Ö REFERENCE

38.

STATE OF NORTH CAROLINA

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

CONTENTS

SHEET NO. **DESCRIPTION** TITLE SHEET LEGEND (SOIL & ROCK) 2Α SUPPLEMENTAL LEGEND (GSI) SITE PLAN BORE LOGS

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY MACON

PROJECT DESCRIPTION BRIDGE NO. 17 ON SR 1309 (CRAWFORD RD.) OVER WAYAH CREEK

STATE PROJECT REFERENCE NO. B-4775

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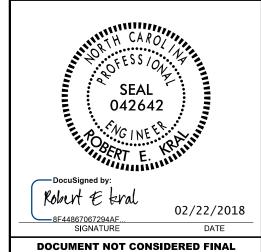
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DATE _ MAY 2017





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	WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.	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 D1586). SOIL CLASSIFICATION	<u>UNIFORMLY GRADED</u> - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. <u>GAP-GRADED</u> - 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	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	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,	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
VERY STIFF,GRAY, SILTY CLAY, MOIST 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 > 100 BLOWS PER FOOT IF TESTED.	A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT
CENERAL CRANIII AR MATERIALS SILT-CLAY MATERIALS	MINERALOGICAL COMPOSITION	FINE TO COARSE CRAIN ICNEOUS AND METAMORPHIC POCK THAT	WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND
CLASS. (≤ 35% PASSING *200) (> 35% PASSING *200) ORGANIC MATERIALS	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC.	ROCK (CP) WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE,	SURFACE.
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.	UNCLISS, OMBBRU, SURISI, EIC.	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 ROCK (NCR) SEDIMENTARY ROCK THAT WOULD YELLD SET REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.
SYMBOL 0000 d00000 0000 0000 0000 0000 0000	SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50	COASTAL PLAIN COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD	CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED
7. PASSING SUIT-	HIGHLY COMPRESSIBLE LL > 50	SEDIMENTARY ROCK SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.	BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
*10 50 MX GRANULAR CLAY PEAT SOILS SOILS CLAY PEAT	PERCENTAGE OF MATERIAL	WEATHERING	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT
*200 15 MX 25 MX 10 MX 35 MX 35 MX 35 MX 35 MX 36 MN 36 MN 36 MN 36 MN 36 MN 36 MN	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% LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20%	HAMMER IF CRYSTALLINE.	DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.
PASSING *40 40 MX 41 MN	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, (V SLI.) CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF	DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE
PI 6 MX NP 10 MX 10 MX 11 MN 11 MN 10 MX 10 MX 11 MN 11 MN 11 MN MODERATE HIGHLY	HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE	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. 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.
OF MAJOR GRAYEL, AND SAND GRAYEL AND SAND SOILS SOILS	STATIC WATER LEVEL AFTER 24 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 RATING FAIR TO		(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	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	- UU- SPRING ON SEEP	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.
CONSISTENCY (N-VALUE) (TONS/FT ²)	WITH SOIL DESCRIPTION → OF ROCK STRUCTURES	SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.
GENERALLY VERY LOOSE < 4	SOIL SYMBOL SPIT 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.
GRANULAR LUUSE 4 10 100	VST PMT INSTRICTION	IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF	MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS
(NON-COHESIVE) DENSE 30 TO 50	ARTIFICIAL FILL (AF) OTHER AUGER BORING CONE PENETROMETER THAN ROADWAY EMBANKMENT AUGER BORING CONE PENETROMETER	VERY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE	USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
VERT DENSE 2 2	CODE DODING A COUNDING DOD	SEVERE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK (V SEV.) REMAINING, SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR	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	VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF	RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
SILT-CLAY MEDIUM STIFF 4 TO 8 0.5 TO 1.0	INFERRED ROCK LINE MONITORING WELL TEST BORING WITH CORE	COMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND	ROCK QUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF
MATERIAL STIFF 8 TO 15 1 TO 2	TTTT ALLUVIAL SOIL BOUNDARY A PIEZOMETER SPT N-VALUE	SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.	ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE
HARD > 30 → 4	INSTRUCTION	ROCK HARDNESS	RUN AND EXPRESSED AS A PERCENTAGE. SAPPOLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT
TEXTURE OR GRAIN SIZE	RECOMMENDATION SYMBOLS	VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK, BREAKING OF HAND SPECIMENS REQUIRES	ROCK.
U.S. STD. SIEVE SIZE 4 10 40 60 200 270	UNCLASSIFIED EXCAVATION - UNCLASSIFIED EXCAVATION - UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE	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	USED IN THE TOP 2 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	SHALLOW UNDERCUT UNCLASSIFIED EXCAVATION - 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	<u>SLICKENSIDE</u> - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT
(BLDR.) (COB.) (GR.) (CSE. SD.) (F SD.) (SL.) (CL.)	ABBREVIATIONS	HARD 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 0.005 0.005	AR - AUGER REFUSAL MED MEDIUM VST - VANE SHEAR TEST	BY MODERATE BLOWS.	STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF
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. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE	A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL
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 Ø.1 FOOT PER 60 BLOWS.
SOIL MOISTURE SCALE FIELD MOISTURE GUIDE FOR FIELD MOISTURE DESCRIPTION (ATTERBERG LIMITS) 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 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.
	DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK	PIECES CAN BE BROKEN BY FINGER PRESSURE.	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	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.
	FOSS FOSSILIFEROUS SLI SLIGHTLY RS - ROCK	SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE, CAN BE SCRATCHED READILY BY FINGERNAIL.	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
PLASTIC SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE	FRAC FRACTURED, FRACTURES TCR - TRICONE REFUSAL RT - RECOMPACTED TRIAXIAL FRAGS FRAGMENTS W - MOISTURE CONTENT CBR - CALIFORNIA BEARING	FRACTURE SPACING BEDDING	
(PI) PL PLASTIC LIMIT	HI HIGHLY V - VERY RATIO	TERM SPACING TERM THICKNESS	BENCH MARK: BL-3
- MOIST - (M) COLID. AT OR NEAR ORTIMIN MOISTURE	EQUIPMENT USED ON SUBJECT PROJECT	VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDDED 4 FEET	ELEVATION: 21775.5 FEET
OM OPTIMUM MOISTURE SL SHRINKAGE LIMIT - MOIST - (M) SULID; HT 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	
PEOLITES ADDITIONAL WATER TO	CME-45C CLAY BITS X AUTOMATIC MANUAL	CLOSE 0.16 TO 1 FOOT VERY THINLY BEDDED 0.03 - 0.16 FEET	NOTES:
- DRY - (D) ATTAIN OPTIMUM MOISTURE	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	X 8*HOLLOW AUGERS	INDURATION	
PLASTICITY INDEX (PI) DRY STRENGTH	X CME-550 HARD FACED FINGER BITS X-N Q2	FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.	
NON PLASTIC 0-5 VERY LOW	TUNGCARBIDE INSERTS	RUBBING WITH FINGER FREES NUMEROUS GRAINS;	
SLIGHTLY PLASTIC 6-15 SLIGHT MODERATELY PLASTIC 16-25 MEDIUM	VANE SHEAR TEST CASING WY ADVANCER HAND TOOLS:	GENILE BLUW BY HAMMER DISINTEGRATES SAMPLE.	
HIGHLY PLASTIC 26 OR MORE HIGH	BORTARIE HOICT TRICONE STEEL TEETH POST HOLE DIGGER	MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.	
COLOR	TRICOUS TRICO	CRAING ARE DIFFICULT TO SEPARATE WITH STEEL PROPE.	
		INDURATED DIFFICULT TO BREAK WITH HAMMER.	
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.	VANE SHEAR TEST	EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE;	
The second secon		SAMPLE BREAKS ACROSS GRAINS.	DATE: 8-15-1-

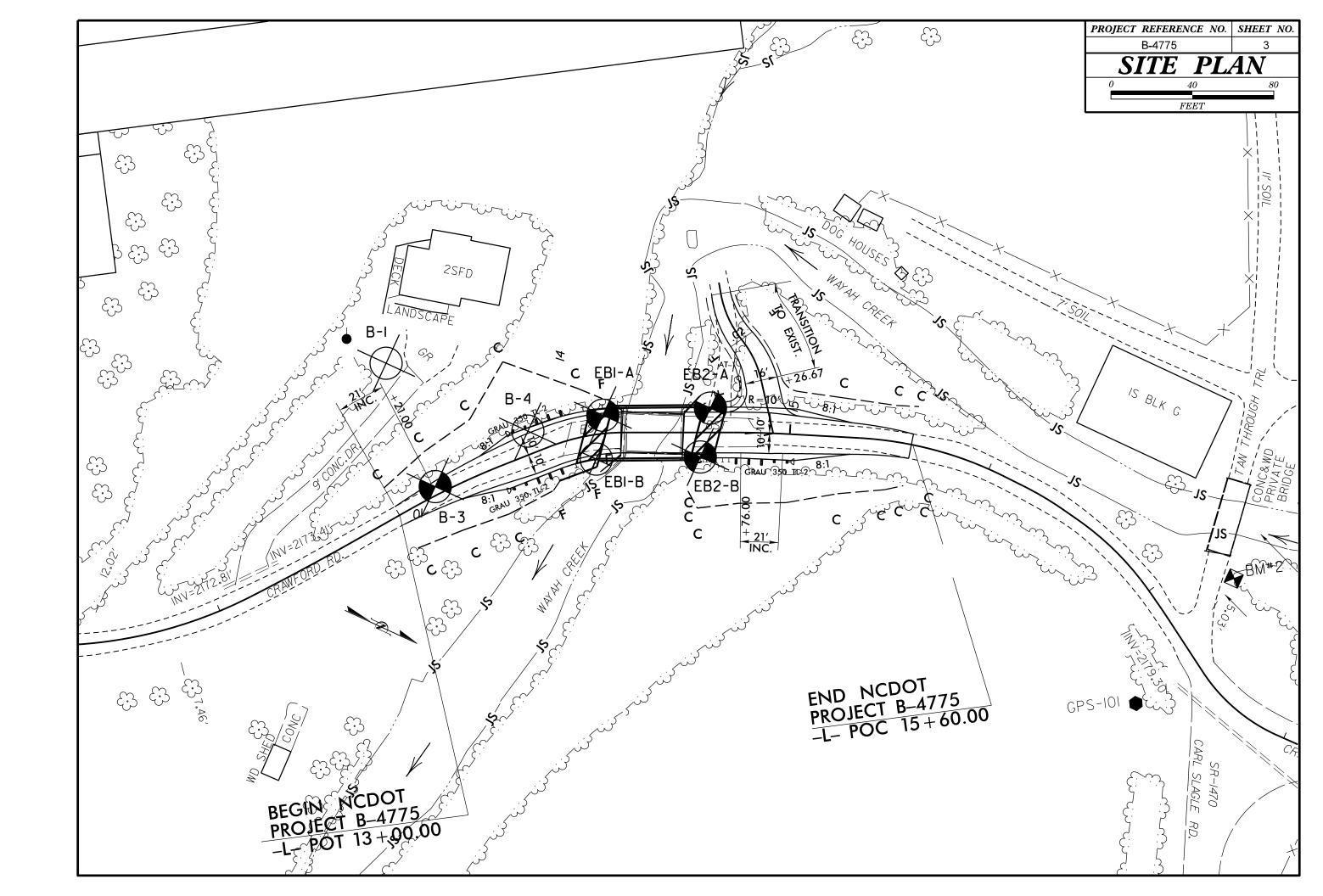
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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES

AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Join	nted Ro	ock Mass (Marinos 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 Marinos, 2000)		s p		s e O	a Ces	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 surfaces Very slightly weathered, iron stained surfaces	FAIR Smooth, moderately weathered and altered surfaces	POOR Slickensided, highly weathered surfa with compact coatings or fillings or angular fragments	VERY POOR Slickensided, highly weathered surf with soft clay coatings or fillings	Execution of the lithology, structure and sortage conditions (barticularly of the pedding planes), choose a pox in the chart. Tocate the bosition in the pox that corresponds to the condition of the discontinuities and estimate the average value of GSI from the controlled failures. Mooth, moderately these mild opinions weak blanar discontinuities are bresent, these discontinuities are bresent, these discontinuities are bressine dos by a slight shift to the right in the columns for the code and controlled by a slight weather of soft colled court of the code and controlled for the code and controlled by a slight weather of soft colled controlled by a slight weather of controlled contr
STRUCTURE		DECREASING SU	JRFACE 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 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. 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 VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets	OCKING OF ROCK	60	50			B. Sand- stone with thin inter- layers of siltstone amounts D. Siltstone or silty shale with sand- stone layers stone layers amounts D. Siltstone or silty shale with sand- stone layers stone layers layers Add D. Siltstone or clayey 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	_ - D ECRE⊄			20		G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers H. Tectonically deformed silty or clayey shale forming a chaotic structure with pockets of clay. Thin layers of sandstone are transformed sandstone are transformed sandstone are transformed sandstone are transformed.
LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes	V	N/A N/A		$\langle \ / \ \rangle$	10	into small rock pieces. → Means deformation after tectonic disturbance DATE: 8-19-



									SURI		UG							
	38546					P B-477			TY MA					GEOLOG	IST Contra	ct Geolo	<u> </u>	
				DGE N				AWFORD				CREE	K				GROUND V	
	ING NO					TATION					9 ft LT			ALIGNME			0 HR.	Dry
OL	LAR ELI	EV . 2,	177.5	ft	TO	OTAL DE	PTH 15.	5 ft	NORT	HINC	541,3				658,583		24 HR.	FIAD
RILI	RIG/HA	MMER E	FF./DA	TE SN	ИЕ6573	CME-550 7	7% 05/16/2	2017			DRILL I	METHO	D H.	.S. Augers		HAMN	IER TYPE Au	tomatic
RIL	LER C	ontract	Driller	ſ	S	ART DA	E 05/1	9/17	COME	P. DA	TE 05/			SURFACE	WATER DE	PTH N	/A	
LEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	0.5ft	0.5ft	-	0	BLOW 25	/S PER FOC	ΣΤ 75 '	100	SAMP. NO.	MOI	LOG	ELEV. (ft)	SOIL AND R	OCK DES		DEPTH (ft)
2175		<u> </u>							· · ·	- 1				- 2,177.5 - -	GROU ROADWA BROWN AN		KMENT	0.0
.175	2,174.0	3.5	8	23	77/0.4									 - 2,173.5				4.0
] :	‡			, 57				10	00/0.9	•			- - _ 2,170.8		HERED R TTE GNEI		6.7
<u>2170 </u>	- - -									· ·				_	RAY AND BLAC VEATHERED, ' LOSE TO WIDI	VERY HAI E FRACTU	I TO SLIGHLTY RD TO HARD, IRE SPACING,	
2165	- - -	‡ ‡					1							- - -	R	TITE GNEI EC = 99% QD = 96%		45.5
	-	‡												2,162.0 Bor	Gring Terminated	SI = 80-85 d at Elevat		15.5 I
		<u> </u>												_	Gravel Encour		Ground Surface	
	- -	‡												- -	Lic	valion (5)	
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NBS 38546.1.1	TIP B-4775 COUNT	Y MACON	GEOLOGIST Contract Geolo	ogist
SITE DESCRIPTION BRIDGE NO). 17 ON SR 1309 (CRAWFORD R	D.) OVER WAYAH CREEK		GROUND WTR (ft
BORING NO. EB1-A	STATION 14+09	OFFSET 9 ft LT	ALIGNMENT -L-	0 HR. Dr
COLLAR ELEV. 2,177.5 ft	TOTAL DEPTH 15.5 ft	NORTHING 541,398	EASTING 658,583	24 HR. FIAI
DRILL RIG/HAMMER EFF./DATE SME	6573 CME-550 77% 05/16/2017	DRILL METHOD H.S	S. Augers HAM	MER TYPE Automatic
ORILLER Contract Driller	START DATE 05/19/17	COMP. DATE 05/19/17	SURFACE WATER DEPTH	N/A
CORE SIZE NQ2	TOTAL RUN 8.8 ft			
$ \begin{array}{c c} ELEV \\ (ft) \end{array} \begin{array}{c c} RUN \\ ELEV \\ (ft) \end{array} \begin{array}{c c} DEPTH \\ (ft) \end{array} \begin{array}{c c} RUN \\ (ft) \end{array} \begin{array}{c c} DRILL \\ RATE \\ (Min/ft) \end{array} $	REC. RQD SAMP. REC. RQD NO. (ft) (ft) %	L O [[] [] [] [] [] [] [] [] []	DESCRIPTION AND REMARKS	DEPTH
70.82 2,170 2,170.8 6.7 3.8 1:36/0.8 1:50/1.0 1:50/1.0 1:50/1.0 1:45/1.0 1:36/1.0 1:45/1.0 1	(4.9) (4.9) 98% 98%	TO HARD, CLOSE 2,162.0 Boring Termina	Begin Coring @ 6.7 ft CRYSTALLINE ROCK FRESH TO SLIGHLTY WEATHERE TO WIDE FRACTURE SPACING, BIG REC = 99% RQD = 96% GSI = 80-85 ated at Elevation 2,162.0 ft IN BIOTIT (CRYSTALLINE ROCK) Incountered at Ground Surface Elevation 2,162.0 ft IN BIOTIT	OTITE GNEISS 15 E GNEISS

	E	BORE LOG							
WBS 38546.1.1	TIP B-4775 COUN	TY MACON	GEOLOGIST Contract Geolog	gist	WBS 38546.1.1	TIP B-4775 CO I	UNTY MACON	GEOLOGIST Contract Geolo	gist
SITE DESCRIPTION BRIDGE N	O. 17 ON SR 1309 (CRAWFORD	RD.) OVER WAYAH CREEK		GROUND WTR (ft)	SITE DESCRIPTION BRIDGE N	IO. 17 ON SR 1309 (CRAWFOR	RD RD.) OVER WAYAH CREEK		GROUND WTR (ft)
BORING NO. EB1-B	STATION 14+03	OFFSET 12 ft RT	ALIGNMENT -L-	0 HR. Dry	BORING NO. EB2-A	STATION 14+61	OFFSET 12 ft LT	ALIGNMENT -L-	0 HR. 6.8
COLLAR ELEV. 2,177.6 ft	TOTAL DEPTH 3.0 ft	NORTHING 541,404	EASTING 658,604	24 HR. FIAD	COLLAR ELEV. 2,176.7 ft	TOTAL DEPTH 19.0 ft	NORTHING 541,445	EASTING 658,558	24 HR. FIAD
DRILL RIG/HAMMER EFF./DATE SMI	E6573 CME-550 77% 05/16/2017	DRILL METHOD H.S	S. Augers HAMN	MER TYPE Automatic	DRILL RIG/HAMMER EFF./DATE SM	1E6573 CME-550 77% 05/16/2017	DRILL METHOD	H.S. Augers HAMN	MER TYPE Automatic
DRILLER Contract Driller	START DATE 05/18/17	COMP. DATE 05/18/17	SURFACE WATER DEPTH N	I/A	DRILLER Contract Driller	START DATE 05/18/17	COMP. DATE 05/18/17	SURFACE WATER DEPTH N	/A
	START DATE 05/18/17 NT BLOWS PER FOO	COMP. DATE 05/18/17 OT	SURFACE WATER DEPTH N	ACE 0.0 IKMENT LTY SAND SR REFUSAL at DTITE GNEISS ROCK) Ground Surface	DRILLER Contract Driller	START DATE 05/18/17	COMP. DATE 05/18/17 FOOT 75 100 SAMP. NO. MOI G	SURFACE WATER DEPTH N SOIL AND ROCK DES 2.176.7 GROUND SURF (PAVEMENT ROADWAY EMBAN BROWN, SILTY: 2.170.7 RESIDUAL BROWN AND TAN, CLA	SACE 6.6 SAND AYEY SAND OCK 18.5 18.0 18.0 19.0
NCDOT BORE DOUBLE B4775_GEO_BRDG_SPT_BORINGS.GPJ NC_DOT.GDT 6/2/17								CRYSTALLINE F (BIOTITE GNEI Boring Terminated BY AUG Elevation 2,157.7 ft IN BIG (CRYSTALLINE F	ISS) ER REFUSAL at OTITE GNEISS

GROUND WTR (ft)

6.8

FIAD

DEPTH (ft)

HAMMER TYPE Automatic

GEOTECHNICAL BORING REPORT **BORE LOG**

W	BS 3	88546.1.1			TI	P B-477	 5	1	TY MACO			GEO	LOGIST Contract G			w	'BS 38546	5.1.1			TIP B-47	75				1ACON		GEOLOGIST Co	ntract Geolog	gist
			ON BE	RIDGE					RD.) OVEF		H CREEK			`	D WTR (ft)	-			N BRII								WAYAH CREEK			GROUND WTF
		NO. EE				ATION	· · · · · · · · · · · · · · · · · · ·		OFFSET				NMENT -L-	0 HR.	6.8	-	ORING NO.				STATION						12 ft RT	ALIGNMENT -L-		0 HR.
С	OLLA	R ELEV.	2,177.	4 ft	тс	TAL DEP	TH 25.4	ft	NORTHI	NG 541	1,450	EAST	TING 658,582	24 HR.	FIAD	C	OLLAR ELI	EV. 2,	177.4 1	ft	TOTAL DE	PTH 2	25.4 ft		NOF	RTHING	G 541,450	EASTING 658,58	32	24 HR . F
DI	RILL RI	G/HAMMEF	R EFF./D	ATE S	ME6573	CME-550 7	7% 05/16/20 ⁻	17		DRILI	L METHOD	H.S. Augers	s 1	HAMMER TYPE	Automatic	DF	RILL RIG/HAI	MMER E	FF./DA	re SME65	73 CME-550	77% 05/1	6/2017				DRILL METHOD H.	S. Augers	HAMM	ER TYPE Automa
D	RILLE	R Contra	act Drill	er	S1	ART DAT	E 05/22/	17	COMP. D	ATE 0	5/22/17	SURF	FACE WATER DEPT	H N/A		DI	RILLER C	ontract	t Driller		START DA	ATE 05	/22/17		COI	MP. DA	ATE 05/22/17	SURFACE WATER	R DEPTH N	'A
EL	EN E	RIVE DEP	…—	LOW CC				PER FOO			P. 🔻 🐰	L O	SOIL AND ROCK	C DESCRIPTION		C	ORE SIZE	NQ2			TOTAL RU									
(1	τ)	(ft) (ft	0.51	ft 0.5ft	0.5ft	0	25	50	75 10	00 NO	· MOI (G ELEV. (f	ft)		DEPTH (ft)	EL	#/ CLCV	DEPTH	RUN	DRILL RATE	REC. RQD (ft) (ft) %	SAMP NO.	. ST REC	RATA RQD (ft) %				DESCRIPTION AND RE	MARKS	
																(f	(ft)	(ft)	(ft)	(Min/ft)	% %	NO.	(II) %	(II) %	G	ELEV. ((ft)			DEP
21	80	\rightarrow										-				215	59.9 2,159.9	17.5	2.9	1:30/0.9	(2.9) (2.5)					2,159.9	9	Begin Coring @ 1 CRYSTALLINE R	7.5 ft OCK	
		—				<u> </u>		1				2,177.4	GROUND		0.0		2,157.0			1:45/1.0 1:45/1.0	(2.9) (2.5) 100% 86%					-	GRAY AND BLACK	, FRESH TO VERY SEV , CLOSE FRACTURE S	ERELY WEAT	
21	75	Ŧ						1					ROADWAY EI	MBANKMENT	/	21	55	Ĺ	5.0	1:00/1.0 1:15/1.0	(4.4) (3.3) 88% 66%					- -		REC = 92%		
	2,	173.9 3.5	5 2	2	2								BROWN, S	LTY SAND			- 4500			1:15/1.0 1:15/1.0						- 	_	RQD = 73% GSI = 55-60		
		†				¶						2,170.4			7.0		2,152.0	25.4				1				2,152.0		ated at Elevation 2,152.	0 ft IN BIOTITE	GNEISS
21	70 2,	168.9 8.5	5			 		+		$\exists 1$			RESII BROWN AND TA				-	-								<u> </u>		(CRYSTALLINE R	OCK)	
		‡	6	3	2	5						* ‡	BROWN AND 17	III, OANDI OILI				‡								-				
21	65	‡				``.		<u> </u>		41		Ł					_	‡								<u>-</u>				
	2,	163.9 13.	6	13	21		●34					L .						‡								-				
21	60	‡					: : : :					2,159.9			17.5			†								- -				
	00	‡					· '	†	I	7		2,139.9	CRYSTALL GRAY AND BLACK		17.5		-	Ŧ								-				
		‡											SEVERELY WEATHER	RED, VERY HARD	O T O			Ŧ							F	-				
21	55	‡								-			HARD, CLOSE FRA BIOTITE	GNEISS	G,		-	Ī								- 				
		Ŧ							I	1 1		2,152.0	REC =	= 92% = 73%	25.4			Ŧ.								-				
		Ī										E	GSI =	55-60			-								1 -	- -				
		Ŧ										E	Boring Terminated at I BIOTITE GNEISS (CR	Elevation 2,152.0 RYSTALLINE RO	ft IN CK)			-							1 -	-				
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NCDOT BORE DOUBLE B4775_GEO_BRDG_SPT_BORINGS.GPJ NC_DOT.GDT 6/2/17		‡										E				CDOT CORE DOUBLE B4775_GEO_BRDG_SPT_BORINGS.GPJ NC_DOT.GDT 6/2/17		‡								-				
NCD																NCP		<u>t</u>								<u>-</u>				

CORE LOG

SITE D	38546.1 DESCRIF				TII	P B-	4775		СО	UNTY	' MAC	NC					GEOLOG	GIST Cor	tract Geolo	aist			WBS	38546	11			TIP	D 1
BORIN	DESCRIP																0_0_0			5		L		30340	. 1 . 1			1	D-41
		TION	BRID	DGE N	NO. 17	ON S	SR 130	9 (CR/	AWFO	RD R	D.) OVE	RW	'AYAH	CREI	EK					GROUN	ID WTR (ft)	L	SITE	DESCR	IPTION	BRII	DGE NO	. 17 OI	N SF
COLLA	IG NO.	B-1			ST	ΓΑΤΙΟ	N 13	+27			OFFSE	T 6	9 ft LT				ALIGNM	ENT -L-		0 HR.	Dry		BORI	NG NO.	B-1			STAT	ΓΙΟΝ
,OLL,	AR ELE\	/. 2,2	01.7 f	t	TC	DTAL	DEPTI	H 10.0) ft		NORTH	ING	541,2	291			EASTING	3 658,60	4	24 HR.	FIAD		COLL	AR ELE	EV. 2,2	201.7 f	t	TOTA	AL D
RILL F	RIG/HAMI	MER EF	F./DAT	TE SN	ME6573	CME-5	550 77%	05/16/2	017				DRILL I	METHO	DD I	H.S.	Augers		HAMI	MER TYPE	Automatic		DRILL	RIG/HAI	MMER E	F./DA	TE SME6	573 CM	1E-55(
	ER Co	ntract I	Driller		ST	TART	DATE	05/18	3/17		COMP.	DAT	E 05/	18/17		Ц	SURFAC	E WATER	DEPTH N	I/A		L	DRILI	LER C	ontract	Driller		STAF	RT D
.EV ft)		DEPTH		W COL			0.0		S PER I			400	SAMP.	17				SOIL AN	D ROCK DES	SCRIPTION			CORE	SIZE	NQ2			TOTA	
+	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0	25	.	50		75 	100	NO.	/MO	I G	l E	ELEV. (ft)				DEPTH (ft)		ELEV (ft)		DEPTH (ft)	RUN (ft)	DRILL RATE	REC.	RQI
																						+		(ft)		(11)	(Min/ft)	(ft) %	(ft) %
+	$-\pm$															F						2	2200.7 2200	2,200.7_	_ 1.0	5.0	2:30/1.0	(3.7)	(0.0
	‡															<u> </u>	2,201.7	GF	ROUND SURF	FACE	0.0			-	-		1:00/1.0 1:00/1.0	74%	0%
0	£											:				£ 2	2,200.7	ROAD	WAY EMBAN OWN, SILTY	NKMENT			2195	2,195.7	- 6.0		1:00/1.0 1:00/1.0		
	‡								- 1							+	<u> </u>	CR	YSTALLINE I	ROCK	/		Z 130	-	-	4.0	1:30/1.0 1:00/1.0	(3.8) 95%	(1.9 48°
	‡											.				1	C	COMPLETE	BLACK, MOD LY WEATHER	RED, HARD	TO			2,191.7	- - 10.0		1:00/1.0 1:00/1.0		\perp
+	+										 					+			SE FRACTU BIOTITE GNE		G,			-	-				
	‡									 				L		1 2	2,191.7		REC = 83%		10.0			-					
	‡				[E			RQD = 21% GSI = 25-30)				-	-				
	‡															þ			ated at Eleva EISS (CRYST					-	-				
	‡															þ	1) Gravel En	countered at (Ground Surf	ace			-	-				
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VBS	3854	6.1.1			TIP	B-477	'5	С	OUNT	Y	CON	GEOLOGIST Contra	ct Geolog	jist	
ITE	DESC	RIPTION	I BRI	DGE NO	. 17 0	N SR	1309 (CF	AWF	ORD F	RD.) (ER WAYAH CREEK			GROUN	ID WTR (ft
BOR	NG NO). B-1			STAT	ΓΙΟΝ	13+27			OFI	ET 69 ft LT	ALIGNMENT -L-		0 HR.	Dr
OLI	AR EL	EV. 2,	201.7	ft	TOTA	AL DE	PTH 10	.0 ft		NO	HING 541,291	EASTING 658,604		24 HR.	FIAD
RILL	. RIG/HA	MMER E	FF./DA	TE SME	573 CN	1E-550 7	77% 05/16/	2017			DRILL METHOD H	.S. Augers	HAMM	ER TYPE	Automatic
RIL	LER (Contract	Driller	r	STAF	RT DA	TE 05/1	8/17		СО	P. DATE 05/18/17	SURFACE WATER DI	EPTH N	′A	
OR	E SIZE	NQ2			TOTA	AL RUI	N 9.0 ft					•			
EV	RUN ELEV	DEPTH		DRILL RATE	REC.	JN RQD	SAMP.	STR REC.	RQD	L		DESCRIPTION AND REMAR	RKS		
(ft)	(ft)	(ft)	(ft)	(Min/ft)	(ft) %	(ft) %	NO.	(ft) %	(ft) %	Ğ	LEV. (ft)				DEPTH (
00.7 200	2,200.7	1.0	5.0	2:30/1.0 1:00/1.0 1:00/1.0	(3.7) 74%	(0.0) 0%						Begin Coring @ 1.0 f CRYSTALLINE ROCK K, MODERATELY TO COMF , CLOSE FRACTURE SPAC	LETELY W		
195	2,195.7	6.0	4.0	1:00/1.0 1:00/1.0 1:30/1.0 1:00/1.0		(1.9) 48%					11AND 10 301 1	REC = 83% RQD = 21%	ing, bioti	IL GIVLIO	3
	2,191.7	10.0		1:00/1.0	3370	4070					,191.7	GSI = 25-30			10
		-		1.00/ 1.0								nated at Elevation 2,191.7 ft I CRYSTALLINE ROCK		GNEISS	
		‡									1) Gravel	Encountered at Ground Surfa		n (1")	
		+ + + + + + + + + + + + + + + + + + + +													
		+ + + + + + + + + + + + + + + + + + +													

										UKL		<u> </u>																					KE L	
	38546					P B-477				Y MAC					GEO	LOG	IST Contr	act Geo			-		38546				1	B-477					IACON	
			N BRI	DGE		ON SR 1		RAWF	ORD F	- 			CRE	EK						D WTR (ft)	\vdash				BRI	DGE NO					ORD			AYAH CRE
BOR	ING NO	. B-3			S1	TATION	13+22			OFFSI	ET 4	ft LT			ALIG	NME	ENT -L-		0 HR.	Dry	В	ORIN	NG NO.	B-3			STA	TION	13+22			OFF	FSET 4	ft LT
COL	LAR ELI	EV . 2	176.4	ft	TC	OTAL DEF	PTH 10).5 ft		NORT	HING	541,	338		EAS	TING	658,649		24 HR.	FIAD	С	OLL	AR ELE	V . 2,1	176.4	ft	TOT	AL DE	PTH 1	0.5 ft		NOI	RTHING	541,338
DRIL	RIG/HA	MMER I	FF./DA	TE SI	ME6573	CME-550 7	7% 05/16/	/2017				DRILL	METH	DD H	I.S. Auger	s		HA	MMER TYPE	Automatic	DI	RILL	RIG/HAN	MER E	FF./DA	TE SME	6573 CN	/IE-550	77% 05/1	6/2017				DRILL METH
DRIL	LER C			r	ST	ART DAT	Γ E 05/1	18/17		COMP	. DA				SURI	FACI	E WATER [EPTH	N/A		D	RILL	ER C	ontract	Driller	ſ	STA	RT DA	TE 05	/18/17		COI	MP. DAT	E 05/18/1
ELEV	DRIVE ELEV	DEPTH	BLC	w co	-				R F001			SAMP	$\cdot lacksquare$				SOIL AND	ROCK D	ESCRIPTION		С	ORE	SIZE	NQ2			TOT	AL RU	N 5.0					
(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0	25	50		75 	100	NO.	/MC	OI G	ELEV. (1	ft)				DEPTH (ft)	EĻ	LEV	RUN ELEV	DEPTH	RUN	DRILL RATE	REC.	UN RQD (ft) %	SAMP.	ST REC.	RATA RQD (ft) %	-		
																					(1	(ft)	(ft)	(ft)	(ft)	(Min/ft)	(π) %	(π)	NO.	(π)	(ft) %	Ğ	ELEV. (ft)	
2180		1													_						217	70.9	2,170.9_	5.5	F 0	2:00/1.0	(4.0)	(2.0)					0.470.0	
ì		‡													-							170	2,170.5	- 0.0	5.0	2:00/1.0	98%	60%					_2,170.9	GRAY AND
0175		<u> </u>	-			1				.		-		1 %	- 2,176.4 -			UND SU	RFACE ANKMENT	0.0			2 465 0	- - 10 F		1:45/1.0 2:00/1.0							- 0.405.0	TO HARI
2175	1 -	‡] - - - -	_				EY SAND			ľ	2,165.9 _	10.5		2:00/1.0							2,165.9 	
	2,172.9	3.5	2	2	3	5	.								_								= =	-									- \	
2170	_	ŧ				Ľ	+								<u>2,170.9</u>		CRYS	TALLIN	ROCK	5.5				-									<u>-</u> -	Boring
		ł													E		RAY AND BLA	CK, FRE	SH TO SLIGH HARD TO HAF				-	-									-	
		Ŧ													2,165.9		MODERATE	LY CLOS	SE FRACTURI TE GNEISS				}	_									•	1)
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		Ŧ													-			REC = 98 RQD = 60	0%				7	-									-	
		Ŧ													-	Bo		GSI = 55- ed at Elev	·60 vation 2,165.9	ft IN				-									-	
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WBS	38546	.1.1			TIP	B-477	'5	C	OUNT	Y	ACON GEOLOGIST Contract Geologist
SITE	DESCR	IPTION	I BRI	DGE NO	. 17 O	N SR	1309 (CF	RAWFO	ORD F	RD.)	VER WAYAH CREEK GROUND WTR (fi
BOR	ING NO.	B-3			STAT	ΓΙΟΝ	13+22			OF	SET 4 ft LT ALIGNMENT -L- 0 HR. Dr
	LAR ELE		176.4 1	ft			PTH 10	.5 ft		+	THING 541,338
							77% 05/16/			I	DRILL METHOD H.S. Augers HAMMER TYPE Automatic
	LER C						TE 05/1			СС	IP. DATE 05/18/17 SURFACE WATER DEPTH N/A
	E SIZE						N 5.0 ft				
ELEV	RUN	DEPTH	RUN	DRILL	Rl	JN	SAMP.	STR			
(ft)	ELEV (ft)	(ft)	(ft)	RATE (Min/ft)	REC. (ft) %	RQD (ft) %	NO.	REC. (ft)	RQD (ft) %	O G	DESCRIPTION AND REMARKS ELEV. (ft) DEPTH (
170.9				, ,	,,,	,,		,,	,,,		Begin Coring @ 5.5 ft
2170	2,170.9	5.5	5.0	2:00/1.0 2:00/1.0	(4.9) 98%	(3.0) 60%					2,170.9 CRYSTALLINE ROCK GRAY AND BLACK, FRESH TO SLIGHTLY WEATHERED, VERY HARD
		-		1:45/1.0 2:00/1.0	3070	0070					TO HARD, MODERATELY CLOSE FRACTURE SPACING, BIOTITE
	2,165.9	10.5		2:00/1.0							2,165.9 GNEISS 10
	-	-									REC = 98% RQD = 60%
	1	- -									GSI = 55-60 Boring Terminated at Elevation 2,165.9 ft IN BIOTITE GNEISS
		- -									(CRYSTALLINE ROCK)
		- -									1) Gravel Encountered at Ground Surface Elevation (2")
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DORNON NO. 9-4 STATION 137-74 DORNON NO. 9-4 STATION NO. 9-4 DORNO NO. 9-4 STATION NO. 9-4 DORNO NO. 9-4					_								GEOLO	GIST Contract Ge				\vdash					l				OUNT
COLLAR ELEV. 2, 178.1 ft TOTAL DEPTH 0.5 ft TOTAL DEPTH 0	ITE D	ESCRIPTION	N BRI	DGE N				/FORD F			CREEK						R (ft)	-			BRID	DGE NO				RAWF	ORD
DRILL REPORT DIES START DATE 55/18/17 COMP DATE 55/18/17 SURFACE WATER DEPTH NA	ORIN	G NO . B-4			ST	ATION 13	3+74		OFFSET ^	1 ft LT			ALIGNI	IENT -L-		0 HR.	Dry	BO	RING NO.	3-4			STAT	TION	13+74		
DRILLER Contract Deliver START DATE DRIVER TOTAL DRIVER DRIVER TOTAL DRIVER DRIVER TOTAL DRIVER DRIVE	OLLA	R ELEV. 2	,178.11	ft	то	TAL DEPT	H 10.5 ft	:	NORTHING	541,3	68		EASTIN	G 658,605		24 HR . F	IAD	COI	LAR ELEV.	2,1	78.1 f	t	TOTA	AL DEF	PTH 10.	.5 ft	
Section Sect	RILL R	IG/HAMMER F	EFF./DA	TE SM	E6573	CME-550 77%	% 05/16/2017	7		DRILL N	METHOD	H.S.	. Augers	Н	AMME	R TYPE Automa	ntic	DRIL	L RIG/HAMM	ER EF	F./DAT	E SME6	573 CM	E-550 7	7% 05/16/	2017	
Column C	RILLE	ER Contrac	t Driller		ST	ART DATE	05/18/1	7	COMP. DA	TE 05/	18/17		SURFA	E WATER DEPTH	I N/A	4		DRI	LLER Con	tract I	Driller		STAF	RT DAT	TE 05/1	8/17	
2190 00 0.00 0.00	∨	RIVE DEPTH	d BLC	W COU	INT		BLOWS F	PER FOOT		SAMP.				SOIL AND BOCK	DESCI	RIPTION		CO	RE SIZE N	Q2			TOTA	L RUN	9 .3 ft		
2980 2775 GROUND SURFACE 0.0 2775 1/2 43 0.05 0.0 0.05			0.5ft	0.5ft	0.5ft	0 2	25 5	50	75 100	NO.			ELEV. (ft)	001271110710011	DE001		TH (ft)		RUN DE	PTH	RUN		REC.	JN RQD	SAMP.	STF REC.	RATA RQD
2175																		(ft)		(ft)	(ft)		(ft) %	(ft) %	NO.	(ft) %	(ft) %
2770. 27	80											L						2176.									
CONSTRUCTION CONS		<u> </u>																2175		1.2	4.3	0:20/0.3 1:00/1.0	(3.7) 86%	(0.8) 19%			
2770 CORYSTALLINE ROOF CORYSTALLINE ROOF CORYSTALLINE ROOF CORYSTALLINE ROOF CORYSTALLINE ROOF CORYSTALLINE ROOF CLOSE PROCTURE SHADNING BOOTITE CLOSE PROCTURE SHADNING BOOTITE CLOSE PROCTURE SHADNING BOOTITE CORYSTALLINE ROOF Thomas Transmited SHAP ALGER REFUSAL at Shape Booting at Corystalline ROOF CORYSTALLINE ROOF Thomas Transmited SHAP ROOF Th		Ŧ						1					2,176.9				1.2		2 172 6	5.5		1:00/1.0					
ADDIFFACTIVE SYMPACTIVE SYMPACTIVE STATE STATE AND ADDITION OF THE PROPERTY WAS AND ADDITION OF THE PROPERTY WAS AND ADDITION OF THE PROPERTY ADDI	75	Ŧ						<u> </u>					_	CRYSTALLI	NE RO	CK			+		5.0	1:15/1.0	(5.0)	(1.9)			
2.107.8 REC = 04% (9.0 = 20% (9.0		Ŧ												MODERATELY WEA	THER	ED, HARD,		2170	-			1:00/1.0	100%	36%			
RED = 04-16 ROD = 35-25 REPUBAL at REPUBAL at RED = 15-25 REPUBAL at REPUBAL	70	Ţ						1								NG, BIOTTE			2,167.6 1	0.5		0:45/1.0 1:00/1.0					<u> </u>
Boring Terminated by AUGEN REFUSAL at Beviation 2 (17 of in 14 BIOTITE CHRISS) (CRYSTALLER ROCK) 1) Cravel Encountered at Ground Surface (Flevation (3)) 1 (17 of in 14 BIOTITE CHRISS) (CRYSTALLER ROCK) 1 (17 of in 14 BIOTITE CHRISS) (CRYSTALLER ROCK) 1 (18 of in 14 BIOTITE CHRISS) (CRYSTALLER ROCK) 1 (18 of in 14 BIOTITE CHRISS) (CRYSTALLER ROCK) 1 (18 of in 14 BIOTITE CHRISS) (CRYSTALLER ROCK) 1 (18 of in 14 BIOTITE CHRISS) (CRYSTALLER ROCK) (CRYSTAL		‡										\$							‡								
Beging Terrained of BY AUSER REFUSAL at Elevation 2 of Terrained State (Control Lucker Control		‡			-	1				1		4	2,167.6			Γ	10.5		‡								
CRYSTALINE ROCULOS 1 Gravel Encounted a Ground Surface		‡										L	E	oring Terminated BY	UGEF				‡								
Elevation (3°) - Elevation (3°)		‡										E							‡								
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		<u> </u>										E		1) Gravel Encountered	at Gro	ound Surface											
B4775_GEO_BROG_SPT_BORINGS.GPJ_NC_DOT.GDT		+										F		Elevatio	n (3")												
B4775_GEO_BROG_SPT_BORINGS.GPJ_NC_DOT.GDT		ł										E							1 ±								
B4775_GEO_BROG_SPT_BORINGS.GPJ_NC_DOT.GDT		Ŧ										F							 								
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VBS	38546	.1.1			TIP	B-477	5	С	OUNT	ΥN	ACON GEOLOGIST Contract Geologist	
SITE	DESCRI	PTION	I BRI	DGE NO	. 17 OI	N SR	1309 (CR	AWF	ORD F	RD.)	OVER WAYAH CREEK GROUP	ND WTR (1
	NG NO.				1		13+74			ı i	SET 11 ft LT ALIGNMENT -L- 0 HR.	Dı
OLL	AR ELE	V . 2	178 1	ft			PTH 10.	5 ft		-	RTHING 541,368	FIA
				TE SME	l .						DRILL METHOD H.S. Augers HAMMER TYPE	
	ER Co						TE 05/1			CO	//P. DATE 05/18/17 SURFACE WATER DEPTH N/A	7 tatornatio
	SIZE		Dillici	I			v 9.3 ft	0/1/			SURFACE WATER DEFIN N/A	
	DUN		1	DRILL	RL			STR	ATA	L		
LEV (ft)	ELEV (ft)	DEPTH (ft)	RUN (ft)	RATE (Min/ft)	REC. (ft) %	RQD (ft) %	SAMP. NO.	REC. (ft) %	RQD (ft) %	OG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH
76.9 175	2,176.9	1.2	4.3	0:20/0.3 1:00/1.0 1:00/1.0 1:00/1.0	(3.7) 86%	(0.8) 19%					Begin Coring @ 1.2 ft 2,176.9 CRYSTALLINE ROCK GRAY AND BLACK, SLIGHLTY TO MODERATELY WEATHERED, H. OLOSE TO WIDE EDACTHER SPACING BIOTITE CNEISS	ARD,
	2,172.6	- - <u>5.5</u> -	5.0	1:00/1.0 1:00/1.0 1:15/1.0 1:00/1.0	(5.0) 100%	(1.9) 38%					CLOSE TO WIDE FRACTURE SPACING, BIOTITE GNEISS REC = 94% RQD = 29%	
170	2,167.6	- - - 10.5		1:00/1.0 0:45/1.0 1:00/1.0							- GSI = 35-40 2,167.6	1
		- - -									Boring Terminated BY AUGER REFUSAL at Elevation 2,167.6 ft IN BIG GNEISS (CRYSTALLINE ROCK)	
	1	- -									1) Gravel Encountered at Ground Surface Elevation (3")	
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