SOILS	GRANULAR SILT - CLAY ORGANIC MATERIAL SOILS SOILS OTHER MATERIAL	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER	ROCKS OR CUTS MASSIVE ROCK.
MATERIAL	TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10%	HAMMER IF CRYSTALLINE.	DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.
PASSING *40 SOILS 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,	DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE
LL 48 MX 41 MN 48 MX 41 MN 48 MX 41 MN 48 MX 41 MN 40 MX 41 MN LITTLE OR PI 6 MX NP 18 MX 18 MX 18 MX 11 MN 11 MN 18 MX 18	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 COLUMN	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
USUAL TYPES STONE FRACS. FINE SILTY OR CLAYEY SILTY CLAYEY MATTER		(SLI.) I INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.	SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
OF MAJOR GRAVEL, AND MATERIALS SAND GRAVEL AND SAND SOILS SOILS	▼ STATIC WATER LEVEL AFTER <u>24</u> HOURS	MODERATE SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN	FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM
CEN BATING FAIR TO	∇PW PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA	(MOD.) GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS	PARENT MATERIAL.
AS SUBGRADE EXCELLENT TO GOOD FAIR TO POOR POOR UNSUITABLE	O→∭► SPRING OR SEEP	DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.	FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.
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	FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.
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.	JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
PRIMARY SOIL TYPE COMPACTNESS OR RANGE OF STANDARD RANGE OF UNCONFINED PENETRATION RESISTENCE COMPRESSIVE STRENGTH	ROADWAY EMBANKMENT (RE) 25/825 DIP & DIP DIRECTION	IF TESTED, WOULD YIELD SPT REFUSAL	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO
CONSISTENCY (N-VALUE) (TONS/FT ²)	WITH SOIL DESCRIPTION F ROCK STRUCTURES	SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC CLEAR AND EVIDENT BUT	ITS LATERAL EXTENT.
GENERALLY VERY LOOSE 4 TO 10	SOIL SYMBOL OPT ONT TEST BORING SLOPE INDICATOR INSTALLATION	(SEV.) REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED 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.
MEDIUM DENSE 10 TO 30 N/A	ARTIFICIAL FILL (AF) OTHER AUGER BORING COME PENETROMETER THAN ROADWAY EMBANKMENT TEST	IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF	MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
(NON-COHESIVE) DENSE 30 TO 50 VERY DENSE > 50	THAN ROADWAY EMBANKMENT THAN ROADWAY EMBANKMENT THAN ROADWAY EMBANKMENT 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	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE
VERY SOFT < 2 < 0.25	— INFERRED SOIL BOUNDARY — CORE BORING ● SOUNDING ROD	(V SEV.) REMAINING, SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR	OF AN INTERVENING IMPERVIOUS STRATUM.
GENERALLY SOFT 2 TO 4 0.25 TO 0.5 SILT-CLAY MEDIUM STIFF 4 TO 8 0.5 TO 1.0	INFERRED ROCK LINE MN MONITORING WELL TEST BORING	VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <u>IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF</u> COMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND	RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
MATERIAL STIFF 8 TO 15 1 TO 2	A PIEZOMETER	SCATTERED CONCENTRATIONS, QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS, SAPROLITE IS	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
(COHESIVE) VERY STIFF 15 TO 30 2 TO 4 HARD > 30 > 4	TTT ALLUVIAL SOIL BOUNDARY ALLUVIAL SOIL BOUNDARY INSTALLATION SPT N-VALUE	ALSO AN EXAMPLE.	RUN AND EXPRESSED AS A PERCENTAGE.
TEXTURE OR GRAIN SIZE	RECOMMENDATION SYMBOLS	ROCK HARDNESS VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK, BREAKING OF HAND SPECIMENS REQUIRES	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	UNDERCUT UNCLASSIFIED EXCAVATION - UNCLASSIF	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 STILLING ASSISTED EXCAVATION - 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	UNDERCUT ACCEPTABLE DEGRADABLE ROCK EMBANKMENT OR 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
(BLDR.) (COB.) (GR.) (CSE. SD.) (F SD.) (SL.) (CL.)	ABBREVIATIONS	MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK, GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK, HAND SPECIMENS CAN BE DETACHED	OR SLIP PLANE.
GRAIN MM 305 75 2.0 0.25 0.05 0.005	AR - AUGER REFUSAL MED MEDIUM VST - VANE SHEAR TEST BT - BORING TERMINATED MICA, - MICACEOUS WEA, - WEATHERED	BY MODERATE BLOWS.	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
SIZE IN. 12 3	BT - BORING TERMINATED MICA MICACEOUS WEA WEATHERED CL CLAY MOD MODERATELY 7 - UNIT WEIGHT	MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. HARD CAN BE EXCAVATED IN SMALL CHIPS TO PEICES I INCH MAXIMUM SIZE BY HARD BLOWS OF THE	WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER, SPT REFUSAL IS PENETRATION EQUAL
SOIL MOISTURE - CORRELATION OF TERMS	CPT - CONE PENETRATION TEST NP - NON PLASTIC $\gamma_{ m d}$ - DRY UNIT WEIGHT	POINT OF A GEOLOGIST'S PICK.	TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.
SOIL MOISTURE SCALE FIELD MOISTURE GUIDE FOR FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION	DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST SAMPLE ABBREVIATIONS	SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN	STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
- SATURATED - USUALLY LIQUID; VERY WET, USUALLY	DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK e - VOID RATIO SD SAND, SANDY SS - SPLIT SPOON	PIECES CAN BE BROKEN BY FINGER PRESSURE.	STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY
(SAT.) FROM BELOW THE GROUND WATER TABLE	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	THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.
PLASTIC LIQUID LIMIT	FOSS FOSSILIFEROUS SLI SLIGHTLY RS - ROCK FRAC FRACTURED, FRACTURES TCR - TRICONE REFUSAL RT - RECOMPACTED TRIAXIAL	FINGERNAIL.	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
RANGE - WET - (W) SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE	FRAGS FRAGMENTS W - MOISTURE CONTENT CBR - CALIFORNIA BEARING	FRACTURE SPACING BEDDING	BENCH MARK: BM #1 - NAIL SET IN 18" MAPLE TREE, -L- STA. 14+77.79,
(P) PL PLASTIC LIMIT	HI HIGHLY V - VERY RATIO	TERM SPACING TERM THICKNESS VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDDED 4 FEET	OFFSET - 191' RT
OM _ OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE	EQUIPMENT USED ON SUBJECT PROJECT DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE:	WIDE 3 TO 10 FEET THICKLY BEDDED 1.5 - 4 FEET	ELEVATION: II8.48 FEET
SL SHRINKAGE LIMIT	CME-45C CLAY BITS X AUTOMATIC MANUAL	MODERATELY CLOSE	NOTES:
- DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE	G. CONTINUOUS ELICHT VICEB	VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET THINLY LAMINATED < 0.008 FEET	TOP OF RAIL AT EBISTA.14+97,14'RT ELEV. = 126.2'
PLASTICITY	X CME-55	INDURATION	1
		FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.	TOP OF RAIL AT EB2 STA.15+44,14'RT ELEV.= 126.2'
NON PLASTIC 0-5 VERY LOW	TUNG-CARRIDE INSERTS	RUBBING WITH FINGER FREES NUMEROUS GRAINS;	
SLIGHTLY PLASTIC 6-15 SLIGHT MODERATELY PLASTIC 16-25 MEDIUM	VANE SHEAR TEST X CASING X W/ ADVANCER HAND TOOLS:	GENILE BLUW BY HAMMER DISINTEDRATES SAMPLE.	
HIGHLY PLASTIC 26 OR MORE HIGH	POST HOLE DIGGER	MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.	
COLOR	TRICONE 2 5/k TUNGCARB. SOUNDING ROD	INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE;	
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN. RED. YELLOW-BROWN, BLUE-GRAY).	CORE BIT SOONDING NO.	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-
		SHITTLE BILENCS MUNUSS UNHINS.	UATE: 8-15-14

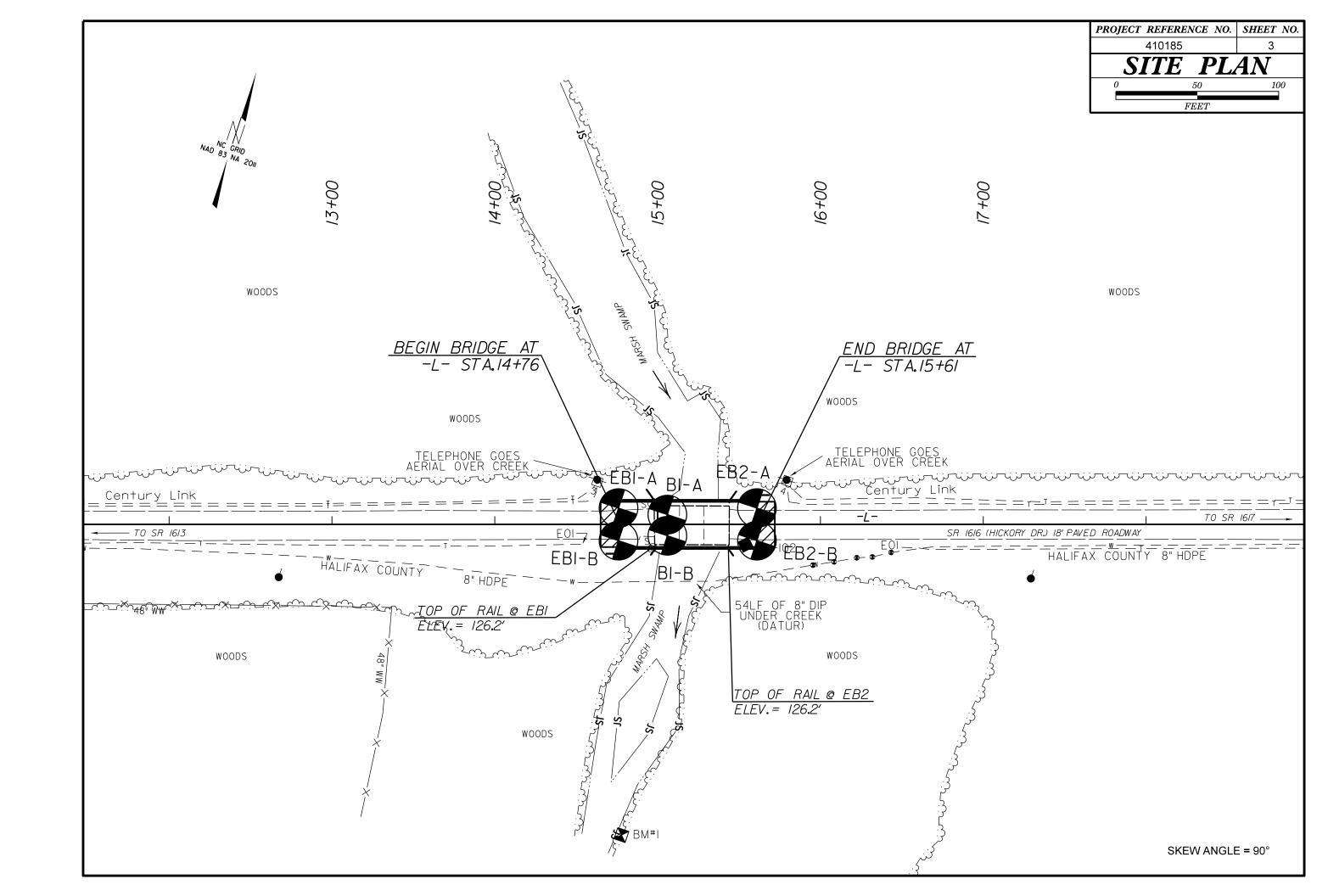
PROJECT REFERENCE NO.	SHEET NO.
410185	2A

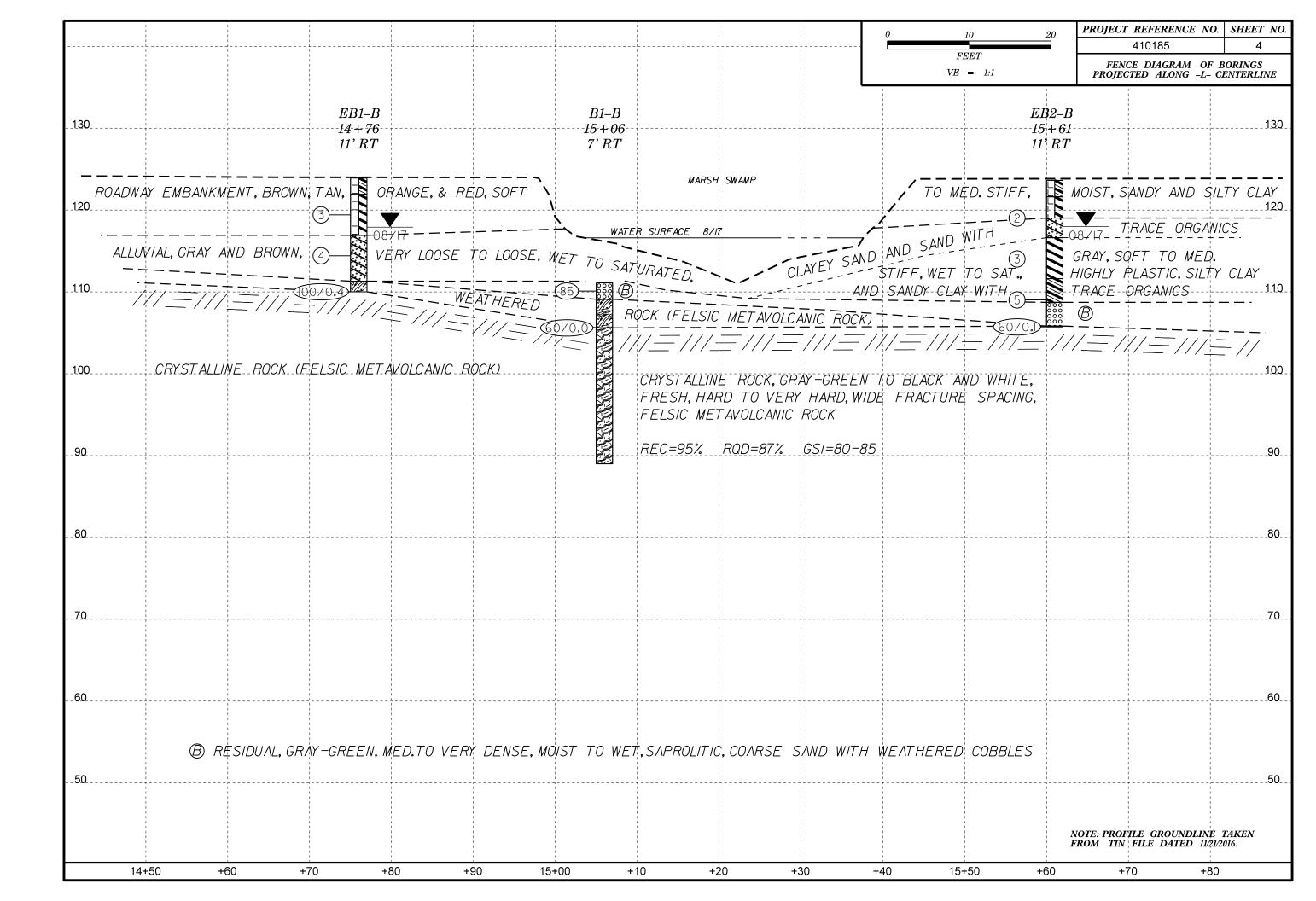
DATE: 8-19-16

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT

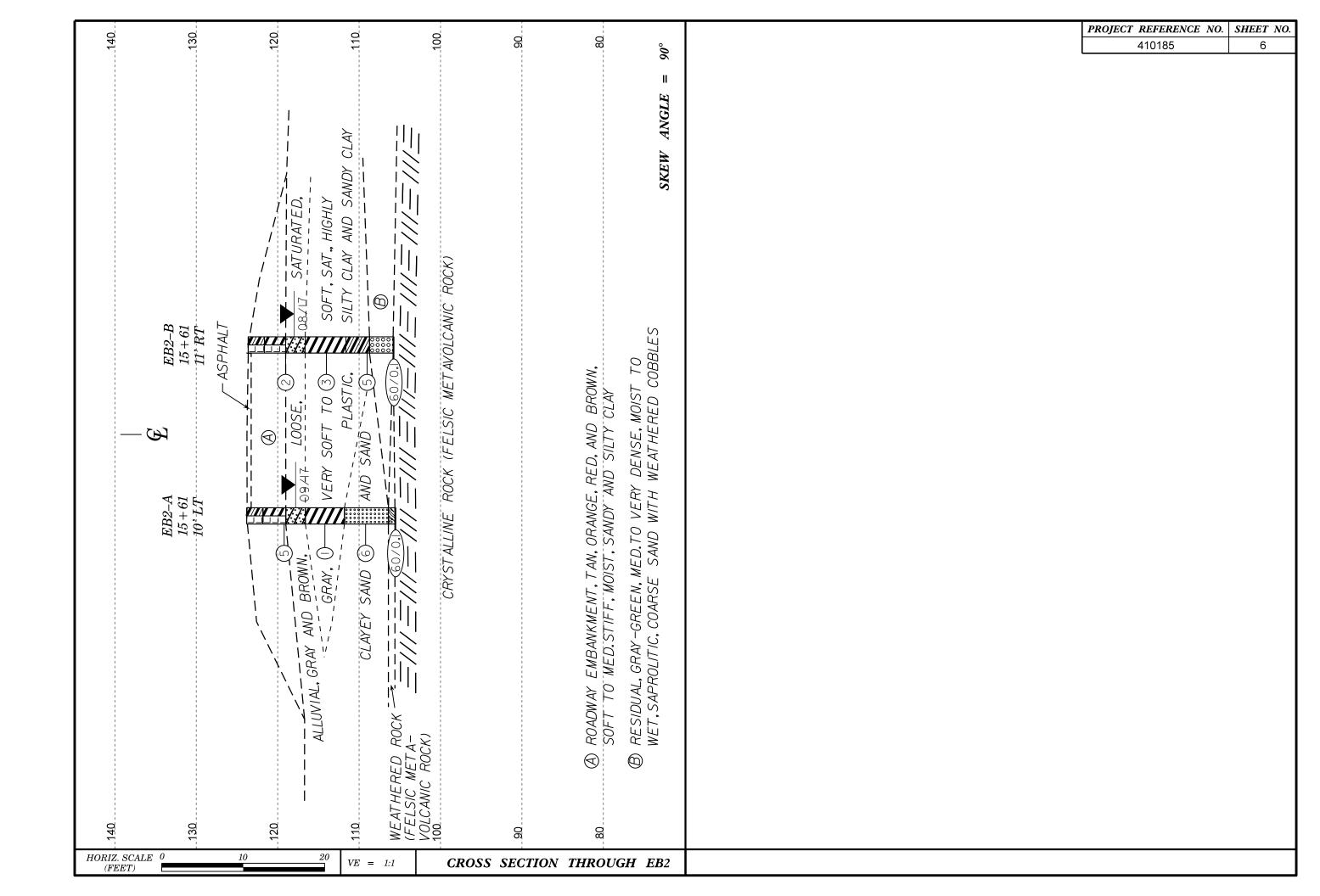
SUBSURFACE INVESTIGATION

		S	UPPLEME FR	ENTAL L OM AAS	EGEND, G. SHTO LRI	EOLOGIC FD BRID	AL STRENGTH INDEX (GSI) TABLES GE DESIGN SPECIFICATIONS
AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jo.	ınted Ro	ock Mass (Marı	nos and Hoek, 2	2000)			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 Marınos, 2000)		aces	70		8 e o	s O O	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 surfa	G00D Rough, slightly weathered, iron stained surfaces	FAIR Smooth, moderately weathered and altered surfaces	POOR Slickensided, highly weathered surface with compact coatings or fillings or angular fragments	4 v	Surface conditions (barticularly of the pedding planes), choose a pox in the chart. Focate the bosition in the pox that corresponds to the condition of the discontinuities and estimate the average value controlled failures. Mere and south of series of freed surfaces with controlled failures. Mere and south of series of freed surfaces with controlled failures with controlled surfaces with contr
STRUCTURE			REASING S		1	1	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	70		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. 70 A
disturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets	OF ROCK		60				B. Sand- stone with thin inter- stone and siltstone siltstone or silty shale with sand- B. Weak siltstone or silty shale or clayey B. C. D B. C. Sand- stone and siltstone or silty shale or clayey
VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets	OCKING		5	50			layers of siltstone amounts stone layers shale with sandstone layers
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 of clayers of transformed G. Undisturbed silty or clayey shale forming a chaotic structure with pockets thin sandstone layers of lay. Thin layers of lay. Thin layers of sandstone are transformed
LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes	, ♥	N/A	N/A			10	into small rock pieces. Means deformation after tectonic disturbance

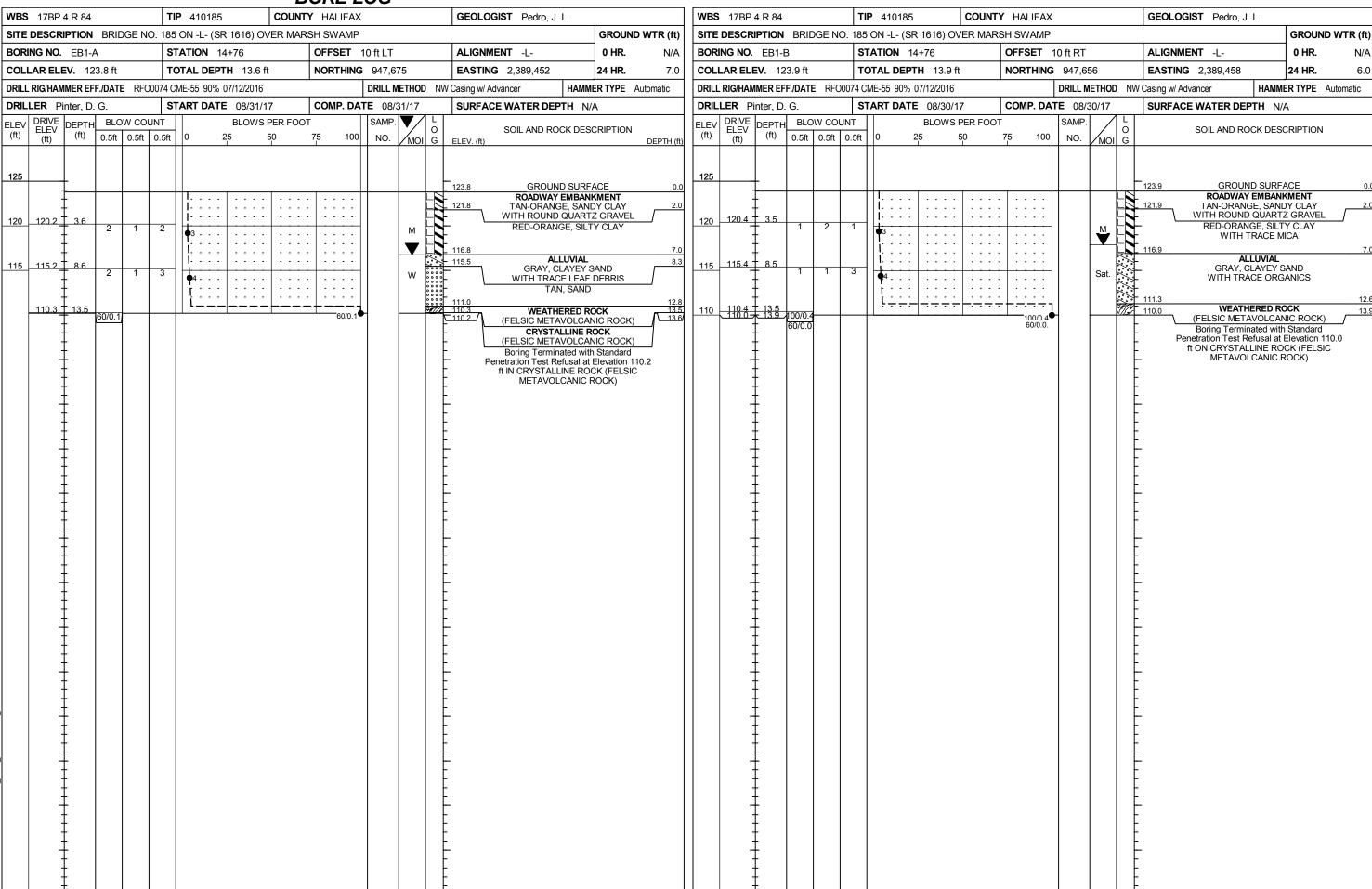




140	130	<u>†</u> 10.	100	80	130.	120.	110.	100.	-06	PROJECT REFERENCE	
		; AWI(ICK)		J.		 				410185	5
	======================================	WITH TRACE WITH TRACE		SKEW ANGLE = 90°	BI-A $BI-B$ $BI-B$ $BI-B$ $BI-B$	6' LT * MARSH SWAWF		CRYSTALLINE ROCK, GRAY-GREEN TO BLACK TELSIC METAVOLCAWIC ROCK) WIDE FRACTURE SPACING, TELSIC METAVOLCAWIC ROCK	REC=95% ROD=87% GS/= 80-85	AY-GREEN, MED.TO VERY DENSE, MOIS	ROLLI IC, COARSE SAND WITH $E = 90^{\circ}$
140	130	110_	.100	80	130	_120_	_110_	100_	06 -	80	02
HORIZ. SCALE 0 (FEET)	10	$\begin{array}{c cccc} 20 & VE & = & 1:1 \end{array}$	CROSS SECTION	THROUGH EBI	HORIZ. SCALE (FEET)		10	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	\boldsymbol{C}	ROSS SECTION TH	ROUGH B1



GEOTECHNICAL BORING REPORT BORE LOG



		V S E C
		E
		1

SHEET 8

BORING NO. B1-A STATION 15+06 OFFSET 6 ft LT ALIGNMENT -L- 0 COLLAR ELEV. 111.2 ft TOTAL DEPTH 2.3 ft NORTHING 947,681 EASTING 2,389,481 24					
COLLAR ELEV. 111.2 ft TOTAL DEPTH 2.3 ft NORTHING 947,681 EASTING 2,389,481 24	ROUND WTR (ft)				
DRILL RIG/HAMMER EFF,/DATE RF00074 CME-55 90% 07/12/2016 DRILL METHOD NW Casing w/ Advancer HAMMER T DRILLER Pinter, D. G. START DATE 08/31/17 COMP. DATE 08/31/17 SURFACE WATER DEPTH 5.5ft ELEV (ft) DEPTH (ft) DEPTH (ft) BLOW COUNT (ft) DEDIC (ft) DEDIC (ft) DEPTH (ft)	ALIGNMENT -L- 0 HR. N/A				
DRILLER Pinter, D. G. START DATE 08/31/17 COMP. DATE 08/31/17 SURFACE WATER DEPTH 5.5ft ELEV (ft) DRIVE ELEV (ft) DEPTH (ft) BLOW COUNT (ft) BLOWS PER FOOT 0.5ft SAMP. NO. NO. MOI G SOIL AND ROCK DESCRIFM NO. 110 110.3 0.9 80 20/0.2 WATER SURFACE (08/3) WHITE-TAN, COARSE S. AND QUARTZ PEA-GRAW WITH LEAF DEBRISM WITH LEAF DEBRISM WEATHERED ROCK (FELSIC METAVOLCANIC F. Boring Terminated with State Penetration Test Refusal at Eleventration Test Refusal	HR. N/A				
ELEV (ft) DRIVE (LEV (ft) DEPTH BLOW COUNT (ft) 0.5ft 0.5ft 0.5ft 0 25 50 75 100 NO. MOI G SOIL AND ROCK DESCRIF	YPE Automatic				
SOIL AND ROCK DESCRIF (ft) (ft)					
110	PTION				
110					
	ROCK) ndard ation 108.9 FELSIC				

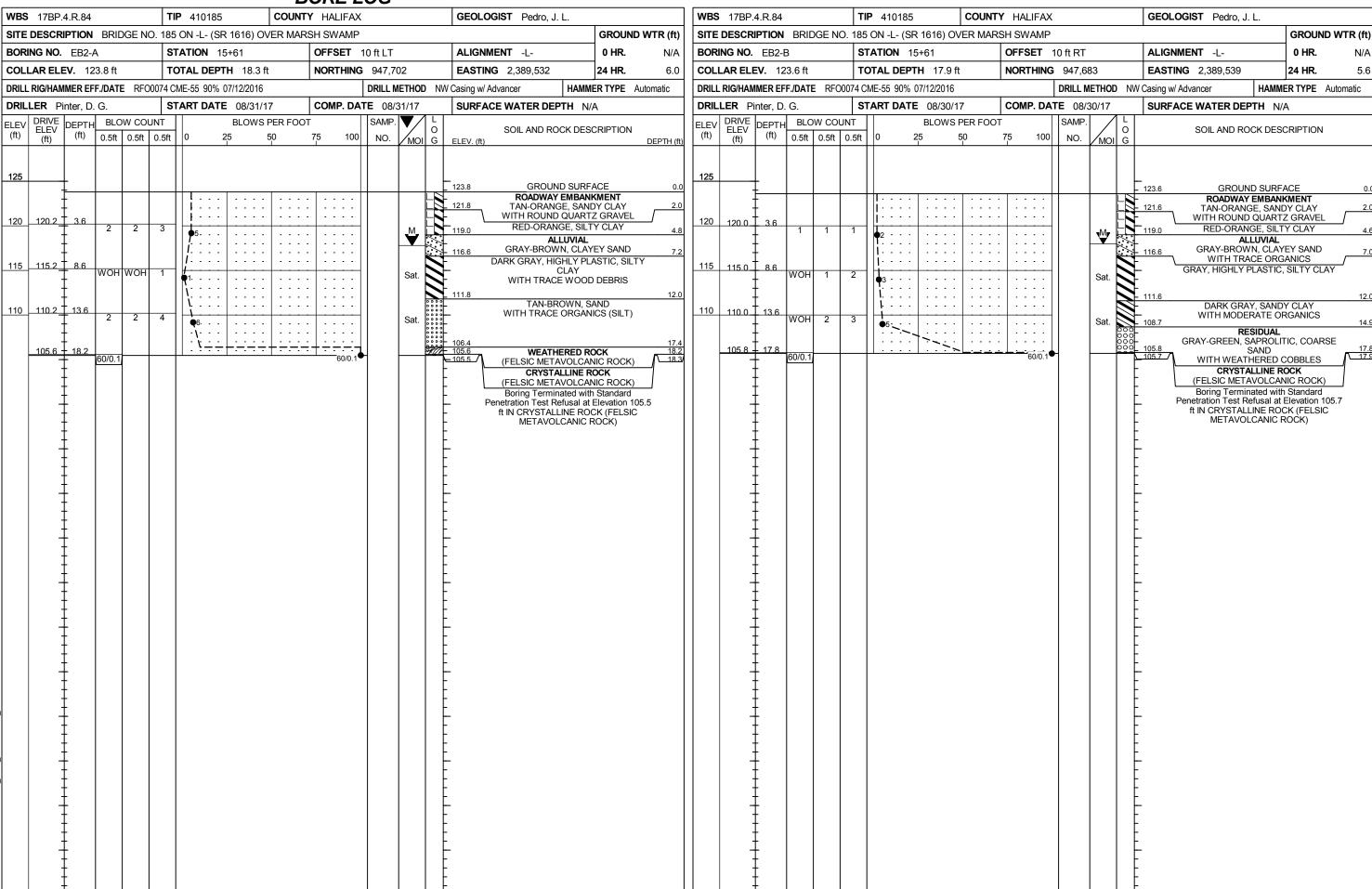
GEOTECHNICAL BORING REPORT BORE LOG

BORE LOG TIP 410185 **WBS** 17BP.4.R.84 COUNTY HALIFAX GEOLOGIST Pedro, J. L. SITE DESCRIPTION BRIDGE NO. 185 ON -L- (SR 1616) OVER MARSH SWAMP **GROUND WTR (ft)** OFFSET 7 ft RT ALIGNMENT -L-BORING NO. B1-B STATION 15+06 0 HR. N/A COLLAR ELEV. 111.1 ft TOTAL DEPTH 22.1 ft **NORTHING** 947,669 **EASTING** 2,389,485 24 HR. N/A DRILL RIG/HAMMER EFF./DATE RFO0074 CME-55 90% 07/12/2016 DRILL METHOD NW Casing W/SPT & Core HAMMER TYPE Automatic DRILLER Pinter, D. G. **START DATE** 08/30/17 COMP. DATE 08/30/17 **SURFACE WATER DEPTH** 5.5ft ELEV DRIVE ELEV (ft) DEPTH BLOW COUNT (ft) 0.5ft 0.5ft 0.5ft **BLOWS PER FOOT** SAMP. SOIL AND ROCK DESCRIPTION (ft) 0.5ft 0.5ft 0.5ft MOI G NO. 75 100 ELEV. (ft) WATER SURFACE (08/30/17) 115 **GROUND SURFACE** W 0000 22 RESIDUAL GRAY-GREEN, SAPROLITIC, COARSE SAND WITH WEATHERED COBBLES WEATHERED ROCK 105.6 105 (FELSIC METAVOLCANIC ROCK) CRYSTALLINE ROCK GRAY-GREEN TO BLACK AND WHITE, RS-1 FRESH, HARD TO VERY HARD, WIDE FRACTURE SPACING, FELSIC 100 METAVOLCANIC ROCK REC=95% RQD=87% GSI-80-85 95 90 Boring Terminated at Elevation 89.0 ft IN CRYSTALLINE ROCK (FELSIC METAVOLCANIC ROCK)

GEOTECHNICAL BORING REPORT CORE LOG

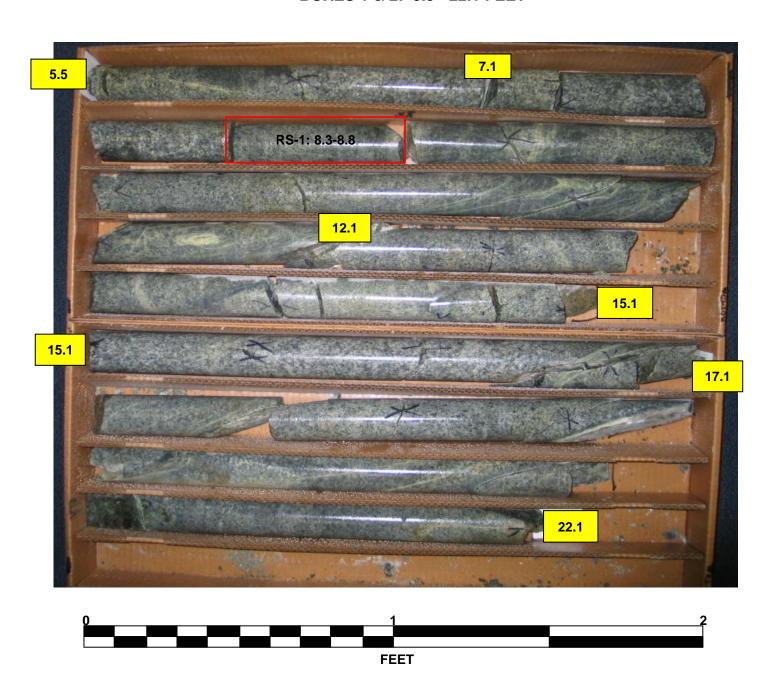
									C	0	RE L	OG							
WBS	17BP.4	1.R.84			TIP	41018	35	С	OUNT	Υ	HALIFAX			GEOLOG	IST	Pedro, c	J. L.		
SITE	DESCRI	PTION	BRI	DGE NO.	185 C	N -L- (SR 1616) OVEI	R MAF	RSH	SWAMP							GROU	ND WTR (ft)
BOR	ING NO.	B1-B			STA	TION	15+06			OF	FFSET 7	ft RT		ALIGNME	ENT	-L-		0 HR.	N/A
COLI	LAR ELE	V . 11	1.1 ft		TOT	AL DE	PTH 22	.1 ft		NC	ORTHING	947,669		EASTING	2,3	89,485		24 HR.	N/A
DRILL	RIG/HAM	MER EF	F./DATI	E RFO0	074 CM	IE-55 9	0% 07/12/2	2016				DRILL METHO	DD NW	Casing W/SF	PT & Co	ore	HAMN	MER TYPE	Automatic
DRIL	LER Pi	nter, D.	. G.		STAI	RT DA	TE 08/3	0/17		CC	OMP. DAT	E 08/30/17	•	SURFACE	E WA	TER DE	PTH 5	5.5ft	
COR	E SIZE	NXWL	1				N 16.6 f		\ \ \ \ \	ļ.,									
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	REC. (ft)	JN RQD (ft) %	SAMP. NO.	REC. (ft)	RQD (ft) %	L O G	ELEV. (f	t)	DI	ESCRIPTION	N AND	REMAR	KS		DEPTH (ft)
105.6 105	105.6	5.5	4.0	N 00/0 0	(4.0)	(4.0)		(45.7)	(4.4.5)	- Care .				Begin Co	ring (5) 5.5 ft			
	105.6	- <u>5.5</u> 7.1 -	1.6 5.0	N=60/0.0 1:17/1.0 1:11/0.6 1:53/1.0 2:02/1.0	(1.3) 81% (5.0) 100%	(1.2) 75% (5.0) 100%	RS-1	95%	87%		105.6	GRAY-GR		CRYSTA ESH, HARD NG, FELSIC	TO V	ERY HAI			5.5 IRE
100	99.0	12.1	5.0	1:36/1.0 1:45/1.0 1:57/1.0		(4.4)								G:	SI-80-8	85			
95	94.0	- 17.1		1:46/1.0 1:47/1.0 1:38/1.0 1:52/1.0 1:43/1.0	88%	88%													
	04.0	<u>- 17.1 -</u> - -	5.0	1:52/1.0 1:56/1.0 1:38/1.0	(5.0) 100%	(3.9) 78%													
90	89.0	22.1		1:51/1.0 1:10/1.0							89.0								22.1
		- -										Boring Term	inated at	METAVO	9.0 π II LCANI	IC ROCK	ALLINE ()	ROCK (FE	LSIC
	+	<u>-</u>									F								
											E								
		- -									E								
		•									E								
		<u>-</u> -									-								
											-								
		• •									E								
											F								
		- -									F								
		•									-								
		-									E								
		•									-								
	 	=									F								
		• •									_								
	+	-									F								
											E								
		• •									Ė								
		-									-								
		- -									-								
		• •									_								
											Ē								
		• •									-								
		-									-								

GEOTECHNICAL BORING REPORT BORE LOG



CORE PHOTOGRAPHS

B1-BBOXES 1 & 2: 5.5 - 22.1 FEET



SITE PHOTOGRAPH

Bridge No. 185 on -L- (SR 1616) over Marsh Swamp

