NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION GRADATION ROCK DESCRIPTION TERMS AND DESI															
										ROCK DESCRIPTION HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WHEN TESTED, WOULD YIELD SPT REFUSAL AN INFERRED				TERMS AND DEFINITIONS	
CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND WHICH YIELDS LESS THAN 100 BLOWS PER								IIFORM. INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE (ALSO POORLY GRADED). P-GRADED- INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.			NDICATES THE LEVE AL IS PENETRATION E	EL AT WHICH NON-COA BY A SPLIT SPOON SA	ASTAL PLAIN MATERIAL WOULD YIELD S MPLER EQUAL TO OR LESS THAN 2.5 or BETWEEN SOIL AND ROCK IS OFTEN REI	ALLUVIUM (ALLUV.) - SOILS WHICH HAVE BEEN TRANSPORTED BY WATER.	
TEXTURE, M	OISTURE, AAS	SHTO CLASSIFICA	ATION, AND OTHER PI	RTINENT FACTORS	NCLUDE: CONSISTENCY IS SUCH AS MINERALO	r, color, Sical	ANGULARITY OF GRAINS			OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLOWS:				AQUIFER - A WATER BEARING FORMATION OR STRATA.	
			, PLASTICITY, ETC. EX				THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS ARE DESIGNATED BY THE TERMS; ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.			WEATHERED NON-COASTAL PLAIN MATERIAL THAT YIELDS SPT N VALUES > 100 BLOWS				ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.	
	VERT STUPP, GRAY SILTY CLAY, MOIST WITH INTERBEDDED PINE SAND LATERS, HIGHLY PLASTIC, 4-7-6 SOIL LEGEND AND AASHTO CLASSIFICATION						MINERALOGICAL COMPOSITION			ROCK (WR) PER 30 cm. FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT				ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC.	
GENERAL CLASS.	(≾5%	GRANULAR MATERIALS SILT-CLAY MATERIALS (25% PASSING #200) ORGANIC MATERIALS ORGANIC MATERIALS		TERIALS	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.			ROCK (CR) WOULD YELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.				ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.			
GROUP CLASS.	A-1 A-1-a A-1-b	A-3	A-2 A-4	A-5 A-6 A-7			COMPRESSIBILITY			NON-CRYSTALL ROCK (NCR)	INE	SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE		IF TESTED. ROCK TYPE	CALCAREOUS (CALC.) - SOILS WHICH CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
SYMBOL 8	000000000			A76	20220	·	SLIGHTLY COMPRESS MODERATELY COMPR	RESSIBLE LIQUID LIMIT	LIQUID LIMIT LESS THAN 30 LIQUID LIMIT 31-50 LIQUID LIMIT 31-50 LIQUID LIMIT 51-50 LIQUID LIMIT DILA	COASTAL PLAIN		COASTAL PLAIN	LITE, SLATE, SANDSTONE, ETC. SEDIMENTS CEMENTED INTO ROCK, BU	JT MAY NOT YIELD	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE
% PASSING	000000000000000000000000000000000000000						HIGHLY COMPRESSIB			SEDIMENTARY ROCK (CP)		SPT REFUSAL. R SHELL BEDS, ETC	ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED		OR AT BOTTOM OF SLOPE.
#10 5	50 MX				GRANULAR SILT-	, MUCK,	ORGANIC MATERIAL TRACE OF ORGANIC MATTER	PERCENTAGE OF MATE		-			ATHERING		CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED
	50 MX 50 MX 5 15 MX 25 MX 1		WX 35 MX 35 MX 36 MN	36 MN 36 MN 36 M	SOILS SOILS			SOILS SOILS <u>O</u> 2-3% 3-5% TRAC	THER MATERIAL CE 1-10%		OCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER		OCK RINGS UNDER	BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS	
LIQUID LIMIT			MN 40 MX 41 MN 40 MX				LITTLE ORGANIC MATTER MODERATELY ORGANIC	3-5% 5-12% L	ITTLE 10 - 20%	1	ROCK GENERALLY F		IED. SOME JOINTS MAY SHOW THIN CLA	Y COATINGS IF OPEN.	OR CUTS MASSIVE ROCK.
GROUP INDEX	6 MX	N.P. 10 MX 10 M	VX 11 MN 11 MN 10 MX	10 MX 11 MN 11 M	LITTLE OR	HIGHLY	HIGHLY ORGANIC	>10% >20% H	SOME 20 - 35% HIGHLY 35% AND ABOVE	(V. SLI.)		ROKEN SPECIMEN FAC	CE SHINE BRIGHTLY, ROCK RINGS UNDE		<u>DIP</u> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.
USUAL TYPES					AMOUNTS OF	ORGANIC SOILS	□ WATER LE	GROUND WATER		SLIGHT	ROCK GENERALLY	FRESH, JOINTS STAIN	IED AND DISCOLORATION EXTENDS INT		<u>DIP DIRECTION (DIP AZIMUTH)</u> - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
OF MAJOR MATERIALS	GRAVEL AND SAND			SILTY CLAYEY SOILS SOILS	ORGANIC MATTER			EVEL IN BORE HOLE IMMEDIATELY AFTER DRIL VATER LEVEL AFTER <u>24</u> HOURS.	LING.	CRYSTAL	CRYSTALS ARE DUL	5 cm. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR RYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.		MMER BLOWS.	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
GEN. RATING AS A	EVO	ELLENT TO GOOD			FAIR TO	_	-	O WATER, SATURATED ZONE OR WATER BEAR!	STDATA		SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HA			FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.	
SUBGRADE	EXCE		<u> </u>	FAIR TO POOR	POOR POOR UNSUITABLE		SPRING OR SEEPAGE				DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.			NGTH AS COMPARED	FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED
			A-7-5 ≤L.L 30 : P.				SPRING C			MODERATELY	ALL ROCK EXCEPT QUARTZ DISCOLORED OF		ED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL.		FROM PARENT MATERIAL.
	CONSISTENCY OR DENSENESS COMPACTNESS OR RANGE OF STANDARD RANGE OF UNCONFINED				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.			GIST'S PICK. ROCK GIVES "CLUNK" SOU		FLOOD PLAIN (F.P.) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.		
PRIMARY SOIL TYPE		CONSISTE	ENCY PENETRU	(TION RESISTENCE (N-VALUE)	COMPRESSIVE S (kN/m²)		ROADWAY EMBANKI WITH SOIL DESCRIP		ING SAMPLE DESIGNATIONS	1	IF TESTED. WOULD YIELD SPT REF				FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.
GENERA		VERY LO LOOS		<4 4 TO 40			SOIL SYMBOL	AUGER BORING		(SEV.)	ALL ROCKS EXCEPT QUARTZ DISCOLORE IN STRENGTH TO STRONG SOIL. IN GRAN		NITOID ROCKS ALL FELDSPARS ARE KA		JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS
GRANULAR MATERIAL (NON-COHESIVE)		MEDIUM D	DENSE	4 TO 10 10 TO 30	N/A		ARTIFICIAL FILL OTH	HER THAN BULK SAMPLE L	OCATION SS - SPLIT SPOON		EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. F. TESTED. YIELDS. SPT. N. VALUES. > 100 BLOWS. PER. 30 cm.			LATERAL EXTENT.	
		VERY DE		30 TO 50 >50			ROADWAY EMBANKI	-U- CORE BORING	SAMPLE ST - SHELBY TUBE				ARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT ELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING.		LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS USUALLY
GENERALLY SILT-CLAY MATERIAL (COHESIVE)		VERY S SOF		<2	50 TO 100 5 100 TO 200		INFERRED SOIL BOUNDARIES		SAMPLE		SAPROLITE IS AN EX	N EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE		NLY MINOR VESTIGES OF THE	INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
		MEDIUM:	STIFF	2 TO 4 4 TO 8			到7回7号 INFERRED ROCK LIN			1	ORIGINAL ROCK FABRIC REMAIN. <u>IF TESTED, YTELDS SPT N VALUES < 100 BLOWS PER 30 cm.</u> ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND			PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.	
		VERY ST	TIFF	8 TO 15 15 TO 30			PIEZOMETER INSTALLATION SLOPE INDICATOR SLOPE INDICATOR		RT - RECOMPACTED TRIAXIAL SAMPLE		SCATTERED CONCE ALSO AN EXAMPLE.	ENTRATIONS, QUARTA	UARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS		RESIDUAL SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
		HARE		>30 DAIN CIZE	>400		25/025 DIP/DIP DIRECTION OF INSTALLATION		CBR - CBR SAMPLE		ROCK HARDNESS				ROCK QUALITY DESIGNATION (R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY: TOTAL LENGTH OF
He em ein	Æ erze		10 40	OR GRAIN SIZE			O SOUNDING ROD	MARSH	VERY HARD				IMENS REQUIRES	ROCK SEGMENTS EQUAL TO OR GREATER THAN 10 CENTIMETERS DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.	
U.S. STD. SIEVE SIZE OPENING (MM)		4.76 2.0 0.42		2 0.	60 200 270 0.25 0.075 0.053		O SOUNDING ROD RED— SPT REFUSAL & TREE! ABBREVIATIONS		ζ TREE LINE	HARD	SEVERAL HARD BLOWS OF THE GEOLOGISTS PICK. HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED			R BLOWS REQUIRED	SAPROLITE (SAP.) - RESIDUAL SOIL WHICH RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.
BOULDER COBBLE (BLDR.) (COB.)			IAVEL COA SAN GR.) (CSE	SAND SILT CLAY		AR - AUGER REFUSAL FRAGS FRAGMENTS BT - BORING TERMINATED LS LIMESTONE			TO DETACH HAND SPECIMEN. MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK, GOUGES OR GROOVES TO 6 mm DEEP CAN BE				SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, WHICH HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.		
						0.005	C.I CAVE IN MED MEDIUM CL CLAY PMT - PRESSUREMETER TEST CPT - CONE PENETRATION TEST SD SAND, SANDY			HARD EXCAVATED BY HARD BLOW OF A GEOLOGISTS PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.				SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.	
		IL MOISTURE - CORRELATION OF			F TERMS		CPU - COASTAL PLAIN UNDIVIDED SL SILT, SILTY			MEDIUM HARD			EEP BY FIRM PRESSURE OF KNIFE OR F O PIECES 25 mm MAXIMUM SIZE BY HAR		STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N) OF A 63.5 kg HAMMER FALLING 0.76 METERS REQUIRED TO PRODUCE A PENETRATION OF 30 cm INTO SOIL WITH
SOIL MOISTURE SCALE FIELD MOISTURE GUIDE FOR FIELD MOISTURE DESCRIPTION OUTPERBERG LIMITS) DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION							DMT - DILATOMETER TEST TCR - TRICONE REFUSAL			ener.	POINT OF A GEOLOGISTS PICK. SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS				A 5 cm OUTSIDE DIAMETERS REQUIRED TO PRODUCE A PENETRATION OF 30 cm INTO SOIL WITH A 5 cm OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS LESS THAN 2.5 cm PENETRATION WITH 50 BLOWS.
(ATTER	BERG LIMITS)					DPT - DYNAMIC PEN e - VOID RATIO	GHT	3071	FROM CHIPS TO SEV		CHIPS TO SEVERAL CENTIMETERS IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN		STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY	
			- SATURATED - (SAT.)	FROMERE	LIQUID; VERY WET, USUALLY LOW THE GROUND WATER TABLE		F FINE FIAD - FILLED IMMEDIATELY AFTER DRILLING FOSS FOSSILIFEROUS FRAC FRACTURED V VERY VST - VANE SHE W - MOISTURE C W - MOISTURE C		/EIGHT	VERY CAN BE CARVED WITH		AN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 25 mm R MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY		CK. PIECES 25 mm	TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
	LIQUIDLI	IMIT												ATCHED READILY BY	STRATA ROCK QUALITY DESIGNATION (S.R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY: TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 10 CENTIMETERS
			- WET - (W)		D; REQUIRES DRYING 1 PTIMUM MOISTURE	ю	EQUI	PMENT USED ON SUBJECT		FR	RACTURE SI	PACING	BEDD	ING	DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.
	PLASTIC	LIMIT	·		OLID; AT OR NEAR OPTIMUM MOISTURE		DRILL UNITS:	ADVANCING TOOLS:	HAMMER TYPE:	TERM	ş	SPACING	TERM	THICKNESS > 1 m 0.5 - 1 m 0.05 - 0.5 m 10 - 50 mm	TOPSOIL (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
	OPTIMUM		- MOIST - (M)	SOLID; AT			_ DIEDRICH D-50	CLAYBITS	AUTOMATIC X MANUAL	VERY WIDE WIDE		MORE THAN 3 m	VERY THICKLY BEDDED THICKLY BEDDED THINLY BEDDED VERY THINLY BEDDED		BENCH MARK: -BL-62: LOCATION -STATION 178+79.0m, OFFSET 17.3m RT,
	SHRINKA	GE LIMIT		DECUMPE				6" CONTINUOUS FLIGHT AUGER	CORE SIZE:	MODERATE CLOSE		LOSE 30 TO 100 cm 5 TO 30 cm			ELEVATION 41.910m
	l .		- DRY - (D)		PTIMUM MOISTURE	10	CME-550	8" HOLLOW AUGERS	-B	VERY CLOS		ESS THAN 5 cm	THICKLY LAMINATED THINLY LAMINATED	2.5 - 10 mm < 2.5 mm	
			PLASTIC	ITY			X CME-45 ON MARSH BUGGY	HARD FACED FINGER BITS			<u> </u>		DURATION		NOTES: Geotechnical Exploration
			PLASTICITY INDEX	(PI)	DRY STRENGTH			TUNGCARBIDE INSERTS	<u> </u>	FOR SEDIMENTA	OR SEDIMENTARY ROCKS, INDURATI		ING OF THE MATERIAL BY CEMENTING,		Performed By:
NONPLASTIC LOW PLASTICITY			0-5 6-15		VERY LOW SLIGHT		CME-55 ON BARGE	X CASING W/ADVANCER	U [#]	FRIABLE	ABLE		RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.		MACTEC
MED. PLASTIC HIGH PLASTIC			16-25 26 OR MORE		MEDIUM HIGH		PORTABLE HOIST	X TRICONE 7-9cm STEEL TEETH	HAND TOOLS: POST HOLE DIGGER	MODER	ERATELY INDURATED GR	ED GRAINS	GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE;		
	·		COLOR					TRICONETUNGCARB.	HAND AUGER			BREAKS	REAKS EASILY WHEN HIT WITH HAMMER.		MACTEC ENGINEERING AND CONSULTING, INC. 3301 ATLANTIC AVENUE
DESCI	RIPTIONS MA	Y INCLUDE COLO			D, YEL-BRN, BLUE-GRA'	Y)	TRAILOR			INDL	URATED		ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; T TO BREAK WITH HAMMER.		RALEIGH, NORTH CAROLINA 27604
MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.							OTHER	OTHER SIDE-DISCHARGE WING BIT	OTHER	ЕХТ	REMELY INDURATED	D SHARP	HAMMER BLOWS REQUIRED TO BREAK E BREAKS ACROSS GRAINS.	SAMPLE;	(919) 876–0416